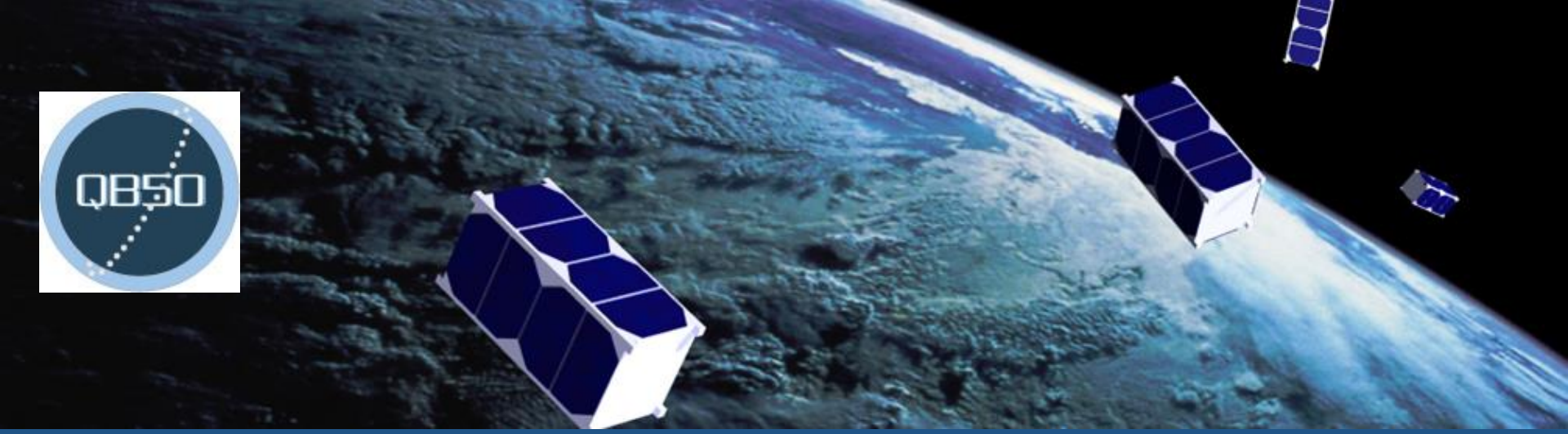


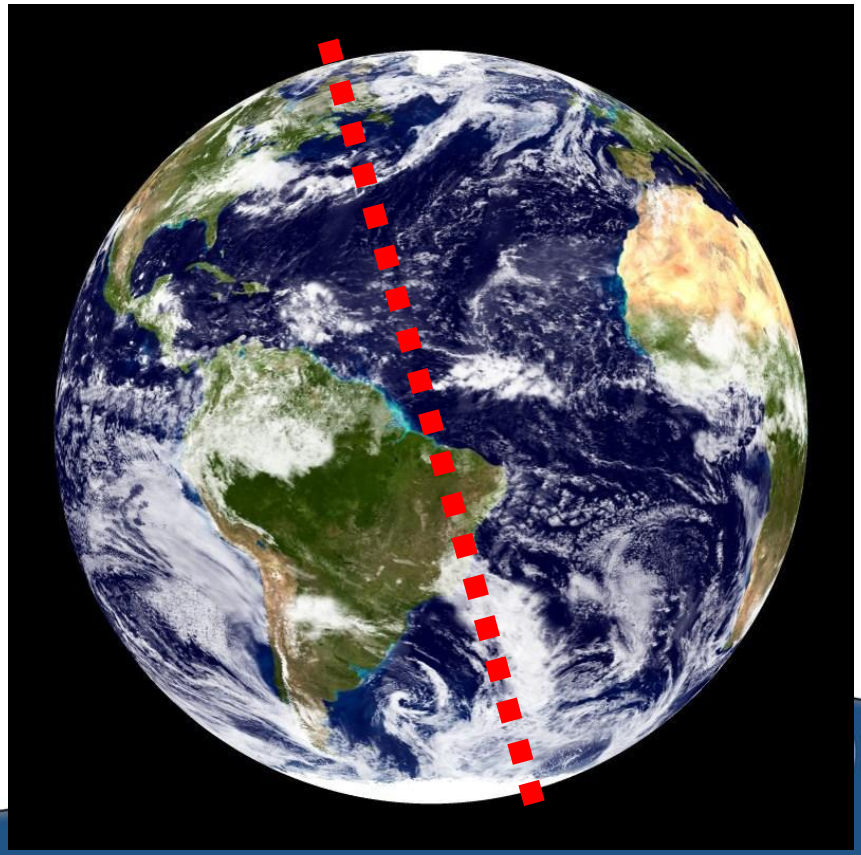
STATUS OF QB50

J.Thoemel, J. Muylaert
von Karman Institute, Belgium

Overview - Project's Main Activities

QB50

- has invited 50+ international universities to join
- will send 50 double CubeSats into LEO in January 2016
- carry-out an unprecedented science campaign to probe the thermosphere with fragmented sensors on ~40 satellites
- demonstrate new technologies
- supports teams with
  - provision of Sensor Units and ADCS
  - guidance on satellite design
- carries out a test flight since June 2014



