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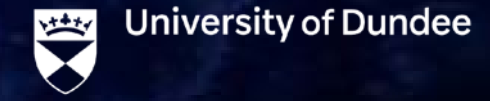


# The ESA Earth Explorer 10 Candidate Mission LOCUS

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# A Wideband Spectrometer

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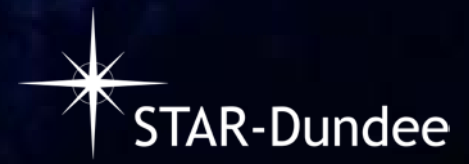
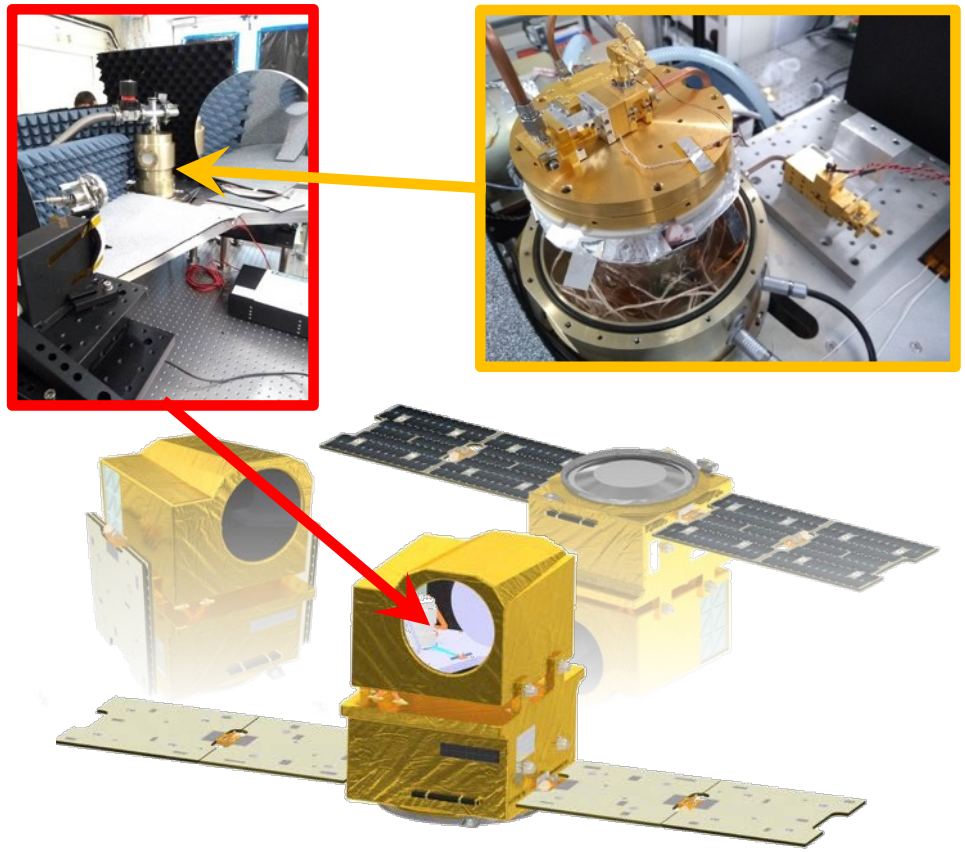


# The LOCUS EE-10 Candidate Mission

- Small satellite mission
- Study composition and thermal structure of Mesosphere – Lower Thermosphere (50km to 150km)
- Least well known region of our atmosphere!
- Gather missing data to improve climate and weather models



