



# Pulsars as Probes of Gravity

The properties of rapidly spinning neutron stars, or pulsars, make them unique and precise probes for studying gravity in many different contexts. In this talk, I shall begin with an overview of these characteristics, then turn to the variety of gravity studies we can conduct using pulsars as probes. All such studies and gravity tests rely, firstly, on our ability to conduct high precision timing of the fastest spinning pulsars (millisecond pulsars) often observed in binary systems. I will turn to the highly sensitive South African MeerKAT telescope, and specifically the Meertime Research Project, to illustrate how we conduct such pulsar timing experiments at radio wavelengths.

I shall highlight key results of tests of gravity (and nuclear matter) in the strong field regime from the Meertime Relativistic Binary Project, and shall showcase recent MeerKAT Pulsar Timing Array results searching for a cosmic nanoHertz gravitational wave background. Finally, I shall provide thoughts on potential gravity studies near the Galactic Centre in the contexts of future experiments.

## Biography

Marisa Geyer is a lecturer at the University of Cape Town (UCT) and researcher within the HEPCAT research group. Prior to this, she was in charge of commissioning and operating the 64-dish MeerKAT radio telescope as part of the Science Commissioning team at the South African Radio Astronomical Observatory (SARAO) in Cape Town. Her undergraduate and Master's Alma Mater is Stellenbosch University, after which she completed a DPhil in Astrophysics at the University of Oxford.

She is an active research member of the Meertime and TRAPUM collaborations: two 5-year Large Survey Proposals running on MeerKAT, studying known pulsars and conducting targeted searches for new pulsars, respectively. She is the team lead of the UCT MeerTime node, and the chair of the recently established African Pulsar Timing group – which aims to grow the South African and African participation in pulsar science.

At present, her research focusses on high precision pulsar timing techniques and their applications, especially in the context of studying pulsars in relativistic binary systems, and as part of pulsar timing arrays to conduct tests of fundamental physics. In addition, her research interests also include pulsar signal propagation and ISM science, giant pulses pulsars, Fast Radio Bursts, and finding pulsars in extra-galactic environments.



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