Wolfgang von Schweinitz

Plainsound Forest Song

Trio in 47-limit just intonation
for Violin, customized French Horn, and 6-valve Tuba in F

op. 68
(2022-2023)

for Sara Cubarsi, Christine Chapman, and Maxime Morel

SCORE
and VIOLIN + TUBA iPad performance part

PLAINSOUND MUSIC EDITION

PROGRAM NOTE

The ‘Plainsound Forest Song’ was composed in the summer weeks of 2022 and 2023 for Sara Cubarsi, Christine Chapman, and Maxime Morel. PART 1 features the microtonal potential of the 6-valve F-Tuba and of Christine Chapman’s customized French Horn which is equipped with an additional quartertone valve. The violin part was inspired by Sara Cubarsi’s extraordinary expertise in the field of microtonal just intonation, and in PART 2 the violin explores some novel melodies and harmonies associated with pitches that are tuned to the very high overtones °29, °31, °37, °41, °43, and °47.

PERFORMANCE DURATION
circa 43 minutes

PART 1 : circa 14 minutes
PART 2 : circa 28 ½ minutes

PART 2 may also be performed on its own.

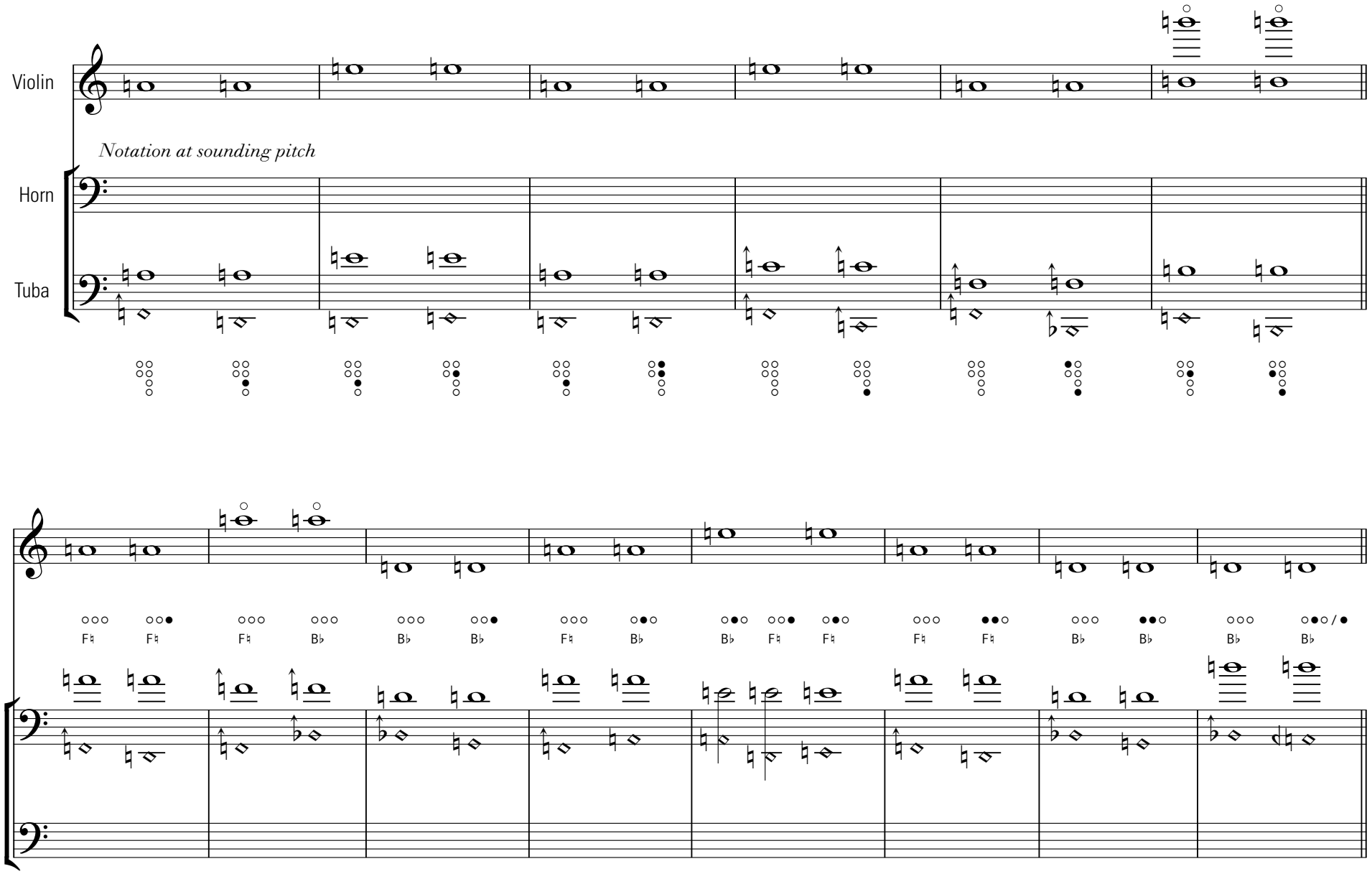
TUNING INSTRUCTIONS

VIOLIN: The strings are tuned in non-tempered Pythagorean Fifths (frequency ratio 3/2).

Customized FRENCH HORN with 4 valves:
Before carrying out the step-by-step tuning procedure, please make sure that you have a simple and efficient method to restore all the standard valve slide positions, either by marking them, by measuring them, or by retuning them by ear with a synthesizer or piano in Equal Temperament. – The open F horn is tuned with harmonics 5 & 10 to the pitch of the violin's A string. The open B-flat horn is tuned with harmonics 3 & 6 to the pitches of the harmonics 4 & 8 of the open F horn. The F horn's 3rd valve slide (D horn) is tuned with harmonics 6 & 12 to the harmonics 5 & 10 of the open F horn. The B-flat horn's 3rd valve slide (G horn) is tuned with harmonics 6 & 12 to harmonics 5 & 10 of the open B-flat horn. The B-flat horn's 2nd valve slide (A horn) is tuned with harmonic 8 to harmonic 10 of the open F horn (or to the pitch of the violin's A string). The F horn's 2nd valve slide (E horn) is tuned with harmonic 8 to harmonic 6 of the A horn or to harmonic 9 of the D horn. The F horn's 1st valve slide (for the 17-limit E-flat horn) is tuned with harmonics 6 & 12 by employing the valve combination 1+2 (to get another identical D horn) to harmonics 5 & 10 of the open F horn (or to the pitch of the violin's A string). The B-flat horn's 1st valve slide (for the 17-limit A-flat horn) is tuned with harmonics 6 & 12 by employing the valve combination 1+2 (to get another identical G horn) to harmonics 5 & 10 of the open B-flat horn (or to the pitch of the violin's D-string). The horn must be equipped with a 4th valve (stopping valve) with an extra-short custom-built slide to lower the pitch of the open B-flat horn by a 31-limit Quartertone (31/30, or 57 cents) by prolonging the B-flat horn's tube length by 1/30 of the open horn's length (circa 10 cm). The quartertone valve slide is tuned with harmonic 11 by employing the valve combination 2+4 (on the B-flat side of the horn) to harmonic 10 of the open B-flat horn. – Please see next page!

6-valve TUBA in F:
Before carrying out the step-by-step tuning procedure, please make sure that you have a simple and efficient method to restore all the standard valve slide positions, either by marking them, by measuring them, or by retuning them by ear with a synthesizer or piano in Equal Temperament. – The open horn (5-limit F comma up) is tuned with harmonic 5 to the violin's A string. The 3rd valve slide (D) is tuned with harmonic 6 to harmonic 5 of the open horn. The 2nd valve slide (E) is tuned with harmonic 8 to harmonic 9 played with valve 3. The 1st valve slide (for the utonal 17-limit E-flat) is tuned by employing valve combination 1+2 (to get another identical D horn) with harmonic 6 to harmonic 5 of the open horn. The 4th valve slide (5-limit C comma up) is tuned with harmonic 8 to the open horn's harmonic 6. Then the 5th valve slide is tuned by employing valve combination 4+5 (5-limit B-flat comma up) with harmonics 6 & 9 to harmonics 4 & 6 of the open horn. The 6th valve slide is tuned with valve combination 4+6 (B) with harmonics 4 & 8 to harmonics 3 & 6 played with valve 2. – Please see next page!

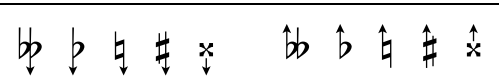
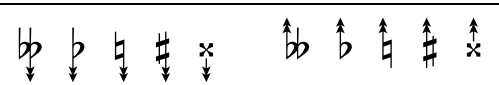
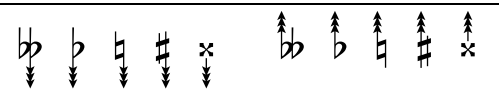
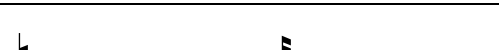
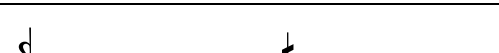
TUNING PROCEDURE



Microtonal ACCIDENTALS for JUST INTONATION

The revised Helmholtz-Ellis JI Pitch Notation HEJI 2020

The intended tuning of each note is spelled out in this score with the following harmonically defined accidentals:

Prime Harmonic 3		Pythagorean series of non-tempered perfect fifths	
Prime Harmonic 5		Alteration by one syntonic comma (81/80)	21.5 cents
Prime Harmonic 5		Alteration by two syntonic commas	43.0 cents
Prime Harmonic 5		Alteration by three syntonic commas	64.5 cents
Prime Harmonic 7		Alteration by one septimal comma (64/63)	27.3 cents
Prime Harmonic 7		Alteration by two septimal commas	54.5 cents
Prime Harmonic 11		Alteration by one undecimal quartertone (33/32)	53.3 cents
Prime Harmonic 13		Alteration by one tridecimal thirdtone (27/26)	65.3 cents

Prime Harmonic 17		Alteration by one 17-limit schisma (2187/2176)	8.7 cents
Prime Harmonic 19		Alteration by one 19-limit schisma (513/512)	3.4 cents
Prime Harmonic 23		Alteration by one 23-limit comma (736/729)	16.5 cents
Prime Harmonic 29		Alteration by one 29-limit sixthtone (261/256)	33.5 cents
Prime Harmonic 31		**Alteration by one 31-limit quartertone (32/31)**	**55.0 cents**
Prime Harmonic 37		**Alteration by one 37-limit quartertone (37/36)**	**47.4 cents**
Prime Harmonic 41		Alteration by one 41-limit comma (82/81)	21.2 cents
Prime Harmonic 43		Alteration by one 43-limit comma (129/128)	13.5 cents
Prime Harmonic 47		Alteration by one 47-limit quartertone (752/729)	53.8 cents

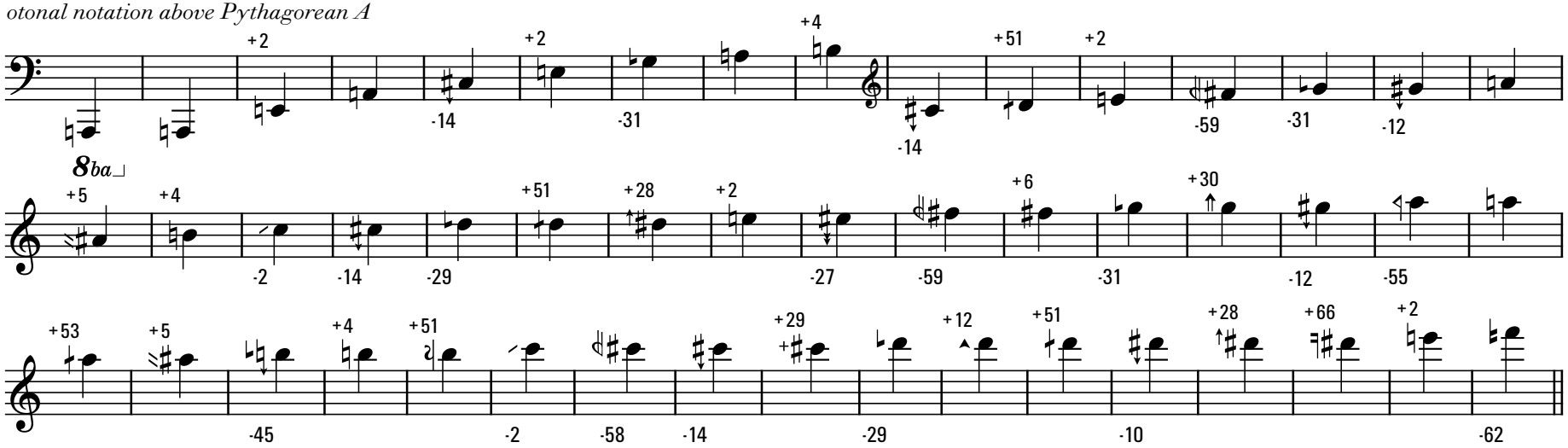
CENTS: The HEJI accidentals may be combined with an indication of their deviation in cents from Equal Temperament.

These accidentals for Just Intonation were devised in collaboration with Marc Sabat in the early 2000s
and revised in 2020 by Marc Sabat and Thomas Nicholson in collaboration with Catherine Lamb and M.O. Abbott

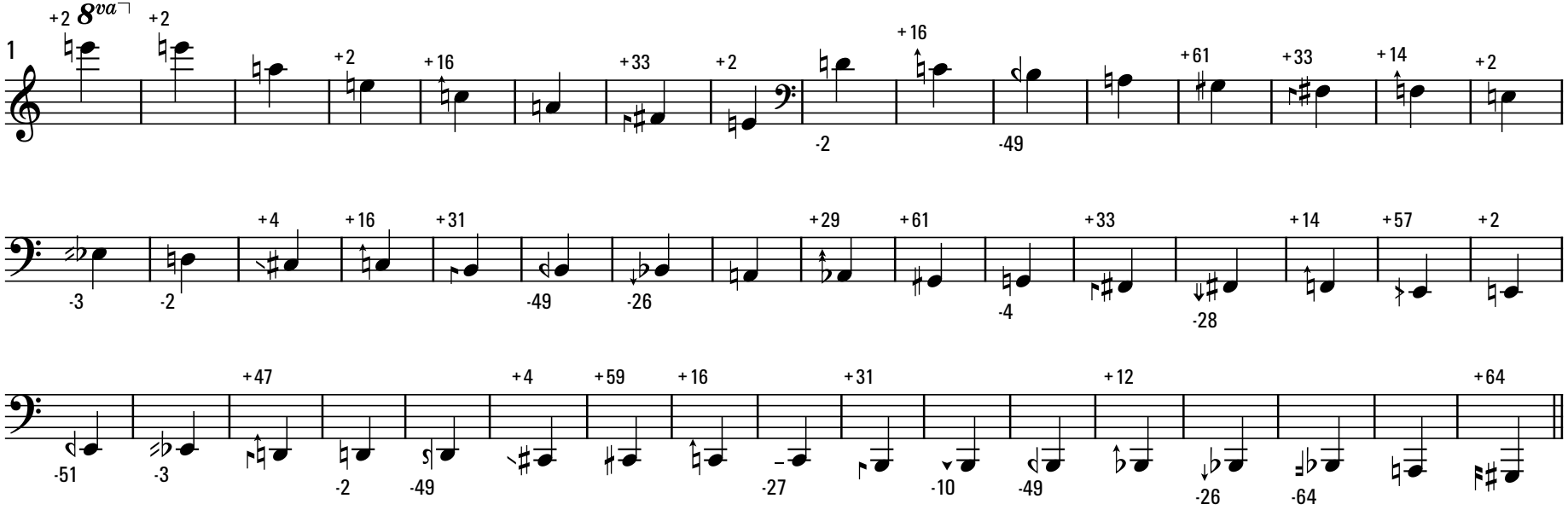
The Helmholtz-Ellis JI Pitch Notation HEJI 2020

Harmonic / Subharmonic series º1-º49 notated by modifications of Pythagorean notes

otonal notation above Pythagorean A



utonal notation below Pythagorean E

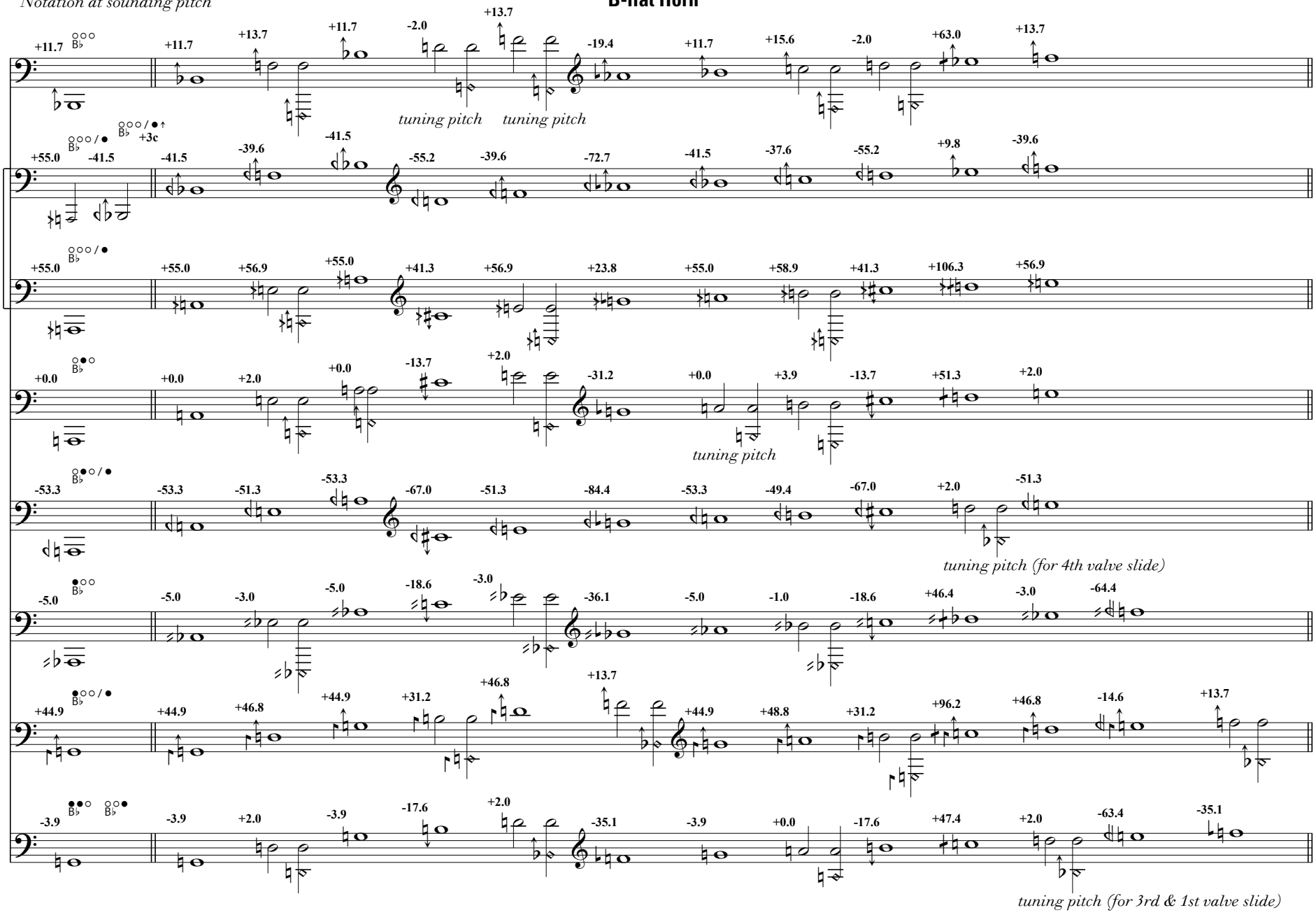


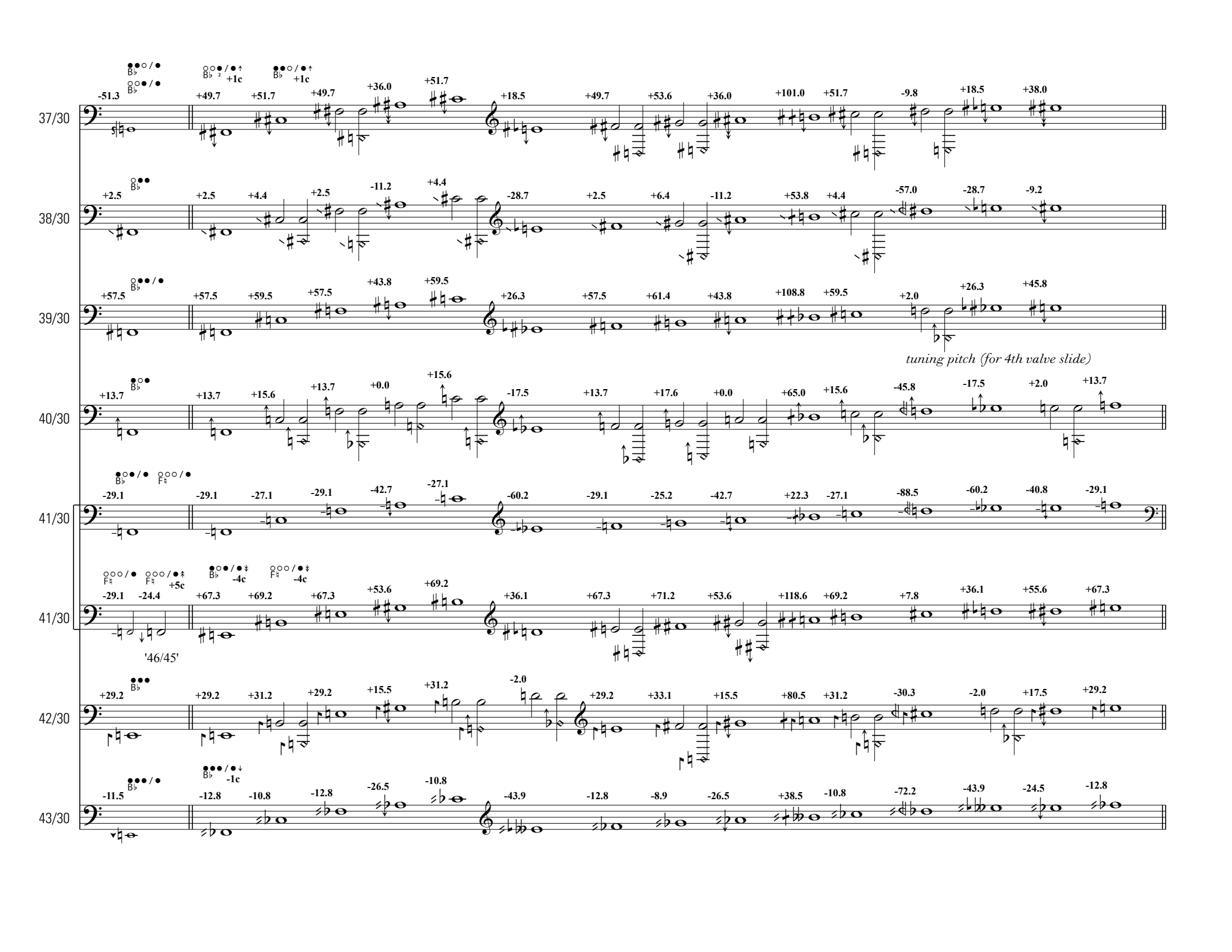
Microtonal Pitch Repertoire of the 4-Valve French Horn

with valve slides 1, 2, 3, and 4 tuned to the rational proportions 2/15 = 4/30, 1/15 = 2/30, 1/5 = 6/30, and 1/30 of the open B-flat horn's length

Notation at sounding pitch

B-flat Horn



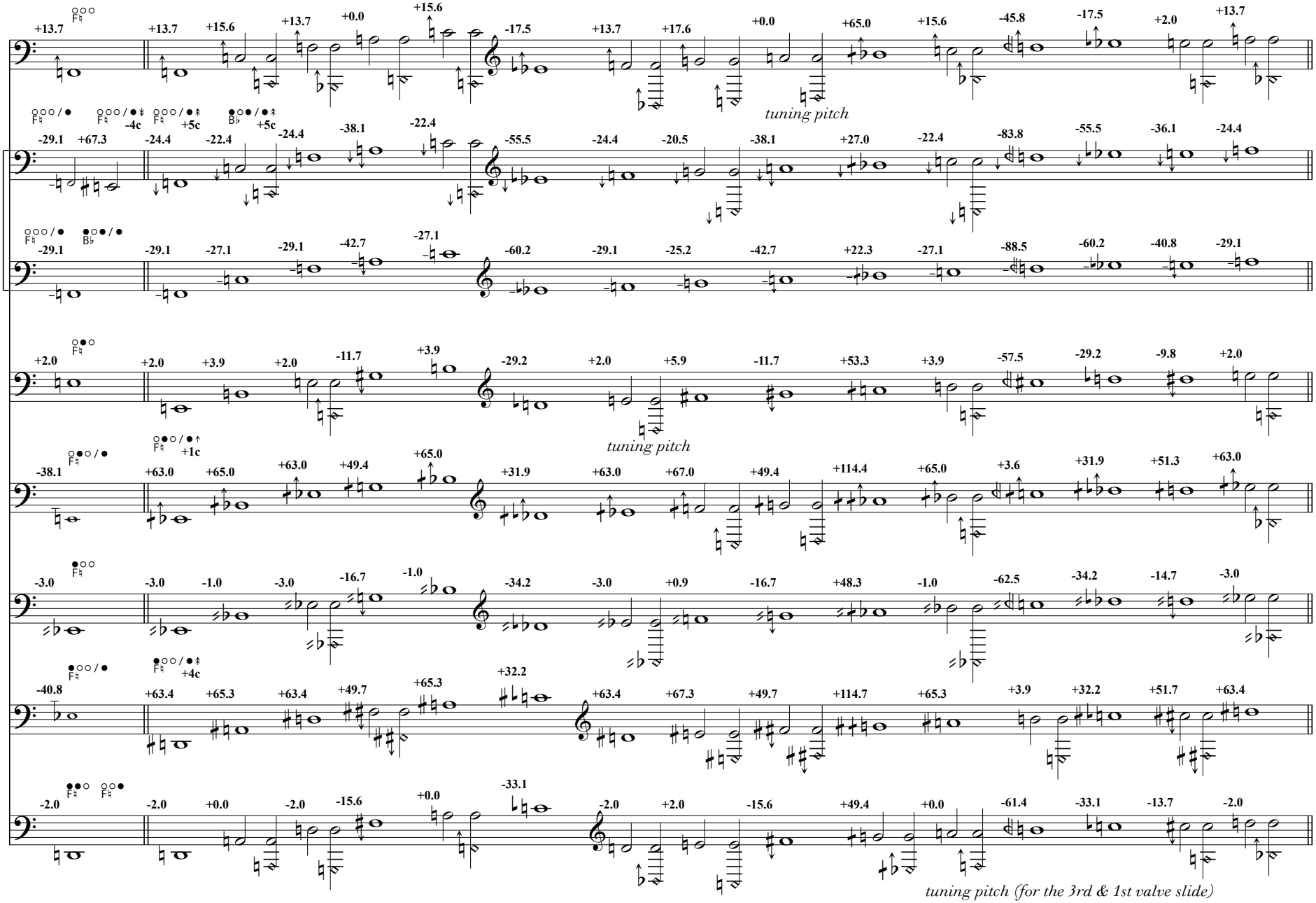

37/30
38/30
39/30
tuning pitch (for 4th valve slide)
40/30
41/30
41/30
'46/45'
42/30
43/30

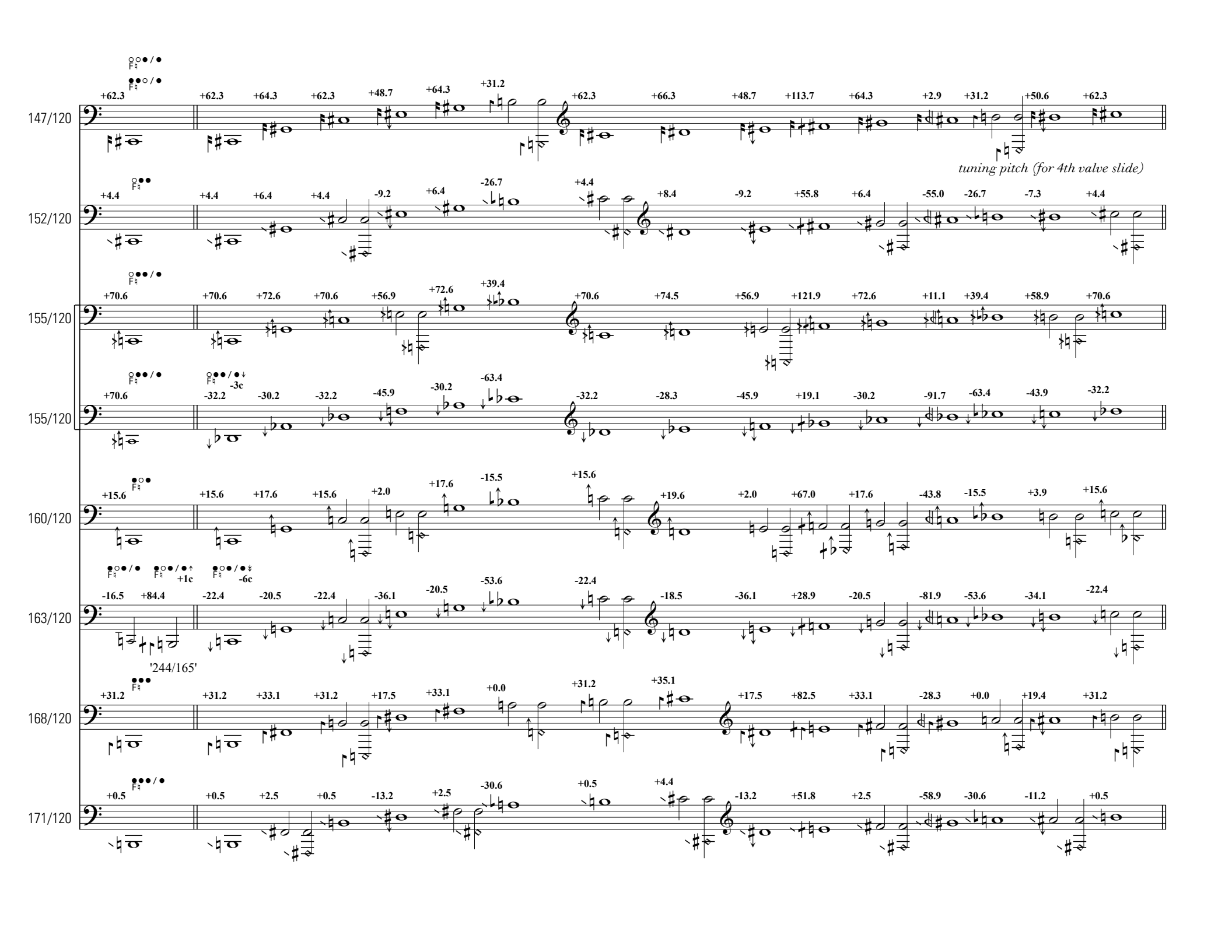
Microtonal Pitch Repertoire of the 4-Valve French Horn

with valve slides 1, 2, 3, and 4 tuned to the rational proportions 2/15 = 4/30, 1/15 = 2/30, 1/5 = 6/30, and 1/40 of the open F horn's length

