L FAR libr tion str tu y

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Abs rac

his is the st te of irs t the LOFA Critic l Design eview,

2 Development strategy

Reduction of ■ SRT ob ervation that include the experimental LOFAR/ HAT tation. Thi exerci e the modelling of LOFAR HBA voltage beam , and the combination of (highly) di imilar tation . Thi i the fir t example of a pro ect that cannot be handled by any of the exi ting package .

■c1 7 ■ 117 MHz (SRT LFFE) exerci e the Minimum Iono pheric Model (MIN) concept, and other low-frequency i ue that are highly relevant for LOFAR. Optionally another LFFE field without a bright ource could be attempted, to exerci e olving for pha e gradient only (after cro -calibration with a calibrator ource). It could al o be u ed to exerci e redundant pacing calibration.

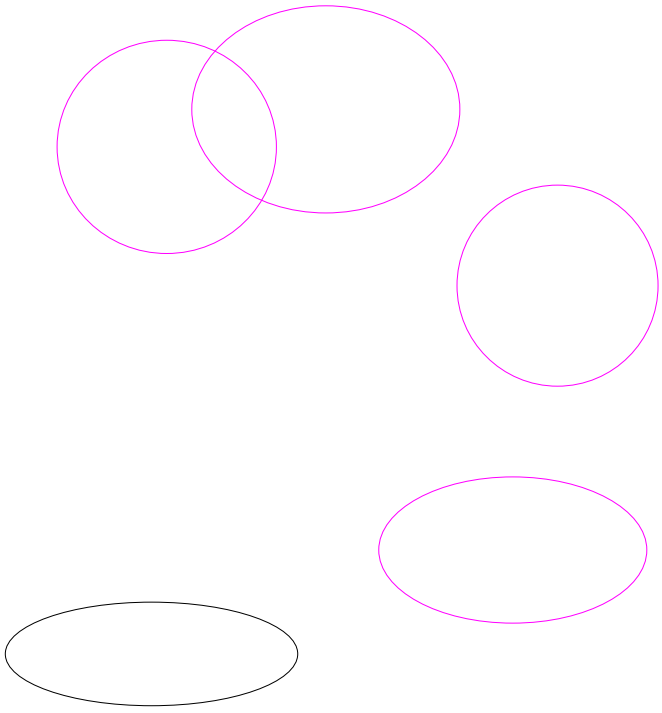
■c...: Thi field contain a ub tantial number of bright point ource in the field. It exreci e the olving for individual tation beam hape (which include pointing error).

■ee al o the appendix.

3 t ■■br tion = ource i ubtr ction

A tated before, calibration can be equated with the ubtraction of foreground ource . Becau e of image-plane effect , they mu t be ubtracted from the uv-data a much a po ible. Unfortunately, in order to pre erve the field ize, ubtraction mu t be done at full (f,t) re olution, which i expen ive. ne di tingui h three categorie of ource :

1. **Cat I sources** are the 20- 0 ource per FOV that are o bright that they



olving for M.E. parameters (Me Parms)

Arguably the mo t important function of the calibration y tem i olving for M.

7 Local ky Model (L M)

The Local ky Model (ee fig) repre ent the ub et of the GM that i relevant to a particular ob ervation. It contain the following main component :

The **sourc list** refer to the ource that are included in the LM. The majority will be parametri ed ource component (P

B

field-of-view

Some of the e effect have been analy ed to ome extent (cite BSR), but it remain unclear what their preci e impact on the image will be in practice. In addition, there are bound to be other one , that we have not yet thought of. In ome ca e , the artefact may be impo ible to get rid of entirely, o the be t we can do i make ure that it cannot be confu ed with a cientifically intere ting feature like the EoR. In all ca e , the only way ahead i to u e adequate tool to patiently chip away at the problem.

ibrevs (MIM)

Over the year , the idea for an iono pheric model for LOFAR have undergone

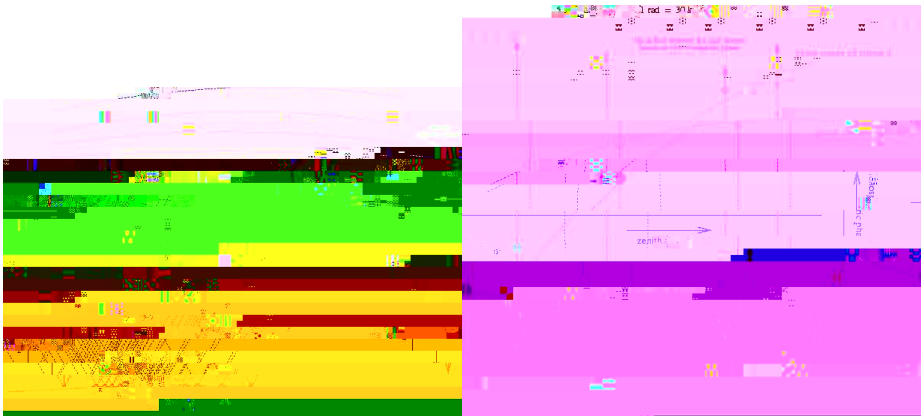


Figure 8: *The*

12 tation Beam shapes

The LOFAR tation primary beam will have much h gher idelobe thanthe parabolic d he that we are u ed to. In the word ofJaap Bregman: “LOFAR

