SPANISH FACILITIES AND FIRST RESULTS IN MEASURING THERMODYNAMIC TEMPERATURE USING THE RADIANCE METHOD

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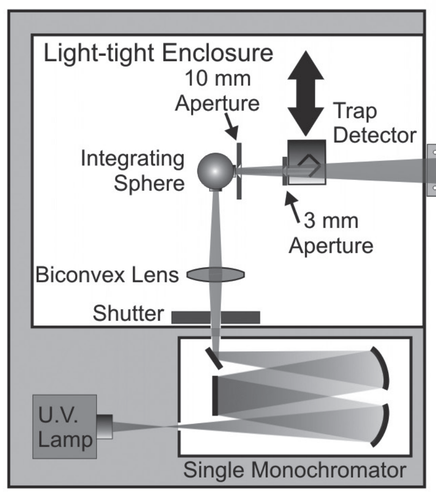
Currently, the dissemination of the kelvin at high temperatures, according to the International Temperature Scale (ITS-90), is realised at Centro Español de Metrología (CEM) by using the fixed points of Ag and Cu and a standard radiation thermometer. Recently, absolute radiometry has been proposed by the CCT Working Group 5 [1] to be included in future revisions of the Mise-en-Practique for the kelvin (MeP-K). Centro Español de Metrologia (CEM) in collaboration with Instituto de Óptica of Consejo Superior de Investigaciones Científicas (IO-CSIC) has been working in the following lines linked to this new alternative to disseminate the kelvin:

- Absolute calibration of commercial radiation thermometers, by using a facility based on a monochromator and a high stability lamp [2].
- Development of a filter radiometer to measure thermodynamic temperature [4]. It has been designed by CEM based in NPL previous work [3]. This filter radiometer can be calibrated with a laser based experimental setup.

Absolute calibration of LP2 in a monochromator based facility

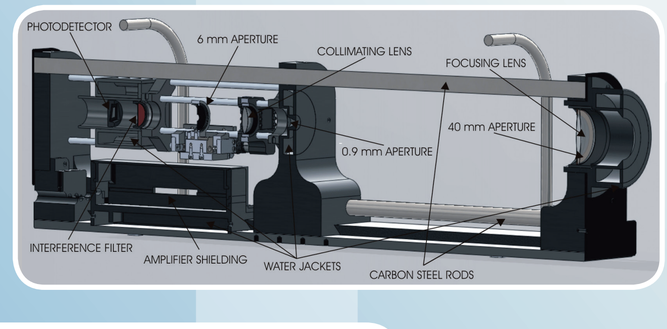
Radiancemeter, common for both facilities: trap detector + two precision apertures at a fixed distance

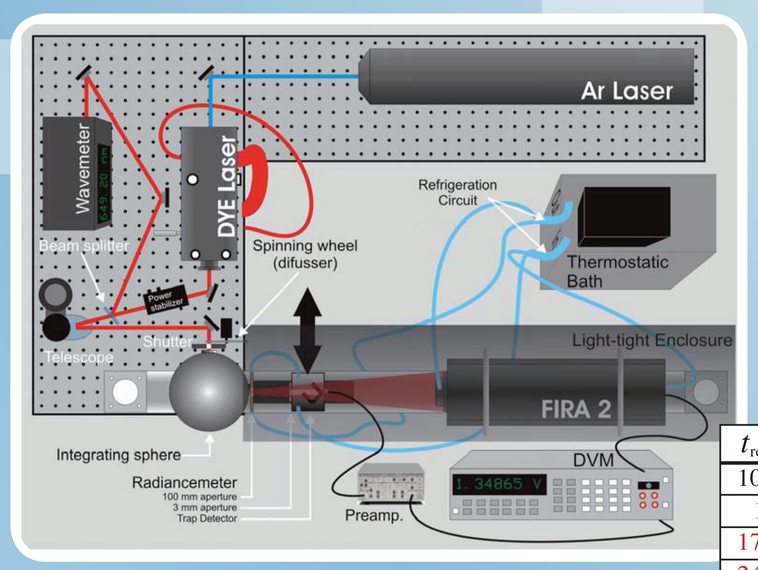


InK measurements

t_{ref}, °C	t_{LP2}, °C	t_{ref} - t_{LP2}, °C	U, °C
1084,62	1084,56	0,06	0,36
1324	1324,01	-0,01	0,45
1737,90	1738,18	-0,27	0,65
2474,20	2474,65	-0,45	1,13

Design and construction of an imaging filter radiometer to be absolutely calibrated in a laser based facility





FIRA2 drifts

t_{ref}, °C	t_{FIRA2}, °C	t_{ref} - t_{FIRA2}, °C	U, °C
1084,62	1084,74	-0,12	0,24
1324	1323,74	0,26	0,32
1737,90	1737,31	0,59	0,52
2474,20	2472,36	1,84	0,96
2474,20	2471,76	2,44	0,96

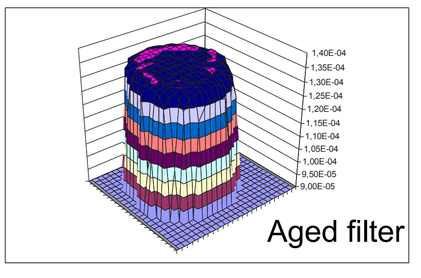
Improvements

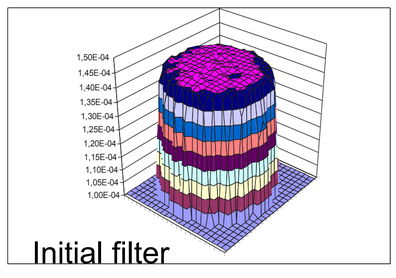
In a near future: all the experimental setups will be at CEM (except the cryogenic radiometer) in order to avoid transportation of the radiometer.

Monochromator based sources:
A new lamp more intense and stable: Hamamatsu Super Quiet Xe-Hg 500 W (model L8288).

Laser sources:
- Calibration with a Kr laser at one wavelength instead of using a tuneable dye laser
- In the next year: supercontinuum laser

Radiometer (FIRA2):
- Filter seems OK, but a new scan with 0,3 mm diameter aperture will be done on its surface.
- Field stop: instead of a blackened SiNi 0,9 mm aperture, a tilted stainless steel 0,9 mm aperture (less sensitive to the high t)





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[3] M. R. Dury, T. M. Goodman, D. H. Lowe, G. Machin, E. Wooliams. AIP Conf. Proc. (2013) 1552: 65-70
[4] J. M. Mantilla, M. J. Martín, M. Hernanz, J. Campos, A. Pons y D. del Campo. NEWRAD'14 Congress, Helsinki, 2014.

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