



**The MADERE radio-activity Measurement Platform:  
Developments for a better addressing to the  
experimental needs.**

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Presented by JC. Bosq

# Introduction

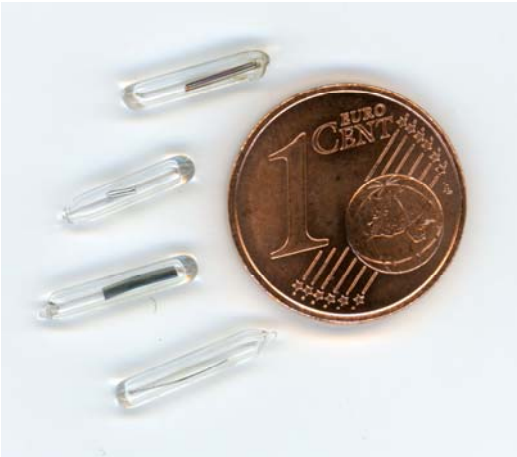


The MADERE platform (Measurement Appplied to the DosimEtry of Reactor) is a powerful tool for the dosimetry analysis of the experimental programmes performed in the CEA critical facilities (MASURCA, EOLE, MINERVE) and MTR reactor facilities (OSIRIS and in the future, JHR and RES) and also for the control of vessel fluence (and damage) in EDF industrial plants and CEA/RES.

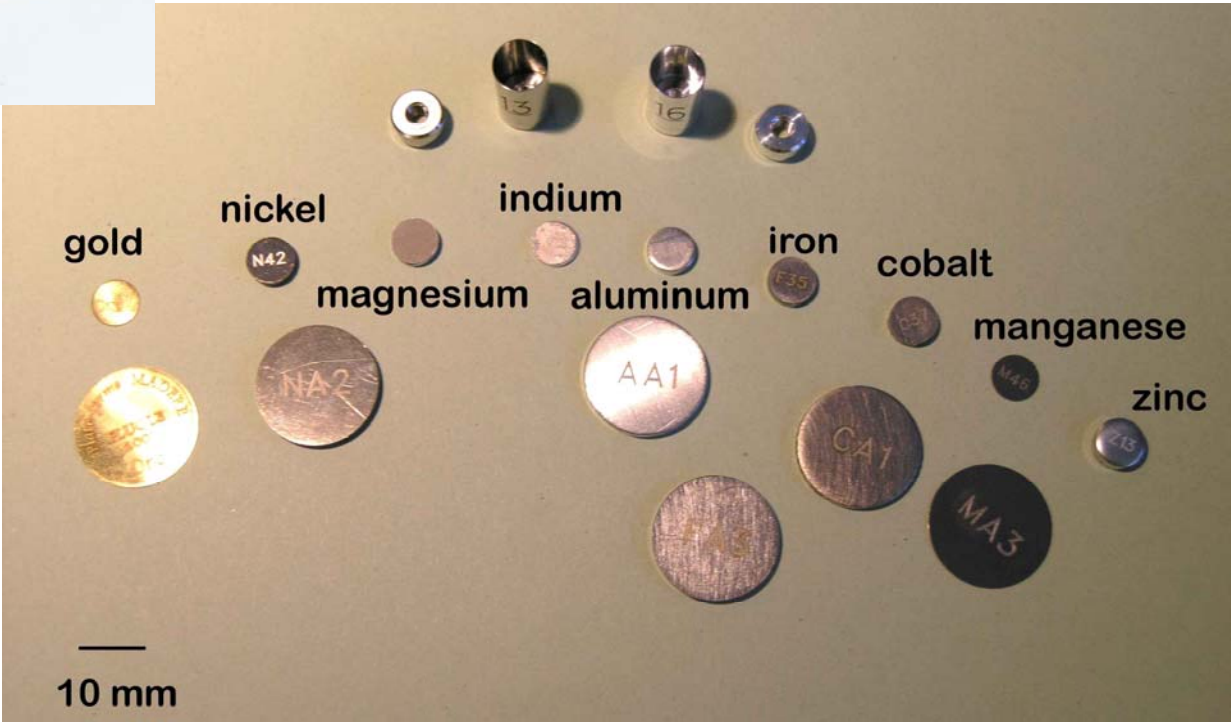


The MADERE platform is one of the main centre of skill in dosimetry measurement at CEA/Cadarache; it is accredited by COFRAC, French Quality Body signatory of the multilateral agreements set up by EA, ILAC and IAF

# Dosimeter manufacturing



Dosimeters are small disks, 1 to 20 mm diameter, 0.1mm to 2mm thick, or quartz encapsulated wires, few mm long, and few 10th of mm diameter.

