Triskaidekaphonia

for unconventionally tuned virtual piano

Performance score and

Real pitch score in Johnston notation

by Kyle Gann 2005

Triskaidekaphonia is a piece for virtual electronic piano, i.e., electric keyboard that sounds like a piano. Unlike my earlier microtonal works, this one can be performed live by a soloist, without additional electronics. The tuning is superlatively simple: it consists of merely all the ratios formed by the whole numbers from 1 to 13, of which there are 29:

- 13/12, 13/11, 13/10, 13/9, 13/8, 13/7 (13/6, 13/5, and so on, are merely octaves of those already mentioned)
- 12/11, 12/7 (12/10 is the same as 6/5, 12/9 = 4/3, and so on)
- 11/10, 11/9, 11/8, 11/7, 11/6
- 10/9, 10/7 (10/8 = 5/4, 10/6 = 5/3)
- 9/8, 9/7, 9/5
- 8/7, 8/5
- 7/6, 7/5, 7/4
- 6/5
- 5/4, 5/3
- 4/3
- 3/2
- 1/1

The resulting scale (given in a typographical approximation of Ben Johnston's notation) is as follows:

Pitch:	Ratio:	Cents from tonic:
D	1/1	0 cents
E13b	13/12	138.6 cents
Ev+	12/11	150.6 cents
E^b	11/10	165 cents
E	10/9	182.4 cents
E+	9/8	203.9 cents
E*L*	8/7	231.2 cents
F7+	7/6	266.9 cents
F13v+	13/11	289.2 cents
F+	6/5	315.6 cents
F^	11/9	347.4 cents
F#+	5/4	386.3 cents
F#*L*+	9/7	435.1 cents
G13b	13/10	454.2 cents
G	4/3	498 cents
G^	11/8	551.3 cents
A7b+	7/5	582.5 cents
G#*L*	10/7	617.5 cents
A13b	13/9	636.6 cents
A+	3/2	702 cents
A^*L*	11/7	782.5 cents
Bb	8/5	813.7 cents
B13b	13/8	840.5 cents
B	5/3	884.4 cents
B*L*	12/7	933.1 cents
C7+	7/4	968.8 cents
C+	9/5	1017.6 cents
C^	11/6	1049.4 cents
C13*L*	13/7	1071.7 cents

This is my first piece to go beyond 11-limit tuning to use the 13th harmonic. I figured out that I could make different scales within this network by taking all notes expressible by the form 13/X, or 11/X, or X/7, and the scales with the smallest numbers would be closest to simple tonality, while the larger-numbered scales will have a much more oblique relationship. Thus the scales that run through the piece are:

13/X:	1/1	13/12	13/11	13/10	13/9	13/8	13/7
12/X:	1/1	12/11	6/5	4/3	3/2	12/7	
11/X:	1/1	11/10	11/9	11/8	11/7	11/6	
10/X:	1/1	10/9	5/4	10/7	5/3		
9/X:	1/1	9/8	9/7	3/2	9/5		
8/X:	1/1	8/7	4/3	8/5			
7/X:	1/1	7/6	7/5	7/4			
X/9:	1/1	10/9	11/9	4/3	13/9	5/3	
X/7:	1/1	8/7	9/7	10/7	11/7	12/7	13/7
X/5:	1/1	11/10	6/5	13/10	7/5	8/5	9/5
X/3:	1/1	13/12	7/6	4/3	3/2	5/3	11/6
X/2:	1/1	9/8	5/4	11/8	3/2	13/8	7/4

Of course, the scales with X in the numerator are overtone series', and those with X in the denominator are undertone series'. Since all the pitches have a simple relationship to 1/1 D, a rhythmicized drone on that pitch runs throughout. The piece, then, moves "in and out of focus" depending on which scale is used at a given moment.

The five-octave keyboard should be tuned as follows:

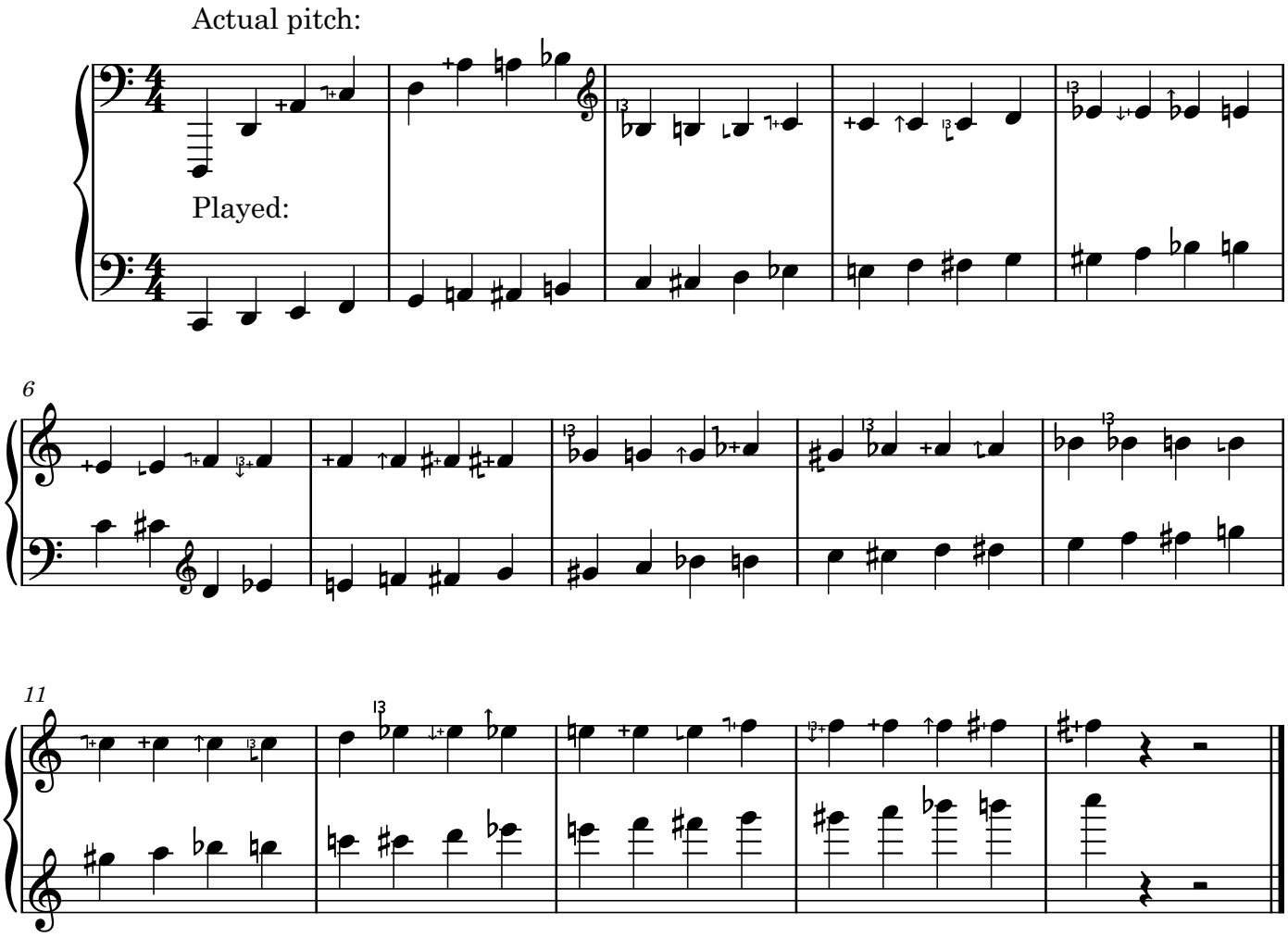
Key:	**Pitch:**	**Ratio:**	**Tuning (relative to normal 12tet):**
C1	D	1/1	D0 + 0 cents
D1	D	1/1	D1 + 0 cents
E1	A+	3/2	A1 + 2 cents
F1	C7+	7/4	C2 - 31.2 cents
G1	D	1/1	D2 + 0 cents
A1	A+	3/2	A2 + 2 cents
A#1	A^L	11/7	A#2 - 17.5 cents
B1	Bb	8/5	Bb2 + 13.7 cents
C2	B13b	13/8	Bb2 + 40.5 cents
C#2	B	5/3	B2 - 15.6 cents
D2	BL	12/7	B2 + 33.1 cents
D#2	C7+	7/4	C3 - 31.2 cents
E2	C+	9/5	C3 + 17.6 cents
F2	C^	11/6	C3 + 49.4 cents
F#2	C13L	13/7	C#3 - 18.3 cents
G2	D	1/1	D3 + 0 cents
G#2	E13b	13/12	Eb3 + 38.6 cents
A2	Ev+	12/11	E3 - 49.4 cents
A#2	E^b	11/10	E3 - 35 cents
B2	E	10/9	E3 - 17.6 cents
C3	E+	9/8	E3 + 3.9 cents

C#3	E*L*	8/7	E3 + 31.2 cents
D3	F7+	7/6	F3 - 33.1 cents
D#3	F13v+	13/11	F3 - 10.8 cents
E3	F+	6/5	F3 + 15.6 cents
F3	F^	11/9	F3 + 47.4 cents
F#3	F#+	5/4	F#3 - 13.7 cents
G3	F#*L*+	9/7	F#3 + 35.1 cents
G#3	G13b	13/10	G3 - 45.8 cents
A3	G	4/3	G3 - 2 cents
A#3	G^	11/8	G#3 - 48.7 cents
B3	A7b+	7/5	Ab3 - 17.5 cents
C4	G#*L*	10/7	G#3 + 17.5 cents
C#4	A13b	13/9	Ab3 + 36.6 cents
D4	A+	3/2	A3 + 2 cents
D#4	A^*L*	11/7	Ab3 - 17.5 cents
E4	Bb	8/5	Bb3 + 13.7 cents
F4	B13b	13/8	Bb3 + 40.5 cents
F#4	B	5/3	B3 - 15.6 cents
G4	B*L*	12/7	B3 + 33.1 cents
G#4	C7+	7/4	C4 - 31.2 cents
A4	C+	9/5	C4 + 17.6 cents
A#4	C^	11/6	C4 + 49.4 cents
B4	C13*L*	13/7	C#4 - 28.3 cents
C5	D	1/1	D4 + 0 cents
C#5	E13b	13/12	Eb4 + 38.6 cents
D5	Ev+	12/11	E4 - 49.4 cents
D#5	E^b	11/10	E4 - 35 cents
E5	E	10/9	E4 -17.6 cents
F5	E+	9/8	E4 + 3.9 cents
F#5	E*L*	8/7	E4 + 31.2 cents
G5	F7+	7/6	F4 - 33.1 cents
G#5	F13v+	13/11	F4 - 10/8 cents
A5	F+	6/5	F4 + 15.6 cents
A#5	F^	11/9	F4 + 47.4 cents
B5	F#+	5/4	F#4 - 13.7 cents
C6	F#*L*+	9/7	F#4 + 35.1 cents

The piece is dedicated to Aaron Krister Johnson, one of my comrades in the fight to expand the world's tuning resources. Duration: five minutes.

