Asymmetric dual grating gate graphene FETs for direct detection of Terahertz radiation

J.A. Delgado-Notario[1], V. Clerico[1], E. Diez[1], J.E. Velázquez-Pérez[1], T. Taniguchi[3], K. Watanabe[3], D. Yadav[2], T. Otsuji[2] and Y.M. Meziani[1]

[1]*Nanolab, Salamanca University, Salamanca, 37008 Spain.*
[2]*Research Institute of Electrical Communications, Tohoku University, Sendai, Japan.*
[3]*National Institute of Material Sciences, Tsukuba, Japan.*

juanandn@usal.es

The unique optical and electronic properties of graphene open the way for the development of new graphene-based devices for terahertz technology. Exfoliated graphene shows a high value of electronic mobility at room temperature [1] and even higher at low temperatures. Applications of graphene field effect transistors (GFET) operating in the terahertz (THz) range are appealing as it is one of the least explored frequency regions and holds potential to revolutionize different fields like security, medical imaging or high-speed wireless communication. Recent research on vertically stacked heterostructures of graphene with hexagonal-boron nitride (h-BN) and other two-dimensional materials has opened a new realm for intriguing device physics making them ideal candidates for future high-frequency technology [2–3].
We report on direct detection of terahertz radiation by using graphene-based FETs with asymmetric grating gates (ADGG GFETs). The device was fabricated with a stack of h-BN/Graphene/h-BN on SiO_2/Doped-Si. The former layer was used as a back gate as well as an asymmetric dual grating top gates (Fig.1). It was subjected to terahertz radiation at frequencies of 150 and 300 GHz from 4K up to 300 K and a clear photocurrent was observed (Fig.2).

References

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Figures

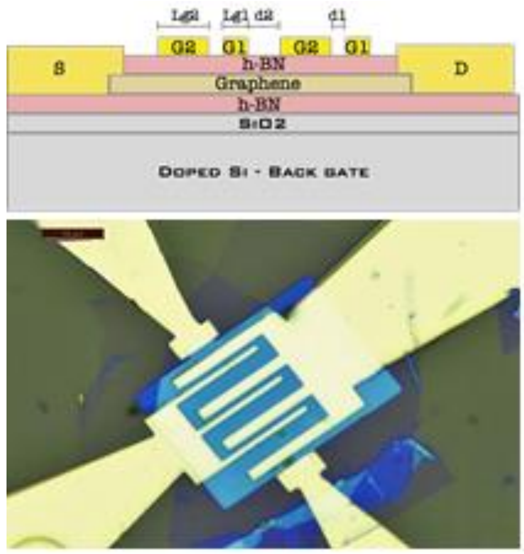

Figure 1: Side description of the GFET structure and top view microscopic image of the GFET

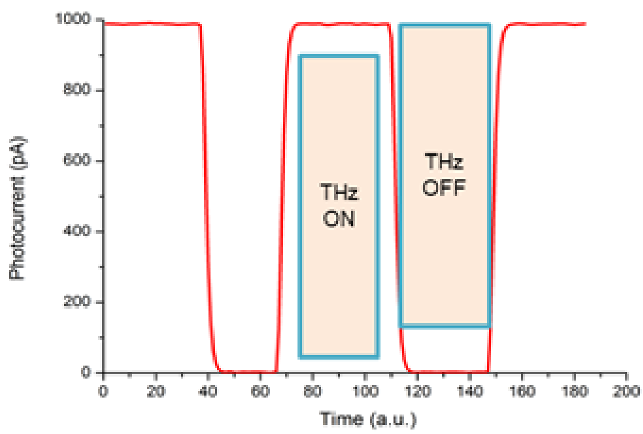

Figure 2: Photocurrent vs time when the THz beam at 300 GHz was switched on and off.