Fast Radio Burst (FRB) Search in Parkes and the Green Bank Telescope (GBT) Pulsar Survey Data

a.k.a
FRB Project

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Fast Radio Bursts (FRBs)

- “Lorimer Burst” FRB 010724 (Lorimer et al. 2007)
- **FAST**: ~5 ms. duration
- **RADIO**: radio astronomy (duh…)
- **BURST**: a 30 Jy pulse
- Unknown extragalactic(?) origin
36 published FRBs (http://www.frbcat.org)

(close to 60 FRBs known in total)

1.) Data archive: “classic”
[HTRU (Parkes), GBNCC (GBT)]

2.) Real-time data processing: “modern”
[UTMOST, ASKAP, CHIME]
36 published FRBs (http://www.frbcat.org)

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

CHIME/FRB Collaboration

FRB 180725A
Beam 0

Matthew Bailes 😏 Rumours abound about their rate! Have I lost my bet with Vicky already? I need <= 3/day.

Like · Reply · 18h

Bryan Gaensler

Like · Reply · 17h

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, +67:00:01; J2000) and RA, Dec = (06:12:53.1, +67:03:50.1; 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

Credentiale Certification: Patrick Boyle (patrick.boyle@mcgill.ca)

E: www.chime-experiment.ca is a collaboration of 240 radio reflectors oriented North/South, 480-m diameter dish at the Green Bank Observatory, near the town of Green Bank, West Virginia. The CHIME/FRB Project (CHIME/FRB) is a wide-spread, stationary intensity beam search for fast radio bursts. The project is searching for a signal of 400 - 800 MHz, CHIME/FRB has an instantaneous field of view of $\frac{\pi}{4}$ steradians, which is approximately equal to the area of the moon in the sky.

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 $S/N \sim 20.6$ in one beam and 19.4 in a neighboring beam. The centres of 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, +67:03:50.1; 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 380 MHz and
FRB 121102: the repeater

- Spitler+2014 and Spitler+2016
- 18 bursts (and counting) followed up by the GBT and Arecibo
- Keep observing known FRBs!
More questions & theories than FRBs...

- Progenitors? (neutron stars? black holes? mergers? collisions?)
- Population? (repeat? non-repeat? both?)
- Emission mechanism?
- A new standard candle?
- Galactic?
- Extragalactic?
- Spectrum?
Meetings, collaborations and potential projects

- Attend FRB2018: Finding and Understanding Fast Radio Bursts, Melbourne, Australia, 14-6 February 2018
- Visit/discuss collaboration with Dr. Duncan Lorimer, National Astronomical Observatory of China (NAOC)/ FAST site, China, 12 May – 1 June, 2018
- 100% of budget was used

- “GreenBurst” follow-up FRBs with the 40m telescope in Green Bank
- Starting in September 2018: GreenBurst + Thai Robotic/Remote Telescope (TRT) in Sierra California to **simultaneously observe** the new FRB found near Virgo (... when the TRT is up online ...)
Meetings, collaborations and potential projects

- "Fast radio bursts and their possible neutron star origins" 18 - 20 February, 2019 in Amsterdam, the Netherlands

- Key dates:
  - Second announcement: September 2018
  - Final announcement: October 2018
  - Abstract submission closes: November 2018
  - Registration closes: 15 December, 2018

- Registration fees:
  - Registration will be free of charge for all participants

FRB2020 meeting will be held in Thailand (90%+ certainty)!
When: February 2020
Where: “The beach wins out for me every time!”, said Dunc