HOLMES is an experiment aiming at pushing down the sensitivity on the smallest neutrino mass at the order of ∼ eV performing a calorimetric measurement of the Electron Capture decay spectrum of 163Ho. For reaching its goal, HOLMES will deploy an array of 1000 microcalorimeters based on Transition Edge Sensors with gold absorbers in which the 163Ho will be ion implanted. A major challenge is represented by the fabrication of the microcalorimeters with the required amount of 163Ho (300 Hz/det). Therefore, the fabrication process needs to be compatible with ion implantation without impairing the detector performances. The gold absorber will be fabricated in more steps: before, during and after the ion implantation. In particular, the gold deposition during the embedding process is intended to compensate for the absorber atom sputtering caused by ion implantation and to control the 163Ho concentration in the absorbers.

The implanted area will finally be encapsulated in-situ to ensure the fully containment of the decay energy and to avoid oxidation of the holmium.

We describe here the multi-step microfabrication process, mainly focusing on the last steps.

**Detector design**

- **Detectors:** Transition Edge Sensor (TES) with 163Ho implanted in Au absorbers
- **Activity:** 6.3 x 10^15 nuclei per detector → 300 dec/h
- **Performances:** ΔE = 1 eV and τe = 1 μs
- **Design:** side-car design to avoid TES proximitation and G engineering for τ decay control

**Detector array fabrication**

- TES originally fabricated at NIST, Boulder, CO, USA
- 163Ho implantation and final 1 μm Au layer deposition at INFN, Genova, Italy
- Final fabrication processes: SiN membrane release & lift-off

**In summary**

- The first processed HOLMES array without 163Ho is in measurement now!