

1 Introduction

This document describes the optical design of the FIES fiber link upgrade. By the use of octagonal fibers and the introduction of a double scrambler the RV precision is expected to improve. Using a slicer allows also for higher throughput in the high-resolution mode.

2 Fibers

In the front-end at the telescope there are 6 fibers of two different sizes:

All fibers are CeramOptec fiber type WF. The total length of all fibers is ~43.5m. They are intersected after 42m and connected via FC/FC couplings.

Fiber name	Fiber size [μm]	Fiber type
Low-res	179	WF OCT 179/250 A - NA=0,22
Mid-res sky	89	WF OCT 89/125/250A - NA=0,22
Mid-res target	89	WF OCT 89/125/250A – NA=0,22
High-res	89	WF OCT 89/125/250A – NA=0,22
Pol-1	89	WF OCT 89/125/250A – NA=0,22
Pol-2	89	WF OCT 89/125/250A – NA=0,22

The specifications of the fiber types are:

WF OCT 89/125/250A - NA=0,22

Core: 89 $\mu\text{m} \pm 2\%$ (pure fused silica)
 Cladding: 125 $\mu\text{m} \pm 2\%$ (F-doped fused silica)
 Jacket: 250 $\mu\text{m} \pm 5\%$ (transparent Acrylat)
 NA: 0.22 $\pm 0,02$

WF OCT 179/250 A - NA=0,22

Core: 179 $\mu\text{m} \pm 2\%$ (pure fused silica)
 Cladding: 250 $\mu\text{m} \pm 2\%$ (F-doped fused silica)
 Jacket: 350 $\mu\text{m} \pm 5\%$ (transparent Acrylate)
 NA: 0.22 $\pm 0,02$

Additionally, there is a rectangular fiber after the double scrambler/image slicer for the high-res mode:

Fiber name	Fiber size [μm]	Fiber type
High-res rect	45x180	WF RCT 45 x 180 / 52 x 207 / 360 / 450 A

Its specifications are:

WF RCT 45 x 180 / 52 x 207 / 360 / 450 A

Core: 45 x 180 $\mu\text{m} \pm 2\%$ (pure fused silica)
 Cladding: 52 x 207 $\mu\text{m} \pm 2\%$ (F-doped fused silica)
 Cladding: 360 $\mu\text{m} \pm 3\%$ (fused silica)
 Jacket: 450 $\mu\text{m} \pm 5\%$ (transparent Acrylate)
 NA: 0.22 $\pm 0,02$