

# ASIAA in 2011



**EACOA at Kyoto 11.07.11**

**19 ALMA Telescopes**

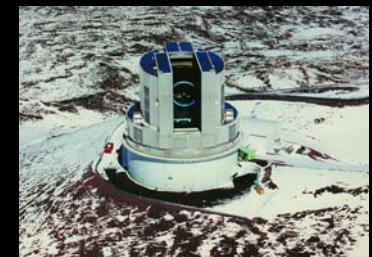
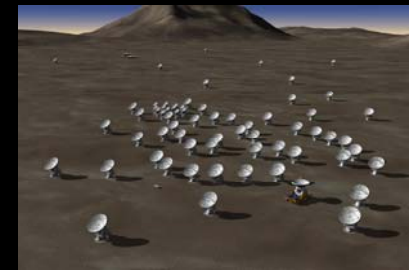
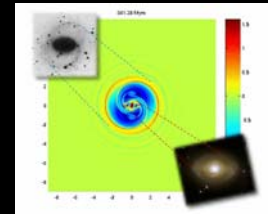


# Masato Convincing Another Donor?

It is great to be back in Kyoto!



# MAJOR ASIAA PROJECTS (2011)



- SAO** • **SMA** : Array Completed; **BW Upgrade**
- NTU** • **AMiBA** : 7-element papers; 13-element installed
- NTHU** • **TIARA**; **SIS Junction** : 230, 345, 400, 690, **900 GHz**  
(NAOJ, PMO)
- NCU** • **TAOS-1** : 4-element Operation; **TAOS-2**: Building
- ASIM** • **CFD-MHD** : 2-D Hydro Codes – **3-D**
- CFHT** • **WIRCam** : Operating; **SPIROU**
- NAOJ** • **ALMA-J** : **FEIC shipped 15<sup>th</sup> FE to Chile**
- NRAO** • **ALMA-NA**: 12m antenna, ALS; **5 FEs, VLBI**
- NAOJ** • **HSC**: filter exchanger, 125 CCDs, lens; **PFS**
- SAO** • **Submm VLBI**: acquired ALMA-NA prototype



# Submillimeter Array

**1<sup>st</sup> ASIAA Project: 15% Partner**

Completed 2003

Mauna Kea, Hawaii



**ASIAA Built 2 of the 8 SMA Antennas including Receiver Systems**



# SMA ( 2011)

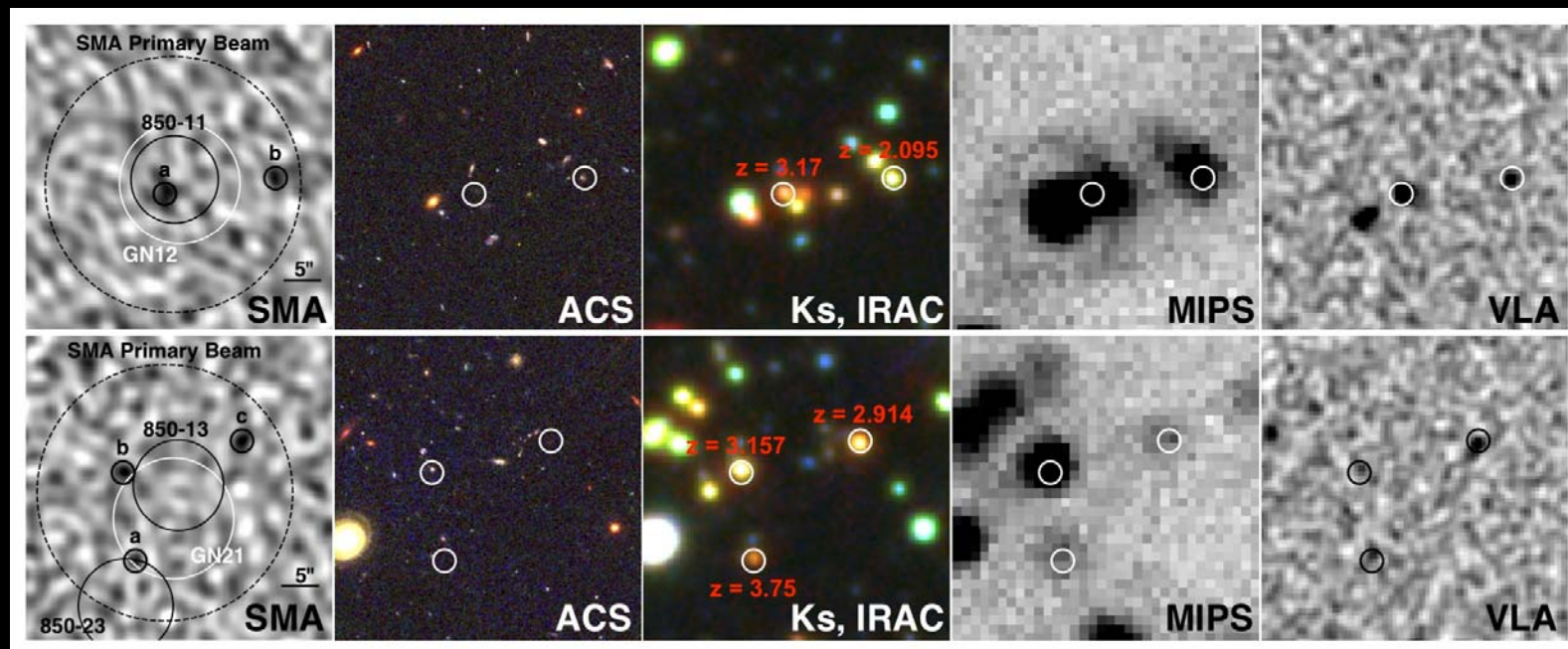
87 Papers Published/Submitted  
(2009-2011): 56 1st Author Papers

