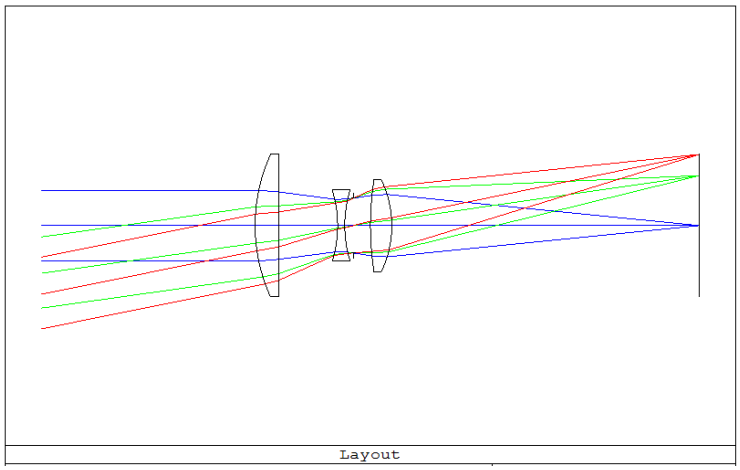
OPTI 421/521 – Introductory Opto-Mechanical Engineering

Homework 12

1) Lens mount

Develop a preliminary design for a barrel to mount the lenses as specified:



50 mm EFL, F/5 objective
Use the optical design provided
Zemax file 521P12.ZMX:

Maintain the following tolerances:
Lens spacings < 0.2 mm
Lens centration < 0.1 mm
Lens tilt < 30 arcmin

Field of view defined by 14 mm square detector

No requirement for specific mounting interface:

Scenario: These are low volume production. You should assume that a single prototype will be made, demonstrating performance and serving as pilot for production. After that ~200 units will be made. Design so the parts can be assembled according to the tolerances without requiring any adjustment.

Develop a preliminary design in Solid Works. Provide a section view showing the details of your barrel. Provide appropriate dimensions and tolerances. Provide the details of your retainer, including properly dimensioned and tolerance drawings of each part.

The lens elements are custom parts. You can specify edge features for mounting. You must provide drawings for the lens elements which include appropriate tolerances for any mounting features.

Provide your design in the form of a brief technical report.

SURFACE DATA SUMMARY: (in mm)

Surf	Type	Radius	Thickness	Glass	Diameter
OBJ	STANDARD	Infinity	Infinity		
1	STANDARD	Infinity	30		
2	STANDARD	24.06669	3.3	SK16	20
3	STANDARD	Infinity	8.3		20
4	STANDARD	-16.78867	1	F2	10
5	STANDARD	16.78867	1.2		10
STO	STANDARD	Infinity	2.4		7.7
7	STANDARD	42.52806	3	SK16	13
8	STANDARD	-14.85076	43.2		13
IMA	STANDARD	Infinity			20

2) Mounting for a glass mirror

For the case of a flat mirror made of Zerodur, 100 mm diameter, and 15 mm thick. This mirror should be supported kinematically at three points on the back near the outer edge.

Perform analysis and write a brief technical report for the self-weight deflection support of this mirror. Include the following:

a) How much does this mirror weigh?
b) For the case where the mirror is on its back (optical axis vertical), use the relationship provided in class to calculate the self-weight induced figure errors for a 3 point support on the back near the outer edge.
c) Create a Solid Works model of this design and use finite element modeling to determine this self-weight deflection. Be careful with your constraints.
d) Use the Solid Works model to evaluate the deflection due to gravity when the mirror is held on edge, with optical axis horizontal.
e) Post process the data for both cases using SAGUARO to determine the amount of power in the surface and RMS surface irregularity after removing bias, tilt, and power.

Provide your design in the form of a brief technical report.

3) Rules of Thumb

Provide three rules of thumb using the standard format.