Latest commissioning results of GRG

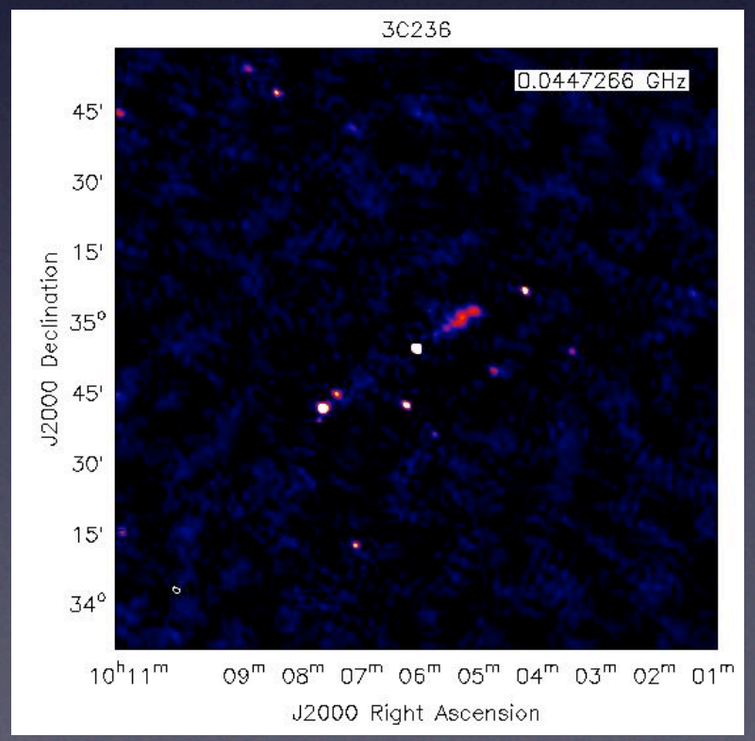
Emanuela Orru'

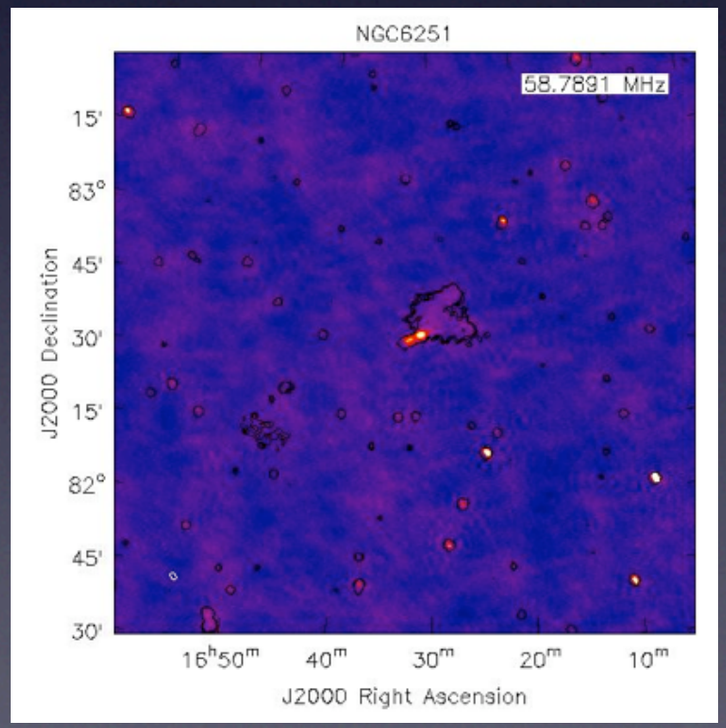
MKSP meeting Bologna

Collaborators: R. Pizzo, G. de Bruyn

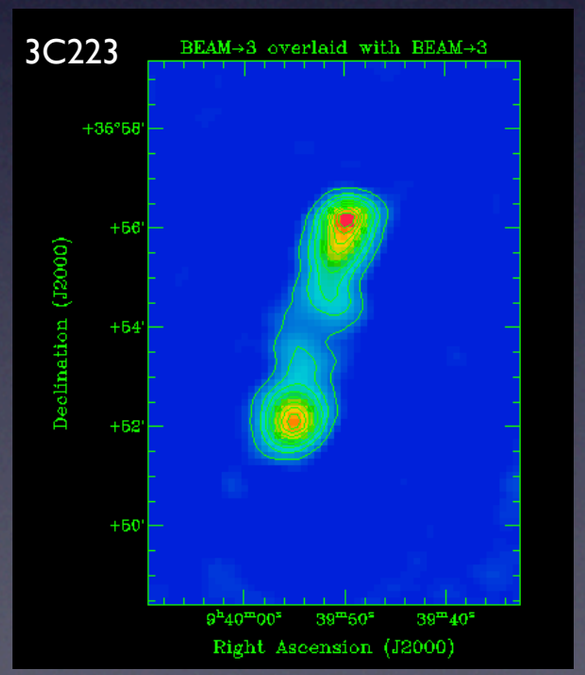
Giant Radio Galaxies

- the goal: characterization of polarized emission in GRG to study AGN evolution in low density environments
- the group: G. De Bruyn (chair), E. Orru', R. Pizzo
- find calibrators in the Lofar frequency range
- the challenge: low surface brightness, difficult to model





courtesy of A. Shulevski



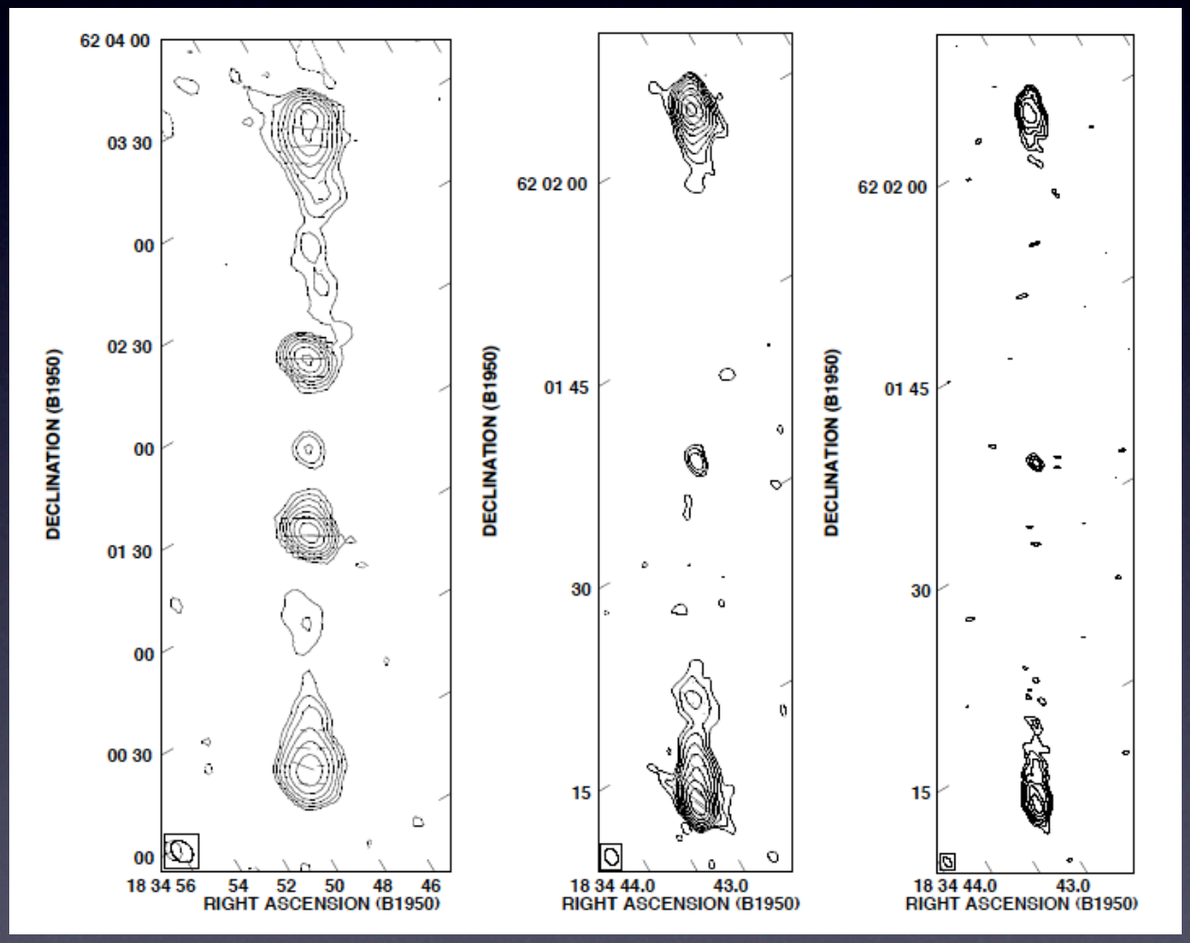
E. Orru'

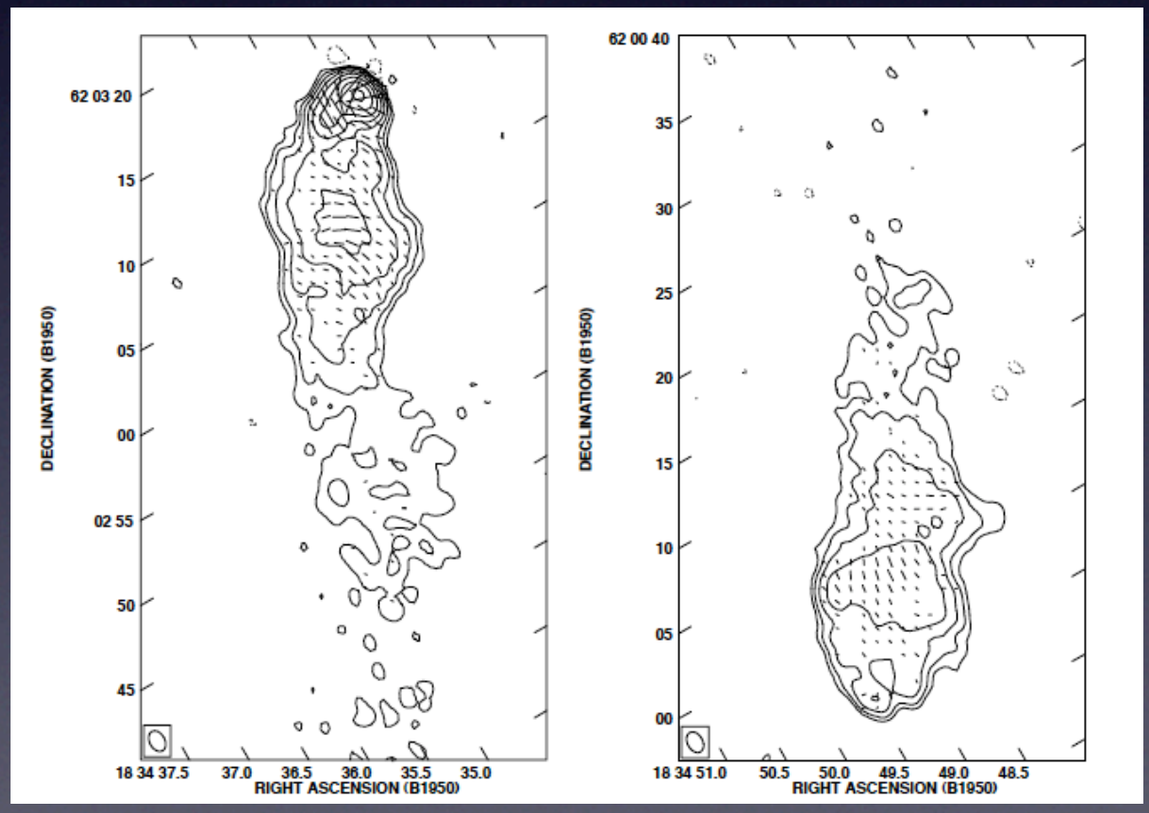
LOFAR LBA

Commissioning targets

DoubleDoubleRG: B1834+620

- easy to model
- available WSRT model
- known to be polarized at 150 MHz (Ger priv. com.)

