

X-Ray Transition Radiation from High Energy Particles

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X-ray transition radiation can be used to measure the Lorentz factor of relativistic particles. At energies approaching $E/mc^2=10^5$, transition radiation detectors can be optimized by using thick (~125-250 μm) radiator foils with large (~5-10 mm) spacings. Such a configuration implies the production of x-ray energies ~100 keV and the use of scintillators as the x-ray detectors. Compton scattering of the x rays out of the particle beam then becomes an important effect. We discuss the design of such high energy transition radiation detectors, including the use of metal radiator foils rather than the standard plastic foils, present the results of detailed simulations, and apply the results to the ACCESS cosmic ray experiment proposed for the Space Station.