Wilsonic

- **MTS-ESP + Simple Synth**

WilsonicController

- **MTS-ESP + MIDI Effect**

wilsonic.co

Public Beta Downloads

- MacOS 0.42 Beta
- Windows 10 64-bit 0.42 Beta

Support in Wilsonic Discord

Updated 2024-07-01

Overview

- What Is MTS-ESP?
- Architecture
- Installation
- ODDSound MTS-ESP Overview
- ODDSound Client Support (DAW+Soft Synth setup)
- Microtonal Keyboard
- Pitch Wheel
- Favorites

Scale Designs

- Wilson's Garden
- Moments of Symmetry
- Persian-17 North Indian Raga Scales
- Combination Product Sets
- Euler Genus 6 and subsets
- Recurrence Relations
- Equal Temperament
- Tritriadic
- Scala
- CoPrime Grid
- Diamonds
- Morph
- Partch

What is MTS-ESP?

- MTS-ESP is a protocol for automatically and invisibly sharing tuning data between plug-ins in a DAW in real-time, without any routing or other setup required. ODDSound Github link

- MTS-ESP does not use MIDI data and is not routed through MIDI connections in a DAW.
  - Wilsonic is an MTS-ESP Source and has a simple synth for reference tones
  - WilsonicController is both an MTS-ESP Source and a MIDI Source, but has no simple synth

- Sharing of tuning data happens directly between plug-ins. It does not involve the DAW at all and therefore it will work in any DAW.

- Developers must explicitly add support for MTS-ESP to their plug-ins for this to work. A list of supported plug-ins can be found here

- Most synths that support MTS-ESP will automatically retune to Wilsonic when loaded, however some have a UX preference to enable MTS-ESP (like SurgeXT).

- Synths that don't natively support MTS-ESP can usually be retuned using MIDI pitch bend messages. This can even work polyphonically for synths that support MPE.

What is MTS-ESP?

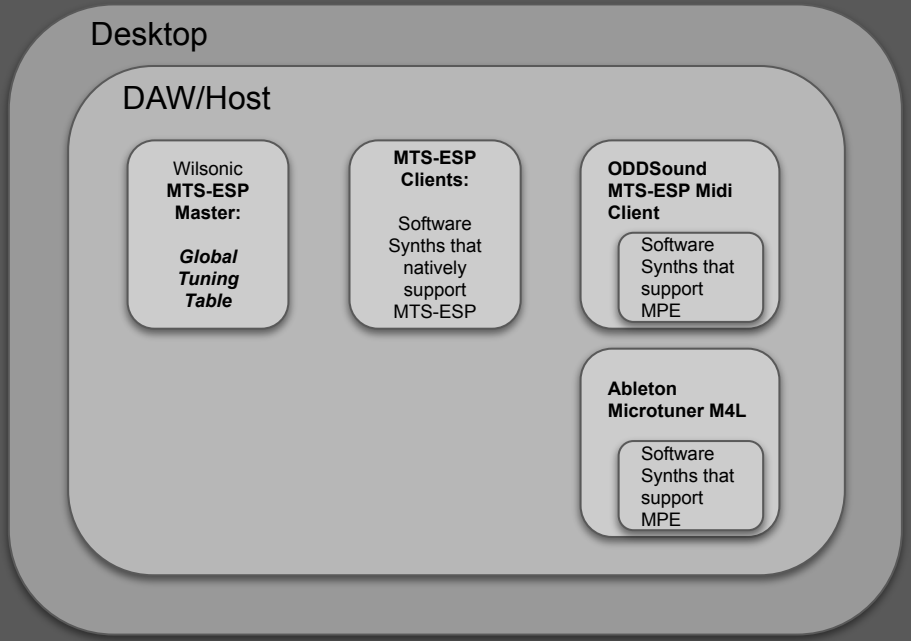
- Synths that don't natively support MTS-ESP can usually be retuned using MIDI pitch bend messages. This works best for synths that support MPE.

- Re-tuning via MIDI pitch bend requires a plug-in that can receive tuning data via MTS-ESP and generate MIDI pitch bend messages in response. Available options are:
  - Paid:
    - ODDSound MTS-ESP MIDI Client (part of the MTS-ESP Suite)
  - Free:
    - Ableton Microtuner M4L device (in MTS-ESP client mode) and
    - Xen MIDI Retuner

- The Wilsonic installer includes everything required for MTS-ESP to work on your computer, however if you have problems you can do a clean install of the MT-ESP components here
  - Mac-specific MTS-ESP installer
  - Windows-specific MTS-ESP installer

Architecture

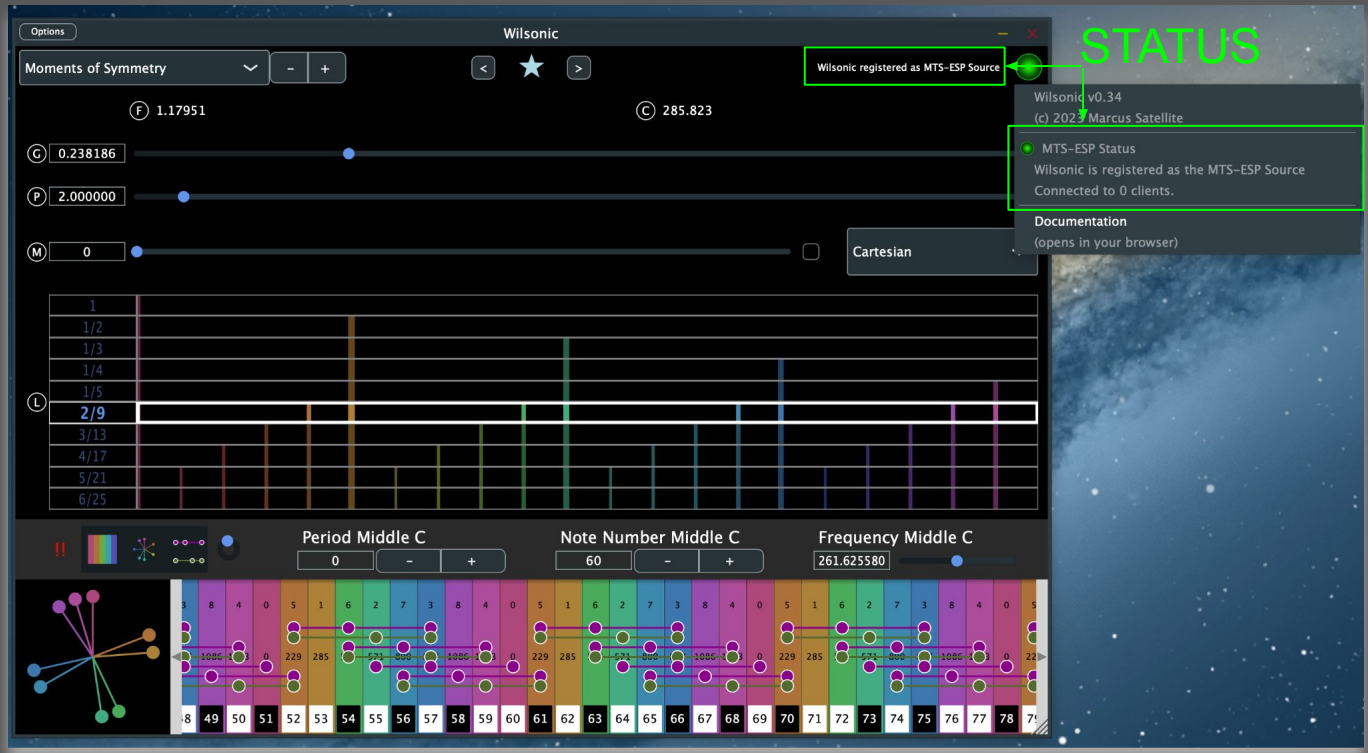
- Wilsonic should be the *only* MTS-ESP **Master** active in your DAW/Host session
- Your software synths are the “**clients**”



See [Wilsonic MTS-ESP]

MTS-ESP Status Indicator: Green

- Wilsonic should be the *only* MTS-ESP Master active in your DAW/Host session
- The green indicator means Wilsonic is actively managing the global tuning table
- Do not run Wilsonic and WilsonicController simultaneously–I'm still figuring out how to gracefully manage multiple apps wanting to be the Master
- Hover over status label for status history



MTS-ESP Status Indicator: Yellow

- This status may appear if there is another plug-in already managing the global tuning table, or after a crash.
- The yellow indicator means this instance of Wilsonic is NOT actively managing the global tuning table.
- Check there is no other instance of Wilsonic or any other MTS-ESP master plug-in in use, then select “Register” from the menu to make Wilsonic the master.

Installation

- Download installer at wilsonic.co
- Run installer
- Reboot your machine
- Run as a Plugin in your favorite DAW
  - Rescan plugins
  - Load Wilsonic as a AUv2 or VST3 on a MIDI track
  - Wilsonic's "simple synth" can be played from this track. Check that your synths are tuned.
  - Wilsonic's DAW automation will be on this track
  - Load your soft synths in other tracks per the ODDSound client documentation
  - See next slide for more details
- Run as a standalone:
  - Standalone synths such as Surge and Pianoteq are tuned up in real-time!

