

SSEC@Manchester

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Japanese Possible Contribution to the International SKA Program

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Scientific Contribution

- Japanese SKA forum chaired by Prof. Nakanishi, Kagoshima University, has been established in Japan.
- More than 50 astronomers have started the investigation on possible SKA sciences.
- SKA-WS2010 is planned in November 2010.

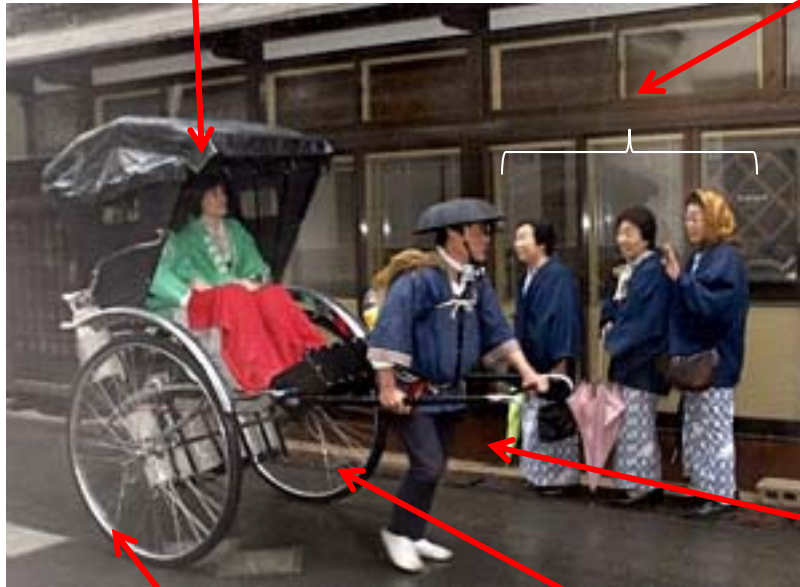
Possible Technical Contribution

- Radio wave Launcher
 - Taper Slot Antenna
 - Taper Balun
- Wide-band Low-noise Amplifier
 - Decade band receiver
- High Speed AD Converter
 - 50GHz Sampler
 - Wire Bonding problems
- High Speed Optical Fiber Data Transmission
- Long way Reference Signal Broadcasting
- High Speed Correlation Processing

Short Break at Japanese Tourist Spot 'Scientific Research and Engineering Support'

Astronomer

Tax Payers



- God science based on advanced technologies
- Creative technology based on deep scientific understandings to the nature

