VALIDATION OF THE NEW TRAPPED PROTON ELECTRON MODELS (AP9/AE9)

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Traditionally, to obtain estimates of trapped proton/electron populations within the Earth geomagnetic field, radiation exposure estimates for the semiconductor/tissue based components are computed using NASA trapped radiation models AP8/AE8. These models were developed in the 1970s and 1980s and provide sufficient information for the shield design of a spacecraft. There are however well-known limitations on the validity of AP8/AE8 and over the past few years, in the space radiation community, a broad consensus has been building that the trapped environment as quantified by AP8/AE8 requires a more accurate, comprehensive and up-to-date standards. This is due to the fact that modern design and systems engineering techniques require models with finite time duration probability distributions, error bars, inclusion of a broader energy range (i.e., hot plasma and energetic protons) and a more complete spatial coverage as increasingly complex technologies are flown into the trapped regions (LEO, MEO, GTO, HEO and GEO) with consideration for missions in non-traditional orbit regimes. To meet the design criteria of future satellites, Aerospace Corporation, Los Alamos National Laboratory (LANL), National Reconnaissance Office (NRO) and Air Force Research Laboratory (AFRL), embarked on a project to produce the next generation trapped radiation belt model, namely the AP9/AE9. This model upgrade offers improvements in terms of specified radiation hazards, spectral and spatial coverage definition, time correlated probability of occurrence definition and statistics accuracy and uncertainty quantification. In this presentation comparison between AP8/AE8 and AP9/AE9 for a LEO-GEO mission will be presented. In addition, for specific locations onboard International Space Station (ISS), validation results for dosimetric measurements will be presented and differences between the two models will be discussed.