

# Ultrasensitive switching between resonant reflection and absorption in periodic gratings

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Guided-Mode Resonance (GMR) effects in loss-free periodic gratings show a number of peculiar features. Dips, peaks, cusps, and high Q-factor resonances are all characteristic manifestations of GMRs in the optical spectra. In some cases resonant reflection with the theoretical efficiency equal to unity can be observed [1].

We demonstrate that the introduction of small losses somewhere in the structure can drastically modify its optical response by causing strong absorption resonances. These absorption peaks experience a resonant behavior with respect to both frequency and material losses. We show that unity reflection in loss-free structures can be converted into unity absorption peaks as soon as very small losses are introduced. Even thin absorbing films in the structure (or in its vicinity) can lead to such strong resonant absorption effects. The resonances may exhibit a negligible spectral shift, but a significant variation in the magnitude when losses are slightly altered. The effect of switching between resonant reflection and absorption could be highly attractive for sensor and switch applications [2].

[1] S. S.Wang and R. Magnusson, "Theory and applications of guided-mode resonance filters," *Applied Optics*, **32**, 2606–2613, 1993.

[2] N. Komarevskiy, V. Shklover, L. Braginsky and Ch. Hafner "Ultrasensitive switching between resonant reflection and absorption in periodic gratings", *PIER*, **139**, 799-819, 2013.