MUSE, a second-generation integral-field spectrograph for the VLT

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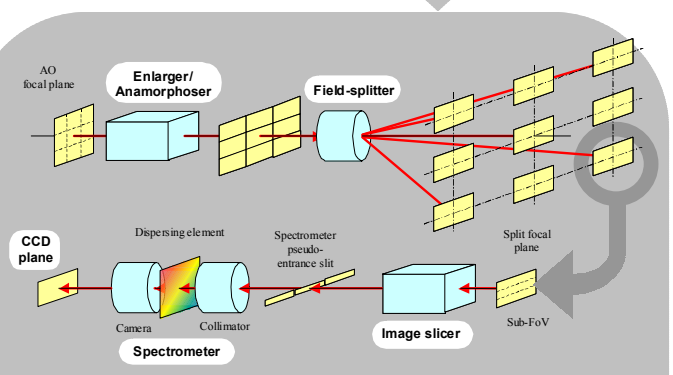
SCIENCE CASE

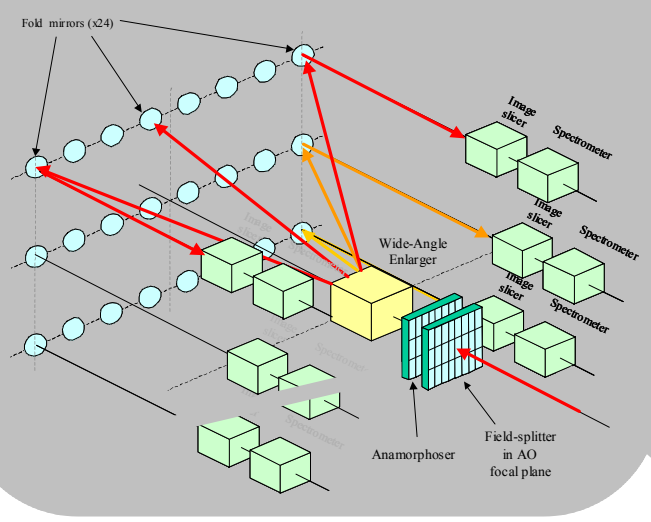
- Study of intrinsically faint galaxies at high redshift, including determination of the luminosity function, clustering, etc
- Detection of Lyman α emission out to the epoch of reionization and determination of the nature of the reionization
- Detection of population III stellar populations out to z=5
- Map the growth of dark matter halos
- Study the link between the evolution of the IGM and star formation
- Study the physics of Lyman break galaxies, including their winds and feedback to the intergalactic medium
- Identification of very faint sources detected in other bands
- Detailed study of luminous distant galaxies
- Serendipitous discovery of new classes of objects

INSTRUMENT REQUIREMENTS

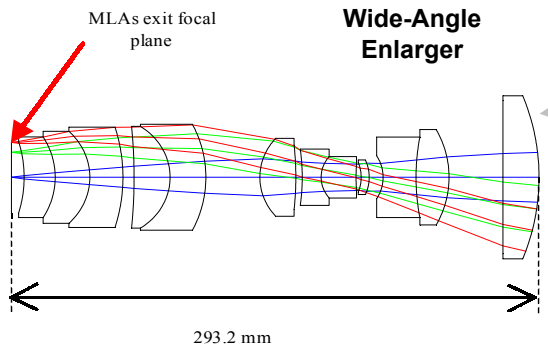
SCIENTIFIC REQUIREMENTS		
Angular FoV dimensions	1 x 1 arcmin	
Angular sampling	0.2 arcsec	
Spectral range	0.48-1 μm	
Spectral resolution	1500 at 0.6 μm	Nominal
	3000 at 0.6 μm	High resolution
Image quality	80 % of encircled energy within 0.2 arcsec (1 sample)	From 0.6 to 1 μm
	80 % of encircled energy within 0.4 arcsec (2 samples)	Below 0.6 μm
Optical transmission	≥ 30 %	
VLT INTERFACE REQUIREMENTS		
Telescope pupil diameter	8 m	
Telescope F/D #	15	
FOCAL PLANE CHARACTERISTICS		
Pixel number	4096	Cross-dispersion direction
	2048	Dispersion direction
Pixel/sample	1	Cross-dispersion direction
	2	Dispersion direction
Pixel size	15 μm	
Output F/D number	1.93	



