Transposing Score in 415 Hz and 440 Hz

Marc Sabat

To walk in this what came to pass

for mixed ensemble

415 Hz instruments : flauto traverso, baroque oboe,
theorbo, positive organ; strings;
440 Hz instruments : bass flute, harp,
Fender Rhodes synth, violin, viola, cello, contrabass

PLAINSOUND MUSIC EDITION

To walk in this what came to pass (2022)

remembering my grandparents' flight
composed for and premiered by Zafraan Ensemble and the Akademie für Alte Musik Berlin

A short passacaglia: walking and a dance in the street.
Past and present hearing one another, each reprise once again distant, across a divide, spiraling notes and harmonies passing by.

Letters written in a time of war.

Berlin, May 2022

The Helmholtz-Ellis JI Pitch Notation (HEJI) | 2020 | LEGEND

revised by Marc Sabat and Thomas Nicholson | PLAINSOUND MUSIC EDITION | www.plainsound.org

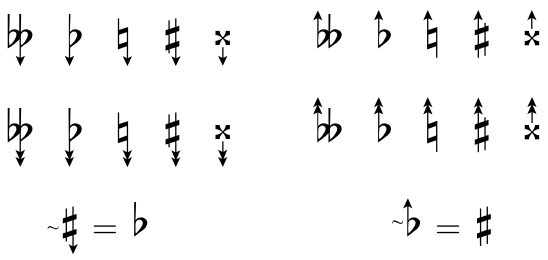
in collaboration with Wolfgang von Schweinitz, Catherine Lamb, and M.O. Abbott, building upon the original HEJI notation devised by Marc Sabat and Wolfgang von Schweinitz in the early 2000s

PYTHAGOREAN JUST INTONATION | generated by multiplying / dividing an arbitrary reference frequency by PRIMES 2 and 3 only

*notate a series of **perfect fifths** above / below a reference*
$^{3}/_{2} \approx \pm 702.0$ cents *(i.e. 2c wider than tempered)*
each new accidental represents 7 fifths, altering by one apotome
$^{2187}/_{2048} \approx \pm 113.7$ cents

Frequency ratios including higher prime numbers (5–47) may be notated by adding the following distinct accidental symbols. Custom indications for higher primes or various enharmonic substitutions may be invented as needed by simply defining further symbols representing the relevant ratio alterations.

PTOLEMAIC JUST INTONATION | PRIMES up to 5



*includes the consonant **just major third***
$^{5}/_{4} \approx \pm 386.3$ cents *(ca. 14c narrower than tempered)*

alteration by one syntonic comma
$^{81}/_{80} \approx \pm 21.5$ cents

alteration by two syntonic commas
$^{81}/_{80} \cdot {}^{81}/_{80} \approx \pm 43.0$ cents

alteration by one schisma to notate an exact enharmonic substitution
$^{32805}/_{32768} \approx \pm 2.0$ cents

SEPTIMAL JI | PRIME 7

*includes the consonant **natural seventh***
$^{7}/_{4} \approx \pm 968.8$ cents *(ca. 31c narrower than tempered)*

alteration by one septimal comma (Giuseppe Tartini)
$^{64}/_{63} \approx \pm 27.3$ cents

alteration by two septimal commas
$^{64}/_{63} \cdot {}^{64}/_{63} \approx \pm 54.5$ cents

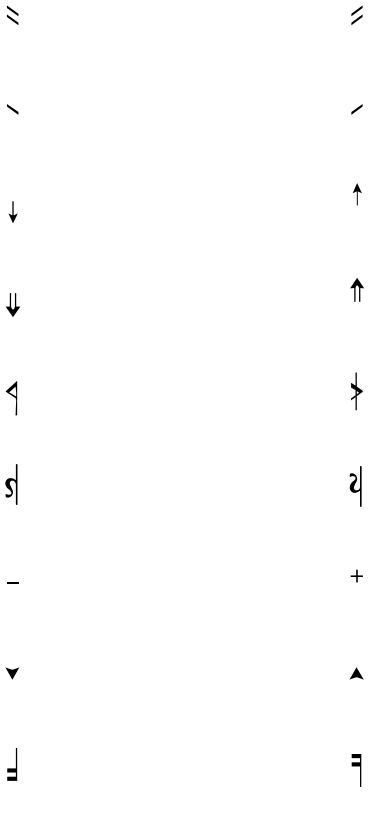
UNDECIMAL | PRIME 11

*includes the **undecimal semi-augmented fourth***
$^{11}/_{8} \approx \pm 551.3$ cents *(ca. 51c wider than tempered)*
alteration by one undecimal quartertone (Richard H. Stein)
$^{33}/_{32} \approx \pm 53.3$ cents

