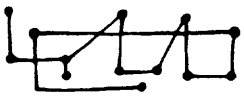
Originally published in Perspectives on New Music - Spring/Summer 1885
Translated by Jerome Kohl

ELECTRONIC MUSIC FOR *KATHINKA'S CHANT AS LUCIFER'S REQUIEM*



KARLHEINZ STOCKHAUSEN

SINCE THE BEGINNING of my composition of electronic music I have always been seeking for the technical means to produce phase-synchronized spectra with controlled phase-shifting of the individual partials. One learns ordinarily in the study of acoustics that the phase-alignment of the partials plays no audible role. However, that is true only to a very limited degree. Some results of phase-rotation which I achieved in an adventurously experimental manner in the Cologne studio were very encouraging toward making further investigation in this direction (for example, while simultaneously recording a spectrum on two parallel tape recorders, slowly pressing a finger down on the tape between the record and playback heads, and recording both outputs on a third tape recorder). By this means one can achieve wonderful spectral-"rotations," in which all of the partials undergo phase-shifting among themselves.

The compositional availability of such phase-shifting in the Cologne Studio

for Electronic Music of WDR (Western German Broadcasting) in any case remained a permanent pipedream, like most of what I wanted to compose from 1952 (*Etude, musique concrète*, O.R.T.F., Paris) to 1976 (completion of the realization of *Sirius* at WDR), and could not realize because of technical limitations.

Since the opening of the studio for electronic music at IRCAM I have regularly been invited there for demonstrations of the equipment. From among the sound-examples of the demonstration tape made by Giuseppe Digiugno (the designer of the *synthétiseur 4X*), I was fascinated by an example of the slow phase-rotation of an overtone spectrum of "over 700 phase-synchronized generators," as he proudly explained.

At the first opportunity to find out whether I could realize a large project in the IRCAM studio, I concentrated on processes of phase-rotation with the use of the *synthétiseur 4X*.

The 4X has six "plaques" ("boards"—memory storage), and each "plaque" can be programmed for a maximum of 64 oscillators, when these are used with a sampling rate of 32,000 Hz (at which rate frequencies above 16,000 Hz are no longer available).

There are therefore 6 × 64 = 384 programmable oscillators. Each "plaque" is divisible into 32 + 32 oscillators. If one wants to produce a *continuous succession* of spectra, then these "plaques" must be divided into two halves (with 3 × 2 outputs each, therefore six potentiometers), so that during the running of the program of one half, one can "load" the other half.

Depending on the complexity of the program, the "loading" sometimes takes rather a long time (in my program sometimes as much as six seconds). By doing this, the number of the simultaneously employable oscillators is automatically reduced by half—that is to say, by 192 (3 × 64 or 6 × 32). The twelve outputs of the six "plaques" (each is divided in two) can be separately regulated during the work by means of 2 × 6 volume-controls on a mixing-table, and—if necessary—filtered.

These were the technical conditions known to me when, in May of 1983, I wrote the version of

Kathinka's Chant

as

Lucifer's Requiem

for

Flute and Electronic Music.

The work had appeared at the beginning of 1983 in a first version for flute and six percussionists—as the second scene of the opera *Samstag aus Licht* (Saturday

from Light). This form was premiered in a quasi-concert version in October 1983 at the Donaueschinger Musiktage by Kathinka Pasveer (flute) and the Kolberg Percussion Ensemble. On the 25th of May 1984 the stage premiere followed, under the auspices of the Teatro alla Scala at the Palazzo dello Sport, Milan, with Kathinka Pasveer and the Slagwerkgroep Den Haag (Stage Director: Luca Ronconi; Stage Design and Costumes: Gae Aulenti; Sound Director: K. Stockhausen).

Composition and Realization

In May of 1983 I first wrote for the electronic music to *Kathinka's Chant* a *form scheme* with explanations of the symbols. It contains the information for the theoretical programming. This I discussed with Marc Battier, a musical/technical colleague from IRCAM (Paris), with whom I wanted to collaborate.

In December 1983 and August 1984 I realized the electronic music in 2 × 7 days at IRCAM. Battier, using a PDP-11 computer, programmed the 4X according to my score.

During the time spent in the studio there came about *working notes* containing the data for the particulars (chosen by ear) of the timbres and relative dynamics. Finally they were summarized in a four-page *synchronization scheme* with 2 × 6 tracks for copying from the 4X onto a 16-track tape. A *supplemented form scheme* with meter-level numbers is the result of the mix-down (August 21, 1984) in the auditorium "Espace de Projection" from the 16-track tape recorder to an eight-track tape recorder for the production of a performance master-copy. In this scheme I added the numbering (above each [K]) of the K 1 to K 6 sounds.

The realization was concluded on the 22nd of August, 1984.

The automatically generated *tables for the sounds K1–K6* (*Tables d'ondes pour les K1–K6*) are dated the 20th of July 1983; all of the *tables for the sounds notated in ellipses in the form scheme* are dated the 14th of December 1983; the last version of the *explanation of terms in the score* (*Explication du nom des partitions*) and the *score* of the whole composition (*Partition*) are dated the 20th of August, 1984.

From the 9th to the 14th of May 1985 the world premiere and five further performances took place at IRCAM, with Kathinka Pasveer (flute) and a six-track projection of the electronic music.

The work lasts about 33 minutes.

