

Terahertz absorption and emission tuning in graphene sandwich structures

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Relatively simple graphene physical parameters regulation opens wide possibilities for different applications. Flexible and discrete tuning of electromagnetic wave-graphene interaction (EM transmission, absorption and emission) is important type of such applications that can be used for developing of detectors/sensors and EM sources, particularly in terahertz range. Our work presents EM interaction with sandwich structure [1]. Electromagnetic parameters tuning in that case can be provided by electrostatic doping of one or several sandwich layers (flexible tuning) or by varying the number of layers (discrete tuning). These tuning methods give possibility to change as strength, so the frequency range of interaction. Some examples of tuning are presented on Fig. 1. Fig 1a demonstrates dependence of graphene absorption on chemical potential (μ) for sandwich, Fig 1b shows dependence of Cherenkov emission resonance frequency on μ for sandwich and Fig. 1c gives dependence of cyclotron resonant frequency on μ for one graphene layer. It was shown that effective chemical potential for symmetric plasmon-polariton mode in graphene sandwich [1, 2] is a sum of chemical potentials of its layers. Therefore, combination of layers number and doping level of single levels gives possibility to realize conditions corresponding to Fig.1.

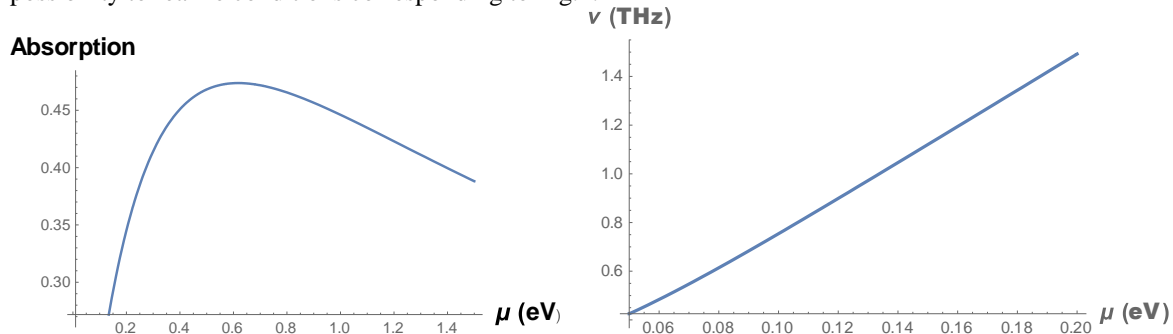


Fig 1a. Dependence of graphene absorption on chemical potential, frequency is 1 THz.

Fig 1b. Dependence of Cherenkov resonant frequency on chemical potential, energy of electron beam is 60 KeV.

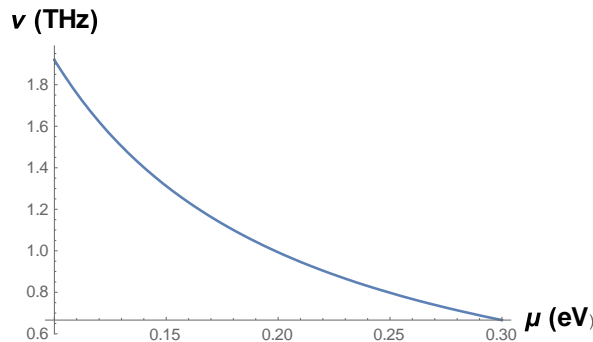


Fig. 1c Dependence of cyclotron frequency on chemical potential. Magnetic field strength is 1 T.

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References

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