Summary of Pulsar Busy Week #12

Jason Hessels
on behalf of
Aris Noutsos, Aris Karastergiou, Ben Stappers, Anastasia Alexov, Vlad Kondratiev, Tom Hassall, Thijs Coenen, Sander ter Veen, Joeri van Leeuwen, Ashish Asgekar, Jan David Mol, Joris Verbiest, Jean-Mathias Griessmeier, Masaya Kuniyoshi, Charlotte Sobey, John Romein

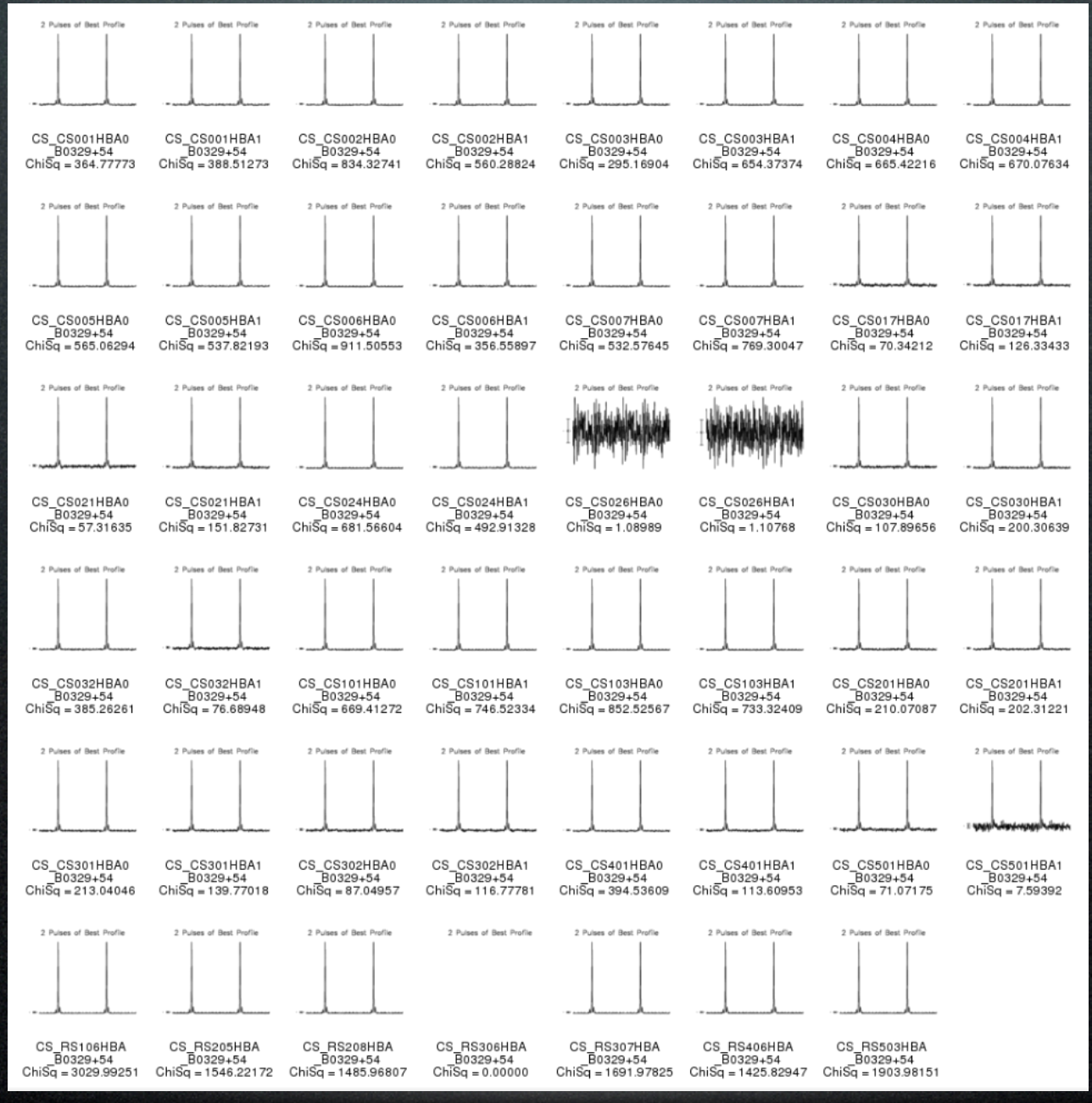
Outline

- RFI / station sensitivity via “Fly’s Eye” pulsar observations
- Phase-resolved polarimetry
- Phase-coherent pulsar timing
- Pulsar search pipeline

“Fly’s Eye” mode

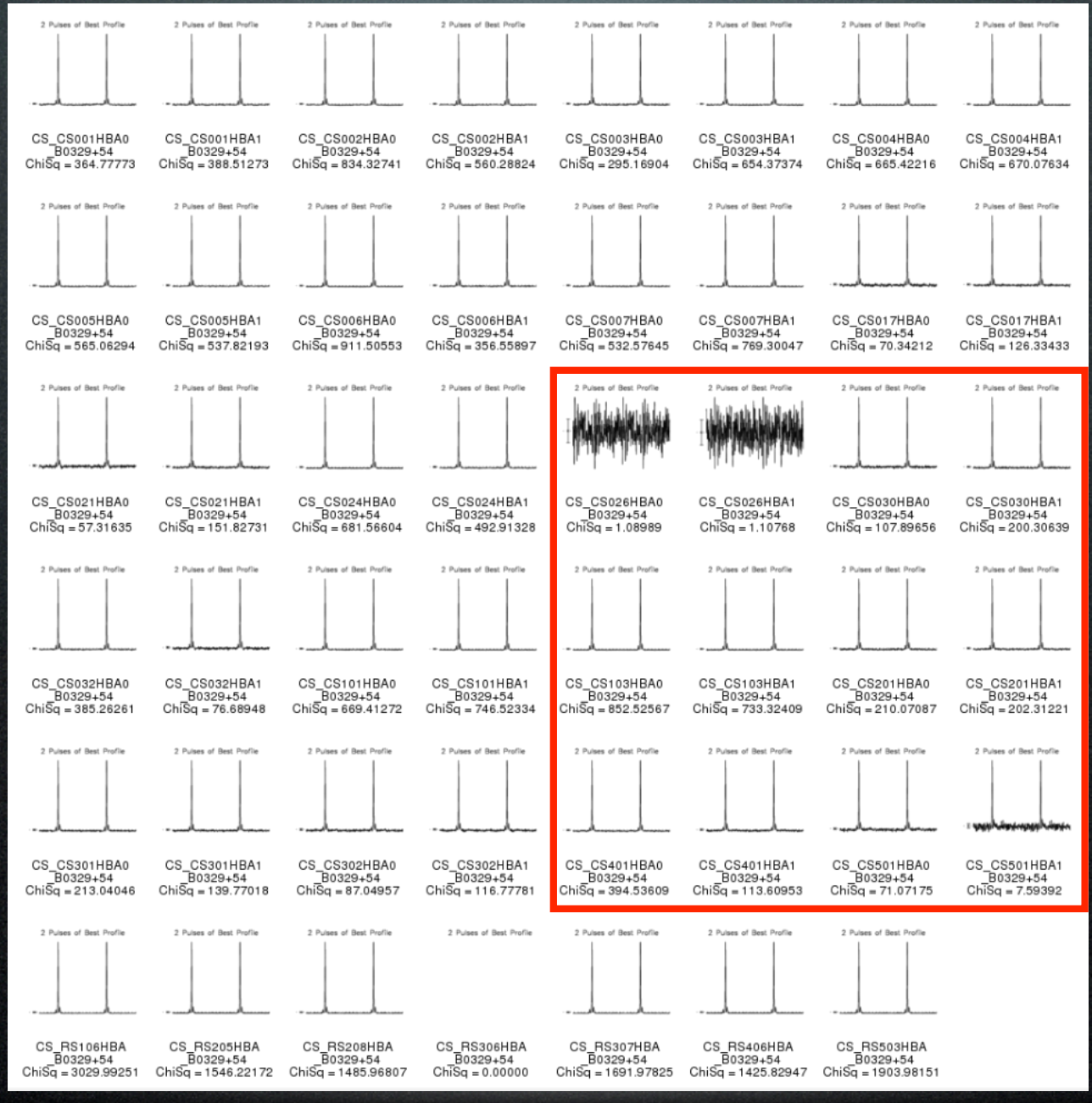
- Beam-formed mode in which the station signals are recorded separately.
- Can use to cover a very large FoV (if MoM/SAS/MAC can set this up).
- Also very useful for diagnosing individual stations.
- With CEP2 we can now easily take full-bandwidth Fly’s Eye data for *all* stations (data rate ~600MB/s).

