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Bright burst detections from FRB 20220912A at 332 MHz using the Westerbork-RT1 25-m telescope

ATel #15817; O. S. Ould-Boukattine (ASTRON, UvA), W. Herrmann (Astropeiler Stockert e. V.), M. Gawronski (NCU, Torun), A. Gopinath (UvA), J. W.T. Hessels (UvA, ASTRON), E. F. Keane (TCD), R. Blaauw (ASTRON), J. J. Sluman (ASTRON), H. Mulder (ASTRON), D. J. McKenna (DIAS, TCD), M. P. Snelders (ASTRON, UvA), F. Kirsten (Chalmers), K. Nimmo (MIT)

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Credential Certification: Jason W.T. Hessels (j.w.t.hessels@uva.nl)

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Tweet

We report the detections of bright fast radio bursts from FRB 20220912A using the Westerbork-RT1 25-m telescope at 332 MHz.

After the discovery of the highly active repeater FRB 20220912A by CHIME/FRB (ATel #15679), we started a high-cadence monitoring campaign using 25-m and 32-m class European radio telescopes. We have been observing the source almost daily at C-, L-, and P-band using the Stockert (Germany), Westerbork (Netherlands) and Torun (Poland) radio telescopes. Depending on availability of the telescopes we observe simultaneously at complementary wavelengths. Additionally we have had overlapping coverage with the LOFAR Core stations in the Netherlands and the international IE613 LOFAR station in Ireland.

Here we report the discovery of four bright bursts detected during 156 h of observing at P-band. Observations were conducted at a central frequency of 332 MHz with a bandwidth of 64 MHz using the Westerbork RT-1 radio telescope. We have a significant drop in sensitivity in the top 8 MHz and therefore mask these channels. The receiver has a system equivalent flux density (SEFD) of 2100 Jy.

The properties of the detected bursts are:

1. Bright pulses at 1400 MHz from FRB 20220912A
2. Detection of a burst from the newly discovered active repeater FRB20220912A with the Northern Cross radio telescope
3. Detection of bursts from FRB 20220912A at 1.4 and 2.2 GHz
4. Detection of FRB 20220912A at 300 - 750 MHz frequency range
5. Erroratum to ATel #15693
6. Detection of FRB 20220912A at 111 MHz with BSA radio telescope
7. Simultaneous Optical Non-detections of FRB 20220912A with KeplerCam
8. Detection of a burst from the newly discovered active repeater FRB20220912A with the Northern Cross radio telescope
9. Extreme activity at 1400 MHz from FRB 20220912A
10. Detection of a burst from the newly discovered active repeater FRB20220912A with the Northern Cross radio telescope
11. Redshift of the candidate host galaxy of FRB 20220912A
12. Bright radio bursts from the active FRB 20220912A detected with the Allen Telescope Array
13. Detection of bursts from FRB 20220912A detected with the Allen Telescope Array
14. Detection of a burst from FRB 20220912A detected with the Allen Telescope Array
15. Detection of a burst from the active FRB 20220912A detected with the Allen Telescope Array
16. Detection of FRB 20220912A at 750 MHz with the Tianlai Dish Pathfinder Array
17. A descriptive title
18. Bright burst detections from FRB 20220912A at 332 MHz using the Westerbork-RT1 25-m telescope
19. Detection of FRB 20220912A at 111 MHz with BSA radio telescope
20. Nine Bursts in Three Days from a Newly Discovered
Burst 1:
Fluence: 426 +/- 86 Jy ms
Arrival time (MJD, TDB): 59905.8871460520

Burst 2:
Fluence: 176 +/- 35 Jy ms
Arrival time (MJD, TDB): 59911.8835634820

Burst 3:
Fluence: 438 +/- 88 Jy ms
Arrival time (MJD, TDB): 59912.9809171292

Burst 4:
Fluence: 892 +/- 179 Jy ms
Arrival time (MJD, TDB): 59922.8202534060

The arrival time is referenced to infinite frequency at the solar system barycentre (in TDB) using a dispersion measure (DM) of 219.46 pc cm^-3, as determined by CHIME/FRB in the discovery ATel (#15679), and DM constant of 1/2.41e-4 MHz^2 pc^-1 cm^3 s.

Each of the four detected bursts had overlap with a subset of the following observations, where we found no counterparts: 151 MHz (VHF-band, IE613 LOFAR station), 1.37 GHz (L-band, Stockert), 1.41 GHz (L-band, Torun) and 4.6 GHz (C-band, Torun). We can place an upper limit on the fluence assuming an 8-sigma 1-ms detection threshold of 30 Jy ms, 7 Jy ms, 14 Jy ms and 11 Jy ms, respectively.

During our campaign we have also detected many tens of bursts at 1.4 GHz (L-band) ranging between 10-1000 Jy ms while no bursts were found at 4.6 GHz (C-band) in hundreds of observing hours, see also ATel #15727. The analysis of all detected bursts, in both L- and P-band, are currently in preparation as part of a forthcoming paper.

Dynamic spectrum of the brightest burst (Burst 4)