Marc Sabat

The Luminiferous Aether

for orchestra

PLAINSOUND MUSIC EDITION

The Luminiferous Aether (2017–18)

for orchestra

2 Flutes, Alto Flute (3)
2 Oboes, English Horn (3)
2 Clarinets in Bb, Bass Clarinet (3)
2 Bassoons, Contrabassoon or Contraforte (3)
4 Horns
3 Trumpets in Bb
2 Tenorbass Trombones (1. doubling on Alto Trombone), Bass Trombone (3)
5-valve non-compensating C-Tuba
Timpani
Percussion 1 (Glockenspiel, 5-octave Marimba)
Percussion 2 (5 Tuned Gongs, Vibraphone)
Percussion 3 (Bass Drum, Crotales, Tubular Bells)
Chromatic Pedal Harp in a scordatura tuning (see Legend)
Violin I
Violin II
Viola
Violoncello in a scordatura tuning (all 4 strings lowered by a whole tone)
Contrabass

commissioned by BBC Radio 3 for the Tectonics Festival Glasgow 2018
premiered by the BBC Scottish Symphony conducted by Ilan Volkov
in the Grand Hall, Glasgow, March 6, 2018

About the piece

The Luminiferous Aether is harmonic space music, drawing inspiration from the gradual unfolding of tonal interactions and connections which characterises the Dhrupad style of North Indian Hindustani music. The underlying principle of a consonant tanpura drone, commonly *sa* and *pa*, is projected here into a spine of perfect untempered fifths extending from the Violins' open E string downward though the open strings of Violas and retuned Violoncelli in an unbroken chain to the F and Bb of the open brass. Within each of these perfect fifths, the instruments are exploring gradual movements upward in small melodic steps, embedded in simple phrases and counterpoints. The music successively reveals shadings and harmonies based on the untempered intervals of the 7th, 11th, 13th and finally 5th natural harmonics from the various open string fundamentals. Over the course of the approximately 18 minute composition, these small "microtonal" steps gradually approach the simplest melodic counterpoint: passing from a perfect fifth to a perfect fourth by the interval of a tone.

The title refers to an imaginary medium, postulated in 19th century physics, which was believed to permeate the universe, thus allowing the transmission of electromagnetic vibrations. It is also reminiscent of the unheard primordial vibration of all things described in Indian conceptions of sound: *nada*, that which reveals and is revealed by time.

About the notation

The use of extended just intonation in this piece applies both to vertical, harmonic structures and to melodic sequences of tones, asking players to hear and play some pitches which depart from conventional tempered tones. There is no fixed system, scale or number of tone-divisions, instead the entire tonal continuum is imagined as a fabric connected by rational interval relationships based on interlocking harmonic series. These relationships are translated into the score by attaching small numbers to each pitch, indicating cents (1/1200 octave), measured as deviations from the nearest tempered pitch. When the deviation from the harmonically correct spelling of the pitch would have exceeded ±50c, the nearest sounding pitch-class is also written to facilitate work with an electronic tuner.

The orchestra chooses its Kammerton frequency based on the tuning of the fixed pitch percussion instruments, so that each individual player may rehearse using a clip microphone and electronic tuning device set to this chosen reference. In a performance, it is very likely that the overall tuning will deviate at times, so it is useful to explore several possible alternate fingering scenarios to be able to flexibly adapt to unexpected changes in the intonation.

More important than static, absolute pitch height is the players' perception and musical articulation of consonant harmonic relationships, which are dynamic and moving interactions of

tones and their harmonics. Several complementary notations indicate the intervallic relationships which allow pitches to be adjusted in context. The accidentals used are based on the Extended Helmholtz-Ellis JI Pitch Notation, which uses different symbols to show the characteristic tuning of various natural harmonic series primes:

3 (Pythagorean, fifths and fourths) is represented by using the conventional series of flats, naturals, sharps: therefore flats are tuned lower than enharmonically similar sharps by a Pythagorean comma, approximately 1/9 tone (23.5c);

5 (Ptolemaic, the consonant thirds and sixths) by attached arrows indicating the syntonic comma, lowering the Pythagorean ditone by approximately 1/9 tone (21.5c) to make a major third;

7 (Septimal, the bluesy low natural seventh and minor third) by Tartini's 7-like half-arrows indicating the septimal comma, lowering the Pythagorean intervals by approximately 1/7 tone (27c);

11 (Undecimal, the natural fourth-plus-quartertone) by Richard Stein's reverse flat and cross indicating the 32 : 33 quartertone (53c);

13 (Tridecimal, the neutral sixth) by quartertone symbols with a second vertical stroke indicating the 26 : 27 thirdtone (65c);

Please also see the following legend with symbols of the Helmholtz-Ellis Notation.

To help read the microtonal accidentals, or to clarify the characteristic sound or function of certain pitches, additional numerical notations are used. Readily tunable harmonic (vertical) pitch relations are written as frequency ratio fractions in boxes, representing simple consonant intervals. For example, a natural major third might be written as 5/4 (the interval between harmonics 4 and 5 of the series). In the following pages tables of tuneable intervals and of the harmonic series in HE notation are included to provide examples of these ratios.

Another indication used in the score consists of a harmonic series number (3, 5, 7, 11, 13) combined with either "u" or "°" to indicate the function of a tone. For example, 7° means "sounds like a natural 7th harmonic *above* something" and u11 (under-11) means "tuned a quartertone plus fourth *below* something, which would then sound as its 11th harmonic".

Melodic intervals are often written as ratios and cent distances positioned between notes, using a colon notation. For example, the diatonic semitone *15 : 16 = 112c*.

In general, the composition attempts to provide consonant pitches in the instrumentation to allow the various microtones to be realised by ear, however, the sometimes dense microtonal counterpoint creates beatings and collisions which may disorient the ear. The style of articulating pitches in this context is perhaps closer to that in Byzantine song or Turkish, Arabic, Persian or Indian traditions, where the microtonal *sruti-region* of a complex pitch relationship is brought into awareness, and its exact, precise tuning found in the course of a subtle *portamento* into the center of pitch, rather than the Western convention of experiencing an "in tune" / "out of tune" dichotomy based on static pitch. The intention of the intonation is to maximise the resonance and sensation of both consonance and dissonance, the impression that melody and harmony are interwoven in a beautiful, at times complex network of relationships perceptible to the ear, interacting *tonally* at all times.

About the instruments

A number of instruments are given special scordatura tunings, or subtle retunings of valves, to more reliably provide some fixed microtonal pitches. On the following pages, charts are provided describing details of the various scordature.

For the woodwind players, the use of instruments with dedicated quartertone keys (for example, Kingma System flutes, Howarth-Redgate oboes, etc.) is recommended to come as close to the required pitches as possible. Adjustments of embouchure, though absolutely necessary when producing the pitches, may not be sufficiently accurate or reliable used on their own to realise this score with the necessary accuracy. Seeking out alternate fingerings with clear and steady timbre (even if unusual or melodically quite varied) is recommended. Conventional fingerings should be tested with a tuner to determine their tendencies, which will vary from instrument to instrument.

For the brass I suggest using a subtle adjustment of valve tunings as described in the tables, and including less conventional harmonics (natural 7th, 11th) and all possible valve combinations to provide a larger microtonal gamut. Some suggested fingerings to get close to desired pitches are given in the score, but players are encouraged to seek out other, possibly better solutions which facilitate the accurate and expressive realisation of the written pitches. Sometimes it may be more musical to use more lip adjustment or a temporary change of valve-slide position to obtain a suitable timbre or to articulate small microtonal variations.

The tempered (fixed-pitch) percussion – Glockenspiel, Crotales, Tubular Bells, Vibraphone and Marimba – should be chosen so that their frequencies are as close to equal-tempered tuning as possible, sharing the same reference frequency in Hz. This frequency will determine the Kammerton shared by the ensemble when setting tuning meters and used for tuning the scordatura fixed pitch instruments. The tuneable percussion (Timpani, Tuned Gongs) play 5 Pythagorean pitches: Bb-10 F-8 C-6 G-4 D-2, and these ought to be tuned as accurately and sonorously as possible.

