

HD163296

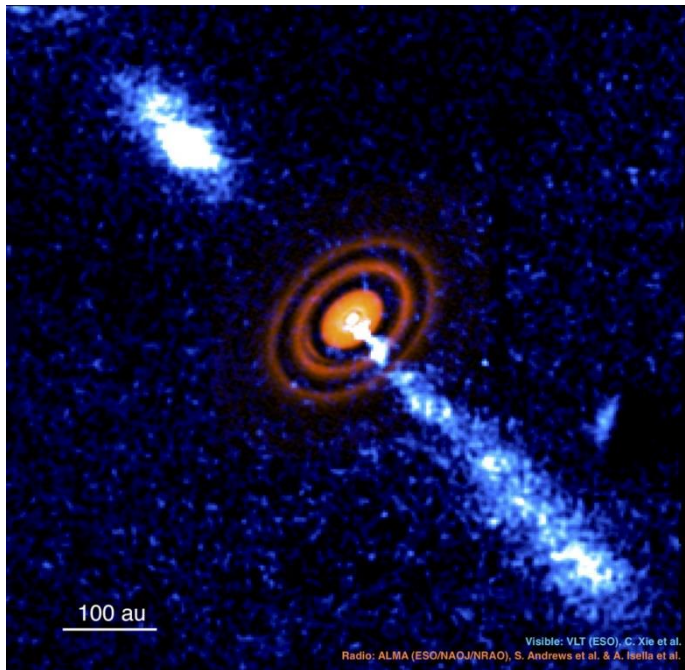
Self-Calibration and Imaging

이선재, 이희원

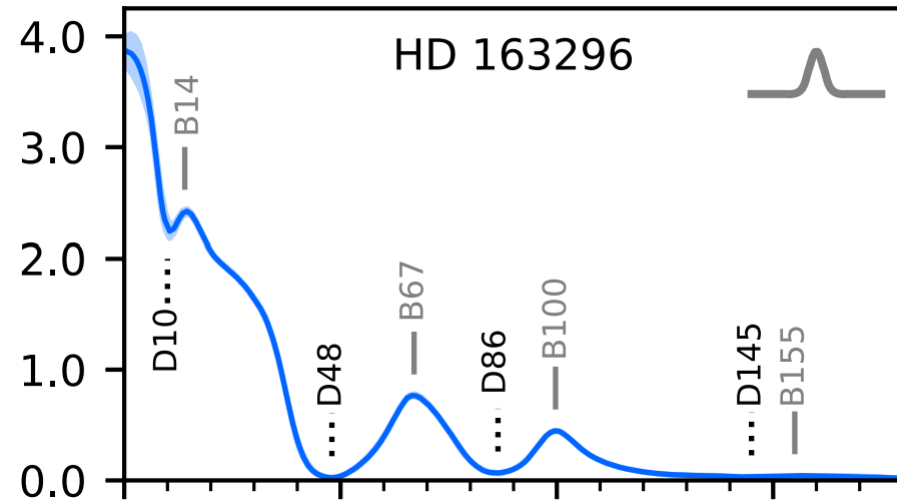
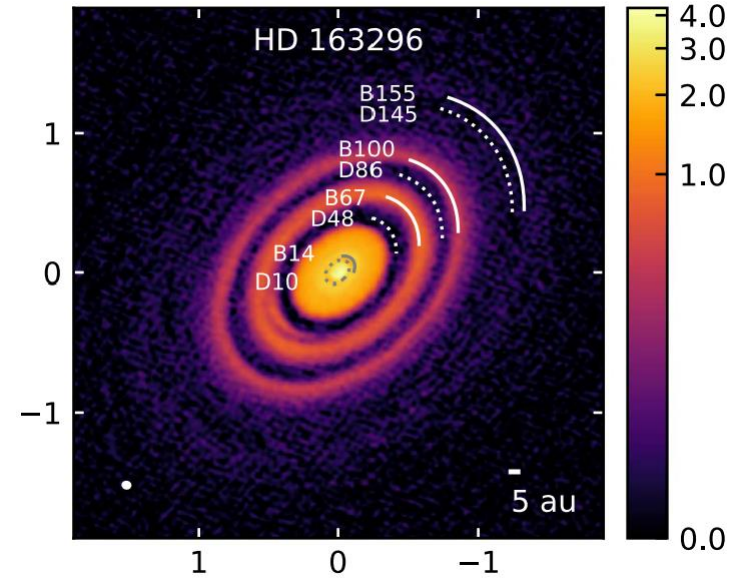
Tutor : 윤형식

HD 163296

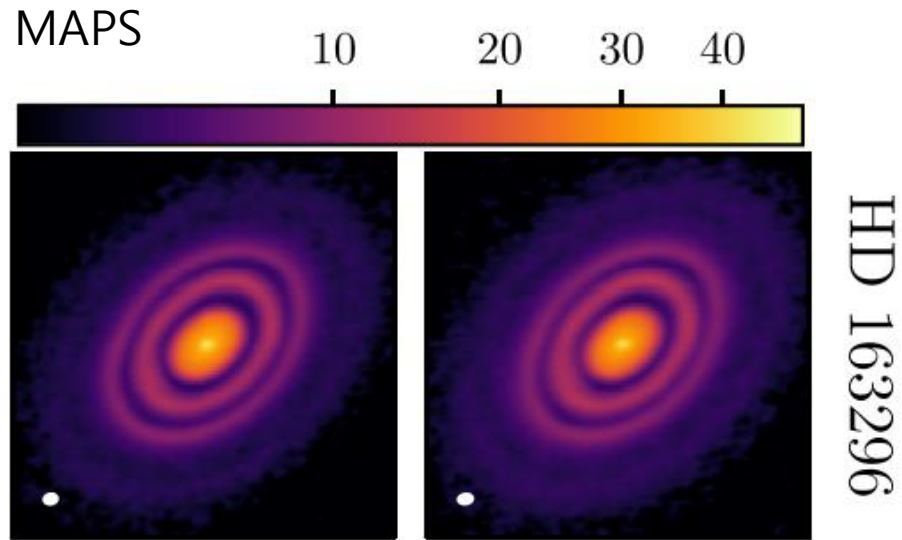
Herbig Ae/Be Star
Class II (Disk)
Distance : 100pc



DSHARP



HD 163296 (Observations)

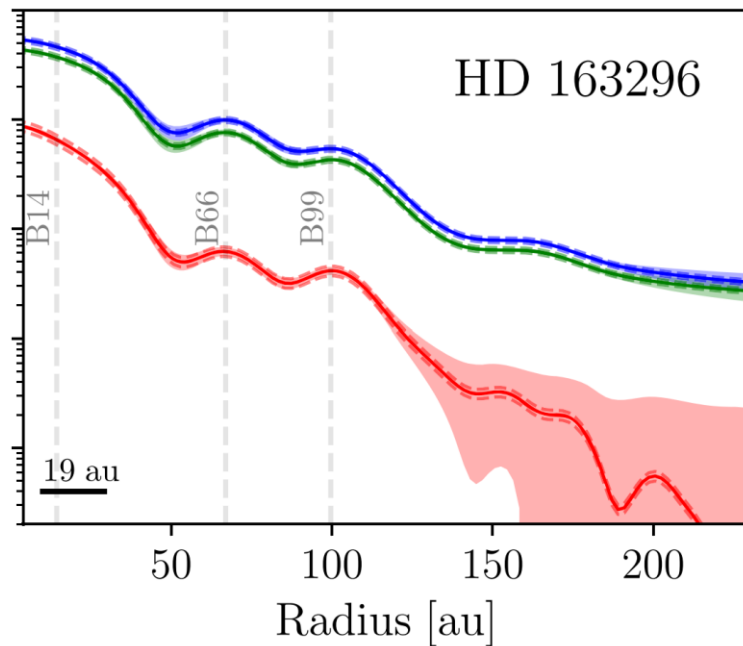


2018.1.01055.L

Observation : 2019 Apr ~ 2019 Aug

Band 6-2 continuum data (~250GHz)

