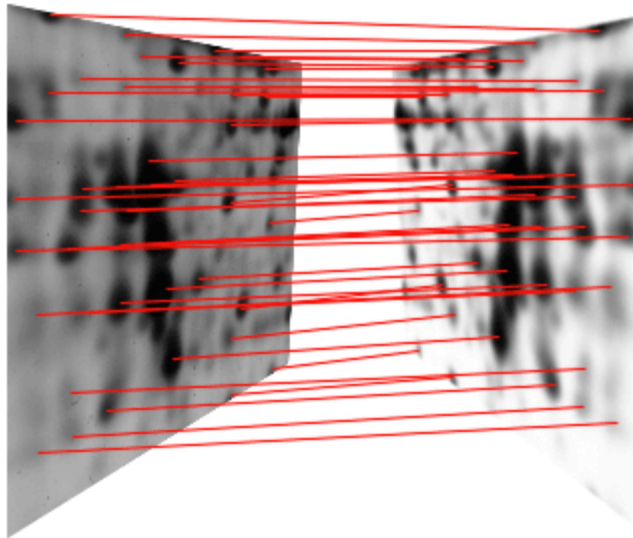


## Threshold Detection



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

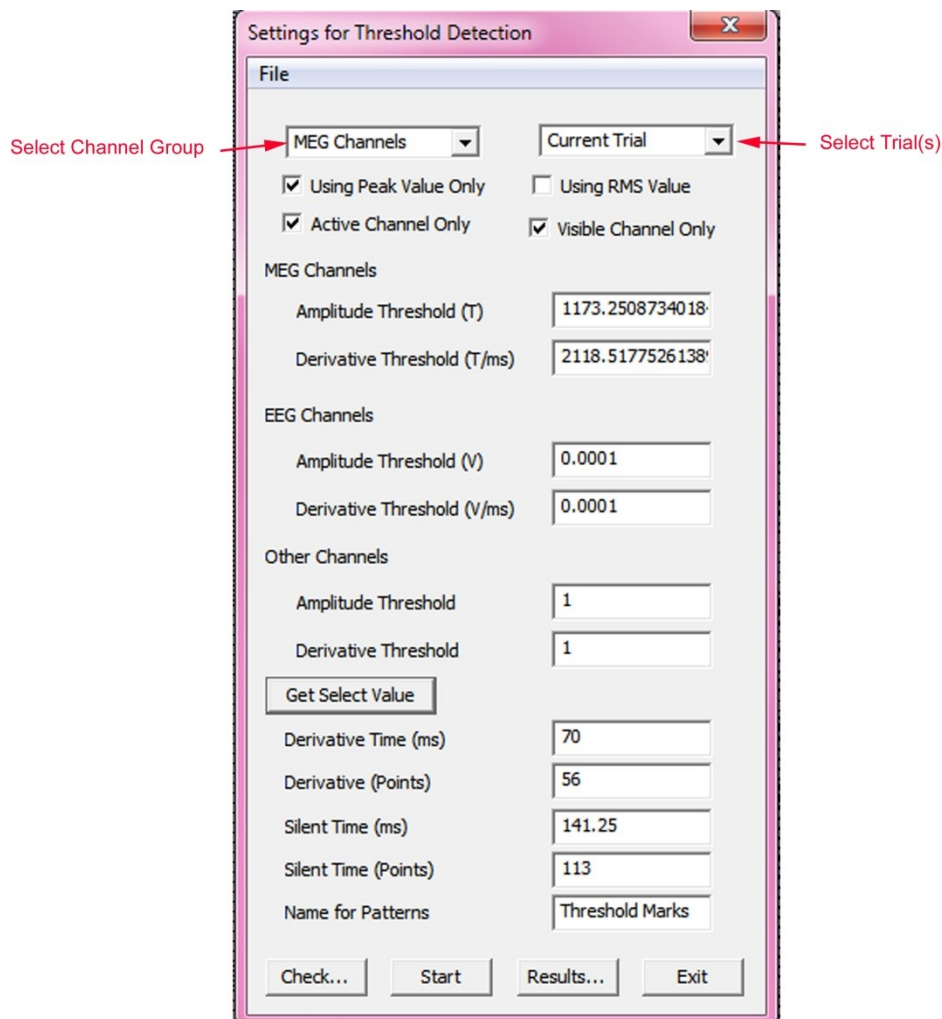
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Thank you.

