



*"Making Antimatter Matter"*

## Hearing Conservation and Noise Monitoring

### 1. Company Policy

Hbar Technologies, LLC, is committed to providing a safe work environment for all its employees. Based on the nature of the research and development work performed, exposure to excessive noise may be likely, especially when working in/around machinery. Exposure to high noise levels is typically brief and sporadic.

To demonstrate compliance with the occupational noise exposure requirements, Hbar Technologies, LLC, has established the following policy and procedure. Compliance with the requirements is the responsibility of all affected employees of Hbar Technologies, but will be coordinated by the ES&H Officer. Failure to abide by the requirements stated herein may result in disciplinary action. In addition, a copy of the applicable portion of the Occupational Health and Safety Administration regulations governing occupational noise exposure (29 CFR 1910.95) accompanies this program and is also available for review.

### 2. Responsibilities

OSHA requires that employers administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or equivalently a dose of fifty percent. Table 1 contains the OSHA specified permissible exposure levels (PELs) for occupational noise. OSHA assumes a 5 dB change in the sound level equates to a factor of two in the duration.

Table 1: OSHA Permissible Exposure Levels for Occupational Noise

Duration per day (hours)	Sound Level (dBA)	50% Dose (hrs)
16	85	8
8	90	4
6	92	3
4	95	2
3	97	1.5
2	100	1
1.5	102	0.75
1	105	0.5

0.5	110	0.25
≤ 0.25	115	≤ 0.12

One can use Equation 1 to calculate the dose to an individual with the numerical value of 1 equal to a dose of 100% and a numerical value of 0.5 equal to a dose of 50%.

Equation 1: 
$$\sum_1^n \frac{C_n}{T_n} = Dose$$

$C_n$  = total time of exposure at a specified noise level

$T_n$  = total time of exposure permitted at that level calculated by Equation 2.

Equation 2: 
$$T_n(\text{hours}) = \frac{8}{2^{(L-90)/5}}$$

L = measured sound level in dBA

The ES&H Officer will coordinate implementation of this program. The ES&H Officer is responsible for performing sound level measurements and documenting the results of the measurements, posting high noise areas, evaluating adequacy of hearing protection, and identification and notification of affected employees.

Employees are expected to alert the ES&H Officer to work activities or equipment that has significant noise levels. Identified employees will cooperate with all scheduled audiometric testing, participate in annual training, and wear personal protective equipment when required.

At present, there are no employees that are exposed to noise levels at or exceeding 85 decibels. Hbar Technologies, LLC will notify in writing each employee exposed at or above an 8-hr TWA of 85 decibels. Identification of employees will be through area monitoring.

### **3. Exposure Assessment**

Area monitoring will be performed by the ES&H Officer to identify areas or equipment that exceed the limiting values and repeated whenever there is a changed in the area or equipment which could significantly change the noise level exposure. All affected personnel are provided the opportunity to observe any measurements of noise exposure. In addition, potentially affected personnel are requested to alert the ES&H Officer to areas and/or equipment that may exceed the limiting values. Area monitoring shall be recorded on the form attached to this procedure.

The sound level meter used shall meet the Type II requirements of American National Standards Institute (ANSI) S1.4. The meter selected and its calibration is described in the Technical Appendix to this procedure.

The individual dose shall be calculated using Equation 1 and 2 as necessary. Equation 1 does allow for the combined effect of daily noise exposure composed of two or more periods of noise

at different levels, rather than the individual effect of each. Exposure of impulsive or impact noise should not exceed 140 dB peak sound pressure level.

Areas, activities, or equipment exceeding the limiting values shall be labeled accordingly to alert personnel to the high noise levels. The use of engineering or administrative controls shall be investigated, documented and implemented where feasible to reduce employee exposure levels to below a dose of 1. When not feasible, suitable hearing protection (hearing protection capable of attenuating noise levels to less than 90 dBA or 85 dBA for employees with a documented threshold shift) shall be provided at no cost to the employee.

#### **4. Employee Training**

Hbar Technologies staff will be trained in the requirements of this program and procedure.

OSHA requires specific training in the principles of hearing conservation of all individual assigned to work identified as having an exposure level in excess of the action level of 85 dBA. Initial training will be provided upon assignment to such a work activity. Training must be provided annually thereafter.

The training shall address:

- The effects of noise on hearing;
- The basis elements of the noise reduction and hearing conservation program;
- The specific nature of operations that could result in over exposure to noise;
- The use of engineering controls to reduce noise exposure;
- The fitting, use, and maintenance of personal protective equipment associated with the employee's job assignment;
- The location of high noise areas and the identification of such areas;
- The operations with the potential of producing high noise levels and special precautions to be taken in these areas;
- The purpose and description of the audiometric testing program;
- The requirements for recordkeeping and employee access to records.

Prior to the use of a hearing protection device at another facility, the Hbar Technologies staff member should be oriented as to the use and limitations of the device. Staff should also be acquainted with posting requirements in that facility. If clarification is needed, please contact the ES&H Officer.

