2nd CS1 Pulsar Detection

CS1 Meeting

2 April 2008

Outline

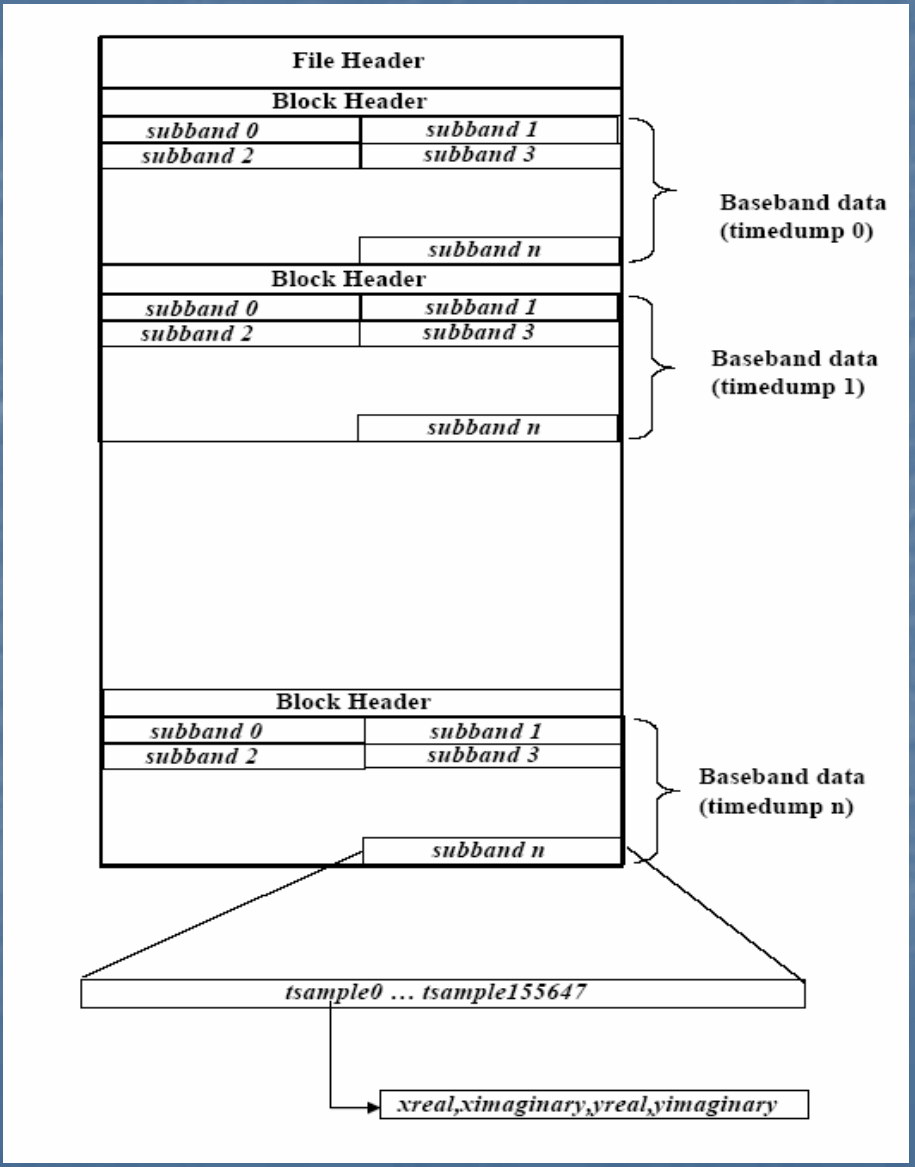
- Observation details
- CS1 raw data format
- Pulsar reduction software
- Results

Observation

- CS1 as transit telescope
- CS1 – 6 Tiles, 96 dipoles
- A_{eff} = 2.6 m^2 to 25 m^2
  (G_{dip} = 1.5 and λ=1.5m)
- Tiles pointed to zenith
- 3 runs – ~19 min, 30 min, 30 min.
- 170-230 MHz, 24 subbands, 160 MHz sampling

