

The Fiber Routing of the Fiber Link Subsystem of ANDES@ELT: Design and Key Components

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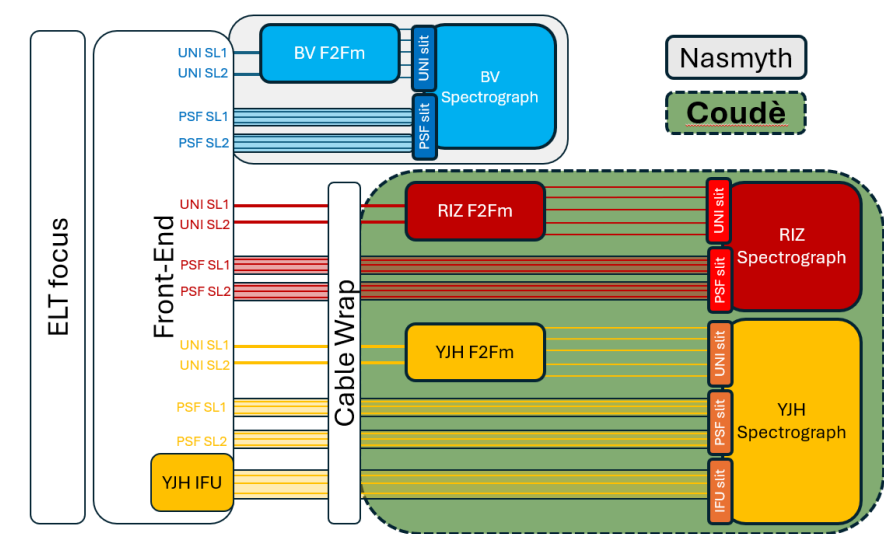
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^b INAF - Osservatorio Astronomico di Arcetri



