Development of Omni-SLR System: (1) Optical subsystem

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Very compact and low cost SLR system, Omni-SLR, is now under development by the joint team of Hit-U, NAOJ, U-Tokyo, and JAXA aiming to expand SLR tracking station network. The system is designed to be controllable via web browsers, on-site or remotely, as the user interface part is constructed using Streamlit and Flask.

Laser transmission part (compact laser and beam expander telescope (TX)) and receiving part (receiving telescope (RX), bandpass filter, and photon detector) are on AXJ mount (Vixen). Green pulse laser FDSS532-Q2 (CryLas; λ=532nm, Δt=1.3 nsec.) is selected as laser source considering its repetition rate (10kHz) and averaged power (60mW). Laser output timing is controllable by the external trigger signal generated by Raspberry-Pi. Small refractor FL55SS (Vixen, D=55mm, FL=300mm) is selected for TX to get the beam spreading angle less than 10 arc sec. There are two candidates for RX; 1. Classical Cassegrain reflector cc6 (MICROTECH, D=15.3 cm, FL=1836mm) and 2. Catadioptric reflector VMC260 (Vixen, D=260mm, FL=3000mm). We aim to build the optical subsystem using cc6 telescope as the first step then develop it to the next model using VMC 260. MPPC C11202-100 (Hamamatsu Photonics) is mainly used as detector and id100-50 STD (IDQ) or SPD-100-CTC (MPD) can be optionally used.

Several optical mounts, plates and attachments of the detector and filter used for configuring total optical subsystem are now under development including self-making with 3D printer in Hitotsubashi University. Basically, the optical axes of TX and RX are collimated using a star. Then laser and TX are collimated through the laser spot position test. Concurrently, we are investigating the method and procedure how the optical alignment is established reproductively among TX, RX, and Laser.

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