AAC
CLYDE
SPACE

ARCTIC WEATHER SATELLITE

JOHAN RIESBECK

AAC OMNISYS

AAC CLYDE SPACE AT A GLANCE

WHAT WE DO

Founded in 2005 – over 15 years' operational experience

Focus on design, manufacture and assembly of spacecraft up to 50 kg.

29 satellites designed, manufactured and launched to date

Enable a growing number of commercial, government and educational organisations to access high-quality, timely data from space

Production facilities in-house; majority of design, manufacturing, assembly and testing in-house

Some of our clients include Orbcomm, NSLComm, OHB Sweden, ESA, Intuitive Machines, Orbital Micro Systems, United States Airforce Academy, UK Space Agency and NASA.

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OUR SUBSIDARIES

AAC Clyde Space
Sweden

AAC Clyde Space
Scotland

Hyperion Technologies
Netherlands

SpaceQuest
USA

Omnisys
Sweden

AAC Space Africa
South Africa

ARCTIC WEATHER SATELLITE

Background

- **Approved by ESA council in Nov 2019**
- **Improve observations in the arctic regions for both climate change and weather predictions**
- **Consortium of OHB Sweden (platform), AAC Omnisys (payload) and Thales (ground segment)**

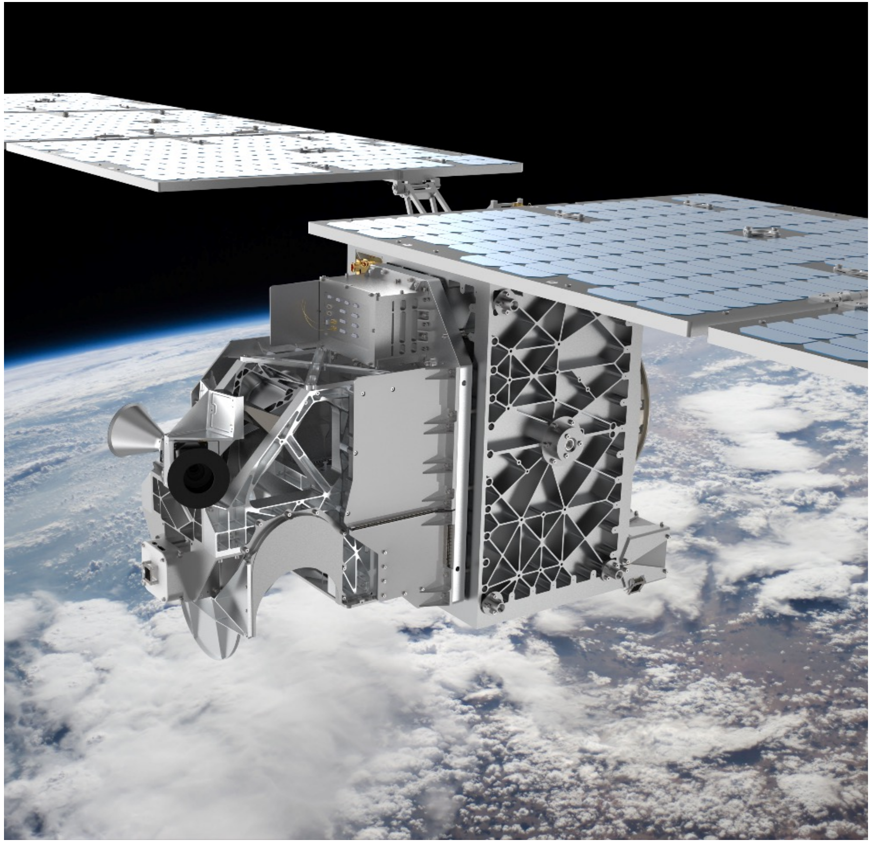

Image credit: OHB Sweden

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ARCTIC WEATHER SATELLITE

The Mission

- **Improved nowcasting and numerical weather prediction**
- **Demonstrate a cost-effective, new-space approach**
- **Pave the way for EPS-Sterna, a constellation of several AWS satellites**
- **Launch: July 2024 (TBC) on SpaceX Transporter 11**
- **Polar orbit at 600 km.**

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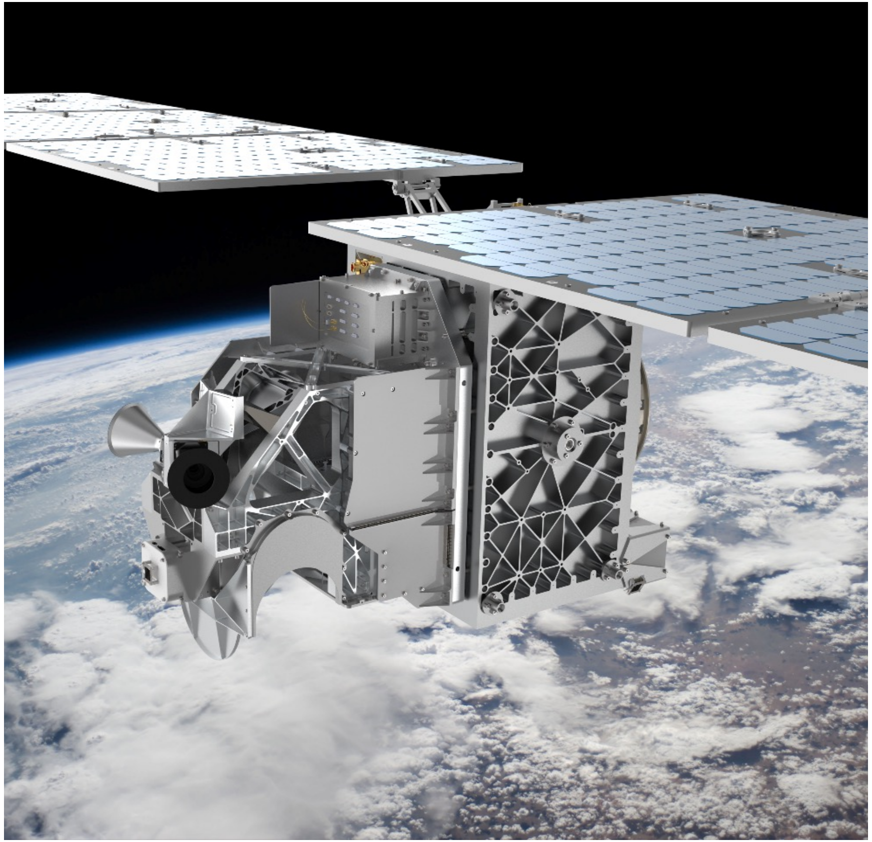

