Sub-additivity in Electron Emission from GaAs

EVAN BRUNKOW, NATHAN CLAYBURN, MARIA BECKER, ERIC JONES, HERMAN BATELAAN, TIMOTHY GAY, Univ of Nebraska - Lincoln — When two spatially-overlapped laser pulses (775 nm center wavelength, 75 fs duration) are incident on an untreated <100> GaAs crystal surface, the electron emission rate depends on the temporal separation between the two pulses [1]. We have shown that for delays between 0.2 and 1000ps, the emission rate is “sub-additive”, i.e., is lower than when the beams have separation >>1 ns. We believe the cause of this sub-additivity is an increase in reflectance and transmittance due to electrons occupying the excited state of the GaAs. We are now able to manipulate the magnitude of the sub-additivity by changing the number of electrons that are in the excited state. Sub-additivity is not observed with tungsten tip surfaces which have no excited state. [1] E. Brunkow et al., Bull. Am. Phys. Soc. 60 (2015)

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