

Probing atmospheric reentry

Earth's lower thermosphere, spanning altitudes of roughly 90–320 km, is largely unexplored. But the QB50 project is looking to change that. Led by Belgium's von Karman Institute for Fluid Dynamics, the international project is launching a network of 50 small satellites. Known as CubeSats, the spacecraft are made up of only two or three 10 cm x 10 cm x 10 cm units. (For more on CubeSats, see *PHYSICS TODAY*, November 2014, page 27.) Most will be equipped with identical atmospheric sensors and will collect data for months. But four have special purposes.

One of those four is QARMAN (QubeSat for Aerothermodynamic Research and Measurements on Ablation). As the CubeSats' orbits decay and they fall back through Earth's atmosphere, the spacecraft will reach speeds of Mach 27 and aerodynamic heating to more than 10 000 K. QARMAN is especially designed to survive reentry and study the extreme environment. A cork-based ablative front heat shield will protect the

sensors within, and adjustable silicon carbide side panels will help stabilize and steer the satellite. Once the fiery plasma surrounding QARMAN dissipates, antennas will have a brief opportunity to transmit the measurements to Earth via the Iridium satellite network before the CubeSat crashes.

QARMAN's hindmost unit, which houses the satellite's broadcast antenna inside the angled side panels, is seen here mounted on the measurement arm of the European Space Agency's Hybrid European RF and Antenna Test Zone, or HERTZ. The cavernous room, the size of a small sports arena, has metal walls lined with radio-absorbing foam to simulate the RF environment of space. There the QARMAN team can test the satellite's broadcast signal for possible interference from the side panels.

QARMAN is scheduled to be deployed from the International Space Station later this year. (Photo: ESA/G. Porter.)

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