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可用磁场和栅压动态调控的金圆盘石墨烯太赫兹吸收器

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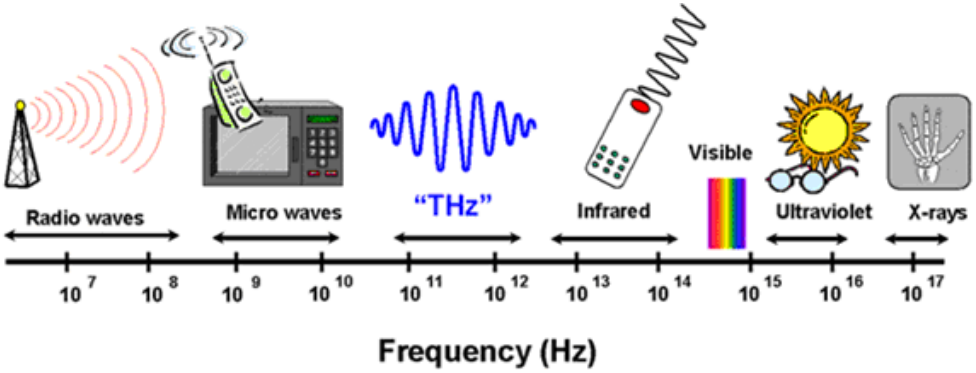
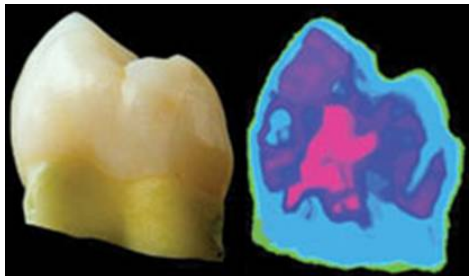
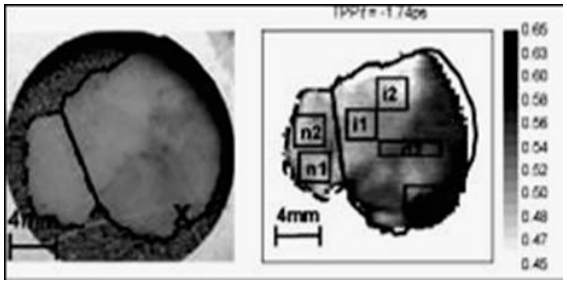
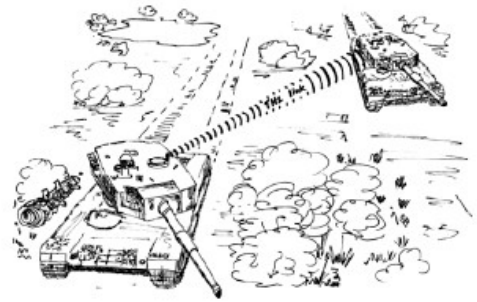
江西省固体微结构重点实验室
周玉修, 程融, 刘坚强, 孙光厚, 查一昆



