Sonic Visualiser Tour

CHARM Symposium

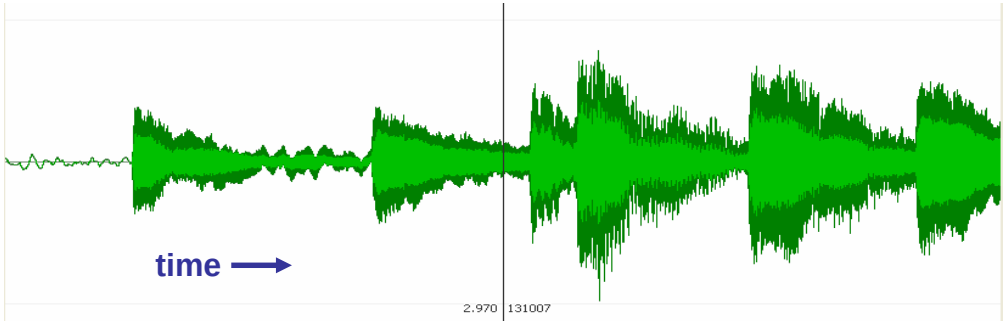
30 June 2006

Craig Stuart Sapp

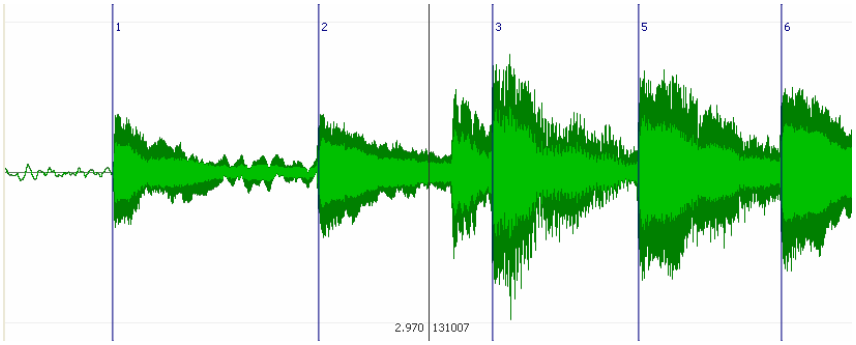
Primary Purpose of SV

- Align audio and analyses in time

Audio Waveform

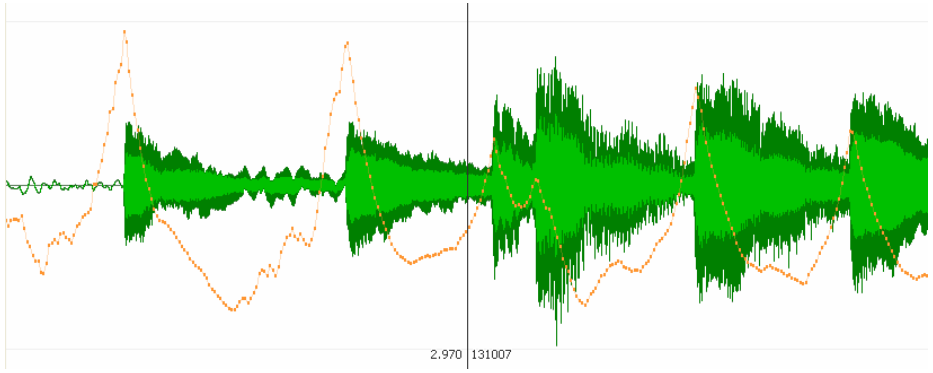


Time Instants:



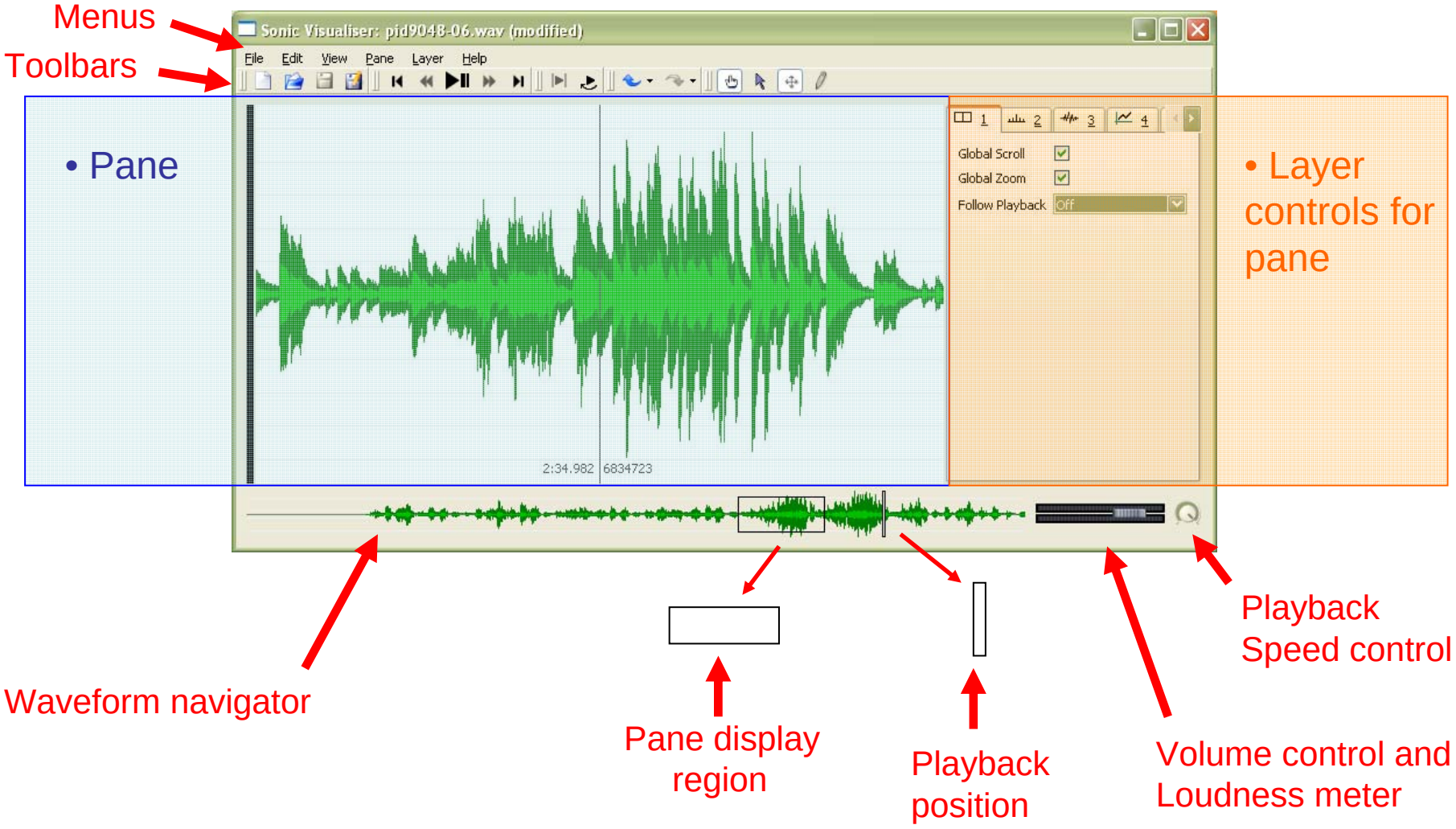
Called “labels” in Audacity

Time Functions:



No equivalent in Audacity

SV Main Window Components



Menus

File For loading and saving audio files and annotation layer information.

Edit Mostly selection controls and copy/paste/undo commands

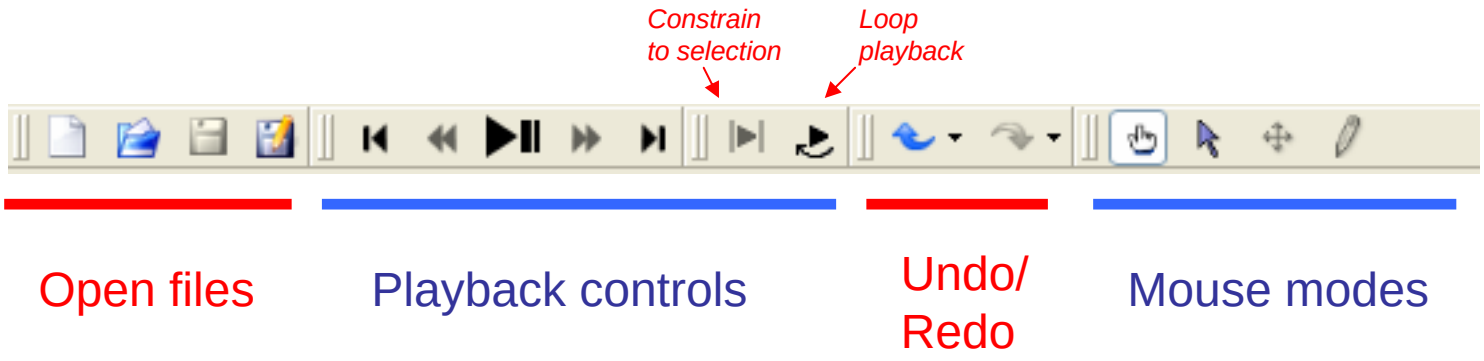
View Text overlay controls and navigation controls

Pane Pane controls (Pane = a display window)

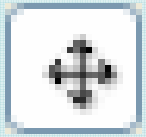
Layer Layer controls (Layer = a layer in a pane)

Help Help and information materials

Toolbars

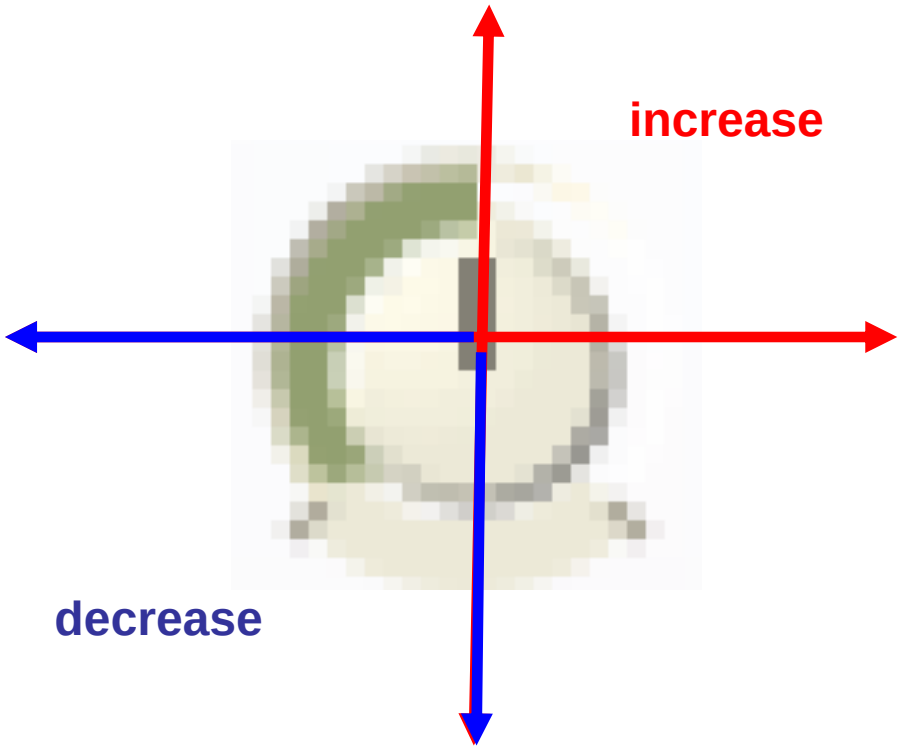


- Important to understand mouse modes:

	Navigate	Mouse is used for panning left/right in pane
	Select	Mouse is used to select time regions (behaviour is slightly different in different layer types).
	Edit	Mouse is used to change data in active layer.
	Draw	Mouse is used to add data in active layer.

Using Dials

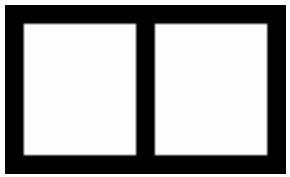
- **Tricky to get used to: takes practice**
- **Don’t think in terms of twisting to change values**



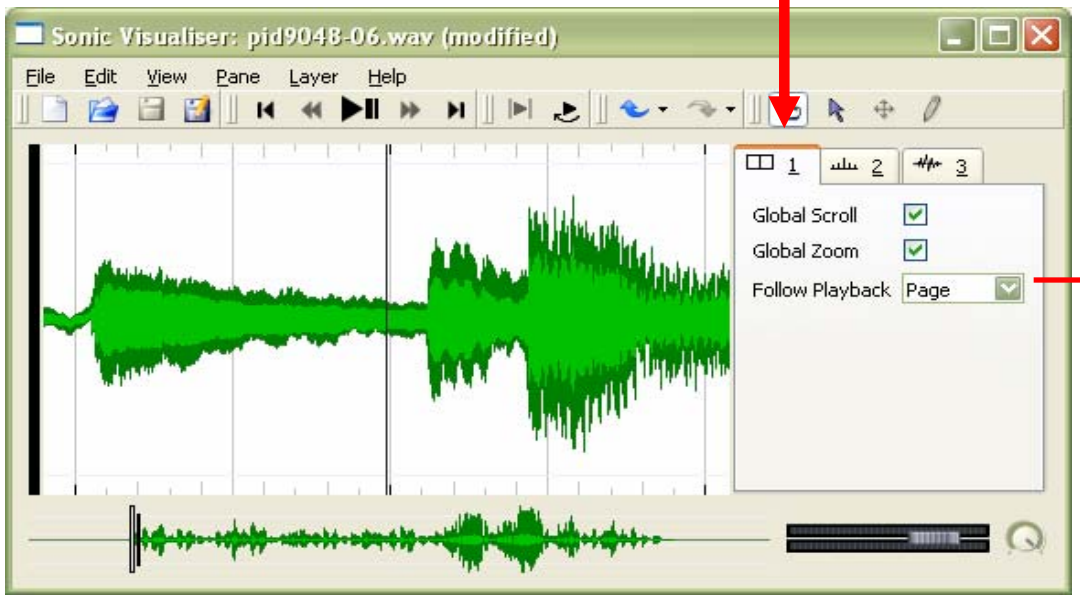
- **Click-drag left/right or up/down to change values**

LAYERS

Pane Layer



Pane layer tab

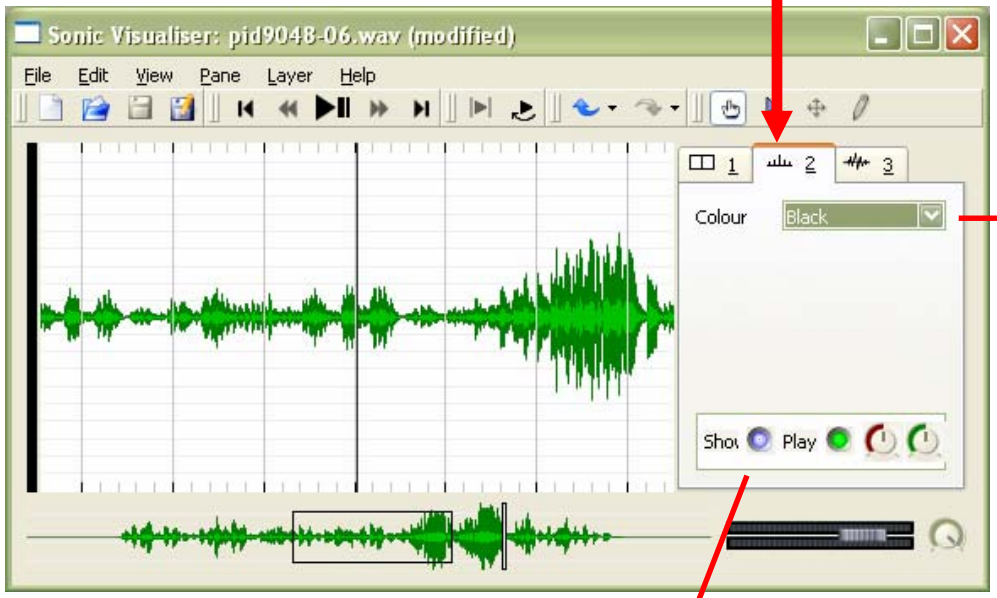


How display updates when playing an audio file:

1. **Scroll** – continuous update of display
2. **Page** – update display to next page when playcursor gets to end of pane.
3. **None** – don't update display (good for slower computers)

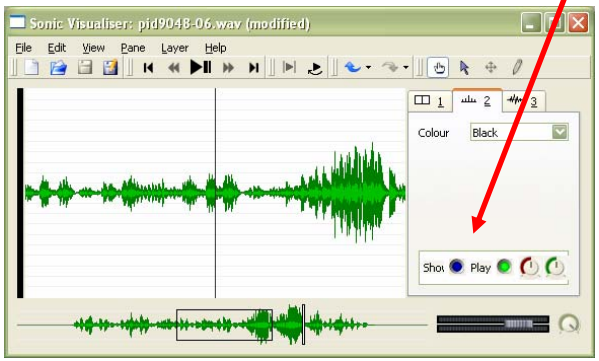
Ruler Layer

Ruler layer tab



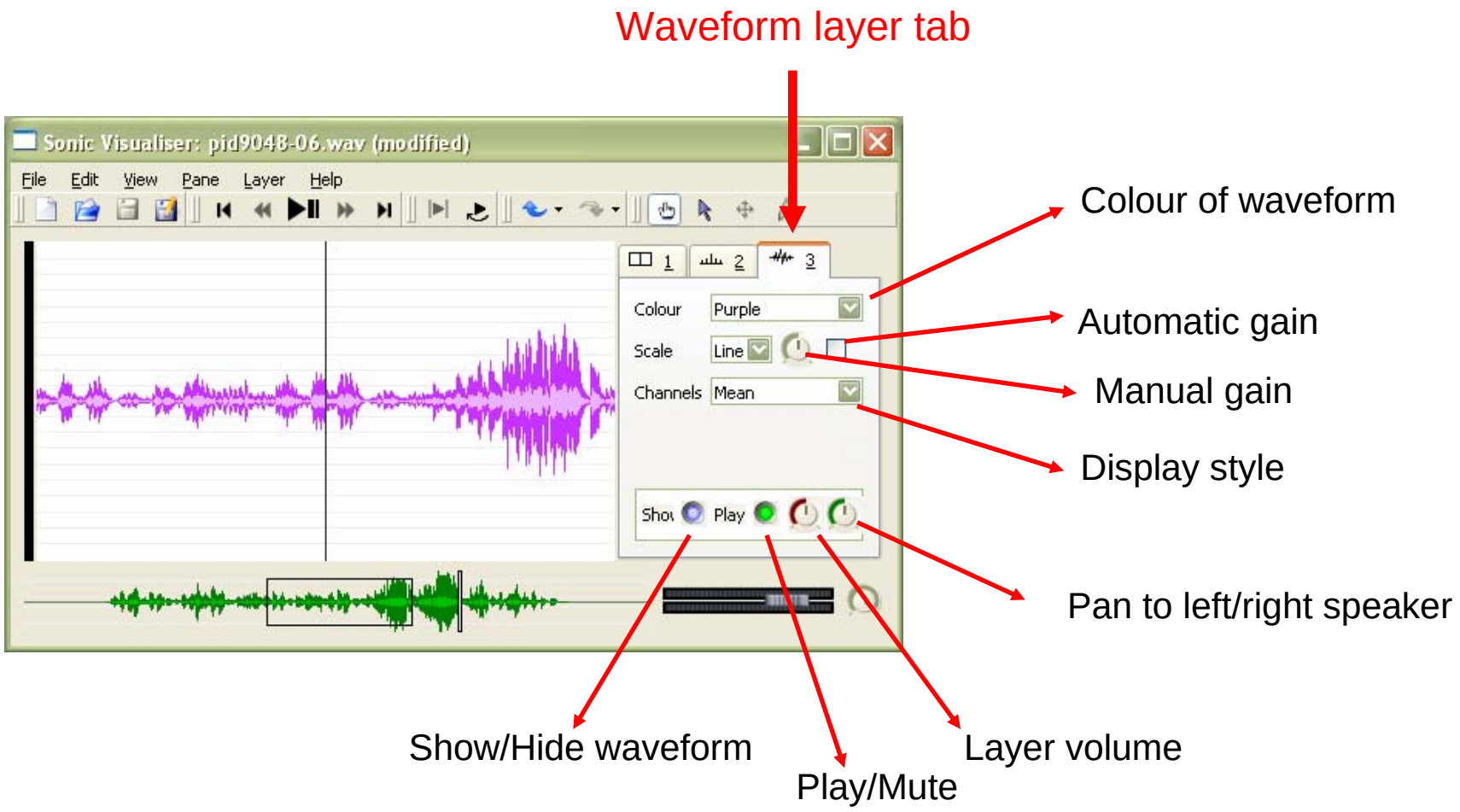
Colour of ruler lines.

Show/Hide the ruler layer



- Notice that active layer is display on top of other layers.

Waveform Layer



Waveform Layer (2)

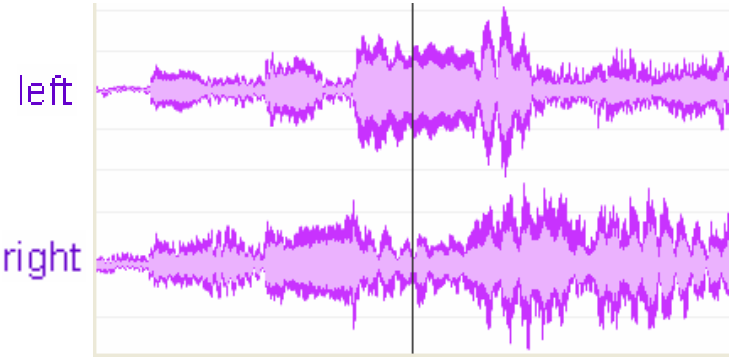
Channel display types

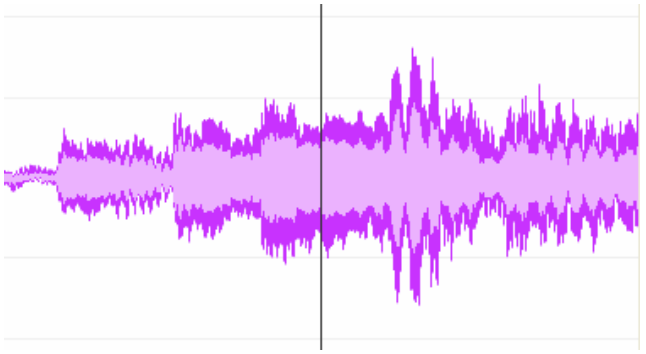
Separate

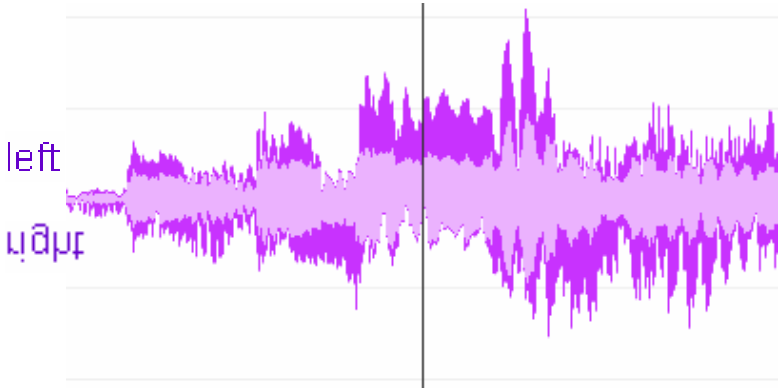
Mean

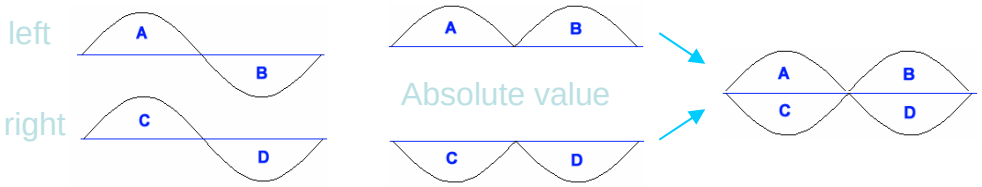
(left + right)/2

Butterfly









Annotation Layers

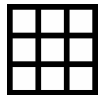
Types of Annotation Layers

Instants

"*A point in time*"

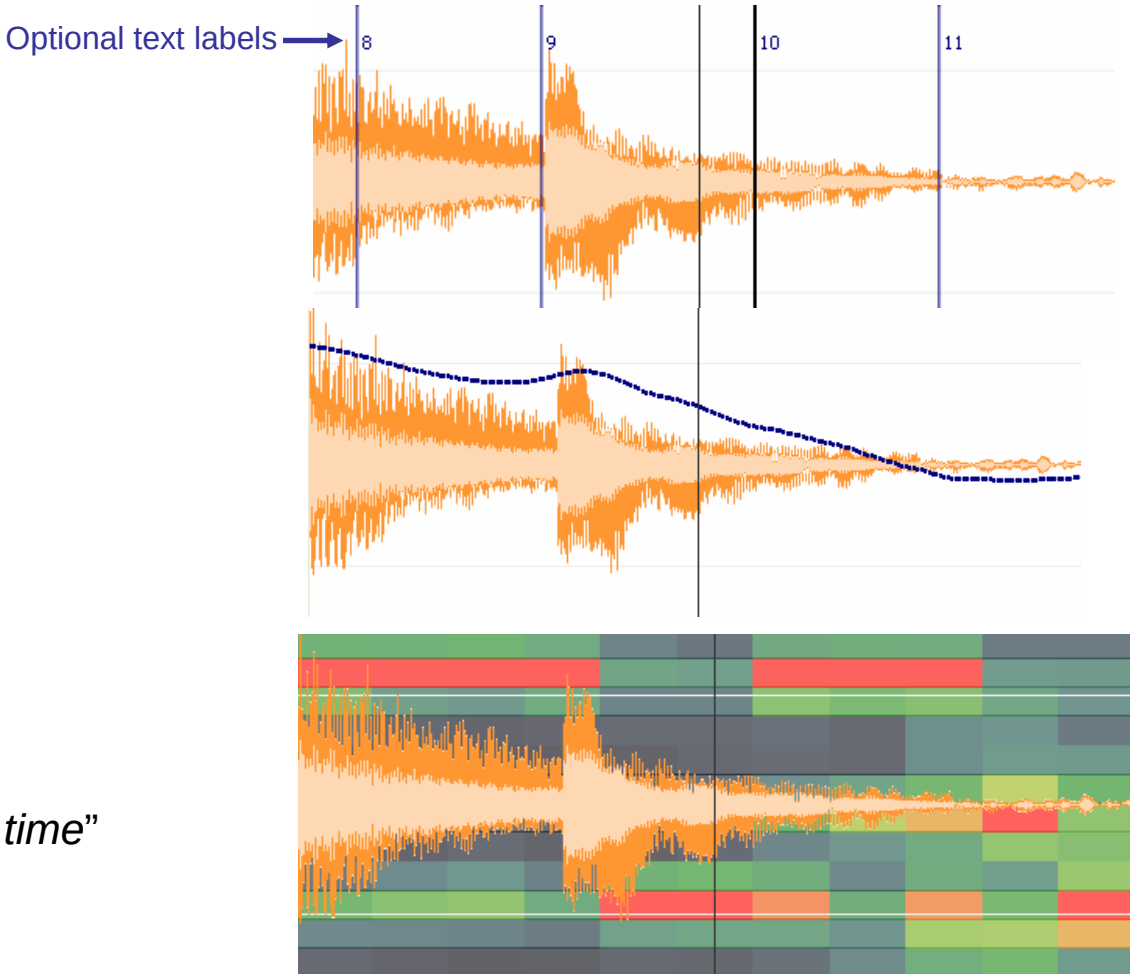
Functions

"*A value at a time*"

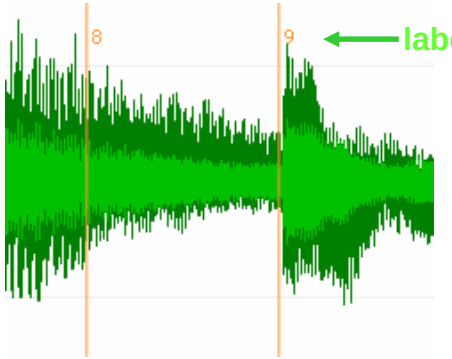


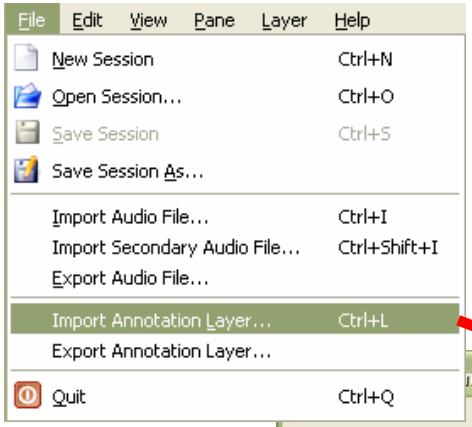
Grids

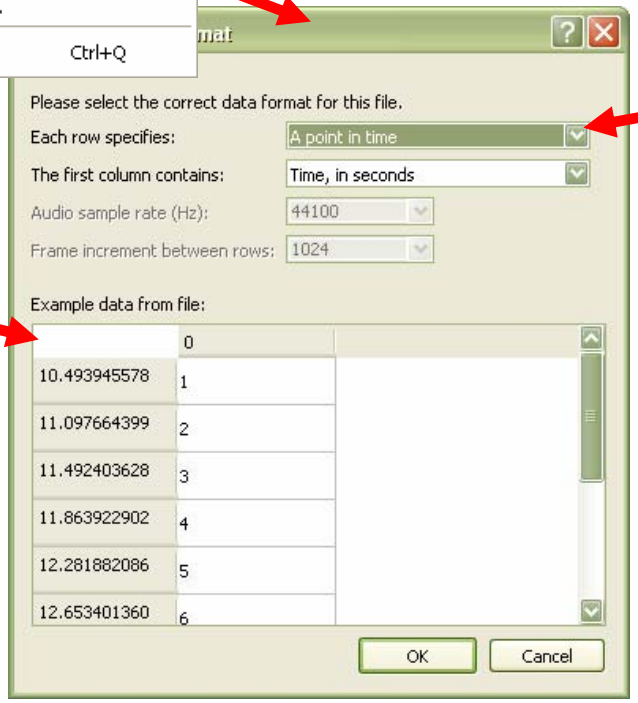
"*A set of values at a time*"



Time Instants







Very important!

