

IIT Hyderabad scientists within InPTA paving the way to charting Interstellar ‘Weather’

Highlights:

- *The InPTA collaboration is the only PTA consortia which do simultaneous dual frequency observations of millisecond pulsars over widely separated lower and higher frequency bands, which is critical for our ultra-high precision measurement of interstellar noise.*
- *No other radio telescope among the other PTA consortia has sensitivity equal to that of InPTA at low frequencies.*

Hyderabad, January 03, 2023: The Indian Pulsar Timing Array (InPTA) recently published its first official Data Release. Prof Shantanu Desai from the Physics department of IIT Hyderabad, PhD student Aman Srivastava, B.Tech student Divyansh Kharbanda, and IITH alumnus Raghav Girgaonkar have co-authored this research article which got published recently in the Publications of the Astronomical Society of Australia. The data release stems from three and a half years of observation using the upgraded Giant Metrewave Radio Telescope (uGMRT) near Pune. The Indo-Japanese team of thirty-eight radio-astronomers measures delays in the arrival of radio pulses from special types of neutron stars called millisecond pulsars, which are crucial for the discovery of low-frequency gravitational waves. InPTA has joined hands with similar teams from the USA, Europe and Australia to detect these tiny, elusive ripples in spacetime, named nanohertz gravitational waves.

Complementing the team’s efforts, Prof B S Murty, Director, IITH, said, *“The research which we are doing should motivate young students to take up careers in science and engineering. The InPTA collaboration involves both Indian and Japanese scientists working at multiple institutes and people at all levels (faculty, PhD students, postdocs, UG students, Engineers, Computing professionals etc.) who have actively contributed towards it is a such amazing example.”.*

“This research helps us better understand our Universe and our role in it. However, one should remember wifi (ubiquitous) in daily life was a spin-off of research in radio astronomy while searching for radio bursts from primordial black holes. The precision measurements which we are making use state of the art electronics and communication systems and also involve the application of novel data analysis and data mining tools. These could have potential industrial applications”, added Prof Shantanu.

The authors explain, *“The universe is filled with gravitational wave background holding answers to deep secrets of nature. The waves that we detect now are strong but short-lived. We are listening to large waves crashing loudly upon the seashore, whereas space-time is continually brimming with tiny ripples. Imagine a symphony where high-pitched sections blare at crescendos while bass sections play the fundamental progressions throughout. The interplay of gravitational waves in the universe is similar to a symphony played by nature. We have been eavesdropping upon the crescendos while a persistent buzz forms the basis of this cosmic melody. These waves are generated by supermassive black hole binary pairs orbiting around each other for millions of years during their courses of collision. The primary hindrance in their detection is the vast ocean of interstellar medium lying in between. The InPTA data is critical for charting this interstellar ‘weather’ and paving the way to the discovery in the near future.”*

Electronic Release (Video Abstract): <https://youtu.be/fjXGC-KDObc>

About IIT Hyderabad

Indian Institute of Technology Hyderabad (IITH) is one of the eight new IITs established by the Government of India in 2008. In a short span of 14 years, the institute has become a top-ranker. It has 290+ full-time faculty, ~4,200 students, 18 Departments + Centre for Interdisciplinary Programs, nearly 200+ state-of-the-art laboratories, and five research and entrepreneurship centers. The institute has a strong research focus with



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Please direct all media queries to Ms Mitalee Agrawal | Public Relations Officer, IIT Hyderabad | Cell: [8331036099](tel:8331036099) | Email: pro@iith.ac.in