This application note will describe one method to automatically score GSR responses.

For these expirments, the subject engaged in stressful tasks followed by relaxation periods. The goal of the experiment is to compare reactions within and between subjects over time. Since the tasks were of different duration manual markers were inserted to indicate the start and end of the stressor.
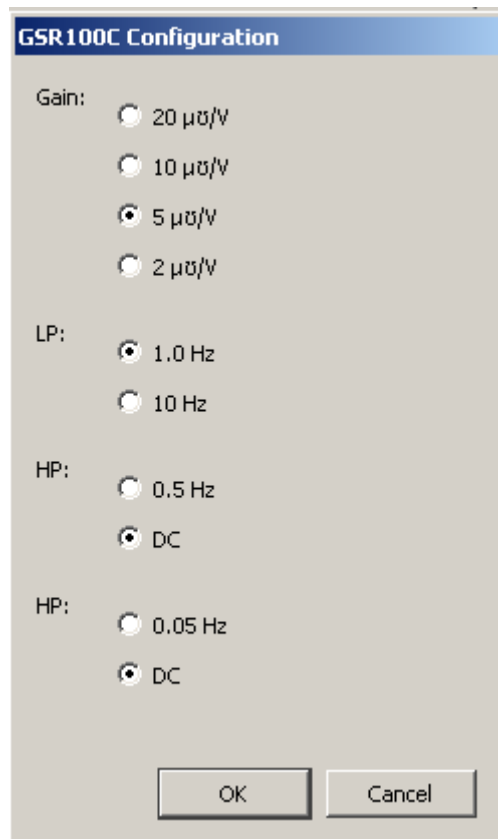
Equipment required:

MP36R with Acqknowledge 4.1 or later
or MP150, GSR100C and Acqknowledge 4.1 or later

Acquisition configuration:
Channel Setup

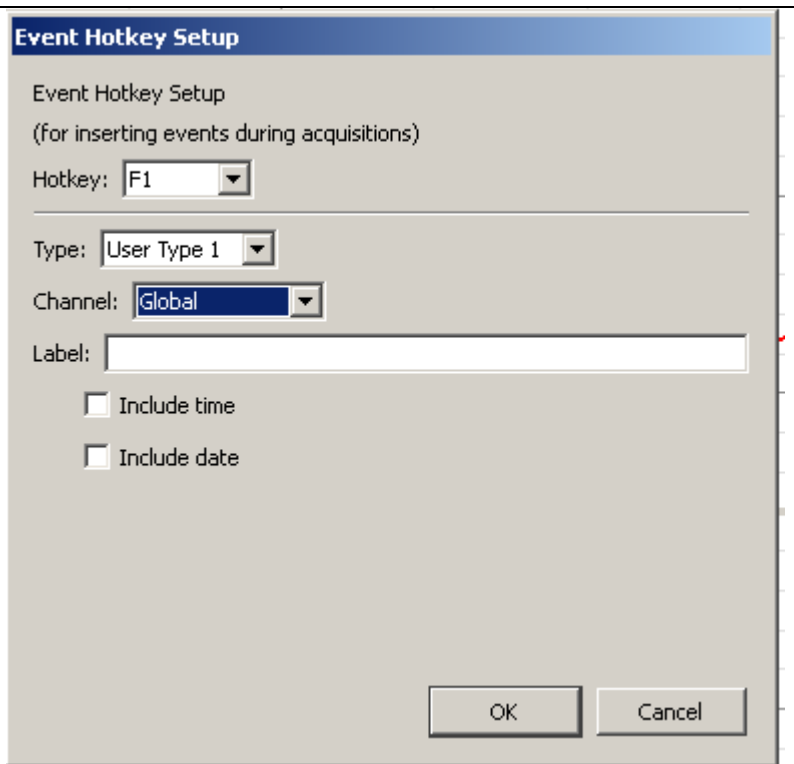|	
With the MP36R, the analog input channels preset Electrodermal Activity 0-35 Hz was chosen to record tonic GSR. With the MP150 system, under Setup Acquisition, Add module, the GSR100C module was chosen. Following the prompts, the setting on the right were chosen, the amplifier was configured with the same settings.	**GSR100C Configuration** Gain: ○ 20 µʊ/V ○ 10 µʊ/V ● 5 µʊ/V ○ 2 µʊ/V LP: ● 1.0 Hz ○ 10 Hz HP: ○ 0.5 Hz ● DC HP: ○ 0.05 Hz ● DC OK Cancel

