

Expected AtLAST instrumentation specifications

The aim of this memo is to provide AtLAST's WP6, and the scientific community in general, an overall idea of the type of instruments foreseen for AtLAST, and their expected (or feasible) specifications, for two different epochs: commissioning and 1st generation instruments (in a few years), and 2nd generation instruments (~10 years). These specifications were derived from discussions at various meetings and videocons during 2022 and 2023, mostly involving the instrumentation WG and discussions with individual instrument builders. Commissioning instruments could also be existing instruments which are taken over from other telescopes, or used on loan.

This memo is an executive summary that should be of use to people writing the various science cases for AtLAST, but also to future instrument builders. Please note each of these specifications carry a cost in terms of funding, weight, and energy use, which will need to be balanced out. The specifications are not fixed, and should be treated as indications of what is likely be feasible for AtLAST, as predicted by instrumentalists.

Summary of the estimated specifications for possible AtLAST instruments:

Multi-choic Camera (with polarization):

- 1st generation: 50000 pixels per band, 4 bands (simultaneously)
or 25000 pixels per band, 8 bands (simultaneously)
- 2nd generation: 300000 pixels per band, 8 bands

Integral Field Units (one or more):

- 1st generation: R=500, 10000 detectors (#spaxels x #channels),
70 GHz to 950 GHz range, probably covered by more than one IFU
For example: a high-freq one (>600 GHz) and a low-freq one (<500 GHz)
Readout: 1000 MKIDs/line (multiplexed on a single transmission line), bandwidth 2 GHz
- 2nd generation: R=2000, 50000 detectors, similar frequency range
Readout: 8000 MKIDs/line

Heterodyne array:

- 1st generation: 16 GHz bandwidth, 64 spaxels (spectral pixels)
- 2nd generation: 30 GHz bandwidth, 256 spaxels

Single pixel multi-band (for VLBI):

- 1st generation: simultaneous three band SIS receiver (wideband)
- 2nd generation: same, but more bands and better sensitivity

Solar instrument:

- ideally any of the instruments listed above can also be used for Solar observing, or
a separate specialized multi-choic camera without cooling and capable of very short
integration times and fast scanning