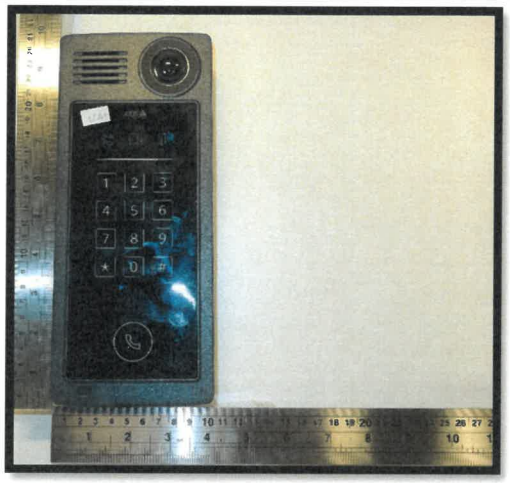
Prüfbericht-Nr.: *Test Report No.:*	60236958-002	**Auftrags-Nr.:** *Order No.:*	23870128
			Seite 1 von 33 *Page 1 of 33*
Kunden Referenz-Nr.: Client Reference No.:	-	**Auftragsdatum** *Order date:*	2018-12-17
Auftraggeber: *Client:*	Axis Communication AB Emdalavägen 14 223 69 Lund Sweden	Kahsay Tsegay Kahsay.Tsegay@axis.com +46 46 272 1800	
Prüfgegenstand: *Test item:*	Network Video Door Station		
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	AXIS A8207-VE FCC ID: PNB-AXISA8207-VE		
Auftrags-Inhalt: *Order content:*	FCC Certification testing of RFID 125 kHz and 13.56 MHz transmitter		
Prüfgrundlage: *Test specification:*	47 CFR FCC Part 15 subpart C Part. 15.209 and 15.225 - Intentional Radiators ANSI C63.10-2013		
Wareneingangsdatum: *Date of receipt:*	2018-12-19		
Prüfmuster-Nr.: *Test sample No.:*	A000221928-001 & A000221928-003		
Prüfzeitraum: *Testing period:*	2019-02-19 – 2019-03-07		
Ort der Prüfung: *Place of testing:*	Lund, Sweden		
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland Sweden		
Prüfergebnis: *Test results:*	Pass		



Geprüft von *Tested by:*	Stefan Olsson Test Engineer	**Kontrolliert von** *Reviewed by:*	Per Isacsson Lab Manager
2019-05-07		2019-05-07	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sontiges /*Other:*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts.

SWEDAC ACKREDITERING
Ackred. nr. 10325
Provning
ISO/IEC 17025

Revisions ***Revisions***			
Revision Revision	**Datum** Date	**Anmerkung** Remark	**Verfasser** Author
001	2019-03-29	First release	Stefan Olsson
002	2019-05-07	Update after TCB input	Stefan Olsson
Note: Latest revision report will replace all previous reports			

Summary of Test Results

FCC Rule Part	Test item	Result	Remarks
15.203	Antenna Requirements	N/A	Internal permanently attached antenna
15.207 (a)	Power Line Conducted Emissions	N/A	
15.215 (a) (b) (c)	Additional provisions to the general radiated emission limitations	Pass	
15.215 (c)	20 dB Bandwidth	Pass	
15.225 (a)	Field strength in band 13,553 – 13,567MHz	Pass	
15.225 (b)	Field strength in band 13,410-13,553 MHz and 13,567- 13,710 MHz	Pass	
15.225 (c)	Field strength in band 13,110-13,410 MHz and 13,710- 14,010 MHz	Pass	
15.225 (d) 15.209 (a) (f)	Field strength outside of the 13,110-14,010 MHz band	Pass	
15.225 (e)	Frequency tolerance of the carrier signal	Pass	
15.225 (f)	Radio frequency powered tags	N/A	Tag is not powered

Possible test case verdicts:

- test case does not apply to the test object ....: N/A
- test object does meet the requirement .....: PASS
- test object does not meet the requirement ....: FAIL
- test case not performed on the test object ....: n.p.

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1 TEST SITES

Testing facility

TÜV Rheinland Sweden AB
Mobilvägen 10
223 62 Lund
Sweden

FCC Test Firm Registration Number: 517458

2 PRODUCT INFORMATION

2.1 General description

Model name:	Axis A8207-VE Network Video Door Station
Manufacturer:	Axis Communication AB
Model number:	AXIS A8207-VE
FCC ID:	PNB-AXISA8207-VE
Description:	Network Video Door Station
Supported Radio Technologies:	Video active / T-coil induction loop active RFID 13.56 MHz RFID 125kHz
Highest internal frequency	1062MHz
Supply Voltage to Product:	DC Adaptor / POE
Ancillary Equipment:	See section 2.4

2.2 Radio specific details

2.2.1 RFID Radio

Operating Frequency Range	125 kHz and 13,56 MHz
Radio Protocol	RFID
Number of antennas	1
Antenna type	Internal coil

2.3 Equipment Under Test (EUT) identification

TÜV Rheinland ID	S/N	HW	SW
A000221928-001	ACCC8EBFA887	A2R6	1.85_EMC
A000221928-003	ACCC8EBFA885	A2R6	1.85_EMC

2.4 Ancillary equipment identification

Ancillary equipment	Type	Model	Manufacturer	S/N
A000218596-022	Multitone Field Strength meter	Univox FSM 2.0	UNIVOX	
A000218596-005	DC adapter	SA 150B-12U	Axis Communications	N/A
A000218596-006	HDMI cable			
A000218596-004	Electric Door Strike	893P	Von Duprin Indpls	24168759
A000218596-016	RFID card/tag	HF MIFARE RFID 13.56MHz		
A000218596-019	I/O cable	Multi conductor cable 4 x I/O ports		
A000218596-020	RS-865 cable	Multi conductor cable 485 A/B		
A000218596-021	Audio line-in/out	Dual shielded cables		
A000218596-011	Shielded Ethernet cable	CAT5E / 6STP		
A000218596-010	Shielded Ethernet cable	CAT5E / 6STP		
Equipment used outside the chamber				
A000218596-008	Computer	EliteBook 8470p	HP	-
A000218596-009	DC adapter for Computer	-	-	-
A000218596-003	PoE Midspan	AXIS T8134	Axis	PD-9501GR/AC

3 TEST METHODS AND OPERATION MODES

3.1 Test Methods

The following standards/references has been considered for the testing

Reference Standards	
Standard	**Description**
FCC Part 15 (Subpart C)	§15.225 Operation within the band 13.110 – 14.010 MHz.
FCC Part 15 (Subpart C)	§15.207 Conducted Limits
FCC Part 15 (Subpart C)	§15.209 Radiated emission limits; general requirements
FCC Part 15 (Subpart C)	§15.203 Antenna Requirement
ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 EUT Operation modes

Operation Mode	Description
#1	Continuous Modulated RF Transmission at 125 kHz and 13,56MHz at max power.

