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Measurement of the hot electron mean free path in GaN DONALD J. SUNTRUP III, The University of California Santa Barbara - Department of Physics, GEETAK GUPTA, HAORAN LI, STACIA KELLER, UMESH K. MISHRA, The University of California Santa Barbara - Department of Electrical and Computer Engineering — We present a method for measuring the mean free path (MFP) and relaxation time of hot electrons in GaN using the hot electron transistor (HET). In this device electrons are injected over a high energy emitter barrier into the base where they experience quasi-ballistic transport well above the conduction band edge. After traversing the base, high energy electrons either surmount the base-collector barrier and become collector current or reflect off the barrier and become base current. We fabricate HETs with various base thicknesses and measure the common emitter transfer ratio (α) for each device. The MFP is extracted by fitting a decaying exponential to α as a function of base width and the relaxation time is computed using a suitable injection velocity. For current devices with an injection energy of $\sim$1eV, we measure a hot electron MFP of 14nm and calculate a relaxation time of 16fs. These values are in agreement with theoretical calculations where longitudinal optical (LO) phonon scattering is the dominant relaxation mechanism.

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