Kombinirani pristup u astronomiji
prvi rezultati

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Astronomsko društvo Koprivnica
Koprivnica, 30. studenog 2017.

Matematičko-fizički list, 4, 2005./2006.

ASTRONOMIJA

Kombinirani pristup u astronomiji

Dario Hrupec[1], *Koprivnica*

Uvod

Pročitavši nedavno staru indijsku priču o slijepcima i slonu[2] uočio sam zgodnu analogiju s kombiniranim[3] pristupom u astronomiji (engl. multimessenger approach). Za razliku od slijepaca iz priče, astronomi su danas svjesni da svoje različite poglede u nebo moraju ujediniti kako bi dobili širu sliku i bolje razumjeli ono što opažaju.

multimessenger approach

Multi-messenger astronomy

From Wikipedia, the free encyclopedia

Multi-messenger astronomy is astronomy based on the coordinated observation and interpretation of disparate "messenger" signals. The four messengers are electromagnetic radiation, gravitational waves, neutrinos, and cosmic rays. They are created by different astrophysical processes, and thus reveal different information about their sources.

The main multi-messenger sources outside the heliosphere are expected to be compact binary pairs (black holes and neutron stars), supernovae, irregular neutron stars, gamma-ray bursts, active galactic nuclei, and relativistic jets.[1][2][3]

Milestones [edit]

- **1940s**: Some cosmic rays are identified as forming in solar flares.[7]
- **1987**: Supernova SN 1987A, which was first detected with an optical telescope, also emitted neutrinos that were detected at the Kamiokande-II, IMB and Baksan neutrino observatories.
- **August 2017**: A neutron star collision that occurred in the galaxy NGC 4993 produced the gravitational wave signal GW170817, which was observed by the LIGO/Virgo collaboration. After 1.7 seconds, it was observed as the gamma ray burst GRB 170817A by the Fermi Gamma-ray Space Telescope and INTEGRAL, and its optical counterpart SSS17a was detected 11 hours later at the Las Campanas Observatory. Further optical observations e.g. by the Hubble space telescope and the Dark Energy Camera, ultraviolet observations by the Swift Gamma-Ray Burst Mission, X-ray observations by the Chandra X-ray Observatory and radio observations by the Karl G. Jansky Very Large Array complemented the detection. This was the first instance of a gravitational wave event that was observed to have a simultaneous electromagnetic signal, thereby marking a significant breakthrough for multi-messenger astronomy.[8] Non-observation of neutrinos is attributed to the jets being strongly off-axis.[9]
- **September 2017**: On September 22, the extremely-high-energy neutrino event EHE170922A[10] was recorded by the IceCube Collaboration. Consistent detections of gamma rays above 100 MeV by the Fermi-LAT Collaboration[11] and above 100 GeV by the MAGIC Collaboration[12] were announced. The signal is consistent with ultra-high-energy protons accelerated in blazar jets, producing neutral pions (decaying into gamma rays) and charged pions (decaying into neutrinos).[13]

