

NIKA prototype scientific program

F.-X. Désert (IPAG) on behalf of the NIKA team

- The past: 4 observing runs at the 30m and INeel calibrations
- Ongoing efforts
- Future: polarization, share with community
- Improve performance and learn for the NIKA definitive instrument

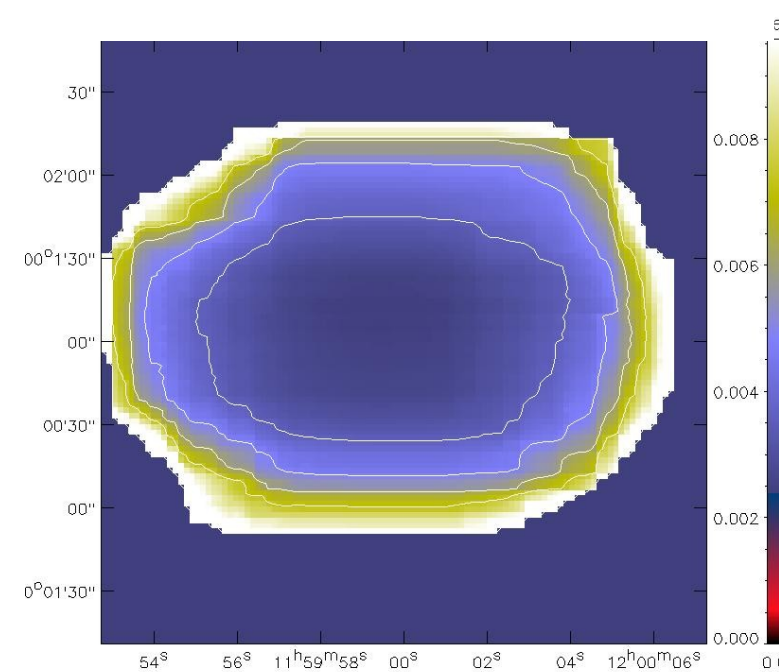
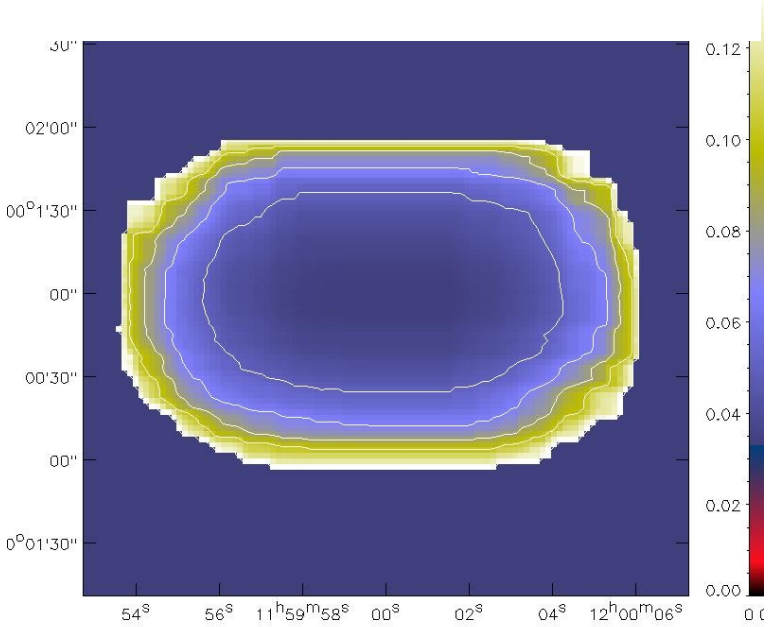
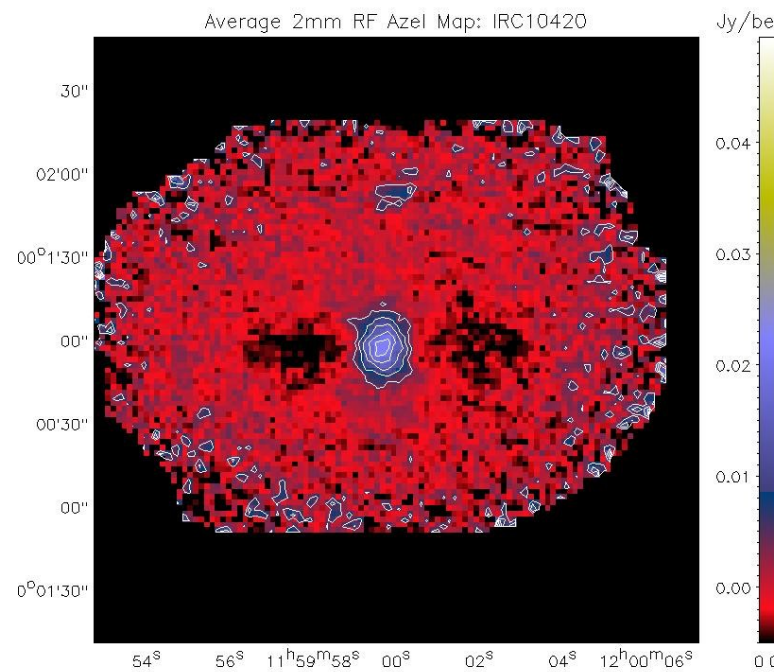
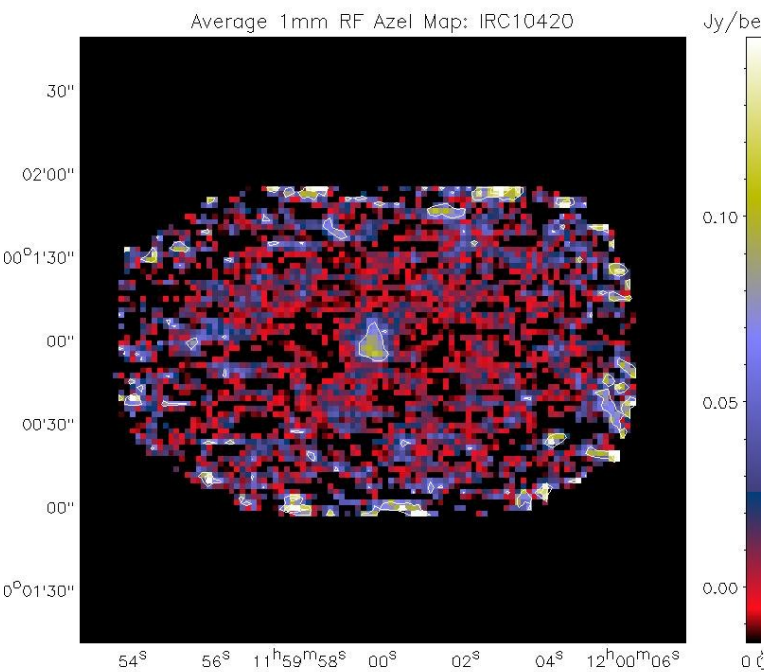
Run 1 Oct 2009

