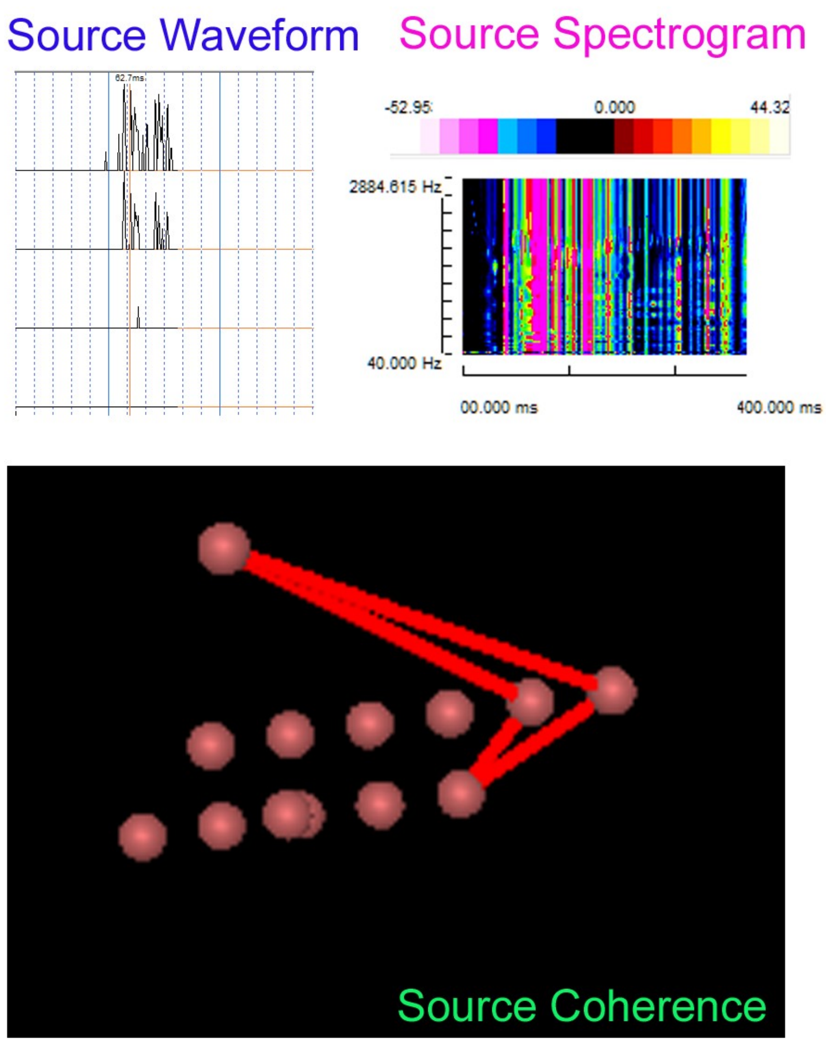
Virtual Menu Guide



DISCLAIMER

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Features and specifications of this software program are subject to change without notice. This manual contains information and images about EEG Studio, its user interface, GUI and its other signal processing algorithms, publications that are protected by copyright.

Sending Your Comments and Critiques: We would like to hear from you. Your comments and suggestions for improving this document are welcome and appreciated. Please e-mail your feedback to BrainX@live.com

Thank you.

Contents

Warnings and Cautions

This software supports both magnetoencephalography (MEG) and electroencephalography (EEG) data. Though MEG and EEG waveforms appear similar, they have different unit in amplitude. If the MEG and EEG data recorded simultaneously, their time unit or temporal resolution is typically the same.

Modern EEG/MEG systems typically have EEG/MEG sensor/electrode channels as well as other channels. For example, trigger channel, head-localization channels and additional ADC (analog-to-digital) channels. To avoid problems, please pay attention to the channel names and the amplitude value/unit. Their values may be of different orders of magnitude. Unexpected results may occur if their values are mixed in measurements.

When performing waveform analysis, regardless of whether EEG or MEG or both are displayed, ensure that the data are appropriately filtered with DC-offset/linear-trend removal. If the waveforms had very large amplitude (e.g. > 3 pt), it is recommended that you identify possible noise.

There are a set of source localization algorithms in the program. Each source localization algorithm has been designed and tested for specific reasons. To ensure the quality and visibility, all source localization algorithms will generate a volumetric source image, which can be considered as an image with millions of “dipoles” or multi-value-voxel, which is significantly different from the conventional magnetic source imaging (MSI) or equivalent current dipoles.

Head movement during EEG recordings may affect the accuracy of source imaging. If subjects move too much during EEG recordings, the EEG results are more than likely poor.

The accuracy of the structural images (MRI/CT) may also affect the EEG results if the conventional magnetic source imaging (MSI) is used. If MRI/CT is distorted, the combination of EEG/MRI/CT will be low-quality. In addition, multiple local sphere, head model or other structural constrained source localization my internally use the MRI/CT images. Any analysis based on those distorted images may yield unexpected or poor results.

The following warnings and cautions appear in this guide. Please ensure you are aware of all the operations and interpretations.

Preface

The Main Frame is one of the core windows of EEG Studio software. It is used as the primary tool to view MEG, EEG, triggers and other data, mark and classify the data, and identify results of interest for academic or clinical purposes. Importantly, the Main Frame provides graphic user interface (GUI) for access other function. In other words, it is also often used to launch other windows such as source localization.

This guide describes the operation of the EEG Studio application for MEG/EEG. Though there are many functions related to MRI/CT, analyses of MRI/CT are not the focuses of this guide.

Determining the Software Version

In the Main Frame: select Help -> About.

The About Dialog will show the version of the software.

