The **STEAM** Sub-Millimetre Wave Radiometer on the **PREMIER** mission

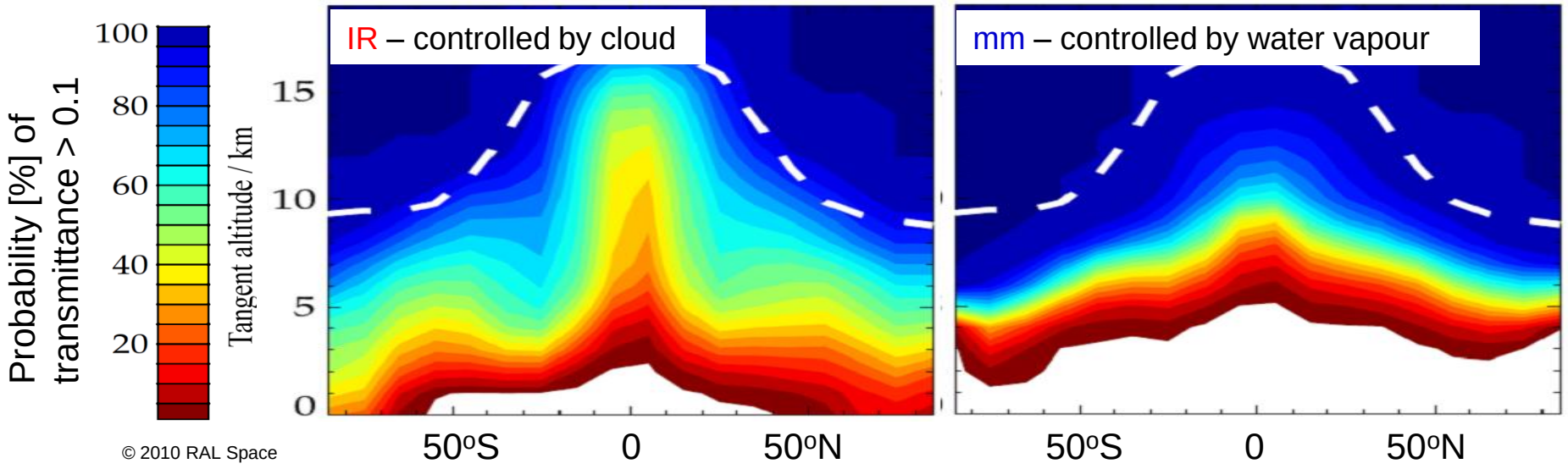
RAL Space

PREMIER Mission Concept

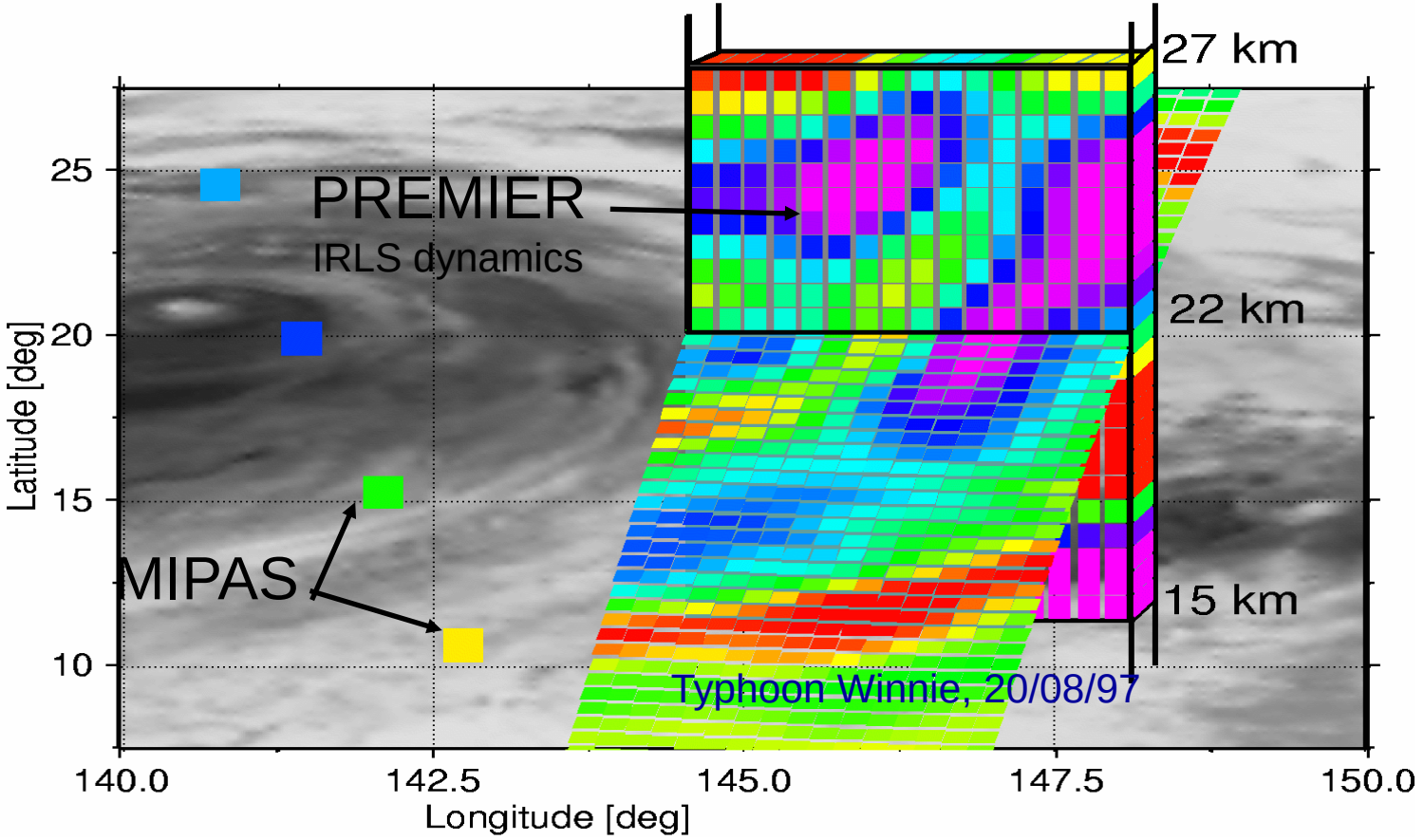