Notation at sounding pitch

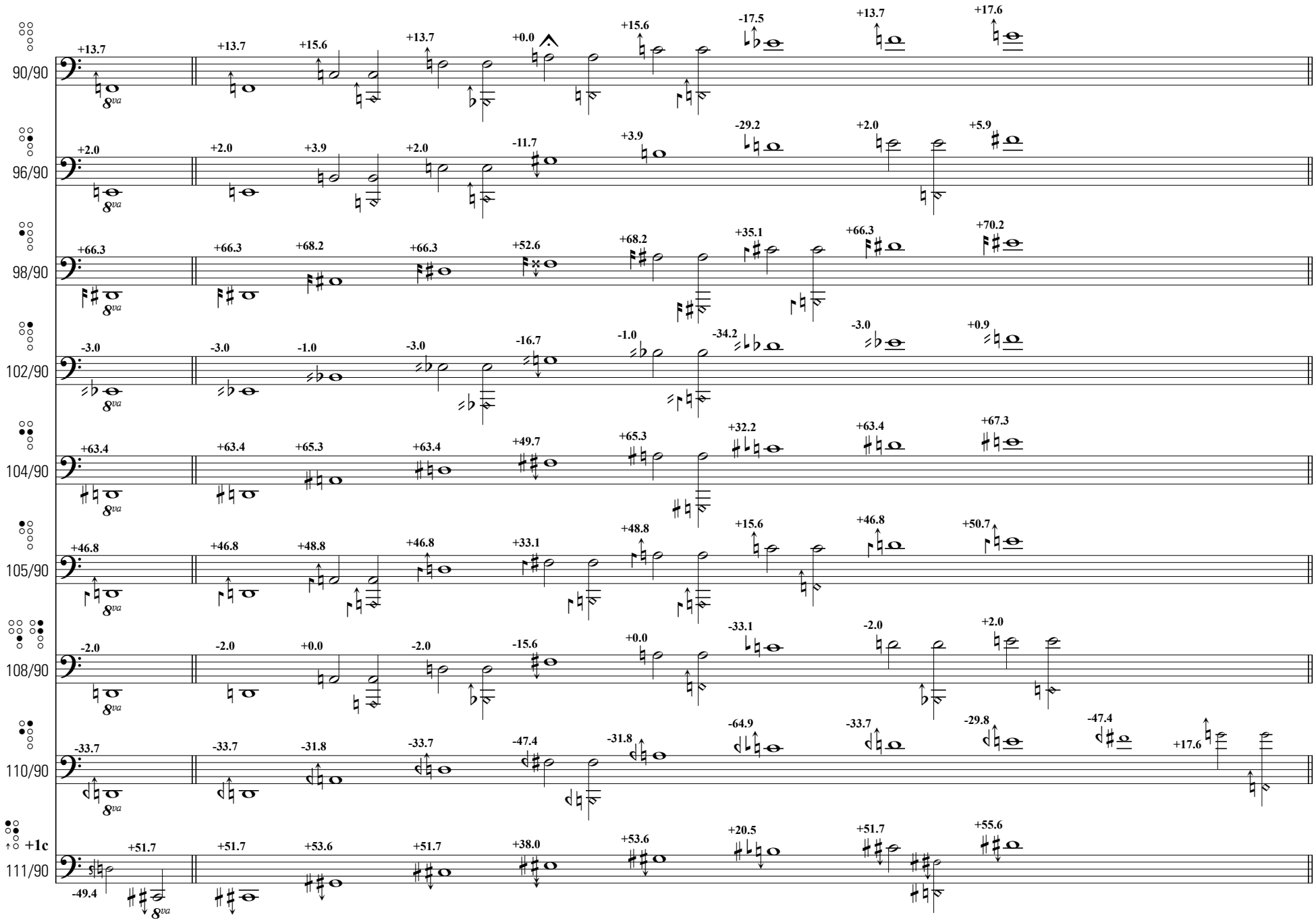
F Horn

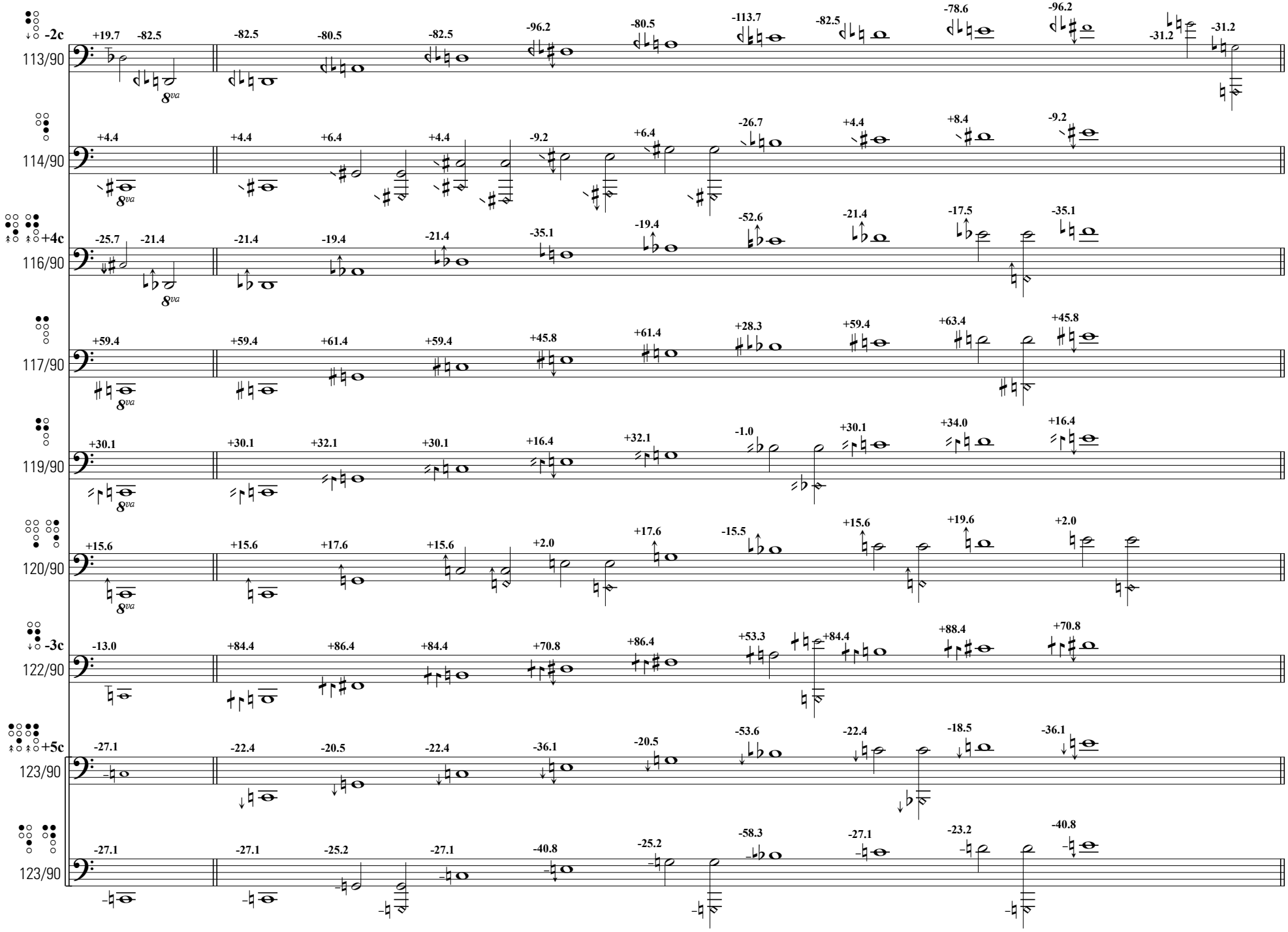


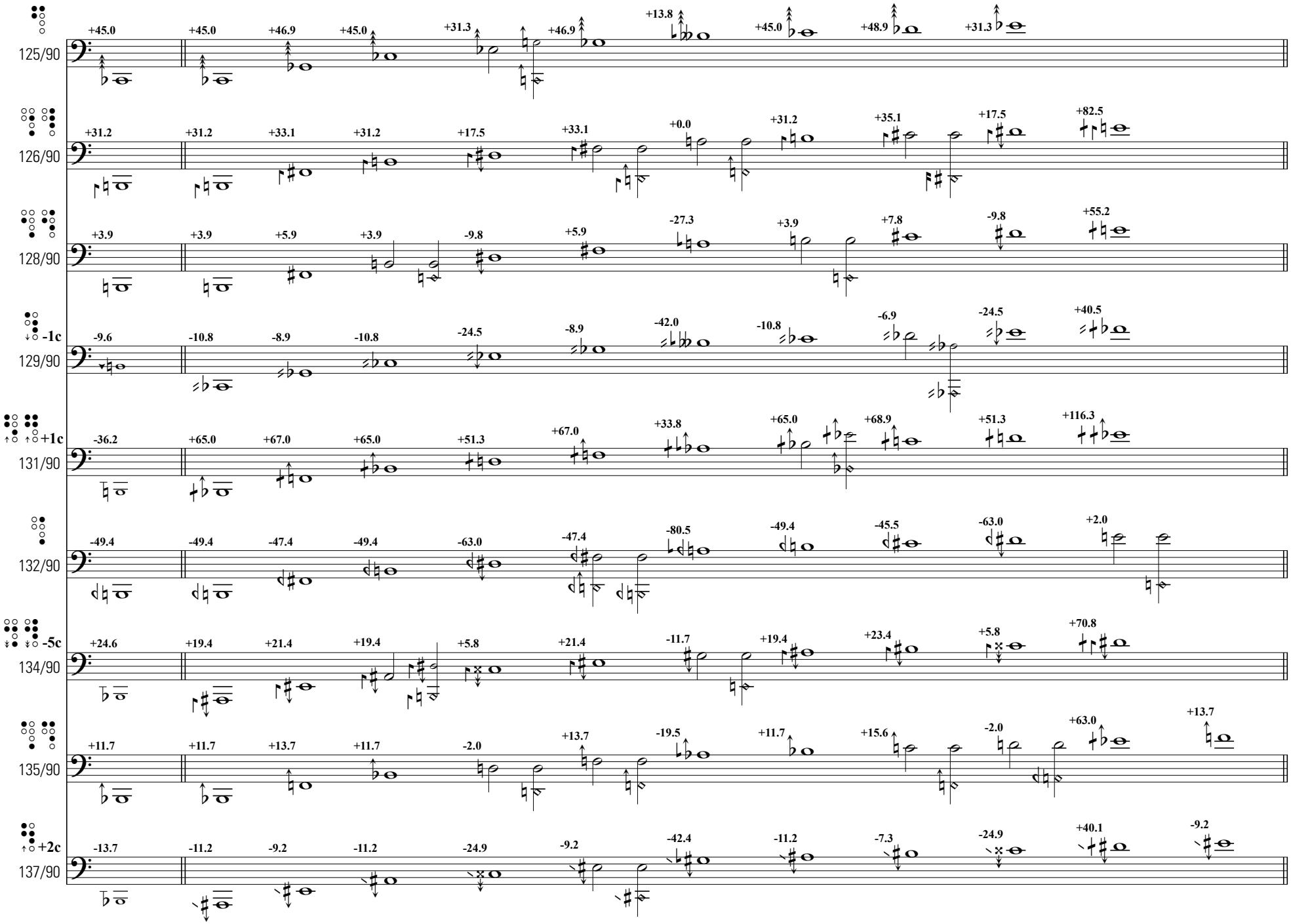

147/120
152/120
155/120
155/120
160/120
163/120
168/120
171/120
tuning pitch (for 4th valve slide)
'244/165'

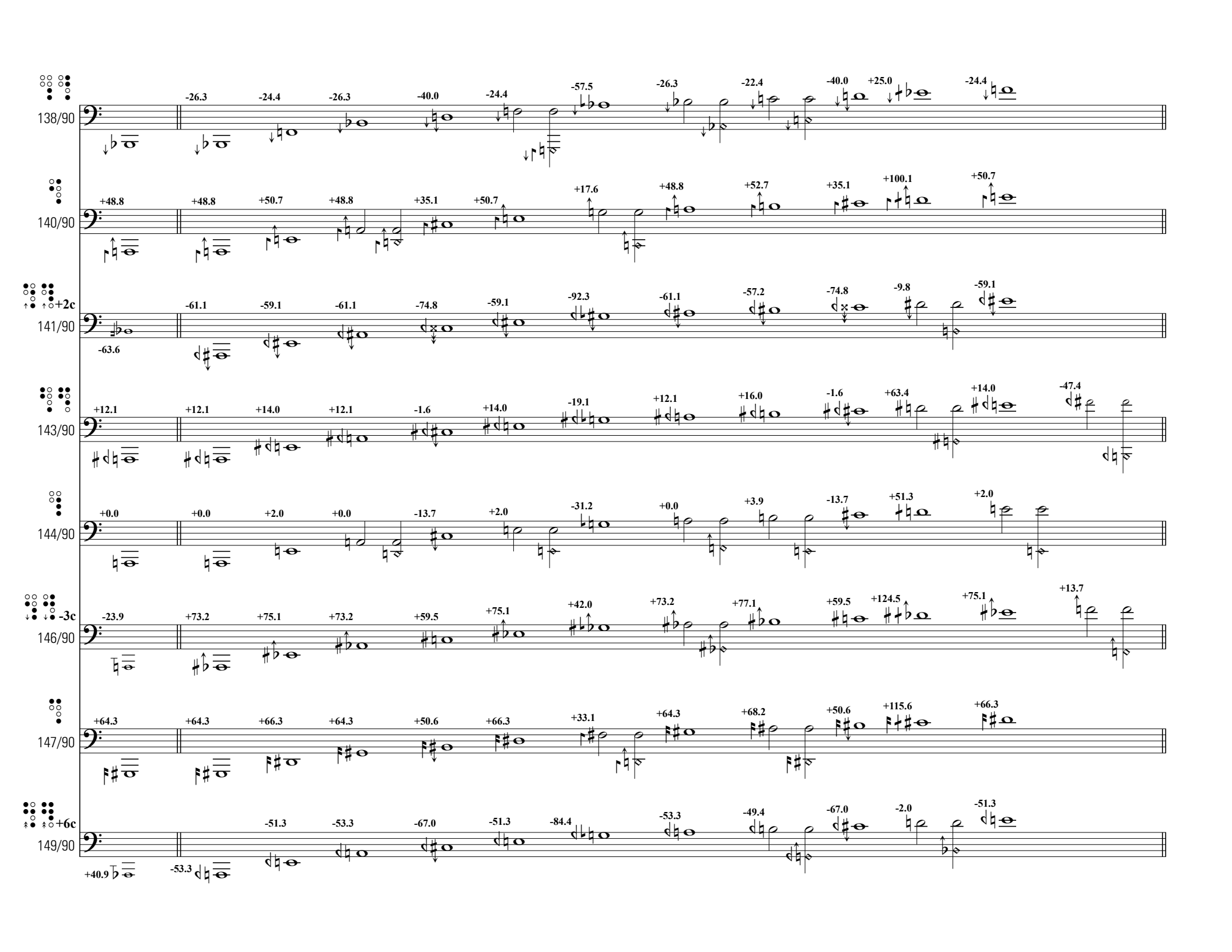
Microtonal Pitch Repertoire of the 6-Valve F-Tuba

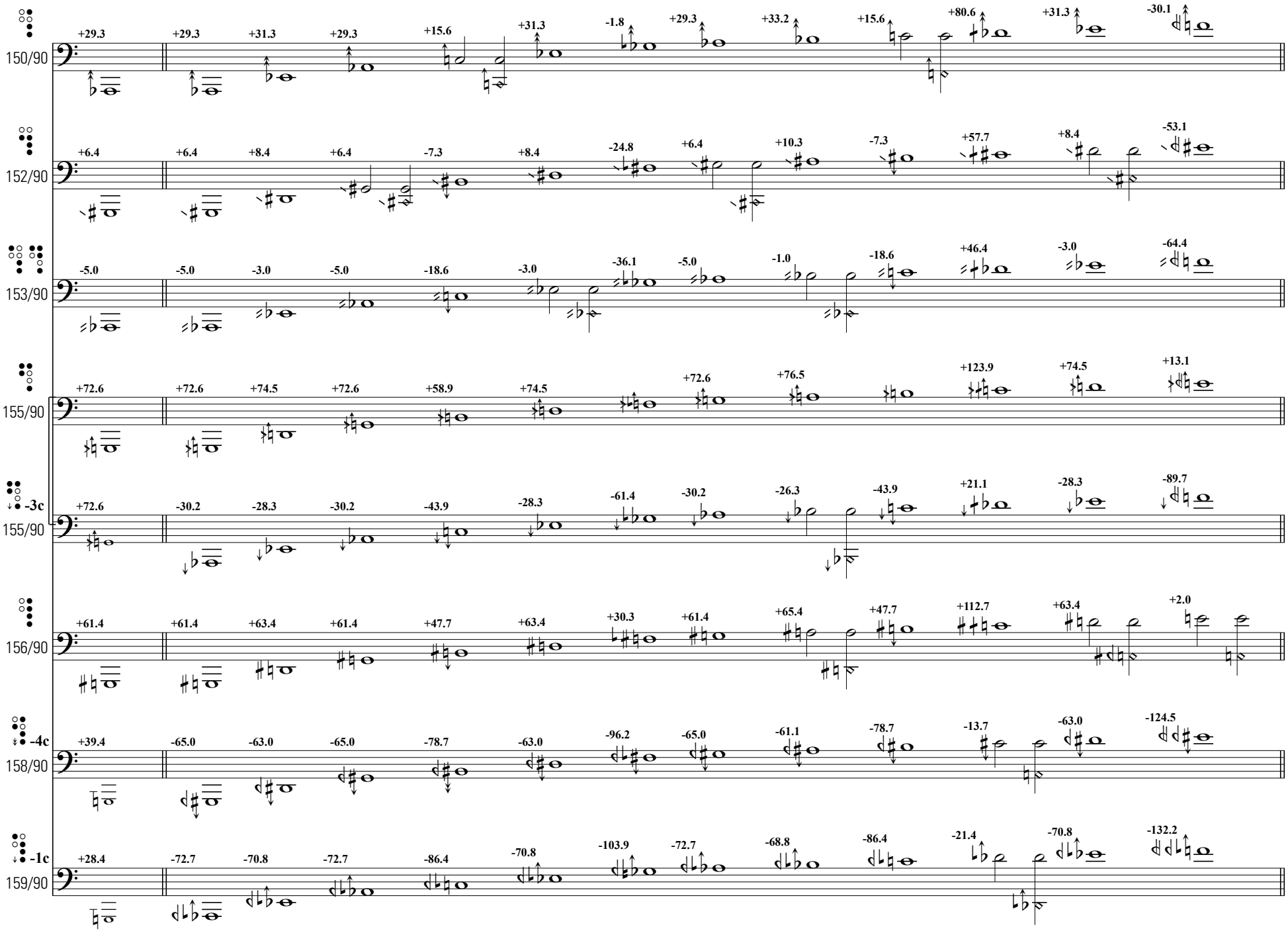
with valve slides 1, 2, 3, 4, 5, and 6 tuned to the rational proportions 2/15 = 12/90, 1/15 = 6/90, 1/5 = 18/90, 1/3 = 30/90, 1/6 = 15/90, and 4/45 = 8/90 of the open horn's length

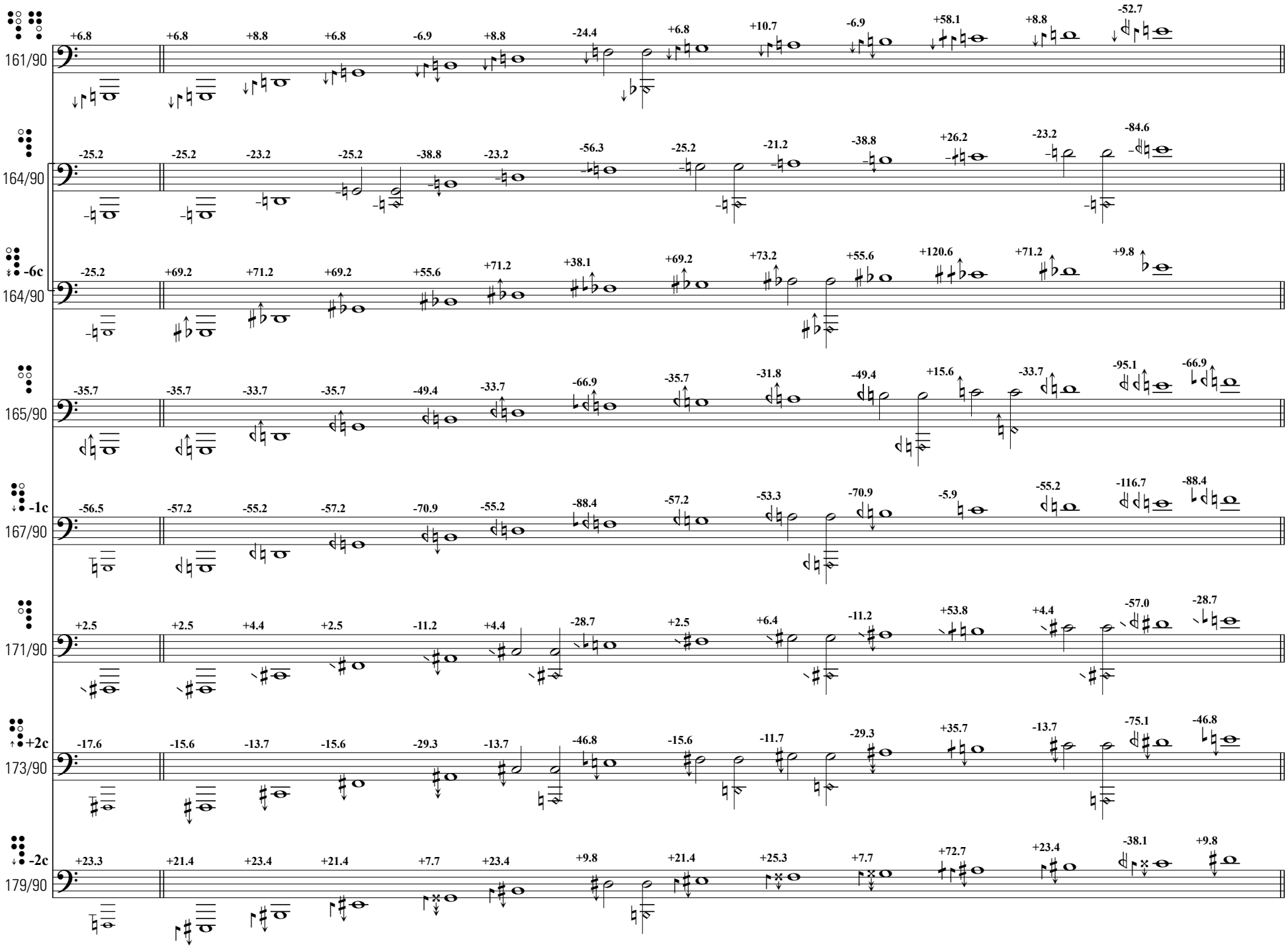



-2c
113/90
+19.7 -82.5 -82.5 -80.5 -82.5 -96.2 -80.5 -113.7 -82.5 -78.6 -96.2 -31.2 -31.2
8va
114/90
+4.4 +4.4 +6.4 +4.4 -9.2 +6.4 -26.7 +4.4 +8.4 -9.2
8va
+4c
116/90
-25.7 -21.4 -21.4 -19.4 -21.4 -35.1 -19.4 -52.6 -21.4 -17.5 -35.1
8va
117/90
+59.4 +59.4 +61.4 +59.4 +45.8 +61.4 +28.3 +59.4 +63.4 +45.8
8va
119/90
+30.1 +30.1 +32.1 +30.1 +16.4 +32.1 -1.0 +30.1 +34.0 +16.4
8va
120/90
+15.6 +15.6 +17.6 +15.6 +2.0 +17.6 -15.5 +15.6 +19.6 +2.0
8va
-3c
122/90
-13.0 +84.4 +86.4 +84.4 +70.8 +86.4 +53.3 +84.4 +88.4 +70.8
+5c
123/90
-27.1 -22.4 -20.5 -22.4 -36.1 -20.5 -53.6 -22.4 -18.5 -36.1
123/90
-27.1 -27.1 -25.2 -27.1 -40.8 -25.2 -58.3 -27.1 -23.2 -40.8


125/90
+45.0 +45.0 +46.9 +45.0 +31.3 +46.9 +13.8 +45.0 +48.9 +31.3
126/90
+31.2 +31.2 +33.1 +31.2 +17.5 +33.1 +0.0 +31.2 +35.1 +17.5 +82.5
128/90
+3.9 +3.9 +5.9 +3.9 -9.8 +5.9 -27.3 +3.9 +7.8 -9.8 +55.2
-1c
129/90
-9.6 -10.8 -8.9 -10.8 -24.5 -8.9 -42.0 -10.8 -6.9 -24.5 +40.5
+1c
131/90
-36.2 +65.0 +67.0 +65.0 +51.3 +67.0 +33.8 +65.0 +68.9 +51.3 +116.3
132/90
-49.4 -49.4 -47.4 -49.4 -63.0 -47.4 -80.5 -49.4 -45.5 -63.0 +2.0
-5c
134/90
+24.6 +19.4 +21.4 +19.4 +5.8 +21.4 -11.7 +19.4 +23.4 +5.8 +70.8
135/90
+11.7 +11.7 +13.7 +11.7 -2.0 +13.7 -19.5 +11.7 +15.6 -2.0 +63.0 +13.7
+2c
137/90
-13.7 -11.2 -9.2 -11.2 -24.9 -9.2 -42.4 -11.2 -7.3 -24.9 +40.1 -9.2


138/90
-26.3 -24.4 -26.3 -40.0 -24.4 -57.5 -26.3 -22.4 -40.0 +25.0 -24.4
140/90
+48.8 +48.8 +50.7 +48.8 +35.1 +50.7 +17.6 +48.8 +52.7 +35.1 +100.1 +50.7
+2c
141/90
-63.6 -61.1 -59.1 -61.1 -74.8 -59.1 -92.3 -61.1 -57.2 -74.8 -9.8 -59.1
143/90
+12.1 +12.1 +14.0 +12.1 -1.6 +14.0 -19.1 +12.1 +16.0 -1.6 +63.4 +14.0 -47.4
144/90
+0.0 +0.0 +2.0 +0.0 -13.7 +2.0 -31.2 +0.0 +3.9 -13.7 +51.3 +2.0
-3c
146/90
-23.9 +73.2 +75.1 +73.2 +59.5 +75.1 +42.0 +73.2 +77.1 +59.5 +124.5 +75.1 +13.7
147/90
+64.3 +64.3 +66.3 +64.3 +50.6 +66.3 +33.1 +64.3 +68.2 +50.6 +115.6 +66.3
+6c
149/90
+40.9 -53.3 -51.3 -53.3 -67.0 -51.3 -84.4 -53.3 -49.4 -67.0 -2.0 -51.3


150/90
+29.3 +29.3 +31.3 +29.3 +15.6 +31.3 -1.8 +29.3 +33.2 +15.6 +80.6 +31.3 -30.1
152/90
+6.4 +6.4 +8.4 +6.4 -7.3 +8.4 -24.8 +6.4 +10.3 -7.3 +57.7 +8.4 -53.1
153/90
-5.0 -5.0 -3.0 -5.0 -18.6 -3.0 -36.1 -5.0 -1.0 -18.6 +46.4 -3.0 -64.4
155/90
+72.6 +72.6 +74.5 +72.6 +58.9 +74.5 +72.6 +76.5 +123.9 +74.5 +13.1
-3c
155/90
+72.6 -30.2 -28.3 -30.2 -43.9 -28.3 -61.4 -30.2 -26.3 -43.9 +21.1 -28.3 -89.7
156/90
+61.4 +61.4 +63.4 +61.4 +47.7 +63.4 +30.3 +61.4 +65.4 +47.7 +112.7 +63.4 +2.0
-4c
158/90
+39.4 -65.0 -63.0 -65.0 -78.7 -63.0 -96.2 -65.0 -61.1 -78.7 -13.7 -63.0 -124.5
-1c
159/90
+28.4 -72.7 -70.8 -72.7 -86.4 -70.8 -103.9 -72.7 -68.8 -86.4 -21.4 -70.8 -132.2


161/90
+6.8 +6.8 +8.8 +6.8 -6.9 +8.8 -24.4 +6.8 +10.7 -6.9 +58.1 +8.8 -52.7
164/90
-25.2 -25.2 -23.2 -25.2 -38.8 -23.2 -56.3 -25.2 -21.2 -38.8 +26.2 -23.2 -84.6
-6c
164/90
-25.2 +69.2 +71.2 +69.2 +55.6 +71.2 +38.1 +69.2 +73.2 +55.6 +120.6 +71.2 +9.8
165/90
-35.7 -35.7 -33.7 -35.7 -49.4 -33.7 -66.9 -35.7 -31.8 -49.4 +15.6 -33.7 -95.1 -66.9
-1c
167/90
-56.5 -57.2 -55.2 -57.2 -70.9 -55.2 -88.4 -57.2 -53.3 -70.9 -5.9 -55.2 -116.7 -88.4
171/90
+2.5 +2.5 +4.4 +2.5 -11.2 +4.4 -28.7 +2.5 +6.4 -11.2 +53.8 +4.4 -57.0 -28.7
+2c
173/90
-17.6 -15.6 -13.7 -15.6 -29.3 -13.7 -46.8 -15.6 -11.7 -29.3 +35.7 -13.7 -75.1 -46.8
-2c
179/90
+23.3 +21.4 +23.4 +21.4 +7.7 +23.4 +9.8 +21.4 +25.3 +7.7 +72.7 +23.4 -38.1 +9.8

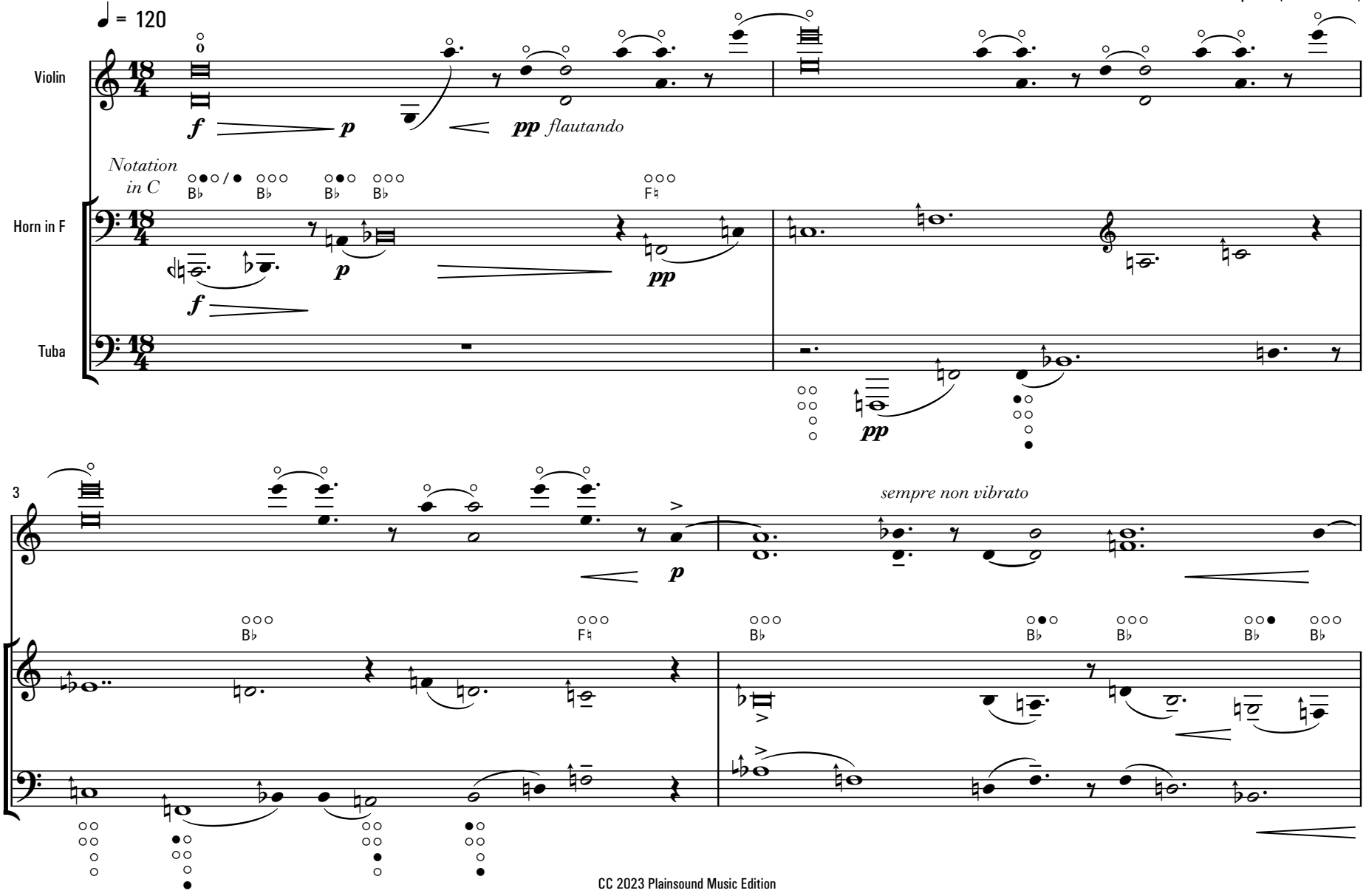
Plainsound Forest Song

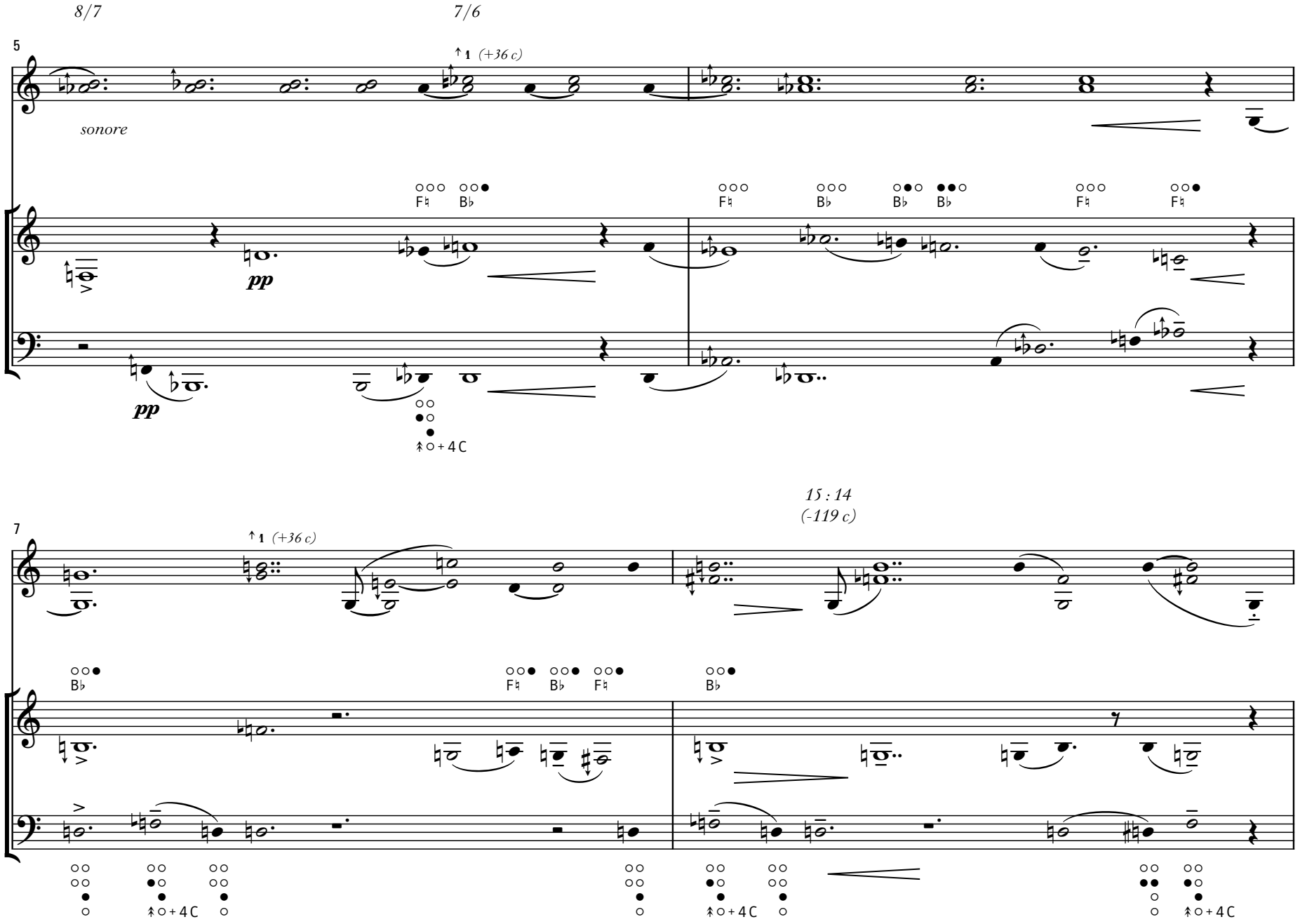
for Sara Cubarsi, Christine Chapman, and Maxime Morel