Intended Audience

This guide is intended for anyone needing to view or edit data collected using a EEG/MEG system. It assumes the reader is familiar with standard EEG/MEG procedures and with the Windows operating systems.

Document Structure

Documents are generally provided in both Microsoft Word® format and Adobe® Acrobat® PDF (Portable Document Format). All editions are distributed on Flash Driver, CD or websites with the related software, and include bookmarks and hyperlinks to assist navigating the document. Please feel free to send your critiques, corrections, suggestions and comments to Brainx@live.com.

Conventions

Numeric: Numeric values are generally presented in decimal but in special circumstances may also be expressed in hexadecimal or binary. Hexadecimal values are shown with a prefix of 0x, in the form 0x3D. Binary values are shown with a prefix of 0b, in the form 0b00111101. Otherwise, values are presumed decimal.

Units: Units of measure are given in metric. Where measure is provided in imperial units, they are typically shown in parenthesis after the metric units.

A millivolt (mV) is one one-thousandth of a volt (0.001 V or 1 10^{-3}. These units commonly are used in EKG, EMG, and sometimes in EEG. A microvolt (uV) is one one-millionth of a volt (0.000000 V or 1 x 10^{-6}). This is the commonest voltage measure in EEG. A nanovolt (nV) is one-thousandth of one-millionth of a v (0.000000001 V or 1 x 10^{-9}). This measure is used in the specific area of EEG dealing with evoked potentials.

The unit of current is the ampere (A). In EEG, typical smaller amounts are encountered. A milliampere (mA) is one one-thousandth of an ampere (0.001 A or 1 x 10^{-3}). A microamplere (uA) is one one-millionth of an ampere (0.000000 A, or 1 x 10^{-6}).

Magnetic signal strength is given in Teslas (T), the SI unit of flux density (or field intensity) for magnetic fields, also known as the magnetic induction. Typical signal strengths in MEG measurements are in the order of pT (picoteslas = 10^{-12}) or fT (femtoteslas = 10^{-15}).

Menu Virtual

The virtual menu provides GUI to access the functions for computing virtual waveforms, virtual spectrogram and source coherence. The computing of virtual waveforms, virtual spectrogram and source coherence can be one or more locations.

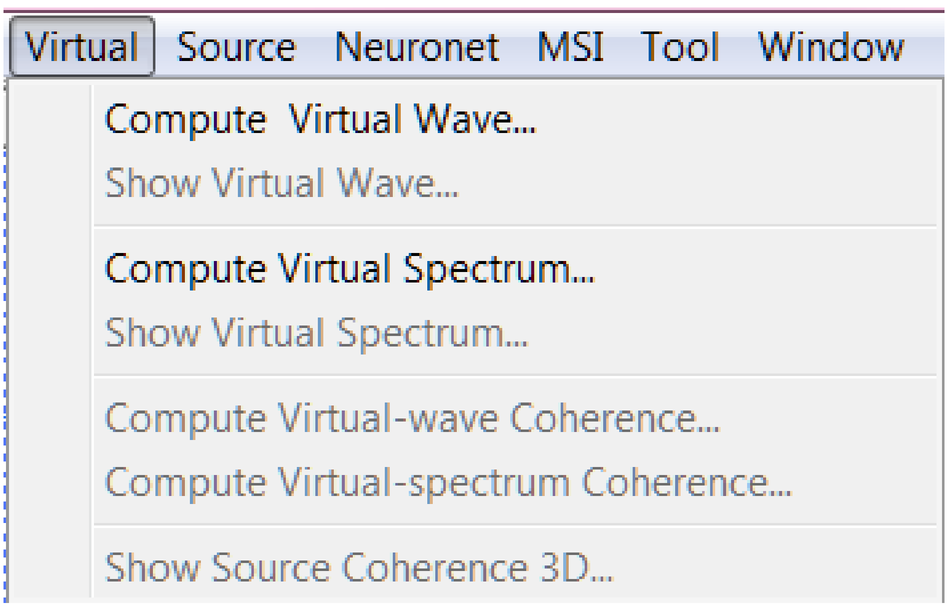


Figure 1. Virtual Menu.

The virtual waveform, virtual spectrum and source coherence/correlation seems to be similar volumetric source coherence analysis or neural network. However, methodologically, there are many differences: (1) the computing of virtual waveforms, virtual spectrogram and source coherence can be one or more locations. However, volumetric source coherence computing is based on volumetric sources that could be thousands of sources. (2) Neural network computed with volumetric source data is objective and requires much more computer memory.

Compute Virtual Wave (Source Wave)

Virtual waves are the time-amplitude data at source levels, which are also called source waveforms. The virtual waveforms can be computed for a small cubic region or a source point. Mathematically, the selected source region will be automatically converted to multiple source points. Therefore, the selection of the source points really depends on the research/clinical purposes. Generally speaking, if you know the point of interest, just use the point. If you do not know the exact point, use the region of interest to include the possible point.

