THE UNIVERSITY OF CHICAGO

TESSERACT, ACT I. FOR AMPLIFIED SOPRANO SAXOPHONE QUARTET AND OCTOPHONIC SPEAKER ARRAY

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE DIVISION OF THE HUMANITIES

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BY

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I would like to dedicate this dissertation to my grandmother Olidia Bussad; I love you and miss you.

SCORE

Rodrigo Bussad

Tesseract, Act I.

For amplified soprano saxophone quartet and octophonic speaker array

(2022)

Rodrigo Bussad

Tesseract, Act I.

For amplified soprano saxophone quartet and octophonic speaker array
(2022)

Score in C

Foreword

TESSERACT, ACT I.., my dissertation piece and research project at the University of Chicago, is a work for amplified soprano saxophone quartet and octophonic (8-channel) fixed media electronics. This work plays with spatial dimensions, imagination, and perception. The universe, as we know it, exists in three dimensions: height, length, and width. As tri-dimensional beings, we can only perceive dimensions equal to or below ours, like the two-dimensional x-y coordinate plane. But this limitation hasn't stopped humans from imagining dimensional universes with more than these three elements. The concept of the **fourth dimension**–a dimensional plane above ours and inaccessible from our tri-dimensional reality–for instance, was first published by French mathematician Jean le Rond d'Alembert in his book *Dimensions* (1754), and popularized by Carl Sagan on his television show *Cosmos: A Personal Voyage* (1980). During his explanation on the fourth dimension, Sagan summons the **Tesseract**[1]. The TesserAct I.s a four-dimensional structure that exists only in the realm of possibility, thus its true form remains only a hypothesis. My work, TESSERACT, ACT I. is an attempt to sonically portray the idea of a hypercube, to build an aural Tesseract. The sound in this structure is designed to actuate the listener's inner ear perception, or psychoacoustic space of listening within an internal, subjective reality. The sounds' height, length, and width are used in such a way that allows a fourth sonic dimension to dynamically emerge as psychoacoustic phenomena, thus inviting the listener to play along with what belongs in the acoustic realm and what emerges within one's inner aural space.

TESSERACT, ACT I. is an attempt to alter a concrete physical space into an imagined and real aural space, revealing a sonic reality that may emerge both physically and metaphysically. Within the invisible, inner auditory layer of psychoacoustics, space and silence have equal weight. This allows physical performance space to become internally active within the ear/mind of the listener. Most importantly, the listener's motions throughout the space make its dimensions malleable, so that the listener's "when and where" dictate the sonic experience. The concept of building such an auditory space is by no means novel. Spatialized audio and psychoacoustic games, and can be found in the musical traditions of Japanese gagaku and Indonesian gamelan, for example. In contemporary Western music works such as *Kontakte* (1958-60) by Karlheinz Stockhausen, *Atmosphères* (1961) by Györgi Ligeti, and the grandiose *Prometeo* (1981-84) by Luigi Nono are canonic examples of how auditory effects can be explored with the combination of orchestras, electronics, and spatialized seating plans. Technologies used here in TESSERACT, ACT I., such as ambisonics and imaginary space creation are crucial in the fast-growing field of virtual reality (VR).

TESSERACT, ACT I. builds its space through invisible sonic lines projected by either acoustic instruments (four amplified saxophones) or by fixed-media electronics (projected via an array of eight speakers). These elements interact through a series of psychoacoustic phenomena, which provocatively destabilize the independent identity of any single element. Later movements of this work will explore additional spatial electronic music techniques further in-depth, using tools such as signal analysis and decomposition to more fully explore the theories of sound discussed below.

What happens inside of the TESSERACT, ACT I.. will be discovered by whomever ventures into it during this performance/installation. The listener will be invited to move around in the space while listening, thus becoming

[1] The TesserAct I.n Physics is portrayed by a hypercube, which is a visual representation of two tri-dimensional cubes drawn in a bi-dimensional x-y coordinate plane.

a living part of the performance experience. The piece shortens the barrier between where the sound is produced and where it is perceived, thus enabling a mode of active listening, where the listener becomes an important element of the work. As such, this work expands several horizons simultaneously: what a saxophone quartet can do instrumentally; how fixed media electronics can be spatially deployed; and most importantly, how the listener's inner perception can become a crucial filter for the living work. This piece brings creative concepts and innovative theories from scientific, perceptual research into the aesthetic space of musical creation. Above all things, TESSERACT, ACT I., promotes an immersive, sensorial, and extremely playful experience to the interactive audience.

The following text delves into the theory behind the psychoacoustic and ambisonics concepts used to compose this work. A detailed roadmap of the form of the piece (TABLE 1) follows. Finally, this document closes with detailed performance notes where the technical set-up instructions of the work are provided with additional commentary. When the score is published, the crucial technical instructions will move here, after the foreword, and remain with the score.

Auditory Scene Analysis (ASA)

This dissertation project is heavily based on Auditory Scene Analysis[2] (ASA), a term coined by psychologist Albert Bregman and published his well-regarded book in 1990. Auditory Scene Analysis is, very broadly speaking, the study of the perceptual organization of sound, organizing listening into two categories: Analytic and Synthetic. In the **analytic listening** mode one can identify (conscious, that is cognitive) the harmonic spectrum of a pitch. When a single pitch rings, other sympathetic pitches are activated to create the harmonic spectrum. These sympathetic pitches are all proportional to the fundamental frequency of the single pitch. For example: if one of the tones is 1046.50 Hz one's ears can analyze it as the thirty-second partial of 16.35 Hz (C_0). By applying special techniques to the saxophone, or an oscillator to a pure sine tone, the same C_6 is now slightly flattened and could also be associated as a flat seventh partial (in this case the 18th partial) of a hypothetical 18.35 Hz (D_0). What if the two C_6's are ringing at the same time? What if the result is a "false impression" of a lower frequency emerging from the 2 Hz difference between the two hypothetical fundamentals? What if I then modulate this new pitch by adding noise to its source?

With these questions I enter into the holistic characteristics of a tone (sub-conscious, perceptual), which, according to Bregman, is defined as **synthetic listening**. According Stanford University's CCRMA: Center for Computer Research in Music and Acoustics, on the article ASA 25[3]: "Analytic versus Synthetic Pitch. Description: Our auditory system has the ability to listen to complex sounds in different modes. When we listen analytically, we hear the different frequency components separately; when we listen synthetically or holistically, we focus on the whole sound and pay little attention to its components."

The sound experiment proposed by G.F.Smoorenburg (1970) in his work "Pitch perception of two-frequency stimuli," exemplifies the different experiences that listeners can have while "a two-tone complex of 800 and 1000 Hz is followed by one of 750 and 1000 Hz. If you listen analytically, you will hear one partial go down in pitch; if you listen synthetically you will hear the pitch of the missing fundamental go up in pitch (a major third, from 200 to 250 Hz)." J. Acoust. Soc. Am. 98, 924-942.

Before continuing, I ask the reader now to take a while and listen to the audio file below.

[2] Bregman, Albert S. 1996. Auditory scene analysis. MIT Press.
[3] Online source: https://ccrma.stanford.edu/~malcolm/correlograms/index.html?48%20Analytic%20Vs%20Synthetic%20Pitch.html

Figure 1 – Analytic Vs. Synthetic Listening

Following the concepts within ASA's analytic and synthetic processes in which auditory attention happens, Bregman divides attention into two modes: voluntary (cognitive) and involuntary (subconscious). I have translated these modes into the following table of musical material:

Figure 2 – Voluntary Vs. Involuntary Attention

Voluntary Auditory Attention	**Involuntary Auditory Attention**
Pitch	Critical Bandwidth
Tessiture	"Busy-ness" of sonic texture
Intensity (Physical)	Loudness (Perceptual)
Timbre Modulation	Auditory Masking
Attention vs. Time	Attention vs. Time
Filtering	Continuity Illusion

According to Bregman, our auditory attention is inversely related to time (meaning the more the time over the same stimulus, the less attention the brain will dedicate to the former), and can process a limited amount of inputs at the same time, thus meaning that the more a sound is iterated or sustained, the less attention our auditory perception will reserve for that stimulus.

For me, auditory attention fits both the voluntary and involuntary attention columns of TABLE 1, because its perception over time relates individually to each listener's experience during the performance of the work. Also, this simple concept can be used in interesting ways, such as juxtaposing several layers of sonic material over different scopes of lengths. This creates a structure of "auditory attention dynamics," in the same way that our ears are immediately drawn to louder volumes rather than softer ones. The second to last section of the work (R.L. U) is a good example of attention versus time and where I expect a part of the audience to activate the analytic while the other sum the synthetic auditory modes. The section is composed of an "exhausting" and descending flux of microtones in the saxophones being juxtaposed by a sequence of accentuated sound bursts in the electronics which will gradually modulate itself as to become a shadow of the microtonal cascade in the saxophones, becoming a mirage of the latter.

Informed by these basic concepts of ASA, TESSERACT, ACT I. renders a playful stimulation of both cognitive and perceptual. The goal is that by dislocating themselves or just turning their heads left and right, the listeners inside this sonic structure can freely play with the acoustic differences between two or more sonic phenomena happening at the same moment in the space surrounding as in the individual inner ear. As previously mentioned, TESSERACT, ACT I. plays in particular with several concepts of cognitive perception and psychoacoustics, which I will now define and explain. The sonic samples provided in this dissertation elaborate the continuity illusion, critical bandwidth, and auditory masking.

Continuity illusion is generated when there is the impression that a sound is continuously produced by the same sound source, even though it is being produced by a different source. A way to achieve this effect is by applying a transient (attack) and/or a white noise source to the primary source while shifting the “continued” sound to the secondary one, misleading the ear apparatus and thus providing a fake impression of limitless continuity. This idea has much to do with the physical direction of the primary source in the space it inhabits, which can also provoke interesting reactions in the listener's ears. In TESSERACT, ACT I., I conveyed this effect via the juxtaposition of artificial sine tones to the ones produced by the saxophones. The material in Rehearsal Letter A (R.L. A) is actually based on playing with the idea of continuity Illusion, where the saxophones fade out, the sine tones continue, coming from a different point in space. The concepts behind the process of composition for this section were: frequency proximity, spectral similarity, and correlations of the changes in acoustic properties. Figure 3 provides a recording example from a previous version of the work (2017). The psychoacoustic phenomenon is surely improved perceived during a live performance of the work, since listening with headphones collapses and flattens the sonic space into two dimensions (LEFT/RIGHT).