- Kyle Gann

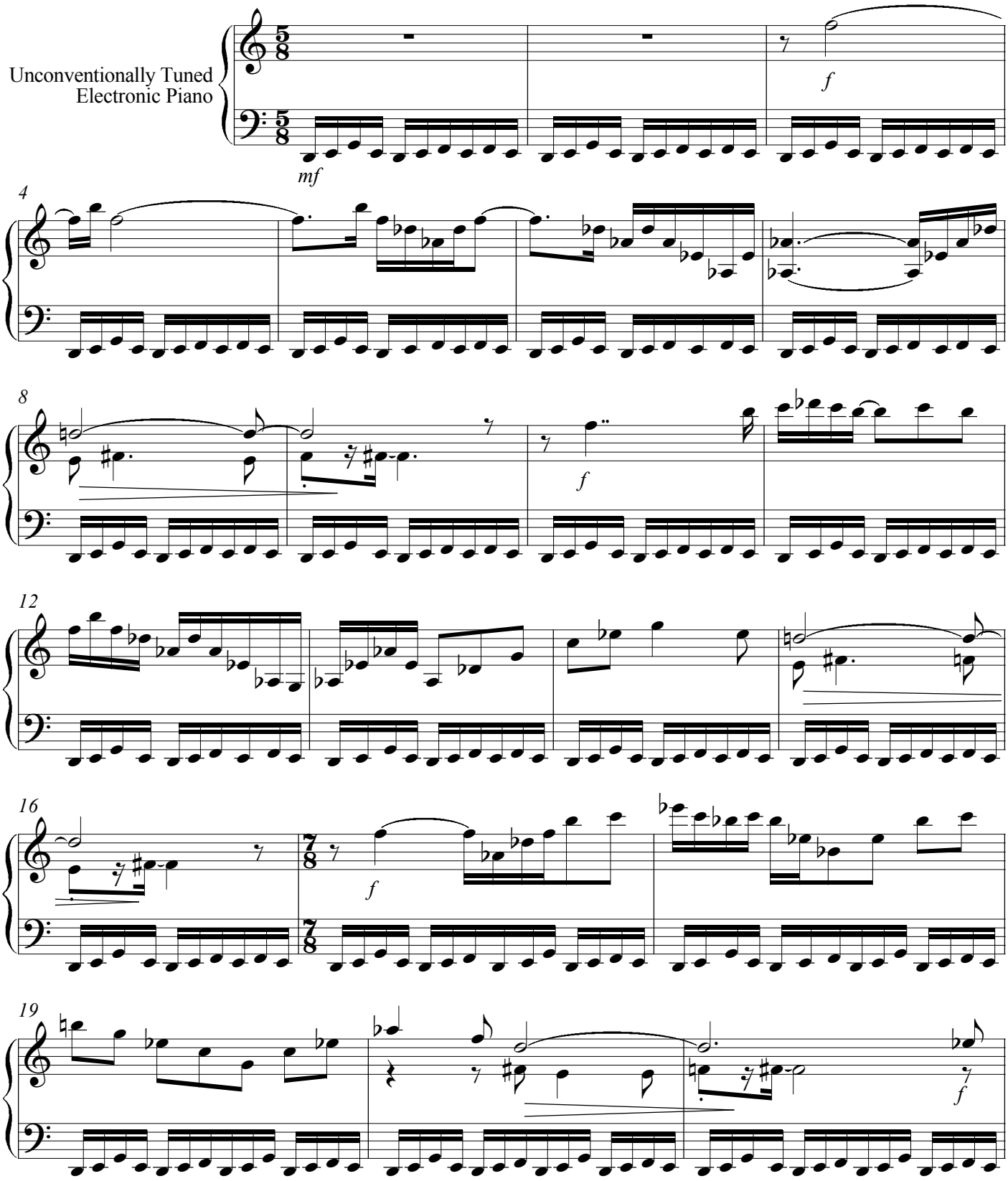
Triskaidekaphonia Pitch Key

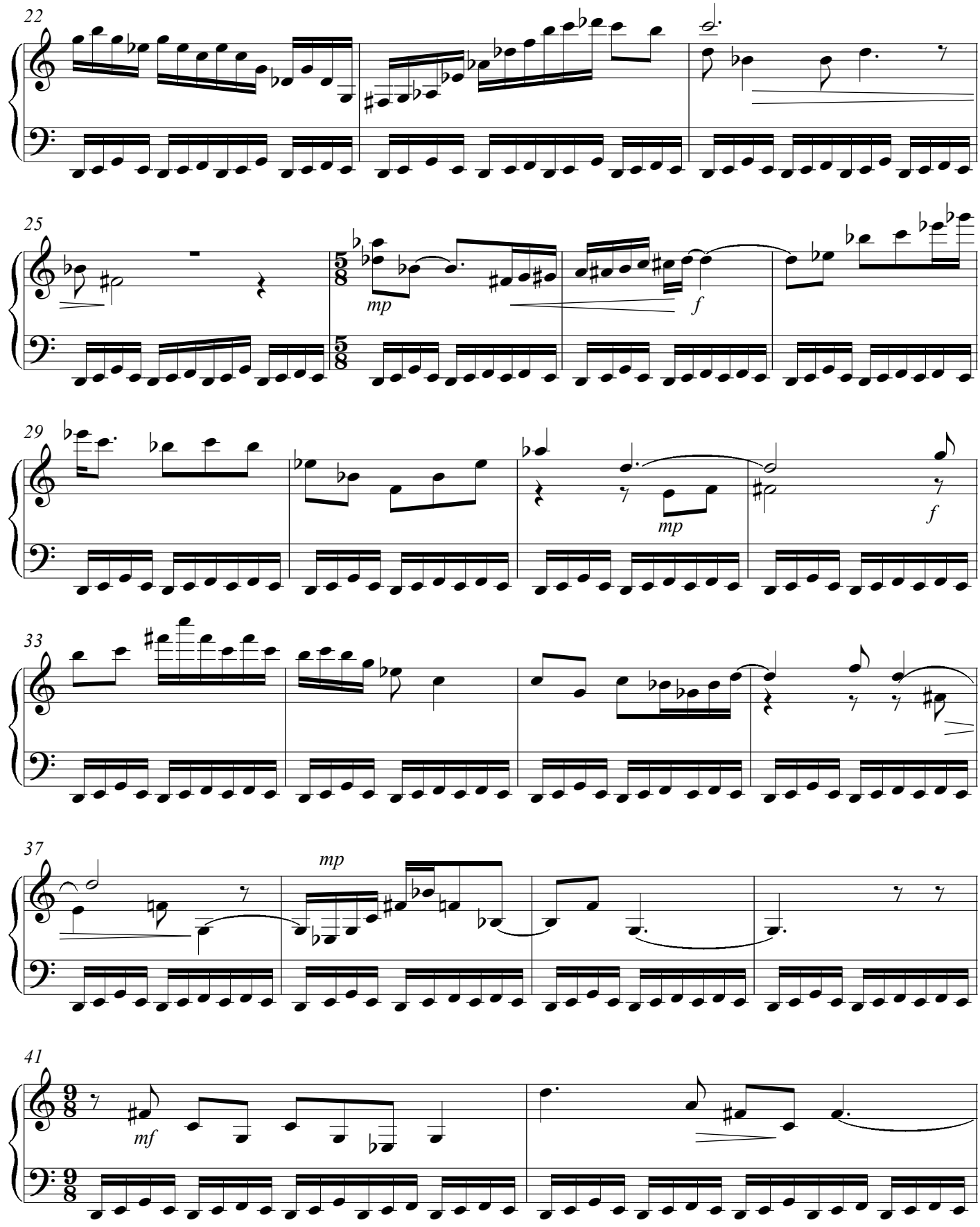


to Aaron Krister Johnson

Triskaidekaphonia

Kyle Gann
2005

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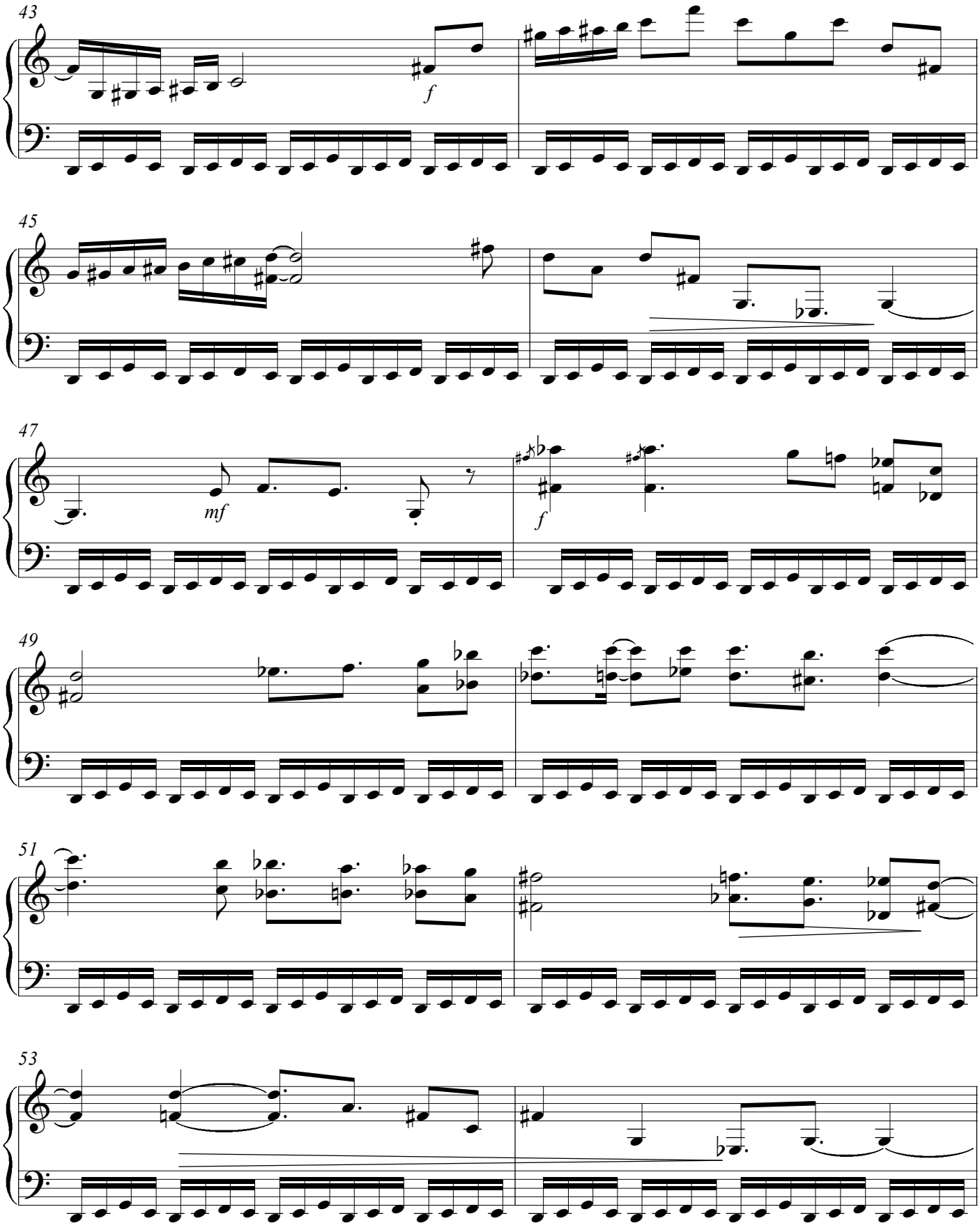
