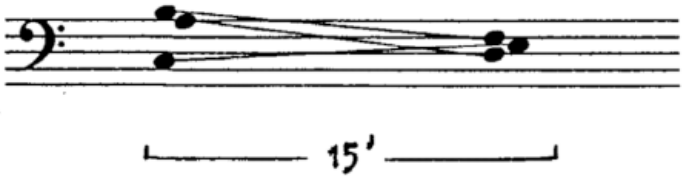
A JOURNAL OF THE SOCIETY FOR MUSIC THEORY

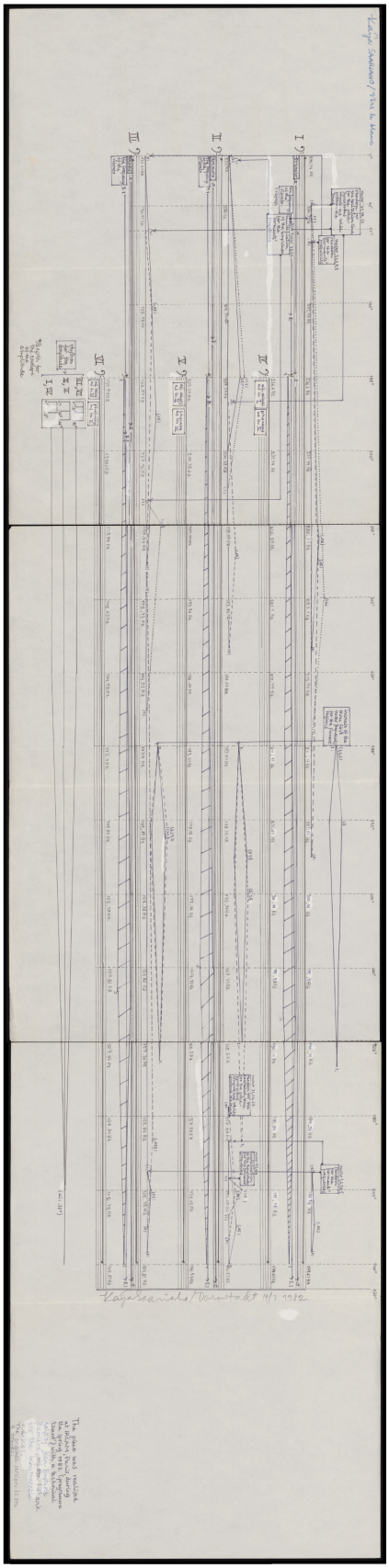
MTO 27.3 Examples: Morrison, Encoding Post-Spectral Sound: Kaija Saariaho's Early Electronic Music at IRCAM, 1982–87

(Note: audio, video, and other interactive examples are only available online)
https://mtosmt.org/issues/mto.21.27.3/mto.21.27.3.morrison.html

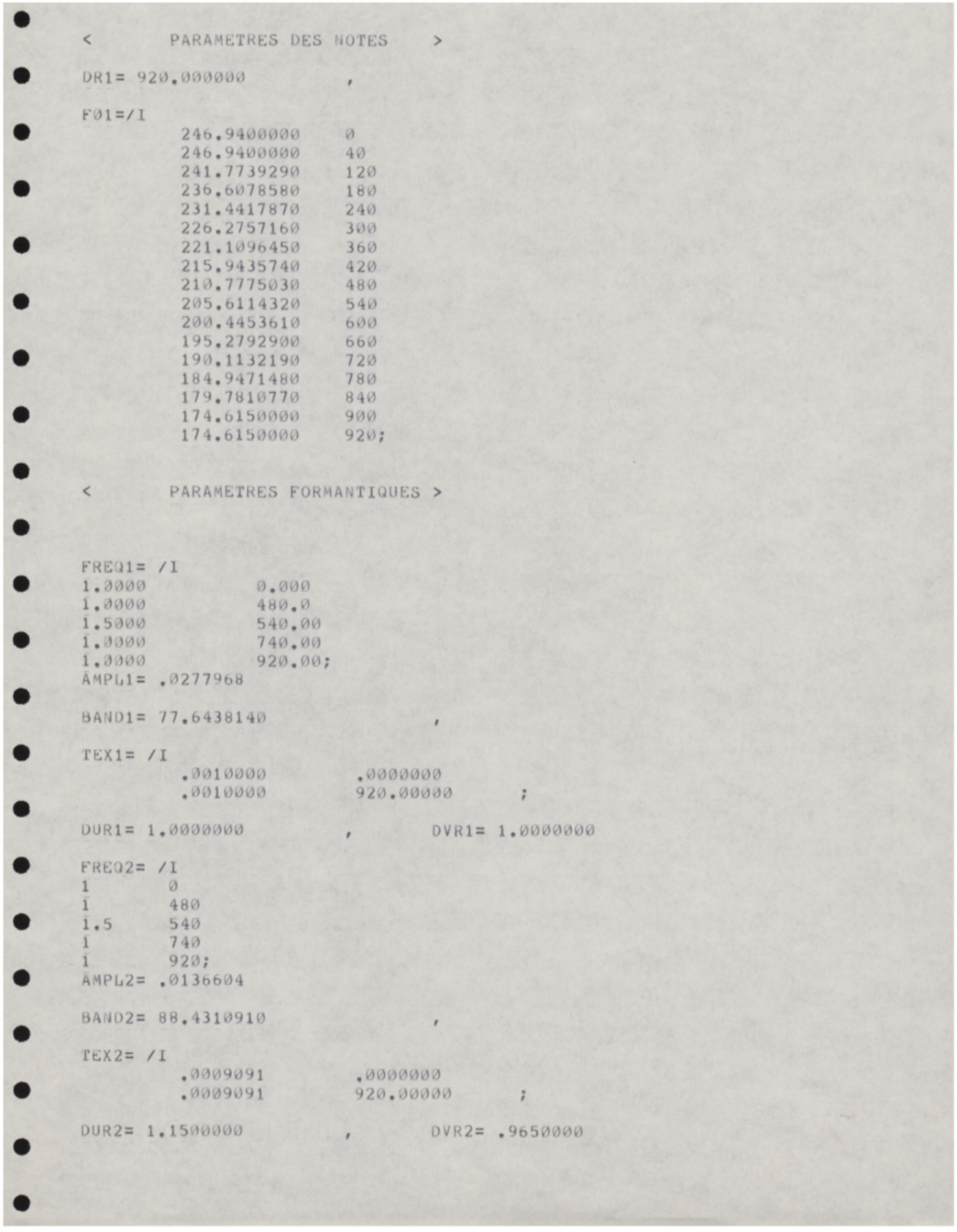
Example 1. Saariaho, score for *Vers le blanc* (originally printed in 1987, 104)



Example 2. Saariaho, form diagram of *Vers le blanc*, Sacher Foundation, Basel



Example 3. Saariaho, excerpt of parameter file for Voice I, Sacher Foundation, Basel



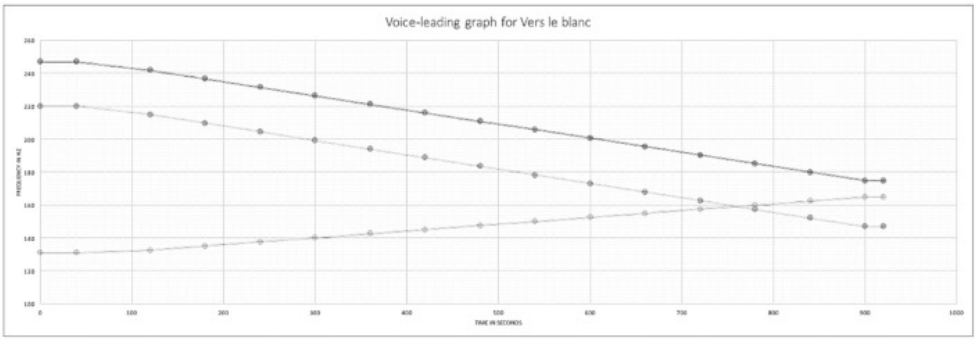
```
<       PARAMETRES DES NOTES    >

DR1= 920.000000          ,

F01=/I
          246.9400000    0
          246.9400000    40
          241.7739290    120
          236.6078580    180
          231.4417870    240
          226.2757160    300
          221.1096450    360
          215.9435740    420
          210.7775030    480
          205.6114320    540
          200.4453610    600
          195.2792900    660
          190.1132190    720
          184.9471480    780
          179.7810770    840
          174.6150000    900
          174.6150000    920;

<       PARAMETRES FORMANTIQUES >


FREQ1= /I
1.0000          0.000
1.0000          480.0
1.5000          540.00
1.0000          740.00
1.0000          920.00;
AMPL1= .0277968

BAND1= 77.6438140               ,

TEX1= /I
          .0010000        .0000000
          .0010000        920.00000       ;

DUR1= 1.0000000          ,       DVR1= 1.0000000

FREQ2= /I
1         0
1         480
1.5       540
1         740
1         920;
AMPL2= .0136604

BAND2= 88.4310910               ,

TEX2= /I
          .0009091        .0000000
          .0009091        920.00000       ;

DUR2= 1.1500000          ,       DVR2= .9650000
```

