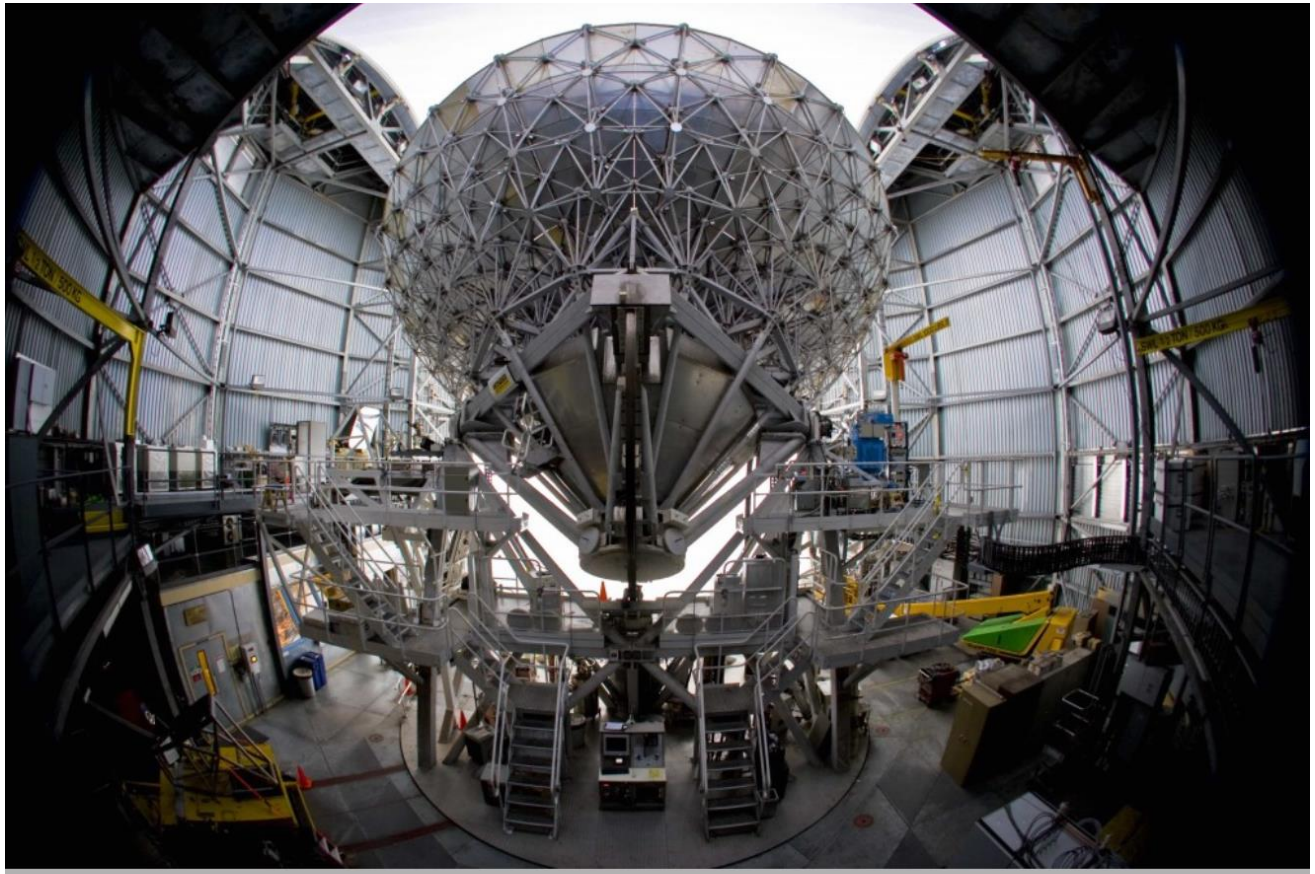
15m James Clerk Maxwell Telescope (JCMT)

The JCMT on Mauna Kea.