Setup Event hotkeys

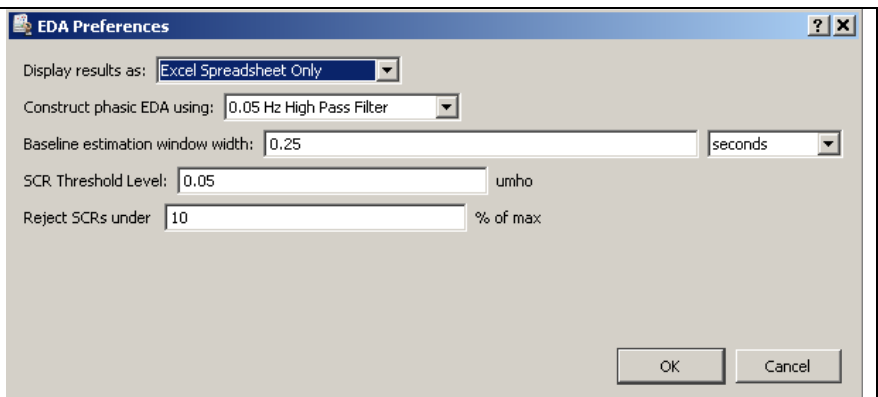|	
Since the tasks duration is variable, Event hot keys, configured under the MP150 or MP36 menu were used to identify the segments. These markers will be used by the software to automatically identify these periods. Using the function Set up Event Hotkeys… Configure Hotkey F1 as shown on the right. Similarly, configure F2 as User Type 2 event. These will introduce marks labelled 1 and 2 in the event marker window. Optionally labels could be added to these hotkeys.	**Event Hotkey Setup** Event Hotkey Setup (for inserting events during acquisitions) Hotkey: F1 Type: User Type 1 Channel: Global Label: ☐ Include time ☐ Include date OK Cancel

Acquisition set up
Sampling rate is not critical in this case, 200 or 500 sampling rate can be used , under set up acquisition of the MP150 or MP36 menu.
Since a phasic EDA will be derived from tonic EDA, allow at least one minute of recording before starting the first tasks

Automated scoring

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Before using the Electrodermal Activity routine the first time, use the Preferences menu option, under Analysis, Electrodermal Activity and use the configuration shown on the right	**EDA Preferences** ? X Display results as: Excel Spreadsheet Only Construct phasic EDA using: 0.05 Hz High Pass Filter Baseline estimation window width: 0.25 seconds SCR Threshold Level: 0.05 umho Reject SCRs under 10 % of max OK Cancel

After data collection, use the function Locate SCRs under Analysis and Electrodermal Activity.
The software will automatically identify response onset with an open parenthesis (, maximum response with a blue water drop
 	
💧 and end of response with a closed parenthesis).
	Locate SCRs ? X
	
	Tonic EDA Channel: CH1, GSR100C
	Phasic EDA:
	    ⦿ Construct new
	    ◯ Use channel: CH1, GSR100C
	
	OK Cancel

Extracting measurements from data:
In this case we will measure the amplitude at the onset of the first GSR response, amplitude at the onset of the first response, the sum of all GSR responses during the task, the number of responses, the number of responses over time and the number of responses per minute.

