

Design of a VHF broadband antenna for lightning on international space station

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Since a transient luminous phenomenon called Sprite reported for the first time in 1989, the research of lightning discharge has changed greatly. It is commonly thought that Sprites are optical phenomena in the middle atmosphere associated with lightning discharges in thunderstorm. Moreover, lightning discharges are also suggested to produce gamma ray called terrestrial gamma ray flashes (TGFs). However, not being yet clarified is details of sprites and TGFs phenomena because it is difficult to observe them.

At present, Japan Aerospace eXploration Agency (JAXA) develops an experiment module called Kibo, which is a part of International Space Station (ISS). Kibo is a facility in which astronauts can perform experimental activities for a long duration of time. This module has Exposed Facility (EF), which is a multipurpose experiment space, and enables us to have various experiments including earth observations.

JEM-GLISM mission is one of the missions conducted in Kibo. This mission aims to clear the generation mechanisms of sprites and TGFs. Nadir observations from ISS provide coincident data of sprites and lightning discharges. In this mission optical and VHF EM wave sensors are employed to detect the lightning discharges.

In this study we design a broadband patch antenna for receiving VHF EM waves radiated by lightning from space and discuss antenna characteristics.