MTS-ESP Overview

- ODDSound MTS-ESP Overview
- ODDSound Client Support (DAW+Soft Synth setup)
  - Ableton
  - Bitwig
  - Cakewalk
  - Cubase/Nuendo
  - Digital Performer
  - FL Studio
  - Kontakt
  - Logic Pro
  - Reaper
  - and many more
- How To Install ODDSound Plug-ins (Mac and Windows)
- Microtuning in Ableton Live with MTS-ESP (YouTube)
- Microtuning in Bitwig Studio with MTS-ESP (YouTube)

Microtonal Keyboard

These 3 controls define the global tuning table root frequency and MIDI mapping:

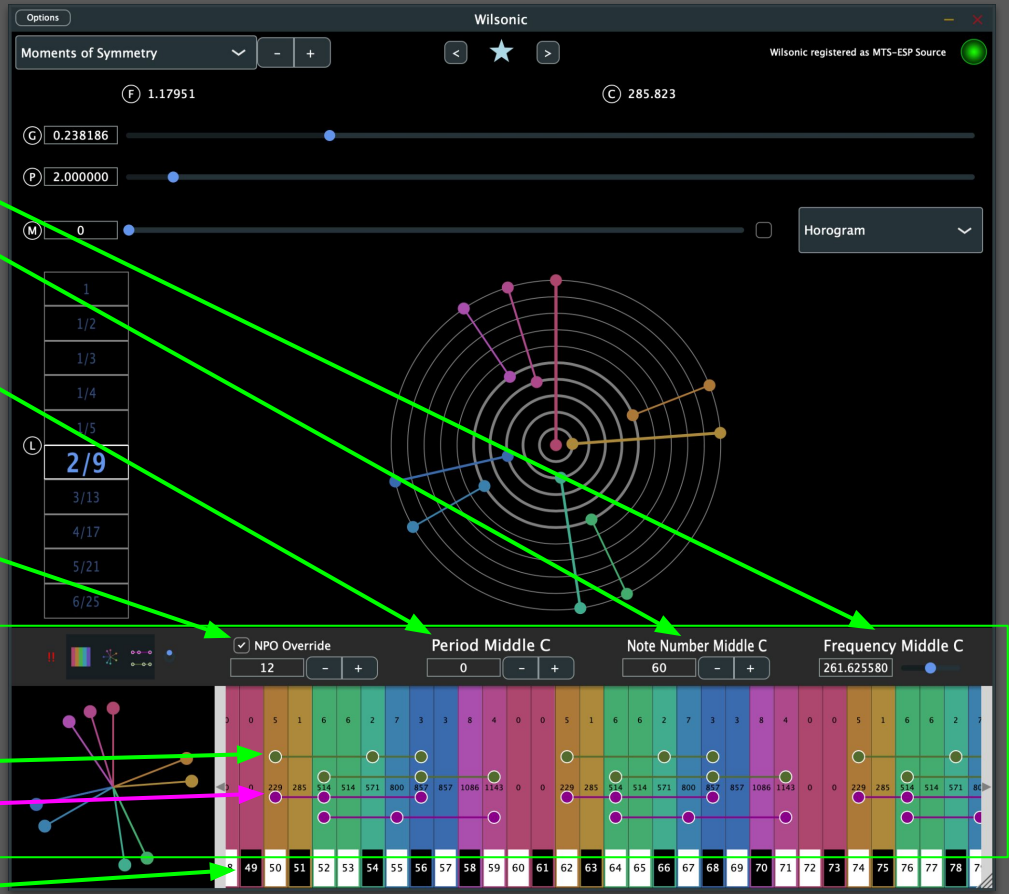
- Frequency of Middle C
- Note Number Middle C:
  - Default = Origin = Middle C = 60
  - TRANSPOSE = PERFORMANCE
- Period Middle C:
  - lower/raise all notes by this octave/period
- All automatable in the DAW!

- Notes Per Octave (NPO) Override adds/removes notes
- Resize keyboard by dragging bar vertically

Real-time Major/Minor Analysis:
Pythagorean Means

- Arithmetic Mean: “Proportional Triad”
- Harmonic Mean: “Subcontrary Triad”

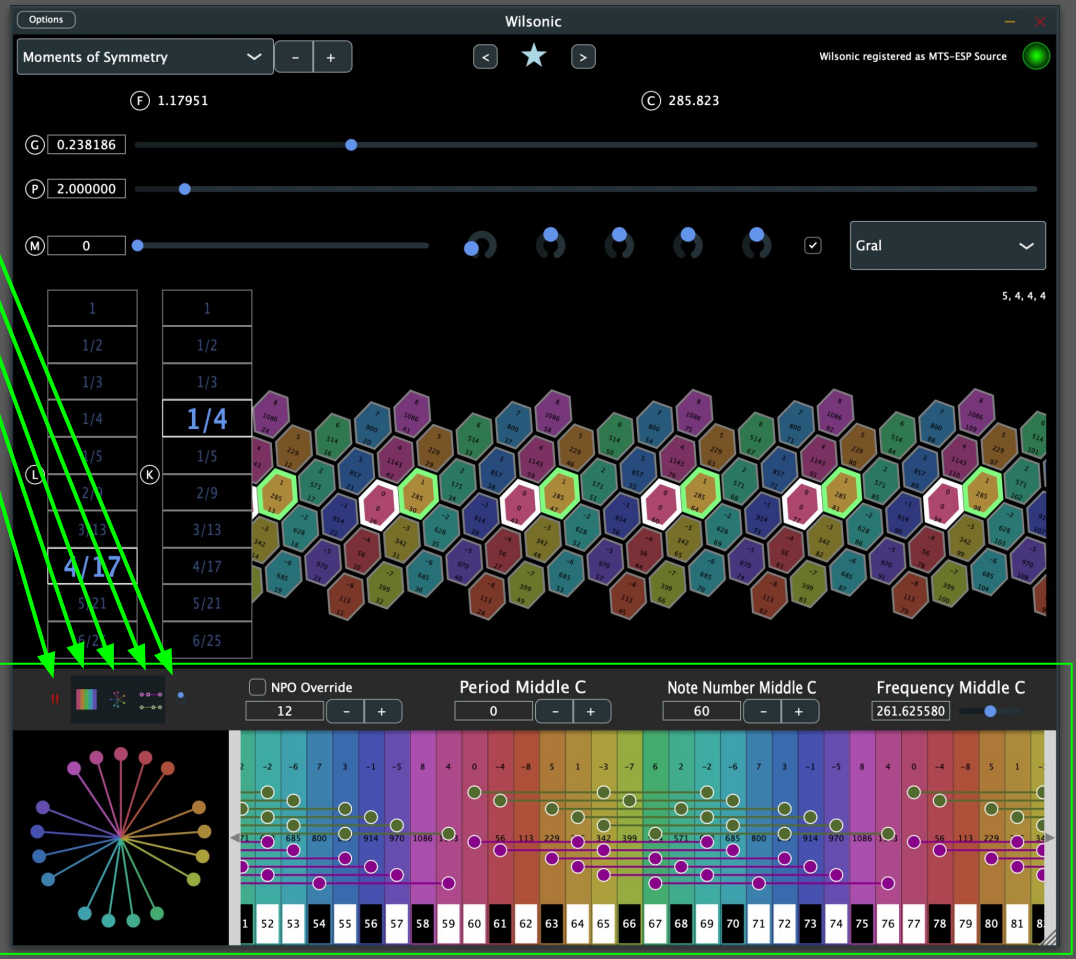
MIDI Note Number Mapping + Black and White Keys of linear keyboard



Microtonal keyboard is updated in real-time (!)

Microtonal Keyboard

- Offset Pitch Wheel color at Middle C
  - Toggle Proportional Triads
  - Toggle Pitch Wheel on Keyboard
  - Toggle Microtonal Keyboard
- MIDI Panic: turns all playing notes off

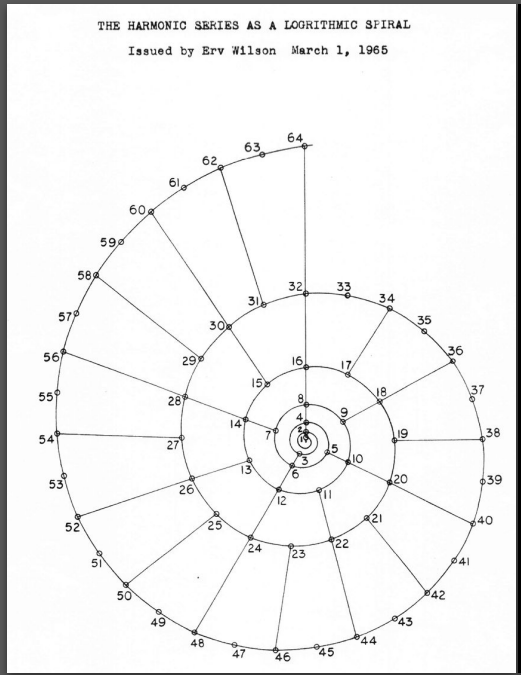


Pitch Wheel

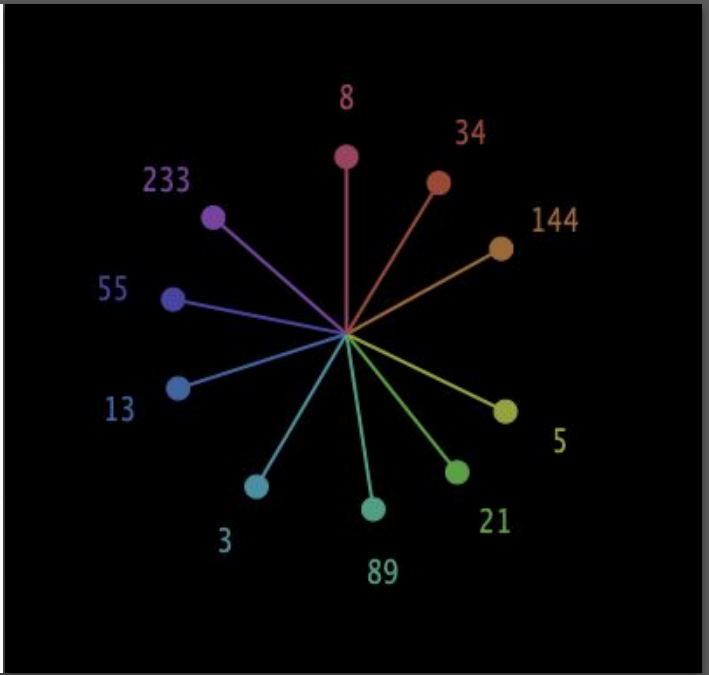
Pitch Wheel

- Pitch Wheels appear throughout the app
- Pitch is defined as log base-Period of Frequency
- Period = 2 = Octave: the most common period
- The Pitch Wheels also take the modulus of Period
- Period = Octave Equivalence: 1=2=4=8=16=32=64=…
- 12 o’clock = C = “1” = 2^0
- The colors of the Pitch Wheels correspond to the colors of the microtonal keyboard
- Wilsonic supports non-octave tunings such as Scala files and MOS
- When you change the Period the appearance of the Pitch Wheels do not change because by definition they are log-base-period

