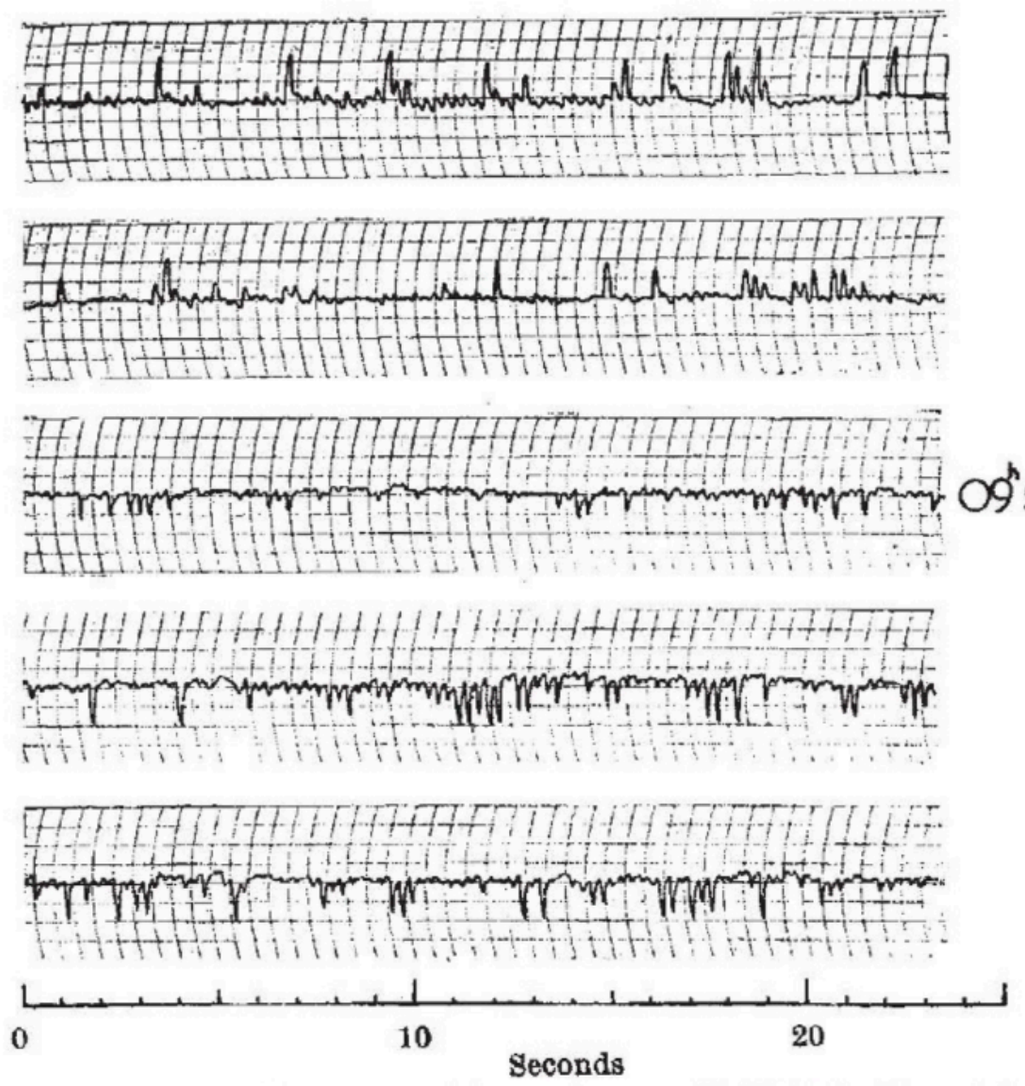
Pulsar of the week :

B0950+08

Introduction

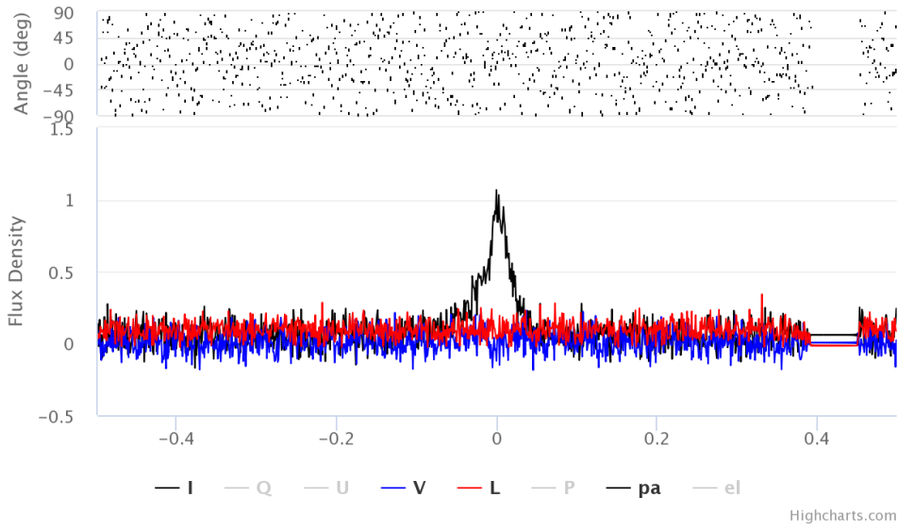
- Discovered in 1968 by J. Philkington, A. Hewish and J. Bell
- P = 0.2530651649482 sec
- DM = 2.96927 (relatively low)
- Multi-wavelength observations (Gamma ray - Radio waves)
- Initial observations showed large fluctuations in flux density.



