Particle Accelerators in the Cosmos Radiation Phenomena

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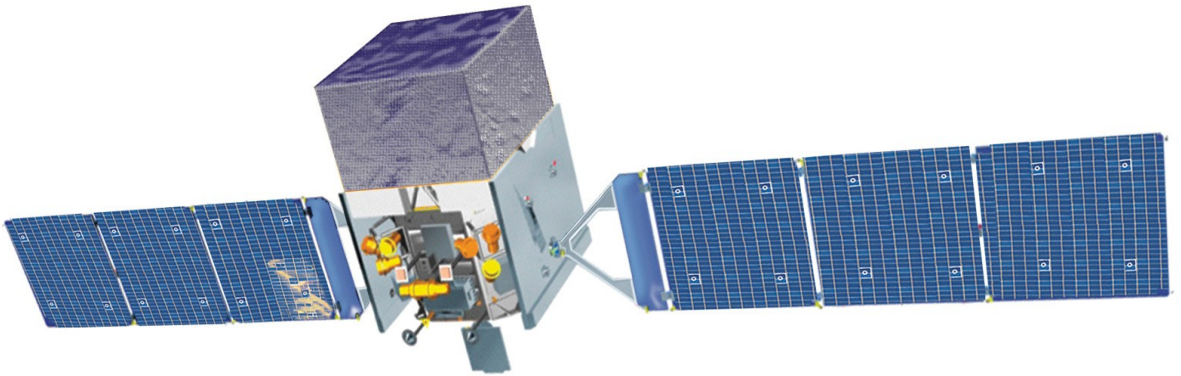
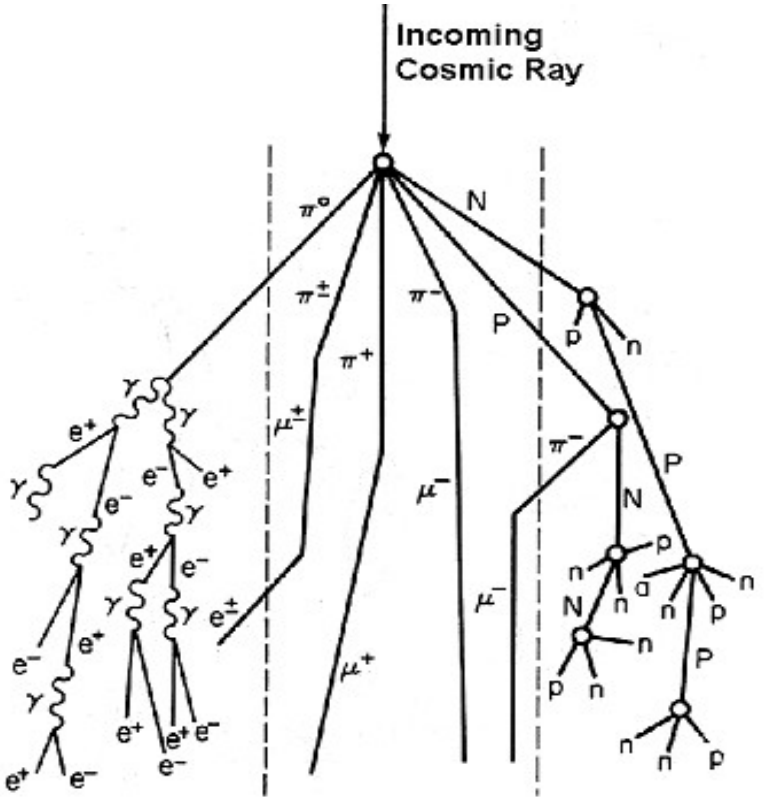
Cosmic Ray

- high energy particles with intrinsic masses
- Classification based on the source:
  - ➔Solar Cosmic Rays (SCR)
  - ➔Galactic Cosmic Rays (GCR)
- collisions in the atmosphere may produce secondary cosmic rays

