CCAUV/08-29

Recent Activities in AUV for KRISS

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11 pages inclusive

Recent Activities in AUV for KRISS

Hyu-sang Kwon

Acoustics & Vibration Lab.

Physical Metrology Group

KRISS

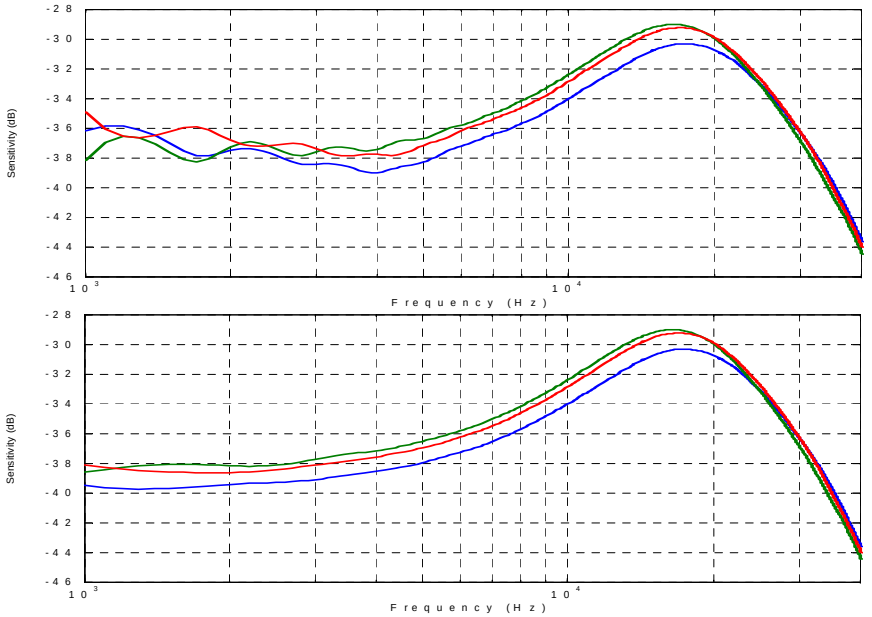
Contents

- Acoustics
- Ultrasound
- Vibration

Acoustics

- Contact Points:
  - Name: Dr. Sang Joon Suh
  - Email: sjs@kriss.re.kr
  - Name: Dr. Hyu Sang Kwon
  - Email: hyusang@kriss.re.kr

- **Free-field microphone sensitivity calibration**
  - Frequency range: 1 ~ 20 kHz
  - Uncertainty: 0.06 ~ 0.2 dB
  - Research under development
    - *Cross-talk cancellation*
    - *Instrumentation*

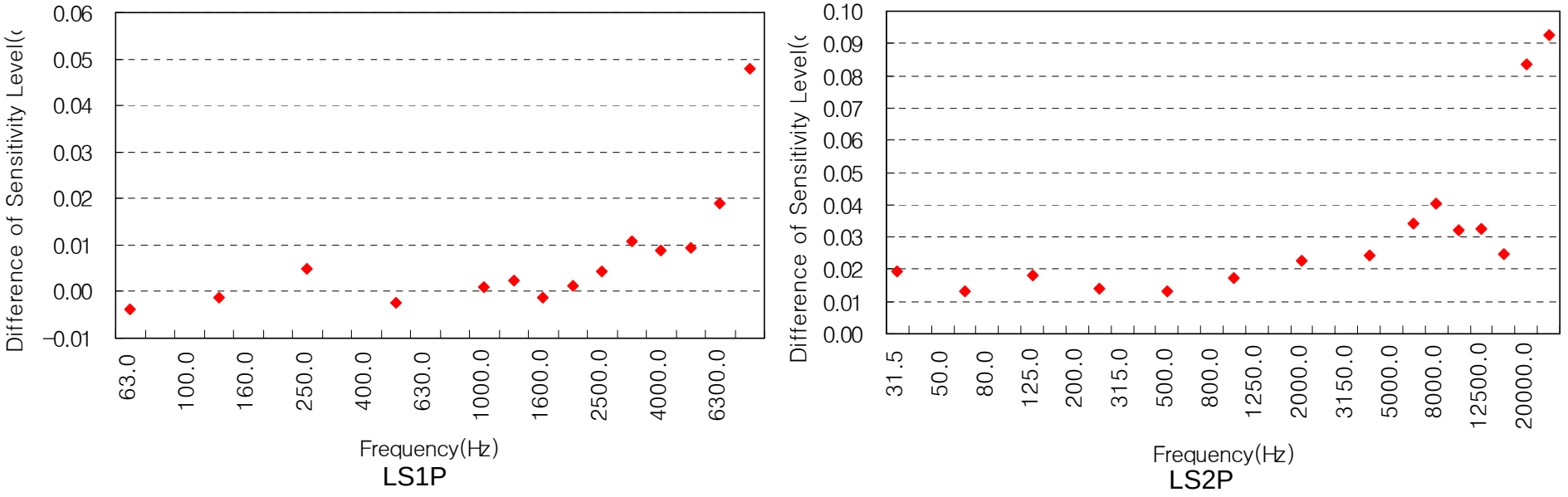


- **Pilot lab. for APMP.AUV.A-K3**
  - Project year: July-2006 ~ present
  - 10 Countries
  - Draft B