- Only a 2mm array
- First multiplexed kids on the sky
- SRON and LEKID arrays (30 pixels tested)
- planets, Galactic regions, M87 detected

NIKA run2 Oct 2010

Characteristics

- 224 TOI outputs
- 172 kids - 12 (optical double, blind,bad)
- And 24+10 off resonance data, 18 undef
- 62 at 1mm , 98 at 2mm (valid pixels)
- FWHM: 12", 15.5"
- Pointing accuracy determination:
<2 arcsecond per detector
- Array pointing accuracy: < 1arcsec



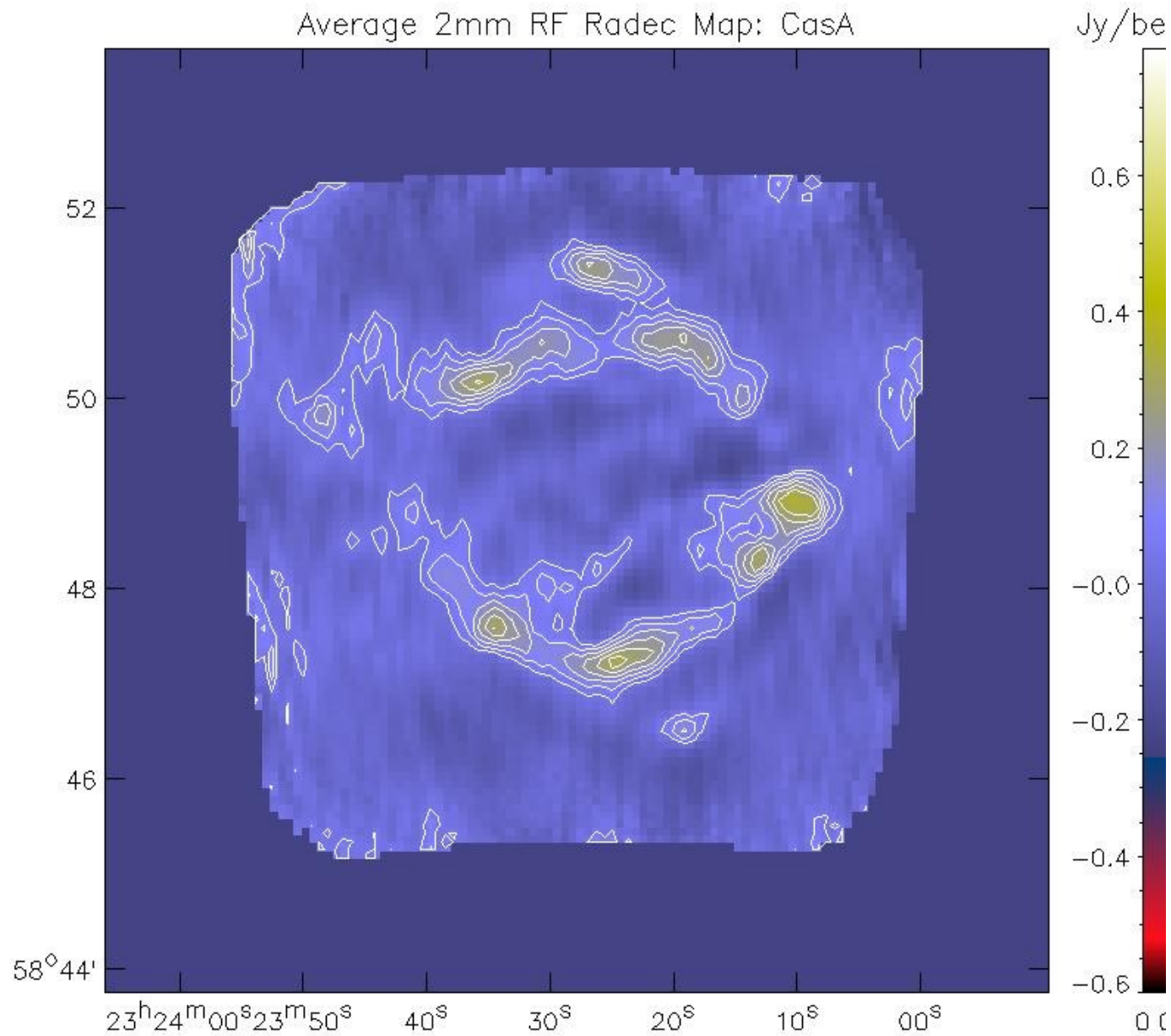
Noise performance

Weak sources, Sky Decorrelation ($\text{mJy s}^{1/2}$)

Use an exclusion radius of 25 arcseconds

- IRC10420 (94 ± 12 , 21 ± 1 mJy): 371, 45
- PSS2322+1944 (2 ± 12 , 1.1 ± 0.6 mJy): 330, 29
- Conservative NEFDs ($\text{mJy s}^{1/2}$) are
370 @ 1mm,
45 @ 2mm

CasA: Effect of baseline filtering 110"



Run 3 October 2011

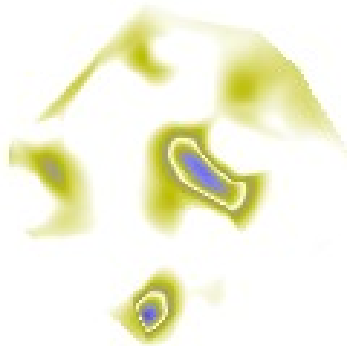
- Cryogen-free cooling.
- Hilbert pattern tested. Detect the whole intensity. 132x2 pixels
- Emphasis on calibration issues. New RF_dIdQ method
- Improved 1mm sensitivity but bandpass problem identified afterwards
- Systematics analyzed

Run 4 June 2012

- Definitive optics and location of NIKA proto
- First time 1mm achieves 12" FWHM on Mars.
- Total power mode assessed for all calibration sequences (pointing, focus, skydips).

Run 4 pointing sequence

Nasmyth



Mars AzEl



2mm



1mm

Run 5 November 2012

- Test the new electronics (LPSC)
- Commissioning of the camera with test observations

2013-2014 runs

- Test polarization mode
- Use guaranteed time and open time in common campaigns. High demand for a 1mm sensitive channel.

Present and Future Cameras

Sensitivity (mJy per beam in one second), Effective FOV (arcmin²)

IRAM Cameras	1.2mm	2.1mm
MAMBO2	35 mJy, 2.6 arcmin ²	
NIKAproto_run2	370 mJy, 1.2 arcmin ²	45 mJy, 3.0 arcmin ²
NIKA3	150	25
NIKA4	70?	35?
NIKA5		
NIKA final	18 mJy, 36 arcmin ²	12 mJy, 36 arcmin ²
		y ~ 1E-5 in one hour
		dTcmb ~ 3E-5K in one hour

