KaVA Q-band Monthly Monitoring of Sgr A* with 1-Gbps recording

G.-Y. Zhao, K. Akiyama, M. Kino, B.W. Sohn, and T. Jung on behalf of the KaVA AGN sub-workgroup
Outline

• Sgr A* and the related KaVA AGN Large Project
  – Motivation
  – Observation

• Preliminary results
  – Epoch: R14308A, good weather condition
  – Epoch: R13102A, KaVA + NOB
  – Light curve

• Future and summary
  – KaVA + NOB + TM65 ?
Introduction: Sgr A*

Sgr A*: The GC SMBH

- Nearest SMBH
  - $\sim 4 \times 10^6 M_{\text{solar}}$ BH at 8kpc
- Largest angular size
  - $1 R_s \sim 0.01$ mas
- The best laboratory for studying SMBH
- Emission mechanism
  - Accretion flow? Jet? ...
- Angular size and ISS

Doeleman+ 2008
Introduction: Sgr A*

Variability and emission mechanism

Variability of Sgr A*: Flux, major & minor axis

Lu + 2011

Time Variation of the Flux, Major and minor axis in early 2013 measured by VERA
Akiyama + 2013
Motivation: G2 encounter

Newly predicted phenomena after G2 encounter (i=60°)
(1) back-reaction of fall-back gas (2) tilting of accretion-disk

For i=60°, G2 encounter dynamically changes accretion flow geometry. AGN SWG will test whether this will happen or not.

Kawashima-san’s talk
Why KaVA

• Excellent UV-coverage

Configuration

uv coverage for Sgr A*

KaVA

VLBA
Observations

Monthly Monitoring started as KaVA AGN large project since September 2014, test observation started in 2013

• Recording rate: 1-Gbps; 16IF * 16 MHz BW
• Calibrators: NRAO 530; VX Sgr (SiO); OH0548 (SiO)
• On source time for Sgr A*: ~220 min per epoch
• Correlation: Hardware correlator in KJCC
• Data analysis: Ilje Cho’s poster for details
Example: epoch r14308a

2014 Nov 04
Tsys plot
Fringe SNR
R14308A uv-coverage

- uv-coverage achieved
R14308A closure phase

- Closure phase of MIZ-IRK- *

Station editing of all channels of all IFs.
SgrA  2014 Nov 04
Closure triangles of 1:MIZ in IF 1
R14308A visibility
• Visibility amplitude and phase vs. uv distance
R14308A imaging

• natural weight clean map

rms ~1.0mJy/b

DR 1000
R13102A: KaVA+NOB

2013 Apr 12

Tsys plot

Fringe SNR
R13102A: uv-coverage

- uv-coverage achieved
R13102A imaging

- natural weight clean map

rms

~0.7 mJy/b

DR

> 1000
Light curve

preliminary
Future

• Closure amplitude method
• KaVA + NOB + Tianma?
Summary

• KaVA AGN Large Project on Sgr A*:
  – Emission mechanism
  – G2 encounter

• Monitoring
  – Good $u,v$-coverage $\rightarrow$ high quality map
  – KaVA + NOB: sensitive

• Future aspects
  – KaVA + NOB + TM65: more sensitive, refractive effect?