Wolfgang von Schweinitz

Plainsound Sonata “Arcadia”

for Marco Fusi’s viola d’amore

11-limit Just Intonation Study

based on the classical 5-limit Dorian mode

op. 64

2018

for Marco Fusi

PLAINSOUND MUSIC EDITION

NOTES

This intonation study features the timbre of the most consonant 11-limit quartertone harmonies, all of which may be tuned by ear: the octave-expanded quartertone-augmented fourth (11/4) and its octave expansion (11/2), the neutral seventh (11/6) and its octave expansion (11/3), and the neutral ninth (11/5).

The piece also provides some practice material for the refinement of the melodic ear – with a focus on the size of the diatonic semitone (16:15 or 112 cents, i.e. the difference between a perfect fourth and a pure major third) and on the subtle distinction between the major whole tone (9:8 or 204 cents, i.e. the difference between a perfect fifth and a perfect fourth) and the minor whole tone (10:9 or 182 cents, i.e. the difference between a perfect fourth and a pure minor third). – These two whole tone steps constitute the basis for the performance practice of non-tempered just intonation, and they have a distinctly different melodic character or feeling, even though their difference in size is but a syntonic comma (81:80 or 21.5 cents). The major whole tone (8:9) sounds strong (like the sun) and straightforward ("Beethoven"), whereas the minor whole tone (9:10) sounds soft (like the moon) and very touching ("Schubert").

The distinction between the two different whole tones may best be practiced within a tonal context that can establish a secure "key feeling". So this piece is composed in the traditional 5-limit Dorian mode with its two alternative tunings for the 6th and the 4th scale degree – simultaneously based on G in the treble voice and on D flattened by a quartertone in the lower voice – and it is a challenging experiment for the performer to try maintaining a reliable melodic key feeling even under the unfamiliar circumstances of quartertone bitonality.

TUNING INSTRUCTIONS

The seven strings are tuned in pure major and minor thirds to the pitches A – F – D – Bb – G – Eb – C by carefully optimizing the unisons between their partials (please see the next pages for details).
Regular viola strings should be used for the strings I, III, V, and VII.
String II should be a standard viola d'amore F# string, lowered by a chromatic semitone (25:24 or 71 cents).
String IV should be a standard viola d'amore low A string, raised by a diatonic semitone (15:16 or 112 cents).
String VI should be a standard viola d'amore low D string, raised by a diatonic semitone (15:16 or 112 cents).

The seven sympathetic strings should be custom-made from harpsichord strings, as Marco Fusi suggested. They must be tuned according to the non-tempered diatonic scale degrees of F major, lowered by a just 11-limit quartertone (33:32 or 53 cents), using either a tunable synthesizer or the playback of previously recorded drones with the seven reference pitches, played on the viola d'amore (please see the next pages for details).

PERFORMANCE DURATION *circa 15 minutes*

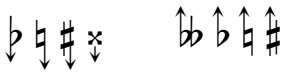
ACCIDENTALS

for microtonal just intonation

EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION

The exact intonation of each pitch is written out by means of the following harmonically defined accidentals:

Pythagorean series of perfect fifths, based on the open strings
(… c g d a e …)



lowers / raises the pitch by a syntonic comma:
81 : 80 = circa 21.5 cents

lowers / raises the pitch by two syntonic commas:
circa 43 cents

raises / lowers the pitch by an 11-limit quarter-tone:
33 : 32 = circa 53.3 cents

The following accidentals are not used in the score, but some of them are needed to notate the difference tones in the "Table of the featured 11-limit consonances" on the last three pages of the preface:

lowers / raises the pitch by a septimal or 7-limit comma:
64 : 63 = circa 27.3 cents

lowers / raises the pitch by two septimal commas:
circa 54.5 cents

lowers / raises the pitch to diminish the Pythagorean major sixth 27:16 by a 13-limit third-tone to represent the 13:8 median sixth:
27 : 26 = circa 65.3 cents

lowers / raises the pitch to diminish the 16:15 diatonic semitone by a 17-limit schisma to represent the 17:16 semitone:
256 : 255 = circa 6.8 cents

raises / lowers the pitch to augment the 32:27 Pythagorean minor third by a 19-limit schisma to represent the 19:16 small minor third:
513 : 512 = circa 3.4 cents