The Harp part requires a dedicated instrument, specially retuned several days before the first rehearsal. Since some strings are lowered by as much as a minor third, it will take a little time for the instrument to adapt to the unfamiliar tension. The legend provided indicates all of the retuned pitches with both played and sounding pitches at their nearest semitone and cents deviation. The tuning, like the entire composition, is based on pitches a perfect fifth apart. Rather than repeating the same pitches an octave apart, the scordatura repeats, for the most part, at the fifth: the legend is written accordingly. The Harp part is written normally, in playing pitches, using only the sharp and flat positions of the pedals. In the score, the resultant sounding pitches are written. The instrument may need to be subtly reinforced with amplification: the impression for the orchestra players should be a clear, substantial presence, and for the audience a natural, acoustic balance.

String parts are written normally, making frequent use of open strings and natural harmonics. The Violoncelli are to be retuned one wholetone lower than normal, to the pitches Bb-10 F-8 C-6 G-4, and the remaining strings (Violins, Violas, Contrabasses) to the pitches C-6 G-4 D-2 A+0 E+2 (Pythagorean tuning). 4-string Contrabasses need to retune their lowest string to D-2 or C-6 to obtain an Eb-39 and (occasionally for inside players) a low C-6.

When tuning the open strings of the orchestra, please take time to obtain clear and open Pythagorean fifths, since so much of the music is based on them! These very subtle detunings of the tempered fifths are meant to produce pure, resonant, beatless fifths, which string players in the higher register will find sound completely “normal”. For the Violas and Violoncelli, the wider fifths may be more unfamiliar, but should sound clear and resonant rather than beating and certainly not out-of-tune!

The score is written in transposing pitch, with the exception of the scordatura instruments (Harp and Violoncello), which are scored at sounding pitch.

About phrasing

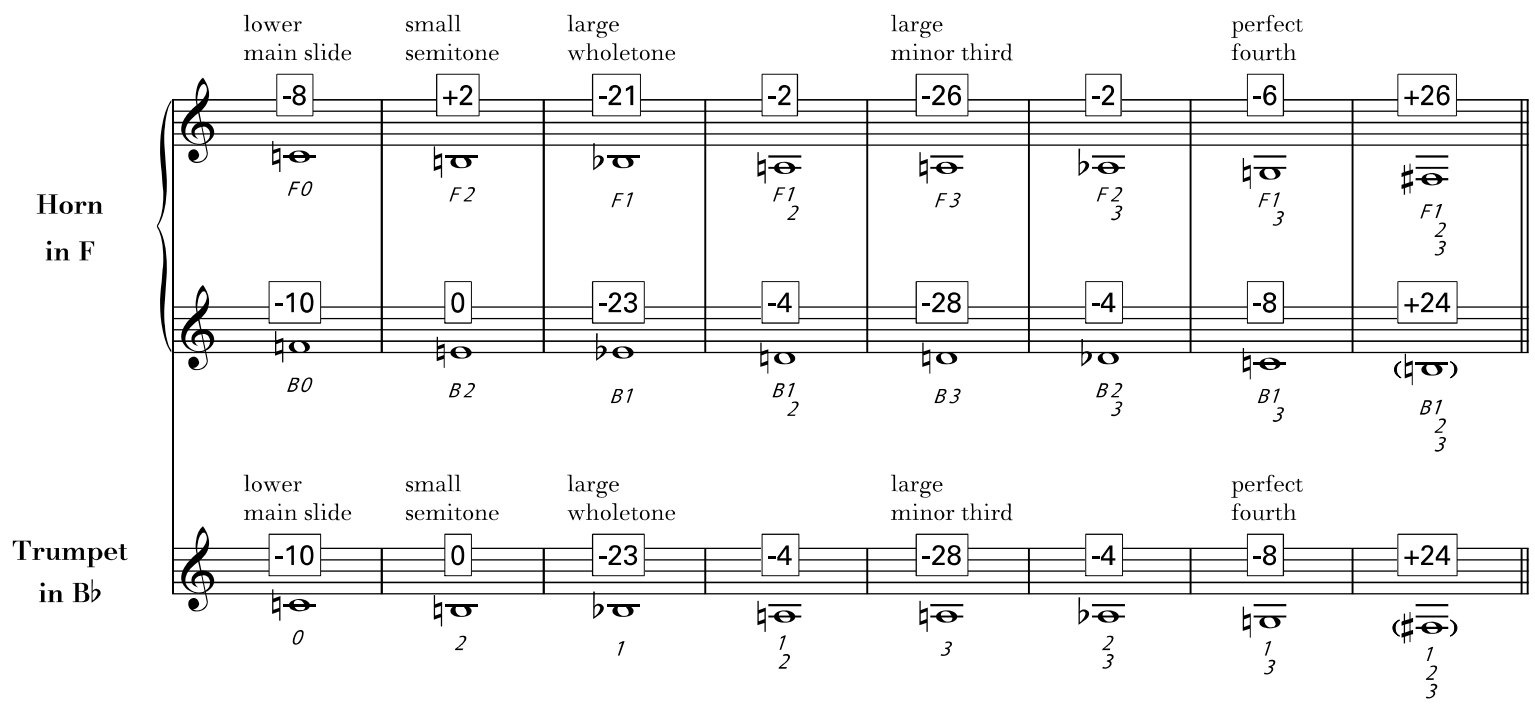
The dynamic level of the music is, for the most part, soft and resonant, though at times the sonorities will reach a loud fullness, but never harshly so. Written dynamics are suggestions to phrasing and articulation, and may be interpreted with some measure of freedom. Because there are many sustained tones, musicians may breathe or change bow whenever needed. Seek timbres which maximise harmonic interaction and blend with each other and with the other instruments. Rather than emplying vibrato, which obscures resonance of the pure intervals, players are encouraged to explore shadings of timbre produced by variations of bowing and breath to produce an expressive and lyrical music.

Regarding the flow of time: the perception of intonations and modulations, swiftly but fully and clearly revealed, should inform pacing. The music is never absolutely metronomic.

