Developing a Personal Vocabulary for Solo Double Bass Through Assimilation of Extended Techniques and Preparations

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Statement of Originality

This is to certify that, to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Thomas Botting
November 8th, 2018

Abstract

This research focuses on the development of a personal musical idiolect for solo double bass through the assimilation of extended techniques and preparations. The research documents the process from inception to creative output. Through an emergent, practice-led initial research phase, I fashion a developmental framework for assimilating new techniques and preparations into my musical vocabulary. The developmental framework has the potential to be linear, reflexive or flexible depending on context, and as such the tangible outcomes can be either finished creative works, development of new techniques, or knowledge about organisational aspects of placing the techniques in musical settings. Analysis of creative works is an integral part of the developmental framework and forms the bulk of this dissertation. The analytical essays within contain new knowledge about extended techniques, their potential and limitations, and realities inherent in their use in both compositional and improvisational contexts. Video, audio, notation and photos are embedded throughout the dissertation and form an integral part of the research project. Engagement with the media at appropriate junctures in the analysis is intended to enhance the narrative of the dissertation and facilitate a greater comprehension of the knowledge contained therein.

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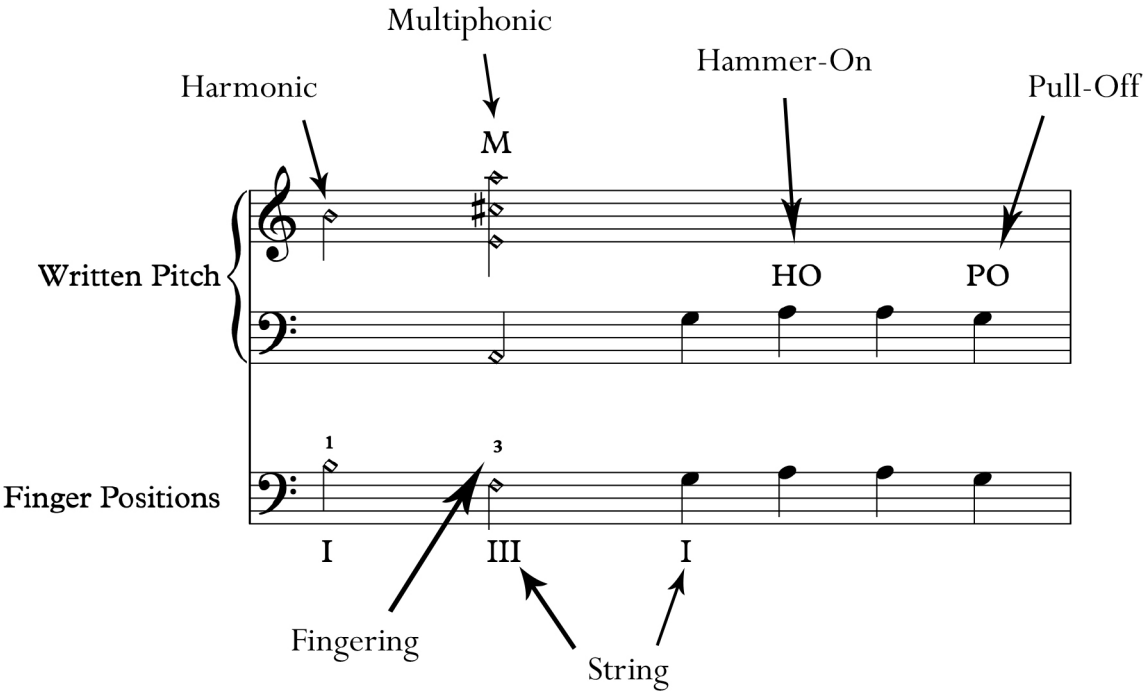
Notation Key

For this dissertation I decided to use a dual-stave notation system consisting of one or more staves depicting the *written pitch* of the intended notes and one or more staves showing the *finger position* or 'where' on the bass the techniques are executed. I devised this notation to try and communicate as clearly as possible certain physical aspects of how the techniques are performed and how they interact with one another. Specific notations for particular techniques, some existent and some new, will be explained at appropriate junctures throughout the dissertation, but several of the more common notations are illustrated below.



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Chapter One
Introduction

1.1 Introductory comments

This research has emerged from a desire to both deepen my knowledge of the double bass and its musical possibilities and to develop a personal solo idiolect on the instrument. I began playing double bass in 2009, the final year of my Master of Music degree, the previous 5 years of study having been conducted on bass guitar. From that point on, I became determined to become as proficient as possible at playing the instrument and to gain knowledge over its functions and possibilities. Eventually this course of action led me to relocate from New Zealand to Sydney, Australia at the end of 2011. Since then, I have made a living and career as a jazz double bassist and have had numerous performing, recording, composing and improvising opportunities. Audio 1.1, 1.2, 1.3 and 1.4 are excerpts from a selection of recordings I have been a part of during my time in Sydney so far, released by Tiny Hearts (*Alluvium*, Alluvium Records, 2014), The Jazzgroove Mothership Orchestra (*Fiddes vs. Tinkler*, Rattle Jazz, 2016), Antipodes (unreleased recording, 2015), and Jeremy Rose and The Earshift Orchestra (*Iron in the Blood*, ABC, 2016). These excerpts are intended to introduce my playing, improvising and composing.

Audio 1.1 Excerpt from *Balclutha* (T. Botting), released by Tiny Hearts

Audio 1.2 Excerpt from *Gaffer Work* (A. Fiddes), released by The Jazzgroove Mothership Orchestra

Audio 1.3 Excerpt from *Hidden Falls* (T. Botting), unreleased recording by Antipodes

Audio 1.4 Excerpt from *Tyranny and Van Dieman's Land* (J. Rose), released by The Earshift Orchestra

I first began thinking about exploring double bass extended techniques in 2013. At this time, I attended a solo performance by Mike Majkowski, a double bassist originally from Sydney who had recently begun to reside in Berlin. During this particular performance Majkowski played for around 30 minutes, completely improvised (as far as I am aware); he used a bow to execute a tremolo effect for the entirety of the performance, seemingly pulling overtones out of thin air, as well as several sounds and tones I could not

identify at that point. I consider this to be a defining moment in my personal musical trajectory. I had never witnessed nor heard anything that would have prepared me for the sounds and physical aspects to the work in question; it was, in every way, a revelation to my sheltered musical perspective. Eventually, Majkowski's performance lead me to undertake this research project, focusing on the timbral possibilities of the double bass, an instrument I had dedicated so much of my life to without realising anywhere near its full sonic potential.

Around the same time as becoming interested in extended techniques on the double bass, I began considering the development of a personal solo approach to the instrument. This interest arose as a result of watching and hearing Majkowski and fellow Australian bassist Clayton Thomas, which led to exploring the solo work of international bassists such as Mark Dresser, Stefano Scodanibbio, Bruno Chevillon, Håkon Thelin, Renaud Garcia-Fons, Jöelle Léandre and many more. It was through the meeting in my mind of these two new focuses that I began considering the possibility of developing a solo voice on the double bass through assimilating various extended techniques and preparations into my personal vocabulary.

I found initial experimentation in this area to be slow, sporadic and frustrating, due largely to the fact that I had no conscious processes in place for assimilating new techniques and devices into my performance practice. This led me to make two important decisions: the first was to develop a practice-based methodology for incorporating extended techniques and preparations into my musical idiolect; and the second was to document this process through the Sydney Conservatorium of Music's Doctor of Philosophy program. The doctoral framework, I surmised, would give me the structure and support I felt was necessary in order to properly develop practices and procedures to achieve my aims, and framing the research within this dissertation would, I felt, lead me to think more critically, and with greater focus, about the processes involved and any additional important factors.

1.2 Research methodology overview

1.2.1 Practice as research

This project follows a practice-based research model. The move towards formal acceptance of creative practice as research has been gathering momentum in research circles for several decades. In *Practice-led Research, Research-led Practice in the Creative Arts* (2009), edited by Hazel Smith and Roger T. Dean, the editors state that "creative work in itself is a form of research and generates detectable research outputs" (2009: 5). The deepening acceptance of practice-based research means that the need to justify such research projects in an academic sense has lessened considerably. The importance of such research is summed up by Estelle Barrett in *Practice as Research: Approaches to Creative Arts Enquiry*:

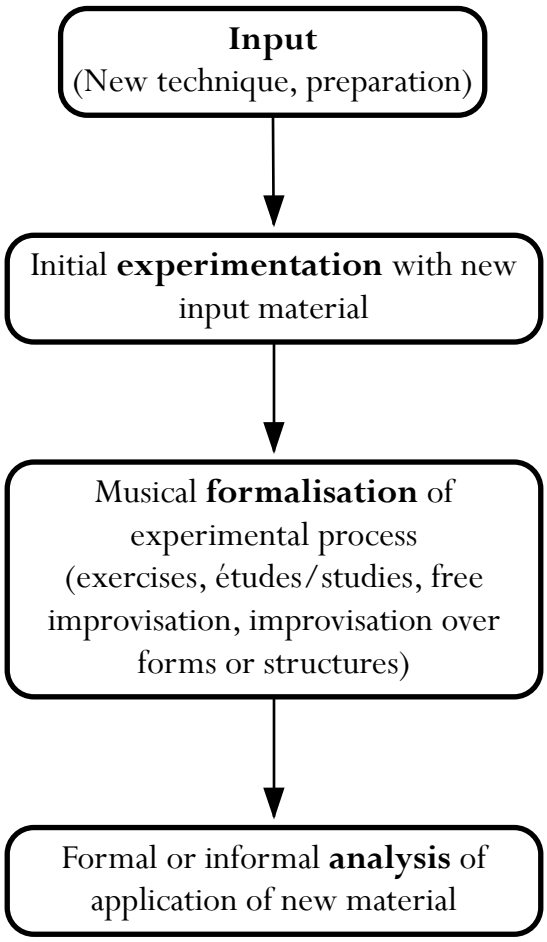
> *…practice led research is a new species of research, generative inquiry that draws on subjective, interdisciplinary and emergent methodologies that have the potential to extend the frontiers of research*.
> (Barrett in Barrett and Bolt, 2007: 1)

The research output for this project is intended to fall into two main classifications. The first consists of the creative output itself. This output is split into compositions and improvisations, which are disseminated through scores, videos, and audio recordings. The second research output classification consists of knowledge gathered as a result of analysis of the creative output. The two interrelated streams of research output fit with Smith and Dean's concept of practice-led research:

> *In using the term practice-led research, we as editors are referring both to the work of art as a form of research and to the creation of the work as generating research insights which might then be documented, theorised and generalised, though individual contributors may use this and related terms rather differently*. (Smith and Dean, 2009: 7)

Smith and Dean's assertion is that the practice-led research ideal works in both directions; that practice informs research and, likewise, research can inform practice. The way in which I developed a methodology for the primary focus of my research project was an example of these two directions in action. The initial phase of my creative practice consisted of experimentation with extended techniques that I was already aware of. The experimentation was then directed into one of two types of outputs: composition or improvisation. Following this, I began analysis of the creative outputs. These analyses were either *formal* analyses, which consisted of writing about the output, or *informal* analyses, where I would analyse the work as I played it or listened back to recordings. These analyses began to inform the next iteration of what was, at the time, mostly a subconscious process. Methods of dealing with problems garnered from analysing the creative process started to affect how I would deal with new problems arising from input of another technique or device. As I became more consciously aware of the processes that were unfolding, I formalised the process into a practice-based research methodology:

Figure 1.1 Personal practice-based research model for assimilation of extended techniques and preparations.



As Figure 1.1 shows, my creative research practice is split into four stages. The first and fourth stages align more with Smith and Dean's concept of *research-led practice*, whereas the second and third stages are situated more in the *practice-led research* context. This concept of a two way relationship between research-led practice and practice-led research is crucial. It represents what I believe to be a formalisation of processes inherent in musical practice which are becoming increasingly recognised as rich veins of research. In particular, two recent doctoral dissertations from contemporaries of mine at the University of Sydney Conservatorium of Music feature research methodologies similar to the one I have employed: Andrew Gander's *Developing a Polyrhythmic Idiolect* (2017) and James McLean's *A New Way of Moving: Developing a Solo Drumset Practice Informed by Embodied Music Cognition* (2017). McLean terms his methodology "The Practice/Research Cycle" (McLean 2017: 3) and differentiates between the academic and creative practice processes that form the four stages of his cycle. McLean's process shows clearly the inherent relationship between the two facets of his research, with academic theorisation leading into creative development and documentation, which leads into analysis, leading back into theorisation, and so on. Gander's methodology features a similar four-stage "iterative loop cycle" (Gander 2017: 57) as the second part of a two-part methodological process.

My own developmental framework, while similar to those of Gander and McLean in its conception and construction, is less *cyclic* than Gander's and McLean's; information gained from the analysis stage does not necessarily lead back into a new input. Knowledge garnered from the analytical output *can* inform subsequent iterations of the process; I have found, however, that each technique, device or preparation inputted into the framework often has its own particular set of parameters, and that issues arising from

their interaction and organisation with other extended techniques or normal techniques are necessarily particular to each application of the developmental framework.

1.2.2 Developmental framework

In Chapter 3 I will offer a more in depth explanation of my personal developmental framework, including examples of it in action; however, I feel that a brief explanation of each stage at this juncture is pertinent.

Input: The input stage consists of inputting a technique, device, preparation, or concept into the developmental framework. Much of the time, part of this stage involves the acquisition of the technique, which can come from singular or multiple sources. I have split these sources into *external input* sources, such as videos, instructional texts or audio, and *internal input* sources, which result from personal experimentation.

Experimentation: During the experimentation stage, I first practise executing the technique(s) in question, paying attention to any parameters that either pose organisational problems or can be exploited in various ways. Often during this stage I will devise formal or informal practise exercises in order to facilitate greater control of the technique as well as beginning to organise it in a musical setting.

Formalisation: In the formalisation stage I organise the technique(s) in a more 'formal' musical setting. The organisation can be presented in a variety of ways; études or studies, free improvisations, more structured improvisations, longer form compositions, or combinations thereof. If this creative output is situated more in a *compositional* framework, notation is devised and a score created. If the creative output is situated in an *improvisational* context, an audio or video recording is generated.

Analysis: Analysis of creative output from the formalisation stage can take one of two forms. *Formal* analysis consists of writing about the creative output, paying particular attention to problems arising from organisation of techniques in a musical setting and solutions to these issues, fixed and unfixed parameters, issues pertaining to switching between different techniques, and so forth. *Informal* analysis consists of real-time critical analysis while either listening to recordings or viewing videos of the creative output, reading through scores, or during performance itself. In both forms of analysis, the focus is on aspects such as the techniques themselves; how they interact with each other as well as normal performance practices; problems arising from organising them creatively; exploitable parameters; and real-time thought processes, rather than on the creative work as a whole.

1.2.3 The eBook format

The decision to present this dissertation in the eBook format was a straightforward one which had its beginnings in my initial research phase. The first stage of the developmental framework I designed for this project consists of external input of a technique. These techniques can be gathered from various source types, including visual, aural and text based. As I began to collect techniques to start the process with, I found certain ways of disseminating the information to be more effective than others, and each way to have its own strengths and weaknesses. I discovered purely text based descriptions of techniques to be particularly hard to decipher. I found it could be difficult sometimes to know if the sounds I was producing were what the writer was intending. Similarly, it was occasionally difficult when attempting to recreate a sound purely from a visual/aural source due to there being particular finger pressures, bow

techniques or other physical realities that might not be obvious without verbal or text based instructions. Therefore I decided that the best way to present my own research was in the form of a document with videos, audio files, graphics and photos all in-line with the text. I vehemently believe this to be the best method for accurately conveying specific musical techniques and devices of this sort.

1.2.4 Application versus execution: framing the research

The focus of this research is on the *application* of extended techniques and preparations rather than just the *execution*, although obviously the realities around execution play a part in application. This dissertation is not intended to be a taxonomy of extended techniques, nor an exhaustive list of other works containing them; rather, its aims are to:

a) document the process I have applied in order to broaden the possibilities of my own performance practice and develop my personal voice on the instrument;
b) document the creative output of the process; and
c) document any problem-solving processes or parametric insights through analysis.

The intended end result of this project has always been the creation of new music through process-driven assimilation of techniques and preparations, and I hope that by documenting the *process*, the *output* and any *problem-solving*, that I can offer a model on which other practitioner/researchers can use as a starting point or influence on their own developmental procedures.

1.3 Chapter Summaries

Chapter one closes with an overview of the double bass, followed by a glossary of terms and already standardised techniques and devices. I briefly map out the history of the instrument before discussing properties pertinent to this research, including physical properties, tonal sonorities, range and more.

Chapter two is a historical overview of double bass extended techniques and other related topics, including extended techniques on other stringed instruments and some discussion of instrument preparations. I trace the lineage of these techniques chronologically through instances in composed works, the development of the instrument, extended techniques or preparations on other instruments that can be or have been applied to the double bass, and the occurrence of jazz and improvised music and their interaction with extended techniques and the modern classical lexicon. The chapter concludes with a brief overview of the current era and the directions in which these aspects of the instrument and music have the potential to go.

Chapter three consists of a detailed explanation of my developmental framework, which makes up the bulk of my methodology. I present an overview of the research model before moving into the framework in action. I also offer examples of inherent flexibility and reflexivity built into the developmental framework.

Chapter four consists of analyses of compositional and improvisational works that have resulted from my methodological process. Each analysis begins with a video/audio recording of the work in question. I then offer a brief overview of the work before looking at individual techniques in action and discussing any difficulties that have arisen, as well as explaining the ways in which I have overcome, exploited or dealt with these difficulties.

Chapter five consists of my concluding remarks.

1.4 An introduction to the double bass

1.4.1 Overview

The double bass, contrabass, upright bass, or bass violin is a member of the violin family. While the octobass is technically the lowest member of the family in range, it is for the most part a curiosity relegated to historical instrument museums; for all intents and purposes, the double bass is the lowest voiced member of the violin family. Like the other members of the family, the double bass is a stringed instrument consisting at its most basic level of four strings that are generally activated by either drawing a bow across one or more strings (arco) or plucking one or more strings with fingers (pizzicato). The instrument is played by a performer, either standing or sitting on a stool of an appropriate height, who depresses the strings with their left hand to change the pitch of the string and activates the string's vibration with their right hand. The vibrations of the strings are transferred to a resonating chamber (the 'body') through a wooden 'bridge' positioned on a horizontal plane at a 45 degree angle to the body. The strings are tuned with metal mechanisms in located on the peg box at the upper end of the bass. From the peg box, the strings pass through a wooden 'nut' and over a long wooden 'fingerboard' upon which the performer depresses the string. Between the end of the fingerboard and the bridge is the area of the string upon which most arco techniques are performed; mid way between the fingerboard and bridge is considered *normale* bowing position, nearer the fingerboard is termed *sul tasto*, while nearer the bridge is *sul ponticello*. The four strings pass over the bridge through a series of small notches and are then attached by means of a loop or a ball end to the 'tailpiece', a piece of wood that is secured around the 'endpin', and held in suspension by the pressure of the taut strings.

1.4.2 Tuning System

The double bass differs in several important ways from the other members of the violin family. The first, and most striking, is the tuning system. Unlike the other members of the violin family which all (with the exception of the aforementioned octobass) have strings tuned an interval of a perfect fifth apart, the double bass's strings are most often tuned a perfect fourth apart. It appears a combination of factors led to this difference in tuning, but the most obvious reason is physical. The size of the instrument and the resultant string length means that the distance between the notes is much larger than on any of the other members of the family. Having the strings tuned to a fourth apart, rather than a fifth, means that the performer's left hand often does not have to move too much, due to the reduction in physical space between one 'open', or non-depressed, string and the next.

In comparison to the most famous member of the family, the violin, the double bass in its current and most used form is an extremely young instrument. The model of a four stringed instrument tuned E1, A1, D2, G2 did not become standardised until the 1920's, compared to the violin, which reached its final form in about 1580. All manner of three or four stringed models with an array of tuning systems were used up until this point, and indeed versions of the instrument tuned in fifths were still being used by jazz players such as Red Mitchell throughout the 20th century (and even to this day).

1.4.3 Notation

The double bass is a transposing instrument. Standard notation for the instrument is written an octave above sounding pitch, for ease of reading. Without the transposition, many of the instrument's notes would be up to four ledger lines beneath the standard bass clef stave. Because of the instrument's quite large range, other clefs may be utilised for certain passages or works, including tenor clef and treble clef. Once harmonics are brought into the equation, the range of the instrument is even wider, and may include several ledger lines above a treble clef stave (albeit still written an octave above standard pitch).

1.4.4 Range

Due to the lack of standardisation in double bass construction size and string scale length, it is difficult to fully define the range of the instrument. Complicating this is the occurrence of fingerboard extensions, which can be located at either end of the instrument's range and increase the lowest and highest possible notes. Furthermore, development of arco technique can allow skilled performers to play 'above' the end of the fingerboard in the area between the fingerboard and the bridge by fingering the *side* of the string and pulling very slightly. For the most part however, the 'standard' range of the instrument is from E1 to around C5.

Through the use of extended techniques, in particular subharmonic and harmonic techniques, the range of the instrument can be extended even further. There are a lot of parameters to factor in when using these techniques, however; examples include whether the note is arco or pizzicato, different string construction materials affecting execution of harmonics, tempo considerations, natural intonation of harmonics clashing with equal-tempered instruments, and so forth. With these factors in mind, the possible range becomes less a question of the *instrument's* range and more the *practitioner's* range within a particular musical context.

1.5 Glossary/Taxonomy

At this juncture I will discuss and explain some of the extended techniques I am attempting to assimilate into my compositional and improvisational vocabulary, as well other terms used throughout this dissertation. Some techniques are unique to the double bass while some are more universal to different degrees, although I will be viewing them in this context as double bass specific.[1] This section can then be used as a reference guide for later chapters featuring recurring mentions of specific extended techniques or concepts that may be unfamiliar to the reader.

Arco: *Arco* is the formal term for using the bow to generate sound by drawing the bow hair across the strings.

Col Legno: This term means literally 'with the wood' and refers to using the wood of the bow to generate sound. The term can be combined with registration directives such as *ponticello* or *tasto*.

Col Legno Battuto: This term signifies that the wood of the bow is used to hit or strike the strings.

Col Legno Tratto: Means 'drawn with the wood' and refers to drawing the wood of the bow across the strings.

1 Harmonics, for example, exist on most instruments but I will be defining and explaining them as they exist on the double bass.

Double Stop: 'Stopping' or fingering two notes with the left hand. The notes may be activated at the same time or one after the other; the crucial definition is that they are both *stopped* together. *Triple stops* and *quadruple stops* are self explanatory variants.

Dyad: A two note 'chord'; as in the two note version of the term 'triad'.

Fundamental: The pitch from which a particular harmonic series is produced. Traditionally this would be the lowest pitch available at any one location; however, subharmonic technique allows pitches below the fundamental to be sounded.

Hammer-on: Generating a tone by tapping the string against the fingerboard at a particular point with force.

Harmonic: The sound produced when activating a node on a string with the bow, pizzicato, or any other method of sound generation. The term 'harmonic' is used interchangeably with the terms 'overtone' and 'partial' throughout this dissertation. Most of the time I will use the term partial because particular partials can be more easily defined (1st partial, 2nd partial, etc). It is worth noting that the open string itself is the 1st partial; so the 2nd partial is actually the first overtone or harmonic. The numbering of the partial refers to how many parts the string is divided into when the partial is fingered. The 2nd partial has one node where it can be played, dividing the string in two. Similarly, the 3rd partial has 2 nodes where it can be played, dividing the string into three, and so on.

Multiphonic: In the context of this dissertation, the term 'multiphonic' refers to the activation of several harmonic partials at once due to a combination of left hand finger placement and a particular bow pressure and placement. I use several classes of multiphonic in this research, definitions and explanations of which will be provided at appropriate junctures in the dissertation.

Pizzicato: *Pizzicato* signifies that the strings are to be plucked with one or more fingers.

Pull-off: Generating a sound by using a left hand finger to pluck either another fingered note (behind the plucking finger) or an open string.

Registration: The vertical positioning of the bow along the string. There are several terms that come under this umbrella; *Normale* refers to the usual bow position between the end of the fingerboard and the bridge, *Sul Tasto* refers to positioning the bow higher up the string, generally above the fingerboard, *Sul Ponticello* refers to positioning the bow near to the bridge and *Sub Ponticello* means to bow between the bridge and the tailpiece.

Reverse Bowing: This term refers to bowing one or more strings from 'underneath'. The bow is positioned between the strings and belly of the bass with the hair facing away from the body. On a bass with a regular setup, it is only possible to play either the E or G strings (or both together) in this manner.

Scordatura: A term for an alternate or non-standard tuning system on a string instrument.

Stopped note: A normal fingered note, 'stopped' with a left hand finger. This term is used interchangeably

with the term ‘fundamental’ in this dissertation.

Subharmonic: In the context of this dissertation, the term ‘subharmonic’ refers to a tone produced ‘below’ or lower than the fundamental, an effect created by bow overpressure.

Chapter Two
Historical Context: The Expanding Tonal Palette

The purpose of this chapter is to establish a historical narrative of the development of extended techniques, instrument preparations and sound manipulation in music for the double bass and other western string instruments. It is my hope that a thorough grounding in the history of these techniques and their previous use in music will provide valuable insights into both new musical applications and the integration of new techniques, sounds and preparations into my own work and future contemporary works.

2.1 The Beginning

In influential bassist and educator Bertram Turetzky's groundbreaking treatise on double bass extended techniques *The Contemporary Contrabass* (1974), the author directs the reader's attention to the first printed method for viola da gamba, Silvestro di Ganassi dal Fontego's *Regola Rubertina* (1542). Although the viola da gamba and the violin families are in many ways vastly different, there are enough similarities between the two groups for us to draw comparisons between aspects of their performance.[1] Turetzky points out that in *Regola Rubertina*, di Ganassi makes mention of different kinds of bow registration and an explanation of the effects that varying vertical bow placement can have on tonal characteristics. As both sets of instruments are bowed in essentially the same fashion we can consider this to be the first printed reference to extended techniques in western bowed string instruments. Turetzky states:

> *Documented evidence is readily available to substantiate the concept that viol technique, complete with its arsenal of sounds and 'bag of tricks' was taken into the 'new' technique of the violin.* (Turetzky, 1974: viii)

Turetzky alludes to Carlo Farina's "Capriccio Stravagante" (1627) as evidence of this statement. Farina (ca. 1600-1639) was an Italian composer, conductor and violinist. He is credited with many important contributions to violin technique, some of which can be easily traced back to di Ganassi's method. For instance, Farina is often credited with inventing the double stop (Forsyth 1935: 315); however, sounding two or more strings at once was common practice for viol performers and is described in *Regola Rubertina* nearly a century earlier in 1542. In "Capriccio Stravagante", many such examples of Farina's adaptation of established viol techniques to the violin family method can be found. These include early instances of such extended techniques as col legno, sul ponticello, sul tasto, and sub ponticello. The use of these techniques in "Capriccio Stravagante" has been the subject of some rather critical analysis throughout history, seemingly in response to Farina's use of them to portray hens, roosters, cats and dogs as well as imitating other musical instruments such as fifes, drums, guitars and more. Boris Schwarz proclaims as recently as 1983 that "Capriccio Stravagante" is nothing more than "…a 'fun' piece…there is no use pretending that it had musical value" (Schwarz 1983: 35). Regardless of individual perspectives on the perceived musical value of the work, there is no question of its historical significance and the influence Farina had on the use of extended techniques in composition and performance.

1 There has also been ongoing historical debate about the origins of the modern double bass, as it shares characteristics of both the violin and viola da gamba families.

Other examples of extended techniques can be found throughout the remainder of the seventeenth century, particularly in the works of Heinrich Biber, Gasper Sanz and Johann Jakob Walther, all of whom wrote works in the late 17th century featuring similar mimicry of animals or other instruments to "Capriccio Stravagante". Biber's "Battalia" (1673), as well as employing the col legno technique, contains two techniques specifically for the double bass that are worthy of note. The first of these is possibly the earliest example of a preparation for double bass. The double bassist is instructed to weave a sheet of paper between the strings, in an effort to imitate the sound of a drum. The second double bass-specific technique in the work is the use of 'slap pizzicato',[2] which Biber utilises to emulate the sound of cannon fire.

2.2 A Worship of Sound

Turetzky asserts in *The Contemporary Contrabass* that a growing focus on applying characteristics of the *bel canto* style of operatic singing to the violin family throughout the seventeenth, eighteenth and nineteenth centuries developed into what he terms a "worship of sound":

> *The twentieth century is slowly beginning to see the dangers of the worship of sound and I see a circular movement back to the earlier concepts of Western instruments and further back to the very wellsprings of stringed instruments – the East.* (Turetzky, 1974: viii)

Turetzky's shrewd description of the historical narrowing of the tonal possibilities of the violin family until "the late nineteenth century, when sound becomes an end in itself" (Turetzky, 1974: viii) helps to put the many criticisms of Farina's extended techniques into context; if the highest art is inextricably linked to an increasing Western musical infatuation with "tone quality or beauty" (Turetzky, 1974: viii), then Farina's screeching cats and barking dogs, viewed in the light of centuries of 'sound worship', must surely be considered humorous dalliances rather than serious artistic expression.

Moving into the 18th century, examples of col legno, pizzicato techniques and registration based techniques such as sul tasto and sul ponticello become very difficult to find. The use of harmonics, however, became widespread, presumably because the tone of a harmonic was considered more in line with the rich, vocal-imitating beauty of the bel canto ideology. The French violinist and composer Jean-Joseph de Mondonville's "Les Sons Harmoniques, Op. 4" (1738) makes effective use of natural harmonics. A more refined and ambitious use of harmonic techniques (both natural and artificial) is found in "Minuet Sons Harmoniques" by another French violinist and composer, Joseph-Barnabé Saint-Sevin dit L'Abbé, who featured the piece in his influential treatise on violin techniques *Principes Du Violon* (1761). Harmonic techniques were also being applied to works for the double bass in this century, notably in Austrian violinist and composer Karl Ditters von Dittersdorf's "Concerto for Contrabass in Eb Major" (1761). The work of the great cellist Luigi Boccherini (1743-1805) in the second half of the 18th century is also worth noting. Boccherini made use of various extended techniques including sul ponticello, harmonics and tremolo in a successful bid to give a bass instrument a solo voice.

As conservatories began to spread throughout Europe, the emphasis on a particular interpretation of a 'beautiful' tone aesthetic continued to relegate most alternative timbres to the background for the

2 'Slap pizzicato' is often referred to as 'Bartók pizzicato', especially in classical music circles, due to Bartók's popularisation of the technique within the classical idiom.

duration of the 19th century. Sporadic instances of extended techniques can be found throughout the 1800's; however, almost every example from this period is of col legno, suggesting once again a narrowing of sonic possibilities. Francois Adrien Boieldieu's "Le Calife de Bagdad" (1800), Frédéric Chopin's "Piano Concerto no. 2" (1830), Camille Saint-Saëns' "Danse Macabre" (1874), Gustav Mahler's *Symphony No. 1 in D major* (1888) and Hector Berlioz's "Dream of a Witches' Sabbath" from *Symphonie Fantastique* (1899) all make use of the col legno technique, often in an attempt to depict something specific aurally. For example, in "Danse Macabre", Saint-Saëns uses the technique to evoke the sound of skeletons rattling.

2.3 Signs Of Life

In the last half of the 19th century, signs that extended techniques other than col legno were beginning to be reintroduced into the repertoire began to surface. A notable example is Hector Berlioz's "The Damnation of Faust" (1846), in which the second violins and violas are required to use the right thumb to play pizzicato four note chords. The pioneering work of the great bass virtuoso Giovanni Bottesini (1821-1889) is also worth noting. Bottesini further refined the use of harmonics on the double bass, composing long, lyrical melodies with harmonics, whereas most previous written examples of the technique had been largely arpeggio based.

The previous centuries' intermittent instances of col legno continued in the early 1900's, notably in Igor Stravinsky's "The Firebird" (1910) and Gustav Holst's "Mars: The Bringer of War" (1914) from *The Planets*. Other extended techniques continue to surface in this period however, showing that composers and instrumentalists were beginning to broaden their timbral horizons. Maurice Ravel makes use of harmonic glissandi in his works "Rapsodie Espagnole" (1908) and "Trois Poèmes de Stéphane Mallarmé" (1912). Edward Elgar's "Violin Concerto in B Minor, Op. 61" (1910) features the use of what Turetzky calls 'pizzicato tremolo' in the violin cadenza. The Italian double bassist and composer Isaia Billè (1874-1961) wrote a series of methods for the double bass, featuring many études that included groundbreaking use of harmonics across all four strings and harmonic double stops. Turetzky offers anecdotal evidence in *The Contemporary Contrabass* that David Walter, a colleague and teacher of Turetzky's, used extended techniques, extraneous percussion and preparations during a period in 1934-35 in which he was performing with a rhumba band. Turetzky quotes from a letter sent to him by Walter where the latter states:

> *I pizzed on (beats) 1, 4, 7; slapped (open-palm) the strings against the fingerboard on 2, 3, 6, 8; struck a hi-hat cymbal on 3 and 7; held a maraca in my right hand for 8-beat rattle; and kept a paper between fingerboard and strings with my left hand to get a 'jawbone' rattle.* (Walter, as cited in Turetzky, 1974: 34)

2.4 John Cage and the Prepared Piano

At this point I would like to make an aside from the linear historical narrative of string instrument extended techniques to briefly mention John Cage's work with the prepared piano. Cage's experiments with preparing pianos began in 1938 with the composition "Bacchanale", in which the piano is prepared with felt strips/wedges, 1 bolt, and 1 screw with nuts/washers. Cage was by no means the first person to prepare the piano;[3] in *John Cage's Prepared Piano: The Nuts and Bolts* (2008), Tzenka Dianova notes that Erik Satie had woven paper between the strings as early as 1913 in the piece "Le Piége de Meduse" and Henry Cowell had "experimented extensively with the inside of the piano" up until 1930 (Dianova 2008: 49).

3 Nor was Cage the first to prepare any instrument; as we saw earlier, Biber had prepared the double bass as early as 1673.

Both composers were very influential to Cage and must have sparked his interest in the idea of preparing the piano, but Cage himself took the idea much further, refining it into his own concept and composing some 38 works for the instrument between 1938 and 1954 with various stages and types of preparation, some of which were 'fixed' while others were not.

I believe it is worth noting Cage's work with the prepared piano because it lays the groundwork for the acceptance of the prepared double bass as a significant instrument for performance and composition in its own right. Cage's works have now been studied, written about, taught in conservatories and performed all over the world and I see this as a very real and important precedent for double bass preparation, which has been in fairly widespread use in the free improvisation world but has not yet, to my knowledge, enjoyed the same success in more formal musical situations.

After his extensive work with the prepared piano drew to a close in 1954, Cage began experimenting with some pioneering writing for strings using extended techniques. "26'1.1499" for a string player" (1955) features rapid changes in registration, including changing from sul ponticello to normale and then to tasto while the left hand sustains one note.[4] "Solo for Bass" from Cage's *Concert for Piano and Orchestra* (1957-58) calls for a constantly changing scordatura for the double bass. Cage also requires the bassist to use three mutes of different materials, although he does not specify which materials in particular they should be made from.

2.5 The 1950's, Turetzky and Penderecki

As the 1950's drew to a close, one of the most important events in the history of the double bass occurred: namely, Bertram Turetzky's call for composers to write for the bass as a solo instrument. In *The Contemporary Contrabass*, Turetzky discusses his frustration with the lack of solo material available for the instrument at the time. After considerable research turned up frugal results, Turetzky began to write to composers, entreating them to compose works for him and the instrument. Turetzky states:

> *In order to have accomplished this without foundation money for my commissions, as I did and still do, the composers had to hear something special in the demonstrations I played or taped for them (...) I had to look into the instrument and be able to show composers what was special about the contrabass. This is the genesis of my timbral research.* (Turetzky, 1974: viii)

By all accounts Turetzky's 'timbral research' certainly seems to have piqued many composers' attention. He asserts that over 150 works had been commissioned for him by the time he was writing the first edition of *The Contemporary Contrabass* in 1974. The earliest of these appears to be William Sydeman's "For Double Bass Alone" in 1959.

At this juncture I would like to make another aside from the linear narrative to briefly mention the works of Krzysztof Penderecki, which was unfolding concurrent with Turetzky's call for commissions. In 1959 Penderecki composed "Miniatures" for violin and piano. This work not only featured the use of sul ponticello and sub ponticello but also marked the beginning of Penderecki's influential compositional work using string instrument extended techniques. The next of these works, "Anaklasis" (1960), uses harmonics, tremolo, vibrato, col legno, pizzicati, tremolo glissandi and sul ponticello. "Threnody for the

4 This technique is named *transient sul ponticello* in Patricia and Allen Strange's book *The Contemporary Violin: Extended Performance Techniques* (2001).

Victims of Hiroshima" (1960), perhaps the most famous of Penderecki's works, went further, making use of sul ponticello, col legno, col legno battuto, sub ponticello, arco arpeggios on 4 strings behind the bridge, bowing on the tailpiece, bowing on the bridge, quarter tones and "striking the upper sounding board of the violin with the nut[5] or the fingertips" (Penderecki, 1960). Penderecki continued his timbral explorations in "Polymorphia" (1961), a work for 48 string instruments that features techniques such as col legno battuto, sub ponticello, bowing the bridge, bowing the tailpiece, microtones, tapping with the fingers between the bridge and tailpiece, two-fingered pizzicato (unusual at the time in music outside of the jazz idiom), striking the strings with the palm of the hand, tapping the soundboard with the fingertips, striking a wooden music stand with the bow and striking wooden chairs with the 'nut'.[6] Several more examples of this kind of writing can be found in Penderecki's compositional output throughout the 1960's, including "Fonogrammi" (1961) and "Capriccio per Oboe a 11 Archi" (1964). After this period, Penderecki seems to have ceased his experiments with string instrument extended techniques. This could be because he considers these techniques and sounds to be inextricably linked to the avant-garde movement, a style he purposely moved away from in the mid 1970's. Penderecki states:

> *The avant-garde gave one an illusion of universalism. The musical world of Stockhausen, Nono, Boulez and Cage was for us, the young - hemmed in by the aesthetics of socialist realism, then the official canon in our country - a liberation…I was quick to realise however, that this novelty, this experimentation and formal speculation, is more destructive than constructive; I realized the Utopian quality of its promethean tone.* (Penderecki, cited in Tomaszewski, 2000)

It is worth noting before moving on the contribution Penderecki has made to the notation of extended techniques, much of which has become standard notation for these devices throughout the printed literature.

2.6 The 1960's, the Double bass as a Solo Instrument, Jazz and Free Improvisation

The world of string instrument extended techniques, and double bass specific techniques in particular, opened considerably in the 1960's, with Turetzky's call for commissions seemingly the catalyst for this movement. It would be impossible in this chapter to discuss all the techniques used in this era and the compositions they can be found in, but a few words on the historical arc of the decade are necessary. As a result of Turetzky's entreatment, a host of composers began writing for the double bass in both solo and group settings, paying particular attention to the timbral opportunities the instrument presented as a result of alternative performance devices and methods. Composers such as George Crumb, Donald Erb, Barney Childs, Richard Moryl, Wayne Peterson, Peter Phillips, William Sydeman, Jon Deak and Jogi Yuasa created pioneering and challenging works for the instrument during the 1960's and into the 1970's. Alternative timbres and techniques, many never before seen in written work for the instrument, became a major part of the composer's palette. The rise in the use of 'contrabass percussion techniques', in particular, created a multitude of new rhythmic, polyrhythmic and polyphonic possibilities. 'Contrabass percussion technique' is a very wide descriptor, encompassing any number of different strike areas of the instrument (ribs, shoulders, tailpiece, strings, different areas of the body) and combining them with as many different 'sound generators', as Turetzky names them (nails, fingers, palms, knuckles, the bow, mallets).

5 I am not entirely certain what Penderecki means by 'nut' in this instance; I assume he means the screw of the bow, although I have never heard this referred to as a nut. Usually 'nut' in regards to string instruments refers to the piece of ebony that the strings travel over between the fingerboard and the pegbox.

6 See footnote 5.

I will discuss certain techniques in more detail in their respective chapters later on, but for the purposes of gaining an insight into the sheer volume and breadth of extended techniques in this period I will mention a select few. These include various scordaturas, harmonics both natural and artificial (also bowed and pizzicato), left hand hammer-ons, 'reverse bowing',[7] pulled harmonics[8], triple and quadruple stops, various registration changes, moving scordatura (tuning the string as it is being activated), and bi-tones[9].

During the 1960's, stronger connections between the jazz and contemporary classical worlds begin to appear. There had already been examples of both idioms influencing each other, such as the development of slap pizzicato by the early jazz bassists and Turetzky discovering the concept of 'pulled harmonics' through witnessing the prolific jazz bassist and composer Charles Mingus execute the technique in concert. Some more deliberate collaborations, however, began to emerge in the 1960's and early 1970's. These included Swedish composer Folke Rabe's 'Pajazzo for 8 Jazz Musicians' (1964) and Penderecki's 'Actions for Free Jazz Orchestra' (1971), a collaboration with The New Eternal Rhythm Orchestra, led by Don Cherry and featuring several other influential and important jazz musicians including Kenny Wheeler, Tomasz Stanko, Peter Brötzmann and Han Bennink.

The 1960's also marked the genesis of the 'free improvisation' movement, an evolution of free jazz that has often assimilated extended techniques and alternative timbres with great success. Early exponents such as Derek Bailey, Evan Parker, Kenny Wheeler, John Stevens and Eddie Prévost, and groups such as the Spontaneous Music Ensemble, the Association for the Advancement of Creative Musicians (AACM) and AMM, sought to distance themselves from the inherent stylistic expectations and perceived pitfalls of free jazz and improvise in a more style-free, non idiomatic manner. An event of particular note during the early years of this movement is the formation of Alexander von Schlippenbach's Globe Unity Orchestra in 1966. This influential group featured double bassist Peter Kowald, who would go on to co-lead the ensemble and become one of the most respected and influential bassists in the free improvisation scene. Two live recordings of the Globe Unity Orchestra from 1967 and 1970, although they were unreleased until 2001, document some early examples of double bass extended techniques in a free improvisation setting.

2.7 The 1970's and The Contemporary Contrabass

Several important events in the history of double bass extended techniques occurred in the 1970's. George Crumb's piece 'Black Angels' (1971) featured the first notated examples of subharmonics in string instrument literature. Crumb referred to the subharmonics as 'pedal tones'[10] and wrote the technique into the violin and viola parts. More detail will be spent on this technique in later chapters but essentially the technique consists of using bow placement, overpressure and a steady stroke to access various partials of the subharmonic series which exists in inverse to the harmonic series, 'beneath' the fundamental as it were.

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7 This technique consists of placing the bow upside down underneath the strings so as to activate the 1st and 4th strings together.

8 Pulled harmonic technique consists of bowing or plucking a harmonic and 'pulling' it away from the fingerboard or to either side to sharpen the note.

9 Bi-tone technique revolves around using both sides of a stopped note (ie, the side of the finger closest to the bridge and the side closest to the nut).

10 Crumb most probably named them 'pedal tones' due to their similarity in concept, execution and timbre to the brass instrument technique of the same name.

1973 marked the release of the aforementioned double bassist Peter Kowald's first album as a leader, *Peter Kowald Quintet*. This recording features many examples of double bass extended techniques and alternate timbres within a free improvisation setting. Much like the 1967 and 1980 recordings of the Globe Unity Orchestra, *Peter Kowald Quintet* serves as an important documentation of early applications of these techniques to improvisation.

In 1974 Turetzky published the first edition of *The Contemporary Contrabass*, one of the most significant treatises in the history of this field of work. *The Contemporary Contrabass*, in comparison to other treatises for double bass such as Franz Simandl's *New Method for the Double Bass* (1904) and Francois Rabbath's *Nouvelle Technique de la Contrebasse* (1977), focuses entirely on 'non-traditional' methods of double bass performance. The book references all the extended techniques known to Turetzky at the time of printing and gives examples of their use from the instrument's compositional literature. The examples are a particularly effective addition to the book, as they demonstrate to the reader practical musical applications of the techniques as they are being defined and taught. Turetzky also includes several techniques that, at the time of publication, had not yet made it into any composed works for the instrument. One of the most interesting of these is his discovery of pizzicato harmonic 'chords'. This technique is executed by placing the thumb of the right hand on a harmonic node and plucking with the first finger and thumb simultaneously, thereby sounding the fundamental of the string and the harmonic located at the node the thumb is resting on. This can be translated to artificial harmonics by stopping the string with the left hand, finding a node as per artificial harmonic technique, and executing the same right hand technique.

Influential Italian double bassist Fernando Grillo's experimentation with extended techniques culminated in his work "Paperoles" (1976) for solo double bass. This piece explores a large amount of techniques and timbres in a very short time. As Grillo's erstwhile student Stefano Scodanibbio put it, "Paperoles" is "a manifest where more than 30 techniques of the modern double bass are concentrated in just a little over 3 minutes, specifically notated almost to fetishism" (Scodanibbio, in Thelin 2011: 1-2). It is important to note the influence that Grillo had on his student and fellow Italian Scodanibbio, who would become a virtuoso bassist, composer, technical pioneer and one of the most important and original exponents of the double bass in the history of the instrument. In fact, Scodanibbio's "e/statico" (1980), one of his first compositions for solo double bass, builds on the timbral and technical advancements of his former teacher. "Paperoles" in particular was a huge influence on this piece; as Norwegian Academy of Music Research Fellow and leading authority on Scodanibbio's work Håkon Thelin puts it:

> *The similarity between the two pieces in their dissection and isolation of the sound object and in the elaborate notation of sounds and actions is striking. However, Scodanibbio would very soon abandon Grillo's style and notation, and instead adapt impressions from other contemporaries…* (Thelin, 2011: 2)

2.8 The 1980's and Scodanibbio

In 1980, Dennis Lane Woodrich completed a Master of Music thesis entitled *Multi-Nodal Performance Technique for Contrabass Harmonics*. In this work, Lane explores a phenomenon where, by fingering two harmonic nodes at once with the left hand, a partial is activated which is the multiple of the two fingered partials; that is to say, if the 4th and 3rd partials are fingered, the 12th partial will sound, and so on. This technique presents some interesting opportunities for the composer or improviser and, to my knowledge, has not yet been explored to the extent that it perhaps should.

From 1981 to 1983, Scodanibbio composed *Sei Studi*, a set of 6 short études. These pieces mark the development of the new style and techniques referred to by Thelin, particularly the often rapid interchanging of harmonics and ordinary tones that was to become a hallmark of Scodanibbio's work as a composer and performer. Scodanibbio continued to refine his techniques and composing until his death in 2012, writing works for solo guitar, cello, string quartet and other formats, as well as continuing his exploration of the double bass as a solo instrument. His advanced concept of harmonic techniques and its use in his composing led him to create what I believe to be one of the most original and unique bodies of work for the instrument.

Concurrent with these developments in the realm of what, for my purposes, I will term the 'classical' double bass,[11] the free improvisation movement was evolving and a host of new voices for the instrument were coming to the fore. Bassists such as Barry Guy, Barre Phillips, and William Parker from the 1970's onwards and Joëlle Léandre and Mark Dresser from the 1980's onwards stretched the instrument in often unpredictable ways, spurred on by the urgency of the improvising process.

As well as the use of extended techniques, the idea of preparing the bass began to surface in the playing of the free improvisers. Barry Guy's work in this field, in particular, was and continues to be extremely influential. Threading metal pipes between the strings and striking various points along the string length, Guy opened up a new world of sonic possibilities through his inventive preparations.

It can be observed that within this 'new school' of double bassists, both in the modern classical and free improvisation idioms, the lines between the two worlds become blurred. Scodanibbio, for instance, was known to be an excellent and avid improviser, and the likes of Guy, Léandre and Dresser each have a foot firmly planted in each camp. Guy, as well as being one of the most influential improvisers on the instrument, has held the principal bass position in several orchestras throughout his career and is a respected and prolific composer across a variety of genres. Similarly, Joëlle Léandre has worked extensively in contemporary classical settings as well as in jazz and free improvisation, with composers such as John Cage and Giacintov Scelsi having composed works specifically for her.

2.9 The 1990's

In the mid 1990's, the next important treatise on double bass extended techniques was published. French bassist and composer Jean-Pierre Robert's bilingual book *Les Modes De Jeux De La Contrabass - Un Dictionaries De Son / Modes of Playing the Double Bass - A Dictionary of Sounds* was first published in 1995. This work built on the foundation of *The Contemporary Contrabass* but featured many new additions to the repertoire of double bass extended techniques that had surfaced in the period between the two books. Robert's book was thorough and up to date, including descriptions, diagrams and tables of techniques such as bi-tones, micro intervals, lightly touched harmonics, multiphonics and artificial multiphonics, as well as spectral analyses of various sounds including both bowed and plucked multiphonics.

1995 also marked the release of the virtuosic double bassist, composer, improviser and academic Mark Dresser's first solo album, *Invocation*. Dresser's playing and writing, as with Guy and Léandre, spans any perceived gap between the improvisation and contemporary classical idioms. Dresser first came to

11 Obviously the term 'classical' does not do justice to the breadth of this music which is really just composed solo double bass music; however, this music has most certainly evolved and unfolded from the lineage of the western classical music tradition.

prominence in the 1970's as a member of Stanley Crouch's free jazz ensemble Black Music Infinity whilst concurrently performing with the San Diego Symphony Orchestra. Dresser studied with Turetzky at UC San Diego, earning a BA and MA and, it can be assumed, becoming interested in the timbral possibilities offered by the extended techniques that Turetzky was undoubtedly one of the leading authorities on. *Invocation*, recorded after 9 years and 9 recordings as a member of iconic free jazz multi instrumentalist Anthony Braxton's quartet, represents the distillation of decades worth of timbral research into a cohesive solo voice on the instrument. Dresser has recorded several other solo albums since then, including *GUTS: Bass Explorations, Investigations, and Explanations* (2010), a CD accompanied by a DVD of Dresser explaining and executing various techniques as well as a PDF file with written explanations and scores. Dresser has been particularly diligent in documenting his research. As well as *GUTS*, he has authored a chapter entitled "A Personal Pedagogy (2000)" for the book *Arcana: Musicians on Music* (edited by John Zorn) and two articles for the string instrument journal *The Strad*, "Double Bass Harmonics" (2008) and "Double Bass Multiphonics" (2009).

2.10 The 2000's

Norwegian double bassist and composer Håkon Thelin has contributed significantly to the field of double bass extended techniques, especially to harmonic and multiphonic technique. Much of Thelin's work was completed during his time as an artistic research fellow at the Norwegian Academy of Music and is documented in his project *A New World of Sounds: Advancements in Contemporary Double Bass Techniques*. As mentioned earlier, Thelin is a leading expert on Scodanibbio and this research project builds on the foundation laid by the great Italian bassist's work. Culminating in a series of essays entitled "A Folk Music for Double Bass", "Multiphonics on the Double Bass", "New Techniques - New Works" and "The Story of ZAB", as well as an album of original compositions inspired by the research entitled *Light* (2011), Thelin's research is interesting and well documented. His work with the late double bassist and acoustician Knut Guettler researching bowed string multiphonics, documented in Thelin's own research and the joint-authored article "Bowed-string Multiphonics Analysed by use of Impulse Response and the Poisson Summation Formula", is extremely thorough and ground breaking. Thelin continues to be an innovative composer and double bassist today and has released several more excellent albums under his own name and with various groups and contemporaries.

In 2010 Michael Duch, another Norwegian double bassist, composer and improviser, published the results of his tenure as an artistic research fellow at the Norwegian University of Science and Technology. The research project, entitled *Free Improvisation: Method and Genre* is a very intriguing discussion on the grey area between the terms 'composition' and 'improvisation', the definitions of these terms, and the nature of 'free' improvisation. In his conclusion, Duch presents an interesting paragraph that mentions the role of extended techniques in this music:

> *Asking whether free improvisation is a genre or not, has also raised some more questions rather than given many definite answers. It is experimental in the way that we cannot know the outcome of the other participants' reactions in advance, and its musical form is open with no fixed conclusions. Instrumental technique is commonly challenged by extended rather than conventional techniques, and these techniques might even be further extended as a direct result of freely improvising. It is idiomatic because we often can recognize it from its method of music-making, but it can also be said that it strives for being non-idiomatic as it can contain and be produced by means of any other musics and musicians with any musical background.* (Duch, 2010)

Duch's research offers insights into the nature of free improvisation, whether it is a type of music, a method of making music, or both, and its relationship with composition. I consider this to be important to my research as I am focusing on how extended techniques and devices affect composition, improvisation and what I consider to be the inherent relationship between the two.

Jeff Denson's 2010 DMA dissertation "Melodic and Chordal Applications for Harmonics on the Double Bass: A Study of Techniques, Chords, and Compositions" is a thorough treatise on double bass harmonics, with a detailed focus on *application* of the techniques rather than just their *execution*, including studies and études to facilitate a greater level of control and examples of practical use of harmonics through solo arrangements of two Duke Ellington works. Eric Daino's 2010 Honours thesis "The Double Bass: A Technical Study of Timbre" features a detailed taxonomy of double bass extended technique and methods for their generation, building on the work of Turetzky and Robert in particular.

2.11 Present

In the last decade and a half the use and refinement of extended techniques, preparations and modifications, and sound manipulation, has continued to progress. Dresser's development of a pickup system mounted inside the neck of the bass has allowed him to explore the world of bitones and other 'neck only' tones such as left hand hammer-ons and any other sounds not easily transferred to the resonating chamber of the body. Eivind Opsvik, yet another Norwegian double bassist and composer, has created some interesting solo work for the double bass using various effects pedals, a loop station and extended techniques. Léandre, Guy and Parker are still active performers and composers, Kowald was still active until his death in 2002, a new generation of multi-idiom double bassists has surfaced including David Leahy and Dominic Lash, and at the time of completion of this dissertation Phillips has just announced his retirement from performing. Thelin continues to refine his concept of a 'folk music for the double bass'. The world of prepared bass has flourished greatly in this time, producing excellent exponents such as France's Bruno Chevillon, Pascal Niggenkemper, Sean Ali, the late Matthew Sperry, and local performers Clayton Thomas and Michael Majkowski, although the latter, now based in Berlin, has more recently been focusing on extended technique-based work. And, of course, there are many more excellent double bassists, composers and improvisers working in this area. The lines between improvised and composed music continue to be blurred with many performers and composers working across both fields, and the definition of an 'extended technique' continues to shift as more and more devices that were once considered 'extended' become mainstream performance practice. Now, more than ever, there is a world of tonal colours at our disposal as modern improvising composers; it just remains to harness them into a cohesive musical vocabulary through analysis, understanding and application.

Chapter 3
Developmental Framework

3.1 Introductory comments

In Chapter One, I offered a brief explanation of the developmental framework I devised as a method for assimilating extended techniques and preparations into my personal musical idiolect. The creation of this developmental framework was emergent, and is a result of informal practice-based research experimentation.

3.1.1 Emergence of developmental framework

When beginning this research project, I initially avoided creating a formal practice-based methodology. Instead, I gathered information about extended techniques and preparations and began experimenting with them. Gradually, I began to pay more attention to particular processes I was implementing and which processes I found personally more effective than others. Eventually, I distilled the individual processes into a four-stage developmental framework.

In this chapter, I lay out a more detailed description of the developmental framework, breaking it down stage by stage and describing the intricacies of each step. Following this, I offer an example of the framework in action, again breaking it into stages and looking at each step individually and how they relate to and lead into each other.

While the overall direction of the developmental framework is linear from one stage to the next, there is inherent flexibility built into its structure. The entire process need not be adhered to on every occasion; there have been instances wherein I have discontinued the process part way through. There have also been occasions where an *external* input technique has led to the development of an *internal* input technique, at which point the framework has been restarted with a stream for *each* inputted technique.

3.2 Stage One: Input

The input stage consists of selecting a particular (or combination of) technique or preparation for input into the developmental framework. There are two main classes of input types from which the selection can be made:

3.2.1 External Input

External input techniques are gathered from one or more sources outside of myself as a practitioner. There are several subcategories of external input sources which I have used throughout the project:

Text-based: Text-based input techniques are gathered from reading books, journal articles or online sources. Often, these texts are not accompanied by any kind of audio or visual material and I must attempt to execute the technique in question from descriptions alone. Texts such as Turetzky's

The Contemporary Contrabass, Robert's *Modes of Playing the Double Bass: A Dictionary of Sounds*, Strange and Strange's *The Contemporary Violin*, and Dresser's articles and essays have all proved invaluable to me as sources for input techniques.

Visual-based: Visual-based input sources consist of live performances or video documentation of performances featuring extended techniques or preparations. Following the viewing stage, experimentation is conducted in order to try and recreate a particular technique from the performance. I have found visual sources to be a particularly effective way to source input techniques, due to the combination of visual and aural information; being able to both *hear* and *see* the technique in action aids the replication process immeasurably.

Audio-based: Audio-based input sources consist of audio recordings, from which I select one or more techniques or sounds to attempt to replicate. This form of input has become more effective as my personal knowledge of extended techniques has grown; it has become easier to identify common aspects of techniques through aural information alone which has in turn led to more effective paths to imitation, recreation and development.

All three subcategories of external input sources have the potential to lead to original techniques or personal developments of a technique, examples of which will be offered both in this chapter and the analyses in Chapter 4.

3.2.2 Internal input

Internal input techniques are either (to the best of my knowledge) original techniques or original developments of existing techniques. Generally, internal input techniques emerge from one of two processes:

Experimentation: This process involves extensive theorisation and/or experimentation. The experimentation process can either be *conscious* experimentation, in which I consciously set out to attempt creation of a new technique or preparation, or *emergent* experimentation, in which new techniques or preparations emerge from improvisational or compositional experiments.

Development: This process involves original development of an existing technique or preparation. Similar to the experimentation process, the development process can be *conscious* development, in which I consciously set out to attempt development of an existing technique or preparation, or *emergent* development, in which development emerges from improvisational or compositional experiments.

3.3 Stage Two: Experimentation

The experimentation stage of my developmental framework involves a lengthy process of both theorisation and practice-based research involving the technique in question. Generally, the experimentation stage is an informal process on which the third stage of my developmental framework is built; however, there are several recurring processes that I have found myself gravitating towards at this stage of development. The two main recurring processes are:

Development of practise exercises: These practise exercises are designed to help facilitate a greater

technical control over the technique in question. The practise exercises can be organised both *formally* and *informally*, depending on the requirements; certain examples I have found it useful to notate, whereas others can be more easily visualised and/or memorised

Locating fixed or unfixed parameters: This process involves experimentation with the technique in question with a focus on aspects of the technique that are either *fixed* or *unfixed*. *Fixed* parameters are aspects of a particular technique that are unable to be changed, while *unfixed* parameters are aspects that have varying degrees of flexibility.

3.4 Stage Three: Formalisation

The formalisation stage of my developmental framework consists of a more formal application of the technique or techniques to a musical situation. This formalisation can take one or more of several forms:

Études or Studies: The études are short compositional works for the purpose of gaining technical mastery over a technique, group of techniques, preparation or a combination of the three.

