

HERA Electron-Beam Lifetime Disruption Machine Studies and Observations, D.R.C. KELLY,

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Extensive machine studies of the electron beam lifetime problem in HERA were performed in Dec 1995 at energies ranging from 12 GeV to 27 GeV and at currents up to 40 mA. Transient and persistent rate increases observed in 213 electron beam loss monitors located near quadrupoles around the machine and in background and electron detectors at the ZEUS and H1 experiments coincided with transient and persistent electron beam lifetime disruptions. The observations were consistent with the passage through the electron beam of dozens of disrupting targets (dust particles) per minute, whereby many permanent lifetime disruptions and local electron loss rate increases (stationary target trappings in quadrupoles) could be observed per hour at high current and energy. Detectors indicated frequent longitudinal motion of transient disrupting targets at speed $\sim 60 \text{ ms}^{-1}$ along arc regions, the targets apparently being frequently lost in straight sections. The time evolution of electron loss monitor rates around the ring illustrates clearly the passage of targets through the beam, the trapping of targets in particular quadrupoles, and the successful removal of many disrupting targets by strong repeated beam kicking and high-frequency beam kicking. The integrated ion pump system was again implicated as the disruption culprit. Regions most prone to disruption have been identified so that the benefits of future trial NEG pump installation can be most effectively assessed.