

Multi-frequency scatter broadening evolution of pulsars. II :

Supplementary Material

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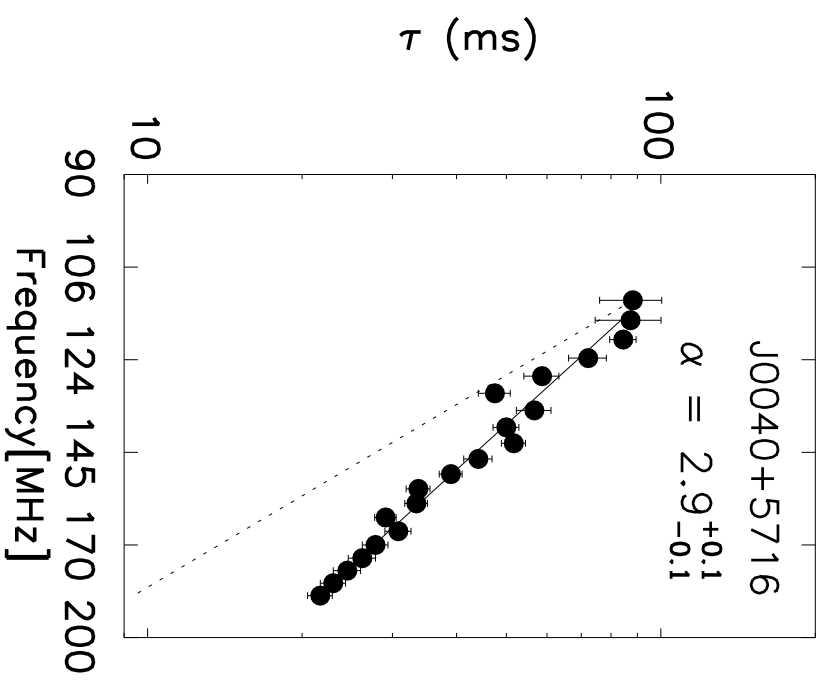
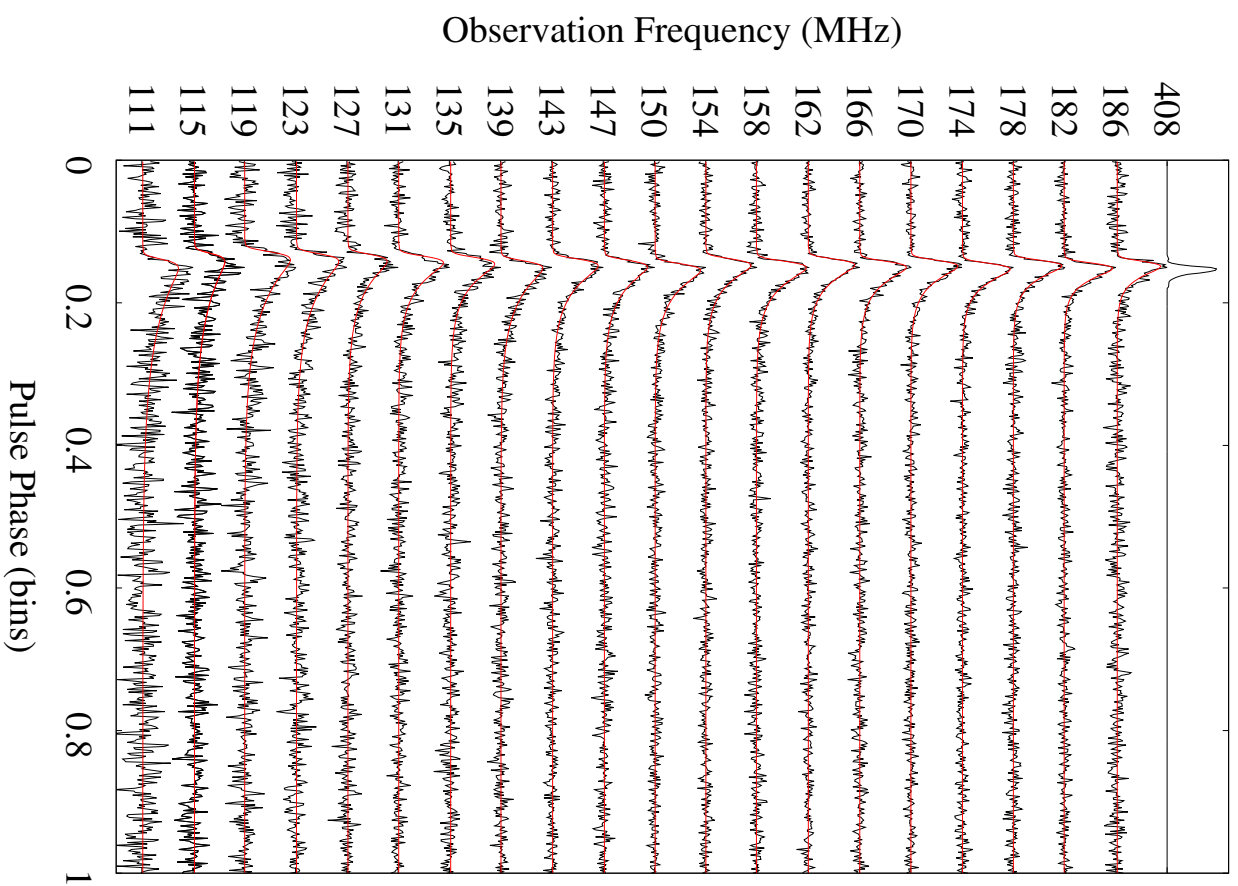
This is the supplementary material for the paper titled “Multi-frequency scatter broadening evolution of pulsars. II: Scatter broadening of nearby pulsars”. The following pages contain plots of the profile fits and α estimation of each pulsar. Each panel is divided into two panels as **left** and **right**.

(left panel): The plot shows the profiles of the pulsar at each frequencies and the fit for estimating τ_{sc} . The observed profiles are plotted as **black continuous curve** and the best fit are in **red continuous curves**. The high frequency profile used for fitting is plotted at the top in **black continuous curve**. The observing frequency of each sub-bands are labeled in the y-axis. In the case of pulsars where we have used profiles from other frequencies above HBA range (111 – 180 MHz), the center frequency of observation is given. For pulsars which have several sub-bands in the observing band, only some of the profiles are shown to improve the readability of the plot.

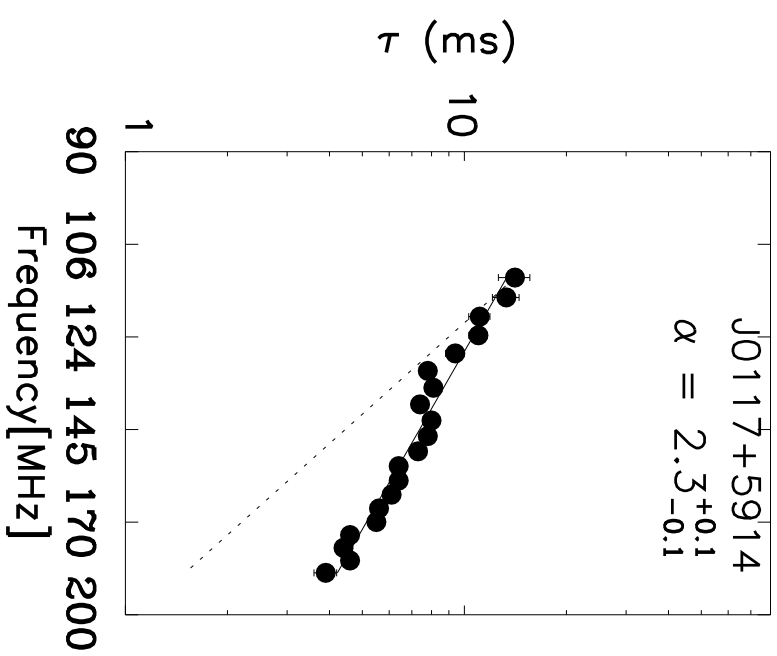
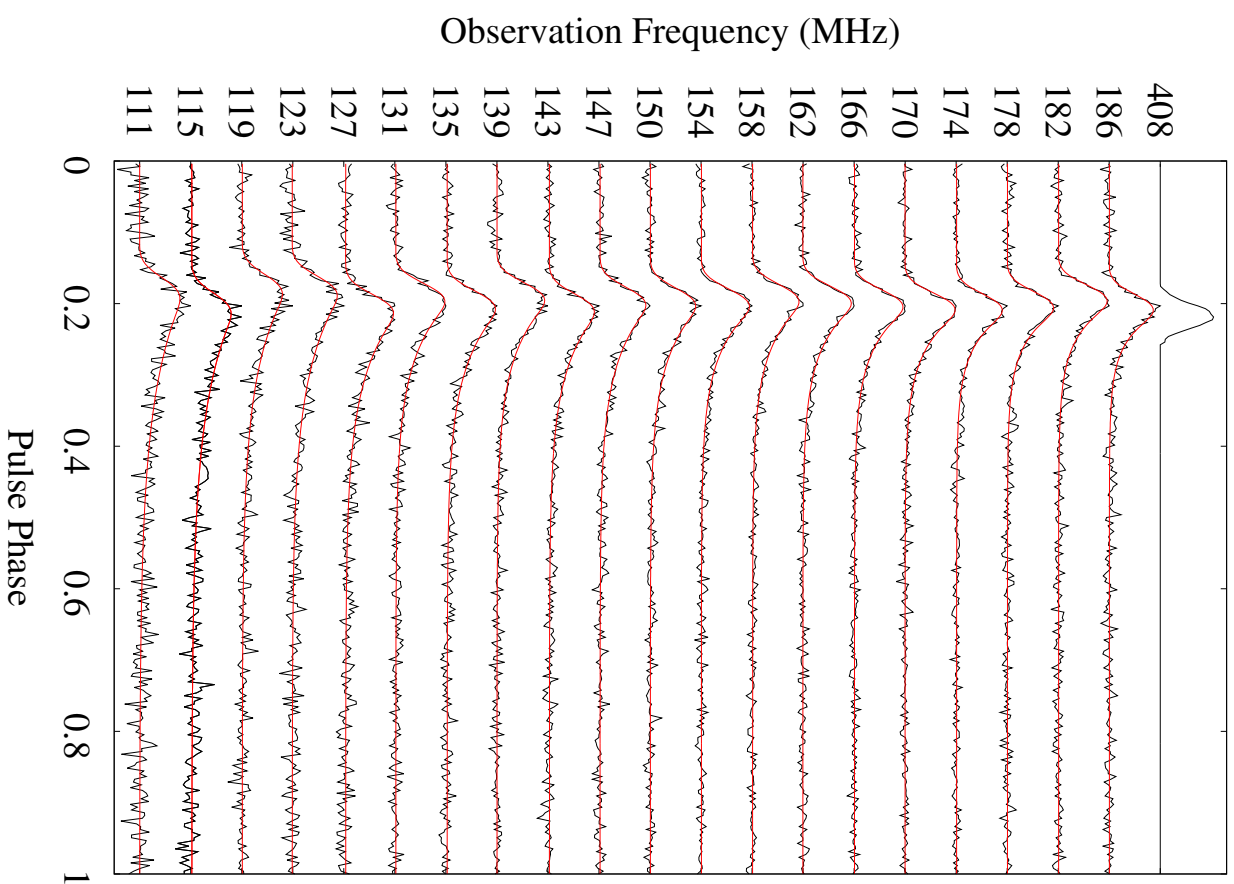
(right panel): The plot shows the fit to the τ_{sc} measurements (black filled circles) as a function of observing frequency. The black continuous line shows the best fit model to the dataset and the dashed line shows the expected line for the Kolmogorov turbulence model. The pulsar name and the value of α obtained is also given in the right side of the panel along with confidence limits.

After the plots section, in the last part of the supplementary material, we have given the τ_{sc} values obtained from the fitting method as explained in the manuscript. For each pulsar, the frequency of the profile, measured values of τ_{sc} with error and the reduced χ^2 are given. If there are data from different telescopes, that is also mentioned for clarity.

