

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Ground Operations - Systems and Solutions (1)

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DEVELOPMENT, OPTIMIZATION AND OPERATION OF UPAEP'S MISSION OPERATION
COMMAND CENTER USING SOFTWARE DEFINED RADIOS TO MONITOR SMALLSAT
MISSIONS**Abstract**

Gxiba-1 is a project hosted by UPAEP, supported by JAXA and UNOOSA. This project won the 6th round of the KiboCube competition; it is projected to be deployed in summer 2023 by JAXA. Its mission is to observe active volcanoes in Mexico in order to analyze their dispersion of ash, to have a clearer idea of their status and prevent eventualities. A particularity of the Gxiba-1 satellite is the communication with radio amateurs. So far, the communication with most satellites is unidirectional, meaning that any station may only receive data. Gxiba-1 will also accept commands from radio amateurs, these will contain real time information of the volcanoes so that it can take directed action, therefore, a vital part to the mission success is the communication with ground stations.

UPAEP's Mission Operation Command Center is a ground station based in Puebla, Mexico, operating since 2019, operated by engineering students and professors of UPAEP university. Its main purpose was to achieve communication with the satellital mission of the AztechSat-1, a CubeSat of one unit developed at UPAEP. The mission of the AztechSat-1 was assigned by NASA, as a technological demonstration consisting of attaining communication with the constellation of Globalstar satellites, to improve the transit of data. Nowadays, it is used for monitoring small satellites like the Quetzal-1 and it will be used for the new CubeSat developed by the university, the Gxiba-1.

Currently, the command center uses the NanoCom GS-100 transceiver to enable communication with satellites, this equipment is very specific for Cubesat missions, it gives optimal performance and offers full control of the ground station. Nevertheless, the equipment is very expensive and has a high level of complexity in its use, limiting the amount of ground stations that can have this technology. Nowadays, solutions are being searched, developed and proposed, using software defined radios which can connect

easily to SmallSats using an easy software with graphic interface, in order to create more accessible ground stations, allowing to reduce costs and facilitating the replication of this model, so countries starting to develop their aerospace program, like Mexico, can have more impact in Space Missions. In order to get the data obtained by these missions, the use of a ground station is needed. The creation of affordable ground stations would enhance the performance of these missions because, that way, even radio amateurs could improve their equipment to participate actively in smallsat missions.