Revealing the Progenitors of Fast X-ray Transients

Abstract

Fast X-ray transients (FXTs) are short (less than a few hours) bursts of soft X-ray emission that have been discovered through archive searches from data recorded by small field of view X-ray telescopes. The lack of prompt discovery has prevented systematic multi-wavelength followup of these events, with typical response times ranging from months to years post burst. The paucity of multi-wavelength information has lead to significant uncertainty in the progenitors of FXTs, with supernovae shock breakout, white dwarf tidal disruption events, and, crucially, binary neutron star mergers all proposed as possibilities based on the timescales and energetics of the roughly 30 known FXTs. If associated with binary neutron star mergers, the detection of fast X-ray transients provides an alternative discovery path for the electromagnetic component of these events detectable to significantly larger distances than from wide-field optical facilities. Radio detections, which have already been associated with the gravitational wave event GW170817, are crucial for making this association. With the impending launch of the Einstein Probe X-ray telescope, which will survey large regions of the sky while providing localisation for any FXTs it discovers, a new era in FXT science will begin. These discoveries will be reported via public channels on sub-hour timescales allowing for rapid multi-wavelength followup for the first time. We propose to use the high sensitivity and angular resolution of MeerKAT, with its newly operational S-band receivers, to constrain the radio emission, and therefore progenitor system, of FXTs.