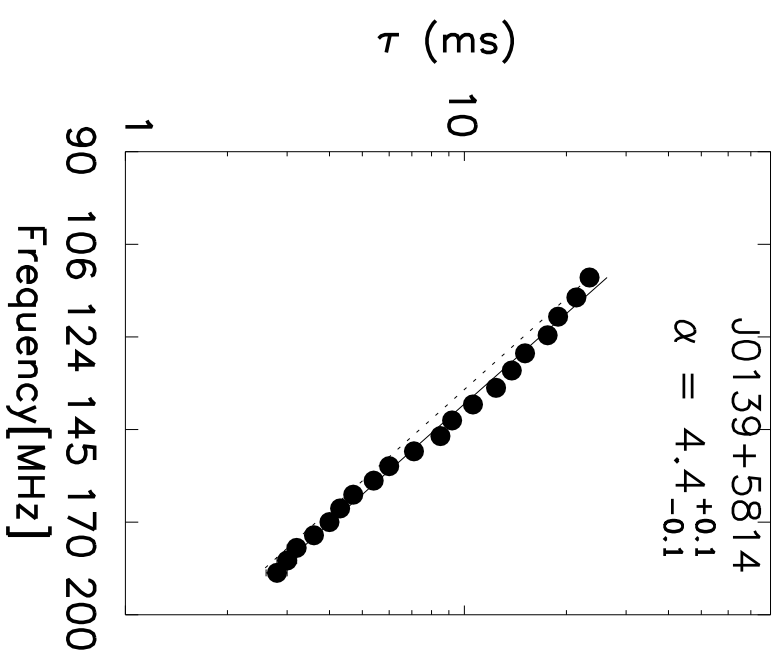
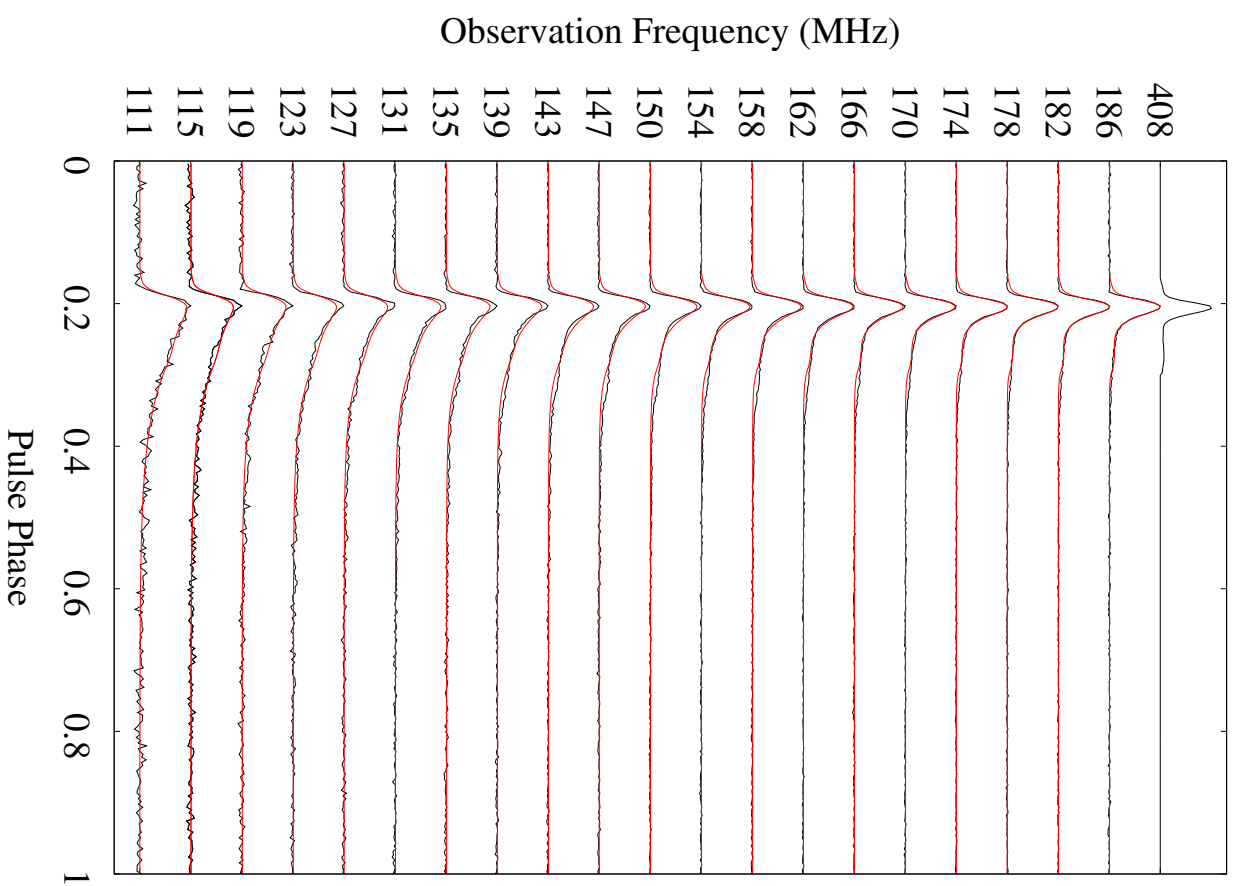
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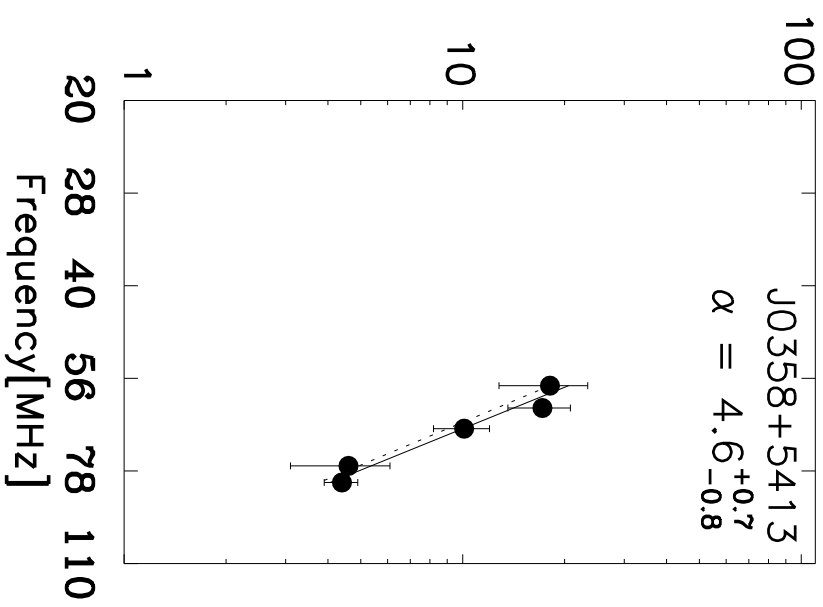
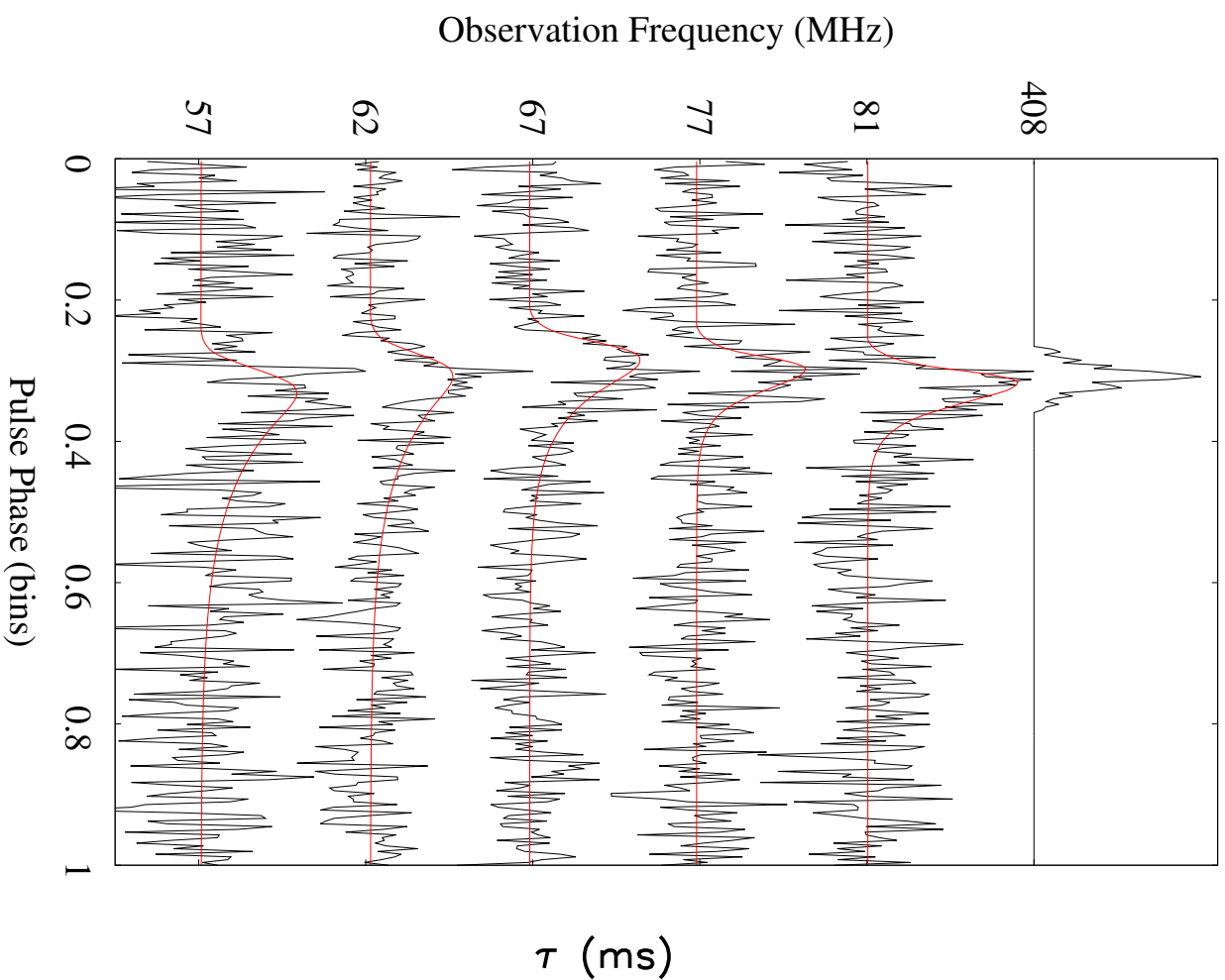
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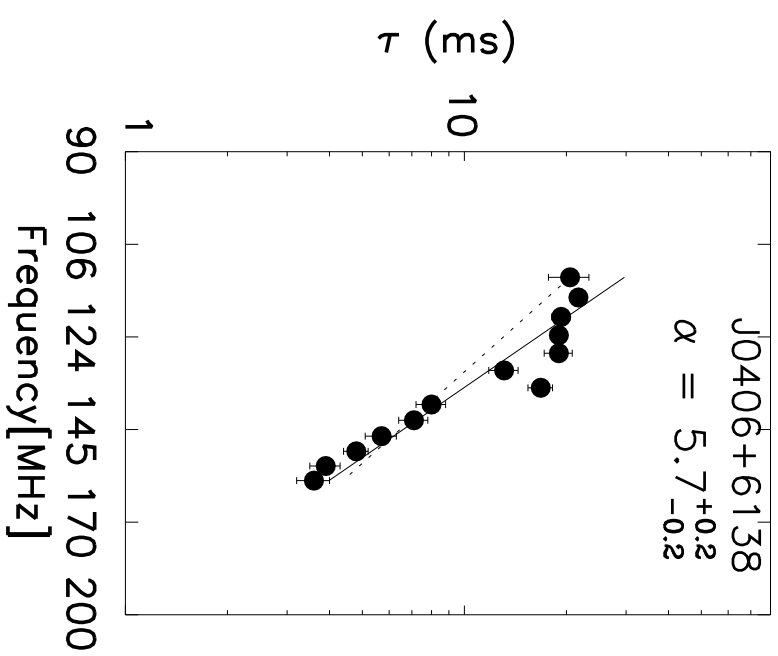
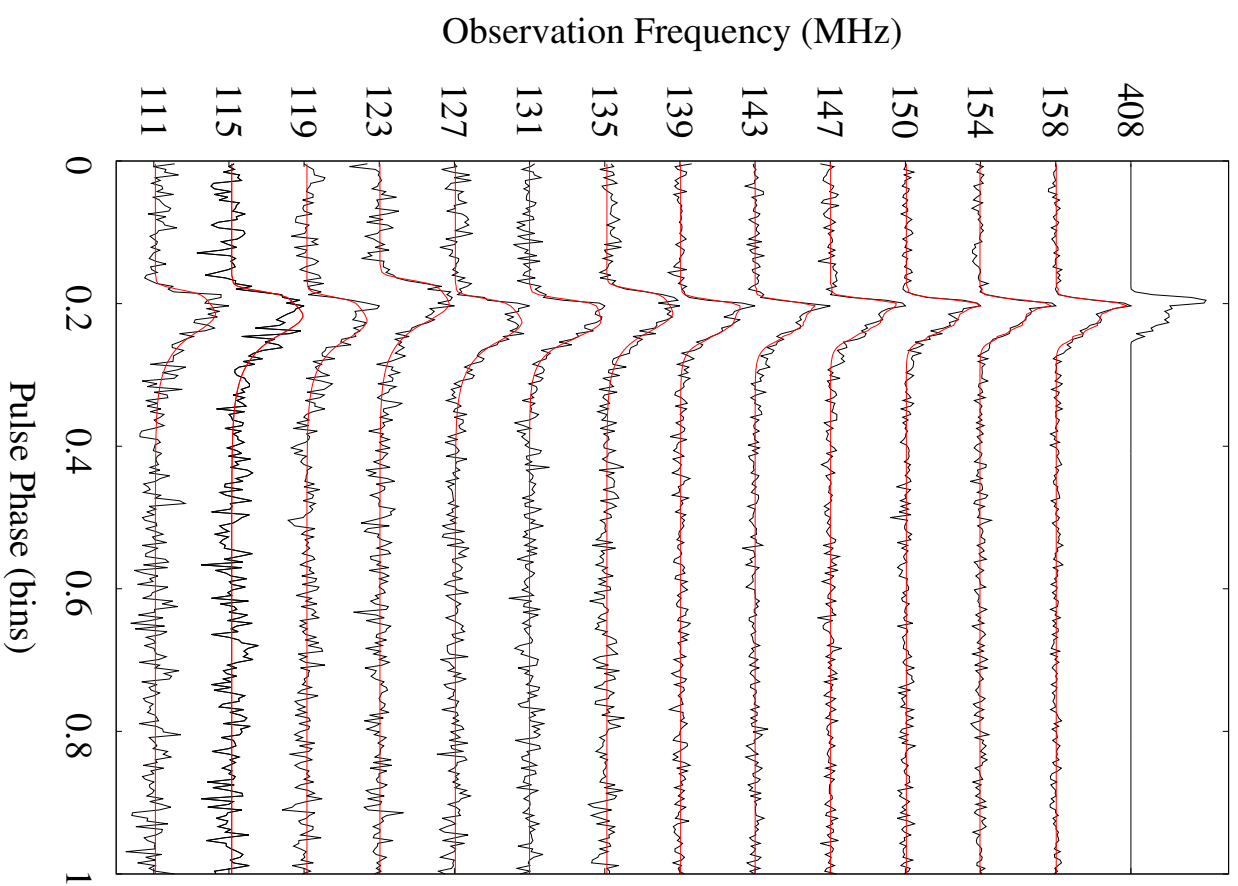
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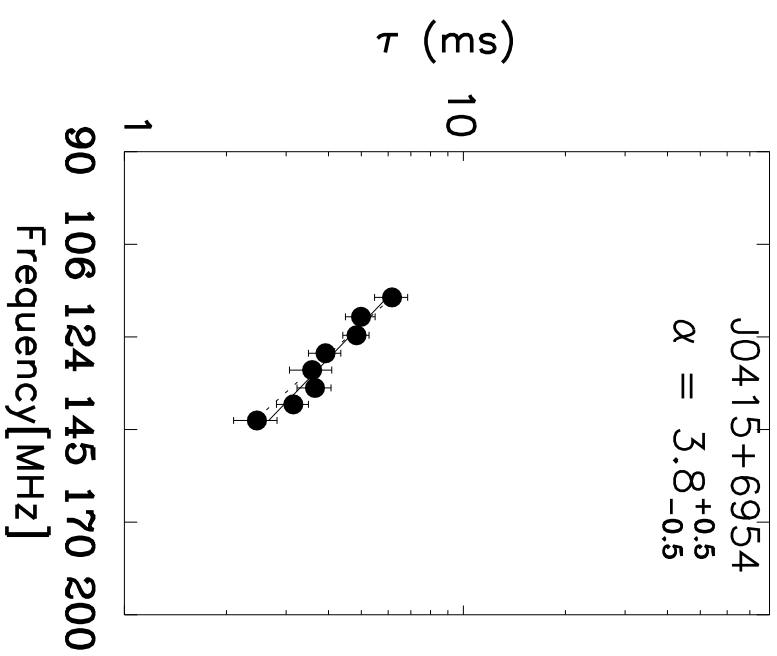
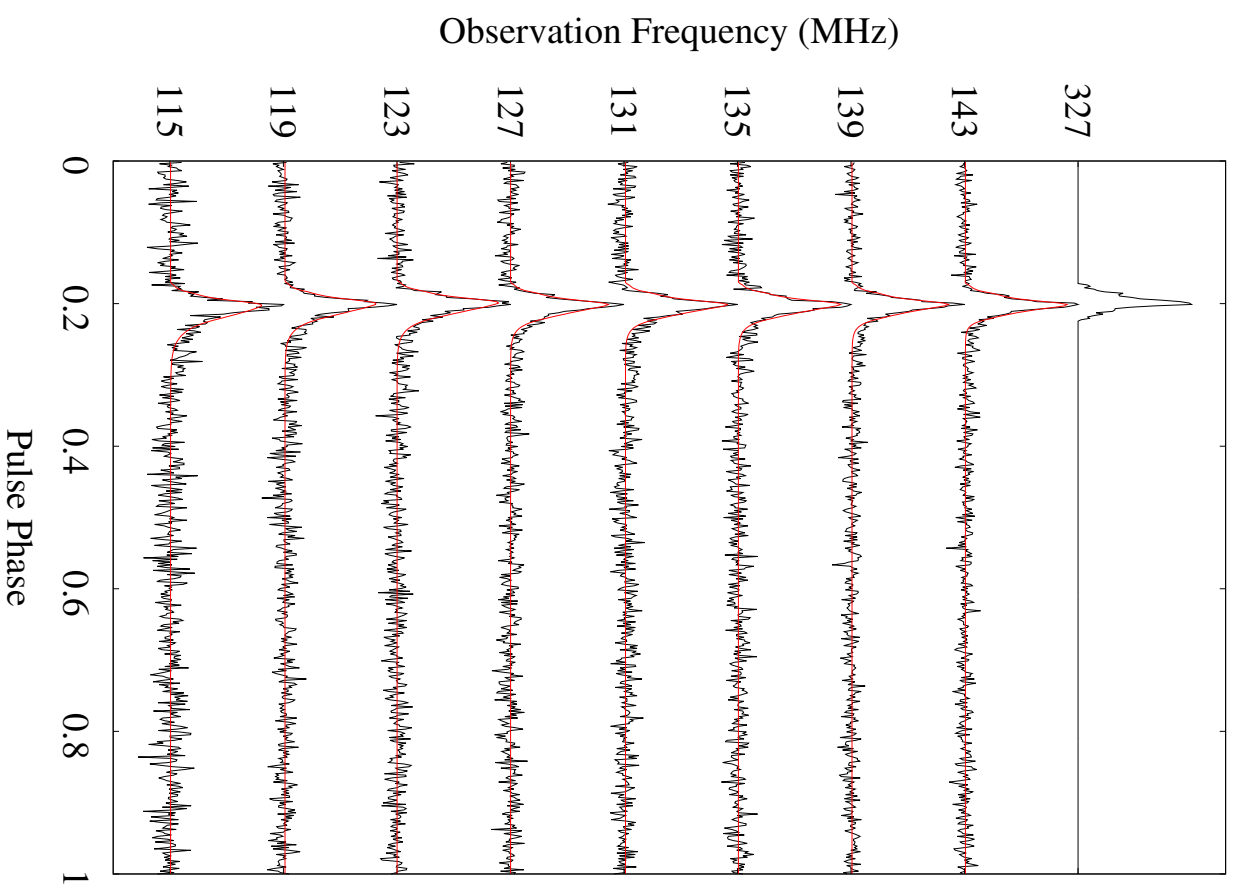
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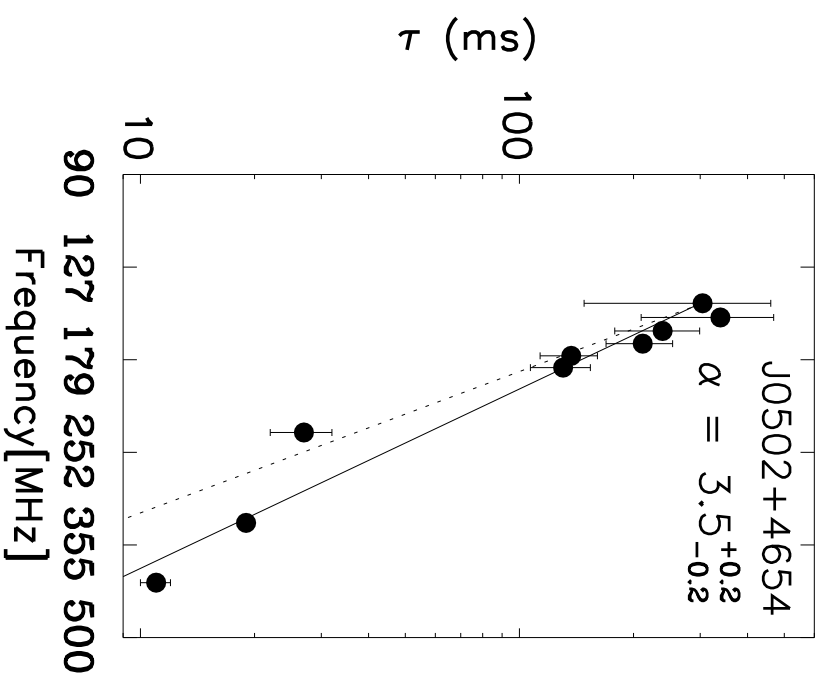
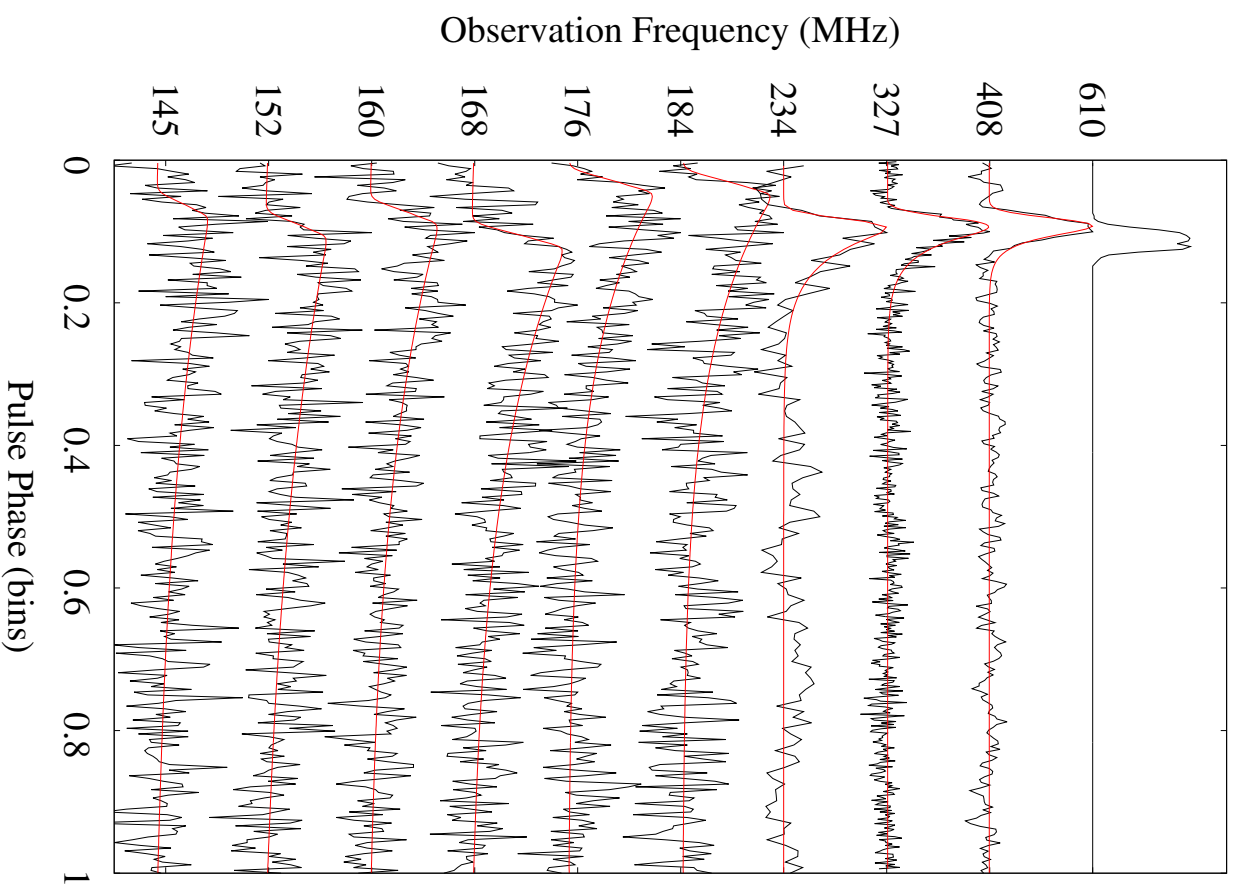
