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INAF Test facilities for sub-systems of space mission instruments

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ROCT (Run Optical Chamber Test setup)

The facility consists of a vacuum chamber and a cryocooler, the temperature range is from 6.5 to 353K and the vacuum down to 10⁻⁶ mbar. The thermal profile execution, the time base, the ramp rate, and the stabilization time is managed by the IAPS LabVIEW software connected to a temperature controller. The set up was employed to test the QM and FM of the shutter which is a part of the Moons And Jupiter Imaging Spectrometer (MAJIS) on board of the Jupiter ICy moon Explorer (JUICE) space mission. For this activity has been performed 139200 test without damage at operative temperature of 135 K, an example of the configuration is shown in figure 1. The same cryo-cooler was used to test the JSIR, an IR emitter which is a part of the ICU of the MAJIS spectrometer. In this configuration, the vacuum chamber was connected by special fiber with a Fourier spectrometer. Thanks to this configuration on able to acquire the spectral radiance at different T at operative in flight conditions in the spectral range in between [2-5.5] μm. The final configuration e the results are shown in figure 2 and 3 respectively.

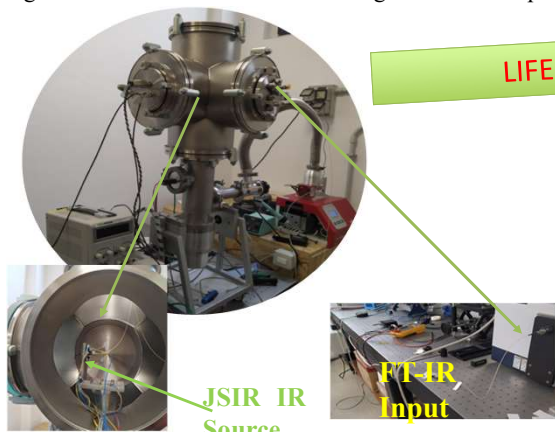


Figure 2: Optical configuration of the JSIR inside the thermo-vacuum chamber (on left) and connection with the FT-IR (on right)

LIFE TIME TEST



Figure 1: Lifetime test configuration of the FM of the Shutter

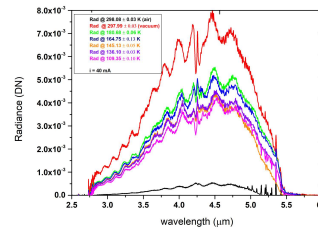


Figure 3: JSIR radiance acquired at different temperatures and @ i = 40 mA

MPC (Multi Purpose cryogenic Cell)

The facility was realized to test @ operative in flight conditions two representative filters which are part of the internal calibration unit of MAJIS . The set up consists of an optical cryogenic cell coupled with a Fourier Transform InfraRed (FT-IR) spectrometer, as shown in figure 4. The cell, if flushed with the helium, can operate at 6 k, while if flushed with liquid nitrogen can reach an operative temperature

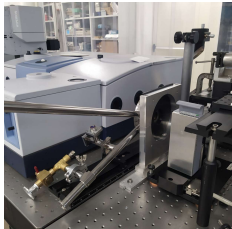


Figure 4: Set up configuration: on left the FT-IR spectrometer and on right the cryogenic cell

of about 100 K. Alternatively the cell might be heated up to 475 K. he filters transmittance was acquired in between [0.5-6] μm at four representative temperatures, 137-126-110 K and ambient temperature. In figure 5, the results obtained in the whole spectral range.

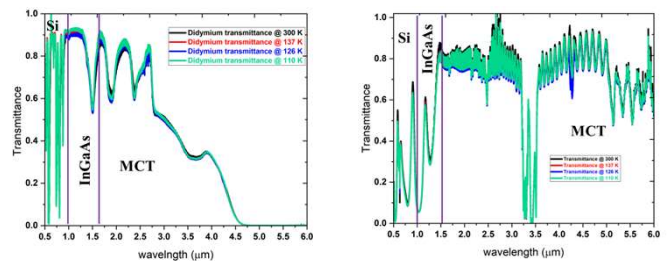


Figure 5: Transmittance acquired @ different temperatures

Thermo-vacuum chambers and clean room

Two thermo-vacuum chambers (see figures 6 and 7) are placed inside of two cleans rooms of 10000 and of about 40 mq and an ISO 6 of about 15 mq. These facilities have been employed to test and to qualify electronic, mechanical and optical parts of spatial instrumentations at operative in flight conditions.



Figure 6: Thermo-vacuum chamber

Internal Collaboration:

- ✓ Fasy
- ✓ INAF-To
- ✓ IXPE
- ✓ MAJIS

Main features

- ✓ Volume 1600 l
- ✓ Vacuum limit 10⁻⁷mbar
- ✓ Primary vacuum 10⁻²mbar
- ✓ Temperature range - 60°/+100°C

External Collaboration:

- ✓ Bercella
- ✓ CGS
- ✓ IKR
- ✓ Kayser
- ✓ Leonardo
- ✓ OHB Italia
- ✓ Sab Aerospace

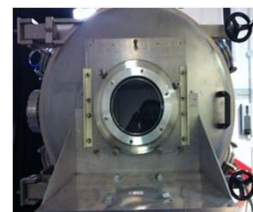


Figure 7: The CRV Thermo-vacuum chamber

Main features:

- ✓ Volume: 90 l
- ✓ Primary vacuum: 10⁻²mbar
- ✓ Max vacuum :10⁻⁶mbar
- ✓ Temperature range: -180/60°C
- ✓ Optical window: 165 mm CaF₂

The CRV was employed to test optical and mechanical parts of the VIRTIS spectrometer on board of the VENUS EXPRESSES, ROSETTA space mission of the SERENA/ELENA instrumentations on board of the BepiColombo.