3.2.1 Tested channels/Frequencies

Frequency Band (MHz)	Frequency (MHz)
RFID 125 kHz	125 kHz
RFID 13,56 MHz	13,56 MHz

4 TEST METHODOLOGY

4.1 Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the turntable on an 80cm high table for below 1 GHz & 1.5 m height for above 1 GHz measurement, for frequencies up to 18GHz the EUT is 3 meters far from the measuring antenna, above 18GHz the distance is 1 meter. The turntable was rotated 360˚ for obtaining the maximum emission. The height of the measuring antennas was scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurements above 1000 MHz was performed by 3 different horn antennas, the measurement below 30 MHz was performed by loop antenna and measurement from 30 MHz to 1 GHz was performed by Log-Periodic Antenna.

Test Setup Configuration

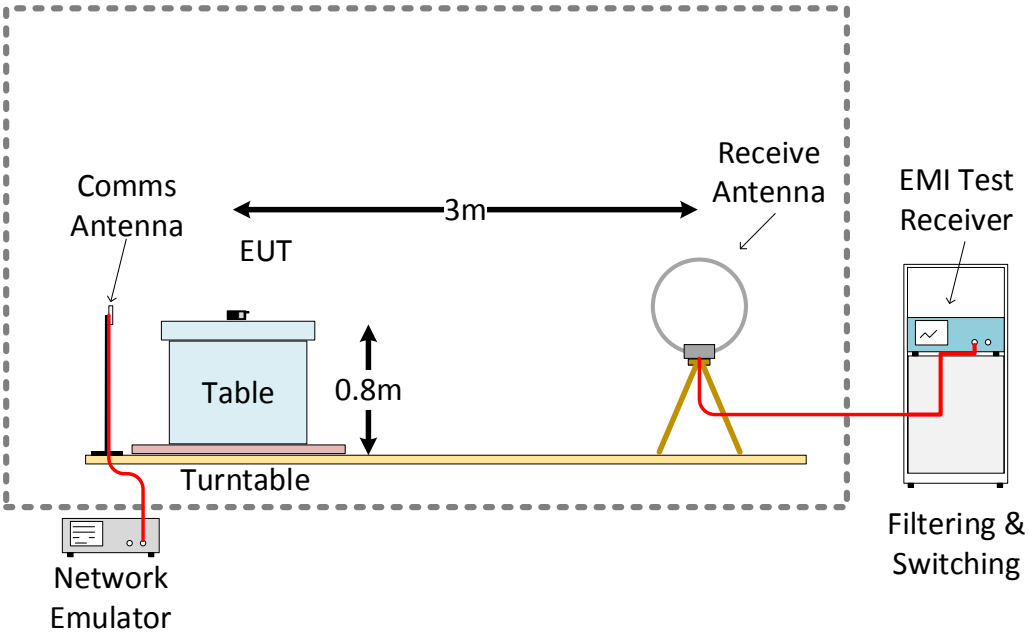


Figure 1: Frequency range 9 KHz – 30 MHz

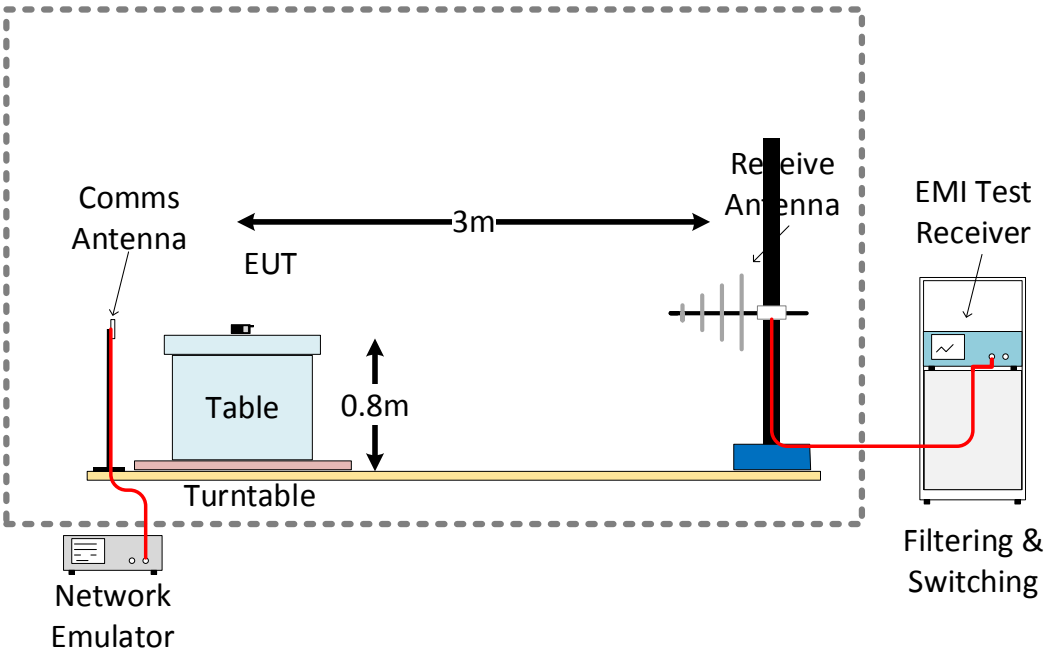


Figure 2: Frequency range 30 MHz – 1 GHz

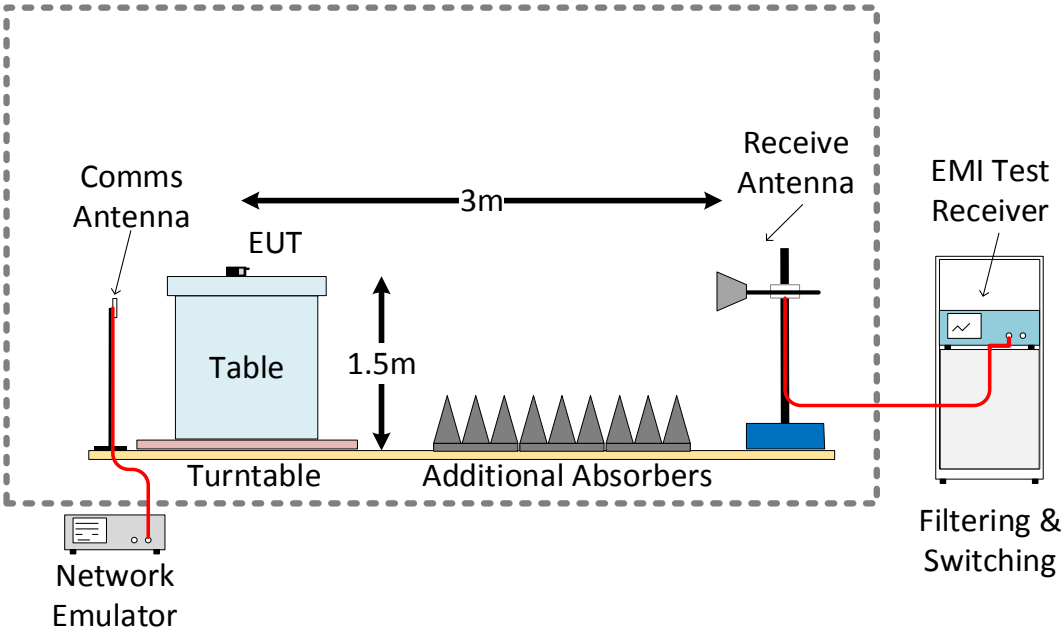


Figure 3: Frequency range 1 GHz – 18 GHz

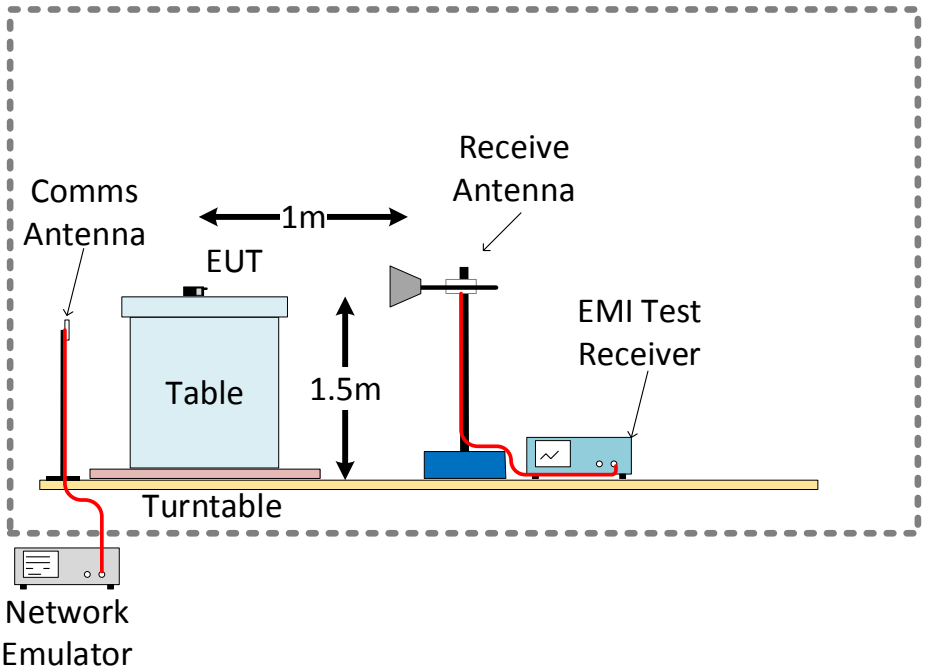


