Solar Array Deployment Monitoring System

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Abstract

A innovative method for wirelessly monitoring earth-based solar array deployments tests has been designed and developed. A full software package for live monitoring and recording of deployments has been developed in the LabView environment. All components of the system are self-contained, and have been demonstrated on a 1/4 scale solar array prototype.

Objective

Develop a wireless system to measure solar array panel hinge-line angles during deployment testing. Develop and facilitate software interfacing for ATK testing applications.

Test Platform

Solar array mockup is constructed from sections of 80/20™. Four composite panels are spring-hinged together and hung from the frame with Teflon™ bearings to simulate zero gravity conditions. Sensor packages are mounted on the top front corner of each wing [Figure 4]. Digital magnetometer and Bluetooth modem powered by a 7.4 V Lithium-Polymer battery in lightweight packaging are shown [Figure 3].

Software Design

A turnkey system was designed with high emphasis on intuitive use and simplicity. The interface follows a linear progression that mirrors a solar array deployment. 

→ Initialization – The user confirms that the sensors are online and performs calibration if needed.
→ Deploying – A dynamic display of the heading of all four sensors; top-down graphical representation of the actual array.
→ Viewing and saving – Simple data export.

System Validation

Several tests were conducted with the compass sensors mounted on the scale prototype charting heading vs. time. Data acquired wirelessly from the sensors through our LabView software showed zero drift and accuracy of ±1° [Figure 7]. These tests verified the 90° heading change with a sampling rate of 8 Hz [Figure 6].

Conclusion

The system developed is both scalable and adaptable. The product will be useful for future ATK deployment tests, and shows promise for other applications in multi-geometry deployments.

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References