Starting Point





FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 -0.003761 0.0656 0.844 0.000000 -0.002975 0.0656 0.844

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 -0.005351 0.1021 0.663 0.000000 -0.002975 0.1023 0.662

Y 0.71 10.00 -0.000264 0.000078

X 0.00 0.00 0.000000 0.000630 0.0830 0.762 0.000000 -0.002975 0.0836 0.759

Y 1.00 14.00 -0.000908 -0.001628

COMPOSITE RMS FOR

POSITION 1: 0.08488

With Asphere





FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 0.003583 0.0518 0.899 0.000000 0.000763 0.0524 0.897

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 -0.006919 0.0573 0.879 0.000000 0.000763 0.0605 0.865

Y 0.71 10.00 -0.000494 0.000179

X 0.00 0.00 0.000000 0.005883 0.0795 0.779 0.000000 0.000763 0.0805 0.774

Y 1.00 14.00 0.000458 -0.000148

COMPOSITE RMS FOR

POSITION 1: 0.06497

Units of RMS are waves at 546.1 nm.

Running MATLAB Code: Smallest Objective:5.677612453076e-04

R1:54.8436, R2:44.6463, R3:92.9965, R4:-57.8486, t1:4.5408, t2:4.5578, d:3.0056

Change the asphere to two singlets:





FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 0.004128 0.0503 0.905 0.000000 0.652539 1.7201 0.000

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 0.588189 1.7791 0.000 0.000000 0.652539 1.7847 0.000

Y 0.71 10.00 0.068992 0.074738

X 0.00 0.00 0.000000 2.510408 10.5163 0.000 0.000000 0.652539 11.3637 0.000

Y 1.00 14.00 0.390081 0.136744

COMPOSITE RMS FOR

POSITION 1: 6.03397

After Optimization





FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 0.004270 0.0506 0.904 0.000000 0.000884 0.0514 0.901

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 -0.008975 0.0630 0.855 0.000000 0.000884 0.0679 0.834

Y 0.71 10.00 -0.000869 0.000178

X 0.00 0.00 0.000000 0.007777 0.0782 0.786 0.000000 0.000884 0.0800 0.777

Y 1.00 14.00 0.001043 0.000035

COMPOSITE RMS FOR

POSITION 1: 0.06692



It is obvious that my phantom asphere are able to replicate the performance of the asphere. Notice that you have to run the program for several times to get the best performance. Next, I am going to compare the performance of my method to simple adding a thin plate.

Thin plate at front:





FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 -0.004287 0.0589 0.872 0.000000 -0.001952 0.0593 0.871

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 -0.004559 0.0857 0.748 0.000000 -0.001952 0.0860 0.747

Y 0.71 10.00 -0.000209 0.000146

X 0.00 0.00 0.000000 0.003898 0.0841 0.756 0.000000 -0.001952 0.0854 0.750

Y 1.00 14.00 0.000527 -0.000580

COMPOSITE RMS FOR

POSITION 1: 0.07747

Thin plate at back:







FIELD BEST INDIVIDUAL FOCUS BEST COMPOSITE FOCUS

FRACT DEG SHIFT FOCUS RMS STREHL SHIFT FOCUS RMS STREHL

(MM.) (MM.) (WAVES) (MM.) (MM.) (WAVES)

X 0.00 0.00 0.000000 -0.003556 0.0568 0.881 0.000000 -0.001251 0.0571 0.879

Y 0.00 0.00 0.000000 0.000000

X 0.00 0.00 0.000000 -0.003446 0.0863 0.745 0.000000 -0.001251 0.0865 0.744

Y 0.71 10.00 -0.000270 0.000043

X 0.00 0.00 0.000000 0.004036 0.0865 0.744 0.000000 -0.001251 0.0875 0.739

Y 1.00 14.00 0.000602 -0.000442

COMPOSITE RMS FOR

POSITION 1: 0.07788

Compare:

 