ATel #10817

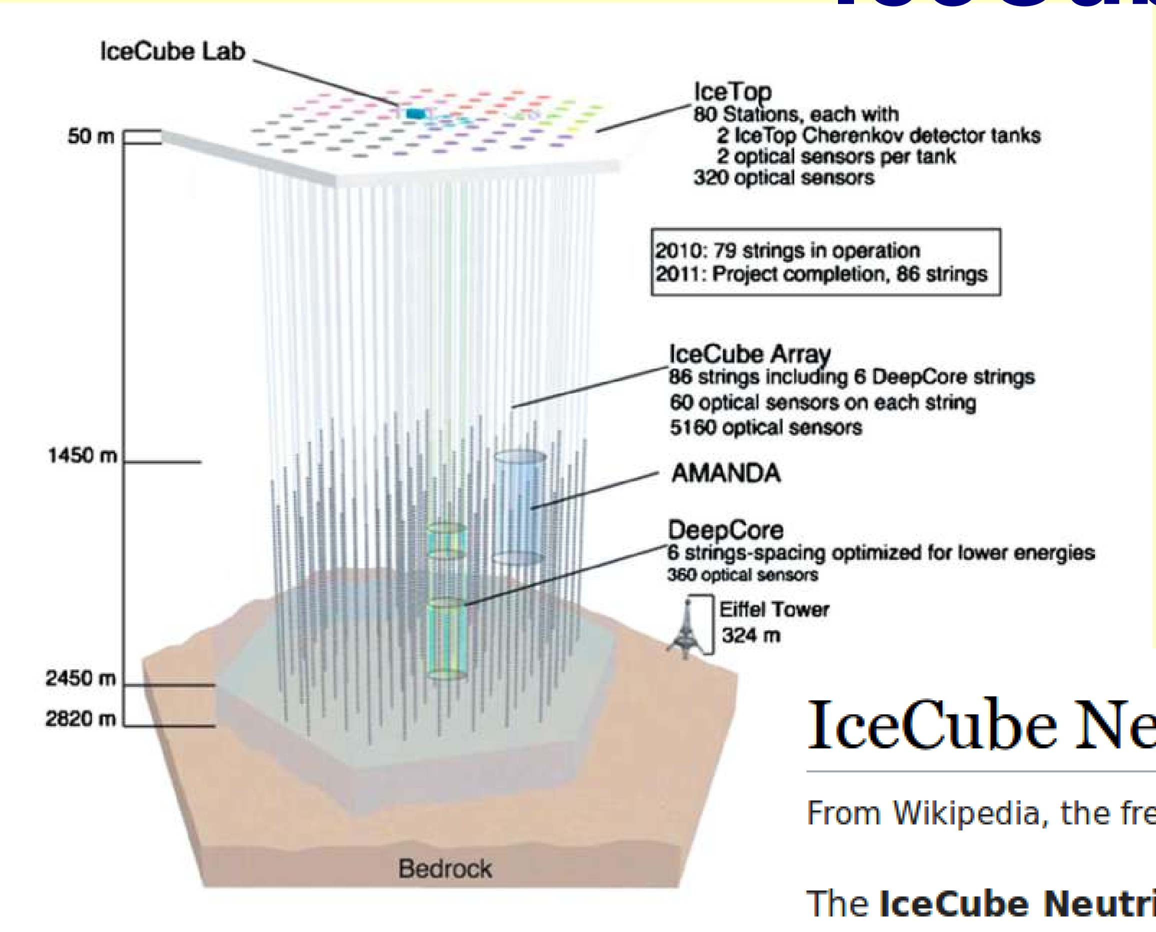
The Astronomer's Telegram

First-time detection of VHE gamma rays by MAGIC from a direction consistent with the recent EHE neutrino event IceCube-170922A

ATel #10817; ***Razmik Mirzoyan for the MAGIC Collaboration***
on ***4 Oct 2017; 17:17 UT***

After the IceCube neutrino event EHE 170922A detected on 22/09/2017 (GCN circular #21916), Fermi-LAT measured enhanced gamma-ray emission from the blazar TXS 0506+056 (05 09 25.96370, +05 41 35.3279 (J2000), [Lani et al., Astron. J., 139, 1695-1712 (2010)]), located 6 arcmin from the EHE 170922A estimated direction (ATel #10791). MAGIC observed this source under good weather conditions and a 5 sigma detection above 100 GeV was achieved after 12 h of observations from September 28th till October 3rd. **This is the first time that VHE gamma rays are measured from a direction consistent with a detected neutrino event.**