TRIDECIMAL | PRIME 13

*includes the **tridecimal neutral sixth***
$^{13}/_{8} \approx \pm 840.5$ cents *(ca. 59c narrower than a tempered major sixth)*
alteration by one tridecimal thirdtone (Gérard Grisey)
$^{27}/_{26} \approx \pm 65.3$ cents

PRIMES 17 THROUGH 47



alteration by one 17-limit schisma
$^{2187}/_{2176} \approx \pm 8.7$ cents

alteration by one 19-limit schisma
$^{513}/_{512} \approx \pm 3.4$ cents

alteration by one 23-limit comma (James Tenney / John Cage)
$^{736}/_{729} \approx \pm 16.5$ cents

alteration by one 29-limit sixthtone
$^{261}/_{256} \approx \pm 33.5$ cents

alteration by one 31-limit quartertone (Alinaghi Vaziri)
$^{32}/_{31} \approx \pm 55.0$ cents

alteration by one 37-limit quartertone (Ivan Wyschnegradsky)
$^{37}/_{36} \approx \pm 47.4$ cents

alteration by one 41-limit comma (Ben Johnston)
$^{82}/_{81} \approx \pm 21.2$ cents

alteration by one 43-limit comma
$^{129}/_{128} \approx \pm 13.5$ cents

alteration by one 47-limit quartertone
$^{752}/_{729} \approx \pm 53.8$ cents

CENTS HEJI accidentals may be combined with an indication of their deviation in cents from equal temperament as read on a tuning meter; A♮ 440 Hz is usually defined to be ±0 cents. If this deviation exceeds ±50 cents, the nearest tempered pitch-class may be added: e.g. A𝄲 (−65 cents from A♮) could include the annotation A♭+35 placed above or below its accidental.

TEMPERED NOTES | may be combined with cents deviations to notate free microtonal pitches

indicate the respective equal tempered quartertone;
show which pitch is assigned a deviation of 0c

The Helmholtz-Ellis JI Pitch Notation (HEJI) | 2020

Harmonic / Subharmonic series 1–49 notated by modifications of Pythagorean notes

with dedicated microtonal accidental symbols for primes 5 through 47

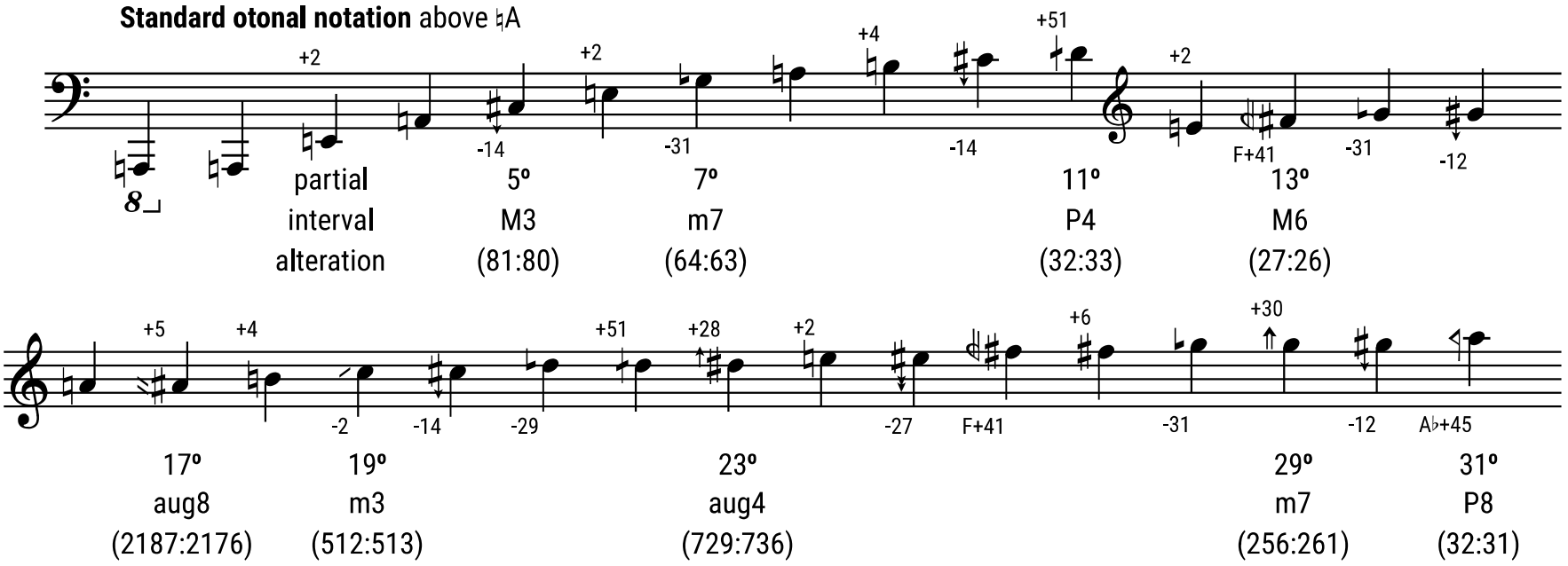
revised by Marc Sabat & Thomas Nicholson

