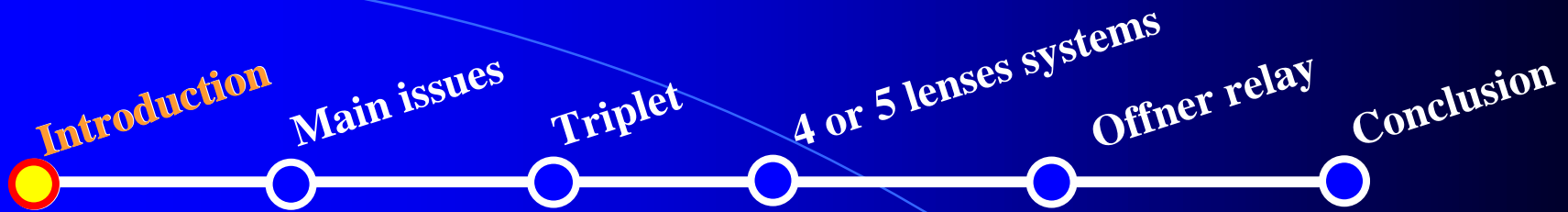




# **RVS: Choice of a new optical system**

Fanny CHEMLA  
GEPI

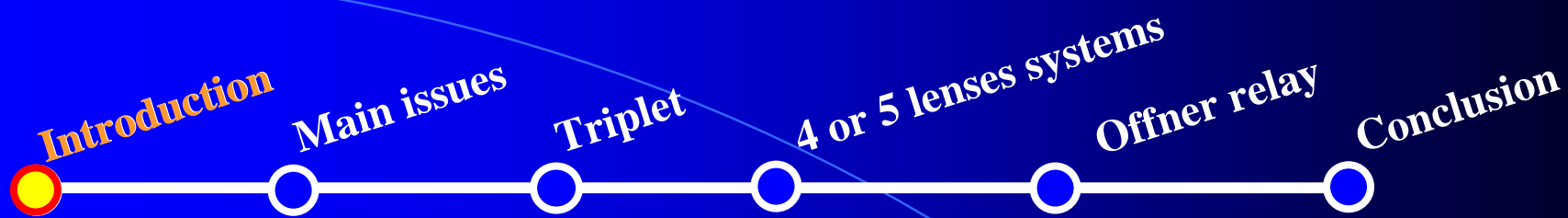


Astrum has provided a design that exceeds the specification in terms of mass

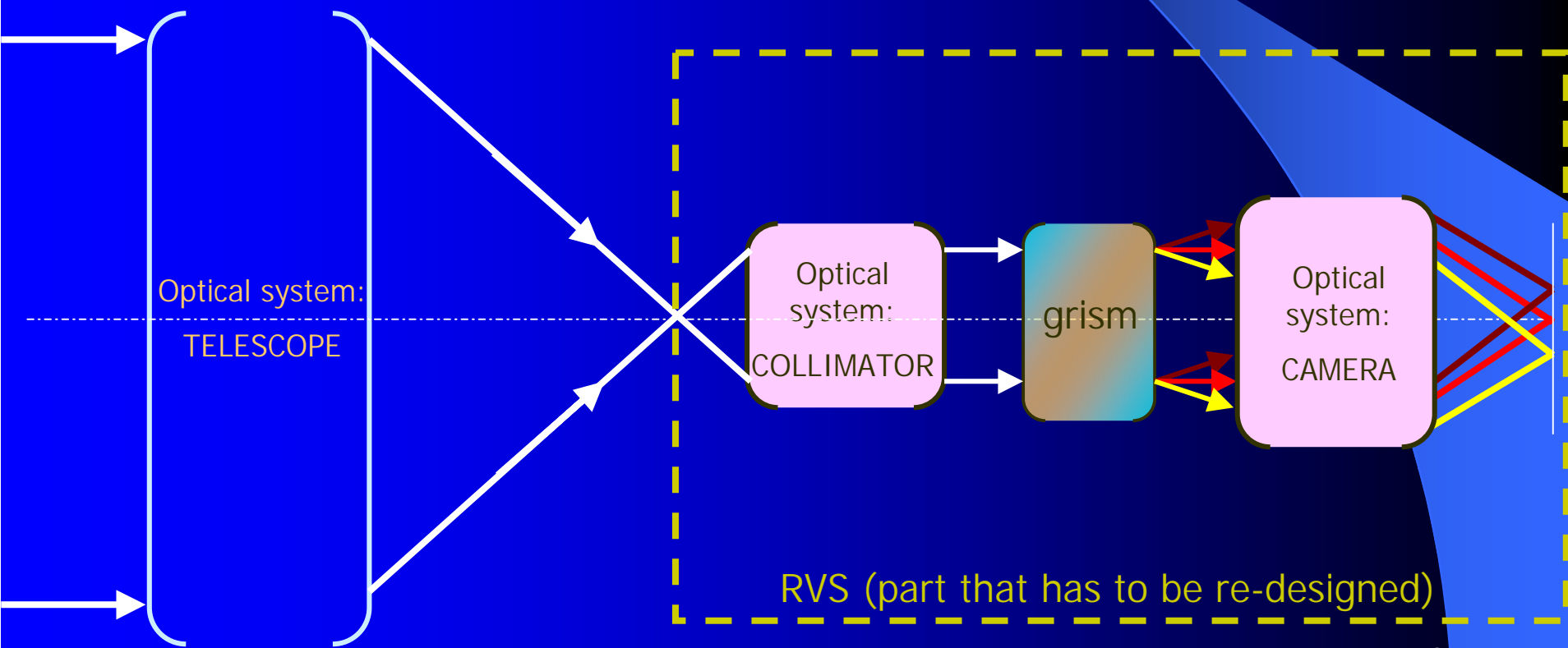


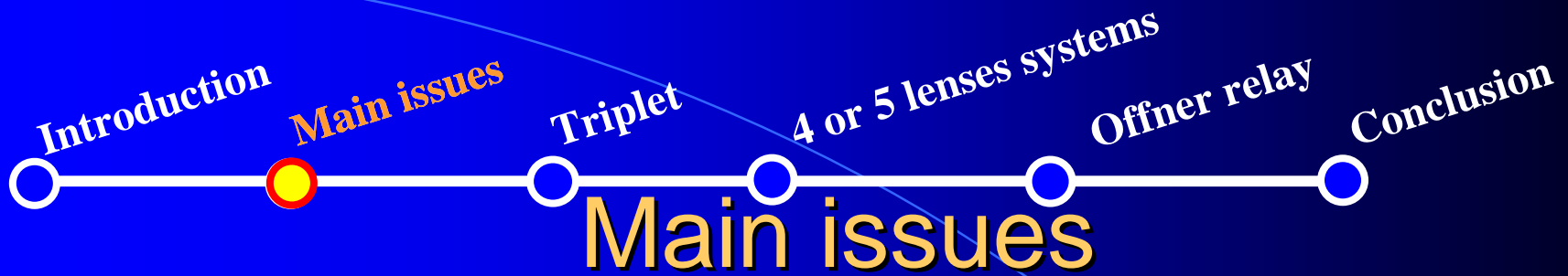
