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DEVELOPMENT OF SHAPE MONITORING SYSTEM USING SMA DIPOLE ANTENNA ON A
DEPLOYABLE MEMBRANE STRUCTURE.**Abstract**

One of the promising structures as a constructing element of a large space structure is a membrane structure, as shown by solar sails which is launched in 2010 and ROSA in 2017 etc., launch performance of such structures has been increasing. In the future, the deployable membrane structure can be used not only as a solar sail, but also as a large arrayed antenna and space solar power generator, then be expected to promote being itself as a working device for some functions.

However in the microgravity environment, since the rigidity of the wrinkle significantly affects on the dynamics of the structure or adversely effects on flatness, this effect should be reduced as much as possible. For example, when installing a device such as an antenna where directionality is important, it may have a fatal influence on a satellite mission. Therefore, in this research, in order to reduce the influence of wrinkles, we propose a method of installing a strip of material which has shape recovery function and removing the curl created in the membrane on its folding pattern. Here, shape memory alloy (SMA) is adopted as a material, and correction of wrinkles by this shape recovery on orbit is assumed. Furthermore, by using the SMA material itself for the radiating part of the antenna, we propose a method of shape monitoring by utilizing the change of the gain of the antenna due to the shape change of the SMA antenna. The antenna used in this research is a dipole antenna having the simplest operation principle and simple structure as an antenna.

In this study, we developed a dipole antenna using SMA material and a circuit board for data acquisition, and changes in received power due to shape change of response were summarized. Then we investigated for realizing shape monitoring by thin dipole antenna by obtaining input characteristics and radiation pattern of the antenna and showed the possibility of this system.

In the future, adoption of the most advanced technologies such as HySIC (Hybrid Semiconductor Integrated Circuit) which is also proposed and developed by one of the authors and other microwave circuit technologies to make the wireless device as smaller, we hope that will be broaden the application of deployable structures.