The most essential aspect is the six-layered space-polyphony of controlled phase-rotations of harmonic spectra. A new orientation of musical logic in the realm of the *harmonic* stands out, which was not realizable with the technical means available up until now. Simultaneous phase-rotations of phase-

synchronous partial-groups of rich overtone-spectra (with completely determined fundamental tones and durations of each rotation, above all with very long durations and with certain intensity-relations of the partial-groups amongst themselves) can be of a beauty such as has never before been experienced. The changes of slow phase-rotations have such an intense temporal logic, that one can accurately follow quarter, third, and, above all, half-phases; and the coincidence of the maxima of all of the overtones (where a sharp explosion occurs at the point of phase synchronization) is perceived each time as a liberating new beginning.

I would like therefore to summarily describe the composition and the work of its realization.

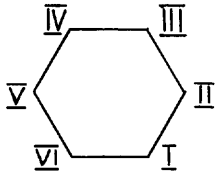
Comments on the significance of the *requiem*-character, of the *24 stages*, etc., of *Kathinka's Chant* are in the general forward to the score and will not be repeated here. I will describe only the technical aspect.

Description of the Form Scheme (Example 1)

1) *24 Grundton-Segmente* (Fundamental-tone segments) of the *Lucifer formula* are distributed over the *24 stages* (1)–(24) (see *Grundtöne* and under them their *durations* [Dauern]).

   Normal notes ● signify periodic vibrations, slashed-through notes ◢ noise-bands.

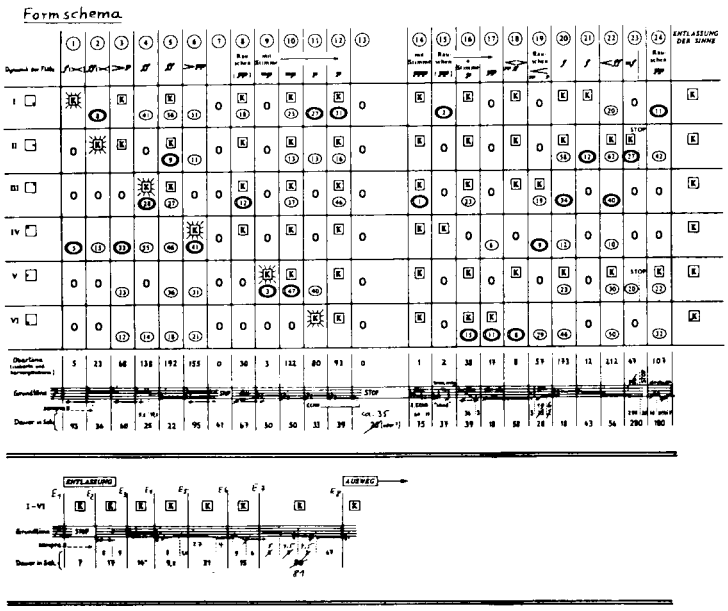
2) In *six layers*, overtone-groups are reproduced over six loudspeakers (see the comments beneath the *form scheme*).



3a) Where [K] appears, a **complete overtone-spectrum** of the first to the 212th overtone was placed, with levels of the overtones inversely proportional to the frequency-intervals (fundamental-tone level 1000.000000 = maximum; second overtone level 500.000000; third overtone-level 333.333344, etc.), graphically depicted in my working notes (Example 2) as 212 ⌜◥.

b) Moreover, at each [K] there is an **electronically imitated instrumental sound** mixed in, phase-synchronous to the complete 212-overtone-spectrum. By this means six different sounds are employed, which I designate K1–K6.

They had already been recorded for other programs, so then they were



I–VI = reproduction-channels I–VI (6-track tape): I ▭ back right, II ▭ middle right, III ▭ front right, etc.

= focus spotlight aimed at the loudspeaker.

[K] = sound with all overtones: 212 (or more) generators on 1–212 above the notated fundamental.

= number of the lowermost overtones, beginning with 1 = the fundamental (e.g. (8) = overtones 1–8);

= the further overtones in descending vertical order below (e.g. in column (3) channel II has overtones 1–9, channel III has 10–36, channel IV has 37–82, channel V has 83–118, channel VI has 119–136, and channel I has 137–192).

= these overtones should be heard, the others are suppressed (by ear).

[K] = sound with all of the overtones, where emphasis on the overtones in should be heard.

= phase-rotation of each overtone in the indicated time, with initial and final *explosion*.

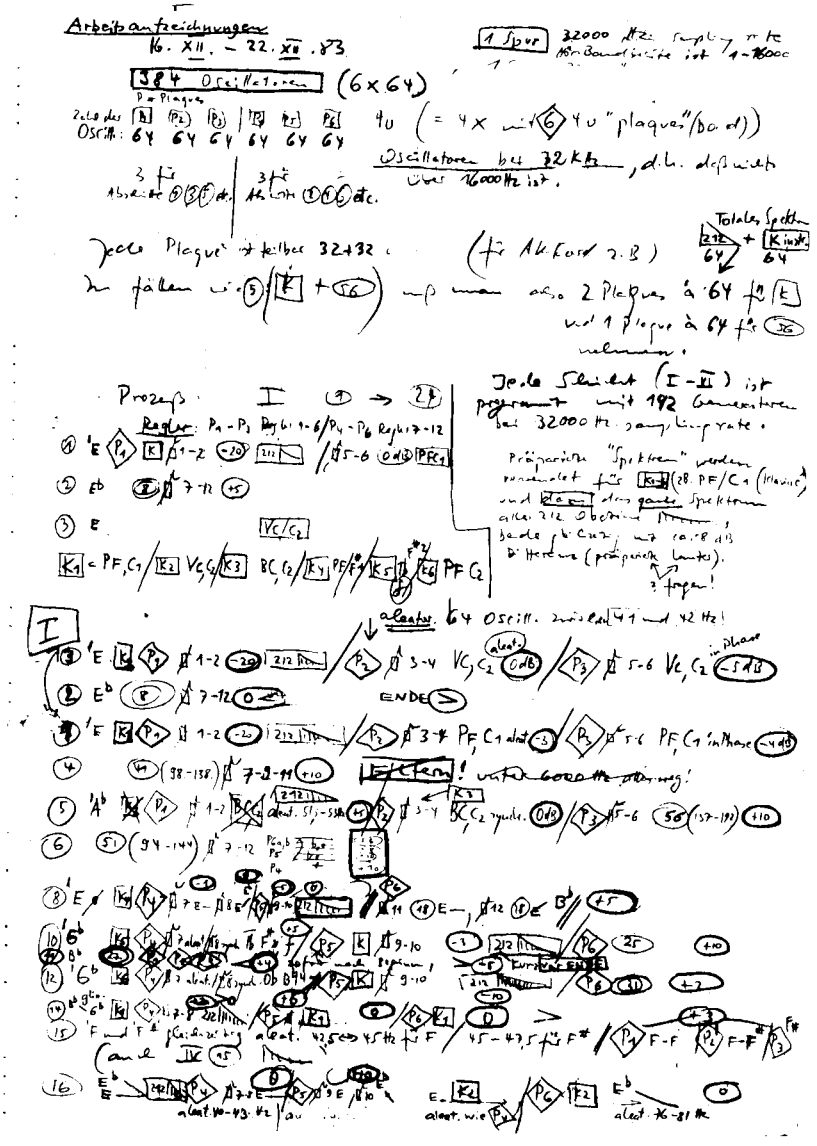
= *explosion* shaded by ear.