**A new design has to be found**  
**objective: at least 20% of lightening**

**Four options are currently studied in parallel**



# General shape of the design

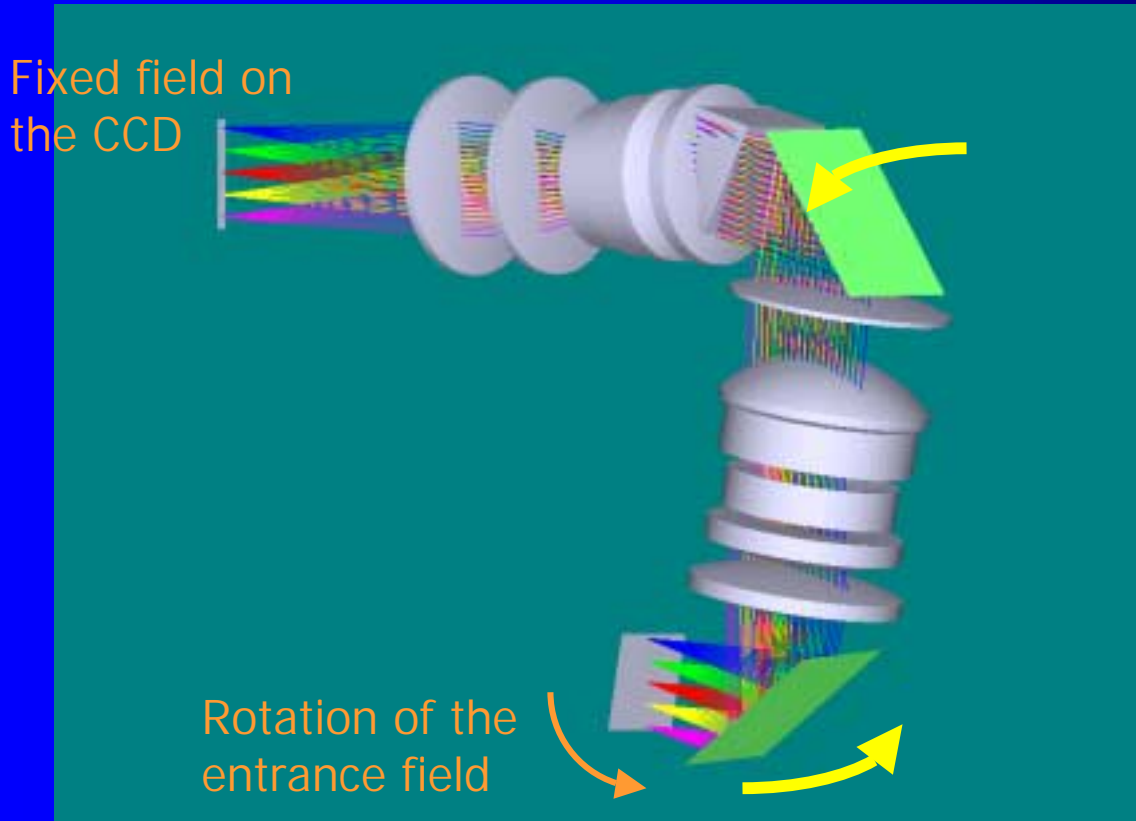




Criteria on which the systems are compared:

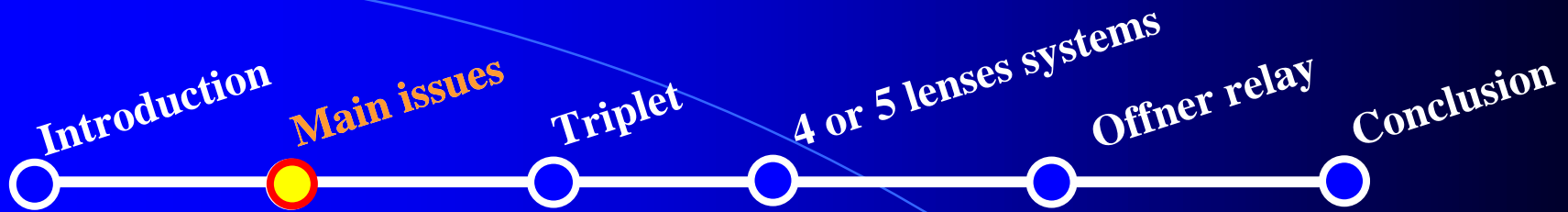
- Mass
- Volume
- Transmission
- Telecentricity
- Possibility to add two folding mirrors before the grism?