Figure 4: Frequency range 18 GHz – 40 GHz

5 TEST RESULTS

5.1 Radiated emissions

Result	Pass
Equipment under Test	A000221928-001
Test period	2019-02-19 – 2019-02-25
Test Engineer	Stefan Olsson
Test Specification	FCC part 15 Subpart C Section Part 15.205, 15.209, 15.225
Test Method	ANSI C 63.10 - 2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3 m
Detector	QP for frequencies below 1 GHz, average for frequencies above 1 GHz
Requirement	As per the limits in the below table
EUT Operation mode	#1
Ancillary equipment	See section 2.4
Environmental conditions	Temperature: + 18 - 20 °C Relative Humidity: 20 - 40 %

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Note: * The limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 128.51 – 93.80, 73.80 – 62.96 and 69.54 dBµV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

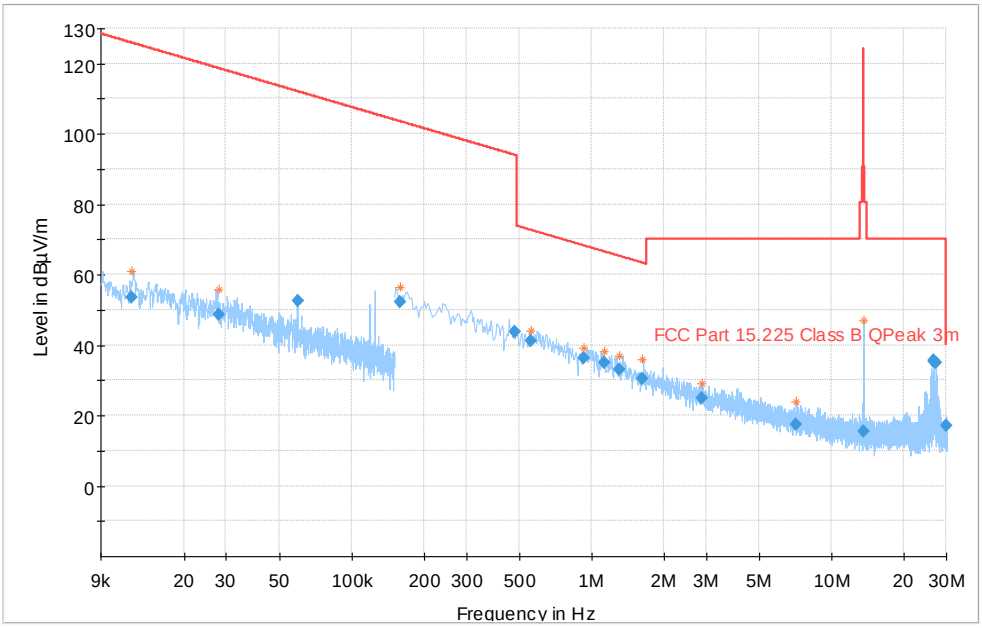
For measurements above 18GHz the measurement was performed at 1m distance, the limit line has been adjusted for this using the following formula: Extrapolation (dB) = 40log (3meter / 1meter) = +19,08db