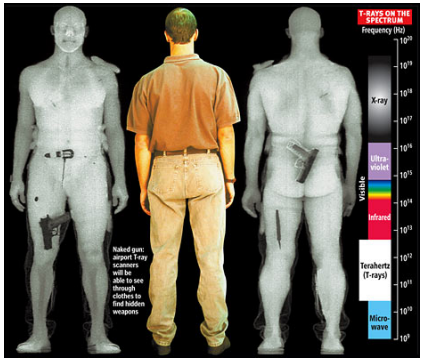
太赫兹：医疗、通信、公共安全等



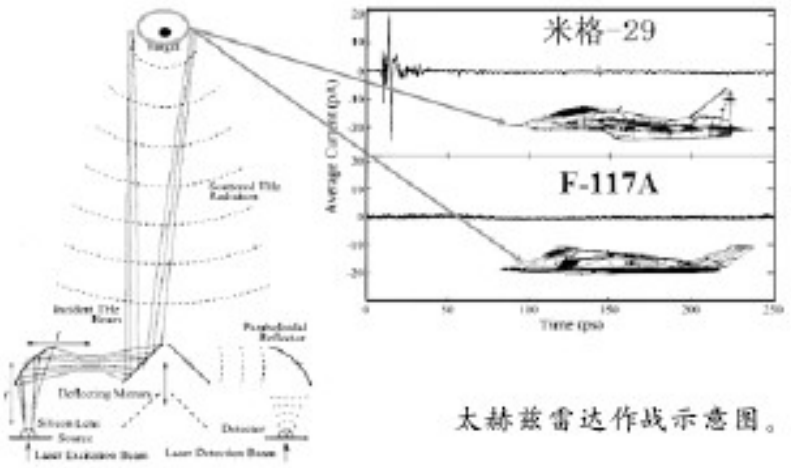




战场中坦克之间太赫兹保密通信示意图。



太赫兹雷达



太赫兹雷达作战示意图。

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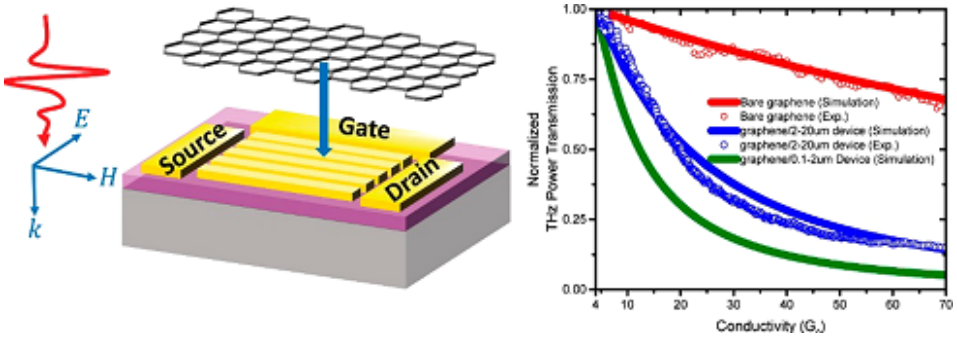
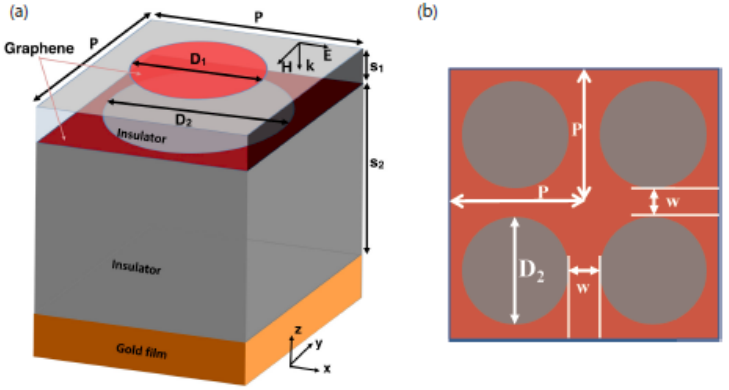
现有的太赫兹波吸收器

Optimizing Broadband Terahertz Modulation with Hybrid Graphene/ Metasurface Structures