Overview II - Mission Architecture

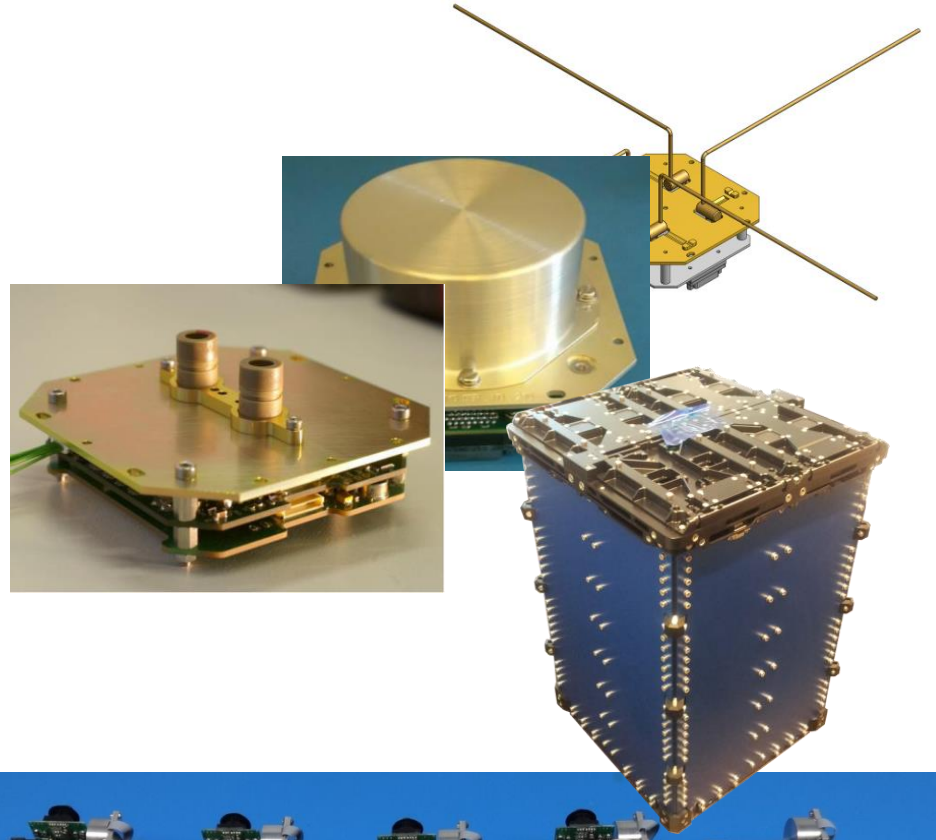
QB50

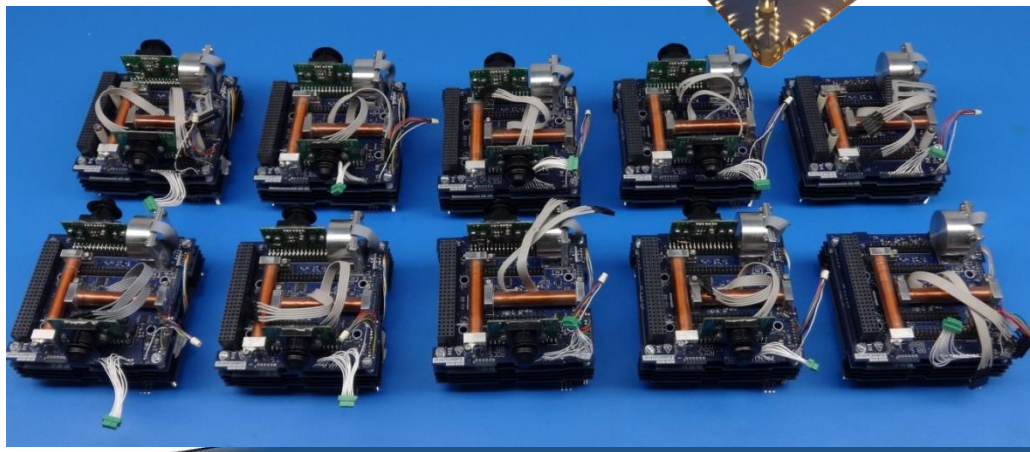
- consists of:
  - space segment
    - ~40 satellites contributed by a world wide community for an atmospheric science campaign
    - ~10 additional In-Orbit Demonstration satellites
  - ground segment
    - combination of 50 amateur ground stations
    - central functions like Mission Display Centre, Central Node
  - launch segment
    - modular, versatile deployment system
    - launcher: Cyclone-4
- is realized by:
  - an EC funded consortium of 15 world wide partners
  - 50 CubeSat teams from all over the world
  - many collaborators

QB50 status

- CDR completed for
  - consortium technologies:
    - QuadPack
    - INMS
    - FIPEX
    - mNLP
    - Ground Segment
    - satellites developed by consortium

    with few left-over issues
  - community cubesats with few left-over issues, no showstoppers:
    - small technical issues
    - some contract signing
  - assembly ADCS
  - frequency coordination started