## Formation of Planets, Stars, Galaxies



### Wiggling Jet in HH211

Lee et al. 2010



**GOODS 850-13 (top) and 850-11 (bottom) resolved by the SMA** Wang et al. 2011

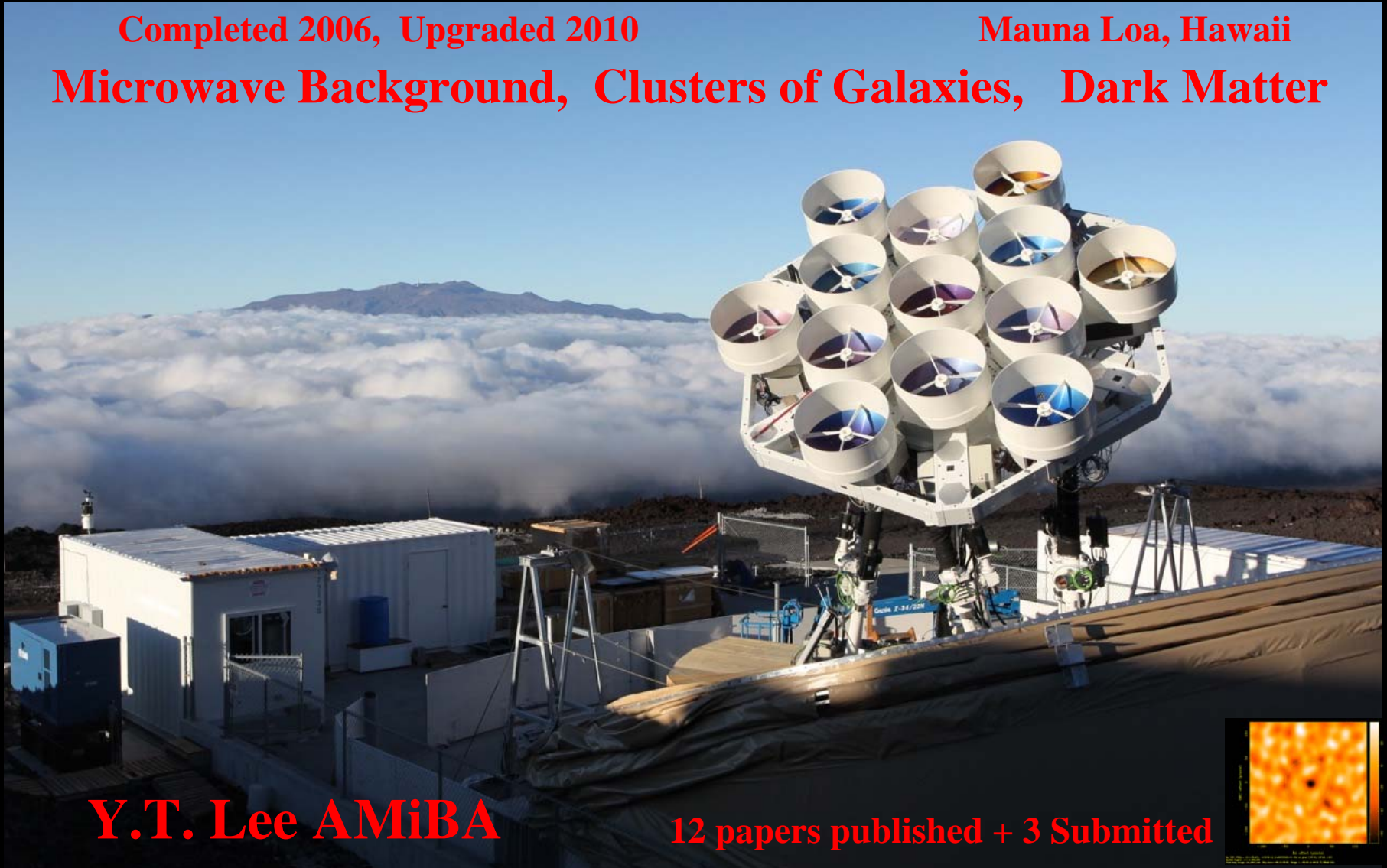
# Array for Microwave Background Anisotropy

1<sup>st</sup> ASIAA Led International Project

Completed 2006, Upgraded 2010

Mauna Loa, Hawaii

Microwave Background, Clusters of Galaxies, Dark Matter



Y.T. Lee AMiBA

12 papers published + 3 Submitted



# Atacama Large Millimeter/submillimeter Array

World's Largest Ground-Based Telescope: 3% Partner

To be Completed 2012

Atacama, Chile

Target Solar System Weather to the Most Distant Galaxies



# ALMA 12m Telescope on Transporter

Taiwan Contributes Equivalent 2 Elements







# EA FEIC @ ASRD (2011)

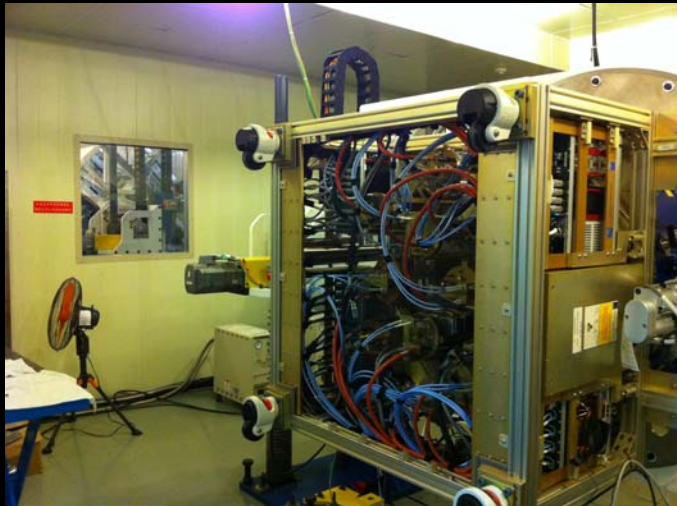
15<sup>th</sup> EA Front End System Delivered to Chile (3.11): 50% of Total



