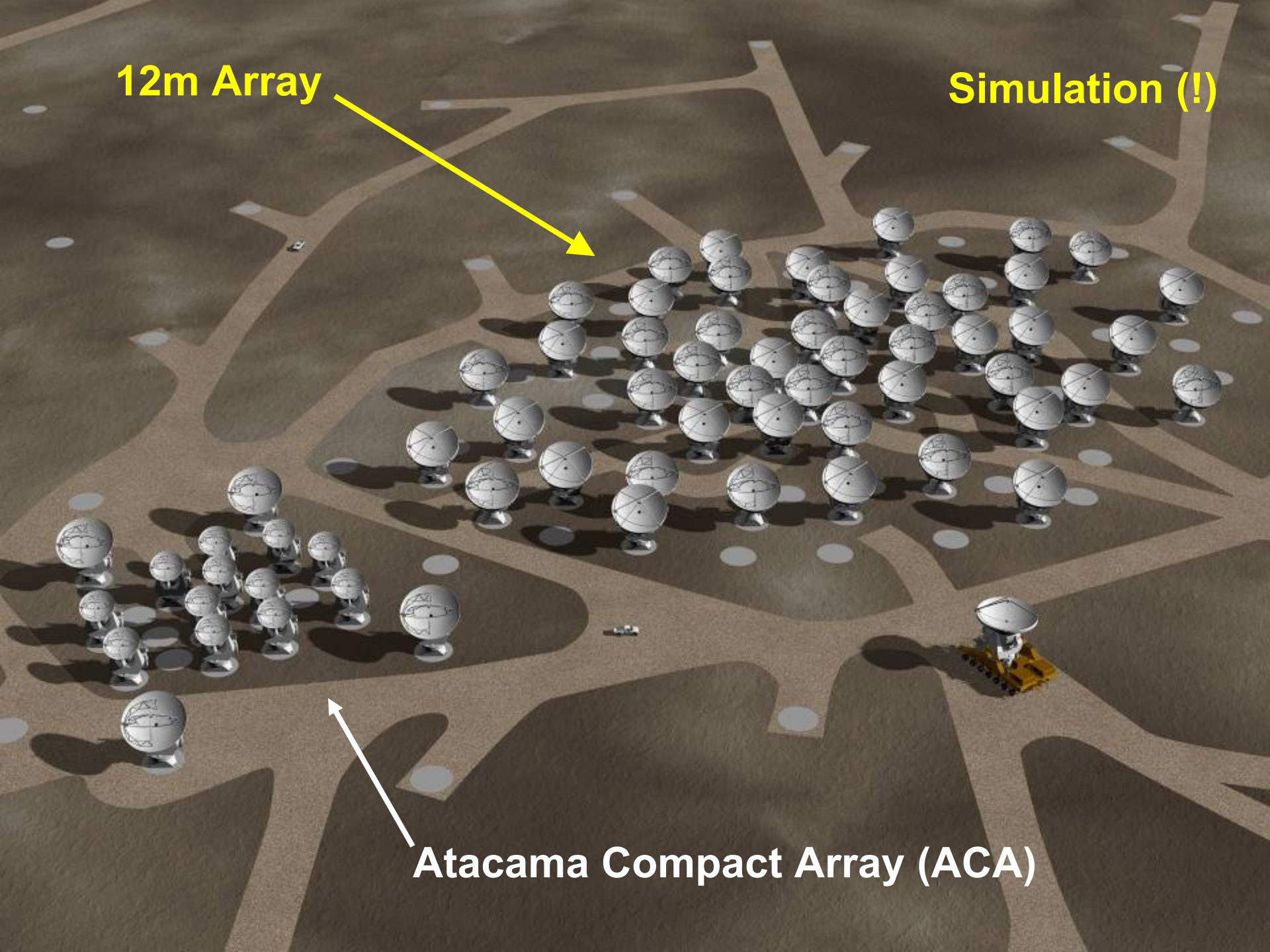
ALMA STATUS
August 2008

(selected topics only!)

Grading of Central Area Complete


12m Array
Simulation (!)
Atacama Compact Array (ACA)

