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Transmission line model for channels with spin-momentum locking[1] SHEHRIN SAYED, Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47907, USA, SEOKMIN HONG, Intel Corporation, Hillsboro, OR 97124, USA, SUPRIYO DATTA, Electrical and Computer Engineering, Purdue University, West Lafayette, IN 47907, USA — We will present a simple transmission line model for channels with spin-momentum locking (SML) based on the Boltzmann formalism with four electrochemical potentials [1, 2], which can be used for both time-dependent and steady-state analysis on a wide variety of materials including topological insulators, Rashba interfaces and heavy metals. The model has two components: charge and spin which are coupled by a factor $p_0 = (M - N) / (M + N)$ representing the degree of SML, where M and N are number of modes for forward moving up and down spins respectively. In normal metal channels ($p_0 = 0$), the charge and spin signals travel at different velocities resulting in spin charge separation. In spin-momentum locked channels, an additional spin signal accompanies the charge signal which suggests a new mechanism in such materials with possible spintronic applications. [1] Hong et al., Sci. Rep. 6, 20325 (2016). [2] Sayed et al., Sci. Rep. 6, 35658 (2016).

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Shehrin Sayed
Purdue Univ

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