

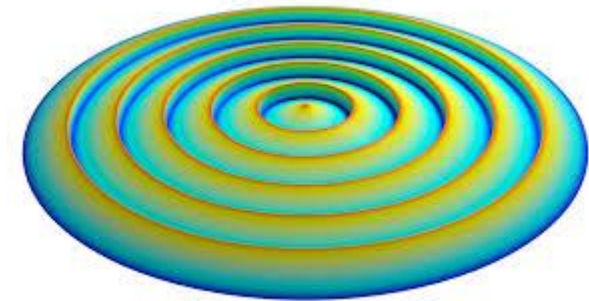
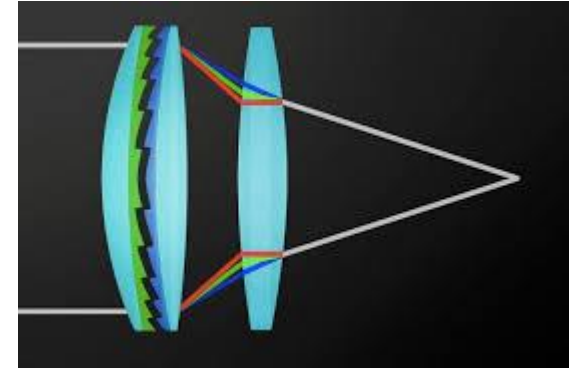
Multi-level diffractive lens PlanOpSim example

30/09/2024

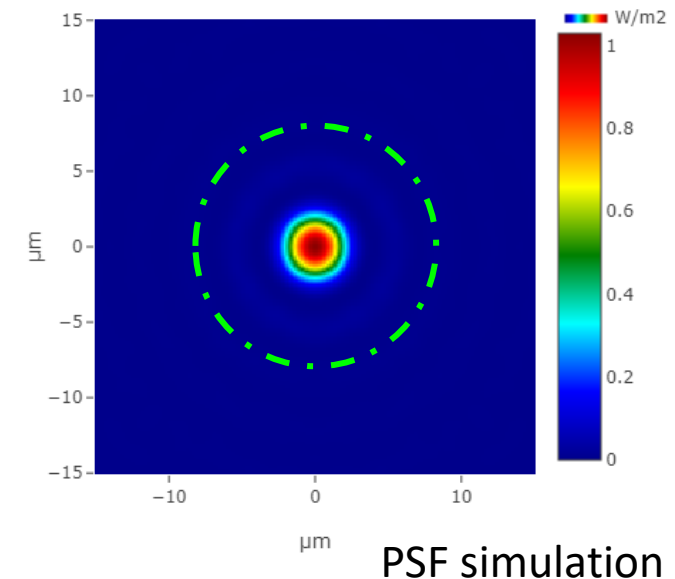
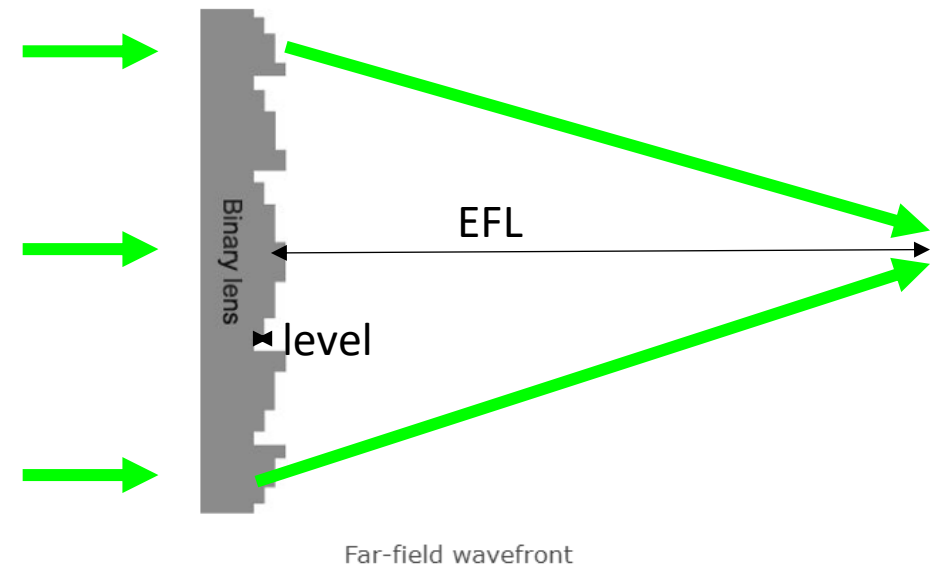


