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Sub-gap optical conductivity in the Mott insulator in one-dimensional Hubbard model with randomness CHENG-JU LIN, OLEXEI MOTRUNICH, California Institute of Technology — We demonstrate a non-zero optical conductivity within the Mott gap in the one-dimensional Hubbard model with randomly distributed onsite potential. The effective Hamiltonian in the spin sector is described by the random exchange coupling spin-$\frac{1}{2}$ antiferromagnetic Heisenberg model, which is in the random-singlet phase. An electric field couples to the electric polarization operator, and we first find its expression in terms of the spin variables in the Mott insulator regime. We then apply the decimation renormalization-group analysis pioneered by Dasgupta, Ma and Fisher to keep track of the polarization operator. Via Kubo formula, we find the optical conductivity to be $\sigma(\omega) \sim \frac{\omega^2}{(\ln \omega)^{4-2\psi}}$ at low frequencies, where $\psi = (1+\sqrt{5})/4$.

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