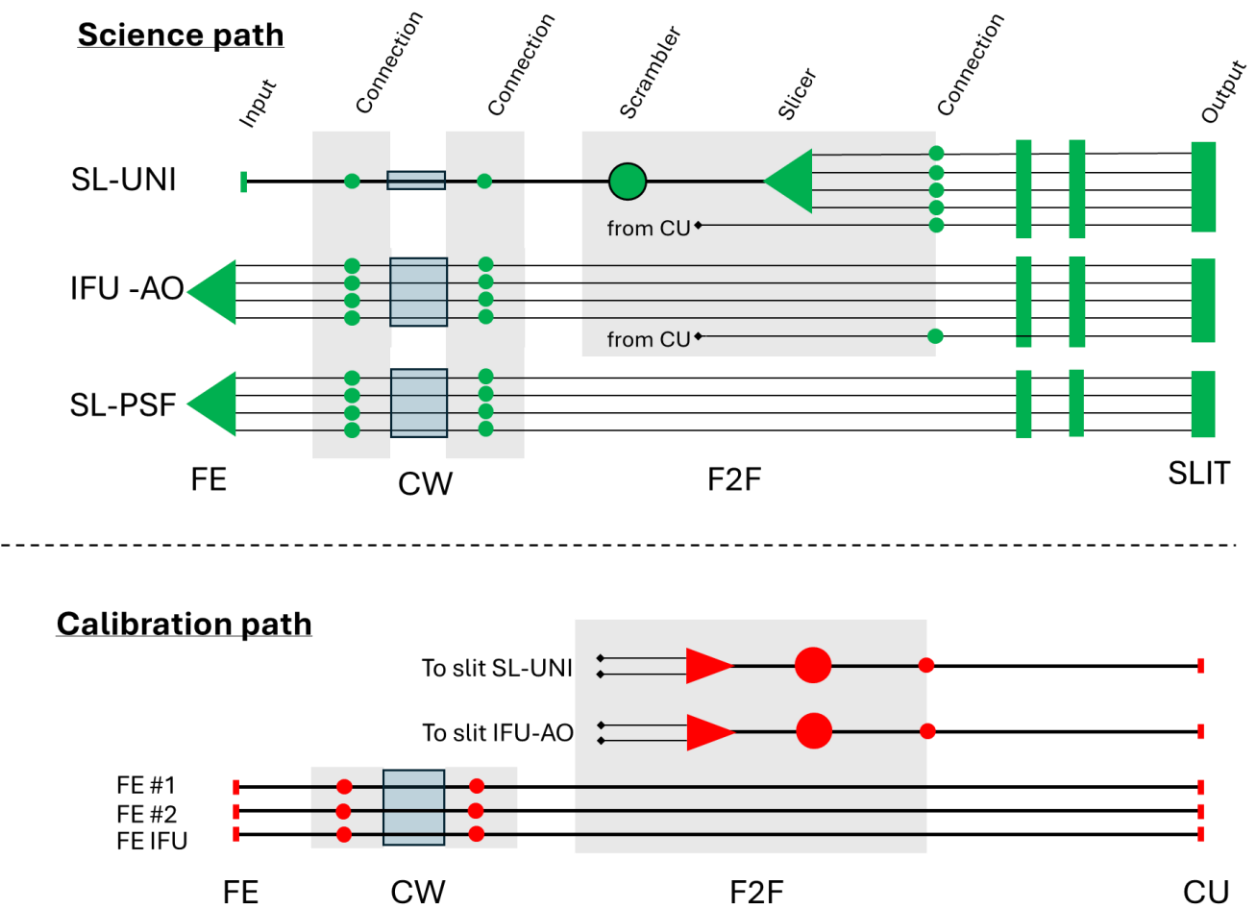
Fiber routing: functional scheme

Overall picture



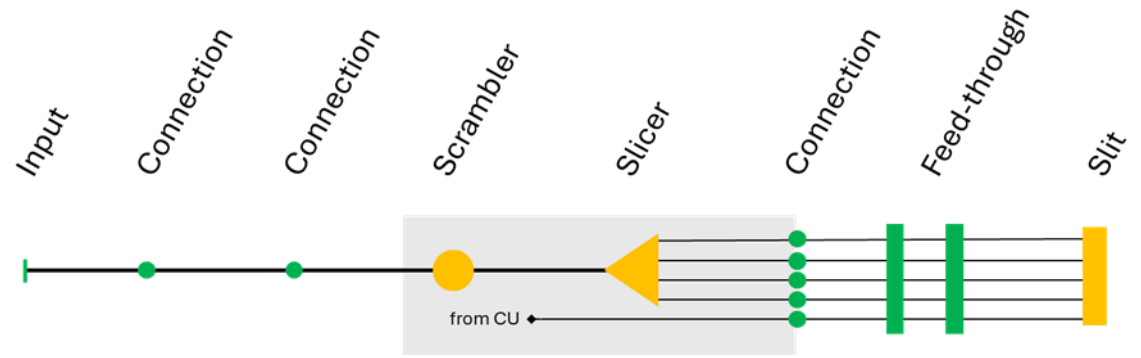
Some numbers on the fiber routing	
Total fiber length	30 km
Total fiber weight	612 kg
Number of fiber connections	~1500

The YJH functional scheme



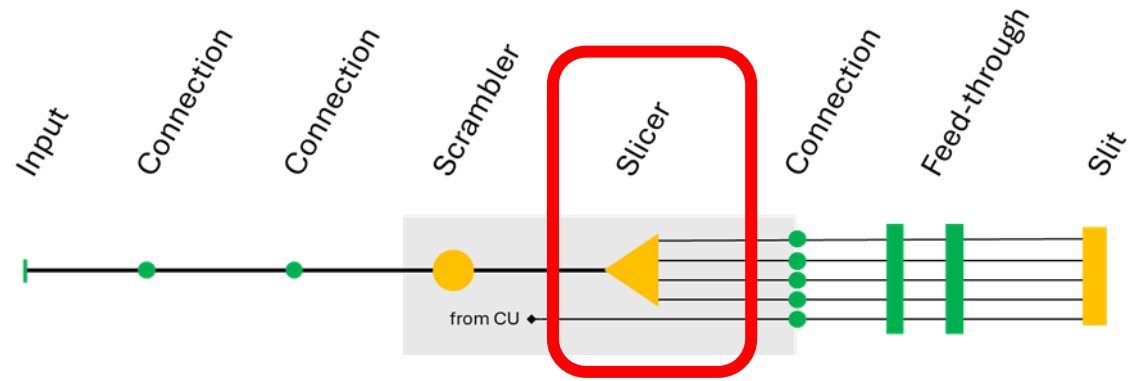
Fiber routing: Main goals

- **maximize final efficiency**
 - Fiber attenuation and FRD
 - Geometrical coupling
 - Fresnel losses
 - Alignment and manufacturing
- **Guarantee stability**
 - Octagonal fibers
 - Scrambling
- **Provide the required slit**



