Consultative Committee for Photometry and Radiometry (CCPR)
23rd Meeting (22 - 23 September 2016)

Questionnaire on activities in radiometry and photometry

Reply from: <NMI name>

Delegate: <author name>

1. Summarize the progress in your laboratory in realizing top-level standards of:

   (a) broad-band radiometric quantities

   METAS has introduced a new tunable laser system (1kHz, ns-pulses) covering the wavelength range form 200 nm to 2 μm for the calibration of photodiodes and laser power meters. The new system complements the existing quais-cw system that covered a limited wavelength range. Investigation on the effects related to short pulses (fs to ms) and duty cycles on various detectors types are ongoing.

   (b) spectral radiometric quantities

   The new tunable laser system is used for the characterization of spectra-radiometers (i.e. straylight, linearity and wavelength). In new spectrometer system has been integrated in to the existing goniophotometer allow the realization of the quantity spectral radiant flux.

   (c) photometric quantities

   In the framework of the EMRP project MESaiL METAS has introduced new characterization methods for goniophotometers. Using a highly spatial modulated light source the uncertainty due to angle can be estimated.

   (d) fiber-optics quantities

- METAS is working in the frame of the EMPIR PhotInd project on the development of a fully traceable system for the calibration of the Encircled Angular Flux (EAF) in step index multimode fiber systems. A first prototype system was already built and is currently under evaluation.

- METAS is also working in the same project on the development of traceable artefacts for the calibration of the distance scale of high resolution Optical Time Domain Reflectometers (OTDR) and of Optical Low Coherence Interferometers (OLCR). These artefacts are based on integrated optical recirculating delay lines.
  Another topic of interest is the development of spectral attenuation reference fibres with controlled modal distribution for the calibration of the attenuation scale of multimode OTDR.

- METAS also contributes in the same project to the development of a fibre coupled cryogenic radiometer, together with CMI.

- METAS is working on the development of a compact stabilized optical frequency combs based on pulsed MIXSEL lasers, in order to produce compact multiline wavelength standards for the calibration of high resolution spectrometers. Different approaches towards the stabilization of the MIXSEL comb are currently under investigation.

- In the frame of the EMPIR project MIQC II METAS contributes to the development of measurement techniques for the characterization of the optical properties of critical components and systems used in quantum communication systems.

- METAS is seeking for comparisons in the field of fibre optics, in particular for the following quantities:
    - Absolute power and linearity
    - Wavelength (frequency comb)
    - Spectral Attenuation (fibres)
    - Encircled Flux.

2. What other work has taken place in your laboratory in scientific or technological areas relevant to the CCPR?

   METAS is offering consultancies and test services to national authorities (federal, cantons, cities) in the field of laser safety and glar evaluation of laser pointers. It participates at glare tests of helicopter pilots. In addition METAS consults National Health Organization of Switzerland elaborating a National law for safety of non-ionizing radiation. These activities will increase in future as a national law for protection against non-ionizing radiation is presently under adoption by the Parliament.

3. What work in PR has been/will be terminated in your laboratory, if any, in the past /future few years? Please provide the name of the institution if it has been/will be substituted by a DI or accredited laboratory.

Presently no activity related to CCPR is planed to be terminated.

4. What are present, new or emerging needs of users of your services that are not being supported sufficiently by current CCPR activities or initiatives? In the light of this information please suggest desirable changes in the future working program of the CCPR.

5. What priorities do you suggest for new research and development programmes at NMIs in the area of Photometry and Radiometry?

   The priorities for new research and development programmes at NMIs depend greatly on the national needs. Larger developments shall be developed with international coordination and in international collaborations (like EMRP and EMPIR).

6. Are there any research projects where you might be looking for collaborators from other NMIs or are there studies that might be suitable for collaboration or coordination between NMIs?
7. Have you got any other information to place before the CCPR in advance of its next meeting?
8. Bibliography of radiometry and photometry papers of your laboratory since the last CCPR (September 2014)?

- P. Blattner, F. Rinderer, "Real-time assessments of laser show hazards", ILSC 2015, #801, Mar. 23, 2015 - Mar. 26, 2015, Albuquerque, 2015
- P. Blattner, "CIE Test Method for LED Lamps, LED Luminaires and LED Modules", LED professional Symposium +Expo (LpS) 2015, Bregenz, 2015
- P. Blattner et al. "Polarization effects in mirror type goniophotometers", 28th CIE SESSION, Manchester, United Kingdom, June 28 – July 4, CIE 216, p. 1794 ff, 2015
- V. Jacobs, P. Blattner, Y. Ohno, A.S.J. Bergen, U. Krüger, P. Hanselaer, P. Rombauts, F. Schmidt "Analyses of errors associated with photometric distance in goniophotometry, also in this publication" 28th CIE SESSION, Manchester, United Kingdom, June 28 – July 4, CIE 216, p. 458 ff, 2015
- U. Krüger, P. Blattner, R. Hornischer, W. Bechter, W. Steudtner, W. Jordan, "Measurement uncertainty of photometric measurements considering the requirements of the new international Standards CIE S025:2015", 28th CIE SESSION, Manchester, United Kingdom, June 28 – July 4, CIE 216, p. 797 ff, 2015
- S. Nevas, , P. Blattner, O. El Gawhary, T. Pulli, P. Kärhä, L. Egli, Luca and J. Gröbner, "Characterisation of nonlinearities of array spectroradiometers in use for measurements of the terrestrial solar UV irradiance", 12th International Conference on New Developments and Applications in Optical Radiometry (NEWRAD 2014), p.89, 2014
- P. Blattner, S.M. Foaleng, S. van den Berg, O. El Gawhary, M. Blumthaler, J. Gröbner, and L. Egli " Devices for characterizing the wavelength scale of UV spectrometers"12th International Conference on New Developments and Applications in Optical Radiometry (NEWRAD 2014), p.201, 2014