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Nonlinear surface plasmon assisted electron pairing in gold at room temperature

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Strong electromagnetic field of femtosecond Ti:Sa lasers has been used to excite surface plasmons (SPO) in gold films at room temperature in the Kretschmann geometry. Experimental investigations were carried out using a surface plasmon near field scanning tunneling microscope, measuring its response to excitations at SPO hot spots on the gold surface. Furthermore, the spectra of photoelectrons, liberated by multi-plasmon absorption, have also been measured by a time-of-flight spectrometer. In both cases new type of anomalies in both the STM and electron TOF signals have been measured in the same laser intensity range. The existence of these anomalies may be qualitatively understood, by using an intensity-dependent effective electron-electron scattering potential, derived earlier in a different context. In this theoretical work, an effective attraction potential has been predicted in the presence of strong inhomogeneous radiation fields, leading to electron pairing.

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