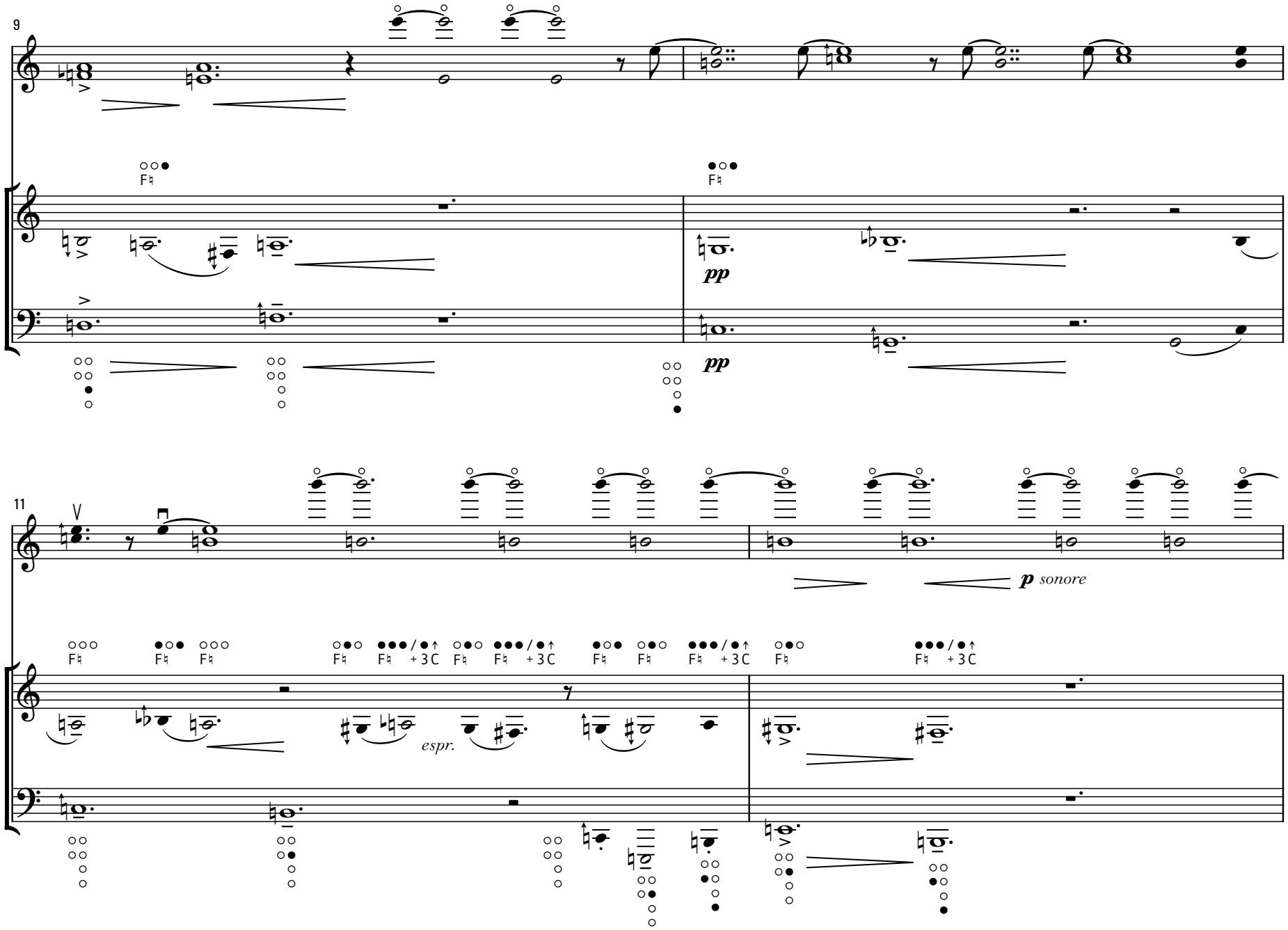
Wolfgang von Schweinitz
op. 68 (2022-2023)

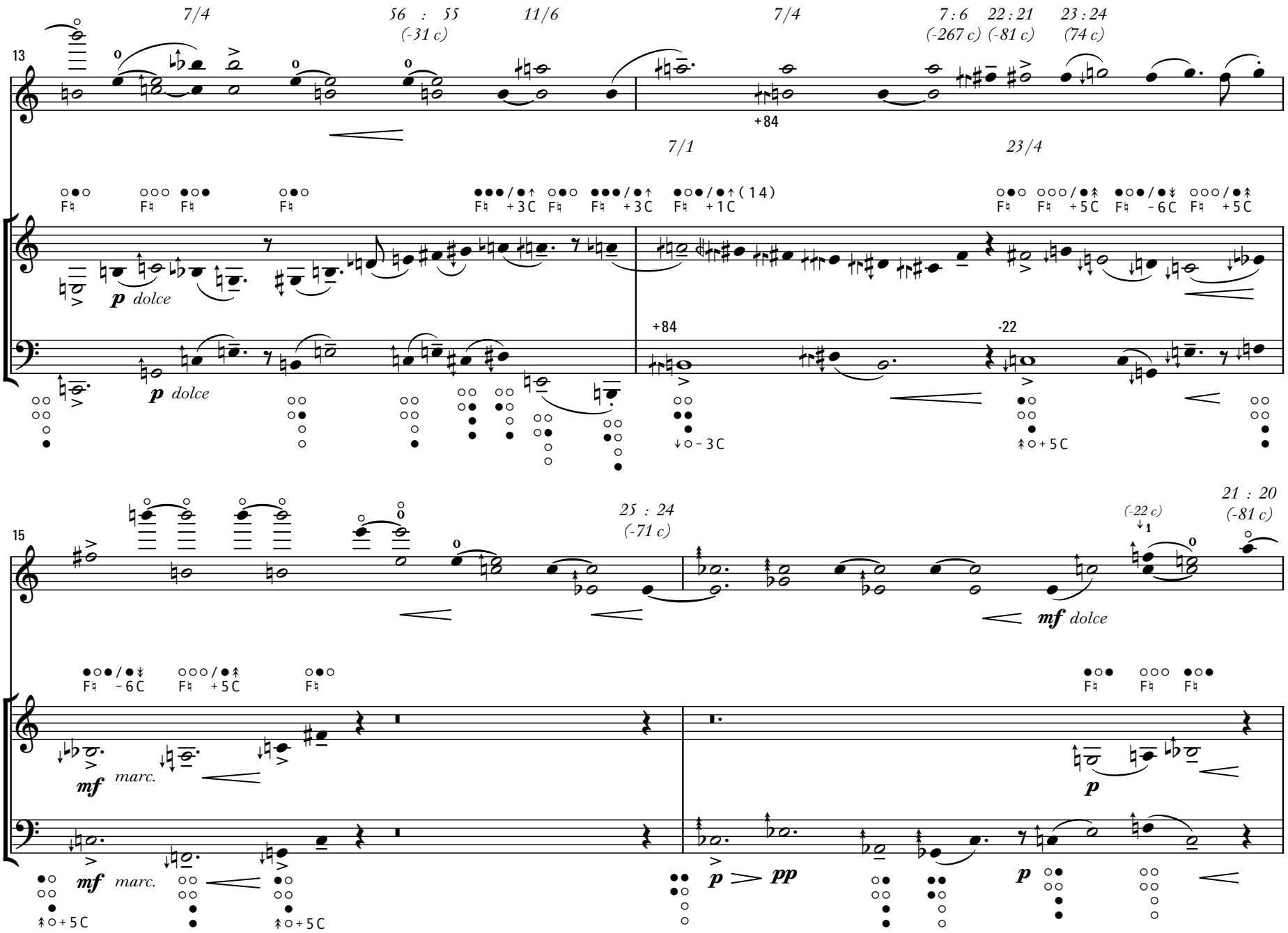
PART 1

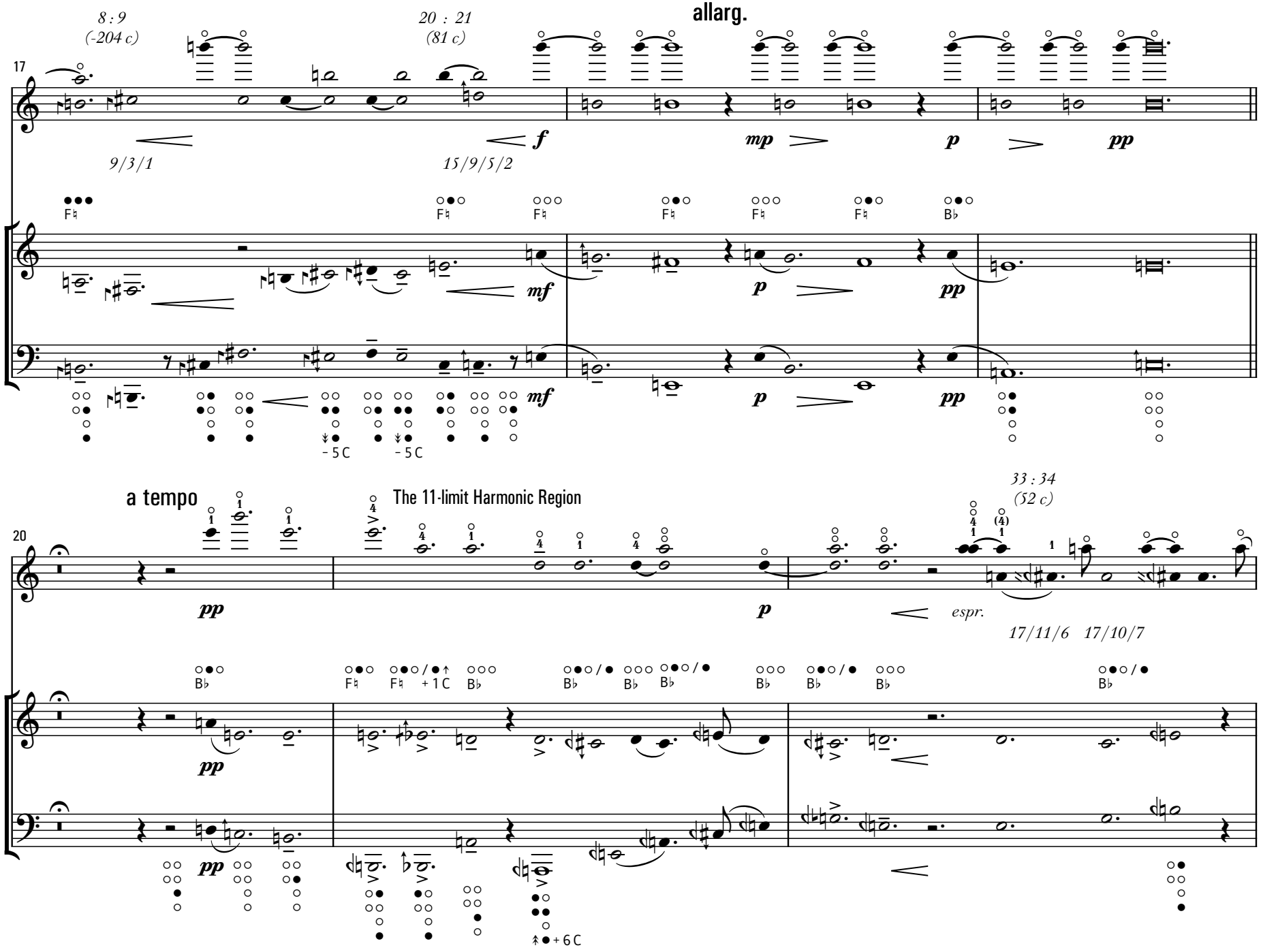
♩ = 120

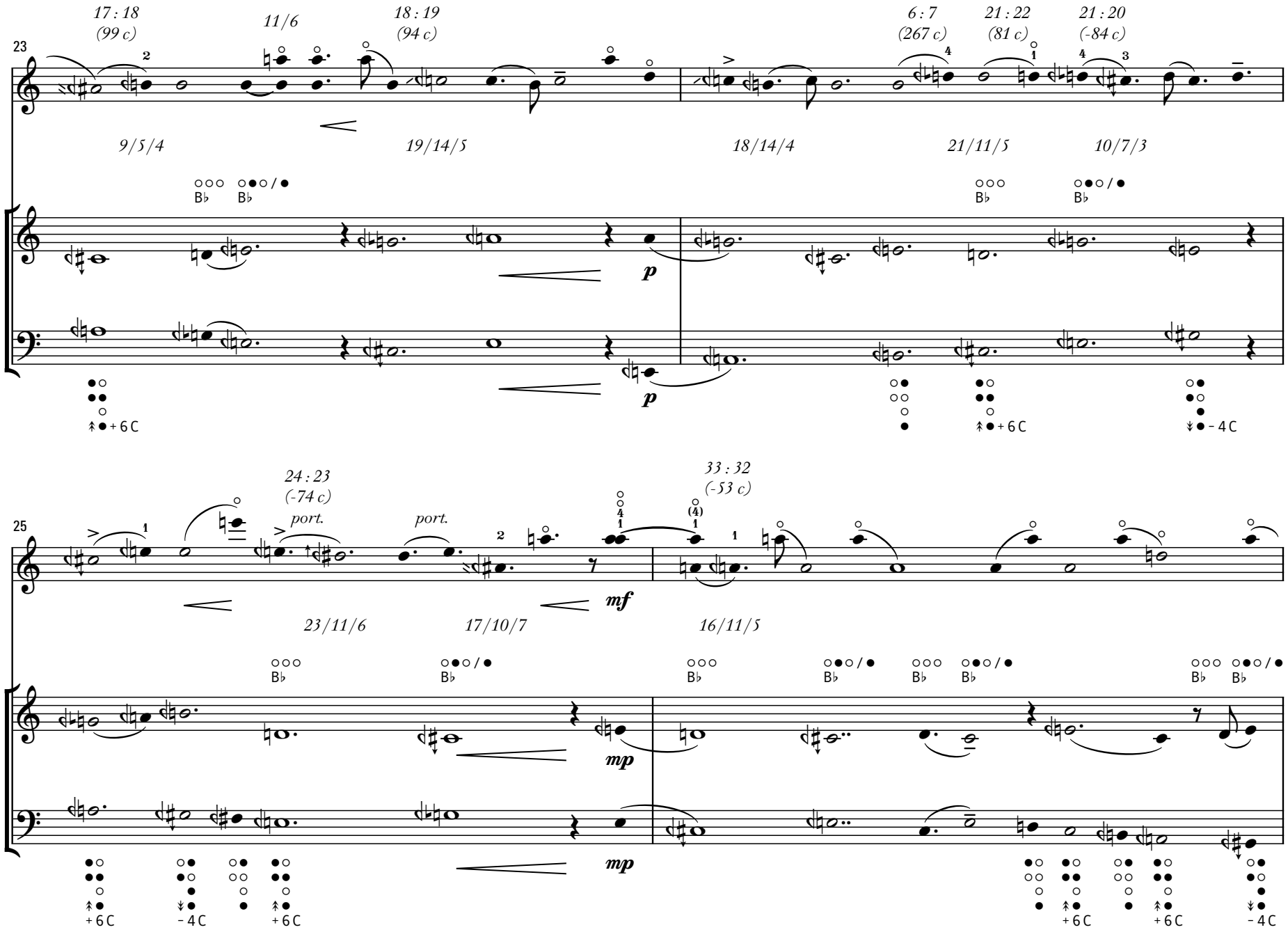


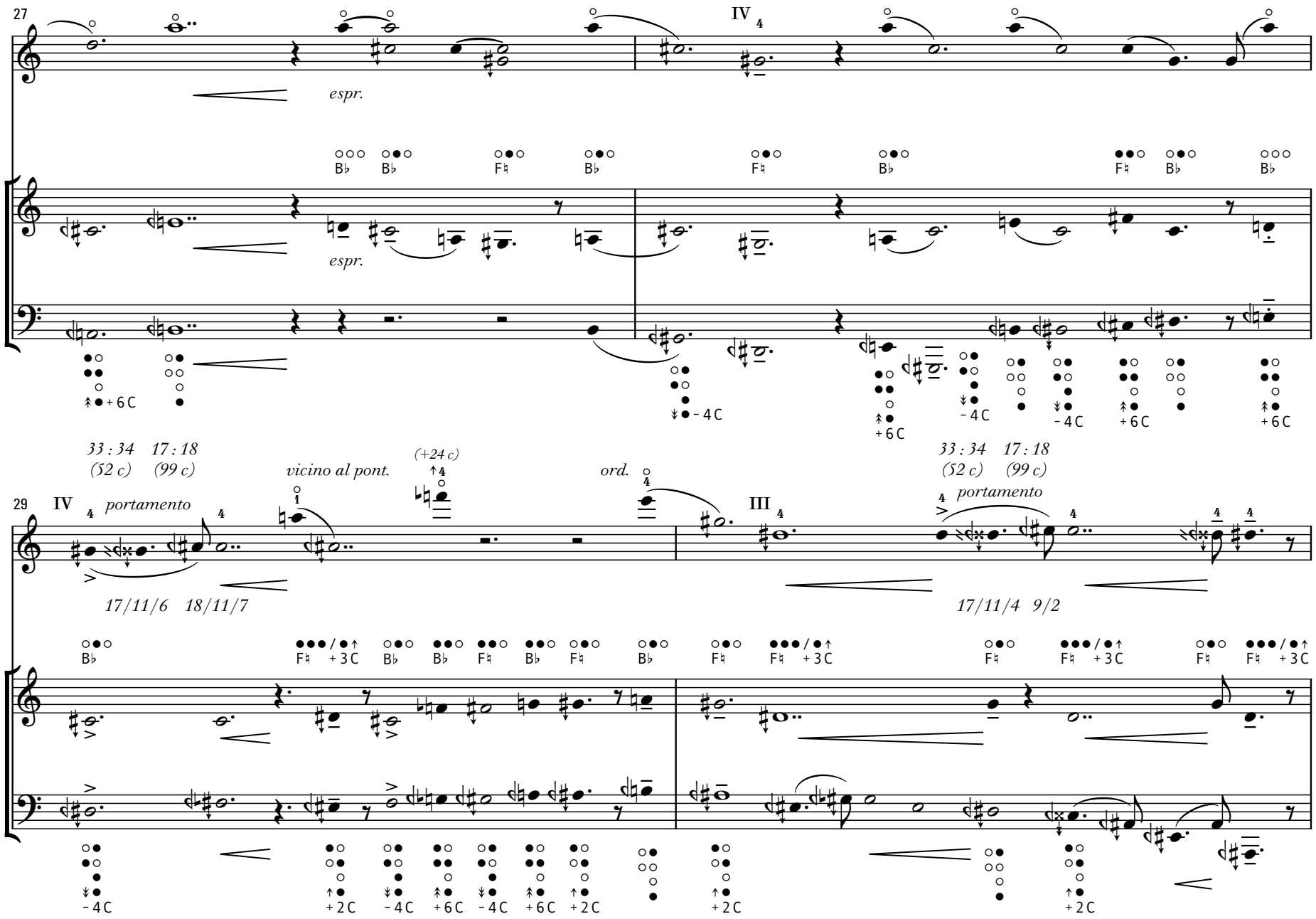

8/7
7/6
5
↑1 (+36 c)
sonore
pp
pp
F♮ B♭
F♮ B♭ B♭ B♭ F♮ F♮
+4C
15 : 14
(-119 c)
7
↑1 (+36 c)
B♭
F♮ B♭ F♮
B♭
+4C
+4C
+4C

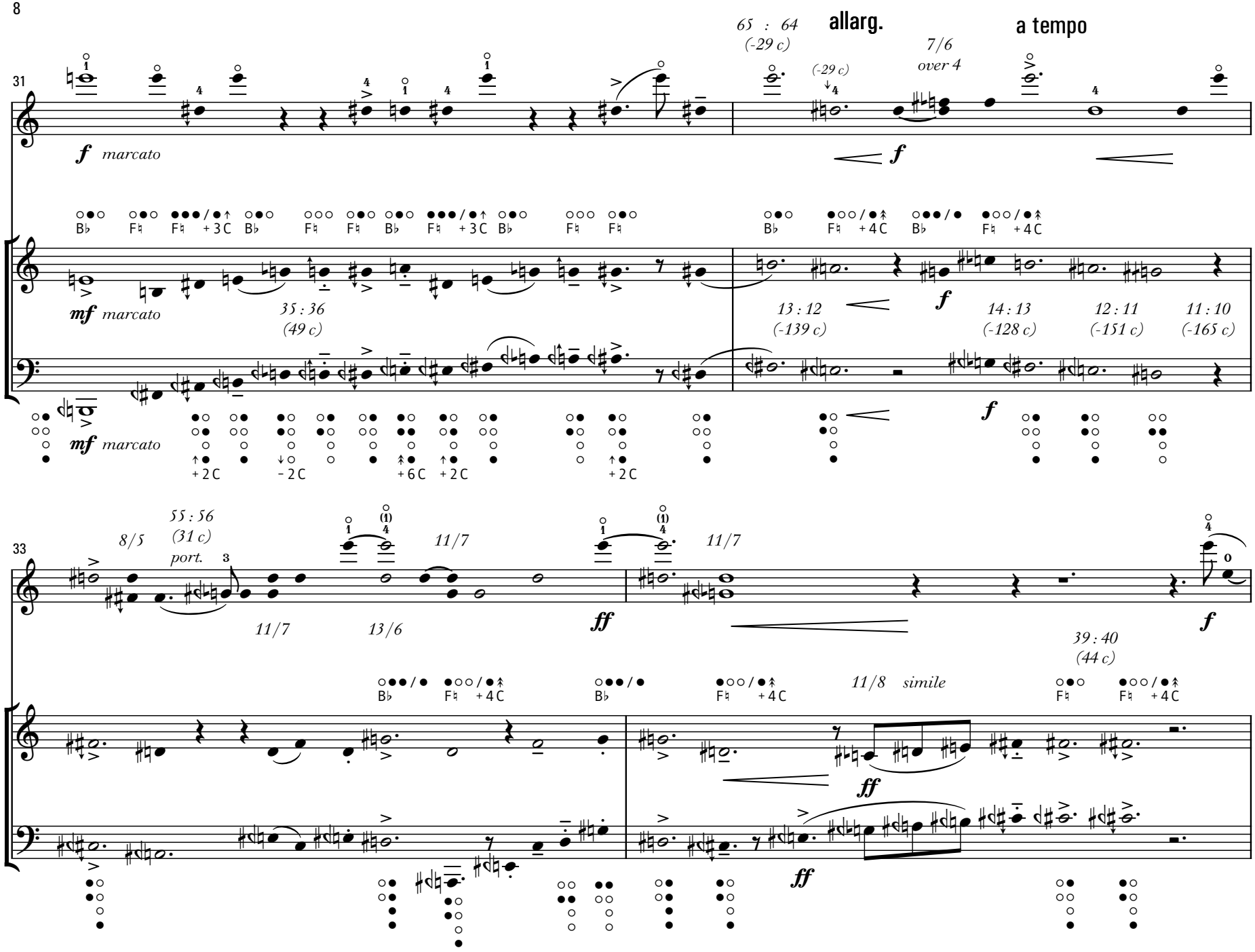

9
pp
pp
11
p sonore
espr.

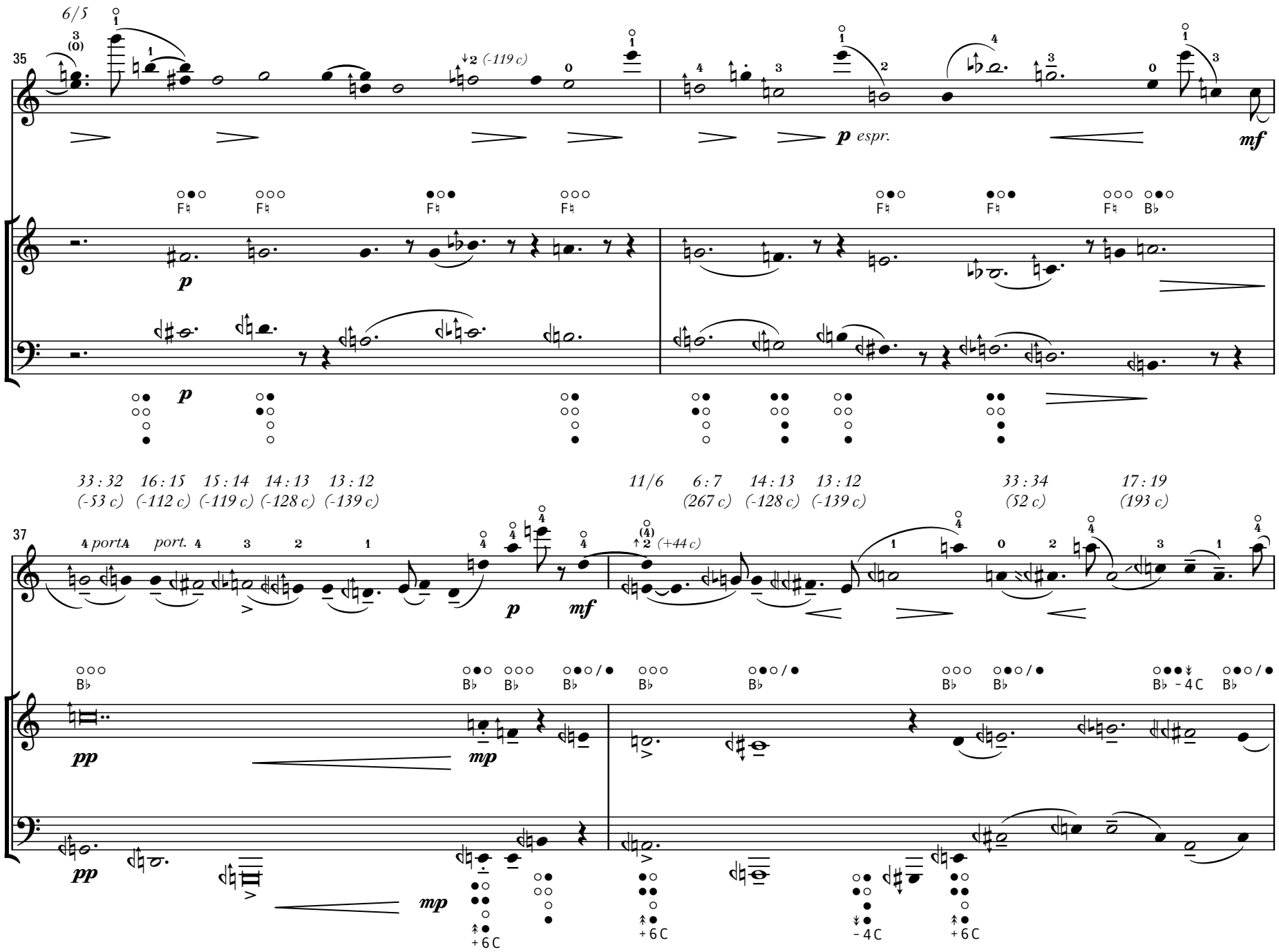

13
7/4
56 : 55
(-31 c)
11/6
7/4
7 : 6
(-267 c)
22 : 21
(-81 c)
23 : 24
(74 c)
+84
7/1
23/4
p dolce
p dolce
+84
-22
-3C
+5C
15
25 : 24
(-71 c)
(-22 c)
21 : 20
(-81 c)
mf dolce
mf marc.
mf marc.
p
p pp
p
+5C
+5C

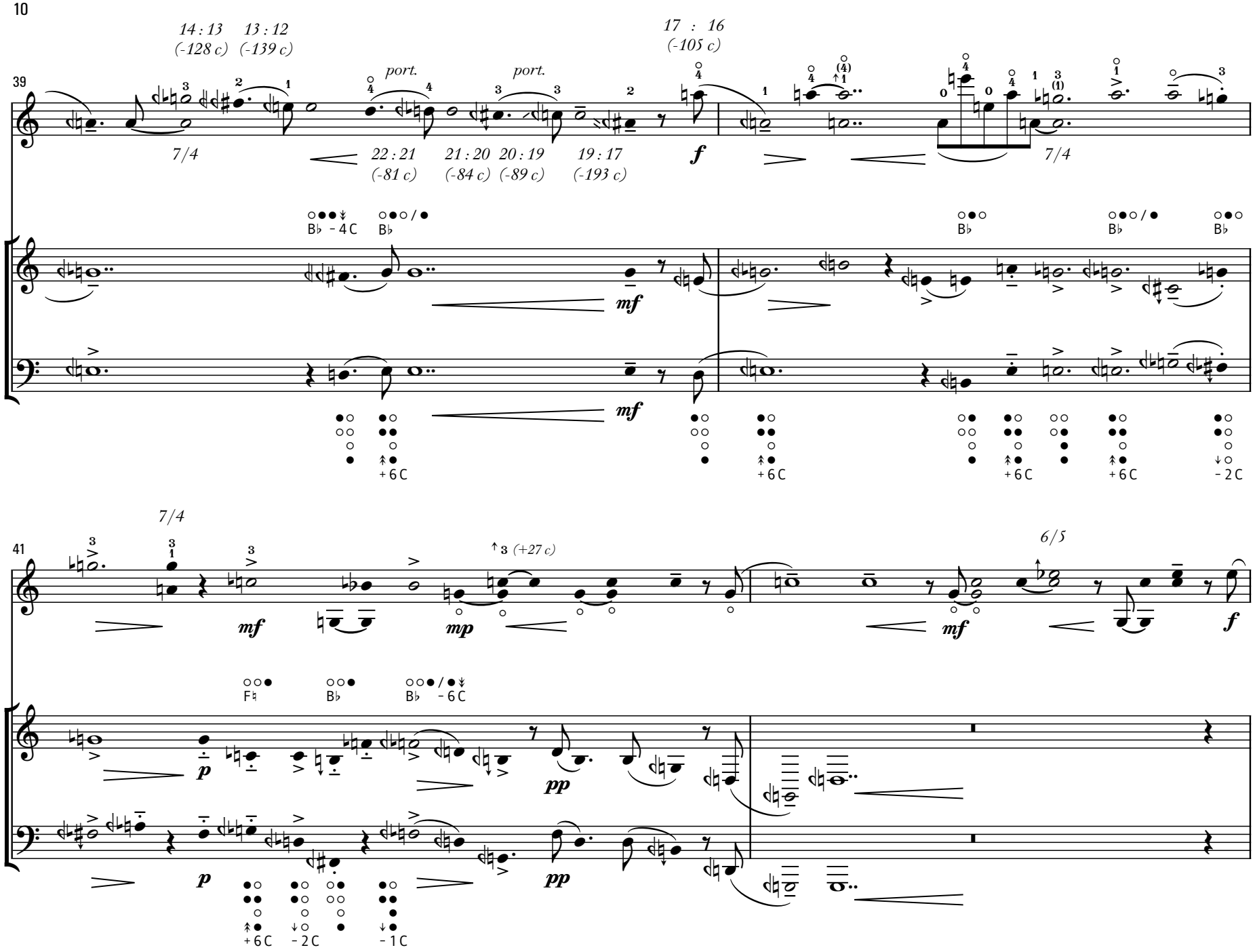

allarg.
8 : 9
(-204 c)
20 : 21
(81 c)
17
f
mp
p
pp
9/3/1
15/9/5/2
mf
mf
p
p
pp
pp
- 5 C
- 5 C
a tempo
The 11-limit Harmonic Region
33 : 34
(52 c)
20
pp
p
espr.
17/11/6
17/10/7
pp
pp
+ 1 C
+ 6 C

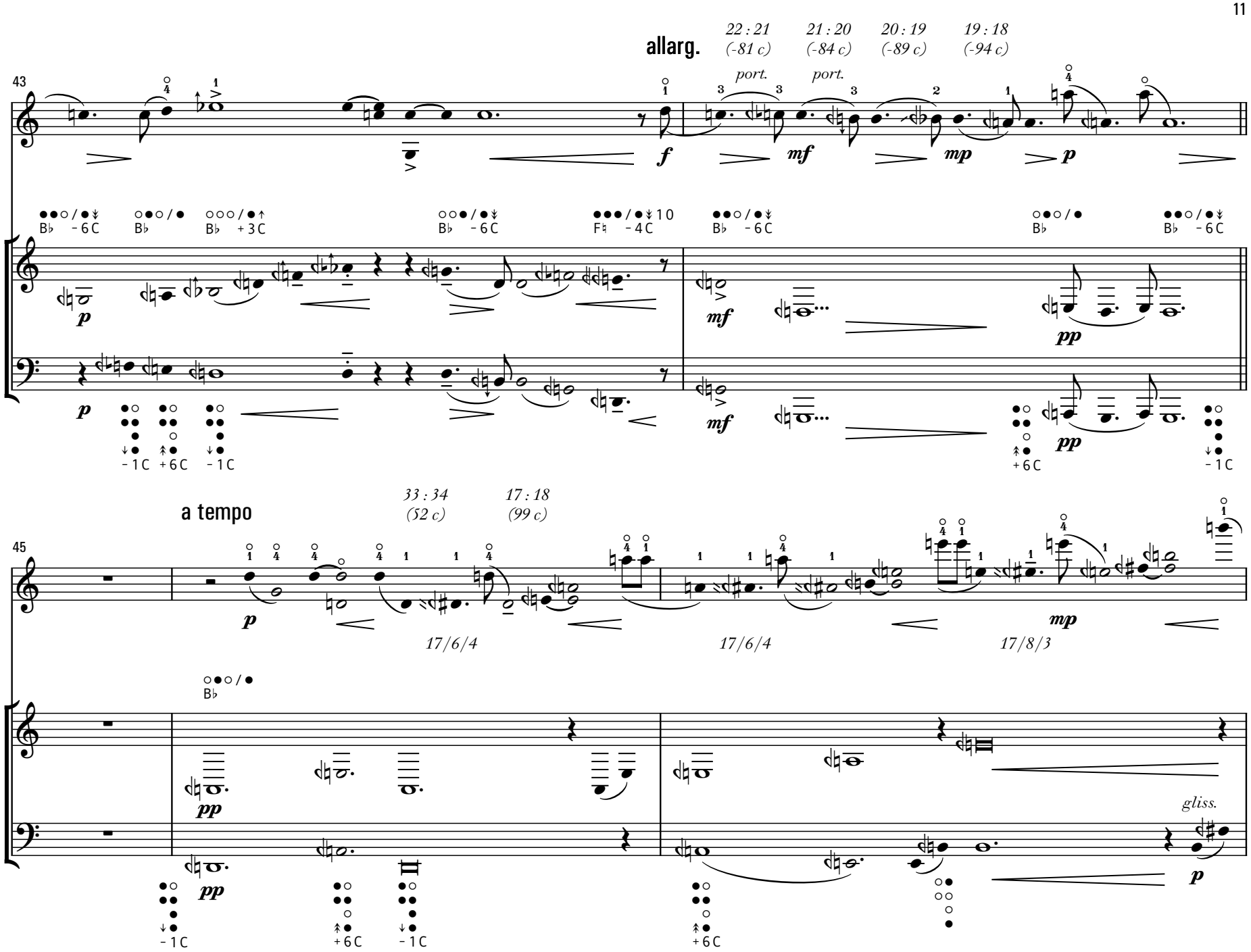

23
17 : 18
(99 c)
11/6
18 : 19
(94 c)
6 : 7
(267 c)
21 : 22
(81 c)
21 : 20
(-84 c)
9/5/4
19/14/5
18/14/4
21/11/5
10/7/3
p
p
25
24 : 23
(-74 c)
port.
port.
33 : 32
(-53 c)
mf
23/11/6
17/10/7
16/11/5
mp
mp

