Pico satellite activities of the University of Wuerzburg

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The UWE pico satellite project

- **UWE = University of Wuerzburg Experimental satellites**
- **General Objectives of the UWE Project:**
  - Building small satellites for education
    - Students can design and develop a complete satellite in their curriculum
    - Interdisciplinary groups are working together to realize a complex project
  - Developing technologies for small satellites
  - Building small satellites for space research
The UWE pico satellite project

- Long term research objective
  - Operating swarms of small satellites
  - Intelligent swarm behaviour

- To achieve this goal, a step by step strategy is followed
The UWE pico satellite project

UWE X
- High Data Rates
- Attitude Control
- Formations
- Ad-Hoc Networks
- ...

201? UWE-3
- Attitude Control
- ...

2009 UWE-2
- Attitude- and Orbit Determination

2005 UWE-1
- Telecommunication
Cubesat UWE-1

UWE-1 was launched 2005 as research satellite

Dimensions: Size: 1 dm³, Weight: 977 (complies to Cubesat standard)

Scientific aim:
- IP communication experiments:
- Communication tests to characterize the radio link

Secondary objectives
- Experiments for in-orbit tests of hardware (e.g. solar cells)
Cubesat UWE-1

- Launch on 27. Oktober 2005 as payload on the ESA student satellite SSETI-Express
- Integrated in T-POD launch adapter
- UWE-1 orbit is a sunsynchronous, polar orbit

Further cubesats on SSETI Express: Ncube, Cubesat XI-IV
Cubesat UWE-1

- Technology demonstration: Test of highly efficient GaAs solar cells from industry
- UWE-1 tested these solar cells for the first time under space conditions

Produced energy from the solar cells
Cubesat UWE-1

- Tests related to communication and Internet Protocols (IP)

Phase I
- LEOF
- Data transfer

Phase II
- BER determination (downlink)
- BER determination (uplink)
- Webserver

Phase III
- Parameter and protocol tuning
Cubesat UWE-2

Supported from DLR (FKZ 50RU0704)
Cubesat UWE-2

- University of Wuerburg Experimental satellite 2
- Launched successfully 23. September 2009

- Scientific aim
  - Verification of the newly developed Attitude Determination System (ADS)
  - Testing the performance of the integrated Phoenix GPS receiver
Cubesat UWE-2
Cubesat UWE-2
Cubesat UWE-3

- 3rd satellite of the UWE series
- Currently backup for the Vega Maiden flight

Scientific aim:
- Verify simple actuation for attitude control

Planned secondary objective:
- Testing new prototype dosimeter
Cubesat UWE-3

- **Radio Subsystem**
  - custom design
  - compact, efficient
  - unrestricted access
  - comprehensive configuration enables flexible adjustments to varying orbital conditions

- **Thermal & Structure**
  - various optimizations
    - mass
    - assembling
  - support for CAD based thermal simulation