Acoustics

Bilateral Comparisons for LS1P and LS2P between Korea(KRISS) and Indonesia(KIM-LIPI)

- APMP.AUV.A-K1.1 and APMP.AUV.A-K3.1
  (Equivalent to CCAUV.A-K1 and CCAUV.A-K3)
  - LS1P microphone frequencies 63Hz ~ 8kHz
    LS2P microphone frequencies 31.5Hz ~ 25kHz
  - Measurements were completed, draft report A is under preparation

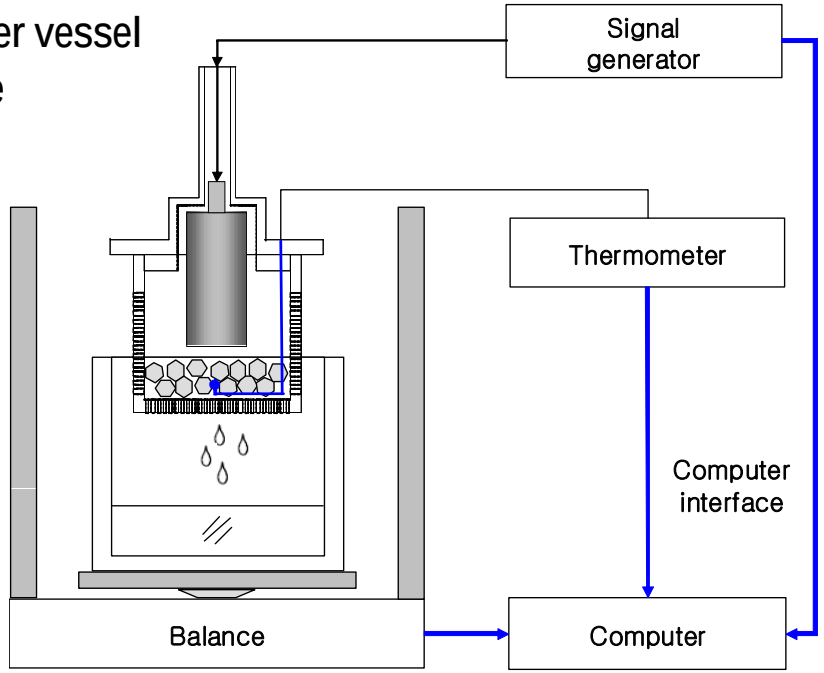


Sensitivity level difference between KRISS and KIM-LIPI

Ultrasound

- Contact point:
  - Name: Dr. Yong Tae Kim
  - Email: ytkim@kriss.re.kr

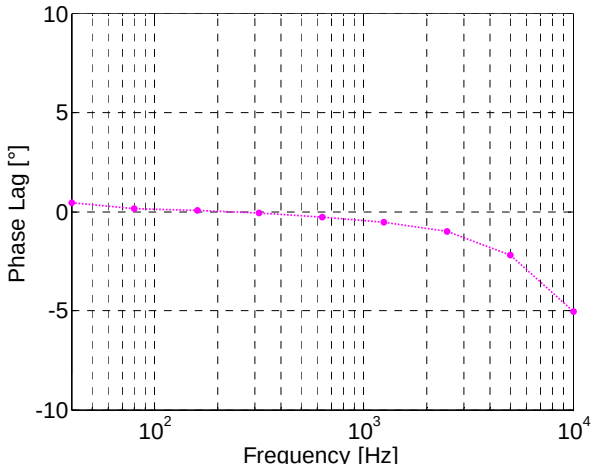
- Developing a new ultrasonic power measurement technique
  1. Move downward transducer and ice in a water vessel
  2. Generate the ultrasound in water-ice mixture
  3. Ultrasound induces temperature rise
  4. Ice is melted by the increased temperature
  5. Move upward the transducer and ice left
  6. Measuring weight of melted water
  7. Multiply specific latent heat of ice
  8. Various corrections
  9. Determine the ultrasound power