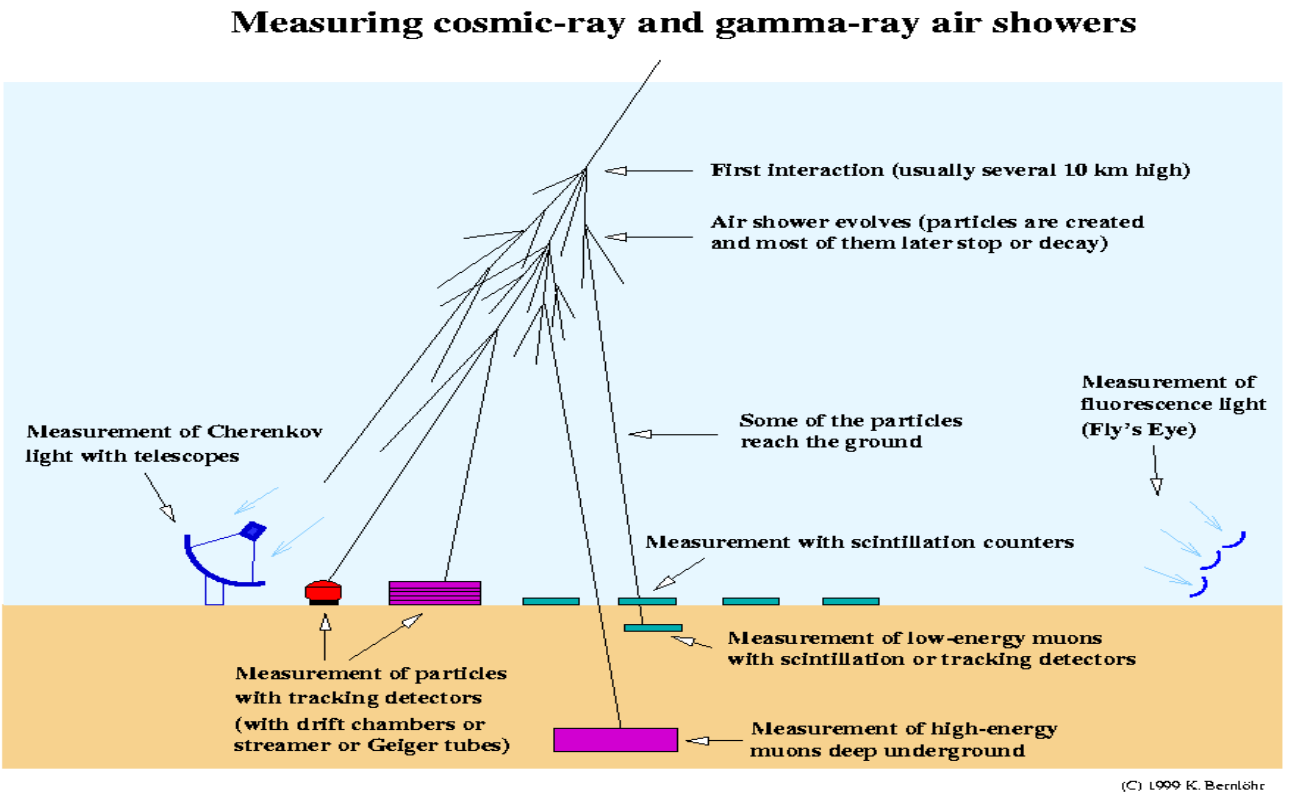


https://upload.wikimedia.org/wikipedia/commons/1/1f/Fermi_telescope_illustration_01.jpg