## Threshold Detection Dialog

This menu option displays the Threshold Detector dialog shown in Figure 64 on page 120. This dialog is used to mark data points and classify trials based on the detection of a threshold event in the data. Threshold detection operates over the channels you specify. You can either select the channels by clicking the corresponding channel names in the main window before opening the Threshold Detector dialog, or you can select the channels after opening the dialog, and then click the Select Channels button to include them in the threshold detection process. Included channels will appear in the bottom pane of the dialog. The selected channels are treated collectively as a spatial vector. Thresholds are compared against the magnitude of the vector.



1. Select the channel(s) to perform threshold detection.

Select one or more channels, channel groups, or channel types to mark. (For more information, see "Selecting Channels in the Main Window" on page 36.)

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### WARNING and NOTICE

Different type of MEG/EEG channels (e.g. MEG, EEG, ADC and Trigger) may not be distinguished from each other in terms waveforms. However, because their values are typically of different orders of magnitude, unexpected results may occur if different type of channels are selected for simultaneous threshold detection. To avoid problems, only select one type of channels (MEG or EEG) at a time.

**Note:** Do not select MEG and EEG channels at the same time.

2. Use the range cursor to select the threshold data.

If you want to base the criteria of threshold on a pattern in the current dataset, select it using the range cursor. Alternatively, you can specify threshold values in the Threshold Detector dialog.

3. Open the Threshold Detector dialog.

From the main window, select the Analyses -> Threshold Detect menu option to display the Threshold Detector dialog (see Figure 64 on page 120).

4. Specify threshold values.

Enter values for the Amplitude Threshold, Derivative Threshold, and Dead Time, or click Get Values From Cursor to populate these fields with the values contained in the data pattern selected by the range cursor. For more information about these fields, see page 120.

5. Specify names for the threshold marker set and trial classification.

In the Save Marker as field, enter a name for the marker set to use for marking samples that meet the threshold criteria. If you want to classify trials that contain samples meeting the specified threshold criteria, enter a name for the trial class and indicate whether you also want to classify the trials as Threshold-Bad. For more information about the trial classification area of this dialog, see “Classify trial as” on page 121.

6. Specify the applicable channels.

If you have already selected the channels on which to apply threshold detection before opening the Threshold Detector dialog, they will be listed in the bottom pane. You can also select channels in the strip chart while this dialog is open (or change the existing channel selection). Click the Select Channels button to update the channel list in the bottom pane if you add or change the channel selection.

7. Specify the trial scope.

## Threshold Detection Dialog

At the bottom of the dialog, select whether you want threshold detection to apply to all trials (Scan All Trials option) or only the current one (Scan Current Trial Only option).

8. Start threshold detection.

Click the Start button.

During the threshold detection process, MEG Processor will create the marker set (if it does not yet exist) and add markers to samples that meet the threshold criteria. If you have enabled trial classification, it will also create the trial classification (if it does not yet exist) and classify trials containing the threshold events. For more information on the Threshold Detector dialog, see “Threshold Detect” on page 119.

Select Channel Types

### **MEG Channels**

The threshold detection will be performed on MEG channel only.

### **EEG Channels**

The threshold detection will be performed on EEG channel only.

### **Others Channels**

The threshold detection will be performed on non-MEG/EEG channel only, such as Trigger, head motion and other ADC channels. In this case, “Active Channel Only” and “Visible Channel Only” are typically enabled, so that the threshold detection can be performed on one or more specific channels.

### **All Trials (Scan)**

Scans all trials in the dataset during the threshold detection process.

### **Current Trial (Scan Only)**

Scans only the current trial during the threshold detection process.

### **Using Peak Value Only**

The threshold detection will be performed using the Peak value of the amplitude of waveforms. In other words, the Derivative Threshold will not be used. This option is useful for detecting irregular spikes and triggers.

## Threshold Detection Dialog

### Using RMS Value

The threshold detection will be performed using RMS (Root-Mean-Square) value of the amplitude of waveforms. This option enables the detection to ignore the polarity of magnetic signals.

### Active Channel Only

The threshold detection will be performed on Active (or selected) Channel only. This function is handy for detecting pulses in a triggering channel.

### Visible Channel Only

The threshold detection will be performed on the Selected channel, which are visible in the Main Frame viewer only. The function ensures that “what you get is what you see”.

Includes selected channels to the list of channels to mark during the threshold detection process. Do not select both ADC and EEG channels simultaneously. See the warning on page 120 for details. If you have not selected the channels before opening the Threshold Detection dialog, you can select them in the strip chart, and then click this button. The selected channel names will appear in the list box in the bottom pane.

Note: If multiple channels are selected, they are treated collectively as a spatial vector, and thresholds are compared against the magnitude of the vector.

### Amplitude Threshold

Specifies the minimum amplitude necessary for the detection of a threshold event. This is measured relative to zero.

Note: The amplitude and derivative threshold are set separately for MEG and EEG/ADC channels.