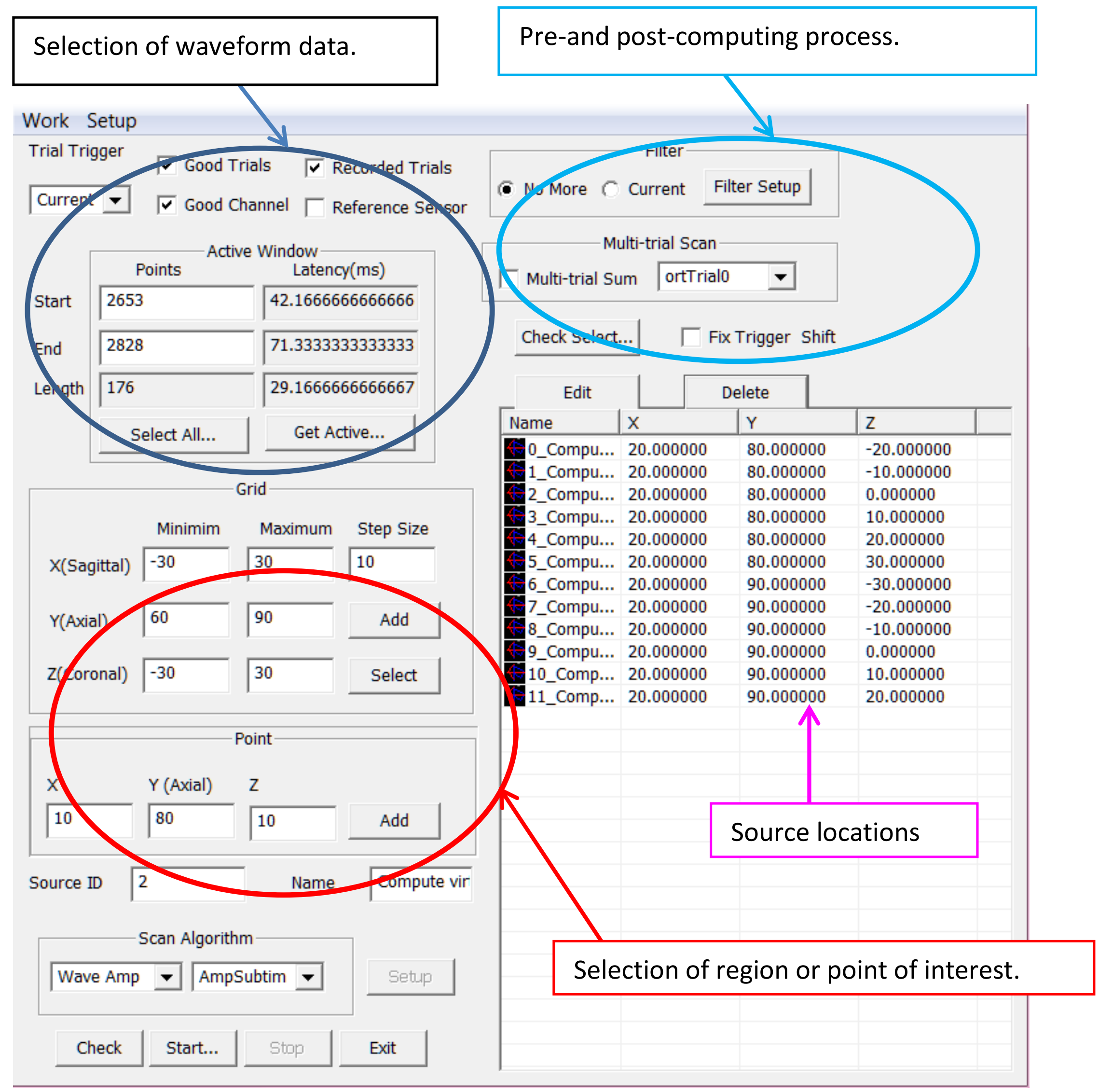


Figure 2. The main window for computing virtual waveforms or source waveforms.

In this Manual, we use "virtual channel" to describe a channel computed by two physical channels (e.g. MEG measuring channel or EEG channel). Here the computing may be an operation of addition or subtraction of two channels. On the other hand, "Virtual sensor" is typically used to describe a sensor placed in a source level, which is computed with a group of physical sensors. In other words, a "virtual sensor" is based on source localization. Here the physical sensors are usually included in the channels.

Show Virtual Waveform (Source Waveform)

Click menu Virtual-> Show Virtual Wave to open the Virtual Waveform Viewer. From this window you can view and measure the source waveforms.