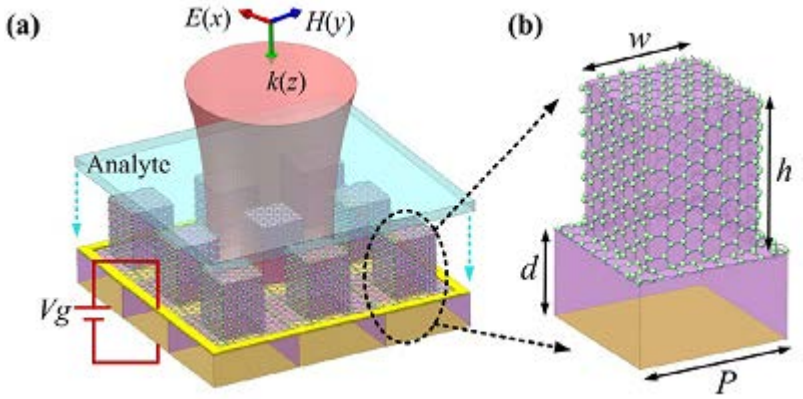
Nano Lett, 2015, 15, 372-377

Graphene-based dual-band independently tunable infrared absorber



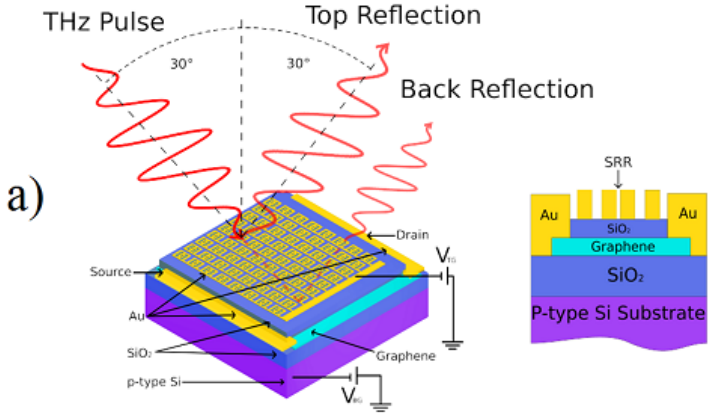
Nanoscale, 2018,10, 15564-15570

Multiple plasmonic resonance excitations on graphene metamaterials for ultrasensitive terahertz sensing



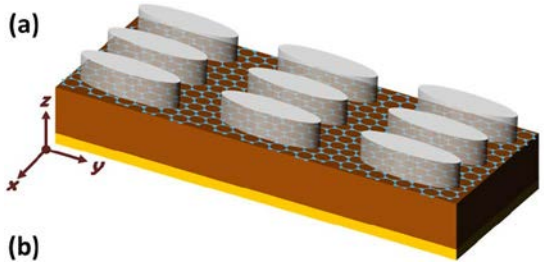
Carbon, 2018, 133, 416-422

Low-Bias Terahertz Amplitude Modulator Based on Split-Ring Resonators and Graphene



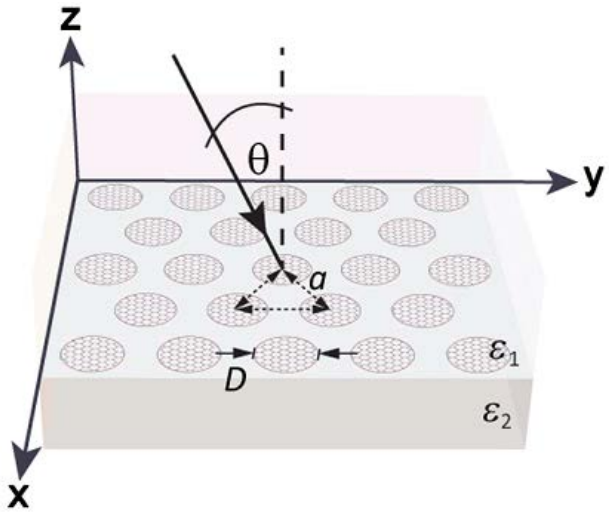
ACS Nano, 2014, 8, 2548

Broadband terahertz absorber based on multi-band continuous plasmon resonances in geometrically gradient dielectric-loaded graphene plasmon structure