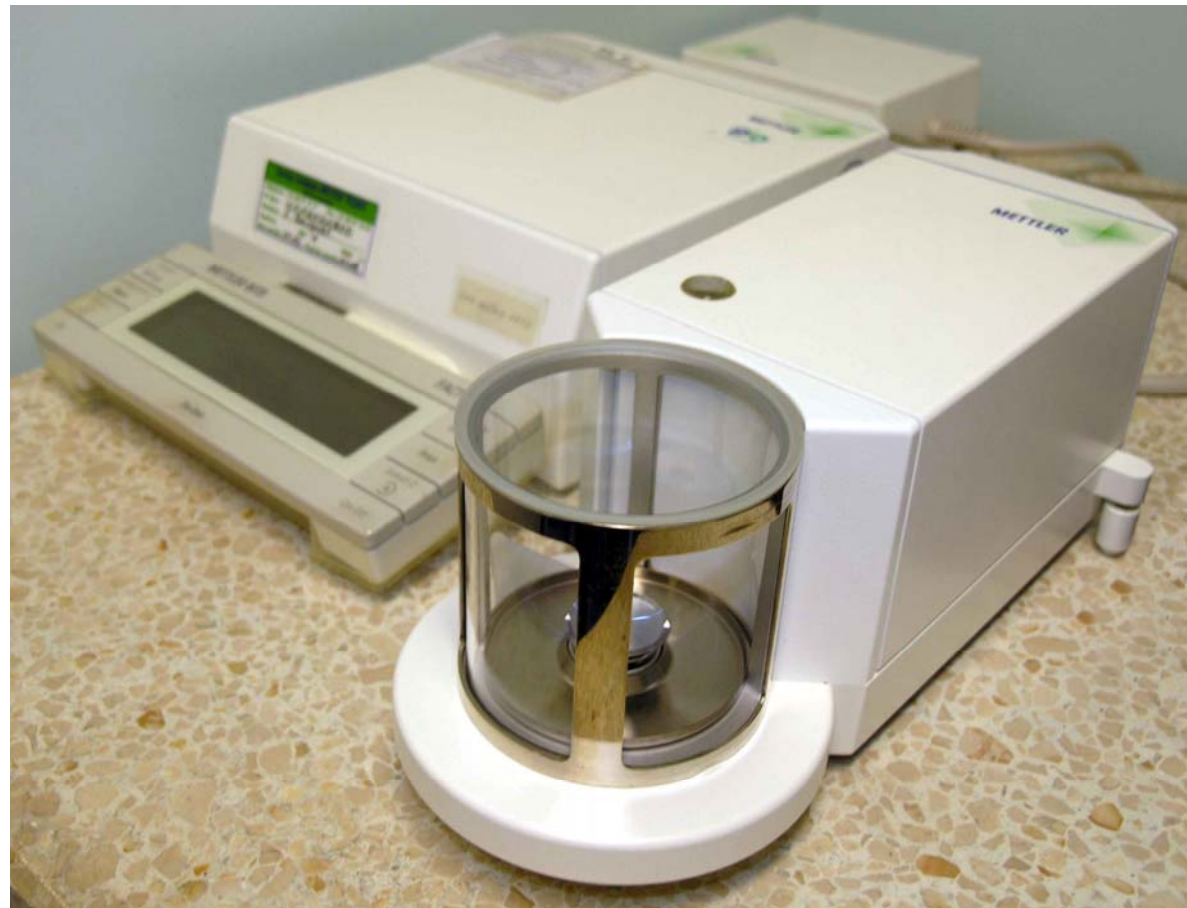


# Weighing Measurements

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**A computer-controlled precision micro-balance of high resolution (5.Mbits for a 1 $\mu$ g to 5g range) enables the storage of the measured masses in a dedicated database.**