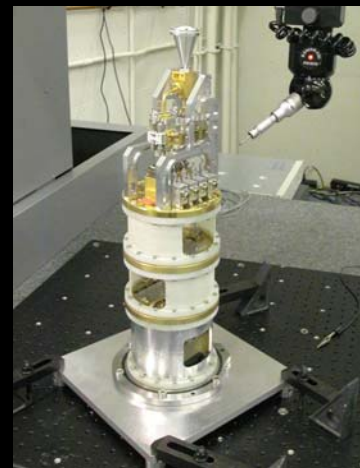
2<sup>nd</sup> Test Line established in 2010



New Assembly Line at EA-FEIC in 2010



First Tilt Table at EA-FEIC



Band 3 Cartridge



Band 9



Band 7



Band 6 Cartridge

# EA FE #7 Antenna Installation



YI AXIS

730 KG

THIS SIDE

Rutherford Appleton Laboratory  
CRYOSTAT No 40.03.00.00-001-19  
MASS: 450Kg  
PRESSURE VESSEL  
ALMA

Front End Assembly  
SN-19  
P/N 40.00.00

VENT INLET  
Keep Clear

FE Electronics Chassis  
P/N 40.05.00.00 S/N-19

Mass = \_\_\_ kg



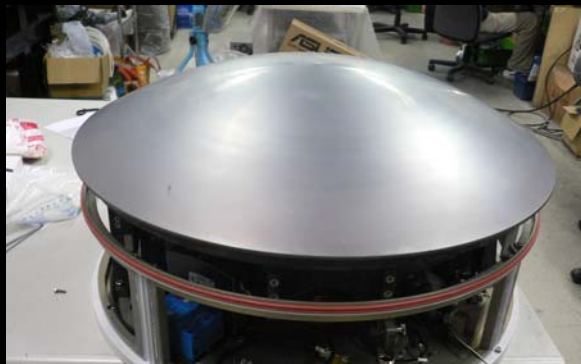
# ASIAA and NAOJ Team in Chile





# other ALMA-Taiwan Projects

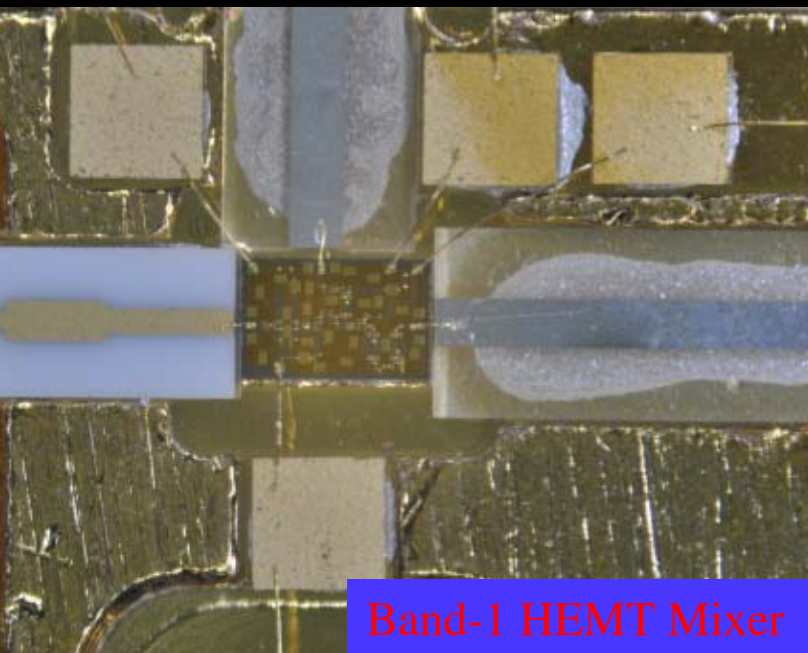
Taiwan Industries work with ASIAA Labs in Taiwan and Hawaii



2<sup>nd</sup> Nutator in Production



Alternative Laser Synthesizer



Band-1 HEMT Mixer



FESV





# FESV at OSF





# TAOS-1, 2 (2011)

2<sup>nd</sup> ASIAA Led International Project



**TAOS-1: (Lulin, Taiwan)**

**4 papers published in 2010**

**3 Frame Transfer Cameras ordered**

**All 4 0.5m TAOS telescopes operational**

**Data Efficiency Increased**

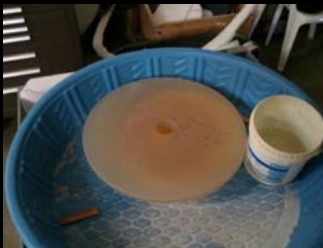
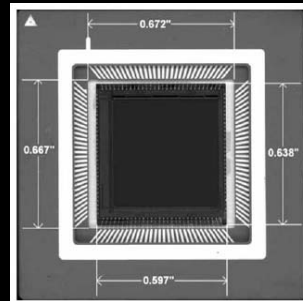
**TAOS-2: (San Pedro de Martir, Mexico)**

**Site selected and MOU signed**

**3 1.3m Telescopes Under Construction**

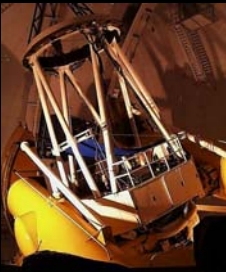
**CMOS Cameras under development**

**To be Completed 2012-2013**



**Target Outer Solar System Bodies**





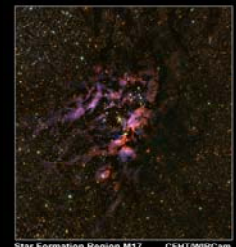
# CFHT (2011)

