

M a r c S a b a t

*Wonderful Scatter*

*for 6-valve F-tuba, sensors, computer and loudspeaker*

PLAINSOUND MUSIC EDITION

## Wonderful Scatter

for tuba and computer (Marc Sabat, 2005)

6-valve F-tuba equipped with sensors for each valve, computer, loudspeaker

duration circa 2 hours

*for Robin Hayward*

The 6-valve F-tuba is equipped with 6 independent valves of different lengths, which may be combined in 64 possible ways including the open horn position (no valves depressed). If these valves are adjusted so that their lengths are proportional to each other (open tube-length : V1 : V2 : V3 : V4 : V5 : V6 = 45 : 6 : 3 : 9 : 15 : 8 : 4), then the 64 valve combinations produce 40 different possible lengths of tube ranging from 45 units (○○/○○○○) to 90 units (●●/●●●●). (There are only 40 tube-lengths because some of the 64 combinations are synonymous.) These tube-lengths form a set of fundamental pitches (pedal-tones) related to each other by natural number proportions and forming part of a *subharmonic series*. (In the case of this F-tuba tuning, the subharmonic series is generated by a high B-natural, tuned in unison with the third harmonic of a violin's open E-string.) Over each of these subharmonic fundamentals, a tubist can play a *harmonic series* of overtones. Since all pitches produced in this way are related to each other by whole number ratios, the entire set forms a microtonal gamut in Just Intonation. [This tuning of the valve-combinations was devised in November 2004 by Marc Sabat in collaboration with Robin Hayward.]

For each of the 6 valves, a sensor is installed under the valve mechanism, which continually measures its position. The movements of valves produced by the tubist's fingers (and thus information about the valve lengths being used at any given time) are transmitted in real-time across an ethernet cable to a computer. [The sensor mechanism used in this performance was developed in Berlin by Sukandar Kartidanata.]

The tubist plays all available pitches in the first four octaves of his instrument, organized in an ascending microtonal gamut. The lengths of notes in bpm are proportional to the respective tube lengths. Notes are separated in time by durations proportional to the melodic distance between them (measured in cents). Each semitone contains one minute of non-playing pause. After the second, third and fourth octaves, the player repeats the lowest octave (pedal tones).

A computer program (MAX/MSP patch) analyzes the played valve combinations. Corresponding to the 40 possible tube-lengths there are 40 loops, with (subaudio) lengths proportional to the respective fundamental wavelengths. Using information from the sensors, each new note is routed to its corresponding loop. Over the course of the installation, the computer acts as a memory-sieve, sorting the pitches played into 40 different overtone-series loops. These loops are activated one-by-one as the tubist changes fingerings. Depending on the lengths of the loops and of the notes played, the resulting textures range from a spectral chord to a chance-determined overtone melody.

A loudspeaker amplifies the output of the computer program, which eliminates higher frequencies (above 352 Hz), producing a soft, round sound resembling sinewaves. Thus, as the music progresses, each new note gradually merges with harmonically-related tones and the movement from tone to tone is transformed from a relationship based on melodic distance to various possible relationships of harmonic distance.

This piece is dedicated to composer and tubist Robin Hayward, with warm thanks for his ongoing collaboration, in particular, his idea for the "Double Tuba" valve tuning on which the current valve-combinations are based, and his suggestion to amplify and filter the tuba with a subwoofer speaker. The title is a literal English translation of the Latin Requiem Mass text "Tuba mirum, spargens sonum" ("War-trumpet wonderful, scatter sound").

# 6-Valve F Tuba Tuning in Just Intonation

valves 1, 2, 3, 4, 5, 6 tuned to rational proportions (6/45, 3/45, 9/45, 15/45, 8/45, 4/45) of the open tuba's length producing, in various combinations,

a Utonal Series of fundamental pitches with wavelengths in the proportions 45 : 48 : 49 : 51 : 52 : 53 : 54 : 55 : 56 : 57 : 58 : 59 : 60 :

61 : 62 : 63 : 64 : 65 : 66 : 67 : 68 : 69 : 70 : 71 : 72 : 73 : 74 : 75 : 76 : 77 : 78 : 79 : 80 : 81 : 82 : 83 : 84 : 86 : 87 : 90

tuning of the valve combinations devised by Marc Sabat based on Robin Hayward's proposed "Double Tuba in F and C" valve tuning (Berlin 11.2004)

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

The image displays a musical score for 6-Valve F Tuba Tuning in Just Intonation. It consists of 11 staves, each representing a different valve combination (45, 48, 49, 51, 52, 53, 54, 55, 56, 57). Each staff shows the fundamental pitch and its adjustments in cents for various valve combinations. The adjustments are indicated by numbers above or below the notes, and the notes are marked with accidentals (sharps, flats, naturals, and double naturals) to represent the just intonation pitches. The score is divided into two sections by a vertical dashed line. The first section shows the fundamental pitch and its adjustments for each valve combination. The second section shows the fundamental pitch and its adjustments for each valve combination, with the adjustments being the same as in the first section. The notes are written in both bass and treble clefs. The accidentals are designed by Marc Sabat and Wolfgang von Schweinitz, 2004.

Valve Combination	Adjustment 1	Adjustment 2	Adjustment 3	Adjustment 4	Adjustment 5	Adjustment 6	Adjustment 7	Adjustment 8	Adjustment 9	Adjustment 10	Adjustment 11	Adjustment 12	
45	+13.7	+13.7	+15.6	+13.7	+15.6	-17.5	+13.7	+17.6	+65.0				
48	+2.0	+2.0	+3.9	+2.0	+3.9	-11.7	+2.0	+5.9	+53.3	+3.9			
49	+66.3	+66.3	+68.2	+66.3	+52.6	+68.2	+35.1	+66.3	+70.2	+52.6	+117.6	+68.2	
51	-3.0	-3.0	-1.0	-3.0	-16.7	-1.0	+32.2	+63.4	+67.3	+49.7	+114.7	+65.3	+3.9
52	+63.4	+63.4	+65.3	+63.4	+49.7	+65.3	+32.2	+63.4	+67.3	+49.7	+114.7	+65.3	+3.9
53	+30.4	+30.4	+32.4	+30.4	+16.7	+32.4	+30.4	+34.3	+16.7	+81.7	+32.4	+70.9	
54	-2.0	-2.0	-2.0	-15.6	-2.0	-15.6	-33.1	-2.0	-15.6	+49.4	-61.4		
55	-33.7	-33.7	-31.8	-33.7	-47.4	-31.8	-64.9	-33.7	-29.8	-47.4	-31.8	-93.2	
56	+35.1	+35.1	+37.0	+35.1	+21.4	+37.0	+3.9	+35.1	+39.0	+21.4	+86.4	+37.0	+3.9
57	+4.4	+4.4	+6.4	+4.4	+6.4	-9.2	-26.7	+4.4	+8.4	+55.8	+6.4	-24.4	-26.7

This image displays a musical score for ten staves, numbered 58 through 67. Each staff is divided into two parts by a vertical dashed line. The left part of each staff is written in bass clef, and the right part is written in treble clef. Numerical values are placed above or below notes, often with arrows indicating the direction of movement. Some notes are grouped with brackets. At the beginning of each staff, there are symbols consisting of circles and dots, possibly representing a specific musical notation or a diagram. The numerical values range from -85.1 to +81.0. The staves are arranged vertically, with staff 58 at the top and staff 67 at the bottom.

