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

Questionnaire on activities in radiometry and photometry

Reply from: Centro Nacional de Metrologia

Delegate: Carlos H. Matamoros

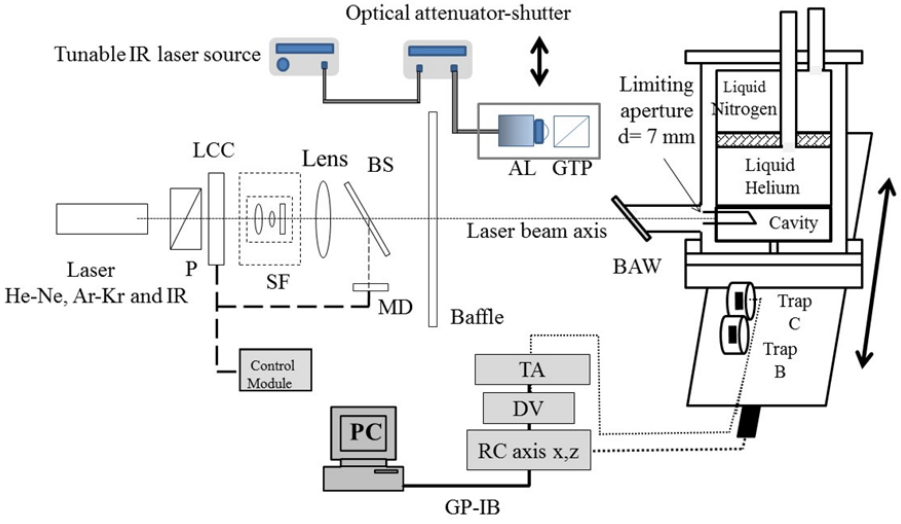
1. Summarize the progress in your laboratory in realizing top-level standards of:

   (a) broad-band radiometric quantities

   Continuing with the effort of improvement of UV measurements, new LED sources has been included in the system to provide services in 254 nm and 313 nm.

   (b) spectral radiometric quantities

   New laser lines has been already introduced in the cryogenic radiometer, to mention: 476 nm, 488 nm, 520 nm, 568 nm, 676 nm, 1 550 nm and 1 610 nm. This allows direct calibration of trap detectors against the cryogenic radiometer with reduced uncertainty.



Schematic of the Vis-IR multiple lines introduced to CENAM cryogenic radiometer

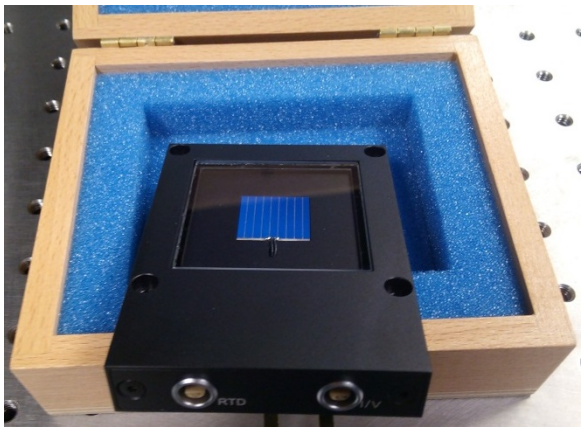
   (c) photometric quantities

   As a consequence of new laser lines in the cryogenic radiometer, the calibration of photometric detectors has been improved and lower uncertainty has been achieved, with an average uncertainty of 0.7 %, improving also other photometric scales, such as illuminance and luminance.

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

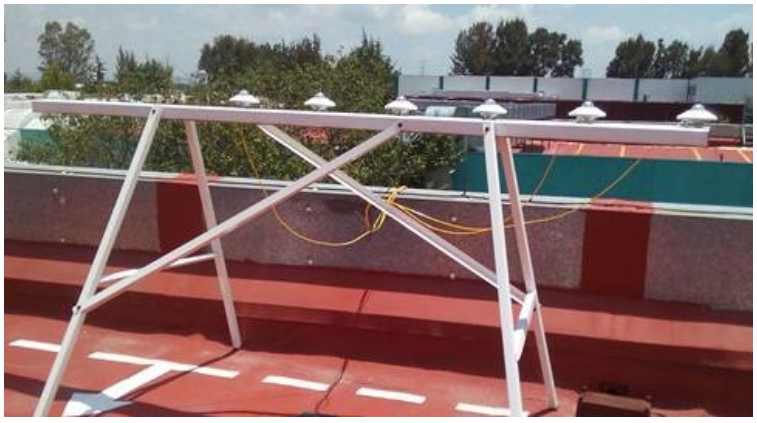
   Continue with the maintenance and improvement of scales (spectral irradiance, spectral responsivity, total luminous flux, Color temperature, etc.).

Setting of some capabilities related with renewable energy area, now we have some capabilities to characterize solar simulators: intensity distribution, stability test, spectral distribution, and its classification in terms of IEC standards.



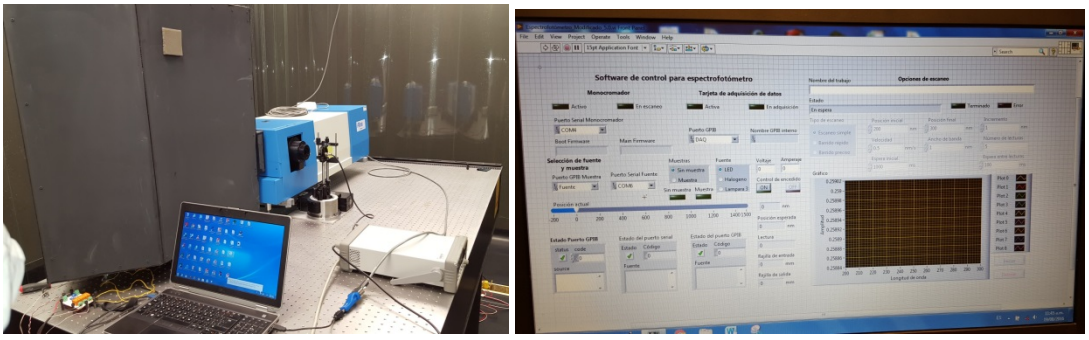
Reference solar cell for solar simulator classification.

