

Construction of VGOS Antenna (3)


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2年連続、
つくばへようこそ！

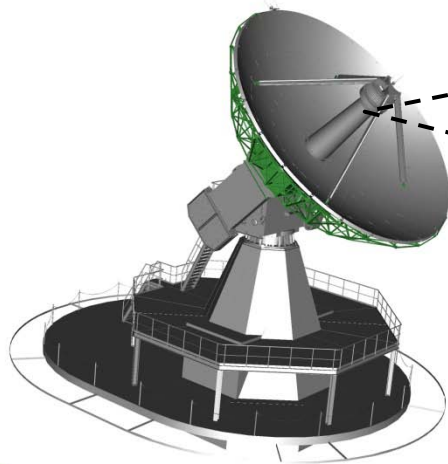


New Project for VGOS in Japan

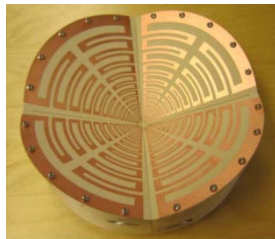
- Budget for a new antenna & facilities obtained.
- Fully compliant with VLBI2010 concept
- Observing facilities including the following components,
 1. Antenna (Single)
 2. Front-end
 3. Up-Down Converter
 4. Data Processing & Acquiring System
 5. Precise Frequency Standard (H-maser)
 - (6. Operations rooms)  Operations Building will be constructed two years late.

Components

Antenna side

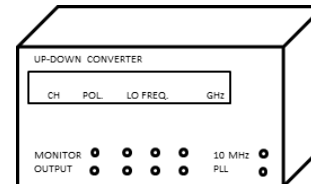


1. Antenna



2. Front-end

Operation Building side



3. Up-Down Converter



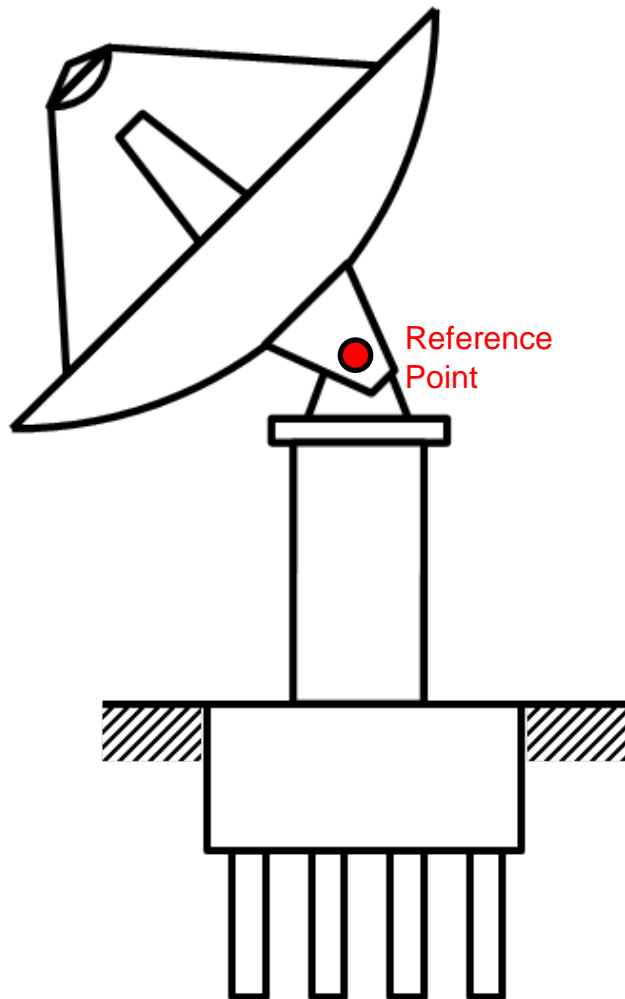
5. Precise Frequency Standard (H-maser)



4. Data Processing & Acquiring System

(6. Operations Rooms)

1. Antenna (Single type)



Diameter : 13.2m

Optics : Ring Focus

Frequency: 2-14GHz

Aperture Efficiency: $\geq 50\%$

Antenna Noise Temperature: $\leq 10\text{K}$

(Excl. Atmosphere Contribution)

Reference Point Stability : $\leq 0.3\text{mm}$ (rms)

Path Length Stability : $\leq 0.3\text{mm}$ (rms)

Reference Point should be measured directly from the ground for Co-location!