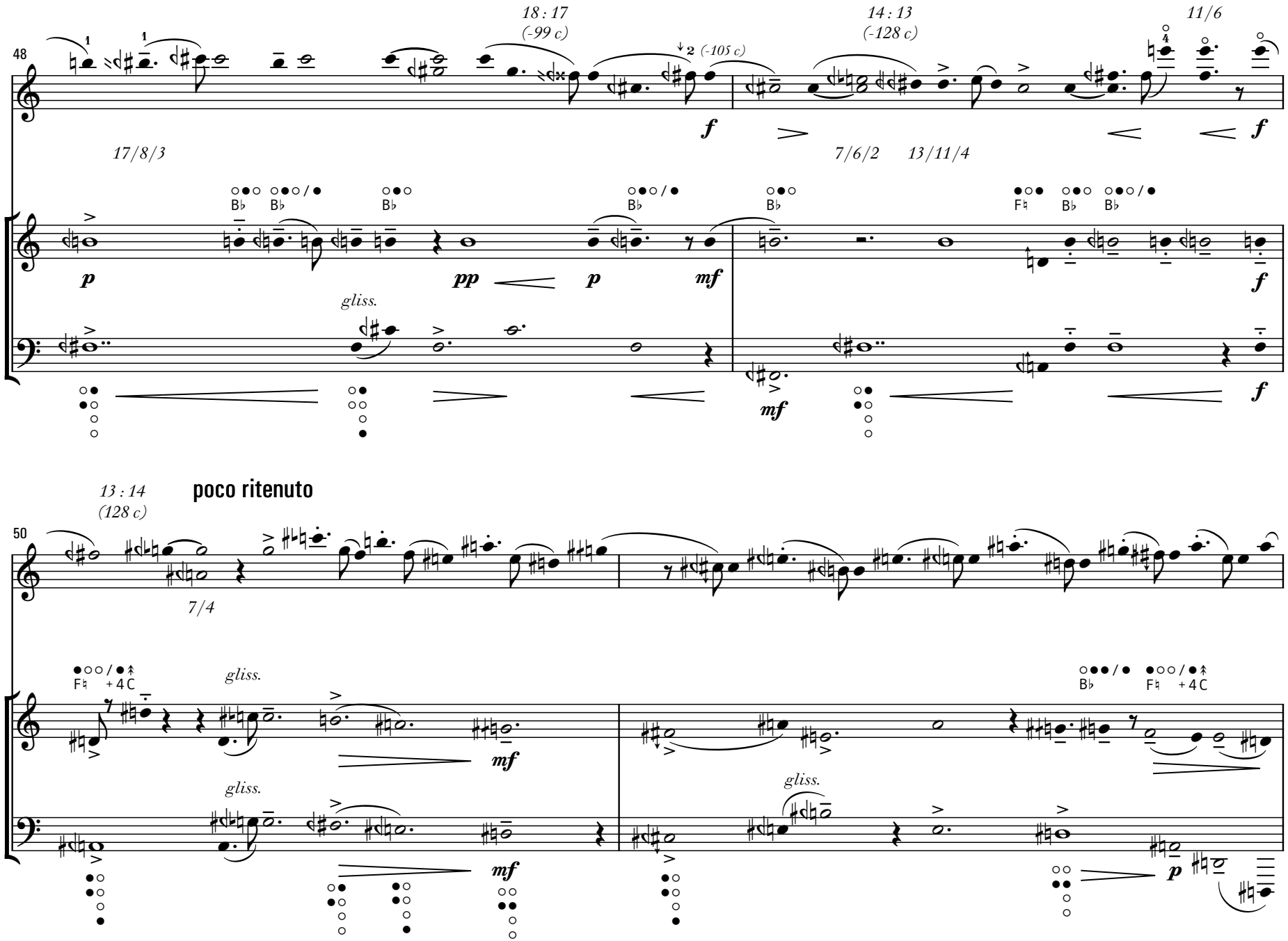

27
IV
4
espr.
espr.
33 : 34 17 : 18
(52 c) (99 c)
vicino al pont.
(+24 c)
ord.
29
IV
portamento
17/11/6 18/11/7
III
33 : 34 17 : 18
(52 c) (99 c)
portamento
17/11/4 9/2

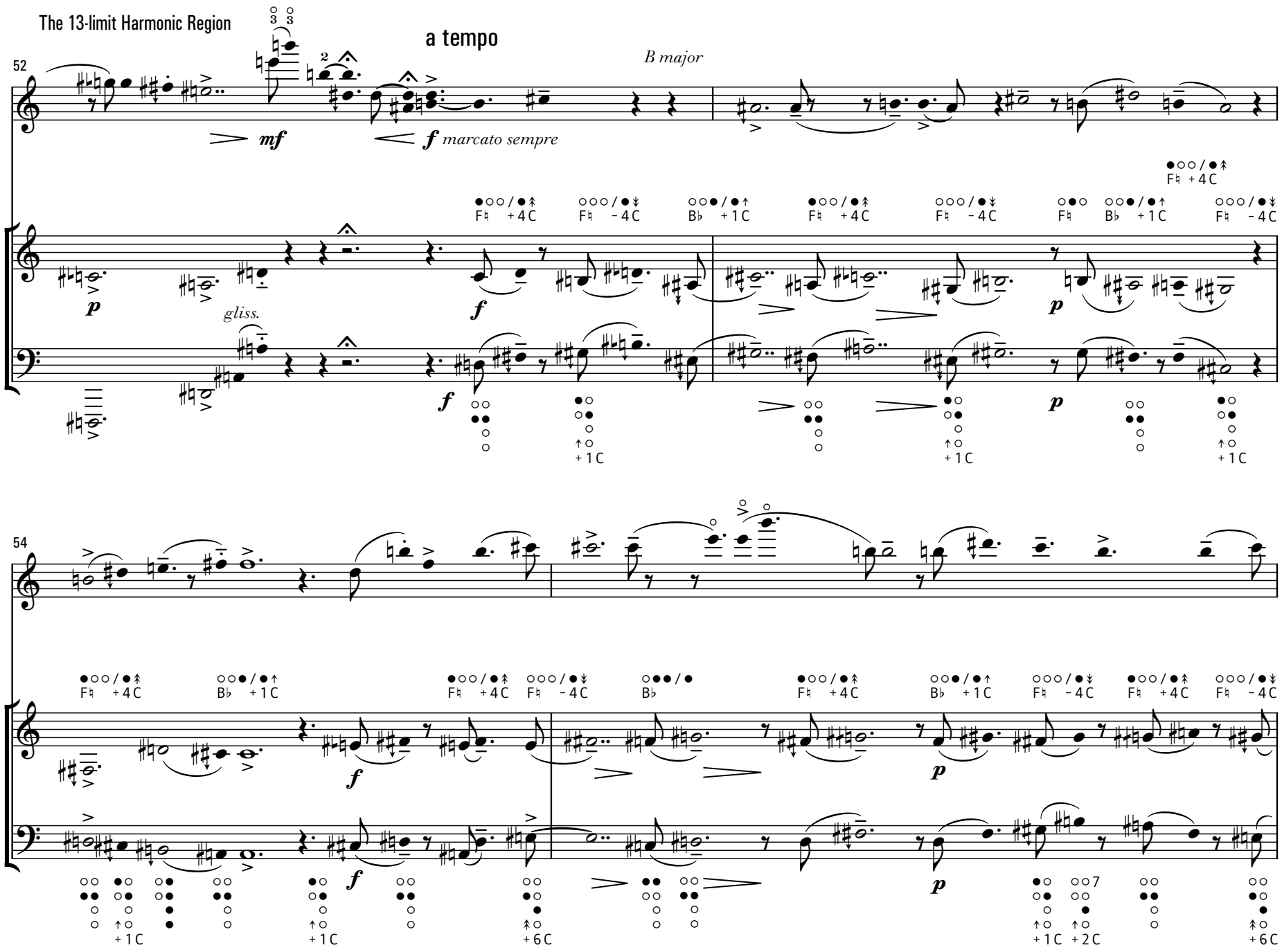

31
allarg.
a tempo
65 : 64
(-29 c)
(-29 c)
7/6
over 4
f marcato
f
mf marcato
35 : 36
(49 c)
13 : 12
(-139 c)
14 : 13
(-128 c)
12 : 11
(-151 c)
11 : 10
(-165 c)
f
mf marcato
f
33
8/5
55 : 56
(31 c)
port.
11/7
11/7
11/7
13/6
ff
f
39 : 40
(44 c)
11/8 simile
ff
ff

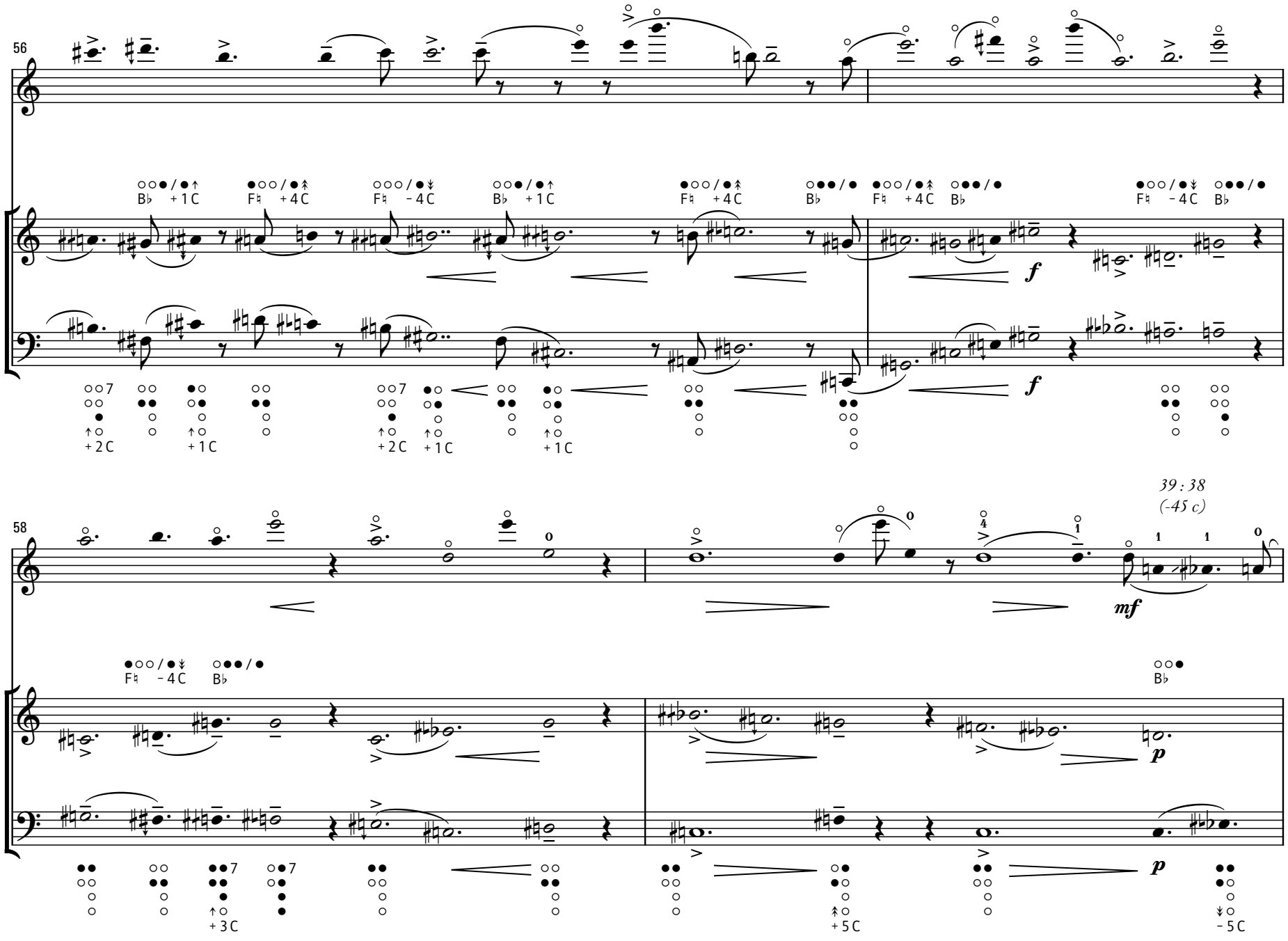

6/5
35
p espr.
mf
p
33 : 32 (-53 c)
16 : 15 (-112 c)
15 : 14 (-119 c)
14 : 13 (-128 c)
13 : 12 (-139 c)
11/6
6 : 7 (267 c)
14 : 13 (-128 c)
13 : 12 (-139 c)
33 : 34 (52 c)
17 : 19 (193 c)
37
port.
pp
mp
mf

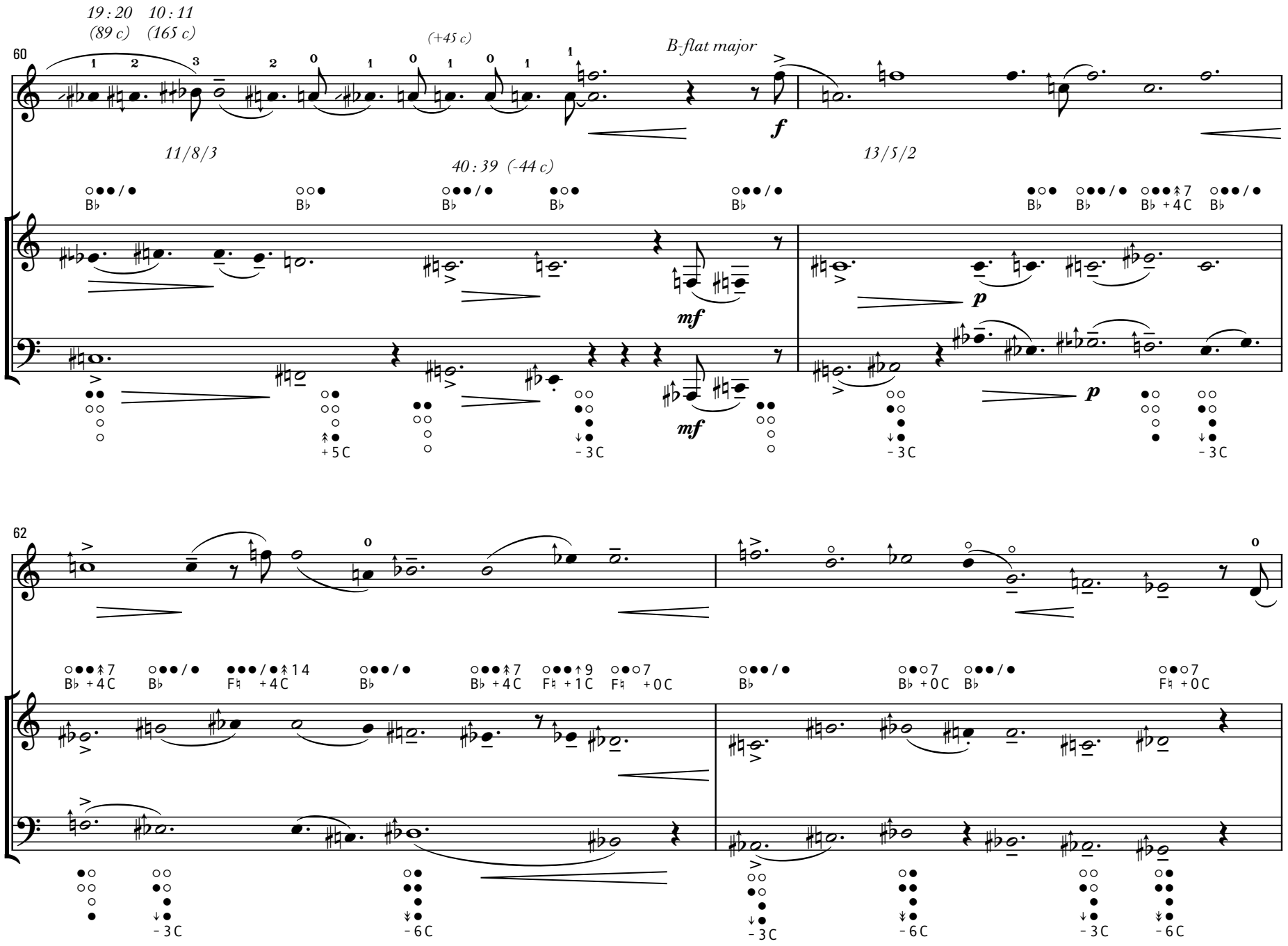

39
14 : 13 (-128 c)
13 : 12 (-139 c)
17 : 16 (-105 c)
port.
port.
7/4
22 : 21 (-81 c)
21 : 20 (-84 c)
20 : 19 (-89 c)
19 : 17 (-193 c)
f
7/4
mf
mf
B♭ -4C
B♭
+6C
+6C
+6C
+6C
-2C
41
7/4
mf
mp
↑3 (+27 c)
mf
6/5
f
p
pp
p
pp
F♮
B♭
B♭ -6C
+6C
-2C
-1C

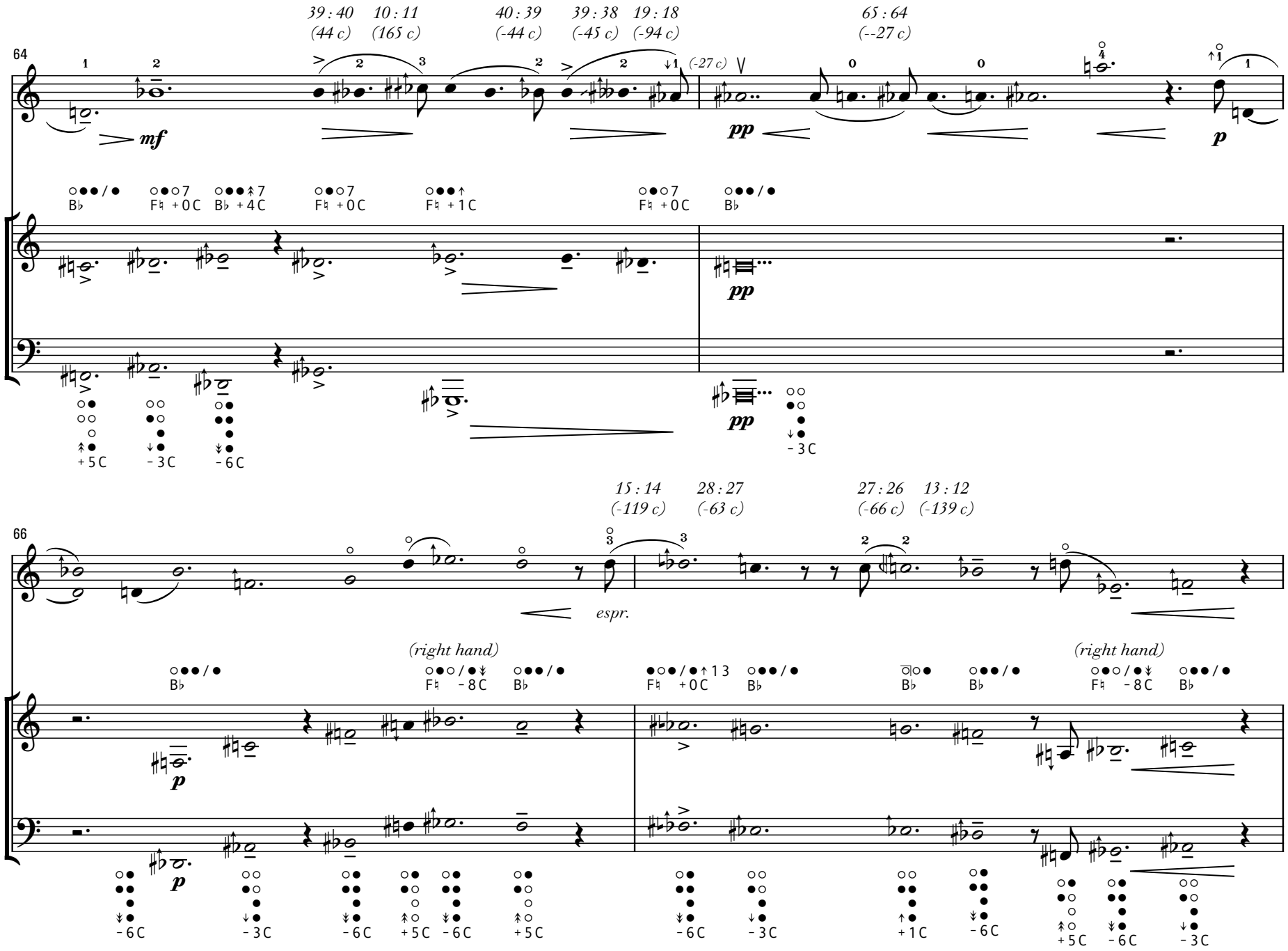

allarg.
22 : 21
(-81 c)
21 : 20
(-84 c)
20 : 19
(-89 c)
19 : 18
(-94 c)
port.
port.
43
f
mf
mp
p
mf
pp
mf
pp
a tempo
33 : 34
(52 c)
17 : 18
(99 c)
45
p
mp
17/6/4
17/6/4
17/8/3
pp
pp
gliss.
p

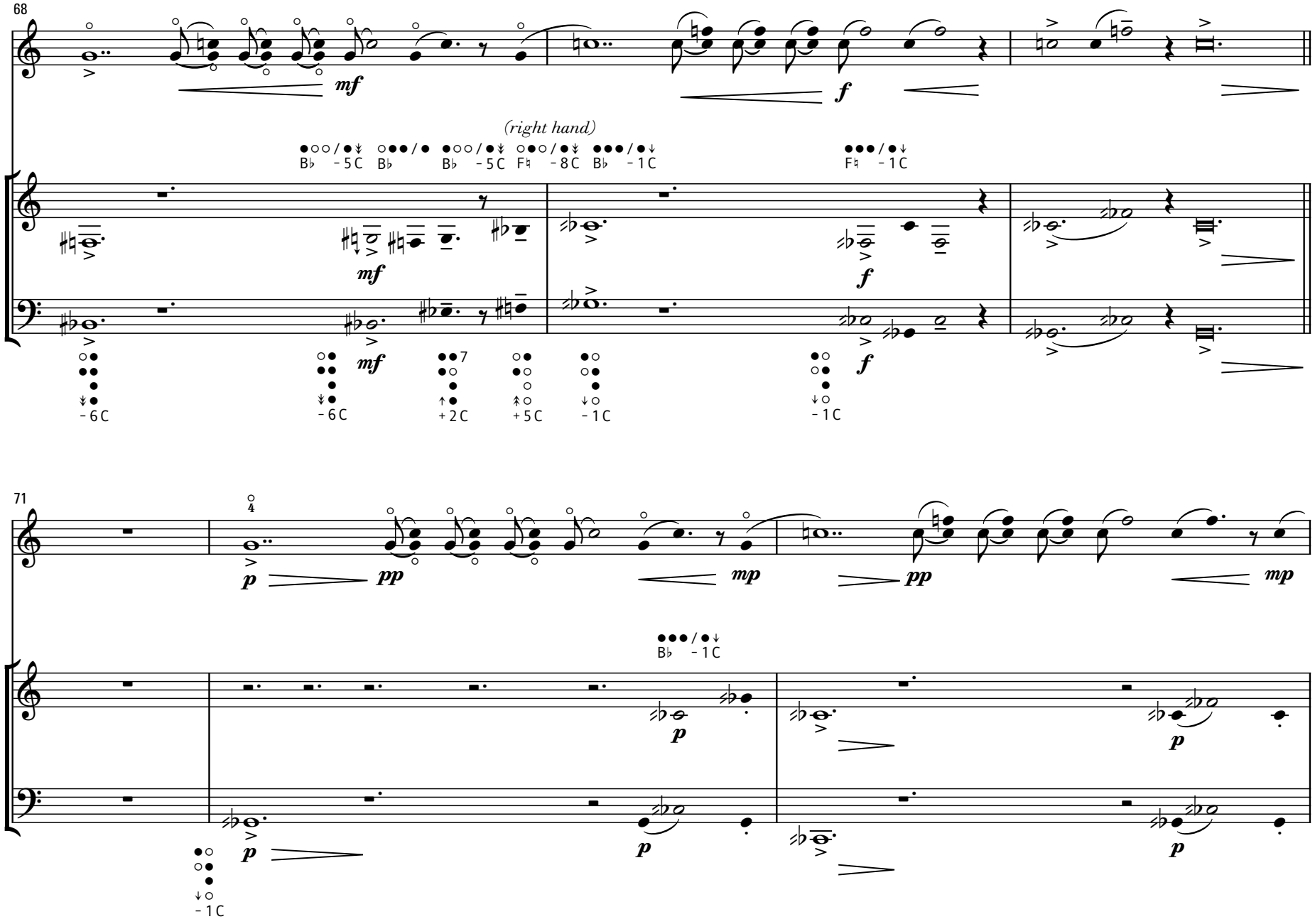

48
18 : 17
(-99 c)
(-105 c)
14 : 13
(-128 c)
11/6
17/8/3
7/6/2
13/11/4
gliss.
50
13 : 14
(128 c)
poco ritenuto
7/4
gliss.

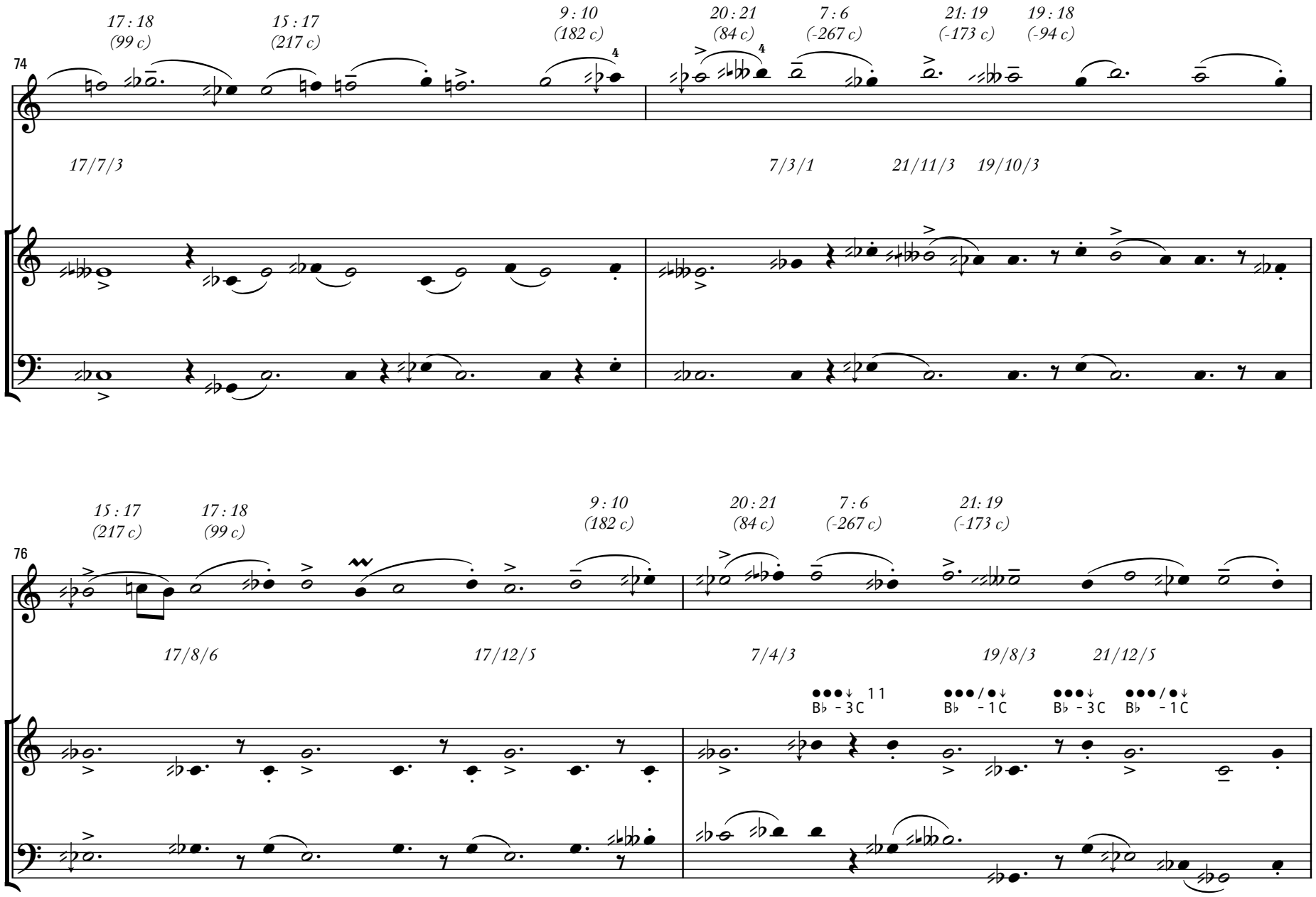

a tempo
B major
52
mf
f marcato sempre
p
gliss.
f
54

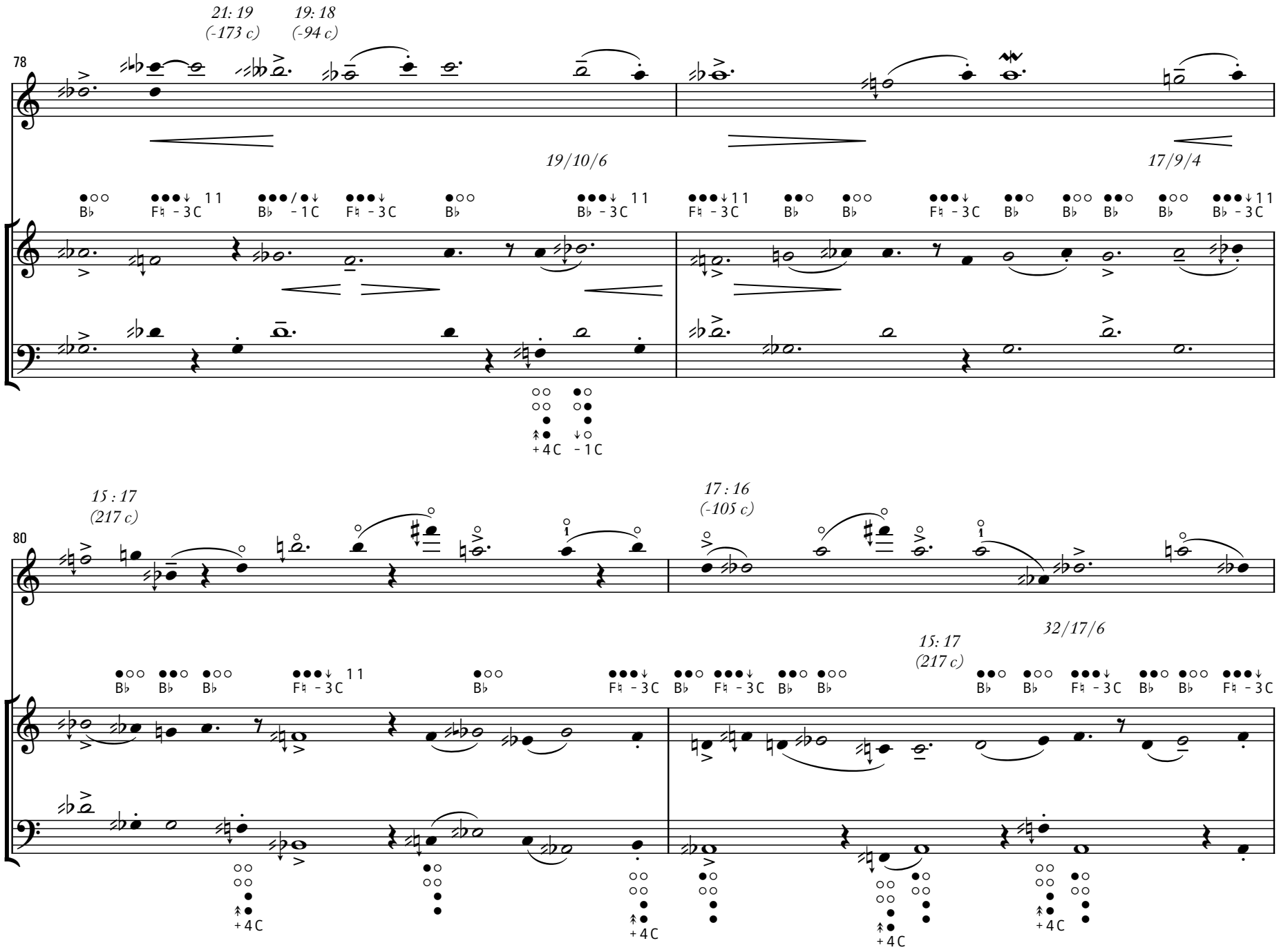

56
58
39 : 38
(-45 c)
f
mf
p

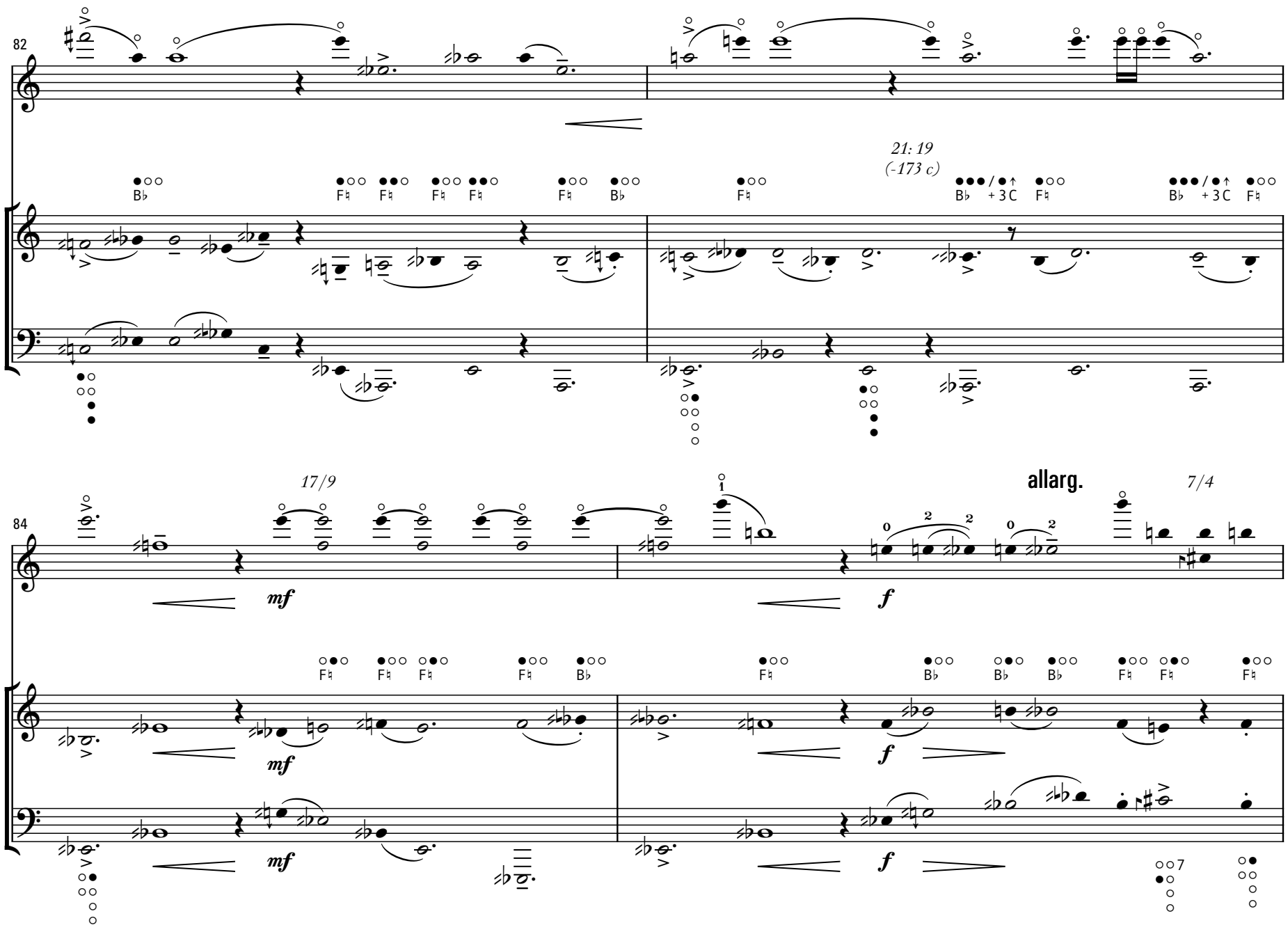

19 : 20 10 : 11
(89 c) (165 c)
(+45 c)
B-flat major
11/8/3
40 : 39 (-44 c)
13/5/2
60
62
f
mf
p

