Phase Space Engineering in Optical Microcavities I. Preserving near-field uniformity while inducing far-field directionality\textsuperscript{1} G. PAINCHAUD-APRIL, J. POIRIER, D. GAGNON, L.J. DUBÉ, Laval University, Quebec (Canada) — Optical microcavities have received much attention over the last decade from different research fields ranging from fundamental issues of cavity QED to specific applications such as microlasers and bio-sensors. A major issue in the latter applications is the difficulty to obtain directional emission of light in the far-field while keeping high energy densities inside the cavity (i.e. high quality factor). To improve our understanding of these systems, we have studied the annular cavity (a dielectric disk with a circular hole), where the distance cavity-hole centers $d$ is used as a parameter to alter the properties of cavity resonances. We will present results showing how one can affect the directionality of the far-field while preserving the uniformity (hence the quality factor) of the near-field simply by increasing the value of $d$. Interestingly, the transition between a uniform near- and far-field to a uniform near- and directional far-field is rather abrupt. We can explain this behaviour quite nicely with a simple model, supported by full numerical calculations, and we predict that the effect will also be found in a large class of eigenmodes of the cavity.

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