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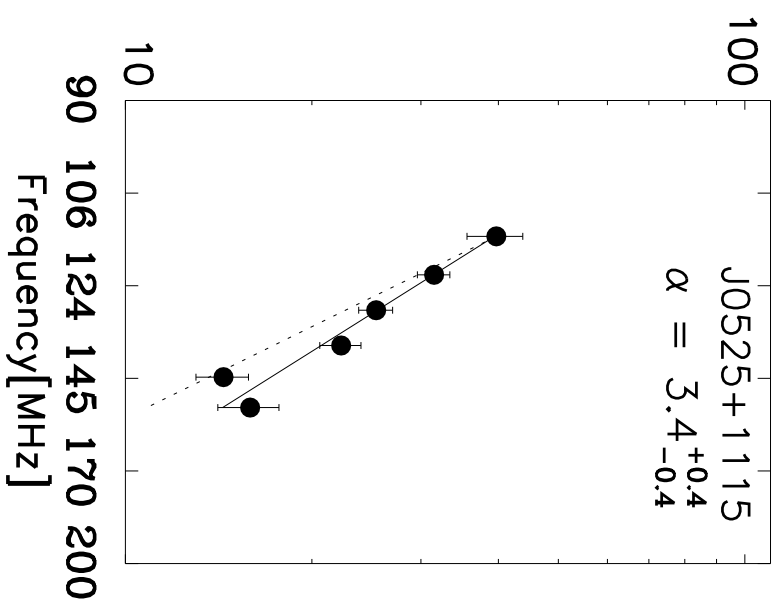
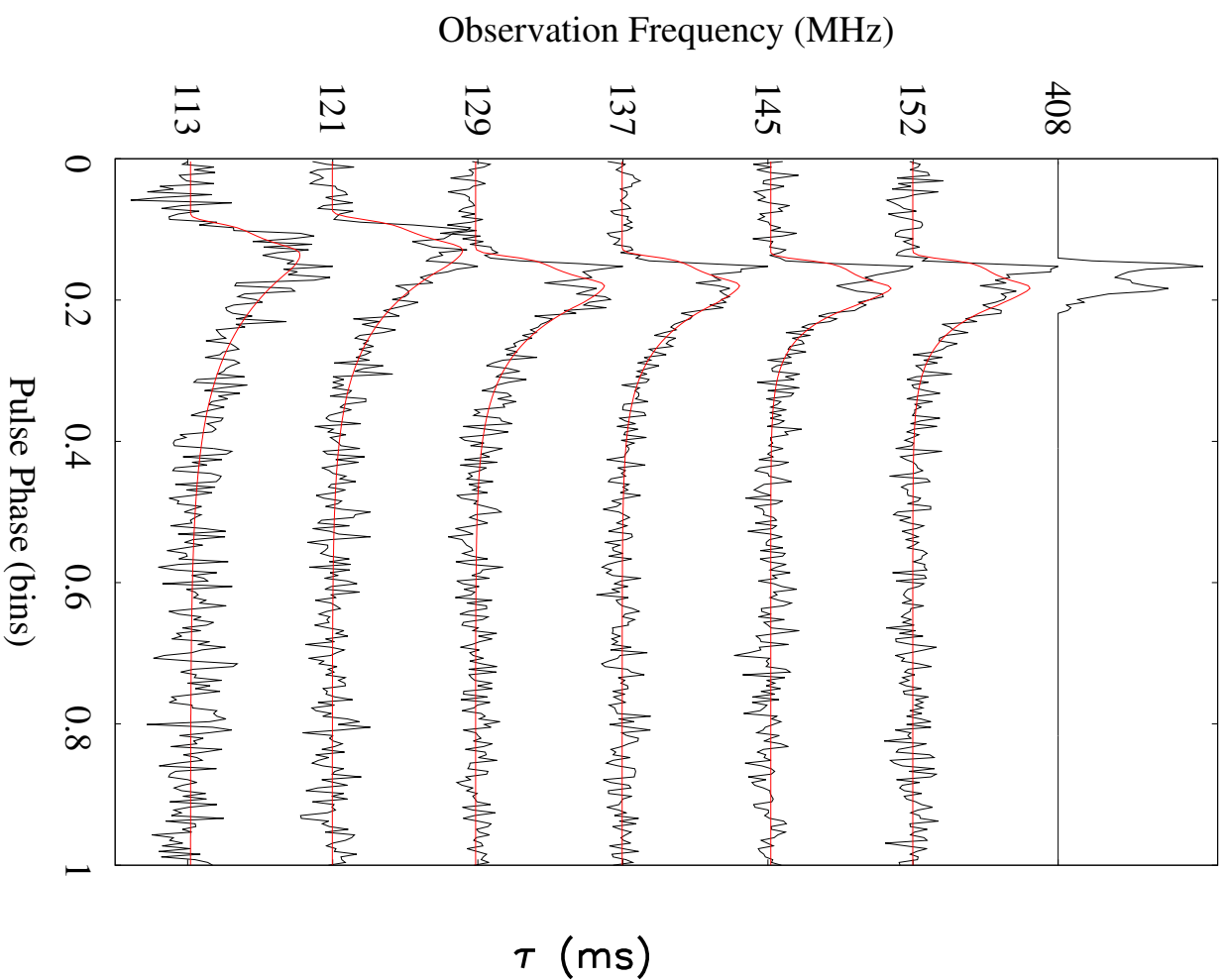
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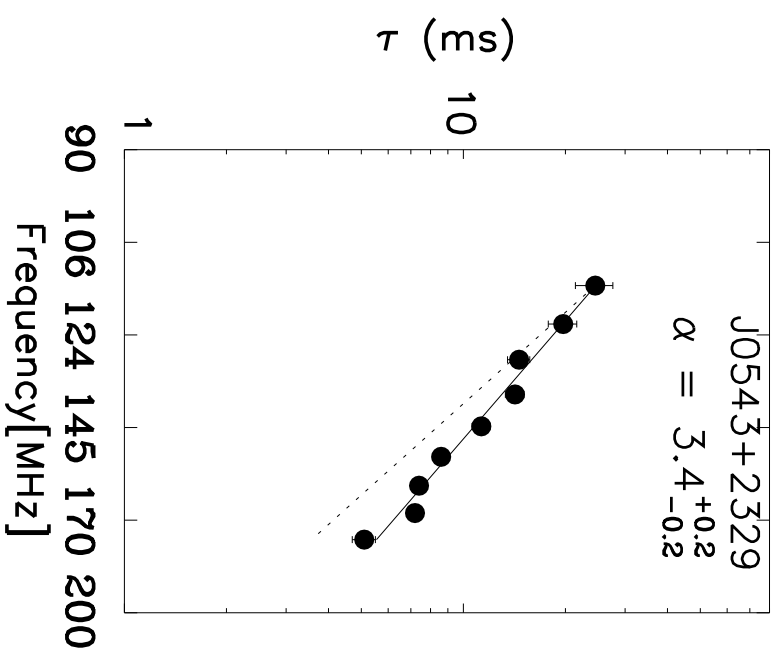
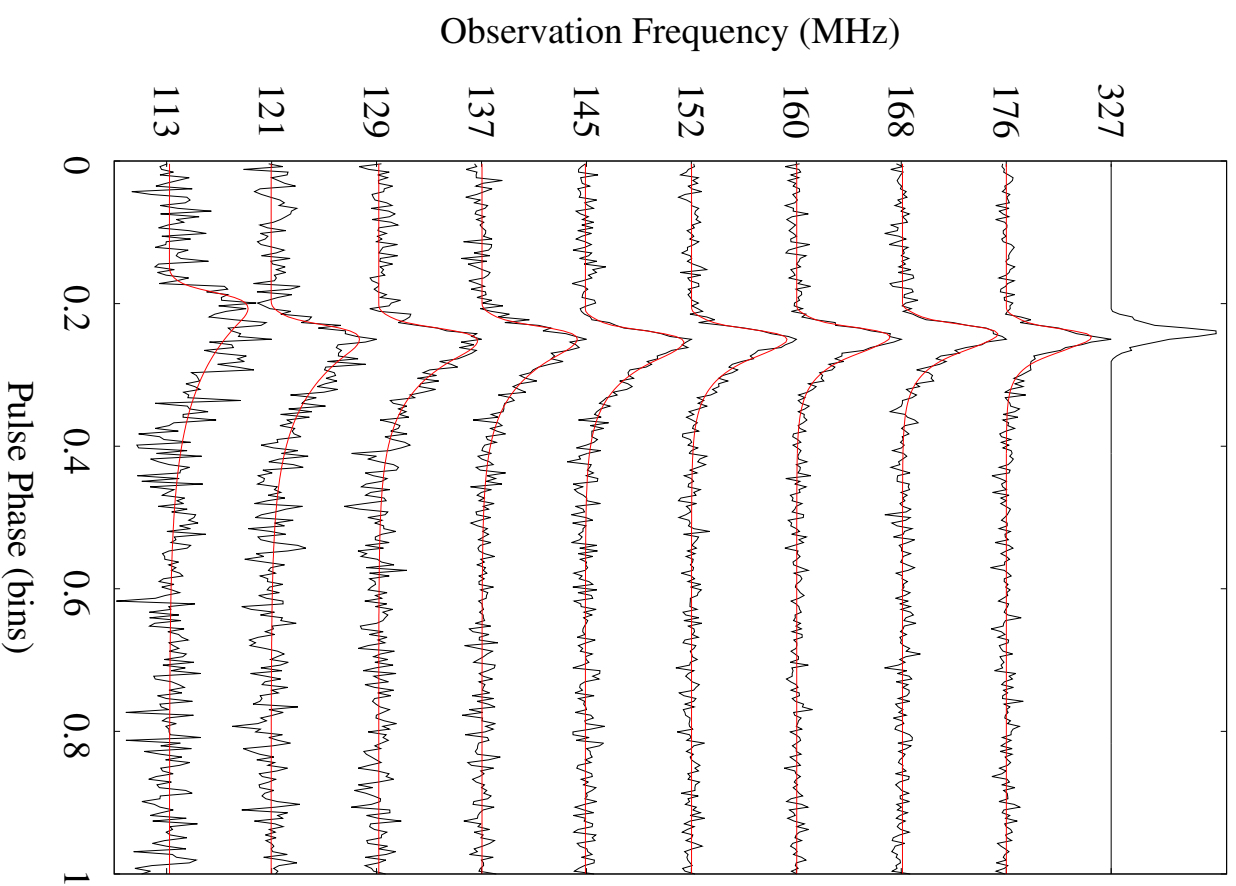
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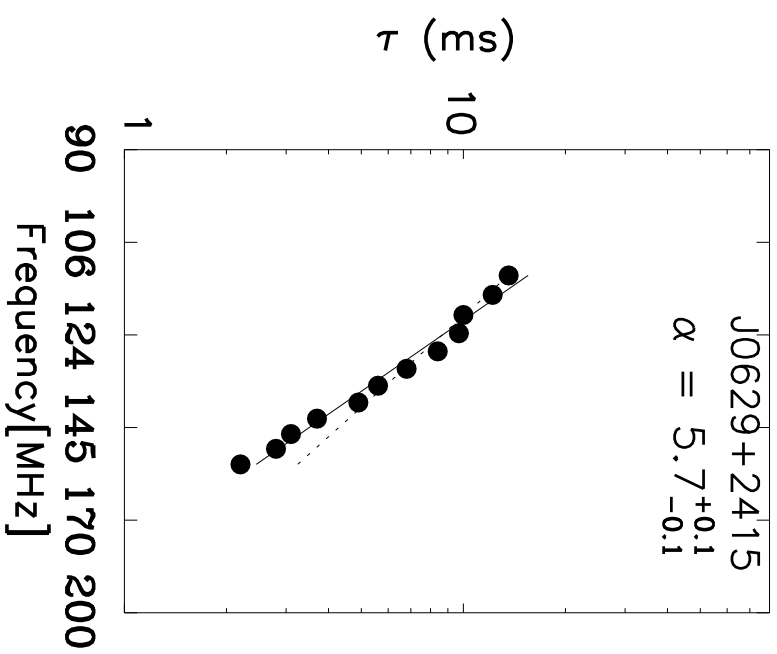
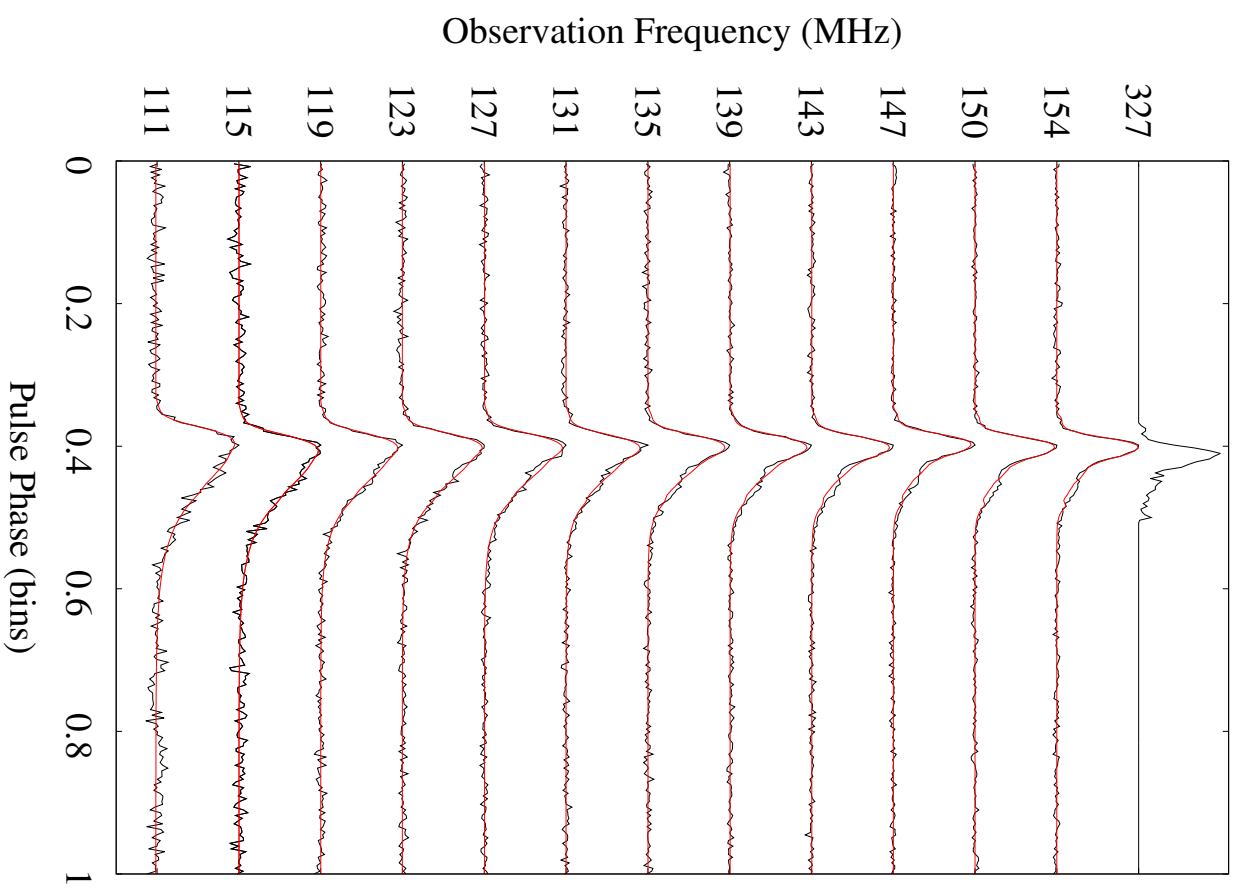
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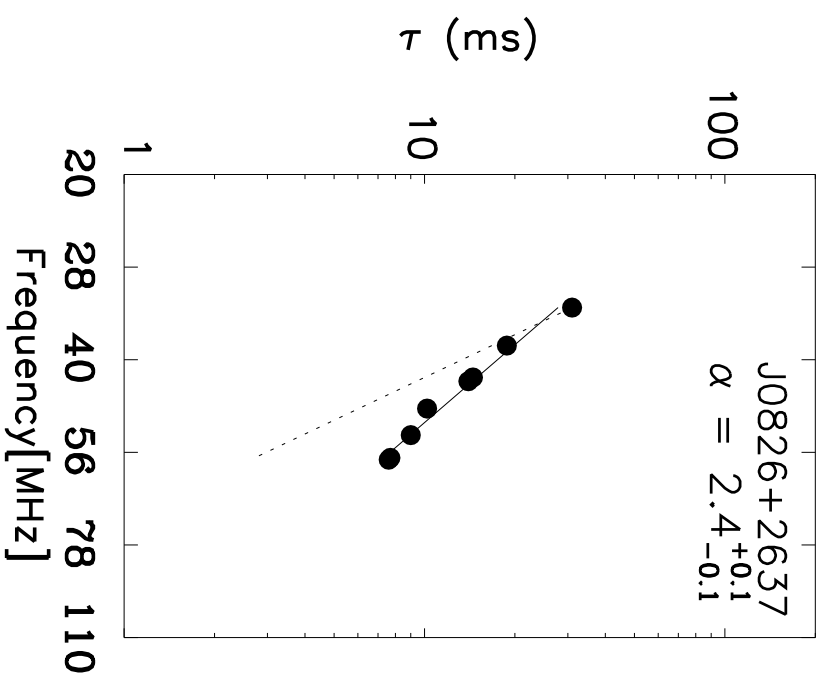
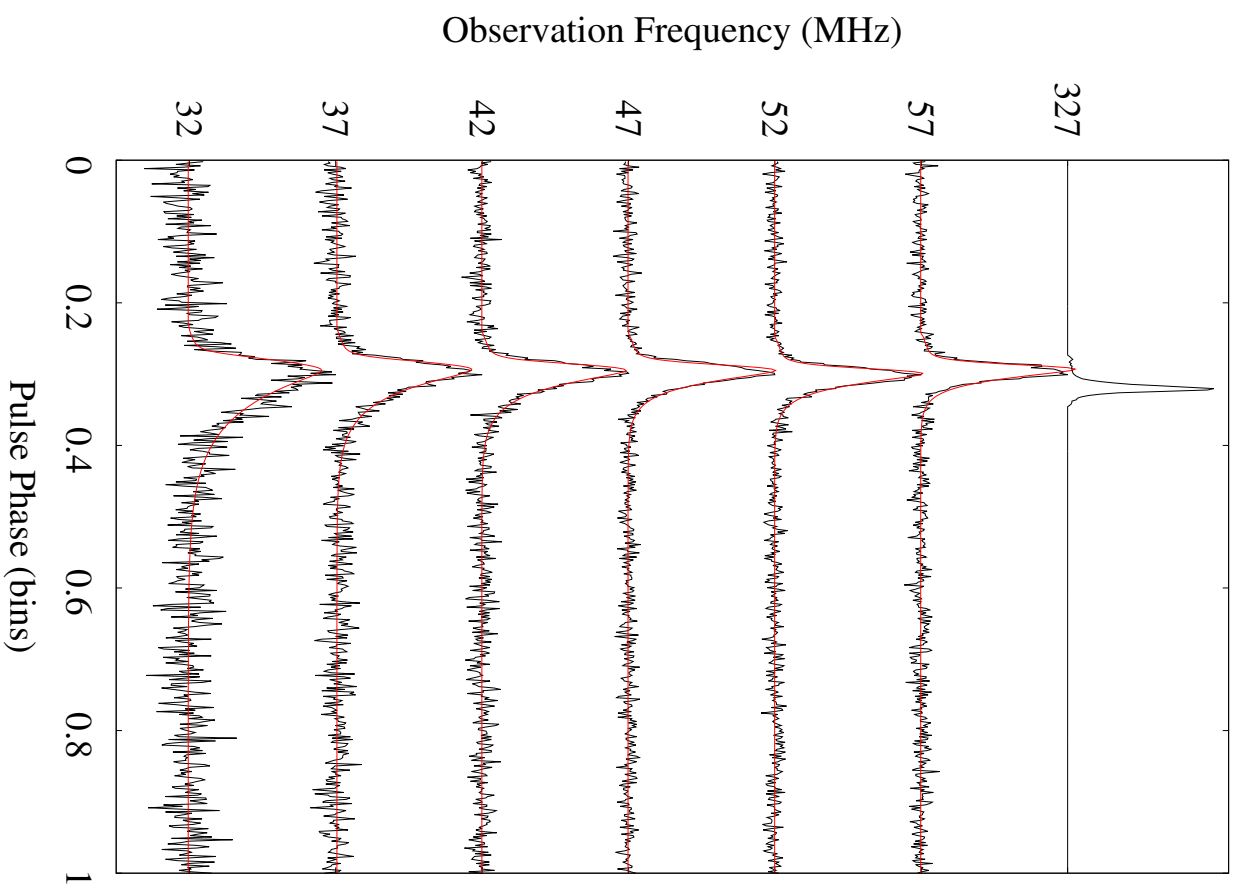
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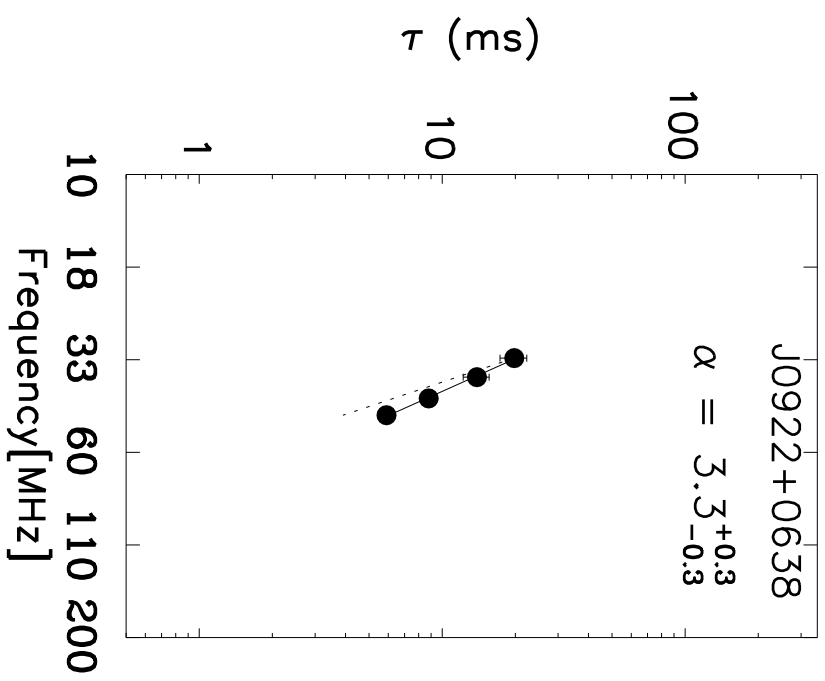
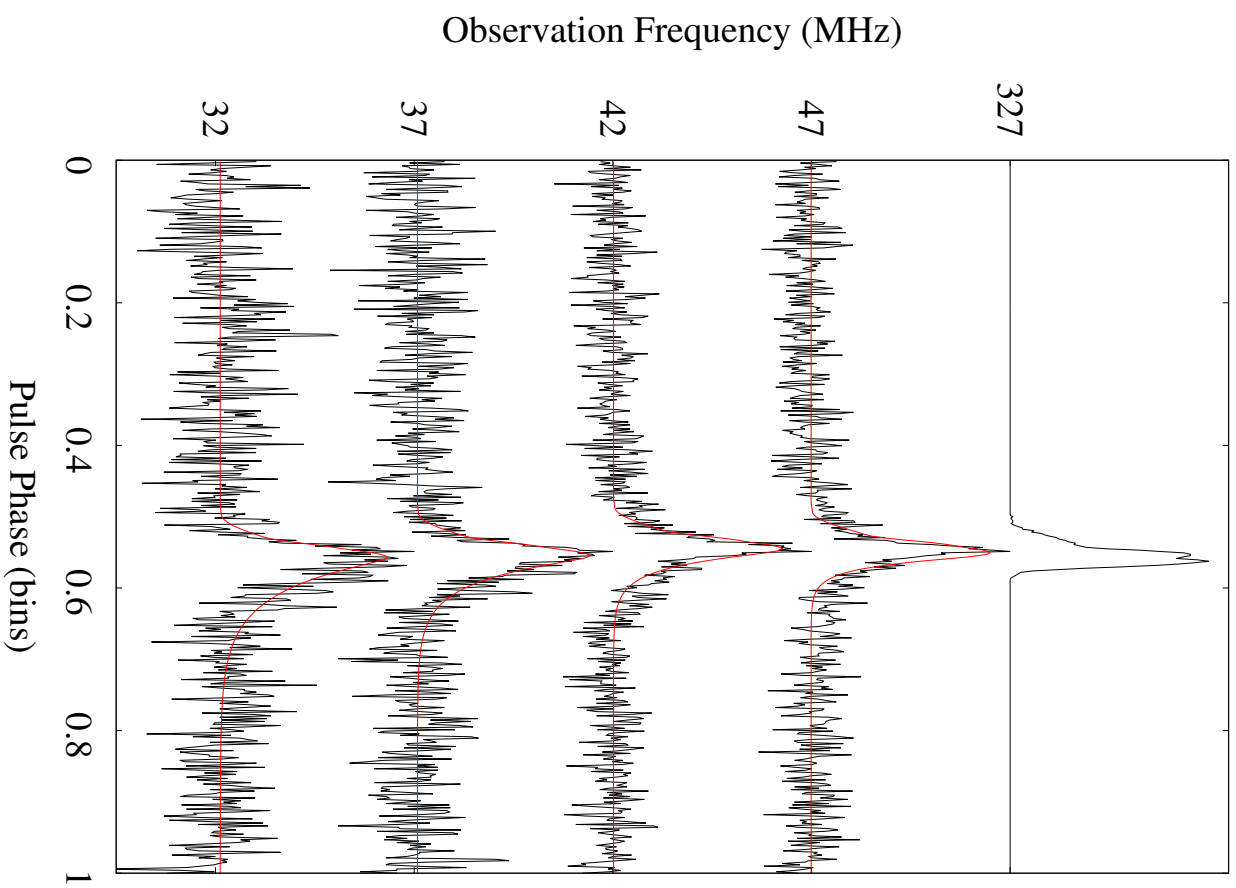