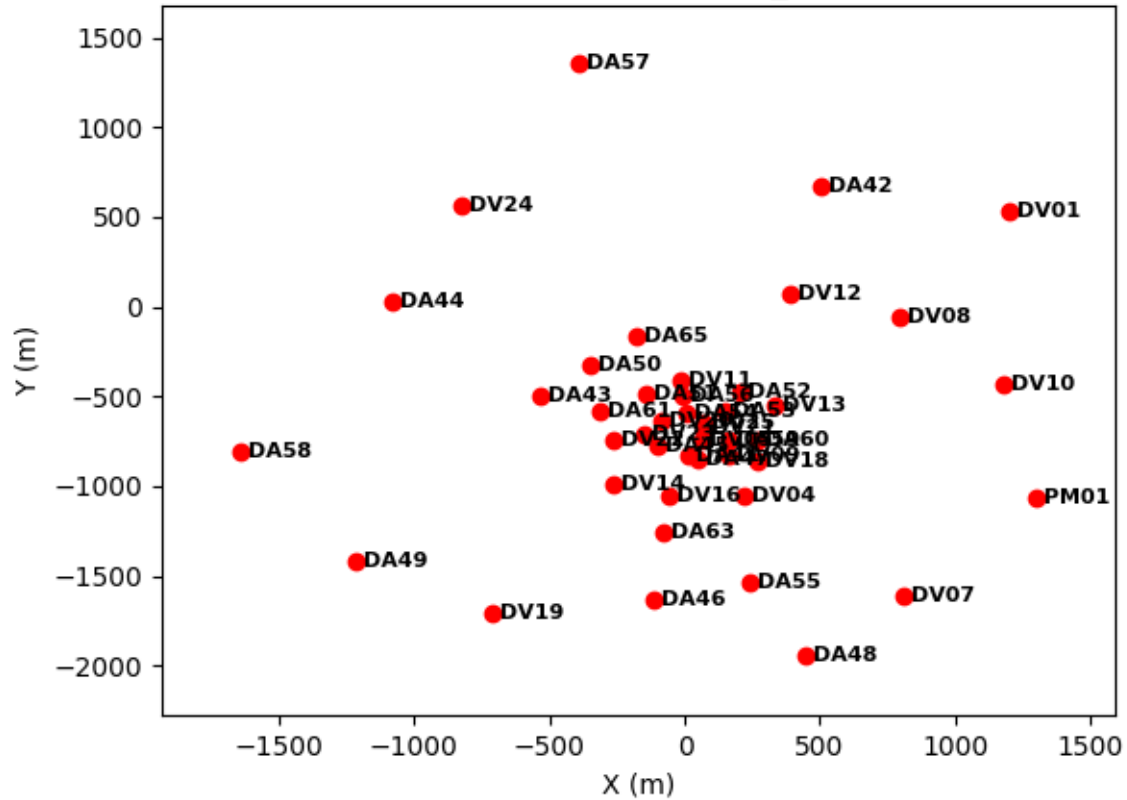
Short & Long baseline configurations



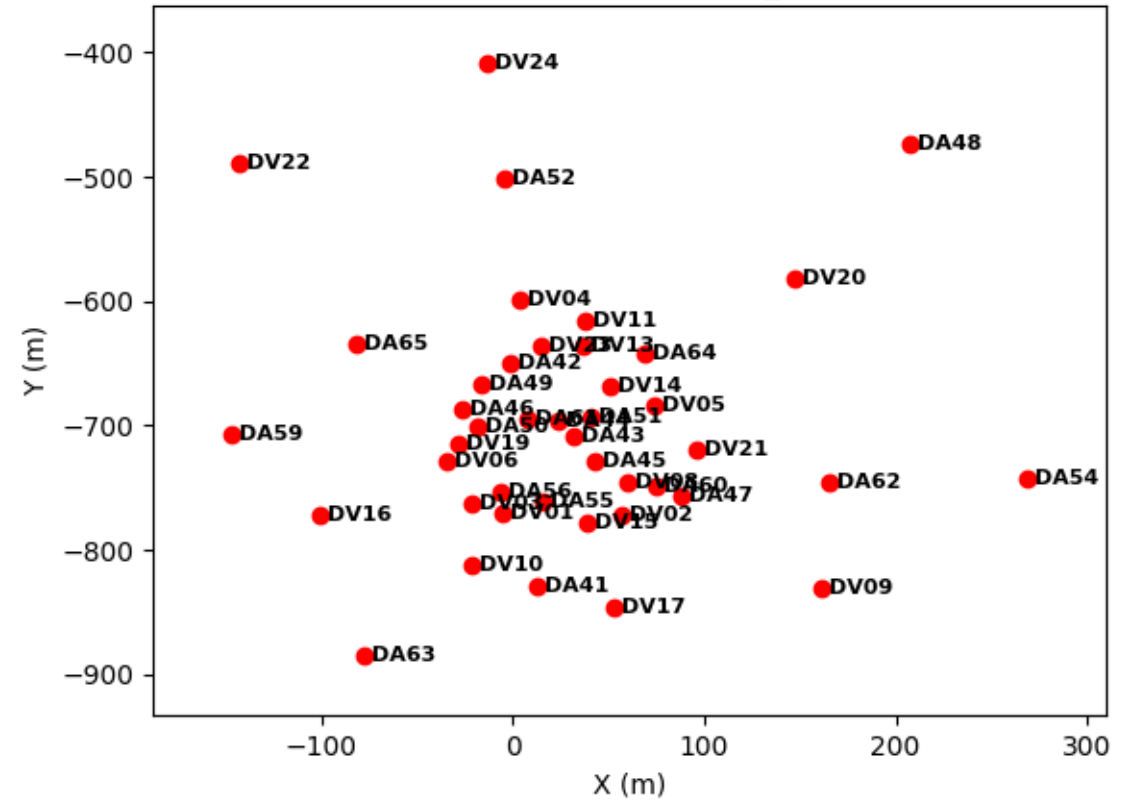
Date	No. Ant.	Int. (minutes)	Baselines (m)	Res.	Max. Scale
2019 Apr 7	43	35	15-500	0".57	6".1
2019 Aug 21	44	47	41-3396	0".09	1".4
2019 Aug 25	45	47	41-3396	0".09	1".4
2019 Aug 26	45	47	41-3638	0".08	1".4

HD 163296 (Observations)