Compositions: These works are longer in form and less restrictive in terms of which or how many techniques are utilised.

Improvisations: The improvisations are generally completely freely improvised; however, there have been occasions where improvisations have emerged from a melodic cell or theme that I have been working on.

3.5 Stage Four: Analysis

The analysis stage consists of critical and reflective analysis of aspects of creative output resulting from the formalisation process. The aim of this stage is to draw conclusions about specific realities when dealing with organising extended techniques in a musical way. The analyses can take one of two forms:

Formal analysis: As described in Chapter One, *formal* analysis consists of written critical analysis of a work with in depth insights into how techniques work in a musical setting, how they interact with other techniques or normal performance practice, any problems as a result of organising the techniques in a musical setting, solutions or methods for dealing with these issues, and so forth.

Informal analysis: This type of analysis involves thinking about aspects of a work in real time and formulating conclusions about the organisation of the techniques and how they are functioning musically Informal analysis is usually the first type of analysis I perform, as often I begin to analyse aspects of a technique, work or phrase during the process of developing it in a musical context. The informal analysis can then lead to a formal analysis or not, depending on how necessary I believe it is to document it in essay form.

3.6 Developmental framework in action: Multiphonics

By way of an example, this section endeavours to show my developmental framework unfolding through specific instances of the framework being applied.

3.6.1 Input

String instrument multiphonic technique was first bought to my attention while reading Dresser's article "A Personal Pedagogy" from *Arcana: Musicians on Music*. As such, multiphonics were, initially at least, a *text-based external input* source for the input stage of my developmental framework. As an example of the inherent flexibility in my developmental framework, in the case of multiphonics I began initial experimentation having only the aforementioned text description to use as a source. During the experimentation stage, however, I discovered another text source (Dresser's article "Double Bass Multiphonics" for string journal *The Strad*) as well as a video source (Dresser's instructional DVD accompaniment to his album *Guts*). These sources contained more information about execution of the technique and the intricacies surrounding it, as well as offering visual, aural and verbal knowledge. In this case, I restarted the developmental framework, having garnered a greater understanding of some of the practicalities surrounding multiphonic technique.

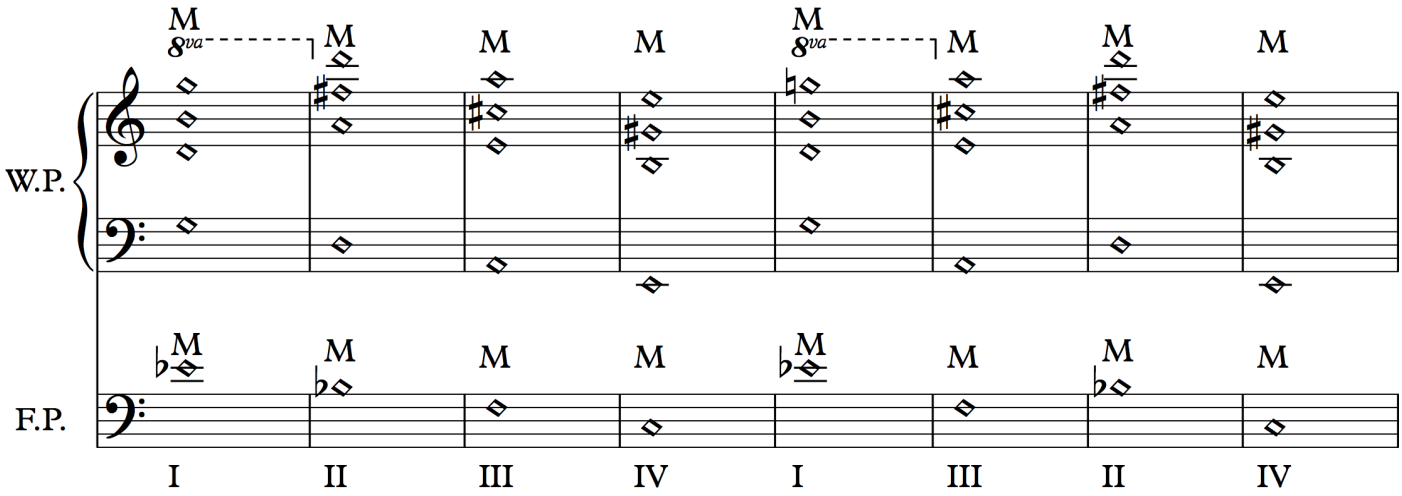
3.6.2 Experimentation

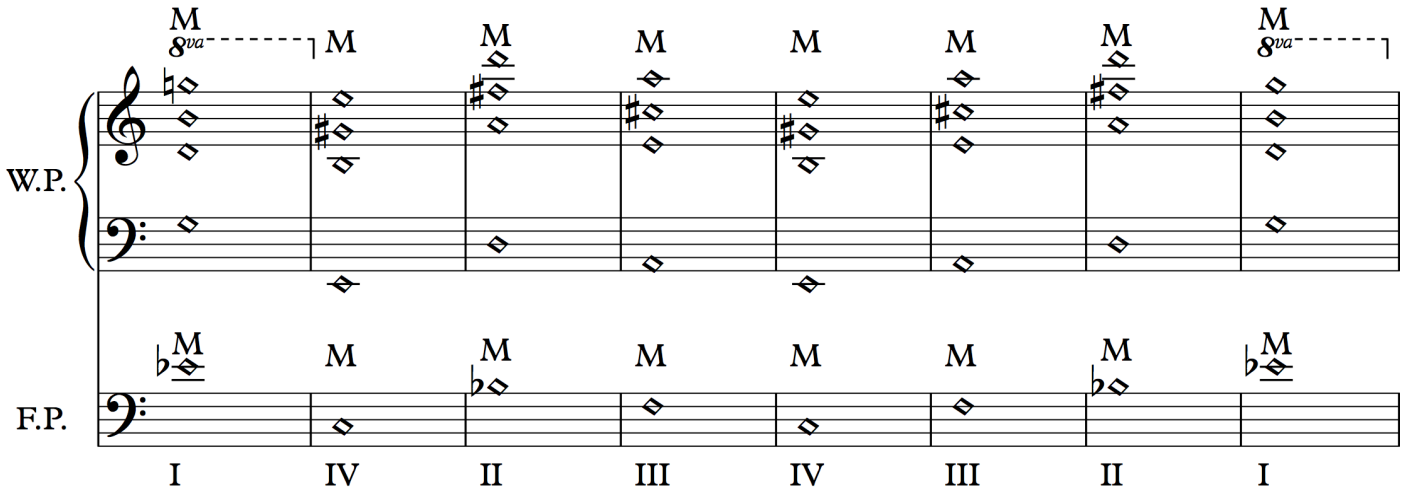
The multiphonic experimentation stage took various forms. At first, I focused on just learning how to execute the particular multiphonic described by Dresser in "A Personal Pedagogy":

> *1) Place the left hand finger touching broadly but lightly at the D* (sic)*, an augmented fifth above the open G string and play the natural harmonic. This corresponds to the 8th partial, very near to the 19th, 13th, 18th, 11th, 14th, 17th, 3rd, and the 5th partials. 2) Draw an energetic bow stroke placed midway between the fingerboard and the bridge. (…) a more subtle bow force interrupts the normal vibration of the string* (Dresser, in Zorn: 258)

Using the description given, and subsequently further information gathered from "Double Bass Multiphonics" and the *Guts* DVD, I commenced attempting to effect the specific multiphonic in question. Once I was able to execute the technique at the location specified on the G string, I began to experiment with multiphonics at the same location on the other strings. I then developed this initial experimentation into an exercise.

Figure 3.1 Multi-nodal multiphonics exercise 1





Taking Dresser's description of the multi-nodal method of multiphonic creation, I experimented further with other possible multiphonic locations, beginning with particular locations he had specified in his writings before attempting my own versions. Similar practice exercises to Figure 3.1 emerged as a result of this process, examples of which are shown in Figures 3.2 and 3.3.

Figure 3.2 Multi-nodal multiphonics exercise 2

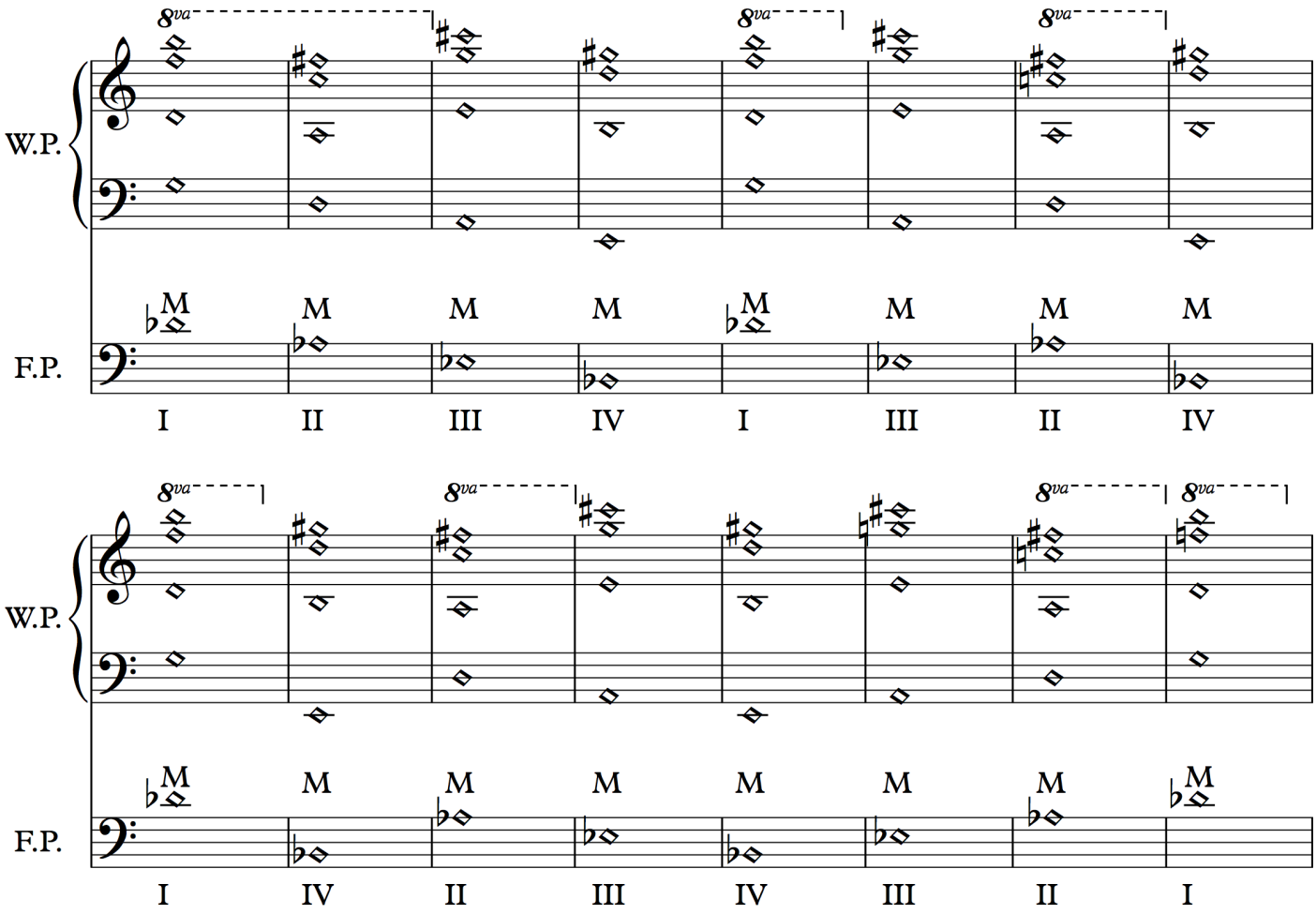
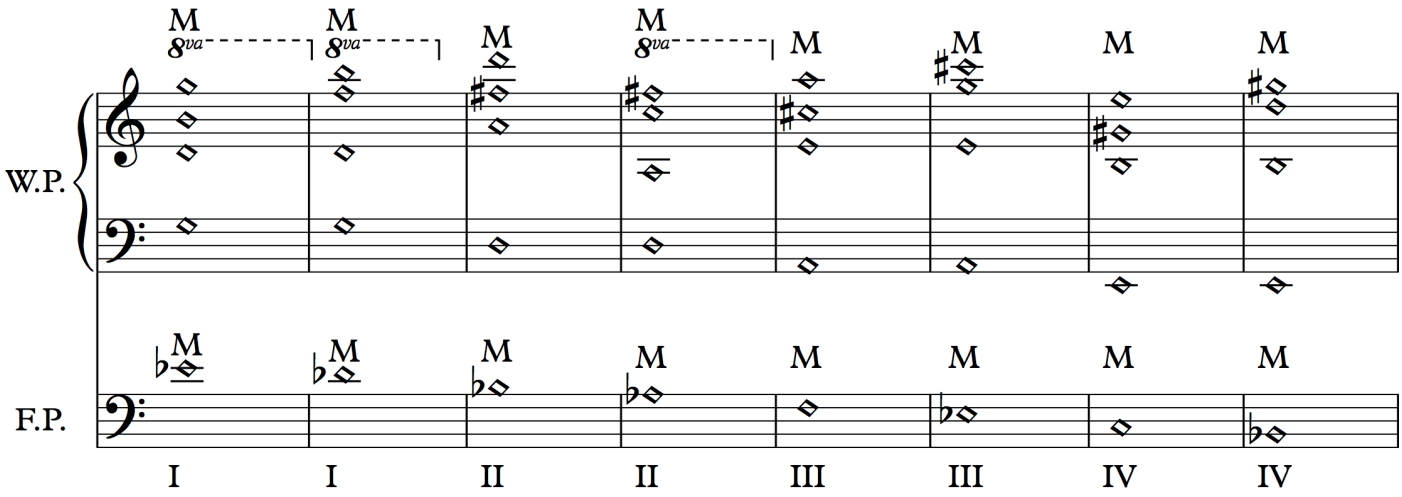


Figure 3.3 Multi-nodal multiphonics exercise 3



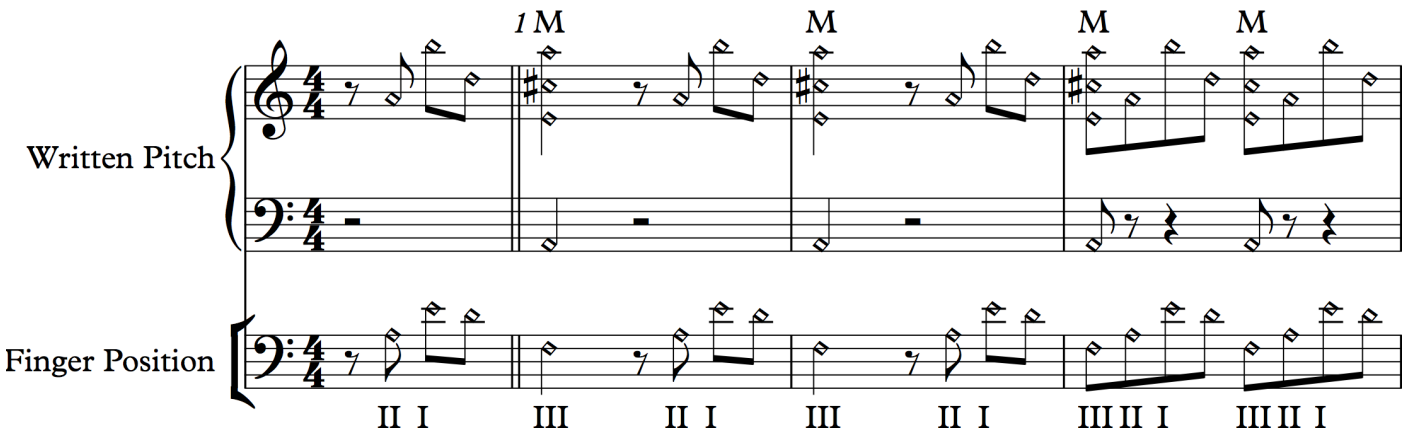
While conducting initial experimentation and creating practise exercises, I made sure to pay attention to what parameters of the multiphonic technique were *exploitable* in various ways, a process that involves both theorisation and practical methods. For example, with multi-nodal multiphonic technique the available set of multiphonics are limited by two things: 1) the harmonic series of each string and 2) which nodes are close enough to one another to be activated with one left hand finger. These two parameters can be adjusted through various methods. The notes of the harmonic series can be adjusted by changing the pitch of the string, either through retuning/scordatura or stopping the string in some manner. Stopping the string can also affect which nodes are close enough together to be activated with one left hand finger; the shorter the vibrating length of the string, the closer together physically the nodes become. Whether the method of exploiting a parameter emerges from a theorisation process or a practical process, I conduct more practical experiments to determine if and how it functions in reality. These experiments can lead to practise exercises.

Another key part of the experimentation stage is beginning to test how the technique in question interacts with other techniques, whether extended or regular. In the case of multi-nodal multiphonics, I started experimenting particularly with how multiphonics both related to and differed from harmonics.

3.6.3 Formalisation

The formalisation stage often emerges directly from the experimentation stage. Particular practise exercises I have created can lead to development into an étude or study; parametric exploitation can lead to improvisation; interaction with regular performance techniques can lead to longer form compositions, and so forth. In the case of multi-nodal multiphonic techniques, exercises designed to facilitate greater skill at alternating between harmonics and multiphonics led to the creation of a simple opening phrase which, with development, became the basis for an étude entitled *Study in Harmonics and Multiphonics #1*.

Figure 3.4 *Study in Harmonics and Multiphonics #1* opening phrase



If, as in this example, the formalisation stage takes the form of a composition, I generally devise a notation system for the work.

3.6.4 Analysis

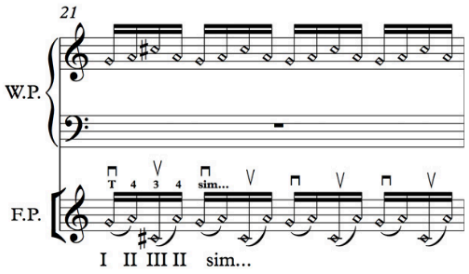
The analysis stage, as already alluded to, can take the form of either *formal* or *informal* analysis of creative output from the formalisation stage. Examples of the formal analysis category are included in Chapter Four. In the case of *Study in Harmonics and Multiphonics #1*, I first conducted informal analysis, initially while composing and practising the work and later while listening back to a demo recording. During this process, I focused on aspects such as difficulty of execution, physical issues, differences in execution between techniques and more. I then developed formal analysis, drawing on conclusions of the informal analysis and writing them into an essay setting, which is included in this dissertation as the first example of analysis in Chapter Four. The essay is presented in a multi-modal eBook format, with video, audio, photos and scores inserted inline as necessity dictates:

Figure 3.5 *Study in Harmonics and Multiphonics #1* analysis example

The facet of this passage I found the most challenging is the alternation between the natural harmonics and the two types of multiphonics. Each technique in this passage has its own specific intricacies regarding bow placement, weight, stroke speed and left hand technique. I will discuss the execution of the multiphonic techniques and the peculiarities involved in alternating between them and the natural harmonics in their respective sections later in this analysis.

The next passage of *Study in Harmonics and Multiphonics #1* I would like to discuss with regards to arco natural harmonics begins at section 3. Section 3 is based around a pattern where each bar consists of a group of four sixteenth note harmonics that is then repeated three times. In most cases the three harmonics are spread across three strings and should be allowed to ring throughout, giving the effect of a 'static' chordal texture behind the more frenetic sound of the sixteenth notes.

Figure 4.2.6 *Study in Harmonics and Multiphonics #1* bar 21



Video 4.2.4 *Study in Harmonics and Multiphonics #1* bars bar 21

As can be seen in Figure 4.2.6, I have specified fingering in the notation. In order to allow the harmonics to sound for as long as possible, the left hand fingers must remain stationary throughout the bar and some of the melodic patterns in this passage require very specific fingerings. The example above requires the 2nd partial on the G string to be activated with the thumb, the 3rd partial on the D string with the 4th finger, and the 5th partial on the A string with the 3rd finger.

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3.7 Developmental framework flexibility and reflexivity

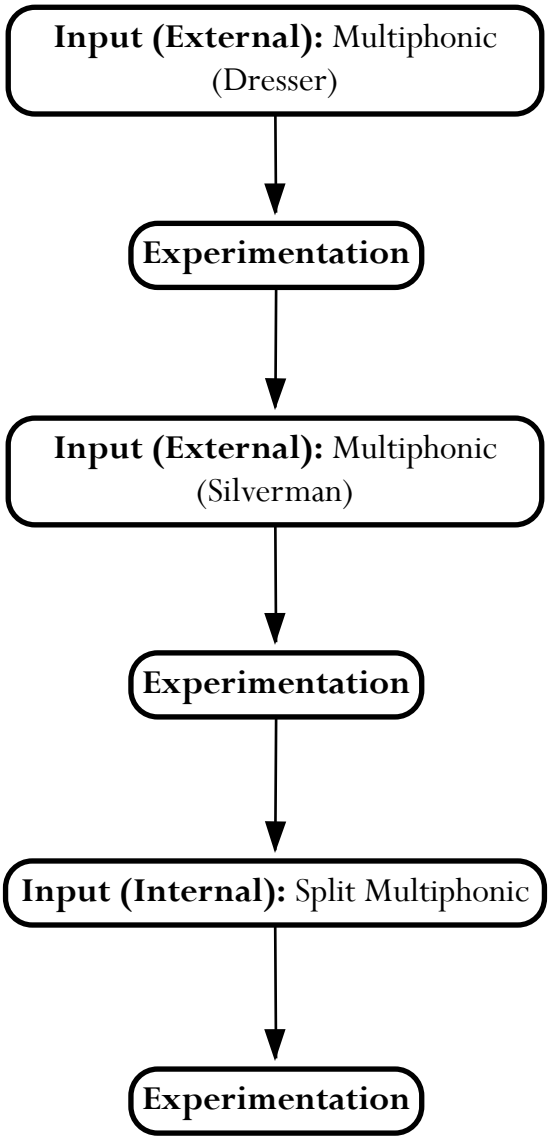
The example of multiphonic technique inputted into my developmental framework has so far been a linear approach. In this section, I would like to examine examples of the flexibility of the framework, its potential for reflexivity, and how they can be used to widen my personal musical idiolect.

3.7.1 External input leading to internal input

As explained in the previous section, after initial experimentation with the multiphonic technique learned from the external input source of Dresser's article "A Personal Pedagogy", I restarted the process after gaining more knowledge about its execution from other external sources. As part of this source-gathering, I read a passage in Strange and Strange's *The Contemporary Violin* that explained a different kind of multiphonic technique. Through inputting this new external input technique into the developmental framework, I developed what I believe to be a new technique during the experimentation stage. At this point, once again, the developmental framework was restarted, this time with an internal input technique

developed through initial stages of the developmental framework.

Figure 3.6 External input leading to internal input through reflexive use of the developmental framework

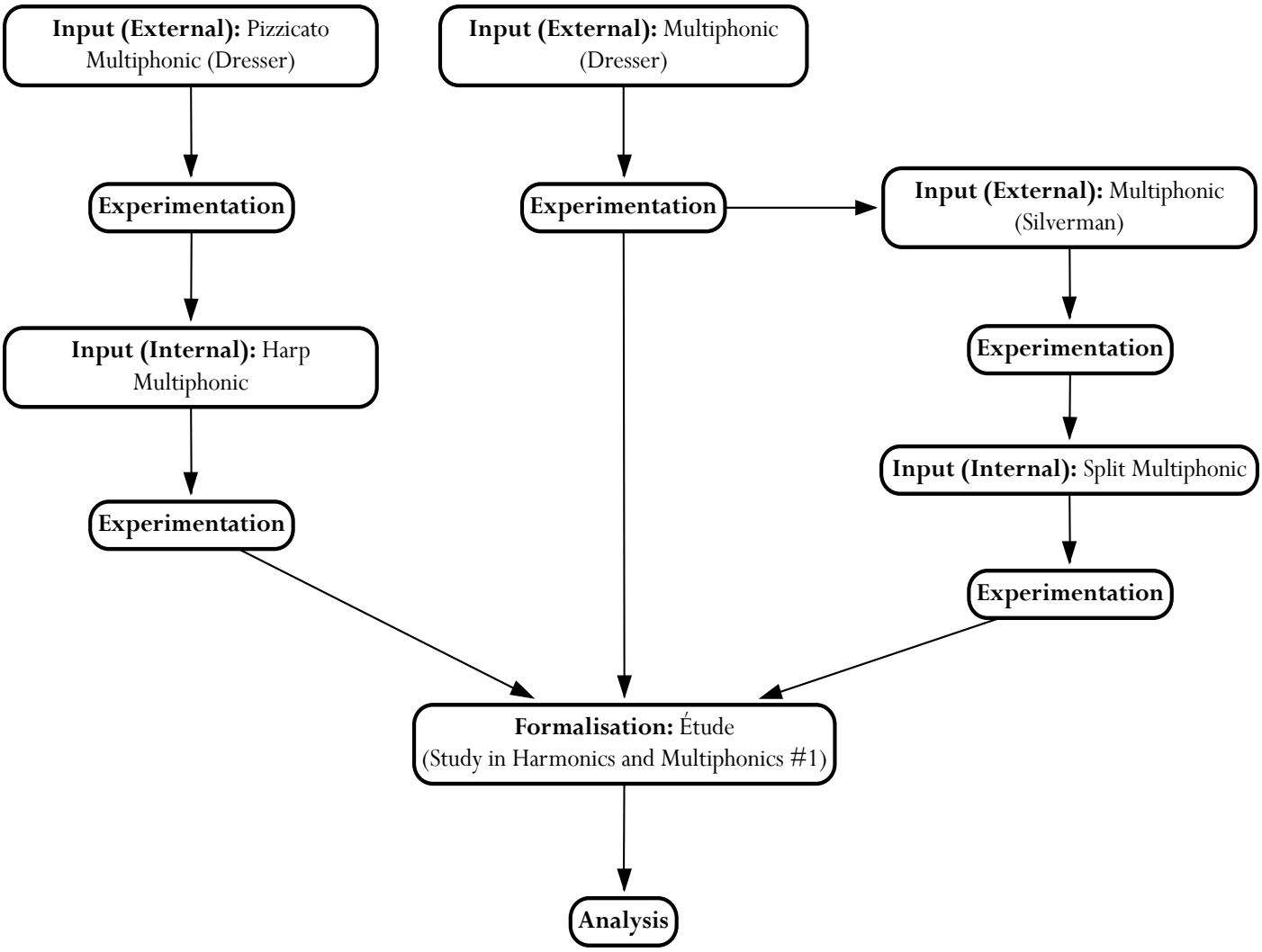


Eventually, the two types of multiphonic converged with several other techniques in a creative output, the aforementioned étude *Study in Harmonics and Multiphonics #1*.

3.7.2 Convergence of separate streams of developmental framework

Another example of flexibility inherent in my developmental framework can be seen in the way in which several different passes through the framework converge in a shared formalisation stage. Figure 3.7 shows initial divergence in the process through experimentation leading to reflexivity. As these new streams diverge from the initial input, their offshoots each go through the experimentation process; however, the streams converge in the formalisation process, where the aforementioned étude *Study in Harmonics and Multiphonics #1* is the culmination of the practice-based stages of the developmental framework.

Figure 3.7 Example of different streams, single stream divergence and convergence in developmental framework



In hindsight, the inherent flexibility and reflexivity in the developmental framework has led to what I believe to be a 'deeper' assimilation of extended techniques than would have been possible without this particular formalisation of the process.

Chapter 4
Analytical Essays

4.1 About the analytical essays

The analyses in this chapter form part of the 4th stage of my developmental process. They are situated within the *formal* branch of analysis and are both informed by and separate to the *informal* branch. This chapter contains analyses of seven works that have emerged as creative output from my developmental framework.

The following analytical essays represent the bulk of this dissertation. The practical application of extended techniques to musical situations in order to facilitate creative output has, to my mind, presented the most interesting facets of this research, and the most scope for further development. The flexibility and reflexivity of my developmental framework means that the analysis stage has the potential to lead back into the input or experimentation stages, due to new techniques or new discoveries relating to organisation of particular techniques or groups of techniques interacting with one another.

The analyses are not intended to be a completely exhaustive look at the works as a whole, nor an explanation of every specific detail; rather, the intent is to discuss physical or musical aspects of the work that I have found to be challenging or to have required problem solving and possible solutions to these issues, as well as focusing on methods of organising extended techniques in a musical context.

The analytical essays are generally situated within one of two classes, *compositional* analysis or *improvisational* analysis, although there are often elements of both in a particular work. The essays themselves do not follow any particular critical analysis models. They are intended to be flexible, organic discussions of aspects of each work such as processes, practical concerns, musical restrictions or limitations and physical issues.

4.1.2 Compositional analyses

The compositional analyses are accompanied by a video of the whole work, shorter videos illustrating specific sections or passages, notation, and photos. I generally break the analyses up into sections focusing on particular techniques, classes of techniques, or specific interactions of techniques; as such, the same passage may be analysed more than once in the analysis as focus on a particular technique or group of techniques is shifted.

4.1.3 Improvisational analyses

The improvisational analyses are accompanied by videos of the improvisations unfolding in real time, excerpts from the original video inserted into the text at pertinent moments, and notated transcriptions of relevant passages or techniques. Through watching the videos and listening to the aural information contained within, I draw conclusions about thought processes, physical processes and technique interaction realities that become obvious as they emerge. The process of analysing improvisations has the potential

of uncovering real-time problem solving, due to a lack of premeditation regarding the organisation of particular groups and types of techniques together.

4.2 Analysis: *Study in Harmonics and Multiphonics #1*

Video 4.2.1 *Study in Harmonics and Multiphonics #1*

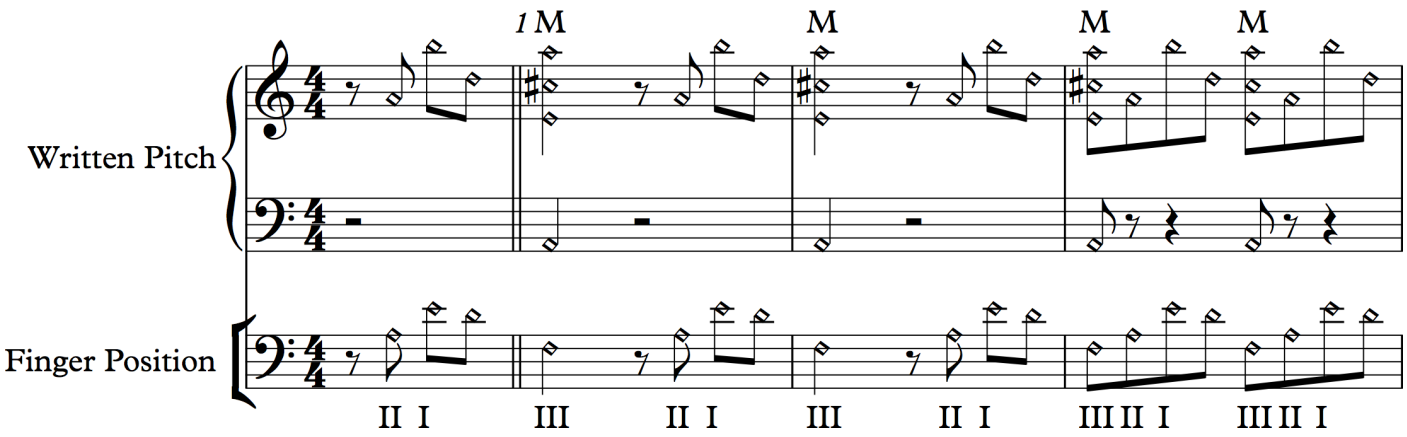
4.2.1 About the Work

Study in Harmonics and Multiphonics #1 is a quasi-rubato work almost entirely composed using harmonics and multiphonics, both arco and pizzicato. It consists of three contrasting sections with a D.C. al Fine or a second exposition of the first section. The first section is built around arco harmonics, arco harmonic double stops, and two distinct types of multiphonics. The second section utilises left hand hammer-ons, harp harmonics, harp harmonic double stops, and a harp multiphonic which is, to the best of my knowledge, an original technique. The third section consists of fairly rapid harmonic arpeggios across three strings.

4.2.2 Notation

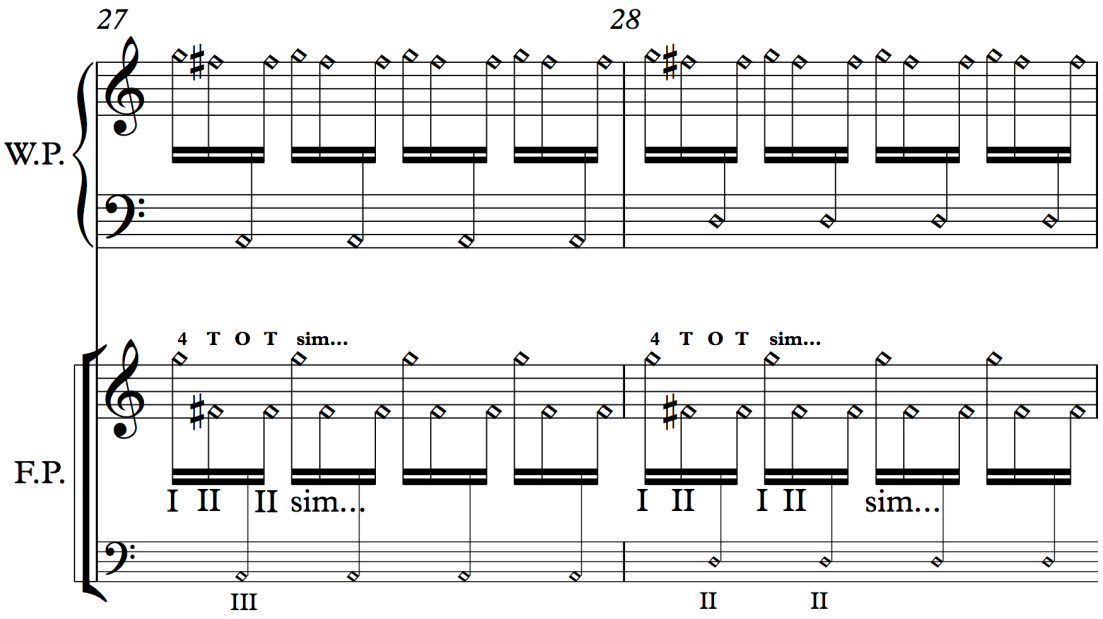
The first aspect of *Study in Harmonics and Multiphonics #1* I will discuss is notation. Currently, there exists no completely standardised notation for harmonics and multiphonics. *Study in Harmonics and Multiphonics #1* also contains several techniques that, to my knowledge, have not previously been performed or notated. With this in mind, I have used what I consider to be the most accurate way of notating harmonics; 3 staves, two denoting sounding pitch, one in treble clef and one in bass clef (as the spread of sounding pitches is very wide as a result of the combination of harmonics, ordinary tones and multiphonics) and one with a rough guide as to where on the bass the harmonics are to be generated, including roman numerals indicating which string the techniques are to be generated on.

Figure 4.2.1 *Study in Harmonics and Multiphonics #1* notation example



The finger position stave also has an ossia stave below it at several points where there are jumps between harmonics and regular tones that would require rapid changing of clefs if they were to be written in one stave.

Figure 4.2.2 *Study in Harmonics and Multiphonics #1* ossia stave example



This is important as many of the harmonics used in the work are located at several different positions on one or more strings. With this in mind, my intention when devising this notation was to illustrate the most functional hand or finger positions for the passage in question. There are also several new notations for specific techniques which will be discussed as they are approached in the analysis.

4.2.3 Harmonics

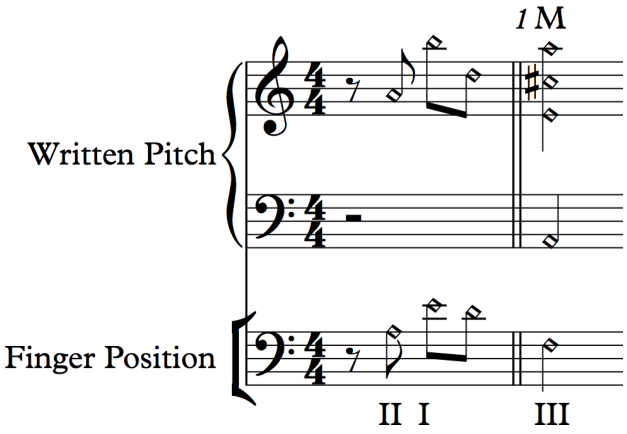
Study in Harmonics and Multiphonics #1 features several classes of harmonics which I will now discuss.

4.2.3.1 Arco natural harmonics

Arco natural harmonics are the most prevalent technique in this study. Consisting of the natural harmonic nodes of each string activated with the hair of the bow, they produce a clear, bell like quality without the

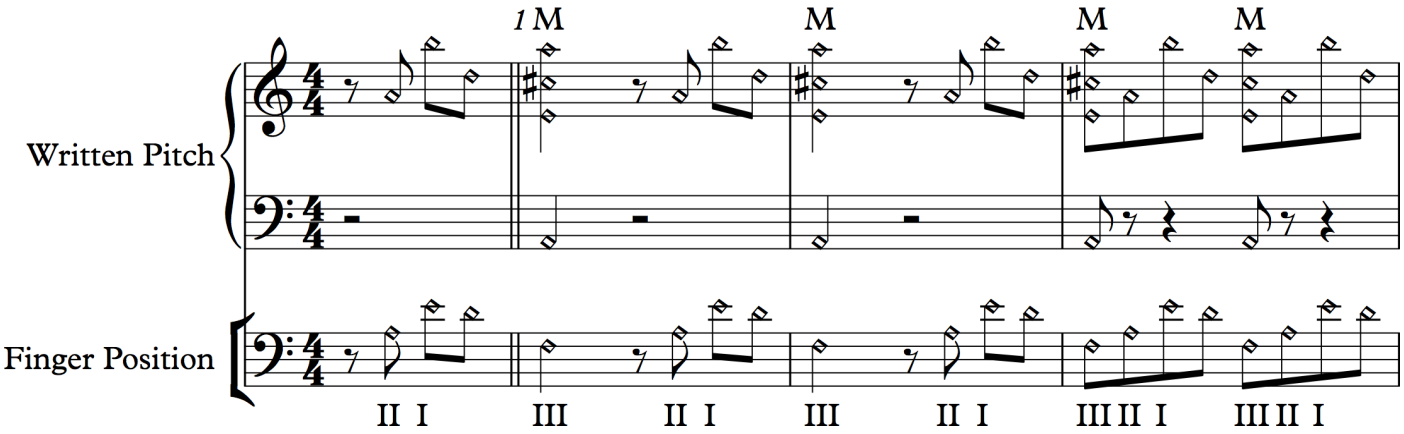
overtones and complexity of a stopped note or open string. I have utilised them throughout the work, beginning with a three note anacrusis leading into a multiphonic on beat 1 of bar 1.

Figure 4.2.3 *Study in Harmonics and Multiphonics #1* anacrusis and bar 1



This melodic cell of three arco natural harmonics followed by a multiphonic makes up the bulk of the first section of the study, as evidenced in Figure 4.2.4.

Figure 4.2.4 *Study in Harmonics and Multiphonics #1* bars 0-3



Video 4.2.2 *Study in Harmonics and Multiphonics #1* bars 0-3

The next five bars consist of the same alternation between natural harmonics and multiphonics, albeit with a different class of multiphonic. The phrase then resolves to a multiphonic of the first type.

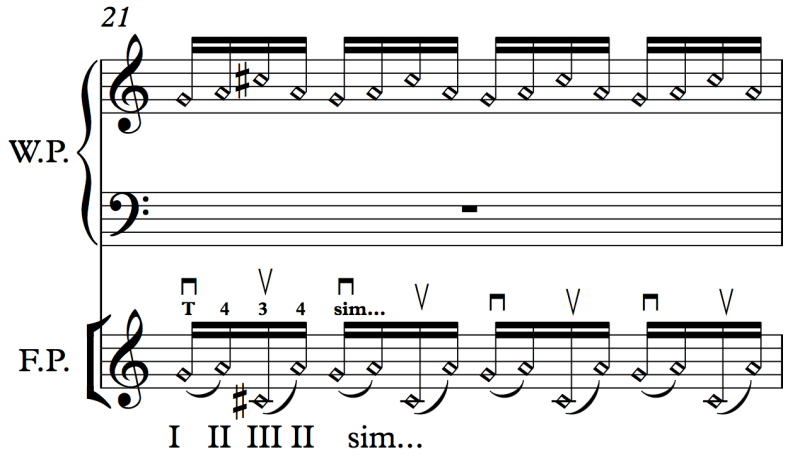
Figure 4.2.5 *Study in Harmonics and Multiphonics #1* bars 4-8

Video 4.2.3 *Study in Harmonics and Multiphonics #1* bars 4-8

The facet of this passage I found the most challenging is the alternation between the natural harmonics and the two types of multiphonics. Each technique in this passage has its own specific intricacies regarding bow placement, weight, stroke speed and left hand technique. I will discuss the execution of the multiphonic techniques and the peculiarities involved in alternating between them and the natural harmonics in their respective sections later in this analysis.

The next passage of *Study in Harmonics and Multiphonics #1* I would like to discuss with regards to arco natural harmonics begins at section 3. Section 3 is based around a pattern where each bar consists of a group of four sixteenth note harmonics that is then repeated three times. In most cases the three harmonics are spread across three strings and should be allowed to ring throughout, giving the effect of a 'static' chordal texture behind the more frenetic sound of the sixteenth notes.

Figure 4.2.6 *Study in Harmonics and Multiphonics #1* bar 21



Video 4.2.4 *Study in Harmonics and Multiphonics #1* bars bar 21

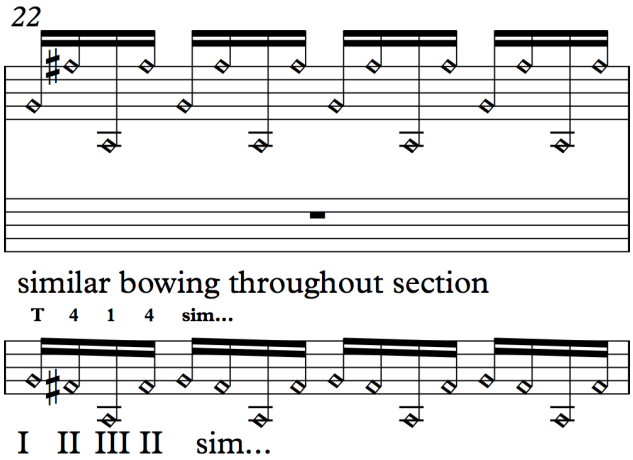
As can be seen in Figure 4.2.6, I have specified fingering in the notation. In order to allow the harmonics to sound for as long as possible, the left hand fingers must remain stationary throughout the bar and some of the melodic patterns in this passage require very specific fingerings. The example above requires the 2nd partial on the G string to be activated with the thumb, the 3rd partial on the D string with the 4th finger, and the 5th partial on the A string with the 3rd finger.

Photo 4.2.1 *Study in Harmonics and Multiphonics #1* bar 21 hand position

Although this feels an unusual fingering, more akin to a guitar chord than standard double bass technique, I feel that in this case it is the most appropriate way to execute the desired result. In my experience, practise and repetition of this passage has bred familiarity and made performance more comfortable.

Bar 22 features an even more unusual fingering in order to properly sound the harmonics.

Figure 4.2.7 *Study in Harmonics and Multiphonics #1* bar 22



The thumb continues to act as an anchor at the 2nd partial on the G string, the 4th finger moves to the 5th partial on the D string and the 1st finger stretches upwards to the 2nd partial on the A string.

Photo 4.2.2 *Study in Harmonics and Multiphonics #1* bar 22 hand position

It should be noted that I found the above hand position fairly uncomfortable at first and I have had to take extra care to make sure the arm, wrist and fingers are relaxed in order to avoid any physiological strain or damage.

In bar 25, the 4th and 3rd fingers move towards the bridge to activate the 4th partials on the G and D strings while the thumb is used to sound the 5th partial of the A string.

Figure 4.2.8 *Study in Harmonics and Multiphonics #1* bar 25

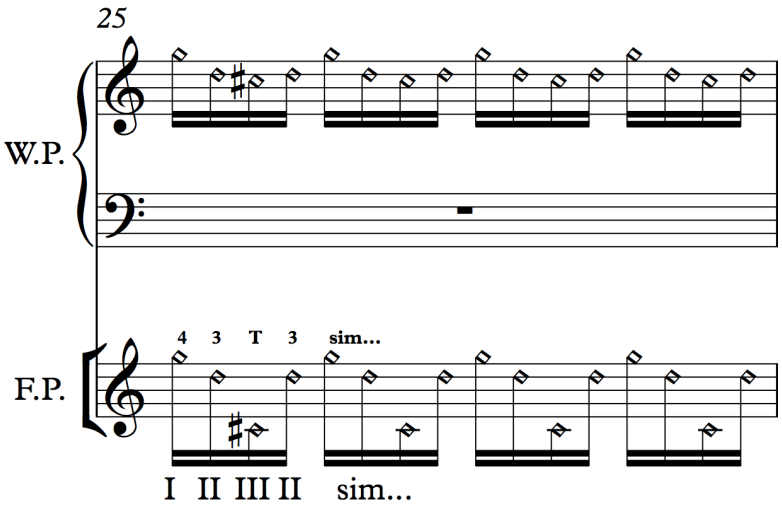
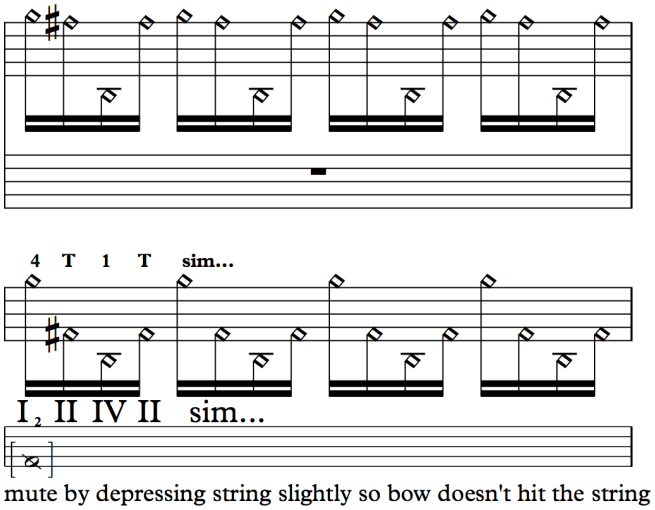


Photo 4.2.3 *Study in Harmonics and Multiphonics #1* bar 25 hand position

I consider this to be a much more 'normal' hand position, although it is strange to be utilising the 4th finger in this area of the bass as regular thumb position technique typically only makes use of the 1st, 2nd and 3rd fingers.

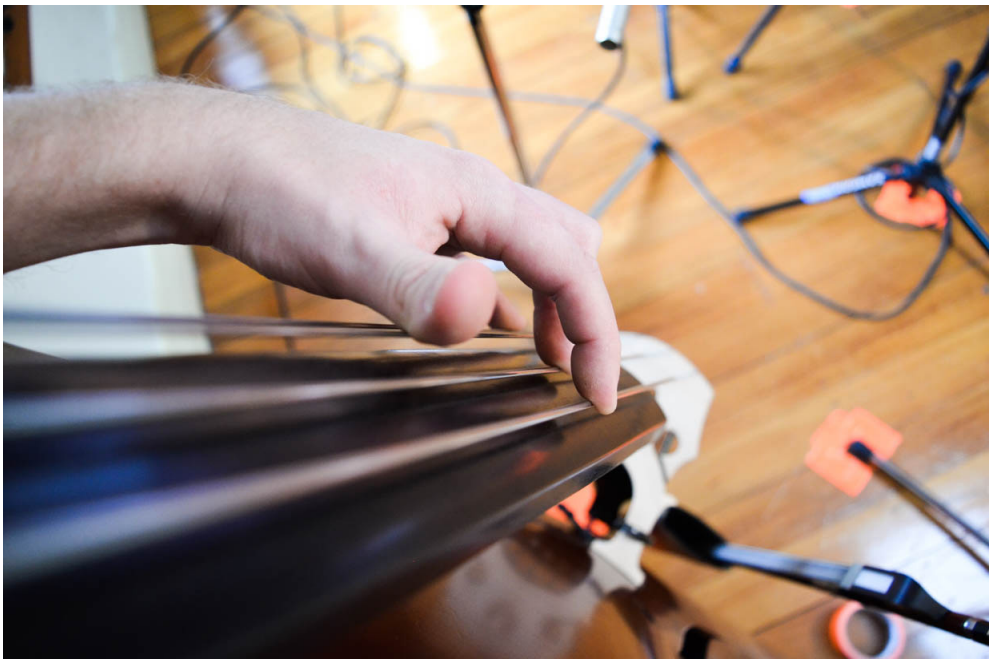
Bar 26 features another unusual, and very unique, fingering. The 4th finger stays on the 4th partial of the G string, the thumb moves across to activate the 5th partial of the D string and the 1st finger plays the 3rd partial of the E string.

Figure 4.2.9 *Study in Harmonics and Multiphonics #1* bar 26



The execution of Figure 4.2.9 in a similar manner to the previous phrases presents a singular problem; making sure that the A string is not sounded as the bow crosses it in its movement from the D string to the E string. My solution to this problem is to utilise the second finger on the left hand to depress the string just enough to move it below the plane of bow movement.

Photo 4.2.4 *Study in Harmonics and Multiphonics #1* bar 26 hand position

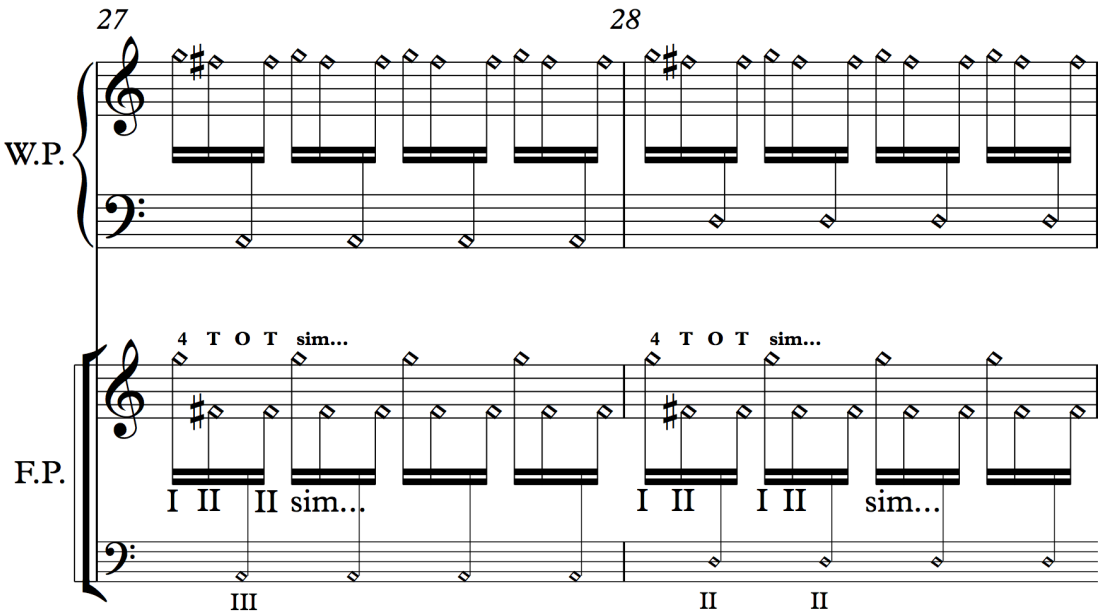


Video 4.2.5 *Study in Harmonics and Multiphonics #1* bar 26

This is once again a very strange fingering to the untrained hand, and the added aspect of one finger depressing one string with a different degree of force to the other fingers is initially problematic. It is, however, a very effective way of executing smooth bow strokes across two non-adjacent strings and, once mastered, may be useful in other musical scenarios. As Figure 4.2.9 shows, I have chosen to notate this fingering by adding an ossia stave below the 'fingering' stave with an A whole note with a strike-through in parentheses, text indicating the technique's execution and the finger that the string should be depressed with.

Bars 27 and 28 are comparatively straightforward, using the same harmonics on the G and D strings as bar 26 interspersed with an open A and open D respectively.

Figure 4.2.10 *Study in Harmonics and Multiphonics #1* bars 27 and 28



At this point I would like to briefly talk about the performance register of Section 3. Due to the nature of harmonic nodes on the double bass there are several different points on the strings that most of the harmonics in this section can be sounded at. However, I feel that the fingerings and locations I have specified represent the best overall places for the harmonics to be performed. The need for hand movement is minimal and the overall 'shape' of the hand remains fairly constant; the thumb always resting above the fingers towards the nut, a position familiar to performers from regular thumb position technique, and the fingers moving and pivoting below towards the bridge. Since familiarising myself with the required hand shapes performance of the entire section has become simple, relaxed and fluid.

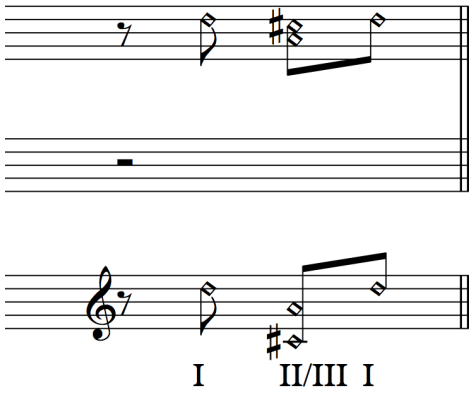
4.2.3.2 Arco harmonic double stops

An arco harmonic double stop consists of two harmonics on two strings sounded together with the bow. The strings are most often adjacent strings, but it is possible to sound harmonics on the E and G strings together using 'reverse bowing' as defined by Turetzky.[1] It is also possible to sound two harmonics together on the G and A strings or the D and E strings if using the fingering concept shown in Figure 4.2.9 and Photo 4.2.4 wherein I depress the string in between enough to move it out of the bow trajectory. The selection of harmonics available using this technique is small however; in order for the depressed string to move far enough below the bow to not be sounded, the depression must occur in the area of the bass closer to the bridge. Another factor of consideration is that of bow placement. It is easier to 'skip' the center string if the bow is closer to the point of depression but, dependent on the location of the harmonics being sounded, this could cause the bow to be in a *sul tasto* position, thereby making the timbre of the harmonics duller than normal as well making their execution more difficult.

The first example of an arco harmonic double stop in *Study in Harmonics and Multiphonics #1* occurs in the second half of bar 8 with a three note pickup into bar 9 consisting of a harmonic, a harmonic double stop, and a reiteration of the first harmonic.

1 'Reverse bowing' refers to the act of turning the bow 180° and activating the E and G strings by bowing them back to front (between the strings and the body of the bass).

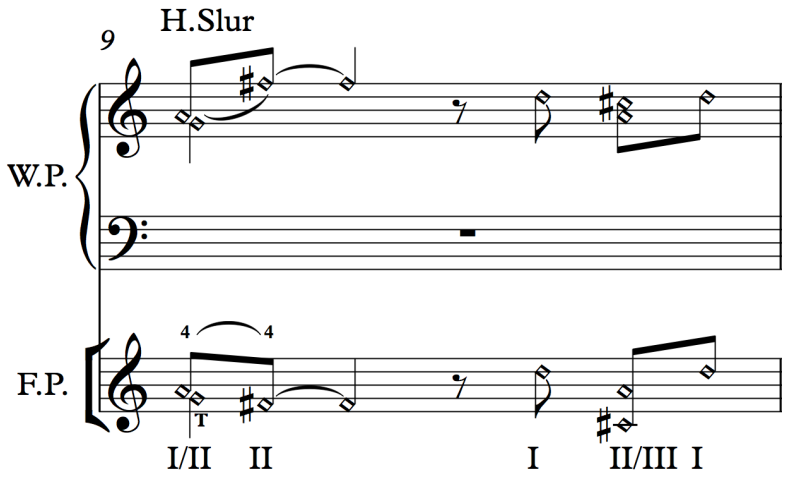
Figure 4.2.11 *Study in Harmonics and Multiphonics #1* second half of bar 8



Video 4.2.6 *Study in Harmonics and Multiphonics #1* bar 8

The second example of an arco harmonic double stop occurs at the start of bar 9, where it is coupled with a technique I have termed a 'harmonic slur'. I will discuss the harmonic slur technique in the next section.

Figure 4.2.12 *Study in Harmonics and Multiphonics #1* bar 9



Video 4.2.7 *Study in Harmonics and Multiphonics #1* bar 9

The main issue regarding the execution of the arco harmonic double stops in this section is being able to place the two fingers necessary for each double stop on the respective nodes with enough accuracy to immediately sound the partials. Through practise I found that at each point where there was a double stop I could focus more on the positioning of the finger sounding whichever was the higher partial. This is due to the lower notes of each double stop (the 3rd partial of the D string and the 2nd partial of the G string respectively) being easier to sound. The lower partials of the string have a slightly wider area around the node that will still allow the harmonic to sound, meaning that a little less precision is necessary to produce the note. Therefore, in bar 8 I found I could focus more on the C# harmonic (5th partial of the A string) and in bar 9 I could focus more on the A harmonic slurring to the F# (3rd and 5th partials respectively of the D string).

I would also briefly like to talk about the fingering and register specified at the beginning of bar 9 in Figure 4.2.12. The figure shows that the G harmonic/2nd partial of the G string is to be fingered with the left hand thumb while the A harmonic/3rd partial of the D string is to be played with the 4th finger. The reason for the fingering is that the physical distance between the two harmonics is great enough that this is the only fingering option.[2] Once settling on a fingering, the next decision I had to make was that of register. The A harmonic can be produced at two nodes on the D string, one closer to the bridge and one closer to the nut. It is possible to produce this same double stop with the thumb on the A harmonic located nearer the nut and the 4th finger on the G; I have chosen, however, to use the thumb on the G harmonic and the 4th finger on the A nearer the bridge, for three reasons. The first is due to the phenomenon discussed in the previous paragraph regarding amount of precision needed for certain partials. I am less used to producing harmonics with my thumb than my fingers, so using the thumb for the partial requiring less precision makes the execution simpler. The second reason is that the thumb is more commonly used in this area of the bass because of standard thumb position technique. The third reason is that the A harmonic slurs to an F# harmonic after being sounded and I found my thumb less dexterous than my fourth finger and therefore a less useful choice for the harmonic slur.

