Report on Research Activities of KRISS CCAUV

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KRISS - CCAUV

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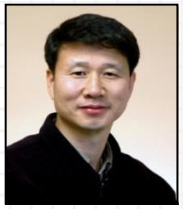

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ACOUSTICS IN AIR

- **Improvement of Free-field Sen. Calibration**
  - Development of Post Processing Method
  - Low-pass filtering for stabilizing impulse response
  - Extended low frequency limit of calibration below 2 kHz.
- **Audiometer calibration system**
  - Air conduction audiometer
  - Frequency range : 125 Hz – 8000 Hz
  - Hearing level, Linearity, Harmonic distortion, etc.

ACOUSTICS IN WATER

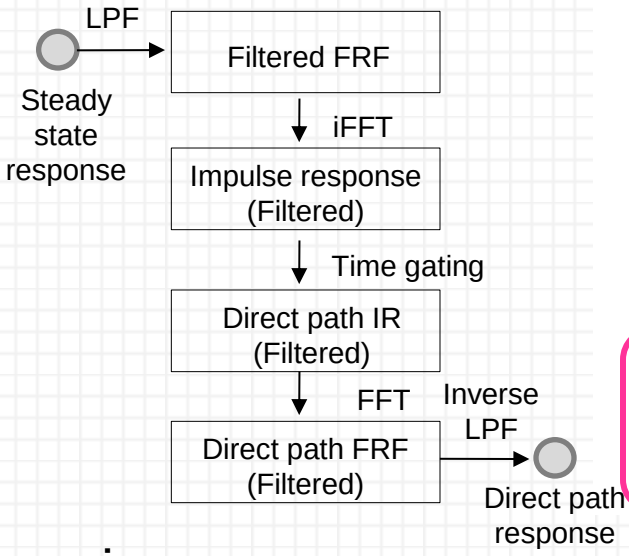
- **Hydrophone calibration system**
  - Free-field reciprocity calibration (under establishment).
  - DAQ: Digitizer – PXI 5922.
- **Ultrasonic power measurement system & Others**
  - Ultrasound Lab. moved to: Centre for Medical Metrology.
  - Fabrication/Calibration of transfer standard transducer(NIMT)
  - Voltage response measurement of thermal voltage converter.
  - Evaluation of newly developed ultrasonic absorbing material.