Foundation being kept warm while it cures

AOS occupied – some issues

OSF – significant work needed: being planned

First Quadrant of the 64-element Correlator in the AOS building

AEM #1 Mount

- CFRP cabin
- Stiff yoke
- Direct drives

Drive tests complete

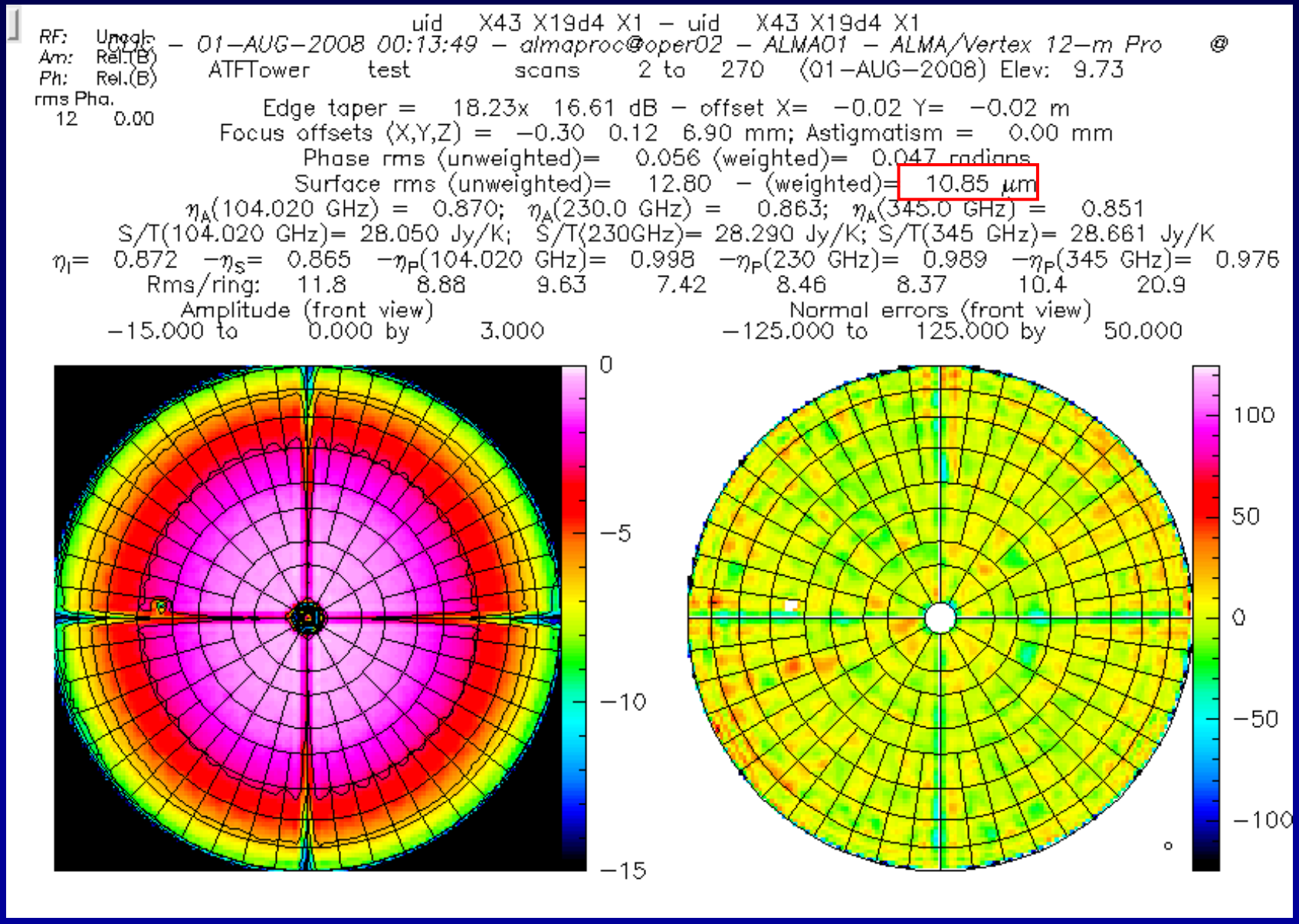
Stiffer Az bearing support being added

All-CFRP Backup Structure

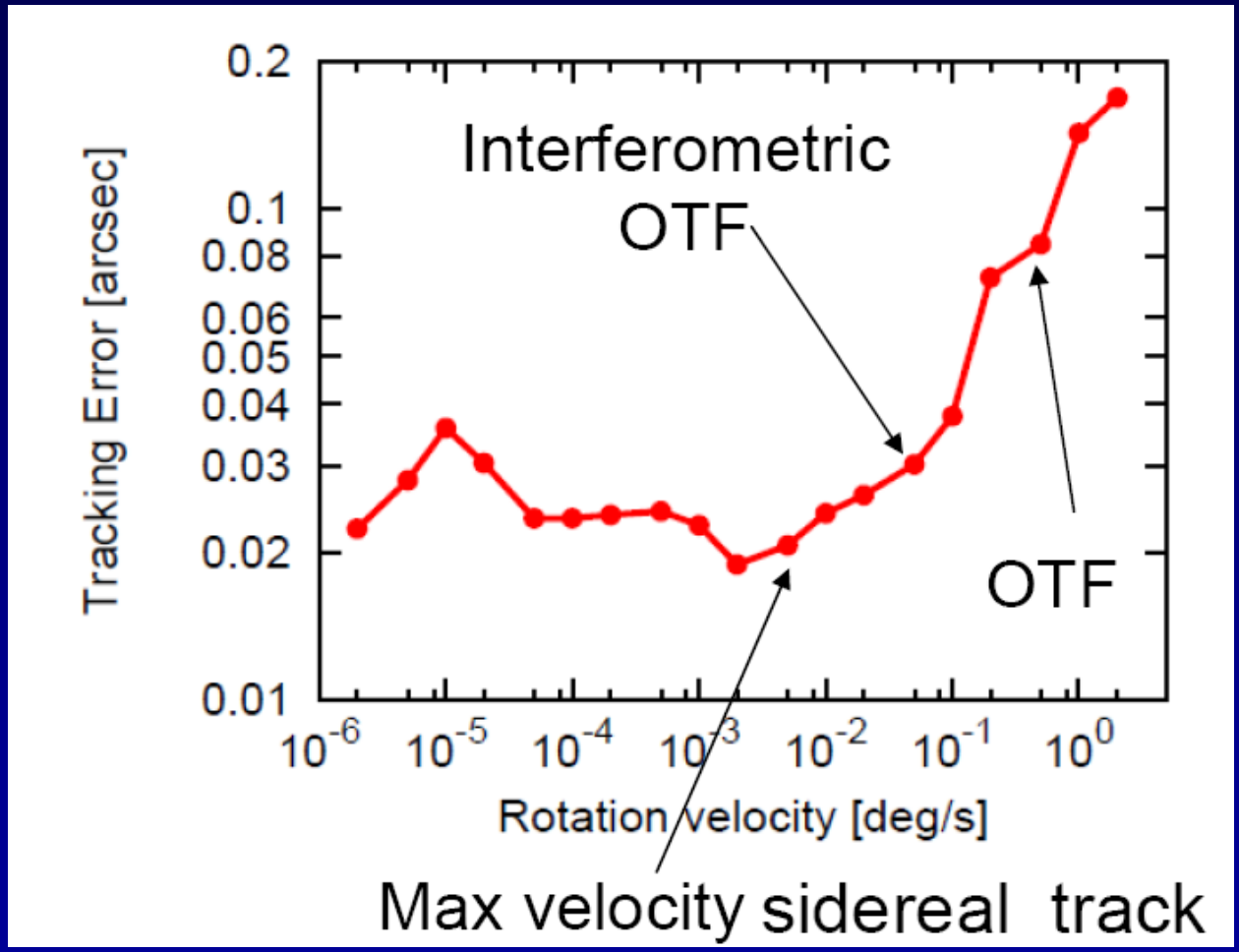
Four MELCO Antennas being tested
Two Vertex under test – Four more being assembled

Dishes measured by holography at 104 GHz
Use source on tower at ~300m distance and correct for the curved wavefront