4.2.3.3 Harmonic Slur

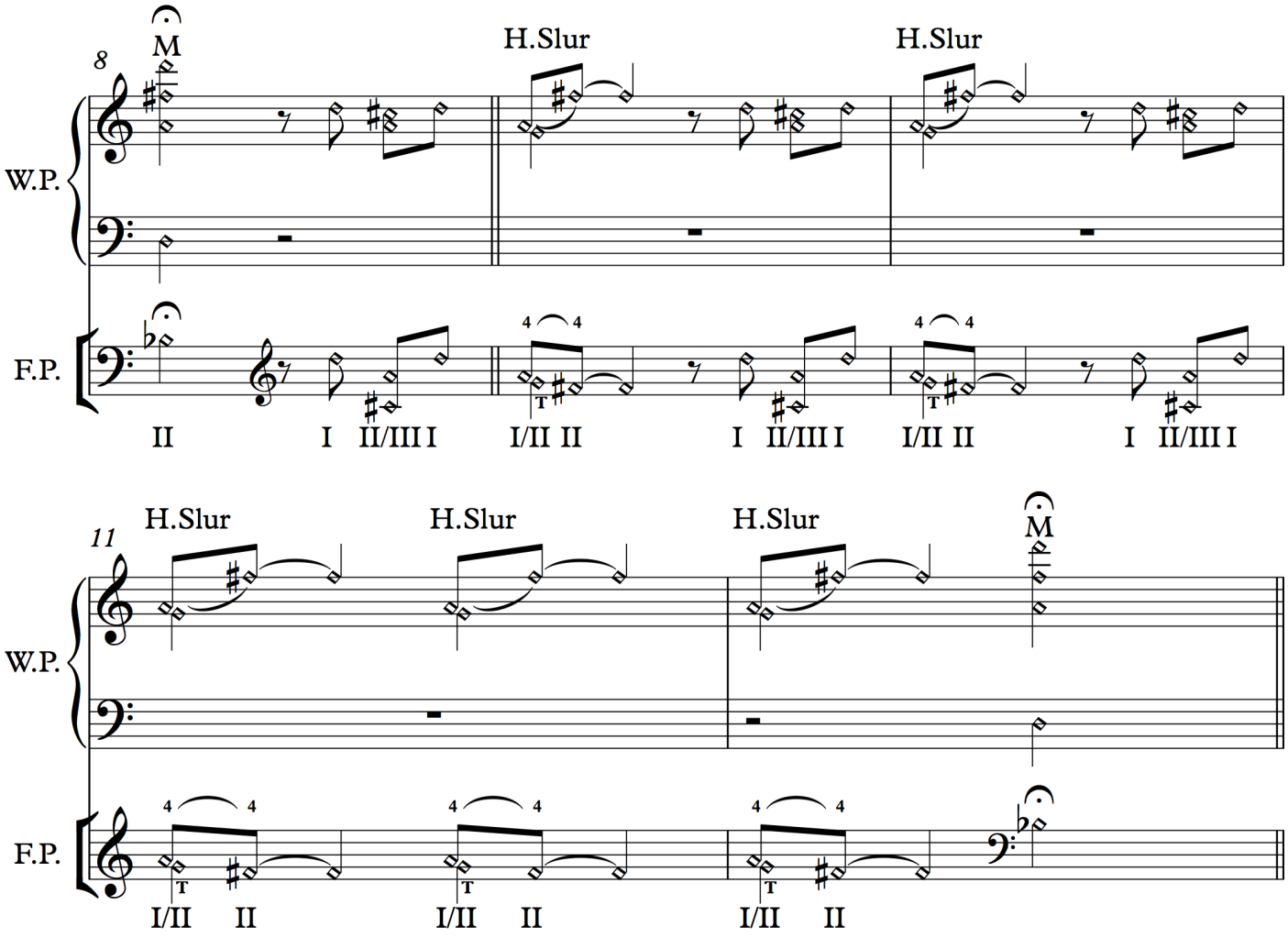
2 I am specifically referring to myself here. Different hand sizes obviously have different fingerings available to them.

I have briefly mentioned the 'harmonic slur' technique first introduced in bar 9 of this study in the previous paragraphs. As discussed (and shown in Figure 4.2.12), the start of bar 9 consists of a harmonic double stop made up of the 2nd partial of the G string and the 3rd partial of the D string. The G string harmonic is then sustained while the 4th finger slides along the D string from the 3rd partial towards the thumb at its location in the middle of the string, landing on the 5th partial. I have termed this technique a harmonic slur, and it is denoted by the letter 'H' followed by the word slur and a slur sign between the notes to be slurred (and between fingerings on the finger position stave).

The previous section also included a discussion of the specified fingering of the harmonic slur. To reiterate, because ordinary playing technique often uses the thumb as an 'anchor' of sorts in the upper register of the bass ('thumb position'), it is practical to use the thumb as the stationary note in this context while one of the more 'dexterous' fingers performs the harmonic slur.

The arco double stop harmonic slur and its three note pickup (from the end of bar 8) are repeated twice, followed by two repetitions of the harmonic slur alone.

Figure 4.2.13 *Study in Harmonics and Multiphonics #1* bars 8-12



Video 4.2.8 *Study in Harmonics and Multiphonics #1* bars 8-12

The greatest difficulty I encountered when executing bars 8-12 was keeping the volume of the G harmonic equal to the volume of the harmonic slur, due to the fact that the volume of the 2nd partial is naturally the loudest of all the harmonics on a given string. The solution I found was to try and execute the harmonic double stop and subsequent harmonic slur with less bow pressure on the G string than on the D string. I initially found functional execution of this aspect of bars 8-12 to be exasperating but it has become less problematic with practise.

4.2.4.4 Harp harmonics and harp harmonic double stops

Harp harmonic technique consists of placing the thumb of either hand on a harmonic node and plucking the harmonic with any of the fingers of the same hand, most commonly the 1st finger. Harp harmonic double stop is a term I have applied to a technique where the thumb of either hand is used to 'barre' two nodes on adjoining strings[3] which are then either plucked with two fingers from the same hand or 'raked' with one finger. Section 2 of *Study in Harmonics and Multiphonics #1* revolves around the use of both harp harmonics and harp harmonic double stops, but their use is intertwined with other techniques so I will discuss them together in section 4.2.5: Independent hand techniques.

4.2.4 Multiphonics

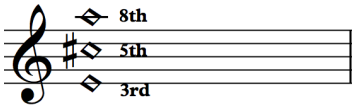
4.2.4.1 Arco multi-nodal multiphonics

The term *arco multi-nodal multiphonics* refers to arco multiphonics of the type described by Dresser in multiple sources including "A Personal Pedagogy", one of his articles for *The Strand* journal and the instructional DVD accompaniment to *Guts*. This class of multiphonic is executed by activating several harmonic nodes located close together through a specific left hand technique as well as a particular bow location and pressure. The left hand finger, as Dresser instructs in "A Personal Pedagogy", should touch the string "broadly but lightly" (Dresser, 2000: 258). I find using more of the 'pad' of my finger, rather than the tip, to assist the production of the sound. In this case, the finger is placed on the A string above

3 In this case it is the same node on both strings but there is scope for developing methods of rotating the thumb so different partials on adjoining strings can be activated, although it would be limited on double bass to lower partials located close together, due to their wider activation areas and proximity to each other.

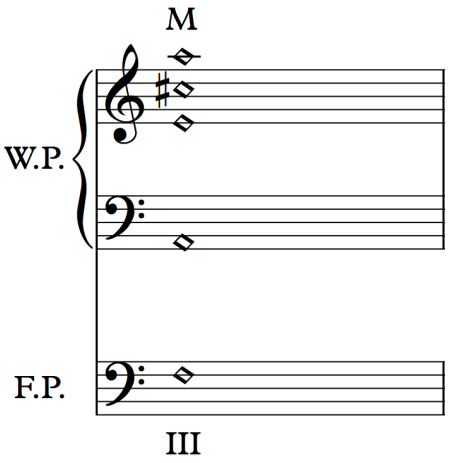
where an F ordinary tone would be fingered. This is the location of the 8th partial, which produces a note 3 octaves above the fundamental. Slightly towards the nut on the same string is the 3rd partial and slightly towards the bridge is the 5th partial, producing notes an octave and a half and two octaves and a 3rd respectively above the fundamental.

Figure 4.2.14 Three harmonic partials available close to the location of the lowest fingered 'F' note on the A string



With a flat finger, a slight increase in left hand pressure and a 'weightier' bow stroke, all 3 partials can be activated together along with a hint of the fundamental pitch. The resulting multiphonic chord, then, should be a 'drop 2' voicing of an A major triad, second inversion (underpinned by the fundamental).

Figure 4.2.15 Multi-nodal multiphonic at location of the lowest fingered 'F' note on the A string

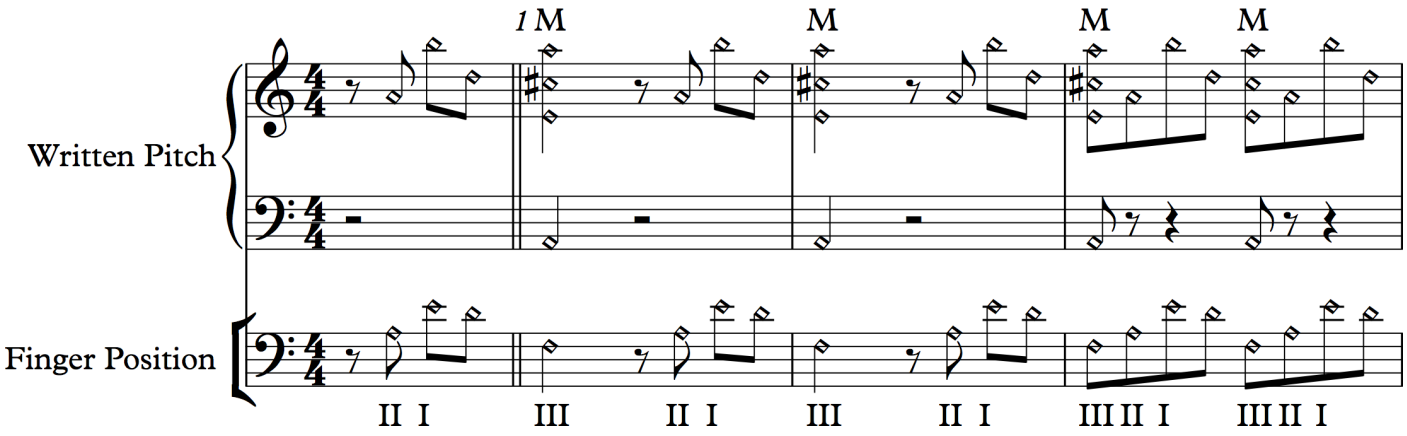


Video 4.2.9 Multi-nodal multiphonic at location of the lowest fingered 'F' note on the A string

Practise is required to understand the proper finger placement, bow placement, speed and various pressures required to activate the multiphonic, as it is quite different from regular harmonic technique.

As mentioned in section 4.2.3.1, one of the most difficult aspects of this work is the alternation between arco natural harmonics and multiphonics. The first passage of section 1, as mentioned in 4.2.3.1, is built around a repeated melodic cell of three arco natural harmonics followed by the multiphonic shown in Figure 4.2.14.

Figure 4.2.16 *Study in Harmonics and Multiphonics #1* bars 0-3

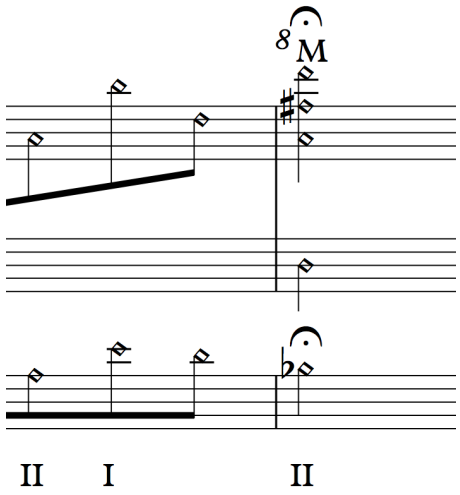


Video 4.2.10 *Study in Harmonics and Multiphonics #1* bars 0-3

While these two techniques are not unrelated, their execution is quite different and oscillating between them in this fashion has required meticulous practise, paying close attention to the subtle differences in left hand technique (using a 'flat' finger to cross several harmonic nodes), bow stroke, bow weight and registration.

A similar phrase is found in the 'pick-up' to and first half of bar 8 of the study. The same three arco natural harmonics this time precede a multiphonic located above where the fingered Bb on the D string would be, producing a drop 2 voicing of a D triad underpinned again by the fundamental of the string.

Figure 4.2.17 *Study in Harmonics and Multiphonics #1* first half of bar 8 with 'pick-up' phrase



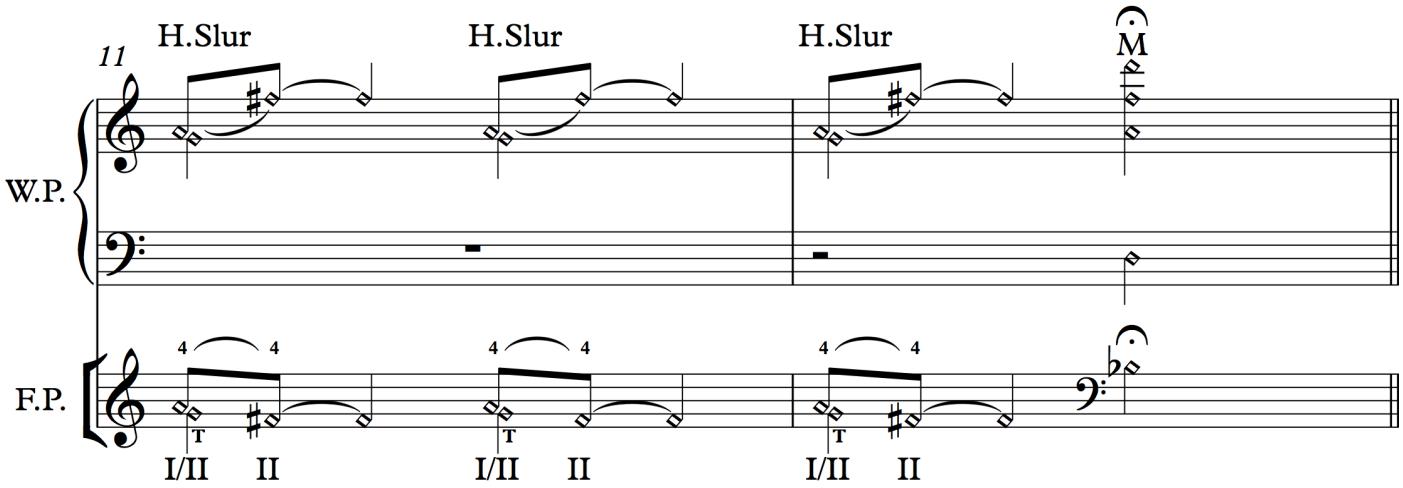
Video 4.2.11 *Study in Harmonics and Multiphonics #1* first half of bar 8 with 'pick-up' phrase

This multiphonic is essentially the same as the one shown in Figures 4.2.14 and 4.2.15, produced on the D string rather than the A string. In practice, however, I have found there are slight differences in their execution. I find the multiphonic on the A string to be slightly easier to produce, whereas the multiphonic at the same location on the D string requires greater precision and awareness of the parameters of execution, especially left hand finger placement and bow weight and registration. I believe this to be due to the differences in the string sizes and the register of the nodes being activated.

Another key difference between execution of the A string multi-nodal multiphonic and the one on the D string is the way each multiphonic 'feels' under the left hand finger. In "A Personal Pedagogy", Dresser states that "a vibrant multiphonic will characteristically be accompanied by a sensation of the whole string vibrating underneath the left hand finger" (Dresser: 258). Part of the inherent intricacy in producing this type of multiphonic is in being able to sustain the necessary specific left hand finger pressure while the string vibrates in such an unusual manner beneath it. Complicating matters is the fact that the vibration caused by the same multiphonic on two different strings occurs at remarkably different rates, meaning that the multiphonics each feel quite distinct and require individual care to keep the left hand finger pressure constant.

The D string D major chord multiphonic depicted in Figure 4.2.16 is used throughout the study as a resolution point. In several instances, it follows a passage that is located in an area of the bass closer to the bridge, such as this example from the end of section 1.

Figure 4.2.18 *Study in Harmonics and Multiphonics #1* bars 11-12



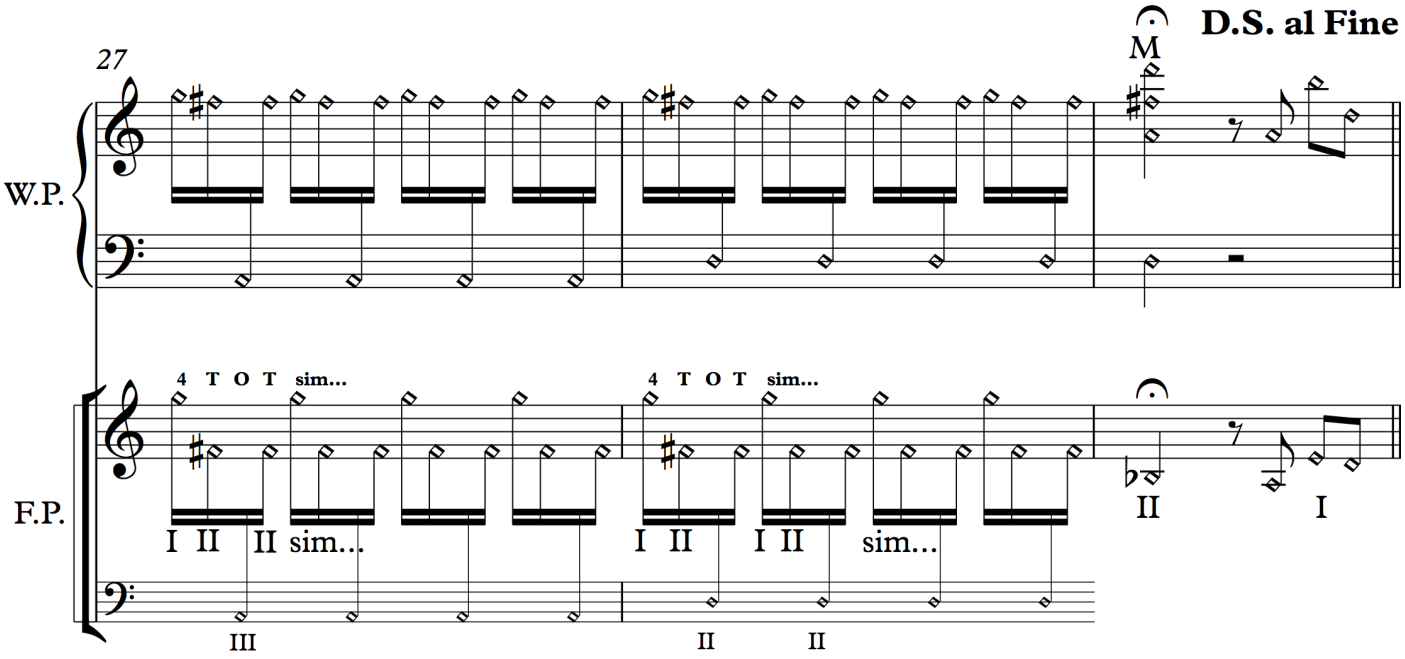
Video 4.2.12 *Study in Harmonics and Multiphonics #1* bars 11-12

As Figure 4.2.17 shows, the harmonic slurs are located in the upper reaches of the fingerboard, for reasons I have already explained in sections 4.2.3.2 and 4.2.3.3. The D string multiphonic, however, is to be produced in the half of the string closer to the nut, even though the same multiphonic can be produced in the half of the string closer to the bridge (near where the left hand 4th finger is already located at the end of the harmonic slur). It might seem counter intuitive to jump from one location to the other at this point but there are two reasons in particular why I have chosen to. The first is that all the multiphonics of this type so far have been produced in this same area and the familiarity is helpful in order to efficiently produce the correct chord. The second is that the following passage requires the left hand to be near the nut, hammering on a low G on the E string, and the more gradual movement of the hand from where it is placed for the harmonic slurs, through the multiphonic, down to the nut is physically slightly simpler than what would be a fairly large 'jump' were the multiphonic produced nearer the bridge.

A similar resolution occurs at the end of section 3. Again, the material prior to the multiphonic resolution

is located in the area of the bass closest to the bridge, and once more the multiphonic is played in the region closer to the nut.

Figure 4.2.19 *Study in Harmonics and Multiphonics #1* bars 27-29



Video 4.2.13 *Study in Harmonics and Multiphonics #1* bars 27-29

As well as the aforementioned familiarity with the already established multiphonic location, in this instance the multiphonic is followed by the three note arco natural harmonic phrase from the beginning of the work which leads back into the A triad multiphonic in bar 1 by way of a D.S. It makes sense in this case to play the multiphonic in bar 29 at the specified location because the following phrase is located around the same area.

4.2.4.2 Arco split multiphonics

The term *arco split multiphonic* is one I have coined for a technique that may be hitherto unexplored. It is a variation of a multiphonic technique attributed to violinist Tracy Silverman that I first learned of in Allen

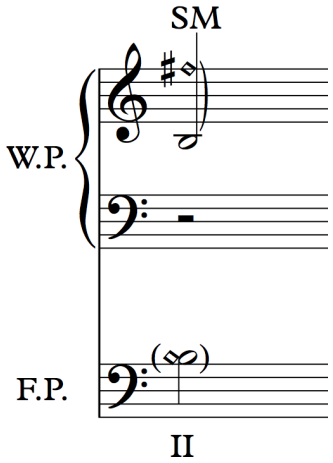
and Patricia Strange's book *The Contemporary Violin: Extended Performance Techniques*, but which originally comes from an article written by Silverman for the journal *American String Teacher* entitled "Hooked on Multiphonics". Silverman describes its execution thus:

> *The general idea is to lighten the finger of the left hand somewhere between a note and a harmonic, keeping the bow pressure firm and very steady. (…) Start with the note 'E' on the A string. (…) The harmonic on that note sounds one octave higher and bears a timbre that is to be replicated on other notes. Then increase finger pressure just slightly-not enough to lose the harmonic, but enough so that if the finger slides down to a 'D', a note still sounds one octave above the normal note at that point* (Silverman, 1997: 45-46).

I confess I found this description to be very confusing at first but have since, with practise and experimentation, been able to make Silverman's multiphonic technique work. However, through my initial attempts to reproduce Silverman's technique from his description, I discovered a new concept. While following the directive to "lighten the finger of the left hand somewhere between a note and a harmonic", I found I was able to sustain the sound of the harmonic while adding the fingered fundamental at the same location. *Study in Harmonics and Multiphonics #1* features the use of this technique on several occasions.

Firstly, I will offer a further description of the method of producing the split multiphonic. In the case of *Study in Harmonics and Multiphonics #1*, the split multiphonic is located on the D string. First, the 5th partial located at the node above the note B on the D string is fingered. With a steady bow stroke, the left hand finger pressure is increased until both the harmonic (which should be an F# 2 octaves and a 3rd above the fingered fundamental) and the stopped B are sounded simultaneously.

Figure 4.2.20 Split multiphonic at location of fingered B note on D string

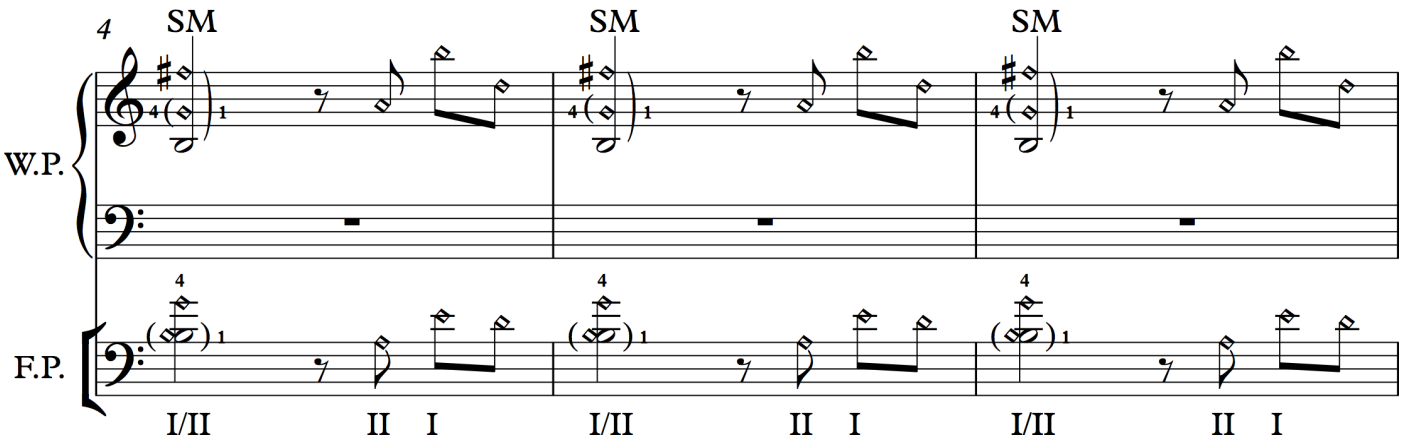


Video 4.2.14 Split multiphonic at location of fingered B note on D string

It is difficult at first to hold both tones at once but with practise, a steady bow stroke, and a steady left hand finger pressure it creates a very effective one string dyad. I have chosen to notate the technique with a diamond notehead for the harmonic, a normal notehead for the fundamental, and the abbreviation 'SM'. On the written pitch stave the two notes are bracketed to denote that they are both produced from the same finger. Regarding the finger position stave, although both tones are obviously produced at the same finger position, I have chosen to use both notehead types to show that there are two notes occurring in the same location. The notes are then bracketed on either side.

In the examples of split multiphonic technique in *Study in Harmonics and Multiphonics #1* I have coupled the multiphonic depicted in Figure 4.2.19 with an arco harmonic at the 2nd partial of the G string played with the 4th finger of the left hand. Fingerings for the respective sounding notes and finger positions are bracketed.

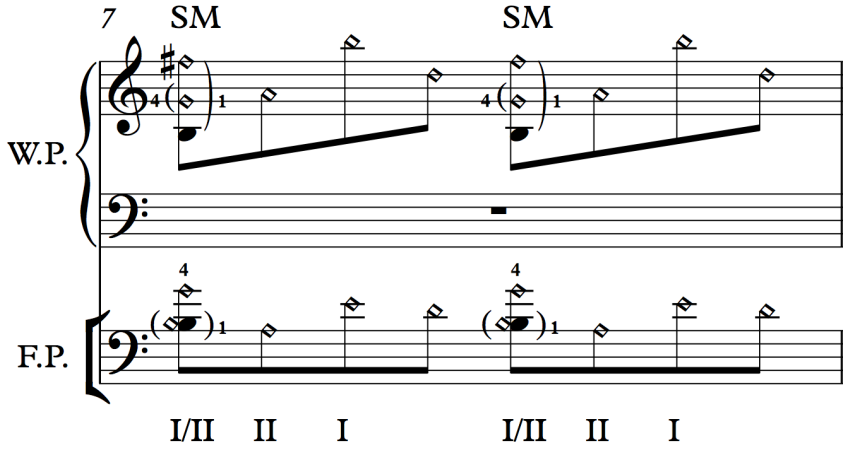
Figure 4.2.21 *Study in Harmonics and Multiphonics #1* bars 4-6



Video 4.2.15 *Study in Harmonics and Multiphonics #1* bars 4-6

The addition of the G harmonic complicates execution of the chord considerably, firstly because the required finger pressures of the first and fourth fingers are vastly different and secondly because the plane of the bow must stay steady across two strings as pressure is added to the D string, thereby changing the angle of the strings slightly and requiring subtle changes in bow angle. Once mastered, however, this is a useful method for creating a three note chord (which is quite difficult on double bass using the bow) across two strings. As with the multi-nodal multiphonics earlier in the piece, it is the alternation between the arco natural harmonics and the split multiphonics which is the most difficult aspect of the passage, especially as the speed of alternation between the two techniques increases in bar 7.

Figure 4.2.22 *Study in Harmonics and Multiphonics #1* bar 7



Video 4.2.16 *Study in Harmonics and Multiphonics #1* bar 7

Practise with a focus on the minute differences in bow trajectory, left hand finger pressure and placement, and the contrasts in execution between the natural harmonics and the split multiphonics (particularly when they are being sounded together in the three note chord) has been the key to proper execution of Figures 4.2.20 and 4.2.21

4.2.4.3 Harp Multiphonics

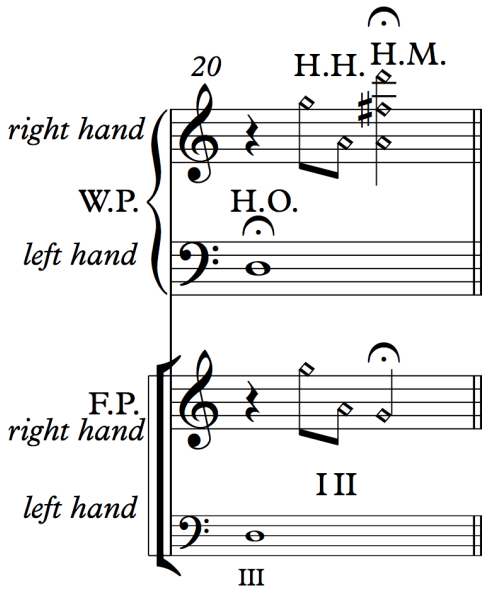
The term 'harp multiphonic' is a variation on both harp harmonic technique and pizzicato multi-nodal multiphonic technique and, to the best of my knowledge, has not been defined before. I discovered this quite by accident as I was trying to locate some nodes to produce harp harmonics on. I was attempting to execute the harp harmonic while my thumb was not quite on the right node and I heard several harmonics ring out at once. Harp multiphonic technique is similar in concept to both arco and pizzicato multiphonics as described by Dresser. It is executed by crossing several adjacent nodes with a slightly angled thumb, plucking vigorously with the first finger of the same hand, and immediately removing the thumb from the string to allow all three partials to sound simultaneously. The fundamental does not seem to be present (or at least *as* present) as with arco multiphonics, but the sound is very similar to those I have produced when experimenting with Dresser's description of pizzicato multiphonics from his article "Double Bass Multiphonics" in *The Strad* journal:

> *Pizzicato multiphonics are particularly effective and not difficult to produce. Most clear are the fifth, seventh, and ninth partials. Place the left-hand finger over the harmonic and pluck energetically very close to the bridge. As the string is plucked, release the left-hand finger from the string.* (Dresser, 2009: 75)

A major advantage of the harp harmonic technique is that it is executed with one hand, meaning the other hand is free to execute any number of other one handed techniques. Indeed, the single instance of a harp multiphonic in *Study in Harmonics and Multiphonics #1* occurs at the same time as the left hand is holding a low D created from a left hand alone hammer-on. Figure 4.2.22 shows my chosen notation for the harp multiphonic; a diamond notehead on the finger position stave depicting where to execute the multiphonic, diamond noteheads on the written pitch stave showing the harmonics that should be

sounded, and the letters 'H.M.' denoting 'Harp Multiphonic'.

Figure 4.2.23 *Study in Harmonics and Multiphonics #1* bar 20



Video 4.2.17 *Study in Harmonics and Multiphonics #1* bar 20

The single hand execution of the technique opens up a whole world of possible combinations, although the harp multiphonic is naturally rather quiet and care must be taken not to drown it out with other techniques. Amplification is a possibility in order to combat this problem, although naturally it would amplify any simultaneous techniques too.

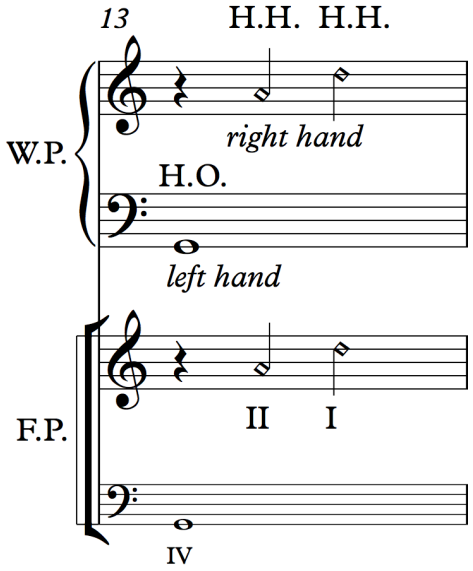
4.2.5 Independent Hand Techniques

Section 2 of *Study in Harmonics and Multiphonics#1* consists of various independent hand techniques. The reason I have chosen to place the analysis of all the techniques under the same heading is that most of the intricacies relating to organisation of these techniques are due to whatever devices the opposite hand is executing at any given moment.

The first bar of Section 2 (bar 13) begins with a call and response pattern between the left and right hands.

The left hand sounds a low G on the E string via a hammer-on (denoted by the abbreviation 'H.O.'). This is followed by two right hand harp harmonics (denoted by the abbreviation 'H.H.') on the 3rd partials of the D and G strings. Which hand is executing each technique is specified by text in each stave.

Figure 4.2.24 *Study in Harmonics and Multiphonics #1* bar 13

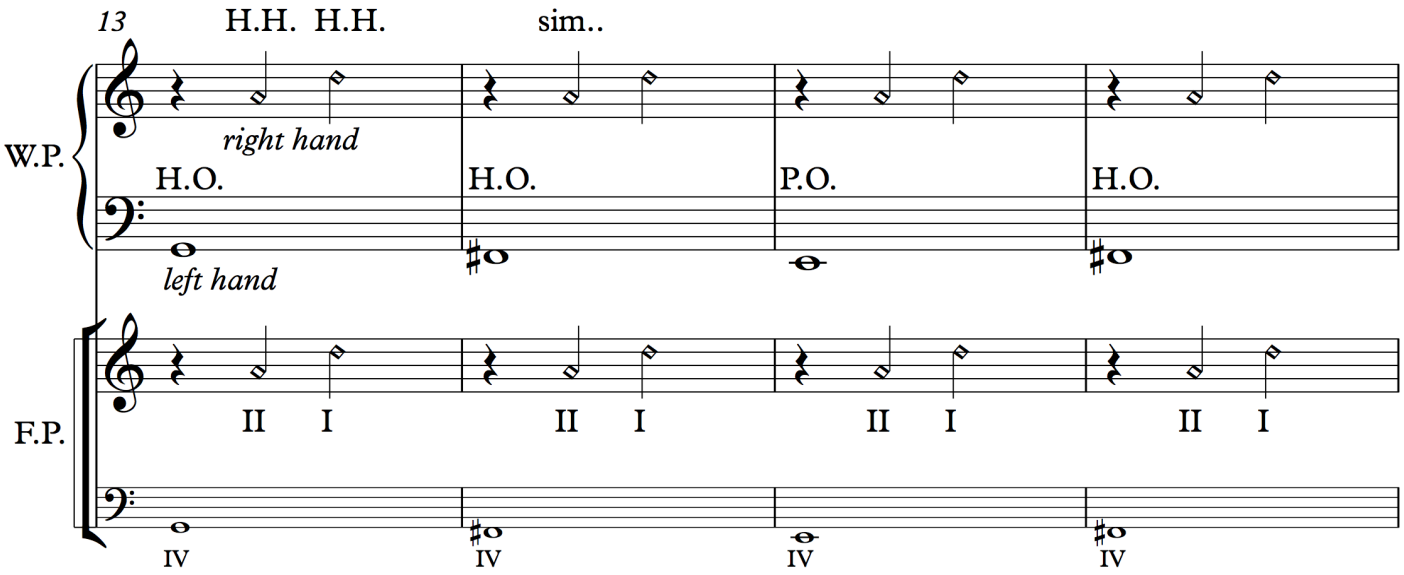


Both the low G note and the harp harmonics are intended to ring for as long as possible (ideally right until the next note produced by that hand). This stipulation has a causal effect on the physical performance of both techniques. Firstly, in order to make the hammered on G last the whole bar the string must be struck with enough force that the note rings clearly for 4 beats; the sound of a hammer-on has a tendency to decay at a faster rate than a normally plucked string. Secondly, in order to allow the first harp harmonic to continue ringing while the following one is played care must be taken to not touch the D string when executing the G string harp harmonic. This does not sound difficult in theory but in practice it requires a slight and deft change in wrist angle. In my 'normal' harp harmonic technique, I have found that my thumb is fairly perpendicular to the top of the string, meaning the base of the thumb and even the edge of the palm may be resting on adjacent strings. If I was executing the technique in this way in bar 13, it would cause the D string to stop vibrating when I sounded the G string harp harmonic. Therefore, the wrist must be rotated slightly when playing the G string harp harmonic so that the thumb touches the string at an acute angle.

Video 4.2.18 Wrist rotation for harp harmonics in *Study in Harmonics and Multiphonics #1*

Bars 14-16 follow the same right hand harp harmonic pattern as bar 13 while the left hand notes and techniques change.

Figure 4.2.25 *Study in Harmonics and Multiphonics #1* bars 13-16

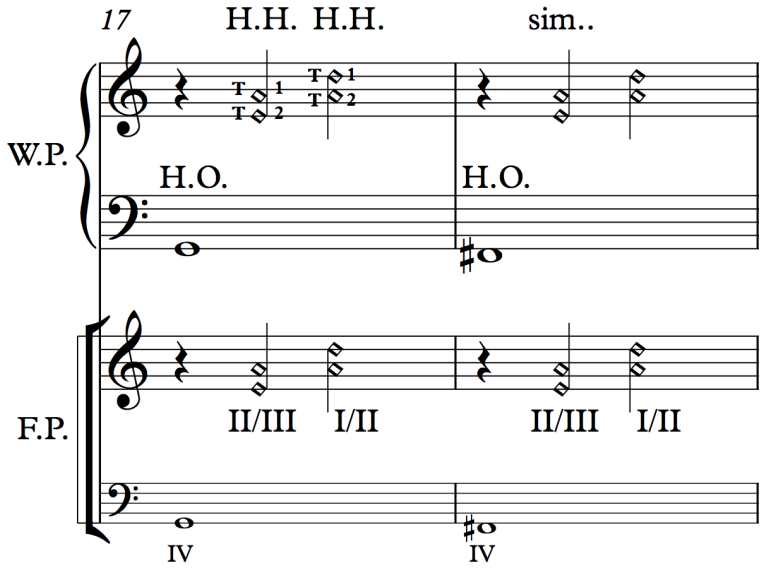


As Figure 4.2.24 shows, the left hand hammer-on notes in bars 14 and 16 are both F#. In bar 15 however, the left hand note is a pull-off to an open E. I chose to use a pull-off in order to sound the open string without the assistance of the right hand, while making sure the hammer-on from bar 14 lasts as long as possible.

Video 4.2.19 *Study in Harmonics and Multiphonics #1* bars 13-16

Bars 17 and 18 continue the same left hand hammer-on pattern as the previous four bars, while the right hand changes from single note harp harmonics to double stop harp harmonics. The double stop harp harmonics consist of adding a harp harmonic a perfect 4th below the harmonics from bars 13-16 and are executed by the thumb crossing two strings at the same harmonic node while the first and second fingers pluck the harmonics simultaneously.

Figure 4.2.26 *Study in Harmonics and Multiphonics #1* bars 17-18

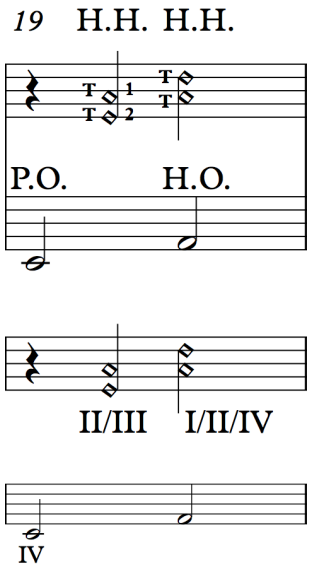


Video 4.2.20 *Study in Harmonics and Multiphonics #1* bars 17-18

Correct execution of this technique requires the thumb to be extremely straight, at as close to a perfect right angle to the strings as possible. It is partially for this reason that I decided on producing all of these harp harmonics in the region corresponding to the upper register of the instrument. As with many of the examples of harmonic and multiphonic techniques discussed in this work, these harmonics can be produced at another location on the bass, in this case in the half of the string nearer to the nut. In order to create the perfect right angle of thumb to string required for the double stop harp harmonics, however, the wrist would need to be bent at a very uncomfortable angle if this passage were played in the register closer to the nut. The specified harp harmonic double stops are much more comfortably performed in the 'upper' reaches of the instrument. Obviously the previous issue of angling the wrist so as to avoid dampening the D string for the second harp harmonic does not apply here as the D harmonic is meant to be sounded at the same time as the G. However, I have had to take care after playing the harp harmonic double stop on the D and A strings not to dampen the A as the second harp harmonic double stop is sounded.

Bar 19 begins the same as bar 15 (see Figure 4.2.24), with the left hand pulling off to an open E followed by the same two harp harmonic double stops used in bars 17 and 18. The pattern changes on beat 3 of bar 19, however, with the left hand hammering on an A note on the E string, which presents a few difficulties.

Figure 4.2.27 *Study in Harmonics and Multiphonics #1* bar 19



Video 4.2.21 *Study in Harmonics and Multiphonics #1* bar 19

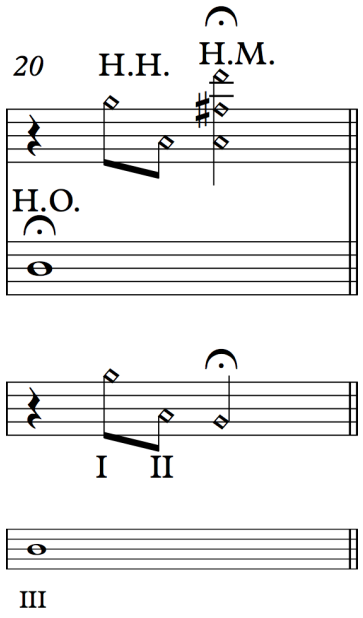
Up until this point each of the techniques in this section have been sounded on their own; the left hand executes a hammer-on or pull-off followed by the right hand playing either single or double note harp harmonics. Bar 19 begins in the same way until beat 3, where the simultaneous performance of a left hand hammer-on and a right hand harp harmonic double stop is required. I found this to be an unusual mix of techniques requiring significant coordination practise.

Bar 19 also creates an issue around intonation. As Figure 4.2.26 shows, I have written the A note as a hammer-on located on the E string rather than a left hand pull-off on the open A. This is in order to allow the previous harp harmonic double stop, which is played on the A string, to continue ringing throughout the rest of the bar. Fingering an A note on the E string is unusual as there is an open A string adjacent to the E. A performer would usually choose to play the open A over a stopped A on the E string for several reasons: to give the left hand a brief break from stopping the string; to 'ground' the intonation; and because it is a 'clearer' sound. I have also chosen to execute all of the left hand hammer-ons in this section with my second finger, as I feel this to be my strongest finger for producing a clear hammer-on sound, and it is even *more* unusual to be fingering the A in this location with the second finger. Consequently, practise

with a mind to intonation and finger location has been required in order for me to adequately perform this bar.

The last bar of section 2 consists of a left hand hammer-on D on the A string followed by two harp harmonics and the harp multiphonic discussed in section 4.2.4 of this analysis.

Figure 4.2.28 *Study in Harmonics and Multiphonics #1* bar 20



Video 4.2.22 *Study in Harmonics and Multiphonics #1* bar 20

This left hand hammer-on presents similar challenges to the A note from the previous bar, although it feels to me that this region of the bass is less unexplored than the notes above the G# on the E string. Again, the note is played in this position to allow it to speak for the whole bar while the right hand is executing techniques on the G and D strings. Particular care must be allowed in both bar 19 and bar 20 to hammer-on the note using the tip of a curved finger so that the adjacent string on which the harp techniques are to be sounded is not dampened.

4.3 Analysis: *Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello*

Video 4.3.1 *Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello*

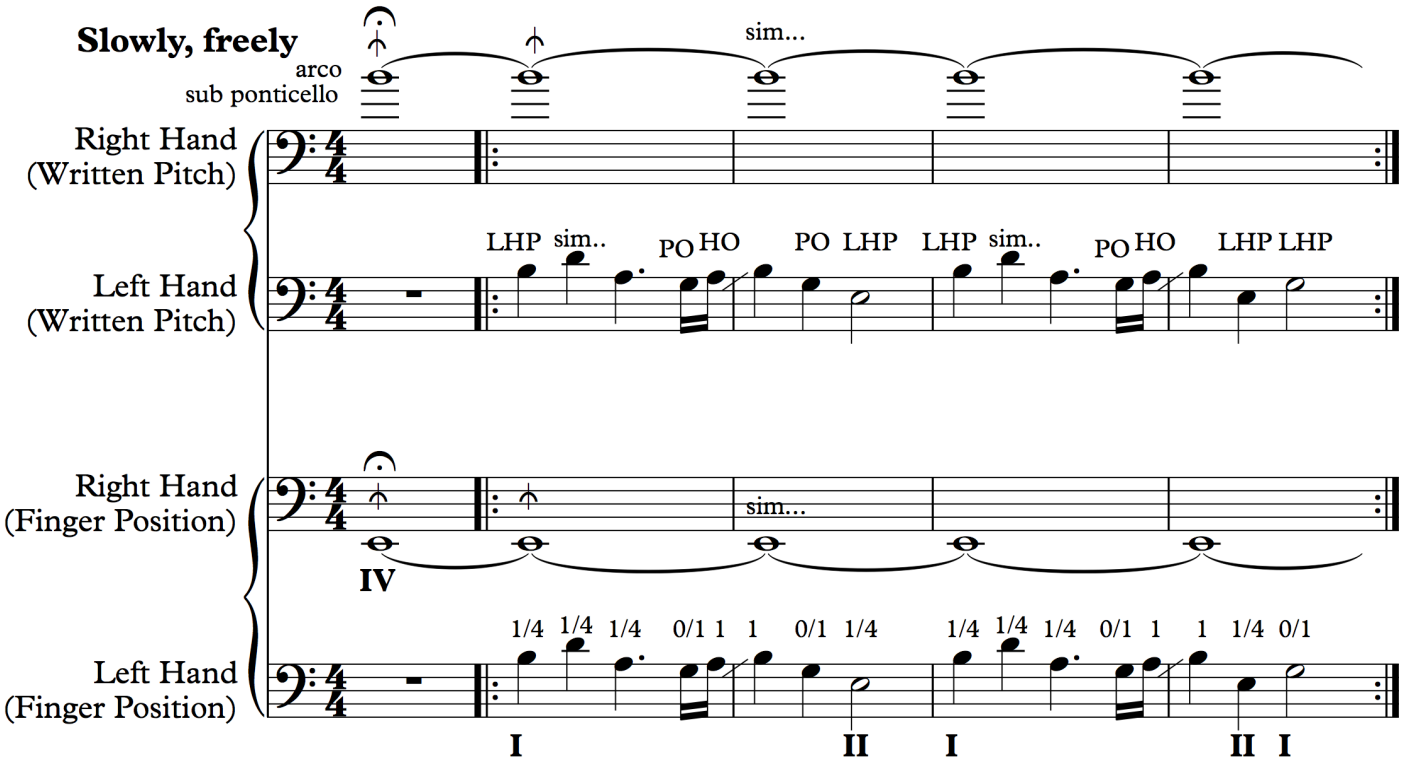
4.3.1 About the work

Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello was composed with a focus on increasing my ability to improvise and compose using left hand alone techniques, in order to facilitate independence and the use of simultaneous and contrary techniques, movement, and motion in both hands. As a result of this focus, I found myself pursuing several other avenues of interesting research, including the effects mid-performance retuning can have on possible harmonic scenarios, potential effects of sub ponticello on harmonic, melodic and timbral content, and problems in translating sub ponticello effects to different instruments due to the lack of standardisation in instrument and construction.

4.3.2 Notation

The notation system I have used for *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* differs slightly from that used in *Study in Harmonics and Multiphonics #1*. The concept of having a stave depicting the notes that are to be sounded in written pitch and a separate stave showing where on the bass to execute the notes and techniques remains the same. In *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*, however, I have split both the written pitch and finger position staves into two bracketed staves, one for each hand.

Figure 4.3.1 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* notation example

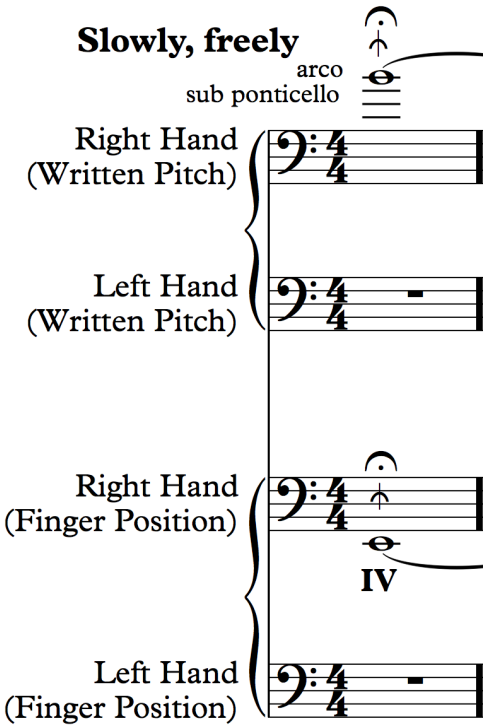


I decided on this notation system because both hands are executing completely different and unrelated techniques throughout the work and it seemed easier to me visually to depict them on different staves.

4.3.3 Arco sub ponticello

The term arco sub ponticello refers to bowing one or more strings in the area between the bridge and the tailpiece or 'below' the bridge. This technique is used throughout the entirety of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*. A continuous drone is present throughout the work, caused by bowing the E string sub ponticello. On the bass I used to compose and record the work, the note produced when bowing the E string sub ponticello is a concert B3. It is notated on the right hand written pitch stave with the B3 pitch, the sub ponticello symbol (as used by Penderecki), and the words 'arco sub ponticello'. On the right hand finger position stave the arco sub ponticello is notated with the fundamental of the string to be bowed (in this case the E string) and the sub ponticello symbol.

Figure 4.3.2 Arco sub ponticello drone in *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*



Video 4.3.2 Arco sub ponticello drone in *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*

To a certain extent, the arco sub ponticello B3 note can be 'tuned' by very carefully either pressing down on the bridge around where the E string crosses it (to sharpen the note) or pulling up the bridge (to flatten the note). Fluctuations in temperature or bridge angle can cause the arco sub ponticello note to change, so being able to tune it slightly in this manner is useful.

An important factor to consider when using of arco or pizzicato sub ponticello as a melodic or harmonic component of a work with a specified pitch is the effect the dimensions of a particular instrument have on the pitch of the strings behind the bridge. Because the double bass has never had a completely normalised size or string length, composing or improvising with techniques such as sub ponticello can be fraught with difficulties in terms of being able to specify pitches. For example, I own two double basses. One is roughly a three-quarter size and the other roughly seven-eighths with a close to full-scale string length.

All of the work for my PhD project has been composed, performed and recorded on the smaller bass. One fact pertaining to this instrument choice is that, while the note produced by bowing the E string sub ponticello on the smaller bass is a high B, the same is not true of bowing in the same area on the larger bass. This opens up an interesting area of discussion regarding what pitch possibilities are available on any double bass and which are specific to a particular instrument.

I feel that these parameters are especially important to be aware of when it comes to improvising, or at least improvising within a context even partially pitch-based; in order to be truly free to improvise, an in depth knowledge of the parameters of one's instrument is necessary. There is a myriad of these variable parameters on a double bass; sub ponticello pitches, the pitch produced when bowing a tailpiece, the available pitches in the peg box, pitches available when striking or bowing the body of the bass and volume of particular techniques due to personal instrument set up. The important thing, I posit, is knowing one's own instrument intimately, from available pitches, to multiphonics that 'pop out' more easily than others, to certain subharmonics that may be easier to achieve than others, and so on.

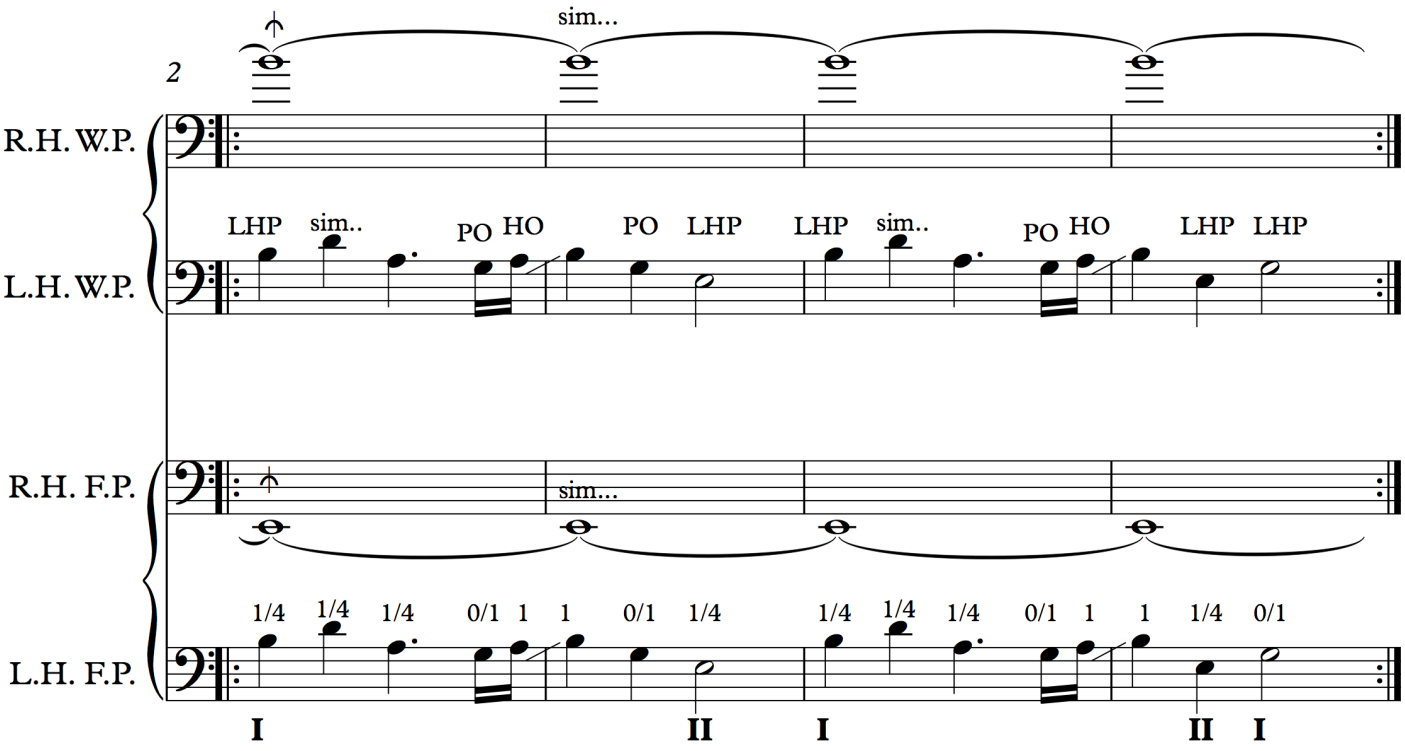
4.3.4 Left Hand Techniques

For the basis of this particular analysis, "Left Hand Technique" refers to any sound made on the strings with the left hand fingers alone. As mentioned in section 4.3.3, *Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello* is based around a high B3 note drone created by the right hand bowing the E string between the bridge and the tailpiece. The drone continues throughout the entirety of the work and all other material is produced by the left hand alone, using a variety of different techniques which I will now discuss.

4.3.4.1 Left hand pizzicato techniques

Much of the melodic content of this study is generated through the use of various left hand alone pizzicato techniques, the first examples of which appear in a four bar melodic sequence from bars 2-5.

Figure 4.3.3 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 2-5



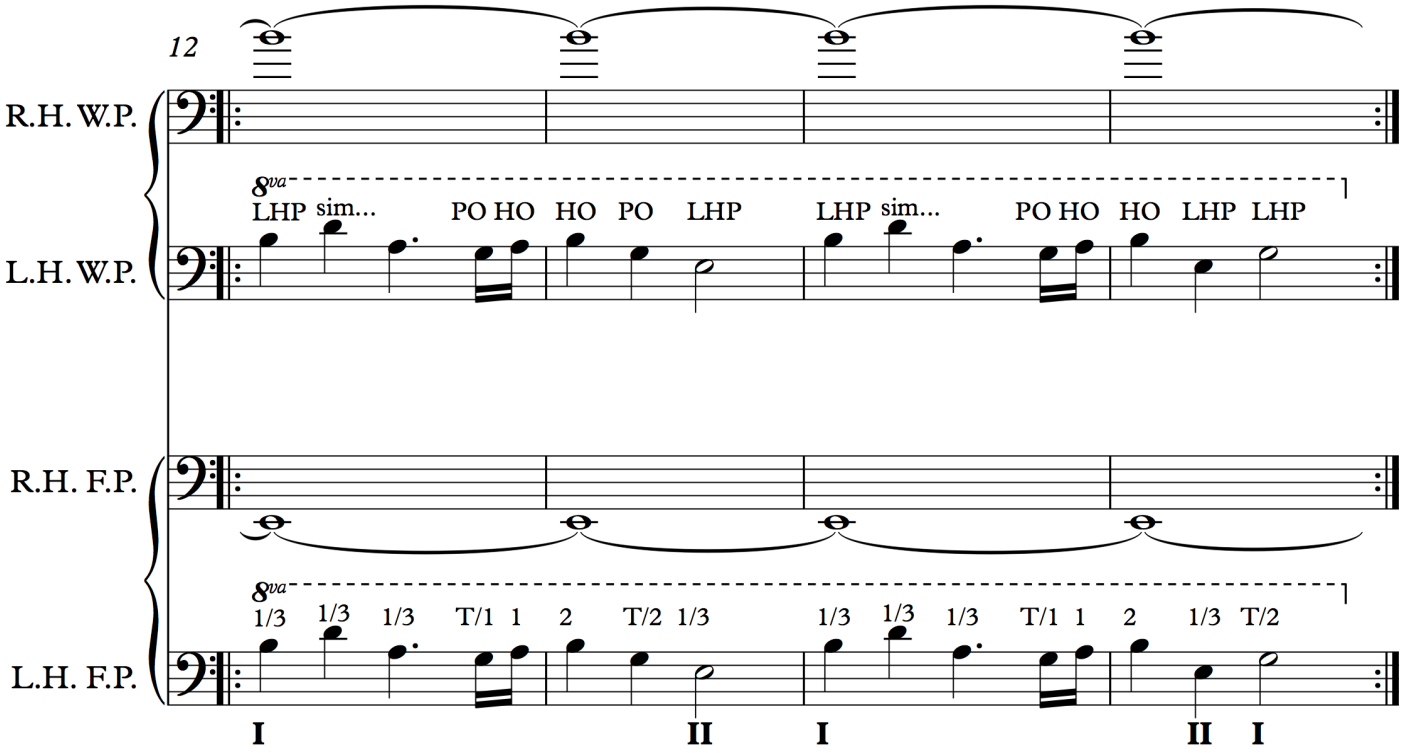
Video 4.3.3 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 2-5

The melodic material is produced through a combination of left hand pizzicato[1], pull-offs, hammer-ons and slides. The left hand finger position stave shows where on the instrument the notes are to be produced and specifies fingering combinations. '1/4', for example, denotes that the note should be fingered with the first finger of the left hand and plucked with the fourth finger of the same hand, '0/1' suggests the open string should be plucked with the first finger, and so forth.