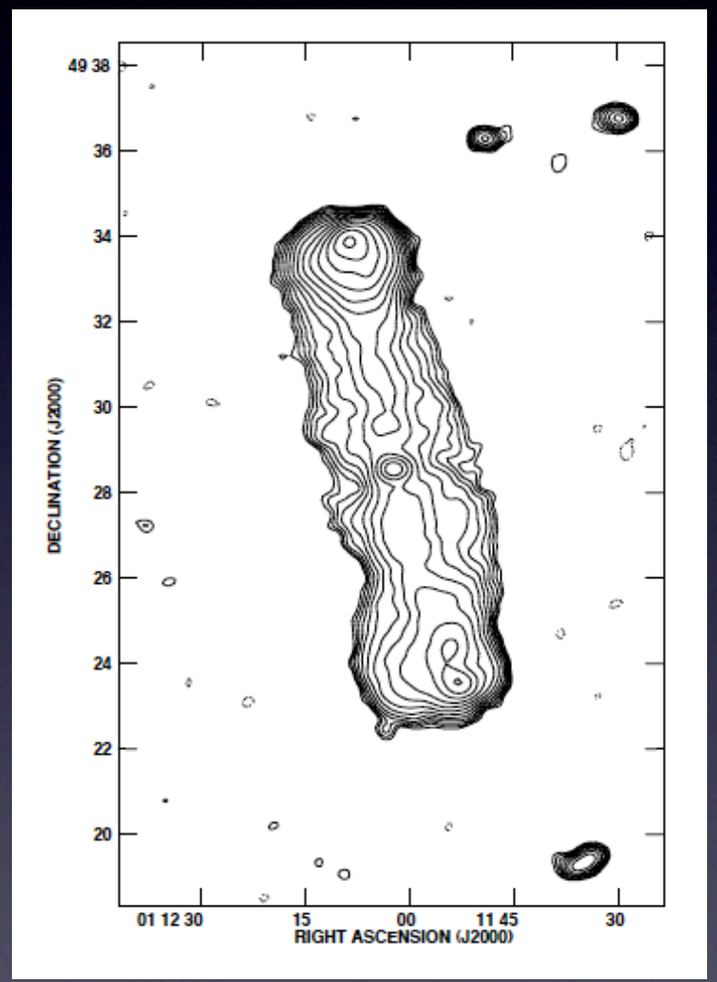




Schoenmakers et al. 2000

Commissioning targets

Giant Radio Galaxy: 3C35



Orru' et al. 2010

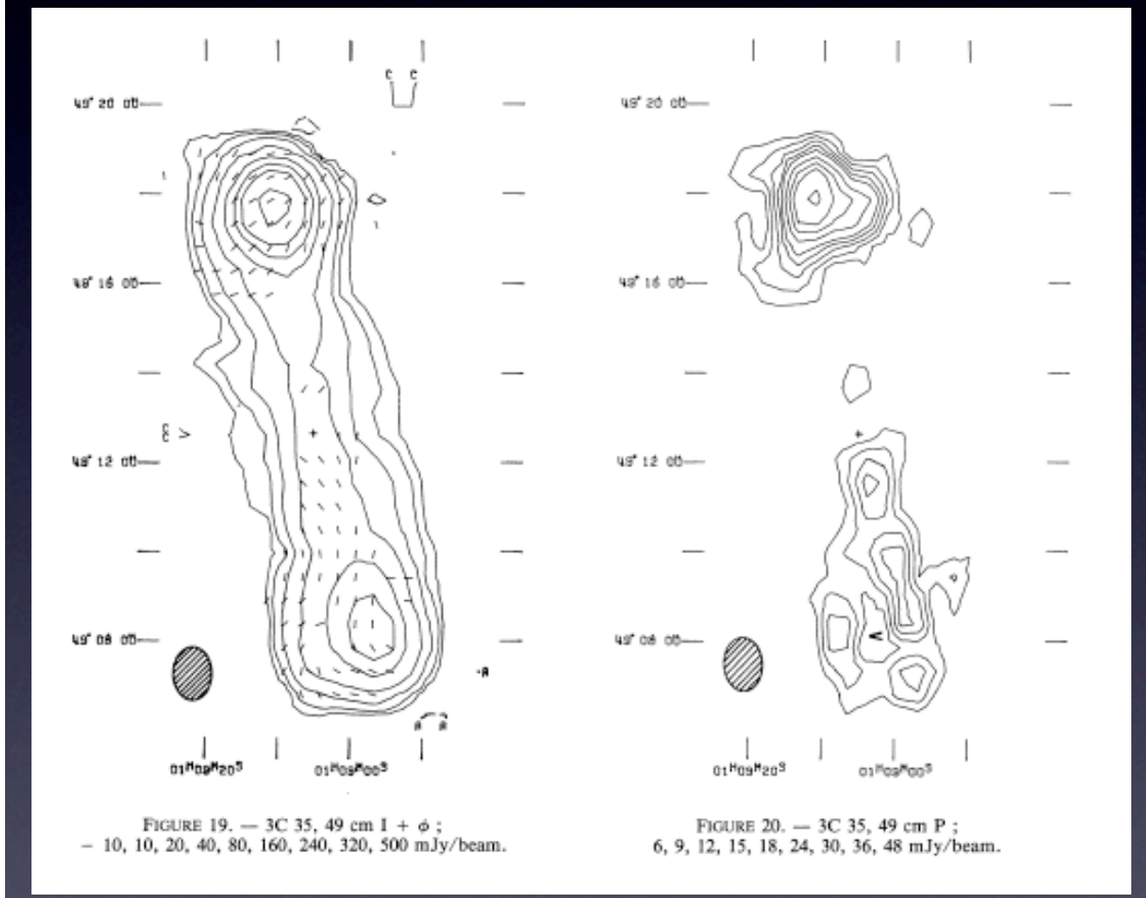


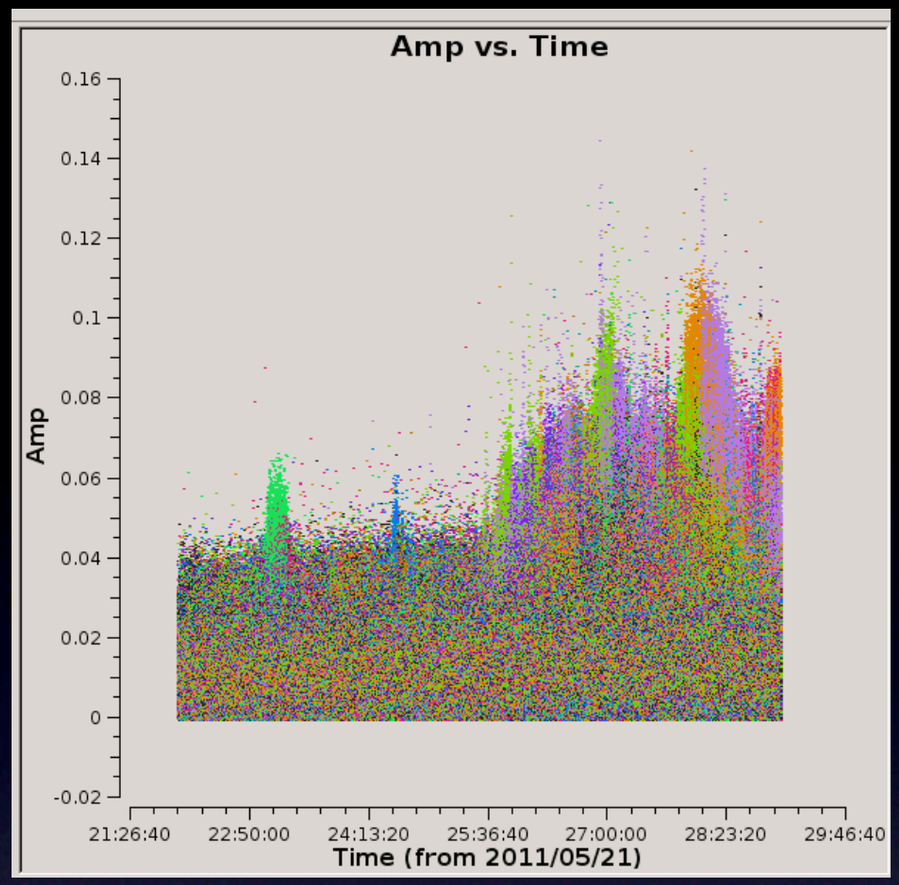
FIGURE 19. — 3C 35, 49 cm I + φ ;
– 10, 10, 20, 40, 80, 160, 240, 320, 500 mJy/beam.

FIGURE 20. — 3C 35, 49 cm P ;
6, 9, 12, 15, 18, 24, 30, 36, 48 mJy/beam.

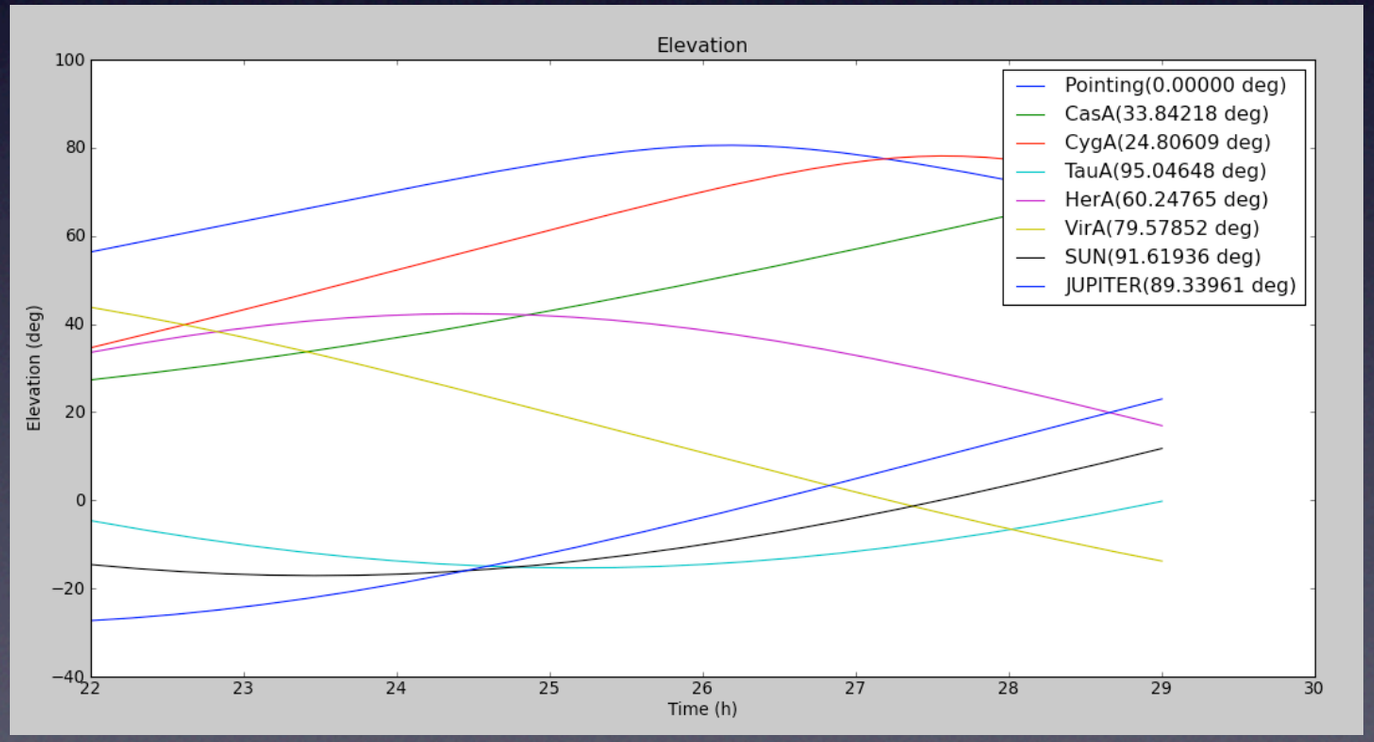
Van Breugel & Jaegers 1982

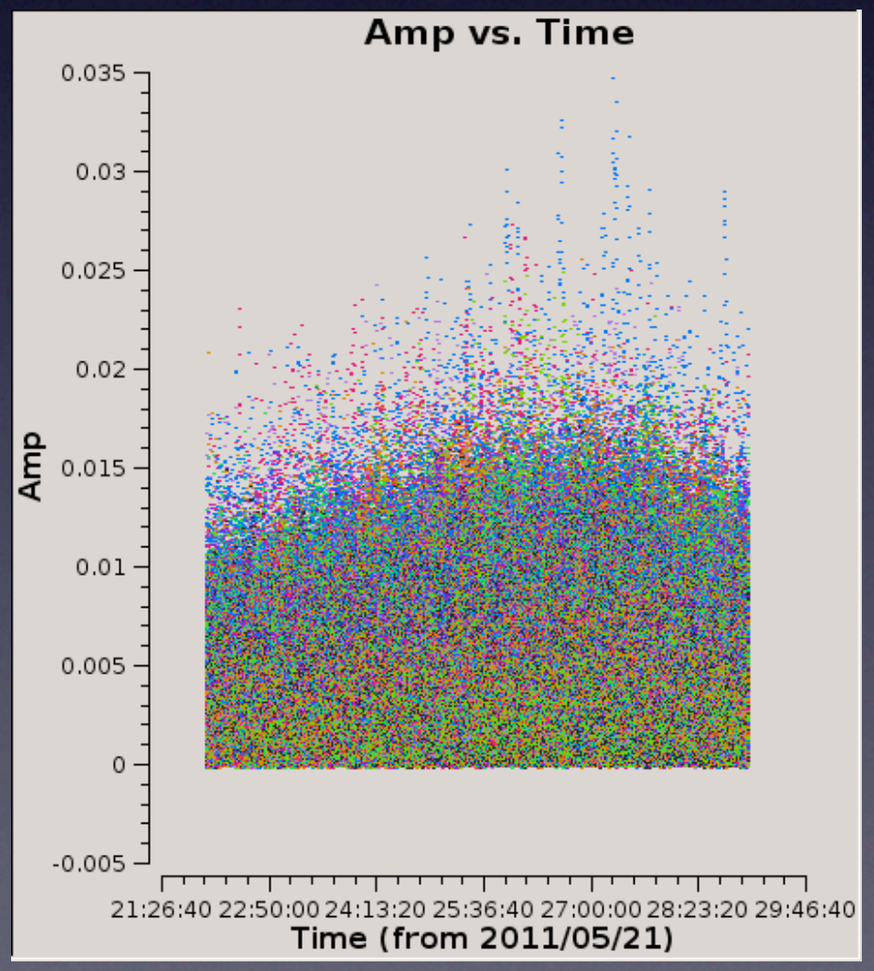
- known to be polarized up to 610 MHz
- Model VLA low freq. high resolution image

