

Ray tracing exercise 2

Optics, spring 2018

Assignment: Layer thickness measurement using CD-pickup

In the previous ray tracing exercise we designed a CD-pickup and characterized its sensitivity, working distance, and depth of focus using different lenses. The designed apparatus can be used as a noncontact profiler as demonstrated in the paper by Bartoli et al [1]. At this time, let's use the CD-pickup to measure layer thickness. In the simulation, replace the reflecting sample by a transparent sample that consists of two surfaces (front and back) separated by 0.5 mm. What would be an ideal lens for measuring layer thickness in the range of 0.3 – 1 mm? How would you evaluate the layer thickness from the simulated data? Does the evaluation need any calibration and how would you do it if required?

Write a short report (1-2 A4s) on the results from the assignment and return it to the assistant before the course exam.

Some helpful tips

- To simulate transparent sample use the same trick that was used to generate the beam splitter.
- The focus error signal should look something like double S-curve. If you don't receive such, try lenses with different focal lengths or change the layer thickness.

References

[1] A. Bartoli et al. "Fast one-dimensional profilometer with a compact disc pickup", Applied Optics, Vol. 40(7), pp. 1044-1048 (2001).