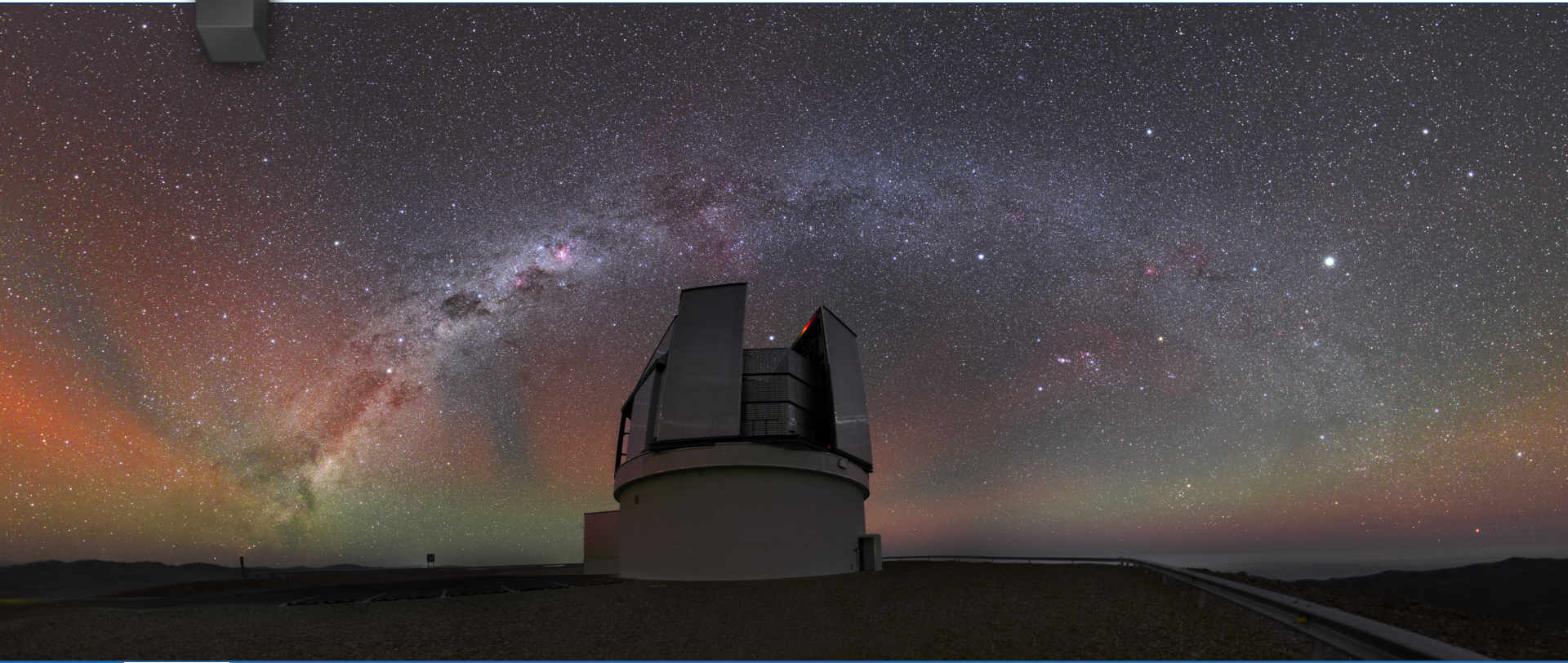




# 4MOST – 4m Multi-Object Spectroscopic Telescope





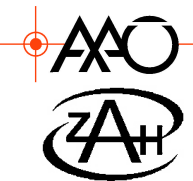
# 4MOST – 4m Multi-Object Spectroscopic Telescope

4MOST: a Wide-field, high-multiplex optical spectroscopic survey facility for ESO

Roelof de Jong, PI (AIP)

15 April 2016

[www.4MOST.eu](http://www.4MOST.eu)



# 4MOST: Wide-field, high-multiplex optical spectroscopic survey facility for ESO

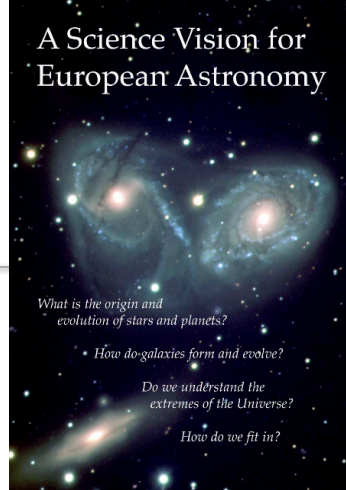


- Status:
  - ESO Council approved 4MOST in June 2015
  - Preliminary Design Review scheduled for June 2016
  - Operations start on **VISTA** telescope 2021 (at least 2x 5 year)
- Science:
  - Cosmology, galaxy evolution, high-energy and Galactic science
  - Complement large-area space missions: Gaia, eROSITA, Euclid, PLATO
  - Complement ground-based surveys: VISTA, VST, DES, LSST, SKA, etc.
- Survey facility:
  - Consortium delivers instrument, science operations, data products, science
  - Run all-sky 5 year public surveys in parallel, with yearly data releases
  - Key surveys organized by consortium in coordination with community
  - Add-on surveys from community and Chile through ESO peer-reviewed applications

# Background: EU strategic docs

- A Science Vision for European Astronomy (ASTRONET)
  - Extreme Universe (Dark Energy & Dark Matter, Black holes)
  - Galaxy Formation & Evolution
  - Origin of Stars and Planets
  - Solar System
- ASTRONET Infrastructure Roadmap  
*„A smaller project, but again of high priority, is a wide-field spectrograph for massive surveys with large optical telescopes.“*
- ESA-ESO Working Group on Galactic populations, chemistry and dynamics  
*„Blue multiplexed spectrograph on 4 or 8m class telescope“*
- Strategic Review on Europe’s 2-4m telescopes over the decade to 2020 (ASTRONET/OPTICON)  
*„Optical wide-field spectrograph on 4m telescopes (N+S)“*

