

enable the power system to continue to supply power to a load in the event of failure of one of the modules.

- In addition to serving as building blocks of reliable power-supply systems, SiC MCPMs could be augmented with external control circuitry to make them perform additional power-handling functions as needed for specific applications. Because identical SiC MCPM building blocks could be utilized in such a variety of ways, the cost and difficulty of designing new, highly reliable power systems would be reduced considerably. This concludes the information from the cited prior article.

The main activity since the previously reported stage of development was the design, fabrication, and testing a 120-

VDC-to-28-VDC modular power-converter system composed of eight SiC MCPMs in a 4 (parallel)-by-2 (series) matrix configuration, with normally-off controllable power switches. The SiC MCPM power modules include closed-loop control subsystems and are capable of operating at high power density or high temperature. The system was tested under various configurations, load conditions, load-transient conditions, and failure-recovery conditions.

Planned future work includes refinement of the demonstrated modular system concept and development of a new converter hardware topology that would enable sharing of currents without the need for communication among modules. Toward these ends, it is also

planned to develop a new converter control algorithm that would provide for improved sharing of current and power under all conditions, and to implement advanced packaging concepts that would enable operation at higher power density.

This work was done by Alexander Lostetter, Edgar Cilio, Gavin Mitchell, and Roberto Schupbach of Arkansas Power Electronics International, Inc. for Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18341-1.

Radio Ranging System for Guidance of Approaching Spacecraft

Lyndon B. Johnson Space Center, Houston, Texas

A radio communication and ranging system has been proposed for determining the relative position and orientations of two approaching spacecraft to provide guidance for docking maneuvers. On Earth, the system could be used similarly for guiding approaching aircraft and for automated positioning of large, heavy objects. In principle, the

basic idea is to (1) measure distances between radio transceivers on the two spacecraft and (2) compute the relative position and orientations from the measured distances.

Half-duplex communication links would be established between transceivers on the two spacecraft, and pulses having durations of the order of a nanosecond

would be exchanged. The distances would be determined by the pulse-time-of-flight method. Data signals could be transmitted in addition to ranging pulses.

This work was done by Vikram Manikonda and Eric van Doorn of Intelligent Automation, Inc. for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-23474-1

Electromagnetically Clean Solar Arrays

Cells are laminated with shielding, narrow-current-loop wiring, and structural supports.

John H. Glenn Research Center, Cleveland, Ohio

The term “electromagnetically clean solar array” (“EMCSA”) refers to a panel that contains a planar array of solar photovoltaic cells and that, in comparison with a functionally equivalent solar-array panel of a type heretofore used on spacecraft, (1) exhibits less electromagnetic interference to and from other nearby electrical and electronic equipment and (2) can be manufactured at lower cost. The reduction of electromagnetic interference is effected through a combination of (1) electrically conductive, electrically grounded shielding and (2) reduction of areas of current loops (in order to reduce magnetic moments). The reduction of cost is effected by designing the array to be fabricated as a more nearly unitary structure, using fewer components and fewer process steps. Although EMCSAs

were conceived primarily for use on spacecraft, they are also potentially advantageous for terrestrial applications in which there are requirements to limit electromagnetic interference.

In a conventional solar panel of the type meant to be supplanted by an EMCSA panel, the wiring is normally located on the back side, separated from the cells, thereby giving rise to current loops having significant areas and, consequently, significant magnetic moments. Current-loop geometries are chosen in an effort to balance opposing magnetic moments to limit far-field magnetic interactions, but the relatively large distances separating current loops makes full cancellation of magnetic fields problematic. The panel is assembled from bare photovoltaic cells by means of multiple sensitive process steps that con-

tribute significantly to cost, especially if electromagnetic cleanliness is desired. The steps include applying a cover glass and electrical-interconnection tabs to each cell to create a cell-interconnect-cell (CIC) sub-assembly, connecting the CIC subassemblies into strings of series-connected cells, laying down and adhesively bonding the strings onto a panel structure that has been made in a separate multi-step process, and mounting the wiring on the back of the panel. Each step increases the potential for occurrence of latent defects, loss of process control, and attrition of components.

An EMCSA panel includes an integral cover made from a transparent silicone material. The silicone cover supplants the individual cover glasses on the cells and serves as an additional unitary structural support that offers the advantage, relative