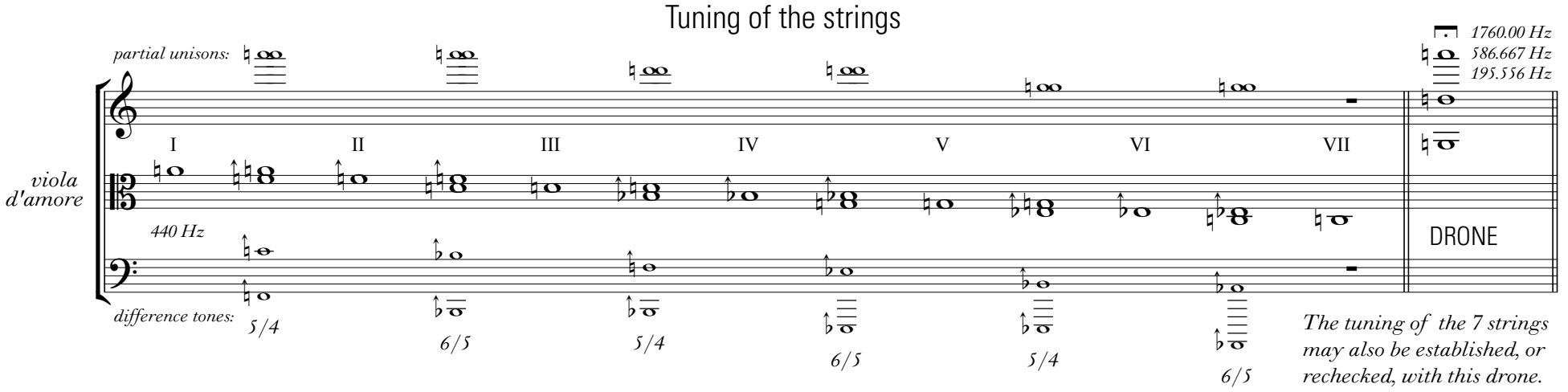
raises / lowers the pitch to augment the Pythagorean tritone 729:512 by the 23-limit comma to represent the 23:16 augmented tritone:
736 : 729 = circa 16.5 cents

These 'Helmholtz-Ellis' accidentals for just intonation were designed in collaboration with Marc Sabat.

The attached arrows for pitch alterations by a syntonic comma are transcriptions of the notation used by Hermann von Helmholtz in his book "Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik" (1863). – The annotated English translation "On the Sensations of Tone as a Physiological Basis for the Theory of Music" (published 1875/1885) was made by Alexander J. Ellis, who refined the definition of pitch within the 12-tone system of Equal Temperament by introducing a division of the octave into 1200 cents. – The accidental sign denoting an alteration by a septimal comma was devised by Guiseppe Tartini (1692-1770), the composer, violinist and researcher who investigated the difference tones created by double-stops.

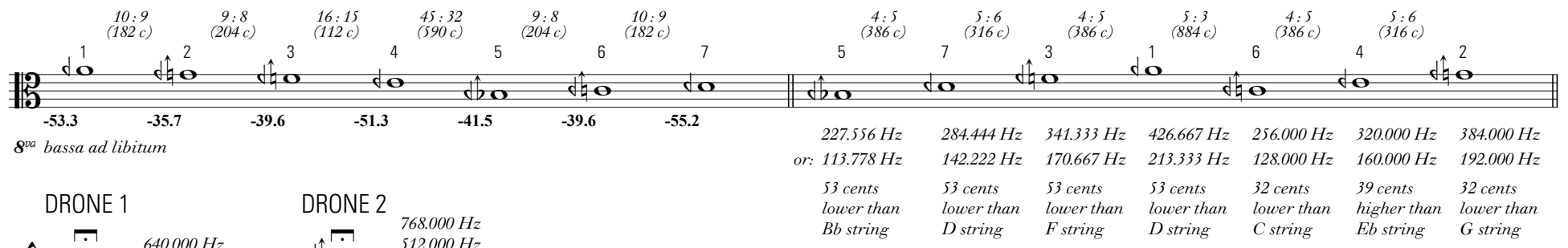
Pitch-bend information:
In addition to the harmonic definition of a pitch by means of its accidentals, it is also possible to specify its absolute pitch-height as a cents-deviation from the respectively indicated chromatic pitch in the standard 12-tone System of Equal Temperament. – Such additional pitch-bend numbers are not included in the score, as every pitch can be tuned by ear, so that there is no need for rehearsals with the aid of a tuning device. But they are given for the pitches of the seven sympathetic strings (please see the chart on the next page).

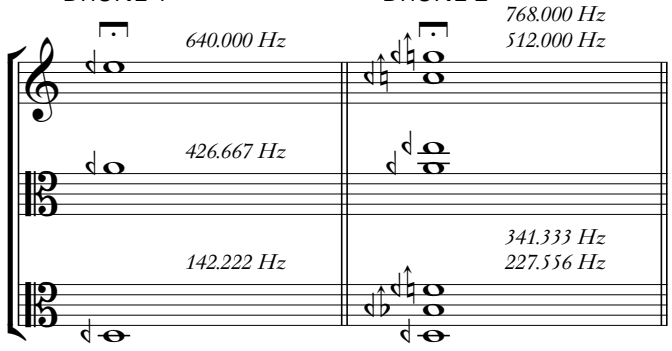
Tuning of the strings



The tuning of the 7 strings may also be established, or rechecked, with this drone.

