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Excitonic Hierarchies in Gapped Carbon Nanotubes ROBERT KONIK, Brookhaven National Lab — We present evidence that the strong electron-electron interactions in gapped carbon nanotubes lead to a hierarchy of excitons within a given nanotube subband. We study these hierarchies by employing a field theoretic reduction of the gapped carbon nanotube permitting electron-electron interactions to be treated exactly. We analyze this reduction by employing a Wilsonian-like numerical renormalization group. We are so able to determine the gap ratios of the one-photon excitons as a function of the effective strength of interactions. We also determine within the same subband the gaps of the two-photon excitons, the single particle gaps, as well as a subset of the dark excitons. The strong electron-electron interactions in addition lead to strongly renormalized dispersion relations where the consequences of spin-charge separation can be readily observed.

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