Antenna Positions for EB1_cont.ms



Antenna Positions for EB4_cont.ms



4 Execution Blocks (EBs)

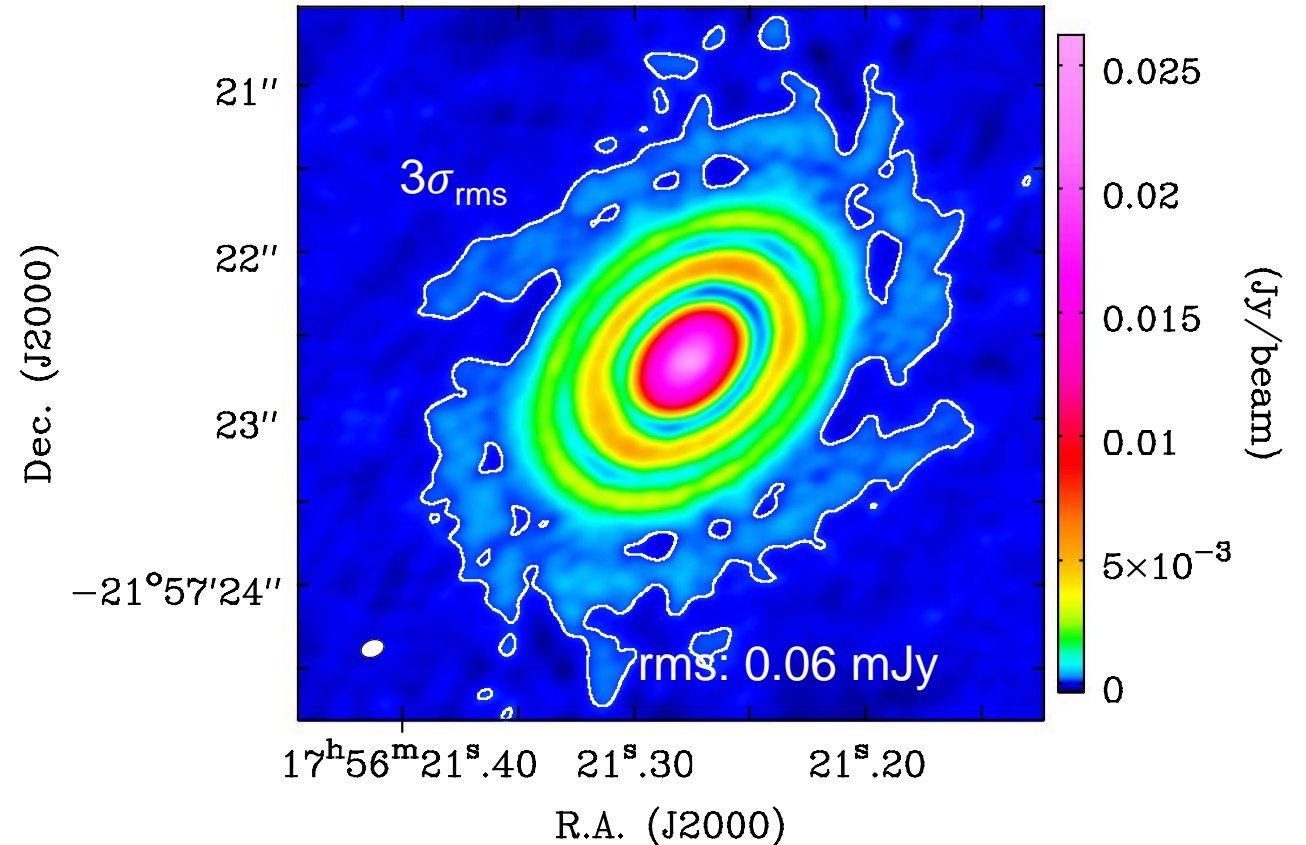
EB4 has a different configuration : need to self-calibrate separately!

1. Change Robust Parameter while CLEAN
2. Change Mask while CLEAN
3. Change solint while GAINCAL
4. (not self-calibration) Change Robustness in final CLEAN

Self-Calibration (1)

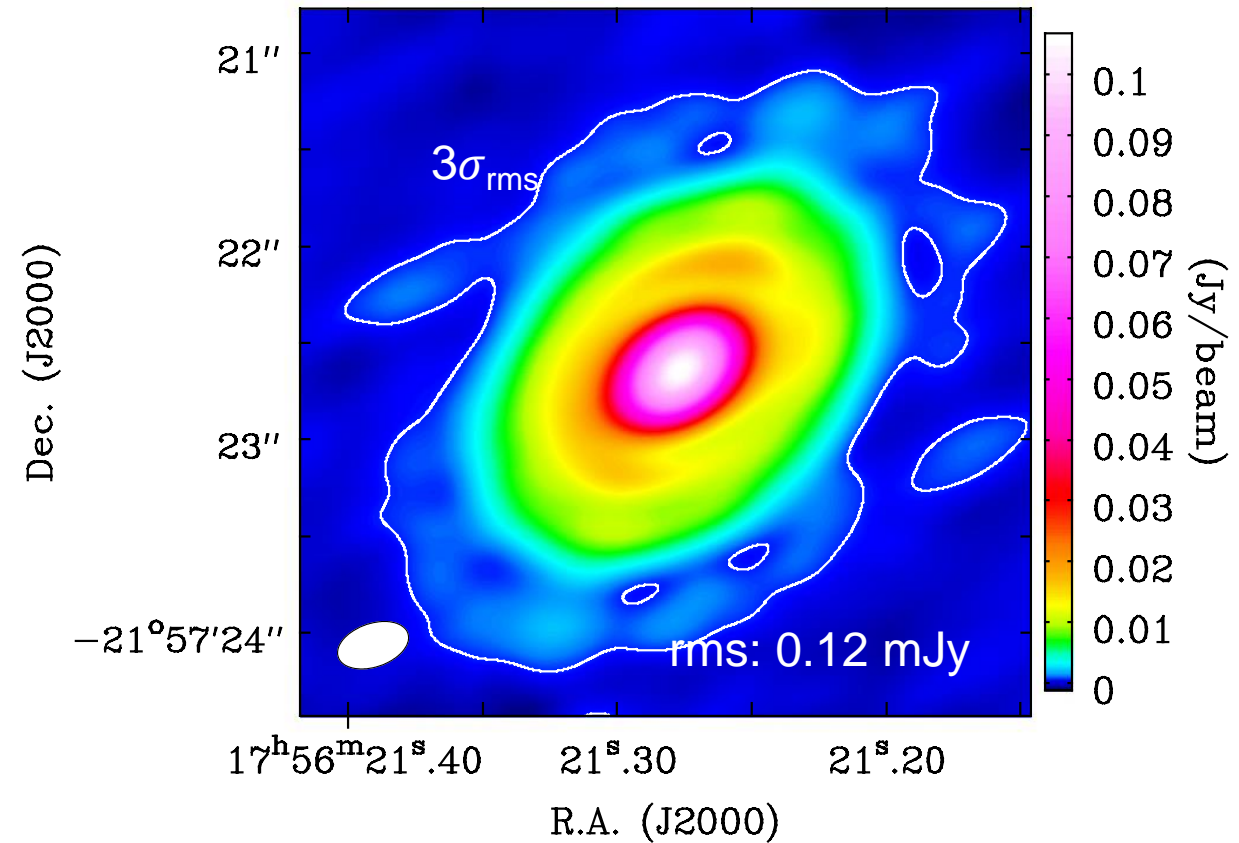
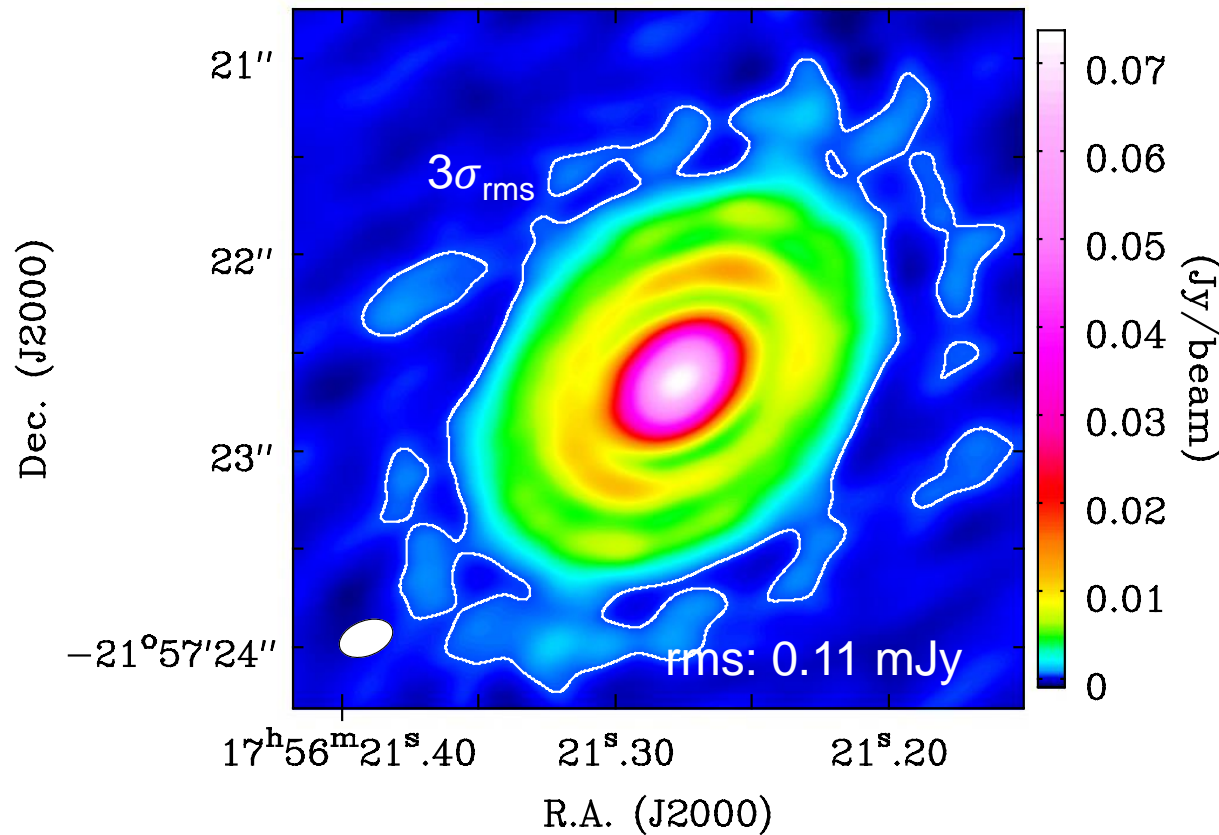
4 phase calibrations (solint : inf, 180s, 60s, 30s)
Small, fixed mask
Robust=0
Threshold = 1.76mJy (~10% of peak intensity)

