Astronomers detect a new radio source of unknown origin

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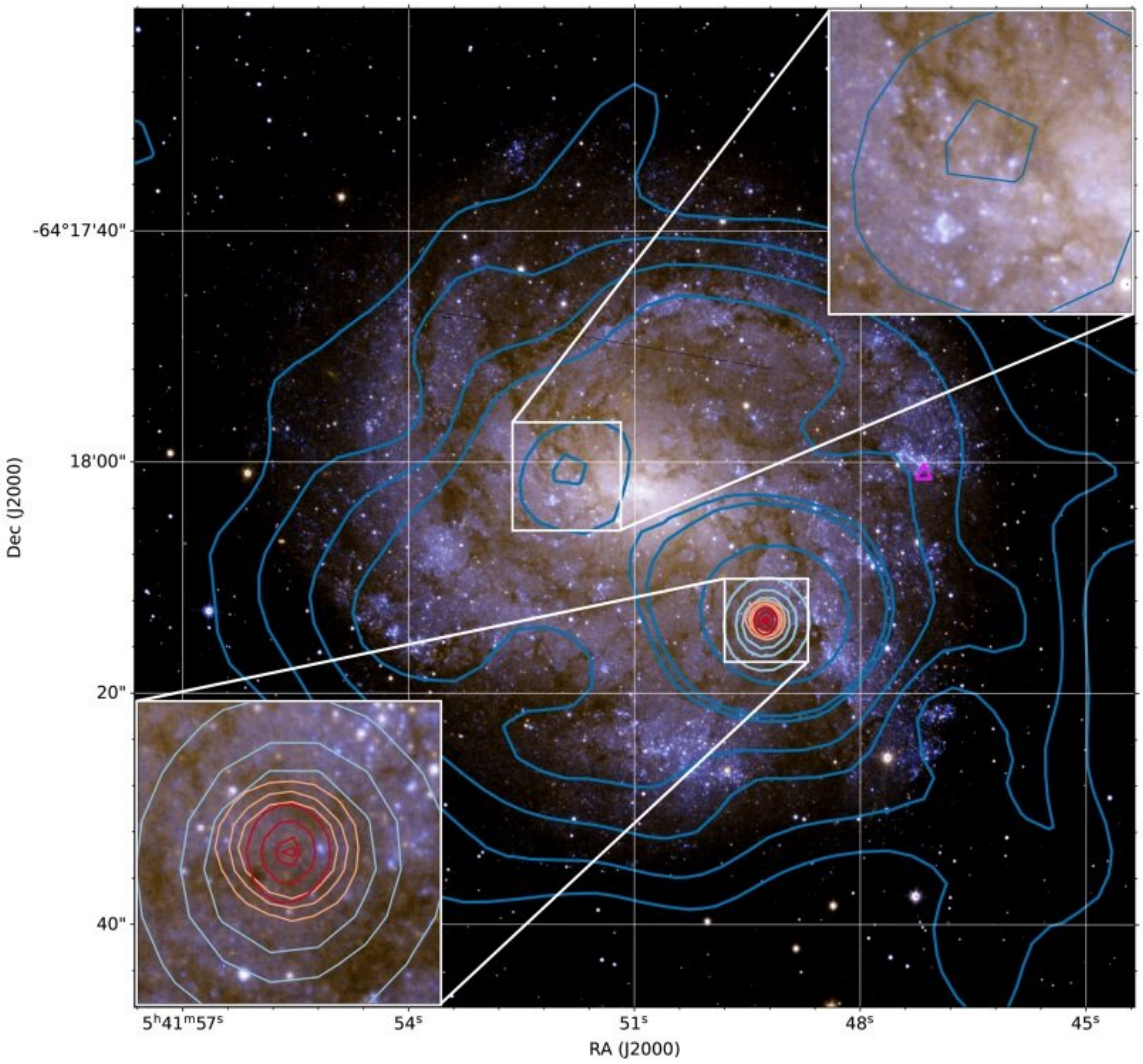

Three-color HST image of NGC 2082 overlaid with ASKAP and ATCA contours. The inset image in the bottom-left provides a zoom in of

J054149.24–641813.7, showing the absence of any optical counterpart. Credit: Balzan et al., 2022.

During radio continuum observations of a spiral galaxy known as NGC 2082, Australian astronomers have discovered a mysterious bright and compact radio source, which received designation J054149.24–641813.7. The origin and nature of this source is unknown and requires further investigation. The finding is reported in a paper published May 23 on the arXiv pre-print repository.

In general, radio sources are various objects in the universe that emit relatively large amounts of radio waves. Among the strongest sources of such emission are pulsars, certain nebulas, quasars, and radio galaxies.

Now, a team of astronomers led by Joel Balzan of Western Sydney University in Australia, report the finding of a new radio source, whose true nature is still uncertain. While observing NGC 2082 using Australian Square Kilometer Array Pathfinder (ASKAP), Australia Telescope Compact Array (ATCA) and Parkes radio telescope, they identified a strong point radio source positioned 20 arcseconds from the galaxy center. NGC 2082 is a G-type spiral galaxy in the Dorado constellation, located some 60 million light years away from the Earth, with a diameter of approximately 33,000 light years.

"We present radio continuum observations of NGC 2082 using ASKAP, ATCA and Parkes telescopes from 888 MHz to 9,000 MHz. Some 20 arcsec from the center of this nearby spiral galaxy, we discovered a bright and compact radio source, J054149.24–641813.7, of unknown origin," the researchers wrote in the paper.

The study found that the radio luminosity of J054149.24–641813.7 at

888 MHz is at a level of 129 EW/Hz and that it has a flat radio spectral index (about 0.02). This, according to the astronomers, disfavors the scenario in which J054149.24–641813.7 may be a supernova remnant (SNR) or a pulsar, suggesting that the source may be of thermal origin.

The researchers noted that the compact nature of J054149.24–641813.7 and its location at the outskirts of NGC 2082 are reminiscent of those of some fast radio bursts (FRBs). However, the results suggest that J054149.24–641813.7 is probably not bright enough to be a persistent radio source with an embedded FRB progenitor.

The astronomers concluded that the most likely remaining possibility is that J054149.24–641813.7 is an extragalactic background source, such as quasi-stellar object (QSO, quasar), radio galaxy or active galactic nucleus (AGN). They added that the flat spectral index together with somewhat weak polarization at 5,500 and 9,000 MHz support this hypothesis. However, there is currently no high resolution neutral atomic hydrogen (HI) absorption data for NGC 2082, which could confirm this assumption.

"We find that the probability of finding such a source behind NGC 2082 is P = 1.2 percent, and conclude that the most likely origin for J054149.24–641813.7 is a background quasar or radio galaxy," the authors of the paper explained.

More information: Joel C. F. Balzan et al, A Radio Continuum Study of NGC 2082. arXiv:2205.11144v1 [astro-ph.GA], arxiv.org/abs/2205.11144

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