Scientific Activities Related to SKA in Taiwan

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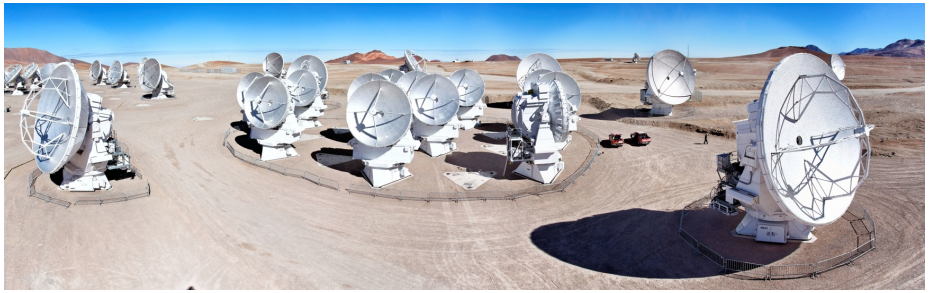
(ASIAA, Taiwan)

1. Radio Research Activities in Taiwan

SMA

ALMA



AMiBA

Future

GLT

SKA?

Possible SKA-Related Activities

(1) Cosmology and galaxy evolution

- H I emission/absorption statistics
- Radio-FIR relation of galaxies

(2) AGNs

- Collimation of jets
- Search for diffuse radio emission around AGNs

(3) Star formation

- Monitoring of young stellar objects

(4) Instrument Development

- Extension of ALMA Band 1
- GBT multi-beam receiver
- AMiBA future plan

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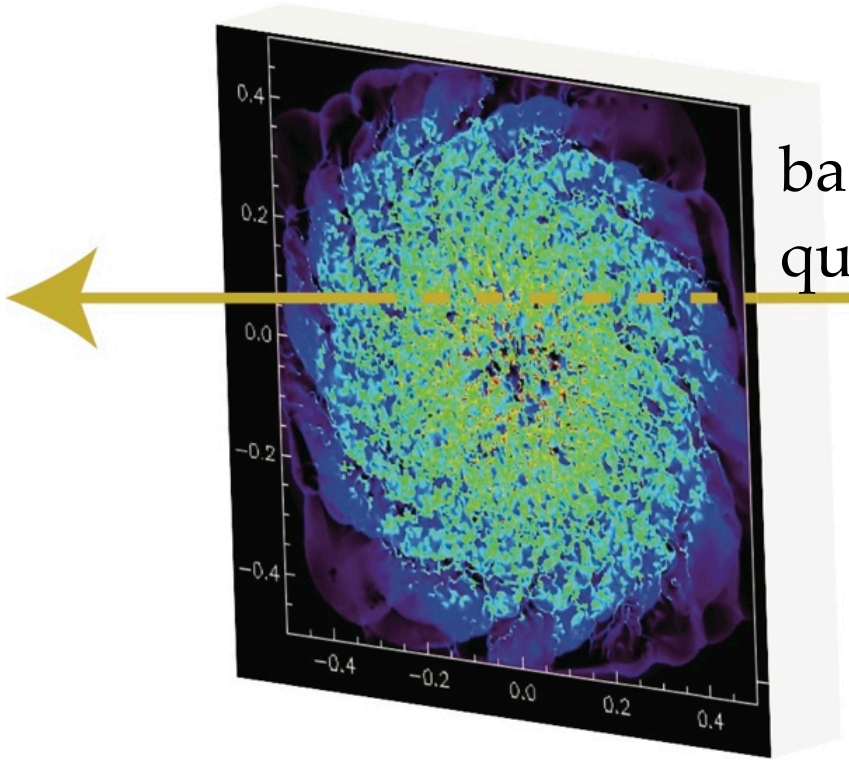
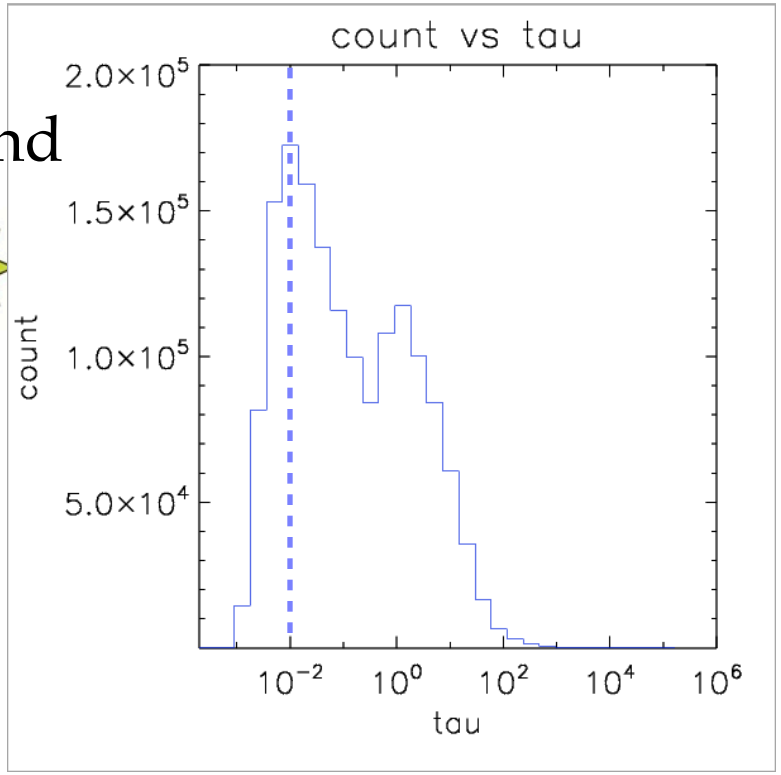
H I Absorption Statistics

