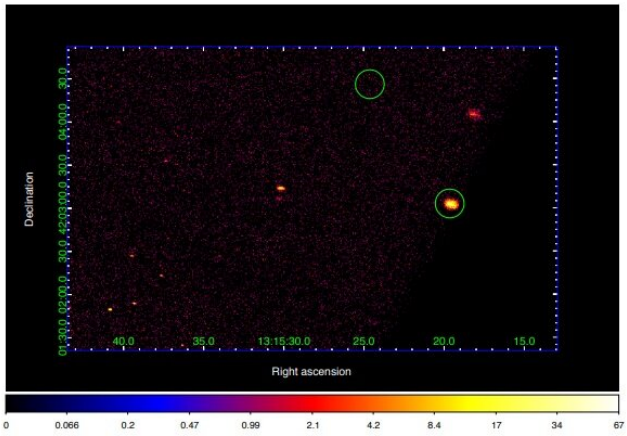
Astronomers investigate an ultraluminous X-ray source in NGC 5055

12 August 2020, by Tomasz Nowakowski



The X-ray image in counts/pixel displays the field of view of Chandra ACIS-S. The green circle containing bright pixels shows NGC 5055 X-1, while the empty green circle represents the region from where the background was extracted. Credit: Mondal et al., 2020.

Using the Chandra and XMM-Newton spacecraft, astronomers from the Nicolaus Copernicus Astronomical Center in Warsaw, Poland, have investigated an ultraluminous X-ray source (ULX) in the galaxy NGC 5055. The study, detailed in a paper published August 5 on the arXiv preprint server, provides more insight into the properties of this source.

ULXs are point sources in the sky that are so bright in X-rays that each emits more radiation than 1 million suns emit at all wavelengths. They are less luminous than active galactic nuclei, but more consistently luminous than any known stellar process. Although numerous studies of ULXs have been conducted, the basic nature of these sources remains unsolved.

NGC 5055 (also known as Messier 63, or the Sunflower galaxy) is a spiral galaxy located some 29 million light years away. It hosts an ultraluminous X-ray source designated NGC 5055 X-1, with an X-ray luminosity reaching approximately 23 duodecillion erg/s. However, although the ULX is very luminous in the X-ray band, it had not yet been comprehensively studied.

A team of astronomers led by Samaresh Mondal has now conducted timing and spectral analysis of observational data regarding NGC 5055 X-1. The datasets were delivered by NASA's Chandra X-ray Observatory and ESA's XMM-Newton satellite.

"In this paper, we perform the first systematic analysis of X-ray observations of NGC 5055 X-1 using the three longest Chandra and XMM observations. We carried out X-ray timing and spectral analysis using phenomenological models available in xspec fitting package," the astronomers wrote.

In general, the observations found that NGC 5055 X-1 does not show much variability. Based on the hardness ratios (3-10 keV/0.3-3 keV flux), the astronomers concluded that the source is not spectrally variable.

According to the study, NGC 5055 X-1 mostly emits in soft X-rays in the range of 0.3-3 keV. Its hard X-ray band flux is only a fraction of the soft X-ray emission. This points to a dominant thermal component.

Furthermore, the researchers added that the relatively low inner disk temperature of NGC 5055 X-1 and the steep power law slope may suggest that it hosts an intermediate mass black hole (IMBH). The study also confirmed that the source is intrinsically extremely luminous, as it reached 0.3-10 keV luminosity of approximately 23.2 duodecillion erg/s.

In concluding remarks, the astronomers noted that NGC 5055 X-1 was observed in a soft

ultraluminous spectral state. However, better data with longer exposure time are required to fully confirm this conclusion. They assume that NGC 5055 X-1 is accreting at super-Eddington luminosity, and is beamed by an optically thick wind, as seen in other high luminosity ULXs. They added that further broadband observations of this ULX are needed to confirm this assumption.

More information: An extreme Ultraluminous X-ray source X-1 in NGC 5055, arXiv:2008.02178 [astro-ph.HE] arxiv.org/abs/2008.02178

APA citation: Astronomers investigate an ultraluminous X-ray source in NGC 5055 (2020, August 12) retrieved 5 October 2022 from https://phys.org/news/2020-08-astronomers-ultraluminous-x-ray-source-ngc.html