Log Base 2 of Frequency, drawn as a log2 spiral

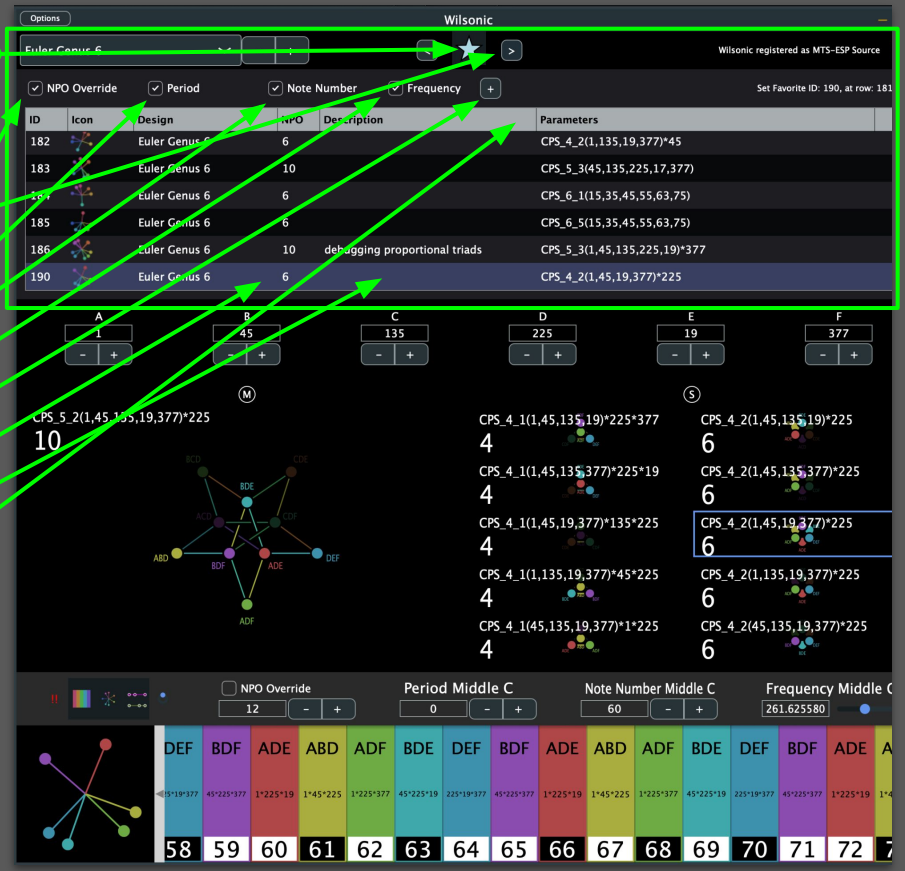


Log Base Period of Frequency, drawn as a circle



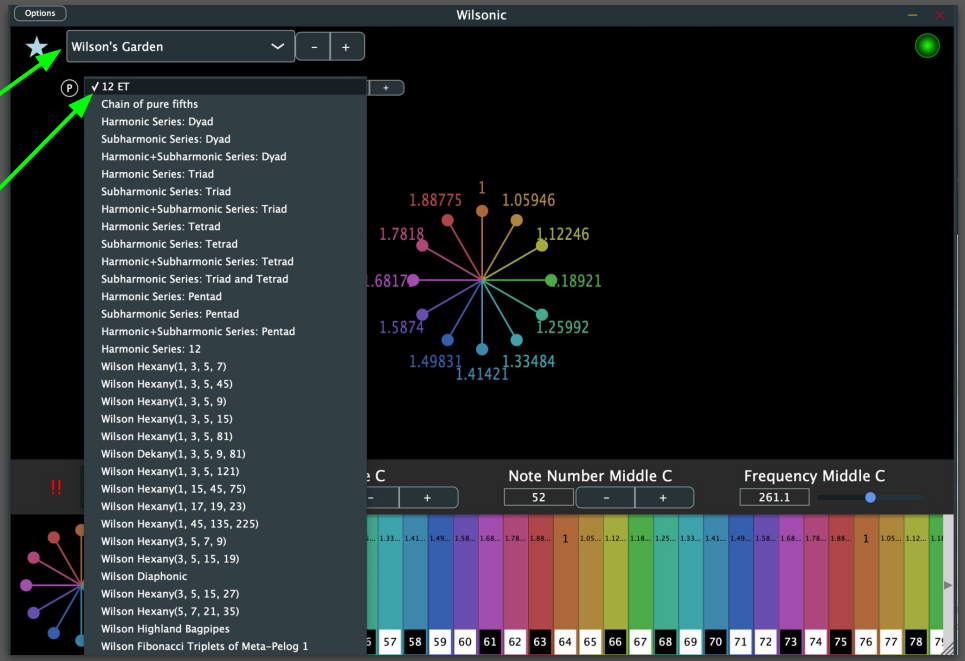
Favorites

- Toggle Favorites panel by clicking on Favorites star icon
  - Favorites takes up 1/3 of the vertical screen space: you can resize Wilsonic to increase the height
- Navigate Favorites by hitting “<”, or “>” buttons
- Toggle to save NPO Override with Favorite
- Toggle to save Period with Favorite
- Toggle to save Note Number Middle C with Favorite
- Toggle to save Frequency Middle C with Favorite
- Save current scale as a Favorite by hitting “+” button
- Delete a selected row by hitting “backspace”
- Double-click Description cell to edit description
- Tap column header to sort by:
  - ID
  - Design
  - NPO (“number of notes per octave”),
  - Description



“Wilson’s Garden”

- Select “Wilson’s Garden” from the Scale Design menu
- Select a scale from the “Curated Presets” menu



Curated scales by

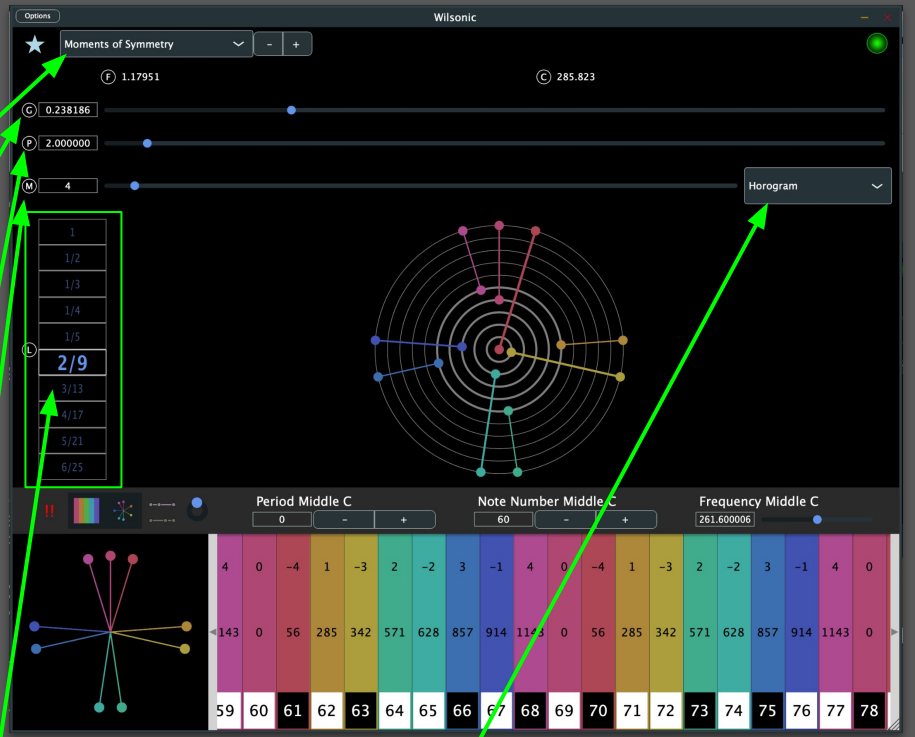
- Erv Wilson
- Kraig Grady
- Stephen James Taylor
- Jose Garcia
- Gary David
- Marcus Hobbs
- Elementary, archetypal scales

*Be sure to also explore the Scala Archives

Moments of Symmetry

[Link to Erv Wilson's MOS papers]

- Select “Moments of Symmetry” from the Scale Design menu
- Select the Generator with the slider.
  - Units are in “Pitch space”, i.e., Log-base-Period of Frequency
    - 0 = Middle C
    - 1 = C one Period higher
  - G = 0.58333 = 7/12 = 12 tone equal temperament when Period = 2
  - The “F” label is the Generator in Frequency
  - the “C” label is the Generator in Cents
- Select the Period with the Slider
  - Units are in Frequency, default is “2”, the Octave
- Select the Murchana with the slider
  - Murchana is a type of mode, or rotation
- Select the Level by click-dragging over the Level box



