Charge to Spin Interconversion Coefficients as the Function of a Chemical Potential in Proximitized Graphene on 1T-TaS_2 - the Effect of a Perpendicular Electric Field

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Abstract. The two-dimensional van der Waals heterostructures are an exceptional example of materials with high tunability of their properties by proximity effects. In this study, we focus on the heterostructures of graphene and 1T-TaS_2, where the spin texture of graphene close to the Dirac points is strongly influenced by the spin-orbit field of the 1T-TaS_2 layer. The 1T-TaS_2 monolayer is known for its low-temperature phase called the charge density wave phase, represented by the spontaneous structural distortion and formation of the David star pattern. The altered states of graphene are then captured in an effective Hamiltonian containing only the low-energy π bands and proximity-induced Rashba and intrinsic spin-orbit couplings. For the calculation of charge to spin interconversion coefficients, we used a linear response method in the short quasiparticle lifetime limit and identified (un)conventional Rashba Edelstein effects (U)REE. In this talk, we examine the dependence of charge to spin interconversion coefficients for different stacking configurations of bilayer graphene/1T-TaS_2 and trilayer 1T-TaS_2/graphene/1T-TaS_2 on chemical potential. We investigate the effect of a perpendicular electric field and different magnetization directions in the 1T-TaS_2 layer. For specific cases preserving horizontal mirror plane symmetry, we identify a perpendicular electric field as an effective tool to control the sign switch of the current-induced spin accumulation in the graphene layer.

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