

Title

Deep Imaging of Magnetar Swift J1834.9-0846, its Magnetar Wind Nebula, and SNR W41

Abstract

Magnetars are unusual types of neutron stars with particularly strong magnetic fields which are thought to be responsible for the flaring activity that magnetars can exhibit. X-ray observations of magnetar Swift J1834.9-0846 (residing in SNR W41) have revealed that it is surrounded by an extended nonthermal synchrotron nebula -- the first (and currently only) magnetar wind nebula (MWN) discovered. We propose sensitive MeerKAT observations of the MWN to detect it in radio, measure (or constrain) its low-energy spectrum, search for persistent radio emission from the magnetar, discern whether the radio emission seen in the SNR center is SNR ejecta or a relic magnetar wind nebula displaced by a reverse shock interaction, and understand the system's connection to the TeV source coincident with the center of the SNR. Constraining the multiwavelength spectrum of a MWN will provide valuable insight into magnetar particle acceleration and the physical properties of the nebula that they can produce. Understanding the properties of the plasma winds which surround magnetars also has implications in the study of fast radio bursts, as it is believed that at least some FRBs may be produced by young magnetars embedded in wind nebulae.