QB50 status II

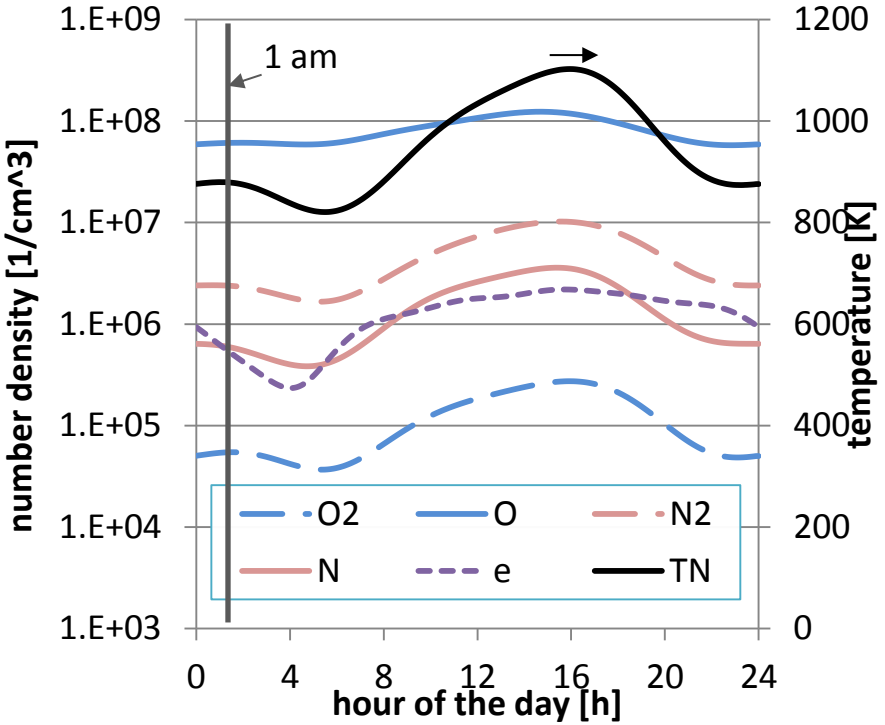
Management: Consortium Consolidation

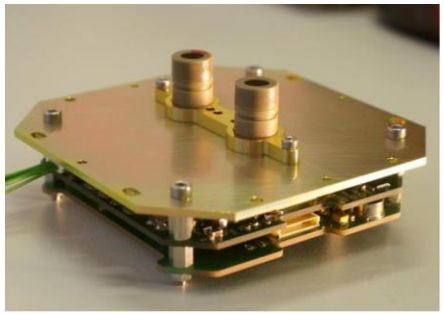
- central server and mission display centre at VKI
- distribution of Sensor Units
- Launcher consolidation

- thermosphere science: measurements predictions carried out
- VKI:
  - 5+4 full time engineers working on small satellites ready to help you
  - clean room, integration room and ground station established
  - up-to-date website to disseminate information
  - forum to facilitate discussion with and among cubesat teams
- Successful Precursor Campaign

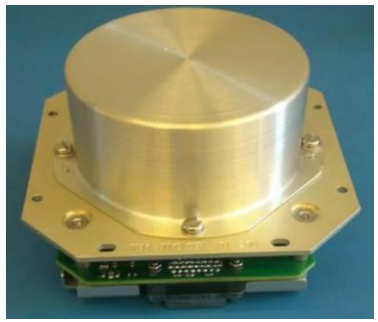
Science: Sensor Units

- in total 43 sensors
  - 19 AO, O2: FIPEX
  - 11 electron density: multi Needle Langmuir probes (MNLP)
  - 13 ion and neutral mass spectrometers (INMS)

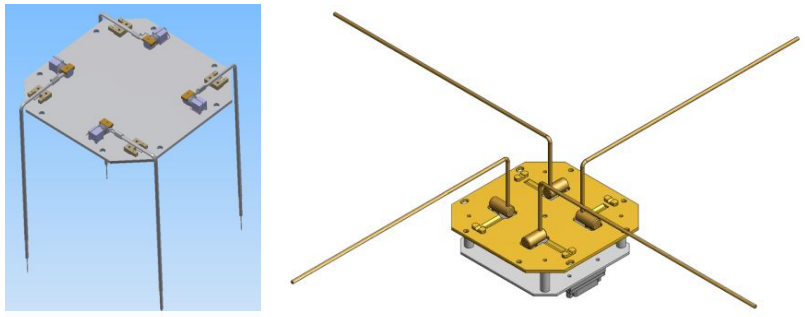




FIPEX (TU-Dresden, D),



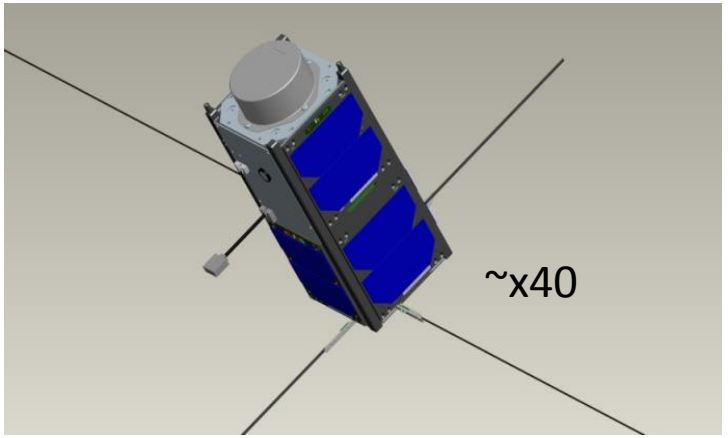
INMS (MSSL, UK),

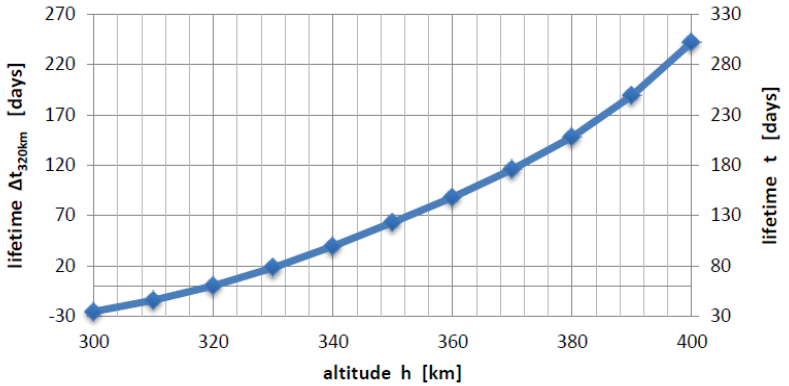


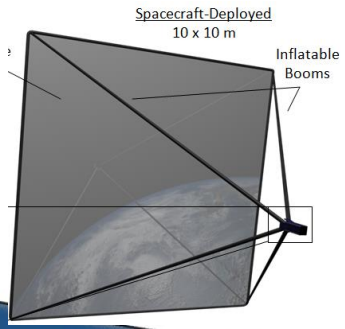
Langmuir Probe, stowed, deployed (UiO, Norway)

