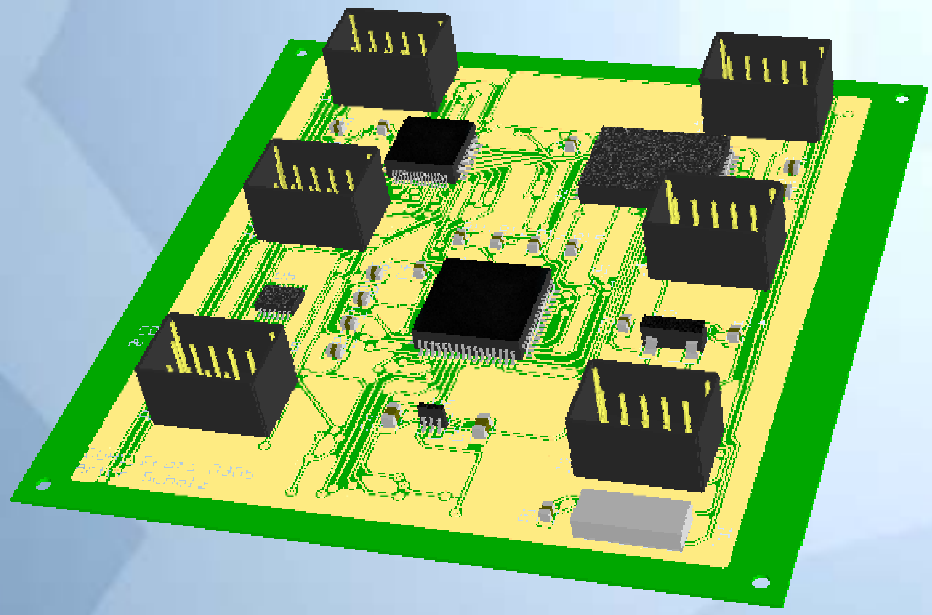
Command and Data Handling System for a Picosatellite



Artur Scholz

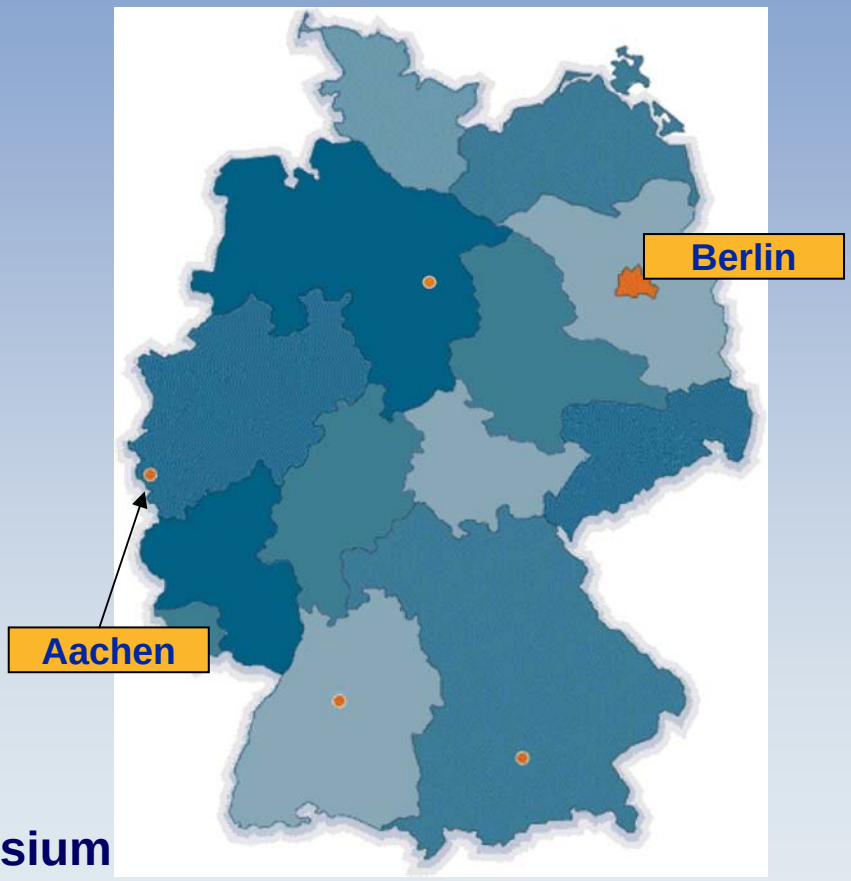
Astronautical Department

University of Applied Sciences Aachen

Contents

- Introduction
- COMPASS-1 Picosatellite
- CDHS
  - Requirements
  - Design and Development
  - Testing and Results
- Outlook

