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An Analysis
of
Edgard Varèse's
Poème Électronique

by

Sal Sofia

2001

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An Analysis of Edgard Varèse's *Poème Électronique*

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An Analysis of Edgard Varèse's *Poème Électronique*

Edgard Varèse (1883-1965) was born and educated in France but lived in America in New York from 1916. While still a student of music composition he was constantly frustrated by the limiting sounds of the traditional instruments and was encouraged by Busoni¹ to develop his unconventional compositional ideas regarding sound, texture and color. Once in America he began experimenting with unusual sonorities and though his works are known as precursors of electronic music, most of his professional life is plagued by disappointment. His compositions were too avant-garde for the masses, yet he was well respected by his colleagues for his purism concerning sound and instrumentation. Sixteen of his compositions survive but he is mostly known for *Ionisation* (1931), a percussion ensemble piece, written for thirty-five percussion instruments and thirteen musicians.

Poème Électronique was written when Varèse was seventy-five years old and is the composition that finally gave him notoriety in society. It is the only purely electronic piece he ever wrote, and it represents the culmination of his life's work for different sonorities, instrumentation and effects in music composition.

Background for *Poème Électronique*

In 1956, Louis Kalff, the art director of Philips Industries, proposed to the famed modern architect, Le Corbusier, to build a pavilion in the World's Fair at Brussels. Philips wanted a magnificent show of sound and light effects to illustrate the ability of Philips' technology through this visionary structure. Le Corbusier wanted to give the world an "Electronic Poem": "I won't create a pavilion; I will create an electronic poem. Everything will take place in the interior – sound, light, color. and rhythm."² To this end Le Corbusier entrusted Iannis Xenakis, who was working at that time as an ingegeener

1. Ferruccio Busoni (1866 - 1924) was a composer and a piano *virtuoso*; he was also known as a prophet of electronic music.

and who was very deeply interested in mathematical structures, to formulate a “mathematical translation” of his sketches. And, for the creation of the music despite the artistic director’s suggestion of famed modern composers like Walton, Copland, or Landosky, Le Corbusier chose to work only with Edgard Varése. He commissioned Varése to compose the music and moreover insisted that “Varése shall be accorded a remuneration worthy of him.”³

Varése’s *Poème Électronique* was composed with tracks of organized sounds on magnetic tape between September 1957 and April 1958 at Philips Laboratories in Eindhoven, the Netherlands. *Poème* premiered in Brussels in May through October, 1958 at Le Corbusier’s Pavillon Philips International and Universal Exposition. The exhibition was a complete success, and millions of people attending the Fair heard Varése for the first time. Also in the same year a concert version (for two or three tapes) was presented on November 9th at the Village Gate in New York, and on August 3, 1961 in Montreal, Canada.

Technical Methods used by Varése for *Poème Électronique*.

There was no formal score for “*Poème*”, only the charts which Varése used to plan the composition and for the performance of the work. Varése used studio-made recordings of machine noise, transposed piano chords, bells, filtered recordings of choruses (vocalizations) and soloists. He also made use of oscillators and recorded pure sinusoidal signals and some hybrids made from all these sounds used in various segments and shapes. Varése gave every sound image that he created by mixing synthetic sounds or real instruments and which were then recorded on tape its own name derived from its source or nature. This process gave origin to names with words such as “peowip”, “wauwwauw”, some were named “parameter” or “parabola,” inspired by the sound or the *scenario* which it would suggest, others were called “tram” or “jet plane” because of the sound-object they portrayed. After these sound-images were recorded and cataloged on the three-track tape (cutting or editing tape in those days was a very demanding

2. & 3. Jean Petit. *Le Poème Électronique Le Corbusier*. Editions de Minuit. Paris 1958.
http://www.oswalt.de/en/text/txt/xenakis_p.html.

effort and extremely tedious technical work), the following step was to arrange the score for the performance in the Pavilion for the public.

Varèse had several challenges to overcome for the sound realization of his compositions: spatialization, speaker positions, circuitry were to be considered in respect to the architectural specifications. He determined that the performance would be audio-perceived through the paths and groups of loudspeakers which were in a total of 400 and powered by 10 120-watt amplifiers. The space and acoustical effects were going to be realized by means of three-track tape, each of their synchronized tracks having their own playback head, a group of amplifiers and loudspeakers, and a multi-track machine with signals to activate the various loudspeakers circuits. The paths and groups of loudspeakers were divided so that sounds were sent to different circuits. For example, along the side of the pavilion on the beams of the roofs (there were three peaked structures to the pavilion), and on the bottom for the reproduction of special sounds and the frequency in the low range. Two groups of loudspeakers were placed above the entrance and exit to enhance the stereo sound effect in particular, beside the group that were placed in the horizontal path and that were channel-fed by tracks one and two while the third channel was coming out through selected loudspeakers. By this kind of output, the listener would perceive a stereo effect no matter where he was standing in the pavilion. The effect of these sounds slowly turning and overlapping in the continuous 360° sound space must have been staggering. And while the music was playing, images and colors selected by Le Corbusier were projected on the walls of the pavilion. It was truly a multimedia event.

The people were no longer listening to music only they were experiencing the art of the future: installation art by architectural and sound design, and synchronization of music to graphic visuals to create a multi-media artistic whole, all realized through mathematical and scientific methods.

The following Chart 1 is a descriptive time line relating events as they occur in *Poème Électronique*.

Descriptive Analysis of *Poème Électronique*

Introduction (0:00 - 0:42)

Poème Électronique is written in two movements, has an Introduction and a *Finale*, and it is 8:00 minutes in duration. *Poème* starts at 0:00 - 0:40 with bells (church) played five times within ten seconds plus an ulterior bell sound played at 0:13 without the attack, and *sostenuto* of the bell's hum decaying up to 0:23. While the bells are still humming (resonating) a new sound-object comes into scene – a low pitch temple block followed by a higher pitch wood block. While the temple block is playing a siren *glissando* frequency comes in joined at 0:21 by electronic granular *glissando* sounds (square wave type). A bursting percussive rhythmic quintuplet is played six times. The first three times the accent is defined at each of the first primary pulse quarter note. This sets up an ascending amplitude *glissando* and machine Doppler effect sound with reverb, followed by the juxtaposition of several sounds, suggesting short segments of machine sounds mixed with a jet plane sound-object. The Introduction ends with two seconds of silence starting at 0:40 to 0:42.

The First Movement (0:42 – 4:04)

At 0:42 (to 1:30) the silence is broken by percussive bursting sounds followed by an electronically manipulated natural metal sound-object and by short bursts of percussive rhythm sound patterns (siren segments) with a granular wood-like timbre high in frequency. A short pause and siren(s) very high in frequency (Frequency Modulation) sounding like a call – a type of long stretched vowel sound in a linear chromatically played which suggests a whale-like calling sound. The siren repeats three times in a slow resonant timbre while the frequency remains unchanged with an amplitude from *forte* to a gradual decay *piano*. The reverb suggests (especially with the last siren) a good image-scape of a far distant illusion. After a short rest a natural sound-object, an electric fan (recorded in reverse) with an object interfering the flow of the fan blade results in a periodic change in amplitude and attack sounds like a granular complex sound-object juxtaposed with an electronically

distorted bass sound. Frequency from oscillators amalgamates the complex slow moving sound timbre. Following this is an electric (mechanical) machine, a metal grinder playing a triplet rhythm shuffle pattern for a compounded duple time performed at an andante speed with a sudden decay with a short reverbed end. Next, metal *sonagli* objects (with echo and which were previously introduced) play in a straight accented rhythm pattern loud to soft to diffused. These two patterns (metal grinder and metal *sonagli*) sequentially following each other are thematically suitable. At 1:26-1:30 while the previous pattern is decaying it is overlapped with a cymbal splashed with a hard mallet. This sets the background for several sirens of high frequency glissandi then to a short quick decay with reverb. On the bottom of all, there is a low frequency (machine) sound-object used as pedal point.