*4MOST will play an important role in almost all research areas identified in the ASTRONET Science Vision document*



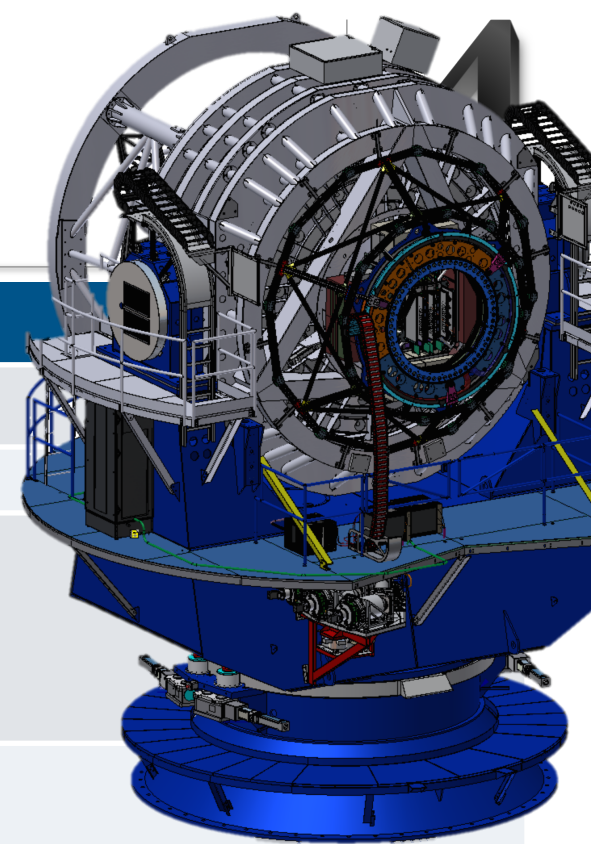
ESA ESO Working Groups

Report No.4 Galactic Populations, Chemistry and Dynamics June 2008



# Instrument Specification

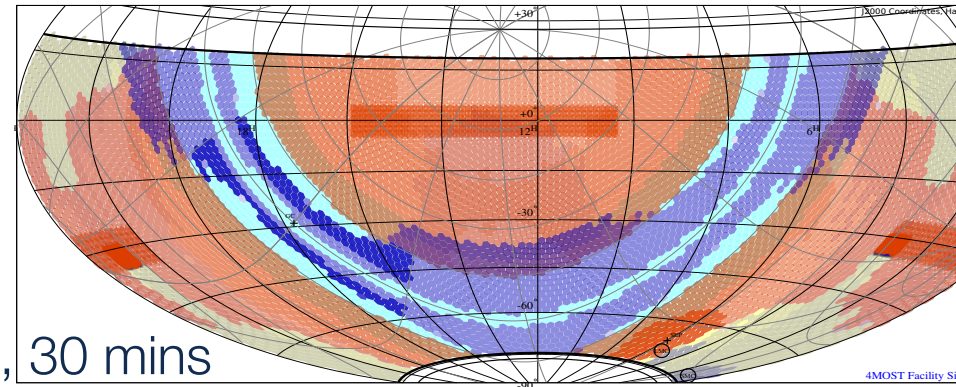
Specification	Design value
Field-of-View (hexagon)	$\sim 4.1 \text{ degree}^2 (\phi > 2.5^\circ)$
Multiplex fiber positioner	$\sim 2436$
Medium Resolution Spectrographs (2x)	R $\sim 4000\text{--}7000$
# Fibres	812 fibres (2x)
Passband	370-950 nm
Velocity accuracy	$< 1 \text{ km/s}$
High Resolution Spectrograph (1x)	R $\sim 20,000$
# Fibres	812 fibres
Passband	392.6-435.5, 516-573, 610-679 nm
Velocity accuracy	$< 1 \text{ km/s}$
# of fibers in $\phi = 2'$ circle	$> 3$
Fibre diameter	$\phi = 1.45 \text{ arcsec}$
Area (first 5 year survey)	$> 2\text{h} \times 18,000 \text{ deg}^2$
Number of science spectra (5 year)	$\sim 75 \text{ million of } 20 \text{ min}$



# 4MOST Operations



- Unique operations model for MOS instruments that allows observations *for most* science cases
- 4MOST program defined by *Public Surveys* of 5 years
- Surveys will be defined by *Consortium* and *Community*
- All Surveys will run *in parallel*
  - Surveys share fibres per exposure for increased efficiency
- *Consortium Key Surveys* will define observing strategy
  - Millions of targets all sky
- *Add-on Surveys* for smaller surveys
  - Small fraction fibers all sky or
  - dedicated small areas
  - $10^3$  to  $10^6$  targets
- Several passes of sky with 2, 10, 20, 30 mins
- Wedding-cake distribution for total time 1h to 10h



# SN research opportunities



- Possible transient return using 2% of fibres:
  - 32 fibres/pointing x 8/night x 150 dark nights ~ 40,000 spectra / year (~8 / degree<sup>2</sup> per pointing)
- Can be live transients or host galaxies
- Scheduling 1–7 days in advance (TBD)
- Aim for live transients near peak in deep drilling fields?
- Use of HR fibres?
  
- Adding science case currently being negotiated (Bob Nichol)
- ESO member state institutes/individuals can still join
  - Individual membership: 100k€ + 1 FTE
    - 1 staff + 1 post-doc + students

# Magnitude limits for typical science cases