Figure 3 – Tesseract, Continuum (ver. 2017)

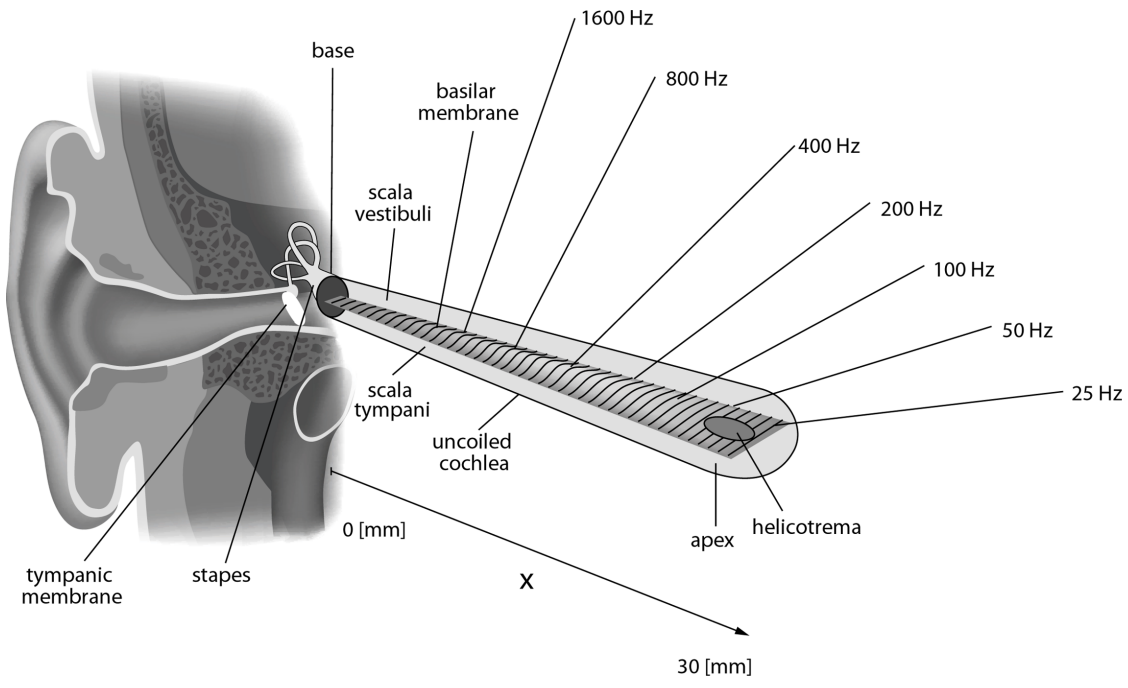
The concept of **Critical Bandwidth (C.B.)**, coined by American physicist Harvey Fletcher in 1933, an alumnus of the University of Chicago, describes how the human ear and brain process tones. In broader terms, C.B. is the difference in frequency between two sine tones, which happens in the inner ear of the subject, stimulating the basilar membrane, in which the sensation of roughness disappears and the tones sound "smooth". This "sweet spot" within the basilar membrane is called the critical band. A byproduct of two tones existing within the critical band is **beating**. The phenomenon of “beating” is an acoustic one, meaning that happens while sound is travelling in the air. It can be explained by the conflicting partials of two sounds. The experience of beating, depending upon critical bandwidth and perception, needs a clearer definition of human body architecture and behavior.

During the performance of TESSERACT, ACT I., although I set the stage for beating to happen by clashing close frequencies against each other, it will depend of the listener’s ears position over the length of the work for it to be perceived or not. The psychoacoustic phenomenon of "roughness", "smoothness" or "beating" happens in the inner ear of the subject, stimulating the basilar membrane. With that in mind while composing I expect for the attentive listener to start to intuitively “scavenge” for beating by slightly tilting ones ears. This is one solid example of the type of active listening I propose with this work.

According to the book *Hearing: an Introduction to Psychological and Physiological Acoustics*[4] (1998) by Stanley A. Gelfand, the basilar membrane, which is located within the cochlea, is thinner and stiffer in its outside edge (closer to the sound source) and it processes higher frequencies. The inner region of the membrane, the "apex", is more elastic and is activated by lower frequencies.

[4] Gelfand, Stanley A. 2017. *Hearing: an Introduction to Psychological and Physiological Acoustics, Sixth Edition*.

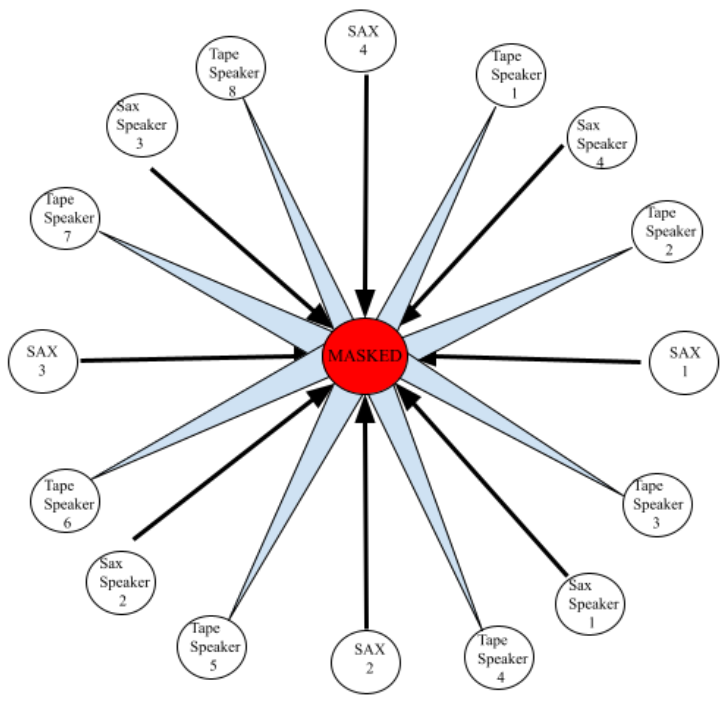
Figure 4 – Basilar Membrane



When the basilar membrane cannot resolve the difference between the two inputs. The ability of the ear to process and hear two distinct frequencies is known as frequency selectivity, thus the critical band happens exactly when the brain understands two frequencies as one, where the second tone will interfere with the perception of the first tone. **Auditory Masking** occurs right at the boundary of frequency selectivity and in the axis of time since the original signal needs to exist first to "be masked" by a second. This all happens in the auditory filters located within the inner ear. The masking signal (second frequency) should always be louder than the original signal (first frequency). Masking will occur more successfully between two signals of the same frequency. There are two types of masking that I use in the work: Masking of a tone-by-a-tone and Masking by-noise. Taking in consideration that masking of tone-by-tone is more complicated to achieve than by noise, masking of a tone-by-a-tone is more pronounced at higher frequencies, Masking increases proportionally with the masker level at high frequencies. In TESSERACT, ACT I., masking of a tone-by-a-tone happens frequently in section A when the first frequency of 1046.50 Hz will be masked by the second one, which is slightly flattened if the second one is higher in volume. Masking here happens because the sine tones are processed in the same region of the basilar membrane.

One place in the work where masking-by-noise is used is in mm. 299-308, approx. 34 seconds of duration. Tape speakers 1-8 gradually emit a continuous white noise signal (starting at m.332) that will completely mask saxophones 1-4 playing *forte* at a continuous tone of 1046.502 Hz (C6). Figure 5 represents visually what will happen in these measures of the piece.

Figure 5 – Masking Effect Diagram 1

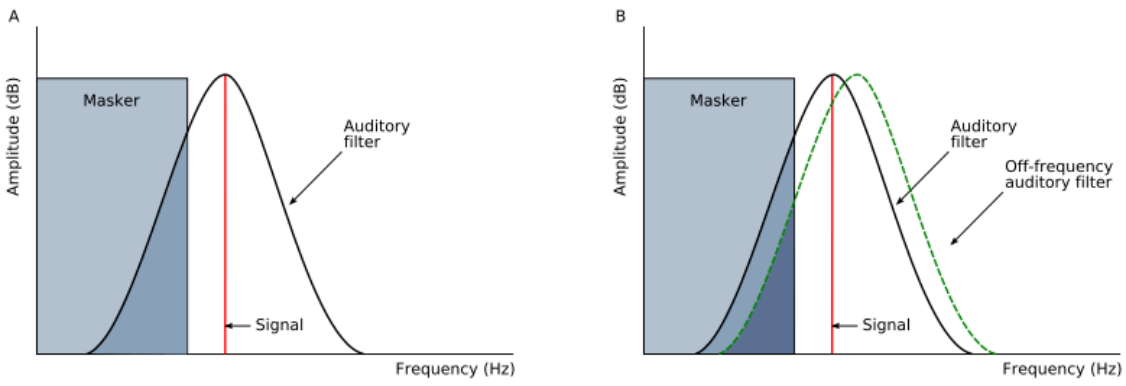


For more of the theory behind “masking-by-noise” I bring some of my notes taken from Prof. Dr. –Ing. Bernhard U. Seeber’s master class entitled “Psychoacoustics (s): Masking By Noise”[5], taught at the Technical University of Munich (2020). Recalling here that masking operates in the hearing threshold within the cochlea, for that reason auditory filters are closely associated with masking.

The section of the work described above was based in the graphic shown in Figure 6: Equivalent Rectangular Bandwidth (ERB)

- C.B. of the filter increases in size with increasing frequency also the filter itself becomes more asymmetrical with increasing level.
- Lower Frequencies will mask higher frequencies more effectively than the contrary.
- Masking is also proportional to volume.

Figure 6 – Masking Effect Diagram 2



Ambisonics[6]

When it comes to creating psychoacoustic effects in sound, spatial audio bears incredible potential. First, a brief history[7], and definition of Ambisonics. The pioneering British engineer Michael Gerzon at Oxford University developed Ambisonics in the 1970’s. As Daniel Arteaga covers on his article Introduction to Ambisonics (2018) “Although hardware Ambisonic systems were soon developed, they were never a commercial success. However, Ambisonics has many nice features and has attracted the interests of researchers in spatial audio since the early beginning. In the 90s, the theory for higher Order Ambisonics was developed. In the academic environment, Ambisonics is still nowadays a topic of research”.