Final CLEAN :
Noninteractive
2"*1.5" elliptical mask
Robust=0
Threshold = 0.04mJy (~2rms)



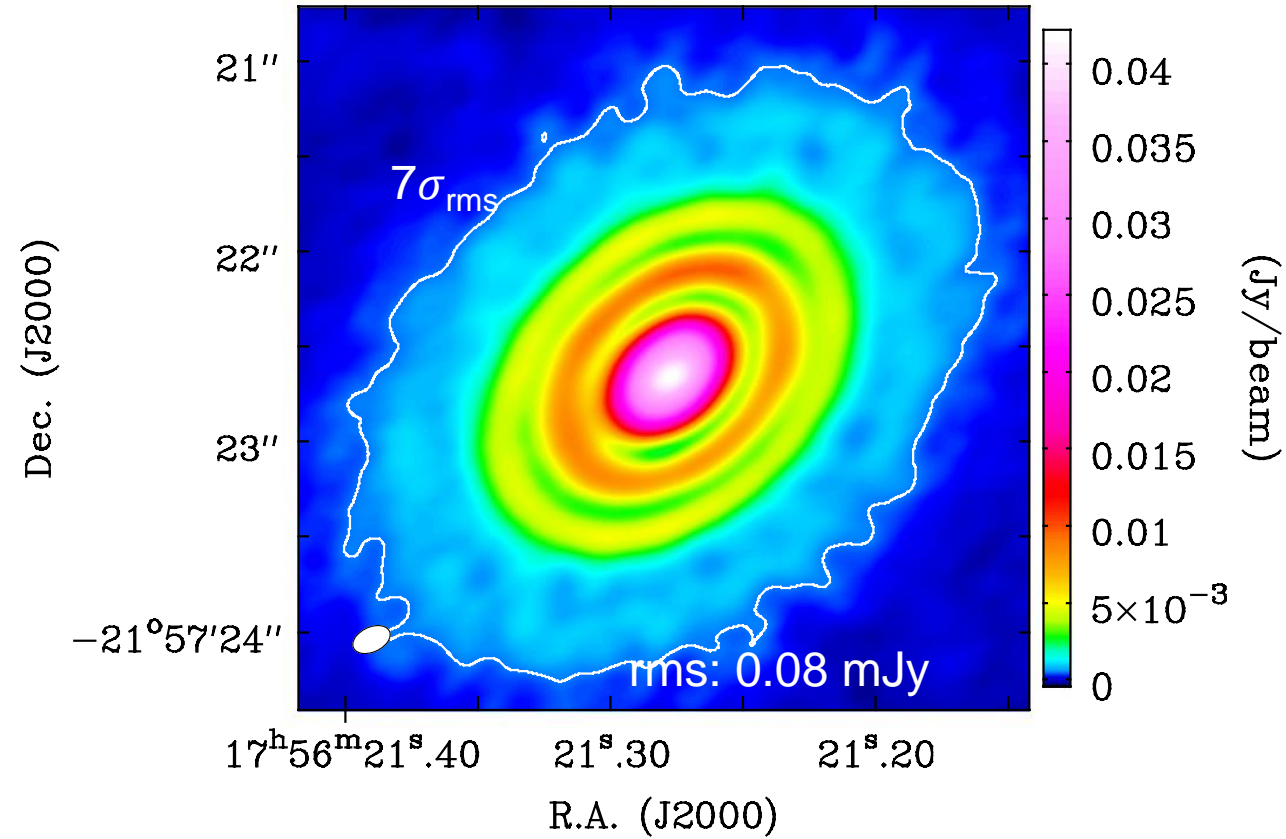
Self-Calibration (2)

4 phase calibrations (solint : inf, 120s, 30s, 15s)
Small, fixed mask
Robust=0.5
Threshold = 1.76mJy (~10% of peak intensity)



Final CLEAN :
Noninteractive
2''*1.5'' elliptical mask
Robust=0.5
Threshold = 0.04mJy (~2rms)

Self-Calibration (3)



Adapting mask (mask is extended over many rounds of cleaning)