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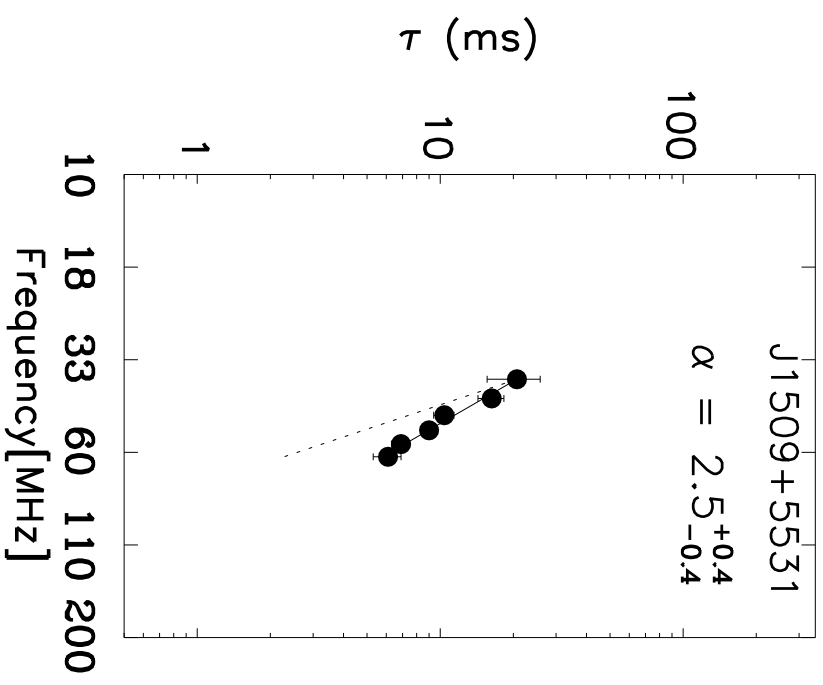
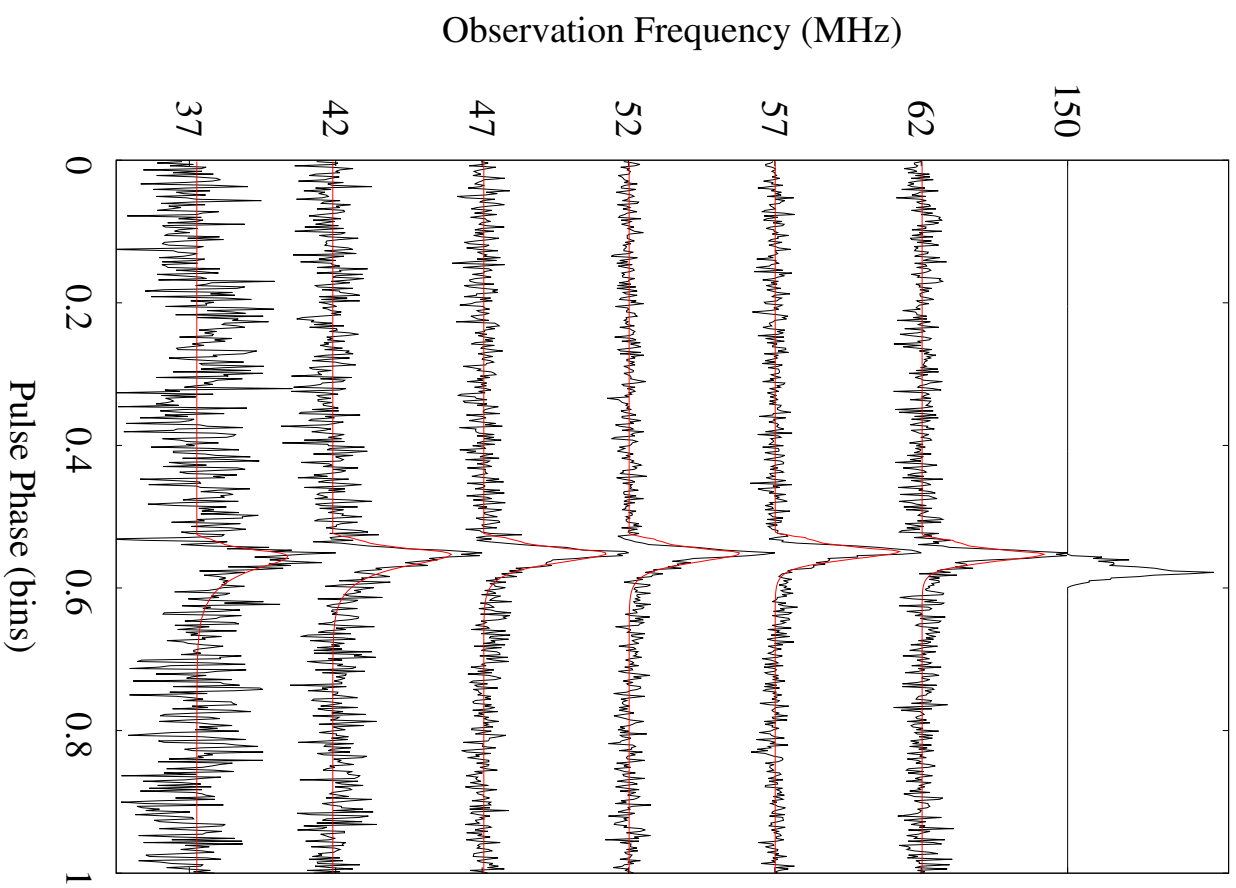
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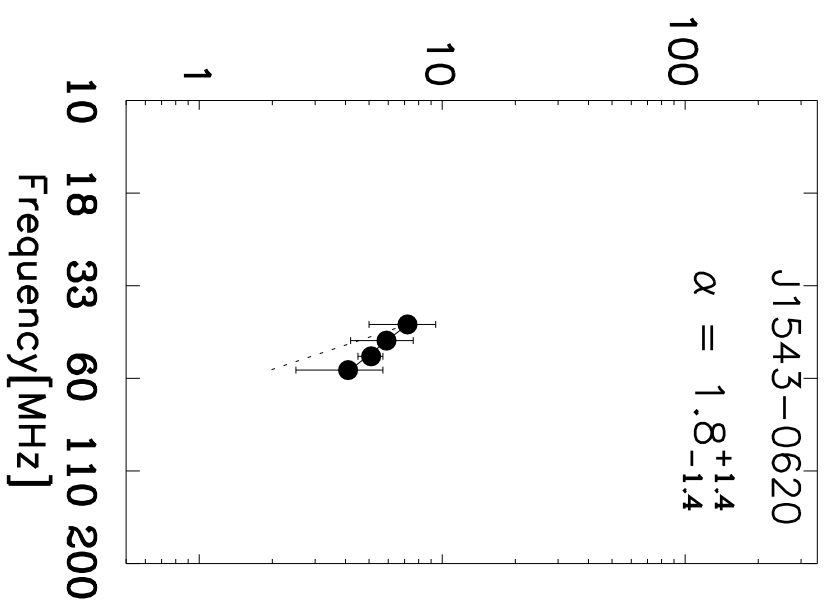
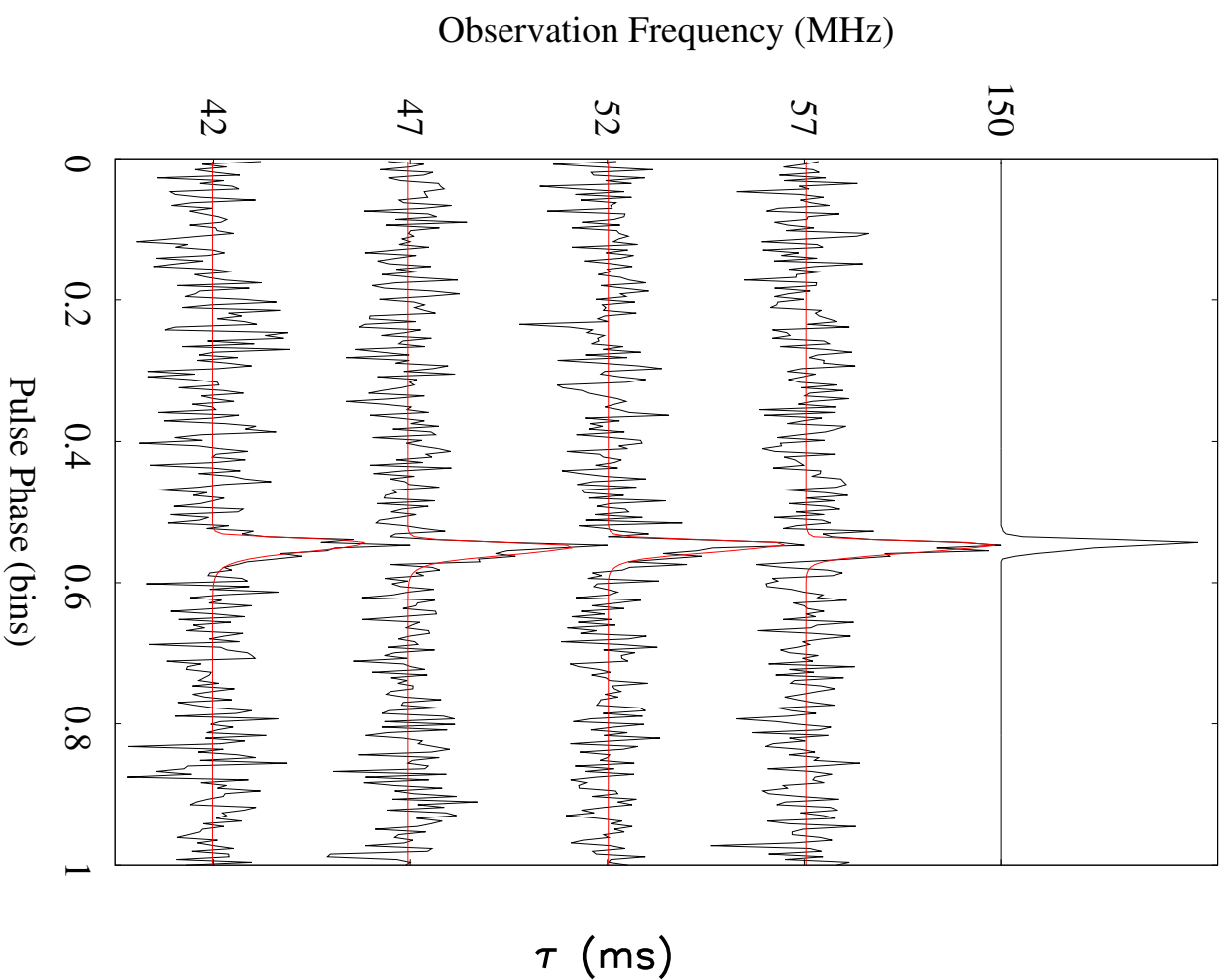
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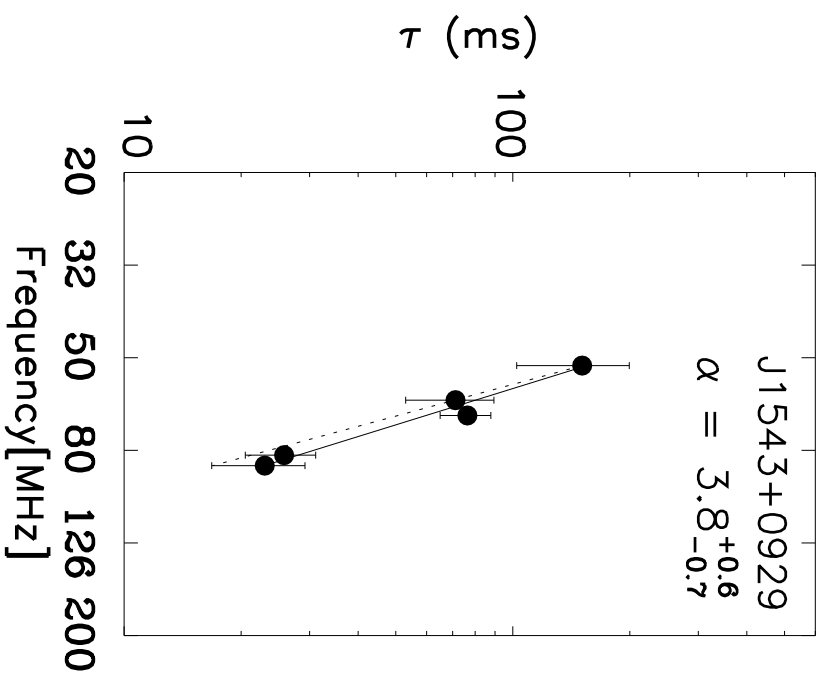
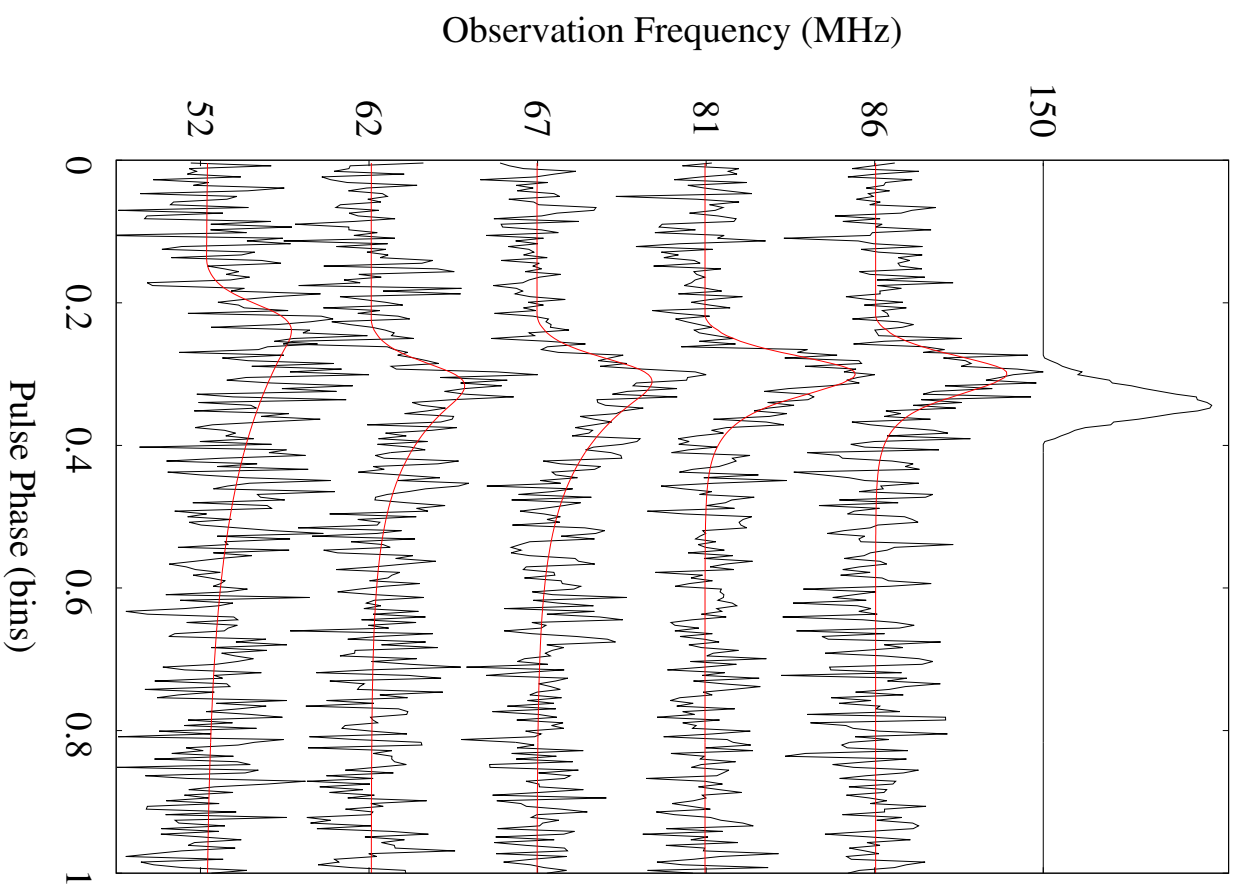
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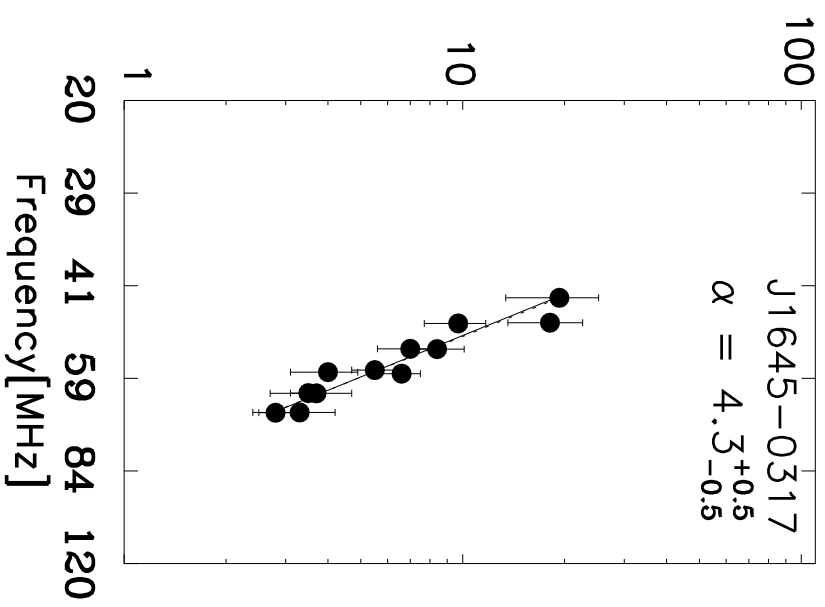
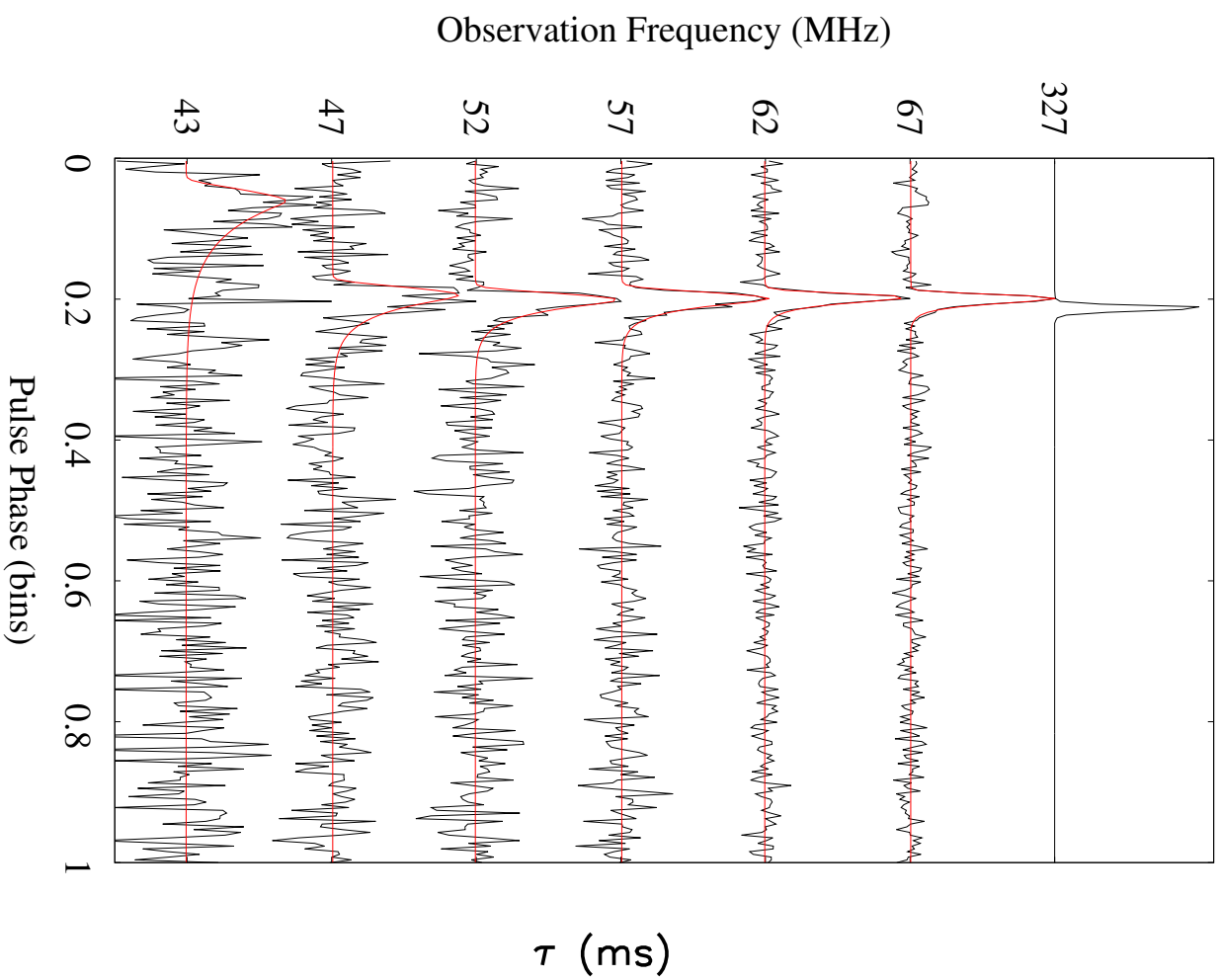
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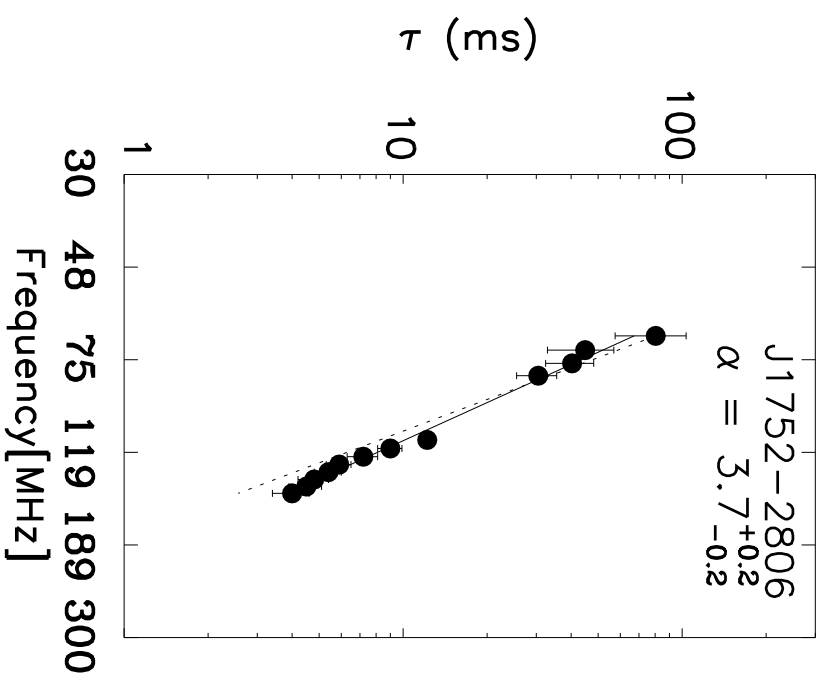