http://neutronm.bartol.udel.edu/catch/cr2b.gif

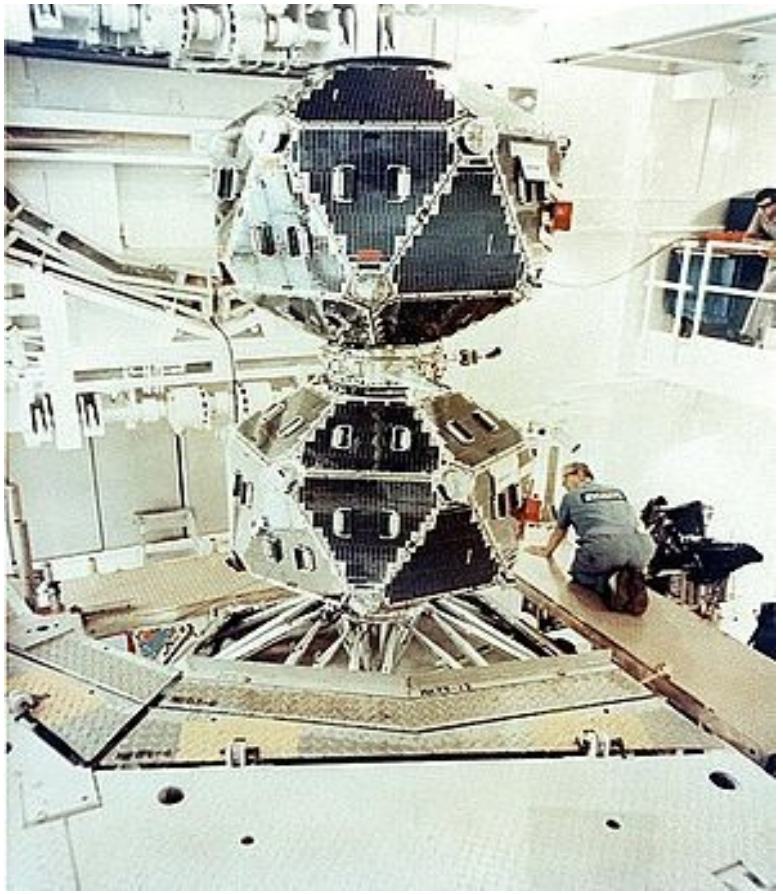
Detection of Cosmic Rays



https://en.wikipedia.org/wiki/Cosmic-ray_observatory#/media/File:Shower_detection.png