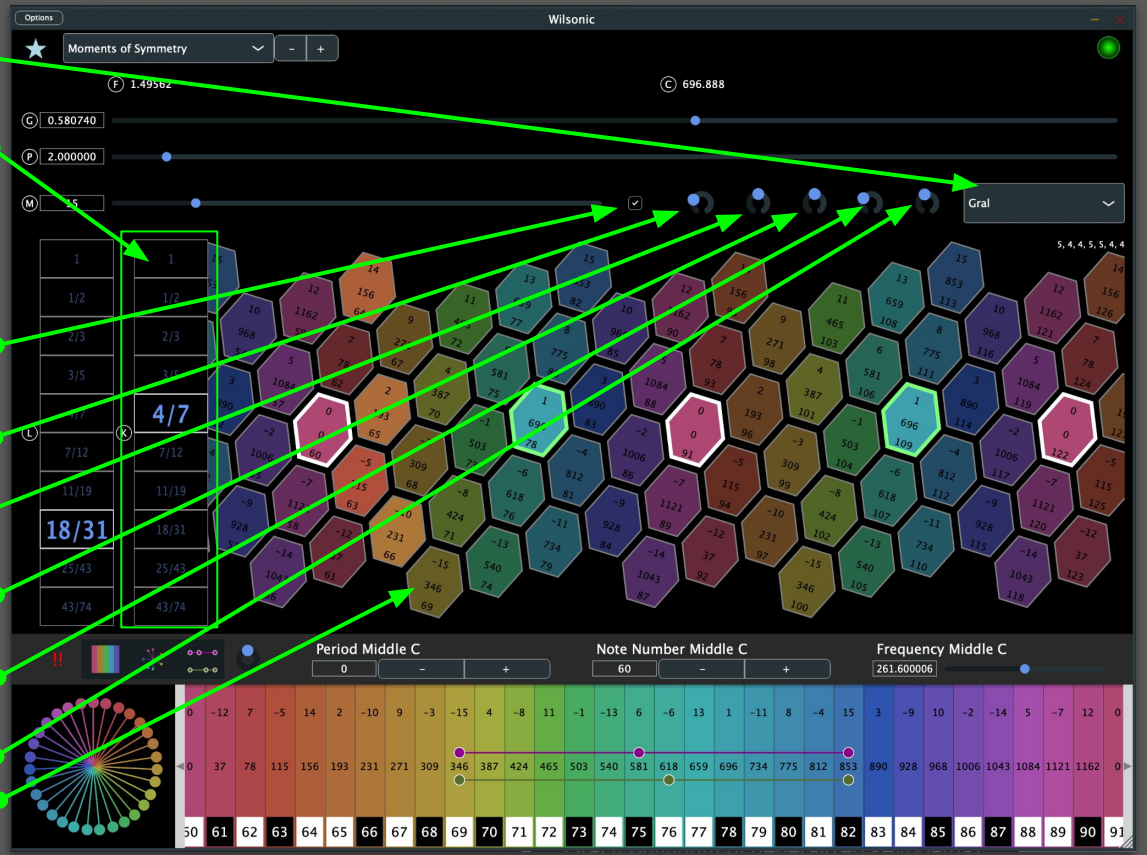
Four drawing modes:

- Cartesian
- Horogram
- Horogram Inverse
- Gral (continuum of generalized keyboards)

Moments of Symmetry

Supports “Touch” Devices

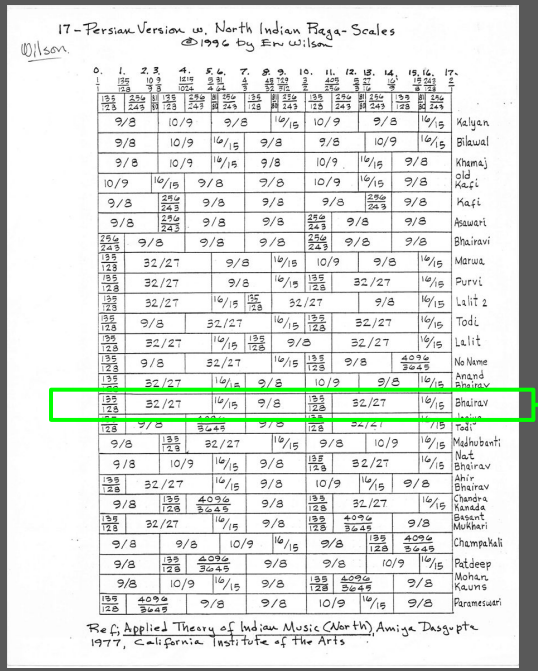
- Select “Gral” from the display mode popup
- A secondary Level box appears…this is the keyboard mapping. The denominator is the number of columns in an octave. Shown here is the 4/7 layout of the 18/31 MOS.
- The toggle will set Murchana to 0 at the center of the chain, automatable
- The first knob is the zoom
- The second knob is the rotation. Leave this at 0 for Wilsonic to optimize for horizontal layout
- The third knob is “shear” which you can use to make the columns vertical
- The fourth knob is the left-right position of the keyboard
- The fifth knob is the up-down position
- Hex tile labels: Scale degree, frequency, and MIDI NN

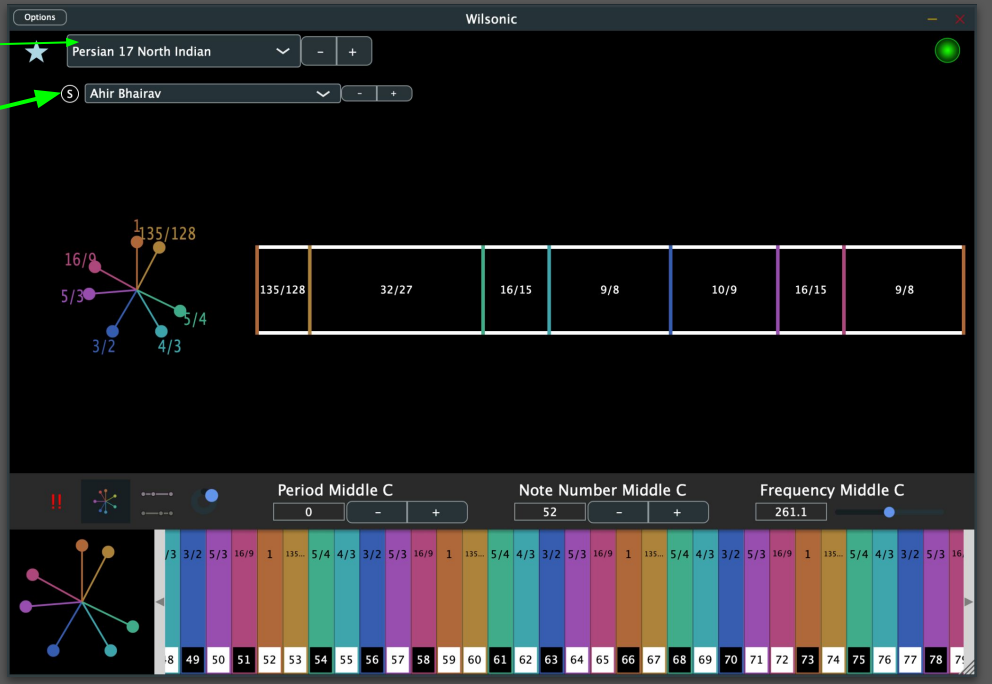


North Indian Raga Scales

[“17-Persian Version w. North Indian Raga Scales”]

- Select “Persian 17 North Indian” from scale design menu
- Select the variant from the scale menu



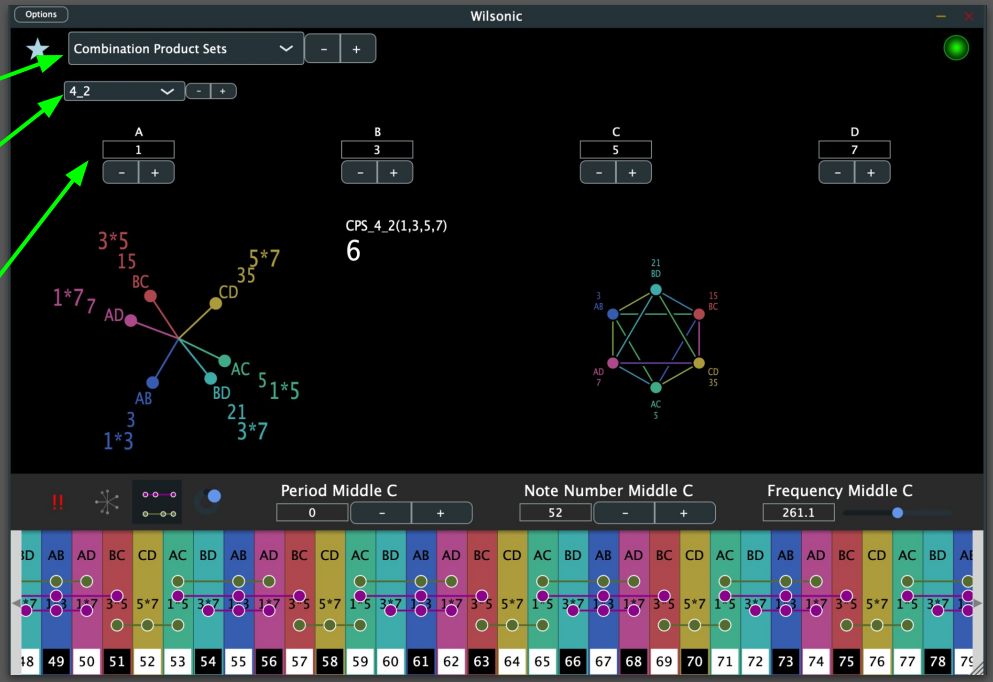


Combination Product Sets

Combination Product Sets

- Select “Combination Product Sets” from the scale design menu
- Select the CPS from the scale menu
  - “4_1” = “4 choose 1” = Harmonic Tetrany
  - “4_2” = “4 choose 2” = Hexany
  - “4_3” = “4 choose 3” = Subharmonic Tetrany
  - “6_3” = “6 choose 3” = Eikosany
- Set the seeds (A, B, C, D) of the master set

