

EVENT REPORT: WAVES BEYOND LIGHT



Introduction:

Singularity, the Astronomical Society of BMS College of Engineering (BMSCE), in collaboration with BMSCE IEEE APS, organized a technical talk titled “Waves Beyond Light” as part of Space Week 2026. This event was conceived as an initiative to broaden students’ understanding of astronomical observation techniques beyond the conventional optical domain.

The session centered around radio astronomy using Software Defined Radio (SDR), a rapidly evolving field that integrates principles of physics, electronics, and computational signal processing. The primary objective of the event was to expose participants to both the theoretical framework and practical feasibility of radio-based observations, while also demonstrating how modern tools have made advanced scientific exploration increasingly accessible.

By combining academic depth with real-world applications, the session aimed to inspire curiosity, promote interdisciplinary thinking, and encourage students to explore research-oriented domains within astronomy and engineering.

Date, Time, and Venue:

The session was conducted on 12th March, commencing at 12:00 PM onwards, at Audi 2, PJ Block.

The event began as scheduled and was executed in an organized and seamless manner. The venue provided an ideal academic setting, facilitating clear visibility, effective communication, and uninterrupted interaction throughout the duration of the session.

Event Proceedings:

The session was delivered by Dr. Avinash Deshpande, a highly distinguished academic and researcher in the field of radio astronomy. He serves as a Senior Scientist and Professor at the Raman Research Institute (RRI) and has held visiting positions at prestigious institutions such as IIT Kanpur and IUCAA. He holds a Ph.D. in Radio Astronomy from IIT Bombay, and his extensive experience spans observational techniques, instrumentation, and large-scale radio astronomy projects.

Dr. Deshpande's deep expertise, combined with his ability to communicate complex concepts in an intuitive manner, significantly enhanced the effectiveness of the session. His talk followed a well-structured progression, transitioning smoothly from fundamental concepts to practical implementations.

FOUNDATIONS OF RADIO ASTRONOMY

The session commenced with an overview of how astronomical observations extend beyond the visible spectrum. The speaker briefly introduced the fundamental parameters involved in astronomical measurements, including intensity, direction, frequency, time, and polarization.

He highlighted the importance of radio astronomy in enabling observations through cosmic dust and emphasized its role in uncovering phenomena that are otherwise not accessible through optical methods.

RADIO SIGNALS AND COSMIC SOURCES

The discussion moved on to key sources of radio emissions, including pulsars, neutral hydrogen (HI line), and the cosmic microwave background. The speaker outlined how these observations contribute to our understanding of galactic structures, large-scale dynamics, and cosmological models.

The distinction between different types of radiation and the role of radio observations in detecting faint and distant signals were also briefly addressed.

SIGNAL PROCESSING AND CHALLENGES

Dr. Deshpande provided an overview of the challenges associated with radio astronomy, particularly the detection of extremely weak signals in the presence of noise and interference. Concepts such as signal-to-noise ratio and system sensitivity were introduced in a simplified manner.

He also discussed practical challenges such as Radio Frequency Interference (RFI) and the need for careful signal processing techniques.

ANTENNAS AND INTERFEROMETRY

The working principles of antennas and radio telescopes were explained, including how electromagnetic waves are captured and processed. The concept of interferometry was introduced as a method to improve resolution using multiple antennas.

The idea of combining signals to simulate larger apertures was highlighted as a key advancement in modern radio astronomy.

MODERN DEVELOPMENTS IN RADIO ASTRONOMY

The speaker briefly touched upon current advancements in the field, including large-scale telescope arrays and ongoing research into transient phenomena such as Fast Radio Bursts (FRBs).

SOFTWARE DEFINED RADIO (SDR) AND APPLICATIONS

The final segment of the session focused on Software Defined Radio (SDR), highlighting its significance as a flexible and cost-effective tool for radio observations. The speaker demonstrated how SDR systems enable signal acquisition and processing through software, reducing dependence on complex hardware.

Practical examples were discussed, including the observation of hydrogen lines, solar emissions, and other radio signals using simple setups. The speaker emphasized that meaningful experimentation in radio astronomy can now be performed using accessible and affordable equipment.