https://en.wikipedia.org/wiki/Cosmic_ray#/media/File:VERITAS_array.jpg

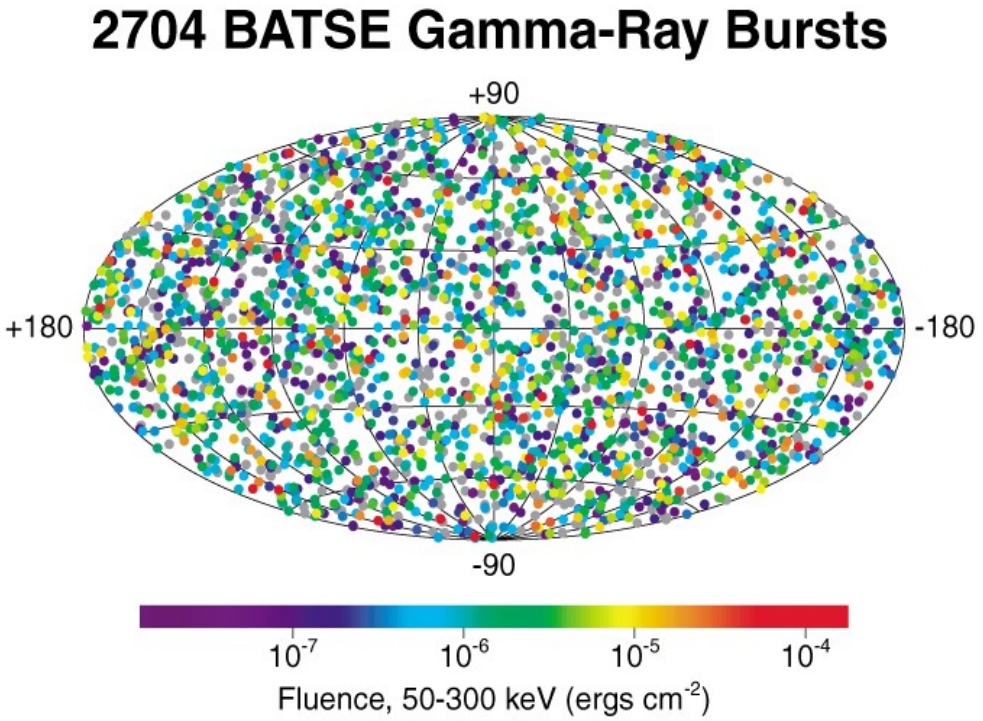
Gammy Ray Bursts

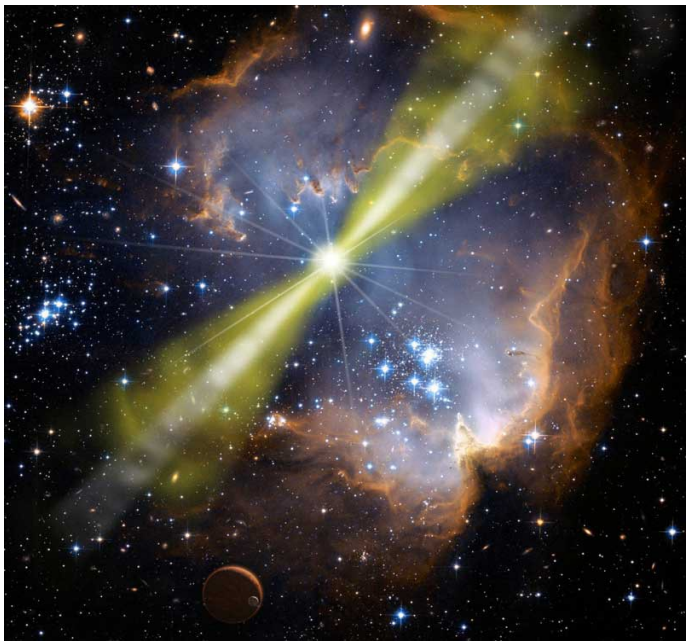


http://images.google.de/imgres?imgurl=http%3A%2F%2Fnsarchive.gwu.edu%2FNSAEBB%2FNSAEBB190%2Fcover.jpg&imgrefurl=http%3A%2F%2Fnsarchive.gwu.edu%2FNSAEBB%2FNSAEBB190%2F&h=312&w=208&tbnid=qrbMdWWSHpwczM%3A&docid=oFFk1_E8UsxmdM&ei=QI-dVpueAcmTav2fpzA&tbm=isch&iact=rc&uact=3&dur=249&page=2&start=32&ndsp=31&ved=0ahUKEwibvsrY2rTKAhXJiRoKHf3PCQYQrQMIvAEwMg

https://upload.wikimedia.org/wikipedia/commons/thumb/7/76/Vela5b.jpg/300px-Vela5b.jpg

Gamma Ray Bursts





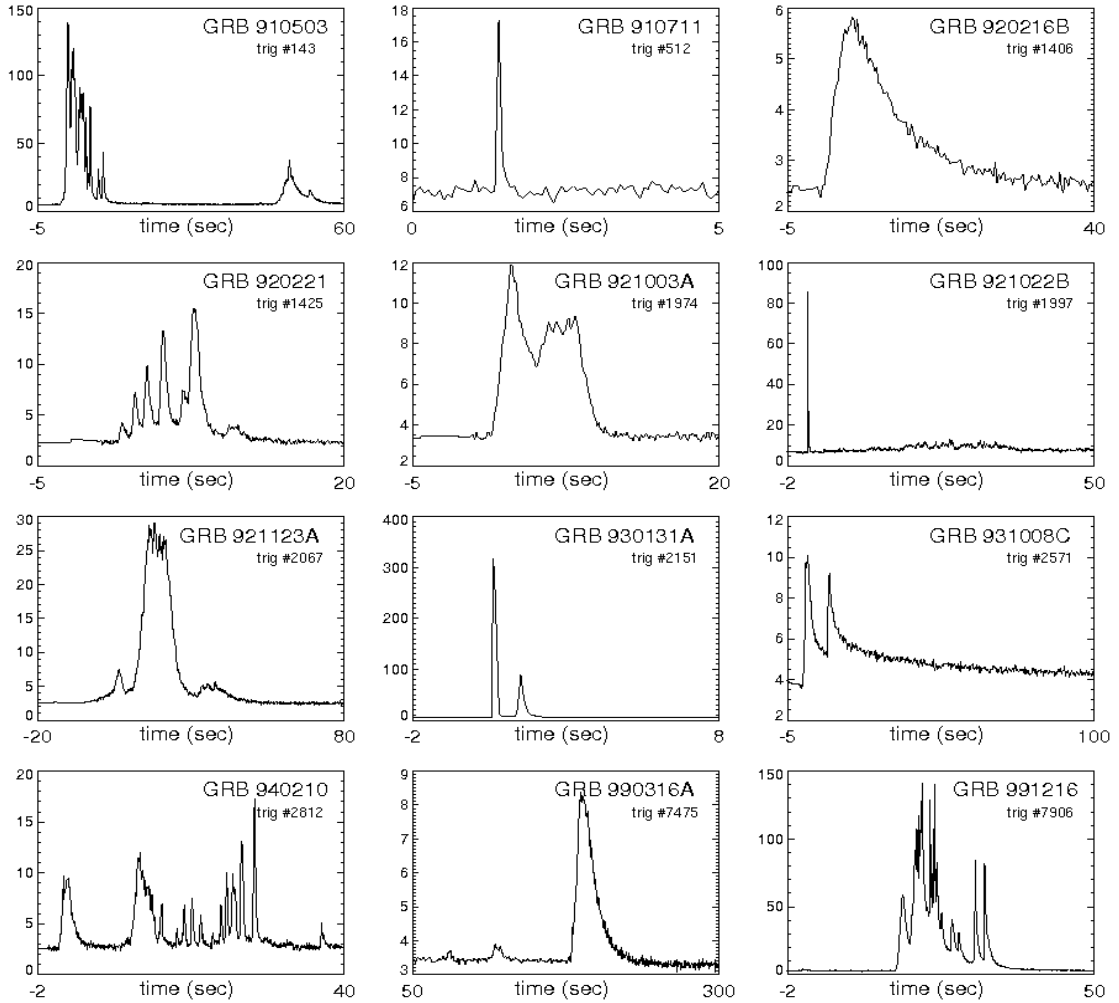
https://en.wikipedia.org/wiki/Gamma-ray_burst#/media/File:GRB080319B_illustration_NASA.jpg