Holography Map after 7 rounds of adjustment
Surface Error has rms < 11 microns

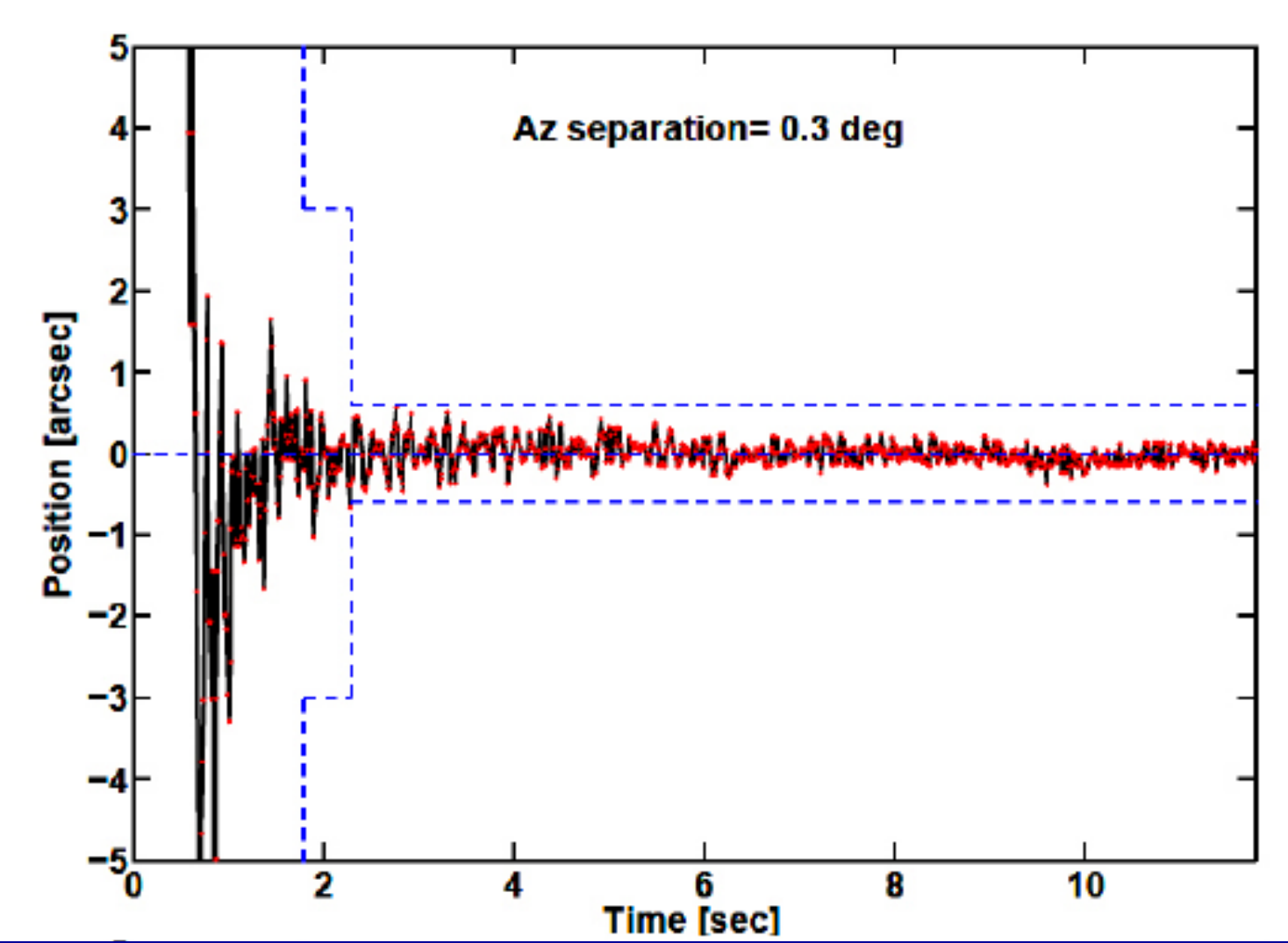


The use of direct drives gives amazingly good tracking and dynamic performance

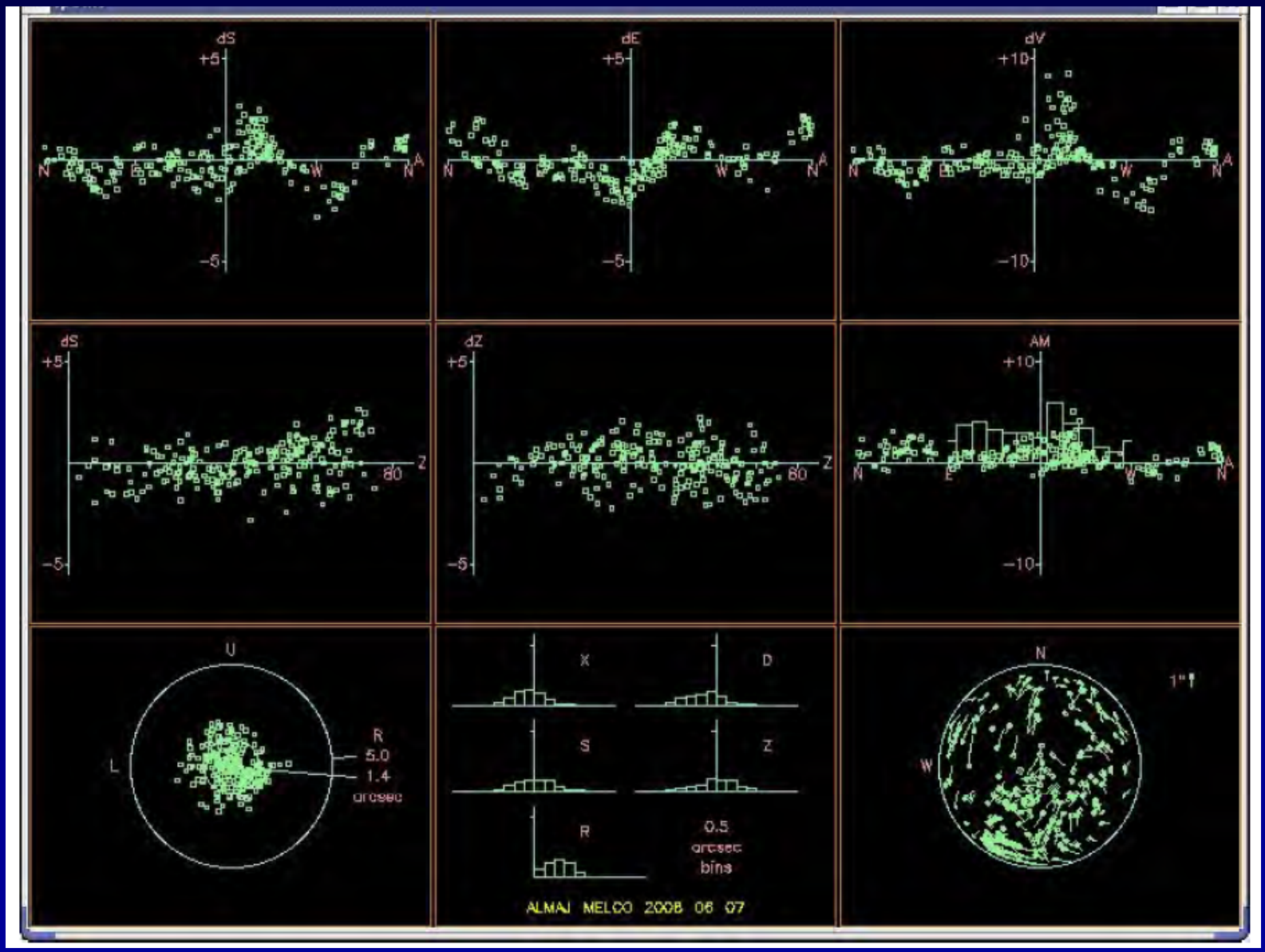


Servo error as a function of tracking speed

Fast switching response – Radio data



All sky pointing is good – rms on this set 1.4 arcsec radial

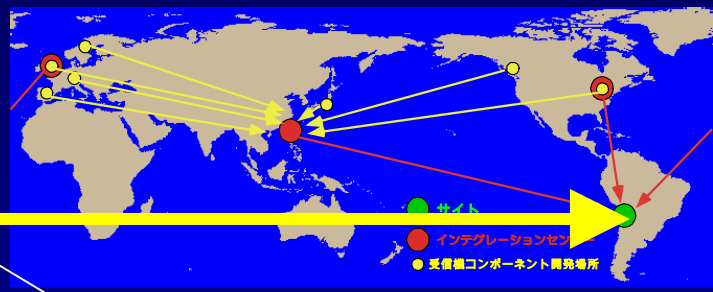


Data taken using prototype optical pointing telescope

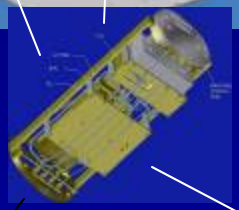
First Move of ALMA Antenna (July 8, 2008)

