Abstract Submitted
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High-frequency current oscillations in graphene-boron nitride resonant tunnel diodes[1] MARK GREENAWAY, JENN GASKELL, LAURENCE EAVES, University of Nottingham, KOSTYA NOVOSELOV, ARTEM MISHCHENKO, ANDRE GEIM, University of Manchester, MARK FROMHOLD, University of Nottingham — The successful realisation of multilayer graphene-hBN-graphene resonant tunnelling diodes (graphene- RTDs) with negative differential conductance (NDC) and MHz current oscillations offers the exciting possibility of exploiting them as high-frequency oscillators and mixers [1, 2]. In this paper, we examine their potential for generating higher frequencies by simulating the oscillations in the tunnel current and charge that arise when the device is biased in the NDC region and placed in a resonant circuit. Using the Bardeen transfer Hamiltonian method, we examine the effect on the device characteristics of the twist angle, θ, between the two graphene electrodes, the hBN barrier thickness and of the carrier density in the graphene electrodes, which can be adjusted by chemical doping or by an applied bias voltage. The simulations accurately reproduce our recently-reported measurements on these RTDs (Fig. 4, [2]). The results of simulations show that frequencies of tens of GHz are achievable by optimising the device parameters [3]. References: [1] L. Britnell et al., Nature Communications **4**, 1794 (2013). [2] A. Mishchenko et al., Nature Nanotechnology **9**, 808 (2014). [3] J. Gaskell et al., Applied Physics Letters **107**, 103105 (2015)

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