Staff	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7	Measure 8	Measure 9	Measure 10						
58	-25.7	-25.7	-23.7	-25.7	-39.4	-23.7	-56.8	-25.7	-21.8	-39.4	-23.7	-85.1	-56.8			
59	-55.3	-55.3	-53.3	-55.3	-68.9	-53.3	-86.4	-55.3	-51.4	-68.9	-3.9	-53.3	-114.7	-86.4		
60	+15.6	+15.6	+17.6	+15.6	+2.0	+17.6	+15.6	+19.6	+2.0	+70.0	+17.6	+19.6	+2.0	+70.0	+17.6	+3.9
61	-13.0	-13.0	-11.0	-13.0	-26.7	-11.0	-44.1	-13.0	-9.1	-26.7	-11.0	-72.4	-44.1	-24.7		
62	+58.9	+58.9	+60.8	+58.9	+45.2	+60.8	+27.7	+58.9	+62.8	+45.2	+110.2	+60.8	+27.7	+47.1		
63	+31.2	+31.2	+33.1	+31.2	+17.5	+33.1	+31.2	+35.1	+17.5	+82.5	+33.1	+35.1	+17.5	+82.5	+33.1	+19.4
64	+3.9	+3.9	+5.9	+3.9	-9.8	+5.9	-27.3	+3.9	+2.0	+55.2	+5.9	+5.9	+3.9	+3.9		
65	+77.1	+77.1	+79.0	+77.1	+63.4	+79.0	+45.9	+77.1	+81.0	+63.4	+128.4	+79.0	+17.6	+45.9	+65.3	+77.1
66	-49.4	-49.4	-47.4	-49.4	-63.0	-47.4	-80.5	-49.4	-45.5	-63.0	-47.4	-108.8	-80.5	-61.1	-49.4	
67	-75.4	-75.4	-73.4	-75.4	-89.1	-73.4	-106.6	-75.4	-71.5	-89.1	-24.1	-73.4	-134.9	-106.6	-87.1	-75.4

This image displays a musical score for guitar, consisting of ten staves (numbered 68 to 77) and a corresponding tablature. The score is divided into three measures by vertical dashed lines. Each staff contains a melodic line with notes and stems, and a corresponding fret number or tablature below it. The fret numbers are numerical values indicating the fret position for each note. The tablature uses circles to represent frets on the strings. The notes are written in a mix of bass and treble clefs. The fret numbers range from -1.0 to +53.7. The tablature includes various symbols such as circles, arrows, and brackets to indicate specific playing techniques.

Measure	Staff 68	Staff 69	Staff 70	Staff 71	Staff 72	Staff 73	Staff 74	Staff 75	Staff 76	Staff 77
Measure 1	+0.9, -1.0, -1.0	-26.3, -26.3	+48.8, +48.8	+24.2, +24.2	+2.0	-23.9, -23.9	-47.4, -47.4	+29.3, +29.3	+6.4, +6.4	-16.2, -16.2
Measure 2	+0.9, -14.7, -32.2, -1.0	-40.0, -24.4, -57.5, -26.3, -22.4	+50.7, +48.8, +35.1, +50.7, +17.6, +48.8, +52.7	+10.5, +26.2, -7.0	+2.0, -13.7, -31.2	-21.9, -37.6, -21.9, -55.1, -23.9, -20.0	-45.5, -47.4, -61.1, -45.5, -78.6, -47.4, -43.5	+31.3, +29.3, +15.6, +31.3, +29.3, +33.2	+8.4, +6.4, +8.4, +6.4, +10.3	-14.3, -16.2, -12.3, -29.9
Measure 3	+2.9, +50.3, +0.9, +3.9	+25.0, -40.0, -24.4, -85.8, -57.5, -38.1, -26.3, -21.4	+35.1, +100.1, +50.7, +17.6, +37.0, +48.8, +53.7	+10.5, +75.5, +26.2, +12.5, +24.2, +29.2	+3.9, +51.3, +2.0, +5.0, +3.9	+27.4, -37.6, -21.9, -83.4, -55.1, -35.6, -23.9, -18.9, -20.0	+3.9, -61.1, -45.5, -106.9, -78.6, -59.1, -47.4, -42.5, -43.5	+15.6, +80.6, +31.3, +17.6, +29.3, +34.3, +33.2	+57.7, +8.4, +6.4, +11.4, +10.3, +3.9	+35.1, -14.3, -75.7, -47.4, -28.0, -16.2, -11.3, -12.3, -18.7

78 +63.4 +61.4 +47.7 +63.4 +30.3 +61.4 +65.3 +47.7 +112.7

79 -60.6 -60.6 -58.7 -60.6 -74.3 -58.7 -91.8 -60.6 -56.7 -74.3 -9.3

80 +17.6 +17.6 +19.6 +17.6 +3.9 +19.6 -13.6 +17.6 +21.5 +3.9 +68.9

81 -3.9 -3.9 -2.0 -3.9 -17.6 -2.0 -35.1 -3.9 -28.1 -17.6 +47.4

82 -25.2 -25.2 -23.2 -25.2 -38.8 -23.2 -56.3 -25.2 -21.2 -38.8 +26.2

83 +53.9 +53.9 +55.8 +53.9 +40.2 +55.8 +22.7 +53.9 +57.8 +40.2 +105.1

84 +33.1 +33.1 +35.1 +33.1 +19.4 +35.1 +2.0 +33.1 +37.0 +19.4 +84.4

86 -7.6 -7.6 -5.7 -7.6 -21.3 -5.7 -38.8 -7.6 -3.7 -21.3 +43.7

87 -27.6 -27.6 -25.7 -27.6 -41.3 -25.7 -58.8 -27.6 -23.7 -41.3 +23.7

90 +13.7 +13.7 +15.6 +13.7 +15.6 +15.6 -17.5 +13.7 +17.6 +65.0

This image displays a musical score for 13 staves, numbered 78 through 90. Each staff contains musical notation (notes, stems, and accidentals) and numerical annotations. A vertical dashed line is positioned between the fourth and fifth measures of the score. The numerical annotations are as follows:

Staff	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7	Measure 8	Measure 9		
78	+63.4	+2.0	+30.3	+49.7	+61.4	+66.4	+65.3	+58.9			
79	-58.7	-120.1	-91.8	-72.4	-60.6	-55.7	-56.7	-63.1			
80	+19.6	-41.9	-13.6	+5.9	+17.6	+22.6	+21.5	+15.1	+3.9		
81	-2.0	-63.4	-35.1	-15.6	-3.9	+1.0		-6.4	-17.6		
82	-23.2	-84.6	-56.3	-36.9	-25.2	-20.2	-21.2	-27.6	-38.8		
83	+55.8	-5.6	+22.7	+42.1	+53.9	+58.8	+57.8	+51.4	+40.2		
84	+35.1	-26.3	+2.0	+21.4	+33.1	+38.1	+37.0	+30.6	+19.4	+3.9	
86	-5.7	-67.1	-38.8	-19.3	-7.6	-2.7	-3.7	-10.1	-21.3	-36.8	
87	-25.7	-87.1	-58.8	-39.4	-27.6	-22.7	-23.7	-30.1	-41.3	-56.8	
90	+15.6	-45.8	-17.5	+2.0	+13.7	+18.6	+17.6	+11.2		+65.0	-15.5

for Robin Hayward

# Wonderful Scatter

Marc Sabat

The first 2 pages are to be repeated after each new octave (indicated by signs in the score). Time between notes is measured in quarter notes at 100 bpm, following the rule 100 cents = 1 minute.

Black noteheads are to be recorded as quarter-notes at the indicated tempo (exact bpm may be somewhat exaggerated to delineate the tempo relationships — *sempre poco rubato*).

White noteheads indicate a connected (quasi legato) sequence of quarter-notes, one for each of the notated synonymous valve-combinations.

one line = 100 cents

Tempo markings:  $\text{♩} = 100$ ,  $\text{♩} = 90$ ,  $\text{♩} = 100$ ,  $\text{♩} = 87$ ,  $\text{♩} = 100$ ,  $\text{♩} = 86$ ,  $\text{♩} = 100$ ,  $\text{♩} = 84$ ,  $\text{♩} = 100$ ,  $\text{♩} = 83$ ,  $\text{♩} = 100$ ,  $\text{♩} = 82$ ,  $\text{♩} = 100$ ,  $\text{♩} = 81$ ,  $\text{♩} = 100$ ,  $\text{♩} = 80$ ,  $\text{♩} = 100$ ,  $\text{♩} = 79$ ,  $\text{♩} = 100$ ,  $\text{♩} = 78$ ,  $\text{♩} = 100$ ,  $\text{♩} = 77$ ,  $\text{♩} = 100$ ,  $\text{♩} = 76$ ,  $\text{♩} = 100$ ,  $\text{♩} = 75$ ,  $\text{♩} = 100$ ,  $\text{♩} = 74$ ,  $\text{♩} = 100$ ,  $\text{♩} = 73$ ,  $\text{♩} = 100$ ,  $\text{♩} = 72$ ,  $\text{♩} = 100$ ,  $\text{♩} = 71$ ,  $\text{♩} = 100$ ,  $\text{♩} = 70$ ,  $\text{♩} = 100$ ,  $\text{♩} = 69$ ,  $\text{♩} = 100$ ,  $\text{♩} = 68$ ,  $\text{♩} = 67$ ,  $\text{♩} = 100$ ,  $\text{♩} = 66$ ,  $\text{♩} = 100$ ,  $\text{♩} = 65$ , 26, 26, 26, 27.

Cent deviations: +13.7, -27.6, -7.6, +33.1, +53.9, -25.2, -3.9, +17.6, -60.6, +61.4, -16.2, +6.4, +29.3, -47.4, -23.9, +24.2, +48.8, -26.3, -1.0, -75.4, -49.4, +77.1.



♭ = 64   ♭ = 100   ♭ = 63   ♭ = 100   ♭ = 62   ♭ = 100   ♭ = 61   ♭ = 100

1/64   1/63   1/62   1/61

+3.9   27   +31.2   28   +58.9   28   -13.0   29

♭ = 60   ♭ = 100   ♭ = 59   ♭ = 100   ♭ = 58   ♭ = 100

1/60   1/59   1/58

+15.6   29   -55.3   30   -25.7   30

♭ = 57   ♭ = 100   ♭ = 56   ♭ = 100   ♭ = 55   ♭ = 100   ♭ = 54

1/57   1/56   1/55   1/54

+4.4   31   +35.1   31   -33.7   32   -2.0

♭ = 100   ♭ = 53   ♭ = 100   ♭ = 52   ♭ = 100   ♭ = 51   ♭ = 100

1/53   1/52   1/51

+30.4   32   +63.4   33   -3.0   34   69

♭ = 49   ♭ = 100

1/49


+66.3   36

♭ = 48   ♭ = 100

1/48

+2.0   112

(on the final repeat, after 112 beats release all fingers to produce the fingering "45" without playing a note; slowly fade out loop)

 (when repeating the pedal tones, play until the cut sign and then return to the respective higher octave)  
 ♩ = 90 ♩ = 45 ♩ = 100 ♩ = 87 ♩ = 100 ♩ = 86 ♩ = 100

2/90 1/45 2/87 2/86

+13.7 59 20 41  
 -27.6 -7.6

♩ = 84 ♩ = 100 ♩ = 83 ♩ = 100 ♩ = 82 ♩ = 100 ♩ = 81 ♩ = 100  
 2/84 2/83 2/82 2/81

+33.1 21 +53.9 21 21 22  
 -25.2 -3.9

♩ = 80 ♩ = 100 ♩ = 79 ♩ = 100 ♩ = 78 ♩ = 100 ♩ = 77 ♩ = 100  
 2/80 2/79 2/78 2/77

+17.6 22 22 22 23  
 -60.6 +61.4 -16.2

♩ = 76 ♩ = 100 ♩ = 75 ♩ = 100 ♩ = 74 ♩ = 100 ♩ = 73 ♩ = 100  
 2/76 2/75 2/74 2/73

+6.4 23 +29.3 23 24 24  
 -47.4 -23.9

♩ = 72 ♩ = 100 ♩ = 71 ♩ = 100 ♩ = 70 ♩ = 100 ♩ = 69 ♩ = 100 ♩ = 68  
 2/72 2/71 2/70 2/69 2/68

24 +24.2 25 +48.8 25 25 25  
 -26.3 -1.0

♩ = 100 ♩ = 67 ♩ = 100 ♩ = 66 ♩ = 100 ♩ = 65 ♩ = 100  
 2/67 2/66 2/65

26 26 26 27  
 -75.4 -49.4 +77.1

♩ = 64   ♩ = 100   ♩ = 63   ♩ = 100   ♩ = 62   ♩ = 100   ♩ = 61   ♩ = 100

2/64   2/63   2/62   2/61

+3.9   27   +31.2   28   +58.9   28   -13.0   29

♩ = 60   ♩ = 90   ♩ = 100   ♩ = 59   ♩ = 100   ♩ = 58   ♩ = 87   ♩ = 100   ♩ = 86   ♩ = 100

