SAND2011-2939C

Sandia National Laboratories

Adequate Hearing Protection?

Subject Fit Test Method used at Sandia

Brad Lackey, CIH

Sandia National Laboratories is a multi program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Elements of an Effective Hearing Conservation Program

(1) Monitoring of employee noise exposures

(2) Engineering, work practice, and administrative controls for excessive noise

(3) Hearing Protection

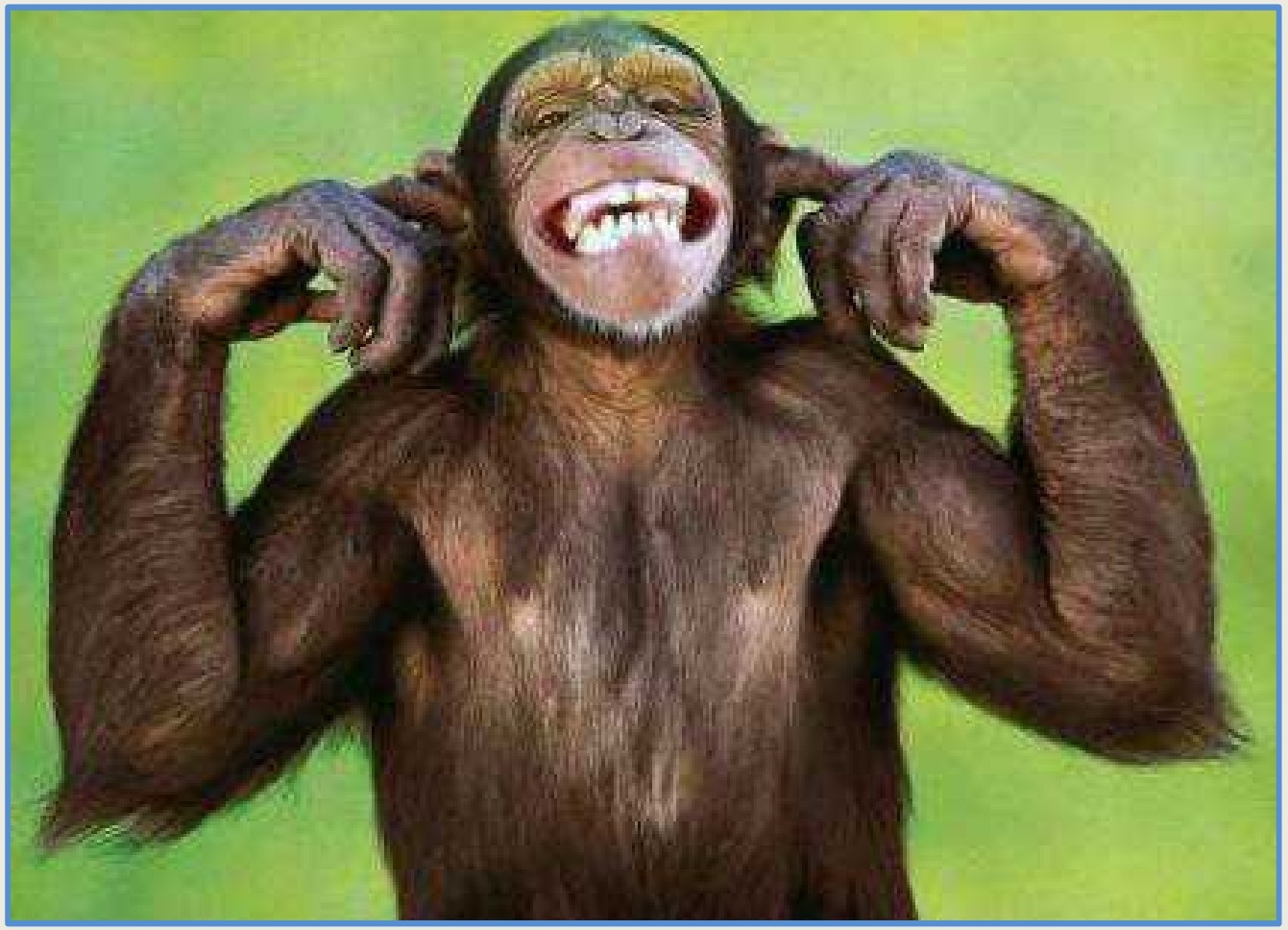
(4) Employee training and education regarding noise hazards and protection measures

(5) Baseline and annual audiometry

(6) Procedures for preventing further occupational hearing loss by an employee whenever such an event has been identified

(7) Recording Keeping

Protecting Against Extreme Noise



Hearing Protection Challenges

High Impact Noise

- Gunfire
- Explosives
- Construction

Very Loud Continuous Noise

- Emergency Generators
- Pumps, Compressors

Which Occupational Exposure Limits To Follow?

- *OSHA PELs (Gen. Ind./Const.)*
  85/90 dBA, 5 dB ER
- *ACGIH TLVs*
  85 dBA, 3dB ER
- *MIL-SPEC*
  Impulse noise

Hearing Protection Options

- **Single**

  (Not enough?)

