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Millimeter-wave band observations of planetary atmospheres with SPART 10m telescope

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In order to investigate how activities of the Sun, which is a typical G-type star in our galaxy, influence the balance of atmospheric environments of solar planets, we are promoting a project to carry out millimeter-wave band monitoring (short/middle/long-term) observations of the middle atmospheres of solar planets by exclusively improving a ground-based 10m telescope of the Nobeyama Radio Observatory. We call this telescope "Solar Planetary Atmosphere Research Telescope (SPART)". The telescope is employing 100 and 200 GHz band superconductor/insulator/superconductor (SIS) mixer detectors with a high sensitivity achieving the quantum noise limit. Our heterodyne sensing technique at this frequency band provides us an highly-spectral resolution, which enables us to derive the vertical distribution of minor constituents and their isotopes in the middle/upper atmospheres of terrestrial and gas-giant planets in our solar system. At present we are newly developing intermediate frequency band systems, local oscillator systems, and a digital Fourier transform spectrometer (1 GHz bandwidth, 8 bit, 163484 channel) with a built-in high-speed processing FPGA, system and tracking control software. We will complete the improvements of the telescope systems within this year, and then start monitoring and line-survey observations before the next solar maximum. In this conference, we will report the progress of the project and these developments.

Keywords: millimeter/submillimeter-wave, heterodyne remote sensing, planetary atmosphere