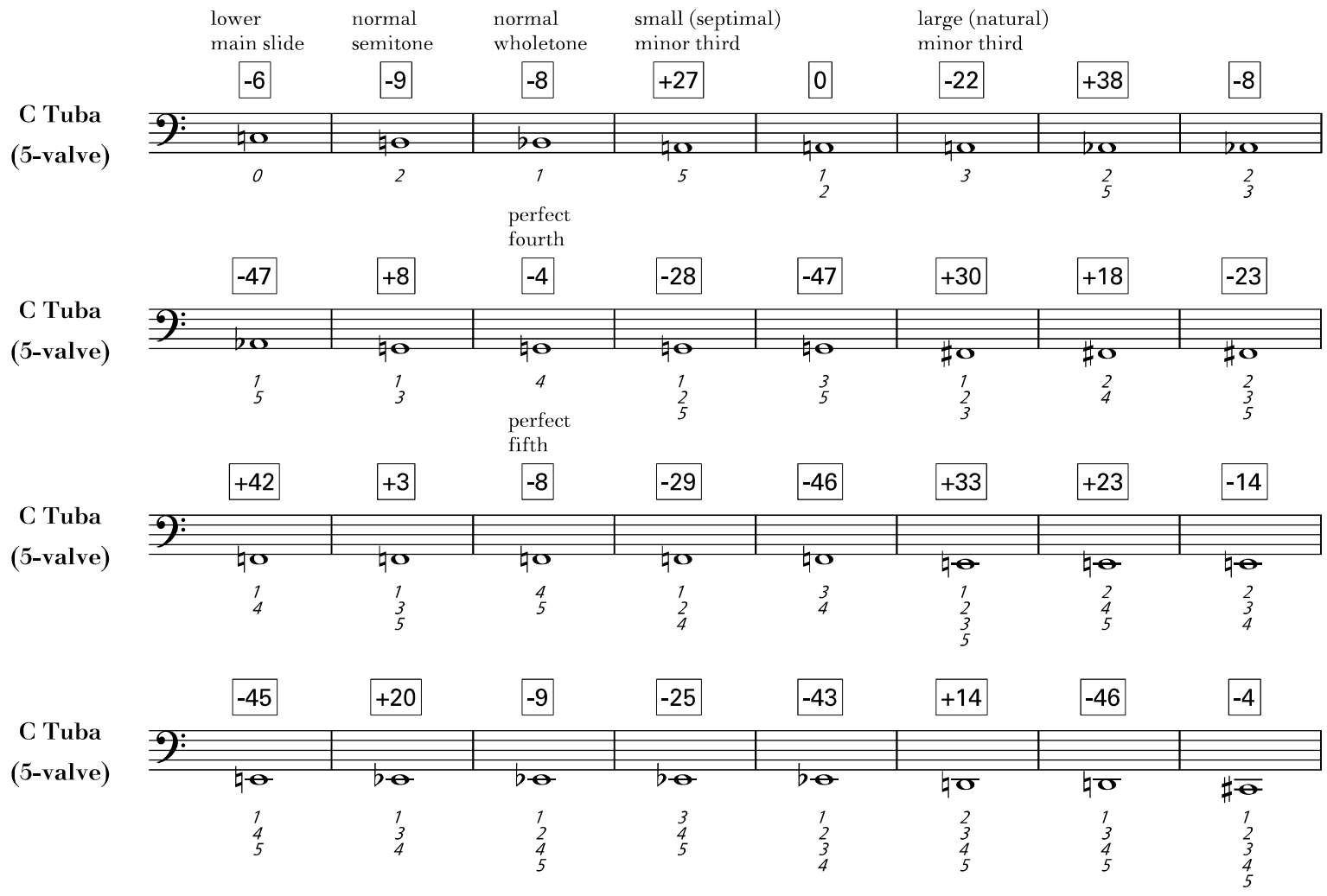
Brussels, 16 March 2018

suggested BRASS VALVE TUNINGS

indicated on the fundamental notes (1°, 2°, 4°, 8° partials) at written pitch
suggested fingerings are based on overblown natural harmonic series (3°, 5°, 7°,...)

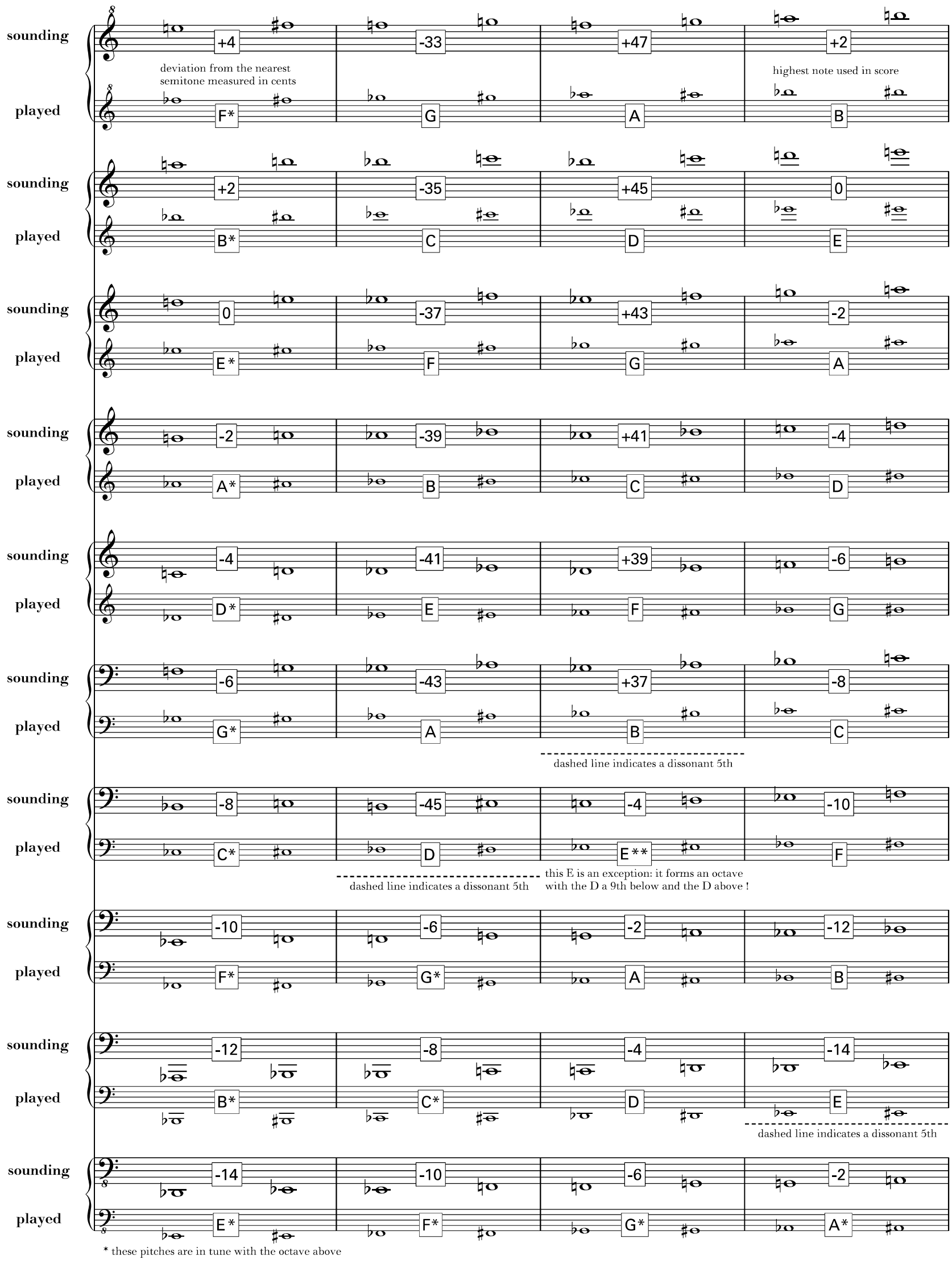


Trombones : please tune open instruments lower to permit E♭ -12 (Alto) / B♭ -10 / F-8 when playing in position I



HARP SCORDATURA

in untempered perfect fifths



* these pitches are in tune with the octave above

An informal introduction to the Helmholtz-Ellis Accidentals
by Marc Sabat

Berlin, April 2009

In learning to read HE accidentals, without having to rely on an electronic tuning device, it is important to be familiar with three things:

First, to keep in mind the natural tuning of intervals in a harmonic series, which deviate from the tempered system.

Second, to get to know how the accidentals refer to these overtone relationships.

Third, to observe that each written pitch may be related to many other pitches by natural intervals, and to tune it accordingly.

In most cases, this approach will allow the player to quickly and intuitively play just intonation (JI) pitches quite accurately. Any remaining adjustments can be made by ear, based on the specific sound of JI intervals.

Just intervals are readily learned because they are built up from simple, tuneable harmonic relationships. These are generally based on eliminating beating between common partials, finding common fundamentals and audible combination tones, and establishing a resonant, stable sonority which maximizes clarity: both of consonance and of dissonance.

A well-focussed JI sound is completely distinct from the irregular, fuzzy beating of tempered sounds. Just consonances, when marginally out of tune, beat slowly and sweetly and may be corrected with the most subtle adjustments of bowing or breath. Just dissonances produce a sharply pulsing regular rhythm and have very clear, distinct colors.

To become familiar with the notation and sounds of JI, the fundamental building blocks are prime number overtones 3, 5, 7, 11 and 13, each of which is associated with a specific pair of accidentals and a basic musical interval.

3 is associated with the signs flat, natural, sharp and refers to the series of untempered perfect fifths (Pythagorean intonation). Generally, A is taken as the tuning reference, and the central pitches C-G-D-A-E can be imagined as the normal tuning of the orchestral string instruments. The just C is rather lower than tempered tuning because of the pure fifths. The further this series is extended, the greater the deviation from tempered tuning: the flats are lower, the sharps higher.