Mapping speed is FOV*Sensitivity²

Main science objectives

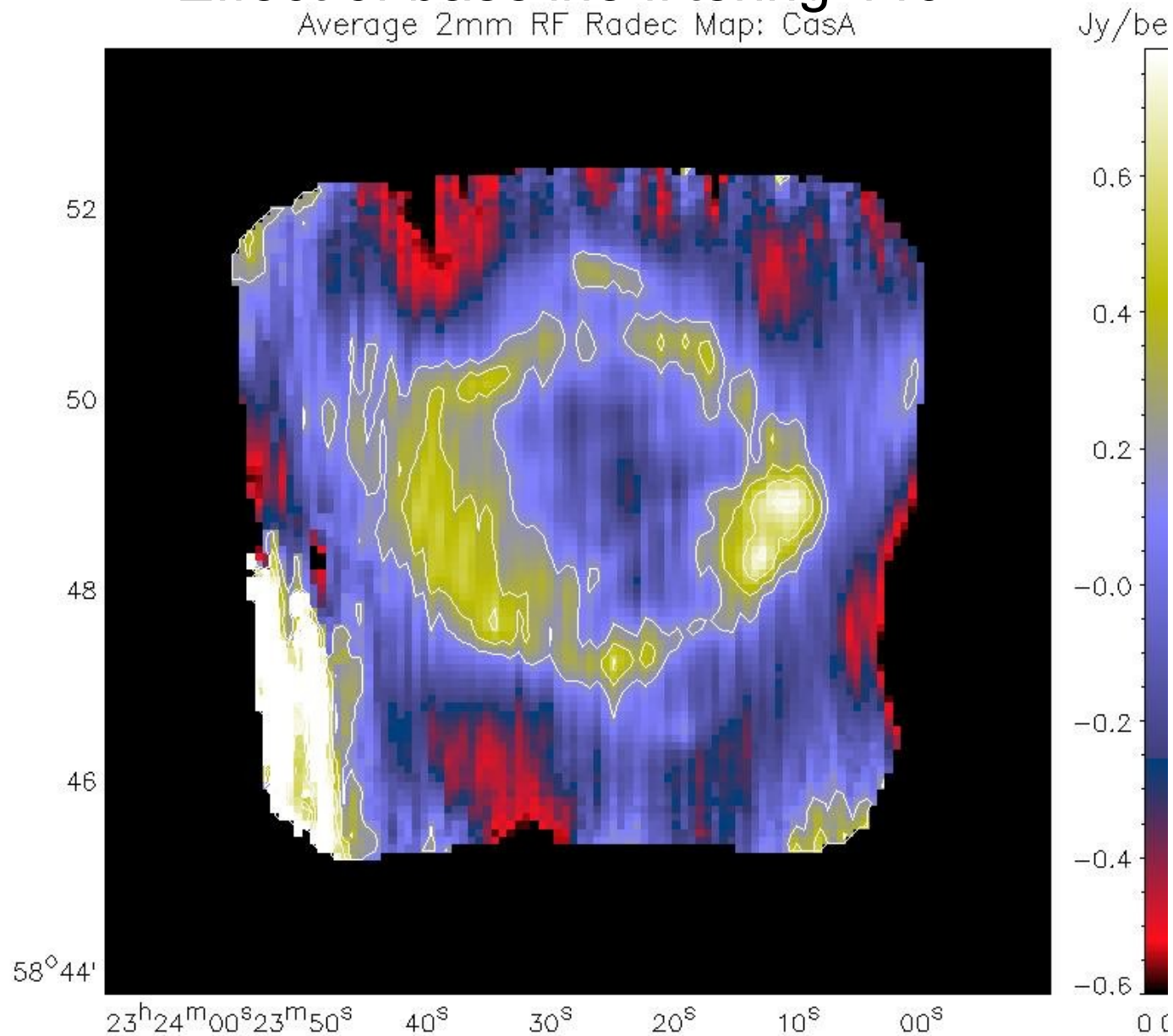
- Early stages of star formation
- Dust/Gas content in nearby galaxies
- Number count and photometry of distant galaxies, and follow-up of Spitzer/Herschel targets
- Secondary CMB anisotropies and follow-up of Planck SZ targets