2/60   3/90   2/59   2/58   3/87   3/86

29   30   20   10

-55.3   -25.7   -5.7

♩ = 57   ♩ = 100   ♩ = 56   ♩ = 84   ♩ = 100   ♩ = 83   ♩ = 100   ♩ = 55   ♩ = 100   ♩ = 82   ♩ = 100   ♩ = 54   ♩ = 81

2/57   2/56   3/84   3/83   2/55   3/82   2/54   3/81

31   21   10   11   21

-33.7   -23.2   -2.0

♩ = 100   ♩ = 80   ♩ = 100   ♩ = 53   ♩ = 100   ♩ = 79   ♩ = 100   ♩ = 52   ♩ = 78   ♩ = 100   ♩ = 77   ♩ = 100   ♩ = 51   ♩ = 100

3/80   2/53   3/79   2/52   3/78   3/77   2/51

22   11   11   22   22   11   11

-58.7   -14.3   -3.0

♩ = 76   ♩ = 100   ♩ = 75   ♩ = 100   ♩ = 74   ♩ = 100   ♩ = 49   ♩ = 100   ♩ = 73   ♩ = 100

3/76   3/75   3/74   2/49   3/73

23   23   12   12   24

-45.5   -21.9

♩ = 48   ♩ = 72   ♩ = 100   ♩ = 71   ♩ = 100   ♩ = 70   ♩ = 100   ♩ = 69   ♩ = 100

2/48   3/72   3/71   3/70   3/69

24   25   25   25

+2.0   +26.2   +50.7   -24.4

one line = 50 cents

*S* (before playing this note, repeat the first 2 pages (pedal tones), beginning directly at the first low "F")

The musical score consists of 12 measures, each with a time signature, a frequency value, and a chord diagram. The measures are as follows:

- Measure 1: Time signature 3/68, frequency  $\text{♩} = 68$ , frequency  $\text{♩} = 100$ , interval +1.0. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 13.
- Measure 2: Time signature 4/90, frequency  $\text{♩} = 90$ , frequency  $\text{♩} = 45$ , frequency  $\text{♩} = 100$ , interval +13.7. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 13.
- Measure 3: Time signature 3/67, frequency  $\text{♩} = 67$ , frequency  $\text{♩} = 100$ , interval -73.4. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 26.
- Measure 4: Time signature 3/66, frequency  $\text{♩} = 66$ , frequency  $\text{♩} = 100$ , interval -47.4. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 20.
- Measure 5: Time signature 4/87, frequency  $\text{♩} = 87$ , frequency  $\text{♩} = 100$ , interval -27.6. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 7.
- Measure 6: Time signature 3/65, frequency  $\text{♩} = 65$ , frequency  $\text{♩} = 100$ , interval +79.0. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 13.
- Measure 7: Time signature 4/86, frequency  $\text{♩} = 86$ , frequency  $\text{♩} = 100$ , interval -7.6. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 13.
- Measure 8: Time signature 3/64, frequency  $\text{♩} = 64$ , frequency  $\text{♩} = 100$ , interval +5.9. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 27.
- Measure 9: Time signature 3/63, frequency  $\text{♩} = 63$ , frequency  $\text{♩} = 84$ , frequency  $\text{♩} = 100$ , interval +33.1. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 21.
- Measure 10: Time signature 4/83, frequency  $\text{♩} = 83$ , frequency  $\text{♩} = 100$ , interval +53.9. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 7.
- Measure 11: Time signature 3/62, frequency  $\text{♩} = 62$ , frequency  $\text{♩} = 100$ , interval +60.8. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 14.
- Measure 12: Time signature 4/82, frequency  $\text{♩} = 82$ , frequency  $\text{♩} = 100$ , interval -25.2. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 14.
- Measure 13: Time signature 3/61, frequency  $\text{♩} = 61$ , frequency  $\text{♩} = 100$ , interval -11.0. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 7.
- Measure 14: Time signature 4/81, frequency  $\text{♩} = 81$ , frequency  $\text{♩} = 100$ , interval -3.9. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 22.
- Measure 15: Time signature 3/60, frequency  $\text{♩} = 60$ , frequency  $\text{♩} = 80$ , frequency  $\text{♩} = 100$ , interval +17.6. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 22.
- Measure 16: Time signature 4/80, frequency  $\text{♩} = 80$ , frequency  $\text{♩} = 100$ , interval -60.6. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 7.
- Measure 17: Time signature 4/79, frequency  $\text{♩} = 79$ , frequency  $\text{♩} = 100$ , interval -53.3. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 15.
- Measure 18: Time signature 3/59, frequency  $\text{♩} = 59$ , frequency  $\text{♩} = 100$ , interval -16.2. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 23.
- Measure 19: Time signature 4/78, frequency  $\text{♩} = 78$ , frequency  $\text{♩} = 100$ , interval +61.4. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 15.
- Measure 20: Time signature 3/58, frequency  $\text{♩} = 58$ , frequency  $\text{♩} = 100$ , interval -23.7. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 7.
- Measure 21: Time signature 4/77, frequency  $\text{♩} = 77$ , frequency  $\text{♩} = 100$ , interval -16.2. Chord diagram:  $\text{♯} \circ \circ \circ \circ \circ \circ$ . Duration: 23.

The image displays a musical score for a string instrument, likely a double bass, consisting of six systems. Each system contains a staff with a bass clef, a series of notes with stems, and a corresponding chord diagram below. The notes are often marked with a treble clef and a note value (e.g., quarter note). Above the notes are boxed ratios (e.g., 3/57, 4/76) and numerical values (e.g., +6.4, -47.4). The chord diagrams use circles to represent strings, with dots indicating finger positions. The score is divided into sections by dashed lines on the left side.

**System 1:** Notes: ♯C<sub>4</sub> (♮C<sub>5</sub>), D<sub>4</sub>, E<sub>4</sub>. Ratios: 3/57, 4/76. Values: +6.4, 57, 76, 100. Chord diagrams: 23, 8, 16.

**System 2:** Notes: D<sub>4</sub>, E<sub>4</sub>, F<sub>4</sub>. Ratios: 4/74, 3/55, 4/73. Values: 74, 100, 55, 100, 73, 100. Chord diagrams: 16, 8, 24.

**System 3:** Notes: G<sub>4</sub>, A<sub>4</sub>, B<sub>4</sub>. Ratios: 3/54, 4/72, 5/90, 4/71, 3/53, 4/70. Values: 54, 72, 90, 100, 71, 100, 53, 100, 70. Chord diagrams: 24, 8, 16.

**System 4:** Notes: C<sub>5</sub>, D<sub>5</sub>, E<sub>5</sub>. Ratios: 5/87, 3/52, 4/69, 5/86, 3/51, 4/68. Values: 100, 87, 100, 52, 100, 69, 100, 86, 100, 51, 68. Chord diagrams: 10, 7, 8, 5, 20.