Ambisonics framework is to capture, represent and manipulate spatial acoustics, based on physical principles of the acoustic field. The concept being a full-sphere of surround sound; where all speakers are equivalent in amplitude from the center of the sphere (Isotropic). Because ambisonics operates in B-format (speaker independency), it makes the spatial recording, as well as the editing/mixing processes the ultimate playback format for both spatial and non-spatial audio recordings.

Ambisonics B-Format (Spherical Harmonics)

- Spatial information is represented in B-format.
- In Ambisonics, editing/mixing is done in B-format (the complexity of B-format is hidden)

[5] My notes were taken on November 1st, 2020 while watching the lecture master class “Psychoacoustics (s): Masking By Noise” recorded on January 27th, 2020. Available on youtube: https://www.youtube.com/watch?v=R9UZnMsm9o8&t
[6] My notes were taken on September 27th, 2021 while watching the webinar “Ambisonics Elements” recorded on June 10th, 2020 and lectured by Leonard Moskowitz: https://www.youtube.com/watch?v=TT726EBb1B0
[7] Arteaga, Daniel. (2015). Introduction to Ambisonics. Preliminary version of some lecture notes on Ambisonics. 4.

- The tridimensional speaker arrangements in Ambisonics work in quantitatively and is expressed by the term “order”, whereas the higher the “order”, the better will be the spatial resolution. The number of “orders” goes up to seven (64 channels).
- First-order B-Format has 4 channels of loudspeakers
- Second-order B-Format has 9 channels of loudspeakers (8+1)
- Third-order B-Format has 16 channels of loudspeakers

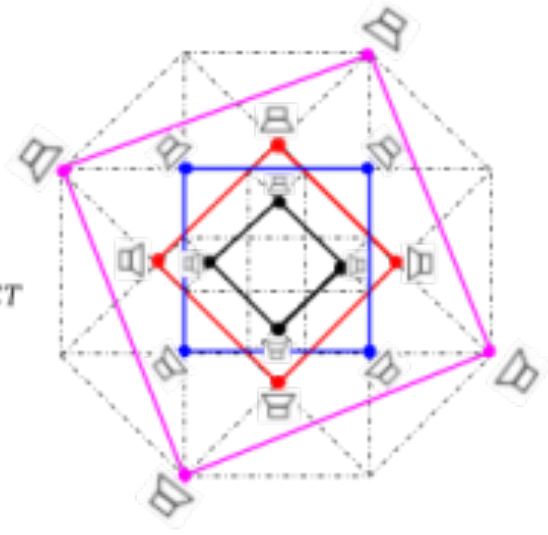
Because Ambisonics works with sound direction, the complexity of B-format grants the engineer sonic precision (in space) from the speakers. As Arteaga follows in his collaboration in the article: Subjective Evaluation of the Localization Performance of the Spherical Wavelet Format Compared to Ambisonics[8] (2021), “A common goal of most spatial audio techniques is to reproduce the precise location and size of sound sources. Ambisonics is a well-established spatial audio technique that renders sound sources with increasing accuracy as the Ambisonics’ order increases.”

TESSERACT, ACT I. works in a third-order B-format of Ambisonics, which is considered the minimum for an immersive speaker array playback. The spatialization of the sound is perhaps the most important element in TESSERACT, ACT I., which I imagine being realized in two ways: a live performance with the quartet being part of the spatialization component (orthogonal projection diagram) and also as a sound installation where the pre-recorded saxophone tracks would be played through an extra set of speakers. In both ways the quartet is perceived as a set of four equidistant sound sources in space (a sonic square), and together with three more sets of squares formed by additional speakers, I can achieve a set of four quadraphonic systems, not equidistant with one another, being only equidistant among its related pairs, thus portraying in the clearest way possible, a sonic image of a hypercube.

Through an orthogonal projection seen from above, a **quadraphonic system diagram** is generated. The hypothetical hypercube, which exists in a plane superior to ours (represented by P), generates a series of vertices in which the sum of them becomes a bi-dimensional projection of its source (P'), where P' consists of all the vertices I chose (represented by dots.) These vertices are, in practical terms, where the sound sources will be placed in space (speakers and/or saxophones). The image below in Figure 7 represents how I picture such an arrangement:

Figure 7 – Orthogonal Projection of a Hypercube

Orthogonal projection of a hypercube set as a speaker arrangement for *TESSERACT - Continuum*



[8] Eguinoa, Ruben, Ricardo San Martin, Daniel Arteaga, and Davide Scaini. 2021. "Subjective Evaluation of the Localization Performance of the Spherical Wavelet Format Compared to Ambisonics". 1-8.

In the diagram, the **black square** is where the saxophone quartet musicians would stand, while the **blue square** is where the speakers that are amplifying the saxophones are placed. These speakers would ideally be set in an array above and below the ground level and pointed at a 45˚angle towards the ground floor, promoting a further and more complex spatialization where auditory masking happens more effectively. The same principle is applied to the electronics track. The **red square** is the set of speakers that will play the electronic track, while the **pink square** is where the subwoofers will be placed. The subwoofers will be suspended from the ground level (to avoid the "coupling effect"-- an unwanted increase in volume) and set below the surface level (within the hollow created by the suspended floor). Since low frequencies travel through the air in a spherical shape, there is no need to point the subwoofers toward a specific point in space. In the case of a sound installation, the saxophones would be replaced by a set of smaller (up to 5") speakers. Since multiple "sonic hot-spots" can be found within the hypercube, the audience should experience this sitting still in one place for a certain amount of time and then venturing to other points within the complex set of speakers.

Although I am also working on more feasible solutions to an actual performance of the piece, the ideal place for this setup of speakers would be one that provides a suspended floor, where some of the subwoofers and speakers could sit beneath. With this, a real three-dimensional arrangement of sonic sources could be achieved. Such spaces do exist in North America. I have visited one of these spaces, the semi-anechoic chamber listening room at CCRMA Stanford (Stanford University). In Chicago, a permanent ambisonic playback system can be found at Treshold Auralization Studio, and another examples of possible spaces include The Cube, located at the Virginia Tech Institute For Creativity, Arts, and Technology. Currently, in my research on sound spatialization, I am studying more in-depth the dissertation on **Vector Base Amplitude Panning (VBAP)**, by Finnish audio researcher Ville T. Pulkki, professor of Aalto University (2015-.) According to his website VBAP “is a method for positioning virtual sources to arbitrary directions using a setup of multiple loudspeakers. In VBAP the number of loudspeakers can be arbitrary, and they can be positioned in an arbitrary 2-D or 3-D setup. VBAP produces virtual sources that are as sharp as is possible with current loudspeaker configuration and amplitude panning methods, since it uses at one time the minimum number of loudspeakers needed, one, two, or three.”

Working together with the potentialities of spatial audio, I have striven to create psychoacoustic phenomena within the Ambisonics realm, which deals with the precise location of sound, (like continuity illusion and beating) that are also spatialized. These are understood as auditory illusions, which is when the listener is influenced to incorrectly localize a sound. One example of this is the Hass Effect.

Precedence Effect or Hass Effect

The name of this binaural auditory illusion derives from a paper[9] written by Helmut Hass (1951). It occurs by a delay in one of the sound sources (a high transient sound). As professor Leonard Moskowitz describes in his master class, This delay will happen below the listener’s threshold of processing. (Delays below 2 milliseconds – 100 milliseconds.) The listener will pursue the source of the sound coming from the first signal (S) but one or more consecutive sounds can be added to other speakers below the threshold earlier cited. Naturally the “Hass effect” will work with high transient sounds (in the case of saxophones, a slap tongue for example.) At 2ms the sounds are perceived as one source. Anything closer to 100ms or above and the listener will start spotting the echoing of the

[9] Haas, H. (1951). "Uber den Einfluss eines Einfachechos auf die Horsamkeit von Sprache," Acustica, 1, 49–58.

source's location elsewhere. At 50 milliseconds impulse signals: for signals with constant amplitude this can go up to the 1 sec.-2sec. range.

In TESSERACT, ACT I. works to recreate the psychoacoustic phenomena described above the compositional process of the work was based on the idea of creating sonic vectors that over the axis of time will cover the virtual space projected by the speakers. This occurs in Figure 8 (m. 279, approx.4 seconds of duration) the graphic demonstrates the sonic vectors (in colors) operating over time in order to achieve the Haas Effect between saxophone 1 to 4 and speakers 1 to 8.

Figure 8 – Haas Effect Diagram

Franssen Effect

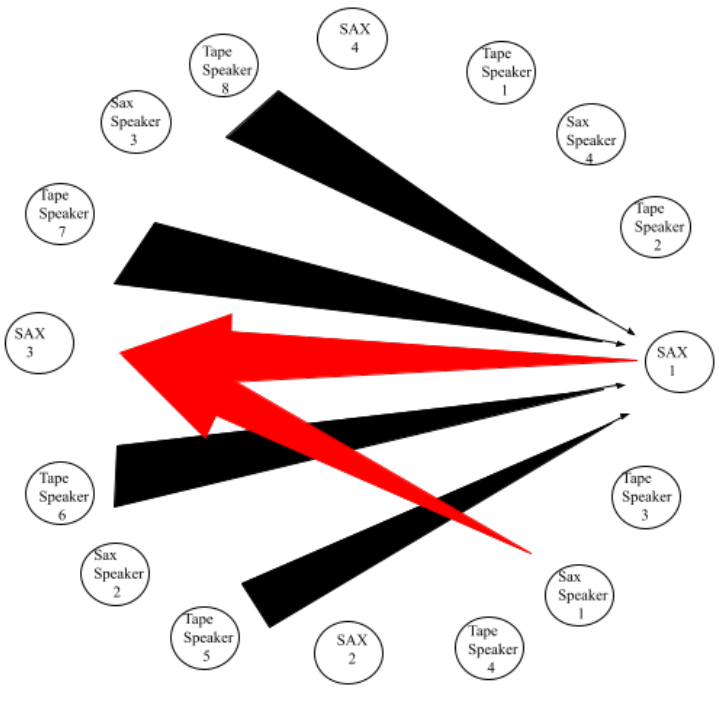
Finally, another illusion that I create in TESSERACT, ACT I. is the Franssen Effect. Written by N.V. Franssen, the book Stereophony[10] (1964) proposes a psychoacoustic experiment named by the author as the Franssen Effect Illusion, or just Franssen Effect. As in the Haas effect, the Franssen effect is an auditory Illusion where the listener located in the space between two or more equidistant sound sources will incorrectly locate the source of a sound. It is divided into two effects possible: Franssen Effect 1 (F.E.1): As a sustained tone in the left speaker (L) decreases (volume) exponentially over time, a same sustained tone, which always will come slightly later than the original source, in right speaker (R) increases in volume until it becomes the main source of sound. The illusion occurs when the listener will still perceive the sound source coming from the left (L) speaker. Franssen Effect 2 (F.E.2): Consists basically of the same process with the only difference is that in Franssen 2 (F.E.2) the auditory illusion will start with one of the speakers generating a steep slope (high transient) attack while right after remaining constant, where the process described in Franssen 1 (F.E.1): starts.

