

Overview of the ground facilities for controlling the OUFTI-1 nanosatellite and for routing its radio-communications through the worldwide D-STAR repeater network

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We present an overview of the current state and upgrade plan of the OUFTI-1 nanosatellite ground segment. The OUFTI-1 project was initiated in September 2007. The OUFTI-1 nanosatellite is a one-unit (1U) CubeSat. Its main payload is - in essence - a D-STAR repeater in space, potentially the first one ever. D-STAR is an amateur-radio (“ham”), digital radio-communication protocol (with associated equipment) allowing the simultaneous transmission of voice and data, such as GPS coordinates and call-signs. The satellite was tested in 2014 and 2015 within the ESA’s Education Office *Fly Your Satellite!* (FYS) project, and it is now fully qualified and ready for launch and operation in space.

One significant feature of the OUFTI-1 satellite is that its main payload is a (new) telecommunication system. It is thus quite logical to view the radio-communication links between the ground and space segments as falling into two categories: (1) telecommand and telemetry (TC/TM) via AX.25 for regular operation, plus on-off-keying (OOK) CW beacon transmissions, mainly for emergencies, but also for general monitoring by ham operators worldwide; (2) payload D-STAR communications.

The mission part (1) of the ground station is composed of an automated tracking system that is able to gather and decode the OOK CW frames sent by OUFTI-1 beacon, and to store the received information in a database. The developed mission control software is able to predict future passes and it offers the possibility to remotely define adaptive TC/TM scenarios that will be automatically executed once the satellite is in view of the ground station. The TC/TM data is also stored in a database, allowing an operator to analyze them later on. Using and storing scenarios allows one to use them several times to ensure correct utilization of the satellite.

The payload part (2) of the ground station is an extension of the existing ground D-STAR repeater which is linked to the global D-STAR network through the internet. This extension uses the same tracking system as the mission part in order to receive and send D-STAR frames from and to the satellite. The frequency shift due to the Doppler effect can be managed on ground between the antennas and the existing D-STAR repeater.

We will present the OUFTI-1 ground station’s bloc diagram, describe the commercial devices used as well as the implemented devices and software at their current state of development.

Preference for presentation: **Poster**

Most suitable session: **N/A**

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