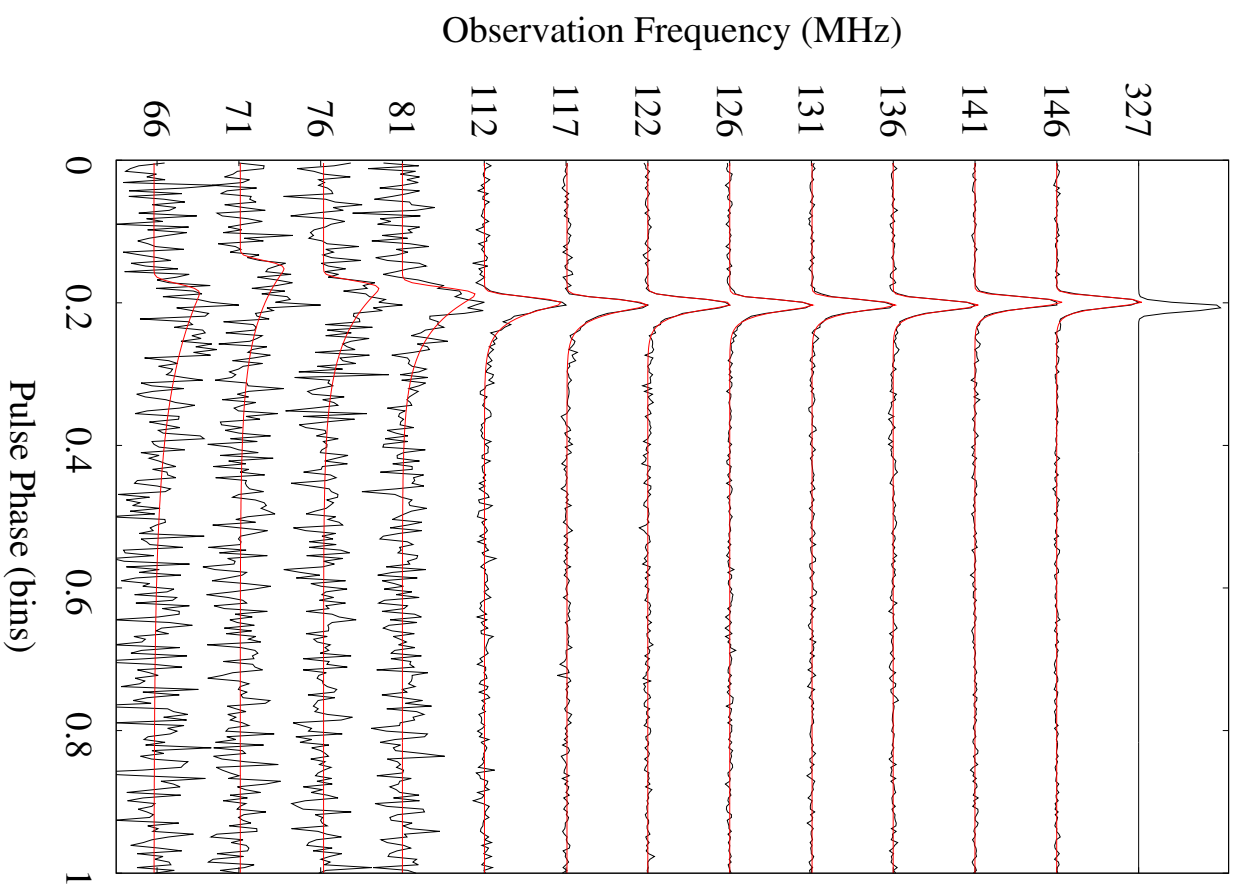
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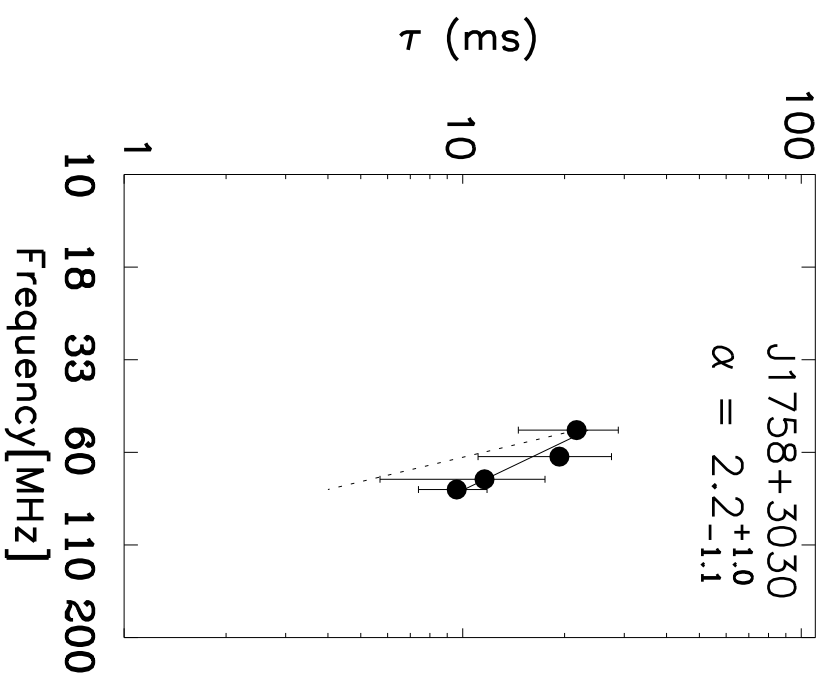
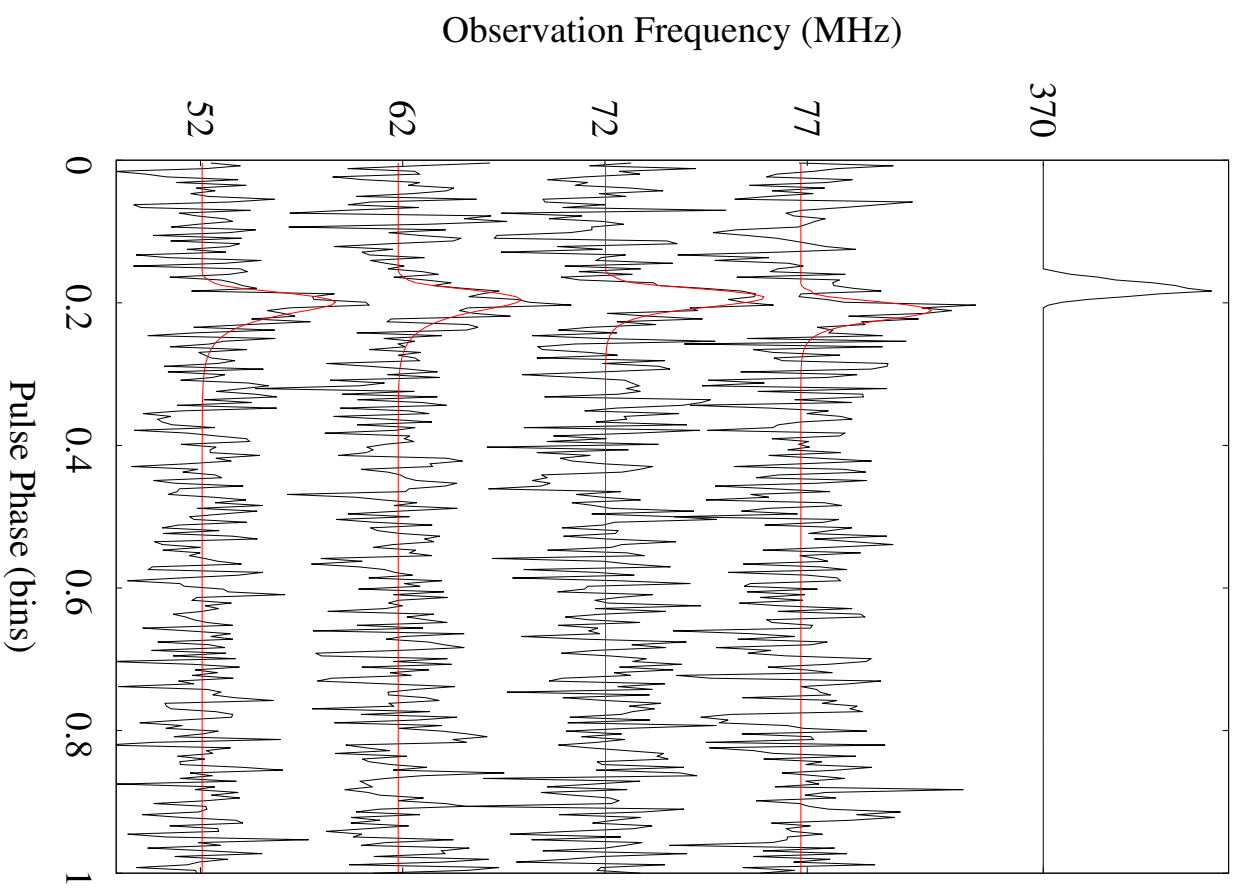
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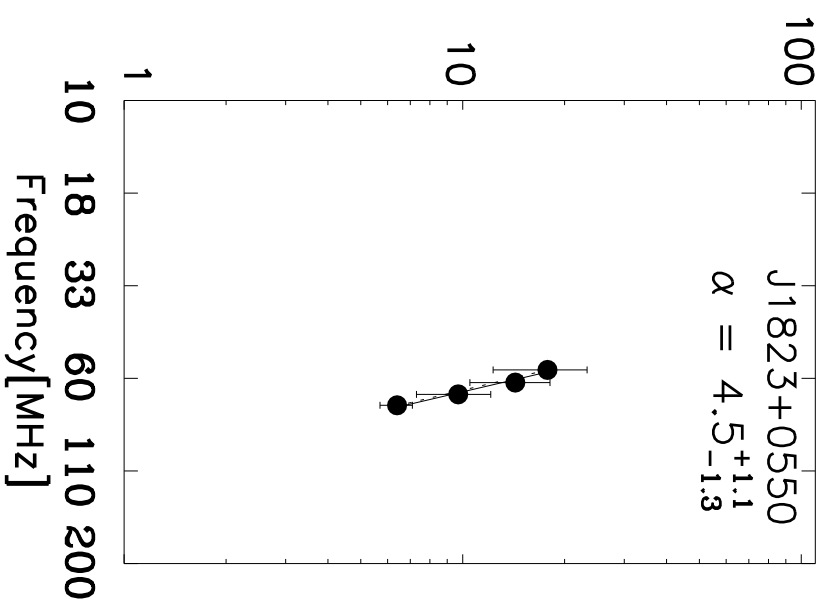
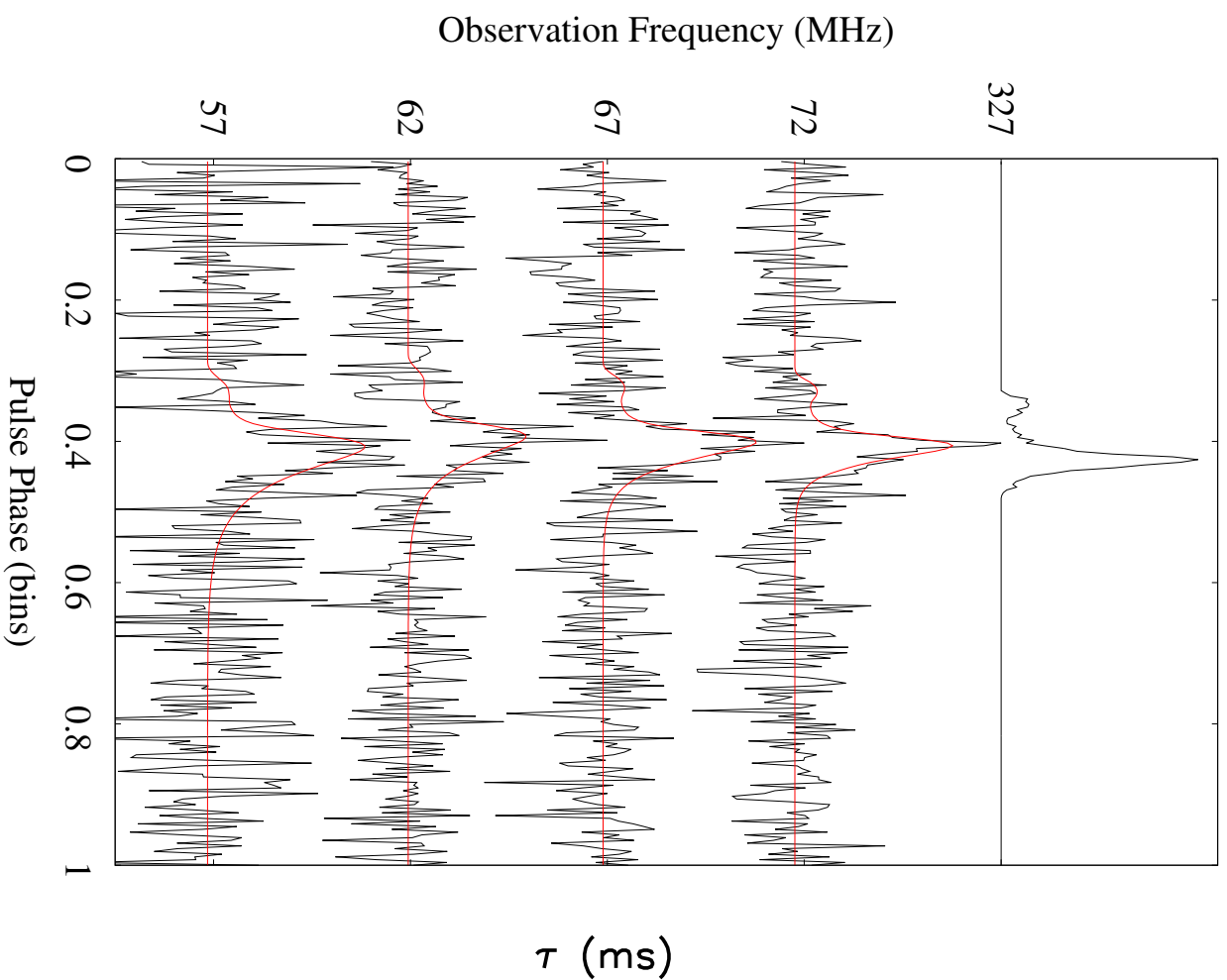
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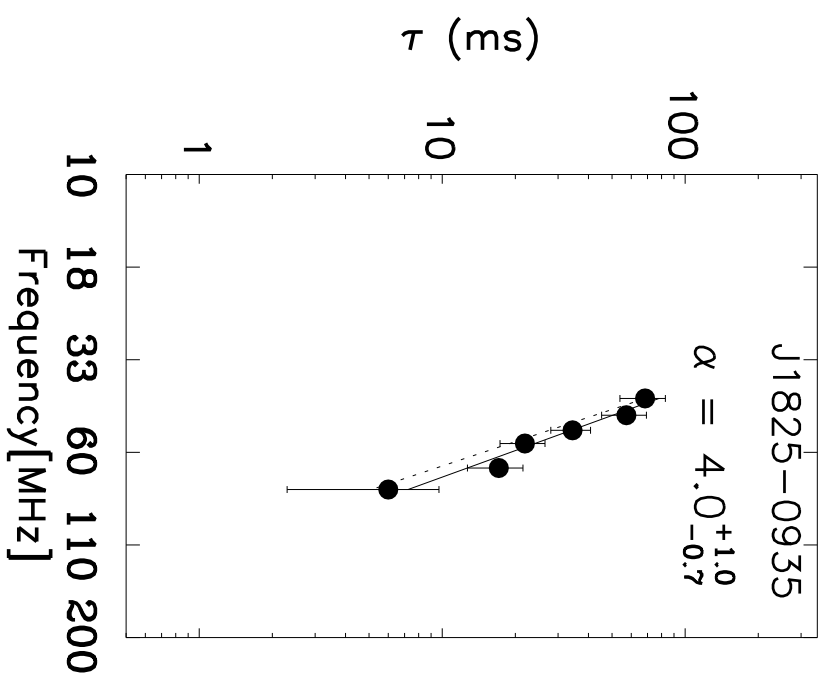
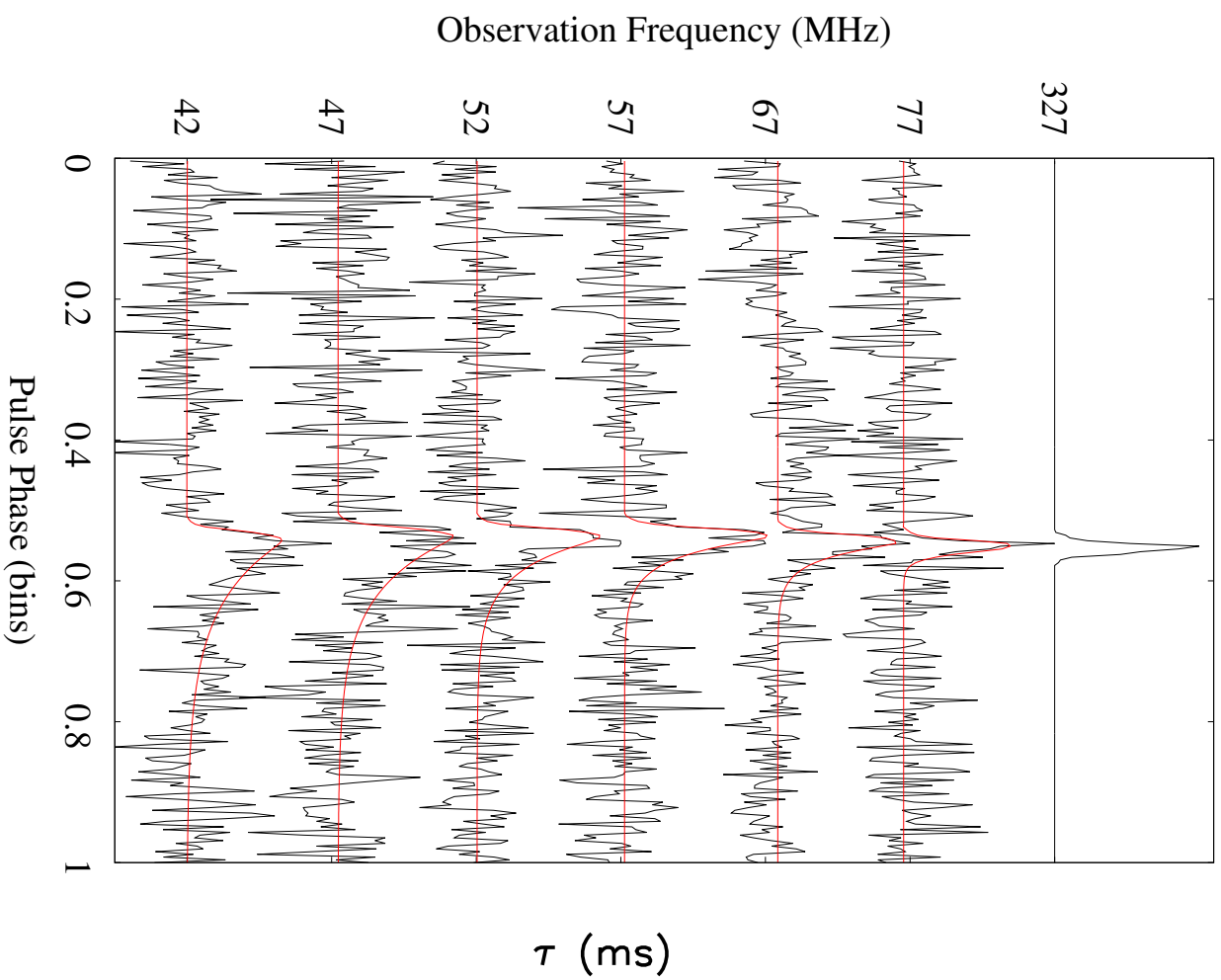
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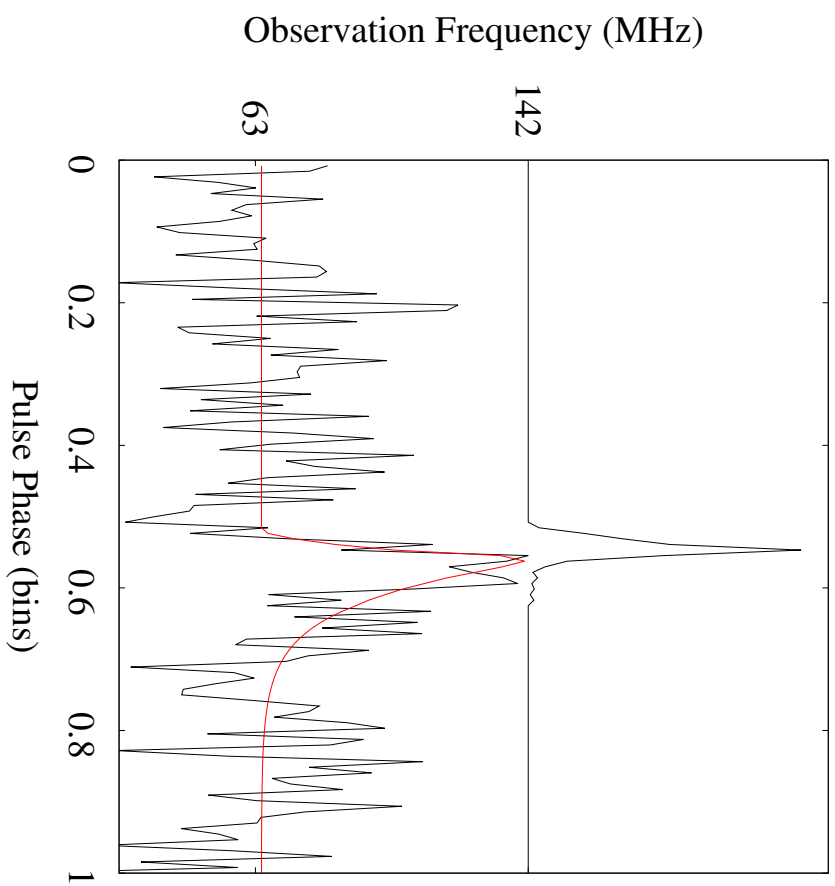
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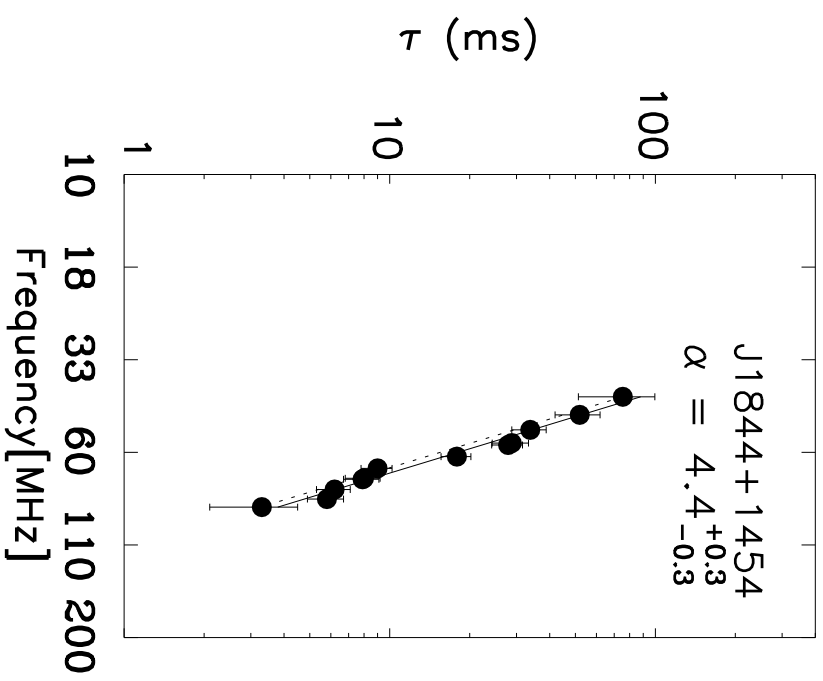