Image credit: OHB Sweden

PFM AND STERNA TIMELINES

Development → Assembly & Test → Evaluation (6-12 months) → Extended Operation Y2-Y5 (TBD)

- Kick-off Feb 2020
- Launch Jul 2024
- STERNA Decision Mid 2025

Kick-off Mid 2025 → Launch 1 Mid 2029 → Launch 2 2034 → Launch 3 2039

- 6 satellites, 3 orbital planes

Total 15 years of operation

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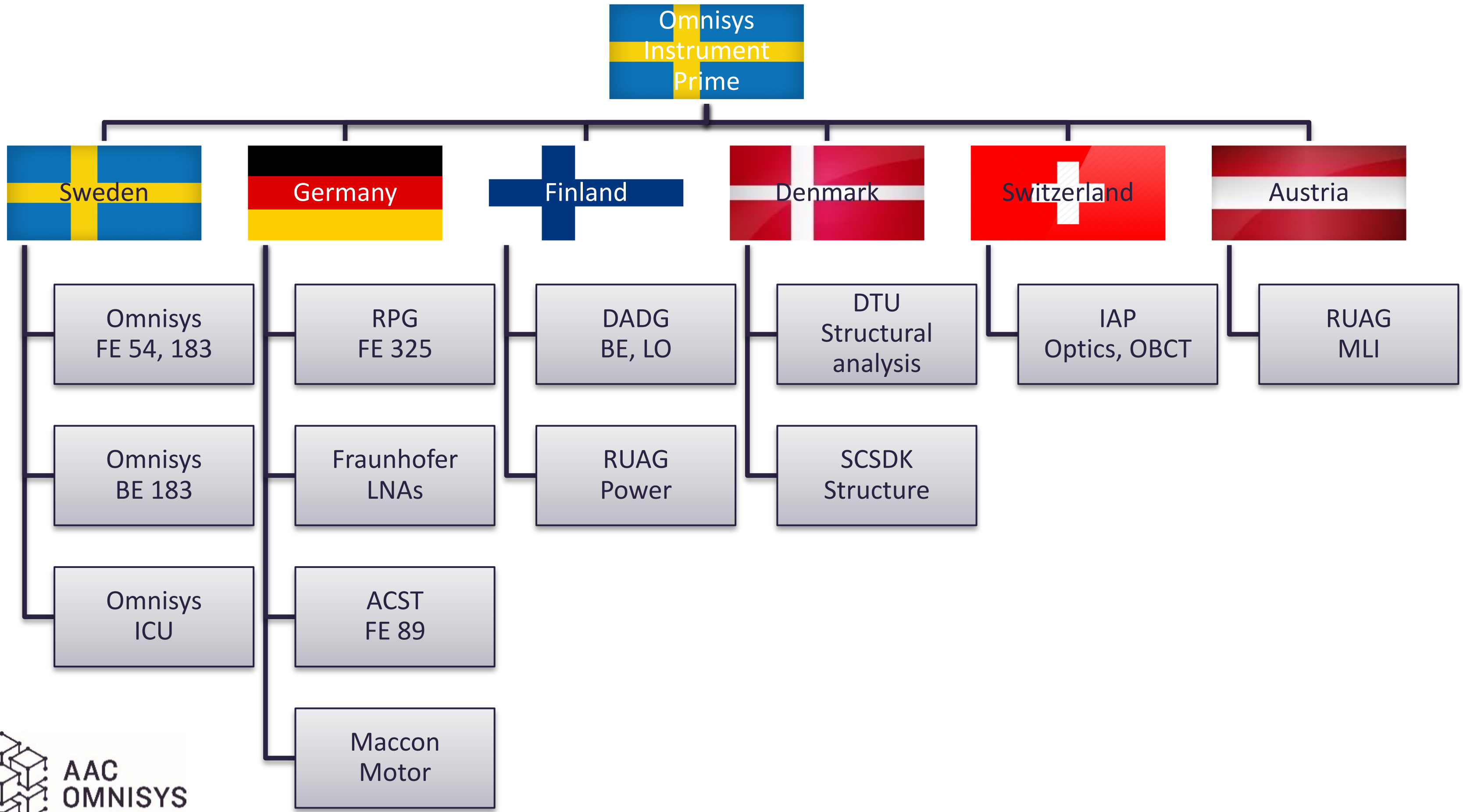
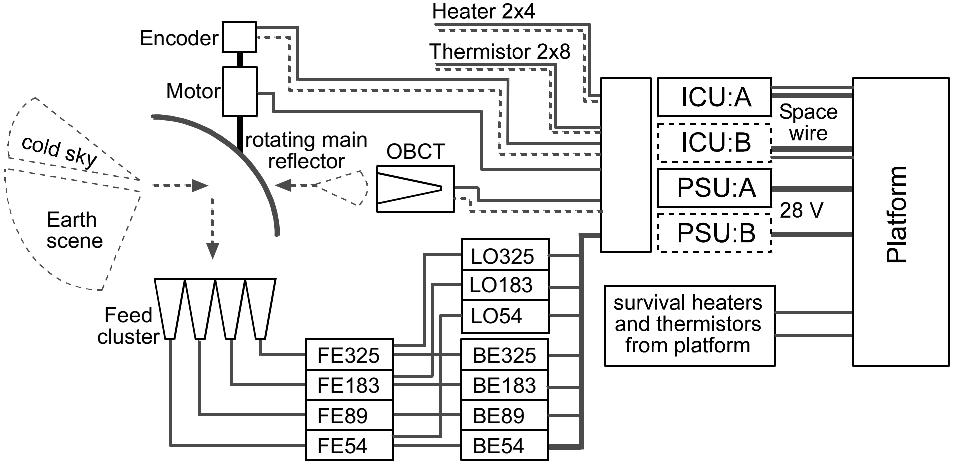