Related with this last item, we develop a national comparison of pyranometers that includes some with traceability to WRR and some to the SI.



Setup for pyranometer comparison.

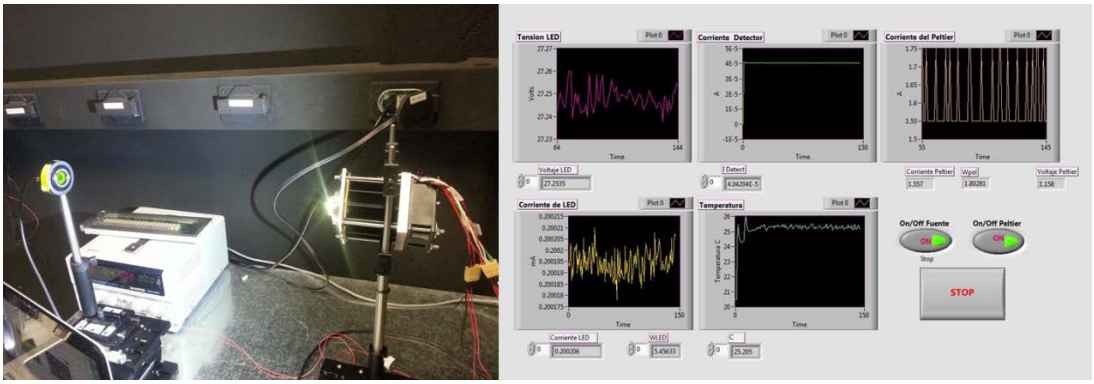
We are setting up an optical spectroscopy system. At the moment we have developed the monochromator control and the sources compartment, achieving a basic spectrophotometer behavior in the wavelength range from 190 nm to 1 500 nm. We are still tuning the system but the intention is to get a reference system for spectrophotometry, color, and related quantities.



Spectroscopy system under development (monochromator and sources housing on left and control program on right).

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.

   We are still working with the prototype for LED reference source (for radiometry and photometry). We are testing some configurations to get an efficient thermal management and reproducible results.



Stability test running on LED device.

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.

   A field that is present in the Mexican needs is turbidity.

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

   Development of countries and needs are very different, in our case, everything related with renewable energy is an item (solar cells, LED lamps).

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?

   LEDs reference standards, q-candela, PQEDs as reference standards in radiometry,

7. Have you got any other information to place before the CCPR in advance of its next meeting?

   None.

8. Bibliography of radiometry and photometry papers of your laboratory since the last CCPR (September 2014)?

   - H. A. Castillo-Matadamas, J. C. Molina-Vazquez, R. Quintero-Torres, Unexplored Indoors method for pyranometers calibration traceable to SI, 2015 J. Phys.: Conf. Ser. 582 012051 doi:10.1088/1742-6596/582/1/012051
   - J.C. Molina, Juan José Soto Bernal, Hector A. Castillo M., Rosario Gonzalez, Electrical substitution radiometer cavity absorptance measurement, Measurement, Volume 64, March 2015, Pages 89-93, ISSN 0263-224.
   - H A Castillo-Matadamas, J C Molina-Vazquez, R Quintero-Torres, CALIBRACIÓN DE PIRANOMETROS EN LABORATORIO CON TRAZABILIDAD AL SISTEMA INTERNACIONAL DE UNIDADES, Simposio de Metrología 2014.
   - SUPERCONTINUUM GENERATION IN PHOTONIC CRYSTAL FIBERS BY USE OF AN ULTRASHORT PULSE LASER WITH A CR:LISAF CRYSTAL, Minerva Robles-Agudo, Hector A. Castillo Matadamas, Eric M. Rivera-Muñoz, Miguel A. Ocampo Mortera, and Rafael Quintero Torres, NCSLI Measure J. Meas. Sci. junio 2014
   - J. C. Molina, Juan José Soto Bernal, Hector A. Castillo M y Rosario Gonzalez. Establecimiento del sistema de medición de la transmitancia de la ventana de Brewster del patrón primario de potencia óptica (cnm-pnf-12). Academiajournals Congress, Celaya-2014.
   - • Eduardo Pecina González (ITQ, Mechratonics Engineering); Yamilka Jocelyn Muñoz Macías (UPSRJ, Metrology Engineering); Alexis Robertson(UNR, Environmental Engineering); ADVISER Tatiana Ortega Alcántara (CENAM); Basic design and development of a spectrometric measurement system, Report of Internship, July 31, 2015
   - • Michel Medina López (ITQ, Electronic Engineer), Tatiana Ortega (Advisor) Diseño básico y desarrollo de un sistema de medición espectrométrico fase 2, Internship report july, 2016
   - • T. Ortega, M. Medina, C, Matamoros, “Sistema de espectroscopia óptica de referencia en el CENAM”, Simposio de metrología 2016, Querétaro, México, Septiembre 2016, ISBN pendiente.
   - Carlos H. Matamoros, Yoshi Ohno, Joanne Zwinkels, Jorge A. Cogno, Iakyra B Couceiro, “SIM key comparison for luminous flux. SIM.PR-K4”, metrologia vol. 53, Technical Supplement. 2016