

**Experimental Confirmation of Powerstick Concept**

A. Pustovalov, V. Gusev\*, A. Borshchovsky, A. Chmielewski\*\*

\* BIAPOS, Moscow, Russia

\*\* JPL, Pasadena, USA

The results relating to the development and testing of the miniature RTG-like Powerstick (PS) device are presented. They confirm the earlier ideas and predictions [1, 2] regarding possible manufacturing of PS-devices. PS is based on a Pu<sup>238</sup> standard Radioactive Heating Unit (RHU) with thermal power 1.1 W developed and manufactured by DOE and successfully being used on spacecraft (Galileo, Cassini, e. g.). In the course of development, several design approaches were explored and achieving high PS efficiencies was considered. Better thermal insulation material (with thermal conductivity 0.02 W/mK) has been developed and used and different designs of PS were evaluated. Two types of PS were manufactured: PS-1, on the basis of one RHU and one thermoelectric battery/converter (TEB), and PS-2, on the basis of two RHU and one TEB. Two different sizes of TEB were used: first - with the legs of cross-section 0.45x0.45 mm<sup>2</sup> and height 35 mm, and second - with the legs of cross-section 0.60x0.60 mm<sup>2</sup> and height 35 mm. In both cases, the number of legs was 400. The electrical power of the PS-1 was observed to deliver 22 mW at 2.5 V and for PS-2 - 53 mW at 4.1 V. The analysis of results showed that optimized version of PS-2 should be capable of more than 70 mW at 5 V, on the basis of TEB with legs of cross-section 0.67x0.67 mm<sup>2</sup> and height 40 mm with number of legs 324.

1. A. Chmielewski, R. Ewell, "The Powerstick", 1994, AIAA-94-3816-CP
2. A. Borshchovsky, A. Chmielewski, Huang Chen-Kuo, J. Bass, D. Bugly, A. Pustovalov, V. Gusev, "Powerstick Development", IECEC-97, p. 465