Omnisys Instrument Prime
Sweden
Germany
Finland
Denmark
Switzerland
Austria
Omnisys FE 54, 183
Omnisys BE 183
Omnisys ICU
RPG FE 325
Fraunhofer LNAs
ACST FE 89
Maccon Motor
DADG BE, LO
RUAG Power
DTU Structural analysis
SCSDK Structure
IAP Optics, OBCT
RUAG MLI

INSTRUMENT OVERVIEW



- **Receivers:**
  - 54 GHz: 8 channels: O2 temperature & pressure
  - 89 GHz: 1 channel: window channel
  - 166/183 GHz: 1+5 channels: window & water
  - 325 GHz: 4 channels: water & ice particles
- **Antenna and optics providing < 10 km diameter ground resolution at 183 and 325 GHz, using 2.5 ms integration time**
- **On-board ambient calibration target (complemented with a cold sky view)**
- **145 spots of the earth, 15 OBCT and 25 cold space.**
- **Mechanism scanning the earth at constant speed of about 1.2 seconds / revolution**
- **Redundant Power and Control electronics for the instrument functions and the interface to the platform**

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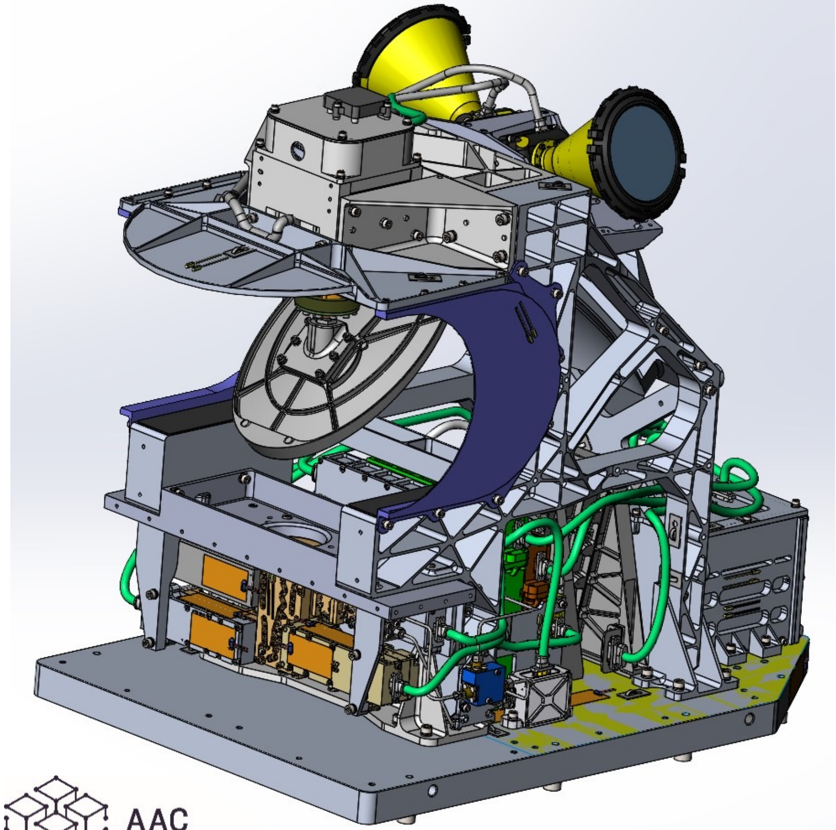
3D CAD MODEL & PHOTO



