

Extended-KVN Project

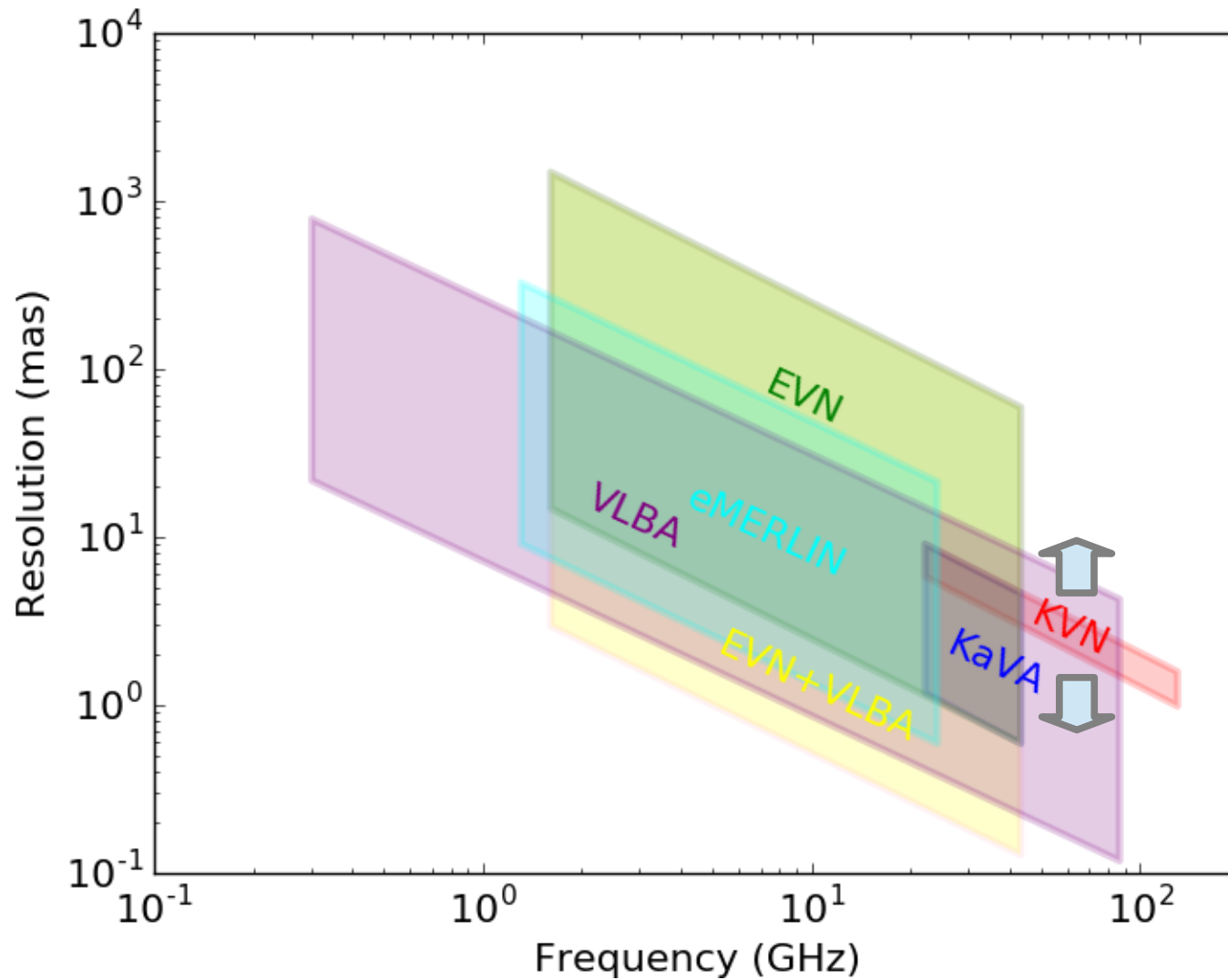
Short thinking

J. C. Algaba

A kick-off meeting for the SWG of the pre-study of the Extended-KVN project

Where do we stand?

- Resolution



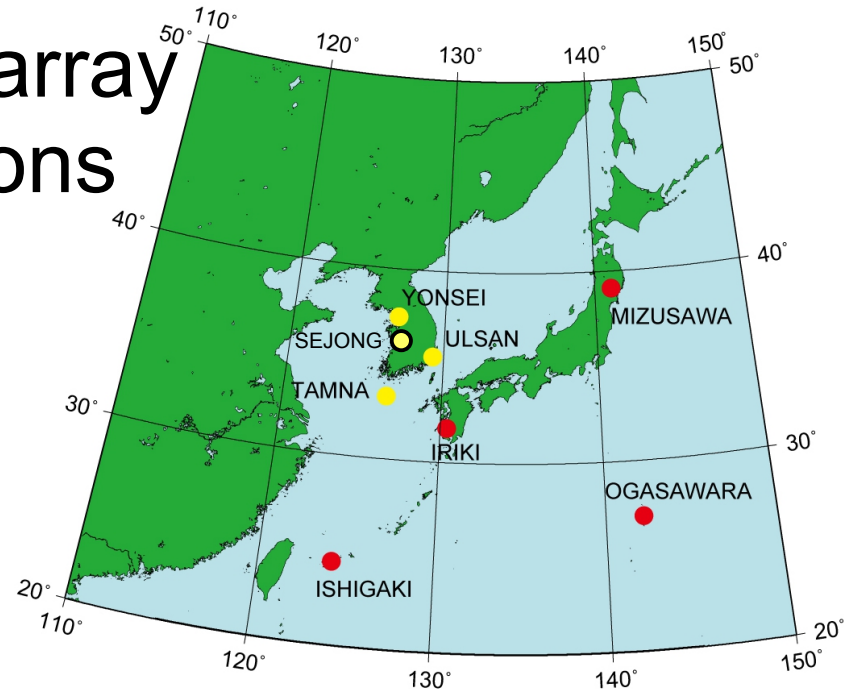
Where do we stand?

