Report to the CCAUV on BIPM-WS on Challenges in Metrology for Dynamic Measurement

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BIPM-WS on Challenges in Metrology for Dynamic Measurement

Considering growing demands for dynamic measurement from industries, and a lack of validated methods and accepted procedures, a workshop on dynamic measurement has been organized at the BIPM on 15-16 November 2012. More than 50 attendees from 25 NMIs participated. WS report has been published on the BIPM website.

http://www.bipm.org/en/events/dynamic_measurement/

Agenda

Date: 15-16 November, 2012, Venue: BIPM

Day 1

- Session 1 Mechanical Quantities
  - (Force, Torque, Vibration, etc.)
- Session 2 Fluid and Flowmetry
  - (Pressure, temperature, and volume of fluid)
- Session 3 Thermo Physical Quantities
  - (material properties, etc.)

Day 2

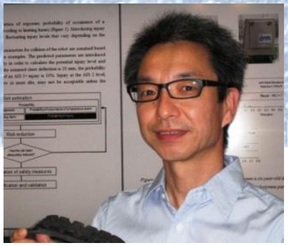
- Session 4 System Identification and Calibration
  - (Numerical analysis, GUM etc.)
- Breakout sessions in 2 groups, 2 time slots

Mechanical Quantity	Thermo physics
Fluid and Flowmetry	System Identification and Calibration