Project Manager

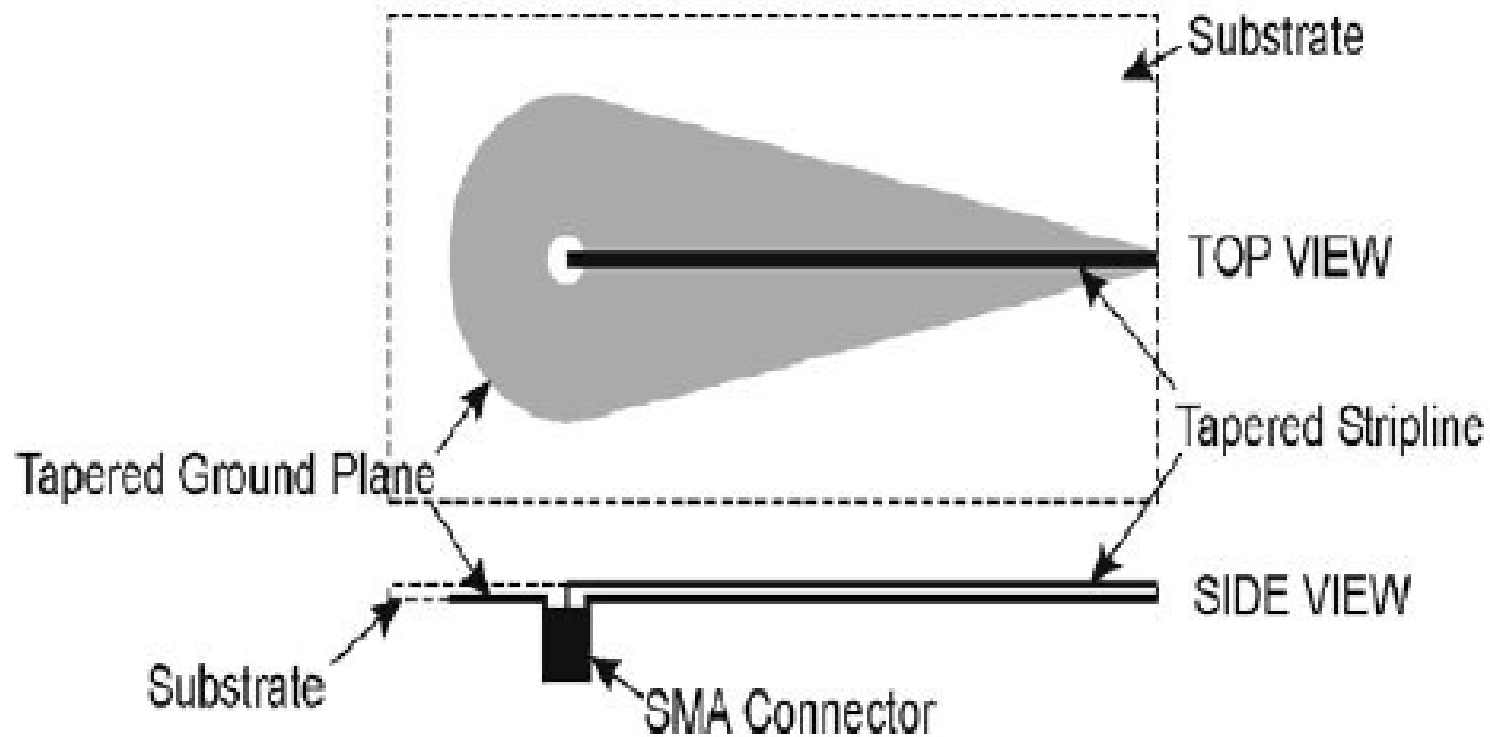
Project Scientist

Project Engineer

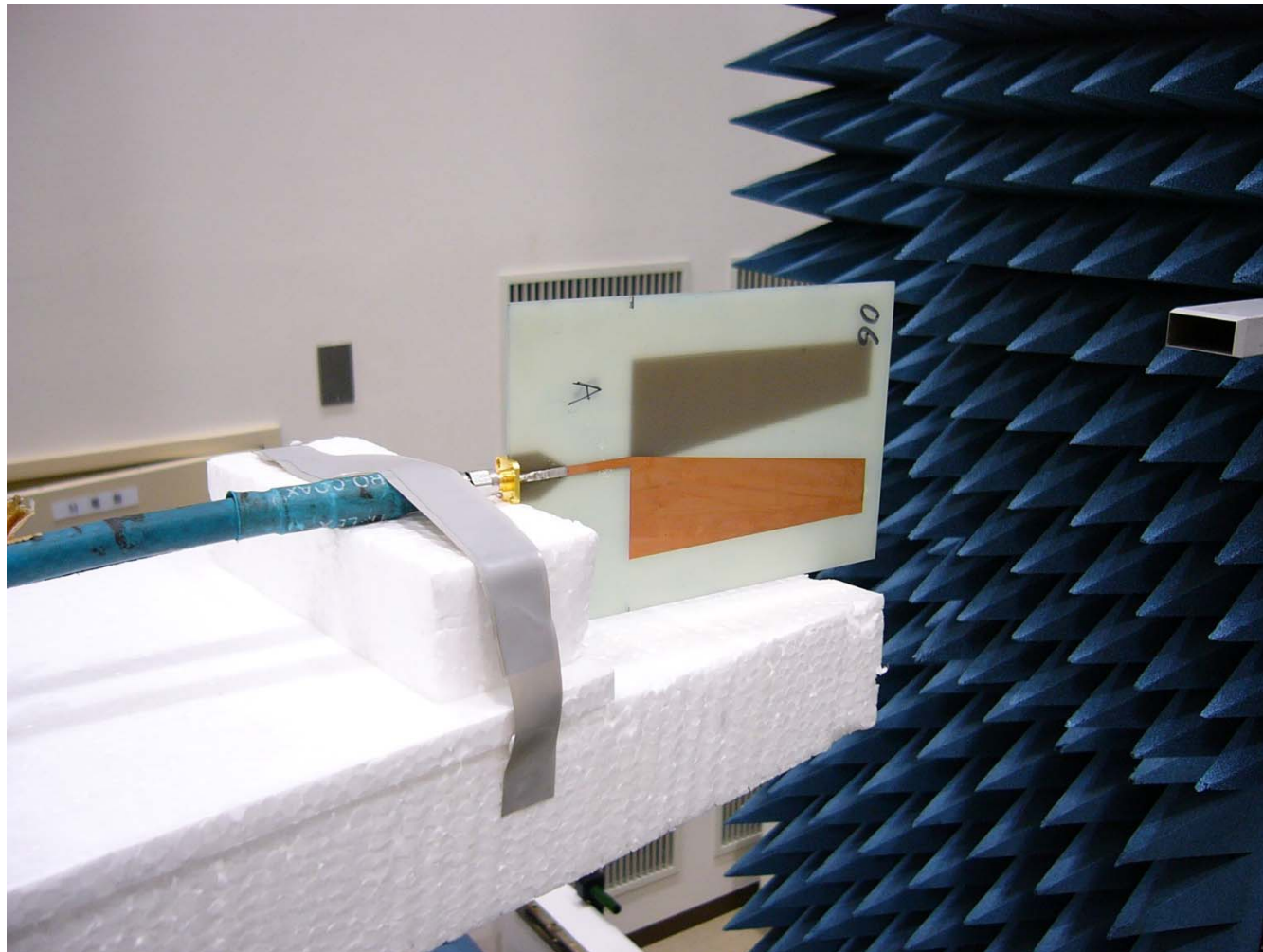
Dual Wheel should work coherently!

