

27th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)Author: Prof. Masahiro Nohmi
Shizuoka University, JapanTETHERED PICO-SATELLITE “STARS” FOR TECHNOLOGY DEMONSTRATION OF SPACE
ELEVATOR AND DEBRIS REMOVAL**Abstract**

STARS (Space Tethered Autonomous Robotic Satellite) project purposes to evaluate and to verify a space mechanical control system by a university satellite. The first satellite was “STARS” launched in 2009. It was a mother-daughter satellite, a tethered satellite, and also a robotic satellite. These three main characteristics were evaluated and verified successfully on orbit. The second was “STARS-II” launched in 2014. It had 300m long tether (5m long on STARS), which was Electro Dynamic Tether (EDT). 300m tether deployment was evaluated by orbital altitude change, though telemetry data from the satellites was not sufficient. And then, STARS Project focuses on Space Elevator and Space Debris Removal. The third satellite of the STARS project and the first satellite of Shizuoka University was “STARS-C” released from the International Space Station (ISS) in 2016. It was the first trial in the world to verify basic space elevator technology as the first step. It was 2U CubeSats connected by 100m long Kevlar tether. Unfortunately, the orbital experiment was not succeeded perfectly, however the tether deployment was confirmed. The fourth and fifth are “Stars-AO” and “STARS-Me” respectively. Stars-AO was launched in 2018, and its objective is to verify basic technology for pico-satellite such as high speed transmission downlink and high resolution camera image. These technologies are expected to apply future STARS missions. STARS-Me was released from the ISS in 2018. The mission sequences are: (i) one CubeSat extends the tether; (ii) the climber stowed in the other CubeSat moving on the extended tether. As the result on orbit in the initial phase, CW beacon was confirmed, and also the command turning on the main CPU was successfully received. However, the main mission has not been performed due to communication trouble, and now under operating. Currently, both Stars-AO and STARS-Me are under operation on orbit. The next satellite is “STARS-Me2” under development. A climber robot is improved, then moving speed, time, and position can be controlled well. The goal of the project is to perform two kinds of missions. One is space debris removal using orbital transfer by tether control. The other is orbital space elevator, which can be applied to orbital transportation, transfer, and the first step for space elevator. This paper describes past mission results, future mission plans, and also future practical missions.