Universal Smart Box

auditory, visual, & somatosensory

evoked potentials

& otoacousisc emissions

INTELLIGENT HEARING SYSTEMS

many options, one **smart** system

our flagship platform

The Universal Smart Box was the first auditory evoked potential and otoacousic emissions system to use USB connection to connect to a PC. Since then, through a number of design improvements, it has become the most powerful clinical and research platforms for AEP & OAE.

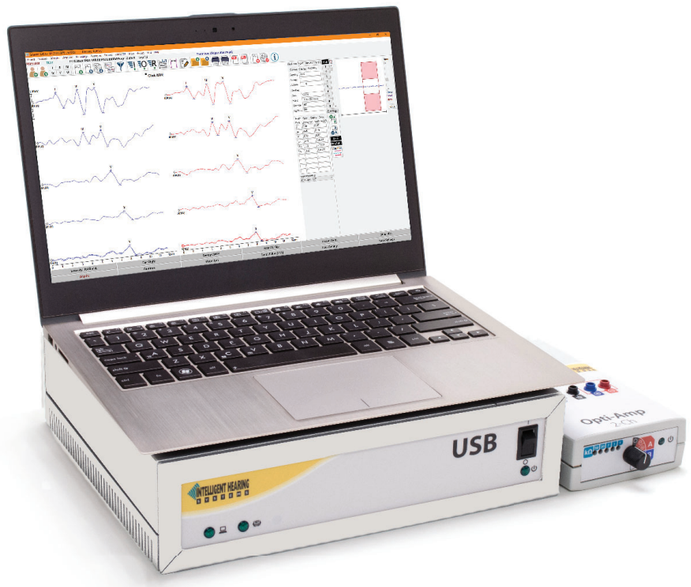
stellar performance

Over 30 years of engineering design experience, combined with unsurpassed expertise in evoked responses, have culminated in the **next generation bio-amplifier** to bring you **superior data quality** for evoked potentials and otoacoustic emissions.

Repeatable, reliable data you can count on

- High definition responses
- Cleaner, more robust responses
- Increased signal-to-noise ratio (SNR)
- Lower residual noise

Reduced test times without compromising data quality



the ultimate in flexibility & versability

The Universal Smart Box can be configured to be an EP system, and OAE system, or an EP/OAE system and can have a maximum of 8 channels. For evoked potentials, the system can be configured to have 1, 2, 4, 6, or 8 channels. OAE systems can have up to two OAE channels. Choose from a variety of add-on modules for the ultimate in flexibility and versatility. Upgrade anytime with minimal or no down time.

the Smart Box that does it all

Standard SmartEP modules:

- ECochG
- ABR (click, tone burst, iChirp)
- MLR
- LLR/CAEP

Standard SmartOAE modules:

- DPOAE
- TEOAE
- SOAE

Optional SmartEP modules:

- P300/MMN
- eABR
- Chained-Stimuli ABR
- cVEMP, oVEMP
- ASSR
- ENoG
- VEP

Somatosensory Evoked Potentials

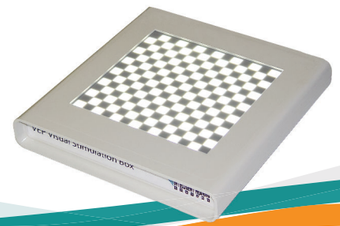
IHS offers an integrated ENoG & Somatosensory EP solution: we manufacture our own Electrical Stimulator Box and Probe.

- Electroneuronography (ENoG) & SSEP on the limbs
- Electrode leads can be connected to surface snap electrodes to deliver stimulus:: no need to hold the probe during the test.
- Low current stimulator option for transtympanic eABR animal research

Visual Evoked Potentials

Ellicit VEP responses using the patterns on a LED light array on the IHS VEP Stimulator.

- Visual patterns can be programmed to stimulate full, half, or quarter fields.
- Stimulator includes centering point to facilitate test subject focusing
- Select from up to 138 different pre-programmed patterns



for all your research needs

Advanced options for SmartEP:

- CLAD for high-rate stimulation
- Notched Noise Masking
- Advanced Auditory Research Module
- Complex ABR
- Frequency Following Response
- Acoustic Change Complex
- CHIRP Stimulus Generation Module
- USB Development Kit
- SmartEP-CAM continuous acquisition module
- Auditory P50
- High Frequency ABR up to 32kHz

Advanced options for SmartOAE:

- Contralateral, ipsilateral, and binaural TEOAE suppression
- Dual OAE probe system
- High Frequency DPOAE for ototoxicity monitoring & animal research