Data processing

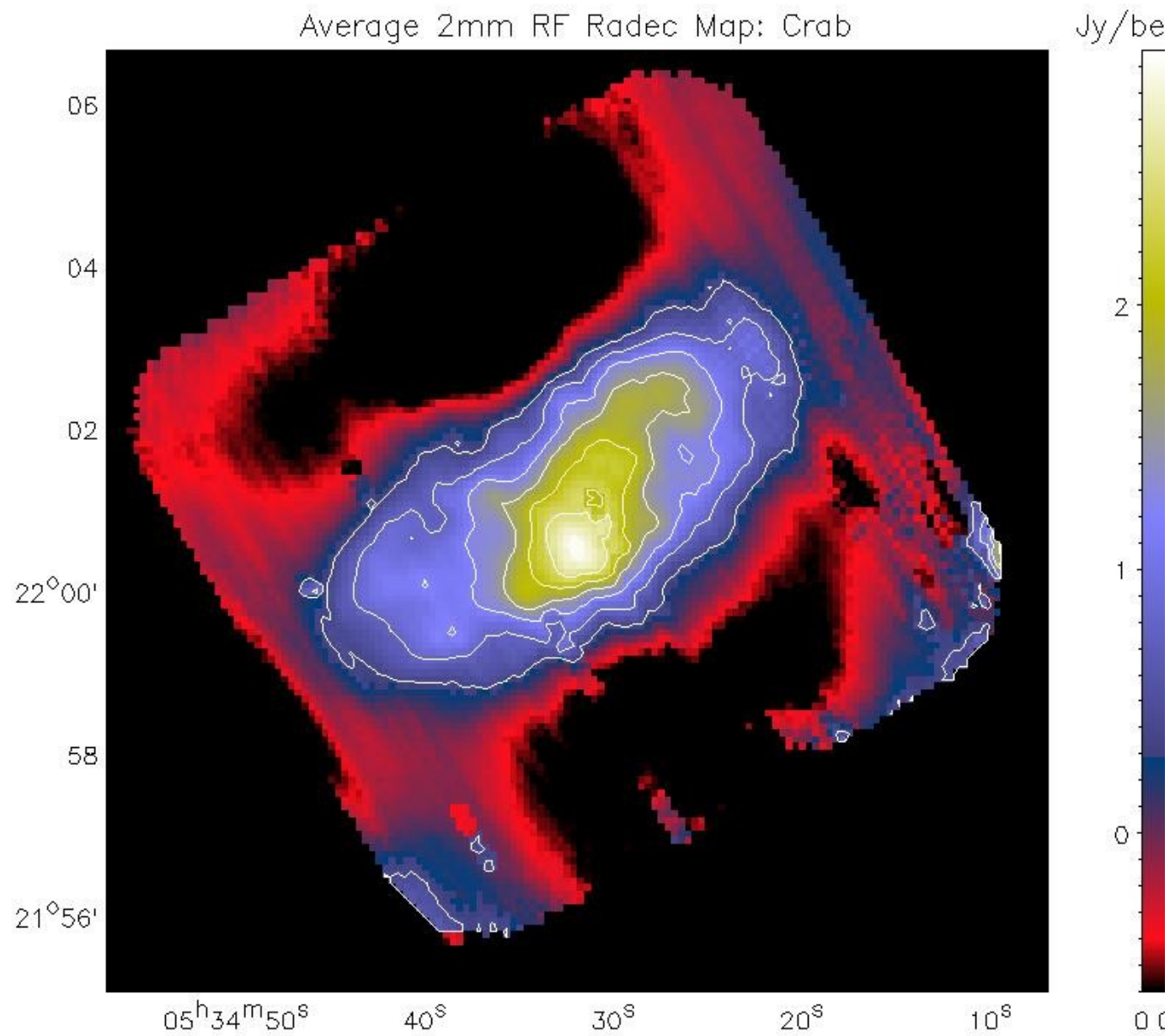
- Calibration
- Delivery of fits files to various groups
- Decorrelation and map-making
 - Simple
 - Scanamorphous
