Comparison of Strawman ES Configurations for ALMA
ES$_{small}$ Cpct3 REH variation
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1 Introduction

This is an extension of an earlier report to investigate a variant on Boone compact configuration V3 cpct3.

2 Cpct3-REH Configuration

The point of this is to modify slightly configuration V3-cpct3 of Boone to remove the close pair A019 to A020. A02 was chosen since it fills in the short spacings well and doesnt obviously upset the coverage further out. Note that this configuration still has the short North-South spacing A039 to A045. This will cause blocking in the North and South. This starts at dec +17 and -63. We have run tracks for dec +20 and dec -65 to see how bad that problem is.

Simulation The Cpct3REH array consists of the antennas shown in the upper right panel of Fig 1. Antenna 2, substituted for Antenna 19 (which is included in Cpct3), is marked. The close NS pair A039 and A045 referred to in the text are circled. For a source at a declination -23d the tracks shown in the lower left result from an integration over 3 hours each side of transit. The resulting inner beam is shown at lower right; this beam has a size of 1.7" x 1.7" at PA -45^o.

Table 1: Compact Array Characterizations

Characteristic	CSV	Cpct-1	Cpct-2	Cpct-3	Cpct-3REH	Cpct-4	Cpct-5	Cpct-6
Beam	2.1x2.1	1.8x1.7	1.7x1.7	1.7x1.7	1.7x1.7	1.7x1.5	1.9x1.6	1.7x1.5
Max sidelobes	22%	9%	11%	6%	7.5%	12%	10%	8%
Close sidelobes	8%	1%	3%	3%	3%	1.50%	6%	2%
Least $\pm$3hr sp(kλ)	17.2	13.5	12.7	13.5	15.2	12.5	12.3	13.5
Flux recovery	5.3"	6.8"	7.2"	6.8"	5".9	7.3"	7.4"	6.8"
Shadowing +10		6.50%	9.80%	5.10%	0%	13.70%	16.20%	4.90%
Max $\pm$HA		4.5h	4.0h	4.50h	4.5h	3.5h	3.2h	4.6h
Max sidelobes	%	6.7%	%	5.5%	7.5%	%	9.1%	6.3%
Close sidelobes	%	$<$1%	%	$\sim$3%	3%	%	6%	$<$2%
Least $\pm$HA sp(kλ)	...	11.6	11.6	11.6	11.6	11.6	11.6	11.6
Flux recovery-HA	...	7.8"	7.8"	7.9"	5".9	7.9"	7.86"	7.95"

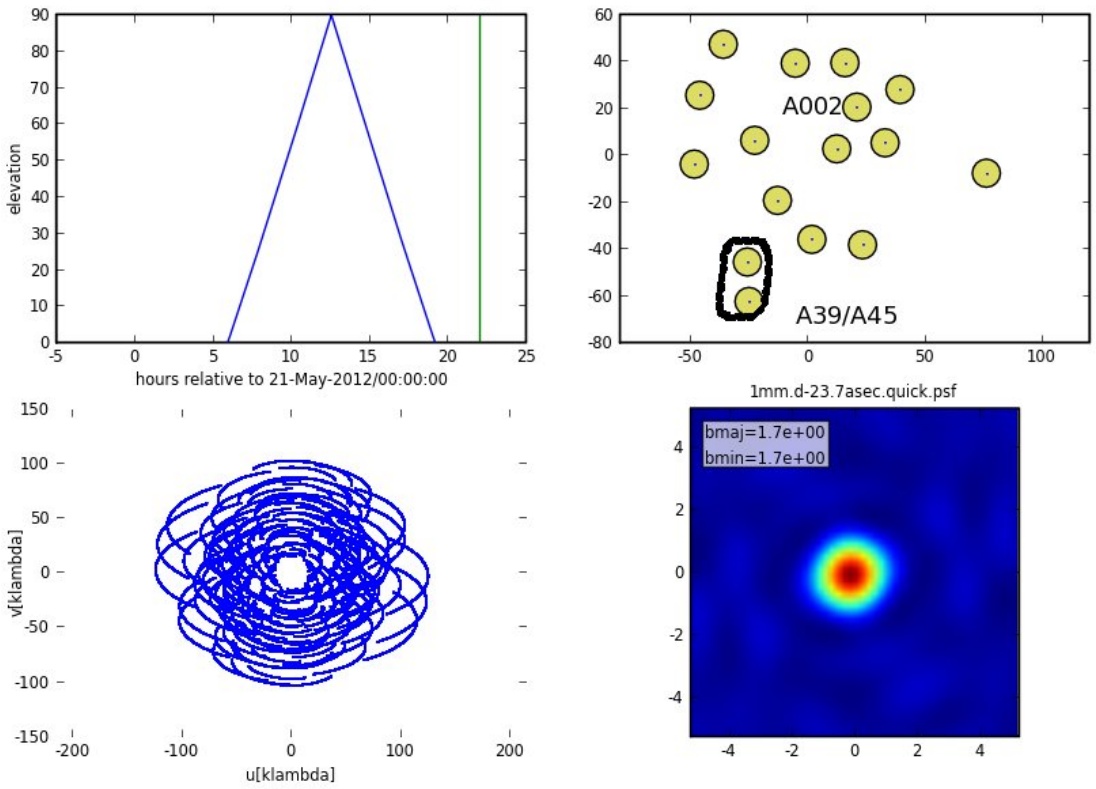

Figure 1: UL: el vs time. UR: Antenna locations for cpct3-REH array at declination -23. LL: (uv) tracks. LR: central region of 1".7x1.7" beam. Antenna 2, substituted for Antenna 19, is marked. The close NS pair A039 and A045 referred to in the text are circled.