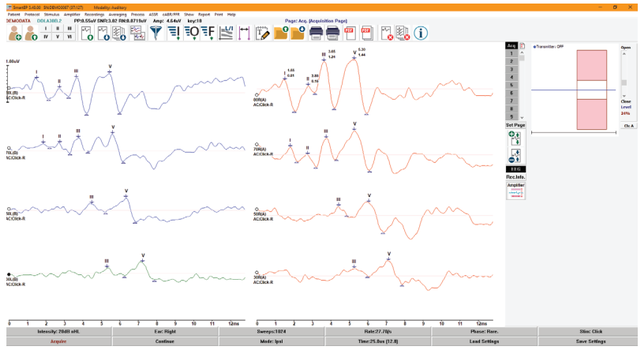
designed for an improved clinical experience

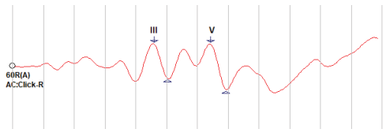
SmartEP

The ideal clinical tool for recording ECochG, ABR, and more.

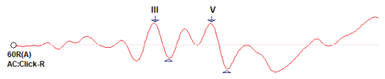
new and improved user interface simplifies acquisition

- Improved toolbar and button design for fast access to key features
- Easy access to all parameters from a simplified control panel and streamlined menus
- Quickly load your own or preset protocols
- Easily view ongoing EEG display for quick assessment of patient state during testing
- Great variety of options allow you to perform the tests the way you want
- Choose from a variety of stimuli, or generate or import your own custom stimuli
- Display or hide a subtle vertical grid or horizontal baseline

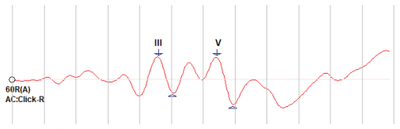




Recording with grid



Recording with baseline



Recording with grid and baseline

streamlined workflow

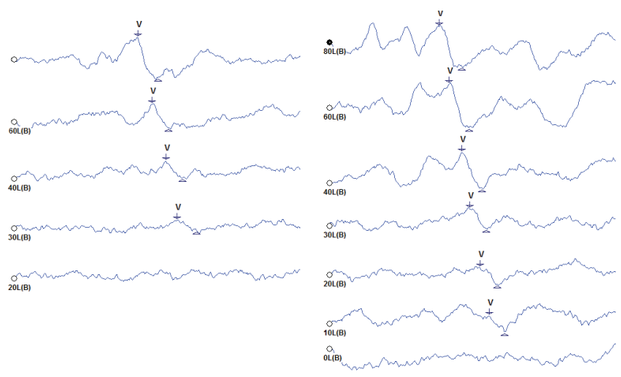
- Easily mark waveforms using over thirty pre-defined peak labels, or create your own custom labels. Easily adjust them using a mouse or keyboard
- View latencies and amplitudes of peaks directly on waveforms and in newly embedded recording information panel.
- Automatically arrange recordings by intensity, acquisition order, stimulus frequency, or rate
- Quickly resize the waveforms using the zoom in/out buttons
- Multi-page display and reports
- Easy PDF report generation
- Auto-save reports on program exit

iChirp™ stimuli included

The intelligent Chirp for SmartEP and SmartEP-ASSR is included in the base package.

- Broadband and narrowband (500, 1000, 2000, 4000 Hz)
- Improved threshold detection
- Robust amplitude responses
- Optimized wave V identification
- Optional, innovative custom chirp design utility

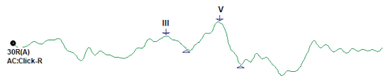
Beneficial for recording ABR in awake and active patients.

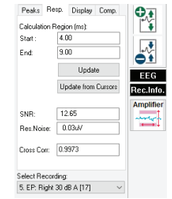


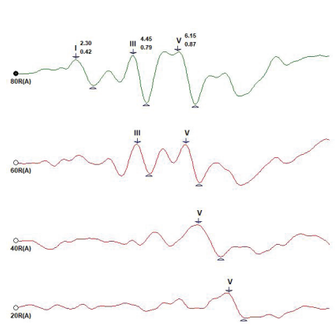
2000 Hz tone burst ABR (left) vs 2000 Hz iChirp ABR (right)

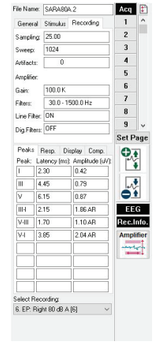
smart features

- Change most test parameters with a single click
- Set your own display scale
- Easily mark waveforms using over thirty pre-defined peak labels, or create your own custom labels
- View latency and amplitude of peaks directly on the waveform
- Latency-Intensity graphs indicating normative data ranges are automatically generated from marked waveforms
- Quickly add, subtract, invert, time shift, or cross-correlate recordings
- Cross-correlation value displayed in information panel