Tuning of the sympathetic strings

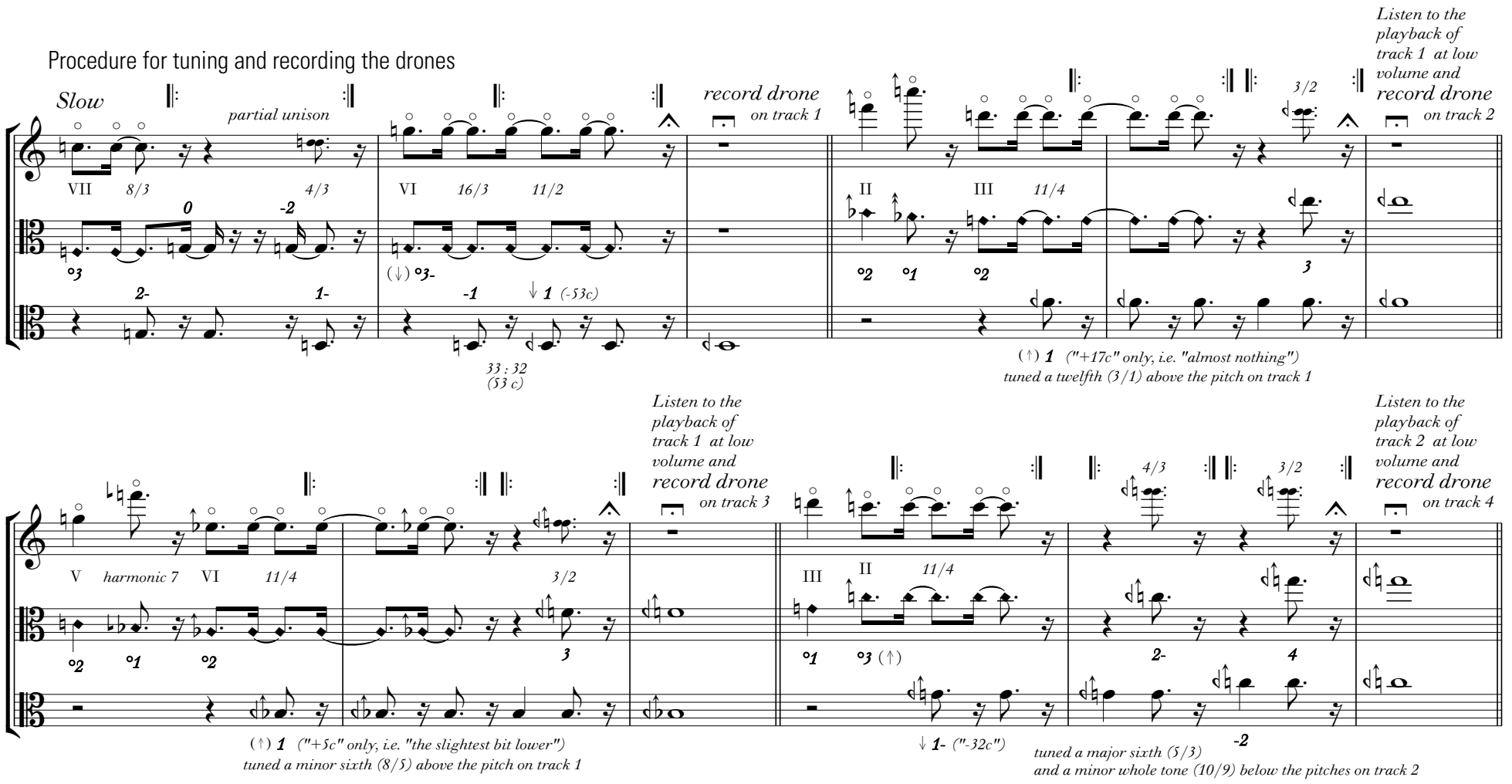




The seven sympathetic strings can be tuned with either one of these drones (more conveniently with Drone 2) which can be generated with a precisely tunable synthesizer, like Marc Sabat's additive synth for microtonal MIDI playback called "31-Limit Helmholtz-Ellis Calculator", which runs on Max/MSP and can be downloaded for free at his website "www.marcsabat.com/#writing".