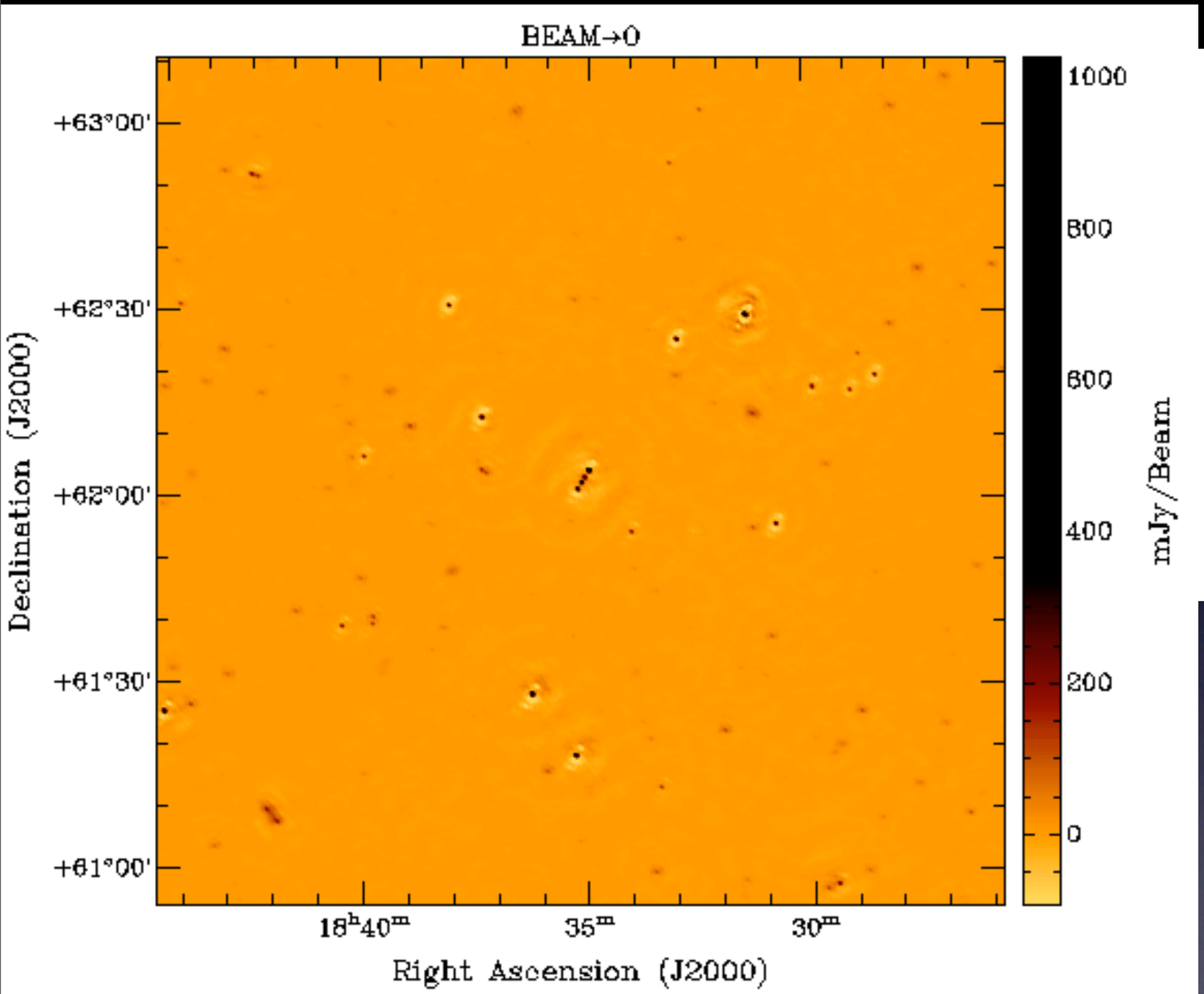
DOUBLE

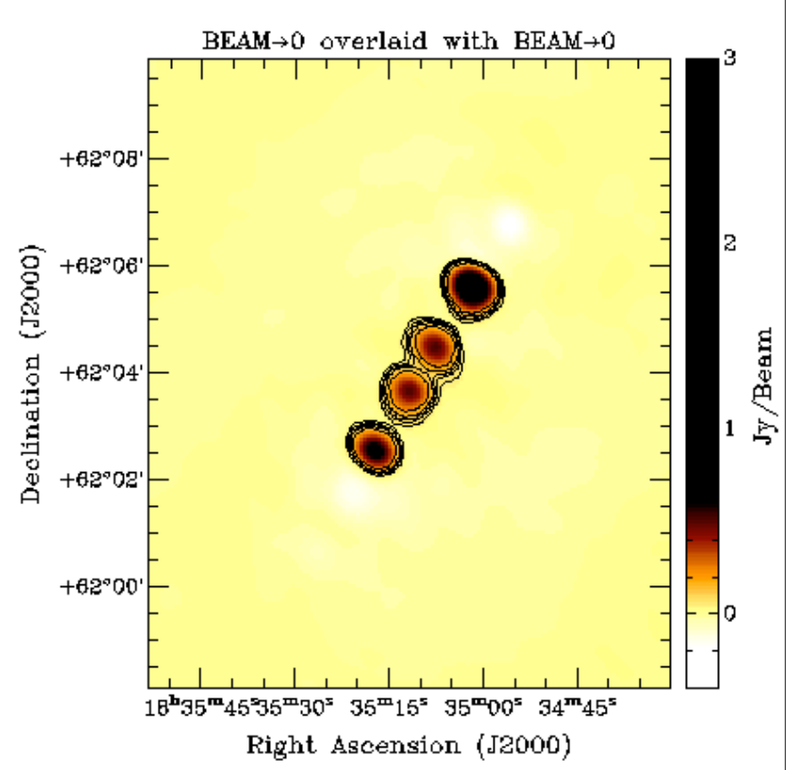


- 21-22 May-2011: 7h
- HBA freq. ~ 140 MHz
- 44 antennas 1DE flagged + one with no data recorded
- 162 SB



