

Converting WAV to STM

using the Stimulus Conversion Utility

Introduction

The Stimulus Conversion Utility included with your system can be used to convert a WAV files to the system's native stimulus format, STM. The utility can be run from the Launch Pad **[UTILITIES]** menu, the IVRA Add/Remove Stimulus window or the Auditory Stimulus Generation window of SmartEP and SmartTrOAE.

Generating a WAV file

There are many programs that can be used to generate or record a WAV sound file. The most popular is Adobe Audition, which allows you to generate customized tones, silence, and noise combinations. You must refer to the respective user manual to learn how to use those programs and produce the required output. When generating your sound file, have the following considerations in mind:

- When saving your sound files, you must define the sample rate to be **22050 Hz** or **44100 Hz**, so that the stimulus conversion utility can read it.
- The file must be in **Mono** format, Stereo files will not be processed by the utility.
- The file must have a resolution of **8 or 16 bits**, other resolutions are not allowed.
- Signals up to 500 milliseconds can be used for Standard SmartEP, signals of up to 1 second can be used in the Advanced Auditory Research (AAR) Module of SmartEP and SmartEP-CAM. Longer durations of up to 8 seconds can be achieved with the AAR Module when using slower sampling rates on the Duet platform.
- The recommended save format is **Windows PMC WAV**. Other formats may be "lossy" and may not produce the expected output.

Converting to STM

Once the Stimulus has been generated and saved to file, you may convert it following these steps:

1. Open the Stimulus conversion utility and click on the **[BROWSE]** button to select the WAV file from your files.
2. Change the target name and destination folder if necessary. It is recommended to

choose a descriptive name. The default program directories for the stimulus files are the ones containing Stim in the folder name, located in your program installation directory (e.g. Look for the "Stim_EP" folder for stimulus files to be used in evoked potential acquisition.)

Steps 3 to 5 are optional.

3. Check the **[SMOOTH]** box if there is a need for the output be a smoother wave. This option is especially helpful when the original recording is noisy.
4. Click on **[DEMEAN]** if the wave is clipping when converted to STM format. This option will reduce the amplitude of the stimulus to avoid clipping throughout the entire wave, and preventing saturation of the stimulator.
5. Click on **[REMOVE DC]** if there is a need to remove any offset that the wave may have (which may cause it to clip as well), bringing the mean value of the wave to zero.
6. When converting stimuli for use with the SmartEP AAR module, if the stimulus exceeds the 500 millisecond limit, change the Maximum number of points from 20000 to 40000.
7. Select the correct sampling rate for the application. For SmartEP and IVRA set it to 40 kHz, for SmartEP-CAM set it to 20 kHz; for SmartEP-AAR choose the option that fits best the duration of the stimulus.
8. Click on **[GO!]** to convert the file.

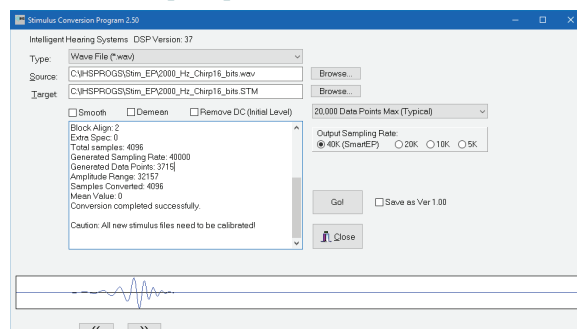


Fig.1 - Stimulus Conversion Utility.

NOTE: If the generated file does not load into the software, you may need to check the box that says "Save as Version 1.0" to ensure compatibility with older software versions.

Calibrating the Files

Before using the converted stimulus files, it is recommended that you calibrate them. Calibration will ensure reliable stimulation. Calibration can be achieved by performing the following steps.

