What is gamma-ray burst?

The first thing you imagine in your head when listening to the gamma rays phrase - what is the gamma flash? Join TipsMake.com to learn about gamma ray bursts!

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What is the first thing you imagine in your mind when you hear the phrase " *gamma rays - lightning gamma* "?

If you are an avid fan of the superhero world then you will soon associate gamma lightning with " *The Incredible Hulk* ". In the process of studying a new weapon, the physicist **Bruce Banner** (*Edward Norton*) was completely transformed after a large amount of radiation. Banner physicist brings in a powerful and uncontrollable power whenever angry.

The Hulk, a famous giant superhero has received supernatural power after accidentally being infected with a large amount of radiation.
However, if you are a " *nerd* " physicist, you would say that gamma rays are on an electromagnetic spectrum and are the strongest energy waves we have ever known. And if you look deeply into space and astrophysics, you've probably heard of the term " *gamma ray burst* " quite often.

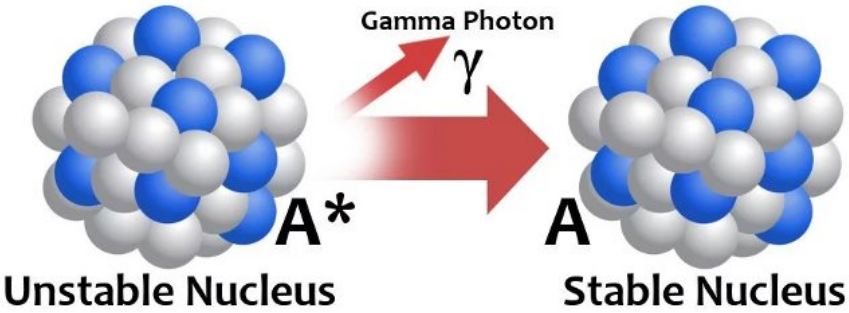
For people who don't know about these phenomena or don't completely understand what it is, start with the following basics:

What is gamma rays?

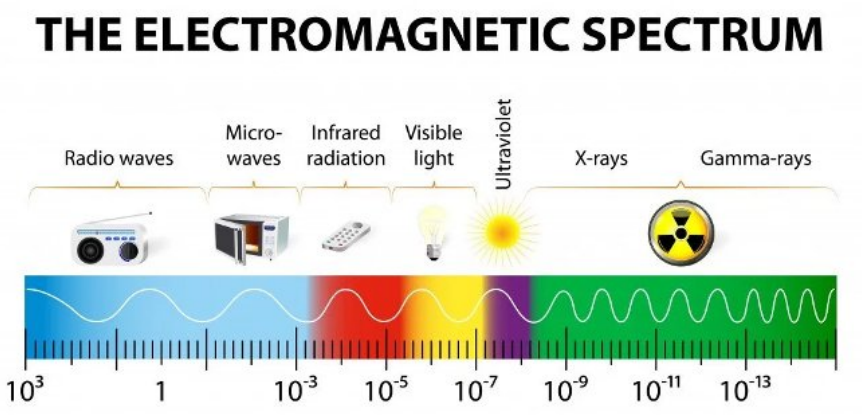
Gamma rays (*denoted by ?*) are a type of electromagnetic radiation or photonic with extremely high frequencies, with the lowest wavelength (*E-14m ÷ E-12m*) and the highest frequency (*E20 - E24 Hz)* in the number of electromagnetic waves, so it carries more energy than radio waves, microwaves, light, infrared rays, ultraviolet rays and X-rays.

Gamma rays are a form of electromagnetic radiation (*or electromagnetic waves*) like radio waves, infrared radiation, ultraviolet radiation, X-rays and microwaves. **In medicine, gamma rays are used as blades in surgery of small tumors in the brain, defects in blood vessels** . **In astronomy, by measuring and determining gamma rays astronomers can determine the location of supernova explosions, interactions between black holes and other companion stars** .

