QB50 Project Status:
Launching 50 CubeSats
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Guildford, UK
26-27/7/2014
Overview

QB50

- will send 50 double CubeSats into LEO
  - 380 km, 98 deg
  - in January 2016
- carry out an unprecedented science campaign to probe the middle and lower thermosphere with
  - distributed sensors on 40 satellites
  - of 3 different types:
    - Ion and Neutral Mass Spectrometer (INMS)
    - AO and O2 sensor (FIPEX)
    - Langmuir Proble (MNLP)
- supports teams with
  - provision of Sensor Units and ADCS
  - guidance on satellite design
- carry out a test flight in June 2014
QB50

- consists of:
  - space segment
    - ~40 satellites contributed by a world wide community for an atmospheric science campaign
    - ~additional In Orbit Demonstration satellites like
  - ground segment
    - combination of 50 amateur ground stations
    - central functions like Mission Display Centre, Central Node
  - launch segment
    - Cyclone-4

- is realized by:
  - an EC funded consortium of 15 world wide partners
  - many collaborators
  - ESA funding some CubeSats
  - by 50 CubeSat teams from all over the world
Science, Sensor Units

- objectives: improve thermosphere modeling
- sensor means: ~ 43 distributed sensors
  - 19 AO, O2: FIPEX
  - 11 electron density: multi Needle Langmuir probes (MNLP)
  - 13 ion and neutral mass spectrometres (INMS)
- science team:
  - Mullard Space Science Laboratory (MSSL, UK)
    - sensor Development/Procurement, Science Lead
  - von Karman Institute (VKI, B)
    - sensor output predictions
  - Institute for Atmospheric Physics (IAP)
    - ground based sensors
- key requirement on science cubesats:
  - acquire and downlink 2Mbit/day for 60 days
  - baseline operations: poles and equator

FIPEX (TU-Dresden, D), INMS (MSSL, UK), Langmuir Probe, stowed, deployed (UiO, Norway)
QB50 Ground Segment

- consists of
  - your 50 amateur ground stations
  - central functions such a Central Node for TLE, Science Data, WOD storage; coordination with JSpOC/NORAD etc
  - Radio Amateurs coordination

- Mission Display Centre

- passed a CDR review carried out by
  - DLR/GSOC
  - Morehead State University

- frequency coordination done with help of AMSAT-UK.

Thanks Graham!
E2E data flow
Ground Segment

Distribution of baseline ground station and coverage for 380 altitude
Launch Segment

- Cyclone 4 is QB50 launcher, contract signed
- mechanical & electrical interfaces defined
- deployment during thrust
- key requirements on cubesats:
  - LTAN 8am-2pm
  - 380 km altitude
  - ~98 deg
  - loads and testing
in less than 12 months:
• consortium and collaborators management
• subsystems definition, design, manufacturing:
  – INMS, FIPEX (MSSL, TU-Dresden)
  – ADCS (SSC)
  – thermal payload and cutting edge thermal analysis (VKI)
  – communication payloads (AMSAT)
• satellite design, assembly and management (ISIS)
• frequency allocation and space object registration

Precursor Derisking Campaign

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<td>Commissioning</td>
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<tr>
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Start: 01/11/13  Finish: 01/06/15
Current status:

• Beacon of P1/P2 received ~10min after launch
• CubeSats are thermal and power safe
• High tumbling rates up to 30°/s
  – P1 in Y-Thompson spin
  – P2 random tumbling with 10/30/10°/s
• Software issue on P1, s/w image upload currently on-going

• Further steps:
  – Complete detumbling & final check-out of ADCS
  – Commissioning and test-phase of SU
  – AMSAT mission
Precursor Derisking Campaign

- Beacon format and transponder information
  

- Upload interface for radio amateur participation
  
  https://upload.qb50.eu/

- Received over >200 MB beacon data

- Bugs & questions: scholz@vki.ac.be

Your help & support is appreciated!
Thank you for your interest.
Do you have any questions?
Thorsten Scholz

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