Bars 12-15 feature the same melodic material from bars 2-5 transposed up an octave.

1 'Left hand pizzicato' refers to one finger on the left hand depressing the string at the specified point and a second left hand finger plucking the string 'below' (towards the bridge) the fingered note. It is denoted by the abbreviation 'LHP'.

Figure 4.3.4 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars12-15

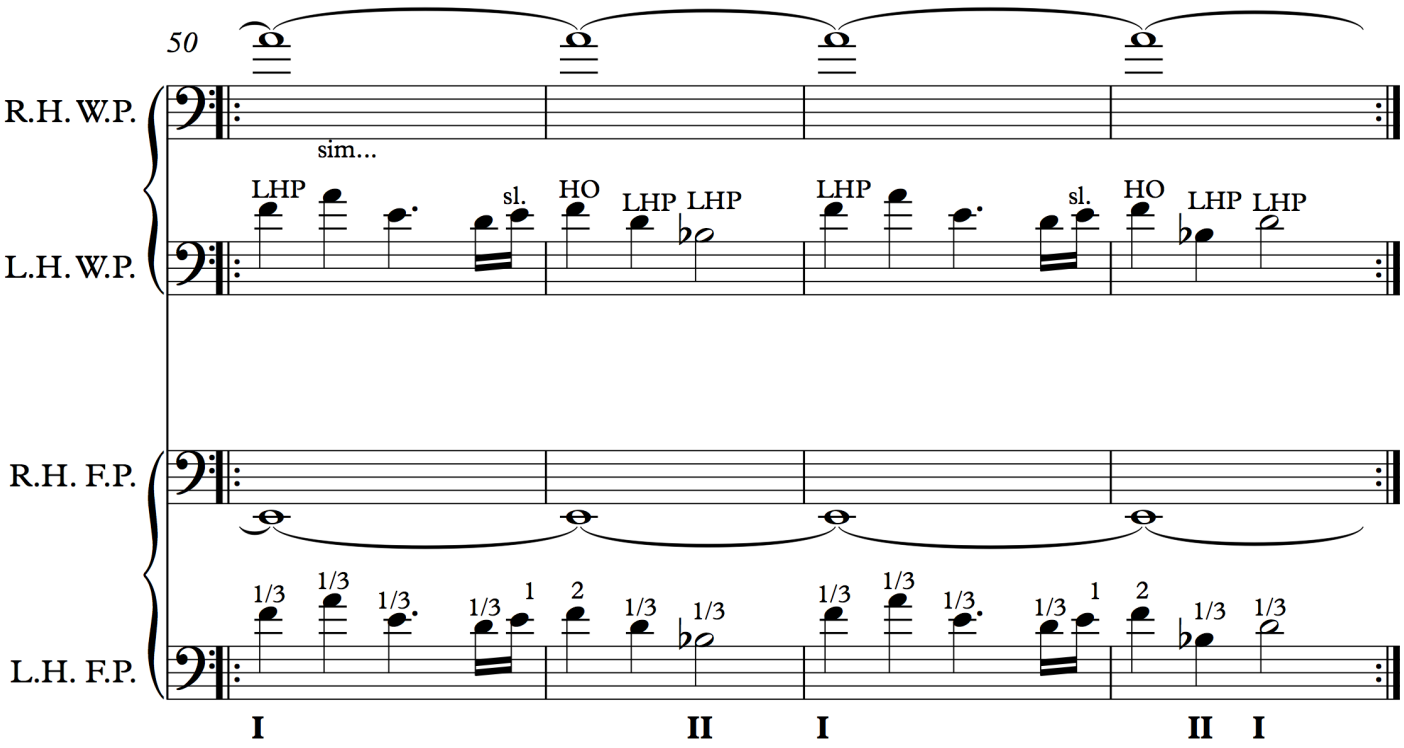


Video 4.3.4 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 12-15

I have found the left hand pizzicato melodic material in bars 12-15 is significantly more difficult to execute than the octave lower material in bars 2-5. Because the left hand pizzicato techniques require the notes to be fingered by the first finger and plucked with the third, the left hand must shift hand position a lot more than would be usual in this area of the double bass. The register of bars 12-15 is within the range of thumb position, wherein normally a range of a perfect fourth can be fingered in one position.

The final passage I will discuss in relation to left hand alone pizzicato techniques begins at bar 50. By this stage, the E string has been detuned to a D, causing the continued drone of the arco sub ponticello to be detuned to an A.

Figure 4.3.5 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 50-53



Video 4.3.5 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 50-53

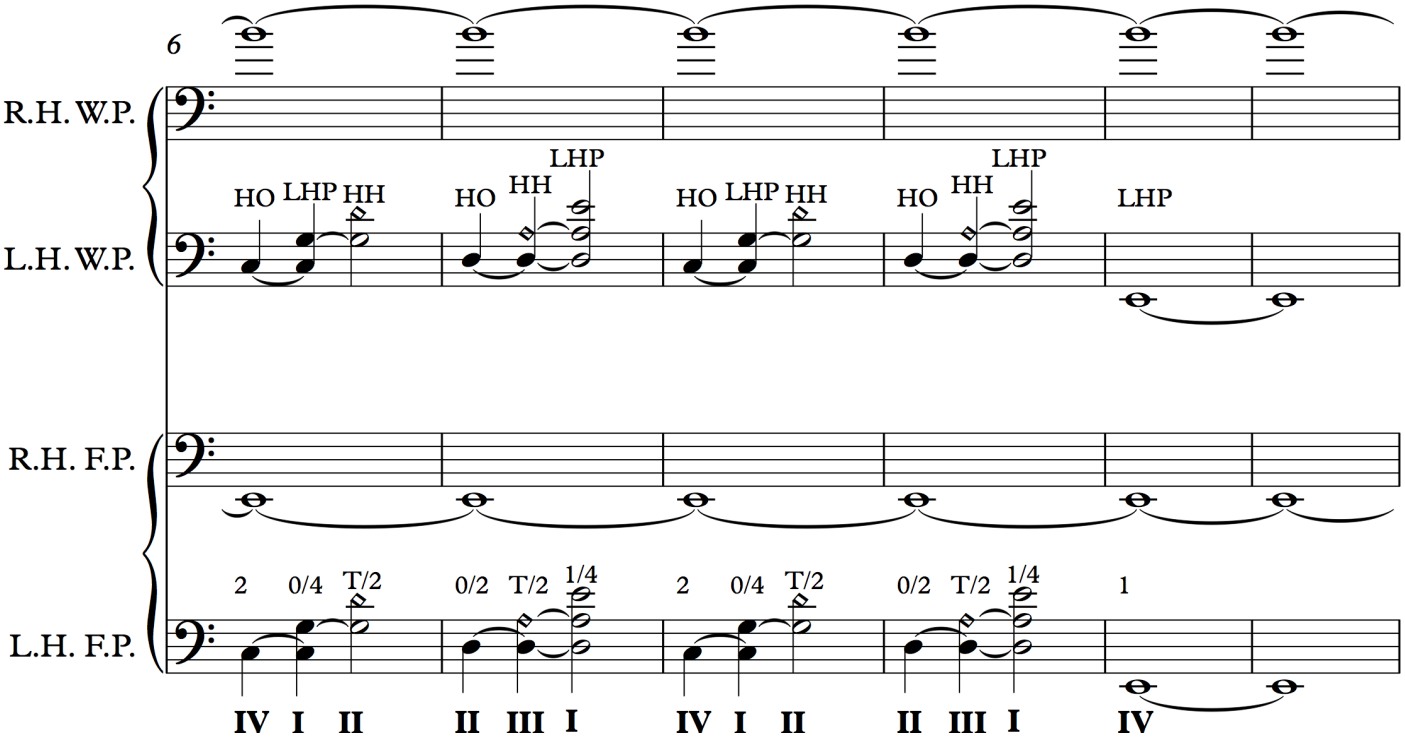
Figure 4.3.5 shows that this passage consists of material that is similar in melodic contour and rhythm to the opening melody of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* (bars 2-5) in terms of rhythm and melodic contour, albeit in the key of D minor now (as opposed to the previous key centre of E minor). I have found bars 50-53 to be more difficult to execute than the melodic material in Figures 4.3.3 and 4.3.4 for two reasons. The first is that the material in both Figures 4.3.3 and 4.3.4 have clear 'anchor' points. In Figure 4.3.3, the anchor point is the open G string, while in Figure 4.3.4 the anchor point is the thumb on the octave G/2nd partial. These anchor points help to ground intonation and offer a point in the phrase of more surety than others. The passage in Figure 4.3.5, however, does not feature any points quite as definite. The second reason I have found bars 50-53 difficult is that the phrase jumps from normal left hand position into what would normally be thumb position and back again, all while maintaining the same left hand pizzicato method of fingering the note with the first finger and plucking it with the third.

These are unusual hand shapes and jumps and have required a lot of practise to get correct, but I feel that they have opened up new possibilities fingering-wise in my normal two-handed technique as well.

4.3.4.2 Left hand harp harmonics

As the name suggests, left hand harp harmonic technique is essentially the same as the more common right hand harp harmonic, albeit more difficult in terms of balancing the instrument and other physical aspects. Left hand harp harmonics are first introduced in bars 6-11 of *Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello*, which feature new melodic material and combinations with other left hand alone techniques.

Figure 4.3.6 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 6-11



Video 4.3.6 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 6-11

There are a few technical difficulties involved with executing bars 6-11. I wanted the effect of the left hand material to be similar to a piano with the sustain pedal down; in other words, I wanted the notes to ring for as long as possible, overlapping in order to create the feeling of a chord. In bar 6, a C note on the E string is hammered on with the second finger, the open G string is plucked with the fourth finger, making sure the C is still ringing. Then, without interrupting the continuing vibration of the open G string, a harp harmonic consisting of the D string 2nd partial being fingered by the thumb and plucked by the third finger is executed.

Video 4.3.7 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bar 6

Bar 7 begins with the second finger of the left hand plucking the open D string, followed by the thumb and third finger executing the same harp harmonic on the A string as opposed to the D, and finally a left hand pizzicato on the G string consisting of the first finger depressing an E note and the fourth finger plucking it.

Video 4.3.8 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bar 7

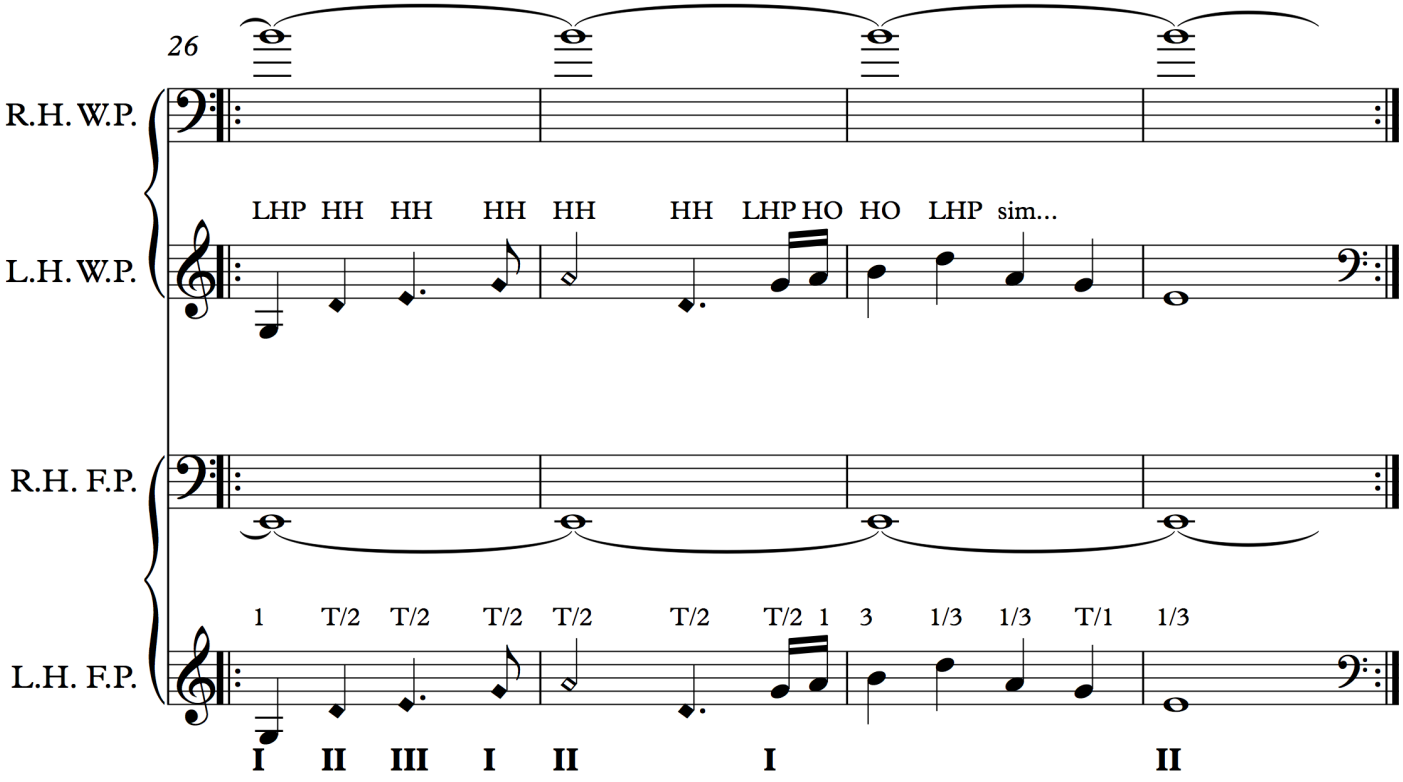
In bar 7, as opposed to bar 6, it is possible to make all the notes last to the end of the bar. This is due to the only stopped note being located at the end of bar 7, whereas the stopped note in bar 6 is situated at

the start of the bar, meaning the finger has to release the note in order to be able to sound the two harp harmonics that follow. As can be seen in Figure 4.3.6, bars 8 and 9 are repetitions of bars 6 and 7 which are then followed by a left hand pizzicato open E string, held for two bars. Any notes still ringing from bar 9 are fortuitous, as they all work within the context of the underlying E aeolian minor diatonic harmony and contribute to the intended feeling of the passage.

In order to make sure all the notes ring as long as possible in bars 6-11, care must be taken to not interrupt the vibrations of any of the open strings or ringing harp harmonics. This involves hand positions and body positions outside of normal performance practice.

Bars 26-29 of *Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub Ponticello* feature further examples of left hand harp harmonic technique. Similarly to bars 6-11, the notes are intended to be left as long as possible to create the sustain effect.

Figure 4.3.7 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 26-29



Video 4.3.9 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 26-29

It can be seen that this entire passage is located in the region of the instrument between the octave/2nd partial and the bridge. I wrote it in this register for two reasons. The first is that the previous instances of left hand harp harmonics in this work have been used in tandem with lower notes located in the area of the bass between the octave/2nd partial and the nut. The second is due to the fact that the phrase beginning on beat 4 of bar 27 can only be played in that part of the instrument, and it follows that there will be less 'jumping' around the instrument if the first two bars are also performed in that area.

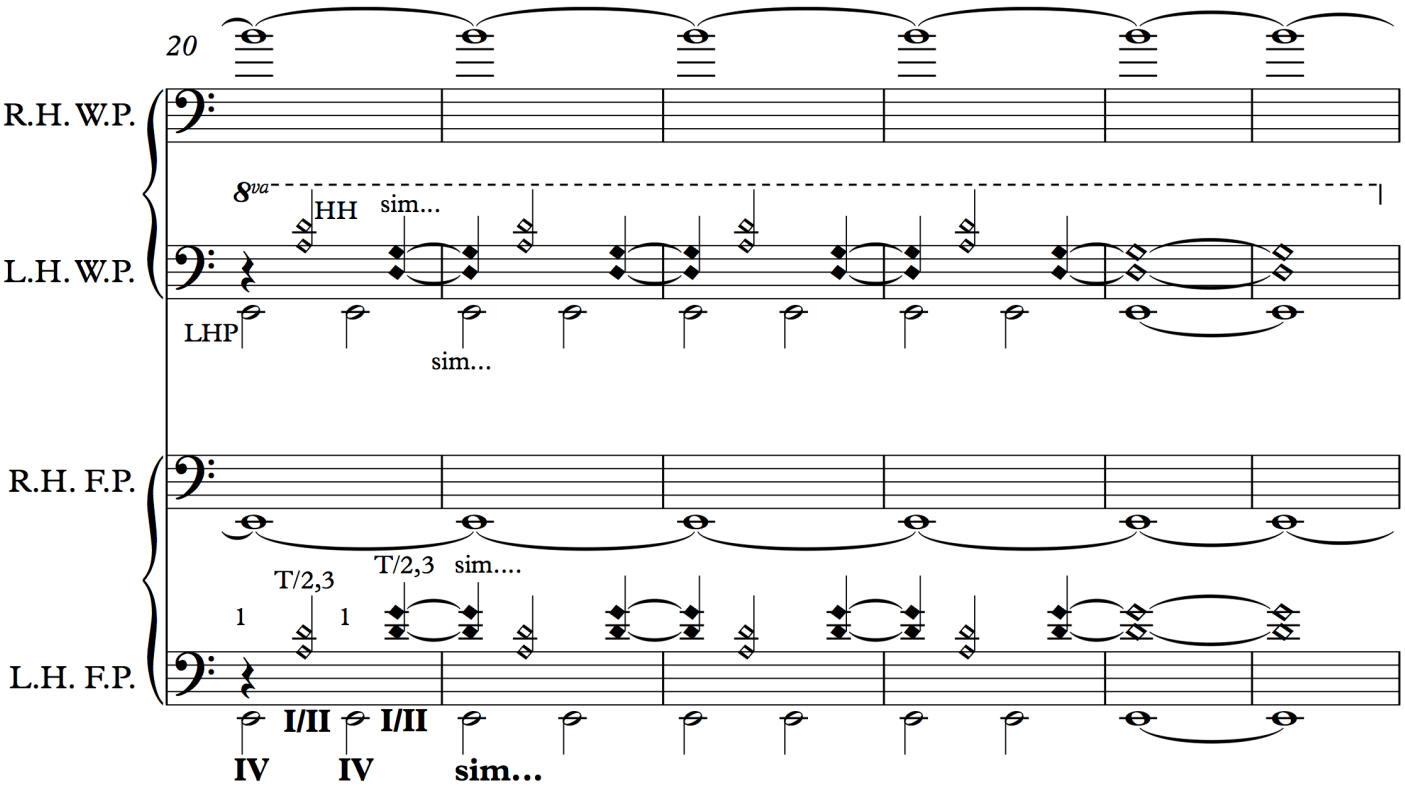
As in the earlier instances of left hand harp harmonics, great care and dexterity must be used in order to allow the notes to ring as long as possible. I have found it particularly difficult when there is a string vibrating adjacent to a string I am about to execute a left hand harp harmonic on; over-rotation of my left wrist so that I am executing the technique in a more 'sideways' fashion than usual has been helpful in order to overcome this difficulty.

Video 4.3.10 Over-rotation of left hand wrist in order to allow harp harmonics to keep ringing in *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 26-29

4.3.3.3 Left hand harp harmonic double stops

Bars 20-25 of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* feature the use of harp harmonic double stops. This technique has been discussed in the analysis of *Study in Harmonics and Multiphonics #1*, although in this case the harp harmonic double stops are executed by the left hand alone.

Figure 4.3.8 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 20-25



Video 4.3.11 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 20-25

As Figure 4.3.8 shows, bars 20-25 are built around a repeated motif wherein the open E string is plucked by the left hand first finger, followed by alternating harp harmonic double stops, first on the 3rd partial and then on the 2nd partial of the G and D strings. I have found bars 20-25 of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* to be considerably more difficult to perform than the harp harmonic

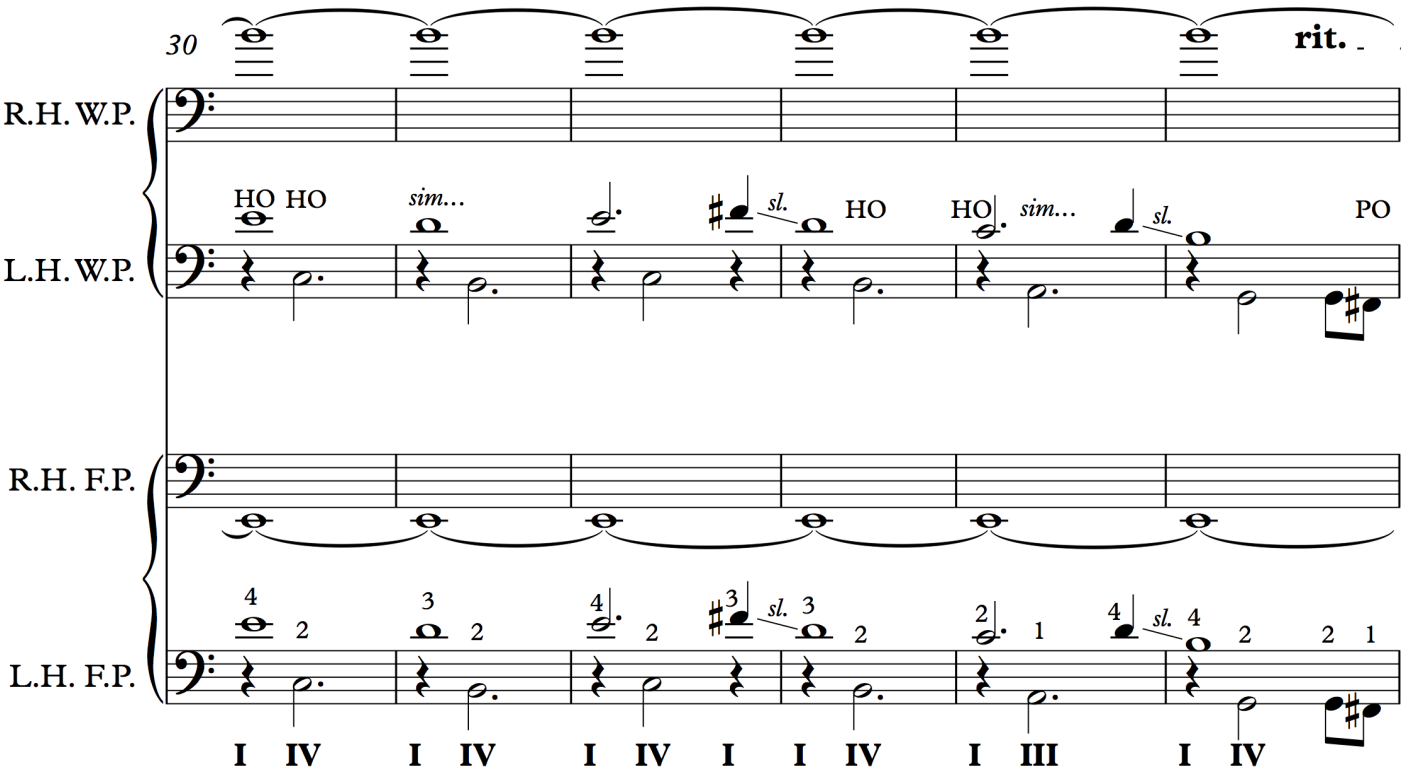
double stops in *Study in Harmonics and Multiphonics #1*, for two reasons. The first reason is that the phrase in *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* features alternation between the 3rd and 2nd partials as activation points, complicated further by the addition of the plucked open E string between each double stop, whereas the harmonic double stops in *Study in Harmonics and Multiphonics #1* are all located at the same nodes, albeit on different strings. The second reason is that using the left hand to produce the harp harmonic double stop in this area of the bass means that the neck of the instrument is not supported with the left hand, causing the instrument to feel rather off balance.

The same technical specifications as discussed in *Study in Harmonics and Multiphonics #1* must be adhered to, such as making sure to keep the thumb as close to a perfect right angle with the strings as possible. As the specified nodes are so far apart, care must be taken when changing position to maintain the right angle.

4.3.4.4 Left hand independent finger hammer-ons

Bars 30 to 35 of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* contain new left hand alone material in the form of one left hand finger playing a hammer-on followed by another left hand finger hammer-on, both notes lasting until the end of the bar in most cases.

Figure 4.3.9 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 30-35



Video 4.3.12 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 30-35

Figure 4.3.9 contains a few points of interest in terms of potential difficulty of performance. The main issue is creating enough impetus when hitting the string to make each note last long enough (four beats in several cases). The first/higher notes in each bar are significantly harder to produce in this regard because they must last the entirety of the bar. It is also important that the fingers producing the higher notes do not move when the second note is produced, as this can cause intonation to change and the length of the note to lessen.

The notes that are created by slides from the final notes of bars 32 and 34 are also particularly difficult to get enough volume and decay out of. The hammer-on note that the slides start on must be particularly loud and full and the slide must be performed with enough momentum to generate extra volume from the note as it begins to decay, as well as enough precision so that the slide stops dead on the intended note, in tune, and no further loss of sound and time from adjusting intonation occurs.

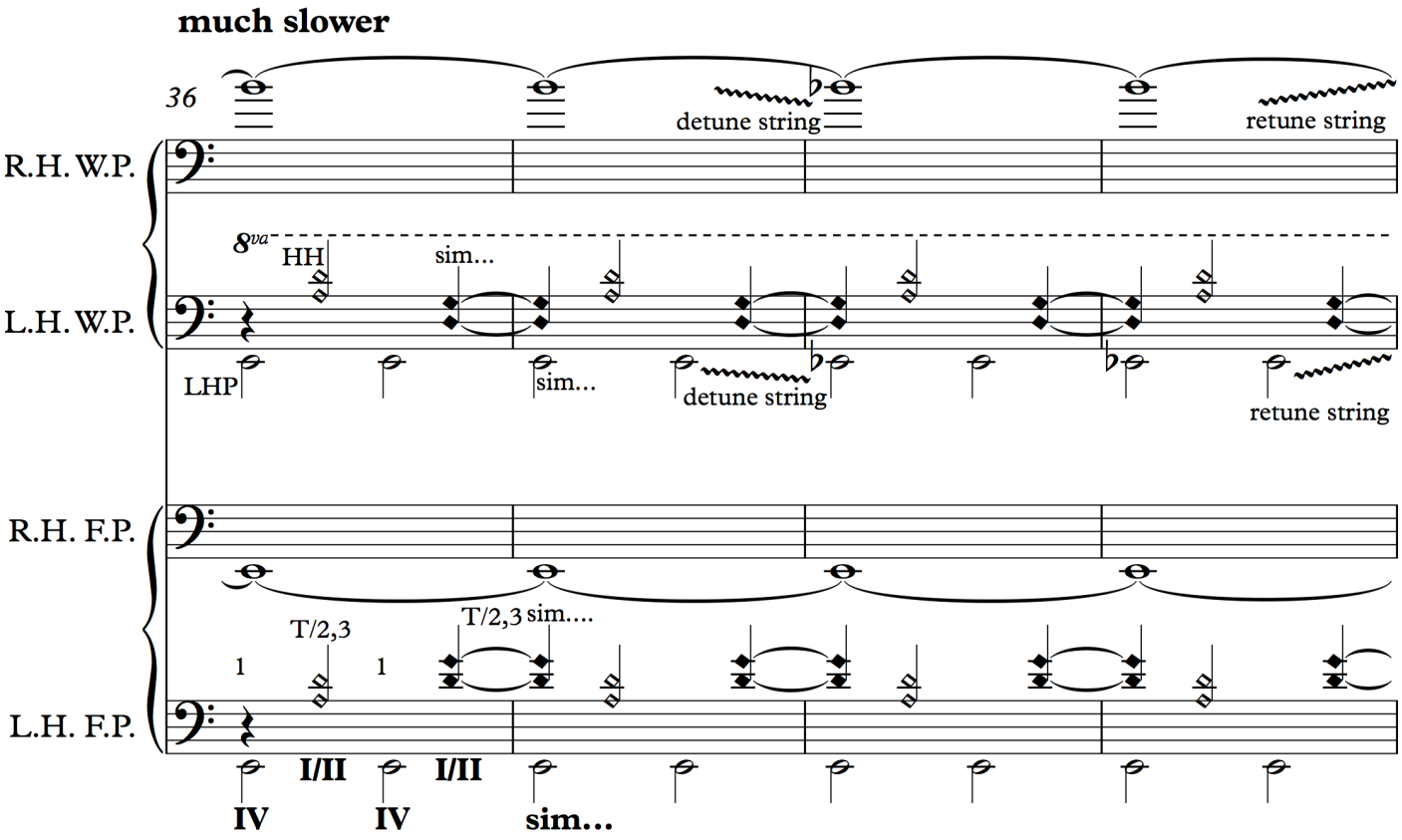
Video 4.3.13 Example of hammer-on followed by slide and independent finger hammer-on

4.3.5 Moving scordatura

The term Scordatura refers to tuning systems other than the standard for the instrument in question. While this may seem at first to be a relatively simple 'extended technique', the implications of changing the fundamental of a string are remarkably broad. The effect scordatura can have on available harmonics, multiphonics, cross-string intervals, range and so forth opens pathways to melodic and harmonic possibilities not available in standard tuning.

In *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*, I have used a 'moving' E string scordatura to change the effect that the arco sub ponticello drone and left hand pizzicato E string pedal points have on the implied harmonic context of the work. The first example of the moving scordatura occurs towards the end of bar 37.

Figure 4.3.10 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 36-39

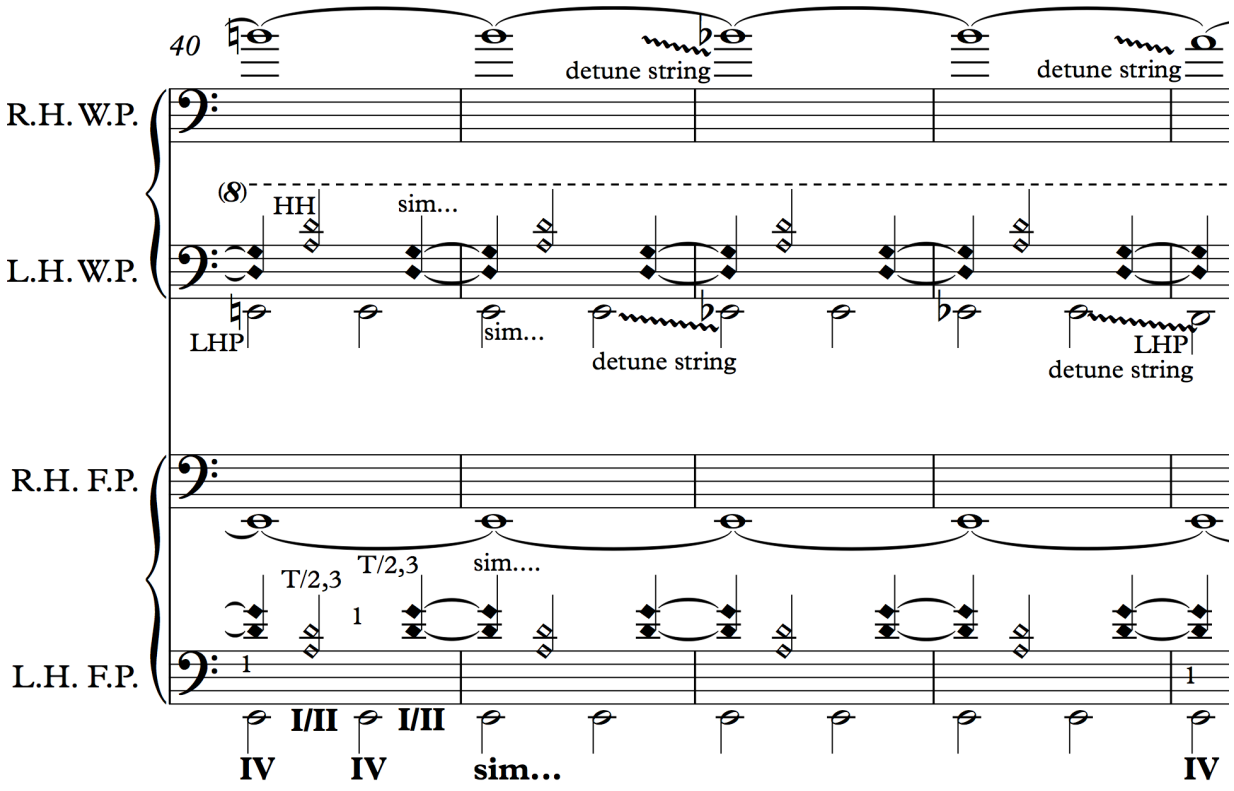


Video 4.3.14 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 36-39

Bars 36 and 37 feature the same left hand harp harmonic double stop material as bars 20-23. At the end of bar 37, however, the E string is detuned. By examining the "written pitch" staves, it can be seen that the E string is detuned by a semi tone to Eb, which in turn causes the arco sub ponticello drone to detune from B3 to Bb3. The double stop harp harmonics on the G and D strings remain the same throughout the passage. This causes the overall harmonic context to move from the Emin11 implied by the relationship between the arco sub ponticello drone, the pedal point left hand pizzicato open E, and the harp harmonics, to an Ebmaj7#11. This change in harmonic context is then reversed at the end of bar 39, where the string is retuned, moving the key center back to Emin11.

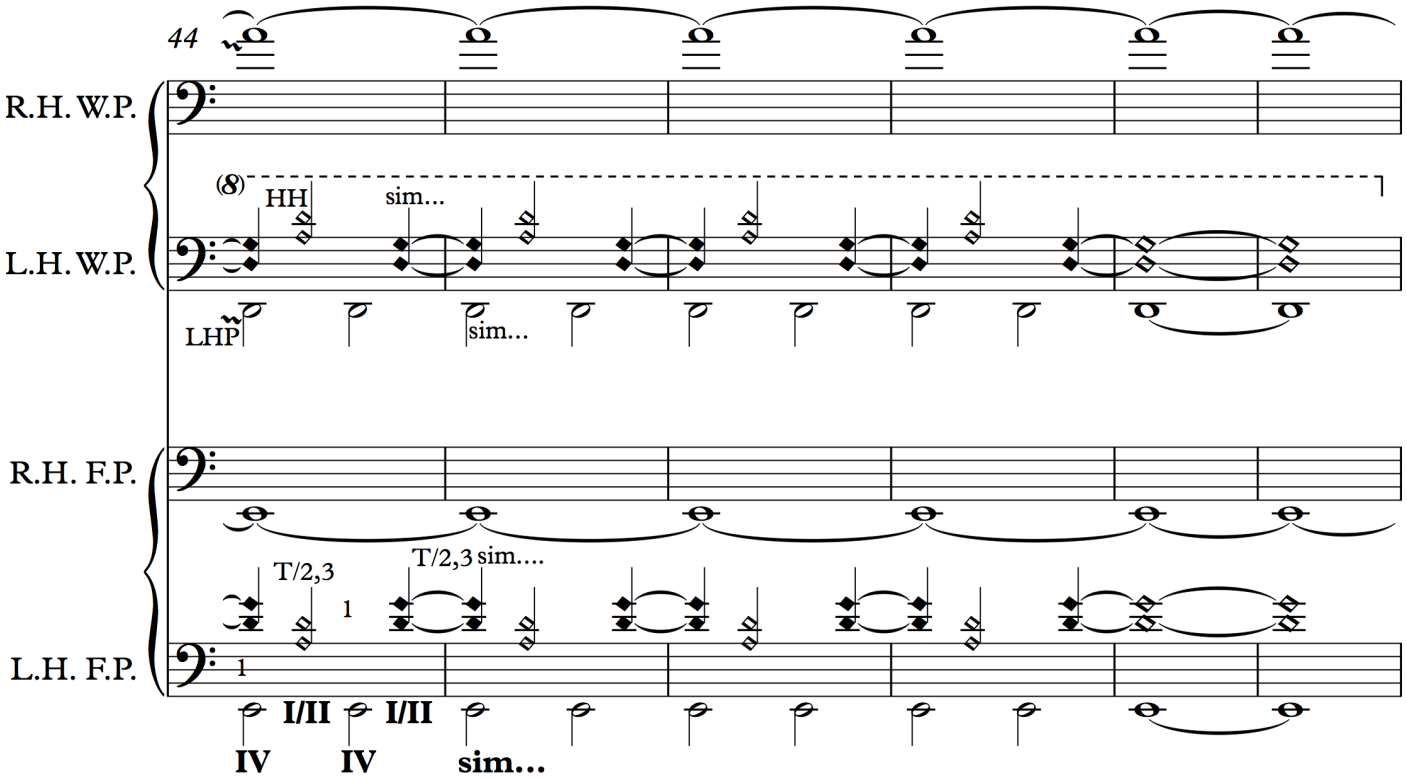
Bars 36-39 are repeated almost verbatim in bars 40-43. The only difference can be seen at the end of bar 43, where instead of the E string being retuned from Eb back to E, it is further detuned to D.

Figure 4.3.11 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 40-43



Bars 44-49 feature similar material to the previous eight bars. Once again, however, the harmonic context is changed due to the aforementioned further detuning of the E string to D. This causes the arco sub ponticello drone to also be lowered once more, this time to an A3, placing the overall harmonic material in what at first appears to be a context of Dsus.

Figure 4.3.12 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 44-49

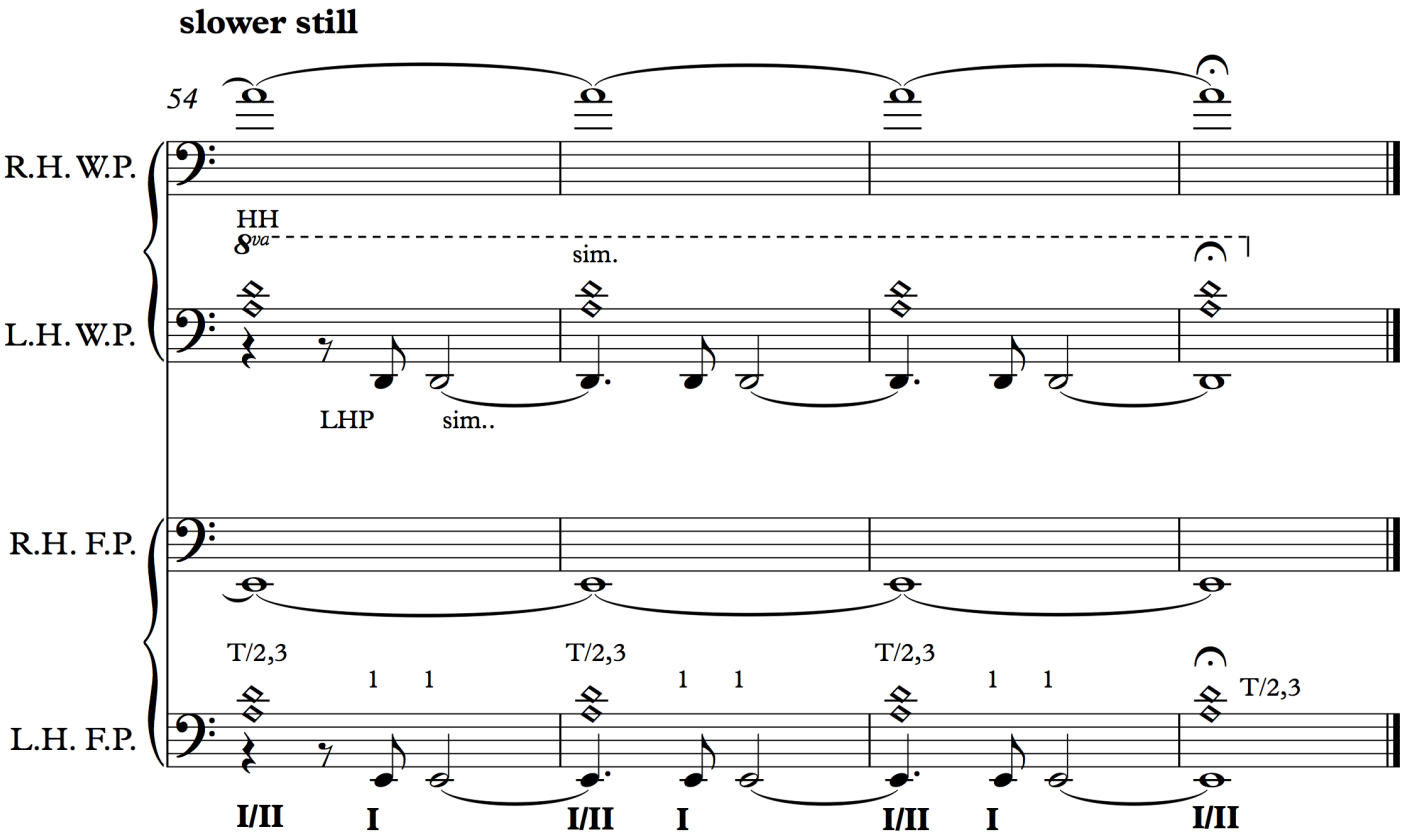


Video 4.3.15 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* detuning from E through Eb to D

The implied Dsus sound does not last long. As mentioned in section 4.3.4, bars 50-57 consist of similar melodic and rhythmic material to the bars 2-5 of *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello*. This melodic material is all built around the D Aeolian scale or mode which, along with the detuned open D pedal point and high A arco sub ponticello drone, place bars 44 to bar 57 in a D minor harmonic context.

The final four bars continue to be placed within a D minor harmonic context, consisting of a simplified version of the harp harmonic and left hand pizzicato pedal point material from bars 20-25 and bars 36-49.

Figure 4.3.13 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 54-57



Video 4.3.16 *Study in Left Hand Pizzicato, Scordatura and Arco Sub Ponticello* bars 54-57

4.4 Analysis: *Karakia*

Video 4.4.1 *Karakia*

4.4.1 About the work

Karakia is a freely improvised piece that emerged as a result of my developmental process. For the most part, *Karakia* is based around various combinations and organisations of pizzicato harmonic techniques. It is generally rubato, with a few sections of more structured time feel.

4.4.2 Pizzicato harmonics

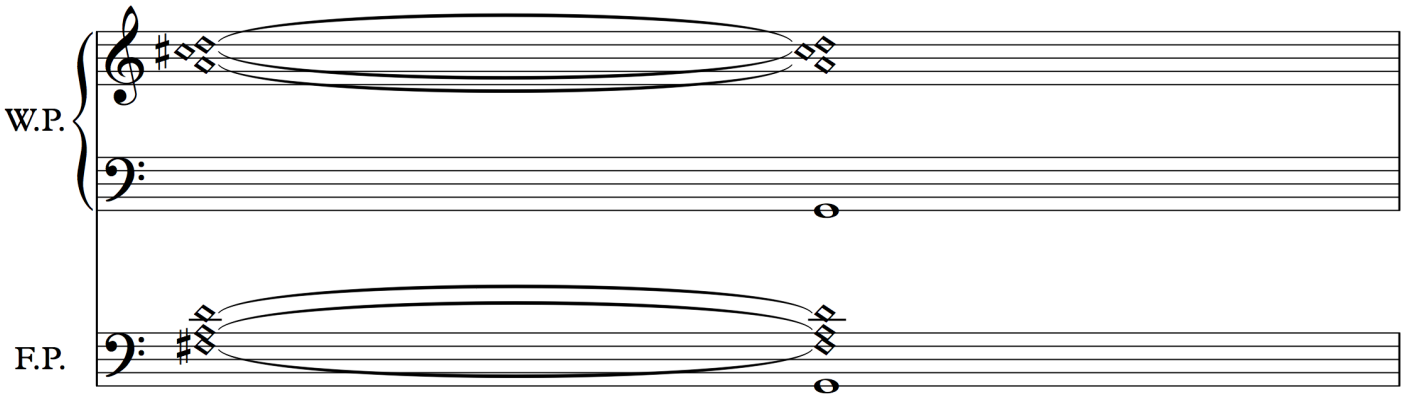
4.4.2.1 Pizzicato harmonic chords

Much of *Karakia* is based around chords made up of pizzicato harmonics. A common pattern I use throughout *Karakia* is executing a three-note harmonic chord and then harmonically contextualising it with a root note, as shown in Video 4.4.2.

Video 4.4.2 *Karakia* three-note harmonic chord followed by contextualising root note

In the case of Video 4.4.2, I play a three-note harmonic chord made up of the 5th partial of the A string and the 3rd partials of the G and D strings, suggesting an Aadd4 tonality. However, the three-note harmonic chord is then contextualised with a low G root note, suggesting a Gmaj9#11 chord.

Figure 4.4.1 *Karakia* example of harmonic contextualising of three-note harmonic chord



The pattern of harmonically contextualising a three-note harmonic chord with a root note effectively creates staggered four-note chords, a method of chordal generation I employ throughout *Karakia*. Due to the physical realities of the instrument, three or four note chords are generally quite difficult to sound on the double bass; finding methods of being able to generate wide-ranged chords has been a personally satisfying result of my developmental process.

Around 01:20 of *Karakia*, I begin a passage built around several repetitions of a three-note harmonic chord made up of the 2nd partials of the G and A strings and the 5th partial of the D string interspersed with pizzicato bass notes.

Video 4.4.3 *Karakia* 01:20-01:36

The first bass note I choose is an open D, which interrupts the vibration of the D string 5th partial in the harmonic chord. The bass note I decide on following the next example of the three-note harmonic chord is an A, but in this instance I finger the A on the E string instead of interrupting the still-ringing A string 2nd partial in the harmonic chord. From this development, I can conclude that 1) I had a specific bass note in mind but did not wish to interrupt the ringing of the chord a second time; and 2) I made a decision to execute the note in a different (and much less common) position in order to facilitate continued sounding of the harmonic chord. Interestingly, following another iteration of the three-note chord, I decide to restate the initial D bass note again; however, this time I finger it on the E string as opposed to the open D string. The fact that I would choose to play a D on the E string (a very unusual fingering for the D in question) further shows that I am committing to the bass notes chosen and problem solving in real-time in order to allow the harmonic chords to continue ringing.

4.4.2.2 Reverse side pizzicato

'Reverse side pizzicato' is a method of pizzicato harmonic chord generation that I learned of from Jeff Denson's doctoral dissertation *Melodic and Chordal Applications for Harmonics on the Double Bass: a Study of Techniques, Chords, and Compositions*. In a description of 'raking' technique, wherein the strings are struck "in rapid succession (in one motion), either from top string to bottom string or the reverse" (Denson, 2010: 56), Denson offers a method of pizzicato harmonic execution I had not previously been aware of:

> *When generating this effect pizzicato the artifacts (noise-to-pitch ratio) can be a bit too high, therefore better results can be achieved by raking the strings behind the left hand with the fleshy part of the thumb. The attack will generally be less pronounced here due to the shorter string length from the left hand to the nut; the shorter string length results in the strings being more taut than on the opposite side of the hand.* (Denson, 2010: 56)

This is the method of three-note harmonic chord generation I have chosen to utilise in much of *Karakia*, as shown in the opening sequence of the work in Video 4.4.4.

Video 4.4.4 *Karakia* opening sequence

Reverse side pizzicato technique is very effective in terms of creating clarity in the harmonic chords; there is much less low frequency information in the right hand attack, frequency information which has a tendency to 'cloud' the sound of pizzicato harmonics. Another advantageous aspect of raking behind the left hand as a means of harmonic chord generation is that the strings are significantly closer together nearer the nut than they are at the point of regular pizzicato technique, meaning the strings can be raked quicker; faster execution of the individual strings means the effect is more like a chord rather than a rapid arpeggio. I alternate between reverse side pizzicato and regular right hand pizzicato harmonic technique throughout *Karakia*, dependent on physical realities and context. Video 4.4.5 shows a passage where I alternate between the two pizzicato harmonic generation methods in an exposition of the different sonorities they each possess.

Video 4.4.5 Alternation between regular pizzicato and reverse side pizzicato techniques in *Karakia*

Between 00:00 and 00:03 of Video 4.4.5, I place my hand at the point for regular pizzicato harmonic technique, then place it at the point for reverse pizzicato technique, before returning to the location of regular pizzicato harmonic technique and finally plucking the fingered harmonic. To me, these three

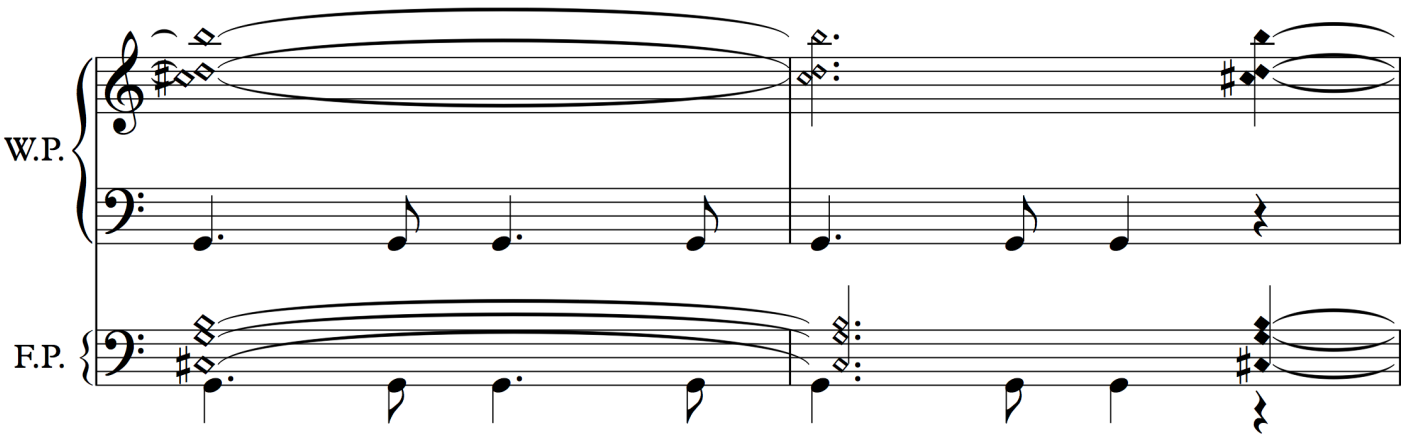
seconds at the start of Video 4.4.5 show a decision-making process involving a knowledge of the two methods of pizzicato harmonic generation and the effect each produces. This decision-making process continues throughout the rest of the passage shown in Video 4.4.5, in which I alternate between regular pizzicato harmonic and reverse harmonic technique, first in single notes, then in three-note chords. The difference in amount of low frequency information between the two methods of harmonic execution are particularly obvious in this passage.

A further exposition of reverse side pizzicato harmonic technique can be found in the passage between 01:35 and 01:55 in *Karakia*.

Video 4.4.6 *Karakia* 01:35-01:55

As Video 4.4.6 shows, the passage between 01:35 and 01:55 of *Karakia* features alternation between a three-note harmonic chord (made up of the 5th partials of the G and A strings and the 4th partial of the D string) and a low G rhythmic pattern.

Figure 4.4.2 Pattern at 01:35 of *Karakia*



The pattern shown in Figure 4.4.2 repeats throughout the passage between 01:35 and 01:55 of *Karakia*. In every instance of the pattern, the harmonic chord is generated through reverse side pizzicato technique, while the low G rhythmic pattern is executed with regular pizzicato technique. The commitment to alternating between the two methods of pizzicato note generation shows how effective reverse side

pizzicato harmonic technique can be; considering the speed of the alternation in this passage, it would be much easier to produce the harmonic chord with regular pizzicato technique, without moving the right hand position at all. The fact that I have chosen to execute the harmonic chord with reverse pizzicato technique on every occasion in the passage between 01:35 and 01:55 of *Karakia* is indicative of a decision-making process that places the desired sound and effect *first* and initiates problem-solving methods to deal with the execution *second*.

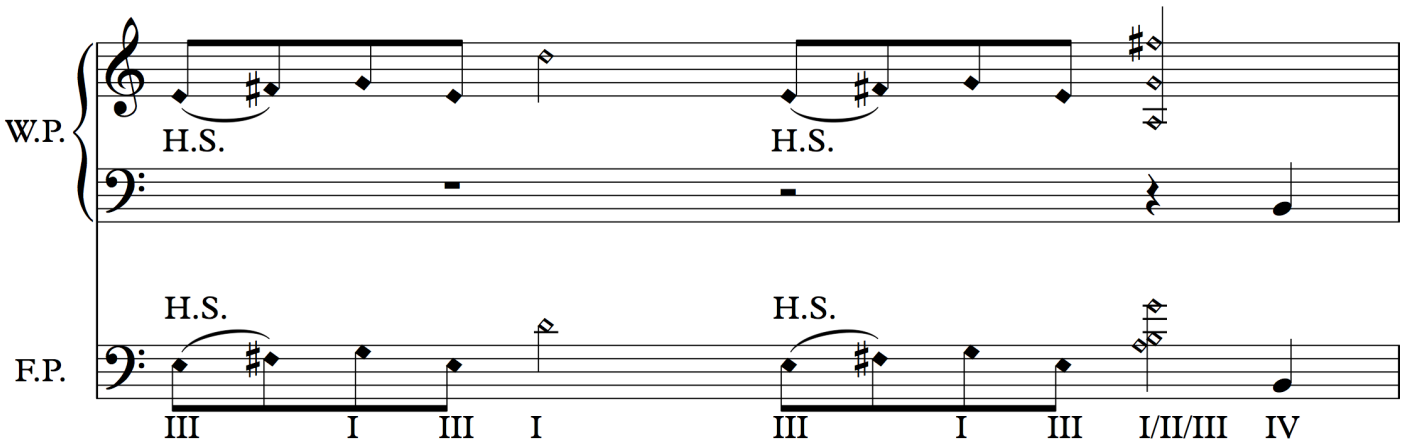
4.4.2.3 Pizzicato harmonic slides

Pizzicato harmonic slides are generated by first plucking a harmonic, then depressing the string into the fingerboard at the location of the harmonic node and sliding the finger in either direction, maintaining a consistent finger pressure against the fingerboard, thereby sliding the harmonic to the desired pitch.

Video 4.4.7 Harmonic slide in *Karakia*

The pizzicato harmonic slide technique allows the execution of notes and melodic phrases outside of the harmonic series, as evidenced in Video 4.4.7. The transcription in Figure 4.4.3 shows that the 3rd partial on the A string, which corresponds to an E3 note, slides up to an F#, followed by a G harmonic played at the second partial of the G string, a repeat of the A string 3rd partial, and the 3rd partial on the G string. The first half of the phrase is then repeated, followed by a three-note harmonic chord contextualised harmonically with a stopped low B.

Figure 4.4.3 Pizzicato harmonic slide example in *Karakia*



The combination of harmonics, harmonic slides and regular tones broadens the melodic and harmonic possibilities of the double bass considerably, but is subject to various parametric realities, including volume, pitch range and generation method.

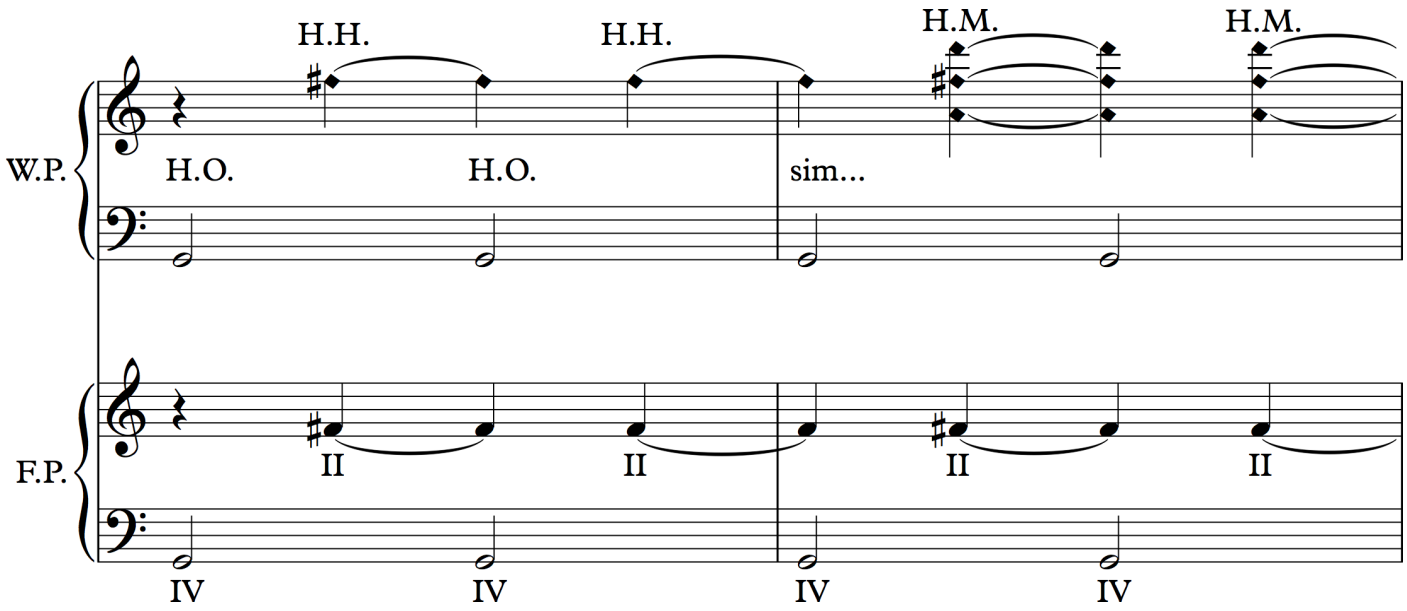
4.4.3 Harp harmonics and harp multiphonics

At 02:12 of *Karakia*, a passage featuring a left hand hammer-on G on the E string followed by either a harp harmonic or harp multiphonic on the D string begins.

Video 4.4.8 *Karakia* alternation between left hand hammer-on low G and harp harmonics/multiphonics

The passage in Video 4.4.8 is similar to material in *Study in Harmonics and Multiphonics #1*. The alternation between the harp harmonics and harp multiphonics in Video 4.4.8 contains a significant point about harp multiphonics and multi-nodal multiphonics in general. The passage begins with the low G hammer-on followed by a harp harmonic at the 5th partial of the D string. These two notes are repeated before the pattern continues, this time with harp multiphonics made up of the 3rd, 5th and 8th partials in place of the harp harmonics.

Figure 4.4.4 *Karakia* alternation between left hand hammer-on low G and harp harmonics/multiphonics



The entire of Figure 4.4.4 is then repeated; however, the second iteration of the harp multiphonics (00:19-00:25 of Video 4.4.8) contains significantly less of the 8th partial than the first iteration (00:08-00:13 of Video 4.4.8). The difference in emergence of all three of the desired partials was at first accidental, caused by an attempt to execute the technique with less volume; however, instead of adjusting my thumb's positioning for the second harp multiphonic, I execute the technique in the same manner. I surmise that although the first harp multiphonic with less 8th partial presence was a mistake, I enjoyed the effect and proceeded to repeat it.

