PAYLOAD OVERVIEW

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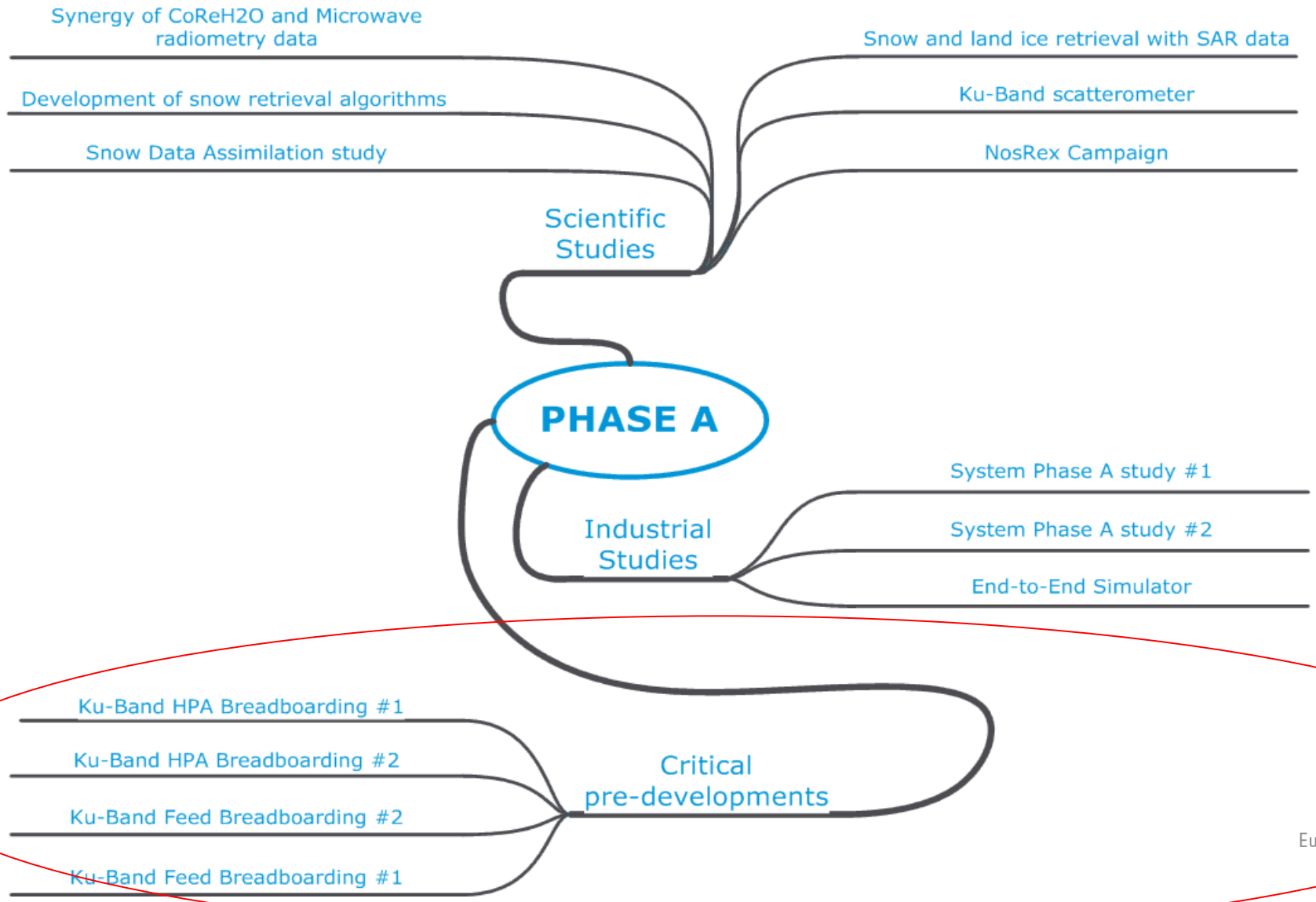
1. Payload Architecture for both concepts