= *metàmp-noise*: 3 × 64 frequencies (in (7) and (16) and (17) 3 × 32 frequencies each for constant pitches and for glissando) distributed aleatorically in a narrow frequency interval (each individually is constant!). The bandwidth is determined in each individual case by ear (see the score).

Tuning = 442 Hz

In (13), in the first section of the ENTLASSUNG and from the AUSWEG on, *witch laughter* (with a high female voice in a six-track recording and six-track or two-track playback over six loudspeakers with free regulation of the six loudspeakers).

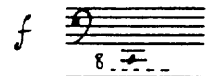
EXAMPLE 1: FORM SCHEME

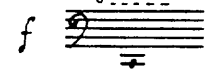


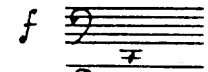
EXAMPLE 2: WORKING NOTES

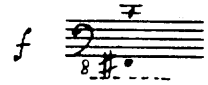
analysed and stored in memory, and there was nothing further to the selection.

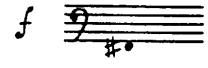
Names of the instruments, recorded intensities and pitches are given in parentheses following the abbreviations:

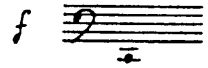
K1 = PF, C1 (*Pianoforte* )

K2 = VC, C2 (*Violoncello* )

K3 = BC, C2 (*Bass Clarinet* )

K4 = PF, F#1 (*Pianoforte* )

K5 = Tuba, F#2 (*Tuba* )

K6 = PF, C2 (*Pianoforte* )

These sounds were then generated on the fundamental tones which are given in the *form scheme*. I add as an example two pages of the *frequency table* for K1 (*pfc 1. tab*) (Example 3): in the left column run the numbers of the overtones (analysed on C1 = 32.7025 Hz[1]); in the middle column is the level, which is referenced to a maximum of 1000.00000; in the third column the phase-shift is given, with reference to the third overtone = 0.00000.

The **succession** of the sounds K1–K6 is entered in manuscript above each [K] in the *supplemented form scheme* (Example 4), thus in track (1) K1, (3) K2, (5) K3, (8) K4, (10) K5, (12) K6, (14) K1, etc.

The **intensity-proportion** in each [K] between the overall level of the 212-spectrum and the overall level of the respective K1–K6 was determined by ear during the studio work. The 212-spectra are mostly very much softer. In several places I decided to overlay a K-sound on itself, both in-phase and also aleatorically.

"Aleatorically" here means that the fundamental-tone frequency is defined as the **middle frequency** of a narrow frequency-band of 64 oscillators with aleatorically distributed frequency-intervals, and the bandwidth is determined by ear. So, for example, in Stage (1), track I, the sound K1 is produced both *in phase* with the fundamental tone E1 = 41.20375 Hz, and also *aleatorically*, i.e. with 64 aleatorically distributed frequencies between 41 and 42 Hz.

4) The instruction that in the case of a number enclosed in an ellipse a sound should be produced with *all* overtones over the notated fundamental-tone,