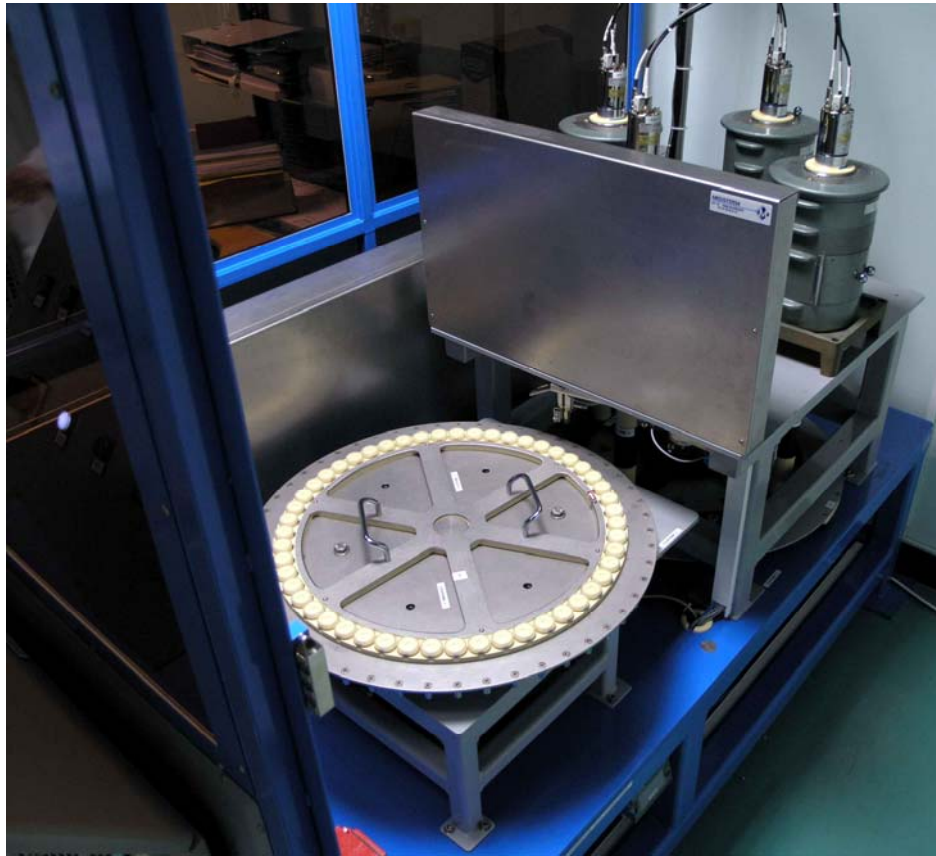


# PASTAGA

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**This automated gamma measurement device is dedicated to the activity measurement of radioactive solid samples irradiated in zero power facilities for experiments aiming at the neutron distribution characterisation.**



**An associated rotating device and 4 NaI detectors allow the measurement of 51 samples per measurement campaign.**

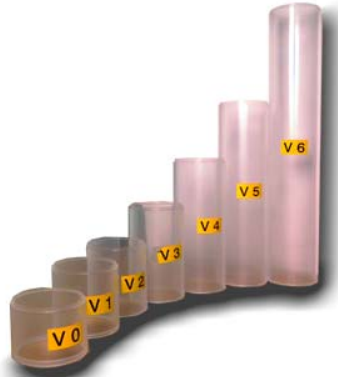


# Classical Gamma-ray measurements



The “Voie 1” and “Passeur” measurement devices are equipped with coaxial HPGe detectors of respectively 10% and 25% efficiency yield which enables the measurement of all gamma emitter samples usually used in dosimetry from 10 Bq to 10 MBq.

The energy range covers 50 keV – 2 MeV.



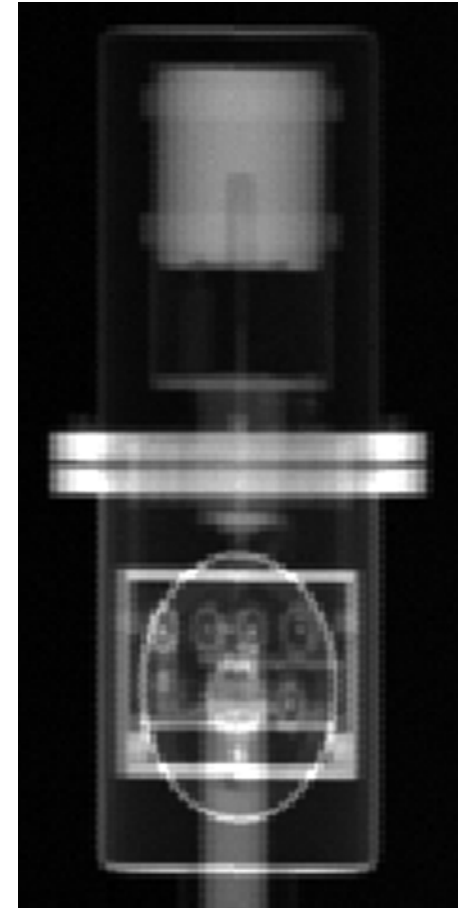
# Measurement device modeling

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**The precise knowledge of the detector geometry and composition is the first step for modelling the energy yield calibration.**

