



JCMT Instrument Future

Status and Drivers



A year into EAO

- 12 months into EAO operation of JCMT
- 5 Calls for Proposals
- All instruments operational
- Large Programs underway: 690 scientists from EAO regions and JCMT partners participating
- Oversubscription rates $> 5x$
- Pol-2 commissioning near completion



Science stats

- 84 papers in 2015 - dip from previous years (~100 in 2013/14)
- PI time awards: 60% SCUBA-2, 30% HARP, 10% RxA - still low demand for poor weather
- Large Programs - only one HARP program (nearby galaxies) awarded time.
- Mapping speeds too low for large-scale surveys in both continuum and heterodyne to be time/cost-effective
- Small-sample science makes up most of the programs



Instrument status

- RxA - new mixer installed (Dec 2015), super insulation has improved hold-time and cryogen usage.
- HARP - 14 mixers operational, no remaining spare mixers (ASIAA working on this), no LO power <330GHz - new tripler ordered to potentially solve this
- ACSIS - baseline issues, stability/performance issues currently intermittent
- SCUBA-2 - aging compressors, helium traps add to cost



Mapping speeds and sensitivities

- SCUBA-2: 95 hrs (70% trans - band 2) to get to a 0.5 degree map to 0.7mJy confusion limit at 850um
- SCUBA-2: 8000 hrs (!!) (40% trans - band 1) to get a 0.5 degree map to 0.5mJy confusion limit at 450um
- Pol-2: 57hrs (70% trans - band1) to get to 3' map to 2mJy at 850um
- HARP: 46hrs to get CO(3-2) 345GHz 1 degree map (50% trans - band 3) at 0.2K rms (1GHz band)
- HARP: 113hrs to get H2D+ 372GHz 1 degree map (70% trans - band 1) at 0.2K rms (1GHz band)



Current limitations

- Simply put, the wide-mapping components of the science drivers for HARP and SCUBA-2 remain unachieved, 8 and 5 years past commissioning, respectively
- Continuum - cosmology - unbiased surveys to the confusion limit require > 2000 hours of time
- Heterodyne - large-scale mapping is limited to CO(3-2) and has been de-scoped and/or lower priority in all but the poorest weather
- The ACSIS backend is obsolete and doesn't offer wide bandwidth options with HARP



JCMT advantages

- IRAM 30-m and LMT have the advantage of resolution at $>1\text{mm}$ wavelengths
- APEX, and ASTE (and GLT?) while smaller, have better sites for 690GHz (450 μm)
- JCMT has the best resolution and site for 345GHz (850 μm) - with no current contenders for the role



Science drivers

- SCUBA2/3 - cosmology surveys need to be unbiased, and deeper, nearby galaxies need faster mapping to get better sample size
- VLBI - needs dual-polarisation, 4GHz backend each polarisation, 230 (and 345?) GHz
- 230GHz - nearby galaxies would love a small array to increase sample size, multiple science goals for a wide backend (>8GHz)
- Large format 345GHz (48,64 or more pixels) - large-scale, multi-wavelength surveys of the galaxy, wide backend options for nearby galaxies

