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"What color is a graphene quantum dot? Exploring the shape and symmetry of graphene quantum dots through optical conductivity"

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Αίθουσα σεμιναρίων στο ισόγειο του ΕΙΕ

What color is a graphene quantum dot? Exploring the shape and symmetry of graphene quantum dots through optical conductivity

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Graphene's unique optoelectronic properties are characterized by a universal optical conductivity in the visible and a broad asymmetric peak at higher frequencies. On the other hand, due to quantum confinement, graphene quantum dots exhibit molecule-like properties such as optical selection rules and a discretized optical absorption spectrum. Here I will discuss a way to distinguish between dots of different edge types by illuminating them with light. Using the Kubo formula in linear response for a non-interacting tight-binding model, I will analyze the optoelectronic properties of spatially confined dots with triangular, hexagonal, and rectangular geometry. I will show that dots with zigzag edges exhibit an additional absorption peak, not present in dots with armchair edges. Using symmetry arguments, I will explain that the optical conductivity is polarization independent for triangular and hexagonal dots, and polarization dependent for rectangular dots. Finally, I will discuss the size evolution of the optical conductivity from dots to the thermodynamic limit by using finite size scaling and recover the spectral features known for graphene.