Vibration: Linear Acceleration

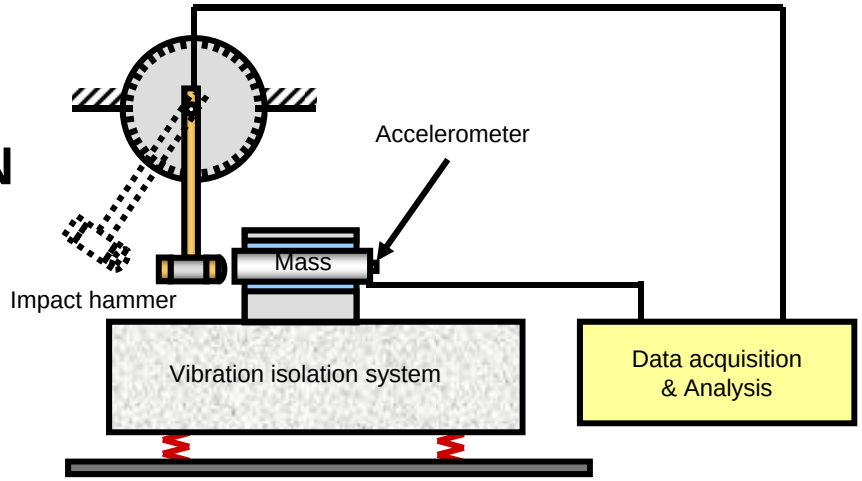
- **Contact point:**
  - Name: Dr. Yong Bong Lee
  - Email: lyb@kriss.re.kr

- **Estimation of phase lags of an accelerometer**
  - **Frequency range : 40 Hz ~ 10 kHz**
  - **Homodyne Michelson interferometer with a single photo-detector is used**
  - **Fourier Transform of the interferometer signal**
  - **Meas. Sci. Technol. 19(2008)**
  - **Under study**



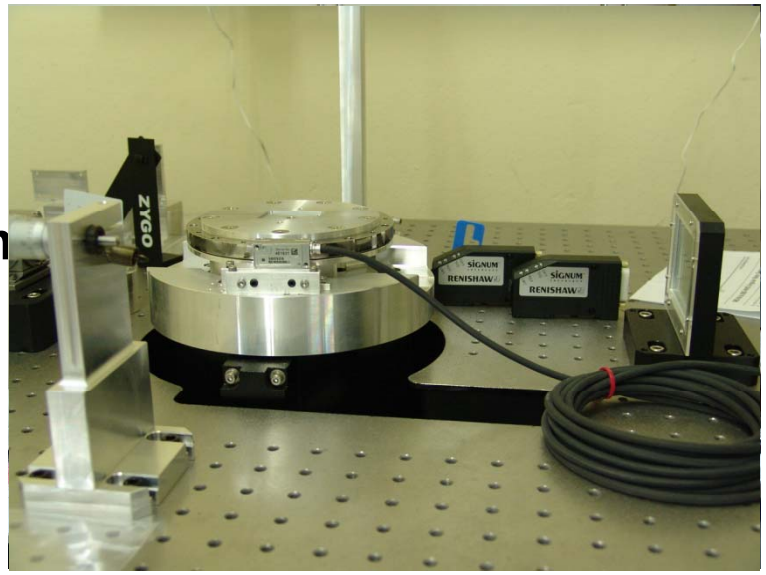
Vibration: Linear Shock

- **Impact hammer calibration system**
  - **Project year: 2007 ~ 2008**
  - **Pulse width : 3 ms ~ 7 ms**
  - **Peak force : 300 N ~ 700 N**
  - **Uncertainty : 5 % (k = 2)**
  - **Under development**



Tip	Force (N)	Duration (ms)	Sensitivity (measured)	Sensitivity (nominal value)
Super soft	300	7	0.245	0.23
Soft	420	4.7	0.256	
Medium	650	3	0.246	