5 is associated with arrows attached to the flat, natural, sharp signs and refers to the pure major third. These arrows correct the Pythagorean intervals by a Syntonic Comma, which is approximately 1/9 of a wholetone or 22 cents.
So, for example, the note E-flat arrow-up is a just major third below G, and the note F-sharp arrow-down is a major third above D. In most music, flats are often raised by a comma and sharps are lowered. Because of the open string tuning, it is common to sometimes raise F and C (to match A and E) and to sometimes lower A and E (to match F and C). Corrections by one Syntonic Comma have been used throughout Western music history and are relatively familiar to the ear. However, traditionally these corrections have been hidden by players, for example in Meantone Temperament where fifths are mistuned narrow by ¼ comma so that the third C-E ends up sounding pure. More recently, the currently prevailing Equal Temperament has made us accustomed to beating thirds, so at first the pure intervals may seem unfamiliar. To play the arrows accurately, one must carefully learn the sound of the consonant major and minor thirds and sixths, and learn to articulate comma differences clearly.

7 is associated with a Tartini sign resembling the numeral. It corrects the Pythagorean intervals by a Septimal Comma, which is approximately 1/7 of a wholetone or 27 cents. When the Pythagorean minor third is lowered by this amount, it becomes a noticeably low third often heard in Blues music.

11 is associated with the quartertone signs (cross and backwards flat). The accidental is used to raise the perfect fourth by 53 cents, producing the exact tuning of the 11th partial in a harmonic series. The sound is most easily learned by playing one octave plus one fourth and raising it by a quartertone.

13 is associated with the thirdtone signs (cross and backwards flat, each with 2 verticals). The accidental is used to lower the Pythagorean major sixth by 65 cents, producing the exact tuning of the 13th partial in a harmonic series. The sound is most easily learned as a neutral-sounding sixth, one-third of the way between the just minor and just major sixths (closer to minor than to major).

The following table presents the accidentals together with their associated ratios and cents deviations. To calculate the cents deviation from Equal Temperament of a specific written pitch (if desired) the following shortcut may be used:

1.) Find the cents deviation of the Pythagorean pitch, by calculating how many fifths it is away from A, multiplying by 2, and using a plus sign if it is on the sharp side and a minus if it is on the flat side.

2.) For each microtonal accidental, add or subtract its approximate cents value (as given above), keeping in mind whether the accidental is raising or lowering the pitch.

The resulting value should be a cents deviation within 1 or 2 cents accuracy, which is an acceptable starting point for fine-tuning by ear.

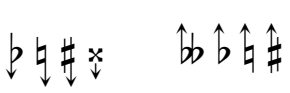
ACCIDENTALS

EXTENDED HELMHOLTZ-ELLIS JI PITCH NOTATION

for Just Intonation
designed by Marc Sabat and Wolfgang von Schweinitz

The exact intonation of each pitch may be written out by means of the following harmonically-defined signs:

Pythagorean series of fifths – the open strings
(… c g d a e …)



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

lowers / raises by two syntonic commas
circa 43 cents

lowers / raises by a septimal comma
*64 : 63 = **circa 27.3 cents***

lowers / raises by two septimal commas
circa 54.5 cents

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

lowers / raises by a 13-limit tridecimal third-tone
*27 : 26 = **circa 65.3 cents***

lowers / raises by a 17-limit schisma
*256 : 255 = **circa 6.8 cents***

raises / lowerss by a 19-limit schisma
*513 : 512 = **circa 3.4 cents***

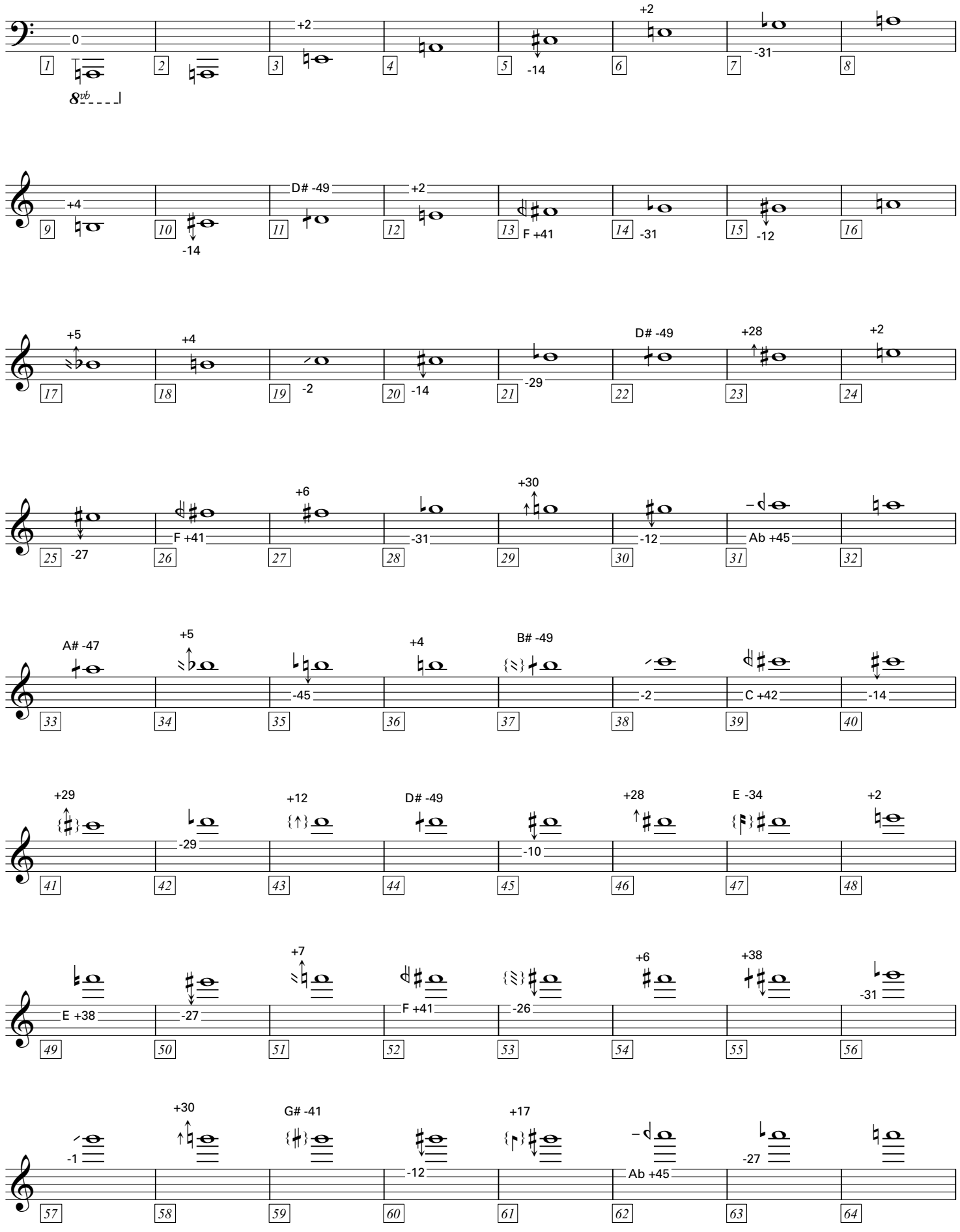
raises / lowers by a 23-limit comma
*736 : 729 = **circa 16.5 cents***

In addition to the harmonic definition of a pitch by means of its accidentals, it is also possible to indicate its absolute pitch-height as a cents-deviation from the respectively indicated chromatic pitch in the 12-tone system of Equal Temperament.

The attached arrows for alteration by a syntonic comma are transcriptions of the notation that Hermann von Helmholtz used 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" (1875/1885) is 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 sign for a septimal comma was devised by Giuseppe Tartini (1692-1770) – the composer, violinist and researcher who first studied the production of difference tones by means of double stops.

