Astroparticle Physics

@ IPARCOS

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People

High Energy Physics Group

- 5 Faculty
- 1 RyC fellow
- 1 PAD
- 3 Postdocs
- 4 Phd students
- 0.5 Administrative
- 0.5 Technician

Electronics Group

- 2 Faculty
- 2 Engineers

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H.E. Physics

- F. Arqueros (CU)
- M.V. Fonseca (CU)
- J.A. Barrio (CU, 1)
- F. Blanco (PTU)
- M. López (PTU, 2)
- J.L. Contreras (PCD, 3)

Electronics

- J.M. Miranda (CU)
- F.J. Franco (PTU)
- O. Martinez (Eng)
- C. Oliver (Eng)

H. E. Physics

- A. Domínguez (RyC, 4)
- J. Rosado (PAD)
- D. Nieto (J. Inv, 5)
- L.A. Tejedor (Assoc, 6)
- L. Saha (PostD, 7)
- P. Peñil (Phd, 8)
- J. Hoang (Phd, 9)
- D Morcuende (Phd, 10)
- A. Baquero (Phd)
- T. Miener (PhD, 11)
- I. Aguado (Tech, 12)
- M. Cividanes (Adm)

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Overview of the Astroparticle line

Transversal line in IPARCOS

Observational work touching several aspects

The Universe in the GeV-TeV range

- Instrumentation.
  - Hardware
  - Software
- Extragalactic Astrophysics
- Galactic Astrophysics
- Fundamental Physics

IPARCOS

MAGIC

Cherenkov observatory @ La Palma

CTA

Projected worldwide Cherenkov observatory
two sites: La Palma & Chile

VERITAS

Cherenkov observatory @ Arizona

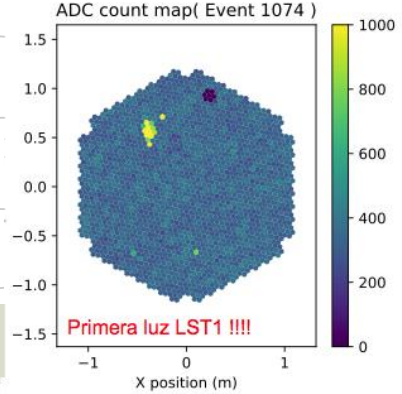
γ-ray mission

FERMI LAT

AS-ASTROGAM

γ-ray project

IPARCOS



Main task : CTA LST1
Inaugurated in October 2018

Instrumentation: Electronics

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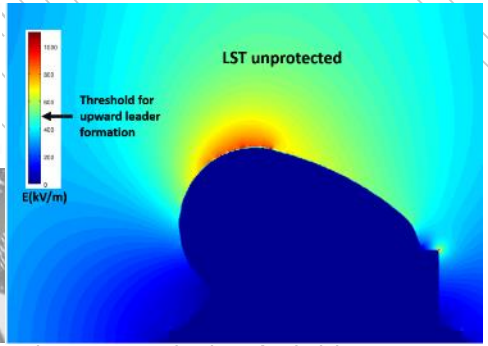
UCM-ELEC
ELECTROMAGNETICS AND HIGH-SPEED ELECTRONICS GROUP

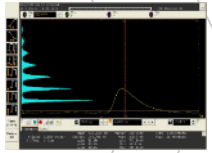
Reliability Engineering
High Speed Electronics
Lightning Protection
Electromagnetic Compatibility
Static Charge Control