How it started…



Small Satellites Symposium

The first phase

DLR

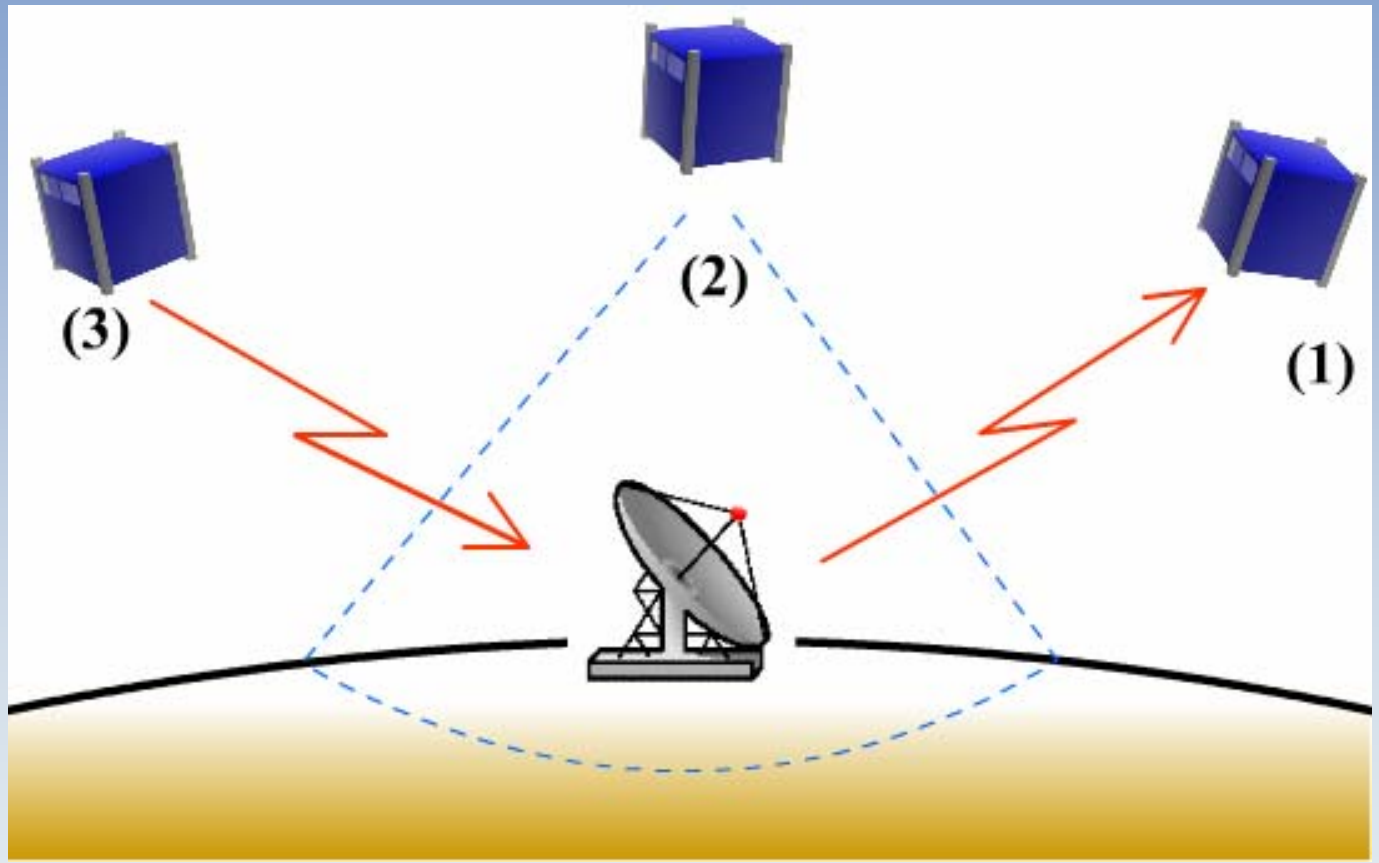
Hochschule Aachen

COMPASS-1 CubeSat Concept

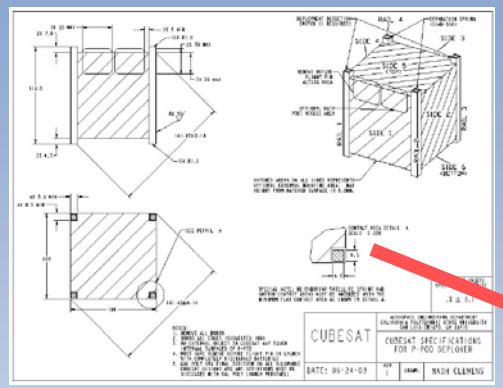
Objectives:

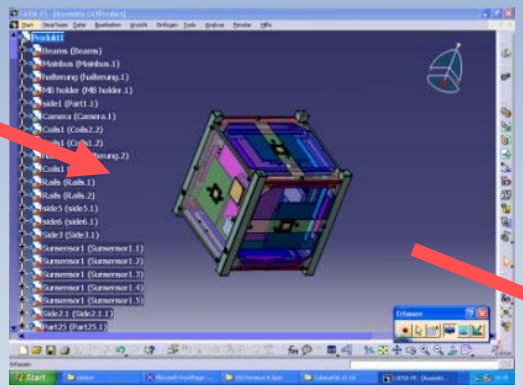
- To gain ‘hands-on’ experience in satellite engineering
- To build a complete satellite
- To conduct an earth observation mission:
  - Camera as prime payload
  - Good public outreach
  - Create high amounts of data