# Why two folding mirrors?

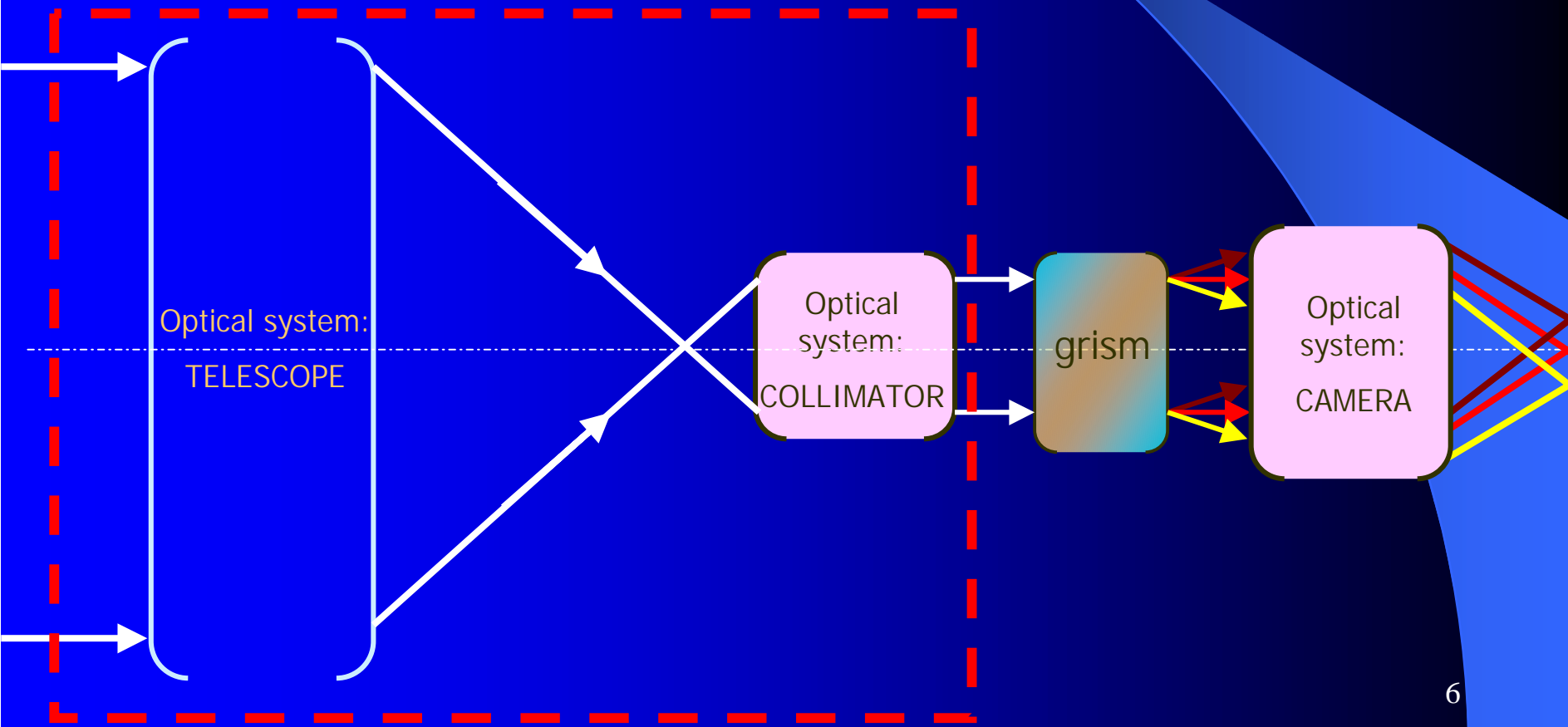


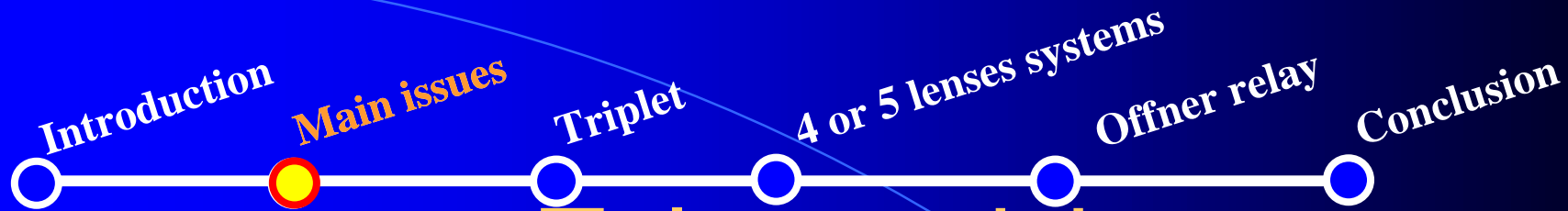
Exemple of a use of two folding mirrors

(here in the former Astrium design)