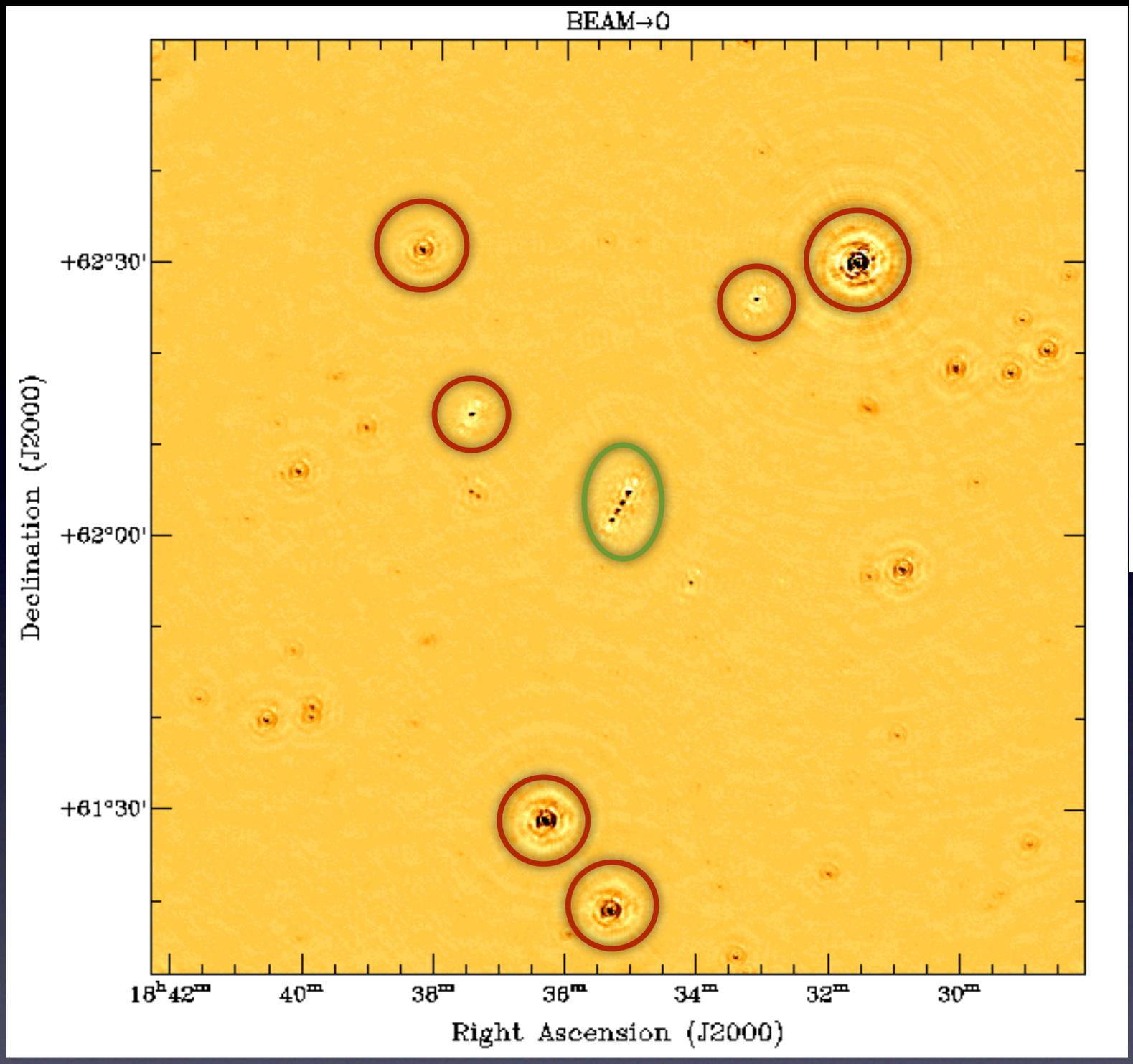


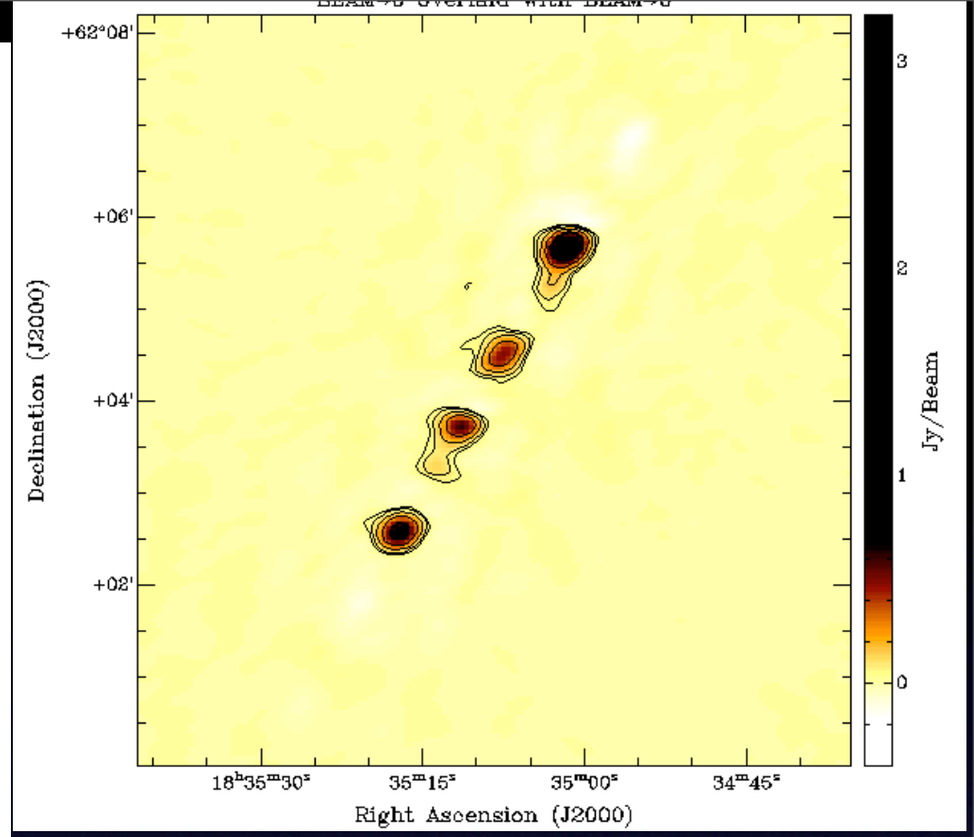




Low res=30”X25”
rms=2.5 mJy/beam

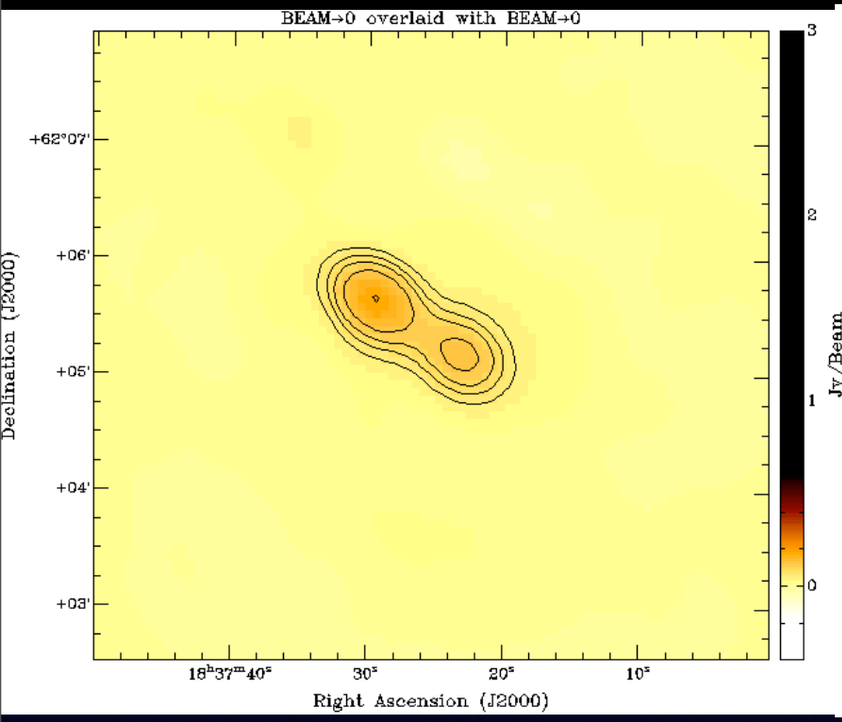
demix+BBS (SC)+flag+imaging

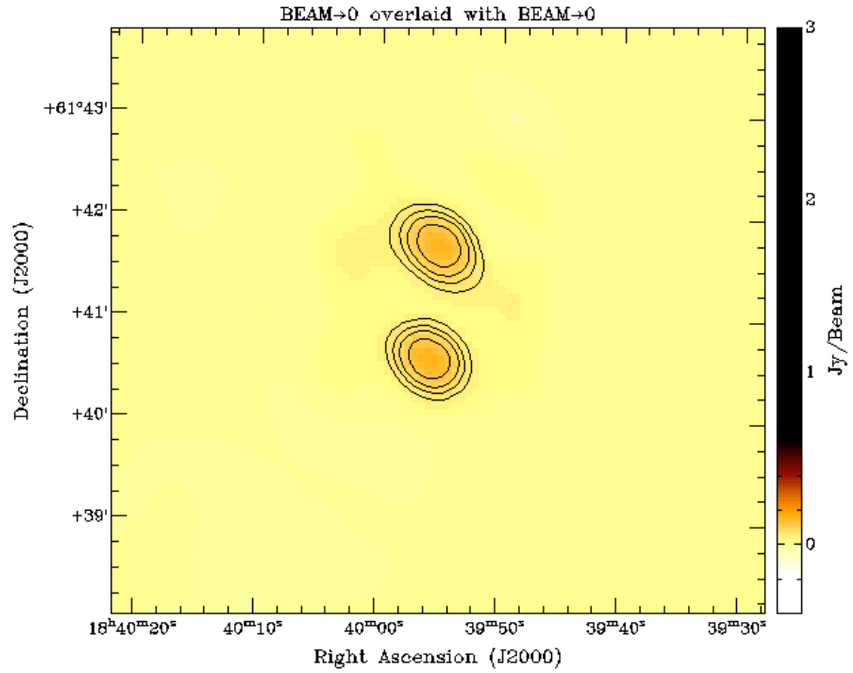


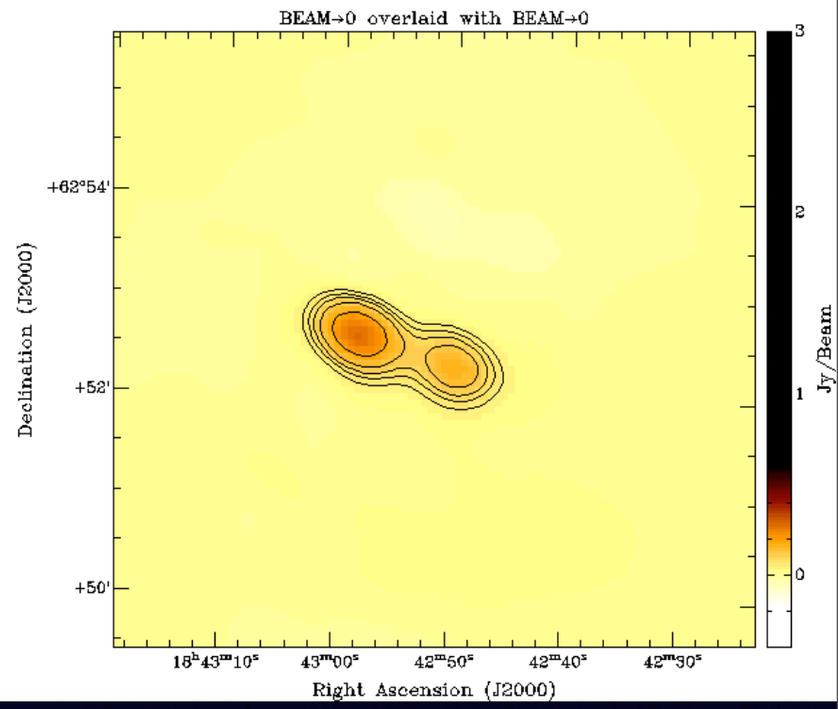


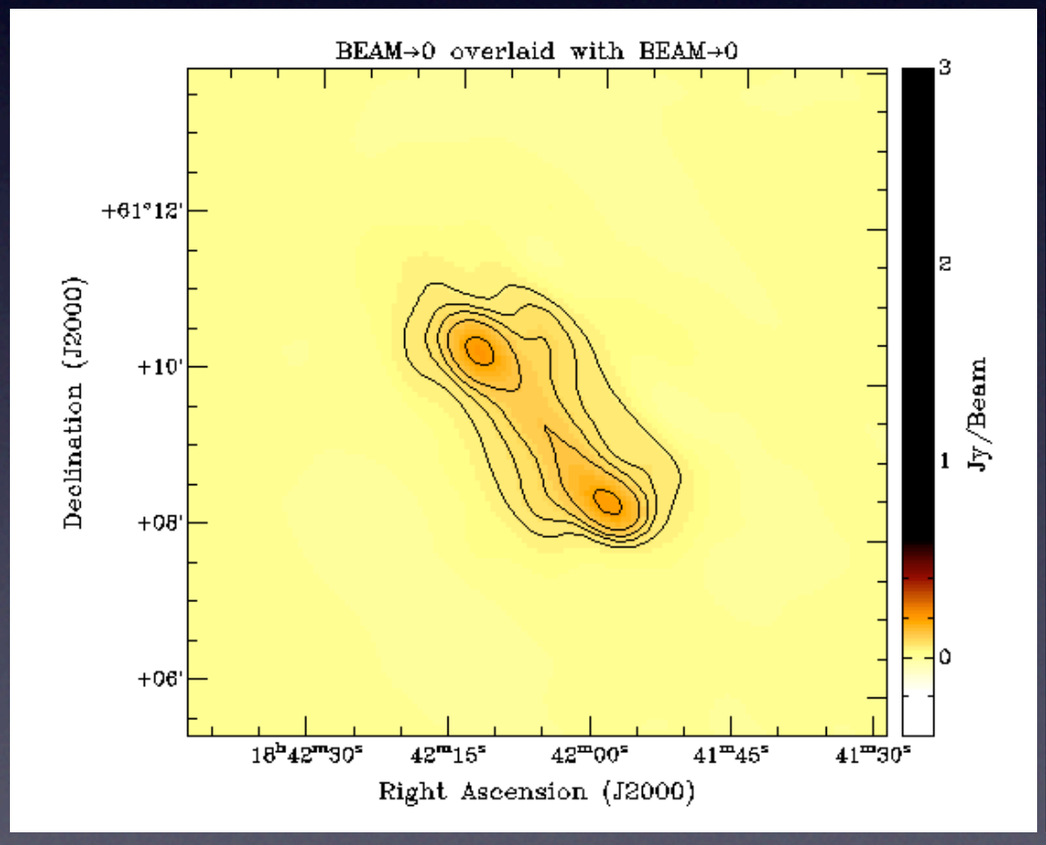
High res=22"X18"
rms=1.5 mJy/beam

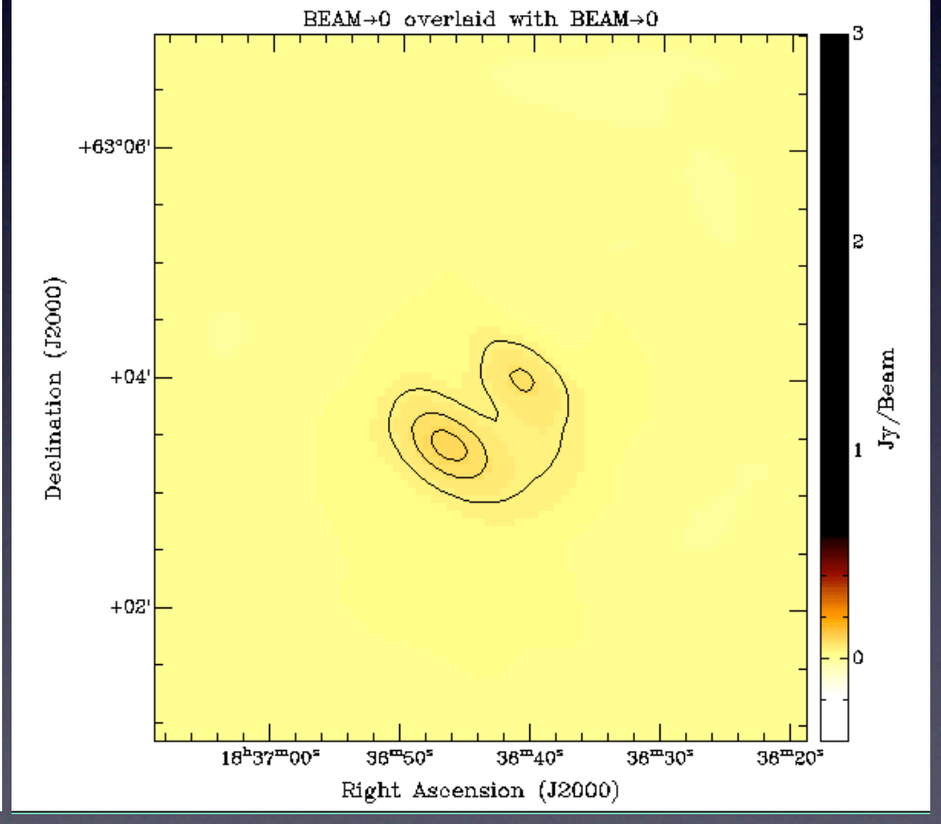
possible issues: model low res, DDE peak flux comparable, variable beam/ionosphere? crash HBA dipoles