At 1:30 to 1:45 there are complex bursting percussive sound-objects short in duration (segments) with a round (not harsh) timbre, and a well-defined rhythm pattern can be heard as a question and answer type of phrasing followed by the “whale” siren call which is the third siren from the previous section played on a very low amplitude (repeated only once). At 1:44 vocals or voices (small patterns) sounding as if voice segments and sirens were duplicated and mixed with sine tones are heard. Here sound-objects are in juxtaposed positions, and Voltage Controlled Filters (VCF) are added to control frequencies as well as reverb which is added to control the shape of the sound-objects. One of the sounds is that of speeding tape recorder spools which starts at a slow speed and ends at a fast high speed glissando; the frequency goes higher because one of the spools is getting more massive by acquiring more tape while the smaller spool builds momentum resulting in a faster linear velocity (and friction-sound of the tape). Suddenly, while the tape sound-object is in an ascending glissando, close to its final destination, the timpani molto forte (modified from Deserts*) accompanied by a snare drum roll with a soft to loud amplitude *glissando* enters the soundscape to play with the final part of the spinning tape .

At 2:08 a complex of granular mixed sounds of hi-hat/cymbal (choked), wood block, and fast snare drum roll in ascending *glissando* is

* Varèse's *Deserts* (1950–54) was written for twenty instrumentalist (wind, piano and percussion) and two track tape using modified recordings of percussion instruments and factory sounds.

played. Some of the sounds return in the following sequence: car horns, wood block, sirens *glissandi*, cymbal roll, tenor (tom-tom) drum roll, snare drum, and shakers. At 2:23 through 2:34 we hear sirens *glissandi* overlapped with *timpani* repeating the rhythm pattern from 2:03, with sirens and wood block.

This section of “*Poème Électronique*” has a flowing rhythm quality, a continuity of colors (timbres) and dense sound texture suggestive of a familiar thematic soundscape, that of traffic-like noise or a sound illustration of a busy metropolis.

The sirens up to 2:23 are low in amplitude *quasi* in the background but this changes from 2:23 to 2:34 as they move more into the foreground. This increases the intensity for the listener while continuous single strokes are played a soft *piano* to *mezzo forte* by the wood block on top of the siren decay. The steady single strokes serve to keep the listener a little suspended.

Then at 2:33, contrary to expectation, bells (church) are played four times, unclouded, changing the mood of the section to calm and for few seconds the bells are the only sound in the audio spectrum (scene); however, a small sine tone breaks the calm by playing soft steady pulses while the hum of the bells decays at 2:51. From 2:51 to 3:10 there are more sine tones heard with longer sounds and different attacks with sine tone intervals (*quasi arpeggiati*). At 2:58 through 3:09 synthetic percussive (oscillator) sounds consisting of eight single steady bursts (with longer pause between five and six) are played, followed by synthetic sine tones of various mid to high frequencies with a soft round timbre. While the synthetic sounds are still playing a new sound-object is introduced – organ(s), low and mid frequency in range with (complex sounds) ascending amplitude *glissando* and sharp decay.

At 3:25 through 3:37 a metal *sonagli* (natural sound-object) segment, modified from its original sound-object, and temple blocks are heard. This sound-object (temple blocks) could also be a wood box played with a rubber mallet, producing steady single notes and repeated four times. (The fourth time the sound is higher in frequency). The *sonagli* performed just before the temple blocks are not the same in sound; there are modifications and even though very minimal their nuances are audible.

The pattern in the next sequence becomes a compound rhythm in that there is one group of three fast notes and a group of four single notes (like a triplet and four single eighth notes), anticipated by seven sound-objects one of which is a pulse wave (synthetic) sound tone mid to high-range in frequency. The remaining sound-objects have some variants in timbres... some are shrill nevertheless they remain similar in sound to the modified metal *sonagli* sound-object. Notably, the precedent to the last sound-object is loud enough to be the primary sound in the foreground together with the temple block, which is then followed by the last sound-object, played quite softer and before the last temple block sound, which is the first sound-object to introduce this next new and important section in Varèse's *Poème*."

At 3:38 the temple block is followed quickly by a short cymbal sequence played with soft mallets (pseudo gong) and with it a choir of voices sings *vocalizzi* of three different vowel-type voice patterns that are non rhythmic, relatively free passages. The importance of this segment of *Poème* is the introduction of the *vocalizzi*, their juxtaposition to the sound-objects, and the manipulation (or lack) of rhythmic *tempo* in this section. Although there are a few patterns with percussion sound-objects they are not as strong and as leading as rhythmic patterns could be, and the rate of the *tempi* is *andanti* but they are sparse and do not supply enough commitment in all, therefore the expectation of the listener is suggestive of an imagescape (as opposed to a more definitive "soundscape"), though one of instability. Additionally, the *sonagli* used are very provocative but tend to irritate the concentration of the listener. *Sonagli* are often used as a good contrast to (either) distract (or attract) the listener's attention. Toward this end Varèse is a master and perhaps why the *sonagli* are used here. He also uses the percussion instruments to create variants and metaphors. For instance, after the instrumental sequence the voices (choir) fulfill the imagescape by suggesting a "hunt," search, wish or a persistent desire.* After a few seconds the high voices decay with low amplitude and blend into the next same type of singing of unidentified spoken words (a woman's voice). The phrase goes up and down in frequency with a short *glissando*,

* Varèse was in constant quest for new sounds and new combinations of sound-objects to capture the metaphor he wished to portray through his compositions.

and it has a wondering quality with a little rhythm in it. There is a short vocal (muted) answer, a high mid-range frequency of a woman's voice entering the scape, and while the voice is still decaying a high shrill frequency pulse wave comes in parallel to the voice and closes the vocal with a fast and smooth (envelope) decay. What follows quickly are the metal *sonagli* and temple block playing a short, but efficient break, not used for separating but as tying or uniting the work which they started earlier. The section closes with a stroke from the temple block followed by a short, vocal vowel sound like a sigh as if to state relief. And thus the first movement ends with four seconds of silence from 4:00 to 4:04.

Second Movement (4:04 - 7:06)

At 4:04 - 4:15 female voices of high and low frequency, *vocalizzi* like "ou," "oo," slowly decay and at a steady state mix with strange voices (see the conceptual analysis for more amplification) up to 4:15. Suddenly a soundscape with a loud and complex gesture is delivered by a choral voice, car horns, and trumpets with sharp attack, followed by a *sostenuto* decay and by a tom-tom drum, a tenor snare drum, an alto snare drum, and temple block. Joining in this drama are cross-stick on a snare drum rim and small cymbal splashing sound-objects. A male voice using the voice timbre of a dark bass in a haunting mode with an upright string bass is heard at 4:28. Here, the music reflects a kind of free jazz rhythmic style where the voice is improvising predominately vowel-type soloing played with music of an upright string bass, drum-set, tambourine, and maracas accentuating the rhythmic time (feel) with some pattern variations by displacing the same pattern on different sound sources.

At 4:39 - 4:57 another dramatic complex sound event (as at 4:15) occurs. Sound-objects are mixed in the lower frequency to achieve a sound-mass. It seems as if filters (VCF) were used to lower the voltage (frequency) rate of the sound-objects. Among some of these sound-objects could also be a jet plane, because there is a little flanged tale. At 4:53 a low frequency granular sound-object that could be a motor-bike sound-object or a manipulated low frequency siren sound-object is heard; the Doppler effect of a motor bike passing through is evident. At 4:57 through 5:37

the voices appear to be transposed in a higher frequency again by use of filters (VCF) which filter out the low frequencies, thus the resulting voice frequencies are characteristic of the telephone-type recording and megaphone-type of voice. In this section of the composition the human voice is manipulated in an interesting way: by mixing a low pitched voice with a high one using filtering techniques, and by retarding the time by flanging the tape, the use of short looped segments of the voices achieved rhythm patterns by repetition.