Damped Lyman α clouds (DLAs): $N_{\rm H} > 2\times10^{20}$ cm^{-2}



background quasar



Statistics of 21 cm absorption optical depth to be compared with a future large SKA sample

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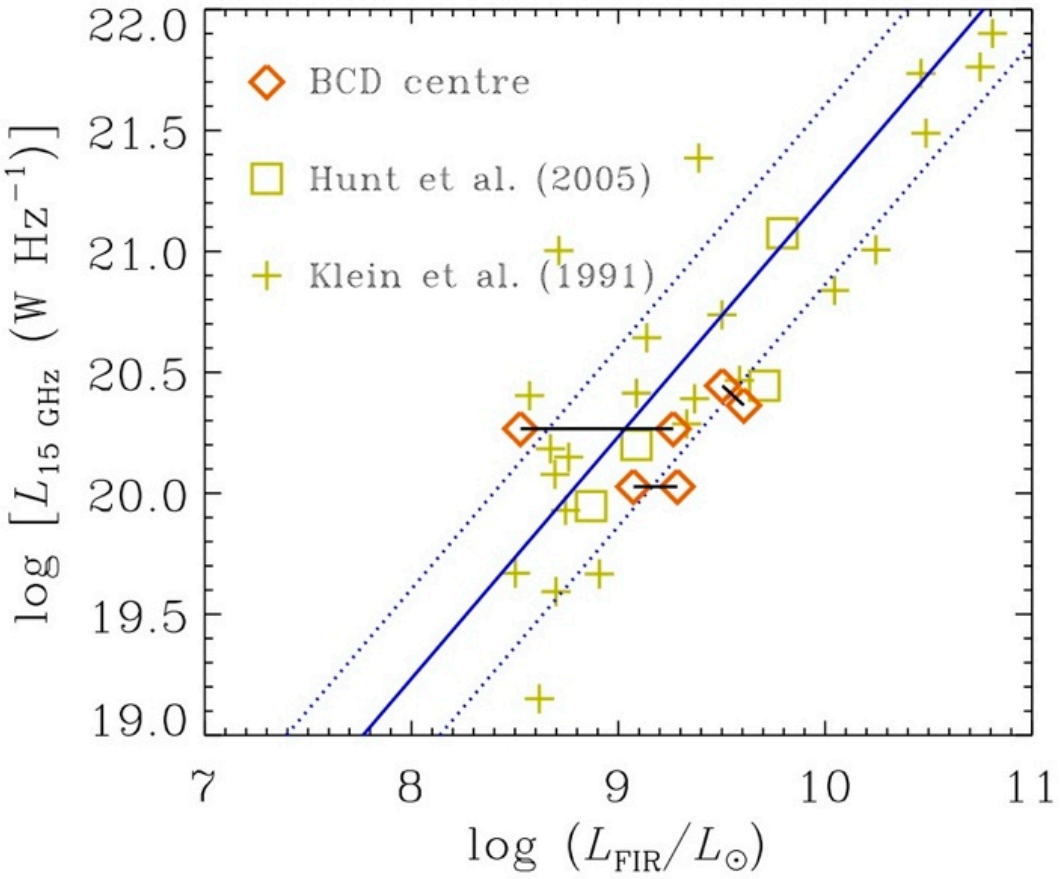
Radio Continuum as a SF Indicator

