Some optical concepts for FLARE

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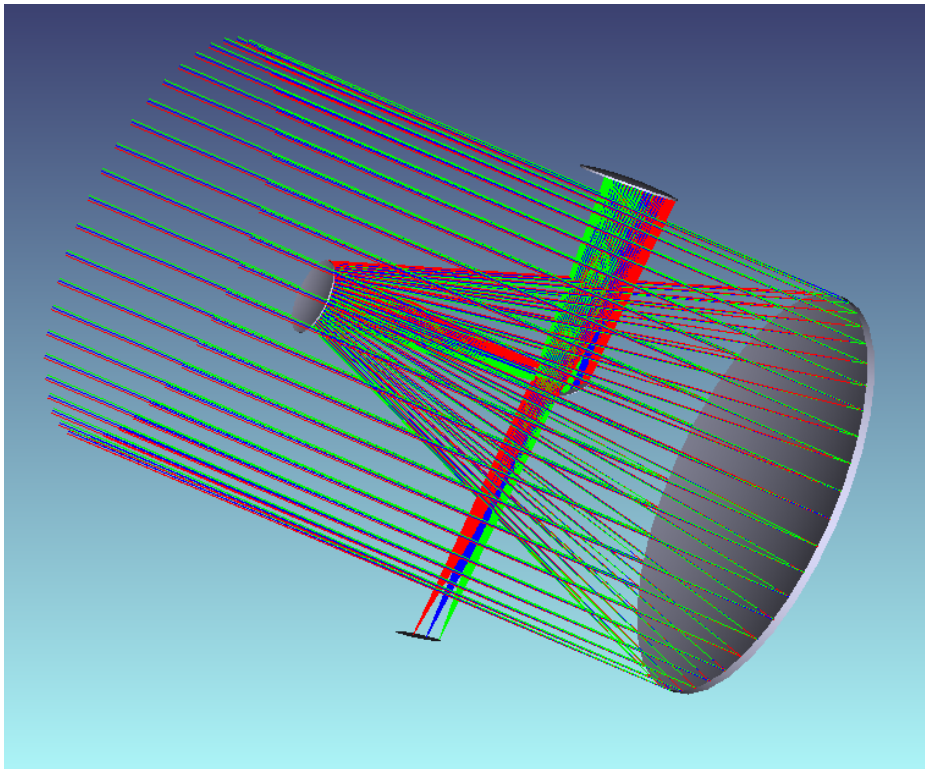
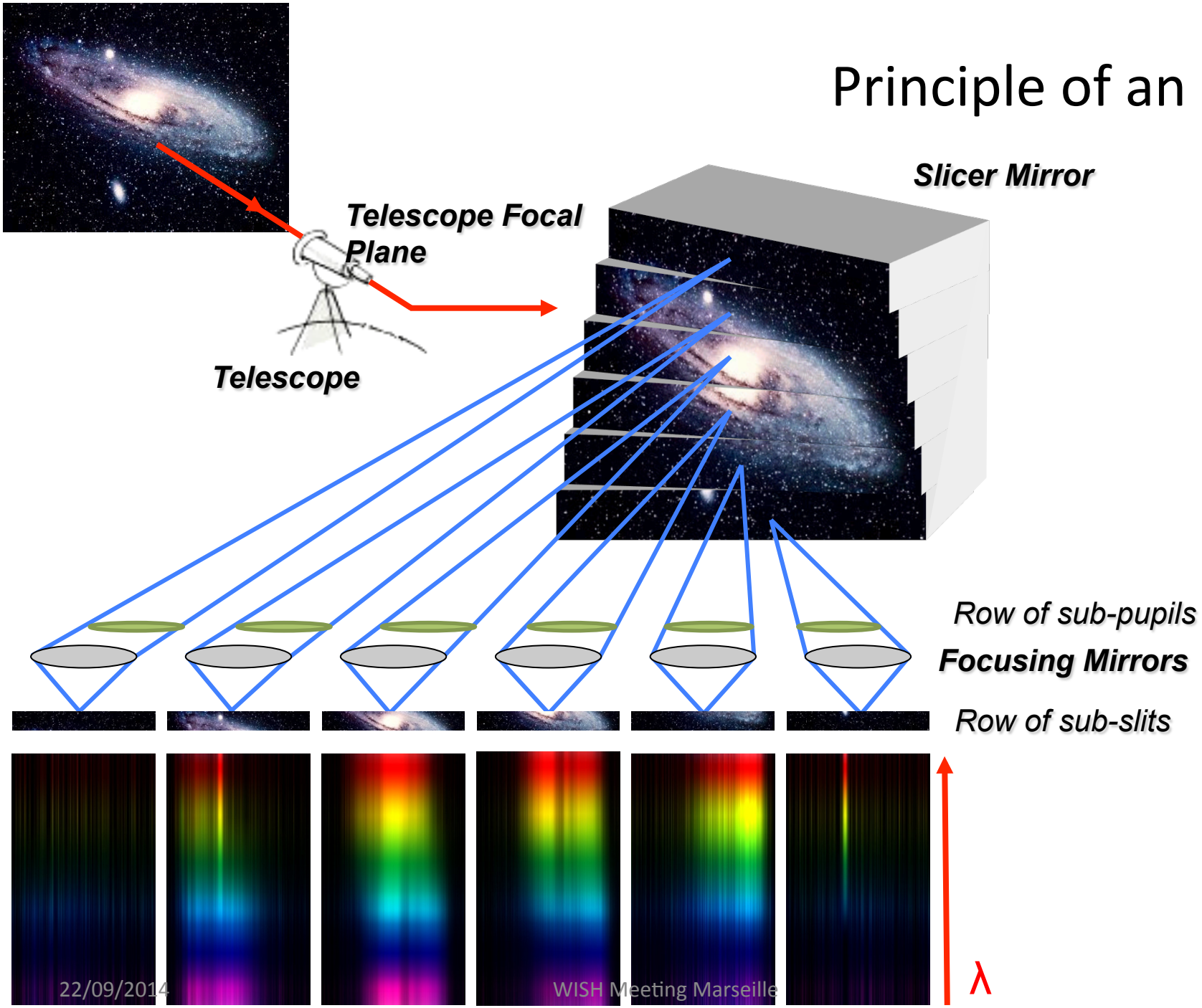
Telescope

