LAB 6: THE GOLFSCOPE

Aberrations in the "cheap" 4x10mm golfscope (green and white case):

Look at a distant point source on-axis (a pinhole source across the lab room). Fully describe what you see, paying special attention as you go out of focus on either side of the circle of least confusion.

(1) • Describe any evidence of spherical aberration that you see (HINT: on one side of focus you'll see a 'hard' edge—on the other side of focus you'll see a 'soft' edge). Does the movement of the eye lens follow what we've already learned about spherical aberration? Explain.

(2) • Describe any chromatic aberration that you see (the orders of the colors on both sides of focus).

(3) • Look at the white walls of the lab through the golfscope. Carefully move the eye lens through focus and describe what you see. The aberration that you're seeing if called field curvature. In addition, you're also seeing spherical and chromatic aberration.

Reverse-engineer the black golfscope:

This is an "open-ended" lab. Use your optical skills to reverse-engineer this device. When finished, you should:

(4) • Explain what kind of optical system this is.

(5) • Explain how it works.

(6) • Have a complete optical prescription (ZEMAX analysis) for it.

Your starting point:

Lens 1:	R1(L1) =79.7mm	n=1.444	t(L1)=?	R2(L1)= R1(L2)
Lens 2:	R1(L2)=?	n=1.656	t(L2)=?	R2(L2)= -50mm
			t(L2 to reticle)=?	
Reticle:	R1=R2= ∞	n=1.52	t(reticle)=?	
			t(reticle to L3)=?	

Prism: (measure its reduced thickness; assume n=1.52)

Lens 3:	R1(L3)= ∞	n=1.677	t(L3)=?	R2(L3)= -R1(L4)
Lens 4:	R1(L4)=?	n=1.54	t(L4)=?	R2(L4)= -11.7mm
Lens 5:	R1(L5)=11.9mm	n=1.613	t(L5)=?	R2(5)= ∞

Make appropriate measurements to "fill in" the blanks. Then, input the optical prescription into ZEMAX to fully analyze the system.

This report will be worth 100 points (the same as any of the other lab reports). Your grade will depend on the detail and sophistication that you use to analyze this as an optical system.

NOTE--Your report should include answers to the following questions:

(Q1)--Based on your optical measurements, what is the height of the flag on a golf course?

(Q2)--Given a height for the flag, what is the uncertainty in knowing the range to the flag? (again, based on your optical measurements).

(Q3)--Based on your optical measurements, what is the reduced thickness of the prism?