

IIT Roorkee Researchers Unveil the Humming of Our Universe Through Low-Frequency Gravitational Waves



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IIT Roorkee, in collaboration with astronomers from India, Japan, and Europe, has made a significant breakthrough in the study of gravitational waves. An international team of astronomers has recently published their findings in the *Astronomy and Astrophysics* journal, providing evidence of ultra-low frequency gravitational waves and shedding light on the humming of our universe.

Using some of the world's most sensitive radio telescopes, including India's largest telescope, uGMRT, the team monitored pulsars, which are rapidly rotating neutron stars, to detect these waves. The pulsars, acting as cosmic clocks, emitted radio beams that were analyzed for changes in arrival times caused by gravitational waves. The analysis revealed characteristic irregularities across the pulsars, pointing to the presence of ultra-low frequency gravitational waves.

These incredibly long-wavelength waves, known as nano-hertz gravitational waves, are generated by dancing monster black hole pairs that exist within colliding galaxies. The observed vibrations in the fabric of space-time resonate throughout the universe, creating a persistent humming. This groundbreaking research opens up a new window in the study of gravitational waves and provides valuable insights into the mysteries of the universe.

Professor P. Arumugam and senior PhD student Mr. Jaikhomba Singha from IIT Roorkee were part of the team behind these extraordinary findings. Their efforts, along with those of many scientists and researchers, including early career researchers and undergraduate students, have led to this momentous achievement.

The results of this study mark the beginning of a new era in understanding the secrets of the universe. Furthermore, this is the first time that data from an Indian telescope has been used in the hunt for gravitational waves. The collaboration between various pulsar timing arrays, including the European Pulsar Timing Array (EPTA) and the Indian Pulsar Timing Array (InPTA), has paved the way for future advancements in unraveling the mysteries of our universe.

The findings presented in this research are a testament to the power of international collaboration and showcase the dedication of IIT Roorkee's researchers. Their remarkable findings contribute significantly to our understanding of gravitational waves and the cosmos as a whole.

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