- Main characteristics:
  - Primary 2m-class
  - TMA configuration
  - Well-known and flexible design
- 0.4°x0.8°, off-axis FOV
- Total length: ~2250mm
  - Length minized thanks to the folding between M1 and M2

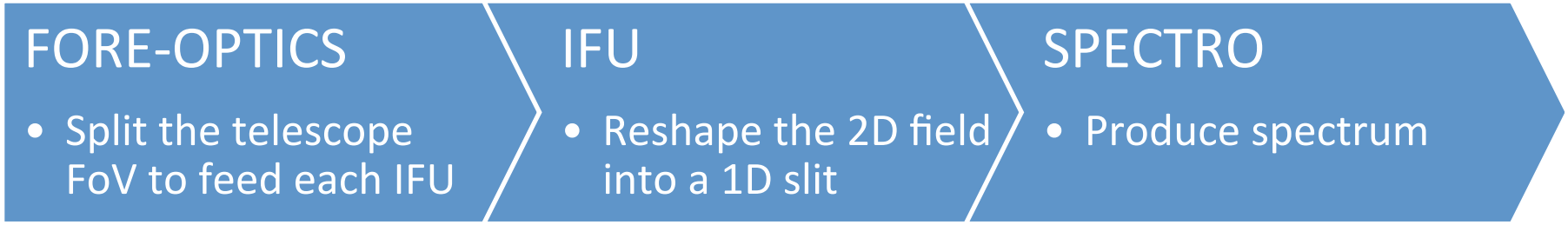


Principle of an IFS



IFS main characteristics

- Slit resolution: 0.4 arcsec
- Total FoV: 150 x 24 arcsec ~1 arcmin²



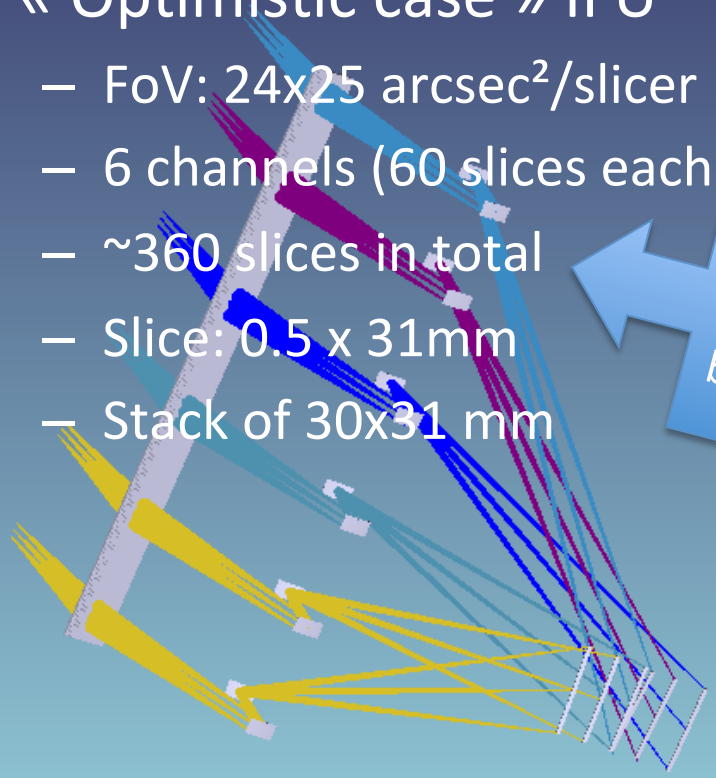
- Need for a Fore-Optics spliting the telescope FoV to feed each IFU
  - F/9 to F/125 with slices of 500µm width
  - Typical slice width ranging between 250µm and 1 mm.
    - A stack of 60 slices with 0.5 mm width already qualified !

- Spectrograph:
  - Not designed yet
    - F/10 for Nyquist sampling
    - F/5 for 1 slice/px
  - It will incorporate a dichroic to separate the spectral range in two bands.

Trade-Off for the IFU

Number of slices/mirrors versus their dimensions and shape !

- « Optimistic case » IFU
  - FoV: 24x25 arcsec²/slicer
  - 6 channels (60 slices each)
  - ~360 slices in total
  - Slice: 0.5 x 31mm
  - Stack of 30x31 mm



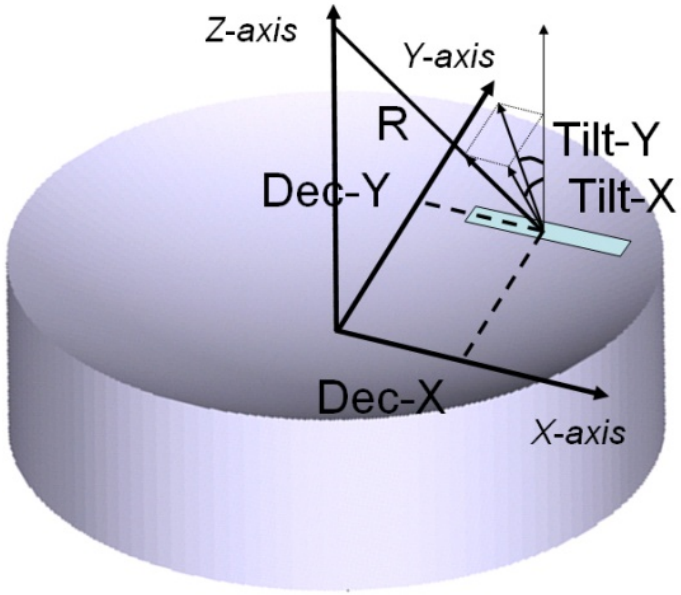
The truth is in between !