Should a staff member receive formal training at another facility, documentation of completion of the course shall be provided to the ES&H Officer along with the course objectives. This will allow for the use of reciprocity.

## **5. Recordkeeping**

Noise exposure measurement records shall be retained for a period not less than 2 years.

All audiometric records shall be maintained confidential and kept under lock and key. Only the ES&H Officer and the President shall have access to cabinet. Audiometric test records shall be retained for the duration of the affected employee's employment. Audiometric test records shall include:

- Name and job classification of the employee;
- Date of the audiogram;
- The examiner's name;
- Date of the last acoustic or exhaustive calibration of the audiometer; and
- Employee's most recent noise exposure assessment.

Records of such monitoring shall be maintained by Hbar Technologies during its operation. If Hbar Technologies, LLC ceases to do business, it will transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period described.

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Elaine Marshall, ES&H Officer

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Date

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Gerald Jackson, President

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Date



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1275 W. Roosevelt Road  
Suite 103  
West Chicago, IL 60185  
Phone: (630) 231-7077  
Fax: (630) 231-7086  
www.hbartech.com

Date: \_\_\_\_\_

To: \_\_\_\_\_

From: Elaine Marshall  
ES&H Officer

SUBJECT: Inclusion in the Hearing Conservation Program

To ensure Hbar Technologies, LLC is in compliance with the applicable regulations regarding occupational noise exposure limits, area sound level measurements are made on a periodic basis. Based on the data obtained and the analysis of those measurements, it has been determined that you are exposed at or above an 8-hr time-weighted average of 85 decibels. As such, steps have been taken to include you in the company hearing conservation program.

Arrangements will be made for you have a baseline audiometric test at a local certified facility. You will be notified of the date and time of that examination. Please note that testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise and you are also asked to avoid high levels of non-occupational noise exposure during this time period. At least annually, you will be scheduled for a new audiogram so that a comparison can be made against the baseline to determine if there has been a shift in your hearing.

Training will be provided by the ES&H Officer in accordance with the governing regulations. You will be afforded an opportunity to ask questions regarding the company program, the effects of noise upon your hearing, hearing protection available, the use and care of your hearing protectors and how noise level measurements are made.

Adequate hearing protection will be made available to you at no cost.

If you have any questions, please contact me.



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## Employee Noise Exposure Interview

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Job Title: \_\_\_\_\_

Names of Persons Performing Similar Work: \_\_\_\_\_

Please describe your work activities. \_\_\_\_\_

\_\_\_\_\_

Has there been a change in your work assignment over the last year? YES NO  
If yes, please explain. \_\_\_\_\_

Employee's Assessment of Hearing: GOOD FAIR POOR

Have you noted a change in your hearing over the last year? YES NO  
If yes, please explain. \_\_\_\_\_

\_\_\_\_\_

Please describe your occupational sources of noise. Include high-noise locations, frequency, and duration of exposure. Comment on any changes over the past year

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Please describe your NON-occupational sources of noise (racing, hunting, woodworking, lawn maintenance, etc.). Include frequency and duration of exposure. Comment on any changes over the past year.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





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## Technical Appendix A

### Care, Use and Calibration of the QUEST 215 Sound Level Meter

#### **1.0 Instrument Specifications**

Hbar Technologies, LLC has procured a QUEST Technologies Model 215 Sound Level Meter to monitor noise levels during work activities to ensure compliance with the governing OSHA regulations. For reference, the serial number of the instrument is M4090077. This instrument is designed to meet or exceed the following standards: ANSI SI-4.1983, type 2 and IEC-651, type 2.

This instrument is a general purpose sound level meter capable of measuring noise levels between 30 and 140 dB. The 215 meter has a fixed microphone configuration mounted directed on top of the unit. It has the capabilities of measurement sound levels in the A, B, and C weighted scales and also has the capability for a linear scale for use with octave band filters which are an available accessory.

Under normal operating circumstances, there are negligible effects on instrument reading due to humidity, temperature, pressure and magnetic fields. Vibration adversely affects measurements.

The Instruction Manual for this equipment is available and should be referred to if additional information regarding the instrument specifications and principles of operations are needed.

#### **2.0 Instrument Care**

The 215 meter was factory calibrated and with proper care should retain its accuracy. Care should be taken, as with any other monitoring equipment, to avoid submersion and electrical and/or mechanical shock. If at any time the meter appears to have been damaged or is malfunctioning, contact the ES&H Officer.

## **3.0 Instrument Use**

### **3.1 Basic Operation**

The 215 is designed to be hand-held, in particular to minimize mechanical vibration. If the unit is placed upon a hard surface, check to see that no significant mechanical vibration exists adversely affecting meter readings. The microphone will record vibration as if it were sound.

Another aspect to consider when using the 215 meter is that the operator's body may act as a reflector for sound. For this reason, the meter should never be held between the noise source and the operator. The meter should be held away from the body with the microphone pointed upward almost perpendicular to the noise source (approximately 70°).

When the meter is in the off position, the meter needle should rest on the left-most line. If it does not, turn the cross hatch screw just below the meter face slowly until the needle does rest on that line. The instrument will need to be recalibrated. See Section 3.4 of this appendix.

The first step in operating the meter is to check the functionality of the batteries. Move the ON-OFF-BAT switch to the BAT position and check that the meter pointer deflects to the green area on the meter face marked BATTERY CHECK. If the needle is not within this region, the batteries must be replaced. Refer to section 2.3 of this Appendix for additional instructions.

Prior to turning the meter on, set the dB RANGE selector at or above the expected sound pressure level. Then ensure that the weighting selector is positioned on A and that SLOW response is selected. After verifying control positions, turn the meter on to perform a calibration check. If the instrument was calibrated within the previous 24 hours, no calibration is necessary. Refer to section 2.4 of this Appendix for calibration instructions.

After calibrating the meter, proceed to the work location to make sound level measurements. Maximum readability and accuracy are obtained with the meter pointer deflected to the higher part of the meter scale. When possible, therefore, select the range to produce a reading between 0 and +10 on the meter.

Measurements are taken by adding the scale reading to the dB range level selected. For example for a scale reading of +8 and a dB range of 80 dB, the sound level measured is 88 dB. For a scale reading of -5 and a dB range of 70 dB, the sound level measured is 65 dB. Record the measurements for evaluation by the ES&H Officer.

### **3.2 Effect of Background Noise**

If the sound level from a particular source is to be determined, all surrounding sources of noise should, as nearly as possible, be reduced or eliminated. When

that is not possible a correction shall be made to correct for background noise. Refer to the Instruction Manual for additional guidance.

### **3.3 Battery Replacement**

Batteries should be replaced whenever a battery test gives a low indication on the meter. To replace the batteries, first ensure that the ON-OFF-BAT switch on the front of the unit is in the OFF position. Then remove the rear cover plate by unscrewing the three retaining screws. The batteries are located in the upper section of the unit. Carefully remove the used batteries and replaced them with two new 9-volt batteries.

### **3.4 Calibration**

#### **3.4.1 Calibrator**

The QUEST CA-12B Sound Level Calibrator is a self-contained unit that quickly and precisely verifies the accuracy of sound measuring instrumentation, such as the QUEST 215 Sound Level Meter. The calibrator generates a reference sound level at precisely 100 dB and 1000 Hz.

The unit is battery operated and thus, fully portable. It requires a 9V batter for its operation.

The calibrator is designed to satisfy the ANSI S1.40-1984 standard regarding similar instrumentation.

The calibrator demonstrates minimal effects upon changes in temperature, humidity and magnetic fields. It is sensitive to atmospheric pressure, necessitating a correction of -0.10 dB for each 1000 meters above sea level. As Hbar Technologies West Chicago offices are near sea level, no correction is needed at this facility.

The CA-12B Calibrator was calibrated by the manufacturer using special acoustical instrumentation traceable to the U.S. Bureau of Standards. Since this instrument is used to calibrate other equipment, it should be periodically checked with laboratory standards. The calibrator should be returned to the factory whenever there is a question about its accuracy. The manufacturer recommends a frequency of annually at a minimum.

To replace the battery, first ensure that the calibrator has been turned off. Remove the two screws from the face plate on the bottom of the calibrator. Slide off the face plate and outer shell to expose the battery. Replace the battery with a new 9V battery. Carefully replace the outer shell and affix the face plate with the two screws.

### 3.4.2 Procedure

The 215 Sound Level Meter shall be checked daily prior to use with the CA-12B calibrator included with the equipment. See Section 3.4.1 in this Appendix for calibrator information.

- 3.4.2.1 First turn on the instrument and verify that the battery is good. Replace the batteries (Section 3.3) if the indicator is below the green region.
- 3.4.2.2 Push the meter switch to ON and select the 100 dB range position.
- 3.4.2.3 Switch on the calibrator and check the calibrator battery level. If the battery level indicator is not within the green region on the calibrator face, replace the batteries. See section 3.4.1 for instructions. Verify that a tone is being emitted. Manufacturer states that if a tone is heard, the calibrator output is accurate and proper.
- 3.4.2.4 Turn calibrator OFF.
- 3.4.2.5 Carefully insert the meter microphone into the calibrator coupler. Be sure microphone is inside the coupler resting flush on the inner rim. NOTE: Rapid insertion or withdrawal of the microphone may damage the microphone or the transducer in the coupler because of the rapid change in pressure on the diaphragms.
- 3.4.2.6 Turn calibrator ON.
- 3.4.2.7 Take measurements with the dB range on 100, 110 and 120. Readings should be +10, 0, and -10 respectively.
- 3.4.2.8 If reading is off slightly, insert a small screwdriver in the small hole on the bottom of the meter and slowly adjust the CAL adjust until the meter reads correctly.
- 3.4.2.9 Turn calibrator OFF prior to removing instrument microphone.
- 3.4.2.10 Meter is now ready for use.