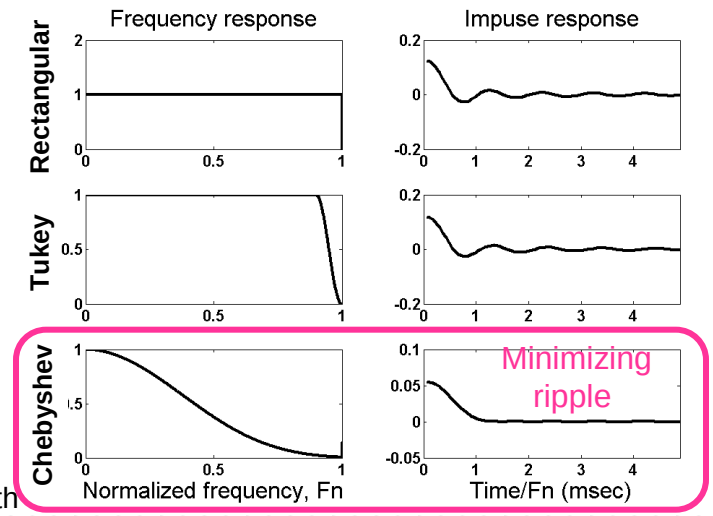
VIBRATION

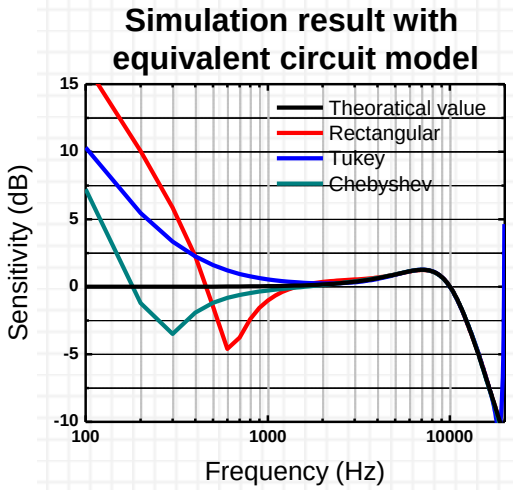
- **Measurement/calibration system for Linear vibration**
  - Interferometer for low frequency phase measurement.
  - DAQ: Digitizer – 100 MS/s, 14 bits.
  - Low frequency shaker system for calibration.
- **Measurement/calibration system for Angular vibration**
  - Developing ‘transfer standards’ for comparison calibration.
  - Angle-prism based laser interferometer.
  - Hybrid calibration system for linear & angular vibration.

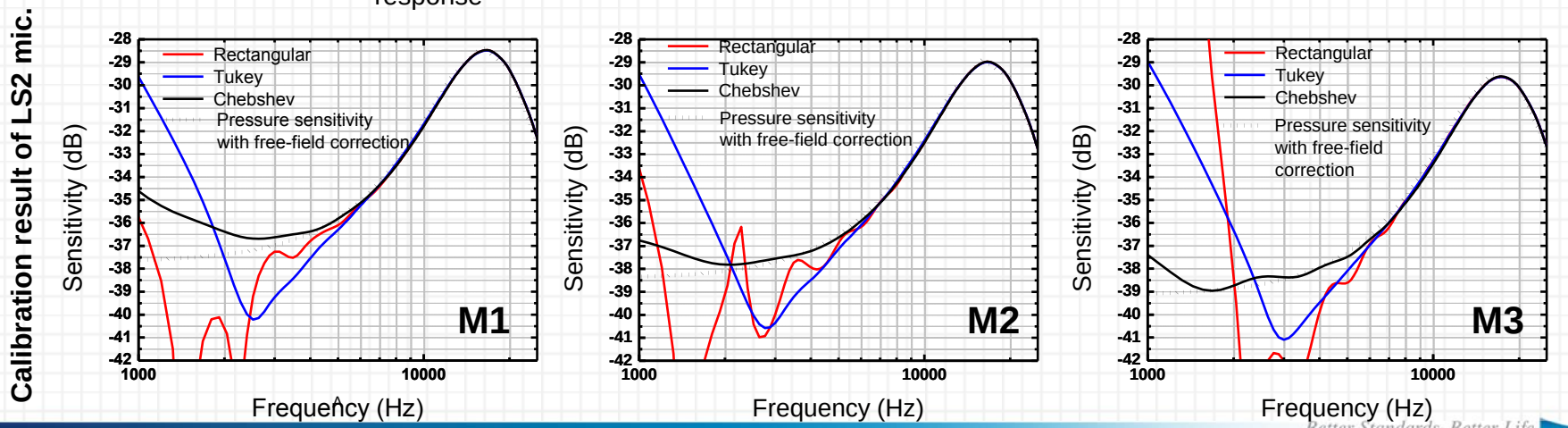
Development of Post Processing Method (Published on JASA 2013)

- **Applying low-pass filtering for stabilizing impulse response**
  - ✓ **Low frequency limit of calibration can be extended below 2 kHz without fitting**