Gamma rays are a form of electromagnetic radiation produced by the radioactive decay of an atomic nucleus. An atom consists of a nucleus, containing protons and neutrons. In most natural nuclides, the structure of these small atomic particles is stable. However, in some atoms, the energy containing these particles (*binding energy*) is not strong enough, so the nucleus becomes unstable and begins to lose protons and neutrons to achieve stability. This is also accompanied by the release of some types of radiation. Gamma radiation is one of the types of radiation after radioactive decay.



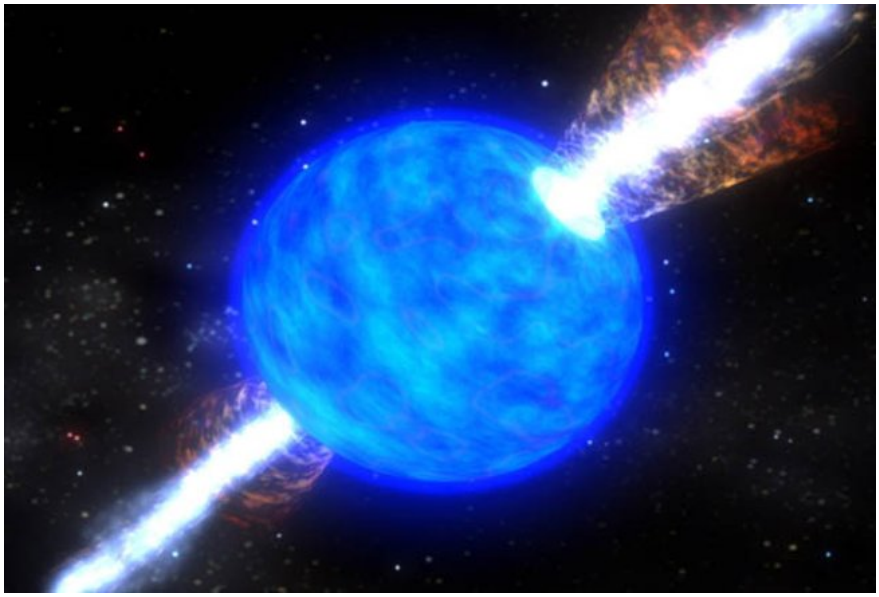
Like any other electromagnetic wave, gamma rays include many small energy packets called **photons** - a kind of elementary particle, as well as quantum particles of electromagnetic and light fields, as well as all forms of electrical radiation. another word. The lowest energy-containing photons are called radio waves and all the world's telecommunications systems rely on them in one way or another.



Radio waves are low energy waves, while gamma rays are high energies.Photo source: Designua / Shutterstock
At the other end of the spectrum, gamma rays have high energy photons. These rays have strong penetrating power and because they can ionize other atoms, it is very dangerous if you are in direct contact.

Gamma rays are usually produced by gamma decay from natural radioisotopes and secondary radiation from interactions with particles in cosmic rays on Earth. In addition, there are other natural gamma sources that do not have nuclear origins such as lightning.

Outside the universe, there are many processes that can produce gamma rays and at the same time create electrons with very high energies. From there, they in turn cause secondary gamma rays by the mechanism of braking radiation, reverse compton and electron radiation. Most cosmic gamma rays are blocked by the Earth's atmosphere and they can only be detected by space research stations or spacecraft.



Electromagnetic radiation spreads in wave or particle form at different wavelengths and frequencies. This wide wavelength region is called the **electromagnetic spectrum** . Electromagnetic spectrum is often divided into seven regions in order of decreasing wavelength, gradually increasing energy and frequency. These areas are radio, microwave, infrared, visible light, ultraviolet, X-rays and gamma rays.

Gamma rays fall into the electromagnetic spectrum above the soft X-rays . Gamma rays have a frequency greater than about 1018 Hz and a wavelength less than 100 pico-meters (*pm - A pico-meter is a trillionth of a meter*). Gamma rays collectively occupy the electromagnetic spectrum with hard X-rays. The only difference is the source: X-rays are produced by accelerating electrons, and gamma rays are produced by atomic nuclei.

Above is the basic knowledge to help you learn more about gamma rays, now we will switch to the main problem .

What is gamma-ray burst?