in collaboration with Wolfgang von Schweinitz, Catherine Lamb and M.O. Abbott

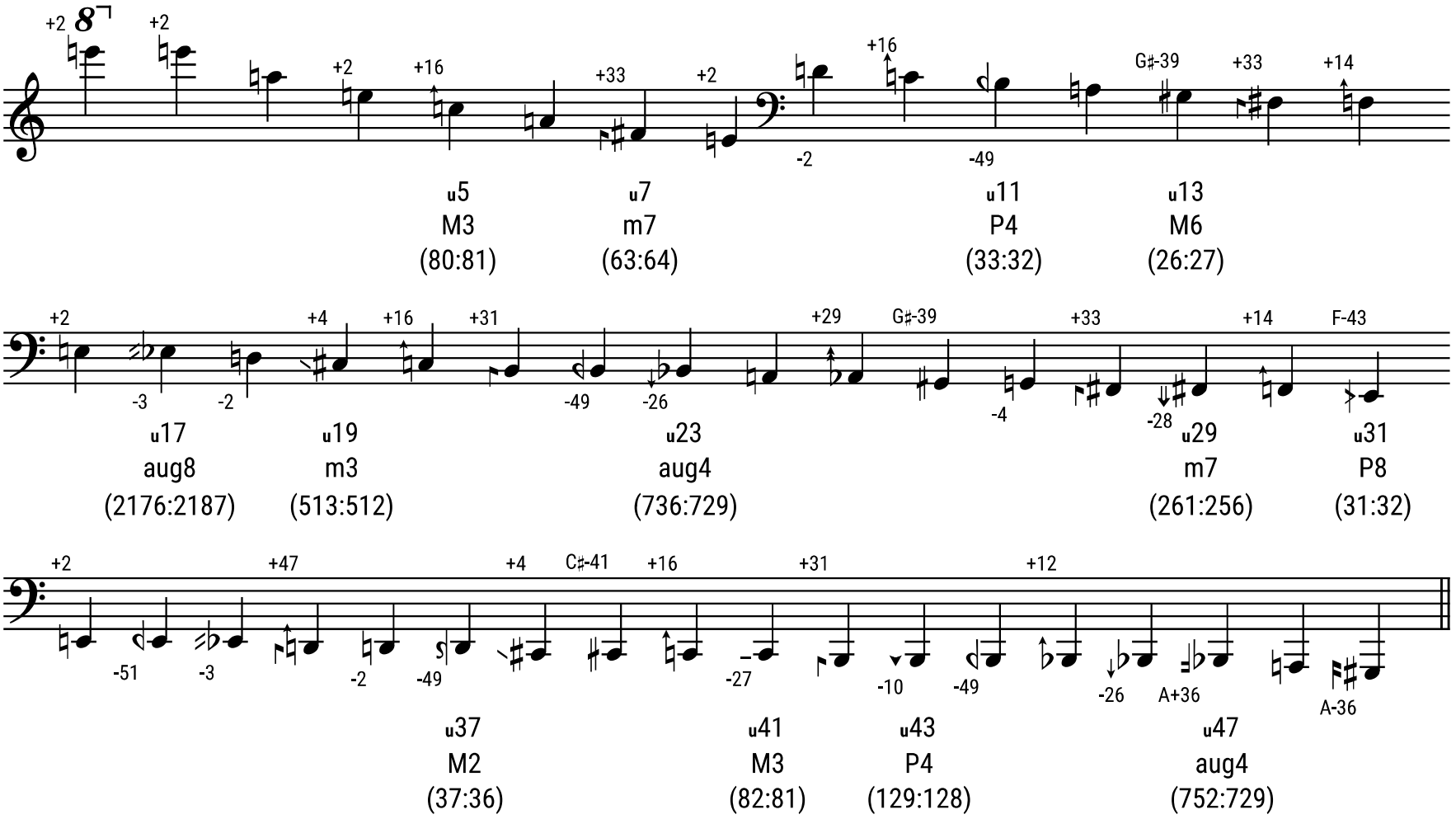
building upon the original HEJI devised by Marc Sabat and Wolfgang von Schweinitz