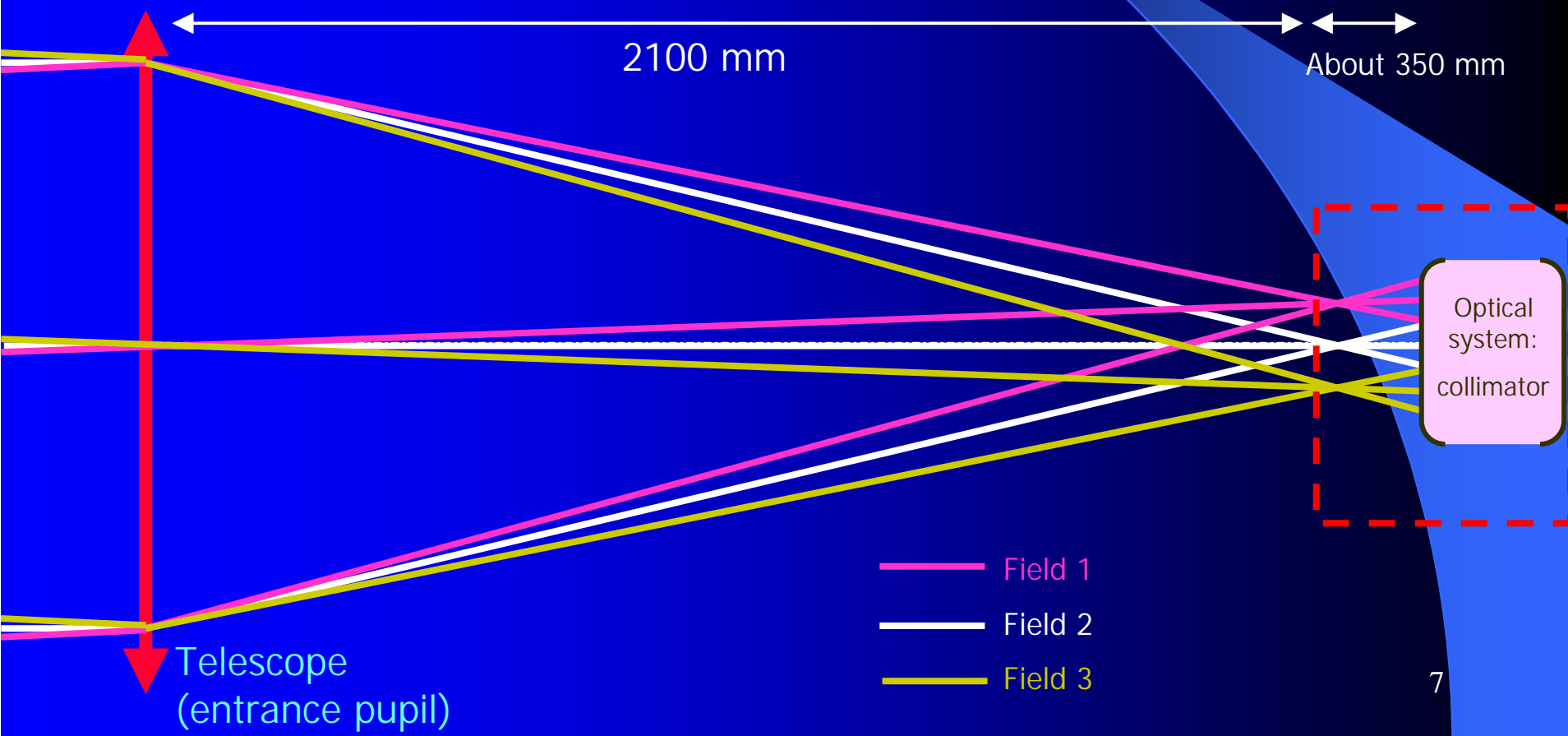


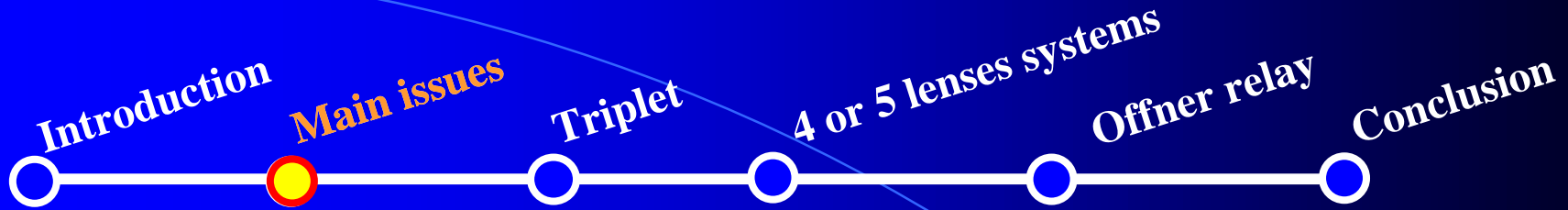
# General shape of the design



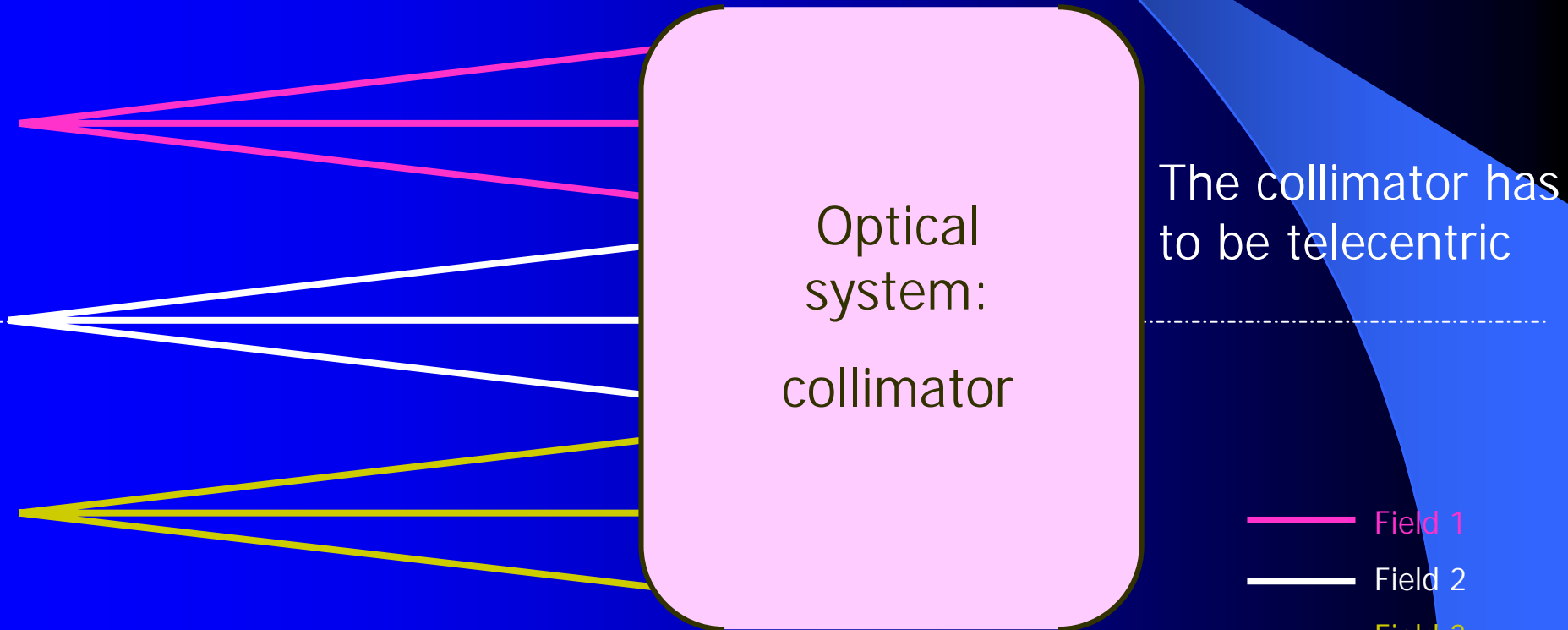


# Telecentricity

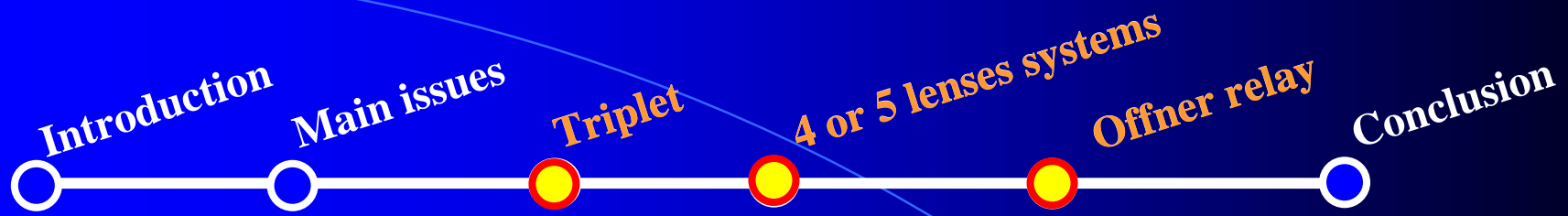