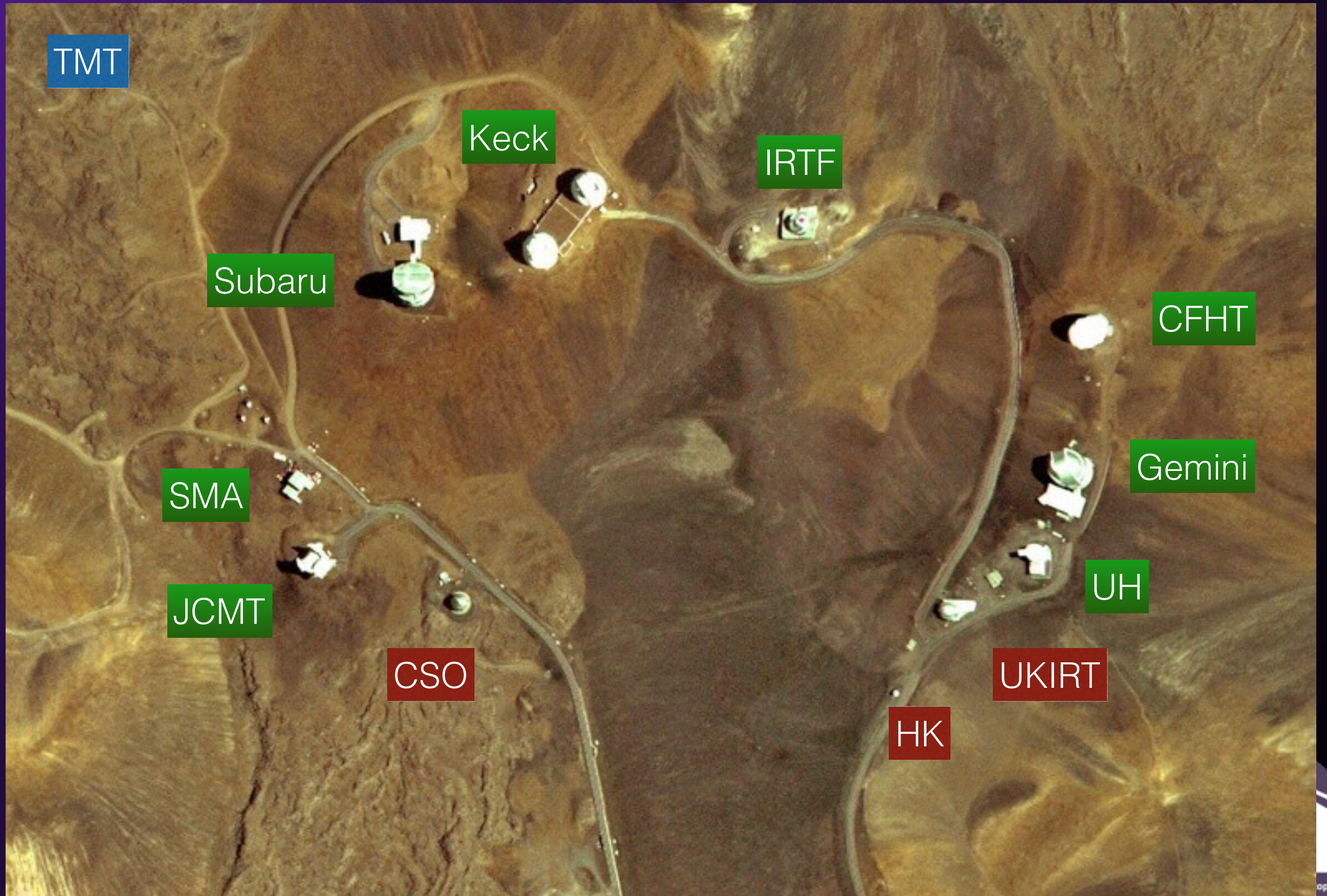


Timeline

- Pol-2 puts key new science in grasp in next two years
- but sensitivities mean it will be time-consuming observing
- The UK would like a new instrument program commitment as a driver to remain in the partnership
- EAO regions have the resources and this is a good pathfinder for larger-scale collaborations
- Maunakea politics makes showing that the JCMT has a longer-term (>5 year) future plan critical



Maunakea



Goals for this meeting

- In order of time criticality:
 - A panel opinion on the science/engineering feasibility of Gismo-2 for JCMT
 - Selection by panel of best design options for new 230GHz receiver
 - Preliminary opinion on best path forward for upgrades to SCUBA-2
 - Decision on whether to solicit a case/design study for a large format heterodyne array



Reference documents

- JCMT 2020
- JCMT current instrument status
- Gismo-2 MSIP
- Time-Pilot proposal
- Notes on heterodyne receivers
- EAO Data Reduction policy overview
- Can be found in Intstrument project google driver folder



Monday 7th

Agenda

Tuesday 8th

- 9:00 am: Introduction - Paul Ho
- 9:05am: JCMT Current status and overview - J Dempsey
- 9:50 am: Pol-2 commissioning update - P Friberg
- 10:15 am: 230GHz new receiver options - M.T. Chen
- 10:45am: Morning tea break
- 11:15am: Large-format 345GHz array possibilities - R Hills
- 11:45am: Correlator back-end upgrade options - P Friberg
- 12:00pm: Lunch followed by tour of the ASIAA laboratories
- 1:30pm: SCUBA-2: Current status and issues - D Bintley
- 2:15pm: SCUBA-2 upgrade options - D Bintley/W Holland
- 3:00pm: SCUBA-2 discussion
- 3:30pm: Afternoon coffee/tea break
- 4:00pm: Gismo-2 talk
- 4:15pm: Time-Pilot talk
- 4:30pm: Gismo-2/Time-Pilot discussion.

- 9:00am: Regional capabilities (15 min each)
 - China (Sheng-cai Shi),
 - Taiwan (Ming-Tang Chen),
 - Japan (Satoru Iguchi),
 - South Korea (Jung-Won Lee),
 - UK (Gary Fuller),
 - Canada (Scott Chapman)
- 10:30 am: Morning coffee/tea break
- 10:45 am: Discussion on short-term issues (Gismo-2, Time-Pilot, 230GHz, other)
- 12:00pm: Lunch
- 1:00 pm: Longer-term instrument development program (large continuum arrays, large-format heterodyne arrays, redshift engines, other)
- 2:30pm/3:00pm: Afternoon coffee/tea break
- 3:15 pm: Conclusions and drafting of report for JCMT Board, planning for future work for the panel.