- **Dual**

  (Too Much?)

Hearing Protection Effectiveness

*Noise Reduction Rating (NRR)

*De-Rating Options

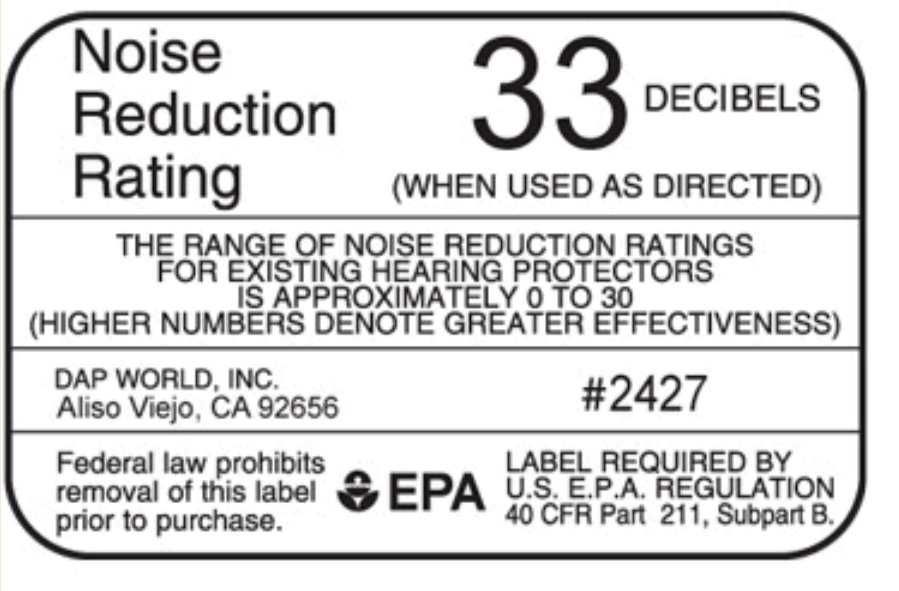
- OSHA NRR-7 vs. (NRR-7)/2
- NIOSH (NRR/2) -7

Add 5 for Dual Hearing protection

*Subject Fit-Test

Hearing Protection Rating

EPA Current



EPA Proposed

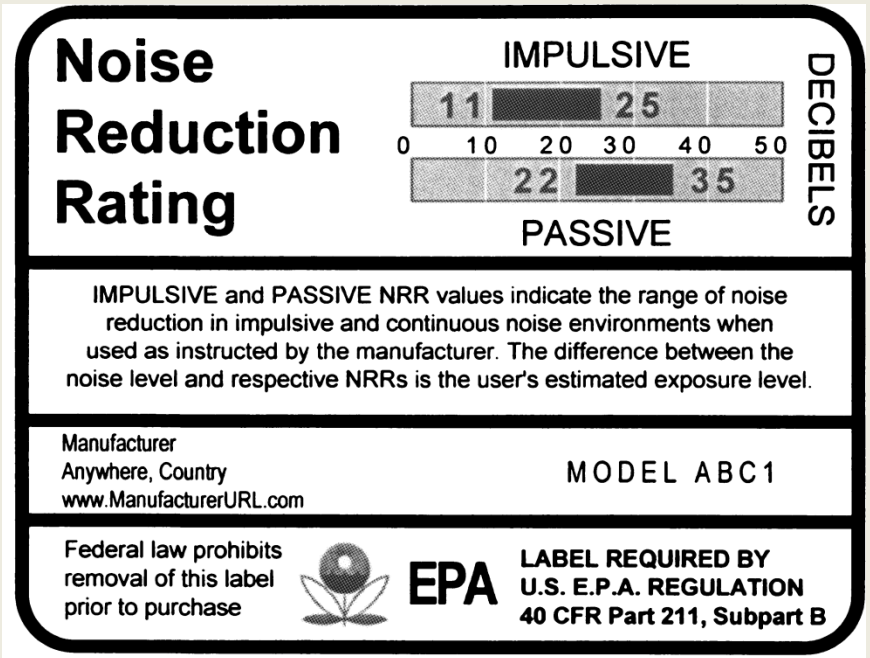


Figure 3. Primary Label for IMPULSIVE Noise Hearing Protection Devices

NRR De-Rating Examples

Earplugs		
	Adjusted NRR after Derating	
NRR of plugs	OSHA Derating	NIOSH Derating
	(NRR-7) * 0.5	(NRR *0.5) -7
30	11.5	8
Earmuffs		
	Adjusted NRR after Derating	
NRR of muffs	OSHA Derating	NIOSH Derating (muffs)
	(NRR-7) * 0.5	(NRR *0.75) -7
30	11.5	15.5
Note: NIOSH derating formula is less restrictive for earmuffs		
Earmuffs + Earplugs		
	Adjusted NRR after Derating	
NRR of best	OSHA Derating	NIOSH Derating
	(NRR-7) * 0.5 (+5)	(NRR *0.75) -7 (+5)
30	16.5	20.5
Note: Double protection adds 5 dB additional protection		

Dual Hearing Protection

Too Much Protection?