Philkington 1968

J0953+0755

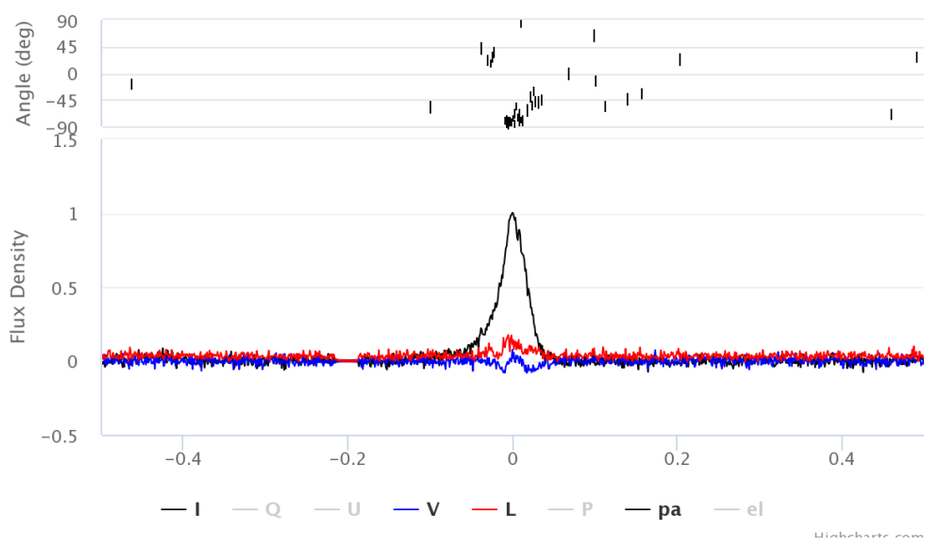
http://www.epta.eu.org/epndb/#hx97b/J0953+0755/hx97b_10450.epn



10GHz

J0953+0755

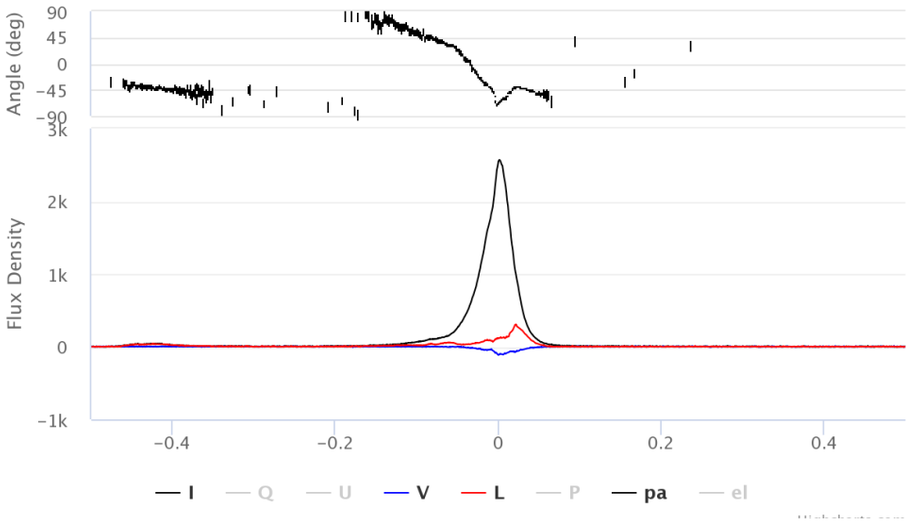
http://www.epta.eu.org/epndb/#hx97b/J0953+0755/hx97b_4850.epn