Exploiting synergies between

- Infra-red and millimetre-wave techniques
- limb and nadir observation geometry

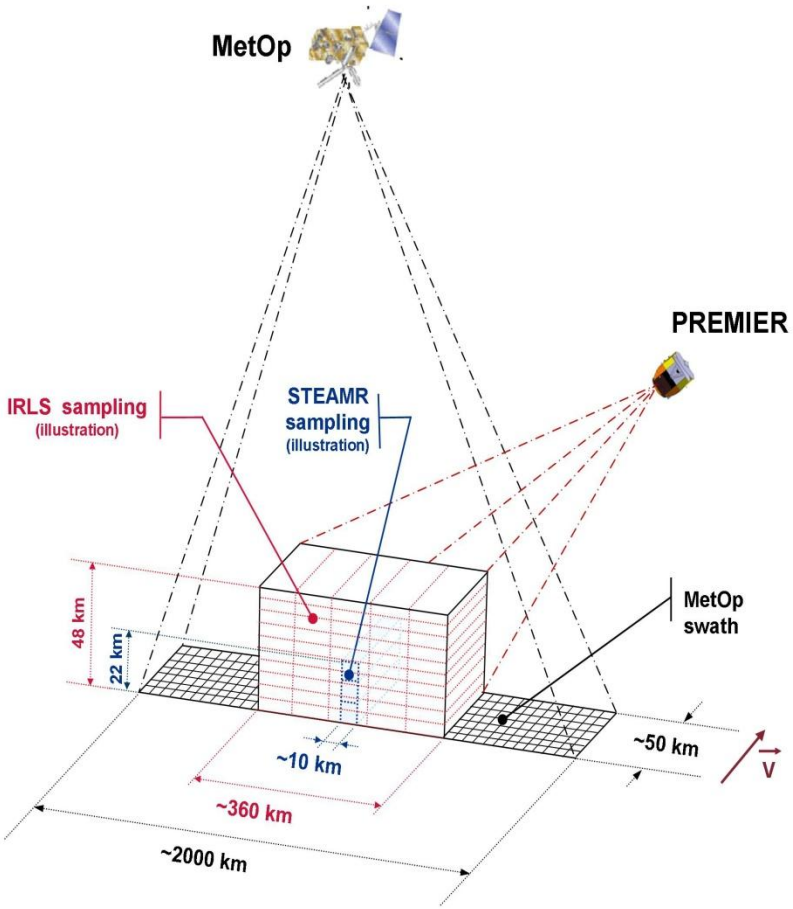
for unprecedented resolution in atmospheric 3D imaging