IceCube



IceCube Neutrino Observatory

From Wikipedia, the free encyclopedia

The **IceCube Neutrino Observatory** (or simply **IceCube**) is a neutrino observatory constructed at the Amundsen–Scott South Pole Station in Antarctica.[1] Its thousands of sensors are distributed over a cubic kilometre of volume under the Antarctic ice. Similar to its predecessor, the Antarctic Muon And Neutrino Detector Array (AMANDA), IceCube consists of spherical optical sensors called Digital Optical Modules (DOMs), each with a photomultiplier tube (PMT)[2] and a single board data acquisition computer which sends digital data to the counting house on the surface above the array.[3] IceCube was completed on 18 December 2010.[4]

MAGIC

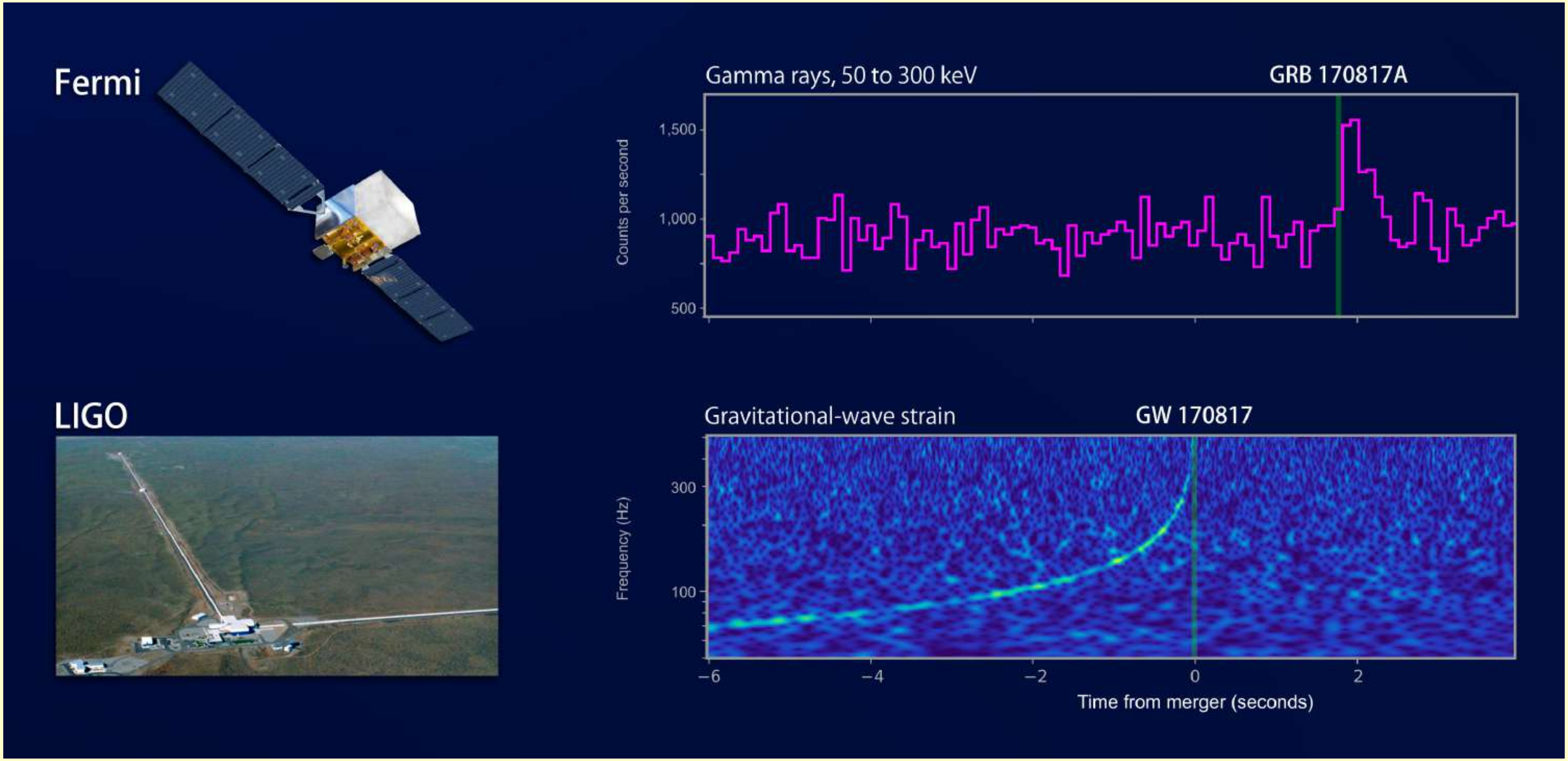
MAGIC (telescope)