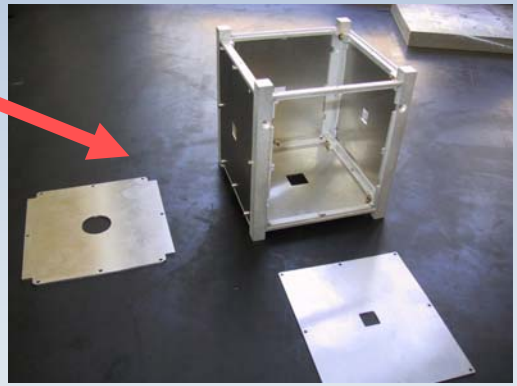
Mission Operation

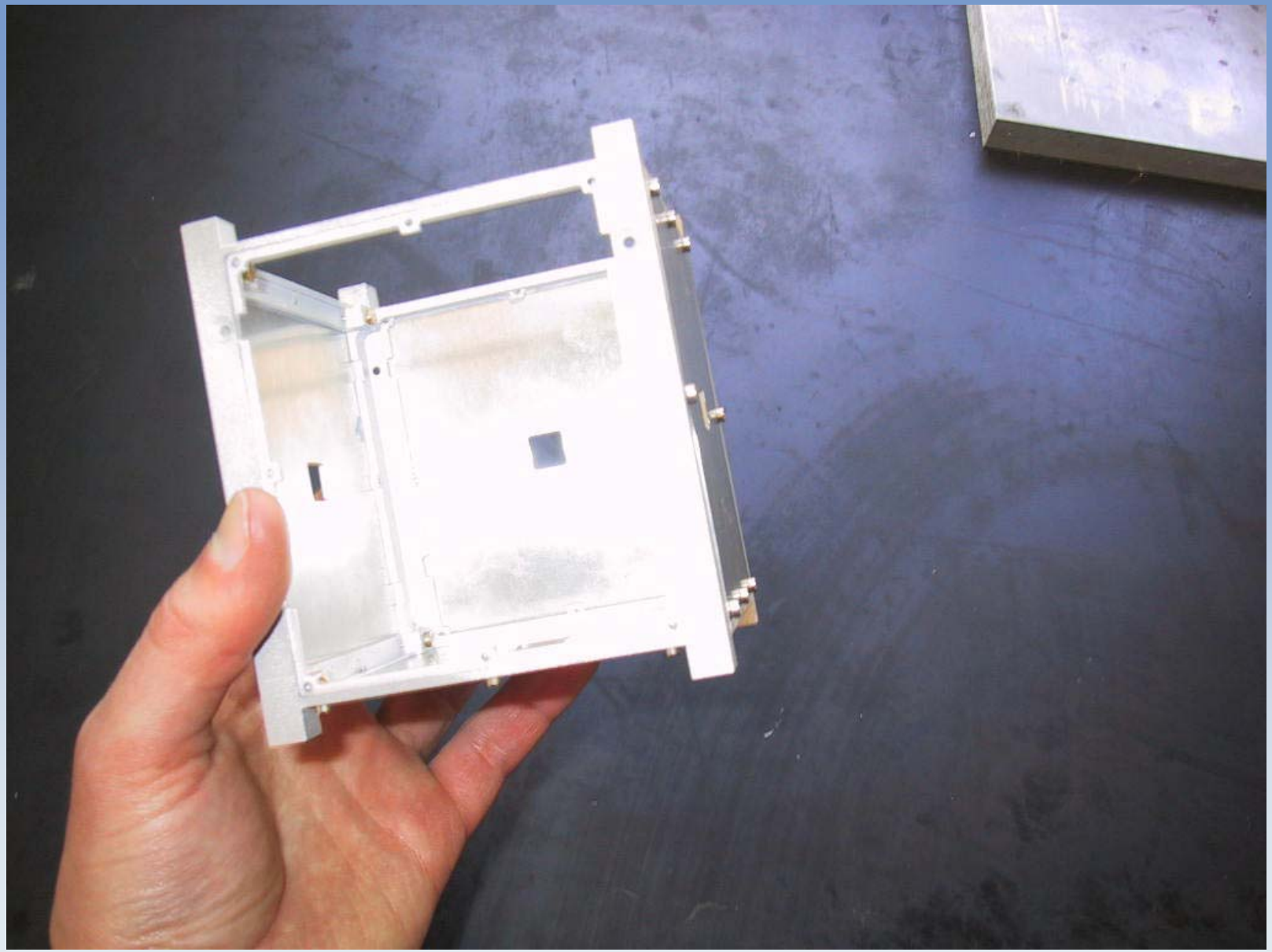


Structural Prototype

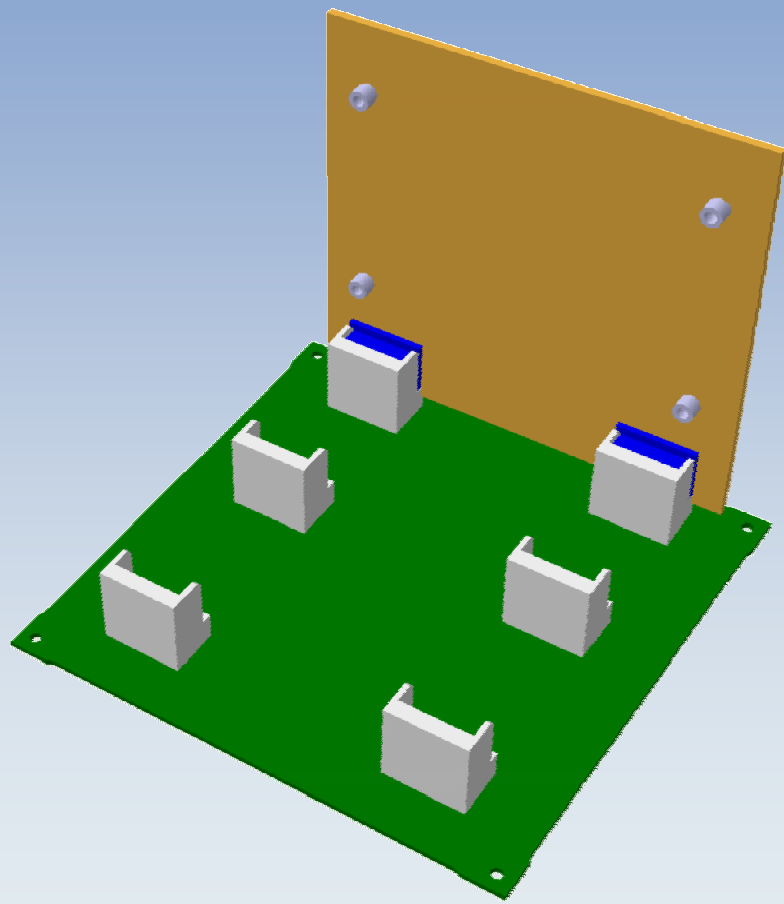


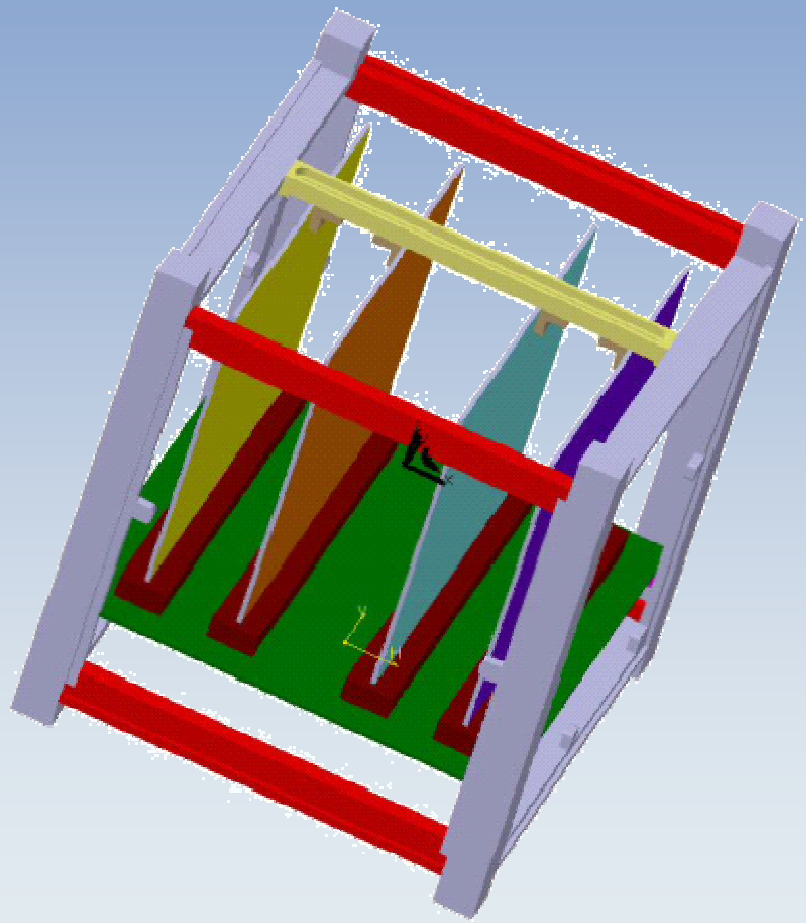






System Engineering





EO exposes requirements

Attitude System

-attitude determination

-active control

-pointing accuracy

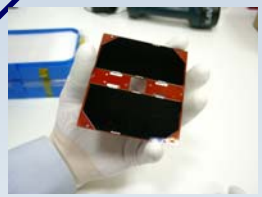
Communication System

-UHF/VHF

-9600 bps

-AX.25 (data)

