Development of the absorption cell filters for remote D/H observation

*Masaki Kuwabara[1], Kazuo Yoshioka[2], Makoto Taguchi[3], Takuya Kawahara[4], Shingo Kameda[3]

1. JAXA, 2. The Univ. of Tokyo, 3. Rikkyo Univ., 4. Shinshu Univ.

The hydrogen atoms in the planetary exosphere scatter the solar Lyman-alpha radiation and produce a faint glow surrounding the planet. The brightest emission among the planetary coronas is hydrogen Lyman-alpha. Absorption cell technique is an efficient tool for remote sensing of the planetary coronas and allows us to measure not only an intensity distribution of the Lyman-alpha emission but also a temperature distribution in the planetary exosphere. These distributions are quite important to quantitatively estimate of the escape rate of the present planetary atmosphere. Since the absorption cell technique can be used as a light-weight ultra-high resolution filter, it will be crucial for realizing an imaging instrument for observation of planetary coronas with small spacecraft. Absorption performance of the cell strongly depends on parameters such as filament shape, filament temperature, applied power to the filament, filled gas pressure, optical path length, and position of the beam path. The hydrogen absorption cells have been developed to optimize the above parameters and evaluated using an ultra-high spectral resolution Fourier transform spectrometer installed at the DESIRS beamline of Synchrotron SOLEIL in France. In this presentation, the summary of the development and the remaining issues are presented. The basic design of an absorption cell imager and the application of it for future space missions are also presented.

Keywords: Lyman-alpha, Hydrogen corona, D/H ratio