Fly's Eye Observation with 47 HBA stations



Credit: Anastasia Alexov

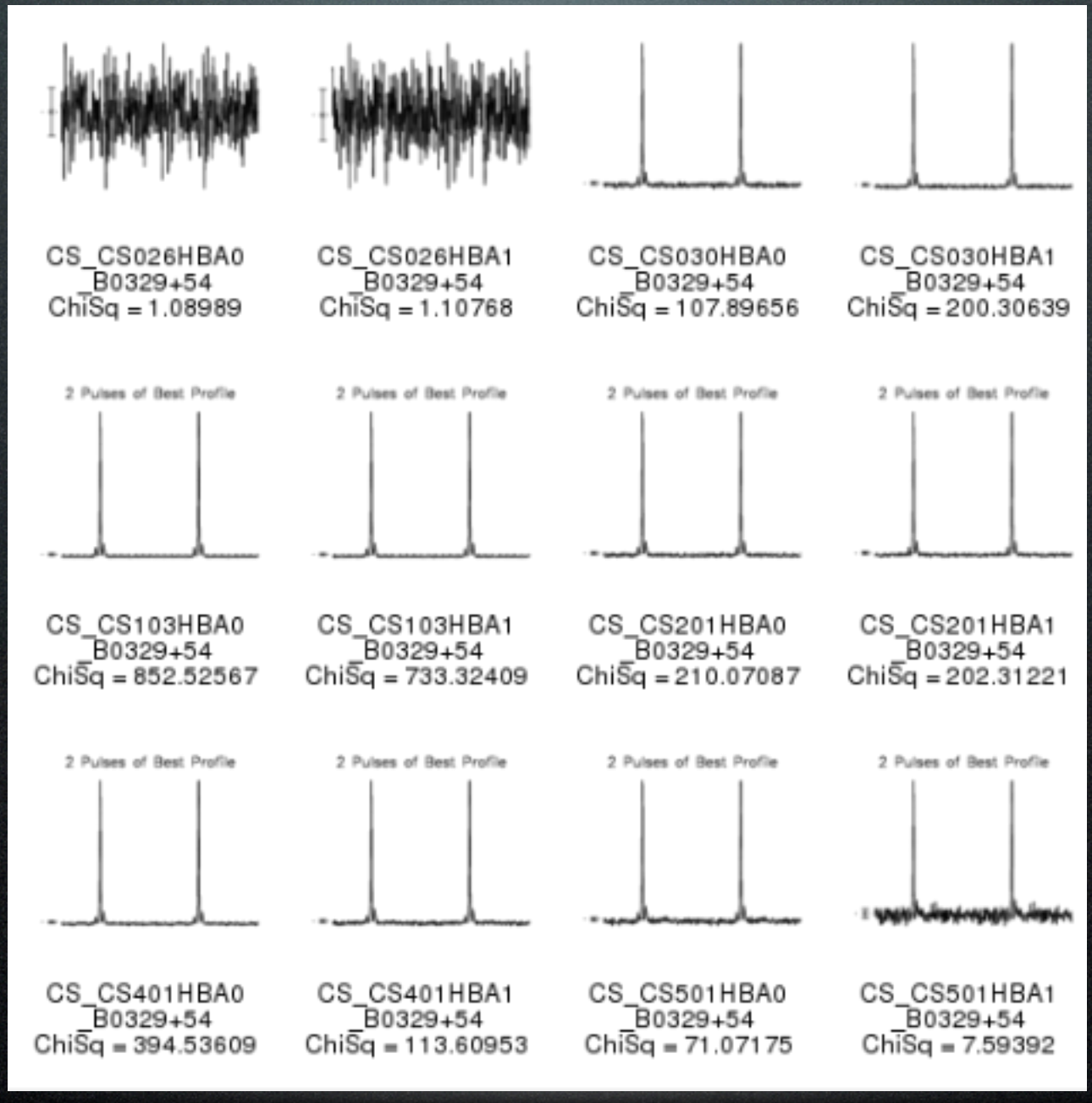
Fly's Eye Observation with 47 HBA stations



Credit: Anastasia Alexov

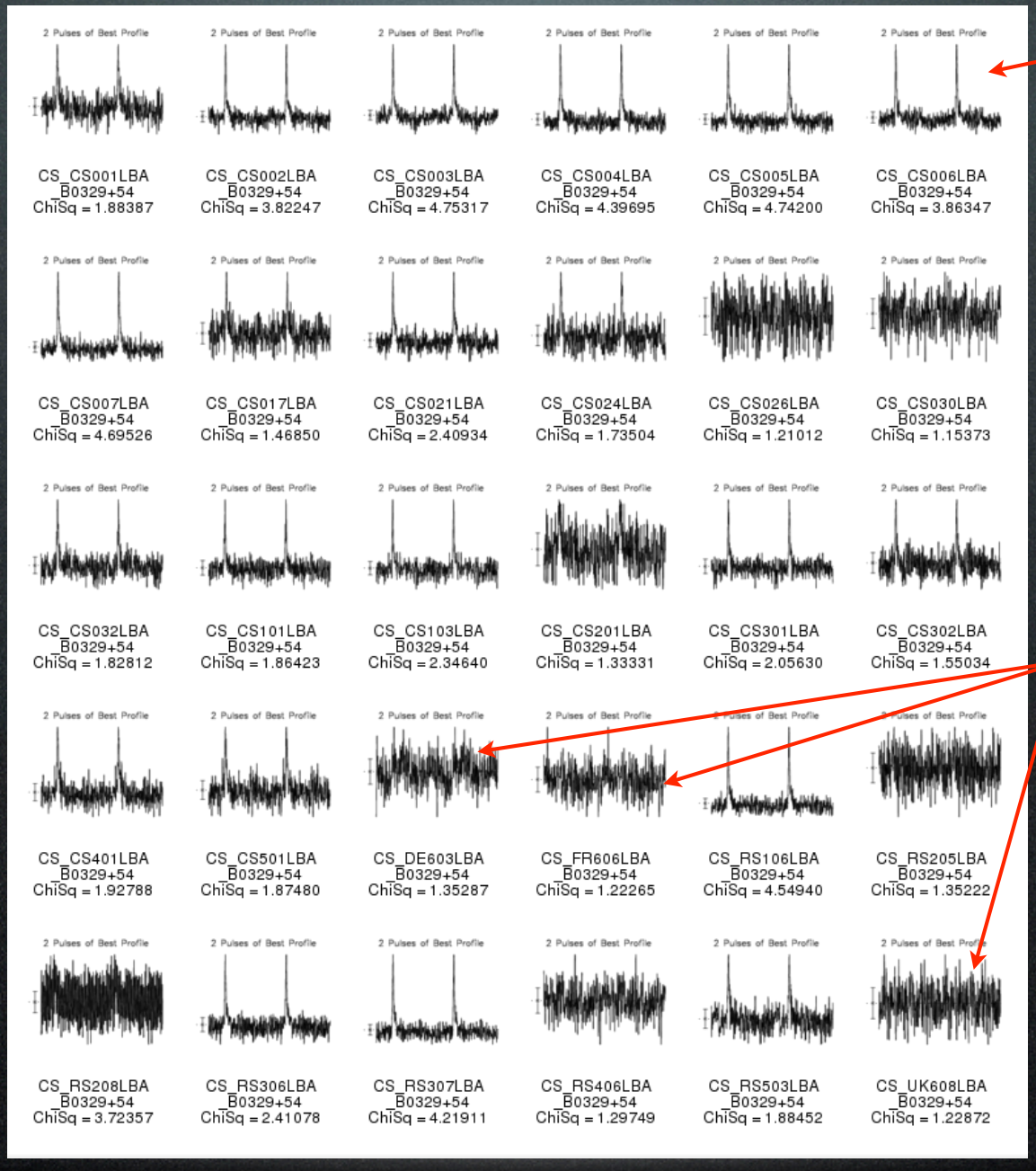
Fly's Eye Observation with 47 HBA stations

Menno at work



Possible issues?

