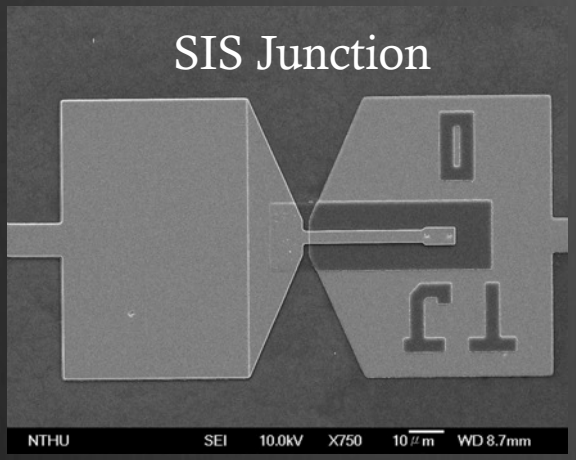
ASIAA Core Technologies

Ming-Tang Chen
Academia Sinica, Institute of Astronomy & Astrophysics

On-Going Developments

- SMA Wideband Upgrade and next generation receivers
  - Receiver Upgrades, 240 GHz and 400 GHz
  - SWARM Digital correlator expansion
  - New generation dual-pol front-end
- CO Intensity Mapping using YTLA (New AMiBA)
  - Digital correlator & IF processor upgrade
- Greenland Telescope:
  - 230 & 345 GHz VLBI receiver system & VLBI hardware
- ALMA Band-1 prototyping development
  - System integration & testing& MMIC design, integration and testing
- Superconducting devices and detectors