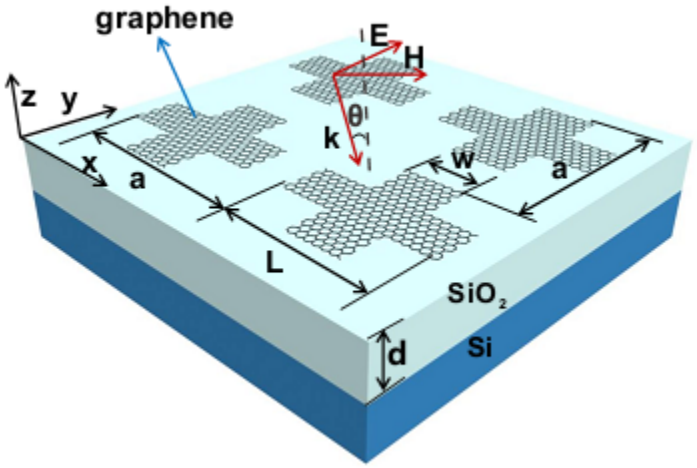
Scientific Reports, 2018,8,3239

Complete Optical Absorption in Periodically Patterned Graphene



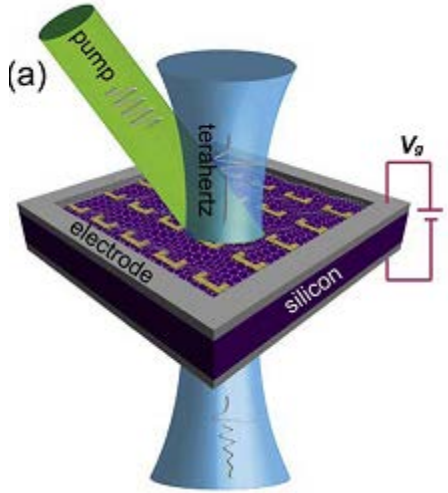
Physical Review Letters, 2012, 108, 047401

Plasmonic absorption enhancement in periodic cross-shaped graphene arrays



Optics Express, 2015, 23, 8888

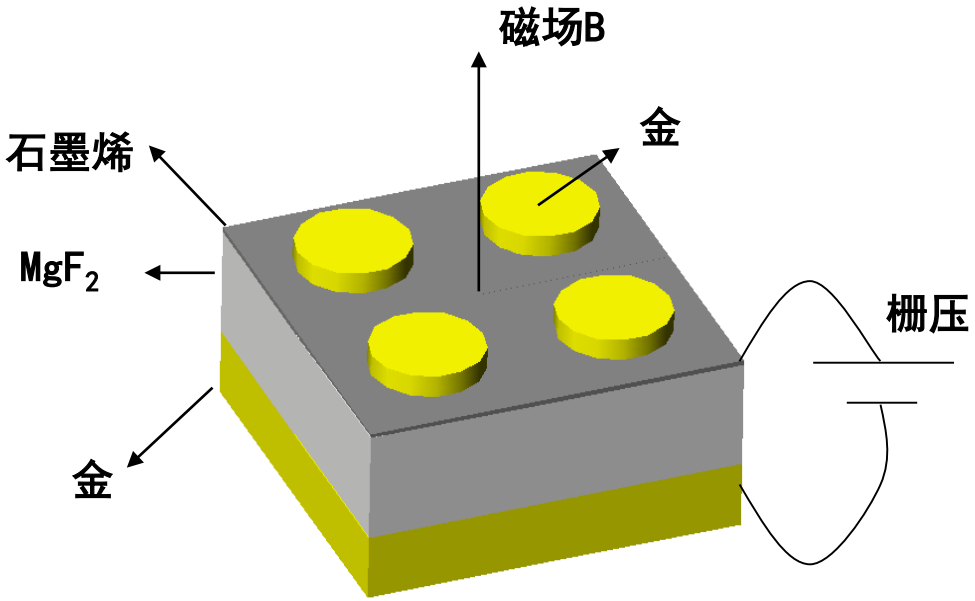
Dual control of active graphene–silicon hybrid metamaterial devices



