Abstract

Creation and utilization of a world wide web based space radiation effects code: SIREST

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In order for humans and electronics to fully and safely operate in the space environment, codes like HZETRN (High Charge and Energy Transport) must be included in any designer's toolbox for design evaluation with respect to radiation damage. Currently, spacecraft designers do not have easy access to accurate radiation codes like HZETRN to evaluate their design for radiation effects on humans and electronics. With computer technology from the early 90's, this meant having an executable copy of the program on the designer's computer. If there were multiple designers at the same geographical location, they could possible share the code. Today, the World Wide Web is sophisticated enough to support the entire HZETRN code and all of the associate pre and post processing tools: SIREST (Space Ionizing Radiation Effects and Shielding Tools). This paper will describe the transition from HZETRN to SIREST. There are many advantages to SIREST and not many disadvantages. The most important advantage is the instant update capability of the web. When the researchers at Langley and elsewhere create and validate a new model for, say, the transport of gamma rays, electrons, and pions, then when SIREST is updated, and everybody has the new update. There is no need to send out updates to all the users and track these updates. Another major advantage is the modularity that the web imposes on the code. Since SIREST will allow a choice of scenarios from LEO to interplanetary orbit and beyond, then the code to service these selections must be modular and therefore can be easily upgraded when, say, new Jupiter trapped charged particle models arise. Right now, the major disadvantage of SIREST will be its modularity inside the designer's system. This mostly comes from the fact that a consistent interface between the designer and the computer system to evaluate the design is incomplete. This, however, is to be solved in the Intelligent Synthesis Environment (ISE) program being funded by NASA. One last exciting aspect of SIREST is in its ability to display data. If special hardware exists at the designer's site, like a CAVE or some other kind of three dimensional display capability, then a total design analysis can be displayed in a three dimensional, 1:1 scale ratio of the vehicle. Therefore, a designer can float like an astronaut to the point of, say, highest radiation damage in the vehicle and literally look in all directions to see what element in the design is causing the radiation anomaly. This is a new capability that has not existed for radiation codes and most other design aspects. With the reduction in cost of the hardware for three dimensional display capabilities, this will become a tool that will be fully utilized and become a standard output of all design tools.