Extended features from EB4 (short-baselines) are over-calibrated

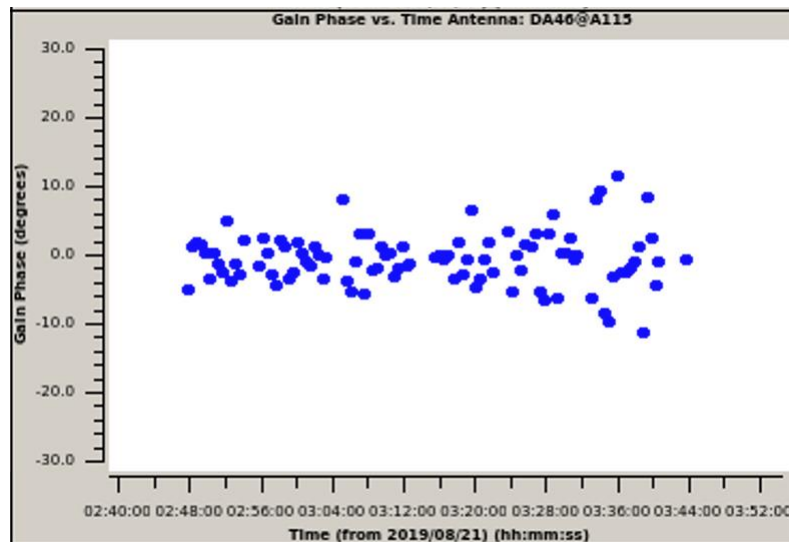
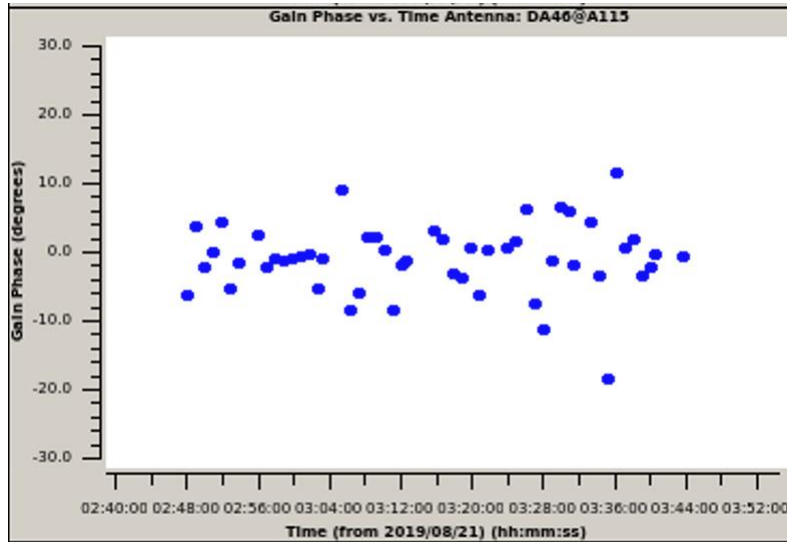
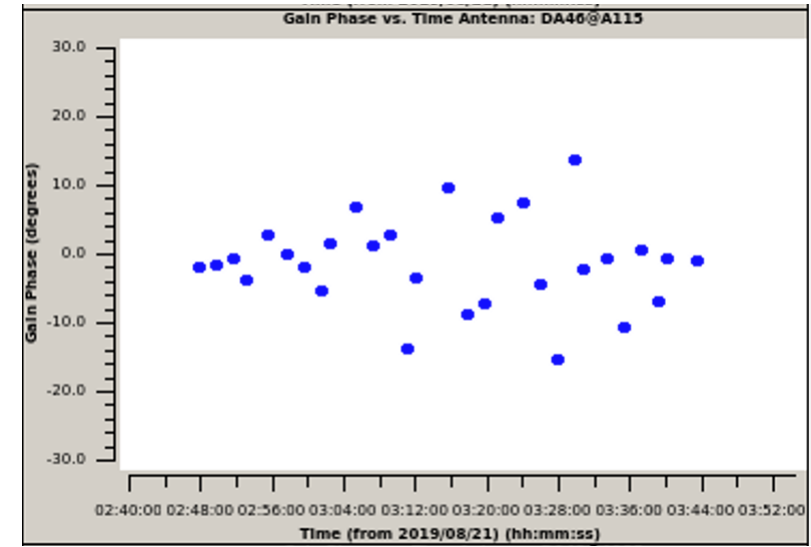
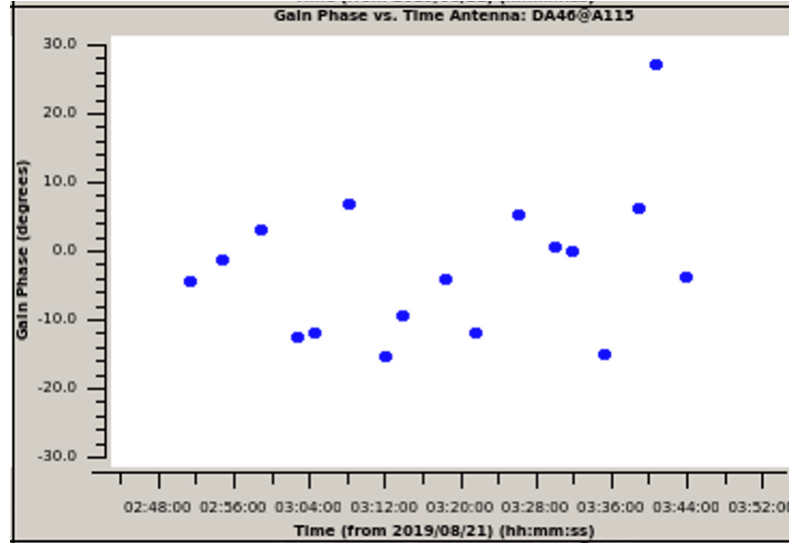
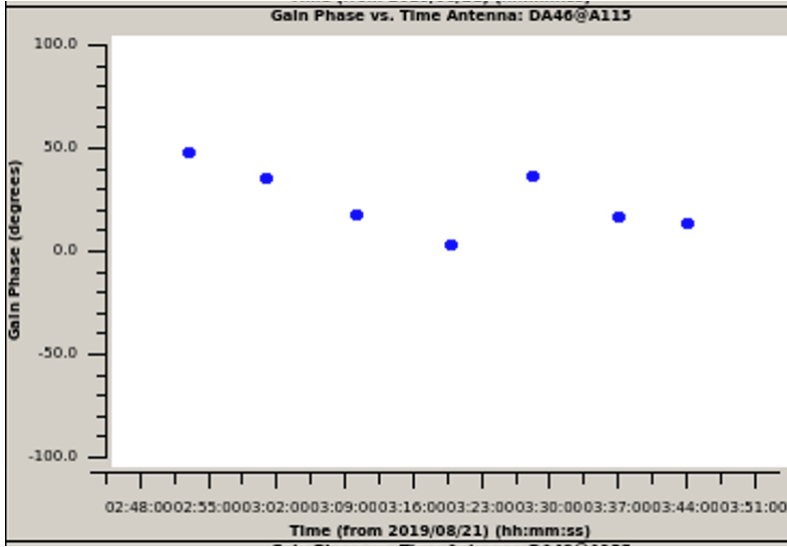
Self-Calibration (3)

SNR table

	EB1			EB2			EB3			EB4			
n_Ant	44			45			45			43			
T_onsource	2829			2830			2832			2129			
parameters	peak	rms	SRN	peak	rms	SNR	peak	rms	SNR	peak	rms	SNR	T_solint
initial	2.71E-02	4.82E-04	56.28919 976	3.16E-02	2.87E-04	110.3518 202	2.93E-02	2.95E-04	99.47	2.76E-01	9.29E-04	297.13	420
first	2.77E-02	8.29E-04	3.35E+01	3.12E-02	6.95E-04	4.49E+01	2.86E-02	6.40E-04	44.68	6.98E-02	1.18E-03	59.21	420
second	3.02E-02	5.52E-04	5.48E+01	3.25E-02	5.41E-04	6.01E+01	3.15E-02	4.46E-04	70.51	2.80E-01	2.93E-04	955.17	120
third	3.39E-02	5.17E-04	6.57E+01	3.66E-02	4.41E-04	8.30E+01	3.40E-02	3.65E-04	93.05	2.80E-01	1.24E-04	2264.15	120
fourth	3.66E-02	3.55E-04	1.03E+02	3.87E-02	3.23E-04	1.20E+02	3.59E-02	2.87E-04	125.14	2.80E-01	8.97E-05	3124.65	60
fifth	3.83E-02	2.92E-04	1.31E+02	4.05E-02	2.60E-04	1.55E+02	3.71E-02	1.99E-04	185.95	2.81E-01	8.60E-05	3262.16	30
sixth	3.96E-02	2.80E-04	1.41E+02	4.17E-02	2.39E-04	1.75E+02	3.78E-02	2.02E-04	187.47	2.81E-01	8.13E-05	3455.29	240
seventh	4.63E-02	2.58E-04	1.80E+02	4.59E-02	2.33E-04	1.98E+02	4.14E-02	1.57E-04	264.26	2.81E-01	4.92E-05	5724.72	
Last	4.64E-02	1.67E-04	2.78E+02	4.60E-02	1.46E-04	3.16E+02	4.13E-02	9.15E-05	451.82	2.81E-01	4.79E-05	5878.67	

Note: T_solint = 420 is for the solint='Inf'

Self-Calibration (3)