At 5:23 through 5:27 a cross-stick on a snare drum rim playing a rhythm pattern can be heard; the same pattern is sequentially repeated by the bongos (percussion instrument). The section finishes at 5:27. Then a bass drum, snare drum, voice, and short segments of scratching noise repeating the high frequencies are being filtered out making the timbre quality dark and muted. At 5:37 through 5:47 there is silence. At 5:47 to 6:00 an organ, bell (reversed), and a triangle is played very softly. At 5:47 to 5:56 it is possible to hear the striking attack of the bell (left channel) by playing the segment backwards. The listener can hear the low, but sharp attack (right channel) of the metal sound-objects blending with the up *glissando* of the organ. At 6:00 to 6:13 a unison pattern is played by several percussion instruments: organ, snare drum, temple block, small tenor drum and tambourine are joined by an upright string bass.

At 6:09 through 6:24 an organ, sine and pulse wave tones in various frequencies and pointillistic in compositional approach, add various timbres and some pause in between the events. At 6:16 a *sostenuto* of an ascending *glissando* tone closes with a sharp decay. At 6:14 to 6:18 a snare drum, tenor drum, upright string bass, and tambourine can be heard and at 6:24 and 6:25 a percussive sound (unpitched), possibly a wood block played with a rubber mallet, is played. In this section we can hear the contrast with the section that was played at 4:21. Though this section is shorter in duration the contrast qualities are prevalent: at 4:21 the voice improvises with the rhythm section in a jazzy style whereas in this section the synthetic sound-objects, the pulse wave and sine tones, are playing with the rhythm section. In both sections the sonorous quality of the full rich sound is maintained

because although the synthetic sounds are playing a *sostenuto* (just a small part) of the rhythm section, the snare drum, string bass, and tambourine are playing in a very crisp pointillistic manner with highs and lows in amplitude.

At 6:18 through 6:26 an ascending amplitude *glissando* of an organ sound playing discrete tones closes with a sharp decay followed by a wood block phrasing a pattern of a septuplet with two accents one on the primary and one on the secondary (the group is divided four plus three). This section is similar with the one played at 3:16 - 3:27 in that both have organ sounds with an ascending amplitude *glissandi* ending with a sharp decay and the wood block performing a different type of pattern. However by considering the first note only (played by the wood block) the patterns would be very similar in context. The only difference between these two sections (besides the absence of the metal *sonagli* at 6:18 - 6:26) would be that the latter section is higher in frequency than the previous one.

At 6:26 through 6:34 a very little obscure melodic phrase is played extremely low in amplitude. At 6:34 - 6:46 an ascending jet plane *glissando* with bells and hi-hat in a short melodic phrase is played. Glass sounding objects like xylophone or bells also play a melodic phrase, followed by cymbals (hi-hat *quasi* closed) making a *decrescendo* short *sostenuto* (sizzling sound effect) and a *crescendo*. Again at 6:43 to 6:45 a roll played on a hi-hat and a female voice performs passages and *vocalizzi* in the higher register and particularly at 6:54 to 7:00 the voice is modified to a frequency range that is too high for the human range to perform.

The Finale (7:06 - 8:00)

While the voice is decaying at 6:59 - 7:06 a choir of male voices sings in a monastic religious chanting style (to celebrate with song). It appears that the chorals are in three groups: *basso*, *tenore*, and *alto* and the word they sing sounds like "Oh Sal-va- o -too-." The chanting goes to a short decay at 7:06 - 7:09 when a suddenly complex noise (steam and a metal-like sound) is repeated twice with short attacks and decays. The amplitude and frequency are high followed by a tenor tom-tom drum playing short rhythmic patterns with reverb repeated three times and

accompanied by an organ. At 7:10 - 7:25 the organ and complex noise are distorted playing a pattern in block note fashion; the organ pattern is edited and only the first part is being played and repeated five times alternately with the drums.

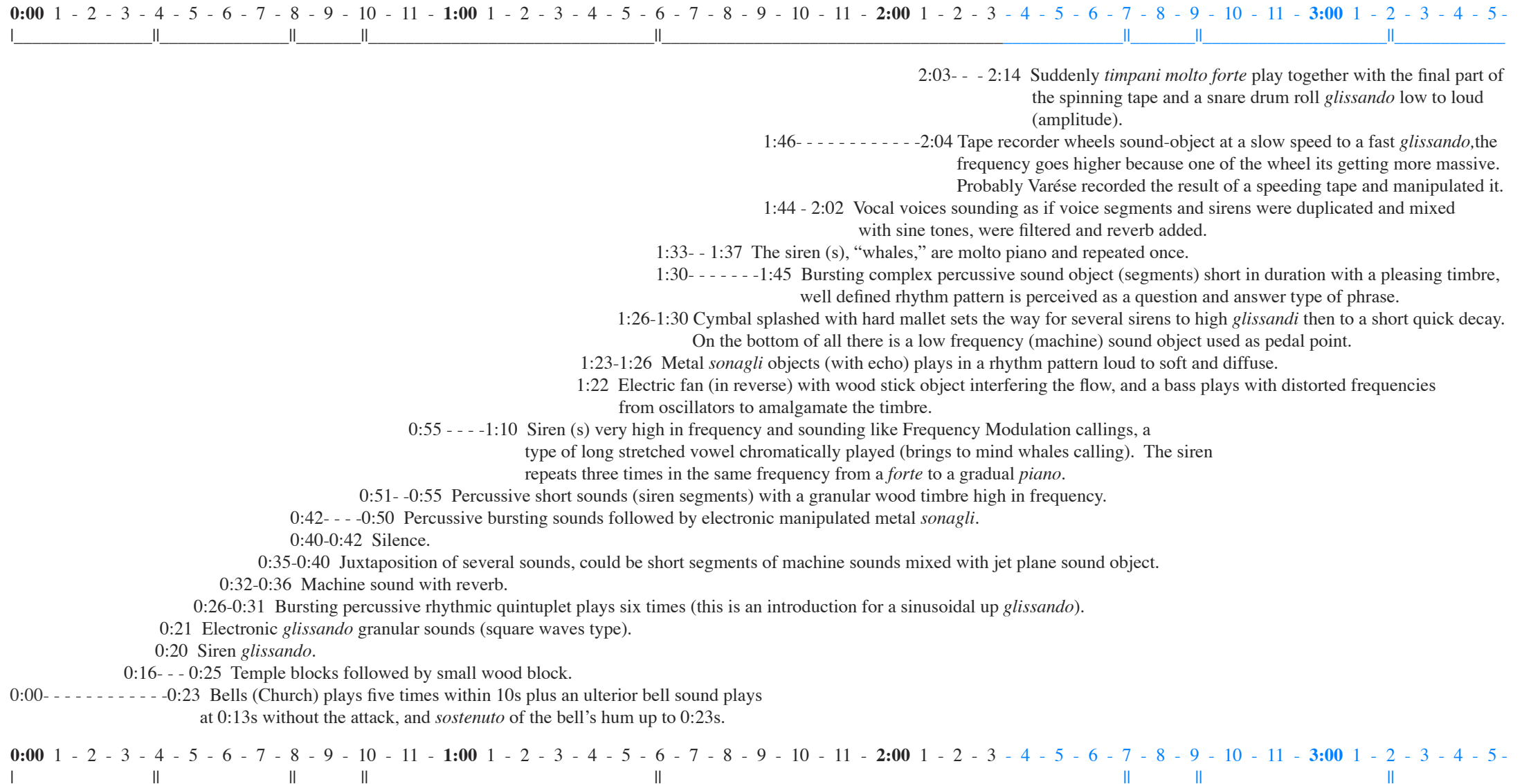
At 7:21 to 7:27 a high frequency (unpitched) percussion instrument (perhaps a glass bottle) is played with a hard mallet playing a medium-fast short staccato pattern of four notes and is repeated five times from a high to a low amplitude, while on the fourth and fifth repetition the pattern gets faster and faster still. At 7:26 to 7:28 an organ sound-object plays a short sequence with an amplitude *glissando* up and down.

At 7:28 -7:35 siren voices (the same as those in the beginning of the composition, with the difference that the calls are repeated twice) sound as if they are chromatically transposed by two semitones and then each of the siren voices modulate three semitones.

Finally, at 7:33 - 8:00, in this last section the siren voices introduce the culminating complex "sound-mass" *finale* of *Poème*: various sounds like a jet plane with *glissandi* of multiple sirens, fast sine tone clips (of spliced tape) and complex segments of derived sound-objects from machines.

The following Chart(s) 2 is a time line of the waveform, spectrogram, linear pitch and sound intensity of selected sections in *Poème Électronique*.

Chart 1: Descriptive Time Line Relating Events as They Occur in *Poème Électronique*



2:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 3:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 4:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 5:00 1 - 2 - 3 - 4 - 5 -

4:34 - 4:39 Snare drum, tambourine, bass drum and cymbals (hi-hats).
 4:24 - - - - 4:35 Male voice using the voice timbre in a dark bass and haunting mode.
 4:23 Cross-stick on the snare drum and small cymbal splashing.
 4:15-4:21 Choral voice, sharp attack and sostenuto with a long decay.
 4:15 Car horns, tom-tom, tenor snare drum followed by an alto snare drum, and temple block.
 4:04 - - 4:15 Female voices of low frequency *vocalizzi* like “ou”, ”oo”, goes to a slow decay.
 4:00-4:04 Silence.
 3:38 - - - - - 3:59 Spoken unidentified words of woman voice with short glissando up and down followed by a high mid-range singing up and a short steady state (sostenuto) quasi arpeggio.
 3:25 - 3:56 Metal sonagli modified and wood (sounding) box played with a strong attack, produces steady single notes and repeats four times. Overall very spacey.
 3:10 - 3:25 Organ and jet plane sound-objects, low frequency with complex sounds, amplitude *glissando* up and sharp decay.
 3:00 - - - 3:08 Percussive synthetic burst, and wood block.
 2:51 - - - - - 3:10 Sine tone intervals (*quasi arpeggiati*).
 2:44 Sine tones (long sounds).
 2:33 - -2:50 Church bells, play four times unclouded changing the mood of the section; wood block plays soft steady single pulses, soft piano to mezzo forte.
 2:26-2:38 *Timpani* playing same rhythm pattern from 2:03, with sirens and wood block.
 2:23 - - -2:34 Sirens *glissandi*.
 2:20-2:25 Tenor (tom tom) drum roll, snare drum, and shakers.
 2:17-2:21 Cymbal roll.
 2:12-2:23 Sirens *glissandi*.
 2:11-2:14 Car horns, wood block.
 2:08 Granular mixed sound-objects of hi-hat/cymbal choked, wood block, and snare drum rolling *glissando* up.

2:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 3:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 4:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 5:00 1 - 2 - 3 - 4 - 5 -

4:00 8 - 9 - 10 - 11 - 5:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 6:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 7:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 -



6:37- 6:46 Glass sounding object like xylophone or bells playing a melodic phrase, followed by cymbals (hi-hat quasi closed) making a *dicrescendo* short *sostenuto* (sizzling sound effect) and a *crescendo*.

6:34 - - - - 6:46 Jet plane with bells and hi-hat in a short melodic phrase.

6:26 - 6:34 A very little obscure, melodic pattern extremely low in amplitude.

6:24-6:25 Percussive sound (unpitched) or a wood block played and recorded with a softer mallet.

6:14- 6:18 Snare drum, tom tom, and shaker.

6:09 - - - - - 6:24 Sine tones in various frequencies, pointillistic compositional approach, and various timbres give some pause between the events. At 6:16 *sostenuto* of the *glissando* tones closes with a sharp stop.

6:00 - - - - - 6:13 Unison pattern played by several percussion instruments: snare drum, clave, and bass drum as well white noise joined by a tenor tom drum.

5:47- - - - - 6:00 Organ, bell (in reverse), and triangle plays very softly; we can hear the low but sharp attack (right channel) of the metal mixed with the *glissando* of the blended resulting sound. At 5:47-5:56 we can hear the attack of the bell (left channel) if we play the segment backwards.

5:37- - - - 5:47 Silence.

5:27 Bass-drum, the high frequencies are filtered out.

5:23-5:27 Cross-stick on snare-drum playing a rhythm pattern; the same pattern is sequentially repeated by the bongos.

4:57 - - - - - 5:37 The voices are now transposed in the higher frequency again using filters (VCF) and the low frequencies are filtered out, resembling telephone-type recording and megaphone-type voice. In this section of the composition the human voice is manipulated in an interesting way, by mixing low pitch voice with high ones using filtering techniques, slowing down the time by flanging the tape and using short segments of the voices by looping it to achieve rhythm patterns by repetition.

4:39 - - - - - 4:57 Voices are mixed in the lower register to form soundmass sounding as if filters (VCF) were used to lower the voltage (frequency) rate of the voices. Some of these sound-object could also be the jet plane, as there is a little flanged tale. At 4:53 the low granular sound-object could be a motor or the siren sound-object manipulated, as we can hear the doppler effect of a motor.

4:00 8 - 9 - 10 - 11 - 5:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 6:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 7:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 -



6:00 6 - 7 - 8 - 9 - 10 - 11 - 7:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 8:00

|| _____ || _____ || _____ |

- 7:33 ----- 8:00 The last siren voice introduces the end of *Poème* together with various sound-objects like a jet plane, with *glissandi* of sirens, fast sine tones clips and complex segments of sound-objects from machines.
- 7:28 - 7:35 Siren voices, same as in the beginning of the composition, with the difference of that the calls are repeated twice; also sound as if they were chromatically transposed by three semitones.
- 7:26-7:28 Organ sound-object short sequence engages in an amplitude *glissando* up and down.
- 7:21- 7:27 High unpitched percussive instrument (it could be a glass bottle) played with a hard mallet plays a medium-fast short *staccato* pattern and is repeated five times from high to low amplitude; on the third, fourth, and fifth time the pattern gets faster and faster.
- 7:10 ----- 7:25 Organ and noise distorted plays a pattern in block note fashion. The organ pattern is edited and only the first part is played and repeated five times alternating with drums sound-object.
- 7:08 ----- 7:19 Tom-tom plays short rhythmic pattern is repeated three times with organ.
- 7:06-7:09 Noise, high amplitude and frequency, repeats twice with a short attack and decay.
- 6:59 - 7:06 Choral of male voices.
- 6:44 ----- 6:59 Woman voice performing passages and *vocalizzi* in the higher register.
- 6:43 - 6:45 High-hat rolling.

6:00 6 - 7 - 8 - 9 - 10 - 11 - 7:00 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 8:00

|| _____ || _____ || _____ |

Chart 2A: The following Time Line Graphs represent *Poème*'s Introduction from 0:00 through 0:42.

Graph A: Waveform or shape. **Graph B:** Frequency Spectrogram (Hz). **Graph C:** Intensity (loudness in dB).