 - Selenepix
 - Crush
 - IRAM

Effect of baseline filtering 440"

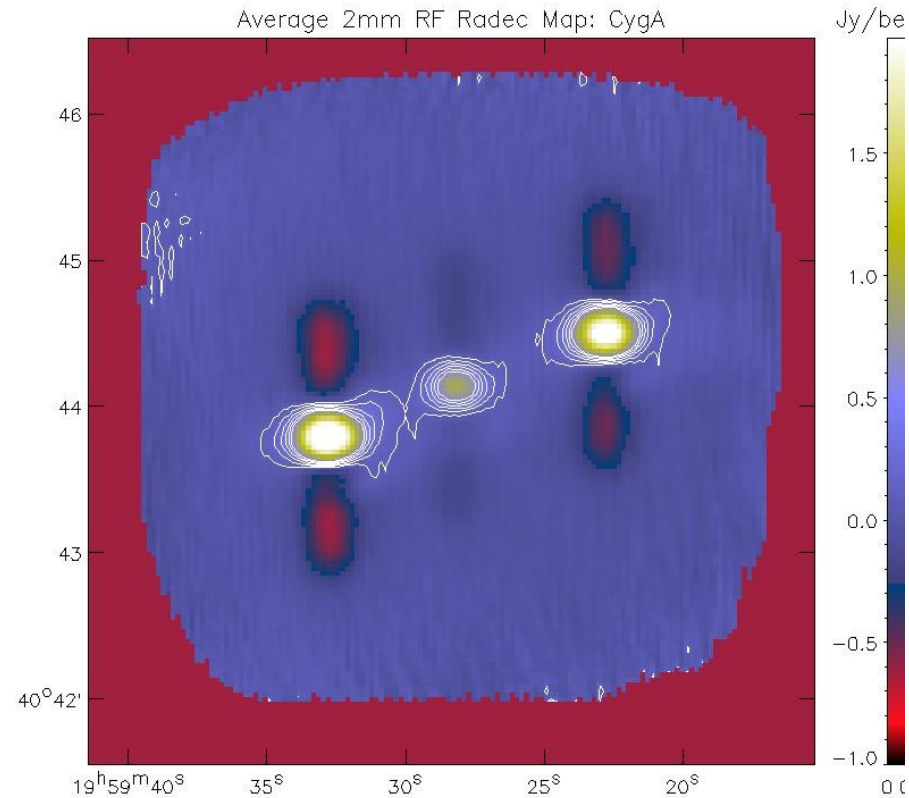
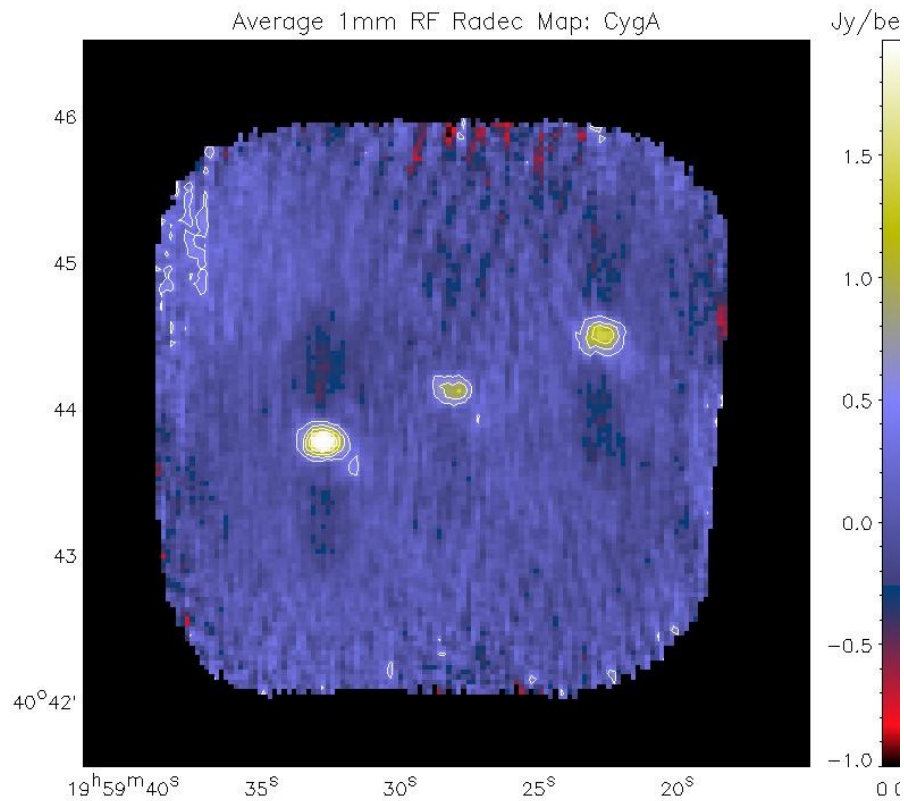
Average 2mm RF Radec Map: CasA