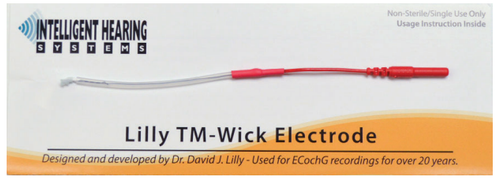


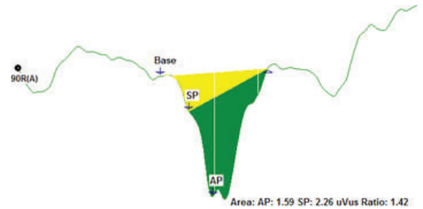


- View repeatability, SNR, and Residual Noise value for each recording
- Split-sweep view to visualize single recording repeatability
- Export to ASCII single recording or page

superior electrocochleography

Our next generation amplifiers combined with the non-invasive IHS Lilly TM-Wick Electrodes produce more robust and repeatable ECochGs.

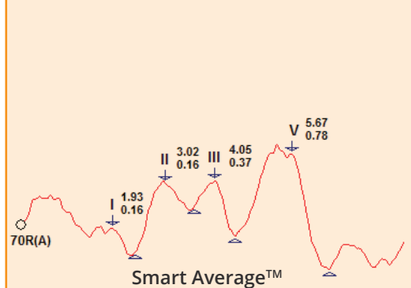


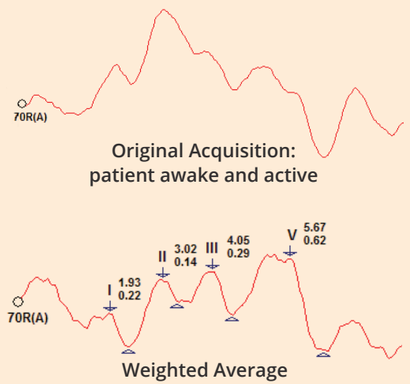


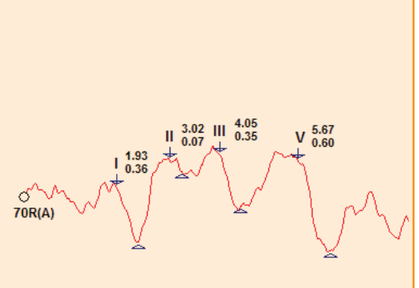
Improved SP/AP amplitude and area curve ratio analysis and automatic calculation.

smarter averaging display options

- Option to automatically acquire and store data in sweep blocks for more powerful processing
- Easily analyze acquired waveforms using additional averaging techniques for further noise reduction
- Averaging techniques includes traditional linear, median, and weighted





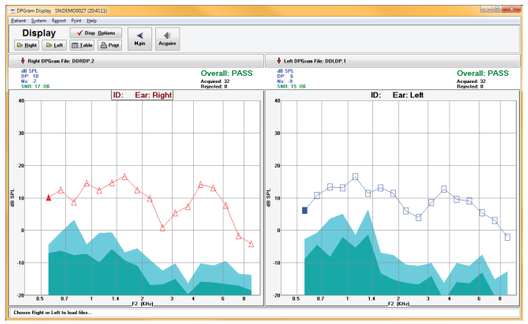


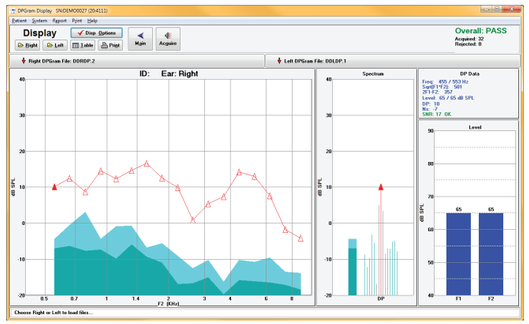
- Objective response measurements provide indicators of recording quality
- Automated averaging stopping rules using residual noise measures allow data to be acquired automatically with consistent quality and noise levels

SmartDPOAE

Screening and diagnostic distortion product otoacoustic emissions.