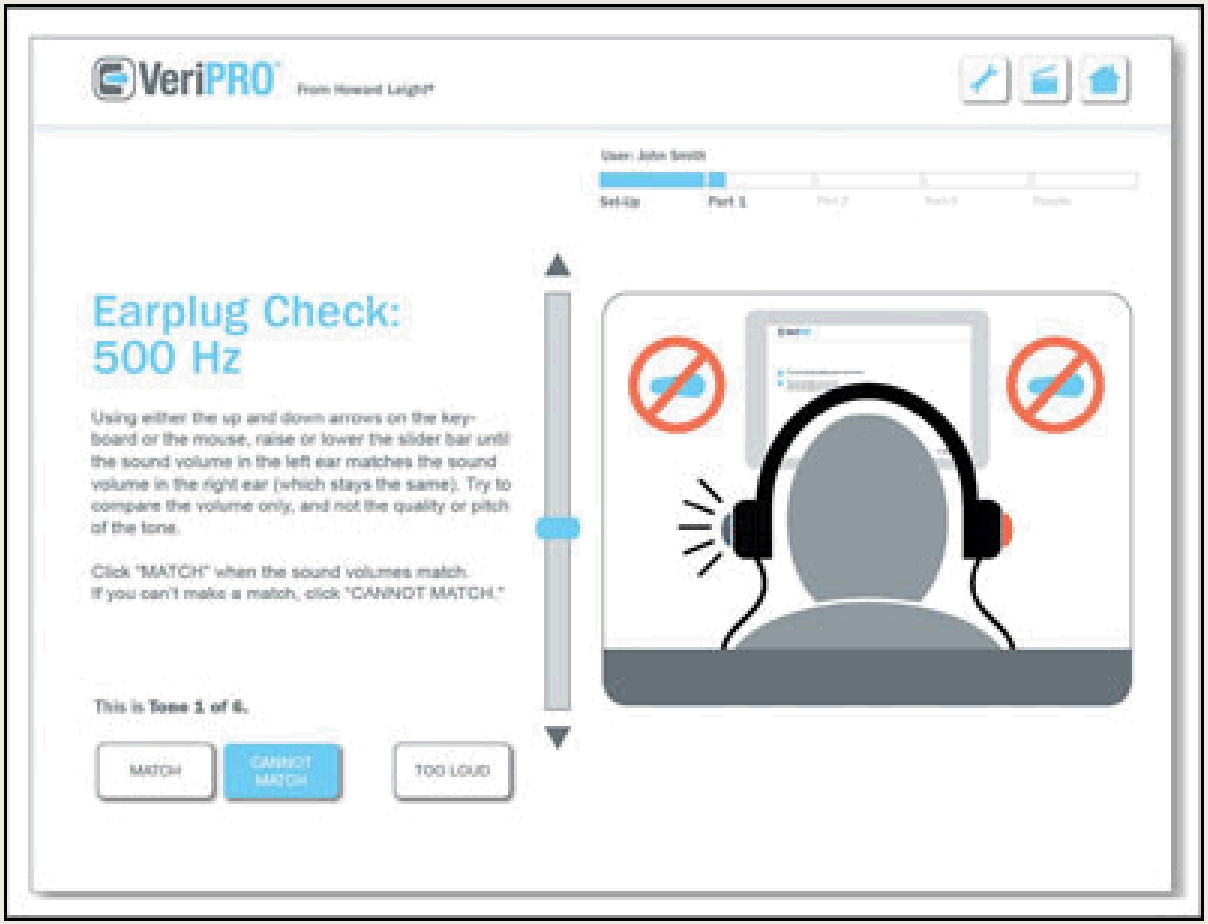
- **The Cone of Silence had some Technical Glitches**

So What to Do?

- What if you could measure how well an earplug fits each individual?
- The Subject Fit Test Method allows you to do just that.
- Sandia has purchased the VeriPro system

Subject Fit-Testing

- **VeriPro Subject Fit-Test**



Advantages of Subject Fit-Testing

- Measures Personal Attenuation Rating (PAR) for each employee. Eliminates confusion
- Gives real-world attenuation for any earplug
- No special sound booth needed
- May provide higher NRR than de-rating formulae
- Can identify over/underprotected employees
- Can identify improper use/fit of earplugs
- Documents training and results
- Provides personalized report