F.J. Franco, O. Martínez, C. Oliver

cta
cherenkov telescope array

MAGIC
Major Atmospheric Gamma Imaging Cerenkov Telescope

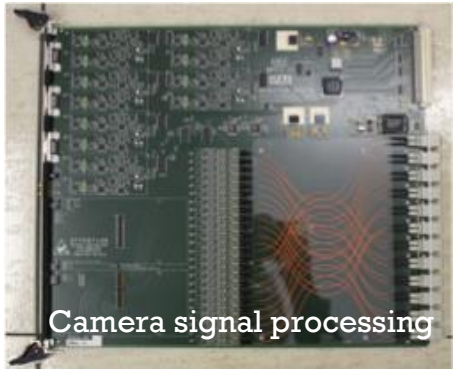




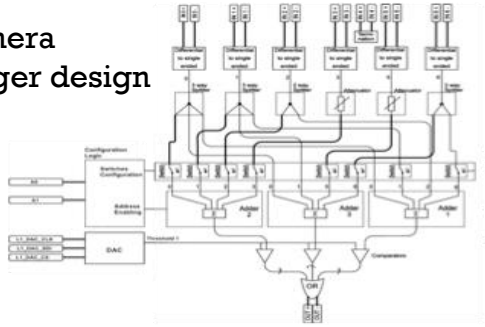
MAGIC

CTA LST & MST Cameras

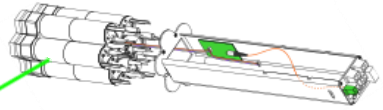
J.A. Barrio, M. López, L.A. Tejedor, P. Peñil



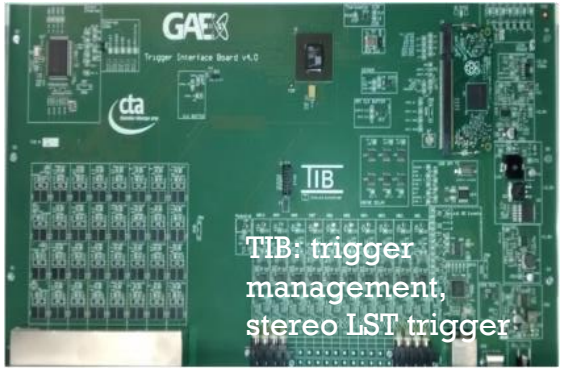
Camera trigger design



Electronics for MAGIC & CTA cameras



Central pixel for optical observation



J. Rosado, L.A. Tejedor, J. Hoang

Work on Silicon PMs
+
Low Gain Avalanche Diodes

In Medical Physics Talk

MAGIC time-stamping system

LST time-stamping system

Convener MST Trigger & Clock WP

IPARCOS

Instrumentation: Software

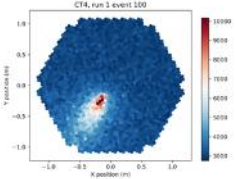
- Deep learning (D. Nieto, T. Miener)
  - Young researchers Project (MICINN-RETOS)
  - Leading CTA Machine Learning group

- Open code and data formats (J.L. Contreras)
  - ASTERICS
  - ESCAPE H2020 Projects

- Onsite processing of MAGIC data at the observatory
  - Processing 1-2 TB/day

- Improving CORSIKA simulation code

  (F. Arqueros., J. Rosado, D. Morcuende)
  - (Fluorescence radiation in atmosphere)



Extragalactic Astrophysics (A. Domínguez, J.L. Contreras)