'Taper Balun' for a wideband radio launcher

Coaxial Line -> Strip Line -> Balanced Line

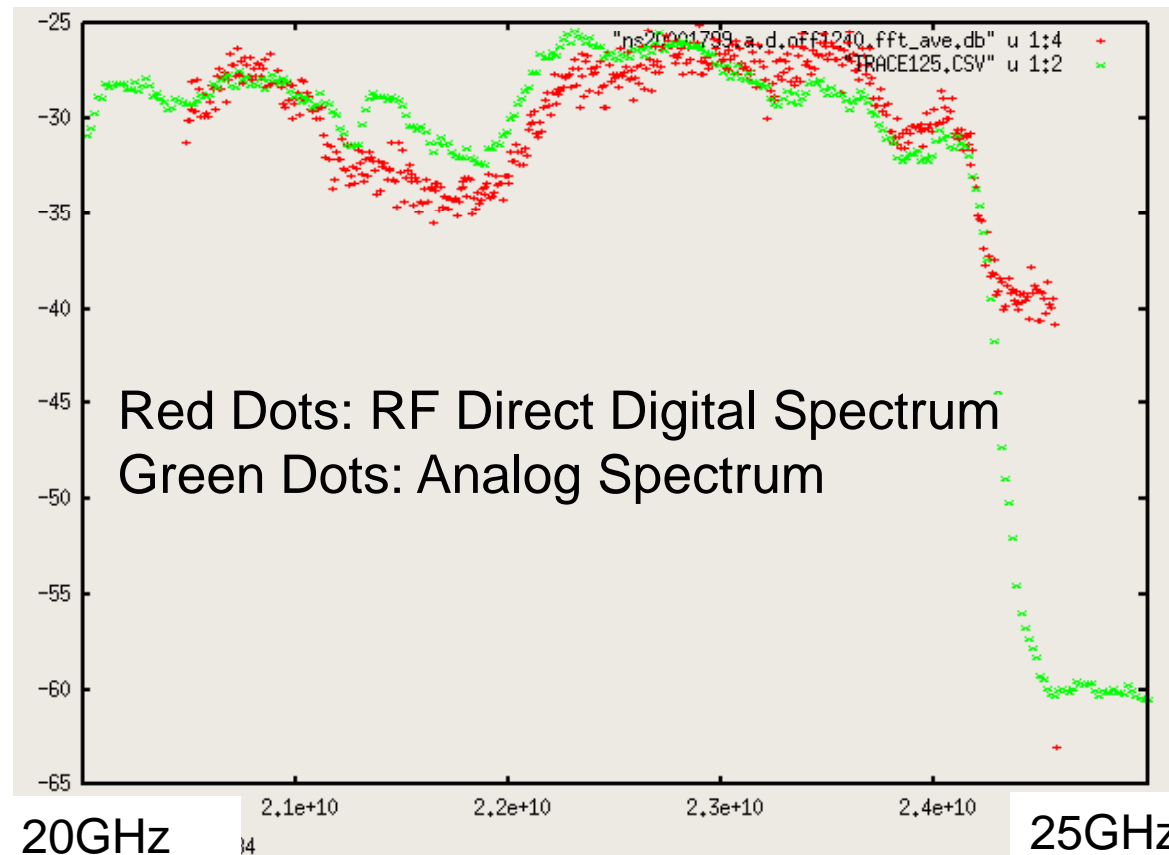


Preliminary Test of Radio-wave Launcher



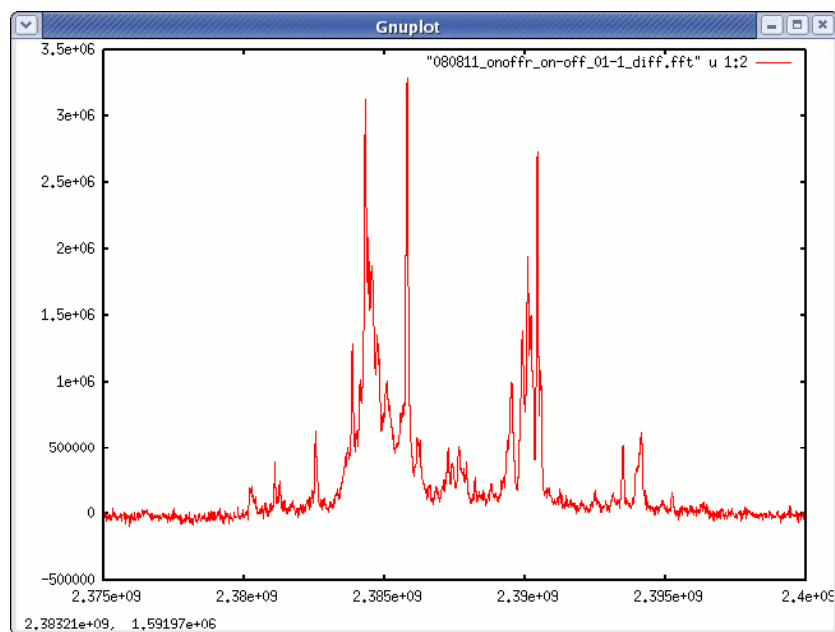
RF Direct sampled Digital Spectrum with a Ultra High Speed Sampler

The first successful result in the world.



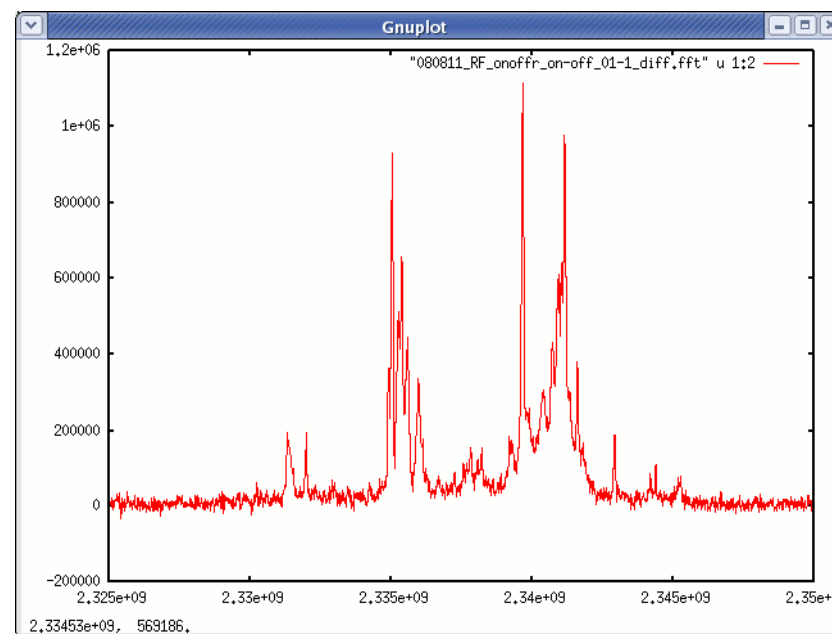
W49N on NRO 45m detected without frequency conversion

Spectrum after frequency conversion



LO=(16.85+3)-GHz signal converts a 22-GHz signal to a 2.2-2.4GHz signal. The IF signal is digitized at a speed of 8.192-GHz (oversampling), then Fourier transformed with 512K spectrum.