Gamma ray bursts (*Gamma Ray Bursts - GRB*) in the universe are gamma rays with super large energies that appear in a very short time. As its name suggests, gamma-ray bursts are a high-energy explosion occurring in space, often abbreviated as GRB, one of the most powerful and intense explosions in the universe and brilliant light. Gamma rays flood the sky at least once a day.

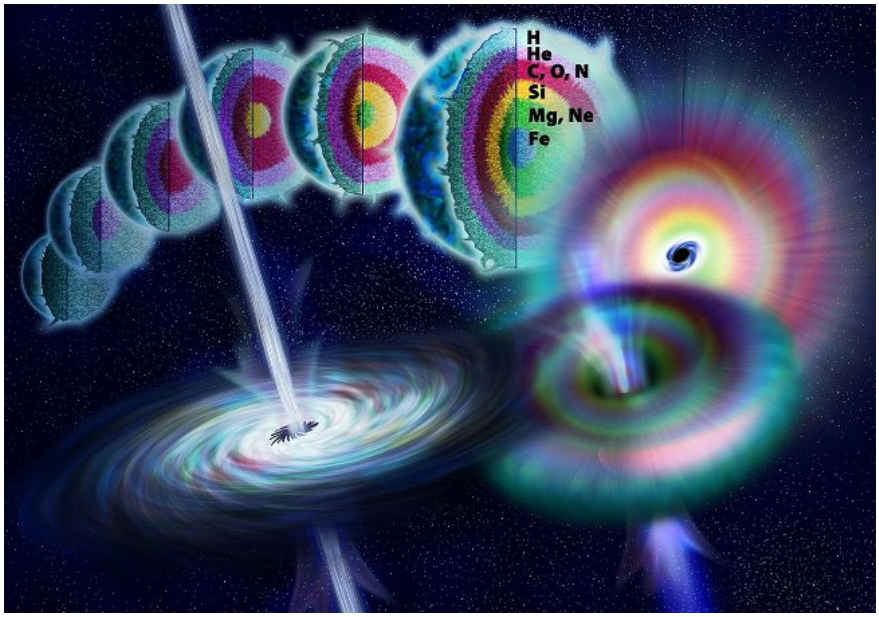
The image illustrates a gamma ray burst.The GRB releases large amounts of energy in a short time, making them the most powerful events in the universe.Photo source: ESO / A Roquette / Wikimedia Commons
Gamma or GRB explosions can last for at least a millisecond to a few minutes . The location and time of GRB appearance can never be predicted. The most remarkable thing about the gamma-ray burst is that it is energetic and intense, even so supernova explosions are still weak when compared to it. To get some idea of ?? the amount of energy we're talking about here, consider: the amount of energy a gamma-ray burst produces in 10 seconds more than the solar energy generated in the entire Its age set!

Gamma-ray bursts are " *cosmic sniper guns* " with tremendous power and the deadliest weapon in space. The energy flows of the gamma ray explosion do not really exist for too long, they only appear for a few minutes. But in that period of time, the energy released is equivalent to the total energy of one hundred trillion nuclear weapons emitted in a second and repeated so continuously for a hundred billion years.

Gamma-ray bursts are highly concentrated high-energy light beams, containing enough power to vaporize nearby planets . Perhaps they are a new kind of superstar, but more like a " *new superstar* ". That means that instead of flaring a star and letting its remnant fire in all directions, it somehow blows out in just one direction, converging all matter and firing like a beam. rays from explosions.

The bottom line here is that we don't talk about what explodes like a sphere and distributes energy in all directions. A gamma ray explosion is fired in a beam and thus carries all the energy but only in one direction towards us. That's why the gamma ray explosion is so intense.

Why can't the GRB be seen with the naked eye?