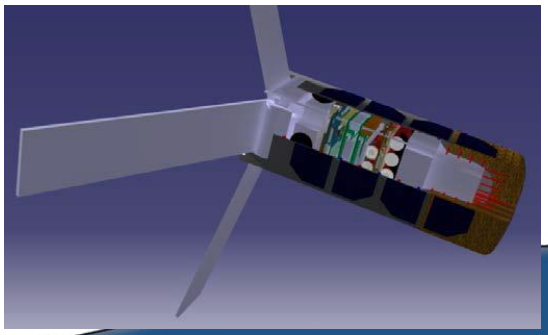
Space Segment

- ~40 science satellites
  - QB50 Sensor Unit
  - CubeSat Payload
- ~10 In Orbit Demonstration satellites
  - InflateSail (Surrey Space Centre, UK)
  - Delta, Phi (TU-Delft, NL)
  - Qarman (VKI)









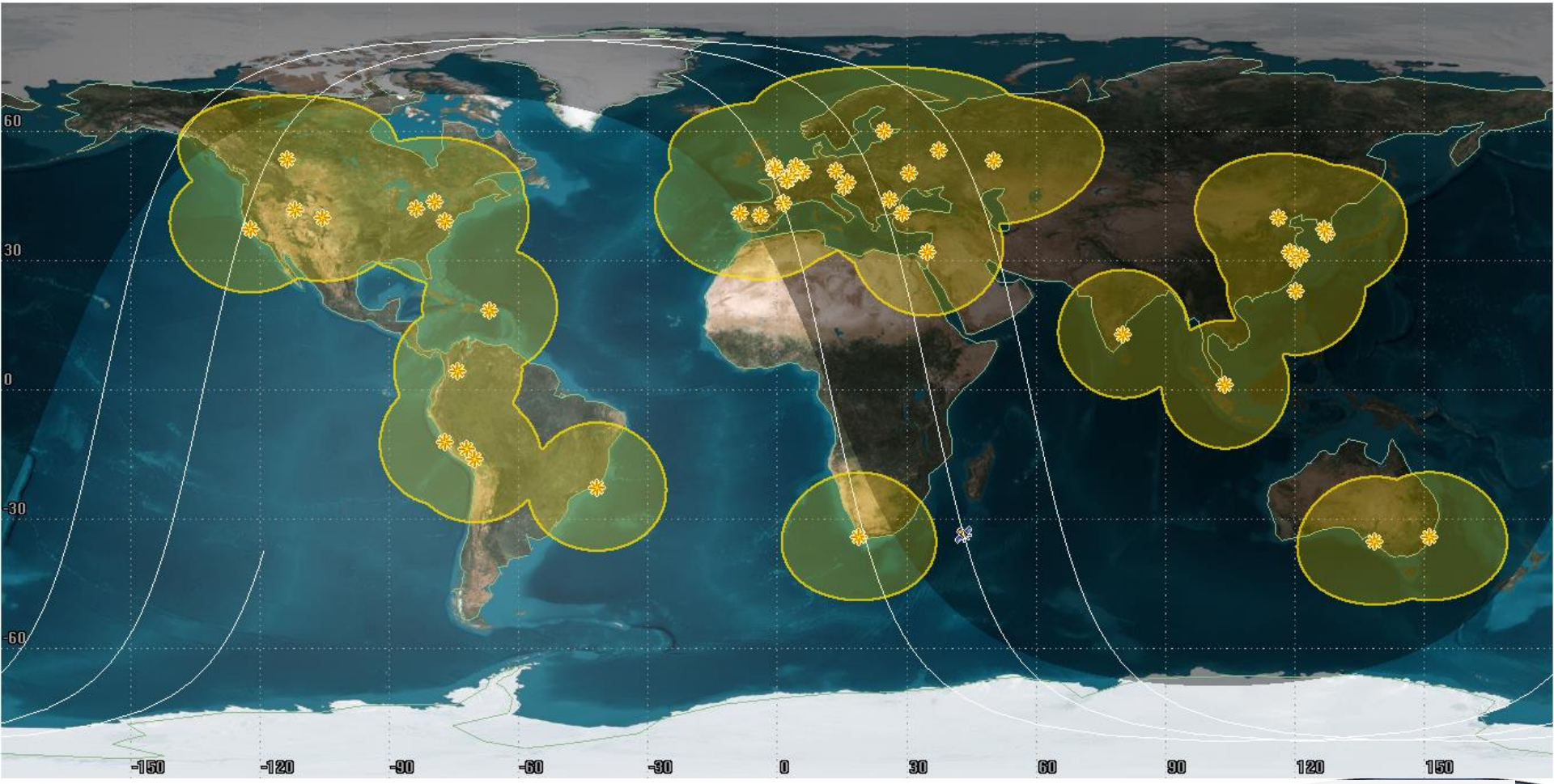
Ground Segment

QB50 Ground Segment

- consists of
  - 50 amateur ground stations
  - central functions such a Central server for TLE, Science Data, WOD storage; coordination with USSTRATCOM/NORAD etc
  - Radio Amateurs coordination
  - Mission Display Centre
- frequency coordination of
  - 50 UHF downlink and
  - 10 shared VHF uplink frequency