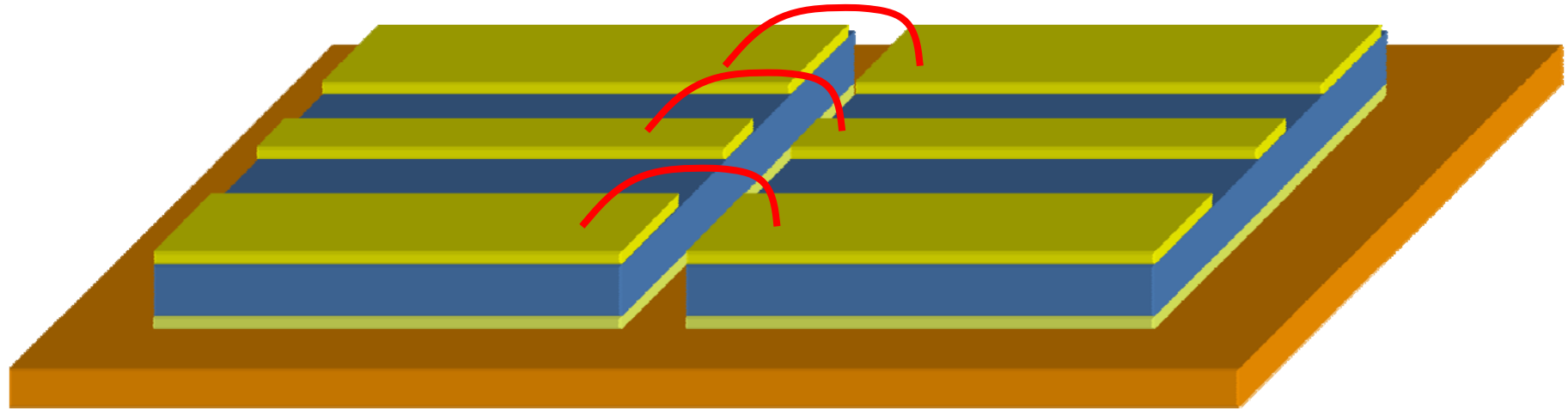
Direct detection (20.480-24.576GHz)



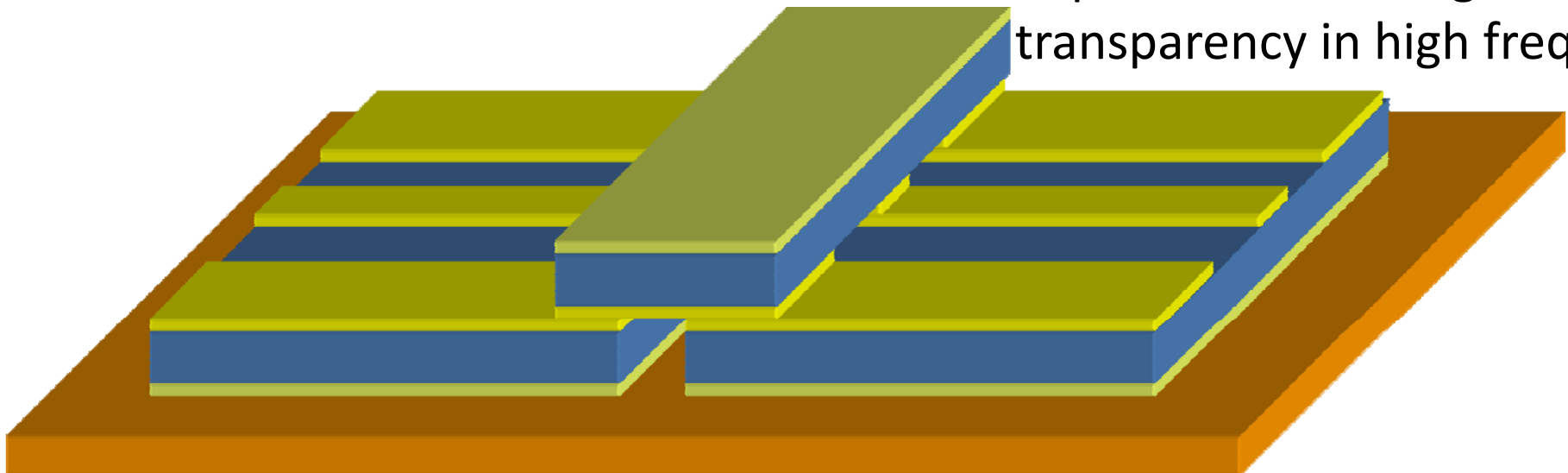
A 20.480-24.576GHz (BW=4.096GHz) signal is directly digitized at a sampling rate of 8.192GHz, then Fourier transformed with 512K spectrum. The spectrum order is inverted.