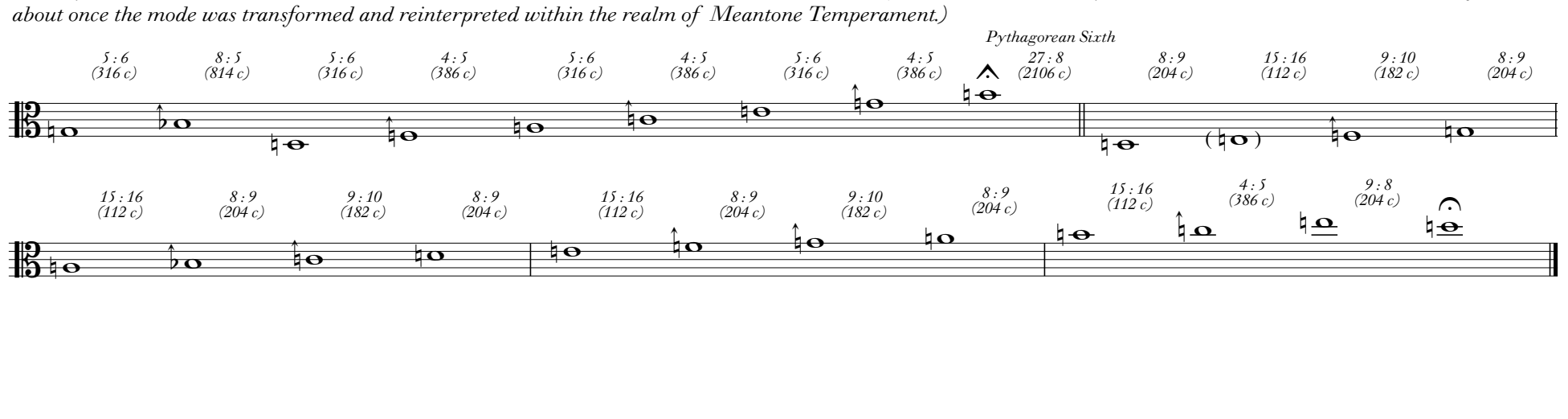
Both drones may also be played on the viola d'amore, recorded on two or on four tracks which are then mixed together. Headphones should be used in this step by step procedure for the playback of a previously recorded track to optimize the intonation (please see below for details).

