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**Single-Dish Total Power Imaging of Bright
Title: Sources: Mapping of 3C295 in C-band and K-
band**

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Single-Dish Total Power Imaging of Bright Sources: Mapping of 3C295 in C-band and K-band

	Name	Date
Authors	A.Pellizzoni, A. Orlati, N.Iacolina, A.Trois, , E.Egron, S.Righini, V.Vacca, M.Burgay, S.Casu on behalf of SDI Team and the Astronomical Validation Team (other contributors will be explicitly added in the author list in the next issue of the document)	15/12/13

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Test overview

In the frame of AV tests “Single-Dish Total Power Imaging of Bright Sources (I:s/w test)” (AV SNR1 test) we performed C band and K band (only central feed) imaging of point-like bright calibration sources (i.e. 3C295 in particular). A first set of observations was performed in parallel to SRT commissioning “fine-tuning” activities with the aim to:

- Test SRT Single-Dish Imager (SDI) software procedures and data formats.
- Test and optimize Nuraghe schedules for OTF total-power mapping of bright sources.
- Provide (preliminary) beam pattern characterization (gaussian two-dimensional fit) before and after active surface setup (shaped for K-band at Gregorian focus and C-band at BWG focus, unshaped parabolic for LP at primary focus) and measurement of other fundamental parameters preparatory to image calibration. A deep beam pattern model will be obtained in the frame of advanced “grey-zone” test GZT07.
- Provide analysis, comparison and diagnostics of image features *ex ante* and *ex post* Commissioning fine-tuning activities.

Observations of the calibrator 3C295 were performed by OTF scans:

- K-band: a 10x10 arcmin² map composed of 70x70 sub-scans (RA/DEC) centred on source position (about 10 passes/beam). Sub-scan duration: 4 sec (2.5 deg/min). Observed frequency 20.77 GHz (setLO=20670), bandwidth 730 MHz, integration time 40 ms (AV/SNR1 schedule SRT-SCICOM_Test_3C295_K_2).
- C-band: a 15x15 arcmin² map composed of 26x26 sub-scans (RA/DEC) centred on source position (about 10 passes/beam). Sub-scans duration: 6 sec (2.5 deg/min). Observed frequency 6.9 GHz (setLO=6800), bandwidth 730 MHz, integration time 40 ms (AV/SNR1 schedule SRT-SCICOM_Test_3C295_C_2).

The observations were performed with Nuraghe 0.2 for three elevation ranges (low: 15-20 deg, mid: 30-35 deg, high: 70-75 deg) in order to check for main beam and secondary features variations. A summary of the observations is presented in table 1. Antenna opto-mechanic configuration is trimmed for 45 deg observations only during fine-tuning operations.

Note that at the epoch of the observations a significant and anomalous dead-time between sub-scans was present implying an observing efficiency of only about 25-30% (total exposure/scan duration %).

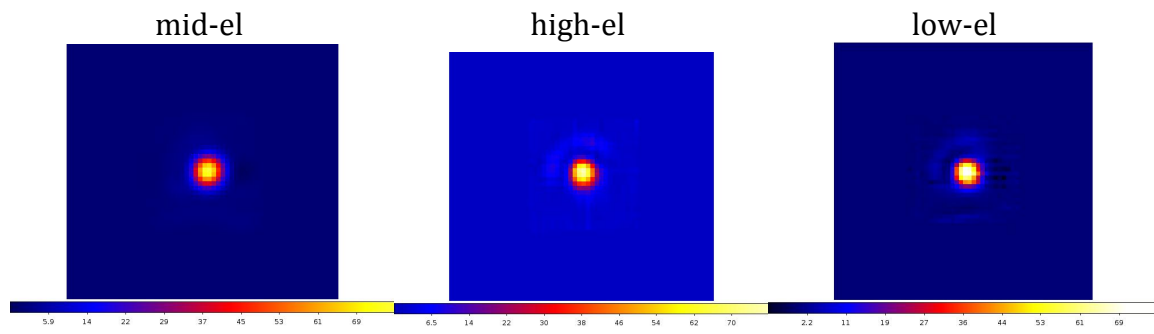
Data were processed by the *SRT Single-Dish Imager* (SDI). Only automatic baseline subtraction and automatic RFI rejection were performed; no full manual data flagging and baseline trimming was applied in the present issue of the analysis. Periodically updated fits images (DS9-readable, including WCS) are available for download in scicom wiki pages (SNR1 tests).

