

Título: OBSERVACIONES MULTIRRANGO DE ESTRELLAS DE NEUTRONES Y AGUJEROS NEGROS CON LOS TELESCOPIOS MAGIC./MULTIWAVELENGTH OBSERVATIONS OF NEUTRON STARS AND BLACK HOLES WITH THE MAGIC TELESCOPE.

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Departamento: Comisión Académica del Programa

Fecha de lectura: 16/10/2020

Programa de doctorado: Programa de Doctorado en Astrofísica por la Universidad Complutense de Madrid

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Descriptores:

- > RAYOS COSMICOS
- > OPTICA

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Resumen: The MAGIC (Major Atmospheric Gamma Imaging Cherenkov Telescopes) telescope system consists of two Imaging Atmospheric Cherenkov Telescopes located at La Palma island, Spain, aiming to explore violent processes in the universe by means of Very High Energy (VHE) gamma rays. Its high detection sensitivity and time resolution enable detailed spectral studies of VHE gamma ray sources. Additionally, the MAGIC II camera is also equipped with a dedicated readout channel, enabling MAGIC to observe also in the visible band at faster speed than conventional optical telescopes equipped with Charge-Coupled Device (CCD). One of the general goals of MAGIC is the study of fast transients in the gamma-ray and optical band, exploiting the unique capabilities of the instrument. Specifically for this work, the ability of MAGIC to collect simultaneously both visible and gamma-ray data makes it a competitive instrument during multiwavelength observation campaigns that search for signals coming from neutron stars and black holes across the electromagnetic spectrum.

This thesis consists of four major works: 1) The study of MAGIC γ 's sensitivity to millisecond optical pulses, 2) MAGIC γ 's multiwavelength observation of the first repeating Fast Radio Burst (FRB) FRB 121102, 3) MAGIC γ 's multiwavelength observation of the recently discovered black hole MAXI J1820+070, and 4) MAGIC γ 's deep observation of the millisecond pulsar PSR J0218+4232. The conclusions to these works, respectively, are: 1) MAGIC γ 's Central Pixel is sensitive to the optical pulses that last for several milliseconds, both in the periodic and isolated cases. A variety of background and science cases are also explored using this device; 2) Five radio pulses were detected by the Arecibo radio telescopes during the observation, but MAGIC detected no gamma-ray emission from the repeating FRB 121102. In the optical band, we found an optical pulse arriving ~ 4 seconds before one of the radio pulses observed. This optical event could not be unambiguously associated with a radio burst; 3) No gamma-ray emission was detected from MAXI J1820+070, but we detected a hint of a significant optical activities from the same object; 4) MAGIC detected neither steady nor pulsed gamma-ray emission from the millisecond pulsar PSR J0218+4232. However, MAGIC observed steady gamma-ray emission from the blazar 3C66A/B in the field of view during the observation.