Angular Vibration

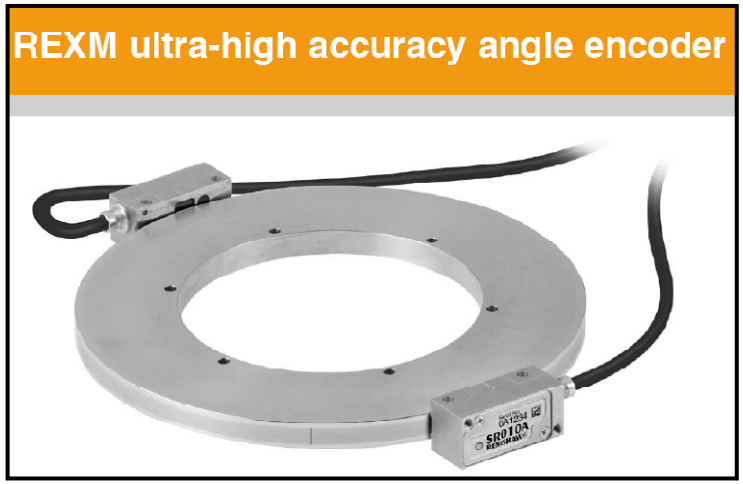


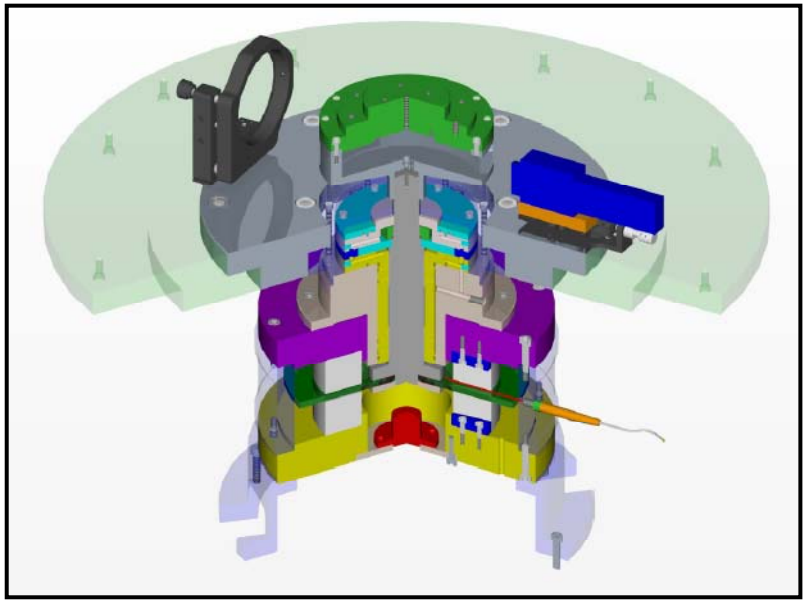
- **Contact point:**
  - Name: Dr. Wan-Sup Cheung
  - Email: wansup@kriss.re.kr
- **Angular Vibration Calibration System**
  - **Laser interferometer**
    - Angular prism + DPMI
    - ZMI4004 measurement board
    - Uncertainty: 0.49 μ-radian (k = 2, ±30 °)
  - **Low frequency angular exciter**
    - Direct driven rotary + Digital power amplifier
    - Characteristics:
      - **0.1 % ~ 1.0 % HDR for 0.1 Hz ~ 8 Hz**
      - **2.0 % ~ 5.0 % HDR for 10 Hz ~ 160 Hz**
  - **Transducer output measurement sub-system**
    - Dual 7.5 digit DMM with 1.8 MS/s isolated digitizer
    - Voltage & current signals measurable
    - Full digital measurement using EASM (Equi-Angle Sampling Method)
      - Amplitude measurement uncertainty: 0.04% (k =2)
      - Phase delay measurement uncertainty: 0.05 degree (k = 2)

Angular Vibration

- **Measurement Range : ± 360˚**
  - Uncertainty (95%) : Amplitude ≤ 0.2 %, and Phase ≤ 0.2˚)
- **Bilateral Comparison with PTB (Planed in 2009~2010)**
  - Protocol in preparation (Draft version by KRISS)
  - Reference angular accelerometer: Under construction by B&K

REXM ultra-high accuracy angle encoder



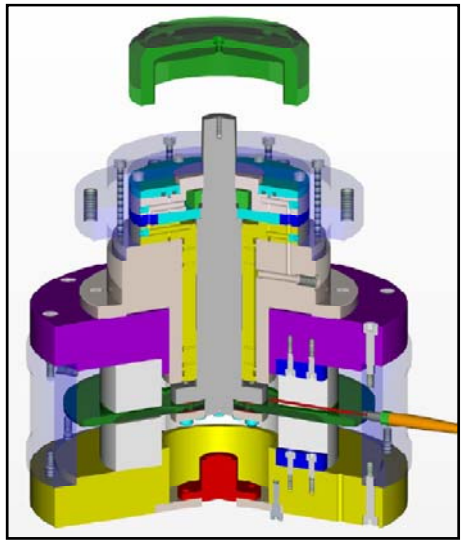


- **Main Specifications:**
  - Resolution: 2.5×10^{-6} °
  - Reference zero position
  - Unlimited measurement range
  - Applicable to 100 Hz

- **Laser Interferometer System**
  - Very compact optic components
  - Calibration exciter (made by KRISS)

Angular Vibration

- **Development of Angular Vibration Exciters**
  - Model for Primary / Comparison Calibration (90% progress): *Commercialised in 2009*
  - Model for Portable Angular Vibration Exciter (Under Design)



- **Applications of Angular Vibration Exciter**
  - Non-Rotation Balancing Machine (applied to patent)
  - Laser Beam Position Locator (like Galvanometer)