The James Clerk Maxwell Telescope

Geoffrey C. Bower

Director

December 2025



Image Credit: William Montgomerie, EAO/JCMT





Maunakea Facts

- The world's tallest mountain:
  - 9330 m above seafloor
  - 4207 m above sealevel
- JCMT Elevation: 4092 m
- 11 active observatories




The Largest single dish submillimeter telescope
• 15m primary mirror
• Surface accuracy < 25 micron
• One of the best sites for submm
• Powerful, but aging instrumentation
• Plans for transformation

JCMT/EAO Partnership

- History
  - UK, Netherlands & Canada 1987 – 2014
  - EAO takes over in 2015
  - Current lease with UH through 2030
- Current Model
  - EAO Board Institutions: ASIAA & NARIT
  - JCMT Board Partners:
    - UKC, Canada, UH, EAVN, Xinjiang AO
  - JCMT Board Observers
    - Japan, Vietnam, Malaysia, Indonesia, Brazil









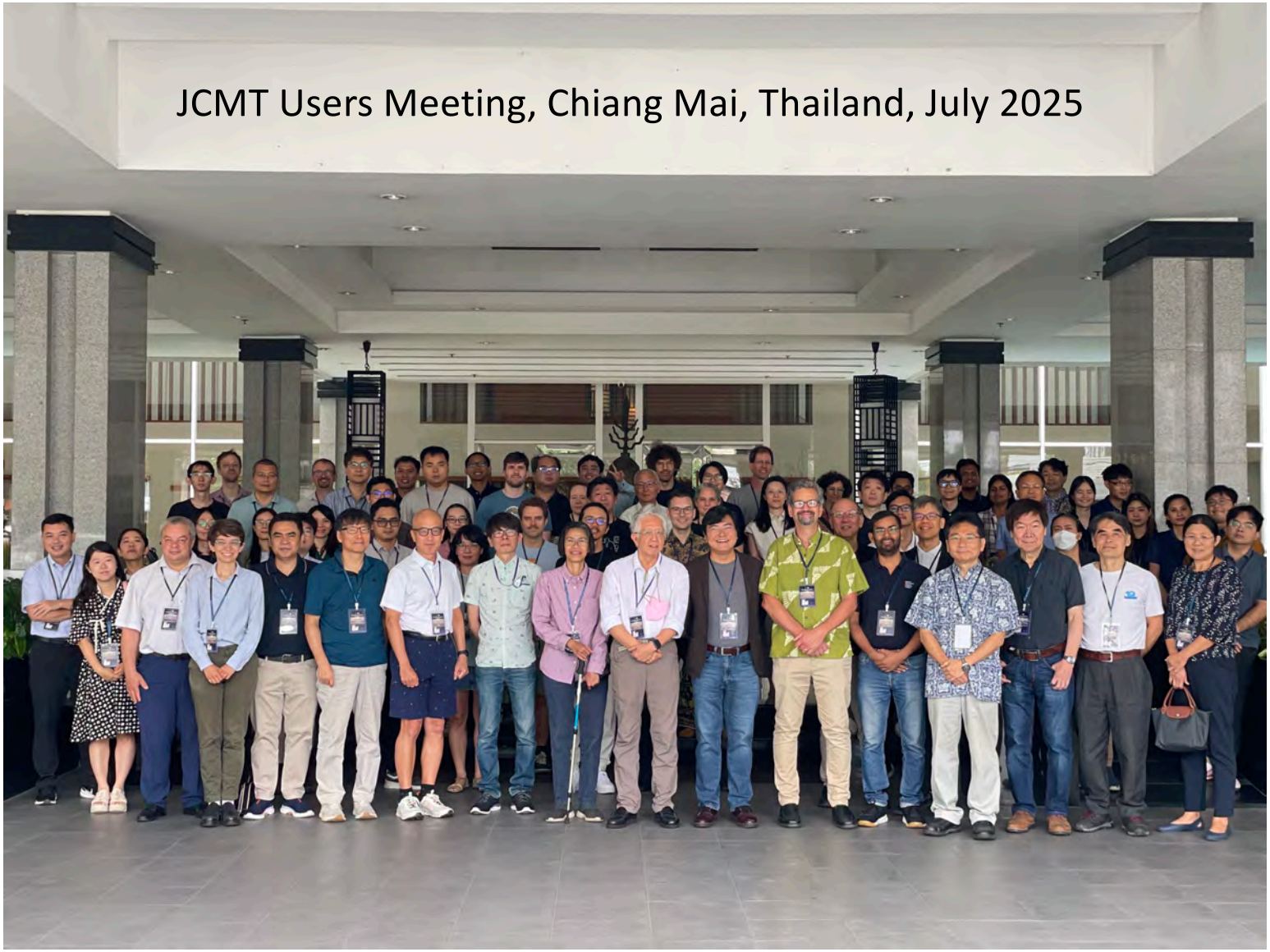






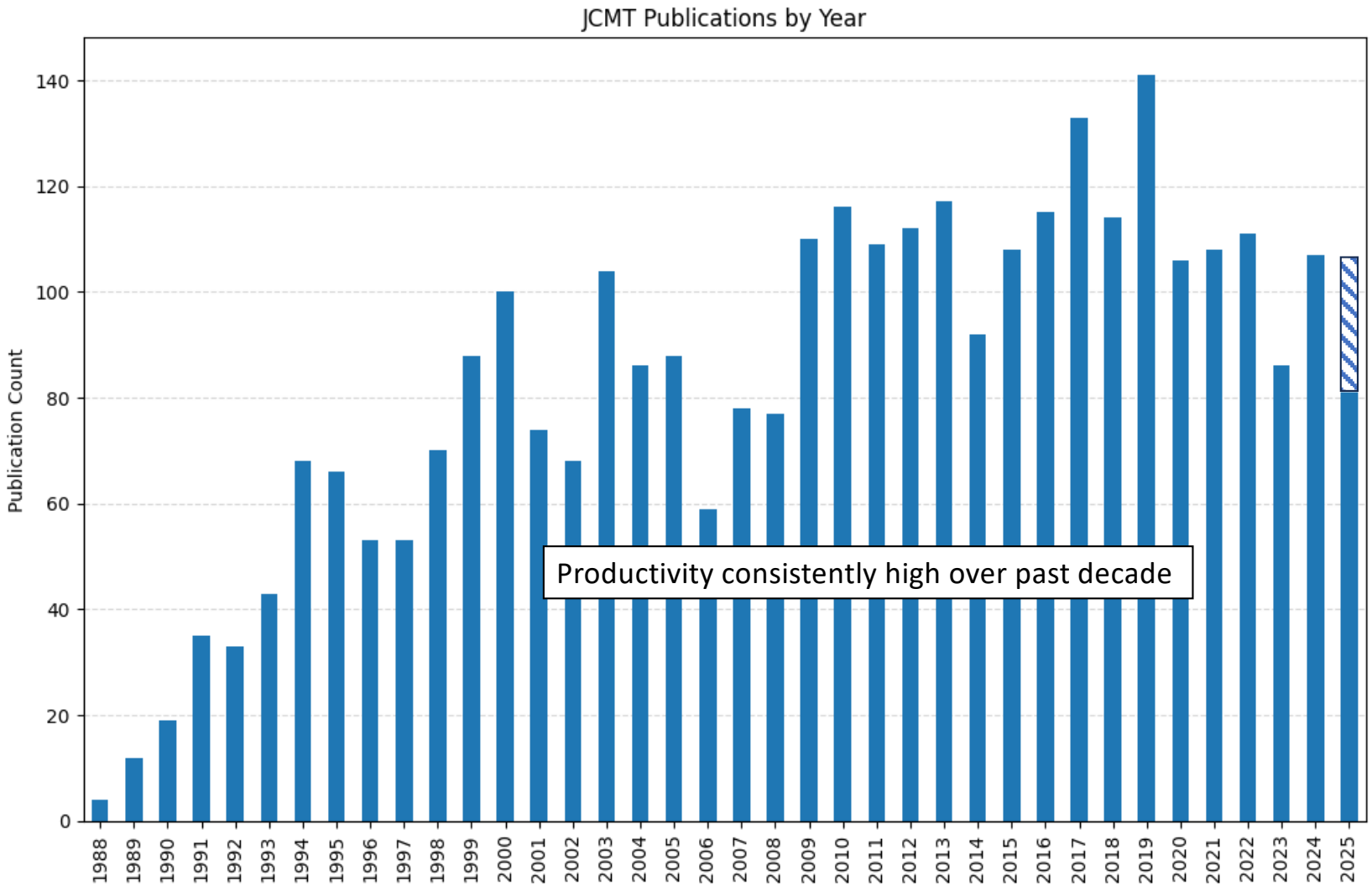
EAVN

JCMT Users Meeting, Chiang Mai, Thailand, July 2025

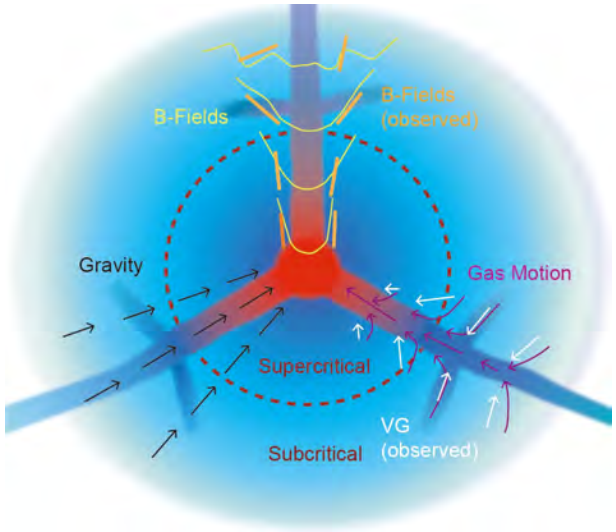



A Global Observatory
James Clerk
Maxwell Telescope
Russia
Canada
Greenland
Iceland
Mongolia
United States
Cuba
Puerto Rico
Guatemala
Nicaragua
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Chile
Argentina
Uruguay
Suriname
France
Spain
Portugal
Morocco
Algeria
Western Sahara
Mauritania
Mali
Burkina Faso
Guinea
Ghana
Nepal
Thailand
Philippines
Papua New Guinea
Australia
New Zealand
Google Maps
Imagery ©2025 NASA, Map data ©2025 Google
Japan
Terms
Privacy
Send Product Feedback
2000 km




JCMT Publications by Year
Publication Count
0
20
40
60
80
100
120
140
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
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2025
Productivity consistently high over past decade