BEAM→0 overlaid with BEAM→0
Declination (J2000)
+62°07'
+06'
+05'
+04'
+03'
18h37m40s
30s
20s
10s
Right Ascension (J2000)
3
2
1
0
Jy/Beam

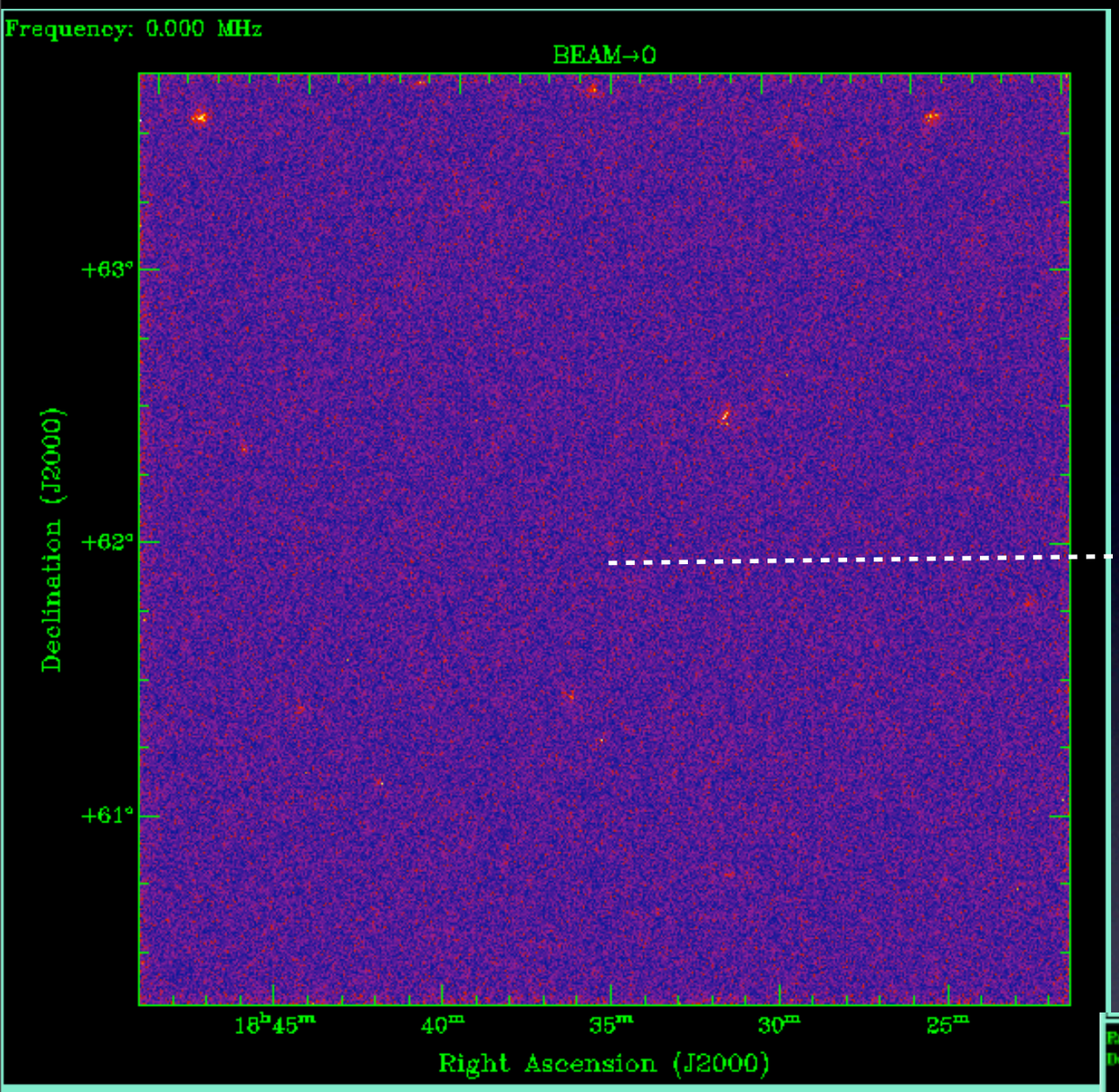

BEAM→0 overlaid with BEAM→0
Declination (J2000)
+61°43'
+42'
+41'
+40'
+39'
18h40m20s
40m10s
40m00s
39m50s
39m40s
39m30s
Right Ascension (J2000)
3
2
1
0
Jy/Beam


BEAM→0 overlaid with BEAM→0
Declination (J2000)
+62°54'
+52'
+50'
18h43m10s
43m00s
42m50s
42m40s
42m30s
Right Ascension (J2000)
3
2
1
0
Jy/Beam


BEAM→0 overlaid with BEAM→0
Declination (J2000)
+61°12'
+10'
+08'
+06'
18h42m30s
42m15s
42m00s
41m45s
41m30s
Right Ascension (J2000)
3
2
1
0
Jy/Beam

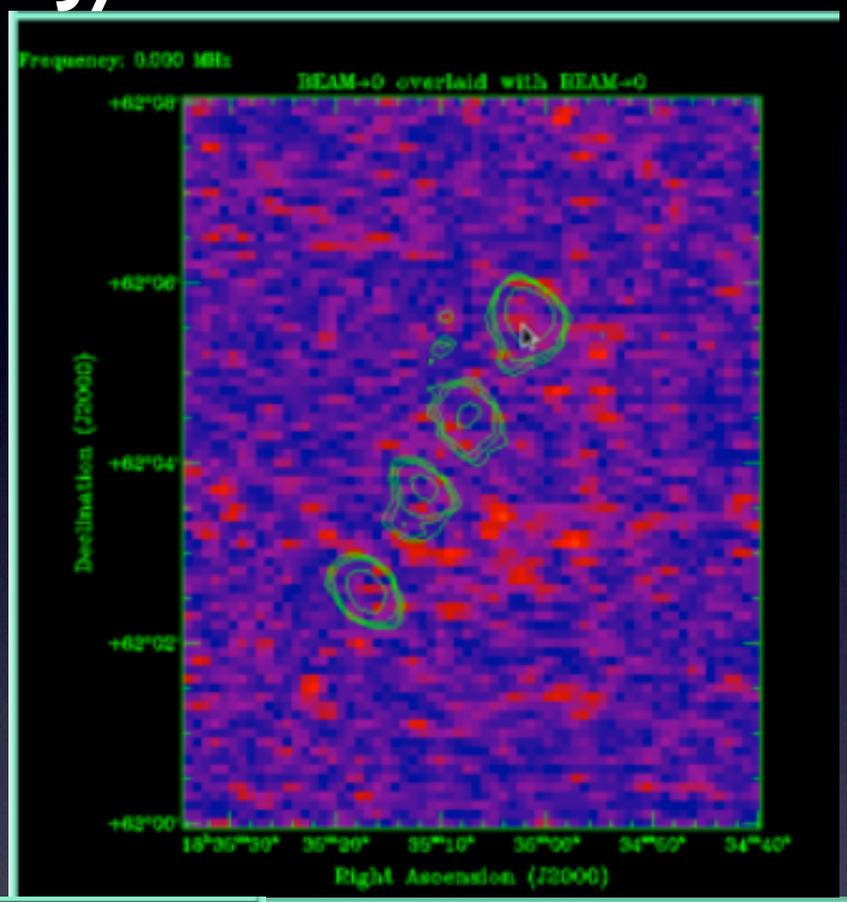

BEAM→0 overlaid with BEAM→0
Declination (J2000)
+63°06'
+04'
+02'
18h37m00s
36m50s
36m40s
36m30s
36m20s
Right Ascension (J2000)
3
2
1
0
Jy/Beam

