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## From Laboratory to Space with the Australian QB50 CubeSats

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Three Australian-built nano-satellites, AU01, AU02 and AU03 were launched into space on April 19, 2017 (Cygnus cargo on an Atlas V rocket) and deployed into orbit from the International Space Station late May as part of the European Union 'QB50' 'CubeSat' mission [www.qb50.eu]. The main scientific objective of the mission is the multi-point in-situ measurement of Earth's thermosphere and ionosphere using miniaturized plasma probes provided by QB50: multi-needle Langmuir probes (mNLP), ion flux probes (FIPEX) and Ion Neutral Mass

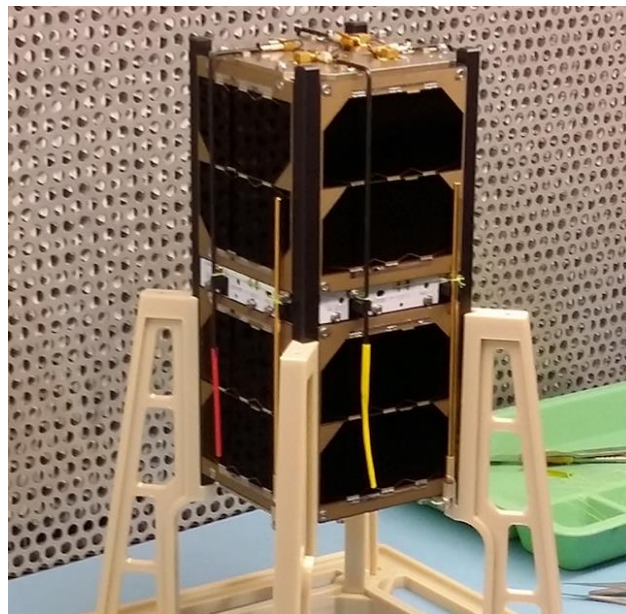


Figure 1. INSPiRE-2 / AU03 QB50 2U CubeSat

Spectrometres (INMS). The INSPiRE-2 / AU03 2-unit CubeSat shown in Figure 1

was accepted by the European Union's QB50 project on 19 August 2016, only 10 months after the project started on 30 September 2015. It is the result of a very strong collaboration between the three participating universities, the University of Sydney (U.Syd), the Australian National University (ANU), and UNSW Australia.

To de-risk the project, ANU provided the commercial satellite parts and UNSW the satellite design and software. INSPIRE-2 carries 5 payloads: a QB50 multi-Needle Langmuir Probe to measure the electron number density; Nanospec (U.Syd), a photonic spectrograph containing the first photonic lantern to fly in space; a Radiation Counter and a Microdosimeter (U.Syd), and UNSW Kea GPS instrument. The INSPIRE-2 / AU03 underwent thermal vacuum and vibration testing in the WOMBAT XL chamber at ANU (Mt Stromlo) along with SUSaT / AU01 (University of Adelaide) and ECO / AU02 (UNSW), both carrying the QB50 INMS sensor. Also, the first detailed functional verification of UCL-MSSL's fully integrated INMS flight unit was carried out at low energy using SP3-ANU's plasma wind tunnel. Australia has set up three strategically located ground stations (Adelaide, Sydney, Canberra) to support the QB50 mission. Australia's space capability includes the development and testing of miniaturised propulsion systems for future nano-satellite missions.

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