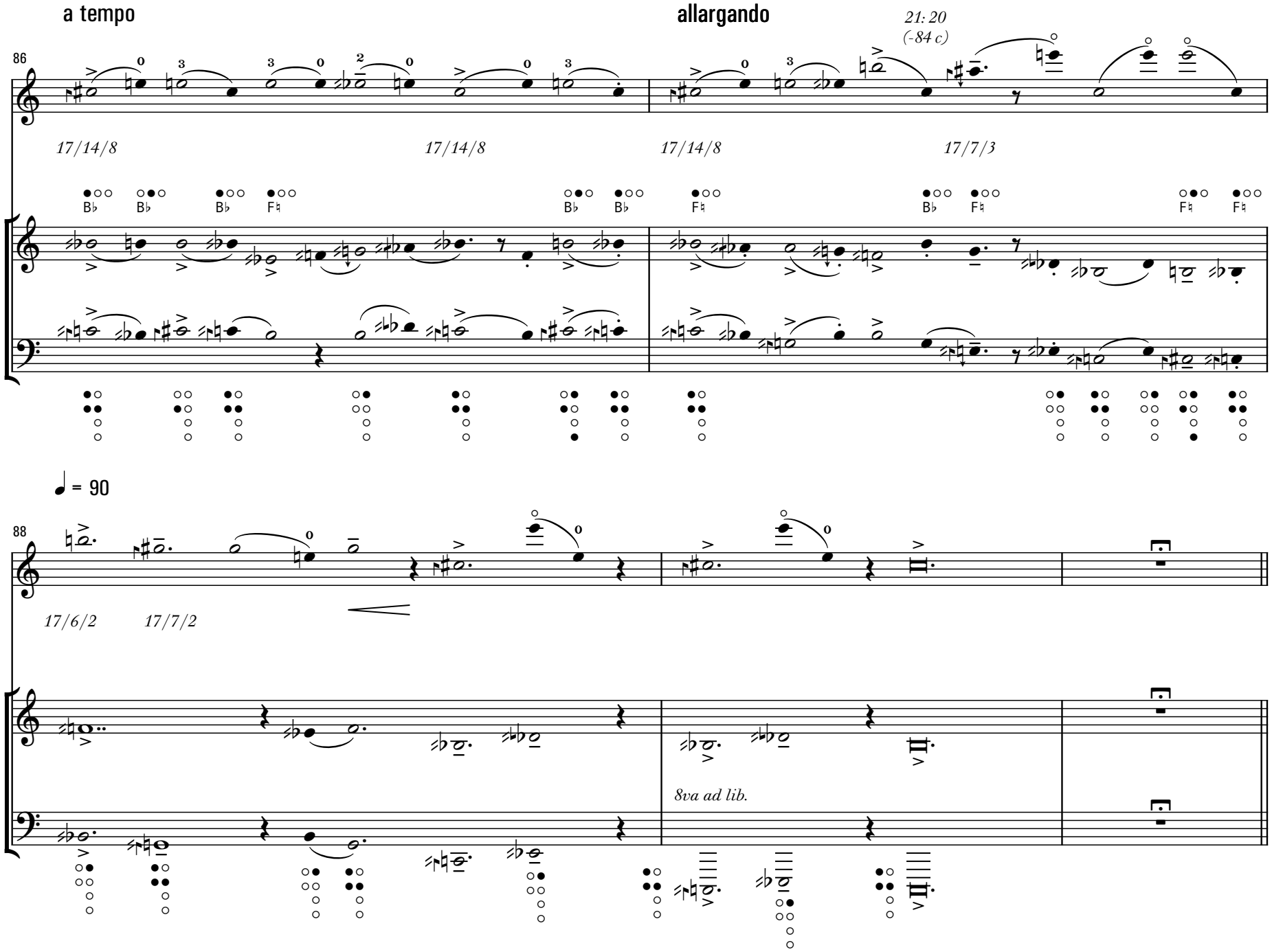

64
39 : 40 (44 c)
10 : 11 (165 c)
40 : 39 (-44 c)
39 : 38 (-45 c)
19 : 18 (-94 c)
65 : 64 (--27 c)
(-27 c)
mf
pp
p
66
15 : 14 (-119 c)
28 : 27 (-63 c)
27 : 26 (-66 c)
13 : 12 (-139 c)
espr.
(right hand)
(right hand)


68
mf
f
(right hand)
B♭ -5C
B♭
B♭ -5C
F♮ -8C
B♭ -1C
F♮ -1C
mf
mf
f
f
-6C
-6C
+2C
+5C
-1C
-1C
71
p
pp
mp
pp
mp
B♭ -1C
p
p
p
p
p
-1C

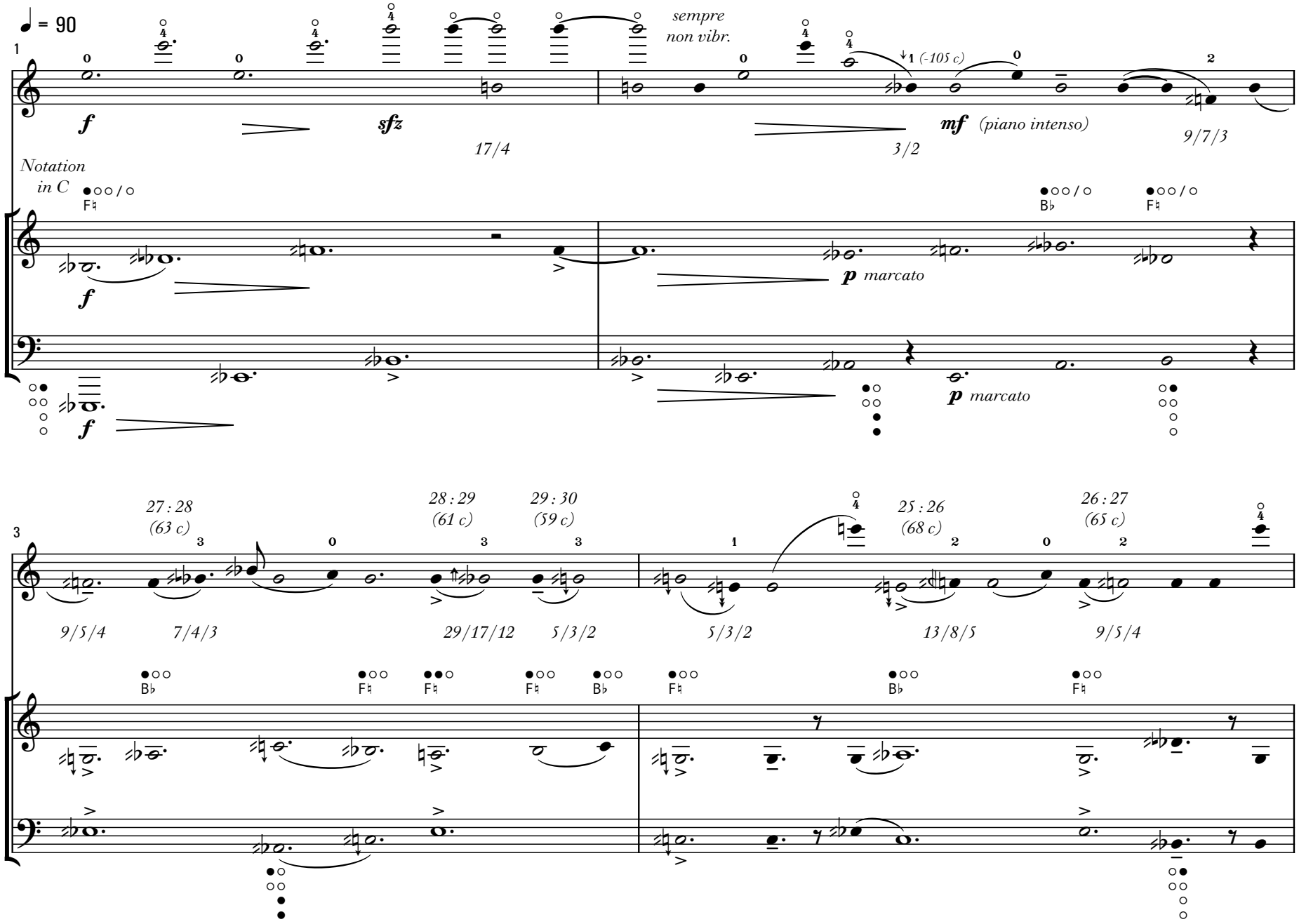

74
17 : 18
(99 c)
15 : 17
(217 c)
9 : 10
(182 c)
20 : 21
(84 c)
7 : 6
(-267 c)
21: 19
(-173 c)
19 : 18
(-94 c)
17/7/3
7/3/1
21/11/3
19/10/3
76
15 : 17
(217 c)
17 : 18
(99 c)
9 : 10
(182 c)
20 : 21
(84 c)
7 : 6
(-267 c)
21: 19
(-173 c)
17/8/6
17/12/5
7/4/3
19/8/3
21/12/5
B♭ - 3C
B♭ - 1C
B♭ - 3C
B♭ - 1C

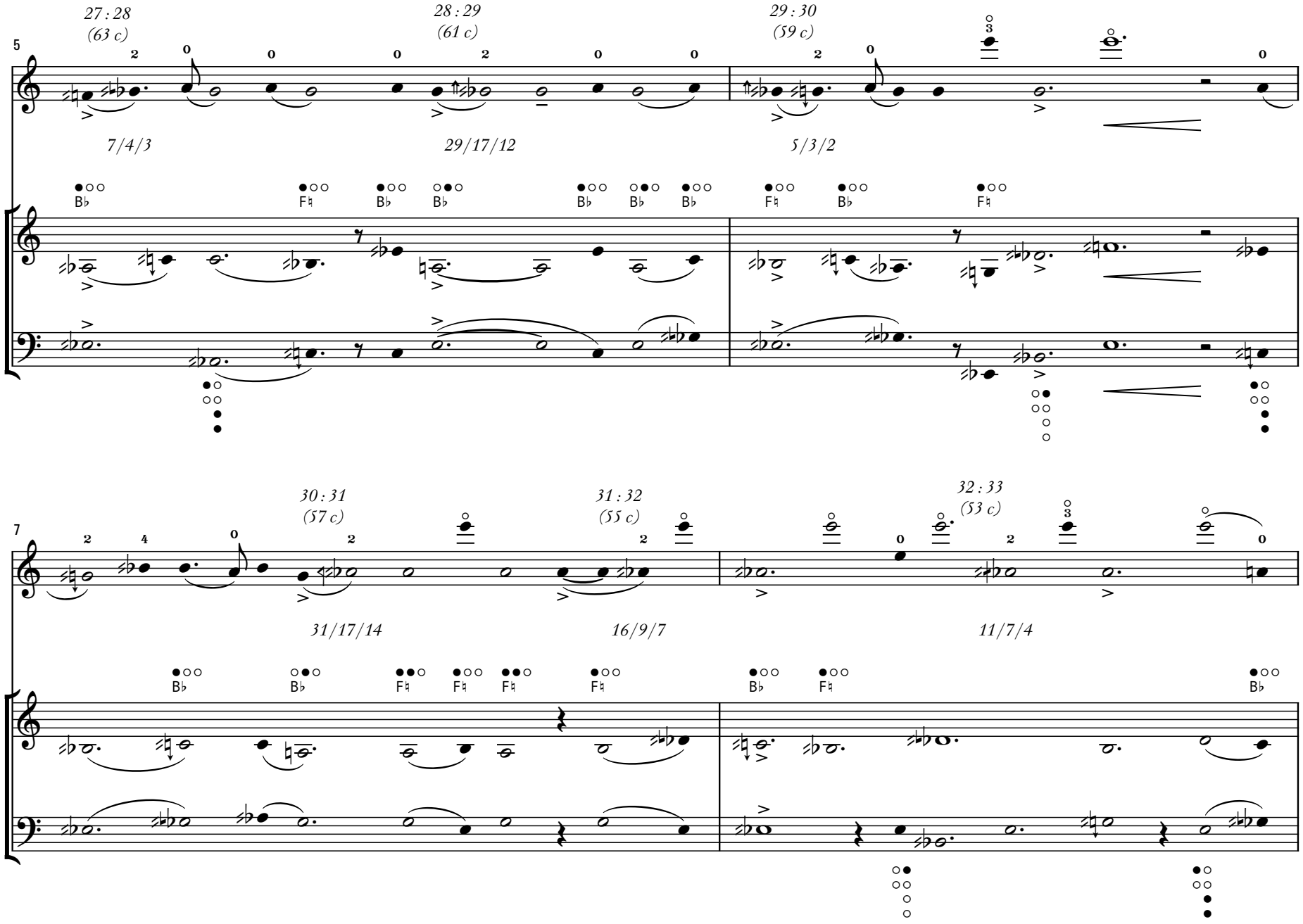

78
21: 19
(-173 c)
19: 18
(-94 c)
19/10/6
17/9/4
+4C
-1C
80
15 : 17
(217 c)
17 : 16
(-105 c)
15: 17
(217 c)
32/17/6
+4C

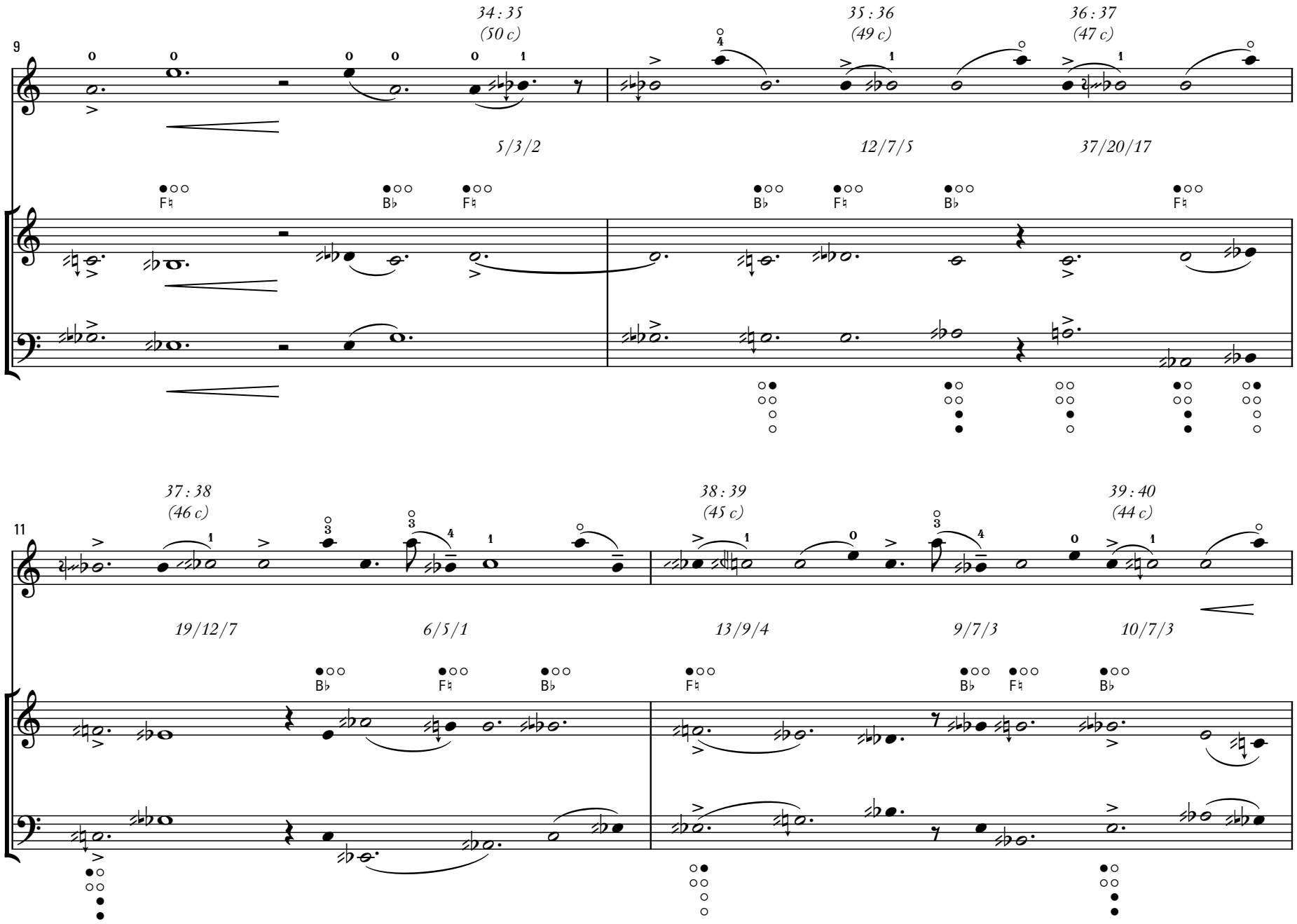

82
21: 19
(-173 c)
84
17/9
mf
f
allarg.
7/4

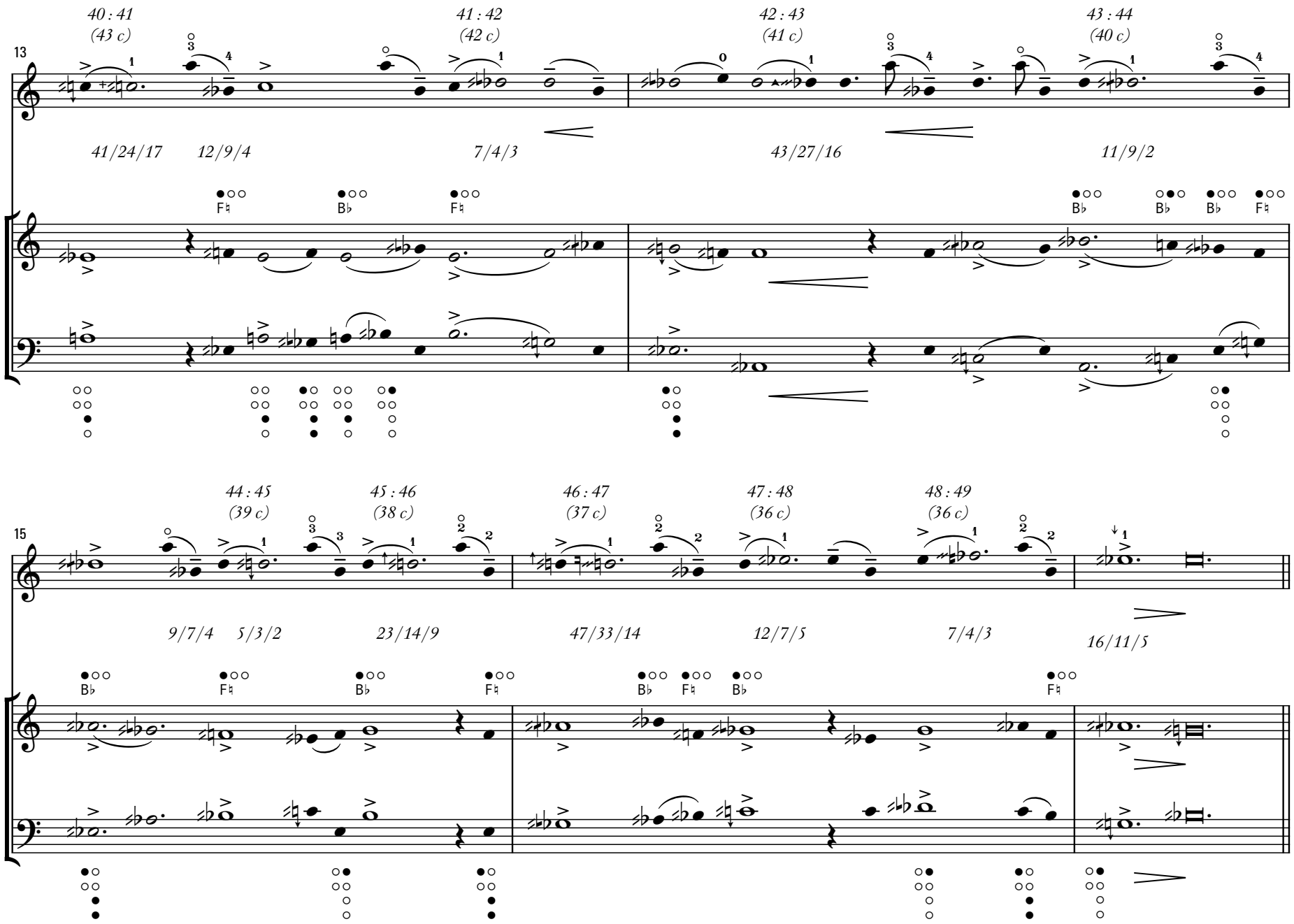

a tempo
allargando
21: 20
(-84 c)
86
17/14/8
17/14/8
17/14/8
17/7/3
♩ = 90
88
17/6/2
17/7/2
8va ad lib.

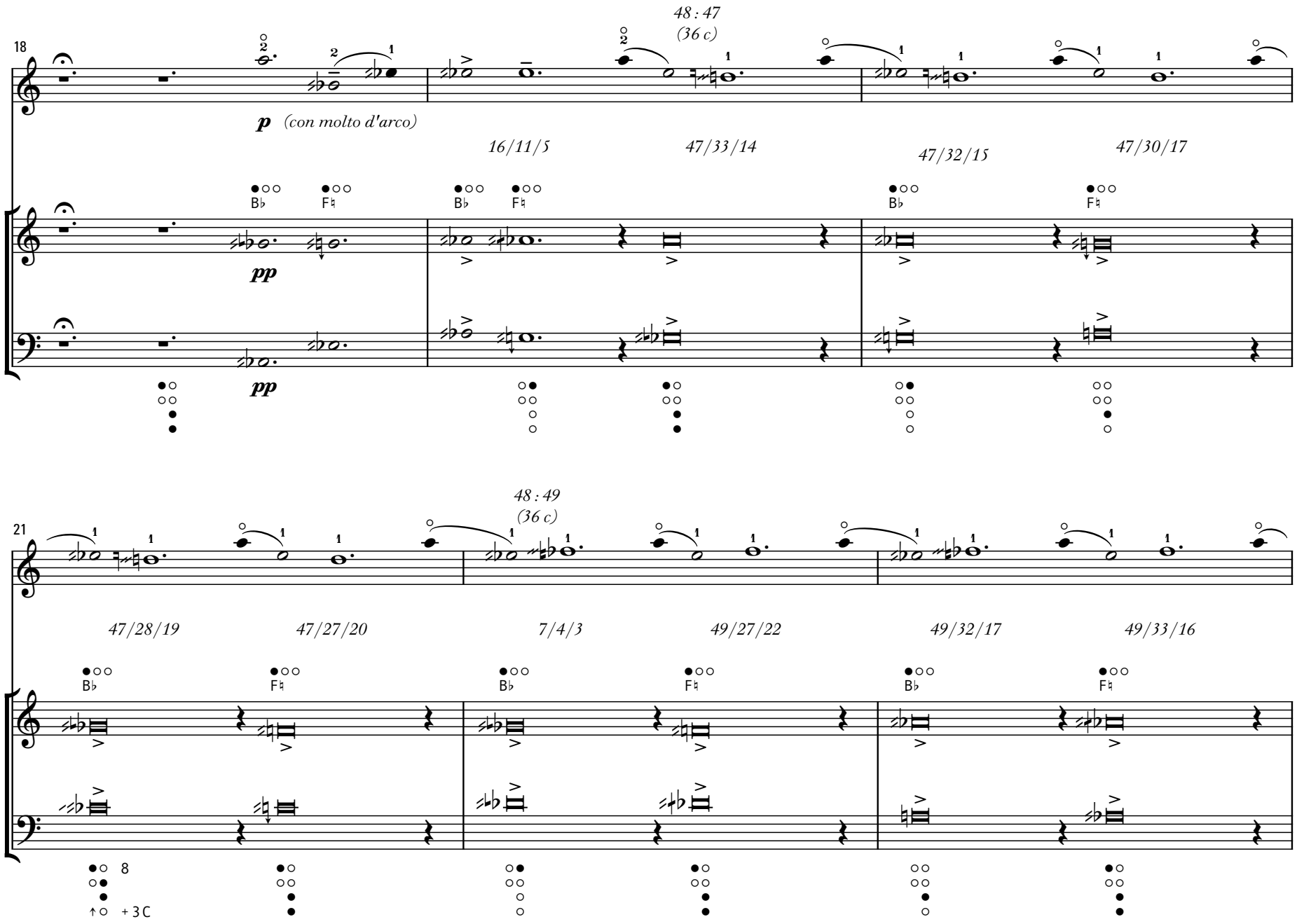
PART 2 The 17-limit Harmonic Region, with all the high primes up to ⁰47

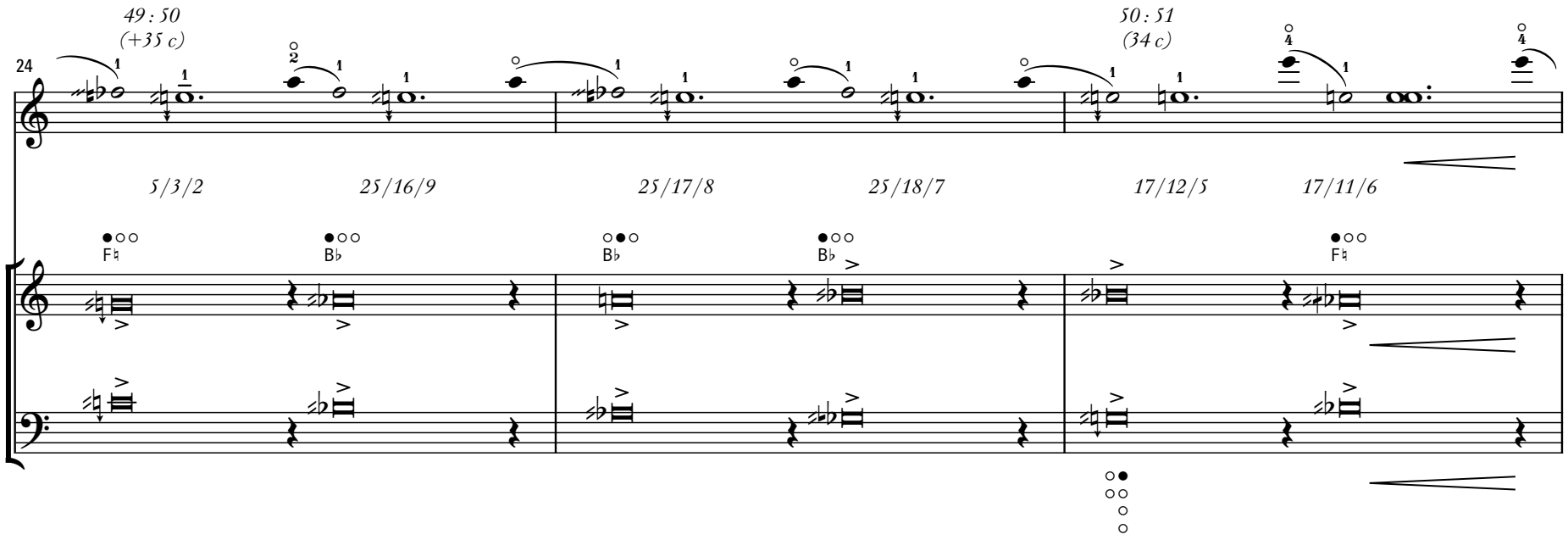



27 : 28
(63 c)
28 : 29
(61 c)
29 : 30
(59 c)
5
7/4/3
29/17/12
5/3/2
30 : 31
(57 c)
31 : 32
(55 c)
32 : 33
(53 c)
7
31/17/14
16/9/7
11/7/4

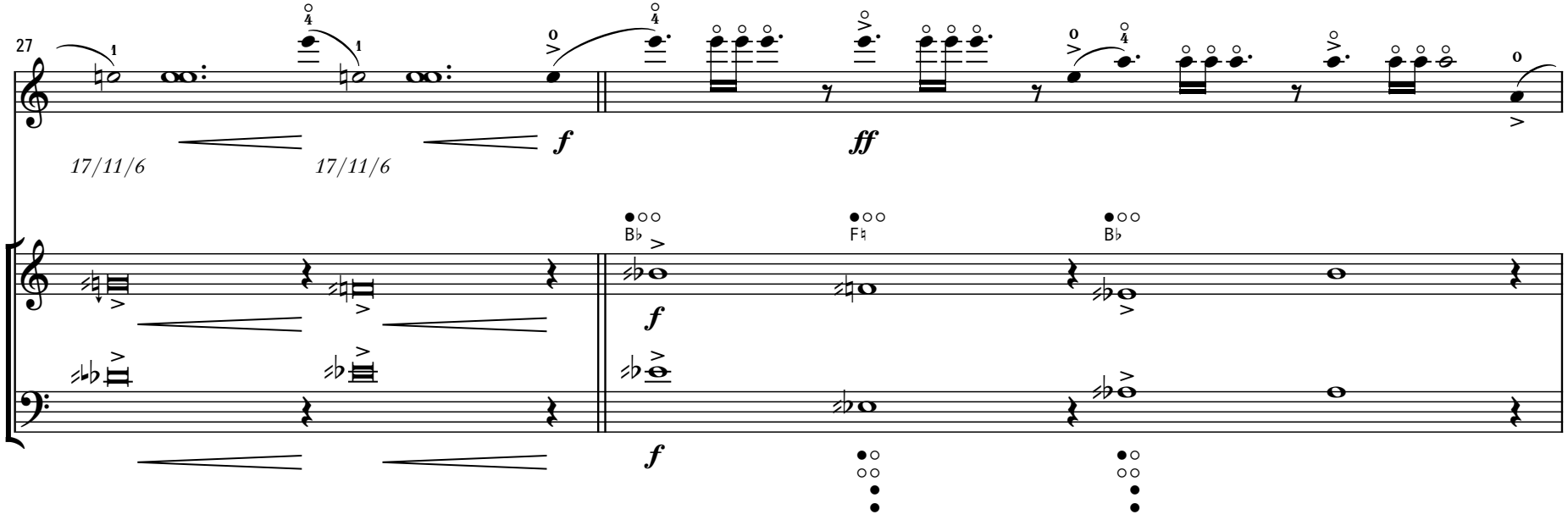

9
34 : 35
(50 c)
35 : 36
(49 c)
36 : 37
(47 c)
5/3/2
12/7/5
37/20/17
11
37 : 38
(46 c)
38 : 39
(45 c)
39 : 40
(44 c)
19/12/7
6/5/1
13/9/4
9/7/3
10/7/3