2. Technology and Pre-developments
    a. Ku-band feed and High Power Switch
    b. High Power Amplifier

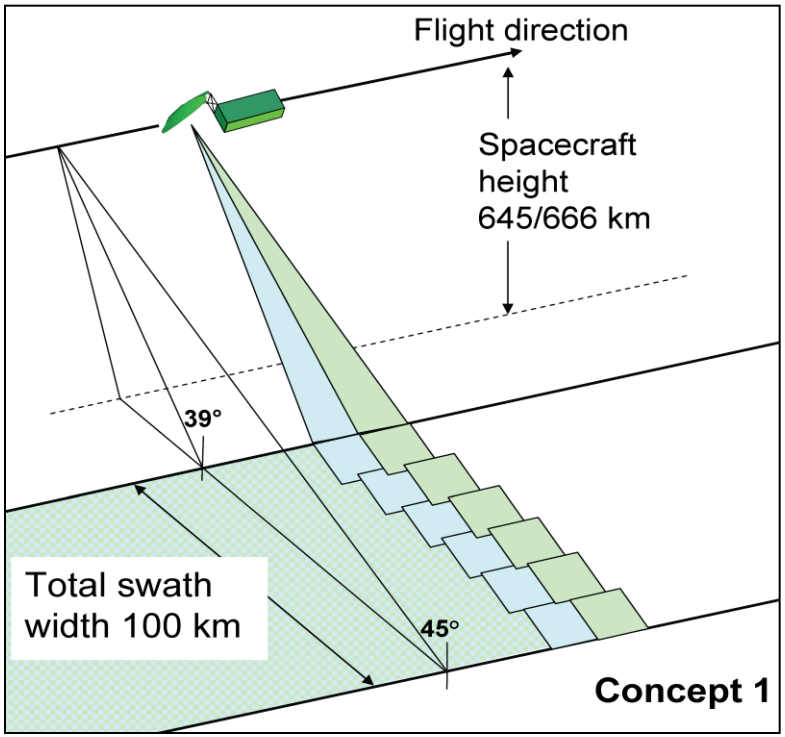
3. Performance Summary

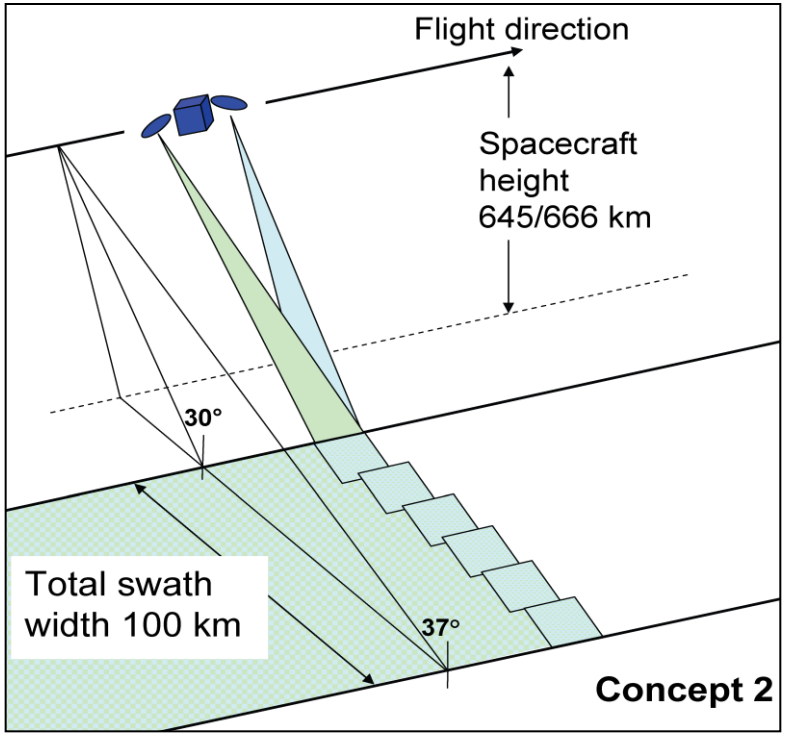
PHASE A ACTIVITIES



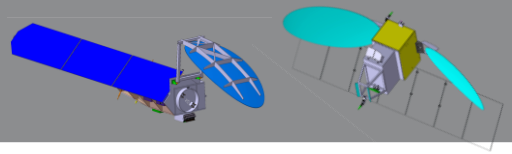
Observation principle and Payload concepts overview

- High frequency: X-band (9.6 GHz) & Ku-band (17.2 GHz)
- Large swath ≥ 100 km
- High resolution ≤ 50 m x 50 m (≥ 5 looks)
- Combination of these requirements lead to the choice of ScanSAR

