Localized states in Mott insulator $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl probed by photoluminescence$^1$ NATALIA DRICHKO, Johns Hopkins University, RUDI HACKL, Walter Meissner Institute Garching Germany, JOHN SCHLUETER, Argonne National Laboratory — We present the luminescence spectra of a low-temperature Mott insulator ($T_c=35$ K) $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl and a metal with a superconductor transition $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br in the temperature range between 300 and 10 K. In the Mott insulating state we observe an appearance of a luminescence at 1.95 eV, which corresponds to a LUMO-HOMO transition in a BEDT-TTF molecule. This luminescence is quenched both in the higher-temperature semiconducting state of $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl and metallic $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br. To our knowledge, it is the first observation of luminescence driven by electronic correlations. This observation gives an evidence of the local character of BEDT-TTF energy levels in the Mott insulating state, in contrast to the band-character in the metallic and semiconducting states.

$^1$Supported by Blewett Fellowship

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Date submitted: 19 Nov 2010

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