DYNAMIC SIMULATION OF THE SATELLITE POWER SYSTEM USED FOR ELABORATION OF A LABORATORY PROTOTYPE

Adebusola F.O., Zymovin A.Ya.
National Aerospace University "Kharkiv Aviation Institute", Kharkiv, Ukraine

The power system of a satellite is its critical part. The purpose of the power supply system (PSS) module is to provide efficient conversion of the radiated from the sun power across into stable regulated voltage on the power bus and to charge the battery. Without a faultless power, the satellite will not be able to operate, and as a result a main requirement for the PSS is stability. To work out the PSS operation principles technical characteristics, a laboratory model was designed [1].

From the preliminary analysis of the problem, it follows that the main tasks of the PSS are:

1) energy conversion (solar array);

2) stabilization, or regulation, of the voltage across the power supply bus;

3) use of a backup power supply, which is a battery that needs appropriate at-time charging;

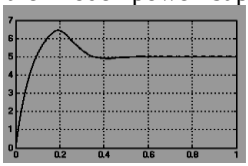
4) control and distribution of electrical power between sources and consumers using appropriate regulators;

5 solar array orientations aimed at obtaining max efficiency of solar cells.

The **paper purpose** is to construct and study a Simulink model for PSS with subsequent selection of hardware specifications that are necessary for designing a laboratory model of a satellite power system.

The system designed is discrete due to utilized switch-mode regulators and corresponding demand of pulse-width modulation. This required the development of a special PWM submodule for the system's integral Simulink model, in addition to submodules for the complex load and adjustable low-pass filter. To obtain the best dynamic performance of the model power supply system, the PID default Simulink controller was used, and its gain components were appropriately tuned.

To obtain the best dynamic performance of the model power supply system, the built-in PID controller Simulink was used, and its component gains were appropriately tuned.



As one of the tests, the initial activation of the regulation system from standby mode was Emulated; the supply bus voltage response is depicted in the attached figure.

References

1. Zymovin A. The bench for solar battery complex research [Text] / A. Zymovin, O. Kosterna // ХШ науково-технічна конференція «Сучасні проблеми ракетно-космічної техніки і технології»: Х., – 2016 – с. 73.