筑波大学
University of Tsukuba

INSTITUTE REPORT: UNIVERSITY OF TSUKUBA

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ON THE BEHALF OF UNIV. OF TSUKUBA
OBSERVATIONAL ASTRONOMY GROUP

Japan VLBI Consortium Symposium: 29th-31st October, 2014

UNIV. OF TSUKUBA
OBSERVATIONAL ASTRONOMY GROUP

20 members
- B4: 3
- M1: 7
- M2: 2
- D1: 1
- D2: 1
- Staffs: 6

→6 members using Tsukuba 32m radio telescope

TSUKUBA 32M RADIO TELESCOPE

· Radio telescope owned by the GSI
· S/X band for geodetic astronomy

· From FY2005, Univ. of Tsukuba have started to use for scientific observations under the agreement b/w the GSI and Univ. of Tsukuba

· perform observation when the GSI do not operate for the geodetic VLBI campaign

TSUKUBA 32M RADIO TELESCOPE

- K band receiver (19.5-25.5 GHz)
- First light of K band
  as a single-dish: Dec. 2006
- T_{sys}: ~80 K
- back-ends: 2GHz bandwidth, 60kHz frequency resolution

- remarkable features:

As a single-dish
- —NH_3 (J, K)=(1, 1)-(6, 6) simultaneous observations
- —H_2O maser observation

As VLBI
- —relatively large aperture telescope

PERIODIC MAINTENANCE

Apr. 7th
Heavy leak at the 1st LO (and some machine) cabin

Aug. 21st
K-band system: shutdown due to the maintenance of the compressor and the receiver
…many obstacles on the horn (kind of seeds, metal so on…)

Oct. 2nd
Re-mount on the antenna
Renewal of the membrane above the horn

Oct. 3rd
The maintenance of the membrane at the dish

PERIODIC MAINTENANCE

Apr. 7th
Heavy leak at the 1st LO (and some machine) cabin

Can not find the leaking point except for when it rains
… air conditioner reduce the humidity
-> hard to detect the accurate position of where the leaking point is
⇒ supportive care: put paste at a hole
which guides the cable from the receiver to the cabin

PERIODIC MAINTENANCE

From Apr.,
T_{sys} getting worse even taking into account for the changes in season

Beginning of Apr.: 80 K @ EL = 40 deg
Middle of Apr. : 200 K @ EL = 40 deg
End of Mar. : 600 K @ EL = 40 deg
…Something wrong w/ the system
→The membrane just above the horn was broken!

Aug. 21st
K-band system: shutdown due to the maintenance of the compressor and the receiver
…many obstacles on the horn (kind of seeds, metal so on…)

Oct. 2nd
Re-mount on the antenna
Renewal of the membrane above the horn

PERIODIC MAINTENANCE

Oct. 3rd
The maintenance of the membrane at the dish

operations

Some big hardware troubles
…troubles concerning to the antenna,
the mend was done collaborating w/ the GSI

ex) FY2012-2013(Master thesis by Fujita-kun)
Pointing accuracy getting worse at particular azimuth
Spatial resolution ~100" @ 22 GHz
⇔offset: r.m.s. 40", maximum >100"
→after the rail recovery,
by now, r.m.s. of pointing accuracy gets better to 18"

VLBI OBSERVATION

A part of the Japanese VLBI Network…

・K band VLBI observations have been performed
First fringe detection: Mar. 2007

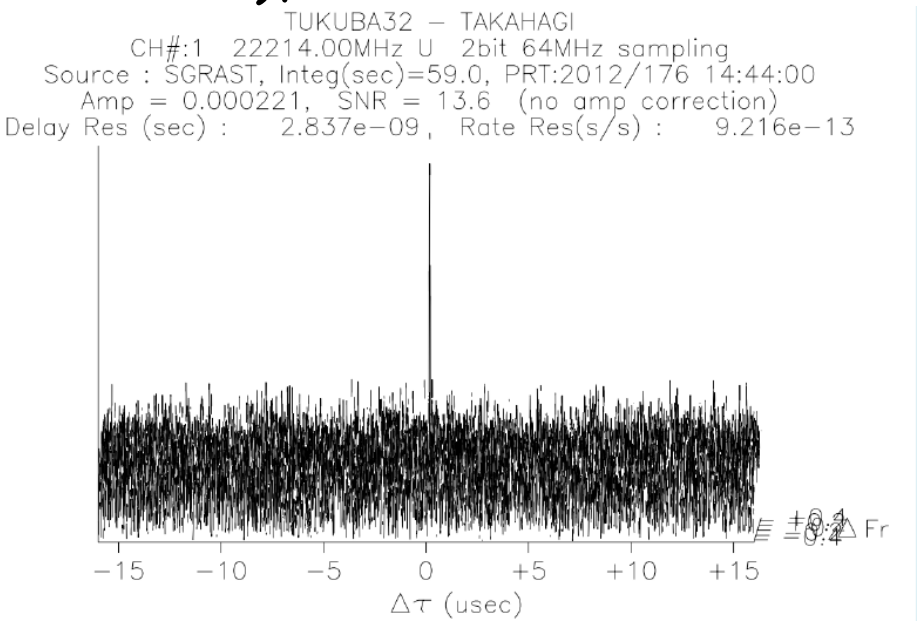
・The JVN X band (8 GHz) observations
Until Mar. 2014: the GSI had operated
From Apr. 2014:
Univ. of Tsukuba have been in charge for the operation
…3 observations have done by now

VLBI OBSERVATION

22 GHz Sgr A* monitor observations
Aiming flare up due to the G2 accretion on Sgr A*

After couple of test observations,
Jan. 2013—Aug. 2014 (about daily monitor [best effort])
Mizusawa 10-m, Takahagi (or Hitachi), Gifu and Tsukuba

First paper is accepted last week by ApJL (Tsuboi et al. 2014).
Two relating papers are in preparation.