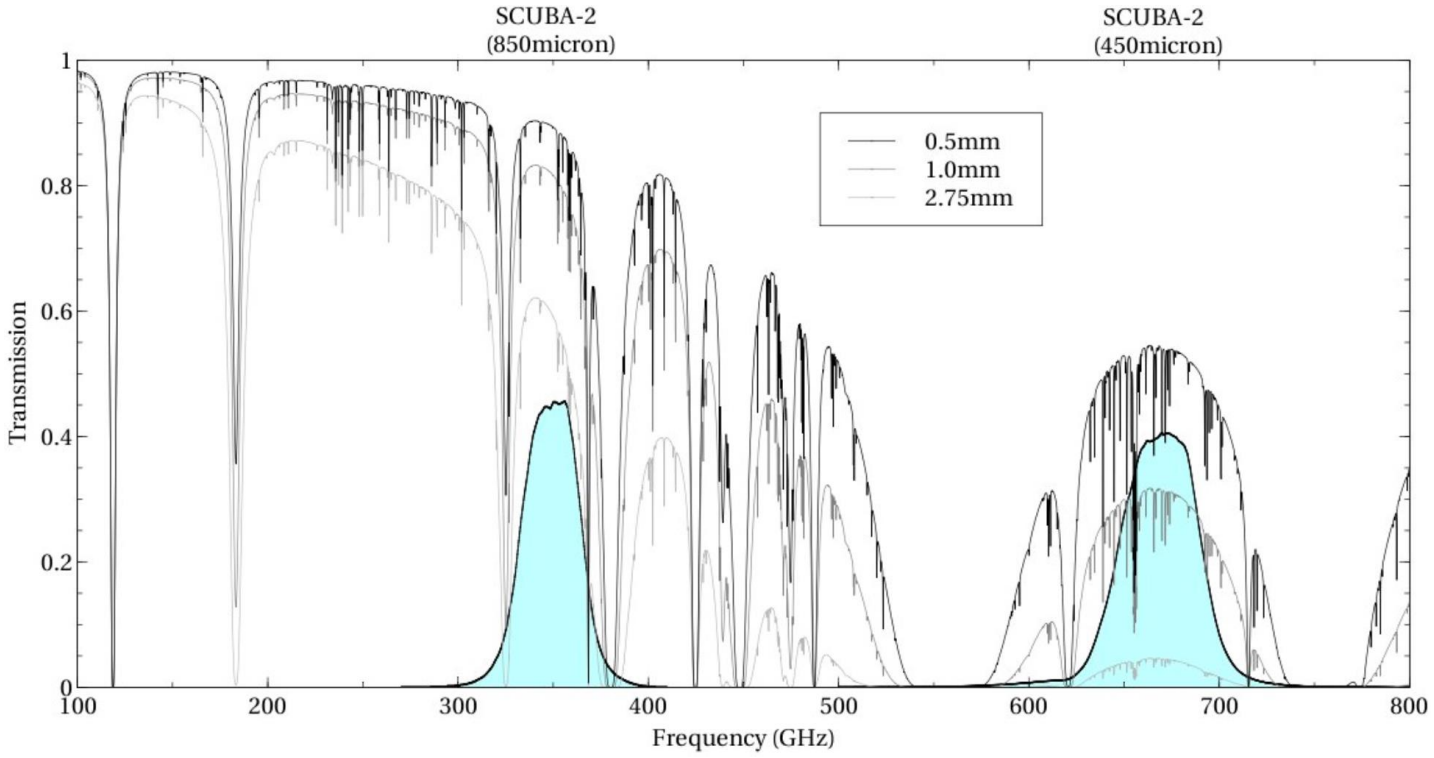


The JCMT looks upward and outward.

Surface accuracy : 24 micron
Pointing accuracy : 2 arcsec in Azimuth and Elevation

Continuum Instrumentation

- 5120 bolometers (4 sub arrays x 1280 bolometers) at each wavelength band.
- Currently about 3500 bolometers are working at each wavelength band.
- The main beam size of SCUBA-2 : 7.9 arcsec at 450 micron
  13.0 arcsec at 850 micron.



