

SPACE PROPULSION SYMPOSIUM (C4)  
Electric Propulsion (4)

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## A NEW POWER PROCESSING CONTROL UNIT FOR A 20 MN CLASS ION ENGINE SYSTEM

**Abstract**

Japan Aerospace Exploration Agency (JAXA) and Mitsubishi Electric Corporation (MELCO) are developing a new Power Processing Control Unit (PPCU) for the 20 mN class ion thruster used in the Kiku-8 spacecraft. This PPCU will be first used in the ion propulsion system for the Super Low Altitude Test Satellite (SLATS) of JAXA. The PPCU consists of the seven power supplies including a high voltage power supply, an auxiliary power converter, a signal interface circuit and a primary power sources interface. It contains the function of a Controller that was a separate component in the Kiku-8 ion propulsion system to reduce the its total mass, volume and cost. Therefore, the signal interface circuit receives Commands and sends Telemetries from/to the Data Handling Unit of the satellite, and has a Thruster Control Algorithm such as the discharge mode and the beam generation mode. The bus power interface with the satellite system has been changed to 22 V to 32 V from 100 V in the Kiku-8. After the PPCU BBM was designed, fabricated and verified in the integrated test with an ion thruster, a partial Engineering Model that only has a high voltage power supply was designed and fabricated. To reduce mass and volume, a new printed wiring board (PWB) of CFRP core was developed and applied to the PPCU. The PWB of CFRP core shows higher heat conductivity and lower thermal expansion than the conventional PWB, which enable to mount large-scale ceramic packages on the PWB instead of mounting on the structure. Applying the PWB of CFRP core, A partial EM of the PPCU was realized with lower mass and smaller size than a previous PPCU. The performance test of the partial EM was conducted and showed good performance. Presently, it is under the environmental tests such as vibration test and thermal cycle test. The technology of the partial EM will be applied to the design and fabrication of the PPCU EFM for the SLATS.