SmartVS™

Smart Virtual Simulator

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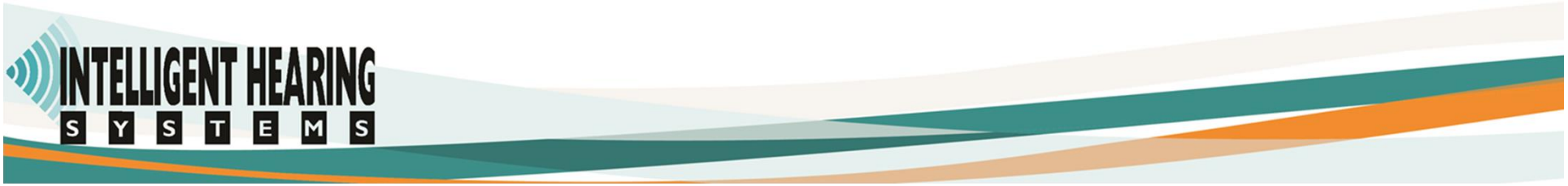
Miami, Florida

USA

Research Funded in Part by an NIH NIDCD SBIR Grant 1-R43-DC018436-01 to Intelligent Hearing Systems



About Intelligent Hearing Systems…

Products: *DSP-based Solutions Since 1983*

SmartEP -Diagnostic AEP

SmartEP-ASSR -Diagnostic ASSR

SmartDPOAE -Distortion OAE

SmartTrOAE -Transient OAE

IVRA -Visual Reinforcement Audiometry

SmartAudiometer -Audiometer

SmartScreener-Plus2 -Newborn Hearing Screening

PetScreener –AEP Animal Screener

Lilly TM-Wick Electrode –EcochG Electrode

EarHug -Disposable Ear Coupler for Screening

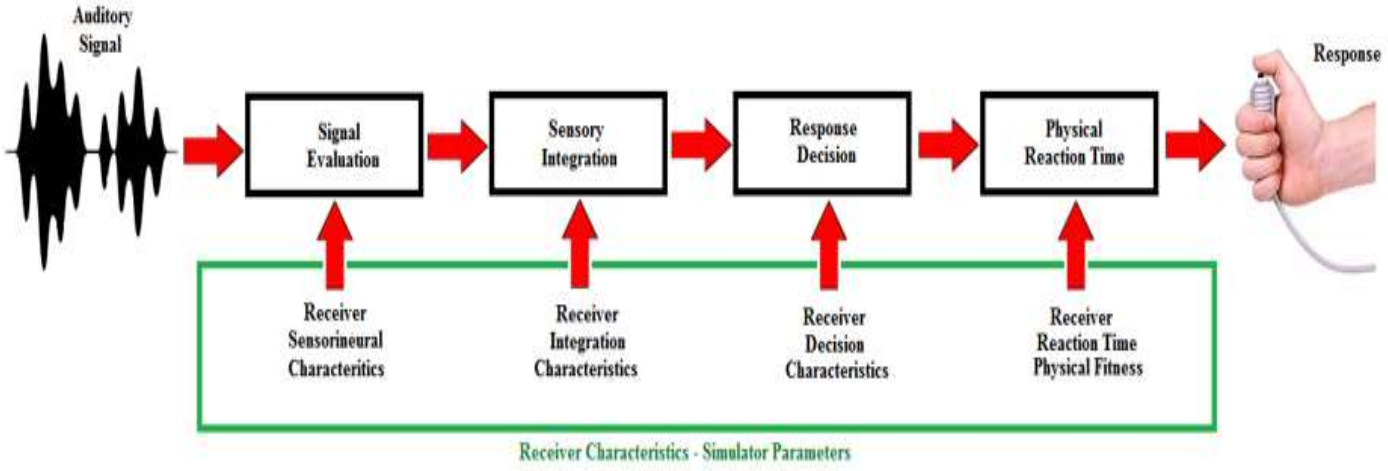
INTELLIGENT HEARING SYSTEMS

SmartEP | ASSR | SmartDPOAE | SmartTrOAE | IVRA | SmartAud | Screener OAE | Screener AEP | PetScreen

About Intelligent Hearing Systems…

Simulators

- **Baby Isao** 功 – AEP & OAE Simulator
- **ISBA** (IHS Simulator for Behavioral Audiometry)



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INTELLIGENT HEARING SYSTEMS

SmartVS™ Introduction

- The aim of the SmartVS product is to provide the students with a real-life testing and work flow experience. At this time, we are including Audiometry (pure tone and speech), otoscopy images and tympanometry results for each patient, and auditory evoked potentials (currently ABR, but will be expanded to middle and long latency potentials as well in the future).

- The software includes a comprehensive user's manual and companion textbook covering theoretical concepts, how the various acquisition parameters affect ABR recordings and exercises that the students can conduct. This will also be expanded in future versions to cover other modalities.

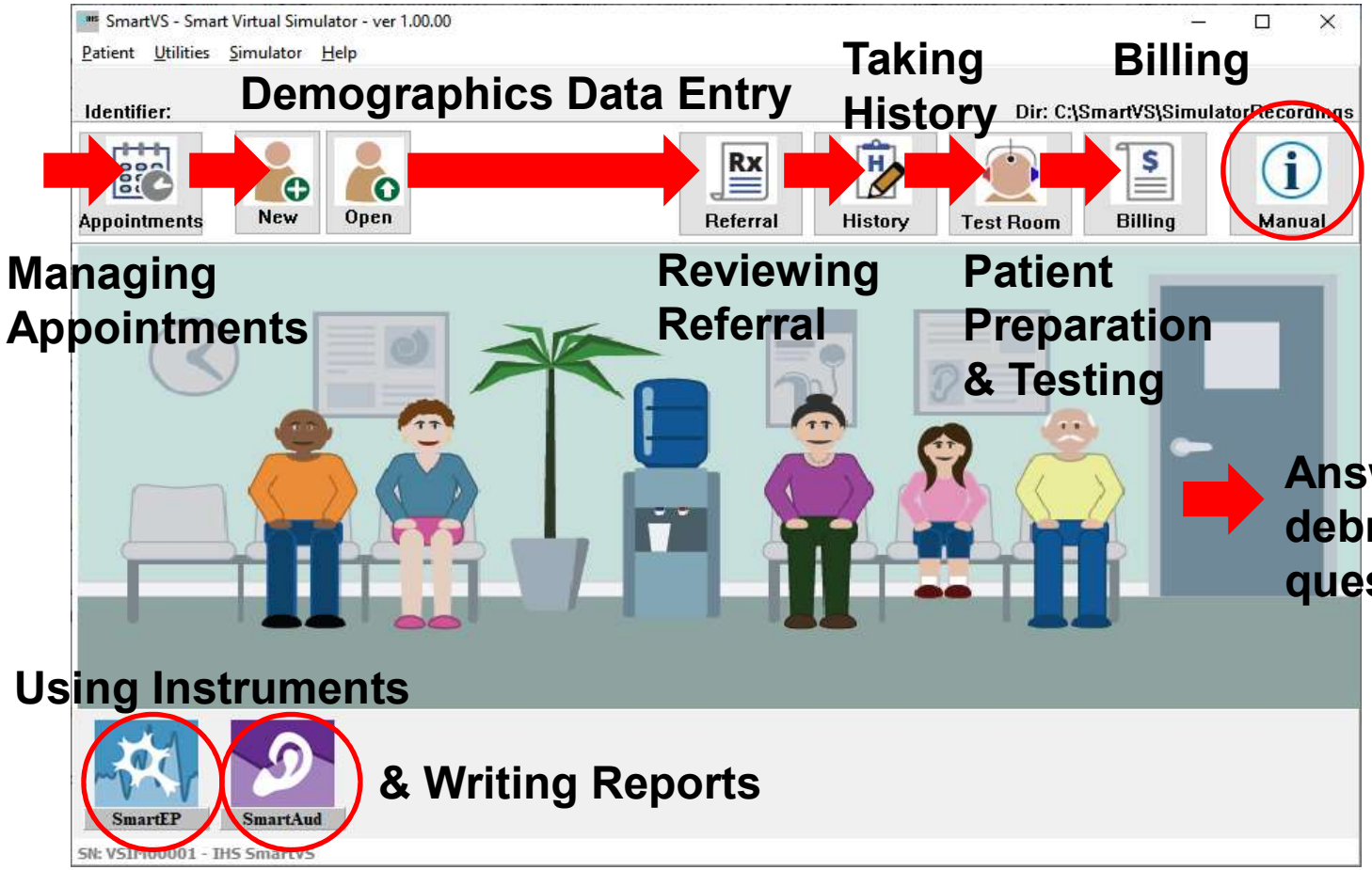
- The software is distributed with a security dongle and is covered under the copyright protection laws as if it were a book. It is intended to only be used by one person at a time. SmartVS can be purchase with a 6 or 12 month license. When the license expires, users will still be able to review their data, perform analysis, and print reports, but they will not be able to perform any further tests.

SmartVS

- Provides realistic virtual testing simulation including:
  - Patient History
  - Patient data entry
  - Patient preparation – electrode and transducer placement
  - Data recording
  - Report generation
  - Billing

