#### 4MOST – 4m Multi-Object Spectroscopic Telescope

#### 4MOST spectroscopy for eROSITA Roelof de Jong (AIP) 4MOST PI



Low-Res Spectrographs

Fibre positioner

www.4MOST.eu











## Specification



Specification	Design value
Telescope	VISTA (4m-class survey telescope)
Field-of-View (hexagon)	>4.0 degree2 ( <b>Ø&gt;2.5°)</b>
Multiplex fiber positioner	~2400
Medium Resolution Spectrographs (2x) # Fibres Passband Velocity accuracy High Resolution Spectrograph (1x) # Fibres Passband Velocity accuracy	R~5000-7000 1600 fibres 390-930 nm < 2 km/s R~20,000 800 fibres 392-437 & 515-572 & 605-675 nm < 1 km/s
# of fibers in Ø=2' circle	>3
Fibre diameter	Ø=1.4 arcsec
Area (first 5 year survey)	>2h x 16,000 deg <sup>2</sup>
Number of science spectra (5 year)	~75 million of 20 min

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# How are we going to run 4MOST?



- Unique operations 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
- Key Surveys will define observing strategy

   Millions of targets all sky
- Add-on Surveys for smaller surveys
  - Small fraction fibers all sky
  - Dedicated small area
  - 10<sup>3</sup> to 10<sup>6</sup> targets



# How are we going to run 4MOST?



- Consortium Surveys will ensure whole hemisphere covered with at least ~120 minutes total exposure time
- Each exposure 20 minutes, repeats possible
- Total exposures times per target between 20 and 120 min (and more) possible till required S/N
- Areas with more targets get visited for more than 120 min



# Simulate throughput, fibre assignment, survey strategy and verify total survey quality

night number: 0000

2000 Coordinates, Hammer-Aitoff Projection



GEPI, Paris, Sartoretti et al.

IoA, Walton et al.

	-30"				
*	Science case	S/N /Å	r <sub>AB</sub> -mags	# Targets	
	MW halo HR	140	12–15.5	0.07M	
· ·	MW halo LR	10	16–20.0	1.5M	
No Marcall	MW disk/bulge HR	140	14–15.5	2.1M	
	MW disk/bulge LR	10-30	14–18.5	10.7M	
and and	X-ray galaxy clusters	4	18–22.0	1.4M	
2	X-ray AGN	4	18–22.0	0.7M	

4

20 - 22.5

12.8M

>29M

**BAO+RSD** galaxies

Total

### **Review science requirements**

- Resolution
- S/N
- Wavelength range
- Absolute/relative flux calibration

   line ratios?
- Sky subtraction accuracy
- Target densities
  - Galaxy clusters



#### Survey strategy



- Target selection
- Imaging data
- Dark/grey/bright time
- Area
- Completeness
- Repeats, cadence, timing
   variability

### Simulator



- Input
  - Mock catalog: positions, target types, weights
  - Template spectra: types, S/N requirements
  - Survey figure-of-merit: number of targets, area, completeness, redshift/ mag distribution
- Output (for different instrument configurations)
  - Simulated spectra
  - Observed target numbers and completeness fractions:
    - type, mag, redshift, sky position,
  - Instrument efficiency
  - Total FOM
- Analysis

- Does the FOM reflect what you need at spectral and survey level?

Science analysis and requirements Science algorithms implementation 4MOST Science organization 4MOST Science Coordination PI, PSs, Survey PIs Principal Investigator Board Project Scientists Survey Teams Survey Teams Community Survey Team 1 Infrastructure Working Groups Management Community Infrastructure Infrastructure Science Management Survey Team 2 Survey Coordination Board Support Strategy Working Groups Targeting High-Res MW Halo Survey Strategy Outreach & Survey Team WG Helpdesk (IWGs) Data Med-Res MW Halo WG Membership Reduction Target Catalogs Survey Team Management WG Calibration & Science Projects High-Res MW Disk+ CO Selection Functions Management **Bulge Survey Team** WG Archiving Publication Med-Res MW Disk+ Calibration & QC Management **Bulge Survey Team** WG Galaxy Clusters Archiving Survey Team WG Repeat for each Survey X-ray AGN High-Res Stellar Survey Team Pipeline WG Galaxy Evolution Mid-Res Stellar Survey Team **Pipeline WG** Cosmology Mid-Res Galaxies Survey Team **Pipeline WG** ESO Classification **Pipeline WG** Community Simulations WG? 4MOST | eROSTIA Consortium meeting, 16 Sept 2014 4MOST Consortium

## 4MOST Surveys

- Responsible for Science Analysis, Science Requirements and Survey Preparation
- Developments will be implemented using a Survey Management Plan following a 4MOST wide schedule
- A number of tasks already foreseen for each survey for which responsible persons will have to be identified within the next year

Survey Teams



## Infrastructure Working Groups

 Infrastructure Working Groups ensure that deliverables that span across more than one survey get implemented in effective way



Science Management Structure | STSC Meeting, Potsdam 4-6 June 2014 | Roelof de

# Infrastructure Working Groups

- These IWGs are relevant to all surveys
- Except for first, all have to have representation from all Surveys
- Mainly developing principles and algorithms, final implementation in general done by Science Operations WP



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Infrastructure Working

# Infrastructure Working Groups

- These IWGs are relevant to a subset of all surveys
- Pipelines require real code development that will run on the 1D spectra coming from the DMS
- Survey PIs responsible for providing sufficient resources
- Do we need a separate pipeline for AGN?





# Survey Teams & IWGs

- Management
- Survey strategy
- Targeting
- Selection functions
- Data reduction
- Calibration & QC
- Archiving



Science Management Structure | STSC Meeting, Potsdam 4-6 June

#### 4MOST Consortium Science Kickoff



- Dates: 17 19 November (Mon-Wed)
- Location: AIP
- Agenda:
  - Science organization, Management & Policies
  - Schedule
  - Surveys
  - IWGs
  - Requirements
  - Operations
  - Publications