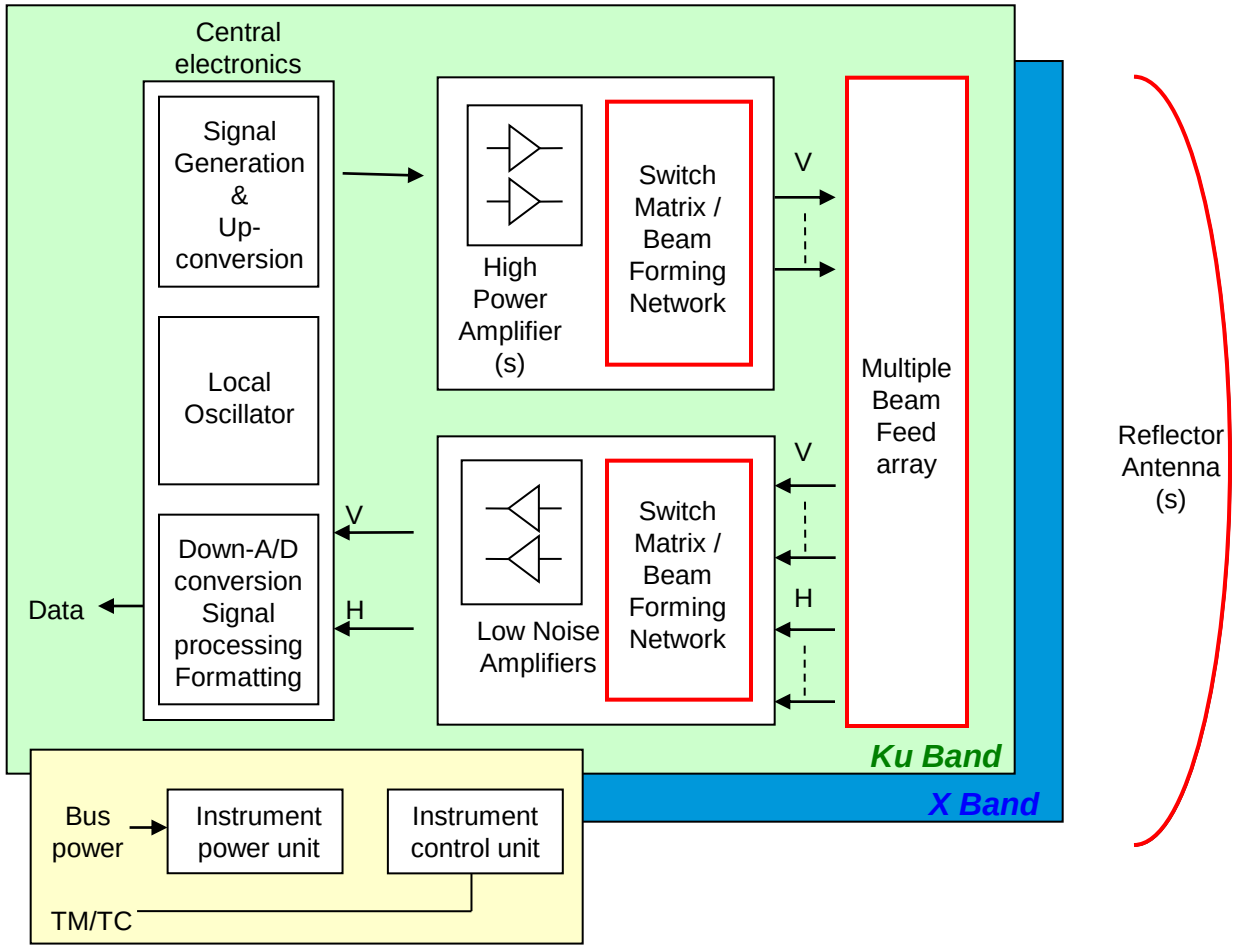




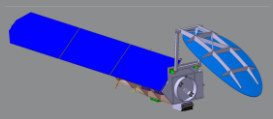
Instrument architecture for both concepts