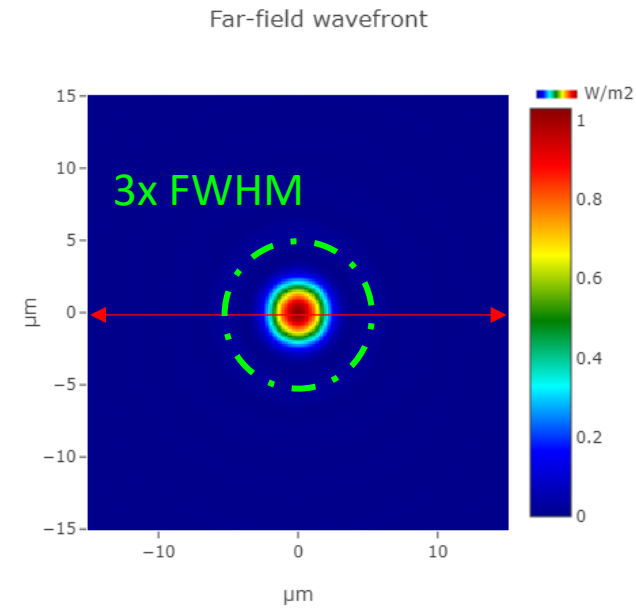
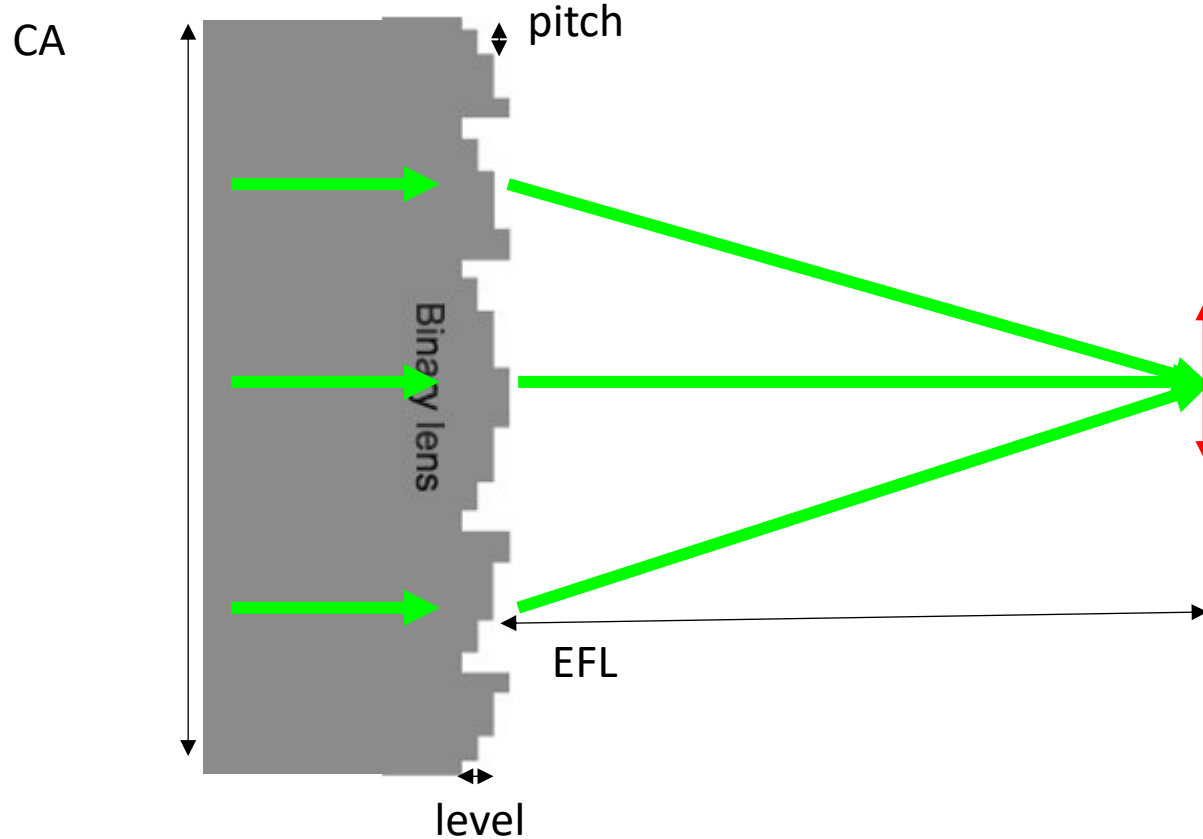
PlanOpSim
Enlightened Planar Optics
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- ❖ **Diffractive optical element lenses (DOE)** are used for their small volume in optics for beam shaping, imaging and other optical systems.
- ❖ Single layer DOEs are known to cause low efficiency due. This is an inherent feature of single layer components.
- ❖ For these applications the requirements are
 - **Control** output light shape
 - **Single component** (robust + lower cost)
- ❖ **PlanOpsim software** was used to **design efficient multi-layer DOEs**



