
Detection of ultra-fast radio bursts from FRB 20121102A

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Supplementary information

Supplementary Table 1: **Basic detection properties of the bursts.** The time of arrival (TOA), signal-to-noise (S/N), duration, probability and frequency extent are with respect to the detection with the highest S/N of that burst.

Burst	TOA ^α [s]	PRESTO S/N	Duration [μs]	Probability ^γ ×100 %	Total detections	$\nu_{\text{low}}^{\delta}$ [MHz]	$\nu_{\text{high}}^{\delta}$ [MHz]	Gajjar et al. ¹⁹ identifier	Zhang et al. ³⁴ identifier
B01	16.2701	74.05	458.752	100	424	6970.00	7157.50	11A	1
B02	18.4898	9.54	294.912	100	6	6970.00	7157.50		2
B03	30.5842	10.15	1572.864	100	13	6126.25	6501.25		4
B04	133.7138	8.36	196.608	100	2	5563.75	5938.75		
B05	170.5020	8.31	196.608	100	2	7063.75	7438.75		
B06	195.1935	14.11	4.096	100	16	6970.00	7157.50		
B07	197.3795	10.58	6.144	0	5	4720.00	4907.50		
B08	204.7666	9.53	458.752	100	7	5001.25	5751.25		6
B09	244.1764	8.82	196.608	100	3	4626.25	4813.75		
B10	248.3161	12.47	12.288	0	15	5001.25	5751.25		
B11	249.9378	8.84	61.440	100	6	4813.75	5188.75		
B12	263.4282	16.01	294.912	100	42	5376.25	6126.25	11B	8,9
B13	277.4008	12.65	3145.728	100	11	5376.25	6126.25		10
B14	281.8991	12.47	196.608	100	13	4813.75	5001.25		
B15	285.4547	23.44	458.752	100	48	6970.00	7157.50	11C	11
B16	315.0567	12.90	983.040	82	5	6970.00	7157.50		12
B17	323.3700	99.22	1048.576	95	154	6876.25	7251.25	11D	13
B18	334.9762	8.84	294.912	100	20	5376.25	6876.25		
B19	344.7870	41.62	1048.576	69	105	6970.00	7157.50	11E	14
B20	356.0529	55.87	1048.576	50	47	6970.00	7157.50	11F	15
B21	415.5190	8.76	458.752	100	6	4626.25	5376.25		
B22	580.6662	14.18	294.912	100	34	5376.25	6126.25	11G	19
B23	597.6259	95.94	294.912	100	128	6876.25	7626.25	11H	20
B24	622.5689	17.49	196.608	100	42	6876.25	8376.25		
B25	652.5810	9.52	458.752	100	12	5376.25	6876.25		21
B26	662.2081	9.45	294.912	100	8	5751.25	6501.25		22
B27	691.0620	10.96	294.912	100	18	5751.25	6501.25	11I	23
B28	691.8646	25.21	458.752	100	77	5376.25	6126.25		
B29	704.0925	21.31	294.912	100	49	6126.25	6501.25	11J	24
B30	731.5633	33.13	4.096	20	56	5751.25	6501.25		
B31	766.6877	11.15	12.288	5	25	5001.25	5751.25		
B32	769.8707	21.22	655.360	100	51	6876.25	8376.25	11K	25
B33	804.5907	8.24	655.360	100	4	5563.75	5938.75		26
B34	808.8735	8.93	458.752	100	7	4813.75	5188.75		
B35	840.9772	9.55	983.040	100	14	5563.75	5938.75	11L	27,28,29
B36	842.1029	8.52	458.752	100	3	5001.25	5751.25		31
B37	878.2482	8.80	131.072	100	6	5001.25	5751.25		
B38	993.2905	14.50	12.288	100	77	5657.50	5845.00	11M	33
B39	994.9033	10.35	294.912	100	11	4813.75	5188.75		
B40	1036.4686	35.74	196.608	100	102	5001.25	5751.25	11N	34
B41	1142.4320	28.03	458.752	100	71	5376.25	6876.25	11O	37
B42	1257.4688	8.32	1474.560	100	3	5001.25	5376.25	11P	39
B43	1280.6520	46.14	12.288	100	47	4813.75	5188.75		40
B44	1327.5579	12.91	12.288	0	12	5001.25	5751.25		
B45	1440.8676	10.10	983.040	100	5	5751.25	6501.25		42
B46	1454.5774	55.57	196.608	100	129	5751.25	6501.25	11Q	43
B47	1630.8575	19.32	458.752	100	46	4626.25	5001.25		45
B48	1637.2393	12.24	196.608	100	22	5657.50	5845.00		
B49	1789.3961	30.26	196.608	100	55	5376.25	5751.25	11R	46

^α Seconds since the start of the observation (MJD 57991.57760417).

