

# ESAT

## The Hands-On Training Satellite



# Contents

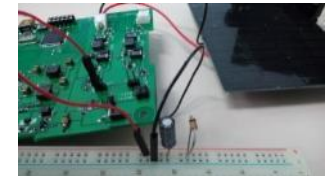
- Theia Space
- ESAT Objectives
- ESAT Subsystems
- ESAT EGSE and MCS
- ESAT Data Management
- Potential ESAT users

# Theia Space



# ESAT Objectives

- Teach space systems engineering.
- Teach how the different subsystems and architectures work and interact with each other.
- Teach how the integration and validation tests are performed.
- Possibility to work with the subsystems stand-alone or integrated.
- Easy to use and robust.
- Community oriented.
- Easy to build on it:
  - Open Source SW
  - Easy programming interface
  - Bus Interface



```

OBC_AdcsData | Energia 0101E0018M
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OBC_AdcsData g
/*
 *This function is only called once at the beginning of the execution.
 *It starts the communication interfaces as well as all the peripherals.
 */
void setup() {
  /*
   *Initialization of the USB interface
   */
  Serial.begin();
  /*
   *Initialization of the I2C interface for communication with peripherals
   *and the EPS subsystem
   */
  Wire.begin();
  /*
   *Initialization of the wifi interface via Serial library
   */
  Serial.begin(115200); // (9600);
  /*
   *ADCS initialization function.
   *Sensors and actuators initialization.
   *When startup sequence exits the sequence bip-bipbip-bipbip-biiip
   */
  ADCS_init();
}

```

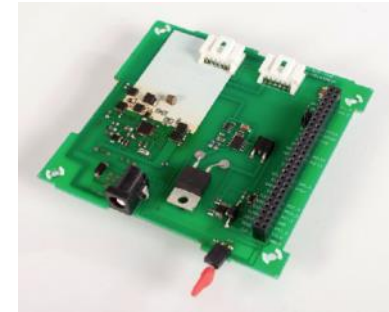
# ESAT Subsystems (I)

## EPS

- 2 solar panels
- 2 solar panel regulators: MPPT/DET
- Voltage/current telemetry
- 5V, 3.3V DC/DC converters and switches
- Battery management module with overcurrent/overvoltage/undervoltage protection
- Integrated battery charger
- Programmable MCU

## OBC

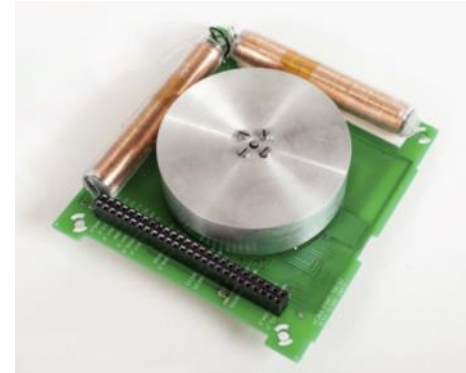
- Fully programmable unit (preprogrammed with open source base software)
- Micro-SD card
- Real Time clock
- Wireless communication via WiFi module



# ESAT Subsystems (II)

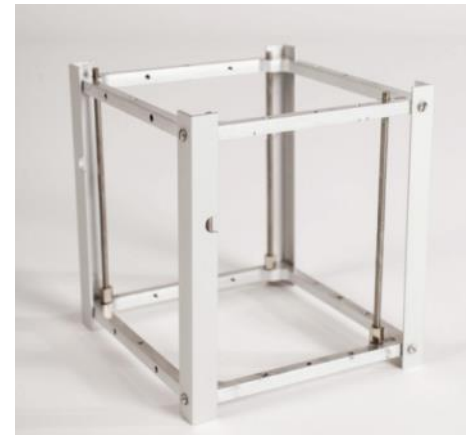
## ADCS

- One reaction wheel
- Two magnetorquers
- One IMU with 9 degrees of freedom (3 accelerations, 3 gyros, 3 magnetic axis)
- 4 sun sensors
- Wheel tachometer
- Customizable control algorithms



## STR

- 2 Aluminium frames
- 4 Aluminium rails
- 4 methacrylate side panels
- 2 Solar panels
- Spacers between the electronic boards



