Title:	Nanohertz gravitational wave astronomy during SKA era: An InPTA perspective
Authors:	Bathula, Adarsh (/jspui/browse?type=author&value=Bathula%2C+Adarsh)
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Abstract:	Decades long monitoring of millisecond pulsars, which exhibit highly stable rotational periods in pulsar timing array experiments is on the threshold of discovering nanohertz stochastic gravitational wave background. This paper describes the Indian pulsar timing array (InPTA) experiment, which employs the upgraded Giant Metrewave Radio Telescope (uGMRT) for timing an ensemble of millisecond pulsars for this purpose. We highlight InPTA's observation strategies and analysis methods, which are relevant for a future PTA experiment with the more sensitive Square Kilometer Array (SKA) telescope. We show that the unique multi-sub-array multi-band wide-bandwidth frequency coverage of the InPTA, provides dispersion measure estimates with unprecedented precision for PTA pulsars, e.g., ∼2×10−5 pc cm−3 for PSR J1909-3744. Configuring the SKA-low and SKA-mid as two and four sub-arrays, respectively, it is shown that comparable precision is achievable, using observation strategies similar to those pursued by the InPTA, for a larger sample of 62 pulsars, requiring about 26 and 7 h per epoch for the SKA-mid and the SKA-low telescopes, respectively. We also review the ongoing efforts to develop PTA-relevant general relativistic constructs that will be required to search for nanohertz gravitational waves from isolated super-massive black hole binary systems like blazar OJ 287. These efforts should be relevant to pursue persistent multi-messenger gravitational wave astronomy during the forthcoming era of the SKA telescope, the thirty meter telescope, and the next-generation event horizon telescope.
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