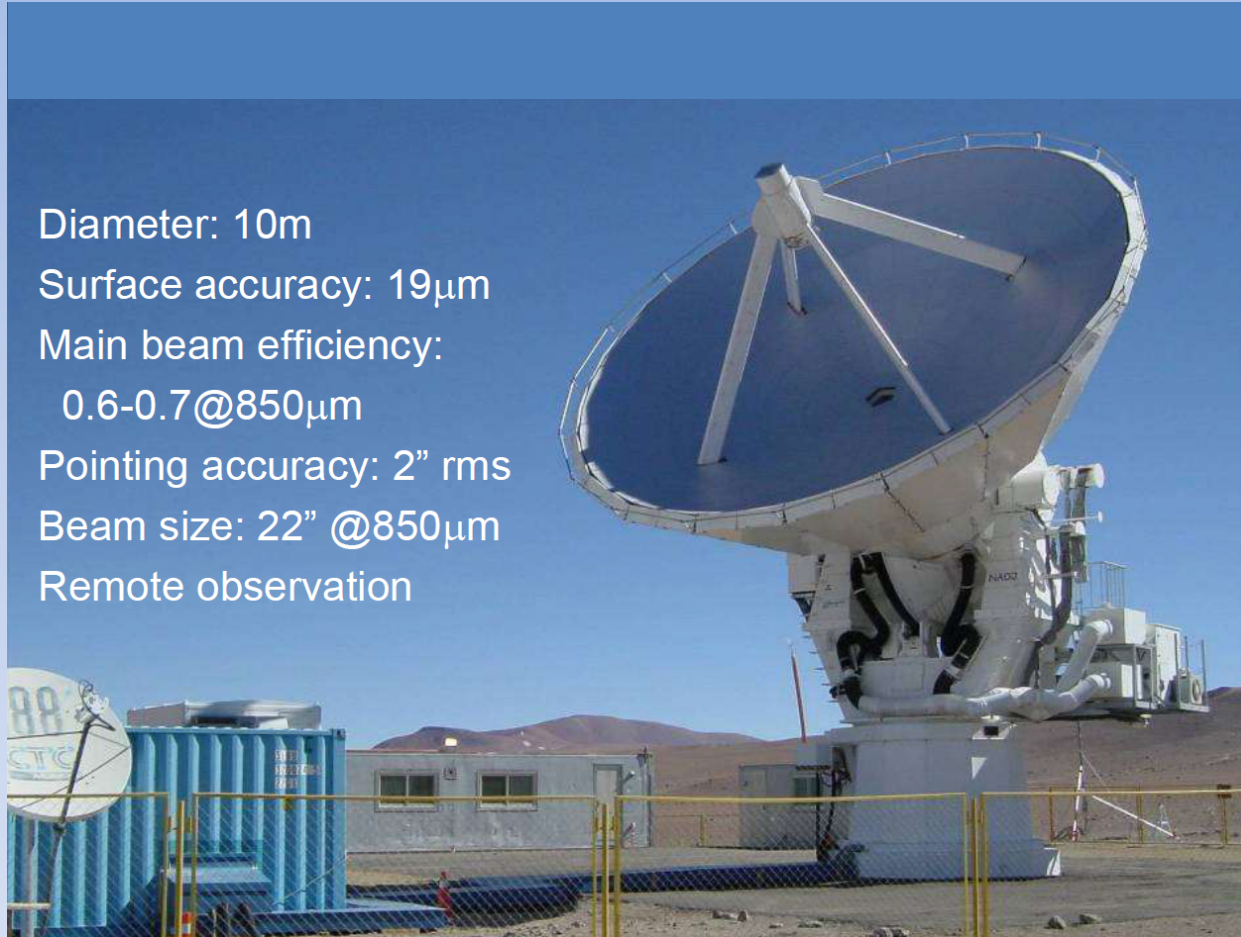


# Focal Plane Array for TP array: Testbed at Chile, ASTRON Observatorio

Diameter: 10m  
Surface accuracy:  $19\mu\text{m}$   
Main beam efficiency:  
0.6-0.7@ $850\mu\text{m}$   
Pointing accuracy: 2" rms  
Beam size: 22" @ $850\mu\text{m}$   
Remote observation



- Initial feasibility study on 300-500 GHz receiver architecture : 2nd quarter of 2014
- Prototyping key components: 2015-2016
- receiver construction expected during 2017-2019

# ASTE 300-500 GHz Focal Plane Array

(KASI, NAOJ & Osaka U.)

