Scanning Tunneling Spectroscopy study of the Charge Density Wave driven Mott Insulator $1T$-TaS$_2$ DOOHEE CHO, CALDES, IBS, POSTECH, Pohang, Korea, YONG-HEUM CHO, Department of Physics, POSTECH, Pohang, Korea, SANG-WOOK CHEONG, Rutgers University, New Jersey, USA, KI-SEOK KIM, Department of Physics, POSTECH, Pohang, Korea, HANWOONG YEOM, CALDES, IBS, POSTECH, Pohang, Korea — Exotic ground states can be generated by competition or interplay between various interactions, such as electron-phonon ($e-ph$), spin-orbit ($s-o$) and electron-electron ($e-e$) coupling. $1T$-TaS$_2$ is a prime example to study such interplay since a Mott gap coexists with charge density waves (CDW) at low temperatures. Our scanning tunneling spectroscopy measurements with high spatial and energy resolution determine the CDW and the Mott gap as 0.20 – 0.24 eV and 0.32 eV, respectively, by analyzing the phase difference between the real space electron densities across multiple energy gaps. In addition, we observe a peculiar reduction of the Mott gap in the vicinity of defect sites. The effect of competition between $e-ph$ and $e-e$ coupling on the Mott gap size will be discussed within the Hubbard-Holstein picture.

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Date submitted: 14 Nov 2014

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