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

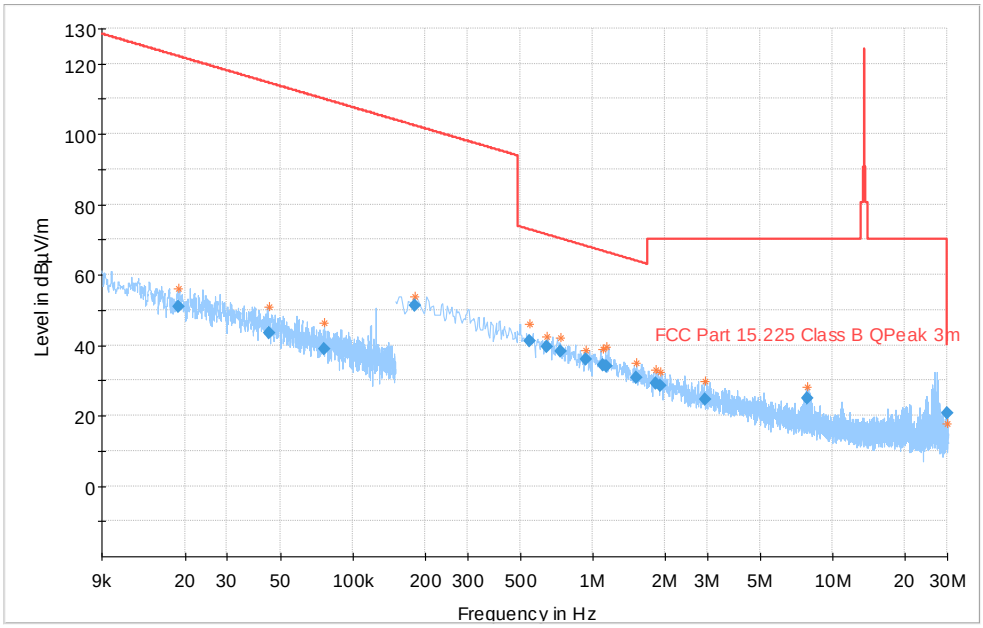
5.1.1 Radiated Emissions - Test results for frequencies in the range 9 kHz - 30 MHz

All emissions were greater than 20dB below the limit for all 9kHz to 30MHz tests.

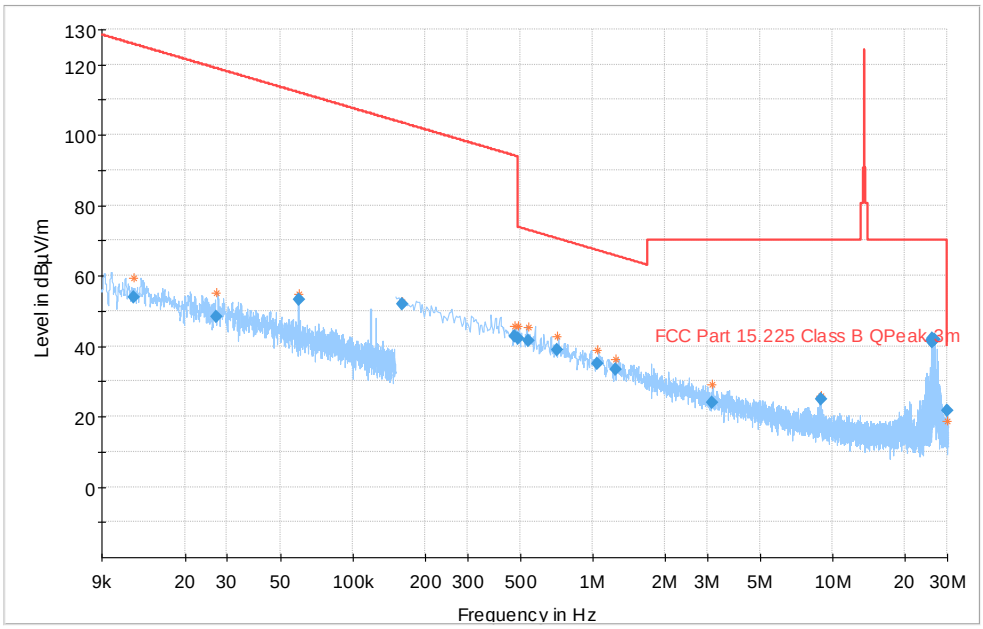
RFID 125 kHz and 13,56MHz - 9kHz - 30Mhz Perpendicular orientation



RFID 125 kHz and 13,56MHz - 9kHz - 30Mhz Parallel orientation



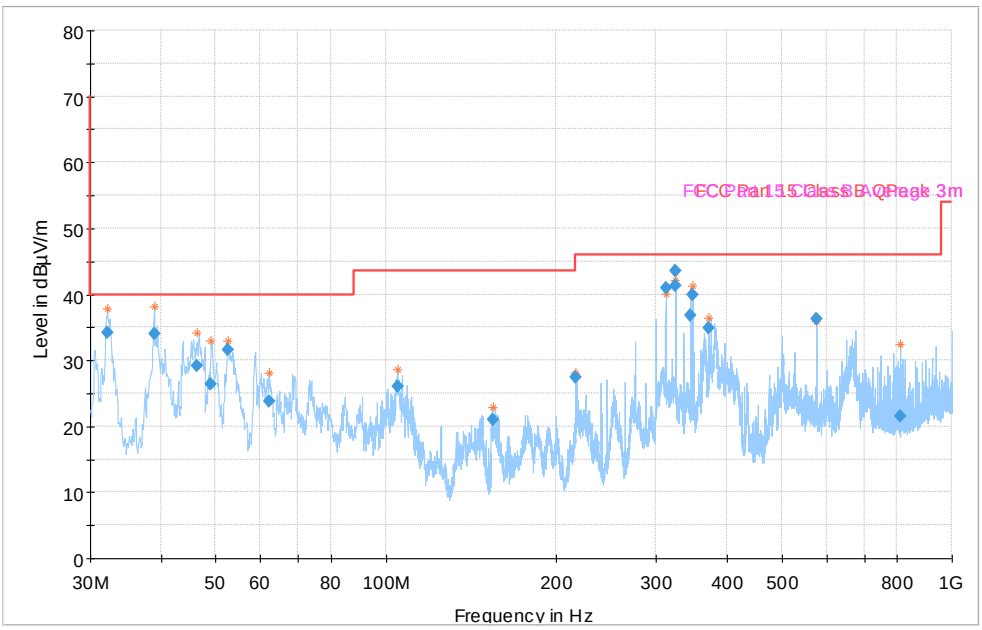
RFID 125 kHz and 13,56MHz - 9kHz - 30Mhz Ground-Parallel orientation



5.1.2 Radiated Emissions - Test results for frequencies in the range 30 MHz - 1 GHz

For all tests between 30MHz and 1GHz the 6 measurement points closest to the limit is listed in the table below the graph.