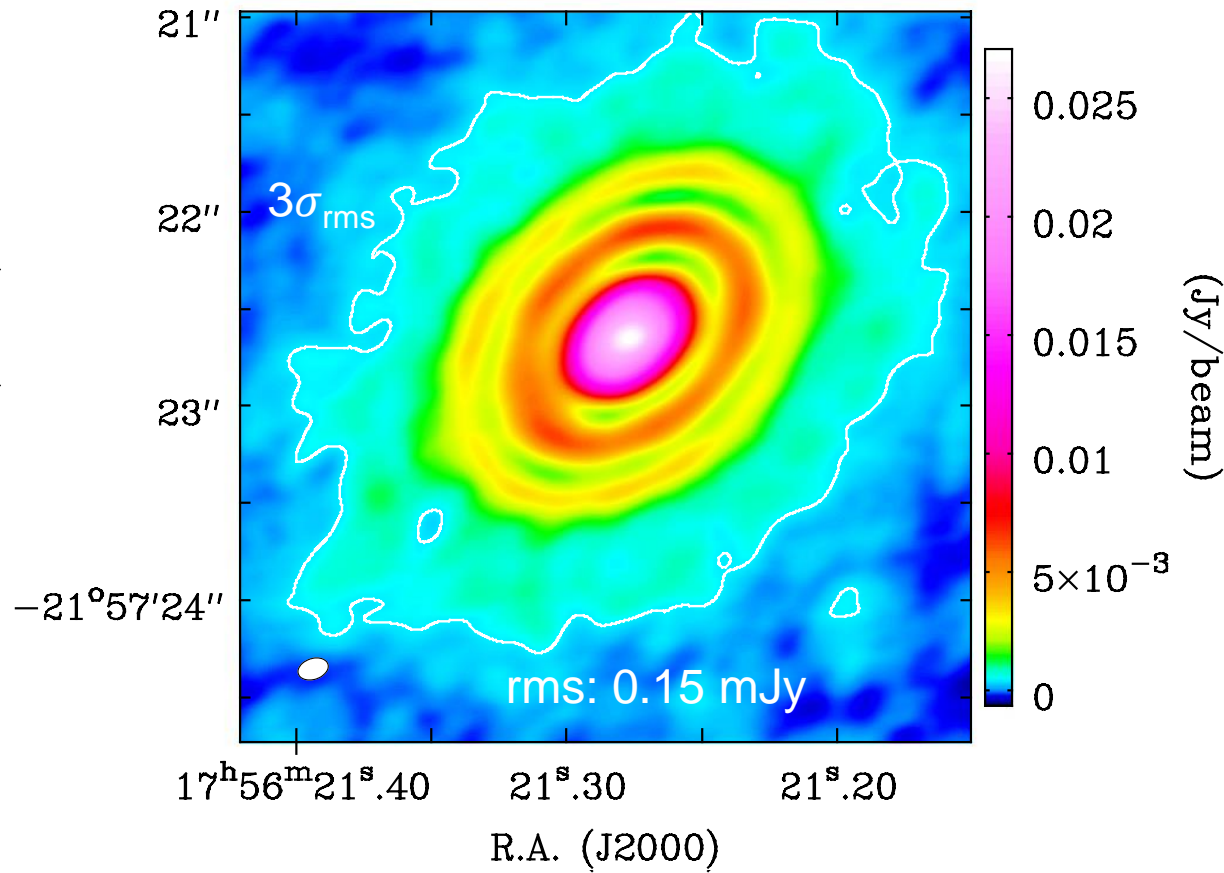


More points because solint decreases

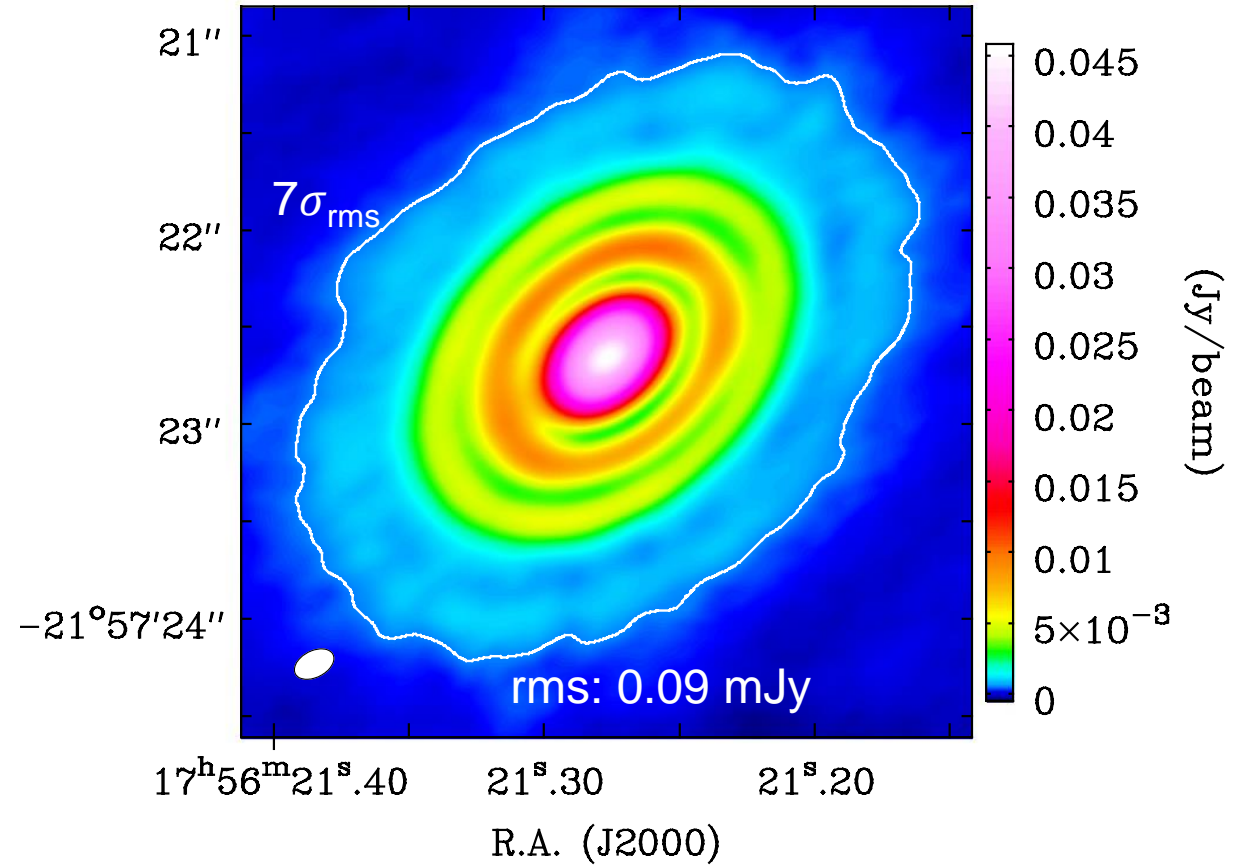
Points align near 0 after consecutive Phase-cals

Self-Calibration (3)