-DTMF (command)



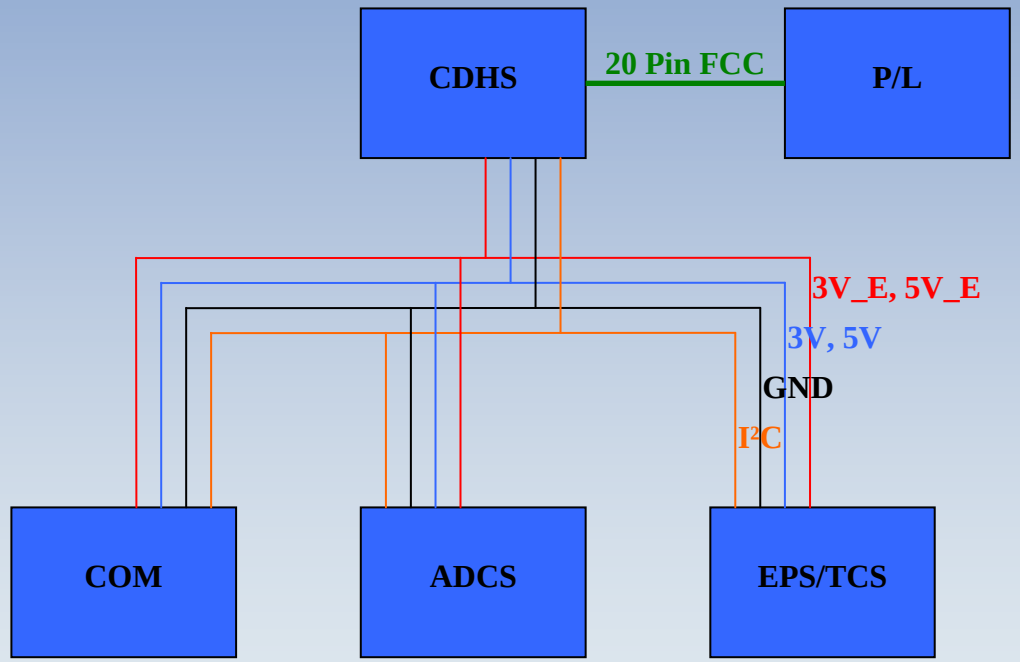
Power System

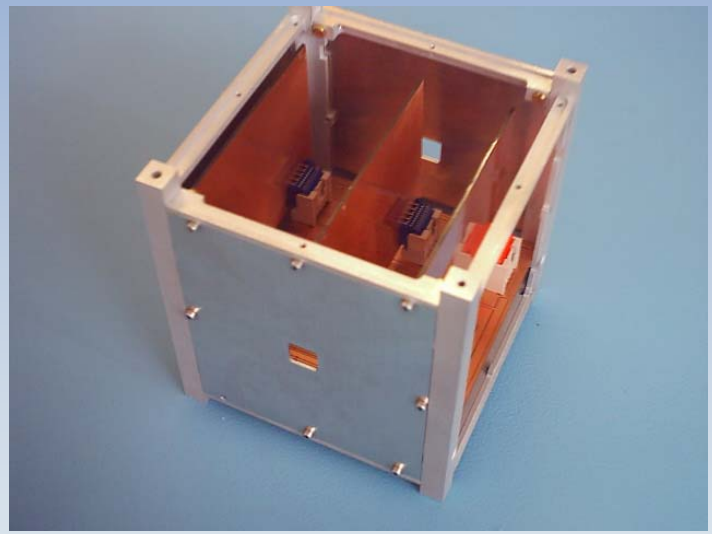
-high-efficient solar cells

-reliable energy storage

Command & Data Handling / Payload Interface

Overview of System





compass one

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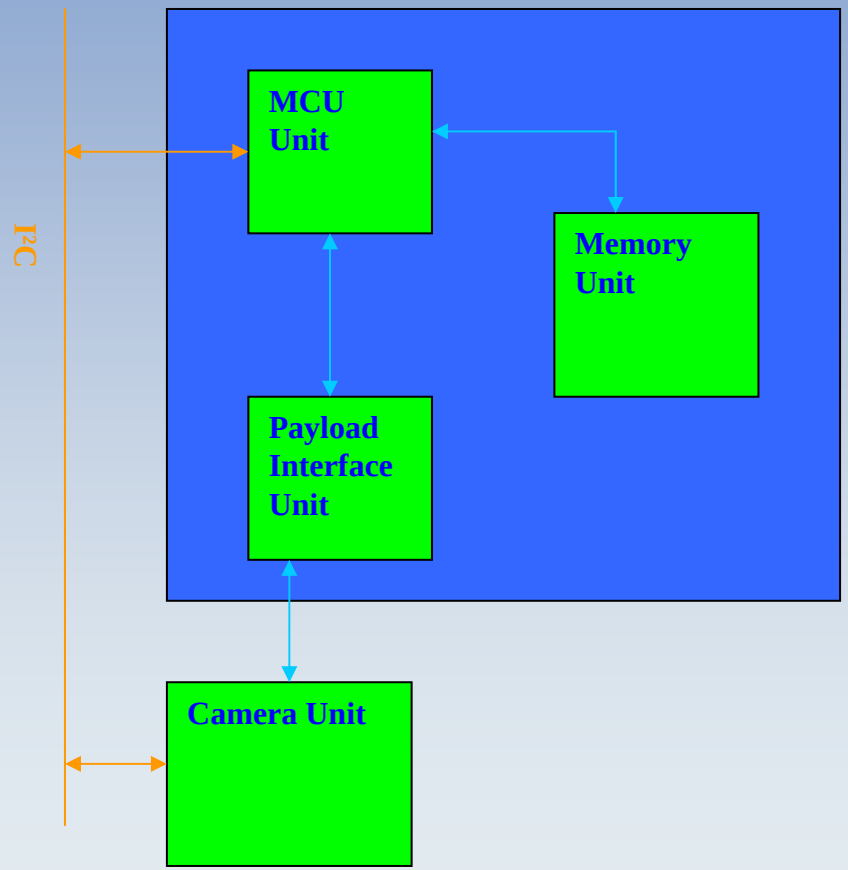
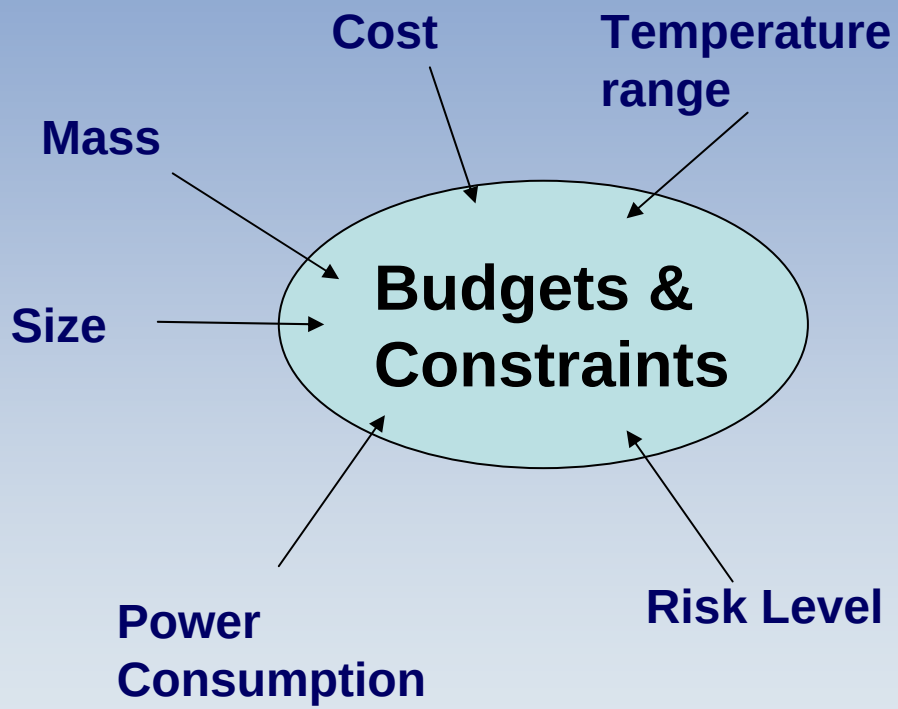
Overview of CDHS