Table d'ondes pour les $k_1 - k_6$

pfc1.tab

2.00000	1000.00000	0.00000
3.00000	263.17566	29.69600
4.00000	501.41113	−209.46489
5.00000	544.94141	−66.21867
6.00000	543.65298	1001.01689
7.00000	964.90581	1194.09778
8.00000	4.35610	1846.61334
9.00000	234.12479	−807.82223
10.00000	410.79207	−470.69867
11.00000	869.80797	−1626.79469
12.00000	702.61979	2315.83289
13.00000	703.47874	284.67200
14.00000	30.79944	−165.66045
15.00000	275.38499	2288.29868
16.00000	9.54046	−1101.14134
17.00000	239.18645	292.06755
18.00000	194.91993	1295.01868
19.00000	394.68679	1420.40179
20.00000	260.47610	423.13956
21.00000	690.77857	2259.74045
22.00000	187.61887	−716.11733
23.00000	314.12970	616.33423
24.00000	16.41205	−410.73779
25.00000	48.37720	1245.29778
26.00000	53.83766	−135.39555
27.00000	345.38929	1944.57602
28.00000	340.02086	877.11289
29.00000	483.64930	1313.90579
30.00000	285.53899	−48.12800
31.00000	52.42653	532.48000
32.00000	6.99429	−159.51644
33.00000	56.19977	1302.41423
34.00000	81.93754	−494.93334
35.00000	168.01644	−698.48177
36.00000	112.06209	2252.34488
37.00000	196.26971	2172.24536
38.00000	100.19020	1813.61780
39.00000	43.46892	1866.63823
40.00000	13.19099	515.64089
41.00000	31.90380	−167.36711
42.00000	119.51653	−747.40623
43.00000	120.80496	1138.91556
44.00000	26.59672	−1658.53868
45.00000	50.18713	1584.46935
46.00000	19.84784	−24.23466
47.00000	29.75643	−1524.73601
48.00000	6.62617	742.28622
49.00000	10.76753	1415.85068
50.00000	24.48003	−1382.17207
51.00000	75.46475	1893.37602
52.00000	31.32094	1106.37512
53.00000	35.86110	1405.04179
54.00000	35.03282	−610.75911
55.00000	10.09264	1203.20000
56.00000	3.95730	−869.83111
57.00000	15.12363	−1427.34224
58.00000	3.37444	2288.75378
59.00000	12.02528	−250.65244
60.00000	17.91521	−612.92089
61.00000	6.19670	−10.24000
62.00000	3.09835	−686.53512
63.00000	7.11700	708.38045
64.00000	21.38168	1307.87556
65.00000	18.34468	−947.42756

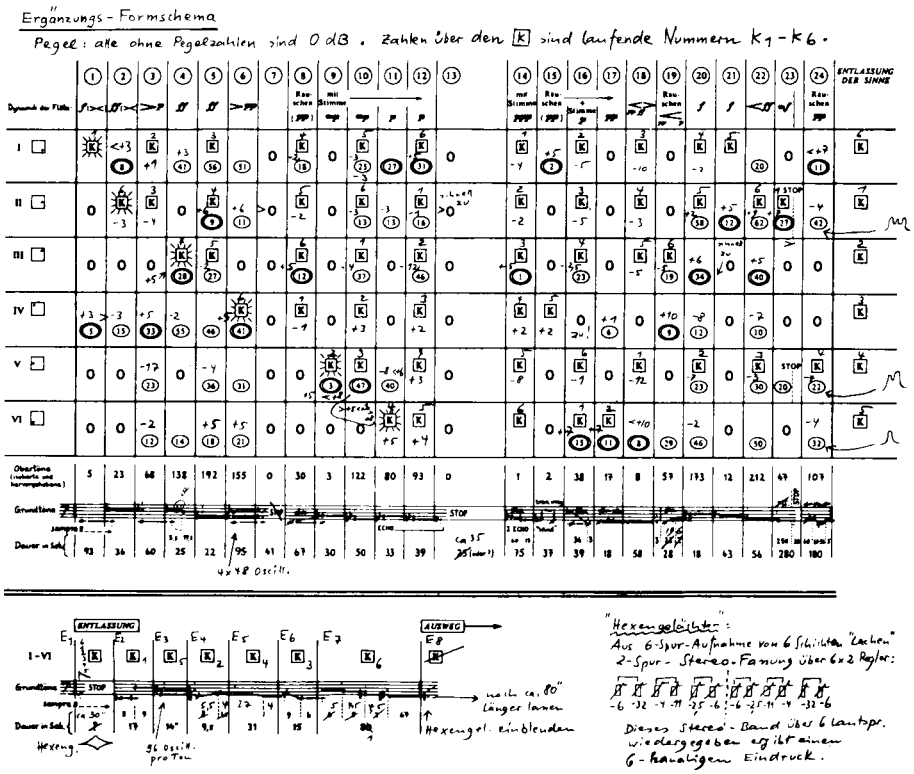
Jul 20 18:10 1983 Page 1 of pfc1.tab

pfc1.tab

66.00000	5.85926	−1166.67735
67.00000	2.17805	1109.90222
68.00000	14.81686	926.60622
69.00000	6.01264	102.17244
70.00000	0.73624	−713.95556
71.00000	19.05025	1008.18489
72.00000	16.07461	−1750.58490
73.00000	14.66348	−1307.76180
74.00000	0.21474	−1225.72803
75.00000	8.58948	1050.05512
76.00000	5.30707	1936.27022
77.00000	1.01233	2247.45245
78.00000	4.38677	360.67556
80.00000	0.55218	−350.32178
81.00000	3.52782	1913.28713
82.00000	1.28842	756.62223
83.00000	1.80993	−787.34223
84.00000	3.74256	136.64711
85.00000	4.90828	240.52622
86.00000	0.92030	1197.51111
87.00000	1.96331	−318.00889
88.00000	0.95098	71.90755
89.00000	1.38045	−1046.98312
90.00000	0.30677	909.53956
91.00000	1.87128	561.83467
92.00000	0.64421	567.75111
93.00000	0.73624	1592.54756
94.00000	0.95098	−1193.98401
95.00000	2.02466	−689.26579
96.00000	2.05534	856.97422
98.00000	9.84723	859.13600
99.00000	0.27609	1110.47112
100.00000	0.27609	−119.23911
101.00000	1.13504	1031.85068
102.00000	0.73624	69.17689
104.00000	0.92030	−1326.64890
106.00000	0.36812	−789.04888
108.00000	0.39880	−970.75201
110.00000	0.21474	−346.90845
112.00000	0.52150	1970.40356
114.00000	0.98166	−205.02755
115.00000	0.24541	23.32444
116.00000	1.84060	614.51378
117.00000	0.92030	1650.91557
118.00000	0.70556	1655.80801