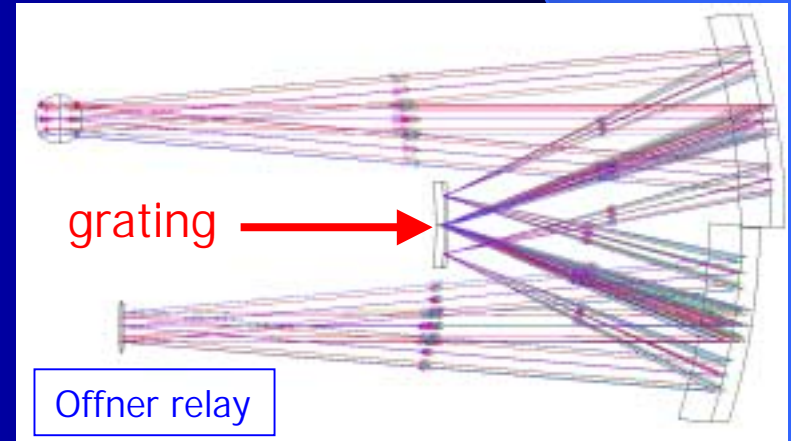
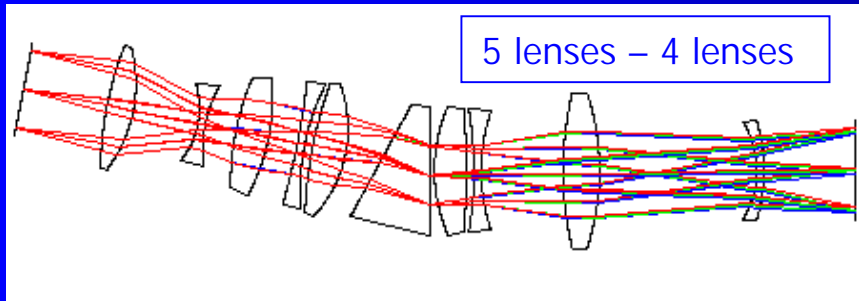
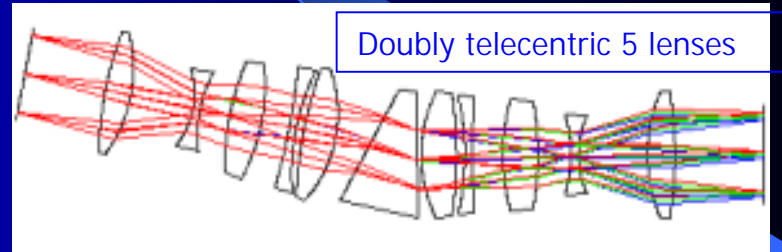
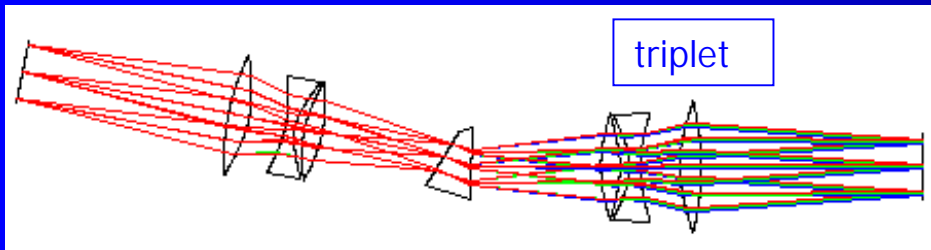
# Telecentricity

