LED collimation

We started with an aspheric lens, placed in the same way it is placed in LED collimators from Thorlabs. That is the plane side facing the LED. The optical setup is shown in figure 1.

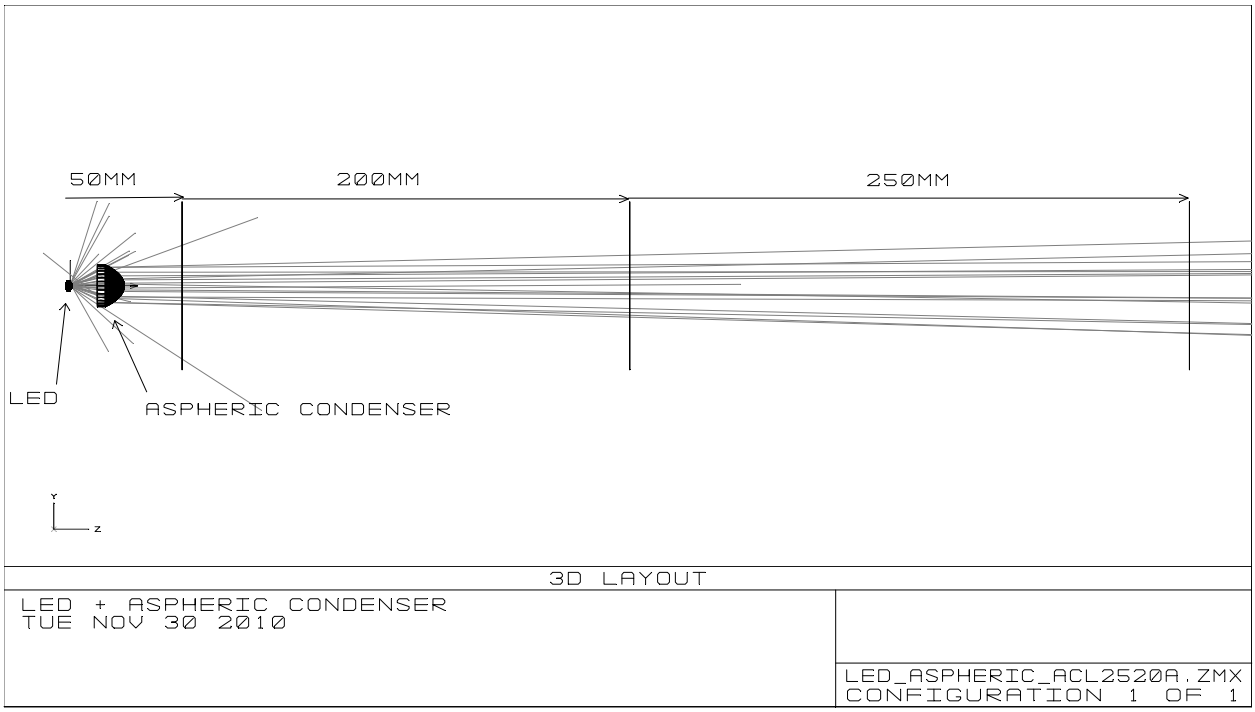

Figure 1. LED collimation setup, using an aspheric condenser. We can observe the divergence of the beam from the ray tracing.