Driving Speed

Az slew rate: 12 deg/sec

El slew rate: 6 deg/sec

Az acceleration: 3 deg/sec²

El: acceleration: 3 deg/sec²

Optical Fiber cable: from Antenna to Building

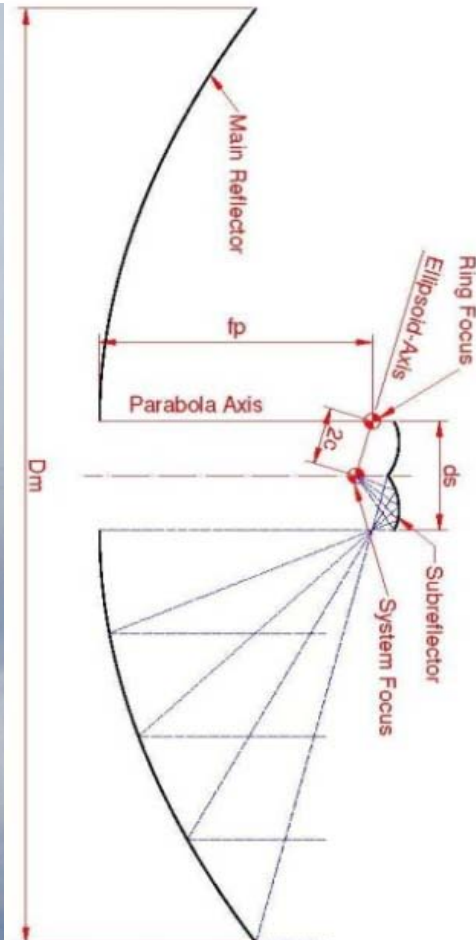
Photo of the antenna (1)



Photo of the antenna (2)

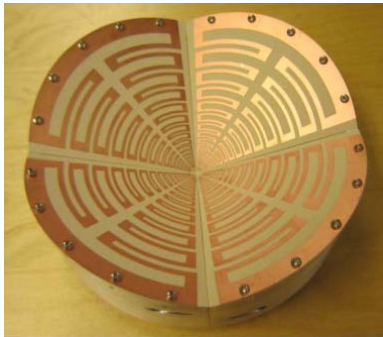


Photo of the antenna (3)



Ring Focus optics

2. Front-end



Developed by Chalmers University of Technology



Developed by Caltech

Eleven feed is assumed for antenna design.
Frequency: 2-14GHz

Receiver Noise Temperature: $\leq 30\text{K}$
System Noise Temperature: $\leq 40\text{K}$
(Excl. Atmosphere Contribution)

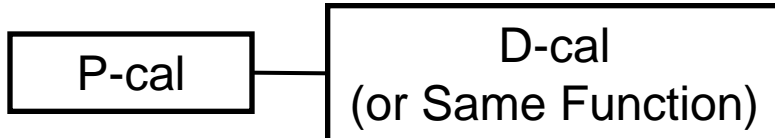
2 types of broadband feed are purchased.