From Wikipedia, the free encyclopedia

This article is about the telescope. For other uses, see Magic (disambiguation).

MAGIC (**Major Atmospheric Gamma Imaging Cherenkov Telescopes**) is a system of two Imaging Atmospheric Cherenkov telescopes situated at the Roque de los Muchachos Observatory on La Palma, one of the Canary Islands, at about 2200 m above sea level. MAGIC detects particle showers released by gamma rays, using the Cherenkov radiation, i.e., faint light radiated by the charged particles in the showers. With a diameter of 17 meters for the reflecting surface, it was the largest in the world before the construction of H.E.S.S. II.

GW170817 & GRB 170817A



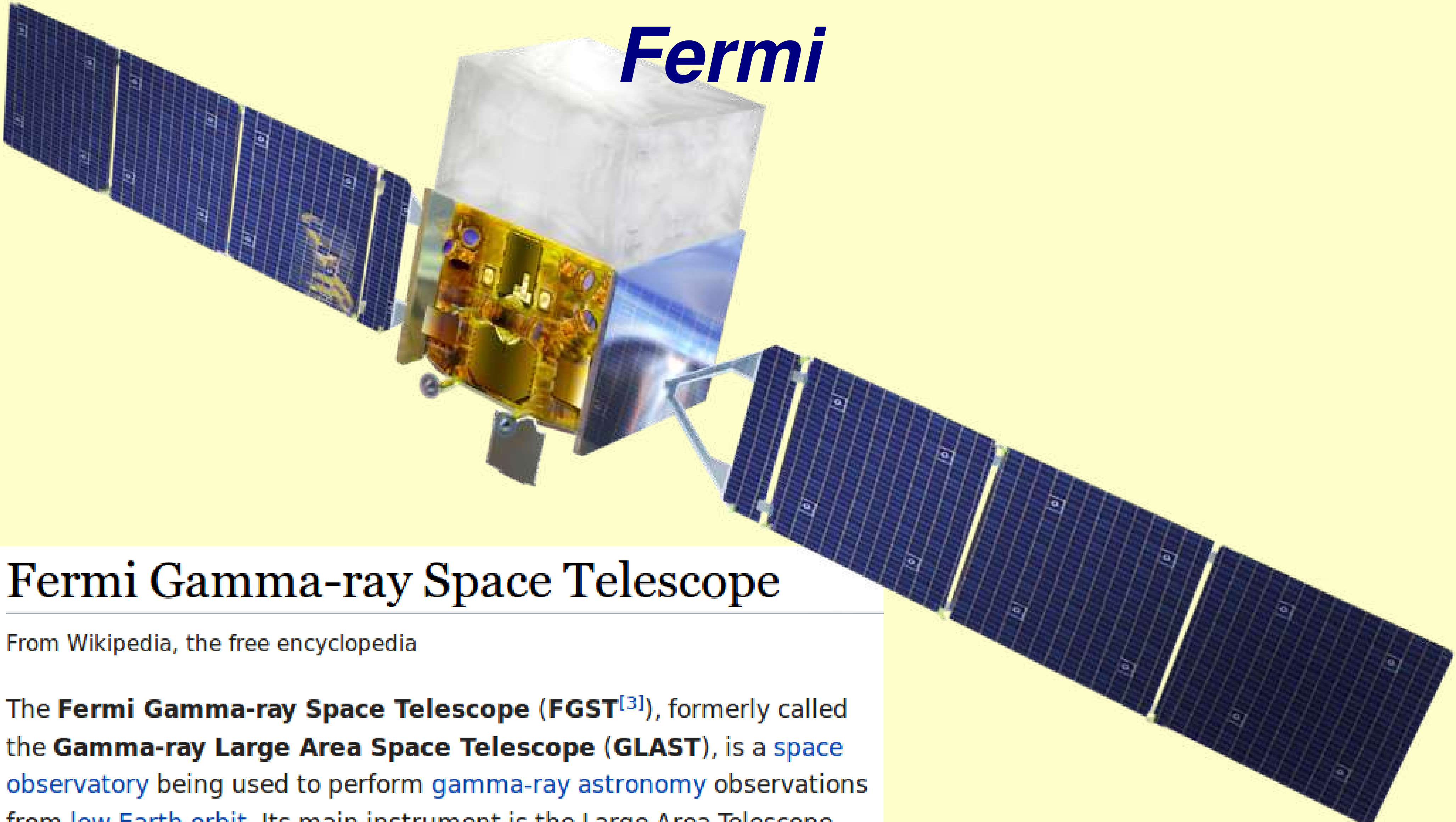
LIGO

LIGO

From Wikipedia, the free encyclopedia

The **Laser Interferometer Gravitational-Wave Observatory** (**LIGO**) is a large-scale physics experiment and observatory to detect cosmic gravitational waves and to develop gravitational-wave observations as an astronomical tool.[1] Two large observatories were built in the United States with the aim of detecting gravitational waves by laser interferometry. These can detect a change in the 4 km mirror spacing of less than a ten-thousandth the charge diameter of a proton, equivalent to measuring the distance to Proxima Centauri with an accuracy smaller than the width of a human hair.[2]

Fermi



Fermi Gamma-ray Space Telescope

From Wikipedia, the free encyclopedia

The **Fermi Gamma-ray Space Telescope** (**FGST**[3]), formerly called the **Gamma-ray Large Area Space Telescope** (**GLAST**), is a space observatory being used to perform gamma-ray astronomy observations from low Earth orbit. Its main instrument is the Large Area Telescope (LAT), with which astronomers mostly intend to perform an