Physikalisch-Technische Bundesanstalt
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Contribution of PTB Working Group 7.32 *Infrared Radiation Thermometry* to VITCEA

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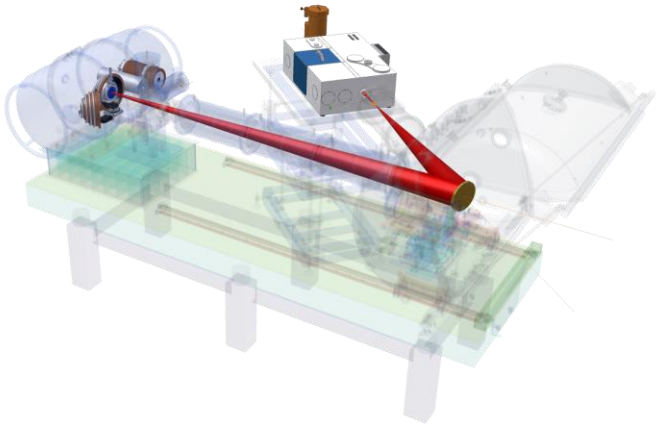
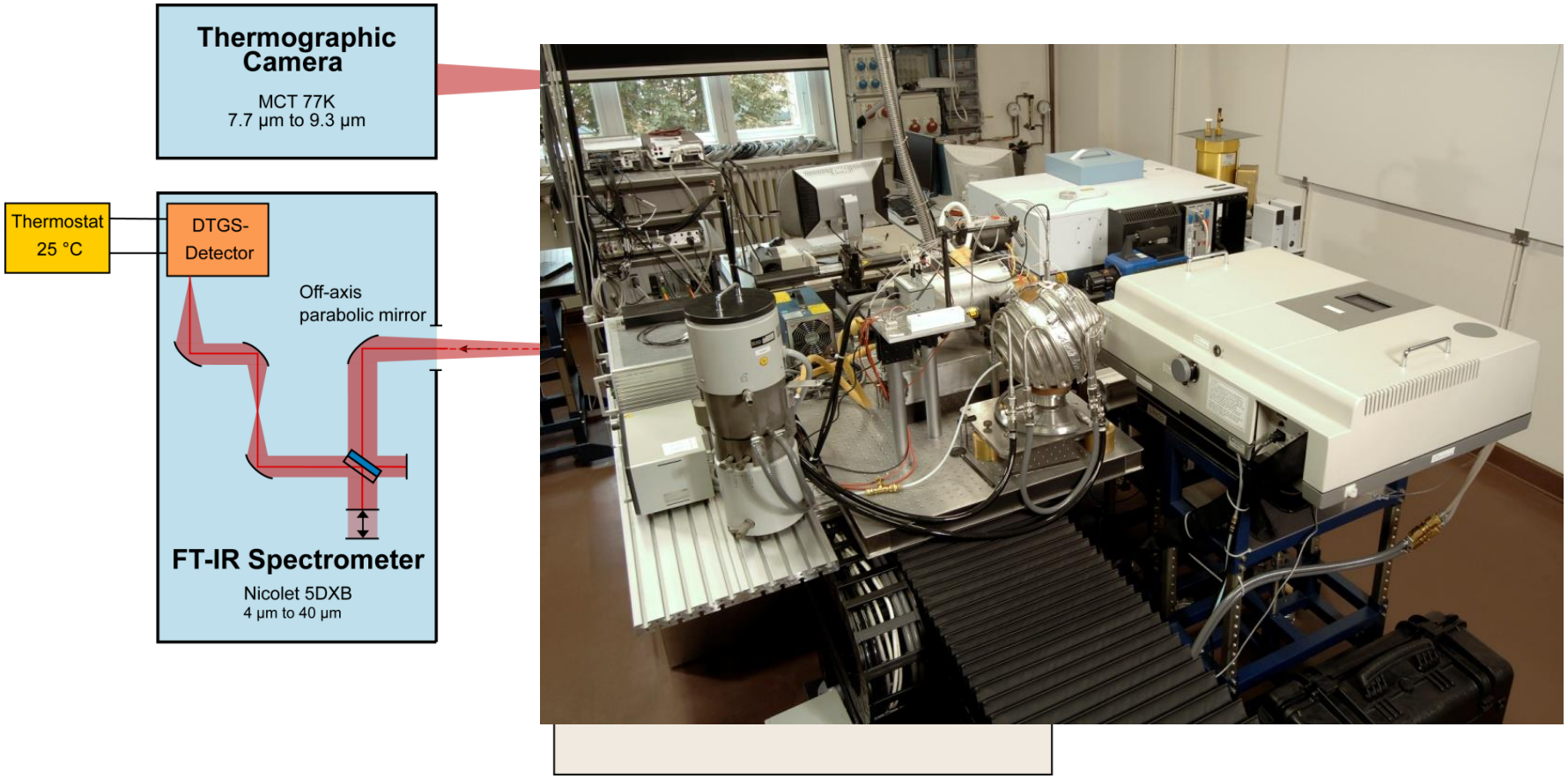