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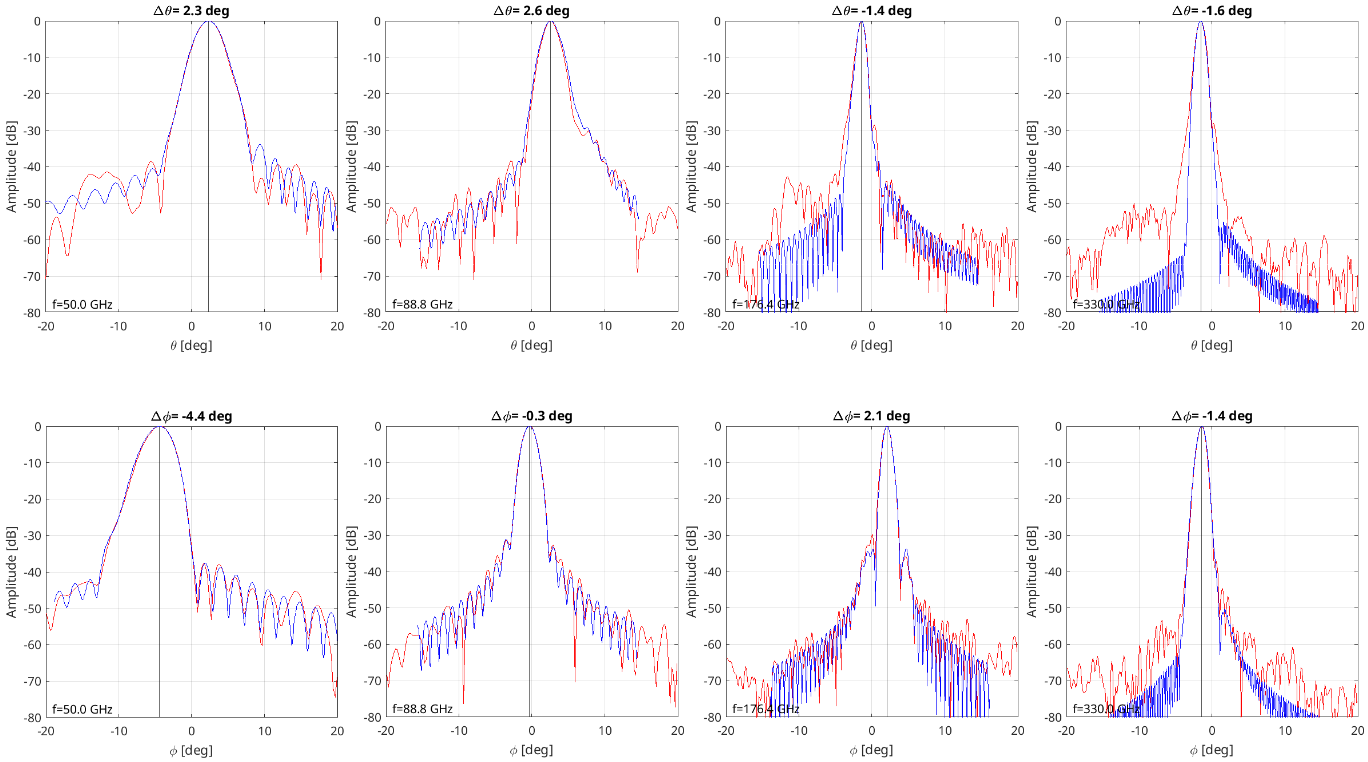
ANTENNA AND OPTICS

Beam shape in excellent correspondent to design (GRASP)

Relative beam pointing between receivers also excellent

In orbit pointing verification and correction will be used

Receiver	FWHM footprint (min) [km]	FWHM footprint (max) [km]
54	14.7	18.1
89	8.6	10.4
183	4.5	5.1
325	4.8	5.5



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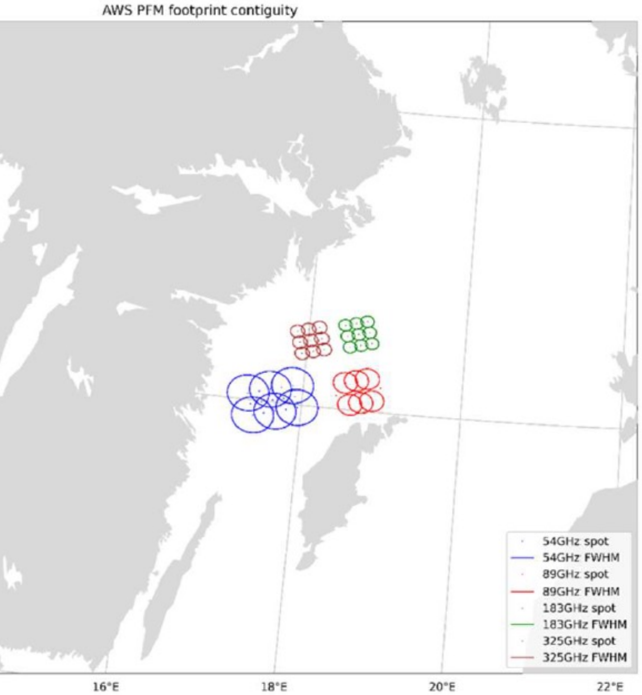
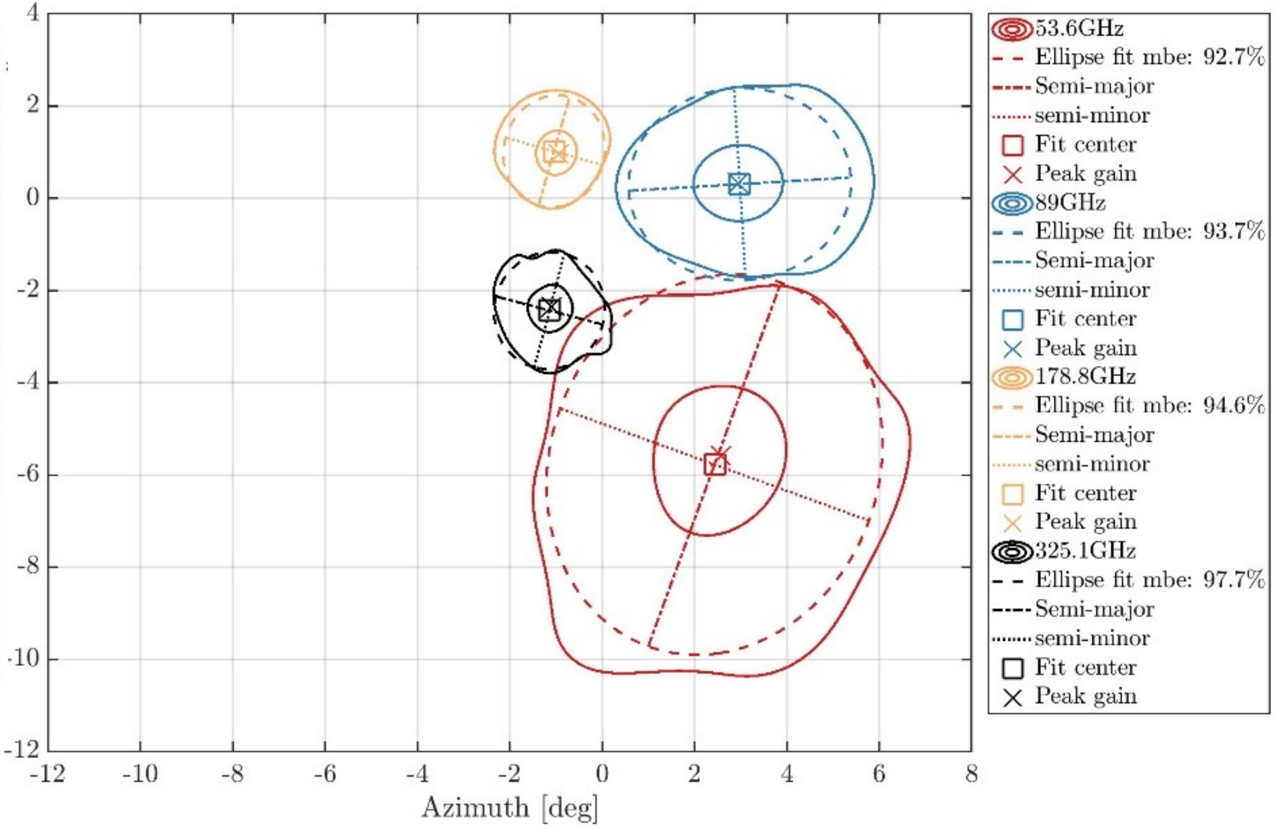
MAIN BEAM EFFICIENCY USING 2.5 TIMES FWHM ELLIPSE APPROXIMATION AS PERCENTAGES OF 4*PI.