Multi-Scale Magnetic Field within Filaments: G33.92+0.11

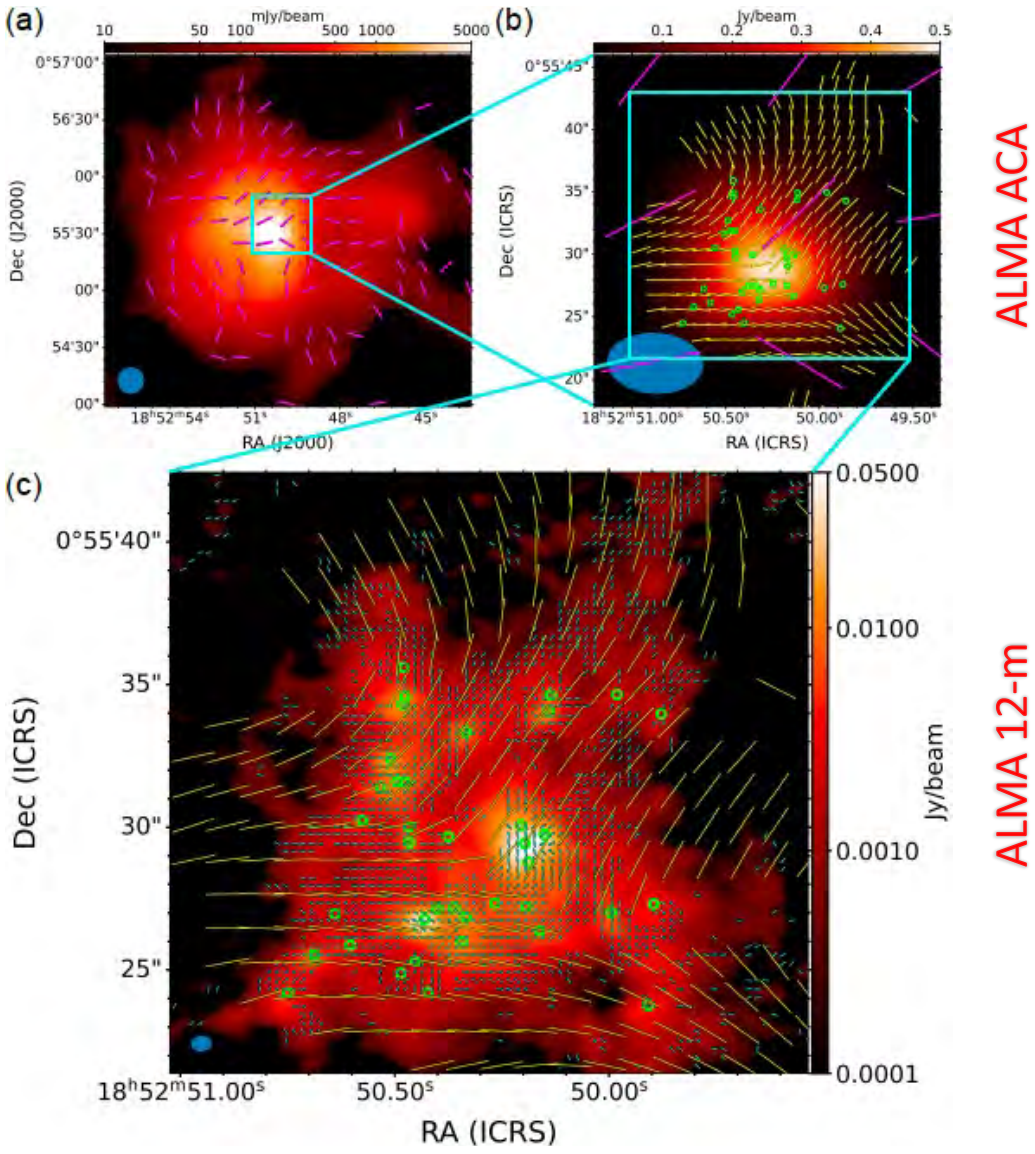


J. Wang et al

JCMT

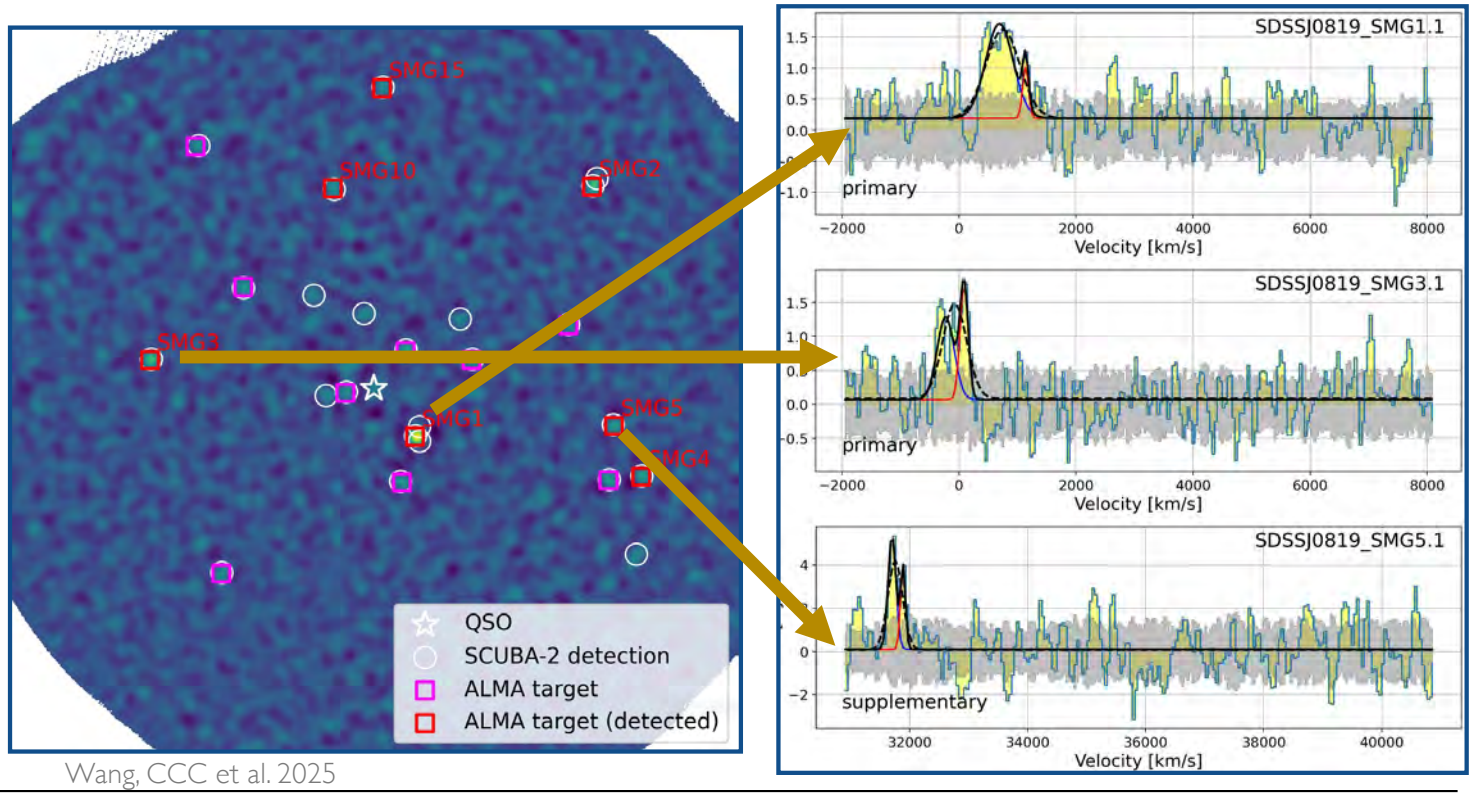
ALMA ACA

ALMA 12-m



AMUSE^2

A SCUBA-2 survey around a sample of quasars at z=2-3, follow-up by ALMA



Wang, CCC et al. 2025

First Reported mm/submm detection of Comet 3I/Atlas



Electronic Telegram No. 5608

Central Bureau for Astronomical Telegrams
Mailing address: Hoffman Lab 209; Harvard University;
20 Oxford St.; Cambridge, MA 02138; U.S.A.
e-mail: cbatiau@eps.harvard.edu (alternate cbat@iau.org)
URL http://www.cbat.eps.harvard.edu/index.html
Prepared using the Tamkin Foundation Computer Network

COMET 3I/ATLAS

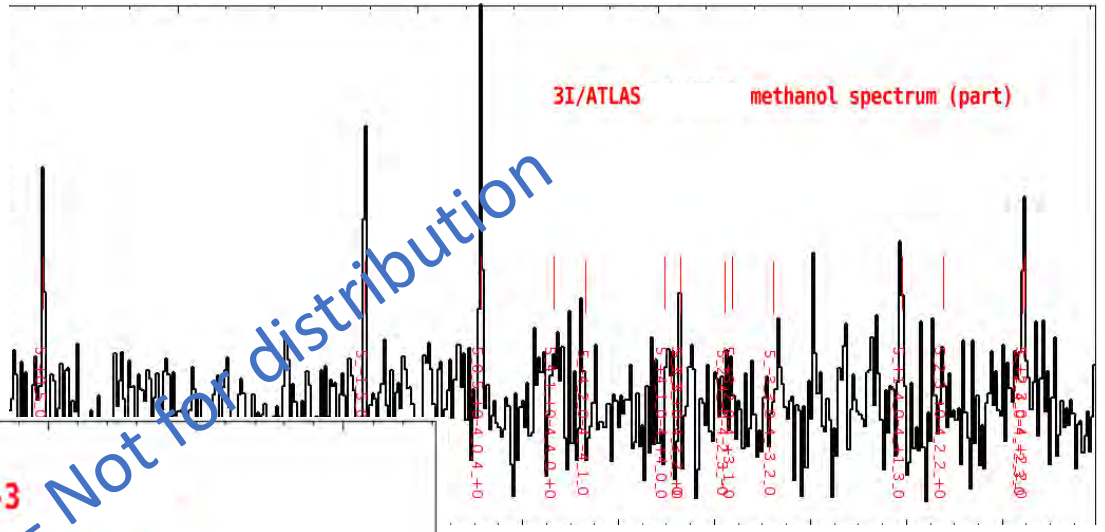
Y.-J. Kuan, National Taiwan Normal University (NTNU); I. M. Coulson, East Asian Observatory; M. A. Cordiner, Goddard Space Flight Center, NASA (GSFC), and Catholic University; S. B. Charnley and S. N. Milam, GSFC; N. X. Roth, GSFC and American University; Y.-L. Chuang and M.-K. Lin, Academia Sinica Institute of Astronomy and Astrophysics; Y.-N. Lee, NTNU; and B. Pimpanuwat, National Astronomical Research Institute of Thailand, report the detection of HCN:J=3D3-2 (265 GHz) emission from comet 3I/ATLAS at heliocentric distance r = 2.13 AU. Observations were made on Sept. 14 UT with the James Clerk Maxwell Telescope on Mauna Kea, using the 'U'u (A-band) heterodyne receiver and the ACSIS spectroscopic backend. The integrated line intensity was 37.0 (+/- 6.5) mK*km/s. Non-local-thermodynamic-equilibrium analysis using the SUBLIME code (Cordiner et al 2022, Ap.J. 929, 38) yields an expansion velocity of 0.45 (+/- 0.14) km/s and a production rate of HCN molecules, Q(HCN), of 4.5 (+/- 1.9) x 10**25 molecules/s (2.0 kg/s) assuming a kinetic gas temperature of 30K and Q(H_2O) = 1 x 10**28 molecules/s. A week earlier, on Sept. 7 when r = 2.33 AU, the authors measured Q(HCN) to be 1.5 (+/- 0.5) x 10**25 molecules/s, and in the month prior, on a roughly weekly cadence during which r = 3.29-2.45 UT, they obtained 3-sigma upper limits of between 0.7 and 1.2 x 10**25** molecules/s.