Jul 20 18:10 1983 Page 2 of pfc1.tab

EXAMPLE 3: TABLES FOR THE SOUNDS K1–K6 (EXCERPT)



EXAMPLE 4: SUPPLEMENTED FORM SCHEME

and from this spectrum the specified overtones should be stressed and all the others suppressed (by ear), was altered in this way:

The numbered overtones in ellipses were phase-synchronously overlaid **with individual oscillators**, and therefore not "filtered out." See the *Tables d'ondes, Page 1* (Example 5): in Stage (1), track IV, five oscillators yield the low E (41.2 Hz) fundamental-tone with the maximum level of 1000.000000; the second overtone with a level of 500.000000; the third overtone with a level of 333.333344, etc. In Stage (2), track I, there are eight oscillators, the first to eighth overtone with the given levels, in track IV a further fifteen oscillators the 9th to 23rd overtone with the given levels, etc.

5) In each of the Stages (1)– (24) and E2–E8 one phase-rotation of each overtone-frequency occurs, during the duration given in seconds, between an "explosion" at the beginning (zero-crossing = synchronicity of all the phases) up to the beginning of the next stage.

```
Dec 14 19:58 1983  k.bat Page 1
Tables d'ondes
$JOB/RT11
.R WRFUN
*1.
*0.
*   1.00       1000.000000
*   2.00        500.000000
*   3.00        333.333344
*   4.00        250.000000
*   5.00        200.000000
*
*1.
*K
.COP K.FUN DM1:S1V4W
.DEL K.FUN/NOQ
 R WRFUN
*1.
*0.
*   1.00       1000.000000
*   2.00        500.000000
*   3.00        333.333344
*   4.00        250.000000
*   5.00        200.000000
*   6.00        166.666672
*   7.00        142.857147
*   8.00        125.000000
*
*1.
*K
.COP K.FUN DM1:S2V1W
.DEL K.FUN/NOQ
.R WRFUN
*1
*0.
*   9.00        111.111115
*  10.00        100.000000
*  11.00         90.909096
*  12.00         83.333336
*  13.00         76.923080
*  14.00         71.428574
*  15.00         66.666672
*  16.00         62.500000
*  17.00         58.823528
*  18.00         55.555557
*  19.00         52.631580
*  20.00         50.000000
*  21.00         47.619049
*  22.00         45.454548
*  23.00         43.478260
*
*1.
*K
.COP K.FUN DM1:S2V4W
.DEL K.FUN/NOQ
.R WRFUN
*1.
```

EXAMPLE 5: TABLES FOR ALL SOUNDS IN ELLIPSES (EXCERPT)

So for example in Stage (1), track I, for K1 the oscillators 1–64 are "loaded" with a low E (41.2 Hz), all with regulated phase. Each oscillator has a frequency difference of 0.0107527 Hz, which causes a cyclical phase-shift over 93 seconds (1/93 frequency-difference).

6) **Noises** (notated) were produced in a similar way, with 3 × 64 aleatorically distributed frequencies in a narrow frequency band (band-width determined by ear).

7) **"Witch laughter"** is used in several places for coloration of silence. A thirteen-minute long monaural microphone-recording of *witch laughter*, made on the 18th of August 1984 in the IRCAM studio with Kathinka Pasveer as a laughing witch and Alain Jacquinot as sound-technician, was synchronized with itself in a five-fold time-delay on six tracks and mixed down to a two-channel stereo version on the 21st of August in the Espace de Projection.

Explanation of Terms in the Score

(See *Page 1, 2, 3 of KA 1.BAT* [Example 6])

EXPLANATION OF THE CODE FOR THE NAMES

The first letter is a K, the second an A, B or C according to the following division:

A : Stages (1) to (6) ;

B : Stages (8) to (12) ;

C : Stages (14) to (24) (plus KE of the RELEASING OF THE SENSES).

Then follows a number, which designates the number of the track (from 1 to 6, which is given in the *form scheme* [Example 1] with roman numerals). From this it follows: KA 1 designates Stages (1) to (6) , track I.

EXPLANATION OF THE CODE FOR THE CONTROL OF THE 4X

The sign **$!** indicates the beginning of a line of commentary.

The addition **$MESSAGE/WAIT** indicates a point of synchronization.

The symbol **WT** indicates the concept *Wave Table*, and that is the Frequency Table (*table d'onde*) of the selected spectrum or spectra for a sequence.

Partition

KA1.BAT KA1.BAT

Karlheinz Stockhausen

KATHINKAs GESANG als LUZIFERs REQUIEM

Voix 1

```
$JOB/RT11
.R RAZ4A
.R WTFAST
*0
*DM1:KS212
*64
*1
*DM1:PFC1
*64
*2
*DM1:PFC1
*64
*3
*DM1:S2V1
*64
*4
*DM1:S2V1
*64
*5
*DM1:S2V1
*64

$! Load frequencies of S1
.R BAM32
*1
*0
*4.
*1.        64.       41.2      .0107527

*1.
*1
*4.
*1.        64.       41.2      .0107527

*1.
*2
*4.
*1.        64.       41.2      .0107527

$! Start S1
$MESSAGE/WAIT
*7.
*0         2

$! Load frequencies of S2
*1
*3
*4
*1.        64.       77.8      .0277
*1.
*4
*4.
*33.       64.       77.8      .0277
*1.
*5
*4.
*1.        64.       77.8      .0277
```


EXAMPLE 6: SCORE OF THE ELECTRONIC MUSIC (BEGINNING)

