NRC Measurement Science and Standards: Report to the 29th Meeting of the CCEM 2015

Dr. Carlos Sanchez was appointed discipline leader for Electrical Standards following the retirement of Dr. Dave Inglis.

Watt balance

A measurement campaign was run in the fall of 2013 and a measurement of Planck's constant with an estimated uncertainty of 19 parts in 10^9 was reported in 2014 in the special edition of Metrologia (S5). The noise in the moving phase of the experiment has been reduced significantly; a 30-minute moving measurement now yields a type A uncertainty of 10 parts in 10^9.

DC voltage

NRC installed a new 10 V PJVS chip from NIST Boulder and performed a direct comparison between the old hysteretic JVS from 1986 and the new PJVS. The results are summarized in the CPEM 2014 Conference Digest. We participated in the NCSLI JVS Interlaboratory Comparison by measuring a set of four Zeners against the new PJVS. The new system will be used to calibrate digital voltmeters and DC reference standards once the quality system documentation is completed.

AC-DC transfer difference

We purchased a new bitstream pattern generator for the pulse-driven ACJVS to extend the frequency range down to a few Hz. The generator is being upgraded with custom amplifiers that will increase the data output voltages. New CMCs will be submitted for AC current shunt calibrations later this year.

DC resistance

NRC continues to support the development of GaAs QHR samples. Uncertainties have been reduced over the whole resistance range and new CMCs will be submitted later this year. We are piloting the CCEM-K2.2012 which is now on the third loop and expected to be completed this year. Excellent agreement was obtained on a bilateral comparison of 10 $\mu\Omega$ and 100 $\mu\Omega$ dc shunts with NIST.

Impedance

We developed a Maxwell-Wien bridge to calibrate inductance standards and participated in the SIM.EM-K3 comparison. New CMCs on Inductance are expected to be submitted this year. The Calculable Capacitor is still under development. Progress

has been significantly delayed due to a staff shortage following the retirements of two senior researchers.

RF

Continued development of the J-band calorimenter.

Electrical Power (details provided by Rejean Arseneau)

A Comparisons

1-EPM participated in the SIM.EM-K5 key comparison of 50/60 Hz power. The final report was published in Metrologia. This final report was presented by Rene Carranza representing the pilot lab CENAM at CPEM 2014

2- A bilateral comparison between NRC Current-comparator-based Power standard with NIST Quantum-based Power standard was recently accepted for publications. This comparison supported a proposed reduction of the uncertainty of our AC power calibrations from 20 µW/VA to 10 µW/VA. This was confirmed during a recent Peer Review.

3- A bilateral comparison with VSL on wideband CT calibration systems was presented at CPEM 2014. The comparison paper on CT calibration system is under review.

4- A Bilateral comparison with KRISS on high DC current shunt was presented at CPEM 2014. A paper on this comparison is expected to be published in April 2015.

B Client Services

The Group continued to provide traceable calibrations to the electrical power industry in Canada and abroad. Unique services of EPM are on-site calibrations and testing and the development of high accuracy measuring devices for other calibration laboratories.

These activities generate more than one million dollars in revenue each year, mostly from the private sector.

C Succession plan

Many long serving members of the Group retired in the past few years. In 2014, 3 technical officers and 2 researchers were hired. The Group has also rehired retired personnel on short term assignments.

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