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Signature of BCS-BEC Crossover in an Iron-Based Superconductor $FeSe_{0.5}Te_{0.5}$.[1] SHANKAR KUNWAR, King Fahd Univ KFUPM — Microscopic mechanism of superconductivity in high-T_C superconductors has been one of the burning questions of condensed matter physics at the moment. Here, we present the scanning tunneling microscopy/spectroscopy (STM/STS) studies of an iron-based superconductor, $FeSe_{0.5}Te_{0.5}$ [1]. The value of superconducting order parameter Δ, has been extracted from differential conductance (dI/dV) spectra with the help of extended Bardeen Cooper Schieffer (BCS) phenomenology for anisotropic s-wave pairing. The tunneling spectra are quite inhomogeneous with the values of Δ extended from $\sim$0.6 to $\sim$4.5 meV and have two distinct peaks in the histogram around 1 and 3 meV. The corresponding values of pairing strength, $2\Delta/k_BT_C$ for the peaks are $\sim$1.5 and $\sim$5.0, respectively, which indicates the coexistence of weak and strong coupling mechanism. We also measured the gap to Fermi energy ratio (Δ/E_f) of the material and found two different regions of coupling inferring to the composite superconductivity in the realm of BCS-BEC (Bose Einstein Condensate) crossover. [1] Kunwar S., et.al. J Supercond Nov Magn, 30, 3183 (2017).

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