

# APMP TCT Report to CCT

**Inseok Yang (KRISS)**

**Chair, APMP TCT**

**29<sup>th</sup> CCT meeting**

**Online, Oct. 2020 – Feb. 2021**

# Content of report

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- Structure of APMP TCT
- Recent APMP Meetings/Workshops
- APMP Comparisons update
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- TCI Project
- On-site peer reviews

# APMP TCT Structure

- Chair: Inseok Yang (KRISS), from Dec. 2018 to Dec. 2021 (3 y)
- Working Groups (5)
  - SPRT, FP and TPW (5 members led by I. Yang, KRISS)
  - Radiation Thermometry (6 members led by X. Lu, NIM, *after retirement of Y. Yamada (NMIJ)*)
  - Humidity (7 members led by H. Abe, NMIJ)
  - Industrial Thermometers (7 members led by Y.-G. Kim, KRISS)
  - Thermophysical Properties (4 members led by M. Akoshima, NMIJ)
- Task Group (1)
  - Strategy (7 members lead by B. I. Choi, KRISS)

Information can be found:

[http://www.apmpweb.org/fms/working.php?tc\\_id=T](http://www.apmpweb.org/fms/working.php?tc_id=T)

# Recent APMP TCT Meetings

- APMP 2017 TCT meeting: New Delhi, India, November 2017
  - 28 participants from 16 economies
- APMP 2018 TCT meeting: Singapore, November 2018
  - 26 participants from 15 economies
- APMP 2019 TCT meeting: Sydney, Australia, December 2019
  - 31 participants from 17 economies
- APMP 2020 TCT meetings:
  - Scheduled to be on [2 November 2020, Online](#)



<APMP 2017 TCT photo>



<APMP 2018 TCT workshop dinner photo>



<APMP 2019 TCT photo>

# Recent APMP TCT Workshops

- APMP TCT usually have a Workshop on Saturday before the annual APMP TCT meeting

<APMP 2017 workshop program>

Time	Title	Institute (Country)	Speaker
09:30 ~ 09:35	Welcome address	NMC/A*STAR (Singapore)	Wang Li
09:35 ~ 09:55	Development of thermopile based micro-calorimeter for biological sample	KRISS (Korea)	Joohyun Lee
9:55 ~ 10:15	The production, application and future of clinical contact thermometers in China	NIM (China)	Xiaofeng Lu
10:15 ~ 10:35	Thermometry metrology for verification of medical devices in Thailand	NIMT (Thailand)	Athikom Manoi
10:35 ~ 10:55	Calibration of Clinical Thermometers in India	NPLI (India)	D.D. Shivagan
10:55 ~ 11:15	Ear thermometer evaluation at NMC	NMC/A*STAR (Singapore)	Wang Li
11:15 ~ 11:30	Coffee break		
11:30 ~ 11:50	Technological Developments of DCC Bridge for Thermometry Applications	Guildline (Canada)	Lu Shao
11:50 ~ 12:30	Q&A		
12:30	End		

<APMP 2018 workshop program>

Time	Title	Organization (Country)	Speaker
09:00 ~ 09:05	Welcome address	NMC/A*STAR (Singapore)	Wang Li
09:05 ~ 09:35	Redefinition of kelvin – The CCT approach	NMC/A*STAR (Singapore)	Wang Li
09:35 ~ 10:05	Determination of the Boltzmann constant by Johnson noise thermometry	NIM (China)	Feng Xiaojuan on behalf of Qu Jifeng
10:05 ~ 10:35	Coffee break		
10:35 ~ 11:05	The Vital link between Measurement and Energy Efficiency	Measurement & Verification Pte Ltd (Singapore)	Steven Kang
11:05 ~ 11:35	Effects of air circulation in climate chamber on the air temperature	KRISS (South Korea)	Y.G. Kim
11:35 ~ 12:05	Development of a TDLAS-based hygrometer for industrial measurement	NMIJ (Japan)	Hisashi Abe
12:05 ~ 12:35	Calibration of Industrial thermometers as an NMI: a case study on KRISS and Korea	KRISS (South Korea)	Inseok Young
12:35 ~ 13:35	Lunch		
13:35 ~ 14:05	Wireless temperature measurement for industry at high temperature	NIM (China)	Feng Xiaojuan
14:05 ~ 14:35	Study of the influence of the platinum wire microstructure on the SPRT/PRT stability performance	Fluke Corporation (USA)	Ding Rong
14:35 ~ 15:05	CHINO's involvement to temperature standard	Chino Corporation (Japan)	Kobayashi
15:05 ~ 15:35	Q&A discussions		
15:35 ~ 16:05	Tea break and end of WS		