- Sensitivity

	MIN BASELINE (km)	MAX BASELINE (km)	NUMBER OF ANTENNAS #	SENSITIVITY 8 hours (μ Jy)
eMERLIN	6	217	7	10
EVN	98	12700	21	41
VLBA	236	8611	10	10 to 600
VLBA+Y27	52	8611	37	10
GMVA	384	11000	<18	355
KaVA	305	2270	7	300
KVN	305	476	3	500

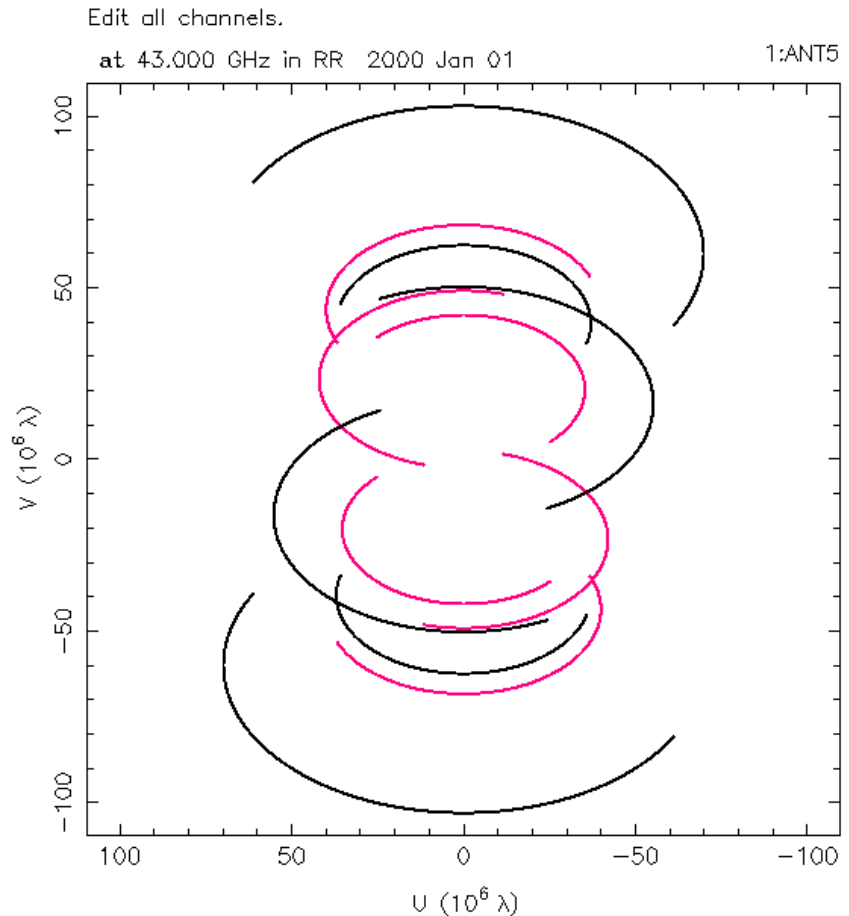
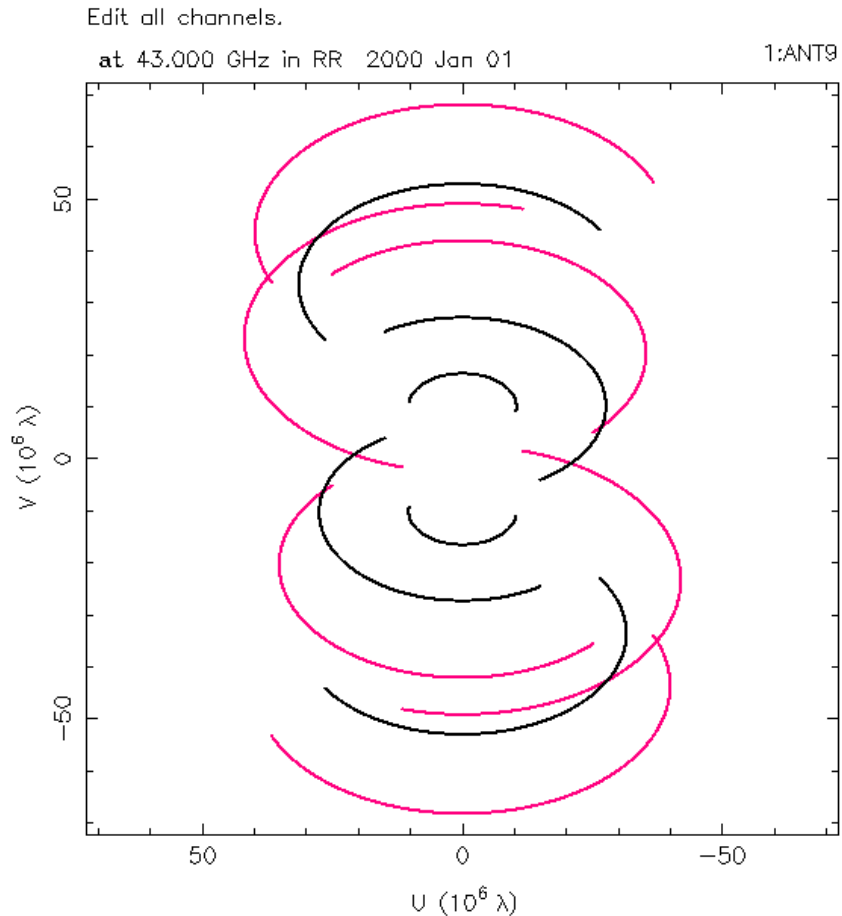
Simulations

- Simulate an extended KVN array with VERA and Sejong stations
- UVCON task in AIPS
 - Antenna efficiency $\sim 0.5-0.6$
 - Antenna $T_{\text{sys}} \sim 200-300$
 - Pointing error rms ~ 3 arcsec
 - $t \sim 12$ hours
- Using various VLBA images as model