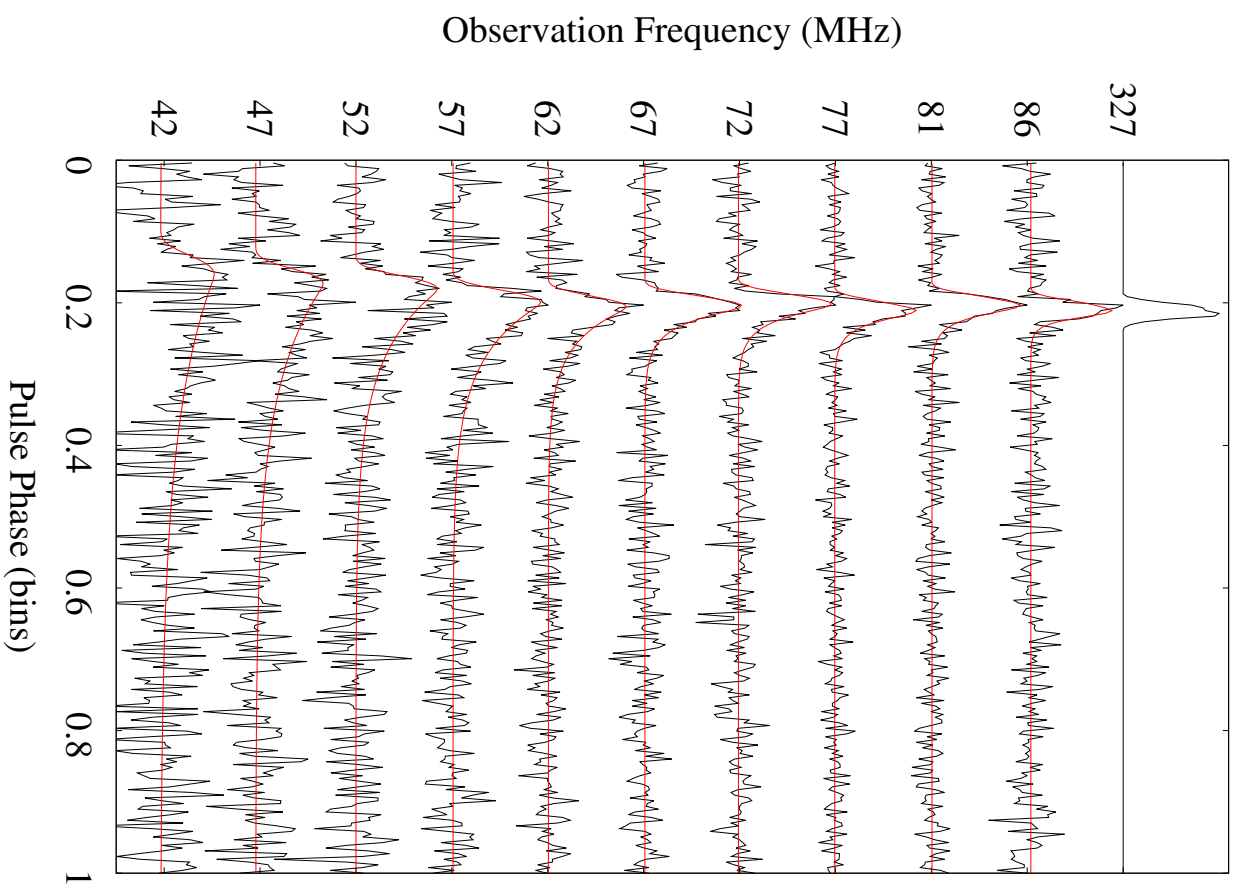
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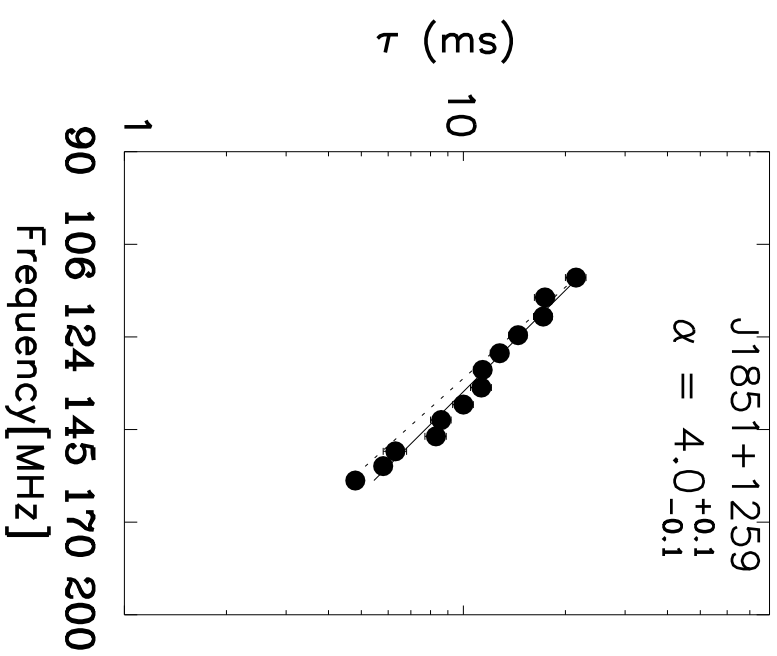
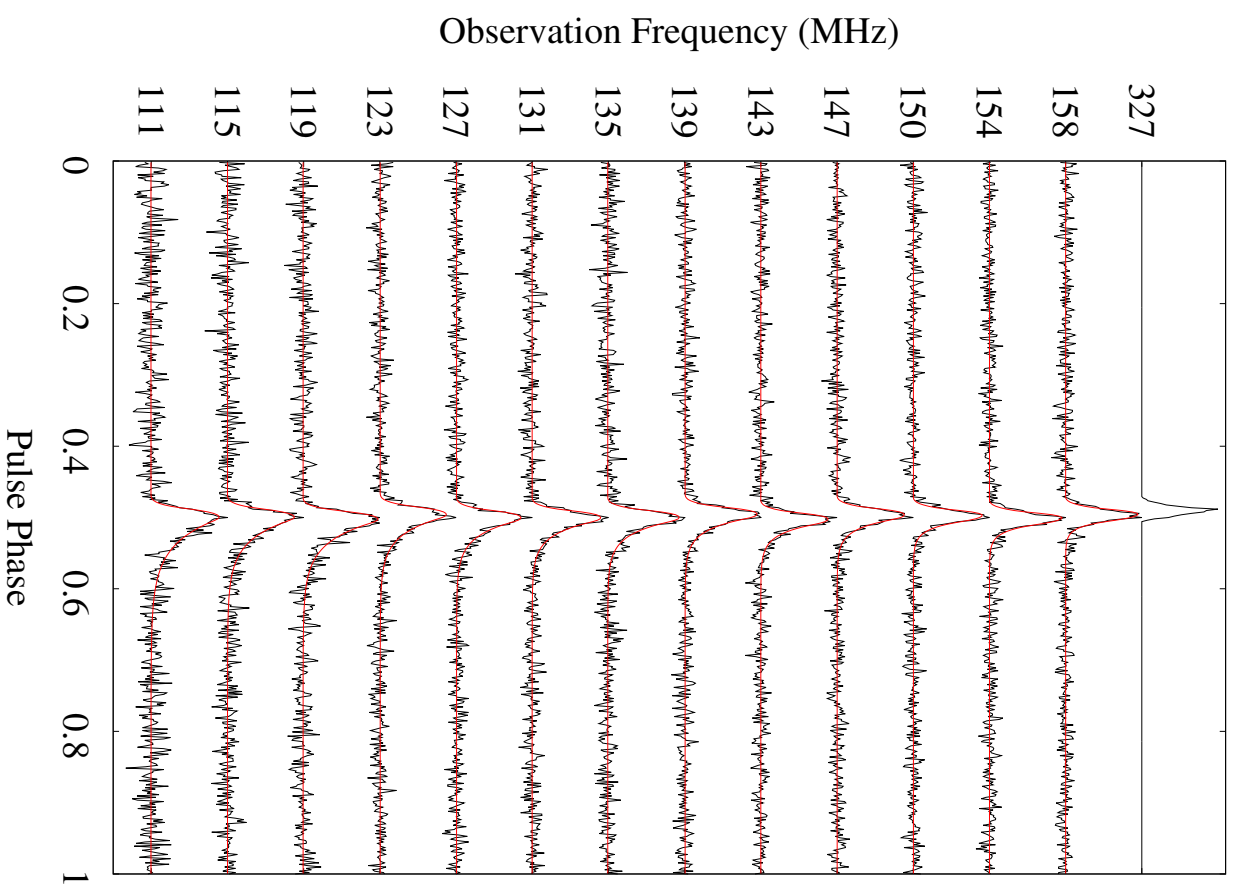
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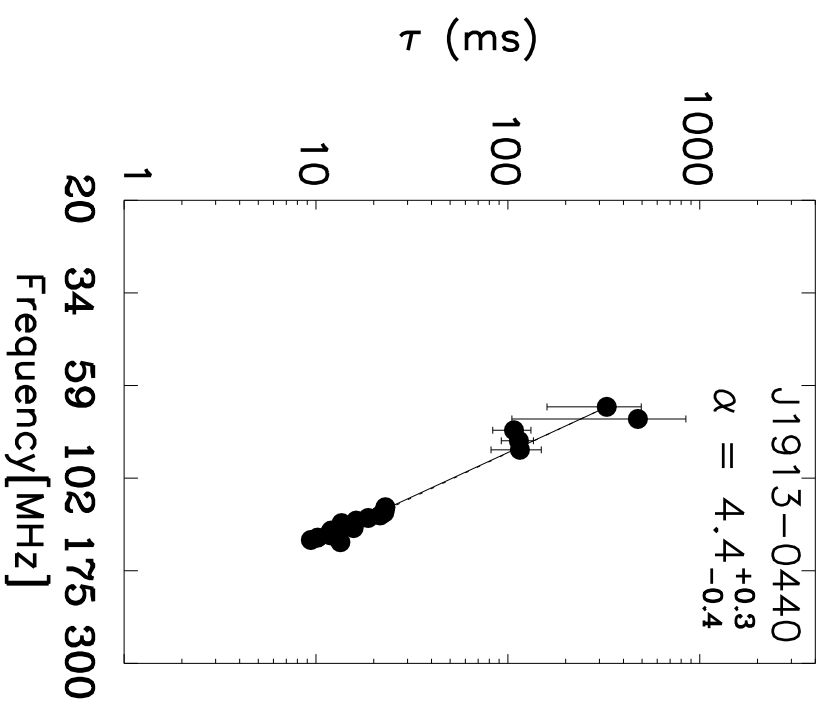
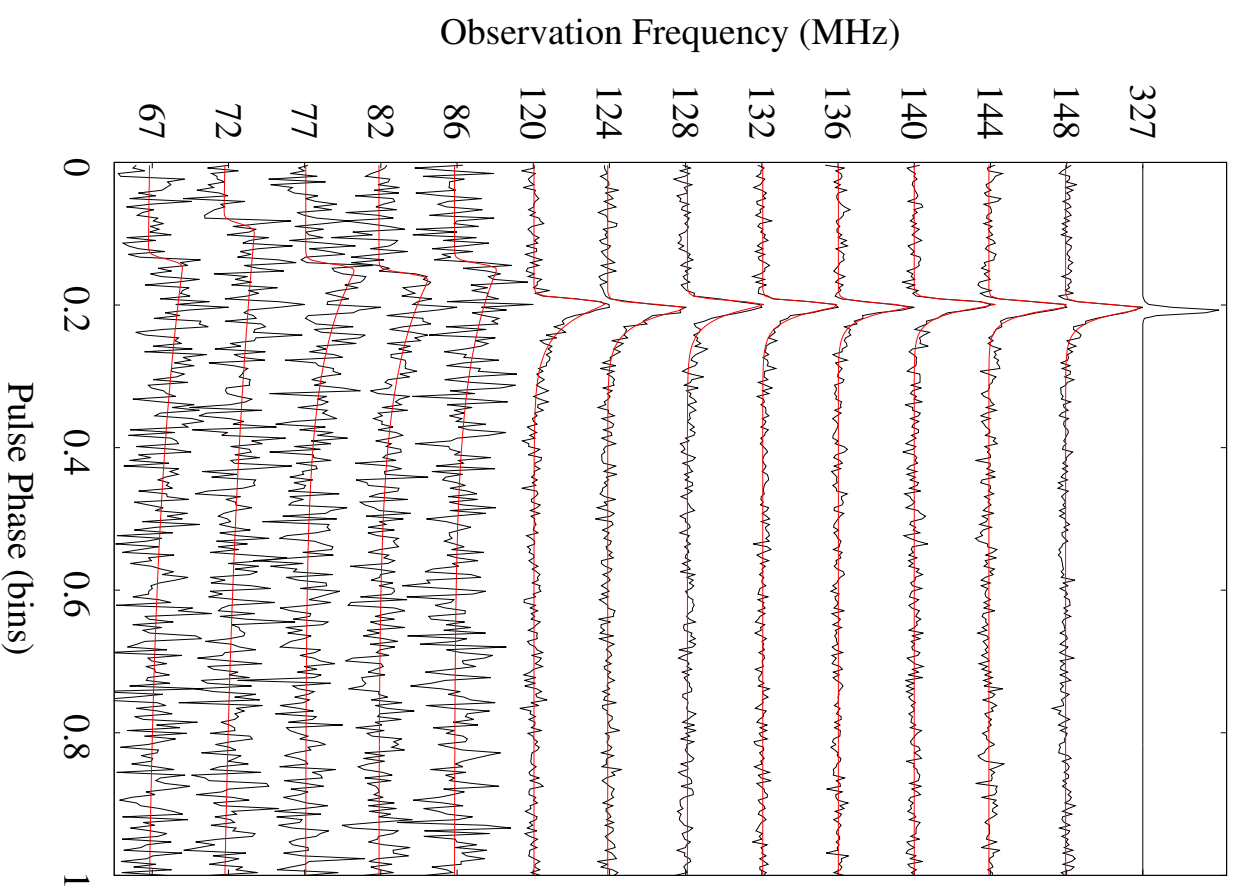
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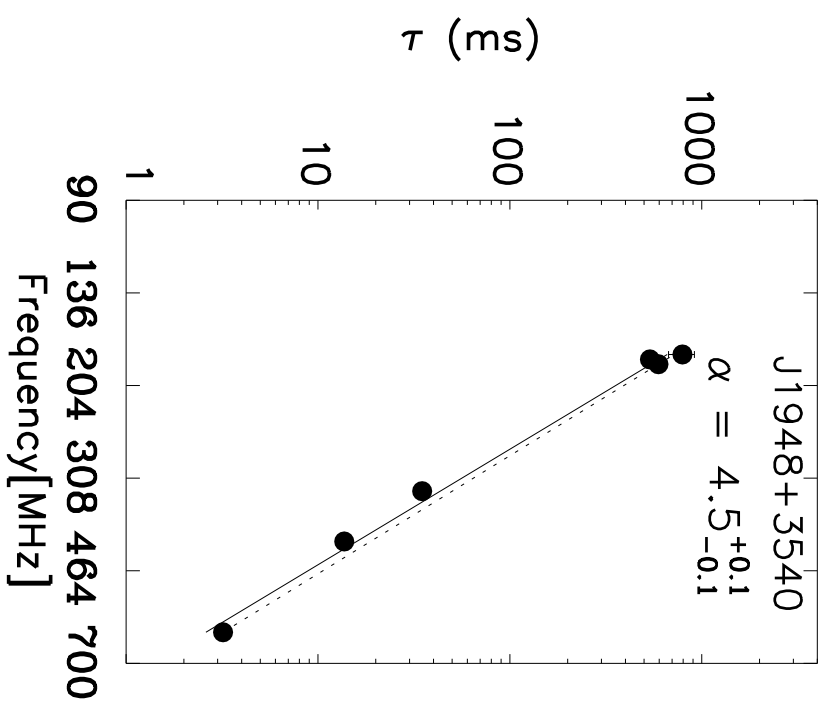
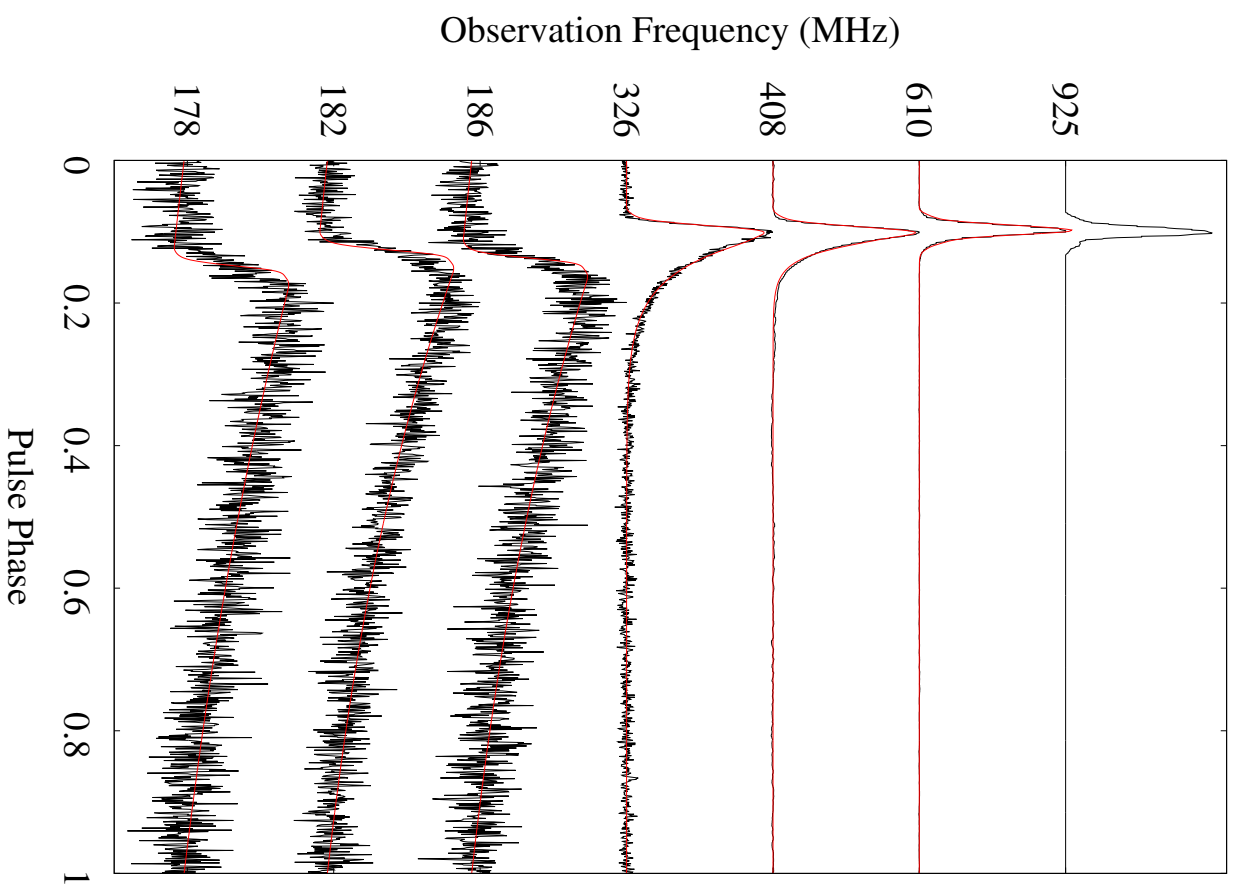
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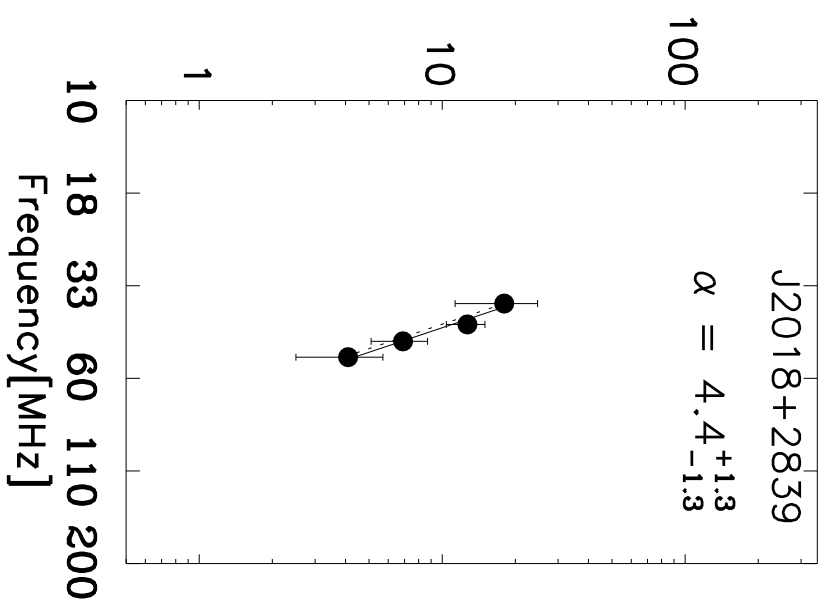
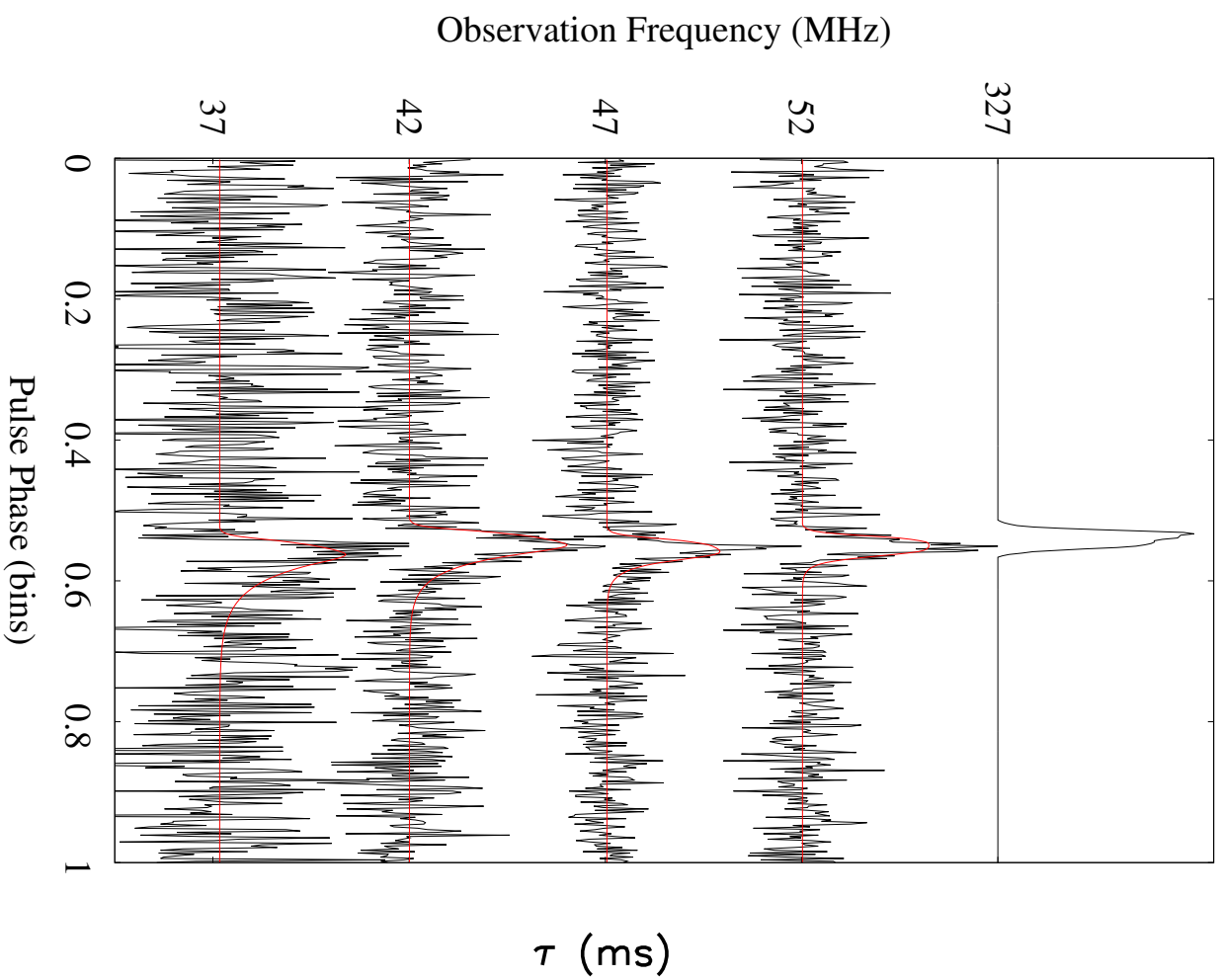
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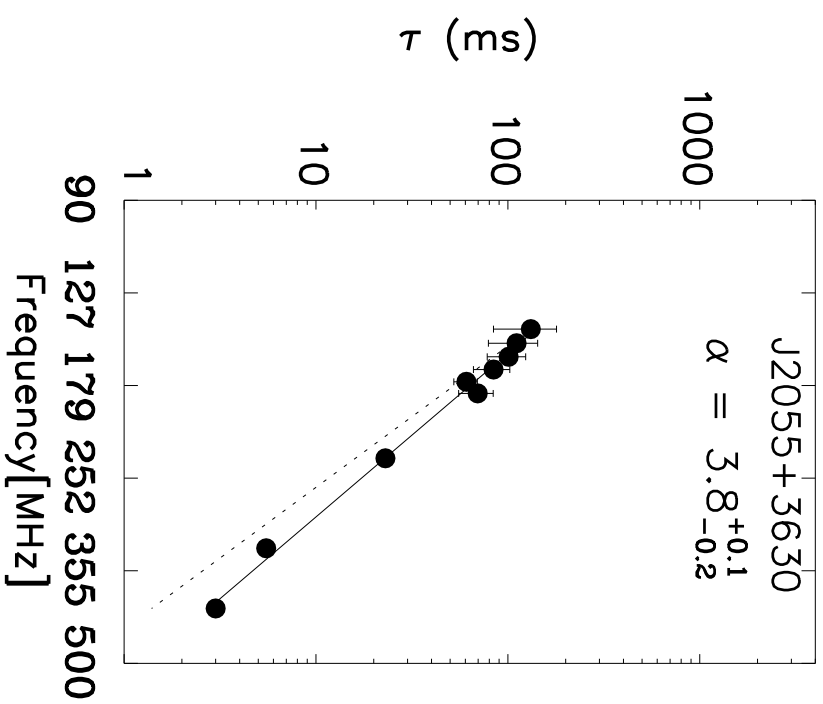
