Brief Report to the third meeting of the Consultative Committee for Acoustics, Ultrasound and Vibration

CSIR-NML
Acoustics, Ultrasound and Vibration Laboratory

ACCREDITATION

The Acoustics, Ultrasound and Vibration Laboratory (AUV) of the National Metrology Laboratory of South Africa (NML) was re-assessed by the South African National Accreditation System (SANAS) in September 2003. The scope of accreditation was extended in the vibration field to cover the frequency range 10 Hz to 10 kHz. Further extension of the vibration calibration capability is planned. This will include phase shift calibration of accelerometers from 10 Hz to 10 kHz.

ACOUSTICS

The laboratory is the process of developing an automated reciprocity calibration system for ½" and 1" laboratory standard microphones. The system will be used to calibrated sensitivity as well as phase shift response of microphones. The design and manufacturing of the system is complete and it is in the evaluation phase. The comparison of results between the new system and the current system (based on the Brüel and Kjær 4143), indicate good agreement.

VIBRATION

The laser interferometer system, based on ISO 16063-11 method 3 (sine approximation method) has been successfully implemented over the frequency range 10 Hz to 10 kHz for the complex sensitivity (magnitude and phase shift) calibration of accelerometers.

The development of a separate low frequency system to cover the frequency range 1 Hz to 40 Hz is planned.

Future developments include the development of primary shock calibration systems.

COMPARISONS

SADCMET.AUV.V-S1

In the field of vibration and shock, this supplementary comparison (SADC.AUV.V-S1) was organized in order to compare measurements of sinusoidal linear accelerations in the frequency range from 10 Hz to 10 kHz. Moreover, the complex (magnitude and phase) calibration and measurement capabilities (CMCs) of the National Measurement Institutes (NMIs) for accelerometer calibration were examined and compared.

In the bi-lateral comparison between NML and PTB, both NMIs applied laser interferometry in compliance with method 3 of the international standard ISO 16063-11:1999. The sine-approximation method specified in ISO 16063-11 (method 3) was applied in three versions:

Version 1: Homodyne interferometer with two output signals in quadrature
Version 2: Heterodyne interferometer with quadrature signals generated by digital data processing
Version 3: Heterodyne interferometer with time-interval analyzer

For the frequency range 10 Hz to 10 kHz, the two NMIs measured the complex charge sensitivity of two different transfer standards (single-ended accelerometer) at 37 different frequency points. The result of SADCMET.AUV.V-S1 is a set of SCRVs with associated uncertainties and degrees of equivalence with regards to the laboratories. From this set of results, six matrices of equivalence per accelerometer were selected and demonstrated by graphs.

For the Endevco accelerometer, in the frequency range 10 Hz to 10 kHz, deviations between the PTB and NML results were smaller than 0,6° for the phase shift measurements (37 measurement points). With the Brüel & Kjær accelerometer, in the frequency range 10 Hz to 10 kHz, the deviations between the PTB and NML results were smaller than 2° for the phase shift measurements (37 measurement points).

