

# Yamaguchi Interferometer



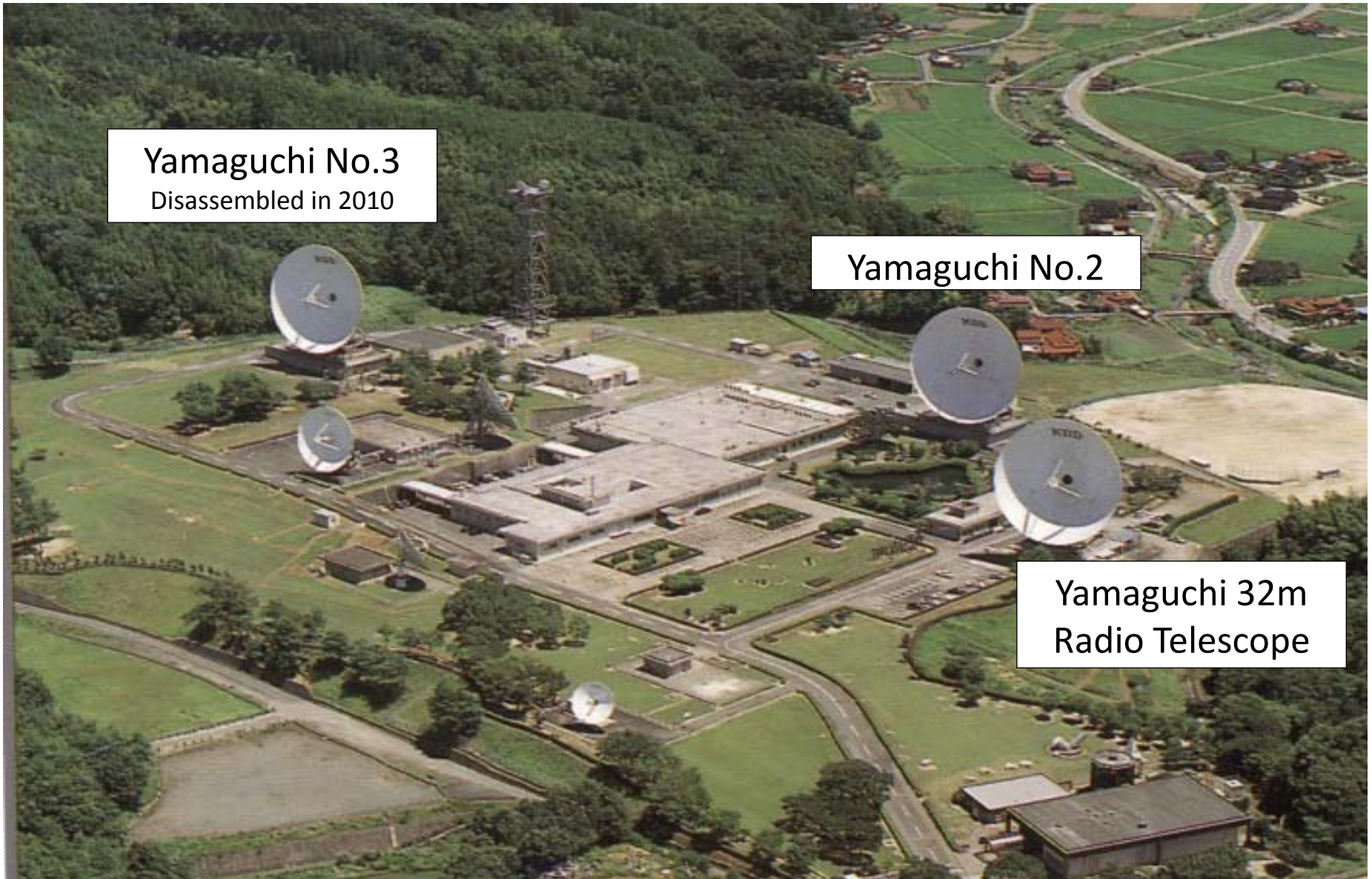
Fujisawa Kenta (Yamaguchi University)

# Yamaguchi Earth Station

Yamaguchi No.3  
Disassembled in 2010

Yamaguchi No.2

Yamaguchi 32m  
Radio Telescope





KDDI

NAO  
KDDI

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# Yamaguchi No.2 antenna



- Diameter 34m
- Surface 0.68 mm
- Frequency 4 – 6 GHz
- Polarization R/L
- Tracking  $< 0.77'$
- Slew 0.3 deg/sec
- Construction 1979
- Telecommunication use finished in 2013

# Application as Radio Telescope

- Single-dish observation
  - Maser, AGN, ...
  - Done many things by Yamaguchi 32m
- Interferometer with Yamaguchi 32m
  - Low angular resolution 1 arcmin
  - High sensitivity of 1 mJy for continuum source
  - Plenty of time to observe

