OPTI 423/523 – Optomechanical Design and Analysis

Problem 1: Lens mount

Design a mount for the lenses from HW3 OPTI 421/521.
Use the tolerances you derived as the specification. You may want to revise these to better balance cost and performance.

A) Write the requirements for the lens mount.

B) Perform preliminary design. Show how to estimate performance and survival

C) Complete the design. Create SolidWorks model and toleranced drawings of parts. Document your design and analysis that predicts performance, survivability.

HW3 system:
The following optical system is used to focus a collimated HeNe laser beam onto a Position Sensing Detector (PSD).

The system requirements are:
20 mm entrance pupil diameter
Nominal EFL = 100 mm
Wavelength = 632.8 nm (HeNe)
Diffraction limited operation, SR > 80%
(A fine focus adjustment can be made by moving the PSD.)
The resolution for this adjustment is ±5 um

A nominal optical design has been supplied, see the following page. The design residual of this system is 0.002 λ rms.

A top level system budget has been performed in terms of rms wavefront error:.

Lenses	0.04 λ rms	:	This term covers errors from lenses themselves
Assembly tolerances	0.04 λ rms	:	This term includes lens positions errors
Operational changes	0.04 λ rms	:	Thermal changes, residual focus
RSS	**0.07 λ rms**		

Design for survival of:
100 G shock
0° C – 40° C
Design for operation in an industrial environment, T= 15° – 25° C

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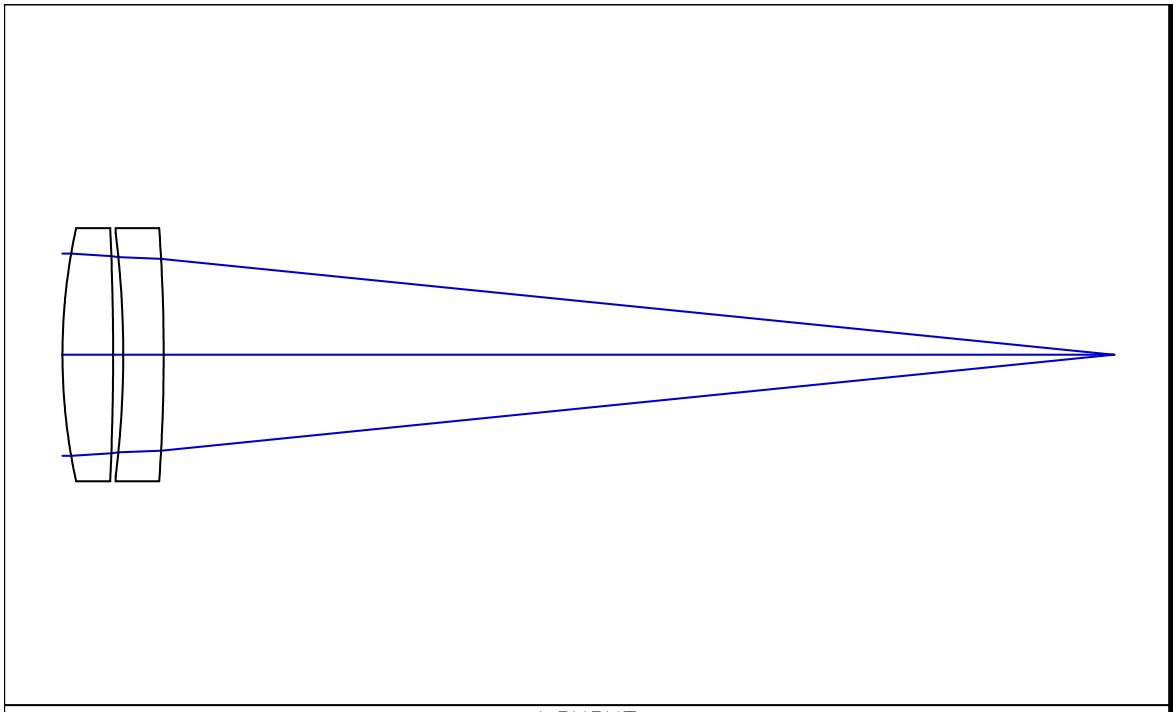
Focusing Doublet



LAYOUT

FOCUSING DOUBLET
TUE SEP 9 2008
TOTAL AXIAL LENGTH: 103.82424 MM

DOUBLET OBJECTIVE.ZMX
CONFIGURATION 1 OF 1

SURFACE DATA SUMMARY:

Surf	Type	Radius	Thickness	Glass	Diameter
OBJ	STANDARD	Infinity	Infinity		0
STO	STANDARD	Infinity	0		20
2	STANDARD	58.6	5.0	N-SK15	25
3	STANDARD	-277.0	1.0		25
4	STANDARD	-97.0	4.0	N-SK15	24
5	STANDARD	-174.0	93.824		25
IMA	STANDARD	Infinity			

INDEX OF REFRACTION DATA:
Index data is relative to air at the system temperature and pressure.
Index of refraction at 632.8 nm
N-SK15 1.620702