

## **A Study on Long Life Hybrid Battery System Consists of Ni-63 Betavoltaic Battery and All Solid Battery**

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**Abstract :** There is a limitation to power supply and operation by the chemical or physical battery in the space environment. Therefore, research for utilizing nuclear energy in the universe has been in progress since the 1950s, around the major industrialized countries. In this study, the self-rechargeable battery having a long life relative to the half-life of the radioisotope is suggested. The hybrid system is composed of betavoltaic battery, all solid battery and energy harvesting board. Betavoltaic battery can produce electrical power at least 10 years over using the radioisotope from Ni-63 and the silicon-based semiconductor. The electrical power generated from the betavoltaic battery is stored in the all-solid battery and stored power is used if necessary. The hybrid system board is composed of input terminals, boost circuit, charging terminals and output terminals. Betavoltaic and all solid batteries are connected to the input and output terminal, respectively. The electric current of 10  $\mu$ A is applied to the system board by using the high-resolution power simulator. The system efficiencies are measured from a boost up voltage of 1.8 V, 2.4 V and 3 V, respectively. As a result, the efficiency of system board is about 75% after boosting up the voltage from 1V to 3V.

**Keywords :** isotope, betavoltaic, nuclear, battery, energy harvesting

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