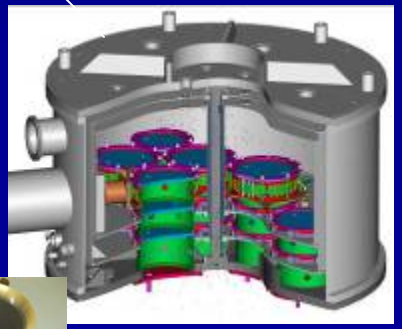
ALMA Front End System Integration

3 FE Integration Centers: NA, EU, EA



ALMA Site

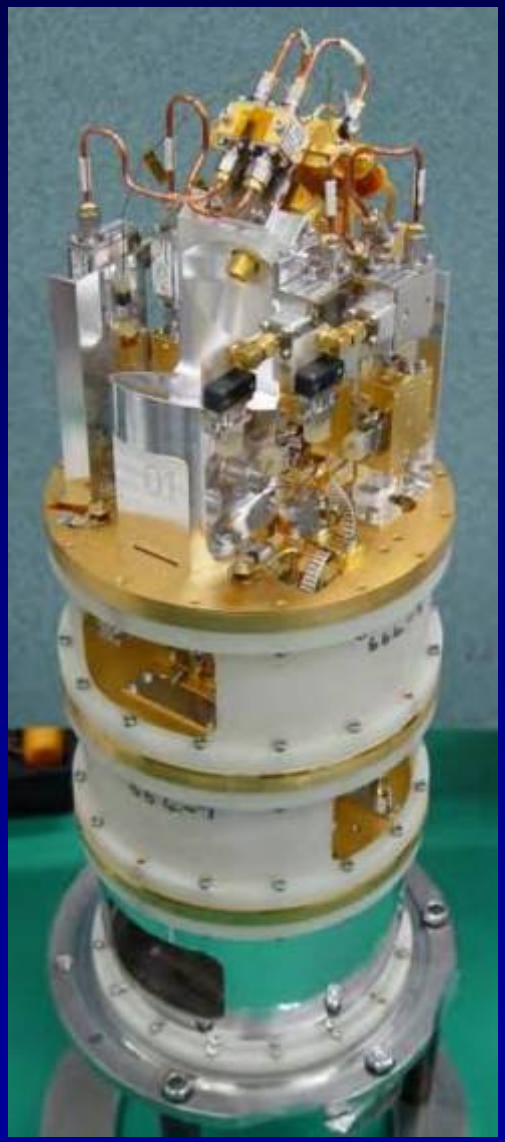




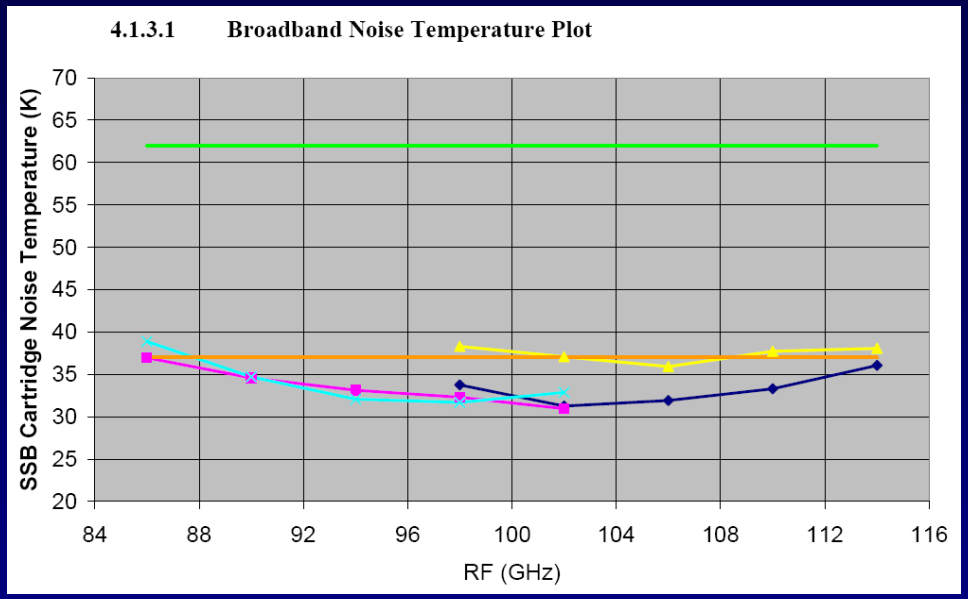
Receiver Cartridges

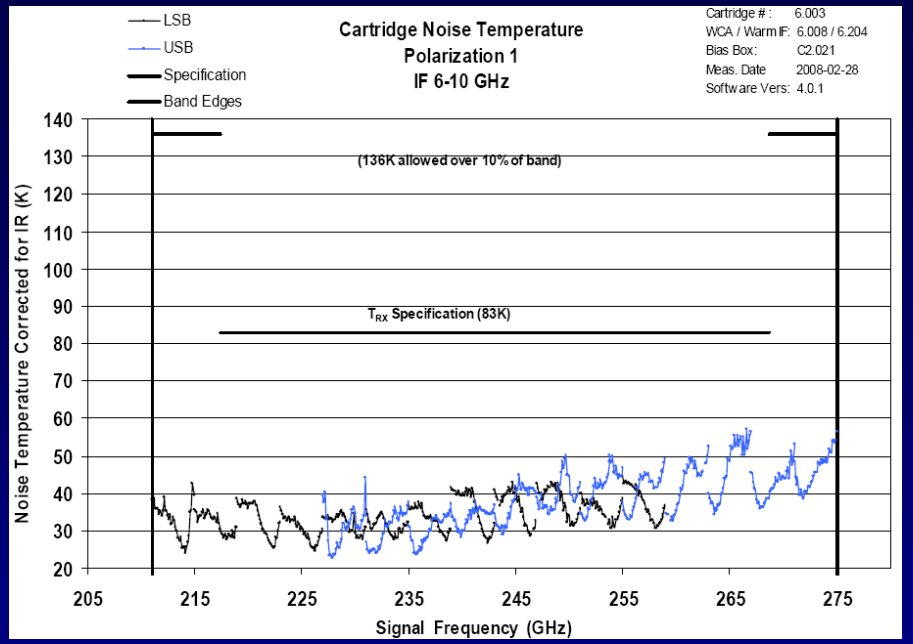
Band 4

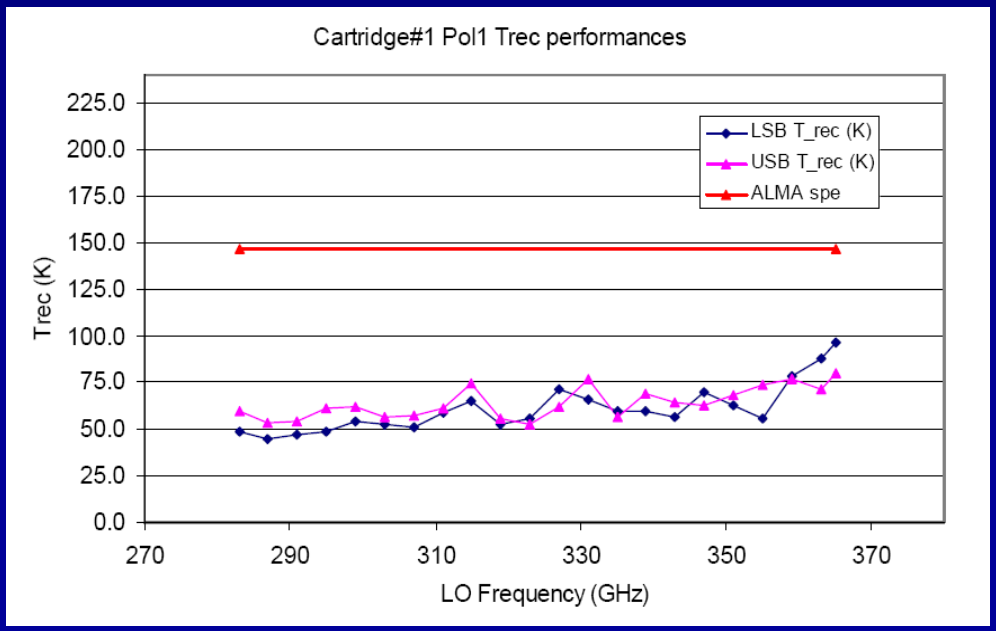
Band 8

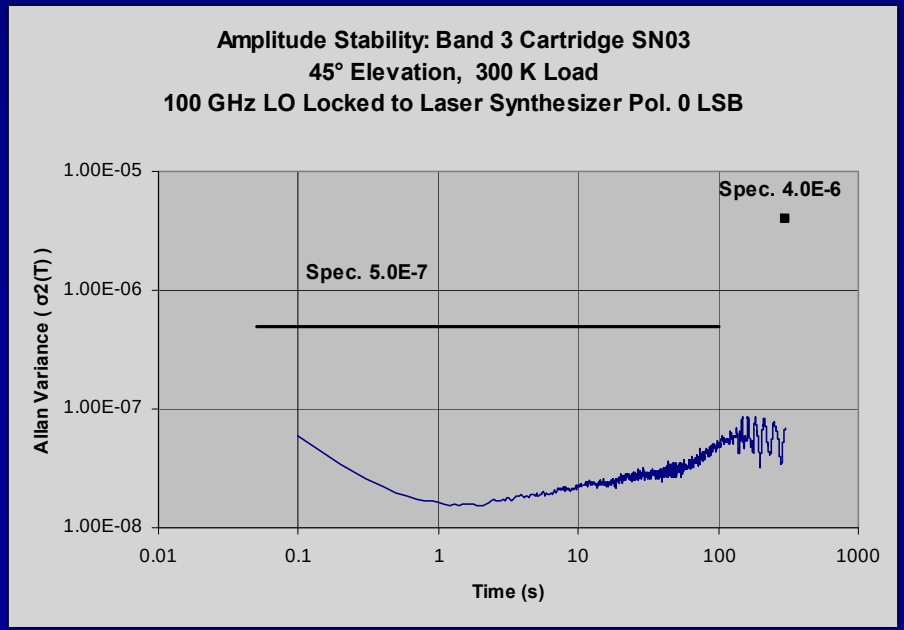


Receiver Performance Looks Excellent



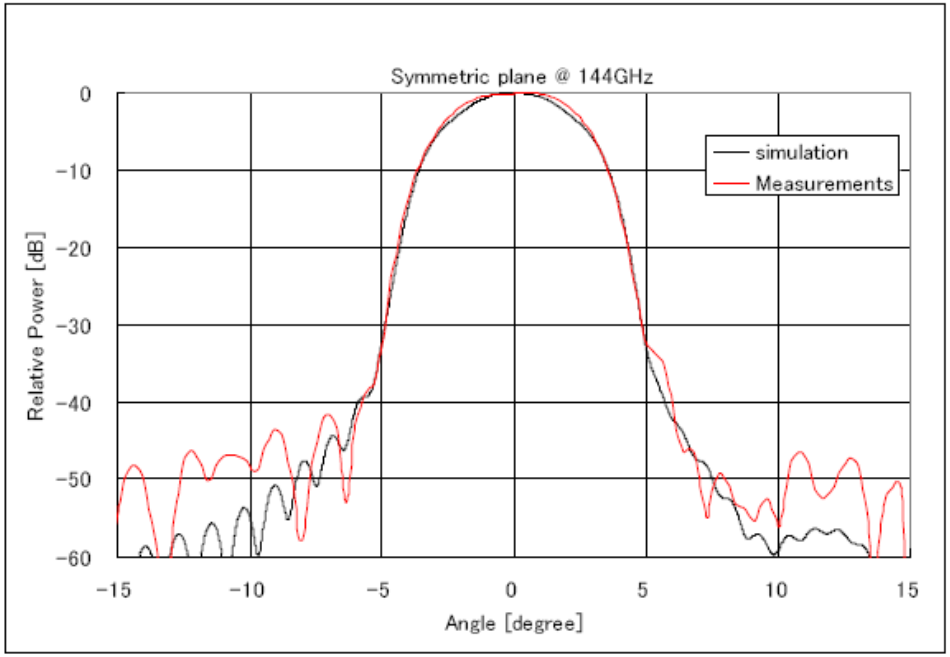


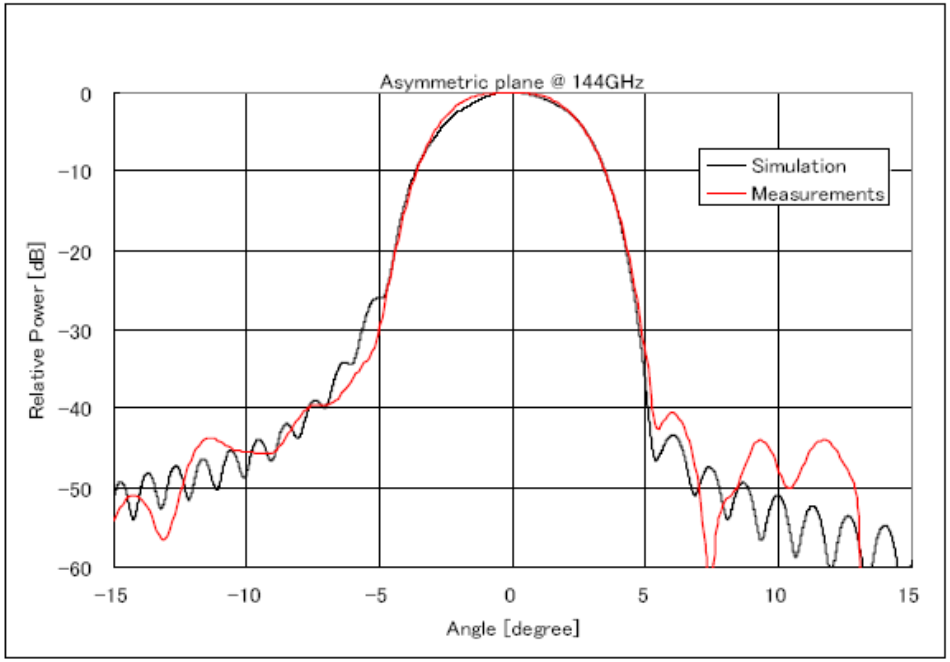




Band 4 Receiver Beam Pattern

- Cross sectional views of co-polar beam patterns in the symmetric and asymmetric plane at 144 GHz. Red lines indicate measured beam pattern of the Pol 0 port. Black lines are the physical optics calculated by M. Sugimoto.





