

Current Status of Nobeyama 45-m Telescope

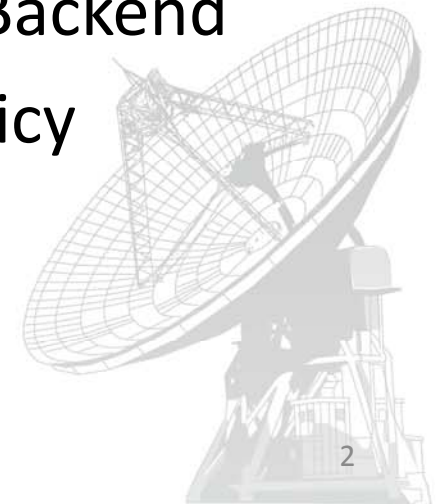
Masao Saito

Nobeyama Radio Observatory



45-m antenna NINS

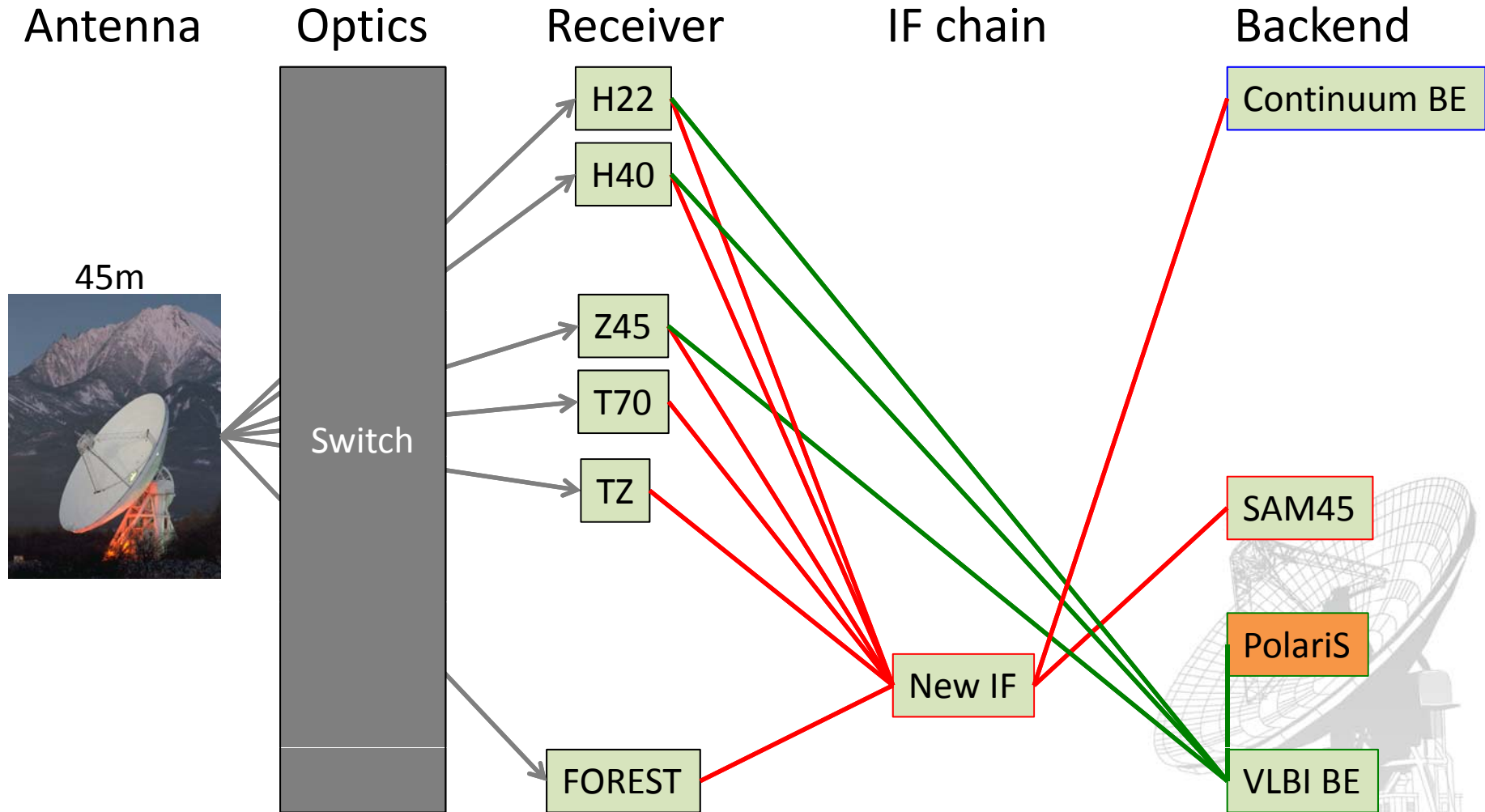
- 45m Diameter
- Beam waveguide optics
- Pointing accuracy: 2-3”
(under decent conditions)
- Receivers (20 – 116 GHz)
- Digital/VLBI Backend
- Open sky policy