The two examples of the same harp multiphonic with different partial content shown in Video 4.4.8 are significant in terms of the potential for engineering how much of certain frequencies appear in a multiphonic through control of generating-finger plucking vigour control (as well as understanding how to consistently produce the desired harp multiphonic) and are also indicative of the potential flexibility and reflexivity of my research framework. In this case, experimentation with harp harmonics led to the development of harp multiphonic technique. Through formalisation of the harp multiphonic technique (during the improvisation process), new flexibility in a parameter of the technique was uncovered. In this case, the formalisation stage led both *forwards* into the analysis stage (evidenced by this analysis) and also led cyclically back to the experimentation stage, where I began trials to understand the possibilities of this new parameter both in the harp multiphonic technique and other multi-nodal multiphonic techniques (pizzicato, arco).

4.5 Analysis: *Study in Prepared Bass #1*

Video 4.5.1 *Study in Prepared Bass #1*

4.5.1 About the work

Study in Prepared Bass #1 is an étude for prepared double bass. The bass is prepared by wedging a 250mL soda drink can between the D and A strings near to the bridge. This has the effect of altering both the timbre of the prepared strings and the available pitches and harmonic series, while leaving the 'outside' G and E strings unchanged.

Study in Prepared Bass #1 is a slow, quasi-rubato work designed to exploit the timbral qualities of the prepared D string, on which an arco drone is performed for almost the entirety of the study. Various combinations of the prepared D string and other techniques are used throughout *Study in Prepared Bass #1*, and the presence of the preparation poses several issues around practicality that I have had to navigate as a composer and practitioner.

4.5.2 About the preparation

For *Study in Prepared Bass #1* I used a 250mL can made from fairly thin aluminium. Thinner aluminium is easier to reshape, in order to fit between the strings, and also seems to resonate and vibrate more than denser aluminium, helping to amplify overtones and harmonics. In order to prepare the bass, the D and A strings are pulled apart slightly with the left hand while the right hand inserts the can from the underside up between the strings so that the middle of the can is held in place by the vertical pressure of the strings.

Video 4.5.2 Insertion of can between the D and A strings

A slight 'denting' of the can was needed in order for it to fit comfortably between the strings as, ideally, there should not be a great deal of horizontal difference between the prepared strings and their normal resting trajectory once the can is inserted. Once inserted, I then 'tune' the can by bowing the D string above the can and checking the note against the open E string. The can should be placed vertically in such a location that the 'open' string between the nut and the can is an E2 one octave above the open E string (or as close to the pitch as possible) so adjustment may be needed at first.

Video 4.5.3 'Tuning' the can

The preparation changes the timbre of the prepared strings considerably. The sound is complex, quite harsh and contains large amounts of overtone information.

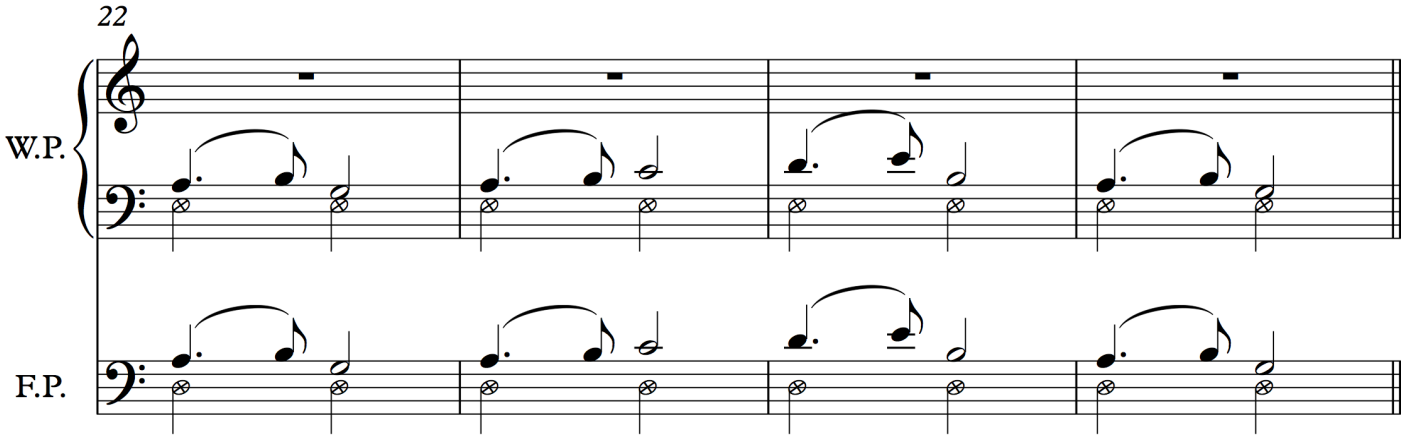
Audio 4.5.1 Example of prepared D string drone

The sound is naturally unstable and changeable, aspects which were necessary to factor in when composing for the preparation.

4.5.3 Notation

Study in Prepared Bass #1, as with all the notated works in the project, makes use of a dual-stave notation whereby one stave is a 'written pitch' stave and the other is a 'finger position' stave. Notes on the prepared strings are denoted by cross-shaped noteheads.

Figure 4.5.1 *Study in Prepared Bass #1* notation example



Generally, the prepared D string note stems point downwards to differentiate further the prepared and unprepared strings, except for a few instances where the prepared D string note is actually the higher note in a particular double stop, as in Figures 4.5.2 and 4.5.3:

Figure 4.5.2 *Study in Prepared Bass #1* stem direction example 1

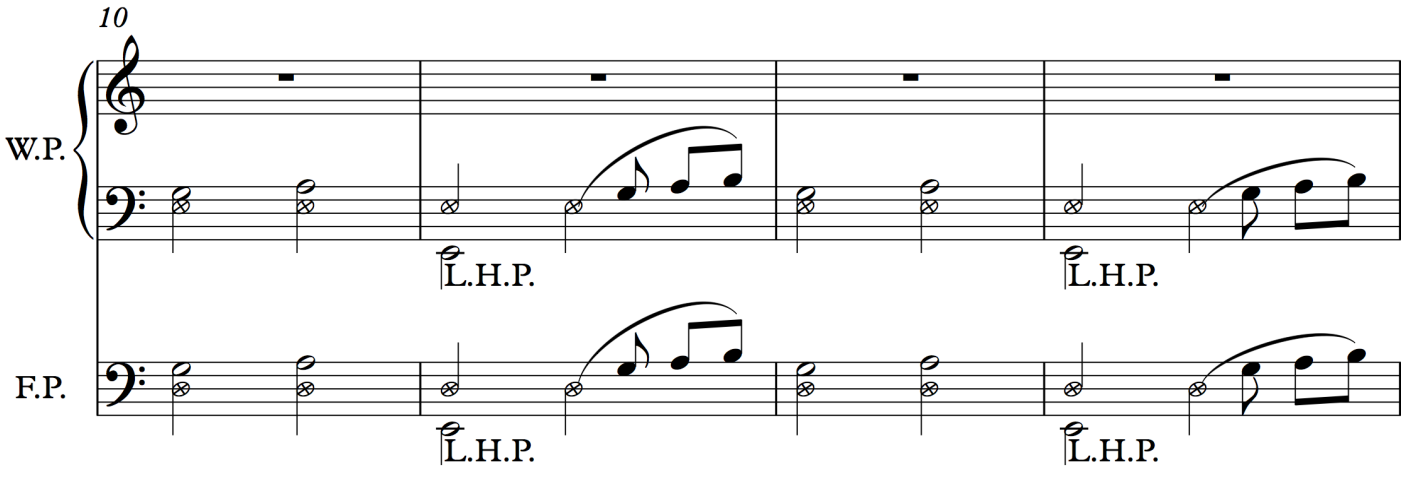


Figure 4.5.3 *Study in Prepared Bass #1* stem direction example 1

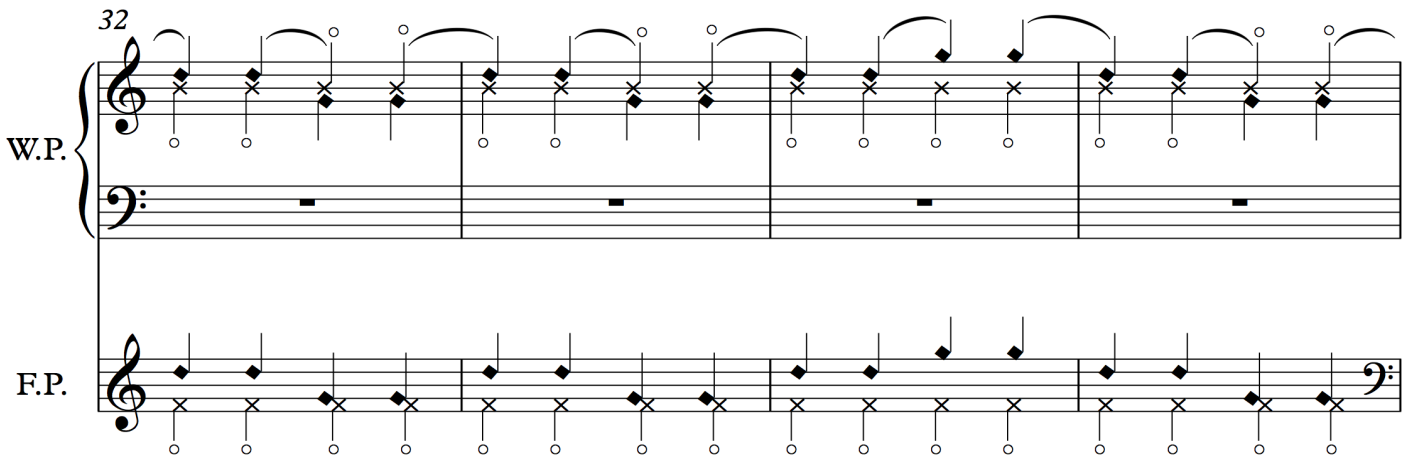


Figure 4.5.3 also shows notation for harmonics on the prepared D string. Generally, my preference is to notate harmonics with diamond noteheads, as evidenced by the unprepared string harmonics in Figure 4.5.3. However, in order to continue to notate the prepared string with cross noteheads in *Study in Prepared Bass #1*, I decided to use another common way of depicting harmonics; a small hollow circle attached to the note in question. Normally the circle would be above the note, but due to the differences in stem direction I decided the notation would look cleaner if I attached the circle to the end of the prepared note stem, regardless of stem direction.

4.5.4 Registration

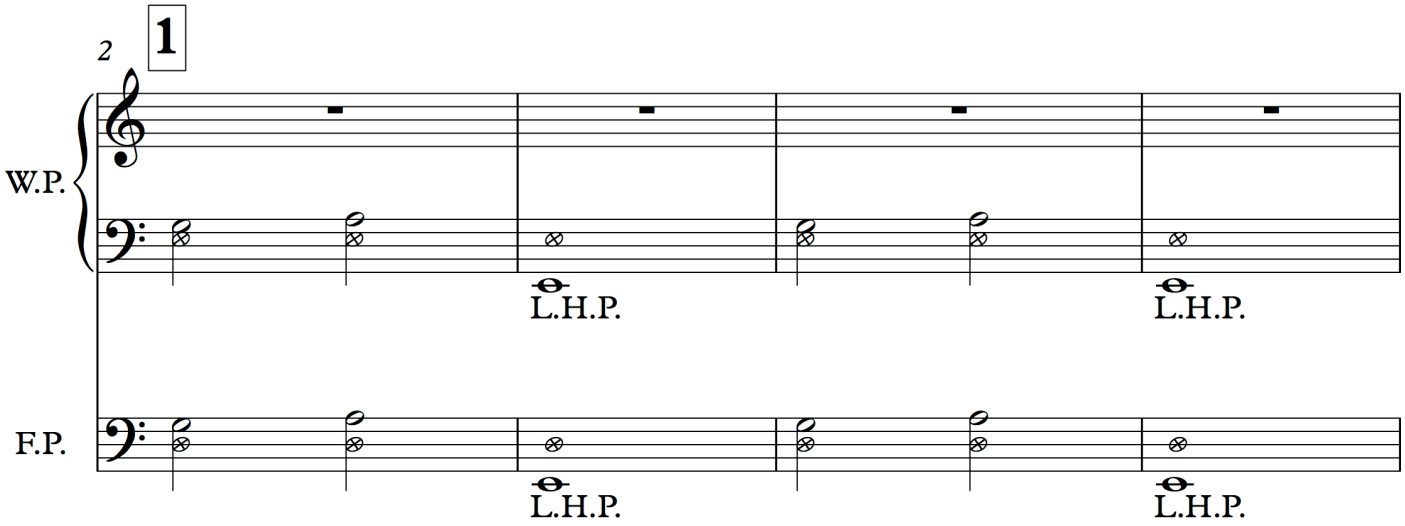
At this juncture, I would like to make a quick point about the way in which the preparation in 'Study in Prepared Bass #1' affects bow registration. The can is positioned almost exactly where the bow would be located for *normale* performance. Needless to say, in order to sound the prepared strings the bow must be placed in varying stages of *sul tasto*, while the unprepared strings can be activated in either the *sul tasto* or *sul ponticello* areas. It is a challenge, therefore, to make the unprepared strings speak in a *normale* manner when bowing an adjacent prepared string, but a change in bow pressure and left arm weight seems to me to solve this problem.

4.5.5 Double stops between prepared and unprepared strings

4.5.5.1 Arco prepared string and adjacent unprepared string double stops

Most of the harmonic and melodic content in Study in Prepared Bass #1 is built around arco double stops created from the prepared D string and the unprepared G string, as can be seen in the opening bars of Section 1.

Figure 4.5.4 *Study in Prepared Bass #1* bars 2-5

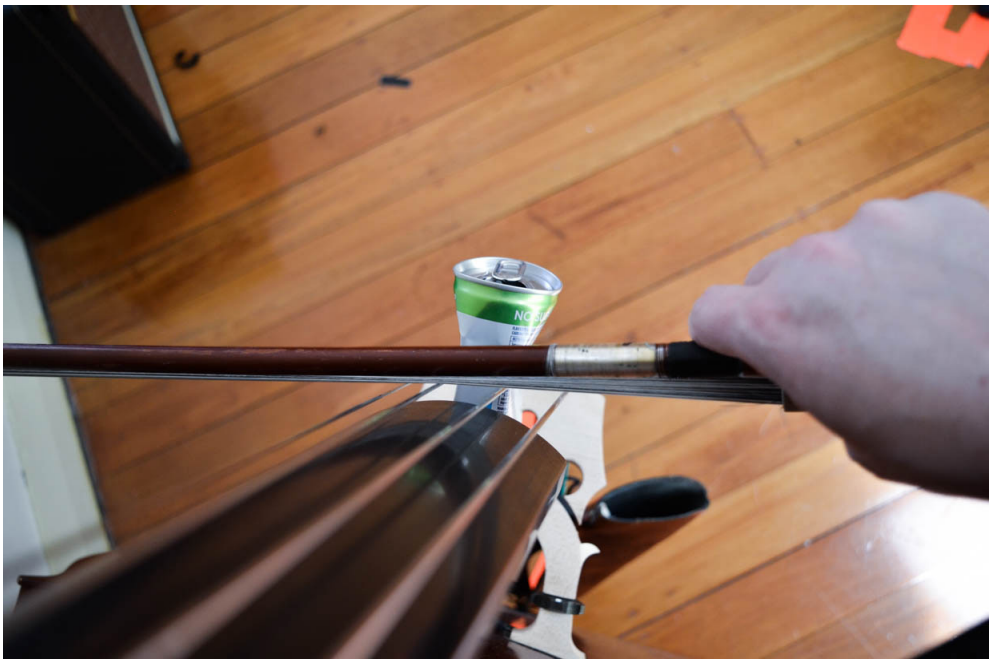


Video 4.5.4 *Study in Prepared Bass #1* bars 2-5

One of the physical issues stemming from the prepared and unprepared string double stop material in *Study in Prepared Bass #1* is how to produce a close to *normale* tone from the unprepared string with the bow in an extremely *tasto* position, due to the location of the preparation. I found it helpful to have less bow hair contacting the strings; after experimenting, I settled on turning the bow anti-clockwise slightly so that it is at a 45 degree angle to the string.

Photo 4.5.1 *Study in Prepared Bass #1* rotated bow angle view 1

Photo 4.5.2 *Study in Prepared Bass #1* rotated bow angle view 2



The rotated bow angle as shown in Photos 4.5.1 and 4.5.2 achieves the desired result of less bow hair contacting the string. *Sul tasto* bow registration causes the tone of the note to become 'softer', 'rounder', or 'breathier', but less bow hair on the string helps to combat this effect. The rotated bow angle also helps to avoid accidental overtones being sounded on the prepared string, creating a clearer drone for the sections of the work with adjacent unprepared string double stops.

4.5.5.2 Left hand pizzicato and right hand arco prepared string double stops

Another type of double stop between prepared and unprepared strings in *Study in Prepared Bass #1* consists of a combination of left hand pizzicato and the continuing arco prepared string drone, also depicted in Figure 4.5.4. In bar 3, the left hand switches from depressing the G string for the arco 'A' note at the

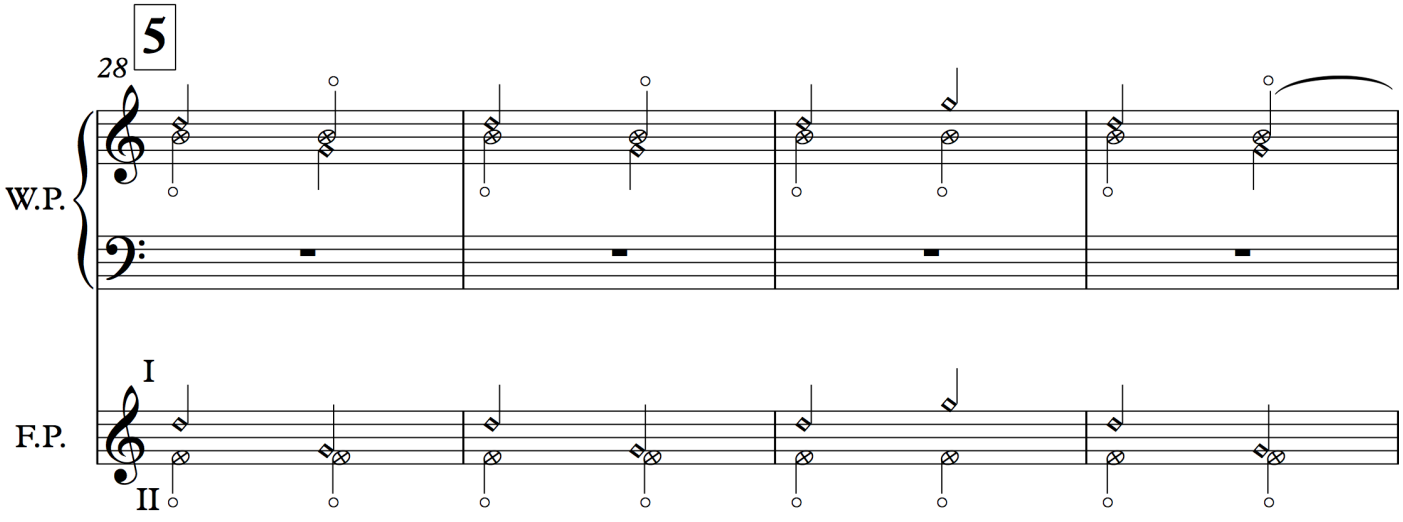
end of bar 2 to plucking the open E string. The most difficult part of this is the coordination involved in order to change between the techniques and notes smoothly and evenly, and issue which I have solved through finger preparation. I finger the A note on the G string with my left hand first finger and, during the course of the note, reach the second finger across the fingerboard and position it near the E string so that, when the bow lifts from the G string to activate the D string alone, my second finger is ready to pluck the open E.

Video 4.5.5 *Study in Prepared Bass #1* finger preparation for transition from arco adjacent string double stop to left hand pizzicato and right hand arco prepared string double stop

4.5.5.3 Harmonic double stops

A further development of prepared string and adjacent unprepared string arco double stop occurs in Section 5 of *Study in Prepared Bass #1*, wherein harmonic double stops are executed between the prepared D string and unprepared G string.

Figure 4.5.5 *Study in Prepared Bass* bars 28-31



Video 4.5.6 *Study in Prepared Bass* bars 28-31

A significant aspect of the harmonic double stop passage in bars 28-31 is that, due to the advent of the preparation shortening the D string, the nodes of the harmonic series on the D string have been relocated. The nodes on a string exist at specific divisions of the string length; as the resonating area of the string has been shortened in this case, the nodes have moved closer together. Examining Figure 4.5.5, it can be seen that the prepared string harmonic shown on the written pitch stave is a B3. As the preparation has shortened the D string to a fundamental of E2, the B3 harmonic corresponds with the 3rd partial of the new harmonic series. The unprepared G string harmonic at the beginning of bar 28 is a D4, which corresponds with the 3rd partial of the G string. Normally, the 3rd partial nodes of each string would be at the same string location, but the finger position stave at bar 28 shows that the 3rd partial of the prepared D string is now located close to where a thumb position F would normally be, two tones higher in location than it would normally be. The implications of this phenomenon are extremely interesting; different locations of harmonic nodes open up new combinations of available multi-nodal multiphonics and cross-string combinations of harmonic-based techniques due to being able to reach different partials. It is worth noting that these possibilities would not be available if the string were simply tuned up to E, as the physical locations of the nodes would remain in the same place. Also worth noting is that, were the string prepared with the can in the same position, but then the vibrating area of the string tuned down to its usual pitch of D2, the different nodal positions would still exist and, therefore, different combinations of harmonic-based techniques and multi-nodal multiphonics would be possible than if the string was the same pitch but unprepared.

4.5.6 Improvisation

Study in Prepared Bass #1 features four improvised sections, two of which constitute the introduction and conclusion of the work and two of which act as musical transition points in the middle of the work.

4.5.6.1 Introductory improvisation

The introduction improvisation is built around an exposition of the prepared D string drone present throughout most of *Study in Prepared Bass #1*. Changes in bow registration are used to sound different overtones and textures. The exposition builds in intensity and dynamics, before settling into a softer

version of the drone with less overtone information present in the sound.

Video 4.5.7 *Study in Prepared Bass #1* introductory improvisation

4.5.6.2 Transition improvisations

The two transition improvisations bookend Section 5 of *Study in Prepared Bass #1*, which is built around lighter and higher partial overtone content, juxtaposing the low richness of the first three sections. The first transition improvisation acts as a bridge to the harmonic double stops of Section 5. The improvisation begins similarly to the introduction improvisation, experimenting with different overtones and bow registration textures. Slowly, I begin to add more high partial overtone information, through the use of what I have termed 'harmonic flutter fingering', a technique where a left hand finger taps one or more harmonic nodes quickly and softly while the bow continues to sound the fundamental of the string. More high partial overtone information is added before eventually settling on the 3rd partial of the prepared D string, which sounds a B3 due to the fundamental of the string becoming an E as a result of the preparation.

Video 4.5.8 *Study in Prepared Bass #1* first transition improvisation

The second transition improvisation acts in inverse to the first. High partial overtone information is

gradually removed until the open prepared D string drone returns, transitioning into a restatement of earlier melodic material.

Video 4.5.9 *Study in Prepared Bass #1* second transition improvisation

4.5.6.3 Conclusion improvisation

The conclusion improvisation of *Study in Prepared Bass #1* acts in inverse to the introduction improvisation. Intensity of registration-based techniques and volume fades throughout the improvisation.

Video 4.5.10 *Study in Prepared Bass #1* conclusion improvisation

4.5.7 Previous iteration

An interesting aspect of *Study in Prepared Bass #1* is that the original iteration of the work featured the use of a 600mL plastic bottle as the preparation, rather than the eventual aluminium can version. Unfortunately, I misplaced the bottle I had used to conduct the experimentation and formalisation stages of my developmental framework after a rehearsal. Attempts to recreate certain parameters specific to that

particular bottle with other bottles proved fruitless; physical properties of the bottle were entrenched in the composition and I was unable to satisfactorily perform it with a different bottle. I had all but given up on the study when I tried an aluminium can on a whim. While aspects of the tone were markedly different with the can, the available harmonic and melodic content aligned with *Study in Prepared Bass #1* and I was able to create a new version of the work with only minor adjustments.

The history of *Study in Prepared Bass #1* opens up avenues of further discussion around what parameters of a preparation are particular to the preparation itself, as well as what aspects of prepared instrument compositions can be replicated with another preparation, and to what extent.

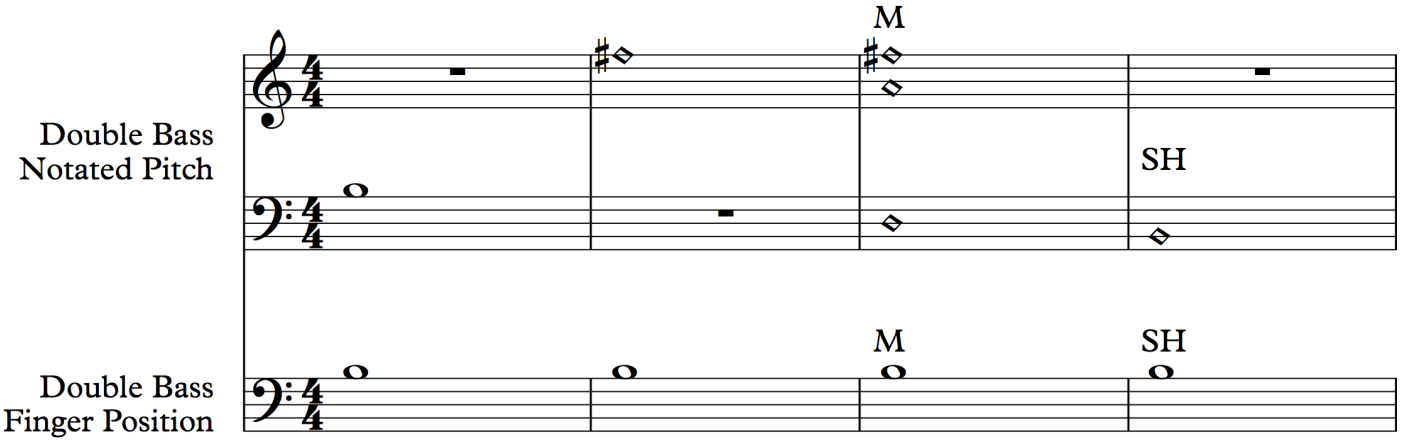
4.6 Analysis: *Heights and Depths*

Video 4.6.1 *Heights and Depths*

4.6.1 About the work

Heights and Depths is a work intended to be longer in form and less restricted in terms of techniques used than the studies. My main focus when composing this work was exploiting the myriad of notes available at any one physical location on the instrument. For example, at the location of the lowest B on the D string, one can produce the fundamental B, the harmonic F# one and a half octaves higher, a multiphonic composed of the fundamental of the string, the A an octave and a half above that and the aforementioned F# (as well as various other possible anomalous frequencies), and a subharmonic one octave below the fundamental.

Figure 4.6.1 Example of different notes and effects available at a single fundamental location



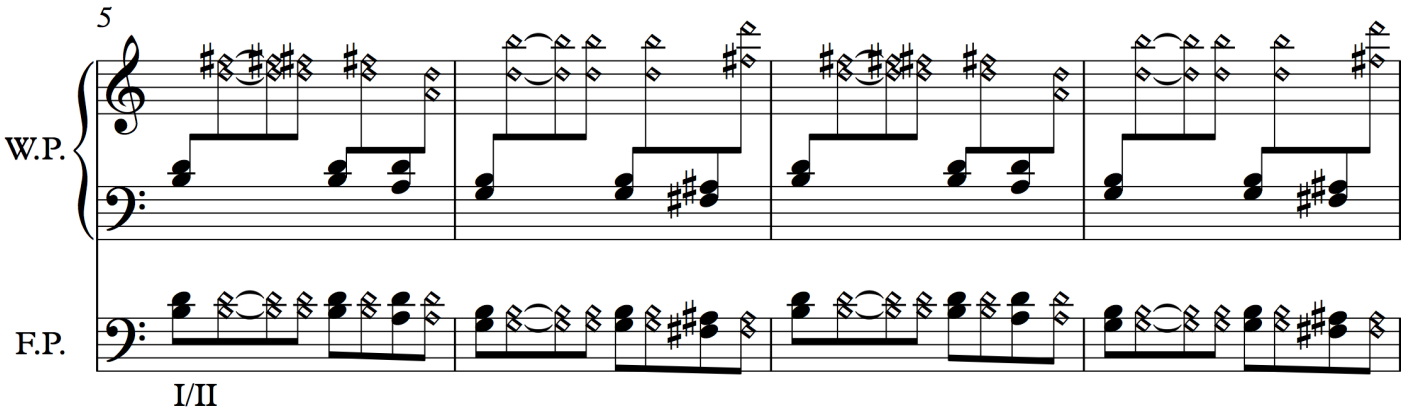
Video 4.6.2 Example of different notes and effects available at a single fundamental location

There are other possible subharmonics and multiphonics at the same location, but the examples in Figure 4.6.1 are the most stable and simplest to produce.

4.6.2 Notation

Heights and Depths is notated similarly to the previous examples of creative output in this text. The dual written pitch/finger position staves are present, as are previously used and devised notations for harmonics, multiphonics and split multiphonics. One main point of difference with regards to the notation for *Heights and Depths* is that it makes systematic use of a cross stem notation between the treble and bass clef written pitch staves.

Figure 4.6.2 *Heights and Depths* cross-stem notation example



I devised the cross-stem notation for *Heights and Depths* due to the constant alternation between fundamentals and harmonics, subharmonics and multiphonics. The cross-stem notation allows the large jumps in register to be clearly depicted while also making clear the *connection* between the tones, many of which are located at the same left hand finger position.

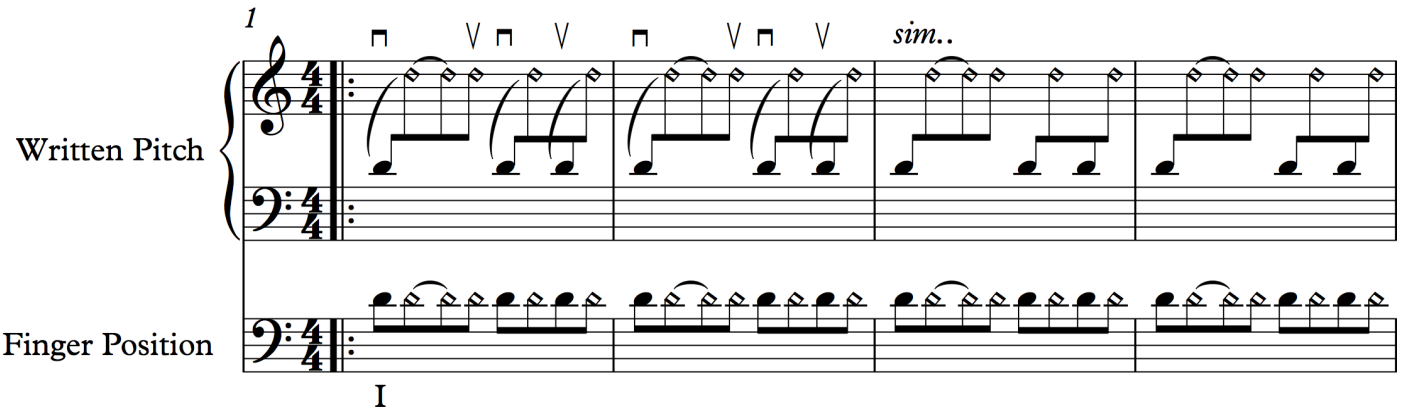
4.6.3 Alternation between 'adjacent' tones at one location

The term *adjacent tone* is one I have coined to refer to a note that can be produced at the same left hand finger location as one or more other tones. The implications of these adjacent tones at the same location have been some of the most personally rewarding aspects of my research. To be able to jump from one note to another two and a half octaves higher at the same left hand finger location is quite remarkable; I feel that it has already opened up new possibilities for me as a composer and improviser, and these are especially obvious in *Heights and Depths*.

4.6.3.1 Alternating between stopped note and harmonic through left hand finger pressure release

Alternating between a stopped note and an adjacent harmonic by releasing the left hand finger pressure is one method of alternation between two adjacent tones. The technique can be executed both arco and pizzicato, although the arco iteration is perhaps the more widely applicable. Bars 1-4 feature of *Heights and Depths* feature an exposition of a theme built around this concept, as evidenced in Figure 4.6.2.

Figure 4.6.3 *Heights and Depths* bars 1-4

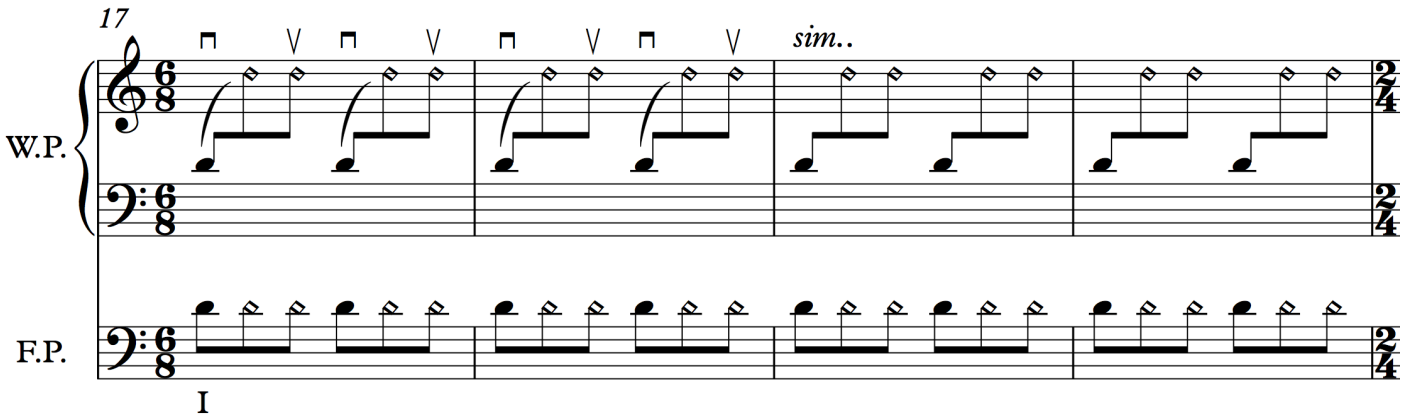


Video 4.6.3 *Heights and Depths* bars 1-4

The lowest D on the G string is bowed and, while the bow stroke continues, the left hand finger depressing the string releases its pressure while still touching the string at the same location, causing the D harmonic at the same location to be sounded. The rhythmic pattern and bowing articulation remain the same throughout bars 1-4.

The melodic, rhythmic, physical and articulatory aspects of bars 1-4 form the foundation for much of the material in *Heights and Depths*. Bars 17-20, for instance, feature a development of the theme from bars 1-4, transmogrified into a 6/8 time signature as opposed to the former 4/4 time.

Figure 4.6.4 *Heights and Depths* bars 17-20

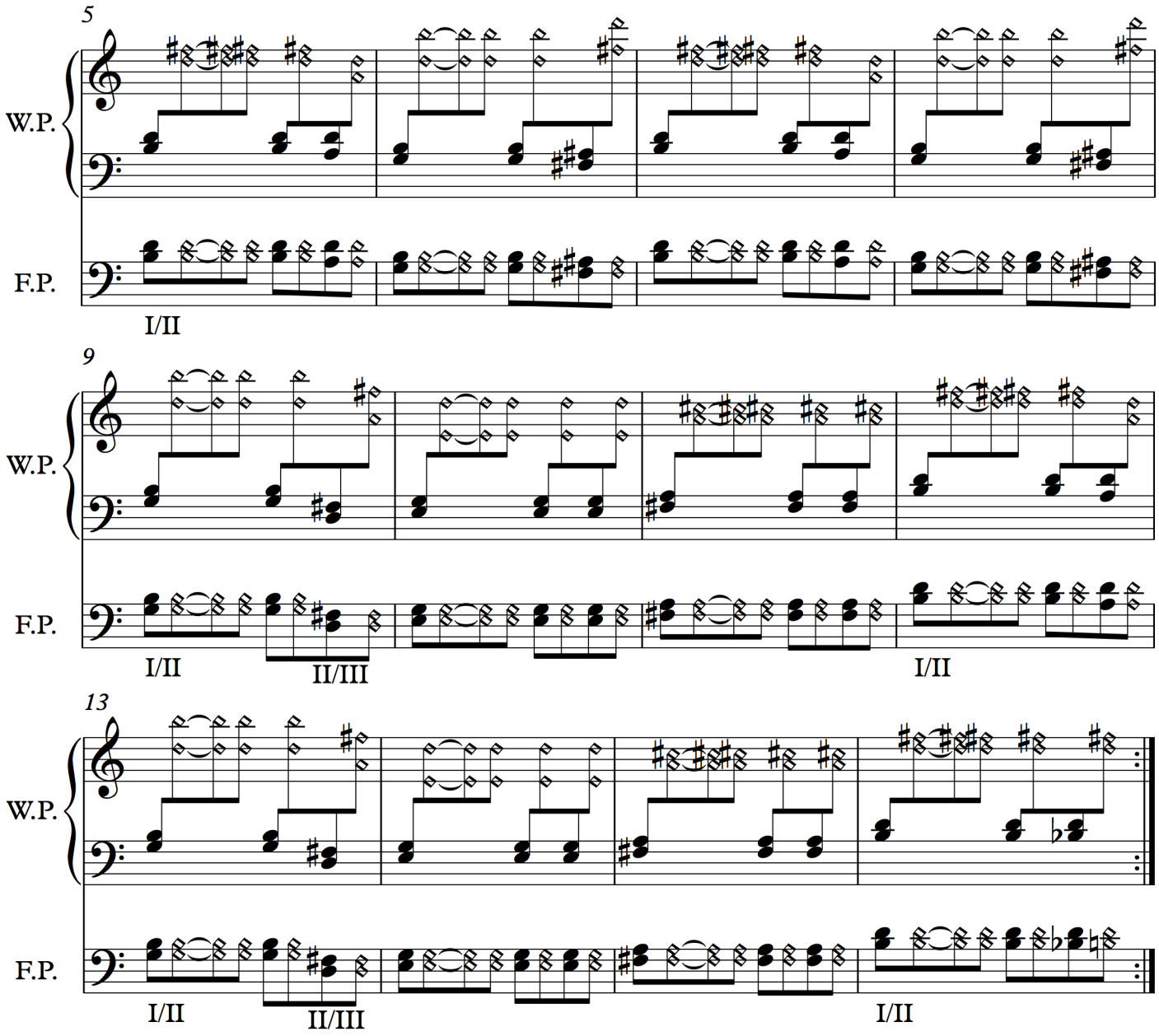


Video 4.6.4 *Heights and Depths* bars 17-20

4.6.3.2 Alternating between double stops and harmonic double stops through left hand finger pressure release

After the introduction, the work continues in the same pattern in terms of articulation, bowing direction and alternating normal tones and harmonics, but as dyads as opposed to single notes.

Figure 4.6.5 *Heights and Depths* bars 5-16



Video 4.6.5 *Heights and Depths* bars 5-16

There are three main issues stemming from both the single note and double stop iterations of adjacent tone alternation through left hand pressure release in *Heights and Depths*:

1) *Bow Trajectory*: As the left hand fingers release their pressure in order to change from normal tones to harmonics, the height of the strings being sounded is raised instantly. The height differential is less towards the bridge where the bow is being drawn than at the left hand finger location, but the change is enough to require the bow to move with the string. This issue is compounded in the double stop/double stop harmonic sections of *Heights and Depths*, as the bow must now move with two strings at once without bow overpressure or breaking contact with either string.

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2) *Left hand finger precision*: This issue revolves around left hand finger positions and their effect on both the intonation of the normal tones and proper execution of the harmonics. Correct intonation on the double bass is never easy and playing two notes on adjacent strings at once with correct intonation is doubly problematic. The same is true for harmonics. Harmonics require a particular left hand finger technique to be properly sounded and the finger must be accurately placed on the relevant node, ideally using the tip of the finger rather than the 'pad'. The accuracy needed is less for the lower partials; for example, the node located at the first octave (the halfway point on the string) can be sounded with a finger position correlating to about a quarter tone higher or lower than the actual position of the node. However, the harmonic never sounds properly 'pure' unless the finger is located exactly at the node. As with the intonation for stopped fundamentals, the difficulty associated with properly locating and executing a given harmonic is doubled when another harmonic on an adjacent string is added into the equation. The nodes on both strings must be fingered at exactly the right location in order for both harmonics to properly sound and ring out. *Heights and Depths* features many passages where double stop fundamentals are released to double stop harmonics, further compounding the intonation and precision issues of each set of double stops.

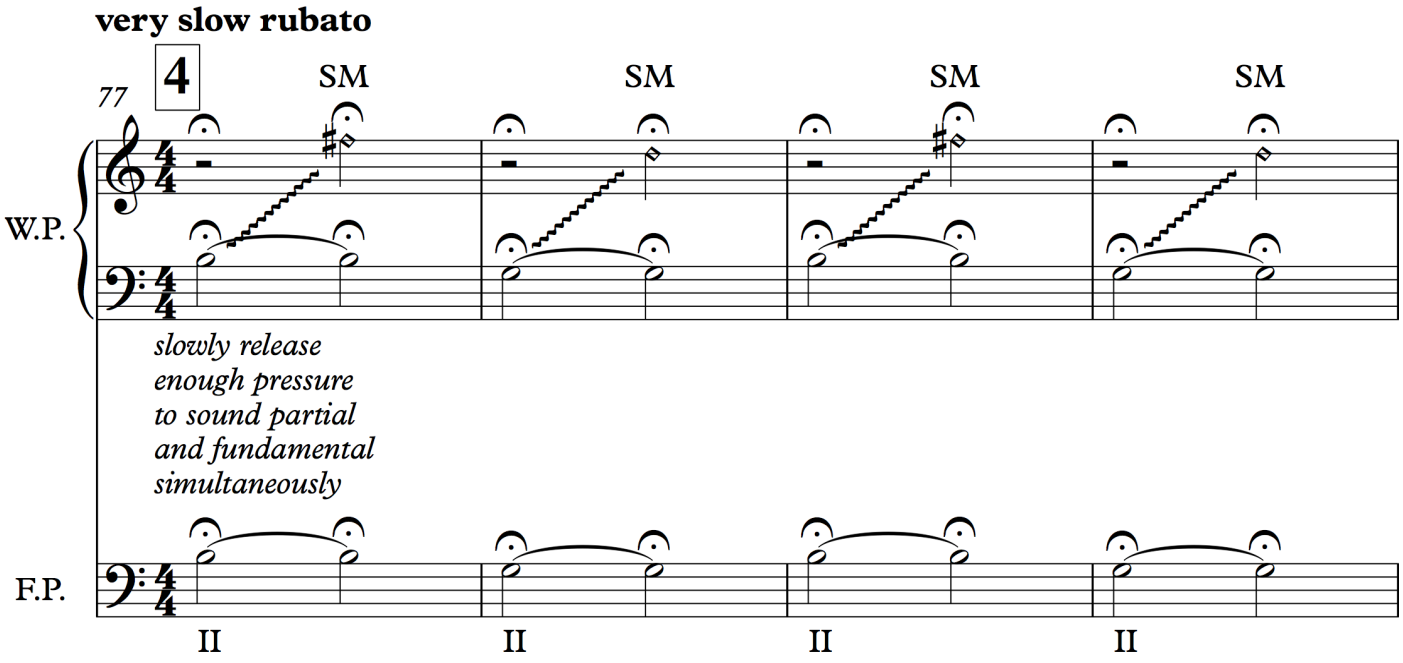
3) *Restricted options of even-tempered fundamentals and corresponding adjacent harmonics*: This issue is a result of the fact that not all harmonic nodes are located adjacent to an exact even-tempered location on the string (nor are all harmonics in *tune* with even-tempered notes around the same pitch). The lower partials are all fairly well exact; the 2nd partial is right at the 1st octave on the G string, the 3rd partial is right at the D below (and above) that, the 4th partial is right at the C below that. Beyond the 4th partial however, discrepancies begin to arise and by the time we get to the 7th partial and higher the locations of the nodes are quite literally all over the place (they are located at one more position on the string than their partial number, although proximity of lower partials confounds the ability of every node to be sounded). As *Heights and Depths* was intended primarily to showcase the amount of different tones available in one position, I generally restricted myself compositionally to using harmonics located at (or extremely close to) the same position as an even-tempered fundamental. As a result of this restrictive process, most of *Heights and Depths* was composed using harmonics from the 2nd to the 6th partials and fundamentals located at the same positions.
(insert graphic)

4.6.3.3 Transitional split multiphonics

Transitional split multiphonic technique is an original development of split multiphonic technique (as described in the analysis of *Study in Harmonics and Multiphonics #1*), and consists of bowing a fundamental

which has a corresponding harmonic at the same location and gradually releasing enough left hand pressure to 'pull out' the harmonic at the same time as the fundamental, producing a split multiphonic. Transitional split multiphonics are used in Section 4 of *Heights and Depths*, which contrasts the earlier rhythmically pulsing material with long rubato pauses featuring the aforementioned gradual transformation of fundamentals into split multiphonics.

Figure 4.6.6 Transitional split multiphonics in *Heights and Depths*

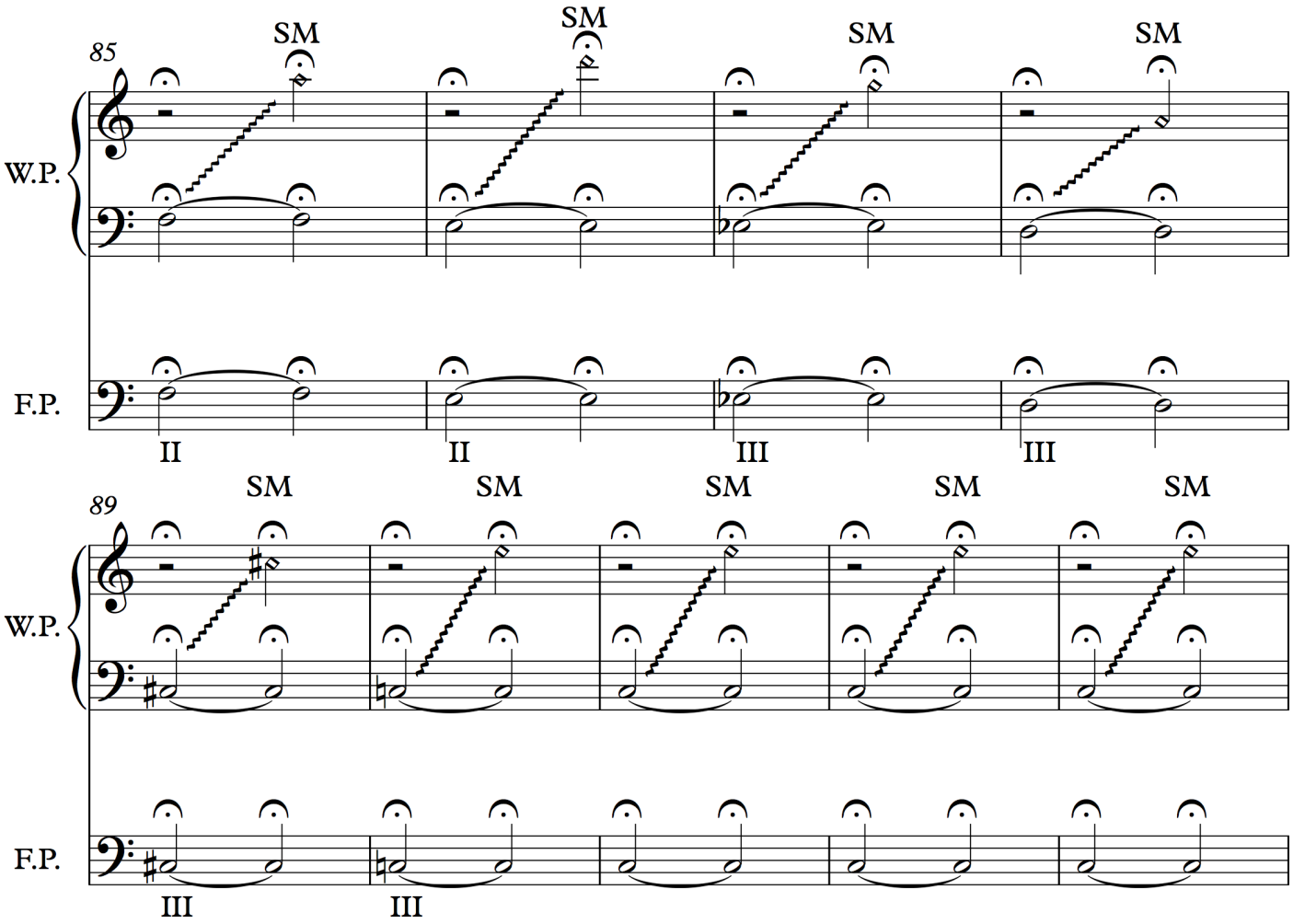


Video 4.6.6 Transitional split multiphonics in *Heights and Depths*

The transition from fundamental to split multiphonic is considerably more difficult than just executing a split multiphonic by itself in the manner discussed in "Study in Harmonics and Multiphonics #1". In order to keep the fundamental present throughout the transition, the bow stroke must be kept even and the left hand finger must not release too much pressure. I have personally found this section to be one of the more difficult parts of the work to execute, and have found that without regular practise of the technique I lose the technical subtleties required for it quite quickly.

The remainder of section 4 of *Heights and Depths* features increasingly difficult iterations of transitional split multiphonic technique. Bars 85-93 consist of fundamentals descending chromatically from F to a four bar resting point on C, each bar still featuring the gradual transition from fundamental alone to a split multiphonic.

Figure 4.6.7 *Heights and Depths* bars 85-93



Video 4.6.7 *Heights and Depths* bars 85-93

The greater concentration of higher partials as the fundamentals move closer to the nut, particularly bars 85-86 and bars 90-94, means that proper execution of these transitions can be difficult. I have found that using the very tip of my finger can help with this issue, although it must be balanced with enough finger pressure to sound both the fundamental and partial. Standard multiphonic technique may become present within the spectrum of several of the split multiphonics which, although it may not be intentional, can contribute effectively to the overall spectrum, as evidenced at 00:00 of video 4.6.1.

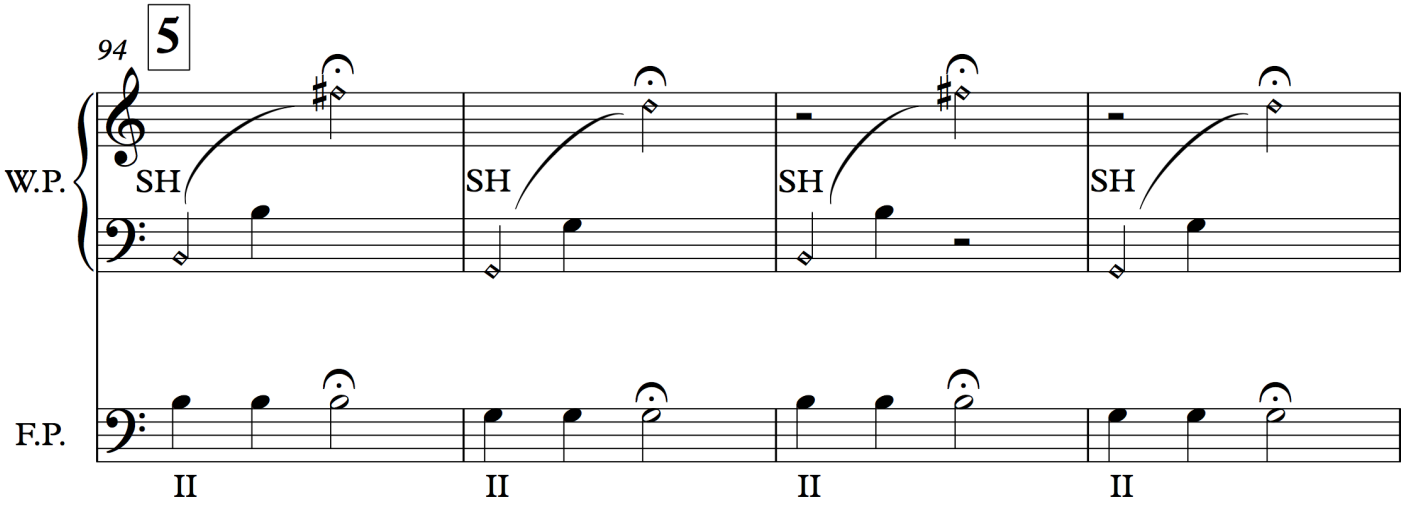
4.6.3.4 Alternating between adjacent subharmonics, fundamentals, and harmonics/multiphonics

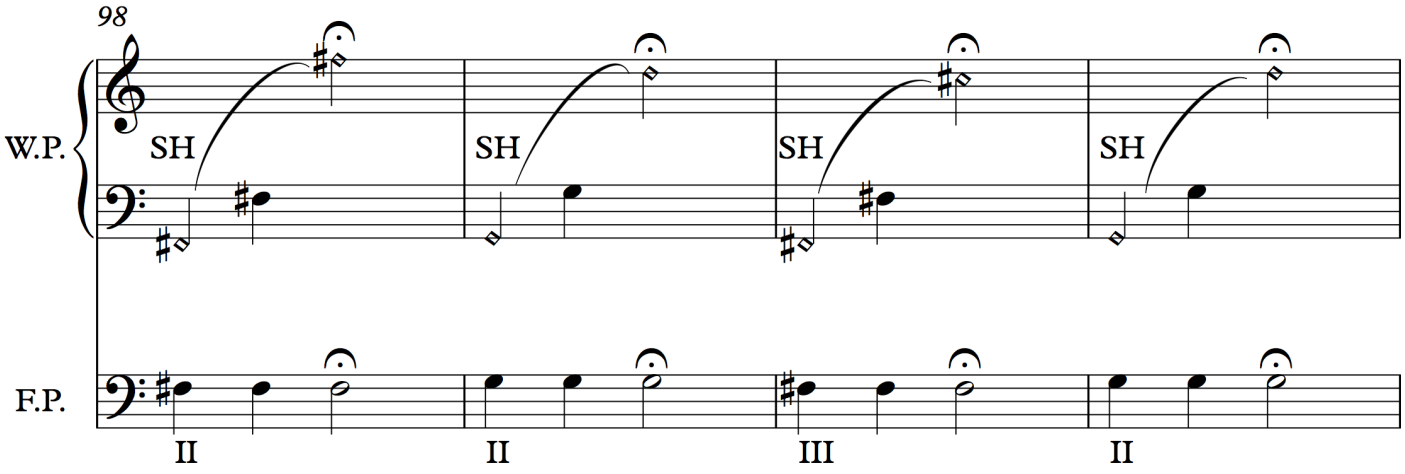
Another iteration of adjacent tone technique featured in *Heights and Depths* is alternation between adjacent subharmonics, fundamentals, and harmonics or multiphonics. Subharmonics are "phenomena in which frequencies lower in pitch than the fundamental are excited by implementing a specific kind of bow pressure" (Dresser, 2000: 255). By using bow overpressure at particular nodes, specific subharmonic tones can be activated and held, the easiest of which is one octave below the fundamental:

> *…use the "harp" harmonic technique to find the node two octaves and a fifth above the fundamental. Draw the bow and apply a simultaneous downward pressure focusing on the point of contact of the hair to the string. On the bass, in contrast to the violin, having a less-than-full left hand pressure aids the subharmonic attack.* (Dresser, 2000: 256)

Section 5 of *Heights and Depths* is based around the same root movement and adjacent partials as section 4, as shown in Figures 4.6.8 and 4.6.9; in section 5, however, the amount of adjacent tones available at one location is exploited even further.

Figure 4.6.8 *Heights and Depths* bars 94-101

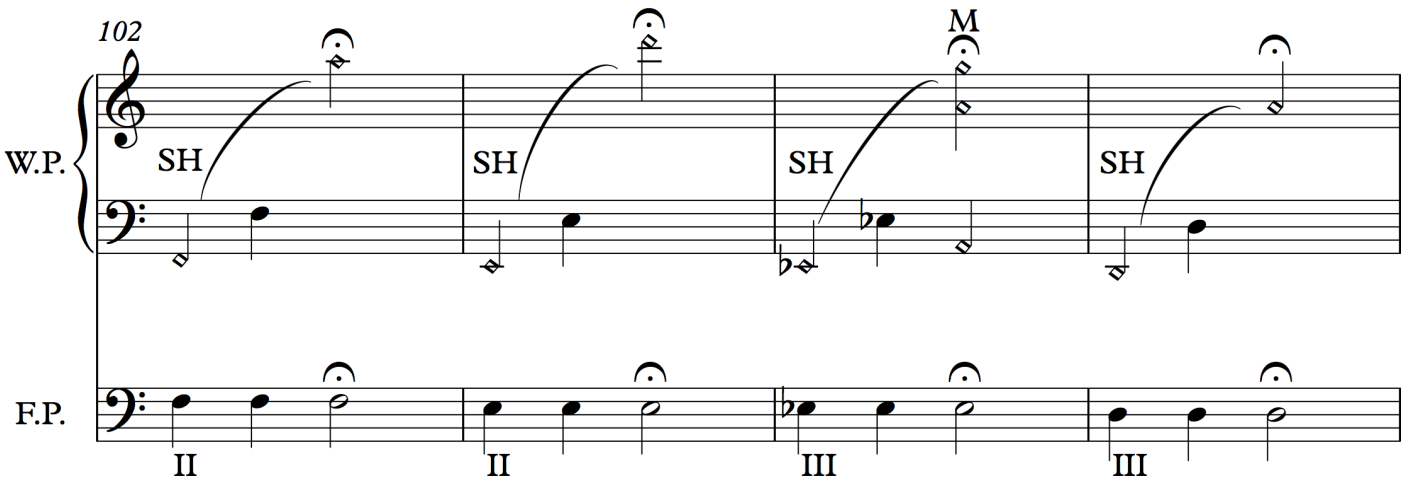


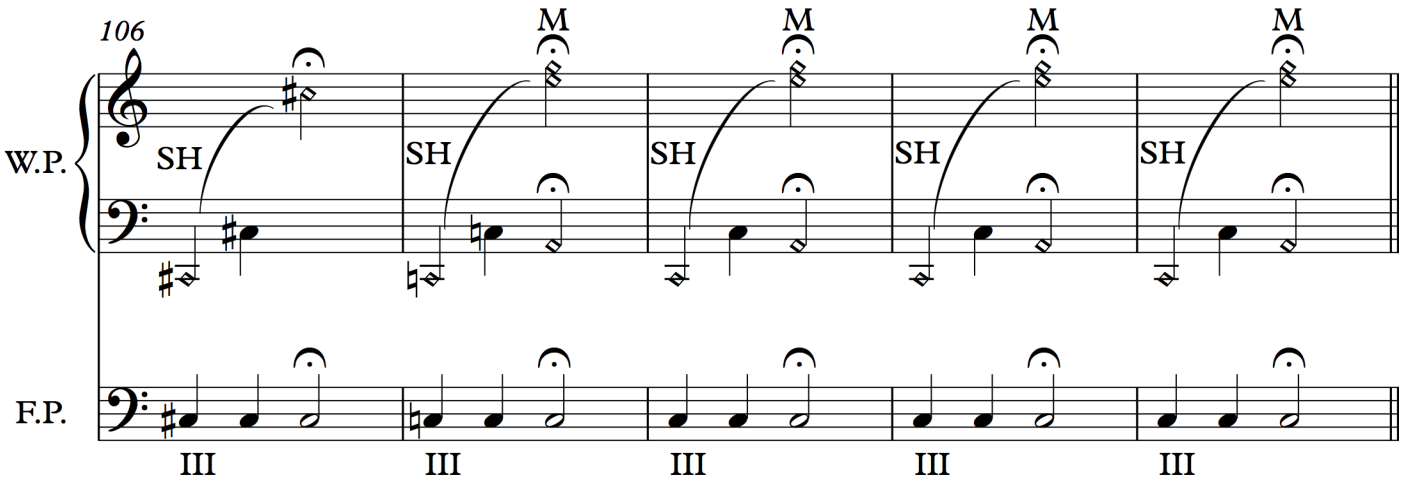


Video 4.6.8 *Heights and Depths* bars 94-101

Each bar in Figure 4.6.8 begins with a subharmonic one octave below the fundamental. In the same bow stroke, the bow overpressure used to activate the subharmonic is relieved in order to produce the fundamental. Finally, while the bow stroke continues, the left hand pressure is released in order to sound the adjacent harmonic. Similar articulation and melodic contour continues throughout section 5.

