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Bandgap Modulation by Transverse Electric Fields in Single Wall Carbon Nanotubes J. M. KINDER, University of Pennsylvania, E. J. MELE, University of Pennsylvania — We study the variation of the electronic bandgap of semiconducting carbon nanotubes in a static electric field perpendicular to the nanotube axis. We consider three models for the transverse field profile and find that the spectrum is sensitive to the spatial variation of the transverse field. For a uniform transverse field, we show the bandgap is fixed until the field strength exceeds a critical value, in agreement with previous theoretical work. In contrast, we find no critical behavior when the applied field is localized to a region of the nanotube much smaller than its length. An arbitrarily weak field produces bound states inside the unperturbed bandgap whose binding energy vanishes as the fourth power of the applied field strength. The field strengths required to reduce the gap by a few percent are the same order of magnitude as those commonly used in scanning tunneling microscopy.

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