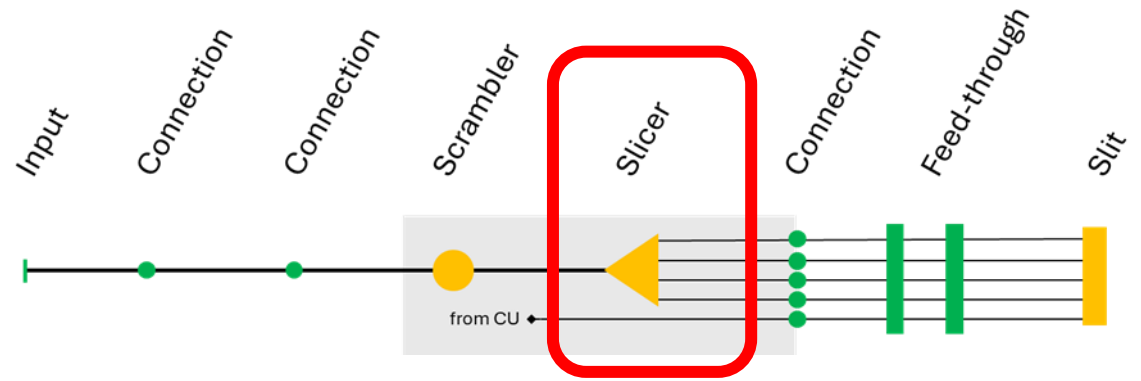
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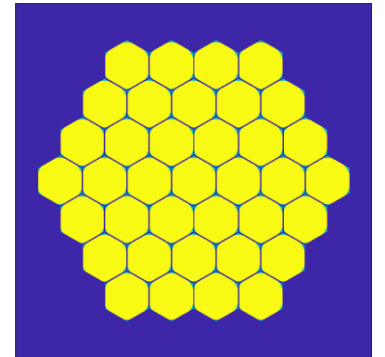
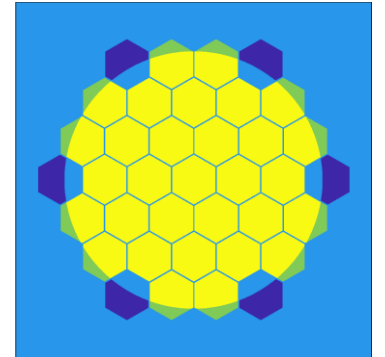
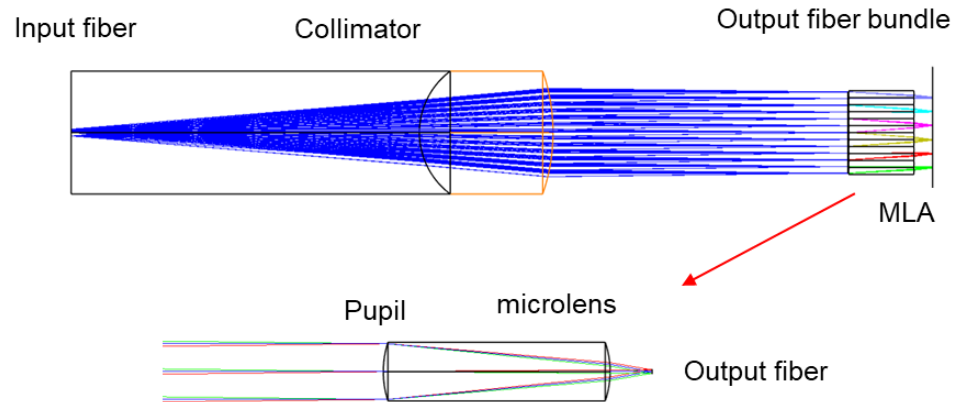