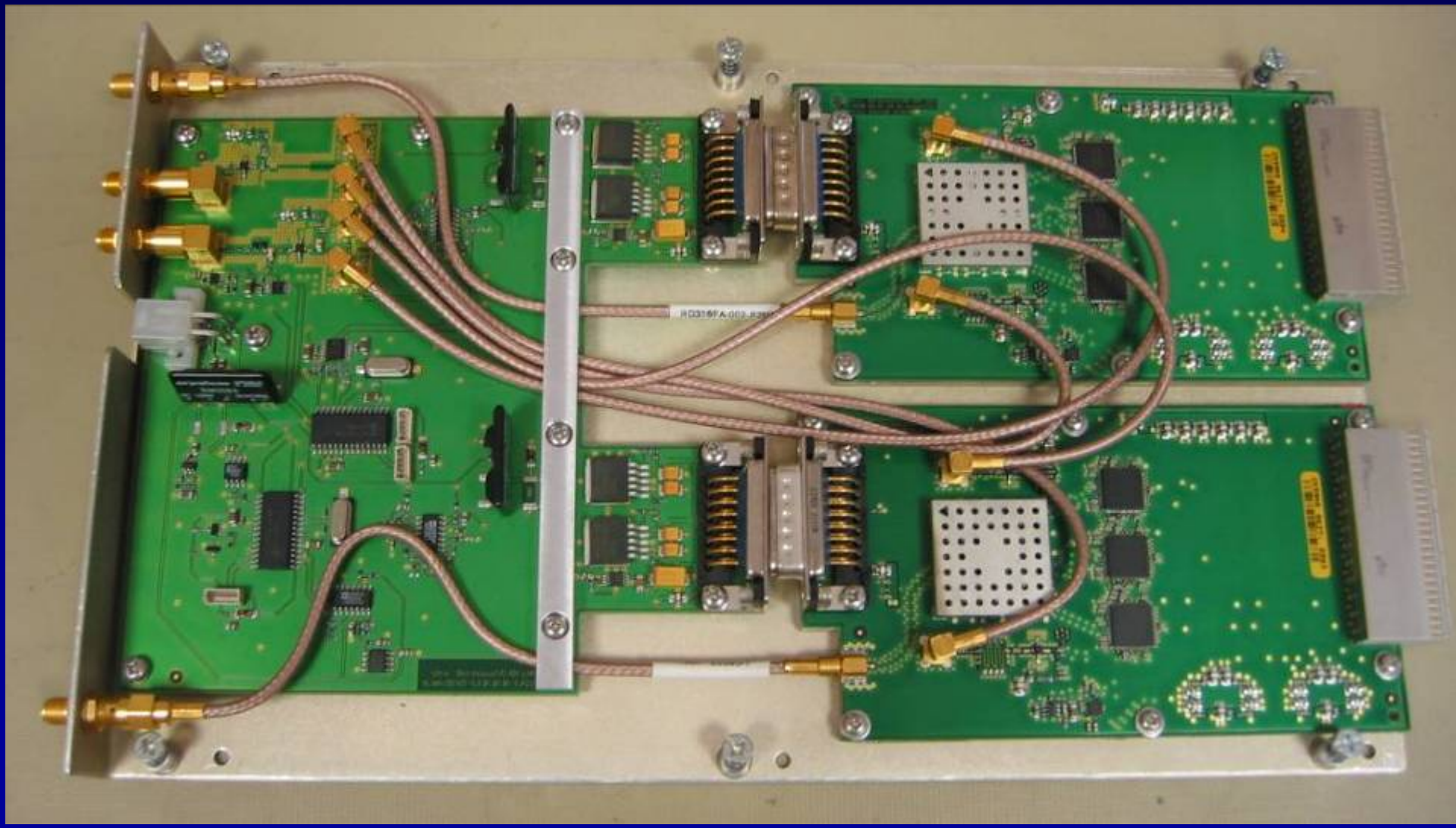
First FE / Second BE under test at OSF

Back End racks being lifted into MELCO #2 receiver cabin

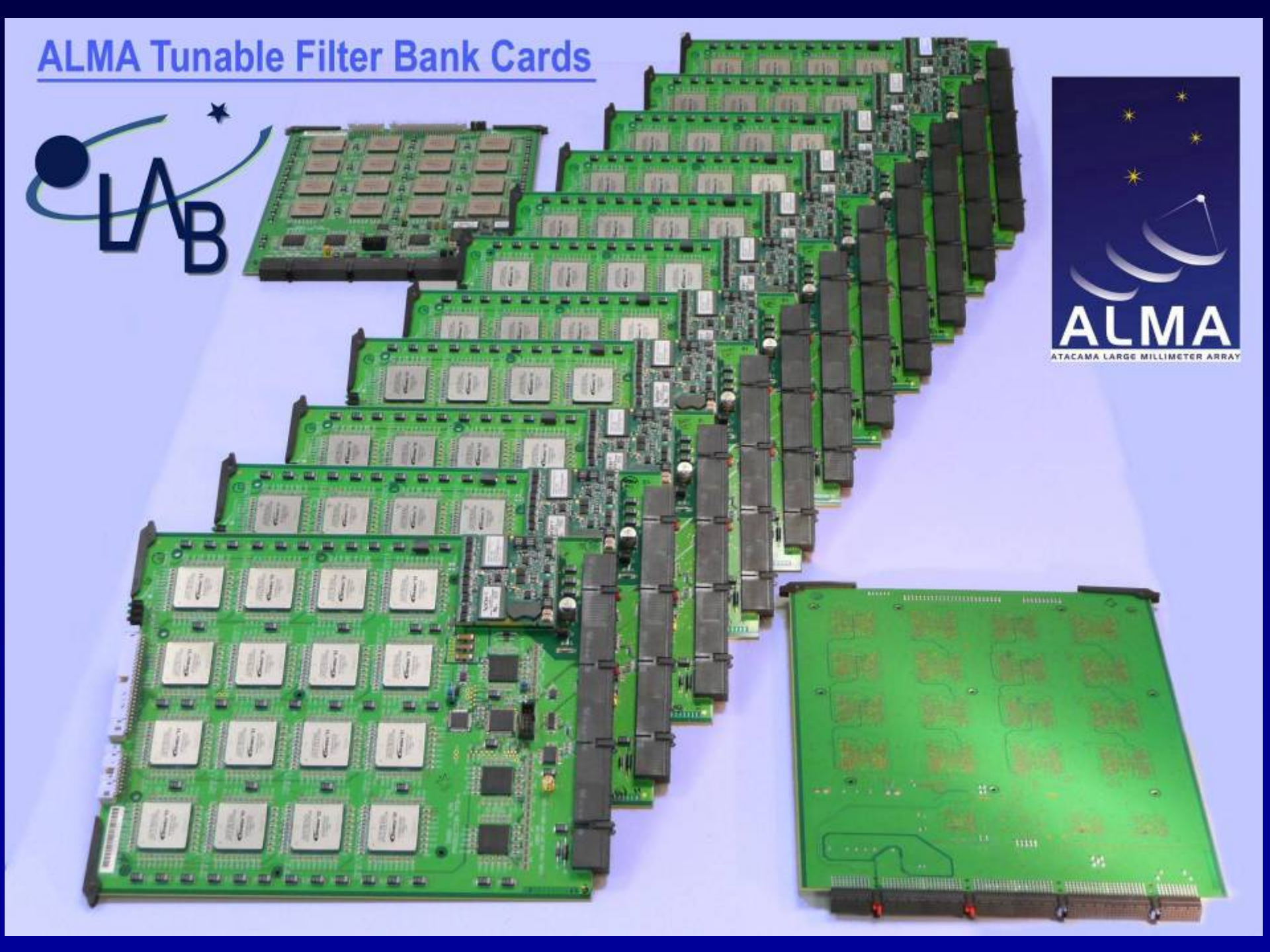
Dual-channel Digitizers on the Antennas

3 bits at 4 Gs/sec per channel

Data rate is 120 Gb/s per antenna

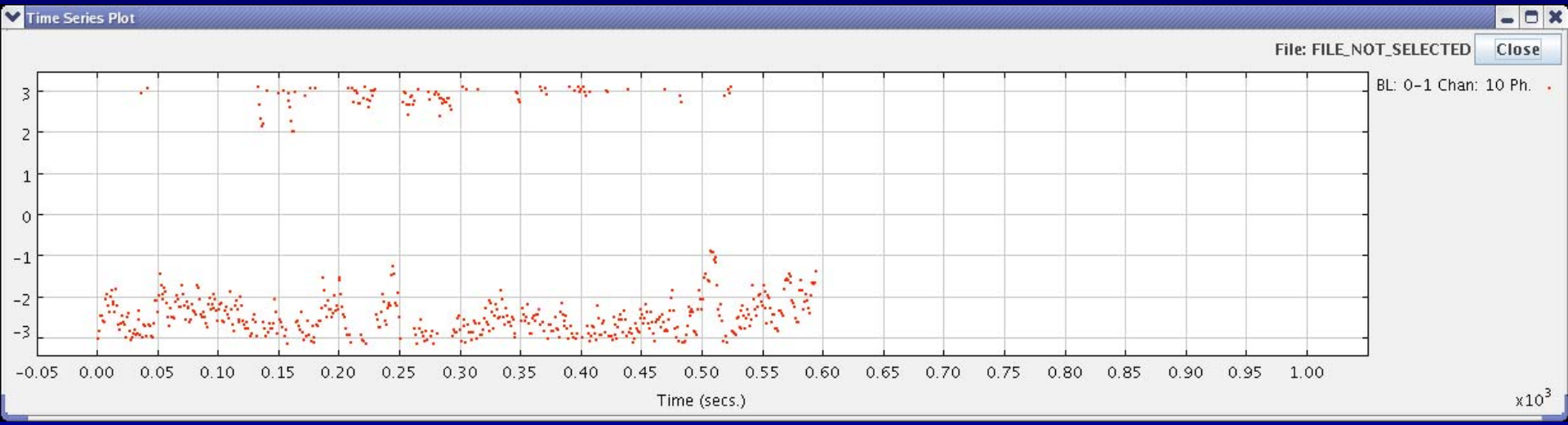


ALMA Tunable Filter Bank Cards



Recent Software Success

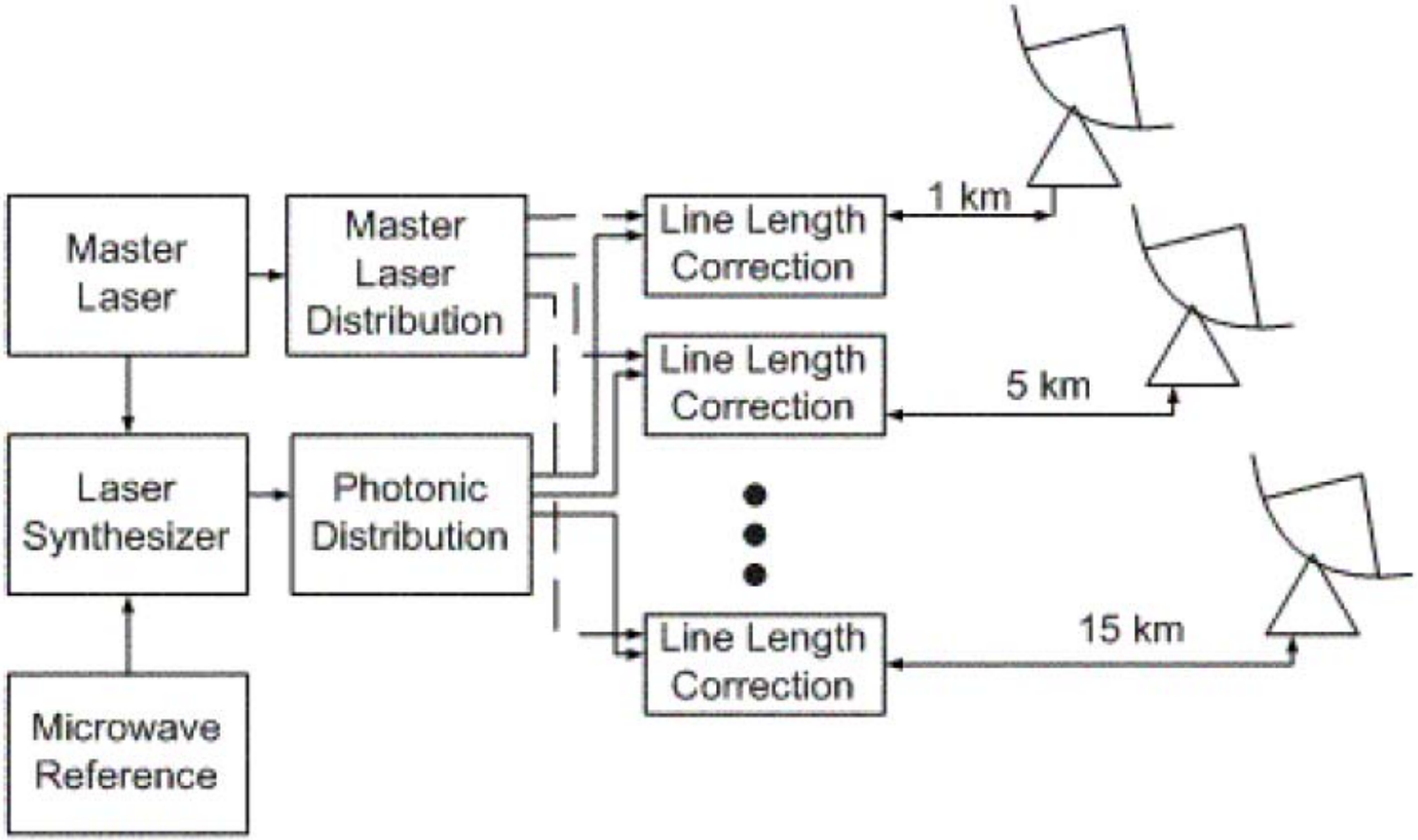
