Sound, Vibration and Optical Radiation Division
Central Office of Measures (GUM)
Warsaw, POLAND

Brief report on acoustics and vibration to the 4th Meeting of CCAUV (September 2004)

As a result of last year reorganization of the structures of Central Office of Measures (GUM) Sound and Vibration Division has been joined with Optical Radiation Division under new name Sound, Vibration and Optical Radiation Division. However this change have had no influence on current activities of GUM in sound and vibration subject fields.

At present the staff engaged in acoustics and vibration activity consists of 12 employees (7 persons in Acoustics Laboratory and 5 in Vibration Laboratory). The activity of this staff continues to be within following fields:

- scientific metrology (development and maintenance of national measurement standards to ensure traceability of acoustical and vibration measurements in Poland);
- industrial metrology – calibration services (dissemination of sound and vibration units of measurement to sound and vibration laboratories situated in industry and other areas such as health care and environmental protection, by calibration of reference devices used in these laboratories, such as measurement microphones, accelerometers, sound calibrators, vibration transducers, vibration calibrators and so on;
- legal metrology (elaboration of national regulations concerning metrological supervision, carrying out pattern evaluation and periodic verification tests).

However, as the result of the Poland accession to EU and progress in the implementation of EU legal regulations into Polish legal system, more importance has became attached to scientific and industrial metrology issues whereas the activity in legal metrology field has became limited to necessary minimum. At present in Poland only three kinds of measuring instruments used in sound and vibration measurements are under legal control: sound level meters, human vibration meters and sound calibrators.

The services provided by Sound, Vibration and Optical Radiation Division:

1. ACOUSTICS

calibration of measurement microphones

- primary calibration — primary method for pressure calibration of laboratory standard microphones by reciprocity technique according to EN 61094-2 (computer-controlled measurement setup - the information on this facility was presented in reports from 1999 and 2001); Polish CMCs published at BIPM website
- secondary calibration — calibrated sound calibrator method using insert voltage technique and electrostatic actuator method for frequency response (computer-controlled measurement setup)

calibration of sound calibrators

- calibrated microphone method using insert voltage technique (computer-controlled measurement setup); Polish CMCs published at BIPM website
- comparison method (computer-controlled measurement setup)

calibration of mechanical couplers and ear simulators (computer-controlled measurement setup)

testing of:

- band pass filters (computer-controlled measurement setup),
- personal sound exposure meters,
- pure-tone audiometers

pattern evaluation of:

- sound level meters
- sound calibrators

periodic verification of sound level meters (computer-controlled measurement setup)

testing of the influence of static pressure on metrological characteristics of sound calibrators, measurement microphones, sound level meters and other measuring instruments (pressure test chamber with associated measuring instruments).

2. VIBRATION

calibration of accelerometers and acceleration measuring chains

• primary calibration	primary calibration method by laser interferometry according to ISO 16063-11, method 3 "Sine-approximation method" (computer-controlled measurement setup - the information on this facility was presented in report from 2002)
• secondary calibration	comparison method according to ISO 16063-21 (computer-controlled measurement setup); Polish CMCs published at BIPM website

calibration of vibration calibrators standard accelerometer method; Polish CMCs published at BIPM website

pattern evaluation and periodic verification of human vibration meters (computer-controlled measurement setup for frequency response)

testing of other kinds of vibration meters.

Last years GUM acceded to following AUV European and international research projects:

- EUROMET No. 198 Traceability for sine acceleration;
- EUROMET No. 479 Meeting of experts in accelerometry;
- EUROMET. AUV.V-K1 European comparison in accelerometers calibration;
- EUROMET No. 401 Harmonisation of audiometry measurements within the EC;
- COOMET.AUV.A-K1 Comparison of laboratory standard microphone calibrations;
- EUROMET No. 615 Meeting of experts in air-borne sound measurements;
- CCAUV.A-K3 Comparison of laboratory standard microphone calibrations;
- EUROMET No. 790 Specification of requirements for the calibration of impedance heads for measurements on mechanical couplers;
- EUROMET No. 791 Measurement of the acoustical impedance of artificial ears.

The employees of the Division regularly conduct training courses for personnel of acoustical and vibration laboratories from industry, health care and environmental protection institutions on acoustic and vibration measurements and testing of measuring instruments of these fields.

The papers concerning current works in acoustics and vibration are presented on scientific conferences of local and international range. These papers are also published. The list of recently published papers can be found below.

1. KOLASA J., Methods for calibration of vibration transducers in accordance to ISO 16063, *Proc. of the Conference on Fundamental Metrology Problems PPM'01*, Polish Academy of Sciences, Ustroń 2001 (in Polish).
2. KOLASA J., Calibration of instruments for mechanical vibration measurements at workplaces, *Proc. of 7th Symposium of Polish Testing Laboratories Club POLLAB*, Zakopane 2001 (in Polish).
3. WĄSALA T., Pressure test chamber for acoustical standard devices investigation, *Proc. of 29th Winter School on the Control of Acoustical and Vibration Hazards*, Polish Acoustical Society, Wisła 2001 (in Polish).
4. KOLASA J., Uncertainty of mechanical vibration measurements, *Proc. of 30th Winter School on the Control of Acoustical and Vibration Hazards,* Polish Acoustical Society, Ustroń 2002 (in Polish).
5. DOBROWOLSKA D., Sound calibrators – methods for calibration and uncertainty estimation, *Proc. of the Conference on Fundamental Metrology Problems PPM'03*, Polish Academy of Sciences, Ustroń 2003 (in Polish).
6. KOLASA J., Calibration of vibration transducers by absolute method, *Proc. of 31st Winter School on the Control of Acoustical and Vibration Hazards,* Polish Acoustical Society, Szczyrk 2003 (in Polish).
7. KOLASA J., Primary calibration system for calibration of vibration transducers, *Proc. of the Conference on Fundamental Metrology Problems PPM'03*, Polish Academy of Sciences, Ustroń 2003 (in Polish).
8. SZELĄG M., ZMIERCZAK T., The setup for primary standard of sound pressure unit, *Proc. of the Conference on Fundamental Metrology Problems PPM'03*, Polish Academy of Sciences, Ustroń 2003 (in Polish).
9. SZELĄG M., ZMIERCZAK T., The realization of the standard of sound pressure unit at national metrological institution (GUM) in Poland. *(Submitted and accepted at INTER NOISE 2004 Congress, Prague 2004)*.