

Abstract Submitted  
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**Ultrafast electron dynamics in freely suspended graphene** LEANDRO MALARD, KIN FAI MAK, TONY F. HEINZ, Columbia University — The optical conductivity of free-standing graphene under the non-equilibrium conditions was investigated by femtosecond pump-probe spectroscopy. The conductivity transient exhibited a strong dependence on pump fluence, with a crossover from enhanced to reduced absorbance occurring with increasing pump fluence. The observed phenomena can be understood by taking into account both the induced intra- and inter-band optical response. Intra-band transitions dominate the transient at low pump fluence (and electronic temperature) and inter-band transitions dominate at high pump fluence (and electronic temperature). Analysis within a model incorporating these two responses allows us to infer the variation of carrier scattering rate with electronic temperature. The temporal evolution of the conductivity transient is controlled by the anharmonic decay of the optical phonons; a lifetime of  $\sim 1.4$  ps was inferred for intrinsic, suspended graphene.

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