A sub-mm SDSS with the Atacama Large Aperture Submillimetre Telescope

The future of long wavelength, large scale sky surveys

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on behalf of the AtLAST collaboration

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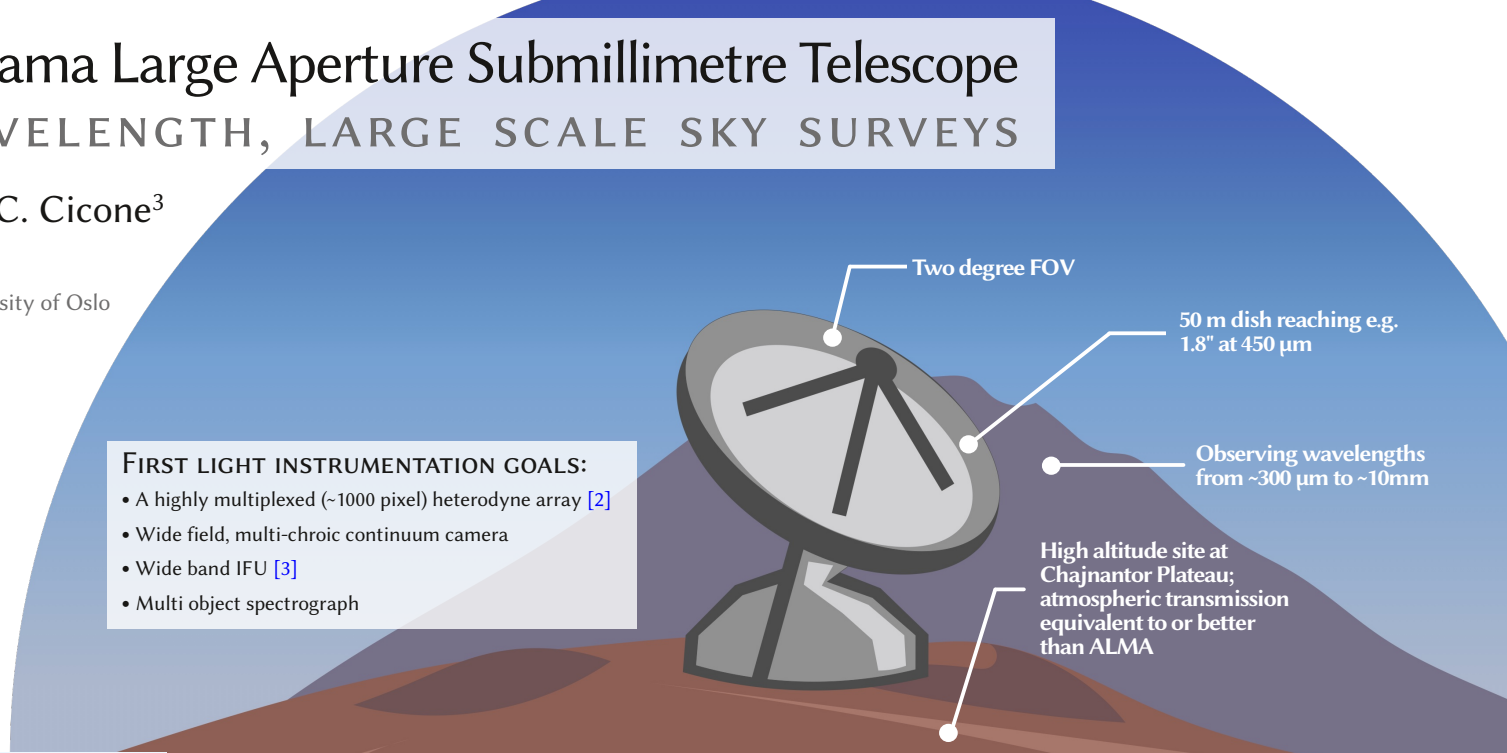
To obtain a complete census of dust in galaxies across cosmic history, we require a high throughput survey facility that can reach high sensitivities and resolutions – a necessary complement to high-resolution interferometric observatories such as ALMA.