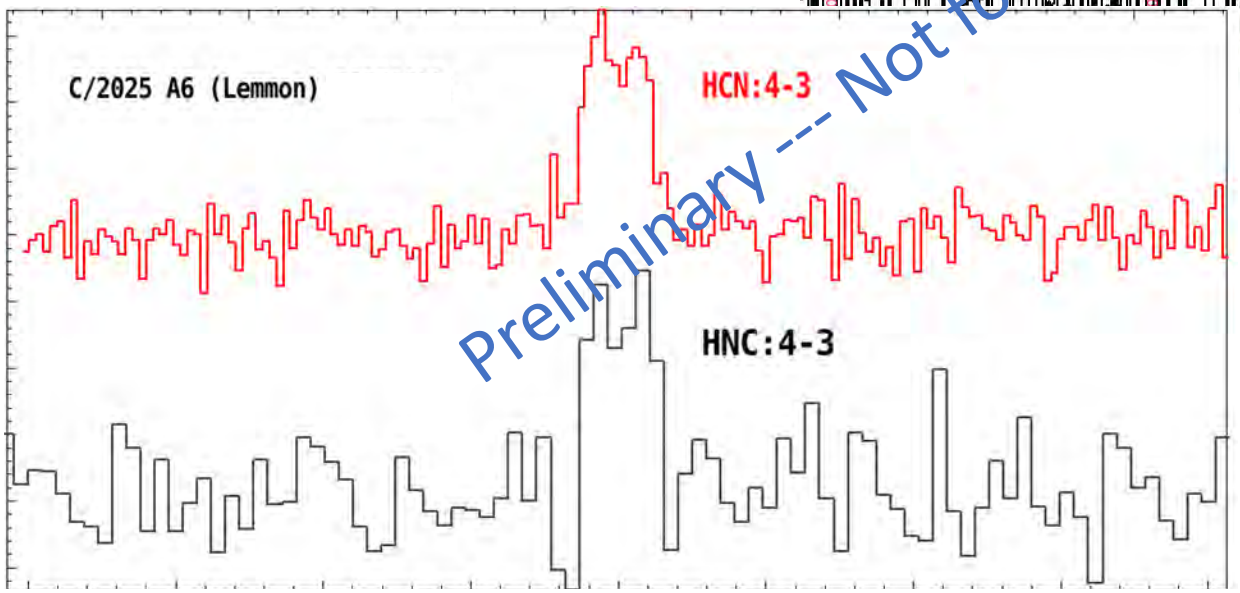
Further to CBET 5596, Twenty-one stacked 60-s CCD exposures taken by Hirohisa Sato at Sukagawa, Japan, with a 0.25-m f/4 reflector during July 28.55-28.56 UT showed a condensed coma about 11".5 in diameter of total mag 16.6. CCD exposures taken remotely on Aug. 9.45 by Hidetaka Sato (Tokyo, Japan) with a 0.51-m f/6.8 astrograph located at Siding Spring, NSW, show a strongly condensed coma 10" in diameter; the magnitude was 16.1 as measured within a circular aperture of radius 5".4. CCD exposures taken remotely by K. Yoshimoto (Yamaguchi, Japan) on Sept. 12.4 with a 0.51-m f/6.8 reflector located at Siding Spring show a diffuse outer coma 2'.2 in diameter and a condensed inner coma with a tail 1'.0 long in p.a. 103 deg; the magnitude was given as 14.1. CCD exposures taken by K. Kadota at Ageo, Japan, with a 0.25-m f/5 reflector yield the following total magnitudes: Aug. 19.44, 15.8; Sept. 1.43, 15.3; 14.42, 14.2.

NOTE: These 'Central Bureau Electronic Telegrams' are sometimes superseded by text appearing later in the printed IAU Circulars.

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Interstellar Chemistry! Comet Update from JCMT