Preview of file contents

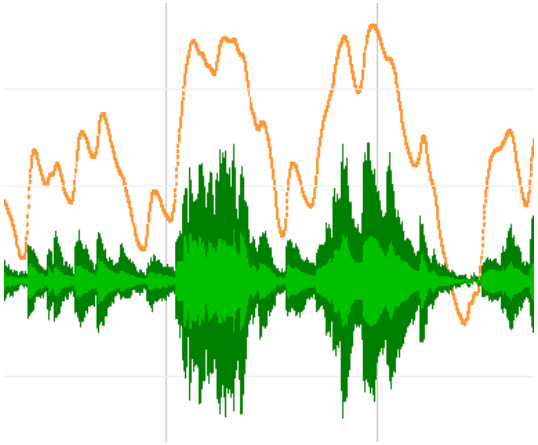
text-based annotation file:

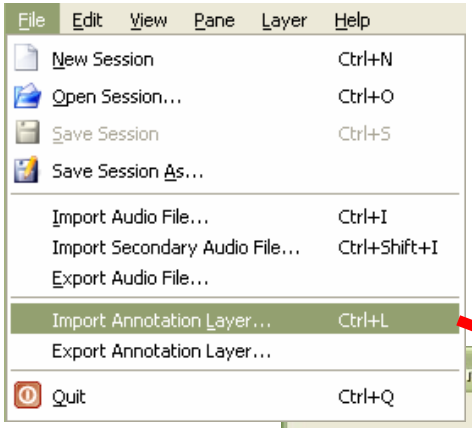
10.493945	1
11.097660	2
11.492403	3
11.863922	4
12.281882	5
12.653401	6
13.094580	7
13.512539	8
13.953718	9
14.464557	10
14.905736	11
15.370136	12
15.788095	13
16.206054	14
16.624013	15

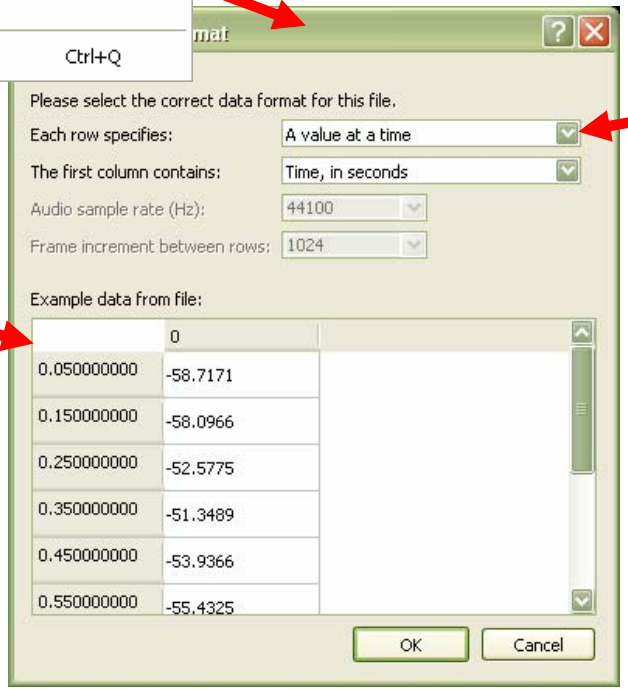
Time in seconds

Display label
(letters and numbers)

Time Functions







Very important!

Preview of file contents

text-based annotation file:

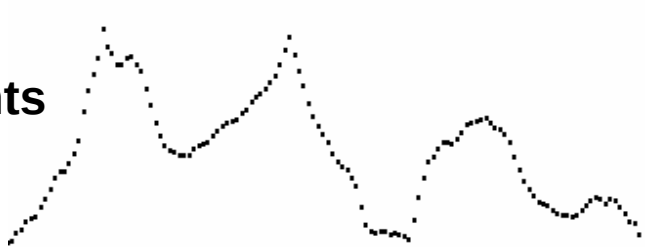
192.050	-24.6398
192.150	-23.8917
192.250	-23.0374
192.350	-25.5914
192.450	-27.8502
192.550	-28.1451
192.650	-31.2799
192.750	-24.8039
192.850	-23.701
192.950	-25.9763
193.050	-28.5637
193.150	-30.5504
193.250	-32.1601
193.350	-34.1313
193.450	-36.0496

Time in seconds

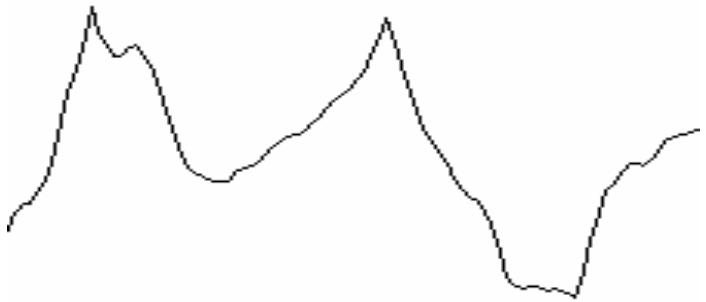
Value at time

Time Function Styles

Points

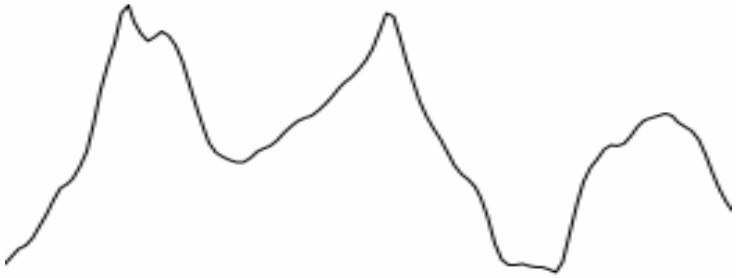


Lines



Stems

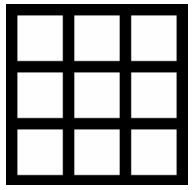
Curve



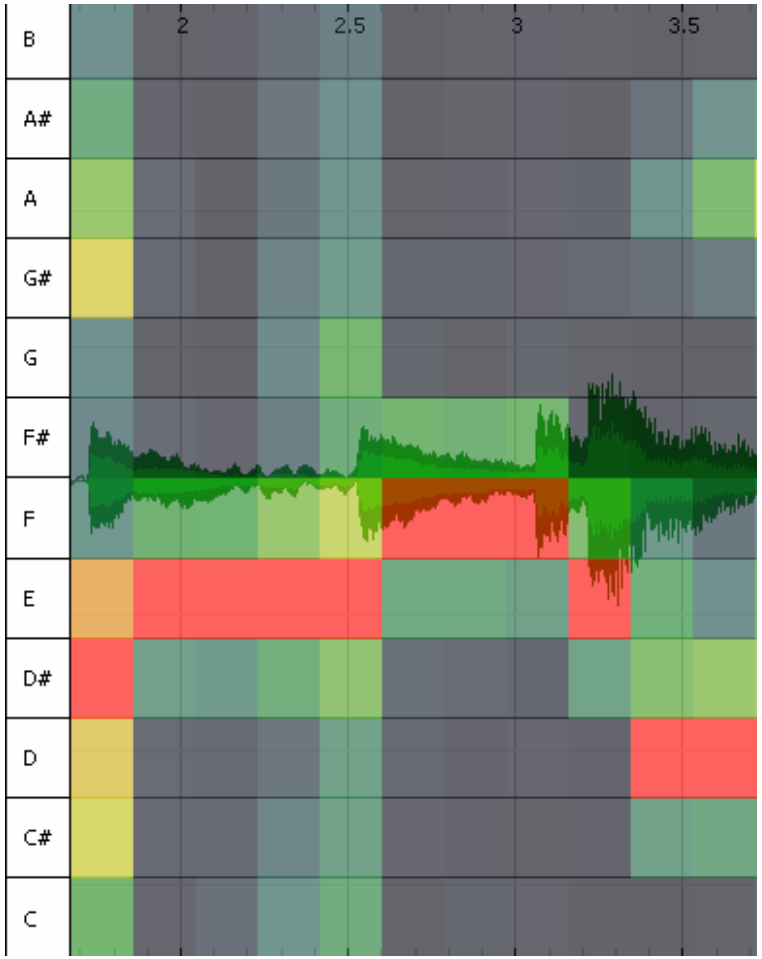
Connected Points

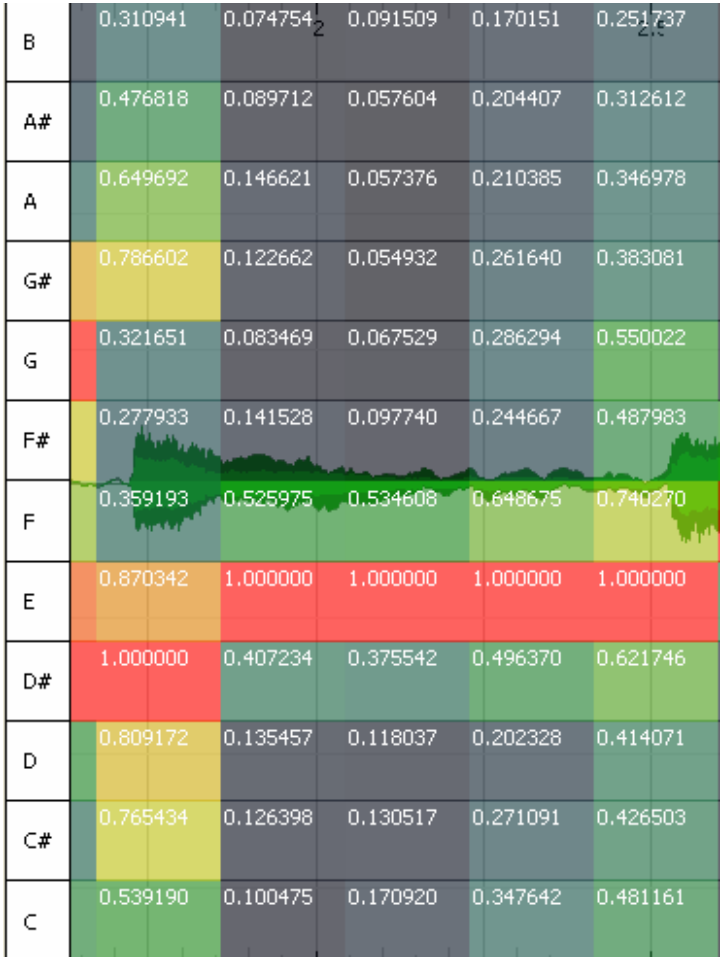
Segmentation

Time Grids



- **Example chromagram plugin gird data**



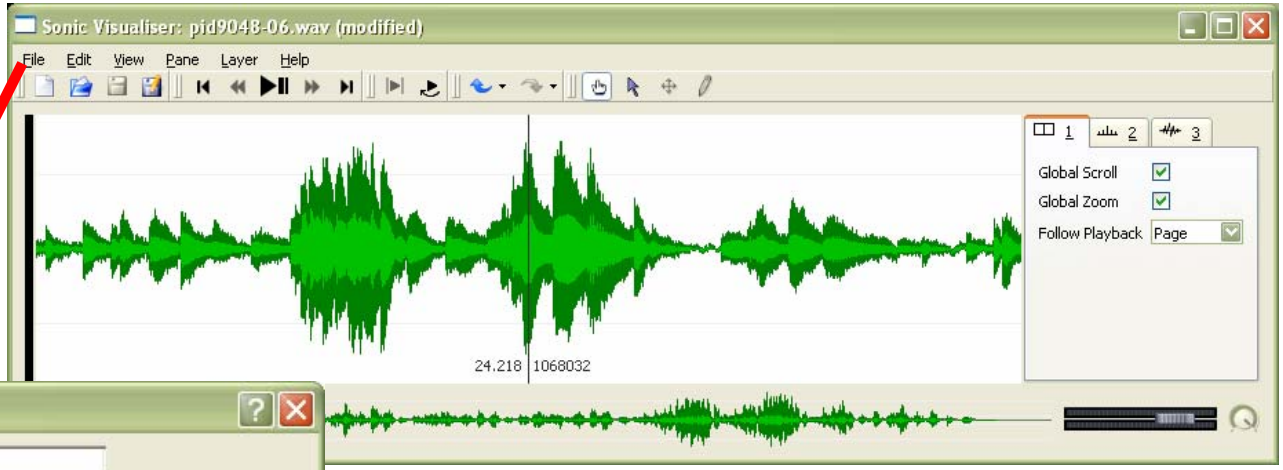


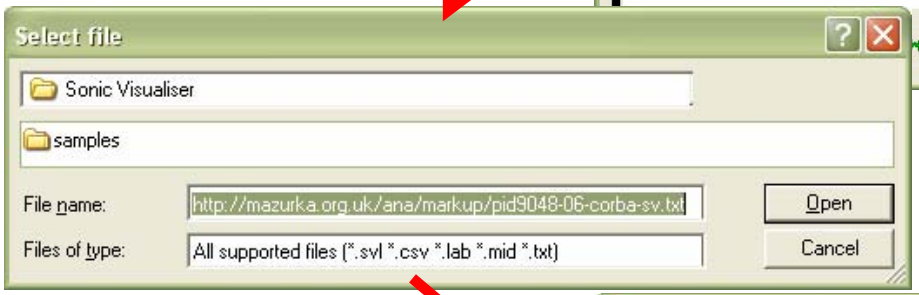
- Load data files with setting: “A set of values at a time”

- Zooming in shows individual numbers in grid

Downloading Web Annotations

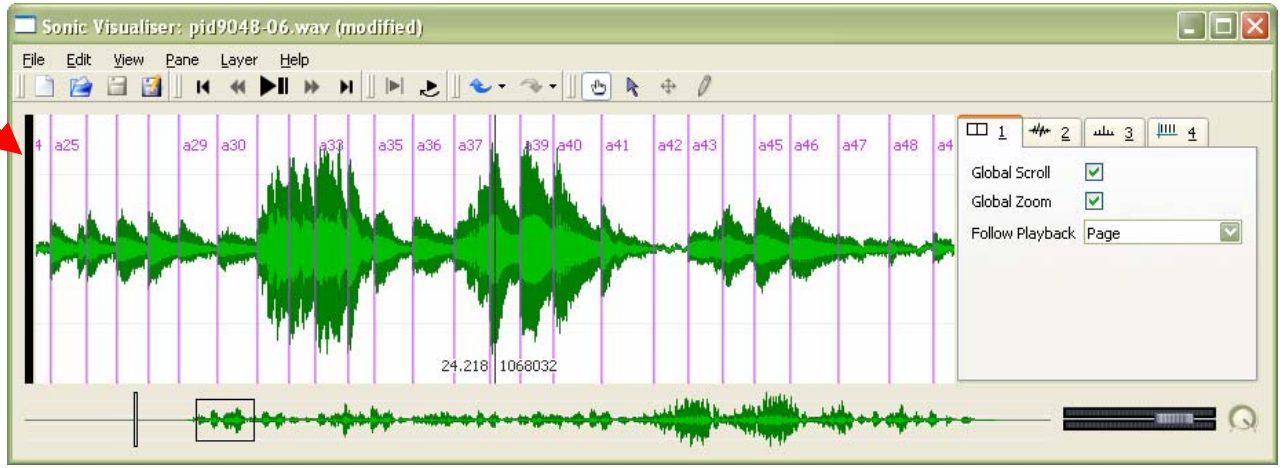
• Import an annotation file as usual for a local annotation file.