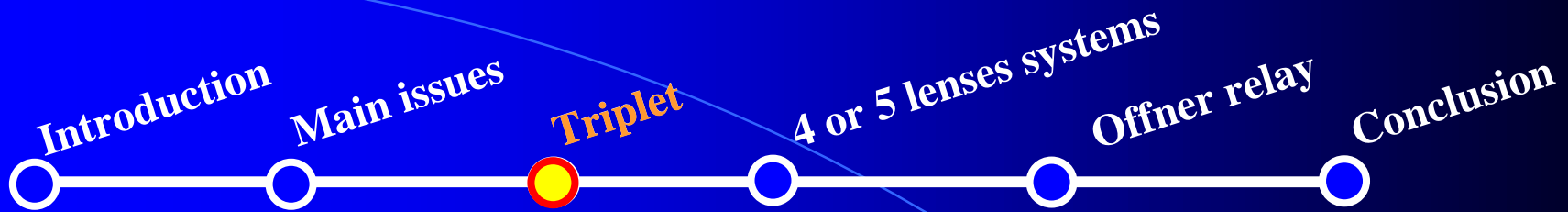




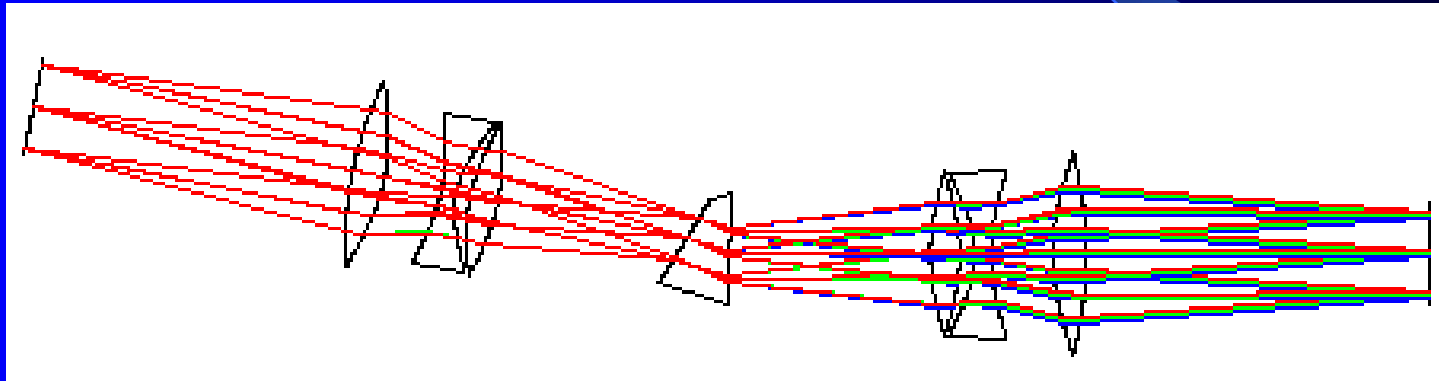


# Four system options found





# Triplet



## Main advantages

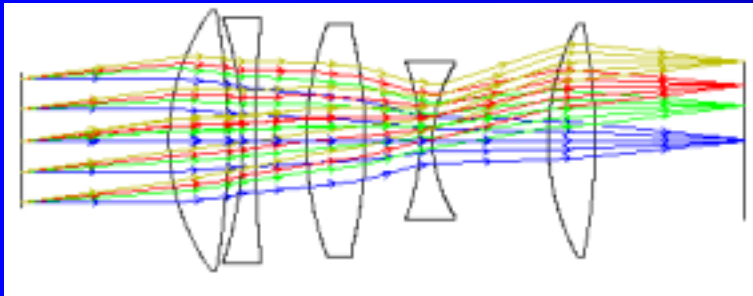
- Light
- Lots of free spaces (possibility to add fold mirrors)
- correct transmission (small number of surfaces)

## Main inconveniences

- Optimisation limited
- High aspherisation needed on the optical surfaces
- High sensitivity to the tolerancing process expected

# 4 or 5 lenses systems

Other light systems that are appropriate with the RVS (Richard Vignier System) (Richard Bingham):