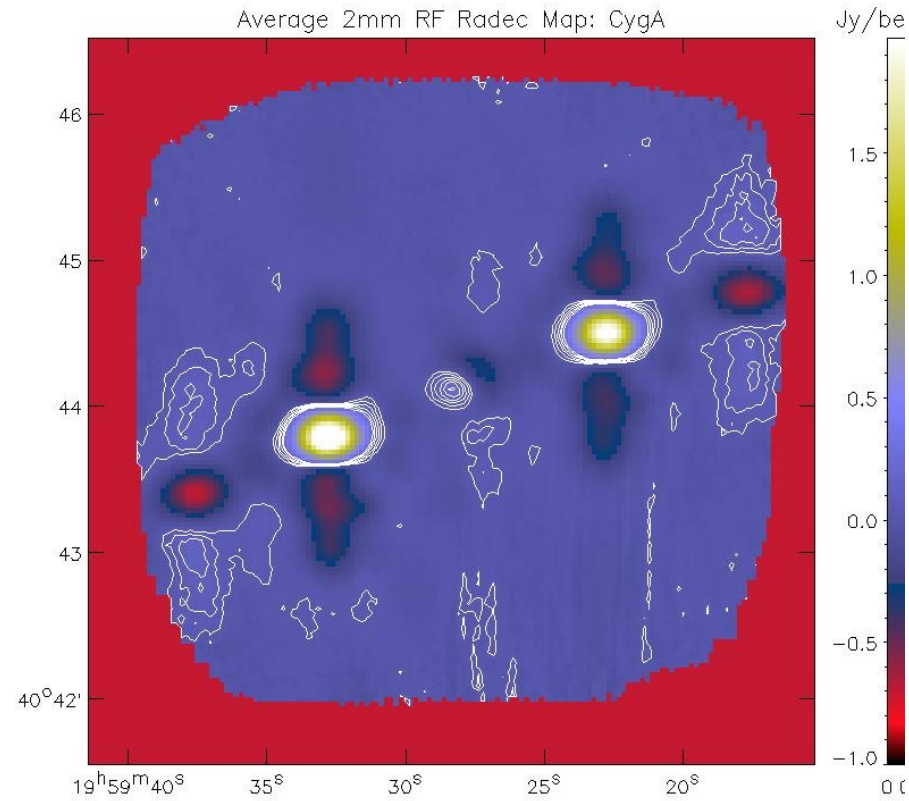
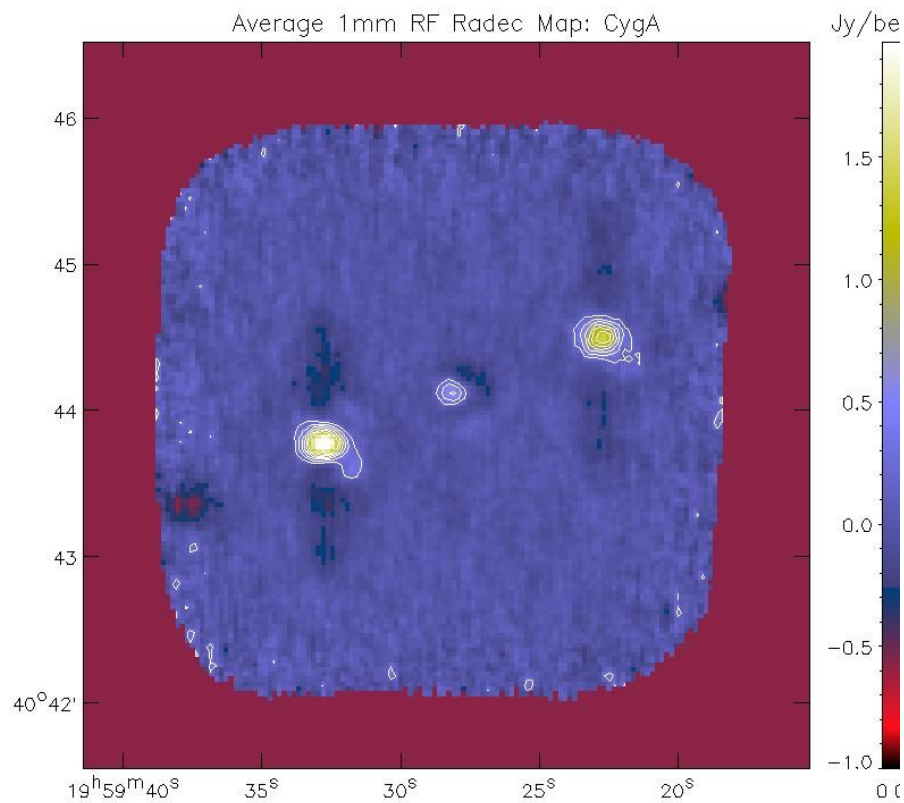
Average 2mm RF Radec Map: Crab