https://en.wikipedia.org/wiki/Gamma-ray_burst#/media/File:BATSE_2704.jpg

Gamma Ray Bursts - Classification

- Short GRB
  - ➔ duration of less then 2 seconds
  - ➔ 30% of GRB
  - ➔ true nature unknown
- Long GRB
  - ➔ last longer then two seconds
  - ➔ 70% of GRB
  - ➔ linked to a galaxy with rapid star formation

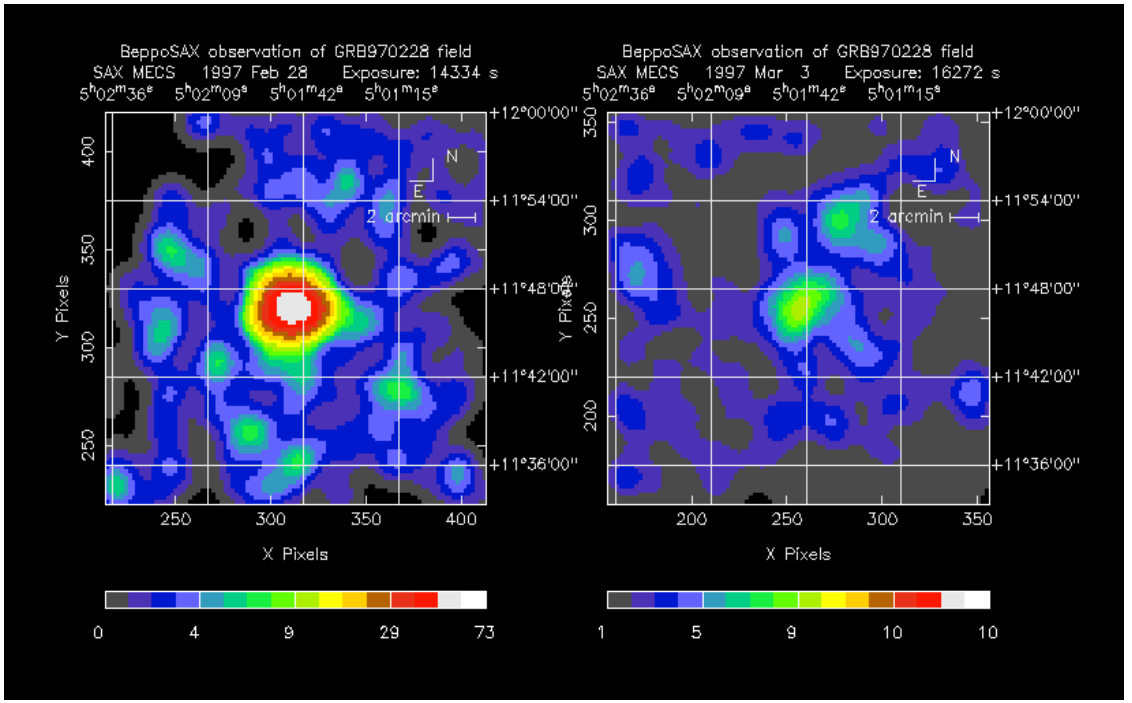
Gamma Ray Bursts - Classification



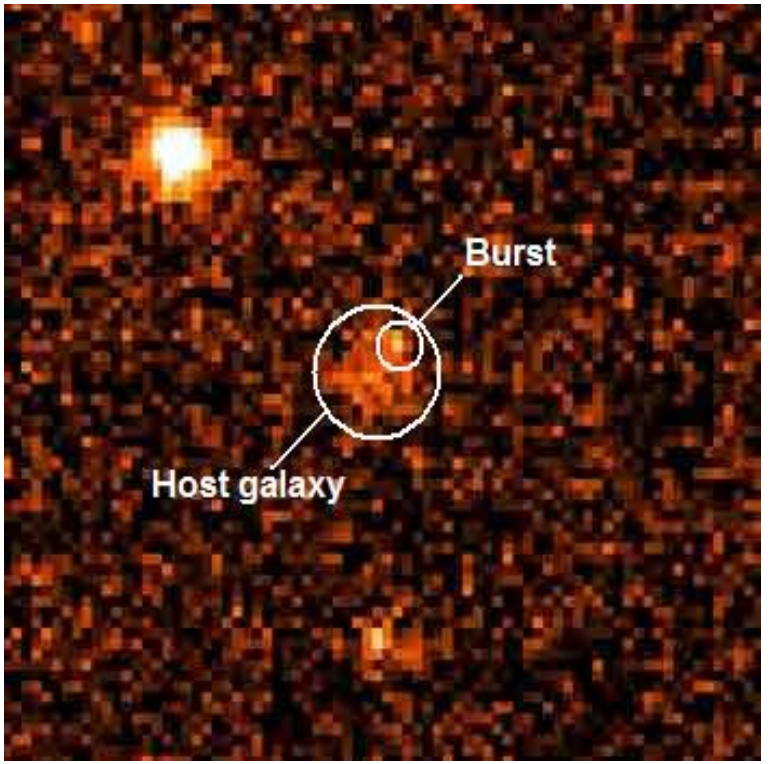
https://en.wikipedia.org/wiki/Gamma-ray_burst#/media/File:GRB_BATSE_12lightcurves.png

Gamma Ray Bursts - Afterglow

- eppoSAX images of GRB 970228 eight hours after the burst (left) and three days after the burst (right).



