

Title

Ultra-long period objects and exotic transients from ASKAP

Abstract

The past decade of work in radio transients has determined that only a few percent of radio sources are highly variable and even fewer radio sources (<0.1%) are highly circularly polarised. Yet, these are among the most interesting sources, spanning the coolest brown dwarfs to the most energetic magnetars. The Australian SKA Pathfinder has been very successful at finding rare and interesting objects using a combination of variability and circular polarisation. Perhaps the most exciting of these is ASKAP's proven capability for discovering members of the newly emerging class of ultra-long period objects.

ASKAP is a discovery machine, but we require follow-up observations to characterise the most rare, newly-discovered objects (highly variable, polarised sources). In particular, there is a significant advantage in having simultaneous imaging and beamformed data for studying sources that have pulsed emission, like candidate ultra-long period objects. The simultaneous data enable deep searches for pulsed emission while the source is verifiably on, which also ensures proper analysis for non-detections of pulsed emission. With its sensitivity, Southern sky coverage and simultaneous imaging and beamforming capability, MeerKAT is the ideal instrument to reveal the nature(s) of these rare sources.

In this multi-year proposal, we will observe up to 15 highly variable, polarised sources detected in the ASKAP Variables and Slow Transients survey. To do this we request 60 hours of MeerKAT observing time over the remaining 3 years of VAST, from 2024 to 2026.