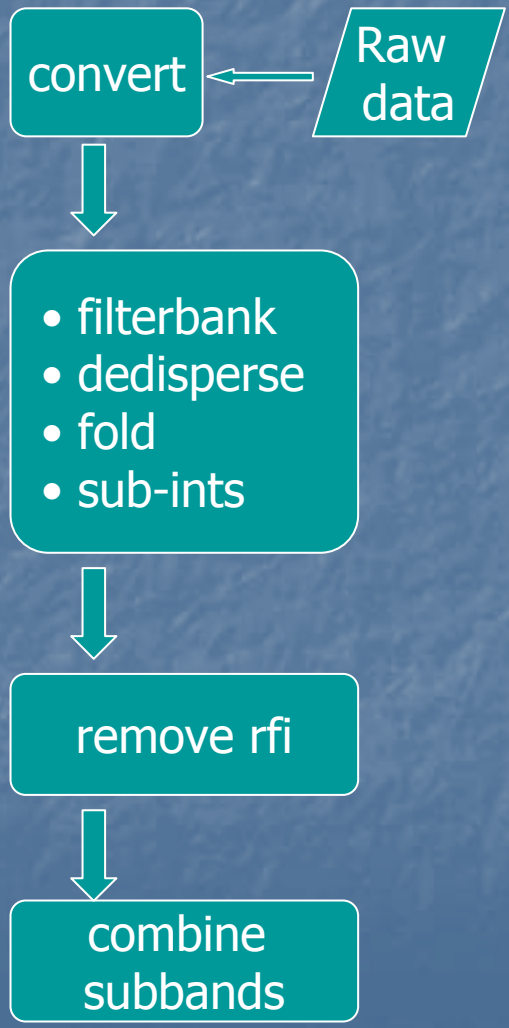
Raw Data Format

- UDP packet dumps
- ~100 GB/hr/24 subbands
- Format conversion:
  - 8-bit format.
  - One file per subband