compass one

Hochschule Aachen

Design Considerations



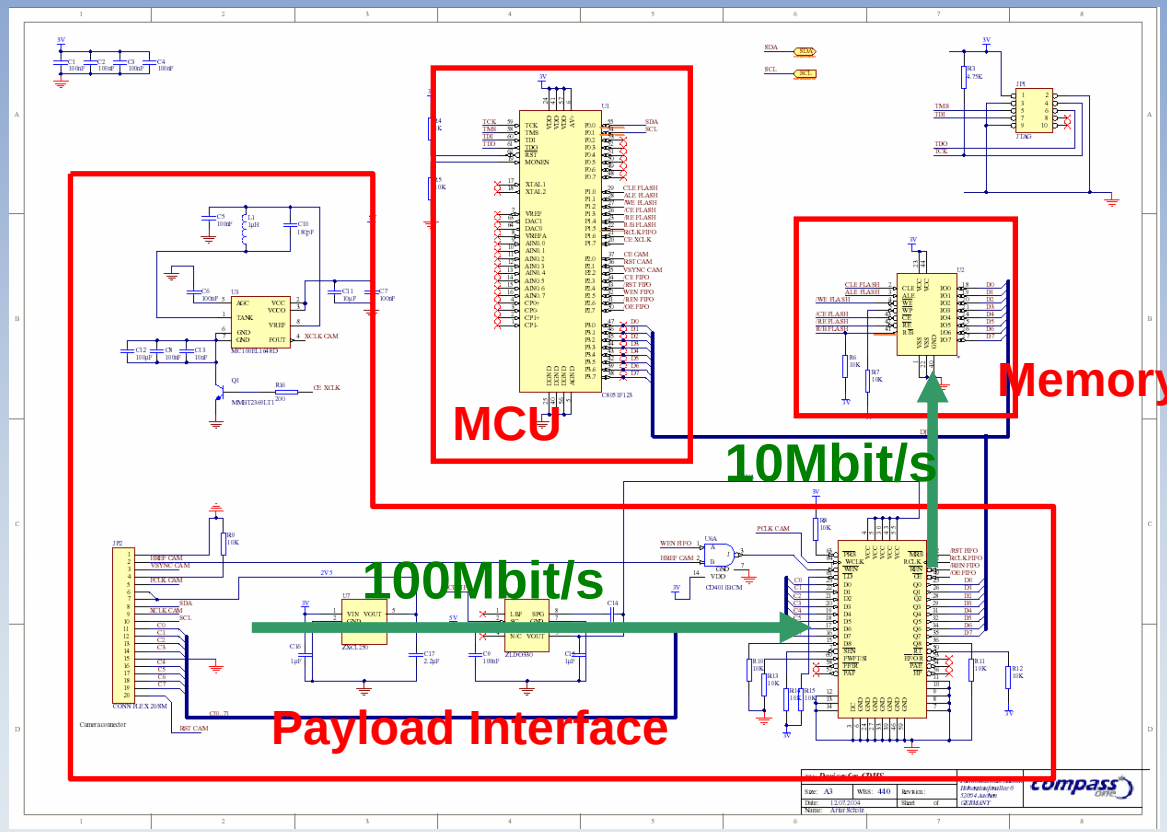
Phase B

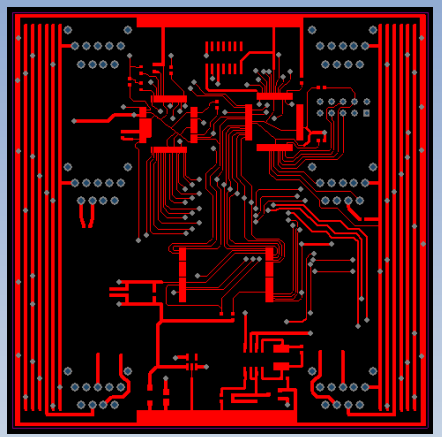
System Definition

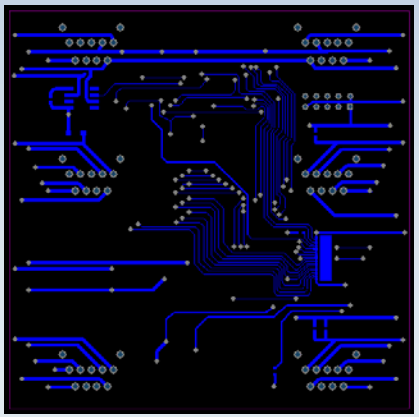
Hardware

Creating the Schematic

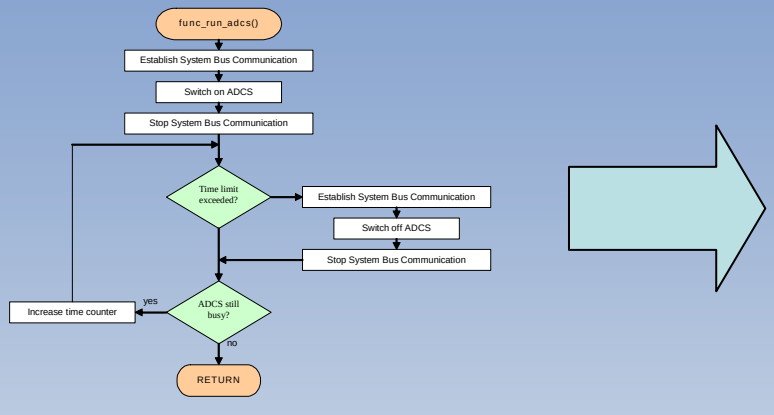
Transition to PCB

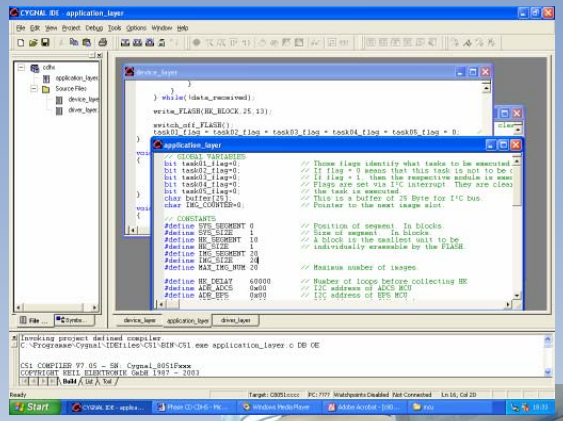