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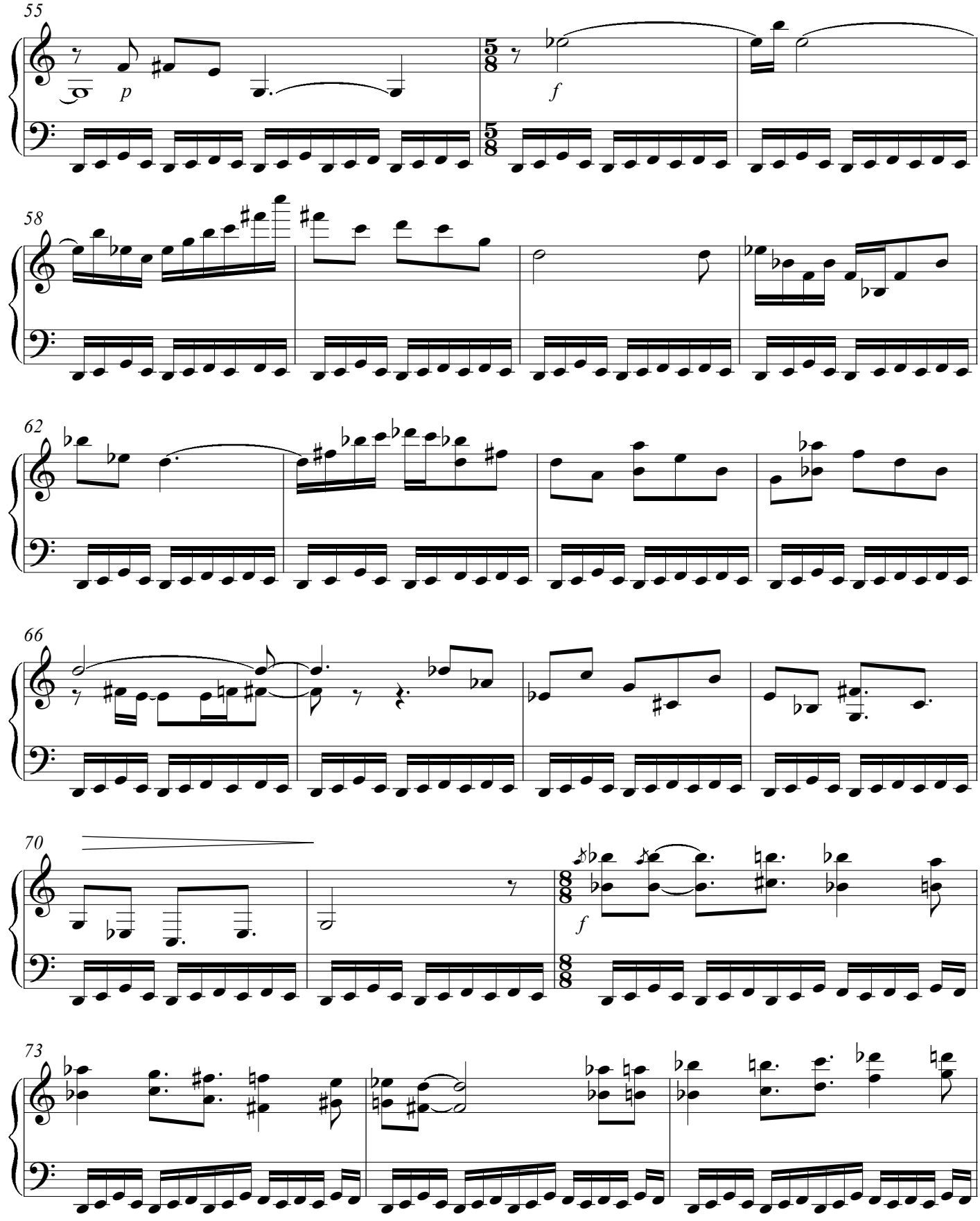
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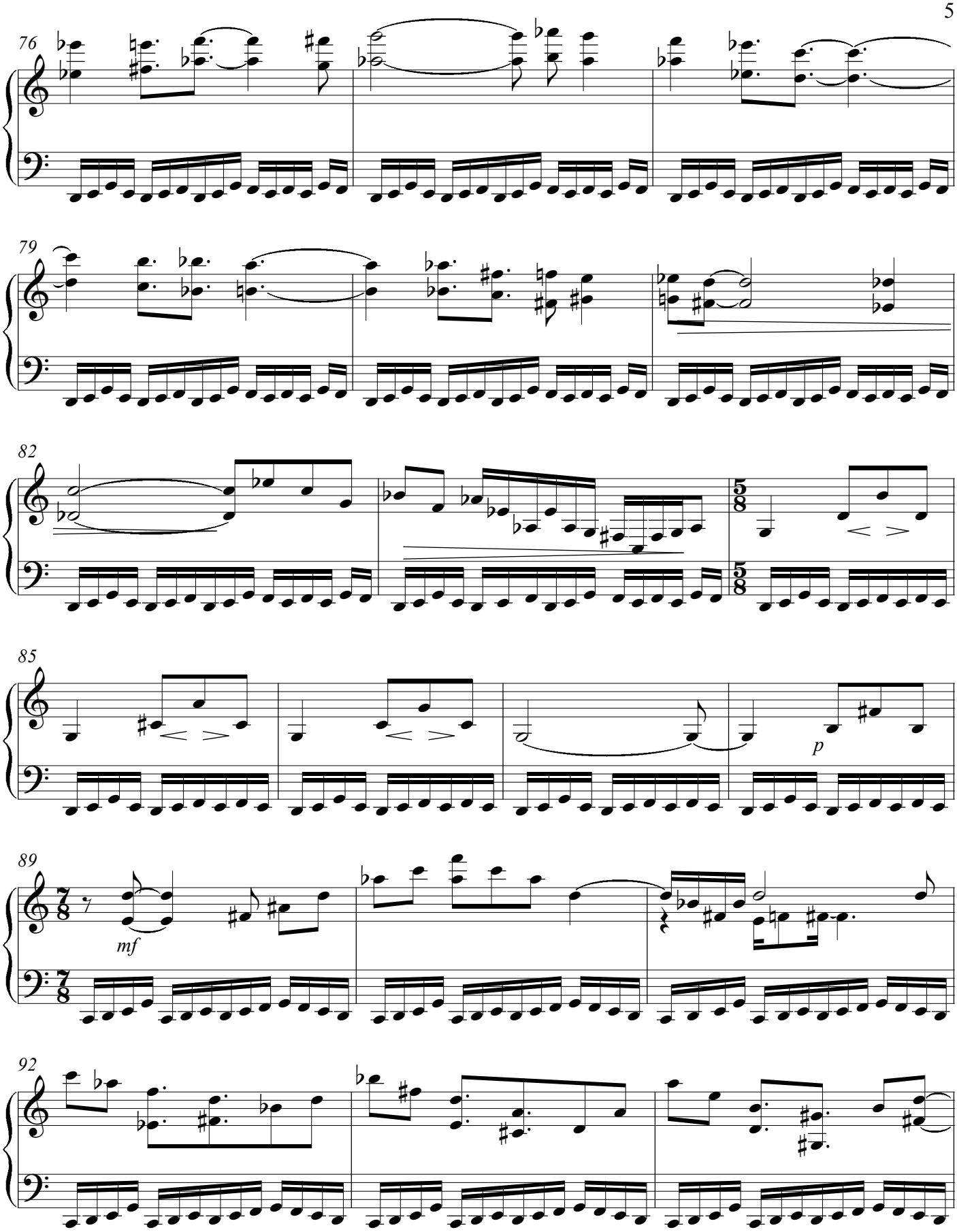
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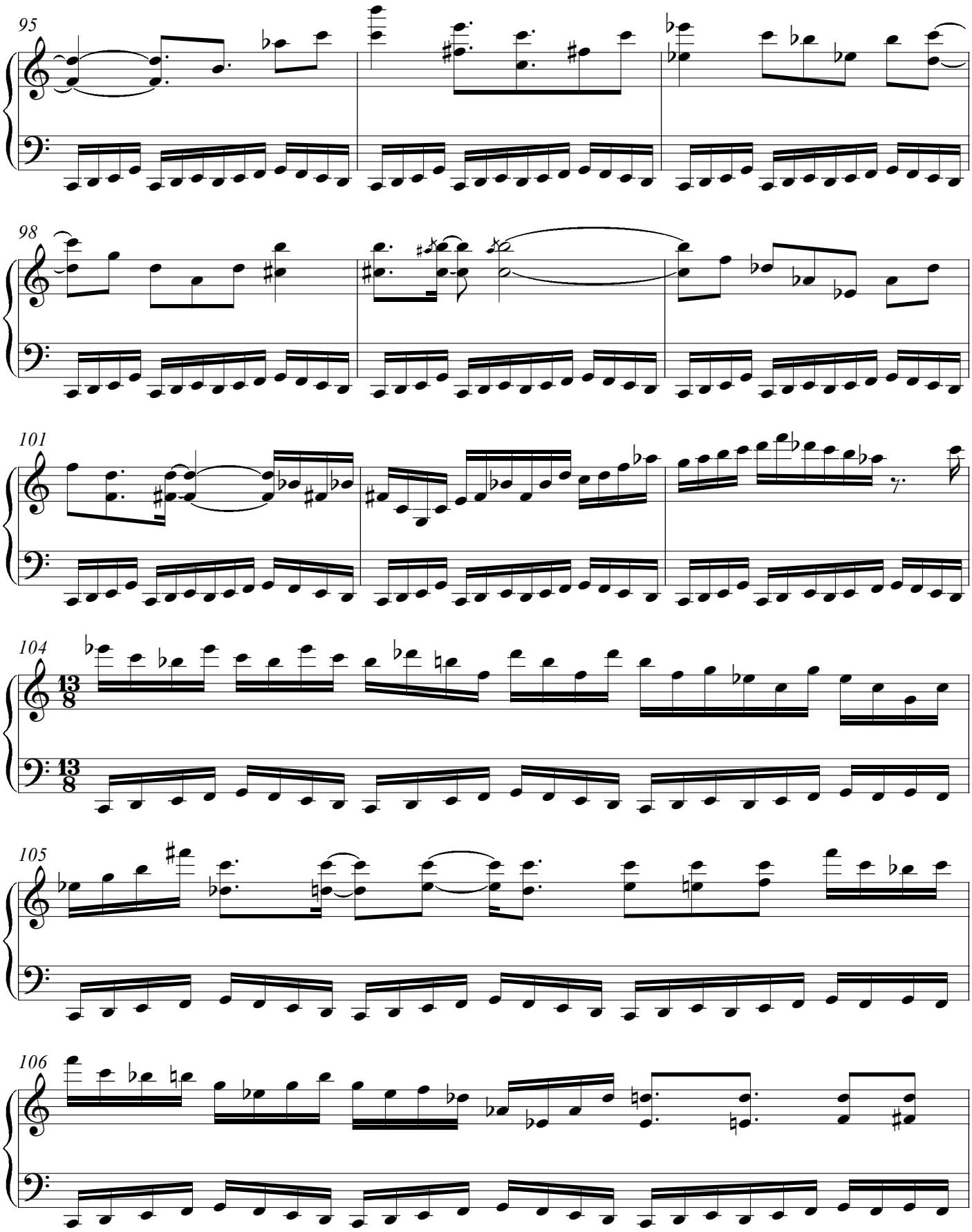
