TAIPAN OPTICS

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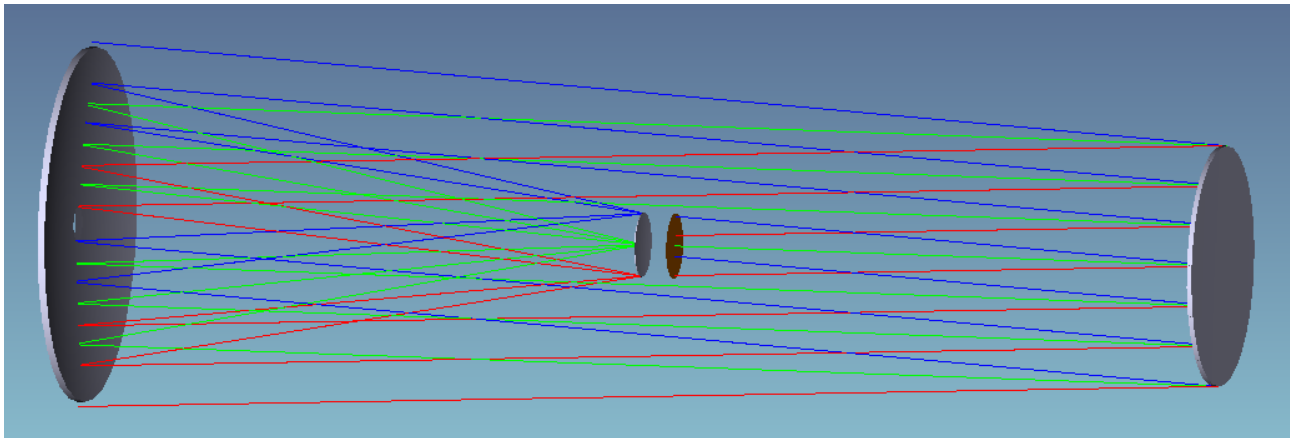
TAIPAN

- Goal: 300 starbugs on a 6° field in the UK Schmidt.
- Optics:
  - Telescope.
  - Field plate.
  - Bug input.
  - Slit.
  - Spectrograph.

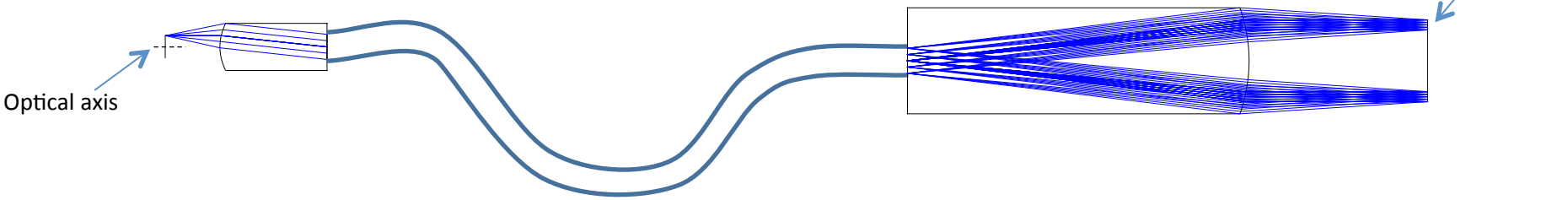
Telescope & field plate



Field plate challenging to get low cost and proper image quality:
-Not flat.
-Low surface error on small scale (direct image quality).
-Low variation of thickness on large scale (defocus).
-Tolerances:
- 0.1 um RMS on small scale.
-25 um RMS on large scale.
-Total effect field plate ~ 1.1” PSF.