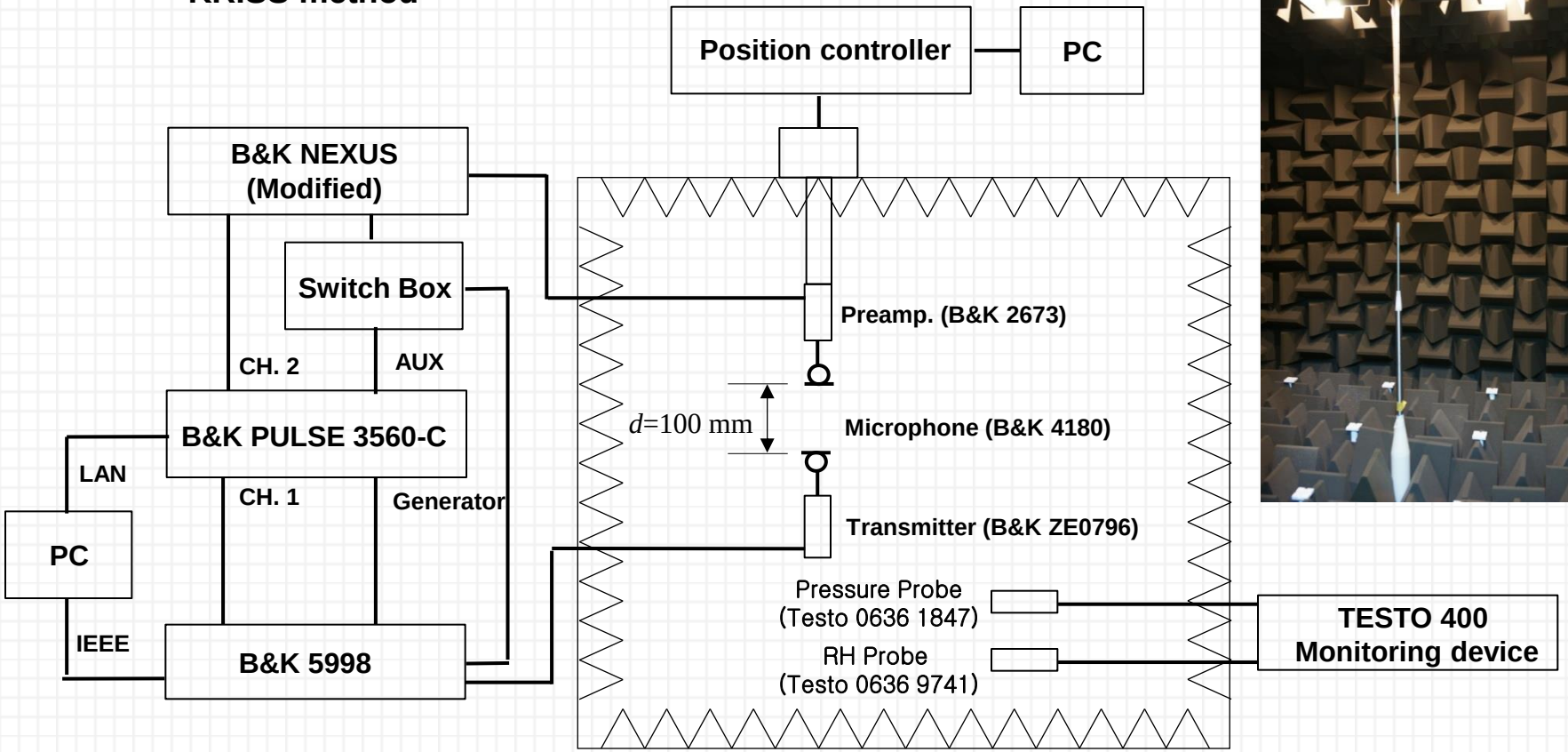






System Renewal

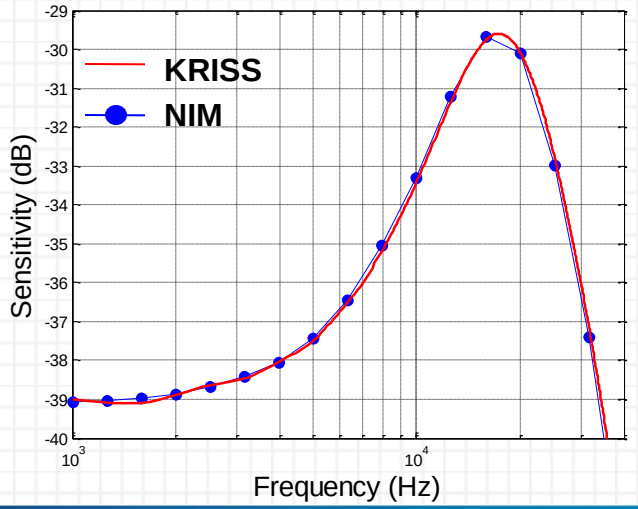
- **Introducing the automation system**
  - ✓ DFM-B&K free-field reciprocity calibration system
  - ✓ Signal processing procedure will be compared with KRISS method



