Title

Chasing collapsars in the early Universe with MeerKAT

Abstract

Long-duration gamma-ray bursts are the brightest explosions in the Universe. Their high luminosity ensures that they can be observed across cosmic time and thus provide a unique probe to study the properties of the medium at very high-z. The GRBs at $z > 10$ are predicted to arise from the first-generation Population III stars whereas at $6 < z < 10$ a mixture of Population III and Population II progenitors is expected. New GRB missions, such as Einstein Probe and SVOM, will make the discovery of such high-z bursts more feasible, potentially giving us the first Population III GRB as well. Radio observations can not only help determine if the GRB was produced by a Population III or Population II star, but also are crucial in disentangling the physics of the GRB jet. We propose MeerKAT observations of high-z GRBs, to monitor the radio afterglow. We are particularly interested in following up on those detected by the Einstein Probe, as our team has access to the proprietary Einstein Probe data stream, and we will complement MeerKAT data with C & X band observations. We aim to build a comprehensive dataset of a high-z GRB afterglow, independent of the nature of the progenitor, to increase the sample of such GRBs with radio detections, and only radio monitoring can access the late phase of the afterglow post the jet break when the optical and X-ray flux is too faint. Further, numerically modeling the multiwavelength afterglow dataset can constrain the jet microphysics.