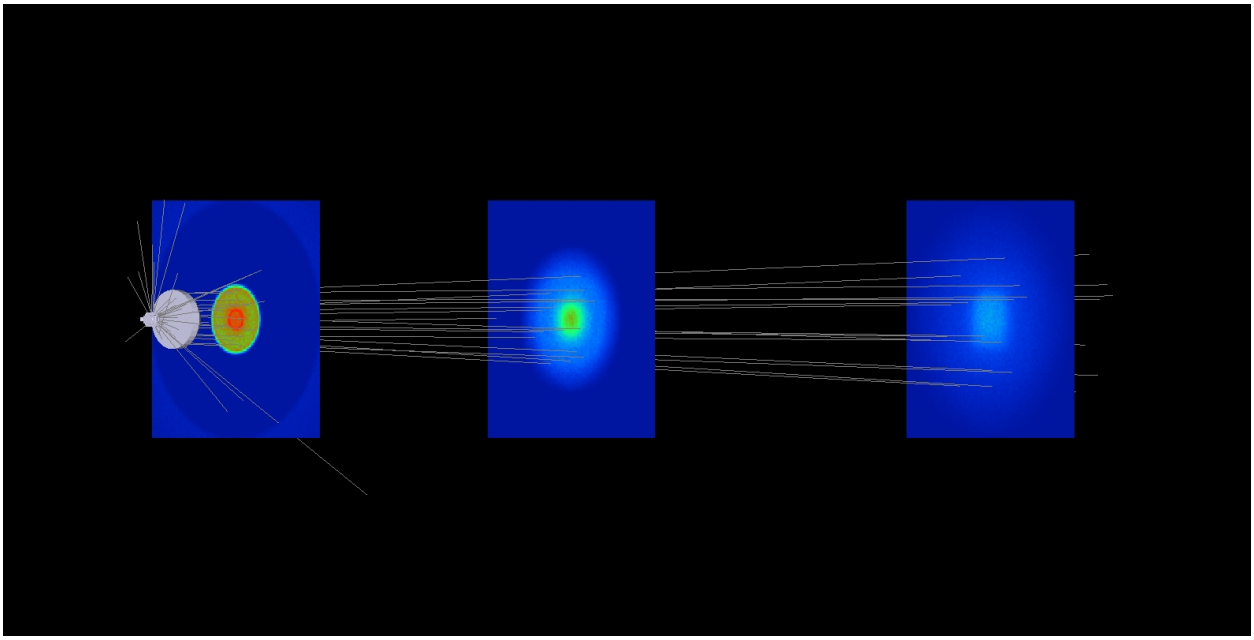

Figure 2. Incoherent irradiance mapped at different distances from the source.