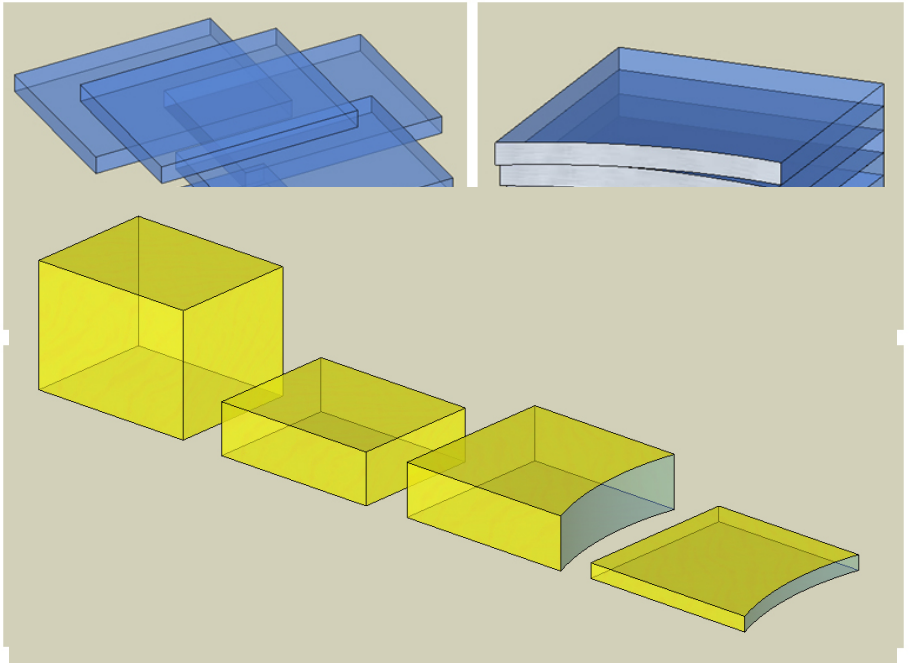
- MUSE-like IFU
  - 40 slices/slicer
  - Slice: 0.55 x 12 mm
  - Stack of 22x12 mm
  - FoV: 15x10 arcsec²/slicer
  - 25 channels
  - ~1000 slices in total
- *MUSE/VLT as reminder:*
  - *24 channels: 1 arcmin²*
  - *Slice : 33mm x 0.9 mm*
  - *48 slices each : 2.5 x 60 arcsec*
  - *> 1000 slices in total!*
  - *Each slice: 0.2 x 15 arcsec*

High performance Low-cost IFU

In 2006, LAM and Winlight proposed an innovative approach to make slicer mirrors

- A single classical polishing process to polish several dozen of slices.
- Therefore we are able for the first
-