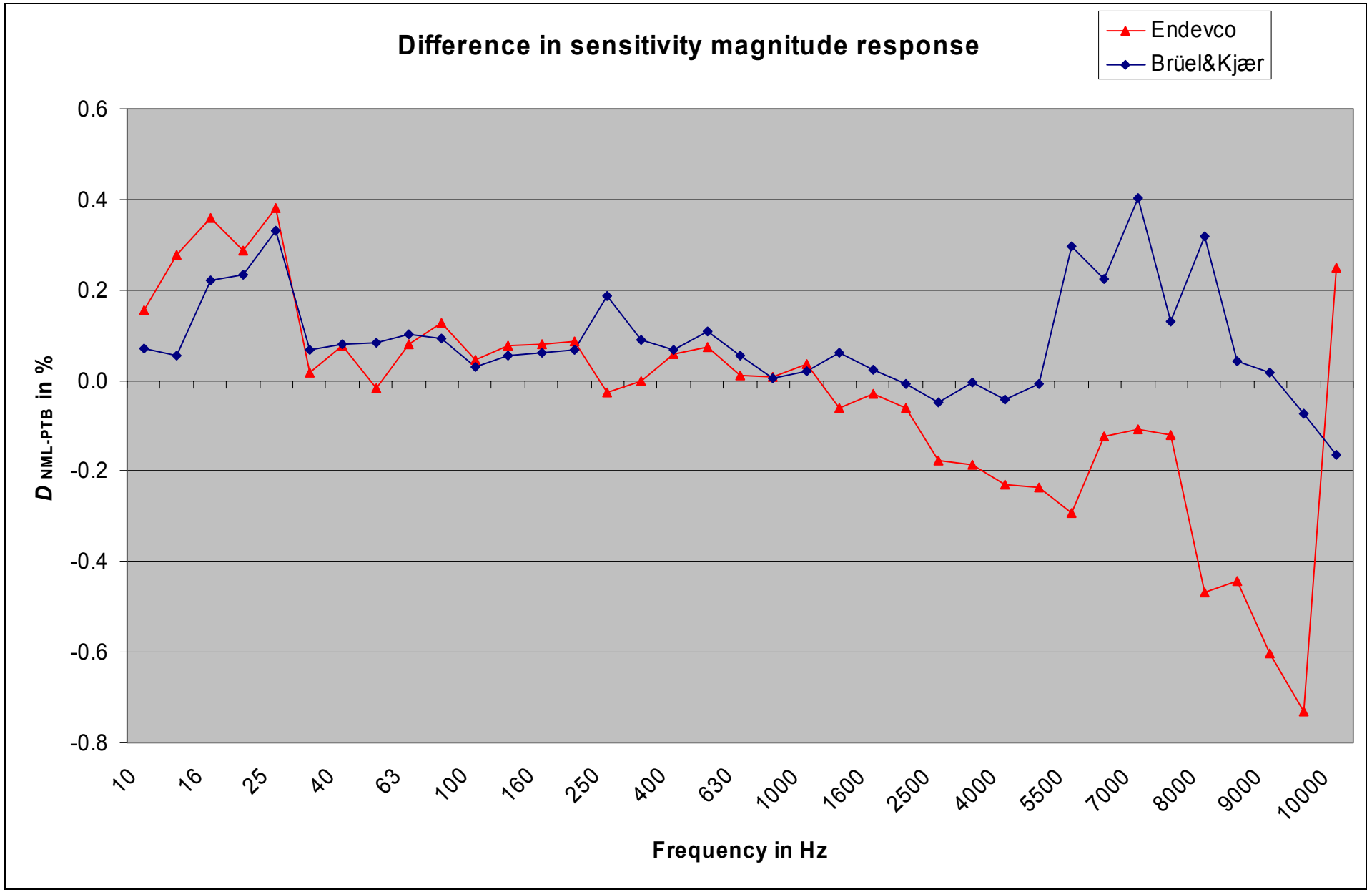

Figure 1: Degrees of equivalence (magnitude sensitivity) for accelerometers A & B

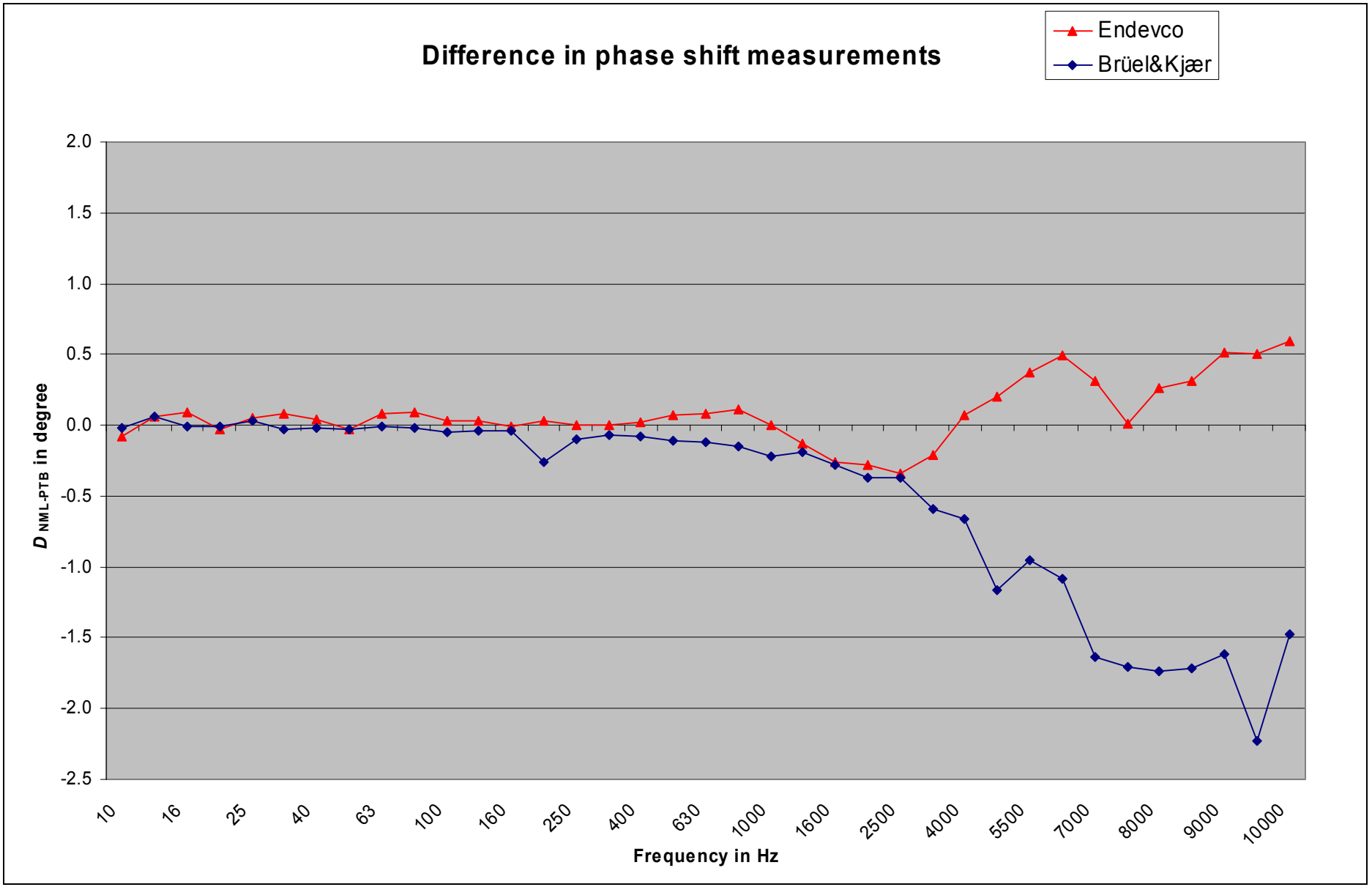

Figure 2: Degrees of equivalence for phase shift measurements for accelerometers A & B