1. From the Launch pad main menu, go to **[SYSTEM > CALIBRATION - STIMULUS FILES]**.
2. From the top right hand corner select the directory where the file is located; then click the **[FILE]** button to select the file to calibrate.
3. Choose the stimulator from the list on the right hand side.
4. Couple the stimulator to an SPL level meter.
5. If performing sound field calibration, place the SPL meter in the spot where the subject will be normally positioned during testing. Set the amplifier volume knob at the mid-point. Start with a correction of -25.
6. With the output intensity at 70 dB SPL, press the output button to stimulate constantly.
7. Read the SPL meter reading and press the correction buttons **[Up]** or **[Down]**, on the calibration module window, as needed until the SPL meter reads 70 dB.
8. Click on **[OUTPUT]** again to stop stimulation.
9. Click on the **[EAR]** button to change from right to left and perform step 6-7 for the second transducer.
10. Enter a maximum intensity value and a minimum intensity value. Keep in mind the physical limitations of the transducers when entering these values.
11. Enter a SPL-to-HL level if known.
12. Click on **[SAVE CALIBRATION]**.

Repeat these steps with any other stimulus files that were created. Remember to calibrate all transducers that will be used in combination with the stimulus files.

Using the STM files in SmartEP

Keep in mind that stimulus files for SmartEP must have a sampling rate of 40 kHz. To load and use the stimulus file in SmartEP:

1. Click on the **[STIM]** button from the control panel to open the auditory stimulus window.
2. From the Stimulus Type options, select **[FILE]** and choose the file to be used from the open file dialog box.
3. Continue using SmartEP as you would normally.

When using a stimulus of lower than 40kHz in SmartEP-AAR, make sure the acquisition sampling rate matches the stimulus.

Using the STM files in SmartEP-CAM

Keep in mind that stimulus files for SmartEP-CAM must have a sampling rate of 20 kHz. To load and use the stimulus file:

1. Click on the stimulus area of the control panel to open the auditory stimulus window.
2. From the Stimulus Type options, select **[FILE]** and choose the file to be used.
3. Click OK to confirm.

Using the STM files in IVRA

IVRA STM files may have duration of up to 2 seconds and may use any of the different sampling rates. To load the stimulus into IVRA:

1. Select **[STIMULUS > ADD/REMOVE STIMULUS]** from the IVRA main menu.
2. Enter a descriptive name for your stimulus. This name will be shown in the stimulus list, at the bottom left of the IVRA main window.
3. Click on the **[BROWSE]** button, locate the converted STM file in your computer and select it.
4. Enter the necessary parameters: "Frequency" defines where the stimulus is to be plotted in the audiogram (for speech sets, or other odd stimuli, select the frequency that is most convenient for plotting). "Repetition" is the number of times the stimulus will occur during a single presentation. "ISI" is the Inter Stimulus Interval, amount of time to delay between repetitions. Select a preferred toy if desired, otherwise choose "Any".
5. Finish by clicking **[SAVE]**.

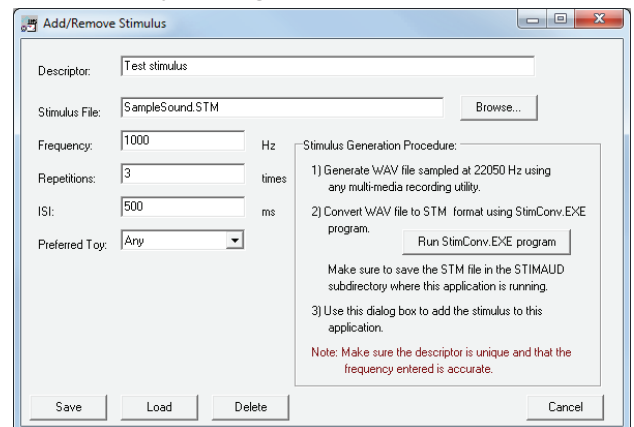


Fig.2 - IVRA Add/Remove Stimulus window

Notice that the stimulus file you have just added will appear at the bottom of the list. You will need to create a stimulus set using the converted files to use them in one of the standard automated routines. Consult the IVRA manual to learn how to create a stimulus Set.