Microwave experiments beyond pure Graphene using dielectric discs

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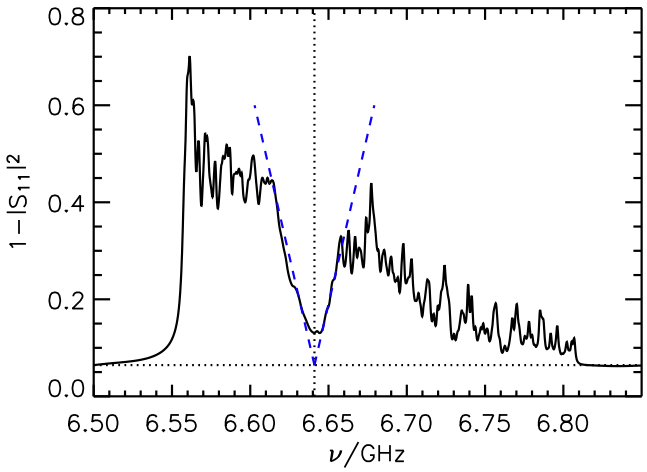
Abstract:
Experiments on hexagonal graphene-like structures using microwave measuring techniques are presented [1]. Employing dielectric discs between two metallic plates and a TE-antenna we establish a tight-binding configuration baring a lot of opportunities realizing different lattice structures. In measurements on graphene-like sheets the vanishing density of states at the Dirac point is observed as well as the linear slope close to it as is shown in the figure below.



Taking advantage of the high flexibility of the setup we move the antenna to zigzag edges of the lattice and find edge states that can not be found in the interior of the sheet or at an armchair edge in agreement with theoretical predictions. The consequences of introduced disorder are investigated and an imitation of boron-nitride- a hexagonal crystal consisting of two different sorts of atoms- is implemented. The experimental results are confirmed by numerical simulation assuming the tight-binding model.

[1] U. Kuhl, S. Barkhofen, T. Tudorovskiy, H.-J. Stöckmann, T. Hossain, L. de Forges de Parny, and F. Mortessagne. Dirac point and edge states in a microwave realization of tight-binding graphene-like structures. Phys. Rev. B **100**, 094308 (2010).