## Development background

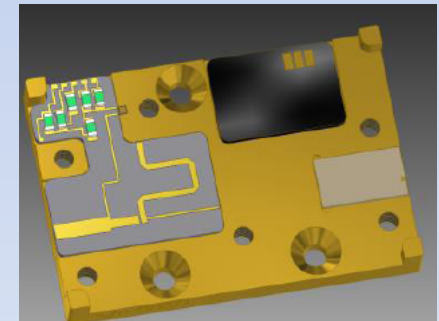
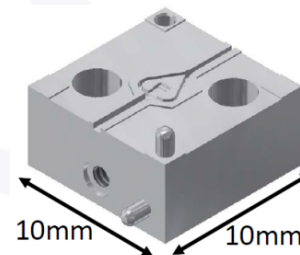
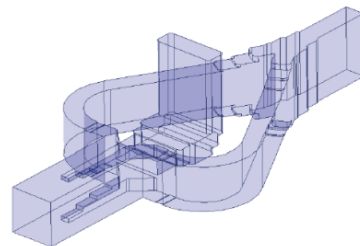
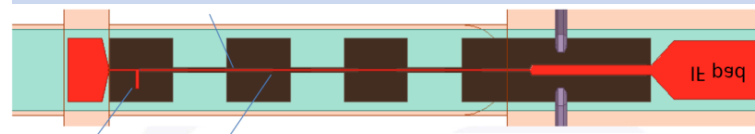
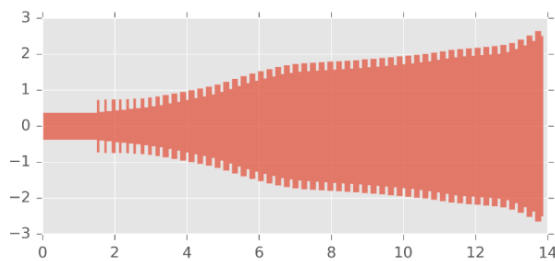
- ✓ Latency in observation caused by sensitivity difference between TP array and main array+ compact array
- ✓ ~10-pixel FPA on TP array could remove this latency
- ✓ ASTE also needs new FPA covering ALMA Band 7 and Band 8 frequencies.
  
- ❖ Collaboration team formed from Korea and Japan
  
- ❖ can be extended to development of prototype FPA for multi-beam interferometry

# ASTE FPA specifications and configuration

parameters	Value	Notes
number of pixels	>4	
frequency coverage	300- 500 GHz	best effort for 275-300 GHz
IF range	4-8 GHz	possible 4-12 GHz extension for 2nd delivery
1st mixer sideband ratio	>10 dB, 2SB	
instantaneous bandwidth	~8 GHz in each pol	
fractional gain stability	1e-4 at 1 sec integration	
IF spurious response power	-10dB/2GHz	
IF spurious response channel occupancy	0.1% of nominal IF BW	
IF power variation		(alma spec) 4dB p-p in 2 GHz BW
LO frequency	308-492 GHz	283-492 GHz as design goal
LO output power level @ coupler	-12~-17 dBm	-27dBm for balanced
spectrometers	GPU-based FFT spectrometer	

# Critical Component Development

- ✓ feed horn : design for direct machining (KASI/NAOJ, BW & Alvaro)
- ✓ SIS mixer : AlN barrier junctions (NAOJ/KASI, Kojima & Matthias)
- ✓ OMT : double-ridged Boifot jct. (OFU)
- ✓ LO system: custom based on VDI design (KASI)
- ✓ 1 mW cooled LNA : COTS (LNF) 3-4K noise, 34-37 dB gain