OPEN USE

Commissioning

Current System



Oct3-4, 2016

Mizusawa Users Meeting

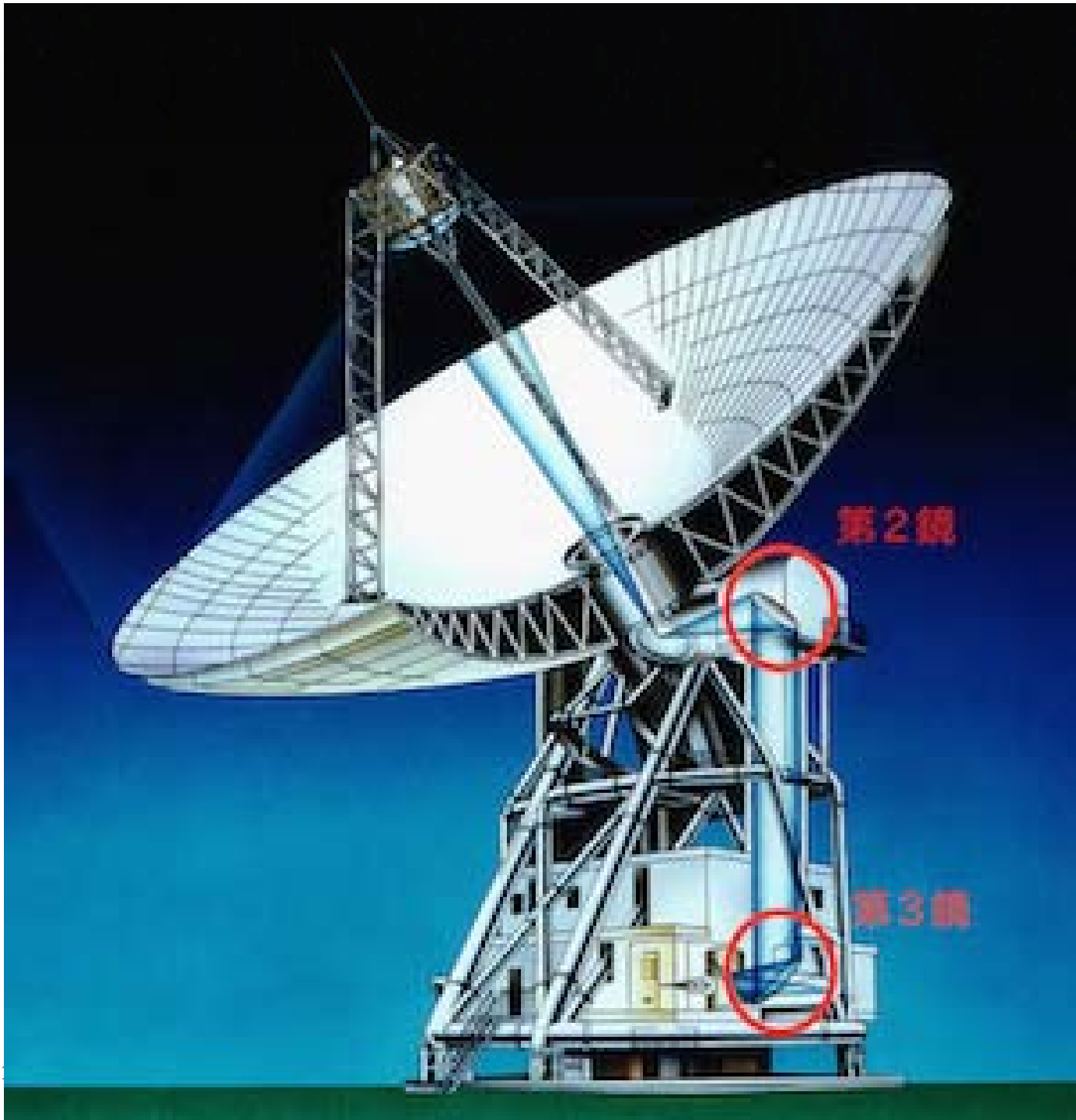
Performance improved

- Large surface errors: 180 μm ($\eta_{A,110\text{ GHz}} : 0.25$)
 - Improved to be 100 μm ($\eta_{A,110\text{ GHz}} : 0.35$)
- High antenna noise temperature: 30 K
 - Reduced to be 19 K (w/o atmosphere)
- Single pixel Rx only at 3 mm
 - Expanded to be 4 pixels