Ratios represent the amount of modification of the Pythagorean notes by each additional symbol,
cents indications are deviations that would be shown on a tuning meter with A = 0 cents

Standard otonal notation above ♮A



Standard utonal notation below ♮E



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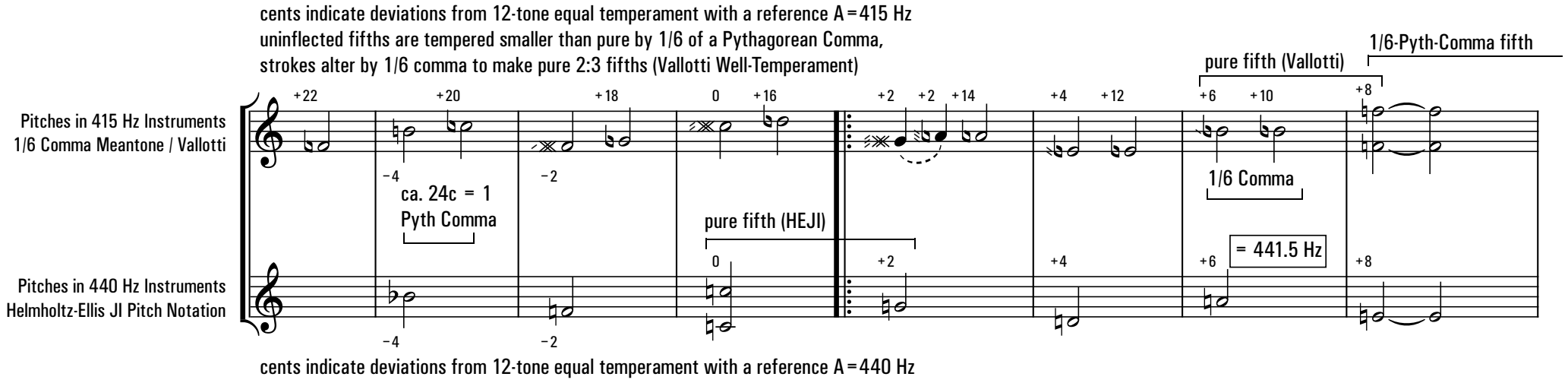
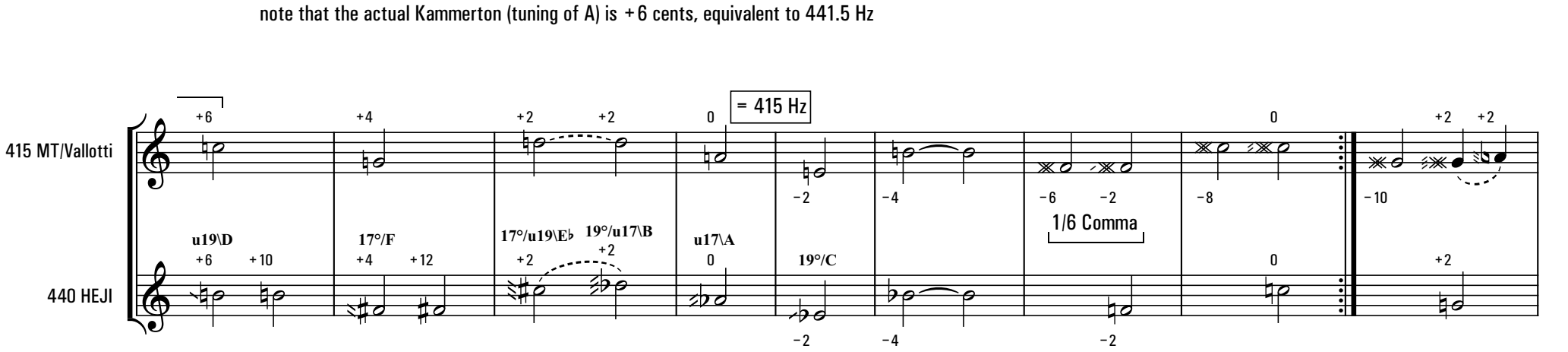
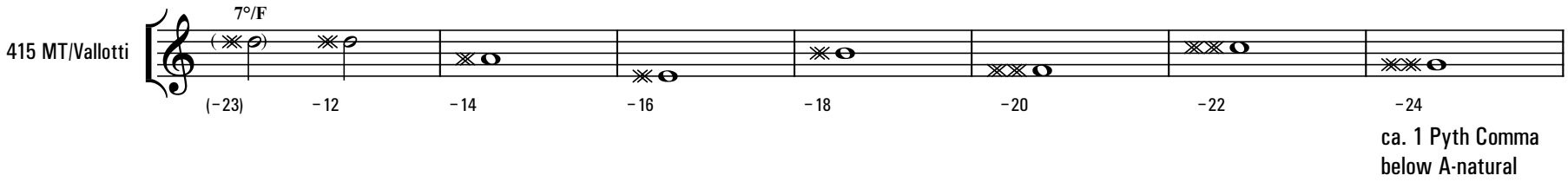
To walk in this what came to pass : tuning charts

