What primary beam does CASA use for ALMA 12-m antennas? And what is the actual ALMA 12-m antenna primary beam, for that matter?

Brian Mason - 2020-09-21 - Offline Data Reduction and/or CASA

The voltage pattern assumed by CASA for the ALMA 12-m primary beam is currently hard coded to a uniformly illuminated 10.7-m dish with 0.75m blockage, resulting in an Airy disk whose FWHM is similar to a 12m Gaussian illumination with -12dB taper and 0.75m blockage. However its actual functional form will differ and in particular the sidelobes will be higher than the real ALMA dish sidelobes are.

The actual ALMA antenna primary beam shape is a matter of active work, but the main lobe is reasonably well represented as having a FWHM of 1.13 lambda/d. This is what you would expect from a 12m with a Gaussian voltage illumination pattern that is tapered to -10 dB (rather than -12 dB as specified in design documents) that has a 0.75m blockage. The reasons for these discrepancies are under investigation.

See also Section "Single-dish Response" of the ALMA Technical Handbook.

Related Knowledgebase article:

- "How do I model the ALMA primary beam, and how can I use that model to obtain the sensitivity profile for an image mosaic?"