Hirashita (2013)

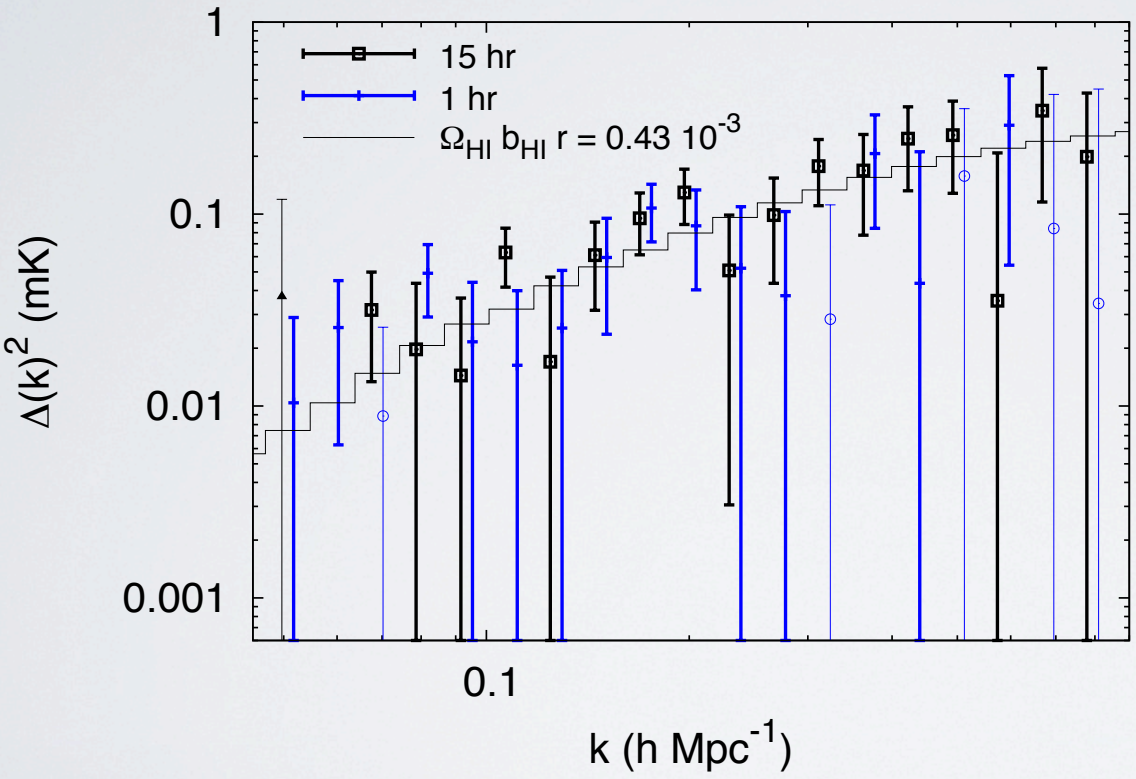


Radio–FIR relation in nearby dwarf galaxies (BCDs: 1/10–1 Zsun)

With SKA, we can extend the sample to high-*z* metal-poor (primeval) galaxies.

21CM INTENSITY MAPPING

Cross-correlating GBT HI & WiggleZ optical galaxies at z ~ 0.6-1



Masui+, GBT-HIM team, 2012

- 200 hours, 41 deg^2 survey at the GBT
- Measuring the WiggleZ fields at 800 MHz band, $0.5 < z < 1.1$
- Foreground subtraction using SVD in freq-freq covariance matrices, and correcting for frequency dependent beam
- Foreground subtraction down to factor of >100

- HI brightness temperature on these scales at z=0.8:

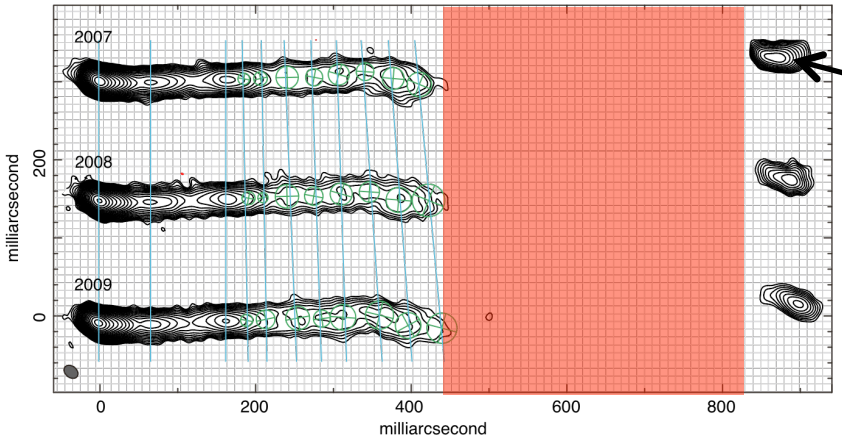
- $\Omega_{HI}\, r\, b = (4.3 \pm 1.1) \times 10^{-4}$

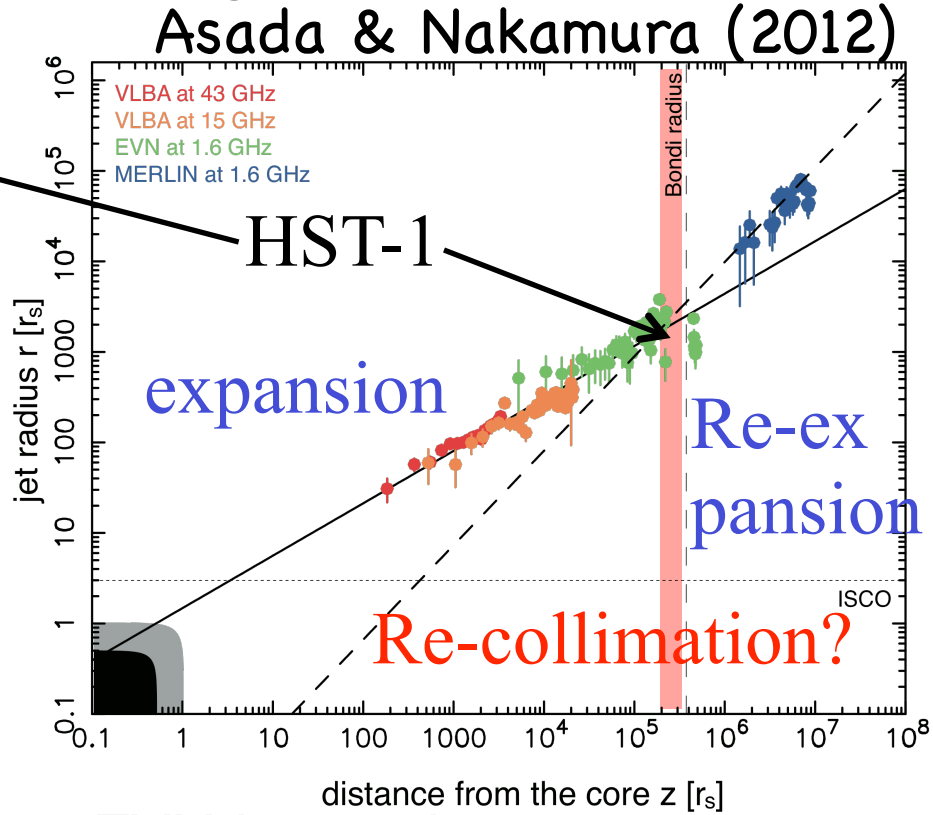
CO intensity mapping with AMiBA-DACOTA

- 1.2 m dish, 6 m baseline, currently operate at 83-102 GHz
- At 30-32 GHz, probes $6.19 < z < 6.67$ for CO[2-1], $2.59 < z < 2.83$ CO[1-0]
- At 31 GHz, resolution=6.7', FoV =28', probes >10 Mpc scales
- AMiBA team (ASIAA): Paul Ho, Kai-Yang Lin, Ming-Tang Chen, Homin Jiang+
- DACOTA team (Berkeley/Arizona): Geoff Bower, Dave Deboer, Dan Marrone+