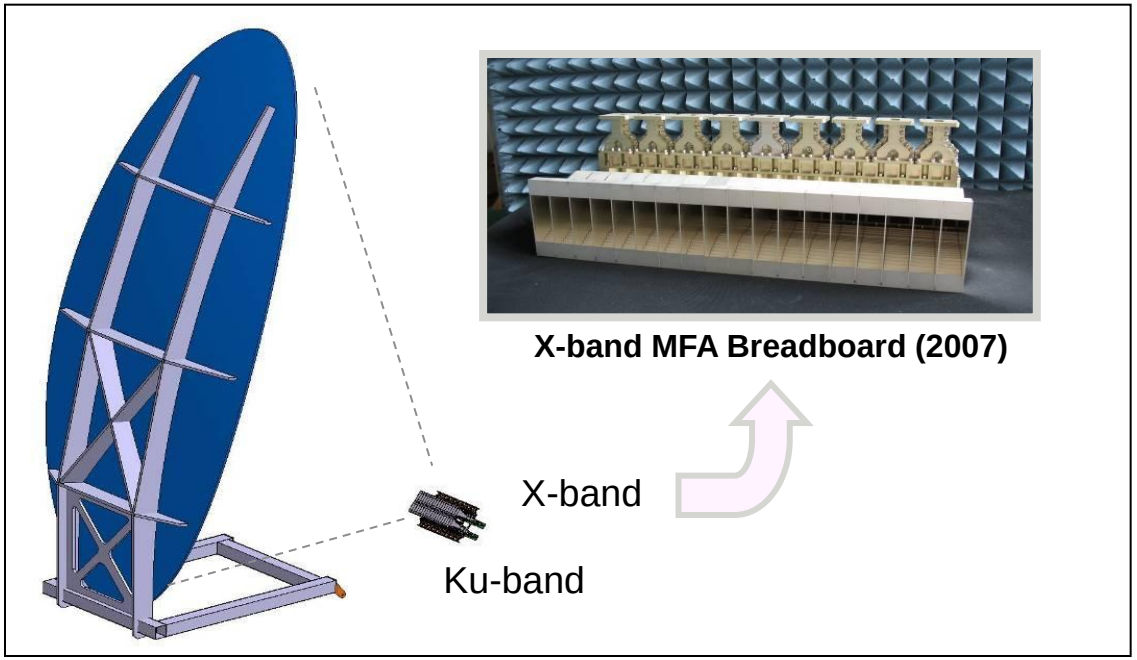
Main differences between the two concepts at front-end level

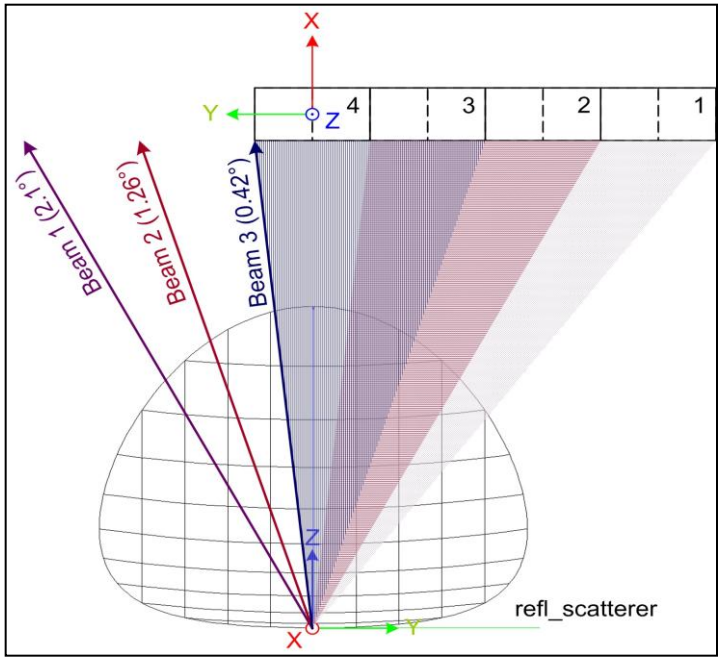


Instrument subsystems – Concept 1

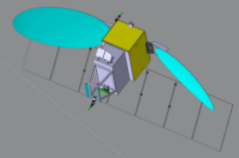


- Single reflector: 4.5m x 2m
  - Sized for X-band, and adequate for Ku-band
- Multi-Feed Array technology: combination in space of the radiated power through the reflector