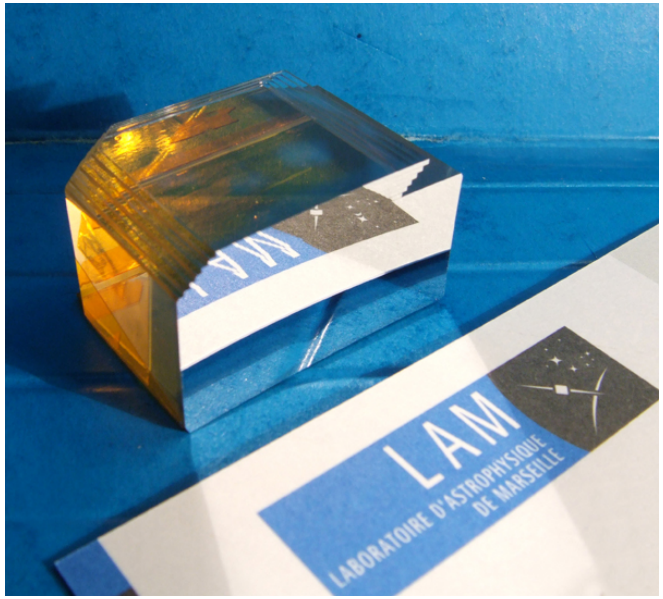




Vives, S.; Prieto, E., Salaun, Y., Godefroy, P.,

"New technological developments in Integral Field Spectroscopy", Proc. SPIE 7018, 70182N (2008)

First Demonstrator (2006)…

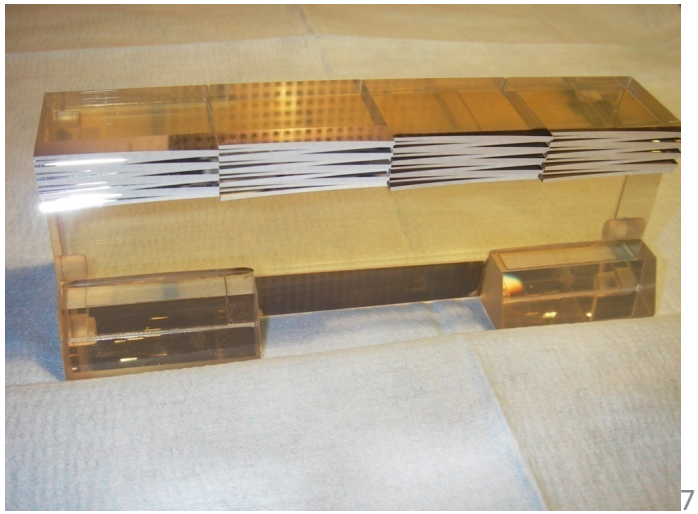


PERFORMANCE

Generic optical specification for these components using our approach:

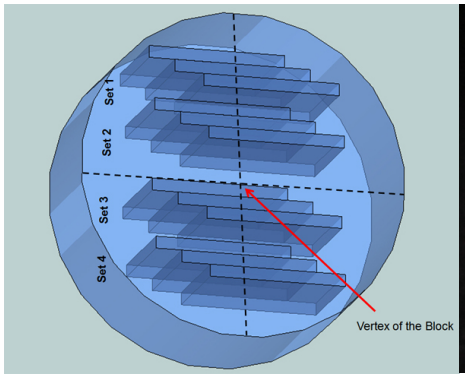
Surface quality **~λ/100 rms**	Surface roughness **~ 0.4 nm**
Edges **~1 µm**	Tilt error of the slices **<15 arcsec PTV**

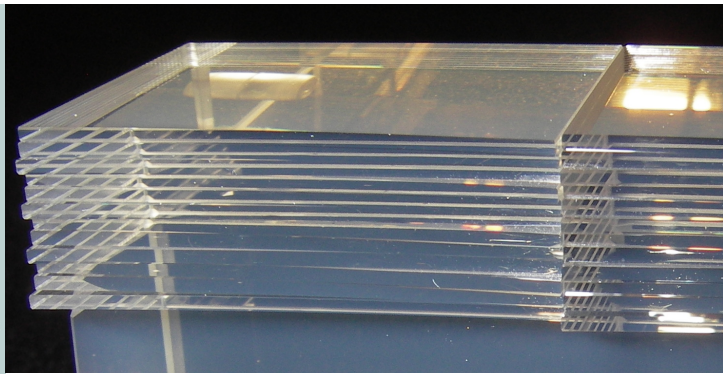
… applied on MUSE (2014) !