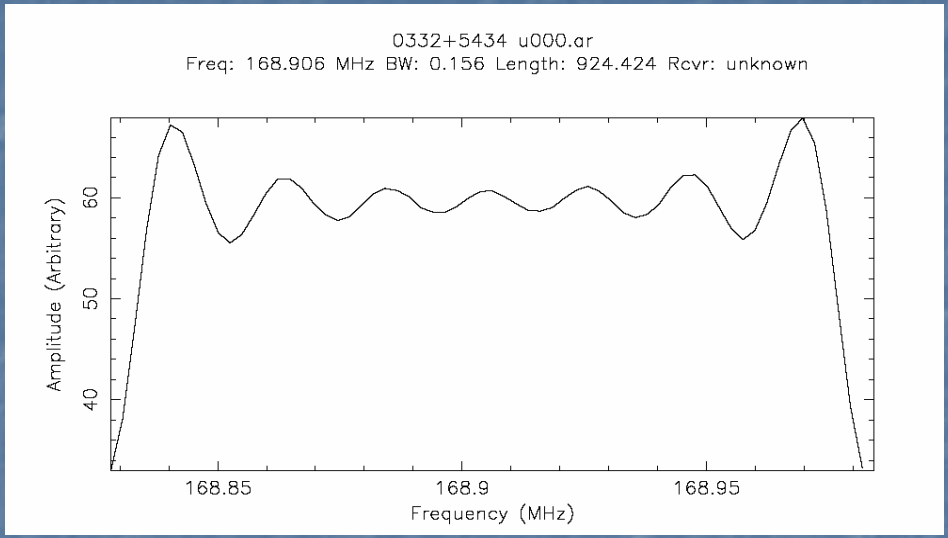


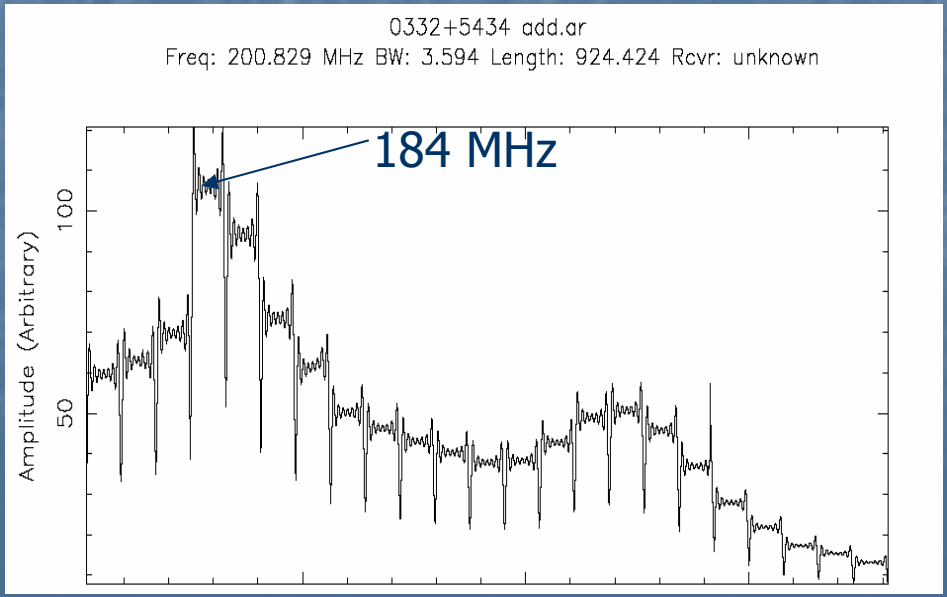
Processing Software

- open-source DSP for pulsars
  - dedisperse, filterbank and fold
- Adapted to read complex data
- Subbands = quadrature sampled baseband voltages.
- Reduced data in PSRFITS
- PSRCHIVE utilities:
  - view
  - combine – freq, time
  - clean RFI
  - compute Stokes and
  - compute TOA

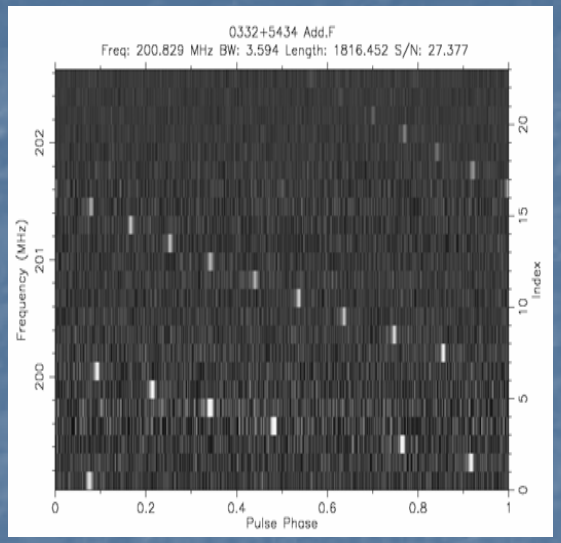


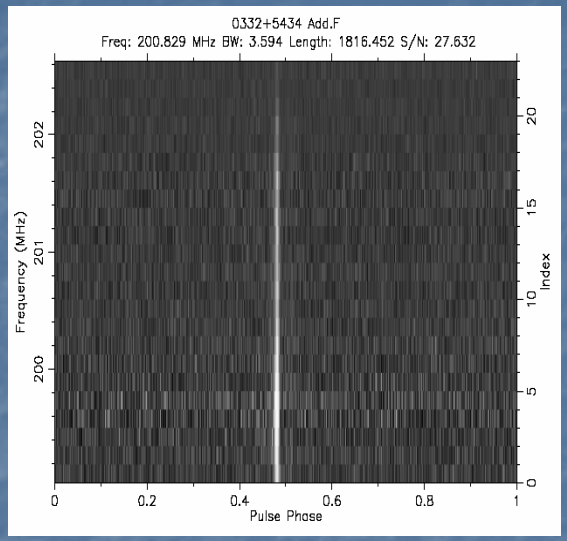
Preliminary Results .....