*Radiography performed on a sample* →



# High Efficiency Measurements

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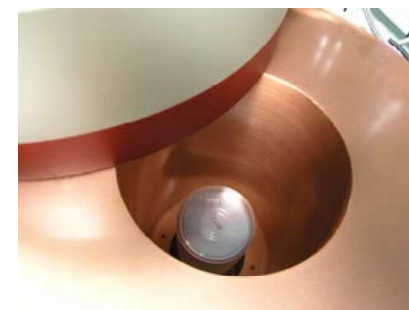
cea



The cooling detector is ensured by a hybrid electric/liquid-nitrogen cryo-cycle device.

This measurement device is equipped with a BEGe type HPGe detector with an efficiency exceeding 50%. This type of detector has both a good efficiency in the entire energy field (50keV – 2MeV) and a limitation of the Compton effects.

The detector is placed in a circular enclosure composed of 125mm thick low noise lead + 25mm thick ultra low noise lead + 1mm Stain +1.6mmCopper.



Radioactive samples with an activity of a few tenths of Bq can be measured.

The radiation background noise measured on this device is about 1Hz.

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# X-ray Measurement device



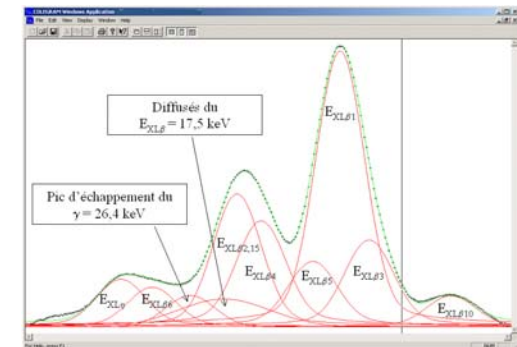
This measurement device is equipped with a LEGe type HPGe detector with a 0.5mm thick window in Beryllium well suited for the detection of low energy rays.

The energy range is 6 keV - 300 keV.



This system is used for 2 types of measurements:

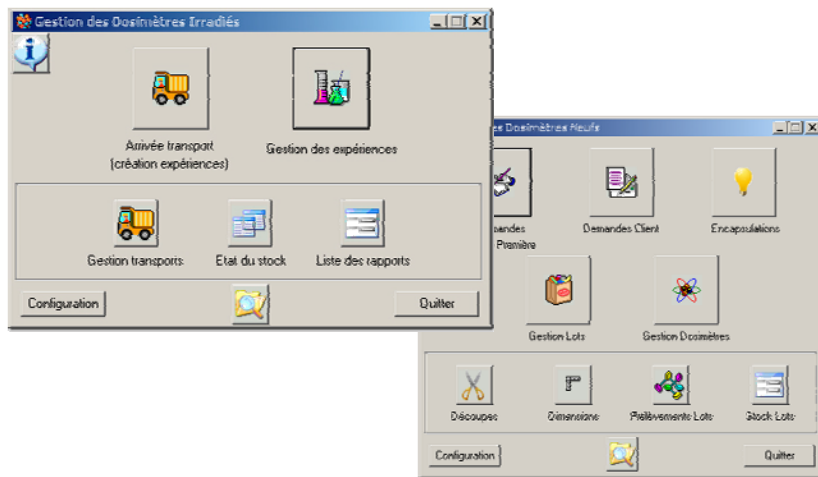
- The activity determination of a  $^{93}\text{Nb}^m$  (X emitter at about 17 keV) samples using a comparative activity measurements method between the irradiated niobium samples and a  $^{93}\text{Nb}^m$  reference standard sample.
- The determination of the absolute activity of any X emitter solid samples.



# Data management



In order to meet the various requirements for the monitoring of the stored activities in the platform but also to ensure the traceability of the results and their contributing elements, the MADERE platform develops and uses computerized management tools that provide it a maximal productivity.



# Conclusion

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**The MADERE Platform is a powerful tool for reactor dosimetry.**

**The ranges covered by the platform in terms of activity (0.1 Bq to 10 MBq) and energy (10 keV to 2 MeV) can meet all the dosimetry requirements for critical facilities as for test reactors or power plants.**

**The MADERE Platform is engaged in a continuous improvement process.**

**It will be the base of the Jules Horowitz Reactor Dosimetry laboratory.**