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INFLUENCE OF PROTON AND ELECTRON BEAMS OF DIFFERENT ENERGIES ON GRAPHENE STRUCTURES USED FOR TERAHERTZ APPLICATIONS *

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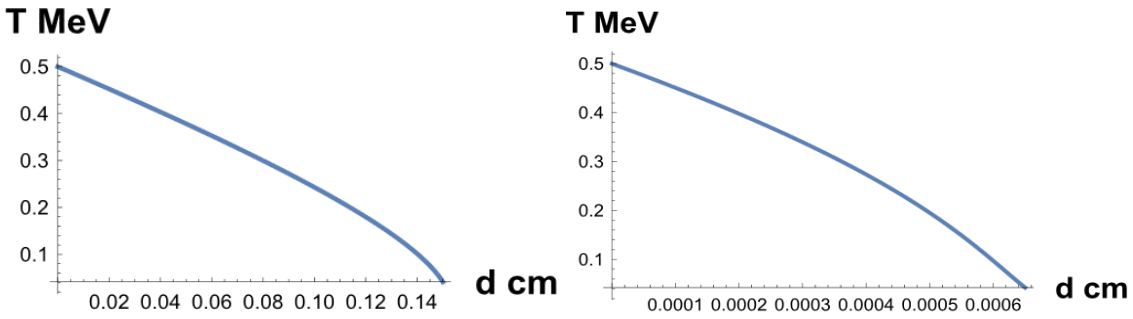
Graphene is one of the most promising 2D material for future development of nanoelectronic and nanophotonics. Its unique properties, such as high transparency, high carrier mobility, ballistic transport, thermal conductivity, make such material very attractive for space applications; in particular, for future development of THz devices working at geostationary orbit (GEO) [1]. Our theoretical and experimental findings [1] showed that graphene with the PMMA support can be used at GEO for over 10 years. However, interaction of charged particles by supported substance leads to decrease of its energy and the specific energy losses increase with particles energy decrease. Within this work, we investigate the influence of graphene interaction with charged particles of different energy, which in experiment can be regulated by the thickness of additional absorber (Fig. 1). The numerical modeling of irradiation of these graphene structures with radiation beam is performed. Purpose of these calculations is to prepare data and conditions for providing experiment on TEMP-4 ions setup with beam comprising carbon and hydrogen (70% and 30%, respectively) ions [2] and electron beam setups. For studying only protons influence of TEMP-4, additional absorber is placed before graphene structure, for example, PMMA layer with the thickness ≥ 1 μm provides carbon ions absorption, but protons pass through this layer, because energy losses are proportional to ion mass. Energy of protons which interact with graphene structure is regulated by thickness of absorber and can be approximately estimated using Bethe-Bloch energy loss per distance for protons, alpha particles and atomic ions. For exploring of electron beam influence, the much thicker absorbers (~ millimeter) should be used (Fig. 1a).



a b

Figure1. Dependence of particle energy (*T*) on the PMMA absorber thickness (*d*) for proton (1a) and electron (1b). Initial beam energy is 0.5 MeV.

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