Wire Bonding Problems

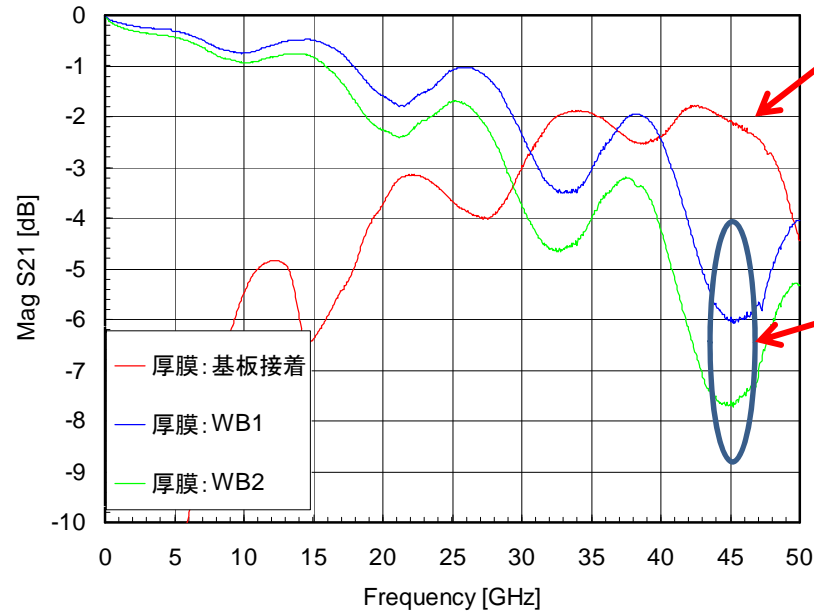
Inductance acts bad in high freq.



Capacitance shows good transparency in high freq.