Before Self-Calibration



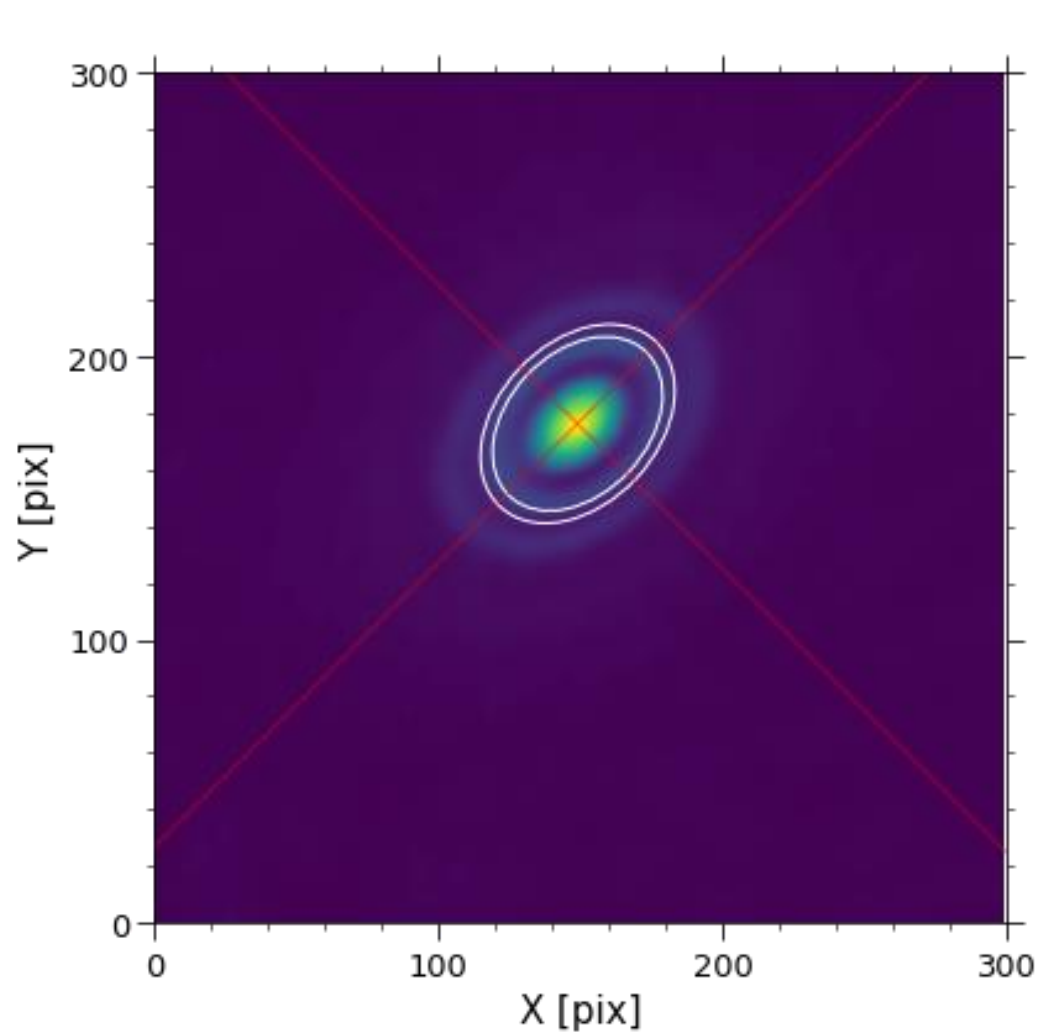
After Self-Calibration



Non-interactive CLEAN
2"*1.5" elliptical mask
Threshold = 0.6mJy
Robust=0.5

Radial Profiles

Images with high SNR are difficult to compare!
-> use radial profiles



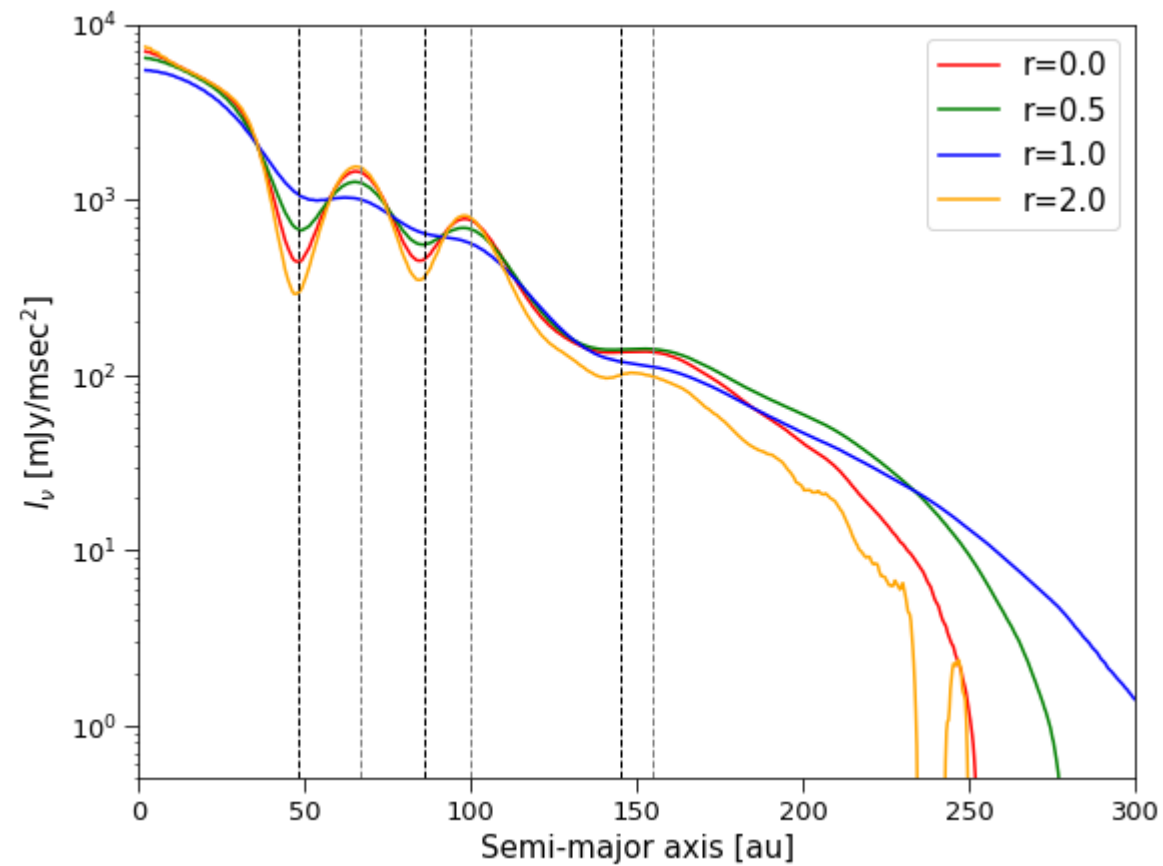
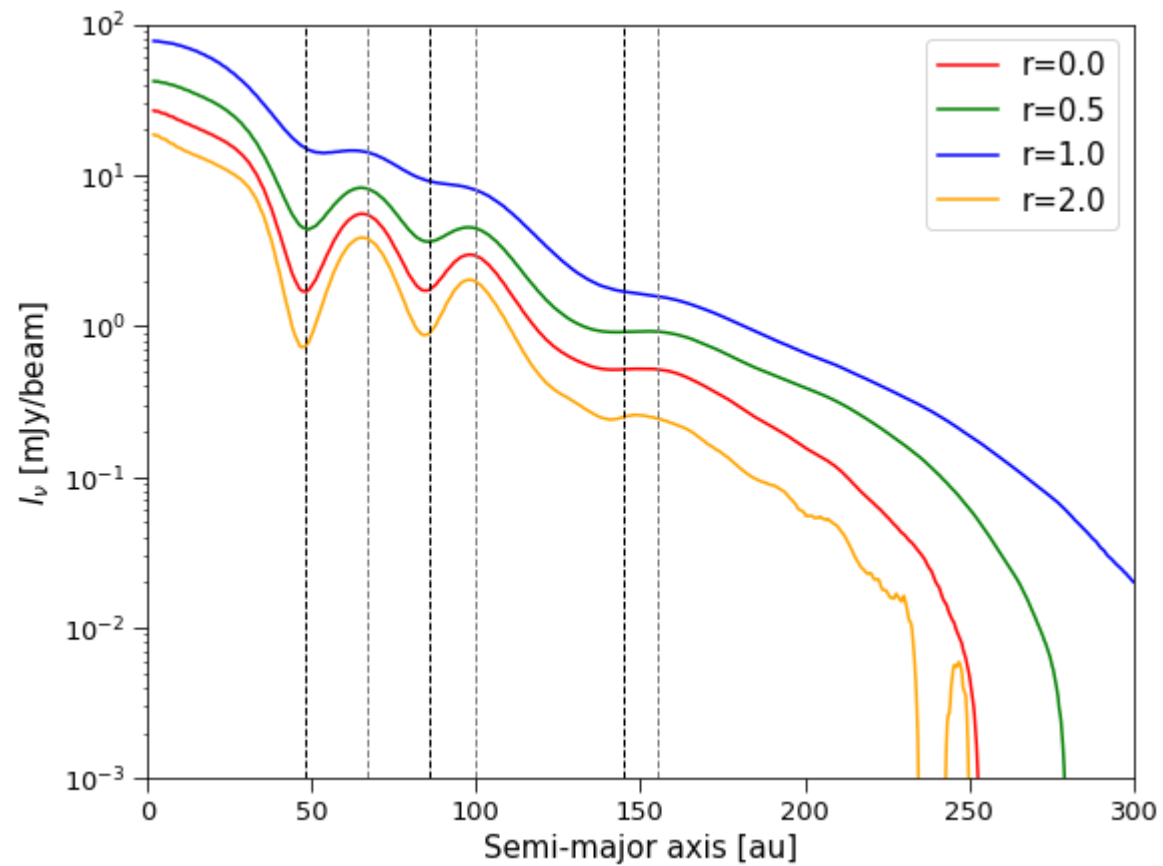
$i=46^\circ$, $\text{PA}=133^\circ$