Contribution of PTB‘s WG 7.32

PTB’s Working Group 7.32, *Infrared Radiation Thermometry*, contributes to two tasks:

- Generation of optical property datasets for reference FRP materials by direct emissivity measurements
- Characterization of reference sources for active thermography

Measurement of directional spectral emissivity in air

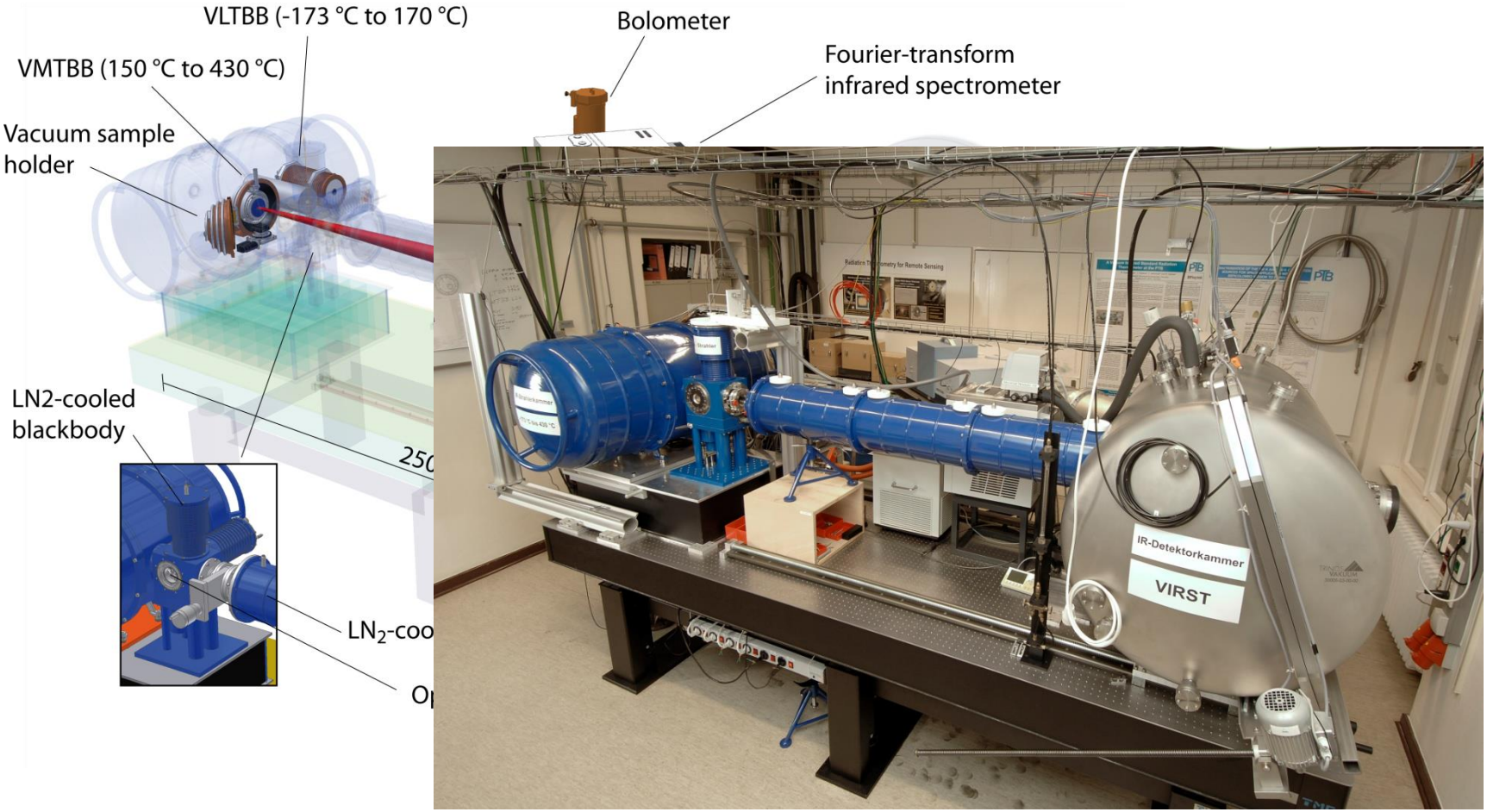


Principle of measurement according to the definition of emissivity:

- Quotient of the radiances of sample and reference blackbody.
- Consideration of the radiances of detector and enclosure and of the directional-hemispherical reflectance of the sample.

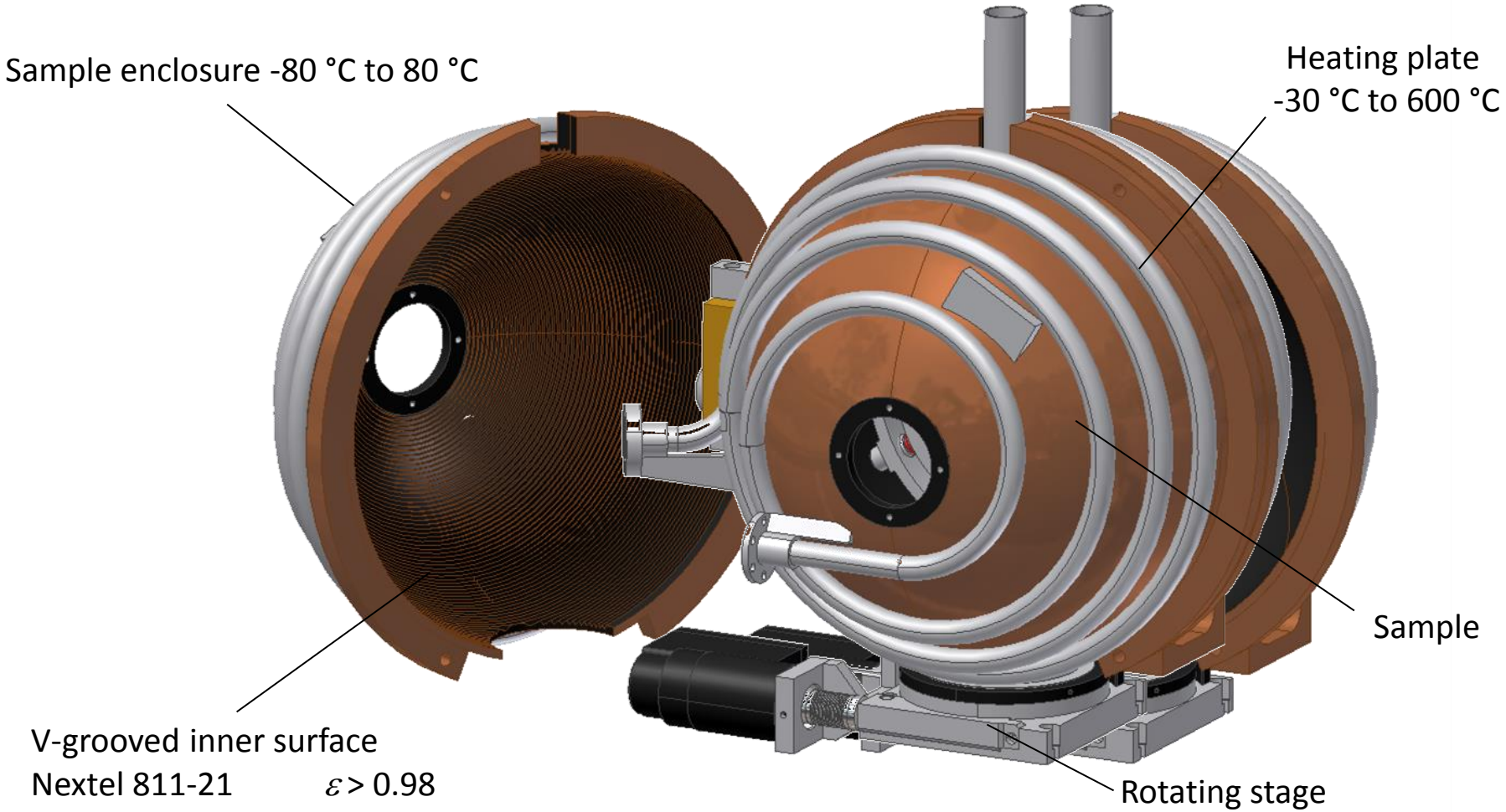
… directional spectral emissivity in vacuum