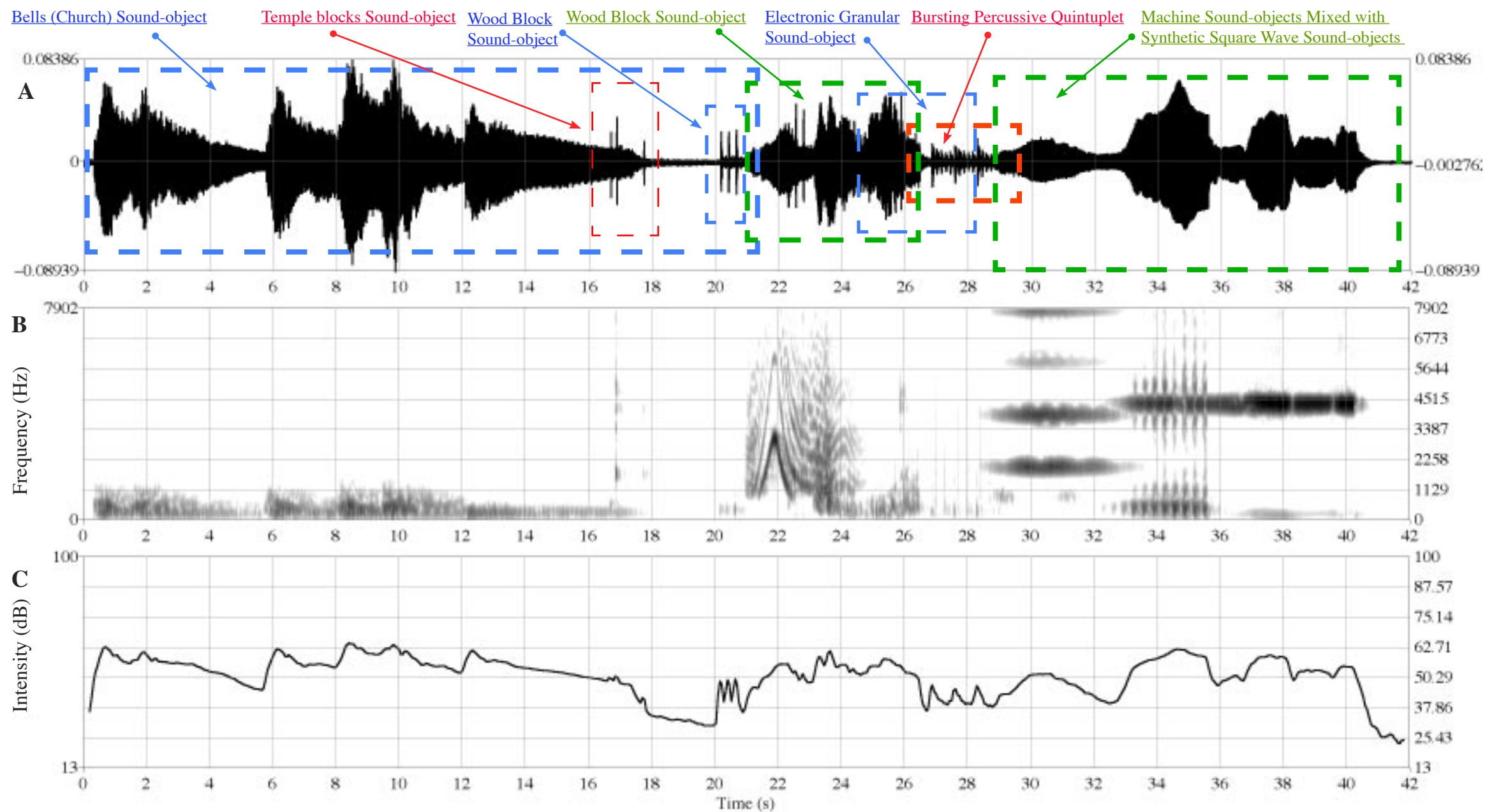


Chart 2B: The following Time Line Graphs represent an amplified selection from *Poème*'s Introduction from 0:16.47s through 0:26.74s.

Graph A: Waveform or shape. Graph B: Frequency Spectrogram (Hz.). Graph C: Intensity (loudness in dB.).

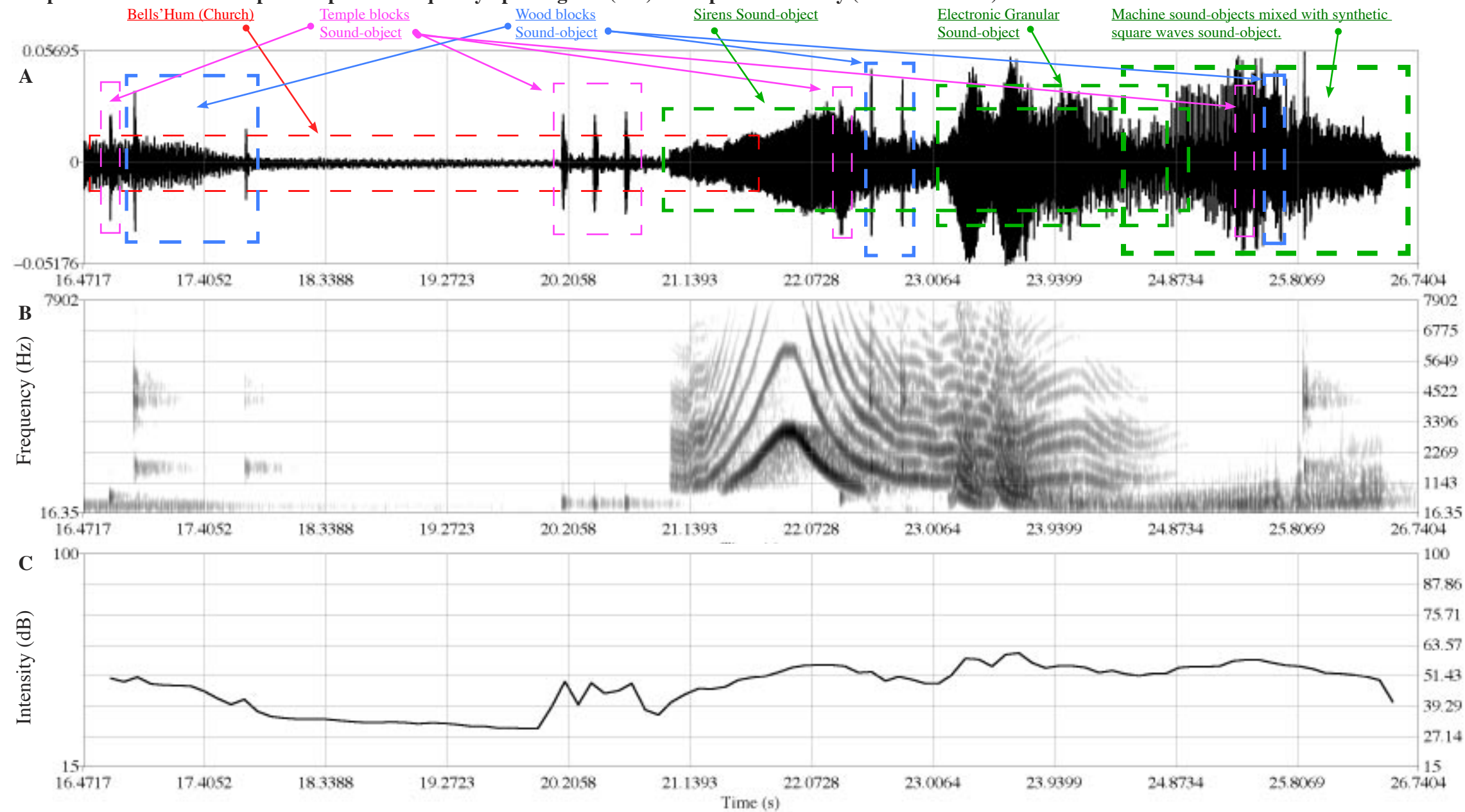


Chart 2C: The following Time Line Graphs represent *Poème*'s First Movement from 0:42 through 4:04.

Graph A: Waveform or shape. Graph B: Frequency Spectrogram (Hz.). Graph C: Intensity (loudness in dB.).