LOCUS EE-10 Concept on AstroBus platform

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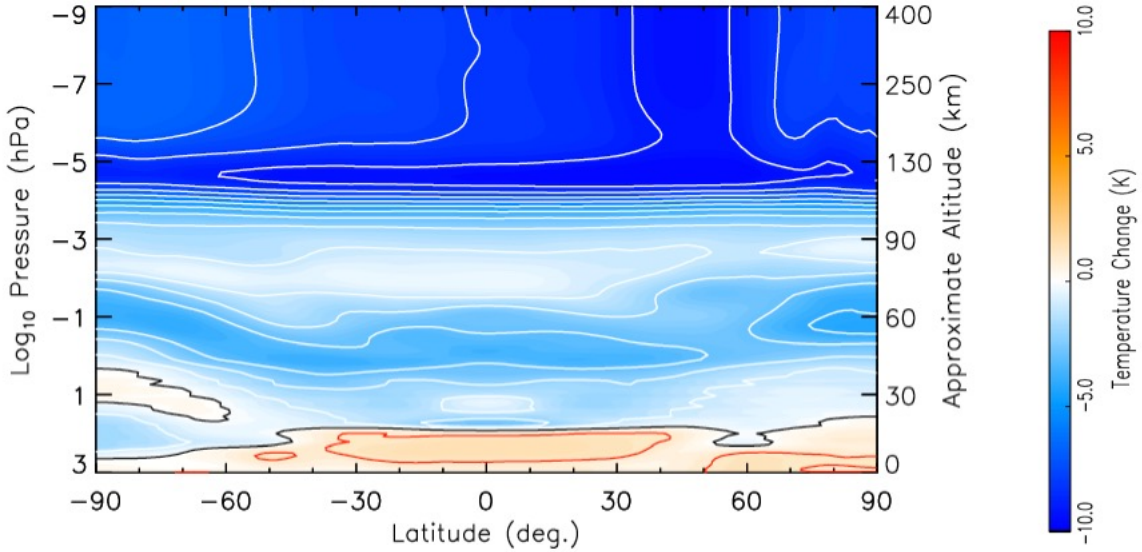
# LOCUS Science Rationale

- Two instruments:
  - THz heterodyne radiometer

  → Composition of key trace gases
  - Infrared detectors

  →Heat fluxes
- Climate Science: Understand if – and by how much – MLT cooling is linked to climate change
- Space Weather: Understand the impact of charged particles on the upper and middle atmosphere




*[Solomon et al. 2018]*

There is a clear cooling trend in the MLT – much stronger than the Tropospheric warming – but we have no idea how much of it is from an increase in greenhouse gases

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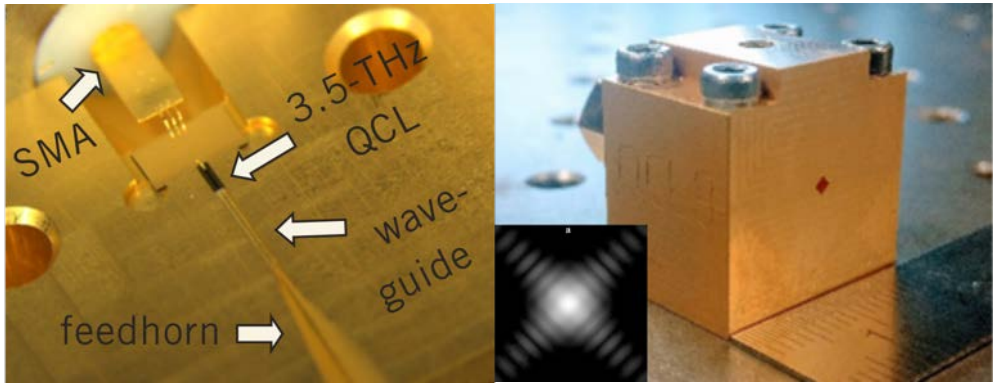
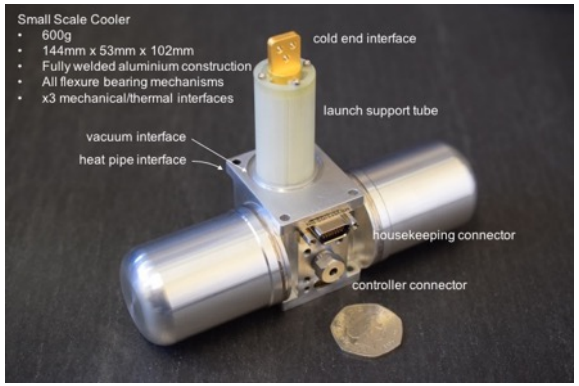
# LOCUS THz Receiver Technologies

- LOCUS (Supra-) THz instrument only becoming viable now through innovative technologies that bridge the “THz-Gap”:

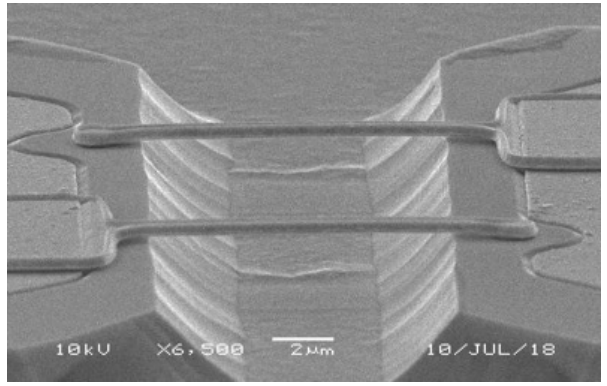
Quantum Cascade Laser devices as a high-power source to pump heterodyne Schottky mixers




Miniature space coolers to provide QCL cooling (~70K)