Masanori Nakamura & Keiichi Asada

Imaging Re-collimation Process of the M87 jet





Dynamic Range of current our EVN image is ~ 2500

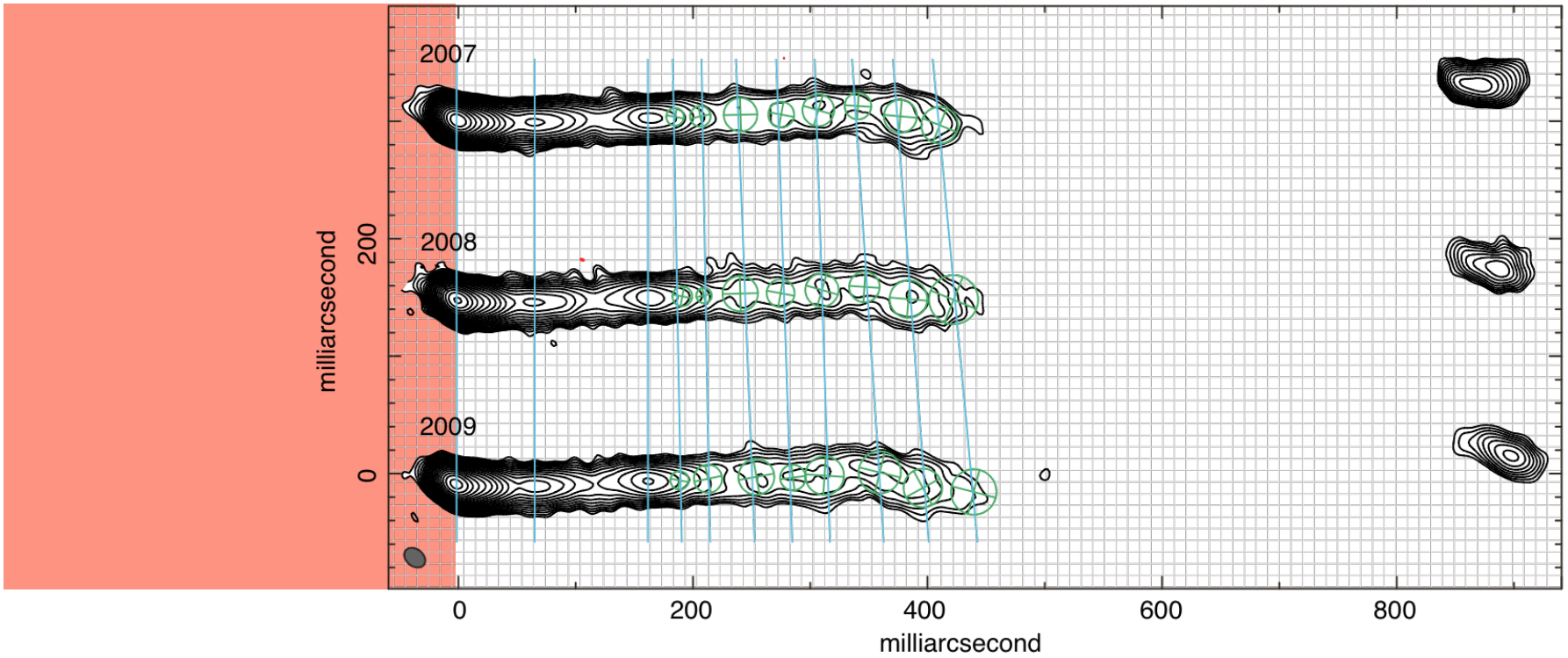
- **SKA** will improve it > 1,000,000

Is the M87 jet re-collimated to form HST-1?

Masanori Nakamura & Keiichi Asada

Imaging the counter-jets

Asada et al.

