

## SoundMexPro - Applications

Here you can find descriptions of some sophisticated lab scenarios where SoundMexPro is used for sound presentation and recording.

### Ultrasonic and audio real-time applications in animal and human psychophysics

In these applications, SoundMexPro is used as a real-time convolution and monitoring engine. Ultrasonic sounds are recorded at a sampling rate of 192 kHz, convolved in real time with the HörTech VST convolver plugin and played back as an echo from a phantom object which is defined in terms of its impulse response (the convolution kernel).

The use of SoundMexPro allows for very low and stable latencies; the fact that the convolution is calculated with a fast VST plugin allows for relatively long impulse responses to be used compared to other real-time systems. A second SoundMexPro VST plugin is used to monitor ultrasonic activity by heterodyning (real-time multiplication with a ultrasonic pure tone of adjustable frequency).

Additionally a randomly varied frequency-roving is applied to all 32 used output channels to avoid an additional queue from differences in particular speakers. This is implemented with the fast convolution plugin as well allowing a total stable I/O-latency below 4 ms when convoluting all 32 channels! The latest interesting feature is the SoundMexPro asio-direct-monitoring (ADM) capability. With suitable hardware, ADM allows for very short latency (<1 ms) routing of inputs to outputs at adjustable gain.

### Measurement of otoacoustic emissions (DPOAE)

The otoacoustic emissions software uses the SoundMexPro feature of synchronous playback and recording of multiple audio channels. The recorded data is evaluated online by retrieving them block-by-block directly from the soundcard to the MATLAB® workspace and the measurement paradigm can be adjusted depending on the recorded data.

### Continuous EEG stimulation

The EEG stimulation package uses multiple SoundMexPro tracks to synchronously play stereo audio stimuli and a trigger signal for the EEG-amplifier. Stimuli and trigger signal can be generated 'on-the fly'. In this way there is no need to create huge stimulation files containing thousands of stimuli in random orders. The single stimuli and trigger signals are created during the measurement and are 'appended' to the buffer of the soundcard that is already playing. If the computation of the stimuli is too complex to be possible in real-time, the entire sequence can be recorded and subsequently played back from a wavfile.

### Threshold driven ultrasonic animal sound playback and recording

In this application SoundMex is used to playback and record 192kHz, 24bit waves for experiments on psycho-physics of echo imaging of bats. In this application the SoundMex special feature to perform threshold driven hard disk recording with 'look ahead' is used: the last few seconds of data are stored (and updated in real-time) in memory and are stored to the hard disk if a predefined threshold is exceeded on the selected record device.

In this way all relevant data are stored on the disk without recording gigabytes of useless data to the disk, and measurements that last for hours can be performed.