Fly's Eye Observation with 30 LBA stations



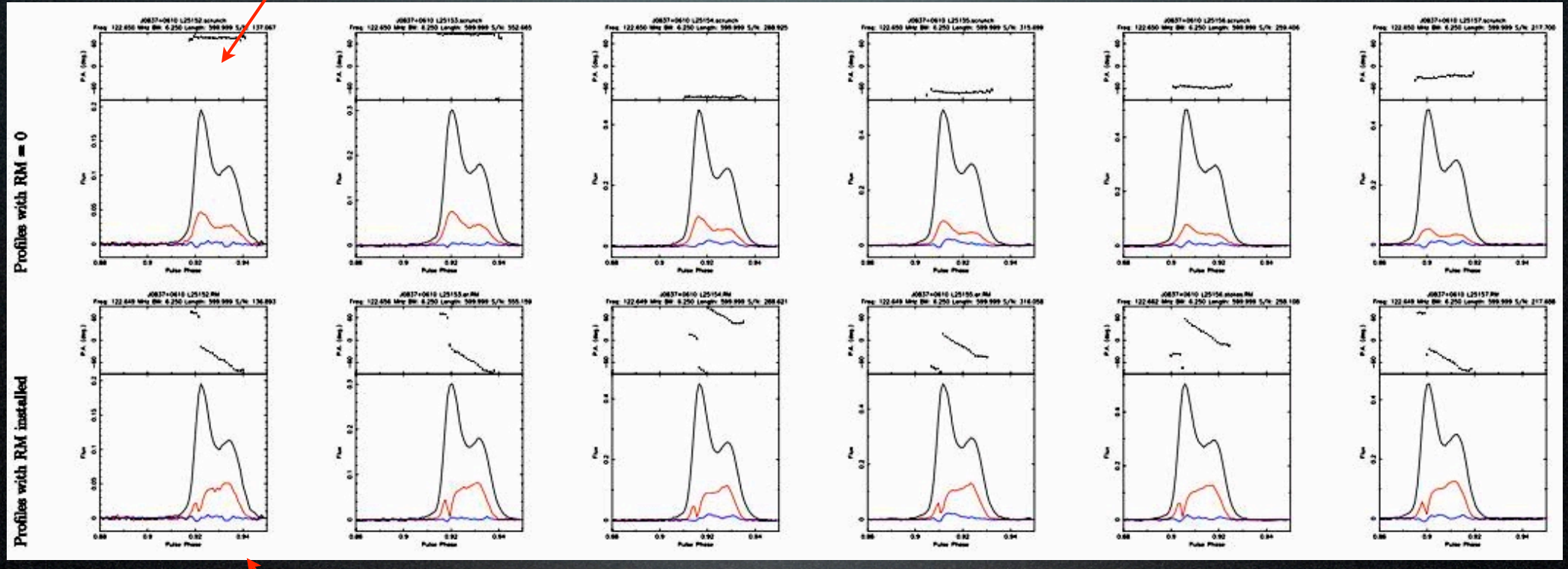
Superterp CS002-007 all look good

No detection with the international stations

Credit: Anastasia Alexov

Polarimetry of PSR B0834+06

RM = 0



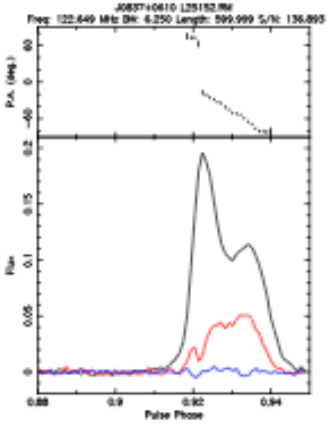
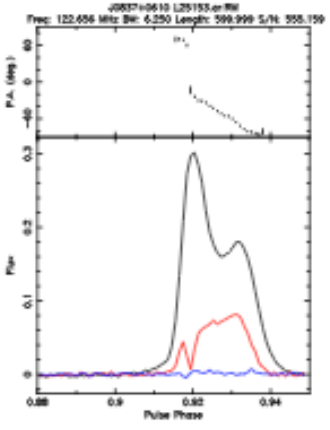
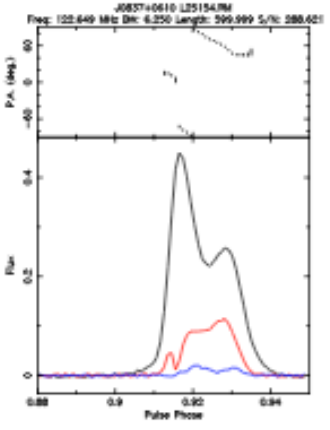
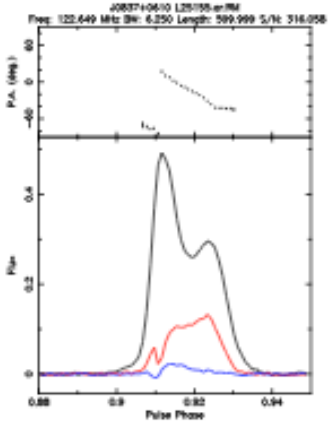
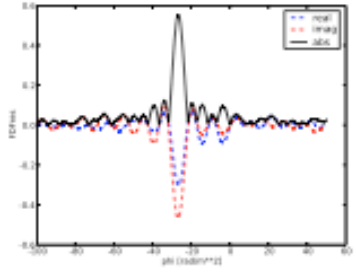
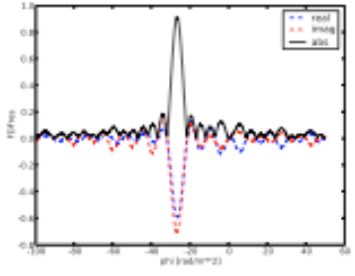
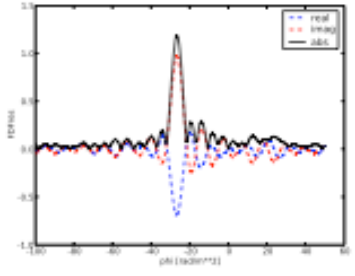
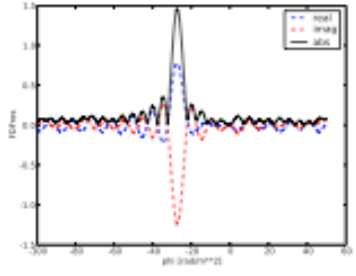
HA = -2 HA = -1 HA = 0 HA = +1 HA = +2 HA = +3

RM ~ 27

- Polarization profile is very stable as a function of hour angle
- Calibration errors on the order of ~5-10%?

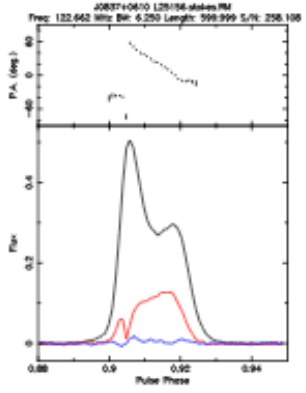
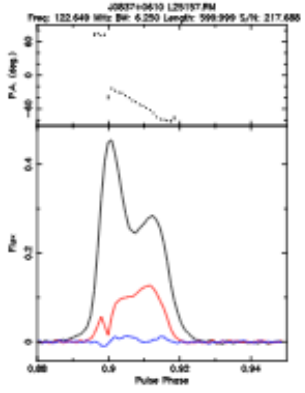
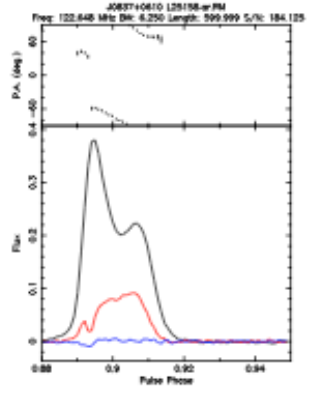
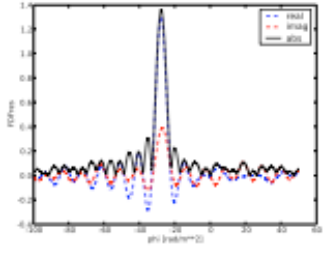
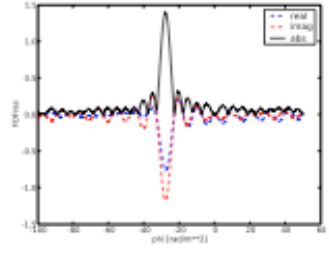
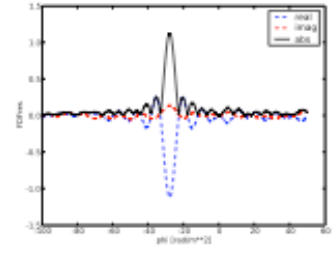
Credit: Charlotte Sobey

B0834+06 polarization stability

	HA = -2	HA = -1	HA = 0	HA = +1
PROFILE (RM = RM2)				
RM1 $[radm^{-2}]$	0+/-2.8	0+/-2.0	0+/-1.7	-27+/-1.8
RM2 $[radm^{-2}]$	-26.71+/-0.15	-26.72+/-0.10	-26.89+/-0.08	-27.28+/-0.07
RM3 $[radm^{-2}]$	-26.837+/-2.8	-26.814+/-2.8	-26.709+/-2.8	-27.472+/-2.8
FDF RES				