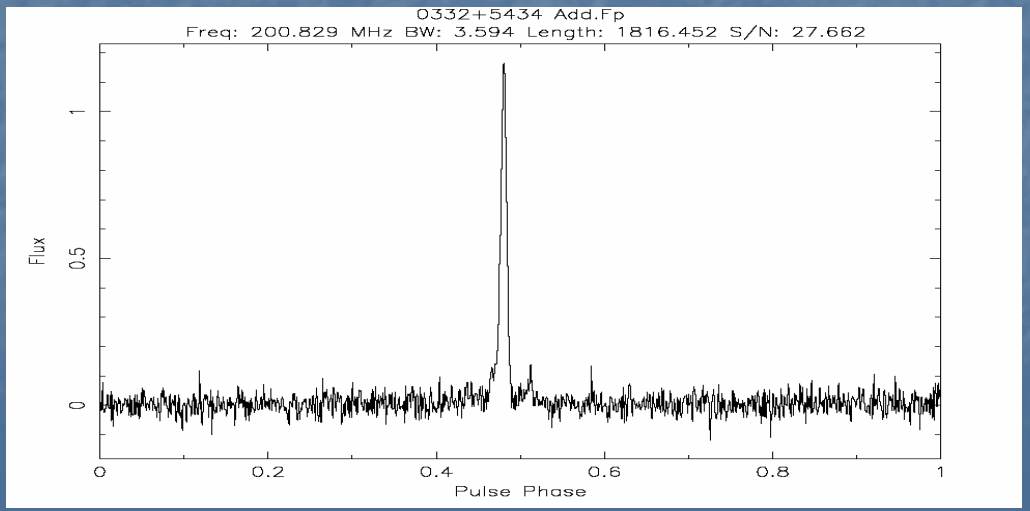




Results





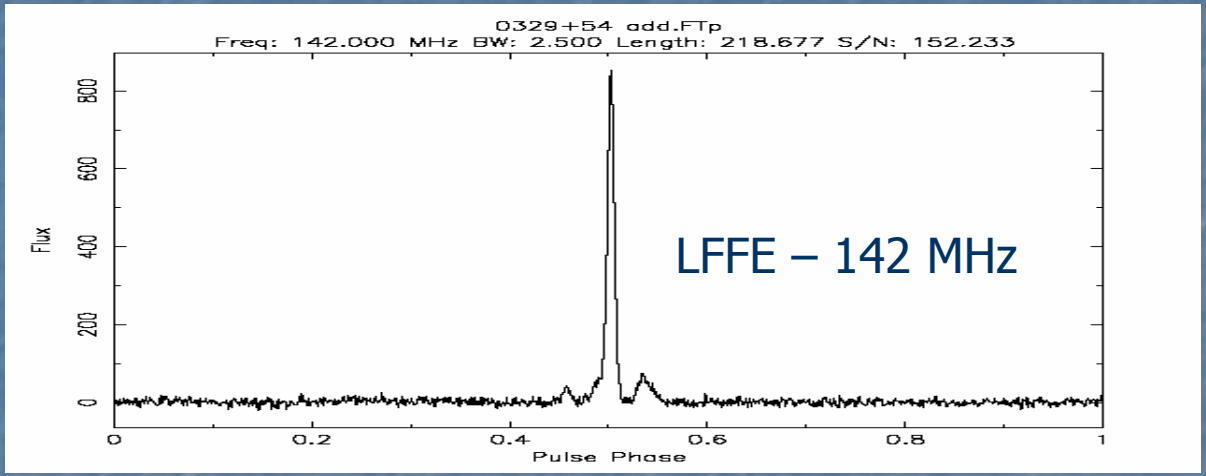


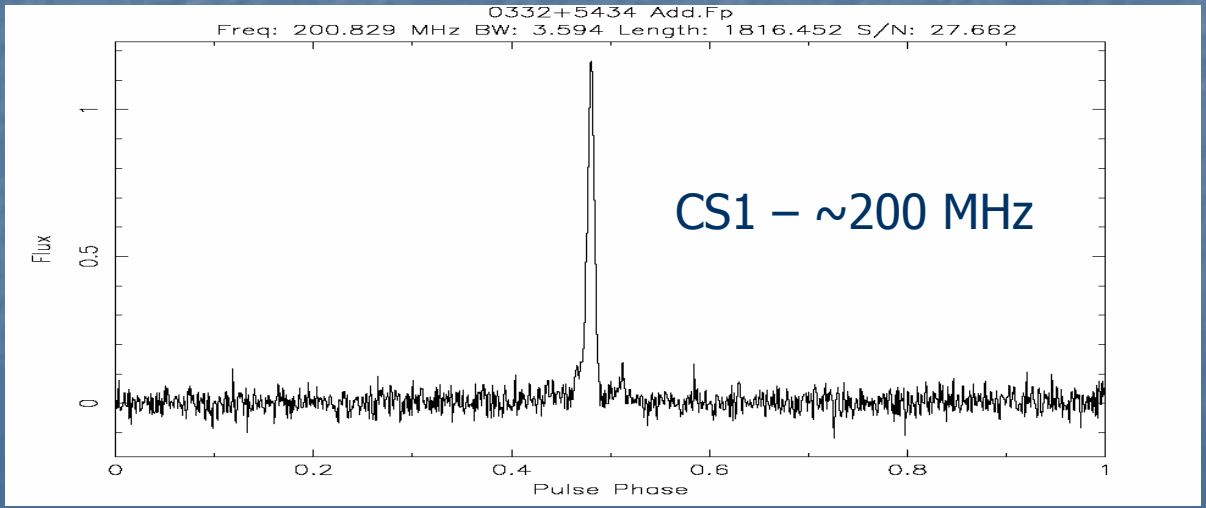