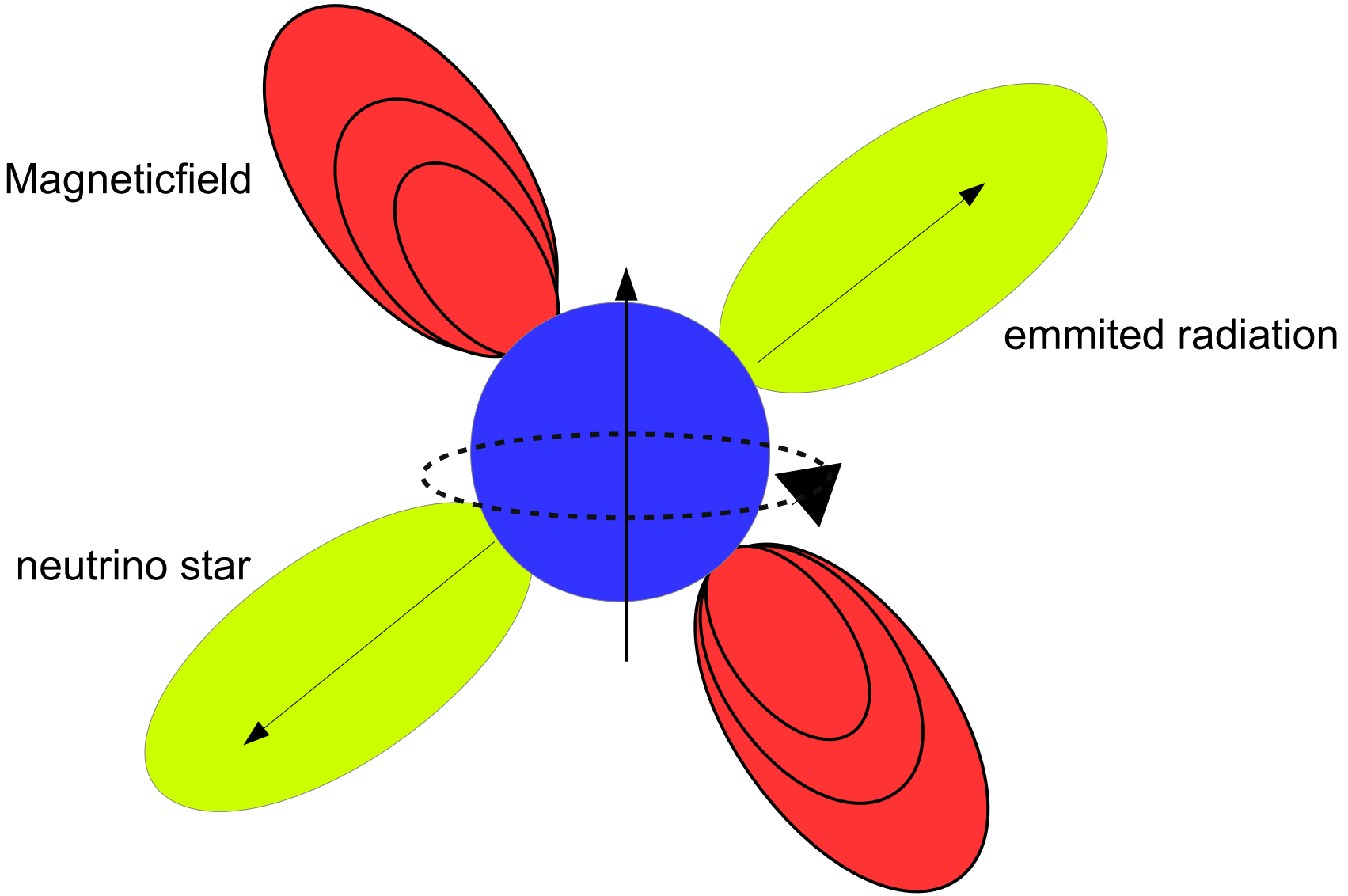
- GRB 970228 as seen by Hubble



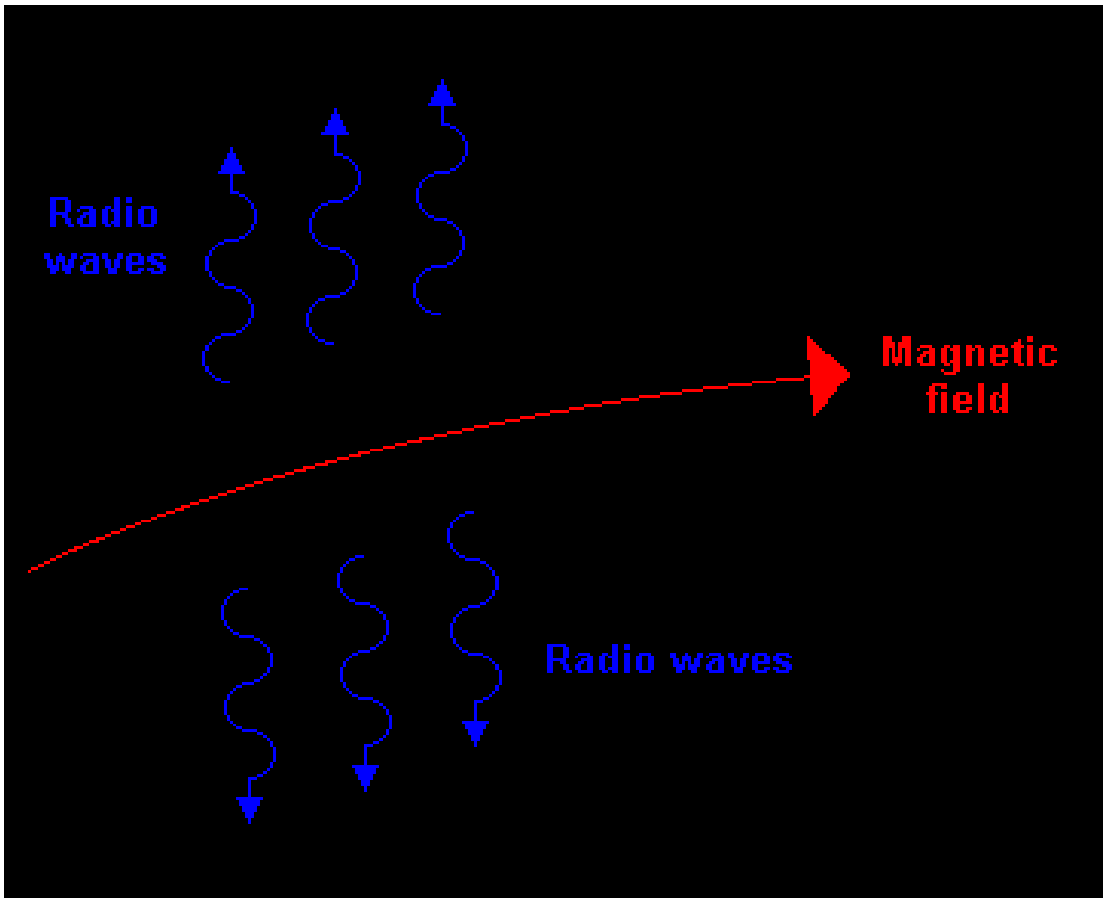
http://swift.sonoma.edu/images/grbs/grb970228.gif