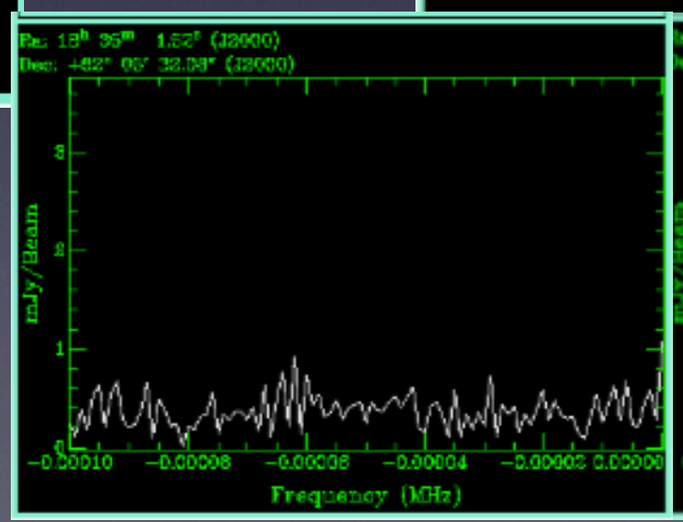
polarization: RM synthesis cubes

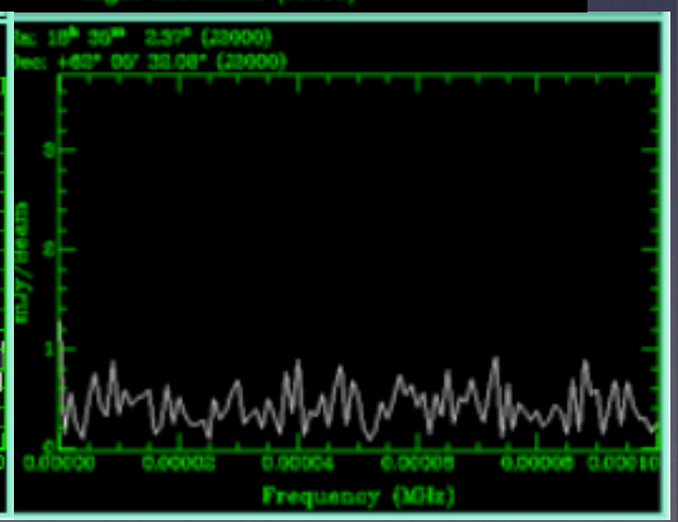


phi=0

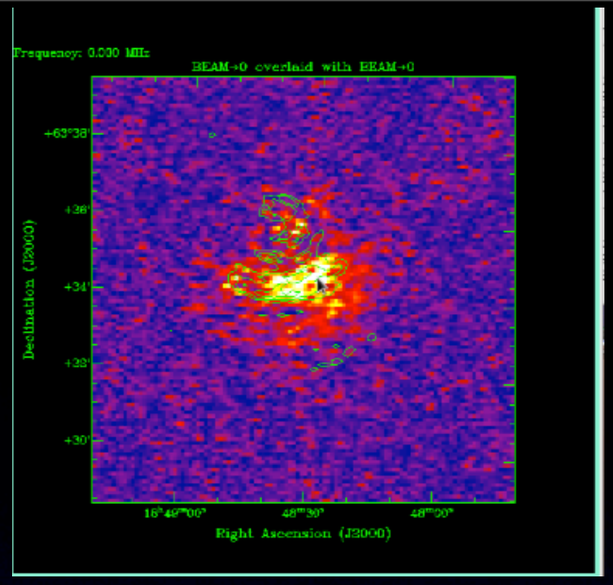
rms=0.3mJy/beam

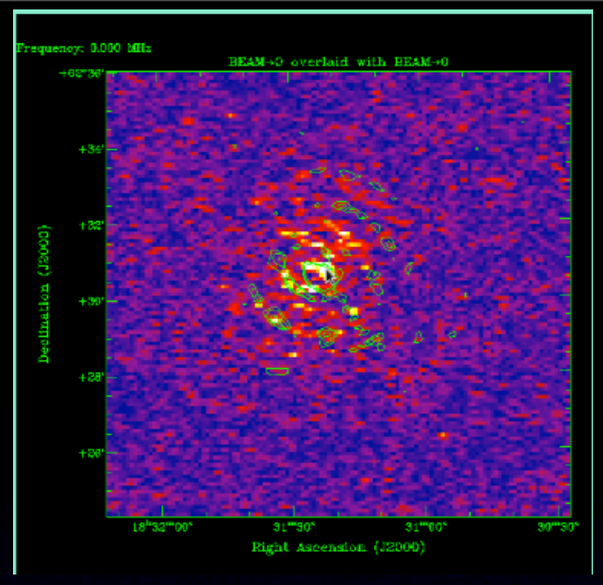


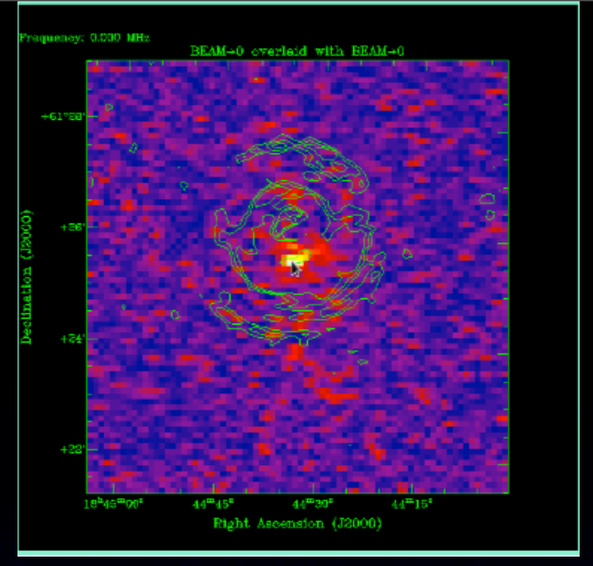


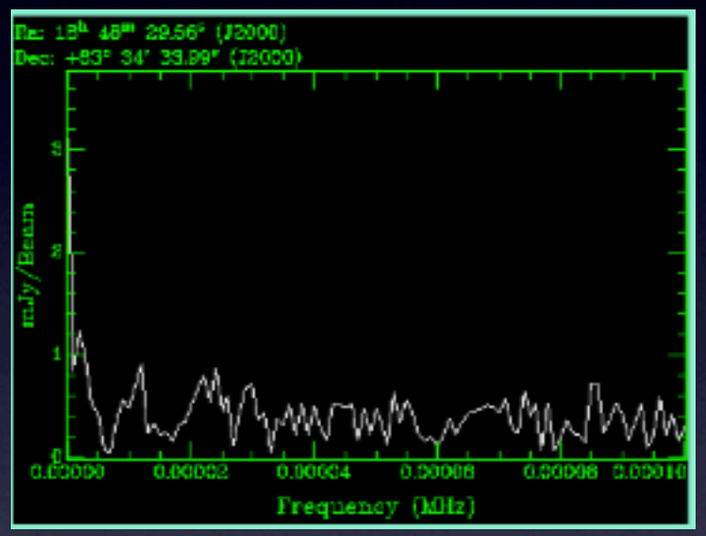


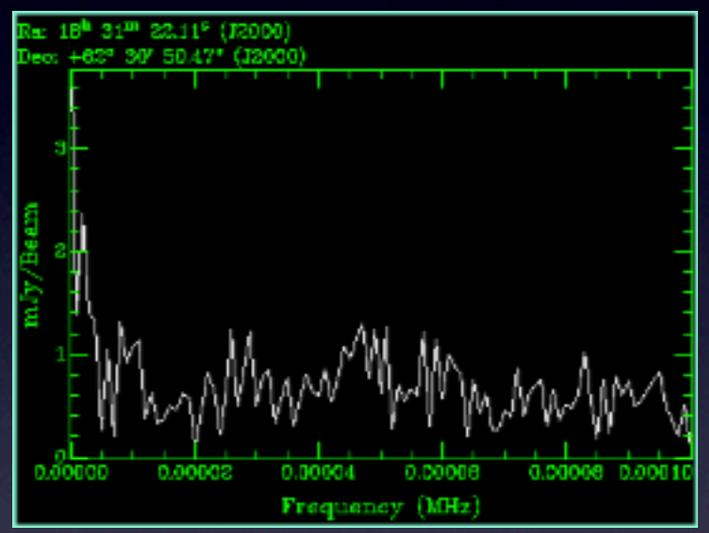
Trend instrumental polarization

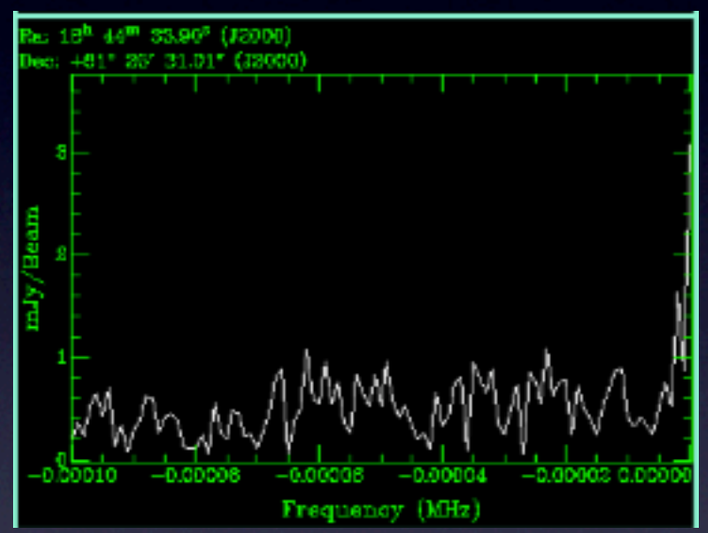












Open issues: why no pol in double?

demix

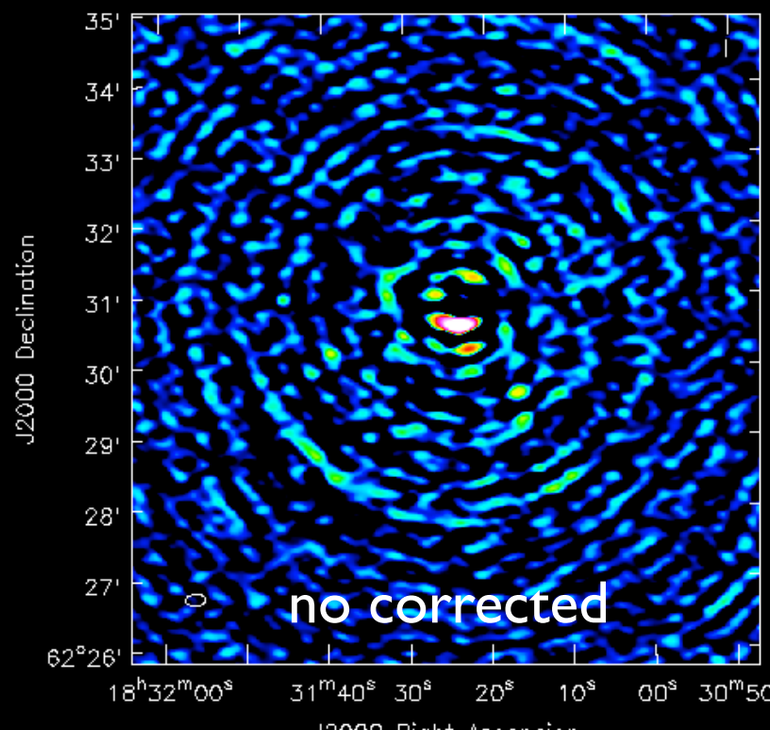
DDE artifacts

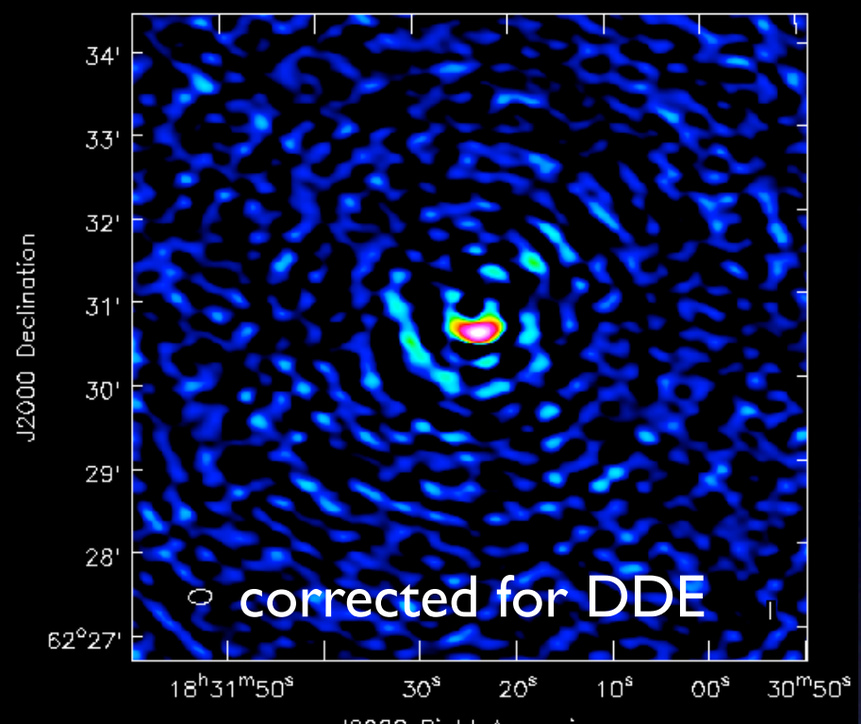
low S/N (162 SB out of 240)

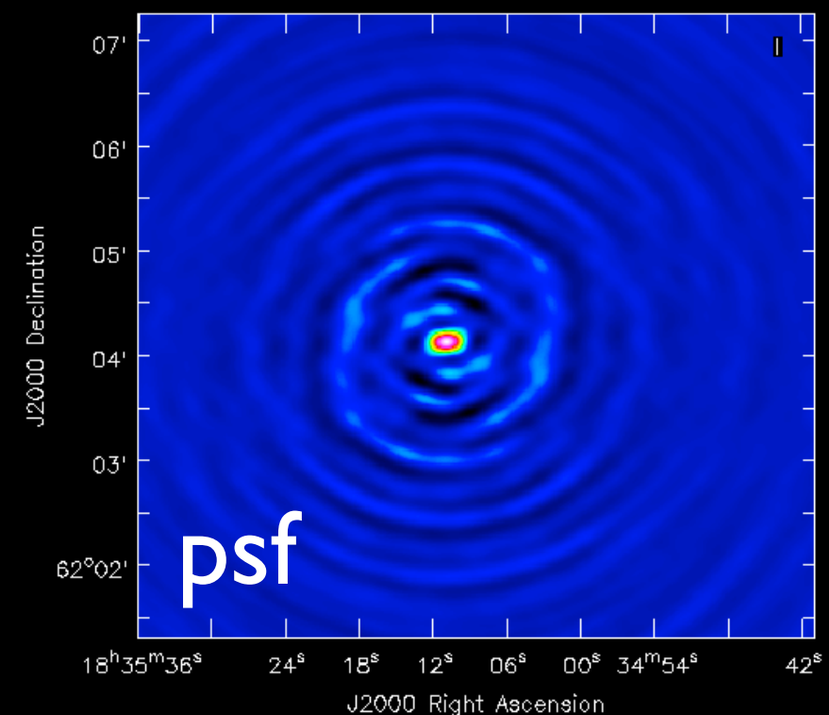
RM synth cubes analysis - emission in more pixels-lowering resolution-beam depolarization

Possible Solutions and future tests?