  done with help of AMSAT UK/FR/NL/BE

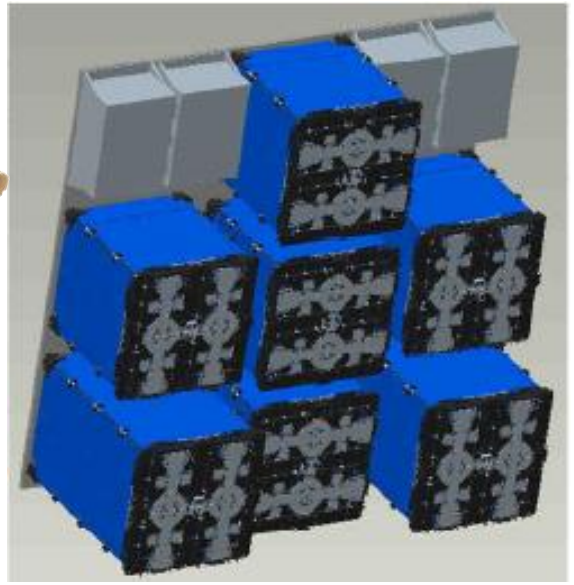
Ground Segment

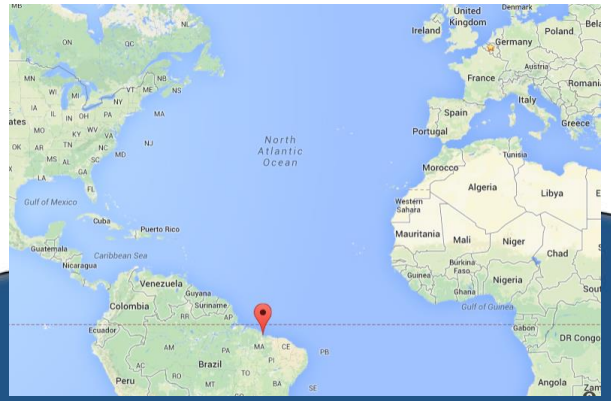


Distribution of baseline ground station and coverage for 380 altitude

Launch Segment

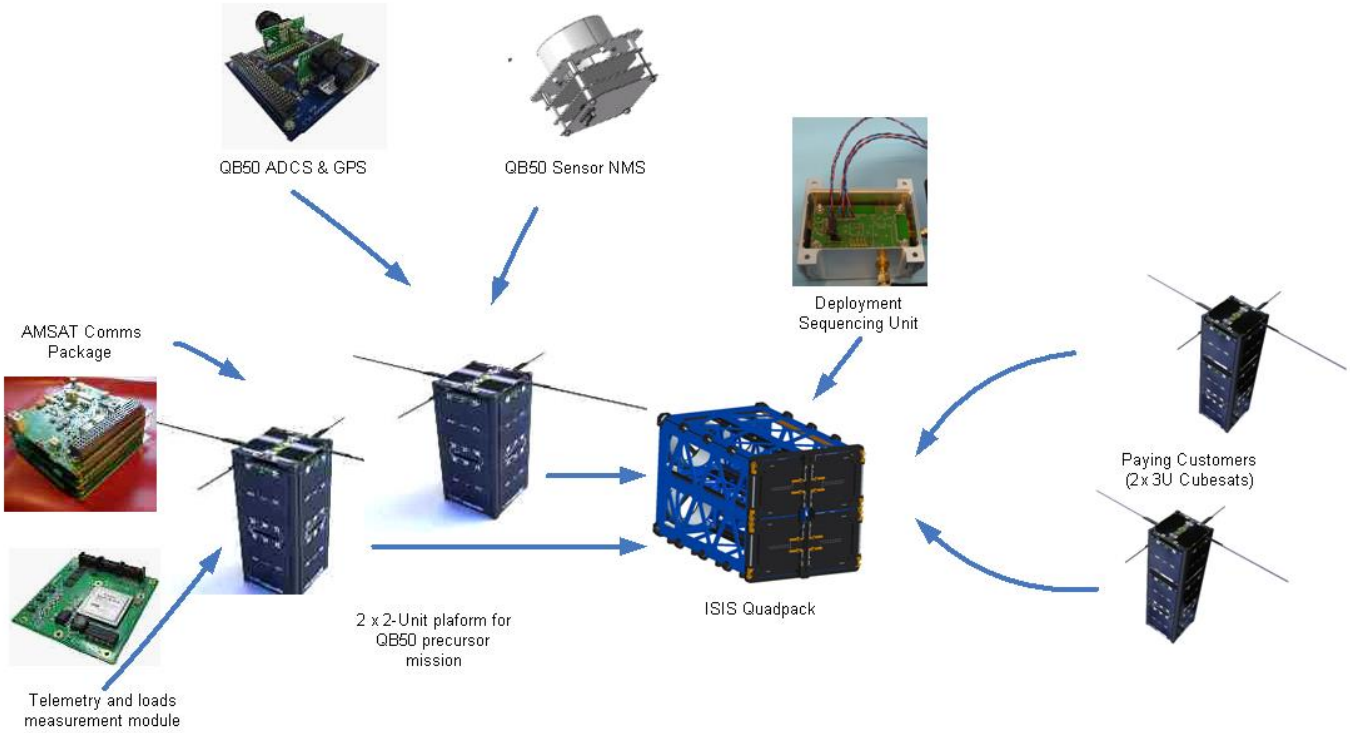
- deployment system made of versatile QuadPack modules, designed and manufactured by ISIS B.V., NL
- Cyclone 4 is QB50 nominal launcher
- back-up launch opportunities are in place
- schedule remains the same
- launch window opens Dec. 2015





