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Improving Space Operations Workshop – Abstract

Using Empirical Models for Communication Prediction of Spacecraft

A viable communication path to a spacecraft is vital for its successful operation. For human spaceflight, a reliable and predictable communication link between the spacecraft and the ground is essential not only for the safety of the vehicle and the success of the mission, but for the safety of the humans on board as well. However, analytical models of these communication links are challenged by unique characteristics of space and the vehicle itself. For example, effects of radio frequency during high energy solar events while traveling through a solar array of a spacecraft can be difficult to model, and thus to predict. This presentation covers the use of empirical methods of communication link predictions, using the International Space Station (ISS) and its associated historical data as the verification platform and test bed. These empirical methods can then be incorporated into communication prediction and automation tools for the ISS in order to better understand the quality of the communication path given a myriad of variables, including solar array positions, line of site to satellites, position of the sun, and other dynamic structures on the outside of the ISS. The image on the left below show the current analytical model of one of the communication systems on the ISS. The image on the right shows a rudimentary empirical model of the same system based on historical archived data from the ISS.