The Event Amplitude Measurement can extract: Amplitude at first event, Amplitude at last event, Sum of Amplitudes at all events, Mean amplitude from all events, minimum amplitude from all events and maximum amplitudes from all events. In our case, we are looking only at the events skin conductance response and onset of response.
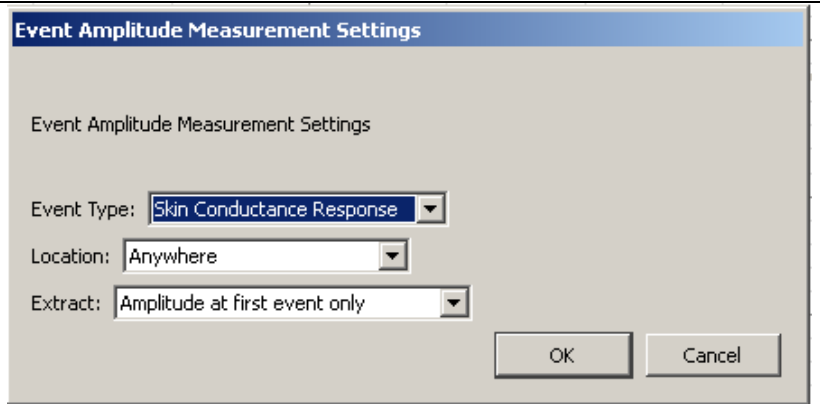
The time of these events (event location) and number of events (event count) can also be extracted.
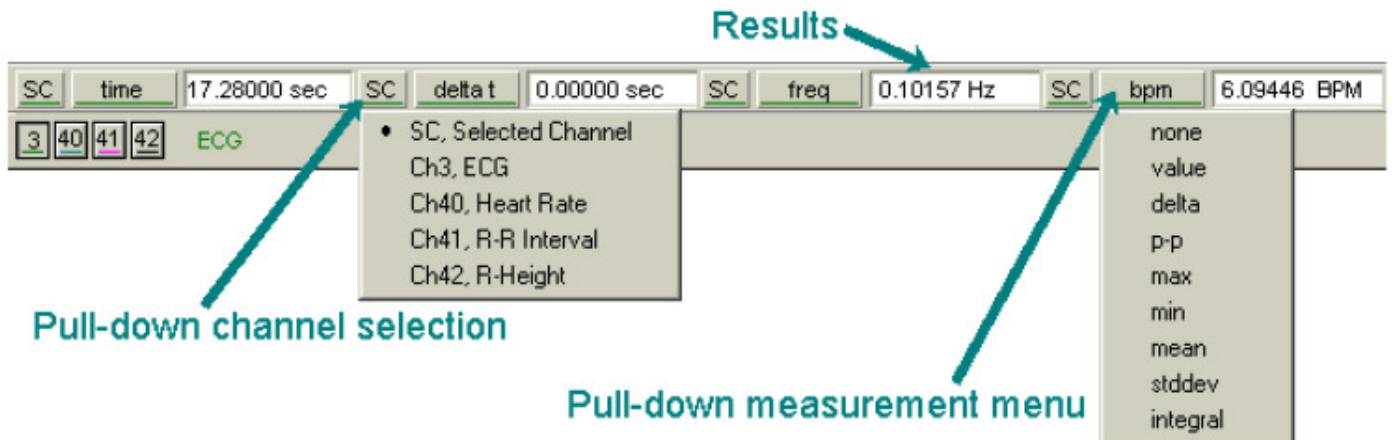
The measurements options are usually located above the graph window. The number of measurements rows can be selected under Display, Preferences.
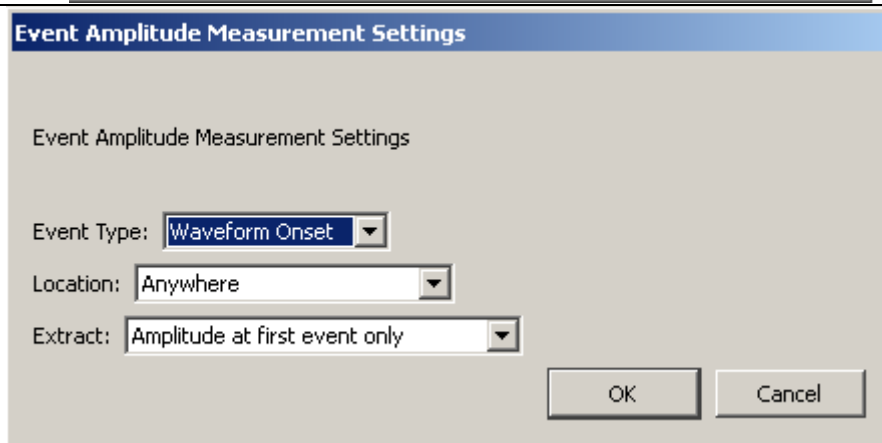
Extracting amplitude at first response: Select the measurement Evt_ampl… from the measurement pull down menu. For event type, select EDA, Skin Conductance response. If only one channel is used, location can be anywhere or selected channel, the channel containing the data of interest. Under extract choose Amplitude at first event only.	
Onset of GSR response: Set the second measurement to be Event Amplitude, event type: General, Waveform Onset.	
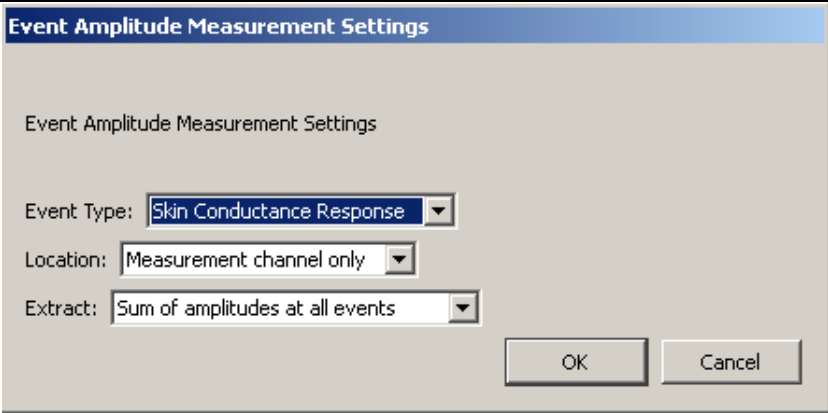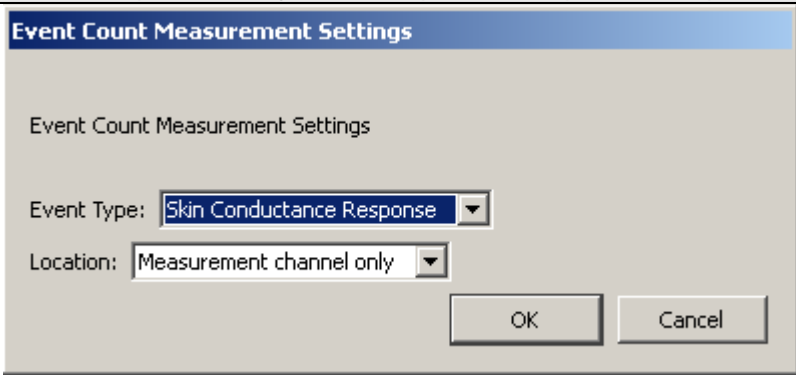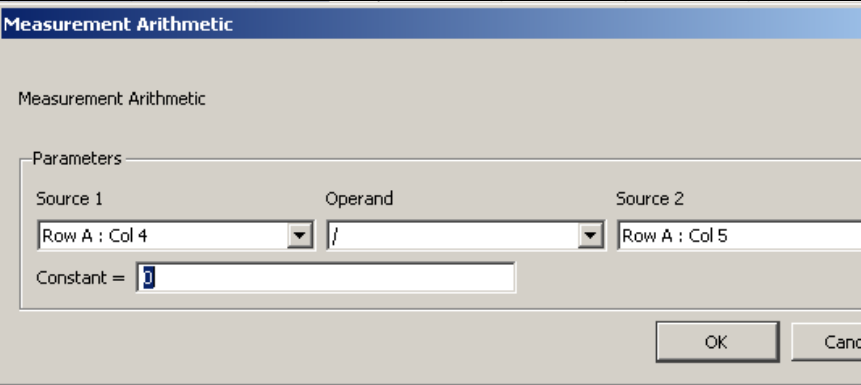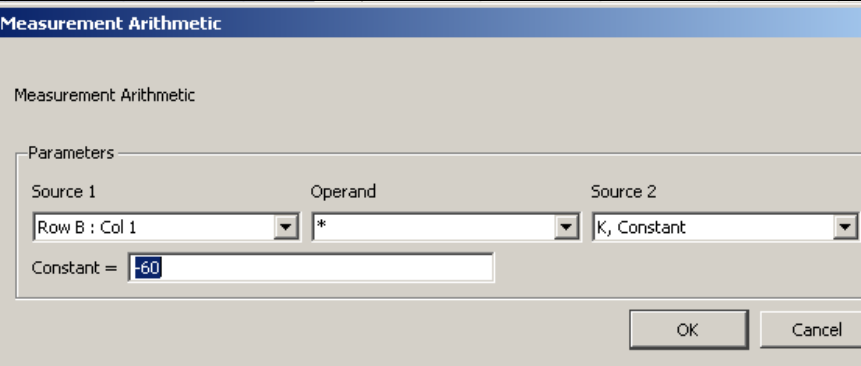
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Sum of GSR responses	**Event Amplitude Measurement Settings** Event Amplitude Measurement Settings Event Type: Skin Conductance Response Location: Measurement channel only Extract: Sum of amplitudes at all events OK Cancel
Number of GSR responses Will be obtained by using the measurement Evt_count	**Event Count Measurement Settings** Event Count Measurement Settings Event Type: Skin Conductance Response Location: Measurement channel only OK Cancel
Number of responses over time The measurement Calculate allows arithmetic operations between measurements as if working with a spreadsheet. In this example, Row A : Col 4 returns the number of GSR responses and Row A: Col 5 was Delta T, the time span.	**Measurement Arithmetic** Measurement Arithmetic Parameters Source 1 Operand Source 2 Row A : Col 4 / Row A : Col 5 Constant = 0 OK Cancel
Number of responses per minute To normalize the number of responses over one minute, the number of responses over time is divided by 60.	**Measurement Arithmetic** Measurement Arithmetic Parameters Source 1 Operand Source 2 Row B : Col 1 * K, Constant Constant = -60 OK Cancel