- 1) Eleven feed
- 2) Quadruple-Ridged Flared Horn (QRFH)

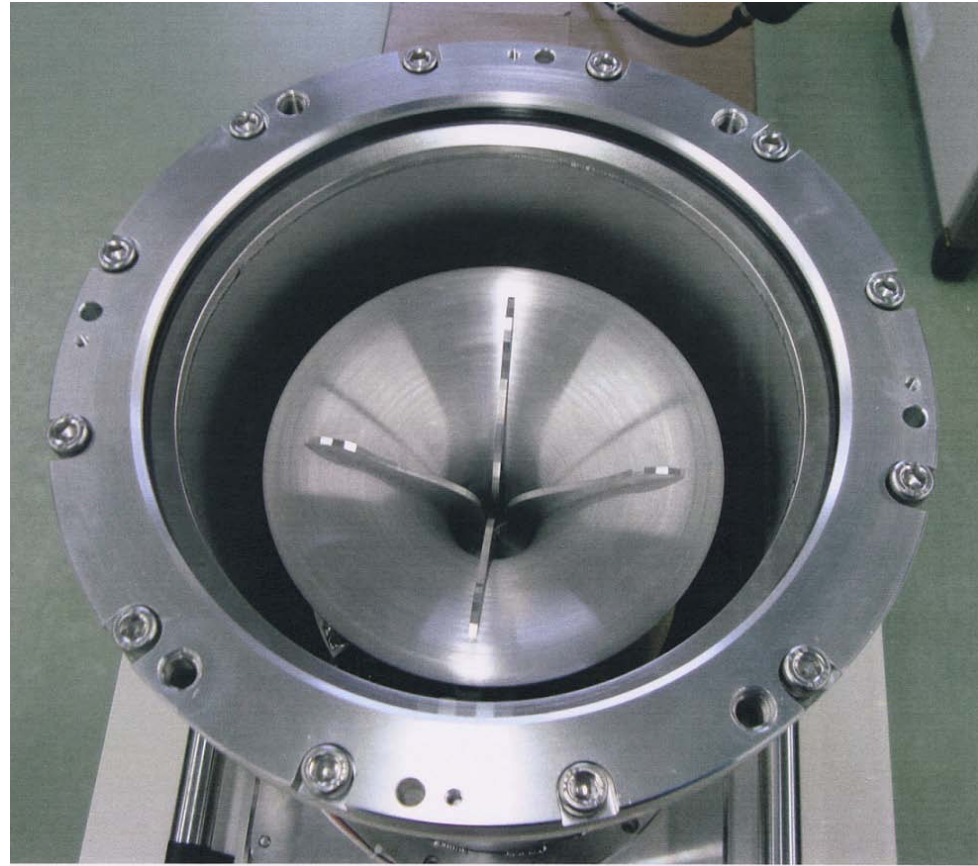
For compatibility with legacy system,
Tri-band feed system is also purchased.

P-cal & D-cal (or the same function)
are installed.