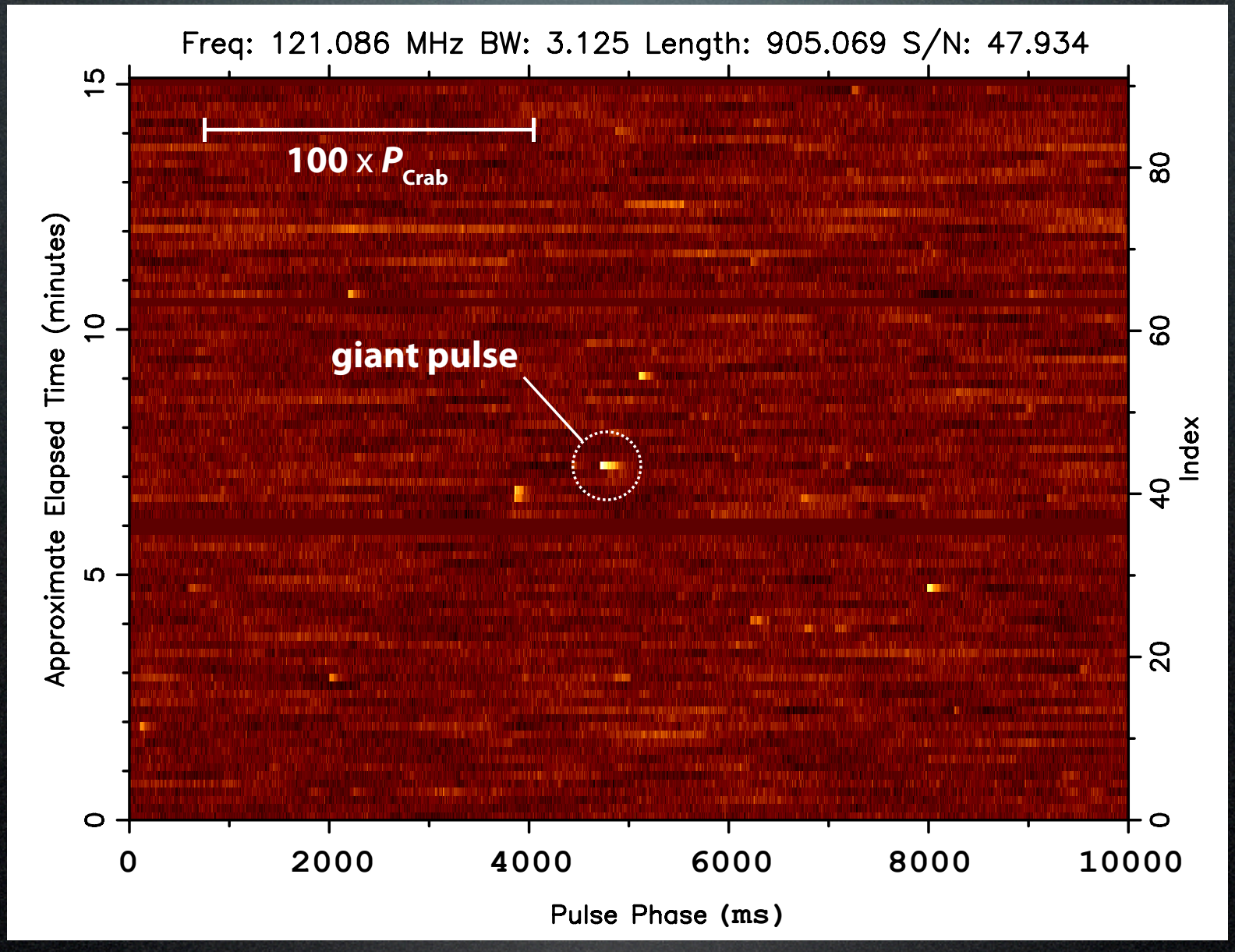
Credit: Charlotte Sobey

B0834+06 polarization stability

	HA = +2	HA = +3	HA = +4
PROFILE (RM = RM2)			
RM1 $[radm^{-2}]$	-28+/-1.7	-28+/-1.5	-28+/-1.7
RM2 $[radm^{-2}]$	-27.77+/-0.13	-27.85+/-0.16	-27.99+/-0.17
RM3 $[radm^{-2}]$	-27.857+/-2.8	-27.829+/-2.8	-27.940+/-2.8
FDF RES			