4.5GHz

J0953+0755

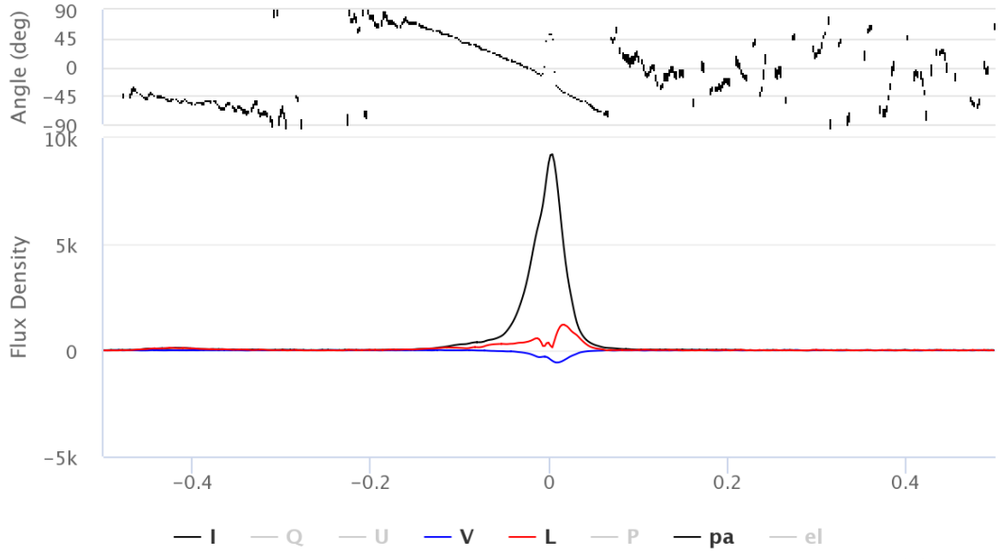
http://www.epta.eu.org/epndb/#jk17/J0953+0755/J0953+0755.1400MHz.psrfits



1.4GHz

J0953+0755

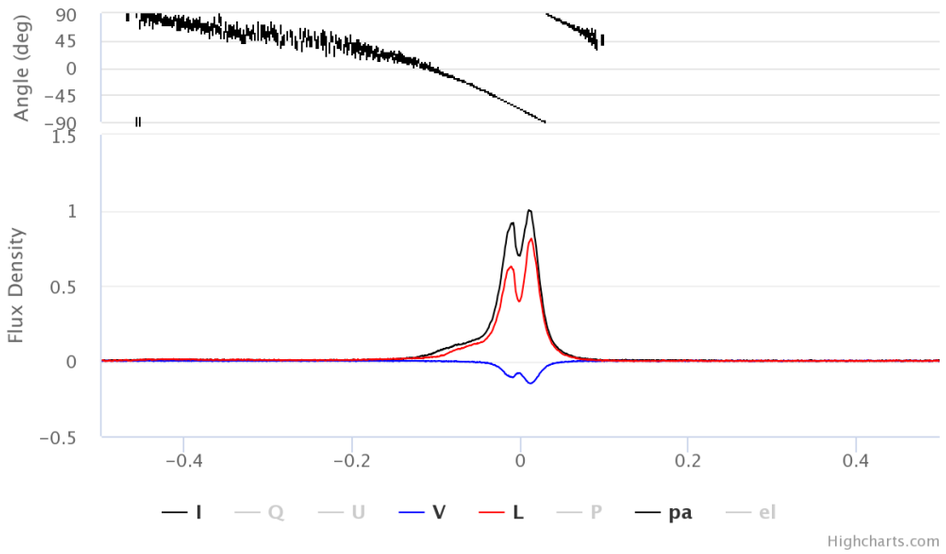
http://www.epta.eu.org/epndb/#gl98/J0953+0755/gl98_610.epn



610MHz

J0953+0755

http://www.epta.eu.org/epndb/#nsk+15/J0953+0755/B0950+08_L78234.STF



150MHz

J0953+0755

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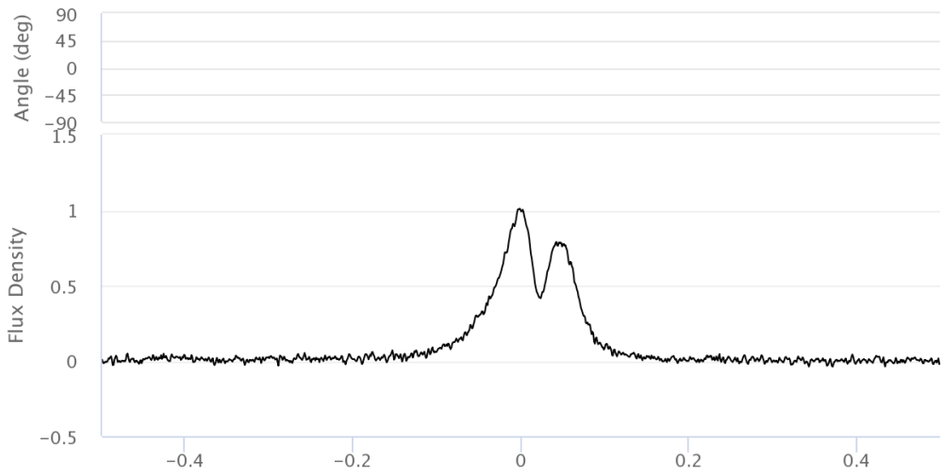