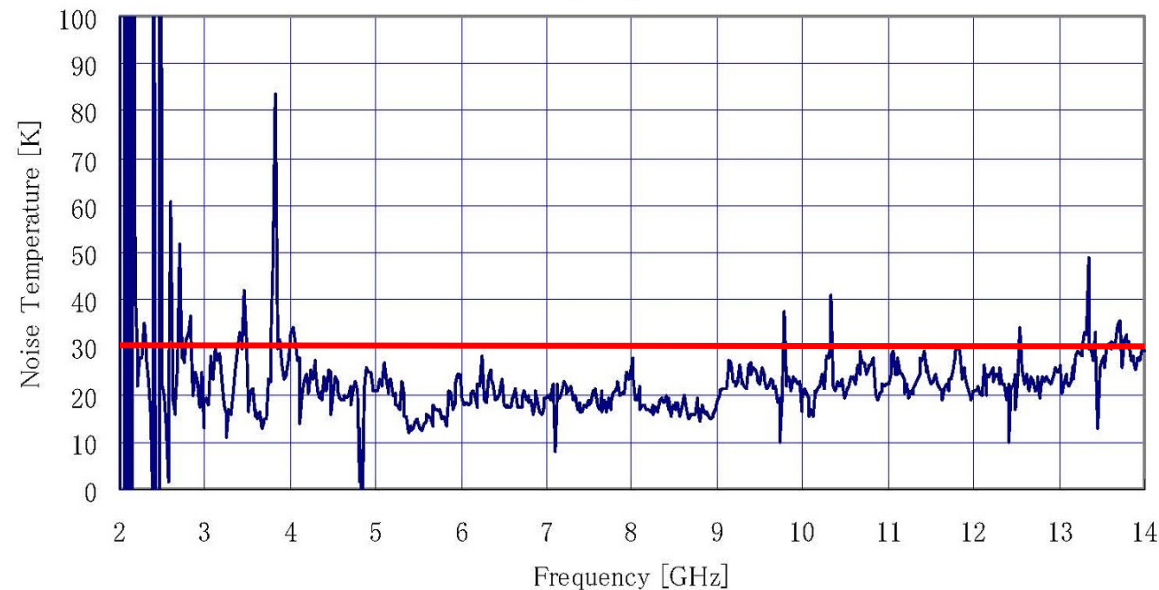
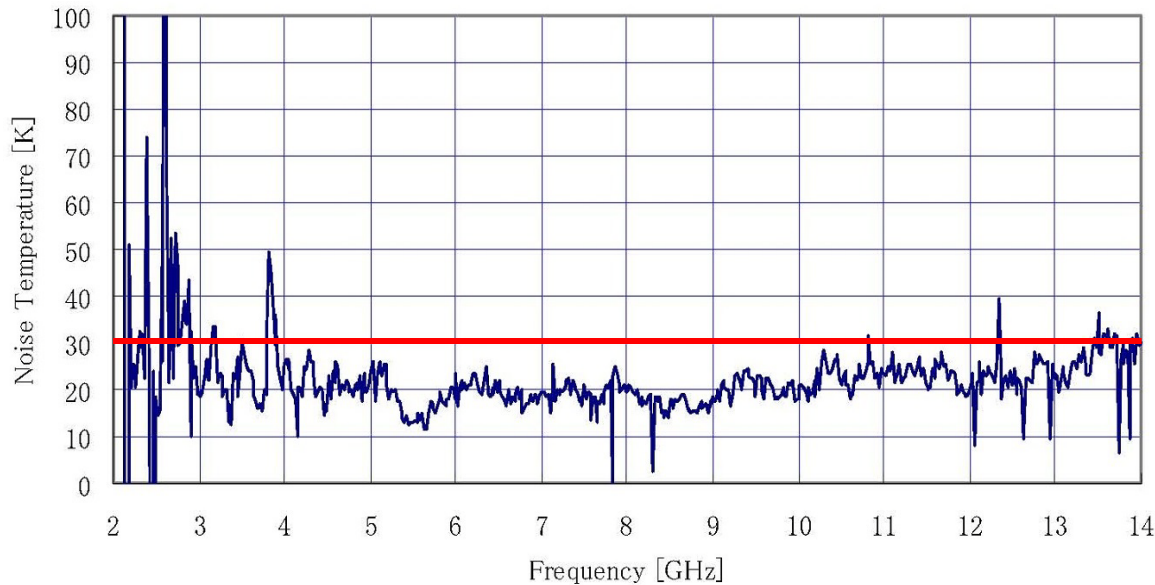
Injection of P-cal/Noise source
in the front of the Feed