Disadvantages of Subject Fit-Testing

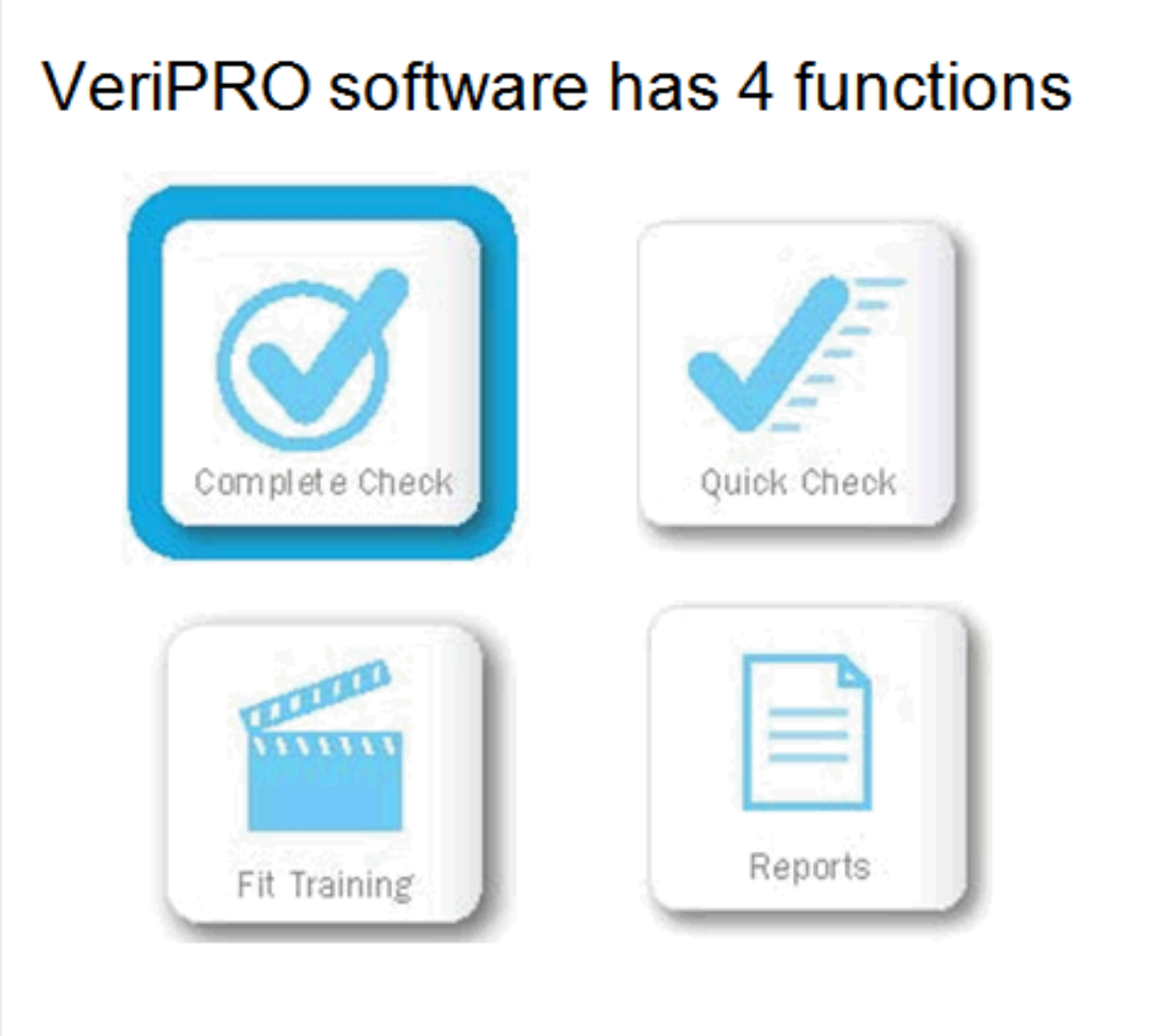
- Learning curve for Administrator
- Requires approximately 30 min. per Subject
- Subject/Computer interface difficulties
- Earplug fit challenges
- Subject with existing hearing loss may have difficulty achieving fit-test

The VeriPro System

All VeriPRO systems include:

- **CD** with software
- **Audiometrically Balanced Headphones**
- **Audio Processor**
- **Replacement Ear Cushions** – *1 pair*
- **USB Cable** - *connects Audio Processor to your computer*
- **Sample Container** – with assortment of Howard Leight earplugs
- **Quick Reference Guide** - *provides an overview of VeriPRO function, step-by-step instructions and basic troubleshooting*
- **Carrying Case**

VeriPro Software Functionality



Complete Check

FUNCTIONALITY

- Tests 5 frequencies in each ear (250, 500, 1000, 2000, 4000 Hz)
- Recommended first test for new VeriPRO users
- Includes reliability check to ensure user is providing valid results
- Includes minimum attenuation warning if earplug is not providing adequate attenuation
- Takes 8-10 minutes per test for novice users

SPECIFICATIONS

- Higher degree of accuracy
- Longer time to take test for novice users

WHEN TO USE

- Annual hearing protection fit training, per OSHA
- Upon hire of new employees
- Employees who utilize dual protection - this may validate or eliminate their need to use both earplugs and earmuffs
- Employees who experience an STS during annual audiogram
- Use during earplug evaluation and selection trials - helps safety manager identify earplugs that gain employee acceptance and wear, as well as identifies protection that matches noise environments

Quick Check

FUNCTIONALITY

- Test 1 critical frequency in each ear (500 Hz)
- Ideal for employees with moderate-to-severe hearing loss who cannot hear high frequencies
- Ideal for periodic employee testing
- Takes 2-3 minutes per test

