

# Optical imaging of exciton-polaritons probability density in cylindrical traps

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We use optical spectroscopy for imaging the probability density of microcavity exciton-polaritons confined in a cylindrical trap. Composite half-matter half-light quasi-particles, the exciton-polaritons exhibit an extremely light effective mass, allowing to confine them inside traps of the size of several micrometers in size. Confined polaritons are therefore unique systems allowing a direct optical access to confined quasi-particles wavefunctions, in opposition to standard quantum confinement means in semiconductors, such as quantum dots.

The traps for polaritons are made of circular mesas, providing a local increased thickness of the microcavity length, therefore a lateral confinement for the photonic part of the polariton [1, 2]. The excitonic matter wave being strongly coupled to the confined photon modes, discrete confined levels are observed for both upper and lower polaritons.

Energies and spatial distributions of the confined polariton states are successfully compared to the solutions of the time-independent Schrödinger equation for a particle confined in a cylindrical potential well, using the effective mass of the microcavity polariton.

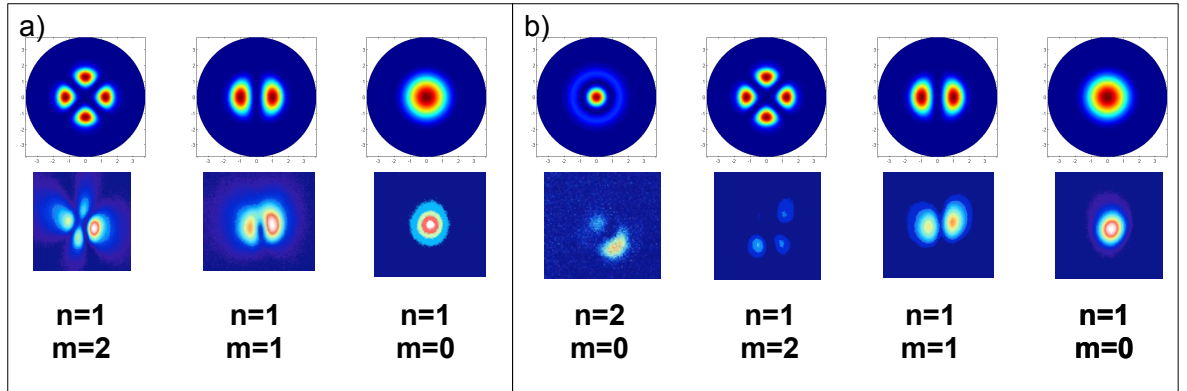


FIG. 1: Real space images of the levels of the a) upper b) lower polaritons confined in a 3 micrometers diameter trap. Top : solutions of the Schrödinger equation. Bottom : optical imaging of the level under resonant excitation.

[1] O. El Daïf, *et al* Applied Physics Letters, **88**(6):061105, 2006.

[2] R. Idrissi Kaitouni, *et al*. Physical Review B, **74**(15):155311, 2006.