Preliminary main beam fit was performed through IDL function GAUSS2DFIT.

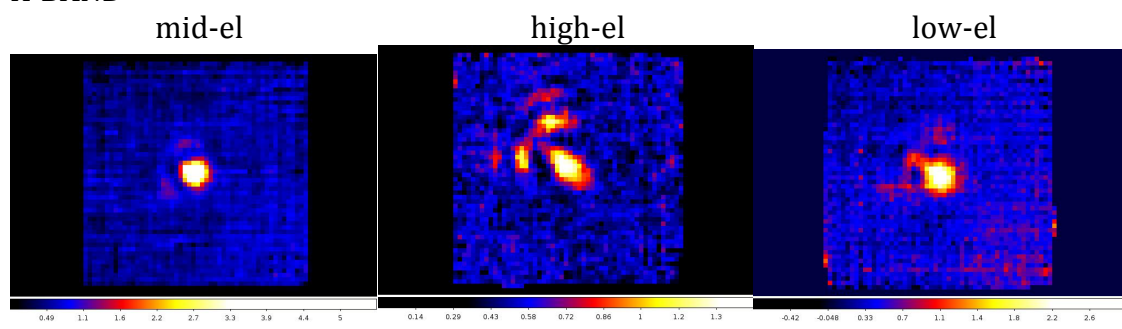
Date	Timerange (UT)	Elevation range (deg)	AV Schedule
22/10/2013	16:37-17:23	31.4-37.2	SRT-SCICOM_Test_3C295_K_2
22/10/2013	17:28-17:44	29.2-30.3	SRT-SCICOM_Test_3C295_C_2
28/10/2013	09:38-10:18	70.2-75.0	SRT-SCICOM_Test_3C295_K_2
28/10/2013	10:24-10:40	75.3-76.6	SRT-SCICOM_Test_3C295_C_2
06/11/2013	17:38-18:18	16.7-21.4	SRT-SCICOM_Test_3C295_K_2
06/11/2013	18:33-18:56	12.7-15.3	SRT-SCICOM_Test_3C295_C_2
15/11/2013	16:38-17:59	15.0-24.5	SRT-SCICOM_Test_3C295_K_2