[10] Franssen, N. V. 1964. *Stereophony*. Eindhoven: Philips' Gloeilampenfabrieken, Distributors Cleaver-Hume Press, London].

In the book *Hearing: An Introduction to Psychological and Physiological Acoustics* (1998), Gelfand points out that this Illusion fails to succeed when in a space with close-to-none reflections. Interestingly, Hartmann and Rakerd (1989) showed that the Franssen effect fails to occur when the environment is anechoic (echo free), and explained the illusion based on the plausibility hypothesis" (p.246). This piece of information has alerted me during the crafting of the piece since it is very unlikely that this effect will work in rooms that are extremely "dead".

In Figure 9 (R.L. I, mm. 151 - 155) the graphic demonstrates the sonic vectors (in colors) operating over time in order to achieve the Franssen Effect 1 between saxophone 1 and speakers 5 to 8. Here the multiphonic composed of four pitches will gradually pass from the speakers to the saxophone. The thickness of the arrows (black and red) represents the dynamic level over the time axis (approx. 15 seconds.)

Figure 9 – Franssen Effect Diagram



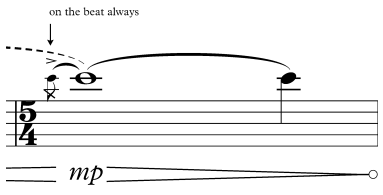
I'll conclude the discussion with performance notes; as you can see, some of these will eventually become part of the published score's preface, to aid in technical set up and performer instruction. Here, my treatment of technological affordances gestures toward the way the piece's sounds were collaboratively shaped with technologies.

Performance Notes:

Saxophones

The score is in concert pitch C.

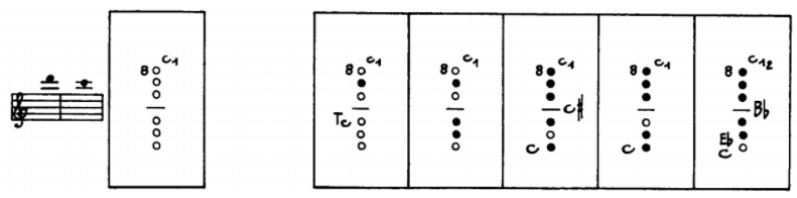
All grace notes are to be performed on the beat. A downward arrow will indicate its entrance.



Accidentals

Unless specified the contrary in the score, for every section of the work where there are two or more players performing a same sustained pitch, as a rule, each ensemble member needs to choose different fingering solutions

for this pitch. The book “The Techniques of Saxophone Playing” (Weiss, Marcus / Netti, Giorgio. 2010), the work *necessità d'interrogare il cielo* (Netti, Giorgio. 1996/1999), and collaborative research with Chicago based artist Jordan Lulloff (~Nois Saxophone Quartet) were used as principal references in the saxophone writing in the piece. The saxophone fingering diagrams for all multiphonics present in the work are provided in the individual parts with a reference number when available.



In TESSERACT, ACT I. saxophones operate up to 1/8th of a tone. The following list provides the inflections (in cents) expected for each microtonal accidental[11]:

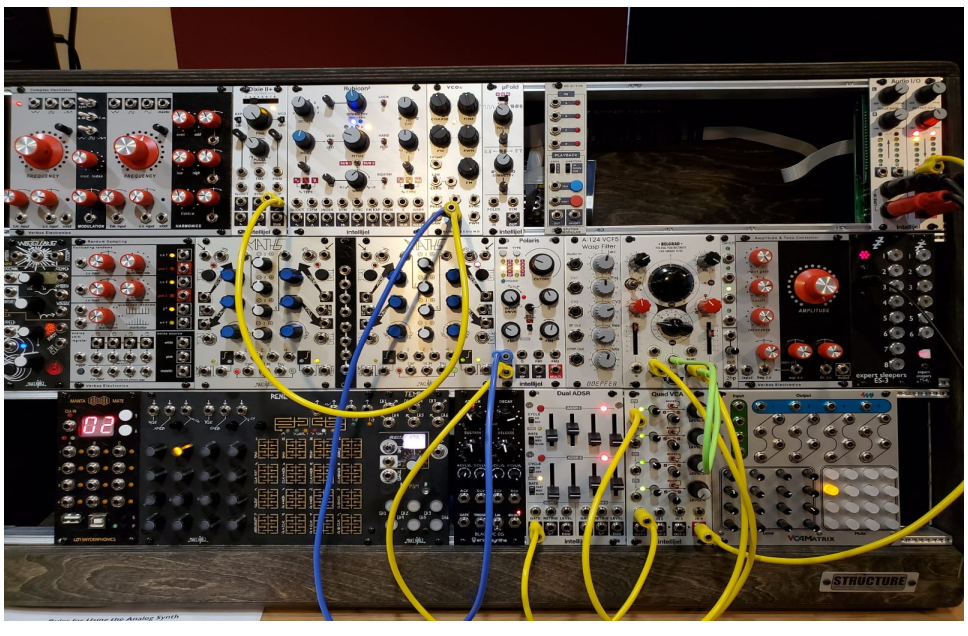
↑↓ sharpened/lowered by an eight-note (+-25 cents)
𝄲 sharpened/lowered by an quarter-note (+- 50 cents)
♯♭ sharpened/lowered by an half-step (+- 100 cents)

Electronics

Synthesizer

The electronics for the recorded sample were created on the modular analog synthesizer and well using the VCV Rack 2 application (which is based on the euro-rack analog synthesizer), where I produced sine tones of the exact frequency as the tones provided by the sound samples I collected from the saxophone quartet previously. For the piece, I used alternate fingerings for all of the tones, which have a very particular microtonal nature to them. These alternate fingerings, together with the micro inflections they may or not produce, are all provided in the score:

After producing all of the sine tones (C_3 to C_6) on the synthesizer, I apply a series of filters; oscillators and envelope-shapers to create patches and alter these newly collected sounds, aiming to produce all the above-discussed sonic phenomena. The photo below shows one of the patches I built during the process at the analog synthesizer in CHIME Studio:



[11] Eight-note inflections can be added to both quarter-note and half-step accidentals.

I have also produced a catalog of qualities for each of the tones from the saxophone, using ASA's synthetic listening concept, looking for the holistic properties of these tones. These are some of my notes taken during the process:

The blue, orange, and red highlights catalog the tones from most to least stable, respectively.

C6

C6 -1: S.U. (fast microtonal beating), overtone prowess

C6- 2: S.U., similar to C6-1 but somewhat darker in timbre

C6-3: U.U., overtone prowess

C6-4: S.U, beautiful extremely fast and controlled beating, less overtone prowess

C6-5: E.U., with a 4th (F) that rings above and a **beautiful** subtone.

C6- 6: U.U, with a fast beating that comes and goes.

C6-7: S.U., with an extreme fast beating

C6-8: U.U., nice color

C6-9: U.U., with a strange mid tone

Volume Measurement

Musical scores are typically marked with dynamic markings to suggest the relative loudness for various parts of the score. While there is no precise standard for the meaning of these dynamic levels, the following table contains a general framework of suggested measured values associated with dynamic markings. It is taken from Backus. Note that the table contains comparisons of decibel levels for the same perceived loudness at relatively high and low pitches. By examining those levels you can see that the relative intensity levels in decibels of low-pitched sounds must be increased for soft dynamic levels. That is, you have to boost the bass more for soft sounds. This is a result of the ear's progressive discrimination against bass for soft sounds. The dynamic levels are also listed in the units' phons and sones, which are units designed to measure the perceived loudness by the normal human ear. The dynamic levels for the speakers in the score are notated as in for an acoustic instrument, from *piano* to *forte* and its varieties in between and beyond. Although the dynamic levels of the tape file were designed for the distance of r = 4 meters from the center of the speaker array it is recommended that a new level automation is made for every room a new performance of TESSERACT, ACT I. takes place.

The table [12] headed "Multiple of Threshold" gives the multiple of the standard threshold of hearing for a 1000Hz[13] tone. This table should be used as a parameter for the volume measurement of a performance of the work.

Multiple of Treshold (Dynamic levels measured in decibels)

Dynamic Level	Decibels at C_6(1024 Hz)	Multiple of Threshold	Decibels at A_1(55 Hz)	Phons	Sones
Threshold of pain	120	10^{12}	130 10 x I_C*	120	256
fff	100	10^{10}	113	100	64

[12] This text and table were taken from http://hyperphysics.phy-astr.gsu.edu/
[13] Multiple of the required level IC at C6(1024 Hz). TESSERACT, ACT I. work with C6 at 1046.502Hz.

			$20 \times I_C^*$		
f	80	10^8	93 $20 \times I_C^*$	80	16
p	60	10^6	79 $80 \times I_C^*$	60	4
ppp	40	10^4	63 $200 \times I_C^*$	40	1
Threshold of hearing	0	1	40 $10{,}000 \times I_C^*$	0	...