Improved Schottky diode manufacturing for THz frequencies

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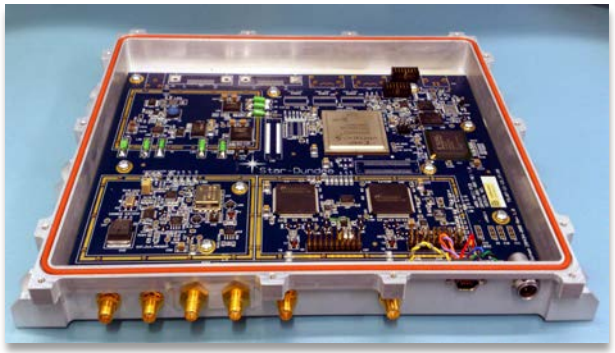
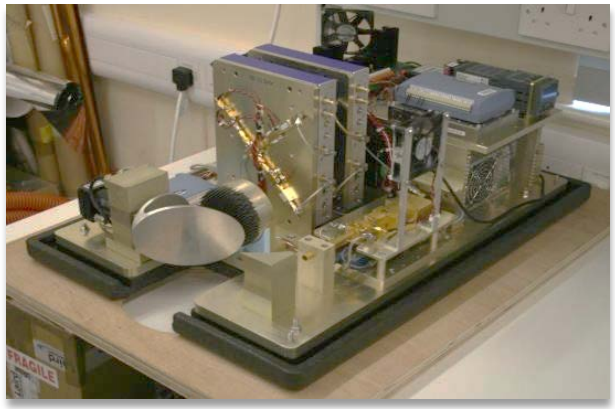
# LOCUS Spectrometer Technologies



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# Wideband Spectrometer WBS-V

- WBS V is a prototype device with a clear path to space flight
- High-performance FFT based spectrometer
  - Designed, implemented and tested
    - Using radiation tolerant parts
    - Or commercial equivalents of radiation tolerant parts
  - 2 GHz bandwidth and 2.4 MHz FFT bins giving 10 MHz resolution
- A 1024-point FFT implemented in the Microsemi RTG4 FPGA
  - Processing power is in the region of 100 GOPS
  - Enabling 1024-point FFT to operate at 2.4 Gsamples/s
    - With I and Q inputs
- STAR-Dundee is now working on an 8 GHz bandwidth spectrometer

