

Polarization Imaging Analysis of the two latest versions of the AW imager

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It was reported by David Mulcahy (herein DM) in the June 21st busy day reports (Investigation of Polarized Sources using Awimager) that non-real flux was observed in the Q and U polarisations with an increasing deviation as a function of distance from the centre point. This was initially observed using a sky model of Stokes I only and was extended to further models in which source fluxes for (I, Q) and (I, U) were included.

Standard Test

In order to maintain consistency between our method and that of DM, the peak flux was obtained from a region placed around each source. In cases where a negative flux was observed the minimum value was taken. For the Stokes I only model, the results were found to be in agreement with those of DM.

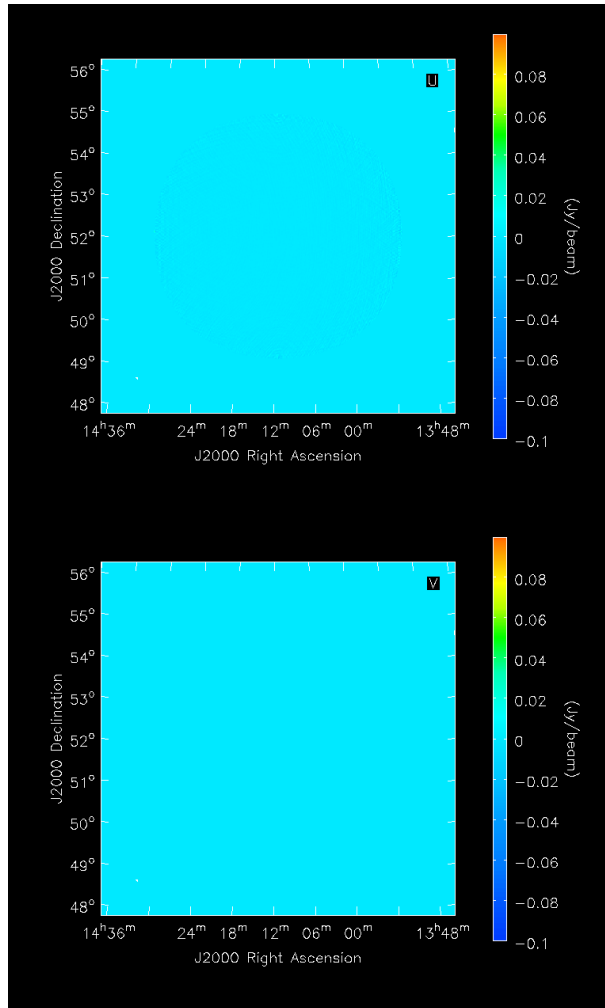
Element Beam Applied

The previous calculations were performed without element beam correction. This was thought to be a possible source of leakage in to polarisations in which a zero flux was expected. In order to test this possibility, both the old and new versions of Awimager were run using the following command parameters for the (I, Q) case:

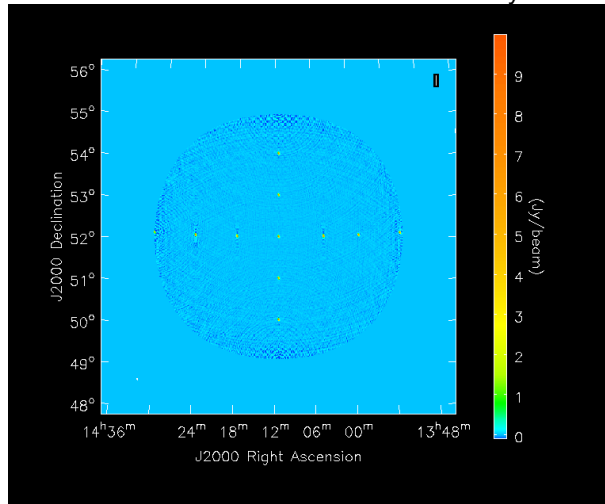
```
awimager ms=/data/scratch/harwood/IQsim/awimager-scanNDPPPIQmodel.MS
image=/data/scratch/harwood/IQsim/awimager-scanNDPPPIQmodel
wprojplanes=64
npix=1024
gain=0.2
cellsize=30arcsec
data=CORRECTED_DATA
padding=1.
niter=500
timewindow=300
stokes=IQUV
threshold=0.
operation=csclean
weight=uniform
StepApplyElement=3
```

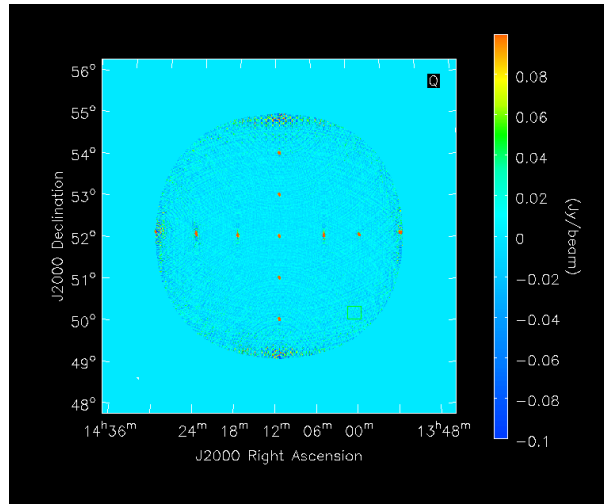
The parameters are the same as those applied by DM's initial tests with the exception that the element beam correction was applied through StepApplyElement. A corresponding command was also run for the MS set of the I-only case.

We observe the leakage effect has been reduced by an order of magnitude, to the level of deconvolution noise (see figures below).



However, it was observed that the peak flux of the sources near the edge of the field of view was greatly reduced. On closer inspection this was due to major degradation of the source within these regions (see figures below). We also note that the imaged field has been reduced by approximately 1 degree on all sides. We understand this a known effect caused by the element beam correction.





In the parameter set used above, W_{max} was left at its default setting of 500. As a further test to explore possible wide-field effects, this was raised to a value of 1000 with all other parameters being left unchanged. The results from this run show no obvious differences with the same major degradation in the flux levels being observed in the outlying regions.