

Examination in Optical physics for F4 051024

All examination aids except those which provide contact with the outer world are allowed.

1-3

Digital light projectors work according to the figure hereby. The DMD is an array of tiltable mirrors one for each pixel, where the mirrors have two possible positions: One that direct the light towards the objective (projection lens in the fig) and the other that sends the light in another direction.

The size of each pixel mirror is $12\mu\text{m} \times 12\mu\text{m}$ and the focal length of the objective is 50mm. Make a drawing of the optical setup (symmetry axes, lenses as lines etc) and give possible values of all focal lengths, lens diameters and distances.

The distance from last lens to screen is 2m.

The diameter of the objective should be just small enough to smear out the image of each pixel with diffraction.

All lenses may be assumed thin and free of aberrations.

4

There is an alternative to DLP called LCoS where the mirrors are not tilted but work with polarisation instead. Each mirror has a layer of electrically controllable birefringent crystals making it possible to control the color of each pixel, thus making the color filter superfluous.

In each pixel we find (from the outside)

An antireflection coating

A polarizing filter

The birefringent crystal layer

The mirror layer.

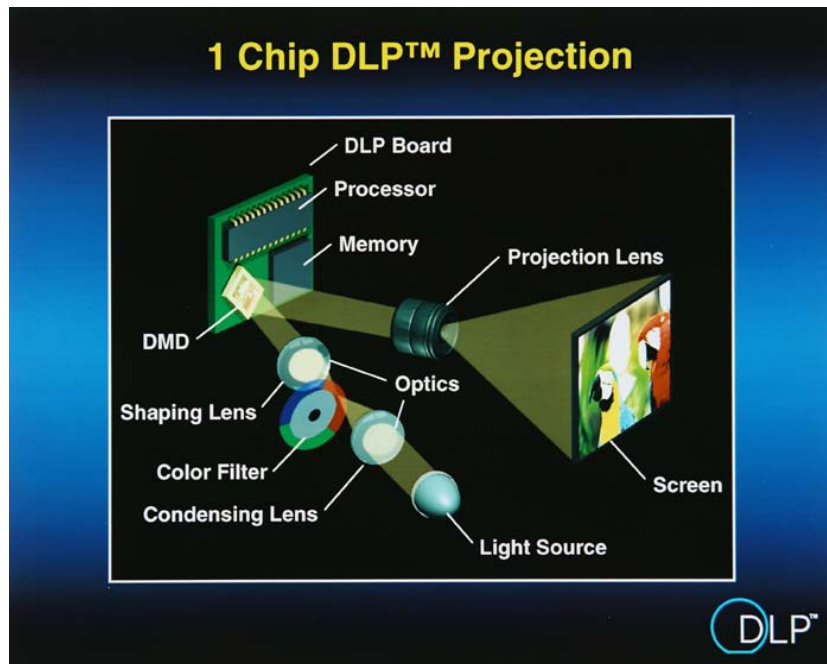
What should be the phase difference between the polarisation components for blue (460nm) if we want the pixel to reflect the colour blue?

5

Assume the AR coating is one layer with $n=1.36$. The index of the polarizer is 1.79. How large will the reflectance be for the design wavelength? Do not neglect multiple reflections.

6

What would be the effect of chromatic aberration in the condensing lens and the shaping lens? (In words)



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