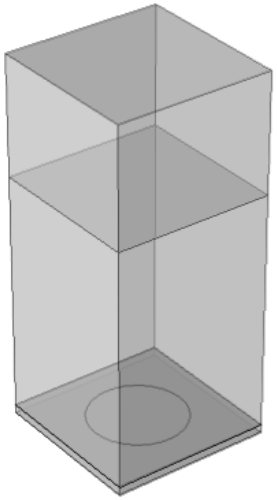
Carbon, 2015, 90, 146-153

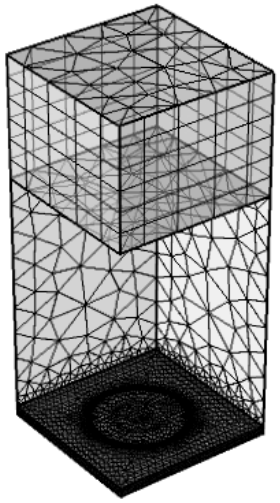
能否使用栅压和磁场共同调控？

金圆盘石墨烯太赫兹吸收器

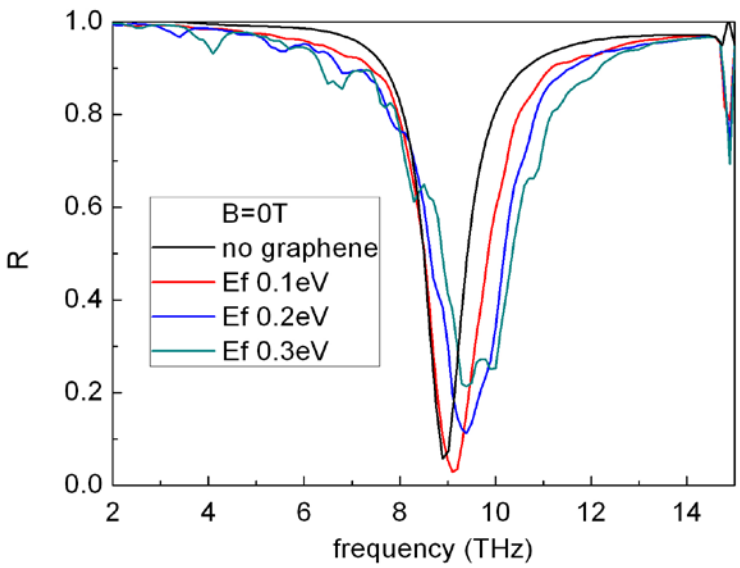


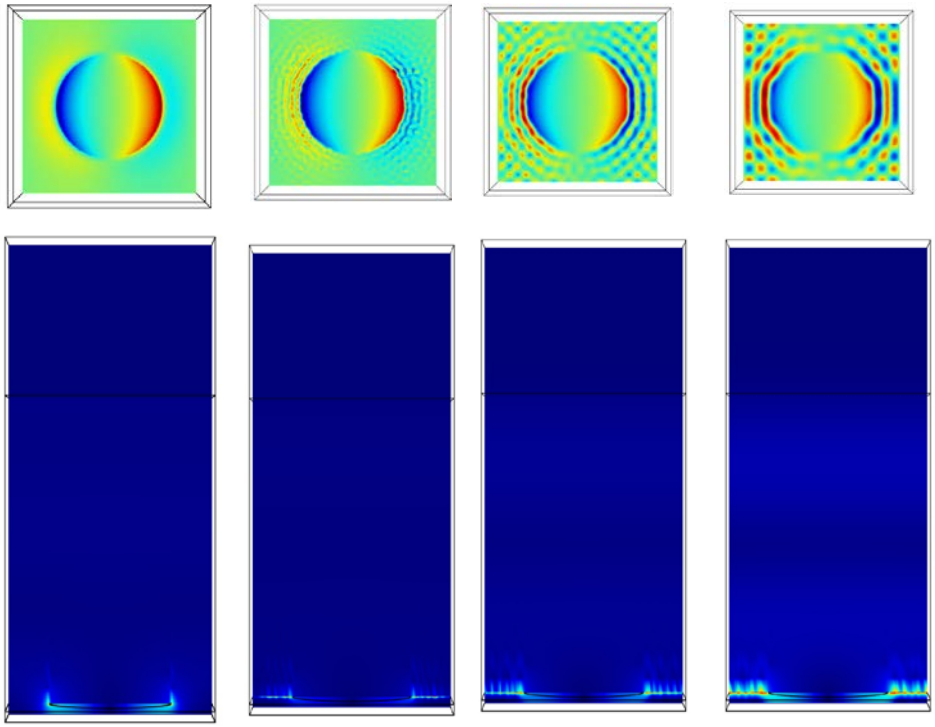
- 几何、材料
  - 周期20μm
  - 金盘半径6μm、厚度50nm
  - MgF_2厚度1μm
  - 底层金厚度50nm
- COMSOL射频模块
  电磁波,频域