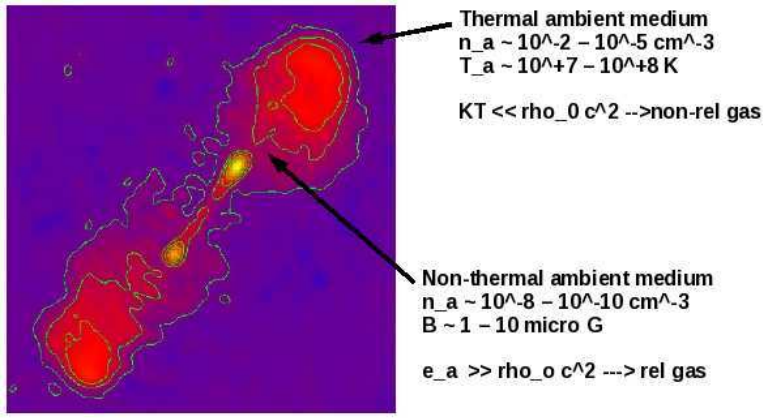


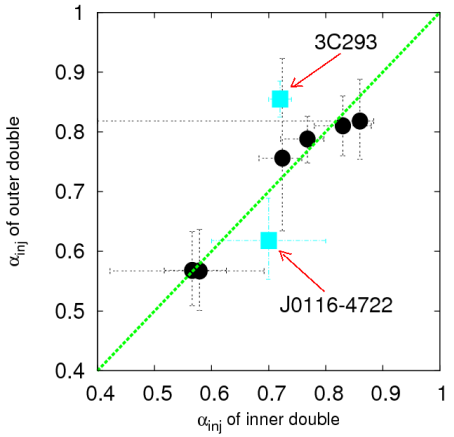
Detection of the counter-jets is very important;

- Constraining a proper viewing angle
  - **Jet acceleration dynamics**
  - **SED analysis for core emission profile**
  - **Modeling the accretion disk and BH shadow**

Chiranjib Konar

Diffuse emission around FR II radio galaxies: episodic activity





$\alpha_{\rm inj}^{inn} \sim \alpha_{\rm inj}^{out}$: similar jet power

(Konar & Hardcastle, 2013)