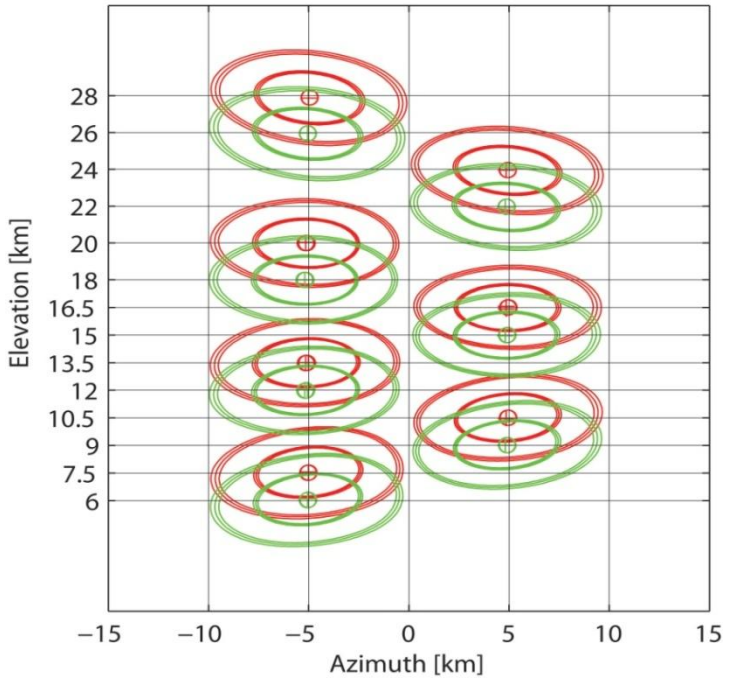


Example: 3D Limb-Imaging of Gravity Wave Structures (Temperature)