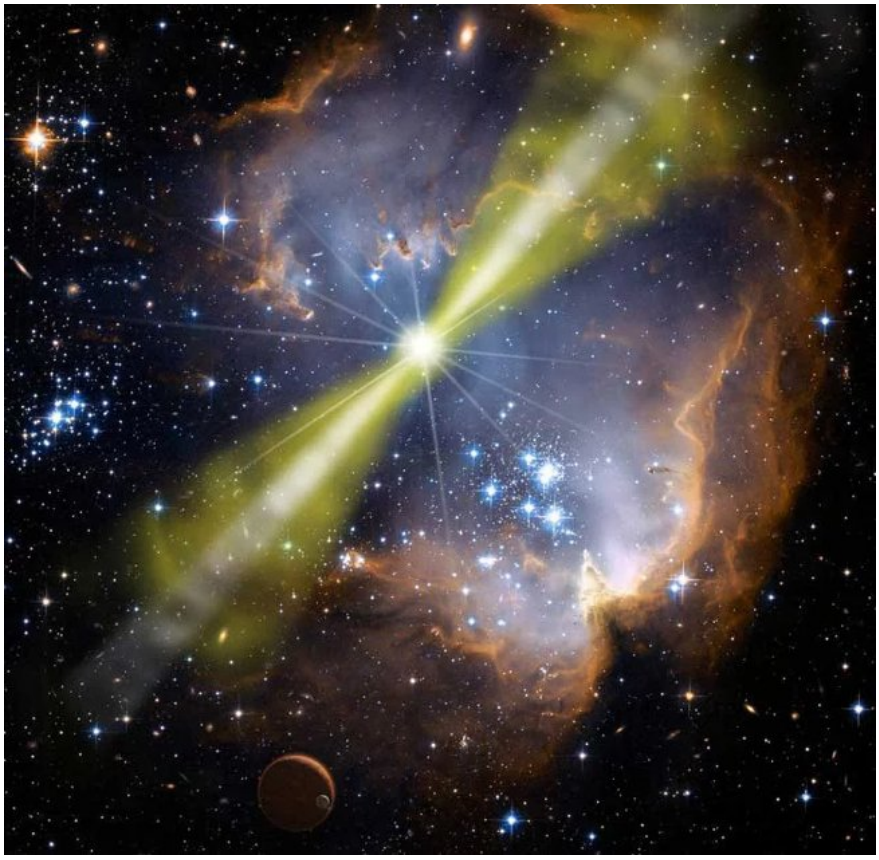


As mentioned earlier, gamma-ray bursts occur at least once a day. However, in reality they were an extremely large explosion with rays of light appearing in the sky. So why don't we see them?

We cannot see them because of gamma rays, which are part of the electromagnetic spectrum that we cannot observe with the naked eye. In fact, we cannot see almost the entire spectrum, except for a very small amount of light that we call " *visible light* ". That is why we cannot observe the gamma ray burst with the naked eye.

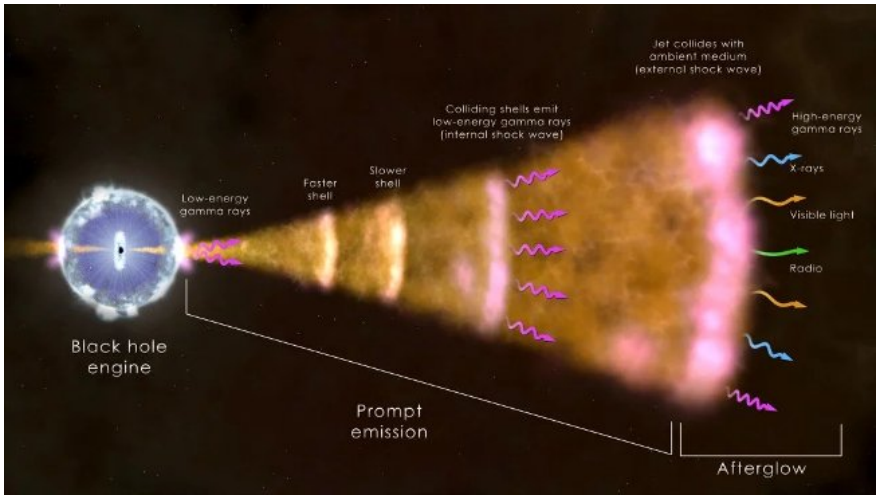
What causes gamma ray bursts?