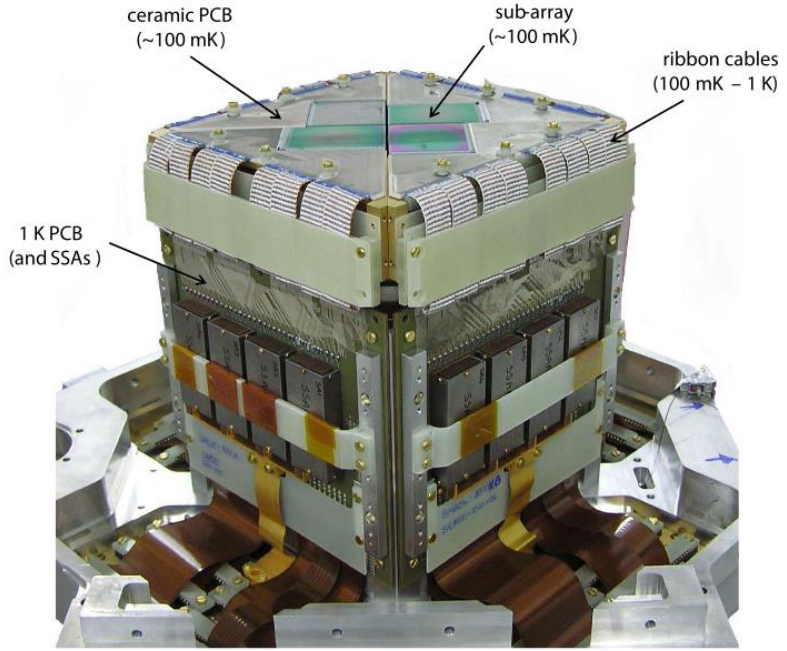
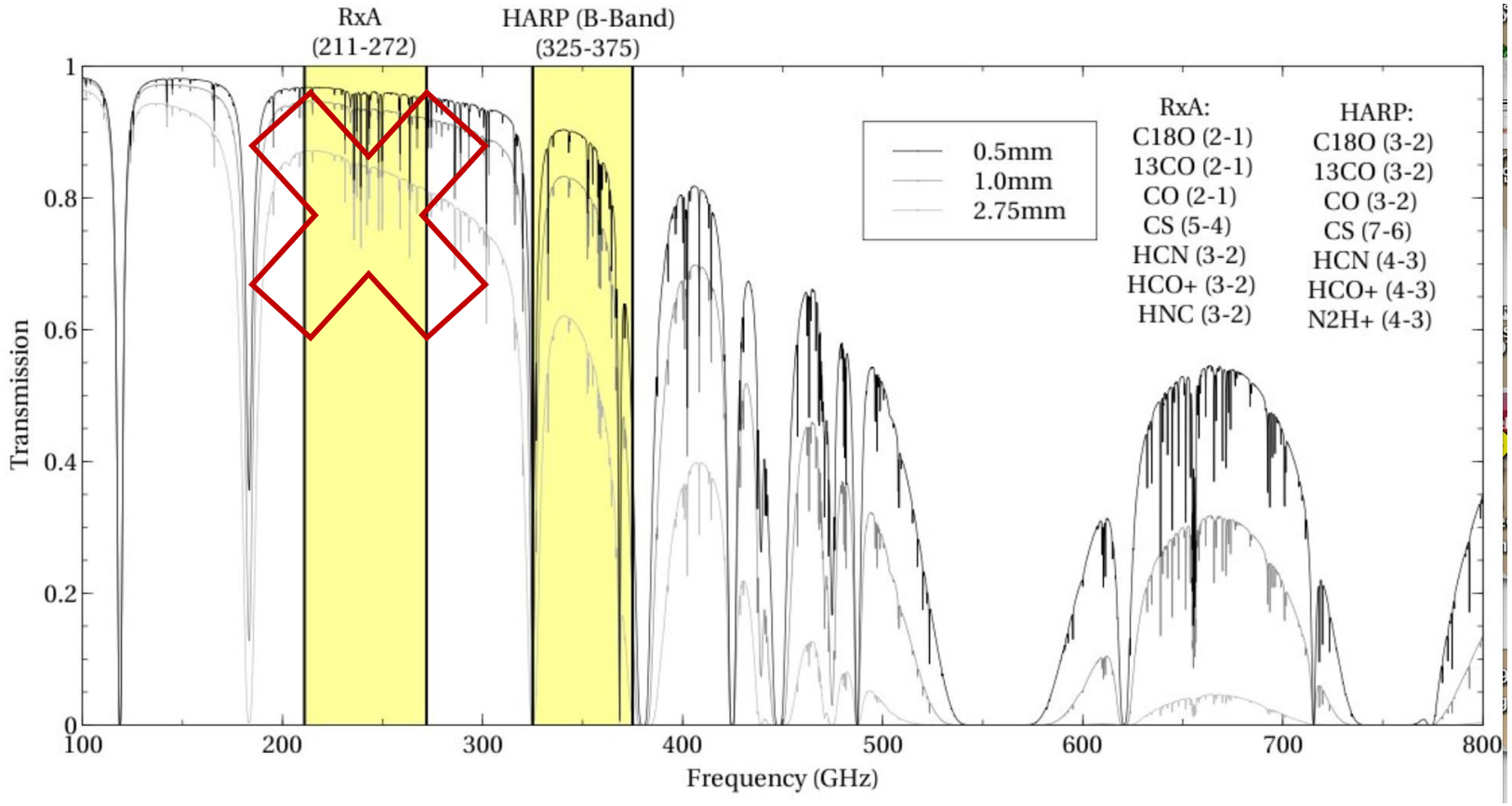


Figure 8. Photograph of four sub-array modules folded into position in a focal plane unit. The principal components are highlighted.

Holland et al. 2013

Heterodyne Instrumentation

- 325 – 375 GHz 16 detector SSB SIS array receiver
- 14 of the 16 receptors (detectors) are operational: H13 and H14 are not operational.
- The largest square fully sampled field of view with a HARP jiggle map is currently 1.5′x1.5′.



JCMT Large Programs

(50% of observing time from December 2015 until January 2019)

http://www.eaobservatory.org/jcmt/science/large-programs/

- A Transient Search for Variable Protostars
- SCOPE: SCUBA-2 Continuum Observations of Pre-protostellar Evolution
- BISTRO: B-fields In STar forming RegiOns

- **MALATANG: Mapping the Dense Molecular Gas in the Strongest Star-forming Galaxies**
- **JINGLE: the JCMT dust and gas In Nearby Galaxies Legacy Exploration**
- **S2-COSMOS: An EAO SCUBA-2 survey of 1,000 SMGs in the COSMOS field**
- **STUDIES: SCUBA-2 Ultra Deep Imaging EAO Survey**