WIRCam Delivered 2005



GOODS North Deep Field  
CFHT / ASAS / Li-Hwai Lin & Chi-Hung Yin

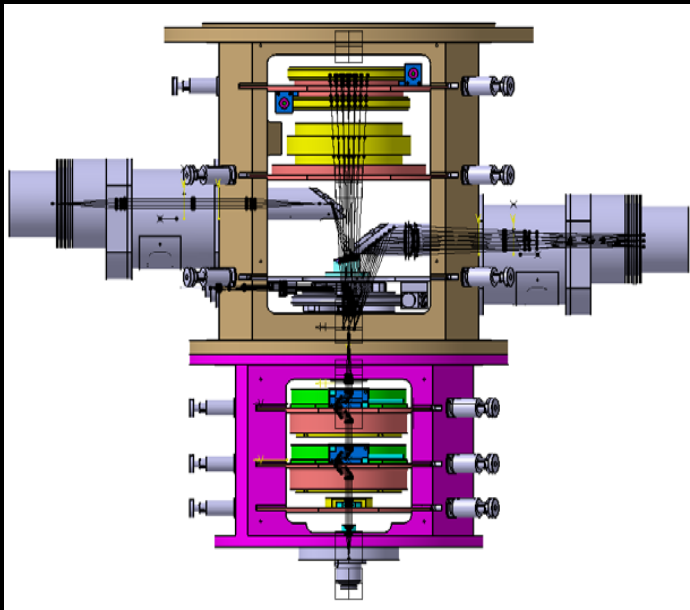
CFHT & Subaru



Star Formation Region M17  
CFHT/WIRCam  
Institute of Astronomy and Astrophysics, Academia Sinica

## CFHT: 3.8m Optical/Infrared Telescope (Mauna Kea)

## 2<sup>nd</sup> Camera Collaboration with Canada-France-Hawaii Group



Tip-Tilt and Viewing Cameras on SPIROU



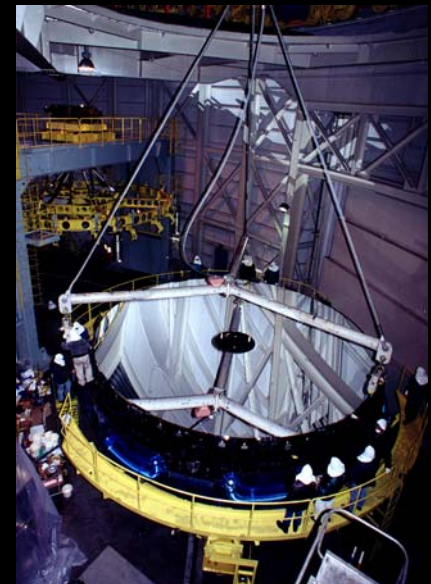
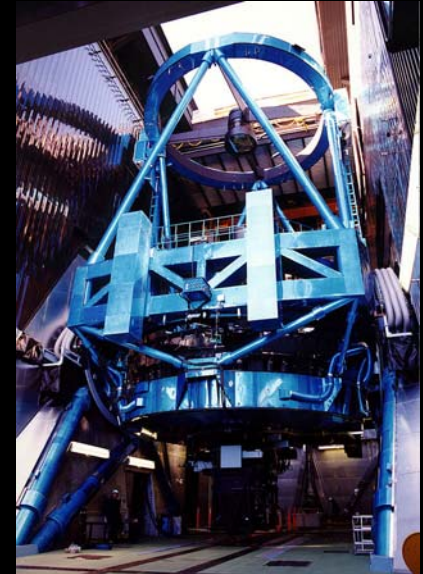
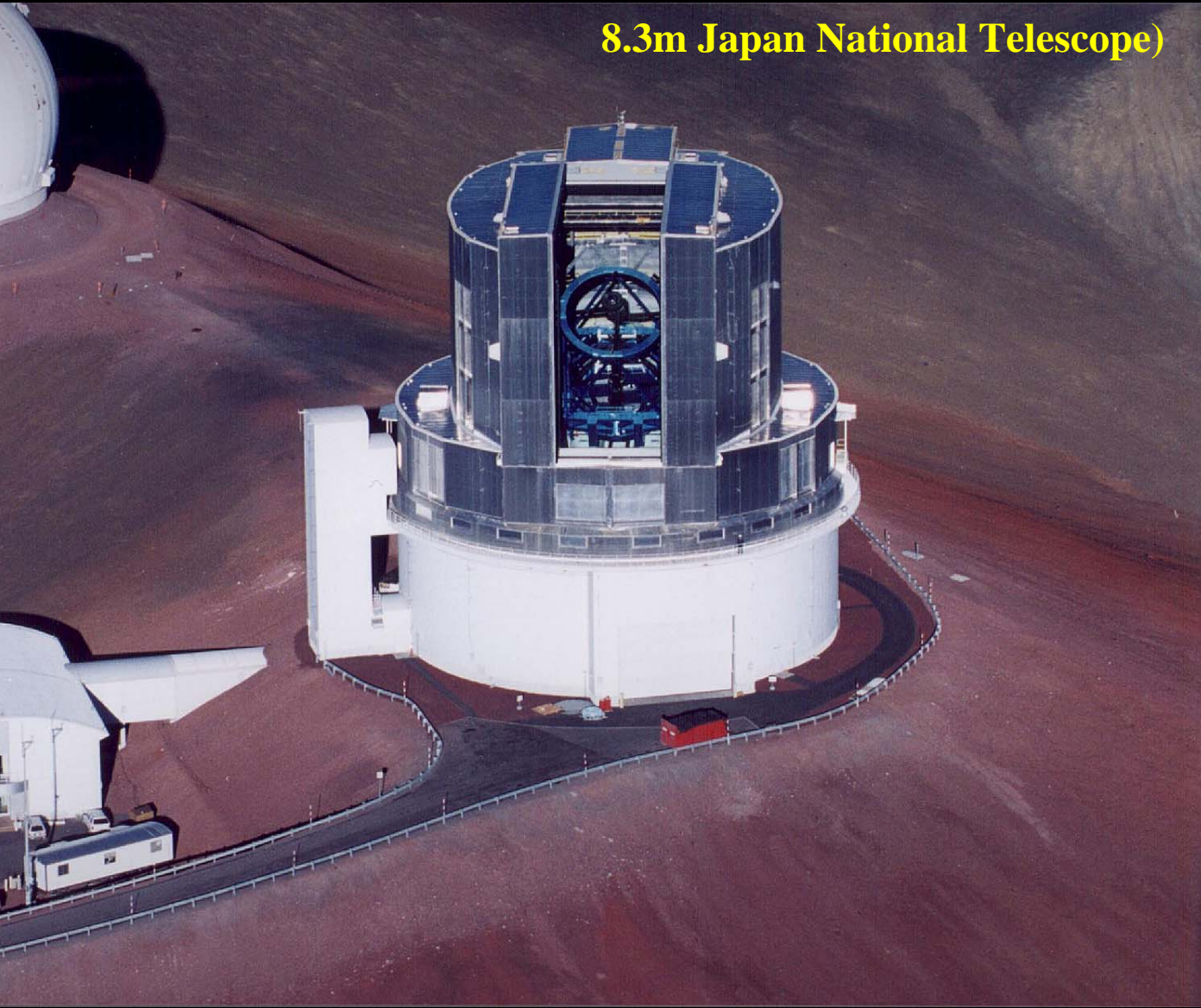
Near IR Spectro-Polarimeter