Procedure for tuning and recording the drones



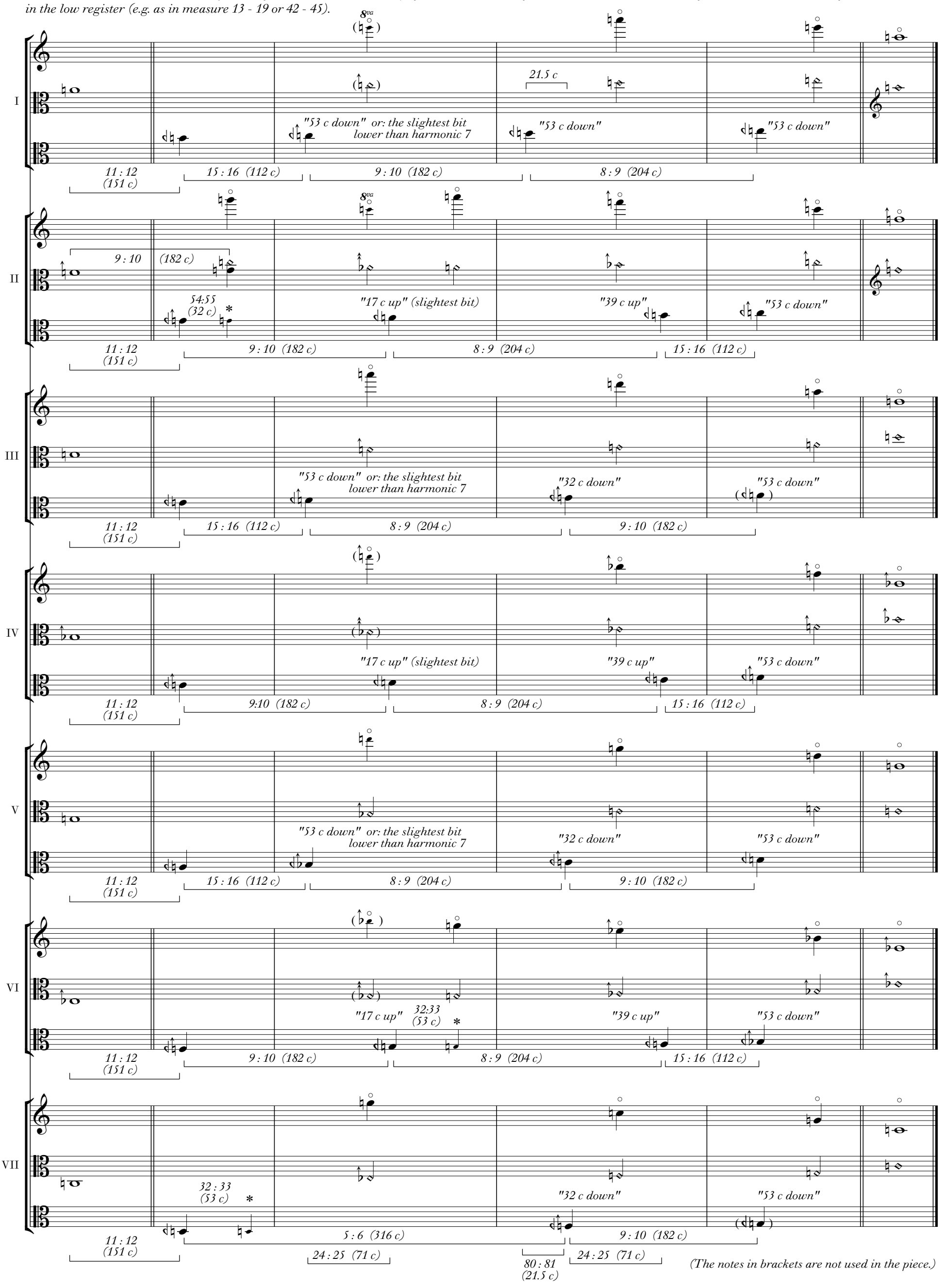
The 5-limit Dorian mode

The traditional 5-limit Dorian mode - notated here on D - is transposed up a perfect fourth in the treble voice, and down by an 11-limit quartertone (with the frequency ratio 33 : 32 or 53 cents) in the bass voice. It has two different pitch classes for its 6th scale degree (the minor sixth and the major sixth) and also two alternative tunings for its 4th scale degree which are a Syntonic comma apart from each other. - When B flat is used, tuned as a pure minor sixth above the tonic D, the mode sounds like the Aeolian mode on D, with a comma-augmented fourth between G and C. But when B natural is used, it is tuned as a perfect fifth above the 2nd scale degree E to serve as the diatonic semitone below C; and whenever the 4th scale degree G appears in conjuction with this Pythagorean Sixth (27/16), it is tuned as a pure major third below B and a perfect fourth below C, and therefore raised by a Syntonic comma, so that the 4th scale degree is now represented by a comma-augmented fourth. In this solo piece, the Aeolian minor sixth is featured in the lower octave register (together with the lower G), and the Dorian major sixth and the raised fourth appear in the upper octave. (Perhaps it should also be mentioned here that the idiomatic Dorian "Amen Cadence" with a major subdominant triad preceding the tonic minor triad could only come about once the mode was transformed and reinterpreted within the realm of Meantone Temperament.)



"How to think of the notes" - Pitch Repertoire and Finger Positions

Except for the three notes marked with an asterisk in this chart (G-4, G-3, and D-3), all stopped notes in the piece are lowered by an 11-limit quartertone (frequency ratio 32/32 or 53 cents). These pitches may be tuned by ear as an 11-limit quartertone consonance (11/2, 11/3, 11/4, 11/5, or 11/6) below a natural harmonic played on an adjacent string. In the 1st position (quartertone-flat), the 1st and the 4th finger remain in the same position on all strings, whereas the positions of the 2nd and 3rd finger are generally a chromatic semitone (24 : 25 or 71 c) apart from each other on adjacent strings. - The cent numbers in quotation marks must be adjusted, because they do not refer to the distance between the finger position of the stopped note to the node of the nearby natural harmonic, but to the finger position for the corresponding stopped note (the perfect fourth, or the pure minor third), which is located a little bit closer to the nut than the corresponding node for harmonic # 4 or # 6. - Therefore the finger movement from the node of harmonic # 4 to the slightly higher stopped note "39 c up" is actually a little bit smaller than the finger movement "32 c down", and the very small finger movement "17 c up" from harmonic # 6 feels like almost nothing. These finger movements should first be studied in the low register (e.g. as in measure 13 - 19 or 42 - 45).