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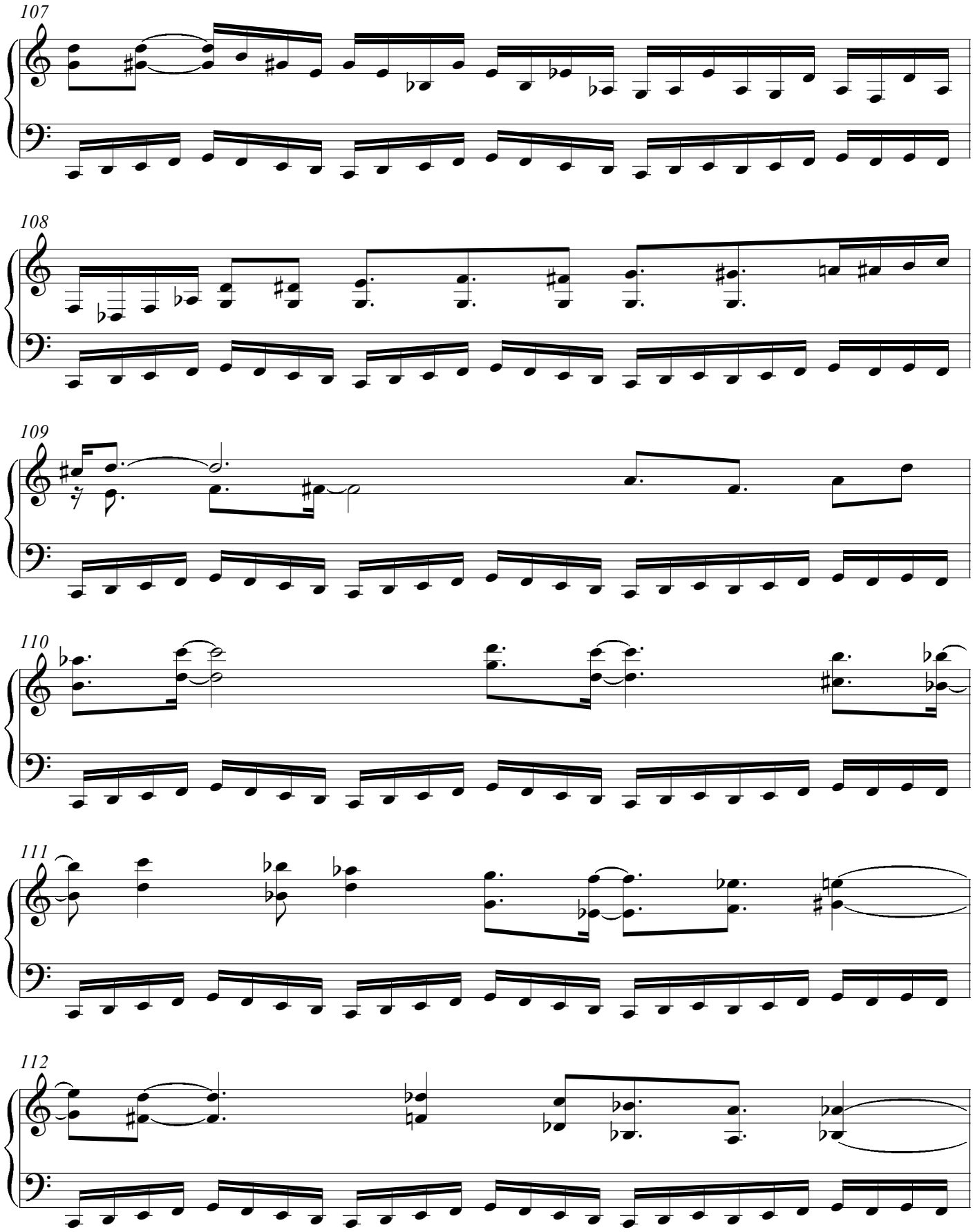
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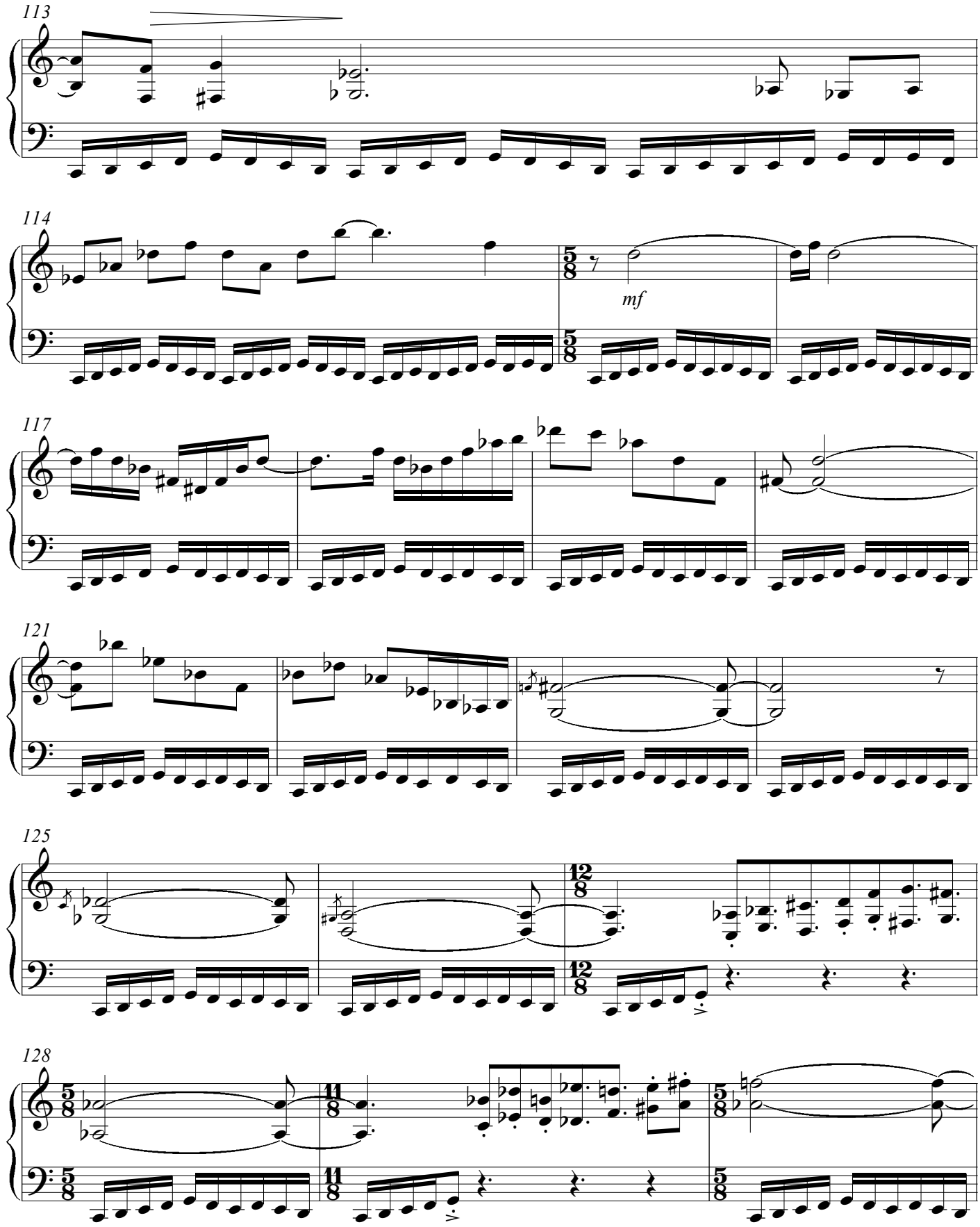
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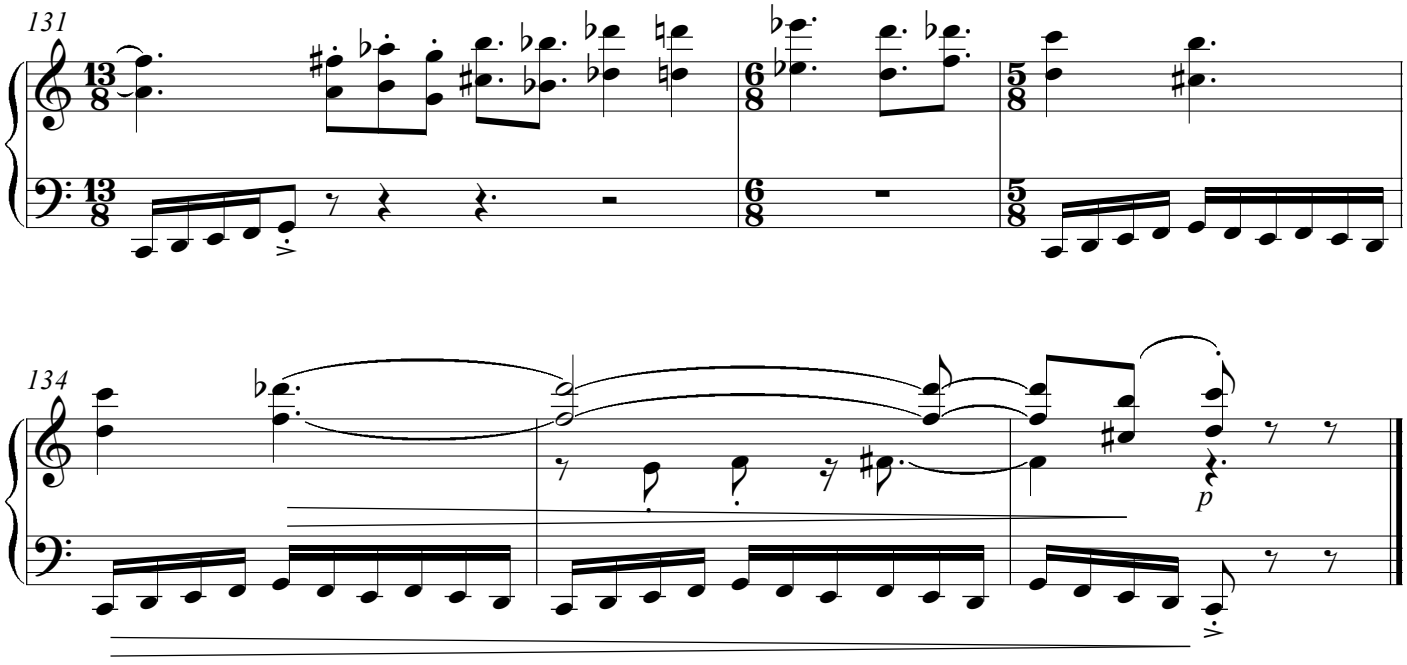