SPECIFICATIONS

- Lower degree of accuracy
- Shorter test time

WHEN TO USE

- Employees with Standard Threshold Shift (STS) in hearing or documented hearing loss
- Periodic safety checks
- Training reinforcement throughout the year

Reports

FUNCTIONALITY

- Allows safety managers to pull employee reports
- Can view current VeriPRO test, as well as employee's historical results
- View on screen or print/save as PDF

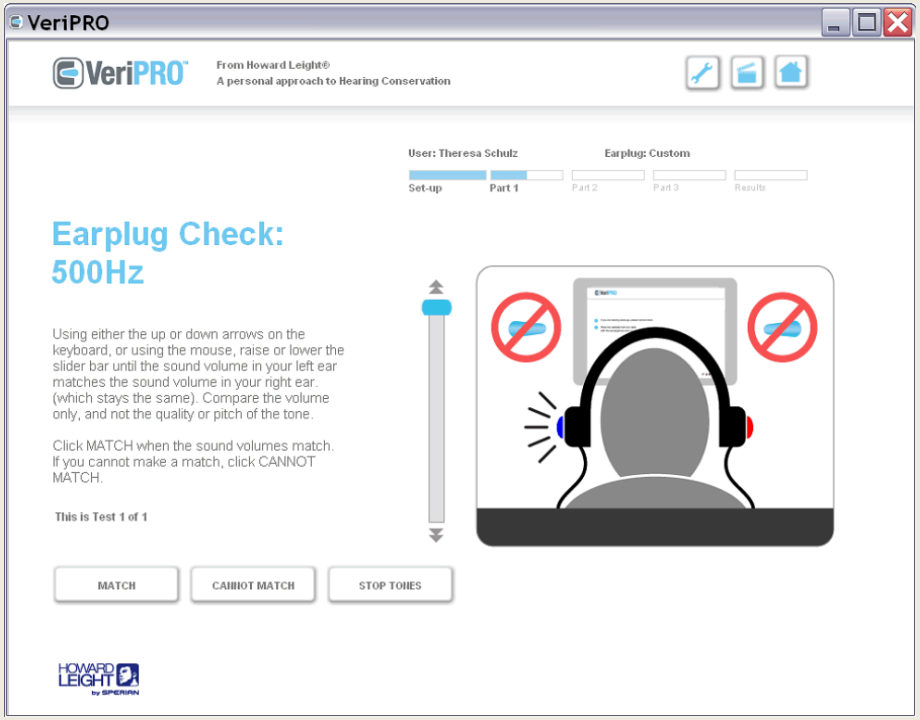
Fit Training

FUNCTIONALITY

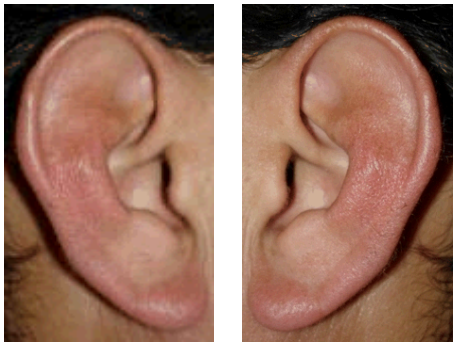
- Training videos with text that demonstrates proper earplug insertion
- Includes all available Howard Leight earplugs
- Can be used as a stand-alone training aid for employees throughout the year

The Test Sequence

1. For each test, you will don the Headphones (red for right, blue for left)
2. You will hear a pulsing tone in the **RIGHT EAR AT A CONSTANT VOLUME**
3. You will hear an alternately pulsing tone in your **LEFT EAR AT A LOWER VOLUME**
4. Using either your computer mouse or up/down arrows on your keyboard, *raise or lower the volume in the left ear to match the volume in the right ear*
5. You are **MATCHING THE VOLUME** only - *not the quality or pitch of the tone*. In fact, the pitch in one ear may sound different than the other, and that is ok.



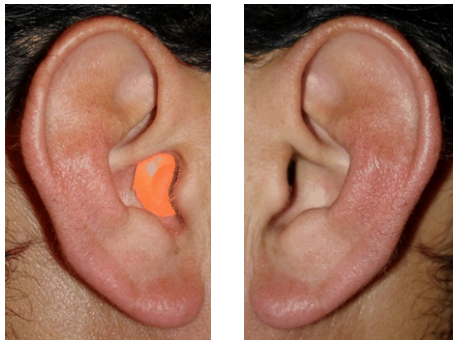
Test Parts



Part 1

Both Ears Unoccluded

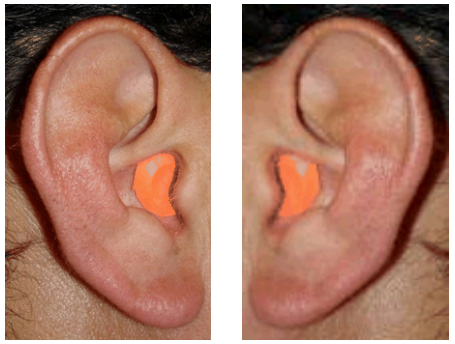
- Sets baseline level for each ear
- Measures any asymmetry between ears