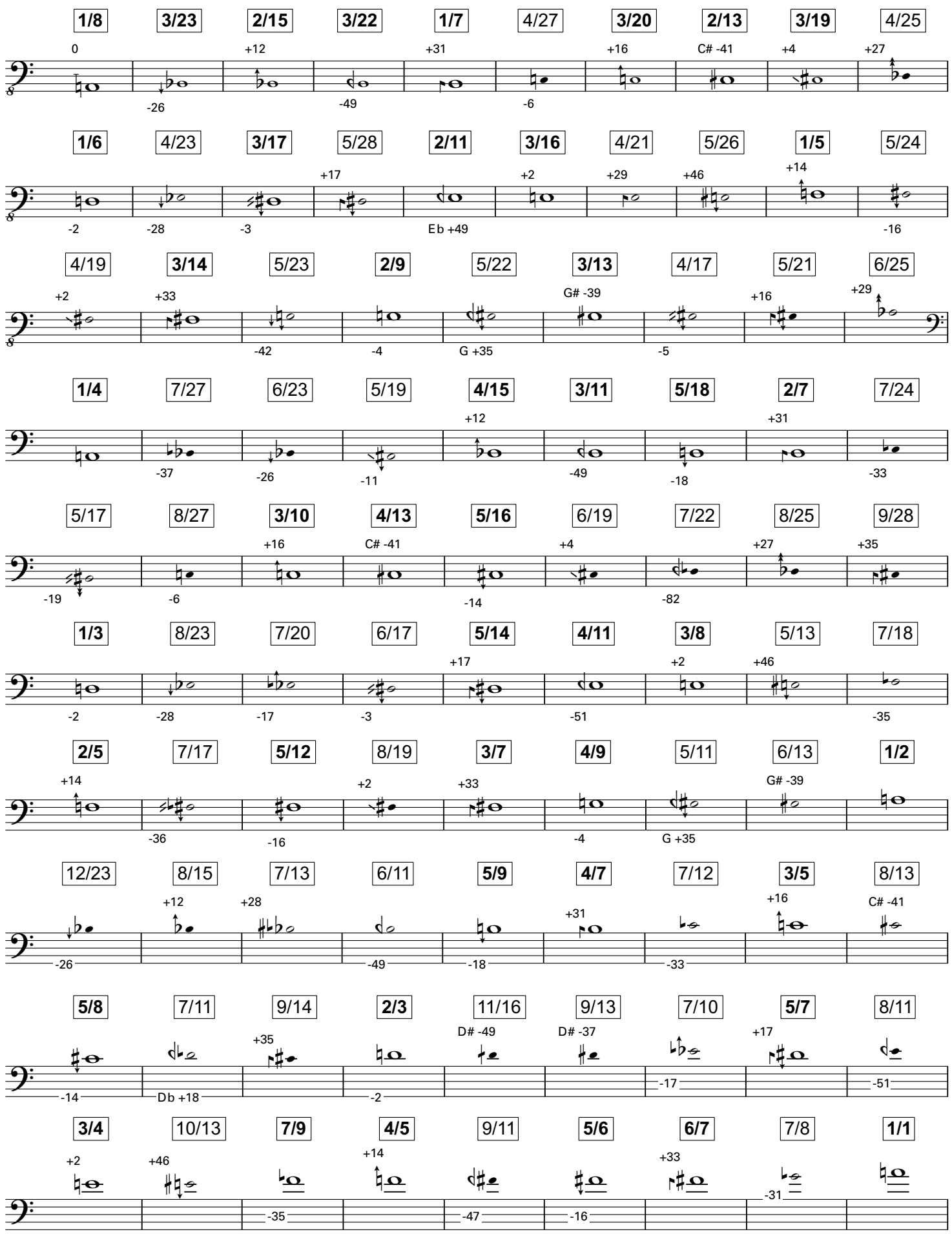
THE HARMONIC SERIES 1 - 64 above “A0” (overtone row)

notated using the Extended Helmholtz-Ellis JI Pitch Notation
microtonal accidentals designed by Marc Sabat and Wolfgang von Schweinitz, 2004



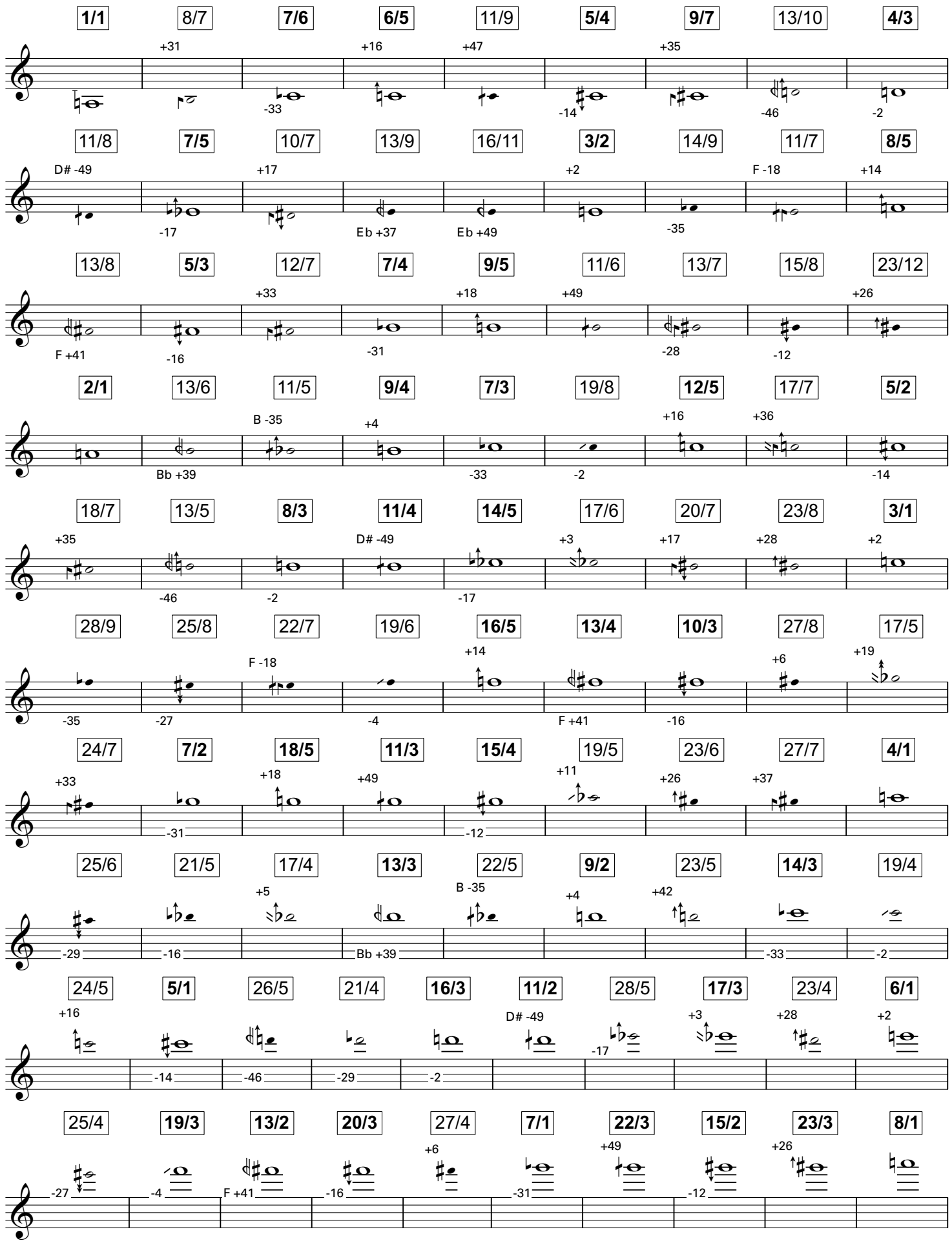
23-LIMIT TUNEABLE INTERVALS below “A4”

tested and notated in three gradations of difficulty (large open notehead = easiest ; small black notehead = most difficult)
by Marc Sabat (violin/viola) with assistance from Wolfgang von Schweinitz (cello), Beltane Ruiz (bass), Anaïs Chen (violin)—Berlin, 2005



