

SMOG-1, the Spectrum Monitoring PocketQube-Class Student Satellite in Hungary

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As one possible continuation of the development of Masat-1, the first Hungarian satellite, in 2015, a group of students, from Faculty of Electrical Engineering and Informatics and Mechanical Engineering at Budapest University of Technology and Economics, decided to realize a PocketQube-class satellite, called SMOG-1.

SMOG-1 is a 5 cm PocketQube with less than 250 g mass (Fig. 1). The main aim of SMOG-1 is to measure the radio frequency (RF) smog caused by human beings on the DVB-T band (Digital Video Broadcasting-Terrestrial).

All on-board subsystems of SMOG-1 is designed to be cold-redundant and single-point-failure tolerant - EPS, OBC, COM and SP - whose block scheme is depicted in Fig. 2.

- The EPS is the electrical power system. The surface of the cube is covered by solar panels, as the source of energy. The main tasks of the EPS are to control the bias point of the solar panels independently to reach the maximal input DC power, to charge the Li-Ion battery to be able to work in the shadow of Earth, and to produce stable (regulated) 3.3 V power supply voltage to the other subsystems.
- The OBC is the on-board computer. The OBC controls the operation of the on-board electronics: COM (communication system) and SP (spectrum monitoring system). OBC is responsible for the on-board data collection and handling (these data will be the radiated telemetry data by COM). The task of the COM is to realize the two-way data connection between the satellite and the fully automated and remote controlled ground stations. This radio transmission is on the 70 cm UHF radioamateur band, mainly because of the size of the on-board antenna, which has to be opened from the cube.
- The primary payload of SMOG-1 is the SP. This measurement system is to monitor the UHF band signal levels of the digital terrestrial TV transmitters, radiated from the Earth on a low Earth orbit. On UHF band, some parts of these TV signals are radiated to the space as radiofrequency "smog" (the name of the satellite SMOG-1 is from this RF smog), so this power is lost power, caused by human beings as electromagnetic pollution.
- The secondary payload of SMOG-1 is the total ionising dose measurement system as a part of the EPS module to be able to monitor the "health" of the satellite during operation and help us to forecast the lifetime of the on-board electronics on a LEO (Low Earth Orbit).

The planned trajectory of SMOG-1 satellite will be a polar, circular LEO with 650 km apogee and perigee.

Launch will be from on-board UNISAT-7 satellite in a cooperation with GaussTeam flown by Dnepr rocket from Russia between November 2017 and February 2018.



Figure 1: The qualification model of SMOG-1 with closed antennas

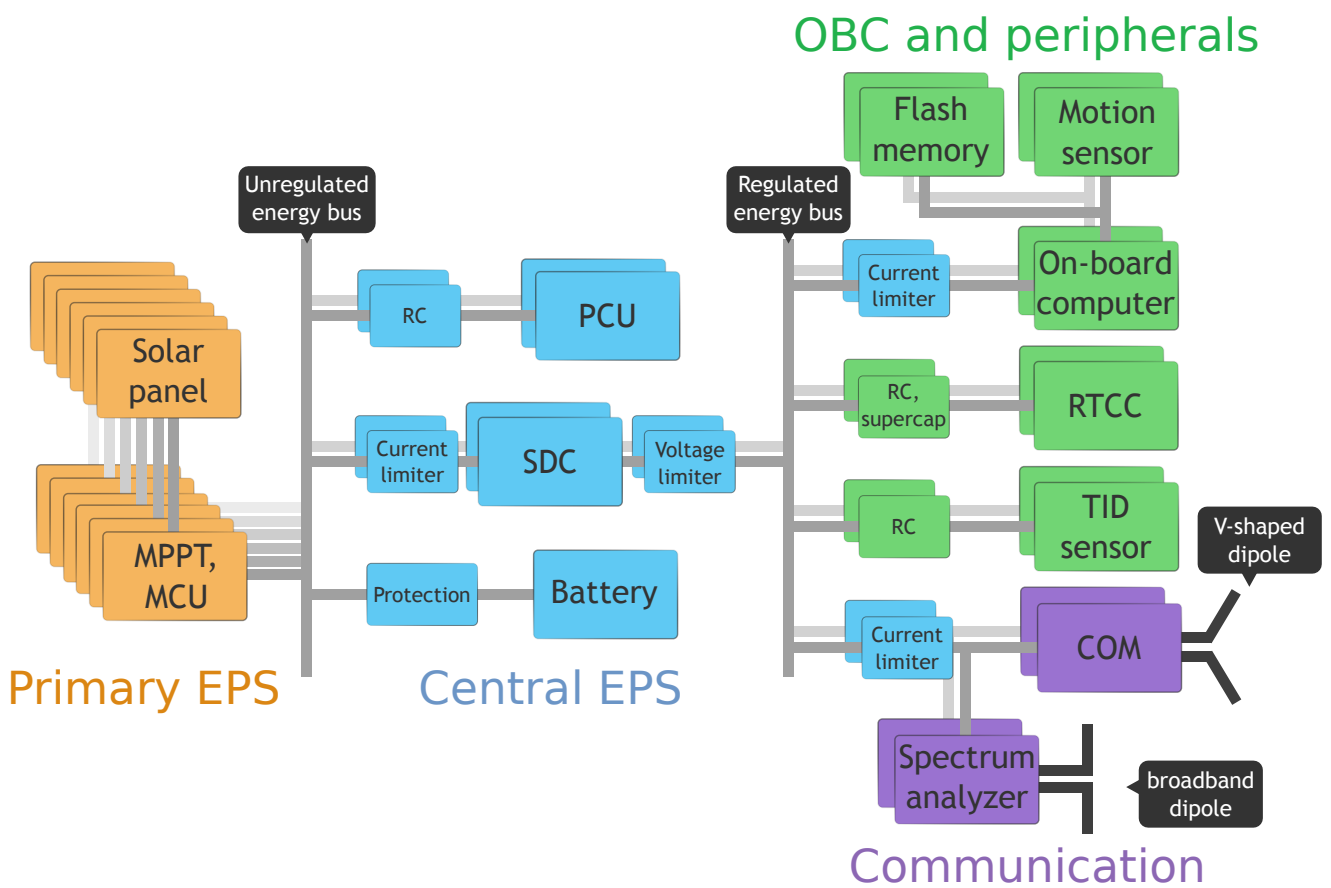


Figure 2: Block scheme of SMOG-1 satellite