Cygnus A without sky noise decorrelation



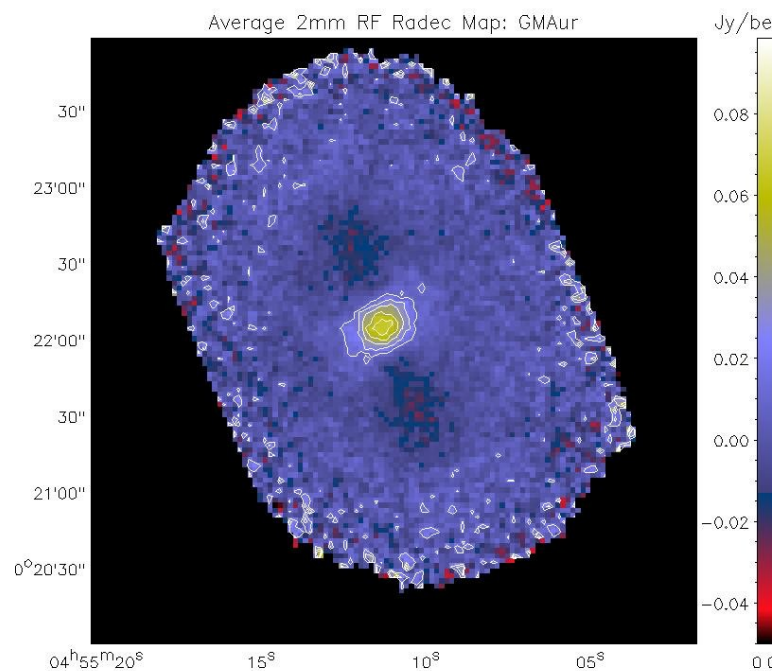
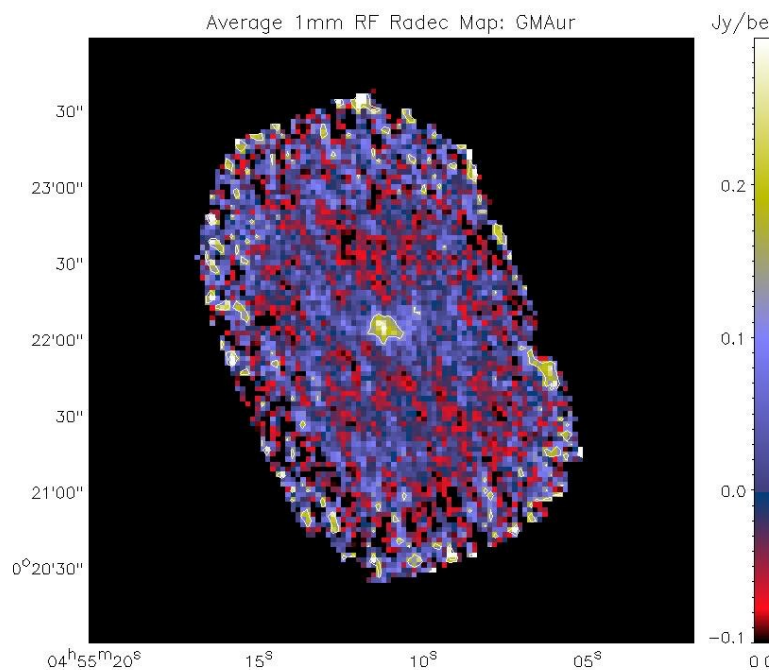
Cygnus A with sky noise decorrelation