23-LIMIT TUNEABLE INTERVALS above “A3”

notated using the Extended Helmholtz-Ellis JI Pitch Notation with cents deviations from 12-tone equal temperament based on A = 0 cents
microtonal accidentals designed by Marc Sabat and Wolfgang von Schweinitz, 2004



Transposing Score

The Luminiferous Aether

Marc Sabat

3/1 Slowly, freely, each sound in the time needed to unfold its harmony

ca. 20-30

Flute 1
Flute 2
Alto Flute in G (3)
Oboe 1
Oboe 2
English Horn in F (3)
Clarinet 1 in B♭
Clarinet 2 in B♭
Bass Clarinet in B♭ (3)
Bassoon 1
Bassoon 2
Contrabassoon (3)
Horn 1 in F
Horn 3 in F
Horn 4 in F
Trumpet 1 in B♭
Trumpet 2 in B♭
Trumpet 3 in B♭
Timpani
Bass Drum
Tubular Bells
Marimba
Vibraphone
Tuned Gongs
Harp (sounding)
Violin I div.
Violin II div.
Viola div.
Violoncello div. (sounding)
Contrabass

tune pure M3 above Cbsn, match Vlc

portamento : connect the pitches with an expressive curve, as in singing, lingering on the beginning and ending of the glide, freely shaping the sound

cents indication is written in relation to transposed pitch: on a tuning meter the indicated pitch is one fourth lower

tune pure M5 above Fl2, match Vl2

tune pure M5 under Cl1

slight bend upward to pure M5 below Vl I, Fl

match Cl2, Vla

senza cresc.

poco f

Please tune untempered perfect fifths
B♭2 -10 F2 -8 C3 -6 G3 -4 D3 -2

softly

(damp D)

(damp E)

Please tune untempered perfect fifths by hammering gongs or using modeling clay
B♭2 -10 F2 -8 C3 -6 G3 -4 D3 -2

(damp C)

Harp is retuned in a special scordatura: (see Legend) this stave indicates the sounding pitches

sempre l.v. unless damp indicated

Please tune strings in pure (untempered) perfect fifths
E +2 A 0 D -2 G -4

div. a 2 (outside players)

div. a 2 (inside players)

non div.

tune pure M5 below Vl I inside u5/E

sempre senza vibrato, phrased with bow, seek even, clear sostenuto & pure tuning using open strings often, as indicated; please balance the open E string's brightness with gentler bowing

harm. glide

press down and slightly raise to pure M5 below Vl I

Please tune strings in pure (untempered) perfect fifths
A 0 D -2 G -4 C -6

slightly raise at nut to pure M5 below Vl I

Violoncelli are all tuned down one tone:
Please tune strings in pure (untempered) perfect fifths
G -4 C -6 F -8 B♭ -10

press down and slightly raise to pure M5 below Vl2

slightly raise to tune pure M5 below Vl2

Contrabasses will need to play a glissando up from low E♭, inside players go down to low C
With 4-string instruments tune IV string down to D/C and transpose where required
Please tune strings in pure (untempered) perfect fourths/fifths G -4 D -2 A 0 D-2/C-6

cc Plainsound Music Edition 2018 corrected June 2019

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Fl 1

Alto Fl (3)

poco f pp

EH (3)

f

slight bend down to pure major third

B♭ Cl 1

B♭ Cl 2

pp

cents indication is written in relation to transposed pitch: on a tuning meter the indicated pitch is one tone lower

Bass Cl (3)

u5/F# u13/B u7/C#

D# -41 +35

p poco f pp pp

Bsn 1

bend down slightly to tune natural major third

5°/F -22

f p pp

match Vlc

Bsn 2

u5/A u13/D u7/E

+14 F♯ -42 +33

f p pp

tune pure M5 below Bsn 1 match Vlc

Cbsn (3)

u5/G u13/C u7/D

+10 E -46 +29

f p p

tune pure M5 below Bsn 2 match Cb

Hn 1

poco f

Hn 2

p

Hn 3

poco f

Hn 4

p

take mute (straight)

B♭ Tpt 1

take mute (straight)

B♭ Tpt 2

p

take mute (straight)

B♭ Tpt 3

p

take Alto Trombone (muted)

Tbn 1

mf poco f rinf.

take mute

Tbn 2

poco f rinf.

Bass Tbn (3)

mf f pp poco f

numbers in italic are suggested valve-combinations

Tuba

u13/C u7/D

E -46 +29

f p

Timp

BD

T Bells

Mar

Vib

Gongs

p p p

Hp (sound)

p f f p

Vln I div.

pp pp non div. pp (pp) (pp)

Vln II div.

4°/III 4°/III

pp pp non div. pp (pp) (pp)

Vla div.

match Bass Cl

u5/E u13/A u7/B

C♯ -41 +35

p pp non div. pp (pp) (pp) (pp) (pp)

match Bass Cl

pp non div. pp

Vlc (sound)

unis.

u5/A u13/D u7/E

+14 F♯ -42 +33

f p

bend down slightly to tune natural major third

-22

pp mf 2°/III f 2°/IV pp

Cb

(l.h. pizz.)

tune pure M5

u5/G u13/C u7/D

E -46 +29

f p pp mf mf poco f

IV string tuned down to D : all pitches written at sounding pitch please transpose accordingly when playing on IV

A

13

Fl 1

Alto Fl (3)

Ob 1

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

B♭ Tpt 1

B♭ Tpt 2

B♭ Tpt 3

Alto Tbn (1)

Bass Tbn (3)

Tuba

Mar

Vib

Gongs

Hp (sound)

Vln I div.

Vln II div.

Vla div.

Vlc div. (sound)

Cb div.

match Cb harm. to play low natural 7th

play low natural 7th

match Cl1

con sord. (match Vlns)

con sord. (match Vlns)

con sord. (match Cb harmonics, Vlns)

play low natural seventh of A

maintain normal tuning against slightly raised u7 in Tuba, Tbn

via sord.

Alto Trombone

play entire phrase in IV pos. (over C)

con sord.

(breathe and shorten G if needed, otherwise hold through)

con sord. (match Strings)

match Tuba : normally tuned G is 7th partial of raised A

tune slightly sharp, so Bass Tbn G matches 7th partial of raised A

(playable as 7° on valve 5 or 8° on valve 4)

written slurs indicate phrases softly

match Cb harmonic

(sounding)

(non div.)

match Cb

(sounding F -35)

(sounding F-35)

l.h. pizz

pizz.

non div.

arco

port.

harm. glide

(all pitches, including harmonics, are written to sound one octave lower)

div. a 2 (outside players)

sul I

cantando

non div.

sul IV ! transpose

div. a 2 (inside players)

slightly sharper than open A so 7th partial matches normal G tune with Tuba, Tbn

B

19

Fl 1
Fl 2
Alto Fl (3)
B♭ Cl 1
B♭ Cl 2
B♭ Tpt 2
B♭ Tpt 3
Alto Tbn (1)
Tbn 2
Bass Tbn (3)
T Bells
Mar
Vib
Gongs
Hp (sound)
Vln I
Vln II
Vla div.
Vlc div. (sound)
Cb div.

poco f
sostenuto
via sord.
play dotted slurs in one position
cantando
con sord.
sotto voce
large wholetone
7 : 8 = +231c
tune natural 7th below Trp 2
small septimal diesis
48 : 49 = +36c
tune natural 7th above Bass Tbn
softly
p
change bows freely, follow phrasing of dotted slurs
arco
sounding B♭-37
unis.
pizz.
pp

24

Fl 1
Fl 2
Alto Fl (3)
Bsn 2
Cbsn (3)
Alto Tbn (1)
Tbn 2
Tuba
Mar
Vib
Hp (sound)
Vln I
Vln II
Vla div.
Vlc div. (sound)
Cb

against Tbn1: beating
unison
match Fl 1,2
tune natural 7th below Vlc
three-quarter tone
12 : 13 = +139c
26 : 27 = +65c
27 : 28 = +63c
port.
stay on 6° and play with slide: 3/4-tone followed by two small semitones final B♭ should match natural 7° of C
tune pure M3 over Tuba C
senza cresc.
small semitone
28 : 27 = -63c
slow bend
non div.