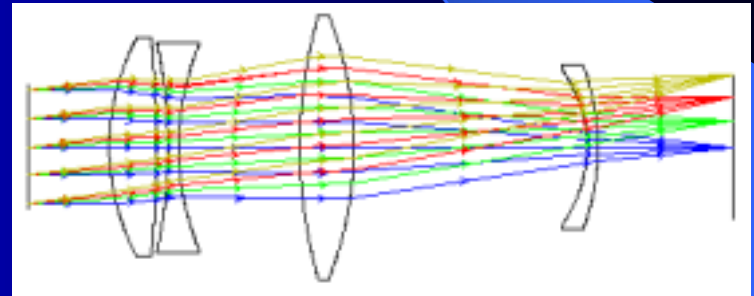


Five lenses system

Telecentric



can be used either as a collimator or a camera

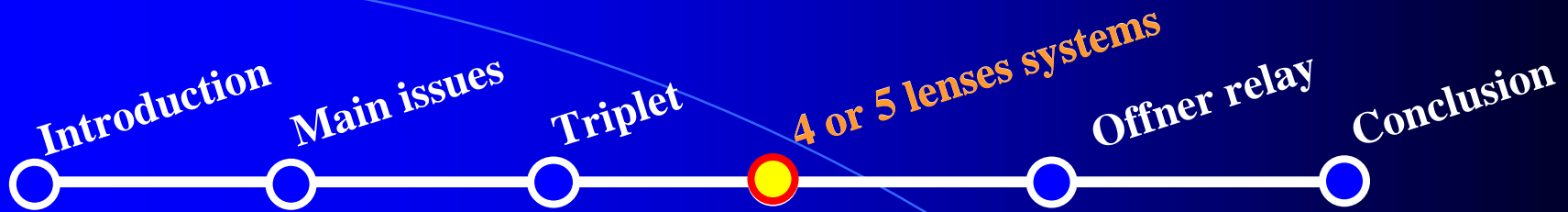


Four lenses system

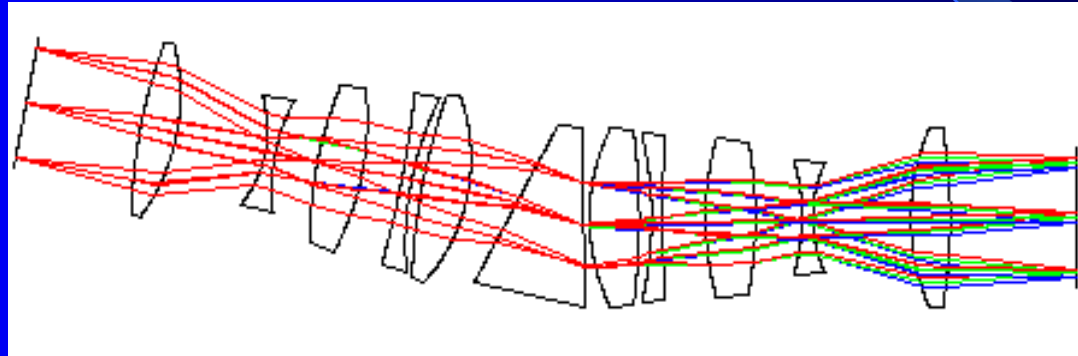
Non-telecentric



can only be used as a camera



## Doubly telecentric (5 lenses on both sides)

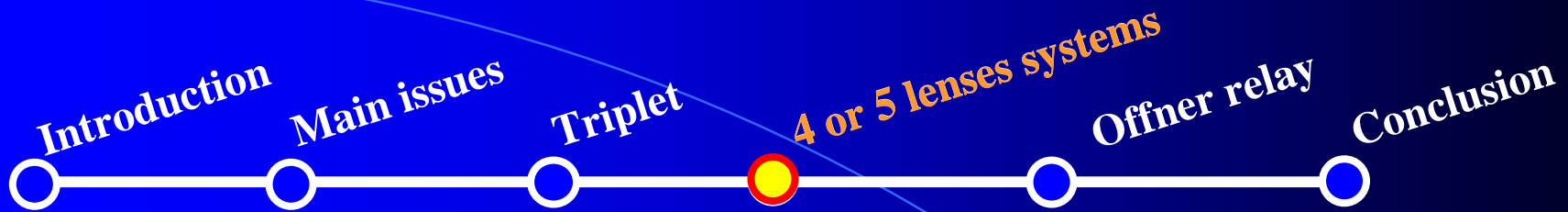


### Main advantages

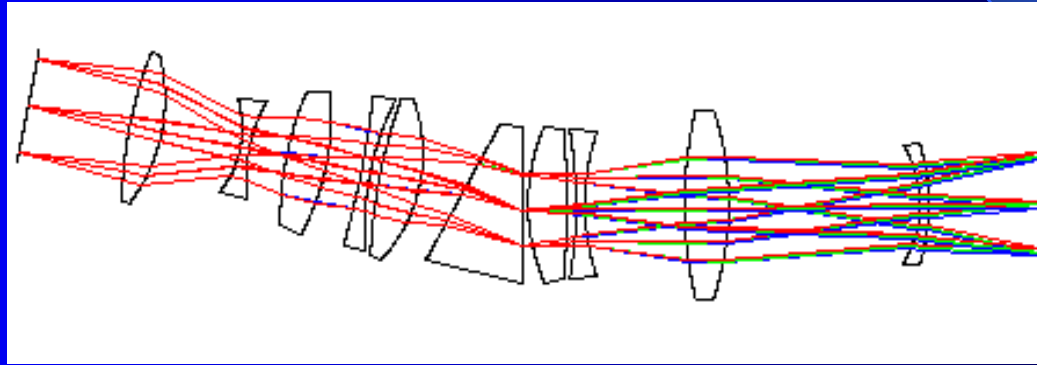
- Light
- High optimisation flexibility

### Main inconveniences

- No free spaces to add fold mirrors for the moment
- High sensitivity to the tolerancing process expected



