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Graphene mediated electrically tunable emission enhancement of quantum dots¹ JAYDEEP BASU, M PRAVEENA, TP SAI, RIYA DUTTA, ARINDAM GHOSH, Department of Physics, Indian Institute of Science, Bangalore - 560 012. India — Graphene is known to strongly quench quantum dots and emitters in close proximity to its surface. While this aspect, enabled by a strong non-radiative energy transfer rate, is utilised in various applications, no pristine graphene based light emitting or display devices have been successfully demonstrated so far. On the other hand semiconductor quantum dots have been widely used as a spectrally tunable, highly efficient, materials in light emitting devices and displays. Here we will discuss the first demonstration of electrically tunable enhanced photoluminescence in a hybrid device of CdSe quantum dots in close proximity to a single layer of graphene. The enhancement is maximum at the Dirac point and decreases symmetrically with positive or negative gate voltage. The photoluminescence enhancement is dependent on the emission wavelength of quantum dots in the visible regime and is also dependent on the surface density of quantum dots. FDTD simulations reveal that graphene mediated super-radiance of quantum dots is responsible for the observed emission enhancement of the quantum dots.

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