35 papers published from CFHT data; 16 in 2008-2011

## Target Galaxy Clusters via Wide Field Imaging

# Subaru Telescope (Mauna Kea)

8.3m Japan National Telescope)

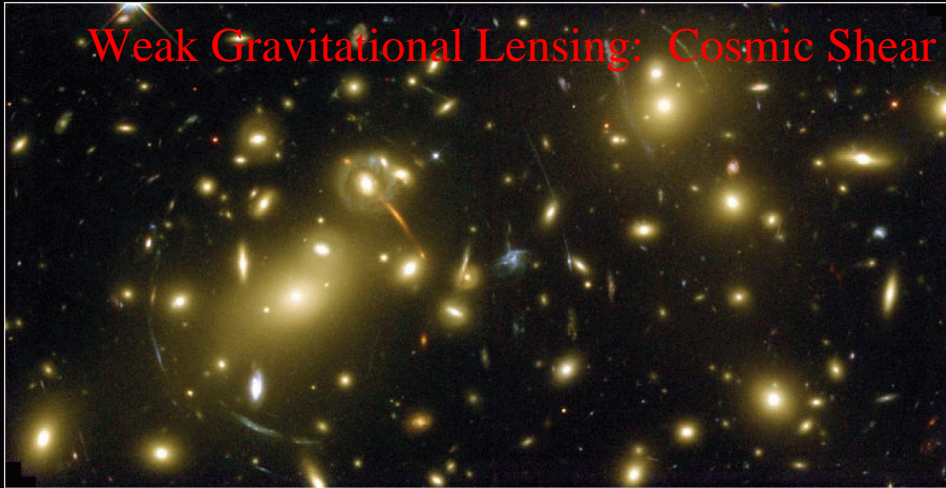




# Subaru HSC Project (2011)

## Target Dark Matter and Dark Energy

Weak Gravitational Lensing: Cosmic Shear



Galaxy Cluster Abell 2218

HST • WFPC2

NASA, A. Fruchter and the ERO Team (STScI, STECF) • STScI-PRC00-08

1.5 degree FOV, 10 x FOV (Surprime Camera)