Table 1 – Observations summary

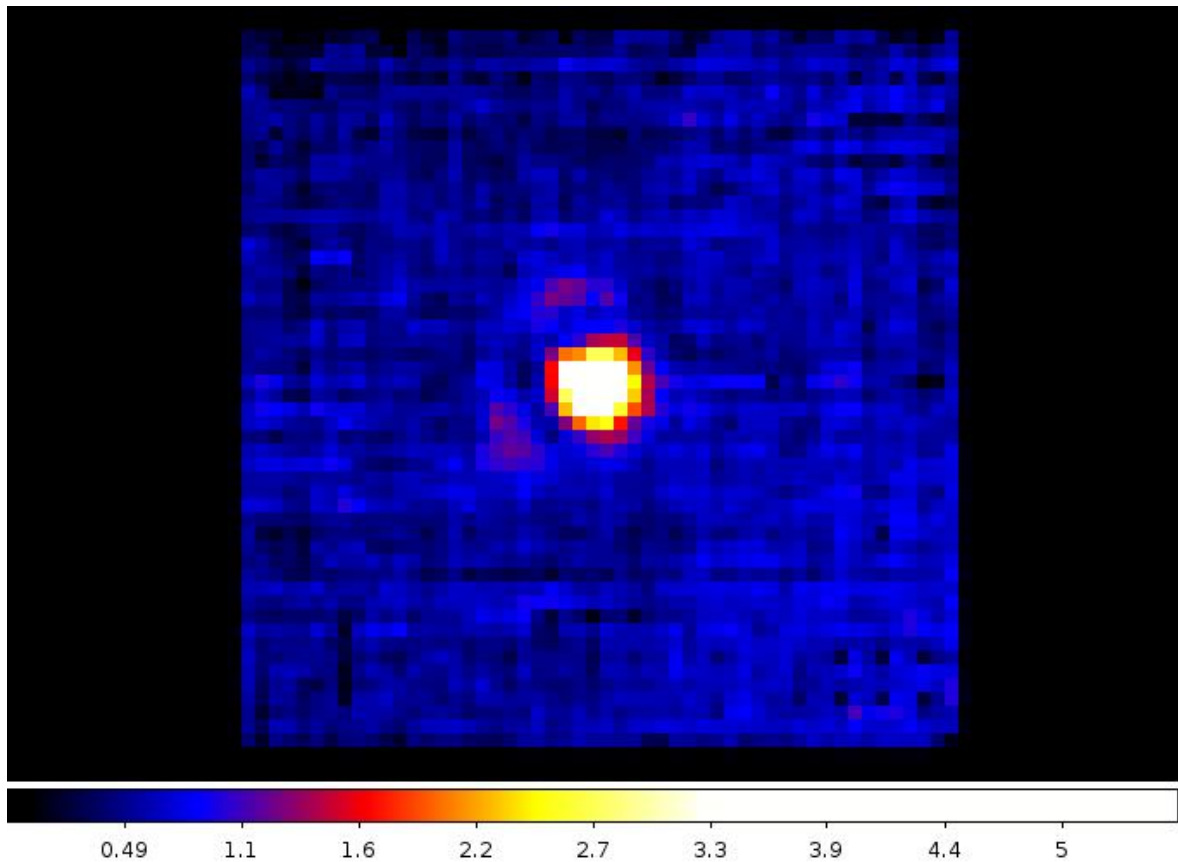
C-BAND



K-BAND



Test results: 3C295 K-band mid-elevation



10'x10' map; pixel size=12", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:21.0s, DEC +52d:12':14" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

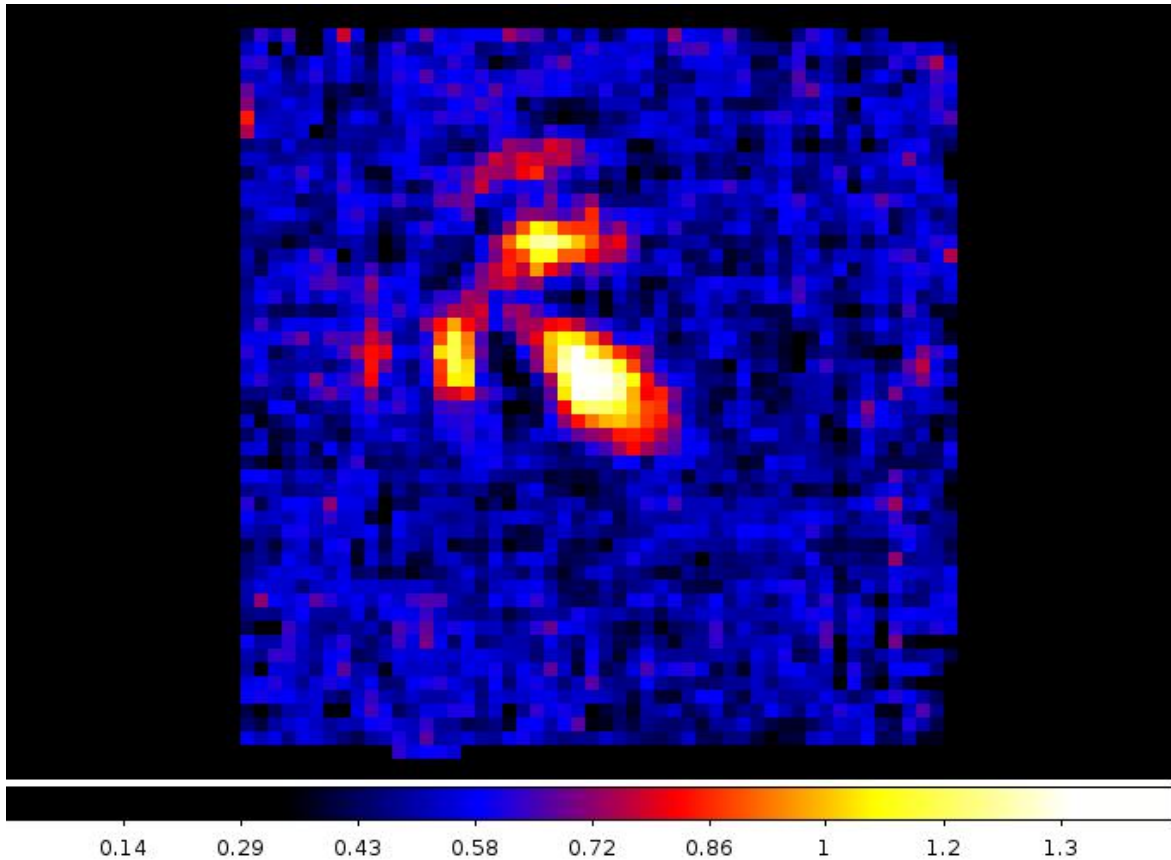
Positional discrepancy 6.2" (14% beam)

