A Particle-in-Cell Model for Space Charge Dynamics in Rings*, J.D. GALAMBOS, <u>J.A. HOLMES</u>, D.K. OLSEN, J.H. WHEALTON, ORNL; M. BLASKIEWICZ, A. LUCCIO, BNL - High power circular accelerators and storage rings have both stringent beam loss requirements and significant space charge forces. It is therefore important to study the space charge dynamics in rings. To represent the space charge forces of the beam for arbitrary distributions in particle tracking calculations, we have developed a particle-in-cell (PIC) model. This has been accomplished by including space charge forces in the injection and tracking code, ACCSIM. Because PIC calculations can become extremely time consuming, we use a fast Fourier transform (FFT) evaluation scheme for the space charge forces. Application of this scheme is made for the calculation of emittance growth and tune shifts in similar doublet and FODO lattice configurations. Also, comparison of the results and computer timing of the PIC model calculations is made with those of a parametrically matched particle core model and with calculations having no space charge effects.