More CPS resources here



Euler Genus 6

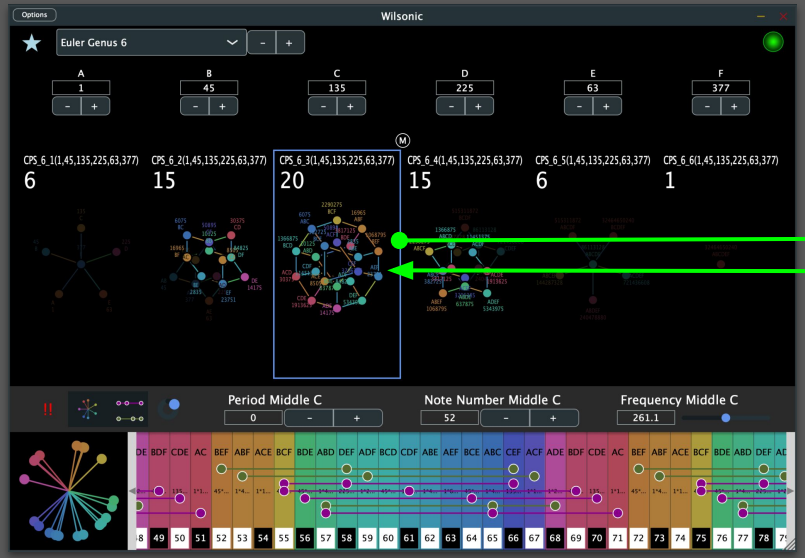
Euler Genus 6

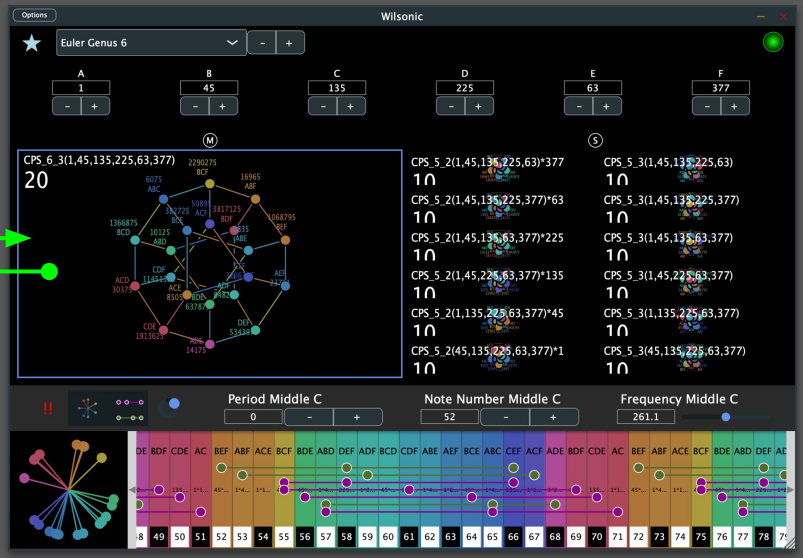
Euler Genus 6 page

- Seeds can be changed on every page
- Selected scale is outlined in blue
- Shift-Mouse-Hover selects scale
- Cursor Left-Right selects scale
- Ctrl-Click drills into Subset page

Euler Genus 6 Subset page

- Seeds can be changed on every page
- Selected scale is outlined in blue
- Shift-Mouse-Hover selects scale
- Ctrl-Click navigates down into subset
- Command-Click navigates up into superset
- Cursor Left-Right-Up-Down selects scale
- Superset on the left, subsets on the right





“Subsets of Combination Product Sets”

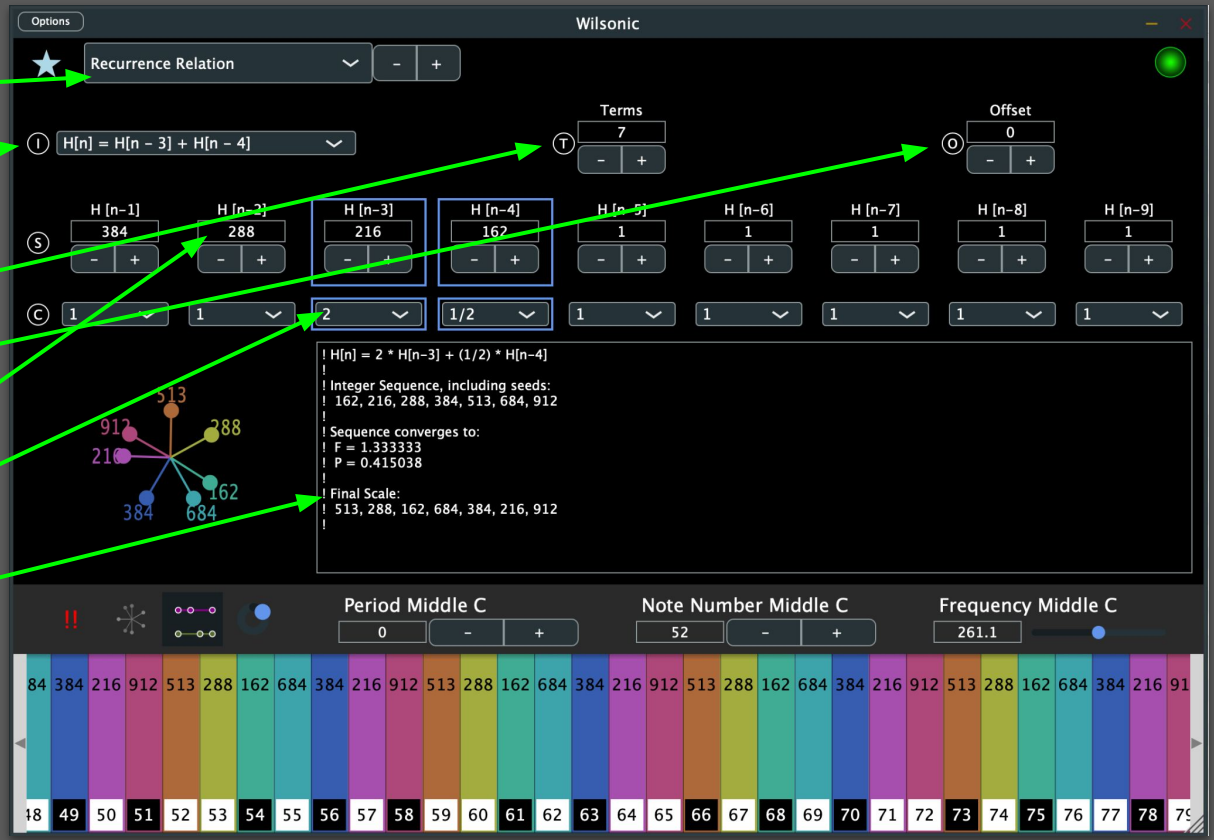
Wilsonic scale designs of “Combination Product Sets” and “Euler Genus 6” are implementations of these canonical microtonal papers:

- D’Allesandro, Like a Hurricane, Erv Wilson,
- Combination-Product Set Patterns, Kraig Grady, 1986
- THE EIKOSANY VIEWED FROM THE CENTERED PENTAD LATTICE, Kraig Grady
- THE EIKOSANY VIEWED FROM A HEXANY LATTICE, Kraig Grady
- Cycle of Hexanies in a Dekany, Kraig Grady, 1998
- Resources Of The Eikosany, Kraig Grady, 1985

Recurrence Relation

Recurrence Relation

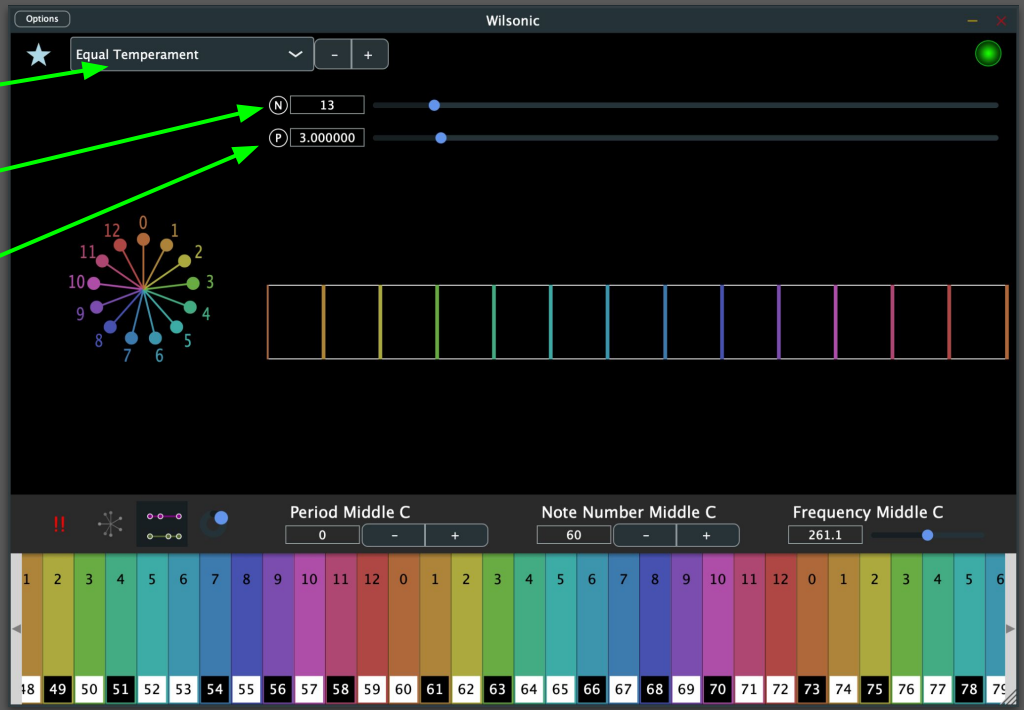
- Select “Recurrence Relation” from Scale Design menu
- Select the **terms** of the recurrence relation from the dropdown.
- Selected terms are highlighted in blue
- Select the **number** of terms to compute
- Select the **offset** (throws away previous terms)
- Set your **Seeds** for each term (initial conditions)
- Set your **Coefficients** for each term from the dropdown
- Final Scale:
  - Sorted as if octave-reduced
- Period is 2 (i.e., an octave)
- Recurrence Relations optimize for difference tones by creating an additive sequence



Equal Temperament

“Equal Temperament”

