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# C1Po1B-05 [10]: Estimation of heat dissipation on a rotating rotor over superconducting magnet bearing

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The continuously rotational mechanism is one of key devices to holds a sapphire half wave plate (HWP) in a polarization modulator of a LiteBIRD satellite. Due to the system requirement, the HWP has to be kept at the cryogenic temperature while it is spinning. Thus, we employ a superconducting magnetic bearing (SMB) and AC synchronous motor, contactless rotational mechanism, to achieve the continuous rotation at the temperature range about 10 K. While we can minimize the frictional heat loss, an estimation of heat dissipation to this contactless rotor is important to predict how much the HWP temperature rises during its rotation. For an estimation of heat dissipation, we conduct two types of experiments in order to establish the thermal simulation model equivalent to the flight model in size. One is the experiment to estimate a thermal contact conductance s between the rotor and the cryogenic rotor holder mechanism. In this experiment, the rotor levitates still over a SMB with a heater and a thermometer mounted on the rotor, and thus we can apply a known Joule heat input. Then the rotor is grabbed through the cryogenic rotor holder mechanism. The other experiment is to monitor the difference of the temperature before and after the rotor rotation. We further monitor the transient temperature profiles of the holder mechanism after the rotor is gripped. The rotational time is related to the heat dissipation to the rotor because the heat dissipation is attributed to two kinds of energy losses: a magnetic hysteresis and induced eddy currents on metal parts of the rotor. Finally, we make a comparison between the thermal model and the experimental result and estimate the heat dissipation to the rotor during its spinning.

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