# ESAT EGSE and MCS

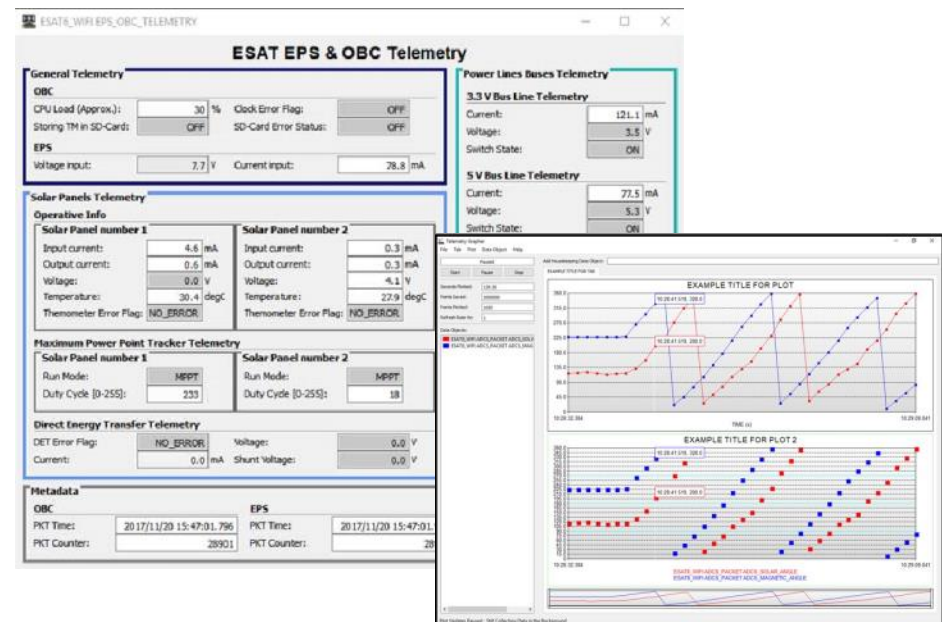
## EGSE

- Turning table
- Sun simulator
- Magnets to provide a useful magnetic field



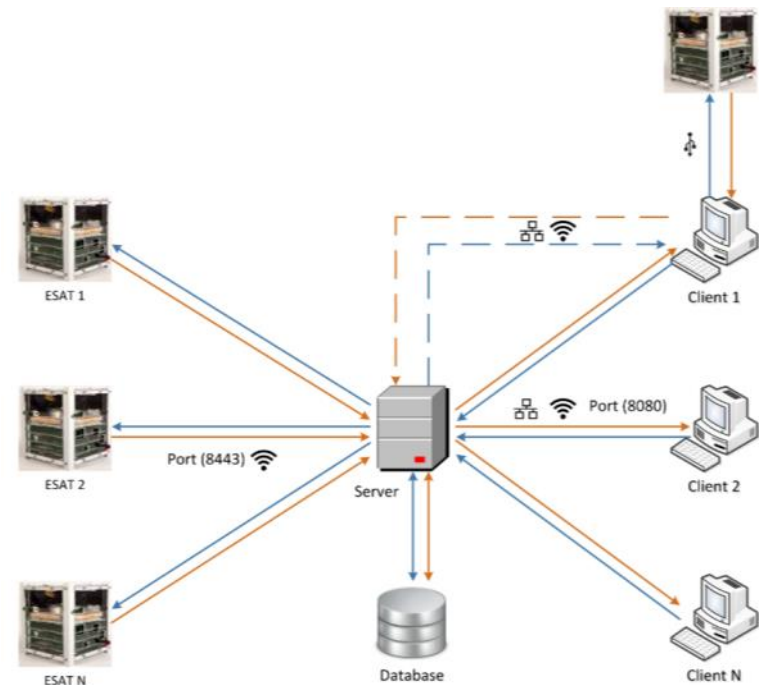
## MCS

- COSMOS SW
- Telemetry visualization:
  - Raw
  - Plots
  - Subsystems displays
  - Replay
- Telecomands



# ESAT Data Management

- A central server handles the TM sent by all the satellites and broadcasts it to the corresponding connected users (clients).
- The server forwards commands from the users to the corresponding satellites.
- The client interface helps the user interpreting the TM and sending TCs.
- Open-source code.





# Potential Users

- STEM education
- Universities
- Space Companies
- Space Agencies
  
- Training
- Fast prototyping
- Satellite programmes
- Outreach activities
- First step towards a real satellite
  
- We provide courses





Thank you!  
Come visit our booth at Exhibition 1

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