- Fast and easy setup with up to 41 frequencies per ear in a single test
- Automatic probe-fit check and in-ear calibration for increased accuracy
- Easy-to-interpret colorful DPGrams and detailed information for each frequency tested
- Clear Pass or Refer indications based on user-selected passing criteria
- User-customizable display of normative ranges on the DPGram facilitates response analysis
- High frequency option for ototoxicity monitoring
- Built-in scripting feature allows you to define sequences of frequencies and intensities for automated data collection
- Optional graphical display of noise standard deviation for improved interpretation

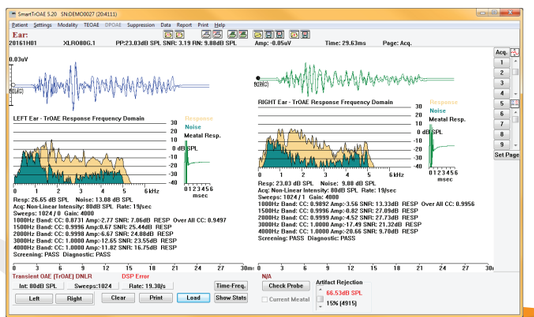




SmartTrOAE

Screening and diagnostic transient evoked and spontaneous otoacoustic emissions.

- Fast and easy test setup and data analysis
- Automatic probe-fit check and in-ear calibration
- Clear Pass or Refer indications based on user-selected passing criteria
- Displays of the OAE time signal, frequency analysis and the ear canal response
- Use clicks, tones, or user-defined stimulus files
- Time-Frequency plots can be used to illustrate how the frequency composition of transient OAE responses, Noise, and SNR change over time



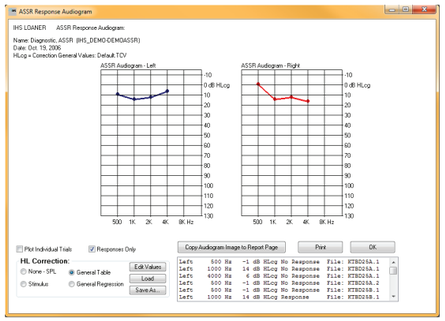
Available in the Universal Smart Box is a dual-probe option that allows for the acquisition of contralateral, ipsilateral, and binaural TEOAE suppression recordings.

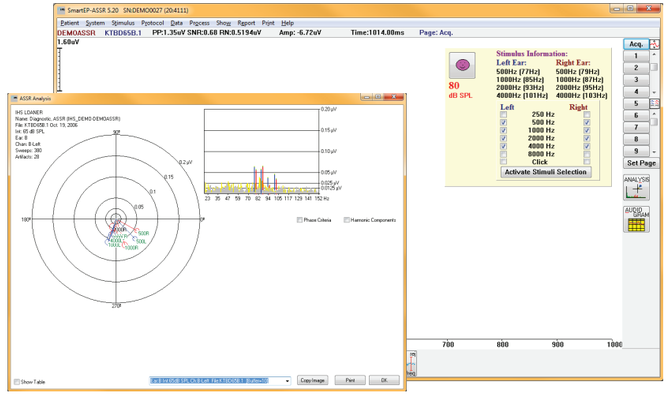
This option includes a Suppression Analysis module for temporal and spectral comparison of control and suppression data.

SmartEP-ASSR

Full-featured screening and diagnostic Auditory Steady State Response System.

- Provides quick, accurate threshold detection using automated statistical analysis
- Test both ears at the same time, four frequencies per ear
- iChirp (broadband & frequency specific) for robust amplitudes and harmonic component analysis for improved threshold detection and reduced test times
- Automated audiogram generation in SPL and HL
- Cost effective add-on to SmartEP

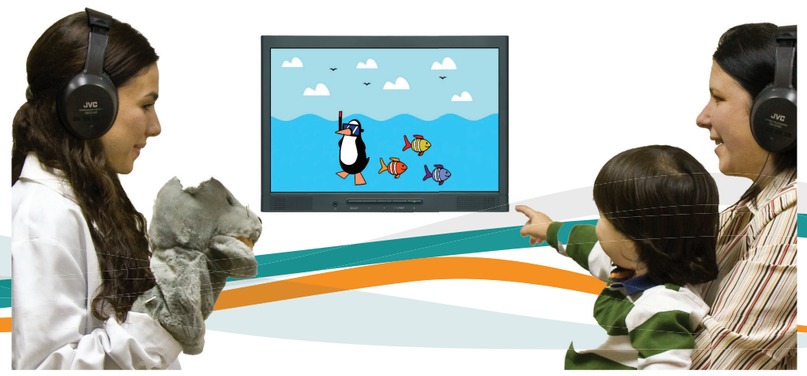




Intelligent VRA

Automated visual reinforcement audiometry.