General Correlation between the 415 Hz and 440 Hz Instruments' Notations and Tuning Systems



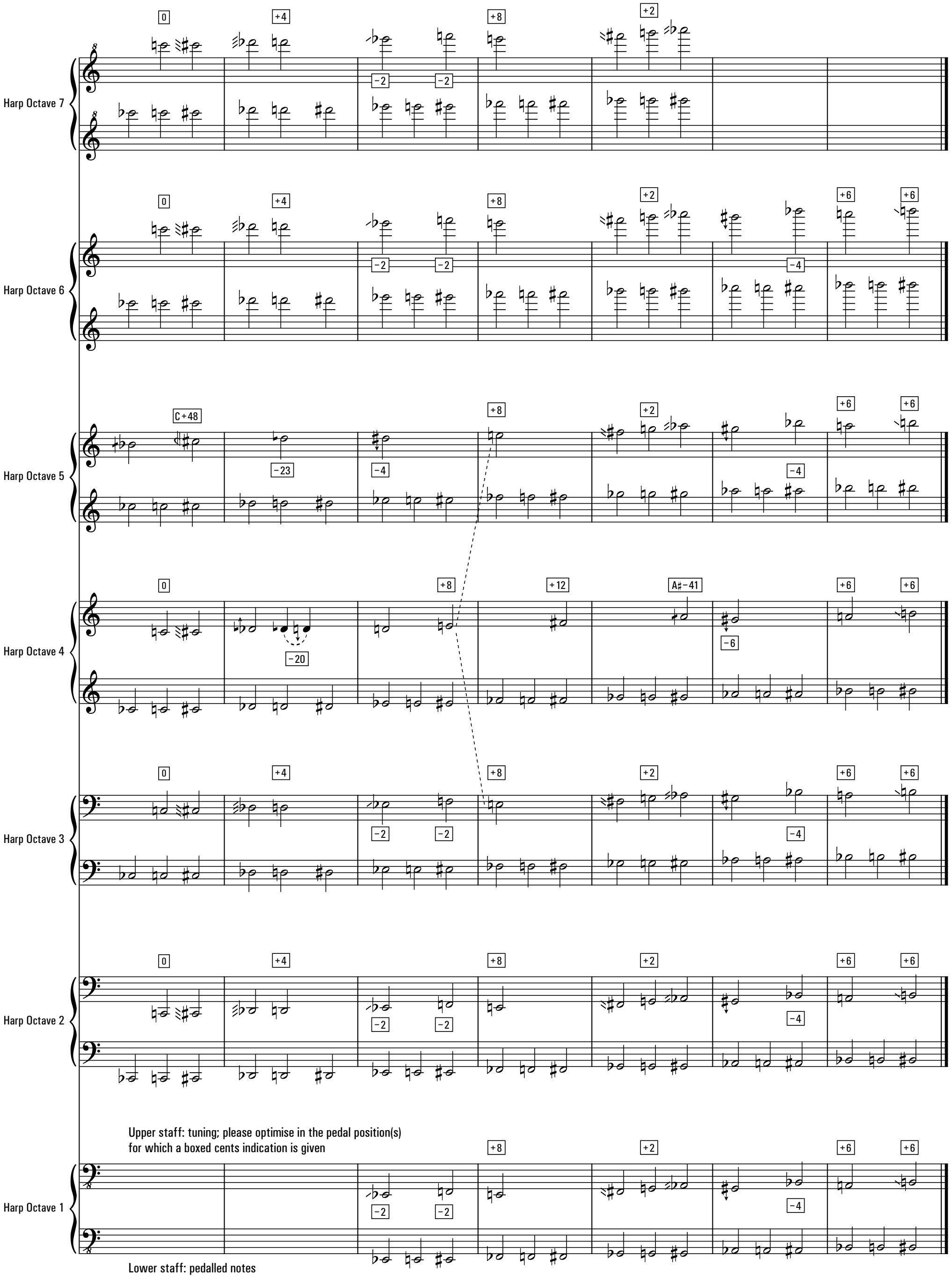


for the 415 Hz instruments, enharmonically spelled intervals are used to approximate septimal tunings based on the low natural 7°
in 1/6-Comma tuning the difference between enharmonic notes, i.e. G-sharp and A-flat, is approximately one Pythagorean Comma, ca. 24 cents
a single cross half-sharp (Zarlino's diesis symbol), alteration ca. +43 cents, is used to approximate "quartertones" based on the natural 11° and 13°
tunings based on partials > 5° are shown above the notes using a style like 7°/F (see example below) to indicate a 7th partial tuned over fundamental F
please tune such pitches contextually, by ear, adjusting intervals / chords to match the harmonic series, maximising resonance and clarity even when dissonant!