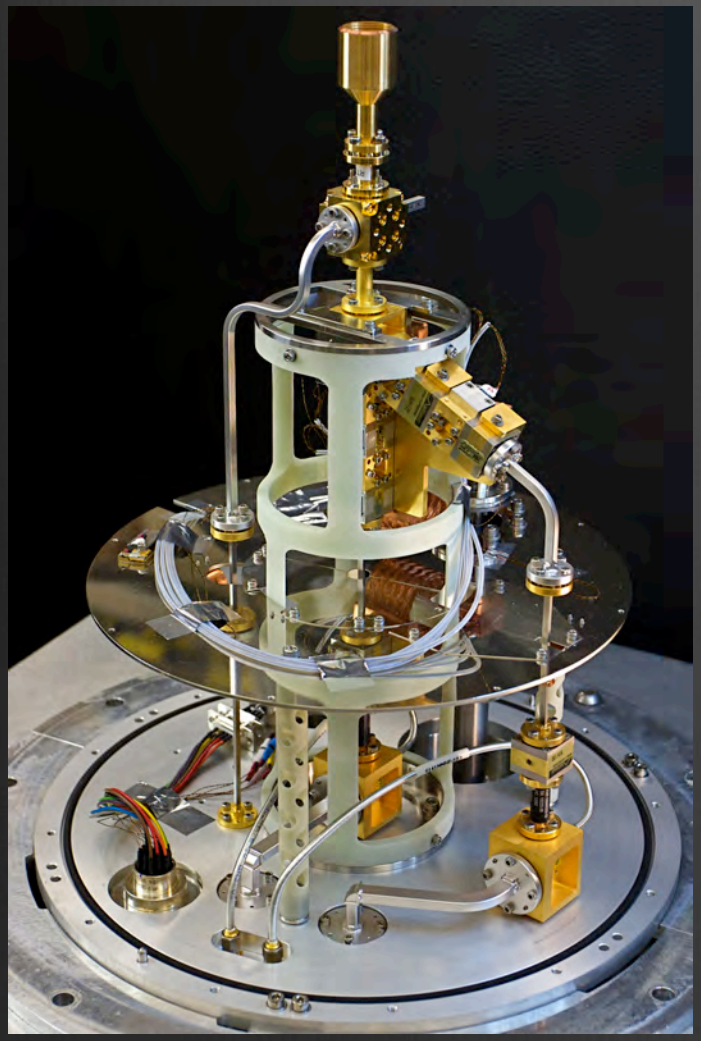
The Submillimeter Array

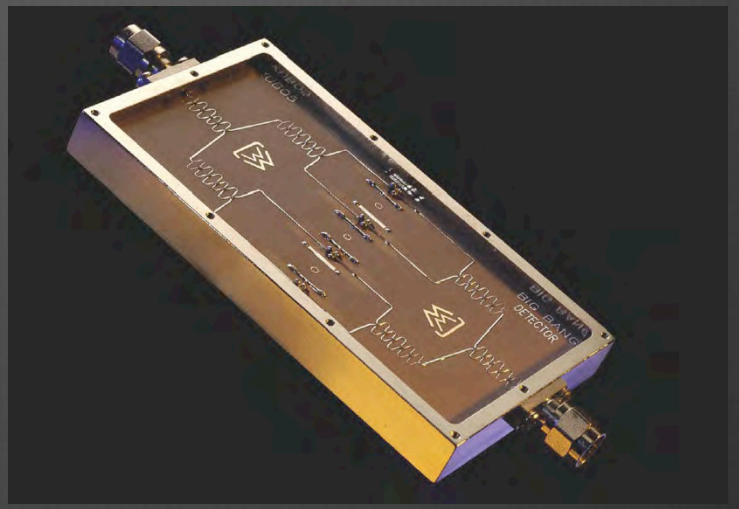


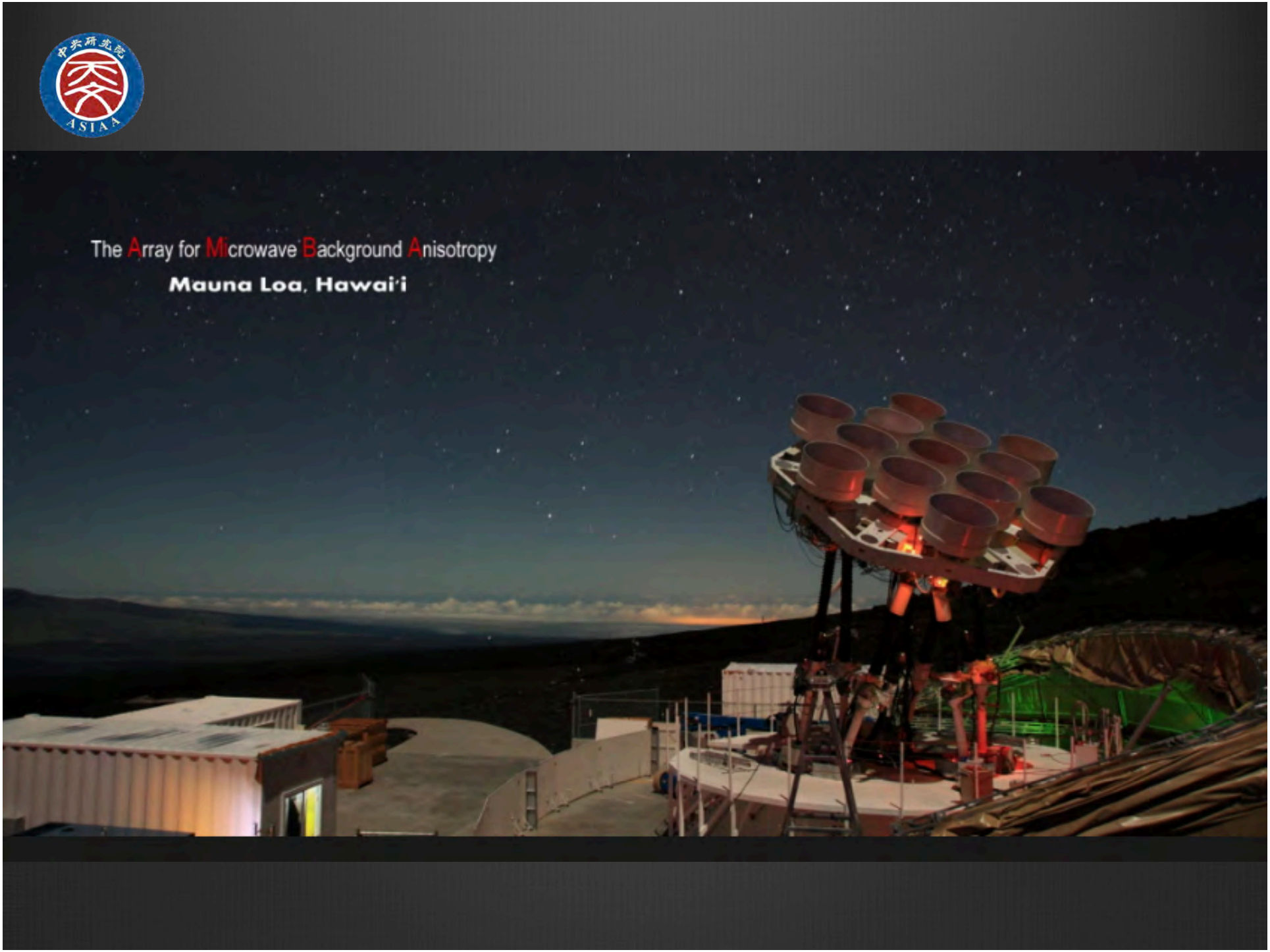

Submm Receiver

First Taiwanese SMA Antenna

Yuan T. Lee AMiBA Telescope






The Array for Microwave Background Anisotropy
Mauna Loa, Hawai'i

Fast Analog to Digital Converter

Derek, Chang Ray, Chen Ming-Tang, PASP, 2014.

Fast Analog to Digital Converter

ROACH-2 with ASIAA Analog-to-Digital Converters (H.-M. Jiang, H. Liu, K. Guzzino, C.-T. Li, M.-T. Chen, et al, 2012

4-Element Prototype Digital Correlator (C.-T. Li, H.-M. Jiang, H. Liu, K. Guzzino, S. Ho, J. Kuroda, R. Srinivasan, D. Kubo, M.-T. Chen, 2014

Users of 5 Gsps ADC

Users:

1. UC Berkeley. USA
2. Green Bank, NRAO
3. JPL/Caltech
4. SKA South Africa, South Africa.
5. University of British Columbia, Canada. CHIME project.
6. Smithsonian Astrophysical Observatory
7. Chinese Academy of Science