Examples 4a–c. (a) table of frequency information for three parameter files;
(b) graph showing pitch contours as breakpoint functions;
(c) table of secondary parameters

(a)

PAR 1		PAR 2		PAR 3	
frequency	time	frequency	time	frequency	time
246.9400000	0	220.000000	0	130.8100000	0
246.9400000	40	220.000000	40	130.8100000	40
241.7739290	120	214.773571	120	132.4867860	120
236.6078580	180	209.547142	180	134.9735720	180
231.4417870	240	204.320713	240	137.4603380	240
226.2757160	300	199.094284	300	139.9471440	300
221.1096450	360	193.867855	360	142.4339300	360
215.9435740	420	188.641426	420	144.9207160	420
210.7775030	480	183.414997	480	147.4075020	480
205.6114320	540	178.188568	540	149.8942880	540
200.4453610	600	172.962139	600	152.3810740	600
195.2792900	660	167.735710	660	154.8678600	660
190.1132190	720	162.509281	720	157.3546500	720
184.9471480	780	157.282852	780	159.8414400	780
179.7810770	840	152.056423	840	162.3282260	840
174.6150000	900	146.830000	900	164.8150000	900
174.6150000	920	146.830000	920	164.8150000	920

(b)



(c)

PAR 1		PAR 2		PAR 3	
random for excitation time of sound source (VUSER31,32,33)					
value	time	value	time	Value	time
.0	0	.0	0	.0	0
.0	40	.0	200	.0	60
.05	330	.05	320	.05	120
.0	570	.0	400	.0	350
.0	920;	.0	745	.035	800
		.05	840	.0	870
		.0	880	.0	920;
		.0	920;		
amplitude of formant frequencies (VUSER43,44)					
1.0	0	1.0	0	1.0	0
1.0	50	1.3	180	1.0	280
1.2	360	1.0	270	1.2	300
1.0	480	1.0	830	1.0	450
1.0	920;	1.01	840	1.0	920;
		1.0	860		
		1.0	920;		
random for formant frequencies (VUSER1,2,3,4,5)					
.0	0	.0	0	.0	0
.0	70	.1	180	.08	210
.06	310	.0	240	.0	330
.0	400	.0	800	.0	825
.0	825	.05	870	.03	840
.03	870	.0	900	.0	890
.0	890	0	920;	.0	920;
.0	920;				
vibrato frequency					
5.1	0	5.1	0	5.1	0
5.1	50	9.0	200	8.5	230
8.	130	5.1	920;	5.1	920;
5.1	920;				
tremolo					
.0	0	.0	0	.0	0
.0	60	.7	150	.6	220
.8	180	.0	920;	.0	920;
.0	920;				

Examples 5a–c. (a) Saariaho, function file for Voice I, Sacher Foundation, Basel; (b) tabulation of phonemes in CHANT dictionary; (c) a spectral envelope defined with five formant regions (reprinted from Baisnée et al., *CHANT manual*, 8; "f1–f5" annotations are my own)

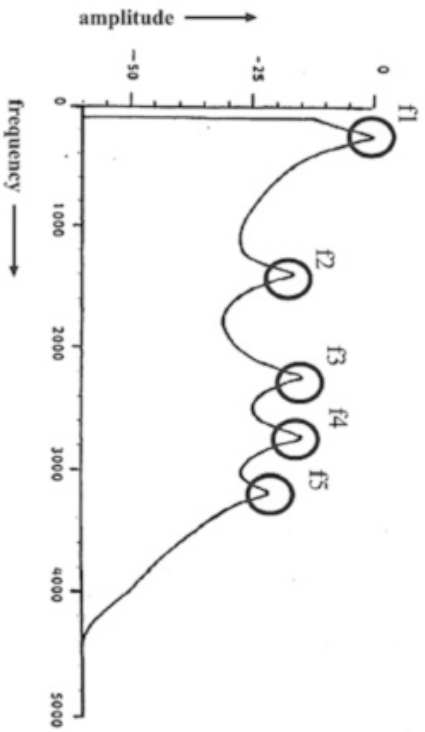
(a)

```
INTERNAL PROCEDURE PREUSER;
BEGIN "PREUSER"
INTEGER I,J,IMAX,ERR,EOF ;
! MISE NOM NICE,OWN PRE-PROCEDURE ;
IF I = 0 THEN BEGIN "INITIALISATION"
PRINT("!!!!!!!!!!  USER POUR TIMBRES AVEC TABLEAU VOYELLES !!!!!!!!!!"&CRLF)
! VALEURS ;

! CHAN← 1 ;
! SETFORMAT(0,2) ;
! JOBNUMBER←CVS(CALLI(0,"PJOB")) ;
! FUN←"PSCR"&JOBNUMBER&".FUN" ;
! ENTER(CHAN,FUN,ERR) ;
! IF ERR THEN IOERR ("ERREUR A L'ENTREE DU SCRTCH FICHIER DE FUN",ERR) ;
! DI    ***** A .5 ENVIRON DANS M1, DI,MSB SUR DSK0 ;
                CODE[I←I+1] ← "DI"  ;
                TENV[I] ← 1 ;
                TCOE[I] ← 1 ;
                TFREQ[I,1] ← 370.0000000000 ;
                TFREQ[I,2] ← 1450.000000000 ;
                TFREQ[I,3] ← 2300.000000000 ;
                TFREQ[I,4] ← 2500.000000000 ;
                TFREQ[I,5] ← 3100.000000000 ;
! FREQ0= 3400.000000000  ;
! YE  A .75←.8 DANS M1     ET DANS SM16  ;
                CODE[I←I+1] ← "YE"  ;
                TENV[I] ← 1 ;
                TCOE[I] ← 1 ;
                TFREQ[I,1] ←   390.0000000 ;
                TFREQ[I,2] ←  1550.0000000 ;
                TFREQ[I,3] ←  2260.0000000 ;
                TFREQ[I,4] ←  2500.0000000 ;
                TFREQ[I,5] ←  3046.0000000 ;
! DE  A  0.0 DE M1          SUR DSK0:DE.MSB  ;
                CODE[I←I+1] ← "DE"  ;
                TENV[I] ← 1 ;
                TCOE[I] ← 1 ;
                TFREQ[I,1] ←   520.0000000000 ;
                TFREQ[I,2] ←  1184.0000000000 ;
                TFREQ[I,3] ←  2400.0000000000 ;
                TFREQ[I,4] ←  2800.0000000000 ;
                TFREQ[I,5] ←  3546.0000000000 ;
! FREQ0= 4307.0000000000  ;
! EA ;
                CODE[I←I+1] ← "EA"  ;
                TENV[I] ← 1 ;
                TCOE[I] ← 1 ;
                TFREQ[I,1] ←  450.0000000 ;
                TFREQ[I,2] ←  1180.000000 ;
                TFREQ[I,3] ←  2200.000000 ;
                TFREQ[I,4] ←  2400.000000 ;
                TFREQ[I,5] ←  2920.000000 ;
! A ;
                CODE[I←I+1] ← "A"   ;
                TENV[I] ← 1 ;
                TCOE[I] ← 1 ;
                TFREQ[I,1] ←  600.0000000 ;
                TFREQ[I,2] ←  1050.000000 ;
                TFREQ[I,3] ←  2400.000000 ;
```

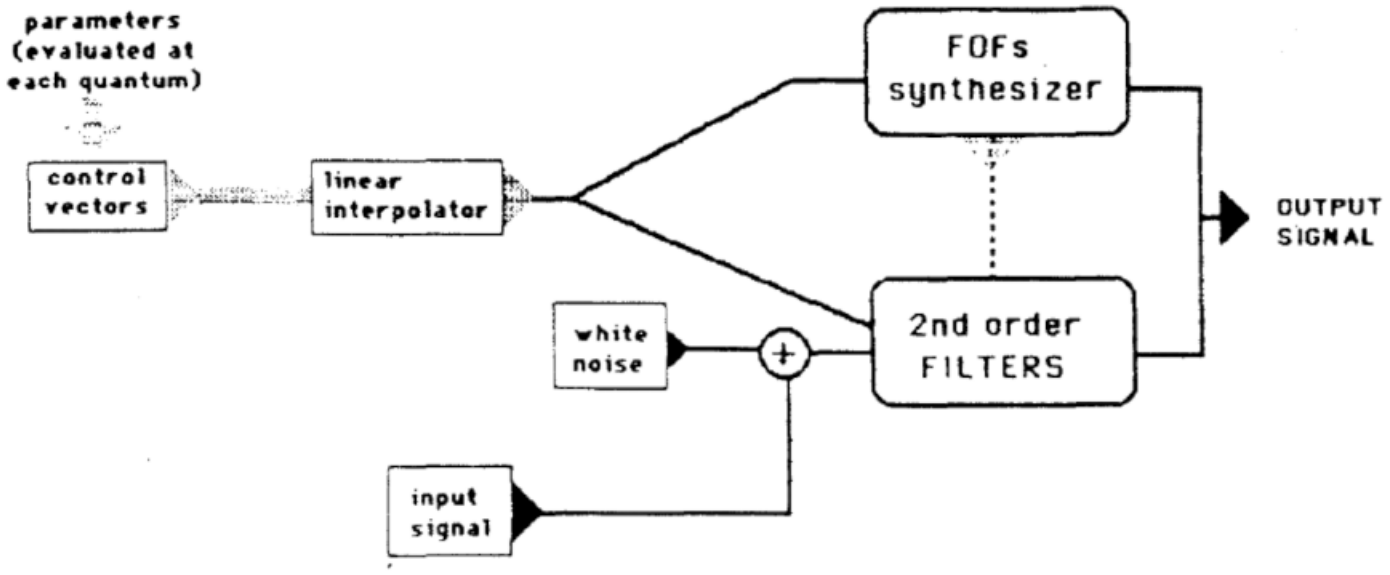
(b)

