Antenna prototype holography data analysis

R. Lucas

September 5, 2000

1 Introduction

The baseline proposition is to use the CLIC data reduction software of the Plateau de Bure interferometer. The raw data should be written in the FITS data format foreseen for the test interferometer (data format being prepared by R. Lucas and B. Glendenning). A FITS reader will be written at IRAM to convert the data into CLIC internal format.

2 Data reduction operations

1. *Calibrate data in amplitude and phase*, based on bore-sight measurements at beginning and end of each map row, assuming gradual drift in amplitude and phase with time.

   This will be done in CLIC, using the standard amplitude and phase calibration commands.
2. *Interpolate data to a regular grid* in antenna-based coordinate system

   This is implemented in CLIC.
3. *phase correction* for variation of the projected distance between the reference field and the antenna aperture plane.

   This is a simple phase correction, to be implemented (combined with the next one in a single operation).
4. *Amplitude and phase corrections* to allow for measured reference feed response.

   Easy to implement.
5. *Optionally taper to improve PSF*

   Not implemented, but quite easy.
6. *FFT to aperture plane* (Note: 64, 128, or 256 are OK).

   Available in CLIC.
7. *FFT Mask edges and blockage*

   Available in CLIC. Change to actual blockage.
8. *Correct for measured feed phase diagram*

   Easy to implement.
9. *Fit and remove 6 phase terms:* constant, 2 linear gradients, 3 focus translations.

   Available in CLIC, the exact formula is used, not the parabolic term, for focus translations.
10. *Convert to normal displacement map:*

    Available in CLIC.
11. *Fit panel displacements (deformations ?) and screw adjustments.*

    Available in CLIC; but actual antenna and panel characteristics are needed. In CLIC we deconvolve for finite resolution effects by an iterative procedure (subtracting the truncated field of the fitted panels from the measurements, to get the next order correction, ...). This procedure might be used to correct for near-field effects if the field of the fitted panels is computed by using the Fresnel integral.

3 To Do List

1. Define FITS data format.
2. Write FITS to CLIC conversion program.
3. Implement pre-FFT amplitude and phase corrections (reference feed motion, reference feed amplitude and phase diagram, apodisation).
4. Implement post-FFT corrections (feed phase diagram).
5. Get aperture blockage data for both prototypes.
6. Get panel mechanical data for both prototypes, implement in CLIC.
7. Implement near-field corrections in panel fitting loop.