The download link for the tape file as well the click track (.rpp) of the work can be found at:

https://www.rodrigobussad.com/music

Stage Diagram, Speaker Array, Gear Inventory and Installation Diagram

DAW: Reaper (latest version is recommended). Free download at: https://www.reaper.fm/download.php

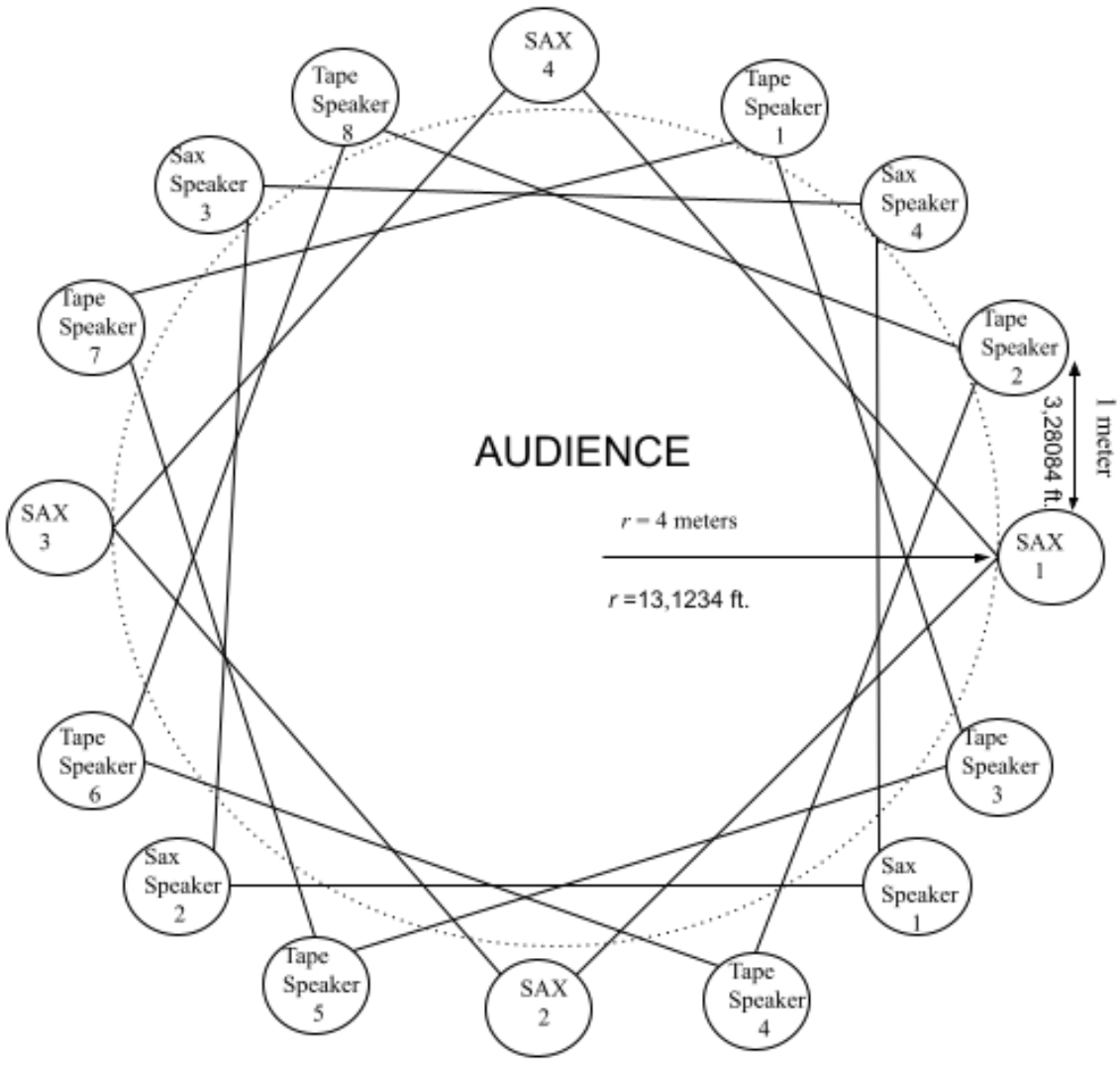
Interface: An audio interface or mixing board (with a USB connection) with 4 – input and 16 – output channels is required.

Microphones: four condensed microphones are necessary. The nature of the microphone can vary from a small capsule to a lava microphone to be attached at the bell of the instrument.

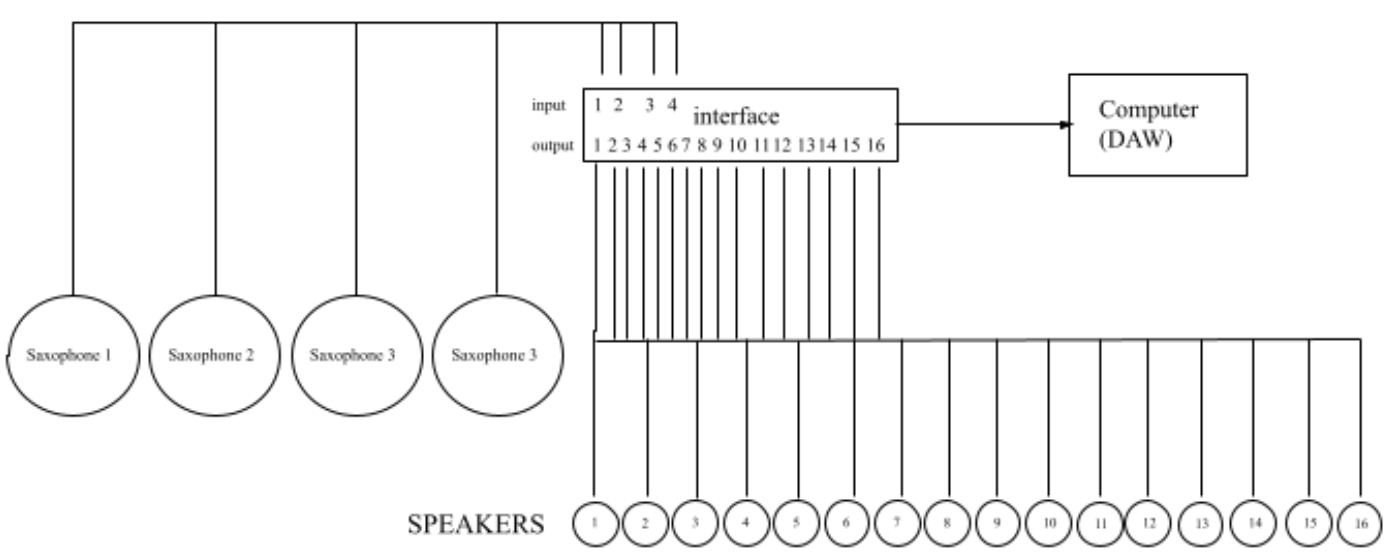
Speakers: This piece requires a number of 12 amplified loudspeakers (audio monitors) that must be equal in model and size. It is recommended for the speaker's size to be of 5 inches (fq. range of 50 Hz to 20 kHz). 8 inches (or more) speakers will also work, but nothing less than 5 inches is recommended. The speakers, together with the saxophones line up must be equally distant from one another, as well in an equal height as showed in diagram 1.1. The measurement chart is provided in the Speaker Array Diagram. Thinking of the availability of the performance for this work, the following Speaker array setup is also provided. In this diagram the orthogonal projection designed for *TESSERACT, ACT I., ACT I.* is provided.

Speaker Array Diagram

Total diameter: 26,2467 ft. / 8 m
Speaker/Saxophone distance: 3,28084ft. / 1 m
Speaker/Saxophone height: 5,24934ft. /160 cm



Signal Path and Installation setup diagram



TESSERACT, Act I.'s SECTION MAP

	Intro	A	B	C	D	E	F	G*	H	I	J	K	L	M**	N	O	P	Q	R	S	T***	U	V	W****
Length	04'00"	02'27"	01'15"	01'58"	02'39"	01'38"	01'15"	01'51"	02'51"	04'08"	01'00"	05'03"	01'15"	00'57"	01'15"	01'06"	01'15"	01'37"	01'33"	01'15"	04'04"	04'57"	00'34"	01'15"
Material	**Electronics**	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	S. Quartet/ Electronics	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	S. Quartet/ Electronics	S. Quartet/ Electronics	S. Quartet/ Electronics	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	S. Quartet/ Electronics	**Electronics**	S. Quartet/ Electronics	S. Quartet/ Electronics	S. Quartet/ Electronics	**Electronics**
Psychoacoustics																								
Continuity Illusion																								
Beating																								
Auditory Masking																								
Envelope Transformation																								
Haas Effect																								
Franssen Effect 1&2																								

G: Sleek/Ridged Time/Space (temps doux et strié, term coined by Boulez's in Musique Aujourd'hui. Paris. Gallimard, 1963.)
M: Amplitude Equanimity between saxophones and electronics.
T: Shepard Tone also happening in both saxophones and electronics.
W: Octophonic Spatialization in the electronics, which will be the compositional material of TESERACT ACT 2, which will be purely composed by the electronics part.

TESSERACT

Act I

for amplified soprano saxophone quartet and octophonic speaker array

Electronics Intro

Rodrigo Bussad (b.1985)

Soprano Saxophone 1

04'00"

A ♩=60 **(the second)**
Entrance at 04'01"

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

6

(+25 -25 0)

Sop. Sax. 1

p

Sop. Sax. 2

on the beat always

p

sub. p molto

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

p *p* *p*

Elect. 2.

mp *f*

Elect. 3

mp

Elect. 4

p *f* *f*

Elect. 5

p *f* *f*

Elect. 6

p *mp*

Elect. 7

p *mp* *f*

Elect. 8

p *p* *p*

12

Sop. Sax. 1

add undertone

on the beat always

p gentile *(p)*

Sop. Sax. 2

71

p

Sop. Sax. 3

add undertone

p *p gentile*

Sop. Sax. 4

71

p *p*

Elect. 1

mf *mf* *sub. mf* *sub. mp* *p*

Elect. 2.

mp *mp* *p*

Elect. 3

f *mp* *mp* *p*

Elect. 4

mf *mf* *sub. p* *mp* *mp* *p*

Elect. 5

mf *mf* *sub. mf* *mp* *mp* *p*

Elect. 6

p *f* *mp* *mp*

Elect. 7

mf *mp* *p*

Elect. 8

mf *sub. mf* *sub. mp* *p*

18

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

5

ppp

p

21

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

mp *p* *f* *sub. p*

26

71

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

f

p

mp

30

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

71

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

33

25

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

bisbi.