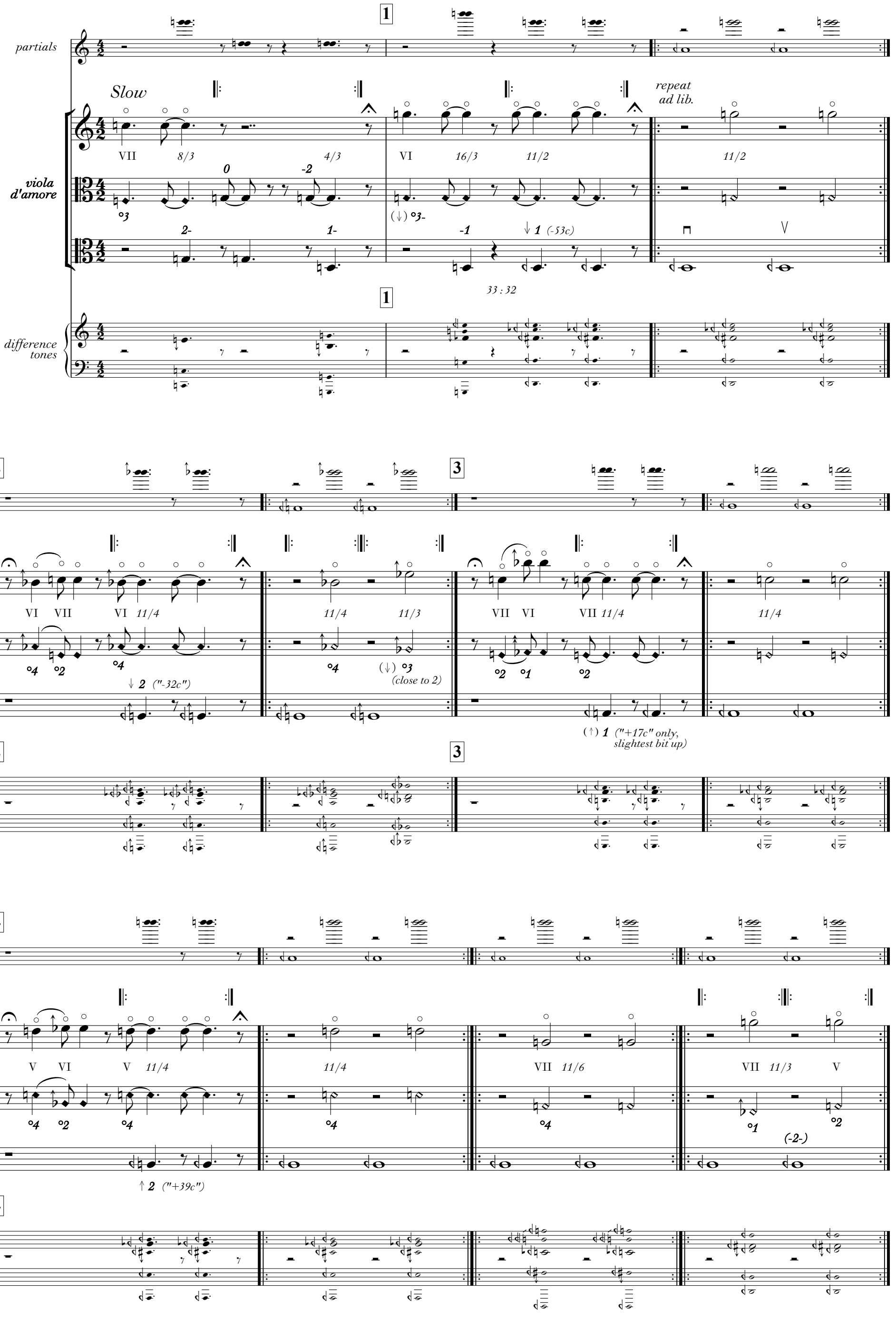


(The notes in brackets are not used in the piece.)

Table of the featured 11-limit consonances

with their lowest common partials and most prominent difference tones

14 short introductory etudes



5

6

VI 4 - 7 VI 11/4 11/4 IV V IV 11/4 IV 11/4 VI 11/6

(↓) 1 ("-5c" only, the sligtest bit down)

↓ 2 ("-32c")

7

V IV V 11/4 11/4 VI V VI 11/4 11/4

(↑) 1 ("+17c" only, slightest bit up)

↓ 3 ("-53c")

8

III IV III 11/4 III 11/4 V 11/6 4/3 IV 9/4 11/5 11/5

↑ 2 ("+39c") 1 ↑ 1 (+39c)

44 : 45

9

10

IV 4 - 7 11/4 11/4 II III II 11/4 IV 11/4 VI 11/6

(↓) 1 ("-5c" only, the sligtest bit down)

↓ 2 ("-32c")

11

12

III II III 11/4 11/4 I II I 11/4 I 11/4 III 11/6

(↑) 1 ("+17c" only, slightest bit up)

↑ 2 ("+39c")

13

14

II 4 - 7 11/4 11/4 II I II 11/5 11/5

(↓) 1 ("-5c" only, the sligtest bit down)