40 M USD Budget (Taiwan 5M), 5 year timescale

ASIAA: Filter Exchanger, CCD and Lens Testing

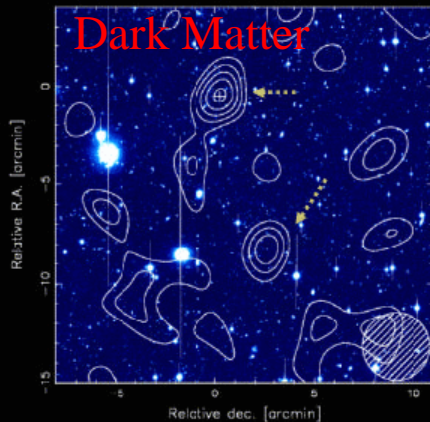
Weak Lensing Tomography;  $z > 6$



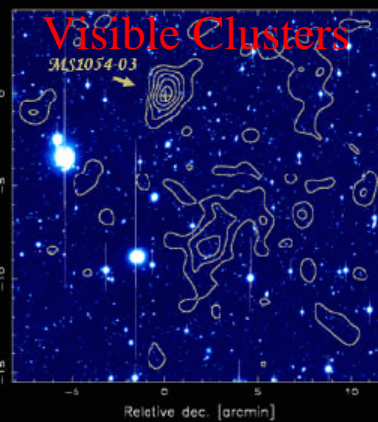
CCD Detector Testing

Peaks with  $S/N > 4$  →

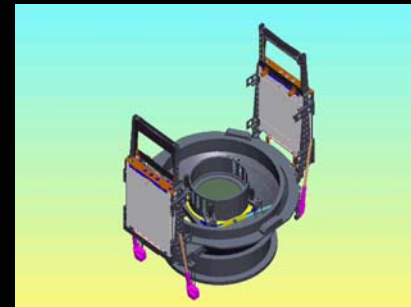
Galaxy Surface Density



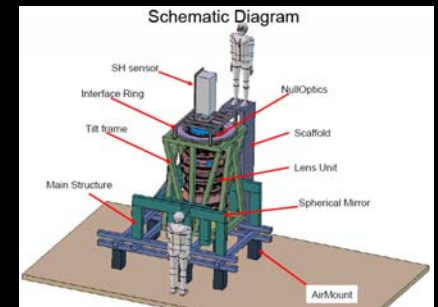
Dark Matter



Visible Clusters



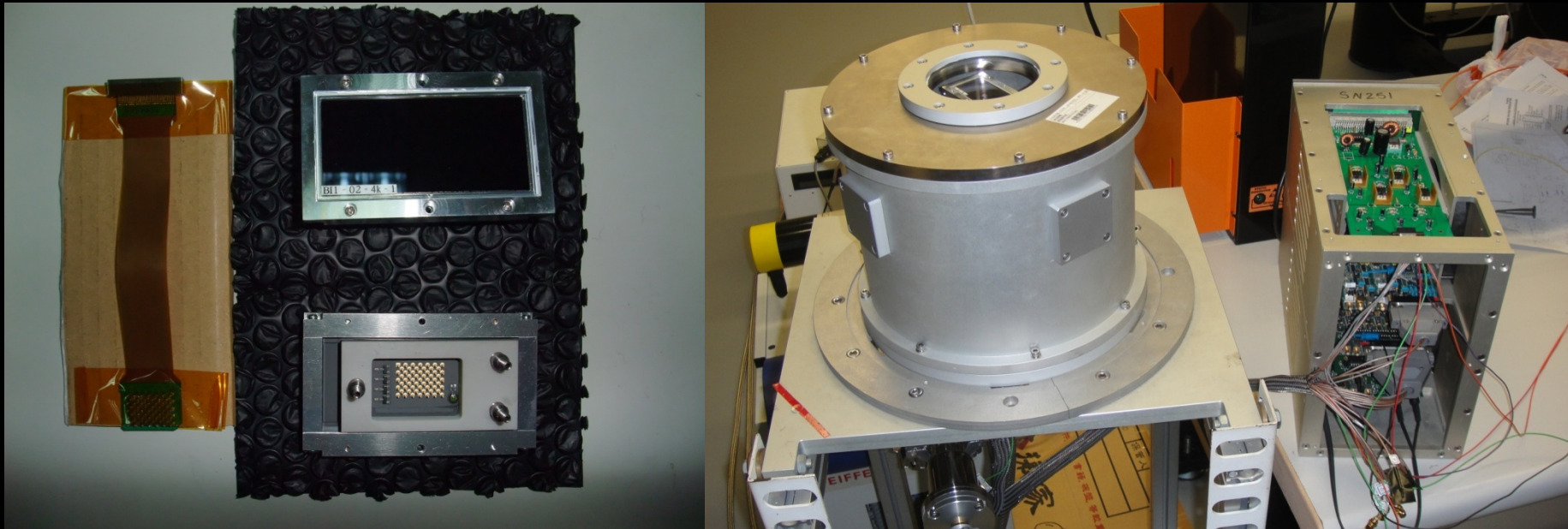
Filter Exchanger



Lens Testing

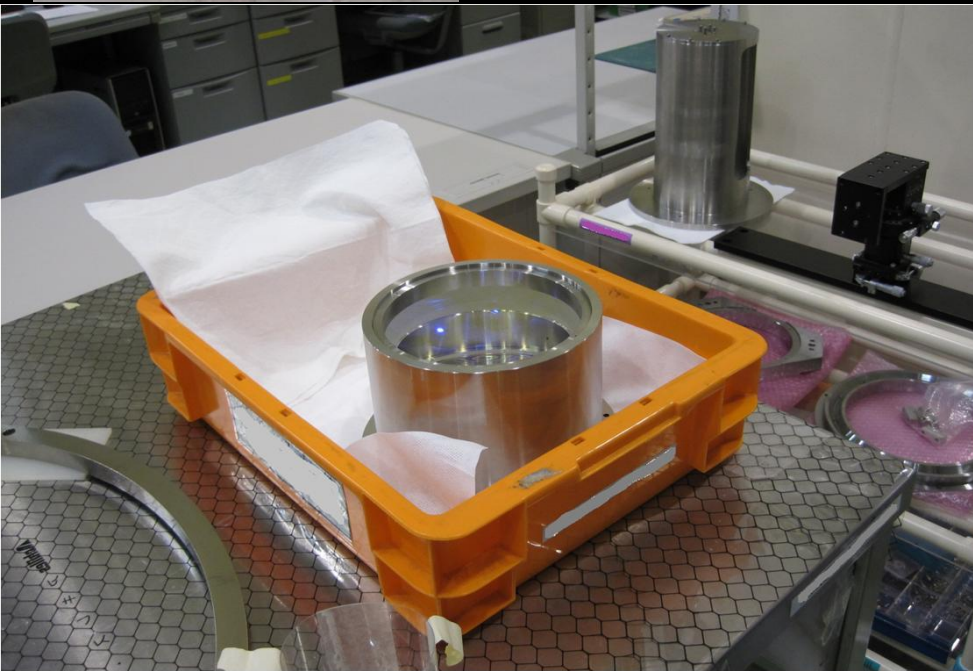
# CCD Procurement and Testing

125 CCDs delivered by the end of Sep 2010  
Assembly testing of focal plane in NAOJ now





# Null Lens Fabrication; Wavefront Testing



**Null lens delivered in May 2010 by GESO**  
**Diameter of the largest lens is 170mm**  
**(Surface error RMS within 15 nm)**