Same measurement principle in a liquid nitrogen cooled vacuum environment



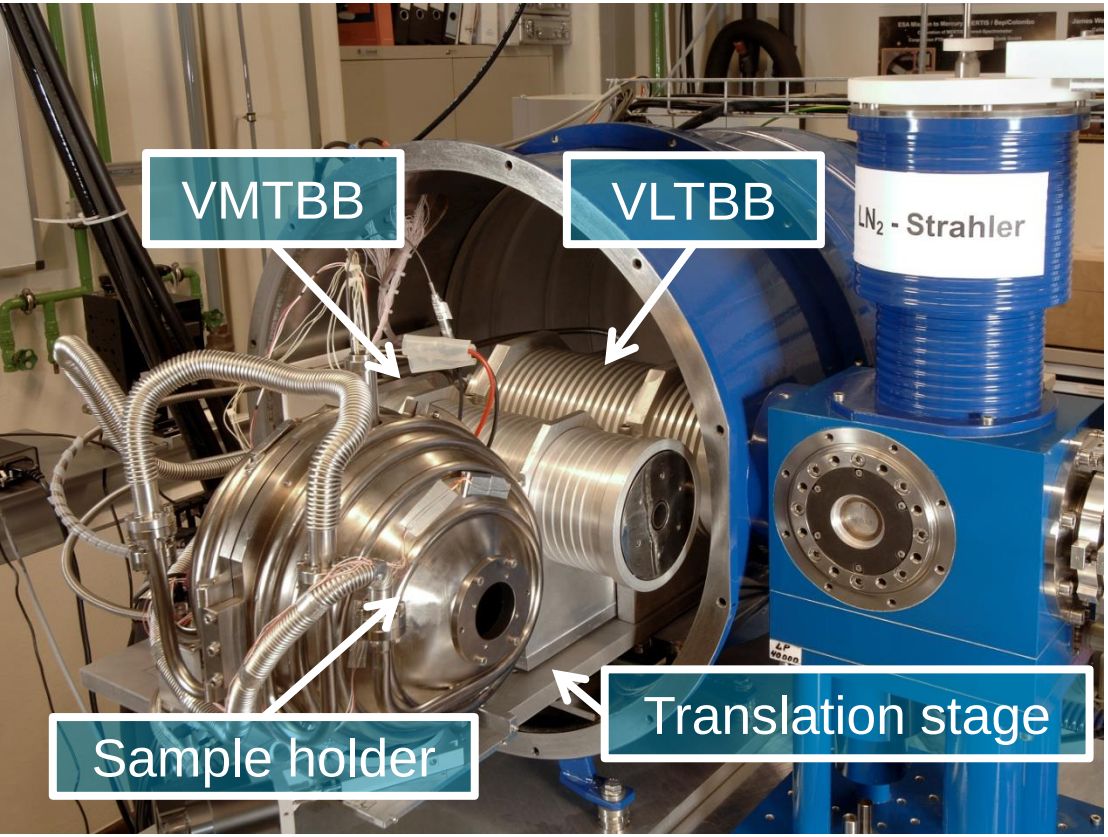
The Reduced Background Calibration Facility