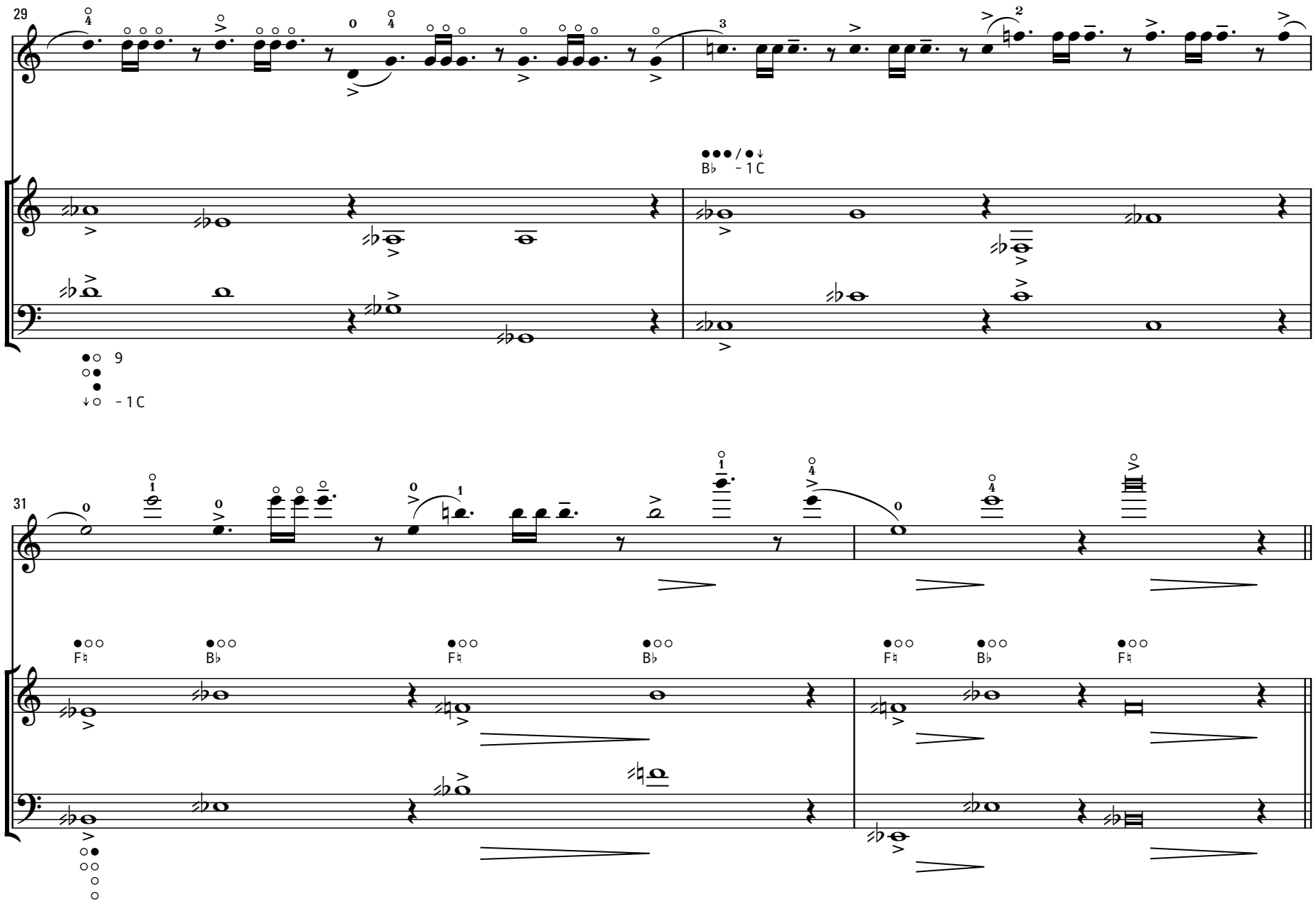

13
40 : 41
(43 c)
41 : 42
(42 c)
42 : 43
(41 c)
43 : 44
(40 c)
41/24/17
12/9/4
7/4/3
43/27/16
11/9/2
15
44 : 45
(39 c)
45 : 46
(38 c)
46 : 47
(37 c)
47 : 48
(36 c)
48 : 49
(36 c)
9/7/4
5/3/2
23/14/9
47/33/14
12/7/5
7/4/3
16/11/5

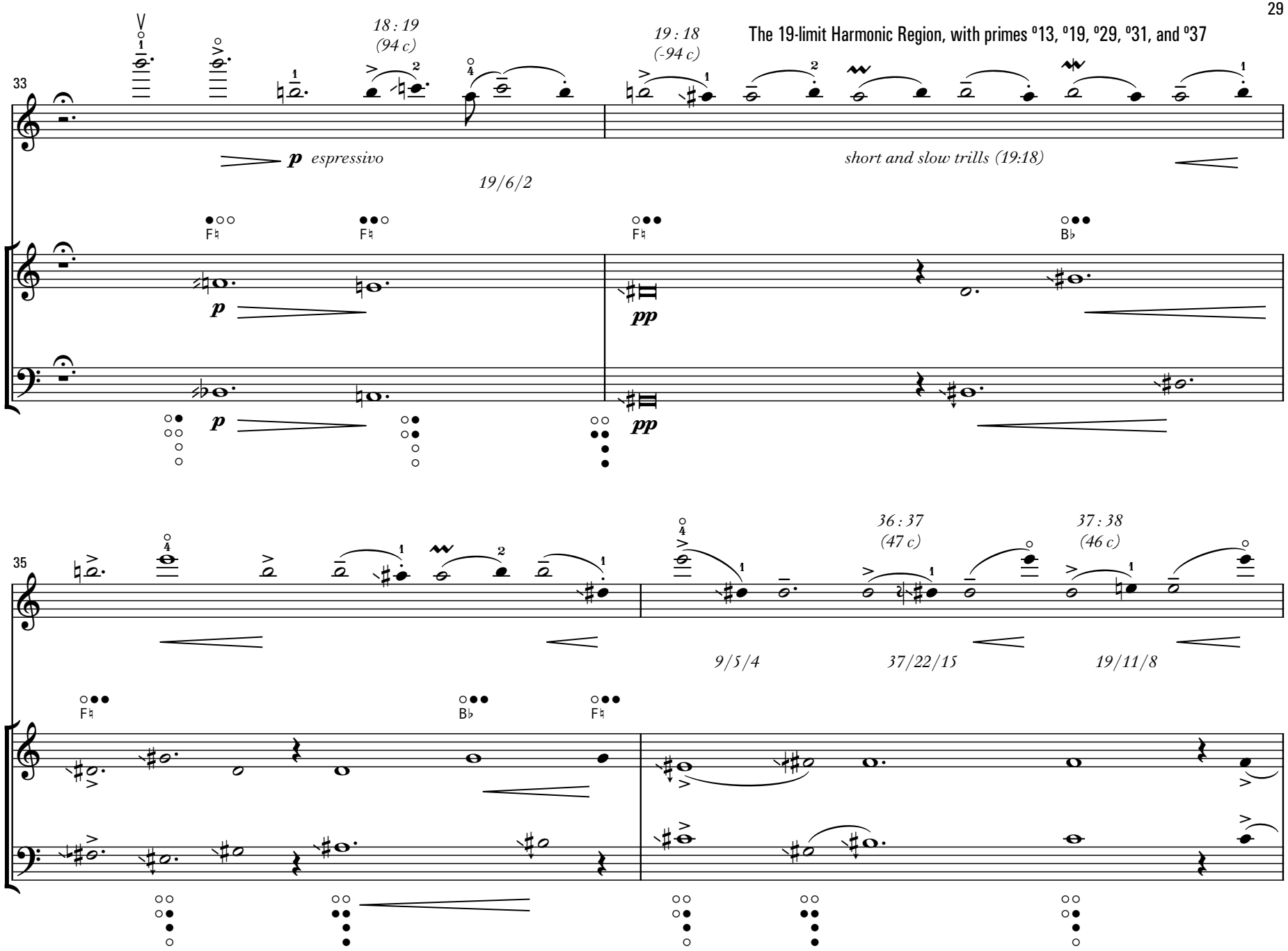

18
48 : 47
(36 c)
p (con molto d'arco)
16/11/5
47/33/14
47/32/15
47/30/17
pp
pp
21
48 : 49
(36 c)
47/28/19
47/27/20
7/4/3
49/27/22
49/32/17
49/33/16
8
+ 3 C

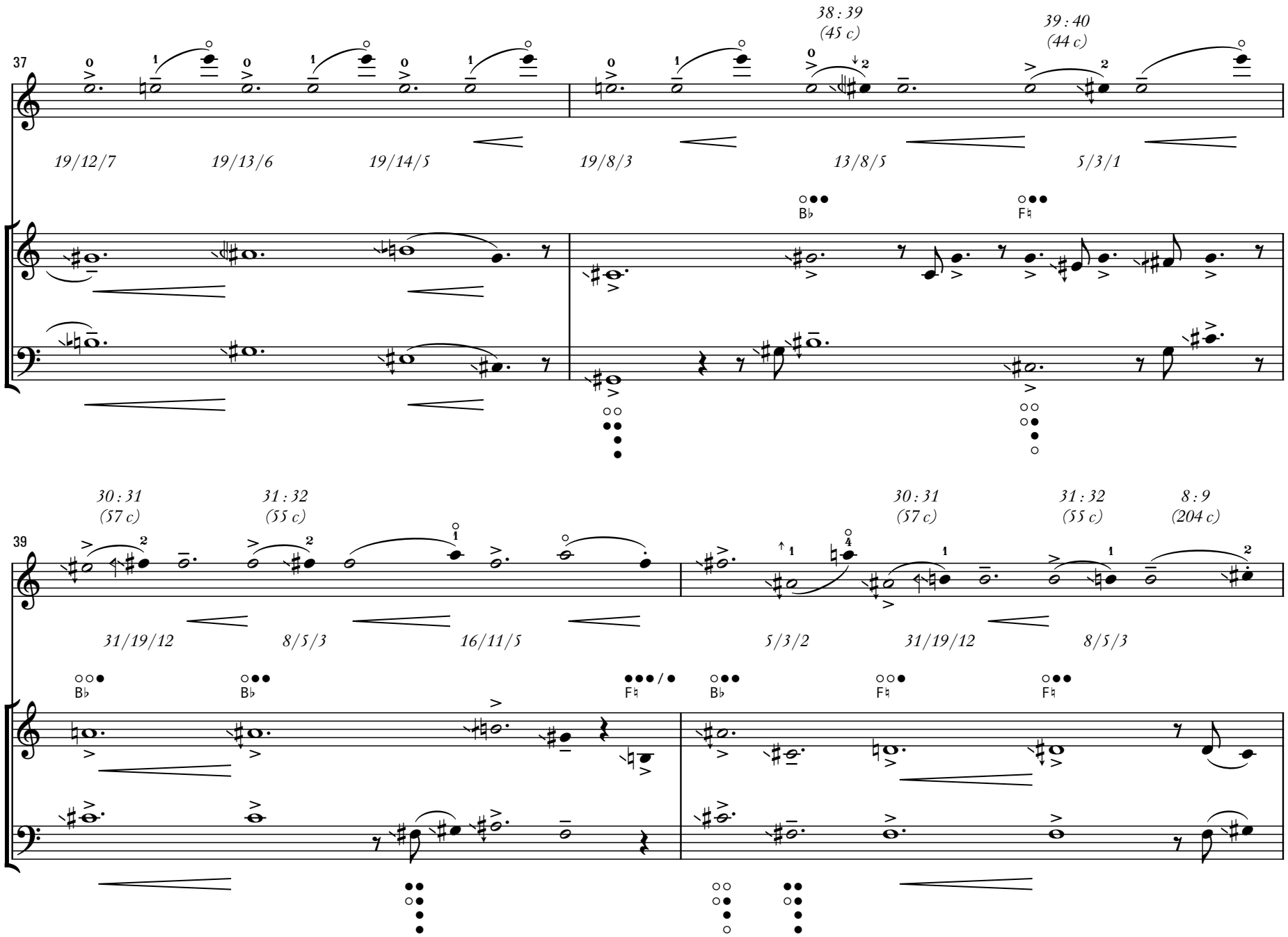


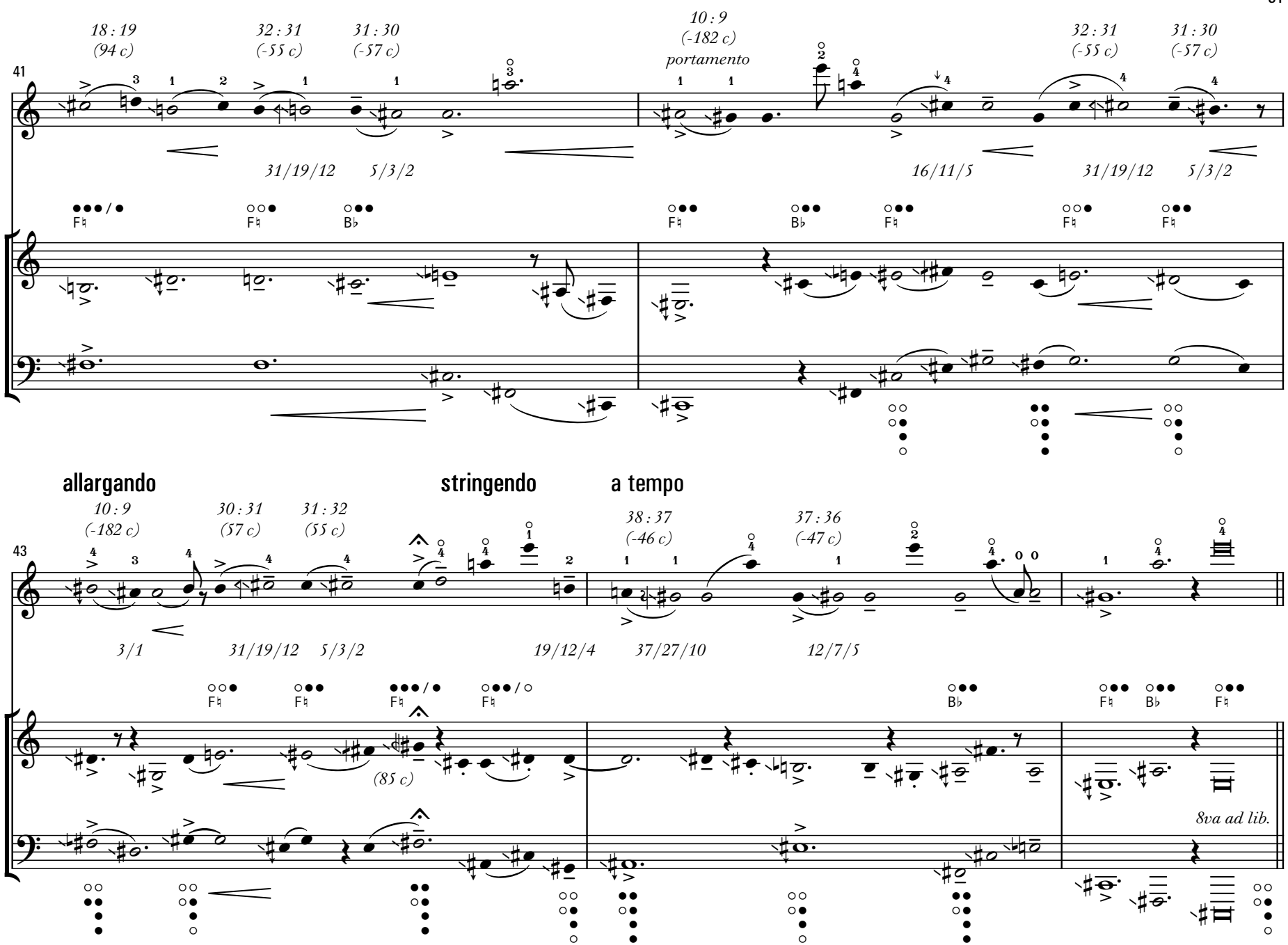
The Pythagorean Mode in the 17-limit Harmonic Region

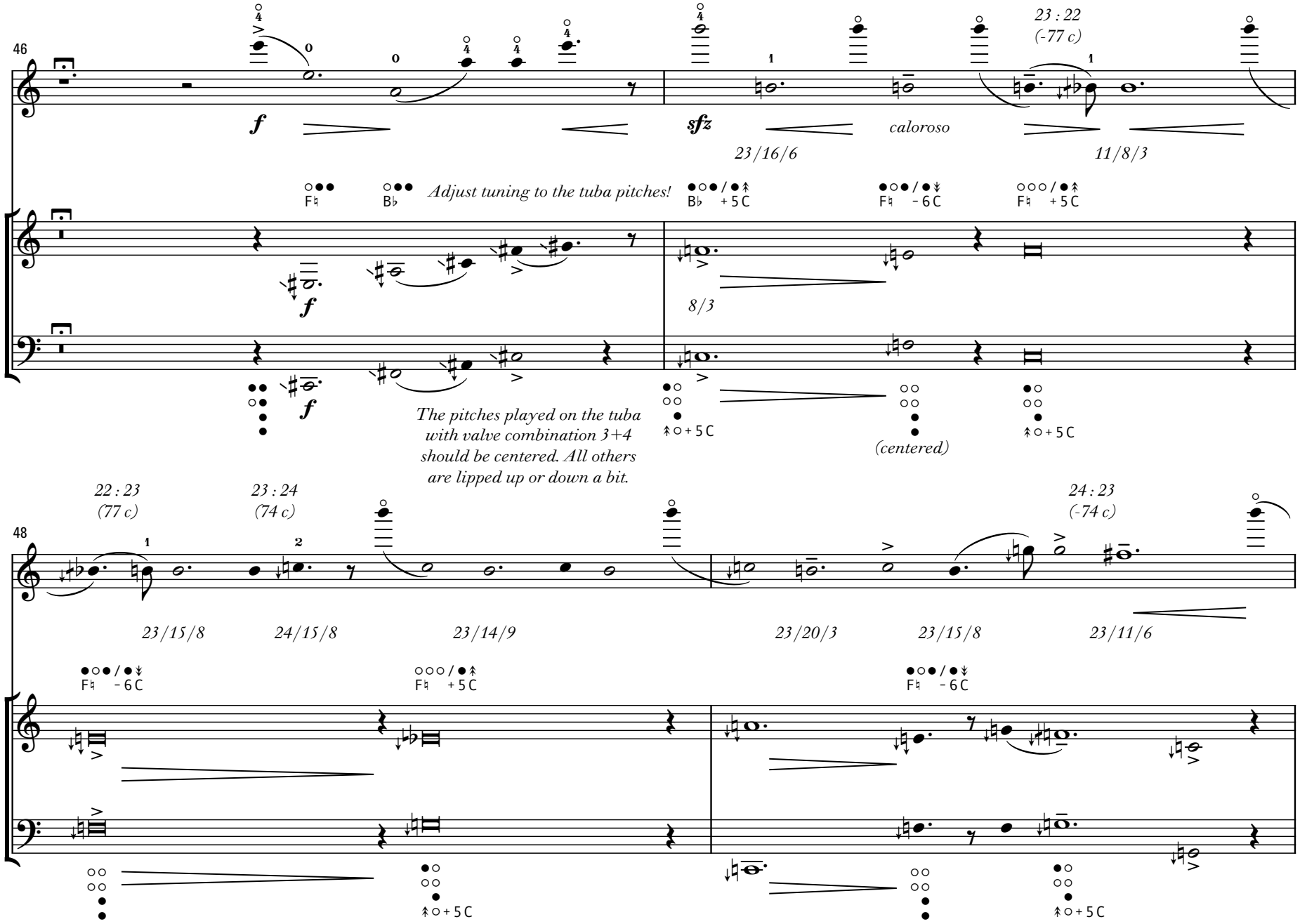


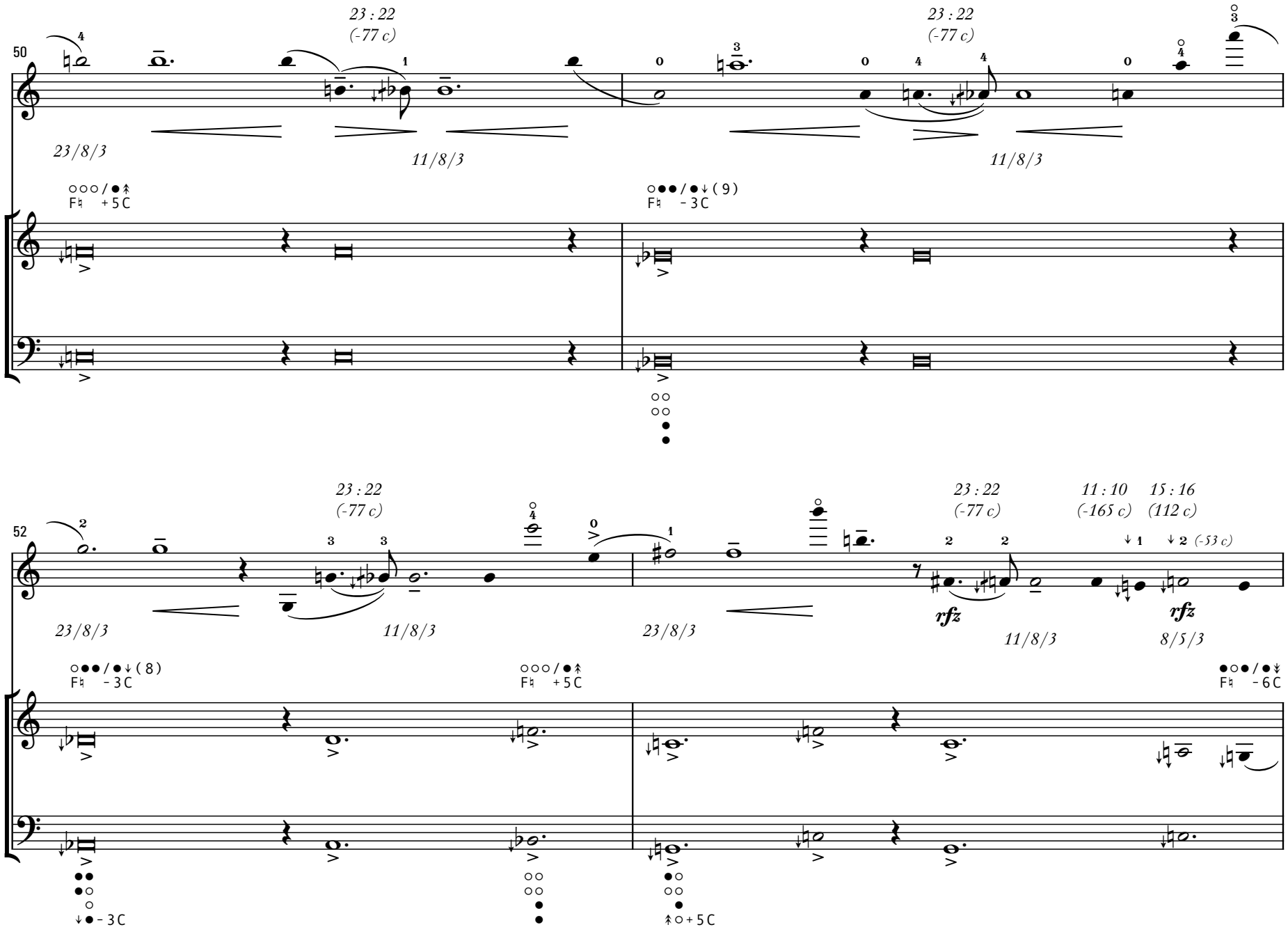

29
B♭ – 1 C
9
– 1 C
31
F♮
B♭
F♮
B♭
F♮
B♭
F♮

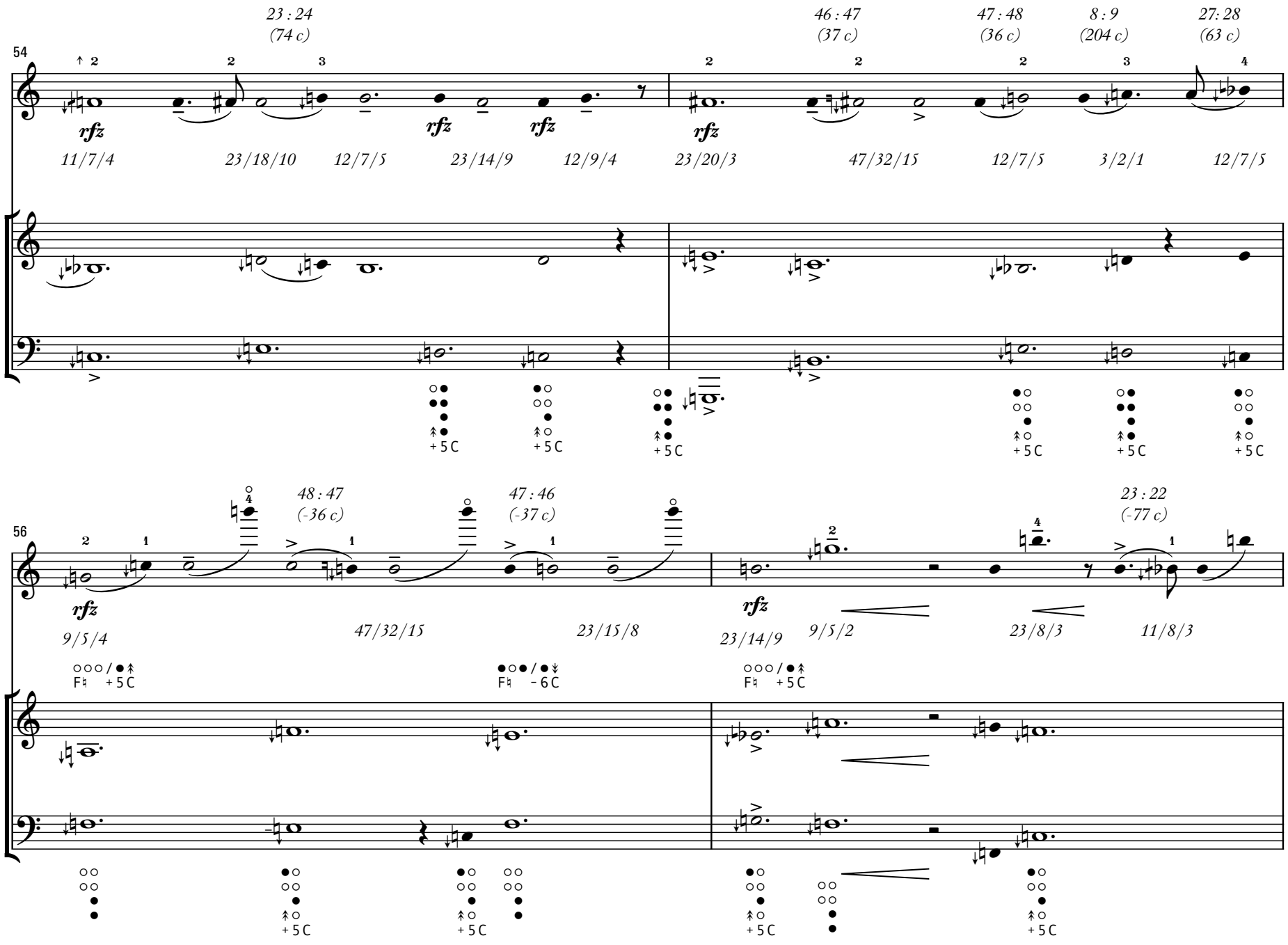

33
18 : 19
(94 c)
19 : 18
(-94 c)
p espressivo
short and slow trills (19:18)
19/6/2
F♮
F♮
F♮
B♭
p
pp
35
36 : 37
(47 c)
37 : 38
(46 c)
9/5/4
37/22/15
19/11/8
F♮
B♭
F♮

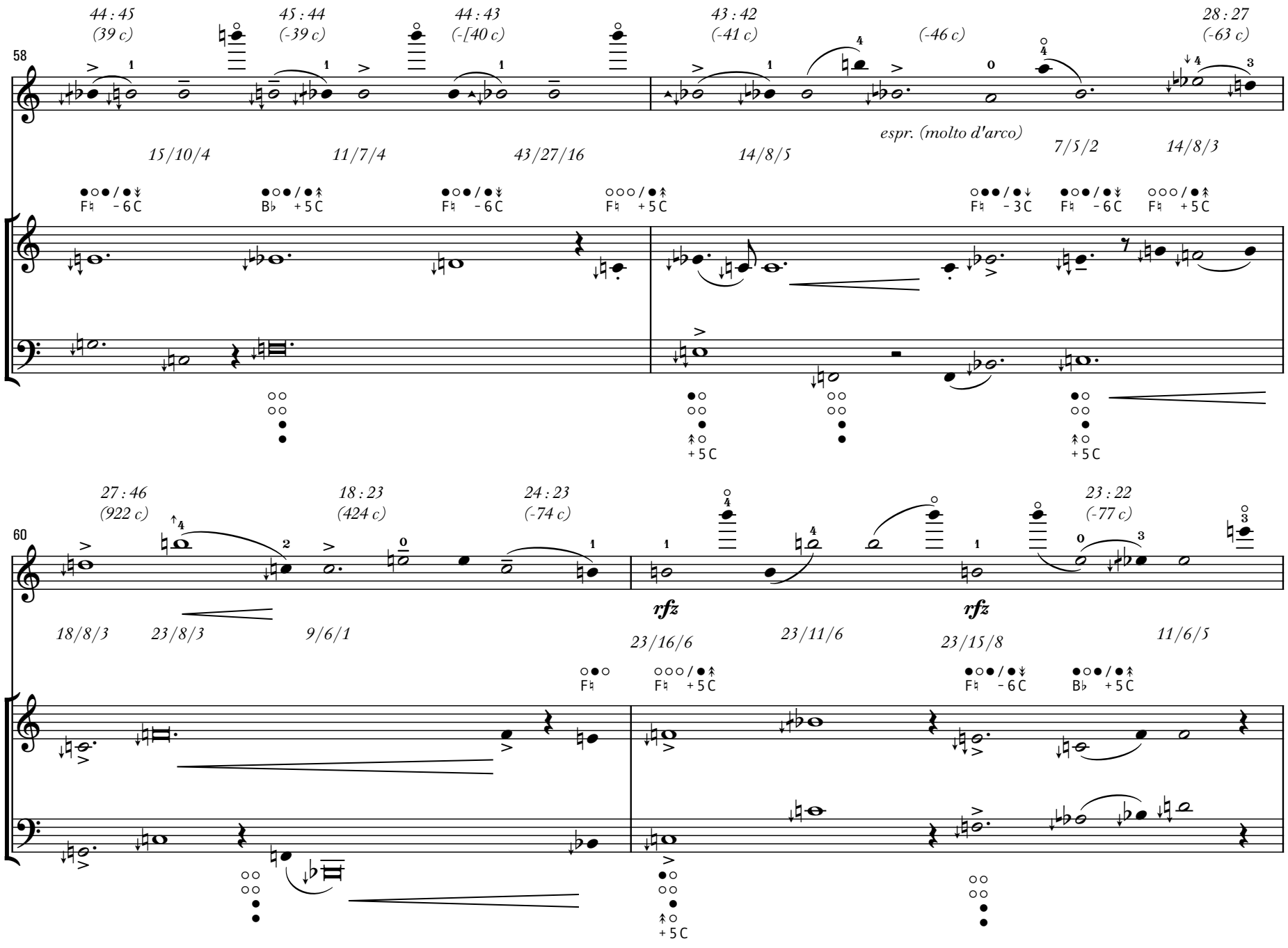

37
38 : 39
(45 c)
39 : 40
(44 c)
19/12/7
19/13/6
19/14/5
19/8/3
13/8/5
5/3/1
B♭
F♮
39
30 : 31
(57 c)
31 : 32
(55 c)
30 : 31
(57 c)
31 : 32
(55 c)
8 : 9
(204 c)
31/19/12
8/5/3
16/11/5
5/3/2
31/19/12
8/5/3
B♭
B♭
F♮
B♭
F♮
F♮

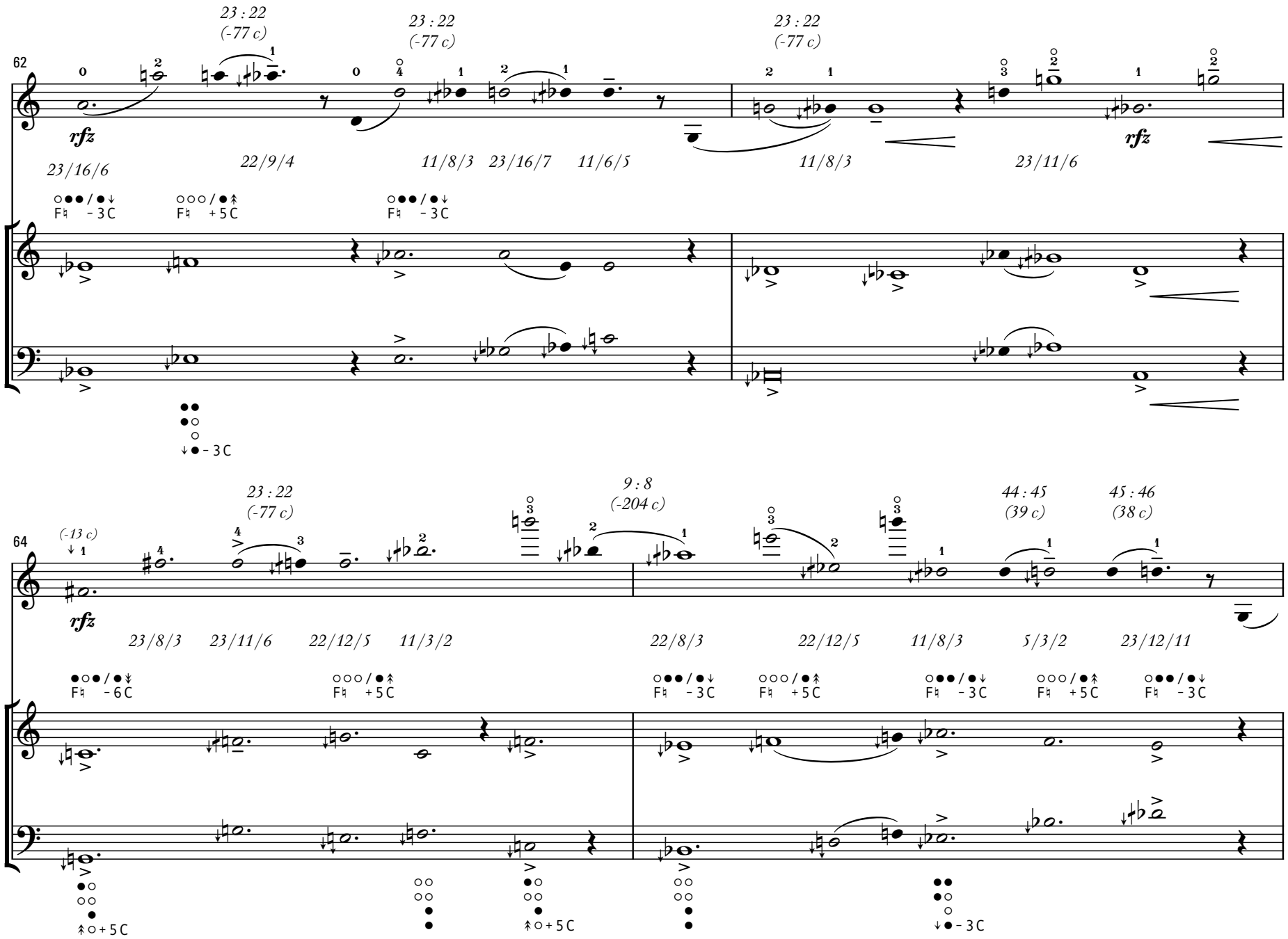

41
18 : 19
(94 c)
32 : 31
(-55 c)
31 : 30
(-57 c)
10 : 9
(-182 c)
portamento
32 : 31
(-55 c)
31 : 30
(-57 c)
31/19/12
5/3/2
16/11/5
31/19/12
5/3/2
allargando
stringendo
a tempo
43
10 : 9
(-182 c)
30 : 31
(57 c)
31 : 32
(55 c)
38 : 37
(-46 c)
37 : 36
(-47 c)
3/1
31/19/12
5/3/2
19/12/4
37/27/10
12/7/5
(85 c)
8va ad lib.

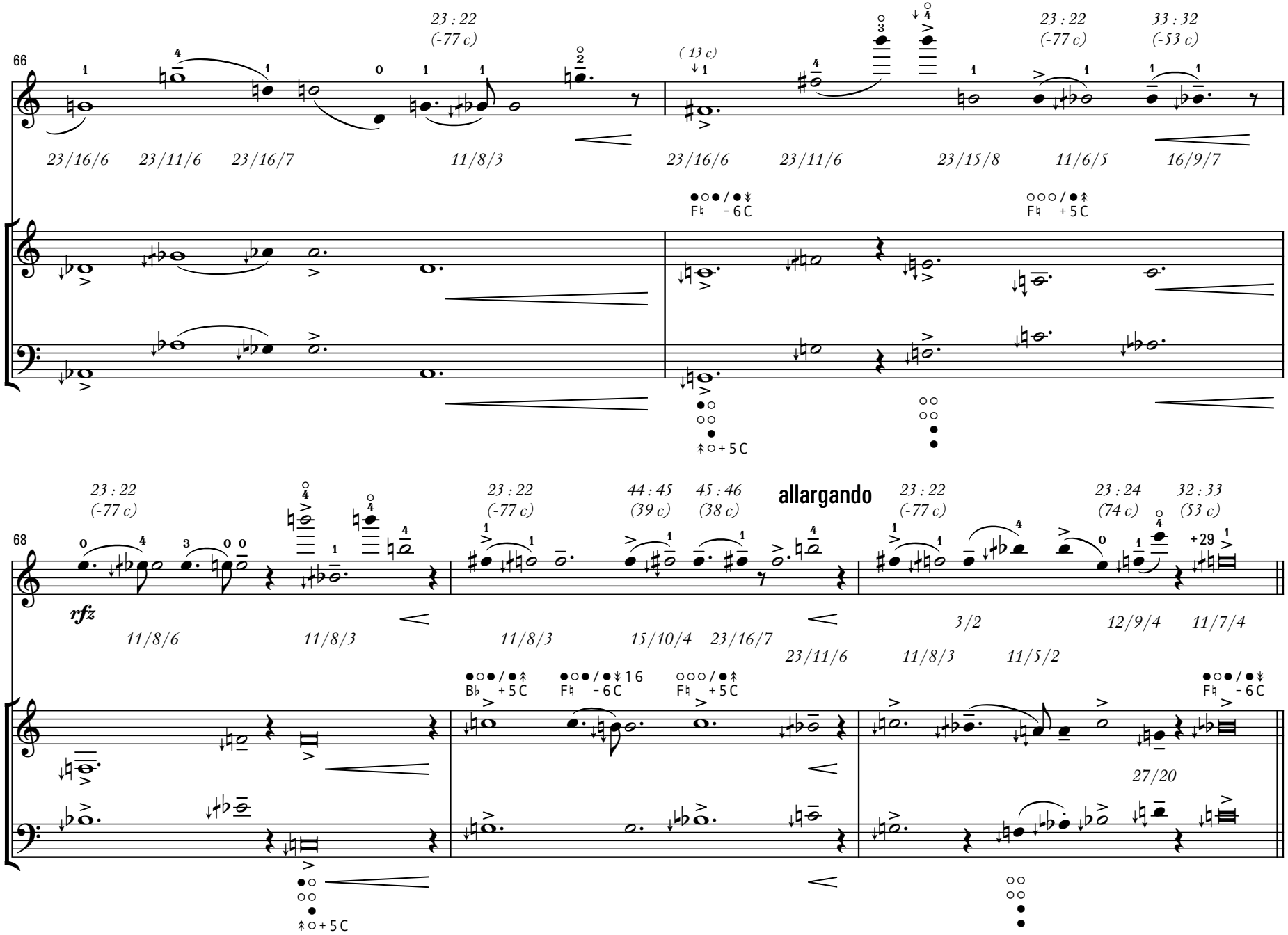

46
f
sfz
caloroso
23 : 22
(-77 c)
23/16/6
11/8/3
Adjust tuning to the tuba pitches!
8/3
The pitches played on the tuba with valve combination 3+4 should be centered. All others are lipped up or down a bit.
(centered)
48
22 : 23
(77 c)
23 : 24
(74 c)
24 : 23
(-74 c)
23/15/8
24/15/8
23/14/9
23/20/3
23/15/8
23/11/6


50
23 : 22
(-77 c)
23/8/3
11/8/3
23 : 22
(-77 c)
11/8/3
○○○/●↟
F♮ +5C
○●●/●↓(9)
F♮ -3C
52
23 : 22
(-77 c)
23/8/3
11/8/3
23/8/3
23 : 22
(-77 c)
rfz
11/8/3
11 : 10
(-165 c)
15 : 16
(112 c)
(-53 c)
rfz
8/5/3
○●●/●↓(8)
F♮ -3C
○○○/●↟
F♮ +5C
●○●/●↡
F♮ -6C
↓●-3C
↟○+5C

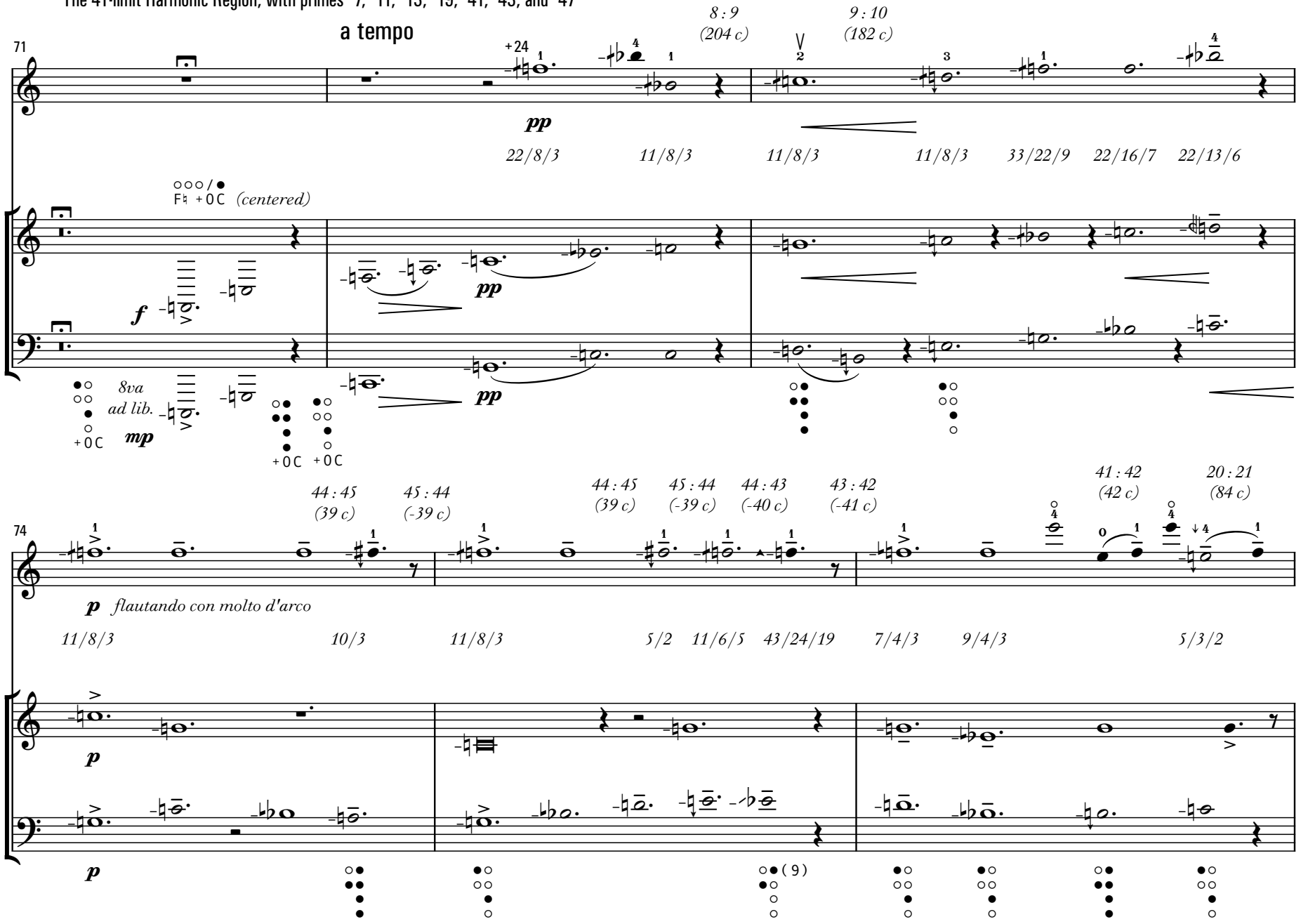

54
23 : 24
(74 c)
46 : 47
(37 c)
47 : 48
(36 c)
8 : 9
(204 c)
27: 28
(63 c)
rfz
11/7/4
23/18/10
12/7/5
23/14/9
12/9/4
23/20/3
47/32/15
12/7/5
3/2/1
12/7/5
+5C
56
48 : 47
(-36 c)
47 : 46
(-37 c)
23 : 22
(-77 c)
9/5/4
47/32/15
23/15/8
23/14/9
9/5/2
23/8/3
11/8/3
F♮ +5C
F♮ -6C

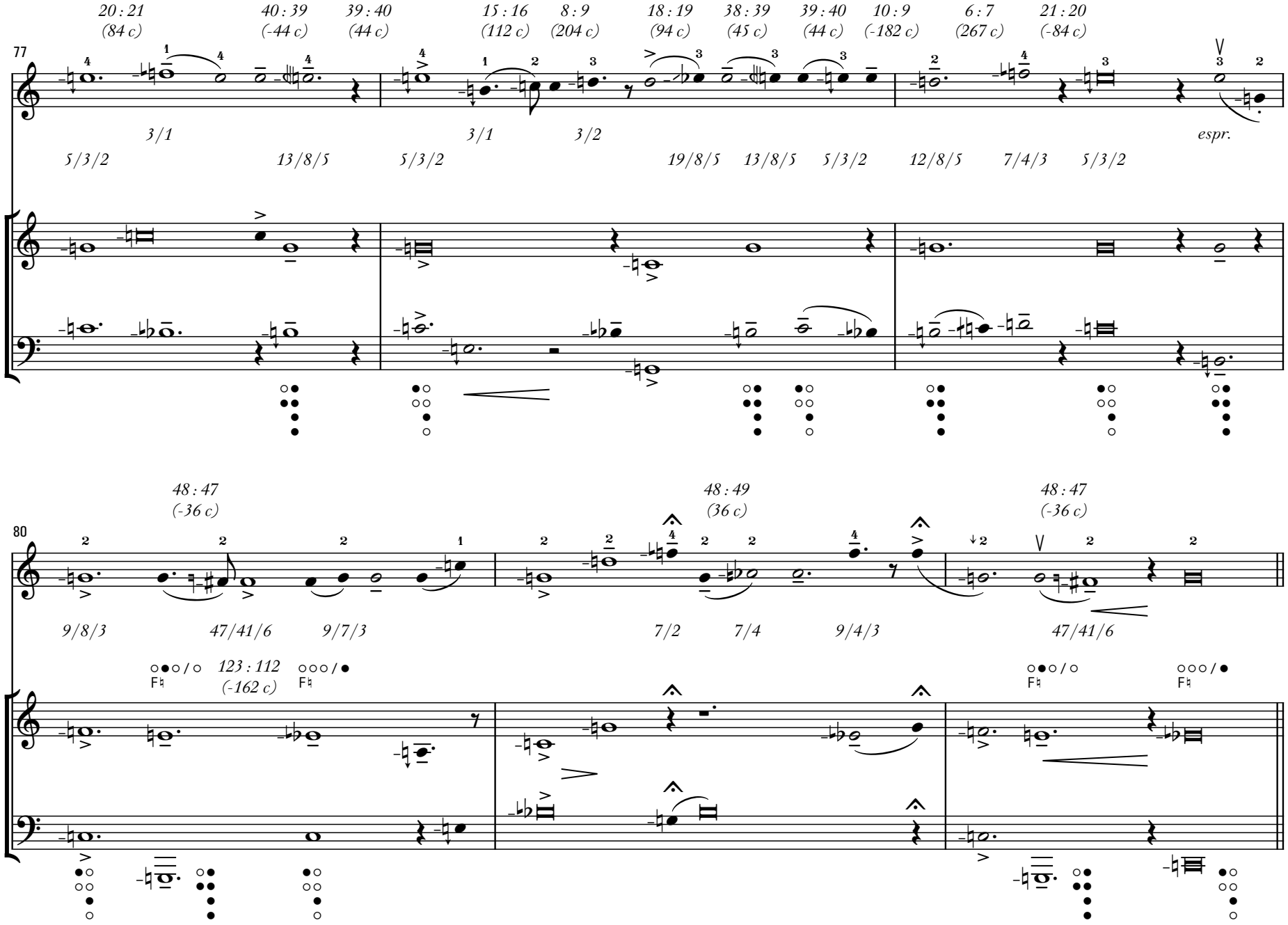

44 : 45
(39 c)
45 : 44
(-39 c)
44 : 43
(-[40 c)
43 : 42
(-41 c)
(-46 c)
28 : 27
(-63 c)
58
15/10/4
11/7/4
43/27/16
14/8/5
espr. (molto d'arco)
7/5/2
14/8/3
27 : 46
(922 c)
18 : 23
(424 c)
24 : 23
(-74 c)
23 : 22
(-77 c)
60
18/8/3
23/8/3
9/6/1
rfz
23/16/6
23/11/6
rfz
23/15/8
11/6/5

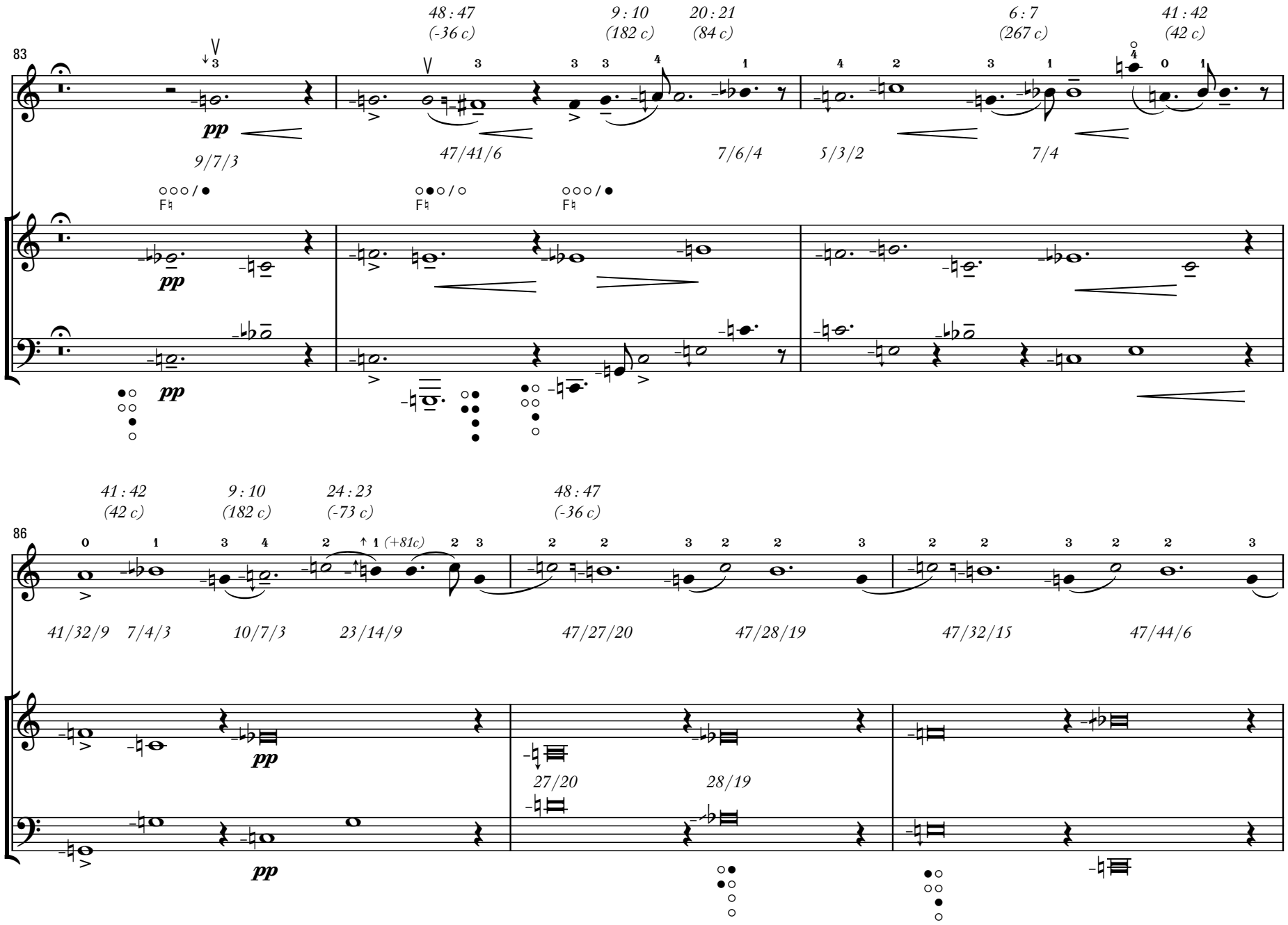

62
23 : 22
(-77 c)
23 : 22
(-77 c)
23 : 22
(-77 c)
rfz
rfz
23/16/6
22/9/4
11/8/3
23/16/7
11/6/5
11/8/3
23/11/6
F♮ -3C
F♮ +5C
F♮ -3C
-3C
64
(-13 c)
23 : 22
(-77 c)
9 : 8
(-204 c)
44 : 45
(39 c)
45 : 46
(38 c)
rfz
23/8/3
23/11/6
22/12/5
11/3/2
22/8/3
22/12/5
11/8/3
5/3/2
23/12/11
F♮ -6C
F♮ +5C
F♮ -3C
F♮ +5C
F♮ -3C
F♮ +5C
F♮ -3C
+5C
+5C
-3C

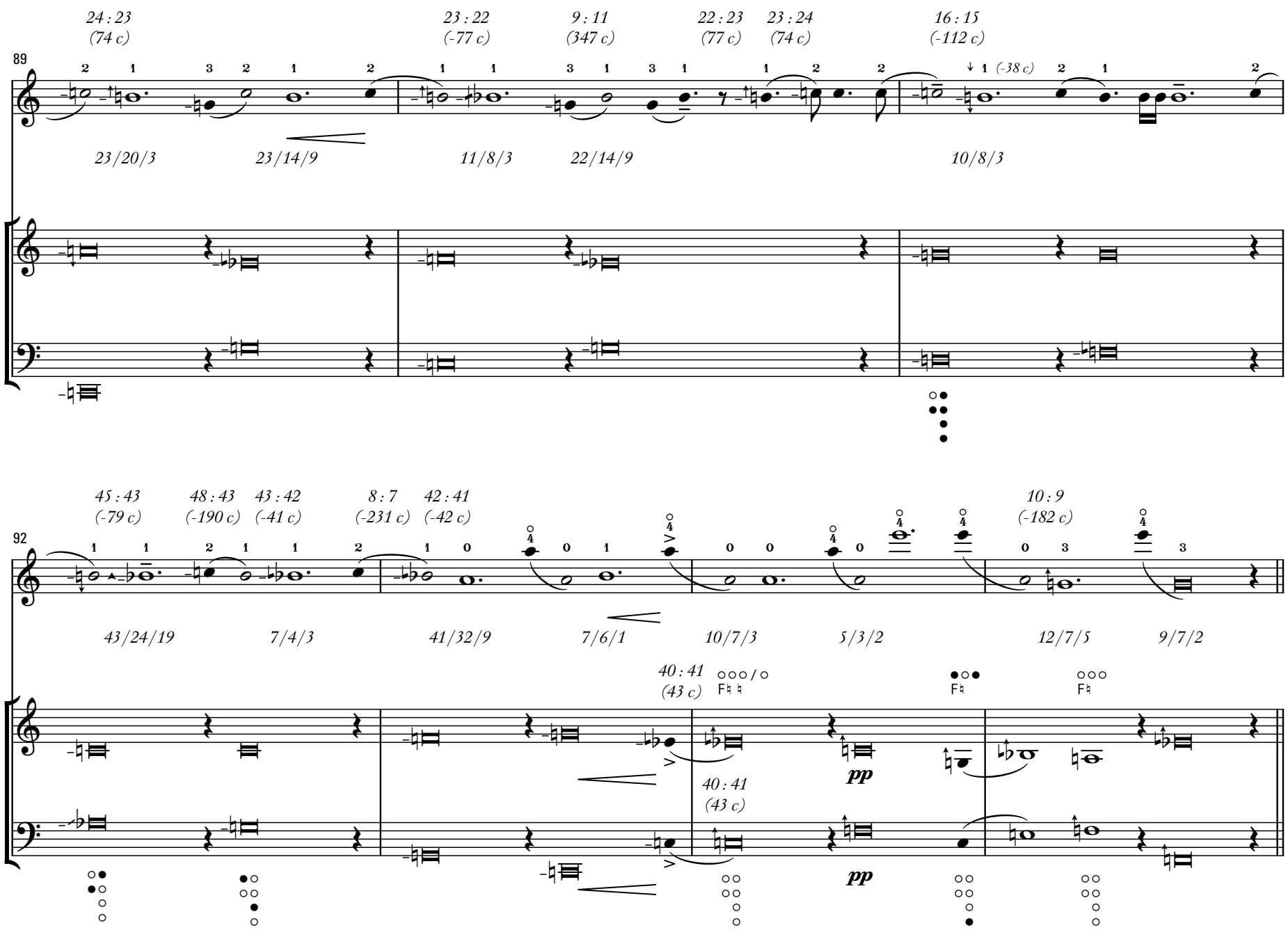

66
23 : 22
(-77 c)
(-13 c)
23 : 22
(-77 c)
33 : 32
(-53 c)
23/16/6
23/11/6
23/16/7
11/8/3
23/16/6
23/11/6
23/15/8
11/6/5
16/9/7
●○●/●↡
F♮ -6C
○○○/●↟
F♮ +5C
●○
○○
●
↟○+5C
○○
○○
●
68
23 : 22
(-77 c)
23 : 22
(-77 c)
44 : 45
(39 c)
45 : 46
(38 c)
allargando
23 : 22
(-77 c)
23 : 24
(74 c)
32 : 33
(53 c)
+29
rfz
11/8/6
11/8/3
11/8/3
15/10/4
23/16/7
23/11/6
3/2
12/9/4
11/7/4
11/8/3
11/5/2
27/20
●○●/●↟
B♭ +5C
●○●/●↡16
F♮ -6C
○○○/●↟
F♮ +5C
●○●/●↡
F♮ -6C
●○
○○
●
↟○+5C
○○
○○
●

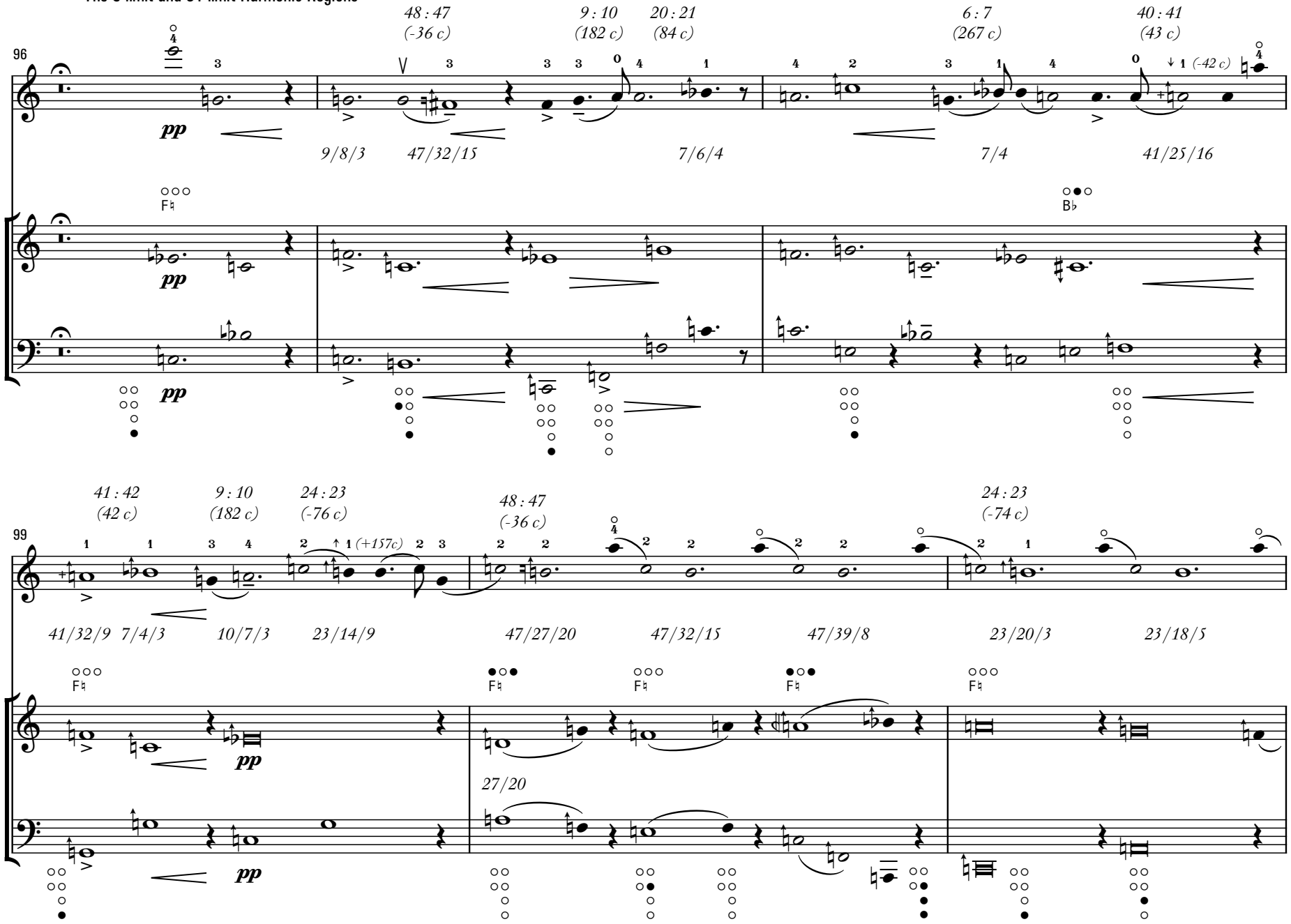
The 41-limit Harmonic Region, with primes °7, °11, °13, °19, °41, °43, and °47

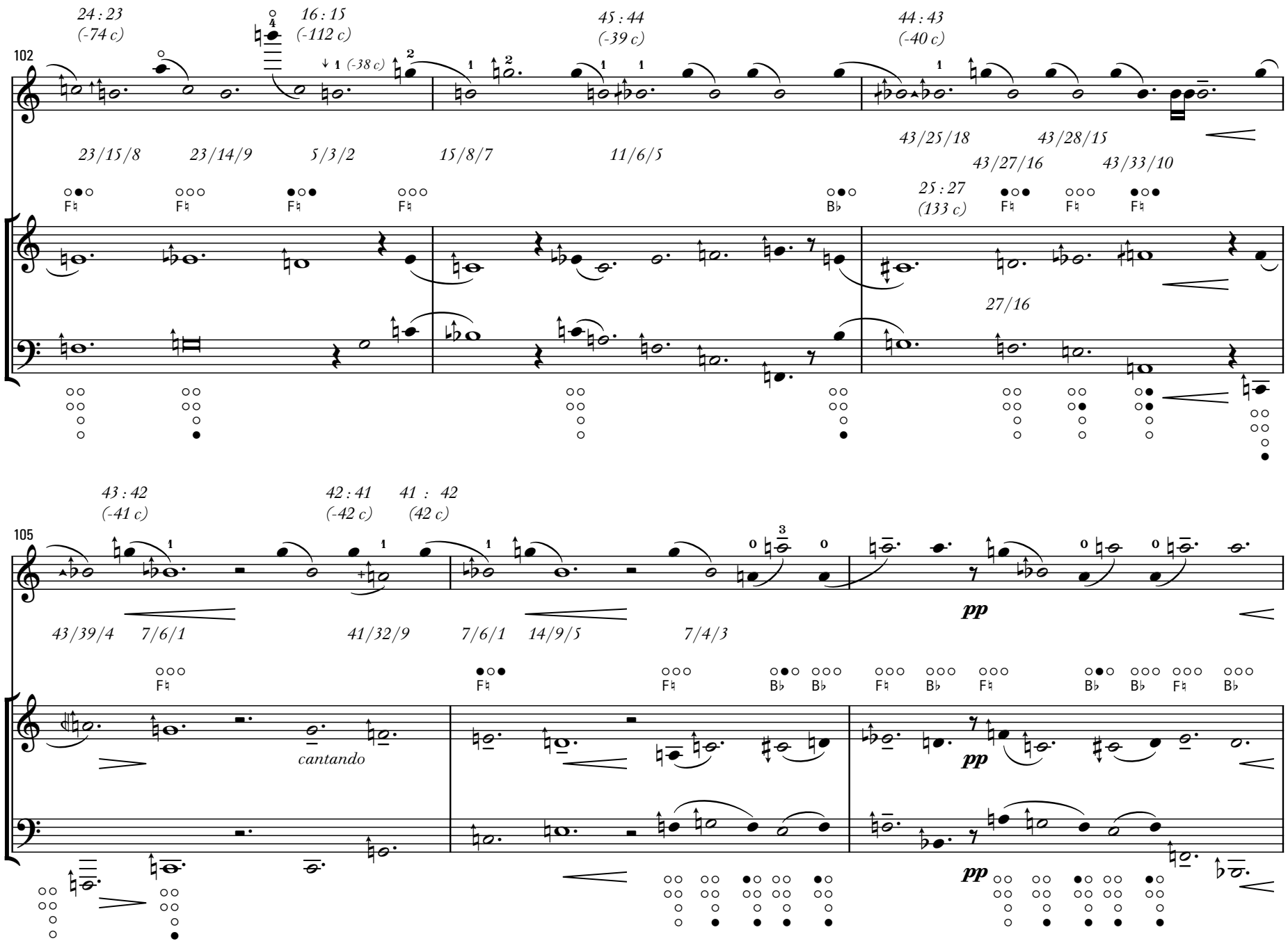


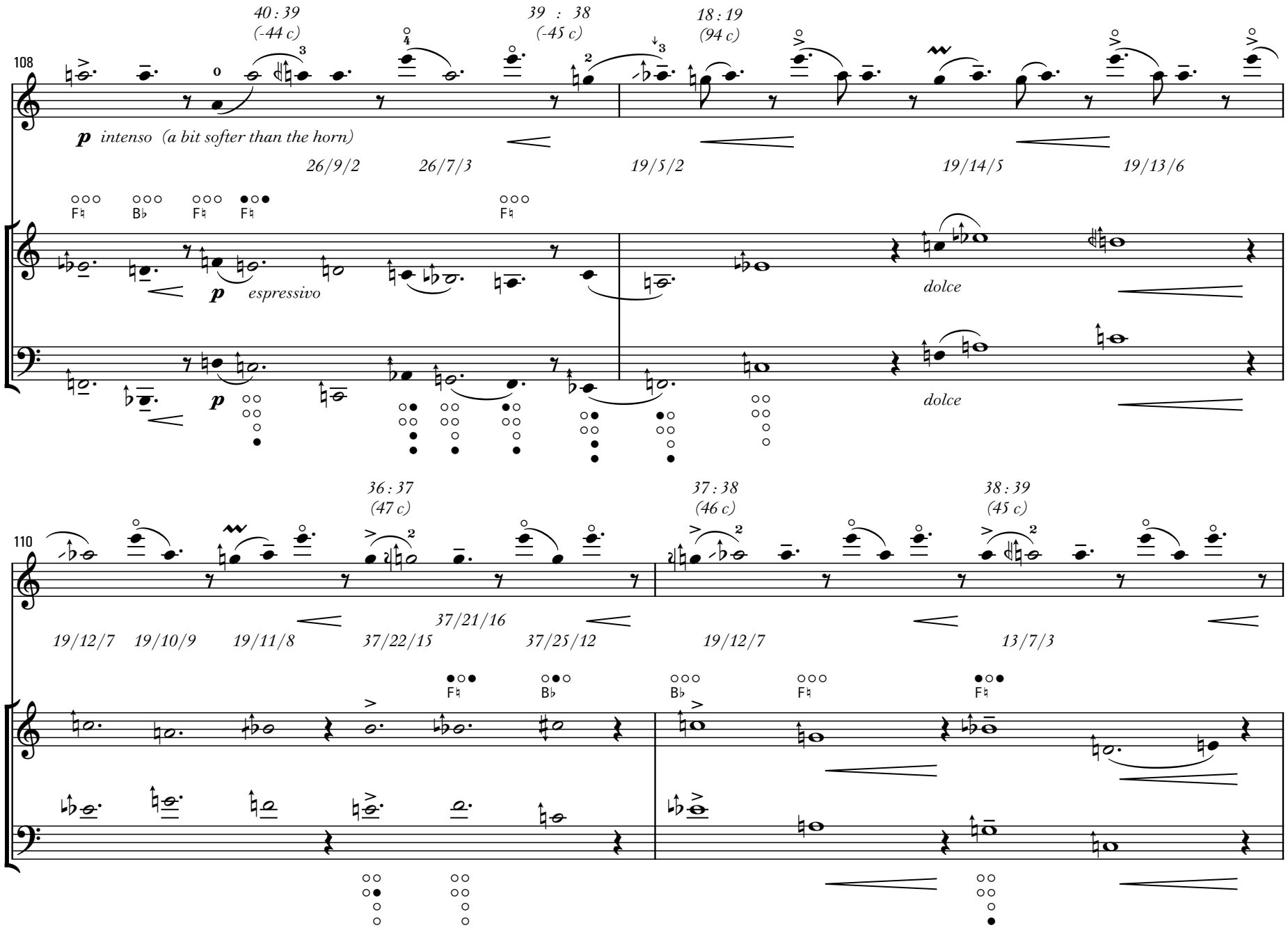

77
20 : 21
(84 c)
40 : 39
(-44 c)
39 : 40
(44 c)
15 : 16
(112 c)
8 : 9
(204 c)
18 : 19
(94 c)
38 : 39
(45 c)
39 : 40
(44 c)
10 : 9
(-182 c)
6 : 7
(267 c)
21 : 20
(-84 c)
3/1
3/1
3/2
espr.
5/3/2
13/8/5
5/3/2
19/8/5
13/8/5
5/3/2
12/8/5
7/4/3
5/3/2
80
48 : 47
(-36 c)
48 : 49
(36 c)
48 : 47
(-36 c)
9/8/3
47/41/6
9/7/3
7/2
7/4
9/4/3
47/41/6
123 : 112
(-162 c)