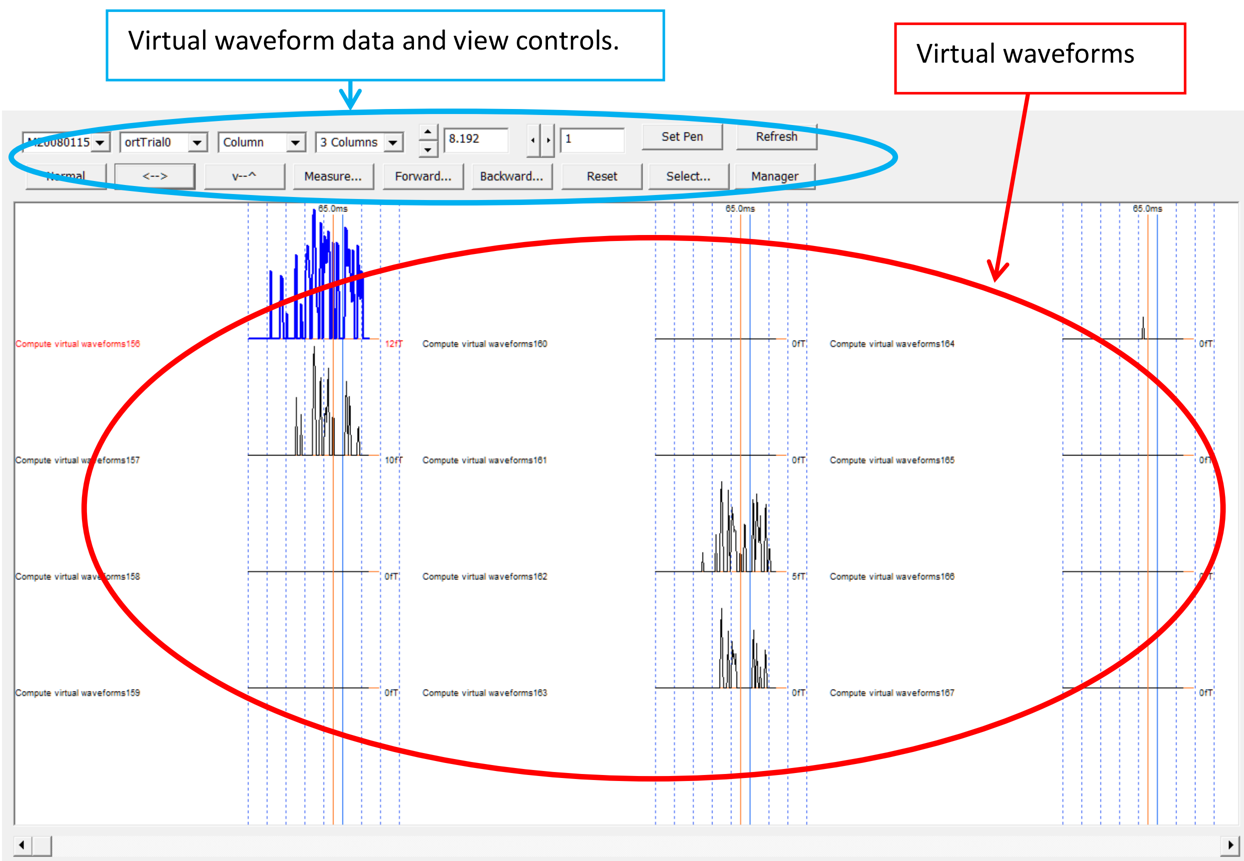
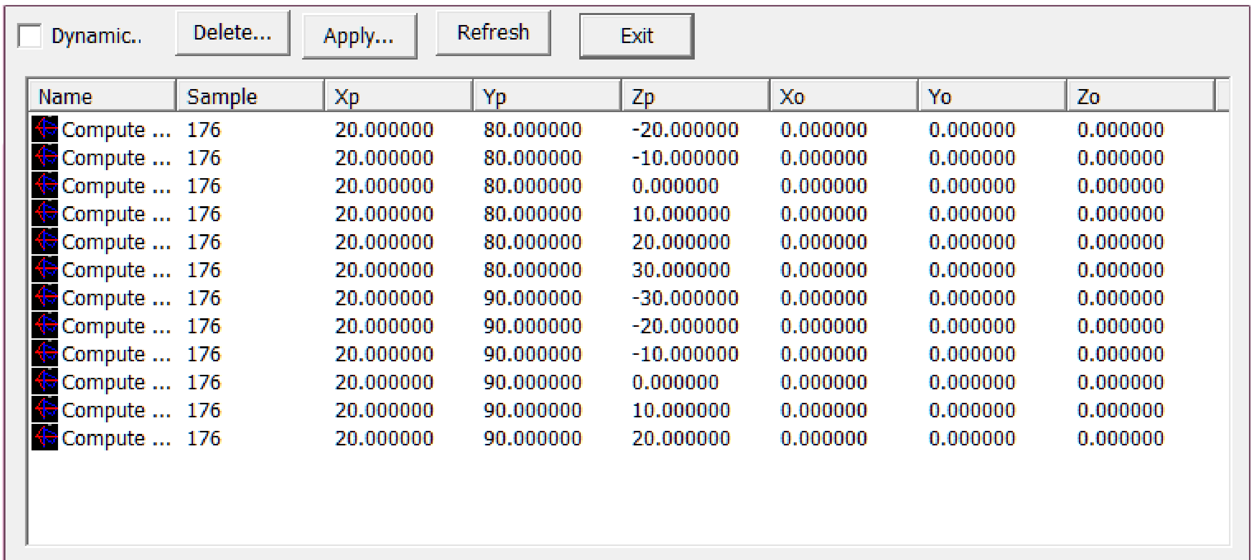


Figure 3. The main window for computing virtual spectrum or source spectrum.

Virtual Waveform Manager

Virtual waveform manager provides GUI for edit, delete, and show or hide virtual waveforms. You may check the 3D coordinate of virtual wave forms easily.



Name	Sample	Xp	Yp	Zp	Xo	Yo	Zo
Compute ...	176	20.000000	80.000000	-20.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	80.000000	-10.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	80.000000	0.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	80.000000	10.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	80.000000	20.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	80.000000	30.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	-30.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	-20.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	-10.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	0.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	10.000000	0.000000	0.000000	0.000000
Compute ...	176	20.000000	90.000000	20.000000	0.000000	0.000000	0.000000

Figure 4. The main window for computing virtual spectrum or source spectrum.

Compute Virtual Spectrum

Click menu Virtual-> Compute Virtual Spectrum to open the main window for computing virtual spectrum or source spectrum.