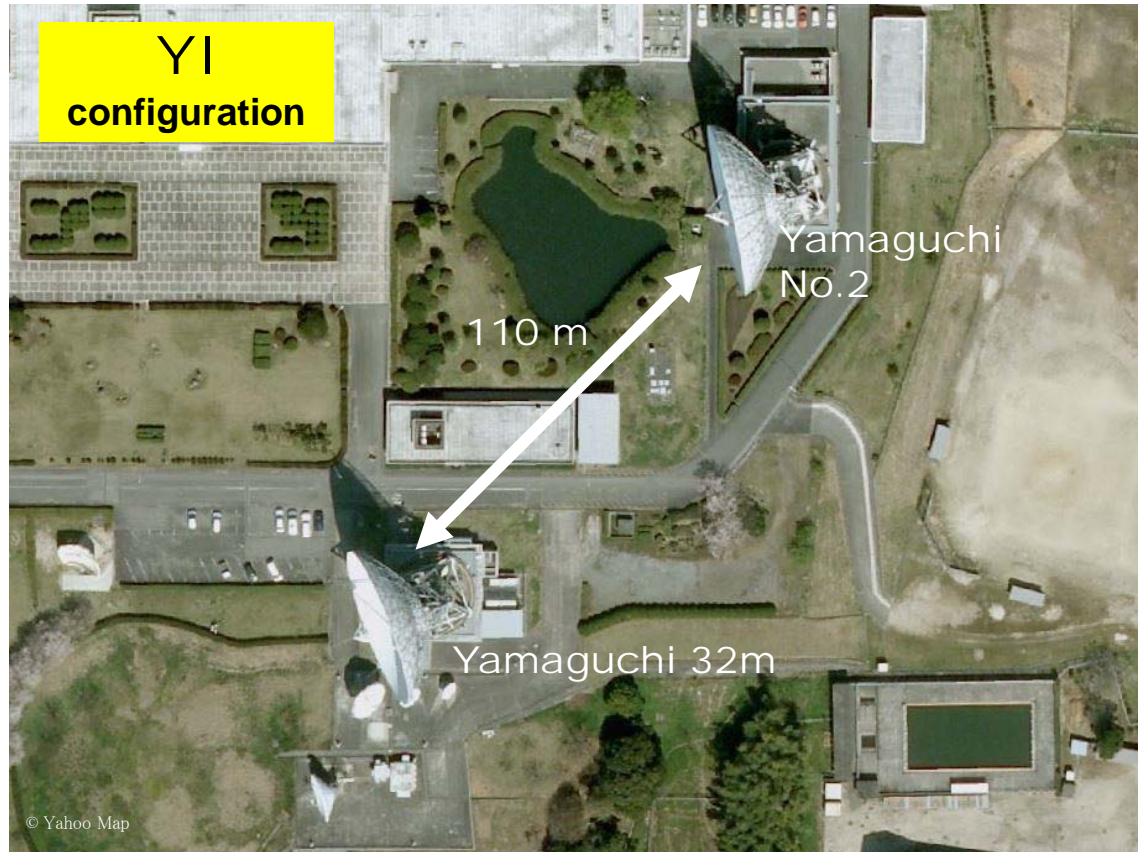


- New Field of Radio Astronomy

# Yamaguchi Interferometer YI

## Basic Specifications of YI

Item	
Frequency	6700 (BW 512) MHz 8300 (BW 512) MHz simultaneous
Baseline	110 m
Polarization	Left / Right simultaneous
Resolution	6 GHz: 1.4' 8 GHz: 1.1'
Sampling	6 GHz: 1 Gbps, 2bit, 2pol 8 GHz: 1 Gbps, 2bit, 2pol
Tsys	40 K
Integ Time	1000 – 10000 sec
Detection	1.8 – 0.56 mJy ( $5\sigma$ )
Available Time	3000 hr/yr



# Field Study of Yamaguchi No. 2

- Antenna
  - Well maintained, good surface
  - Rust at some part of junctions
- Feeding
  - Corrugate hone for 4 to 6 GHz
  - Dual polarization outputs
- Tracking
  - Smooth, same with Y32, I32
- Interferometer construction
  - Fiber tunnel to main building
  - ~ 300 m to Y32