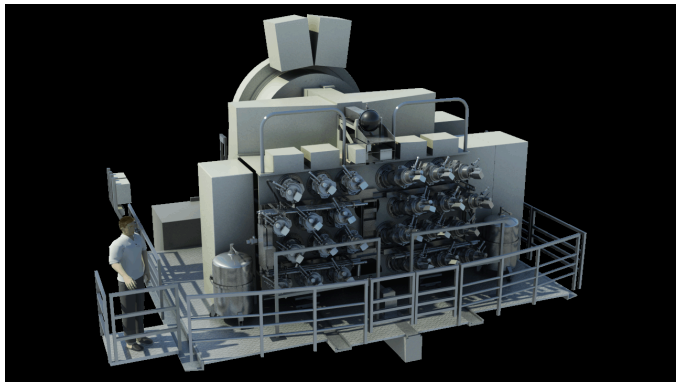


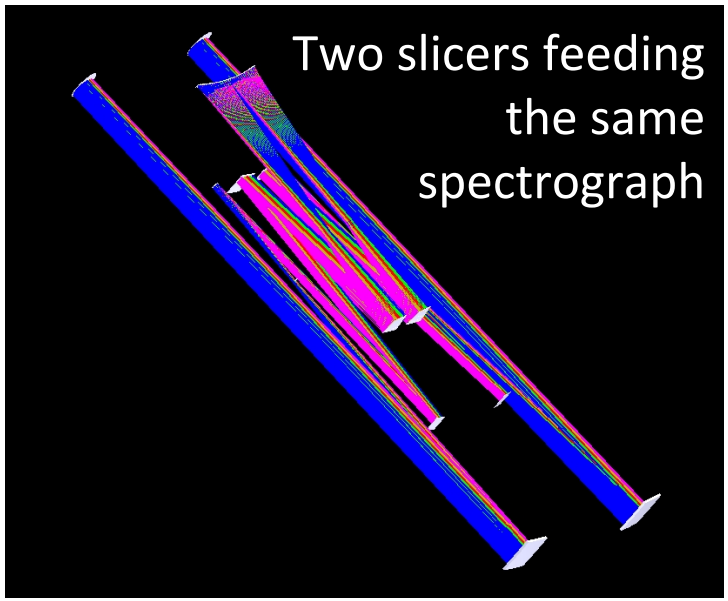
Few optical designs we have proposed for ground based instruments

VLT/MUSE: Optimize manufacturing process

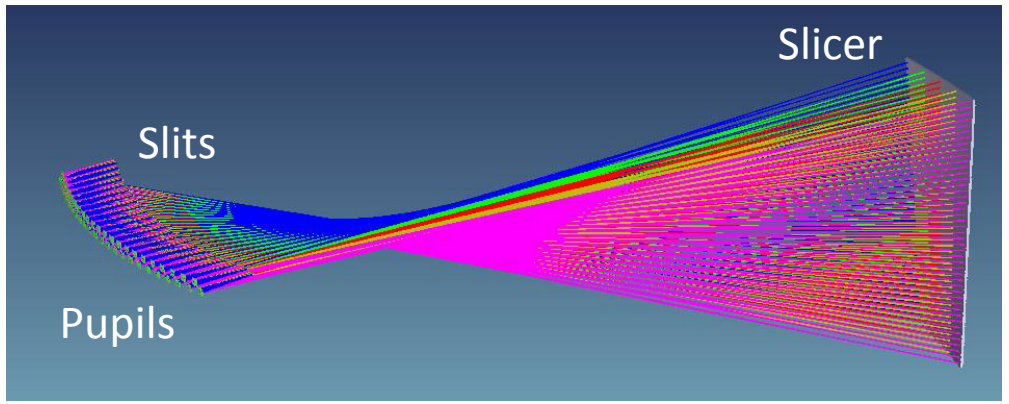








ELT/EAGLE:
Minimize amount of optics



Conclusions

- Although preliminary, the current design allows to demonstrate the technical feasibility of the FLARE
  - Technology is mature
  - No show stopper identified
- Towards the proposal:
  - Iterate on the specifications
  - Perform some trade-off analyses (e.g. the IFU)
  - Move to a complete optical design


MERCI !