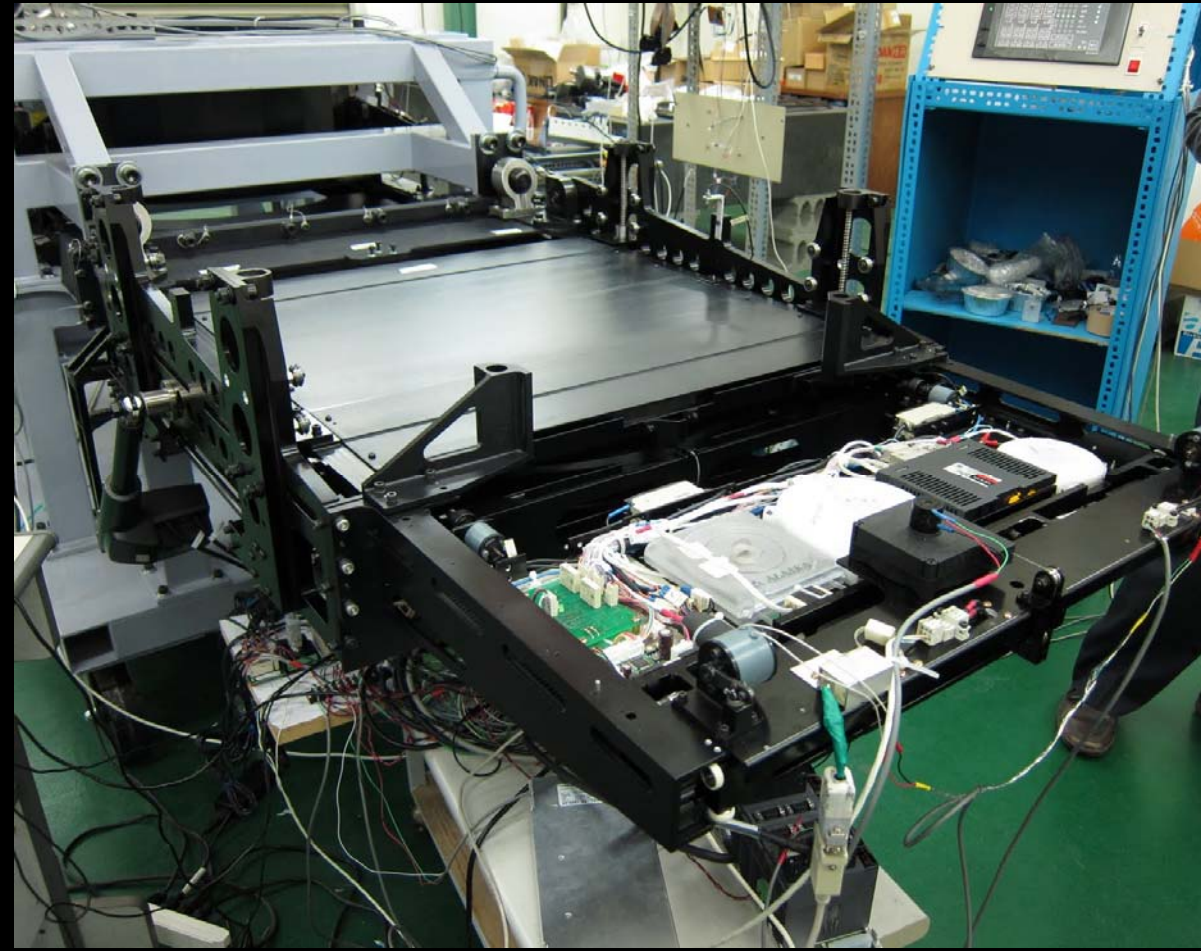
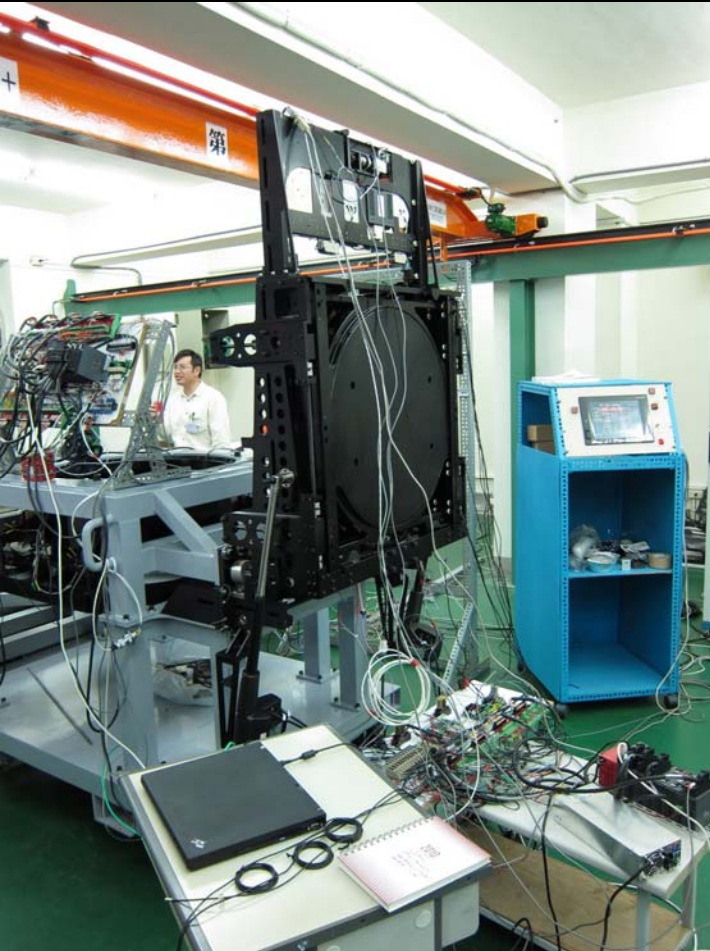


**Wavefront Testing**  
**at Canon Factory**

# Filter Exchanger Built at ASRD

(shipped 09.11, integration and commissioning)