C

28

Fl 1

Fl 2

Alto Fl (3)

Ob 1

Ob 2

EH (3)

Bsn 1

Bsn 2

Cbsn (3)

Hn 1

Hn 2

Hn 3

Hn 4

Timp

Mar

Vib

Gongs

Hp (sound)

Vln I

Vln II

Vla div.

Vlc (sound)

Cb

tune P5s with Fl 2, 3

tune P5s with Fl 1,3

tune P5s with Fl 1,2

tune with Ob 2, EH 7°/C

bend up +36c, tune natural 7th with Ob 2 7°/F°/F

small semitone 27 : 28 = +63c

play low natural 7th

match Horn

match EH

match Fl

match Horn 7°/C

tune to Ob 2

play low natural 7° harmonic of series 7°/C

precise, with Marimba, Harp

softly

consonant narrow minor 10th double-stop

non div.

consonant narrow minor 10th (7°/3°)

bend up +36c, tune natural 7th with Vlc

unis. sul III

consonant narrow minor 10th

sul IV ! transpose

match Vla

D

34

Fl 1

Fl 2

Alto Fl (3)

Ob 1

Ob 2

EH (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

Hn 1

Hn 2

Hn 3

Hn 4

B♭ Tpt 1

B♭ Tpt 2

B♭ Tpt 3

Alto Tbn (1)

Tbn 2

Bass Tbn (3)

Tuba

Hp (sound)

Vln I

Vln II

Vla div.

Vlc div. (sound)

Cb

small semitone
27 : 28 = +63c

tune low natural 7th, match Vl II

match Cb, tune M5 below Cl

play low natural 7th match Vlc

bend up and down by a sixth-tone (56c)

senza sord.

play dotted slurs in one position

match tuning of natural harmonics over B♭

stay in position (valve 1) through m. 45

portamento through the harmonics

non div.

play consonant natural 7th double-stop

consonant narrow minor 10th (7°/5°)

tune to Cb as pure M5

tune pure major chord

raise E♭ by a quarter-tone +49c to tune natural M5 below Vln II G

sounding F-35

E

41

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Cbsn (3)
Hn 1
Hn 2
Hn 3
Hn 4
B♭ Tpt 1
B♭ Tpt 2
B♭ Tpt 3
Alto Tbn (1)
Tbn 2
Bass Tbn (3)
Tuba
Timp
T Bells
Glock
Mar
Vib
Gongs
Hp (sound)
Vln I
Vln II
Vla div.
Vlc div. (sound)
Cb

take mute (straight)
take mute (Harmon)
take bucket mute (Velvetone)
con sord. (bucket)
bend up by a sixth-tone (27c) match Vl I play in one position
very slight bend up
(maintain position)
bend down by a sixth-tone (-27c)
bend down by a quarter-tone (-49c)
very slight bend down
tune to Tbn 2
tune to Tbn1
softly
(damp G and D)
match Tuba
raise pitch very slightly at the nut
raise pitch very slightly at the nut, tune to Vl I
lower pitch very slightly to match natural 7th in Cb
harm. glide

47

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Hn 1
Hn 2
Hn 3
Hn 4
B♭ Tpt 1
B♭ Tpt 2
Alto Tbn (1)
T Bells
Vib
Hp (sound)
Vln I
Vln II
Vla
Vlc (sound)
Cb

tune to Hrn 3, Bsn1
match Vla
tune w Tbn 1
match Cl1
match Hrn 3
con sord.
octave above Hn 1 match Tpt 2, Tbn
take Harmon mute
octave above Hn 1 match Tbn
stay in "low" E♭-59 position
tune w Hrn 1, Trp
match Hn 3
via sord. (Alto)
take Tenorbass Trombone
written slurs indicate phrases
full bows!
poco al pont.
harm. glide
change bows freely
glide with one finger
div. a 2
div.

F

53

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Cbsn (3)
Hn 2
Hn 3
Hn 4
Timp
Crot
Mar
Vib
Gongs
Hp (sound)
Vln I
Vln II
Vla
Vlc (sound)
Cb

u5/A
sotto voce
poco f
7°/C
match Vlns
7°/A
small semitone
21 : 22 = +81c
11°/D
match Cl 2
rinf.
sim.
7°/D
match Cl 1
narrow but consonant augmented 5th
(7° : 11°)
11°/C
unis.
non div.
change bows as needed
(change back to F-55 !)
2°/II
3°/III
3°/I
4°/IV
sounding D

57

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Cbsn (3)
Hn 1
Hn 2
Hn 3
Hn 4
B♭ Tpt 1
B♭ Tpt 2
B♭ Tpt 3
Tuba
Timp
BD
Mar
Vib
Gongs
Hp (sound)
Vln I
Vln II
Vla
Vlc (sound)
Cb

match Vl I
match Vl II, Ob 1
match EH
match Viola
tune to Ob 1, 2
sim.
mezza voce
sotto voce
match Vla
play G-quarter-sharp as 7° over lowered B♭ (extend 1st valve-slide slightly), match Cl
con sord. (Harmon)
match Vla, Hn 3
via sord.
match Vlc, Trp 1
match Trp 1.2
pizz.
arco
non div.
tune natural 11th (11/4)
tune natural 11th 11°/4°
sul II
senza dim.
match Hrn 3
tune natural 11th 11/4

G

63

Fl 1

Fl 2

Alto Fl (3)

Ob 1

Ob 2

EH (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

play natural 11° quartertone harmonics of series

pass through 15° harmonic on the way from 12° to 14°

Hn 1

Hn 3

B♭ Tpt 2

B♭ Tpt 3

Tuba

Timp

Crot

T Bells

Mar

Vib

Gongs

Hp (sound)

Vln I

Vln II

Vla

Vlc (sound)

Cb

H

68

Fl 1

Fl 2

Alto Fl (3)

Ob 1

EH (3)

poco f

B♭ Cl 1

sim.

B♭ Cl 2

match Vla, Vlc

Bass Cl (3)

Hn 1

Hn 2

Hn 3

Hn 4

Tenorbass Trombone

Tbn 1

sotto voce

match Vlc

small semitone
21 : 22 = +81c

match Hrn 1

Tbn 2

tune P5, P4 with Bass Tbn (3)

take mute (cup)

Bass Tbn (3)

Tuba

Timp

BD

Mar

Vib

Gongs

damp G

damp C

Hp (sound)

Vln I div.

Vln II div.

three-quarter tone 11 : 12
= +151c

Vla div.

f, libero

Vlc (sound)

tune to Vl II

non div.

(sim.)

Cb

73

Fl 1
Fl 2
Alto Fl (3)
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Hp (sound)
Vln I div.
Vln II div.
Vla div.
Vlc div. (sound)
Cb

mezza voce
match Vlc
small augmented second = +284c
septimal wholestep 8 : 7 = -231c
release/add harmonics gradually ad lib.
poco
non div.
release harmonic gradually ad lib.

78

Ob 1
Ob 2
EH (3)
Bsn 1
Bsn 2
Cbsn (3)
B♭ Tpt 3
Hp (sound)
Vln I div.
Vln II div.
Vla div.
Vlc div. (sound)
Cb

match Vl II
senza sord.
non arpeggiando
match Vcl.
(gently)
tune pure major 3rd above D
pure minor third
sounding Eb -59
match Vla
sounding F♯ -16
inside players: on 4-string basses lower IV to enable low C

86

J

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
Bsn 1
Bsn 2
Cbsn (3)
Hn 1
Hn 2
Hn 3
Hn 4
B♭ Tpt 1
B♭ Tpt 2
B♭ Tpt 3
Tuba
T Bells
Mar
Vib
Hp (sound)
Vln I div.
Vln II div.
Vla div.
Vlc div. (sound)
Cb div.

mezza voce
tune with Oboes, Bsn 2
match Bsn 2
sotto voce
play low natural 7th, match Bsn 1,2
senza sord.
take mute (cup)
small semitone 21 : 22 = +81c
three-quarter tone 12 : 11 = -151c
small semitone 27 : 28 = +63c
sul tasto
sul tasto flautando (fast bow)
sul tasto ord. (slow bow)
sul tasto (slow bow)
div. a 2 (outside players)
div. a 2 (inside players)
(arco)
pizz.