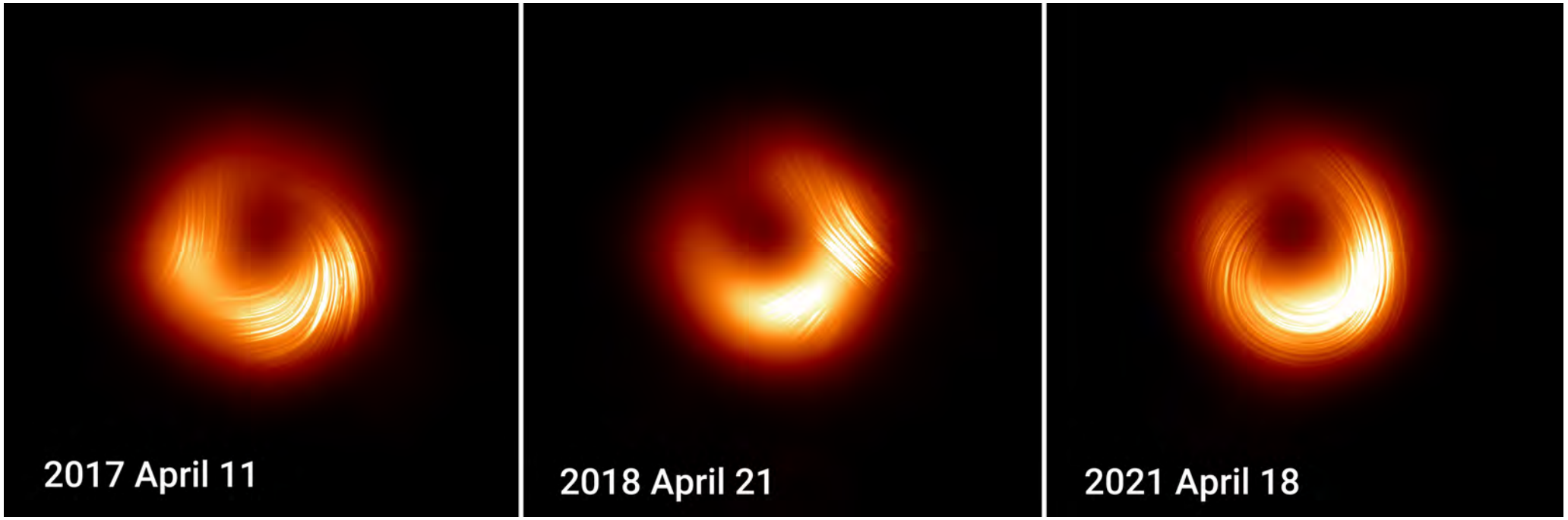




Preliminary --- Not for distribution

Kuan, Coulson, et al

EHT: 3 Years of M87 Polarimetric Imaging

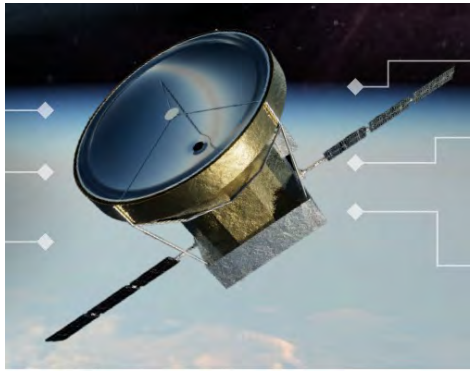


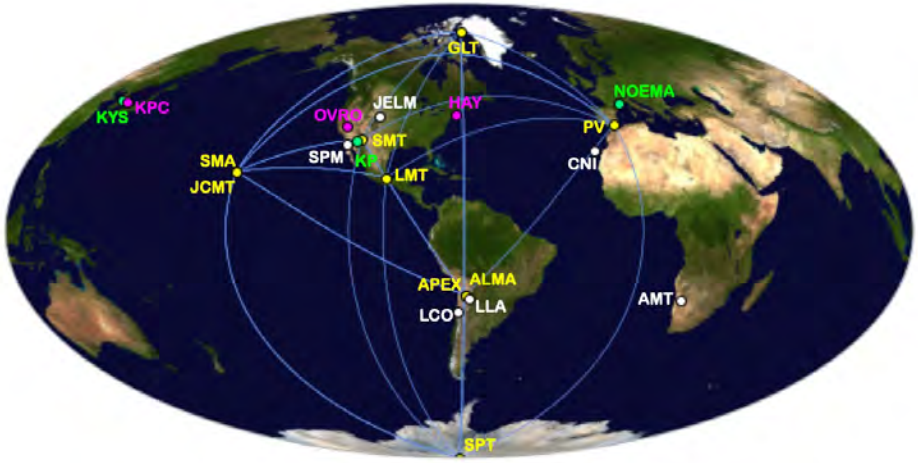
EHTC et al 2025

VLBI Opportunities

- Networks: EHT, EAVN, GMVA
- Test and exploit frequency phase transfer
- Explore high frequency capabilities
- Time domain campaigns
- Long-term: Space VLBI