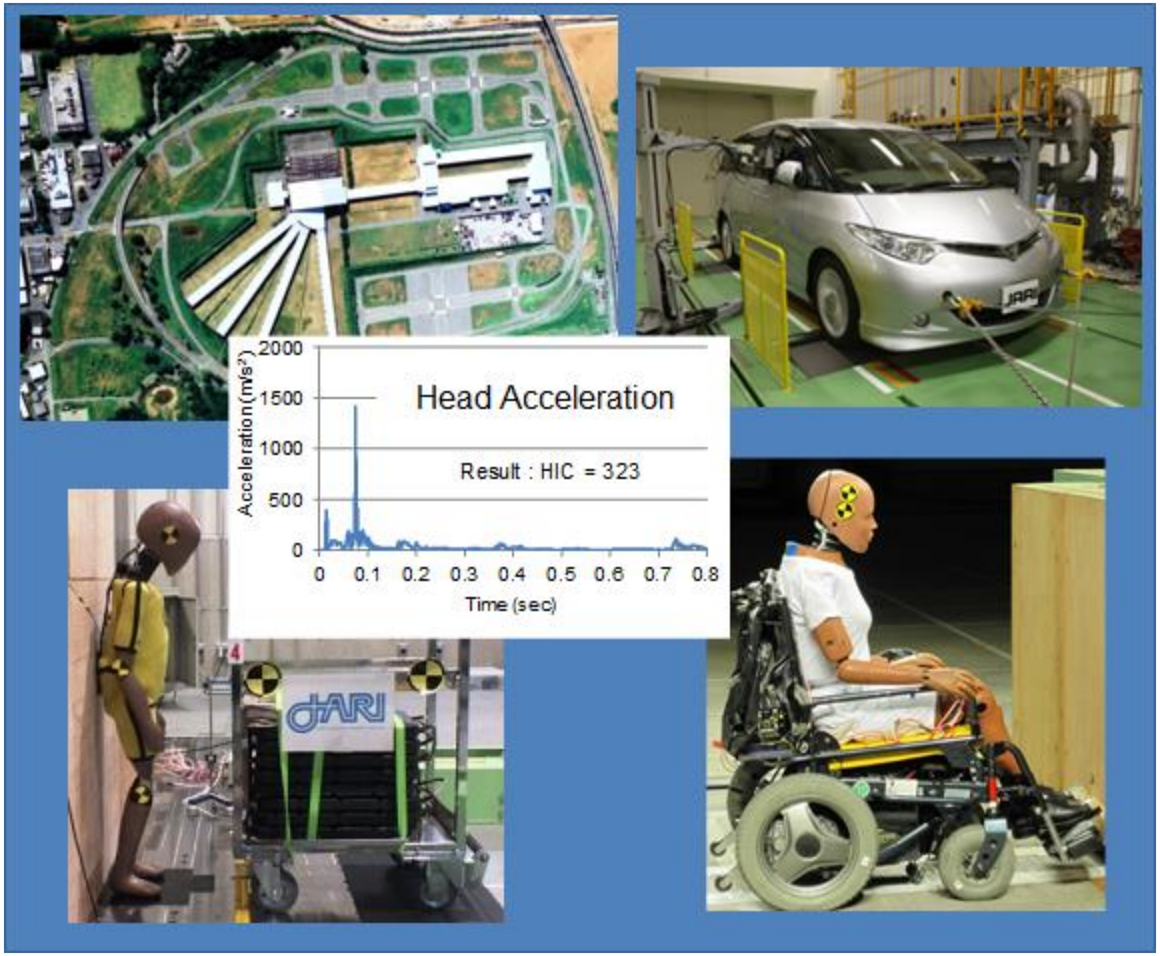
- Wrap-up session

Session 1 Mechanical Quantities

Title: Requested reliability of dynamic mechanical measurement in mobility, from automobile to service robot
Speaker: Dr. Tatsuo Fujikawa, JARI



- JARI: Independent lab. for automotive research & test in Japan
  - ✓Research and testing on automotive safety and environments by contracts with government and private companies
  - ✓Expanding their research and testing field to safety of robotics in terms of interactions with human
  - ✓In this presentation, dynamic measurement methods for collision of robots will be reported and discussed.



Title: Challenges in dynamic torque and force measurement with special regard to industrial demands

Dr. André Schäfer, HBM

- Dynamic Torque
  - engine test stands
  - power measurement

Source: HBM

Source: HBM

- Dynamic Force
  - In production
  - In material testing

Source: „Bremsenhand-buch…" ATZ/MTZ publishing

Source: HBM

Requirements today and in the foreseeable Future

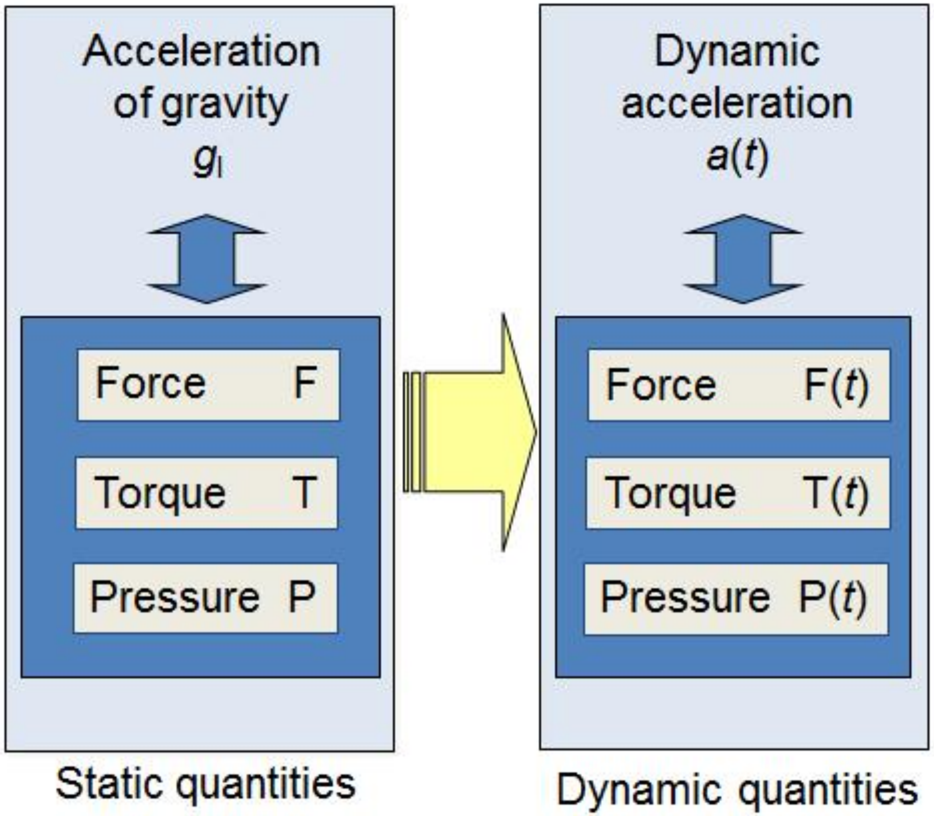
Title: Dynamic measurements for mechanical quantity standards, from NMIs to industries

