ATel #XXXXX: Discovery of a Highly Dispersed, Polarized Fast Radio Burst FRB 20240304B with MeerKAT/MeerTRAP

Instruments & Backend: MeerKAT (L-band; 856–1712 MHz), MeerTRAP coherent beamforming + transient-buffer system.
UT Detection Time: 2024-03-04 00:50:12.567
Designation: FRB 20240304B

Detection & Basic Properties:
During commensal observations with MeerKAT, the MeerTRAP pipeline detected a bright millisecond-duration radio burst with high significance. Coherent-beam detection and transient-buffer (TB) voltages were recorded and subsequently imaged, providing precise interferometric localization. The burst exhibits a highly dispersed, scattered, and strongly linearly polarized signature.

Measured Radio Parameters (L-band):

- **Topocentric arrival time:** 2024-03-04 00:50:12.56 UTC
- **Position (J2000):** RA = 12:11:59.29 ± 0.28″, Dec = +11:48:46.86 ± 0.48″
- **Dispersion measure:** DM = 2458.20 ± 0.01 pc cm^{-3} (scattering-corrected)
- **Rotation measure:** RM = −55.6 ± 0.5 rad m^{-2}
- **Polarization:** Linear fraction = 0.49 ± 0.01; Circular fraction = 0.03 ± 0.01
- **Scattering:** τ_s(1 GHz) = 5.6 ± 0.3 ms; scattering index = −4.7 ± 0.1
- **Signal-to-noise (TB):** 114.7 (856–1712 MHz)
- **Peak flux density:** S_{peak} = 0.49 ± 0.01 Jy
- **Fluence:** 2.75 ± 0.05 Jy ms
- **Effective bandwidth used:** 614.44 MHz

Context:
Considering the Milky Way ISM and halo contributions (≈28 and ≈40 pc cm^{-3} respectively), we infer an extragalactic dispersion measure excess of ≳2300 pc cm^{-3}. The modest magnitude of RM suggests either a weak or complex intervening magnetized medium or magnetic field reversals along the line of sight. The burst shows clear scattering across subbands, accurately described by an exponentially modified Gaussian profile.

Localization:
Interferometric imaging of TB voltages yields the reported position above. ON/OFF source images confirm no persistent radio emission is present at this location.

Repeat Search:
No additional bursts were detected within the ≈300 ms TB capture window. Continued monitoring and deeper repeat searches are strongly encouraged.

Requests for Follow-up:

- **Radio:** Prompt observations with MeerKAT, DSA-110, CHIME/FRB outriggers, uGMRT, FAST, and VLBI arrays are requested to search for repetition, refine polarization, dispersion measure, rotation measure, and frequency-dependent scattering properties.
- **Low-frequency:** LOFAR and MWA observations to place constraints on multipath scattering and potential low-frequency absorption.
- **High-frequency:** Observations at S/X-bands to examine spectral behavior and test polarization properties at higher frequencies.

Data Availability:
Dynamic spectra, polarization profiles, and detailed burst parameters are provided in supplementary material available upon request.

Contact:
Rapid follow-up observations and coordination should proceed through standard FRB communication channels. Ephemerides, search parameters, and localization details are available upon request from the MeerTRAP collaboration.