**System 5:** Notes: F<sub>4</sub>, G<sub>4</sub>, A<sub>4</sub>. Ratios: 5/84, 4/67, 5/83. Values: 100, 84, 100, 67, 100, 83, 100. Chord diagrams: 20, 5, 16, 10.

**System 6:** Notes: B<sub>4</sub>, C<sub>5</sub>, D<sub>5</sub>. Ratios: 4/66, 5/82, 3/49, 4/65, 5/81. Values: 66, 100, 82, 100, 49, 100, 65, 100, 81, 100. Chord diagrams: 11, 7, 9, 5, 22.

♭ = 48 ♭ = 64 ♭ = 80 ♭ = 100      ♭ = 79 ♭ = 100 ♭ = 63 ♭ = 100      ♭ = 78

+3.9 3/48 4/64 5/80      5/79 +31.2 4/63      +47.7 5/78

♭ = 100      ♭ = 62 ♭ = 100      ♭ = 77 ♭ = 100      ♭ = 61 ♭ = 100      ♭ = 76 ♭ = 100

+58.9 4/62      5/77      4/61      5/76

♭ = 60 ♭ = 75 ♭ = 90 ♭ = 45 ♭ = 100      ♭ = 74 ♭ = 100      ♭ = 59 ♭ = 100

+15.6 4/60 5/75 6/90 3/45      5/74 4/59

♭ = 73 ♭ = 100      ♭ = 58 ♭ = 87 ♭ = 100      ♭ = 72 ♭ = 100      ♭ = 86 ♭ = 100

5/73 4/58 6/87 5/72 6/86

♭ = 57 ♭ = 100      ♭ = 71 ♭ = 100      ♭ = 56 ♭ = 70 ♭ = 84 ♭ = 100

+4.4 4/57 +10.5 5/71      +35.1 4/56 5/70 6/84

♭ = 83 ♭ = 100      ♭ = 69 ♭ = 100      ♭ = 55 ♭ = 100      ♭ = 82 ♭ = 100      ♭ = 68 ♭ = 100      ♭ = 54 ♭ = 81

+55.8 6/83 5/69 4/55 6/82 5/68 4/54 6/81

-74.3      -29.9      -13.0      -7.3      -61.1      -55.3      -37.6      -25.7      -13.7      -5.7      -40.0      -33.7      -23.2      -14.7      -2.0

Tempo markings: ♩ = 100, ♩ = 67, ♩ = 100, ♩ = 80, ♩ = 100, ♩ = 53, ♩ = 100, ♩ = 66, ♩ = 100, ♩ = 79, ♩ = 100, ♩ = 52, ♩ = 65, ♩ = 78, ♩ = 100, ♩ = 90, ♩ = 100, ♩ = 77, ♩ = 100, ♩ = 64, ♩ = 100, ♩ = 51, ♩ = 100, ♩ = 76, ♩ = 100, ♩ = 63, ♩ = 100, ♩ = 75, ♩ = 100, ♩ = 87, ♩ = 100, ♩ = 62, ♩ = 100, ♩ = 74, ♩ = 100, ♩ = 86, ♩ = 100, ♩ = 49, ♩ = 100, ♩ = 61, ♩ = 73, ♩ = 100, ♩ = 48, ♩ = 60, ♩ = 72, ♩ = 84, ♩ = 100, ♩ = 83, ♩ = 100, ♩ = 71, ♩ = 100, ♩ = 59, ♩ = 100, ♩ = 82, ♩ = 100, ♩ = 70, ♩ = 100, ♩ = 58, ♩ = 100, ♩ = 81, ♩ = 100, ♩ = 69, ♩ = 100, ♩ = 80, ♩ = 100, ♩ = 57, ♩ = 100.

Interval boxes: 5/67, 6/80, 4/53, 5/66, 6/79, 4/52, 5/65, 6/78, 7/90, 6/77, 5/64, 4/51, 6/76, 5/63, 6/75, 7/87, 5/62, 6/74, 7/86, 4/49, 5/61, 6/73, 4/48, 5/60, 6/72, 7/84, 7/83, 6/71, 5/59, 7/82, 6/70, 5/58, 7/81, 6/69, 7/80, 5/57.

Values: -89.1, +19.6, +30.4, -63.0, -58.7, -17.5, -14.3, -9.8, -3.0, +8.4, +17.5, +31.3, -58.8, -45.5, -38.8, -26.7, -21.9, +2.0, +22.7, +26.2, -68.9, -56.3, +50.7, -39.4, -35.1, -24.4, -13.6, -9.2.

one line = 25 cents

$\text{♩} = 68$     $\text{♩} = 100$     $\text{♩} = 79$     $\text{♩} = 100$     $\text{♩} = 90$     $\text{♩} = 45$     $\text{♩} = 100$     $\text{♩} = 56$     $\text{♩} = 100$

$\boxed{6/68}$     $\boxed{7/79}$     $\boxed{8/90}$     $\boxed{4/45}$     $\boxed{5/56}$

+1.0   -91.8   +13.7   +21.4

(before playing this note, repeat the first 2 pages)

$\text{♩} = 67$     $\text{♩} = 100$     $\text{♩} = 78$     $\text{♩} = 100$

$\boxed{6/67}$     $\boxed{7/78}$

+30.3   -73.4

$\text{♩} = 55$     $\text{♩} = 66$     $\text{♩} = 77$     $\text{♩} = 100$     $\text{♩} = 87$     $\text{♩} = 100$

$\boxed{5/55}$     $\boxed{6/66}$     $\boxed{7/77}$     $\boxed{8/87}$

-47.4   -27.6

$\text{♩} = 76$     $\text{♩} = 100$     $\text{♩} = 65$     $\text{♩} = 100$     $\text{♩} = 54$     $\text{♩} = 100$     $\text{♩} = 86$     $\text{♩} = 100$     $\text{♩} = 75$

$\boxed{7/76}$     $\boxed{6/65}$     $\boxed{5/54}$     $\boxed{8/86}$     $\boxed{7/75}$

-24.8   +79.0   -15.6   -7.6   -1.8



♩ = 100      ♩ = 64      ♩ = 100      ♩ = 53      ♩ = 100      ♩ = 74      ♩ = 100

+5.9      +16.7

6/64      5/53      7/74

8      11      5      12

♩ = 63      ♩ = 84      ♩ = 100      ♩ = 73      ♩ = 100

+33.1

6/63      8/84      7/73

12      5

♩ = 52      ♩ = 100      ♩ = 83      ♩ = 100      ♩ = 62      ♩ = 100      ♩ = 72      ♩ = 100

+49.7      +53.9      +60.8

5/52      8/83      6/62      7/72

4      7      8      6

♩ = 82      ♩ = 100      ♩ = 51      ♩ = 100      ♩ = 61      ♩ = 100      ♩ = 71      ♩ = 100      ♩ = 81      ♩ = 100

