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Author: Ms. Elisa Garbagnati
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

Mr. René Rüddenklau
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany

# SIMULATION OF THE ATTITUDE POINTING PERFORMANCE OF CUBESATS FOR OPTICAL COMMUNICATIONS

**Abstract**

Optical satellite communications have recently gained increasing attention due to the possibility of transmitting high data rates on CubeSats. Thus, the German Aerospace Center (DLR) developed a highly compact and power-efficient laser communication payload for small satellites, OSIRIS4CubeSat (O4C). This terminal will be adapted in the CubeISL mission to establish both Direct-to-Earth and Inter-Satellite Links between two CubeSat terminals in a Low Earth Orbit (LEO). To achieve and maintain these optical links, it is essential to have precise information on the current attitude of the terminal in space. The work develops a framework for the simulation of the Attitude Determination and Control Subsystem (ADCS) of the 6U CubeISL. The developed simulator provides a tool for the performance assessment of the acquisition and keeping of the laser link by the optical communication terminal. The orbital motion and the disturbance torques characterizing the LEO space environment are considered. The CubeSats physical representation embeds dynamics and kinematics, sensors, actuators and desired attitude. Thus, the attitude closed-loop merges determination, control algorithms and filters. Three different control phases are implemented being the detumbling, slew and pointing phase. Two possible pointing targets are considered: the center of the Earth, according to the local-vertical local-horizontal (LVLH) reference frame, and a chosen ground station to simulate the Direct-to-Earth links scenario. The simulations show that the developed ADCS grants an accurate estimation of the CubeSats attitude endorsed by effective control algorithms in the considered mission phases. Focusing on the pointing phase, the ADCS fulfills the pointing requirements of the CubeISL mission.