November 7-12, 2005
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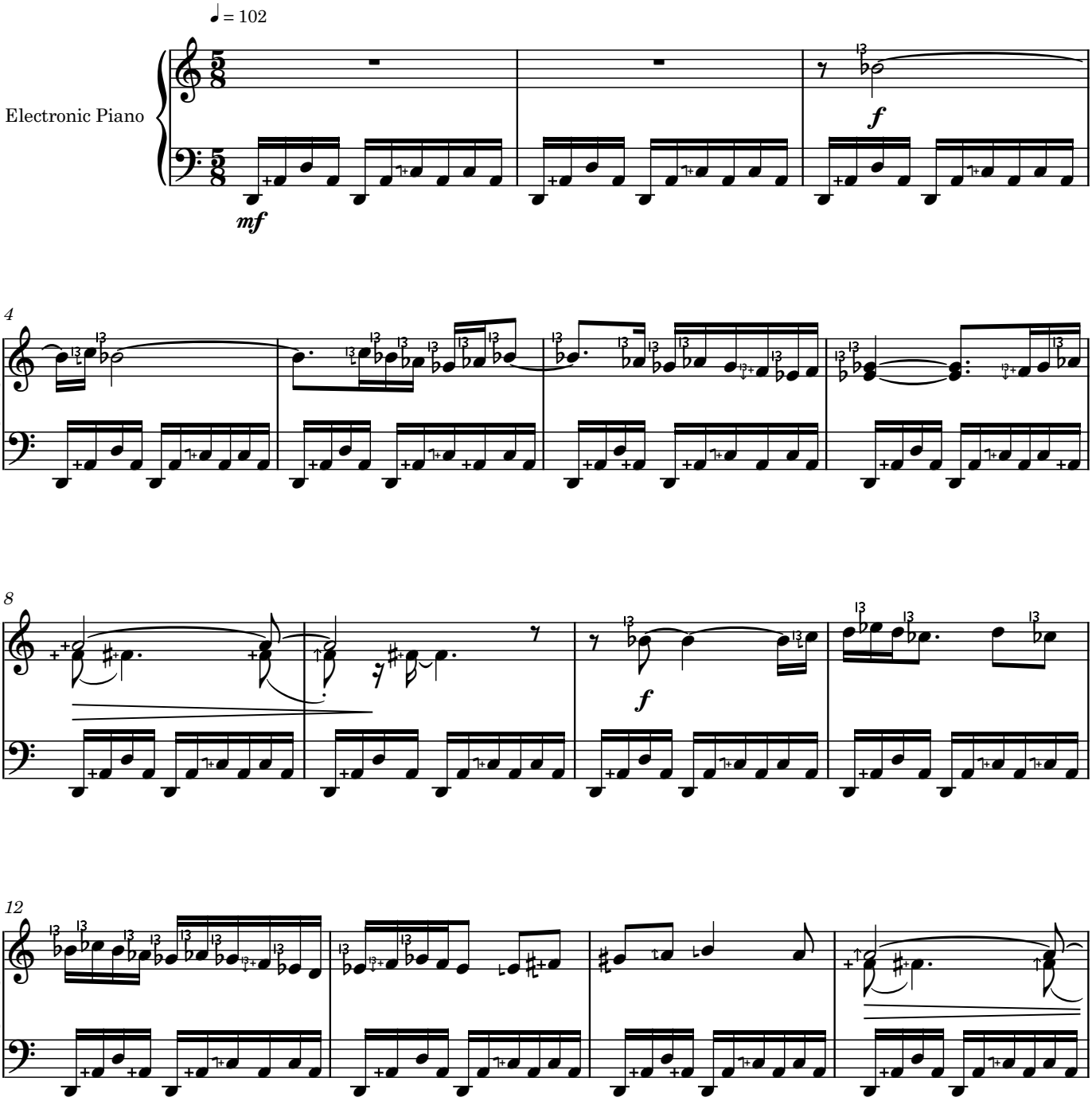