8. Indian Inst of Technology (Indore)
9. Max-Planck Institute, Germany
10. Observatorio Astronomico di Cagliari, Italy
11. Shanghai Institute of Technology, China
12. Universidad de Chile, Chile
13. University of Hong Kong
14. University of Southampton, England
15. University of Washington, USA
16. University of Western Australia
17. Univ of Massachusetts, USA
18. More …

Extension to Technology Communities

NCU EE:
T. H. Chu (瞿大雄) Group

NTU EE:
Huei Wang (王暉) Group

NTU EE: 中央電機
Thong-Yeh Chang (張鴻埜) Group

NTU EE: 中央電機
Thong-Yeh Chang (林佑生) Group

NCCU EE: 中正電機
Zuo-Ming Tsai (蔡作敏) Group

U. of Victoria/HIA
Frank Jiang & Group

WIN Semiconductor Corp
穩懋半導體

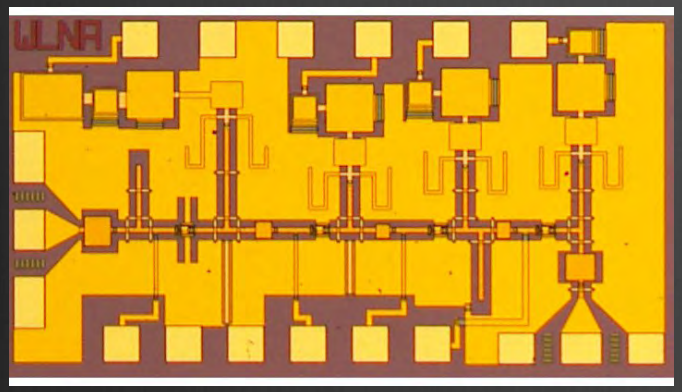
TSMC
台積電

- Supported many man-year of Master and PhD students in engineering disciplines from the past 12 years.
- Challenge and co-develop new technology with local semiconductor foundry.
- More than 25 technical papers in referred journals