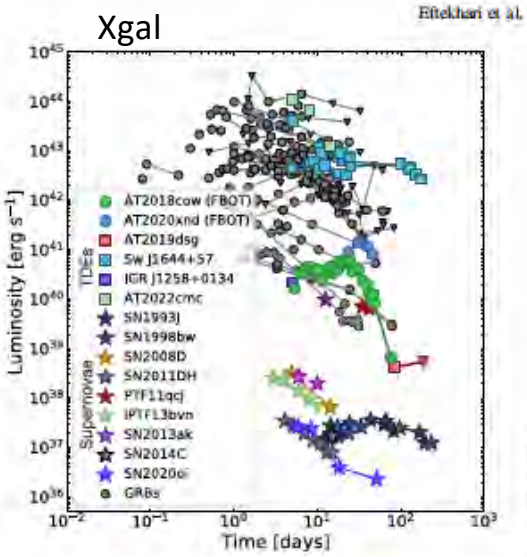


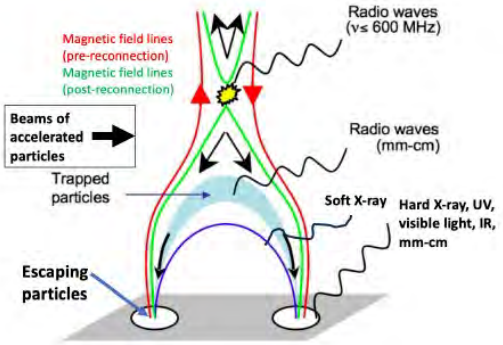


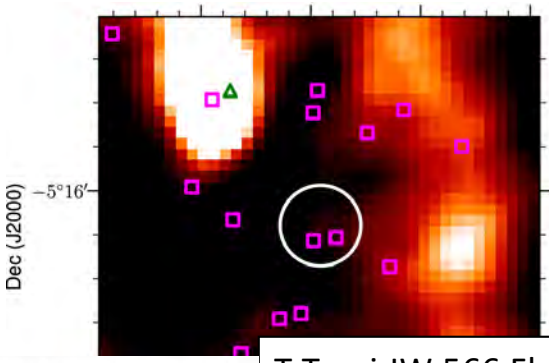


A Zoo of Millimeter Transients and Variables

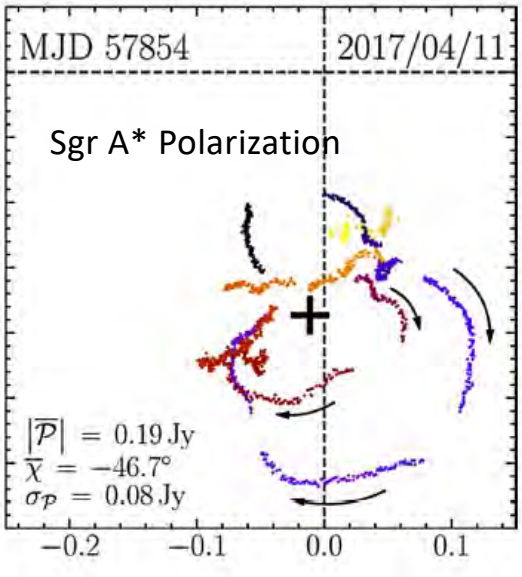
Xgal

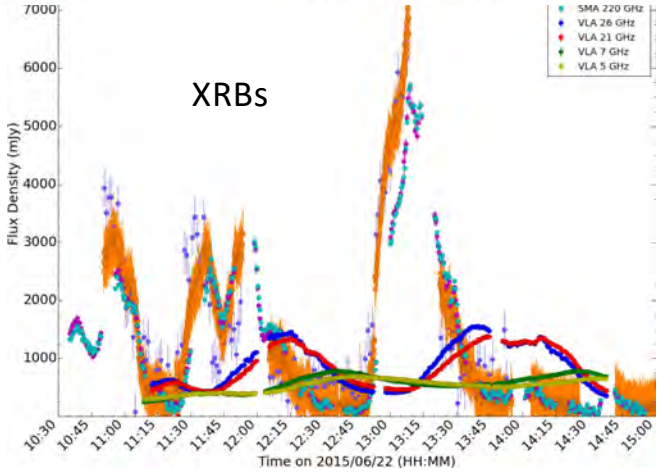




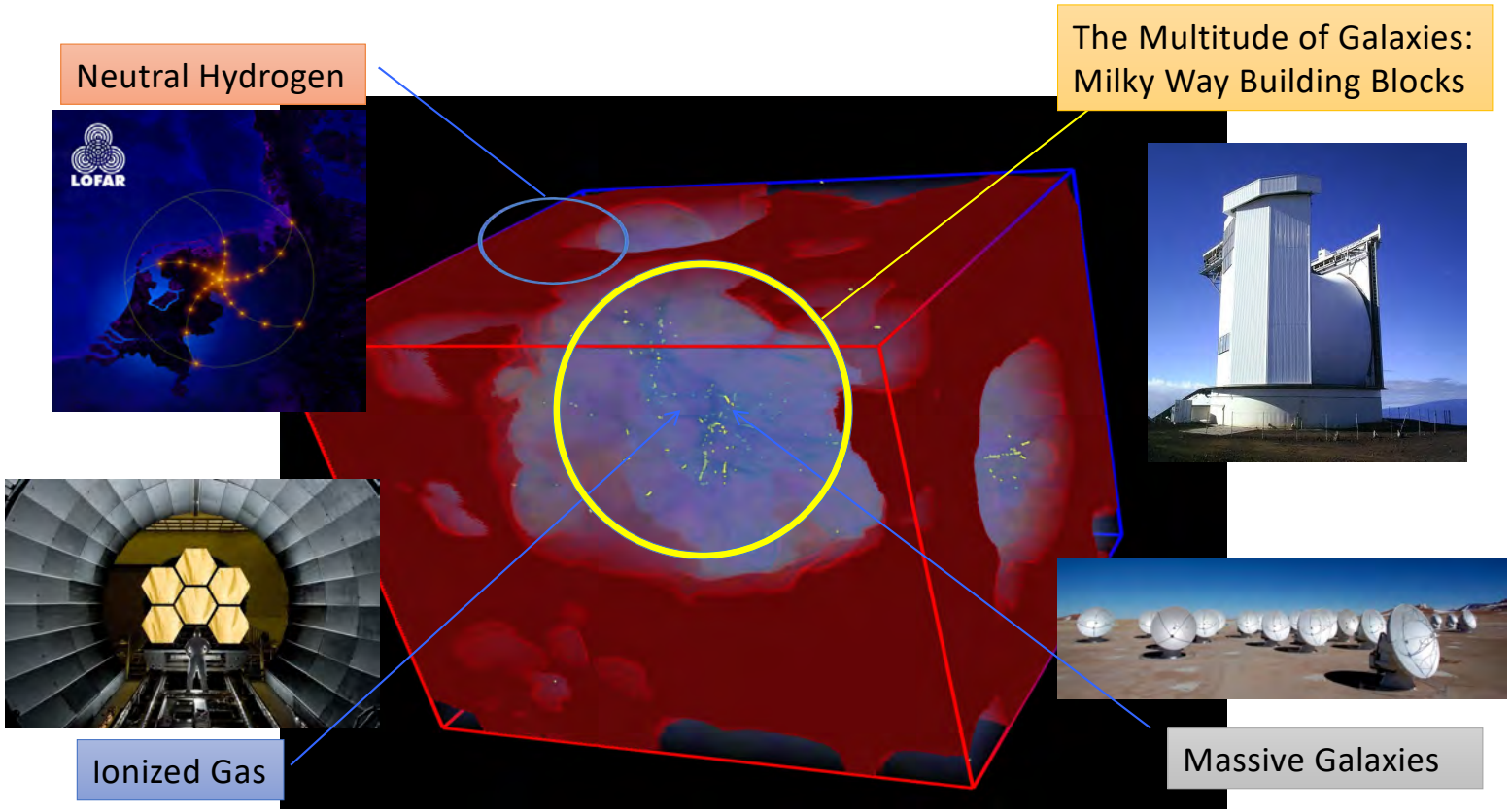


T Tauri JW 566 Flare (Mairs et al 2019)





Cosmic Dawn:
Multi-Pronged Approach with Intensity Mapping

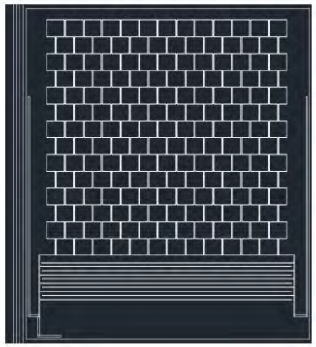


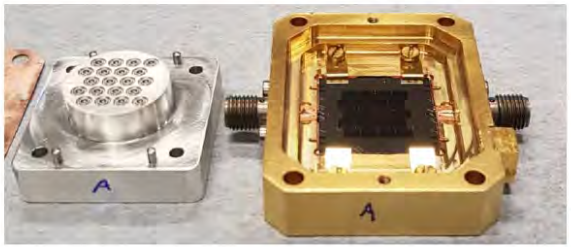
SCUBA-2 back in service – April 2025
Out of service - August 2025

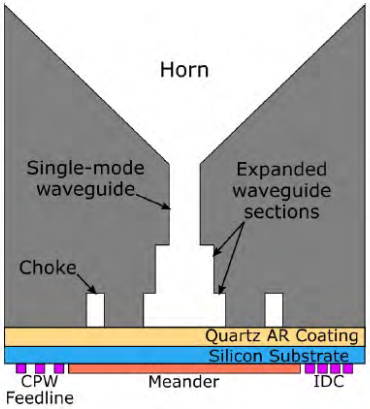


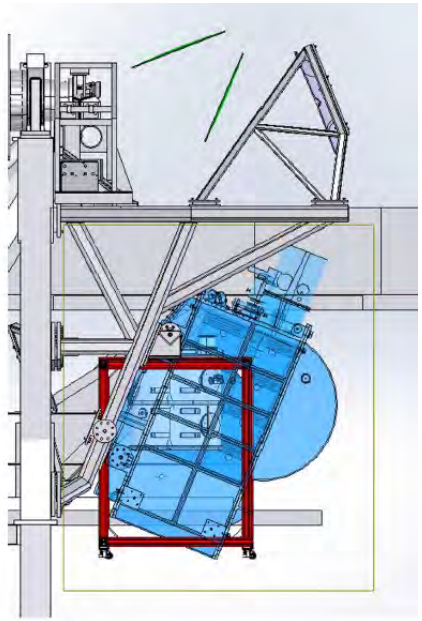
- Cryogenic maintenance brought SCUBA2 online but intermittently and at significant expense