SINGLE-DISH

Master thesis by Funahashi-kun

NGC 5495

…the galaxy with mega maser sources

H_2O maser monitor observations

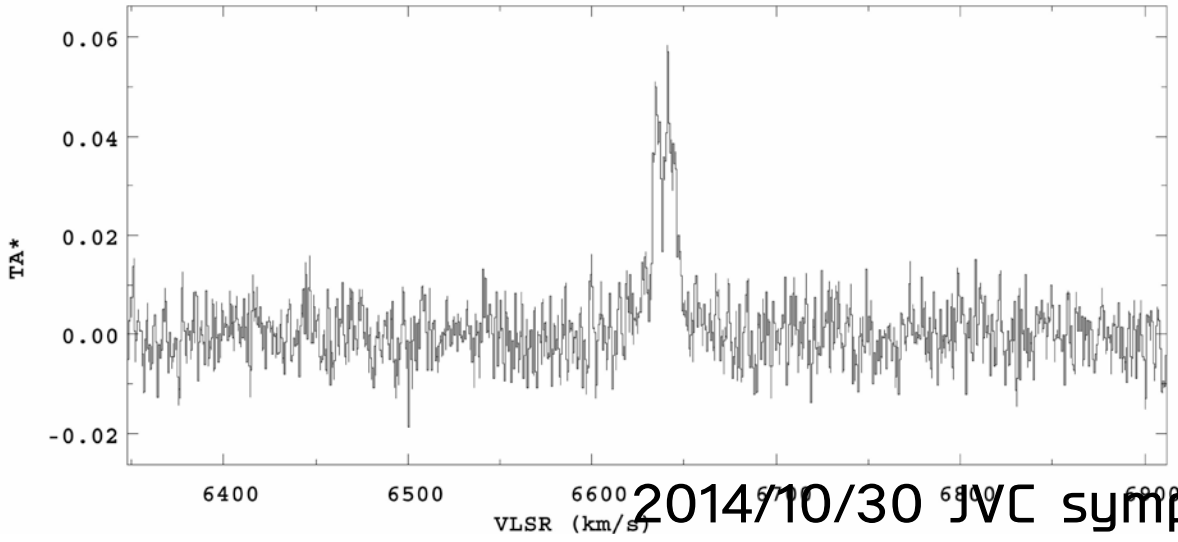
toward the central black hole

5 years monitor w/ NRO 45m radio telescope

Monotonic increase of velocity

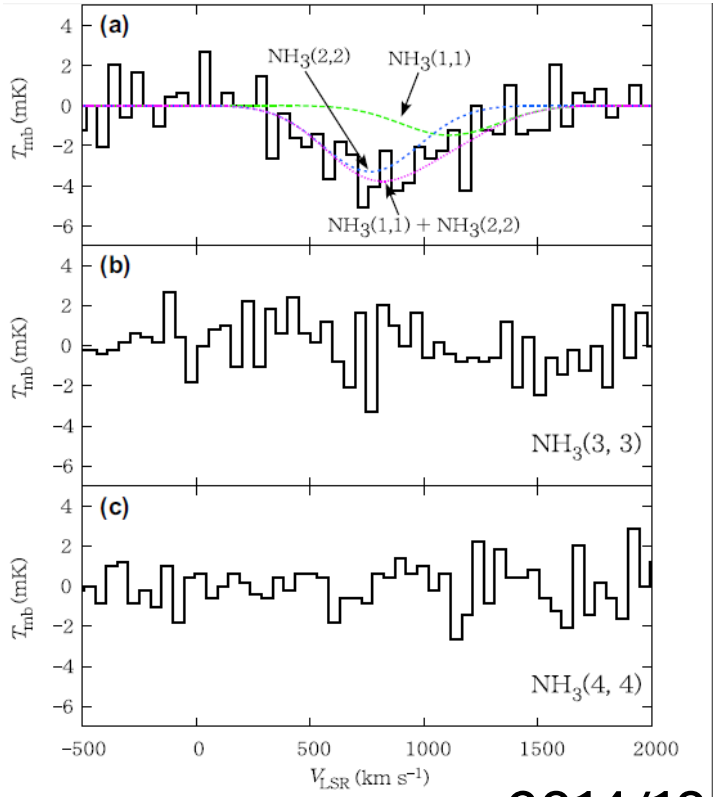
Comparison w/ VLBI observations

→suggesting quasi-Keplerian rotation maser disc



SINGLE-DISH

Detection of ammonia absorption lines
from the galaxy, NGC 3079
The paper is accepted w/ following-up high resolution observation using VLA (Miyamoto et al. 2014)



FUTURE OBSERVATION PLANS

Temperature of the receiver: 11 K
…successfully cooled
→From next winter, we will start observations of…
Extend Galactic plane survey of ammonia
→from the central region to the far-end

JVN
Nearby galaxies AGN:
ammonia absorption line observations

SUMMARY

- periodic maintenance: some anomalies are fixed
- operations are going on as single-dish & VLBI
- starts an operation of VLBI of X-band from this Apr.
- some unique results are obtained
  …Master theses and papers

Acknowledgement :
This talk is the report of observational results using Tsukuba 32m antenna which is based on the agreement between the GSI and Univ. of Tsukuba: "Collaborations about high-resolution observations using VLBI"