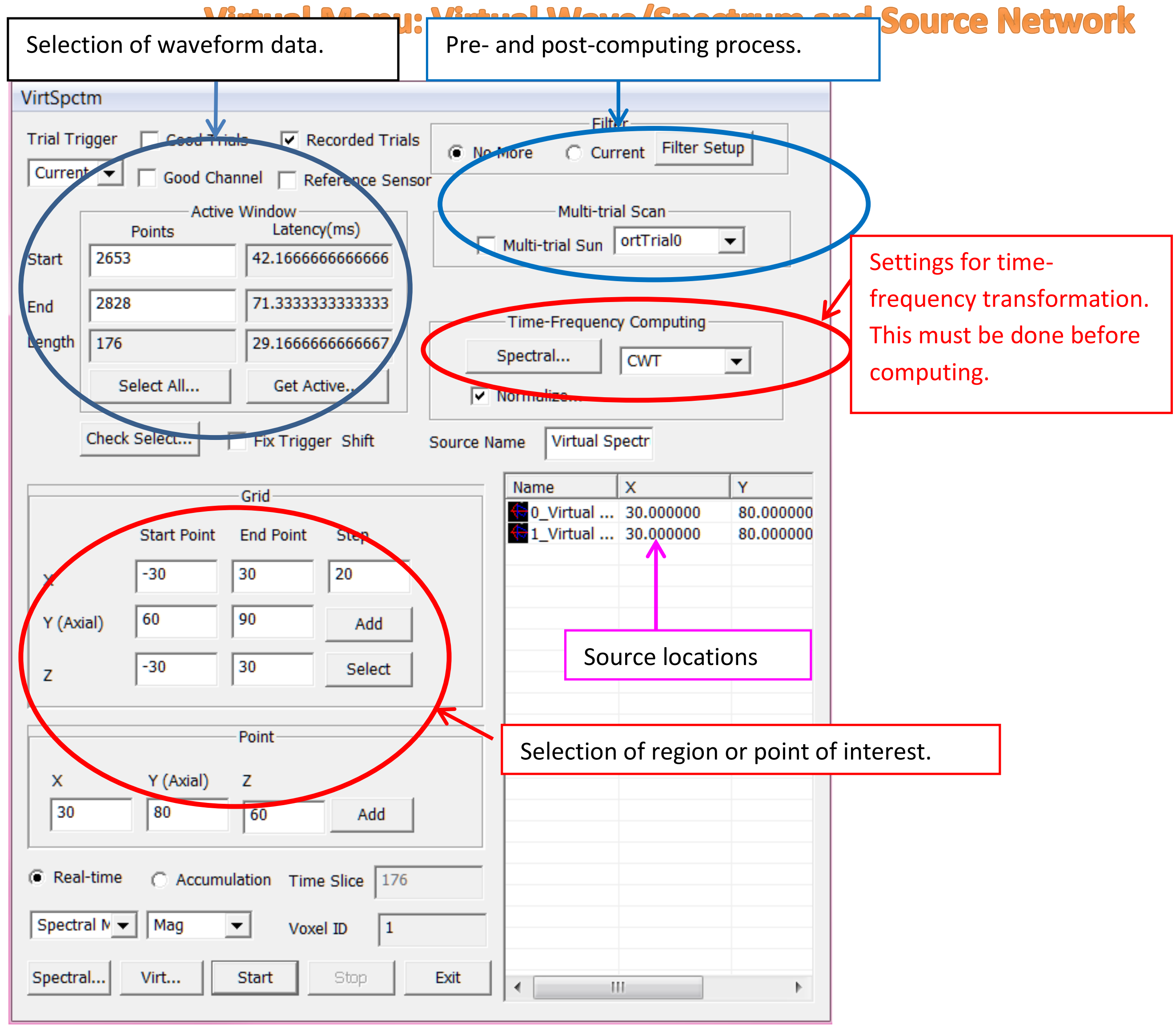


Figure 5. The main window for computing virtual spectrum or source spectrum.

Show Virtual Spectrogram (Source Spectrogram)

Click menu Virtual-> Show Virtual Spectrogram open the Virtual Spectrogram Viewer. From this window you can view and measure the source spectrogram.

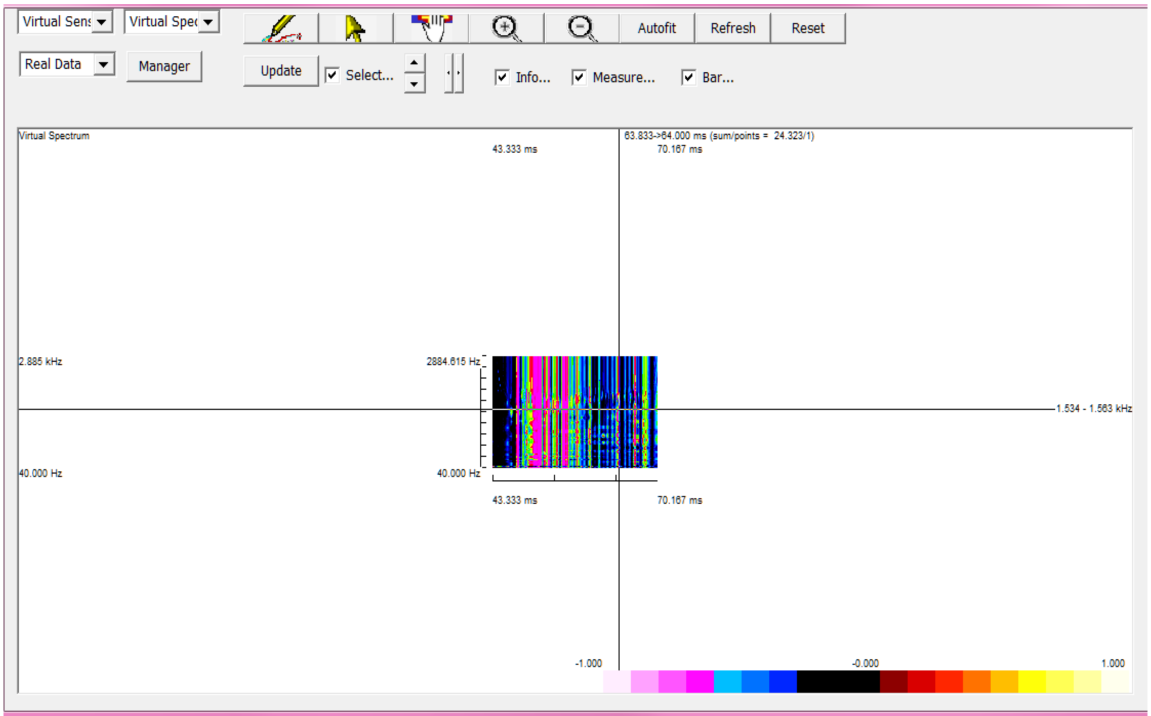


Figure 6. The main window for viewing and measuring virtual spectrum or source spectrum.