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

35

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

f

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

f

Elect. 7

f

Elect. 8

f

B Electronics Interlude I

39

01'15"

Sop. Sax. 1

40

C

Sop. Sax. 1

Sop. Sax. 2

f

Sop. Sax. 3

f (same as sax. 4)

Sop. Sax. 4

f (same as sax. 2)

Elect. 1

Elect. 2.

Elect. 3

(w/ reverb)

(reverb: 8 seconds)

f

Elect. 4

noise
pulse

f (same as sax. 2)

Elect. 5

noise
pulse

(w/ reverb)

(reverb: 8 seconds)

f (same as sax. 2)

Elect. 6

noise
pulse

f (same as sax. 3)

Elect. 7

noise
pulse

f (same as sax. 3)

Elect. 8

47

Sop. Sax. 1

f (same as sax. 3)

Sop. Sax. 2

f

Sop. Sax. 3

Sop. Sax. 4

f (same as sax. 1)

Elect. 1

noise pulse

(w/ reverb)

f (same as sax. 4)

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

(w/ reverb)

(reverb: 8 seconds)

f

Elect. 6

Elect. 7

(w/ reverb)

(reverb: 8 seconds)

f

Elect. 8

noise pulse

(w/ reverb)

f (same as sax. 4)

55

Sop. Sax. 1

f

Sop. Sax. 2

Sop. Sax. 3

f

Sop. Sax. 4

(reverb: 8 seconds)

Elect. 1

f

noise
pulse

Elect. 2.

f (same as sax. 1)

noise
pulse

Elect. 3

f (same as sax. 1)

Elect. 4

Elect. 5

(w/ reverb)

(reverb: 5 seconds)

Elect. 6

f

(w/ reverb)

(reverb: 5 seconds)

Elect. 7

f

(reverb: 8 seconds)

Elect. 8

f

59

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

p

p

f

f

(reverb: 3 seconds)

f

noise
pulse

f (same as sax. 4)

noise
pulse

f (same as sax. 4)

noise
pulse

f (same as sax. 3)

noise
pulse

f (same as sax. 3)

(w/ reverb)

(reverb: 3 seconds)

f

D

63

31

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

pp *p*

66

Sop. Sax. 1

Sop. Sax. 2

p

Sop. Sax. 3

p

Sop. Sax. 4

p

3

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

poco

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

p

34

70

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

74

35

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

36

77

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

81

37

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

38

83

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

E

86

Sop. Sax. 1

[Bells up]Turning Bell side to side (slowly, and not synchronizing with Saxophone 3)

stop moving the bell at default position

Sop. Sax. 2

[Bell up] Turning Bell side to side (slowly, andnot synchronizing with Saxophone 4)

stop moving the bell at default position

Sop. Sax. 3

[Bells up] Turning Bell side to side (slowly, and not synchronizing with Saxophone 1)

stop moving the bell at default position

Sop. Sax. 4

[Bells up] Turning Bell side to side (slowly, and not synchronizing with Saxophone 2)

stop moving the bell at default position

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

89

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

91

41

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

sub. f

p

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

42

93

Sop. Sax. 1

Sop. Sax. 2

(embochure gliss.)

gliss.

timbral/ Tc (fast)

Sop. Sax. 3

Sop. Sax. 4

(embochure gliss.)

gliss.

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

98

43

Sop. Sax. 1

Tc trill (slow)

sub. f

Sop. Sax. 2

bisbi.

(embochure gliss.)

sub. f

f

Sop. Sax. 3

trill 2(fast)
Tc trill (slow)

sub. f

Sop. Sax. 4

bisbi.

(embochure gliss.)

sub. f

Elect. 1

+ granulation
over time

f p f

Elect. 2.

+ granulation
over time

f p

Elect. 3

+ granulation
over time

f p

Elect. 4

+ granulation
over time

f p f

Elect. 5

+ granulation
over time

f p f

Elect. 6

+ granulation
over time

f p

Elect. 7

+ granulation
over time

f p

Elect. 8

+ granulation
over time

f p f

F **Electronics Interlude II**

104

01'15"

Sop. Sax. 1

G

105

Sop. Sax. 1

f *p*

(embochure gliss.)

Sop. Sax. 2

f *p*

Sop. Sax. 3

f *p*

(embochure gliss.)

Sop. Sax. 4

f *p*

Elect. 1

p

Elect. 2.

p

Elect. 3

p

Elect. 4

p

Elect. 5

p

Elect. 6

p

Elect. 7

p

Elect. 8

p

108

45

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

(+75 +25)

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

109

Sop. Sax. 1

6 6 6 6

(sounds like a gliss to C quarter flat)

staccatissimo

Sop. Sax. 2

Sop. Sax. 3

5 5 5 5

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

110

Sop. Sax. 1

Ta trill (slow)

tr

sub. p

Sop. Sax. 2

bisbi.
(faster than saxophone 3)

p

Sop. Sax. 3

bisbi.
(slower than saxophone 2)

sub. p

Sop. Sax. 4

bisbi.
(faster than saxophone 3)

p

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

48

111

Sop. Sax. 1

(tr)

bisbi.

f

5 5 5 5

Sop. Sax. 2

articulate Ta

f

Sop. Sax. 3

f

Sop. Sax. 4

f

6

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

114

Sop. Sax. 1

(microtonal gliss.)

49

5 5 5

p

sub. f

p

Sop. Sax. 2

(embochure gliss.)

gliss.

p

sub. f

p

Sop. Sax. 3

(microtonal gliss.)

p

sub. f

p

Sop. Sax. 4

(embochure gliss.)

6 6 6

p

sub. f

p

Elect. 1

f

Elect. 2.

f

Elect. 3

f

Elect. 4

f

Elect. 5

f

Elect. 6

f

Elect. 7

f

Elect. 8

f

50

116

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

118

Sop. Sax. 1

Sop. Sax. 2

p

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

120

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

H

123

Sop. Sax. 1

Sop. Sax. 2

air

re-articutale

ff

Sop. Sax. 3

p

Sop. Sax. 4

p

Elect. 1

Elect. 2.

white noise

ff

Elect. 3

white noise

ff

Elect. 4

sine tone

f

Elect. 5

sine tone

f

Elect. 6

white noise

ff

Elect. 7

white noise

ff

Elect. 8

128

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

air

re-articutale

ff

sine tone

Elect. 1

f (

white noise

Elect. 2.

ff

Elect. 3

Elect. 4

Elect. 5

Elect. 6

white noise

Elect. 7

ff

sine tone

Elect. 8

f

134

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

air

re-articutale

ff

Sop. Sax. 4

Elect. 1

Elect. 2.

white noise

ff

Elect. 3

white noise

ff

Elect. 4

sine tone

f

Elect. 5

sine tone

f

Elect. 6

sine tone

f

Elect. 7

sine tone

f

Elect. 8

139

Sop. Sax. 1

air

re-articutale

ff

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

white noise

ff

Elect. 2.

sine tone

f

Elect. 3

sine tone

f

Elect. 4

Elect. 5

white noise

ff

Elect. 6

Elect. 7

Elect. 8

144

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

p seco

p seco

white noise

ff

white noise

white noise

pp

white noise

pp

sine tone

f

sine tone

f

white noise

ff

I

150

78

Sop. Sax. 1

mp

f

Sop. Sax. 2

Sop. Sax. 3

p

Sop. Sax. 4

Elect. 1

White noise masking

f

Elect. 2.

White noise masking

f

Elect. 3

White noise masking

f

Elect. 4

White noise masking

f

Elect. 5

f

Elect. 6

f

Elect. 7

f

Elect. 8

f

157

Sop. Sax. 1

mp

ff

Sop. Sax. 2

<ff> <p> <ff><p>

ff

Sop. Sax. 3

<ff> <p> <ff><p>

ff

Sop. Sax. 4

<ff> <p> <ff><p>

ff

Elect. 1

f

f

Elect. 2.

a pulse

f

p

Elect. 3

a pulse

f

p

Elect. 4

a swell

f

f

Elect. 5

f

f

Elect. 6

a pulse

f

p

Elect. 7

a pulse

f

p

Elect. 8

f

f

164

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

21

p

mp

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

White noise masking

White noise masking

White noise masking

f

f

f

f

f

f

8va

p

168

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

f *mp*

Sop. Sax. 4

Elect. 1

a pulse

f

Elect. 2.

a swell

f

Elect. 3

f

Elect. 4

a pulse

f

Elect. 5

a pulse

f

Elect. 6

f

Elect. 7

8va

f

Elect. 8

a pulse

f

173

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

pp poco

ff

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

p

f

(8)

177

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

White noise masking

Elect. 1

Elect. 2.

Elect. 3

White noise masking

Elect. 4

White noise masking

Elect. 5

Elect. 6

Elect. 7

White noise masking

Elect. 8

180

Sop. Sax. 1

Sop. Sax. 2

p

Sop. Sax. 3

81

Sop. Sax. 4

mp

f

Elect. 1

Elect. 2.

f

a pulse

f

Elect. 3

f

a pulse

f

Elect. 4

Elect. 5

a pulse

f

Elect. 6

f

Elect. 7

f

a pulse

f

Elect. 8

185

Sop. Sax. 1
Sop. Sax. 2
Sop. Sax. 3
Sop. Sax. 4
Elect. 1
Elect. 2.
Elect. 3
Elect. 4
Elect. 5
Elect. 6
Elect. 7
Elect. 8

p<poco>
f
mp
ff
a swell
p

191

Sop. Sax. 1

Sop. Sax. 2

86

Sop. Sax. 3

Sop. Sax. 4

p

Elect. 1

f

Elect. 2.

White noise masking

f

Elect. 3

f

Elect. 4

White noise masking

f

Elect. 5

f

Elect. 6

White noise masking

f

Elect. 7

f

Elect. 8

White noise masking

f

195

Sop. Sax. 1

Sop. Sax. 2

f

mp

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

a pulse

f

a swell

Elect. 2.