PSR B0329+54

- P = 0.71451866398
- DM = 26.7

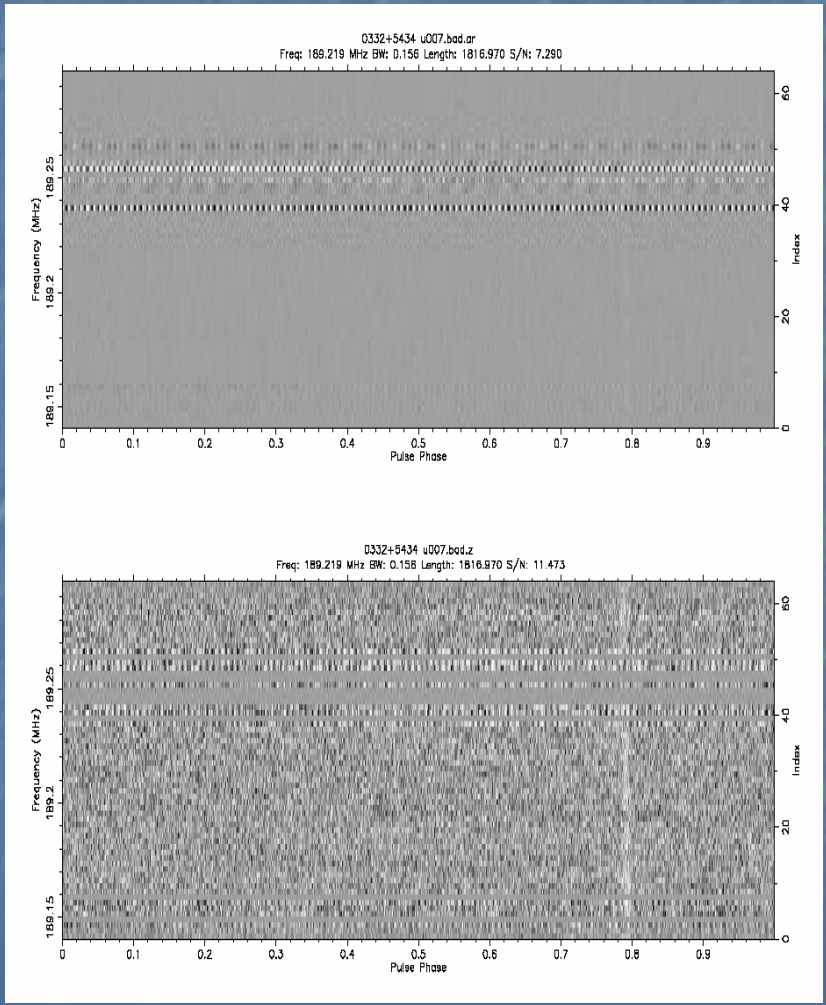
Observation details:

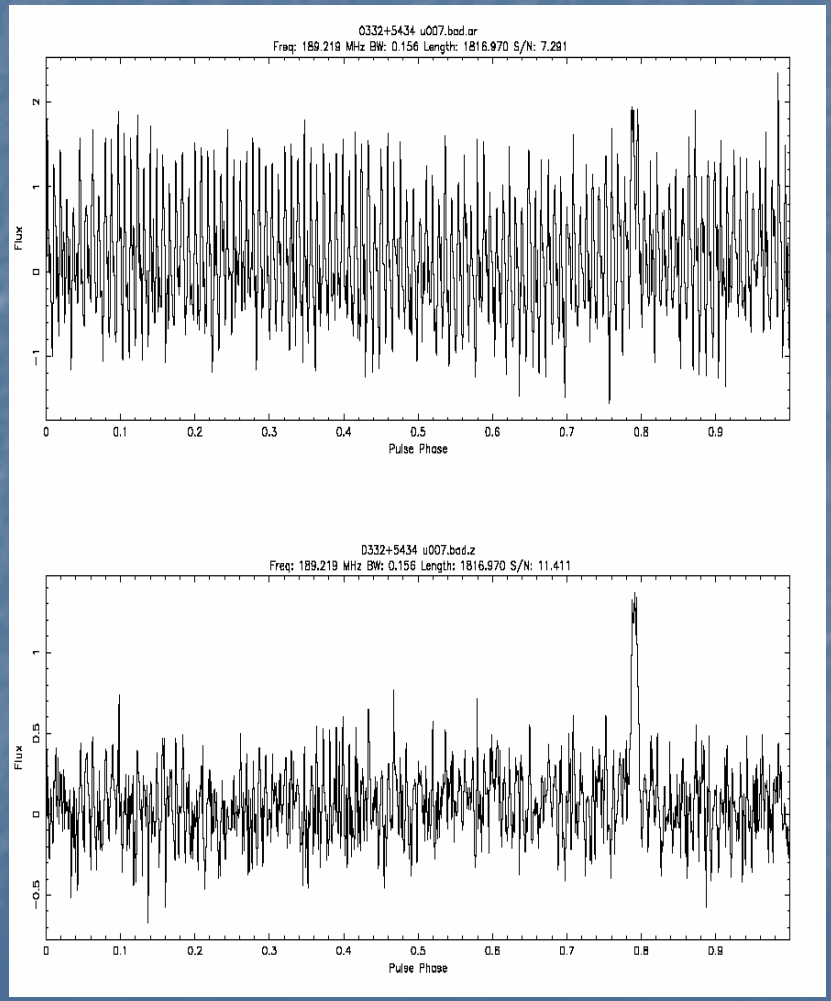
- 17 March 2008
- 1816 seconds
- CS1 in transit mode
- 96 Dipoles, dual pol.
- 160 MHz sampling
- 24 subbands, 156.25 KHz


0329+54 add.FTp
Freq: 142.000 MHz BW: 2.500 Length: 218.677 S/N: 152.233
Flux
0
200
400
600
800
0
0.2
0.4
0.6
0.8
1
Pulse Phase
LFFE – 142 MHz


0332+5434 Add.Fp
Freq: 200.829 MHz BW: 3.594 Length: 1816.452 S/N: 27.662
Flux
0
0.5
1
0
0.2
0.4
0.6
0.8
1
Pulse Phase
CS1 – ~200 MHz