• paste a web address in the file name field

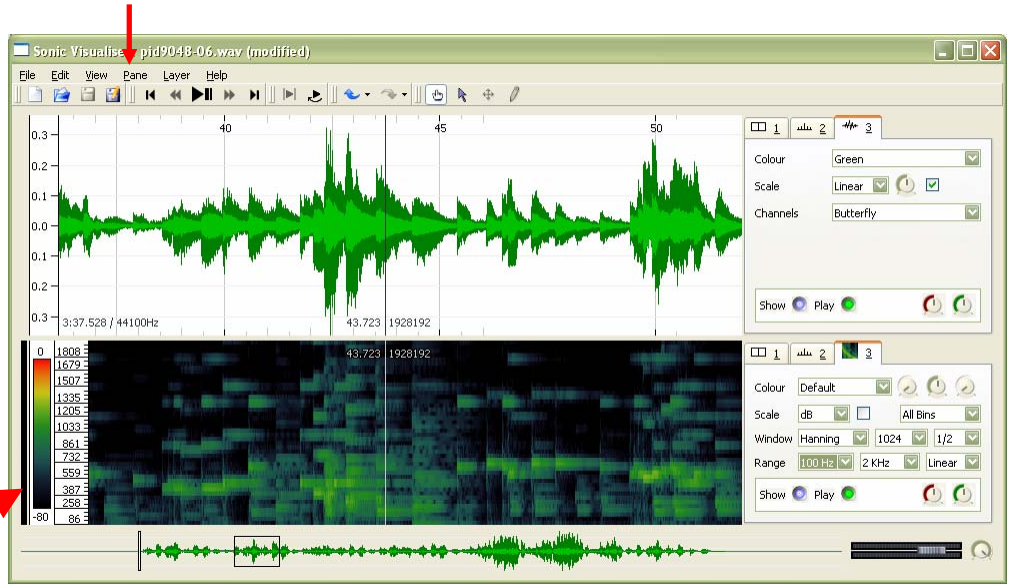
• File is downloaded from the web and loaded like a local annotation file.



Spectrogram Layer

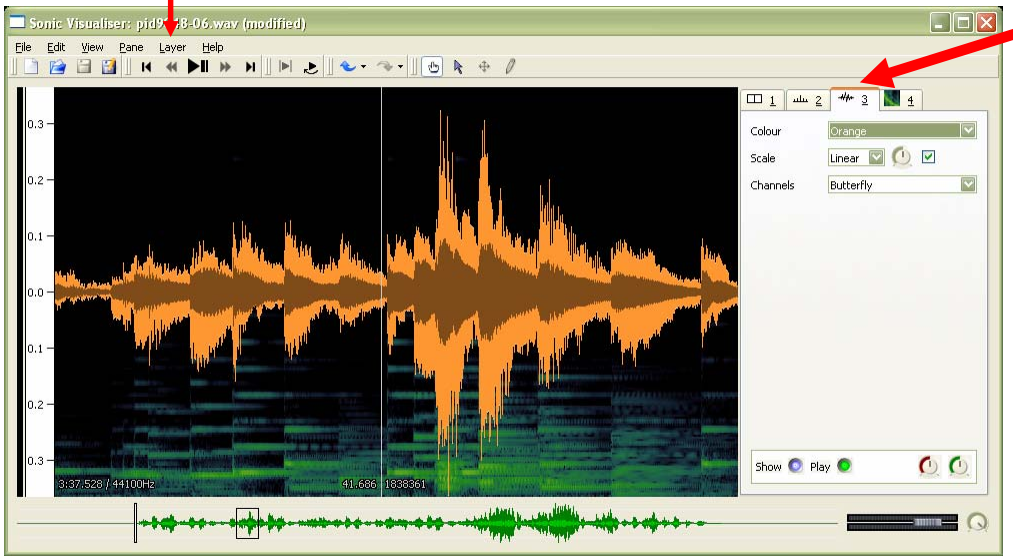
Creating a spectrogram

- Create a new spectrogram pane by selecting “Add Spectrogram” from the “Pane” menu.



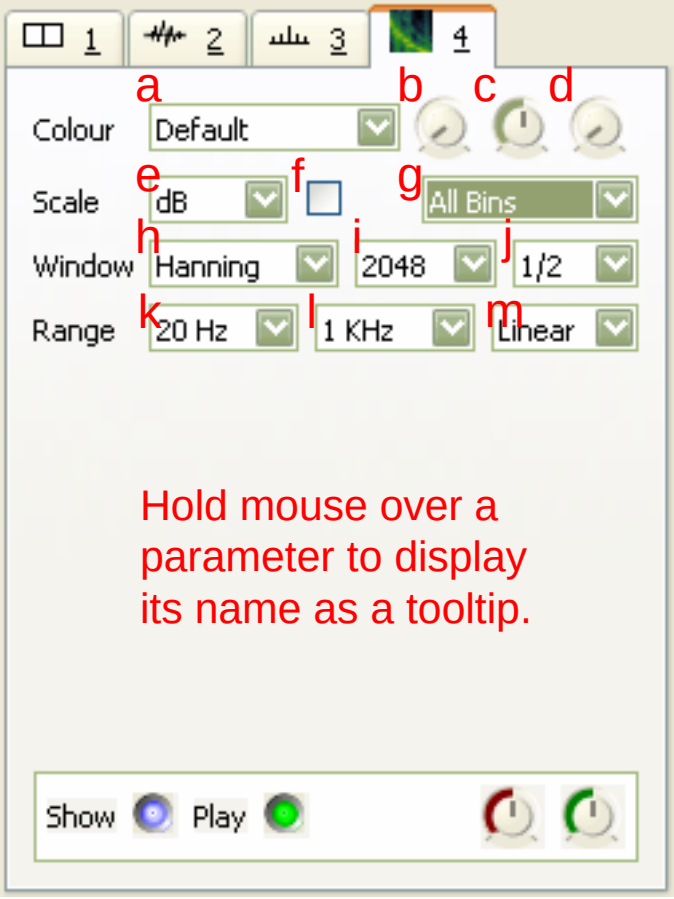
Active pane marker

- Create a new spectrogram in the current pane by selecting “Add Spectrogram” from the “Layer” menu.



Active layer is shown on top of other layers

Spectrogram Layer Controls



Colour a = colouring scheme

b = threshold c = gain d = rotation

Scale e = display: **amp** in *dB*, *linear* or *meter* or **phase**

f = fit columns to maximum colour range

g = display type: raw DFT (*all bins*), peaks only, or detected frequencies

Window h = analysis window

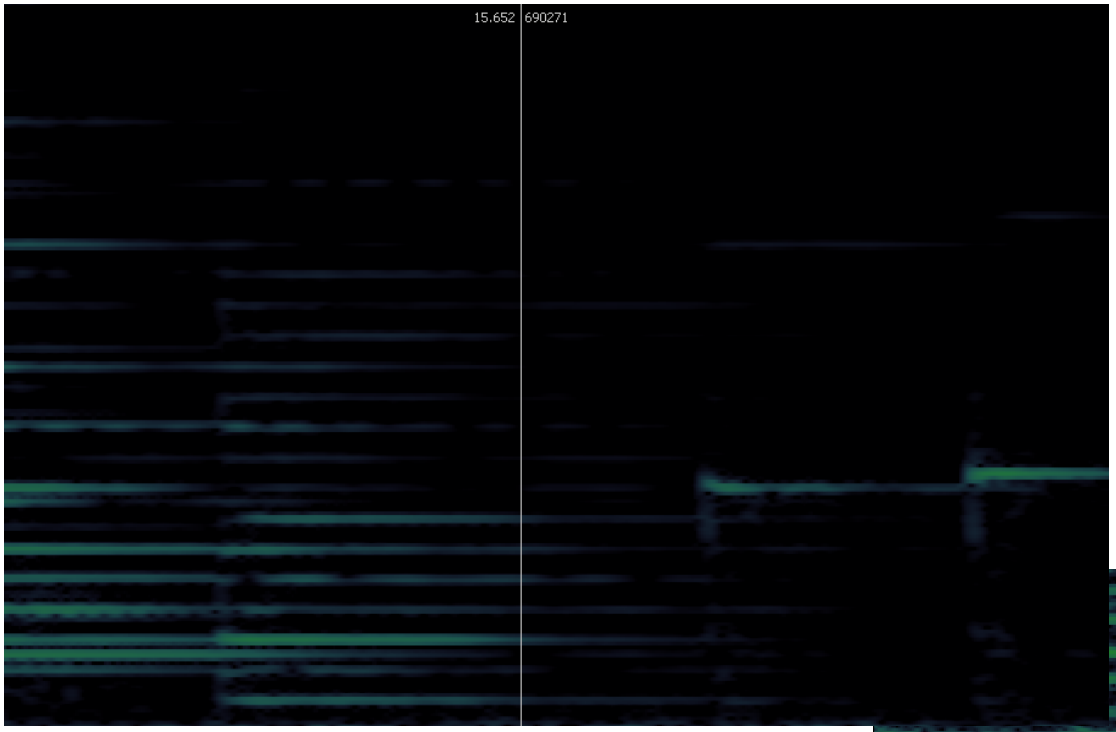
i = window/transform size j = hop ratio

Range k = lowest frequency in display

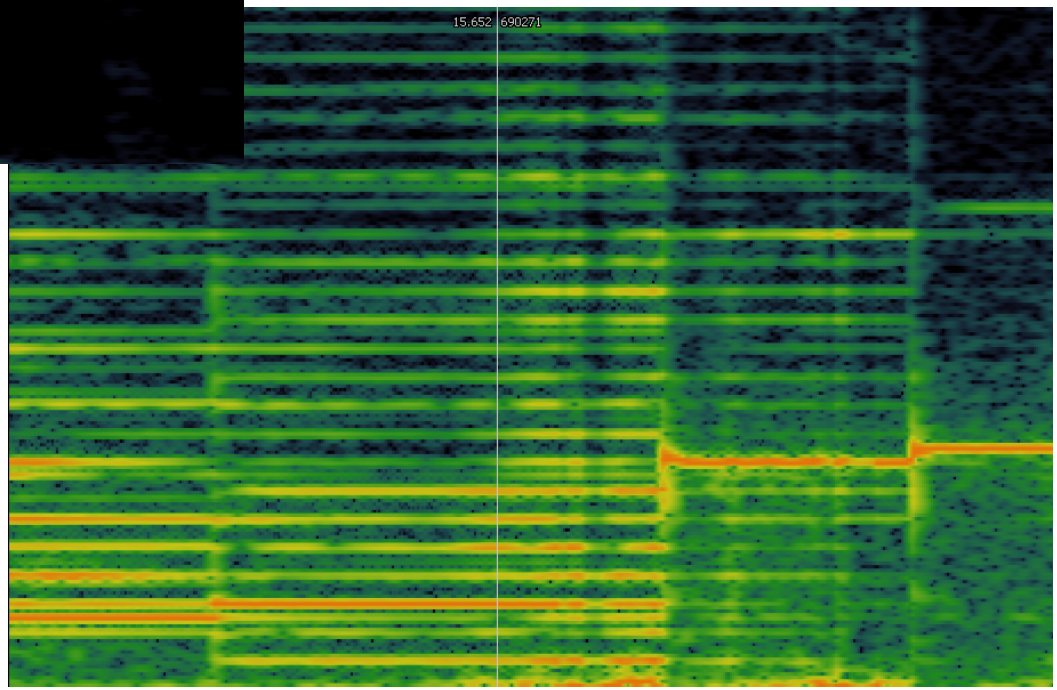
l = highest frequency in display

m = vertical scale: Linear (for equally spaced Harmonics) or Log (for equally spaced pitches)