Dr. Gustavo Ripper, INMETRO

INMETRO

Vibration Laboratory

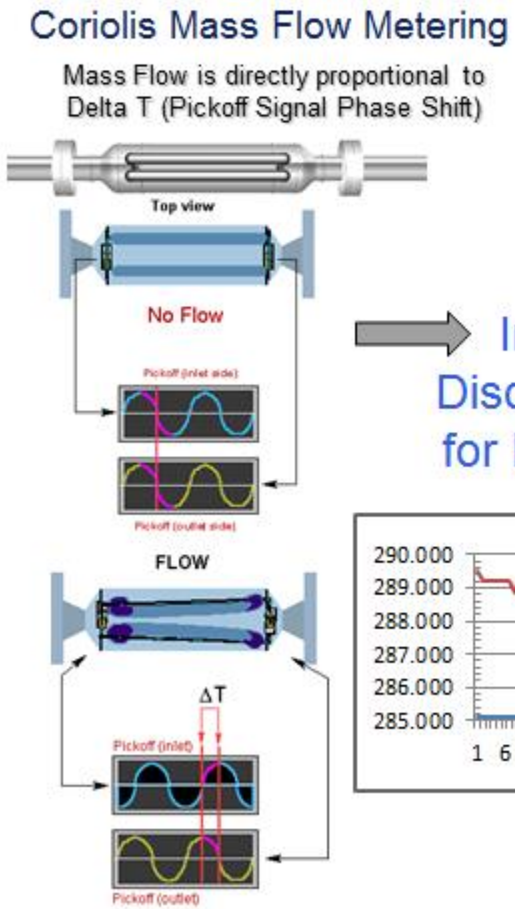
- Realization
  - Acceleration as a strongly related example
  - Measurement principles
  - Facilities at NMI level
- Dissemination
  - Calibration labs and accreditation
  - Documentary standards
- Is the international metrology fit for dynamics?



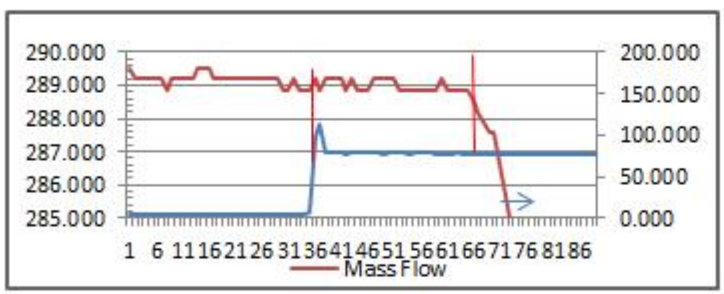
Session 2 Dynamic Fluid and Flowmetry

Title: Challenges in Characterizing Flowmeter Dynamic Response

Chuck Gray, Micro Motion



In this Presentation I will Discuss Industrial Applications for High Speed Flow Metering

