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Special Test
An overview

PRODUCT INSIGHTS

In addition to pure-tone, speech, and supra-threshold tests, most clinical audiometers provide a set of special tests. These procedures are not part of the standard diagnostic routine but can offer valuable information in specific clinical situations.

Special tests are particularly useful to:

- Differentiate between organic and non-organic hearing loss;
- Assess central auditory processing or binaural interaction;
- Support the fitting and fine-tuning of hearing aids.

Among the most widely used special tests are:

- Masking Level Difference (MLD), designed to investigate binaural processing abilities;
- Stenger Test, applied mainly to detect non-organic hearing loss;
- Master Hearing Aid (MHA), which simulates the behavior of a hearing aid and helps in evaluating the benefit of amplification before fitting.

Each of these tests has its own dedicated procedure and clinical application, which will be described in the following sections.

MLD

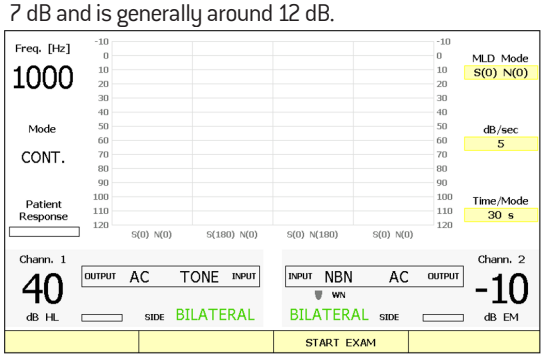
The Masking Level Difference (MLD) test is useful for the diagnosis of Central Nervous System impairments; in particular, it allows the assessment of the function of the lower brainstem, where the signals from the two ears are compared.

The exam consists in presenting to both ears a tone (usually interrupted and with a frequency of 500 Hz) together with a noise of fixed intensity (normally 60 dB EM). The aim is to determine the minimum intensity of the tone heard by the patient under three different conditions:

1. **S(0) N(0)**: both stimulus and noise are in phase, i.e., identical in both ears.
2. **S(180) N(0)**: stimulus out-of-phase (the tone presented to the left ear has opposite phase compared to the right ear), noise in phase.
3. **S(0) N(180)**: stimulus in phase, noise out-of-phase.

The threshold of the tones in the presence of noise is measured for each of these conditions using the Békésy tracking procedure. Typically, thresholds are lower in out-of-phase than in in-phase conditions.

The MLD value is defined as the difference in threshold between in-phase and out-of-phase conditions (usually S(180) N(0)). For a 500 Hz tone, the MLD should exceed 7 dB and is generally around 12 dB.



MLD Test Window (Inventis instruments)

In audiometers such as those by Inventis, the test window presents:

- Bottom section: information about the status of channel 1 and 2.
- Central section: the exam graph, where the x-axis is divided into four segments corresponding to the tone/noise conditions (note that S(0) N(0) is tested twice), and the y-axis indicates the intensity of the tone.
- Left section: frequency of the stimulus and presentation mode (continuous or interrupted, the latter typically at 2.5 Hz).
- Right section: exam parameters, including tone/noise presentation mode, intensity change rate (1, 2.5, or 5 dB/sec), and duration for each condition. These values can be adjusted via the touchscreen interface.

In Inventis audiometers, the MLD is an automatic test. The conditions S(0) N(0), S(180) N(0), S(0) N(180), and S(0) N(0) again are presented in sequence. The tone intensity is regulated through the patient response button: the patient keeps it pressed while perceiving the tone (intensity decreases) and releases it when the tone is no longer heard (intensity increases).

As in other automated procedures, the test is started with the START button and may be interrupted at any time using the STOP button.

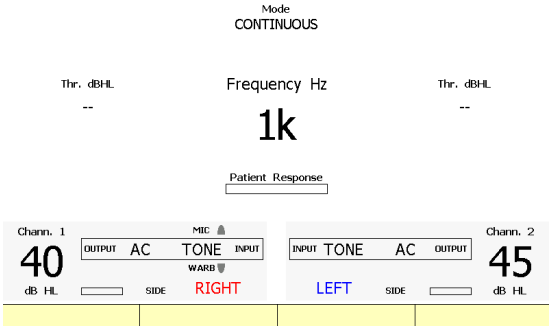
STENGER

The Stenger test can be used to establish whether or not a measured hearing threshold is genuine. It is based on the Stenger effect: if a sound is presented simultaneously to both ears at the same frequency but at different intensities, it will be perceived only in the ear receiving the louder stimulus.

Once the hearing threshold for a given frequency has been identified, the test is performed by:

- presenting the tone to the better-hearing ear at a level 5–10 dB above the threshold;
- presenting the tone to the poorer ear at a level slightly below the reported threshold.

If the loss in the poorer ear is genuine, the patient will continue to respond to the tone perceived in the better ear. A different response pattern, instead, indicates a non-genuine hearing loss.
The Stenger test can be carried out using either pure-tone signals or speech material.



Stenger Test Window (Inventis instruments)

On Inventis instruments, when a pure tone or warble input is selected, the central area of the display shows:

- The stimulation frequency,
- The previously established thresholds for right and left ears (from pure-tone audiometry).

When the test is conducted with speech material (by selecting EXT, INT or MIC inputs), the display shows:

- The VU-meter,
- And, in the case of internal (INT) input, the selected speech material and list.

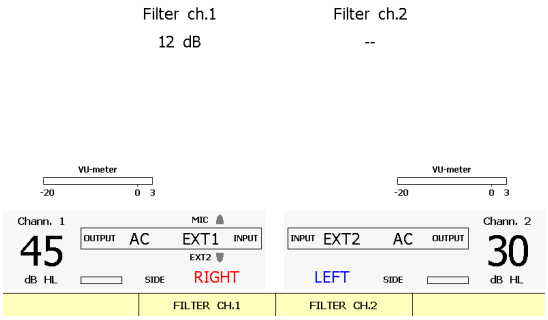
Results are not stored for this type of test. Therefore, no reports can be generated or exported to a computer.

MASTER HEARING AID TEST

The Master Hearing Aid (MHA) test can be used to

support the selection of a suitable hearing aid for patients with impaired hearing. By filtering the speech signal delivered to the patient, the audiometer can simulate the effect of a hearing aid, making it possible to evaluate and quantify any improvement in speech recognition attributable to amplification.

Different filters can be applied independently on each channel. These are high-pass type filters with selectable amplification slopes of 6 dB, 12 dB, 18 dB, or 24 dB per octave.



MHA Test Window (Inventis instruments)

On Inventis instruments, the MHA window displays:

- The active filters on each channel (shown at the top of the screen),
- The two VU-meters (shown at the bottom).

When the internal input (INT) is selected, the window also shows:

- The speech material currently in use,
- The list name,
- And the specific word presented to the patient. The MATERIAL button allows the operator to change the speech material as required.

The buttons FILTER CH.1 and FILTER CH.2 are used to select or disable the filters applied to each respective channel.

As with the Stenger test, no results are saved for the MHA test. Consequently, it is not possible to generate or export reports.

BIBLIOGRAPHY

MLD

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2. Lynn G. E., Gilroy J., Taylor P. C. and Leiser R. P., Binaural masking-level differences in neurological disorders, Arch. Otolaryngol. 1981; 107:357-362.

STENGER

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PI -Special Test An overview_Rev01 • Date: 2025.09.10

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