A FLEXIBLE MONOPOLAR STIMULATOR FOR ANIMAL STUDIES IN AUDITORY PROSTHESES

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1. Introduction
• This paper presents the design of a bench-top monopolar stimulator (BT-MoSTM) that can be used for animal studies in cochlear implants.
• The stimulator is controlled by three high-speed digital Input/Output (I/O) cards manufactured by National Instruments Corporation and is electrically isolated.
• The stimulator provides sixteen independently controlled charge-balanced monopolar channels, each varying in stimulation parameters.
• Four stimulation patterns, which are symmetric biphasic, non-symmetric biphasic, triphasic and amplitude modulate biphasic, are available in either simultaneous or interleaved modes.
• A user-friendly and intuitive MATLAB Graphical User Interface (GUI) is provided with the stimulator board to simplify its control and use.

2. System Overview

MATLAB GUI

3. MATLAB GUI

Fig. 2. MATLAB GUI screen shot of Symmetric Biphasic stimulation

Fig. 3. MATLAB GUI screen shot of Non-Symmetric Biphasic stimulation

Fig. 4. MATLAB GUI screen shot of Triphasic stimulation

Fig. 5. MATLAB GUI screen shot of Amplitude Modulated Biphasic stimulation

4. BT-MoSTM

• 16 independently controlled and charge-balanced monopolar channels
• 5 V compliance voltage
• 1 mA maximum current amplitude per channel
• 7-bit current amplitude resolution per channel
• 4 us minimum pulse width per channel
• 0 us minimum interphase gap per channel
• 4 us minimum interstimulus interval per channel
• 83.3 kHz maximum pulse rate per channel
• >50 MHz output resistance per channel

5. Conclusions
• Presented in this paper is the design of a flexible monopolar current stimulation system for chronic cochlear implant studies on animals. The system is equipped with 16 independently controlled and charge-balanced monopolar current outputs that can easily be programmed to generate a wide array of stimulation waveforms.
• A user-friendly MATLAB GUI has been created to simplify the task of controlling the BT-MoSTM board by allowing the user to simply specify a set of desired stimulation parameters including pulse width, interphase gap, pulse rate, stimulation patterns, etc.

References

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