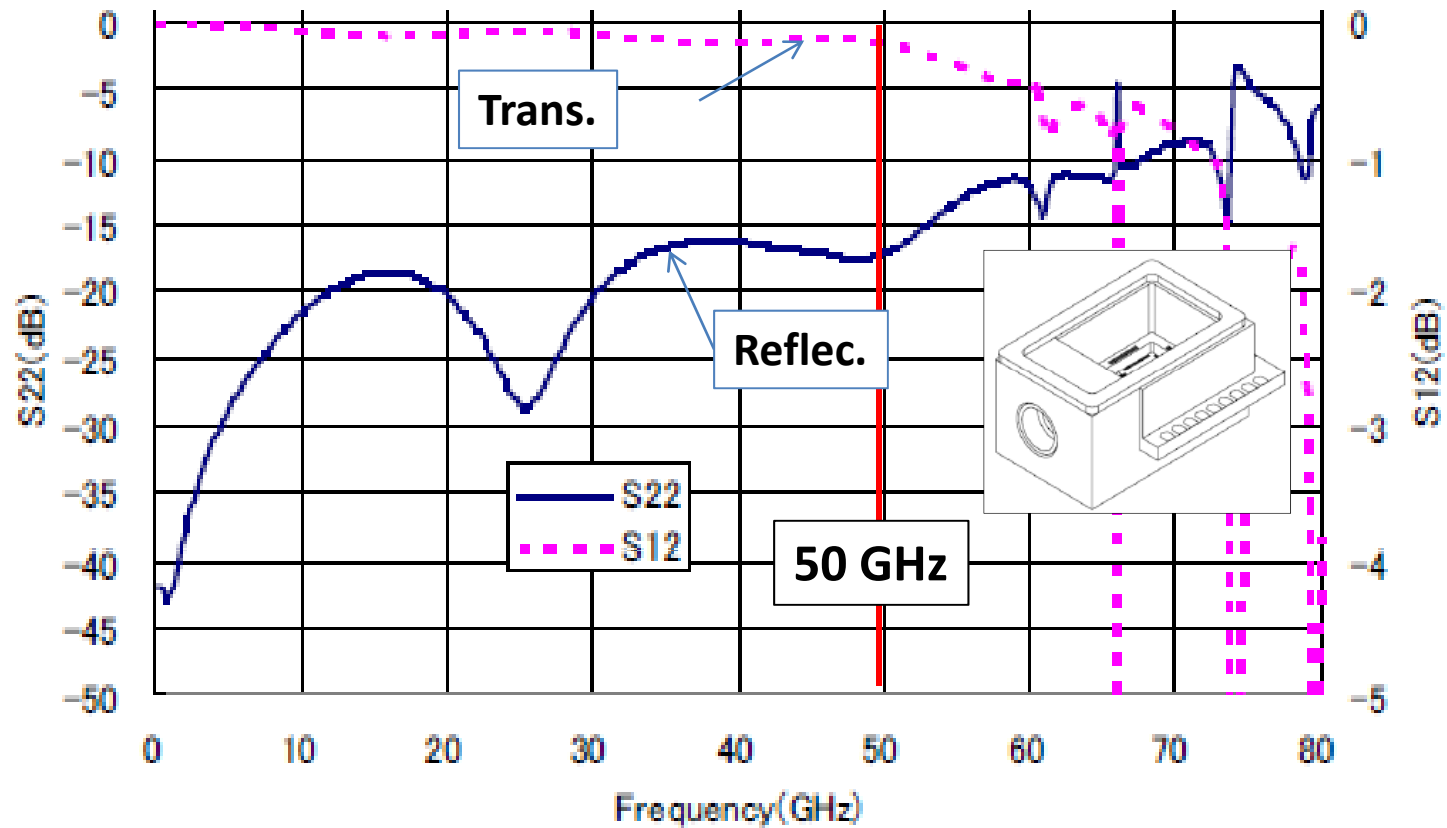


Wire Bonding Problems

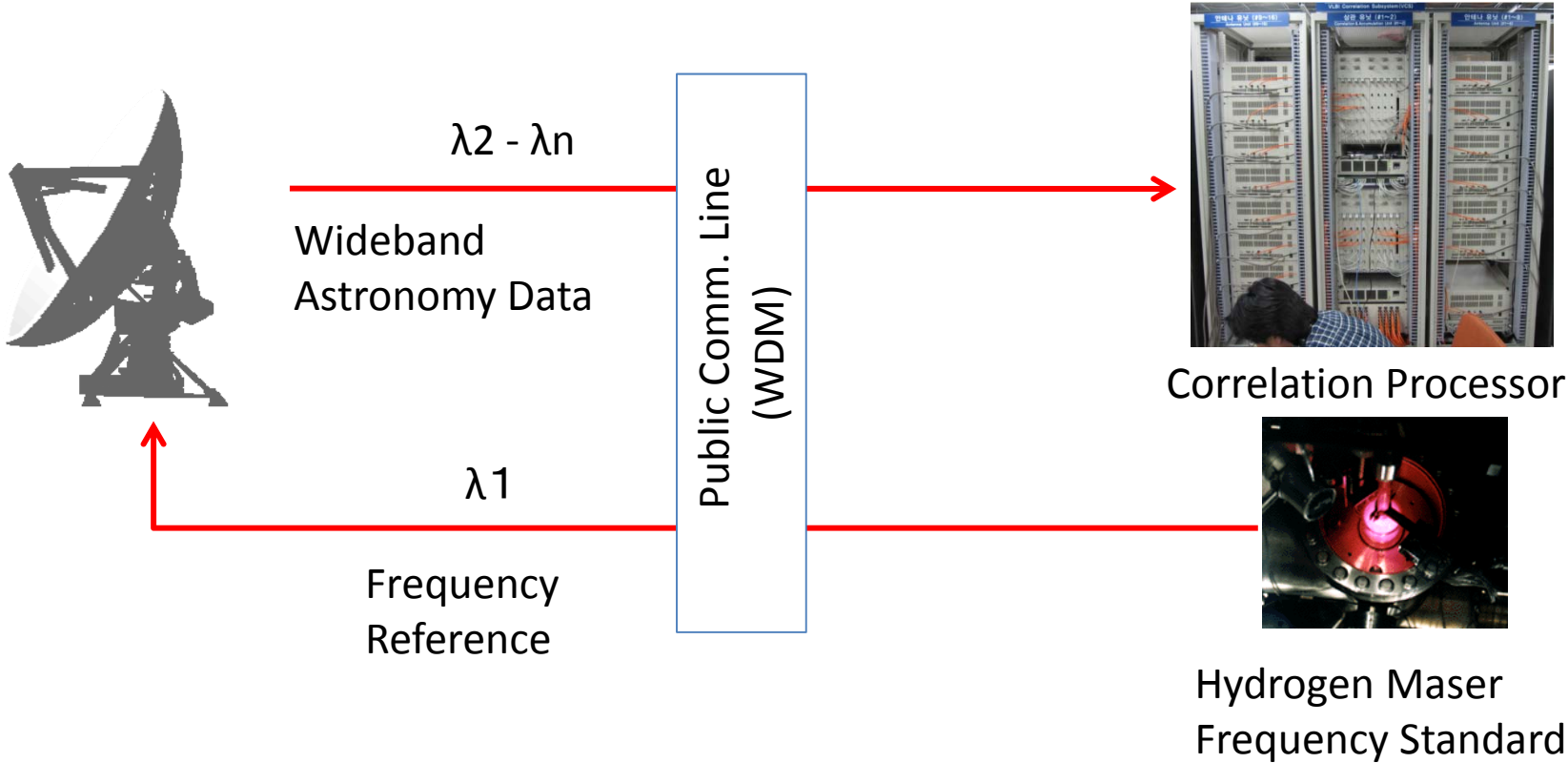


- Capacitive Connection (Cap Line)
 - Good in High frequency
- Inductance Connection (Wire Bonding)
 - Personnel Dependence
 - Bad in High frequency