Gamma-ray bursts take only a few minutes and can release energy equivalent to the solar energy emitted for 10 billion years. However, according to British scientists, the cause of the above-mentioned earthquake gamma-ray bursts is still in secret and is the eternal topic for astronomers. There are a few hypotheses trying to explain the cause behind the emergence of gamma-ray bursts.



Illustrative image of gamma ray burst.Image source: NASA / Swift / Mary Pat Hrybyk-Keith and John Jones / Wikimedia Commons

The first hypothesis suggests that a gamma-ray burst occurred because a star collapsed itself and gave birth to a cosmic black hole . When the planets live out their lifespan, the nuclear reactions in their hearts will automatically stop, causing the nuclear pressure inside the star's center - which helps to keep them in a distressed state - disappears. This leads to the center of the planet collapsing from inside and forming a black hole. What is material is sucked into the black hole and begins to spin at extremely high speeds, giving rise to a tremendous force of matter moving near the speed of light. The force of transmitting a radiation to Earth is detected and identified as gamma ray bursts.

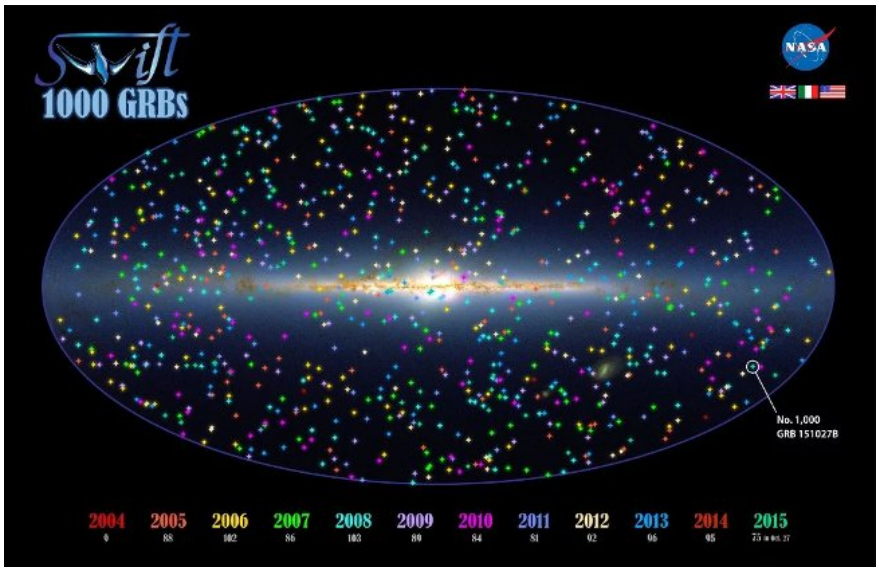


The image causes the gamma-ray burst.Photo source: NASA Goddard Space Flight Center / NASA.gov

The second hypothesis is that the gamma-ray burst can form when two neutron globes collide . Neutron globes are a form of several possibilities that end the evolutionary process. A neutron star is formed from the remains of a massive star collapse after supernova explosions. However, there is still an open hypothesis that experts think, that is most likely a phenomenon that so far has not been found to be the main cause of these explosions.

NASA's unmanned spacecraft was introduced in 2004 to study the link between a gamma / black hole explosion, circulated in orbit for more than a decade and has discovered more than 1,000 gamma-ray bursts. .

This is an illustration of the gamma-ray burst discovered in our galaxy:



Gamma ray bursts are coded in different colors each year.Photo source: NASA Goddard Space Flight Center and 2MASS / J Carpenter, TH Jarrett, and R. Hurt / NASA.gov.
One of the difficulties of observing light rays emitted by GRB is because they exist only from a few milliseconds to a few hundredths of a second. But once there was a $ 250 million Swift (*Rapid Speed*) spacecraft launched into Earth's orbit, the space probe was able to move quickly to observe and capture the phenomenon. extremely secretive and happening in this short time.

So why are gamma-ray bursts in the universe so interested in by scientists? According to the Big Bang theory, the universe was formed from a terrible explosion. Scientists believe that gamma-ray bursts are the largest explosions in the universe whose level is only after the Big Bang.

See also: Stephen Hawking warns: "Humans have only 100 years left to leave Earth"

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