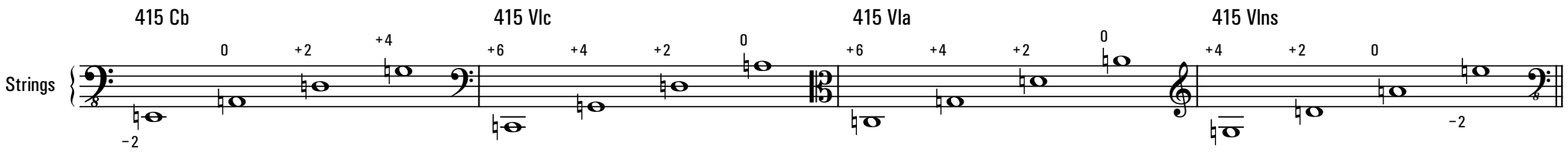
Unison Tuning of the Organ and the Electric Piano Synth

Harp Scordatura

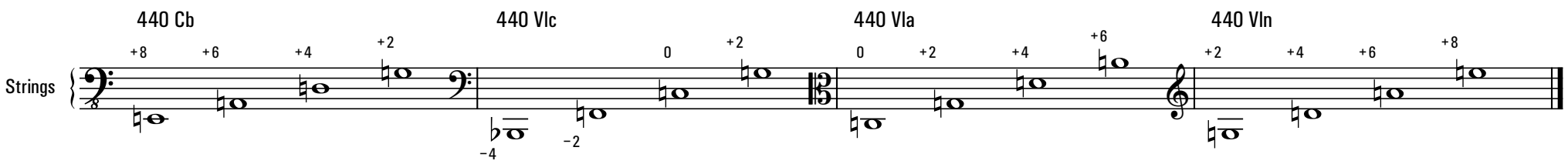


String Instruments

cents indicate deviations from 12-tone equal temperament with a reference A=415 Hz
uninflected fifths are tempered smaller than pure by 1/6 of a Pythagorean Comma



cents indicate deviations from 12-tone equal temperament with a reference A=440 Hz
uninflected fifths are pure (2:3); note that the actual Kammerton (tuning of A) is +6 cents, equivalent to 441.5 Hz



Transposing Score

415 instruments are notated in 1/6-Pythagorean-Comma Meantone, A = 0 cents = 415 Hz; 440 instruments are notated in HEJI, 1/1 = C = 0 cents, A = +6c = ca. 441.5 Hz;
Theorbo to be fretted in 1/6-Pythagorean-Comma Meantone; Organ to be tuned in Vallotti (1/6-Pyth-Comma between F-C-G-D-A-E-B and pure 3/2's otherwise); Harp tuning see chart;
415 and 440 refer to the settings used on an electronic tuning meter to obtain cents. The two tuning systems share the same cents deviations a semitone apart: see chart.

To walk in this what came to pass

remembering my grandparents' flight

composed for and premiered by Zafraan Ensemble in collaboration with Akademie für Alte Musik Berlin

Marc Sabat

𝅗𝅥 ca. 45

415 Flauto Traverso
415 Baroque Oboe
415 Violin I
415 Violin II
415 Viola
415 Violoncello
415 Contrabass
415 Positive Organ
415 14-course Theorbe
440 Bass Flute
440 Harp (sounding)
440 Fender Rhodes (synthesizer)
440 Violin
440 Viola
440 Cello (sounding)
440 Contrabass

libero: move through beamed notes freely, place large beats correctly

cc 2022 Plainsound Music Edition

5

Poco ritenuto

Tempo primo

415 Fl

415 Ob

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

440 Vla

440 Vlc
(snd)

440 Cb

9

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

p f p f 7°/F f f

2°/III 4°/IV 4°/IV f f f f f f f f

f f f f

f f

2°/IV sul IV port. port. port. f f

I 3°/II 2°/II sul II 3°/I 2°/I 3°/II 7°/IV 5°/III

14

415 Fl

415 Ob

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

440 Vla

440 Vlc
(snd)

440 Cb

7°/B♭

7°/E♭

7°/A♭

5°/C 7°/G

u7\D

7°/G

5°/C

5°/F

4°/II

sul I

sul IV

port.

f

p

cantando

poco f

sempre f

18

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

5°/II
sul II
I
non div.
11°/B♭
5°/B♭
4°/IV
4°/III
7°/E♭
7°/B♭
5°/A
5°/I
u5\E
u5\B
sul IV
port.

strokes = ca. 1/6 Pythagorean Comma
to approximate the Vallotti Well-Temperament
using 17° and 19° (please see tuning table)

22

Poco ritenuto

match 440 Cb

415 Fl

415 Ob

7°/G

415 Vln I

non div.