- First fully automated interferometric observations of a planet (Venus). Phase noise is similar to observation of quasar and is dominated by the atmospheric contribution (bad weather).



- Point here is that Venus is a moving source and this has to be taken into account in adjusting the phase.

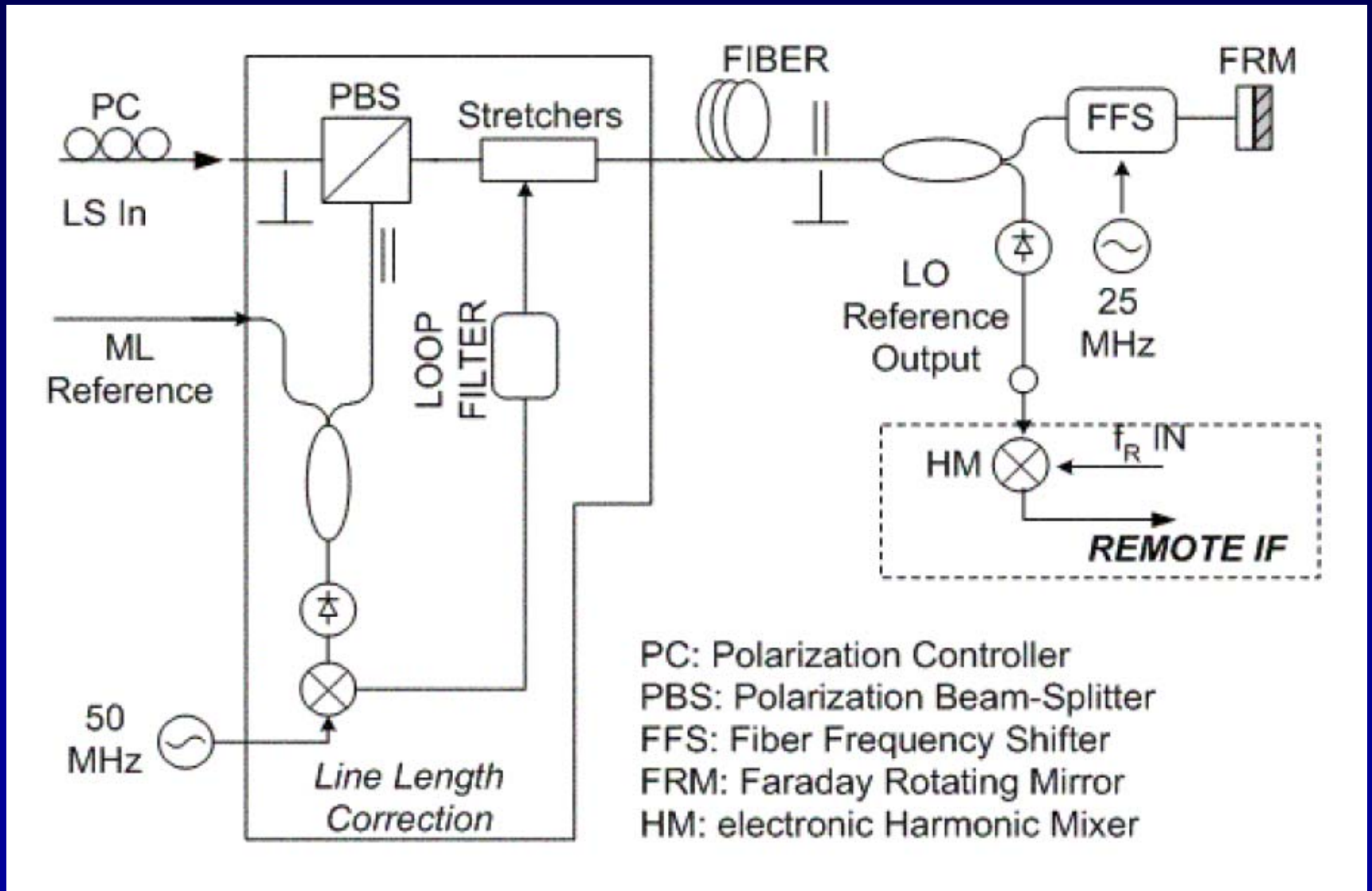
Laser Local Oscillator – Baseline

LO reference distributed optically by using two lasers – master and slave – separated by ~100 GHz