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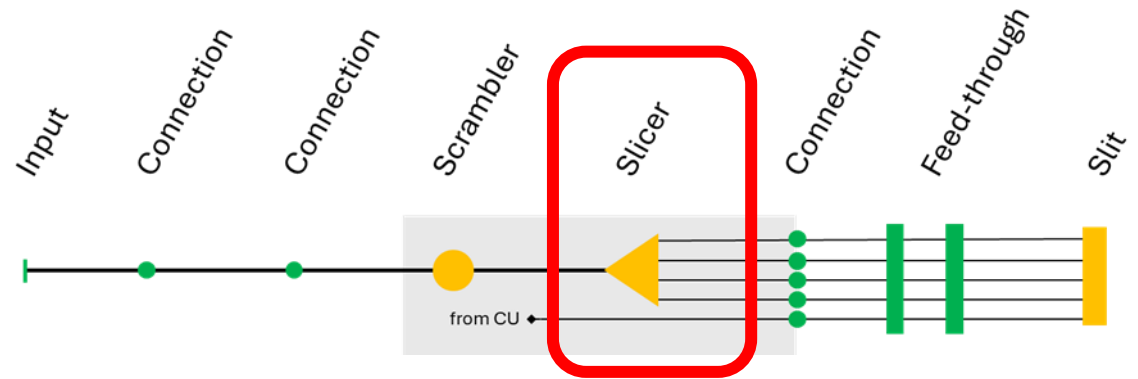


Optical design



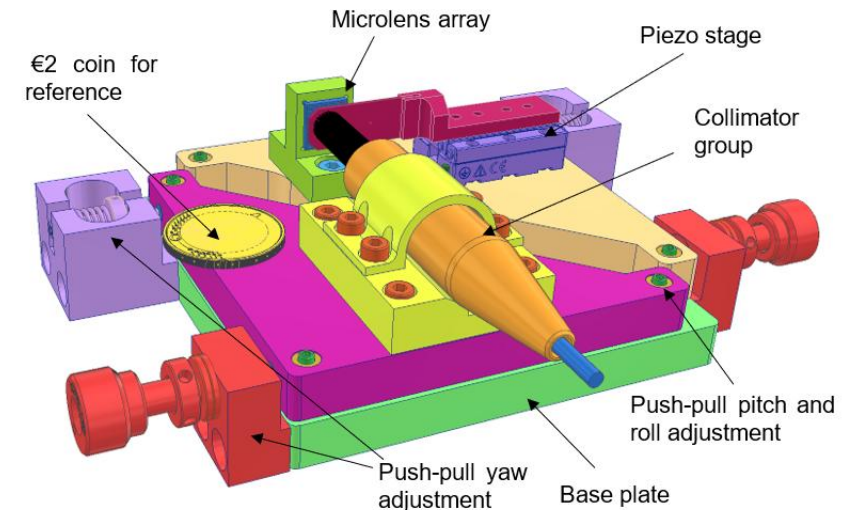
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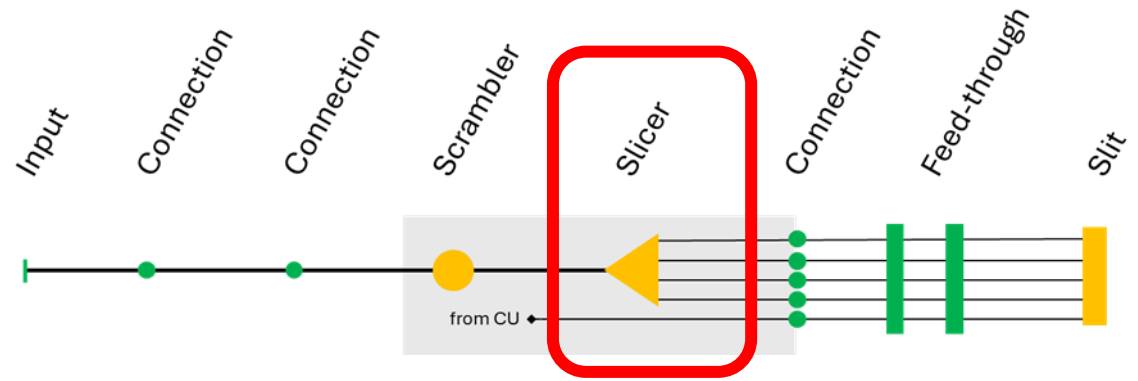
Mechanical design