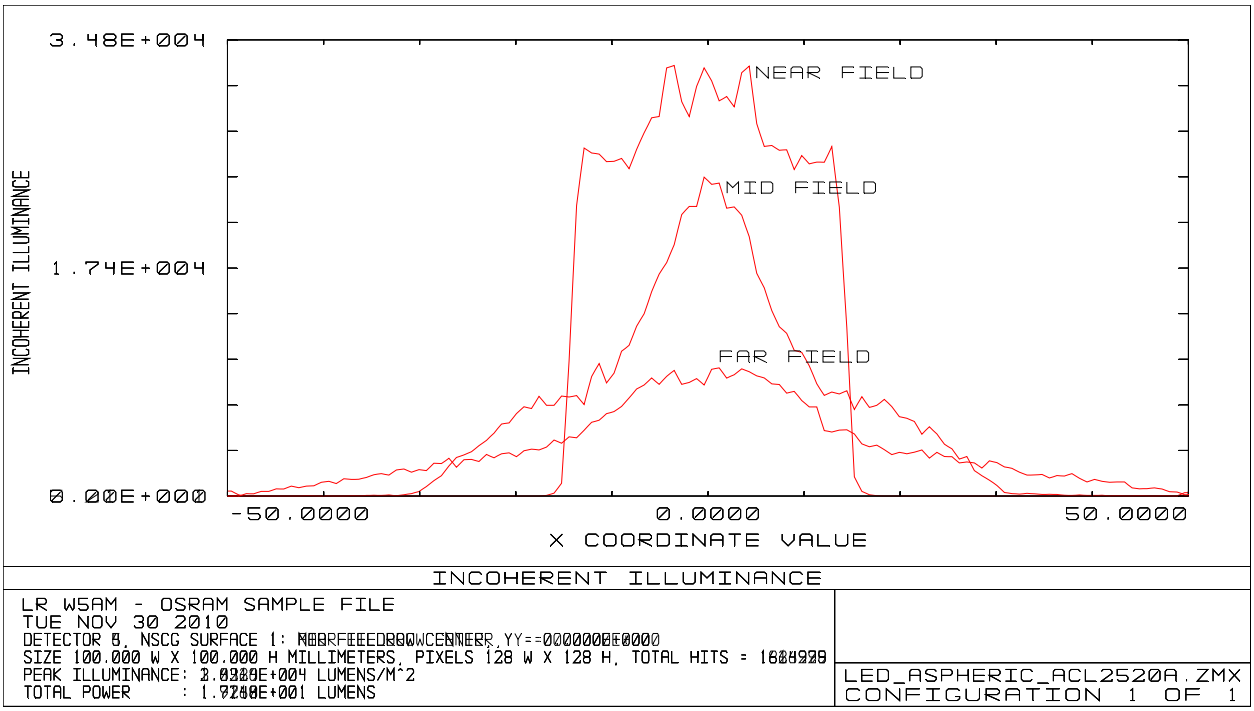

Figure 3. Intensity profile at 50, 250 and 500 mm from the LED source.

Figures 2 and 3 show the intensity profile of the beam, which cannot be perfectly collimated with this lens. Placing the lens at different distances gives even worse results (not shown here).

Another configuration worth to try is shown in fig. 4, it is from a DesAutels (SPIE proceedings, 2009), I still have to learn how to model a Fresnel lens, in this paper they design the lens, but we can find something adequate off the shelf and give it a try, it seems to work nicely.

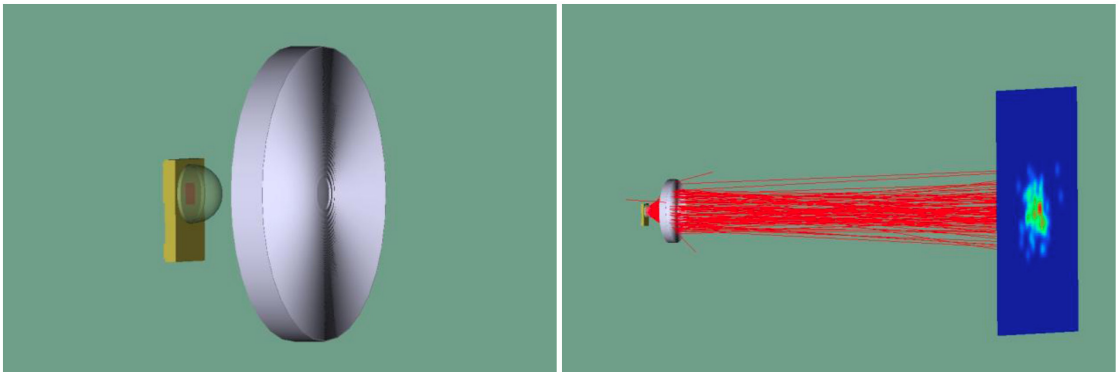

Figure 4. Fresnel lens and LED orientation. LED light distribution collimation using an acrylic Fresnel lens.

I have been trying to use a pair of aspheric lenses to focus the light in a first step and then collimate this focused light, but as you can see the results are not very encouraging (fig. 5), gotta try something similar to Vidal (SPIE proceedings, 2009).