INTELLIGENT HEARING SYSTEMS

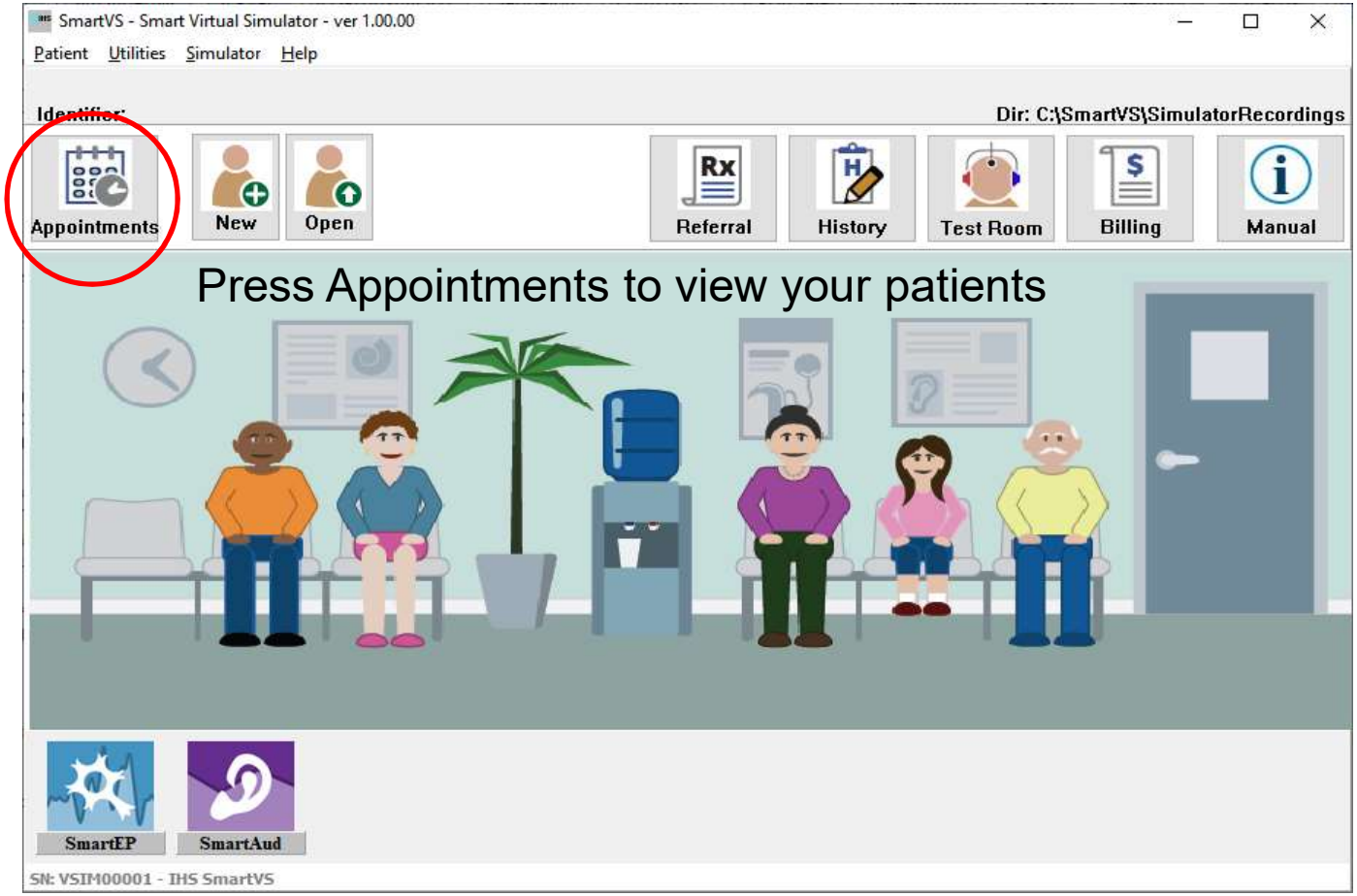
Complete Workflow



Complete manual with background theory and exercises

Answering case debriefing questions

Getting Started…



- Your patients are waiting for you…

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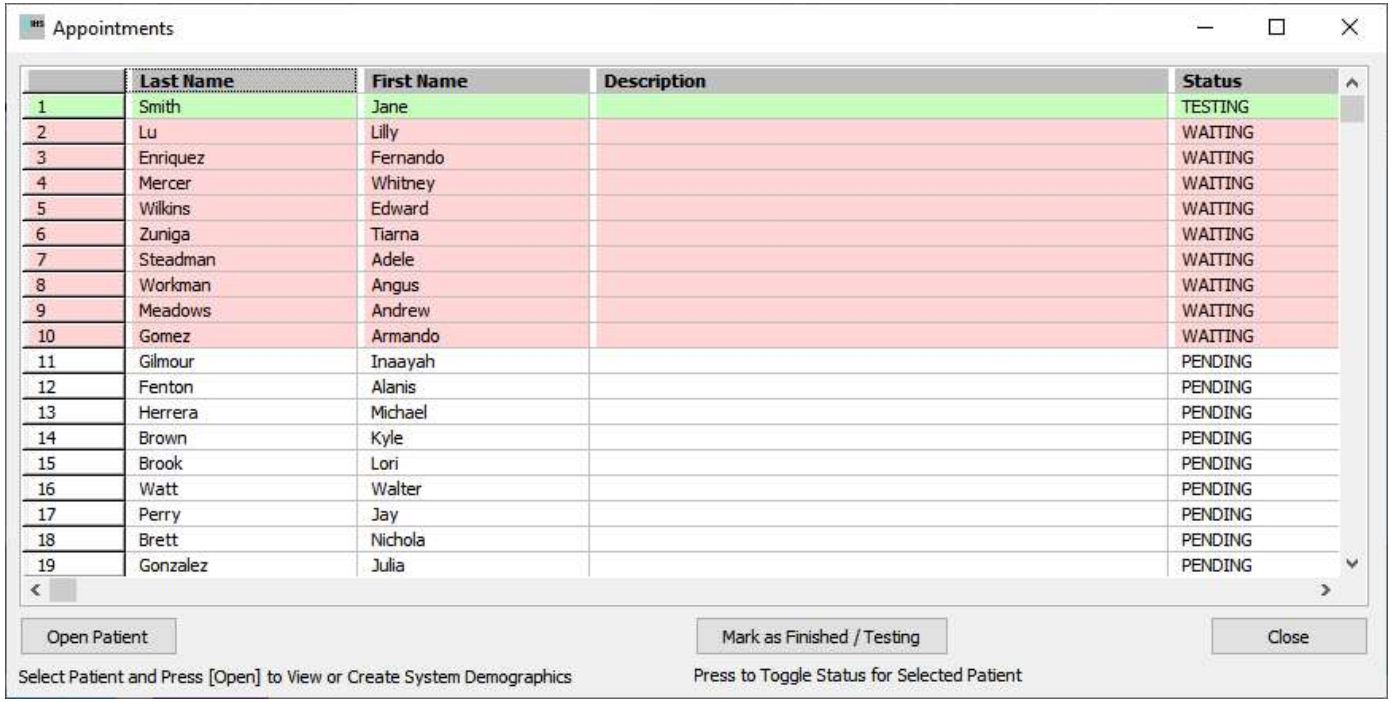
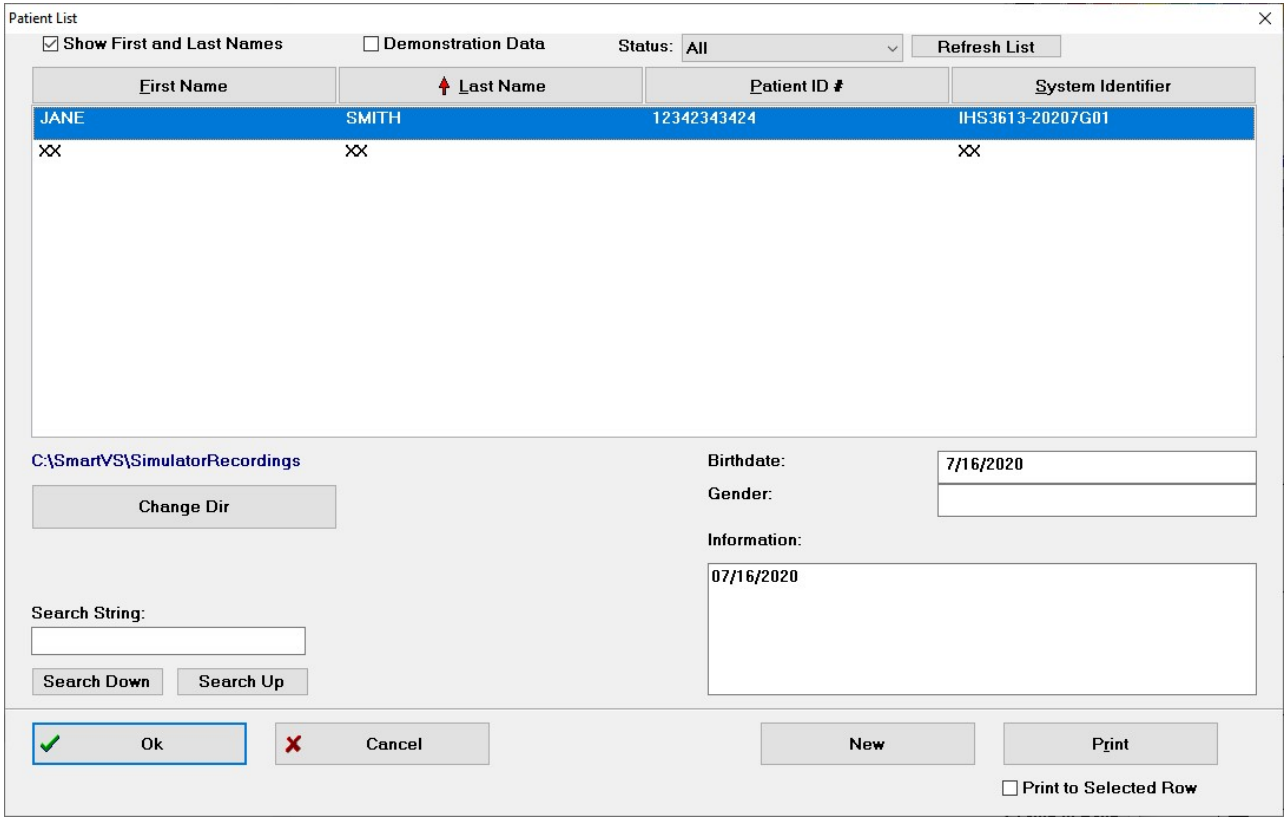
Appointment List



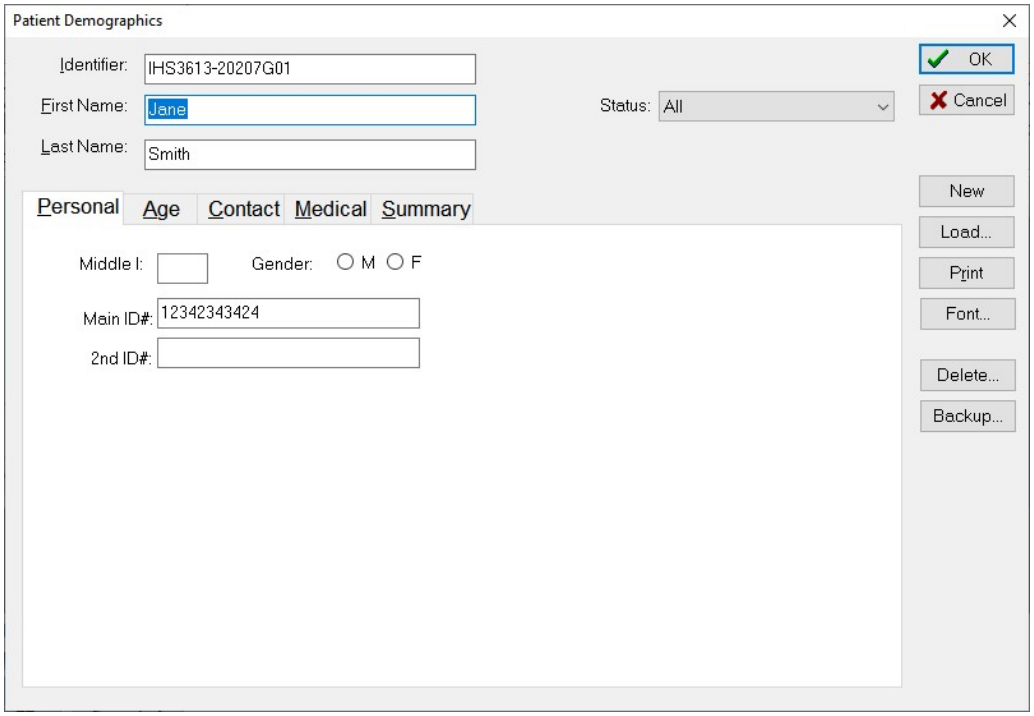
- The list will indicate the patients currently being tested (in green), those waiting to be tested (pink) and those that have not arrived yet (white).
- Click on the patient name to select and press the [Open] button to get started. The selected patient will be highlighted yellow.

Patient Demographics



- After pressing [Open] from the appointment list, if the patient has previously been entered into the system database, the demographics Patient List will open with the selected patient highlighted, allowing you to confirm that that is the correct patient.

Patient Demographics



- After selecting the correct patient from the Patient List or selecting a new patient from the Appointment List, the Patient Demographics screen will open allowing you to enter or edit the patient demographics information.

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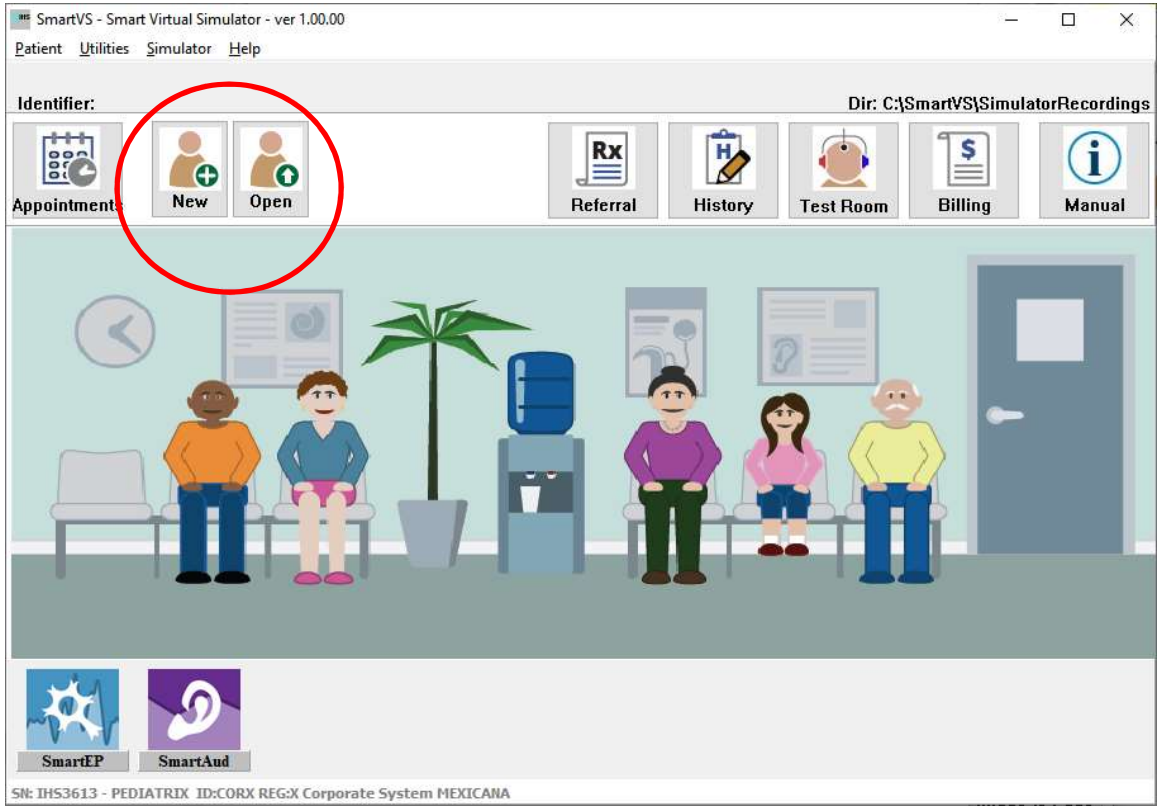
New and Open Buttons



- The New and Open buttons provide direct access to the system database without having to enter the Appointment List. You can use the Open button to open a previously entered patient.

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Testing Room

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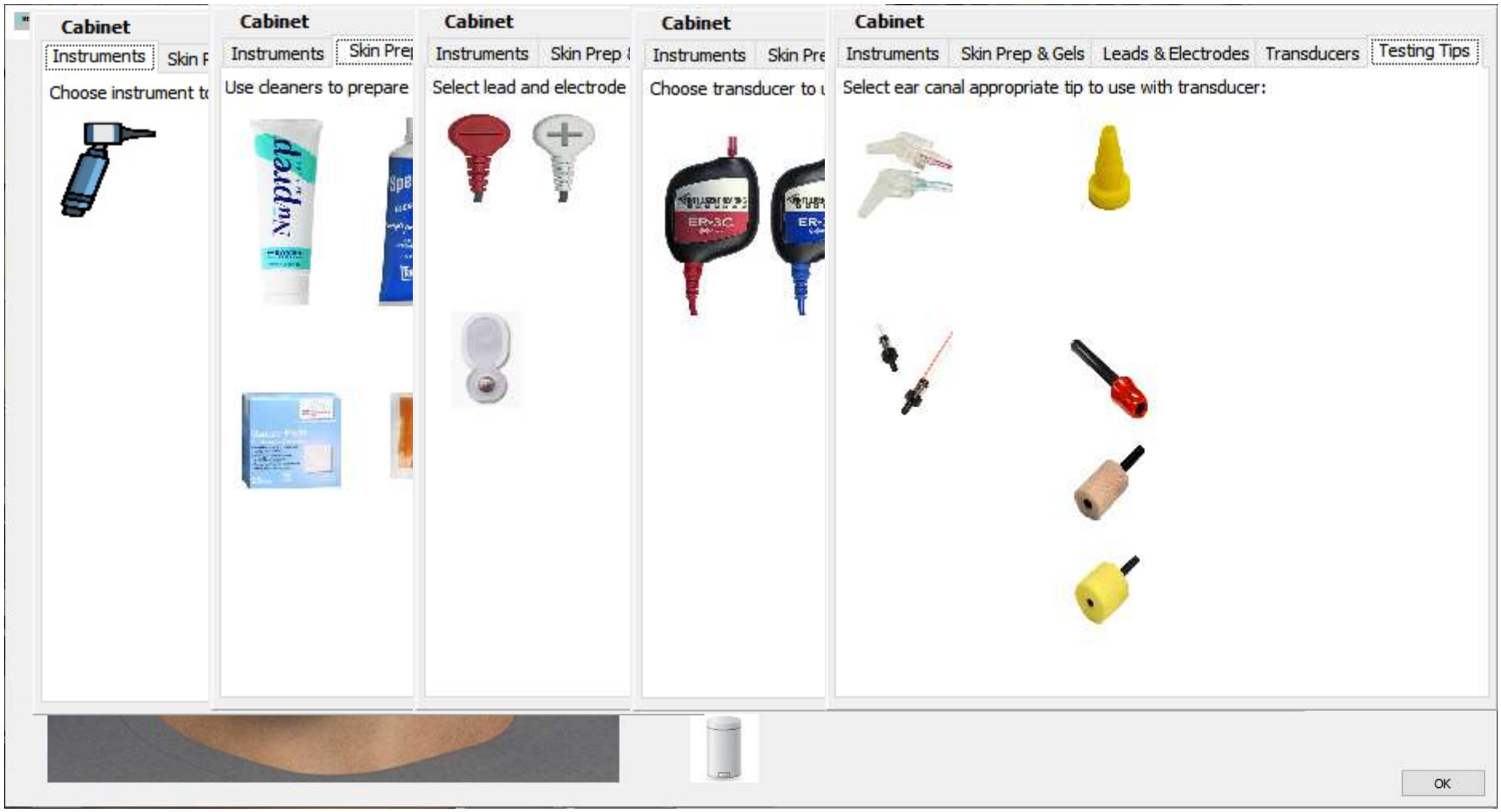
Testing Room – Cabinet



