

**MECH9325 Fundamentals of Acoustics and Noise****Laboratory 2 – Measurement of sound power levels by the direct and the comparison methods****Location:** Room 215 Willis Annexe building J18**Due date:** Monday 24<sup>th</sup> May 5pm (submission through Moodle drop box)**Introduction**

The aim of this experiment is to measure the sound power levels of a noise source (an electric drill) located on a hard surface in a semi-reverberant field. The procedure outlined in AS 1217.5 is to be followed. Correction for reverberation effects is to be made using both the direct method and the comparison method.

**Direct Method**

The drill should be located on the floor and octave band sound pressure level measurements should be made at ten locations on the enclosing hemispherical surface. The radius  $r$  should be 1m. The locations are specified in Table B2 and Figure B1 of AS 1217.5. Thus the average measured surface sound pressure level  $\overline{L_{pm}}$  can be determined for each octave band. The environment correction factor  $K$  must then be subtracted from  $\overline{L_{pm}}$  to correct for the fact that the space is not a true free field but is reverberant. To determine  $K$ , the octave band reverberation time  $T_{60}$  should be measured in each octave band. The equivalent sound absorption area  $A$  can be calculated using AS 1045. The factor  $K$  is then given by  $K = 10 \log_{10} \left( 1 + \frac{4}{A/S} \right)$  where  $S$  is the area of the enclosing hemispherical surface. The corrected, free field average surface sound pressure level  $\overline{L_{pf}}$  is obtained by subtracting  $K$  from the average measured surface sound pressure level  $\overline{L_{pm}}$ . The sound power level is then given by  $L_W = \overline{L_{pf}} + 10 \log_{10} \left( \frac{S}{S_0} \right)$  where  $S_0 = 1 \text{ m}^2$ . The measurements are to be made in each octave band.

**Comparison Method**

A reference sound source (B&K Reference Sound Source Type 4204), which has been located next to the drill from the beginning while the drill was operated, is switched on and octave band sound pressure level measurements are made at the same ten locations (the drill is switched off). The average measured surface sound pressure level is used to determine the uncorrected sound power level of the reference source and then the correction factor  $K$  is then given by  $K = L_{Wr(\text{uncorrected})} - L_{Wr}$ .

These measurements are to be made in each octave band.

**Report**

Your report should include a description of the measuring arrangement, an account of the theory, the raw data in tabulated form, and the results. A comparison between the two methods should be given on the A-weighted sound power levels for each octave band and the total sound power level.