Identification of key areas of importance for the areas of

Acoustical, Ultrasound and Vibration Metrology (CCAUV).

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0 Summary

The “Key Areas” identified below for Airborne Acoustics were identified through the process which lead up to the document “FUTURE NEEDS FOR METROLOGY IN ACOUSTICS, ULTRASOUND AND VIBRATION”. Despite being a few years old, the time-scale considered for the work areas, was 5 to 10 years, so it remains strongly relevant. The members of the Strategic Planning Working Group (SPWG), have recently had the opportunity of up-dating the material, and this has primarily been carried out in the Vibration area, which was considered only very cursorily in the original Report.

More descriptive material on the needs & drivers behind these anticipated required developments may be found in the original “Futures” Report.

1 Airborne acoustics.

- **Development of primary standards for sound pressure derived from optical measurements (laser anemometry and interferometry).**

- Development of primary standards for sound pressure in the pressure range 20 kHz to 200 kHz (airborne ultrasound).

- Calibration of microphones and sound level meters in the frequency range 0.1 Hz to 30 Hz.

- **Development, calibration of miniature microphones and microphone arrays fabricated from nanotechnologies or (more likely in the shorter term) other emerging technologies such as MEMS.**

- **Application of MEMS sensors in the quantification of noise exposure.**

- Standardised methods for the evaluation of free-field rooms and enclosures and hemi-anechoic rooms.

- Evaluation of the performance of ear simulators when used with short duration signals.

- Standardisation of metrics used for sound quality and subjective characterisation of noise.

- Structure borne sound - description of sources and transmission paths.

2 Ultrasonics.

- Development of validated methods of measurement for assessing *‘in-vivo’* temperature rises and cavitation occurrence generated by diagnostic and therapeutic medical ultrasonic equipment.

- Development of new generation of ultrasonic hydrophones providing high spatial resolution and measurement bandwidth.

- Development of measurement methods for characterising the essential properties of hostiles cavitating acoustic fields of the type used in ultrasonic cleaning and sonochemistry.

- **Development of methods for characterising the acoustic output of high intensity ultrasonic surgical and therapeutic equipment.**

• Development of standards for acoustic emission.

3 Underwater acoustics.

• Development of primary standard for free-field sound pressure using optical measurements, including 3-D mapping of acoustic fields.

• **Standards for measurement of underwater radiated noise.**

• Calibration of velocity hydrophones and sensors, including acoustic intensity sensors.

4 Vibration

• **Development of methods and standards for the calibration of laser vibrometers, with special attention on high vibration frequencies (>= 100 kHz). This may include the development of new technologies for vibration exciters.**

• Development of new calibration methods for impedance heads in order to attain independence from specially designed devices, with special attention on the synchronous measurement of force and acceleration including magnitude and phase.

• Introduction of a new dissemination scheme for non-periodic acceleration (specifically shock) in order to have calibration results which are not depending on the individual signal shape during calibration. This may include the development of new facilities and introduction of new written standards.

• The development of new accelerometer based on micro optical interferometers in order to improve stability and resolution while simultaneously reducing sensitivity to electrical and environmental disturbance.

• General research in the area of dynamic measurement and calibration with respect to the spin-off effects from acceleration to other dynamic mechanical quantities (force, pressure, torque, ...) .