GOETHE UNIVERSITÄT FRANKFURT AM MAIN
Fachbereich Physik
Institut für Theoretische Physik

Condensed Matter Theory Seminar

Subject:	**Engineering topological electronic states in graphene without spin-orbit coupling effects**
Speaker:	**Dr. Jose Luis Lado Villanueva (International Iberian Nanotechnology Laboratory, Braga, Portugal)**
Date & time:	**Friday, February 17th, 2017 at 3:15 p. m.**
Venue:	**Seminar room 1.114**

Topological electronic states are electronic phases characterized by a gapped bulk spectrum and topologically protected edge excitations, chased for their potential use in fundamental physics, low consumption electronics and topological quantum computing. Among them, the quantum anomalous Hall (QAH), quantum spin Hall (QSH) and topological superconducting (TS) states are known to appear on electronic systems with strong spin-orbit coupling. In the case of graphene, spin-orbit coupling effects are extremely weak, blocking the appearance of topological states by conventional mechanisms. We will show that such lack of spin-orbit coupling is not actually an obstacle to realize QAH, QSH and TS states in graphene. In particular, we will show how the interplay between: (i) Dirac spectra, (ii) magnetic field, (ii) electronic interactions, (iv) exchange proximity effect and (v) superconducting proximity effect, allows to realize the quantum anomalous Hall, quantum spin Hall and topological superconducting states without spin-orbit coupling. Finally, we will discuss the possible experimental realizations and signatures that would allow to identify those topological states.

References

[1] JL Lado, J Fernández-Rossier, Physical Review B 90 (16), 165429
[2] JL Lado, J Fernández-Rossier, Physical Review B 92 (11), 115433
[3] P San-Jose, JL Lado, R Aguado, F Guinea, J Fernández-Rossier, Physical Review X 5 (4), 041042