… directional spectral emissivity in vacuum



Vacuum sample holder -30 °C to 600 °C

Measurement Scheme



Measurement Scheme :

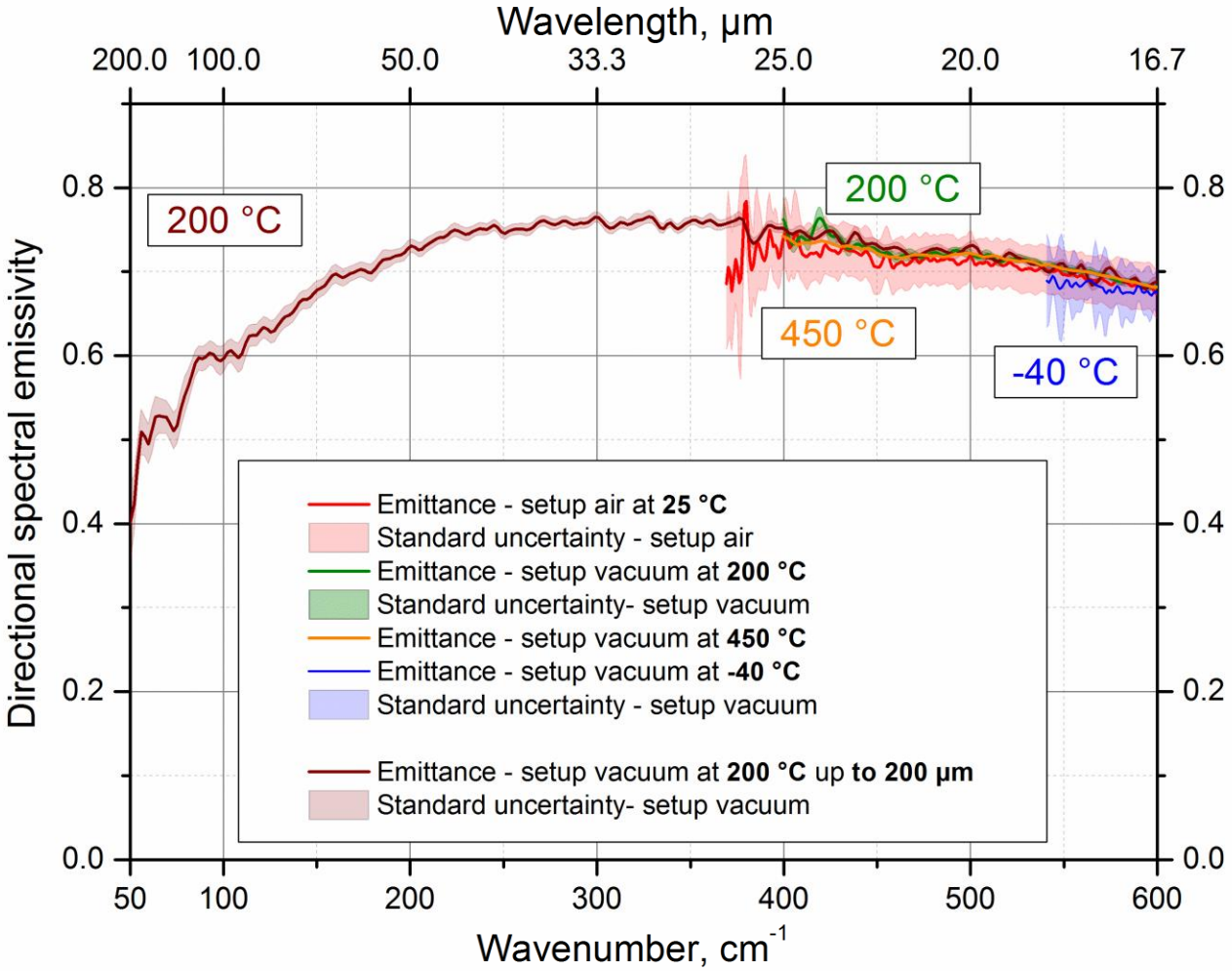
Comparison of the sample with two blackbodies at two different temperatures