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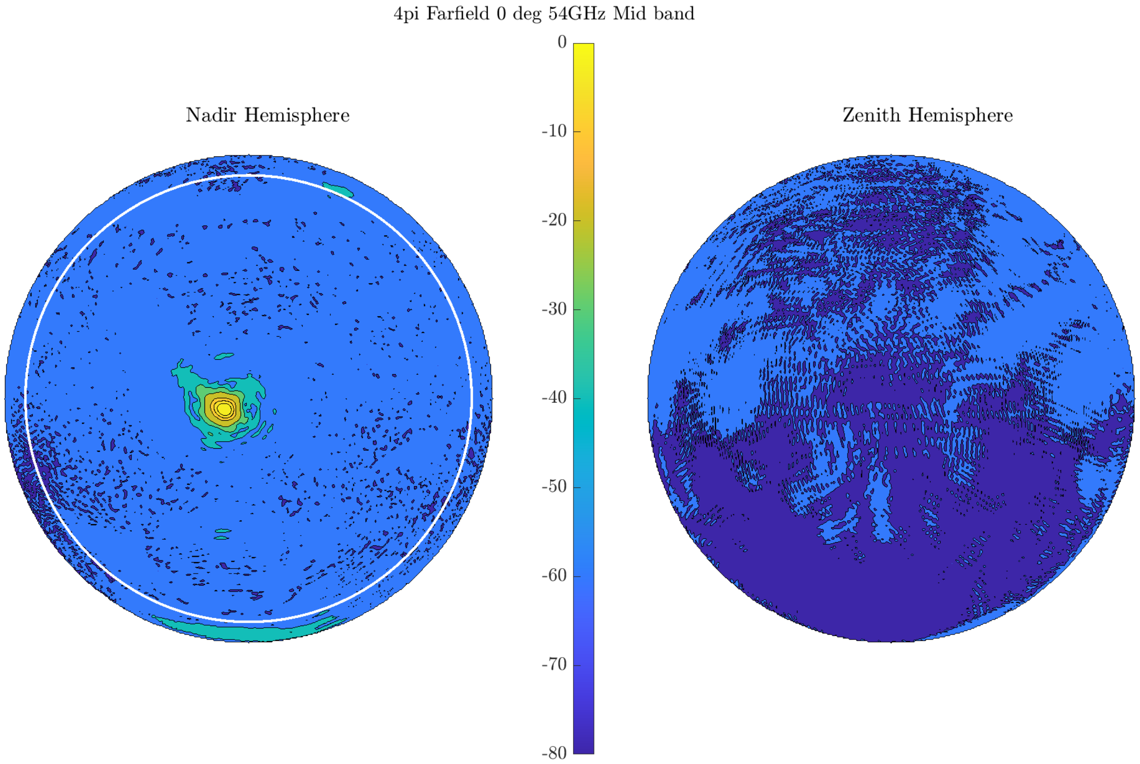
54 GHZ FARFIELD SIMULATION