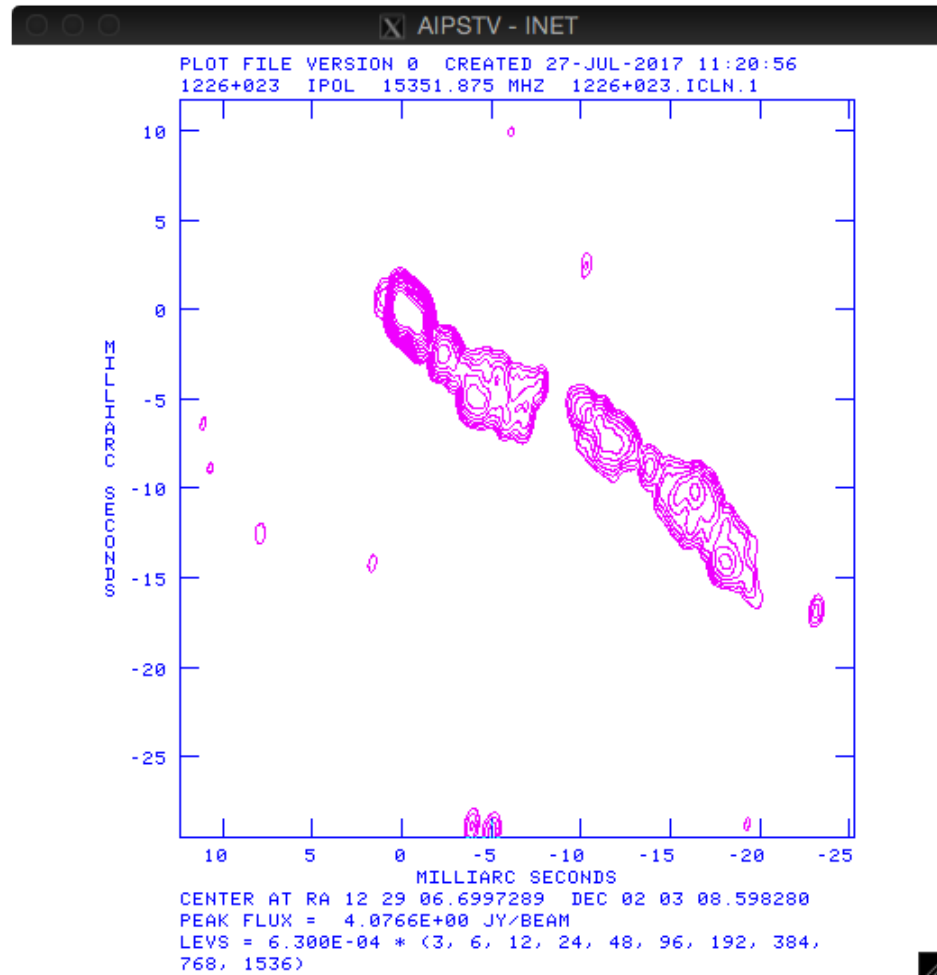
Simulations

- UV Coverage 43 GHz (pink) for DEC=38°
+Sejong (black) +Irk (black)



Simulations

- Case 1
- Image model:
 - 3C273
 - MOJAVE 15 GHz



Simulations

- Simulation at 43 GHz

- KVN

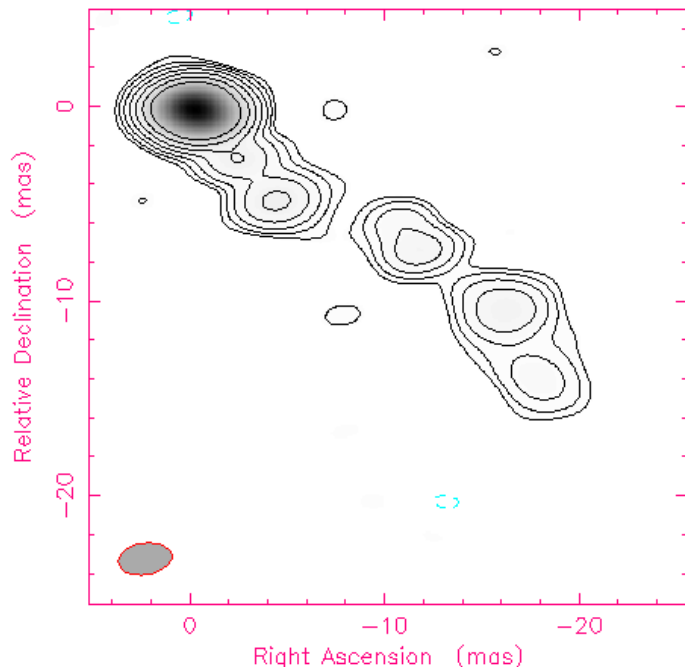
KVN+Sj

KVN+Irk

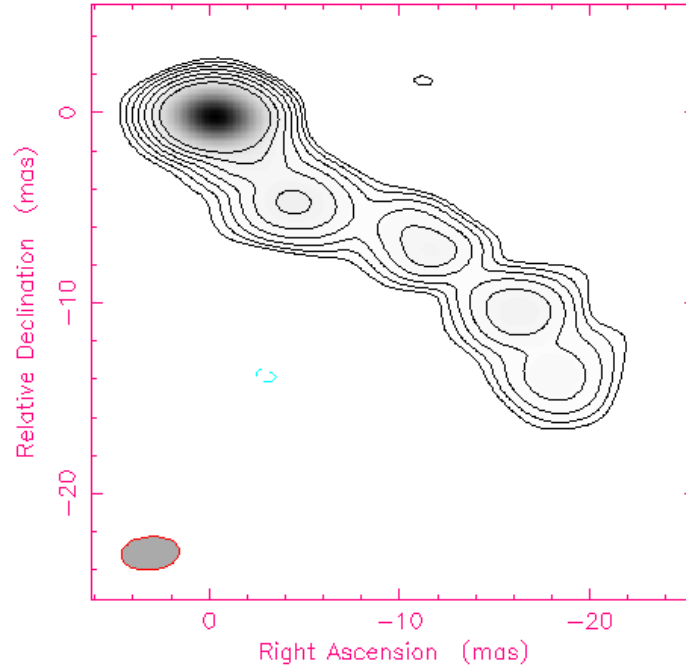
Clean RR map. Array: mma
at 43.000 GHz 2000 Jan 01

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at 43.000 GHz 2000 Jan 01

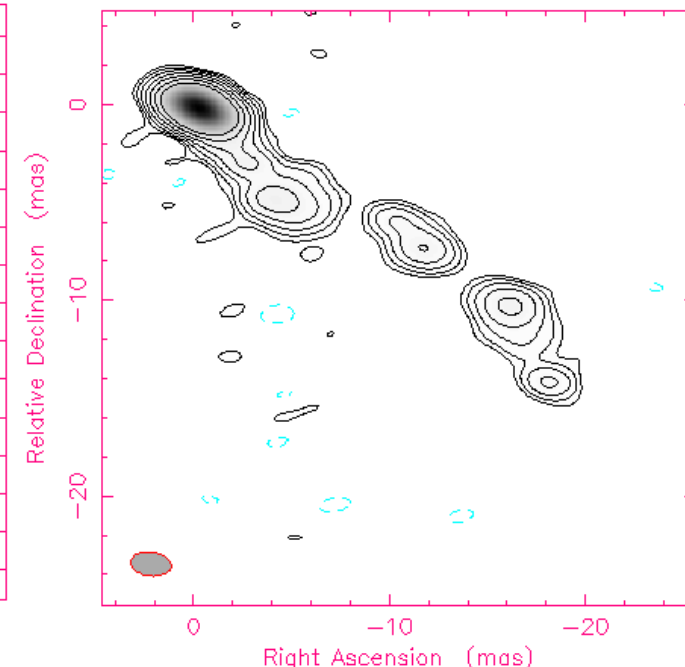
Clean RR map. Array: mma
at 43.000 GHz 2000 Jan 01