Elliptic Annulus Aperture

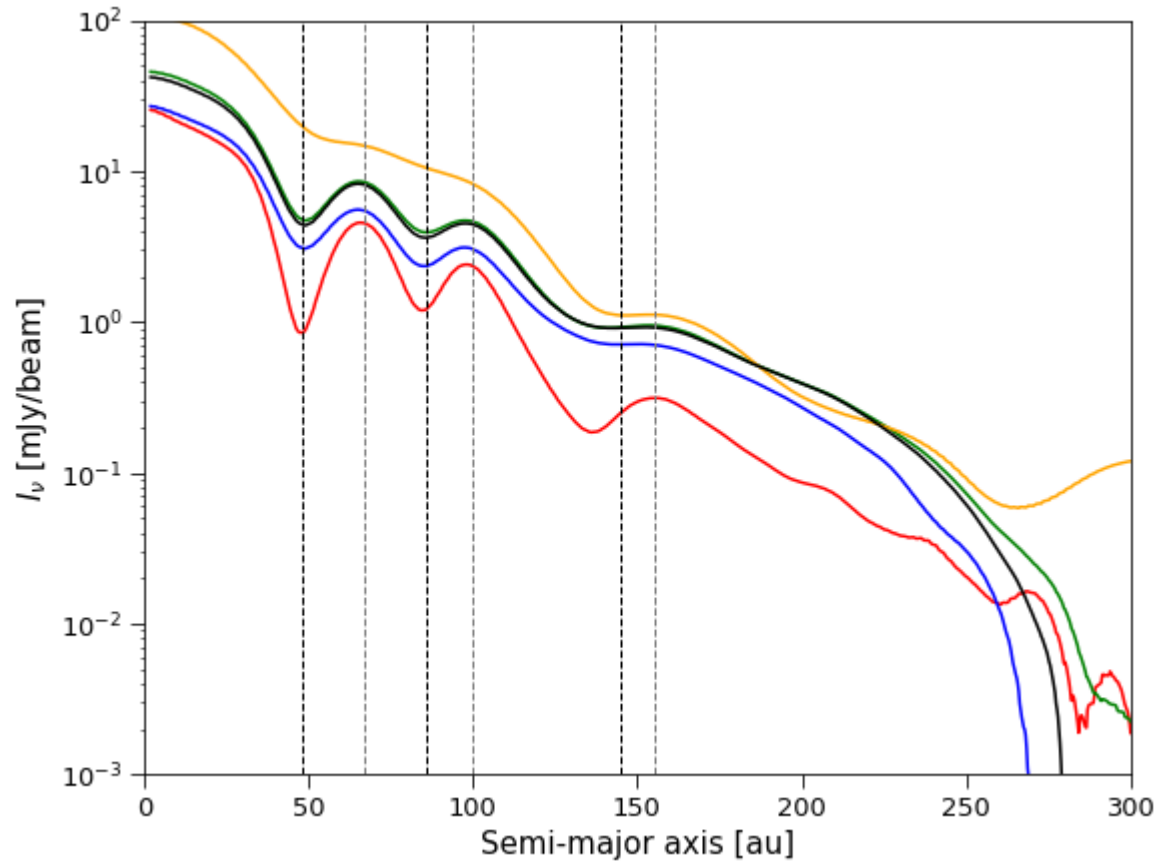
Incl. ($^\circ$)	P.A. ($^\circ$)
46.9 ± 0.2	133.4 ± 0.3
46.9 ± 0.4	132.7 ± 0.5
46.63 ± 0.12	133.37 ± 0.17

DSHARP

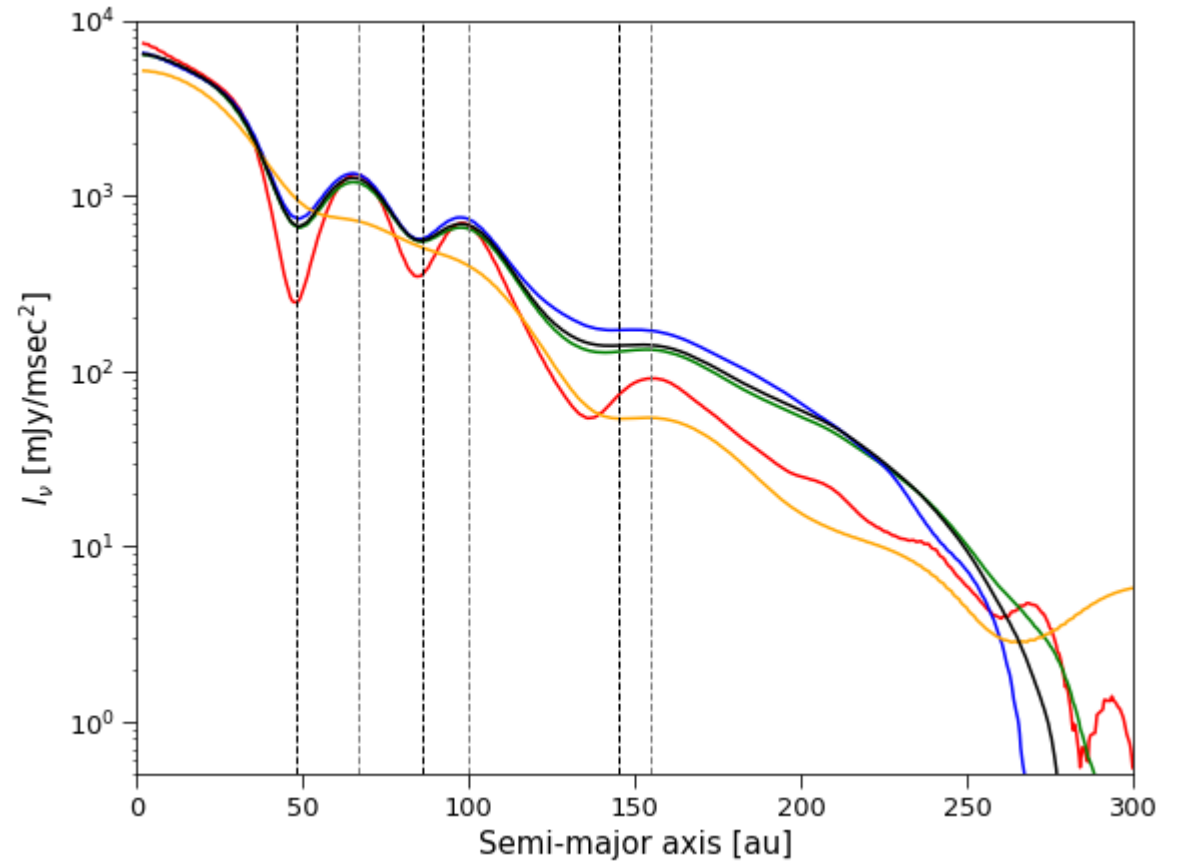
Radial Profiles



Radial Profiles



Red : fixed mask, robust=0
Green : adapting mask, robust=0.5
Blue : no self-calibration, robust=0.5



Yellow : fixed mask, robust=0.5
Black : Over-calibrated EB4, robust=0.5

Green & Black are almost the same (Black is stronger)