KA1.BAT KA1.BAT

```
$! Start S2
$MESSAGE/WAIT
*11
*3          5          0          2

$! Load WT of S3
.R WTFAST
*1
*DM1:VCC2
*64
*2
*DM1:VCC2
*64

$! Load frequencies of S3
.R BAM32
*1.
*0
*4.
*1.         64.        41.2       .0167
*1.
*1
*4.
*1.         64.        41.2       .0167
*1.
*2
*4.
*1.         64.        41.2       .0167

$! Start S2
$MESSAGE/WAIT
*11
*0          2          3          5

$! Load WT of S4
.R WTFAST
*3
*DM1:S4V1
*64
*4
*DM1:S4V1
*64
*5
*DM1:S4V1
*64

$! Load frequencies of S4
.R BAM32
*1
*3
*4.
*1.         64.        77.8       .04
*1
*4
*4.
*33.        64.        77.8       .04
*1
*5
*4.
*1.         64.        77.8       .04

$! Start S4
$MESSAGE/WAIT
*11
```


EXAMPLE 6 CONT.

```
*3          5          0          2

$! Load frequencies of S3, 2nd half
$MESSAGE/WAIT
*1
*3
*4
*1.        64.        73.4       .04
*1
*4
*4
*33.       64.        73.4       .04
*1
*5
*4
*1.        64.        73.4       .04

$! Load WT of S5
.R WTFAST
*0
*DM1:KS212
*64
*1
*DM1:BCC2
*64
*2
*DM1:S5V1
*64

$! Load frequencies of S5
.R BAM32
*1
*0
*3
*1.        64.        51.5       53.        .02
*1.        500.
*1
*1
*4
*1.        64.        51.9       .04545
*1
*2
*4
*1.        64.        51.9       .04545

$! Start S5
$MESSAGE/WAIT
*11
*0         2          3          5

$! Load WT of S6
.R WTFAST
*3
*DM1:S6V1
*64
*4
*DM1:S6V1
*64
*5
*DM1:S6V1
*64

$! Load frequencies of S6
.R BAM32
```


EXAMPLE 6 CONT.

The comment (for example) **$! Load frequencies of S4 V1** indicates the action of loading the *synthétiseur* with the frequencies of Stage (4), track I.

The comment **$! Load WT of S4 V1** indicates the action of loading the *synthétiseur* with the Frequency Tables of Stage (4), track I.

EXPLANATION OF THE CODE OF THE MODULES USED TO CONTROL THE 4X

The modules are "called" by means of a number.

For example: *1 calls module 1. In this score modules with the numbers 1, 3, 4, 7, 9, 11, 17 and 18 are called.

Module 1 serves for the calling of one of the 6 "plaques" of the 4X. Its syntax is:

*1 module 1

*3 appel de la plaque 3 (call of "plaque" 3).

The following numbers are employed for the "plaques":

plaque	*number*
0	1
1	2
2	3
3	4
4	5
5	6

The **syntax of module 3** is:

```
*3
*1.   64.   41.   42.1   .02
```

This means: load oscillators 1–64 with a frequency-*cluster* between 41 Hz and 42.1 Hz. The last parameter (.02) affects the manner of the frequency-distribution.

The **syntax of module 4** is:

```
*4
*1.   64.   41.2   .0107527
```

This means: load oscillators 1–64 with a cluster of frequencies on the low E (41.2 Hz), with regulated phase. Each oscillator has a frequency-difference of .0107527Hz, which yields a phase-shift cycle of 93 seconds (see Stage (1), track I).

Module 7 serves to begin a stage with all oscillators in phase (percussive effect). Its syntax is:

```
*7
*0   2
```

"Plaques" 0, 1 and 2 are employed (0 2 means 0 1 2).

Module 9 serves to arrest a stage with all oscillators in phase. Its syntax is:

```
*9
*0   2
```

All the oscillators of "plaques" 0, 1 and 2 are switched into phase and arrested.

Module 11 combines modules 7 and 9. Its syntax is:

```
*11
*0   2   3   5
```

"Plaques" 0, 1 and 2 struck in phase.
"Plaques" 3, 4 and 5 are arrested (in phase).

Modules 17 and 18 serve for the production of *glissandi*. Module 17 for *noise*-glissandi, module 18 for glissandi of oscillators in phase.

The **syntax of module 17** is:

```
*17
*1.   64.   42.   46.   53.5   0.1
*0    1.    2.
*1.   64.
```

In this example the glissando of Stage (19), track III, from 43.6Hz to 55Hz is indicated (see fundamental-tones F—A 𝅘𝅥 = rustling noise below the *form scheme* [Example 1]).

The syntax of the second line is the same as that of module 3.

Since 43.6 Hz as the middle frequency of a noise-band from 42–46 Hz and 55 Hz as the middle frequency of a noise-band from 53.5–57.5 were chosen, the values 42. 46. and 53.5 occur in the syntax.

The third line indicates that in module 17 the glissando occurs in "plaques" 0, 1 and 2.

The fourth line indicates that in this module the glissando involves all of the oscillators (oscillators 1–64).

The **syntax of module 18** is:

```
*18
*1.   64.   46.248   58.27   .01333
*3.   4.    5.
*1.   64.
```

In this example the glissando from Stage (14), track I is indicated (falling glissando).

The glissando begins at 58.27 Hz (B-flat) and falls to 46.248 Hz (G-flat).

The third line indicates that the glissando occurs in "plaques" 3, 4 and 5.

The fourth line indicates that in this module the glissando involves all of the oscillators (oscillators 1–64).

(A glissando was realised by means of a slider-potentiometer on a mixing-table, which was connected to the controlling PDP-11 computer.)

The final version of the **score**, written out by the computer on August 20, 1984, has 71 pages (KA1–6 18 pp., KB1–6 15 pp., KC1–6 33 pp., KE2–7 plus *Ausweg* [Way out] 5 pp.).