Precursor De-risking Campaign - Rationale

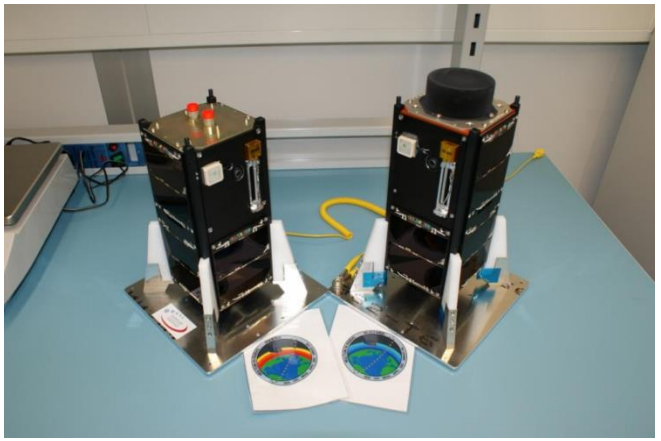
- CubeSat missions are inherently more risky
- Is this acceptable for constellations like QB50?

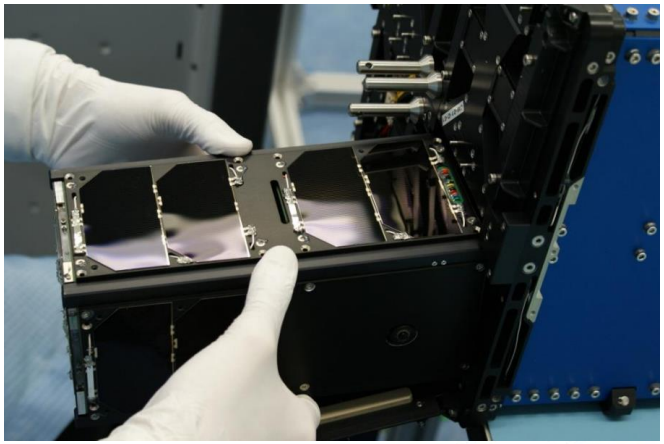


Precursor Derisking Campaign

in less than 12 months:

- consortium and collaborators management
- subsystems definition, design, manufacturing:
- satellite design, assembly and management (ISIS)
- frequency allocation and space object registration

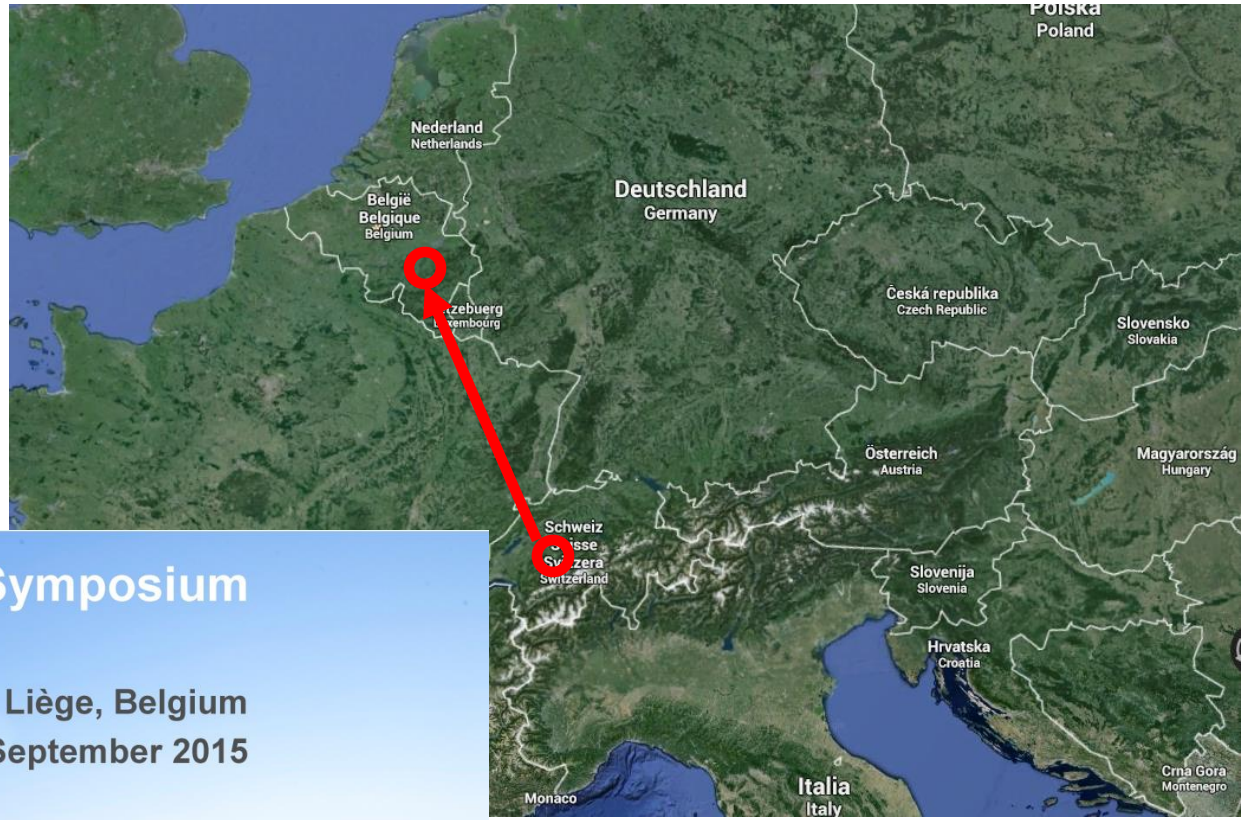




Precursor Derisking Campaign

- status September 2014:
  - satellites healthy
  - commissioning & trouble shooting ongoing
  - lessons learned: improvement of technology and documentation
  - achievement of
    - campaign objective “derisking”
    - project objective “deployment system design” – already commercialized
  - data acquisition expected to start in November 2014