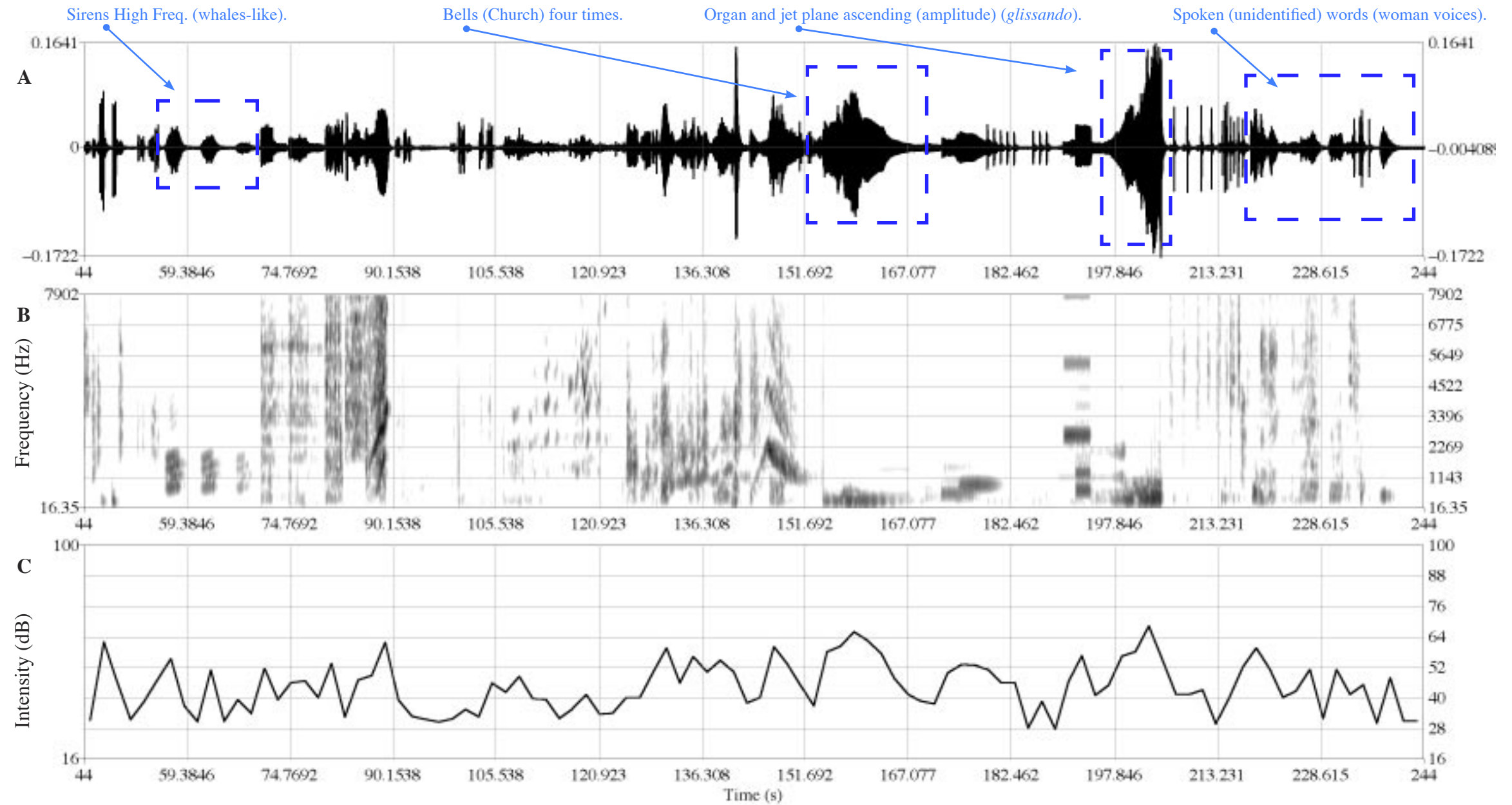


Chart 2D: The following Graphs represent *Poème's* Second Movement including the *Finale* [7:04 (424s)] from 4:04 through 8:00.

Graph A: Waveform or shape. Graph B: Frequency Spectrogram (Hz.). Graph C: Intensity (loudness in dB.).