Starbug input & slit

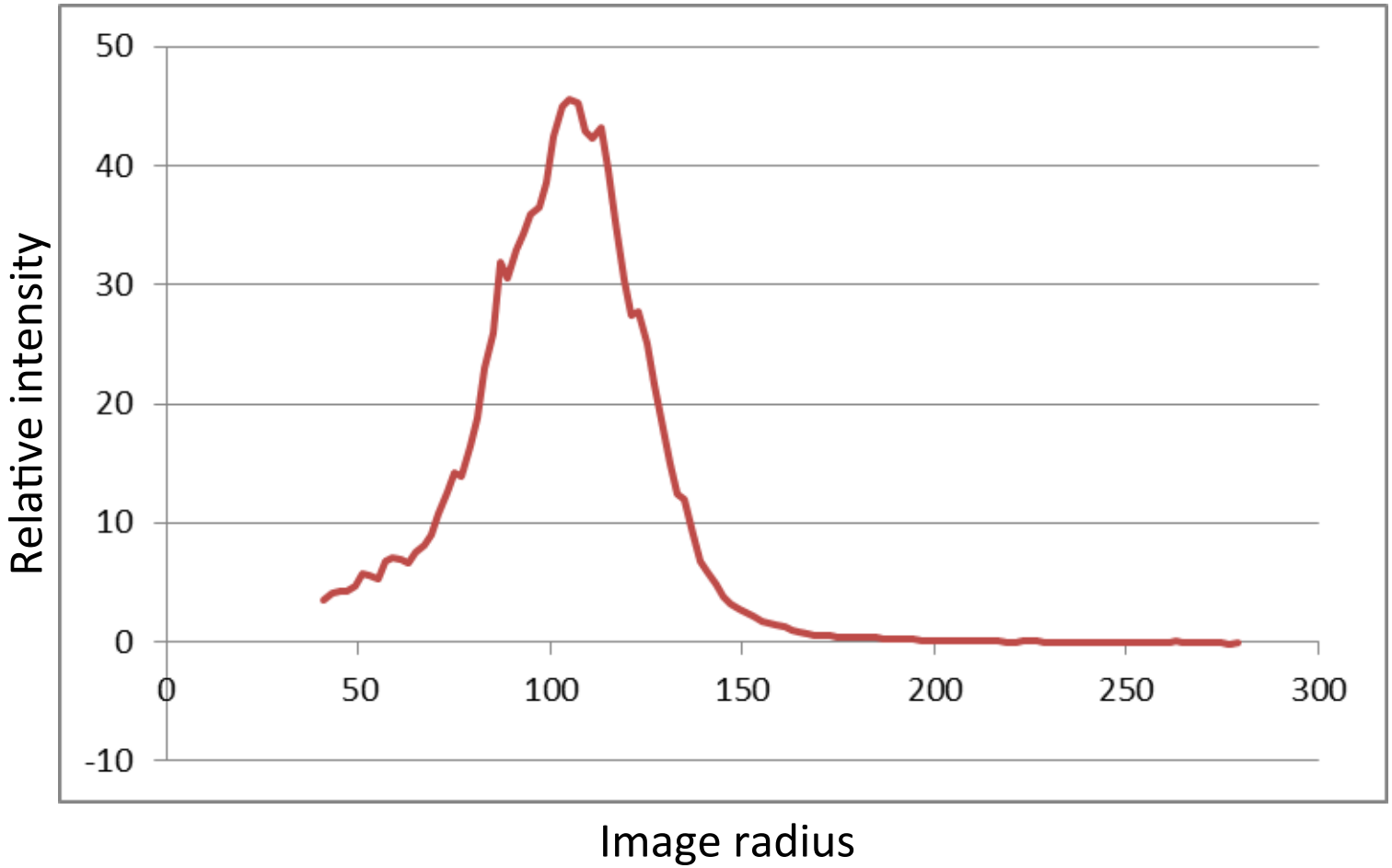
- Input options:
  - Baseline: 3” fibre cores.
  - Lenslets on input and output would maintain spatial information in radial direction:



Input fibre core

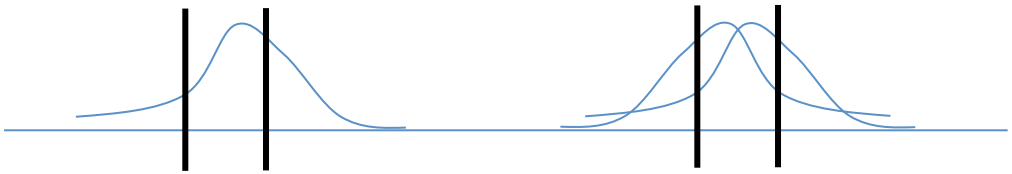
output fibre core

Image from input laser beam



Lenslets on input fibres

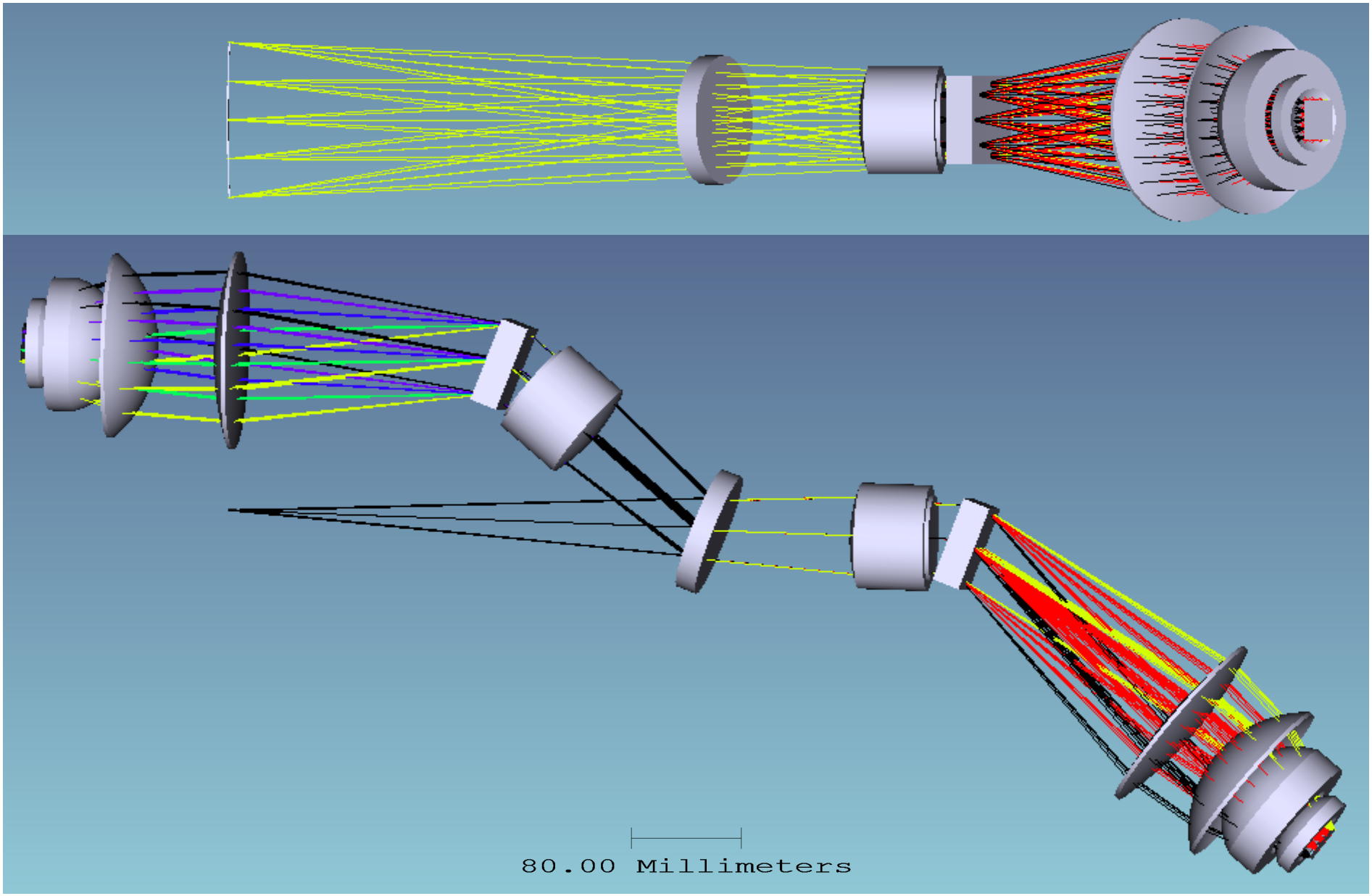
- Advantages:
  - Slit of 2.7” x 5.6” instead of 3” core with 300 starbugs (longer with 150): solid angle 2.2 time larger.
  - Large objects get more light.
  - Small sources decoupled from background.
  - Spatial information available: between IFU and bare fibre.
  - Centering of objects on slit compared to multi-slit spectrograph.



  - Better from the optical side: pupil on input fibre core and imaged on spectrograph stop submitted to a smaller focal ratio degradation (no oversizing to get enough light).
  - Better use of detector which has a given size of 2k x 2k.

New double spectrograph

- Dichroic after slit followed by 2 arms:
  - 370 to 580 nm.
  - 565 to 870 nm.
- R = 2300 (2 pixel FWHM).
- Design for 300 fibres. If less starbugs, additional fixed fibres at the edge of field can be used for sky.
- Microlenses at output slows beam from F/2.45 to F/8.
- Input size:
  - 3” fibre core: 2.3 pixel wide on detector giving 2 pixel per FWHM spectral elements.
  - Lenslet at input of each fibre : slit 2.75” x 5.6” with 2 pixel per FWHM.



Top view: red channel side view; bottom view: full spectrograph with scale