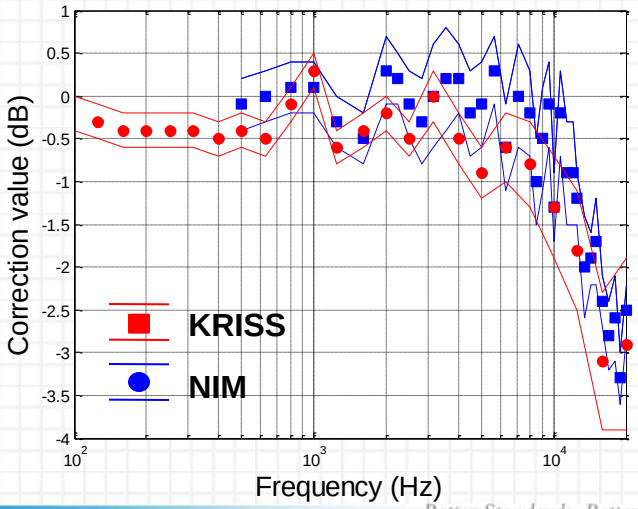
Bilateral Comparison with NIM

No	Calibration laboratory	Artifact	Start date	Finish date
1	KRISS	B&K 4180 S/N 2341431 Larson Davis 824 S/N 824A0974	6-August 2012	31-August 2012
	NIM	B&K 4180 S/N 2660992		
2	KRISS	B&K 4180 S/N 2660992	10-September 2012	5-October 2012 → 31-October 2012
	NIM	B&K 4180 S/N 2341431 Larson Davis 824 S/N 824A0974		
3	KRISS	B&K 4180 S/N 2341431 Larson Davis 824 S/N 824A0974	15-October 2012 → 16-November 2012	9-November 2012 → Mid. December 2012
	NIM	B&K 4180 S/N 2660992		

LS2 Microphone (B&K 4180)



Sound level meter (Larson Davis 824)



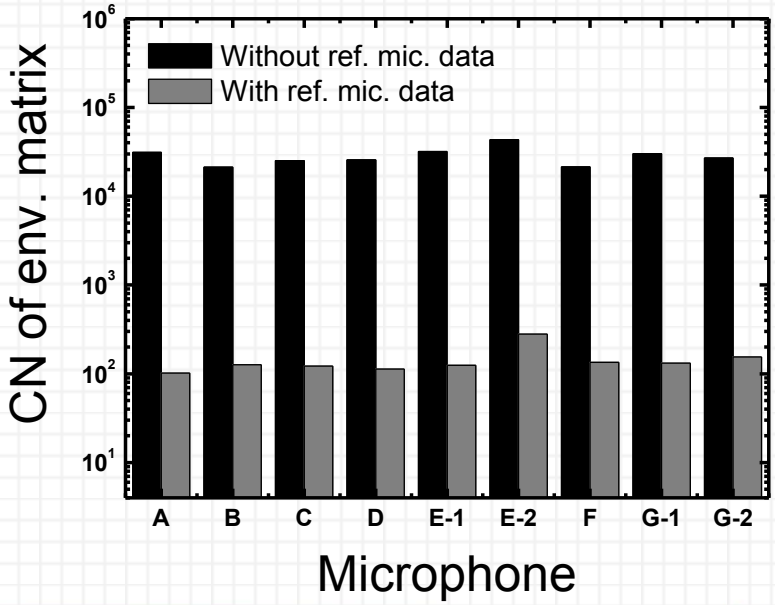
Estimation of correction factor using data collect at the uncontrolled condition (Internoise 2013)

