



Calliope

GAMMA IRRADIATION FACILITY

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ADVANCED TECHNOLOGY FOR MATERIALS EXPERIMENTATION

The Calliope facility is a unique reference point for gamma irradiation in Italy and Europe. Operating since the 1960s in the research field, it features a Cobalt-60 source (active area: 75 cm x 41 cm) emitting gamma radiation with an average energy of 1.25 MeV within a large, shielded cell (7m x 6m x 3.9m). With a maximum licensed activity of 3.7×10^{15} Bq, the plant enables high-precision testing with variable absorbed doses and dose rates. It supports simultaneous tests under diverse environmental and operational conditions, including:

- Environmental: Temperature, Atmosphere, Humidity, Thermo-vacuum, and Altered gravity
- Operational: Biased testing (powered samples)

Dosimetry Laboratory

The Calliope facility features an on-site dosimetry laboratory for the experimental determination of dose rates.

The dosimetric systems cover a wide range of intensities (from mGy/h to kGy/h) and include Fricke solution, EPR-Alanine systems, Red-Perspex and radiochromic dosimeters, TLDs, electronic devices (RADFETs), and innovative online sensors.

Advanced computational code simulations are also available to model the gamma field distribution within the cell.

Capabilities

- Laboratory for material and organic matrices characterization using spectroscopic and non-destructive (NDT) techniques
- Specialized equipment for thermal treatments and accelerated aging tests, a thermo-vacuum chamber, and an altered gravity system (*upcoming acquisitions*)

Certifications

- ISO 9001 certified
- ISO 17025 accreditation in progress (Dosimetric testing with EPR-Alanine)



RESEARCH ACTIVITIES AT CALLIOPE

Calliope serves as a leading research and service hub for multiple scientific, industrial, and technological fields:



Qualification tests

Assessing the radiation hardness of materials, components, and devices for extreme environments (nuclear, high-energy physics, space)



Cultural heritage

Disinfection and disinfestation treatments for archival materials, artifacts, and heritage objects



Medicine and biotechnologies

Dosimetry applications, effects of gamma radiation on biological tissues, and studies on biocompatible materials



Agrifood

- Shelf-life extension of fresh products
- Pathogen and bacteria reduction in specific food products



Biological Control – Sterile Insect Technique (SIT)

Use of gamma radiation for the controlled sterilization of male insects, aimed at reducing pest populations in a sustainable way without the use of pesticides



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