Comprehensive Audiological Assessment System

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I Introduction

To make differential and topical audiological diagnosis, an audiologist needs to perform an extensive battery of tests, using a variety of audiometric devices [1, 2, 3]. This leads to variability of the test results due to changes in the patient's physiological state; limits the accuracy and comparability of the tests due to differences in calibration of the devices [4]; requires a long time of testing, up to several days; creates inconvenience of moving the patient from device to device; and causes problems with electronic storage and processing of data. All these reduce the diagnostic value and the usability of the audiometric test results. To cope with these problems, the Institute of Biomedical Engineering and Poul Madsen Medical Devices Ltd. have introduced a new approach to comprehensive audiometry, and designed an integrated audiometric instrument, the Audiological Assessment System™, the AAS9000™.

II Comprehensive audiometry and the AAS9000

This new concept of audiological assessment makes it possible to perform a battery of tests , including pure-tone and speech, immittance, ERA, TEOAE and DPOAE , at the same work station during a single visit of the patient .

The computer-based instrument includes an Operator Room Unit with a Pentium processor, hard disk and floppy disk drives; a Patient Room Unit with headphones, bone conductor and acoustic probes; an Audiometric Keyboard™, and a colour monitor. The system combines five audiological devices in one instrument. *The clinical audiometer* is a full two-channel pure-tone and speech instrument covering the frequency range from 125 to 10,000 Hz including masking, air, bone, and free-field audiometry. *The acoustic immittance audiometer mode* provides tympanometry, acoustic reflex measurement, decay-test, and assessment of eustachian tube function. *The two-channel evoked response audiometer mode* provides electro-cochleography, brainstem response, steady-state brainstem response, middle latency, and cortical response audiometry. *The distortion product otoacoustic emissions mode* provides measurement of the DP in the range of 500 to 10,000 Hz with increased signal-to-noise ratio. *The transient otoacoustic emissions mode* provides measurement and FFT analysis of the emissions within wide frequency and stimulus level ranges. All functions are controlled from the Audiometric Keyboard™ with an embedded compact QWERTY keypad.

In the course of testing, patient records are automatically entered and stored in a unified, NOAH-compatible data base. They can be printed out, reviewed, restored, processed and shared on a local network. The system can also be used as a normal personal computer for word processing, spread-sheets, electronic communication etc.

III Areas of use

The AAS9000 can be used as a research tool for Audiology, Otolaryngology, Auditory Physiology, Occupational and Environmental Medicine. It is also a universal clinical audiometric instrument both for hospitals with extensive audiological programs and for private audiological clinics.

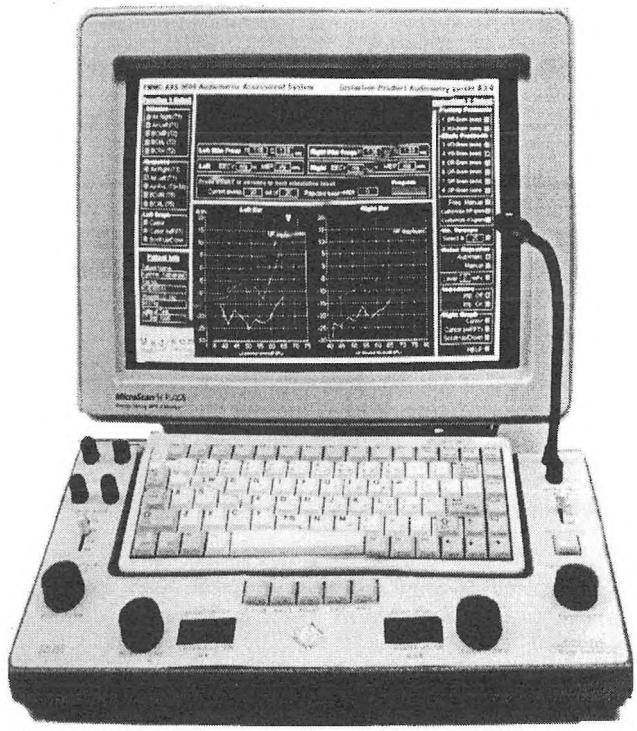

Figure 1: The Audiometric Keyboard™ and 17" Monitor.

The system can also be used in experimental physiological research on animals.

IV Conclusions

Comprehensive audiometry at a single workstation within a single patient's visit enables the audiologist to obtain thorough, comparable, reliable, and reproducible results of different audiometric tests, with less intra-subject physiological variations.

The combined system saves clinic space. It is easy and convenient to use due to uniformity and similarity of an operator interface to that in conventional arrangements. Maintenance, service, calibration and upgrading of the system is a one-step process. Thus it is time- and cost-effective. The system enables effective handling of clinical data.

References

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Acknowledgments

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