Figure 4.6.9 *Heights and Depths* Bars 102-110





Video 4.6.9 *Heights and Depths* bars 102-110

Due to the greater concentration of partials near certain fundamentals in bars 102-110, I chose when composing this section to exploit the inherent 'instability' of these locations by using multiphonics rather than harmonics on several occasions.

During my experimentation with subharmonic technique, I became aware that the octave subharmonic would often be slightly flat when compared to the fundamental. To counter this, I developed a left hand finger technique whereby I rotate my hand slightly clockwise, pivoting on the finger stopping the string, which has the effect of sharpening the subharmonic enough to be more in tune with the fundamental.

Video 4.6.10 Hand rotation technique for sharpening subharmonic

Also worth noting is that throughout section 5, the bow's activation point on the string must move with each new fundamental, so that the bow is always located at the appropriate node for optimal subharmonic production (as described by Dresser).

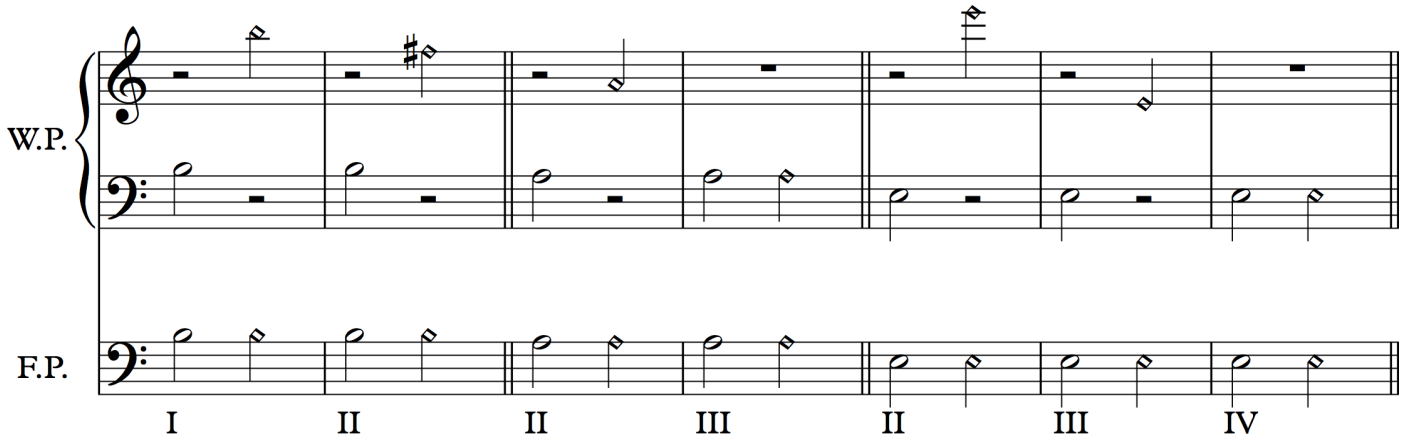
Video 4.6.11 Vertical bow movement with changing subharmonic fundamentals

For me, the entirety of section 5 is some of the most challenging material in *Heights and Depths* and my creative output as a whole, due to the many subtle changes in bow pressure, stroke, and string contact points, coupled with differences in left hand finger locations, angle, pressure, and width of contact point.

4.6.3.5 Multi-location fundamentals and differing adjacent harmonic tones

A reality of adjacent tone technique on the double bass is that a particular fundamental note can, more often than not, have multiple locations across two or more strings, therefore creating the possibility different adjacent tones. Figure 4.6.10 offers several examples of this phenomenon. The multi-location fundamentals are shown with regular noteheads while the adjacent harmonics are shown with diamond noteheads

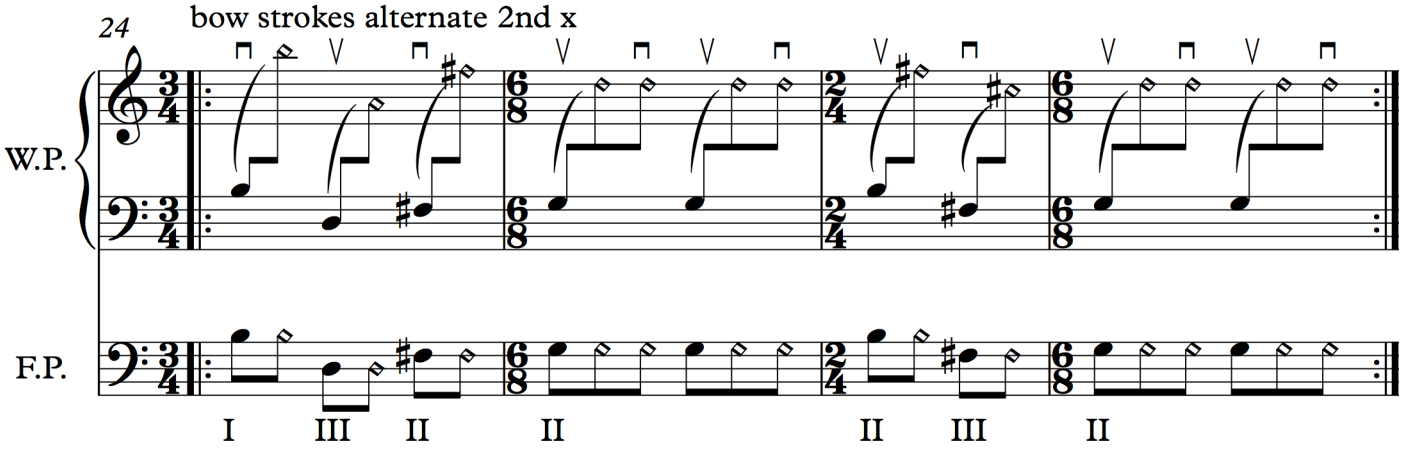
Figure 4.6.10 Examples of multi-location fundamentals producing different adjacent harmonics



Video 4.6.12 Examples of multi-location fundamentals producing different adjacent harmonics

Figure 4.6.11 shows an example of multi-location fundamentals producing different adjacent harmonics in section 2 of *Heights and Depths*.

Figure 4.6.11 *Heights and Depths* bars 24-27



Video 4.6.13 *Heights and Depths* bars 24-27

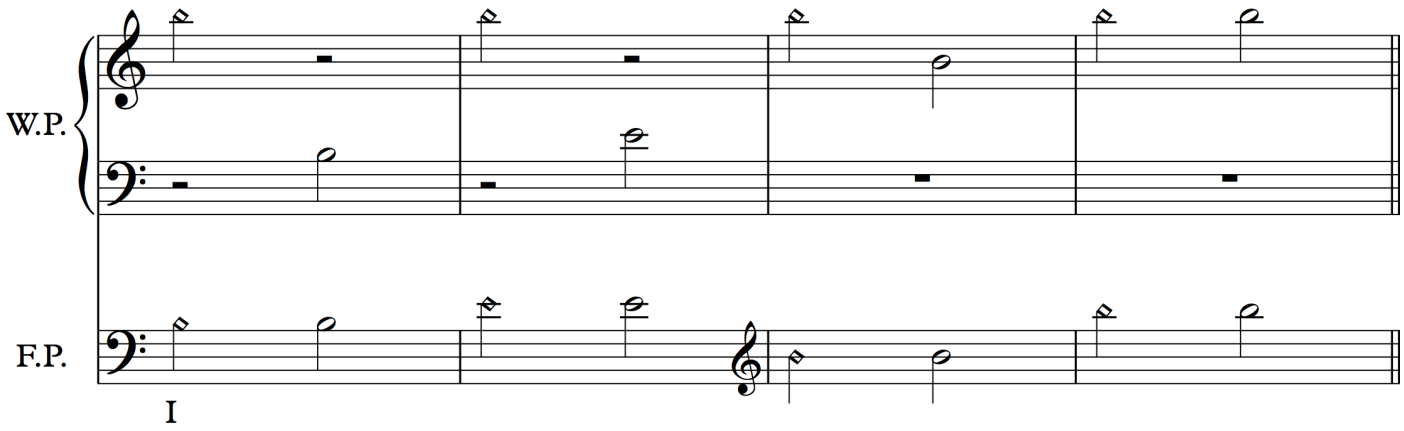
In comparing the first two notes of bar 24 with the first two notes of bar 26 it can be seen that the fundamental is the same but the following harmonic at the same location is different. The finger position stave shows that the location for the two groups of notes is different, the first two notes of bar 24 being located at the B on the G string while the first two notes of bar 26 are located at the same note but in its position on the D string. While the fundamental note is the same at these two locations, the harmonics produced at each location are different. The same effect can be seen when comparing the last two notes of bar 24 with the last two notes of bar 26; in bar 24, the jump from the fundamental to the adjacent harmonic causes a harmonic two octaves above to be produced, while in bar 24 the same fundamental located on a different string sounds a harmonic one octave and a fifth above when the left hand finger pressure is released. Exploiting this fundamental physical attribute of the instrument in *Heights and Depths* has allowed me to generate more adjacent tone melodic content from the same fundamental movement.

4.6.3.6 Multi-location harmonics and differing adjacent fundamental tones

Converse to the phenomenon of multi-location fundamentals producing different adjacent harmonics, multi-location *harmonics* can also produce different adjacent *fundamentals*. As stated earlier in this analysis, higher-numbered partials are not *necessarily* located at the same position as even-tempered fundamentals; however, there are still several useful examples of the same harmonic being found at several different locations that correspond perfectly, or near enough, to properly intonated fundamentals.

Most examples of multi-location harmonics with different adjacent fundamentals are located on one string, due to the multi-nodal nature of harmonic partials.

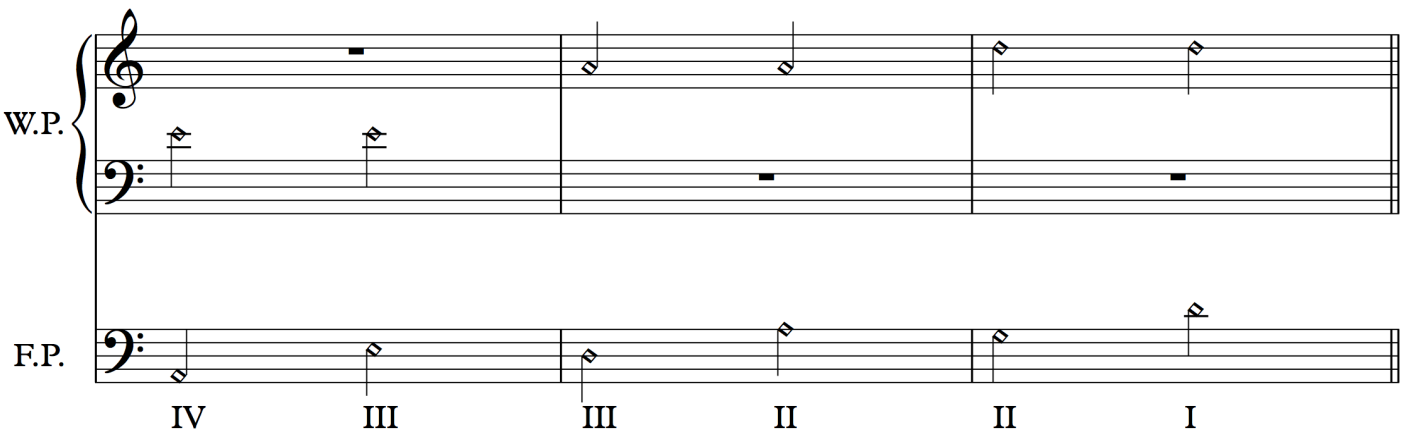
Figure 4.6.12 Multiple locations of 5th partial on G string and their corresponding adjacent fundamentals



Video 4.6.14 Multiple locations of 5th partial on G string and their corresponding adjacent fundamentals

On a double bass in standard tuning, there are a few examples of adjacent string multi-location harmonics with different adjacent harmonics. Most bassists and guitarists are already aware of the concept of adjacent string multi-location harmonics, due to a common tuning practice where one string is tuned to another by comparing the 4th partial of the lower string with the 3rd partial of the adjacent higher string.

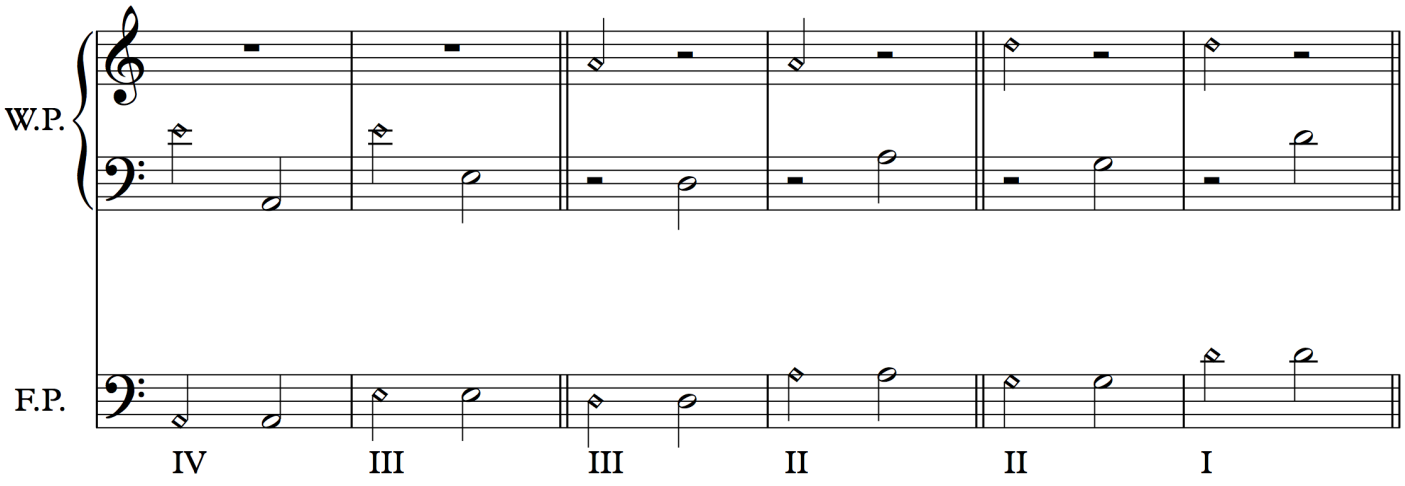
Figure 4.6.13 Adjacent string multi-location harmonics



Video 4.6.15 Adjacent string multi-location harmonics

As Figure 4.6.13. shows, the harmonics produced at the 4th partial of the lower string and the 3rd partial of the adjacent higher string are the same. As a result, the corresponding adjacent fundamentals at the location of each harmonic differ from one another.

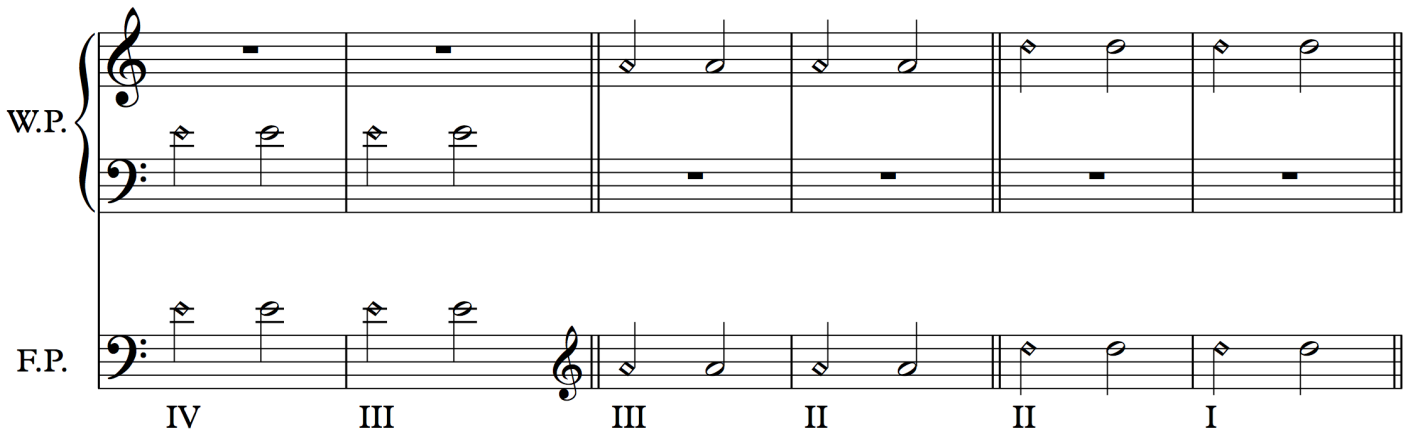
Figure 4.6.14 Adjacent string multi-location harmonics and their corresponding adjacent fundamentals



Video 4.6.16 Adjacent string multi-location harmonics and their corresponding adjacent fundamentals

On a normally tuned bass the 4th partial-3rd partial adjacent string duality is the only example where the exact same harmonic tone can be found on different strings. Due to the multi-nodal nature of harmonic partials, the same harmonics depicted in Figures 4.6.13 and 4.6.14 can be reproduced higher up the fingerboard towards the bridge; however, in the higher location the adjacent fundamentals are the *exact same pitch* as both the lower string 4th partial and the higher string 3rd partial.

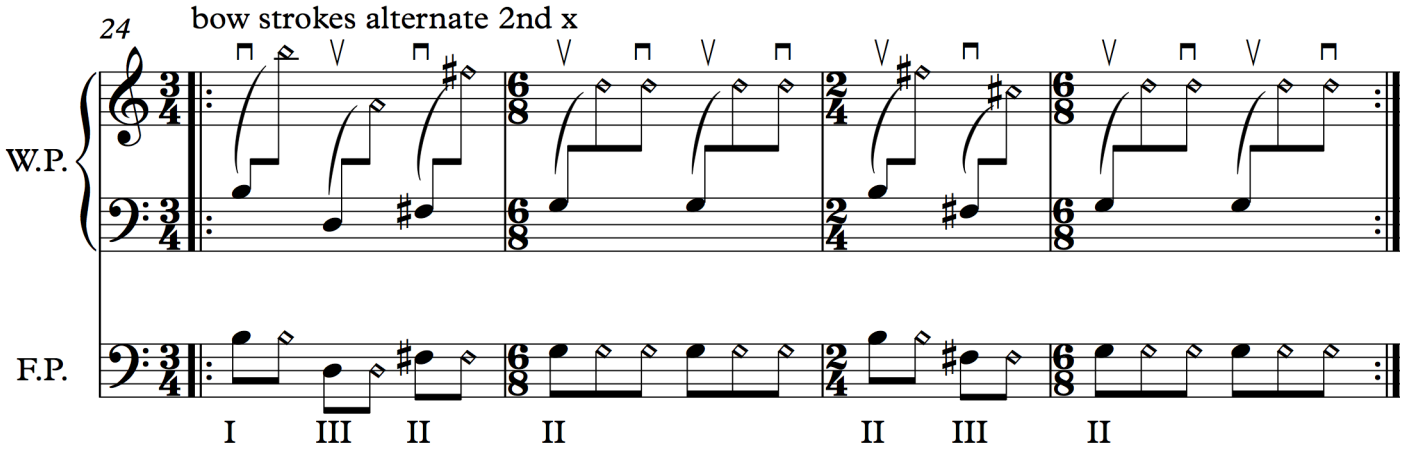
Figure 4.6.15 Adjacent string multi-location harmonics and their corresponding fundamentals in their second position



Video 4.6.17 Adjacent string multi-location harmonics and their corresponding fundamentals in their second position

Heights and Depths makes use of both *multi-nodal single string* and *4th partial-3rd partial adjacent string* versions of multi-location harmonics with differing adjacent fundamentals. Figure 4.6.16 is an example of the multi-nodal single string approach.

Figure 4.6.16 *Heights and Depths* bars 24-27

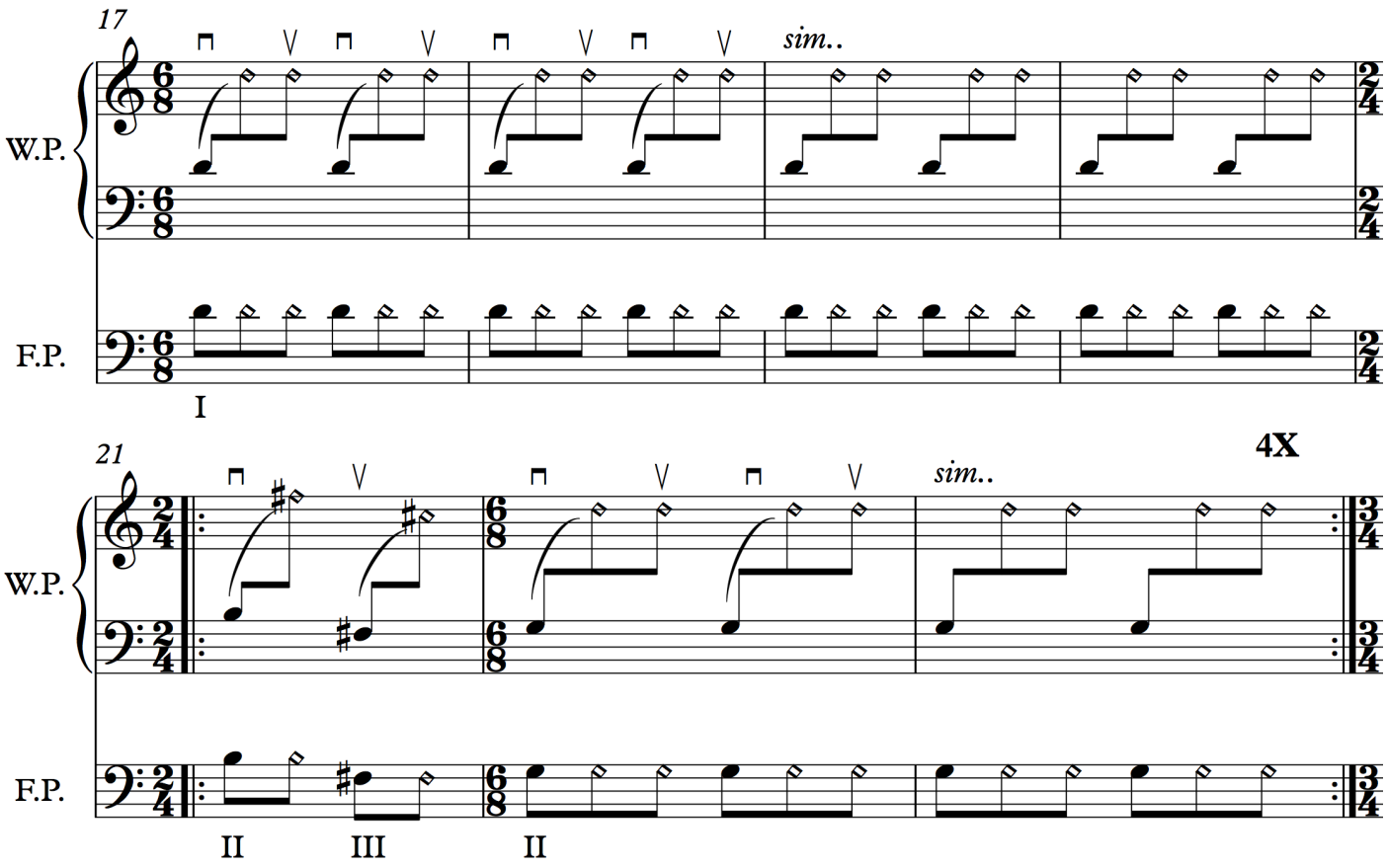


Video 4.6.18 *Heights and Depths* bars 24-27

The last two notes of bar 24 and the first two notes of bar 26 both feature a fundamental followed by an F# harmonic/5th partial activated through left hand pressure release; however, in bar 24 the fundamental is an F# on the D string while in bar 26 the fundamental is a B a fourth above on the same string.

Figure 4.6.17 is an example of the 4th partial-3rd partial adjacent string approach to multi-location harmonics with differing adjacent fundamentals.

Figure 4.6.17 *Heights and Depths* bars 17-23

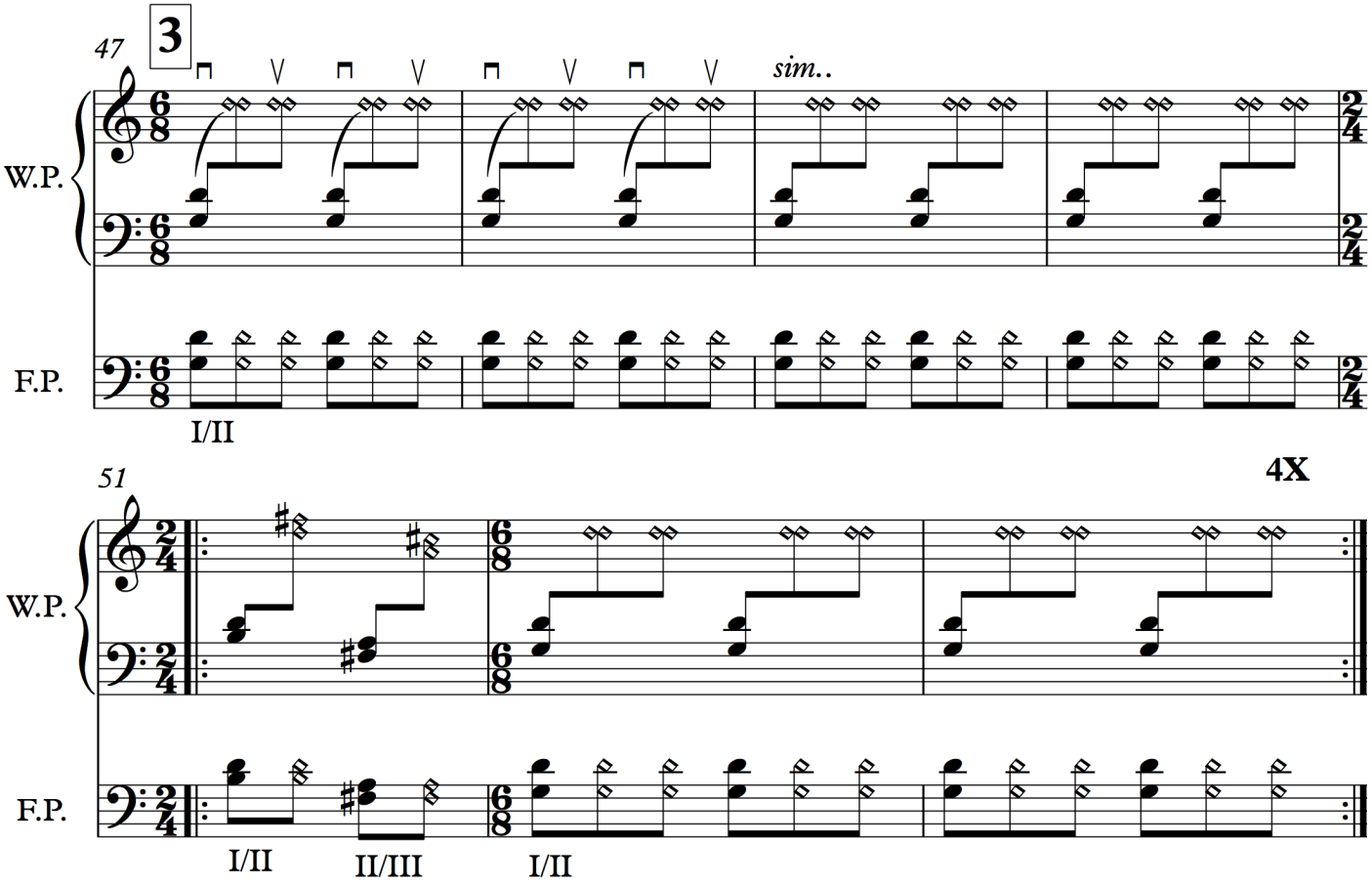


Video 4.6.19 *Heights and Depths* bars 17-23

Bars 17-20 and bars 21-23 consist of the same rhythmic pattern, melodic contour, and harmonics, but the fundamentals from which the harmonics are activated through left hand pressure release differ. In bars 17-20 the fundamental is a D on the G string, while in bars 22-23 it is a G on the D string, both producing the same harmonic.

A more elaborate version of this material occurs in Section 3 of *Heights and Depths*.

Figure 4.6.18 *Heights and Depths* bars 47-53



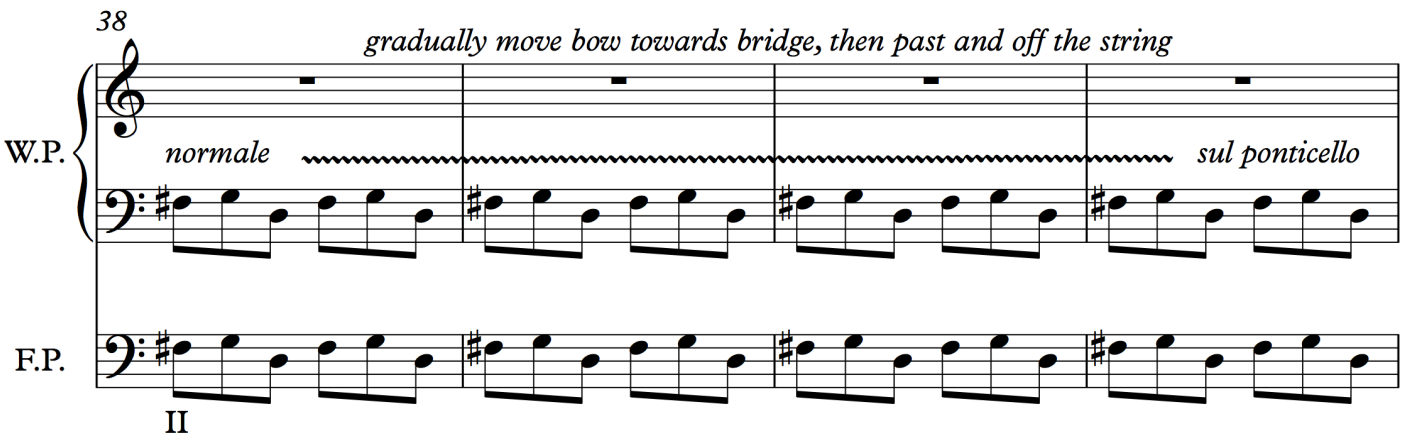
Video 4.6.20 *Heights and Depths* bars 47-53

Bars 47-53 consist of similar material to bars 17-23, on this occasion with alternation between double stops and double stop harmonics at the same location. The double stop fundamentals consist of an interval of a fifth but, when the left hand finger pressure is released in order to sound the harmonic double stops, the same harmonic is produced on both strings, due to the double stops being located at the same points as the 4th partial on the D string and the 3rd partial on the G string. Minute differences in string intonation as well as different string sizes, heights and so forth mean that while the 'unison' harmonics are technically the same pitch, they have slightly different tones and pitches. To my ear, the subtle differences between the two add complexity that would not be found in the 'pure' sound of either of the partials on its own.

4.6.4 Differences in overtone spectrum through travelling bow registration

Adjusting the overtone spectrum of a particular note or notes through changes in the location of bow placement is another method through which I have created multiple pitches with the same left hand position in *Heights and Depths.* The closer to the bridge (sul ponticello) the bow is, the more overtone spectrum can be heard. In *Heights and Depths*, I have used a technique I term *travelling bow registration*. This technique consists of changing the bow registration gradually through a phrase. The technique is used twice in *Heights and Depths*, although the second instance is a repetition of the first.

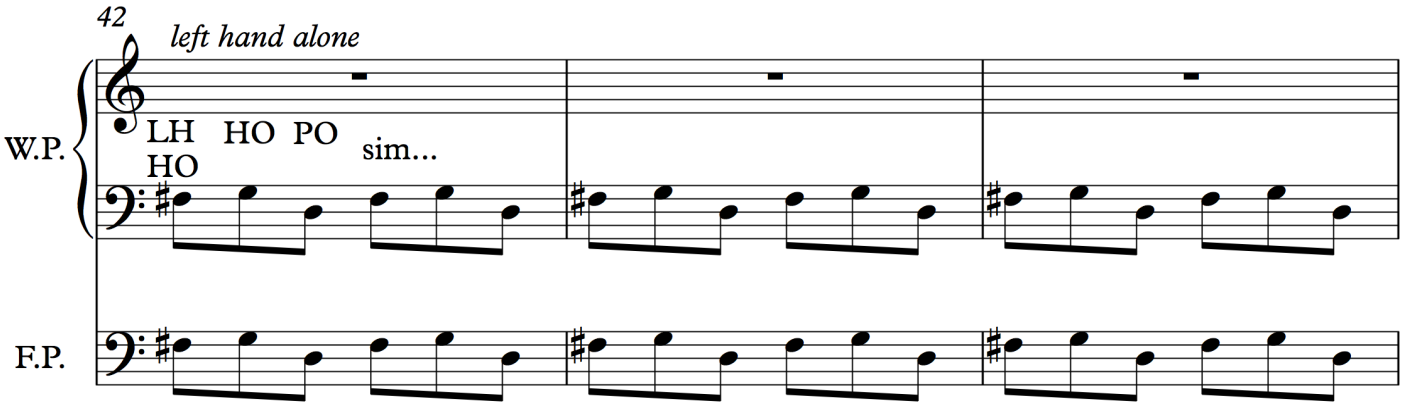
Figure 4.6.19 *Heights and Depths* bars 38-41



Video 4.6.21 *Heights and Depths* bars 38-41

The example consists of a repeated arco three-note figure. The bow is gradually moved from normale to sul ponticello and then past the bridge and off the string completely, leaving the left hand to keep playing the figure by itself using a combination of hammer-ons and pull-offs.

Figure 4.6.20 *Heights and Depths* bars 42-44



Video 4.6.22 *Heights and Depths* bars 42-44

The left hand articulations specified in bar 42 are also executed in bars 38-41. This is intended to create a repetitive low, percussive figure beneath continuously rising overtone spectrum and complexity which eventually disappears completely, leaving the low percussive figure to continue alone.

4.7 Analysis: *Ulchabhán*

Video 4.7.1 *Ulchabhán*

4.7.1 About the work

Ulchabhán is a freely improvised work, based around a constant repeating E harmonic bow figure which is expanded on through alternation with other extended techniques. Compared to the other improvisation included in the analyses, *Karakia*, *Ulchabhán* is a more 'in time' work in that the rhythm stays constant, although it is not necessarily in any time signature as such.

4.7.2 Alternation between arco harmonics and arco multi-nodal multiphonics

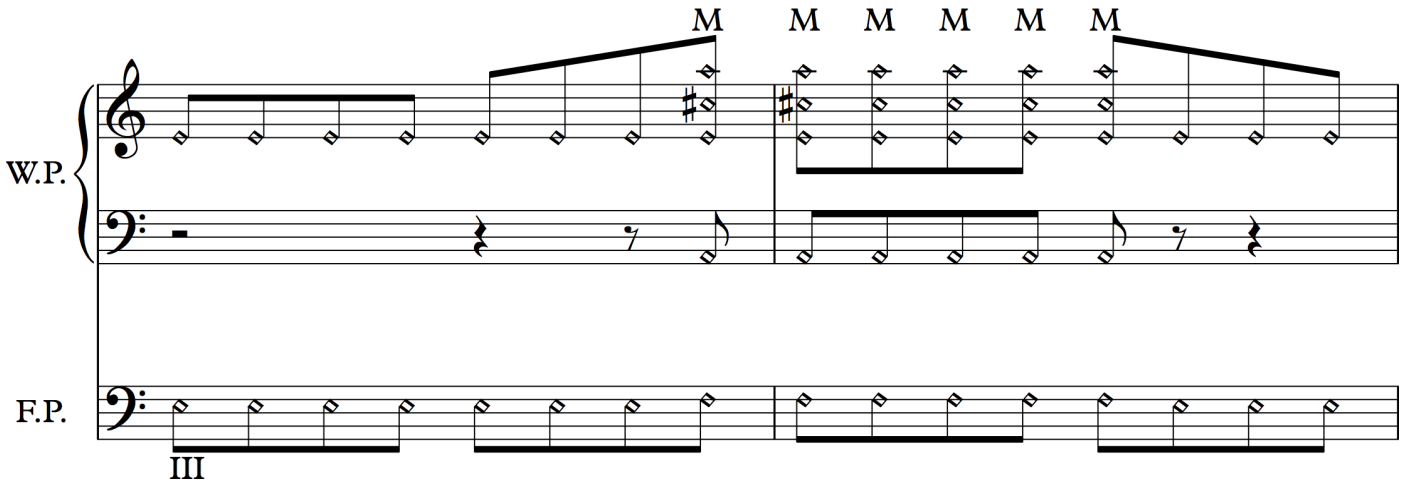
Ulchabhán begins with an exposition of the main component of the work, which is a repetitive arco harmonic figure on the 3rd partial of the A string, producing an E3 harmonic.

Video 4.7.2 *Ulchabhán* initial repetitive bow figure

The E harmonic acts as a pedal point throughout most of *Ulchabhán*, with various other techniques

alternated with or added to it, the first of which is an arco multi-nodal multiphonic located around where the stopped F on the A string would be. The multiphonic at this location is the same one used through much of *Study in Harmonics and Multiphonics #1*, and is comprised of the 3rd, 5th and 8th partials of the A string with elements of the fundamental, creating an A major chord.

Figure 4.7.1 Example of oscillation between E harmonic pedal point and multi-nodal multiphonic in *Ulchabhán*



Further development of this concept begins at 00:59, at which point I begin alternation between the E harmonic and a multiphonic located at the position of the stopped Eb on the A string, producing elements of the 4th, 7th and 10th partials.

Video 4.7.3 *Ulchabhán* alternation between E harmonic pedal point and multi-nodal multiphonic at location of stopped Eb note on A string

The rapid alternation between the repeated E harmonic and the multi-nodal multiphonics in *Ulchabhán* is a marked development from the quasi-rubato passages in *Study in Harmonics and Multiphonics #1*. I believe this is due to the knowledge gained from initial passes through my developmental framework leading to more facility and deeper understanding of the multi-nodal multiphonic technique, its application, and its interaction with other techniques.

4.7.3 Alternation between single string and double string techniques

Ulchabhán features several passages where adjacent string techniques are added to the repetitive A string E harmonic. The first instance of alternation between single string and adjacent double string techniques occurs at 00:44. At this point, I expand on the initial material which is based around alternation between the E harmonic and the A triad multiphonic, both on the A string, and begin a pattern of alternating between the specified harmonic, multiphonic and an adjacent string double stop consisting of the E harmonic and the D string 5th partial.

Video 4.7.4 Alternation between harmonic, multi-nodal multiphonic and adjacent string harmonic double stop in *Ulchabhán*

At 01:06 of *Ulchabhán* I begin a sequence of alternating between the A string E harmonic and an adjacent string double stop comprised of the E harmonic and a multiphonic on the D string consisting of elements of the 4th, 7th and 10th partials as well as the fundamental of the string, creating a complex and unstable chord featuring an array of timbres.

Video 4.7.5 Alternation between E harmonic and adjacent string double stop consisting of E harmonic and multi-nodal multiphonic at location of stopped Ab on D string in *Ulchabhán*

I have found the multiphonic at this finger location to be generally unstable in my experience, which could be a reality of the location itself and the array of nodes being activated with multi-nodal multiphonic technique or a peculiarity of my particular instrument or setup; in any case, I surmise that, in making the decision to use this particular multiphonic at this point in *Ulchabhán* in conjunction with the repeating E harmonic, I have prior knowledge of the multiphonic's possible instability and am purposely exploiting it for a particular sonic effect, and that this knowledge is a direct result of my developmental framework in action.

4.7.4 Alternation between double string techniques

Alternating between double string techniques is another way in which I expand on the overarching concept of *Ulchabhán*. At 01:19, I play several repetitions of a harmonic double stop consisting of the continuing A string 3rd partial E harmonic and the 5th partial of the D string, producing a major 9th interval.

Video 4.7.6 Harmonic double stop at 01:19 of *Ulchabhán*

After the initial exposition of the major 9th interval harmonic double stop, I begin alternating between the harmonic double stop and a double stop consisting of the same D string 5th partial and the multi-nodal multiphonic at the location of the stopped F on the A string.

Video 4.7.7 Alternation between harmonic double stop and multiphonic/harmonic double stop in *Ulchabhán*

Similar material to that shown in Video 4.7.7 appears at 02:00 of *Ulchabhán*. In this case, I execute a repeated double stop consisting of the continuing A string E harmonic and the multi-nodal multiphonic at the location of the fingered Ab on the D string. I then alternate slowly between the harmonic/multiphonic double stop and the aforementioned major 9th interval double stop, comprised of the A string 3rd partial E harmonic and the D string 5th partial F# harmonic.

Video 4.7.8 Alternation between harmonic/multi-nodal multiphonic double stop and harmonic double stop in *Ulchabhán*.

The creation of adjacent string double stops between harmonics and multi-nodal multiphonics is not a concept I have formally explored. The fact that double stops of this type have emerged in an improvisatory setting in this manner is an example of post-developmental framework freedom with techniques that were initially problematic. The awareness of generative practices relating to individual techniques gained through the developmental framework means that I am now able to combine them in real-time within musical settings.

4.7.5 Circular bowing

Circular bowing technique consists of changing bow registration in a circular motion in order to activate different overtone content in the sound. An initial exposition of circular bowing technique begins at 02:19 of *Ulchabhán*.

Video 4.7.9 Circular bowing in *Ulchabhán*

A more involved use of circular bowing occurs in the passage between 02:35 and 02:51 in *Ulchabhán*. Building on the initial exposition of circular bowing in Video 4.7.9, I alternate between circular bowing phrases, arco harmonics and arco multiphonics. The instances of circular bowing are quite precise in their alternation between two particular overtones, as evidenced at 00:03, 00:07 and 00:13 of Video 4.7.10.

Video 4.7.10 Alternation between circular bowing, arco harmonics and arco multi-nodal multiphonics in *Ulchabhán*

Video 4.7.10 shows the differences in bow registration required for each technique and the rapid alternation between them. To me, this shows a greater understanding of the intricacies of each technique and methods for their generation; as far as I am aware of, I have never formally organised this group of techniques together before, and to have developed my musical idiolect to a point where I am 1) making decisions to use techniques based on what I know of their parameters and how they will affect the music

and 2) adjusting and problem solving in real-time in order to facilitate correct execution of and alternation between the techniques in question shows, in my view, how effective my developmental framework has been in helping me assimilate extended techniques into my personal vocabulary.

Chapter 5
Conclusion

My aim for this research project was to develop a personal musical vocabulary for solo double bass through the assimilation of extended techniques and preparations. I initially researched string instrument and double bass specific extended techniques and preparations and situated them within a historical narrative, discussing what I consider to be important developments as they emerged in the timeline. After a preliminary experimentation period with the techniques, I developed a developmental framework for the purpose of adding new techniques to my personal musical idiolect. The developmental framework itself is a product of practice-based research and was developed as a result of an *emergent* process (the preliminary experimentation period).

In Chapter Three I explain my developmental framework in detail, offering examples of the process in action in order to communicate its practical realities and efficacy. The framework is generally a linear process split into four main stages, each of which features several substrata or parameters that are able to be manipulated; however, the nature of the process means that the framework can be *flexible* or *reflexive*, as well as linear, and streams of the framework can be divergent *and* convergent. I believe that the inherent flexibility in this framework has allowed, and will continue to allow, for a greater variety of creative output.

In Chapter Four I offer analyses of creative output resultant from the developmental framework. The creative output consists of musical works, some composed, some improvised, and some featuring aspects of both. The analyses are the final stage of the developmental framework itself and feature detailed commentary on the use of extended techniques and preparations and their physical realities, problems and issues with interaction with each other. The analytical essays also contain knowledge about what I believe to be several new techniques. Each analysis features notation, photos, audio and video in order to communicate clearly the realities inherent in the works themselves.

The musical works themselves are presented as videos, most of which are presented at the beginning of their relevant analytical essays. I have included two further musical works as videos in Appendix B. The developmental framework process resulted in many more works than are included in this dissertation; the works that I chose to include are ones I believe to a) present the most interesting results of the developmental process, in terms of particular techniques, new developments, and interaction between techniques and their parameters; and b) show the development of my personal solo idiolect throughout the research period.

Through researching extended techniques and preparations and assimilating them into my musical idiolect by way of my developmental framework, I believe I have begun developing a less structured method of dealing with new techniques or parameters. I find that I am able to work in real time with existent and/or new techniques and manipulate or respond to particular parameters of their execution in a musical setting. I have found this method to be most evident in an improvisational context, and through analysis of improvisational works I can see and hear myself interacting with groups of techniques or emergent parameters of techniques that I have not necessarily formally explored before. The continued

development of my personal idiolect through both the structure-based developmental framework and real time informal explorations hold implications for future research, and I intend to pursue these avenues as much as possible.

Taking the previous paragraphs into account, I believe the main research outcomes of this project to be:

1) The creative output itself. The principal focus of this project has been the development of a personal solo vocabulary and the musical works are examples of the manifestation of a particular musical idiolect unique to myself.

2) The included analytical essays. The included analyses constitute the majority of pedagogical knowledge developed through my research project. The process of organising extended techniques and preparations within musical contexts has, I hope, uncovered new knowledge and avenues for further research and the analytical essays are the main way in which this knowledge has been disseminated in this research project.

3) My developmental framework. The developmental framework has been a crucial element of this project. The blend of both academic and practical stages, structured and less-structured aspects, and inherent potential for flexibility and reflexivity has resulted in a personal model and methodology that I believe has the potential to be adapted to other situations.

My hope is that the three main research outcomes listed are able to be used and manipulated by both academics and practitioners and can make a contribution to the knowledge surrounding both extended techniques on the double bass and practice-based creative research models.

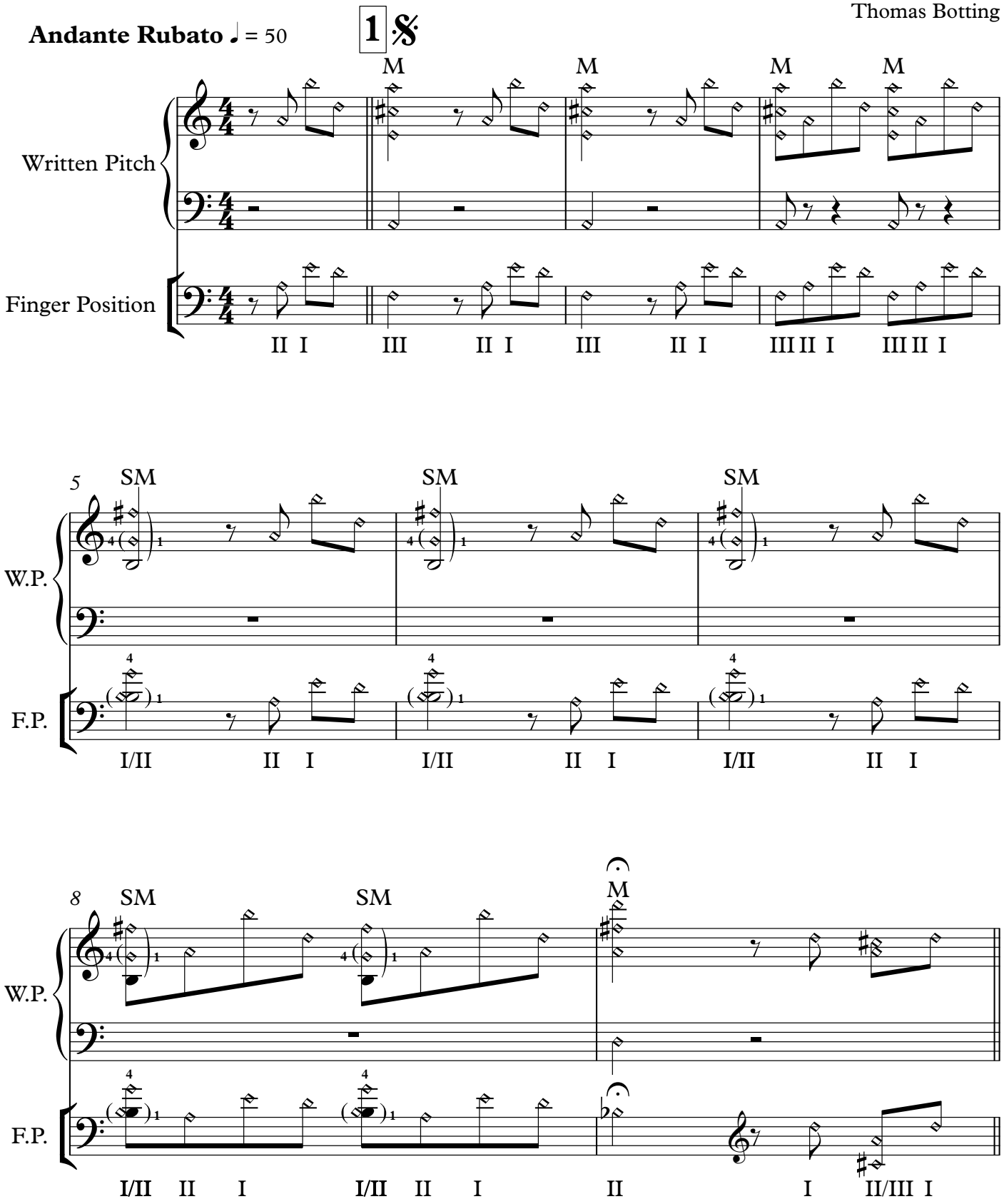
Appendix A:
Scores for Composed Works

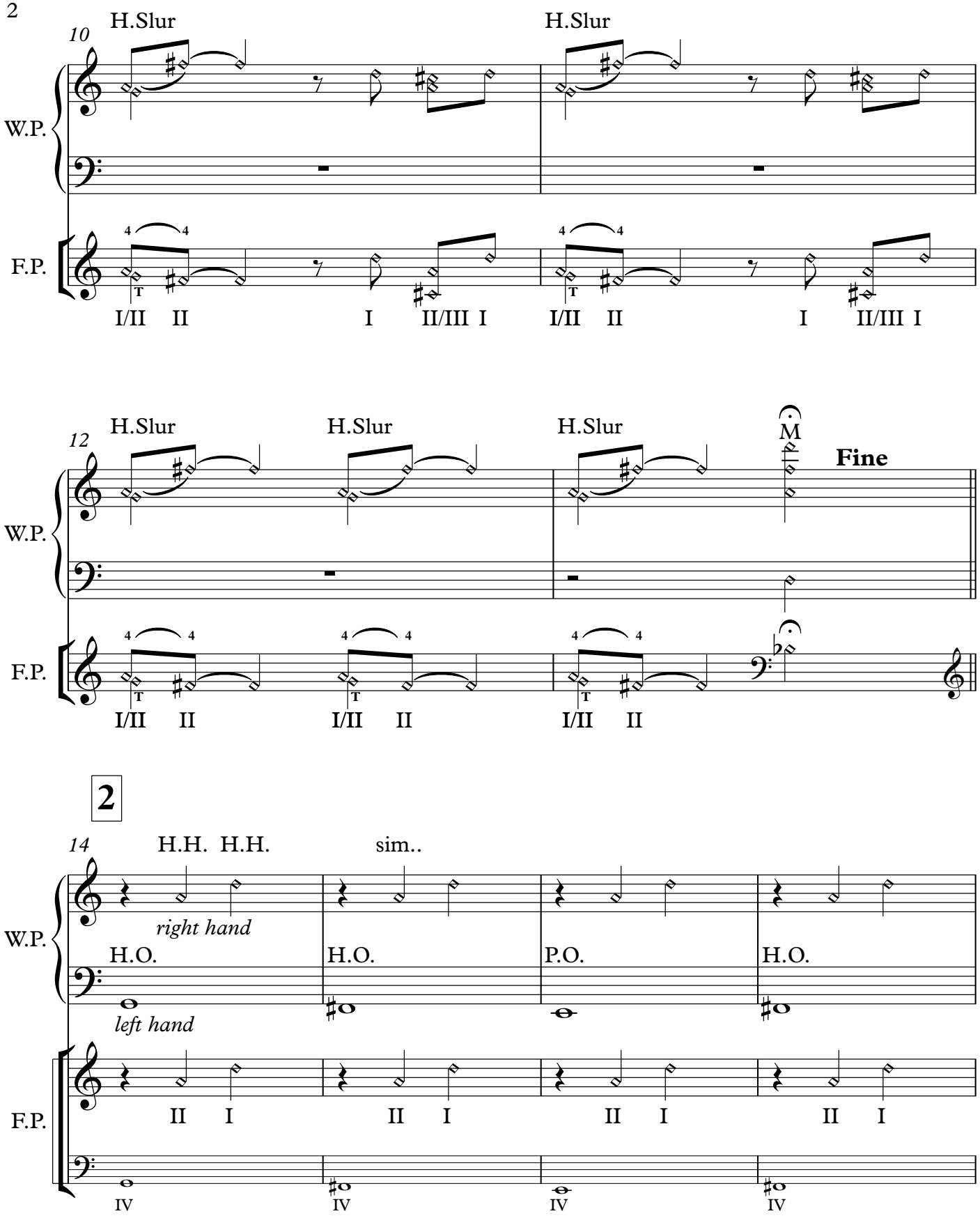
The following pages contain full scores for the composed works included in the analytical essays.