Cryogenic Dewar containing QRFH



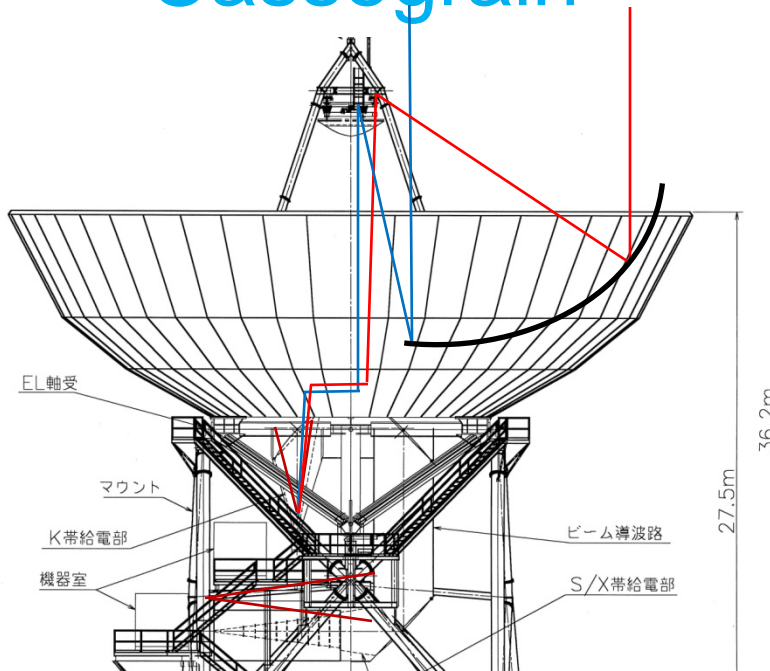
Receiver Noise Temperature of QRFH system



Physical temperature:
 LNA : 9.7K
 Feed : 21.5K

Comparison of antenna optics (Cassegrain vs. Ring Focus)

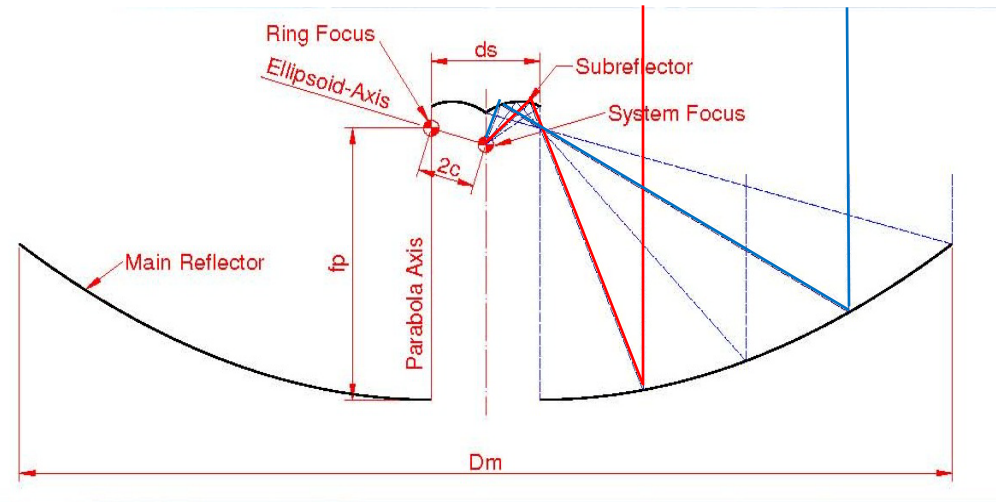
Cassegrain



feature:

- normal efficiency: 50~70%
- Much less RFIs

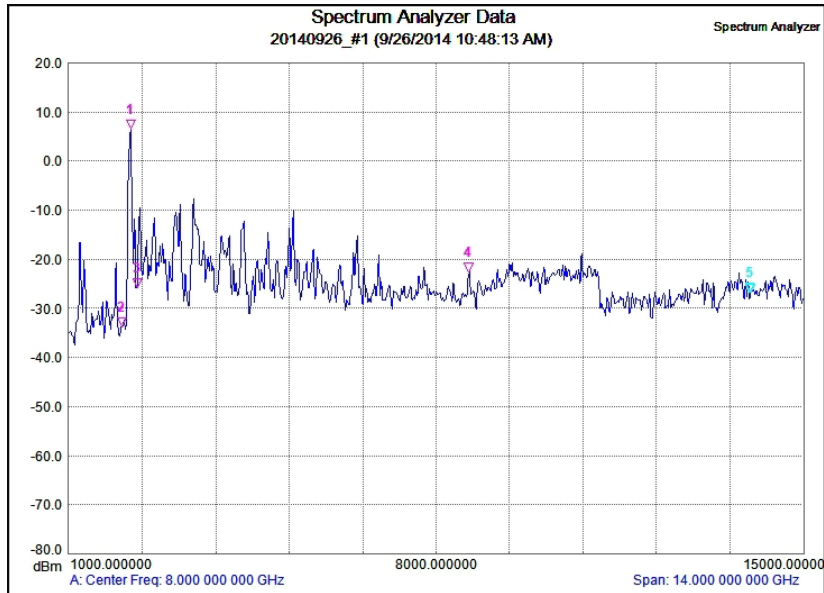
Ring Focus



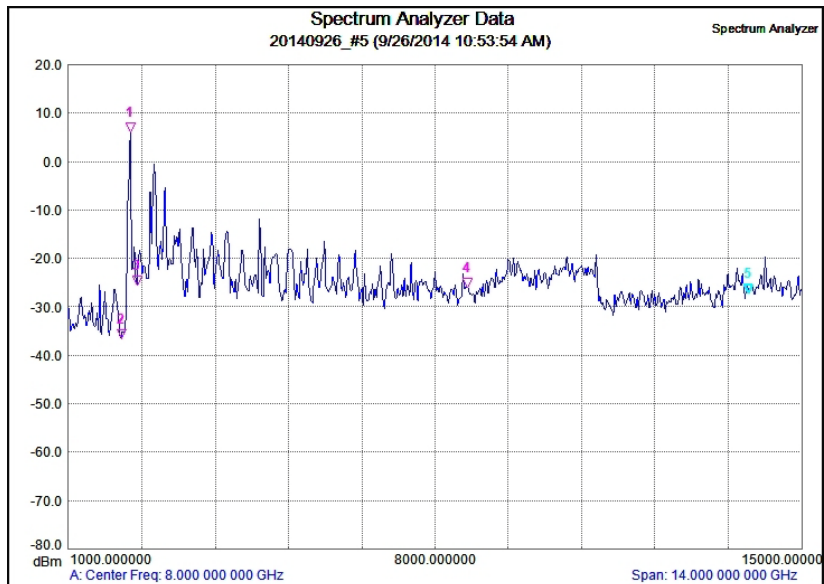
feature:

- better efficiency: ~80%
- Artificial signals easily reach the feed

RFIs by broadband receiving



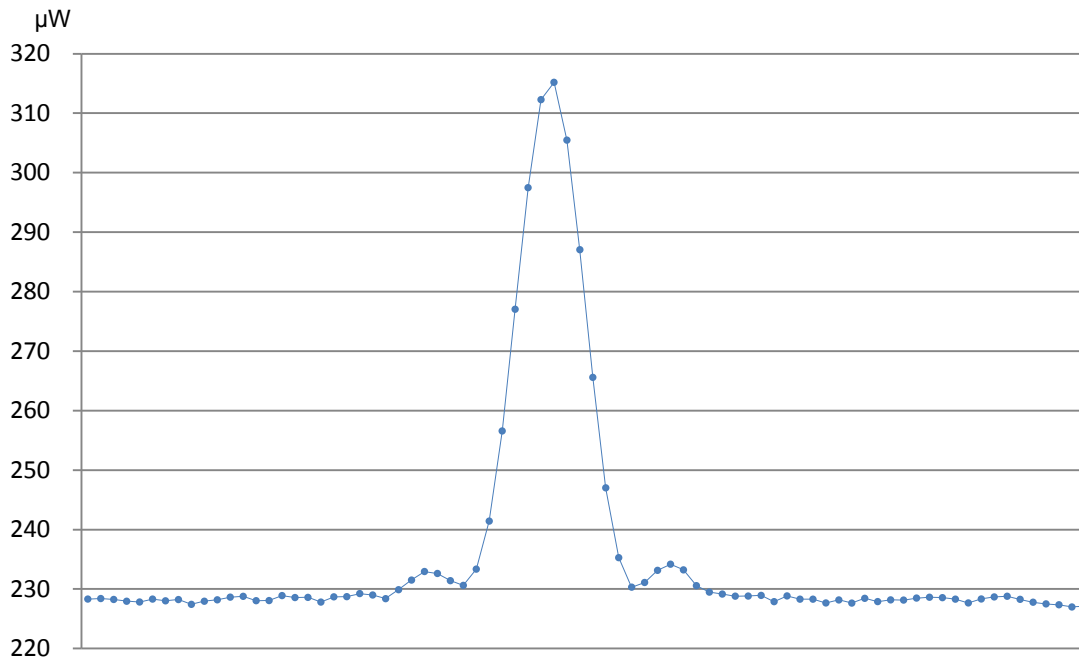
Eleven feed : H polarization



Eleven feed : V polarization

High Pass Filters to cut less than 2.2GHz
are inserted before the 2nd Amps.

First Light !

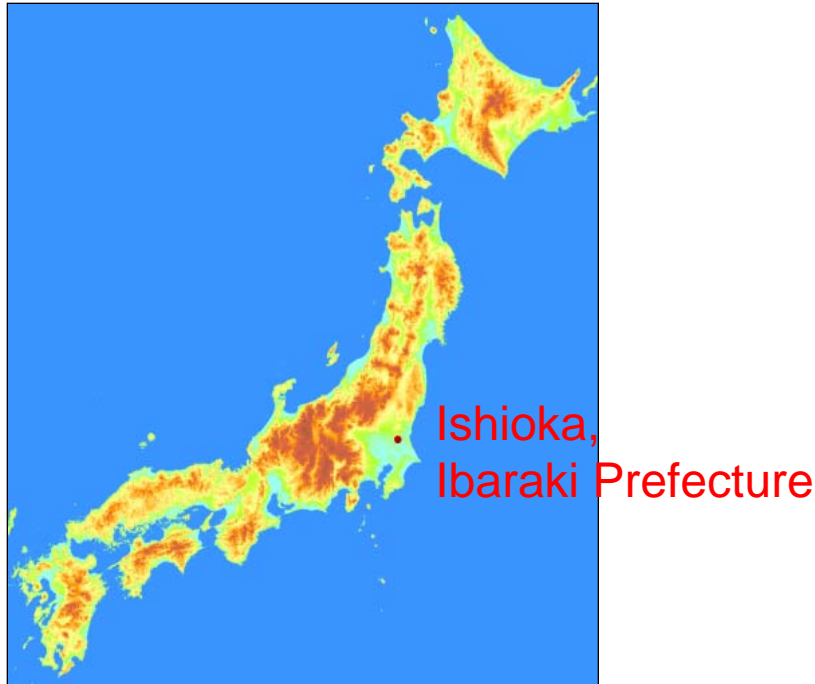


Cross scan data of Taurus-A
with Tri-band feed
at X band (BW: 900MHz)

The same result obtained
by Eleven feed.

According to Y factor, the SEFD is calculated as **1,250Jy**.
Assuming that System Noise Temperature is 50K,
the aperture efficiency is **77%!**

Location of the station



- Stable foundation (the bedrock near to the surface at less than 3 meter depth)
- More silent radio condition (weaker artificial radio signal than Tsukuba)

Summary

- New project for constructing new VGOS station has started in Japan.
- New VLBI observing facilities are installed, fully compliant with VLBI2010 concept.
- Construction of the antenna is complete by the end of March, 2014.
- In 2014, set-up & test observation will be done, and parallel observations will be done with Tsukuba (& other stations) in legacy S/X band mode from February, 2015.

Thank you very much
for your attention!