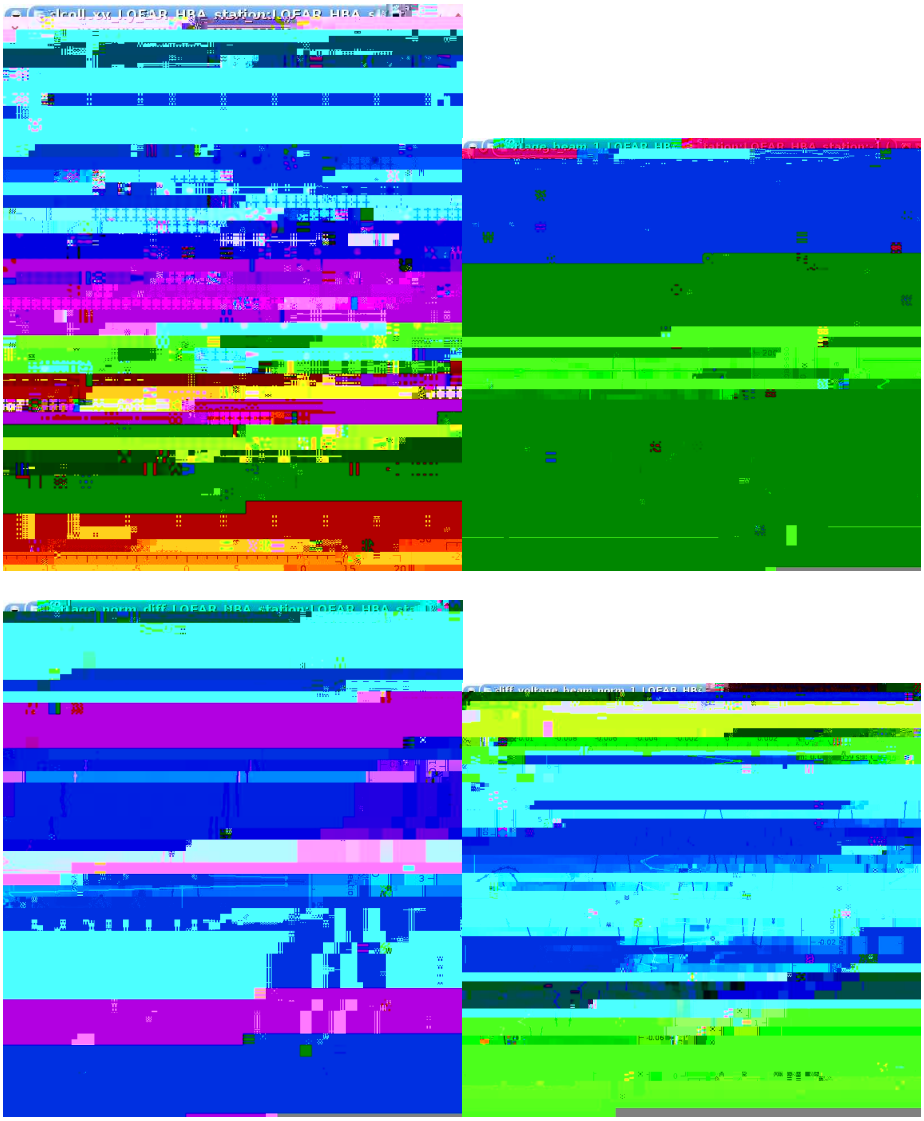


Figure 9: *Simulation of LOFAR HBA station beams, using MeqTrees. The top-left (meqbrowser) image shows the HBA antenna configuration, while top-right shows one of the two voltage beams @ 150 MHz, when pointed at azimuth (a) of rad, and elevation of 1.0 rad. Bottom-left shows the normalised difference between two voltage beams, and bottom-right shows the normalised*

at II ource in tation beam idelobe

MIM validation

Minimi ation of peeling contamination

primary beam.

B

C.2 The MeqBrowser GUI

The MeqBrowser GUI (see fig 11) is a powerful tool for the generation, control, and inspection of MeqTrees. It has the following main features:

- Script editor. Once a TDL script is loaded, it may be edited. The result

It cannot be stressed enough that the functionality of the MeqBrowser GUI enormously reduces the turnaround time for experiments and debugging. If anything, this speeds up development time proportionally, and reduces the chance of undetected errors.

C.3 o ering the threshold

MG cript (example , demon tration, experimentation, importable function) and 'official' TDL cript .

D lossary

Since the LOFAR calibration y tem nece arily contain a few innovation ,

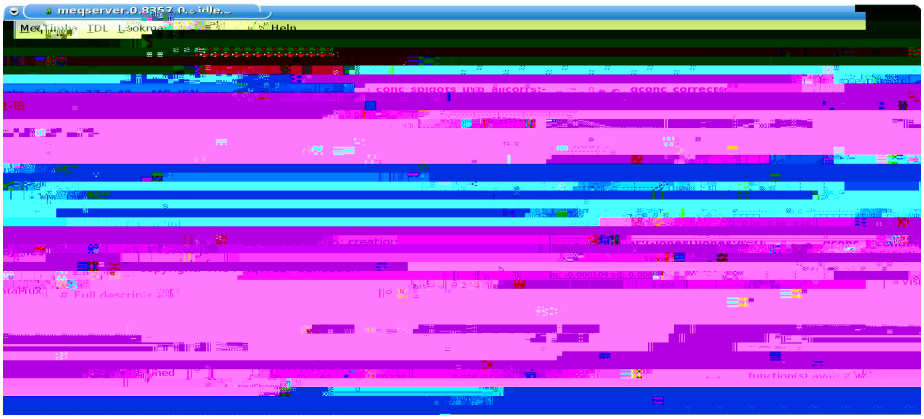


Figure 11:

olver/condeq: A olver collect condition equation from it condeq children, and accumulate them into a olution matrix. It invert te matrix,