Main beam gaussian two-dimensional fit: **BWHM 52.0"/49.6"** (errors TBD).

Notes: asymmetric-concentric secondary features seen at (first-order) side-lobes distance from main beam centroid (features peak intensity w.r.t. main beam peak: 23%). Features are located approximately around 45deg axis in the NE quadrant.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: 3C295 K-band high-elevation



10'x10' map; pixel size=12", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:20.0s, DEC +52d:12':15" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

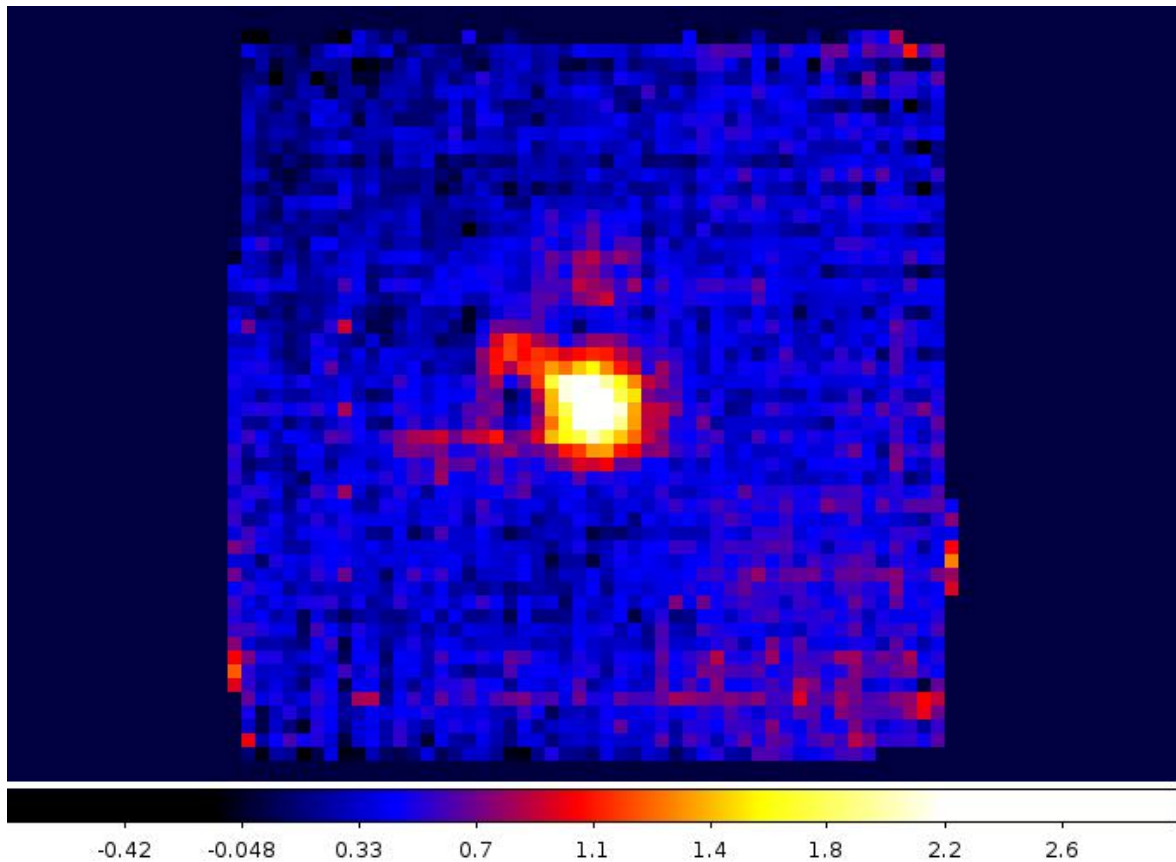
Positional discrepancy 8.2" (18% beam)