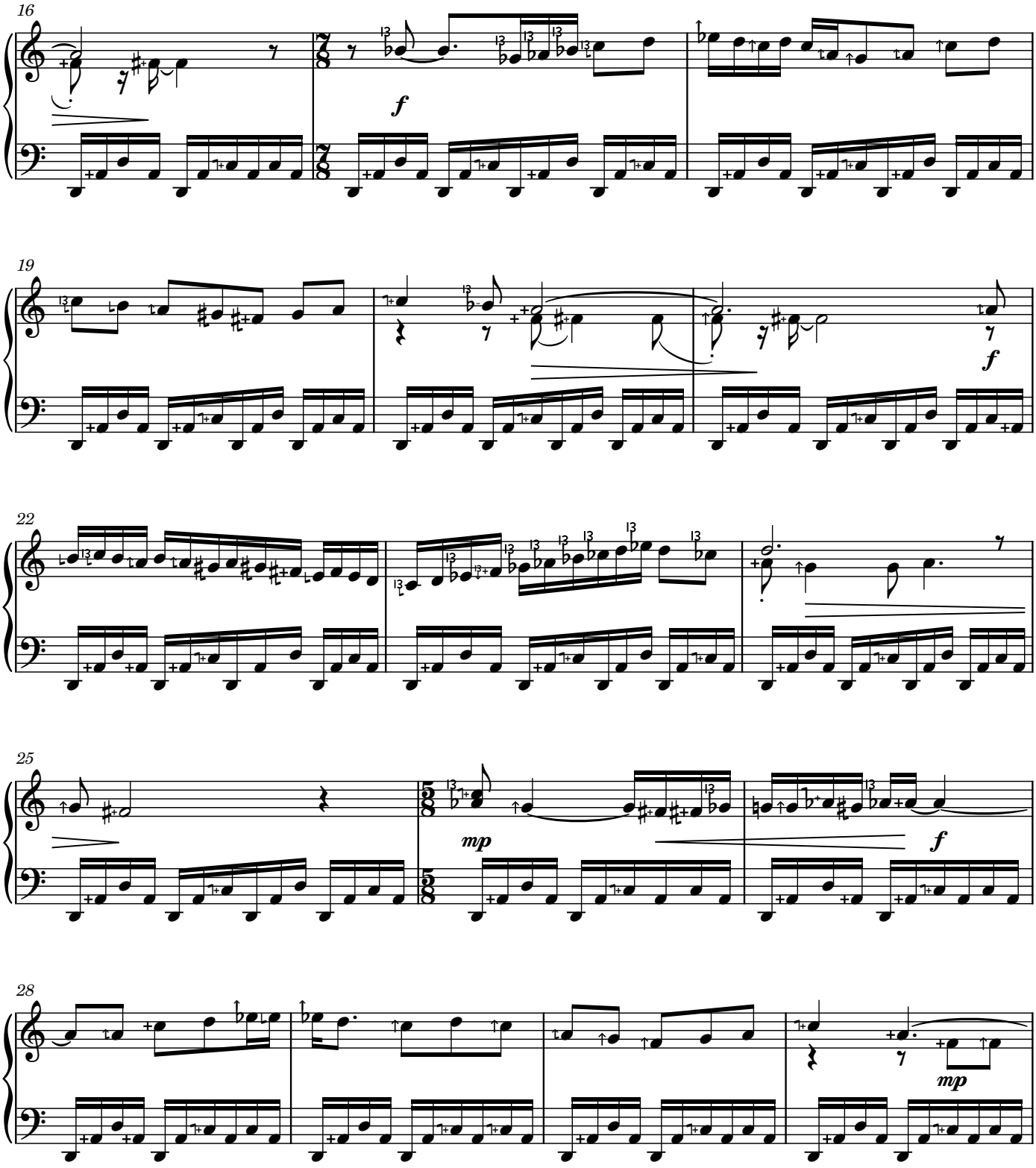
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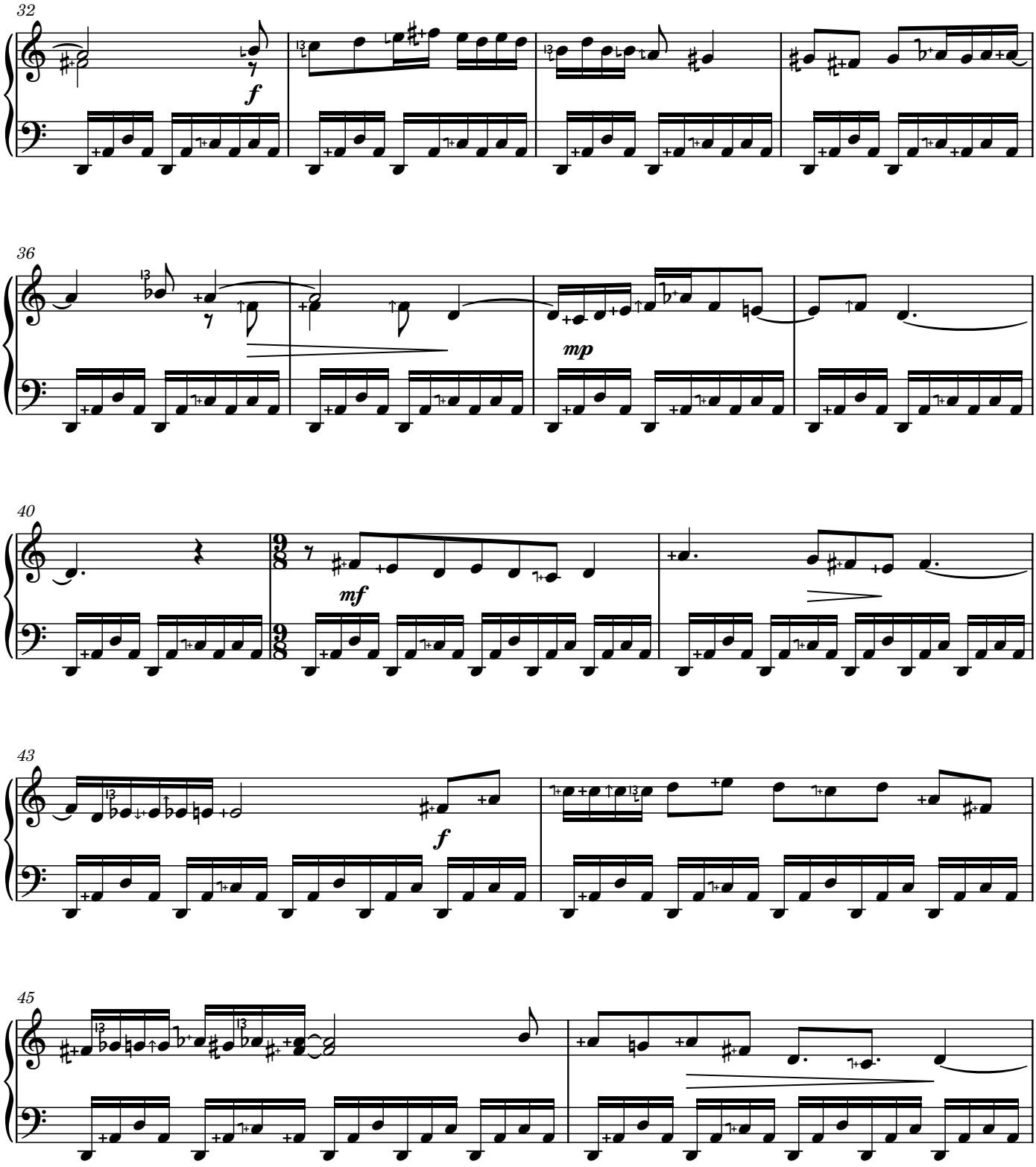
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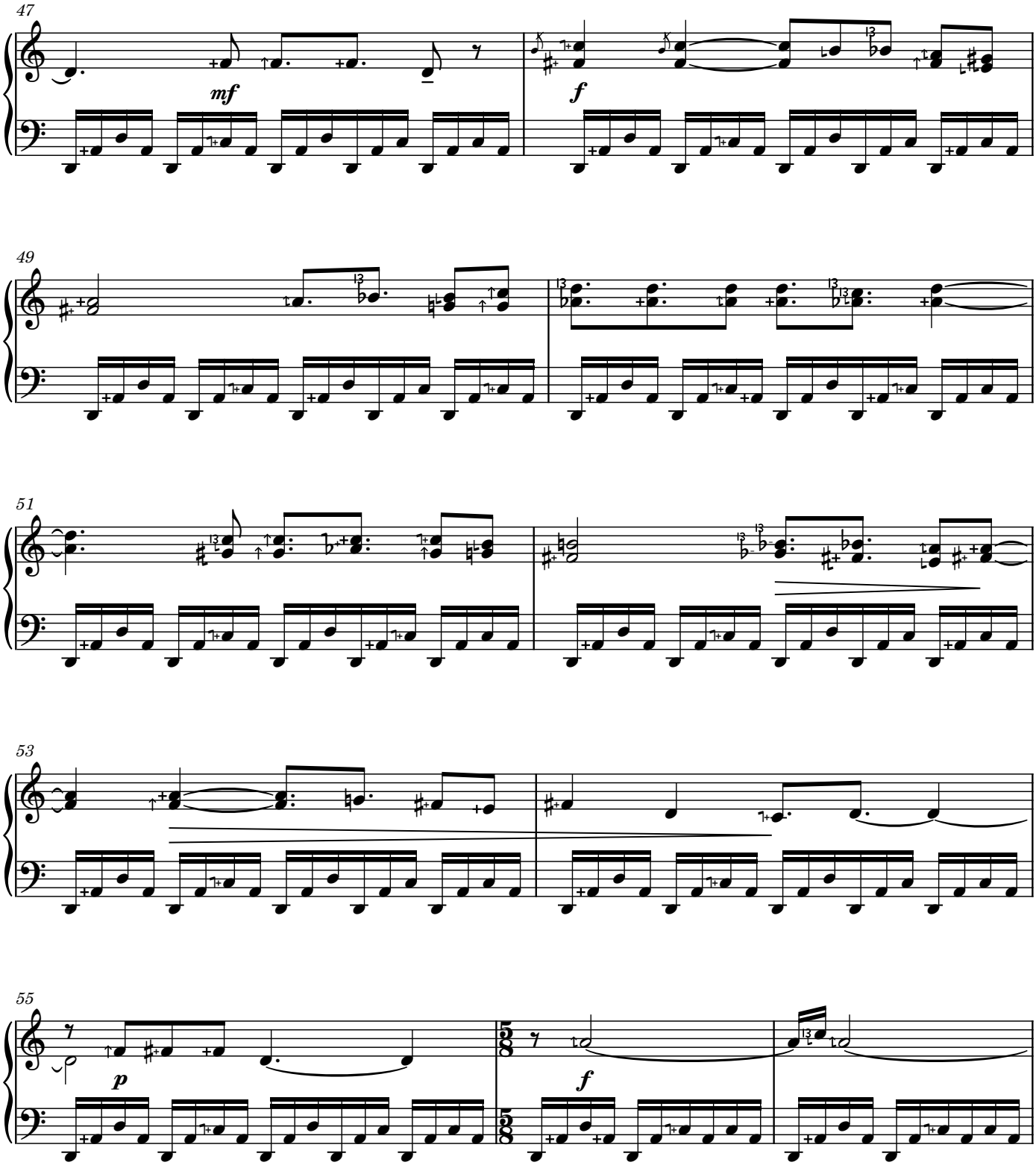
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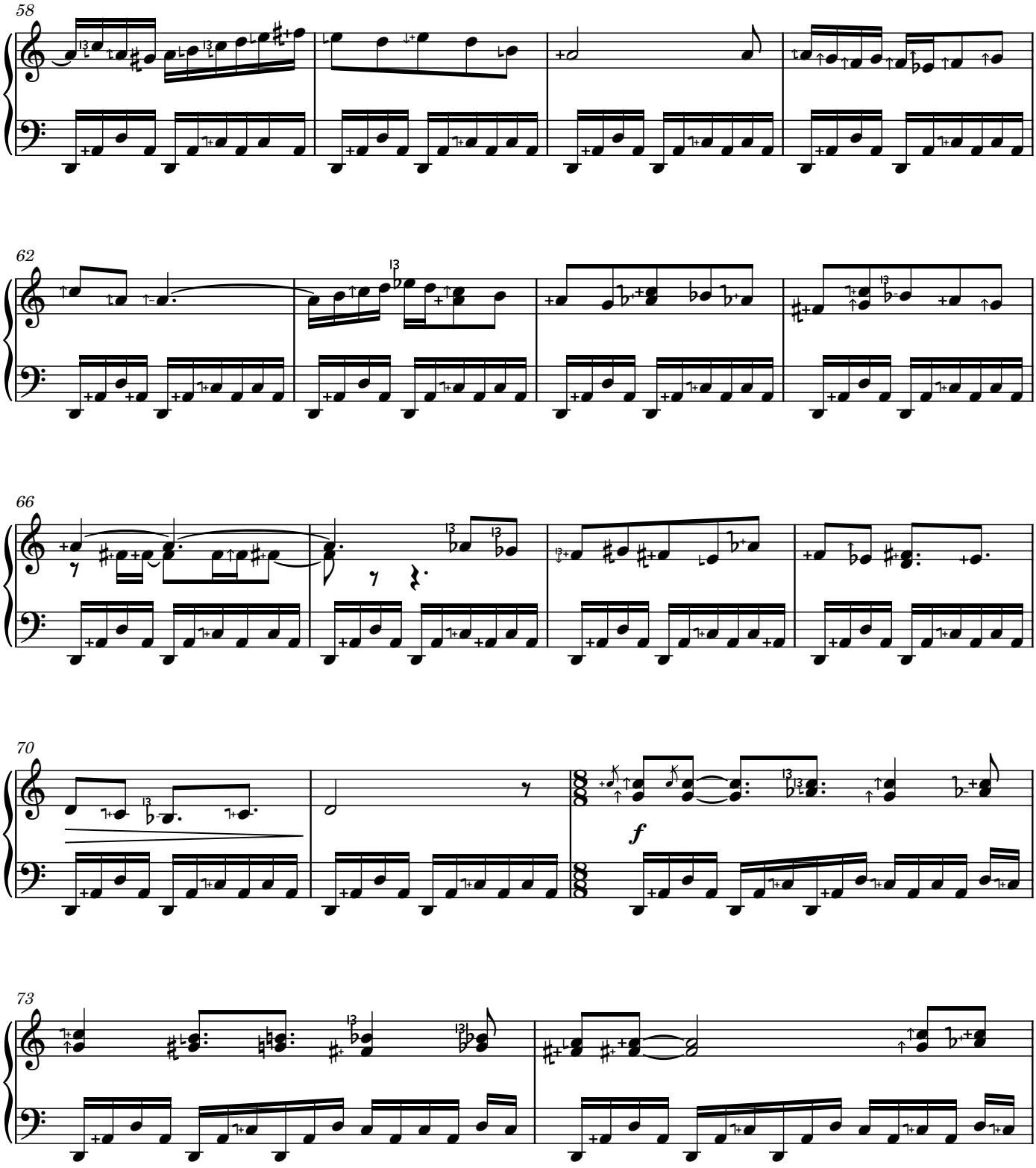
