3M E•A•RCAL Laboratory

To: 3M™ E-A-Rfit™ Validation System Operators

From: Elliott H. Berger

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Re: Revised calibration policies for 3M™ E-A-Rfit™ Validation Systems

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Beginning with Version 4.4 software for the E-A-Rfit validation system, a new calibration policy that extends the factory calibration interval from one year to two years, will be implemented. The decision is based on two factors.

1. Factory calibration is not required to measure PAR: The E-A-Rfit validation systems measure noise reduction (NR), the difference in sound pressure levels (SPLs) between inner and outer mics mounted in and outside the earcanal. From this is computed an estimate of real-ear attenuation, which is converted into a personal attenuation rating (PAR). Such measurements are based on relative differences in SPL, not on knowledge of absolute values. Thus, precise measurement of absolute SPLs is not required. All that is needed is the calibrated difference between the sensitivity of the two measurement units in the microphone assembly, and verification that the difference is stable with time and under varying conditions. This is accomplished via the daily calibration conducted by the user before each day's measurements.
2. Cost: Extending the required time between factory calibrations reduces customer costs and simplifies utilization of the system.

As explained above the key calibration activity to help assure accurate prediction of PARs is the daily check that is conducted by the users. This is important since it is the difference in the sensitivity between the two elements in the dual-microphone assembly that is used as part of the computation of PAR.

The daily calibration check also validates that all the system hardware is functioning properly. For a more detailed explanation of the daily calibration check, refer to the latest 3M™ E-A-Rfit™ Validation System Operations Manual. If the daily check fails with both microphone systems in the user's possession (i.e. their standard mic in daily use and also their backup microphone), then there is likely a hardware failure and the system should be returned for repair.

The reason that we have decided to extend the factory calibration interval is based on the increasing experience we have gained with our system that has now been on the market since 2007, combined with the fact that the calibration we conduct at the factory is primarily required only to help assure the accuracy with which the external mic element estimates the A-weighted sound level (dBA) outside the ear. This dBA estimate is reported on the left side of the measurement screen beneath the octave-band bar chart on the Measured Levels tab. The sound level measurement is not part of the PAR computation but is simply used for educational purposes when discussing E-A-Rfit validation system data with the user. Although it is desirable that the estimate of the external sound levels are accurate, this has no effect on the estimation of user protection.

The other value in the factory calibration is that we examine the entire system for any signs of wear or malfunction and repair/replace or update parts as needed. The speaker must be returned as part of the factory calibration process since the microphone calibration is dependent on measuring system gain and that in turn is related to the microphone sensitivity and to the gain of the microphone preamplifier which is located within the speaker housing.