

Title

**Characterizing a New Population of Very Magnetically Active M-dwarfs**

Abstract

Recently, searches for transient events in wide-field Cosmic Microwave Background (CMB) experiments such as the South Pole Telescope (SPT) have led to the serendipitous discovery of incredibly luminous millimeter-band flares from M dwarf stars, with flux densities of up to  $\sim 1$  Jy, making them the brightest millimeter-band transient events on the sky. Corresponding luminosities exceed the few previously-known M dwarf flares by  $\sim 10^3$  times. This new selection technique -- wide-field and (relatively) shallow mm-band imaging -- has blindly identified a unique population of magnetically active M-dwarfs without pre-selecting specific stars by age, distance, presence of a disk, etc. Here, we propose to use MeerKAT to follow up on the M-dwarfs detected by SPT in the GHz to explore the {nature} of the host stars and determine if there is a consistent emission mechanism across the centimeter- to millimeter-band range. The purity and size of our sample will enable a population-level understanding of the radio-mm emission properties that are inaccessible to single-source studies, and will for the first time allow a comparison between the low-frequency and high-frequency behavior of the Güdel-Benz relation which sets a trend between the radio and soft X-ray luminosities of stars.