JCMT Archive Data

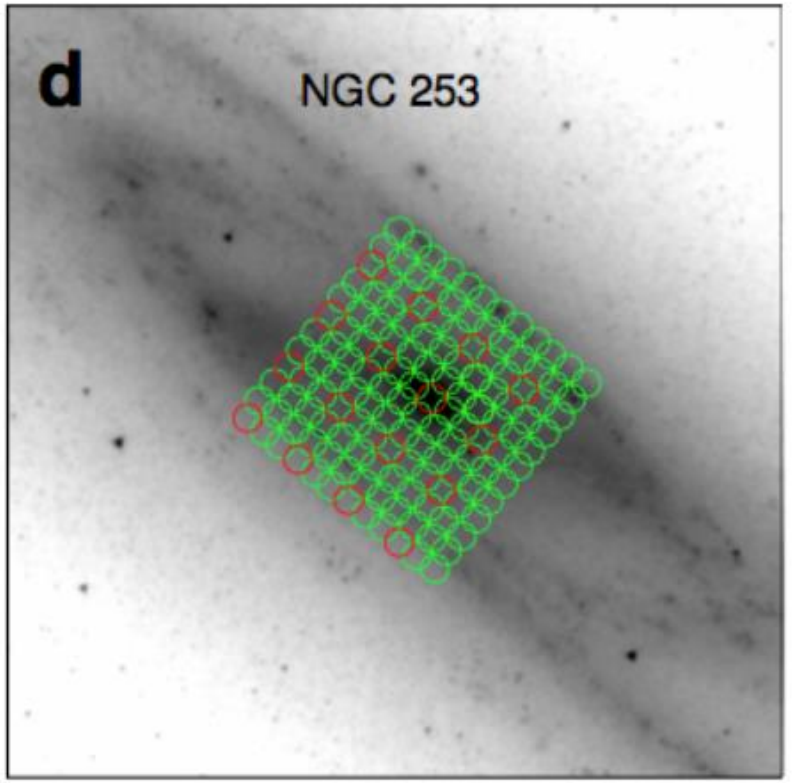
http://www.eaobservatory.org/jcmt/science/archive/guide

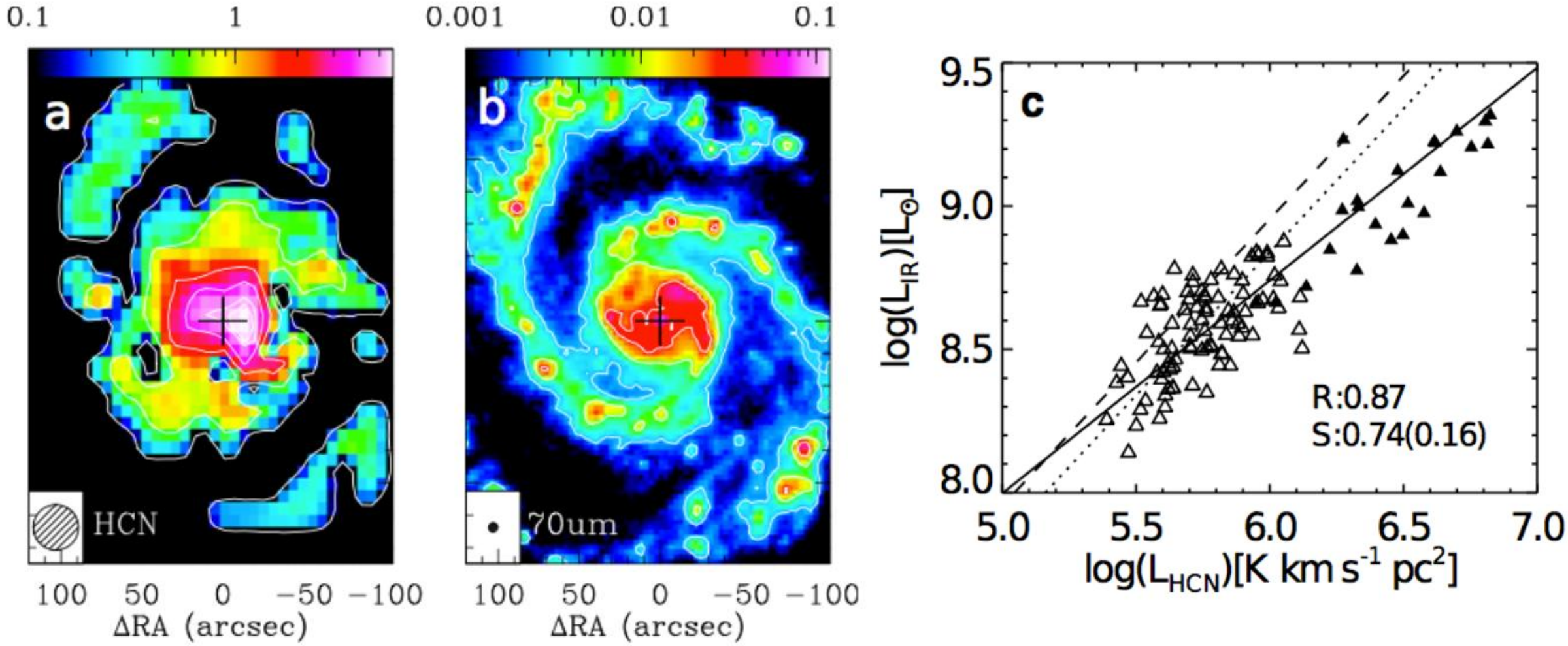
http://www.cadc-ccda.hia-iha.nrc-cnrc.gc.ca/en/jcmt/