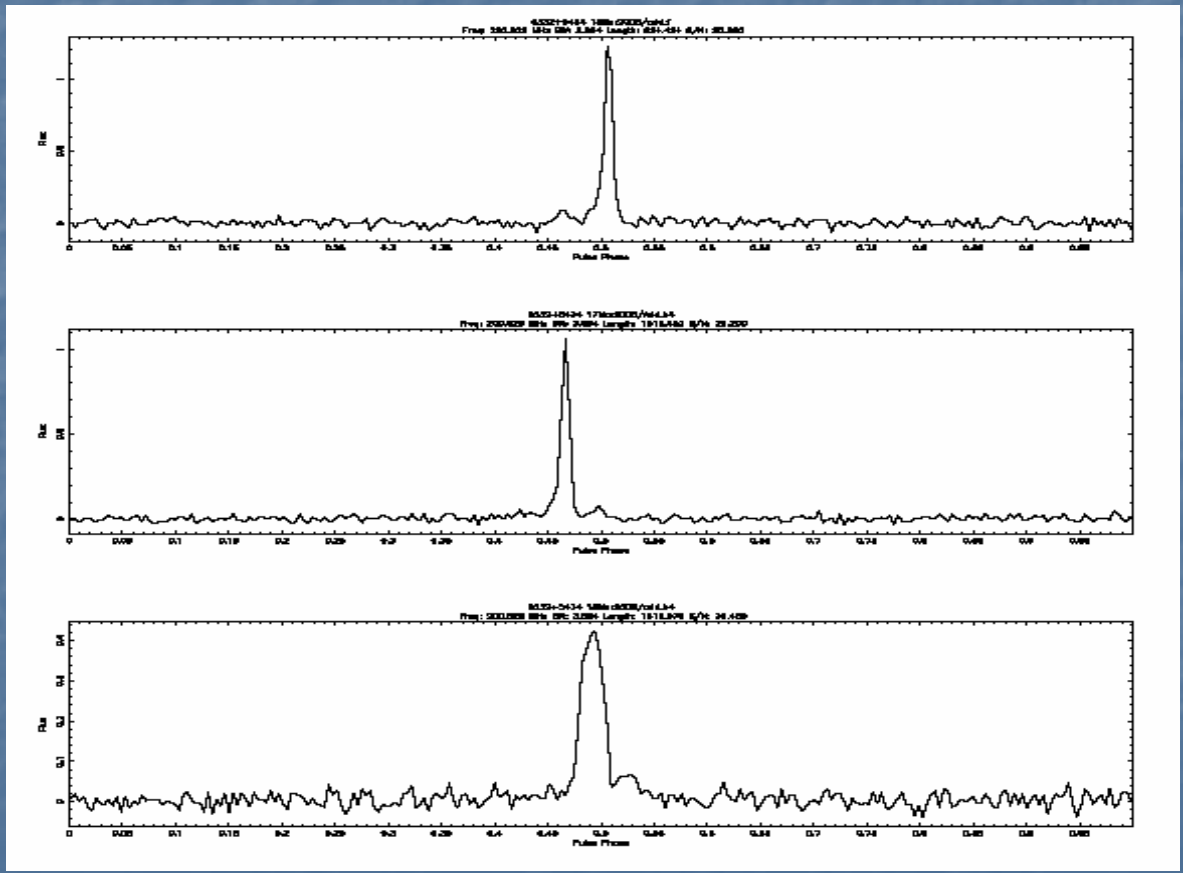
RFI...

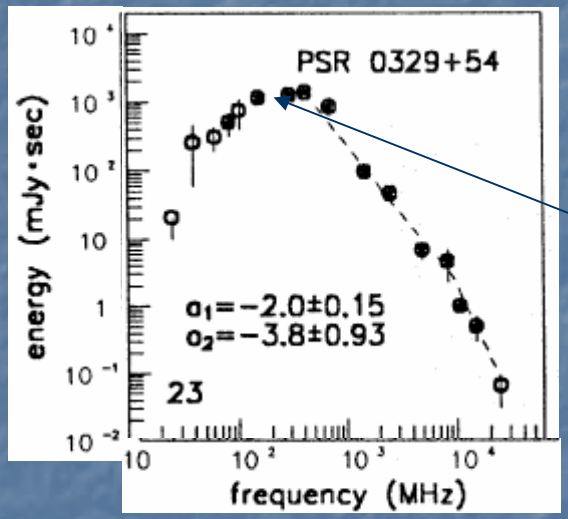

0332+5434 u007.bad.ar
Freq: 189.219 MHz BW: 0.156 Length: 1816.970 S/N: 7.290
Frequency (MHz)
189.25
189.2
189.15
Index
0
20
40
60
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
Pulse Phase
0332+5434 u007.bad.z
Freq: 189.219 MHz BW: 0.156 Length: 1816.970 S/N: 11.473
Frequency (MHz)
189.25
189.2
189.15
Index
0
20
40
60
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
Pulse Phase


0332+5434 u007.bad.ar
Freq: 189.219 MHz BW: 0.156 Length: 1816.970 S/N: 7.291
Flux
−1
0
1
2
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
Pulse Phase
0332+5434 u007.bad.z
Freq: 189.219 MHz BW: 0.156 Length: 1816.970 S/N: 11.411
Flux
−0.5
0
0.5
1
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9
Pulse Phase

Profile changes?