^γ The FETCH² probability of the candidate being of astrophysical origin (model A) indicating the importance of manually checking the candidates with duration $\leq 500 \mu\text{s}$.

^δ For clarity 0.214844 MHz has been subtracted from every number.

Supplementary Table 2: **Frequency coverage per compute node.**

Node	Passband ^γ	$\nu_{\text{low}}^{\alpha}$ [MHz]	$\nu_{\text{center}}^{\alpha}$ [MHz]	$\nu_{\text{high}}^{\alpha}$ [MHz]
BLP00	0	9126.25	9220.00	9313.75
BLP01	0	8938.75	9032.50	9126.25
BLP02	0	8751.25	8845.00	8938.75
BLP03	0	8563.75	8657.50	8751.25
BLP04	0	8376.25	8470.00	8563.75
BLP05 [†]	0	8188.75	8282.50	8376.25
BLP06 [†]	0	8001.25	8095.00	8188.75
BLP07 ^Δ	0	7813.75	7907.50	8001.25
BLP10 ^{†Δ}	1	7813.75	7907.50	8001.25
BLP11 [†]	1	7626.25	7720.00	7813.75
BLP12 [†]	1	7438.75	7532.50	7626.25
BLP13 [†]	1	7251.25	7345.00	7438.75
BLP14 [†]	1	7063.75	7157.50	7251.25
BLP15 [†]	1	6876.25	6970.00	7063.75
BLP16 [†]	1	6688.75	6782.50	6876.25
BLP17 ^Δ	1	6501.25	6595.00	6688.75
BLP20 ^{†Δ}	2	6501.25	6595.00	6688.75
BLP21 [†]	2	6313.75	6407.50	6501.25
BLP22 [†]	2	6126.25	6220.00	6313.75
BLP23 [†]	2	5938.75	6032.50	6126.25
BLP24 [†]	2	5751.25	5845.00	5938.75
BLP25 [†]	2	5563.75	5657.50	5751.25
BLP26 [†]	2	5376.25	5470.00	5563.75
BLP27 ^Δ	2	5188.75	5282.50	5376.25
BLP30 ^{†Δ}	3	5188.75	5282.50	5376.25
BLP31 [†]	3	5001.25	5095.00	5188.75
BLP32 [†]	3	4813.75	4907.50	5001.25
BLP33 [†]	3	4626.25	4720.00	4813.75
BLP34 [†]	3	4438.75	4532.50	4626.25
BLP35 [†]	3	4251.25	4345.00	4438.75
BLP36 [†]	3	4063.75	4157.50	4251.25
BLP37 [†]	3	3876.25	3970.00	4063.75

^γ The passbands were numbered 0–3 and were tuned to a centre frequency of 8563.964844, 7251.464844, 5938.964844 and 4626.464844 MHz, respectively.

^α For clarity 0.214844 MHz has been subtracted from every value.

[†] The nodes that were used to create high-time-resolution filterbanks for the burst search.

^Δ These nodes have exactly 187.5 MHz overlap with an adjacent node of a different passband.

Supplementary Table 3: **Search strategy.** Dispersion measure (DM) range, DM step-size (ΔDM) and number of ‘subbands’ used in PRESTO’s prepsubband as a function of sampling time (Δt), bandwidth (BW) and frequency (ν) range. For clarity we have subtracted 0.214844 MHz from all the shown frequencies. Full table available online

Δt [μs]	BW [MHz]	Channels N	ν_{low} [MHz]	ν_{center} [MHz]	ν_{high} [MHz]	DM_{low} [pc cm^{-3}]	DM_{high} [pc cm^{-3}]	Trial DMs N	ΔDM [pc cm^{-3}]	Subbands N
2.048	4500.0	1536	3876.25	6126.25	8376.25	552.90	566.90	701	0.02	128
2.048	1500.0	512	3876.25	4626.25	5376.25	552.91	566.89	467	0.03	64
2.048	1500.0	512	4626.25	5376.25	6126.25	552.90	566.90	281	0.05	64
2.048	1500.0	512	5376.25	6126.25	6876.25	552.90	566.90	281	0.05	64
2.048	1500.0	512	6126.25	6876.25	7626.25	552.90	566.90	141	0.10	64
2.048	1500.0	512	6876.25	7626.25	8376.25	552.90	566.90	141	0.10	64
2.048	750.0	256	3876.25	4251.25	4626.25	552.90	566.90	281	0.05	32
2.048	750.0	256	4251.25	4626.25	5001.25	552.90	566.90	281	0.05	32
\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots	\vdots