-25.2      -16.7      -11.0      -7.0      -3.9

8/82      5/51      6/61      7/71      8/81

8      6      4      3      22

♩ = 60    ♩ = 70    ♩ = 80    ♩ = 90    ♩ = 100

$\frac{6}{60}$      $\frac{7}{70}$   $\frac{8}{80}$   $\frac{9}{90}$

+17.6

22

♩ = 79    ♩ = 100    ♩ = 69    ♩ = 100    ♩ = 59    ♩ = 100

$\frac{8}{79}$      $\frac{7}{69}$      $\frac{6}{59}$

-60.6    -57.5    -53.3

3    4    6

♩ = 49    ♩ = 100    ♩ = 78    ♩ = 100    ♩ = 68    ♩ = 100

$\frac{5}{49}$      $\frac{8}{78}$      $\frac{7}{68}$

+52.6    +61.4    -32.2

9    6    9

♩ = 58    ♩ = 87    ♩ = 100    ♩ = 77    ♩ = 100    ♩ = 48    ♩ = 100    ♩ = 67    ♩ = 100    ♩ = 86    ♩ = 100

$\frac{6}{58}$      $\frac{9}{87}$      $\frac{8}{77}$      $\frac{5}{48}$      $\frac{7}{67}$      $\frac{9}{86}$

-23.7    -16.2    -11.7    -106.6    -3.7

7    5    5    3    10

This musical score is written for a bass clef instrument and consists of four systems. Each system includes a staff with a note, a chord diagram, and numerical values. The notes are quarter notes, and the chord diagrams show the fingerings for each chord. The numerical values are placed above or below the notes and chord diagrams.

**System 1:**

- Note:  $\text{♩} = 57$ , Chord:  $\boxed{6/57}$ , Value:  $+6.4$
- Note:  $\text{♩} = 76$ , Chord:  $\boxed{8/76}$ , Value:  $13$
- Note:  $\text{♩} = 100$ , Value:  $10$
- Note:  $\text{♩} = 66$ , Chord:  $\boxed{7/66}$ , Value:  $-80.5$
- Note:  $\text{♩} = 100$ , Value:  $10$

**System 2:**

- Note:  $\text{♩} = 75$ , Chord:  $\boxed{8/75}$ , Value:  $+29.3$
- Note:  $\text{♩} = 100$ , Value:  $8$
- Note:  $\text{♩} = 56$ , Chord:  $\boxed{6/56}$ , Value:  $+37.0$
- Note:  $\text{♩} = 84$ , Chord:  $\boxed{9/84}$ , Value:  $9$
- Note:  $\text{♩} = 100$ , Value:  $7$
- Note:  $\text{♩} = 65$ , Chord:  $\boxed{7/65}$ , Value:  $+45.9$
- Note:  $\text{♩} = 100$ , Value:  $7$

**System 3:**

- Note:  $\text{♩} = 74$ , Chord:  $\boxed{8/74}$ , Value:  $-47.4$
- Note:  $\text{♩} = 100$ , Value:  $5$
- Note:  $\text{♩} = 83$ , Chord:  $\boxed{9/83}$ , Value:  $+57.8$
- Note:  $\text{♩} = 100$ , Value:  $10$
- Note:  $\text{♩} = 55$ , Chord:  $\boxed{6/55}$ , Value:  $-31.8$
- Note:  $\text{♩} = 100$ , Value:  $5$
- Note:  $\text{♩} = 64$ , Chord:  $\boxed{7/64}$ , Value:  $-27.3$
- Note:  $\text{♩} = 100$ , Value:  $3$

**System 4:**

- Note:  $\text{♩} = 73$ , Chord:  $\boxed{8/73}$ , Value:  $-23.9$
- Note:  $\text{♩} = 100$ , Value:  $3$
- Note:  $\text{♩} = 82$ , Chord:  $\boxed{9/82}$ , Value:  $-21.2$
- Note:  $\text{♩} = 100$ , Value:  $21$

♩ = 54   ♩ = 63   ♩ = 72   ♩ = 81   ♩ = 90   ♩ = 45   ♩ = 100  
6/54   7/63   8/72   9/81   10/90   5/45

♩ = 80   ♩ = 100   ♩ = 71  
9/80   8/71

21.5   24.2

♩ = 100   ♩ = 62   ♩ = 100   ♩ = 53   ♩ = 100   ♩ = 79   ♩ = 100   ♩ = 70  
+27.7   7/62   +32.4   6/53   9/79   8/70   +48.8

♩ = 100   ♩ = 61   ♩ = 100   ♩ = 87   ♩ = 100   ♩ = 52   ♩ = 78   ♩ = 100   ♩ = 69  
7/61   10/87   6/52   9/78   8/69

65.3   44.1   41.3   26.3

♩ = 100   ♩ = 86   ♩ = 100   ♩ = 60   ♩ = 100   ♩ = 77   ♩ = 100   ♩ = 51   ♩ = 68  
10/86   7/60   9/77   6/51   8/68

21.3   15.5   12.3   1.0

$\text{♩} = 100$        $\text{♩} = 76$     $\text{♩} = 100$        $\text{♩} = 59$     $\text{♩} = 100$        $\text{♩} = 84$     $\text{♩} = 100$

$\frac{9}{76}$        $\frac{7}{59}$        $\frac{10}{84}$

$+10.3$        $-86.4$        $+19.4$

$\text{♩} = 67$     $\text{♩} = 100$        $\text{♩} = 75$     $\text{♩} = 100$        $\text{♩} = 83$     $\text{♩} = 100$     $\text{♩} = 58$     $\text{♩} = 100$

$\frac{8}{67}$        $\frac{9}{75}$        $\frac{10}{83}$        $\frac{7}{58}$

$+33.2$        $+40.2$

$-75.4$        $-56.8$

$\text{♩} = 66$     $\text{♩} = 100$        $\text{♩} = 74$     $\text{♩} = 100$        $\text{♩} = 82$     $\text{♩} = 100$        $\text{♩} = 90$     $\text{♩} = 100$        $\text{♩} = 49$     $\text{♩} = 100$        $\text{♩} = 57$     $\text{♩} = 100$

$\frac{8}{66}$        $\frac{9}{74}$        $\frac{10}{82}$        $\frac{11}{90}$        $\frac{6}{49}$        $\frac{7}{57}$

$+65.0$        $+68.2$

$-49.4$        $-43.5$        $-38.9$        $-26.7$

$\text{♩} = 65$     $\text{♩} = 100$        $\text{♩} = 73$     $\text{♩} = 100$        $\text{♩} = 81$     $\text{♩} = 100$

$\frac{8}{65}$        $\frac{9}{73}$        $\frac{10}{81}$

$+77.1$

$-20.0$        $-17.6$

Musical notation including bass clefs, notes, rests, and chord diagrams with numerical values.

