Tianlai Chime VLBI

for Fast Radio Bursts near NCP

#OutThereNow

The Astronomer's Telegram

@astronomerstel

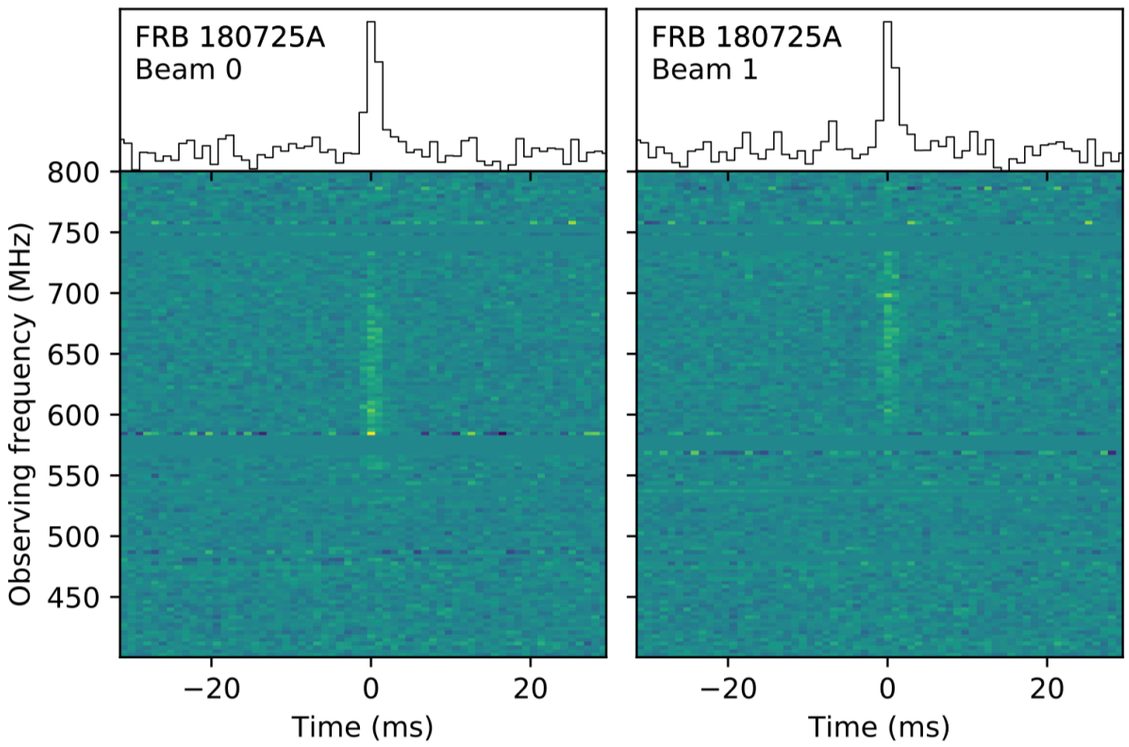

Figure 1: Dynamic spectrum plot after de-dispersion to DM = 716.6 pc cm^{-3}. The time is relative to the topocentric (at 400 MHz) burst peak on 2018 July 25 at 17:59:43.115 UTC. Intensity data for the two beams in which FRB 180725A was detected are shown. These approximately 0.5° wide and circular beams were at RA, Dec = (06:13:54.7, +67:04:00.1; J2000) and RA, Dec = (06:12:53.1, +67:03:59.1; J2000). Some frequency channels with terrestrial radio frequency interference have been zero-weighted.

First detection of fast radio bursts between 400 and 800 MHz by CHIME/FRB

ATel #11901; *P. J. Boyle (McGill University) for the CHIME/FRB Collaboration*
on 1 Aug 2018; 01:12 UT
Credential Certification: Patrick Boyle (patrick.boyle@mcgill.ca)

Subjects: Radio, Fast Radio Burst

Referred to by ATel #: 11902

The Canadian Hydrogen Intensity Mapping Experiment (CHIME; www.chime-experiment.ca) is a transit radio telescope consisting of four 20m x 100m cylindrical reflectors oriented North/South, plus a powerful F-X correlator, located at the Dominion Radio Astrophysical Observatory near Penticton, British Columbia, Canada. The CHIME Fast Radio Burst (FRB) Project (CHIME/FRB Collaboration, ApJ, in press, arXiv:1803.11235) forms 1024 independent stationary intensity beams with 1-ms time sampling and 16k frequency channels over a range of 400 - 800 MHz. CHIME/FRB is a uniquely fast survey instrument that can search for FRBs over an instantaneous field of view of ~200 square degrees in real time.

During its ongoing commissioning CHIME/FRB detected FRB 180725A on 2018 July 25 at 17:59:43.115 UTC (topocentric, at 400 MHz). The automated pipeline triggered the recording to disk of ~20 seconds of buffered raw intensity data around the time of the FRB. The event had an approximate width of 2 ms and was found at dispersion measure 716.6 pc/cm^3 with a signal-to-noise ratio S/N ~20.6 in one beam and 19.4 in a neighbouring beam. The centres of these, approximately 0.5 deg wide and circular beams, were at RA, Dec = (06:13:54.7, +67:04:00.1; J2000) and RA, Dec = (06:12:53.1, +67:03:59.1; J2000). However, precise localisation of the source and a flux estimate await further commissioning and calibration. The expected maximum Galactic line-of-sight dispersion measure in the source's direction is 69 pc/cm^3 (from the NE2001 model) or 81 pc/cm^3 (from the YMW16 model). The observed DM is far in excess of these values, even after accounting for the systematic uncertainties in the Galactic-DM models, confirming the identification of this event as an FRB. The event is clearly detected at frequencies as low as 580 MHz and represents the first detection of an FRB at radio frequencies below 700 MHz.

The de-dispersed frequency versus time plots for both beams can be found at the link below. Some frequency channels with terrestrial radio frequency interference have been zero-weighted. We do not find compelling evidence of scattering in the burst profile, and we caution against over-interpreting the band-limited structure of the pulse spectrum, as the data have not been corrected for frequency-dependent beam sensitivity. Further observations to search for repeated bursts at all wavelengths are encouraged.

Link to plot: FRB 180725A 'http://chime-experiment.ca/figures/chimefrb_1st_event.pdf'

Additional FRBs have been found since FRB 180725A and some have flux at frequencies as low as 400 MHz. These events have occurred during both the day and night and their arrival times are not correlated with known on-site activities or other known sources of terrestrial RFI.

We acknowledge local support from the Dominion Radio Astrophysical Observatory and also support from our funding agencies (for a full list please see arXiv:1803.11235).

Footnote: We have named this event appending an upper-case letter, in alphabetical order corresponding to confirmed event number on the specified date. However, this approach is temporary and we look forward to discussing a sustainable convention with other FRB-detection experiments.