

A fast method for measuring Psychophysical Tuning Curves (PTCs)

SWPTC is software for measuring psychophysical tuning curves (PTCs) using a narrowband noise masker that sweeps in frequency. SWPTC is a program which can be installed on a PC with a standard (good-quality) sound card. It is intended that sounds are delivered via headphones. Each ear is tested separately (the ear to be tested is selected in the software). If required, an external amplifier can be used between the sound card and the headphones.

The method is similar to that described in:

Sek, A., Alcántara, J. I., Moore, B. C. J., Kluk, K., Wicher, A., 2005. [Development of a fast method for determining psychophysical tuning curves](#). Int. J. Audiol. 44, 408-420.

The PTC can be used for two purposes:

- 1) To quantify the frequency selectivity of the auditory system; poor frequency selectivity is associated with broad PTCs.
- 2) To detect dead regions in the cochlea: if the tip of the PTC (the masker centre frequency at which the masker level is lowest) is shifted markedly away from the signal frequency, this probably indicates a dead region at the signal frequency. Small shifts can occur because of errors of measurement, but a shift larger than about 10% of the signal frequency is likely to indicate a dead region at the signal frequency. The frequency at the tip gives an estimate of the “edge frequency” of the dead region.

For more background information, see:

Moore, B. C. J., 2001. [Dead regions in the cochlea: Diagnosis, perceptual consequences, and implications for the fitting of hearing aids](#). Trends Amplif. 5, 1-34.

Moore, B. C. J., 2004. [Dead regions in the cochlea: Conceptual foundations, diagnosis and clinical applications](#). Ear Hear. 25, 98-116.

Moore, B. C. J., 2007. [Cochlear Hearing Loss: Physiological, Psychological and Technical Issues](#), 2nd Ed., Wiley, Chichester.

The task is to detect a sinusoidal signal, which is pulsed on and off, in the presence of a continuous noise masker whose centre frequency slowly changes, from low to high (Forward sweep), or from high to low (Reverse sweep). Initially, the signal is presented without any masker, so that the client knows “what to listen for”. Then the masker is presented, but usually at a low level (which can be specified by the user) so the signal remains audible. The client is requested (via a box on the screen) to press and hold down the space bar when the signal is audible. While the space bar is pressed, the masker level is increased (at a rate that can be specified in the software; the default value is 2 dB/s). The client is requested to release the space bar when the signal is not audible. While the space bar is not pressed, the masker level is decreased. In this way, the masker level “tracks” the level required just to mask the signal.

The masker level and centre frequency at the tip of the PTC are automatically estimated.

If the client has relatively good hearing at low frequencies (40 dB HL or better), the outcome of the test can be influenced by the detection of a combination band produced by the interaction of

the signal and masker. The software includes an option for adding a lowpass noise to the main (sweeping) masker to prevent such a combination band from being detected. A help file is included with the software.

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