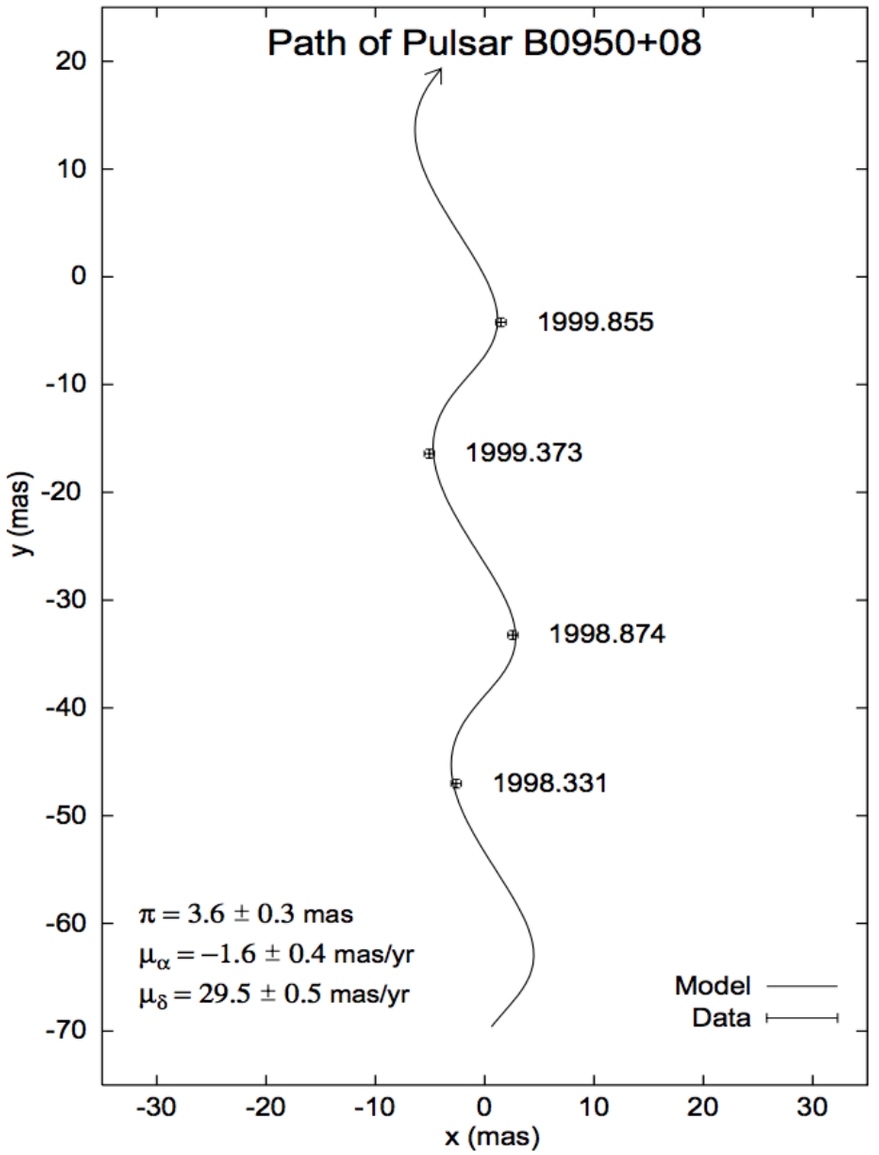
38MHz

Proper Motion

- Accurate pulsar distances - population and birthrate modelling, measurements of dispersion and Faraday rotation, studying the ionised interstellar medium and Galactic magnetic fields.