Overall nearly a factor of 10 improvement in 3 mm mapping

- Painting mount structure

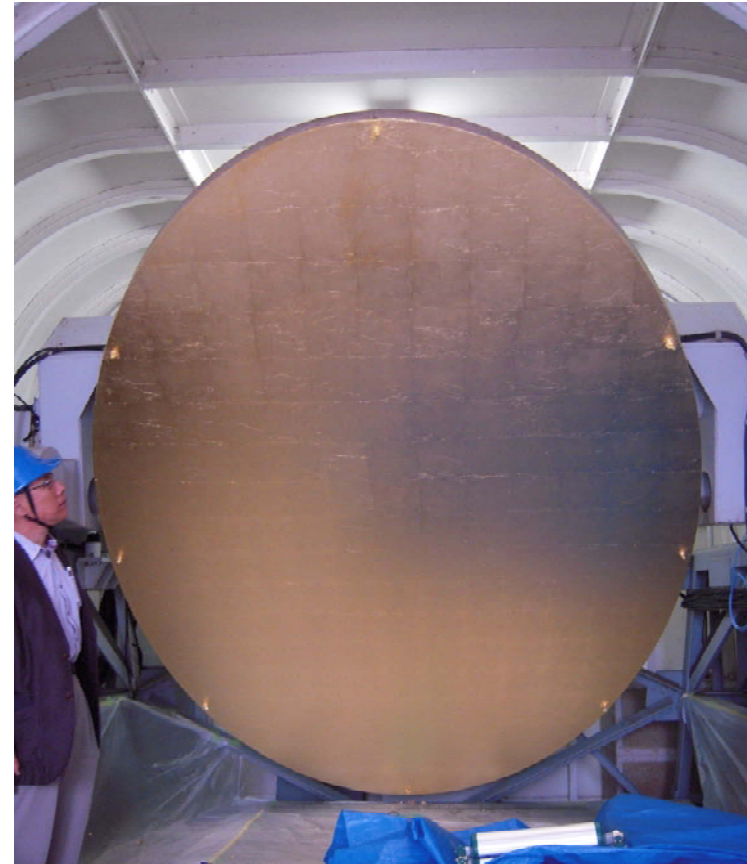




Oct3-4, 20