Phoneme	Formant Frequencies in Spectral Envelope
DI	370, 1450, 2300, 2500, 3100, 3400
YE	390, 1550, 2260, 2500, 3046
DE	520, 1184, 2400, 2800, 3546, 4307
EA	450, 1180, 2200, 2400, 2920
A	600, 1050, 2400, 2700, 3100
A2	450, 950, 2200, 2800, 3500
E	400, 1700, 2300, 2900, 3400
IN	500, 1200, 2500, 2800, 3000
I	238, 1741, 2450, 2900, 4000
IO	238, 1741, 2450, 2900, 4000
OE	415, 1400, 2200, 2800, 3300
G	200, 1700, 1800, 2800, 3500
B	250, 1200, 2200, 2500, 2750
D	230, 1650, 2600, 3200, 4000
AN	609, 800, 2800, 4000, 5000
M	300, 1000, 2200, 2550, 3500
L	350, 1600, 2600, 2900, 3400
LI	350, 1500, 2500, 3100, 4000
O	325, 700, 2550, 2850, 3100
O2	375, 800, 2650, 2950, 3300
U	360, 750, 2400, 2675, 2950
UE	300, 1630, 2150, 2700, 3100'
UH	400, 1050, 2200, 2650, 3100
R	600, 1000, 1800, 2000, 2500
W	100, 400, 2400, 3400, 3900

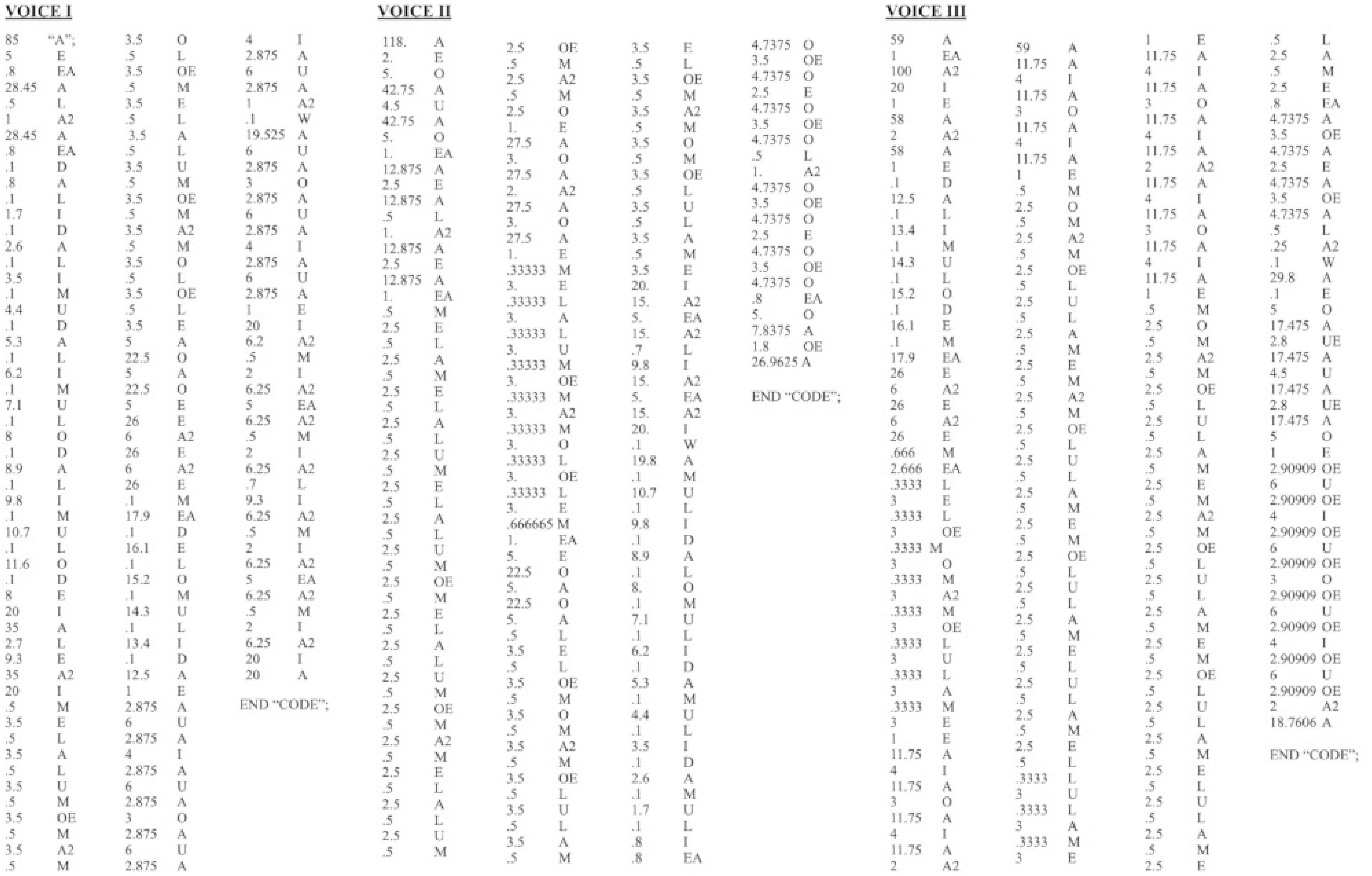
(c)



Example 6. Filter and FOF synthesis techniques in CHANT (reprinted from Baisnée et al. 1985, 30)



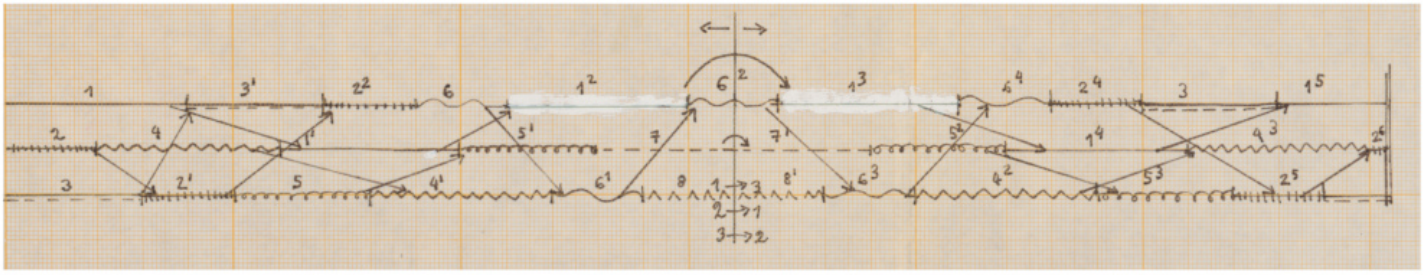
Example 7. “Phrases” composed of phoneme sequences in *Vers le blanc*, transcribed from CHANT code, Sacher Foundation, Basel