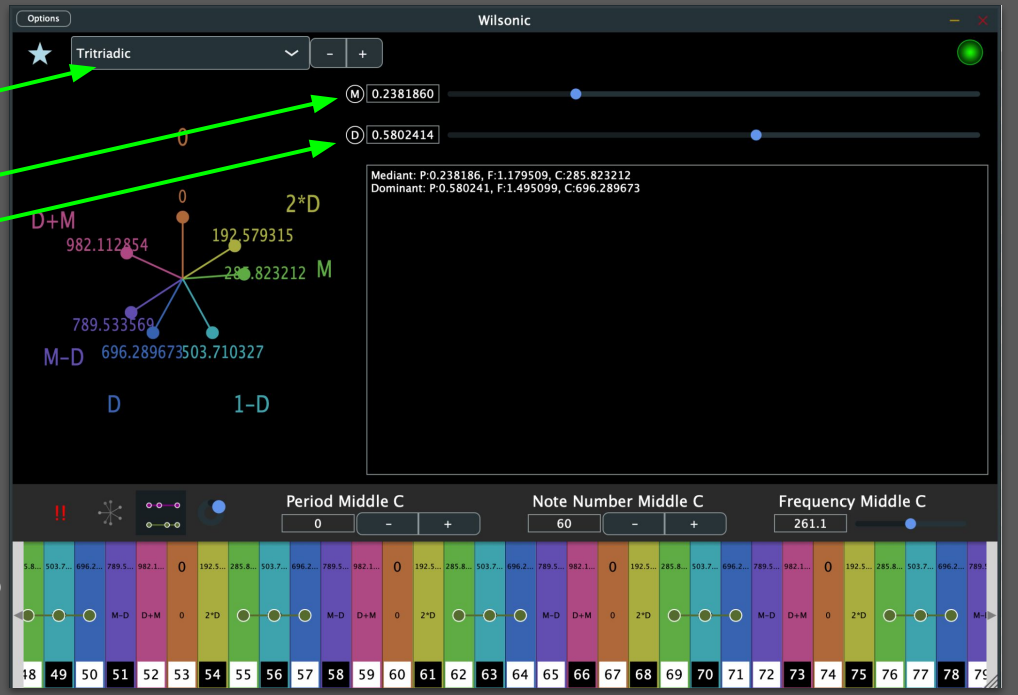
- Select “Equal Temperament” from the Scale Design menu
- Select an ET (“EDO”) from 1-128 notes per octave
- Select the period. “Octave” = period of 2



Tritriadic

“Tritriadic” by John Chalmers

- Select “Tritriadic” from the Scale Design menu
- Select the Mediant with the slider
- Select the Dominant with the slider



Tritriadics are very simple and are based on the major scale as a template. They are defined as three triads composed of a tonic, mediant and dominant interval. Let us set the tonic to 0 [in Cents], then the basic triad has the form 0, M, D. By adding a subdominant triad 1200-D, M-D, 1200 and a dominant triad, D, D+M 2*D, one gets the notes in ascending order 0 2*D M 1200-D D M-D D+M 1200 for an octave spanning scale. In ET, 0 and 1200 are the same note an octave apart, in JI 1/1 and 2/1 have the same harmonic function.

They are also definable in JI--take any triad such as 4:5:6 and write it as 1/1 5/4 3/2. The subdominant is the octave-adjusted triad obtained by dividing by D (=3/2) or more conveniently as 4/3 5/3 2/1. The dominant triad is the tonic multiplied by the dominant interval. This operation yields 3/2, 15/8 and 9/8. Hence the three triads are 4/3 5/3 2/1, 1/1 5/4 3/2 , and 3/2 15/8 9/8 (when reduced to the same octave. Symbolically written as 2/D M/D 2/1, 1/1 M D, D D*M D^2 or in ascending order 1/1 D^2 M 2/D D M/D D*M 2/1--1/1 9/8 5/4 4/3 5/3 15/8 2/1.

In both cases there are two supplementary triads which I refer to as conjugate r triads--M D D+M and M-D 1200 M. These have the form of 0 D-M D or in the JI case, 5/4 3/2 15/8 and 5/3 2/1 5/4, to be reduced to the same octave. Major and minor or more generally prime and conjugate are thus conjugates of each other

Any triad may be used--4:5:6, 4:5:7 or even irrational numbers.

–John Chalmers, May 4, 2022

See Xenharmonikon for more details

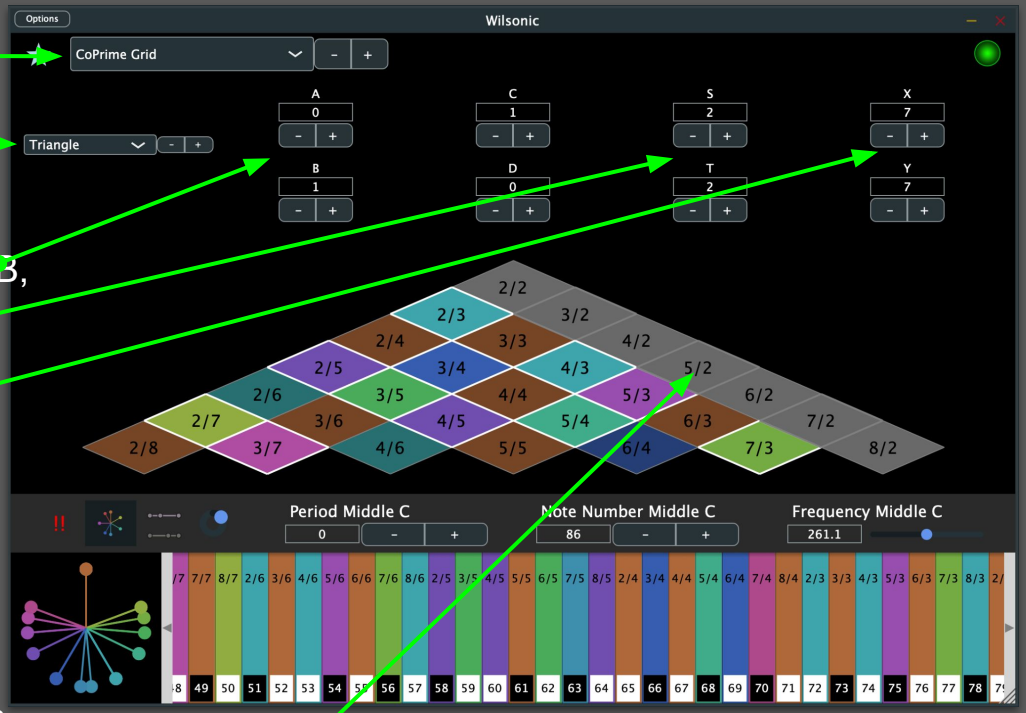
Scala File Support

- Hover over status label for status history

- Select “Scala” from the Scale Design menu
- Select “Bundled” or “User”
- Highlight the row and hit RETURN to tune up the Microtonal Keyboard
- Supports non-Octave tunings
- Mouse-Hover over the row to see the contents of the Scala file
- Only when “User” is selected can you import/delete .scl files:
  - Drag-and-Drop files into the window
  - Click on the “+” for a File Browser
  - Select-Backspace to DELETE
- When “Bundled” is selected:
  - 5,100+ .scl files (read-only)
  - Please see [Huygens-Fokker Centre for Microtonal Music]
  - Shoutout Manuel op De Coul!
- User/Bundled is automatable
- User and Bundled IDs are automatable
- You can “Favorite” Scala files

CoPrime Grid

- Select “CoPrime Grid” from the Scale Design menu
- Select “Harmonic”, “Triangle”, or “Subharmonic”. Same tones, just different layout
- Reseed the CoPrime Grid by modifying A, B, C, D.
- Offset by modifying S and T*
- Expand/Reduce number of terms by modifying X and Y
- Touchscreens: You can play the geometry as a keyboard!
- Best played on a 2-d keyboard such as the Linnstrument
- See Erv’s CoPrime designs on Kraig Grady’s Anaphoria website for more details on the construction and properties of this remarkable object



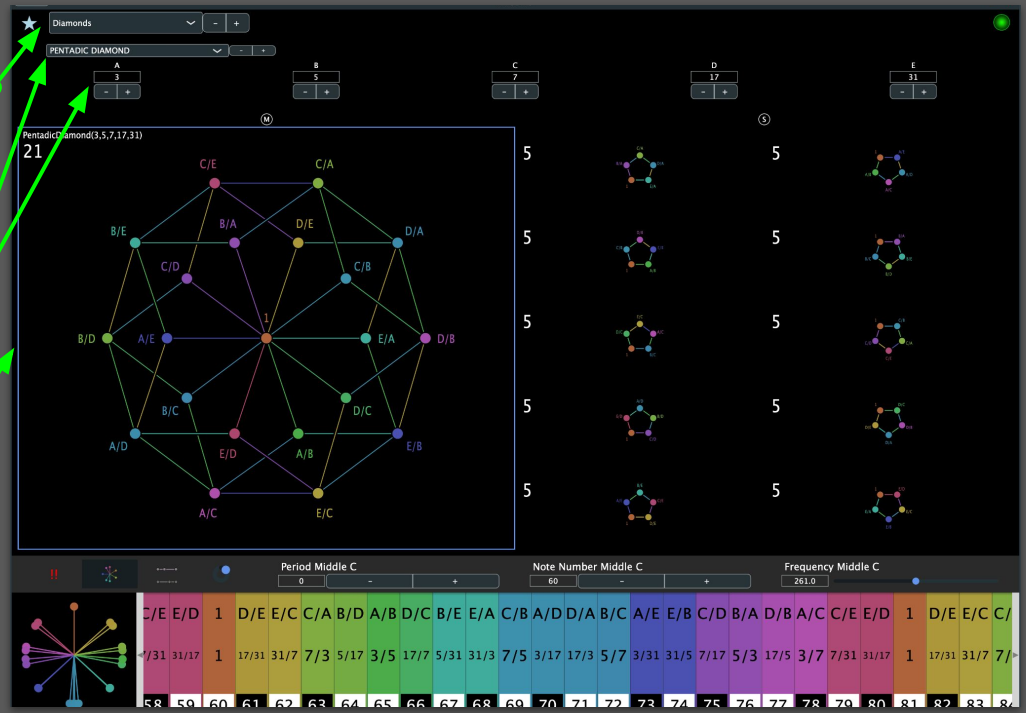
If a note is greyed out it means there is no midi note assigned to it. Use “Note Number Middle C” to lower the root note to get the notes in range