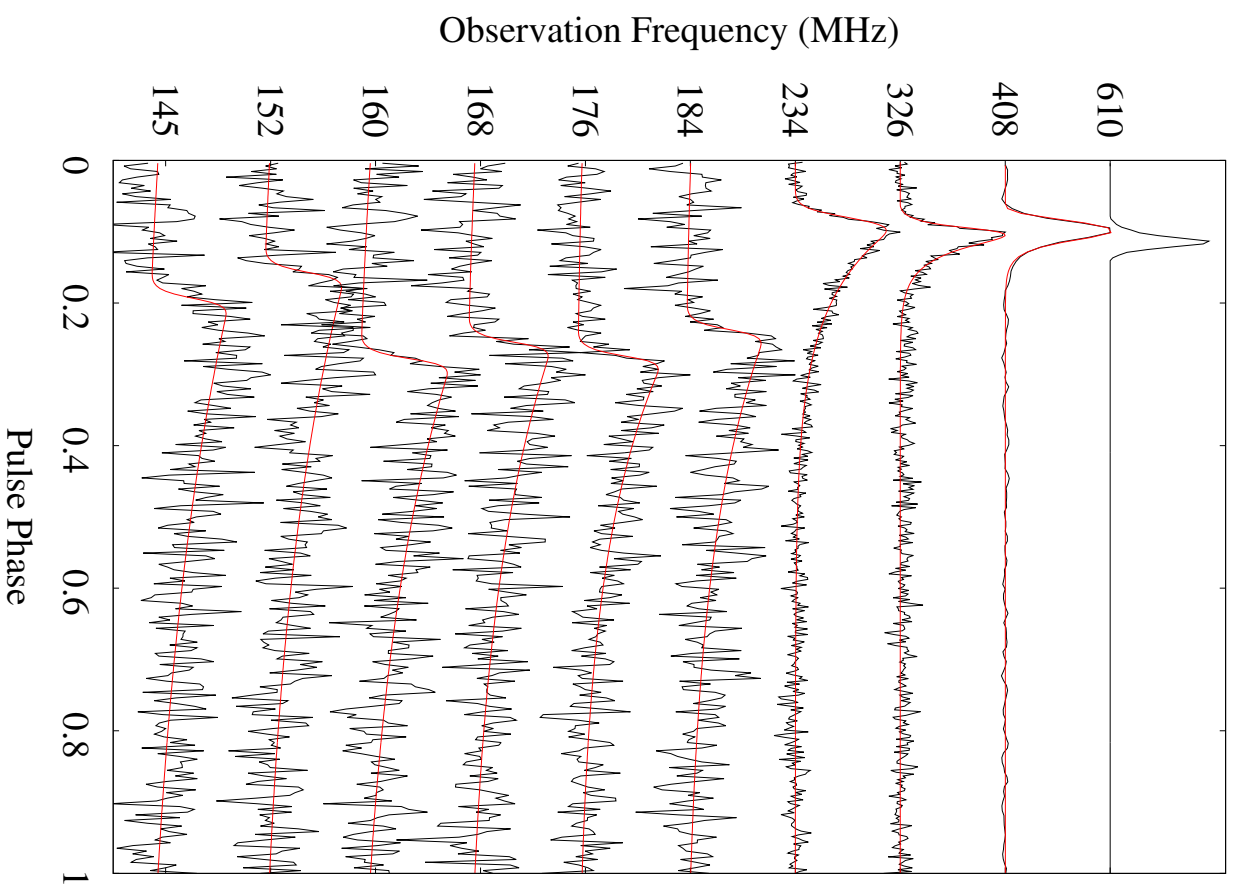
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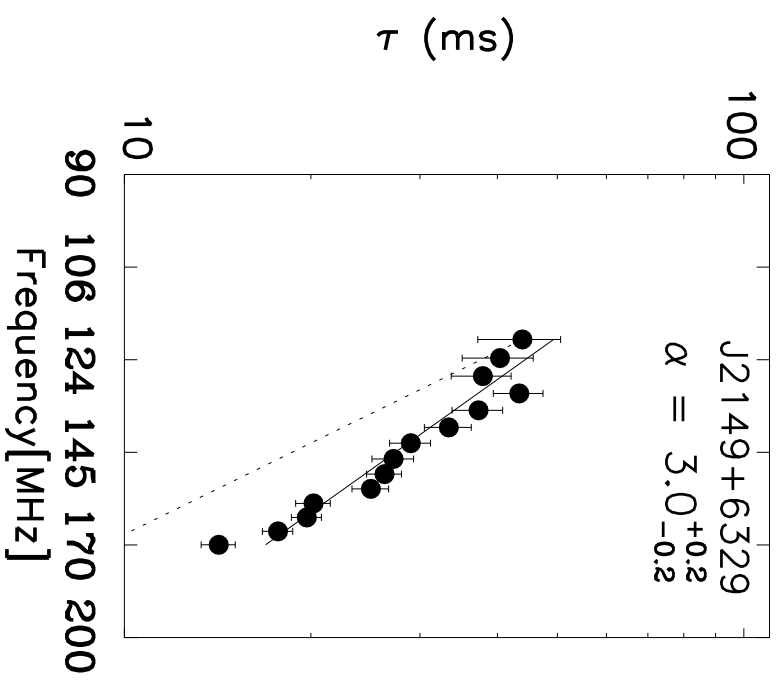
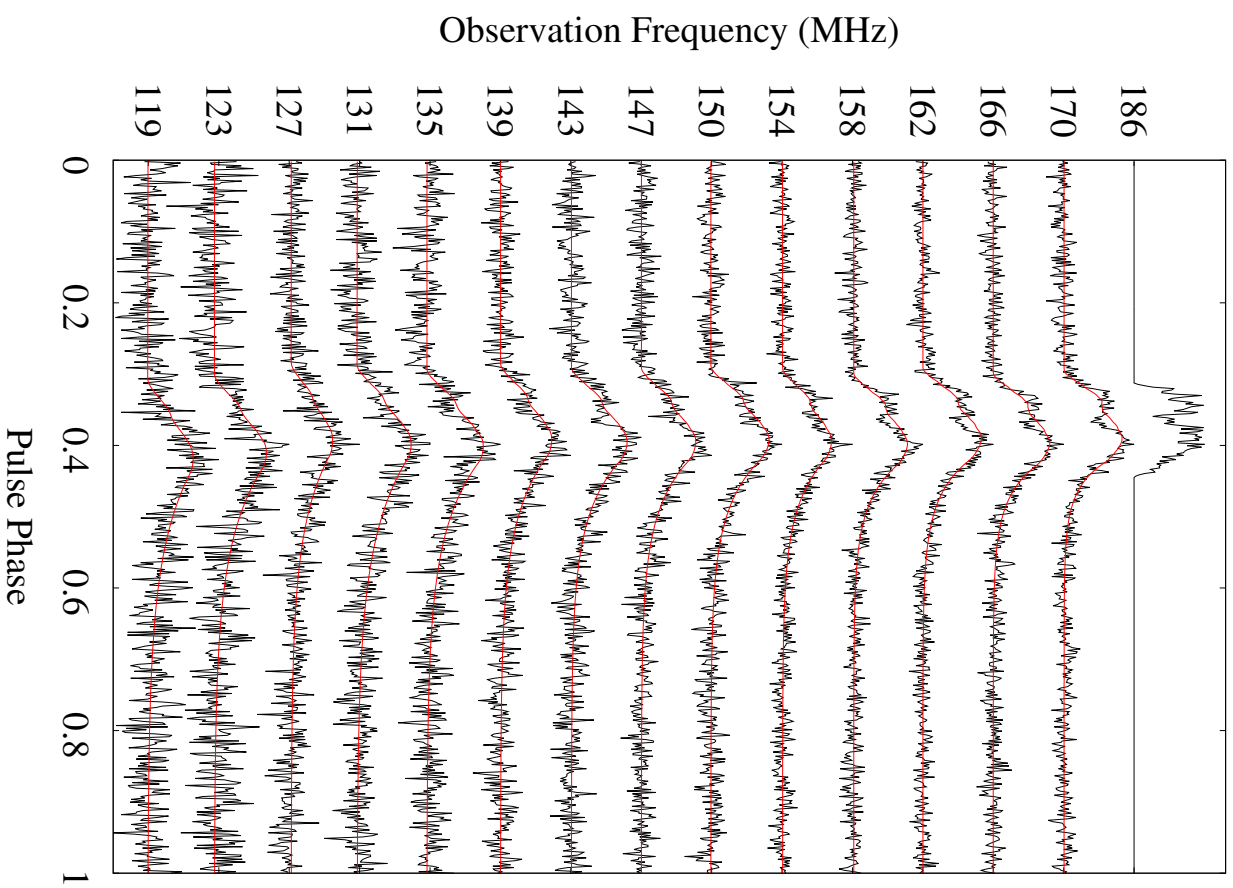
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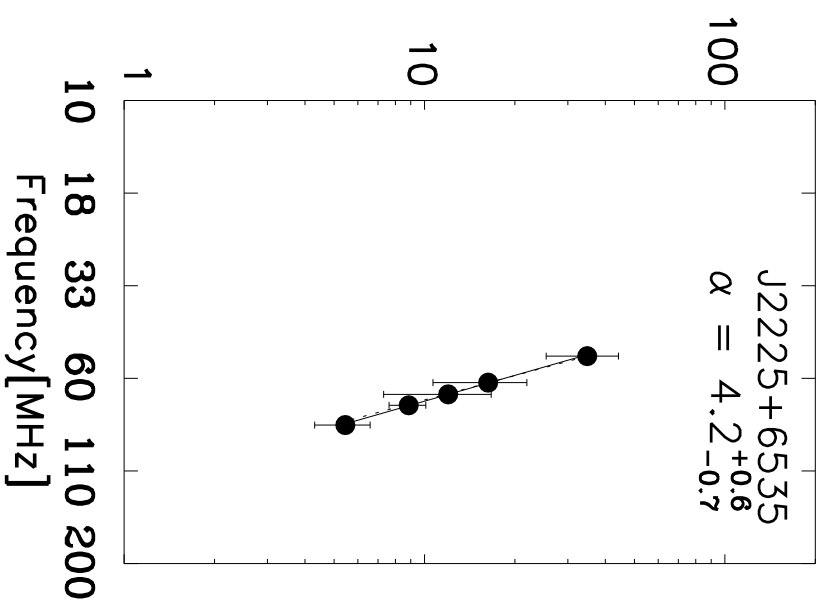
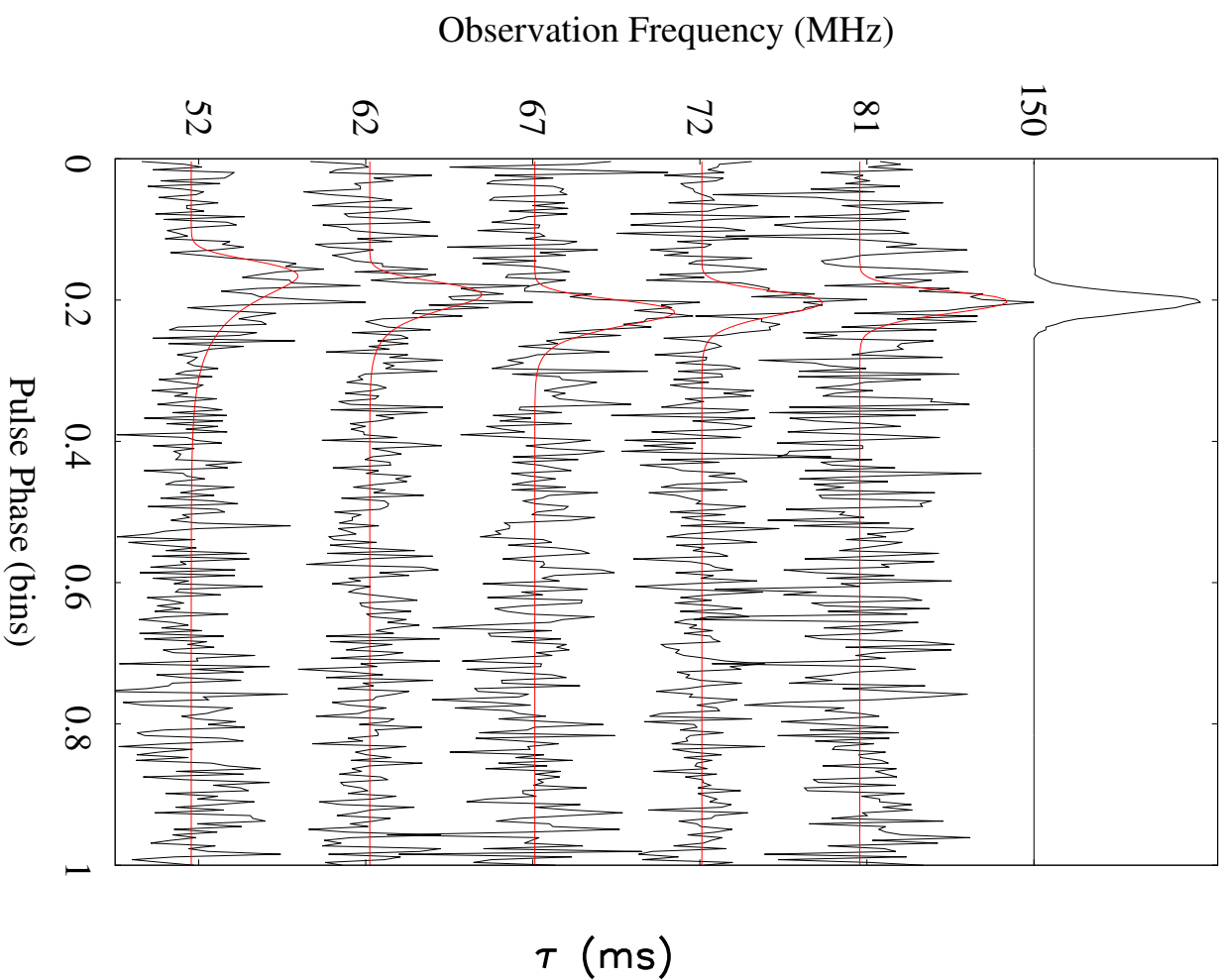
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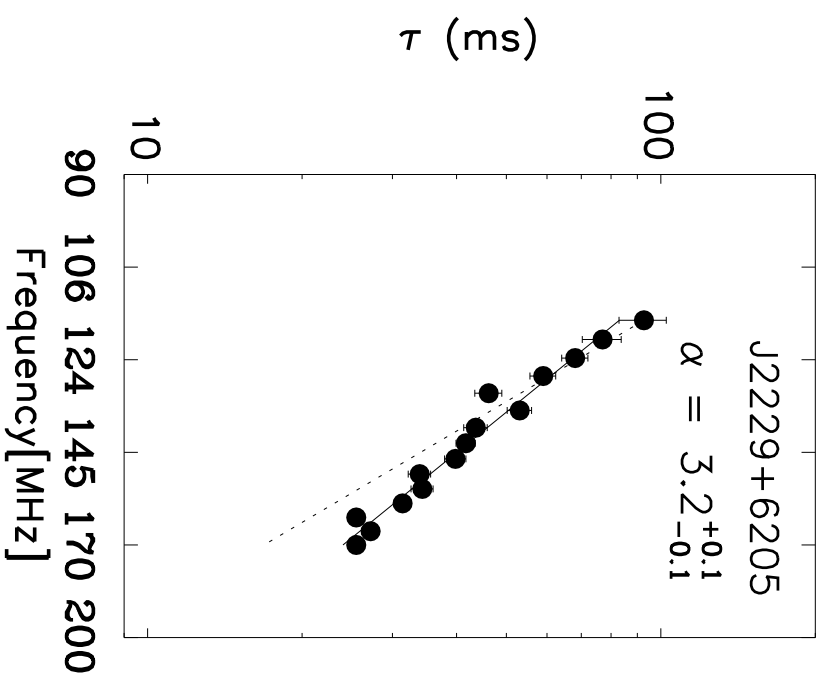
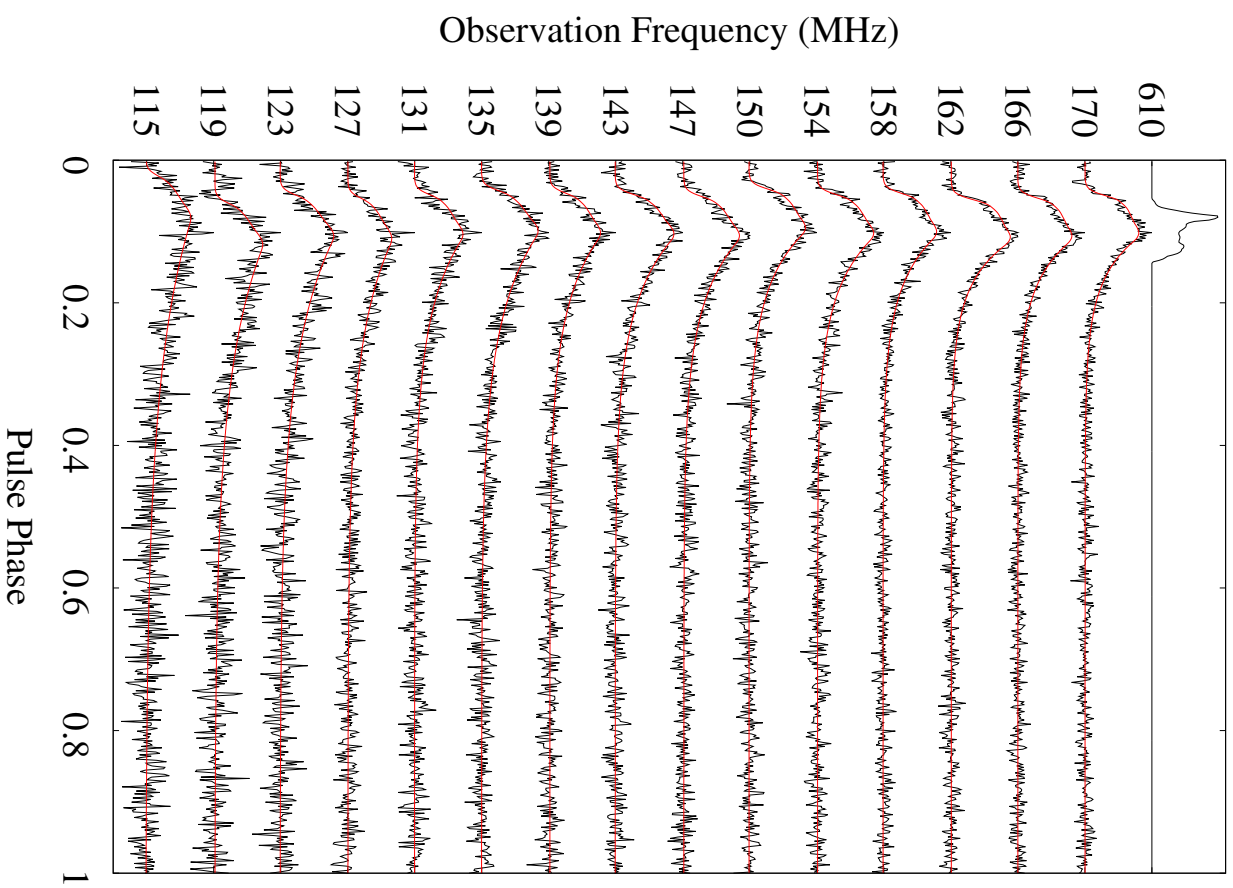
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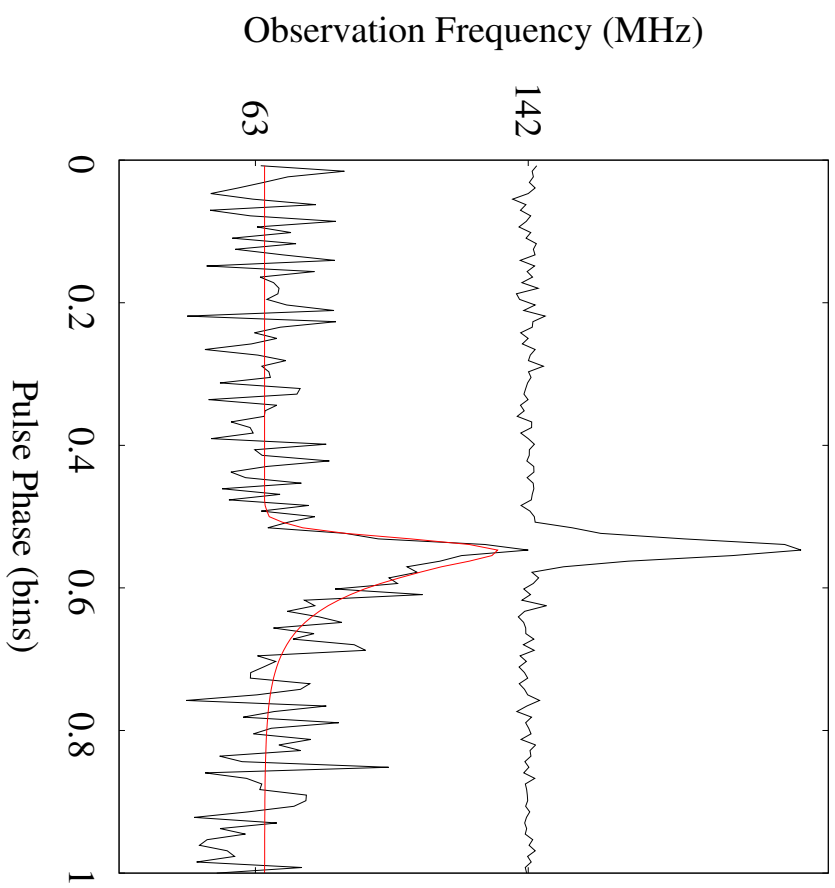
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J2229+6205