- SCUBA2 observations are now paused
- We are considering to replace the 3rd (DR) Pulse tube – a complex operation
- We are exploring next generation MKIDS based detector arrays as upgrade for SCUBA2

An MKIDS Upgrade to SCUBA2

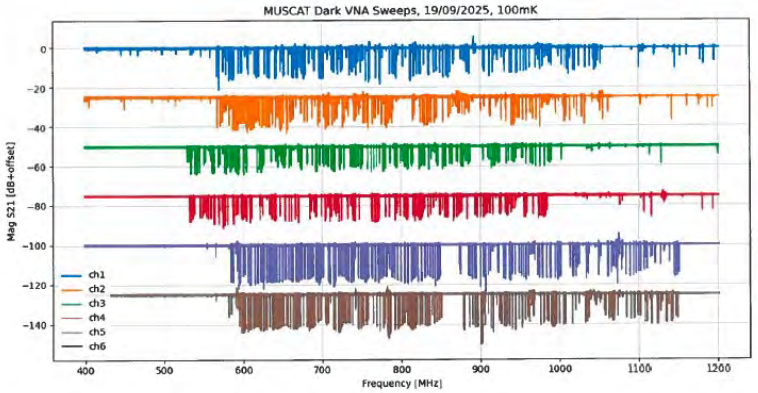








- Scalable architecture with modular focal planes
- 10x survey speed
- Multi-wavelength windows
- Chip on spectrometer technology
- Lower energy use and operating costs



JCMT Instruments: HARP and ACSIS

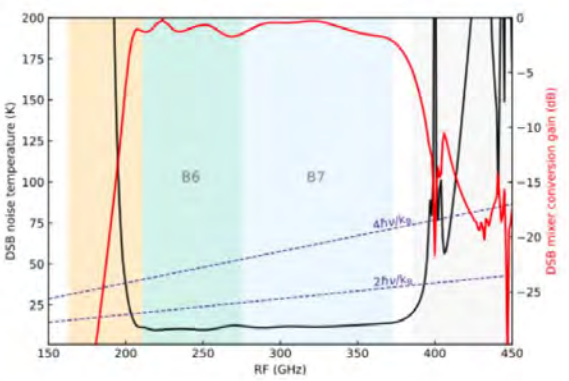
- Multipixel heterodyne camera
- 12 working receptors (out of 16)
- 325 – 375 GHz, SSB heterodyne receiver – 2GHz bandwidth
- ACSIS – a dedicated backend digital spectrometer





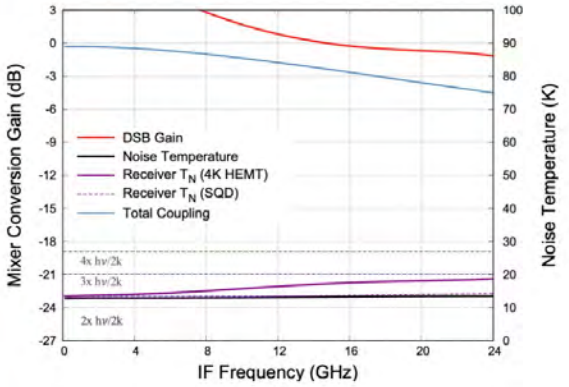
Potential HARP-2 Upgrade

- CARUSO-style modular receiver architecture
- Objective:
  - Improve from SSB to 2SB operation
  - 4x wider RF bandwidth
  - 8-12 GHz IF bandwidth
  - 2x better sensitivity
- Translate to 100x current HARP performance improvement
- Longer term: Compact 2SB mixer designs, if successful

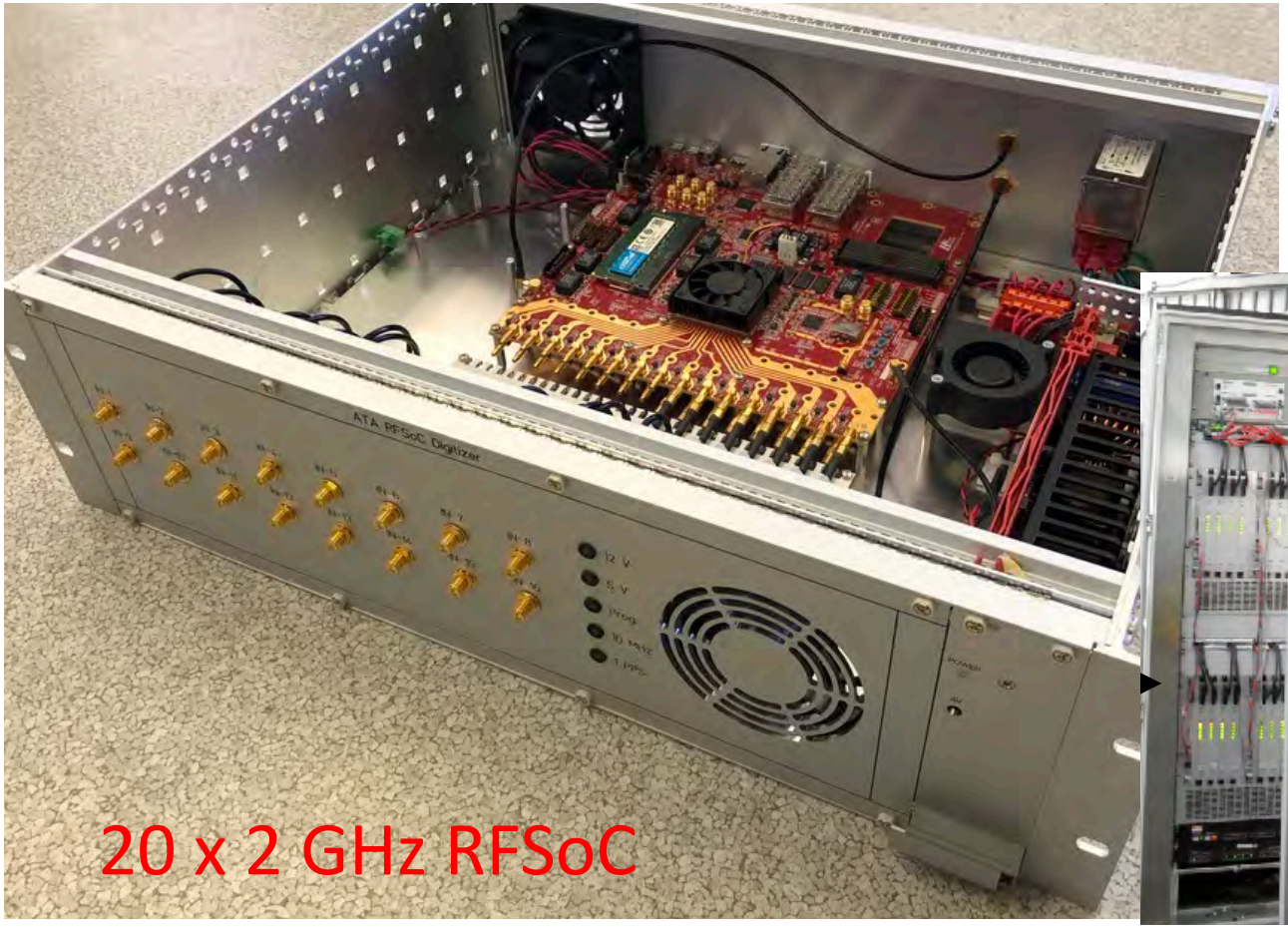








ACSIS Replacement Project





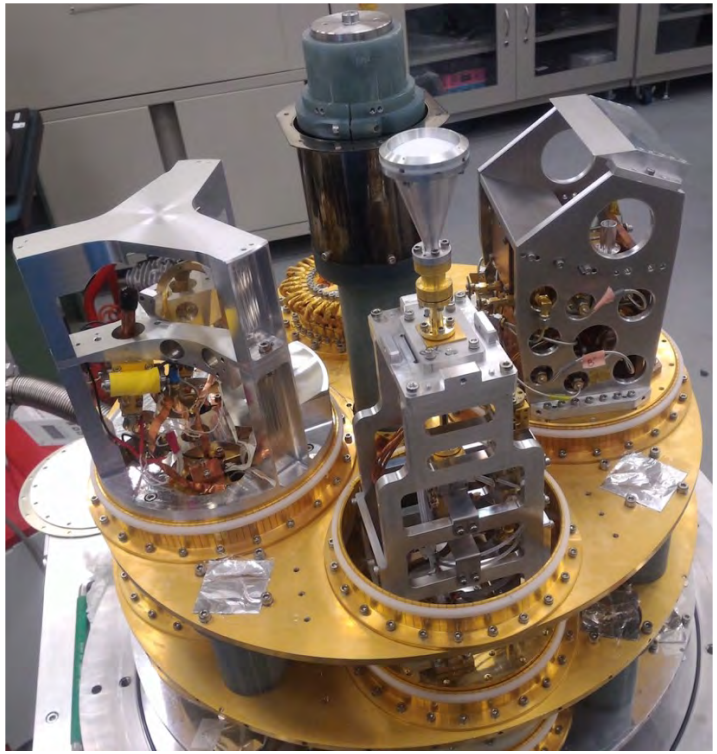
Namakanui
Single-pixel heterodyne receiver system

- On loan from the Greenland Telescope (GLT).
- 3 ALMA style receiver cartridges.
  - Band 3 (86GHz)
  - Band 6 (230GHz)
  - Band 7 (345GHz) or Band 9 (690GHz)
- VLBI & single-dish science

