## X21a Galaxy evolution with NASA FIR-Probe PRIMA

Takuya Hashimoto (University of Tsukuba), Mariko Kubo (Tohoku University), Yoshinobu Fudamoto (Chiba University), Kosei Matsumoto (Gent University), Yoshiki Toba (NAOJ), Hanae Inami (Hiroshima University), Tohru Nagao (Ehime University), PRIMA-Japan Team

We discuss how NASA FIR-Probe PRIMA will bring breakthroughs in the study of galaxy evolution. PRIMA is capable of imaging and spectroscopic observations over $25-265$ $\mu$m and $24-235$ $\mu$m, respectively. "Evolution of galactic ecosystems" and "Buildup of dust and metals" are two of the most important science topics of PRIMA. On the imaging side, with its high sensitivity and survey speed, PRIMA can detect thermal-IR emission of 10,000 to 100,000 galaxies by hyperspectral surveys ($R \sim 10$) of $1-10$ square degrees. By combining PRIMA with ALMA/JWST, we can examine multi-wavelength SEDs of dust in external galaxies, crucial to understand dust-hidden star formation rate, blackhole accretion rate, and their redshift evolution. On the spectroscopic side, PRIMA's OH absorption line observations allow us to study the outflow of molecular gas, and understand how star formation has quenched from the cosmic noon to the present. Mid- and far-infrared fine structure line ([OIII], [NIII], [OIV], [NeV] etc) observations are also feasible, and e.g., thousands of [OIII] detections at $z = 0-3.5$ are expected. These allow us to study the radiation source (star-formation or AGN) and properties of interstellar medium (gas density and abundance ratio) without suffering from dust attenuation, unlike UV and optical emission lines. We will also introduce science cases proposed by the community in Japan and discuss possible multi-wavelength synergies using Japanese facilities.