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 8.8 Jy/beam
Contours: 0.0268 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 2.77 \times 1.62 (mas) at -81.9°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 9.31 Jy/beam
Contours: 0.0157 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 3.07 \times 1.76 (mas) at -84.6°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 8.24 Jy/beam
Contours: 0.0175 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 2.06 \times 1.21 (mas) at 82.6°



Simulations

- Simulation at 129 GHz

- KVN

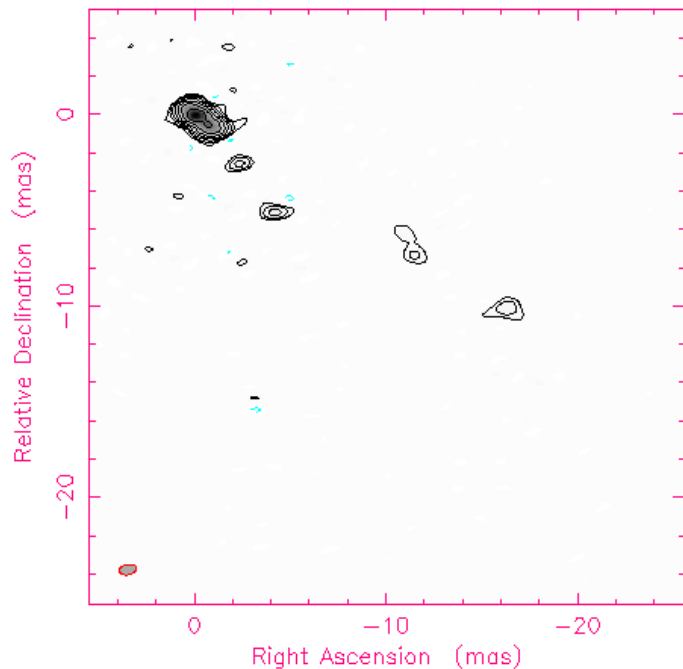
KVN+Sj

KVN+Irk

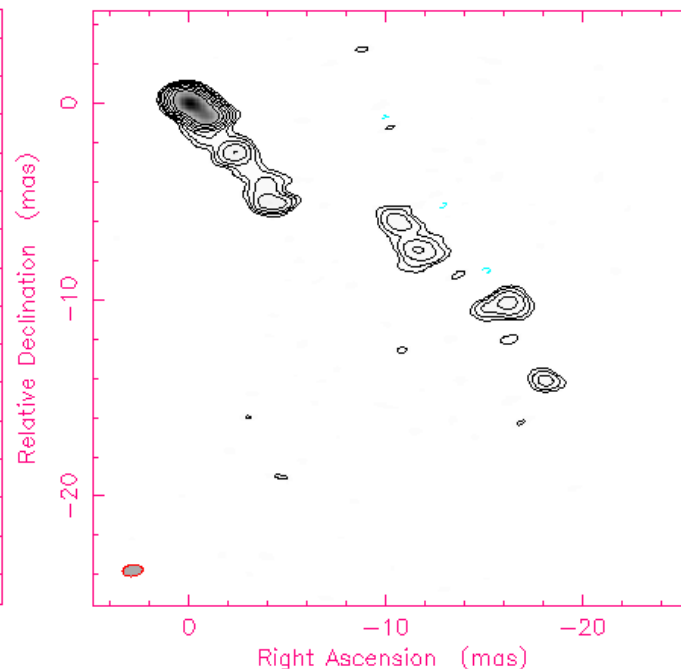
Clean RR map. Array: mma
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at 129.000 GHz 2000 Jan 01

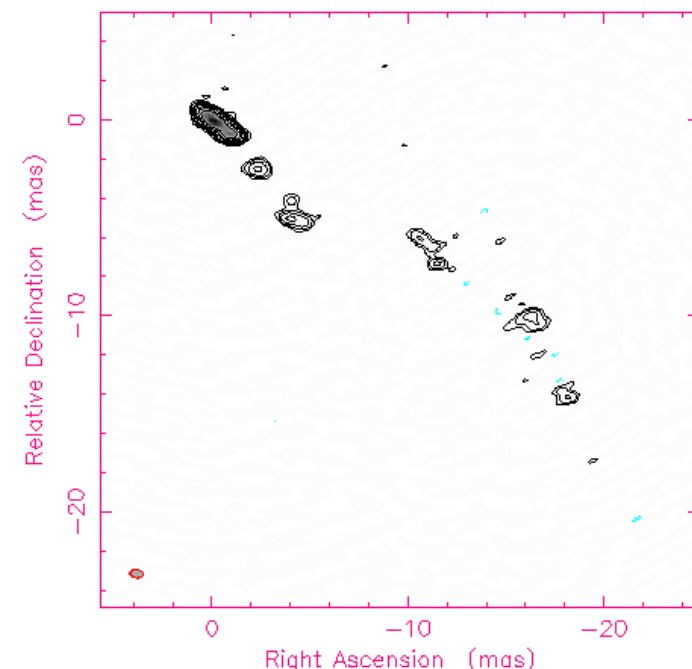
Clean RR map. Array: mma
at 129.000 GHz 2000 Jan 01



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 4.92 Jy/beam
Contours: 0.0443 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.934 x 0.537 (mas) at -79.8°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 4.97 Jy/beam
Contours: 0.0166 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 1.03 x 0.586 (mas) at -81.6°