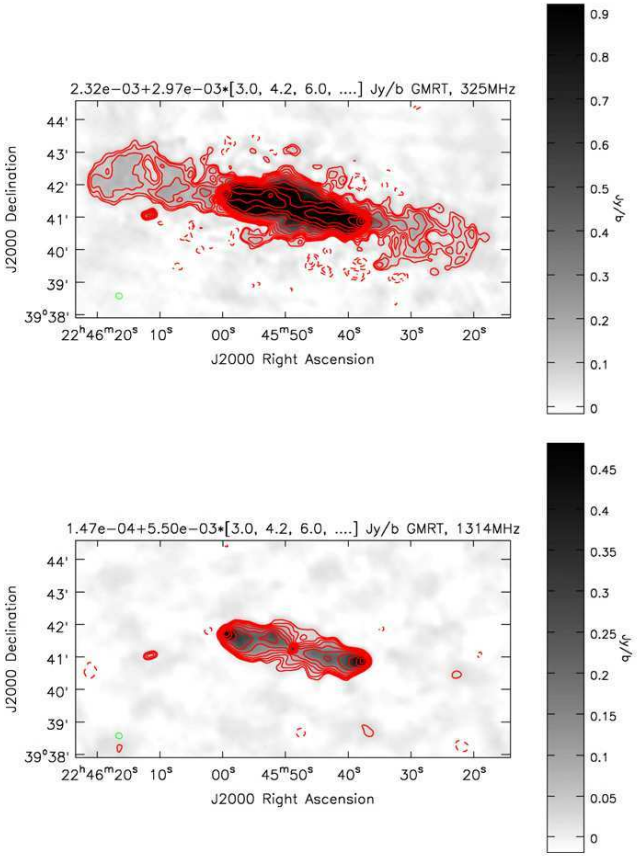


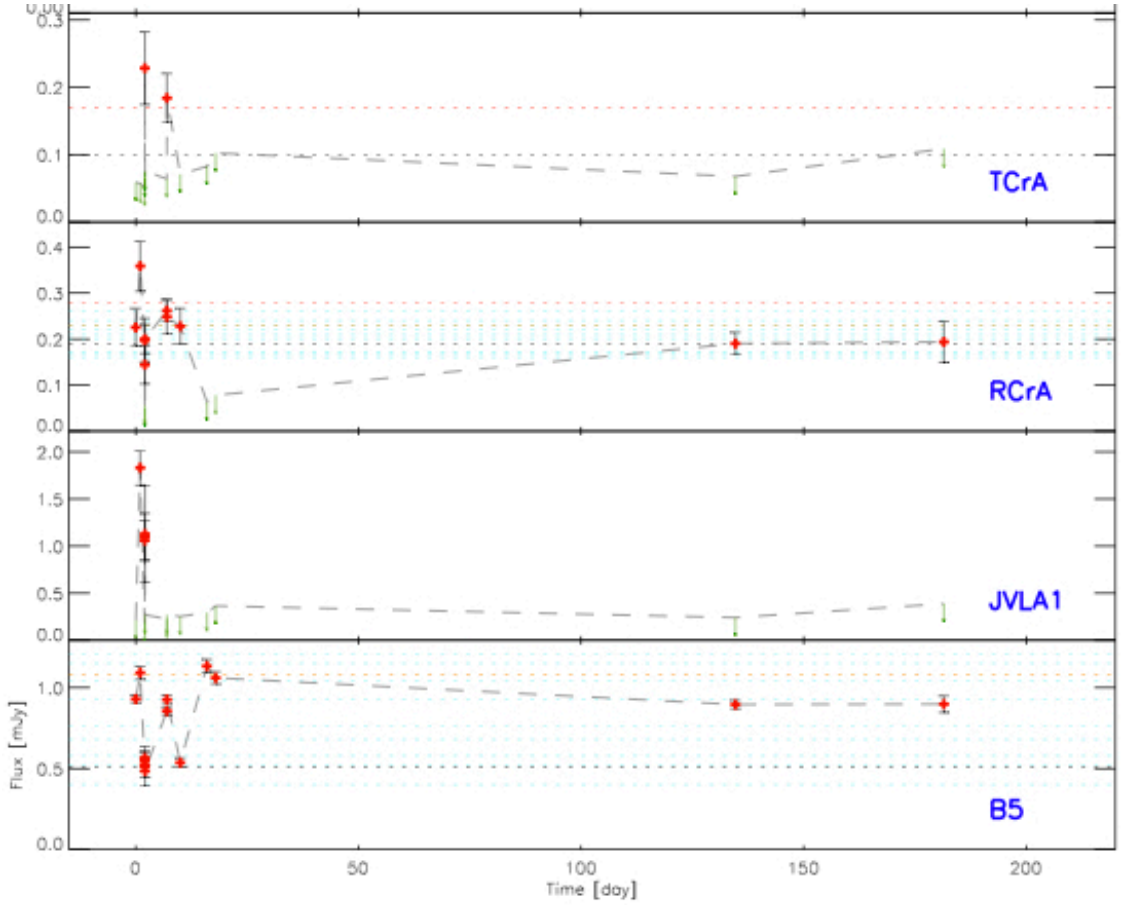
Figure 1. Contour maps of 3C452 at (top) 325 MHz and (bottom) 1314 MHz overlaid on the corresponding gray-scale images. The synthesized beam is $12\farcs1 \times 10\farcs8$ at position angle (P.A.) of $60\fdg5$ for both maps, which were made using AIPS++. The contour values are given as (mean+rms × [$n1$, $n2$, ...]). The small double source seen to the east (more obviously in the bottom panel) is a background radio source.

Newly discovered diffuse halo (Sirothia+, 2013)

Hope to discover many such radio haloes with the SKA

Monitoring of Young Stellar Objects

JVLA 8–10 GHz for ~ 200 days

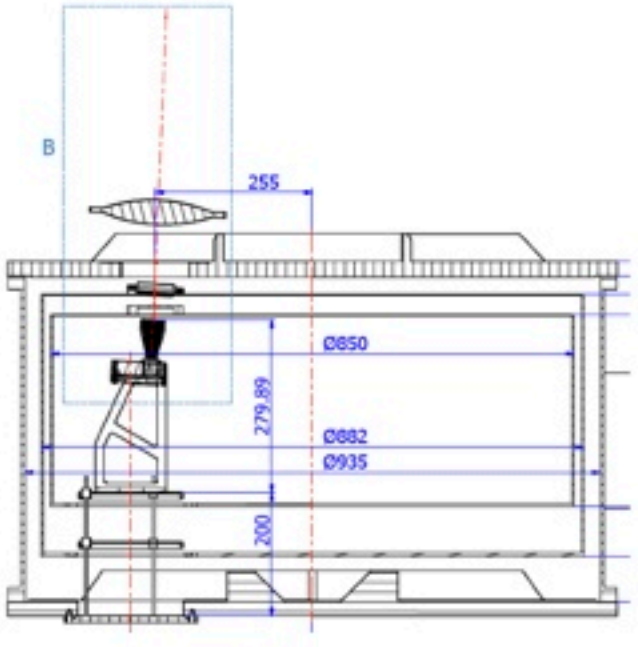


Liu et al. (2013)