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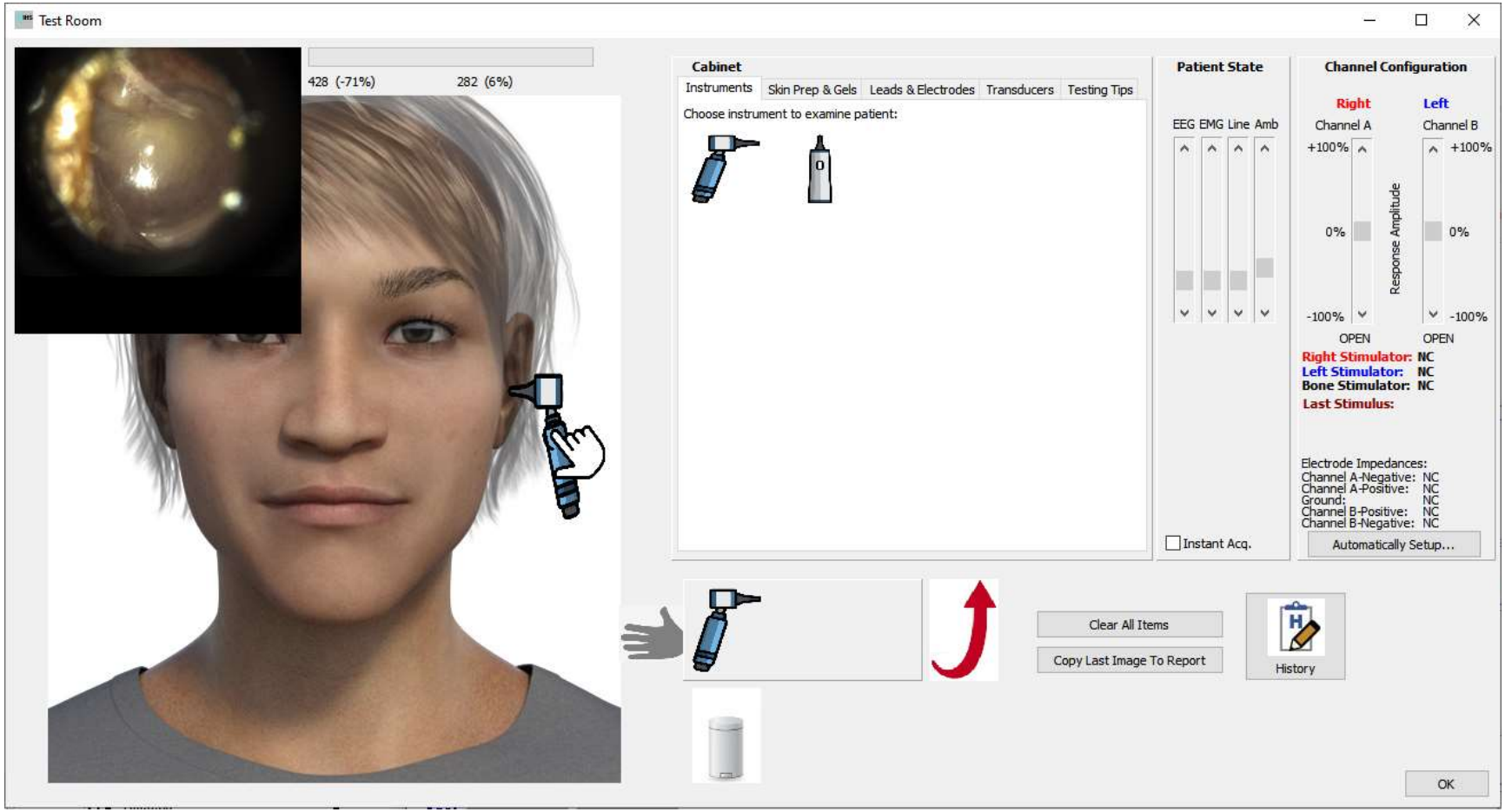
Patient Testing - Otoscopy



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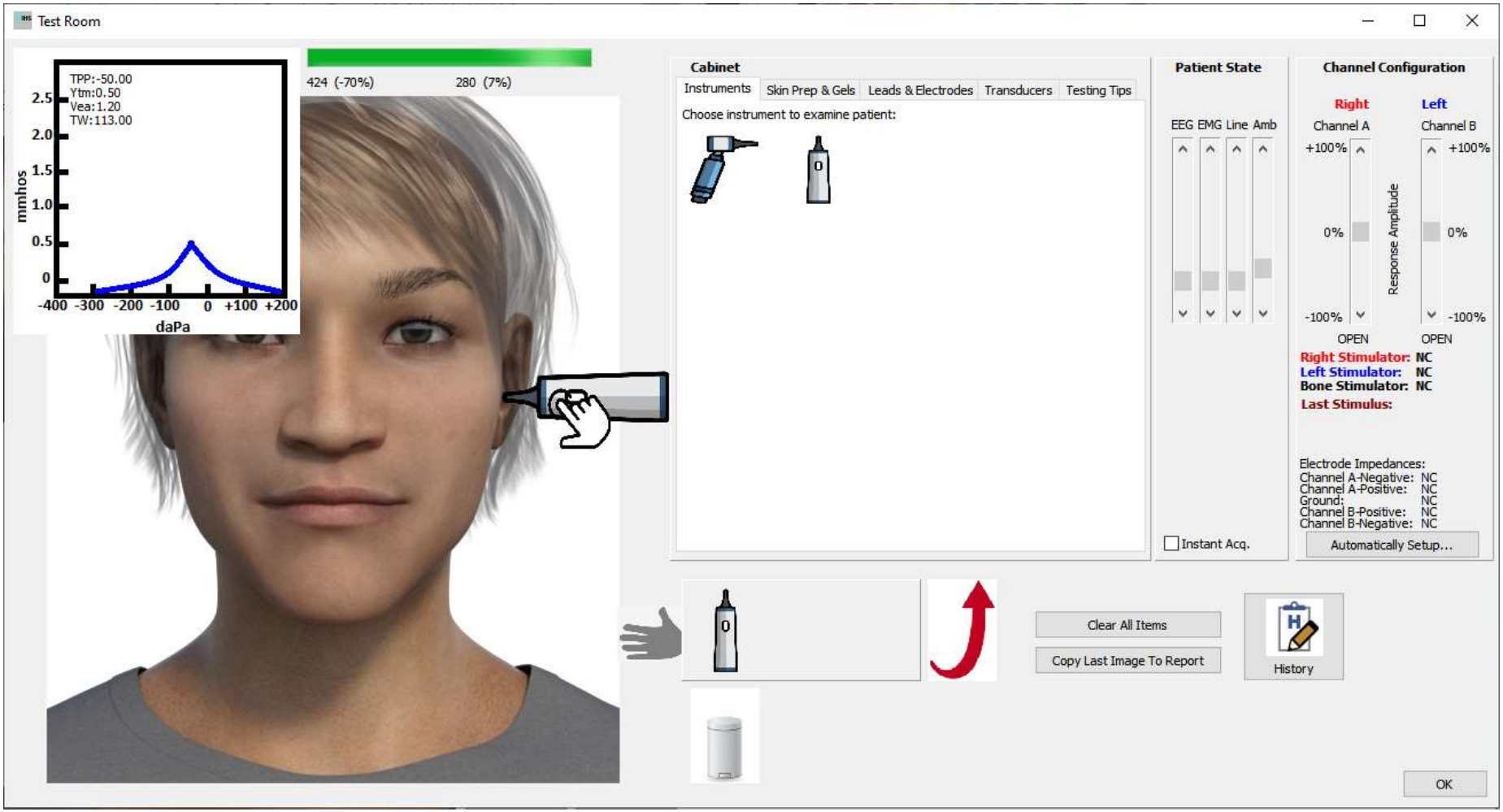
Patient Testing - Tympanometry



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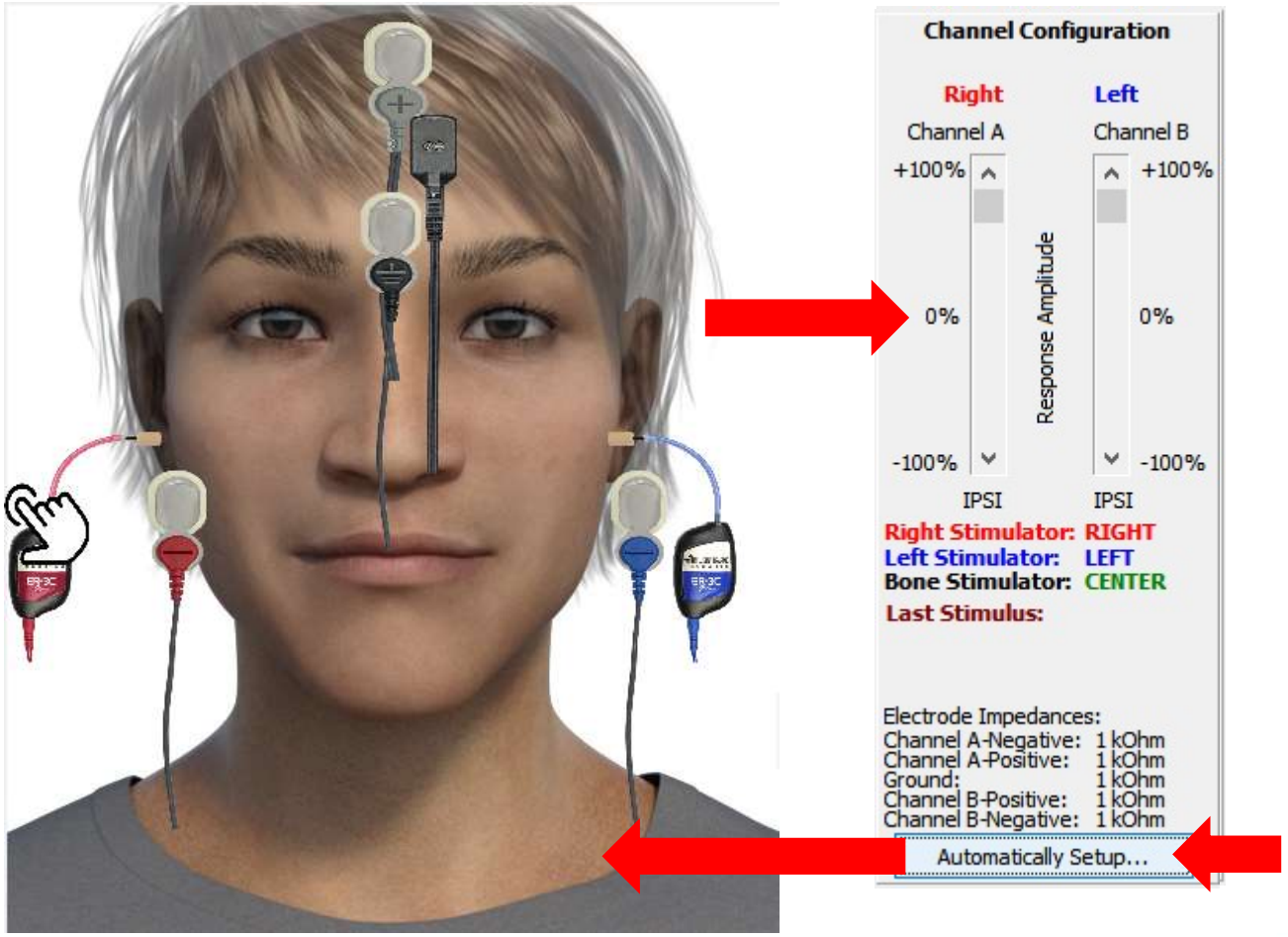
Transducer & Electrode Placement Help Pannel



