Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Open optical microcavities for CQED experiments and devices JASON SMITH, AURELIEN TRICHET, University of Oxford, PHILIP DOLAN, DAVID COLES, LUCAS FLATTEN, SAM JOHNSON, ROBIN PATEL, University of Oxford, UK, STEFAN SCHWARZ, FENG LI, DIMITRII KRIZHANOVSKII, ALEXANDER TARTAKOVSKII, MAURICE SKOLNICK, University of Sheffield, UK, CLAIRE VALLANCE, University of Oxford, DAVID HUNGER, Ludwig Maximilians Universitaet, Germany — Open microcavities have emerged in recent years as flexible tools for quantum optics and engineered light matter coupling. Fabry Perot resonators with concave mirrors on the micrometre scale, highly resonant optical modes can be generated with volumes of order 1-10λ^3, along with facile tunability and efficient external coupling. Here we will describe our latest advances in open cavity fabrication using focused ion beam milled templates on which high reflectivity mirrors can be deposited providing measured finesses up to 50,000 with surfaces that deviate by less than 2 nm rms from the design. This degree of control provides opportunities for engineering optical modes to suit a wide variety of applications. We will describe the fabrication of cavities with radius of curvature from 2 μm to 1 mm, and the realisation of coupled cavities with controlled mode overlap. We will further describe some of the applications of these open cavity devices to particle sensing, exciton-polariton physics with quantum wells and 2D materials, tunable lasers, and spin-photon interfaces using diamond colour centres.

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Date submitted: 06 Nov 2015 Electronic form version 1.4