♩ = 48   ♩ = 56   ♩ = 64   ♩ = 72   ♩ = 80

♩ = 100

♩ = 87

$\frac{6}{48}$   $\frac{7}{56}$   $\frac{8}{64}$   $\frac{9}{72}$   $\frac{10}{80}$

$\frac{11}{87}$

+3.9

+23.7

Bass clef staff with notes and fretboard diagrams. A circled '20' is present in the diagram area.

♩ = 100   ♩ = 79   ♩ = 100   ♩ = 71   ♩ = 100   ♩ = 63   ♩ = 100   ♩ = 55   ♩ = 100   ♩ = 86   ♩ = 100   ♩ = 78   ♩ = 100

$\frac{10}{79}$   $\frac{9}{71}$

$\frac{8}{63}$

$\frac{7}{55}$

$\frac{11}{86}$

$\frac{10}{78}$

+28.1

+31.2

+43.7

+47.7

Bass clef staff with notes and fretboard diagrams. Includes numerical values: -74.3, -64.9, -33.1, -29.9.

♩ = 70   ♩ = 100

♩ = 62   ♩ = 100

♩ = 54   ♩ = 100   ♩ = 77   ♩ = 100

$\frac{9}{70}$

$\frac{8}{62}$

$\frac{7}{54}$

$\frac{10}{77}$

+52.7

+58.9

Bass clef staff with notes and fretboard diagrams. Includes numerical values: -22.4, -13.0, -7.3, -0.8.

♩ = 69   ♩ = 100

♩ = 84   ♩ = 100   ♩ = 61   ♩ = 100

♩ = 76   ♩ = 100

♩ = 53   ♩ = 100

$\frac{9}{69}$

$\frac{11}{84}$

$\frac{8}{61}$

$\frac{10}{76}$

$\frac{7}{53}$

+84.4

Bass clef staff with notes and fretboard diagrams. Includes numerical values: -22.4, -13.0, -7.3, -0.8.

♩ = 68   ♩ = 100   ♩ = 83   ♩ = 100

♩ = 60   ♩ = 75   ♩ = 90   ♩ = 45   ♩ = 100

9/68   11/83

+2.9   +105.1

8/60   10/75   12/90   6/45

+15.6

♩ = 82   ♩ = 100   ♩ = 67   ♩ = 100   ♩ = 52   ♩ = 100   ♩ = 74   ♩ = 100   ♩ = 59   ♩ = 100   ♩ = 81   ♩ = 100

11/82   9/67   7/52   10/74   8/59   11/81

+26.2   +32.2   +47.4

♩ = 66   ♩ = 100   ♩ = 73   ♩ = 100   ♩ = 51   ♩ = 100   ♩ = 80   ♩ = 100   ♩ = 58   ♩ = 87

9/66   10/73   7/51   11/80   8/58   12/87

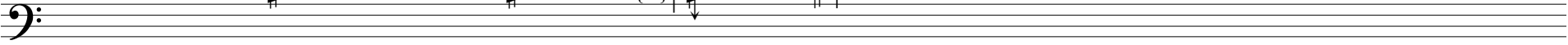
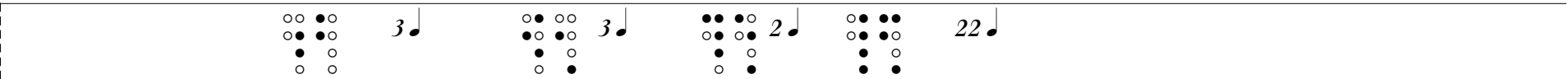
-45.5   -37.6   -34.2   +68.9   -25.7

♩ = 100   ♩ = 65   ♩ = 100   ♩ = 72   ♩ = 100   ♩ = 79   ♩ = 100   ♩ = 86   ♩ = 100

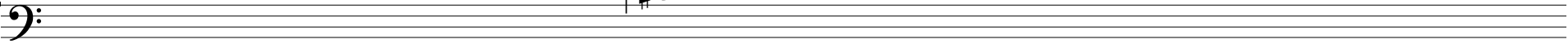
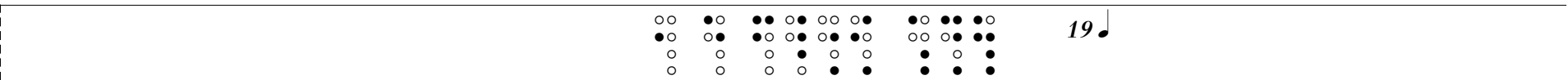
9/65   10/72   11/79   12/86

+81.0   -13.7   -9.3   -5.7

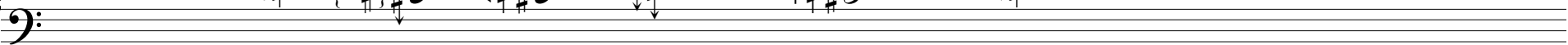
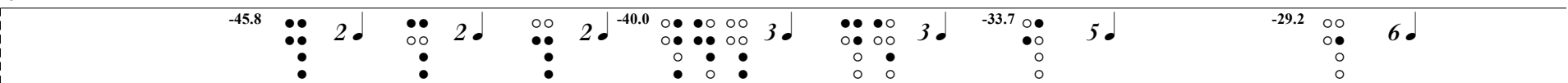
$\text{♩} = 57$     $\text{♩} = 100$     $\text{♩} = 64$     $\text{♩} = 100$     $\text{♩} = 71$     $\text{♩} = 100$     $\text{♩} = 78$     $\text{♩} = 100$   
8/57   9/64   10/71   11/78  
 +4.4   +7.8   +10.5   +12.7

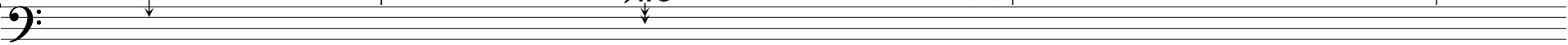
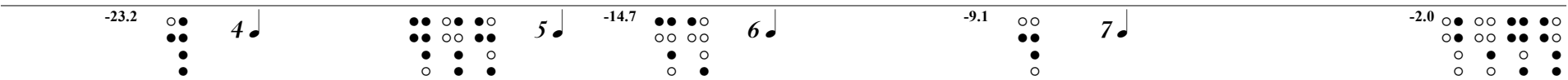
$\text{♩} = 49$     $\text{♩} = 56$     $\text{♩} = 63$     $\text{♩} = 70$     $\text{♩} = 77$     $\text{♩} = 84$     $\text{♩} = 100$   
7/49 8/56 9/63   10/70 11/77 12/84  
 +35.1

$\text{♩} = 90$     $\text{♩} = 100$     $\text{♩} = 83$     $\text{♩} = 100$     $\text{♩} = 76$     $\text{♩} = 100$     $\text{♩} = 69$     $\text{♩} = 100$     $\text{♩} = 62$     $\text{♩} = 100$     $\text{♩} = 55$     $\text{♩} = 100$     $\text{♩} = 48$     $\text{♩} = 100$   
13/90   12/83   11/76   10/69   9/62   8/55   7/48  
 +55.8   +57.7   +58.9