Virtual Spectrum Manager

Virtual spectrum manager provides GUI for edit, delete, and show or hide virtual spectrograms. You may check the 3D coordinate of virtual wave forms easily.

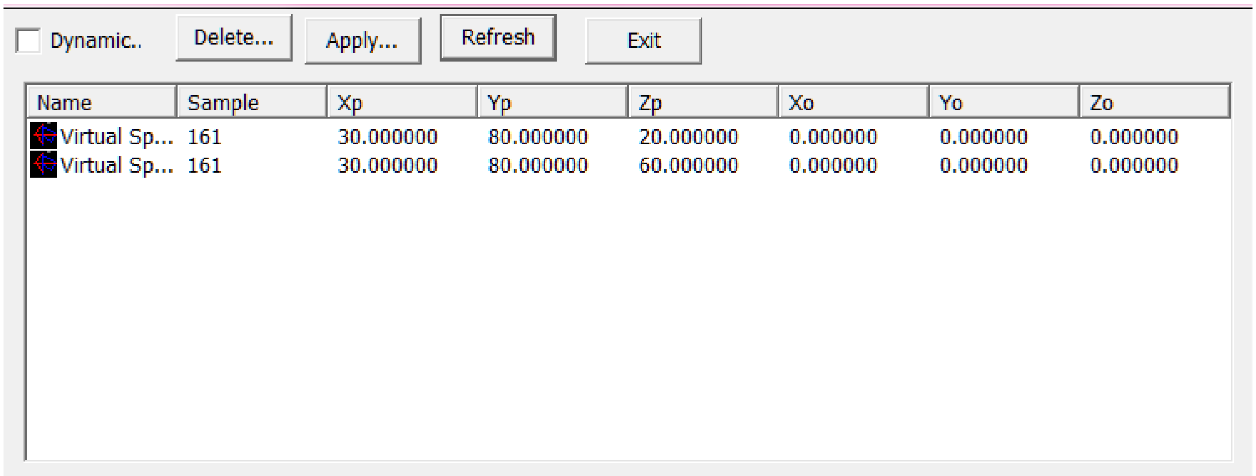


Figure 7. The main window for computing virtual spectrum or source spectrum.

Compute Virtual Wave Coherence

Click menu Virtual-> Compute Virtual Wave Coherence to open the main window for computing virtual wave coherence or correlation.

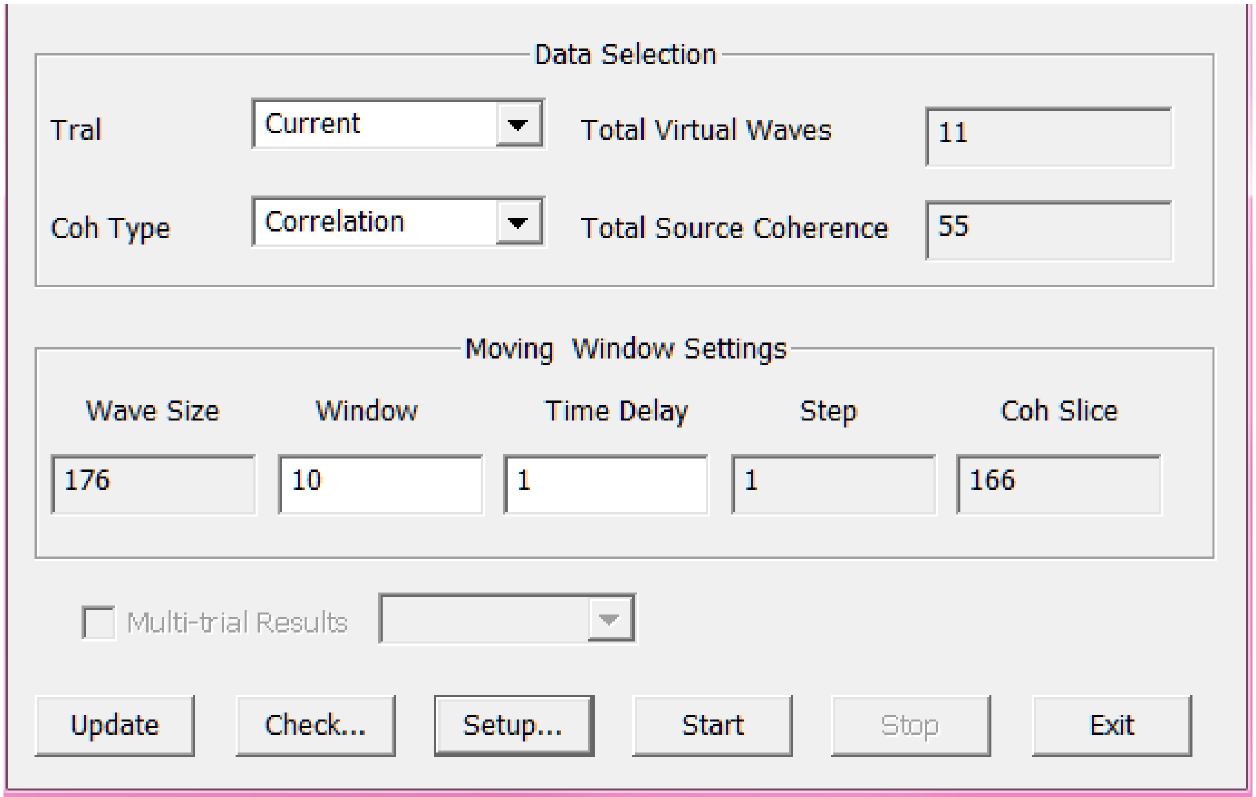


Figure 8. The main window for computing virtual wave coherence or correlation.