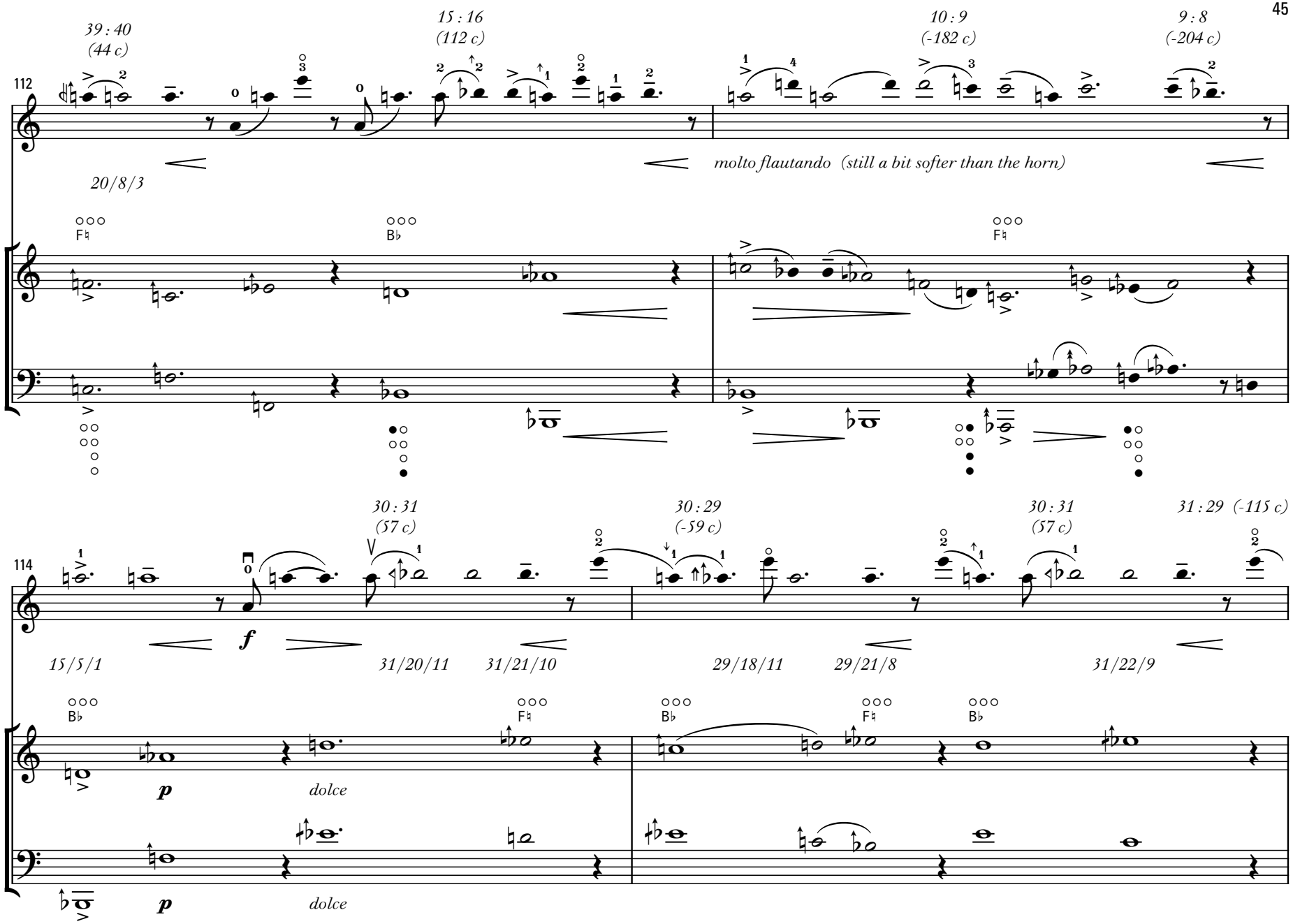

83
48 : 47
(-36 c)
9 : 10
(182 c)
20 : 21
(84 c)
6 : 7
(267 c)
41 : 42
(42 c)
pp
9/7/3
47/41/6
7/6/4
5/3/2
7/4
41 : 42
(42 c)
9 : 10
(182 c)
24 : 23
(-73 c)
48 : 47
(-36 c)
86
(+81c)
41/32/9
7/4/3
10/7/3
23/14/9
47/27/20
47/28/19
47/32/15
47/44/6
27/20
28/19

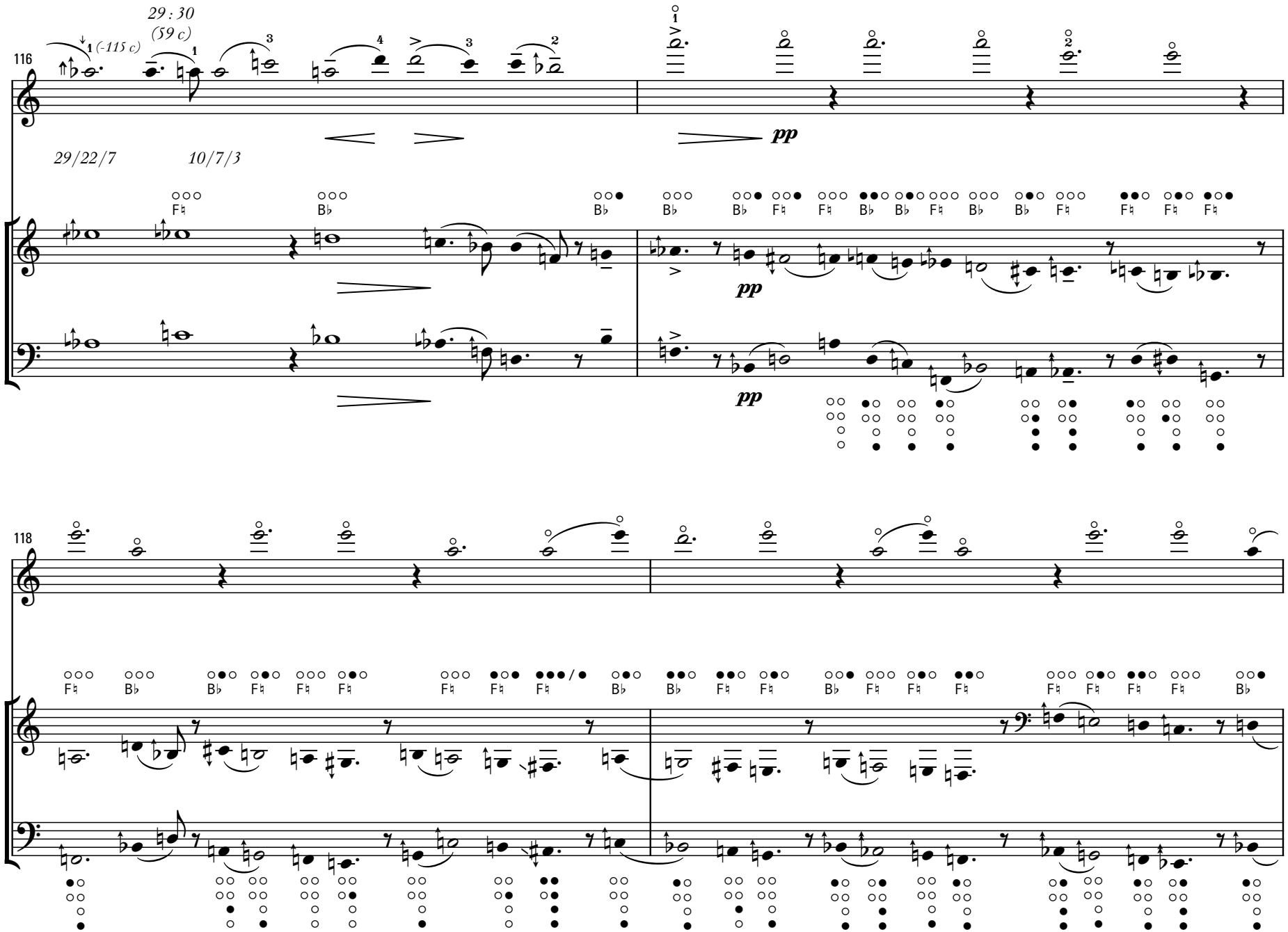

24 : 23
(74 c)
23 : 22
(-77 c)
9 : 11
(347 c)
22 : 23
(77 c)
23 : 24
(74 c)
16 : 15
(-112 c)
89
(-38 c)
23/20/3
23/14/9
11/8/3
22/14/9
10/8/3
45 : 43
(-79 c)
48 : 43
(-190 c)
43 : 42
(-41 c)
8 : 7
(-231 c)
42 : 41
(-42 c)
10 : 9
(-182 c)
92
43/24/19
7/4/3
41/32/9
7/6/1
10/7/3
5/3/2
12/7/5
9/7/2
40 : 41
(43 c)
40 : 41
(43 c)
pp
pp

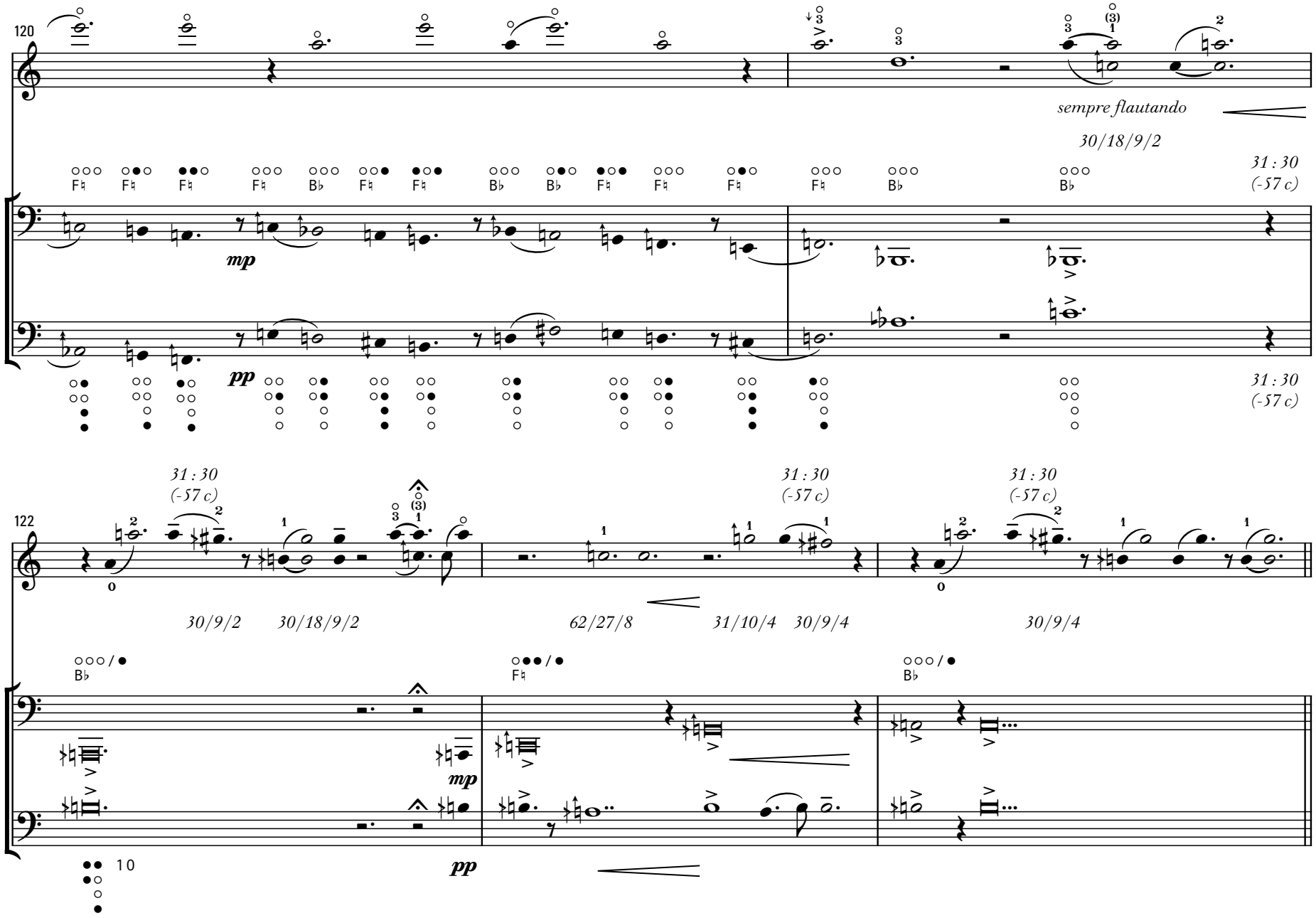

96
48 : 47
(-36 c)
9 : 10
(182 c)
20 : 21
(84 c)
6 : 7
(267 c)
40 : 41
(43 c)
(-42 c)
pp
9/8/3
47/32/15
7/6/4
7/4
41/25/16
F♮
B♭
99
41 : 42
(42 c)
9 : 10
(182 c)
24 : 23
(-76 c)
(+157c)
48 : 47
(-36 c)
24 : 23
(-74 c)
41/32/9
7/4/3
10/7/3
23/14/9
47/27/20
47/32/15
47/39/8
23/20/3
23/18/5
27/20

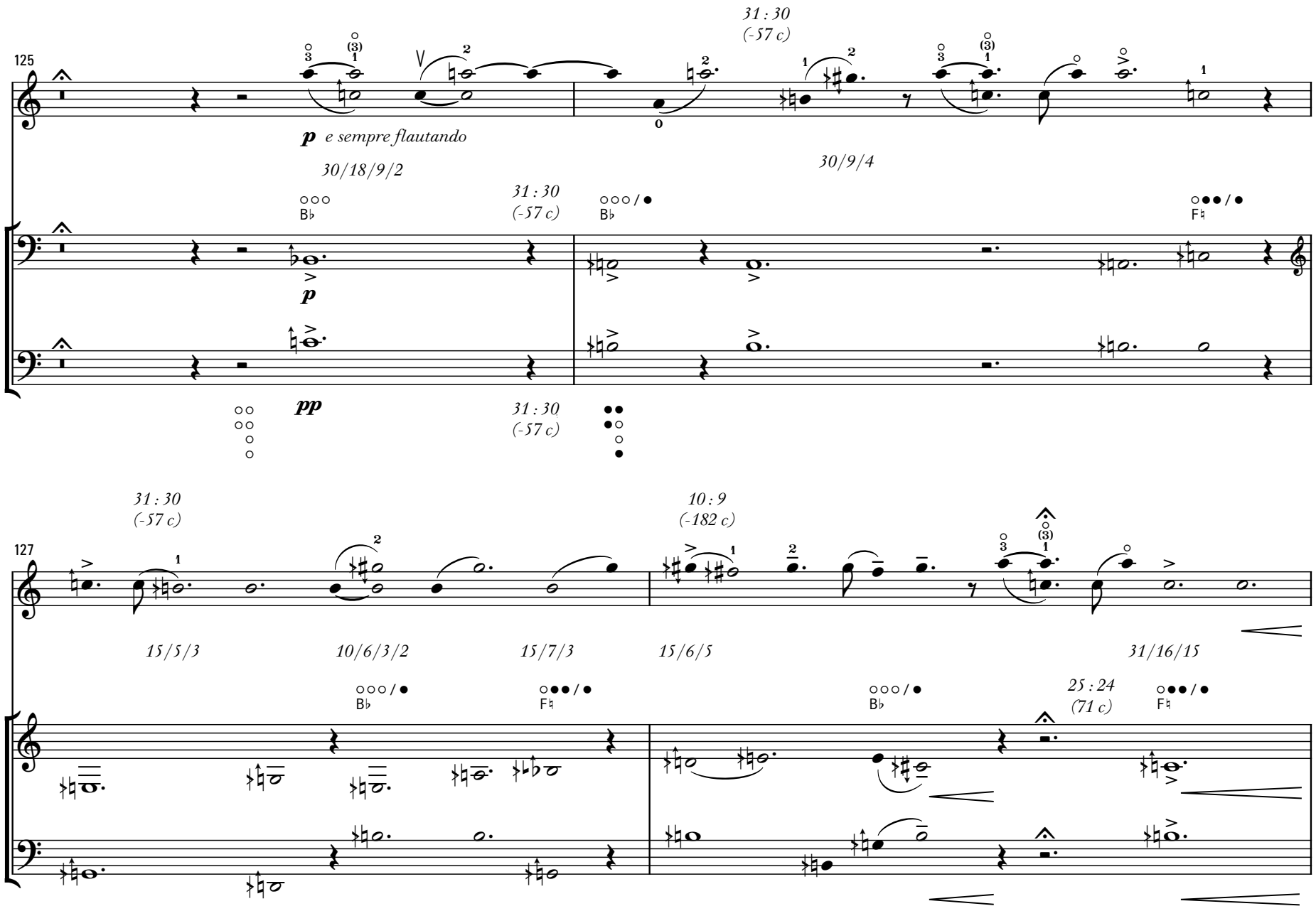

24 : 23
(-74 c)
16 : 15
(-112 c)
(-38 c)
45 : 44
(-39 c)
44 : 43
(-40 c)
102
23/15/8
23/14/9
5/3/2
15/8/7
11/6/5
43/25/18
43/28/15
43/27/16
43/33/10
25 : 27
(133 c)
27/16
43 : 42
(-41 c)
42 : 41
(-42 c)
41 : 42
(42 c)
105
43/39/4
7/6/1
41/32/9
7/6/1
14/9/5
7/4/3
pp
cantando

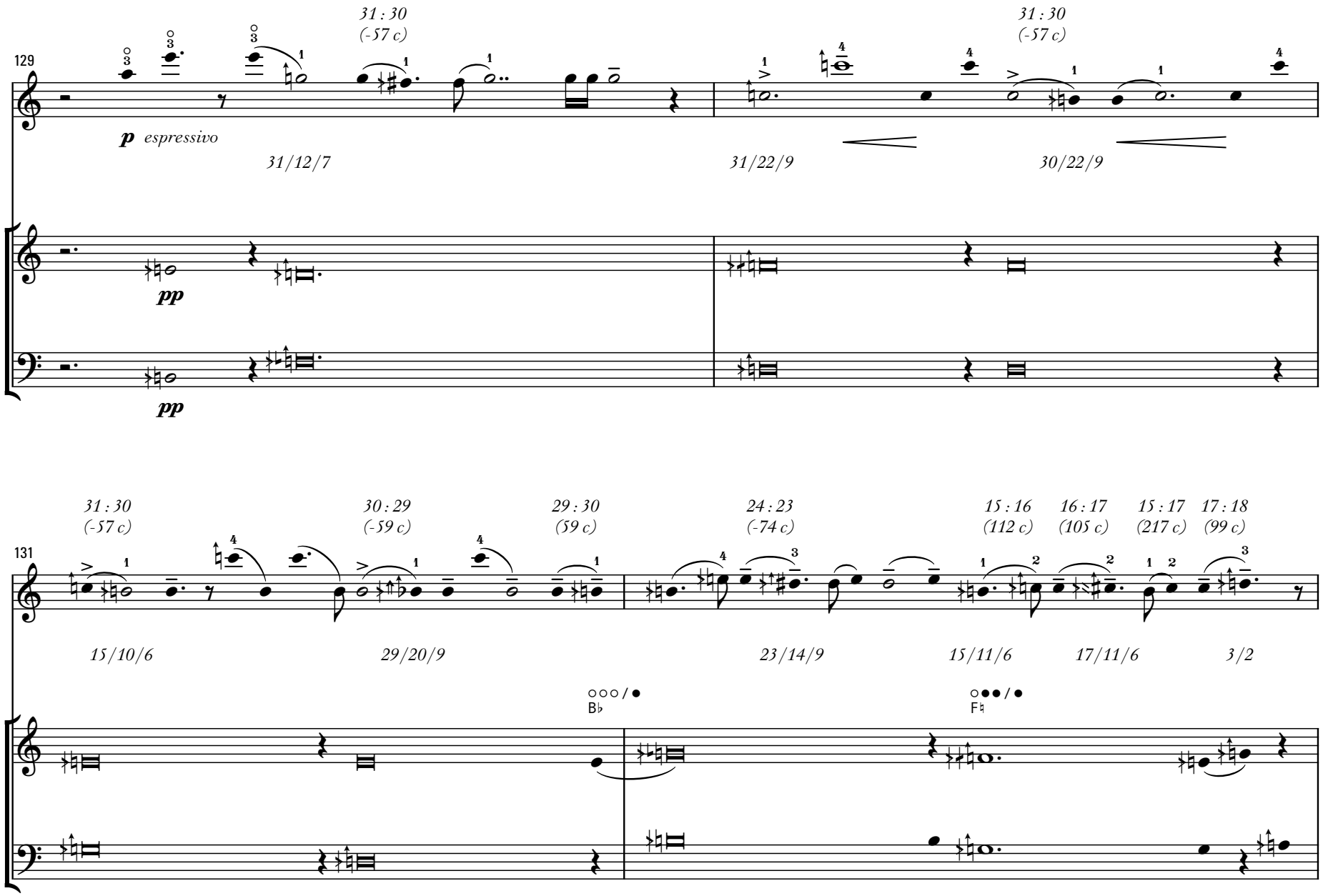

108
40 : 39
(-44 c)
39 : 38
(-45 c)
18 : 19
(94 c)
p intenso (a bit softer than the horn)
26/9/2
26/7/3
19/5/2
19/14/5
19/13/6
p espressivo
dolce
dolce
110
36 : 37
(47 c)
37 : 38
(46 c)
38 : 39
(45 c)
37/21/16
19/12/7
19/10/9
19/11/8
37/22/15
37/25/12
19/12/7
13/7/3

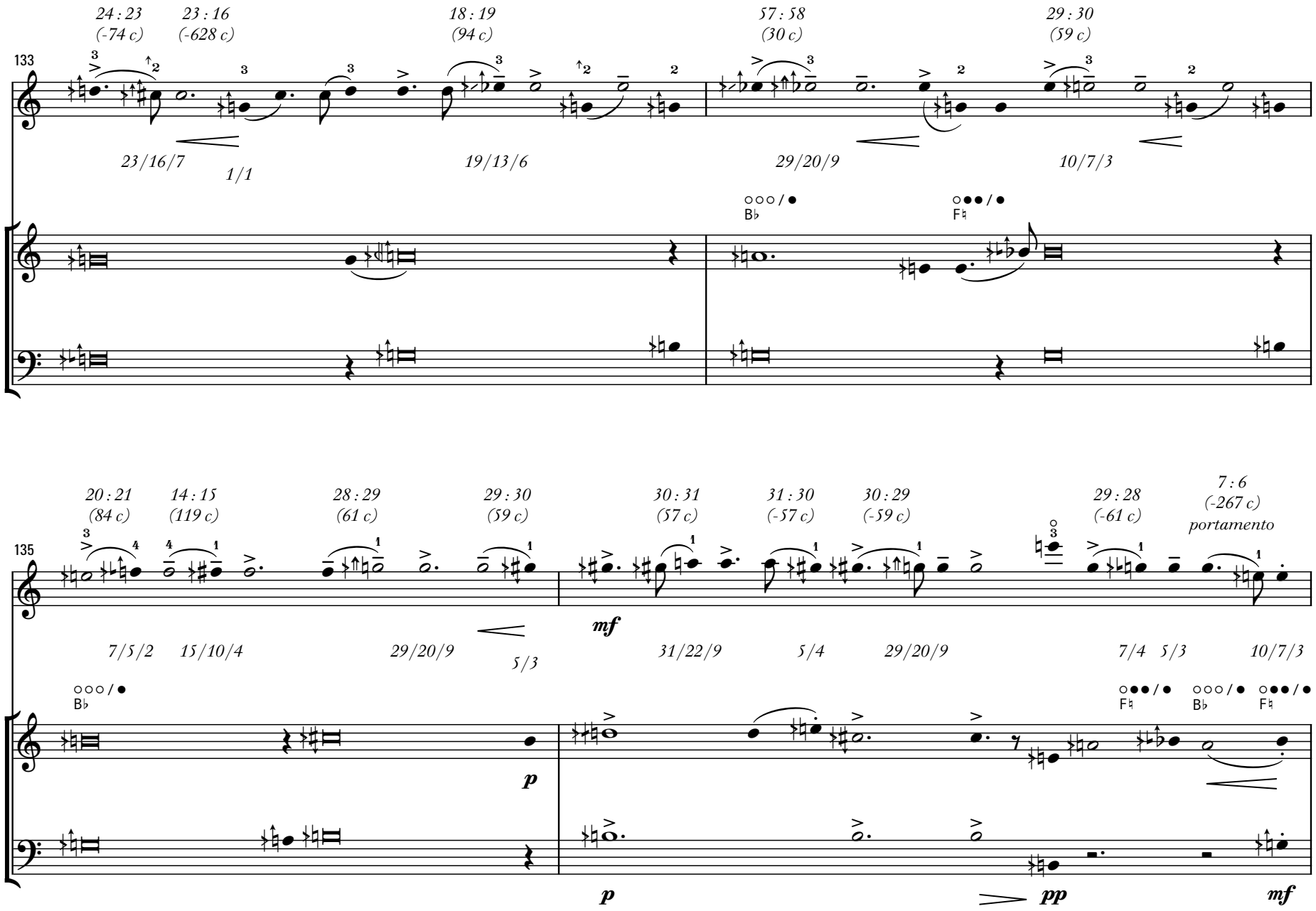

39 : 40
(44 c)
15 : 16
(112 c)
10 : 9
(-182 c)
9 : 8
(-204 c)
112
molto flautando (still a bit softer than the horn)
20/8/3
30 : 31
(57 c)
30 : 29
(-59 c)
30 : 31
(57 c)
31 : 29 (-115 c)
114
f
15/5/1
31/20/11
31/21/10
29/18/11
29/21/8
31/22/9
p
dolce
p
dolce

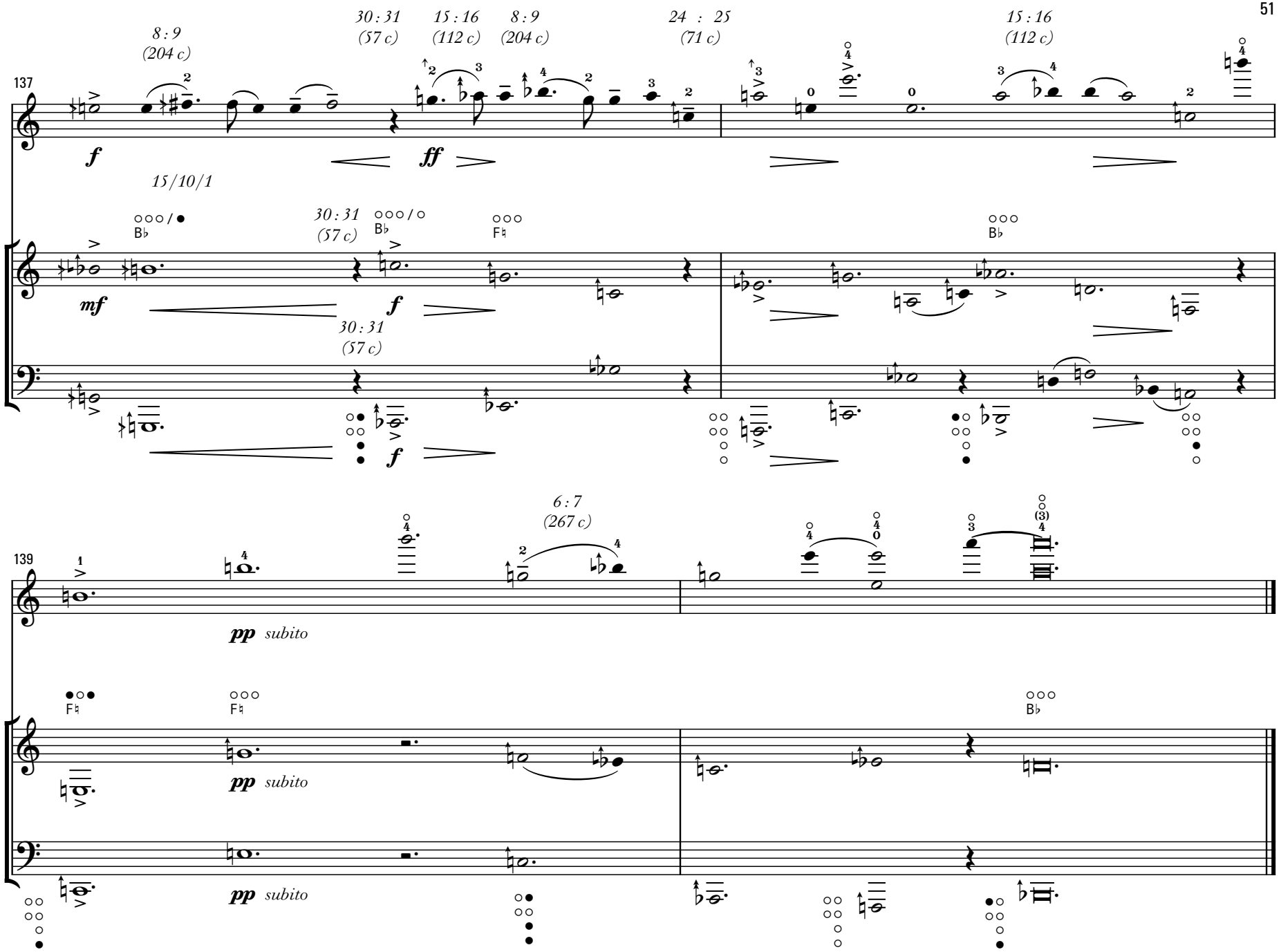

116
29 : 30
(59 c)
(-115 c)
29/22/7
10/7/3
pp
pp
pp
118


120
sempre flautando
30/18/9/2
31 : 30
(-57 c)
mp
pp
122
31 : 30
(-57 c)
30/9/2
30/18/9/2
62/27/8
31/10/4
30/9/4
30/9/4
mp
pp
10


125
31 : 30
(-57 c)
p e sempre flautando
30/18/9/2
31 : 30
(-57 c)
30/9/4
B♭
F♮
p
pp
31 : 30
(-57 c)
127
31 : 30
(-57 c)
10 : 9
(-182 c)
15/5/3
10/6/3/2
15/7/3
15/6/5
31/16/15
25 : 24
(71 c)


129
31 : 30
(-57 c)
31 : 30
(-57 c)
p espressivo
31/12/7
31/22/9
30/22/9
pp
pp
131
31 : 30
(-57 c)
30 : 29
(-59 c)
29 : 30
(59 c)
24 : 23
(-74 c)
15 : 16
(112 c)
16 : 17
(105 c)
15 : 17
(217 c)
17 : 18
(99 c)
15/10/6
29/20/9
23/14/9
15/11/6
17/11/6
3/2
B♭
F♮


133
24 : 23
(-74 c)
23 : 16
(-628 c)
18 : 19
(94 c)
57 : 58
(30 c)
29 : 30
(59 c)
23/16/7
1/1
19/13/6
29/20/9
10/7/3
B♭
F♮
135
20 : 21
(84 c)
14 : 15
(119 c)
28 : 29
(61 c)
29 : 30
(59 c)
30 : 31
(57 c)
31 : 30
(-57 c)
30 : 29
(-59 c)
29 : 28
(-61 c)
7 : 6
(-267 c)
portamento
7/5/2
15/10/4
29/20/9
5/3
31/22/9
5/4
29/20/9
7/4
5/3
10/7/3
mf
p
p
pp
mf


137
8 : 9
(204 c)
30 : 31
(57 c)
15 : 16
(112 c)
8 : 9
(204 c)
24 : 25
(71 c)
15 : 16
(112 c)
f
ff
15/10/1
mf
30 : 31
(57 c)
f
30 : 31
(57 c)
f
139
6 : 7
(267 c)
pp subito
pp subito
pp subito