Credit: Charlotte Sobey

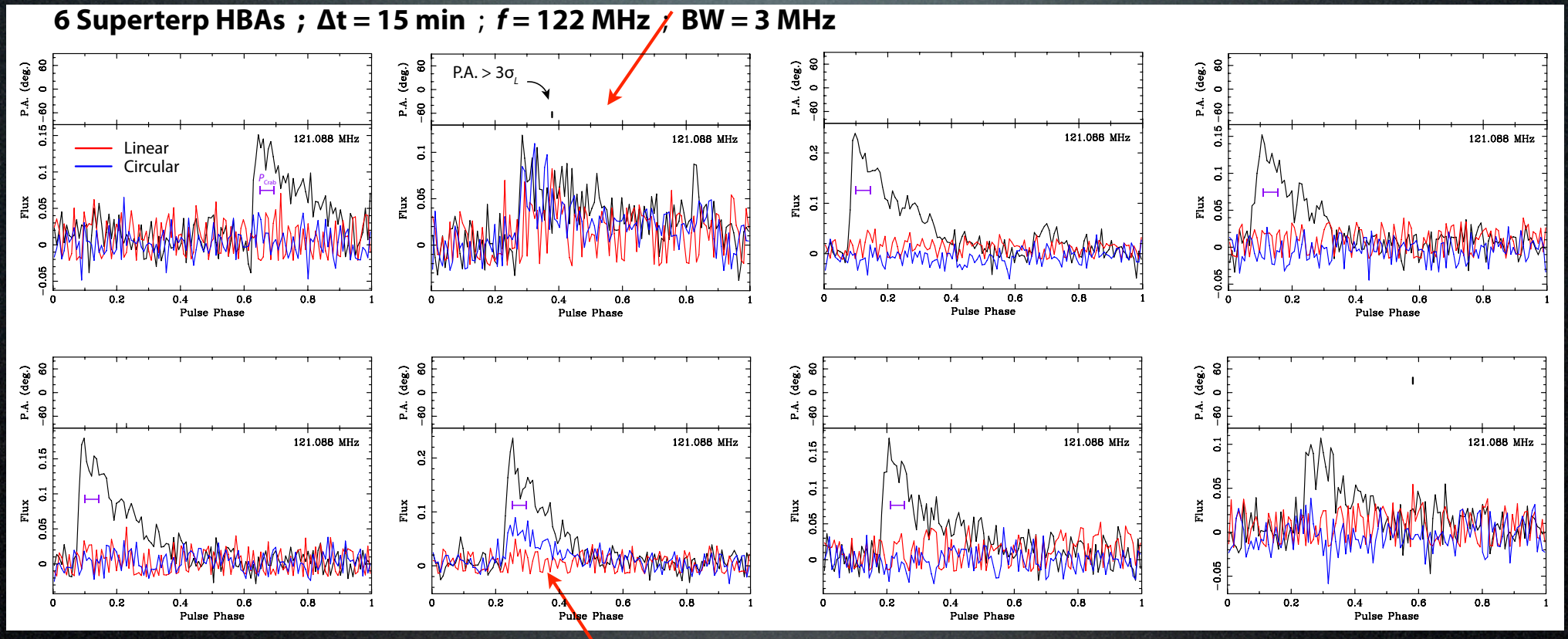
Polarimetry on Crab giant pulses



Credit: Aris Noutsos

Polarimetry on Crab giant pulses

Somewhat polarized

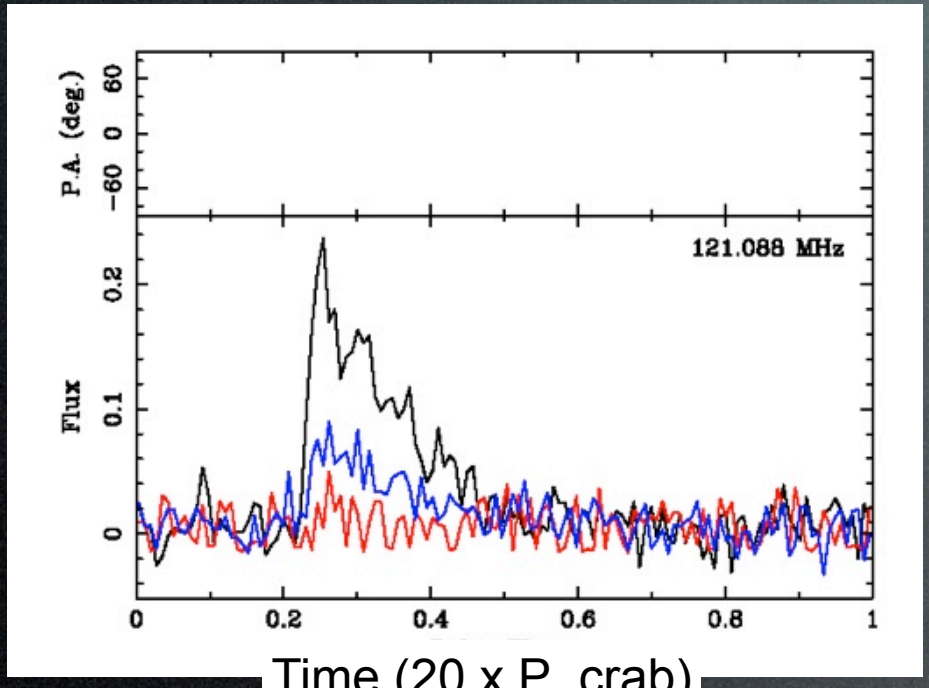


Somewhat polarized

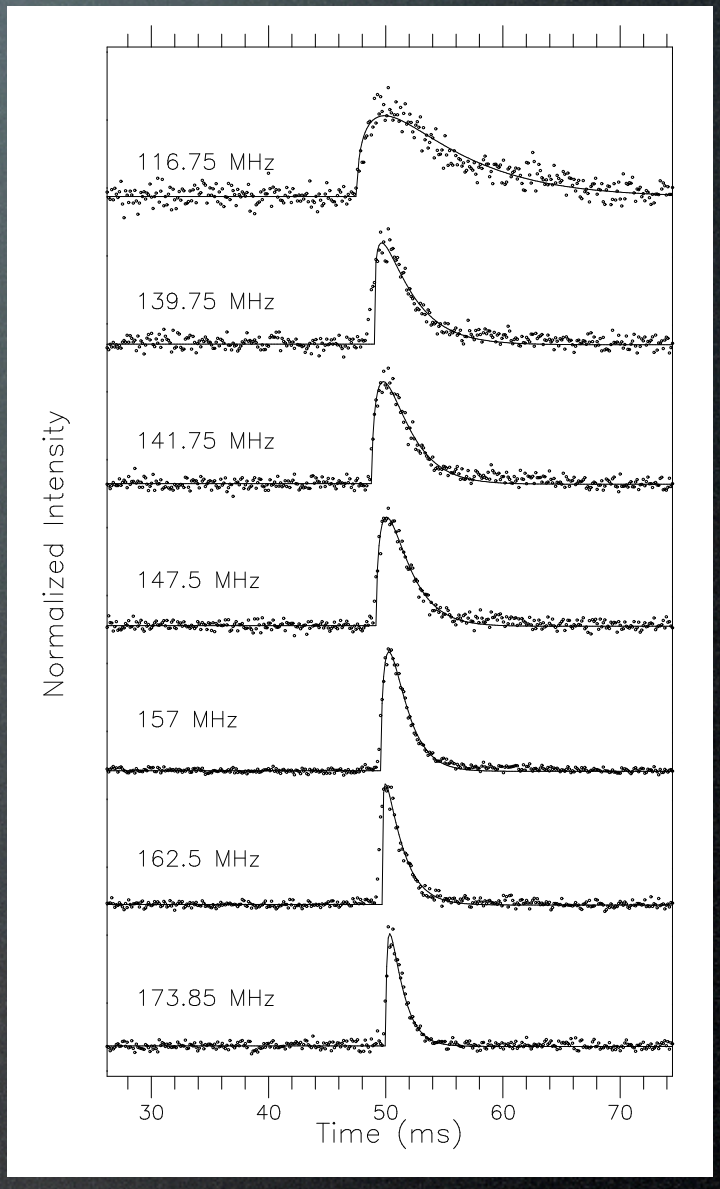
- Very little polarized flux seen in recent imaging observations
- Crab giants normally highly polarized (diff Faraday rotation?)
- > 10x more scattering than a few years ago
- Crab has flared in gamma-rays twice recently

