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Brief report on acoustics and vibration to Third Meeting of CCAUV (October 2002)

1. Acoustics

The measurement set-up for sound calibrators calibration by standard microphone method used in GUM has been developed by bringing into practise the computer control of the experiment course. Special software makes it possible to introduce the necessary initial data, read-in automatically the ambient static pressure, temperature and humidity during experiment, perform automatically the measurement sequence suited to the needs of insert voltage technique, perform necessary calculations and produce the result file. Commutations needed by insert voltage technique are performed by means of specially designed computer-operated switching unit. The main benefits of automated system are: significantly reduced duration of calibration, elimination of random mistakes and easiness of experiment course supervision.

2. Vibration

The measurement set-up for primary vibration calibration by laser interferometry, announced during last CCAUV meeting, has been installed in GUM. Its main part is the primary calibration system CS 18 P made by SPEKTRA (Germany).

The main units of the system are:
- sinusoidal signal generator and power amplifier,
- vibration exciter,
- laser interferometer with vibration-isolating foundation,
- signal conditioning and data acquisition unit for the device under test.

The measuring instruments control, data acquisition and calculations are performed automatically with PC computer.

The measurements are performed according to the method 3 “Sine-approximation method” described in standard ISO 16063-11 “Primary vibration calibration by laser interferometry”.

The system enables an absolute magnitude and phase calibration of accelerometers and acceleration measuring chains. It is also possible to calibrate charge amplifiers alone and perform secondary calibration of vibration transducers using the reference standard accelerometer built in the exciter.

According to the exciter used the sensitivity magnitude and phase are determined in the frequency range from 10 Hz up to 10 kHz (with medium frequency exciter) or from 1 Hz up to 100 Hz (with low frequency exciter).

The expanded measurement uncertainty of sensitivity magnitude is estimated as 0,5 % at reference frequency and does not exceed 1,0 % within frequency range from 10 Hz to 10 kHz. The uncertainty values for sensitivity phase are 0,5° and 1,0°, respectively.

Values given above have been verified by performing the calibration of the same transfer accelerometer using the GUM system and at PTB.

The start-up of the system enabled GUM to join the EUROMET project No. 579 “Comparison in accelerometer calibration” (EUROMET AUV.V – K1). The circulation of the two piezoelectric standard accelerometers is to be started in the second half of 2003.

Quality system

GUM has prepared the documentation on quality system complying with all the requirements given in ISO/IEC 17025:1999, which will be presented at 8th Meeting of OS-Forum in Torino on Sept. 23-25, 2002. The quality system of GUM covering the scope of CMCs submitted under the CIPM MRA will be self-declared. The implementation of quality system is still under way and is planned to be finished by the end of 2003.

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Warsaw, Sept. 18, 2002