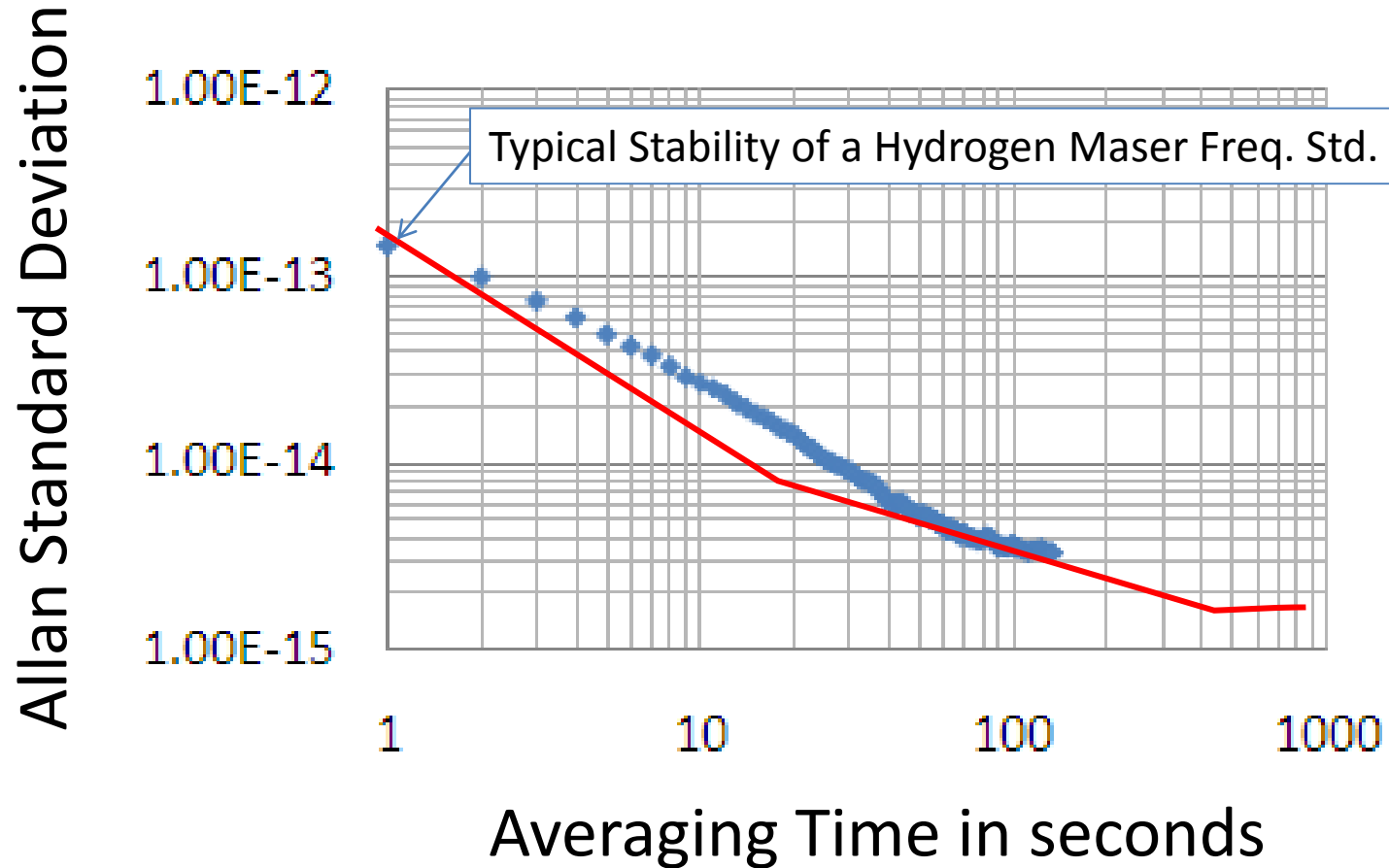
Performance of a new chip carrier



Long-way Transmission of a frequency reference



Stability through a WDM Translator



Conclusion

Possible Japanese Contribution to SKA

- High Speed AD Converter
 - 50GHz Sampler
 - Solution to wire bonding problems
- Optical Fiber Technology
 - High Speed Optical Fiber Data Transmission
 - Long way Reference Signal Broadcasting
- High Speed Correlation Processing
 - 8-Gbps Processor has just started the operation in Tokyo