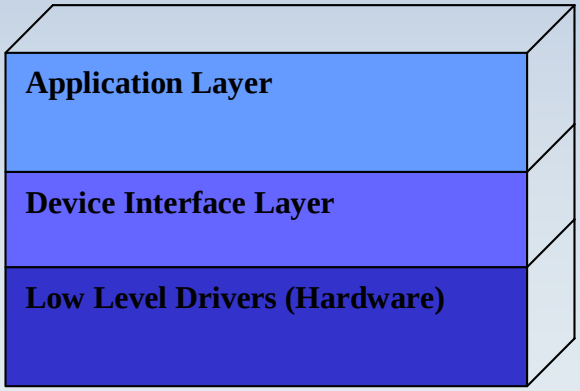




Software







compass one

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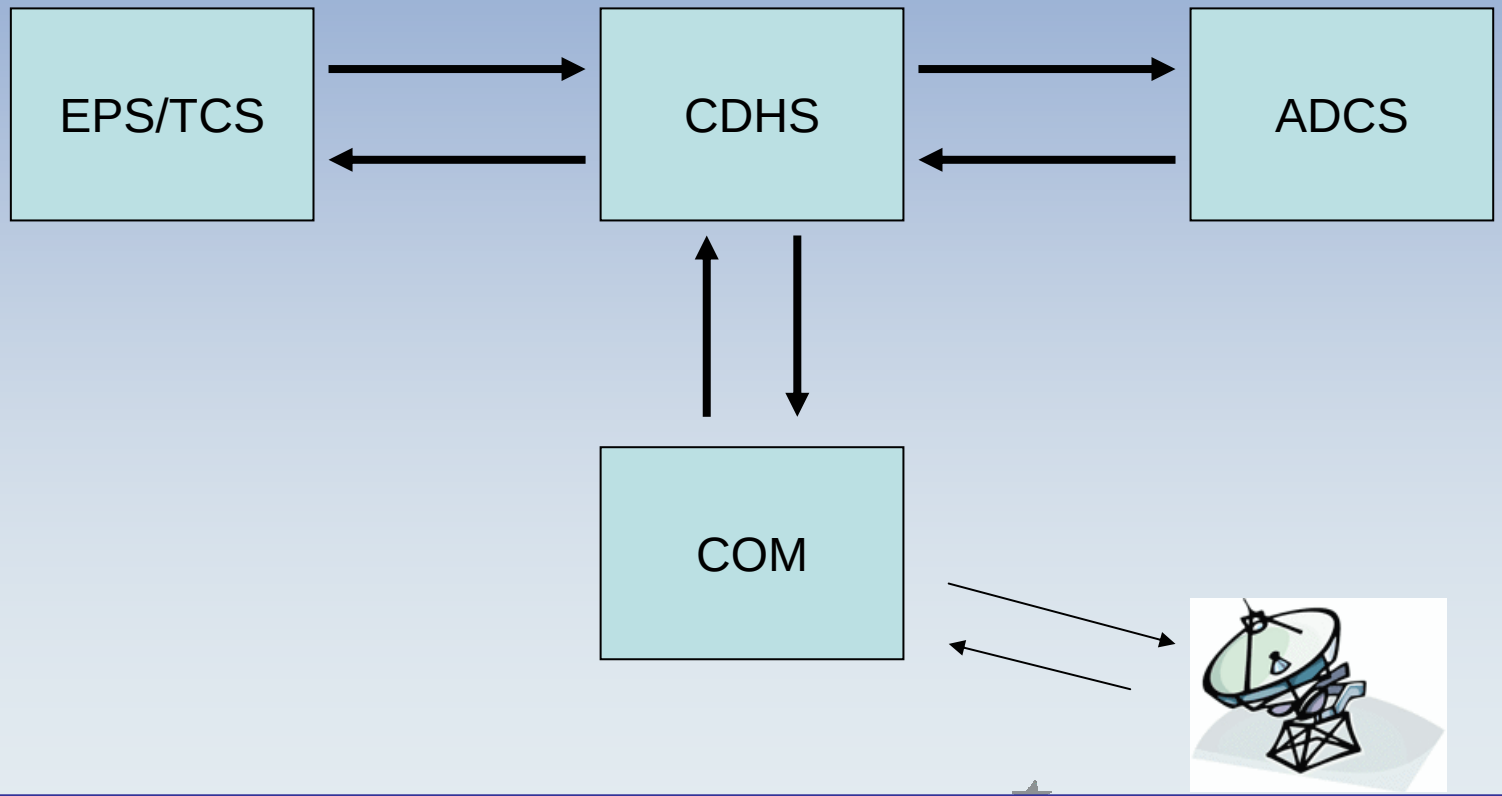
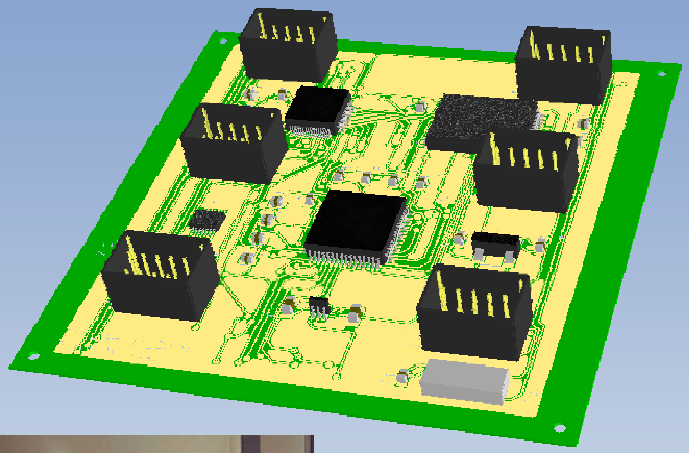
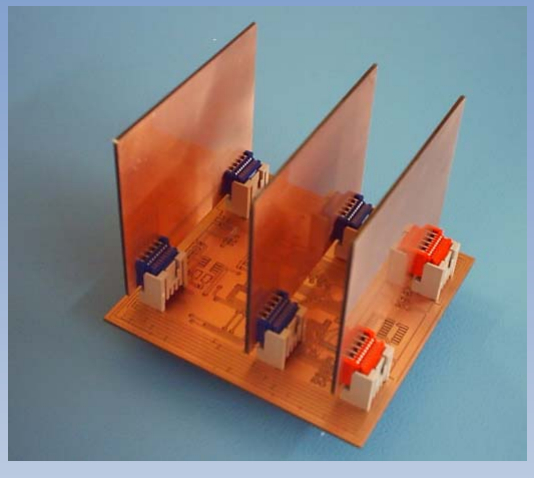
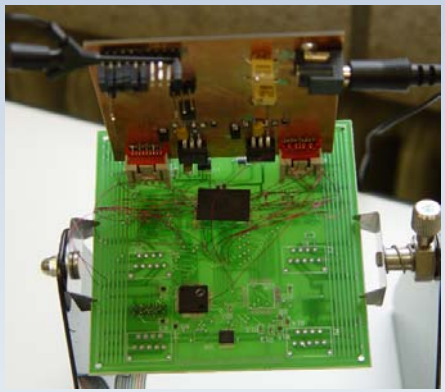
System Bus Communication