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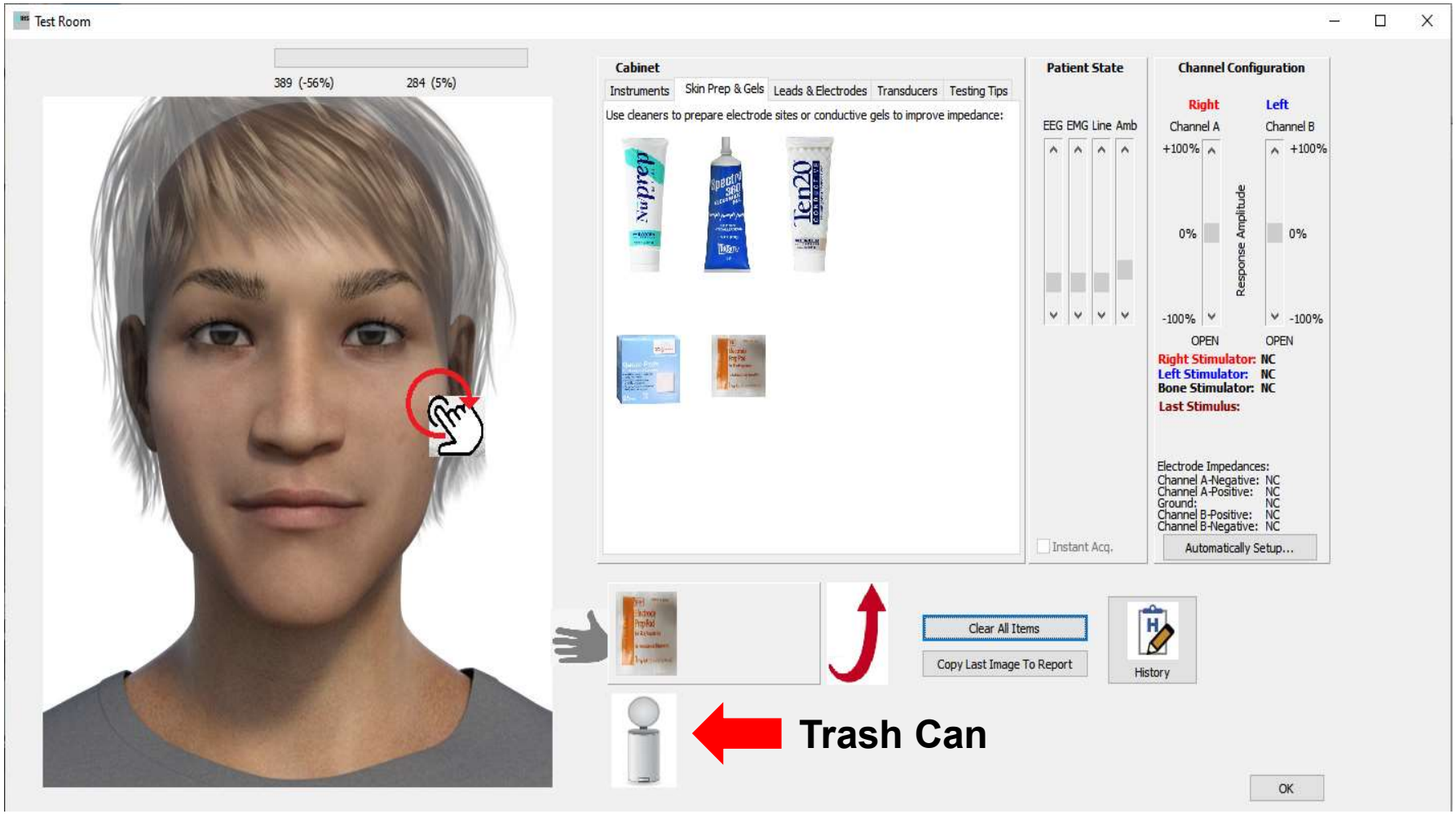
Patient Preparation – Cleaning Skin



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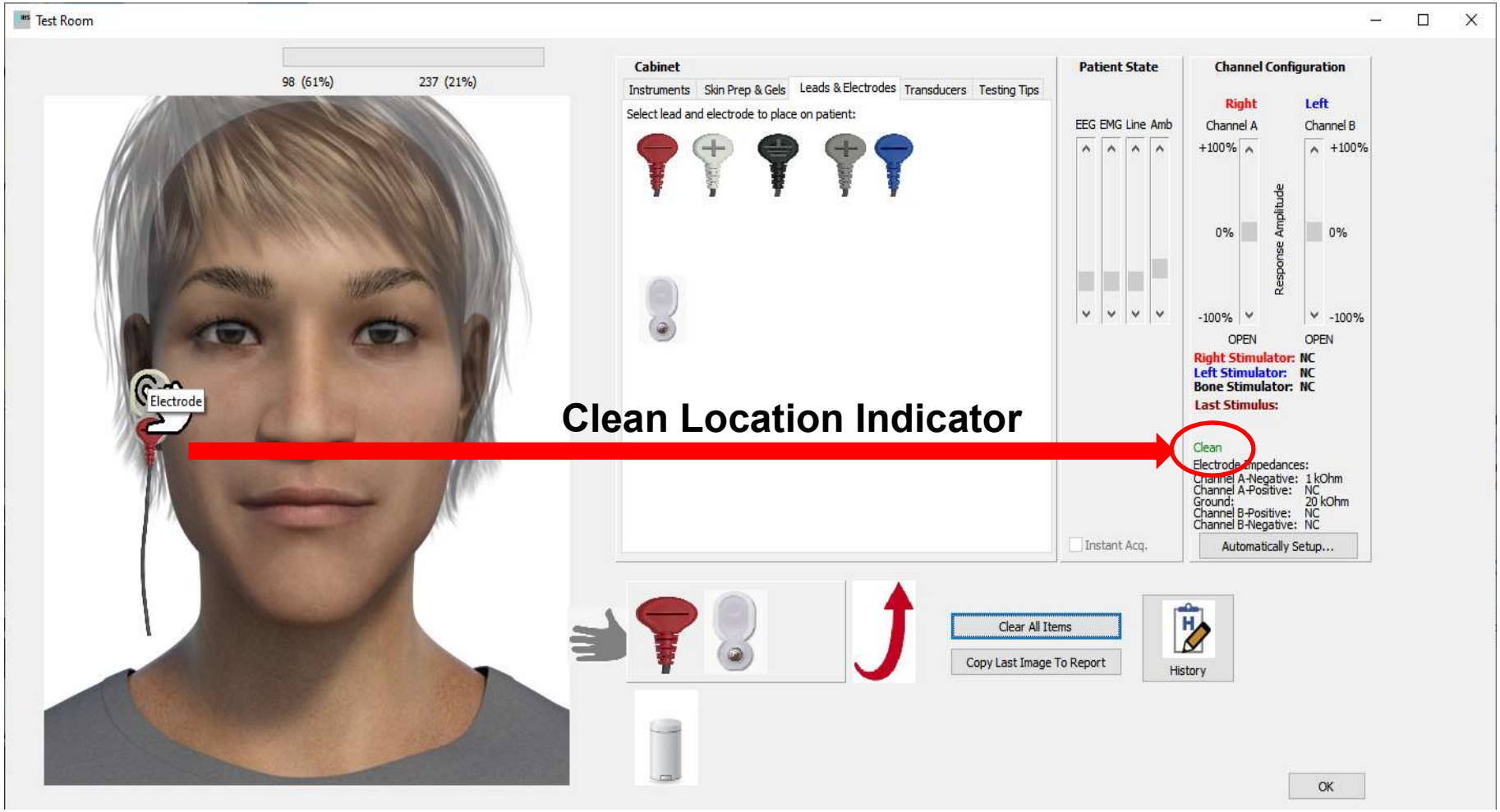
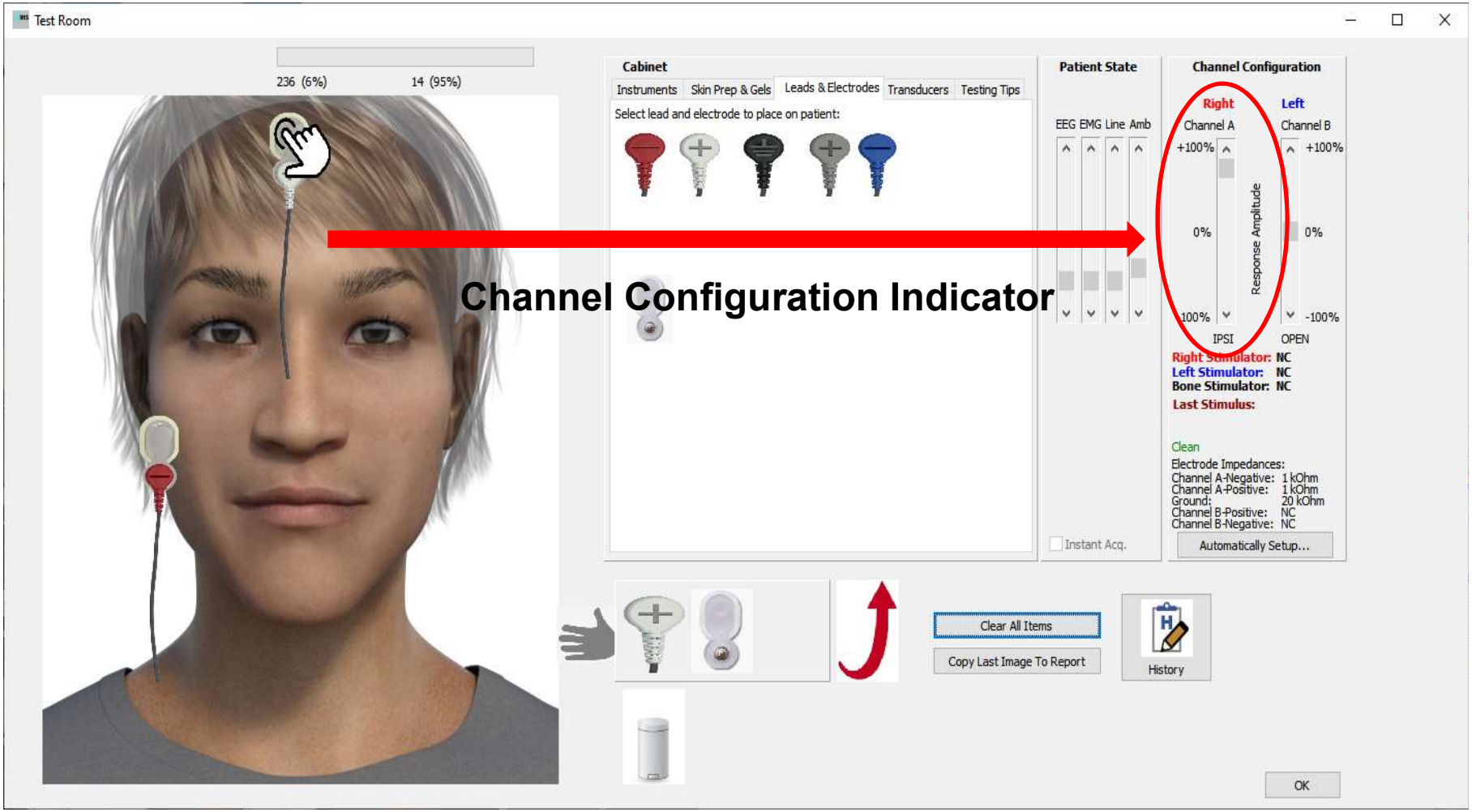
Patient Preparation
Electrode Placement



INTELLIGENT HEARING SYSTEMS

Patient Preparation
Electrode Placement



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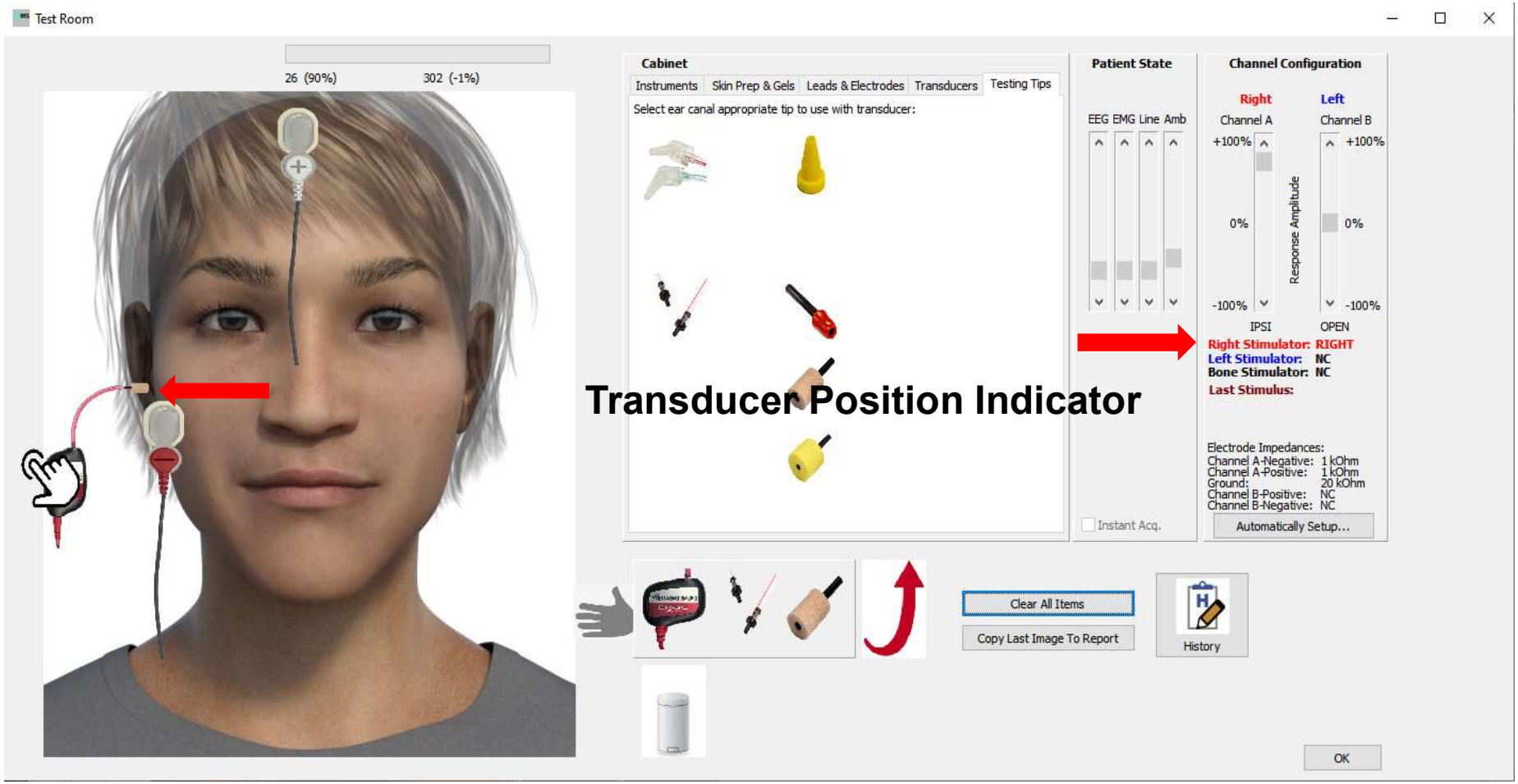
Patient Preparation
Transducer Placement



