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## ATTITUDE DETERMINATION AND CONTROL SYSTEM OF SHARJAH-SAT-1

**Abstract**

Sharjah-Sat-1 is the first CubeSat mission of the Sharjah Academy for Astronomy, Space Sciences, and Technology (SAASST), in collaboration with Istanbul Technical University Space Systems Design and Test Laboratory (ITU-SSDTL) and Sabanci University (SU). The 3U+ CubeSat's primary payload is an improved X-Ray detector (iXRD), with the objectives of detecting hard X-rays from very bright X-ray sources, as well as studying the solar coronal holes. The secondary payload is a dual-camera system for Earth imaging. A dual-camera system will be used to image the SAASST building with a size of about 100m. The iXRD requires an attitude accuracy of 1 degree or better. Its full width at half maximum is 4.26 degrees with a linear response for the square collimator used. Every 1-degree pointing error will lead to 23% information loss.

The ADCS subsystem of Sharjah-Sat-1 has been carefully designed and selected to ensure the success of its sophisticated mission, considering the constraints on the CubeSat standards with regards to size, mass, and power, the operational requirements of the mission, and space environmental disturbances expected throughout the mission's lifetime. Those disturbances are mostly encountered at low altitudes, and Sharjah-Sat-1 is planned to have a Sun-synchronous orbit, with an altitude of 500 km. The anticipated launch date of the mission is in Q4-2021.

The paper will include a discussion and evaluation of the ADCS system in detail and its importance in terms of the achievement of the Sharjah-Sat-1 scientific mission (both star\sun imaging and earth imag-

ing), the hardware and the software implemented for active control, and the various attitude determination and control modes for different sensors and actuators' configurations.