RFID 125 kHz and 13,56MHz



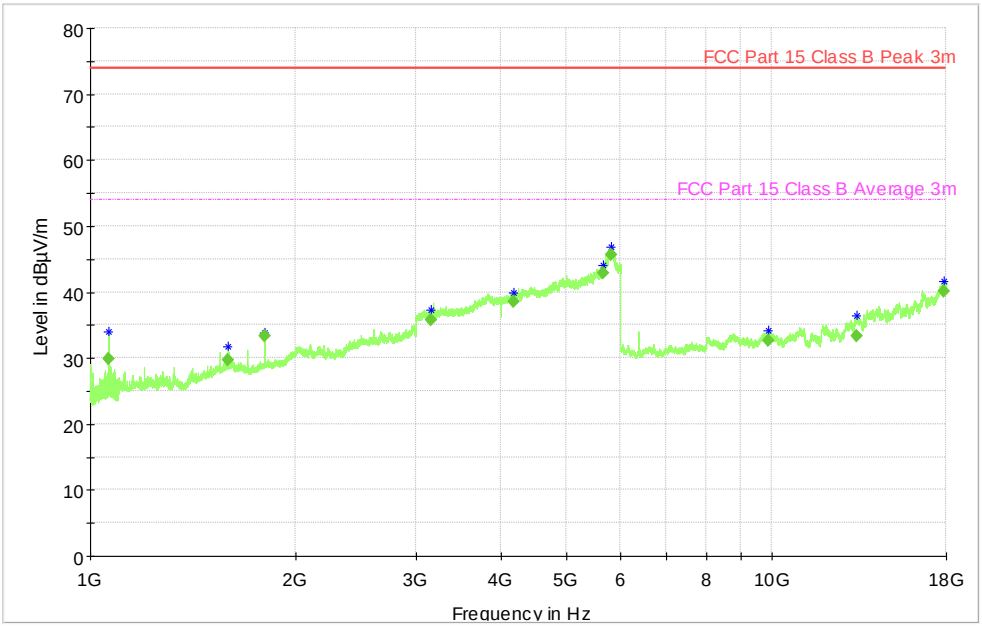
Frequency (MHz)	Quasi Peak (dBµV /m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.141680	34.12	40.00	5.88	120.000	103.0	V	316.0
38.971280	34.05	40.00	5.95	120.000	100.0	V	251.0
311.992320	41.01	46.00	4.99	120.000	104.0	H	115.0
323.997880	43.62	46.00	2.38	120.000	100.0	H	250.0
324.984800	41.26	46.00	4.74	120.000	130.0	H	-20.0
347.995400	39.93	46.00	6.07	120.000	100.0	H	250.0

Note: 323.997880MHz measurement value is within the measurement uncertainty

5.1.3 Radiated Emissions - Test results for frequencies in the range 1 GHz - 18 GHz

For the test between 1GHz and 18GHz the 6 measurement points closest to the limit is listed in the table below the graph.

RFID 125 kHz and 13,56MHz



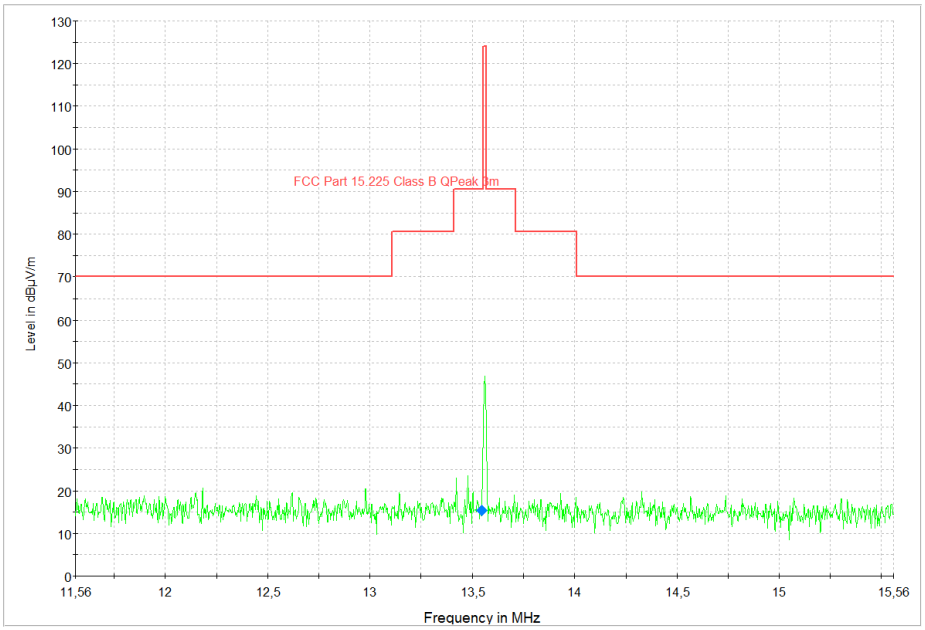
Frequency (MHz)	Average (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1800.034000	33.35	---	54.00	20.65	1000.0	1000.000	135.0	V	233.0
3165.901000	35.73	---	54.00	18.27	1000.0	1000.000	103.0	V	142.0
4176.190000	38.45	---	54.00	15.55	1000.0	1000.000	105.0	V	310.0
5642.066000	42.84	---	54.00	11.16	1000.0	1000.000	102.0	H	52.0
5808.283000	45.63	---	54.00	8.37	1000.0	1000.000	206.0	H	-8.0
17890.609000	40.10	---	54.00	13.90	1000.0	1000.000	186.0	H	262.0

5.2 Field strength in band 13,110 - 14,010MHz

Result	Pass
Equipment under Test	A000221928-001
Test period	2019-02-25
Test Engineer	Stefan Olsson
Test Specification	FCC part 15 Subpart C Section 15.225 (a) (b) (c)
Test Method	ANSI C 63.10 - 2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3 m
Detector	QP for frequency below 1 GHz, average for frequency above 1 GHz
Requirement	a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
EUT Operation mode	# 1
Ancillary equipment	See section 2.4
Environmental conditions	Temperature: + 18 - 20 °C Relative Humidity: 20 - 40 %

Note: In accordance with 47 CFR 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = 40log (300meter / 3meter) = +80db Extrapolation (dB) = 40log (30meter / 3meter) = +40db

Worst case from perpendicular antenna position



5.3 Frequency tolerance of the carrier signal 13,56 MHz

Result	Pass
Equipment under Test	A000221928-003
Test period	2019-04-29 – 2019-05-03
Test Engineer	Niall Forrester
Test Specification	FCC part 15 Subpart C Section 15.225 (e)
Test Method	ANSI C 63.10 - 2013
Measurement Location	Climatic Chamber
EUT Operation mode	# 1
Ancillary equipment	A000218596-016 RFID Card
Environmental conditions	According to below table