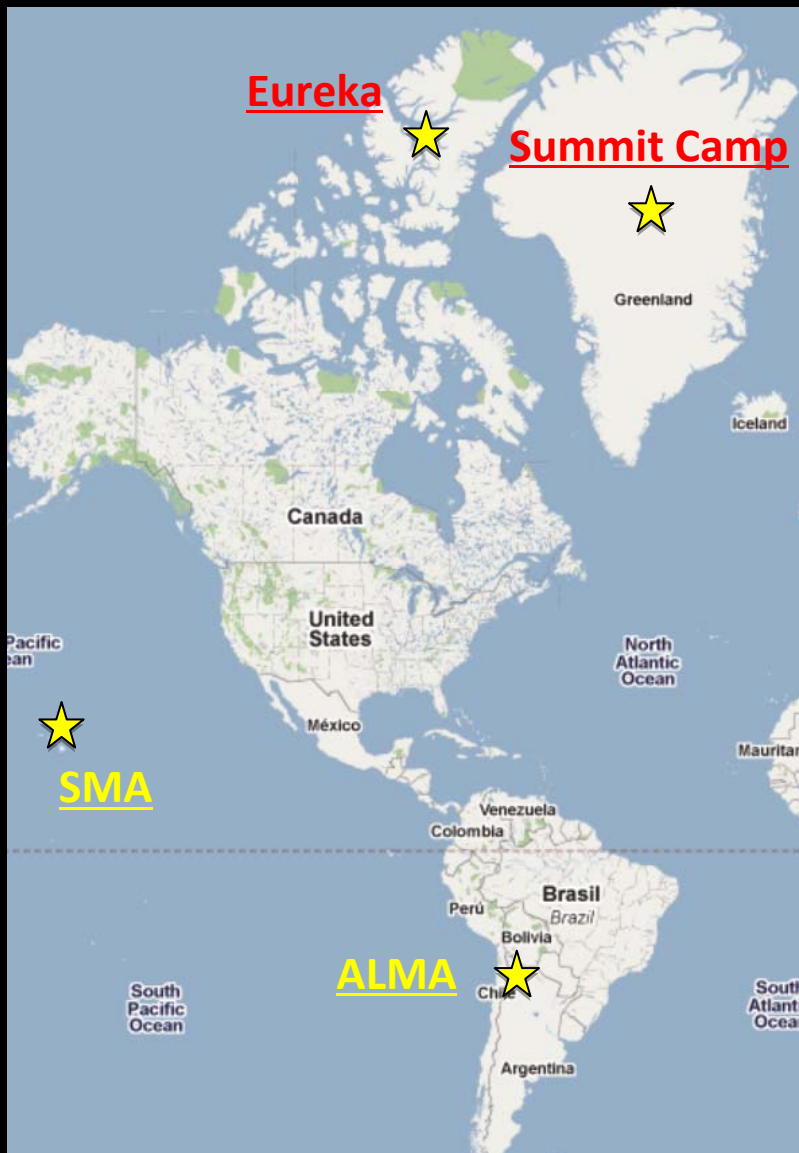
Project to be Completed in 2012





# Submm VLBI : Utilizing SMA + ALMA

3<sup>rd</sup> ASIAA Led International Project



Site Testing: Eureka (Spring 2011)

Greenland (Fall 2011)

Eureka

N 80.0, W 85.9, altitude: 610 m



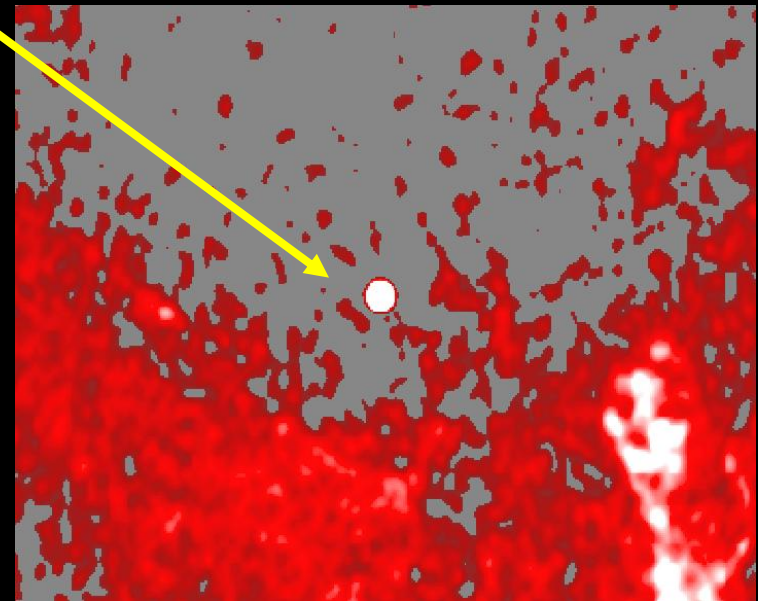
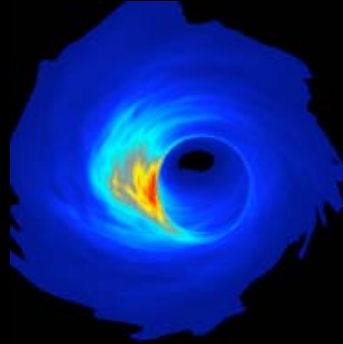
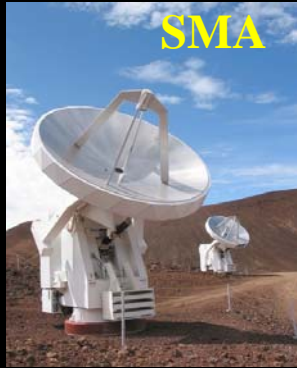
Summit Camp

N 72.5, W 38.5, altitude: 3200 m



# Very Long Baseline Interferometry (2011)

## Target Imaging SMBH



**Strong Gravity at Event Horizon  
of Super Massive Black Hole**

**Goal: Highest Angular Resolution in Astronomy**



# Awarded (04.11): ALMA-NA Vertex Prototype

To be Deployed 2012-2013

Target: Greenland



Retrofit and Redeploy as Submm VLBI Telescope

# PERSONNEL at ASIAA (2011)

- **39 ASIAA Faculty (28 Regular, 11 Research)**
- **14 Adjunct Faculty**
- **32 Postdoctoral Fellows, 6 Visitors**
- **20 Ph.D. Students, 8 Master Students**
- **14 Undergraduate Students, 7 Assistants**
- **55 Technical Staff**
- **25 Administrative Staff**

**Working Language: English**

**Staff: (Australia), Canada, (China), France, India, Japan, Korea, Malaysia, Mexico, Netherlands, Spain, Switzerland, Taiwan, U.S., (Vietnam)**

**Budget: 18M USD**