Beam Figure 2 shows a more extensive map of the dirty beam, covering the inner 15" or so. Sidelobes reach the 7.5% level at a distance of 12". Closer-in sidelobes are of the order of 3% at a distance of about 10".

Shadowing For a source at +10d declination there is no shadowing in a 4.0h track .

Flux recovery Shortest projected spacing in the array is 15.2 kλ in a $\pm$3hr track. Peak flux in the center of the image falls to 50% for a Gaussian source 5.8" in size.

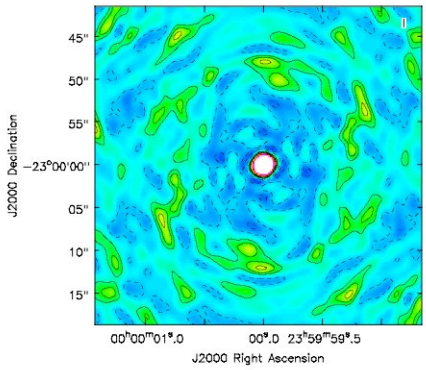

Figure 2: Dirty beam, natural weighting, for cpct3REH with contours lurking at .025,.05,.075, 0.1.

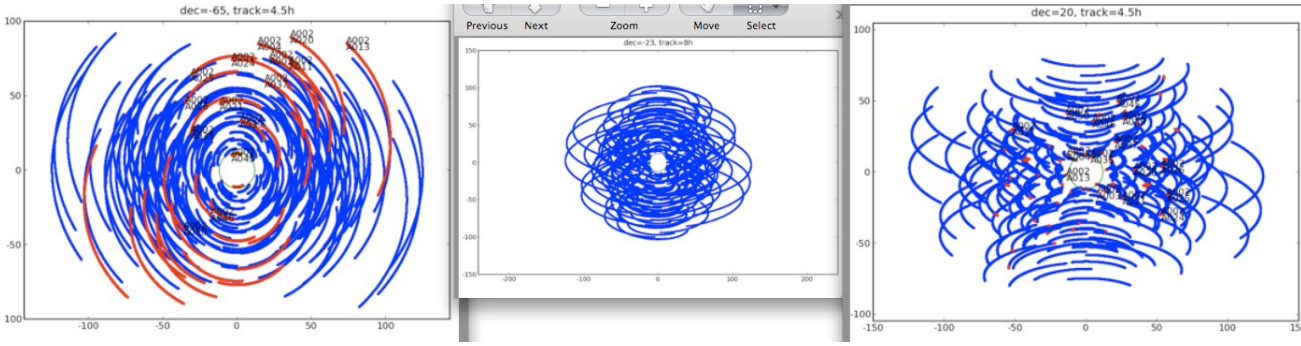

Figure 3: uv tracks showing shadowing calculated for declinations of (l) -65, (c) -23, (r) +20 for cpct3REH. This is calculated for an 9 hour track (8h for -23 but there is no shadowing in 9h) and the shadowed time for each uv track is indicated in red.

Imaging For the cleaned image of the most extensive 9" gaussian, the peak intensity is 40% of that in the input source. A peak of more than 50% of the image flux is recovered for sources smaller than 5.8". Figure 4 shows a cleaned simulation of an observation of a 5" gaussian source at 1mm at declination -23.

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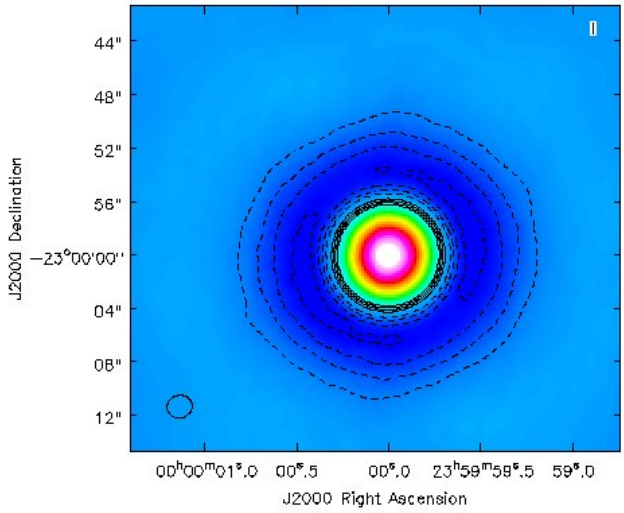

Figure 4: Cleaned simulation of an observation of a 5” gaussian source at 1mm at declination -23 made with the CSV array. Contours are in intervals of 0.025. The dark area surrounding the source is the ’bowl’, which reaches a depth of 1% of the image peak in this case.