Put (Stick) metal foils to M2 and M3



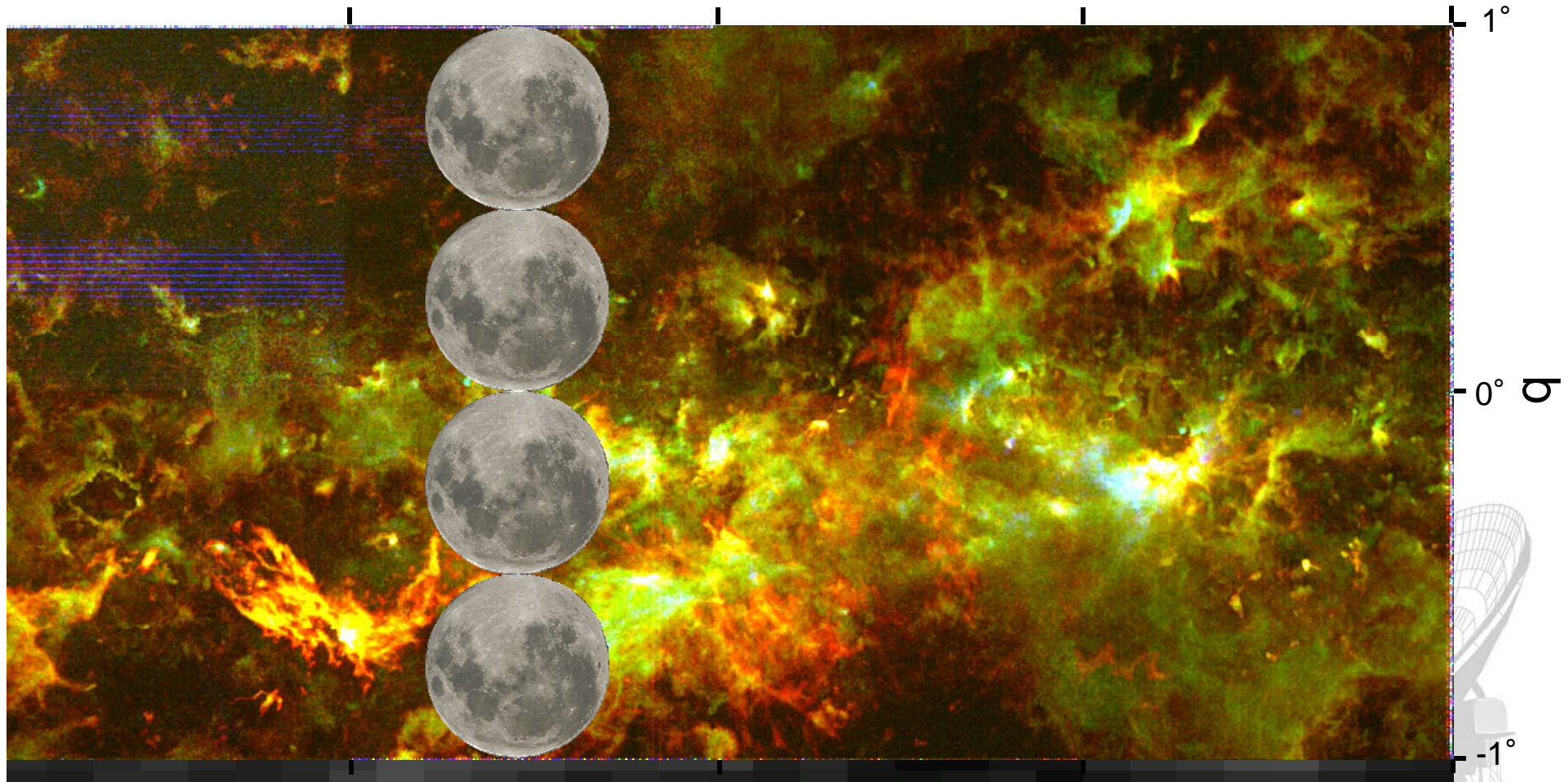
- Put (Stick) metal foils to M2 and M3 (3 um thick)
- Tsys is reduced by $\sim 11\text{K}$ @ 3mm

