DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"

Linear and Non-Linear Terahertz Properties of Bi_2Se_3 Topological Insulator

Introduce:

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Interviene:

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Abstract:

Topological Insulators (TIs) like Bi2Se3, are one of the most intriguing issues at focus in Condensed Matter Physics. TIs exhibit a band gap in the bulk like ordinary insulators, but have intrinsic 2D conducting states on their edge and surface. The edge states arise from a strong spin-orbit coupling, and they are backscattering protected, i.e. not sensitive to disorder (except that coming from magnetic impurities). Such as graphene, TIs surface charge transport is carried out by Dirac fermions, with a very high surface carrier density
(n ≥ 1013 cm-2), compared to typical values on metal surfaces. Dirac fermions in TIs
sustain both single-particle and plasmonic modes [1,2,3,4], whose properties can be used for photonics (terahertz) applications at the nanoscale and for producing non linear effects like electromagnetic transparency and harmonic generation process.

In this talk, after a general review on the properties of Topological Insulators, I will discuss the linear response of Dirac excitations in TIs and their behavior under a strong magnetic field up to 30 T. The appearance of strong non-linear optical effects [5], when the THz electric field reaches values on the order of 1 MV/cm, will be also discussed. Both the linear and non-linear experiments provide a unifying picture of single particle and collective electronic excitations in Topological Insulators, indicating the strong specificity of Dirac carriers in Condensed Matter Physics.

[1] P. Di Pietro et al, Nature Nanotechnology, 2013.
[2] M. Autore et al, Advanced Optical Materials, 2015.
[3] M.Autore et al, Nanoscale 2016.
[4] M. Autore et al, ACS Photonics, 2015.
[5] F. Giorgianni et al, Nature Communications, 2016

Seminario

Martedì 28 giugno 2016

Sala Riunioni, ore 12.00

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