Auto Normalizing



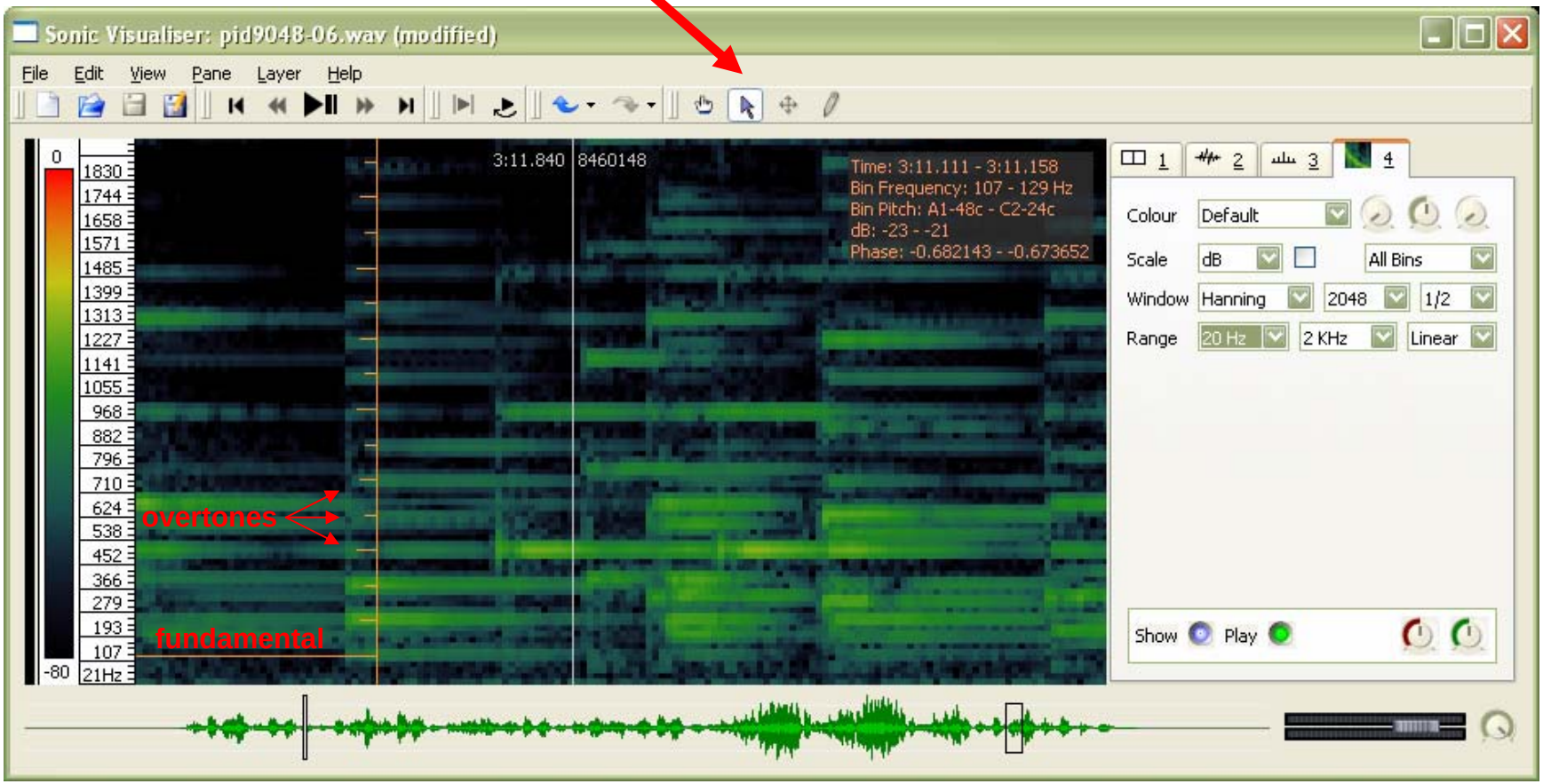
- **Without “Column Normalize”**



- **With “Column Normalize”**

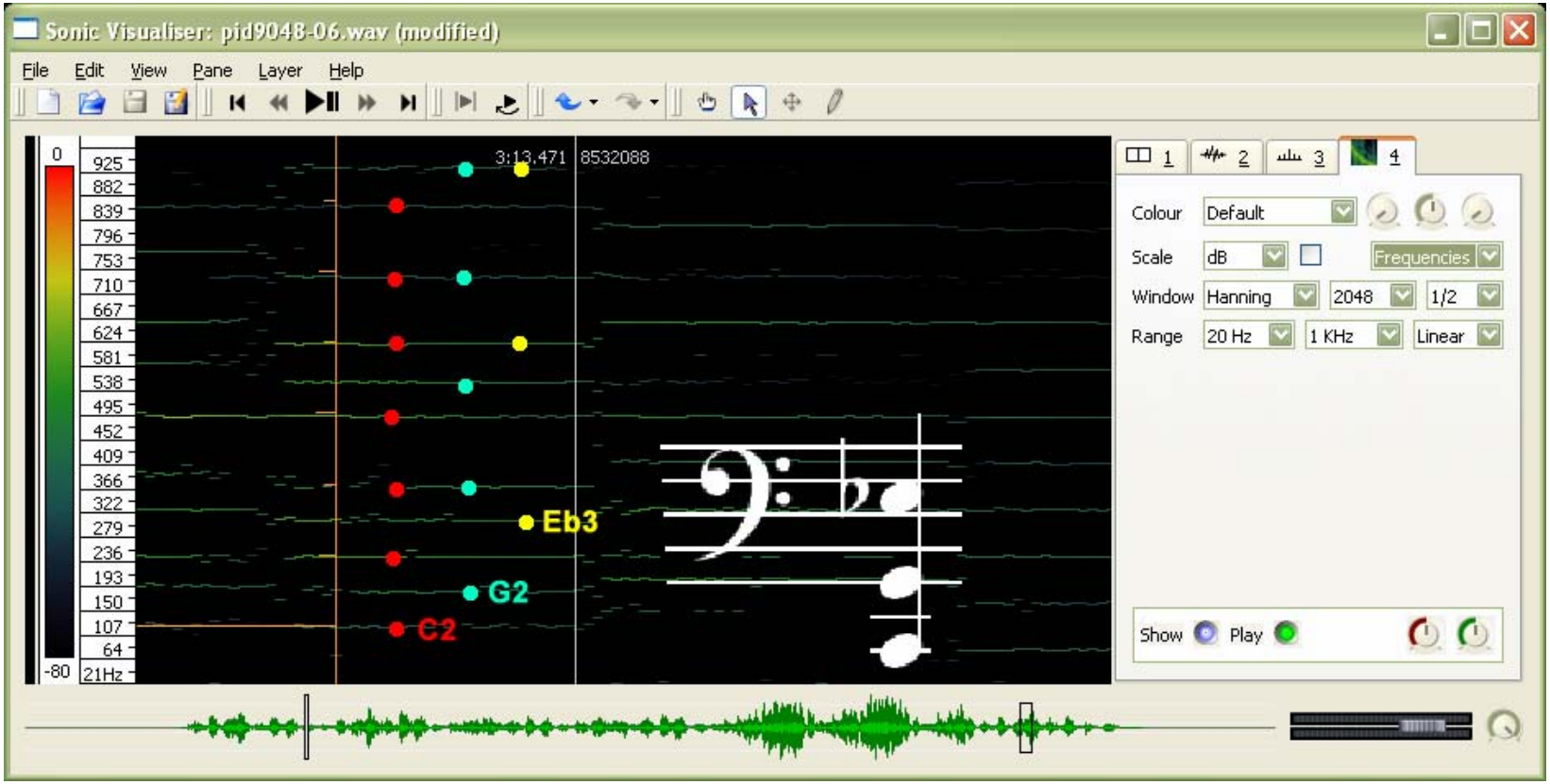
Harmonic Cursor

Go into “Select” mode to activate harmonic cursor



Identifying pitches with HC

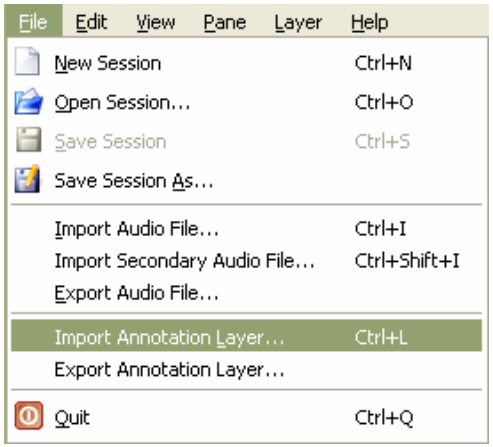
- Example of a chord with three notes

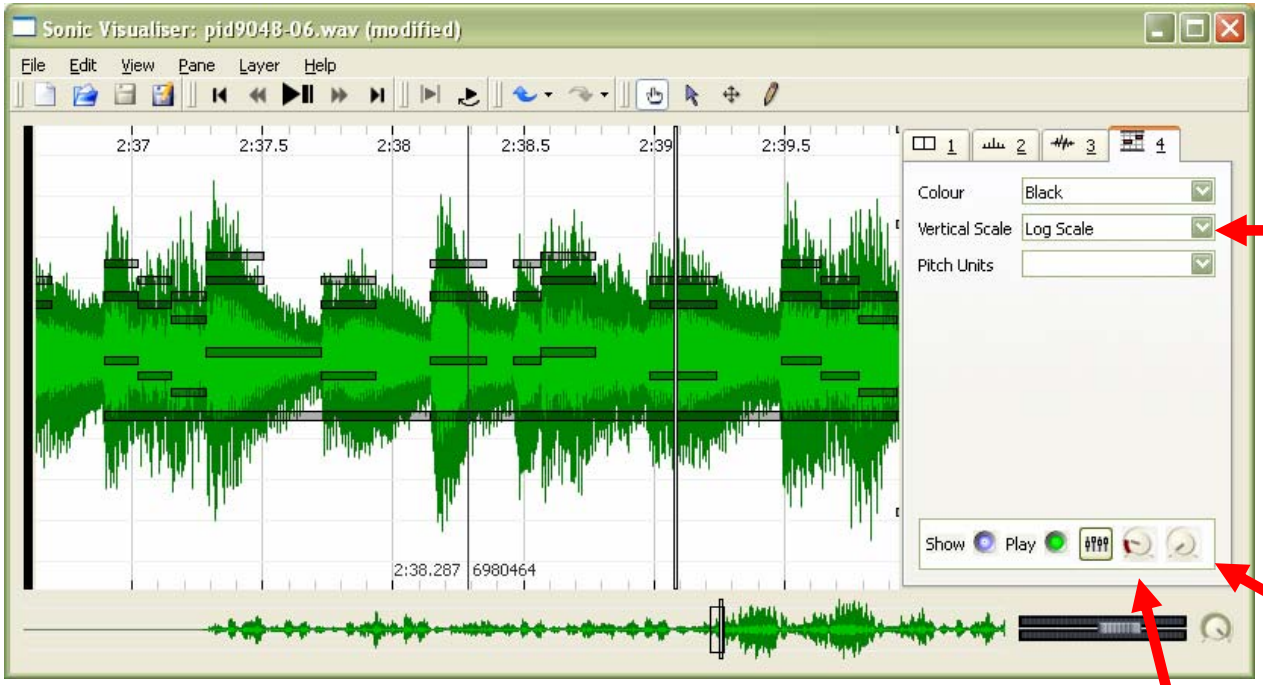


Note Layer

Importing a MIDI file

- **Import as with other annotation layers:**





Choose Log Scale to view notes as a Piano Roll

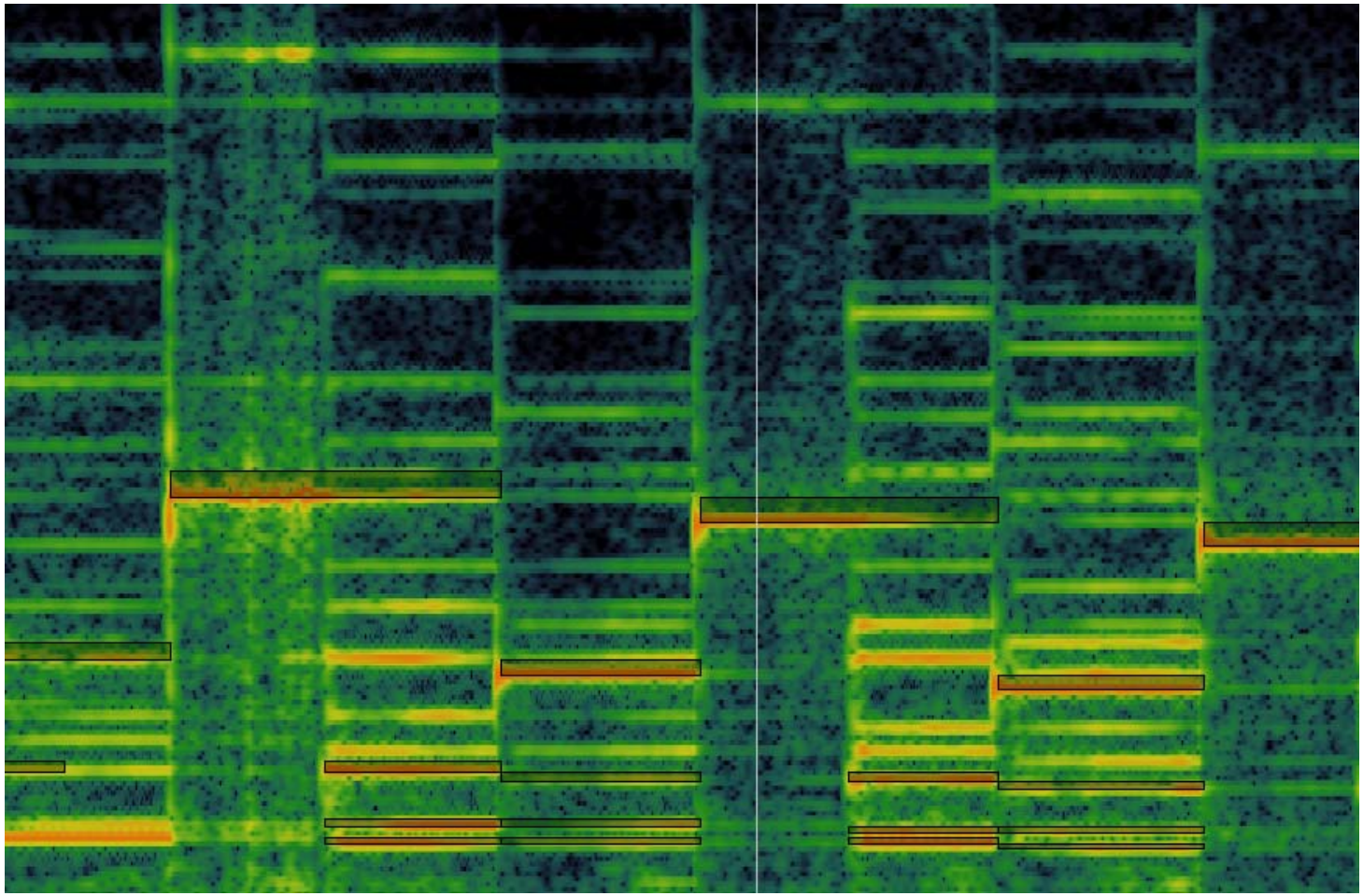
(Linear scale makes harmonics spaced evenly, like default for spectrogram).

Panning for notes

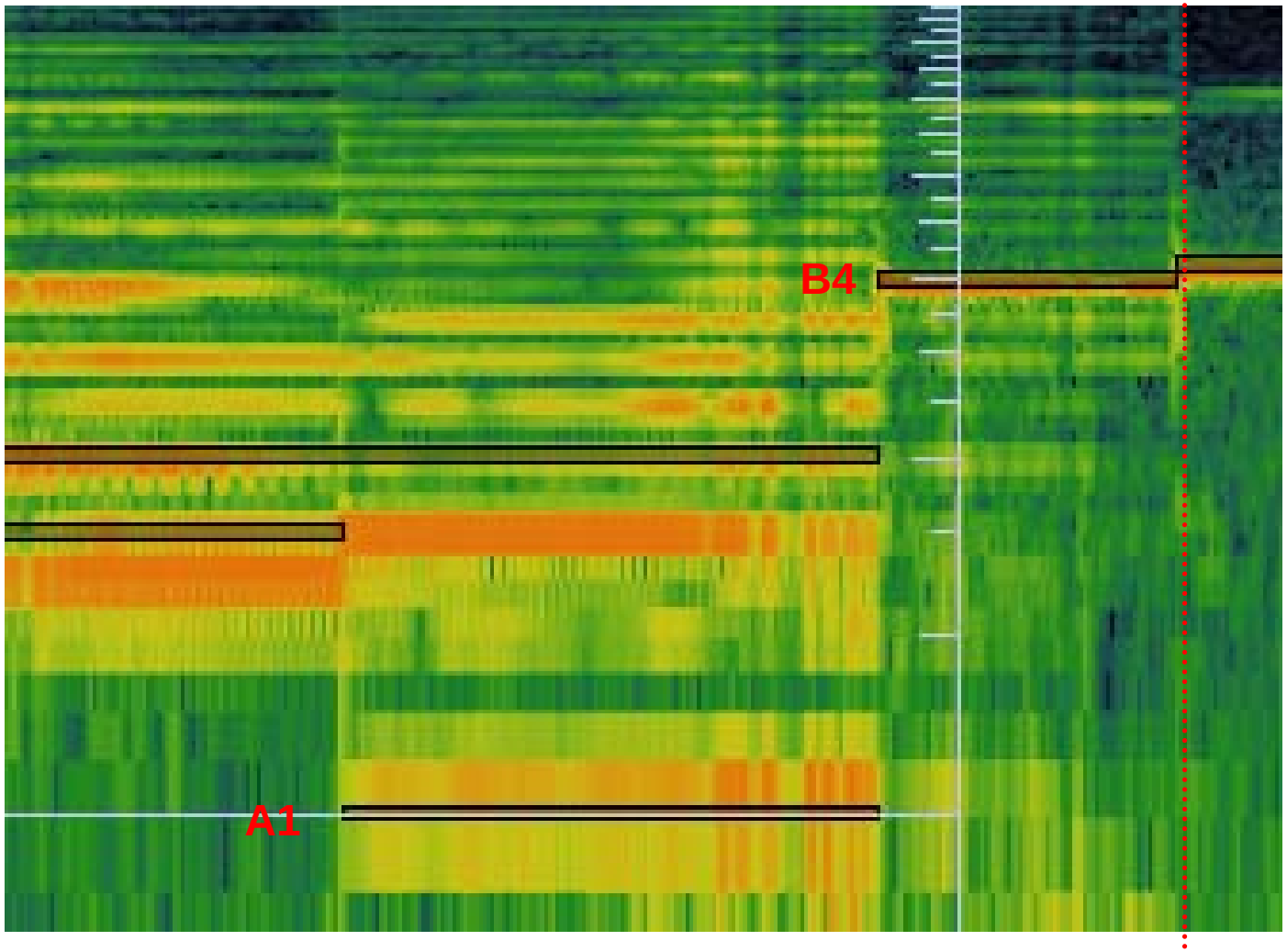
Volume for notes

Note + Spectrogram Layers

- **Notes indicate where pitch frequencies are located**
- **Harmonics are everything else (if MIDI file is correct)**

