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DEVELOPMENT OF TETHERED UNMANNED AERIAL VEHICLE LASER COMMUNICATION  
STATION FOR BEYOND-5G APPLICATIONS

**Abstract**

Free-space laser communications (lasercom) offers many promising merits when integrated in beyond-5G (B5G) communication systems, cross-platforms terrestrial high-throughput feeder links as well as ubiquitous space and ground networks. Similarly, Unmanned Aerial Vehicles (UAVs) are very attractive platforms for deploying fast inter-connectivity between different nodes because of their mobility, agility and cost-effectiveness. However, onboard battery powered UAVs suffer from very short flight-time and small payload-weight margin due to limited energy storage capacity of the batteries. In this paper, we present the work at the Japanese National Institute of Information and Communications Technology (NICT) on the development of tethered-UAV (TUAV) airborne stations capable of unlimited hovering flight-time at 100-m altitude, hosting high-rate full-duplex Ethernet lasercom terminals and delivering over 30-km secured data connection range. Compactness and mobility of TUAV stations make it possible to have multiple of such terminals forming nodes in a ring or star topology separated by large distances. The TUAV stations can easily support rapid ad-hoc broadband networks for disaster relief and emergency operations, surveillance and tactical applications. It can be used in urban centers and remote regions as provisional Wi-Fi hubs, IoT interlinks and temporary telecom cell towers. They can likewise be adapted as “quasi-ground station” diversities serving as receivers or relay stations for space-based (satellites) and higher-altitude platforms (HAPS)-based lasercom links within offshore locations.