VLBI

**Post-Einstein GR measurements, with Ultra-Precise Astrometric measurements of Pulsar Parallaxes.**

R. Dodson (ICRAR; richard.dodson@icrar.org) & M. Rioja (ICRAR; maria.rioja@icrar.org)

The detection of post-Einstein General Relativistic effects would be a paradigm-changing discovery. Hitherto the vast number of investigations have produced only upper-limits, albeit very precise ones. The major residual error is that of the acceleration term due to the Galactic Rotation, which requires a precise distance measurement. We propose to improve these by an order of magnitude.

For the canonical distance error of 10% at the Galactic Centre we have required astrometric errors of 10uas. To reduce these to 1% we will require systematic astrometric errors of 1uas, which is well beyond those achievable with conventional (even in-beam) astrometry. (Furthermore, the thermal limit for 1uas precision will require dynamic ranges of $10^4$.)

The recent development of MultiView offers the only route to such exquisite removal of systematic errors, where a number of calibrators around the target are simultaneously observed to cancel out both spatial (with multiple directions) and temporal (with contemporaneous observation) errors.

The number of observations required per pulsar is modest. Four epochs would be the minimum, but given pulsar scintillation is normal to schedule eight. We imagine that ten such targets would be investigated. Targets will be of the tens milliJy level, which requires the VLBI high sensitivity array with Green Bank and the VLBA for $10^4$ sigma detections (4 hours per epoch, 8 epochs).

These lead to a requirement of 300 hours of VLBI observing for this project. ALPACA, with the ability to observe multiple targets simultaneously, on Green Bank for its collecting area, will be the only way to undertake these observations before the arrival of SKA/ngVLA, and even then we imagine that the observations would continue with a weaker population of targets.