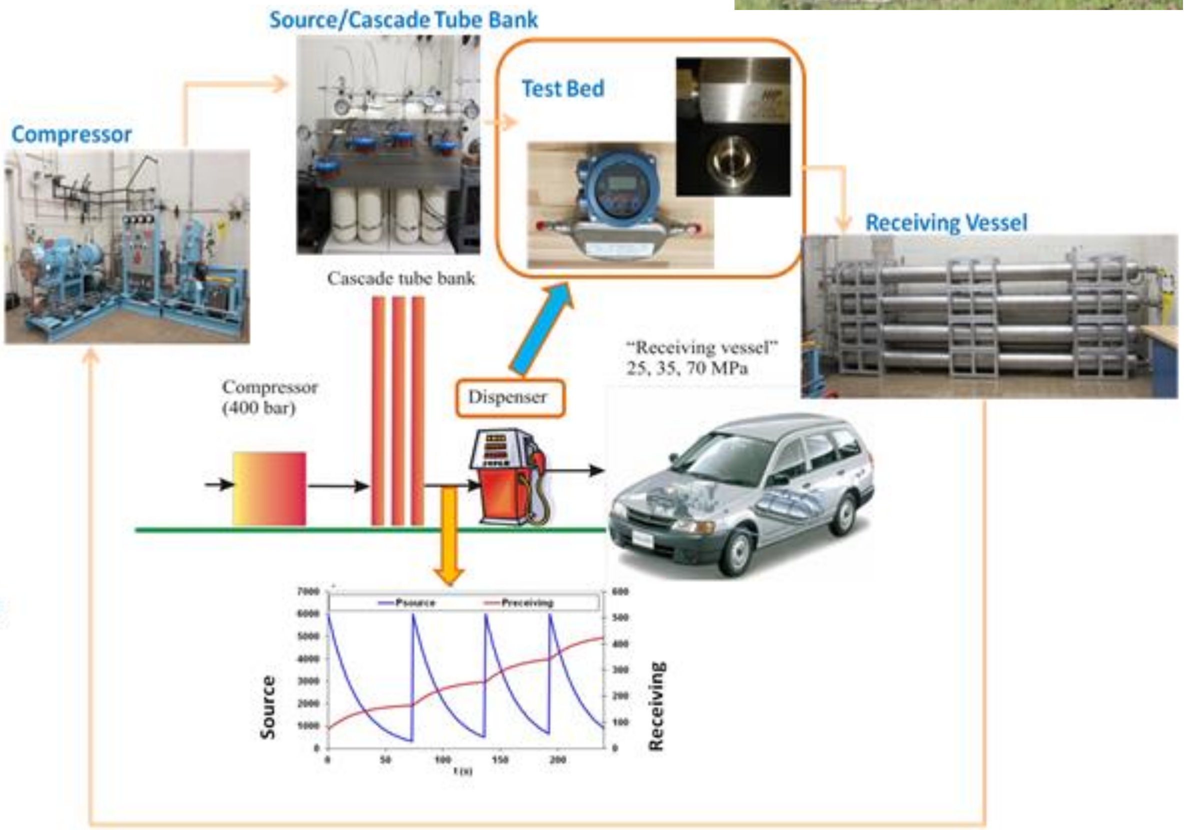


Title: Flow Measurements for Gaseous Fuel Dispensers

Dr. John Wright and Dr. Jodie Pope, NIST

➢ Need for transient flow metrology

- Flow meter calibrations are normally performed under steady state conditions.
- Transient conditions exist in important meter applications (compressors, refueling, engines).
- New facility evaluates flow meters under transient pressure, temperature, and flow conditions.



Session 3 Thermo Physical Quantities

Title : Response time of temperature sensors for civil nuclear applications
Speaker : Dr. Ronan Morice, LNE, France (Collaborated with EdF)

➢ EdF: a leading energy player, active in all major electricity businesses

✓ **EDF-Septen :**
Expertise in the design of new nuclear power stations
Establishing the safety and technical doctrine applicable to the design of facilities and equipment (principles, rules, technical specifications)

✓ **Particular Nuclear Challenges:**
Qualify equipment to demonstrate their ability to fulfill their mission and keep their characteristics throughout their operating life,
Exploit feedback from ourselves & third operators to always re-examine our best-practices.

✓ **Co-developments** with LNE to validate technical criteria prior to installation of equipment for decades

✓ **This lecture :** Dynamic measurement methods for temperature sensors will be presented and discussed