Part 2

Right Ear Occluded

- Right ear attenuation measured



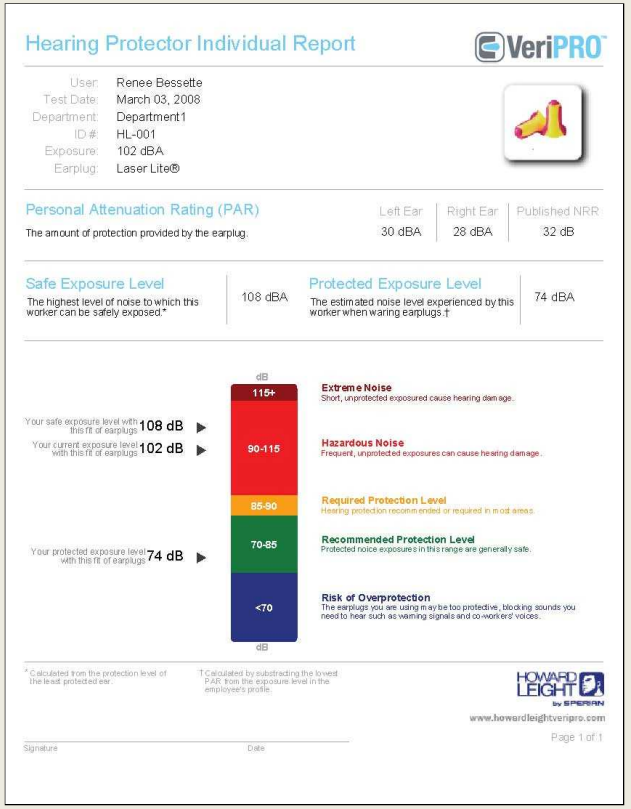
Part 3

Both Ears Occluded

- Left ear attenuation measured

Your Results

- Personal Attenuation Rating (PAR)
- Safe Exposure Level (SEL)
- Protected Exposure Level (PEL)



Hearing Protector Individual Report

VeriPRO

User: Renee Bessette
Test Date: March 03, 2008
Department: Department1
ID #: HL-001
Exposure: 102 dBA
Earplug: Laser Lite®

Personal Attenuation Rating (PAR)
The amount of protection provided by the earplug.

Left Ear	Right Ear	Published NRR
30 dBA	28 dBA	32 dB

Safe Exposure Level
The highest level of noise to which this worker can be safely exposed.*
108 dBA

Protected Exposure Level
The estimated noise level experienced by this worker when waring earplugs.†
74 dBA

Your safe exposure level with this fit of earplugs 108 dB
Your current exposure level with this fit of earplugs 102 dB
Your protected exposure level with this fit of earplugs 74 dB

dB
115+
90-115
85-90
70-85
<70
dB

Extreme Noise
Short, unprotected exposured cause hearing damage.

Hazardous Noise
Frequent, unprotected exposures can cause hearing damage.

Required Protection Level
Hearing protection recommended or required in most areas.

Recommended Protection Level
Protected noice exposures in this range are generally safe.

Risk of Overprotection
The earplugs you are using may be too protective, blocking sounds you need to hear such as warning signals and co-workers' voices.

* Calculated from the protection level of the least protected ear.

† Calculated by substracting the lowest PAR from the exposure level in the employee's profile.

HOWARD LEIGHT by SPERIAN
www.howardleightveripro.com
Page 1 of 1

Signature Date

Sandia National Laboratories

Protected Exposure Level

Safe Exposure Level		Protected Exposure Level	
The highest level of noise to which this worker can be safely exposed.*	108 dBA	The estimated noise level experienced by this worker when waring earplugs.†	74 dBA

PROTECTED EXPOSURE LEVEL

Estimates the noise level that this employee experiences wearing earplugs, while exposed to the noise level previously entered for that person. It is calculated by subtracting the lower-ear PAR from the noise level previously entered in the VeriPRO set-up.

Example:	TWA Exposure Level	102 dBA
	Lower PAR	8 dB
	Protected Exposure Level	74 dBA