↑ 3

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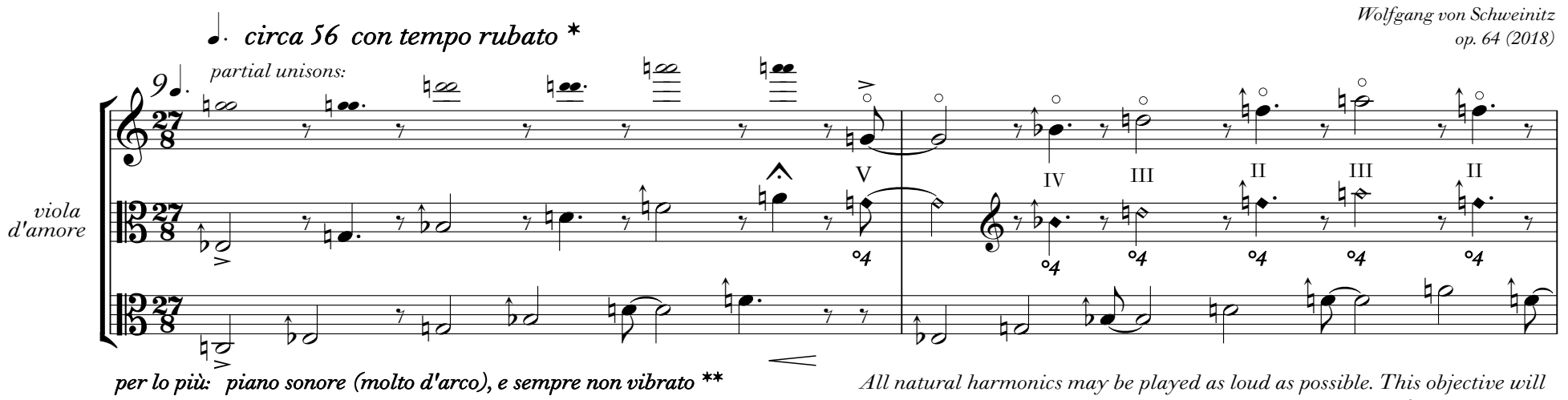


All natural harmonics may be played as loud as possible. This objective will determine the bow's contact position on the string and the timbre of each bass note.

***) i.e.: no frequency vibrato, please! - But the occasional use of some subtle amplitude vibrato (once the intonation has been established) is encouraged and recommended: periodic or aperiodic changes of bow pressure, bowing speed, or bow position (distance from the bridge and angle of the bow, controlling the amount of hair on the strings) produced by the right hand, or by shaking the instrument underneath the bow with the left hand, arm and shoulder, or with the head and chin (which probably works best) - whenever there is enough time to create a vibrating sond. If a personalized form for such a humble amplitude vibrato can be found and executed with comfort, then it is a nice option for some of the drawn-out sounds notated with dotted and double-dotted half notes.*

**) The rhythm, which is very simple and nearly always the same, should be counted and fully established. Then the pulse may always be freely molded "with stolen time" at the performer's discretion, or suspended with a short fermata on any sound - however it may be needed in the moment for the response to the way the notes are speaking.*

11

pizz. (on the sympathetic strings)

8va bassa ad libitum

arco

VII VI

°4 °3

13

VII VI *11/4* V VII

(↑) °4 °2 (↑) °4 °2 (↑) °4 °4 °1

1 ↓ 2 ("-32c") ↑ 2- ("+39c")

simile

16

V IV VI IV III V VI

°4 °2 (↓) °4 °4 °2 (↑) °4 °4 °1

-2 ↓2 ↑2-

19

V *11/6* III II IV II I III

°4 °4 °2 (↓) °4 °2 (↑) °4 °4 °1

-2 ↓2 ↑2-

22

ritenuto *a tempo*

III II *11/5* III

°4 °1 3- °2 (↓) °4 °1 °2 °1

-2- *dolcissimo* -3- *sonore*

25

ritenuto *a tempo* *ritenuto* *a tempo*

III

-3 °4 °2 °4 ↓2- ("-53c") °4 °3 (↓) (close to 2)

(↑) 1- ("+17c" only, slightest bit up) -1-

dolcissimo

colla parte

28

10 : 9
(182 c)

15 : 16
(112 c)

espr.

dolcissimo

simile ad lib.

This phrase may also be played while quietly singing along.

31

9 : 8
(204 c)

9 : 8
(204 c)

34

15 : 16
(112 c)

11/3

(close to 2)

37

9 : 10
(182 c)

15 : 16
(112 c)

(close to 2)

40

9 : 10
(182 c)

(close to 2)

43

("-53c")

46

pizz. (on the sympathetic strings)

8va bassa ad libitum

arco

VII VI

°4 °3

48

partial unisons:

1-

2

-1-

più forte

51

9 : 10 (182 c) 8 : 9 (204 c)

VII VI VII VI VII VI VI VII

3-

°4 (↑) °4

°4 °4 °3 °3 °4 °3

piano *marcato* *marcato*

54

V VI V VI V IV V IV V III IV III V

°4 °3 °4 °3 °3 °4 °3 °4 °4 °3 °4 °3 °4 °3 °2 °3

marcato

(↑) 2- *("+17c", slightest bit up)*

57

colla parte

VI VI

15 : 16 (112 c) 10 : 9 (182 c)