Credit: Aris Noutsos

Polarimetry on Crab giant pulses

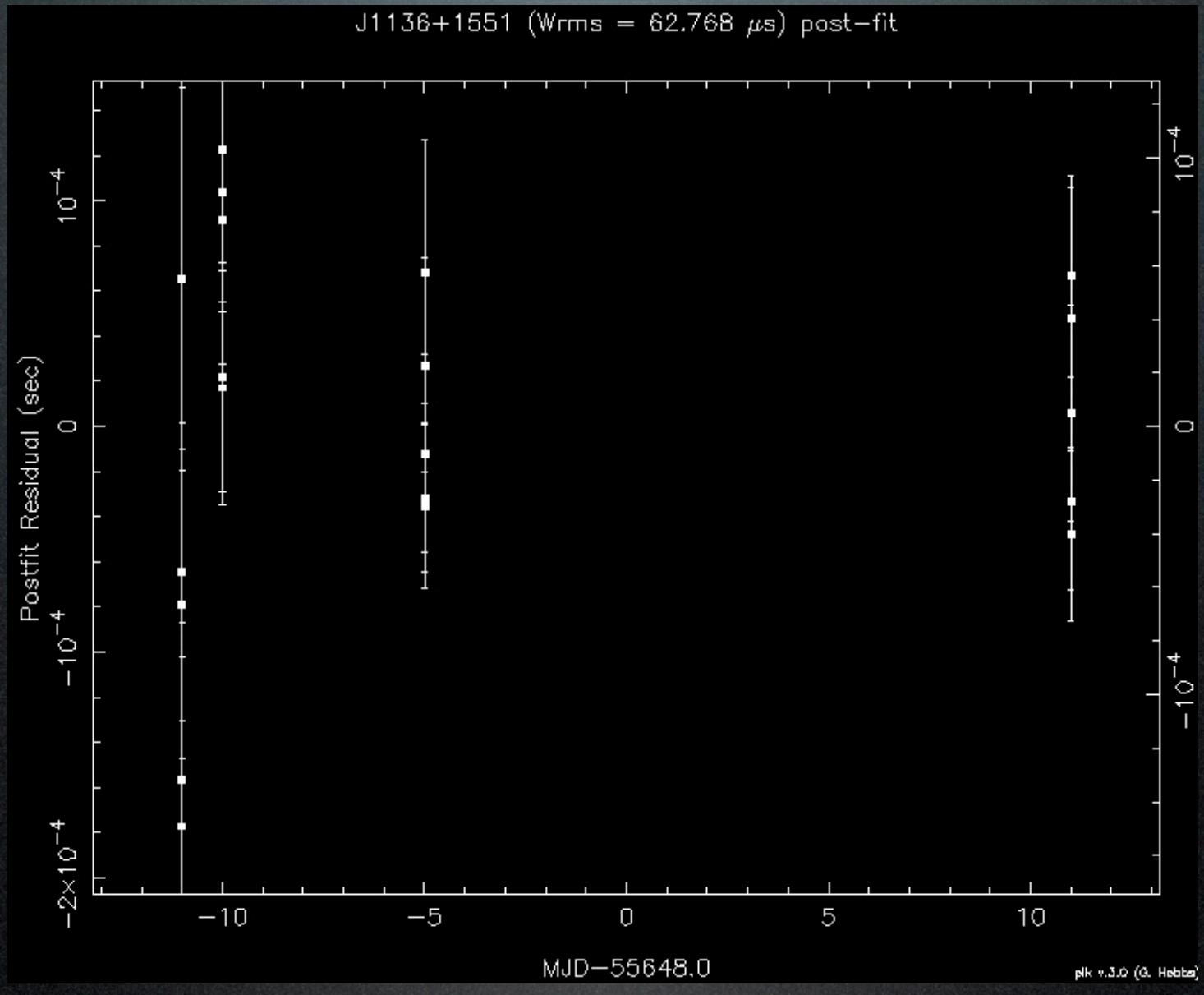


Credit: Aris Noutsos



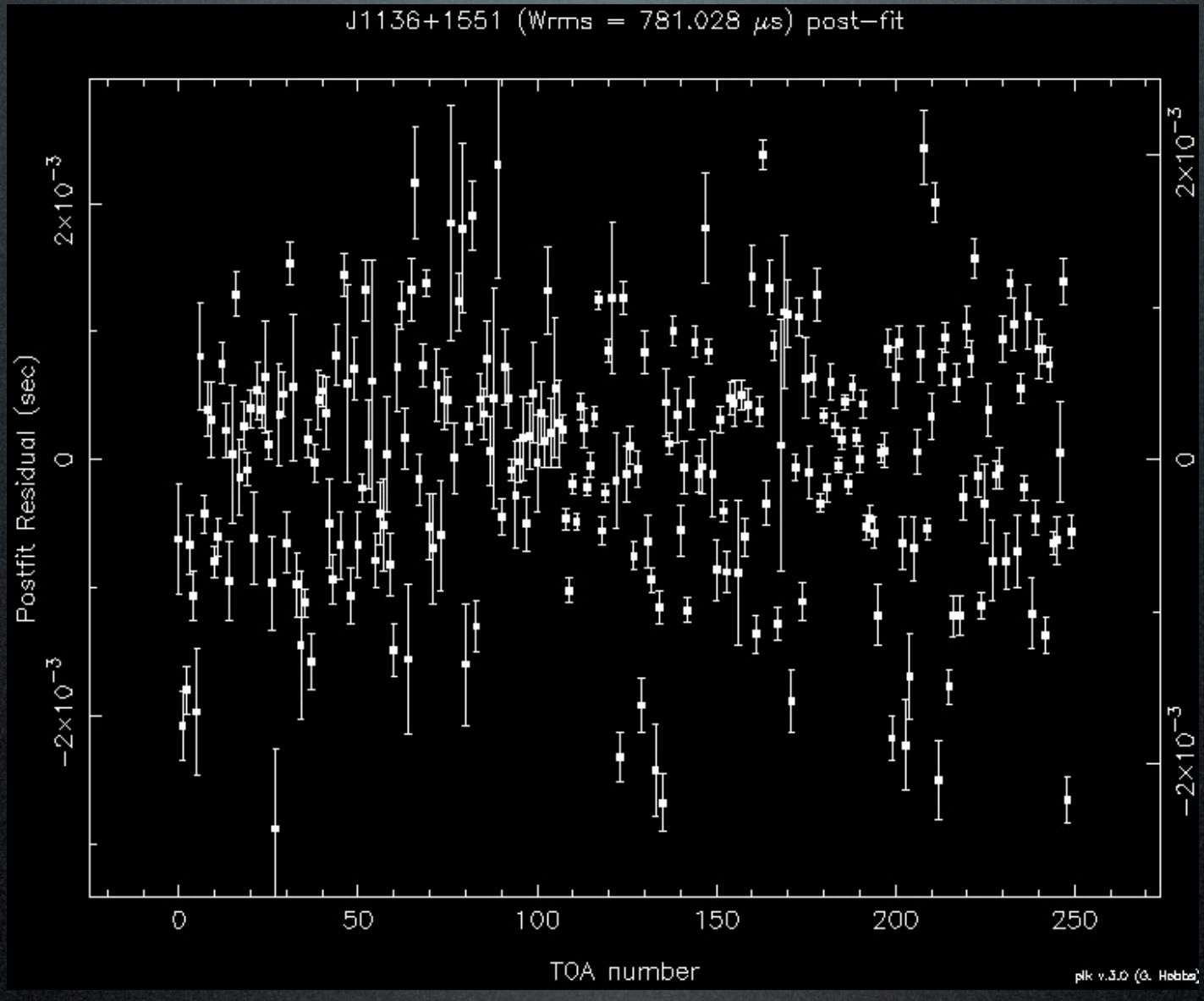
Credit: Ramesh Karuppusamy

Phase-coherent pulsar timing



Credit: Joris Verbiest

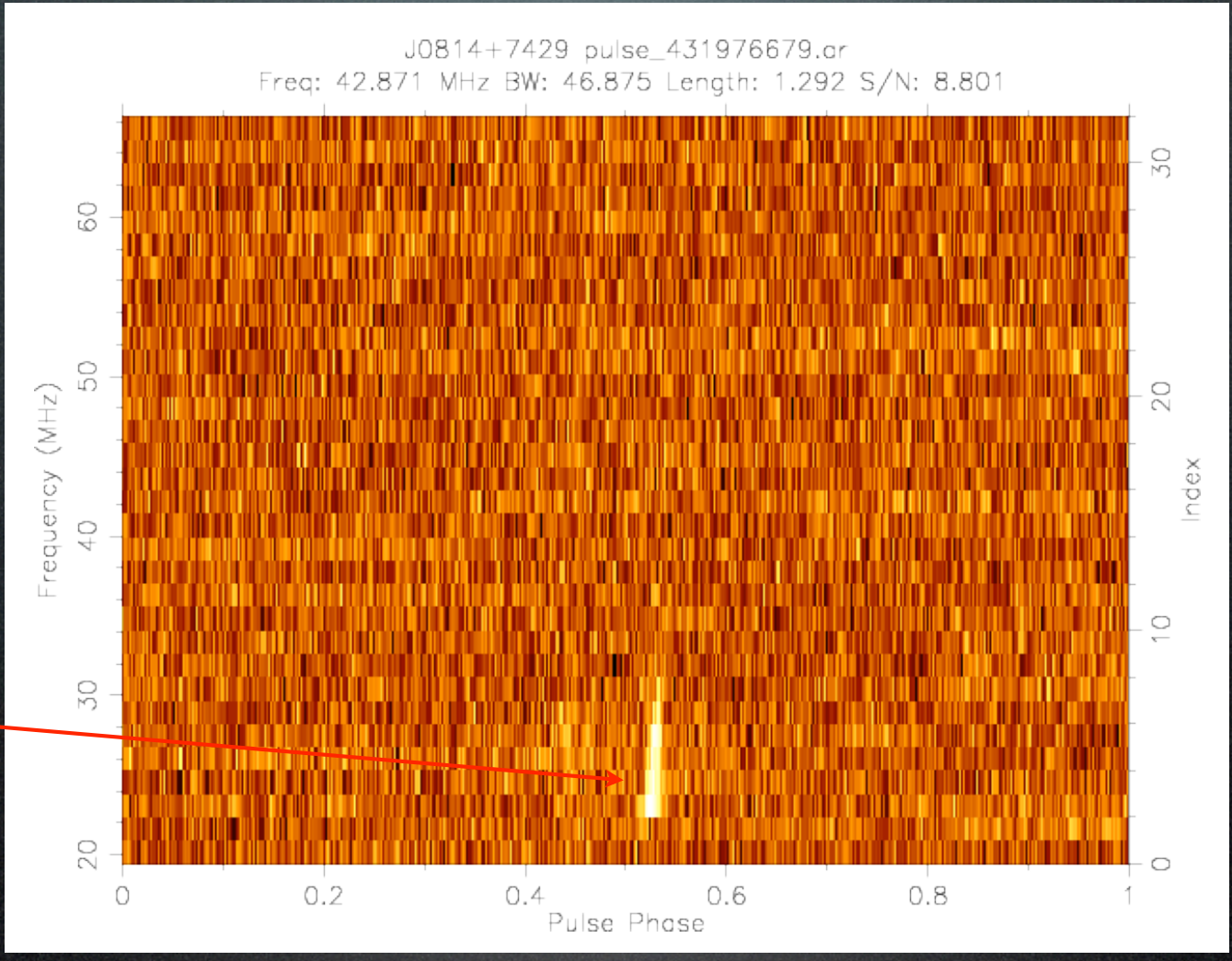