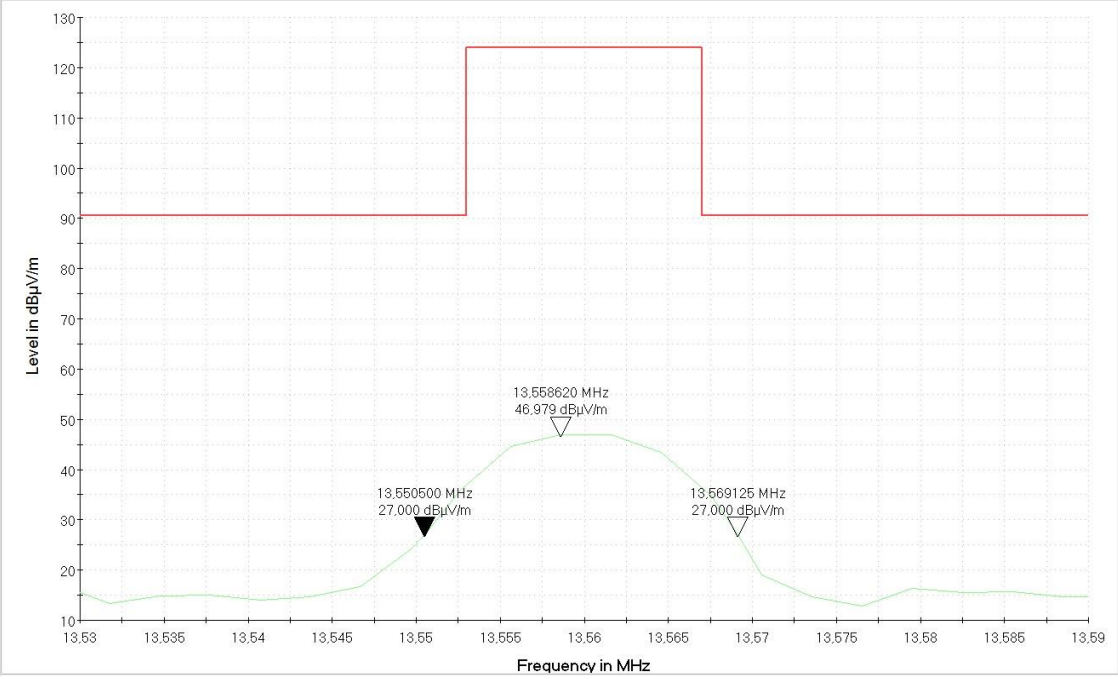
Temperature (°C)	Voltage (V)	Measured Frequency (MHz)	Delta from nominal (PPM)
20	12,00 (nominal)	13,560126	
20	10,20	13,560128	0,15
20	13,80	13,560126	0

Temperature (°C)	Voltage (V)	Measured Frequency (MHz)				Maximum delta from nominal (PPM)
		Start	2 min	5 min	10 min	
50	12,01	13,560072	13,560072	13,560072	13,560080	3,98
40	11,99	13,560081	13,560080	13,560080	13,560080	3,39
30	12,00	13,560110	13,560094	13,560094	13,560094	2,36
20 (Nominal)	12,00	13,560126	13,560126	13,560126	13,560126	0
10	12,00	13,560162	13,560162	13,560162	13,560162	2,65
0	11,99	13,560194	13,560194	13,560194	13,560194	5,01
-10	11,99	13,560194	13,560194	13,560194	13,560194	5,01
-20	12,00	13,560178	13,560178	13,560178	13,560178	3,83

5.4 -20dB Bandwidth

Result	Pass
Equipment under Test	A000221928-001
Test period	2019-02-25
Test Engineer	Stefan Olsson
Test Specification	FCC part 15 Subpart C Section 15.215 (c)
Test Method	ANSI C 63.10 – 2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3 m
Detector	Quasi Peak
EUT Operation mode	#1
Ancillary equipment	See section 2.4
Environmental conditions	Temperature: + 18 - 20 °C Relative Humidity: 20 - 40 %

-20dB Bandwidth graph



Description	Frequency
Fundamental	13,558620 MHz
-20dB, low end	13,550500 MHz
-20dB, high end	13,569125 MHz
Bandwidth @ -20dB:	18,625 kHz

5.5 Additional provisions to the general radiated emission limitations

Result	Pass
Test Specification	FCC part 15 Subpart C Section 15.215 (a) (b) (c)
Test Method	ANSI C 63.10 – 2013
EUT Operation mode	#1

(a) The regulations in §§ 15.217-15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.	
(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in Section 15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.	**Verdict** Pass
(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least	**Verdict** Pass

6 TEST EQUIPMENT LIST

6.1 SAC 5 chamber

Test Equipment List					
Type:	**Manufacturer**	**Model**	**Serial Number**	**GTEM ID**	**Calibration Due:**
EMI Test Receiver	Rohde & Schwarz	ESW44	101760	2881044	27.07.2019
Ultra Broadband Antenna	Rohde & Schwarz	HL562E	100988	2823181	08.03.2020
Double Ridged Waveguide Horn Antenna	Rohde & Schwarz	HF907	102678	2823164	13.02.2020
Horn Antenna – 18 GHz – 26 GHz	ETS Lindgren	UG-596A/U	20898	2814839	10.08.2019
Horn Antenna – 26 GHz - 40 GHz	ETS Lindgren	UG-600A/U	20623	2814834	10.08.2019
Frequency Multiplier	Rohde & Schwarz	SMZ-90	101350	2886126	13.08.2019
Control device	Maturo	NCD	NCD/393/2372.01	2884216	-
Open Switch & Control Unit	Rohde & Schwarz	OSP150	100081	2884198	09.09.2019
Open Switch & Control Unit	Rohde & Schwarz	OSP120	100084	2761253	09.09.2019
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 1	101333	2761265	09.09.2019
Shielded Filter Unit	Rohde & Schwarz	OSP-F Extension 2	101335	2761266	09.09.2019
Shielded Filter Unit	Rohde & Schwarz	OSP-F Base Unit	101330	2761262	09.09.2019
Humidity Temperature Probe	Rotronic	HF532-DG1XX21X	0061829280	2926379	14.08.2020

6.2 Temperature and frequency tests

Test Equipment List					
Type:	**Manufacturer**	**Model**	**Serial Number**	**GTEM ID**	**Calibration Due:**
Test fixture RF-ID	TÜV	-	-	29822823	-
Multimeter	Fluke	87	61320241	2744110	03.08.2019
Thermometer	Fluke	51	41410362WS	2807523	30.04.2019
Thermocoupler	Fluke		WPL26041802	2807528	30.04.2019
Power Supply	Power Box	Powerbox 3000	1737	2759290	-
Climat Chamber	Vötsch	VT4002	58566032870010	2709706	-
Spectrum Analyser	Rohde & Schwarz	FS26	100308	2704108	13.07.2019