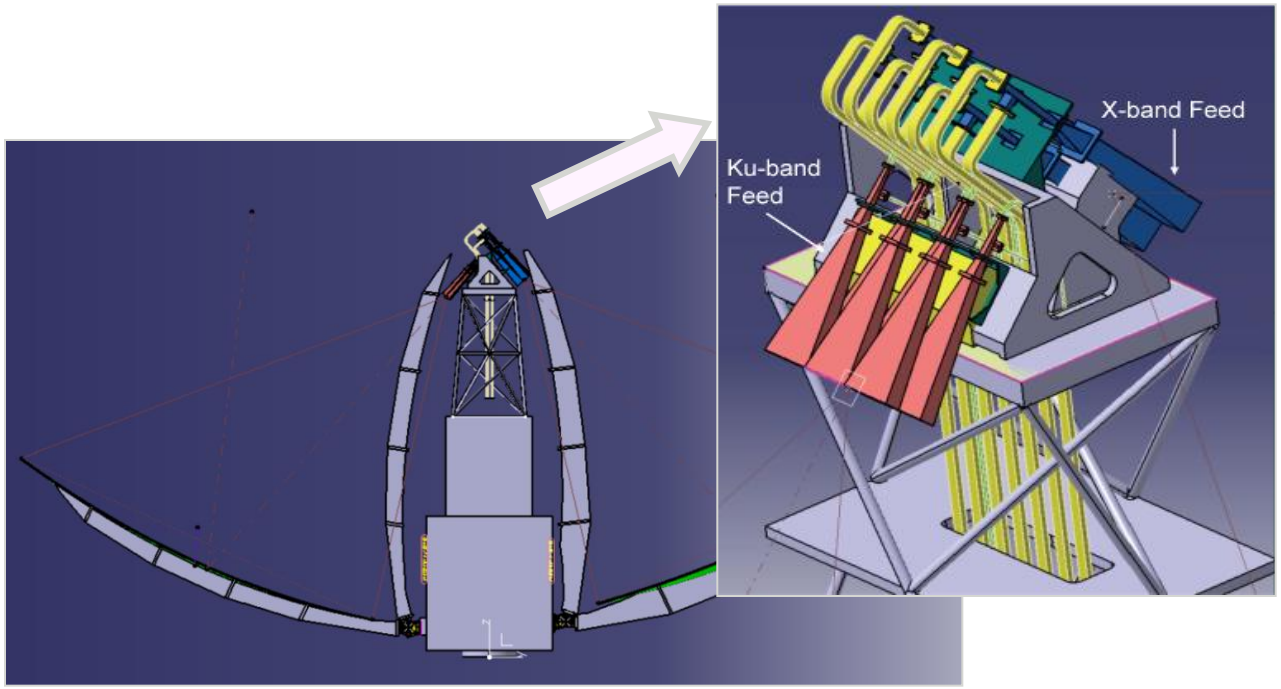


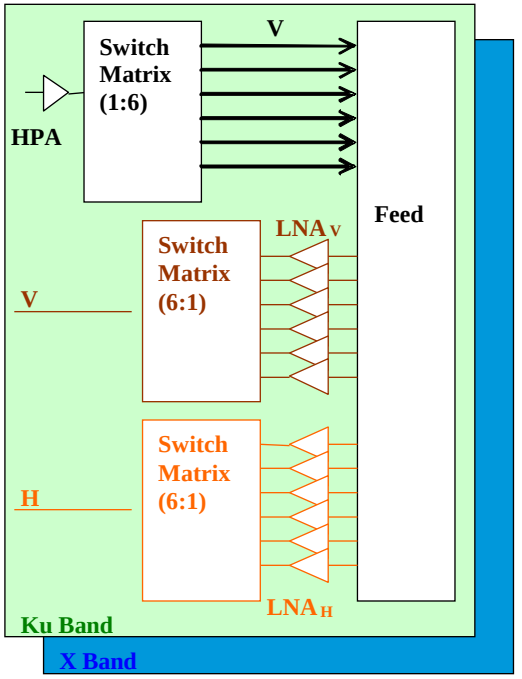


Instrument subsystems – Concept 2



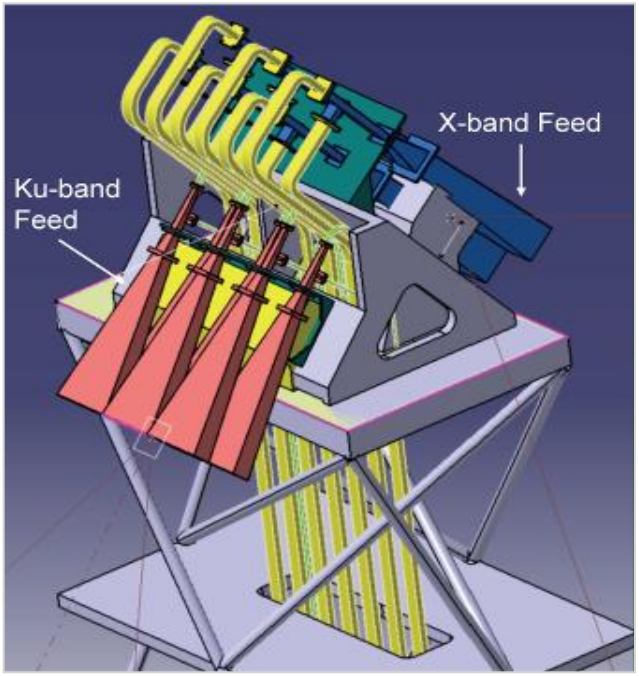
- Two reflectors:
  - X-band: 3.3m x 2.1m; Ku-band: 3.3m x 1.2m
- Centralised power configuration:
  - 1 HPA switched and routed to 1 antenna feed element out of 6