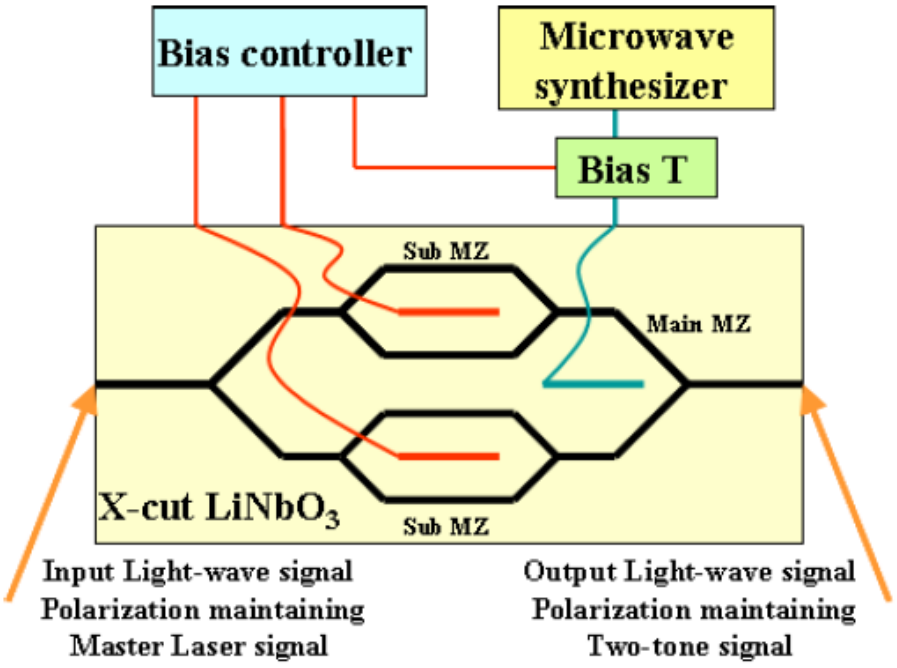


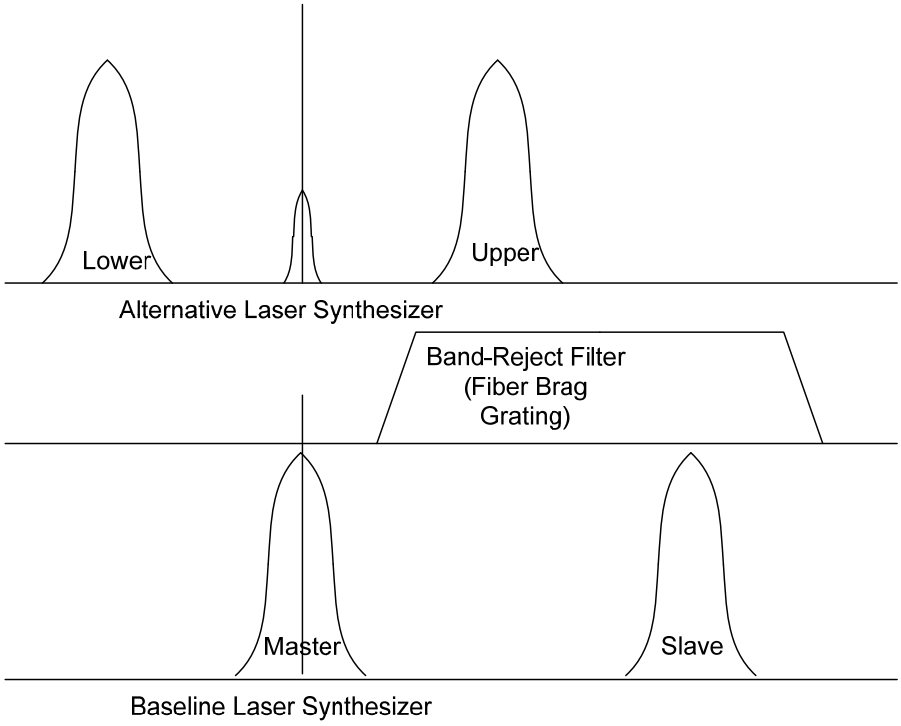
Correcting Fibre Length Changes – Baseline

Close the loop on the optical Master Laser fringes



Alternative Scheme for generating the two optical frequencies – one laser with fast modulation.

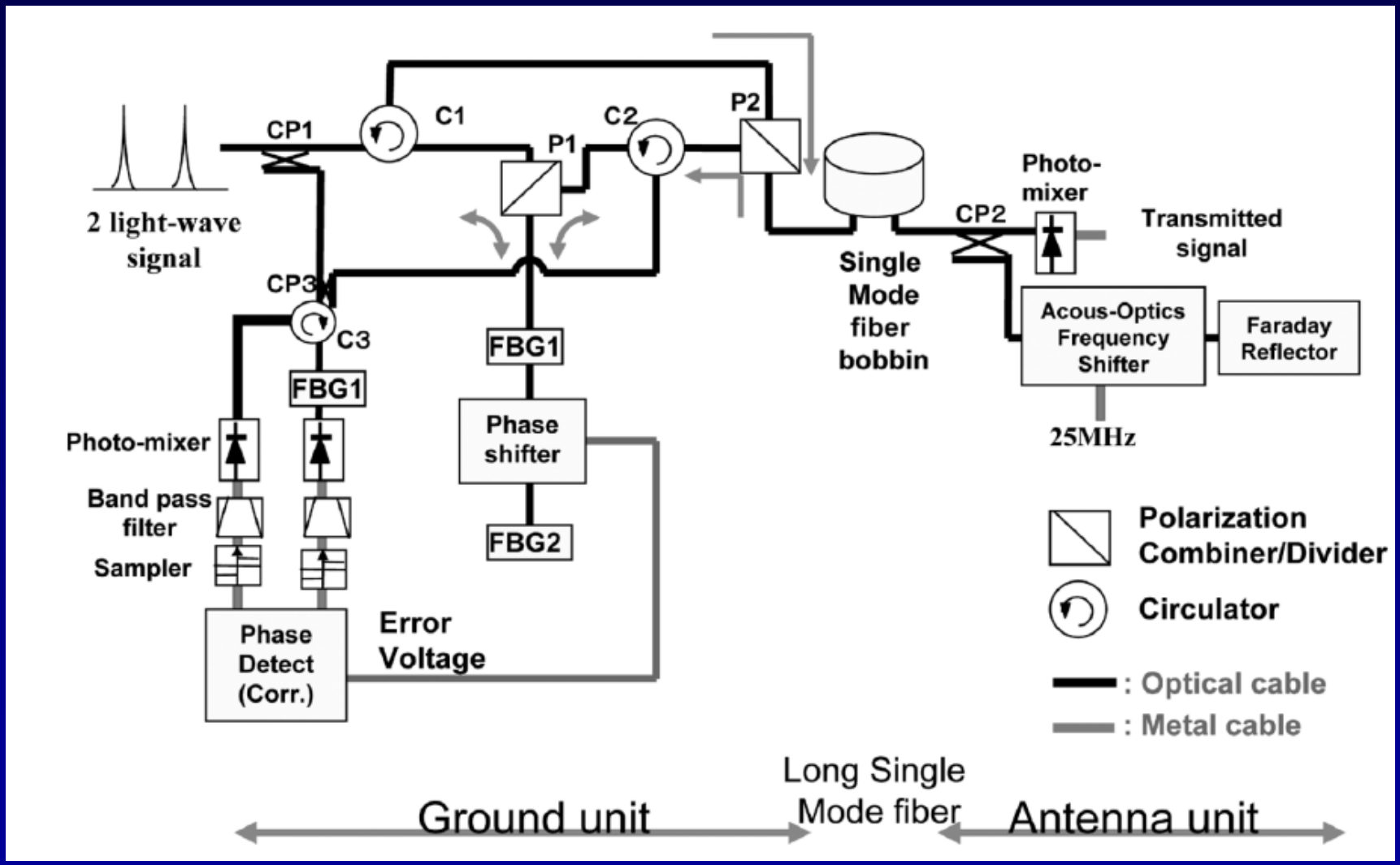




We tried to find a way of getting laser synthesizers #3 and #4 built to this design but this wasn't possible so we will have 4 of the baseline type. Now planning a separate contract to provide one of these as "risk mitigation".