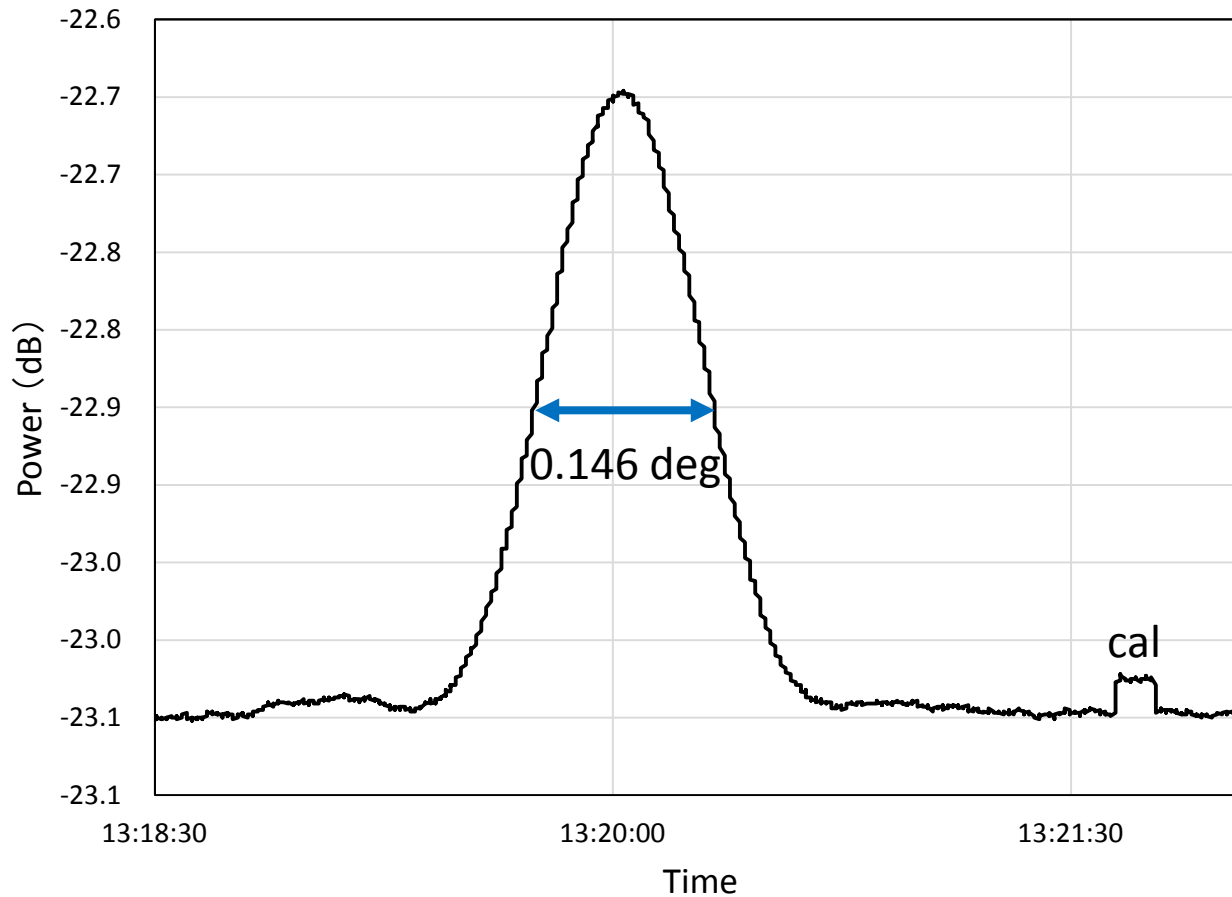








# Test Observation



- Object Vir A
- Date 14/09/16
- Frequency 4 GHz
- Drift Scan
  - Az 190d, El 68d
- FWHM 0.146 deg

# Open-use of YI

- Support observation for JVN
  - Flux measurement of calibrator
  - Weak but nearby calibrator would be available
- Open-use
  - Flux measurement / monitoring at 6/8 GHz
  - ToO observation for transient source
- Call for proposals
  - Handling as JVN or VERA or Yamaguchi local
  - Up to 1000 hr/yr observation

# Science of YI

- Strong Point of YI
  - High-sensitivity, Long Observing Time → Short Time Variable Sources
- Science Cases
  - X-ray binary ... GRS 1915+105, Cyg X-3, Cyg X-1, SS433, Sco X-1
  - Active binary ... RS CVn, Algol
  - Flare star ... EV Lac
  - Giant ... Betelgeuse, P Cyg
  - Nova
  - GRB, Transients, and Gravitational Wave Source
  - Pulsars
  - AGNs ... Genji @ 6/8 GHz, Radio Quiet AGNs
  - ...
  - Galactic Black Hole

# Galactic Black Hole

- Importance

- Many ( $10^8$ ) stellar black hole exist in the Galaxy
- Known only  $<50$  as X-ray binary
- Massive BHs may wander as vestige of merger