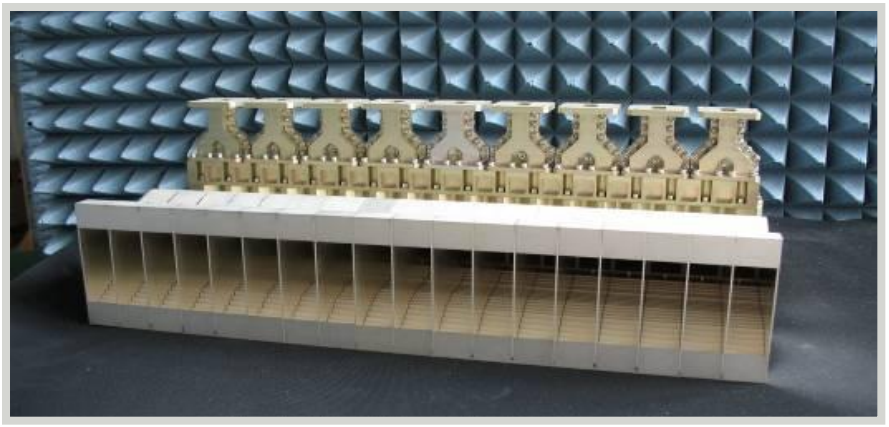


Technology and pre-Development – Ku-Band Feed Breadboarding (17.2 GHz)

- Two parallel activities including High Power Switch breadboarding:
  - One beam per horn



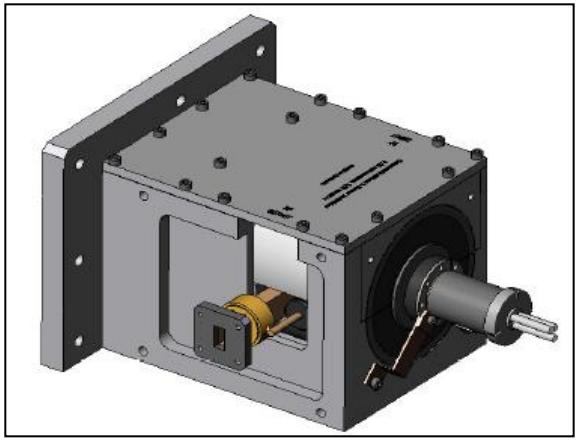
  - Spatial power combining of 2-3 horns



X-band MFA Breadboard (2007)

Technology and pre-Development – High Power Amplifier

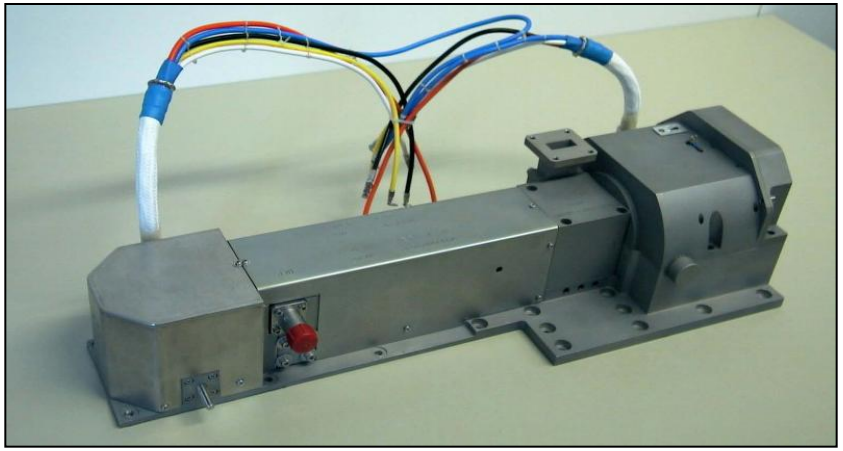
- HPA - Two potential technologies for X-band and Ku-band



Extended Interaction Klystron
Adaptation from Ka-band to Ku-band
Potentially adaptable to X-band

Transmitter Peak Power	Up to 4kW
Instrument Duty Cycle	Up to 20%
Time of Operation	Continuous