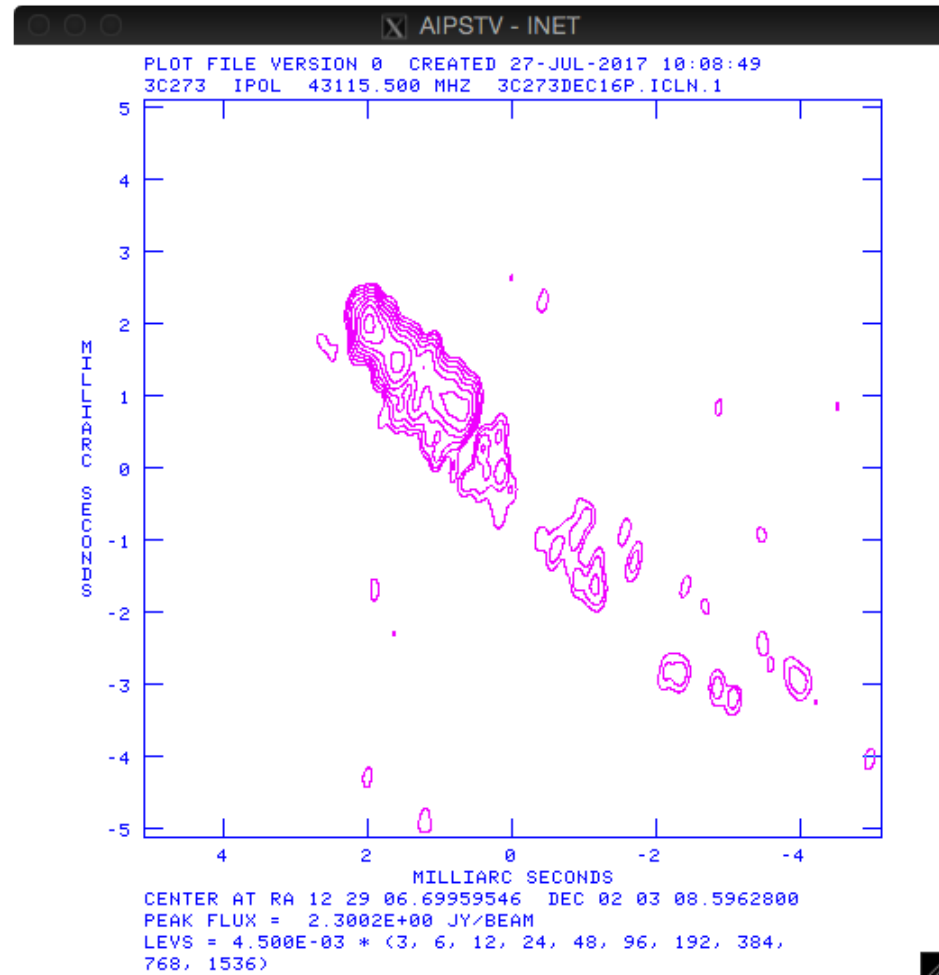


Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 4.26 Jy/beam
Contours: 0.0196 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.694 x 0.409 (mas) at 82.8°



Simulations

- Case 2
- Image model:
 - 3C273
 - BU 43 GHz



Simulations

- Simulation at 43 GHz

- KVN

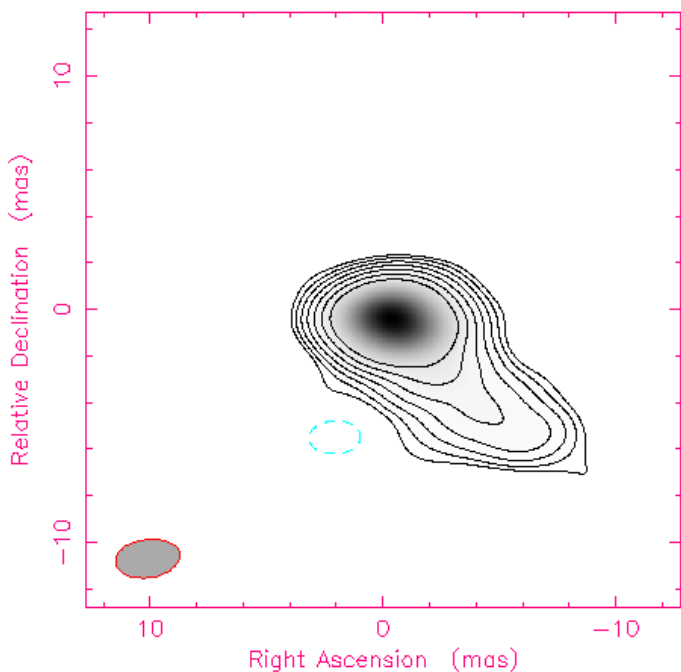
KVN+Sj

KVN+Irk

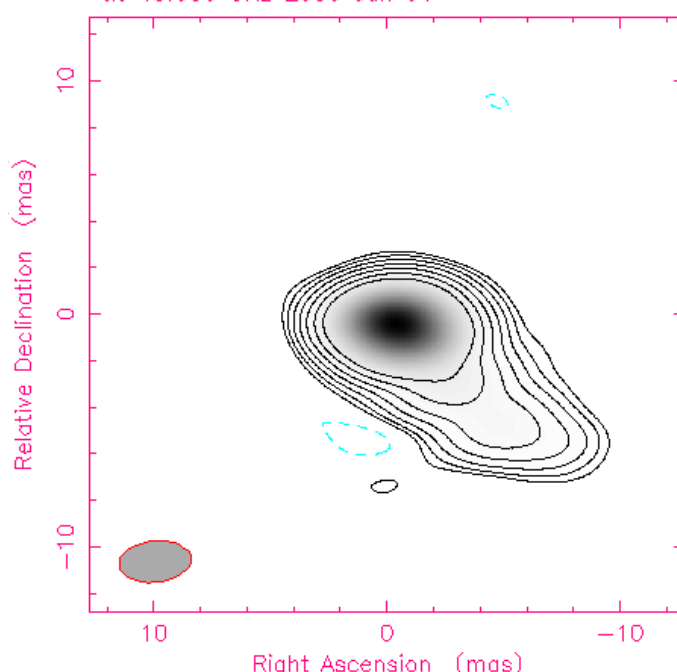
Clean RR map. Array: mma
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Clean RR map. Array: mma
at 43.000 GHz 2000 Jan 01

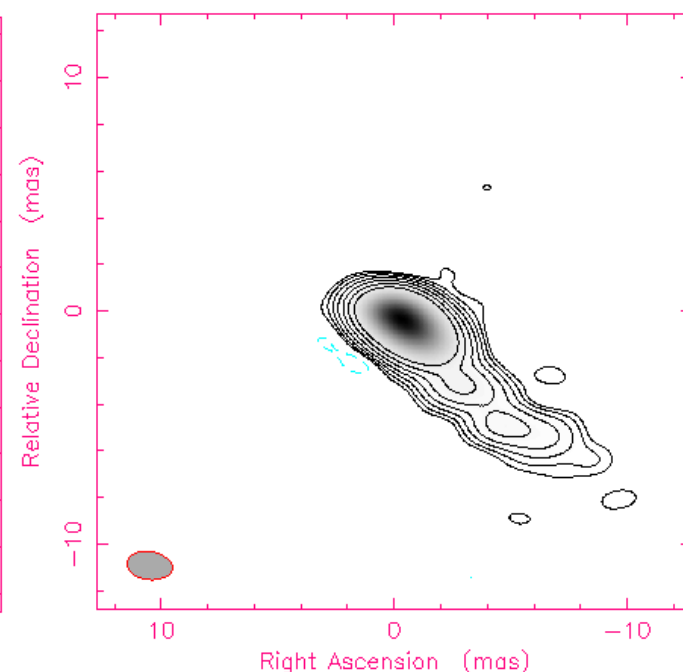
Clean RR map. Array: mma
at 43.000 GHz 2000 Jan 01



Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 8.51 Jy/beam
Contours: 0.0141 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 2.79 \times 1.63 (mas) at -82.2°



Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 8.94 Jy/beam
Contours: 0.0103 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 3.09 \times 1.78 (mas) at -84.1°



Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 7.67 Jy/beam
Contours: 0.00932 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 1.97 \times 1.2 (mas) at 81.4°



Simulations

- Simulation at 129 GHz

- KVN

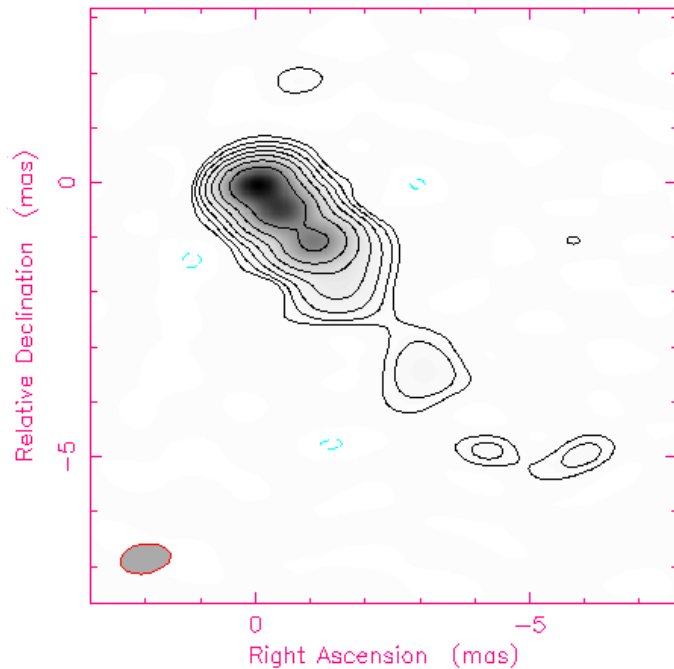
KVN+Sj

KVN+Irk

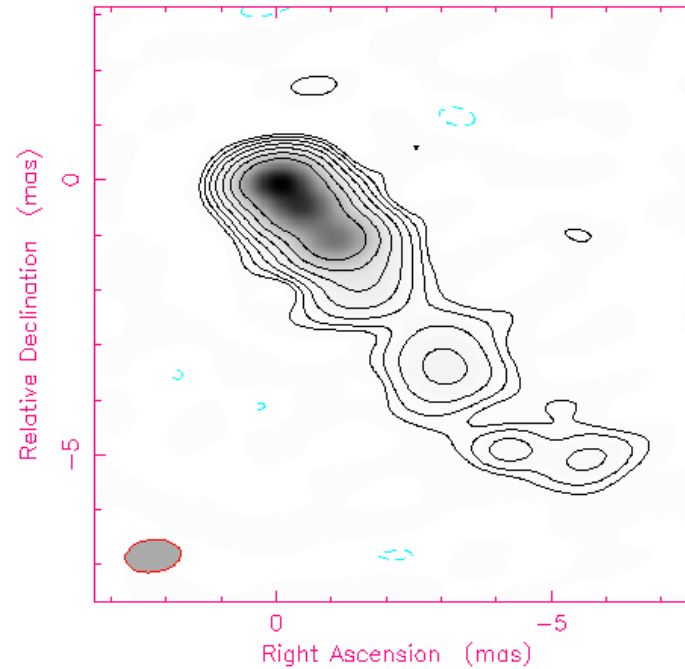
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at 129.000 GHz 2000 Jan 01

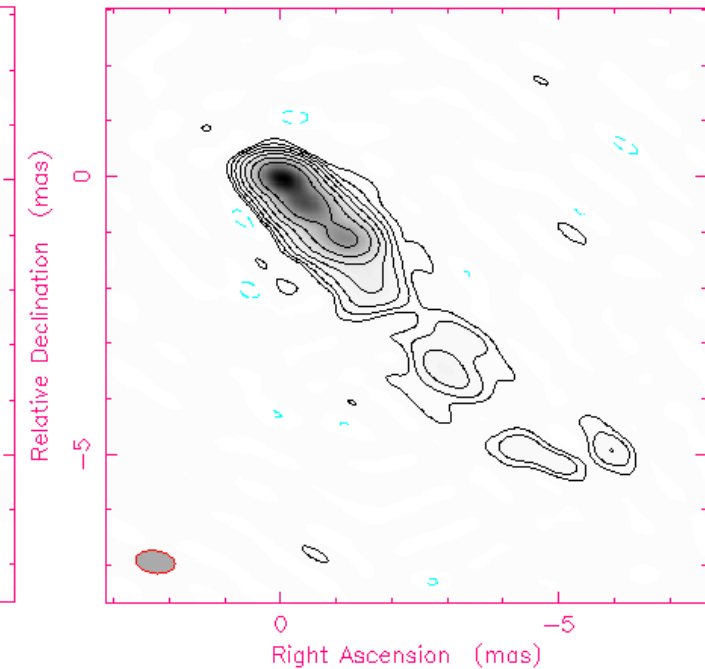
Clean RR map. Array: mma
at 129.000 GHz 2000 Jan 01



Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 4.3 Jy/beam
Contours: 0.0295 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.93 x 0.538 (mas) at -81.1°



Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 4.54 Jy/beam
Contours: 0.0195 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 1.03 x 0.589 (mas) at -83.5°