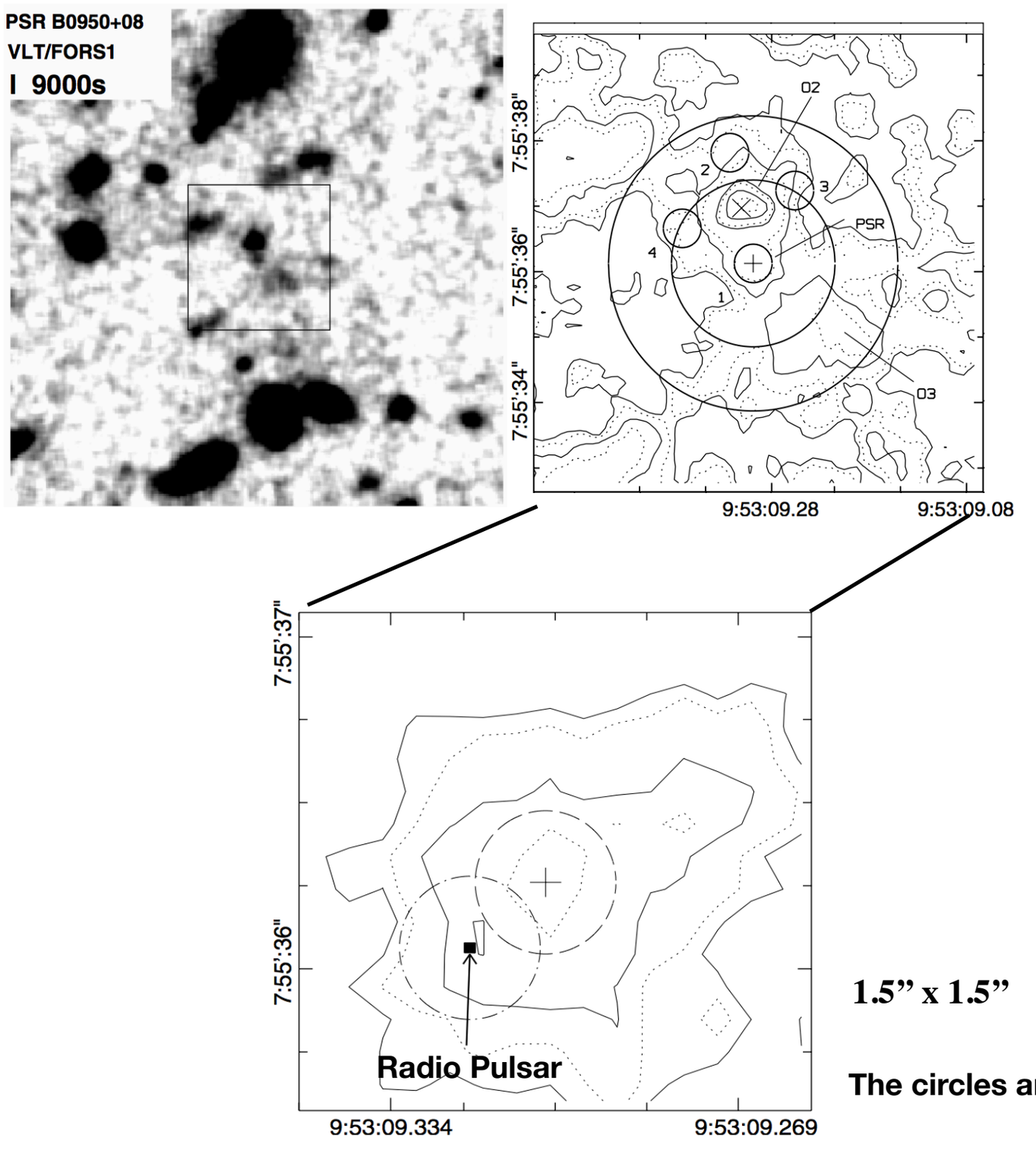
- Long-standing problem of difference in the electron density derived from the distance to PSR B0950+08 with that based on X-ray data (Toscano et al. 1999).

- Radio data puts the PSR more than twice as far away.