Feasible



Travelling Wave Tube
Adaptation from X-band to Ku-band

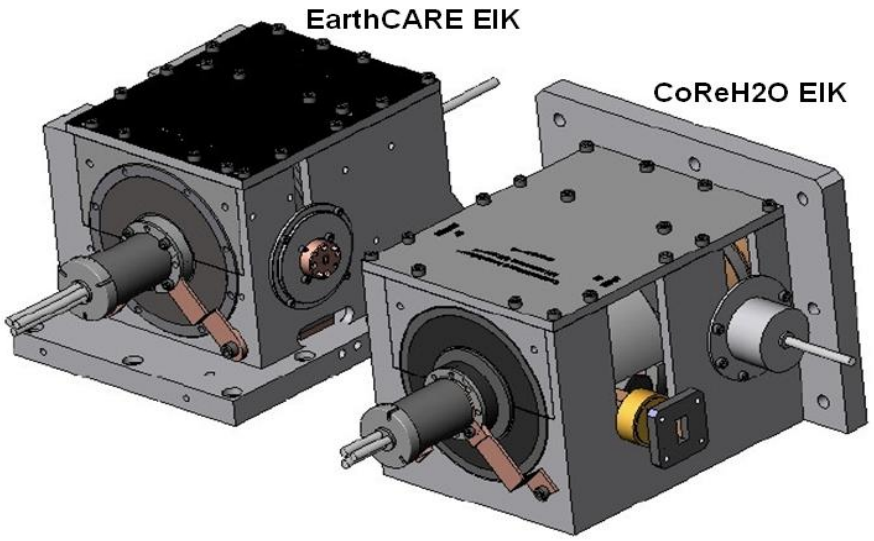
Trans. Peak Power	3kW	3kW
Instrument DC	4% - 8%	Up to 15%
Time of Operation	Cont. - 90sec.	TBD

Available in X-Band **Feasible**

Technology and pre-Development – High Power Amplifier

- EIK technology (CPI, Canada)
  - Modification of the existing terrestrial Ka-band EIK:
    - Interaction circuit appropriately scaled
    - Cooling concept modified from liquid to conduction cooling
    - New thermal and mechanical design for the enclosure
    - Predicted performance: 4 kW peak with duty cycle up to 20%

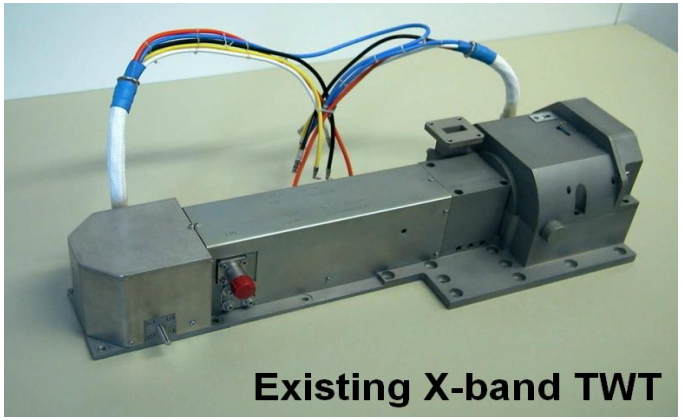
A first engineering model at Ku-band will be built and a preliminary life-test will be carried out



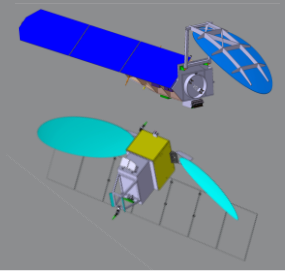
Technology and pre-Development – High Power Amplifier

- TWT technology (Thales Electron Devices, Germany)
  - A modification of a readily space-qualified X-band TWT
  - Existing design has a severe duty cycle limitation, mainly associated with the type of gun used
  - For improving duty cycle performance:
    - Different gun concept to be adopted
    - Re-design of the interaction circuit
    - Cooling aspects to be re-assessed

These critical design issues will be addressed with build of sub-assemblies and extensive testing