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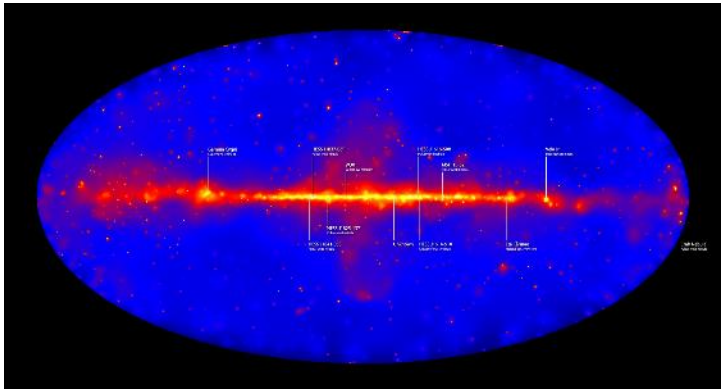
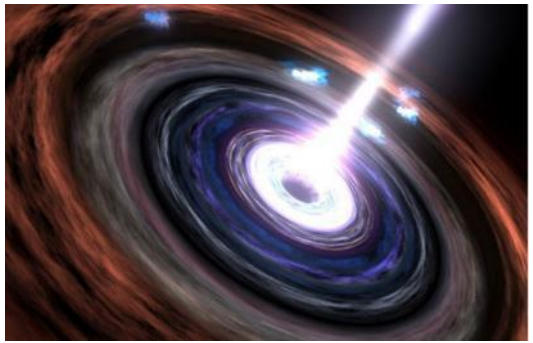
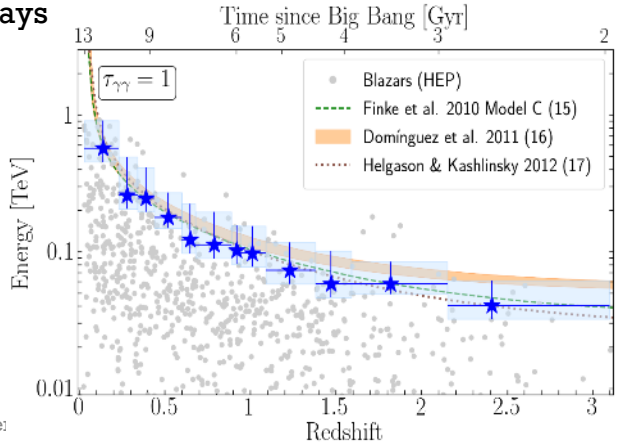
Catalogs of the Gamma-Ray Sky



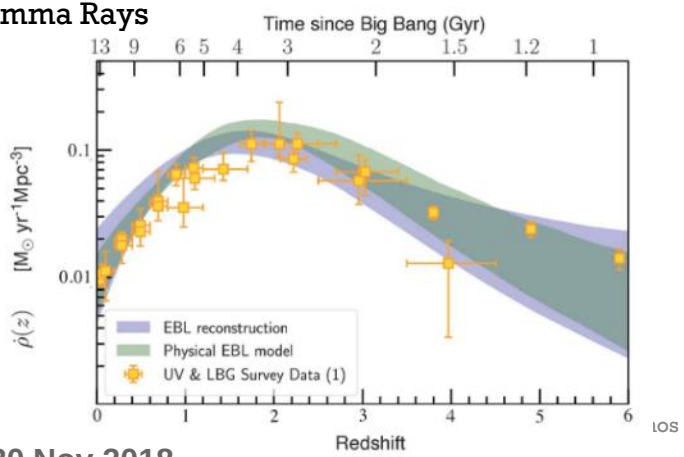
Multiwavelength Study of Blazars and their Emission Mechanisms



Transparency of the Universe to Gamma Rays



Galaxy Evolution and Cosmology with Gamma Rays



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Galactic Astrophysics (M. López, L. Saha, J. Hoang, V. Fonseca)

Main line:

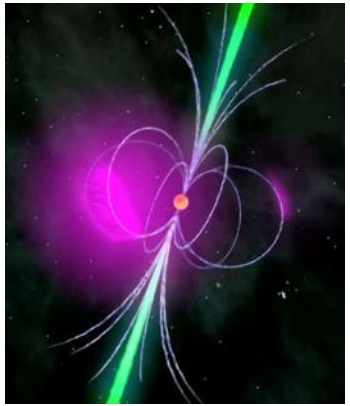
Observations of pulsars ɣ-rays

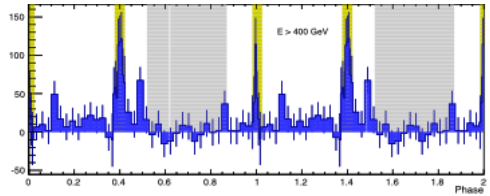
Also : Unidentified ɣ-ray sources

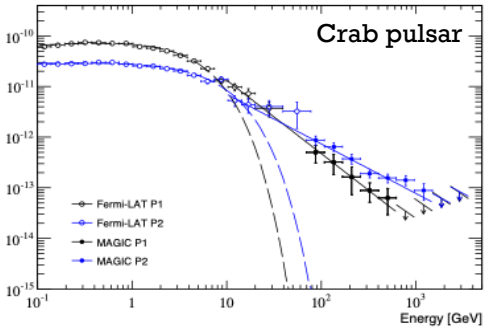
Binary systems

Pulsars

Rotating neutron stars



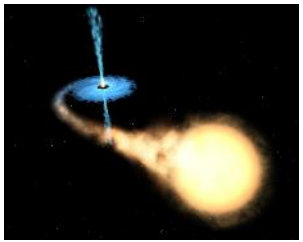




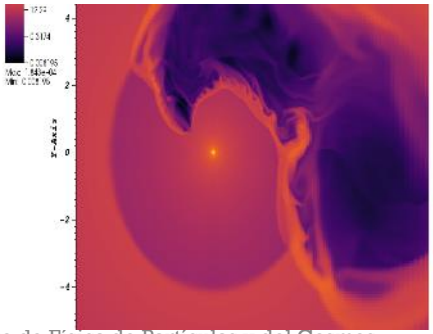
& Pulsar Wind Nebulae

Binaries

Stars orbiting black holes



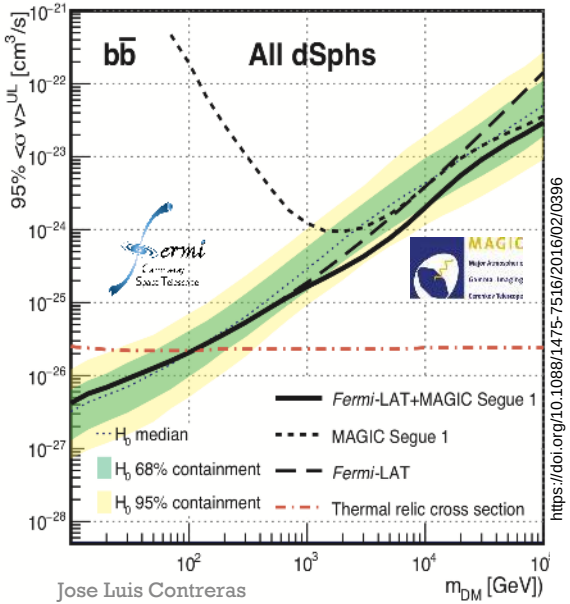
MHD Simulations

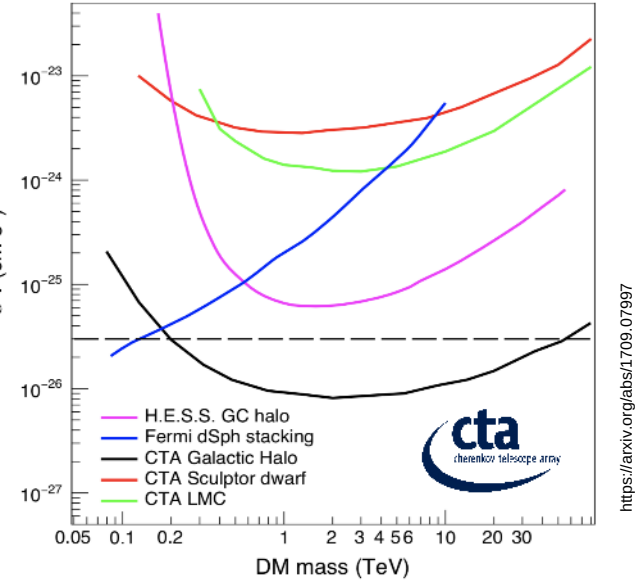


Fundamental Physics

Indirect dark matter searches

D. Nieto, J.A. Barrio, T. Miener

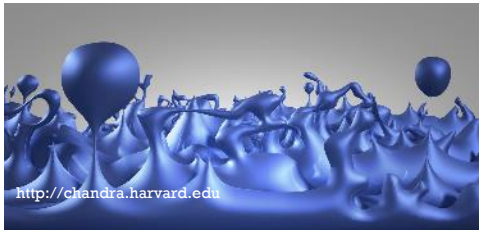