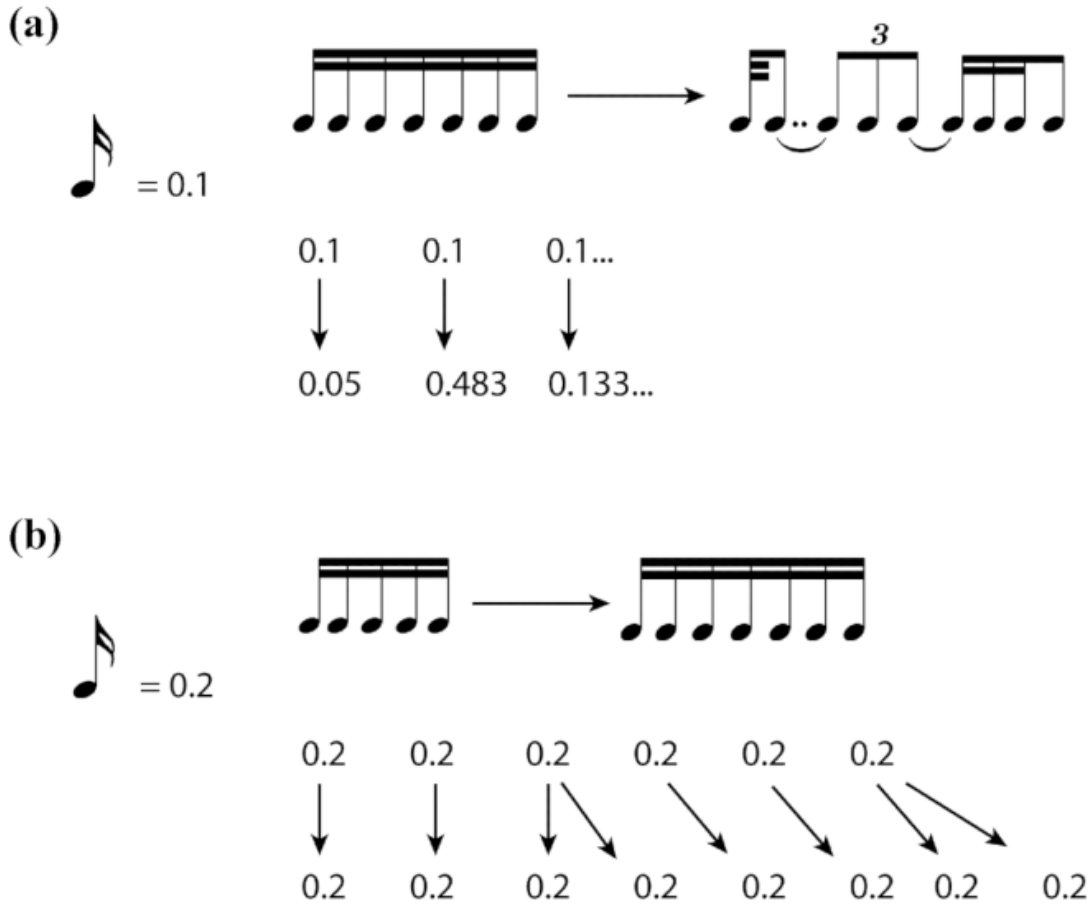
```
VOICE I

85      “A”;
5       E
.8      EA
28.45   A
.5      L
1       A2
28.45   A
.8      EA
.1      D
.8      A
.1      L
1.7     I
.1      D
2.6     A
.1      L
3.5     I
.1      M
4.4     U
.1      D
5.3     A
.1      L
6.2     I
.1      M
7.1     U
.1      L
8       O
.1      D
8.9     A
.1      L
9.8     I
.1      M
10.7    U
.1      L
11.6    O
.1      D
8       E
20      I
35      A
2.7     L
9.3     E
35      A2
20      I
.5      M
3.5     E
.5      L
3.5     A
.5      L
3.5     U
.5      M
3.5     OE
.5      M
3.5     A2
.5      M

3.5     O
.5      L
3.5     OE
.5      M
3.5     E
.5      L
 3.5    A
.5      L
3.5     U
.5      M
3.5     OE
.5      M
3.5     A2
.5      M
3.5     O
.5      L
3.5     OE
.5      L
3.5     E
5       A
22.5    O
5       A
22.5    O
5       E
26      E
6       A2
26      E
6       A2
26      E
.1      M
17.9    EA
.1      D
16.1    E
.1      L
15.2    O
.1      M
14.3    U
.1      L
13.4    I
.1      D
12.5    A
1       E
2.875   A
6       U
2.875   A
4       I
2.875   A
6       U
2.875   A
3       O
2.875   A
6       U
2.875   A

4       I
2.875   A
6       U
2.875   A
1       A2
.1      W
19.525  A
6       U
2.875   A
3       O
2.875   A
6       U
2.875   A
4       I
2.875   A
6       U
2.875   A
1       E
20      I
6.2     A2
.5      M
2       I
6.25    A2
5       EA
6.25    A2
.5      M
2       I
6.25    A2
.7      L
9.3     I
6.25    A2
.5      M
2       I
6.25    A2
5       EA
6.25    A2
.5      M
2       I
6.25    A2
20      I
20      A

END “CODE”;

VOICE II

118.    A
2.      E
5.      O
42.75   A
4.5     U
42.75   A
5.      O
1.      EA
12.875  A
2.5     E
12.875  A
.5      L
1.      A2
12.875  A
2.5     E
12.875  A
1.      EA
.5      M
2.5     E
.5      L
2.5     A
.5      M
2.5     E
.5      L
2.5     A
.5      L
2.5     U
.5      M
2.5     E
.5      L
2.5     A
.5      L
2.5     U
.5      M
2.5     OE
.5      M
2.5     E
.5      L
2.5     A
.5      L
2.5     U
.5      M
2.5     OE
.5      M
2.5     A2
.5      M
2.5     E
.5      L
2.5     A
.5      L
2.5     U
.5      M

2.5     OE
.5      M
2.5     A2
.5      M
2.5     O
1.      E
27.5    A
3.      O
27.5    A
2.      A2
27.5    A
3.      O
27.5    A
1.      E
.33333  M
3.      E
.33333  L
3.      A
.33333  L
3.      U
.33333  M
3.      OE
.33333  M
3.      A2
.33333  M
3.      O
.33333  L
3.      OE
.33333  L
3.      E
.666665 M
1.      EA
5.      E
22.5    O
5.      A
22.5    O
5.      A
.5      L
3.5     E
.5      L
3.5     OE
.5      M
3.5     O
.5      M
3.5     A2
.5      M
3.5     OE
.5      L
3.5     U
.5      L
3.5     A
.5      M

3.5     E
.5      L
3.5     OE
.5      M
3.5     A2
.5      M
3.5     O
.5      M
3.5     OE
.5      L
3.5     U
.5      L
3.5     A
.5      M
3.5     E
20.     I
15.     A2
5.      EA
15.     A2
.7      L
9.8     I
15.     A2
5.      EA
15.     A2
20.     I
.1      W
19.8    A
.1      M
10.7    U
.1      L
9.8     I
.1      D
8.9     A
.1      L
8.      O
.1      M
7.1     U
.1      L
6.2     I
.1      D
5.3     A
.1      M
4.4     U
.1      L
3.5     I
.1      D
2.6     A
.1      M
1.7     U
.1      L
.8      I
.8      EA

4.7375  O
3.5     OE
4.7375  O
2.5     E
4.7375  O
3.5     OE
4.7375  O
.5      L
1.      A2
4.7375  O
3.5     OE
4.7375  O
2.5     E
4.7375  O
3.5     OE
4.7375  O
.8      EA
5.      O
7.8375  A
1.8     OE
26.9625 A

END “CODE”;

VOICE III

59      A
1       EA
100     A2
20      I
1       E
58      A
2       A2
58      A
1       E
.1      D
12.5    A
.1      L
13.4    I
.1      M
14.3    U
.1      L
15.2    O
.1      D
16.1    E
.1      M
17.9    EA
26      E
6       A2
26      E
6       A2
26      E
.666    M
2.666   EA
.3333   L
3       E
.3333   L
3       OE
.3333 M
3       O
.3333   M
3       A2
.3333   M
3       OE
.3333   L
3       U
.3333   L
3       A
.3333   M
3       E
1       E
11.75   A
4       I
11.75   A
3       O
11.75   A
4       I
11.75   A
2       A2

59      A
11.75   A
4       I
11.75   A
3       O
11.75   A
4       I
11.75   A
1       E
.5      M
2.5     O
.5      M
2.5     A2
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      M
2.5     A2
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      L
.3333   L
3       U
.3333   L
3       A
.3333   M
3       E

1       E
11.75   A
4       I
11.75   A
3       O
11.75   A
4       I
11.75   A
2       A2
11.75   A
4       I
11.75   A
3       O
11.75   A
4       I
11.75   A
1       E
.5      M
2.5     O
.5      M
2.5     A2
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      M
2.5     A2
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      M
2.5     OE
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E
.5      L
2.5     U
.5      L
2.5     A
.5      M
2.5     E

.5      L
2.5     A
.5      M
2.5     E
.8      EA
4.7375  A
3.5     OE
4.7375  A
2.5     E
4.7375  A
3.5     OE
4.7375  A
.5      L
.25     A2
.1      W
29.8    A
.1      E
5       O
17.475  A
2.8     UE
17.475  A
4.5     U
17.475  A
2.8     UE
17.475  A
5       O
1       E
2.90909 OE
6       U
2.90909 OE
4       I
2.90909 OE
6       U
2.90909 OE
3       O
2.90909 OE
6       U
2.90909 OE
4       I
2.90909 OE
6       U
2.90909 OE
2       A2
18.7606 A

END “CODE”;
```