MALATANG:

MApping the dense moLecular gAs in the sTrongest stAr-formiNg Galaxies

- **390 hours**
- heterodyne array HARP-B
- **HCN and HCO+ J = 4 − 3** line emission in **23 of the nearest, IR-brightest galaxies beyond the Local Group.**
- Sensitivity = 0.3 K km s^{-1}(~ 4.5 × 10^6 M⊙) at linear resolutions of 0.2 − 2.8 kpc.



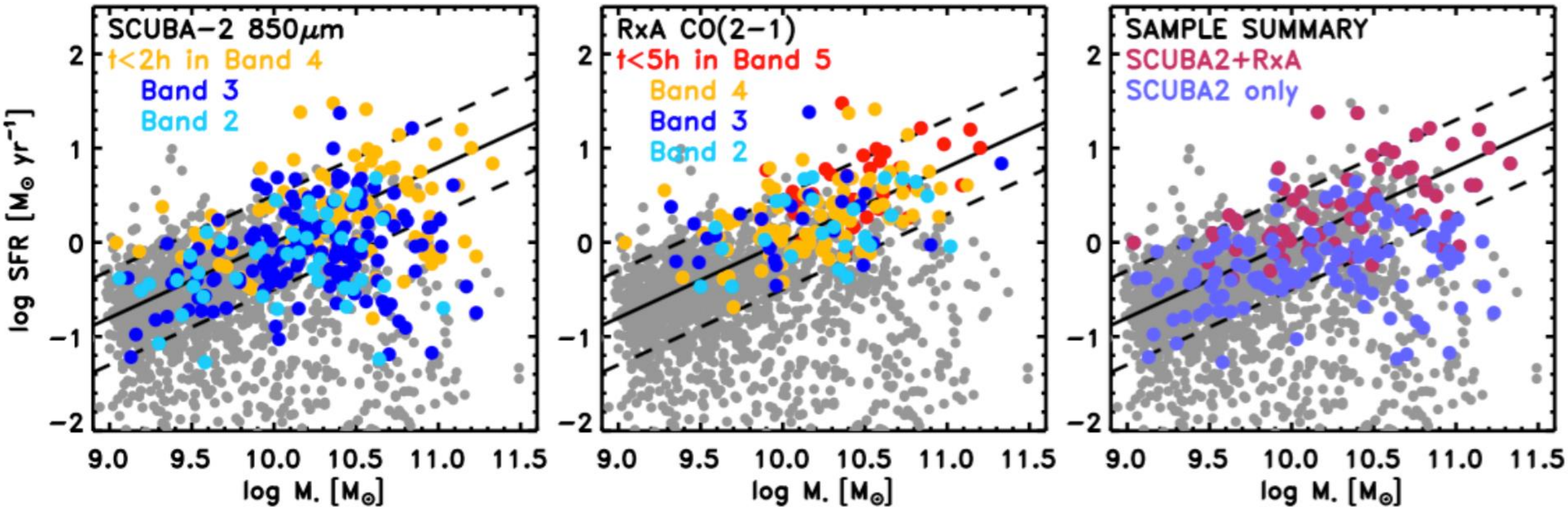


The resolved LIR – L′HCNJ=1-0 relation observed towards M 51, with each symbol representing a region ~1 kpc in size. The solid and dashed lines show the best log-linear fits to the nuclear (filled triangles) and disk (open triangles) regions combined and to the disk regions only, respectively.