* *Wilson allowed for S and T to be zero in the construction of the*

Diamonds

“Reciprocal Cross-Sets”

- Select “Diamonds” from the Scale Design menu
- Select a Diamond or one of its harmonic/subharmonic subsets
- Set the seeds of the master set, from (A,B,C) for Triadic, to (A,B,C,D,E,F,G,H) for Ogdoadic
- Selected scale is outlined in blue
  - Shift-Mouse-Hover selects scale
  - Cursor Left-Right selects scale



See next slide for the definition of “reciprocal cross-set”

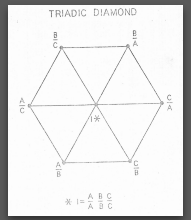
[YouTube Demo of Diamonds]

Diamonds: Reciprocal Cross-Sets

- Rows are the harmonic series of the master set
- Columns are the subharmonic series of the master set
  - Row 0 = Harmonic series divided by A
  - Column 0 = Subharmonic series multiplied by A
  - Diagonal = 1/1

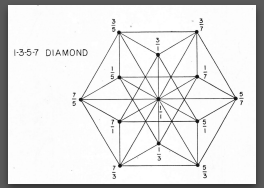
Triadic

_one	B/A	C/A
A/B	_one	C/B
A/C	B/C	_one



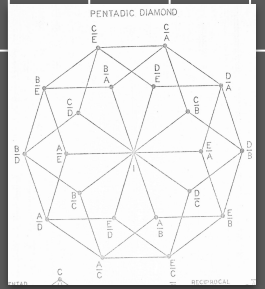
Tetradic

_one	B/A	C/A	D/A
A/B	_one	C/B	D/B
A/C	B/C	_one	D/C
A/D	B/D	C/D	_one



Pentadic

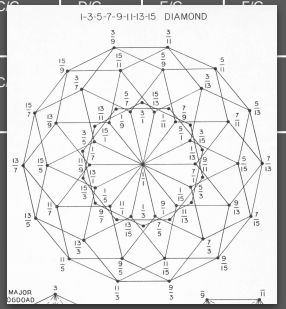
_one	B/A	C/A	D/A	E/A
A/B	_one	C/B	D/B	E/B
A/C	B/C	_one	D/C	E/C
A/D	B/D	C/D	_one	E/D
A/E				_one



…

Ogdoadic

_one	B/A	C/A	D/A	E/A	F/A	G/A	H/A
A/B	_one	C/B	D/B	E/B	F/B	G/B	H/B
A/C	B/C	_one	D/C	E/C	F/C	G/C	H/C
A/D	B/D	C/D	_one	E/D	F/D	G/D	H/D
A/E	B/E	C/E	D/E	_one	F/E	G/E	H/E
A/F	B/F	C/F	D/D	E/E	_one	G/F	H/F
A/G	B/G	C/G	D/G	E/G	F/G	_one	H/G
A/H	B/H	C/H	D/H	E/H	F/H	G/H	_one



Morph

Morph between 2 Favorites

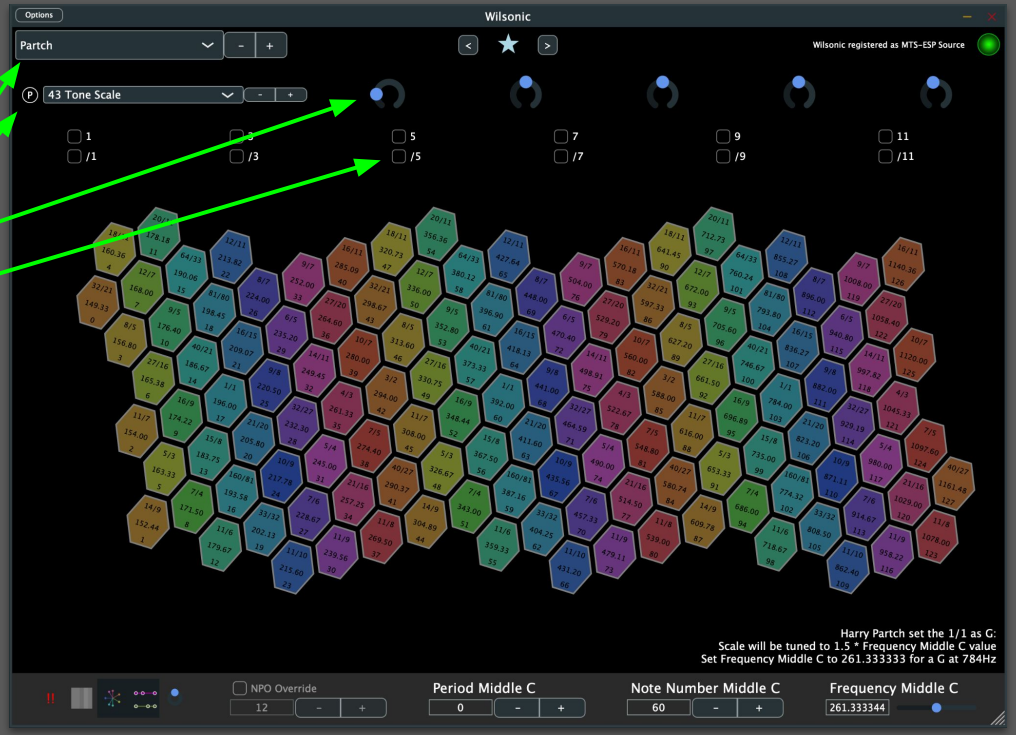
- Select “Morph” in Design Menu
- Left panel of Favorites are “A”
- Right panel of Favorites are “B”
- Hit “S” to swap A and B
- Top Box is A
- Middle Box is the Morph of A and B
- Bottom Box is B
- Interpolation slider morphs between A and B
- Select between Linear or Pitch interpolation
- ID A, ID B, Interpolation, and Interpolation Type are automatable in the DAW
- You can Favorite a Morph!
    - But you cannot Morph between two Morphs
- Pitch Wheel and Microtonal Keyboard reflect the state of the Morph, and show proportional triads

Partch

“Partch 43-tone scale”

- Select “Partch” from Scale Design menu
- Select “43 Tone Scale”
- Knobs: Scale, Rotate, Shear, & Translate X,Y
- Toggles highlight Otonalities, Utonalities
- Same MIDI note mapping as “Diamond Lambdoma: 43 Mapping”: You can mix/match MIDI recordings between these two scales
- 3 labels per hex: “Ratio”, Frequency, MIDI NN
- You can play the scale with the mouse and touch

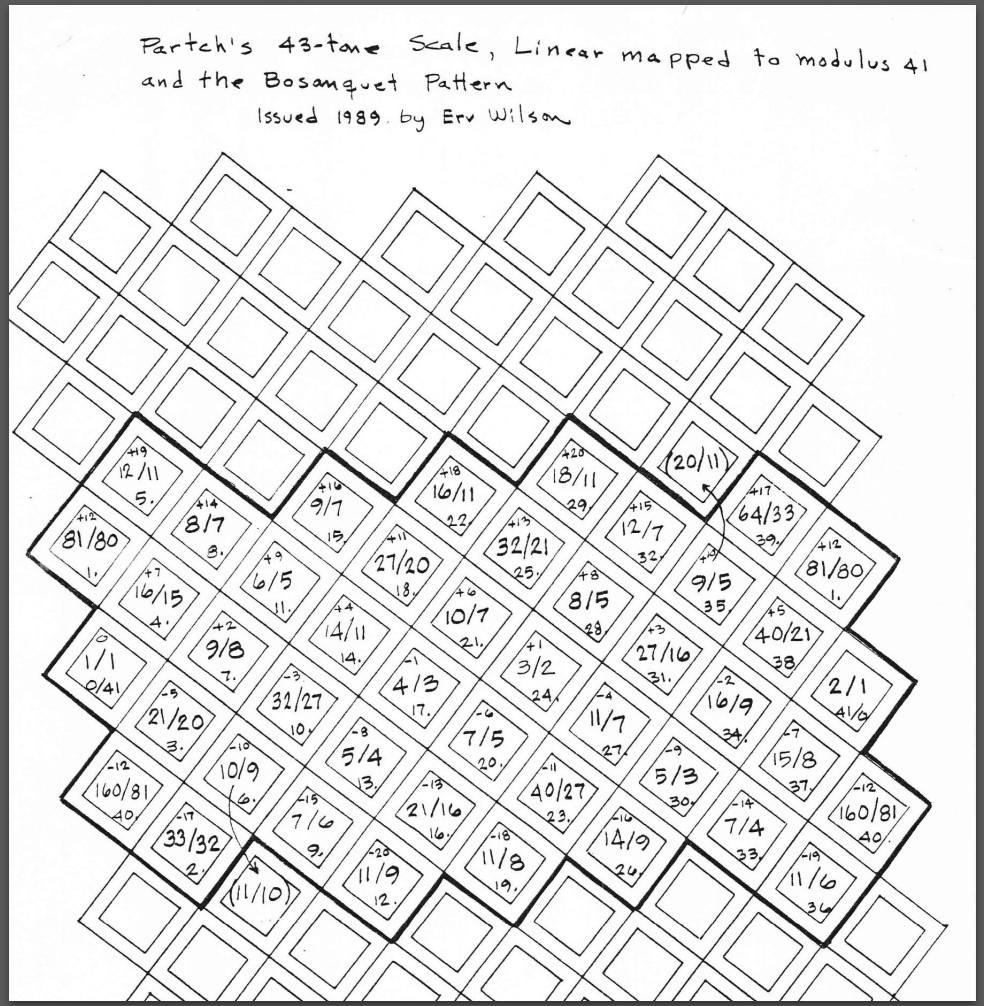
See next slide for Erv Wilson’s paper of this design



Partch

“Partch 43”

- The previous slide shows this figure by Erv Wilson, mapped to a Gral (hexagonal) keyboard by Stephen James Taylor



Partch

“Diamond Marimba: 43 Mapping”

- This version of Diamond Marimba plays a subset of the Partch 43 scale using the same MIDI mapping. You can mix and match MIDI recording between the two

The total range is nearly three 2/1's, the identities of one tonality being spread over about a 2/1 and a half. The relationship of identities is always 4:5:6:7:9:11 in Otonalities, and 1/4:1/5:1/6:1/7:1/9:1/11 in Utonalities; consequently, the sequence of Odentities or Udentities is 1–5–3–7–9–11, rather than the 1–9–5–11–3–7 of the Tonality Diamond. In specific range, the low 16/11 makes about 285 cycles (just above “middle C”), the middle 1/1 makes 784 cycles, and the high 11/8 makes 2156 cycles.