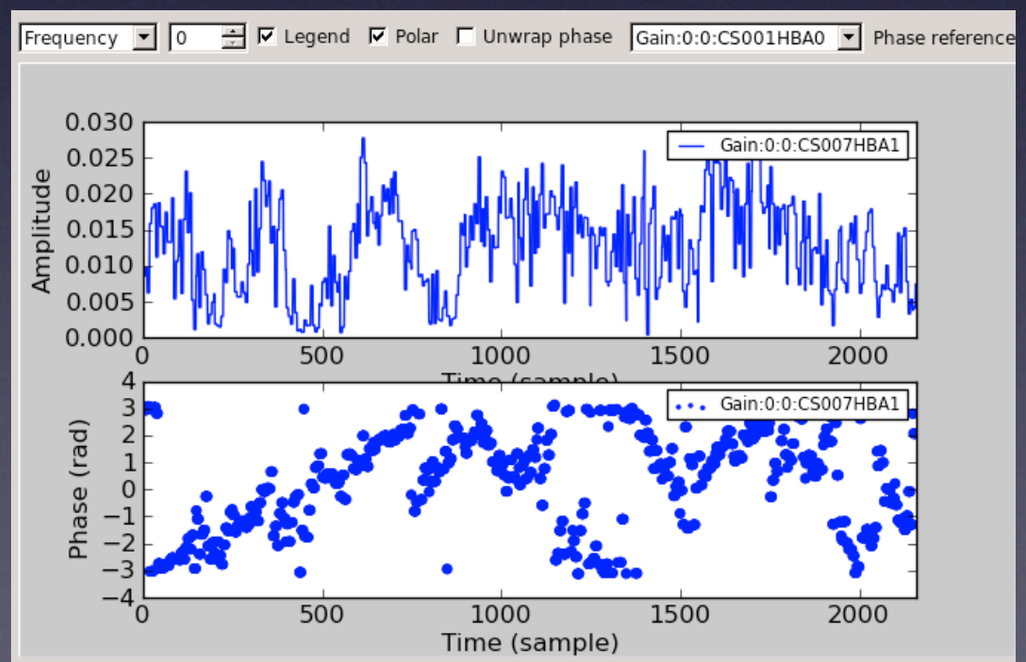
update the model



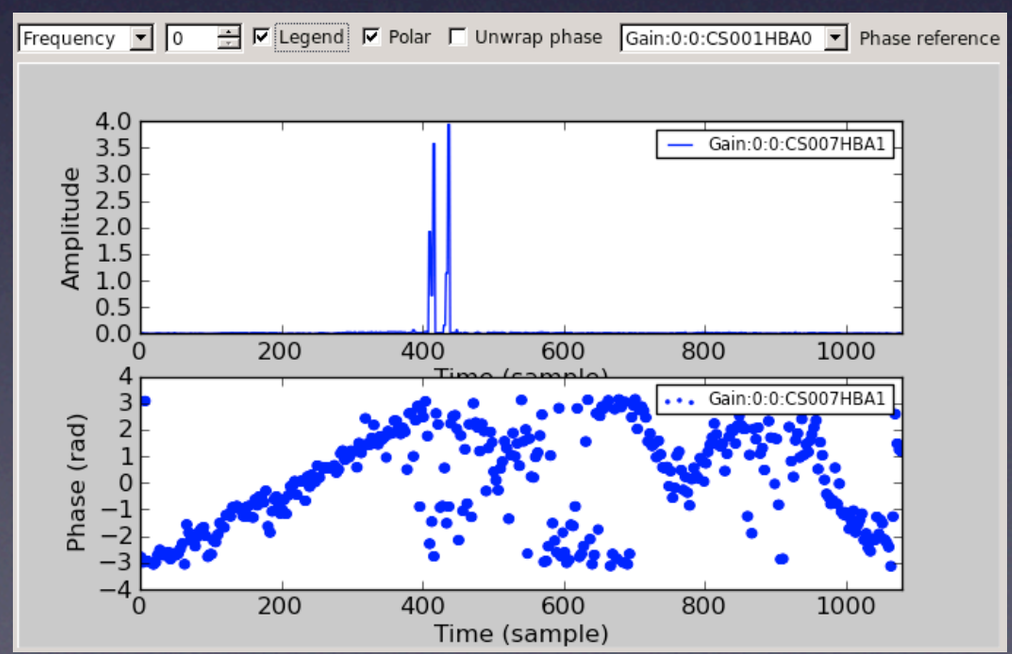




what if we do not use demix but subtract and calibrate in 2 step



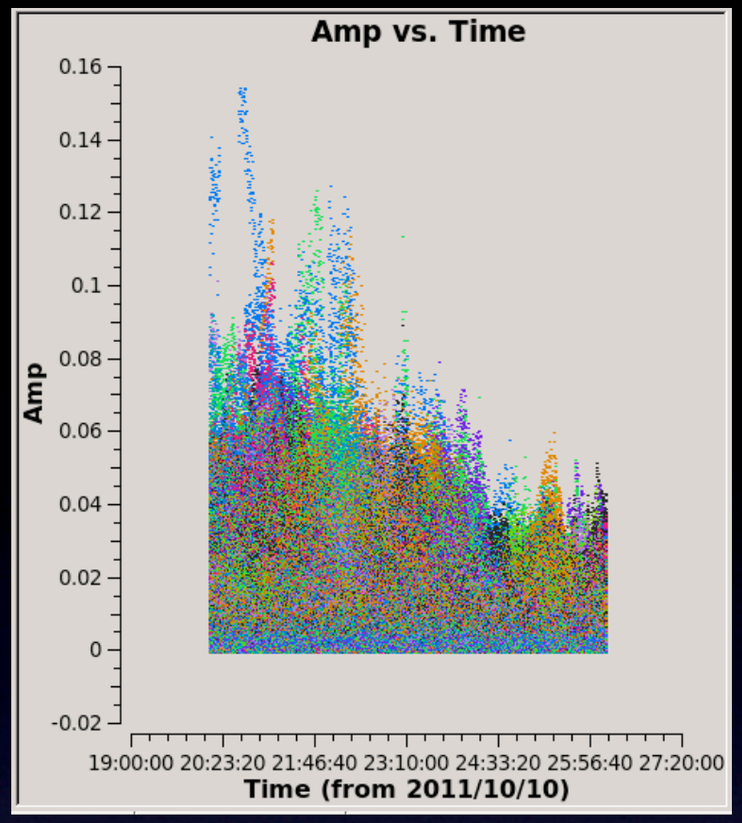
2step

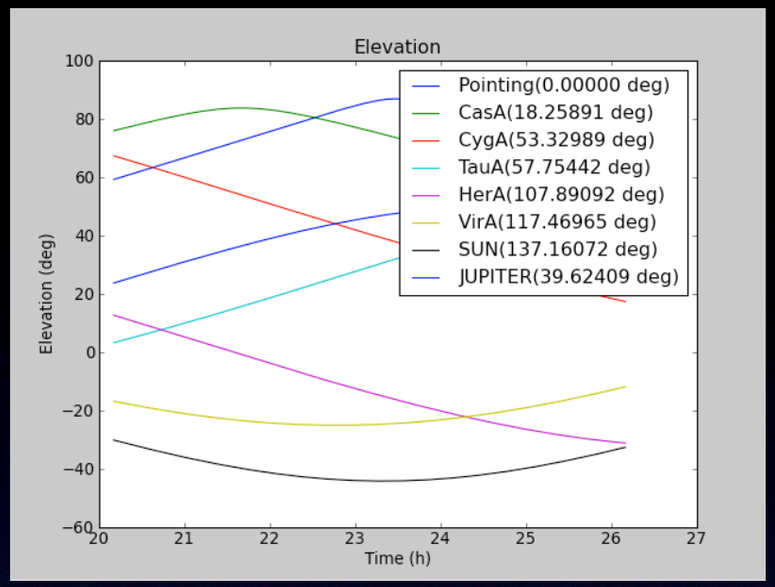


demix

3C35

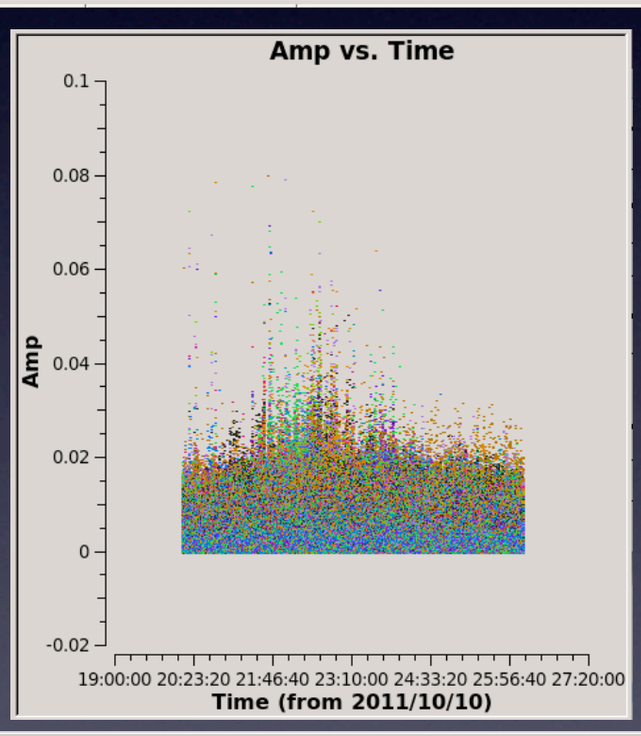
A-team

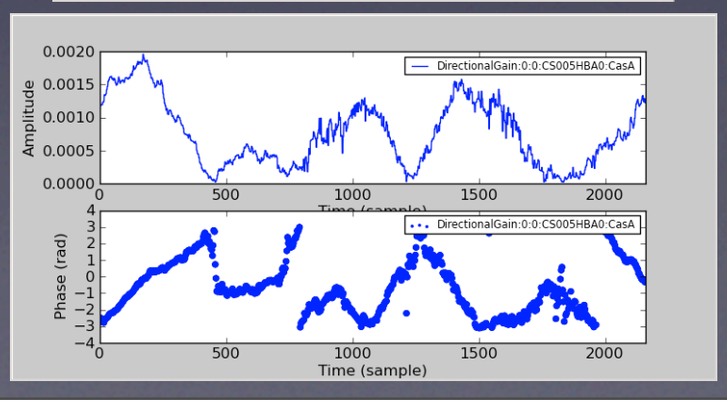




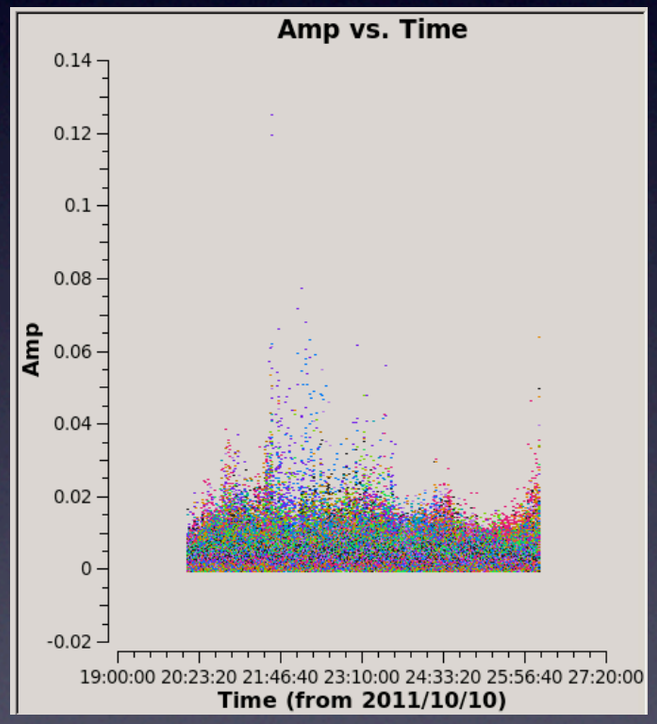
- 10 Oct-2011: 6h
- HBA freq. ~ 140 MHz
- 50 antennas

