

# **The Effects of Radiation on Space Hardware**

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Inner heliospheric missions are increasingly susceptible to radiation hazards. The types of missions are themselves increasingly demanding and payloads are becoming more sophisticated. Use of more lightweight spacecraft and less radiation hardened components can arise from system or financial constraints, and non-availability of radiation-hardened components in some areas can also lead to the use of sensitive technologies. New types of radiation effects are also emerging. Traditionally, concerns have been with effects such as single event upsets and latch-up. Modern systems have to contend with new kinds of problems including ion-induced circuit transients, or complex sensor interference mechanisms. Current modelling capabilities are not adequate to address the emerging problems. In some cases there is a complete absence of data and data resources can be unreliable for engineering applications. This is unfortunate as "data-based" analysis is a potential solution to many engineering questions. Serious problems persist with our abilities to evaluate radiation effects on spacecraft. For example, single event upset effects on systems and sensors remain difficult to predict quantitatively. This contribution reviews the mission trends and problems arising, and outlines actions that are needed to address them.