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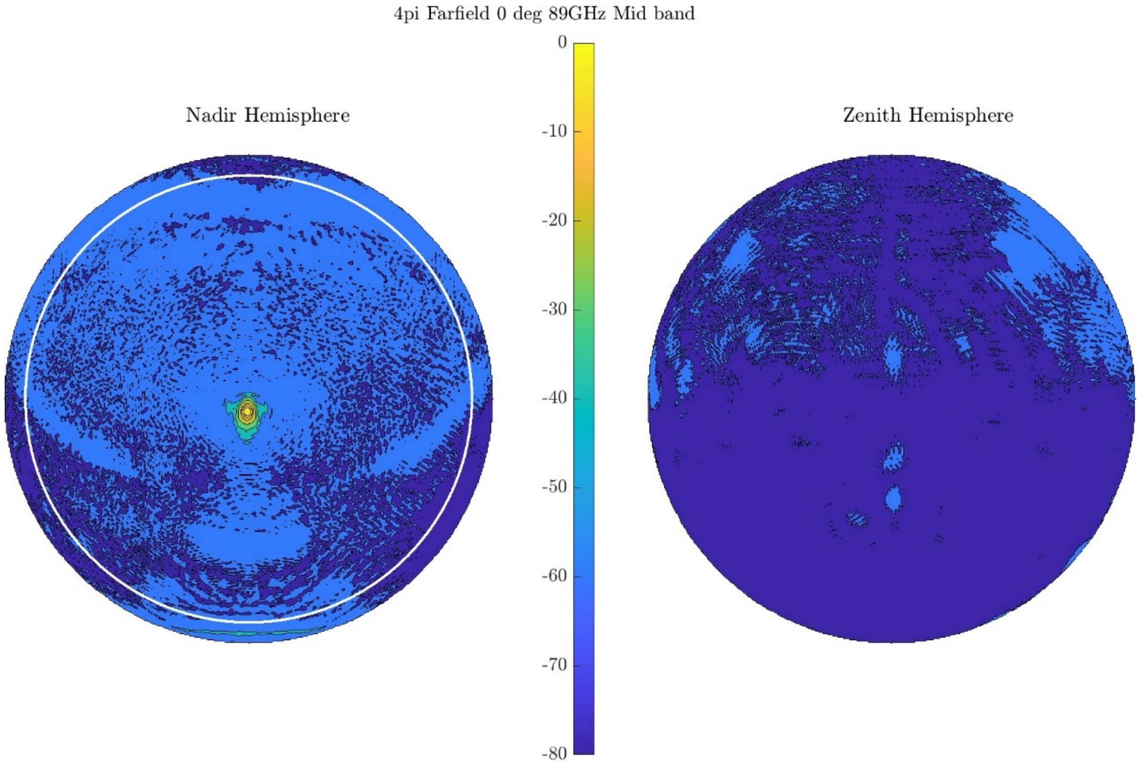
89 GHZ FARFIELD SIMULTATIONS



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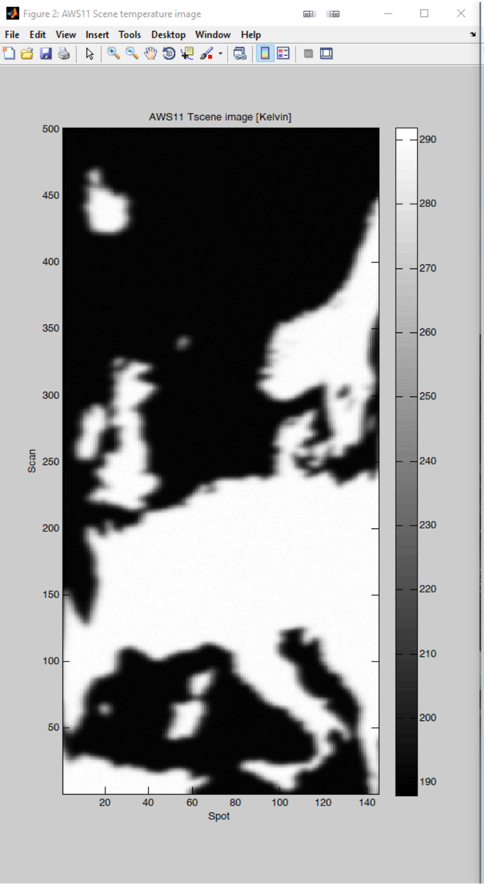
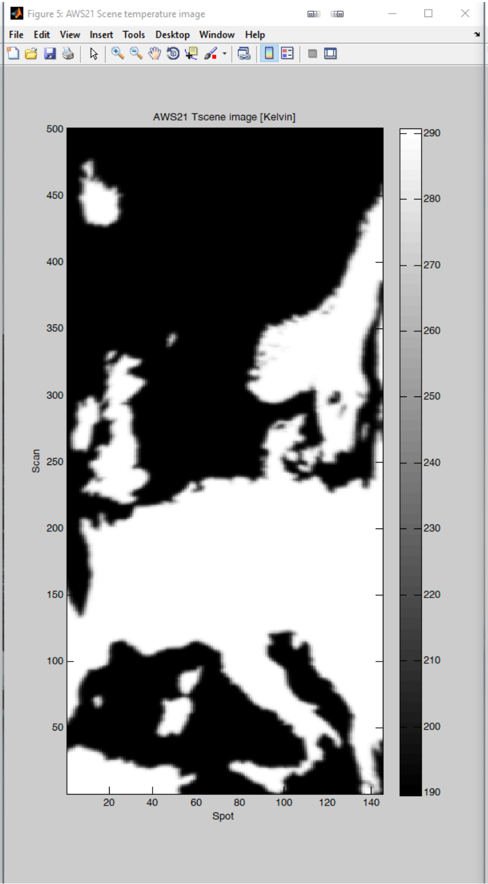
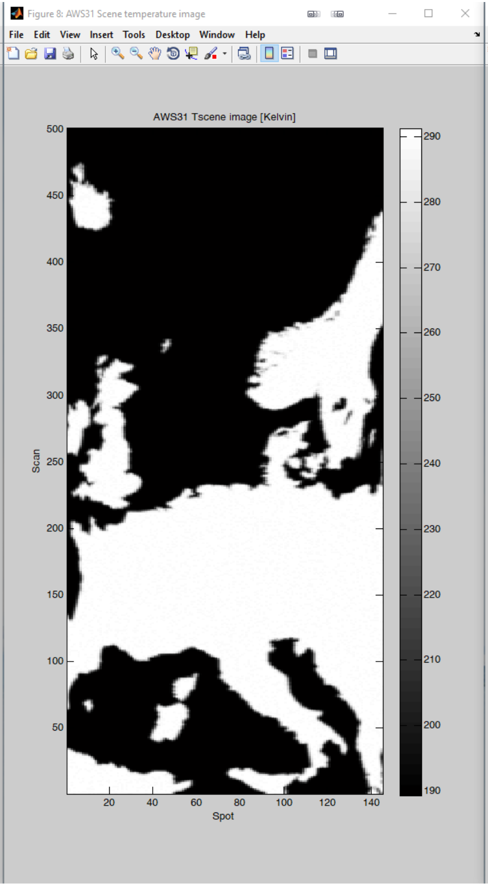
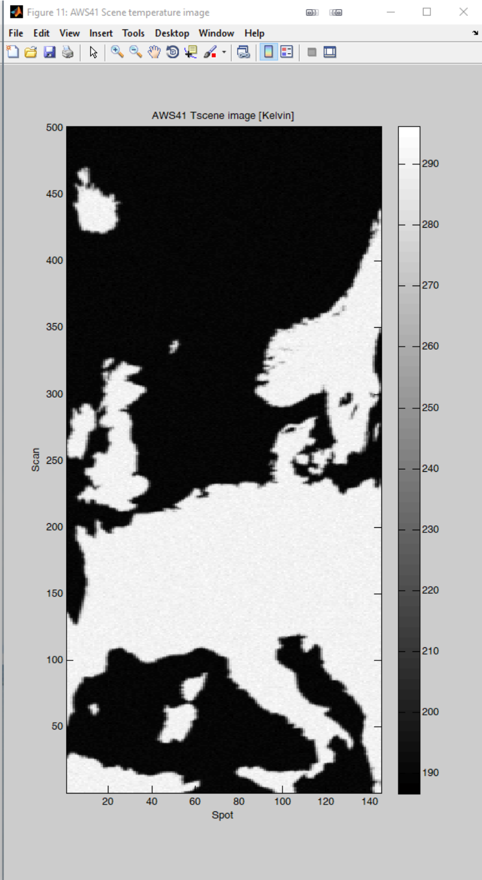
SIMULATED EARTH SCENE