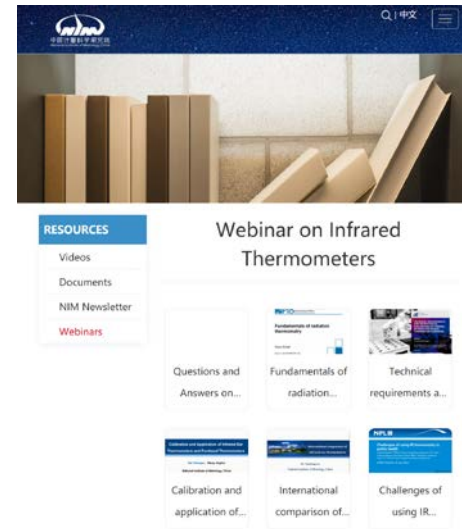
<APMP 2019 workshop program>

Time	Title	Organization (Economy)	Speaker
09:20 ~ 09:30	Welcome address	TCT chair	Inseok Yang
09:30 ~ 10:00	Consideration of melting temperature as a fixed-point of pure nickel	KRISS (Korea)	Yong-Gyoo Kim
10:00 ~ 10:30	Comparison of copper fixed-point cells by using Pt/Pd thermocouples	NIMT (Thailand)	Oijai Ongrai
10:30 ~ 11:00	Tea break		
11:00 ~ 11:30	Progress of the Photonic Thermometry at NIM	NIM (China)	Xiaojuan Feng
11:30 ~ 12:00	Miniaturization of a CRDS-based trace-moisture sensor	NMIJ (Japan)	Hisashi Abe
12:00 ~ 12:30	Overcoming the challenges of migrating from AC to DC thermometry	Guildline	Richard Timmons
12:30 ~ 13:30	Lunch		
13:30 ~ 14:00	Development of a humidity generator operating at low temperature and low pressure for calibration of radiosonde humidity sensors	KRISS (Korea)	Sang Wook Lee
14:00 ~ 14:30	Calibration of upper air temperature sensors under mimicking the air conditions	KRISS (Korea)	Yong-Gyoo Kim
14:30 ~ 15:00	National proficiency testing on industrial radiation thermometer in the temperature range from -20 °C to 900 °C	NMC, A*STAR (Singapore)	Fan Yan
15:00 ~ 15:30	Tea break		
15:30 ~ 16:00	Is extrapolation based on measured (non) linearity an answer to calibrate heat-flux sensors above 120 kW/m <sup>2</sup> ?	NMIA (Australia)	Eric van der Ham
16:00 ~ 16:30	Implementation of instantaneous comparisons method in temperature gradient evaluation of stirred liquid temperature baths	SCL (Hong Kong)	C. M. Tsui
18:00 ~	TCT workshop dinner		

- However, there will be **no** APMP TCT workshop in 2020.

# Webinar on Infrared Thermometers

- Webinar organized by NIM as metrology's response to the COVID-19 pandemic
- Held on 8 July 2020
- More than 270 participants from ~ 80 economies
- Talks can be found at <https://en.nim.ac.cn/taxonomy/term/251>



# APMP comparisons update since 2017 (1/2)

Identifier	Comparison	Status
CCT-K4.1	Ar realization	Draft report being prepared
CCT-S3	Thermal diffusivity	Draft A report completed
APMP.T-K3.5	Zn realization	Abandoned
APMP.T-K3.6	Ar realization	Draft A report being revised after APMP review
APMP.T-K4.1	Ag realization	Draft A report being revised after APMP review
APMP.T-K4.2	Al realization	Measurement in progress
APMP.T-K6.2013	DP Meter	Measurement in progress
APMP.T-K7.1	TPW realization	Final Approval of the report, Result published
APMP.T-K8	High DP meter	Revised Draft B under CCT-WG-KC review
APMP.T-K9	SPRT Ar-Zn	Measurement in progress