White noise masking

f

Elect. 3

a pulse

f

a swell

Elect. 4

White noise masking

f

Elect. 5

a pulse

f

a swell

Elect. 6

White noise masking

f

Elect. 7

a pulse

f

a swell

Elect. 8

White noise masking

f

199

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

203

J

Sop. Sax. 1

ppp

serializing the key fingerings over C6 (never repeating the same key fingering until reaching a slap tongue)

sempre mf

Sop. Sax. 2

pp pppp

serializing the key fingerings over C6 (never repeating the same key fingering until reaching a slap tongue)

sempre mf

Sop. Sax. 3

serializing the key fingerings over C6 (never repeating the same key fingering until reaching a slap tongue)

sempre mf

Sop. Sax. 4

serializing the key fingerings over C6 (never repeating the same key fingering until reaching a slap tongue)

sempre mf

Elect. 1

a pulse

f

White noise swell

f

sf f

Elect. 2.

sf f

Elect. 3

a pulse

f

sf f

Elect. 4

White noise swell

f

sf

Elect. 5

a pulse

f

White noise swell

f

sf f

Elect. 6

sf f

Elect. 7

a pulse

f

sf f

Elect. 8

White noise swell

f

sf

207

Sop. Sax. 1

sempre sf

Sop. Sax. 2

sempre sf

Sop. Sax. 3

sempre sf

Sop. Sax. 4

sempre sf *(mf)*

Elect. 1

poco *f* *poco* *sub. f*

Elect. 2.

poco *f*

Elect. 3

poco *f* *poco* *sub. f*

Elect. 4

f *poco* *sub. f* *poco*

Elect. 5

poco *f* *poco* *sub. f*

Elect. 6

poco

Elect. 7

poco *f* *poco* *sub. f*

Elect. 8

f *poco* *f*

211

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

3

poco *sub. f*

Elect. 3

sub. f

Elect. 4

3

sub. f

sub. f

Elect. 5

Elect. 6

3

poco *sub. f*

Elect. 7

sub. f

Elect. 8

3

poco *sub. f*

sub. f

216

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

poco

sub. f

Elect. 2.

sub. f

Elect. 3

Elect. 4

Elect. 5

sub. f

Elect. 6

sub. f

Elect. 7

Elect. 8

K

221

73

Sop. Sax. 1

ord.

sempre mf

5

f *p*

f

Sop. Sax. 2

ord.

sempre mf

5

f *p*

f

sub. mf

Sop. Sax. 3

ord.

5

f *p*

sub.

5

f *p*

Sop. Sax. 4

ord.

sempre mf

sub.

5

f *p*

sub. mf

Elect. 1

noise pulse

mf sempre

5

Elect. 2.

noise pulse

mf sempre

f

5

Elect. 3

noise pulse

mf sempre

5

Elect. 4

noise pulse

mf sempre

Elect. 5

f

noise pulse

mf sempre

f

Elect. 6

5

noise pulse

mf sempre

Elect. 7

noise pulse

mf sempre

5

f

Elect. 8

noise pulse

mf sempre

f

226

Sop. Sax. 1

sub. mf sub. f p f p

Sop. Sax. 2

f p f sub. mf

Sop. Sax. 3

sub. mf f p

Sop. Sax. 4

sub. f p sub. mf f p

Elect. 1

noise pulse f

Elect. 2.

f p

Elect. 3

f

Elect. 4

noise pulse

Elect. 5

Elect. 6

Elect. 7

pp

Elect. 8

noise pulse

230

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

noise
pulse

Elect. 5

Elect. 6

Elect. 7

Elect. 8

233

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

236

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

noise
pulse

Elect. 3

Elect. 4

noise
pulse

Elect. 5

noise
pulse

Elect. 6

noise
pulse

Elect. 7

Elect. 8

noise
pulse

239

Sop. Sax. 1

(mf)

Sop. Sax. 2

2

3

(mf)

Sop. Sax. 3

5

f

p

Sop. Sax. 4

f

3 3 3 3 3

(sub. mf)

Elect. 1

f

Elect. 2.

Elect. 3

noise
pulse

Elect. 4

Elect. 5

Elect. 6

Elect. 7

noise
pulse

Elect. 8

5

242

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

f *p* *sub. mf*

noise pulse

245

Sop. Sax. 1

sub. mf

Sop. Sax. 2

5

f *p*

sub. mf

Sop. Sax. 3

5

f *p*

sub. mf

Sop. Sax. 4

5

f *p*

Elect. 1

Elect. 2.

noise
pulse

Elect. 3

Elect. 4

5

Elect. 5

noise
pulse

f

Elect. 6

5

Elect. 7

noise
pulse

5

f

Elect. 8

f

248

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

noise pulse

251

Sop. Sax. 1

sub. mf *p* *f* 3 3 3 3 3 3

Sop. Sax. 2

f 5 *p* *sub. mf*

Sop. Sax. 3

5 *f* *p* *(sub mf)*

Sop. Sax. 4

(sub mf) *p*

Elect. 1

Elect. 2.

noise pulse

Elect. 3

noise pulse

Elect. 4

f

Elect. 5

noise pulse *f*

Elect. 6

5 noise pulse

Elect. 7

5

Elect. 8

noise pulse

254

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

noise
pulse

257

Sop. Sax. 1

(sub. mf)

2

Sop. Sax. 2

p

f

3

3

3

p

Sop. Sax. 3

sub. f

3

3

3

3

Sop. Sax. 4

5

f

p

(sub. mf)

Elect. 1

noise
pulse

Elect. 2.

noise
pulse

Elect. 3

noise
pulse

Elect. 4

5

Elect. 5

f

Elect. 6

Elect. 7

Elect. 8

noise
pulse

259

Sop. Sax. 1

(sub. mf)

Sop. Sax. 2

2

3

Sop. Sax. 3

p

f

Sop. Sax. 4

f

3 3 3 3 3

p

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

noise
pulse

Elect. 5

noise
pulse

Elect. 6

noise
pulse

Elect. 7

noise
pulse

Elect. 8

noise
pulse

L Electronics
Interlude III

261

01'15"

Sop. Sax. 1

M

262

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

noise
pulse

f

266

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

change of sine tone
nature

Elect. 4

change of sine tone
nature

Elect. 5

noise
pulse

f

Elect. 6

noise
pulse

f

Elect. 7

Elect. 8

270

Sop. Sax. 1

Sop. Sax. 2

f

Sop. Sax. 3

f

Sop. Sax. 4

Elect. 1

change of sine tone nature

f

Elect. 2.

change of sine tone nature

f

Elect. 3

change of sine tone nature

f

Elect. 4

noise pulse

f

Elect. 5

noise pulse

f

Elect. 6

noise pulse

f

Elect. 7

noise pulse

f

Elect. 8

change of sine tone nature

f

275

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

N Electronics
Interlude IV

277

01'15"

Sop. Sax. 1

90

278

O

Sop. Sax. 1

air sound

re-articulate

ff

sempre f

Sop. Sax. 2

air sound

re-articulate

ff

sempre f

Sop. Sax. 3

air sound

re-articulate

ff

sempre f

Sop. Sax. 4

air sound

re-articulate

ff

sempre f

Elect. 1

ff

Elect. 2.

air

ff

Elect. 3

air

ff

Elect. 4

air

ff

Elect. 5

air

ff

Elect. 6

air

ff

Elect. 7

air

ff

Elect. 8

air

ff

280

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

282

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

283

93

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

285

Sop. Sax. 1

Sop. Sax. 2

f *p*

Sop. Sax. 3

f *p*

Sop. Sax. 4

86

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

287

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

dense ping pong delay in the electronics

289

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

81

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

dense ping pong delay in the electronics

291

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

293

21

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

sf

p *f*

p *f*

p *f* *p*

295

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

78

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

dense ping pong delay in the electronics

297

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

P Electronics Interlude V

299

01'15"

Sop. Sax. 1

Q

300

Sop. Sax. 1

sempre f

Sop. Sax. 2

sempre f

Sop. Sax. 3

sempre f

Sop. Sax. 4

sempre f

Elect. 1

White noise signal
200Hz

Elect. 2.

White noise signal
10KHz

Elect. 3

White noise signal
200Hz

Elect. 4

White noise signal
10KHz

Elect. 5

White noise signal
200Hz

Elect. 6

White noise signal
10KHz

Elect. 7

White noise signal
200Hz

Elect. 8

White noise signal
10KHz

304

Sop. Sax. 1

(f)

Sop. Sax. 2

(f)

Sop. Sax. 3

(f)

Sop. Sax. 4

(f)

Elect. 1

(f) Saxophones MASKED

Elect. 2.

(f) Saxophones MASKED

Elect. 3

(f) Saxophones MASKED

Elect. 4

(f) Saxophones MASKED

Elect. 5

(f) Saxophones MASKED

Elect. 6

(f) Saxophones MASKED

Elect. 7

(f) Saxophones MASKED

Elect. 8

(f) Saxophones MASKED

311

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

(f)

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

White noise signal

(f) Saxophones MASKED

104

321

Sop. Sax. 1

(f)

Sop. Sax. 2

(f)

Sop. Sax. 3

(f)

Sop. Sax. 4

(f)

Elect. 1

White noise signal

(f) Saxophones MASKED

Elect. 2.

White noise signal

(f) Saxophones MASKED

Elect. 3

White noise signal

(f) Saxophones MASKED

Elect. 4

White noise signal

(f) Saxophones MASKED

Elect. 5

White noise signal

(f) Saxophones MASKED

Elect. 6

White noise signal

(f) Saxophones MASKED

Elect. 7

White noise signal

(f) Saxophones MASKED

Elect. 8

White noise signal

(f) Saxophones MASKED

R

332

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

transition
to sine tone

Sine Tone
Signal (fine tunning over time)

pp

poco

338

Sop. Sax. 1

(f)

choose a fingering which is possible to bisbi. in the next bars.

Sop. Sax. 2

(f)

choose a fingering which is possible to bisbi. in the next bars.

Sop. Sax. 3

(f)

choose a fingering which is possible to bisbi. in the next bars.

Sop. Sax. 4

(f)

choose a fingering which is possible to bisbi. in the next bars.

Elect. 1

(f) Saxophones MASKED

pp

Elect. 2.

(f) Saxophones MASKED

pp

Elect. 3

(f) Saxophones MASKED

pp

Elect. 4

(f) Saxophones MASKED

pp

Elect. 5

(f) Saxophones MASKED

pp

Elect. 6

(f) Saxophones MASKED

pp

Elect. 7

(f) Saxophones MASKED

pp

Elect. 8

(f) Saxophones MASKED

pp

344

Sop. Sax. 1

(f)

bisbi.

