

## Contactless magnetoresistance in large area CVD graphene grown on SiC substrates

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We present contactless measurements of magnetoresistance (MR) of large area graphene films grown by CVD method on semi-insulating SiC substrates<sup>1</sup>. For this purpose we propose microwave technique<sup>2,3</sup> using single post dielectric resonator operating at frequency about 13.5 GHz was used. Figure 1a and 1b shows details of the dielectric resonator we used in the experiment. Microwave measurements results have been compared with results obtained with classical DC methods showing good agreement and proves usefulness of microwave technique in magnetoresistance studies (see Fig 1b and 1d for samples details). Experiments have been performed at 4.2K in magnetic fields in the range from 0 to 7 T. Significant differences in magnetoresistance have been observed depending on the orientation and crystal structure of SiC substrates (see Fig 2). Wafer-scale epitaxial graphene was grown on three semi-insulating SiC surfaces: 4H-Si, 6H-Si, and 4H-C. Here, symbols 4H and 6H stand for silicon carbide poly types, labels Si and C denote polarities (faces). Studied samples have carrier concentrations above  $3.8 \times 10^{16} \text{m}^{-2}$  and mobility below  $0.16 \text{m}^2/\text{Vs}$ . The details of the experimental technique and interpretation of magnetoresistance will be discussed in the contribution.

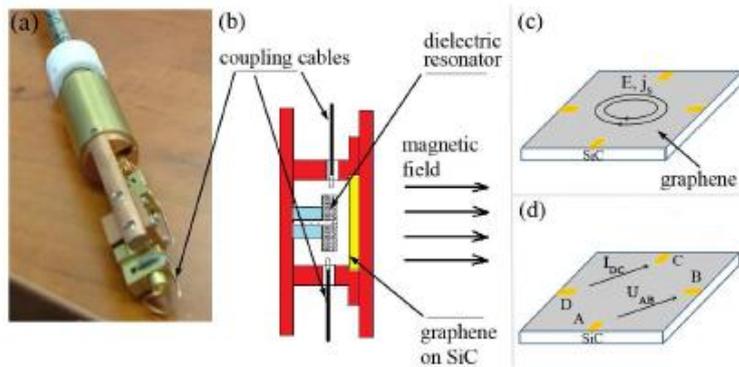
### References:

<sup>1</sup> W. Strupinski, K. Grodecki, A. Wysmolek, R. Stepniewski, T. Szkopek, P.E. Gaskell, A. Gruneis, D. Haberer, R. Bozek, J. Krupka, and J.M. Baranowski, *Nano Lett.* 11, 1786 (2011).

<sup>2</sup> J. Krupka and W. Strupinski, *Appl. Phys. Lett.* 96, 082101 (2010).

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FIG. 1. (color online) (a) Photograph and (b) schematic of 13.5 GHz single post dielectric resonator intended for contactless sheet resistance and magneto-resistance measurements. Draft of the sample for AC (c) and



DC (d) experiment. The electric contacts (Ti/Au) are placed at the middle of each edge of the sample. The opposite electrode are located 8mm from each other.

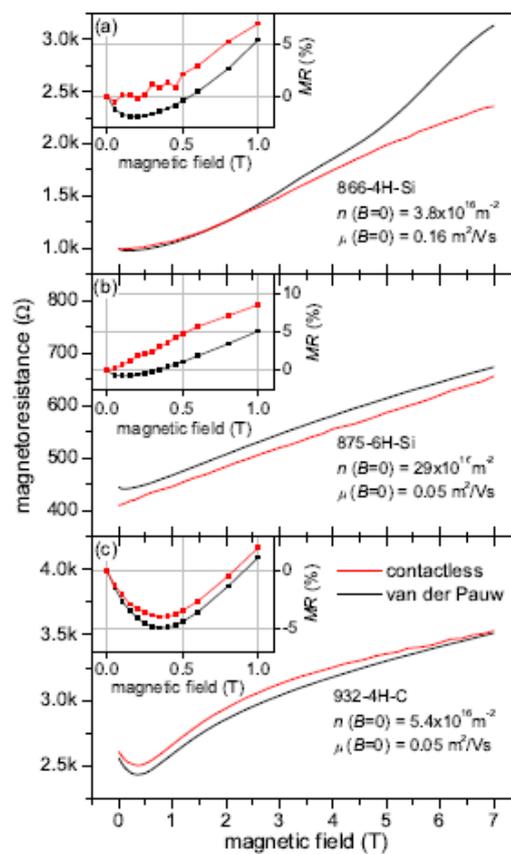


FIG. 2. (color online) Magnetoresistance for three large area graphene films grown on semi-insulating SiC with different poly-types and polarities. Insets emphasize negative relative magnetoresistance for low magnetic fields. Temperature equals 4.2K.