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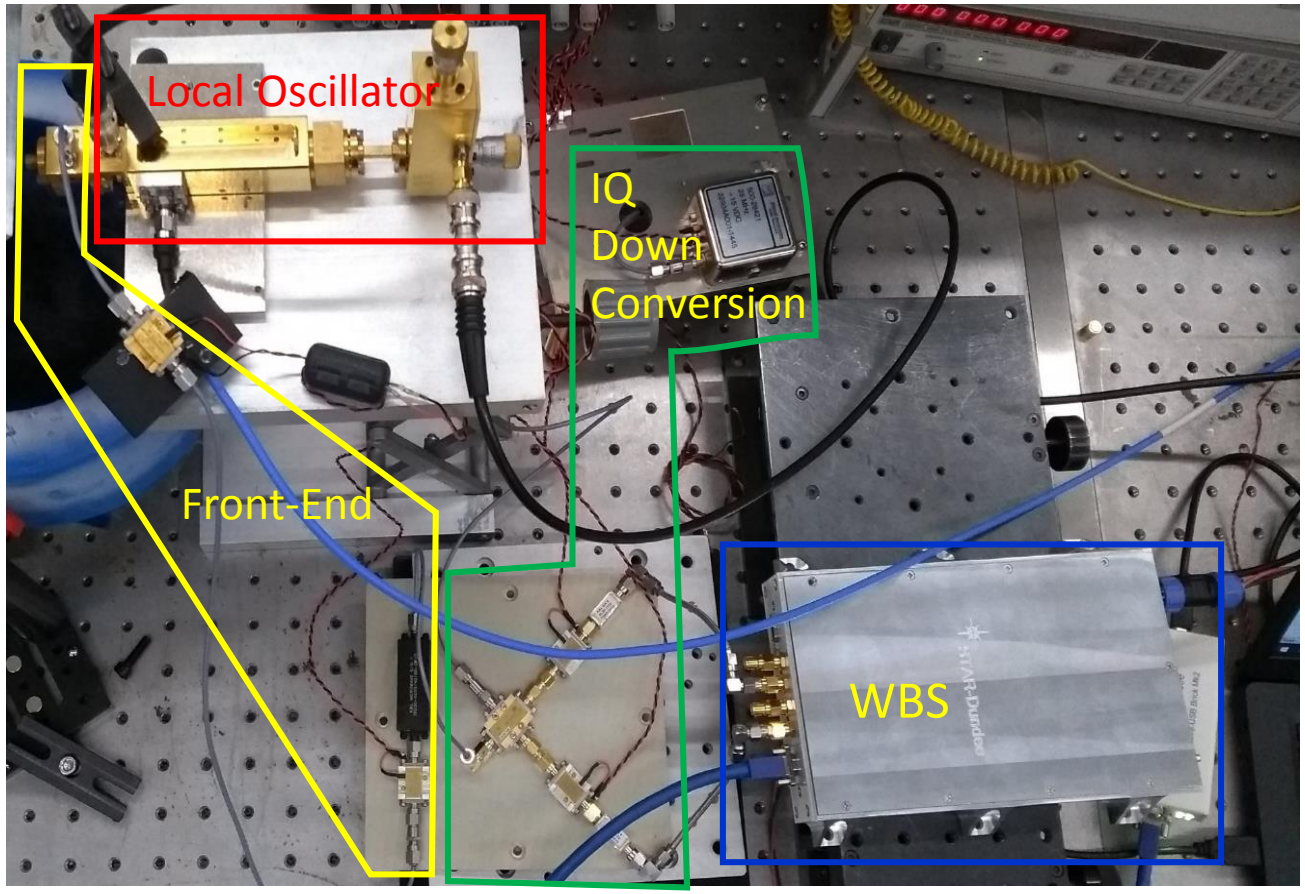
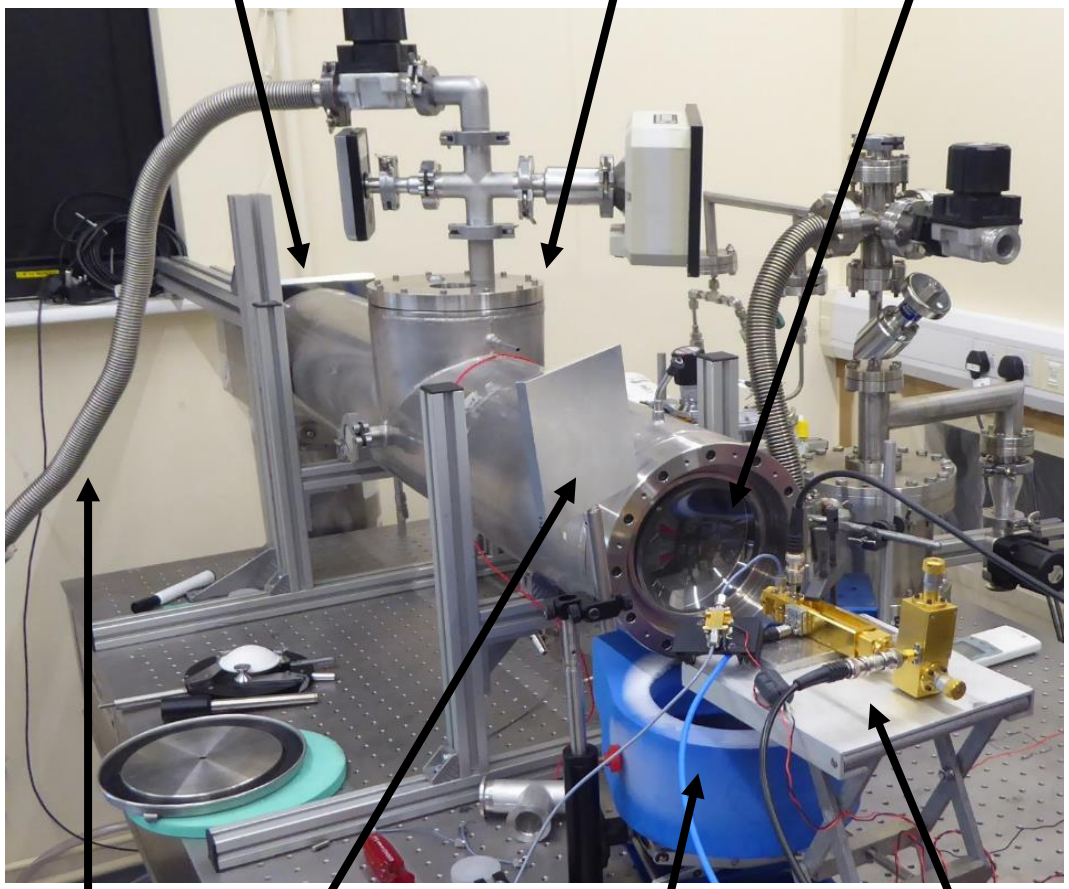
# WBS-V In Action

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# WBS-V In Action


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