Brisken et al, 2000

Optical

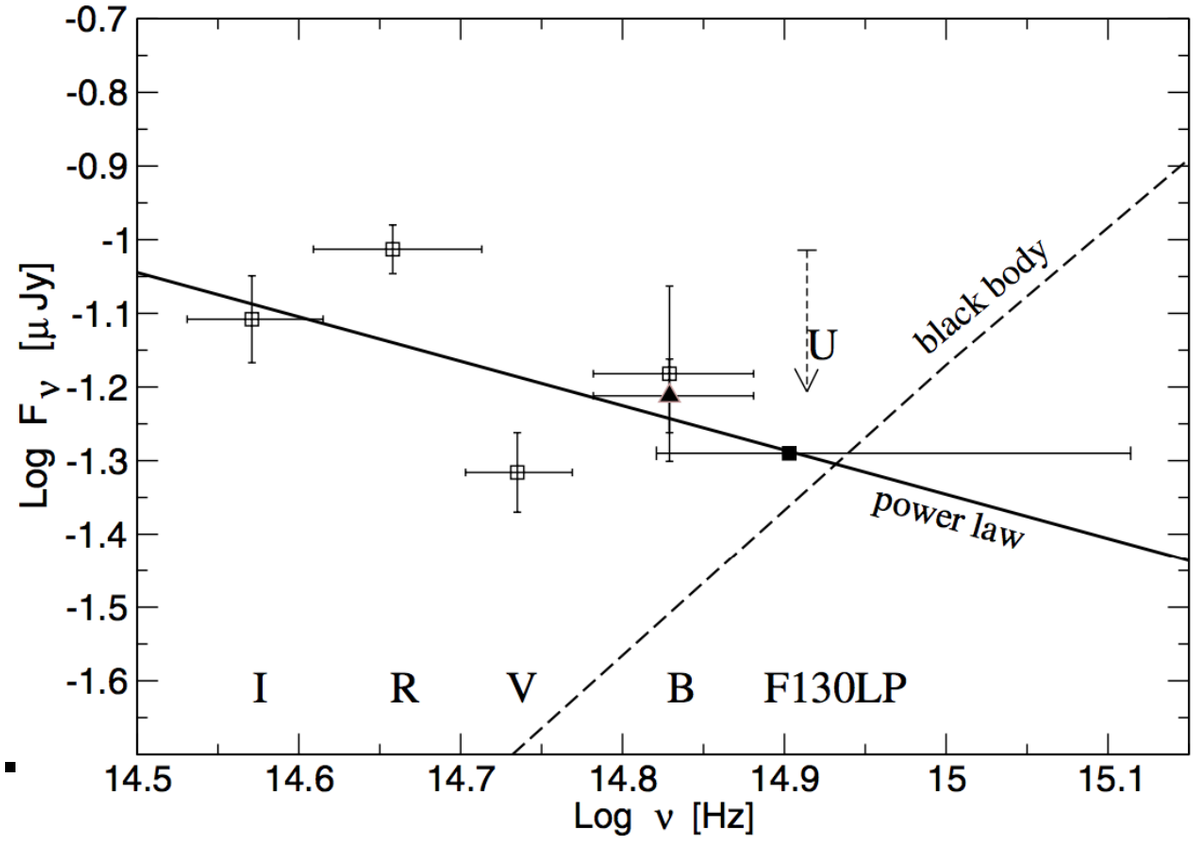


- The optical counterpart suggested by Pavlov et al (1996) was later to be confirmed by Zharikov et al (2002)
- The nearer candidate for the counterpart to the pulsar has a spectral index of ~ 6.45
- Deeper observations with higher spatial resolution are necessary to determine whether it is associated with a faint pulsar wind nebula (PWN) or with a background object.
- Accurate proper motion with deep pulsations from the BVRI counterpart —> confirmation of the pulsar?

The circles are 1 sigma uncertainty

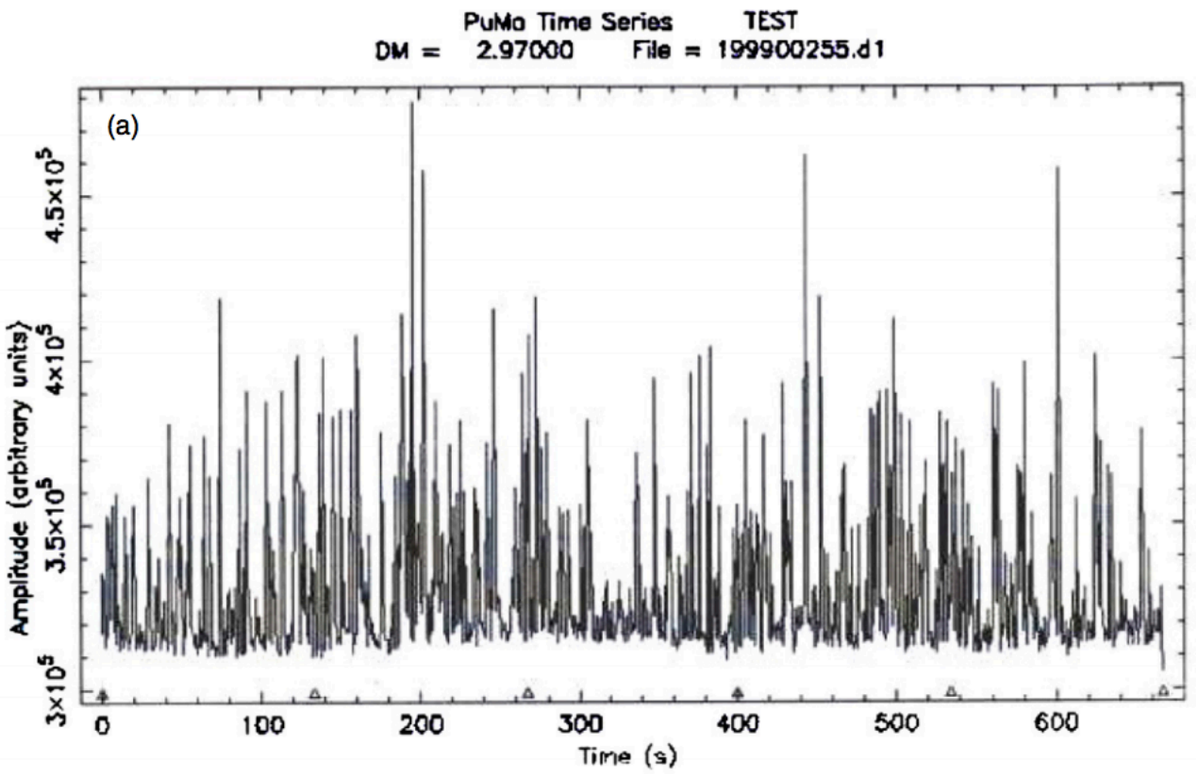
Non thermal origin of optical observations

- Broadband spectrum in optical does not follow Rayleigh-Jeans Law (Pavlov 1996)
- Lower X-ray flux in ROSAT band than the inferred thermal emission from R-J fit.
- Contrary optical model shows -ve slope.
- Emission originate from magnetosphere. - common origin (powered by rotation energy losses)