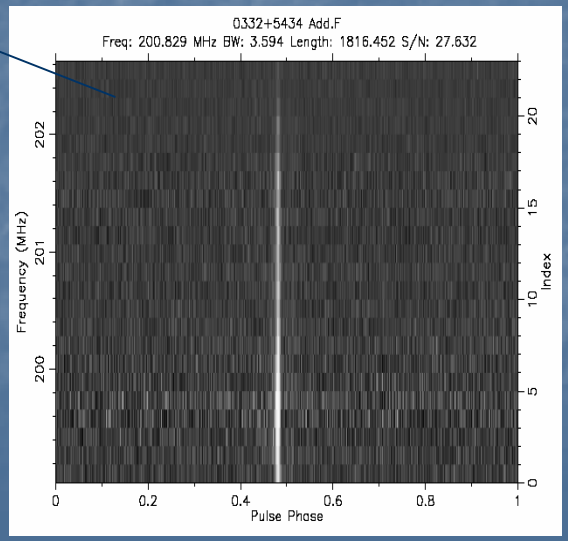
- phase changes
- profile broadening
- sync errors?

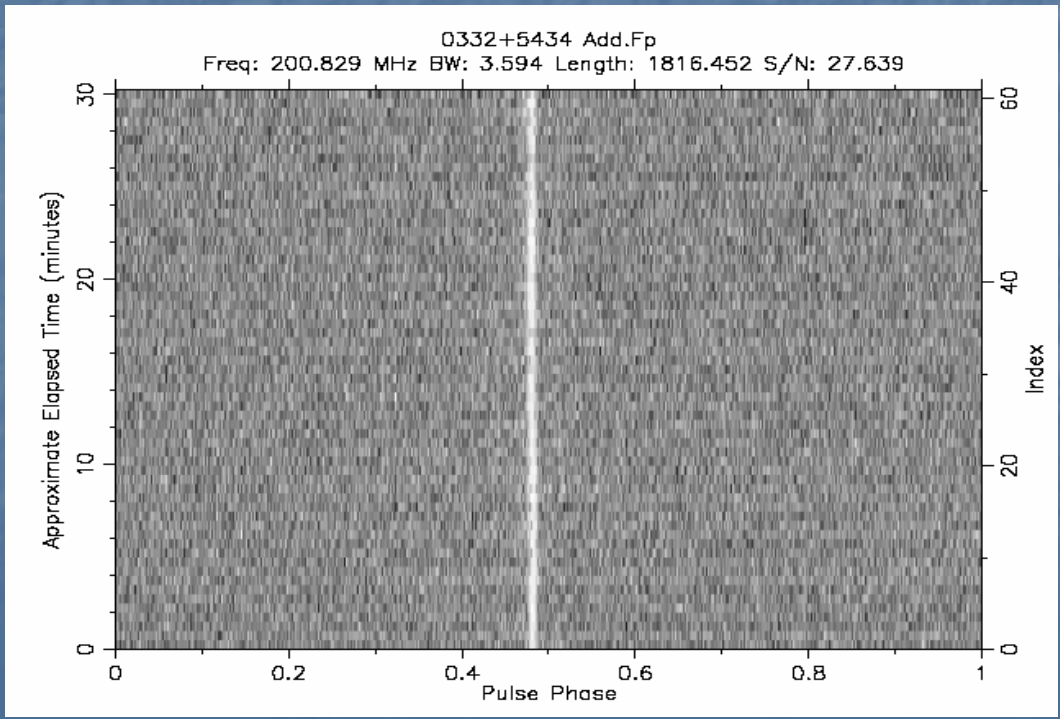




Malofeev et. al, A&A, 1995

- Spectral Index (>400 MHz): -1.6 ± 0.2



Estimates?

- $T_{sys} \sim T_{sky} \sim 80$ to 800 K (assuming Aeff 2.6 to 25 m2)
- Beam shape estimates ….