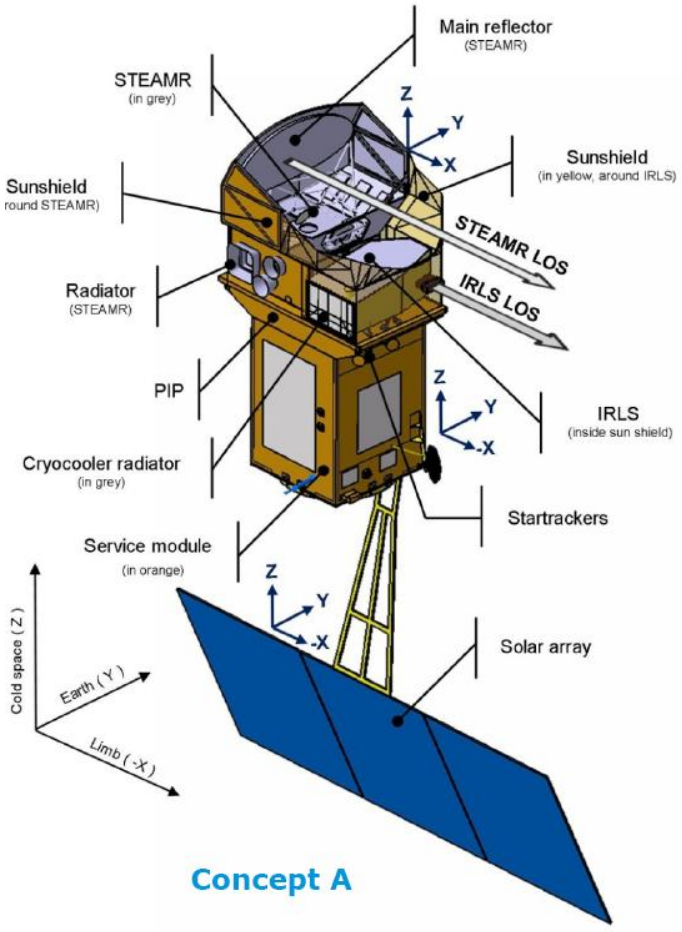
STEAM-R Observation Concept

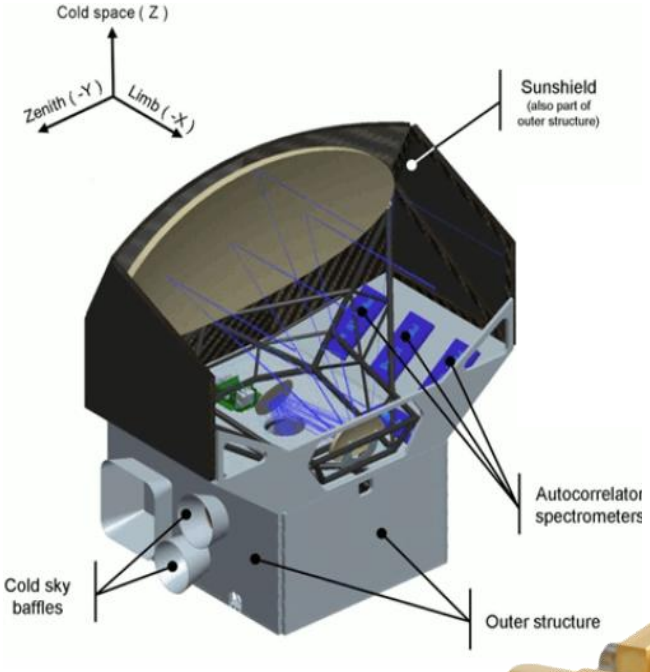




STEAM-R array: 14 fixed staring receivers (2 sets of 7 beams at orthogonal polarisations, UK concept)

STEAM-R System Design





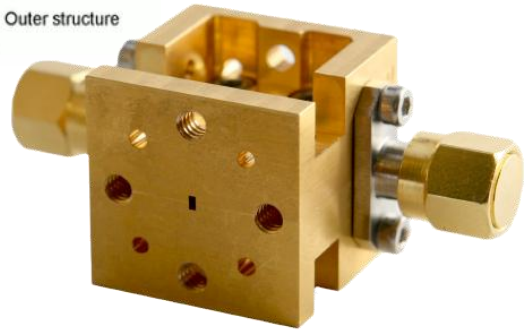
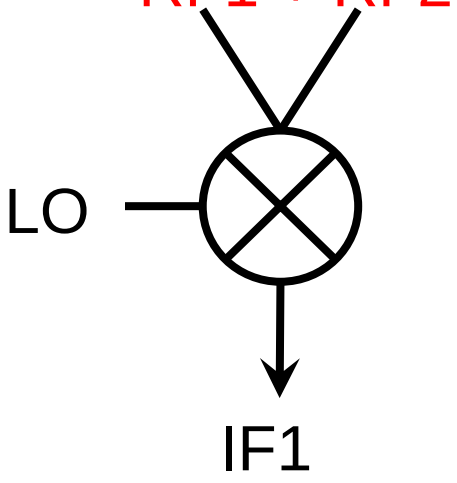


Figure 4: RAL/Astrium sideband separating mixer

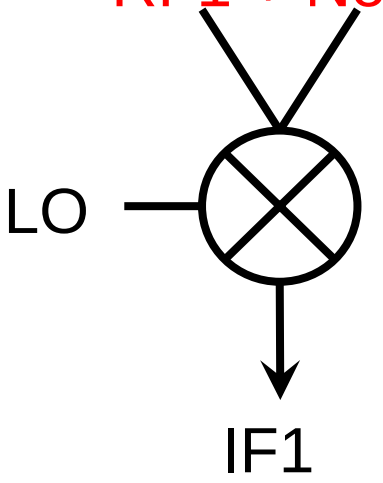
Receiver Technologies (SHIRM)