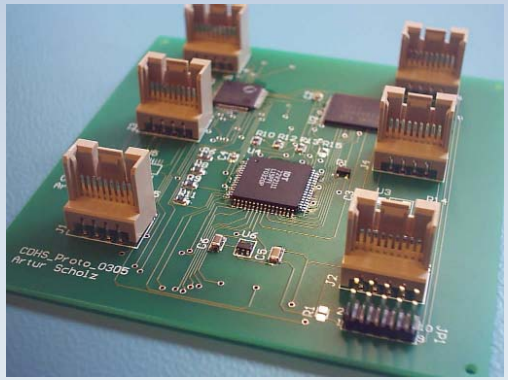


Production & Implementation







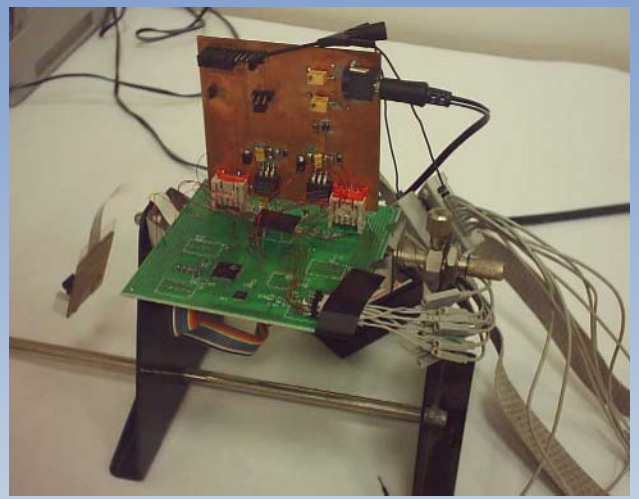


compass one

FH AC Hochschule Aachen

Functional Testing…

MCU is in-system programmable via JTAG



<u>Checking</u>:

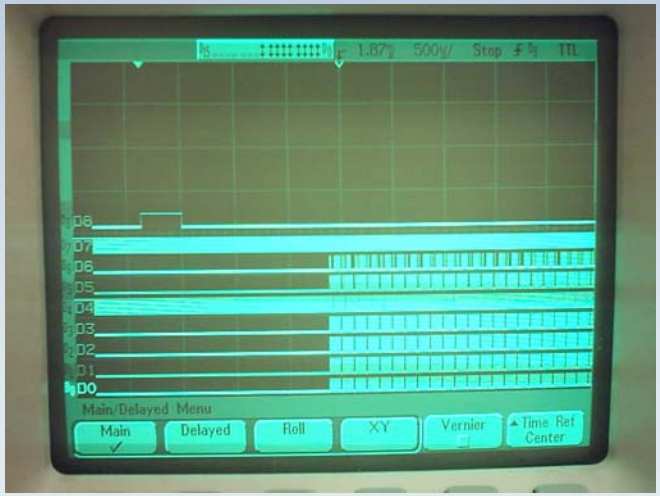
-I2C Bus Communication

-Flash Memory

-Oscillator

-FIFO

-Camera Output



compass one

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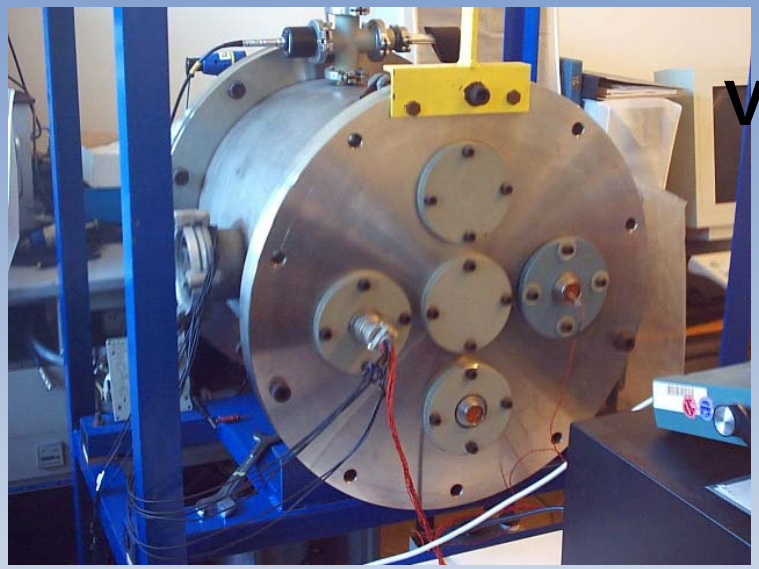
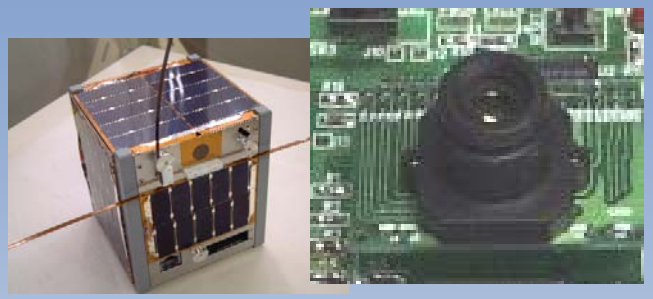
Qualification Testing



Vacuum Testing

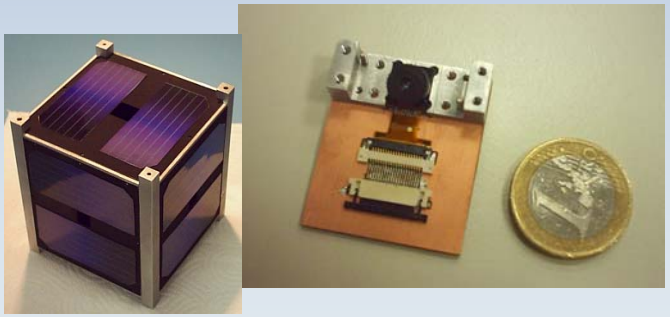
Engineering Model

Mechanical (Vibration) Testing



Camera Images, © ISSL, University of Tokyo, JAPAN

XI-IV CubeSat, University of Tokyo



COMPASS-1 CubeSat, FH Aachen

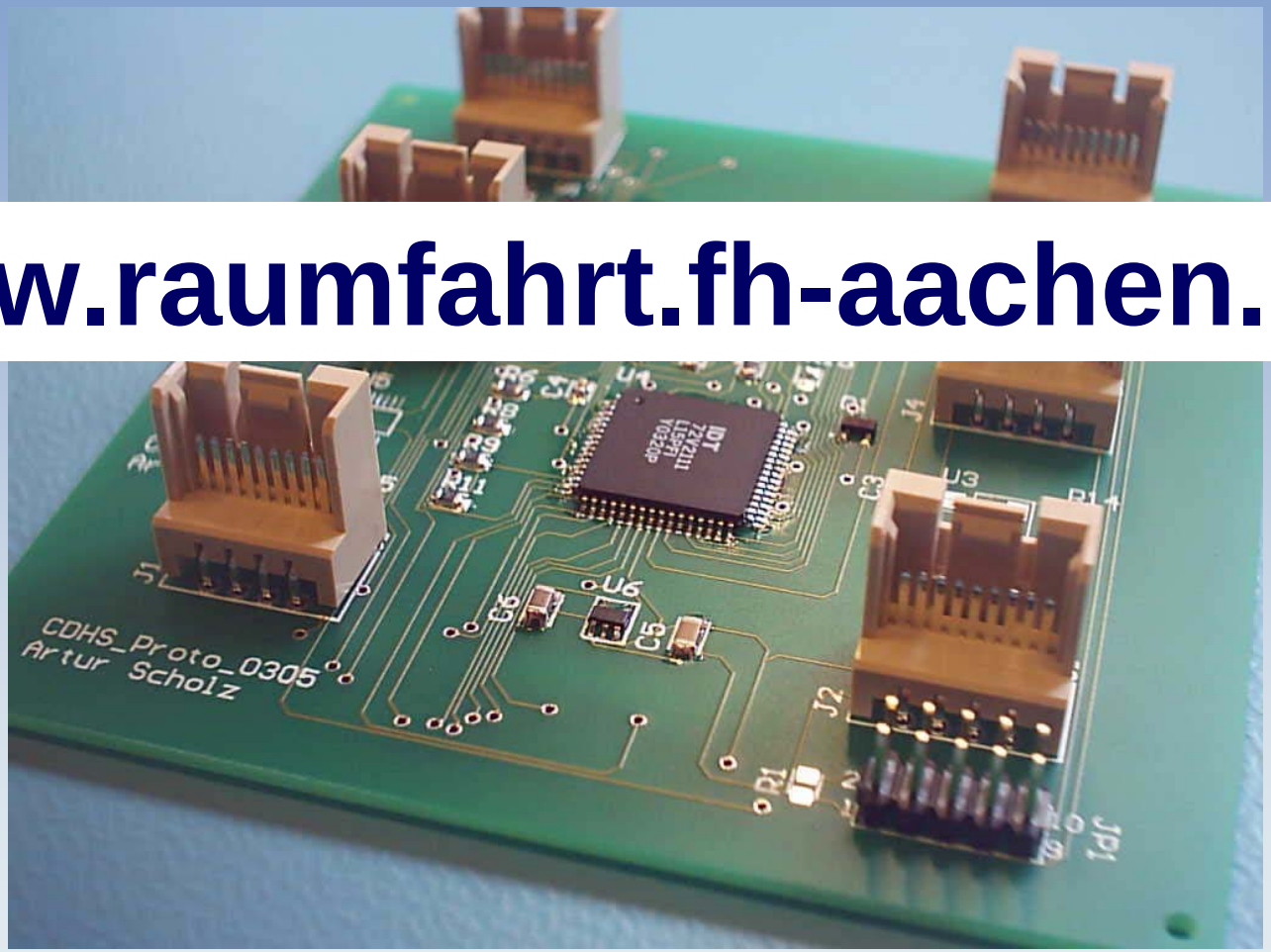
Thanks to:

Prof Ley Prof Blome Mr. Plescher

Prof. Bretschneider & X-Sat Team

Sponsors (financial and components) and Supporter

And thanks to you for your attention!



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