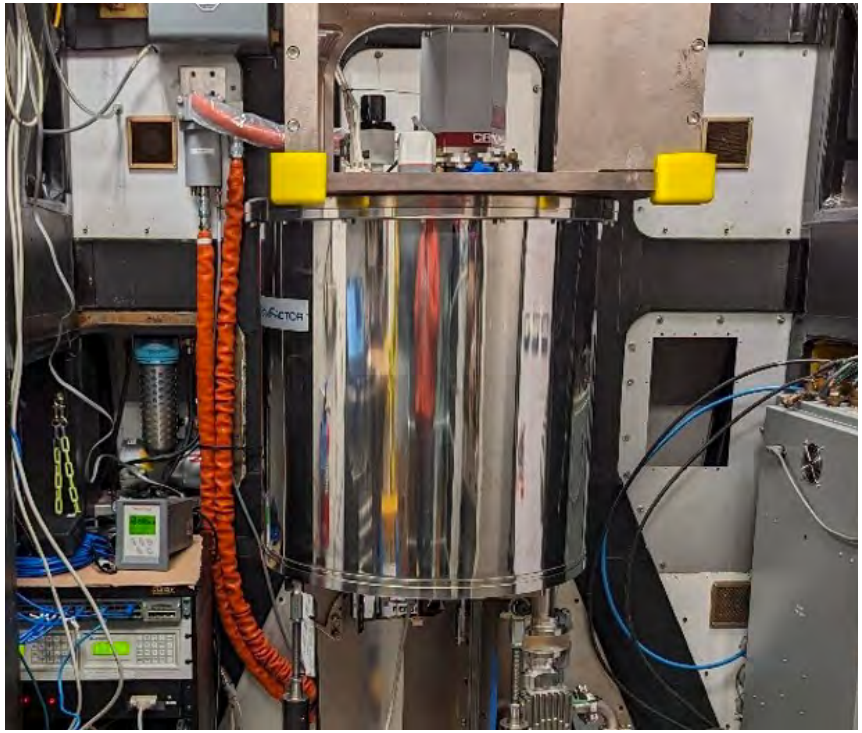


FPT Technologies at JCMT

Tri-band Namakanui Receiver



wSMA Cryostat

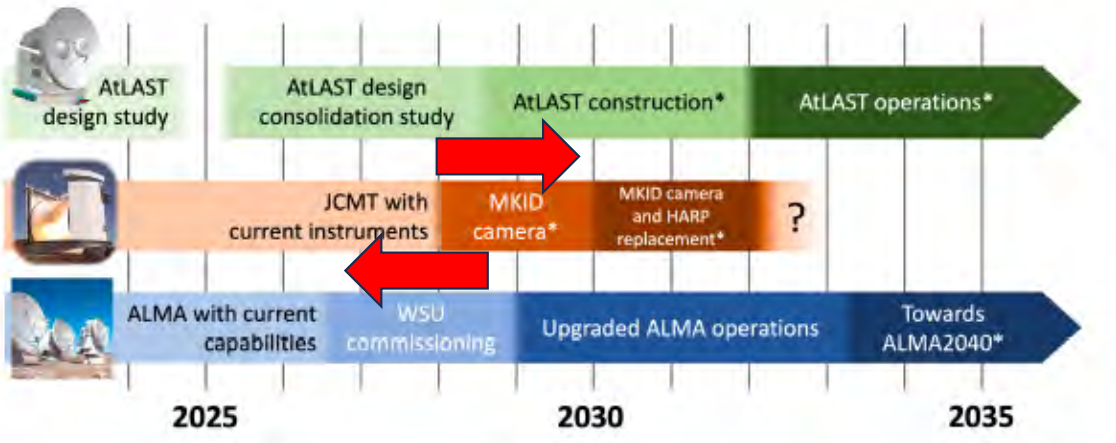




"A whole field of astrophysics essentially founded by the UK, and where the UK leads in both science and instrumentation"

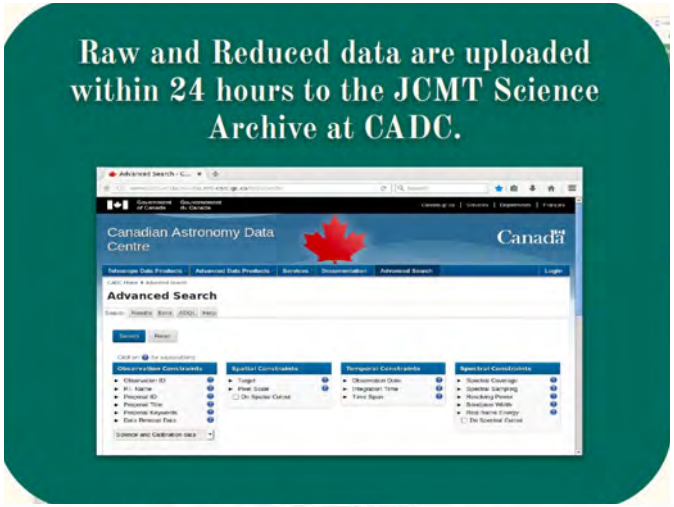
K. Pattle[1], P. S. Barry[2], A. W. Blain[3], M. Booth[4], R. A. Booth[5], D. L. Clements[6], M. J. Currie[7], S. Doyle[2], D. Eden[8], G. A. Fuller[9], M. Griffin[2], P. G. Huggard[7], J. D. Ilee[5], J. Karoly[1], Z. A. Khan[1], N. Klimovich[10], E. Kontar[11], P. Klaassen[4], A. J. Rigby[5], P. Scicluna[12], S. Serjeant[13], B.-K. Tan[10], D. Ward-Thompson[14], T. G. Williams[10], T. A. Davis[2], J. Greaves[2], R. Ivison[15,16,17], J. Marin[9], M. Matsuura[2], J. M. C. Rawlings[1], A. Saintonge[1], G. Savini[1], M. W. L. Smith[2], and D. J. Taylor[18]

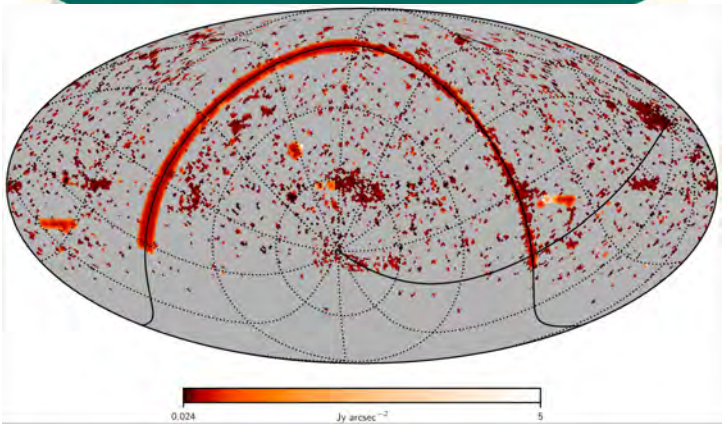
on behalf of the UK Submillimetre and Millimetre Astronomy Community



How Can I Get Involved?

- Analyze archival data
- Write a proposal
- Join a large project
- Join an instrumentation project
- Visit the JCMT







JCMT – largest single dish submillimeter telescope

The best Northern hemisphere site for submm science

Established and strong ongoing science cases with widefield mapping

New opportunities in VLBI, Time Domain, and Intensity Mapping

New instruments will keep JCMT science on the forefront

The EAO & JCMT are transforming



James Clerk Maxwell Telescope
East Asian Observatory