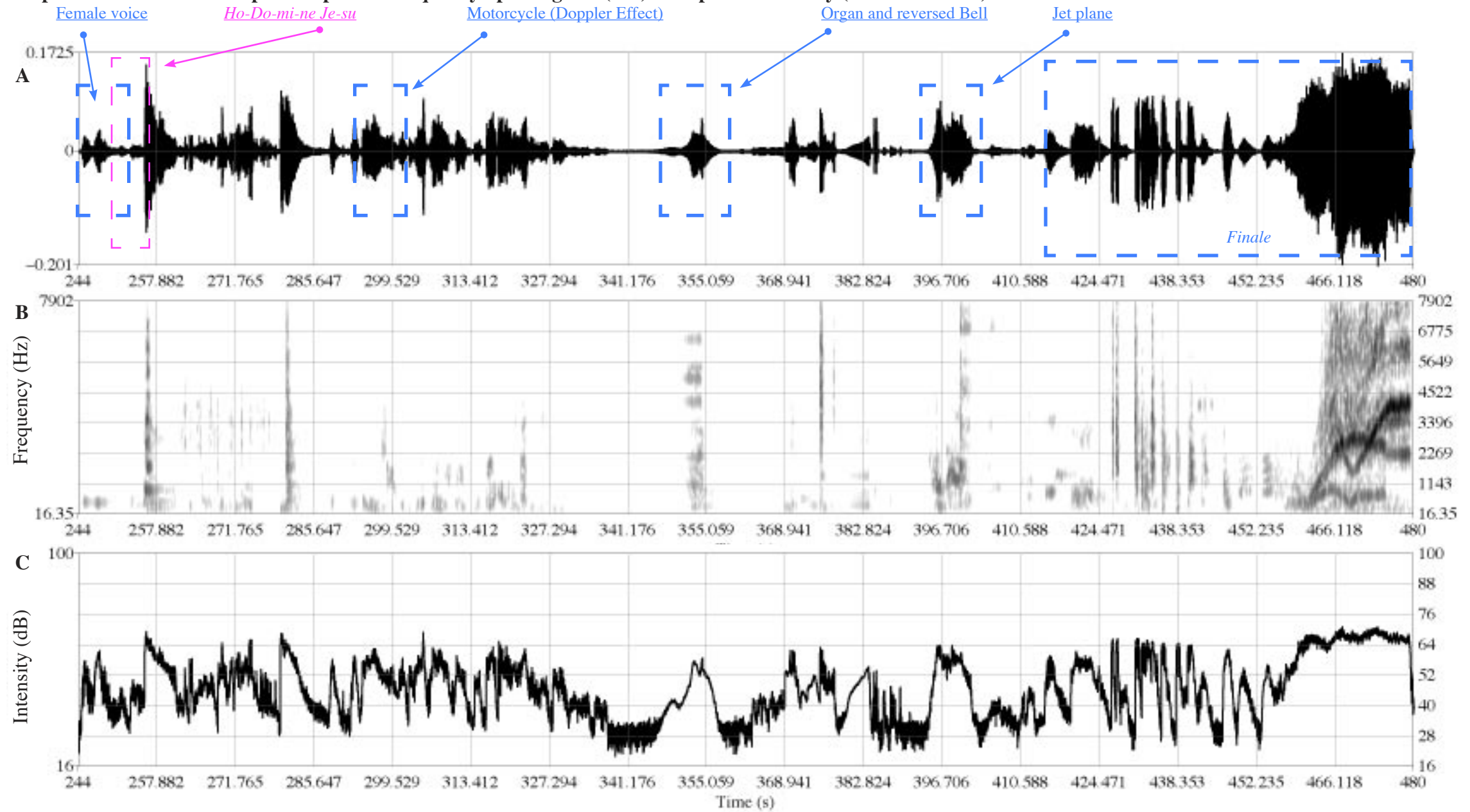


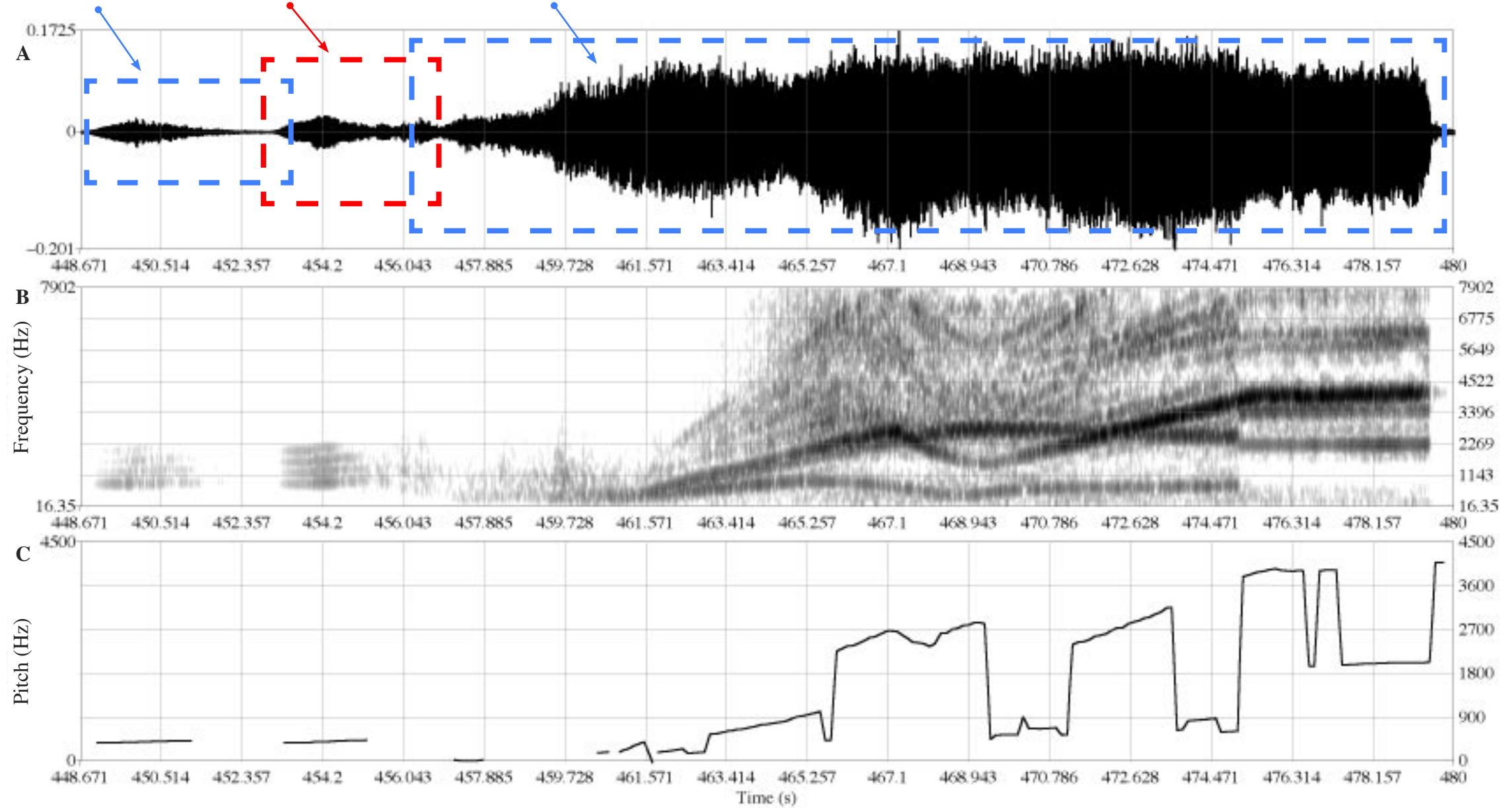
Chart 2E: The following Time Line Graphs represent an amplified selection from *Poéme's Finale* from 7:28 through 8:00.

Graph A: Waveform or shape. Graph B: Frequency Spectrogram (Hz.). Graph C: Linear Pitch (Hz.). Graph D: Intensity (loudness in dB.).

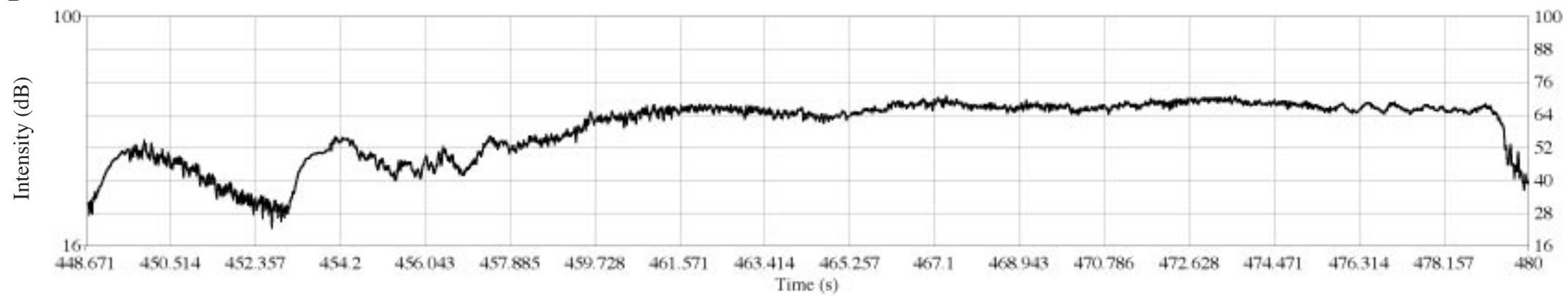
Sirens whales-like

Jet plane sound-object

Jet plane with Last siren voice with various sound-objects, fast sinetones, clips and complex segments of sound-objects from machines.



D



A Conceptual Analysis of *Poème Électronique*

From the very beginning of the composition *Poème Électronique* reveals itself with a strong penetrating statement. Varèse achieves this principally with the sound-objects of the Church bells, Temple blocks, wood block, siren *glissandi* and synthetic granular *glissandi*. The Introduction to *Poème* is just forty-two seconds (including the pause of two seconds of silence) and within that short frame of time Varèse treats the Introduction as an entire composition concerned not only with the orchestration but it is also with the Introduction that Varèse presents the compositional structure of the entire work.

While the bells are still humming in a large space Varèse makes use of a small warm percussion instrument and states a short rhythm pattern followed by another small percussion instrument of the same (timbre) family. It is with these two small instruments that cut through the huge sound-mass of the bells that he achieves the purpose of the Introduction – by complimenting the free spacey sound of the bells with a warm rhythm contrast – and which is also a recurring thematic scheme throughout *Poème*. Yet, Varèse creates space to allow the siren to sing whale-like in free space to be joined by an electronic (synthetic sound) granular *glissando* (square wave type), as well as bursting percussive rhythmic patterns, sound effects, reverb and the juxtaposition of several sounds, suggestive of short segments of machine sound-objects mixed with a jet plane natural sound-object. He then closes the Introduction with two seconds of silence.

The way Varèse composed the music – especially through his use of the rhythmic patterns which he presents and compounds and which is the major ground work and frame work upon which *Poème Électronique* was constructed – he created soundscapes that marvel and made us aware of how much there is to work with, be it the natural environment as well as the synthetic sound-objects.

In the first movement he uses complex electronic synthetic sound-objects, natural sound-objects (manmade), and percussive instruments some of which were traditional musical instruments like cymbals, snare drums, tambourine, et cetera.

And, some instruments were created from mechanical machines as well as created with the aid of electronic equipment which in turn he manipulated. It is interesting that Varèse prerecorded the rhythmic patterns, as well the choral voices, jet plane, and all other sound-objects so as not to leave their interpretation to the musicians (performers) or their use in the composition to chance but specifically as he intended. He also used some of the recordings from his composition *Deserts* which he modified. It seems Varèse wanted to create a musical composition made of *concrete** sound-objects, as well as electronic sounds from oscillators and the natural sounds from his collection hybridized with the synthetic ones so as not to limit his expression for his masterpiece to the usual traditional instruments.