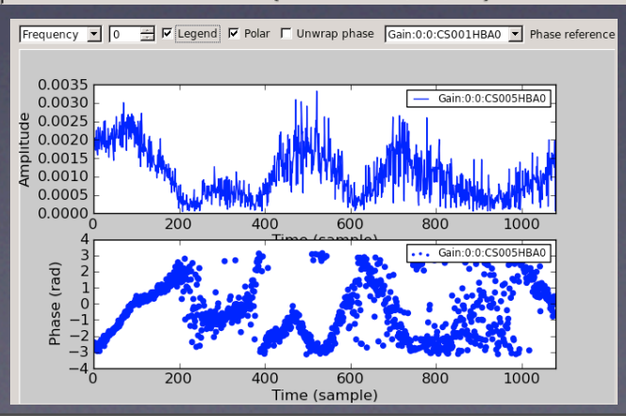
Subtract DDE



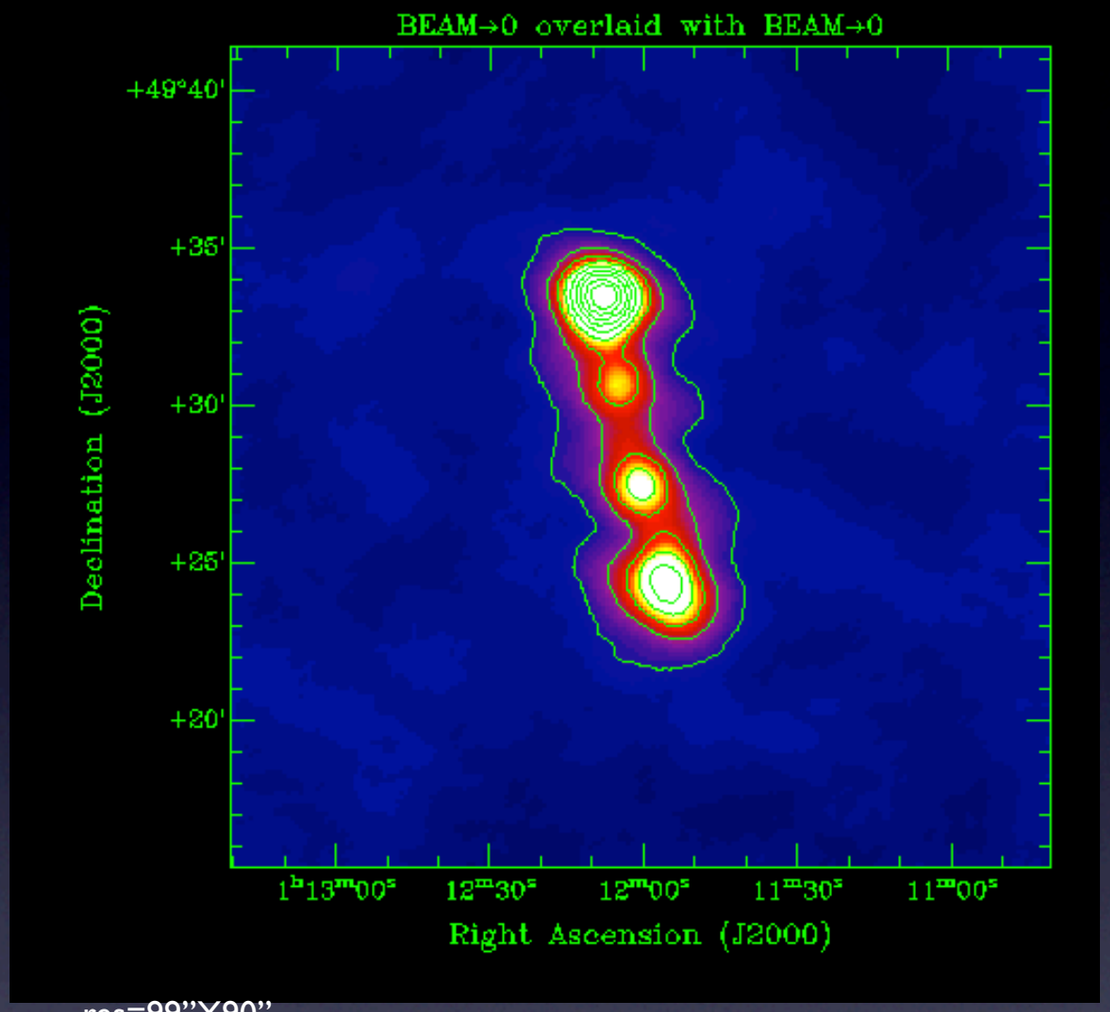


Demix

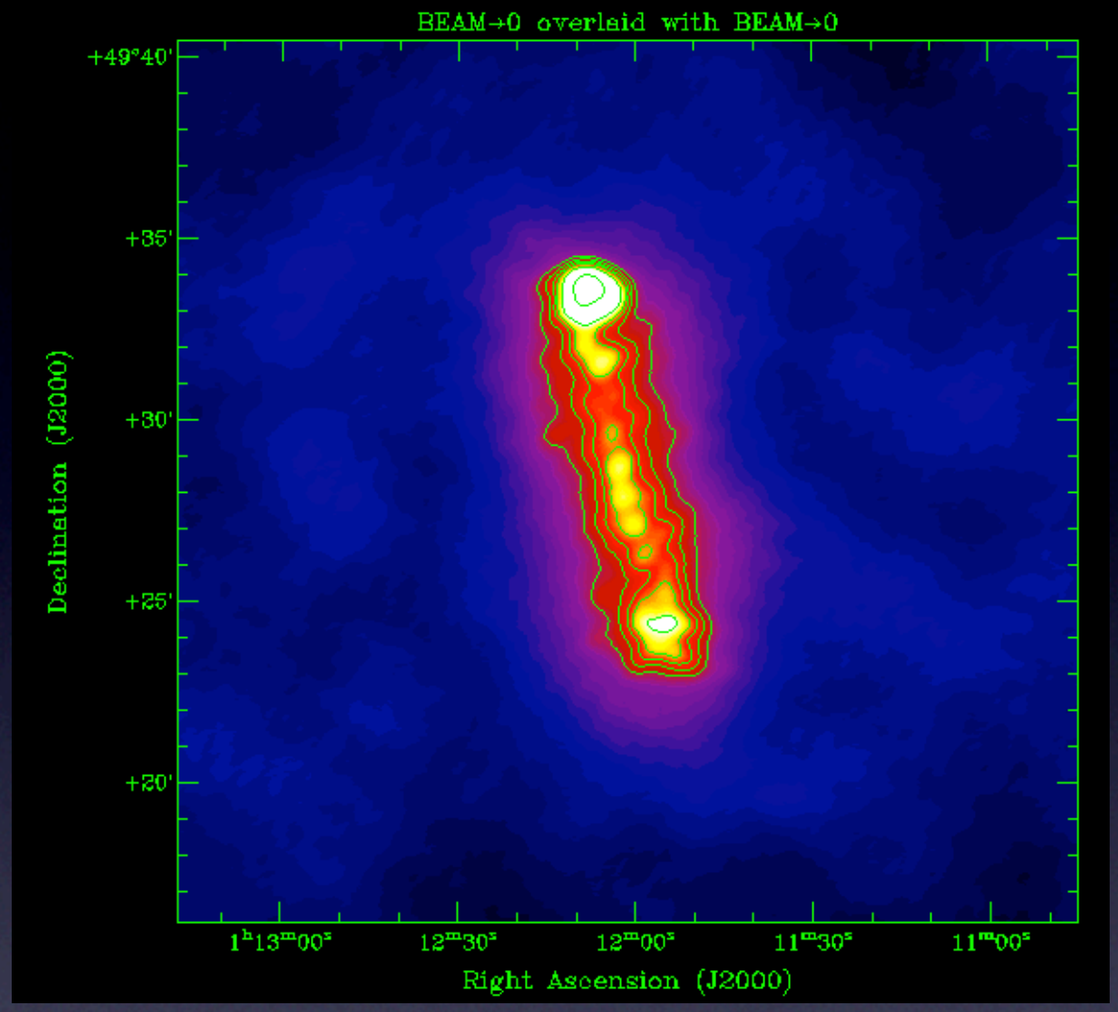




preliminary images



res=99"X90"
rms=35 mJy/beam demix

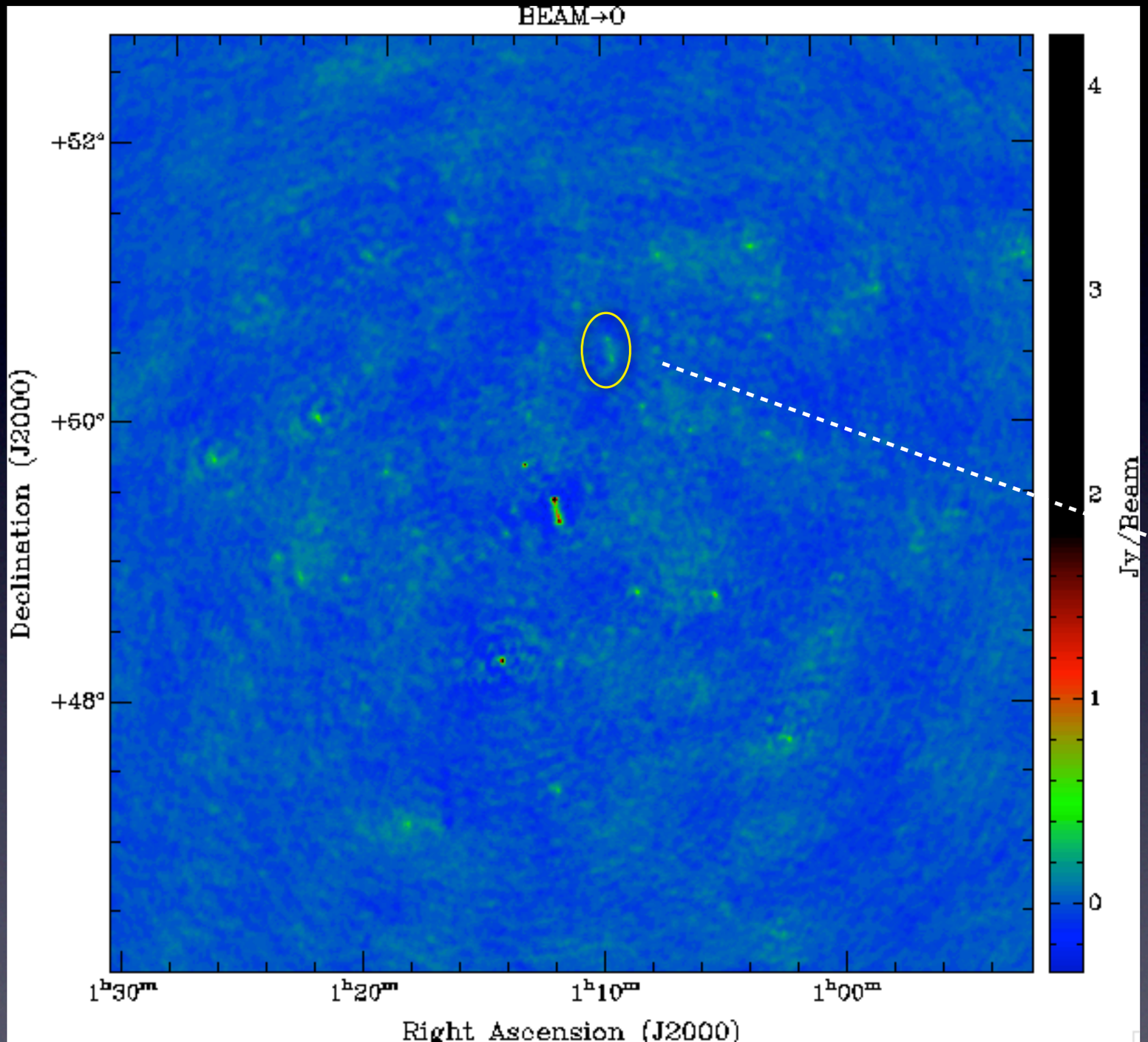


res=45"X39"
rms=30mJy/beam demix

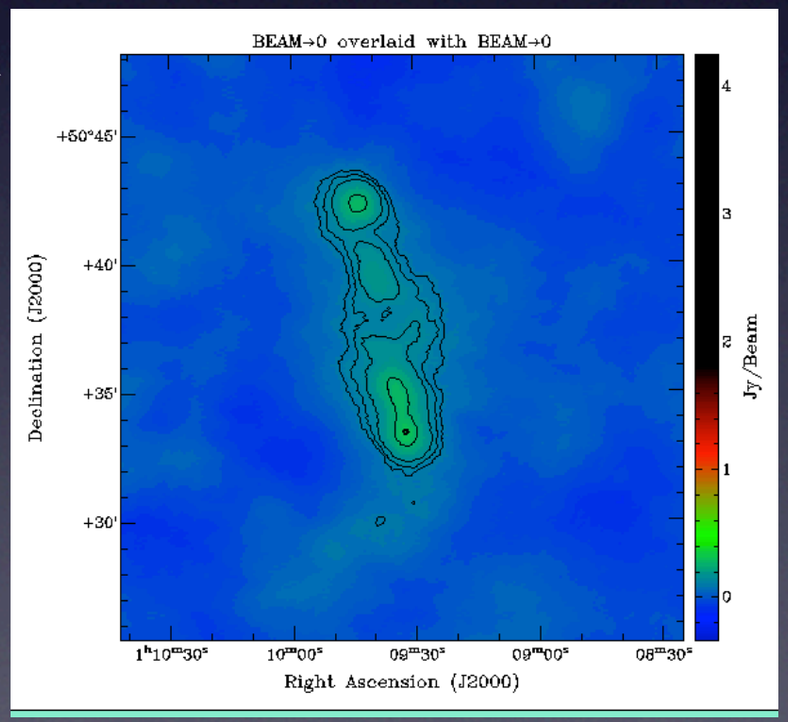
low level RFI after A-team subtraction
pattern short BL
Q U V noisy no evidence of polarized emission

future: model combined
my thesis wenss
point and shapelets
flag low level RFI

preliminary images



res=77”X70”
rms=30 mJy/beam
2step method



Summary

- B1834+620: total intensity and P images. Artifacts offset sources. Instrumental polarization.
- update the model at high resolution, investigate on the reason for SB crashes
- 3C35 preliminary calibration. Total intensity show a pattern, no polarized emission observed in Q U V.
- produce a combined model with point-shapelets, test demix vs 2 step subtraction, residual RFIs after A-team subtraction.

Limits

- calibration DDG correct in several directions - computing capacity -single vs global
- subtraction method demix or 2step subtract
- RM synthesis slow, memory limited, limited in pixels (high resolution small FOV) and Phi range and shift R.A.
- RM cube visualization limits @ 2Gb (kvis).