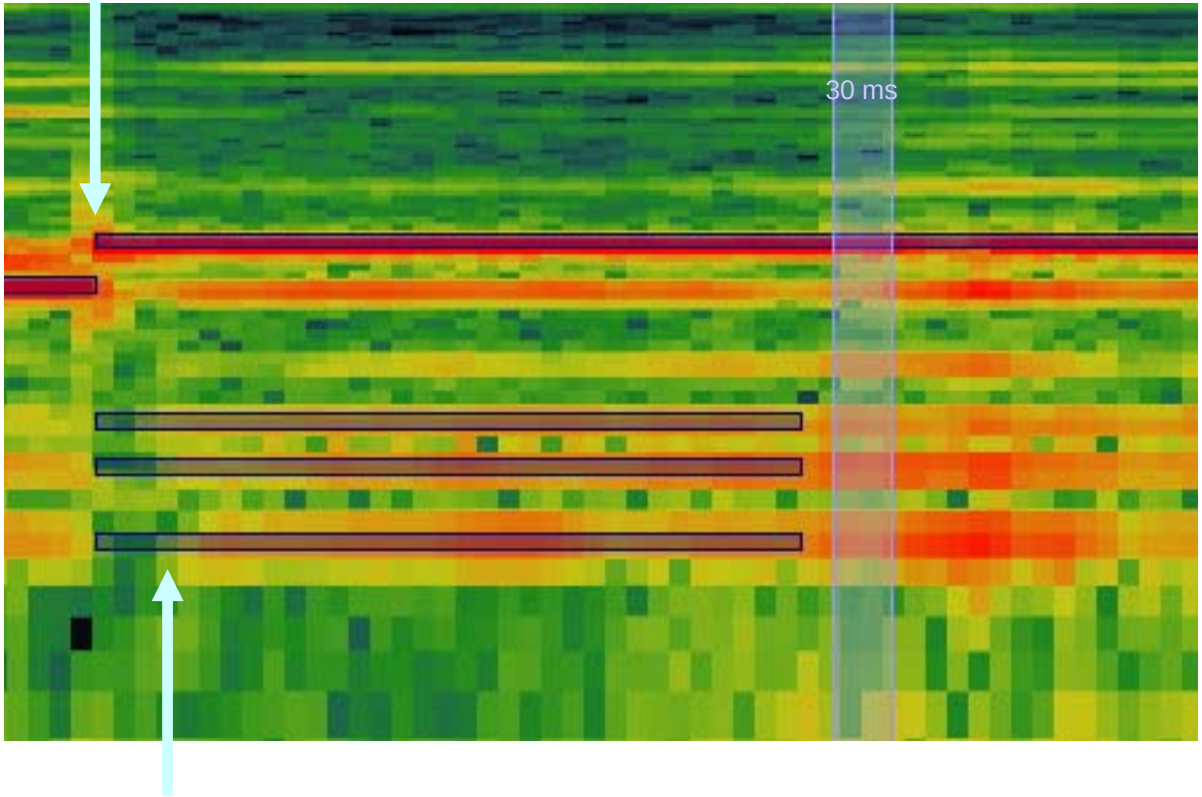


Pedaling



LH/RH coordination

RH note



LH notes occur about 30 ms later

TAPPING

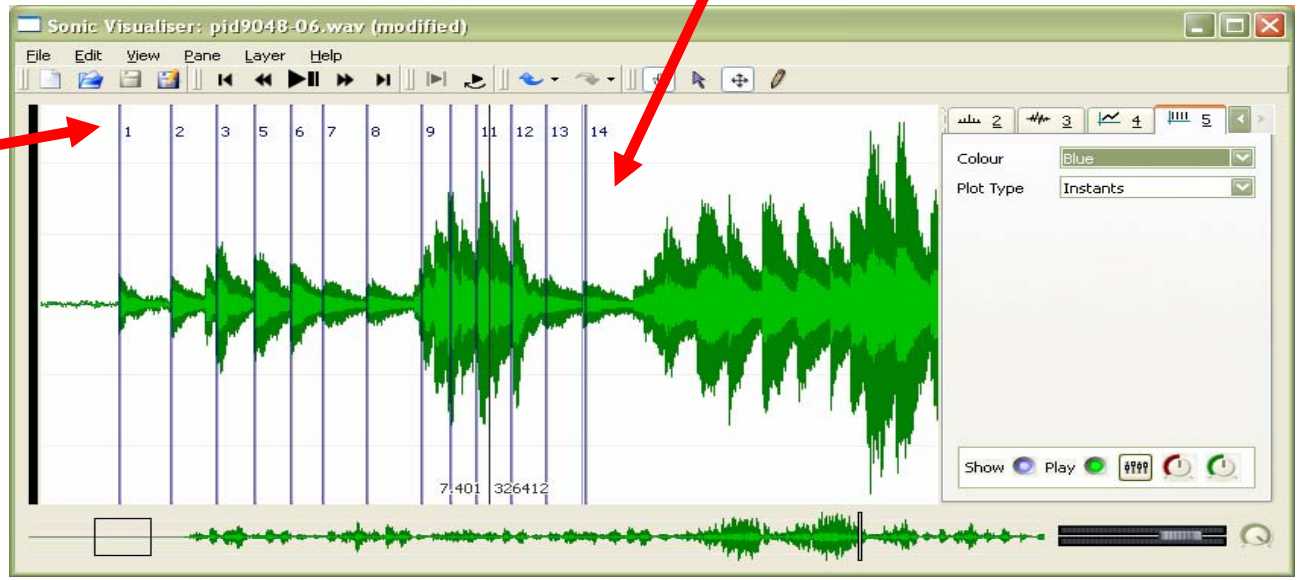
Tapping to performances

- Press numeric Enter key to insert a marker at the current time.
  (can be done while audio is playing or stopped)

- SV adds a time-instant layer for the tap times, or inserts them in the current layer if it is a time instant layer.

Time instants will appear in the pane while the audio plays

Time instants labeled sequentially



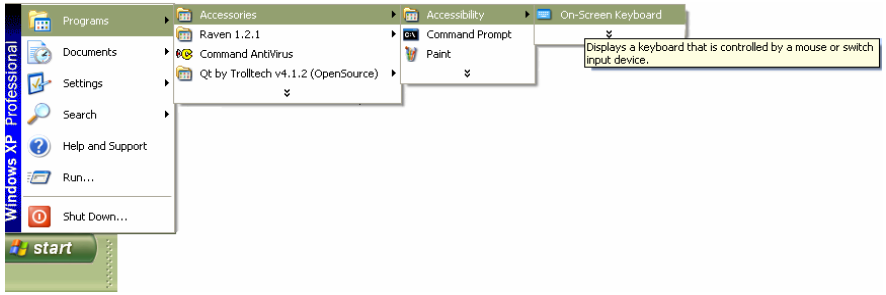
Laptop Tapping

• If using a laptop computer without an extended keyboard, you can use the on-screen keyboard to click with the mouse:

Enter key

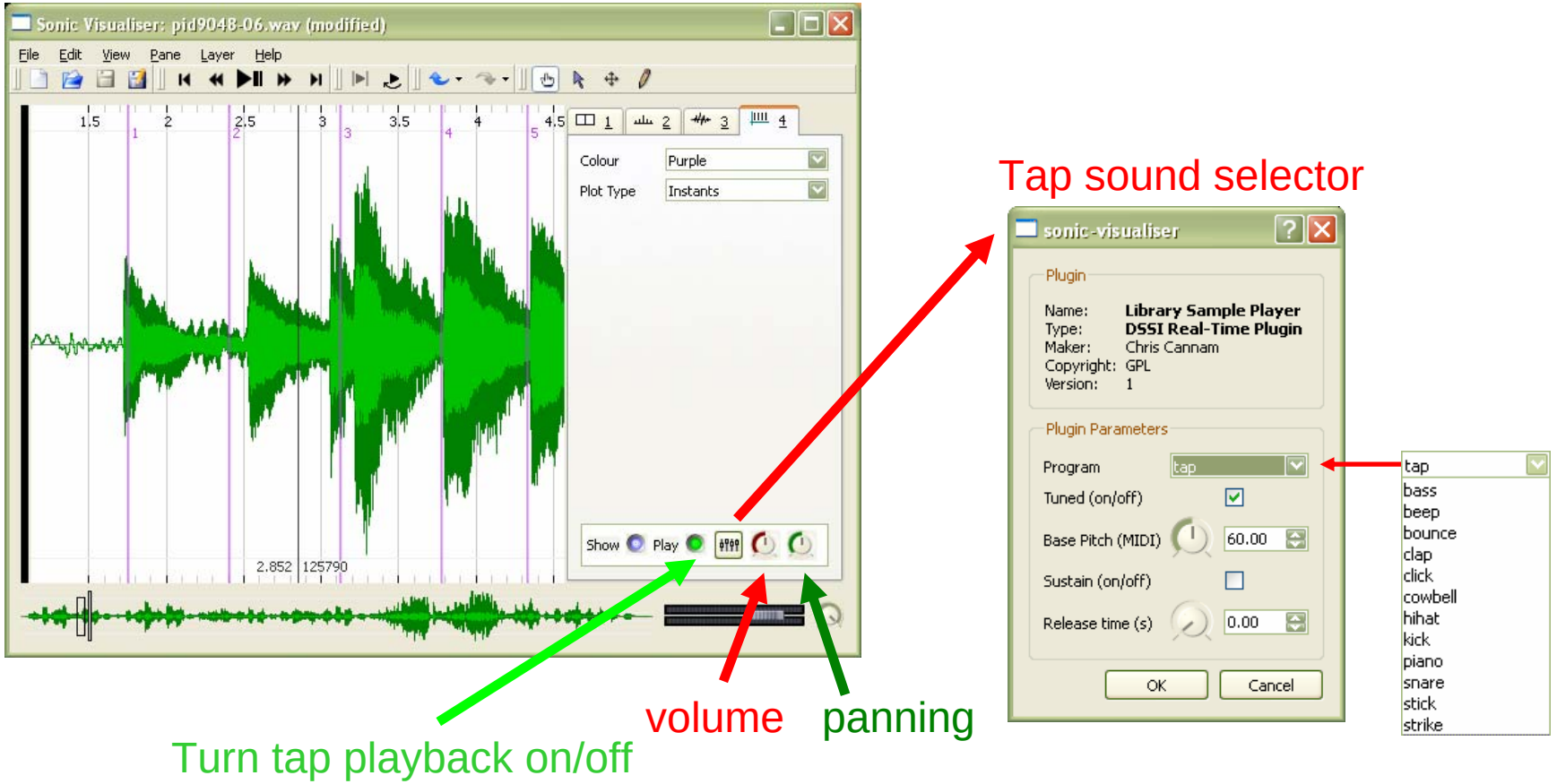
• To open the on-screen keyboard in Windows:

Start menu → Programs → Accessories → Accessibility → On-Screen Keyboard



Tap playback

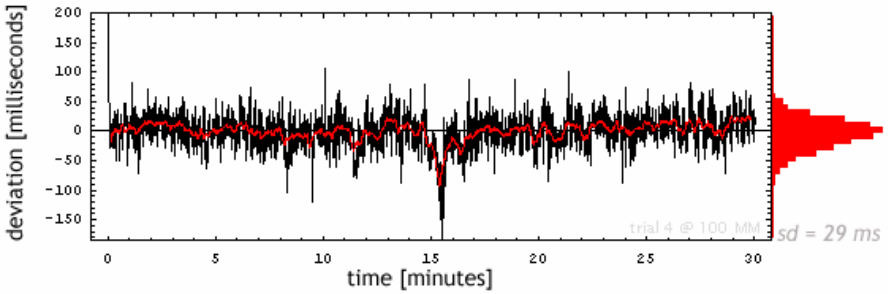
- By default taps will be played back with audio playback



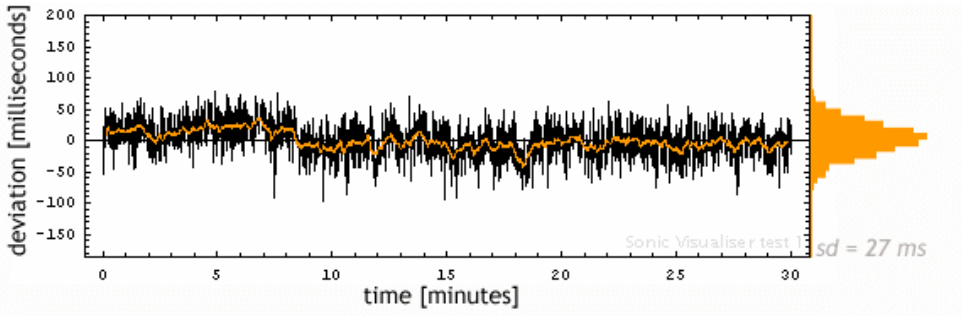
Tapping Evaluation

- Long-term accuracy is very good

Timing from a windows console program

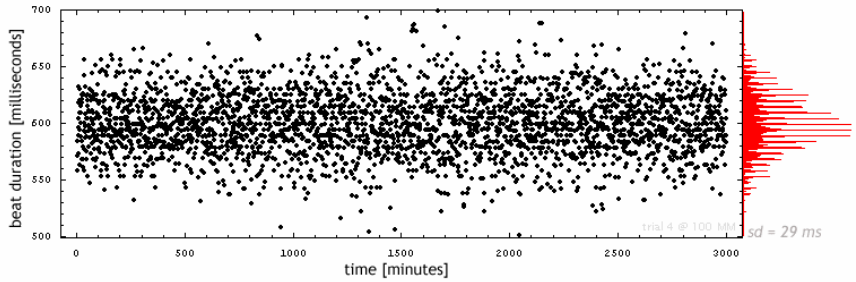


Timing from Sonic Visualiser

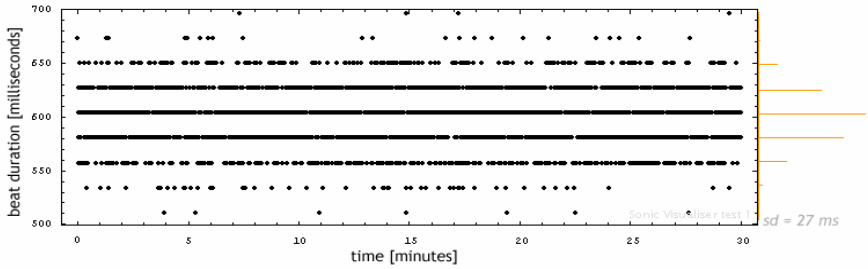


- Time quantization is not so great, but is OK

Console program time resolution about 4.644 ms



Sonic Visualiser time resolution 23.22 ms



- Local accuracy decreases by 40% (35 ms sd compared to 20 ms)
- Multiple tapping sessions can remove quantization errors

PLUGINS

Vamp Plugins

- 3rd parties can add their own audio analysis functionality to Sonic Visualiser
- see list at http://sv1.sourceforge.net/vamp.html

- **default plugins:**

  Spectral Centroid: Linear Frequency Centroid
  Spectral Centroid: Log Frequency Centroid
  Zero Crossings: Zero Crossing Counts
  Zero Crossings: Zero Crossings

- **C4DM@QMUL plugins:**

  Chromagram...
  Constant-Q Spectrogram...
  Tempo Tracker: Detected Beats...
  Tempo Tracker: Beat Detection Function...
  Tonal Change: Tonal Change Positions...
  Tonal Change: Tonal Change Detection Function...
  Tonal Change: Transform to 6D Tonal Content Space...