- **Collection method**
  - ✓ Using the comparison method
- **Data collection period**
  - ✓ 1~2 years about 1~2 month step
- **Estimation of correction factor**
  - ✓ Without reference condition data

$$\boldsymbol{M}_{p,mea} = \begin{bmatrix} 1 & \Delta\boldsymbol{P} & \Delta\boldsymbol{T} & \Delta\boldsymbol{RH} \end{bmatrix} \begin{bmatrix} \boldsymbol{M}_{p,ref} \\ C_P \\ C_T \\ C_{RH} \end{bmatrix}$$

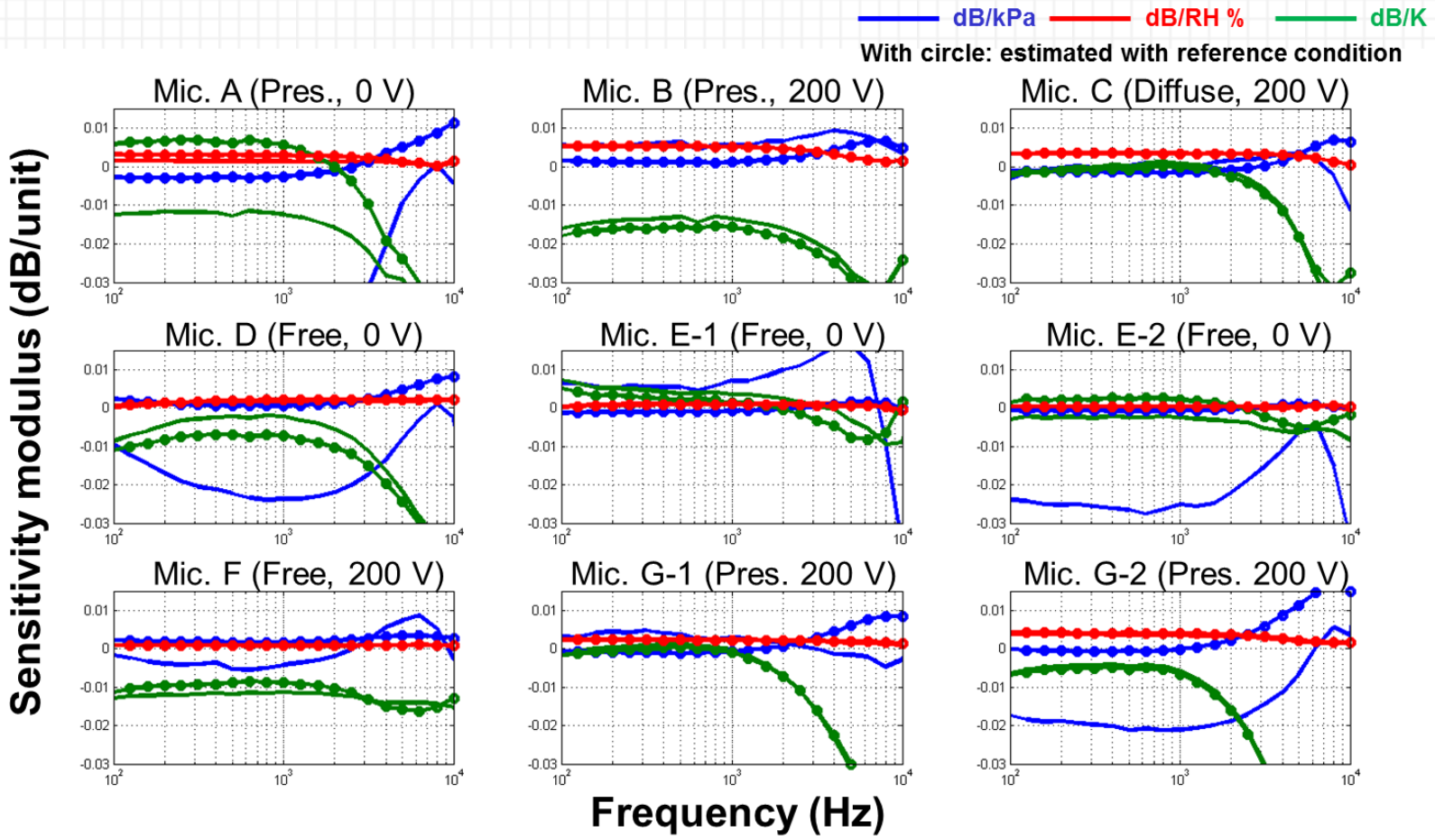
  - ✓ Using mean value as reference condition data

