CRaTER: the Cosmic Ray Telescope for the Effects of Radiation experiment on Lunar Reconnaissance Orbiter

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Lunar Reconnaissance Orbiter (LRO) is the first mission in the NASA Robotic Lunar Exploration Program and is planned for launch in late 2008. The overall mission objective is to prepare for and to support future human exploration of the moon. To achieve that objective, LRO includes investigations that will characterize the lunar radiation environment, develop a high-resolution geodetic grid of the lunar surface for selection of future landing sites, assess the resources and environments of the lunar poles, and map the surface composition. The operational orbit will be 50 ś 20 km altitude inclined at 90 degrees. The spacecraft will be 3-axis stabilized with a primary mission duration of 1 earth year. We present a summary of the design of the Cosmic Ray Telescope for the Effects of Radiation (CRaTER) experiment for LRO, including a description of the anticipated data products. The CRaTER investigation will address the effects of ionizing energy loss in materials due to solar energetic particle events and galactic cosmic rays, specifically in silicon and in an analogue to human tissue. Our investigation focuses on understanding the linear energy transfer (LET) spectrum inside materials through direct measurement in the space radiation environment, particularly above 10 MeV/nucleon, combined with models of radiation transport through materials. The CRaTER results will have direct application to the biological effects of the lunar radiation environment as well as the effects on electronic systems.