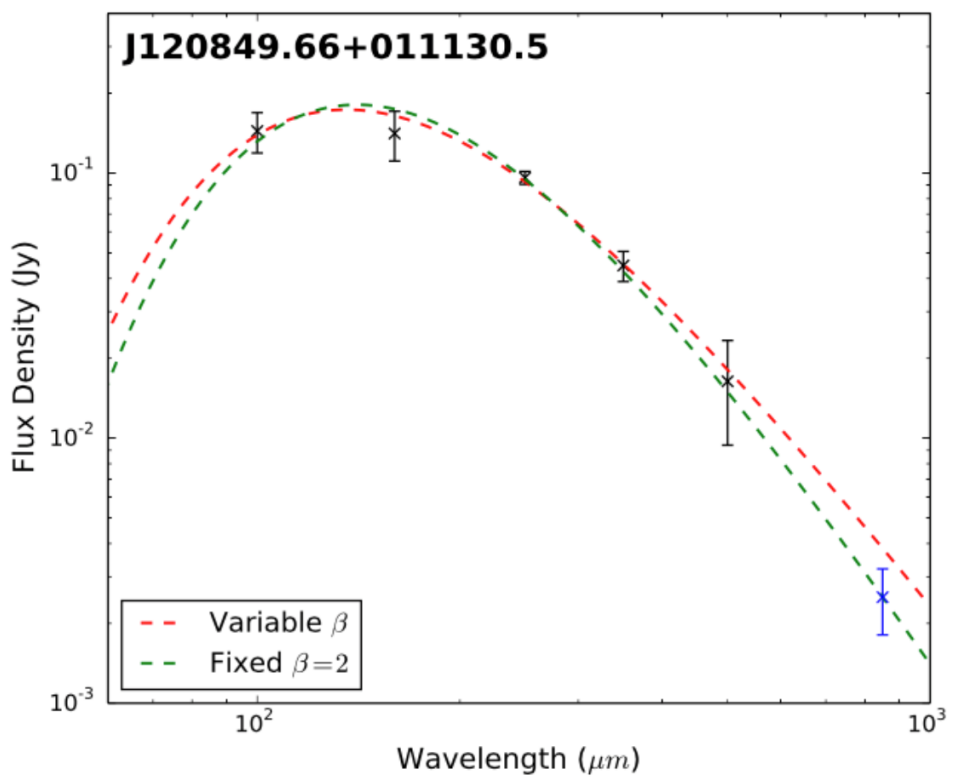
JINGLE: The JCMT dust and gas In Nearby Galaxies Legacy Exploration – A new local galaxy evolution legacy survey

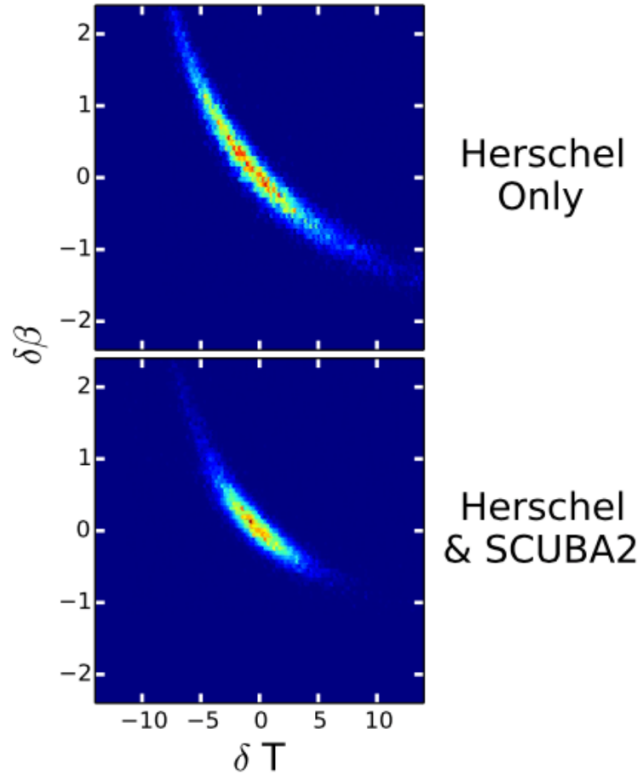
- **780 hours**
- **850μm continuum of 190 Herschel-selected galaxies**
  + CO(2-1) for a subset of 75 of these galaxies.

The galaxies are selected in fields targeted by MaNGA optical integral-field spectroscopic observations, which are also fields with Herschel/SPIRE photometry from the H-ATLAS survey and coverage from upcoming, new, blind interferometric HI surveys.



A summary of our final sample selection, including 190 galaxies for SCUBA-2 observations (magenta and blue symbols), 75 of which will also be targeted by RxA for CO(2-1) (magenta symbols).