$$\boldsymbol{M}_{p,mea} - \boldsymbol{M}_{p,ref} = \begin{bmatrix} \Delta\boldsymbol{P} & \Delta\boldsymbol{T} & \Delta\boldsymbol{RH} \end{bmatrix} \begin{bmatrix} C_P \\ C_T \\ C_{RH} \end{bmatrix}$$



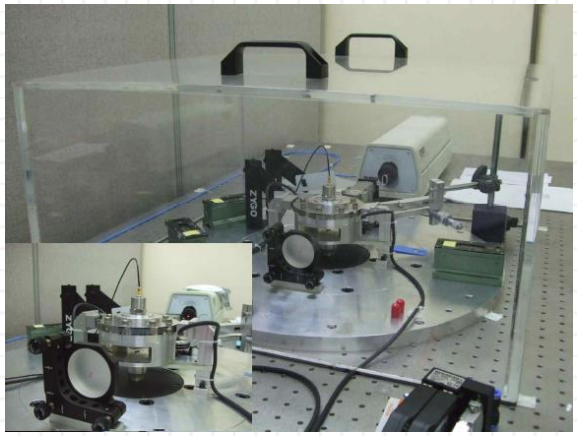
Estimation of correction factor using data collect at the uncontrolled condition (Internoise 2013)

- **Estimated correction factor**
  - ✓ **More reasonable factor obtained with reference condition**



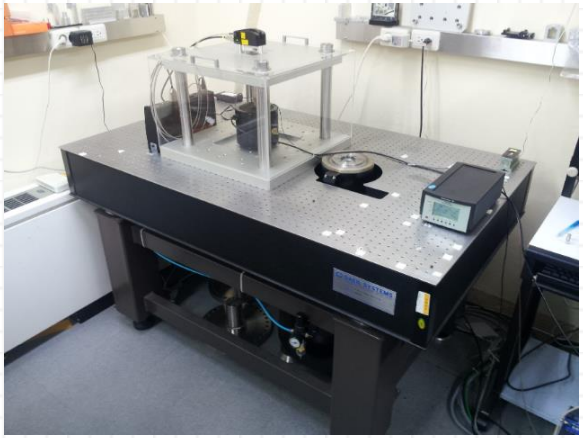
Highlights on Angular vibration

- **Recent activities:**
  - Completed the 1st comparison in angular vibration (with PTB): CCAUV.V-S1
    - Reviewed a draft version of Draft A of CCAUV.V-S1
  - Developing 'transfer standards' for angular vibration comparison calibration
    - Ultra-precision rotary encoders



- **Upgrade the frequency calibration range:**
  - Angle-prism based laser interferometer
    - Frequency range: 0.4 Hz ~ 1 kHz
    - Angular displacement: ± 30°

- **Developing 2nd generation system for primary linear/angular vibration calibration:**
  - New differential plane mirror interferometer (DPMI) system
  - New dynamic displacement measurement module (16-bit-ADC + FPGA) for DPMI
  - Targeted to integrate linear and angular calibration systems into one unit



Thank you !

KRISS 한국표준과학연구원