

Title

Probing the nature of the Einstein Probe Fast X-ray transients with MeerKAT

Abstract

We propose to use MeerKAT to perform the first comprehensive campaign for the radio follow-up of the fast X-ray transient (FXTs) detected by the new Einstein Probe (EP) X-ray survey satellite. Operational since January 2024, EP has already detected 20 new FXTs and is quickly reporting their accurate positions publicly, thus enabling fast follow-up. These extra-galactic burst of X-rays might be caused by supernovae shock breakouts, binary neutron star mergers, long GRBs or white dwarf tidal disruption events, and represent a new unique way to detect these exotic events. In this context, radio observations are crucial to break the existing degeneracies between the different proposed production channels. Building up on the success of a previous MeerKAT pilot program, with the first detection of the radio counterpart of an FXT (EP240315a), we propose to scale this up by observing a total of 20 FXTs during 2024 and 2025, for a total of 100 hours of observing time, overheads included. Due to its unmatched sensitivity in the Southern hemisphere, MeerKAT is the ideal instrument to probe the radio emission from these events and to constrain the nature of their progenitors. For each target, selected according to precise triggering criteria, we ask to perform 4 1-hour observations at S-band, log-spaced in time, while also obtaining spectral information at L-band for a subset of 5 FXTs. In this way, we will perform the first FXT radio population study, while also starting to probe the radio spectral index evolution of the most interesting targets.