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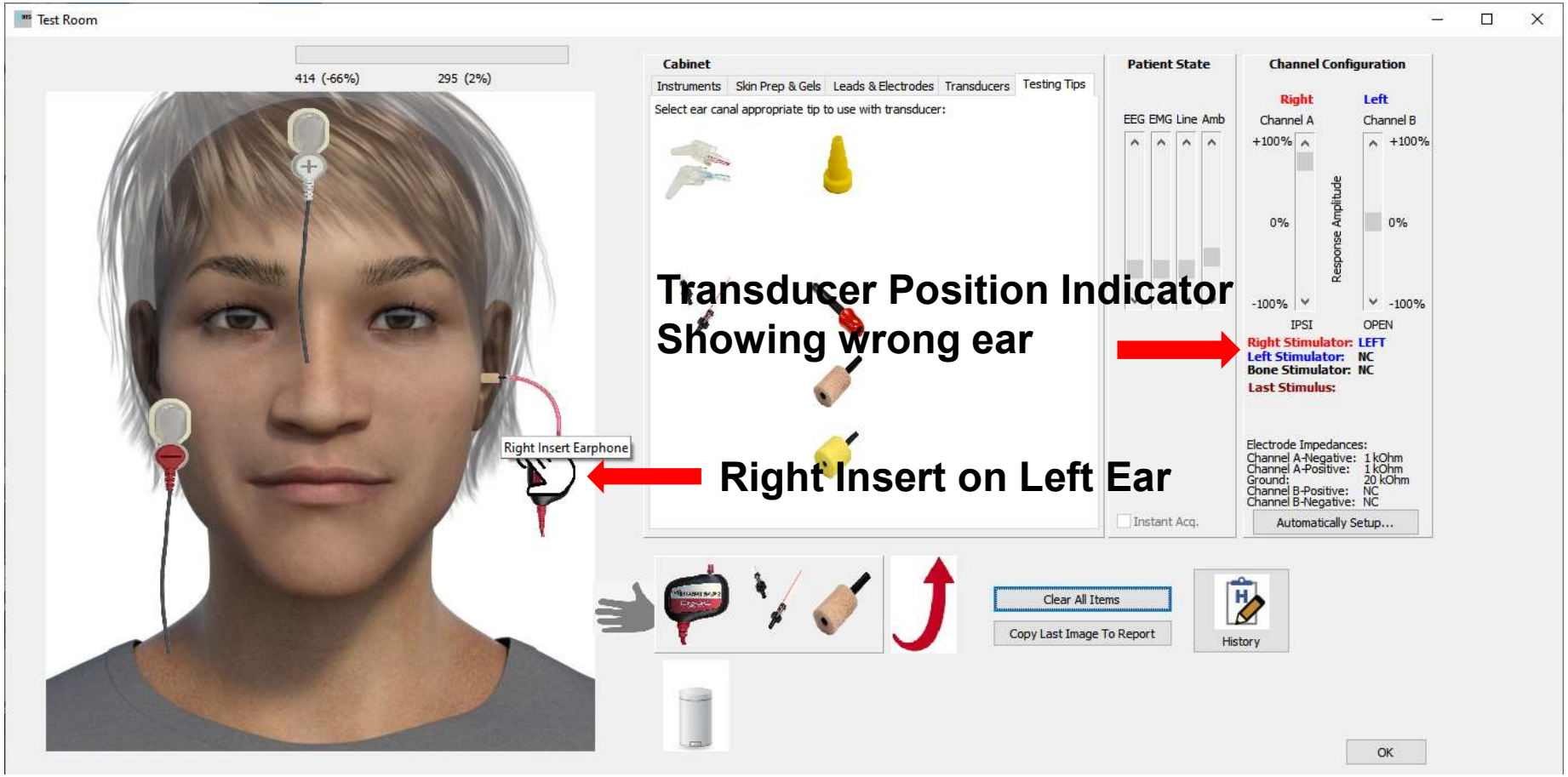
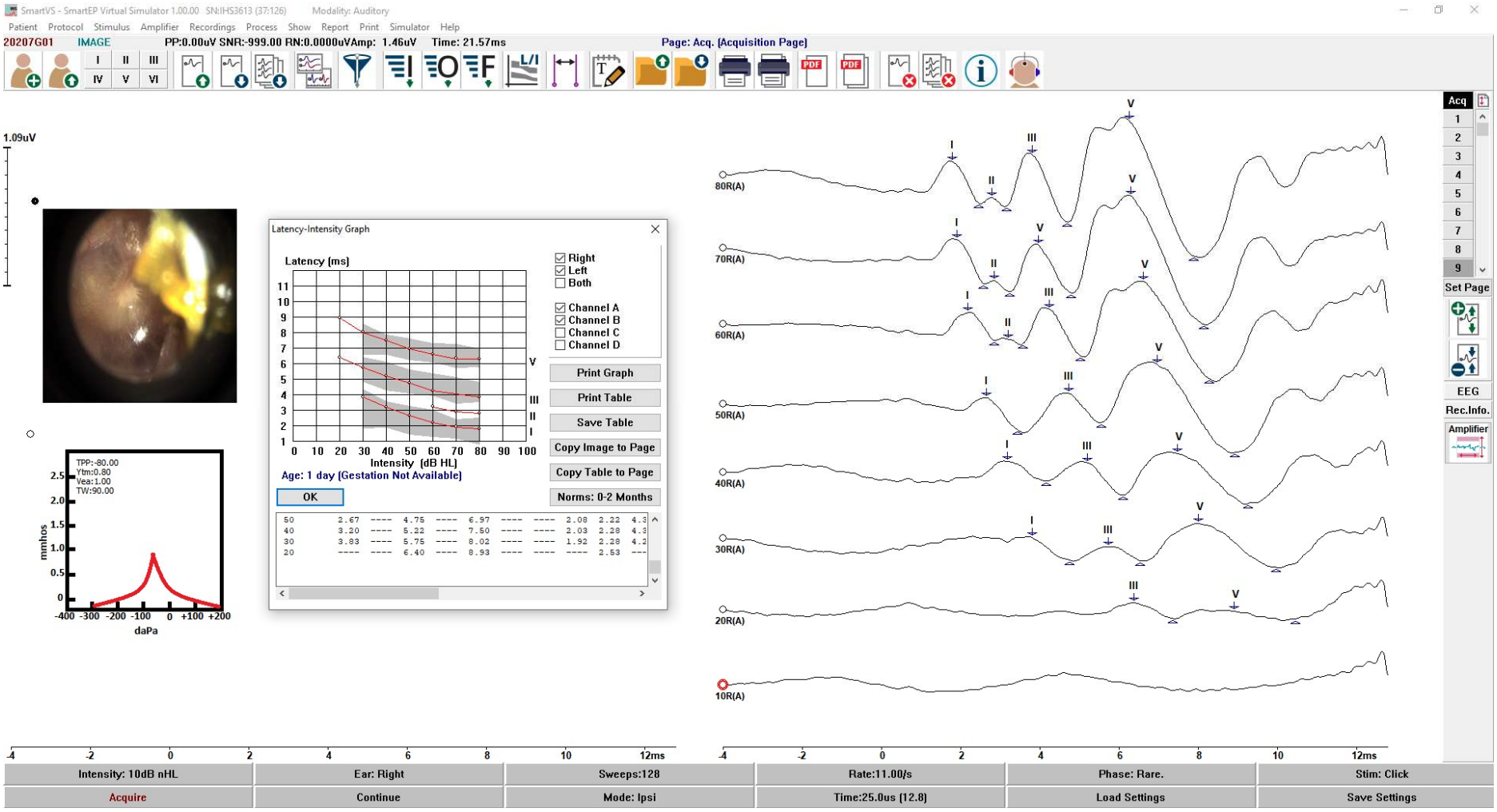
Patient Preparation
Transducer Placement Error



Recording ABR Data



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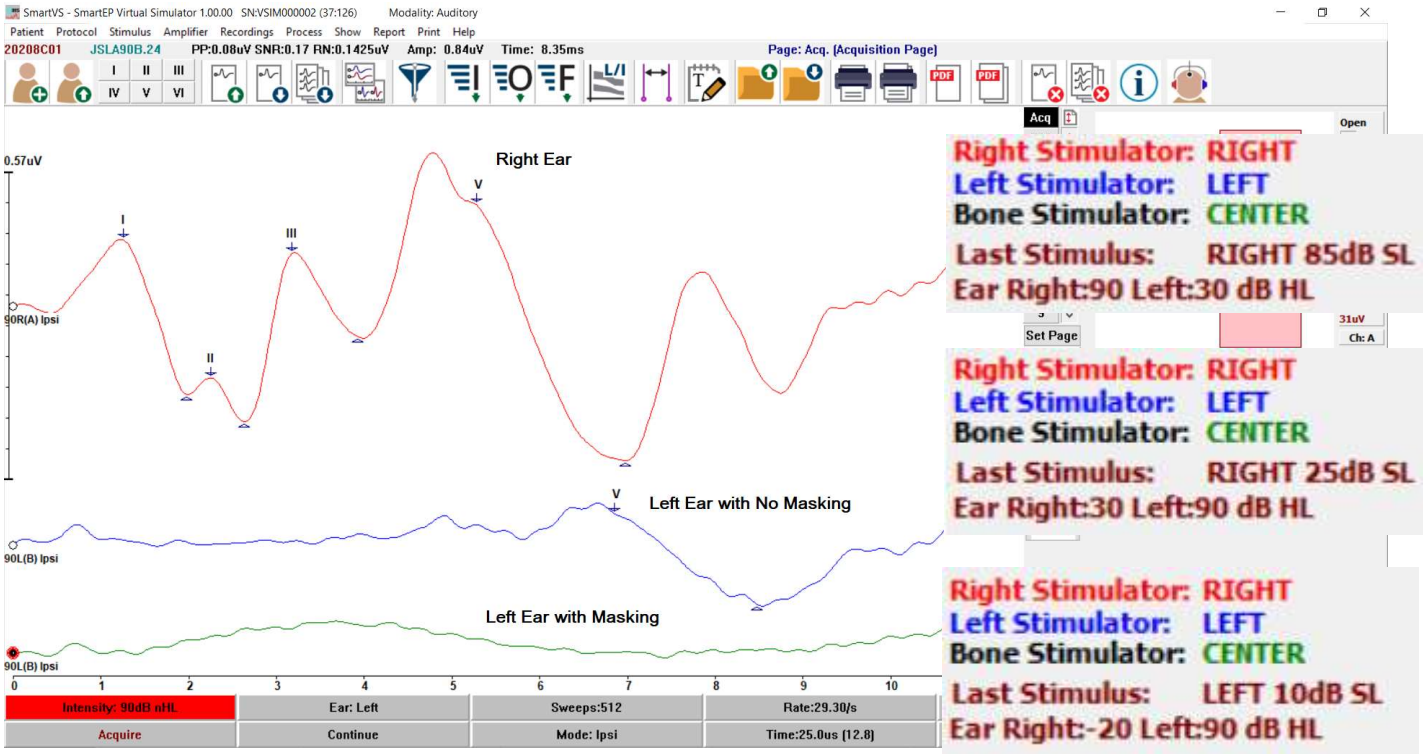
Effect of Masking



Thresholds: Right Ear 5 dB dB nHL Left Ear: 80 dB nHL

Top Recording: Right Ear 90 dB nHL stimulation showing normal response. Note 30 dB nHL stimulus reaching the left ear. Interaural attenuation of inserts is 60 dB.

Middle Recording: Left Ear 90 dB nHL stimulation showing a moderate response originating from right ear at 25 dB SL.

Bottom Recording: Left Ear 90 dB nHL stimulation with 80 dB SPL masking – no response is visible. Masking has reduced the right ear stimulation to -20 dB nHL.

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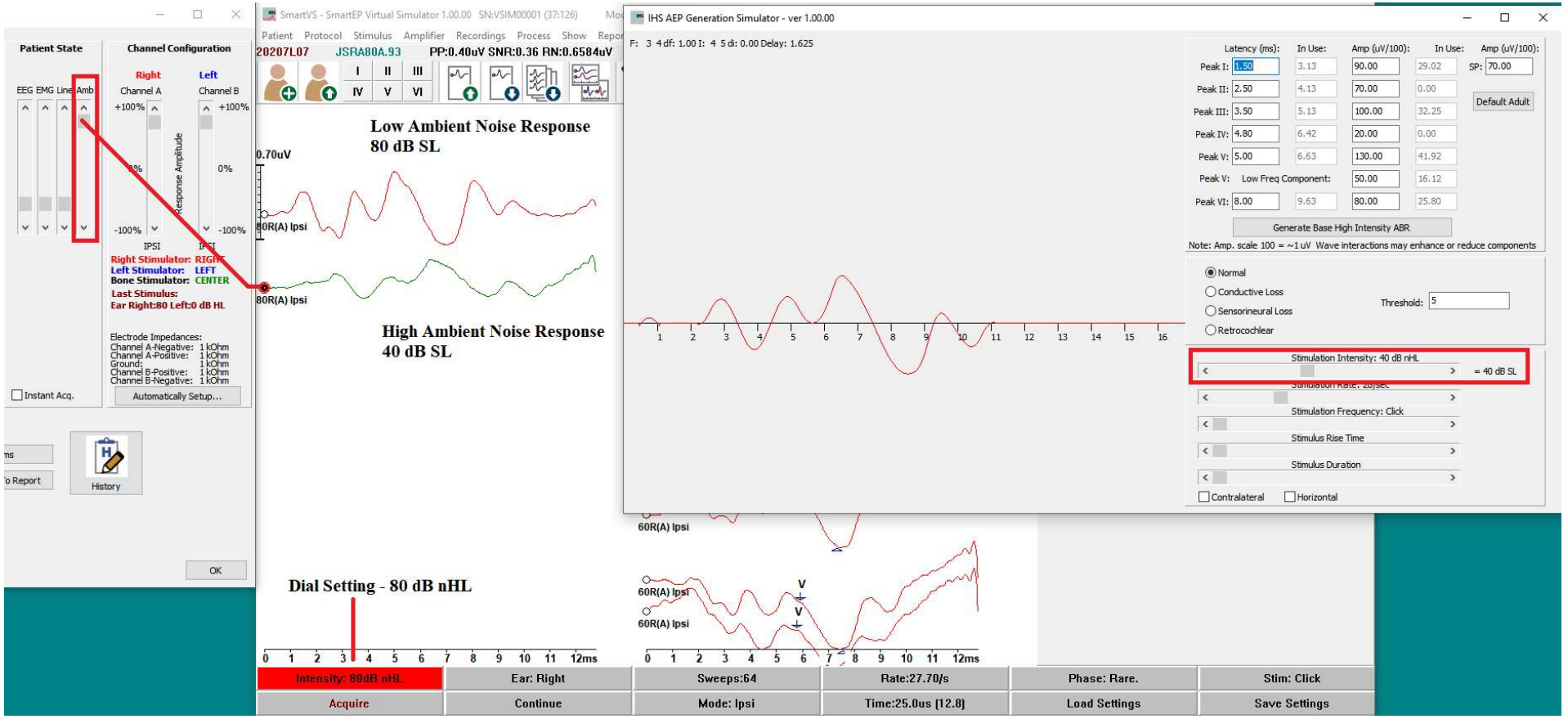
Ambient Acoustical Noise



Ambient acoustical noise (controlled from the “Amb” scroll bar in the testing room) masks the sensation level of the stimulus. In this example, the dial is set to 80 dB nHL, but the perceived sound is one 40 dB SL.

