Optical modes in GaN grating cavities on porous GaN substrates

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A high refractive-index contrast gratings (HCG) is a periodic subwavelenght structure consisting of parallel high-refractive-index stripes surrounded by a low-refractive-index material. HCGs are used as optical cavities for high-quality modes, especially for bound states in the continuum (BICs) – a sort of non-dissipative resonant states. In this paper, we present numerical calculations of optical states in a HCG, in which the high contrast of the refractive indices between the grating and the substrate is realized by using GaN as the grating material and porous GaN as the substrate. We show how the porosity of the substrate affects quality factor of the modes (see Fig. 1). The calculations were performed by using vectorial model based on the Plane-Wave Admittance Method [1].

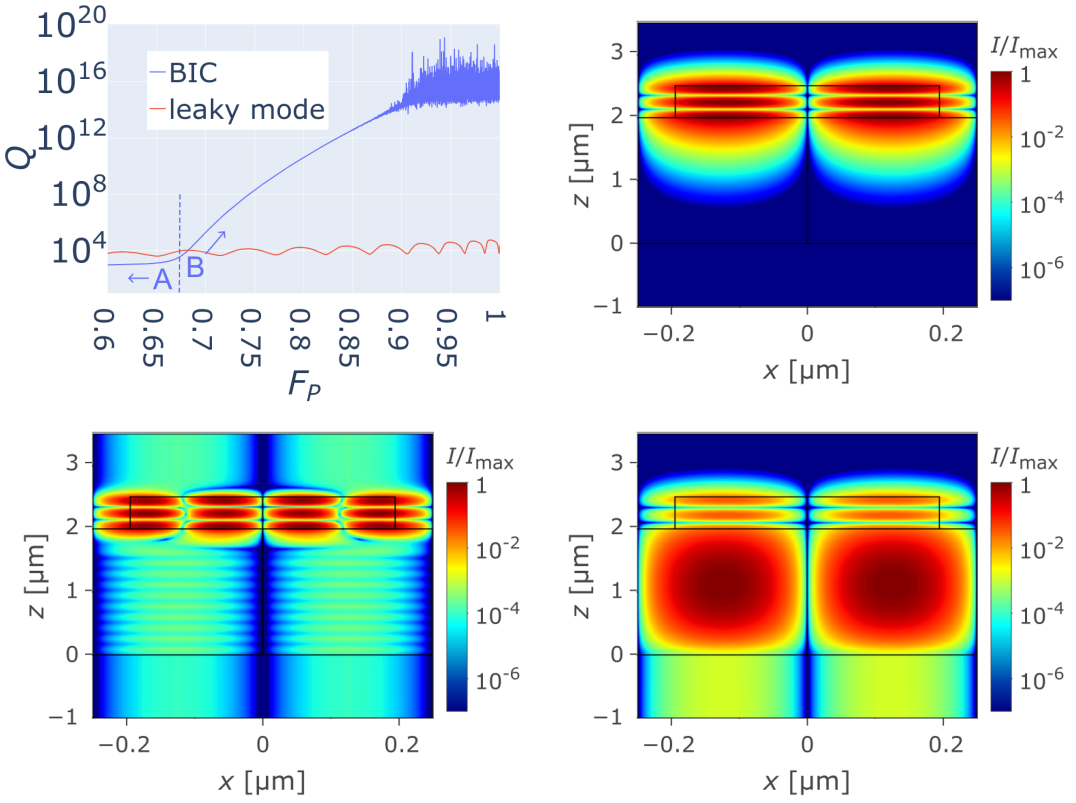

Figure 1: Quality factor Q of a bound-state in the continuum (BIC) and a leaky mode in a function of porosity F_P. "A" and "B" indicate: leakage into the substrate regime and BIC regime, respectively (left top); Optical intensity distributions in one period of the grating for the BIC in the "B" regime (right top), the leaky mode (left bottom) and the BIC in the "A" regime (right bottom).

[1] M. Dems, R. Kotynski, and K. Panajotov, *Opt. Express*, **13**, 3196–3207 (2005)