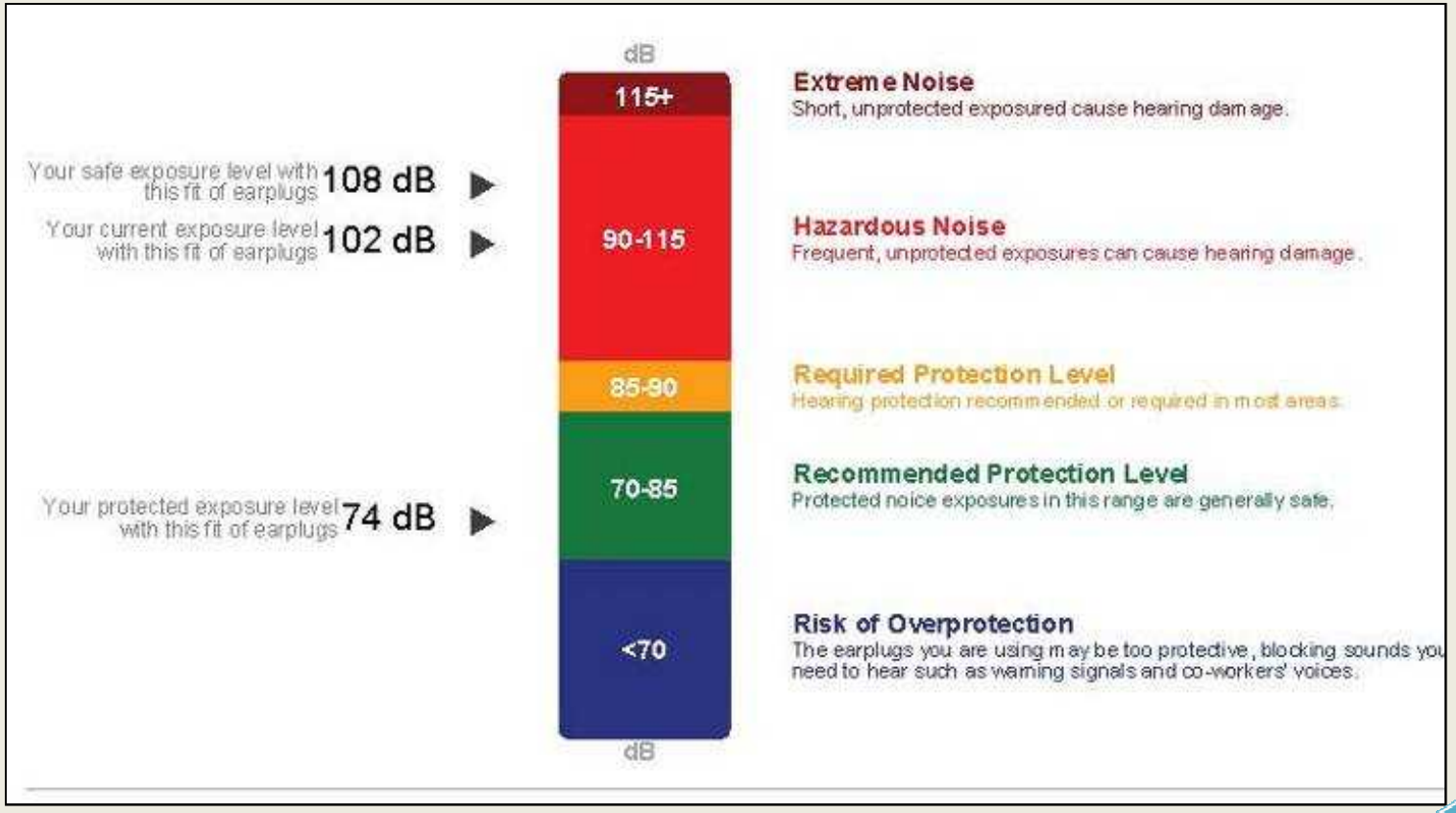
The employee's listening level with that fit of that earplug is 74 dB.

Protected Exposure Level

IF YOUR . . .	THEN
PEL > 85 db	User may be at risk of underprotection and could be at risk of additional noise exposure.
PEL = 70 – 85 dB	User is within safe listening with this fit of the earplug.
PEL < 70 dB	User may be overprotected, and the earplugs may be blocking sounds that they need to hear, such as warning signals and co-worker's voices.

Noise Thermometer

The report also displays a Noise Thermometer at the bottom, which provides a graphical interpretation of all of this data. This is an excellent talking point for use with employees, enhancing their understanding of the VeriPRO test and their earplug fit.



Final Report

Hearing Protector Individual Report

VeriPRO

User:	Brad Lackey
Test Date:	September 30, 2008
Department:	4127
ID #:	76814
Exposure:	85 dBA
Earplug:	Max Lite®

Personal Attenuation Rating (PAR)

The amount of protection provided by the earplug.

Left Ear	Right Ear	Published Attenuation
35 dBA	38 dBA	30 dB

Safe Exposure Level

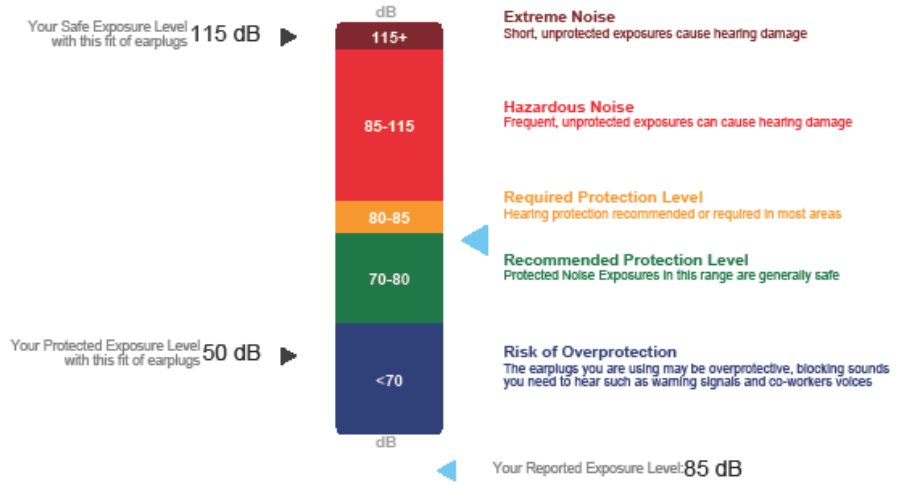
The highest level of noise to which a worker can be safely exposed with this earplug fit.*