Example 8. Saariaho, sketch of eight phoneme sequences, Sacher Foundation, Basel

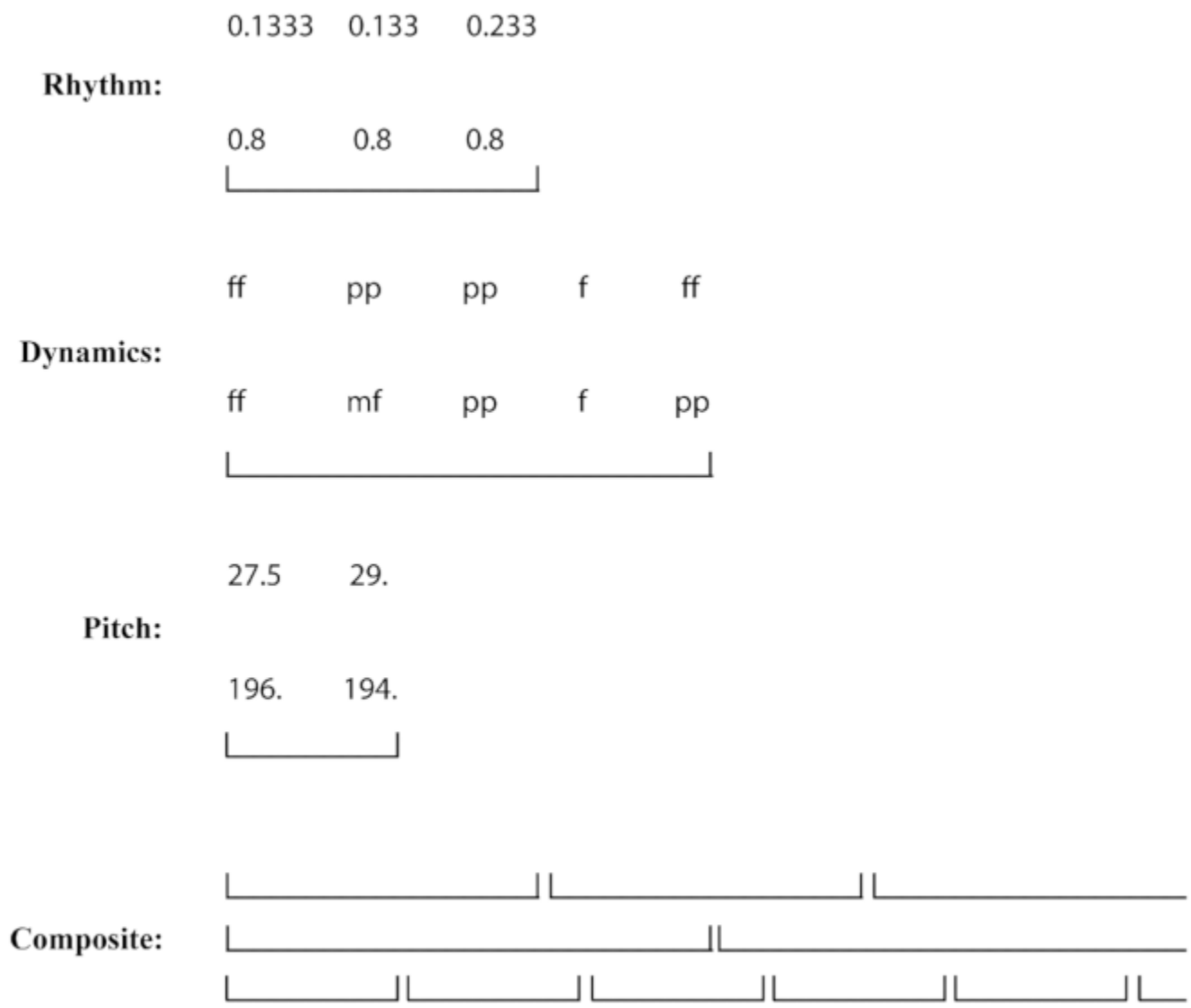
Example 9. Saariaho, diagram of overall phoneme structure, Sacher Foundation, Basel



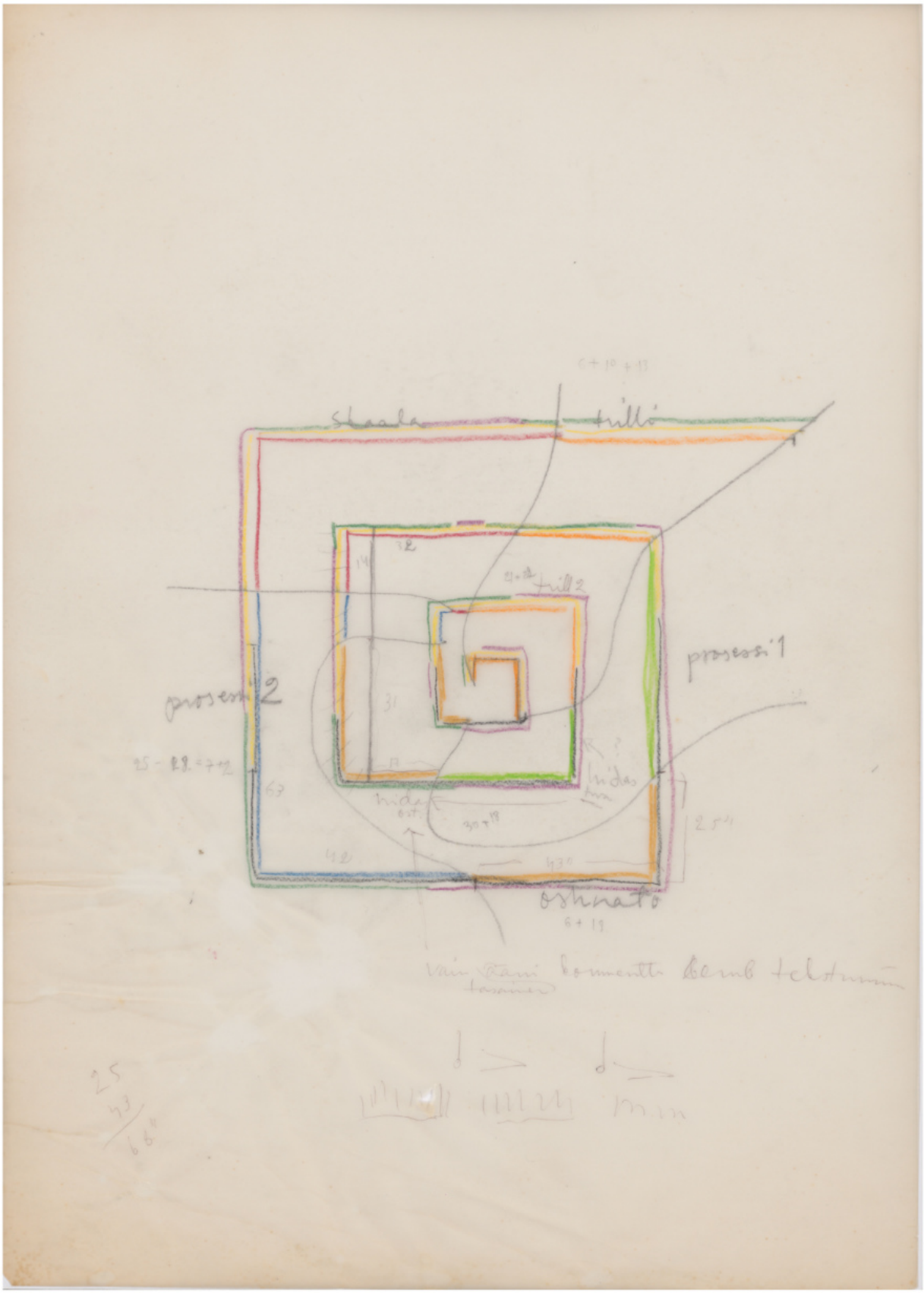
Examples 10a–b. Saariaho, rhythmic interpolations: a) even-to-uneven, and b) few-to-many (reproduced from Saariaho 1984, 164)



Example 11. Saariaho, interpolation processes in multilevel network (reproduced from Saariaho 1984, 163)

