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Investigation of Transparent Silicon Carbide Proprieties for Atom Chips Sensors L. HUET, Thales Research and Technology; Thales Underwater Systems, M. AMMAR, Thales Research and Technology; Ecole Normale Supérieure, E. MORVAN, N. SARAZIN, Thales III-V Lab, J.-P. POCHOLLE, Thales Research and Technology, J. REICHEL, Ecole Normale Supérieure, C. GUERLIN, S. SCHWARTZ, Thales Research and Technology — Atom chips are an efficient tool for trapping, cooling and manipulating cold atoms. This is in particular due to the fact that they can achieve strong magnetic field gradients near the chip surface, hence strong atomic confinement. However, this advantage typically comes at the price of reducing the optical access to the atoms, which are confined very close to the chip surface. Moreover, the maximum achievable confinement strongly depends on thermal management issues within the atom chip. We report in the following experimental investigations showing how these limits could be pushed further by using an atom chip made of a gold microcircuit deposited on a single-crystal Silicon Carbide (SiC) substrate. With a band gap energy value of about 3.2 eV at room temperature, the latter material is transparent at 780nm, potentially restoring quasi full optical access to the atoms. Moreover, it combines a very high electrical resistivity (over 105 W.cm) with a very high thermal conductivity (over 390 W.m-1.K-1), making it a good candidate for supporting wires with large currents without the need of any additional electrical insulation layer. We have demonstrated robust magneto-optical trapping (MOT) of about one million rubidium atoms through the SiC chip.

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