Herschel Only

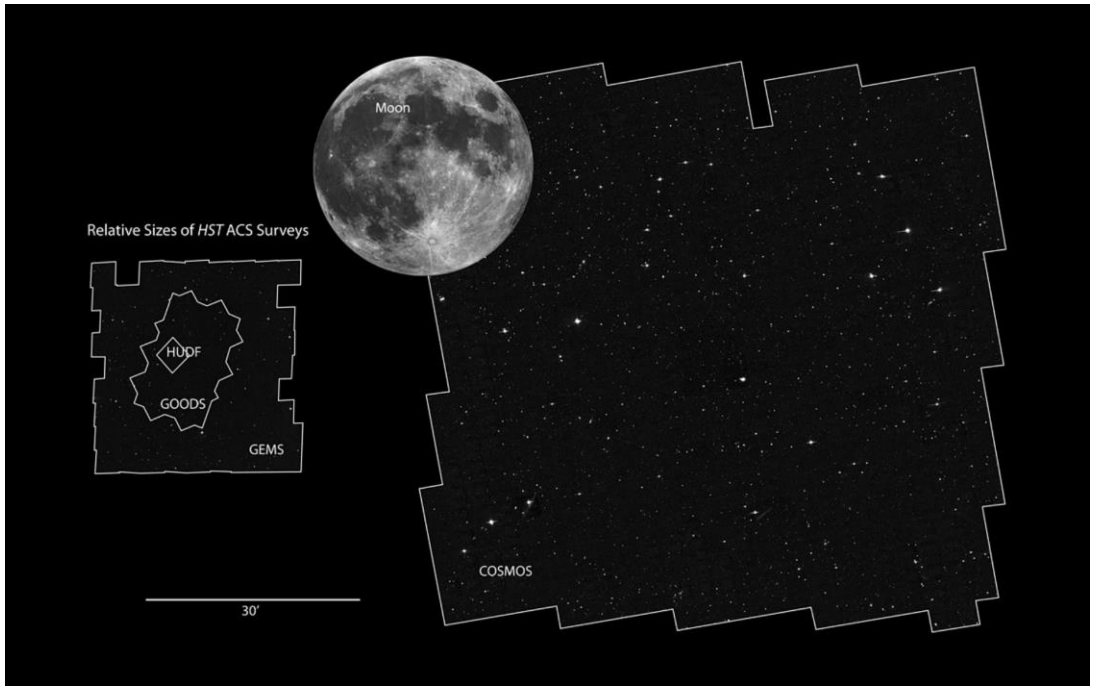
Herschel & SCUBA2

- Determining dust emissivities β and looking for systematic dependencies of on global galaxy properties such as metallicity, stellar mass or SFR.
- Deriving scaling relations between dust mass and global galaxy properties.
- Studying the dust-to-gas mass ratio to establish if and how it varies as a function of stellar mass, metallicity, SFR
- Investigating the correlation between total cold gas and dust masses and spatially-resolved
- quantities from the MaNGA observations

S2-COSMOS:

A SCUBA-2 survey of 1,000 SMGs in the COSMOS field

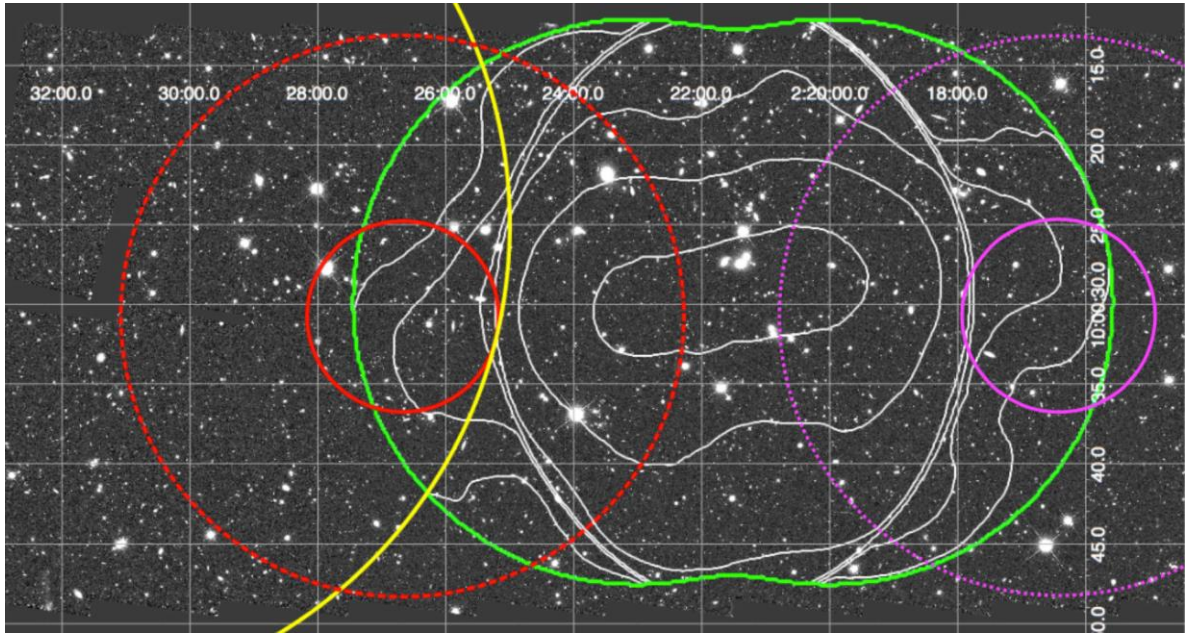
223hr EAO Large Program on JCMT whose goal is to create the largest, contiguous deep **850μm map of the extragalactic sky – in the 2 square degree COSMOS field**.



Our goal is to obtain a sample of ~1,000 submillimetre sources in this field to a flux limit of 4.5mJy (corresponding to a bolometric luminosity of 5e12Lo).