Measurement Presets

The above measurements can be saved as presets so they do not have to be configured every time.
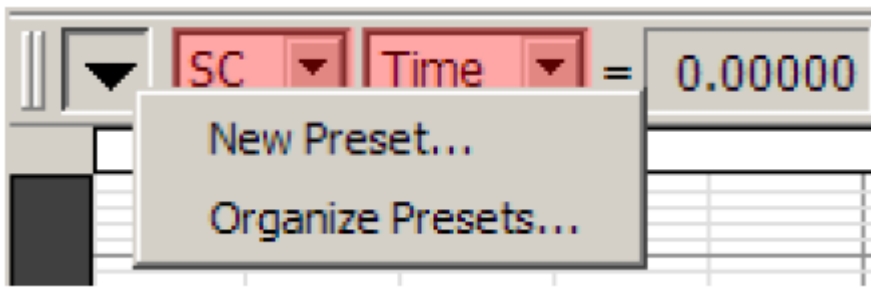
Left click on the down arrow to the left of the measurements to access the Measurement presets function and save your measurement configuration as a New Preset.

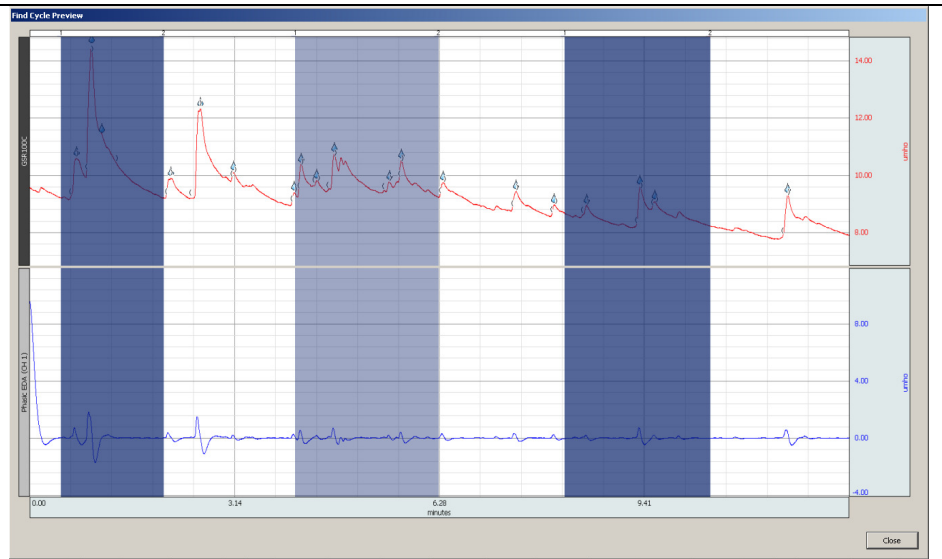**Extracting measurements to Excel.**

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Under Analysis, select Find Cycle In this case we will use the cycle detector to find the markers user type 1 (start of task) and user type 2 (end of task). From the Cycles/ Peaks type, select locate cycles from Event. The start Event will be User Defined, User Type 1 and End event User Defined, User Type 2	
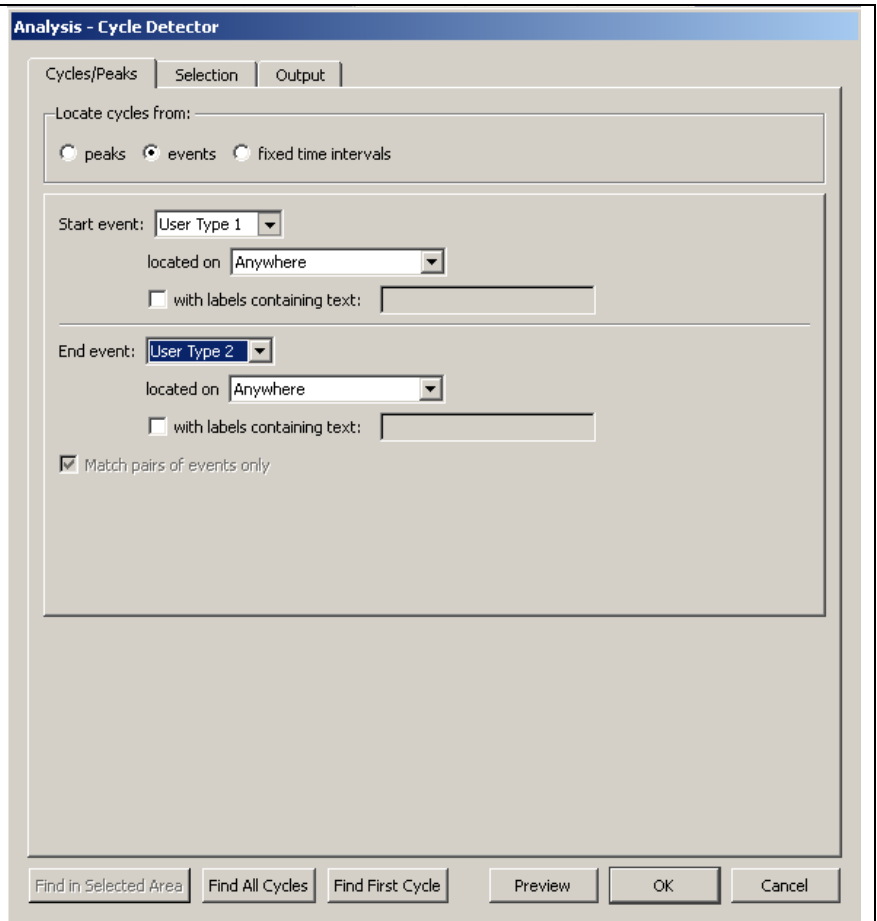
The software will identify with blue bars the sections it found	**Find Cycle Preview**
