# Calculation of the conductivity of the disordered magnetic topological insulators with the Bastin-Kubo formulas

**Akzyanov R S**

Dukhov Research Institute of Automatics (VNIIA), Sushchevskaya 22, Moscow 127055, Russia

akzyanov@phystech.edu

In recent years study of the magnetic topological insulators attract significant attention due to possible applications in electronics and spintronics [1]. Disorder due to charge impurities or non-uniform magnetization significantly affects properties of magnetic topological insulators [2]. However, influence of the strong disorder has not been studied in details. Results of the calculation of the longitudinal and Hall conductivities for the disordered topological insulators within Basin-Kubo formulas with vertex corrections are presented in this work. We consider disorder within a high order Born approximation and compare our results with the analytical formulas given by self-consistent Born approximation (SCBA). We found that convergence properties of this Born series are closely related to the logistic map which is known as a prototypical model for the chaos. We show that vertex corrections to the velocity operator play a major role in the conductivity properties. Increase of the disorder changes behaviour of the system from the insulating to the metallic one. However, in the metallic state conductivity does not follow Drude formula and depends weakly on the disorder strength while density of states increases significantly with the increase of the disorder. Hall conductivity decreases with the increase of the disorder.

[1] Tokura Y, Yasuda K and Tsukazaki A 2019 *Nature Reviews Physics* **1** 126–143

[2] Satake Y, Shiogai J, Mazur G P, Kimura S, Awaji S, Fujiwara K, Nojima T, Nomura K, Souma S, Sato T, Dietl T and Tsukazaki A 2020 *Phys. Rev. Materials* **4** 044202