$\text{♩} = 82$     $\text{♩} = 100$     $\text{♩} = 75$     $\text{♩} = 100$     $\text{♩} = 68$     $\text{♩} = 100$     $\text{♩} = 61$     $\text{♩} = 100$     $\text{♩} = 54$     $\text{♩} = 81$   
12/82   11/75   10/68   9/61   8/54   12/81  
 +80.6



$\text{♩} = 100$      $\text{♩} = 74$      $\text{♩} = 100$      $\text{♩} = 67$      $\text{♩} = 100$      $\text{♩} = 87$      $\text{♩} = 100$      $\text{♩} = 60$      $\text{♩} = 80$      $\text{♩} = 100$

$\frac{11}{74}$      $\frac{10}{67}$      $\frac{13}{87}$      $\frac{9}{60}$      $\frac{12}{80}$

$+3.9$      $-89.1$      $-87.1$      $+19.6$

$\text{♩} = 73$      $\text{♩} = 100$      $\text{♩} = 53$      $\text{♩} = 100$      $\text{♩} = 86$      $\text{♩} = 100$      $\text{♩} = 66$      $\text{♩} = 100$      $\text{♩} = 79$      $\text{♩} = 100$      $\text{♩} = 59$      $\text{♩} = 100$

$\frac{11}{73}$      $\frac{8}{53}$      $\frac{13}{86}$      $\frac{10}{66}$      $\frac{12}{79}$      $\frac{9}{59}$

$+27.4$      $+30.4$      $-67.1$      $-63.0$      $-58.7$      $-51.4$

$\text{♩} = 72$      $\text{♩} = 100$      $\text{♩} = 52$      $\text{♩} = 65$      $\text{♩} = 78$      $\text{♩} = 100$      $\text{♩} = 84$      $\text{♩} = 100$

$\frac{11}{72}$      $\frac{8}{52}$      $\frac{10}{65}$      $\frac{12}{78}$      $\frac{13}{84}$

$+51.3$      $+63.4$      $-26.3$

$\text{♩} = 71$      $\text{♩} = 100$      $\text{♩} = 58$      $\text{♩} = 100$      $\text{♩} = 90$      $\text{♩} = 45$      $\text{♩} = 100$      $\text{♩} = 77$      $\text{♩} = 100$      $\text{♩} = 64$      $\text{♩} = 100$      $\text{♩} = 83$      $\text{♩} = 100$      $\text{♩} = 51$      $\text{♩} = 100$

$\frac{11}{71}$      $\frac{9}{58}$      $\frac{14}{90}$      $\frac{7}{45}$      $\frac{12}{77}$      $\frac{10}{64}$      $\frac{13}{83}$      $\frac{8}{51}$

$+75.5$      $-17.5$      $-14.3$      $-9.8$      $-5.6$      $-3.0$

$-21.8$

♩ = 70   ♩ = 100   ♩ = 57   ♩ = 76   ♩ = 100   ♩ = 82   ♩ = 100   ♩ = 63   ♩ = 100

+0.1  $\boxed{11/70}$    +8.4  $\boxed{9/57}$   $\boxed{12/76}$    -84.6  $\boxed{13/82}$   $\boxed{10/63}$    +17.5

8

7

2

8

♩ = 69   ♩ = 100   ♩ = 75   ♩ = 100   ♩ = 81   ♩ = 100   ♩ = 56   ♩ = 100   ♩ = 87   ♩ = 100   ♩ = 62   ♩ = 100

$\boxed{11/69}$    +31.3  $\boxed{12/75}$     $\boxed{13/81}$     $\boxed{9/56}$     $\boxed{14/87}$     $\boxed{10/62}$    +45.2

-75.0   -63.4   +39.0   -58.8   +45.2

6

5

2

2

4

5

♩ = 68   ♩ = 100   ♩ = 74   ♩ = 100   ♩ = 80   ♩ = 100   ♩ = 86   ♩ = 100   ♩ = 49   ♩ = 100   ♩ = 55   ♩ = 100   ♩ = 61   ♩ = 100

+50.3  $\boxed{11/68}$    -45.5  $\boxed{12/74}$    -41.9  $\boxed{13/80}$    -38.8  $\boxed{14/86}$    +66.3  $\boxed{8/49}$    -29.8  $\boxed{9/55}$    -26.7  $\boxed{10/61}$

4

4

3

5

4

3

3

♩ = 67   ♩ = 100   ♩ = 73   ♩ = 100   ♩ = 79   ♩ = 100

$\boxed{11/67}$     $\boxed{12/73}$     $\boxed{13/79}$

-24.1   -21.9   -120.1

2

2

22

♩ = 48   ♩ = 54   ♩ = 60   ♩ = 66   ♩ = 72   ♩ = 78   ♩ = 84   ♩ = 90   ♩ = 100

+2.0 8/48 9/54 10/60 11/66 12/72 13/78 14/84 15/90

♩ = 83   ♩ = 100   ♩ = 77   ♩ = 100

+22.7 14/83 13/77

{-#} ↓ -75.7

♩ = 71   ♩ = 100   ♩ = 65   ♩ = 100   ♩ = 59   ♩ = 100   ♩ = 53   ♩ = 100

+26.2 12/71 +128.4 11/65 10/59 +34.3 9/53

{-} ↑ # ↑ b ↓ -68.9 {#} ↓

♩ = 82   ♩ = 100   ♩ = 76   ♩ = 100

14/82 13/76

↓ -56.3 ↓ -53.1

♩ = 70   ♩ = 100   ♩ = 64   ♩ = 100   ♩ = 58   ♩ = 87   ♩ = 100   ♩ = 81   ♩ = 100   ♩ = 52   ♩ = 100   ♩ = 75   ♩ = 100

+50.7 12/70 +55.2 11/64 10/58 15/87 14/81 9/52 13/75

↑ -39.4 ↓ -35.1 ↑ +67.3 ↓ -30.1

♩ = 69   ♩ = 100   ♩ = 86   ♩ = 100   ♩ = 63   ♩ = 100   ♩ = 80   ♩ = 100   ♩ = 57   ♩ = 100   ♩ = 74   ♩ = 100

12/69 15/86 11/63 14/80 10/57 13/74

↓ -19.3 {↓} # ↓ +82.5 ↑ -13.6 ↓ -9.2 # ↓ -6.9 {#} ↓

-24.4   ♩ = 51   ♩ = 68   ♩ = 100   ♩ = 79   ♩ = 100   ♩ = 62   ♩ = 100

9/51 12/68 14/79 11/62

+0.9 ↓ -91.8 {-#} ↓ +110.2 ↑

⋮ (repeat the first 2 pages, end as indicated on page 2)