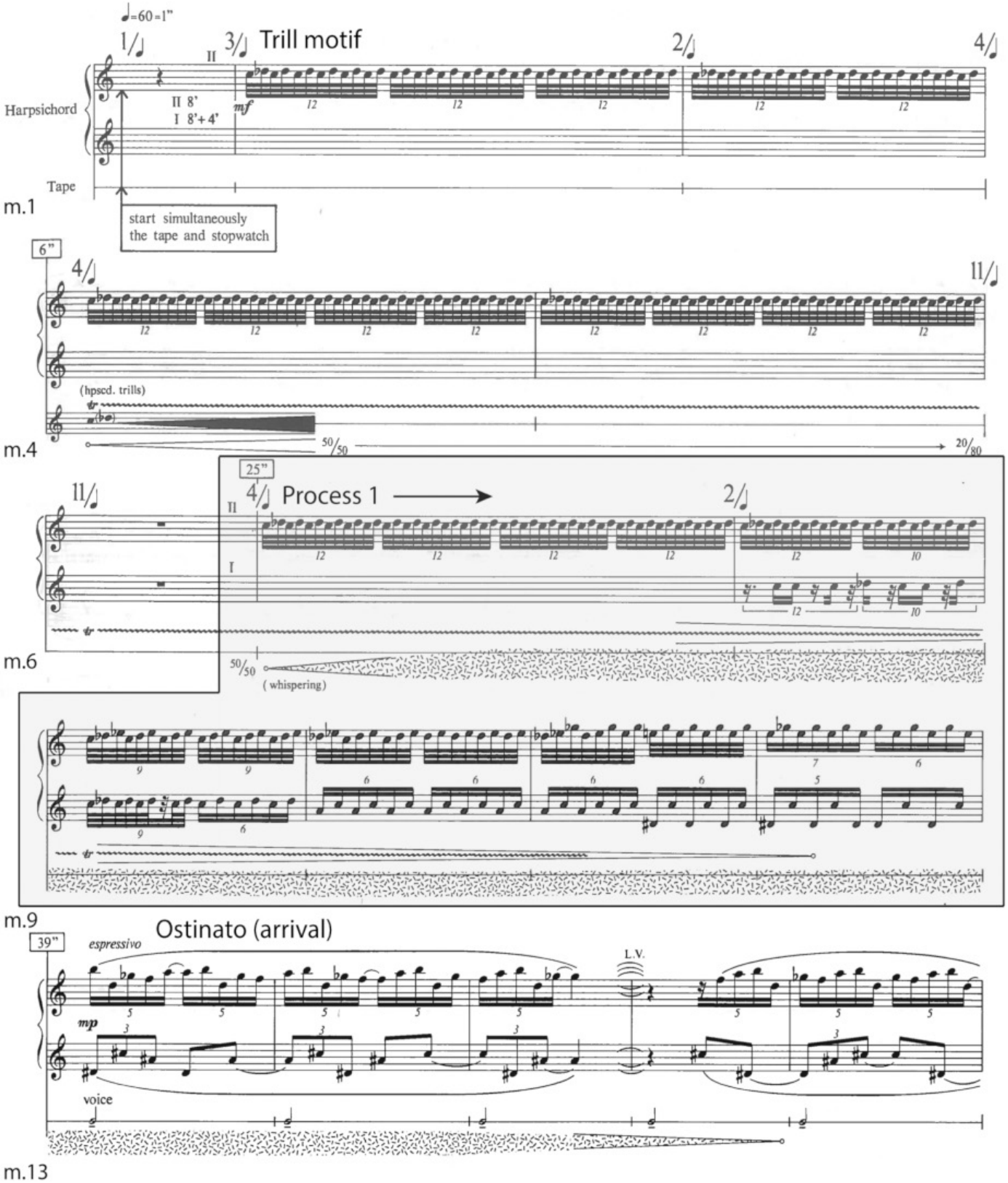


Example 12. Saariaho, sketch of spiral form for *Jardin secret II*, Sacher Foundation, Basel

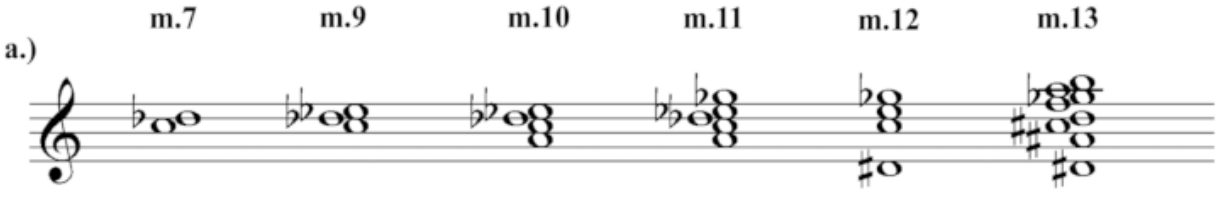


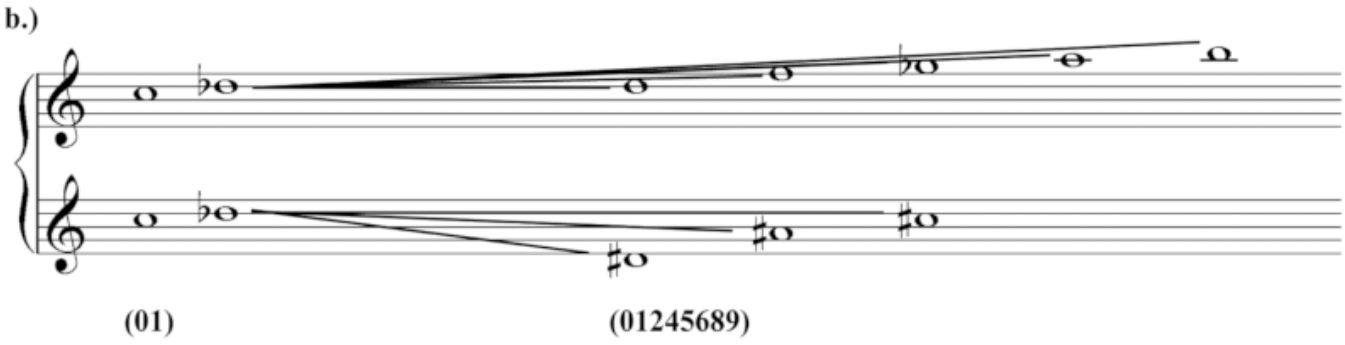
Example 13. Formal analysis of *Jardin secret II*

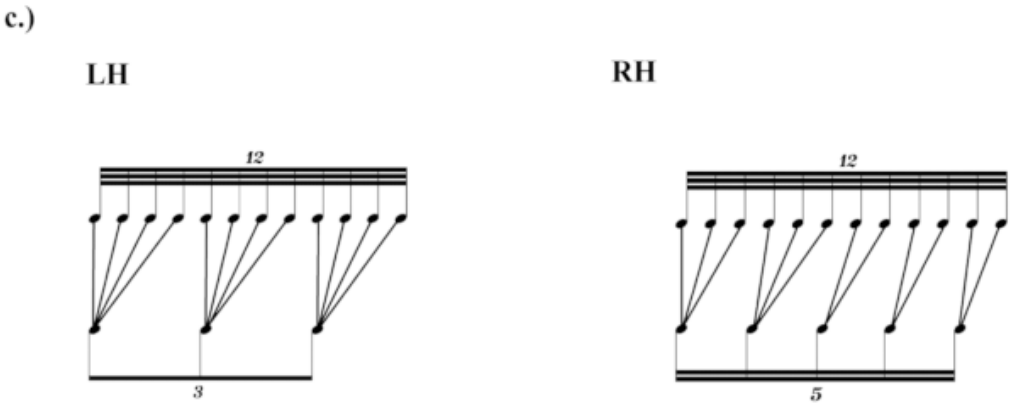
Example 14. Saariaho, *Jardin secret II*, annotated score, mm. 1–17, Section A



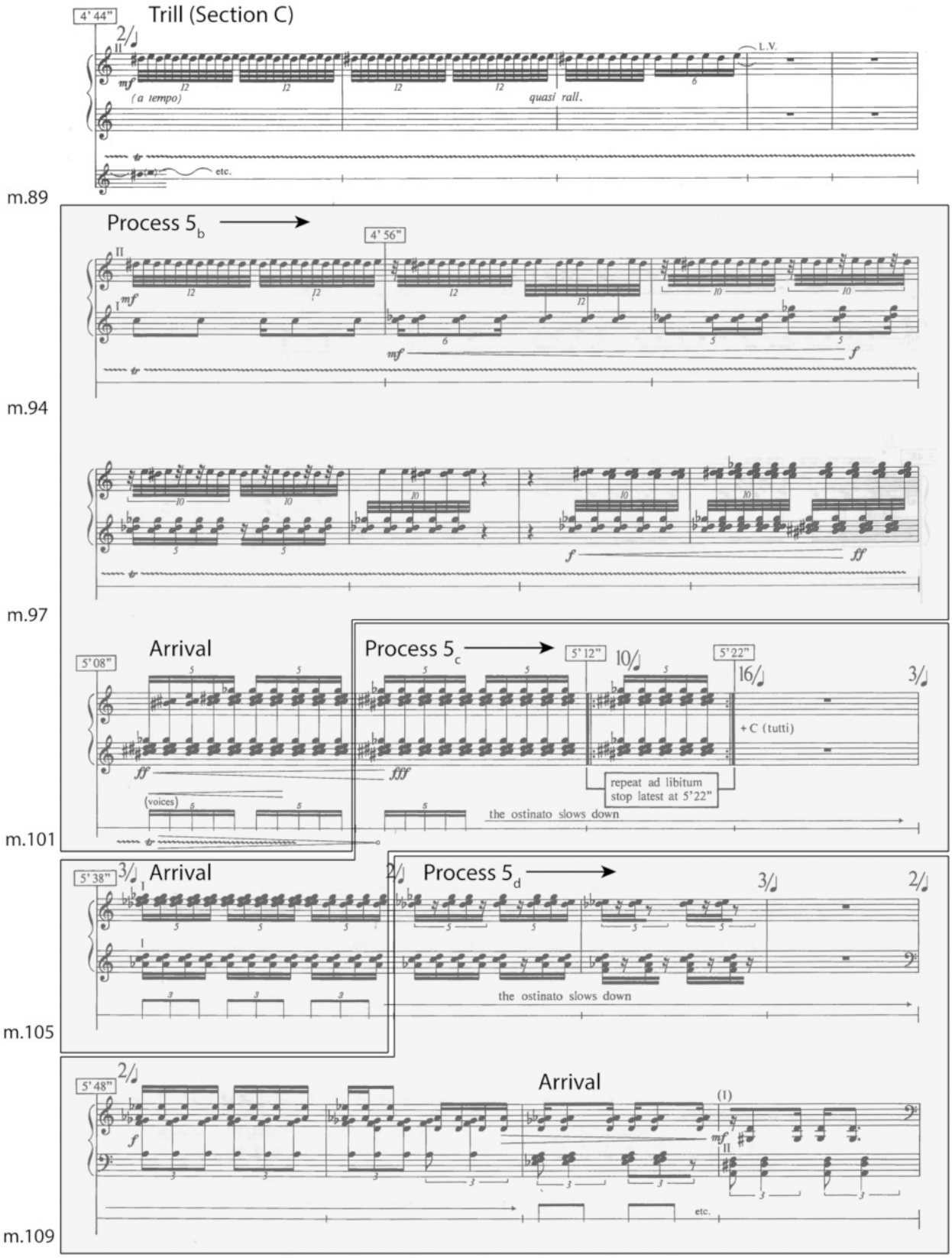
Examples 15a–c. a) harmonic interpolation;
b) Pitches in left hand vs. right hand;
c) rhythmic interpolation.





