



Application Note

The First Key Comparison

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As the national metrology institute of Austria the BEV (Bundesamt für Eich- und Vermessungswesen) maintains the national standards for the realization of the legal units of measurement and ensures their international equivalence and recognition. Thus it is at the top of the national metrology system. The unit relevant for dimensional metrology is the meter. This unit was defined 1983 by the CGPM (Conférence Générale des Poids et Mesures) in a future-proof way by fixing the numerical value of a fundamental physical constant, the speed of light in vacuum. Defining a unit is one thing, realizing it according to the definition is often extreme cumbersome and thus performed only by a few institutions. The situation for realization of the SI-meter has changed due to the introduction of the frequency combs during the last few years. Standards important for dimensional metrology applications (frequency stabilized lasers) can now demonstrate traceability with relative ease.

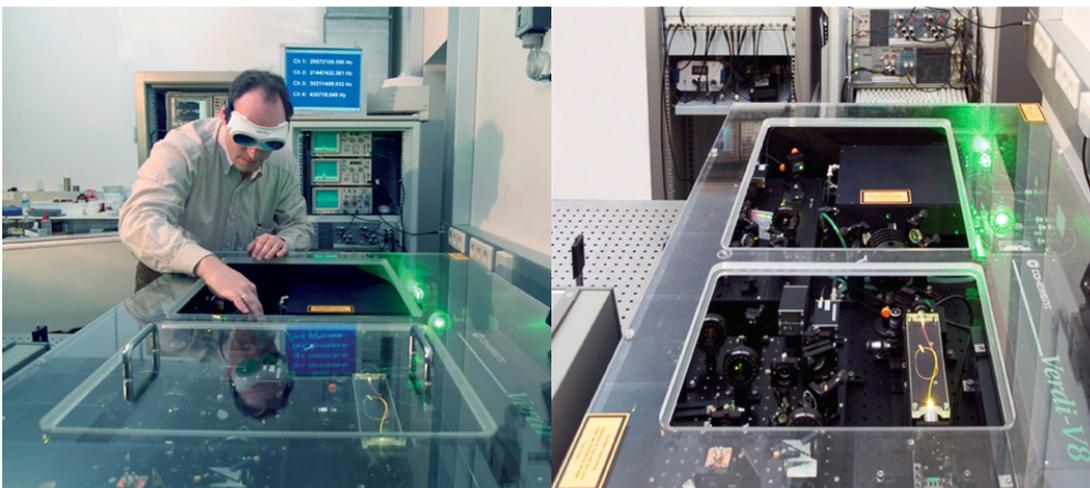


Figure 1: Femtosecond laser setup at BEV

Within the framework of the CIPM MRA (Mutual Recognition Arrangement), the participation on key comparisons is mandatory for institutes offering calibration certificates. The services offered by the signatories of the MRA are published in the Calibration and Measurement Capabilities – CMCs. The CCL-K11, being a key comparison, is designed to provide a technical basis for the review of CMC in the field of standard based optical frequency/wavelength calibrations. It is therefore the most fundamental key comparison in dimensional metrology.

CCL-K11 “Comparison of optical frequency and wavelength standards” is piloted by the BEV with support by four node laboratories: VTT MIKES Metrology in Finland, the National Metrology Institute of Japan NMIJ-AIST, the National Physical Laboratory NPL in the UK, and National Research Council Canada NRC, thus covering the world conveniently. The BEV was the very first institute which had reviewed CMCs and offered comb based laser frequency calibration to costumers (already in 2003).

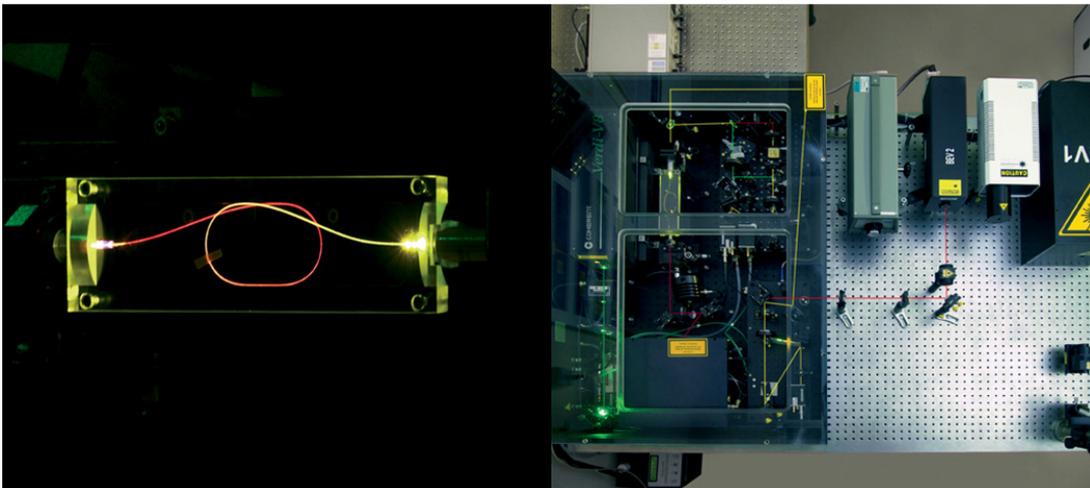


Figure 2: Left: BEV ‘magic fiber’. Right: femtosecond laser setup from top view

Publications:

Michael Matus et al. 2010 Metrologia 47 04009 doi: 10.1088/0026-1394/47/1A/04009 Final report for the period 2007–2009 on the CCL-K11 ongoing key comparison

Michael Matus et al. 2016 Metrologia 53 04009 doi: 10.1088/0026-1394-53-1A-04007 The CCL-K11 ongoing key comparison: final report for the year 2015

Weblinks:

The BEV homepage:
www.metrologie.at

CCL-Comparison of optical frequency and wavelength standards:
kcdb.bipm.org

CIPM Mutual Recognition Arrangement:

