

Upgraded GMRT: (Updated) primary-beam shape parameters

September 9, 2022

This note gives the preliminary and updated coefficients of the beam shape parameters for the upgraded GMRT (uGMRT). These parameters have been determined by fitting an even polynomial (of 8th order) to the measured antenna response. The updated fitted polynomial coefficients are being provided for the bands 5, 4 and 2, whereas fitted polynomial coefficients for band-3 are from our earlier (1 December 2018) note.

This short note does not characterize the level of accuracy of the polynomial fits; this, including details of the methodology, results and other related issues are discussed in the technical note(s) for bands 2, 4 and 5, available at

http://www.gmrt.ncra.tifr.res.in/gmrt_users/help/help.html .

The technical note for the remaining band-3 is currently under preparation. More information, if any please contact Santaji Katore / Jayaram Chengalur (for band-5 only), and Santaji Katore / Dharam Vir Lal (for all other bands).

Primary beam parameters

The table below lists the coefficients of an 8th order polynomial fit to the antenna primary beam for the different bands of the uGMRT. The fit polynomial is

$$1 + \left(\frac{a}{10^3}\right)x^2 + \left(\frac{b}{10^7}\right)x^4 + \left(\frac{c}{10^{10}}\right)x^6 + \left(\frac{d}{10^{13}}\right)x^8,$$

where x is in terms of separation from pointing position in arc-min times the frequency in GHz.

The terms a , b , c and d are essentially the same as would be required for PBPARAM(3), PBPARAM(4), PBPARAM(5) and PBPARAM(6), respectively, with PBPARAM(1) = 0.1 and PBPARAM(2) = 1, in the AIPS task PBCOR. Similarly, we have included these parameters in the CASA6 compatible task `ugmrt_p_b`, available at

<https://github.com/ruta-k/uGMRTprimarybeam-CASA6> .

More information, if any please contact Ruta Kale / Dharam Vir Lal.

Table 1: Coefficients of an 8th order polynomial fit to the antenna primary beam.

observing band (MHz)		polynomial coefficients			
		a PBPARAM(3)	b PBPARAM(4)	c PBPARAM(5)	d PBPARAM(6)
Band-2	125-250	-3.089	39.314	-23.011	5.037
Band-3 [†]	250-500	-2.939	33.312	-16.659	3.066
Band-4	550-850	-3.263	42.618	-25.580	5.823
Band-5	1050-1450	-2.614	27.594	-13.268	2.395

[†]: (old) polynomial coefficients at band-3 from our earlier (1 December 2018) note.