Homework 3 y-nu ray trace & reverse telephoto design

Due by 5:00 pm on Thursday, February 9, 2017 (turn in at my mailbox in 610 Cobleigh)

1) y-nu ray trace of a doublet lens with internal stop (30 points)
Use the y-nu ray trace technique to find the following quantities for the doublet lens described below, assuming an object at infinity and object-space field angle = 1°.

a. marginal ray height at each surface;
b. aperture stop location and size (trace an initial marginal ray to confirm the stop location, then scale the ray to the given stop size to find the actual marginal ray);
c. chief ray height at each surface (trace an initial chief ray through the center of the aperture stop, then scale the chief ray heights and angles to match the given field).
d. entrance pupil location and diameter;
e. exit pupil location and diameter;
f. the "field of view" (or field) angles in object space and image space;
g. the front and rear principal plane locations;
h. the effective focal length
i. the back focal distance (what Zemax calls back focal length)

Make a scale drawing of the lens showing these quantities.

2) Enter your doublet prescription into Zemax (10 points)
Use wavelength = 0.587562 μm, set aperture as "float by stop size," then compare your ray-trace values to those calculated by Zemax (*Analyze – Rays & Spots – Single Ray Trace – Settings*, selecting *Ym,Um,Yc,Uc* in the *Type* menu gives marginal & chief rays).

NOTE: the left-hand lens is BK7 glass and the right-hand lens is SF1 glass

Sit back and breathe a sigh of relief that you have a computer for future problems! ☺

Lens prescription

Sfc	1	2	3 (iris)	4	5	6 (image)
R	49.414	-57.069	infinity	-49.188	-160.303	infinity
t	infinity	5.951	0.500	2.675	4.000	88.380
n	1.000	1.5168 (BK7)	1.0000	1.0000	1.7174 (SF1)	1.0000
Semi-diam	16	16	12	16	16	auto