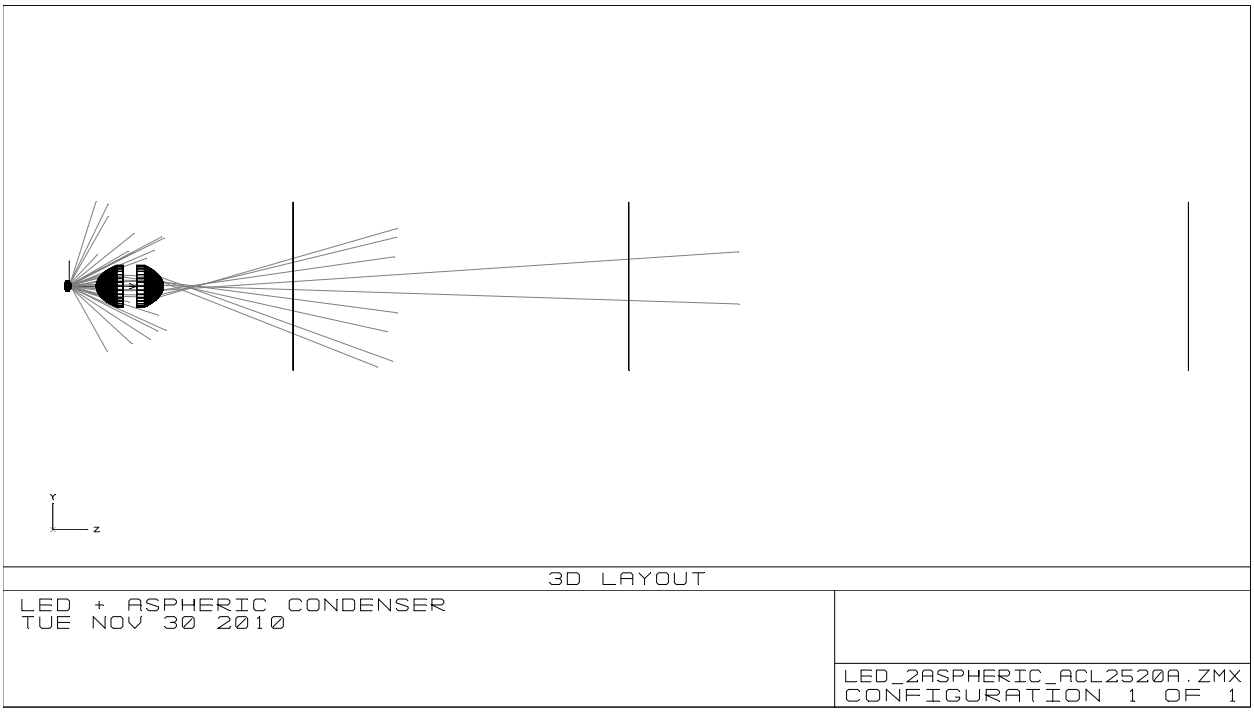

Figure 5. Ray tracing shows that this setup doesn't meet its purpose.

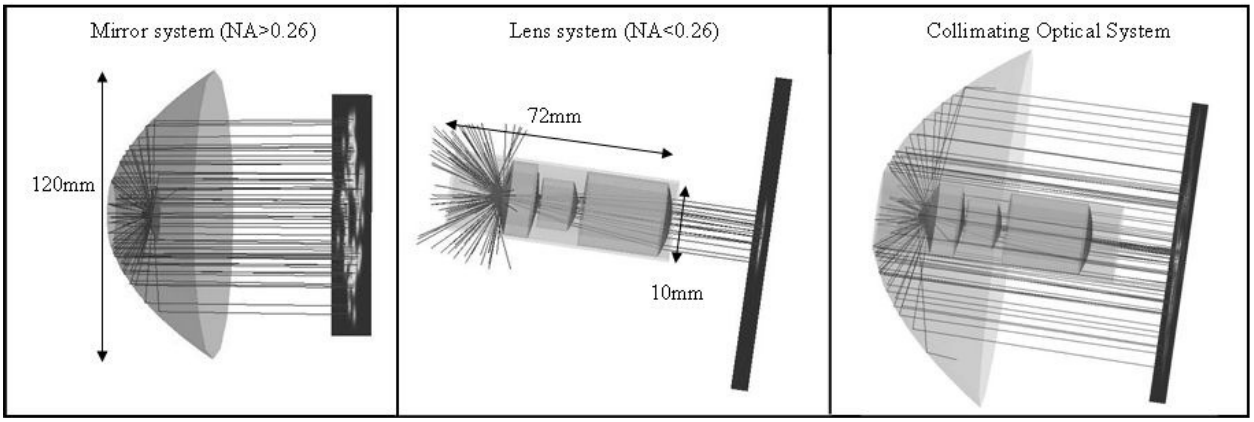

Figure 6. We could try to simulate a 3 aspheric lens system, just like the one in the middle, we could collimate a good portion from the LED light.