Each part of this score begins with the following symbols:

Voix 1 = track I;

$JOB/RT 11 = JOB—beginning, RT 11—operating system of DEC (manufacturer) PDP-11 (= name of the computer);

.R WTFAST = loaded with Frequency Tables;

***DM 1:KS212** = DM1—"Disc 1," with which the 4X is fed (here: KS212 = K-spectrum with 212 overtones).

BAM34 = name of the program.

At the close of every section there is **$EOJ** (end of job).

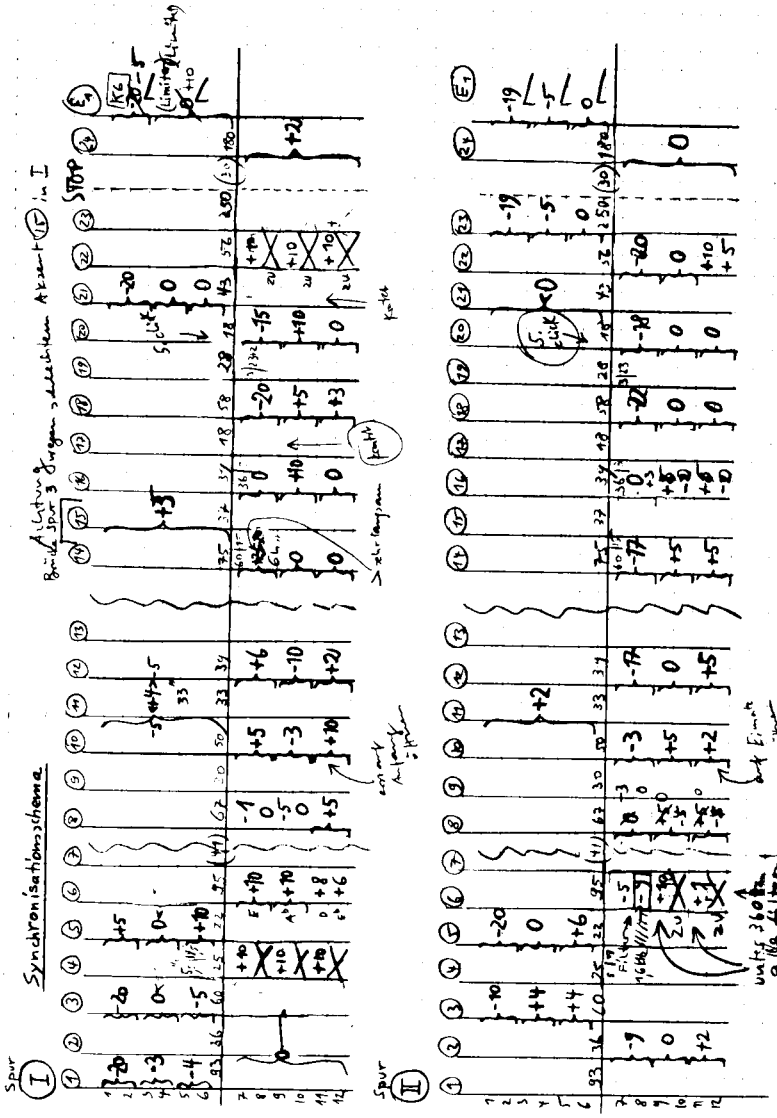
SYNCHRONIZATION SCHEME (Example 7) AND
SUPPLEMENTED FORM SCHEME (Example 4)

Form scheme, frequency tables for all K-sounds, frequency tables for all sounds in ellipses, explanation of terms in the score and *score* have been commented upon.

After all of tracks I–VI had been completely realized, they had to be synchronized (see as an example *synchronization scheme* [Example 7] for tracks I and II, Stages (1) – (24) and (E1)).

"Plaques" 1–3 were recorded through six amplitude-regulators 1–6, and "plaques" 4–6 were recorded through six further amplitude regulators 7–12 onto a 16-track tape recorder with a click-track registering seconds of time. I regulated by this means the levels (noted down during the studio work) for the sound-components, in several places four-handed with Marc Battier. The recording was attended to by the sound-technician Alain Jacquinot.

Tracks I–VI were successively copied onto a 16-track tape recorder and synchronized with the aid of the click-track. Several segments had to be repeated

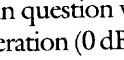


EXAMPLE 7: SYNCHRONIZATION SCHEME

several times, in order that the *explosions* at the beginning of the stages be precisely synchronized.

In order to perfectly realize such a synchronization process, it would be necessary to have six 4X's *simultaneously* at one's disposal.

As has already been mentioned, as the conclusion of the synchronization work, the 16-track tape was projected over six loudspeakers distributed in a circle in the Espace de Projection and with a level-balance—determined by repeated hearings of each segment A, B, C and *Entlassung*—of the six tracks, copied onto an eight-track tape. The technical collaborators were Daniel Raguin and Alain Jacquinot.

The *supplemented form scheme* (Example 4) contains the level-values of this balancing. Where there is no number, the sound in question was copied from the 16-track tape to the eight-track tape without alteration (0 dB);  are crescendi, decrescendi.

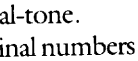
In connection with this production a two-track copy was produced for the studying of the flute part—with a panorama-distribution of the six tracks from left to right. It turned out that a reduction to only two channels had as a consequence an unusually strong impairment of the musical effect. One should therefore unconditionally reproduce the six-track composition over six loudspeakers arranged in a hexagon around the audience. The flute is to be amplified over a transmitter and two loudspeakers each on towers to the left and right of the stage. For a secure synchronization of the flute-playing with the tape a softer stereo-mixdown of the six tracks can be projected into the hall over these loudspeakers through six panorama-regulators, in addition to the six-channel rendition.

