

**Generalization of the Touschek Scattering Theory for a 3-D Velocity Spread\***, CHARLES H. KIM,

LBL - Touschek scattering is an important process that determines the beam lifetime in low-energy high-brightness electron storage rings. Conventional Touschek theory assumes a 1-D velocity distribution which may not be applicable in some cases due to finite vertical dispersion, skew quadrupoles, coupling resonances, etc. In the present paper, the Touschek theory is extended to a beam with a 3-D velocity spread, where the transverse distribution function is given in the form of  $\exp[-H/(2W)]$  where  $H$  is the Courant Snyder invariant and  $W$  is the beam emittance. The energy spread is assumed Gaussian. The calculated beam lifetimes using the new and the old theories are compared with the measurements performed in the Advanced Light Source.

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