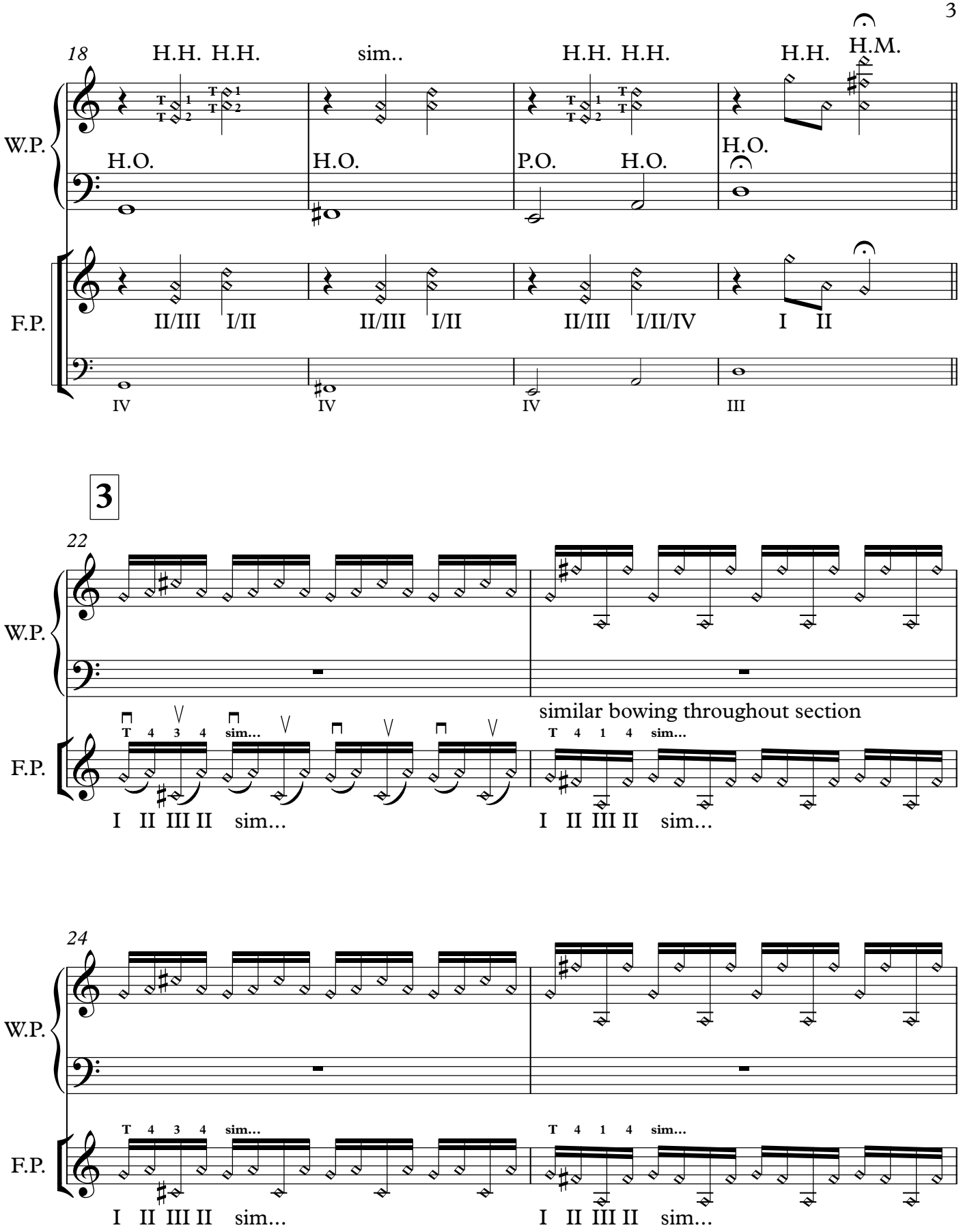
Study in Harmonics and Multiphonics #1

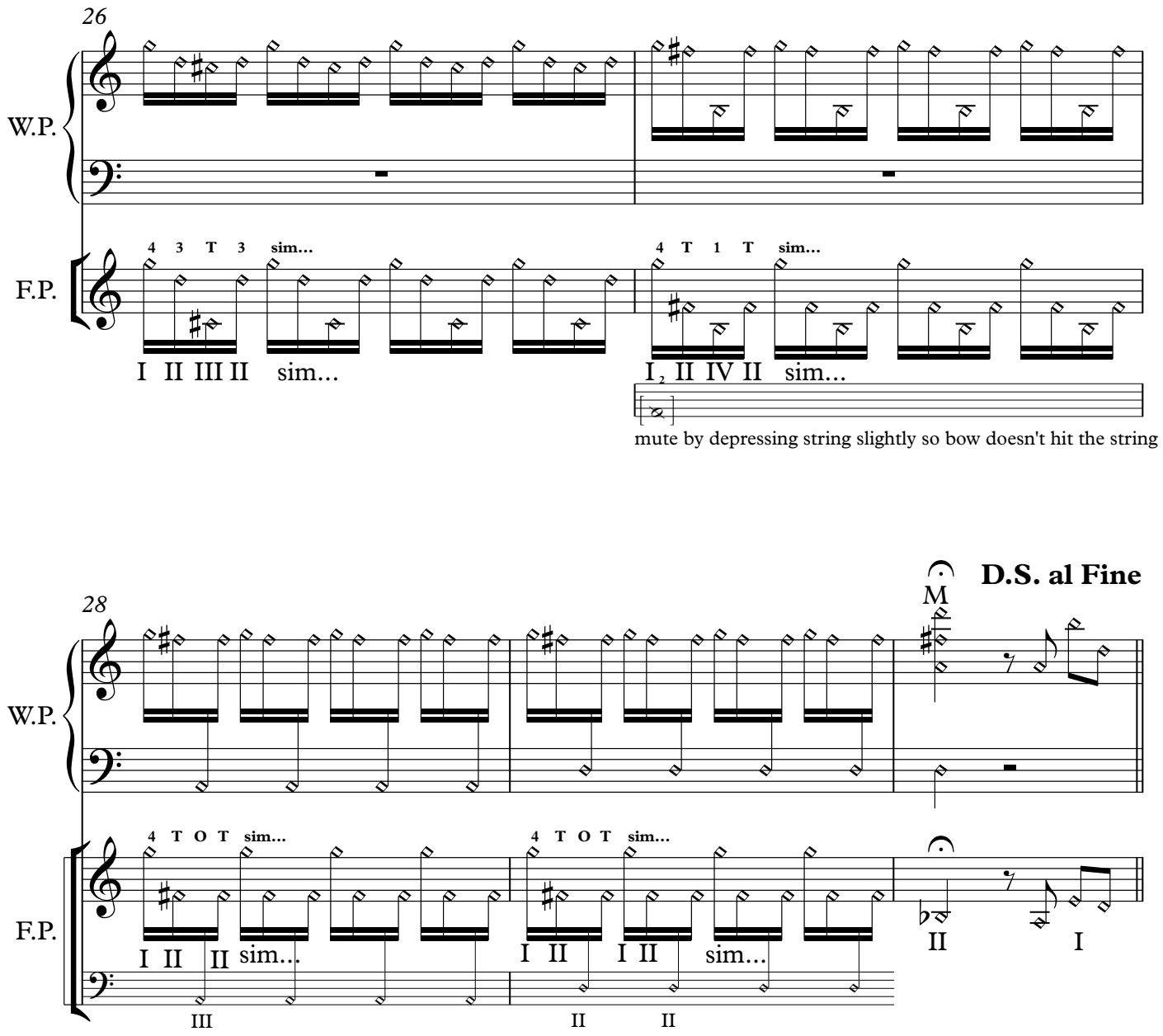
Thomas Botting

Andante Rubato ♩ = 50



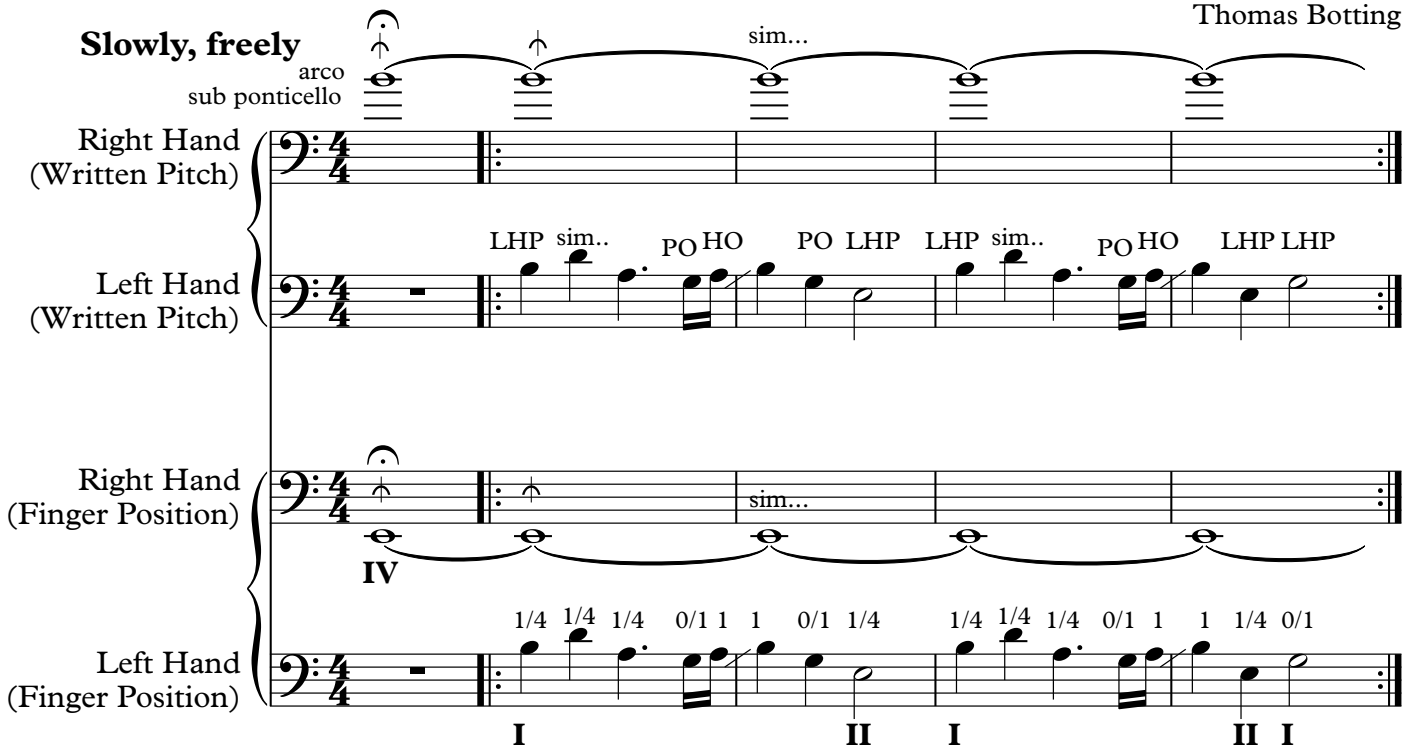

10
H.Slur
H.Slur
W.P.
F.P.
I/II II I II/III I
I/II II I II/III I
12
H.Slur
H.Slur
H.Slur
M
Fine
I/II II
I/II II
I/II II
2
14
H.H. H.H.
sim..
right hand
left hand
H.O.
H.O.
P.O.
H.O.
II I
II I
II I
II I
IV
IV
IV
IV

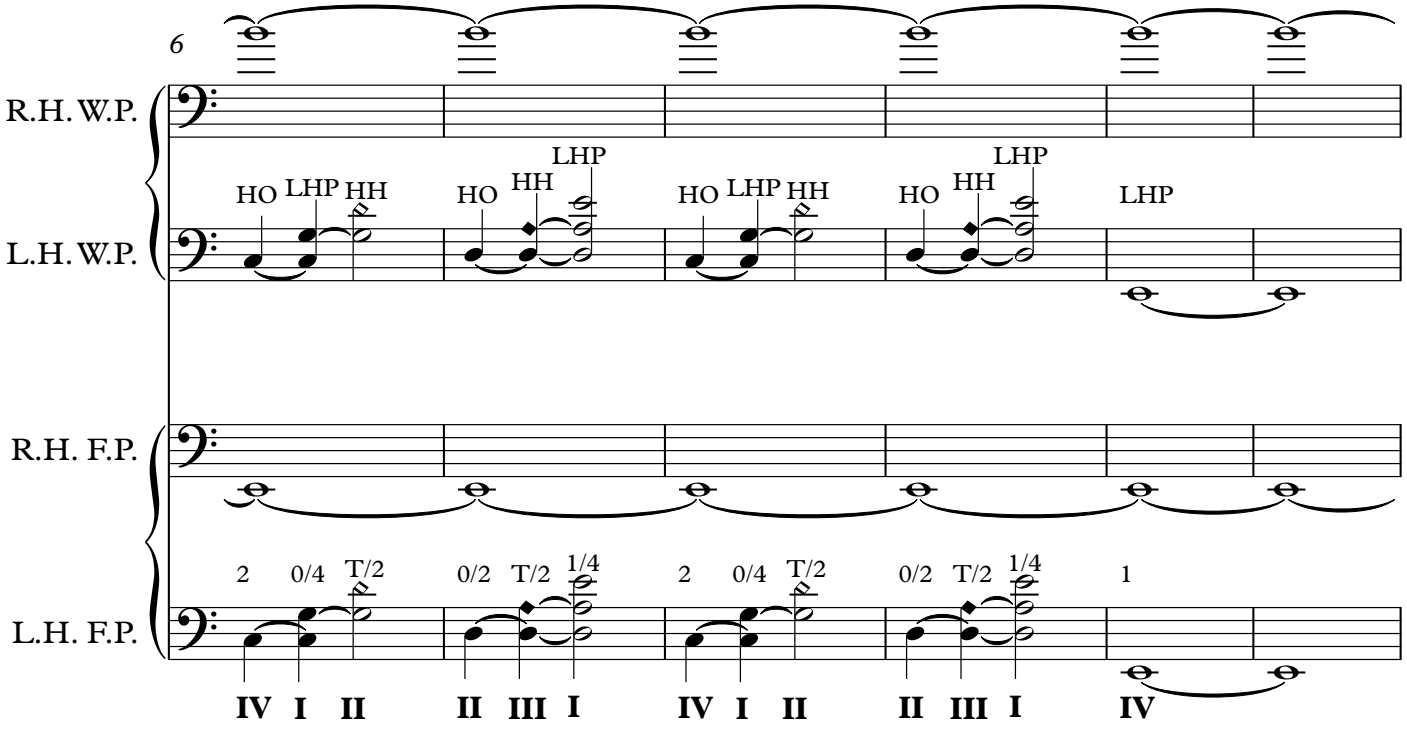

18
H.H. H.H.
sim..
H.H. H.H.
H.H.
H.M.
W.P.
H.O.
H.O.
P.O.
H.O.
H.O.
F.P.
II/III I/II
II/III I/II
II/III I/II/IV
I II
IV
IV
IV
III
3
22
W.P.
similar bowing throughout section
F.P.
T 4 3 4 sim...
T 4 1 4 sim...
I II III II sim...
I II III II sim...
24
W.P.
F.P.
T 4 3 4 sim...
T 4 1 4 sim...
I II III II sim...
I II III II sim...

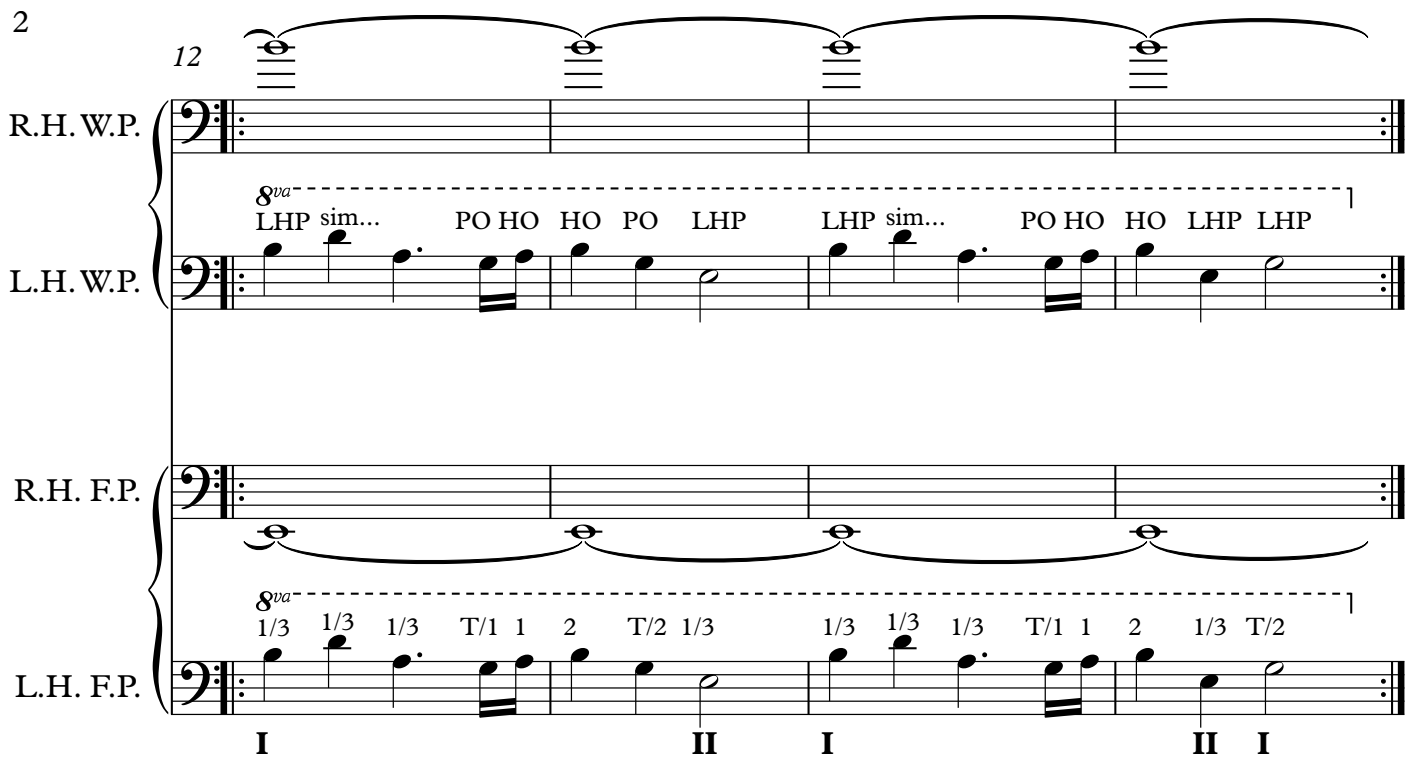

26
W.P.
F.P.
4 3 T 3 sim...
I II III II sim...
4 T 1 T sim...
I 2 II IV II sim...
mute by depressing string slightly so bow doesn't hit the string
28
M
D.S. al Fine
W.P.
F.P.
4 T O T sim...
I II II sim...
III
4 T O T sim...
I II I II sim...
II II
II
I

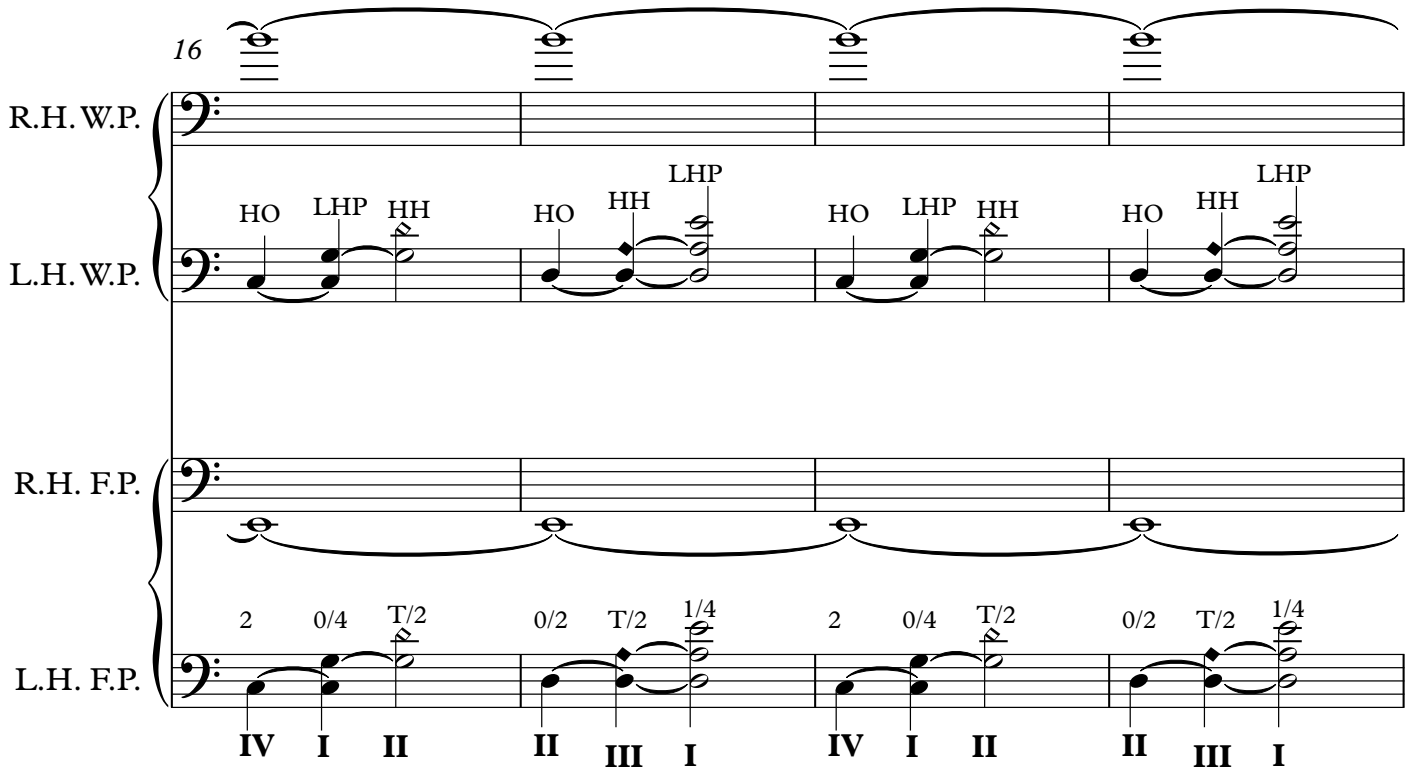
Study in Left Hand Pizzicato Techniques, Scordatura and Arco Sub-Ponticello

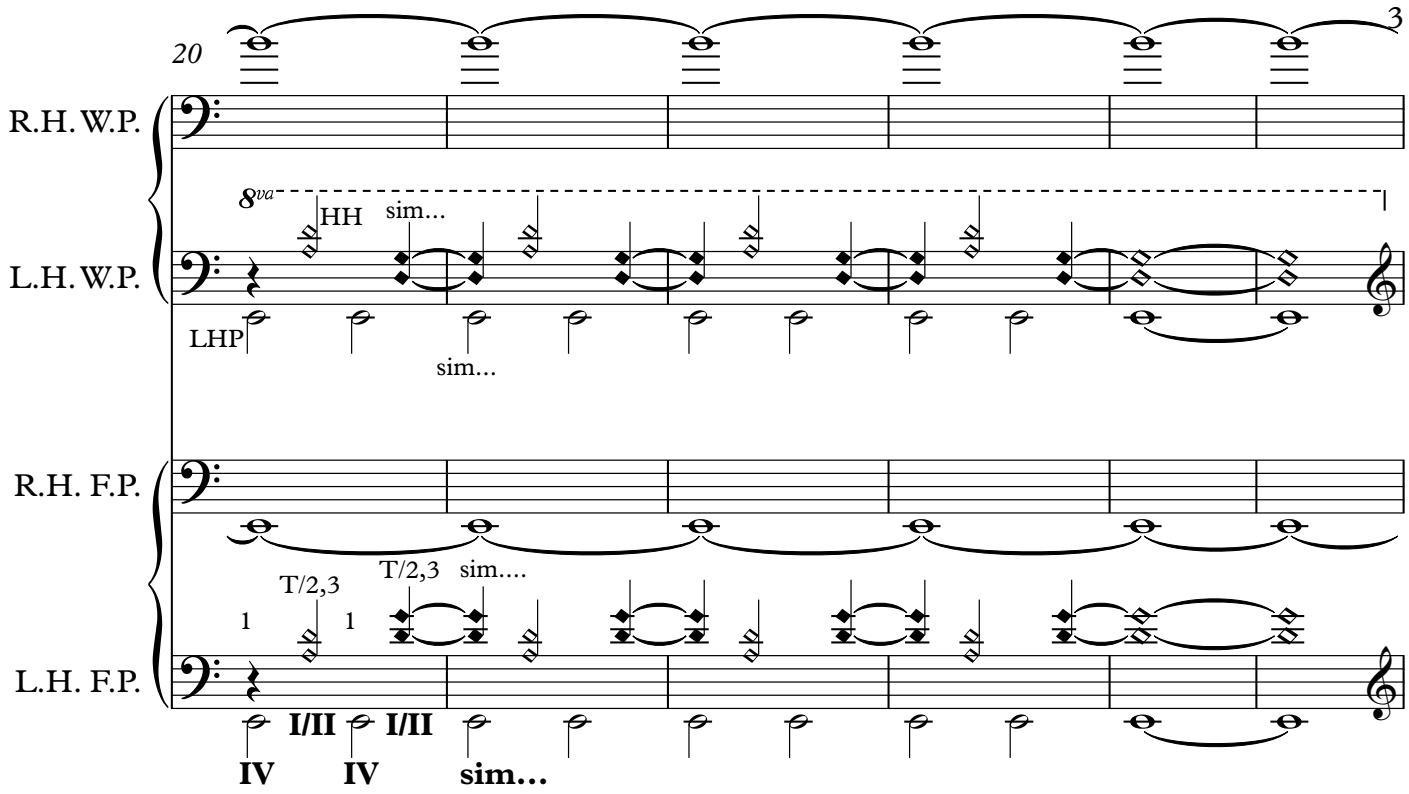
Thomas Botting

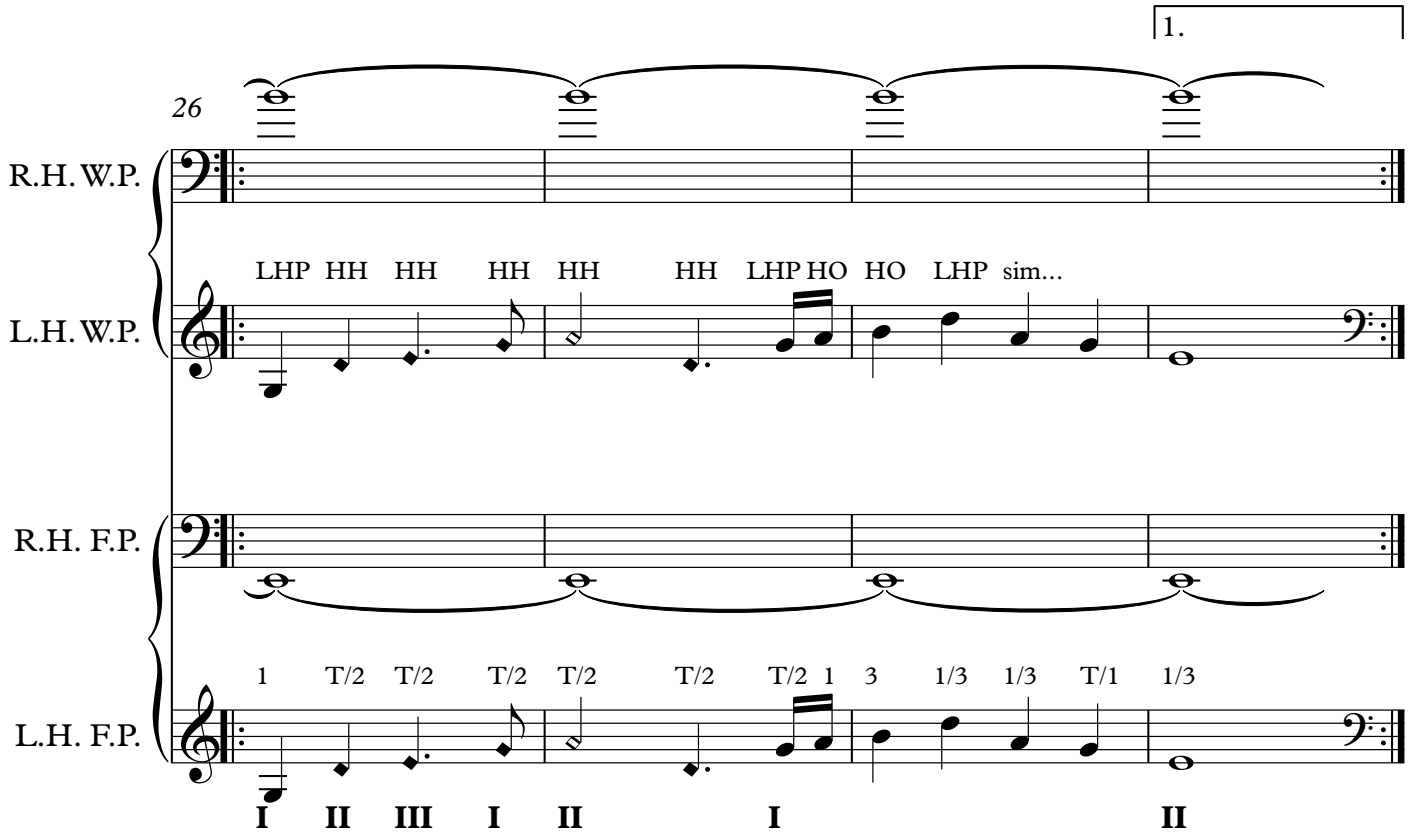


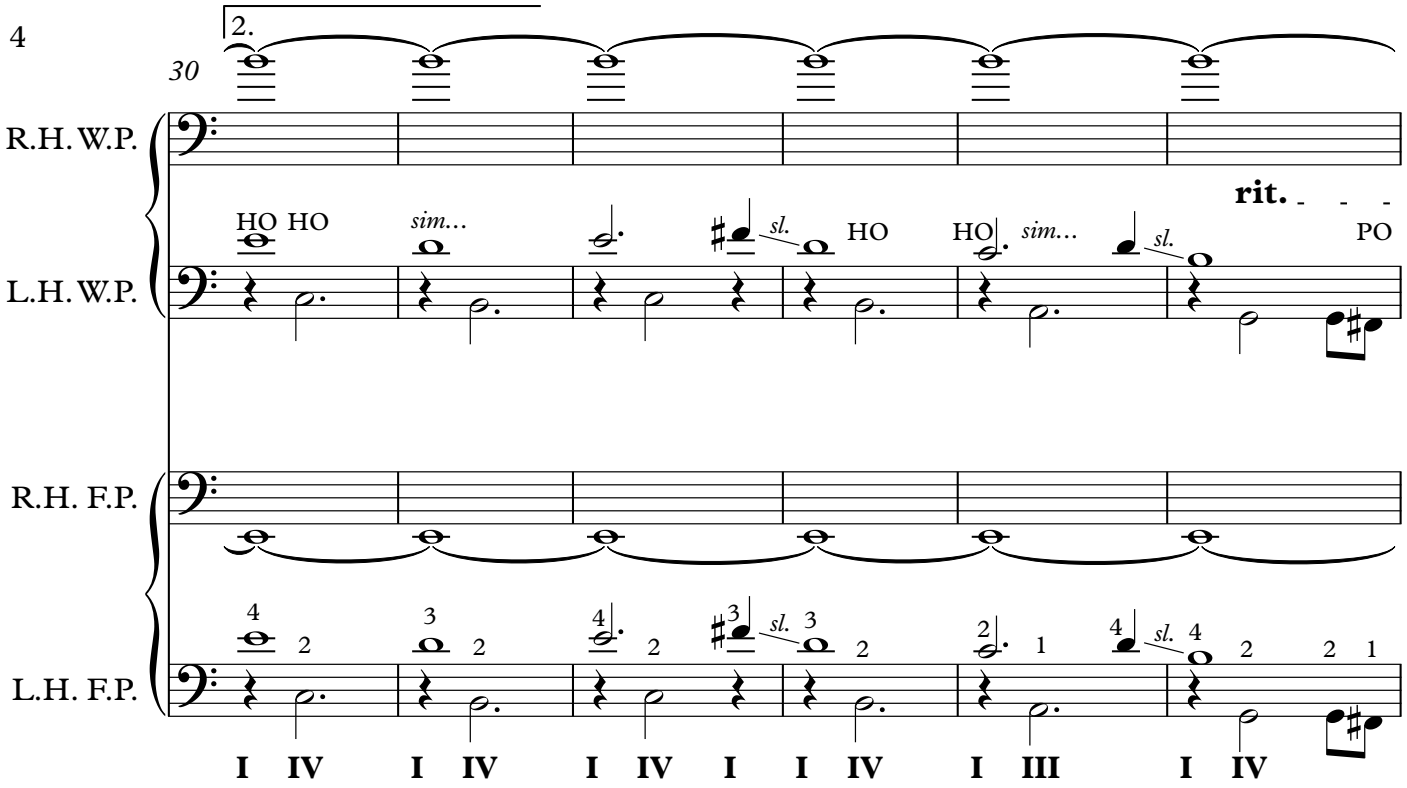


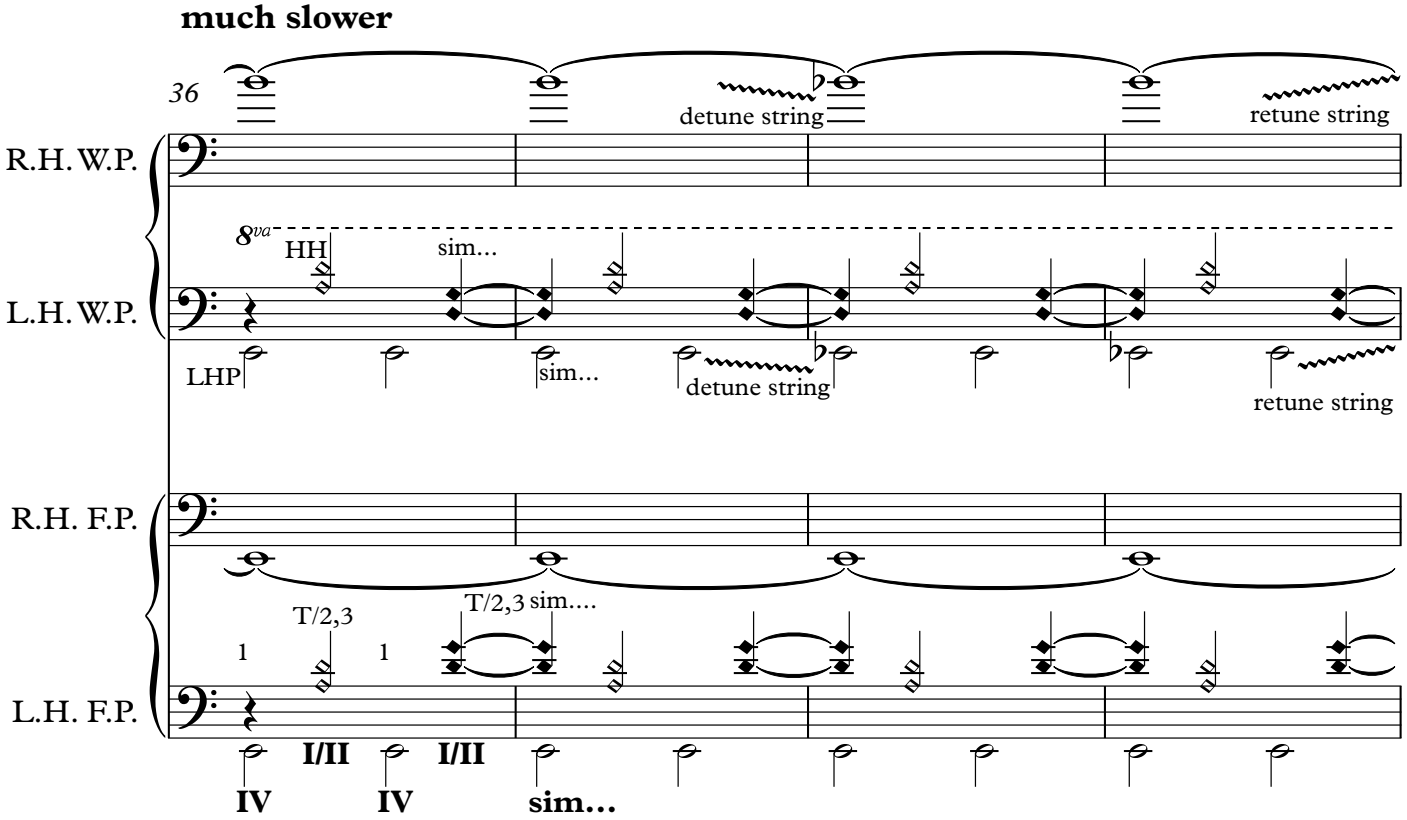

2
12
R.H. W.P.
L.H. W.P.
8va
LHP sim... PO HO HO PO LHP LHP sim... PO HO HO LHP LHP
R.H. F.P.
L.H. F.P.
8va
1/3 1/3 1/3 T/1 1 2 T/2 1/3 1/3 1/3 1/3 T/1 1 2 1/3 T/2
I II I II I

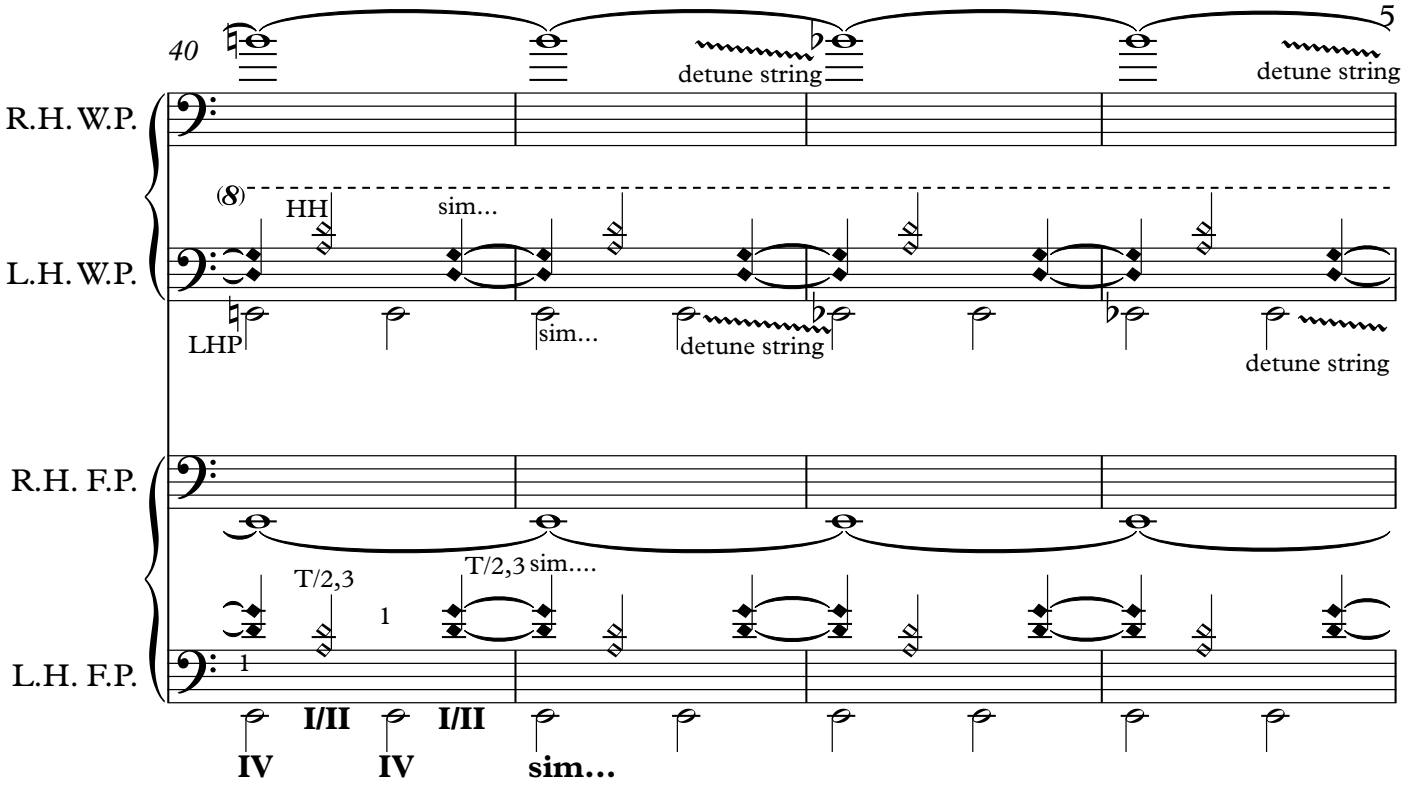

16
R.H. W.P.
L.H. W.P.
HO LHP HH HO HH LHP HO LHP HH HO HH LHP
R.H. F.P.
L.H. F.P.
2 0/4 T/2 0/2 T/2 1/4 2 0/4 T/2 0/2 T/2 1/4
IV I II II III I IV I II II III I

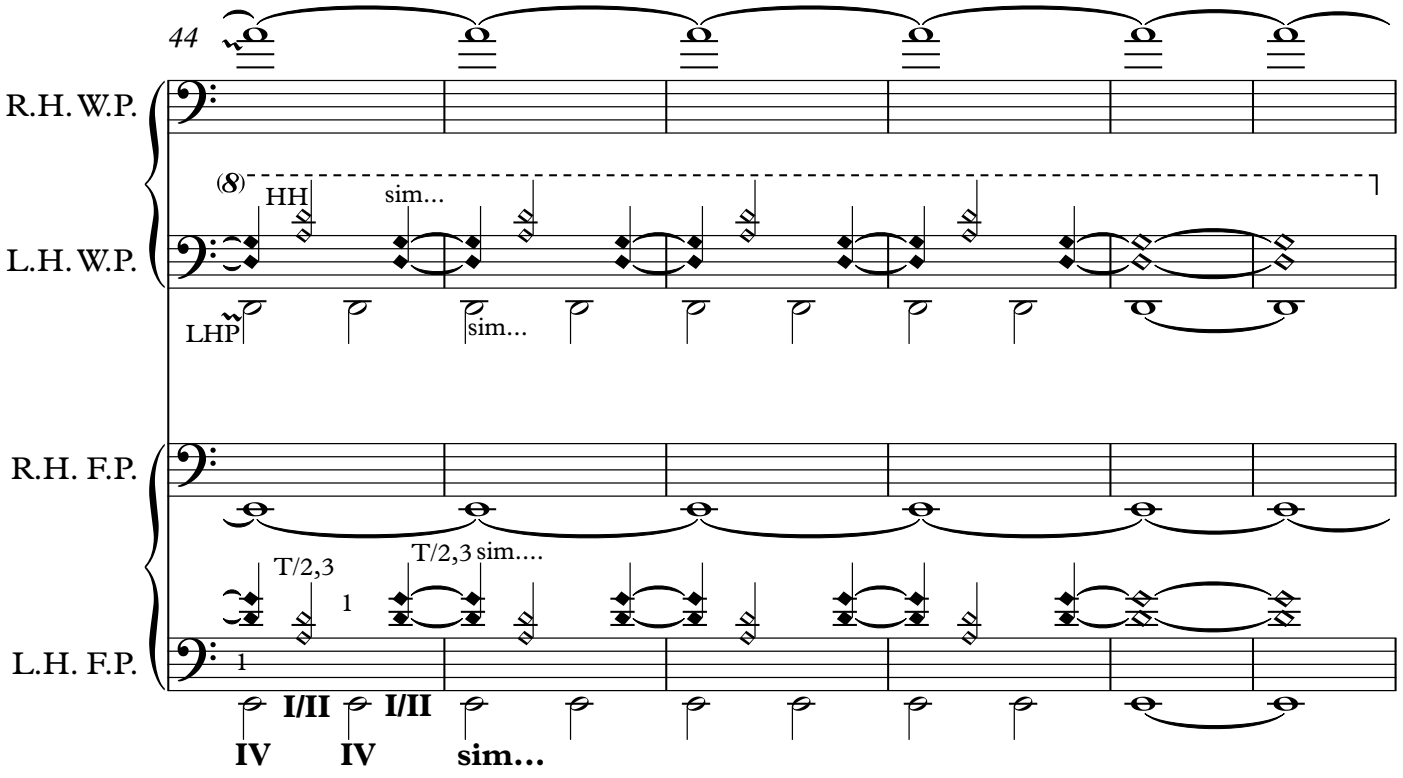

20
3
R.H. W.P.
L.H. W.P.
8va
HH
sim...
LHP
sim...
R.H. F.P.
L.H. F.P.
T/2,3
1
T/2,3
sim....
I/II
I/II
IV
IV
sim…

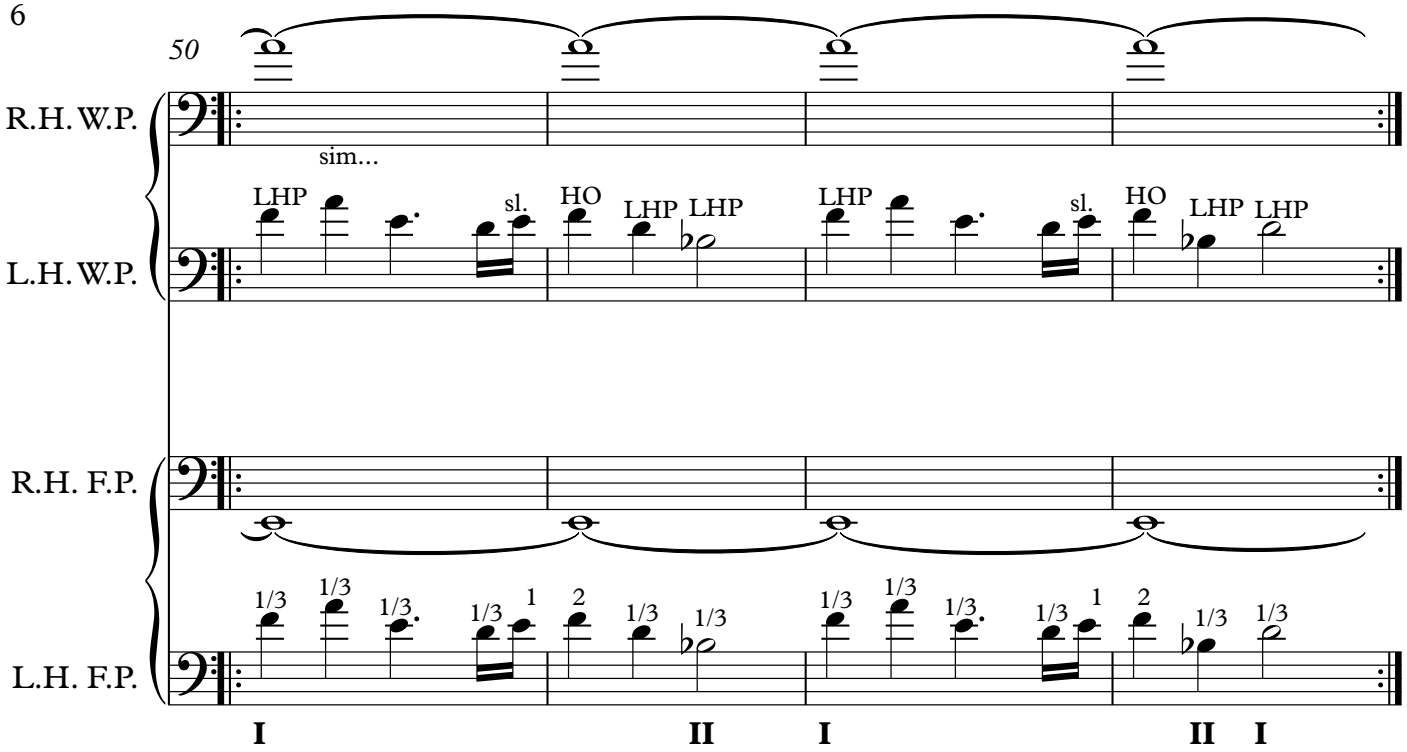

1.
26
R.H. W.P.
L.H. W.P.
LHP
HH
HH
HH
HH
HH
LHP
HO
HO
LHP
sim...
R.H. F.P.
L.H. F.P.
1
T/2
T/2
T/2
T/2
T/2
T/2
1
3
1/3
1/3
T/1
1/3
I
II
III
I
II
I
II


4
30
2.
R.H. W.P.
L.H. W.P.
R.H. F.P.
L.H. F.P.
HO HO
sim...
sl.
HO
HO
sim...
sl.
PO
rit.
I IV I IV I IV I I IV I III I IV

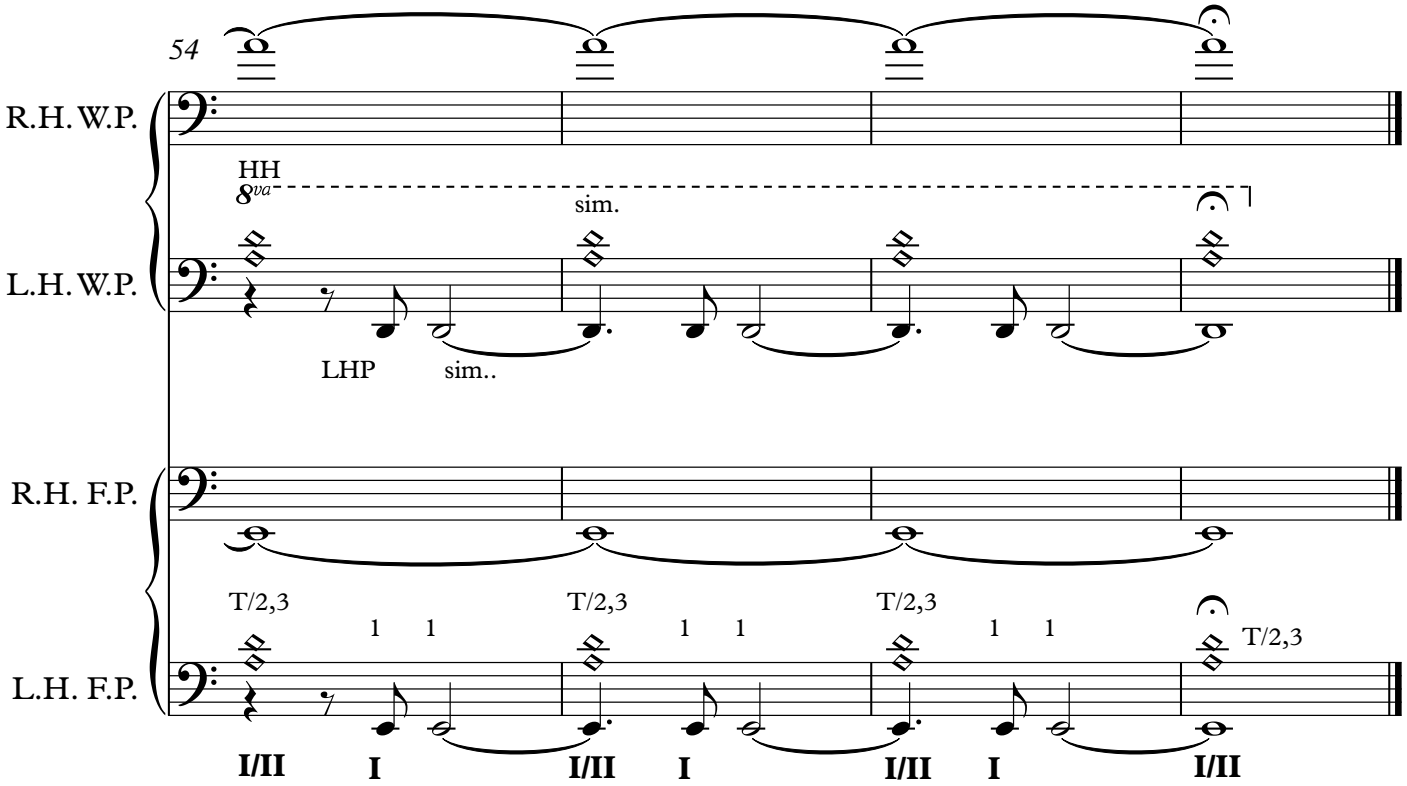

much slower
36
detune string
retune string
R.H. W.P.
L.H. W.P.
8va
HH
sim...
LHP
sim...
detune string
retune string
R.H. F.P.
L.H. F.P.
T/2,3
T/2,3 sim....
I/II I/II
IV IV sim...


40
5
R.H. W.P.
L.H. W.P.
R.H. F.P.
L.H. F.P.
detune string
detune string
(8)
HH
sim...
LHP
sim...
detune string
detune string
T/2,3
1
T/2,3 sim....
1
I/II
I/II
IV
IV
sim…


44
R.H. W.P.
L.H. W.P.
R.H. F.P.
L.H. F.P.
(8)
HH
sim...
LHP
sim...
T/2,3
1
T/2,3 sim....
1
I/II
I/II
IV
IV
sim…



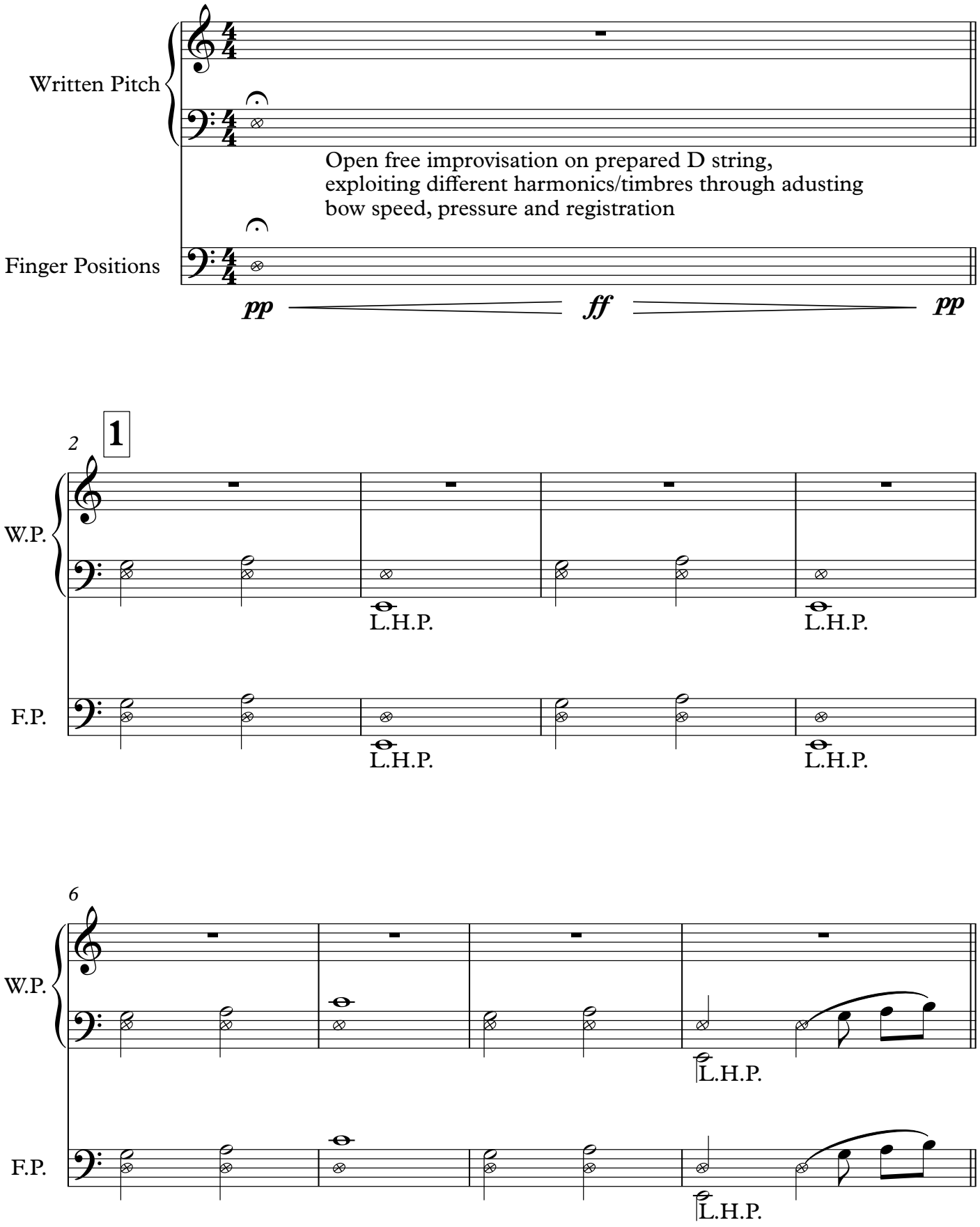
slower still

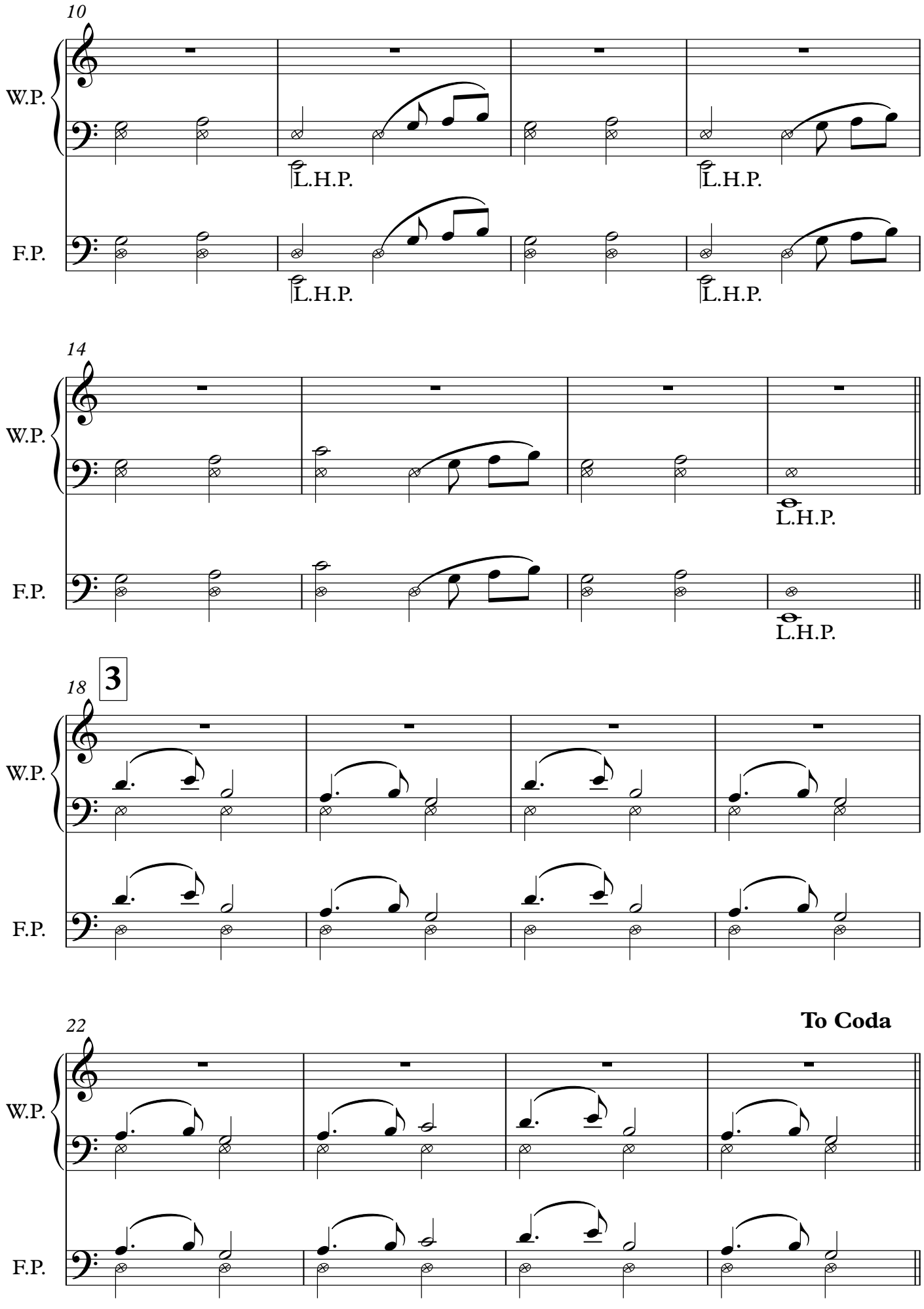


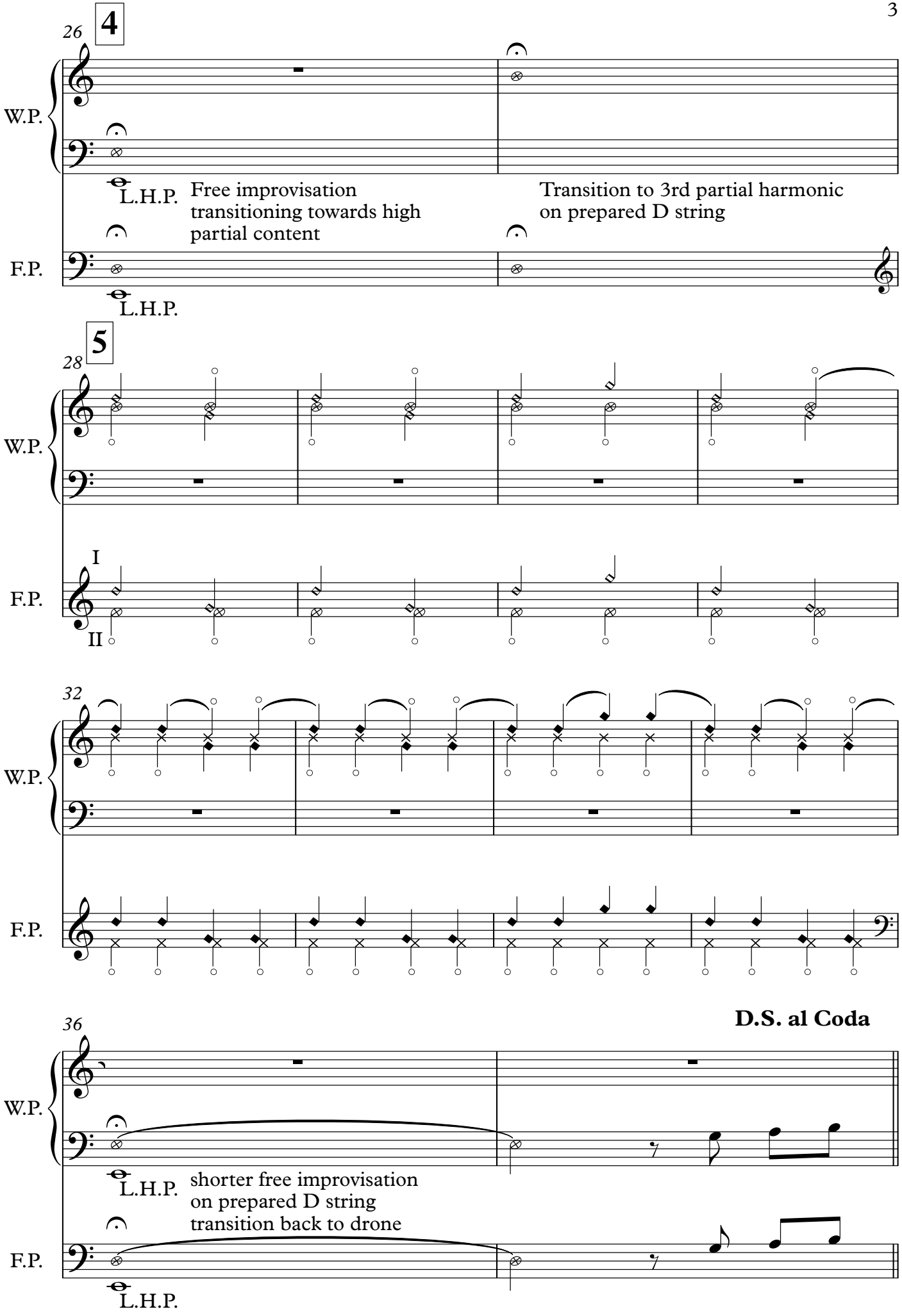
Study in Prepared Bass #1

Thomas Botting

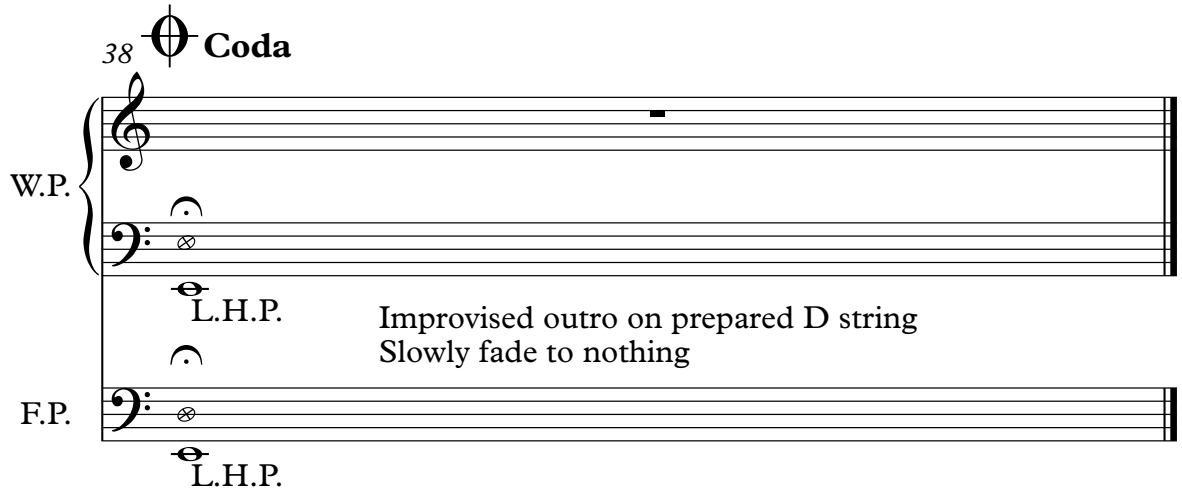
Rubato ♩ = 54




10
W.P.
L.H.P.
L.H.P.
F.P.
L.H.P.
L.H.P.
14
W.P.
L.H.P.
F.P.
L.H.P.
18
3
W.P.
F.P.
22
To Coda
W.P.
F.P.

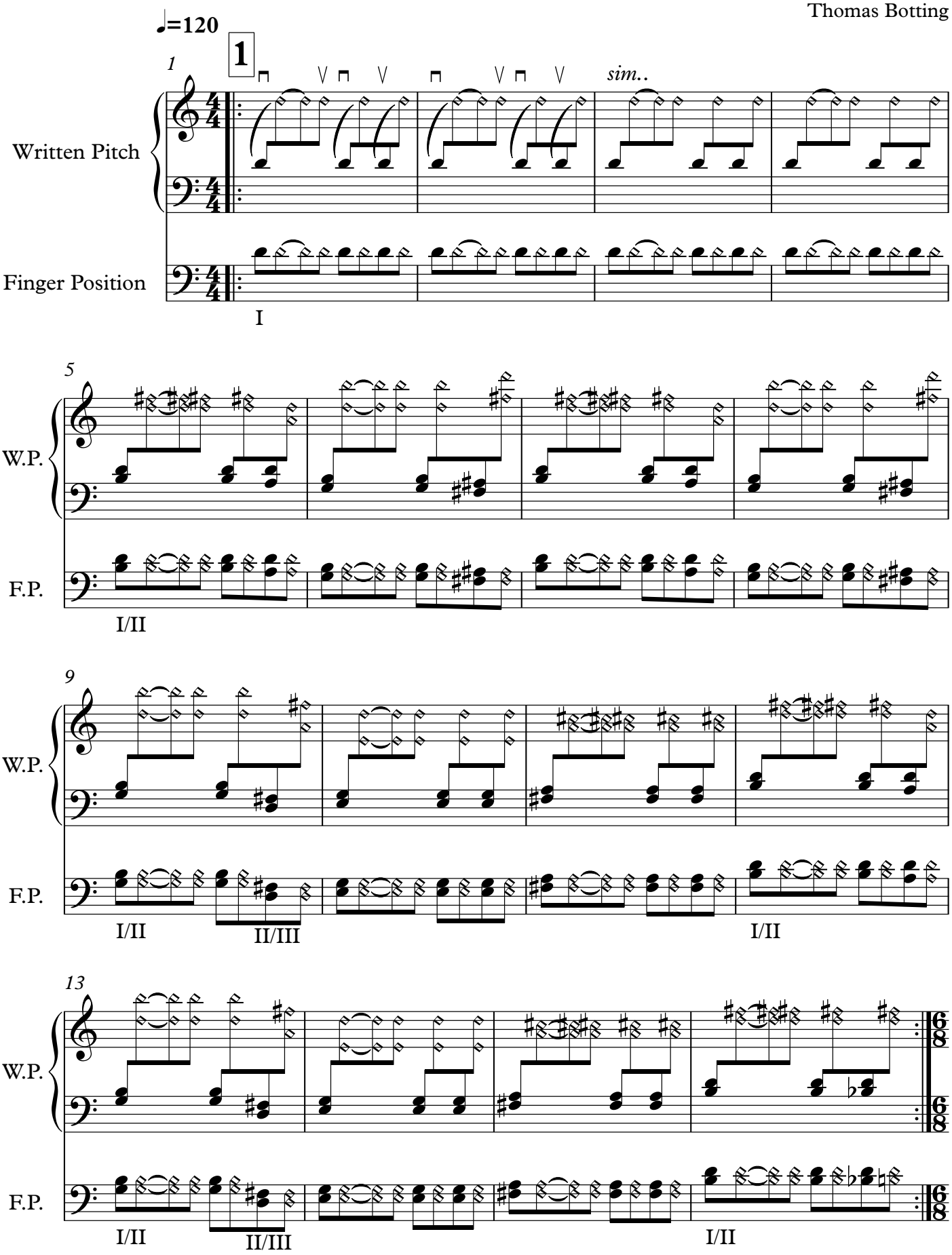

4
26
W.P.
L.H.P.
Free improvisation
transitioning towards high
partial content
Transition to 3rd partial harmonic
on prepared D string
F.P.
L.H.P.
5
28
W.P.
I
F.P.
II
32
W.P.
F.P.
D.S. al Coda
36
W.P.
L.H.P.
shorter free improvisation
on prepared D string
transition back to drone
F.P.
L.H.P.