Compute Virtual Spectrum Coherence

Click menu Virtual-> Compute Virtual Spectrum Coherence to open the main window for computing virtual spectrum coherence or correlation.

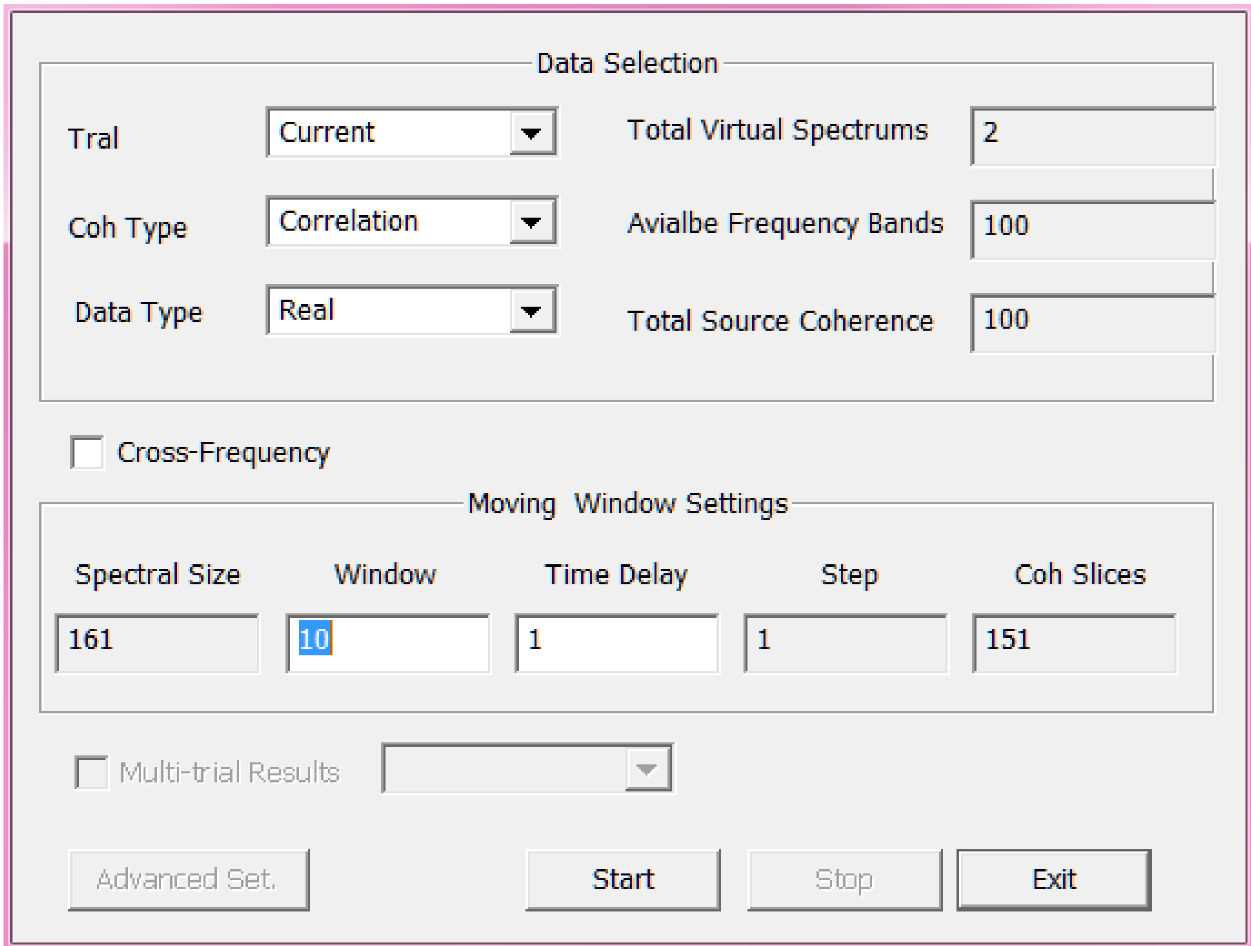


Figure 9. The main window for computing virtual spectral coherence or correlation.

Show Source Coherence in 3D

Click menu Virtual -> Show Source Coherence 3D to open the main window for showing source coherence.