Under the Output tab and Measurements tab select Save measurements to Excel and specify a file name or use a new file. Other options includes saving to the journal or sending the results as new channels in the graph. Click on Find all cycles to analyze all segments. This will extract results for the segments marked F1 to F2, beginning to end of tasks. To analyze from the end of the task to the beginning of the new task, ie the relaxing period, set the Start Event to User type 2 and End Event to User Type 1.	**Analysis - Cycle Detector**
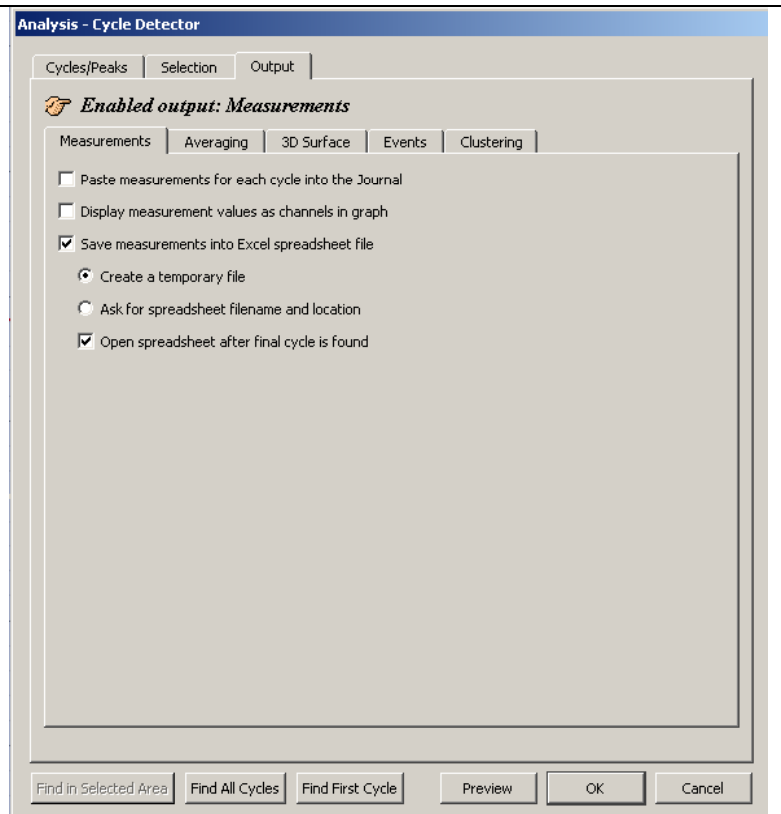
After the first file has been analyzed, subsequent files can be analyzed by using Analysis, locate SCRs, select your measurement presets and use Find Cycles. Toolbar shortcut to these functions can be created under Display, Customize Toolbar .