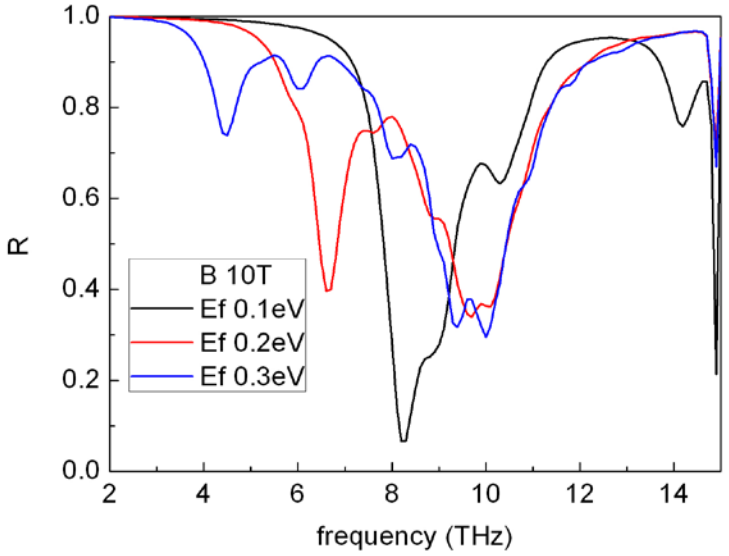
无磁场时，改变栅压

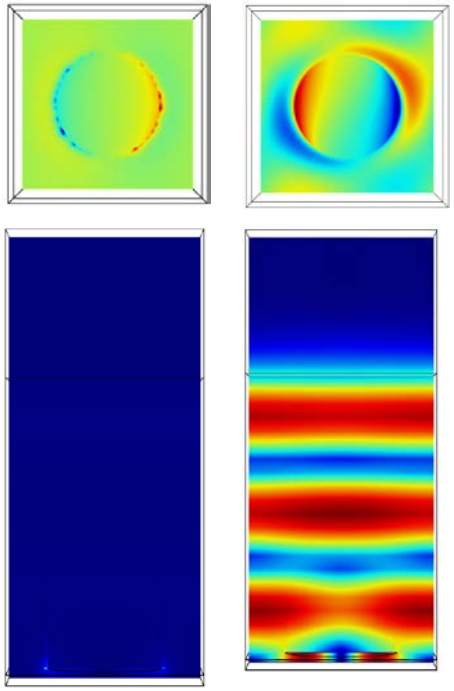




no graphene	Ef 0.1eV	Ef 0.2eV	Ef 0.3eV
8.89THz	9.15THz	9.41THz	9.41THz

磁场10T时，改变栅压

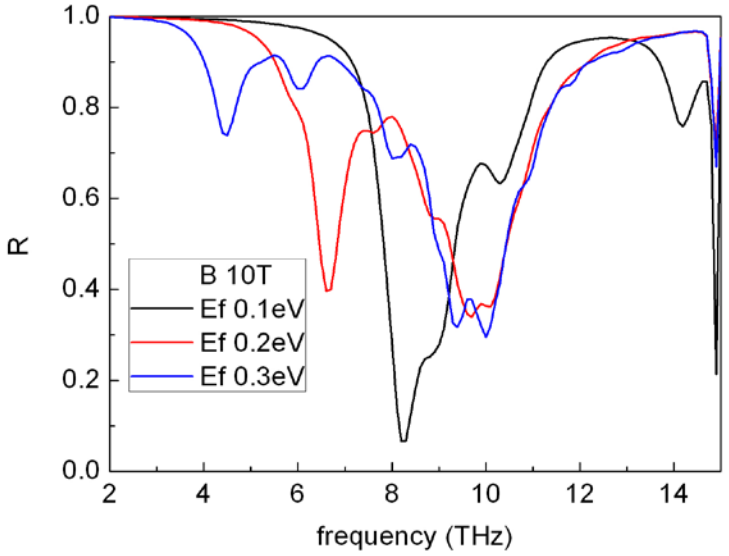


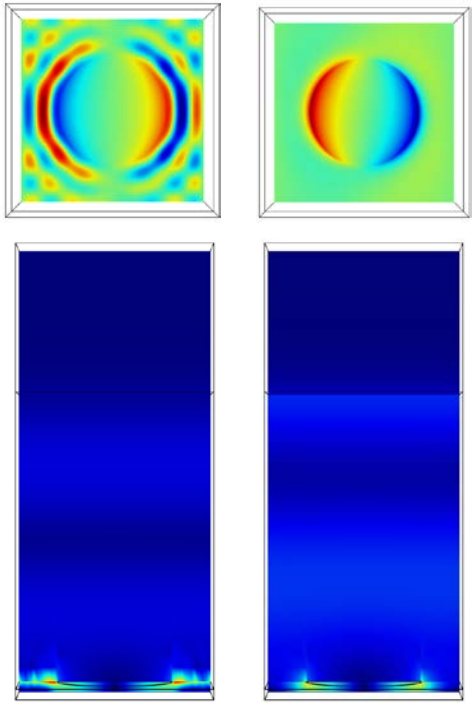


Ef 0.1eV
8.5THz

Ef 0.1eV
14.2THz

磁场10T时，改变栅压