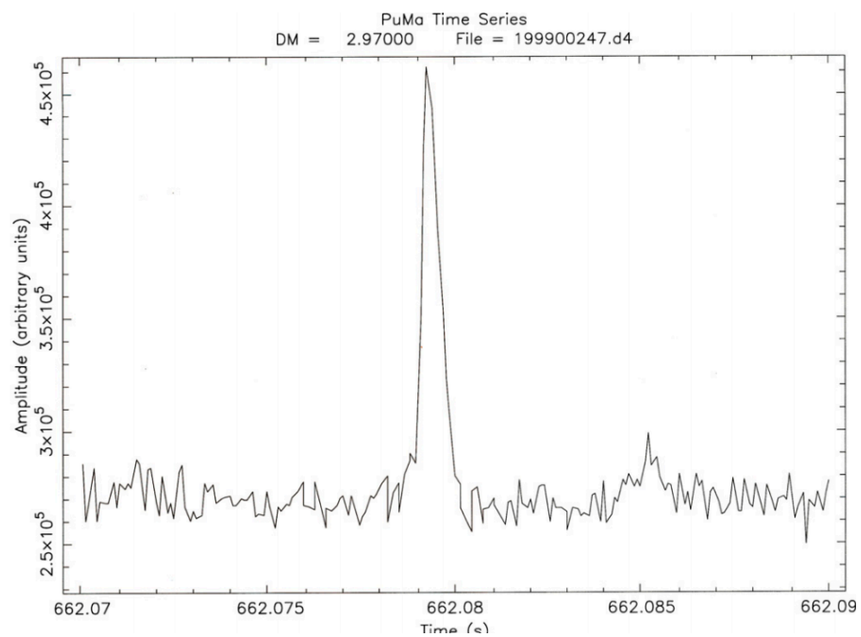


Zharikov et al, 2004

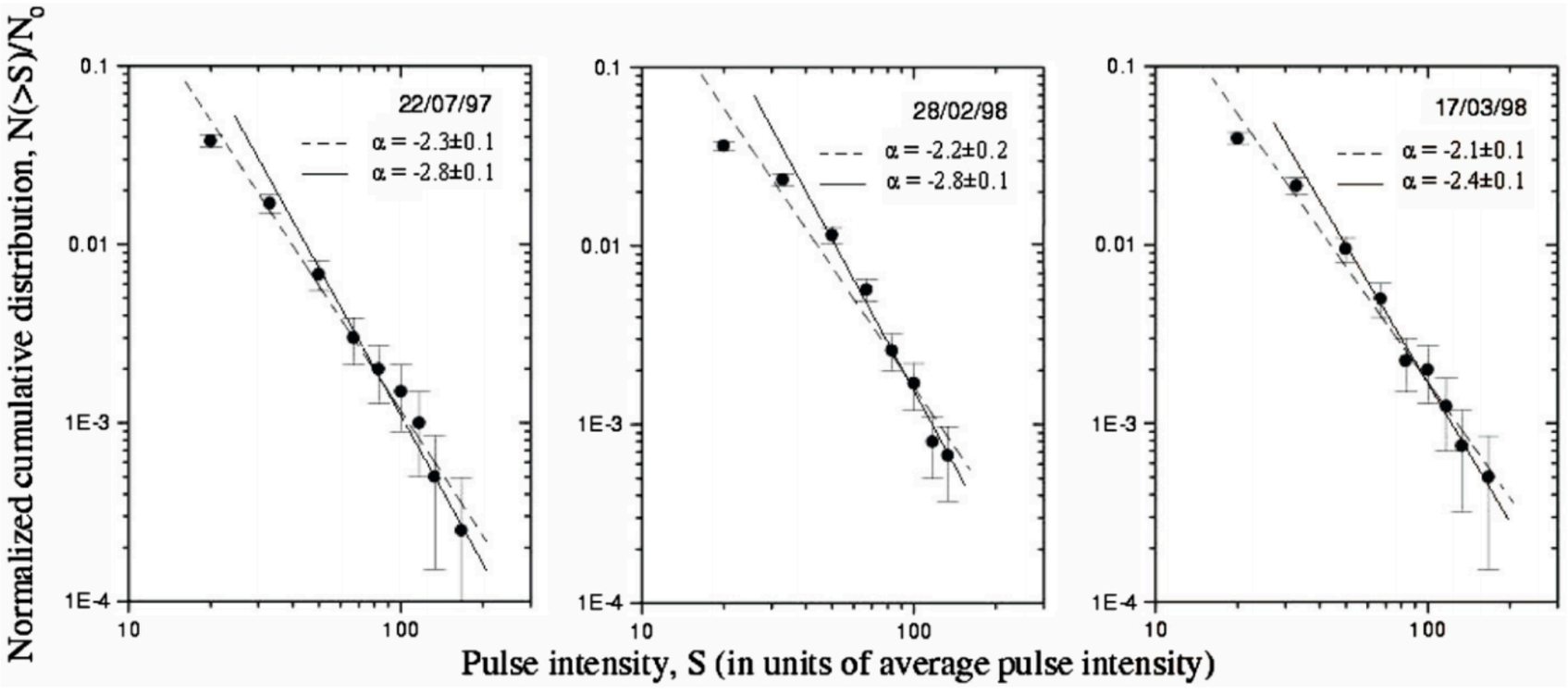
Giant Pulses



297 MHz



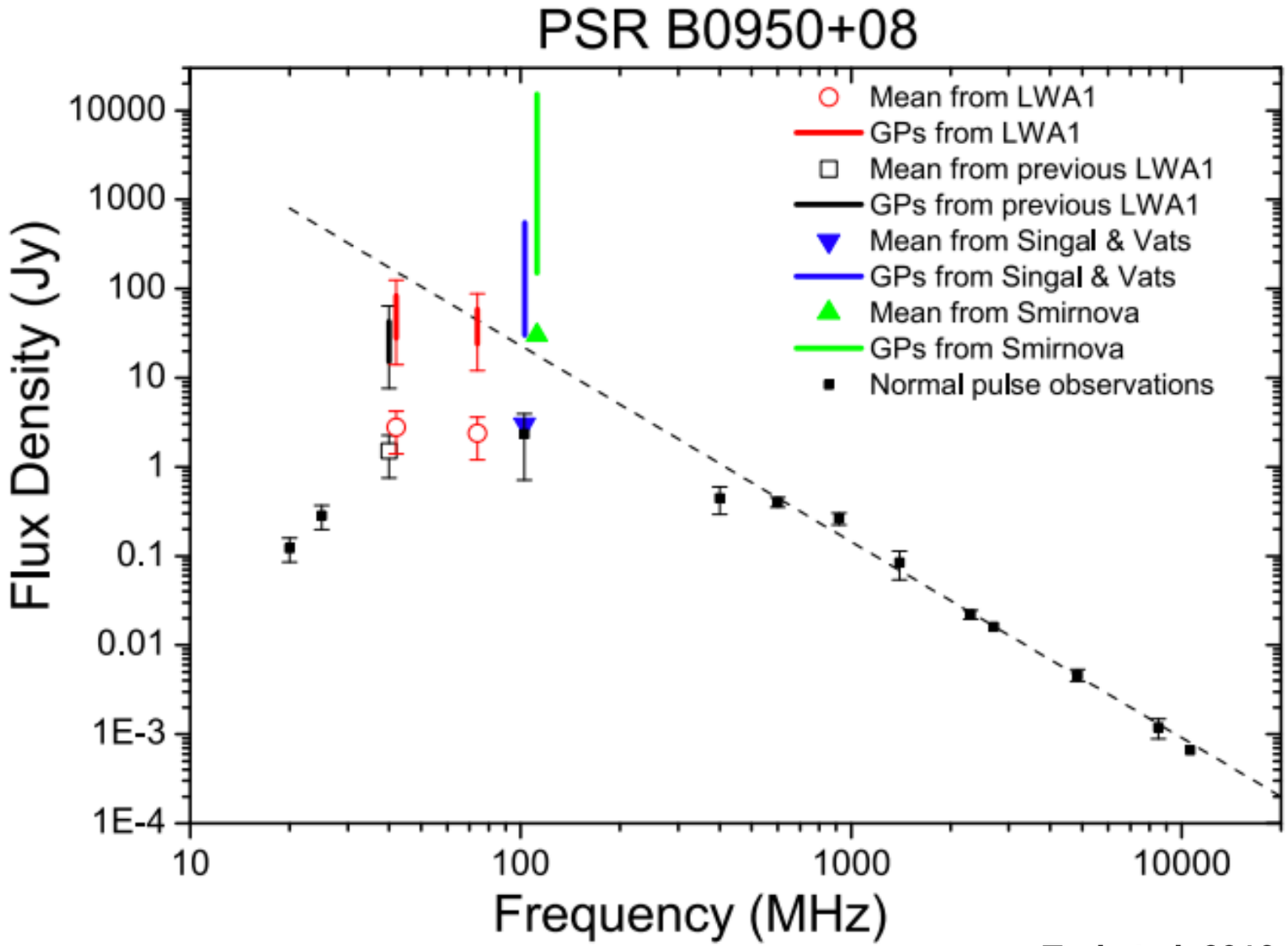
Singal 2012



- - Power law fit to the overall distribution
- Fit to high intensity (>30 times the average)

Ctd..

- Simultaneous observations done at 42 MHz and 74 MHz
- Turnover of spectra
- GPs used to probe pulsar emission region
- Difference in altitude - dipolar magnetic field model (Lorimer and Kramer 2012)



Tsai et al, 2016

Summary

- Multi-wavelength emission.
- Optical counterpart exist ?! — Deep BVRI observations required.
- Common origin of non-thermal X-ray emission and optical emission.
- Turn over in spectrum at lower frequencies for GPs.
- Microstructure present in large fraction of single pulses (5GHz) - refer Lange et al, 1998.