1- °2 (↑) ↓ 2 *("-124c")* 4 3 °2- (↑) -1-

4

60

colla parte

1- 9 : 10 (182 c) 8 : 9 (204 c) 2-

più forte *piano* *marcato*

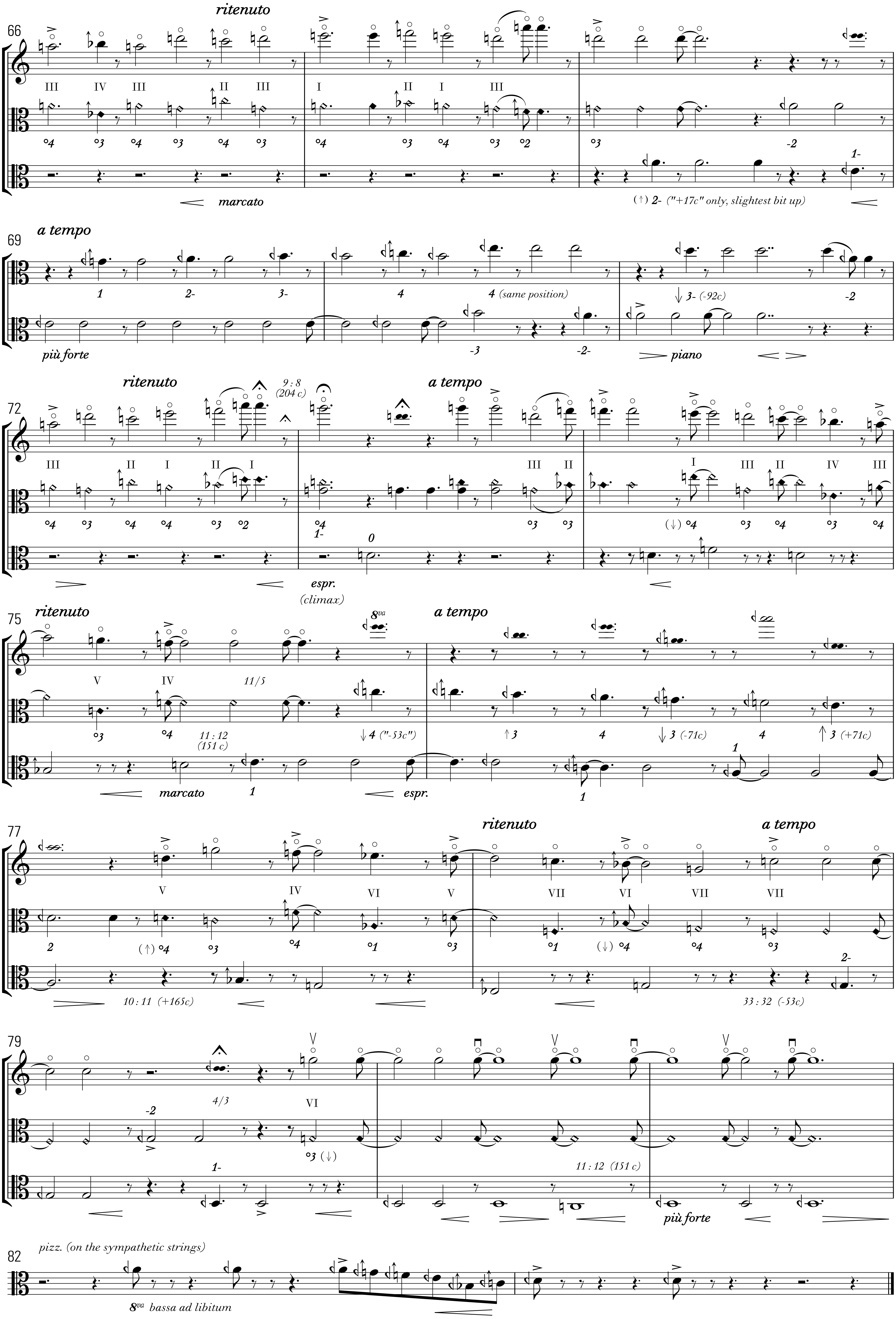
63

ritenuto *a tempo*

V V IV V IV V IV

°4 (↑) °3 (↓) °4 °3 °4 °3 °4 °3 °3

3- ↓ 4 *("-53c")* -2-


66
ritenuto
marcato
(↑) 2- ("+17c" only, slightest bit up)
69
a tempo
4 (same position)
più forte
↓ 3- (-92c)
piano
72
ritenuto
9 : 8
(204 c)
a tempo
espr.
(climax)
75
ritenuto
8va
a tempo
11/5
11 : 12
(151 c)
↓ 4 ("-53c")
↑ 3
↓ 3 (-71c)
↑ 3 (+71c)
marcato
espr.
77
ritenuto
a tempo
10 : 11 (+165c)
33 : 32 (-53c)
79
4/3
11 : 12 (151 c)
più forte
82
pizz. (on the sympathetic strings)
8va bassa ad libitum