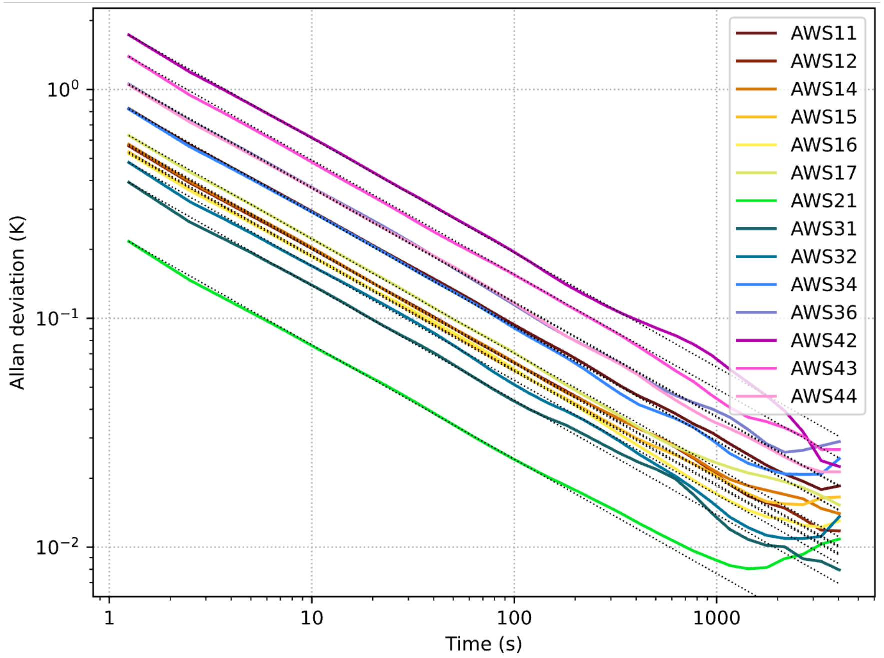






SENSITIVITY AND STABILITY

Channel	Frequency (GHz)	BW (MHz)	BW	NEDT req	Test	Accuracy
AWS-11	50.3	180	180	0.6	**0.484**	0.39
AWS-12	52.8	400	400	0.4	**0.363**	0.32
AWS-13	53.246	400	400	0.4	**0.396**	0.39
AWS-14	53.596	370	370	0.4	**0.354**	0.31
AWS-15	54.4	400	400	0.4	**0.365**	0.27
AWS-16	54.94	400	400	0.4	**0.412**	0.52
AWS-17	55.5	330	330	0.5	**0.515**	0.39
AWS-18	57.2903	330	330	0.6	**1.181**	0.60
AWS-21	89	3000	3000	0.3	**0.21**	0.11
AWS-31	165.5	2000	2000	0.6	**0.363**	0.20
AWS-32	176.311	2000	2000	0.7	**0.499**	0.27
AWS-33	178.811	2000	2000	0.7	**0.561**	0.29
AWS-34	180.311	1000	1000	1	**0.787**	0.30
AWS-35	181.511	1000	1000	1	**0.839**	0.32
AWS-36	182.311	600	600	1.3	**0.996**	0.32
AWS-41	325.15+-1.2	800	800	1.7	**1.601**	0.74
AWS-42	325.15+-2.4	1200	1200	1.4	**1.532**	0.71
AWS-43	325.15+-4.1	1800	1800	1.2	**1.051**	0.68
AWS-44	325.15+-6.6	2800	2800	1	**0.908**	0.64



