

Double radio relic and odd radio circle discovered with MeerKAT

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During observations of the merging galaxy cluster PSZ2 G277.93+12.34 with the MeerKAT radio telescope, an international team of astronomers have serendipitously detected a double radio relic and an odd radio circle. The discovery was detailed in a paper published April 24 on the *arXiv* pre-print repository.

Radio relics are diffuse, elongated radio sources of synchrotron origin. They occur in the form of spectacular single or double symmetric arcs at the peripheries of galaxy clusters. Astronomers are especially interested in the search for double relics as such features could provide crucial information about cluster mergers and the resultant emission.

At a distance of about 2.5 billion [light years](#) away from the Earth, PSZ2 G277.93+12.34 is a galaxy cluster with a mass of some 360 trillion solar masses. The cluster is poorly studied, hence its members are currently not well defined. However, previous observations have found that a galaxy known as WISEA J103230.00–433815.4 is most likely the brightest cluster galaxy of PSZ2 G277.93+12.34.

A team of [astronomers](#) led by Bärbel S. Koribalski of the Western Sydney University in Australia, has recently investigated PSZ2 G277.93+12.34 with MeerKAT in order to shed more light on the nature of this cluster. Their study was complemented by radio continuum images from the Australian SKA Pathfinder (ASKAP) and X-ray data from the Spectrum-Roentgen-Gamma (SRG) [space telescope](#).

By analyzing MeerKAT 1.3 GHz radio continuum images of the PSZ2 G277.93+12.34, the researchers detected two large radio relics, located northeast and southwest of the cluster center, forming a double radio relic with an angular separation of approximately 16 arcminutes (about 8.5 million light years). The southern relic is relatively thin, has a linear extent of about 5.35 million light years, and a surface brightness of some 16 $\mu\text{Jy}/\text{beam}$. When it comes to the northern relic, it is twice as wide as the southern one, has a linear extent of at least 2.15 million light years, and its surface brightness was found to be 55 $\mu\text{Jy}/\text{beam}$.

It was noted that the two relics together form a partial circle, occupying at least 35% of its circumference. According to the authors of the paper, the double relic morphology suggests a face-on orientation of the merger; however, low-frequency imaging of the PSZ2 G277.93+12.34 at both high resolution and high sensitivity is required in order to verify this.

In addition to the discovery of the double radio relic, the astronomers also detected a new odd radio circle (ORC) at a redshift of about 0.3, in a different part of the MeerKAT images. The so-called ORCs are mysterious gigantic rings of radio waves and their origin is still unexplained.

The newfound ORC, which received designation ORC J1017–4422, remains undetected in X-ray emission and has a diameter of about 1.3 million light years. It is the fourth single ORC so far identified.

More information: Bärbel S. Koribalski et al, MeerKAT discovery of a double radio relic and odd radio circle, *arXiv* (2023). [DOI: 10.48550/arxiv.2304.11784](https://doi.org/10.48550/arxiv.2304.11784)

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