Progress Report on Electrical Metrology at CENAM
2015 - 2016
Presented for the CCEM meeting 2017

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Electrical Metrology

CENAM member of the CCEM

The CIPM decided in October 2016, to accept CENAM as member of the CCEM.

Quantum Standards

PJVS. CENAM developed its own PJVS standard based on a NIST 10 V chip. We are currently working on the development of calibration systems for sampling voltmeters, calibrators and thermal voltage converters. A bilateral comparison of PJVS between BIPM and CENAM was performed in 2016; the results show good agreement in DC and in AC. caviles@cenam.mx.

CCC. In a joint project with NIST, a CCC was constructed to measure resistance ratios; the CCC will be used to measure electrical resistance between 1 Ω and 12.9 kΩ ohms having traceability to the QHE. The system has been tested at NIST. fhernand@cenam.mx.

AC voltage and Current

Standard of quality of power. CENAM developed a reference system for the harmonic measurement of voltage and current in steady state rcarranz@cenam.mx.

Thermal current converter. A thermal current converter for 1 A, up to 10 kHz, is under development, in order to improve the power and energy reference standard. The idea is to decrease the uncertainty that can be reached with a conventional system based on thermal voltage converters and current shunts. rcarranz@cenam.mx.

Coaxial Shunts. The design and construction of coaxial shunts was fulfilled, with the objective of increase the range of frequency up to 100 kHz and decrease the uncertainty on AC current measurement at 100 mA, 1 A and 5 A. rcarranz@cenam.mx.

Impedance

Frequency extension of capacitance. We are working to extend the frequency range of capacitance measurements between 50 Hz and 20 kHz, for 1 pF, 10 pF and 1 nF. jmoreno@cenam.mx.

Calculable resistors. The design, construction and characterization of calculable resistors of 1 kΩ (bifilar and quadrifilar) and 10 kΩ (octofilar) was finished. These developments are part of the project to give traceability to the farad from the dc-ohm (QHE). fhernand@cenam.mx.

Sampling Impedance Bridge. The development of an impedance bridge based in sampling techniques will start in collaboration with METAS. fhernand@cenam.mx.

Radiofrequency

Frequency range extension up to 40 GHz. CENAM took the necessary actions to increase the frequency range of the S-parameters standards and power standards up to 40 GHz, and is currently working to increase these up to 50 GHz. igarcia@cenam.mx

Coaxial microcalorimeter up to 50 GHz. In a joint project CENAM-KRISS, a coaxial microcalorimeter is being developed. The microcalorimeter is a 2.4 mm twin type, with thermoelectric type transfer standards, and operation inside a waterbath.. mbotello@cenam.mx

Radiated emissions standard. A reference system for radiated emissions in power supply cables between 30 MHz and 300 MHz was developed. igarcia@cenam.mx.

Magnetism

Magnetic Susceptibility standard. A magnetic susceptibility standard based in the Gouy balance is under development. mescobar@cenam.mx.

High Voltage and high Current

In the context of the recent opening of the mexican market of electrical energy, it is necessary to give traceability to electrical energy and quality of energy in high voltage and high current. To meet these needs CENAM started the design of high voltage and high current laboratories and standards. rcarranz@cenam.mx.

Publications:

In the CPEM 2016 Proceedings

1-Determination and Use of Temperature Coefficients of Inductance Standards./ J. A. Moreno

2- SIM Key Comparison of 10 mH Inductance Standards / J.A. Moreno, M. Cote, A. Koffman, B.I. Castro, R.B. Vasconcellos, G. Kyriazis, M. Cazabat, D. Izquierdo, C. Faverio and D. Slomovitz.

3- Development of Calculable Resistors at CENAM / A. H. Pacheco Estrada, J. A. Moreno, and F. L. Hernandez-Marquez

4- Algorithm for measuring amplitude and frequency deviations intended for PMU./ Rene D. Carranza and Marco A. Rodríguez.

5. CENAM's primary standard for microwave power up to 18 GHz / Mariano Botello-Perez, Thomas P. Crowley, Israel Garcia-Ruiz, Hildeberto Jardon-Aguilar.

In the Proceedings of the Simposio de Metrología, 2016. México

6. Efecto del ajuste a cero y conexión en la calibración de un puente RLC, José Ángel Moreno Hernández

7. Estudio de la distribución de calor en calefactor de transferencia térmica de corriente, Sergio Antonio Campos Montiel

8. El impacto del nuevo sistema internacional de unidades (si) en la metrología eléctrica de alta exactitud, Carlos David Avilés Castro

9. Implementación de algoritmo para la determinación de amplitud, fase y frecuencia para medición de sincrofasores, Marco Antonio Rodríguez Guerrero

10. The testing vs calibration site as a fundamental component of the measurement system in EMC and radiated fields metrology, Luis Eduardo Carrión Rivera

11. Criterios de diseño de un divisor de tensión resistivo con respuesta plana en frecuencia para la medición de parámetros de calidad dela energía, Adrián de Jesus Castruita Romero

12. Description of the calculable primary standard for antenna gain measurements from 1 GHz TO 18 GHz at CENAM / Luis Eduardo Carrión Rivera

13. Evolución de la oferta de servicios de calibración de potencia eléctrica en radiofrecuencias del CENAM / Rafael Castañeda Castillo

14. Cálculo de parámetros de calibración para la medición de coeficientes de reflexión y transmisión con AVRs / Susana Padilla Corral

15. Patrón nacional de campo emitido en forma radiada por cables de suministro eléctrico de 30 MHz A 300 MHz / Miguel Angel Muñoz Sancén

16. Design of a digitally assisted bridge for comparing four-terminal impedances / Alepth Hain Pacheco Estrada

17. Progresses in the development of CENAMs primary standard for microwave and millimeter-wave power up to 50 GHz / Mariano Botello Pérez