Painting white



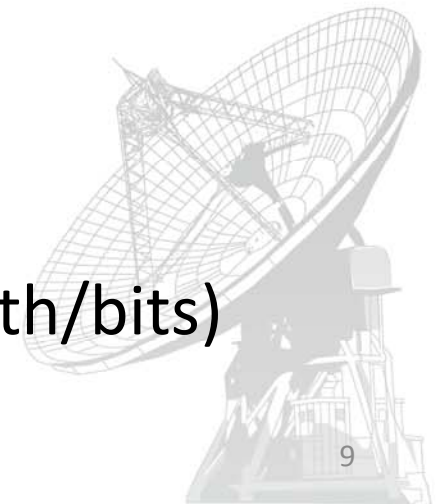
FUGIN (GPS)

Columbia Survey in CO(1-0)



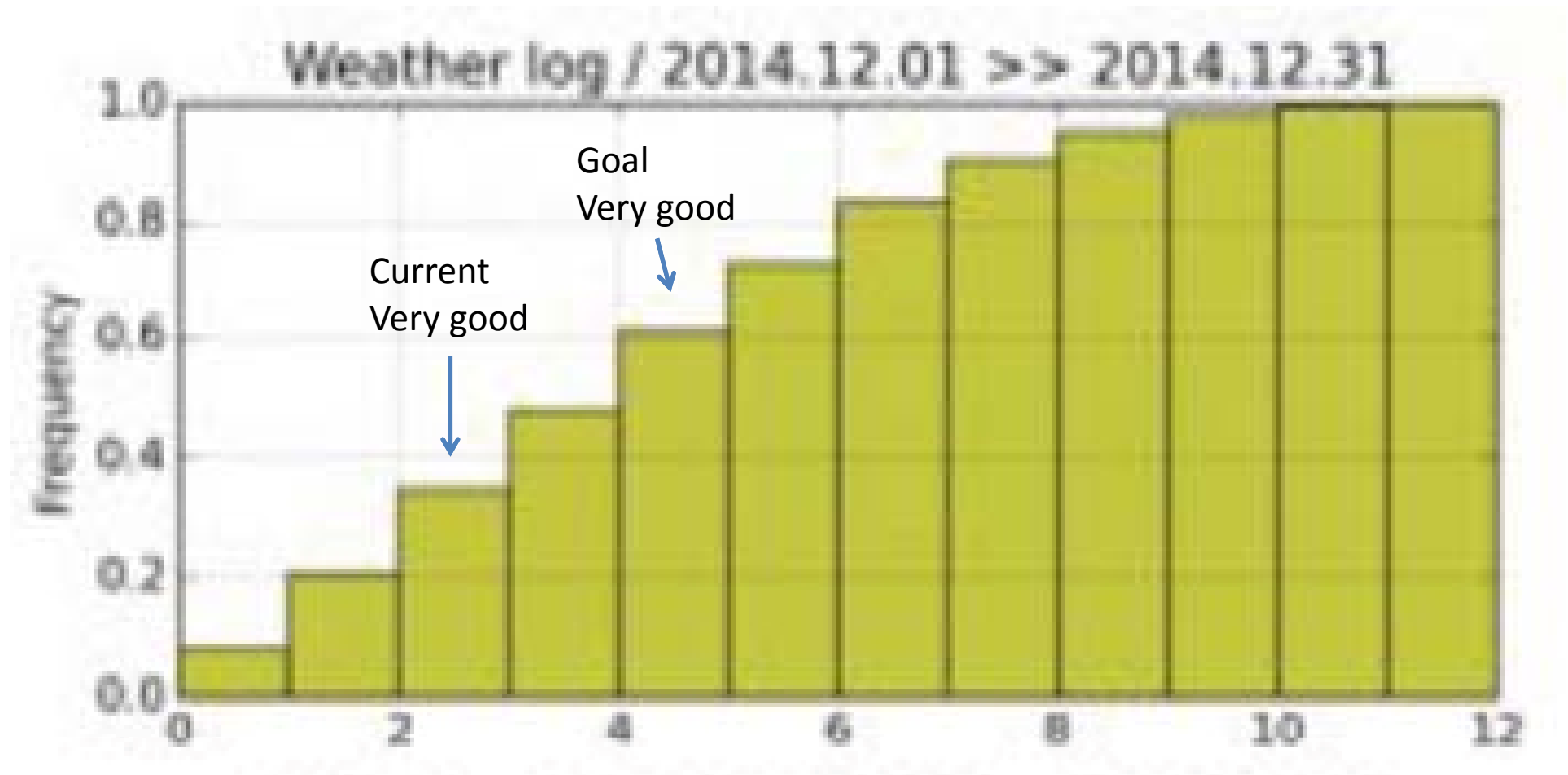
Future Development

- Near Future Development
 - Analysis ported to CASA (Pipeline)
 - Archive System
 - Remote observations
 - VLBI at 86 GHz