J2337+6151



Frequency (MHz)	τ_{sc} (ms)	χ^2
J0040+5716		
LOFAR - HBA		
111.81	88.2 ± 12.2	0.91
115.72	87.3 ± 12.8	0.81
119.64	84.5 ± 5.0	0.95
123.53	72.2 ± 6.1	0.89
127.43	58.7 ± 4.6	1.00
131.26	47.5 ± 3.4	0.98
135.18	56.7 ± 4.4	0.99
139.20	50.0 ± 2.9	1.18
143.07	51.7 ± 2.8	0.99
146.98	44.1 ± 2.8	1.10
150.88	39.0 ± 2.0	1.19
154.78	33.7 ± 1.8	1.04
158.69	33.4 ± 1.7	1.12
162.60	29.1 ± 1.4	1.02
166.50	30.8 ± 1.8	1.05
170.49	27.8 ± 1.6	0.89
174.41	26.2 ± 1.6	0.95
178.20	24.5 ± 1.5	1.27
182.11	23.0 ± 1.3	1.13
186.05	21.7 ± 1.2	1.02
J0117+5914		
LOFAR - HBA		
111.82	14.1 ± 1.5	0.99
115.72	13.3 ± 1.2	0.88
119.61	11.1 ± 0.8	1.04
123.53	11.0 ± 0.7	1.12
127.44	9.4 ± 0.6	1.01
131.34	7.8 ± 0.4	0.86
135.23	8.1 ± 0.4	1.06
139.15	7.4 ± 0.4	0.96
143.07	8.0 ± 0.4	1.04
146.97	7.8 ± 0.4	1.05
150.88	7.3 ± 0.4	0.89
154.78	6.4 ± 0.3	1.14
158.69	6.4 ± 0.3	0.96
162.59	6.1 ± 0.3	1.18
166.50	5.6 ± 0.2	1.14
170.45	5.5 ± 0.2	1.06
174.32	4.6 ± 0.2	0.97
178.21	4.4 ± 0.2	1.32
182.13	4.6 ± 0.2	1.21
186.05	3.9 ± 0.3	1.10
J0139+5814		
LOFAR - HBA		
111.82	23.4 ± 0.7	1.25
115.72	21.4 ± 0.8	1.03
119.61	18.9 ± 0.6	1.15
123.53	17.6 ± 0.5	0.93
127.44	15.1 ± 0.6	1.32
131.34	13.8 ± 0.4	1.21

Frequency (MHz)	τ_{sc} (ms)	χ^2
135.23	12.4 ± 0.4	1.35
139.15	10.6 ± 0.3	1.41
143.07	9.2 ± 0.3	1.38
146.97	8.5 ± 0.3	1.42
150.88	7.1 ± 0.3	1.24
154.78	6.0 ± 0.2	1.14
158.69	5.4 ± 0.2	1.10
162.59	4.7 ± 0.2	0.87
166.50	4.3 ± 0.2	0.98
170.45	4.0 ± 0.2	0.88
174.32	3.6 ± 0.2	1.22
178.21	3.2 ± 0.2	0.96
182.13	3.0 ± 0.2	0.84
186.05	2.8 ± 0.2	0.90
J0358+5413		
LWA		
57.15	17.26 ± 5.13	1.21
62.05	16.41 ± 3.41	0.93
66.95	9.59 ± 1.83	0.98
76.78	4.35 ± 1.40	1.04
81.62	4.44 ± 0.57	0.94
J0406+6138		
LOFAR - HBA		
111.77	20.5 ± 2.8	1.04
115.73	21.7 ± 1.2	1.52
119.67	19.3 ± 1.2	0.75
123.52	19.0 ± 0.9	1.01
127.40	19.0 ± 1.8	0.91
131.24	13.1 ± 1.3	0.84
135.23	16.8 ± 1.4	1.19
139.19	8.0 ± 0.8	0.87
143.01	7.1 ± 0.7	1.07
146.99	5.7 ± 0.6	1.33
150.88	4.8 ± 0.4	1.32
154.76	3.9 ± 0.4	1.21
158.70	3.6 ± 0.4	0.98
J0415+6954		
LOFAR - HBA		
115.71	6.16 ± 0.69	0.92
119.65	4.99 ± 0.50	0.83
123.52	4.84 ± 0.43	0.85
127.41	3.92 ± 0.43	0.72
131.16	3.58 ± 0.51	0.99
135.26	3.65 ± 0.42	1.24
139.15	3.15 ± 0.34	0.89
143.07	2.46 ± 0.36	1.09
J0502+4654		
LOFAR - HBA		
145.02	304.3 ± 156.2	0.91
152.83	339.1 ± 129.6	1.11
160.67	238.7 ± 60.2	0.93
168.40	211.5 ± 42.2	0.89

Frequency (MHz)	τ_{sc} (ms)	χ^2
176.17	137.0 ± 23.6	0.94
184.04	130.4 ± 23.5	0.72
GMRT		
234.0	27.0 ± 5.0	0.92
ORT		
327.0	19.0 ± 1.0	1.24
LOVELL		
408.0	11.0 ± 1.0	0.91
J0525+1115		
LOFAR - HBA		
113.76	36.02 ± 3.74	1.13
121.56	28.67 ± 1.77	1.44
129.22	21.00 ± 1.38	1.21
137.32	18.87 ± 1.45	0.86
145.02	15.37 ± 0.83	0.86
152.83	12.04 ± 1.45	0.68
J0543+2329		
LOFAR - HBA		
113.77	21.4 ± 2.7	1.19
121.57	17.1 ± 1.7	0.93
129.28	12.3 ± 1.0	1.00
137.26	11.7 ± 0.8	0.95
145.02	9.0 ± 0.6	0.99
152.84	6.4 ± 0.4	1.09
160.65	5.1 ± 0.3	0.96
168.41	5.1 ± 0.4	1.22
176.30	3.1 ± 0.3	1.00
J0629+2415		
LOFAR - HBA		
111.80	13.6 ± 0.5	0.89
115.61	12.2 ± 0.4	0.96
119.69	10.0 ± 0.2	1.12
123.52	9.6 ± 0.2	1.12
127.43	8.3 ± 0.2	0.84
131.33	6.7 ± 0.2	1.13
135.21	5.5 ± 0.2	1.17
139.19	4.9 ± 0.2	0.94
143.11	3.7 ± 0.1	0.90
146.96	2.9 ± 0.1	0.84
150.75	2.7 ± 0.1	1.22
154.85	2.3 ± 0.1	1.18
J0826+2637		
LWA		
32.65	29.73 ± 1.93	0.94
37.55	17.13 ± 0.81	0.97
42.23	12.50 ± 0.53	1.04
42.82	11.89 ± 0.52	0.98
47.35	7.85 ± 0.32	0.95
52.21	6.25 ± 0.31	0.89
56.77	4.27 ± 0.34	0.95
57.15	4.08 ± 0.29	1.02
62.05	3.47 ± 0.33	0.98

Frequency (MHz)	τ_{sc} (ms)	χ^2
J0922+0638		
LOFAR - LBA		
32.81	18.72 ± 2.40	0.90
37.11	12.30 ± 1.55	0.94
42.58	8.34 ± 0.36	0.95
47.46	5.33 ± 0.22	1.07
J1509+5531		
LOFAR - LBA		
37.61	21.7 ± 4.74	1.02
42.58	15.82 ± 1.74	0.89
47.46	11.11 ± 0.85	0.93
52.34	9.18 ± 0.58	1.12
57.22	7.60 ± 0.48	1.04
62.11	5.86 ± 0.61	1.08
66.99	3.04 ± 0.81	1.09
71.87	2.14 ± 1.69	0.95
J1543−0620		
LOFAR - LBA		
42.58	9.10 ± 2.37	1.20
47.28	5.35 ± 1.64	1.01
52.34	4.12 ± 0.49	1.35
57.22	3.43 ± 1.11	0.93
J1543+0929		
LWA		
52.25	151.86 ± 49.49	1.01
62.05	68.92 ± 18.03	0.93
66.95	73.58 ± 11.27	1.11
81.57	26.61 ± 5.42	0.89
85.93	19.63 ± 6.11	1.18
J1645−0317		
LWA		
42.92	18.99 ± 5.91	1.04
47.39	8.99 ± 1.97	1.03
52.28	6.14 ± 1.36	0.99
56.77	4.76 ± 0.81	0.98
57.56	5.79 ± 0.88	0.98
62.05	2.54 ± 0.38	1.09
66.95	2.01 ± 0.32	1.08
LOFAR - LBA		
47.26	13.57 ± 2.16	1.11
52.34	8.33 ± 1.68	1.19
57.22	3.97 ± 0.57	1.18
62.11	3.13 ± 0.43	0.94
66.88	2.67 ± 0.40	0.79
J1752−2806		
LWA		
66.94	80.4 ± 22.9	1.08
71.85	44.9 ± 12.0	0.95
76.74	40.3 ± 7.9	1.07
81.60	30.5 ± 5.0	0.94
LOFAR - HBA		
112.30	12.2 ± 0.7	0.94

Frequency (MHz)	τ_{sc} (ms)	χ^2
117.18	9.0 ± 0.9	1.03
122.06	7.2 ± 0.9	1.00
126.94	5.9 ± 0.6	0.92
131.83	5.4 ± 0.6	0.98
136.71	4.8 ± 0.6	1.02
141.59	4.5 ± 0.6	0.99
146.48	4.0 ± 0.6	0.91
J1758+3030		
LWA		
52.26	16.52 ± 6.97	0.96
62.05	9.55 ± 1.68	1.00
71.85	6.28 ± 1.21	1.13
76.75	4.66 ± 1.06	1.11
J1823+0550		
LWA		
57.15	26.00 ± 7.06	0.96
62.03	15.21 ± 3.69	1.09
66.95	10.65 ± 2.36	1.09
71.85	7.87 ± 2.00	1.00
J1825–0935		
LOFAR - LBA		
42.58	68.12 ± 14.42	0.91
47.46	61.74 ± 13.18	1.24
52.34	34.62 ± 6.51	1.05
57.00	21.39 ± 4.64	1.09
66.78	17.06 ± 4.51	0.96
76.76	5.81 ± 3.81	0.98
J1841+0912		
LOFAR - LBA		
63	19.3 ± 5.6	1.28
J1844+1454		
LWA		
42.13	75.58 ± 24.21	1.10
47.35	51.66 ± 9.92	0.97
52.18	33.62 ± 5.00	1.09
56.83	28.47 ± 4.40	1.09
57.55	27.97 ± 3.73	0.92
62.05	17.89 ± 2.32	0.98
66.95	8.92 ± 1.20	1.04
71.39	7.70 ± 1.19	1.10
71.85	7.43 ± 1.12	0.99
76.75	5.66 ± 0.80	1.04
81.65	5.66 ± 0.88	0.96
86.01	3.73 ± 1.06	1.02
J1851+1259		
LOFAR - HBA		
111.82	19.5 ± 1.5	1.24
115.72	15.9 ± 1.2	1.06
119.60	15.6 ± 1.2	0.82
123.50	12.7 ± 0.9	1.01
127.40	11.7 ± 0.9	0.93
131.12	9.6 ± 0.7	1.16

Frequency (MHz)	τ_{sc} (ms)	χ^2
135.17	9.8 ± 0.8	1.10
139.20	6.3 ± 0.6	0.88
142.96	5.4 ± 0.8	0.91
147.04	4.6 ± 0.6	1.00
150.89	4.2 ± 0.5	1.00
154.78	3.6 ± 0.4	1.01
J1913–0440		
LWA		
66.95	327.5 ± 167.6	0.98
71.85	475.8 ± 370.9	0.94
76.76	107.6 ± 24.2	1.14
81.64	114.1 ± 21.7	0.95
86.06	115.5 ± 33.8	1.11
LOFAR - HBA		
120.4	23.0 ± 1.6	1.10
122.4	22.8 ± 1.7	0.89
124.3	22.7 ± 1.6	1.29
126.3	21.6 ± 1.5	0.98
128.2	18.7 ± 1.6	1.04
130.2	16.2 ± 1.0	1.19
132.1	13.6 ± 0.9	1.14
134.1	14.1 ± 1.0	1.25
136.0	15.7 ± 1.2	1.17
138.0	12.0 ± 0.9	1.19
140.0	11.8 ± 1.0	1.43
141.9	11.9 ± 0.9	1.05
143.8	10.2 ± 0.8	1.38
145.8	9.4 ± 0.5	1.16
147.7	13.4 ± 0.9	0.96
J1948+3540		
LOFAR - HBA		
178.20	793.16 ± 122.3	1.40
182.13	536.9 ± 46.0	0.90
186.05	594.7 ± 58.8	1.32
ORT		
326.5	34.9 ± 0.4	1.20
LOVELL		
408.0	13.7 ± 0.1	1.03
LOVELL		
610.0	3.2 ± 0.1	1.07
J2018+2839		
LOFAR - LBA		
37.21	21.43 ± 6.55	0.88
42.58	18.07 ± 2.62	0.93
47.50	9.63 ± 1.63	0.92
52.63	5.66 ± 1.18	1.04
57.22	3.86 ± 0.38	0.93
J2055+3630		
LOFAR - HBA		
145.03	131.7 ± 47.6	1.06
152.82	111.0 ± 31.9	1.10
160.67	100.9 ± 22.9	1.22

Frequency (MHz)	τ_{sc} (ms)	χ^2
168.44	84.2 ± 18.1	1.27
176.27	60.8 ± 8.5	1.14
184.01	69.6 ± 14.2	1.05
GMRT		
234.0	23.0 ± 2.0	0.82
ORT		
326.5	5.5 ± 0.3	0.90
LOVELL		
408.0	3.0 ± 0.1	0.94
J2149+6329		
LOFAR - HBA		
111.82	71.6 ± 16.5	1.05
115.72	62.1 ± 9.3	1.02
119.62	43.9 ± 6.7	0.82
123.52	40.4 ± 5.3	0.91
127.42	37.9 ± 4.2	0.93
131.29	43.4 ± 4.0	0.94
135.16	37.3 ± 3.5	1.05
139.21	33.4 ± 2.9	0.87
143.05	29.0 ± 2.2	1.04
146.98	27.2 ± 2.1	0.84
150.88	26.3 ± 1.7	1.07
154.77	25.0 ± 1.7	0.92
158.69	20.2 ± 1.3	0.93
162.59	19.7 ± 1.1	1.01
166.54	17.7 ± 1.0	1.37
170.43	14.2 ± 0.9	1.18
J2225+6535		
LWA		
52.27	34.82 ± 9.40	0.95
62.05	16.29 ± 5.62	0.90
66.95	11.99 ± 4.68	1.12
71.85	8.86 ± 1.24	1.06
81.64	5.45 ± 1.14	0.98
J2229+6205		
LOFAR - HBA		
115.73	92.7 ± 9.8	0.98
119.62	77.0 ± 6.7	0.97
123.52	68.1 ± 4.0	1.40
127.40	59.0 ± 3.4	1.07
131.24	46.2 ± 2.8	1.09
135.20	53.1 ± 2.9	0.88
139.27	43.6 ± 2.3	1.00
143.06	41.7 ± 1.8	1.08
146.97	39.8 ± 1.9	1.02
150.88	33.9 ± 1.7	0.83
154.78	34.3 ± 1.7	0.86
158.69	31.4 ± 1.2	1.08
162.60	25.5 ± 0.9	1.36
166.50	27.2 ± 1.1	1.17
170.49	25.5 ± 0.9	1.29
J2337+6151		

Frequency (MHz)	τ_{sc} (ms)	χ^2
LOFAR - LBA		
64.0	25.7 ± 5.8	0.86