115 dBA

Protected Exposure Level

The estimated noise level experienced by this worker with this earplug fit.†

50 dBA



* Calculated from the protection level of the least protected ear

† Calculated by subtracting the latest PAR from the exposure level in the employee's profile.

HOWARD LEIGHT by SPERIAN

www.howardleightveripro.com

Page 1 of 2

Signature Date

Sandia National Laboratories

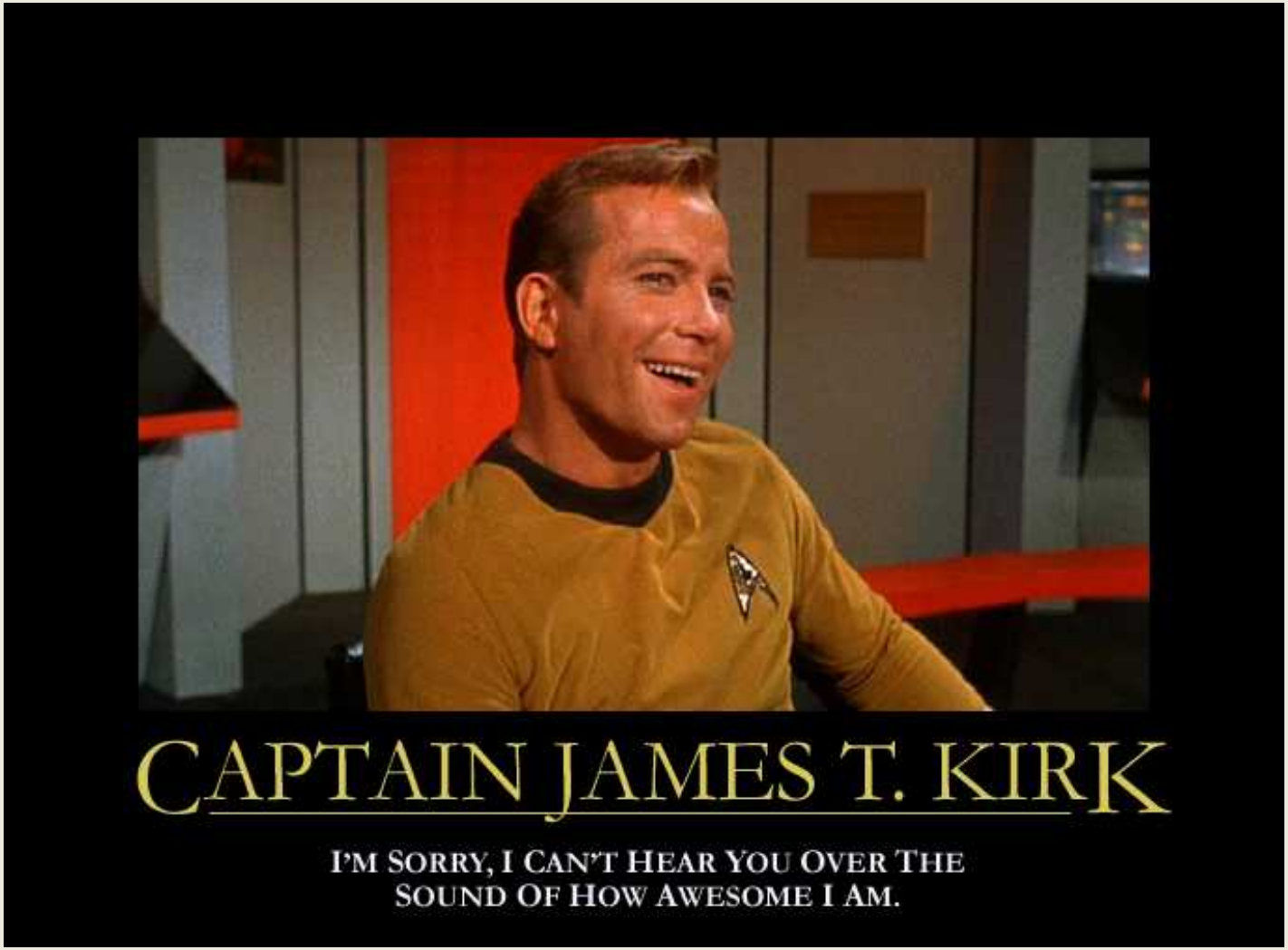
VeriPro Contact Information

http://www.howardleight.com/veripro

877.VERIPRO [877.837.4776]

Extreme Hearing Protection Option

When Fit-Testing, You Will *Always* Get This Guy



Questions?