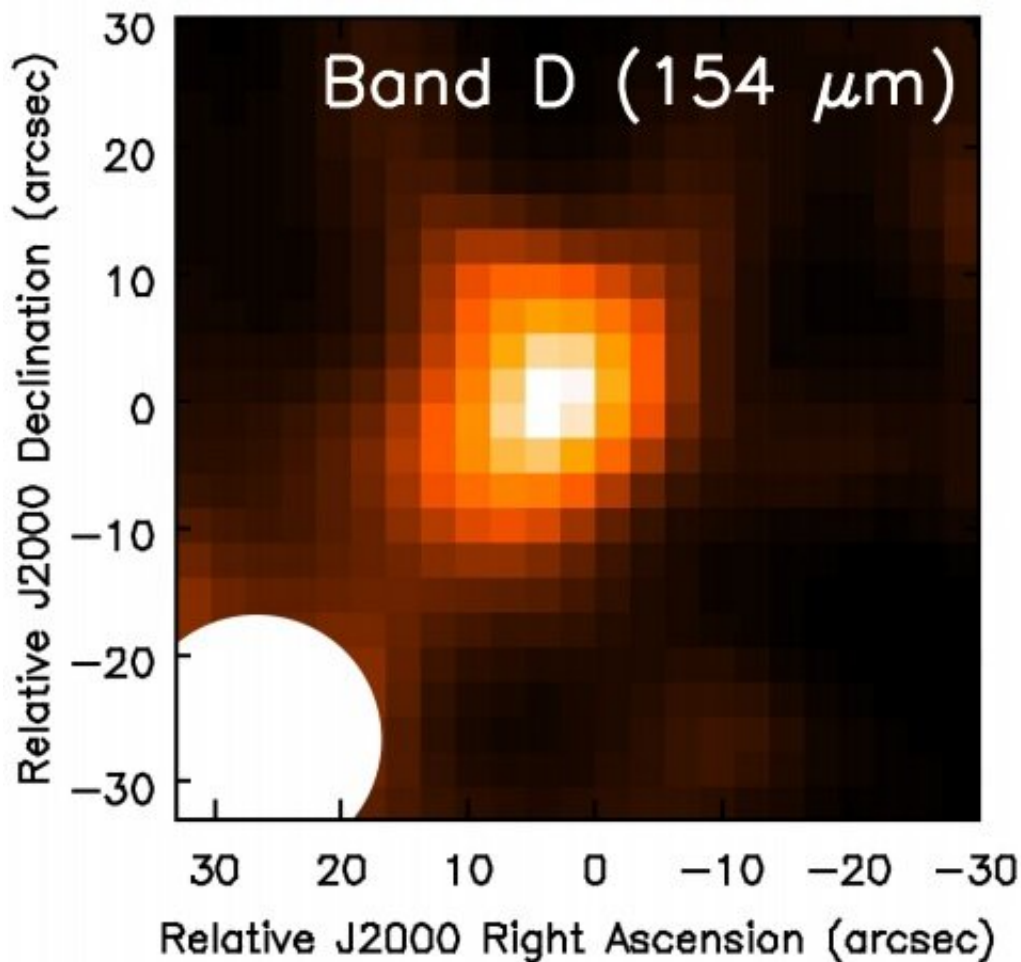


# WISE1013+6112 is one of the most luminous infrared galaxies, study finds

December 19 2019, by Tomasz Nowakowski



Total flux image of WISE1013+6112 at 154  $\mu\text{m}$ . Credit: Toba et al., 2019.

Using the Stratospheric Observatory for Infrared Astronomy (SOFIA),

astronomers have investigated the infrared galaxy WISE J101326.25+611220.1 (or WISE1013+6112 for short). The researchers report that WISE1013+6112 is one of the most luminous infrared galaxies known to date. The finding is reported in a paper published December 12 on arXiv.org.

Luminous infrared galaxies (LIRGs) are galaxies emitting more energy in the infrared portion of the spectrum, with luminosities above 100 billion solar luminosities. LIRGs with luminosities exceeding 100 trillion solar luminosities are known as extremely luminous infrared galaxies (ELIRGs).

The infrared luminosity of ELIRGs is assumed to be produced by star formation, [active galactic nucleus](#) (AGN) activity, or both. Hence, studies of ELIRGs could shed more light on process of galaxy formation and evolution. They could also provide more insights about the connection of these galaxies to their supermassive black holes (SMBHs).

At a redshift of 3.7, WISE1013+6112 is a an extremely luminous dust-obscured galaxy that was classified as an ELIRG candidate by previous observations. Now, a team of astronomers led by Yoshiaki Toba of Kyoto University, Japan, has re-investigated this galaxy with SOFIA's high-resolution airborne wideband camera-plus (HAWC+) in order to unveil its far-infrared properties.

"In this paper, we present follow-up observations of an extremely luminous DOG [dust-obscured galaxy], WISE1013+6112, at 89 and 154  $\mu\text{m}$  using a high-resolution airborne wideband camera-plus (HAWC+: Harper et al. 2018) on the 2.7-m stratospheric observatory for [infrared astronomy](#) (SOFIA) telescope (Temi et al. 2018). These observations with HAWC+/SOFIA enable us to pin down the FIR-SED [far-infrared spectra energy distribution] of WISE1013+6112," the astronomers wrote in the paper.

HAWC+ observations confirmed the ELIRG status of WISE1013+6112. It was found that the infrared luminosity of this galaxy is approximately 162 trillion solar luminosities. This makes WISE1013+6112 one of the most luminous infrared galaxies so far detected in the universe.

The dust temperature of WISE1013+6112 was found to be 89 K, while the galaxy's dust mass was estimated to be about 220 million [solar masses](#). The researchers noted that the dust temperature is significantly higher than that of other populations such as submillimeter and far-infrared-selected galaxies. Moreover, the galaxy's dust mass is relatively large, and the authors of the paper assume that it requires an efficient and rapid dust formation process to produce it at this redshift.

"An efficient formation of dust from the metals may need to be considered to produce such a high [dust](#) mass given the redshift of  $z = 3.7$ ," the astronomers explained.

The study also found that WISE1013+6112 is about 203 billion times more massive than our sun and its star formation rate (SFR) is around 2,810 solar masses per year. This SFR, according to the scientists, is roughly an order of magnitude higher than that of star-forming [galaxies](#) at similar redshifts, what suggests that WISE1013+6112 still has very active [star formation](#).

**More information:** SOFIA/HAWC+ View of an Extremely Luminous Infrared Galaxy, WISE1013+6112, arXiv:1912.05813 [astro-ph.GA] [arxiv.org/abs/1912.05813](https://arxiv.org/abs/1912.05813)

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Citation: WISE1013+6112 is one of the most luminous infrared galaxies, study finds (2019, December 19) retrieved 9 April 2024 from

<https://phys.org/news/2019-12-wise10136112-luminous-infrared-galaxies.html>

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