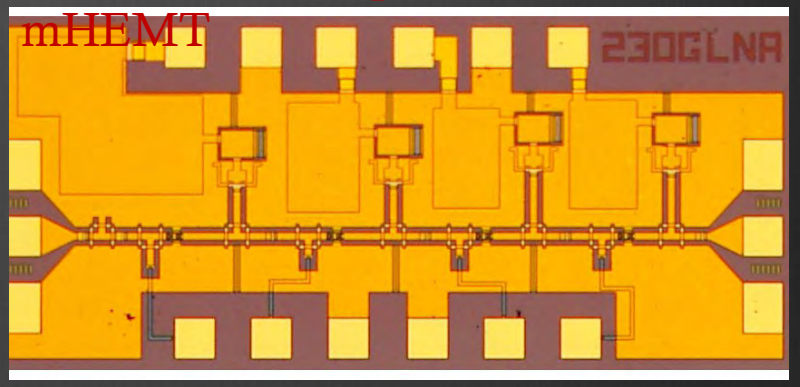
MMIC Development at ASIAA

- MMIC is suitable for multi-pixel, large array receiver for its high reliability, easy system integration, easy mass production, and low cost.
- Excellent foundry support in Taiwan.

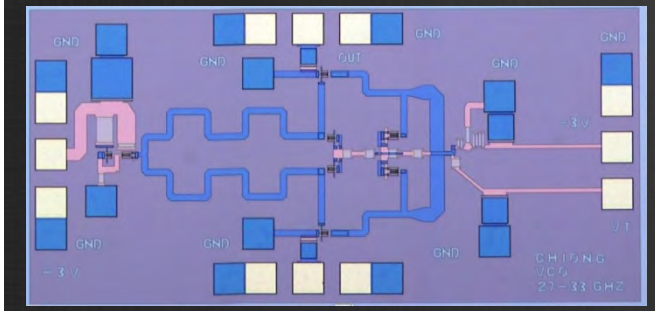
80-120 GHz LNA, 70nm mHEMT



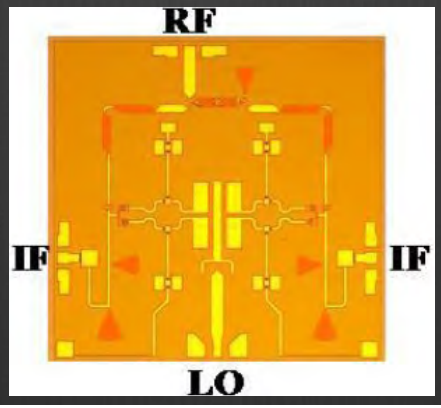
180-210 GHz amplifier, 70nm mHEMT



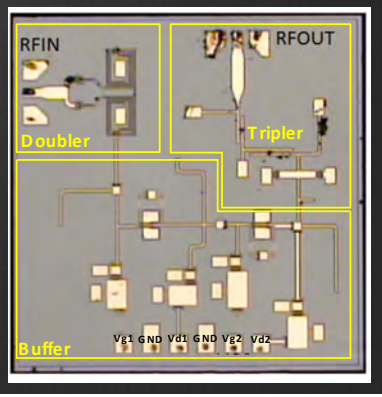
28-34 GHz HBT VCO