Advantage:

the thermal background, of the "warm" spectrometer components and the spectral responsivity of the detection system cancel out

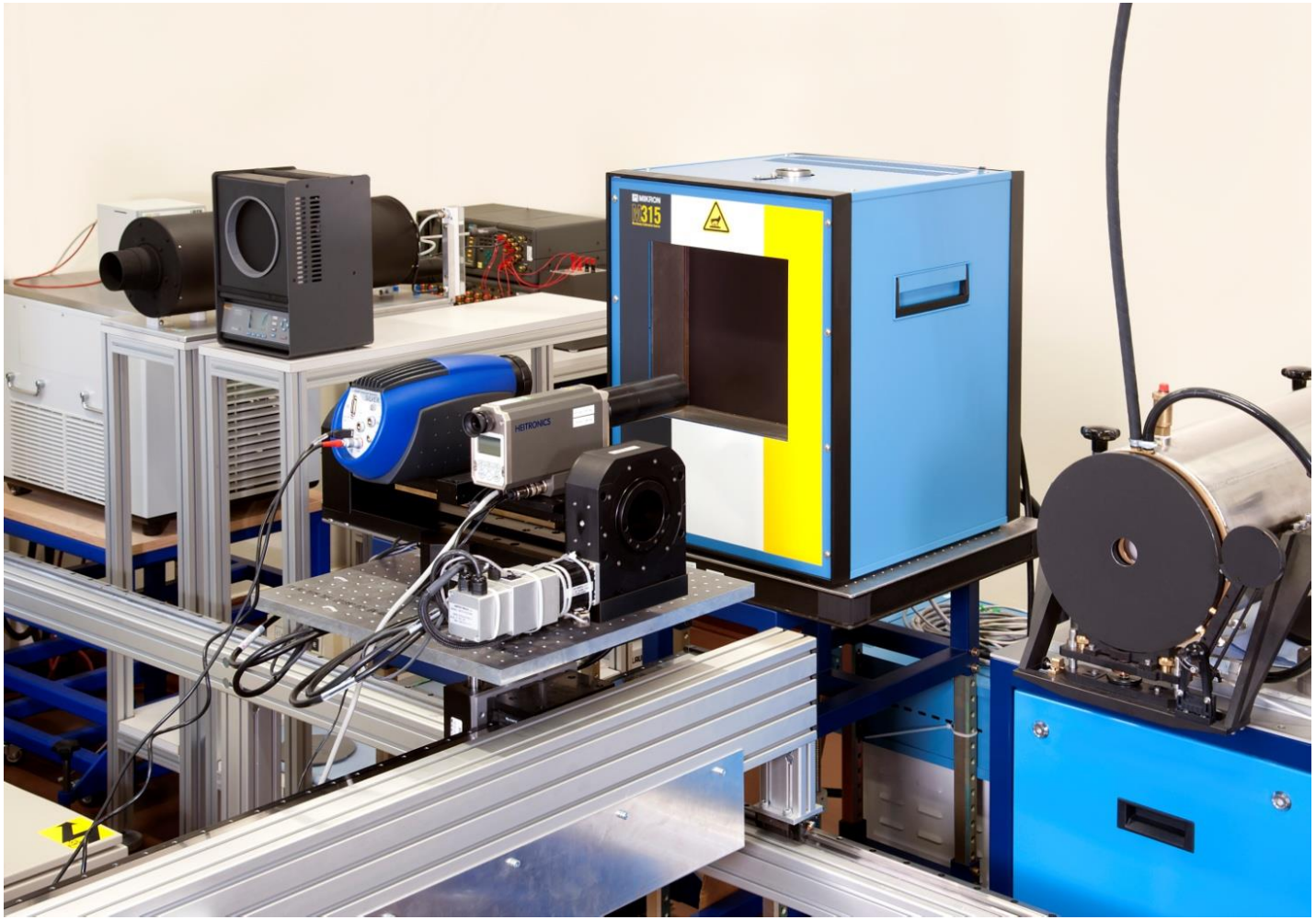
$$Q = \frac{\tilde{L}_{\text{Sample}}(T_{\text{Sample}}) - \tilde{L}_{\text{LN}_2\text{BB}}(T_{\text{LN}_2\text{BB}})}{\tilde{L}_{\text{VLTBB or VMTBB}}(T_{\text{VLTBB or VMTBB}}) - \tilde{L}_{\text{LN}_2\text{BB}}(T_{\text{LN}_2\text{BB}})}$$