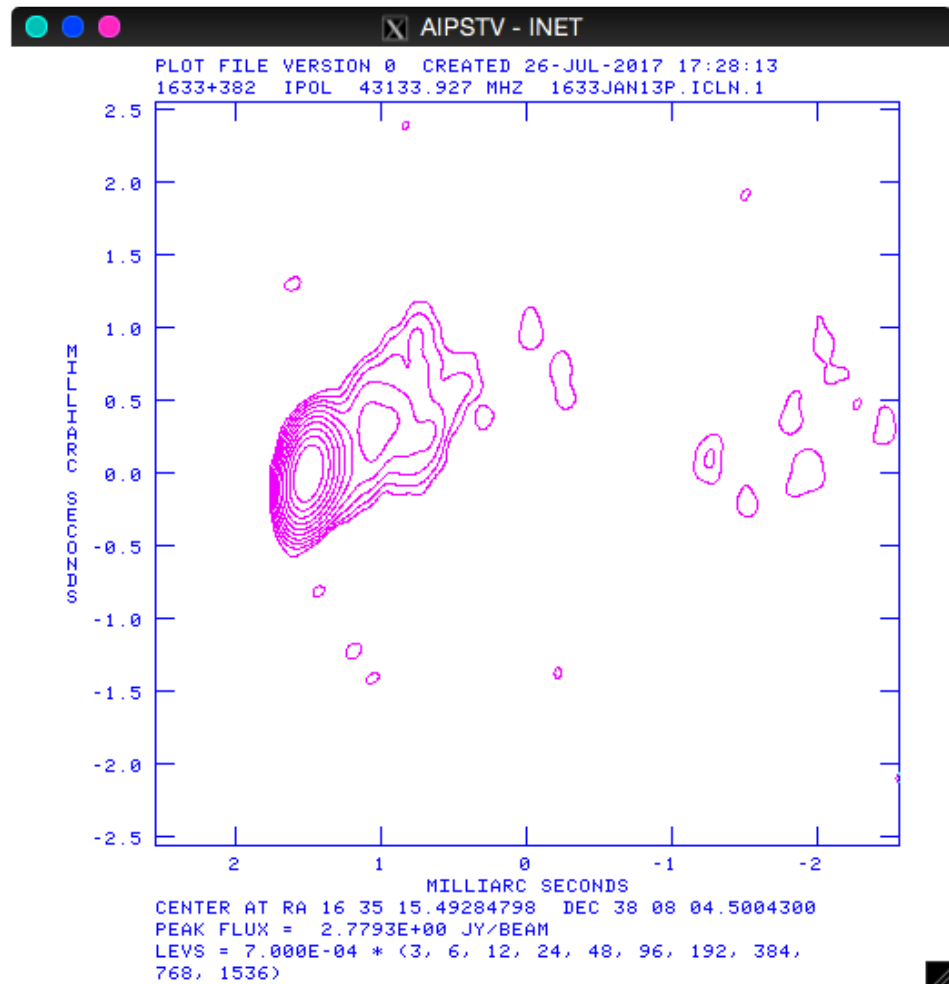


Map center: RA: 00 00 00.000, Dec: +38 00 00.002 (2000.0)
Map peak: 3.92 Jy/beam
Contours: 0.0223 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.71 x 0.407 (mas) at 81.8°



Simulations

- Case 3
- Image model:
 - 1633+382
 - BU 43 GHz



Simulations

- Simulation at 43 GHz

– KVN

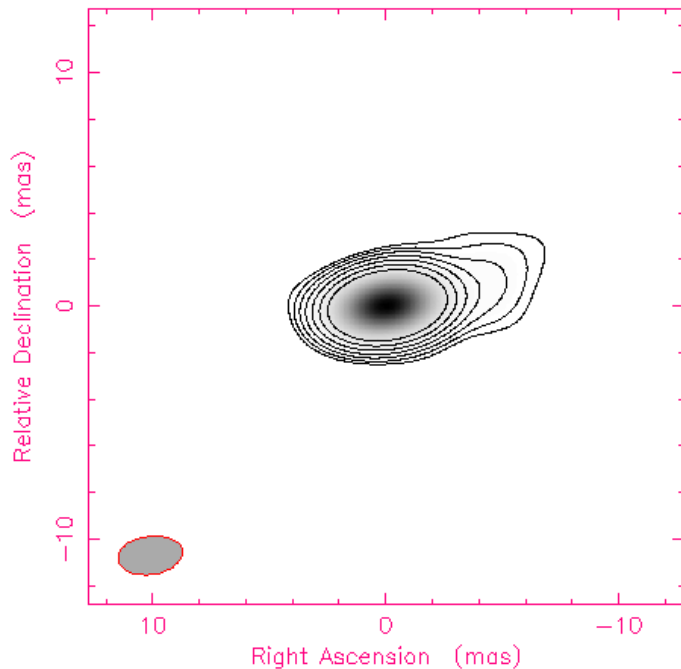
KVN+Sj

KVN+Irk

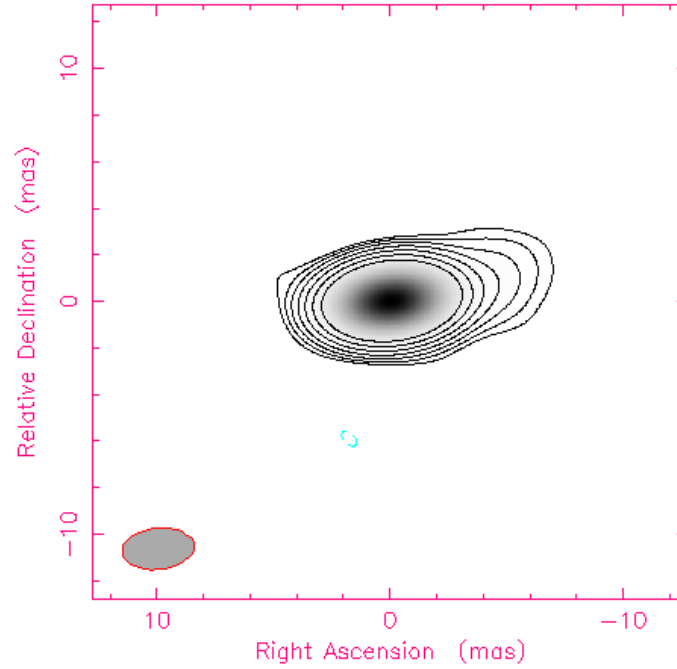
Clean RR map. Array: mma
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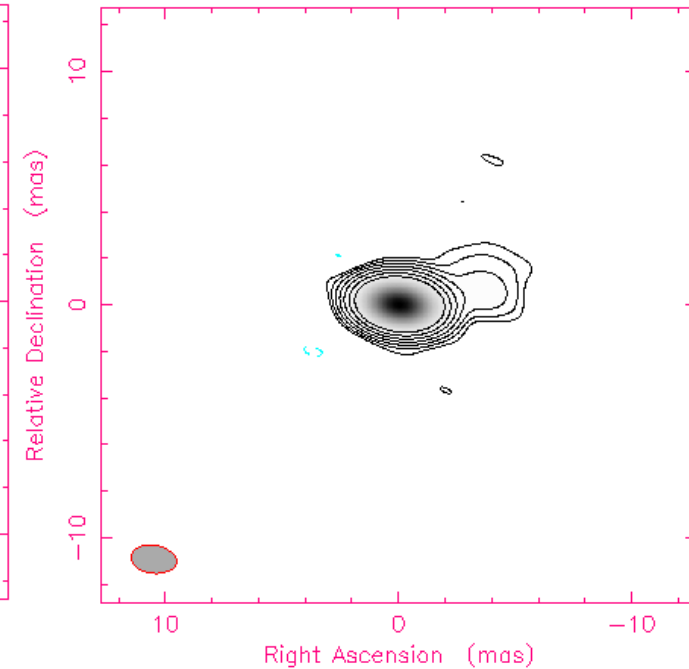
Clean RR map. Array: mma
at 43.000 GHz 2000 Jan 01