Alternative Line Length Correction Scheme

Locks on modulation instead of on the optical wave

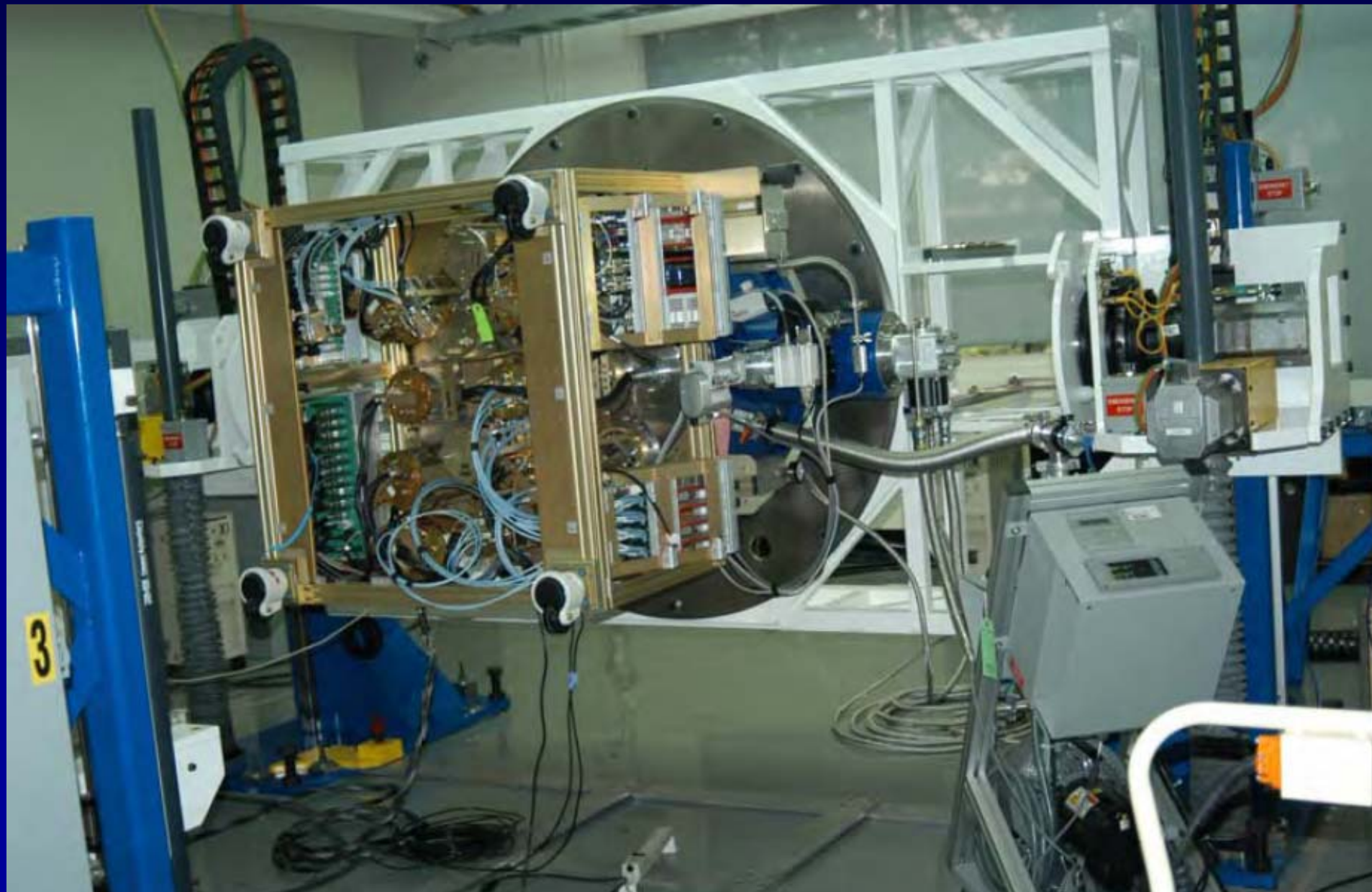


Trying to find way of building a test version of this without delaying the production of the baseline system

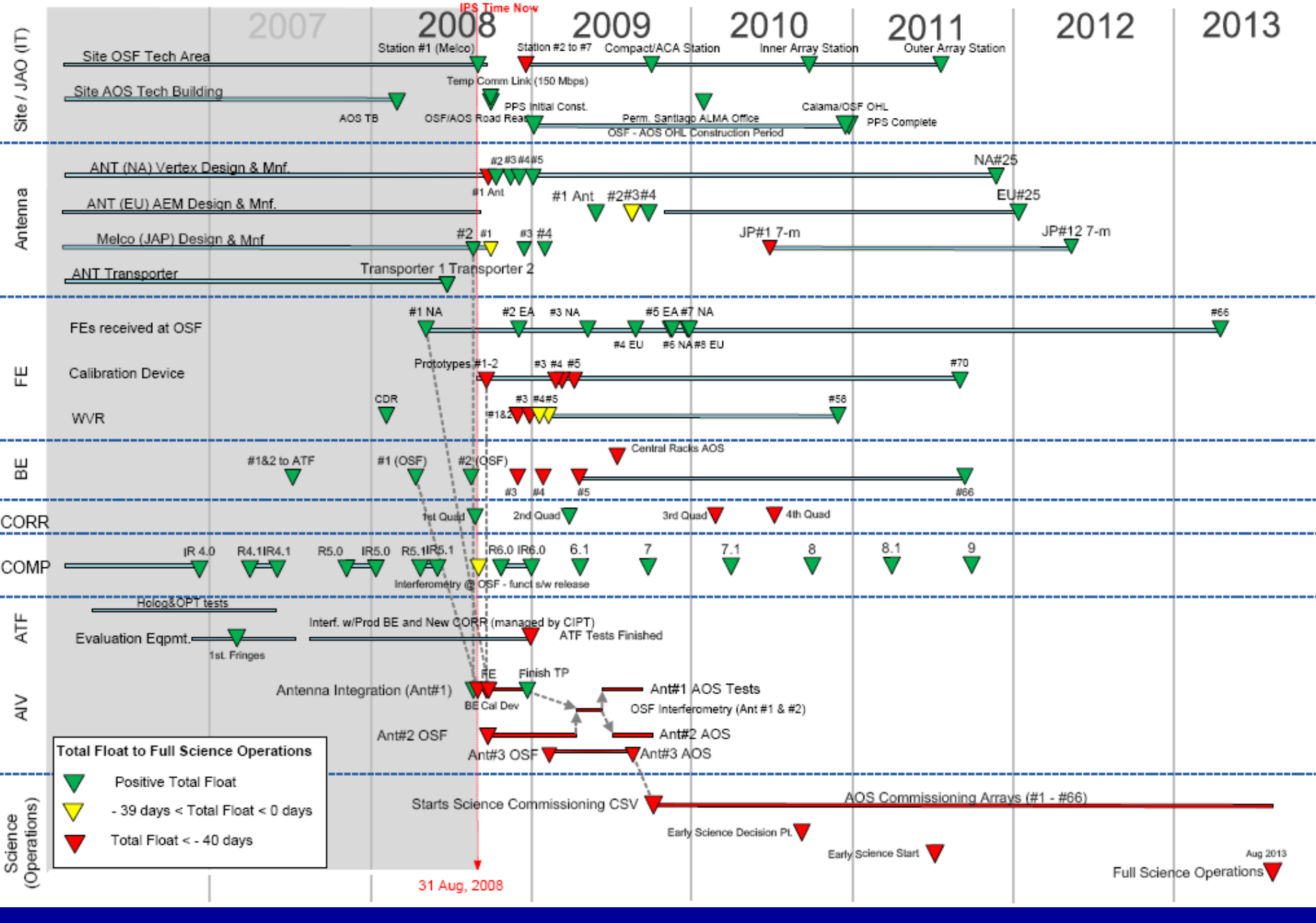
Current Concerns

- Schedule – new approach is being brought in but it has not yet taken effect.
- No major technical problems have shown up but many issues remain to be resolved:
  - Foundation stiffness still not completely OK
  - WVR's and Calibration loads have not yet reached CDR
  - Thermal behaviour of MELCO surface in direct sunlight is not understood

Testing and Verifying Performance is HARD!



ALMA General Overview – Forecast Dates as of 31 Aug 2008



www.alma.cl

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership among Europe, Japan and North America, in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in Japan by the National Institutes of Natural Sciences (NINS) in cooperation with the Academia Sinica in Taiwan and in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC). ALMA construction and operations are led on behalf of Europe by ESO, on behalf of Japan by the National Astronomical Observatory of Japan (NAOJ) and on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI).