



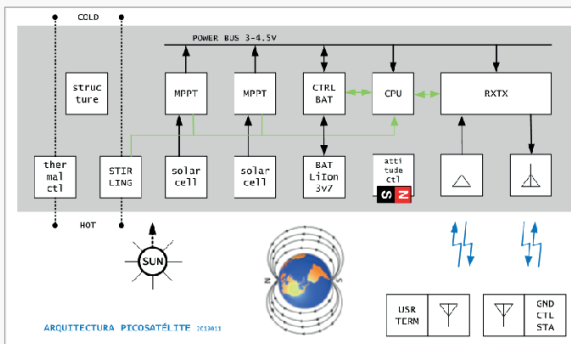
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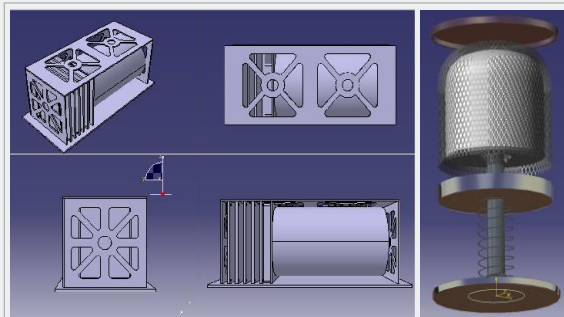
Development of a PocketQube Satellite as Amateur Communication Relay and a Miniature Stirling Engine Demonstrator

EASAT2-UESAT1 is a 2P PocketQube that has two main missions, the first one is to be a satellite for communication between radio amateurs. The second one is to test the use of a Stirling engine, that will work taking advantage of the differential of temperature between the components of the satellite and outer space. This project is being carried out by the students of Universidad Europea with the collaboration of AMSAT-EA Spain.



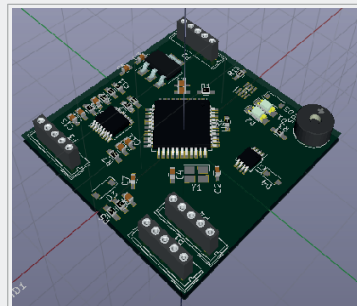
Electric power system.

Architecture of the PocketQube satellite (above). Tests on electric system circuit (below): 4 solar panels, 1 lithium battery. Board 1: interface circuit with 3 solar panels and MPPT; board 2 (bottom right): fourth solar panel and interface circuit with CPU and linear transponder.



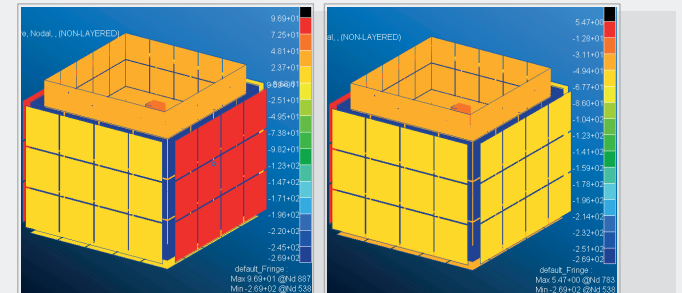
Mechanical design.

Preliminary CAD model of EASAT2-UESAT1 with CATIAv5 (left) and Free-piston Stirling engine (right).



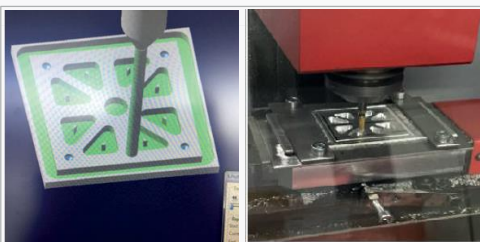
CPU.

Type PIC 18F 2 Mhz. Hardware modelled with KiCad and software with MPLAB IDE of Microchip. Functionalities: receive noise samples, noise level determination, activate linear transponder, decode telecommands, read sensors, beacon and telemetry emitter.



Thermal model.

Software used: Patran/Sinda. Temperature distribution for hot operating (left), and cold operating (right) cases of PocketQube satellite model. Temperatures are in Celsius. Cut view.



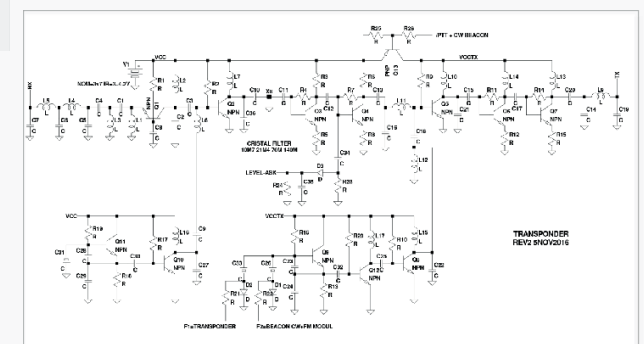
Manufacturing process.

Milling modellization and CNC code obtention with advance machining in CATIA v5 (left); milling machine (right).



Attitude control.

Test devices to study the feasibility of PMASS (passive magnetic attitude stabilization system) compound of hysteresis bars and permanent magnet



Linear transponder.

UHF emitter- VHF receiver module made of discrete components. Communication FM, SSB and low power digital modes

EASAT2-UESAT1 is planning to be launched in mid-2020.

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