100 KHZ BANDWIDTH ULTRASONIC RECORDING SYSTEM

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SUPPLEMENTARY MATERIAL

Fig. 1S. Screenshot of the custom Windows application while recording a Long-Evans rat being ‘tickled’ by a human familiar to the rat. The application is written in C++ and provides the user interface. As the data arrive they are passed through an FIR filter (1 dB equiripple with gains of 0 dB and -80 dB at 100 kHz and 105 kHz, respectively). The data are then downsampled to 210 ksps. An FFT of the downsampled data is taken and a real-time spectrogram is displayed. The spectrogram scrolls up at a rate determined by user settings. The user can specify the FFT window function, FFT length, FFT overlap, as well as various spectrogram display options. The lower window is a time-domain display and is mostly useful for testing and setup. If recording, the filtered data are written to disk as signed 16-bit integers.

The real-time display allows the experimenter to immediately identify the presence of a vocalization, the frequency, and relative intensity levels. It also allows the experimenter to determine if there is a background noise source that overlaps with the frequencies of interest in a particular experiment. For example, the signal near 32 kHz is not part of the vocalization but is a relatively constant background noise that comes from the ventilation system in our lab. The Windows program can also use whatever sound source is in the host computer. This was included to ease software development but it does provide some additional functionality. The common 16-bit mono sampling rates are supported and the software adjusts the spectrogram scale as needed.

Fig. 2S. Custom PCB. Shown with power connections and transducer disconnected.