Main beam gaussian two-dimensional fit: **BWHM 52.0"/109.5"** poor fit (errors TBD).

Notes: asymmetric-concentric secondary features seen at (first-order and second-order) side-lobes distance from main beam centroid (features peak intensity w.r.t. main beam peak: 83% 1st ord., 53% 2nd ord.). Features are located approximately around 45deg axis in the NE quadrant.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: 3C295 K-band low-elevation



10'x10' map; pixel size=12", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:21.1s, DEC +52d:12':07" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

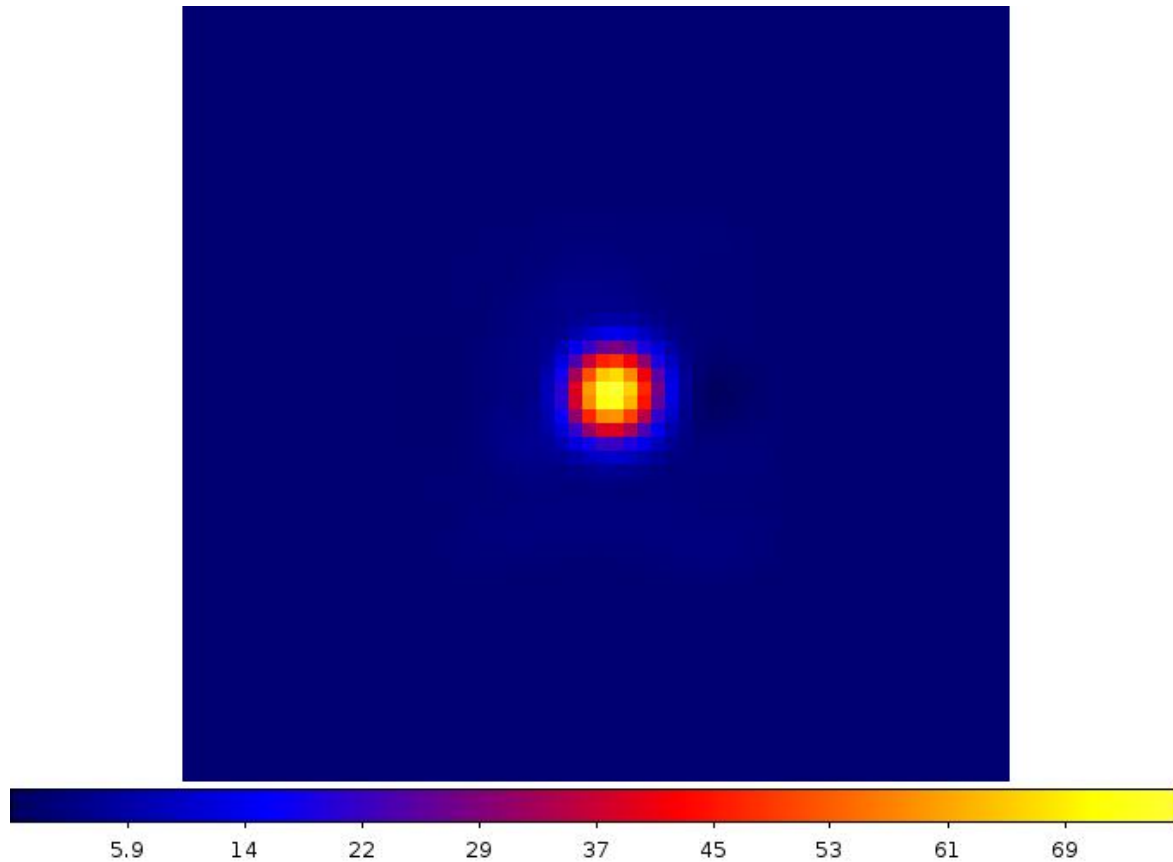
Positional discrepancy 5.0" (11% beam)

Main beam gaussian two-dimensional fit: **BWHM 59.4"/70.7"** poor fit (errors TBD).

