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Hot carriers, phonons and electron-phonon decoupling in graphite[1] TUNG-WU HSIEH, CHIH-WEI LAI, Michigan State University — Visible and near-IR radiation and hot phonons are observed in HOPG graphite following the excitation of picosecond laser pulses at 1.58 eV of fluences exceeding 1000 J/m^2. The optically generated electron-hole carriers lead to non-thermal radiation ranging from 1.2 to 2.8 eV, including black-body-like emissions above the excitation and a broad spectral peak near 1.4 eV. We determine an effective electronic temperature (Te) by fitting the high energy radiation to a Plank spectrum; Tg from G-mode Stokes/anti-Stokes Raman peaks; Tl from spectral line shifts of G-mode. With increasing incident fluence from 10^3 to 10^4 J/m^2, Te, Tg and Tl are decoupled and increase from 1000 to 5000, 1000 to 2500, and 300 to 500K, respectively. At a fluence below 10^3 J/m^2, Te approaches Tg near 2000K, which is $\sim$ 1000K above Tl. This is indicative of quasi-equilibrium, but decoupled, distributions of carriers and phonons. The transient radiation decays within 2ps, limited to instrument response. Similar effects are observed for excitations at 1.53 and 1.49 eV. Experiments are conducted in vacuum at ambient T=300K.

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