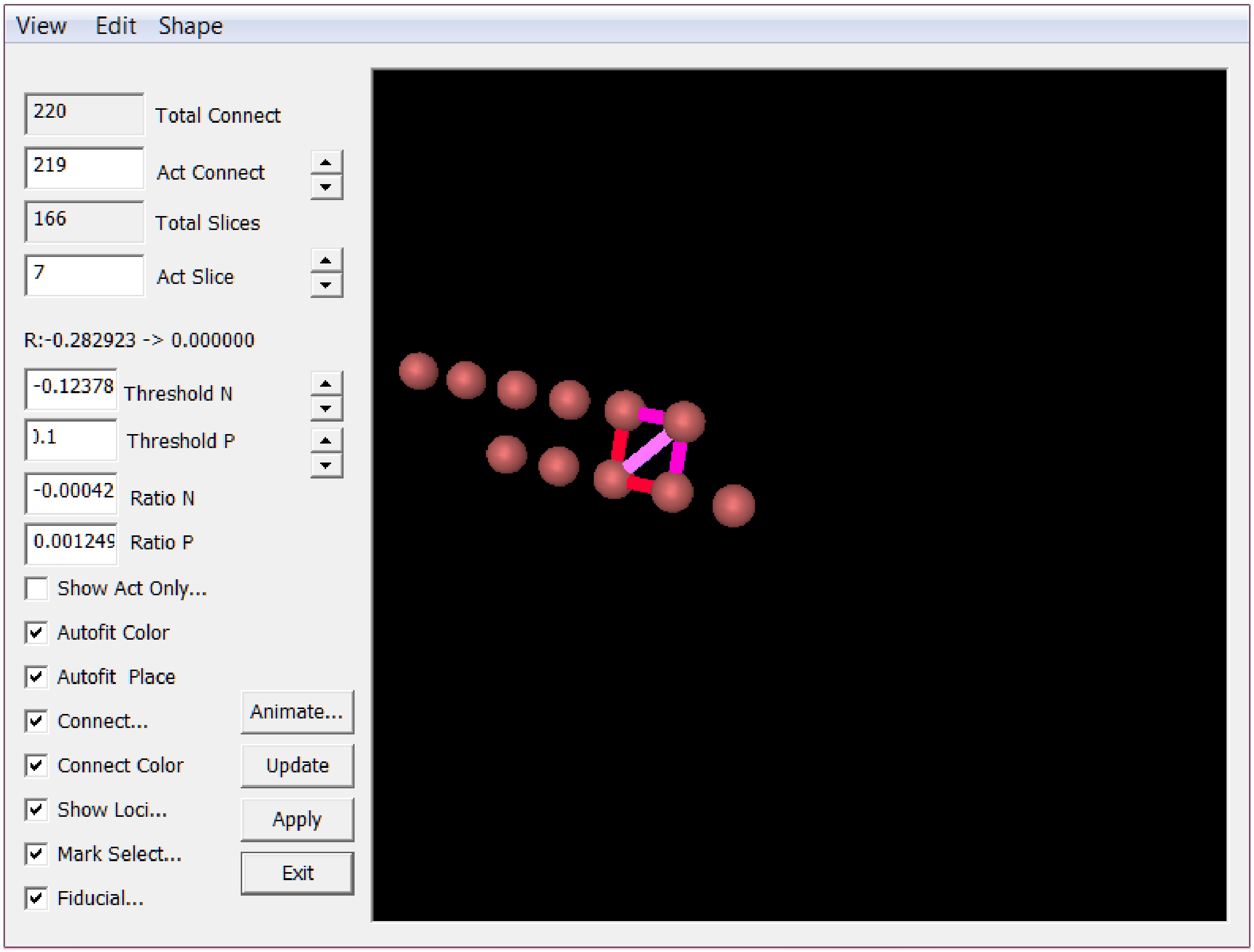
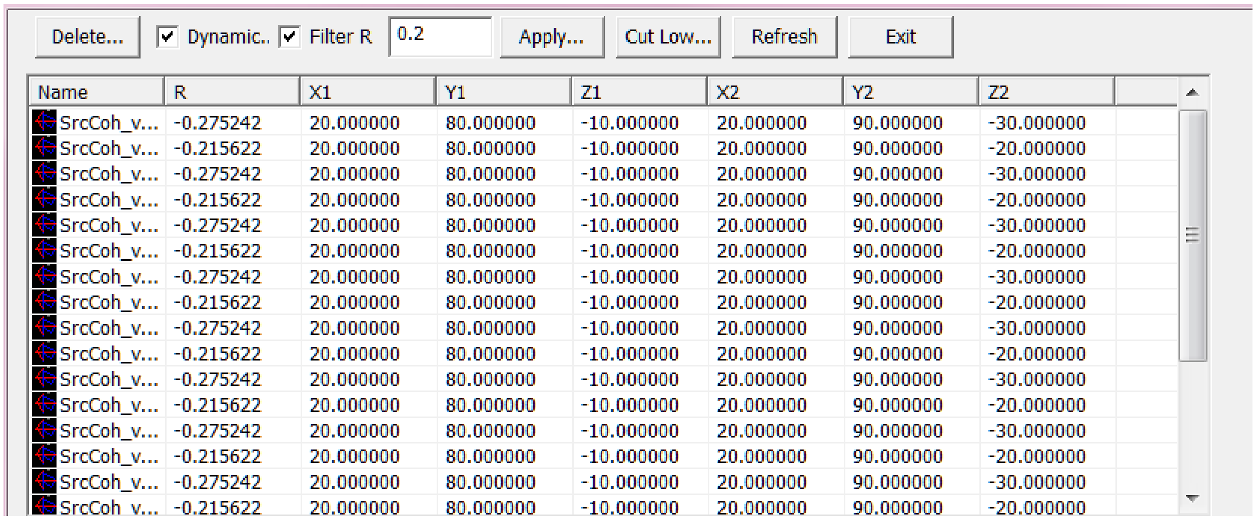


Figure 9. The main window for computing virtual spectral coherence or correlation.

Virtual Spectrum Manager

Virtual spectrum manager provides GUI for edit, delete, and show or hide virtual spectrograms. You may check the 3D coordinate of virtual wave forms easily.



Name	R	X1	Y1	Z1	X2	Y2	Z2
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000
SrcCoh_v...	-0.275242	20.000000	80.000000	-10.000000	20.000000	90.000000	-30.000000
SrcCoh_v...	-0.215622	20.000000	80.000000	-10.000000	20.000000	90.000000	-20.000000

Figure 9. The main window for computing virtual spectral coherence or correlation.

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