

# Electron beam lithography: spintronics and nano-optics applications

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I will discuss several examples of nanodevices fabricated by electron beam lithography (eBL) at CIC nanoGUNE. These nanostructures are employed for different research topics and applications in the fields of spintronics and nano-optics.

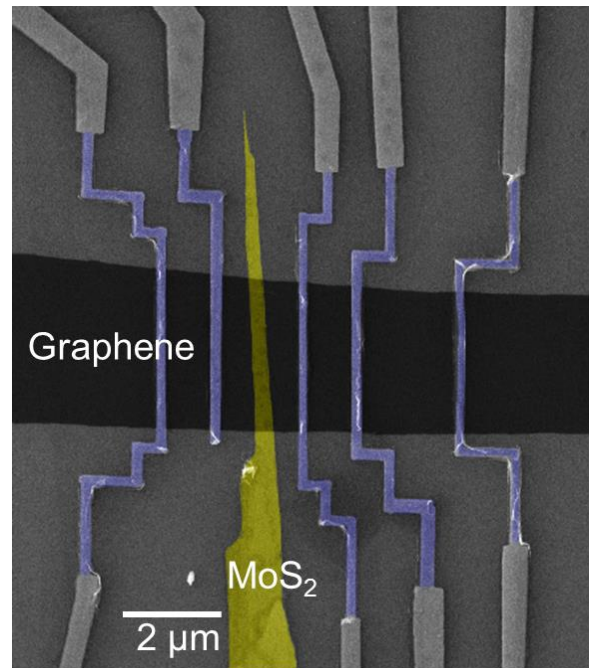
As example of spintronics devices I will introduce the lateral spin valve and its use as a spin-to-charge current converter [1,2] or a spin field-effect transistor (Fig. 1) [3].

As example of nanooptics devices, I will explain graphene-based plasmonic devices such as resonant metal antennas on graphene (Fig. 2) [4] and graphene nanoresonators [5], as well as hexagonal boron nitride-based phononic devices such as waveguide nanoantennas [6].

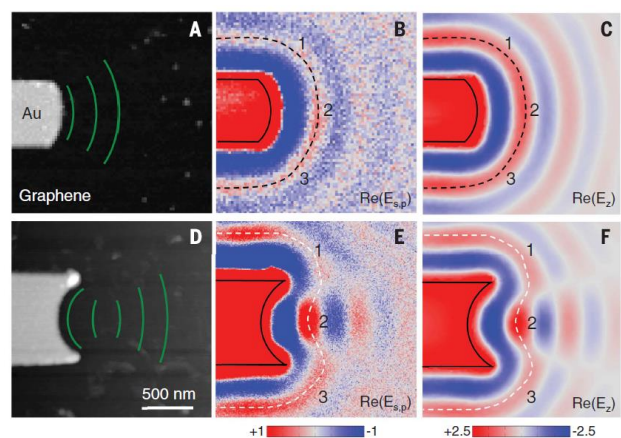
## References

- [1] E. Sagasta et al. Phys Rev. B 94, 060412 (2016)
- [2] W. Yan et al., Nature Comms 8, 661 (2017)
- [3] W. Yan et al., Nature Comms 7, 13372 (2017)
- [4] P. González-Alonso et al. Science 344, 1369 (2014)
- [5] A. Y. Nikitin et al. Nature Phot. 10, 239 (2016)
- [6] F. J. Alfaro-Mozaz et al. Nature Comms. 8, 15624 (2017)

## Figures



**Figure 1:** False-coloured SEM image of the 2D van der Waals heterostructure to be used as spin field-effect transistor. Purple nanostructures are Co electrodes fabricated by eBL.



**Figure 2:** Convex (A) and concave (D) Au antenna on top of graphene fabricated by eBL. (B) and (E) are the corresponding experimental near-field images  $\text{Re}(E_{s,p})$ . (C) and (F) are the calculated near-field images  $\text{Re}(E_z)$ .