MUSE overall architecture

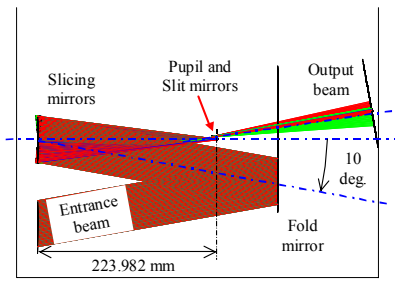


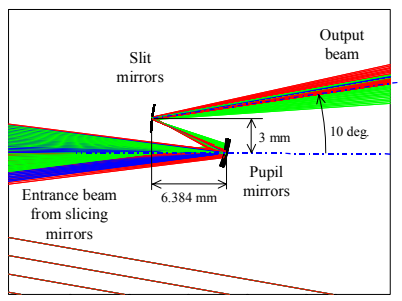
Wide-Angle Enlarger



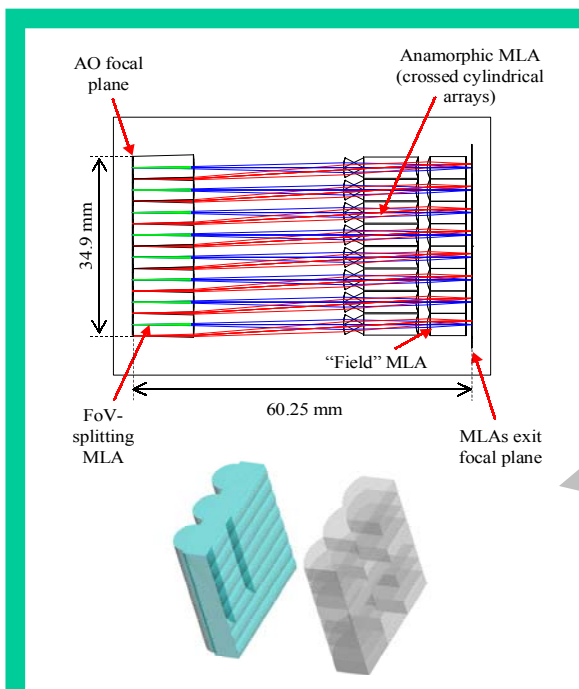
Advanced Image Slicer

IMAGE SLICER REQUIREMENTS	
Slicer mirror dimensions	79.4 x 59.5 mm
Slices number	38
Entrance F/D #	102.3
Entrance pupil position	≈ -3 m
Magnification factor	0.03
Pseudo-slit length	≥ 96.13 mm

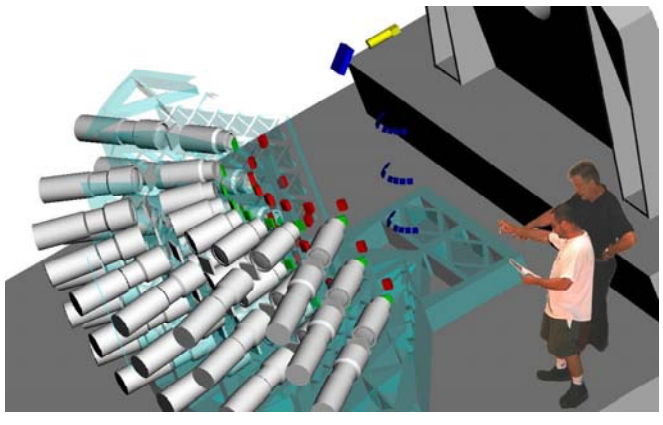




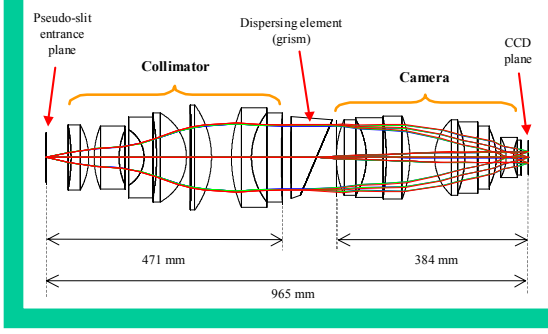
Entrance Micro-Lens Arrays



MUSE on VLT Nasmyth platform



The Spectrometers



INSTRUMENT PREDICTED PERFORMANCE

CASE	R band			I band		
	Magnitude (Cousin)		Flux	Magnitude (Cousin)		Flux
	R=1500	R=150	erg.s^{-1}.cm^{-2}	R=1500	R=150	erg.s^{-1}.cm^{-2}
Point Source without AO	25.9	27.2	6. 10^{-19}	24.6	25.9	8. 10^{-19}
Point Source in AO mode	26.9	28.3	2.5 10^{-19}	25.6	27.0	3. 10^{-19}
Extended Object without AO	25.9	27.2	6. 10^{-19}	24.6	25.9	8. 10^{-19}
Extended Object in AO mode	26.7	28.2	3. 10^{-19}	25.1	26.4	5. 10^{-19}

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MUSE CONSORTIUM

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