Existing X-band TWT

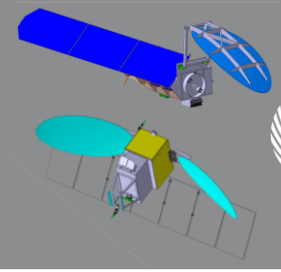
Performance Summary

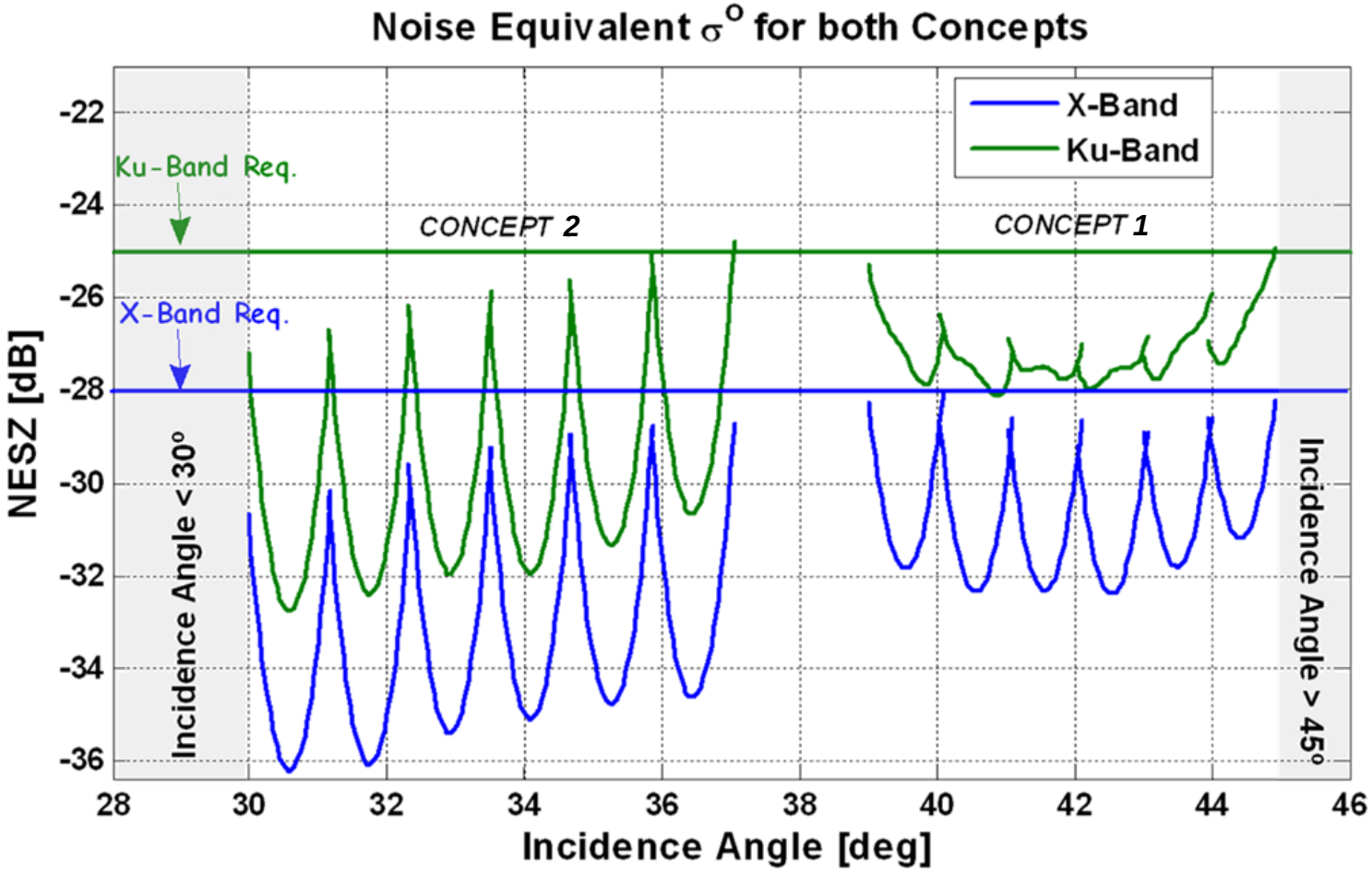


Parameter	Requirements		Concept 1 & 2	
	X-band	Ku-band	X-band	Ku-band
Swath	100 km		**100 km**	
Noise Equivalent σ^0	VV ≤-23 dB VH ≤-28 dB	VV ≤-20 dB VH ≤-25 dB	**≤-28 dB**	**≤-25 dB**
Total Ambiguity ratio	≤-20 dB	≤-20 dB	**≤-22 dB**	**≤-22 dB**
Resolution Azimuth/Range	50 m × 50 m	50 m × 50 m	**50 m × 50 m**	**50 m × 50 m**
Number of Looks	≥5	≥5	**5-6**	**5-6**
Radiometric stability	≤0.5 dB		**≤0.5 dB**	
Absolute radiometric bias	≤1 dB		**≤0.9 dB**	

Performance of both concepts compliant with the system requirements

Instrument performance - Sensitivity





CONCLUSION

$CoReH_2O$ is an Earth Explorer 7 Core Mission candidate. It proposes active sensing of Snow Water Equivalent using a dual-frequency dual-polarisation SAR instrument. It is deemed of interest by the European Earth Science community.

Several activities are on-going in this Phase A. Previous results have shown that the mission is feasible and compatible with schedule constraints. Current work is focused on cost optimisation and risk retirement. This includes pre-developments of payload elements.

So the status of the mission justifies this workshop for the related science to review the on-going scientific activities, the status of the science, and the strength of the rationale.

THANK YOU

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