Emissivity measurement under vacuum: silicon carbide

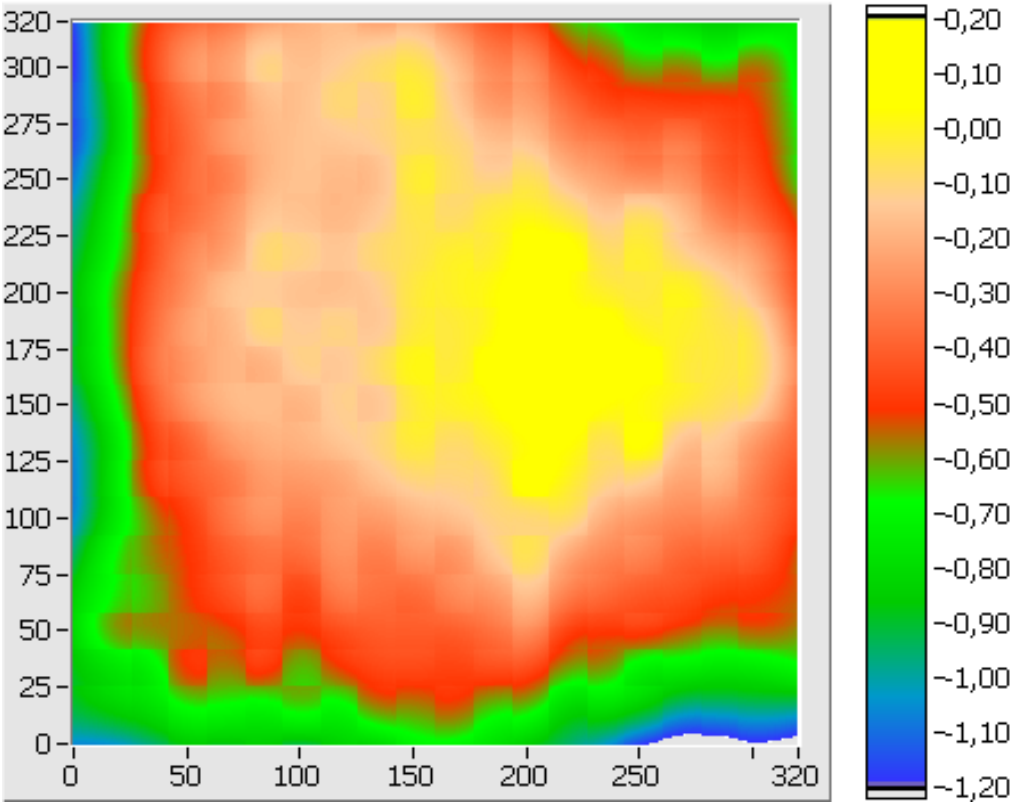


Consistent measurements up to 200 µm
Measurements in the temperature range from -40 °C to 450 °C