92

Fl 1

Fl 2

Alto Fl (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

BD

T Bells

Glock

Mar

Vib

Gongs

Hp (sound)

Vln I div.

Vln II div.

Vla div.

Vlc div. (sound)

Cb div.

K

98

Fl 1

poco f

mezza voce

Fl 2

poco f

mezza voce

Alto Fl (3)

poco f

mezza voce

B♭ Cl 1

p

mezza voce

B♭ Cl 2

pp

p

mezza voce

Bass Cl (3)

rinf.

pp

poco f

Bsn 1

rinf.

tune with Bsn 2

rinf.

poco f

Bsn 2

rinf.

rinf.

poco f

tune with Bsn 1

Cbsn (3)

p

f

pp

poco f

Bass Tbn (3)

tune with Tuba

pp

poco f

Tuba

play or match pitch of natural harmonics of E♭ (valves 1245)

pp

poco f

tune with Bass Tbn (3)

alternate fingering: 5°/valve 3

BD

Crot

p

T Bells

Glock

Mar

Vib

Hp (sound)

Vln I

unis.

f

Vln II div.

pp

pp

(pp)

(pp)

Vla div.

pp

sotto voce

rinf.

finger 1/4-tone triple fifth with 1st finger on III and 2nd across II and I

f

p

poco f

sotto voce

rinf.

f

p

poco f

Vlc (sound)

unis.

f

pp

poco f

non div.

Cb div.

arco

pizz.

rinf.

arco

f

pp

poco f

rinf.

pizz.

arco

rinf.

f

pp

poco f

rinf.

103

Fl 1

Fl 2

Alto Fl (3)

Ob 1

Ob 2

EH (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Crot

Vln I div.

Vln II div.

Vla div.

Vlc div. (sound)

Cb div.

L

109

Fl 1
Fl 2
Alto Fl (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Cbsn (3)
B♭ Tpt 1
B♭ Tpt 2
B♭ Tpt 3
Tbn 1
Tbn 2
Bass Tbn (3)
Tuba
Timp
T Bells
Mar
Vib
Gongs
Hp (sound)
Vln I div.
Vln II div.
Vla
Vlc div. (sound)
Cb div.

mezza voce
sim.
sotto voce
pp
match Vlc, Bass Tbn (3)
11°/E♭
7°/E♭
con sord. (cup)
staccatissimo
via sord.
match Vlc
match Vlc con sord. (cup)
11°/B♭
staccatissimo (dry)
match Trp, Tbn
poco f
Ped.
from the string, sharp bite but not loud
fp
TUTTI unis. PLAY
(SING)
very slow portamento
each player place grace-notes freely
unis.
2°/IV
3°/IV
2°/I
match Vc
pizz.
arco
mezza voce

M

114

Fl 1

Fl 2

Alto Fl (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Cbsn (3)

Hn 1

Hn 2

Hn 3

Hn 4

Tbn 1

Tbn 2

Bass Tbn (3)

Tuba

Timp

Mar

Gongs

Hp (sound)

FROM HERE UNTIL b. 127 each string player is asked to PLAY and SING at the same time (softly, on the indicated syllables); the two parts differ slightly and are therefore written across two staves

Vln I tutti play & sing

Vln II tutti play & sing

Vla tutte play & sing

Vlc tutti play & sing

Cb tutti play & sing

122

Fl 1

Fl 2

Alto Fl (3)

Ob 1

Ob 2

EH (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

Tbn 1

Tbn 2

Bass Tbn (3)

Timp

T Bells

Mar

Gongs

Hp (sound)

Vln I tutti play & sing

Vln II tutti play & sing

Vla tutte play & sing

Vlc tutti play & sing

Cb tutti play & sing

tune to Fl, Cl, Strings

tune to Cl, Strings

tune to Fl, Cl, Strings

take Alto Trombone

Alto Trombone

small semitone 28 : 27 = -63c

three-quarter tone 12 : 11 = -151c

very small semitone 27 : 28 = +63c

three-quarter tone 11 : 12 = +151c

(SING)

Men: 8vb OR loco, ad lib.

(end of singing)

(TUTTI unis.)

quartertone 32 : 33 = +53c

large wholetone 8 : 7 = -231c

tune P5 above Vla place finger just past the nut

tune P5 below Vl II place finger just past the nut

full bows! poco al pont.

non div.

match Violas, sing very small semitone

N

130

Fl 2

Alto Fl (3)

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Hn 1

Hn 2

Hn 3

Hn 4

Alto Tbn (1)

Tbn 2

Tuba

Glock

Mar

Vib

Gongs

Hp (sound)

Vln I

Vln II

Vla

Vlc (sound)

Cb

O

P

137

Fl 2

Alto Fl (3)

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

Tuba

Timp

BD

Mar

Vib

Gongs

Hp (sound)

Vln I

Vln II

Vla

Vlc (sound)

Vlc (played)

Cb

very slight bend

match Cl2

tune consonant pure major third

match Vla, Vlc consonant major third

softly

mezza voce

poco f

non div.

ord.

(div. a 2)

sotto voce

unis. non div.

tune consonant pure major third above Cb

non div. tune pure major sixth

sonore

tune P4

tune pure major sixth

(tiny correction of intonation: tune with Contrabasses)

tune consonant with Vlc, Cb

(non div.)

tune pure minor third

match Vlc, one octave lower

Q

149

Fl 1

Fl 2

B♭ Cl 1

B♭ Cl 2

Bass Cl (3)

Bsn 1

Bsn 2

Cbsn (3)

Hn 1

Hn 2

Hn 3

Hn 4

Tuba

Hp (sound)

Vln II

Vla

Vlc (sound)

Cb

three-quarter tone 12 : 13 = +139c

sempre p

un poco cantando

mezza voce

tune consonant major third

small minor wholetone 9 : 10 = 182c

very subtle bend up and down by a sixth-tone (29c)

pizz.

arco

break freely

tune pure major sixth

tune pure minor third

R

154

Fl 1
Fl 2
Alto Fl (3)
Ob 1
Ob 2
EH (3)
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Bsn 1
Bsn 2
Hn 1
Hn 2
Hn 3
Hn 4
Timp
Mar
Hp (sound)
Vln I
Vln II
Vla
Vlc (sound)
Cb

pp, *un poco cantando*
sempre p
p, *un poco cantando*
poco f
tune consonant major third
match Hn 2
un poco cantando
mezza voce
small minor wholetone
9 : 10 = +182c
with Bass Cl, Marimba, Cb
(sounding)
tune pure
non div.
minor third
tune pure
major sixth
f sonore
sonore
tune P4 above Vl I
sul IV
arco
pizz.

S

159

Fl 1
Fl 2
Alto Fl (3)
Ob 1
B♭ Cl 1
B♭ Cl 2
Bass Cl (3)
Hn 1
Hn 2
Hn 3
Hn 4
Alto Tbn (1)
Tbn 2
Bass Tbn (3)
Tuba
Timp
Mar
Hp (sound)
Vln I
Vln II div.
Vla
Vlc (sound)
Cb

senza dim.
tune to Tuba, Cb
senza cresc.
pp flautando
poco f
(pizz.)

cc Plainsound Music Edition 2018 corrected June 2019

T

164

Fl 1
Fl 2
Alto Fl (3)
B♭ Cl 1
B♭ Cl 2
Hn 1
Hn 2
Hn 3
Hn 4
B♭ Tpt 1
B♭ Tpt 2
B♭ Tpt 3
Alto Tbn (1)
Tbn 2
Bass Tbn (3)
Tuba
Gongs
Vln I
Vln II
Vla
Vlc (sound)
Cb

170

Crot
T Bells
Vib
Gongs
Vln I div.
Vln II div.
Vla div.
Vlc div. (sound)
Cb

Berlin, 30. January 2018
corrected 6 June 2019