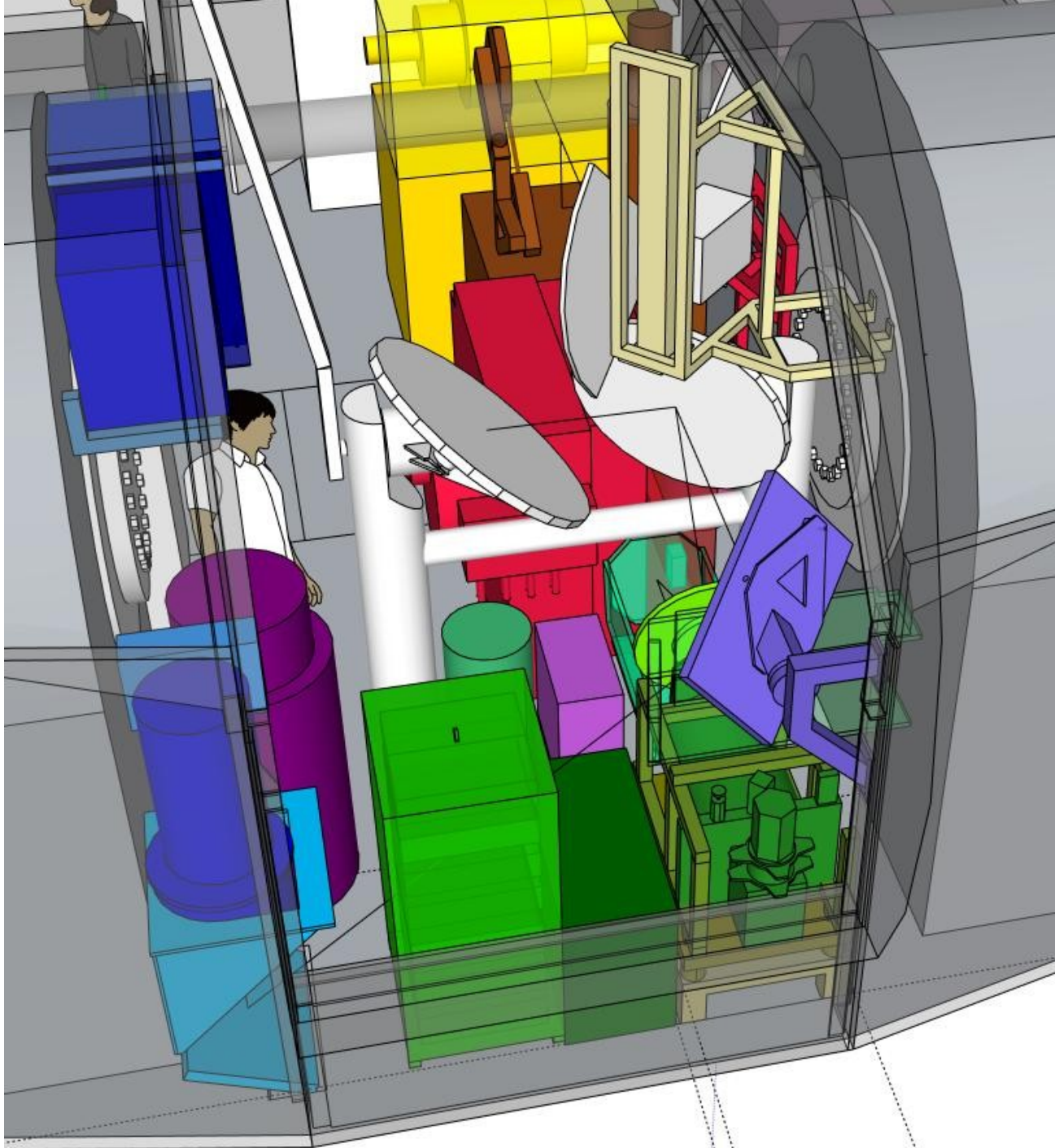
GM Aur (500 sec)

(1.2 mm) 200 $\pm$ 25 mJy,

(2.1 mm) 57 $\pm$ 2 mJy



Proto



Final
NIKA