 - Z45/Polaris capability
- Future Development
 - Metrology System
 - FOREST with wider frequency coverage
 - More advanced spectrometers (bandwidth/bits)



Metrology goal

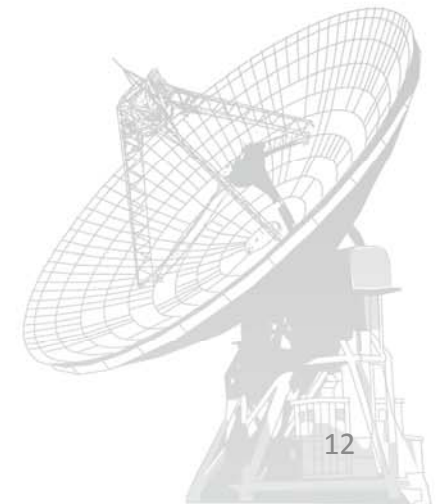
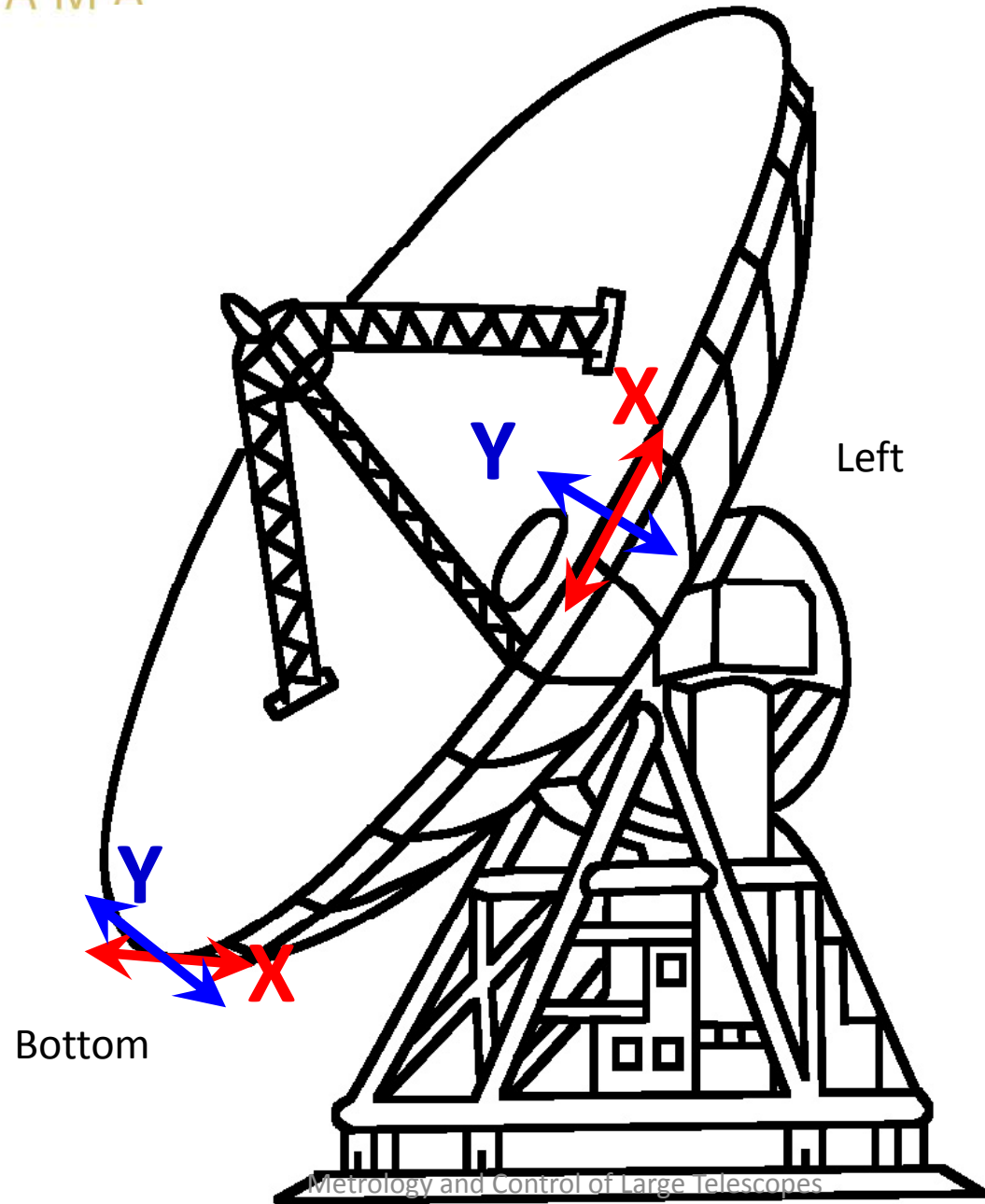
Push wind limit further from 3 to 5 m/s by metrology