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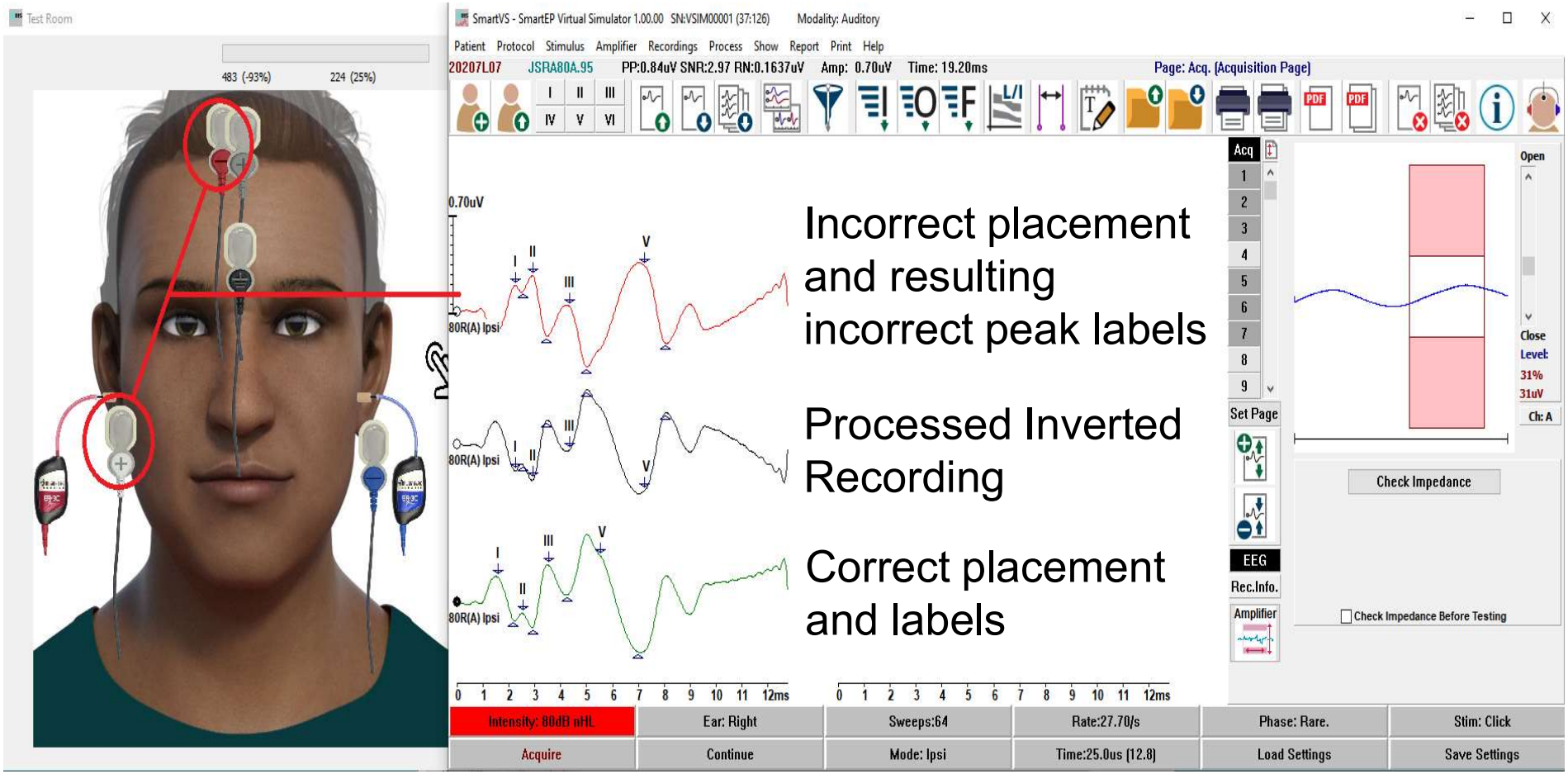
Electrode Montage Errors



Incorrect placement of positive and negative electrode results in an inverted ABR and incorrectly labeled peaks. Can be corrected by inverting the recording or fixing the electrode placement.

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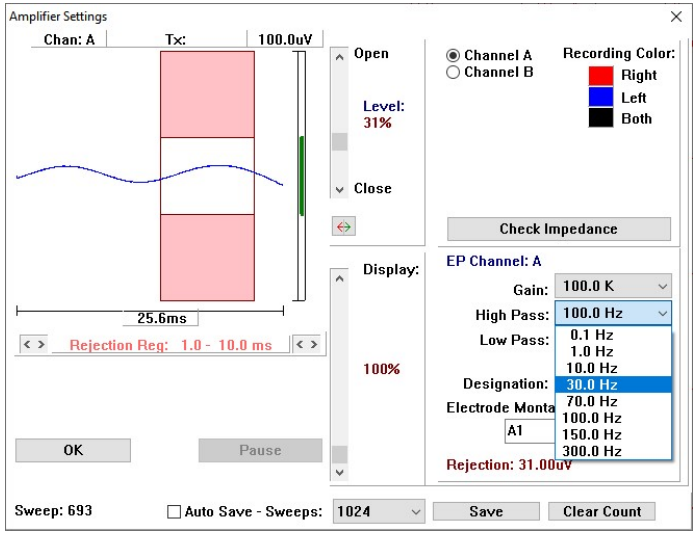
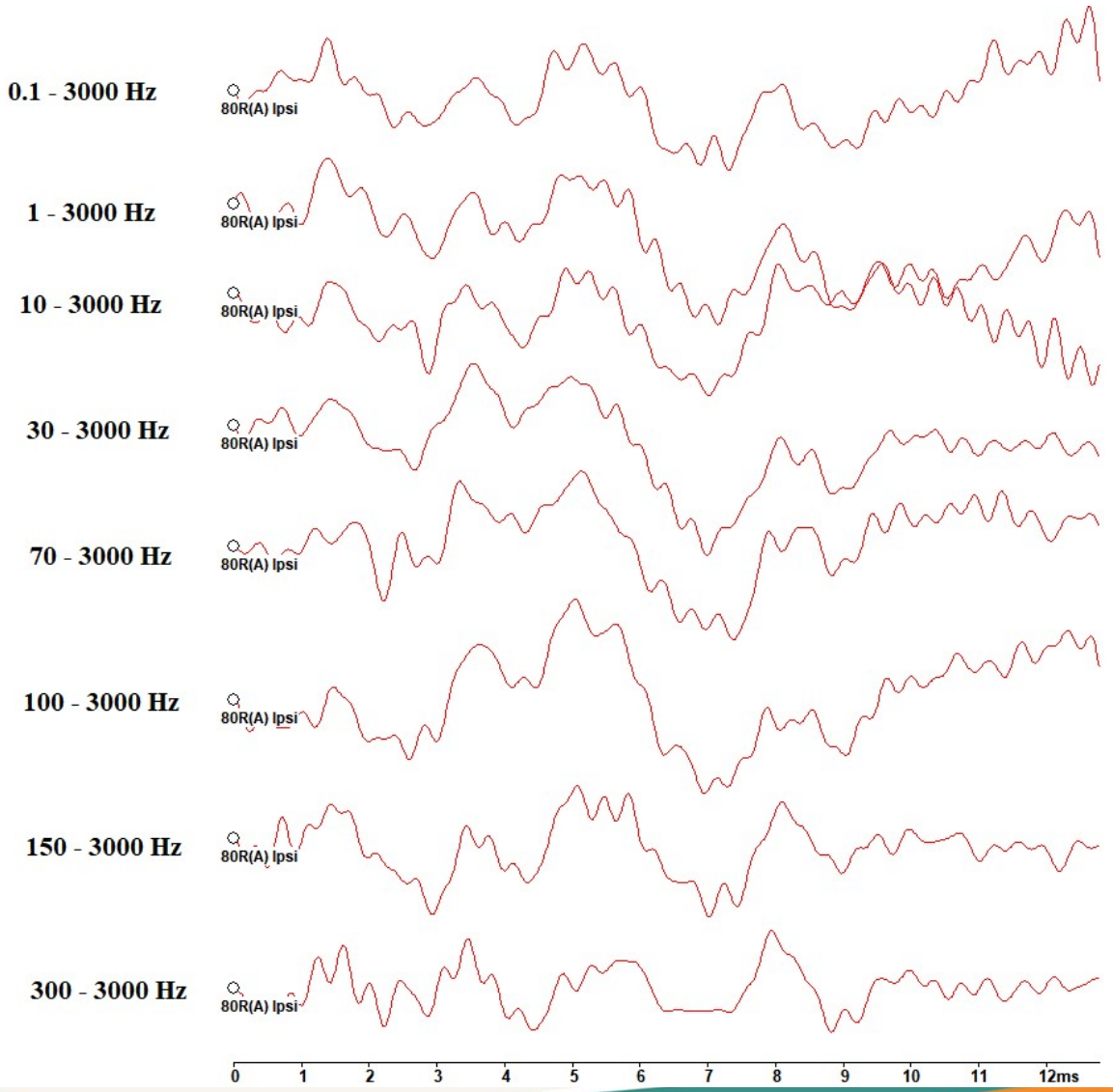
SmartEP – High Pass Filter Effect





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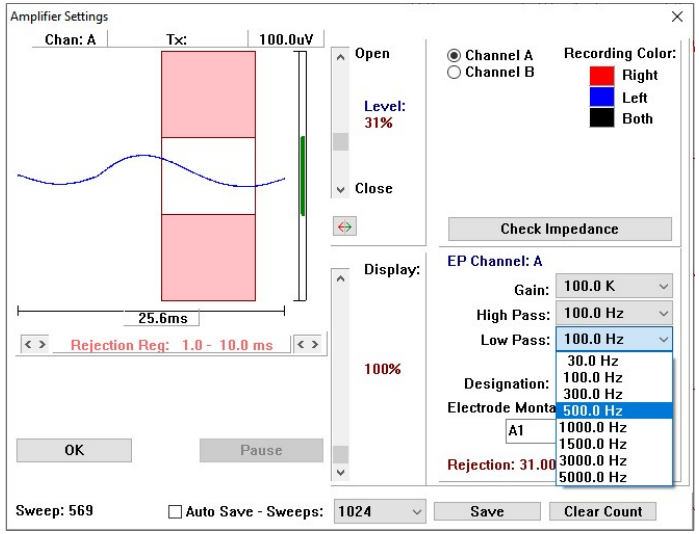
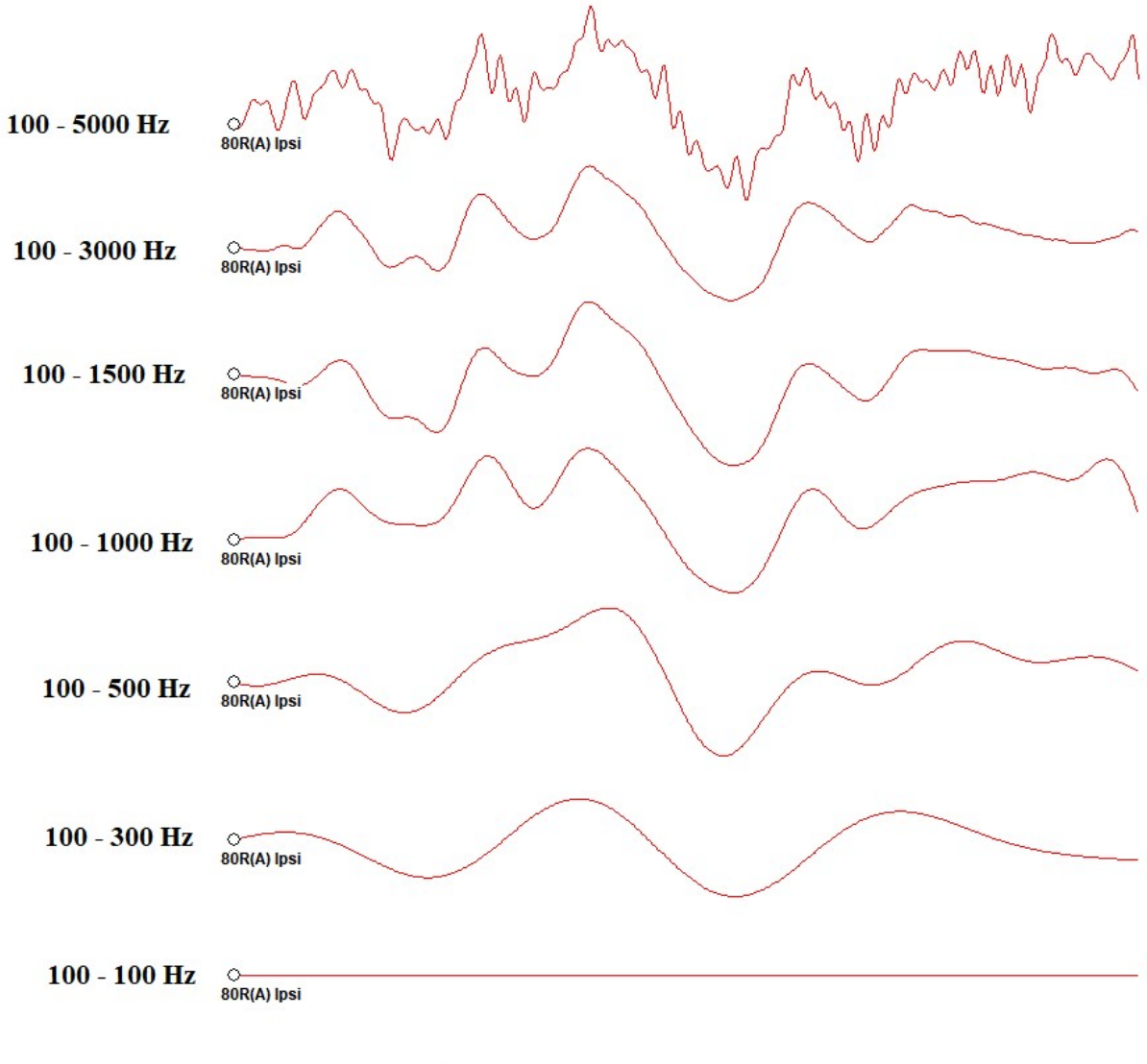
SmartEP – Low Pass Filter Effect





