Abstracts

High-Q radio-frequency structures using one-dimensionally periodic metallic films

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High-Q structures are very interesting theoretically, and very important practically, for a variety of engineering applications in communication systems. We address the issue of designing a thin-film metal structure of reflectivity higher than the intrinsic reflectivity of the bulk metal itself. We study a finite array of planar conducting layers of arbitrary thickness periodically placed an arbitrary distance apart, and we arrive at an exact analytical formula for the reflection and transmission coefficients. These structures are equivalent to a one-dimensional metallic photonic bandgap (PBG) system. We apply our formulas to the microwave regime and fully explore the system's three-dimensional parameter space, consisting of the number of layers, their thickness, and their spacing. We find very significant enhancements of the radio frequency-Q, relative to the bulk metal, in narrow regions of the parameter space.

❑ Return to main document.