

Initial solar observations with Prototype Brazilian Decimetric Array

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Abstract. The Prototype Brazilian Decimetric Array (PBDA) consists of 5 element alt-azimuth mounted parabolic dishes of 4-m diameter, having baselines up to 216 m in East-West direction. We present initial solar observations carried out with the PBDA during the period 22nd November to 11th December, 2004. The frequency of observation was 1.6 GHz. The temporal and spatial resolution were 100 ms and 3 arcmin, respectively.

Keywords. Interferometry, solar observations

1. Introduction: Phases of BDA

INPE's scientists and engineers initiated the design and planning of BDA project in 2000, with collaboration from several national and international institutions (Sawant *et al.*, 2000; Sawant *et al.*, 2002; Sawant *et al.*, 2003). The prototype array (PBDA) was put into operation at INPE's campus in São José dos Campos for preliminary testing and observations, in 2003. After the initial trial run, it was shifted and set-up at the INPE campus in Cachoeira Paulista (45° 00' 20" W and 22° 41' 19" S) in 2004 (figure 1). A complete description of the PBDA is given by Sawant *et al.*, 2006. The final phase of BDA will have 38 antennas, with 26 of them distributed in a random fashion over 400 × 400 m area. The other 12 antennas will constitute the three arms of a 'Y' with baselines up to a maximum of 2 km. This array is expected to be ready by the end of 2008.

2. Initial solar observations with PBDA

During the period from 22 November to 11 December, 2004, about 370 hours of observations of Sun and a few strong sidereal sources were carried out with the PBDA at 1.6 GHz. The temporal and spatial resolution were 1.6 s and 3 arcmin, respectively. The observations indicated the mean ratio between the expected and the observed spatial resolution for all baselines is of about 98 %. We present here the E-W one-dimensional brightness temperature distribution of the Sun, synthesized using data obtained with PBDA on December 11, 2004 (figure 2a). We compared our observations with the North-South integrated soft X-ray image of the solar corona obtained with GOES-12 satellite around the same time (figure 2b). There is a good correspondence between them.

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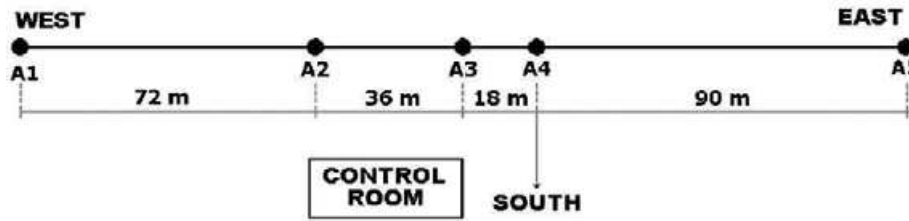


Figure 1. Distribution of the antennas and baselines of PBDA at INPE-CP Campus. The antennas are in the E-W direction and the longest baseline is 216 m.

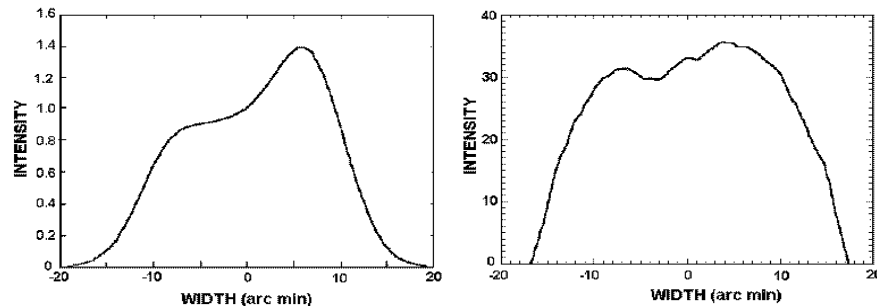


Figure 2. E-W one-dimensional brightness distribution of Sun at 15:00 UT on Dec. 11, 2004): (a) obtained from PBDA observations at 1.6 GHz; (b) generated by integrating the GOES-12 soft X-ray image along the N-S direction of the Sun.

3. Conclusions

The PBDA is the first radio interferometer array in Latin America. It is now in regular operation from December 2004 onwards. The frequency of the fringes obtained on different baselines in the array are in good agreement with the expected value. The E-W one-dimensional brightness distribution of Sun obtained with PBDA was compared with GOES-12 soft X-ray image and they are in good agreement.

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References

- Sawant, H.S., Subramanian, K.R., Lüdke, E., Sobral, J.H.A., Swarup, G., Fernandes, F.C.R., Rosa, R.R. & Cecatto, J.R. 2000, *Adv. Space Res.* 25(9), 1809
- Sawant, H.S., Neri, J.A.C.F., Fernandes, F.C.R., Cecatto, J.R., Sankararaman, M.R., Faria, C., Subramanian, K.R., Sundararajan, M.S., Ramesh, R. & Karlický, M. 2002, *Proc. ESA SP 506* Vol. 2, 971
- Sawant, H.S., Neri, J.A.C.F., Fernandes, F.C.R., Cecatto, J.R., Sankararaman, M.R., Faria, C., Stephany, S., Rosa, R.R., Andrade, M.C. Alonso, E.M.B., Ldke, E., Subramanian, K.R., Ramesh, R., Sundararajan, M.R., Ananthakrishnan, S., Swarup, G., Boas, J.W.V., Botti, L.C.L., Moron, C.E. & Saito, J.H. 2003, *Adv. Space Res.* 32, 2715
- Sawant, H.S., Ramesh, R., Cecatto, J.R., Faria, C., Fernandes, F.C.R., Rosa, R.R., Andrade, M.C., Madsen, F.R.H., Stephany, S., Cividanes, L.B.T., Miranda, C.A.I., Botti, L.C.L., Boas, J.W.S.V., Saito, J.H., Moron, C.E., Mascarenhas, N.D.D., Subramanian, K.R., SundaraRajan, M.S., Ebenezer, E. & Sankararaman, M.R. 2006, *Radio Sci.* (accepted)