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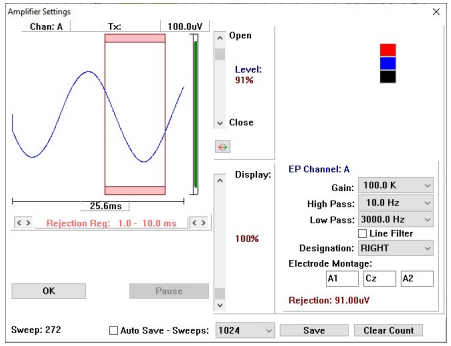
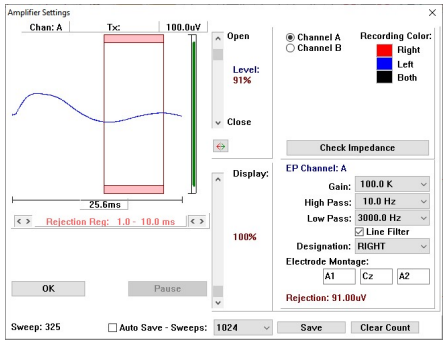
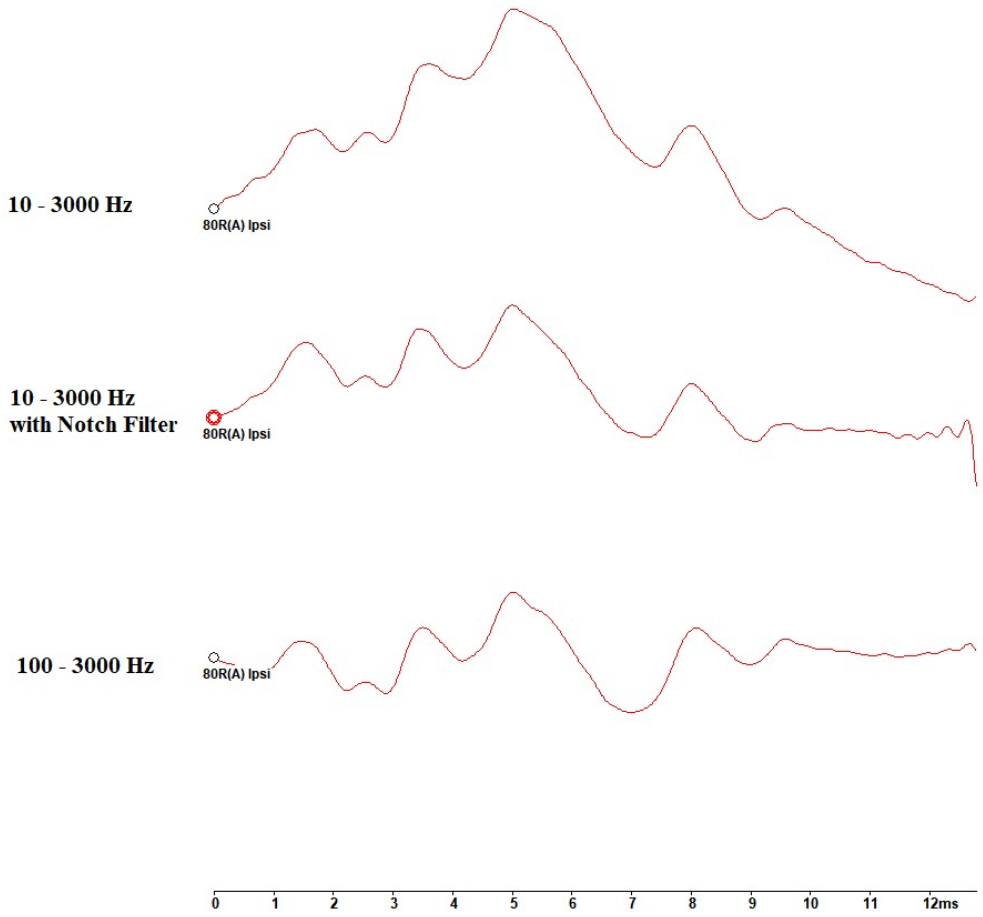
SmartEP – Line Noise & Notch Filter







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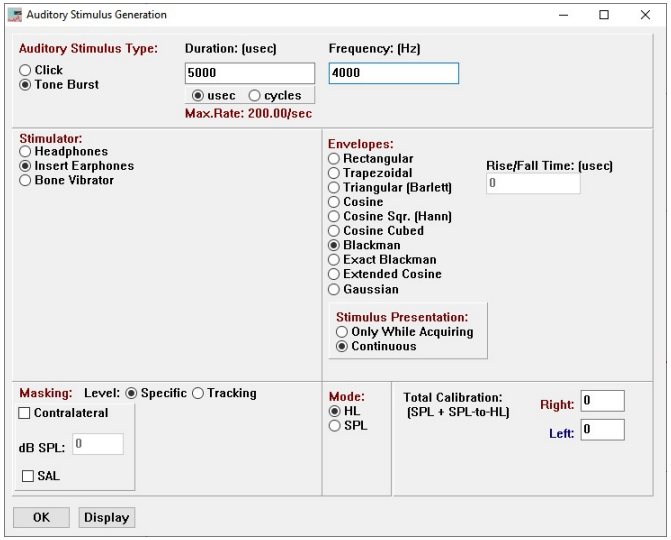
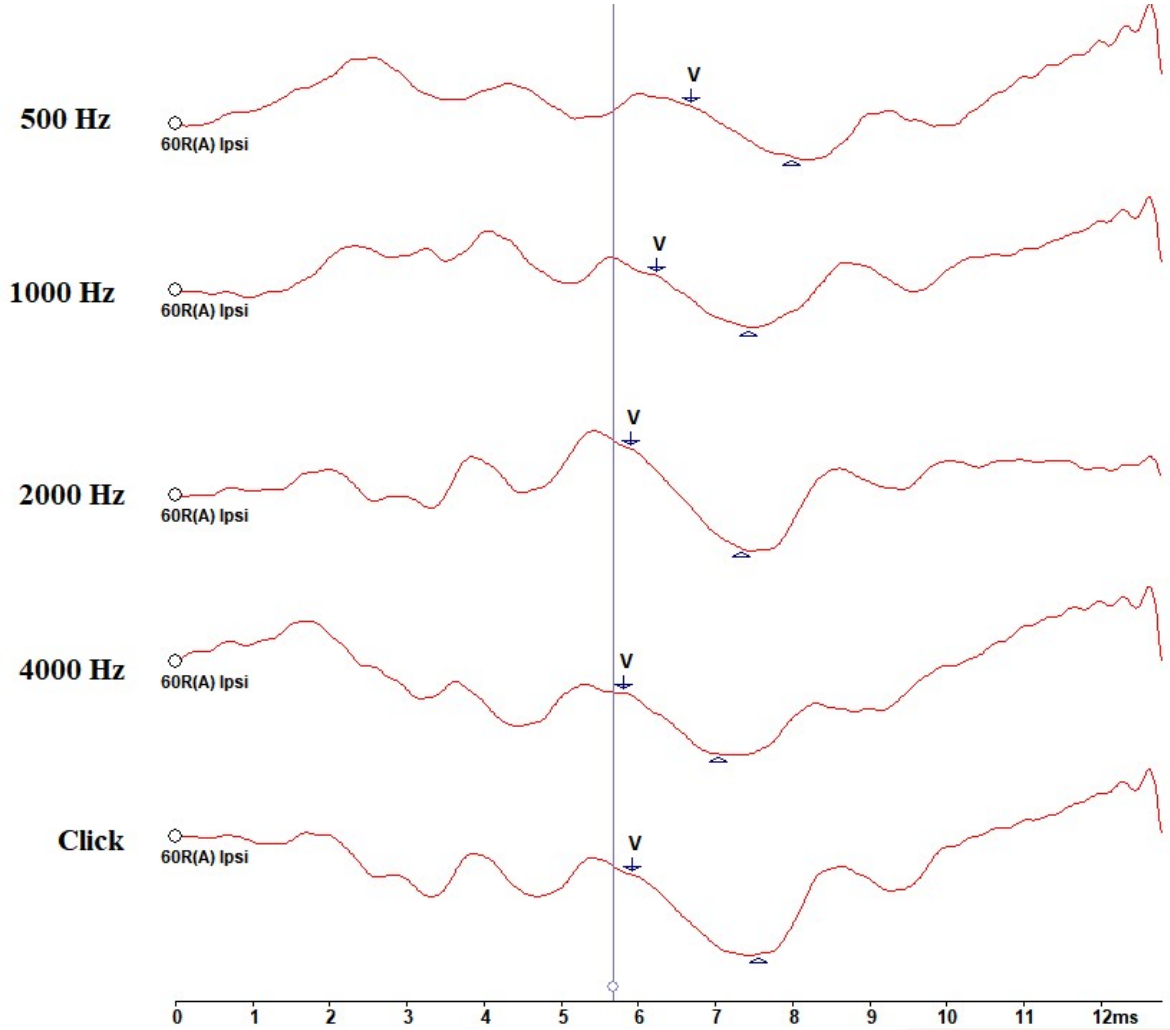
SmartEP – Stimulus Frequency





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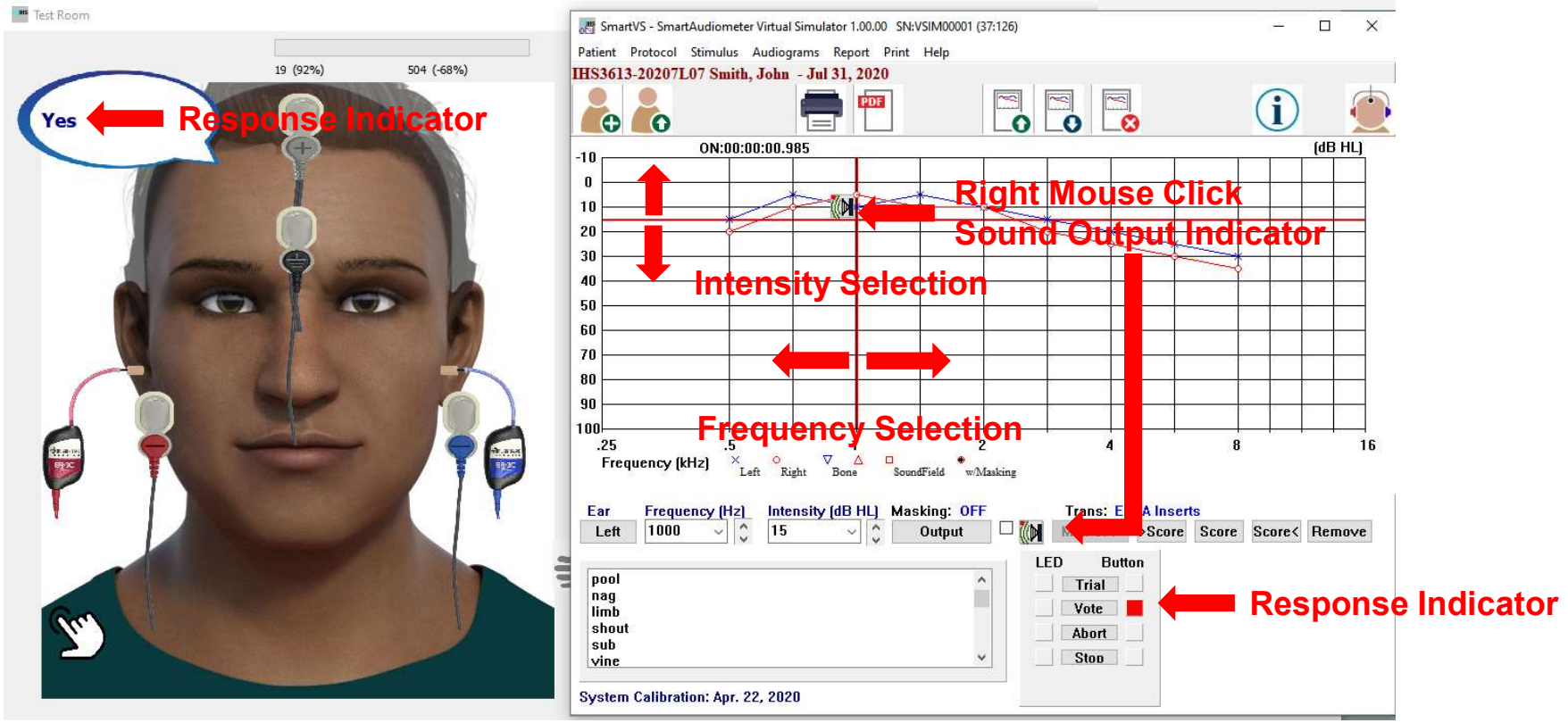
Report Generation

Reports can be generated from within SmartEP with the following features:

- Display AEP waveform and other information such latency-intensity graphs and tabular data on a multi-page format.
- Add report text and comments.
- Add images including patient picture, audiogram, tympanometry and otoscopy images.