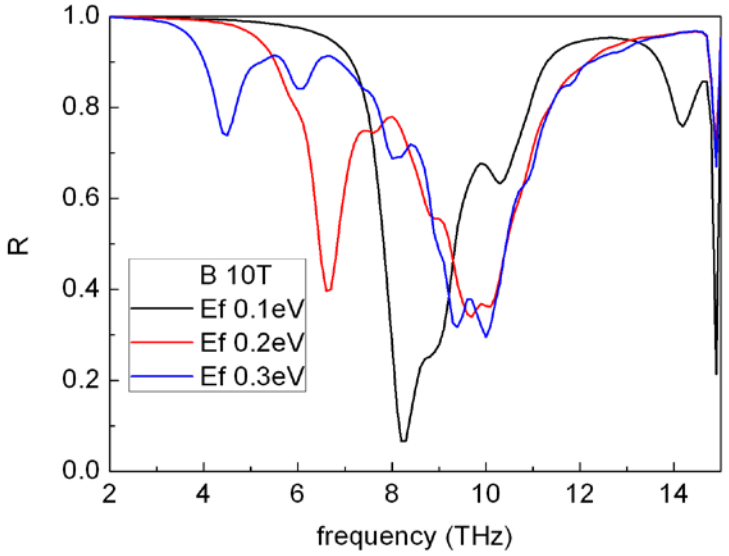


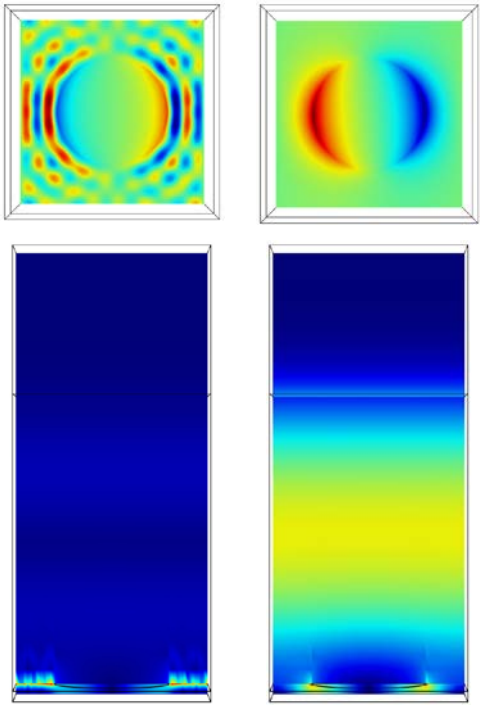


Ef 0.2eV
9.67THz

Ef 0.2eV
6.68THz

磁场10T时，改变栅压

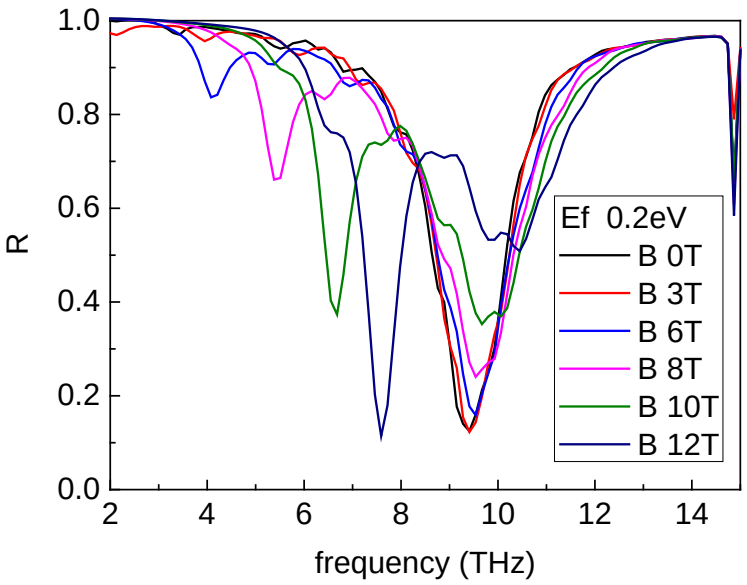


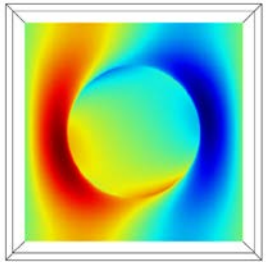


Ef 0.3eV
10.06THz

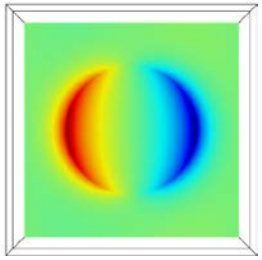
Ef 0.3eV
4.47THz

栅压固定，改变磁场

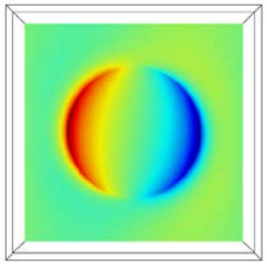




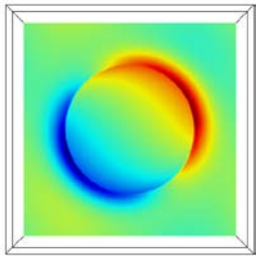
B 6T
4.08THz



B 8T
5.38THz



B 10T
6.68THz



B 12T
7.59THz

- 通过COMSOL的建模和仿真，设计了一种能够通过栅压和磁场双重方式动态调控性能的石墨烯太赫兹吸收器。
- 物理机理？
- 性能优化？

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谢谢！
欢迎各位专家指正！

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