Measurement Setup

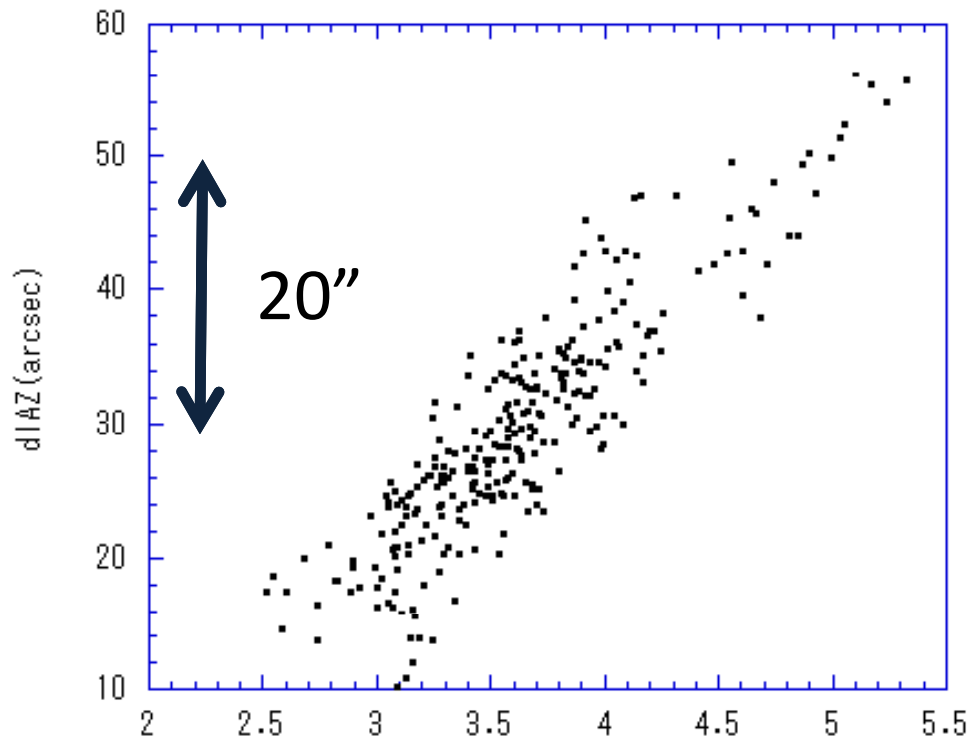
Kuno 2006





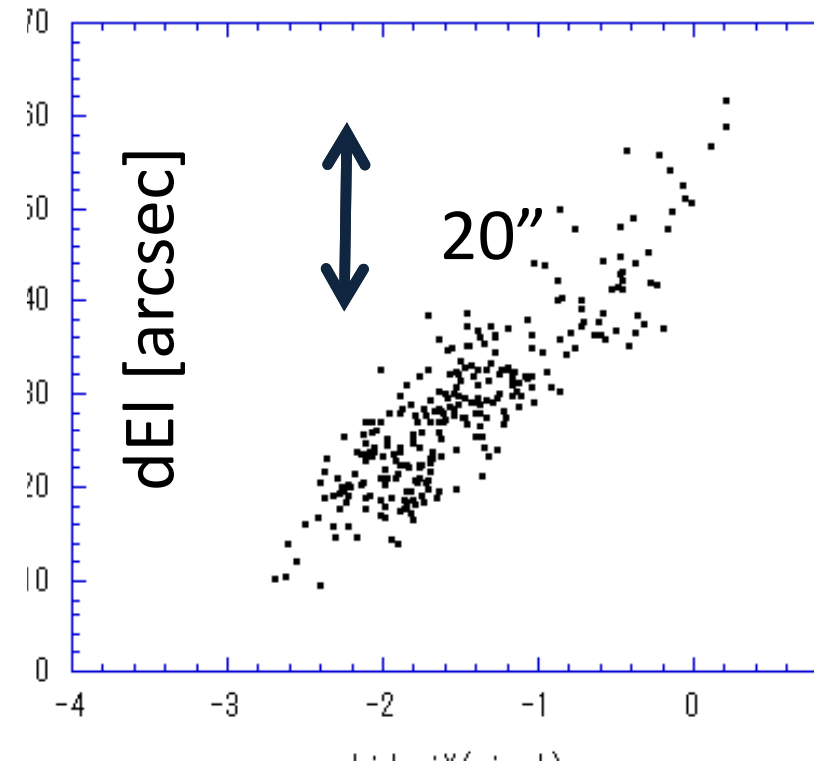
Pointing error and dish movement Azimuth/Elevation

Good correlation seen (sometimes)



Top X [Pixel]

Kuno 2006



Left X [Pixel]



Wind Metrology

- Update the previous wind metrology system
 - Set more stable LED mount structure
 - Enclosure around LET to avoid unwanted sunlight
 - Simplify pointing telescopes
- Jupiter or Venus observations with FOREST yields accurate pointing errors in both Az/EI to confirm metrology performance.
- Large Aperture Metrology Project was proposed in the metrology/control WS in Sep2016.

45-m telescope and VLBI

- Open-sky policy – observing proposals from VLBI community are welcome.
- Observing Time
 - Currently up to 100 hrs per season
 - Possible to increase: **Science Does Matter.**
- Remote Observations from Mizusawa is possible, but needs to be validated.
- NRO provide infrastructure and interface information for outside groups if highly evaluated by JSAC.



Toward successful VLBI Obs.

- ***Do we have a consistent and efficiently plan to use Nobeyama 45-m as a VLBI element?***
- Organization
 - Mizusawa, KASI, others?
- System-wise
 - System Design and Requirements
- Commissioning
 - Commissioning plan/manpower
- Operation/Maintenance Plan
 - With KaVA, VERA, EVN

These are key issues for success!



Summary

- Nobeyama 45-m telescope (34 yrs old)
 - One of the largest single dish antennas operated at 20-116 GHz.
- Performance has been significantly enhanced at 3 mm will be further improved.
- Nobeyama 45-m telescope has high potential to conduct VLBI observations at 43 GHz and higher..

