



Chandra Science Highlight

Abell 1033: Re-energization of electrons in merging galaxy clusters



Composite image of the galaxy cluster Abell 1033 showing optical data from the Sloan Digital Sky Survey in the background, Chandra X-ray (0.5 – 4 keV) data in purple, and radio emission (142 -608 MHz) from the Low-Frequency Array (LOFAR) in blue.

Distance estimate: 1.62 billion light years (redshift $z=0.1259$)

Scale: Image is about 7.4 arcmin on a side (about 3.3 million light years).

- The X-ray and optical data suggest that Abell 1033 is the site of a merger of two galaxy clusters along an axis oriented north-south and tilted along the line of sight, with the north part closer to Earth.
- The radio observations reveal a vast structure that stretches over 500,000 light years.
- The size of the radio structure requires that high-energy electrons have been re-energized after their initial acceleration by a supermassive black hole.
- The likely sources of this re-energization are giant shock waves produced by the merger of the galaxy clusters. The horizontal blue features near the middle of the hot gas cloud mark the location of these shock waves.

Credits: X-ray: NASA/CXC/Leiden Univ./F. de Gasperin et al; Optical: SDSS; Radio: LOFAR/ASTRON, NCRA/TIFR/GMRT

Instrument: ACIS

Reference: de Gasperin, F et al., Sci. Adv. 2017, 3, 1701634; [arXiv:1710.06796](https://arxiv.org/abs/1710.06796)

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