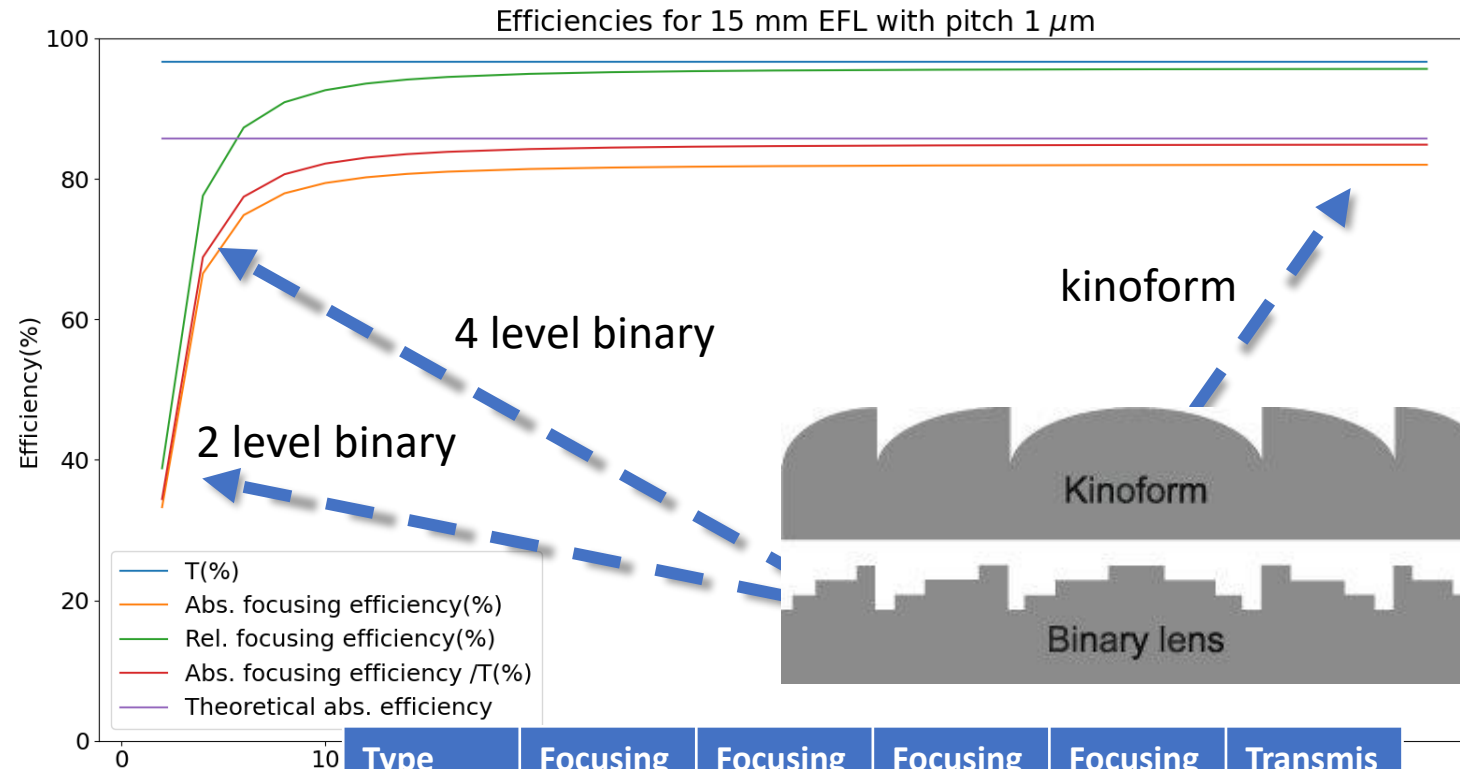
- ❖ 1) Step height layers were designed and optimized in the PlanOpSim MetaCell module.
 - Multiple libraries of 2, 4, 8, 16 ... steps were created
 - The libraries allow effective sampling of the phase at the design wavelength of 1064nm.
- ❖ 2) The lens layout was designed in PlanOpSim MetaComponent module
- ❖ 3) The spot profile and propagation was simulated and analyze dofr focusing efficiency with plane wave and Gaussain beam incidence





- ❖ **Transmission:** Power transmitted through diffractive surface / Power incident on diffractive surface
- ❖ **Absolute focusing efficiency:** Power in 3x FWHM circle at EFL / Power incident on diffractive surface
- ❖ **Relative focusing efficiency:** Absolute focusing efficiency / Theoretical focusing efficiency

- ❖ **Multiple DOEs designed, the efficiency increases with increasing # of layers until it saturates near the efficiency of a continuous 'kinoform' lens**
- ❖ **The relation between the number of layers, step width and focusing efficiency was simulated**
- ❖ **Focusing efficiency in the primary and higher order spots was simulated**



Type	Focusing Efficiency +1	Focusing Efficiency +2	Focusing Efficiency +3	Focusing Efficiency +4	Transmission
EFL	15mm	7.5mm	5mm	3.75mm	
Kinoform	99.976%	0.22%	0.128%	0.101%	100%
2 level	20,6%	10.0%	2.0%	0,15%	100%
4 level	72,4%	2,7%	1.7%	1.0%	100%