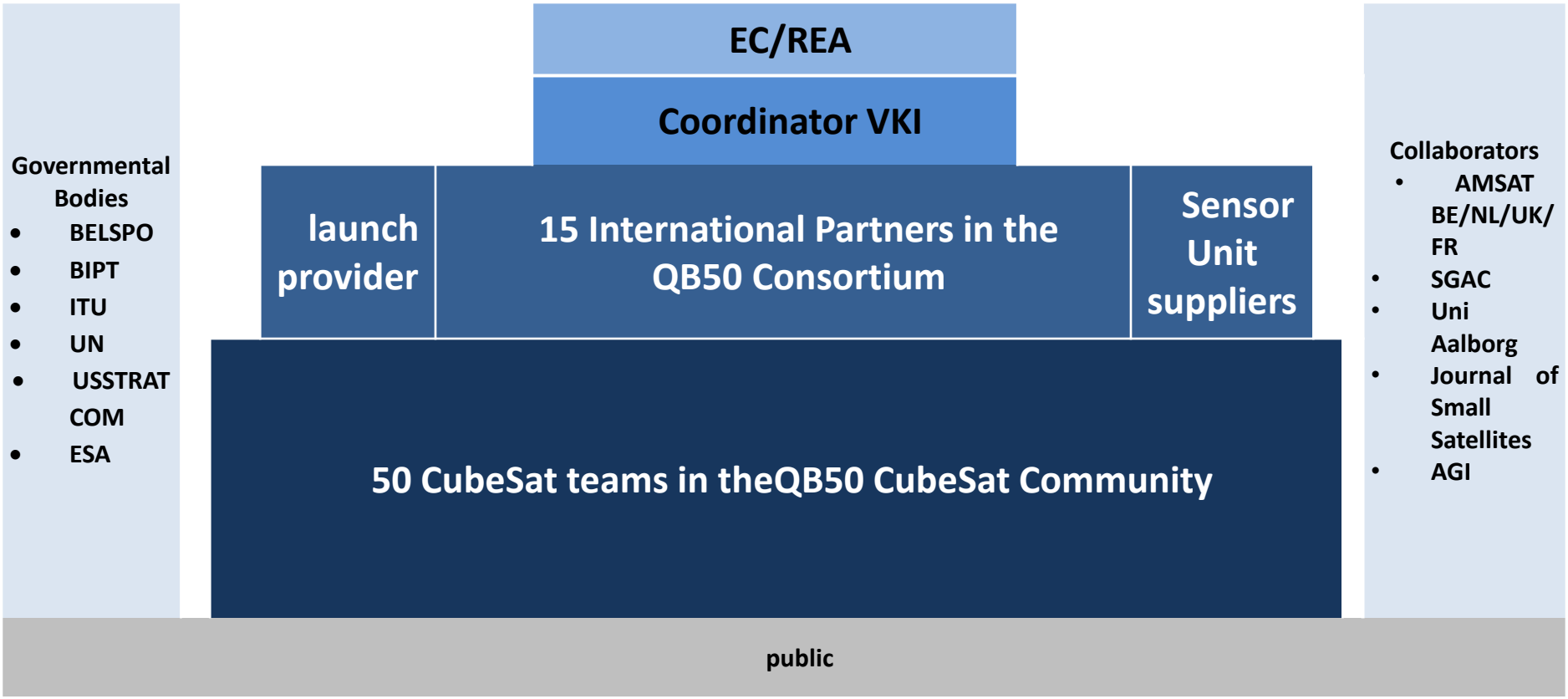
7th European CubeSat Symposium/9th QB50 Workshop