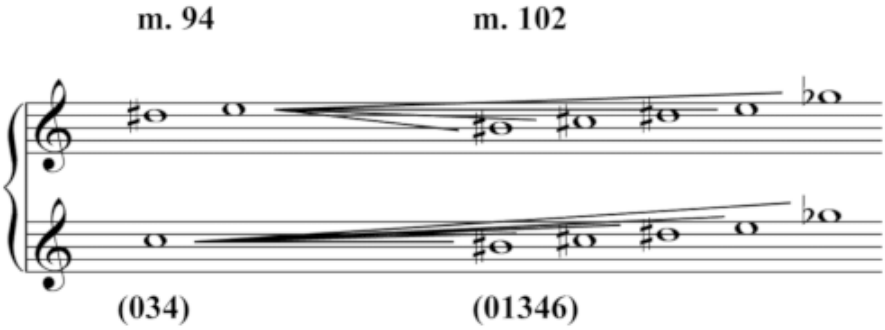


Example 16. Saariaho, *Jardin secret II*, annotated score, mm. 89–112, Section A''

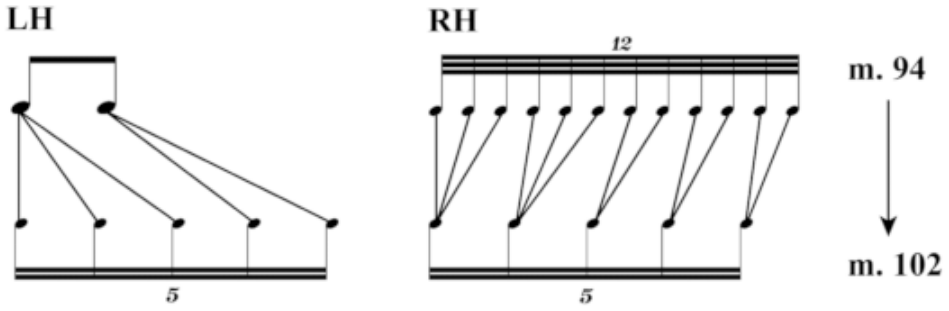


Examples 17a–c. a) harmonic interpolation in Process 5b;
b) rhythmic convergence in Process 5b;
c) polyrhythmic striation in Processes 5c and 5d

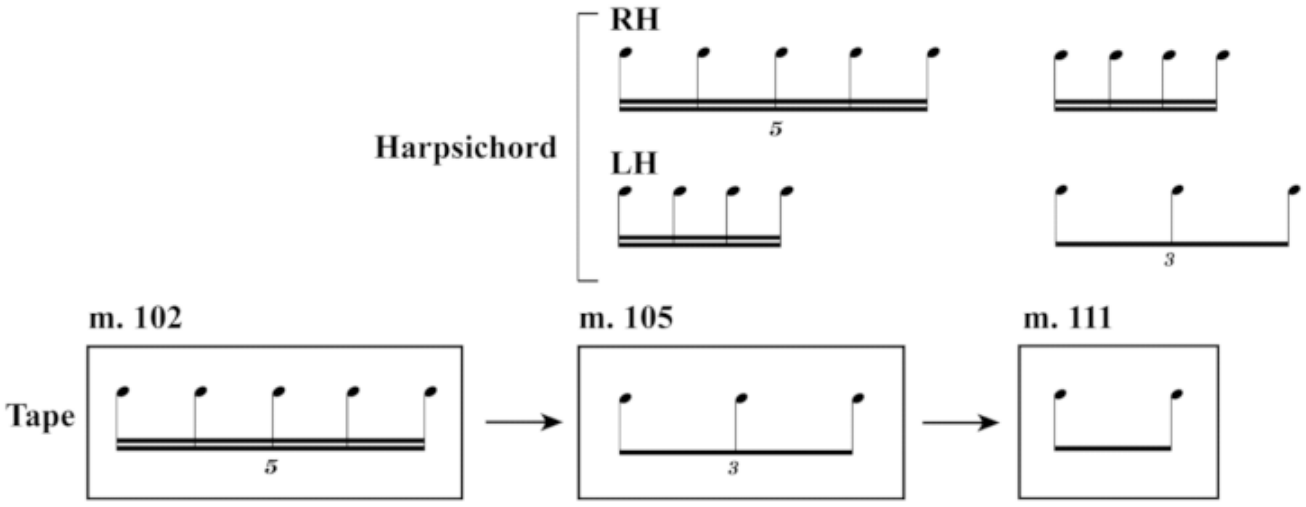
a.



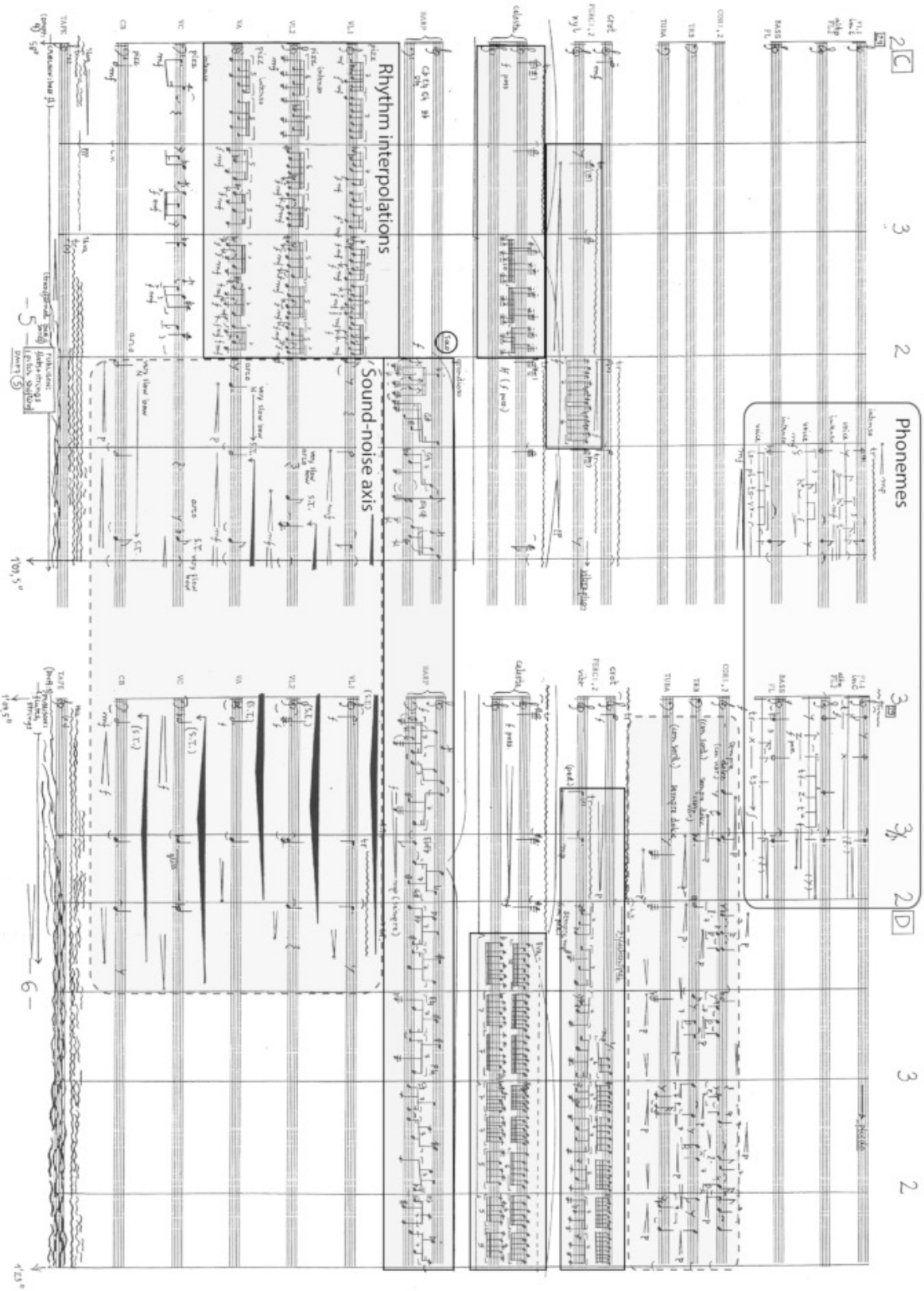
b.

