

Homework 9 Due by 5:00 PM on Tuesday, 11 April 2017**1. (30 points) Catalog Lens Analysis:**

- a. After exploring some of the commercial lenses available in the Zemax lens catalogs, load the Thorlabs LA1251 singlet made of BK7 glass (nominally $f_e = 100$ mm, $f/4.4$). Orient the lens for optimal imaging with an object at infinity and use Zemax “quick focus” to focus the lens for best rms wavefront.

Set field angles = 0° , 1.4° , 2.0° and wavelengths = f, D, c (visible).

Use wave-fan and ray-fan plots to identify the dominant aberration(s).

Discuss how these aberrations are shown in the spot diagrams.

Use a chromatic focal shift plot to determine the f-c lateral chromatic aberration.

- b. Repeat this analysis for a Thorlabs AC254-100-A doublet ($f_e = 100$ mm, $f/4.4$). Also look at a chromatic focal shift plot and determine the approximate secondary chromatic aberration for this doublet.
- c. Repeat this analysis for the Cooke triplet design provided by me via email ($f_e = 100$ mm, $f/4$).

2. (10 points) MTF Analysis

For the doublet and triplet lenses, determine the spatial frequency below which the MTF remains above 10% modulation. What spatial resolution on the ground does this imply if you used this lens for airborne imaging from an altitude of 1000 m?

3. (20 points) Optimization with stock lenses – 582 students only

Work through the online tutorial about the Zemax stock lens matching tool:

<http://www.zemax.com/os/resources/learn/knowledgebase/how-to-use-the-stock-lens-matching-tool>

Show me a few results summarizing what you accomplished and learned.