The Dark Side of the Matter

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Introduction

Dark Matter (DM) accounts for about 85% of the total mass budget in the Universe, but the nature of the DM constituents is still hypothetical. Some theories predict that DM particles can decay or self-annihilate in binary collisions producing high energy photons. MAGIC is a stereoscopic system of two Cherenkov telescopes exploring the gamma-ray sky and DM indirect detection is one of its main fields of research. The photons (and neutrinos) are not deflected from the magnetic field. In this way we know that signal is come from the source directly. When one photon impacts with atmosphere, it generates an electromagnetic shower. Electrons and positrons can be generated Cherenkov light which can be collected by telescopes.

Globular Cluster source: M15

- M15 is a globular cluster located ~10 kpc from the Sun
- Its age is around 12 Gyr, stereotype of core-collapsed globular cluster in our Galaxy
- RA = 21h28m58.3s; DEC = 12°10’00.6’’; sriated in the constellation of Pegasus
- Mass ~ 5x10⁶ M☉, with a stellar mass density ~ 10² M☉ pc⁻³ in the core
- M/L ~ 1.5 M☉ /L☉ inside 1’ radius
- From theoretical considerations, not expected an intermediate massive black hole in the core

MAGIC Telescopes

- MAGIC is Major Atmospheric Gamma Imaging Cherenkov telescopes
- Consist in two 17 m of diameter Imaging Atmospheric Cherenkov Telescopes
- Extremely fast ~1100 photomultipliers, fast electronics for the trigger and signal sampling
- Resolution: 0.07°-0.14°; sensitivity: 0.6% Crab units (integral)
- Collected δ-ray with energy range from a few tens of GeV to a few tens of TeV
- Many scientific target: AGN, Fundamental Physics, GRB, Galactic Sources

Research and future objective

The previous anlaysis put an upper limit on the masses of the particles and on their cross section. Waiting for the construction of new telescopes with a lower sensibility, it is possible to extend the exploring the energy range of some tens of GeV. In this way we can find the signal at lower energy around 10, 20 GeV.

Acknowledgment

Attending this school I could expande my knowledge in different field like machine learning, GPU, SiPM and CCD detector.
I would like to thank Riccardo Paoletti, Giacomo Bonnoli, Stefano Truzzi and Daniel Gubermann that are following me in my PhD journey. If I am here it is because of their support.
I would like to thank Huazhong University of Science and Technology in Wuhan, for organizing the INFIERI 2019 Summer School, and allowing me to use its laboratories and structures. Thanks to the speakers, the lab instructors and the volunteers for their patience and help during these days.
When I will come back in Italy, I would like to put into practice what I learned in this school.