Title : Dynamic measurements of thermophysical properties for materials

Speaker : Dr. Tetsuya Baba, AIST/NMIJ, Japan

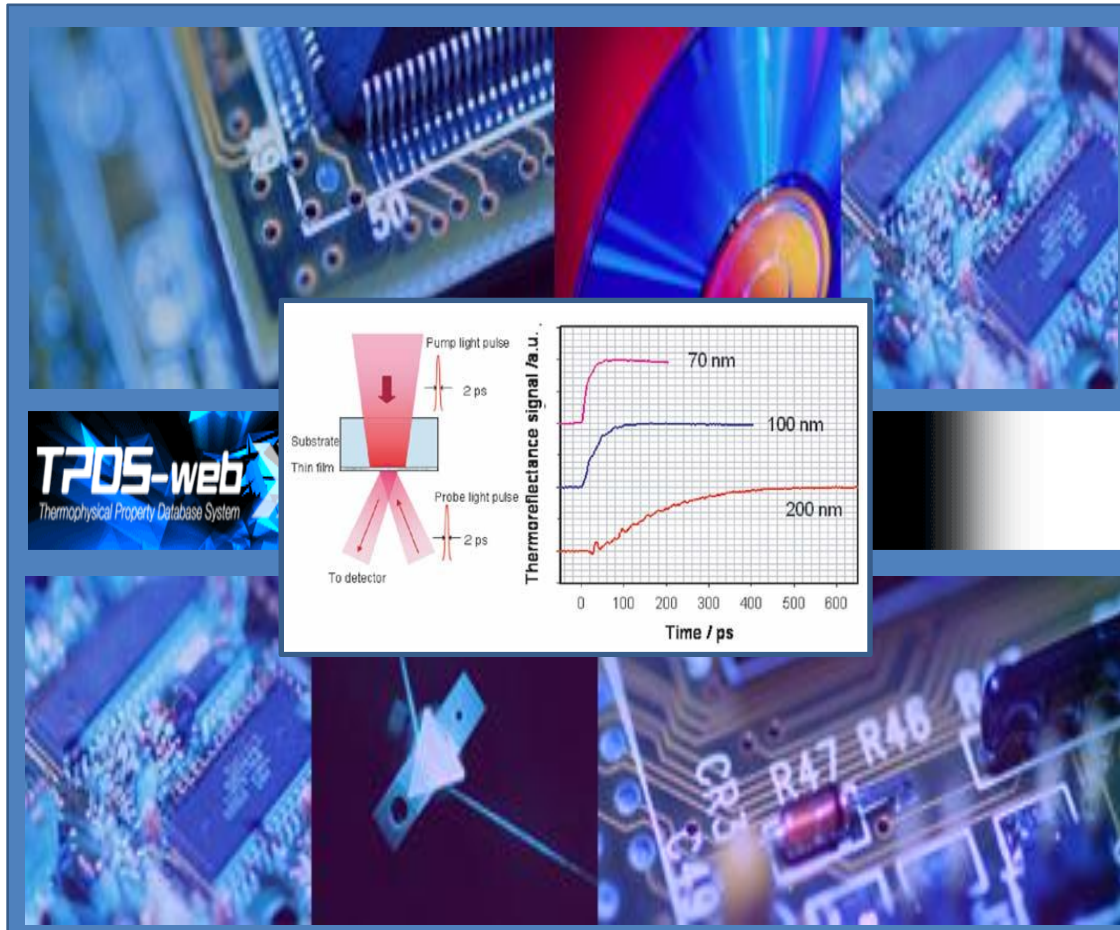
➢ AIST/NMIJ: Supporting the Japanese economic activities in the international market

✓ **Research Field :**
Thermal and measurement science,
Thermal engineering,
Material metrology

✓ **Introduced :**
Impulse response function and transfer function to analyze laser flash method for thermophysical properties measurement

✓ **Developed:**
Thermophysical properties measurement for thin films by thermo-reflectance techniques

✓ **In this presentation :**
Dynamic measurement methods for advanced materials and energy issues will be reported and discussed



Source: www.pico-therm.com & www.nmij.jp

Session 4 System identification and calibration

Title: Dynamic Measurement Challenges: An Industry View

Speaker: Pete Loftus – Rolls-Royce plc

➢ Rolls-Royce - The Global Power-Systems Company

- ✓ Remit: Measurement Engineering for Test, Manufacturing, Laboratories, and Product Systems
- ✓ Interested in: measurement process and optimising the research portfolio
- ✓ In this presentation: overview of requirements for dynamic measurement capability

Title: System identification and uncertainty analysis for challenging dynamic measurement applications: a case study in micro-Newton level force measurement

Speaker: Ben Hughes, NPL

- NPL: National Physical Laboratory, UK

  - ✓The UK's National Metrology Institute, maintains and disseminates measurement standards.
  - ✓Developing methods and instruments for measurement of dynamic thrust and vibration at the micro-newton level.
  - ✓In this presentation, uncertainty analysis for dynamic measurement applications.

Scientific Steering Committee Members

Name	Affiliation and technical expertise
Mr. Thomas Bruns	Physikalisch-Technische Bundesanstalt Traceable dynamic measurement in mechanical quantities
Mr. Fredrik Arrhen	SP Measurement Technology Institute of Sweden Pressure and Vacuum Group
Mr. Trevor Esward	National Physical Laboratory Leads mathematics and statistics work package of EMRP IND09
Mr. John Wright	National Institute of Standards and Technology Chairman of the Working Group for Fluid Flow under CCM
Mr. Jean-Rémy Filz	Laboratoire national de métrologie et d'essais Euramet TC-T, TPM Chair
Mr. Takashi Usuda*	National Metrology Institute of Japan, NMIJ/AIST
Mr. Nick Fletcher**	Electric Department Bureau international des poids et mesures

* Chair of the Scientific Steering Committee
** Scientific Secretary for the Committee

Attendees