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.41 Jy/beam
Contours: 0.00542 Jy/beam x (1 2 4 8 16 32 64)
Beam FWHM: 2.79 x 1.63 (mas) at -82.2°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.42 Jy/beam
Contours: 0.00403 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 3.09 x 1.78 (mas) at -84.1°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.36 Jy/beam
Contours: 0.00391 Jy/beam x (-1 1 2 4 8 16 32 64)
Beam FWHM: 1.97 x 1.2 (mas) at 81.4°



Simulations

- Simulation at 129 GHz

- KVN

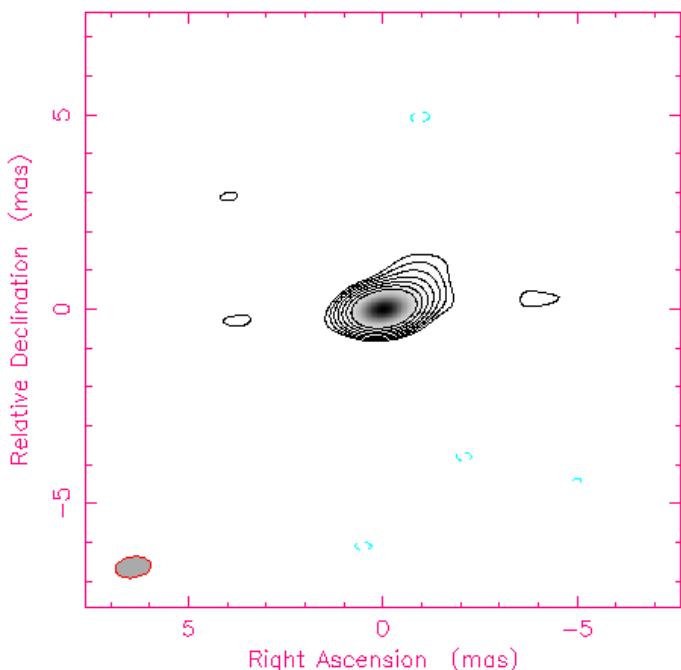
KVN+Sj

KVN+Irk

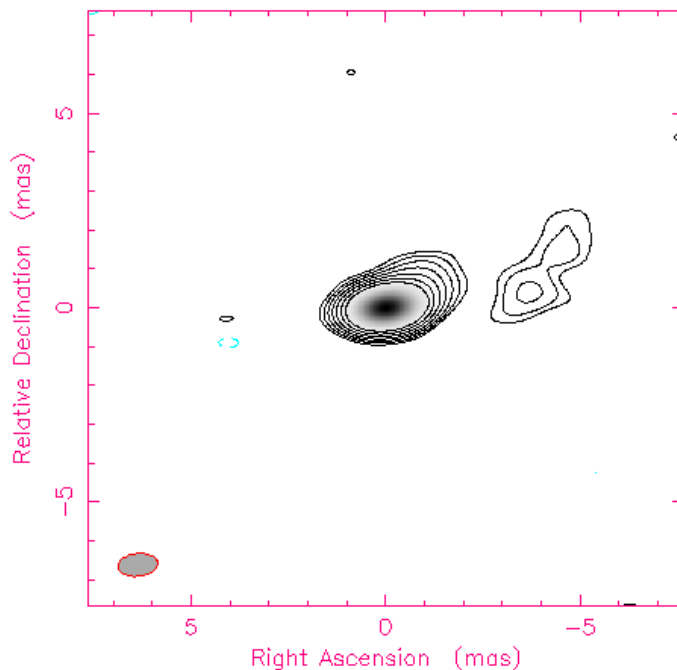
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at 129.000 GHz 2000 Jan 01

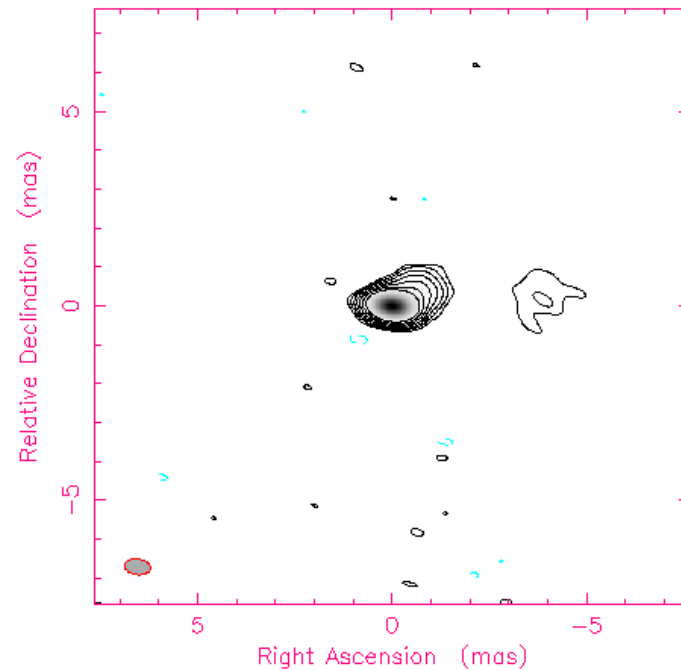
Clean RR map. Array: mma
at 129.000 GHz 2000 Jan 01



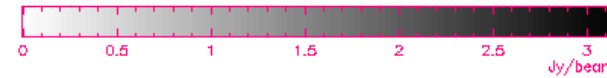
Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.23 Jy/beam
Contours: 0.00581 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.93 \times 0.538 (mas) at -81.1°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.25 Jy/beam
Contours: 0.00301 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 1.03 \times 0.589 (mas) at -83.5°



Map center: RA: 00 00 00.000, Dec: +38 00 00.000 (2000.0)
Map peak: 3.15 Jy/beam
Contours: 0.00337 Jy/beam \times (-1 1 2 4 8 16 32 64)
Beam FWHM: 0.681 \times 0.403 (mas) at 82.5°



Considerations

- Amplitude self-calibration
- Lower rms by a factor ~ 1.4
- Resolution: direct comparison with VLBA/EVN obs. at lower freqs.
 - e.g., KVN+Sj @ 129 GHz \sim VLBA @ 15 GHz