W-band two-sideband mixer



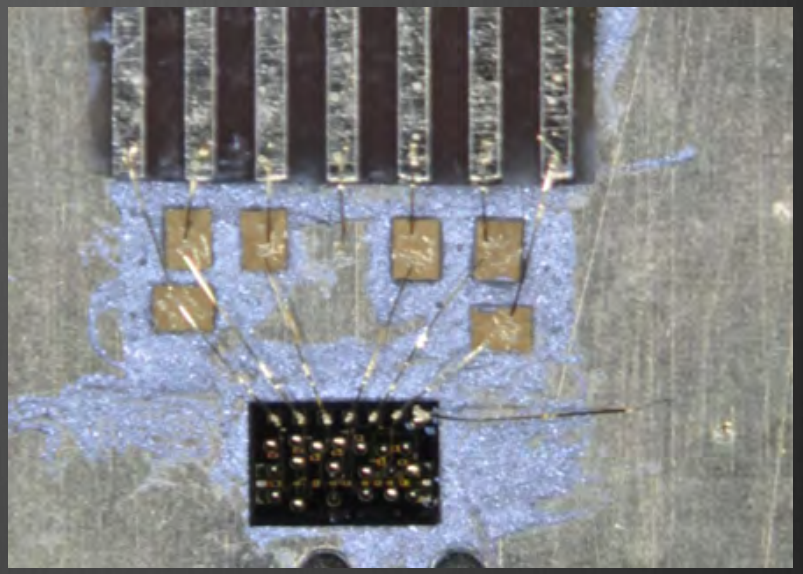
W-band frequency multiplier

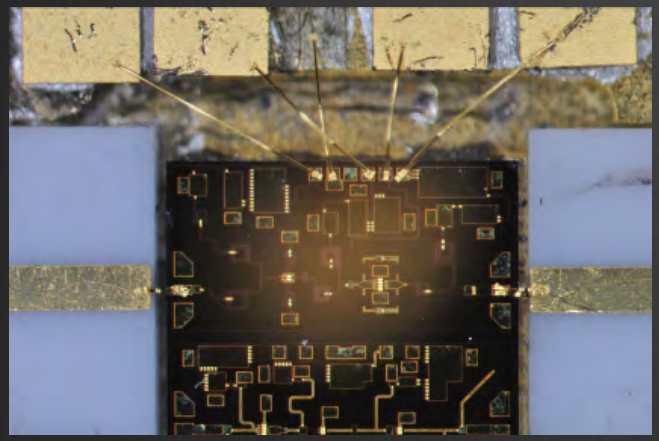


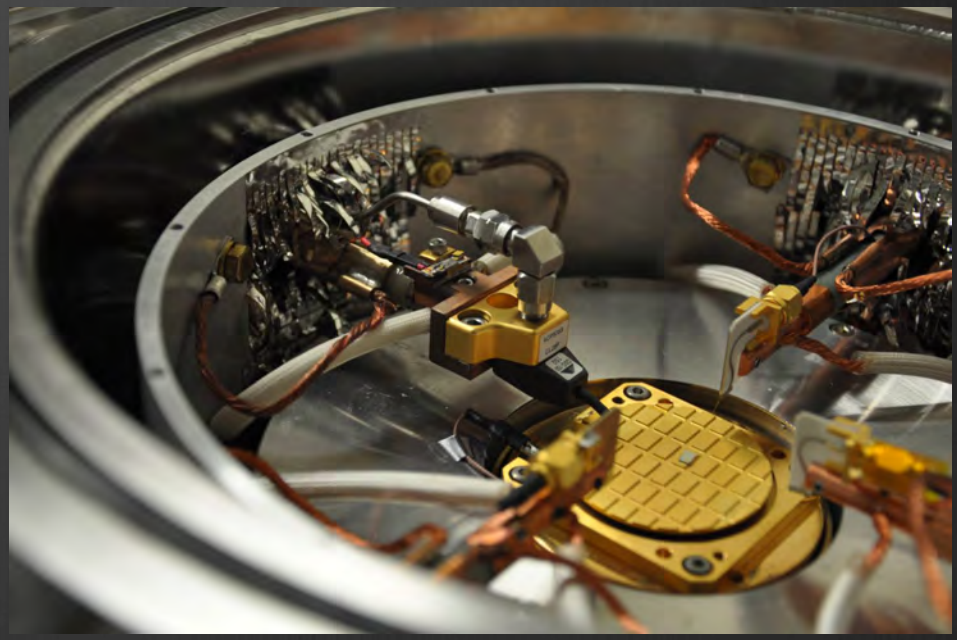
ALMA Band 1: Cold Cartridge Assembly

ALMA Band 1 Key Components: MMIC Approach

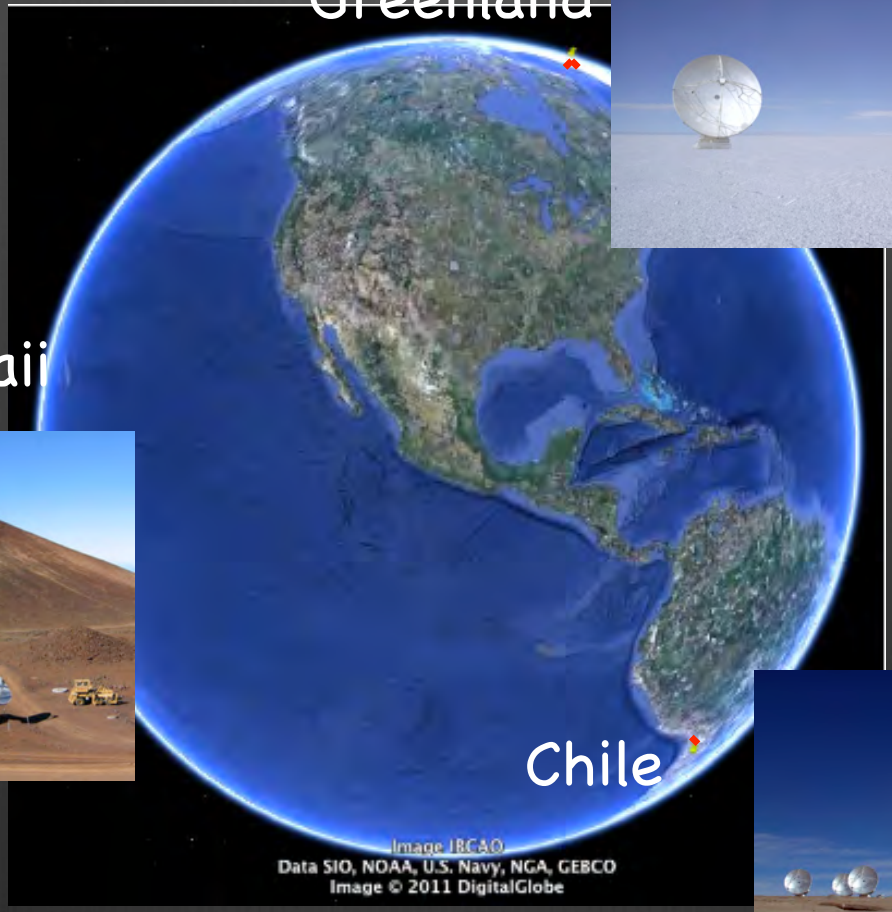
- Cold/Warm amplifier
  30-50 GHz, 4-12 GHz etc.
- Cryogenic on-wafer characterization with cryogenic probe station







Unique Observation at 350 GHz



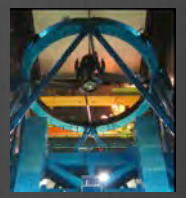
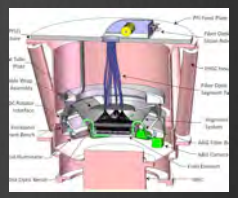

Link-Belt
CAP 75 TONS


Genie

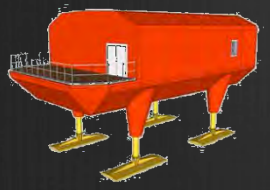
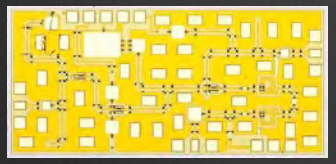
Science, Education, & Applications





- Science driven forefront technologies
- Producing Science, Create Research Opportunities in Taiwan and East Asia
- ASIAA instrumentation is embedded in TW technology and industry



Semiconductor Industry: TSMC, WIN