STUDIES: SCUBA-2 Ultra Deep Imaging EAO Survey

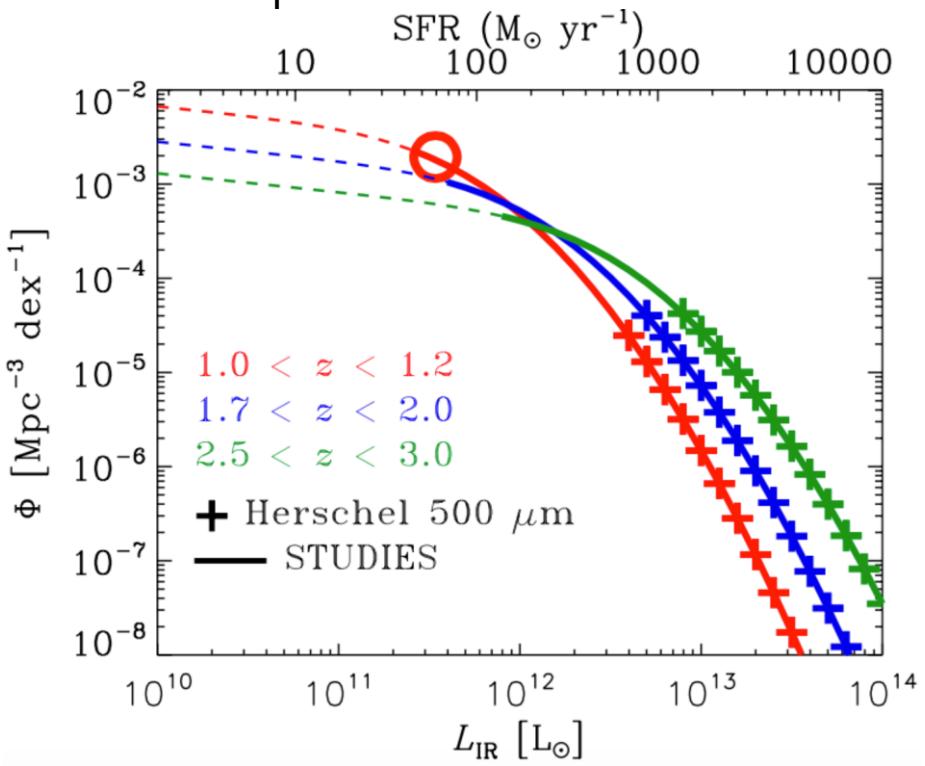
330 hours
SCUBA-2 continuum at 450 μm image in the COSMOS-CANDELS region
The goal is to **detect the typical members in the dusty galaxy population** that gives rise to the far-IR extragalactic background light, and to study the far-IR properties of the optically selected galaxy populations.



Proposed pointing of STUDIES (red circles). The large yellow circle indicates the primary beam of the ultra deep (rms ~ 0.5 μJy) VLA S-band survey (PI: J. Hodge). The background picture is the CANDELS WFC3 F160W image. North is left. **The Green contour indicates the final area coverage of the two Daisy pointings in the S2CLS.** The inner (solid) red circle indicates the central D = 3′ region where STUDIES will reach an rms of 0.57 mJy. The outer (dashed) red circle indicates the outer area of the Daisy map where the sensitivity is $\lesssim$ 1 mJy.

be the deepest 450 μm image ever taken, ~ √2× deeper than the S2CLS and 10× deeper than the deepest Herschel images at 350 μm and 500 μm more than triple the area with σ 450μm < 0.85 mJy previously achieved by S2CLS in the COSMOS field detect ~ **300 450 μm sources**, and even more when combined with the S2CLS map

This will provide a more **complete census of dust obscured star formation and AGN activity in the key epochs of the growths of galaxies and supermassive black holes, ~ 2 Gyr after the Big Bang**, on comoving scales
of > 20 Mpc.



Sensitivity forecast for STUDIES. Curves are FIR luminosity functions of galaxies at z < 3, extrapolated from Burgarella et al. (2013). The crosses mark the luminosity range probed by confusion limited Herschel surveys at 500 μm, assuming the Td–LIR relation in Symeonidis et al. (2013). The solid portions of the curves indicate the luminosity range probed by STUDIES, assuming the same Td–LIR relation. The red circle indicates the size of the predicted 1-σ error for the STUDIES luminosity function at z ~ 1 in the lowest luminosity bin (ΔLIR = 0.5 dex).

SCUBA-2 Cosmology Legacy Survey

first large samples of extragalactic sources selected in the 450- and 850-μm wavebands.

1) a 0.7-mJy rms **850-μm survey of around 35 square degrees**, sufficient to map either the accessible SWIRE Spitzer survey regions or other similar-sized regions with comparable supporting data;
2) a deeper survey undertaken in the best conditions to obtain **450-μm** coverage to 0.5-mJy rms of **1.3 square degrees in the GOODS fields, UKIDSS UDS and COSMOS regions.**

To get sufficient sample of submillimetre population (to constrain galaxy formation models) and to detect and study the (rare) progenitors of rich clusters. Both of these goals require survey areas of 10’s of square degrees.