7°/D

div.

415 Vln II

III

2°/IV

415 Vla

415 Vlc

port.

sul II

I

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

u5\F

u5\C

440 Vla

440 Vlc
(snd)

match Cb natural harmonics

sul IV

440 Cb

27

Tempo primo

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

mezza voce
simile
4°/IV
unis.
senza dim.
port.
non div.
2°/IV
2°/I
p
f
5°/F
5°/A
poco f
mezza voce
II
I
2°/III
3°/III
3°/II
5°/E
11°/E
13°/E
7°/E
5°/B

inflected accidentals indicate Vallotti Well-Temperament: match Organ pitches

33

415 Fl

415 Ob

mezza voce

match Organ, Fl, Vln II pitch

415 Vln I

poco f

match Organ, Fl, Vla pitch

415 Vln II

poco f

match Organ, Fl pitch

415 Vla

poco f

415 Vlc

senza dim.

4°/I

415 Cb

mezza voce

senza dim.

415 Org

415 Theorbe

5°/F

u5\C

440 B Fl

poco f

5°/G

440 Hp (snd)

poco f

p

poco f

440 Rhodes (synth)

440 Vln

4°/III

4°/IV

2°/IV

440 Vla

p

2°/IV

5°/IV

mezza voce

sul III

port.

port.

port.

2°/III

sul II

3

440 Vlc (snd)

p

p

p

mezza voce

2°/I

4°/I

440 Cb

p

mezza voce

senza dim.

38

Poco ritenuto

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

7°/G
I
mezza voce
p
7°/G
sul III
poco f
7°/G
sul I
poco f
p
poco f
u5\A
port.
5°/D
tune P4
above 440 Vc
u13\D
11°/C
13°/C
5°/G
f
u5\A
3
7°/G
port.
mezza voce
2°/IV
5°/u13\D
tune M6
above 440 Vc
5°/IV
senza dim.
2°/II
5°/D
11°/C
5°/C
4°/III
5°/A
u13\A
2°/II
13°/C
sul I
senza dim.

43 **Molto ritenuto** **Tempo primo**

415 Fl

415 Ob

enharmonic diesis in 1/6-Comma =
ca. +1 Pythagorean Comma (24 cents)

inflected accidentals: match
Vallotti Well-Temperament
in Organ part

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

coordinate with Theorbo and 440 Harp

415 Org

Chord symbols are provided in case the player wishes
to ornament the primary line (at times) with additional
notes filling out the currently sounding harmony (ad lib.)

415 Theorbe

match 415 Organ tuning as closely as possible,
inflected notes indicate Vallotti Well-Temperament
approximation using 17° und 19° tunings:
one stroke = ca. 1/6 Pythagorean Comma

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

440 Vla

440 Vlc
(snd)

440 Cb

47

enharmonic diesis in 1/6-Comma =
ca. +1 Pythagorean Comma (24 cents)

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

poco *f*
p
II
2°/IV
3
4°/IV
2°/I
4°/II
7°/B♭
7°/F
arco
5°/III
port.
C♯m
A
C♯/B♭
B♭m
B♭
F7/B♭
Cm
A♭
f

52

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

II non div.
I 2°/IV
2°/IV II
non div.
6°/III
C7 Am7 A G
4°/III 4°/II 5°/C
2°/III
2°/I 4°/I
poco f
p

56

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

III
4°/IV
4°/I
pizz.
B
Abm
D
Gm
3
p
p sostenuto sempre
f
III
4°/II
2°/IV
4°/III
4°/I
6°/II

61

415 Fl
poco f poco f poco f poco f

415 Ob
poco f poco f

415 Vln I
p

415 Vln II
II
p

415 Vla
2°/IV
p

415 Vlc

415 Cb

415 Org

415 Theorbe
F

440 B Fl

440 Hp
(snd)
f

440 Rhodes
(synth)
poco f
(p)

440 Vln
II

440 Vla
2°/IV
p

440 Vlc
(snd)
8°/IV
p

440 Cb

66

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

pocof *pocof* *pocof* *pocof* *pocof*

4°/IV

p

6°/II
arco

p

E Ab Fm F

3 3 3 3 3 3 3

p

4°/IV

p

4°/I

p

4°/III

divide 1/6-Comma sharp (86 cents)
in half (ca. 43 cent)

71

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

5°/E 13°/B 9°/F 11°/F match 440 B Fl
2°/IV
Eb Em/A E/A B F7
match Viola 7°/F 5°/B♭ 7°/E 5°/C u5\F
match Bass Fl 7°/B♭ 5°/E u5\C 7°/F 5°/B♭ 7°/E 2°/IV u5\F
4°/IV 4°/III

poco f *p* *f* *port.* non div.