The current sensitivity of JVLA for full-night integration: ~ μJy.
"Solar flares" at the distance of these YSOs: nJy – μJy.
By SKA, we can target more normal stellar flares.

ALMA Band-1 Project Overview

- Led by ALMA-EA (ASIAA)
- Cooperation with HIA (Canada), NRAO (USA) and U Chile.
- Freq.: 35-52 GHz in SSB operation
- Receiver Noise Temp.: 25-32 K (expected) @ 15K
- PDR in July 2013
- CDR in 2014
- End of project: Summer 2019

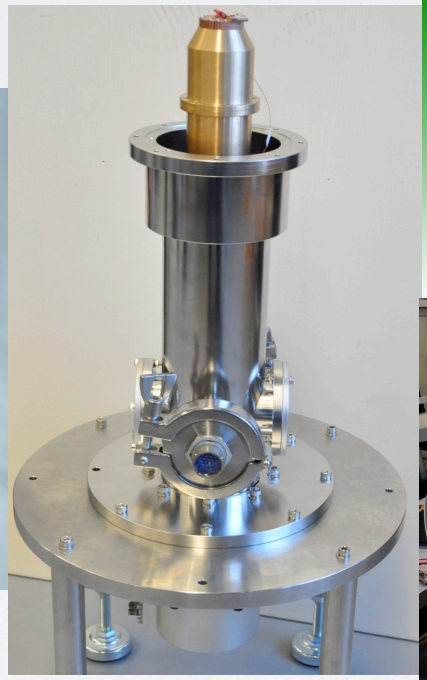


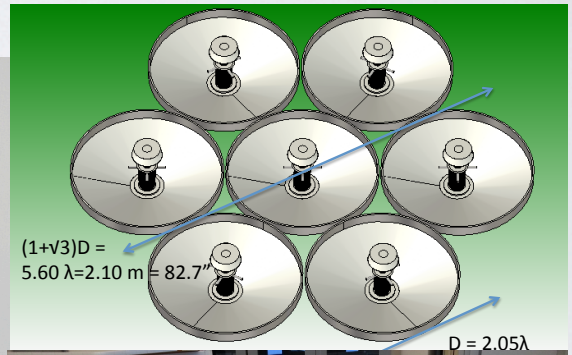
Development of SKA instruments is our natural extension.

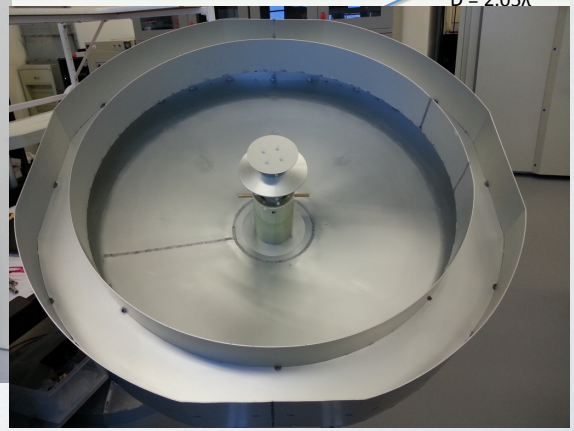
Tzu-Ching Chang, Yuh-Jing Hwang

GBT-HIM: 800 MHZ MULTI-BEAM HIM PROJECT

- GBT-HIM Project (P.I. T.-C. Chang): Building a 7-beam receiver at 700-945 MHz for redshifted HI survey at $0.5 < z < 1$ for BAO measurements.
- Use Short-backfire Antenna (SBA) with a edge-tapered reflector; with a cryogenic tube connecting to the dipole to reduce Tsys.
- Prototype for installation on GBT summer 2013; ASIAA+NRAO+GBT-HIM team







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