



Magnetar--FRB connections: Study of bright pulses from XTE J1810-197

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Fast radio bursts (FRBs) are bright, millisecond-duration pulses, originating from unidentified sources. The dispersion measure (DM) of FRBs strongly suggests an extragalactic origin, however, the underlying emission mechanism and the nature of their sources remain elusive. Several theoretical models have been proposed to explain the emission mechanism behind FRBs, with magnetars emerging as a prominent candidate [1].

Magnetars are a subclass of neutron stars with extremely high magnetic fields. Magnetars exhibit bright emissions across a range of wavelengths mostly powered by the decay of their enormous magnetic fields [2]. Magnetars are mainly detected via persistent high-energy emission. In addition, some magnetars also show transient radio emission, like XTE J1810-197, the first ever magnetar [3] detected at radio frequencies.

Here we will present a study of bright pulses from the magnetar XTE J1810-197. The magnetar XTE J1810-197 has been regularly monitored using various telescopes including, the upgraded Giant Metrewave Radio Telescope (GMRT), since its recent outburst in late 2018. This systematic monitoring aims to investigate the dynamic behavior and potential evolution of the outburst and the energetics of the single pulses. For our study, the data sets are collected using the GMRT and the Green Bank Telescope (GBT), and span a wide range in frequency (300 to 6000 MHz) as well as time (around 4.5 years). In our study of the bright single pulses, we analyze various properties in detail and compare these with the known properties of FRBs. We are also investigating the evolution of different properties with time and frequency. In addition, by analyzing the energetics of the bright pulses, our study also seeks to address crucial questions like (1) is it possible that the magnetar J1810-197 could emit a burst with energy comparable to that of the repeating FRBs or to that of the Galactic FRB 200428, and (2) if yes, over what timescales? Our results could also have significant implications for understanding the likelihood of FRB-like emission from the galactic magnetar population.

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