Full control of reflection: spatial power modulation and its consequences

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Control of electromagnetic waves by thin layers has been a trendy topic for the scientific community in the last decades. From traditional reflectarrays and trasmitarrays to the most recent advances in metasurfaces, the efforts have been directed toward more efficient and compact implementations capable to control the transmission and the reflection. Many functionalities such phase, polarization, and direction of propagation control have been obtained by periodical arranging subwavelength elements with different electromagnetic responses. In particular, the interest on the arbitrary manipulation of the wave propagation has been revived since the formulation of the generalized laws of reflection and refraction [1].

Recently, it has been shown that for having full control of the reflection produced by flat surfaces, even in the simplest, scenarios non-local response or auxiliary evanescent fields are required [2-7]. These solutions do not provide a realistic method for designing more complex functionalities due difficulties in the implementation and, in most of the cases, the strong optimization processes required.

In this talk, we will propose and alternative method which overcome such limitation. We will analyze the reflection control under the point of the spatial power distribution. This approach allows a deep understanding of the problematic and the definition of specific rules for the design of different scenarios. In particular and as a representative example, we will focus the analysis on the anomalous reflection scenario.

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