- **aubio-based plugins:**

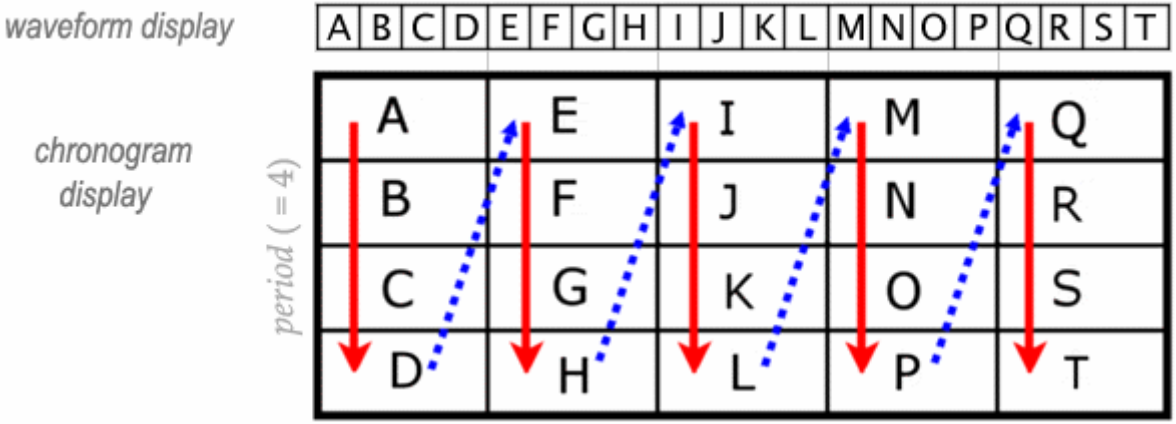
  http://aubio.piem.org
  (linux only?)

Chronogram...
Harmonic Spectrogram: HS raw pitch estimate...
Harmonic Spectrogram: Spectral power...
Harmonic Spectrogram: Spectrogram...
Nevermore Spectrogram...
Power Curve: Scaled Power Slope...
Power Curve: Raw Power...
Power Curve: Smoothed Power...
Power Curve: Smoothed Power Slope...

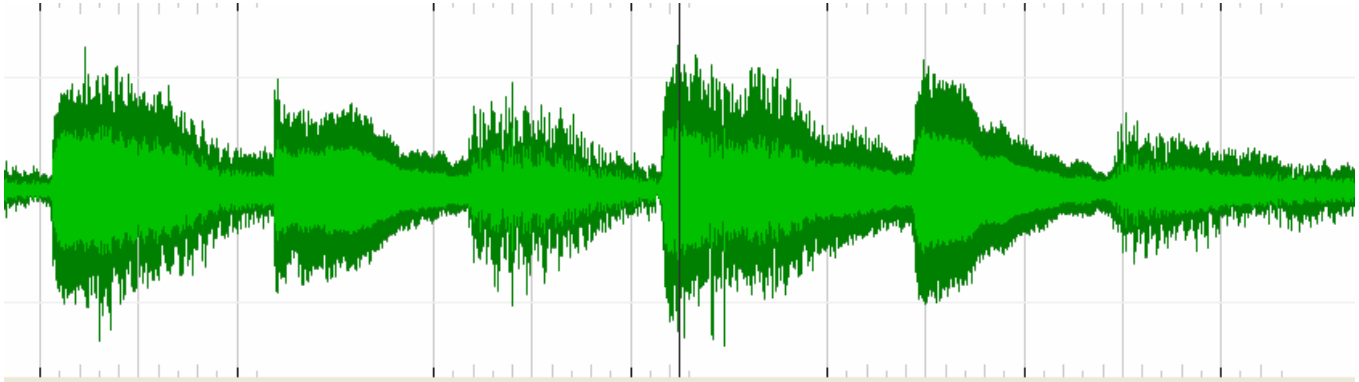
- See **http://sv.mazurka.org.uk** for Mazurka Project related plugins

*Mz*Chronogram

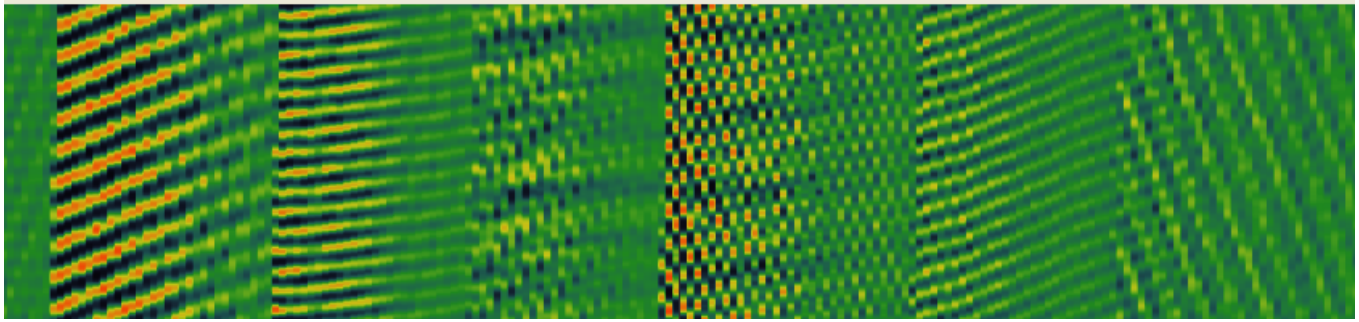
http://sv.mazurka.org.uk/MzChronogram



Waveform:

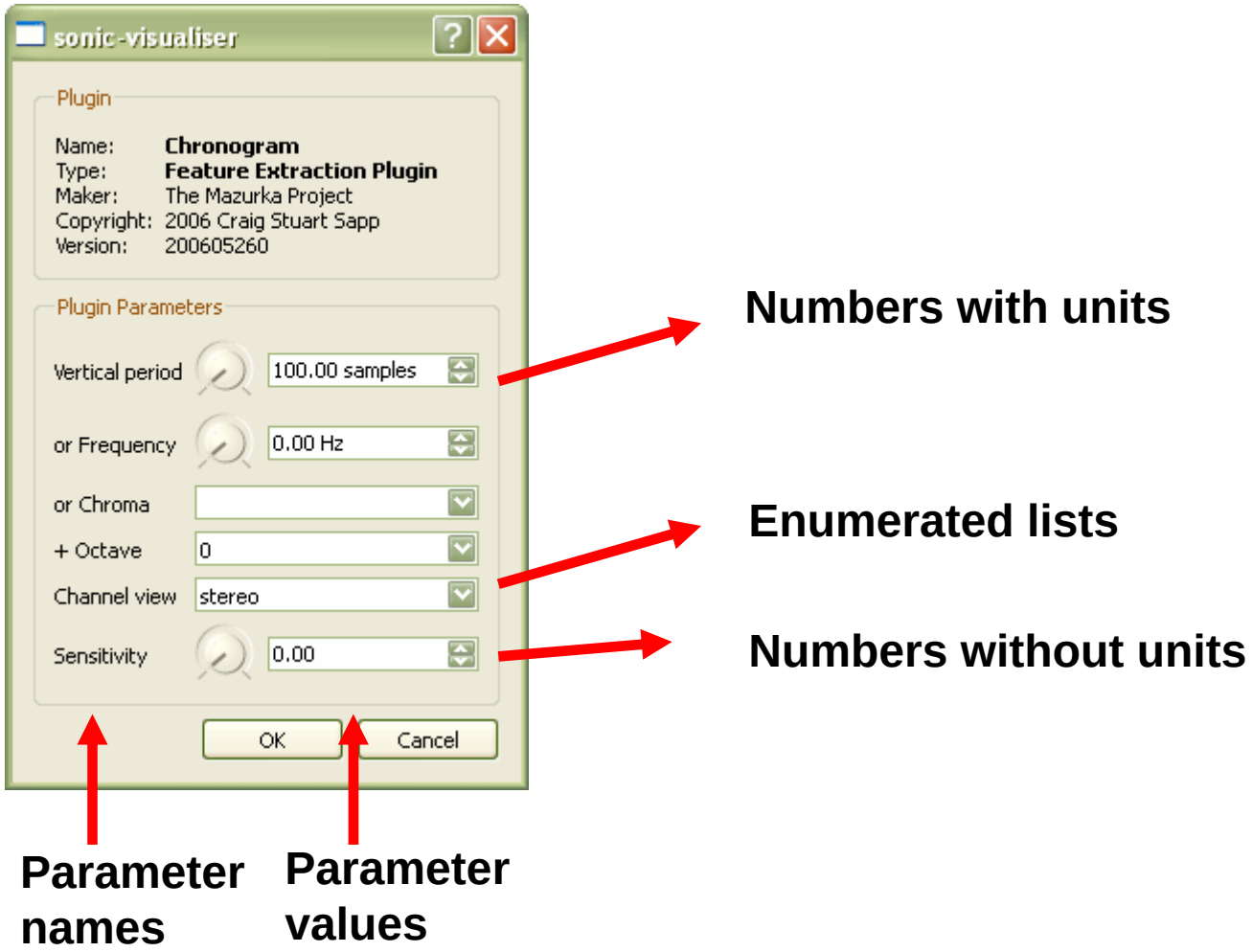


Chronogram:



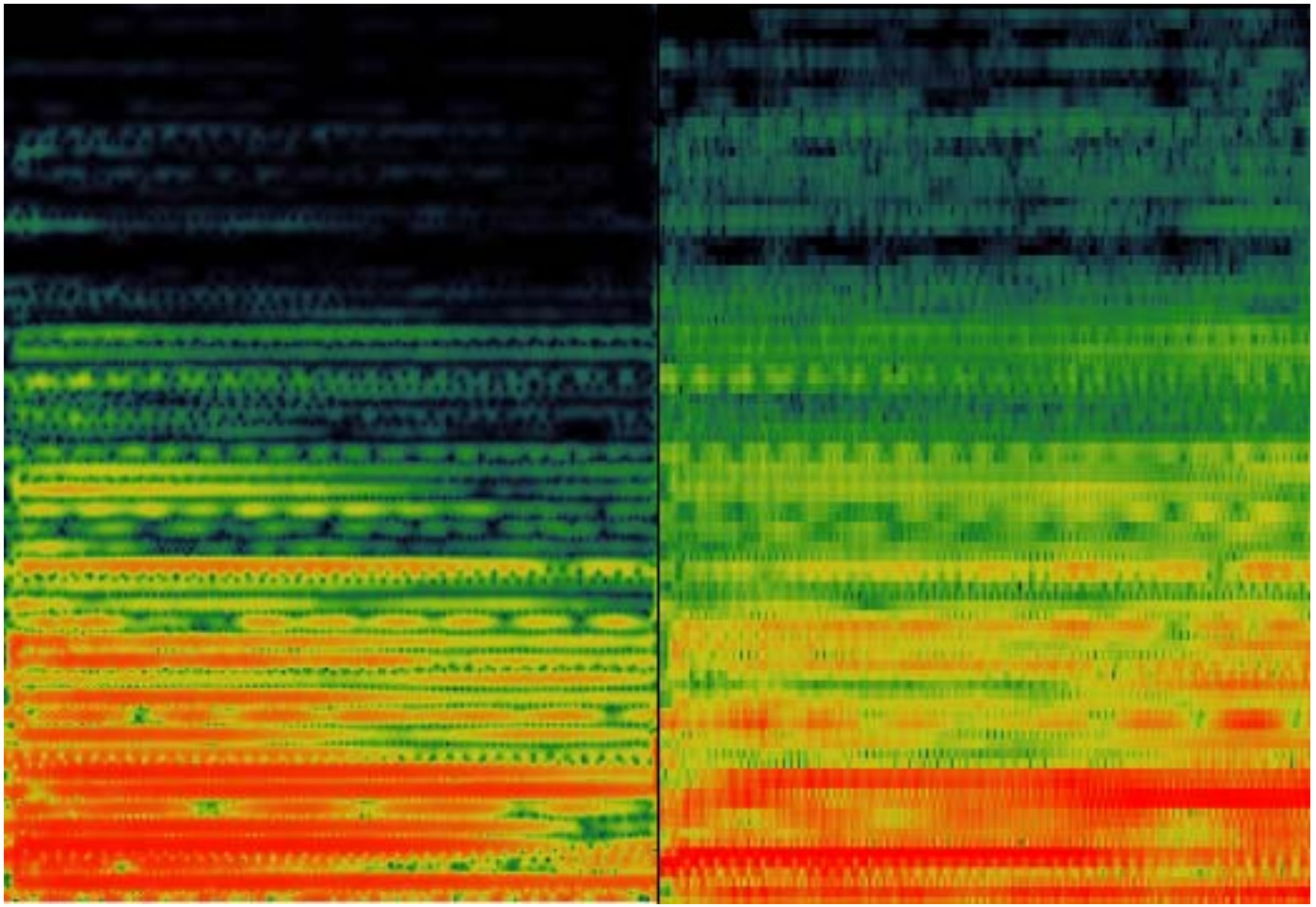
- Each pitch has a different visual character

Plugin Input Parameters

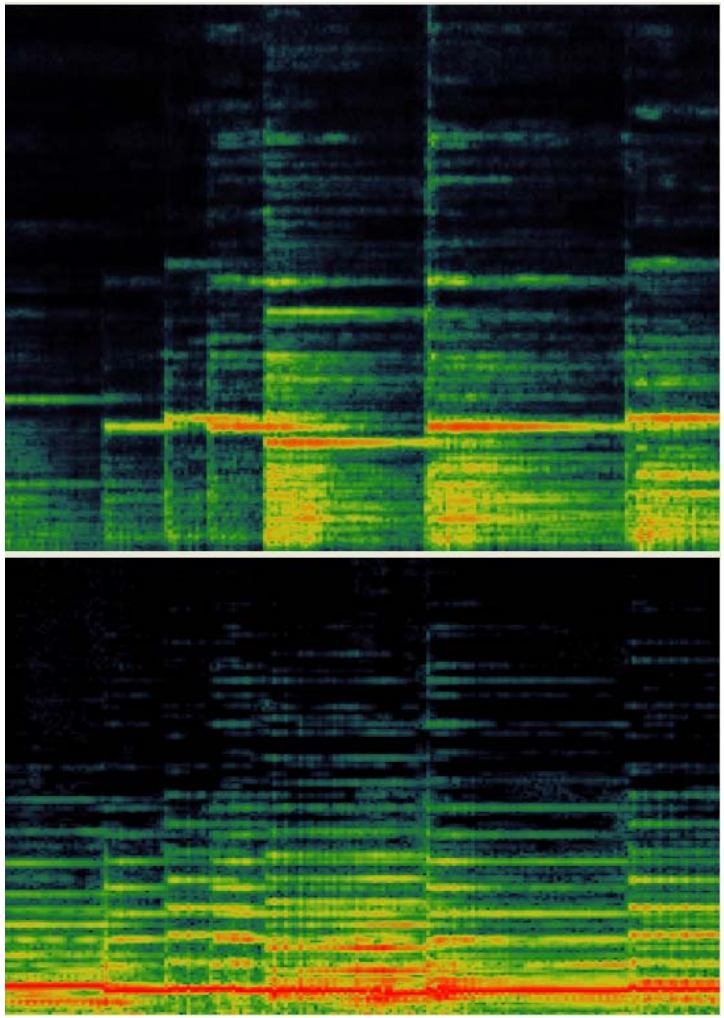


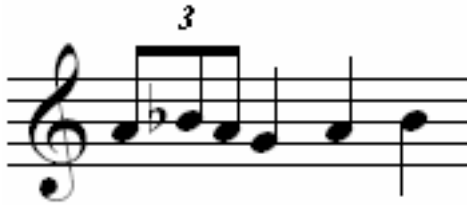
MzNevermore

- **Raven-like (and Praat) spectrogram display**
- **Independent analysis window / transform sizes**



