All you need to know about the neutron star merger

On August 17, this year, the LIGO and VIRGO detectors picked up another disturbance due to a gravitational wave. The signal was different from the earlier four they had sensed. Not surprising, for the earlier signals were due to the distant mergers of black holes. This signal was much much longer – lasting 100 seconds – and had a different signature as it originated not from merging blackholes, but from merging neutron stars. The component neutron stars were estimated to have masses between 1.1 and 1.6 times the solar mass. They were also estimated to be about 130 million light years away, which is, relatively speaking, quite close.

Unlike earlier detections, this time the source was located more precisely because of the involvement of the VIRGO detector which is much farther away. Also, since the neutron stars threw off energy and light during their merging – unlike black holes that do not allow light to escape from within their boundary, neutron stars can throw off matter and light – the merger also had a light signal. This was not in the visible spectrum but in the form of gamma radiation. This was picked up by 70 telescopes around the world and in fact the source was traced quite accurately. The actual object before and after the collision was imaged. This is another “first” in the line of many that we are now getting used to.

Nobel-winning team spots merging neutron stars

Analysis showed that during the merger, the force of the merging melded together smaller nuclei to form heavy metals like gold and platinum. This explains how the universe contains a large amount of such heavy metals.

This was the first time a celestial event was observed both through gravitational waves and light waves emitted. Thus it opens the idea of not just gravitational wave astronomy – which is a way of mapping the universe’s violent, massive, dark and distant mergers – but also multimessenger astronomy, which will use many tools to cross check and make more accurate the said map.

Neutron stars are the final stage in the curve of evolution of very massive stars – which are around two times as massive as the sun. Initially, the stars glow and burn up their fuel. Due to internal pressure building up, they expand and since their mass is so high, they actually undergo a supernova explosion, throwing out the outer layers into space. The inner core collapses under its own gravity, shrinking to a small size, of a few tens of kilometres diameter. It stops short of becoming a black hole, as the mass is not sufficient to enable that. But this is a neutron star – it’s density is extremely high. As explained by Dibyendu Nandi of CESSI Kolkata explains, a spoonful of the material can weigh more than Mount Everest. Their magnetic fields are also huge in comparison to the Earth’s.

An earlier version of this article said that neutron stars are 20-30 times as massive as the sun. It has now been corrected to around two times as massive as the sun. The error is regretted.

A study of nearly 300 people living in different parts of India found that nine single-base variants (single-nucleotide polymorphisms or SNPs) account

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