Parameter	Value
Fiber core decenter	+/- 0.01 mm
Fiber core tilt	+/- 10 arcmin
Lens thickness	+/- 0.05 mm
Lens curvature radii	+/- 1%
L1-L2 tilt	+/- 3 arcmin
MLA thickness	+/- 0.05 mm
MLA curvature radii	+/- 3%
MLA conic constants	+/- 0.5
MLA S2 vs S1 decenter	+/- 2 micron
MLA S2 vs S1 tilt	+/- 3 arcmin
MLA pitch	+/- 1 micron
Spacing collimator - MLA	+/- 0.2 mm
MLA decenter	+/- 0.1 mm
MLA tilt	+/- 1 arcmin
Spacing MLA-fibers	+/- 0.02 mm
MLA-fibers clock	+/- 3 arcmin
Fiber pitch	+/- 4 micron
Fiber core-ferrule centration	+/- 3 micron
Fibers core tilt	+/- 10 arcmin

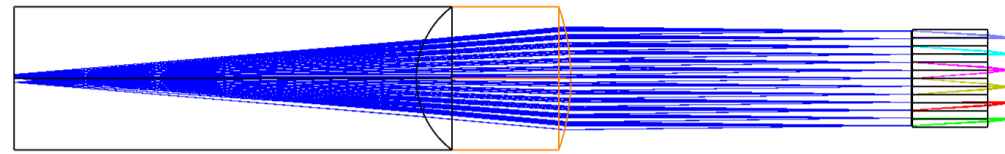


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Efficiency performance

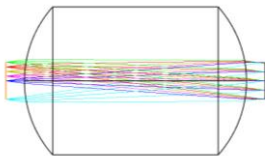


Parameter	Efficiency		
	UBV	RIZ	YJH
Interface collimator	0.995	0.995	0.995
Interface MLA1	0.990	0.990	0.990
Interface MLA2	0.990	0.990	0.990
Glass transmission	0.986	0.989	0.987
Alignment	0.930	0.930	0.930
Optical coupling	0.945	0.975	0.963
Geometrical coupling	0.891	0.891	0.891
MLA edge effects	0.963	0.963	0.963
Total	0.725	0.750	0.740

Fiber routing Performance: efficiency

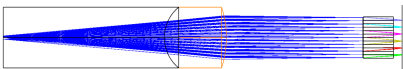
Optical scrambler

Parameter	Efficiency		
	UBV	RIZ	YJH
Interface fiber tip	0.995	0.995	0.995
Interface ball S1	0.980	0.980	0.980
Interface ball S2	0.980	0.980	0.980
Interface fiber tip	0.995	0.995	0.995
Alignment	0.965	0.965	0.965
Optical coupling	0.959	0.971	0.986
Total	0.880	0.891	0.905



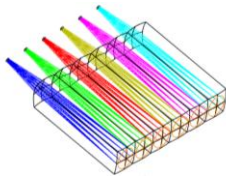
slicer

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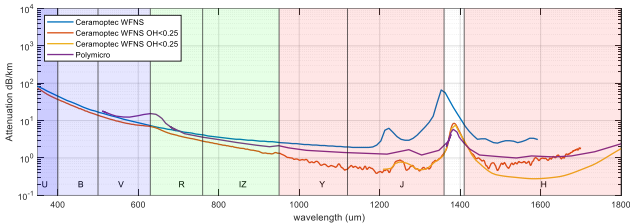
Slit

Parameter	Efficiency		
	UBV	RIZ	YJH
Interface fiber	0.995	0.995	0.995
Interface MLA1	0.990	0.990	0.990
Interface MLA2	0.990	0.990	0.990
Alignment	0.940	0.940	0.940
Optical coupling	0.923	0.942	0.926
Total	0.846	0.864	0.849



Ansys

Fiber attenuation



Fiber coupling