https://en.wikipedia.org/wiki/GRB_970228#/media/File:GRB_970228.jpg

Pulsar

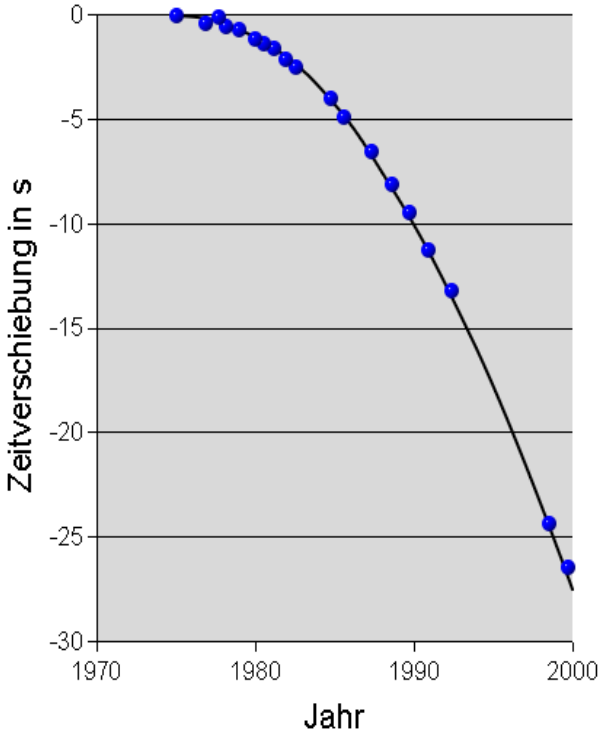


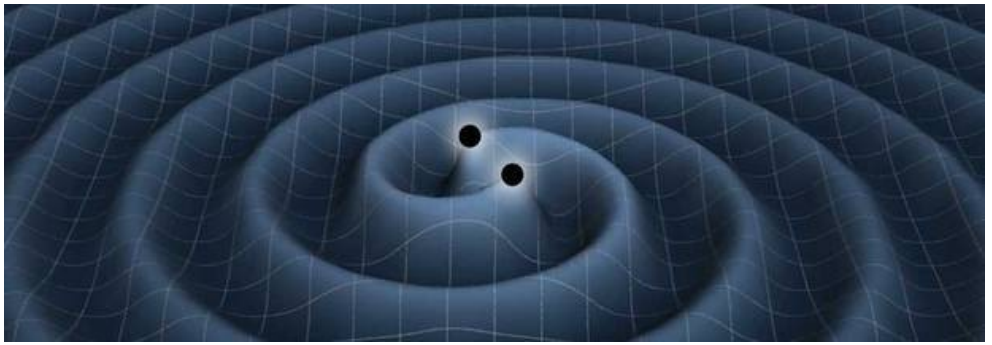
Pulsar – Synchrotron Radiation



http://lightandcolourinmoderntechnology.weebly.com/uploads/5/0/0/6/50062133/9263818_orig.gif

Gravitational Waves





http://www.weltderphysik.de/typo3temp/_processed_/csm_3120131017__BlackHolesGravWaves__Nasa_1e8cfa3bd8.jpg

https://de.wikipedia.org/wiki/PSR_1913%2B16#/media/File:Psr1913%2B16-weisberg.png

„My earlier rumor about LIGO has been confirmed by independent sources. Stay tuned! Gravitational waves may have been discovered!! Exciting.“

— Lawrence M. Krauss (@LKrauss1) January 11, 2016

Aerial views showing the locations and extents of the LIGO Hanford and LIGO Livingston interferometers. (Photos: LIGO)

https://en.wikipedia.org/wiki/Lawrence_M._Krauss#/media/File:Laurence_Krauss.JPG

Sources

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- http://www.spektrum.de/lexikon/astronomie/gravitationswellen/156
- https://ligo.caltech.edu/page/what-are-gw
- http://helios.gsfc.nasa.gov/qa_cr.html#cosmicray