- Increased reliability & accuracy by a single examiner
- Choose from our variety of 4 and 10 second colorful, animated wide-screen video clips, or use your own video clips
- Use one of our three automated test routines, administer a speech discrimination paradigm (IVRISD), or run a VRA test manually
- Probe Trials maintain patient attention while testing near threshold
- Control Trials allow you to determine the reliability of a test
- Trial-by-trial reports include detailed information for each test sequence
- Final report includes audiogram and threshold for each frequency tested



CAST™

Classification of Audiograms by Sequential Testing selects the best-fitting audiogram from 9 patterns, for fast and efficient screening.

OHTA™

Optimized Hearing Test Algorithm is designed to test four frequencies, non-sequentially in an intensity staircase fashion.

5-up/5-down

Automated ‘step-up, step-down’ intensity staircase procedure for testing thresholds at up to four selected frequencies.

Specifications

SmartEP

- Adjustable Gain: 5K - 300K
- Adjustable High Pass and Low Pass filters (-6 dB/Oct)
- Stimulus: Clicks, Tones, iChirps, Complex, and user-defined files
- Stimulus duration in µsec or cycles
- Stimulus Envelopes: Rectangular, Blackman, Cosine, Hamming, Hann, Bartlett, Trapezoidal (Rise/fall time), Extended Cosine (Rise/fall time), Triangular, Gaussian
- Stimulus presented continuously or only while acquiring
- Ipsilateral and Contralateral noise masking. Specified level or tracking the stimulus level

SmartEP-ASSR

- Gain: 100K
- High Pass Filter: 30 Hz
- Low Pass Filter: 300 Hz
- Stimulus: Clicks, Tones, iChirps, and user-defined files
- Frequencies: 250, 500, 1000, 2000, 4000, and 8000 Hz
- Simultaneous testing of both ears
- Test up to four frequencies per ear

SmartDPOAE

- Up to 41 frequencies per DPGram
- DP I/O Function

SmartTrOAE

- Response window: 300 - 6000 Hz
- Stimulus: Clicks and Tones
- Contralateral, Ipsilateral, and Binaural suppression
- Dual probe option

EP Amplifier

- Two channels
- A/D Converter: 16-bit
- Sampling rate: 200 to 40000 Hz
- High Pass: 1 - 500 Hz
- Low Pass: 30 - 5000 Hz
- Adjustable artifact rejection level and time region
- Line Frequency Notch Filter (-12 dB/Oct)
- Common Mode Rejection:
  - ≥ 105 dB @ 1 kHz
  - ≥ 120 dB @ 60/50 Hz, notch filter off
- Noise Level: ≤ 0.333 uV RMS
- Input Impedance: > 5 MOhms

Transducers

- ER-3C Insert Earphones:
  - Intensity: 0 - 130 dB SPL
  - Frequency Range: 125 - 10000 Hz
- ER-2 Insert Earphones:
  - Intensity: 0 - 118 dB SPL
  - Frequency Range: 125 - 16000 Hz
- High Frequency Transducers:
  - Intensity: 0 - 94 dB SPL
  - Frequency Range: 2000 - 32000 Hz
- TDH Headphones:
  - Intensity: 0- 120 dB SPL
  - Frequency Range: 125 - 12000 Hz
- Bone Conductor:
  - Intensity: 0 - 98 dB SPL
  - Frequency Range: 250 - 8000 Hz
- ER-10D OAE Probe:
  - Intensity: 0 - 100 dB SPL
  - Frequency Range: 125 - 16000 Hz
- ER-10B+ OAE Microphone:
- Sound field amplifier and speakers
- Auxiliary output channel for ipsilateral masking and stimulus mixing

Power Requirements

115 - 230 VAC, 50/60 Hz,
560 - 350 mA, 30 W

Operating Environment

- Portable Equipment
- Indoor use
- Operating temperature: 15 °C - 40 °C
- Relative humidity: 15% to 90% at 40 °C non-condensing
- Altitude: 0 - 3000 m

Storage

- Temperature: 0 °C - 50 °C
- Atmospheric Pressure: none specified

Standards Compliance

- Safety: IEC 60601-1 Class II, Type BF
- EMC: IEC 60601-1-2
- EP: IEC 60601-2-40
- Medical Device Directive: 93/42/EEC

Computer Requirements

- Windows 10 operating system
- Minimum 4 GB RAM
- Minimum 5 GB hard drive space
- Min display vertical resolution of 900 px, Full HD recommended.
- Grounded, 3-prong power supply
- Compliant with IEC 60950
- Mouse or other pointing device
- One available USB Port
- Removable media, network drive, or secure Internet storage site for data backup (recommended)
- Printer (optional)

*May not be available in all markets

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Phone: +1 (305) 668-6102 • Toll Free: 1 (800) 447-9783 (USA & Canada)
Fax: +1 (305) 668-6103 • E-mail: sales@ihsys.com • Web: www.ihsys.com