

Abstract Submitted
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Micro-Hall devices for magnetic, electric and photo-detection A. GILBERTSON, Imperial College, H. SADEGHI, Lancaster University, V. PANCHAL, O. KAZAKOVA, National Physical Laboratory, C.J. LAMBERT, Lancaster University, S.A. SOLIN¹, L.F. COHEN, Imperial College — Multifunctional mesoscopic sensors capable of detecting local magnetic (B), electric (E), and optical fields can greatly facilitate image capture in nano-arrays that address a multitude of disciplines. The use of micro-Hall devices as B -field sensors [1] and, more recently as E -field sensors [2] is well established. Here we report the real-space voltage response of InSb/AlInSb micro-Hall devices to not only local E -, and B -fields but also to photo-excitation using scanning probe microscopy. We show that the ultrafast generation of localised photocarriers results in conductance perturbations analogous to those produced by local E -fields. Our experimental results are in good agreement with tight-binding transport calculations in the diffusive regime. At room temperature, samples exhibit a magnetic sensitivity of >500 nT/ $\sqrt{\text{Hz}}$, an optical noise equivalent power of >20 pW/ $\sqrt{\text{Hz}}$ ($\lambda = 635$ nm) comparable to commercial photoconductive detectors, and charge sensitivity of >0.04 $e/\sqrt{\text{Hz}}$ comparable to that of single electron transistors. [1] Boero, G.; Demierre, M.; Besse, P. A.; Popovic, R. S. *Sensors and Actuators A-Physical* **2003**, *106* (1-3), 314-320. [2] Barbolina, I. I. et al. *Applied Physics Letters* **2006**, *88* (1), 013901.

¹Work done while on sabbatical from Washington University. Co-founder of PixelEXX, a start-up whose focus is imaging nano-arrays.

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