MzHarmonicSpectrum

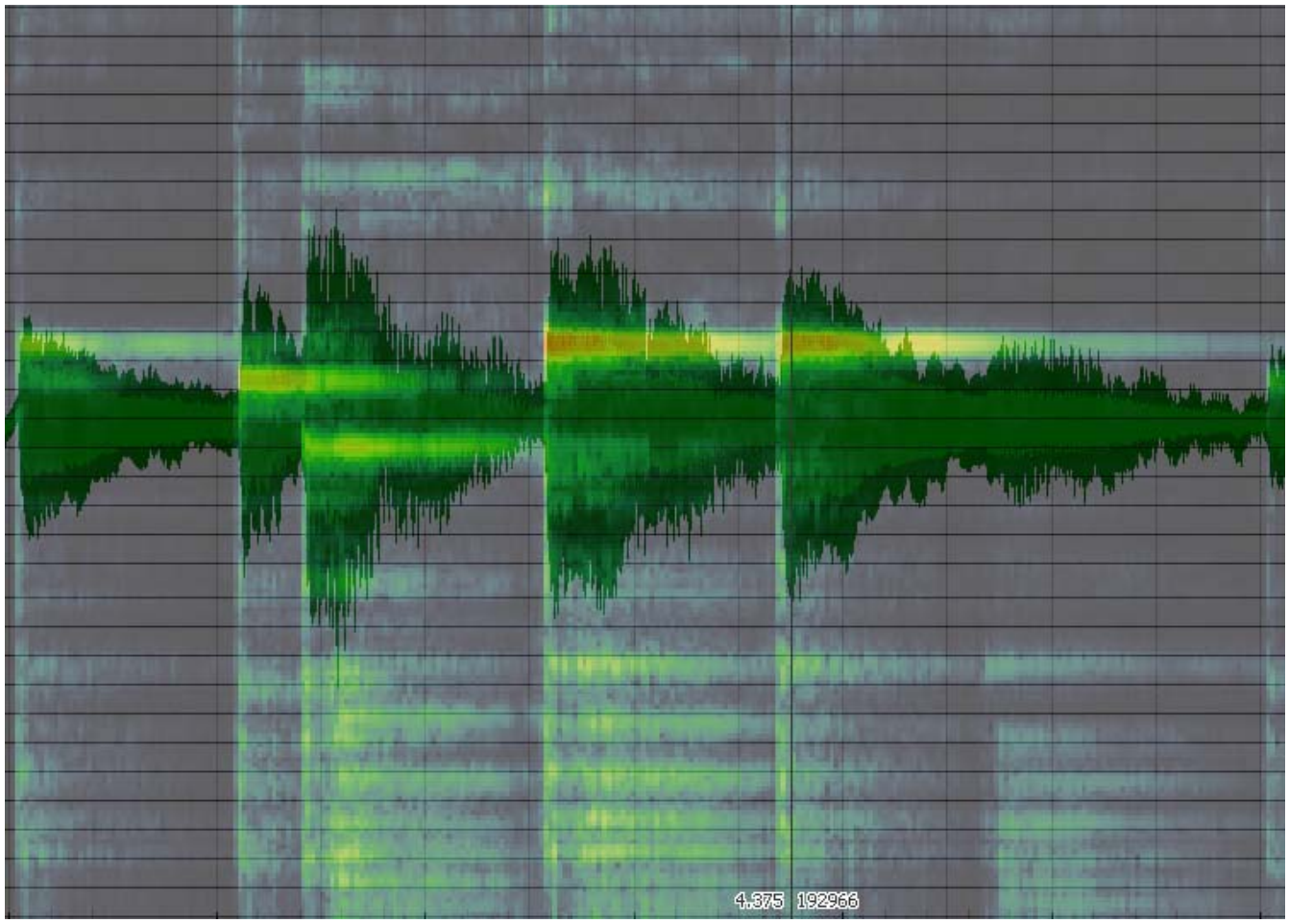




(+ left-hand chords)

- **Harmonic Spectrum**
- **Regular Spectrum**

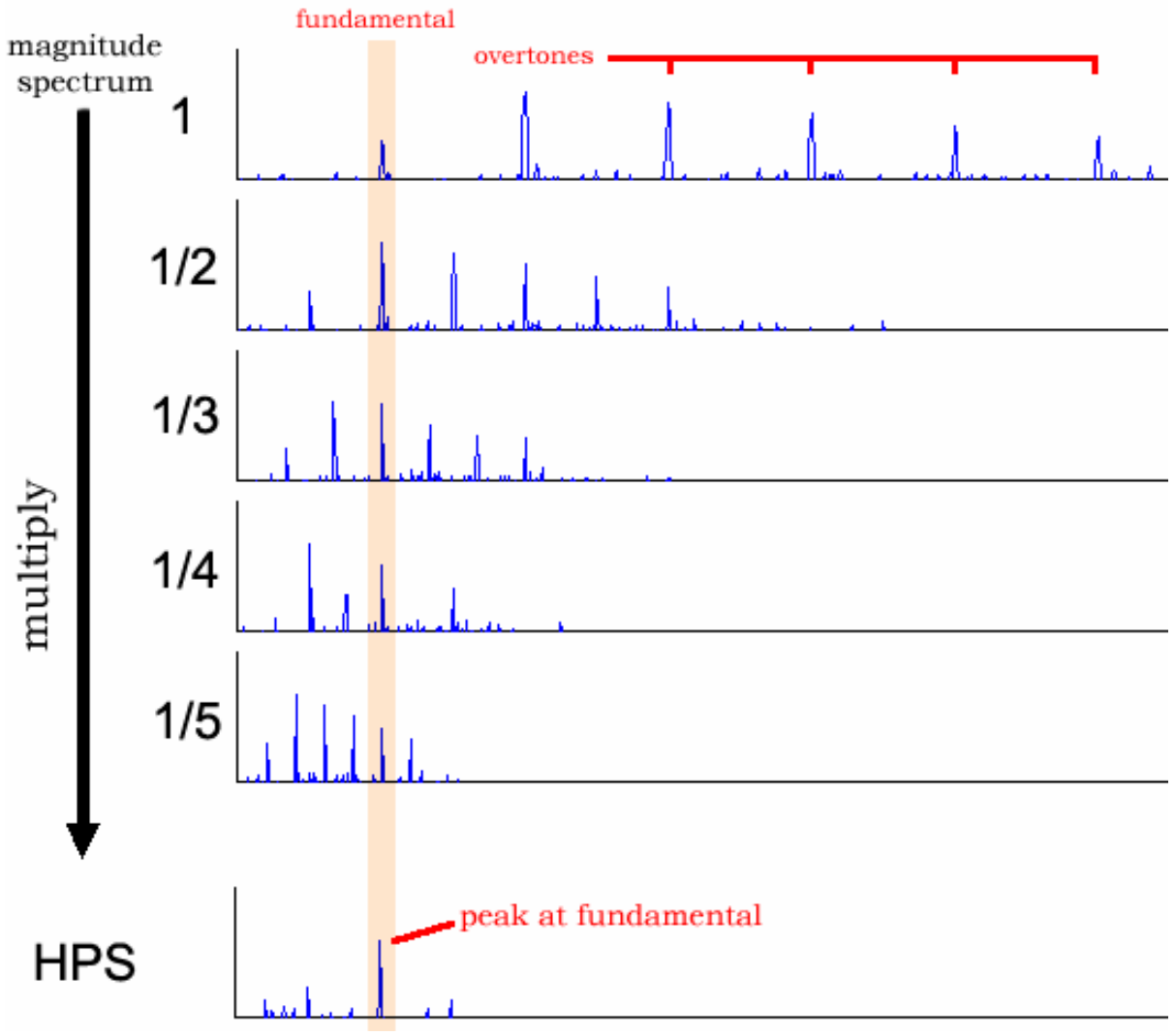
Harmonic Spectrum (2)



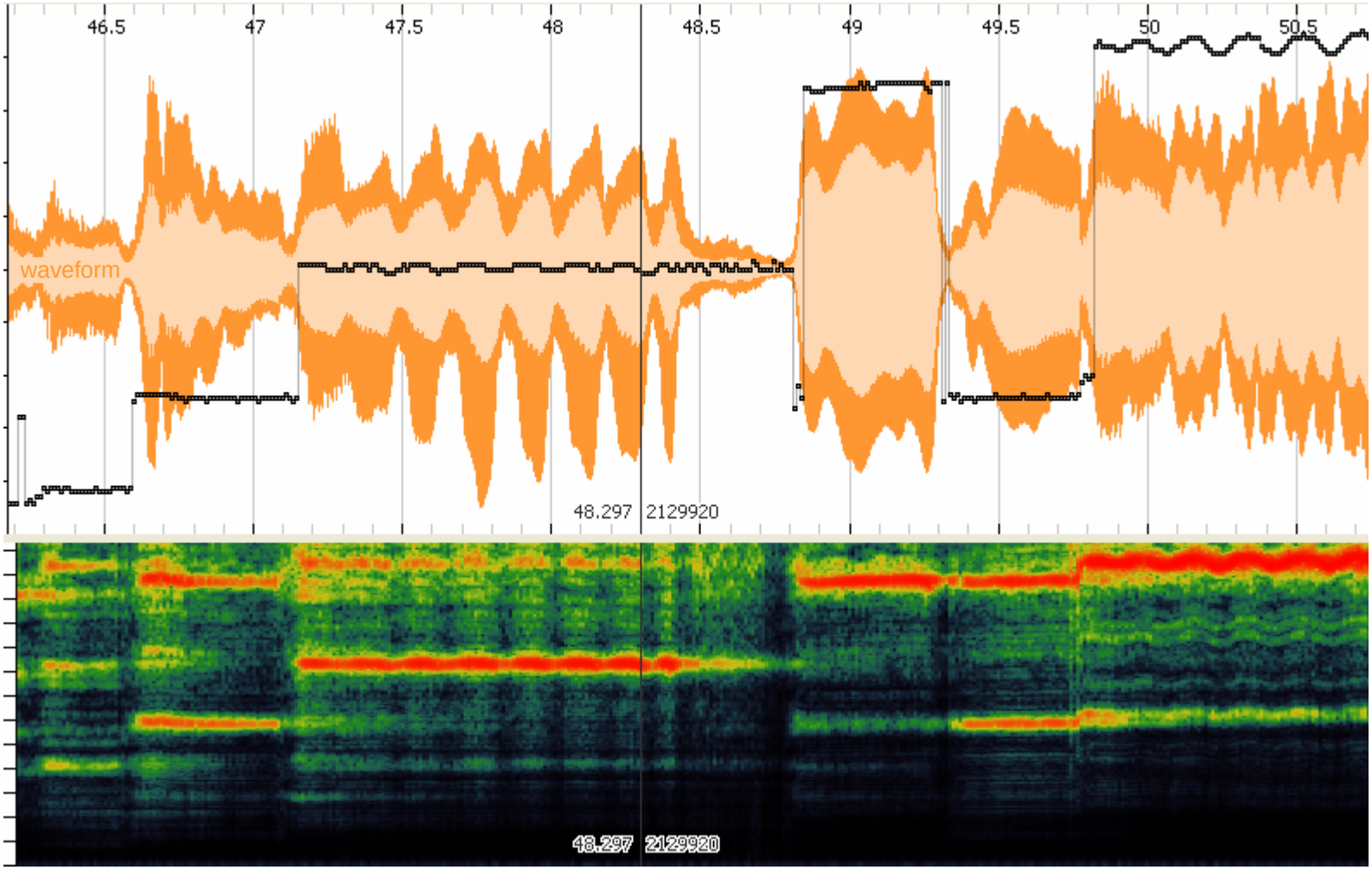
Harmonic Spectrum (3)

- **Geometric mean of the energy at each suspected harmonic.**

$$\mathrm{HPS}(k) = \left(\prod_{n=1}^{N} Y(n\ k) \right)^{\frac{1}{N}}$$



MzHarmonicSpectrum (4)



Pitch estimate

Harmonic Spectrum:

Downloading Mazurka Plugins

- **http://sv.mazurka.org.uk/download**

Windows

Save any of the following *.dll* files into the directory **C:\Program Files\Vamp Plugins**.

plugin name	*dynamic library*	*file size*	*version*	*compile date*
	mazurka-plugins.dll	1.378 MB		25 Jun 2006
	Mz Chronogram		200605270	25 Jun 2006
	Mz HarmonicSpectrum		200606190	25 Jun 2006
	Mz Nevermore		200606170	25 Jun 2006
	Mz PowerCurve		200606210	25 Jun 2006

mazurka-plugins.dll contains the following individually compiled plugins, so you do not need to download any of these individual plugins if you download the main set.

Mz Chronogram:	**MzChronogram.dll**	462 KB	200605270	25 Jun 2006
Mz HarmonicSpectrum:	**MzHarmonicSpectrum.dll**	1.3 MB	200606190	25 Jun 2006
Mz Nevermore:	**MzNevermore.dll**	1.293 MB	200606170	25 Jun 2006
Mz PowerCurve:	**MzPowerCurve.dll**	1.295 MB	200606210	25 Jun 2006

Below is a list of plugins which are not part of the main mazurka plugin set (listed above) since they are for demonstration purposes or are in the initial phase of development.

Mz SpectrogramClient:	**MzSpectrogramClient.dll**	450 KB	200606260	25 Jun 2006
Mz SpectrogramFFTW:	**MzSpectrogramFFTW.dll**	1.284 MB	200606260	25 Jun 2006
Mz SpectrogramHost:	**MzSpectrogramHost.dll**	447 KB	200606260	25 Jun 2006

REFERENCE

Some Useful Keyboard Shortcuts

Space bar = Start/stop playing audio

Numeric Enter = Insert a time instant (tapping)

ALT + # = Go to layer # in current pane

1, 2, 3, 4 = Switch between the 4 mouse modes: Navigate, Select, Edit, Draw

← → = move pane display slightly to the left or right

↑ ↓ = zoom time in/out

CTRL + ← → = page to the left or right

0 = Hide on-pane text messages

9 = Show on-pane text messages

Home/End = Go to start/end of audio file

PgUp/PgDn = Scroll selection through regions in current layer

Web Links

Main webpage for Sonic Visualiser: http://sv1.sourceforge.net (http://www.sonicvisualiser.org)

Online documentation http://sv1.sourceforge.net/doc/reference/en

Analysis plugin resources: http://sv1.sourceforge.net/vamp.html

Mazurka plugins http://sv.mazurka.org.uk

Mazurka SV How-tos http://mazurka.org.uk/software/sv/howto