Varèse arranged parts of the composition in such a fashion that some syntactic sequences that follow are in contrast to the previous one and he makes excellent use of the compositional technique of musical dialogue through “question and answer” or “subject and answer.” For example, he uses a phrase nested with another pattern in such a way so that we hear a sound-object start a phrase with a question, it is then followed or interrupted by another pattern which may be of the same timbre and our mind and ears could be distracted by this contrasting pattern through mental interpolation. Then, perhaps when we least expect it, the answering pattern enters the soundscape and finishes the phrase. At 0:42 - 0:55 there are synthetic sound-objects which are playing and imitating each other’s pattern in a pointillistic style, then joined by contrasting natural sound-objects from a metal *sonagli* sound-object suggesting contrasting syntactic sequences. Another example of this compositional approach happens at 1:30 - 1:45: the siren (modified) is the sound-object that is interpolating and also (in the same section) at 1:38 - 1:46 in the right channel another example of this type of phraseology is heard. This type of stylistic writing is again noticeable in the first movement with derived machine sound-objects and percussion which prevails with the oscillator synthetic sound bursting and mixed segments of sounds that create complex radiant sound-objects which are Varèse’s sound-mass scape specialty.

The usage of the temple block (wood sound) is not the only or the

* For Varèse *concrète* sound-objects were those based on reality or real experience, as well as uniting (congealing) their parts into one mass. In *Poème* he refers repeatedly to “sound” mass.

primary auxiliary percussion instrument that Varèse uses for unpitched timbral control, texture *et cetera*, however the temple block is a good sound source for displacing contrasting timbral sound-objects. This small timbral instrument is skillfully used by Varèse starting in the Introduction and concluding at 6:41- 6:43 in the Second Movement: it is used in the Introduction and in the First Movement with the bell (church) at 2:32, with the metal *sonagli* at 3:25 - 3:56, and in the Second Movement for contrast at 6:00 by playing a unison phrasing pattern with other sound-objects.

In the Second Movement the primary sound-objects are still mostly percussion-like sounds; however, there are new instruments, “singers,” if you will, of female and male voices which for the major part of the Second Movement are creating a dense texture. At 4:28 Varèse makes a great addition to the contrast, texture, and timbre of *Poème* in a such way that the music modulates to a rhythm pattern which has growth and resonance. Here, the male voice is employed in a jazzy rhythmic style and joined by an upright string bass with a drum set and tambourine.

Another interesting use of Varèse’s compositional methods with sound-mass is notable in the Second Movement. He records and plays back in reverse (sometimes) certain phrase(s) at distinct time intervals.* Specifically, the Second Movement begins at 4:04 with female voices performing *vocalizzi*. Also, Varèse placed a choir of male voices singing in a monastic religious chanting style the words “*Oh Do-mi-ne Je-su*” quite distinctly that decays into the female voices coming forward. Then at 5:41 another reversed sound-object is played, the stroke of a bell can be heard on the left channel if the segment is played in reverse. Then we arrive at 7:04 which marks the end of the choir singing, the event made remarkable by a choir of male voices (monastic religious chanting choir) singing “*Oh Sal- va- o- to- (re)*,” the (re) is omitted (not sung). Perhaps Varèse, being a religious man, was grateful to Le Corbusier for allowing him to compose this master piece and to accomplish this dream at the age of 75.

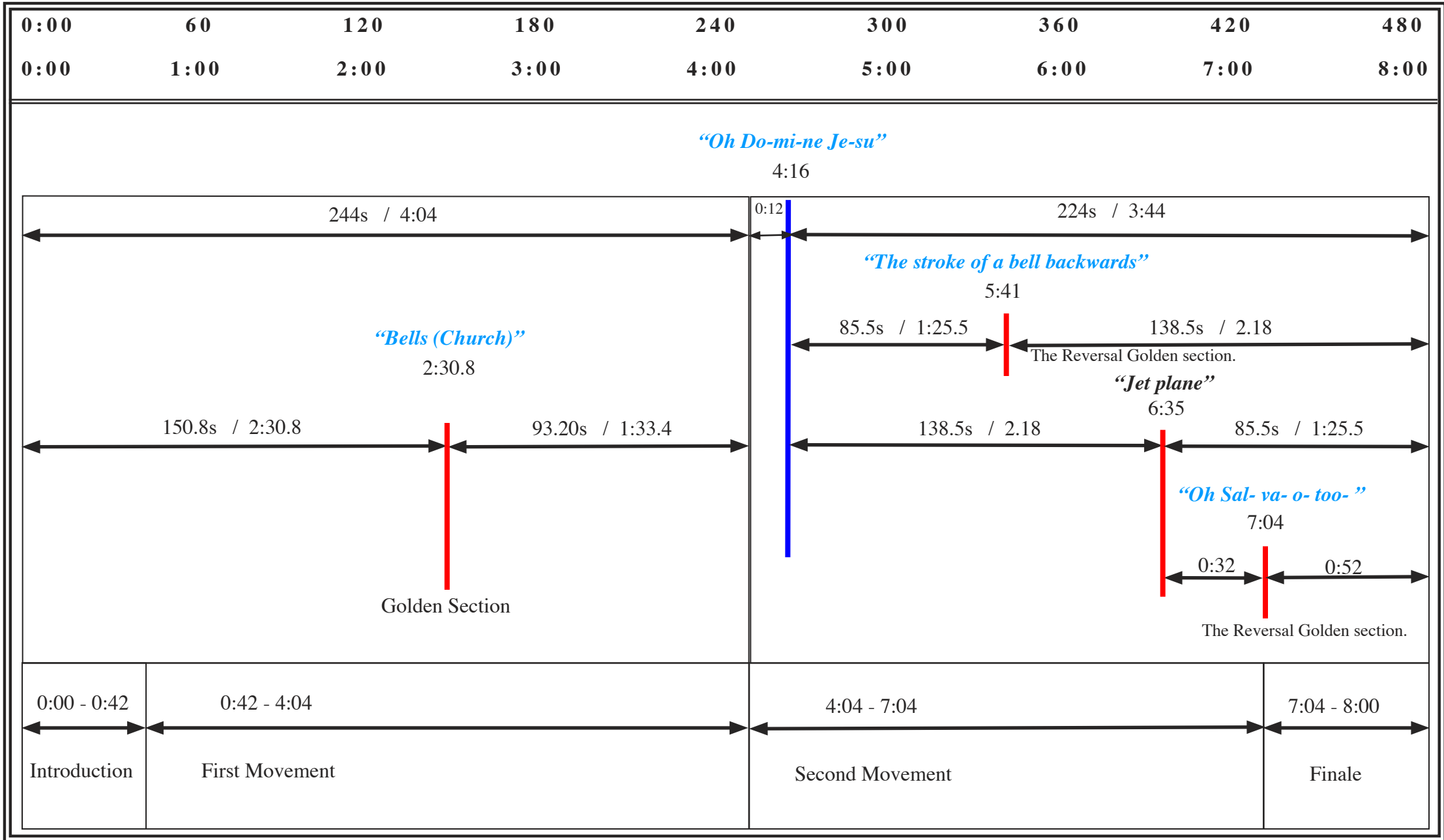
At 7:06 through 8:00 we find that the *Finale (coda)* is written in contrast to the beginning of the composition. Varèse approaches the ending with complex sound-objects which are in opposition to the slowly sounding bells of the Introduction (but just as majestic in sonority). And, we hear again the modification of

* See page 26 for the Time Line Analysis of the Golden Section of Varèse’s *Poème Électronique*.

the siren (call) which repeats twice. This is the last call for the *glissandi* of the jet plane, complex sound-objects from a machine, fast sine tones and sirens.

The following Chart 3 is a time line analysis of the Golden Section in *Poème Électronique*.

Chart 3: The following Time Line Analysis is the representation of the Golden Section in *Poème Électronique*.



Conclusion

The entire composition of *Poème Électronique* is full of sequences of actions and sound-objects which range from narrow bursting sounds to large complex tones. The dynamics are prevalent and well distributed through out the composition, and the sounds are proportioned in that Varèse made excellent use of synthetic and natural sound-objects, especially the human voices and the usage of vowels, as well as balancing the effects as in reverb and the usage of space. Varèse's *Poème Électronique* is a lesson in the electronic arts in how to compose with natural and synthetic sounds as sound-mass(es) and how to place those sounds in a musical context.

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