PTB's setup for camera based radiometry

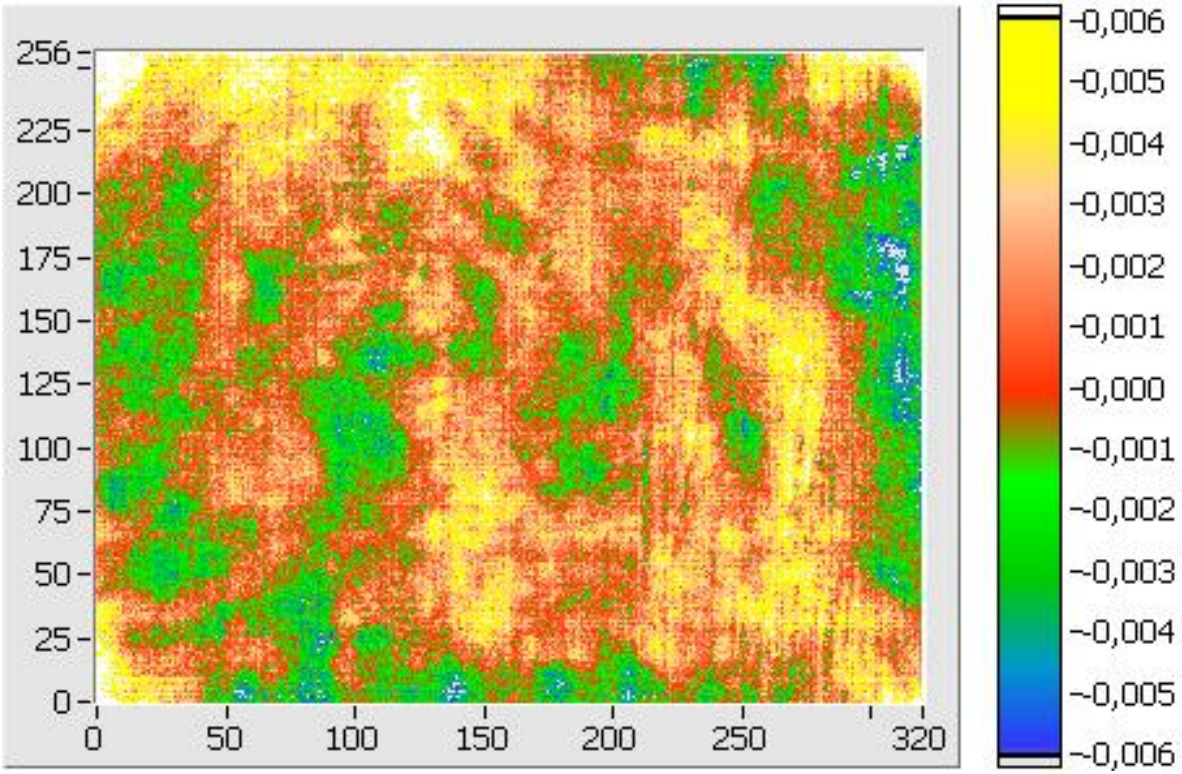


Characterization of large aperture reference sources



Radiation temperature homogeneity of a plate radiator at 100 °C
Area 181 mm x 181 mm.

Characterization of thermographic cameras



Non-uniformity of a infrared camera at 100 °C radiation temperature.
Spectral range of 3 µm to 5 µm

Thank you for your attention!

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