4


38
Coda
W.P.
L.H.P.
Improvised outro on prepared D string
Slowly fade to nothing
F.P.
L.H.P.

Heights and Depths

Thomas Botting



2

17

sim..

W.P.

F.P.

I

21

4X

sim..

W.P.

F.P.

II III II

24

bow strokes alternate 2nd x

W.P.

F.P.

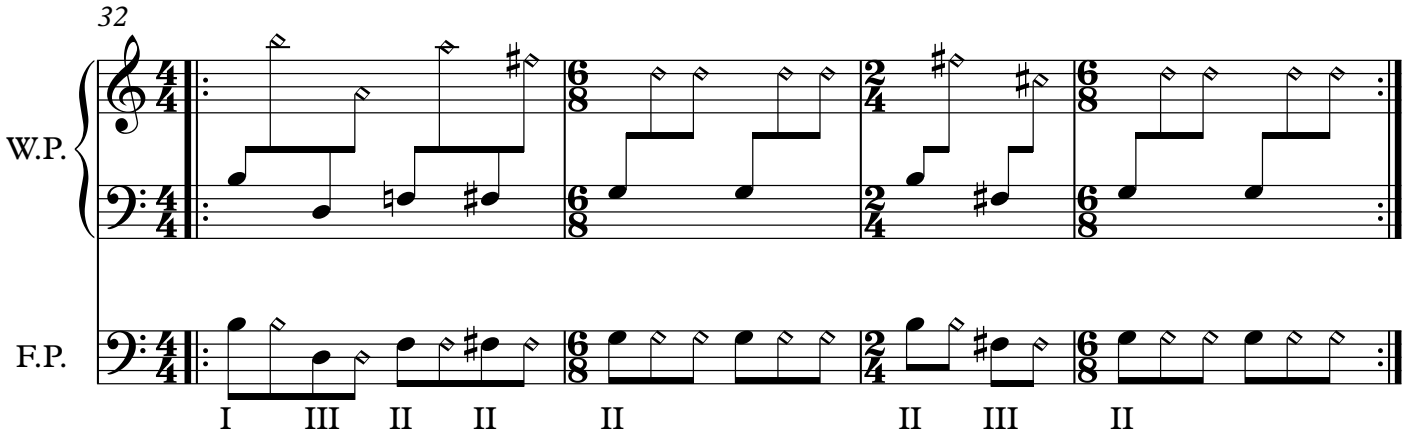
I III II II II III II

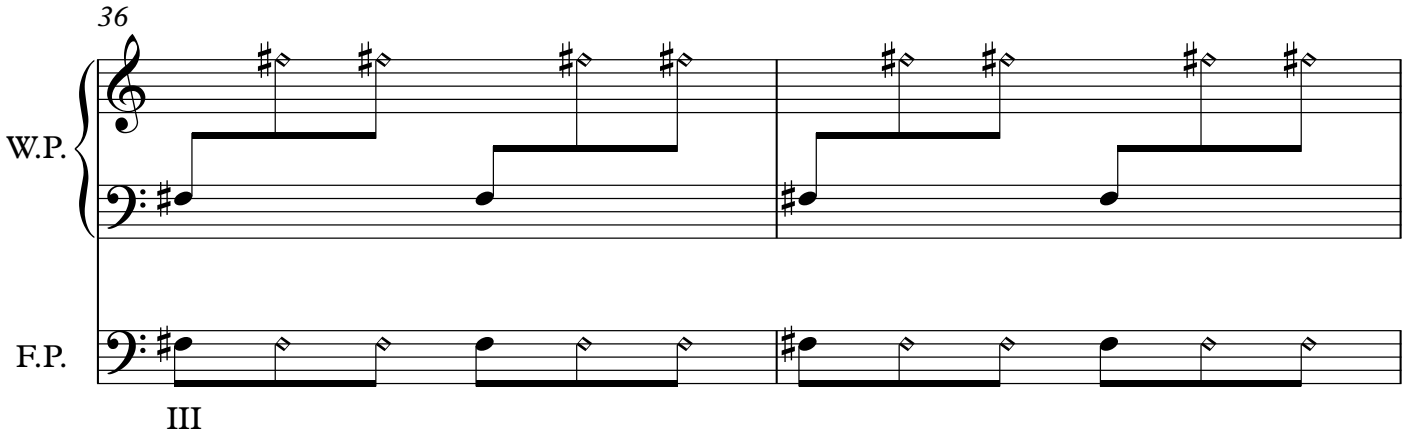
28

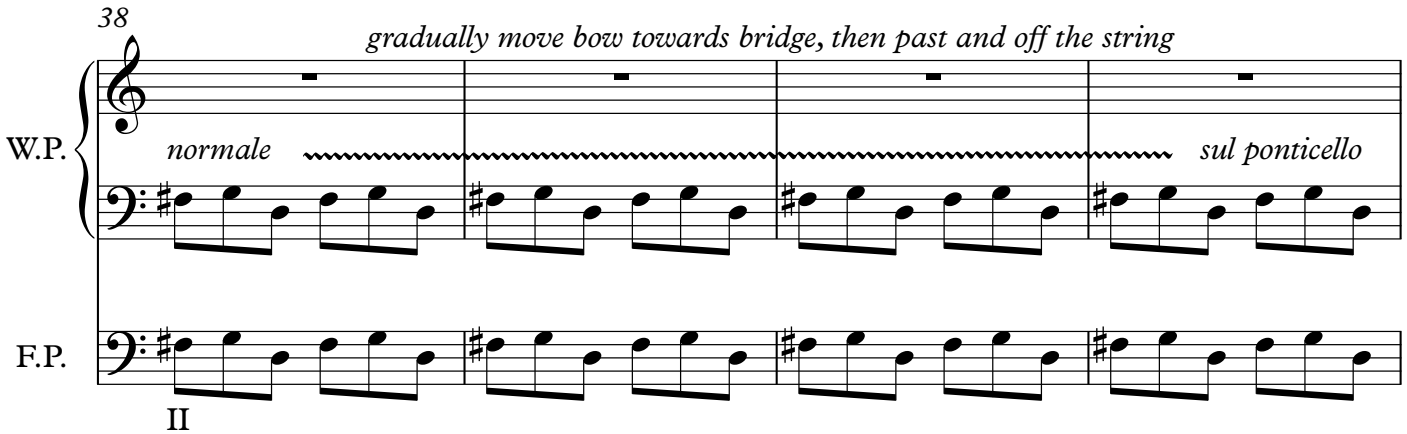
W.P.

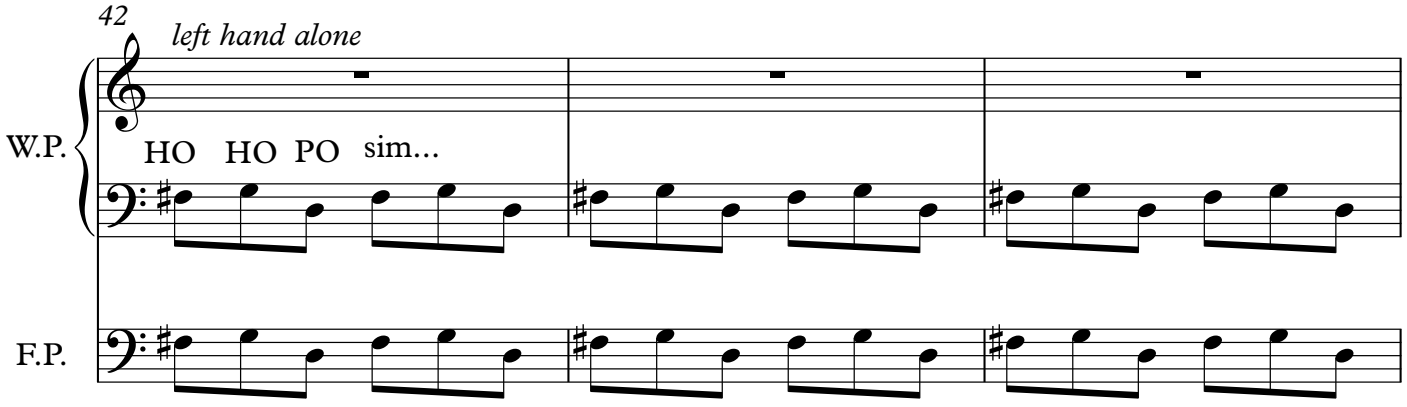
F.P.

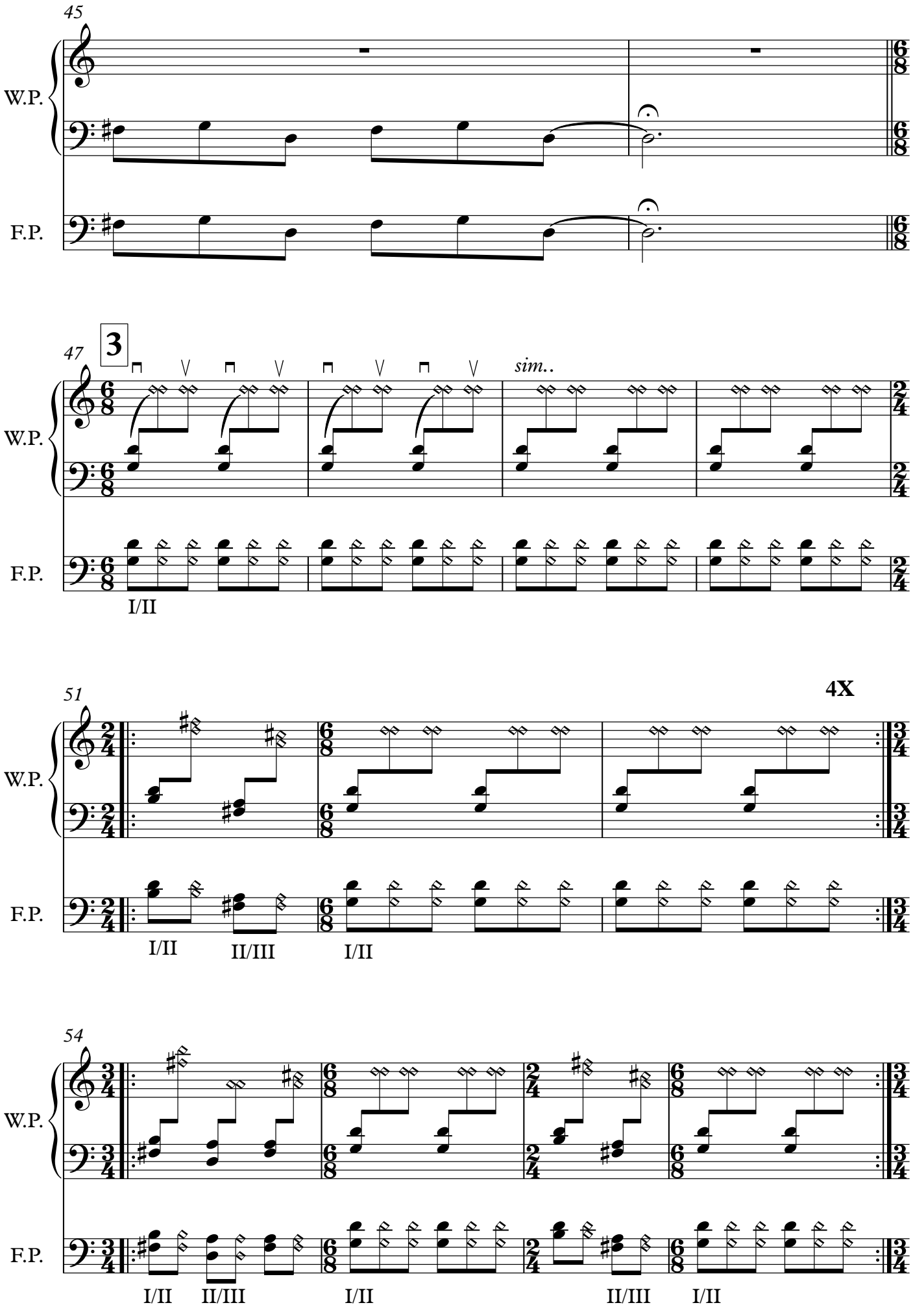
I III II II II III II

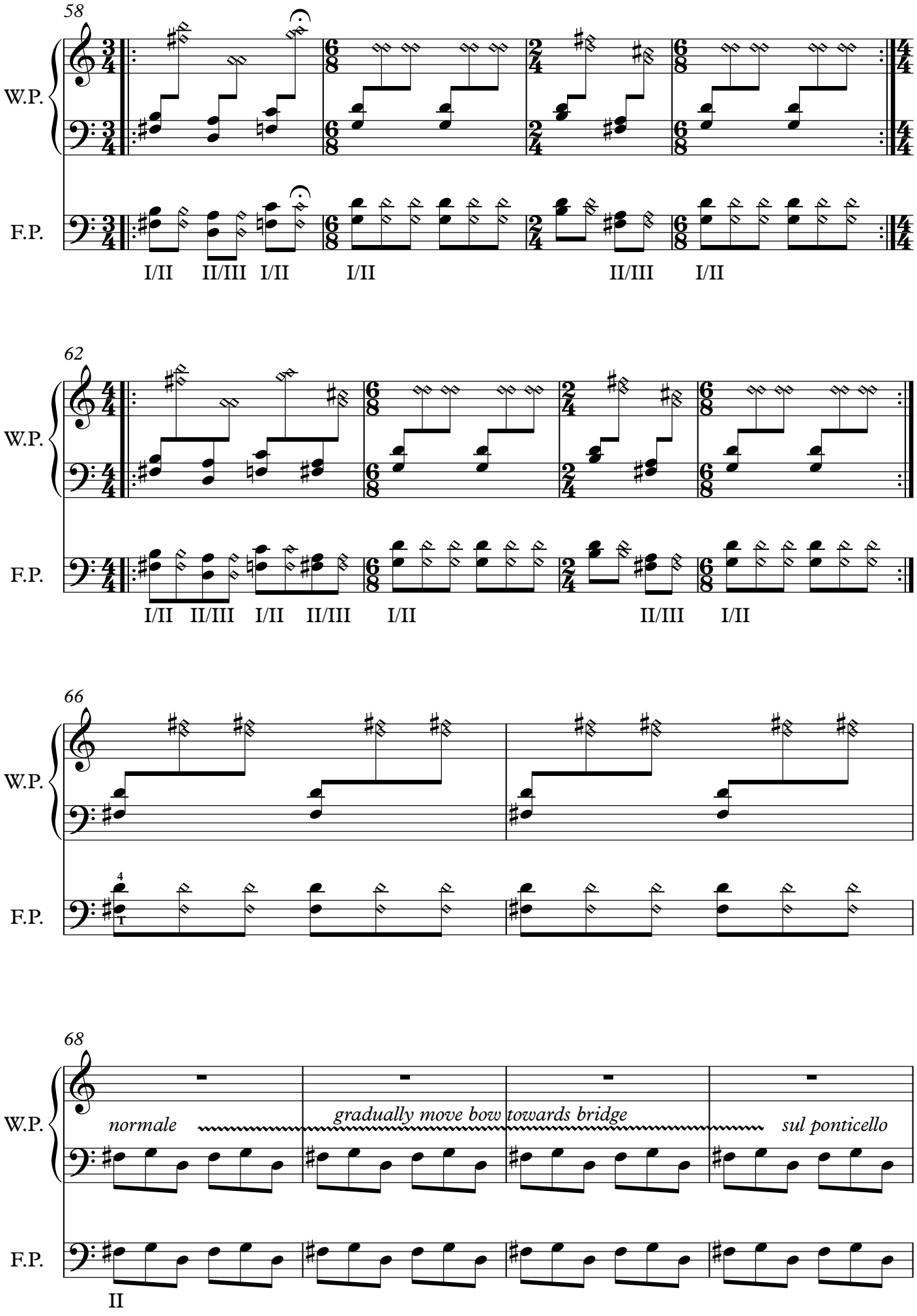

32
W.P.
F.P.
I III II II II II III II

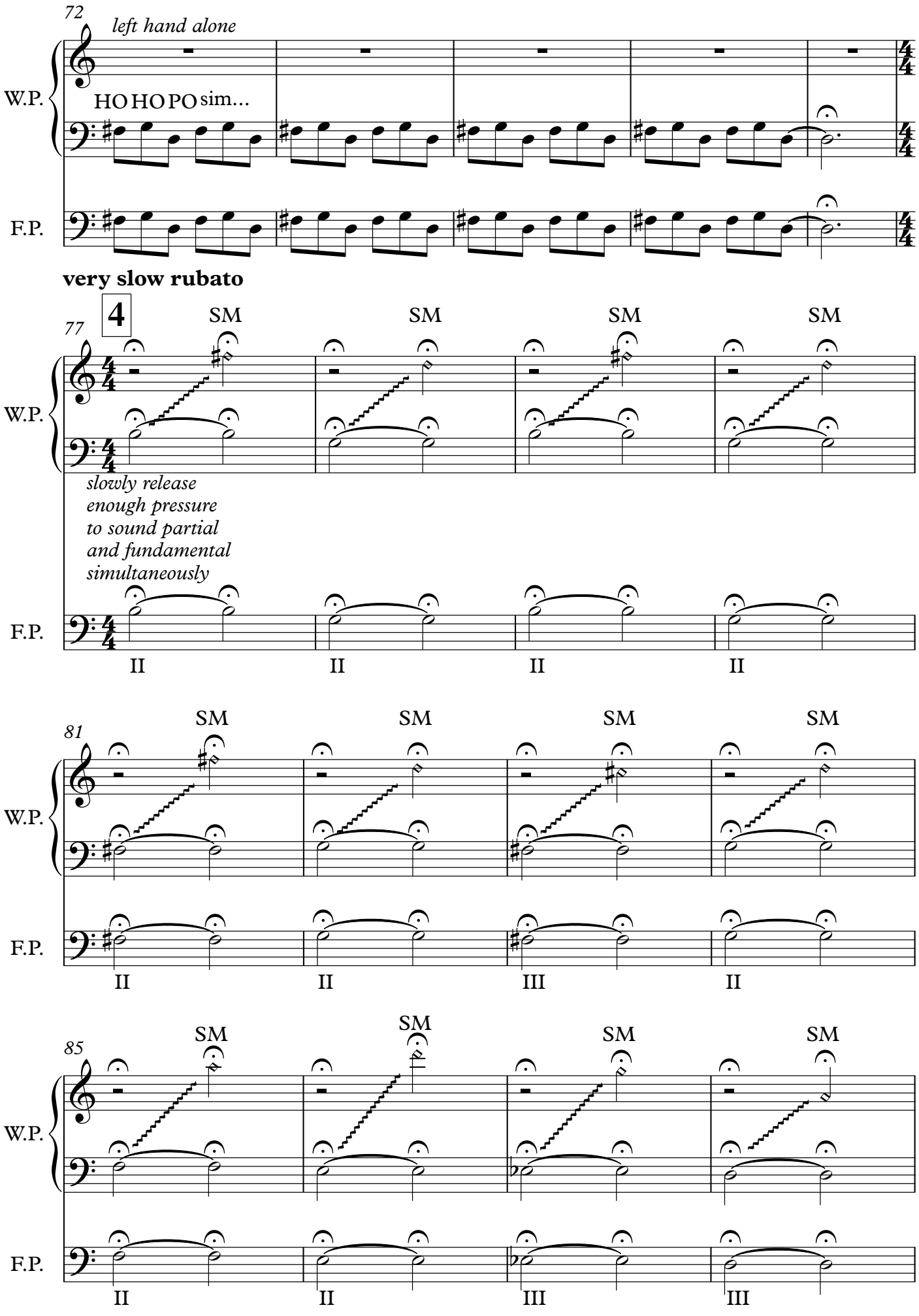

36
W.P.
F.P.
III

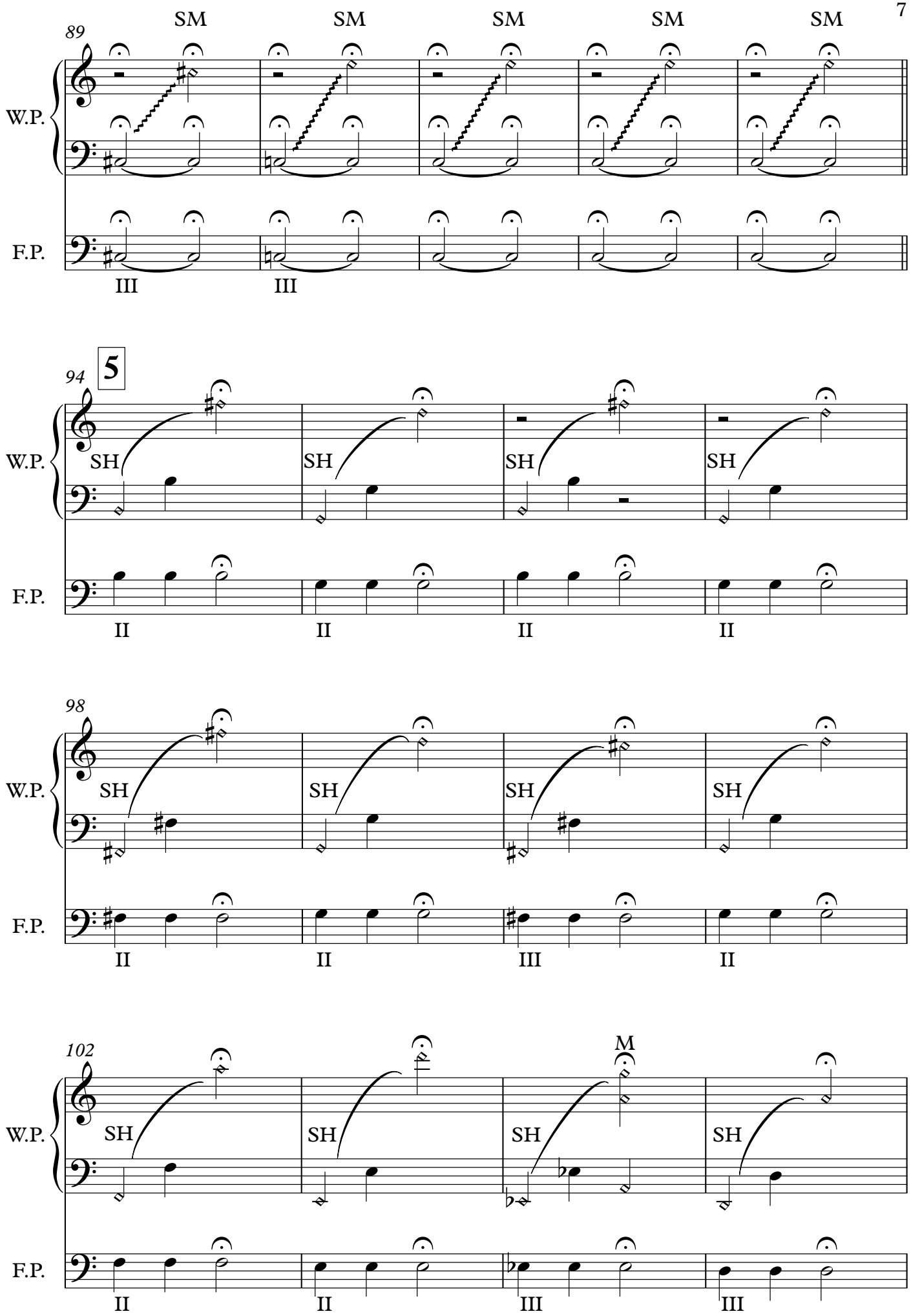

38
gradually move bow towards bridge, then past and off the string
W.P.
normale
sul ponticello
F.P.
II

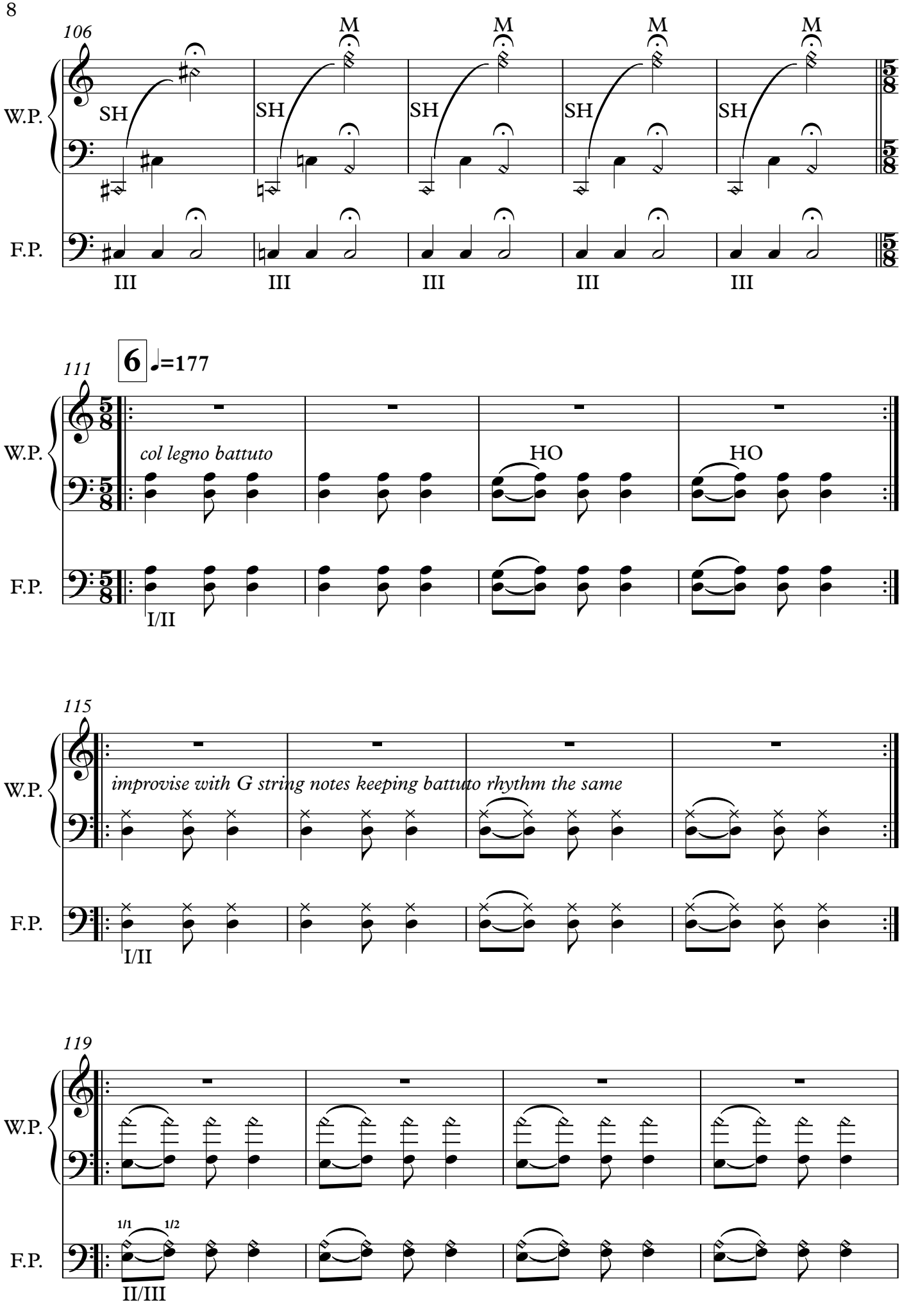

42
left hand alone
W.P.
HO HO PO sim...
F.P.

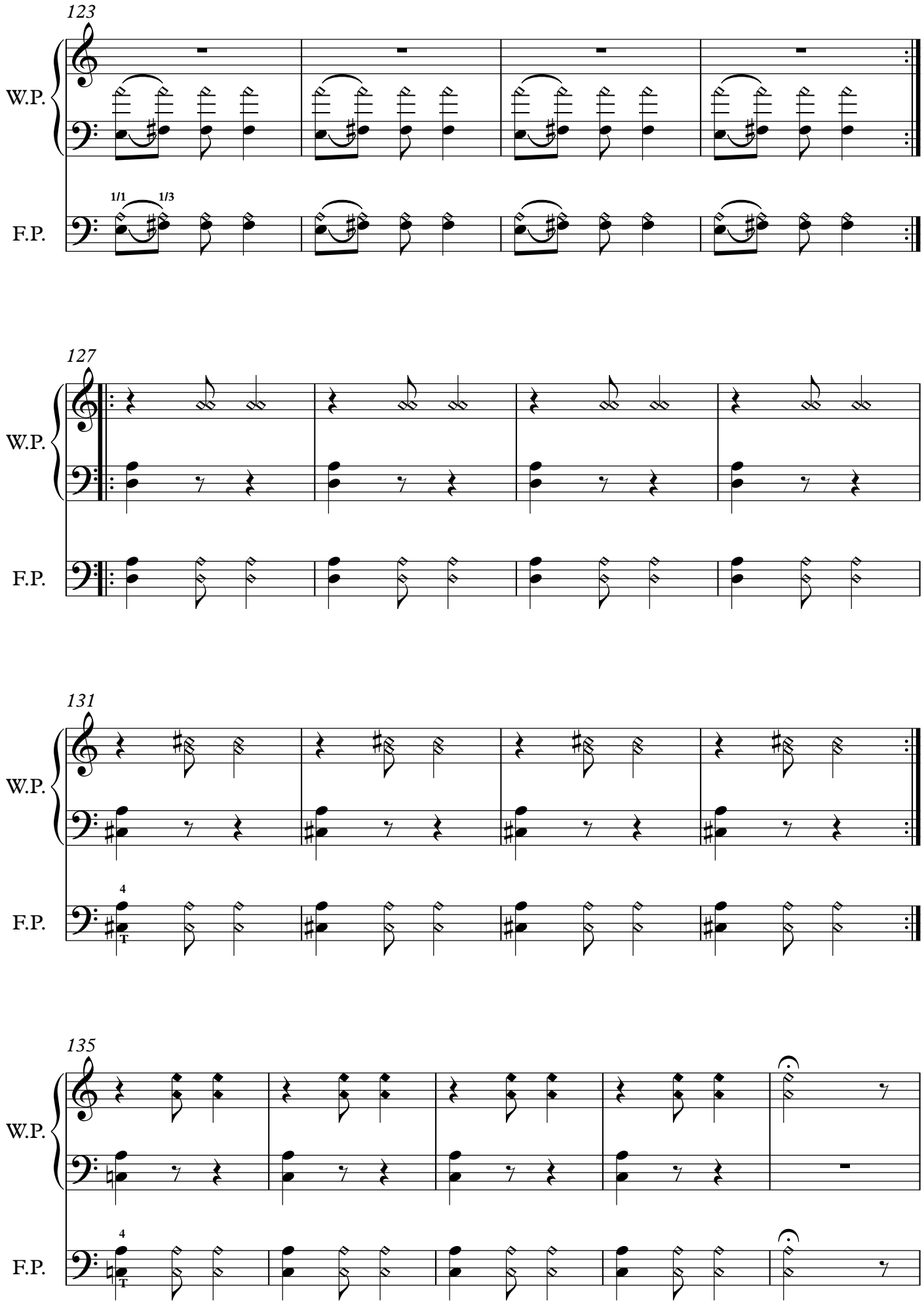

45
W.P.
F.P.
47
3
sim..
I/II
51
4X
I/II
II/III
I/II
54
I/II
II/III
I/II
II/III
I/II

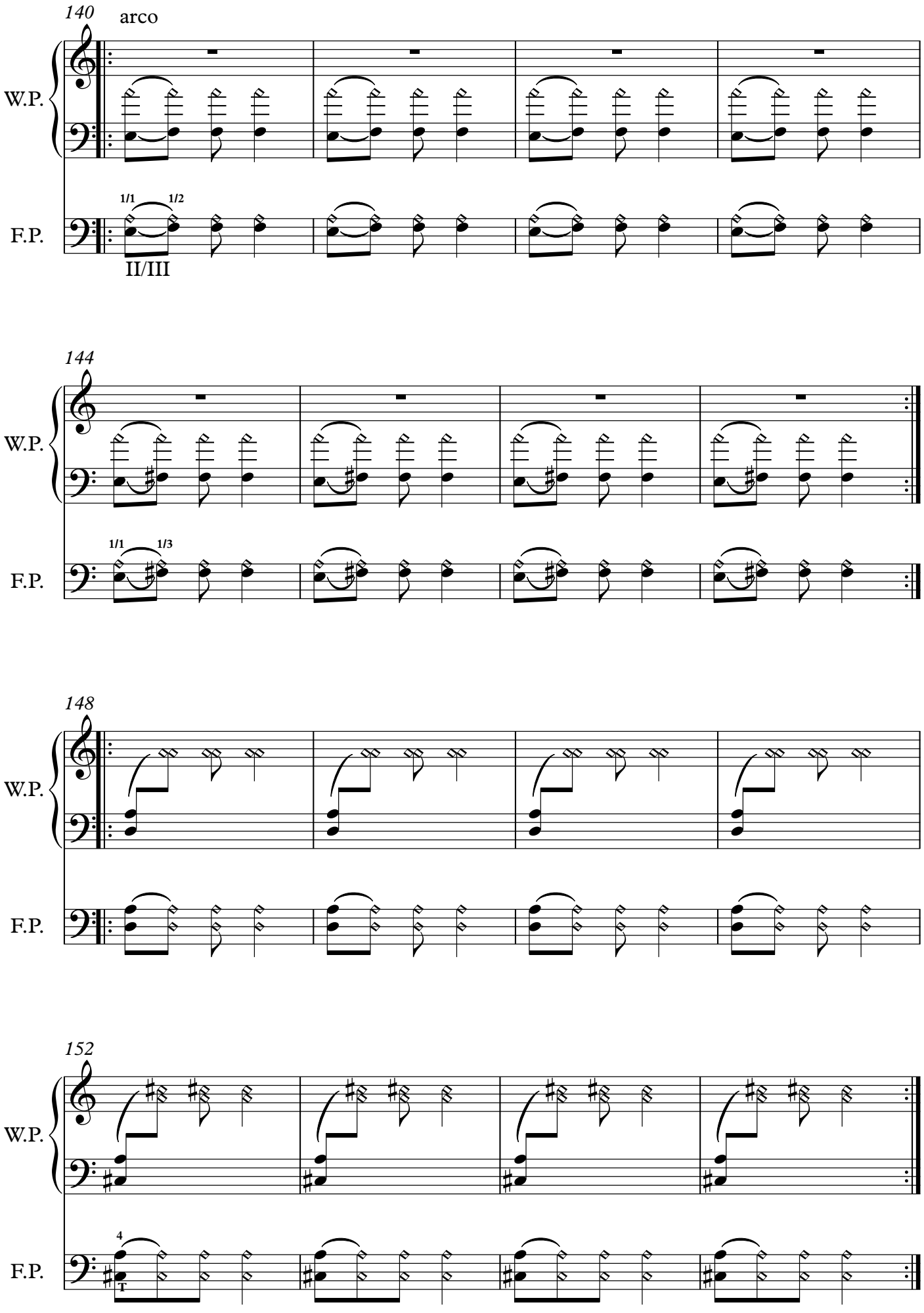

58
W.P.
F.P.
I/II II/III I/II I/II II/III I/II
62
W.P.
F.P.
I/II II/III I/II II/III I/II II/III I/II
66
W.P.
F.P.
4
1
68
W.P.
normale
gradually move bow towards bridge
sul ponticello
F.P.
II

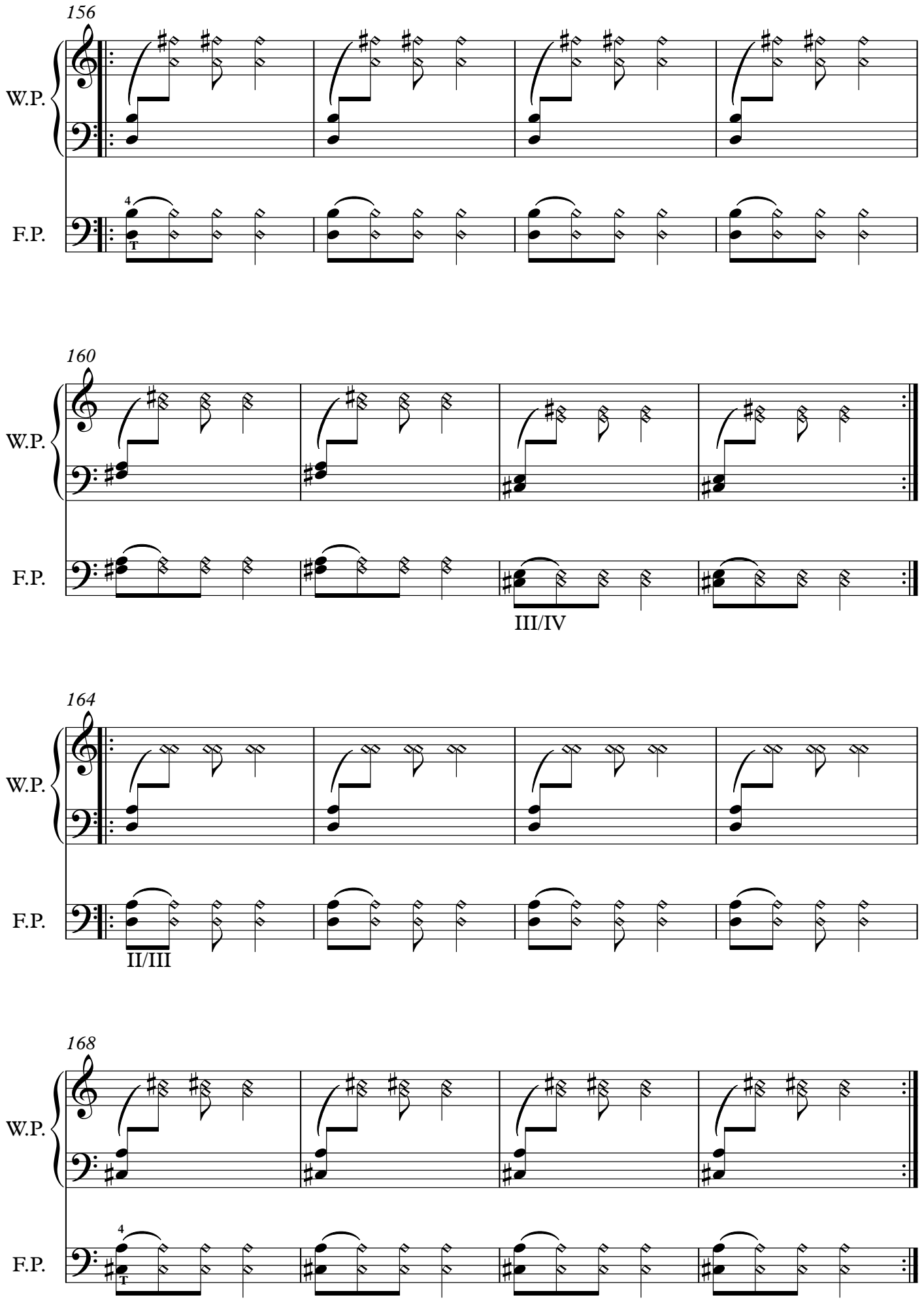

72
left hand alone
W.P.
HO HO PO sim...
F.P.
very slow rubato
4
77
SM
SM
SM
SM
W.P.
slowly release
enough pressure
to sound partial
and fundamental
simultaneously
F.P.
II
II
II
II
81
SM
SM
SM
SM
W.P.
F.P.
II
II
III
II
85
SM
SM
SM
SM
W.P.
F.P.
II
II
III
III

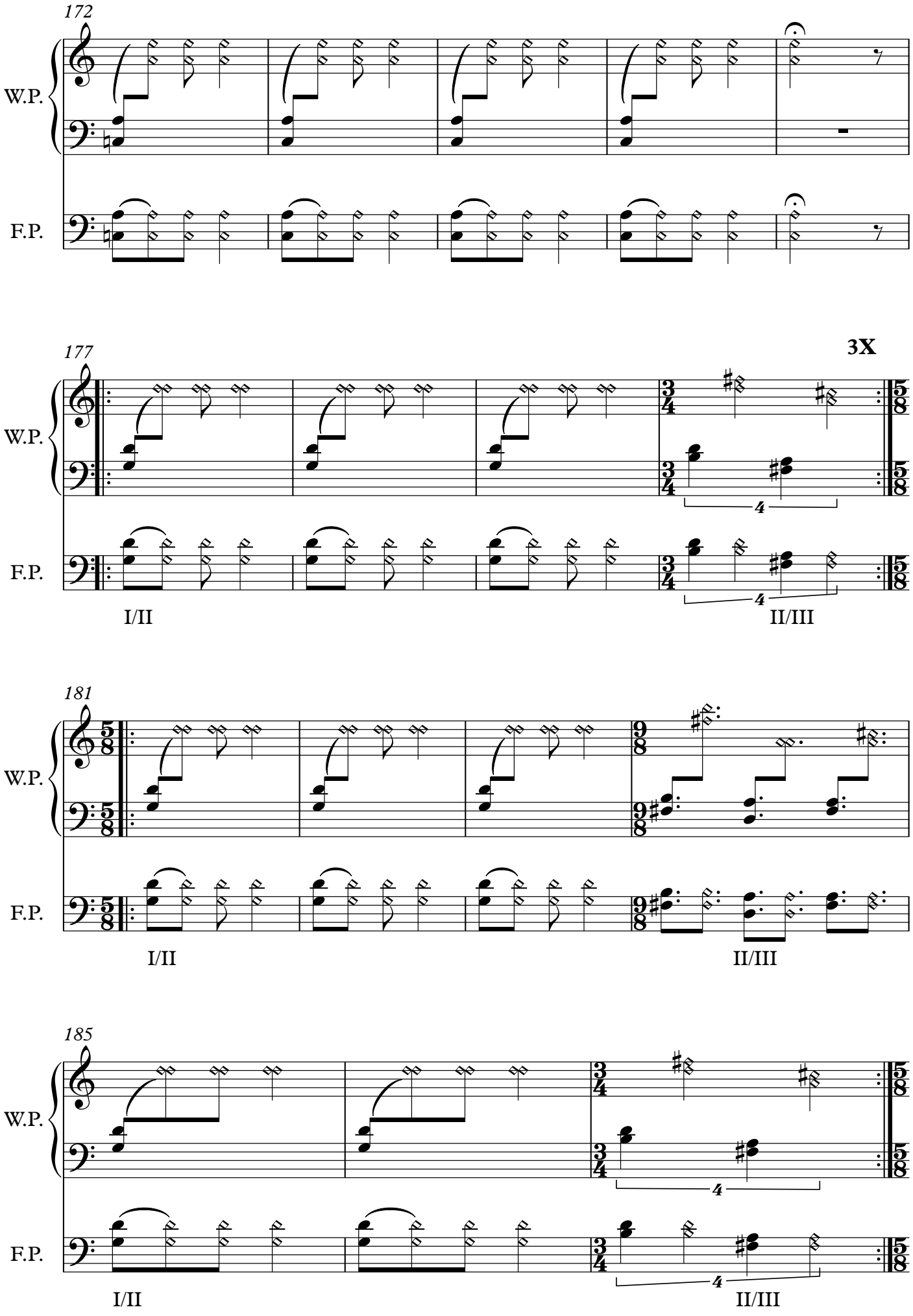

89
SM
SM
SM
SM
SM
W.P.
F.P.
III
III
94
5
SH
SH
SH
SH
II
II
II
II
98
SH
SH
SH
SH
II
II
III
II
102
M
SH
SH
SH
SH
II
II
III
III

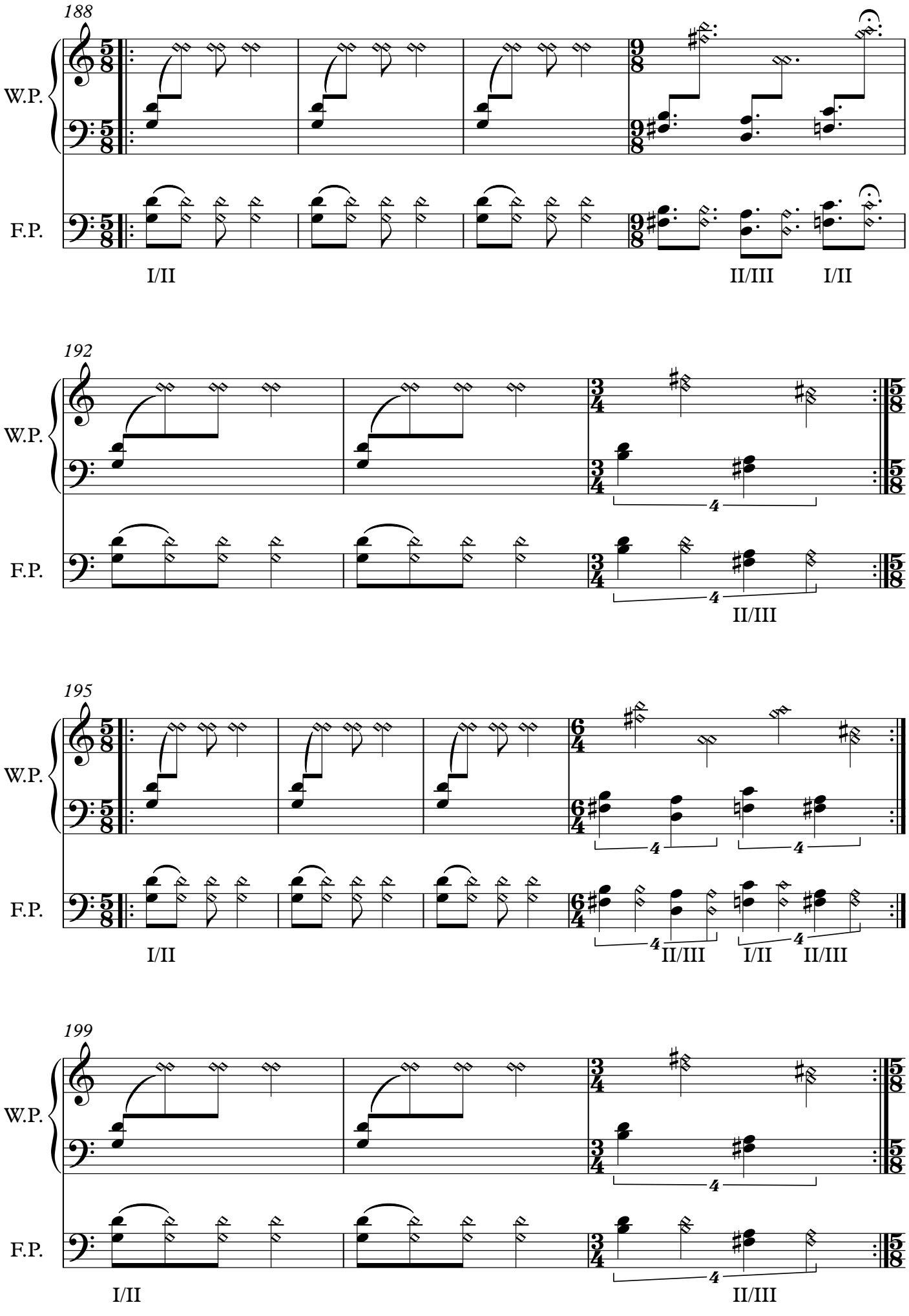

106
M
M
M
M
W.P.
SH
SH
SH
SH
SH
F.P.
III
III
III
III
III
111
6
♩=177
W.P.
col legno battuto
HO
HO
F.P.
I/II
115
W.P.
improvise with G string notes keeping battuto rhythm the same
F.P.
I/II
119
W.P.
F.P.
1/1
1/2
II/III


123
W.P.
F.P.
1/1
1/3
127
W.P.
F.P.
131
W.P.
F.P.
4
T
135
W.P.
F.P.
4
T

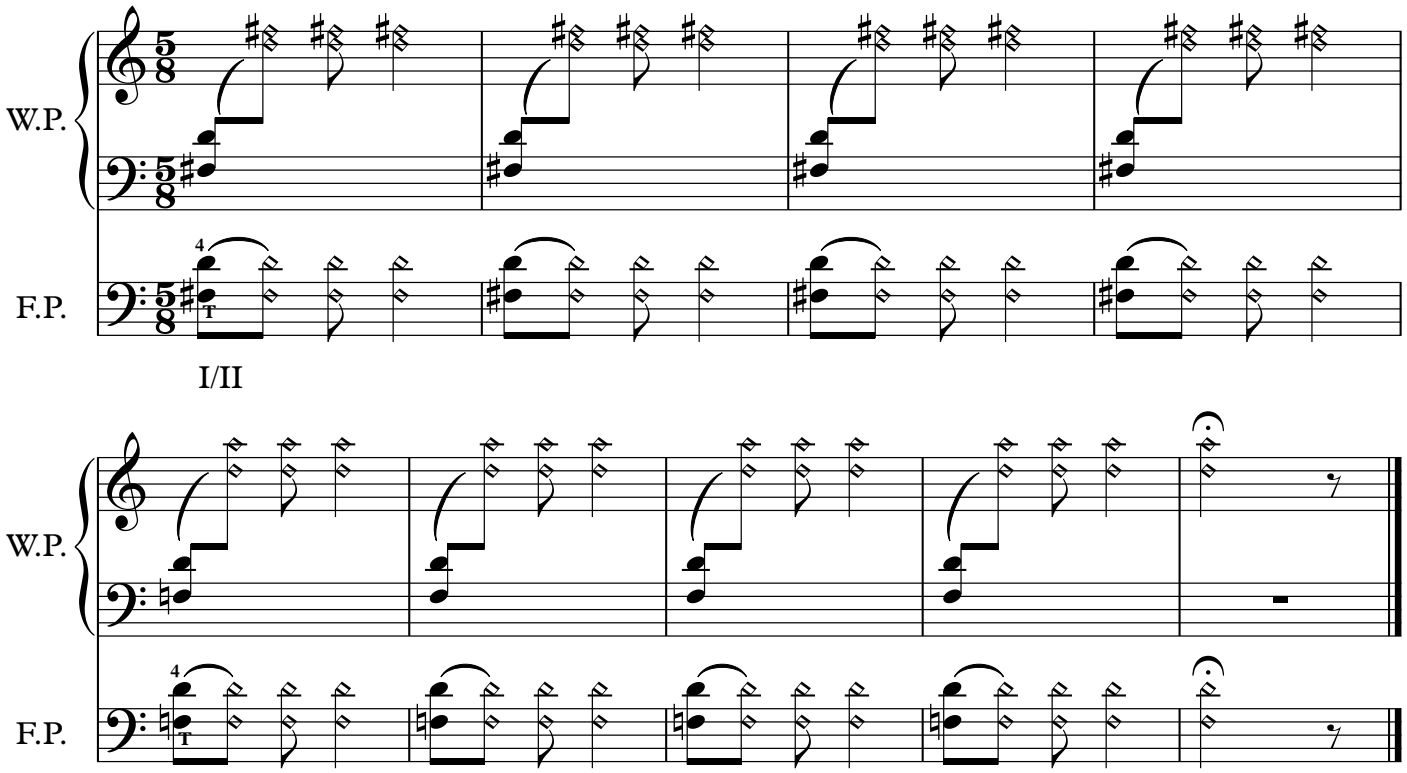

140
arco
W.P.
F.P.
1/1
1/2
II/III
144
W.P.
F.P.
1/1
1/3
148
W.P.
F.P.
152
W.P.
F.P.
4
T


156
W.P.
F.P.
4
T
160
W.P.
F.P.
III/IV
164
W.P.
F.P.
II/III
168
W.P.
F.P.
4
T


172
W.P.
F.P.
177
3X
W.P.
F.P.
I/II
II/III
181
W.P.
F.P.
I/II
II/III
185
W.P.
F.P.
I/II
II/III


188
W.P.
F.P.
I/II
II/III
I/II
192
W.P.
F.P.
II/III
195
W.P.
F.P.
I/II
II/III
I/II
II/III
199
W.P.
F.P.
I/II
II/III

14



Appendix B:
Additional Recorded Works

The following videos are improvisations emergent from my developmental framework that were not included in the formal analyses in this dissertation. They are included to further solidify the developmental framework as a generative tool for creative musical output.

Video B.1 *Ngā Tama a Rangi*

Video B.2 *Lúnasa*

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