CUORE is a ton-scale experiment approaching the data taking phase in Gran Sasso National Laboratory. Its primary goal is to search for the neutrinoless double-beta decay (0νββ) of 130Te using TeO₂ crystals. The crystals are operated as bolometers at ~10 mK taking advantage of one of the largest dilution cryostat ever built. The cryostat commissioning consisted in a sequence of cool down runs each one integrating new parts of the apparatus. The last run was performed with the fully configured cryostat and the thermal load at 4 K reached the impressive mass of about 14 tons. In that run the base temperature of 6.3 mK was reached and maintained for more than 60 days. An array of 8 crystals, the mini-tower, was used to check bolometers operation, readout electronics and DAQ.

CUORE experiment

- **Primary goal**: 0νββ of 130Te
- **Detectors**: 988 TeO₂ crystals, divided in 19 towers, total mass 741 kg (~200 kg of 130Te)
- **Expected background**: 10⁻³ counts/keV/kg/year (at 2527 keV, 0νββ ROI)
- **Target energy resolution**: 5 keV at 2527 keV
- **T[1/2]** (5 years, 90% C.L.): 9.5 - 10^{25} y

Each bolometer (TeO₂ crystal) works at ~10 mK. The particle energy deposition causes a heating measured by a thermistor glued on the crystal.

### Commissioning Runs

The commissioning was carried out in four steps (runs), each one consisting in the addition of new experiment parts and a cool down.

- **Run I**
  - **Setup**: all vessels and plates, DU already tested in a dedicated cryostat, no shields.
  - **Results**: 5.9 mK reached!

- **Run II**
  - **Setup**: added read-out wiring (2600 wires from 300 K to 10 mK) and Detector Calibration System. **Results**: DU cooling power can sustain the heat injection due to the wiring.

- **Run III**
  - **Setup**: added the top lead shield (2.1 t of modern lead at 50 mK).
  - **Results**: sources of mechanical noise highlighted and reduced.

- **Run IV**
  - **Setup**: fully commissioned cryostat apart from the detectors, added bottom and side shields of roman lead (0.004 Bq/kg 210Po).
  - **Final load**: 14 t at 4K, 1.5 t at 10 mK.
  - **Achievements**
    - Mechanical noise reduced (by acting on cryostat cardanic joints and the Pulse Tube flex lines).
    - Measure the cooling power on the mixing chamber of the dilution unit: 3 μW at 10 mK as expected.
    - Stable temperature of (6.3 ± 0.2) mK maintained, thanks to the temperature stabilization system, for more than 60 days.

### Mini-Tower

A 8 crystals array mounted on Tower Support Plate before Run III. It permitted to check several subsystems such as:

- Detector Calibration System (12 strings, each one containing 25 capsules with thoriated tungsten wire, 232Th)
- Readout electronics (Front End and Bessel Filters)
- Data acquisition system
- Temperature stabilization system (PID)

First estimation of the detectors energy resolution: 10 keV at 2615 keV

External lead shield lifted up: no evidence of unaccounted background sources.

**After Run IV**: All detector towers were installed in summer 2016. The experiment is currently at base temperature and detectors optimization is going on. Data taking will start very soon!