PDF reports can be submitted for grading.

SmartAudiometer



A patient's audiogram can be generated by probing sequentially at different frequencies and intensities for each ear. The test frequency and level is selected by clicking at the corresponding location on the audiogram screen. When the right mouse button is pressed, a tone is presented to the patient. If the signal was heard, the patient will respond "yes" and press a response button.

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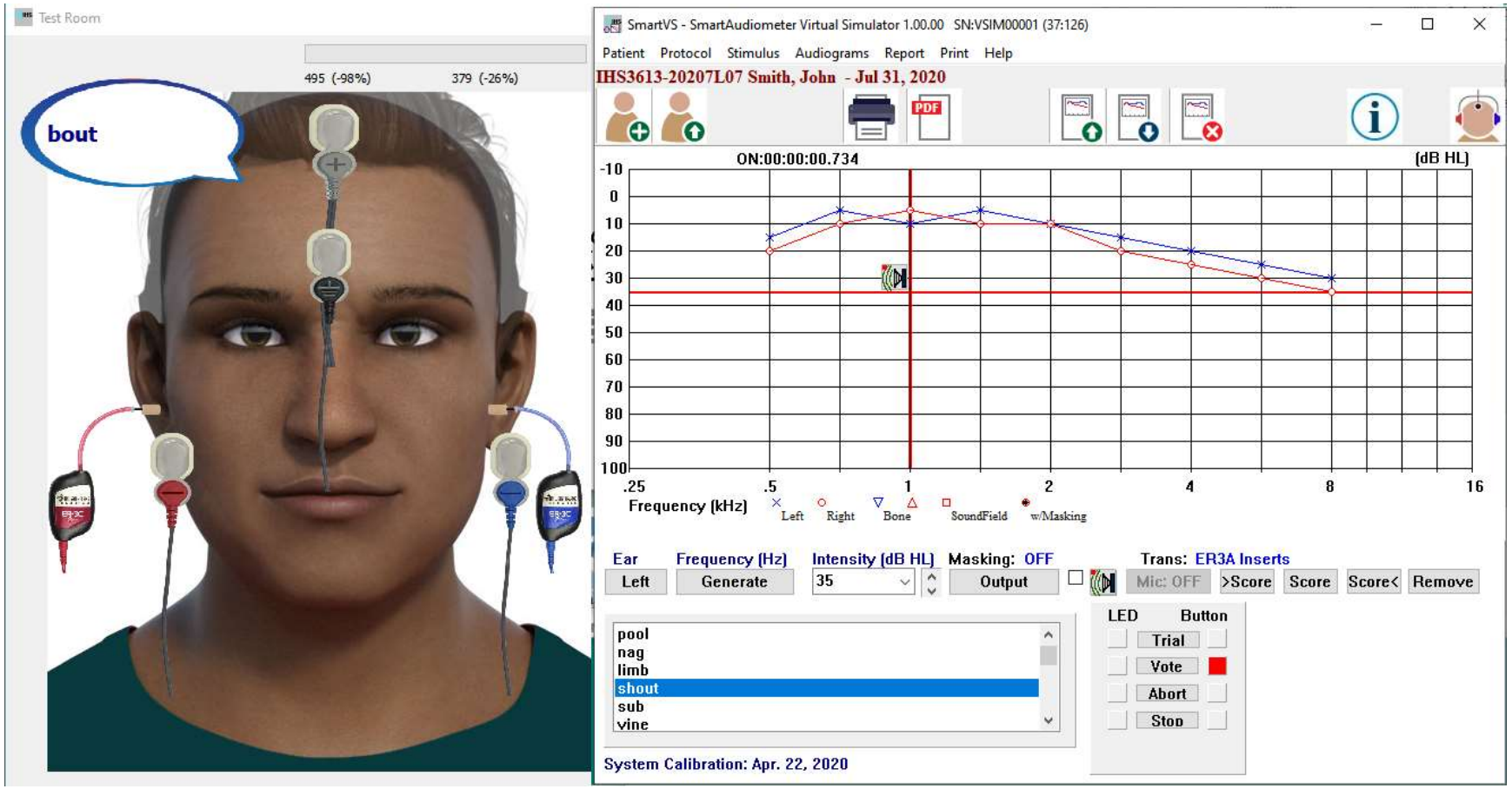
SmartAudiometer



Speech testing incorporated commonly occurring foils for each word. In this example the word presented is “shout” and the patient response “bout”.

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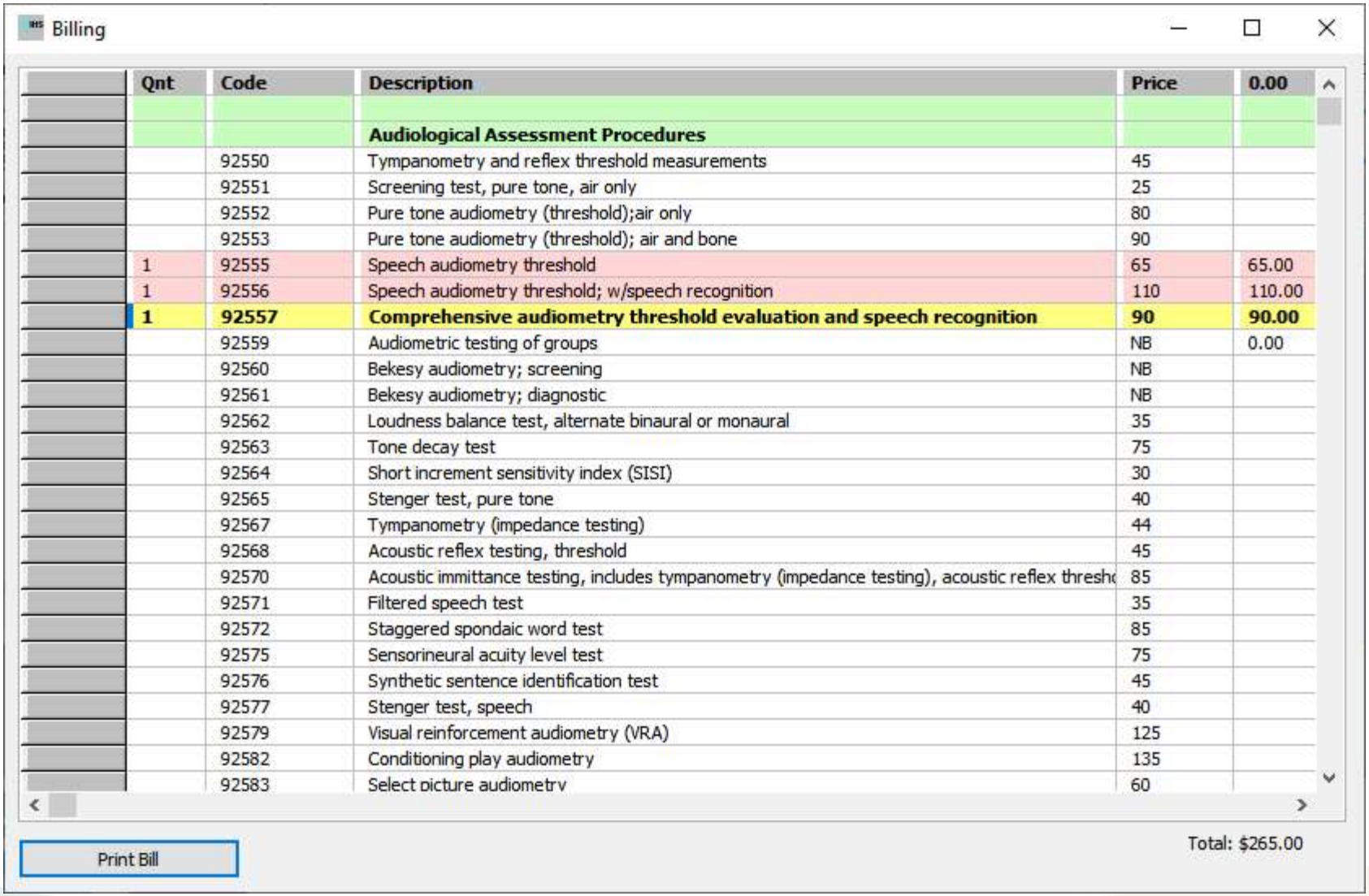
Billing



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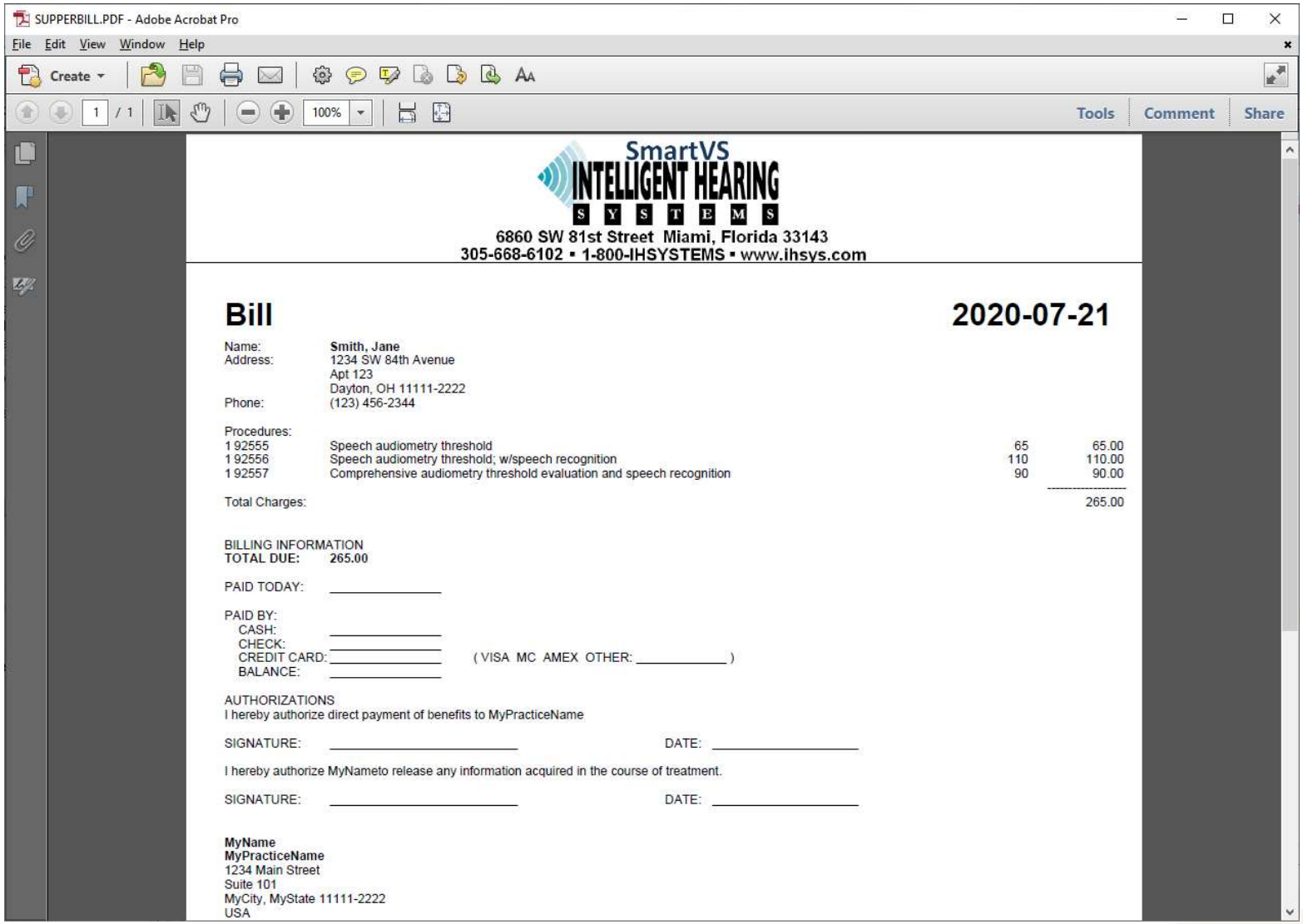
Bill PDF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SYSTEMS
6860 SW 81st Street Miami, Florida 33143
305-668-6102 ▪ 1-800-IHSYSTEMS ▪ www.ihsys.com
Bill
2020-07-21
Name: Smith, Jane
Address: 1234 SW 84th Avenue
Apt 123
Dayton, OH 11111-2222
Phone: (123) 456-2344
Procedures:
1 92555 Speech audiometry threshold 65 65.00
1 92556 Speech audiometry threshold; w/speech recognition 110 110.00
1 92557 Comprehensive audiometry threshold evaluation and speech recognition 90 90.00
Total Charges: 265.00
BILLING INFORMATION
TOTAL DUE: 265.00
PAID TODAY: _____
PAID BY:
CASH: _____
CHECK: _____
CREDIT CARD: _____ (VISA MC AMEX OTHER: _____)
BALANCE: _____
AUTHORIZATIONS
I hereby authorize direct payment of benefits to MyPracticeName
SIGNATURE: _____ DATE: _____
I hereby authorize MyNameto release any information acquired in the course of treatment.
SIGNATURE: _____ DATE: _____
MyName
MyPracticeName
1234 Main Street
Suite 101
MyCity, MyState 11111-2222
USA