Notes: features are located approximately around 45deg axis in the NE quadrant.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: 3C295 C-band mid-elevation



15'x15' map; pixel size=36", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:18.0s, DEC +52d:12':01" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

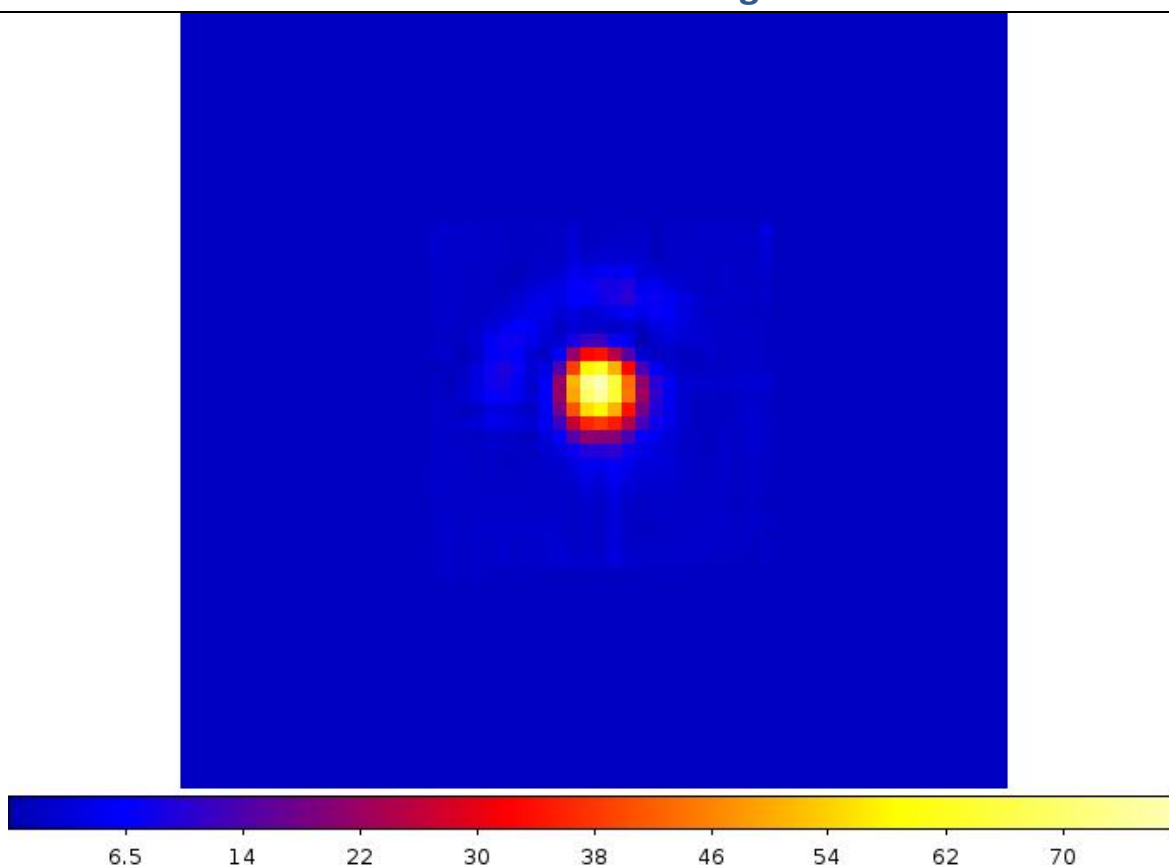
Positional discrepancy 25.2" (16% beam)

Main beam gaussian two-dimensional fit: **BWHM 2.60'/2.73'** (errors TBD).