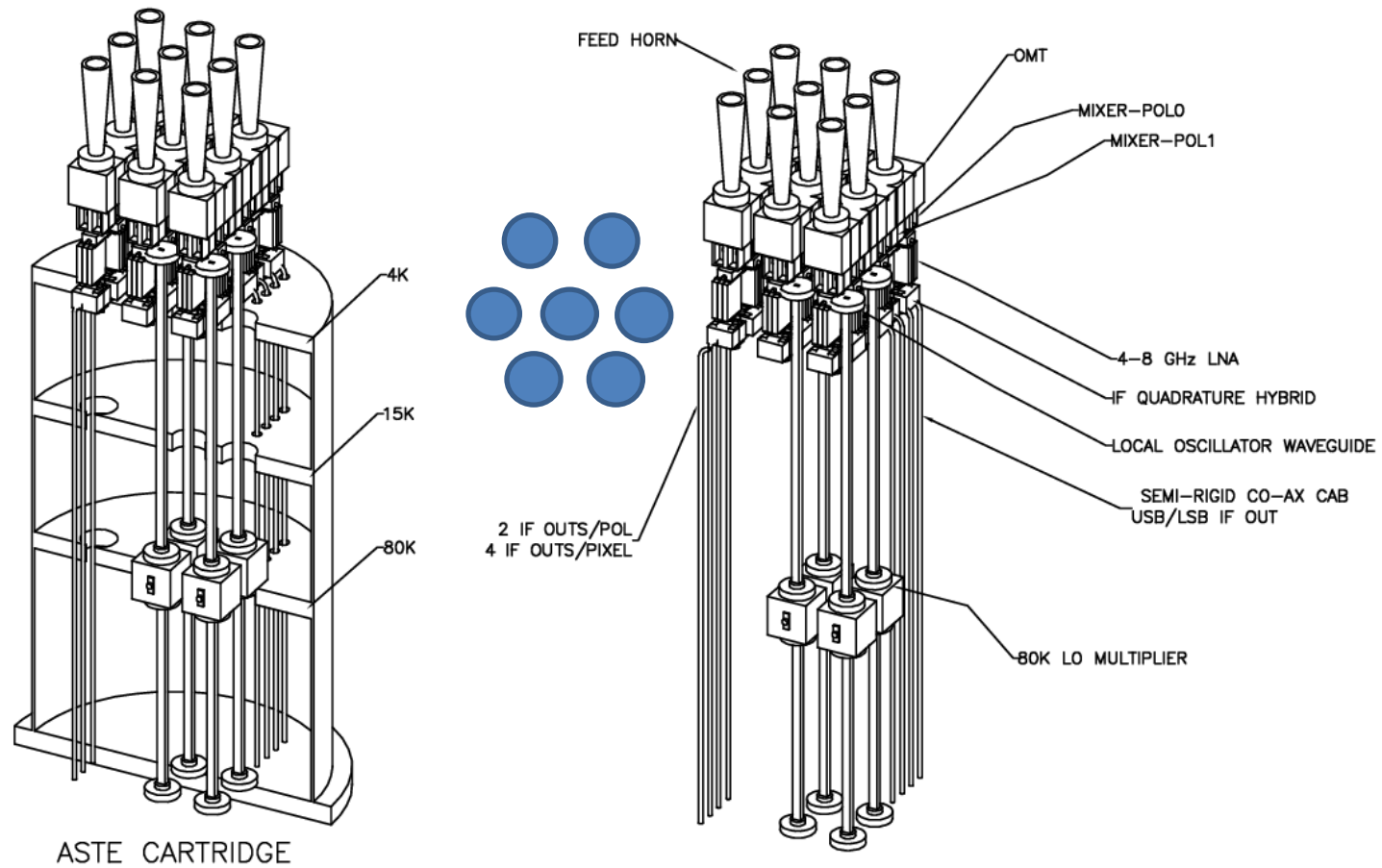


Fig. We indeed considered *possible component sizes* for this layout;  
 OMT: double ridge type with additional E-bend

# Prospects for further trial & test

- microfabricated FE components for more integrated focal plane components ← silicon stacking
- Photomixer LO with balanced mixers
- SOI mixers for easier consistent chip alignment among pixels
- planar OMTs