Participants' Involvement:

The session witnessed a high level of engagement from participants, with students actively listening and responding to the concepts presented. The interactive segments of the talk encouraged attendees to ask questions and seek clarification on various aspects of radio astronomy and SDR implementation.

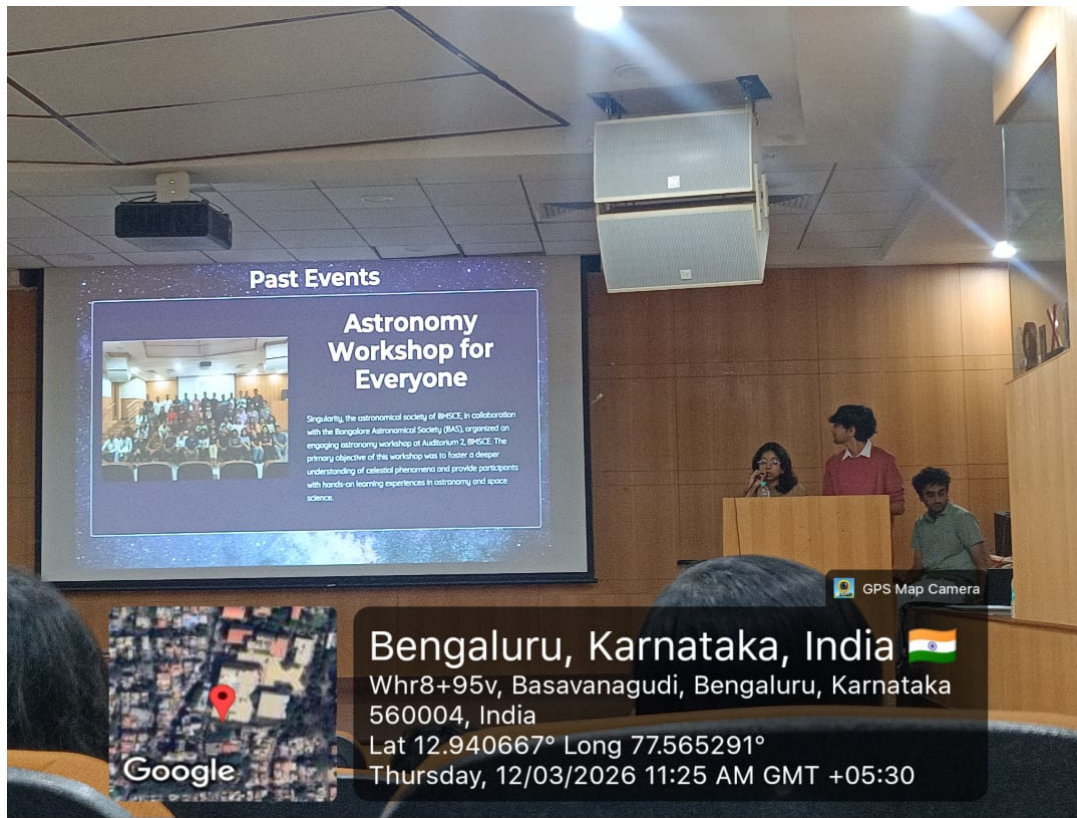
The audience displayed particular interest in the practical applications discussed, especially in relation to building and experimenting with SDR-based systems. The overall atmosphere was one of curiosity, enthusiasm, and active learning, contributing to a highly productive session.

Event Outcomes:

The session lasted approximately 1 to 1.5 hours, during which participants were introduced to both foundational concepts and emerging trends in radio astronomy. The event successfully provided a balanced perspective, combining theoretical insights with practical relevance.

Participants gained a clearer understanding of how modern tools and techniques are transforming the field of astronomy, making it more accessible to students and researchers alike. The session also served as a motivating platform for those interested in pursuing further exploration in this domain.

Conclusion:



The event “Waves Beyond Light” was conducted successfully and achieved its intended objectives of promoting awareness and understanding of radio astronomy and SDR technologies. The session was informative, engaging, and intellectually stimulating, aligning well with the broader vision of Space Week 2026.

The collaboration between Singularity and BMSCE IEEE APS played a crucial role in ensuring the smooth execution and overall success of the event. The talk not only enriched participants’ knowledge but also encouraged them to explore new avenues in scientific research and technological innovation.