Allan variance of calibrated data as in operation

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2.5 ms as nominal integration time
Average over 4 samples = 10 ms used to assess 50-58 GHz channels, using up to 16 could be relevant.

325 FREQUENCY RESPONSE

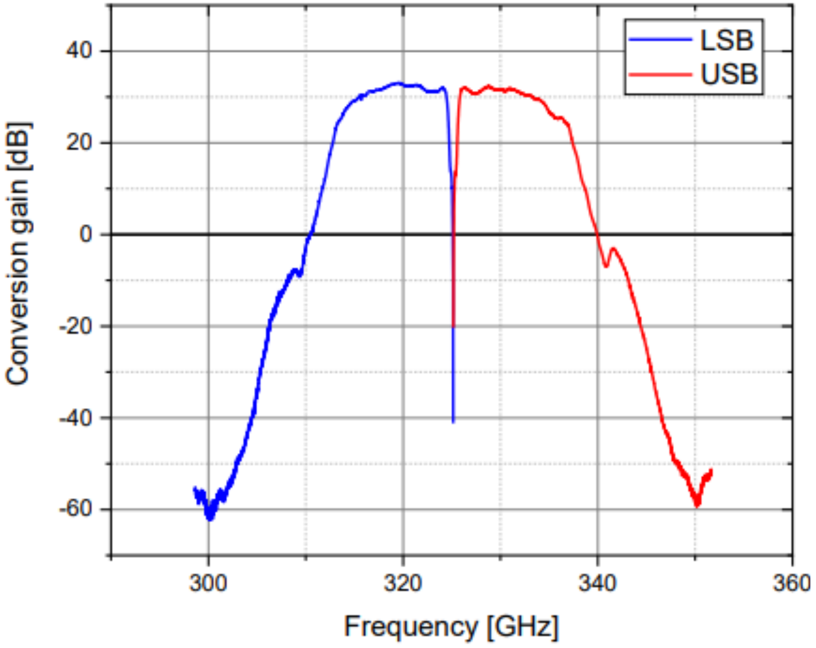
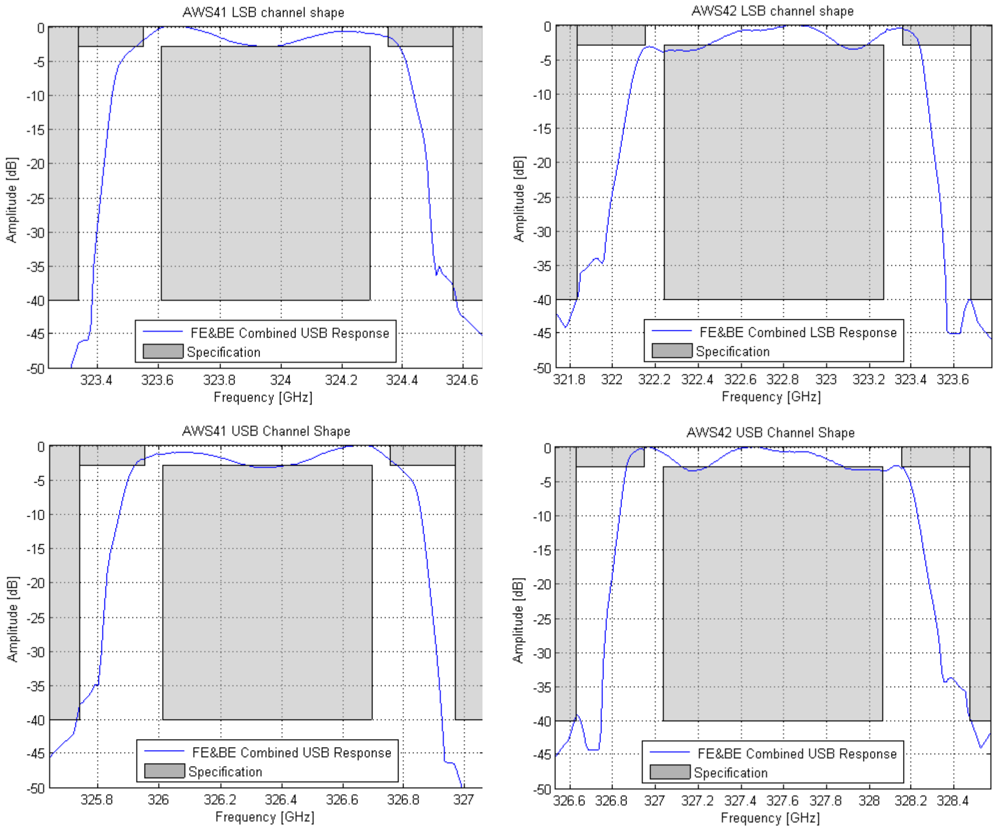


Figure 16: Gain over RF measurement FERX-325.



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THANK YOU

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