

Part 3
Studies of Radio Emission

Section C. Polarization

Linear Polarization Properties of Pulsars at 35 & 327 MHz

Ashish Asgekar^{1,2} & A. A. Deshpande¹

¹*Raman Research Institute, Sadashivnagar, Bangalore 560 080 INDIA.*

²*Joint Astronomy Programme, Indian Institute of Science,
Bangalore 560 012 INDIA.*

Faraday Rotation of the plane of polarization of broad-band signals, during propagation through the intervening medium, manifests as quasi-sinusoidal spectral modulations when observed with a telescope sensitive to a single linear polarization. Such a modulation can be exploited to study linear polarization characteristics of pulsars (Suleimanova, Volodin, & Shitov, 1988; Smirnova & Boriakoff 1997, Ramkumar & Deshpande 1999 (RD99)). We have used our data on a few bright pulsars at 35 MHz (Asgekar & Deshpande 1999, elsewhere in this volume) and data obtained at 327 MHz using Ooty Radio Telescope (see RD99 for details), to study average linear polarization properties using this technique. The data obtained over 256 frequency channels were re-sampled in the spectral domain to make the Faraday modulation appear periodic, and then a simple Fourier analysis was performed to look for (ACF) features associated with the possible spectral modulation (see RD99 for the analysis details).

We show, in fig. 1, the spectral modulation in the case of J0837-4715 at 327 MHz, along with the average polarization behavior. We estimate 1) the apparent $RM \simeq 131 \text{ rad/m}^2$; 2) the percentage linear polarization $\simeq 25\%$. For the pulsar J0846-3533, we find 1) $RM \simeq 126 \text{ rad/m}^2$ and 2) fractional linear polarization $\sim 33\%$ (fig. 2), whereas the corresponding estimates for J0924-5302 are $\sim 126 \text{ rad/m}^2$ & $\sim 15\%$ respectively. Our RM estimates are consistent with the catalogued values within the uncertainties in the ionospheric contributions.

In the data on B0834+06 at 35 MHz, we detect a weak but noticeable spectral modulation that corresponds to a period of 16.1 channel-widths. This would imply an $RM \simeq 13 \text{ rad/m}^2$ (the catalogue $RM = 23.6 \text{ rad/m}^2$). The average intensity corresponding to this modulation is shown in fig. 2 (without any statistical correction). We estimate the percentage polarization to be less than $\sim 38\%$. No periodic spectral modulation feature was obvious in the 35 MHz data on the pulsars B1133+16 & B0943+10, though the spectra did show some quasi-periodic intensity modulations.

References

- Asgekar, A., & Deshpande, A.A. 1999, see this volume
Deshpande, A.A., & Ramkumar, P. S. 1999, *J. Astrophys. Astr.*, 20, 37 (RD99)
Smirnova, T.V., & Boriakoff, V. 1997, *A&A*, 321, 305
Suleimanova, S.A., Volodin, Yu.V., & Shitov, Yu.P. 1988, *Soviet Ast.*, 32, 177

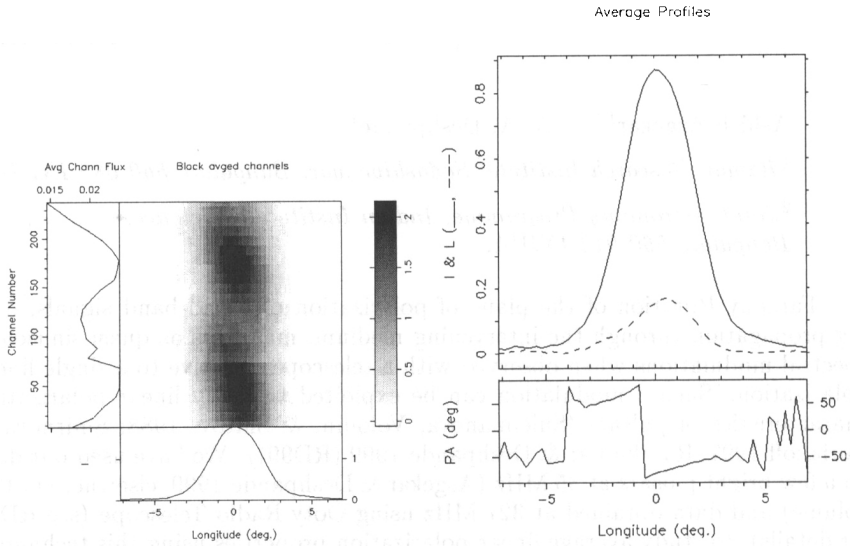


Figure 1. Spectral modulation (left) and average linear polarization profile for J0837-4135

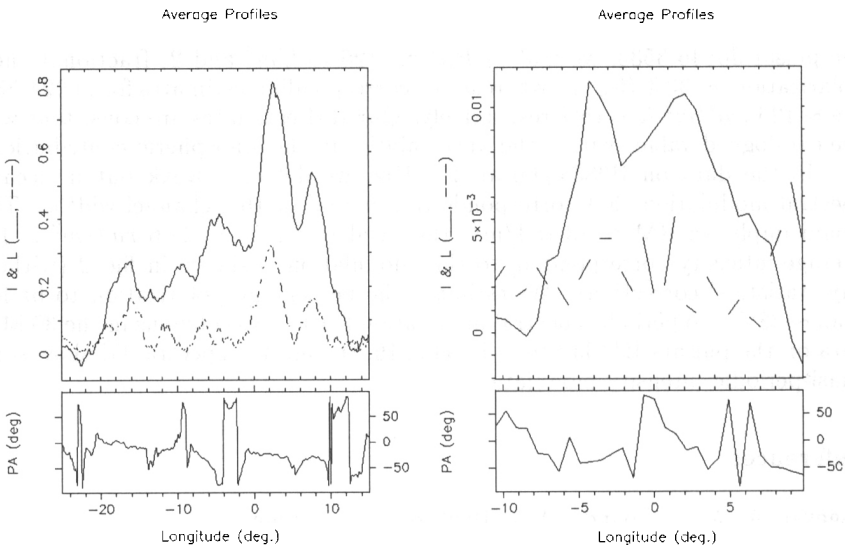


Figure 2. The average linear polarization profiles for J0846-3533 at 327 MHz (left), and for B0834+06 at 35 MHz.