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Detection and localisation of the highly active FRB 20240114A with MeerKAT

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Fast radio burst (FRB) sources show a wide range of repetition rates, with some being able to emit hundreds and even thousands of bursts within hours. This provides a valuable opportunity for studying their burst morphology in detail, investigating their polarisation properties, localising the source to (sub)arcsecond precision, identifying its host galaxy, and searching for any associated persistent radio source (PRS). Here we present the MeerKAT observation of a new, highly active repeater FRB 20240114A, which was initially discovered by CHIME and reported to enter a period of high activity in 2024 January. We detect 62 bursts within 2hr of observation, with 44 in the UHF-band (544-1088MHz) and 18 in the L-band (856-1712MHz), confirming the high activity of the FRB source. Using the brightest burst in the sample, we measure a structure maximising dispersion measure (DM) and a Faraday rotation measure (RM). We find the bursts are band limited with a fractional bandwidth of ~10% and show frequency downward drifting, similar to other repeaters. We also perform the first interferometric localisation of the FRB source, allowing us to confidently identify its host galaxy. Interestingly, this host is classified as a dwarf star-forming galaxy, and contributes a large DM, suggesting the potential existence of a PRS. Based on the simple relation between the PSR luminosity and the RM from the FRB local environment, we derive a flux density for the PRS potentially associated with FRB 20240114A, which can be detected with continuum observations.

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