Phase-coherent pulsar timing



Credit: Joris Verbiest

Anomalously intensive pulses

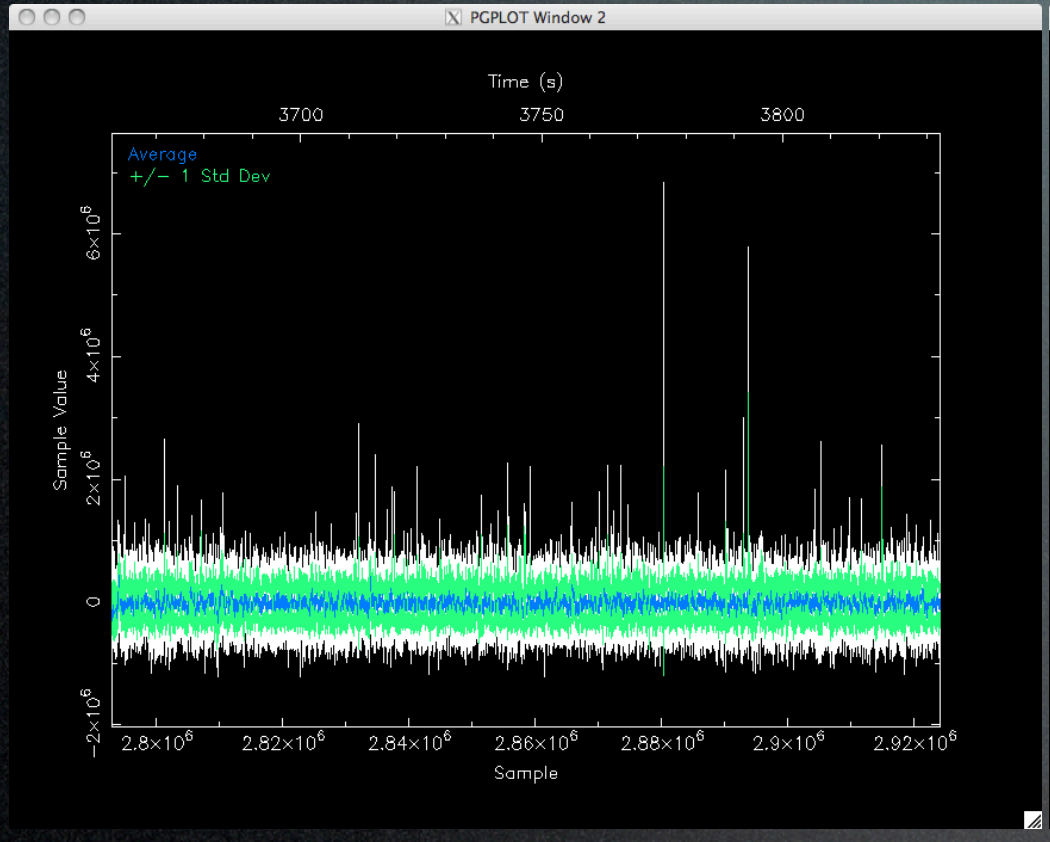
Single, narrow-band bright pulse

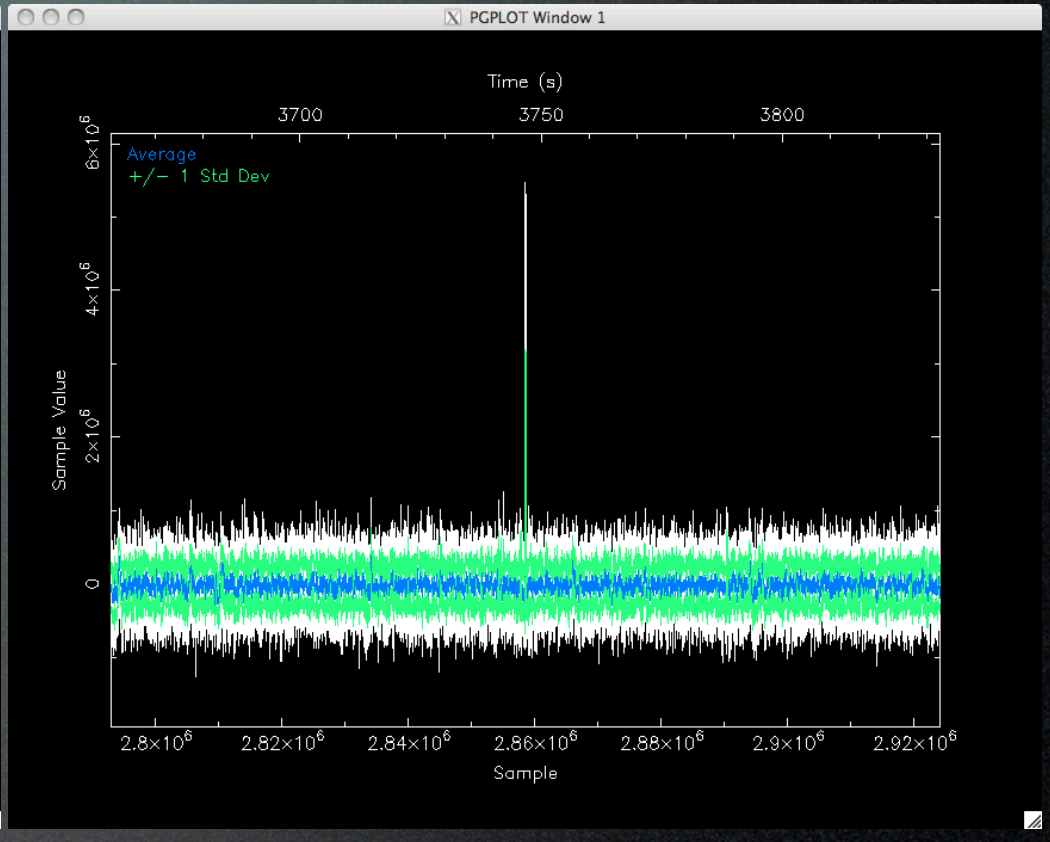


- Investigate further with simultaneous LBA/HBA data.
- Relation with classical “giant pulses”?

