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UV space telescope LAPYUTA: overview of the mission instruments and development updates

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The Life-environmentology, Astronomy, and PlanetarY Ultraviolet Telescope Assembly (LAPYUTA) mission aims to carry out spectroscopy with a large effective area (>300 cm2) and a high spatial resolution (0.1 arc-sec) and imaging in far ultraviolet spectral range (110-190 nm) from a space telescope. The main part of the science payload is a Cassegrain-type telescope with a 60 cm-diameter primary mirror. As a current design, three main UV instruments are installed on the focal plane of the telescope: a mid-dispersion spectrograph, a high-dispersion spectrograph, and a slit imager. The mid-dispersion spectrograph contains a movable slit with different slit width, a holographic toroidal grating with 2110 lines/mm, and an MCP detector coupled with CMOS imaging sensors. Spectral resolution of 0.02 nm and field-of-view of 100 arc-sec will be achieved. The high-dispersion spectrograph consists of a slit, a toroidal mirror, an echelle gating, a cross disperser, and a detector. Highest spectral resolution of 3 pm will be achieved at the target wavelength (130.5 nm). The UV slit imager consists of imaging optics, several bandpass filters with a rotation wheel, and a same type of UV detector as the one installed in the spectrometer. In order to achieve a high spatial resolution of 0.1 arc-sec, we will install a target monitoring camera at 0th order position inside the spectrometer and slit imager for both attitude control and image accumulation process. We also plan to install a fine guidance sensor to monitor guidance stars. In addition, new key technologies such as funnel-type MCPs and CMOS-coupled readout system and highly reflective UV coatings will be applied to satisfy requirements of LAPYUTA. We have demonstrated performance of prototype models and samples of such key components. These key technologies can be applied to the future international flagship missions such as Habitable Worlds Observatory. Here we present the LAPYUTA concept design, the overview of the mission instruments, and the updated status of key technology developments.