all-sky survey studying astrophysical and cosmological phenomena such as active galactic nuclei, pulsars, other high-energy sources and dark matter. Another instrument aboard Fermi, the Gamma-ray Burst Monitor (GBM; formerly GLAST Burst Monitor), is being used to study gamma-ray bursts.[4]

Prvi rezultati kombiniranog pristupa

ZNANOST ASTRONOMIJA TAMNA TVAR

Rođenje novih astronomija i smrt alternativnih teorija gravitacije

Nakon pete izravne detekcije gravitacijskih valova možemo pouzdano reći da smo svjedoci rođenja jedne nove astronomije – astronomije gravitacijskih valova

Dario Hrupec ponedjeljak, 13. studenog 2017. u 14:03

GW170817 Falsifies Dark Matter Emulators

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On August 17, 2017 the LIGO interferometers detected the gravitational wave (GW) signal (GW170817) from the coalescence of binary neutron stars. This signal was also simultaneously seen throughout the electromagnetic (EM) spectrum from radio waves to gamma-rays. We point out that this simultaneous detection of GW and EM signals rules out a class of modified gravity theories, which dispense with the need for dark matter. This simultaneous observation also provides the first ever test of Einstein's Weak Equivalence Principle (WEP) between gravitons and photons. We calculate the Shapiro time delay due to the gravitational potential of the total dark matter distribution along the line of sight (complementary to the calculation in [1]) to be about 1000 days. Using this estimate for the Shapiro delay and from the time difference of 1.7 seconds between the GW signal and gamma-rays, we can constrain violations of WEP using the parameterized post-Newtonian (PPN) parameter γ, and is given by $|\gamma_{GW} - \gamma_{EM}| < 3.9 \times 10^{-8}$.