DSB



One spectrally convolved IF

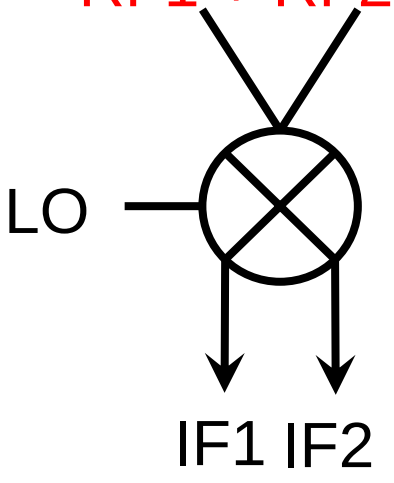
SSB



One spectrally ***pure*** IF

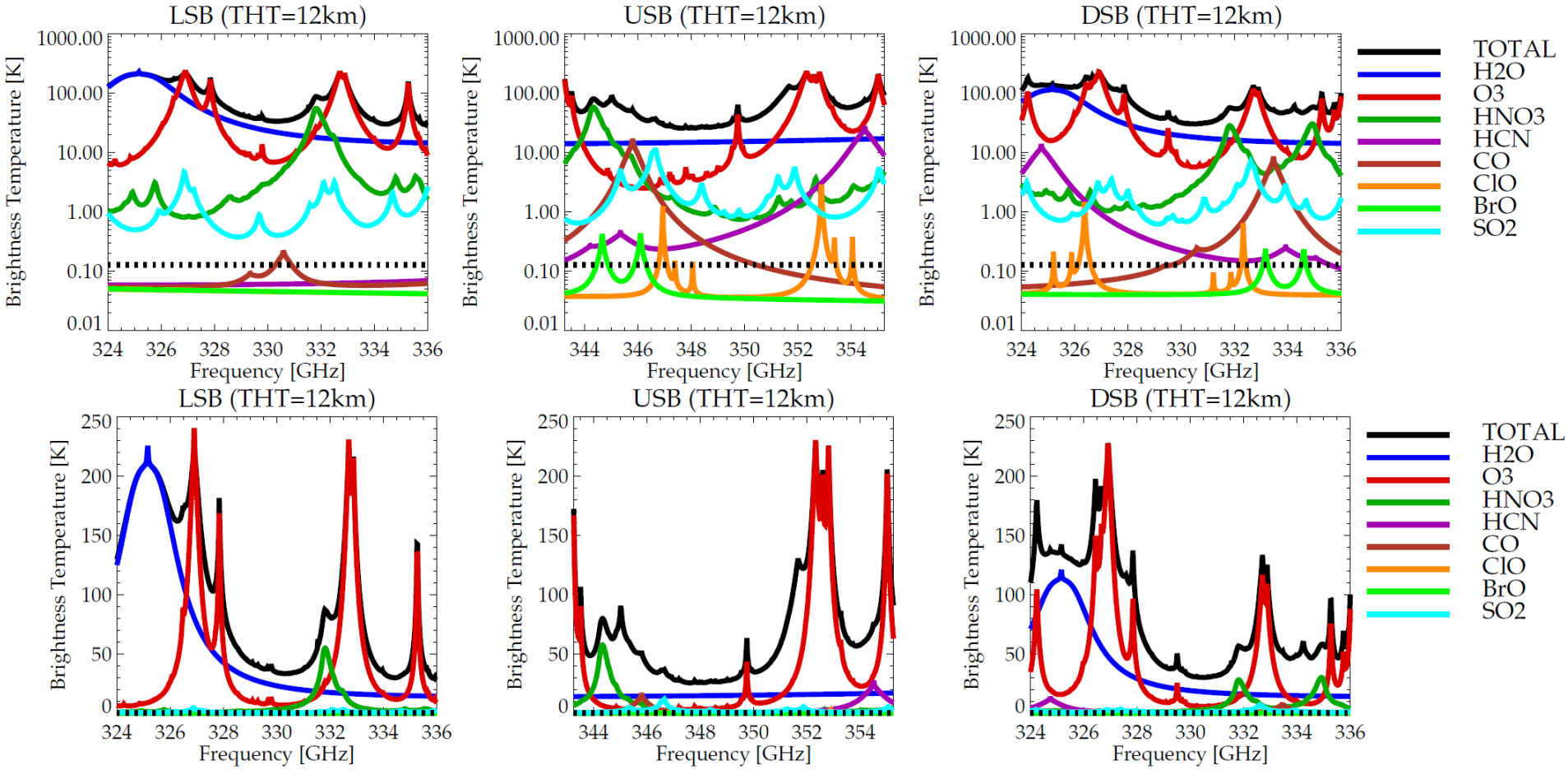
SHIRM

1 × SHIRM ≈ 2 × SSB



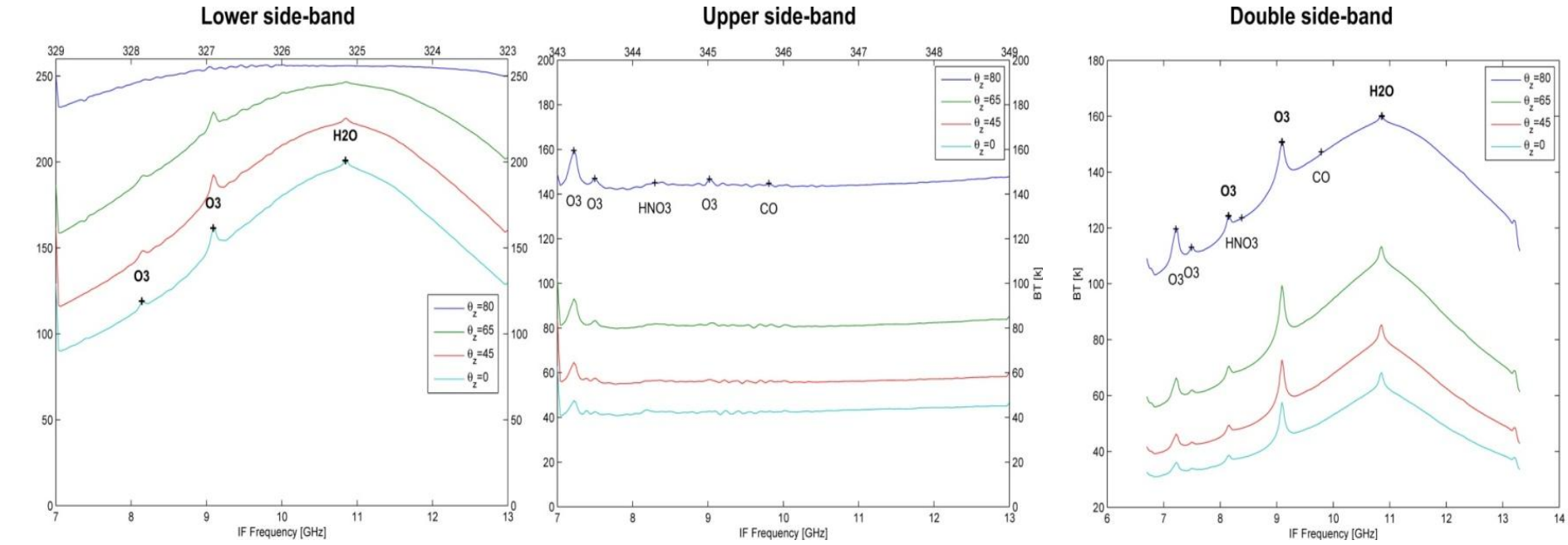
Two spectrally ***pure*** IFs

STEAM-R Frequency Coverage



SHIRM Test Campaign 2011

- Ground-based measurements from Jungfraujoch (3500 m.a.s.l.) using a breadboard receiver setup.
- Demonstrated spectral purity of RF separation.



Conclusions

- STEAM-R adds to PREMIER by virtue of its reduced sensitivity to clouds compared to the infra-red.
- Swept antenna array reduces mechanical complexity, increases sampling rate and yields consistent pointing.
- Novel SHIRM mixer technology rivals the spectral performance of a SSB system, while matching the low power and weight requirements of a conventional DSB system.

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