



Photo: Astrid Eckert/Munich

Operation Darkness

When, on a clear night, you gaze at twinkling stars, glimmering planets or the cloudy band of the Milky Way, you are actually seeing only half the story – or, to be more precise, a tiny fraction of it. With the telescopes available to us, using all of the possible ranges of the electromagnetic spectrum, we can observe only a mere one percent of the universe. The rest remains hidden, spread between dark energy and dark matter.

The latter makes up over 20 percent of the cosmos. And it is this mysterious substance that is the focus of scientists involved in the CRESST Experiment. Behind this simple sounding name is a complex experiment, the “Cryogenic Rare Event Search with Superconducting Thermometers.”

The site of the unusual campaign is the deep underground laboratory under the Gran Sasso mountain range in Italy’s Abruzzo region. Fully shielded by 1,400 meters of rock, the researchers here – from the Max Planck Institute for Physics, among others – have installed a special device whose job is to detect particles of dark matter. According to theory, these particles barely react with their environment. They can easily penetrate the various layers of lead, copper and polyethylene that shield CRESST from background radiation.

The detector can comprise up to 33 individual modules, each containing a 300-gram crystal made of calcium tungstate; the photo shows researchers who are in the process of fitting the measuring device with these. When a particle enters, it generates warmth. In addition, light results, which is then held in the enclosure and captured by a silicon wafer that also warms up in the process. To allow the thermometer to sense these inconceivably minimal temperature increases, CRESST works close to absolute zero at minus 273.15 degrees Celsius.

CRESST-III has been running since summer 2016 with 13 modules and heightened sensitivity. Yet dark matter is living up to its name: to date, there are no convincing findings that unequivocally prove its existence.