Sop. Sax. 2

(f)

Sop. Sax. 3

(f)

bisbi.

Sop. Sax. 4

(f)

Elect. 1

(f) Saxophones MASKED

Elect. 2.

(f) Saxophones MASKED

Elect. 3

(f) Saxophones MASKED

Elect. 4

(f) Saxophones MASKED

Elect. 5

(f) Saxophones MASKED

Elect. 6

(f) Saxophones MASKED

Elect. 7

(f) Saxophones MASKED

Elect. 8

Saxophones MASKED

(

350

bisbi.

Sop. Sax. 1

Sop. Sax. 2

bisbi.

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

pp

Elect. 2.

pp

Elect. 3

pp

Elect. 4

pp

Elect. 5

pp

Elect. 6

pp

Elect. 7

pp

Elect. 8

pp

355

Sop. Sax. 1
molto

Sop. Sax. 2
molto

Sop. Sax. 3
molto

Sop. Sax. 4
molto

Elect. 1
(f) Saxophones MASKED
pp

Elect. 2.
(f) Saxophones MASKED

Elect. 3
(f) Saxophones MASKED

Elect. 4
(f) Saxophones MASKED

Elect. 5
(f) Saxophones MASKED

Elect. 6
(f) Saxophones MASKED

Elect. 7
(f) Saxophones MASKED

Elect. 8
(f) Saxophones MASKED
pp

transtion to white noise → white noise

360

Elect. 1

transtion to white noise → white noise

Elect. 8

S Electronics Interlude VI

364

01'15"

Sop. Sax. 1

T

365

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

noise Saxophone 4 MASKED

sine tone Saxophone 4 MASKED

Elect. 2.

noise Saxophone 2 MASKED

sine tone Saxophone 2 MASKED

Elect. 3

noise Saxophone 2 MASKED

sine tone Saxophone 2 MASKED

Elect. 4

noise Saxophone 2 MASKED

sine tone

Elect. 5

noise Saxophone 2 MASKED

sine tone

Elect. 6

noise Saxophone 3 MASKED

Elect. 7

noise Saxophone 3 MASKED

Elect. 8

noise Saxophone 4 MASKED

sine tone Saxophone 4 MASKED

370

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

sine tone

Saxophone 1 MASKED

Saxophone 2 MASKED

Saxophone 3 MASKED

378

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

f

Sop. Sax. 4

(pure tone)

f

Elect. 1

p

Elect. 2.

Elect. 3

Elect. 4

sine tone

Saxophone 3 MASKED

f

Elect. 5

sine tone

Saxophone 3 MASKED

f

Elect. 6

sine tone

Saxophone 4 MASKED

f

Elect. 7

sine tone

Saxophone 4 MASKED

f

Elect. 8

384

Sop. Sax. 1

grace notes are to be played with the timbral trill key

f

f

Sop. Sax. 2

grace notes are to be played with the timbral trill key

f 3

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

pp

Elect. 3

+ of a rougher tone

p

Elect. 4

+ of a rougher tone

mp

Elect. 5

+ of a rougher tone

mf

Elect. 6

Elect. 7

Elect. 8

390

Sop. Sax. 1

Sop. Sax. 2

f

grace notes are to be played with the timbral trill key

Sop. Sax. 3

f

Sop. Sax. 4

f

Elect. 1

Elect. 2.

Elect. 3

pp

Elect. 4

p

Elect. 5

Elect. 6

f

Elect. 7

+ of a rougher tone

ff

Elect. 8

+ of a rougher tone

fff

396

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

f

Sop. Sax. 4

grace notes are to be played with the timbral trill key

f

Elect. 1

+ of a rougher tone

fff

Elect. 2.

+ of a rougher tone

ffff

Elect. 3

Elect. 4

+ of a rougher tone

Elect. 5

+ of a rougher tone

mp

Elect. 6

+ of a rougher tone

mf

Elect. 7

+ of a rougher tone

f

Elect. 8

+ of a rougher tone

ff

403

Sop. Sax. 1

simile

f 3

Sop. Sax. 2

f

Sop. Sax. 3

f

Sop. Sax. 4

f

Elect. 1

Elect. 2.

Elect. 3

pp

Elect. 4

+ of a rougher tone

p

Elect. 5

+ of a rougher tone

mp

Elect. 6

Elect. 7

Elect. 8

407

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

simile

simile

simile

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

+ of a rougher tone

+ of a rougher tone

410

Sop. Sax. 1

Sop. Sax. 2

f

Sop. Sax. 3

f

Sop. Sax. 4

f

Elect. 1

+ of a rougher tone

fff

Elect. 2.

+ of a rougher tone

ffff

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

ff

413

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

416

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

f

f

f

f

+ of a rougher tone

mp

419

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

+ of a rougher tone

mf

+ of a rougher tone

f

421

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

f

f

fff

+ of a rougher tone

ffff

+ of a rougher tone

ff

+ of a rougher tone

U ♩=♪=60

424

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

425

Sop. Sax. 1

repetition of phrases are always to be accented on the first note

f 3 3 *p*

simile sempre

for now:
continue with this dynamic motion
for the rest of this section

Sop. Sax. 2

repetition of phrases are always to be accented on the first note

f 6 6 *p*

simile sempre 3 3

for now:
continue with this dynamic motion for the rest of this section

Sop. Sax. 3

repetition of phrases are always to be accented on the first note

f 5 5 *p*

simile sempre

for now:
continue with this dynamic motion for the rest of this section

Sop. Sax. 4

repetition of phrases are always to be accented on the first note

f *p*

simile sempre 3 3

for now:
continue with this dynamic motion for the rest of this section

Elect. 1

f *f*

Elect. 2.

f *f*

Elect. 3

f *f*

Elect. 4

f *f*

Elect. 5

f *f*

Elect. 6

f *f*

Elect. 7

f *f*

Elect. 8

f *f*

427

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

429

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

431

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

433

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

435

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

437

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

438

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

6

6

Sop. Sax. 4

5

5

Elect. 1

f p

f

Elect. 2.

f p

f p

Elect. 3

f p

f p

Elect. 4

f p

f p

Elect. 5

f p

f p

Elect. 6

f p

f p

Elect. 7

f p

f p

Elect. 8

f p

f p

439

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

6

6

Elect. 1

>p

f

Elect. 2.

f p

Elect. 3

f p

Elect. 4

f p

Elect. 5

f p

Elect. 6

f p

Elect. 7

f p

Elect. 8

f p

440

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

6

6

Sop. Sax. 4

5

5

Elect. 1

:p

f p

Elect. 2.

f p

f p

Elect. 3

f p

f p

Elect. 4

f p

f p

Elect. 5

f p

f p

Elect. 6

f p

f p

Elect. 7

f p

f p

Elect. 8

f p

f

441

Sop. Sax. 1

5

5

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

6

6

Elect. 1

f p

Elect. 2.

f p

Elect. 3

f p

Elect. 4

f p

Elect. 5

f

Elect. 6

f p

Elect. 7

f p

Elect. 8

>p

f p

442

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

6

6

Sop. Sax. 4

Elect. 1

f p

f

Elect. 2.

f p

f p

Elect. 3

f p

f p

Elect. 4

f p

f p

Elect. 5

p

f p

f p

Elect. 6

f p

f p

Elect. 7

f p

f p

Elect. 8

f p

f p

443

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

444

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

6

6

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

p

f *p*

f

445

Sop. Sax. 1

5

5

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

>p

Elect. 2.

f p

Elect. 3

f p

Elect. 4

f p

Elect. 5

f

Elect. 6

f p

Elect. 7

f p

Elect. 8

f p

446

Sop. Sax. 1

Sop. Sax. 2

5 5

Sop. Sax. 3

6 6

Sop. Sax. 4

Elect. 1

f p f

Elect. 2.

f p f p

Elect. 3

f p f p

Elect. 4

f p f p

Elect. 5

p f p f p

Elect. 6

f p f p

Elect. 7

f p f p

Elect. 8

f p f p

447

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

448

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

449

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

450

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

451

Sop. Sax. 1

Sop. Sax. 2

5 5

Sop. Sax. 3

5 5

Sop. Sax. 4

Elect. 1

>p f p f >p

Elect. 2.

f p f >p f >p

Elect. 3

f p f >p f >p

Elect. 4

f p f >p f >p

Elect. 5

f p f >p f >p

Elect. 6

f p f >p f >p

Elect. 7

f p f >p f >p

Elect. 8

f p f >p f =

453

Sop. Sax. 1

Sop. Sax. 2

6 6 5 5

Sop. Sax. 3

5 5 6 6

Sop. Sax. 4

5 5

Elect. 1

f f

Elect. 2.

f p f p f

Elect. 3

f p f p f

Elect. 4

f p f p

Elect. 5

f p f p f p

Elect. 6

f p f p f p

Elect. 7

f p f p f p

Elect. 8

>p f p f

455

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

457

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

459

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

460

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

462

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

464

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

465

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

466

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

467

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

468

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

469

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

470

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

471

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

472

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

160

473

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

474

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

475

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

476

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

477

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

478

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

479

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

480

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

481

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

482

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

483

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

484

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

485

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

486

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

487

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

488

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

489

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

490

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

491

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

492

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

493

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

494

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

495

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

496

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

497

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

V

499

Sop. Sax. 1
sub. f

Sop. Sax. 2
sub. f

Sop. Sax. 3
sub. f

Sop. Sax. 4
sub. f

Elect. 1
p *f* *p* *f*

Elect. 2.
p *f* *p*

Elect. 3
p *f* *p* *f*

Elect. 4
f *p* *f*

Elect. 5
p *f* *p* *f*

Elect. 6
p *f* *p* *f*

Elect. 7
p *f* *p* *f*

Elect. 8
p *f* *p* *f*

500

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

502

Sop. Sax. 1

Sop. Sax. 2

Sop. Sax. 3

Sop. Sax. 4

Elect. 1

Elect. 2.

Elect. 3

Elect. 4

Elect. 5

Elect. 6

Elect. 7

Elect. 8

W Electronics
CODA

504

01'15"

fine

Sop. Sax. 1