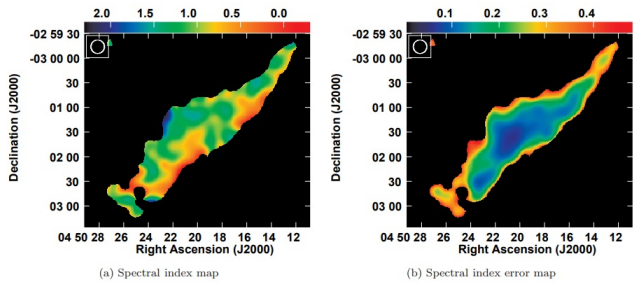


Radio relic discovered in a low-mass merging galaxy cluster

16 August 2017, by Tomasz Nowakowski



(a) – The spectral index map of the radio relic in PLCK G200.9?28.2 between 235 and 610 MHz. (b) – The corresponding noise map. The resolution of the maps shown in upper left corner of each panel is 16.4?? x 16.4??. Credit: Kale et al., 2017.

Given that the number of known radio relics associated with merger shocks is still small, astronomers are interested in finding new examples of these sources. New detections are needed to create a large sample of relics, which could illuminate the connection between mergers and the generation of relics.

One candidate radio relic was spotted in PLCK G200.9?28.2 during previous observations and now a team of researchers led by Ruta Kale of the National Centre for Radio Astrophysics in Pune, India has re-investigated this extended radio source, performing follow-up studies. They used the Giant Metrewave Radio Telescope (GMRT), located near Pune, India and the Karl G. Jansky Very Large array (VLA) in New Mexico, to conduct radio observations of PLCK G200.9?28.2, which resulted in confirmation that the candidate source is, indeed, a radio relic.

Astronomers have detected a new single radio relic in a low-mass merging galaxy cluster known as PLCK G200.9?28.2. The finding, presented Aug. 5 in a paper published on the arXiv pre-print server, could offer some hints about merging processes in galaxy clusters.

"We report the discovery of a single radio relic in the galaxy cluster PLCK G200.9?28.2 using the Giant Metrewave Radio Telescope at 235 and 610 MHz and the Karl G. Jansky Very Large Array at 1500 MHz," the researchers wrote in the paper.

PLCK G200.9?28.2 is a [galaxy cluster](#) at a redshift of 0.22 with mass of about 270 trillion solar masses and an average temperature of 4.5 keV. Observations in X-rays show that this cluster has a disturbed morphology, which indicates an ongoing [merger](#).

The study reveals that this extended radio source is a single radio relic with an arc-like morphology. The relic has dimensions of about 3.26 by 0.91 million light years, and is located approximately 2.9 million light years from the X-ray brightness peak in the [cluster](#). According to the paper, the relic has an integrated spectral index of 1.21 and the 235-610 MHz spectral index map shows steepening from the outer to inner edge of the relic. The authors noted that these findings are consistent with expectations for a relic generated by an underlying merger shock.

Radio relics are diffuse, elongated radio sources of synchrotron origin. Galaxy clusters undergoing mergers such as PLCK G200.9?28.2 are excellent places to search for these sources as they originate in acceleration and re-acceleration at merger-shocks. Radio relics occur in the form of spectacular single or double symmetric arcs at the peripheries of galaxy clusters.

"The spectral index map of the relic shows flatter spectrum emission towards the outer edge and gradual steepening towards the inner side, strongly indicating an underlying merger shock," the paper

reads.

The research shows that the new radio relic is the smallest in size in the sample of single relics with radio power above one septillion W Hz^{21} . Notably, it turns out that PLCK G200.9-28.2 has the lowest mass among the clusters known to host single arc-like radio relics.

More information: Discovery of a radio relic in the low mass, merging galaxy cluster PLCK G200.9-28.2, arXiv:1708.01718 [astro-ph.CO]
arxiv.org/abs/1708.01718

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