## Telecentric collimator (5 lenses) non-telecentric camera (4 lenses)

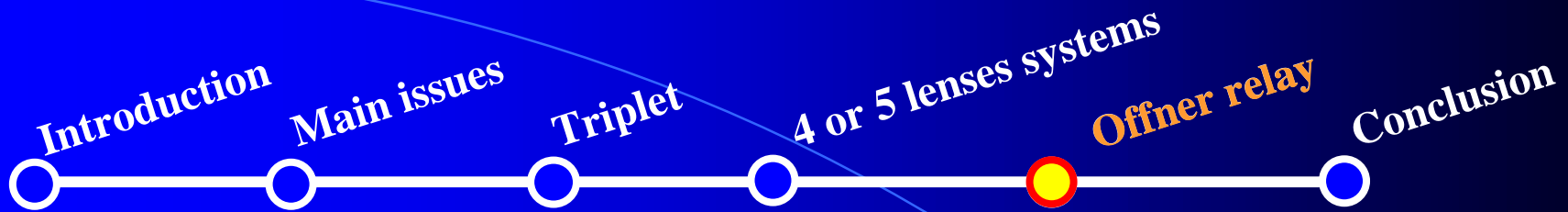


### Main advantages

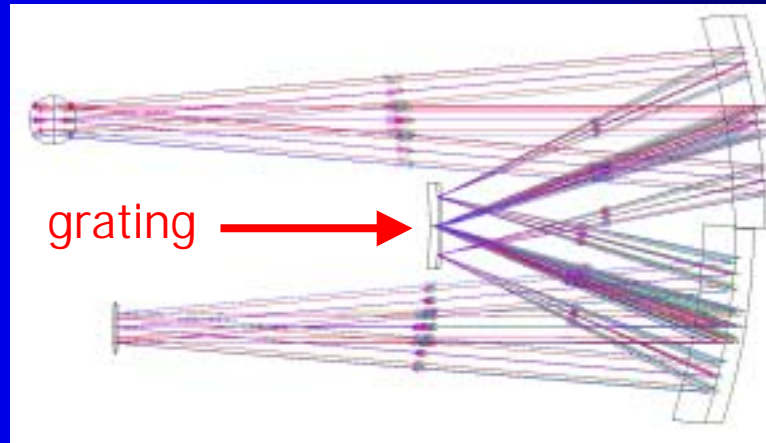
- Light
- High optimisation flexibility

### Main inconveniences

- No free spaces to add fold mirrors for the moment



# Offner relay

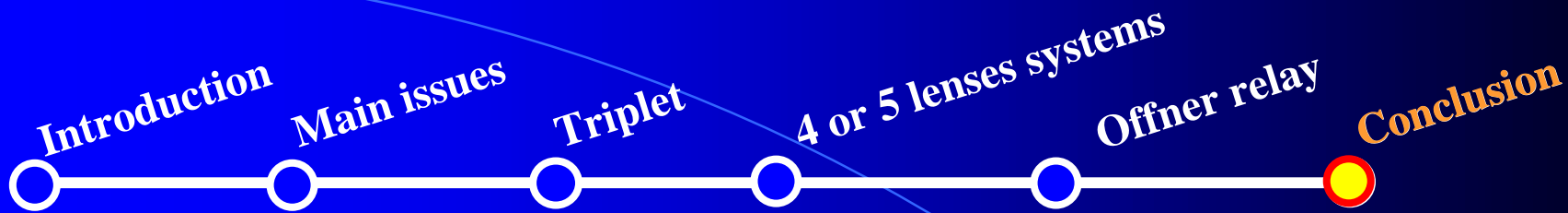


## Main advantages

- Lots of free spaces to add two, or even more folding mirrors
- very light
- High transmission (only 3+2 mirrors)

## Main inconvenience

- High overall volume (might even be redhibitory)
- Low flexibility for optimization



## Comparative table

	<i>Former Astrium design</i>	<i>Triplet on both sides</i>	<i>Five lenses on both sides</i>	<i>Collimator: Five lenses Camera: Four lenses</i>	<i>Offner Relay</i>
<i>Layout (unfolded view)</i>	<b>Warning: old FOV 1.6°+2°</b> 	<b>design in progress</b> 			
<i>Possibility to add 2 mirrors*</i>	<b>YES</b>	<b>YES</b>	<b>NO</b>	<b>NO</b>	<b>YES</b>
<i>Weight</i>	<b>21.7 kg</b> <b>24 kg expected with 2.54°</b>	19 TBC	19 kg (in case there are folding mirror)	18.5 kg (in case there are folding mirror)	<b>14.5 kg TBC with SiC</b>
<i>Max Track (z)</i>	1234 mm	1300 mm TBC	923 mm	1000 mm	1400 mm
<i>Dimensions x, y, z</i>	750*570*200 mm <sup>3</sup> (folded)	800*600*250 mm <sup>3</sup> TBC (folded)	215*215*923 mm <sup>3</sup>	240*240*1000 mm <sup>3</sup>	<b>1400*800*500 mm<sup>3</sup></b>
<i>Number of surfaces</i>	28	16	22	21	5
<i>Total transmission</i>	<b>0.24 TBC</b>	0.29 TBC	0.26 TBC	0.26 TBC	<b>0.34 TBC</b>
<i>Design flexibility</i>	High	<b>Low</b>	High	High	High
<i>Probable sensitivity to the tolerancing process</i>	High	High	High	Low	Low
<i>Feasibility issues</i>	None	<b>Feasibility of high aspherisation of the lenses curvatures to be checked</b>	None	None	<b>Convex grating feasibility: to be checked</b>

\*the two mirrors would allow a de-rotation of the field of view (rotation of the field of view is due to the GAIA scanning law)

**Advantages**

**Inconveniences**