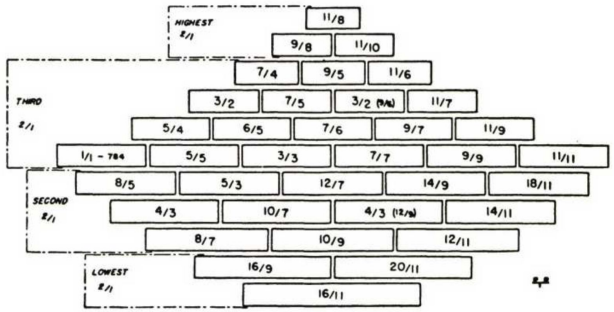
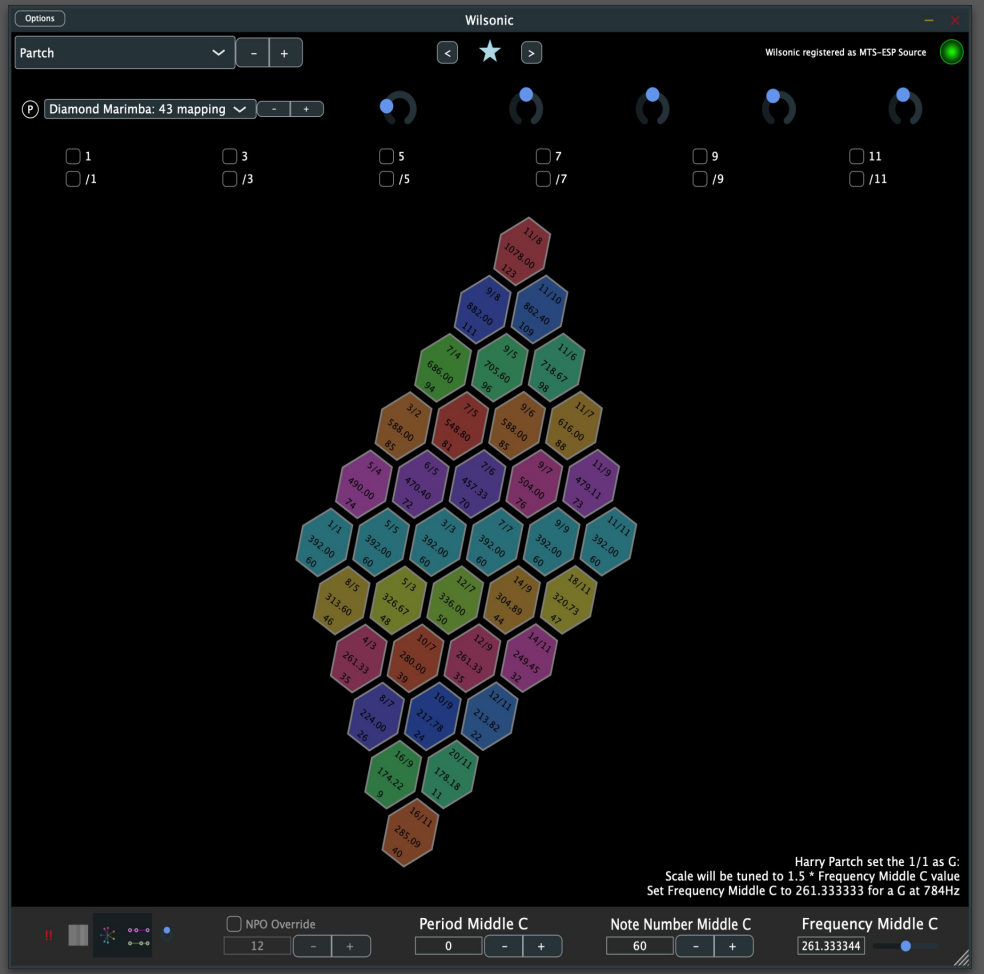


DIAGRAM 17.—BLOCK PLAN OF THE DIAMOND MARIMBA



Partch

“Diamond Marimba”

- This version of Diamond Marimba gets over 3 Marimbas mapped to 128 MIDI note numbers.

The total range is nearly three 2/1's, the identities of one tonality being spread over about a 2/1 and a half. The relationship of identities is always 4:5:6:7:9:11 in Otonalities, and 1/4:1/5:1/6:1/7:1/9:1/11 in Utonalities; consequently, the sequence of Odentities or Udentities is 1–5–3–7–9–11, rather than the 1–9–5–11–3–7 of the Tonality Diamond. In specific range, the low 16/11 makes about 285 cycles (just above “middle C”), the middle 1/1 makes 784 cycles, and the high 11/8 makes 2156 cycles.

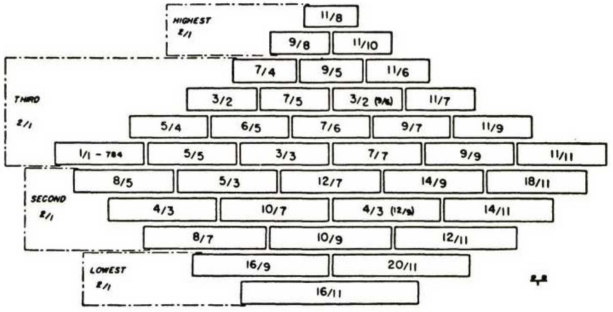
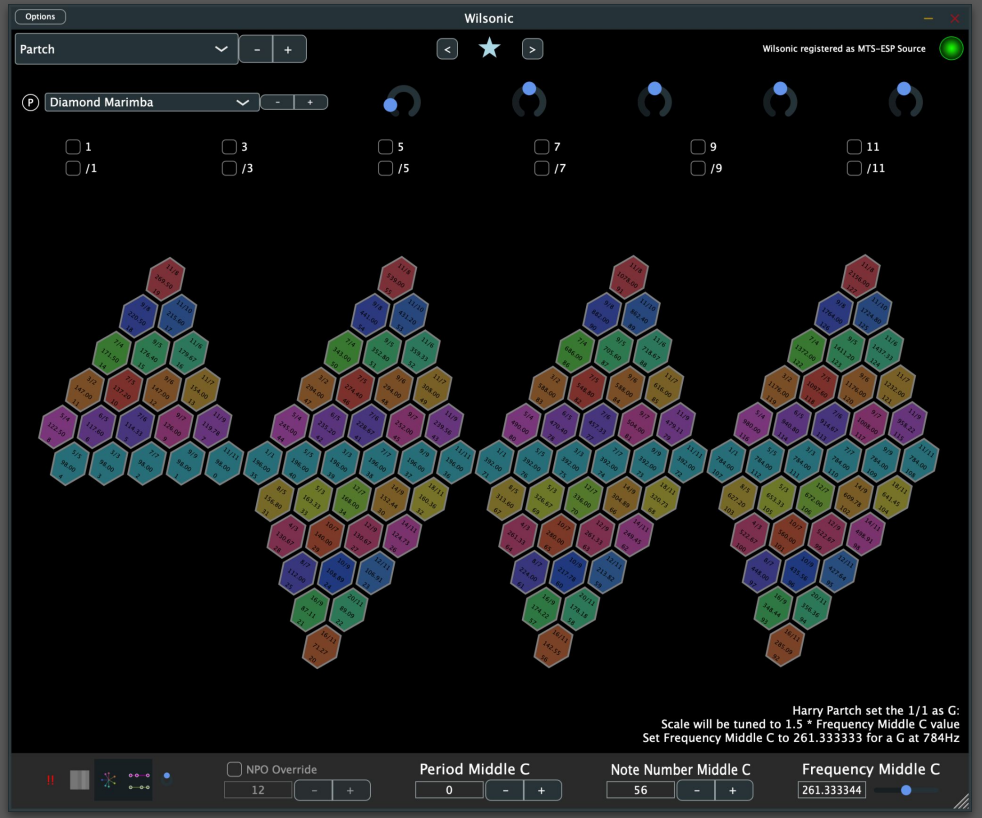


Diagram 17.—Block Plan of the Diamond Marimba



Partch

“Quadrangularis Reversum”

- Two+ Reversums mapped to 128 MIDI note numbers

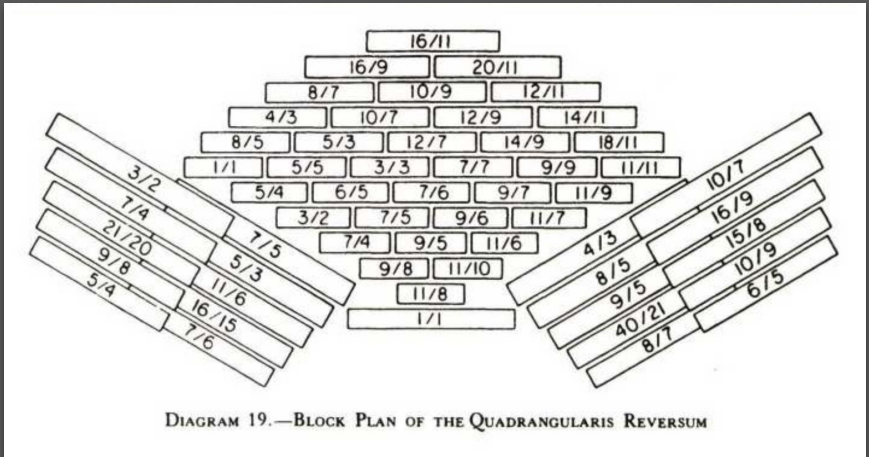


Diagram 19.—Block Plan of the Quadrangularis Reversum