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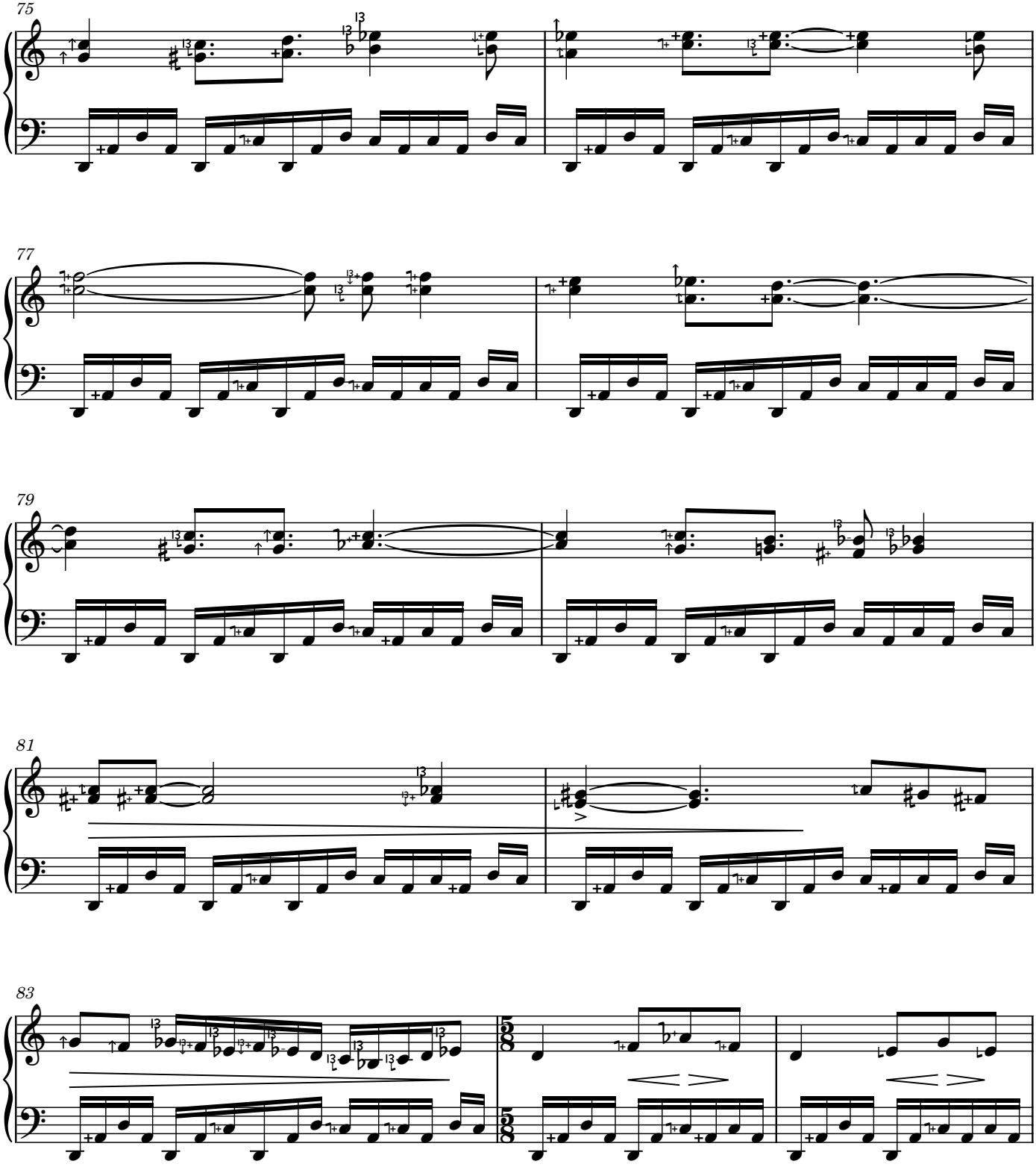
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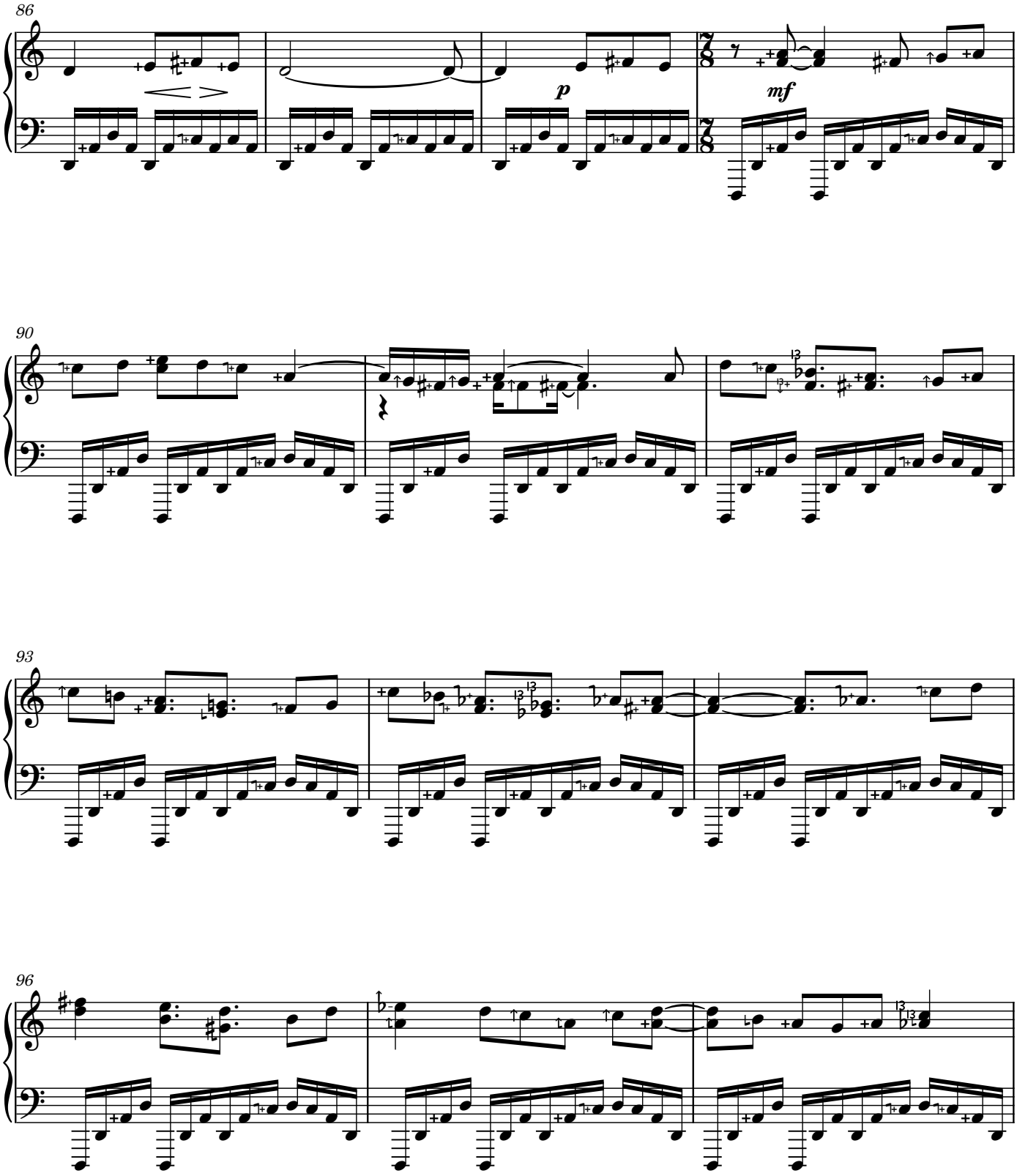
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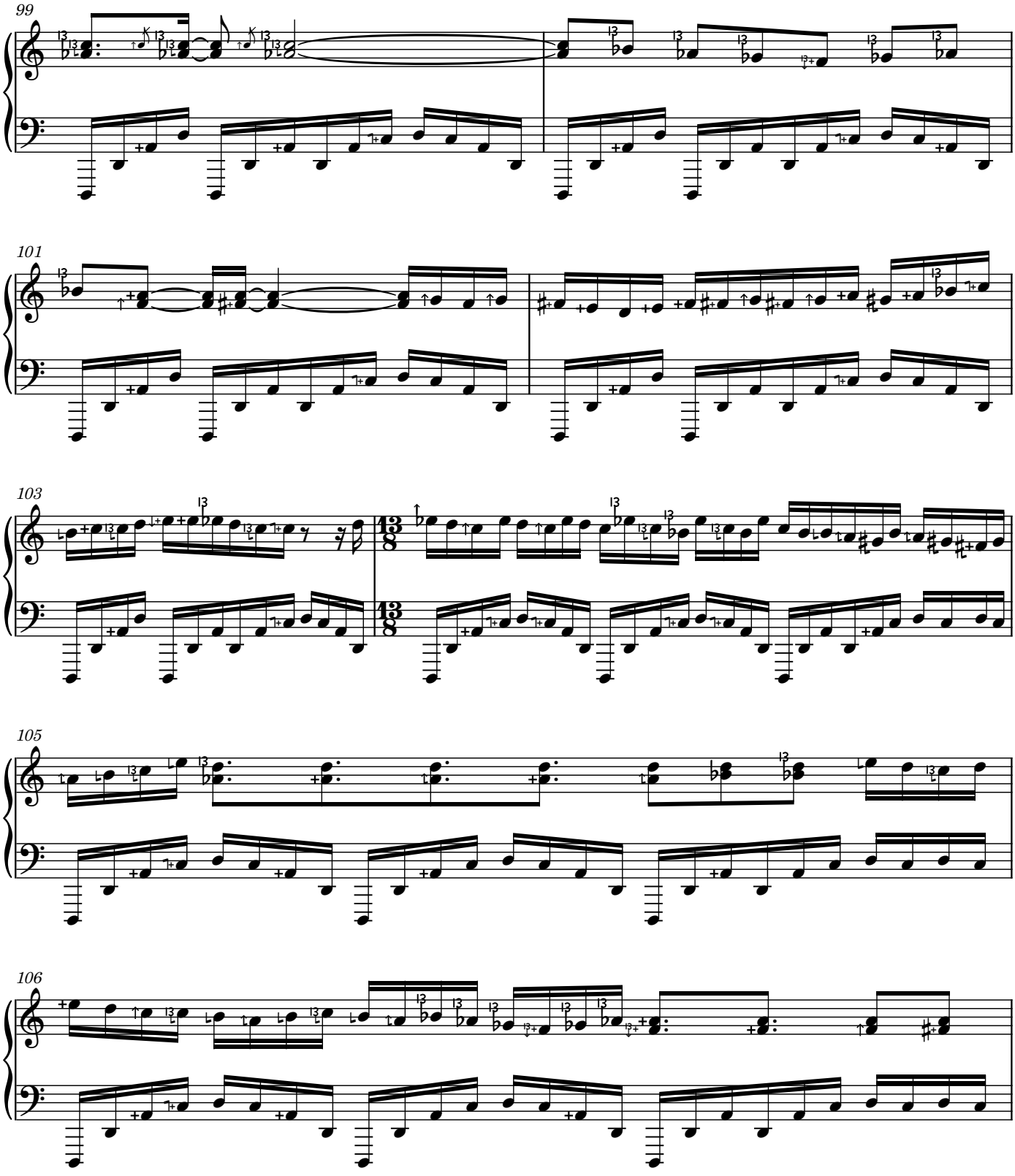
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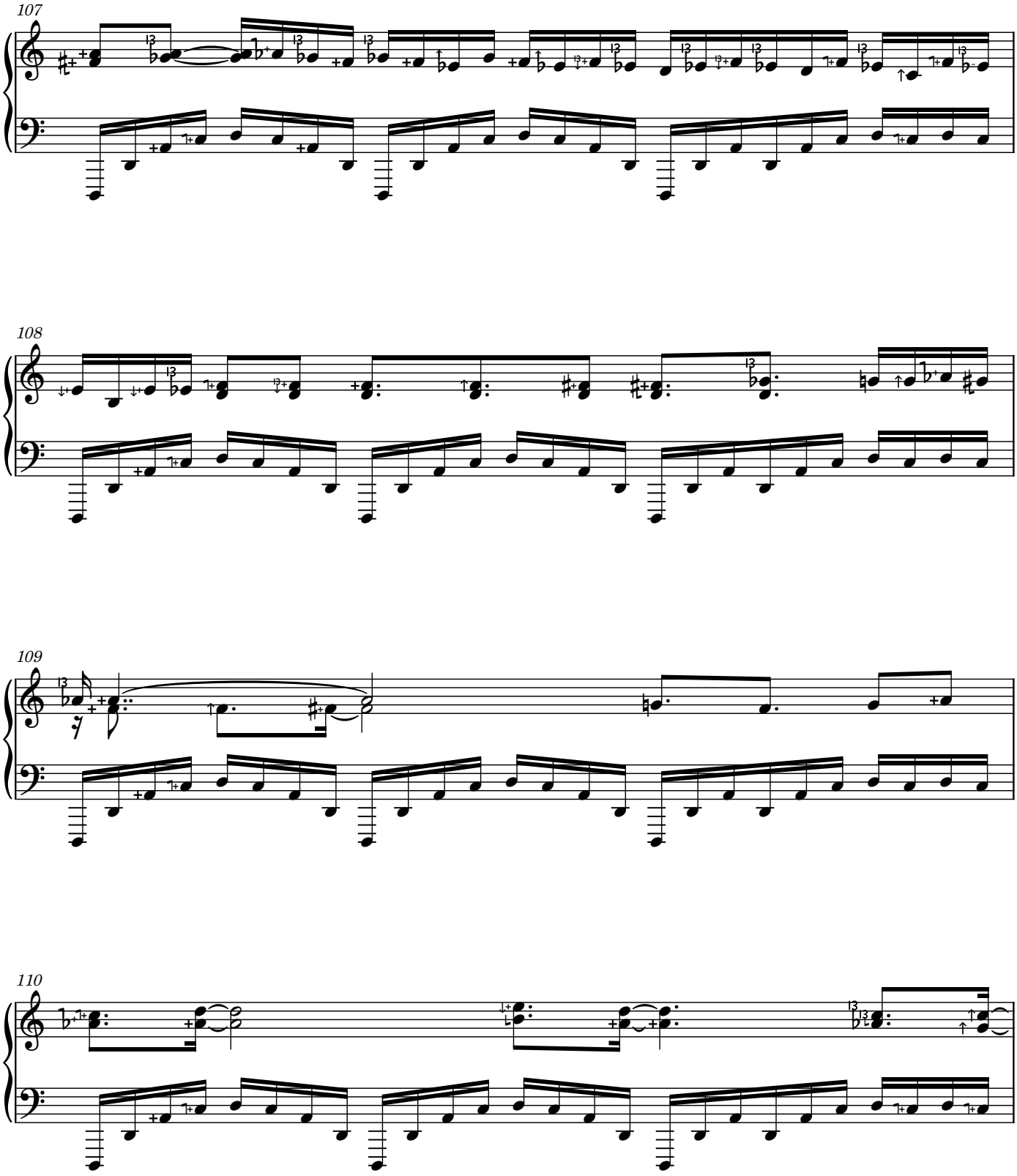