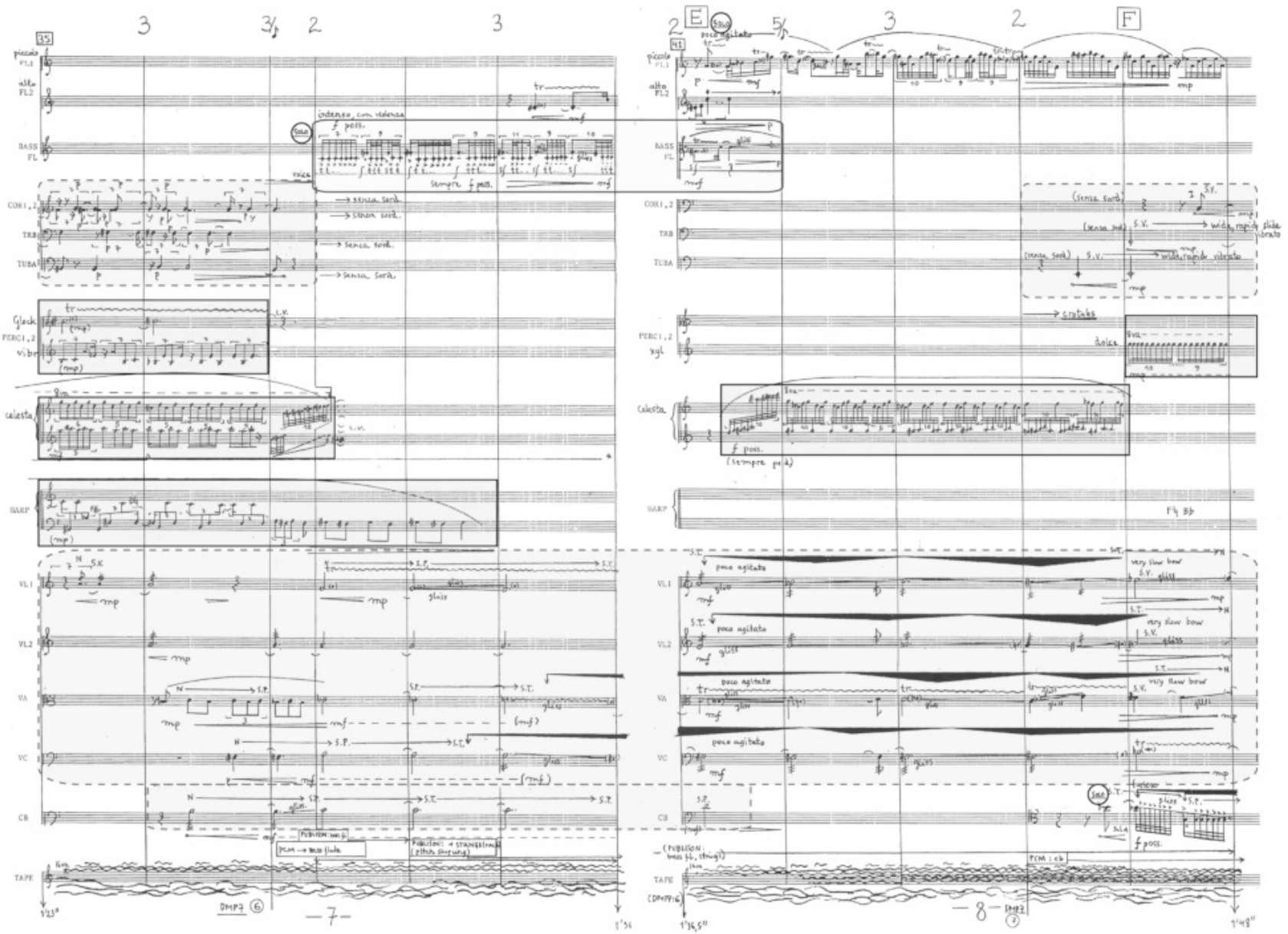


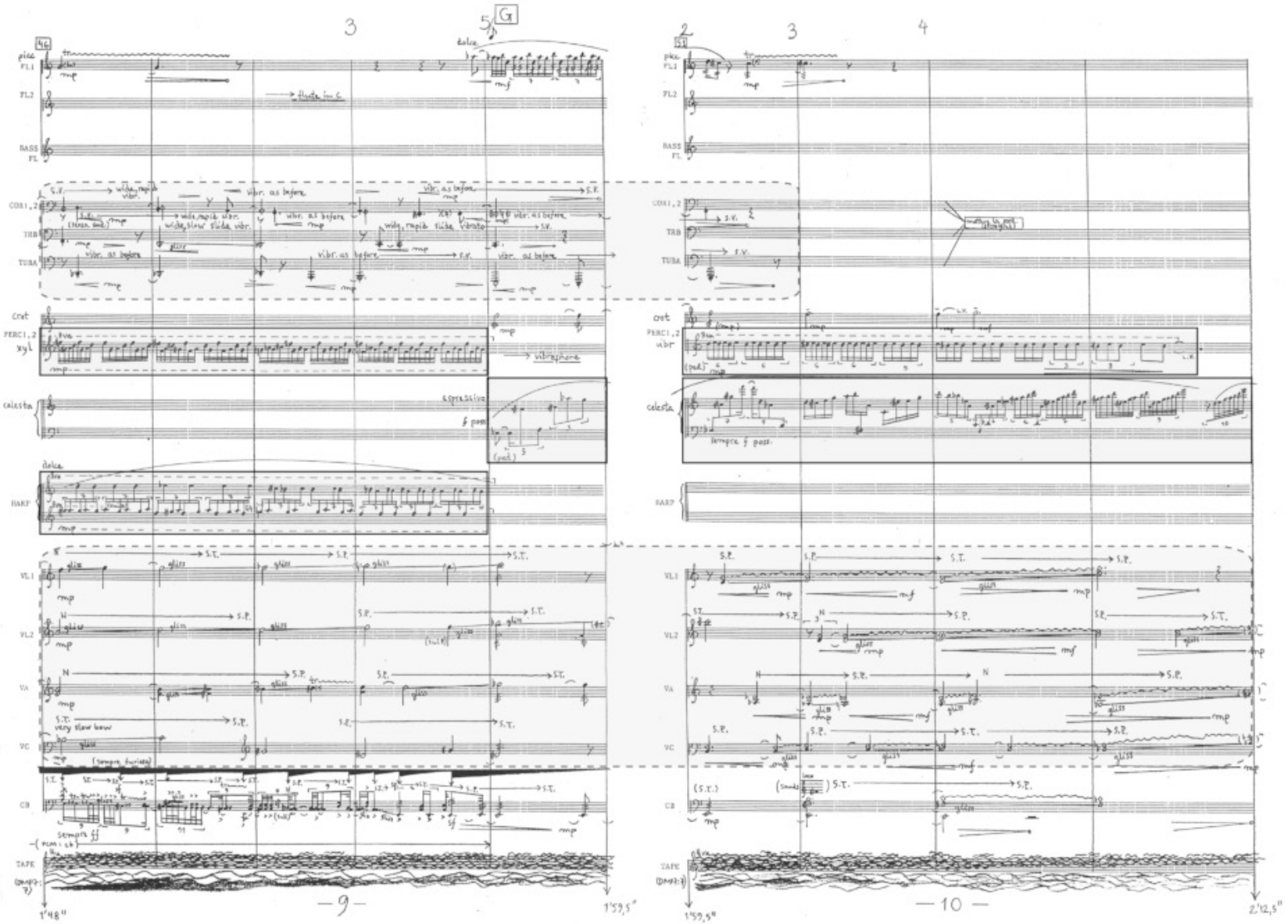
c.



Example 18. Saariaho, *IO*, annotated score, mm. 24–54 (3 pages)




35
piccolo Fl.1
alto Fl.2
BASS FL
COR I, 2
TRB
TUBA
Glock
PERC I, 2
vib
celesta
HARP
VL I
VL II
VA
VC
CB
TAPE
solo
sempre f poss.
Senza Sord.
DMP3 ⑥
— 7 —
1'56
41
E
F
poco agitato
very slow bow
(senza sord.)
wide, rapid glide vibrato
crotales
voice
f poss.
(sempre ped.)
F♮ B♭
(PUBLISHING: bass fl., strings)
PCM : cb
DMP3 ⑦
— 8 —
1'16,5"
1'48"


3
5
G
2
3
4
46
51
dolce
mp
mf
flauto inv. c
S.P.
S.T.
vibr. as before
wide, rapid vibr.
wide, slow/ slide vibr.
wide, rapid/ slide vibrato
F.V.
(tenor sub.)
glissi
vibraphone
espressivo
(pedal)
tempore
(tutti)
(soli)
(sempre furioso)
sempre ff
(con sord.)
(ord.)
TAPE
(DMP3)
1'48"
1'59,5"
2'12,5"
— 9 —
— 10 —

Example 19. Reduction of rhythmic interpolation processes in *IO,* mm. 24–54