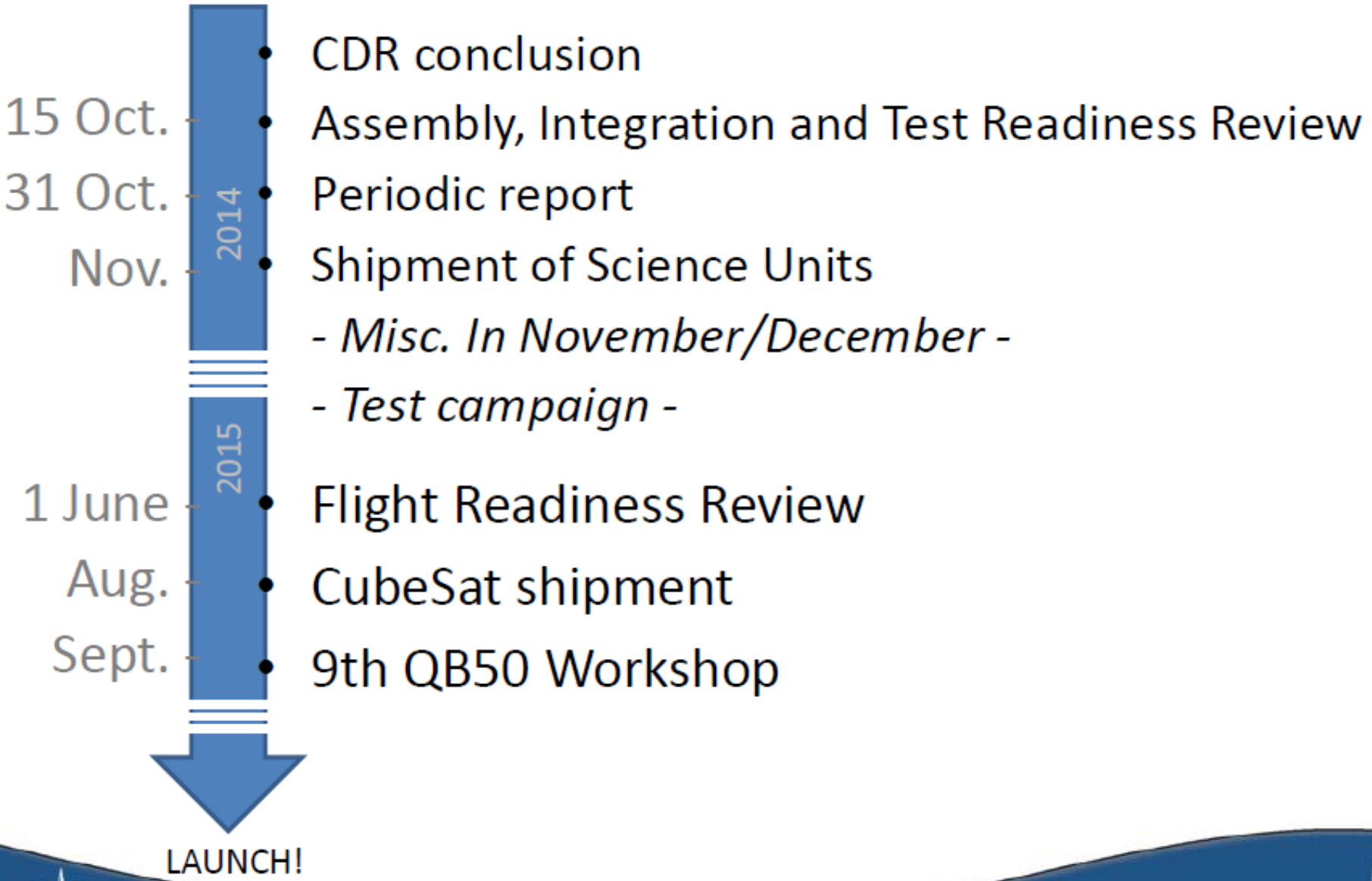
European Commission/REA

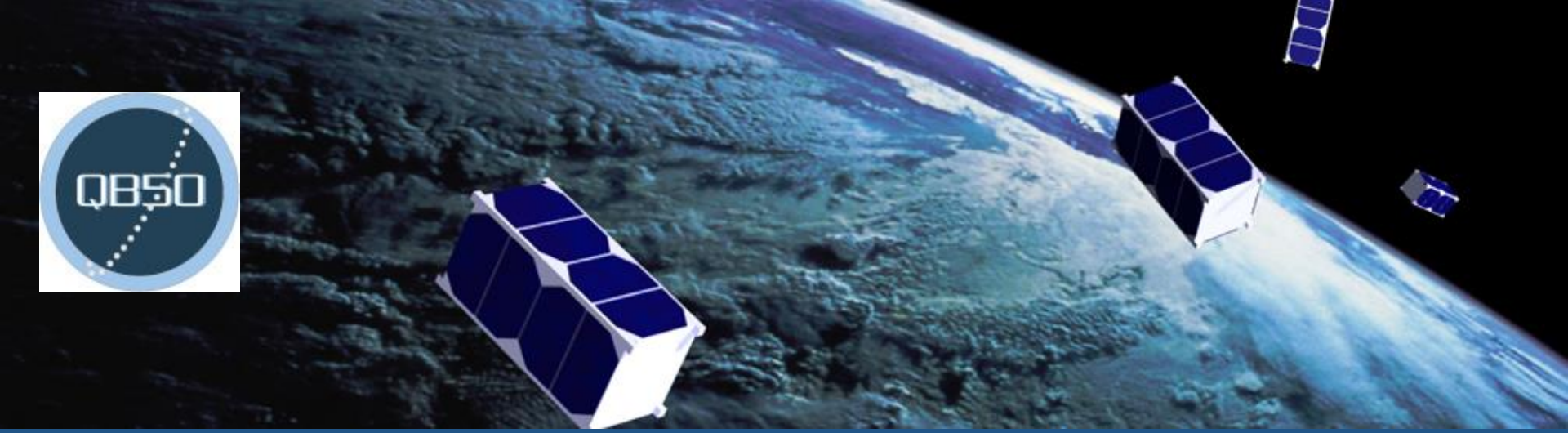
- review meeting are held every 6 months:
  - December 2013: REA congratulated to the good success
  - May 2014: QB50 makes good progress, technical coordination excellent, improving on reporting
  - next meeting December 2014

Acknowledgments



We are grateful for the motivation and support of many individuals from about 90 organizations!


2014
2015
CDR conclusion
15 Oct.
Assembly, Integration and Test Readiness Review
31 Oct.
Periodic report
Nov.
Shipment of Science Units
- Misc. In November/December -
- Test campaign -
1 June
Flight Readiness Review
Aug.
CubeSat shipment
Sept.
9th QB50 Workshop
LAUNCH!



Thank you for being part of QB50 and joining the workshop!

von Karman Institute

SEVENTH FRAMEWORK PROGRAMME