# APMP comparisons update since 2017 (2/2)

Identifier	Comparison	Status
APMP.T-S8	LiG Thermometer	Measurement in progress
APMP.T-S9	Thermal diffusivity	Measurement just started after protocol approval
APMP.T-S10	Thermal conductivity	Measurement just started after protocol approval
APMP.T-S11	Radiation thermometer	Draft report being prepared
APMP.T-S12	Radiation thermometer	Draft report being prepared
APMP.T-S13	DP Meter	Measurement in progress
APMP.T-S14	RH meter	Measurement in progress
APMP.T-S15	Ear Thermometer	Draft report being prepared
APMP.T-S16	Thermocouple	Measurement in progress
APMP.T-S17	Air thermometer	Circulation of artifact delayed after protocol approval



# Hybrid comparison

- Similar to bilateral comparison, but based on the commercial calibration report of the “issuing NMI”
- “Applicant NMI” is supposed to write comparison report, relieving workload of the pilot NMI in usual bilateral comparison
- Blindness of the comparison is assured by the comparison design and the “third party” surveillance
- More information can be found on the APMP Guideline:  
<http://www.apmpweb.org/documents/hybrid.php>

<List of on-going APMP Hybrid comparisons>

Code	A-NMI	I-NMI	Artifact/Range	Third party	Status
APMP.T-H1	MSL-BD	NMC	IPRT from -80 °C to 400 °C	TCT Chair	Report being prepared
APMP.T-H2	MSL-BD	NMC	LiGT from -80 °C to 80 °C	TCT Chair	Report being prepared
APMP.T-H3	MUSSD	NIM	SPRT from TPW to Zn	TCT Chair	Measurement in progress

# Intra-RMO CMC reviews

- APMP TCT makes Call for CMC submission yearly every June
- Upon the Call, NMIs submit CMCs through KCDB 2.0 ([since 2020 submission](#))
- CMCs are reviewed by WGs in TCT (inter-RMO CMCs as well)
- Preliminary review results are discussed during the annual TCT meeting, and finalized by the end of Year.
- CMCs reviewed in 2019 were submitted through KCDB 2.0 in the beginning of 2020. ([Special case due to the start of the KCDB 2.0](#))
- 2020 intra-RMO CMC review is ongoing.

# TCl project

- TC Initiative project
- Funded by APMP to TC-specific projects, usually order of \$10k
- Recent TCI projects in APMP TCT
  - TCT\_01\_TCI2017 Comparison on Relative humidity: Support for travelling standard for APMP.T-S14. Measurement in progress
  - TCT\_02\_TCI2017 Comparison on Moisture measurements. Project finished, result presented at TEMPMEKO 2019
  - TCT\_01\_TCI2018 Comparison on LiG thermometer. Support for “Exercise loop” for developing laboratories. Measurement in progress
  - TCT\_01\_TCI2019 Ag freezing point pilot study within APMP. Protocol being discussed.

# On-site peer reviews 2017–2020

Year	NMI reviewed	Field	Reviewer affiliation
2017	KRISS	Thermometry, Humidity	NIM, NIM, NMIJ
2017	MSL	Humidity	NMIJ
2018	NIM	Contact thermometry	PTB
2018	NMIJ	Thermometry, Humidity	CMS, MSL
2018	SCL	Thermometry, Humidity	NPL, NMIJ
2019	MSL	Thermometry	NRC
2019	NMIA	Thermometry, Humidity	PTB, MSL

- Peer Reviews in 2020 are being delayed due to COVID-19. [APMP Guidelines for On-site Peer Reviews/Assessment under the COVID-19 Circumstances](http://www.apmpweb.org/documents/qsdocuments.php) can be found at <http://www.apmpweb.org/documents/qsdocuments.php>