Notes: nearly free from secondary features apart from minor NE features as for K band.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: 3C295 C-band high-elevation



15'x15' map; pixel size=36", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:22.0s, DEC +52d:12':31" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

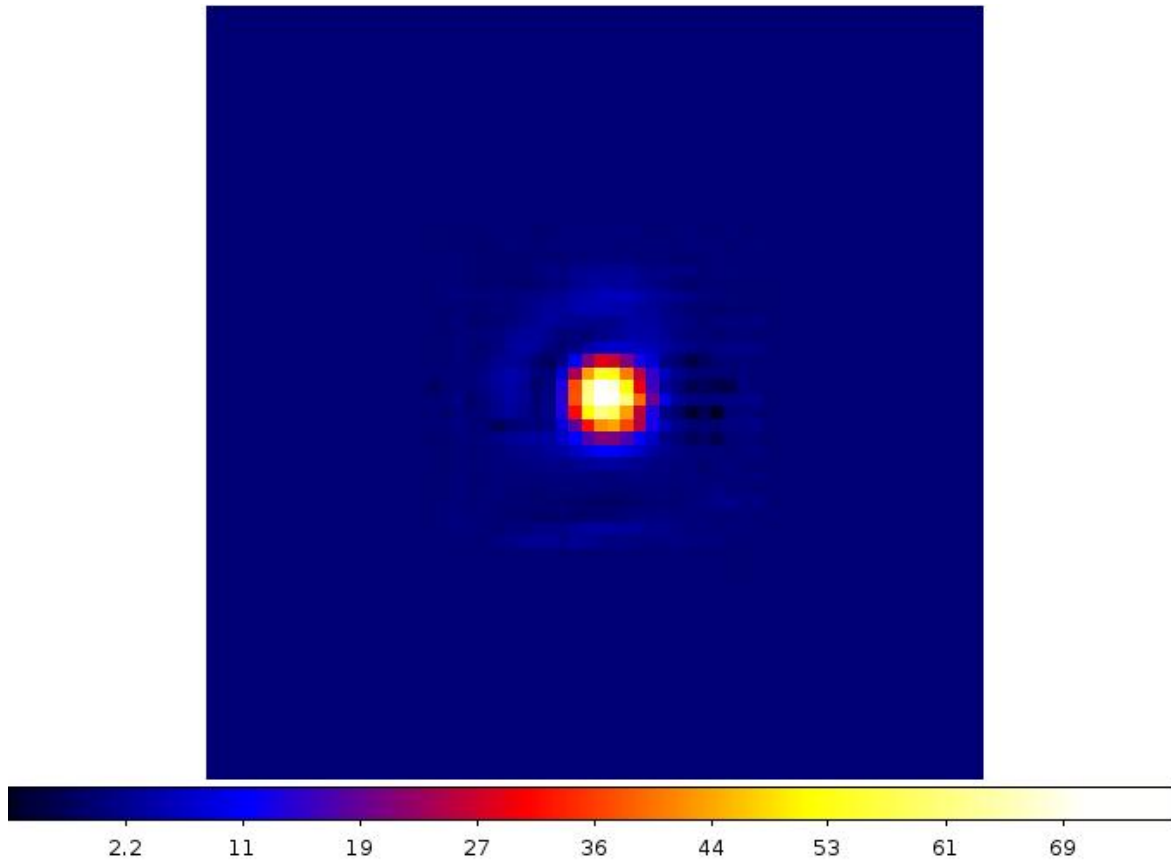
Positional discrepancy 25.5" (16% beam)

Main beam gaussian two-dimensional fit: **BWHM 2.53'/2.72'** (errors TBD).

Notes: nearly free from secondary features apart from minor NE features as for K band.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: 3C295 C-band low-elevation



15'x15' map; pixel size=36", active surface in fixed position

Astrometry (preliminary):

Observed source position: RA +14h:11m:18.7s, DEC +52d:12':03" (accuracy TBD)

Actual source coords.: RA +14h:11m:20.6s, DEC +52d:12':09"

Positional discrepancy 18.5" (11% beam)

Main beam gaussian two-dimensional fit: **BWHM 2.72'/2.73'** (errors TBD).

Notes: nearly free from secondary features apart from minor NE features as for K band.

ONLY AUTOMATIC ANALYSIS PERFORMED (No manual flagging, no manual baseline trimming).

Test results: same tests after fine-tuning and shaping TBD

Test results: overall discussion and interpretation TBD