

Gamma Ray Emitting Active Galaxy

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In News: Scientists from ARIES, Nainital, Government of India, along with researchers from other institutions, have found the farthest gamma-ray emitting Narrow-Line Seyfert 1 (NLS1) galaxy known till date.

Key Finding

- Researchers from ARIES in collaboration with researchers have been studying around 25,000 Active Galactic Nuclei (AGN) from the Sloan Digital Sky Survey (SDSS) and were able to devise a new method to find high-z NLS1 galaxies till now unknown by comparing different emission lines in their spectra. In the process, they found a high-z gamma-ray emitting NLS1 galaxy.
- One of the largest ground-based telescopes in the world, the 8.2 m Subaru Telescope located in Hawaii, US was used to confirm the findings.
- Researchers confirmed that they have found a genuine NLS1 galaxy at a high redshift of 1.34, which is about 31 billion light-years away from us.
- Researchers confirmed that the newly found farthest gamma-ray emitting NLS1 galaxy was formed when the Universe was only about 4.7 billion years old.
- The current age of the Universe is 13.8 billion years.
- Research has potential for finding more gamma-ray emitting NLS1 galaxies and help understand the early Universe.
- The research led by Dr. Suvendu Rakshit, Scientist, ARIES, in collaboration with various scientists Malte Schramm (Japan), C. S. Stalin (IIA, India), I. Tanaka (USA), Vaidehi S. Paliya (ARIES), Indrani Pal (IIA,

India), Jari Kotilainen (Finland) and Jaejin Shin (South Korea) has recently been accepted for publication in the journal Monthly Notices of Royal Astronomical Society.

Active Galactic Nuclei (AGN)

- Most galaxies are powered by a supermassive black hole at their center.
- Normal black holes that form from the death of a single star are ten times the mass of the Sun.
- Supermassive black holes are millions to billions of times the mass of the Sun.
- These supermassive black holes found at the center of the galaxies are the reason that the compact region at the center of a galaxy has an extremely high luminosity.
- Bright central regions of these galaxies are called Active Galactic Nuclei (AGN).
- Galaxies hosting Active Galactic Nuclei (AGN) are called active galaxies.
- Compared to normal galaxies, these active galaxies can emit up to thousands of times of energy.
- Emissions of active galaxies are non-stellar that are observed in the form of microwave, radio, infrared, optical, X-ray, ultra-violet, and gamma-ray wavebands.

Gamma-ray emitting Narrow-Line Seyfert 1 (NSL1) galaxies

- Narrow-Line Seyfert 1 (NSL1) galaxies are classified as AGN.
- Type 1 Seyfert galaxies have narrow emission lines in their optical spectrum.
- Earlier, the NSL1 galaxies were thought to be powered by low mass black holes and therefore were deemed very unlikely to produce relativistic jets. But proved wrong when gamma-ray emissions were detected in them.
- As of now, dozens of NSL1 galaxies with redshifts less

than one have been identified with gamma-ray emissions. But there was no method in place till now to find NSL1 galaxies with redshifts larger than one.

- This situation changed when scientists from the Aryabhata Research Institute of observational sciences (ARIES), ,found a genuine high-gamma ray emitting NLS1 galaxy at a high redshift of 1.34 (larger than 1).

Aryabhata Research Institute of Observational Sciences (ARIES)

- Established in: 1954.
- Autonomous institute of the Department of Science & Technology (DST), Government of India.
- **Location:** It is situated at Manora Peak, in Nainital, Uttarakhand.
- Leading research Institutes which specializes in observational Astronomy & Astrophysics and Atmospheric Sciences.
- The main research interests of Astronomy & Astrophysics division are in solar, planetary, stellar, galactic and extragalactic astronomy including stellar variabilities, X-ray binaries, star clusters, nearby galaxies, quasars, and inherently transient events like supernovae and highly energetic gamma ray bursts.
- The unique position of ARIES (79° East), places it at almost in the middle of 180° wide longitude band, between Canary Island (20° West) and Eastern Australia (157° East), and therefore complements observations which might not be possible from either of these two places.