- Method

1. Survey and Finding by YI

- Compact galactic radio source
- Short-term variability
- 10 measurements for 1800 sources in a year

2. Proper motion by JVN/VERA/EAVN

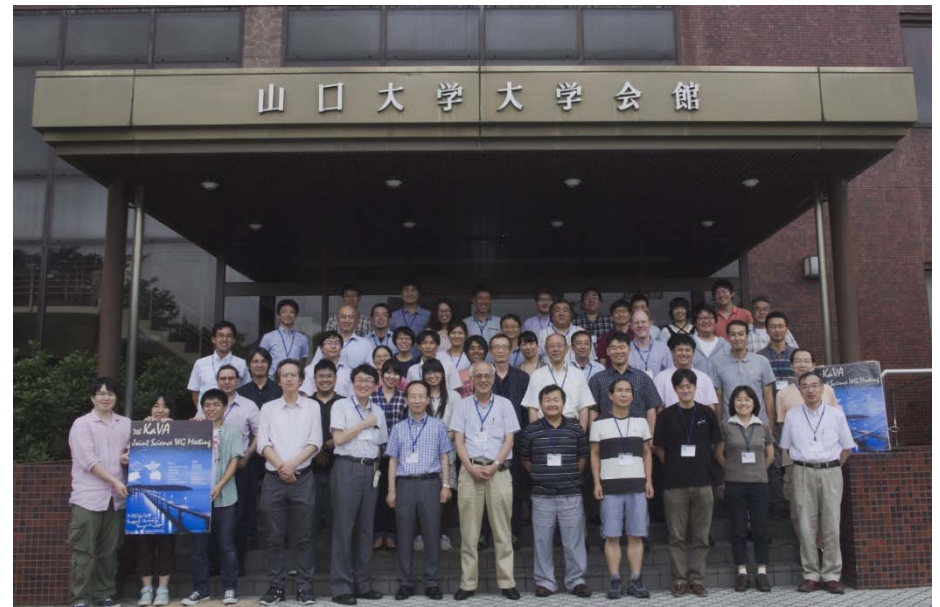
- Easy to detect proper motion of a few mas/yr

3. Multi-band observation, theoretical study

- Collaboration

# Collaboration / Research Group

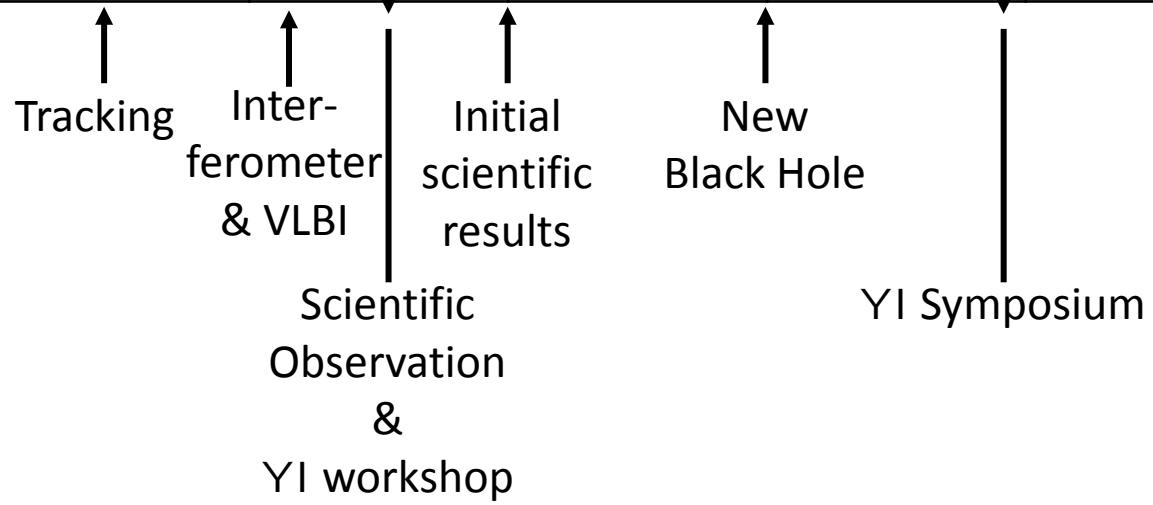
- Engineering
  - Software correlator ... NICT
  - VLBI ... NAOJ
- Science
  - Black Hole Astronomy
  - Optical / Infrared
  - X-ray
  - Theory
- “Open” study
  - Student Exchange
  - International collaboration
  - Data open policy



KaVA Joint Science WG Meeting  
50 participants  
(Yamaguchi, July 2014)

# Time Line

Year	2014	2015	2016	2017	2018	2019
Y2 reform						
YI construction						
Research						





*Thank you*

