

Generalized Snell's-Law: Interaction of light with artificial surfaces

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Optical applications and components very often rely on refraction at geometrically shaped interfaces between two materials or spatial modulation of the phase during the propagation of light. Both effects, however, require a variation of the refractive index in three-dimensional space and lead to optical elements that need to be significantly thicker than the utilized wavelength. Recently, new approaches with, artificially structured materials, the so-called Metamaterials, opened new possibilities for the realization of compact optical elements. The high degree of flexibility in the design and manufacture of optical Metamaterials allows now to control the propagation of light to a high degree. Plasmonic Metasurfaces that consist only of a monolayer of planar metal structures are in particular promising. They have the advantage that they can provide full control over light propagation with relatively low manufacturing costs and no requirements on complex three dimensional nano fabrication techniques. One of the most interesting properties of Metasurfaces is the ability to produce an abrupt phase change for the passage of light through a surface. This phase change offers a unique possibility for controlling the local wave front on a sub wavelength scale which also leads to a modification of the classic law of refraction. The talk will provide an overview of the concept of Metasurfaces and show recent developments in the field of beam shaping and holography.

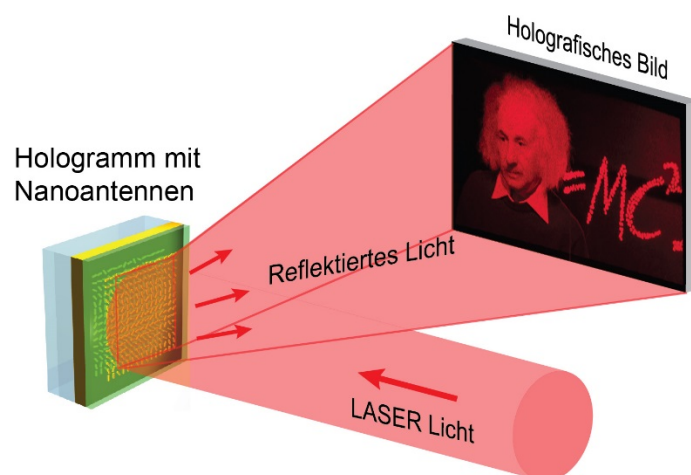


Figure: Projection of a holographic image from a nanostructured surface hologram.