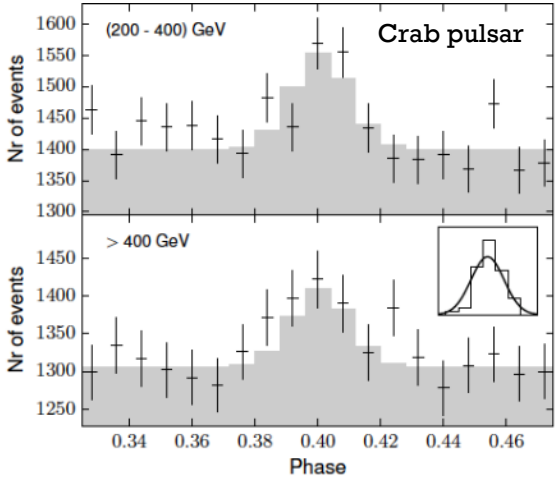


Jose Luis Contreras

Tests of Lorentz invariance

M. López, D. Carreto-Fidalgo

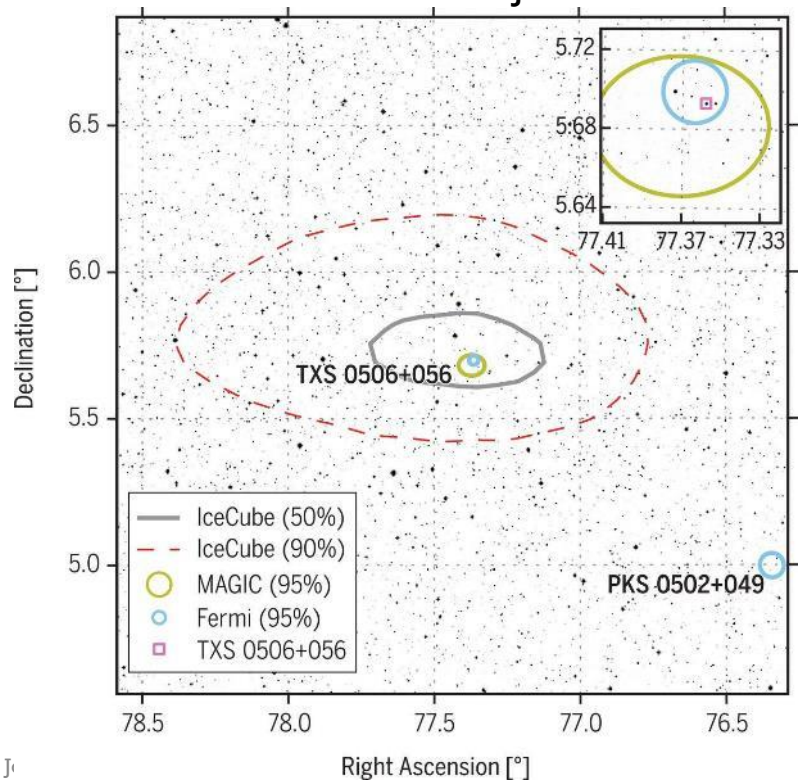




Instituto de Física de Partículas y del Cosmos

The power of Multimessenger Astrophysics

Science V 61 13 Jul 2018



On 22 September 2017 Ice-Cube produces an alert upon detection of a 290 TeV neutrino

FERMI detects an AGN on flare with a position compatible with the Ice-Cube detection.

MAGIC detects acceleration of particles to Very High Energies (400 GeV)

Significance of correlation 3 sigma

The dawn of neutrino astronomy ?