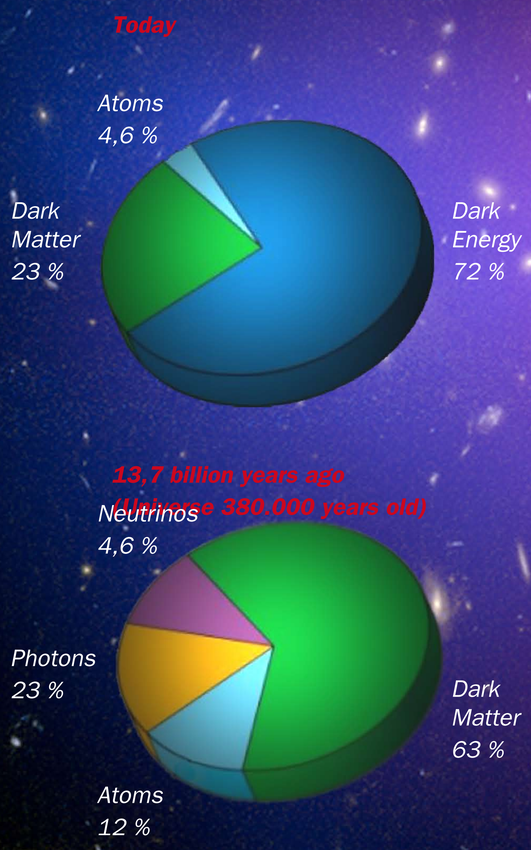
Dark Matter, and how to detect it

From galaxy rotation curves, gravitational lensing, large-scale structure etc, we know that the major part of matter in the universe is non-baryonic = dark matter.

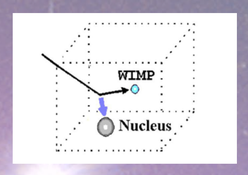
>Most likely, dark matter = new particles!

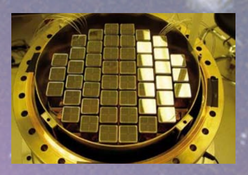


Dark matter search strategies

Direct detection

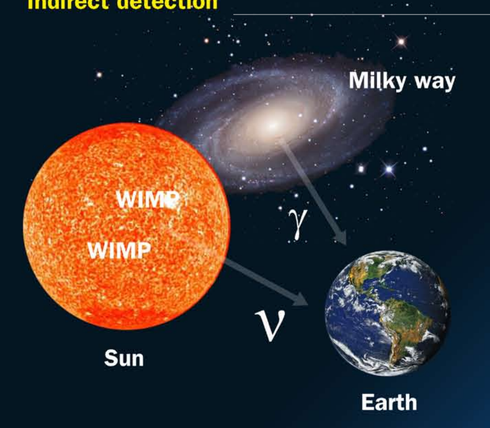
The earth moves through a halo of weakly interacting massive particles. Some may scatter and produce a nuclear recoil signal in low-threshold detectors such as scintillating crystals, cryogenic semi-conductors, liquid noble-gases.





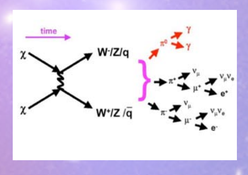
<XENON liquid noble-gas detector.

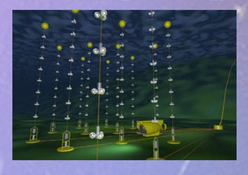
Indirect detection



Dark matter particles may annihilate in the galactic halo, galactic center, or in the sun. Decay particles include energetic neutrinos, gamma rays, positrons, anti-protons. Look for the anomalous flux!

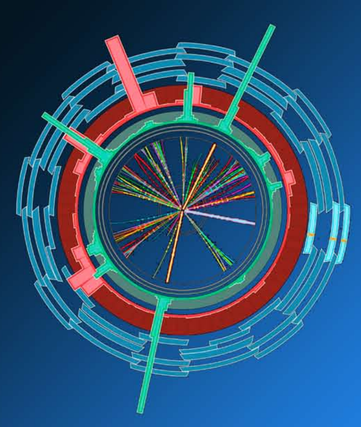
The ANTARES neutrino telescope at the bottom of the Mediterranean Sea looks for high energy neutrinos.





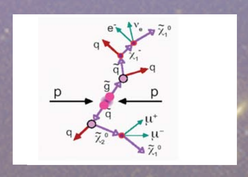
< ANTARES neutrino telescope.

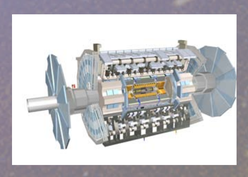
Production at the large Hadron Collider



Dark matter particles may be produced in collisions at the LHC. The lightest supersymmetric particle is an excellent candidate.

The ATLAS experiment will perform this search.





< ATLAS LHC experiment.

>The three methods are complementary, and are all needed to get the full picture!

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