Credit: Vlad Kondratiev

Searches for single, dispersed pulses



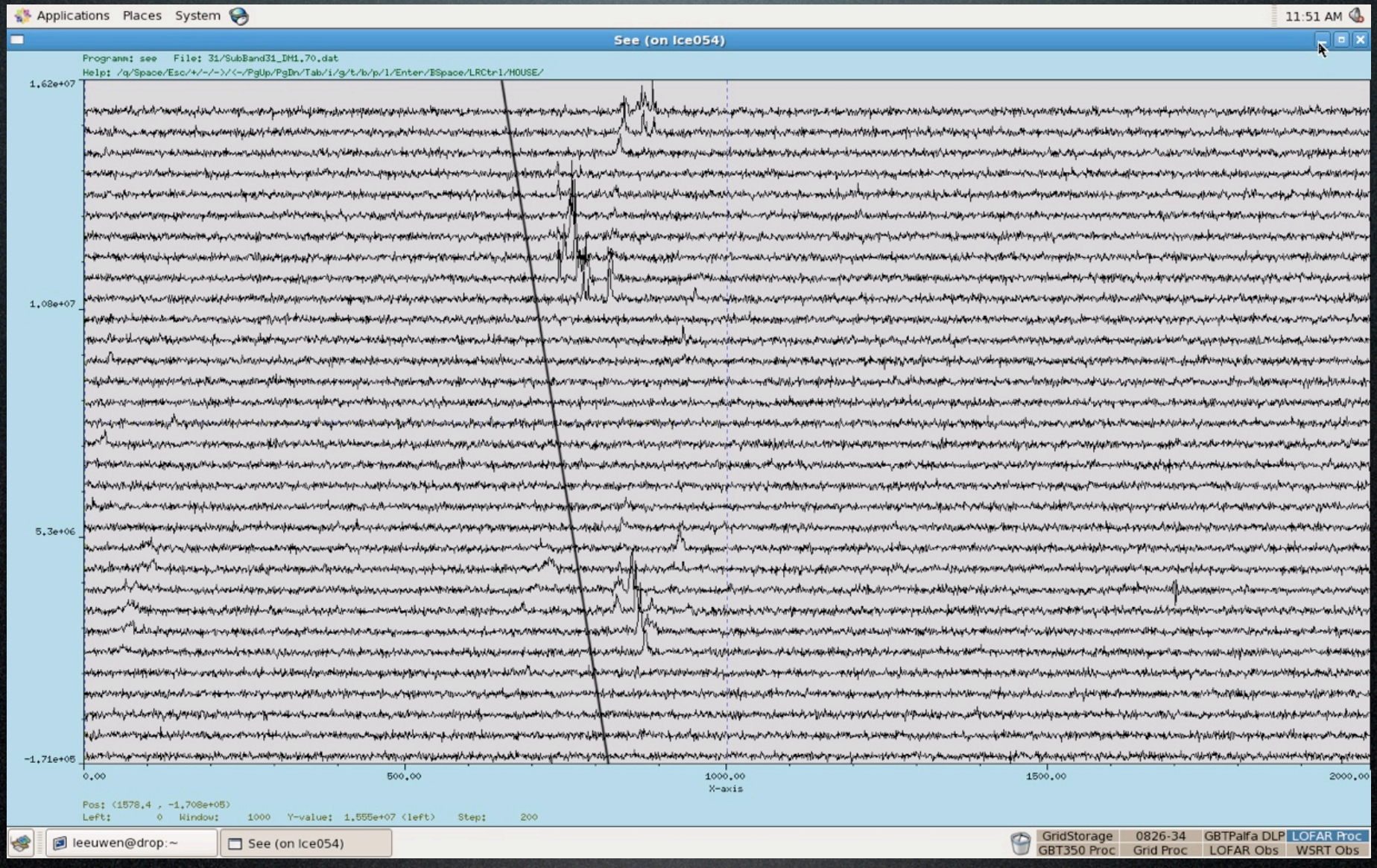


DM = 0 pc cm^{-3}

DM = 1.7 pc cm^{-3}

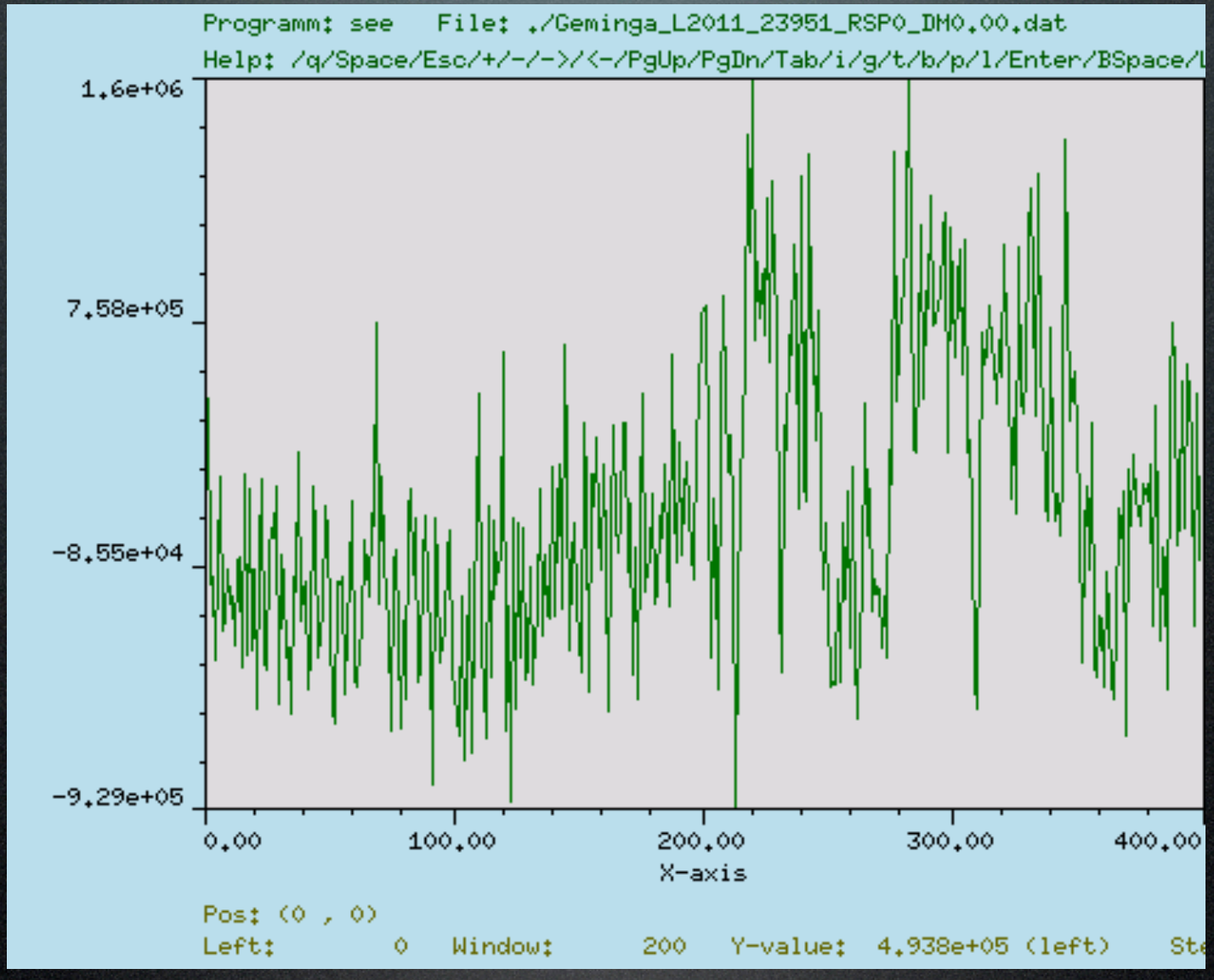
Credit: Jason, Thijs Coenen

Searches for single, dispersed pulses



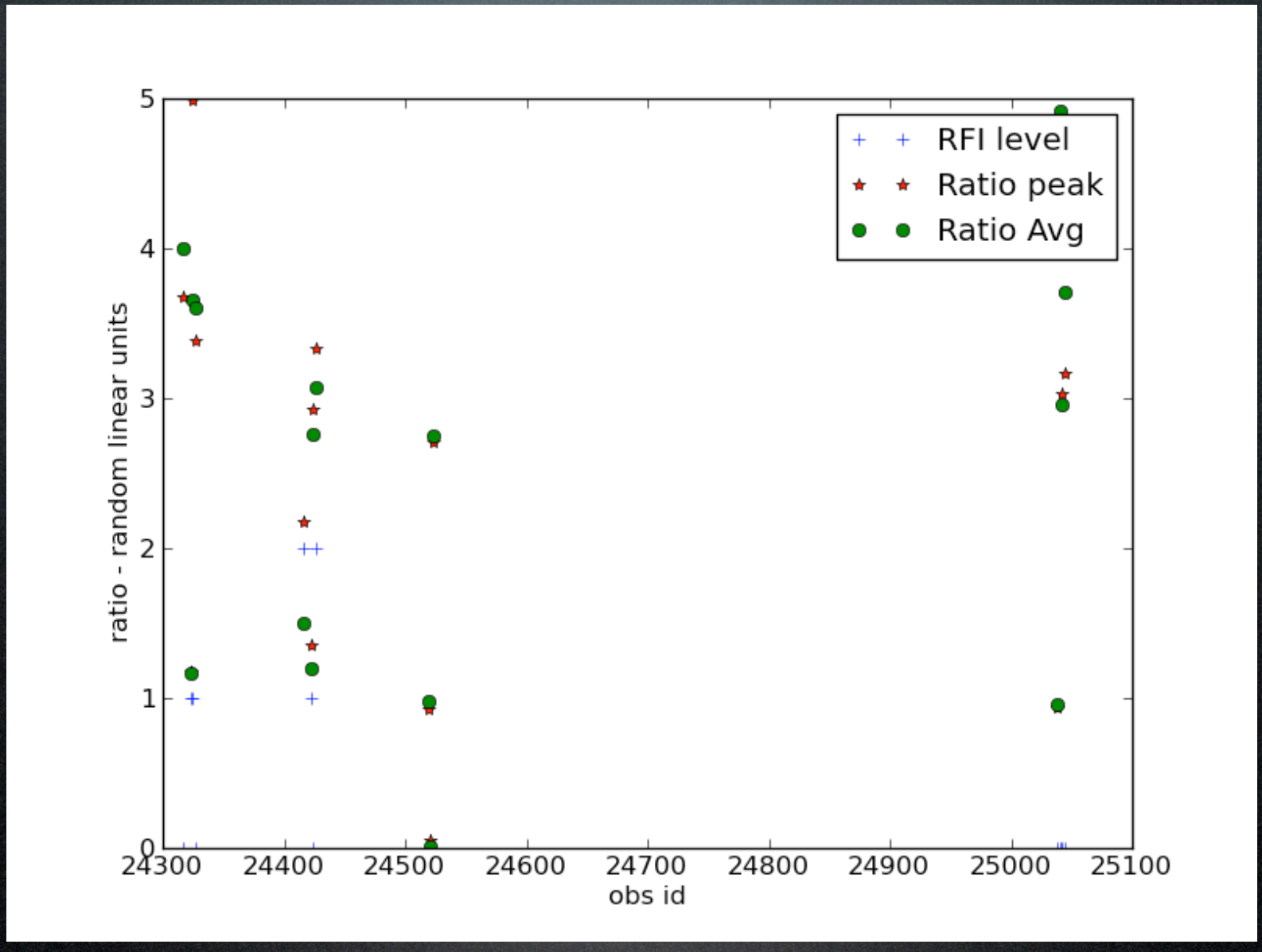
Credit: Joeri, Thijs Coenen

Searches for single, dispersed pulses



Credit: Vlad, Thijs Coenen

Tied-array vs. incoherent beam SNRs



Credit: Ashish Asgekar

Summary

- Fly's Eye monitoring is a useful way to gauge station health, calibration, and RFI environment.
- Polarimetry well advanced, but calibration still required to remove systematics on the ~5-10% level.
- Intriguing behavior seen from the Crab.
- Pulsar timing working so far, but longer timing baselines still need to be tested.
- Starting to do real searches for single dispersed pulses.