XENONIT A TRAP FOR DARK MATTER



Where is it?



At the Gran Sasso National Laboratory (LNGS) of the Italian Institute for Nuclear Physics (INFN), under **1.400 metres of rock**, which acts as a shield to protect the experiment from the continuous shower of cosmic rays. Dark matter signals are hard to detect, so the radiation emitted by other particles must be reduced to a minimum.

• The Experiment

Dark matter interacts with standard matter, albeit rarely. XENON1T, like an extremely sensitive recorder immersed in the cosmic silence of the Gran Sasso underground laboratory, is searching for these rare interactions.

How it's made

The WIMP detector, which is at the heart of the experiment (the time projection chamber TPC) is capable of emitting a signal when particles interact inside it. It is immersed in a cryostat, a thermos, made of low-radioactivity stainless steel, containing approx. 3.500 kg of liquid xenon. The thermos is immersed in 700 m³ of ultra-pure water, in a tank about 10 m tall (the equivalent of a three-storey building), equipped with 84 photomultipliers to detect the passage of cosmic muons.

The WIMP

detector

(TPC)



How it works
When a WIMP interacts with the xenon it creates a weak burst

of light. To capture these interactions, XENON1T is fitted with about 248 photomultiplier tubes; sophisticated eyes that convert light signals into electronic signals.



Whenever a particle interacts with the liquid xenon it creates two signals, a primary flash of light (S1) and a charge signal that will generate a delayed light signal (S2). Together, the two signals permit the measurement of the

energy and position of the interaction, and the nature of the particle.

Why xenon

Its characteristics make it perfect for hunting dark matter. It is very **dense**: with its self-shielding properties, it prevents any external signals not captured by the rock shielding from passing through it.

It has almost **no radioactive isotopes**, whose signals could interfere with the instrument.

Lastly, it is highly **sensitive**: even a weak interaction with dark matter will cause it to emit a flash of light.