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Small sensor node system for measuring space electromagnetic environment

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Based on the technology of the miniaturization of plasma wave receivers, we propose a new system for monitoring the electromagnetic environments in space. We address it MSEE (Monitor System for space Electromagnetic Environments). The MSEE is a kind of the sensor network system in space, which consists of palm-size sensor nodes. Each sensor node carries a compact plasma wave receiver as well as other necessary components, such as communications and digital processing units. Simultaneous multi point observations are possible by distributing the sensor nodes into the target area randomly. The MSEE easily resolves the disadvantage of conventional single-point (or a few points) observations in space scientific missions. The MSEE is a very new concept for measuring the space electromagnetic environments.

The important issue in the development of the MSEE is the design and development of the small sensor node. We develop the bread board model of the sensor node as the first prototype of the system. It contains an analogue ASIC of the plasma wave receiver with small electric and magnetic sensors, a small digital processing unit using a one-chip computer, a small fluxgate sensor for the attitude detection, and a GPS receiver for the location estimation. The system is controlled by the software running on the onboard one-chip computer.

Using the bread board model, we examine the size of the system, the power consumption, the thermal condition, and the EMC (ElectroMagnetic Compatibility) in order to verify the feasibility of the system concept and the function of each component. The present paper introduces the sensor node of the system we develop and shows its feasibility based on our test results.

Keywords: Space electromagnetic environment, Space plasma, Plasama wave, Sensor Network, Small sensor node, MSEE