Results from MAGIC and future projects

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MAGIC-Collaboration

CHIPP 2008
EPFL, Sept. 9.
MAGIC Status

Major Atmospheric Gamma-ray Imaging Cherenkov Telescope, La Palma, Canary Islands; to measure Very High Energy (VHE) cosmic photons

Physics Topics:
Galactic and Extra-galactic VHE Astronomy; Cosmology; Origin of Cosmic Rays; Dark Matter; Quantum Gravity; ...
MAGIC Status

Past 12 month:

- no (significant) hardware problems; smooth operation
- 14 refereed articles published or accepted (mainly detections or important upper limits)
- 4 articles submitted
- Several more in preparation

Two highlights:
MAGIC: Detection of Crab Pulsar

Very first detection of pulsed emission from a pulsar (Crab) [thanks to effort of a small team], see Michael Rissi, CHIPP-Prize 2008

- Breakthrough in understanding of pulsars

- Will allow to do cross-calibration with GLAST satellite ==> first absolute energy calibration of a Cherenkov telescope !!! (crucial if e.g. DM signal found....)
Detection of VHE emission from 3c279:

- new astrophysical class of VHE emitters (FSRQ)
  ==> extragalactic VHE sky richer than expected
  (FSRQ much more abundant AGN class than HBL)

- more than factor 2 further away than any other known VHE source ( >5x10^9 lightyears )
  ==> universe more transparent for VHE than expected:

  \[ \gamma_{\text{VHE}} + \gamma_{\text{IR}} \rightarrow e^+ e^- \]

  ==> less extragalactic IR light than expected
  (redshifted light from early stars/galaxies/dust/...)

  ==> important info for cosmology

(Science, Vol. 320, 1752 [June 2008])
2nd Telescope: (construction almost finished)
=> allow for stereo observation of showers
=> better \( \gamma \)/hadron separation (less BG)
=> gain \( \sim \)factor 2 in sensitivity

(ETH hardware contribution:
Active Mirror Control System;
Team to help mirror mounting)

Inauguration:

(need some months of commissioning)
Beyond MAGIC:

MAGIC-I

MAGIC-II
Beyond MAGIC:

MAGIC-I

MAGIC-II

HEGRA-CT3
Beyond MAGIC: DWARF

(Dedicated multiWavelength Agn Research Facility)

Refurbish small HEGRA-CT3 Telescope to monitor long-term behaviour of the brightest (northern) AGNs (Würzburg, Dortmund, INFN, ETHZ):

- important (astro-)physical topic
  (but large telescopes too valuable for this)
- trigger large telescopes & multiwavelength campaigns in case of sudden bright flares
  (short, bright flares give best QG information)

Prototype for world-wide grid of small robotic(!) Cherenkov telescopes
Beyond MAGIC: FACT

Major problem for all Cherenkov Telescopes: Limited quantum efficiency of PMTs (25-30%)

First G-APD Camera Test:
Construction of first G-APD based camera for HEGRA-CT3 (ETHZ, PSI, UZH, UGe, EPFL):
- improved quantum efficiency (x2)
- R&D; test for future telescopes
- significantly lower E-threshold for DWARF
  ==> higher sensitivity; better physics
  (Goal: physics data-taking in 2010)
Cherenkov Telescope Array: Pan-european effort for next generation (open) Cherenkov observatory

Goal: compared to today, improve sensitivity x10 and significantly extend energy range

Design study phase:
Active swiss participation in all working groups:

Physics: UGe, ETHZ; MC: UGe; Site: ETHZ;
Software: UGe, ETHZ; Telescope: UZH, ETHZ;
Camera&Electronics: ETHZ, UZH, UGe, PSI
European roadmaps:
- Top priority project in ApPEC/ASPERA
- High priority in Astronet
- under discussion in ESFRI

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Next open meeting:
Nov. 3.–5. 2008, Padova

Everybody welcome...