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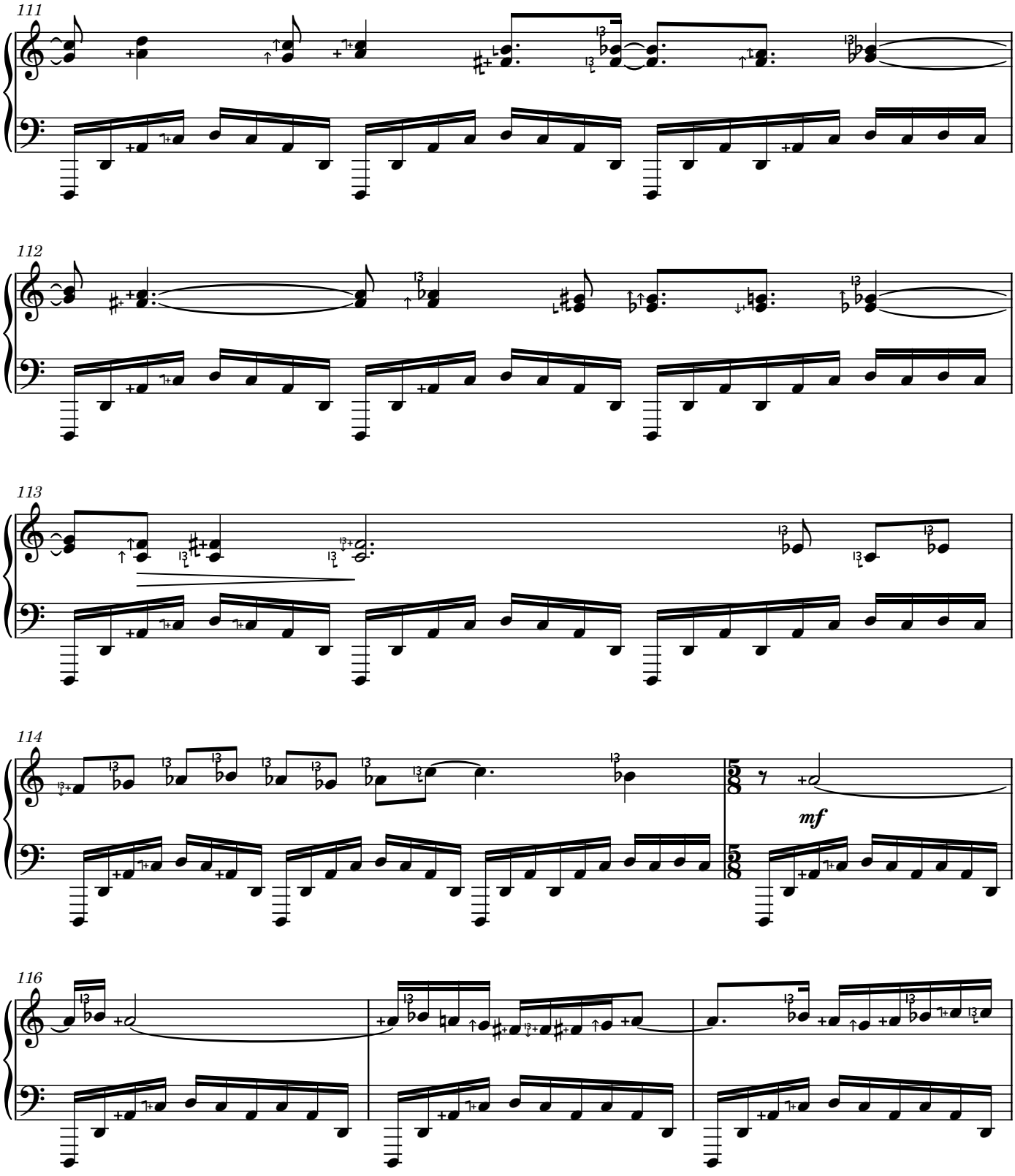
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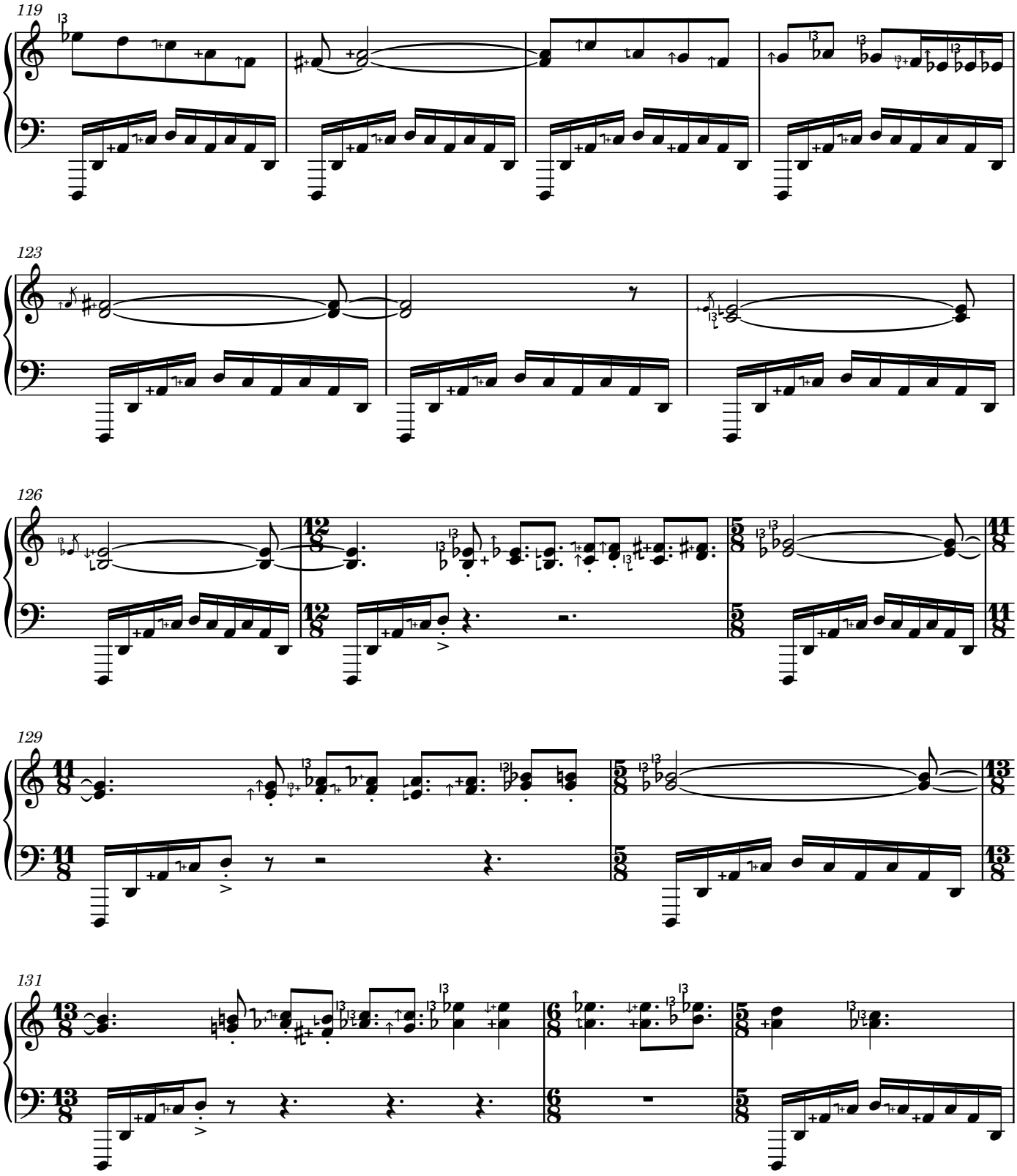
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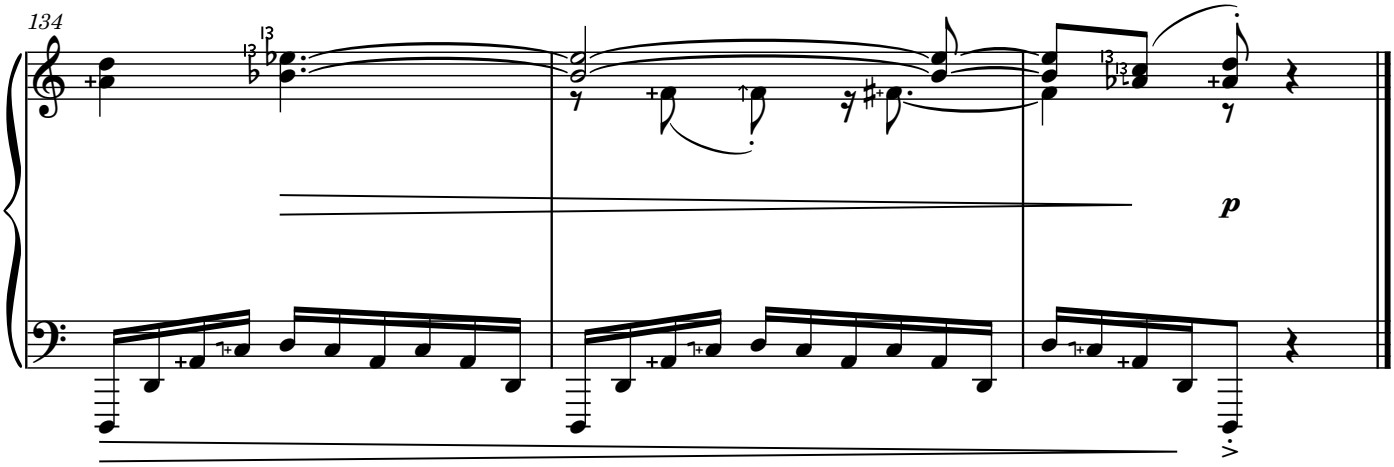

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