### Derivative Threshold

Specifies the minimum derivative necessary for the detection of a threshold event. The derivative at a given point is computed using the data point on either side of the given point, i.e.,

$$\Delta y_i = \frac{y_{i+1} - y_{i-1}}{2\Delta t}$$

given  $y_i$  = amplitude at point  $i$ , and  $\Delta t$  = the time spacing between data points.

Note: The amplitude and derivative threshold are set separately for MEG and EEG/ADC channels.

## Threshold Detection Dialog

### **Derivative Time (ms)**

Specifies a time gap for computing the Derivative Threshold in milliseconds (ms).

### **Derivative (Points)**

Specifies a time gap for computing the Derivative Threshold in data points or samples.

### **Silent Time (ms)**

Specifies a time gap to follow each threshold event in milliseconds. The threshold detector will move past the event by this time gap before starting to look for the next event.

### **Silent Time (Points)**

Specifies a time gap to follow each threshold event in data points or samples. The threshold detector will move past the event by this time gap before starting to look for the next event.

### **Name for Markers**

Save threshold events as markers with the given name. In other words, data points that meet the threshold criteria are marked with the name entered in the text field box.

Note: Markers with the name entered in the text field box will NOT be deleted from the dataset. New markers will be added based on the new threshold detection run. You may edit the markers by clicking "Results" button.

### **Get Select Values (From Select Cursor in the Main Frame)**

Automatically fills in the Amplitude Threshold, Derivative Threshold, and Dead Time fields for the selected channels based on the range cursor data.

### **Check...**

## Threshold Detection Dialog

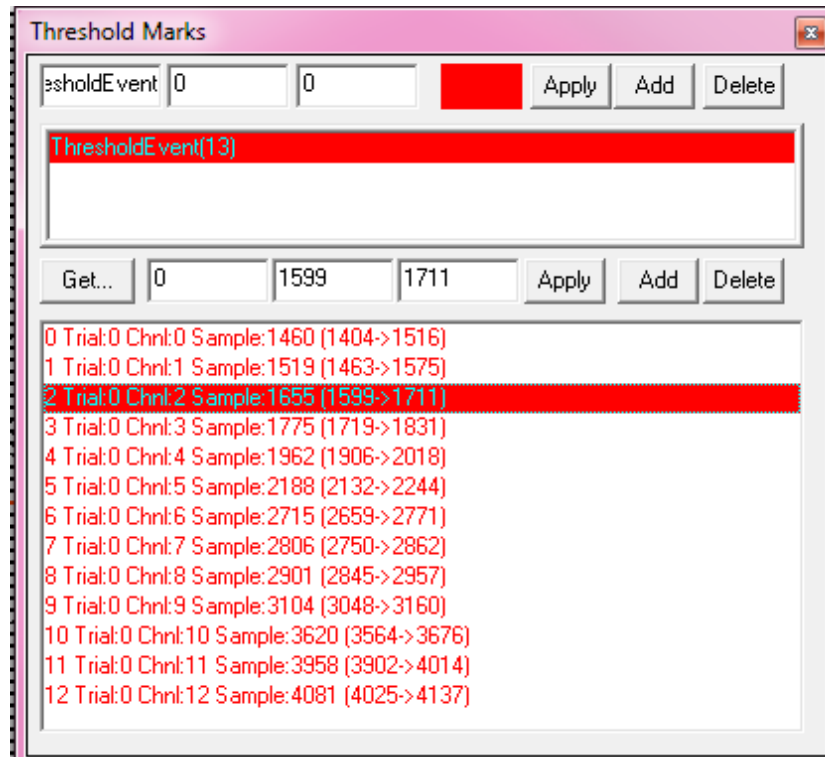
Check the parameters for performing Threshold Detection. It reports possible errors or problems in threshold detection.

### Start (Threshold Detection)

Initiates the threshold detection process. All the events exceeded the defined threshold will be stored internally.

### Results

Shows all the events exceeded the defined threshold (see the following Figure)



### Classify Trial and channel

As Shown in the above figure, all the trial and channel IDs are encoded in the events. Consequently, the marks enable automatic classifying of trials and channels. The classification method depends on how the toggle controls are set. If you enable the first toggle control, the trial will be classified as both BAD and



## Threshold Detection Dialog

the name entered in the text field box. If you enable the second toggle control, the trial will only be classified with the name entered in the text field.

Note: Trial classifications with the name entered in the text field box will NOT be deleted from the dataset. New trial classifications will be added based on the new threshold detection run. You may edit (delete, add) the threshold event marks.

### Exit

Exits the Threshold Detection dialog without taking any (further) action.