76

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
pizz.
415 Cb
415 Org
415 Theorbe
Dm/B
440 B Fl
440 Hp
(snd)
440 Rhodes
(synth)
440 Vln
5°/D
5°/G
440 Vla
2°/IV
II
5°/A
5°/G
tune P5 / P4
above Vln
5°/C
2°/I
440 Vlc
(snd)
2°/III
4°/II
4°/I
2°/I
440 Cb
port.

81

415 Fl

415 Ob

poco f

port.

7°/B

poco f

inflected accidentals indicate
Vallotti Well-Temperament:
match Organ pitches

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

440 Vla

440 Vlc
(snd)

440 Cb

p

arco

poco f

7°/C♯

4°/IV

5°/G

5°/II

4°/II

port.

86

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

pp
poco f
p
2°/IV
2°/II
4°/II
non div.
I
5°/F
u5\D
u5\A
5°/D

91

415 Fl

415 Ob

415 Vln I

inflected accidentals indicate
Vallotti Well-Temperament:
match Organ pitches

415 Vln II

pp

415 Vla

pp

415 Vlc

poco f

pp

415 Cb

match 8ve below 440 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

4°/IV

440 Vln

p

440 Vla

2°/III

440 Vlc
(snd)

poco f

440 Cb

poco f

97

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

non div.
poco f
2°/IV
4°/IV
2°/III
poco f
2°/III
2°/IV

104

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

p
2°/IV
poco f
2°/II
p
pp
2°/IV
poco f

112

Poco ritenuto

Tempo primo

415 Fl

415 Ob

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

440 Vla

440 Vlc
(snd)

440 Cb

5°/E 11°/E

5°/E 11°/E

2°/IV

2°/IV

3°/I

sul I

sul I

, sul IV

, sul IV

port.

port.

port.

port.

3

8

118

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

p f p 7°/F
p f p
III non div. port. IV
III non div. port. IV
2°/IV sul IV port.
III poco f 2°/IV 2°/III non div. sul III port.
sul I port. p
f
3
sul II
port. f
sul IV port. f sul IV port.

122

Poco ritenuto

Tempo primo

415 Fl

415 Ob

415 Vln I

415 Vln II

415 Vla

415 Vlc

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp (snd)

440 Rhodes (synth)

440 Vln

440 Vla

440 Vlc (snd)

440 Cb

poco f

p

f

7°/F

7°/E♭

2°/III

III

port.

2°/IV

sul IV

127

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

7°/B♭ 7°/E♭ 7°/A♭ 4°/IV 4°/IV 5°/C 7°/G sempre f I 3°/II 2°/II sul II u7\D 7°/G 3°/I 2°/I 3°/II 4°/II sul I 7°/IV 5°/III sul I

131

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

I

f

f cantando

poco f

11°/B♭

5°/B♭

3

sul IV

port.

5°/C

5°/F

5°/II

5°/A

7°/E♭

5°/I

u5\B

u5\E

4°/IV

5°/III

p

136

415 Fl
415 Ob
415 Vln I
415 Vln II
415 Vla
415 Vlc
415 Cb
415 Org
415 Theorbe
440 B Fl
440 Hp (snd)
440 Rhodes (synth)
440 Vln
440 Vla
440 Vlc (snd)
440 Cb

5°/II
sul II
port.
non div.
7°/G
7°/D
poco f
III
2°/IV
I
sul II
3
u5\F
u5\C
7°/E♭
4°/III

140

Poco ritenuto

match 440 Cb

Tempo primo

415 Fl

mezza voce

415 Ob

415 Vln I

div.

4°/IV

senza dim.

mezza voce

415 Vln II

div.

4°/IV

port.

415 Vla

unis.

non div.

div.

415 Vlc

non div.

415 Cb

415 Org

415 Theorbe

440 B Fl

440 Hp
(snd)

440 Rhodes
(synth)

440 Vln

port.

8

440 Vla

5°/E 11°/E 13°/E 7°/E 5°/B

match 440 Cb

440 Vlc
(snd)

440 Cb

sul IV