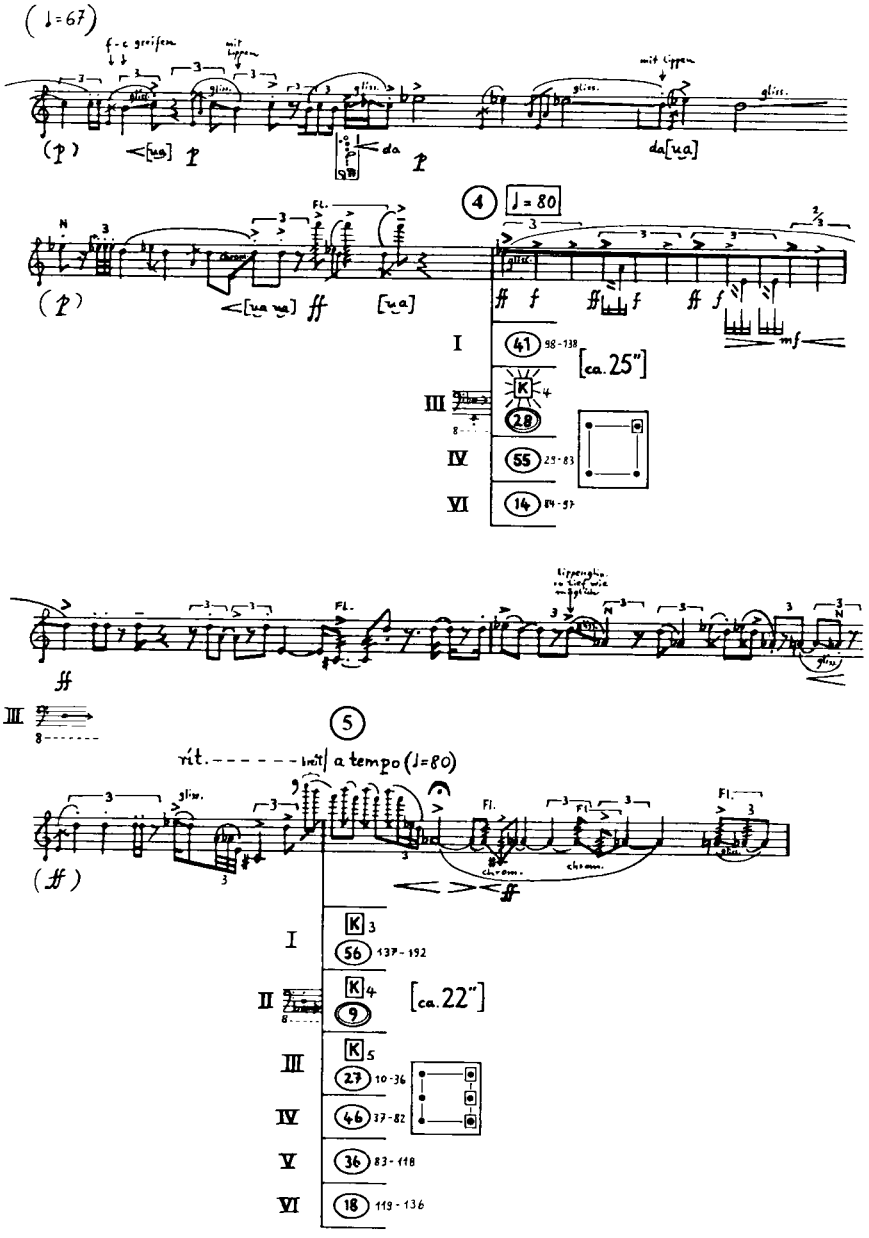
During a performance, the amplitudes of the six-track tape with the electronic music and the two-track tape with the witch laughter must be regulated from the middle of the hall by a sound-projectionist.

Comments on the Score-example (Example 8)

Page 3 is reproduced as an example from the score of the version for flute and electronic music of *Kathinka's Chant as Lucifer's Requiem.*

At the beginning of each new stage the tracks in which the sound occurs is indicated by roman numerals. The six types of [K] -sounds are marked with K1–K6. Right before the track in which the fundamental and first overtones occur (see ), the pitch of the fundamental is notated, marked with an arrow; the note with a staccato-dot is the concluding explosion of the preceding fundamental-tone.

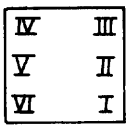
The ordinal numbers of the overtones appear in the ellipses  (thus in Stage (5) : track II the 1st–9th overtone, track III the 10th–36th, track IV the



 Werk Nr. 52 K 3

EXAMPLE 8: SCORE EXAMPLE

37th–82nd, track V the 83rd–118th, track VI the 119th–136th, and track I the 137th–192nd).

The diagram to the right, next to the overtone-numbers shows with dots, from which speakers the sound comes: 

. A dot in a small rectangle [•] indicates a [K]-sound.

CONCLUDING NOTE

The version of *Kathinka's Chant as Lucifer's Requiem* for flute and electronic music has—through the above-described phase-rotations of harmonic spectra and the associated explosions of imaginary giant gongs at the null-points of the phase-cycles—bestowed upon the *Requiem* a heretofore unknown spaciousness, solemnity, austere beauty of the gliding harmonic transitions through all consonance/dissonance gradations, a traceable polyphonic multilayeredness and purposefulness of the partial processes—as a magic world around the solitary voice of the flute.

December 15, 1984

—translated by Jerome Kohl

NOTES

1. All pitches here refer to a tuning-A of 440 Hz (and not 442 Hz, as I originally intended because of the tuning of the flute).