The Atacama Large Aperture Submillimetre Telescope (AtLAST) , a concept for a 50 m single dish community facility to be built in the 2030s, will be able to photometrically and spectroscopically survey large areas at high resolutions, pushing the confusion limit to sub-mJy levels and enabling the detections of "normal" ($L\star$) galaxies to very high redshifts.



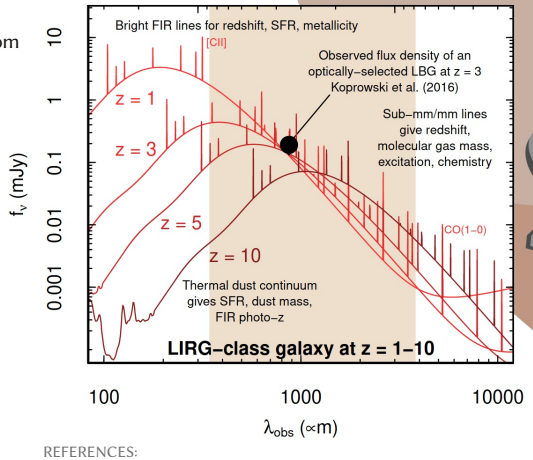
First light instrumentation goals:

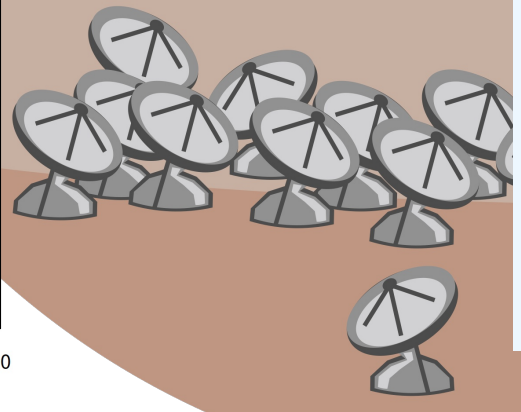
- A highly multiplexed (~1000 pixel) heterodyne array [2]
- Wide field, multi-chroic continuum camera
- Wide band IFU [3]
- Multi object spectrograph

The survey science potential of a "sub-mm SDSS" with AtLAST:

- Perform a complete census of star-forming galaxies at high-z to sub-$L\star$ luminosities
- Reveal the production and evolution of metals in the Universe, as tracked by the dusty ISM
- Determine the evolution of the co-moving H_2 mass density
- Investigate the astrophysics governing star formation efficiency and ISM chemistry
- Chart the growth of large scale structure at the epochs of galaxy assembly
- Detect baryonic acoustic oscillations beyond $z \geq 2$

The figure shows the SED of a star-forming galaxy redshifted through $z = 1$ to $z = 10$, a 2 Gyr timespan from the formation of the first galaxies to cosmic noon. The shaded area shows the wavelength range of AtLAST observations: the wealth of spectral features in this regime will allow the measurement of spectroscopic redshifts for hundreds of thousands of star-forming galaxies. The black point shows the directly detected 870μm continuum emission of an optically-selected Lyman-break galaxy at $z = 3$ with a UV+IR SFR of 35 $M_\odot yr^{-1}$: AtLAST's synergies with facilities like LSST will allow multi-wavelength, in-depth study of galaxy physics and chemistry on unprecedented scales.
Figure from [1]





Defining the science cases: get involved!

We are in the first year of a 3-year Horizon2020 funded design study for AtLAST, currently compiling science use cases from the community and open to new collaborators. What transformational science could you do with this facility? Let us know!

Find out more at atlast.uio.no

or email: joanna.ramasawmy@stfc.ac.uk, pamela.klaassen@stfc.ac.uk

or message me, Jo Ramasawmy, during the poster/coffee sessions!

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REFERENCES:
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