7 MEASUREMENT UNCERTAINTY

7.1 SAC 5

Measurement Uncertainty for Radiated Emission (Coverage Factor k=2)	
Parameter	**Uncertainty**
Field Strength 10 Hz -9 kHz	3,38 dB
Field Strength 9 kHz -30 MHz	3,38 dB
Field Strength 30 MHz -1000 MHz	3,38 dB
Field Strength 1 GHz -18 GHz	4,88 dB
Field Strength 18 GHz - 40 GHz	5,14 dB

7.2 Frequency measurements

Measurement Uncertainty for frequency measurements (Coverage Factor k=2)	
Parameter	**Uncertainty**
Frequency (Hz)	5,81E-06 %

7.3 Temperature measurements

Measurement Uncertainty for temperature measurement (Coverage Factor k=2)	
Parameter	**Uncertainty**
Temperature (° C)	1,00E-01 %

8 APPENDIX 1 – TEST SETUP PHOTOS

Photos of test setups

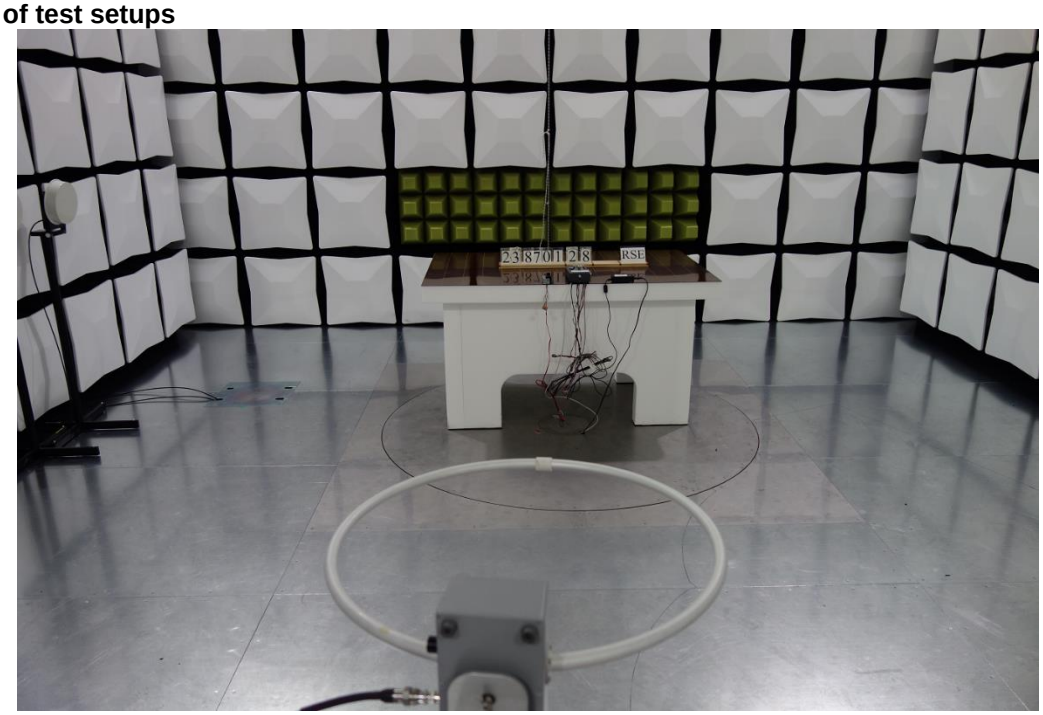


Photo of test setup for 9 kHz – 30 MHz Ground-parallel position

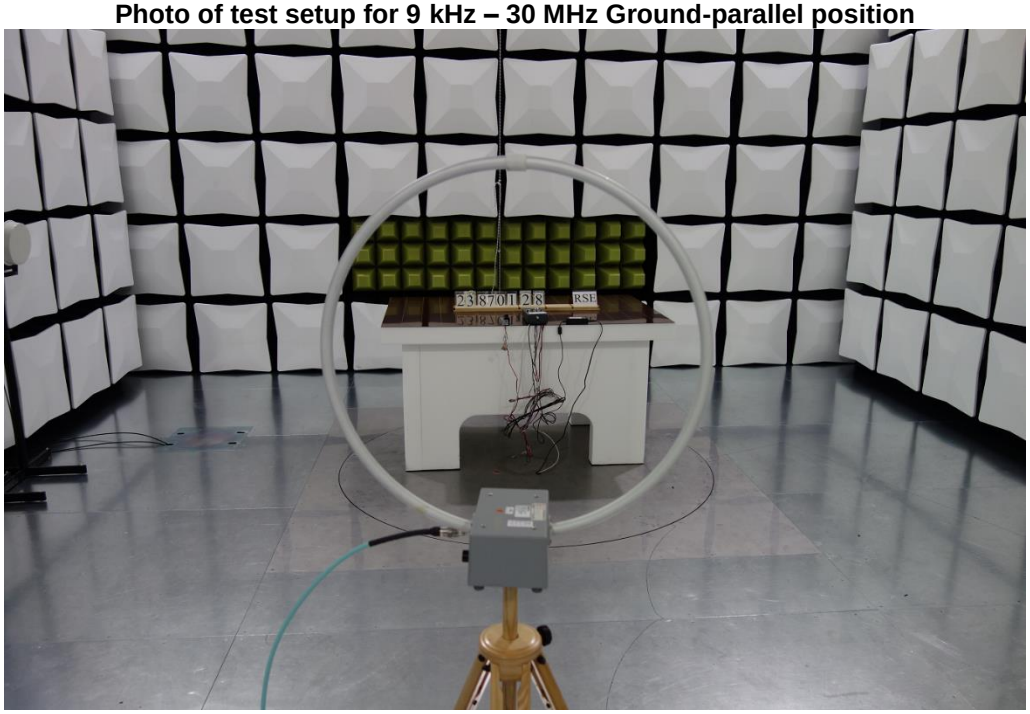


Photo of test setup for 9 kHz – 30 MHz perpendicular position

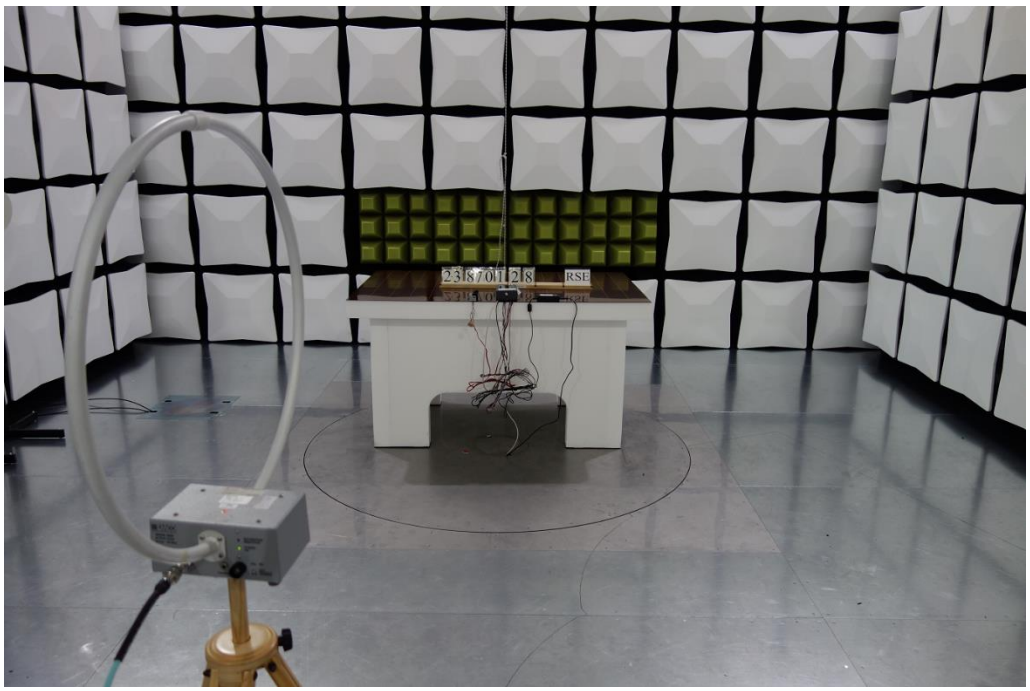


Photo of test setup for 9 kHz – 30 MHz parallel position

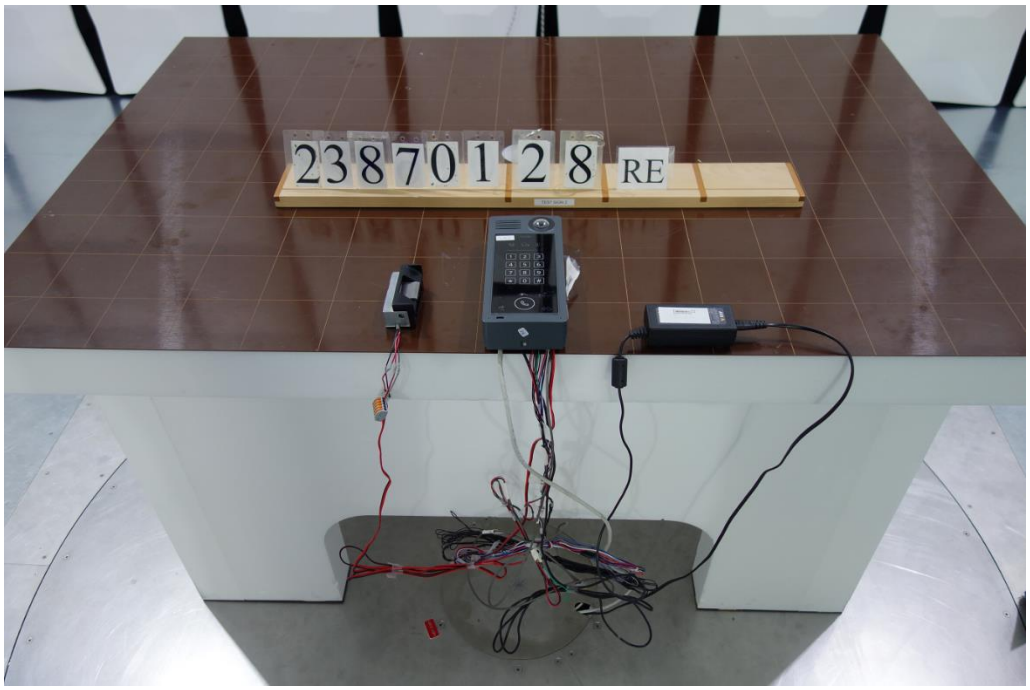


Photo of setup for 30 MHz – 1 GHz

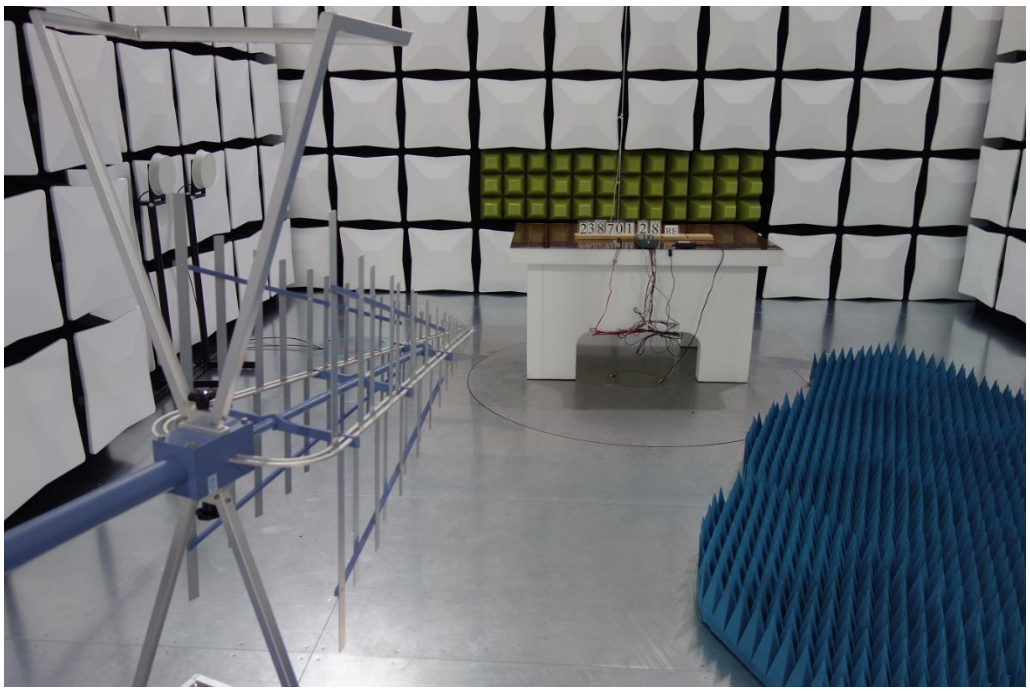


Photo of setup for 30 MHz – 1 GHz

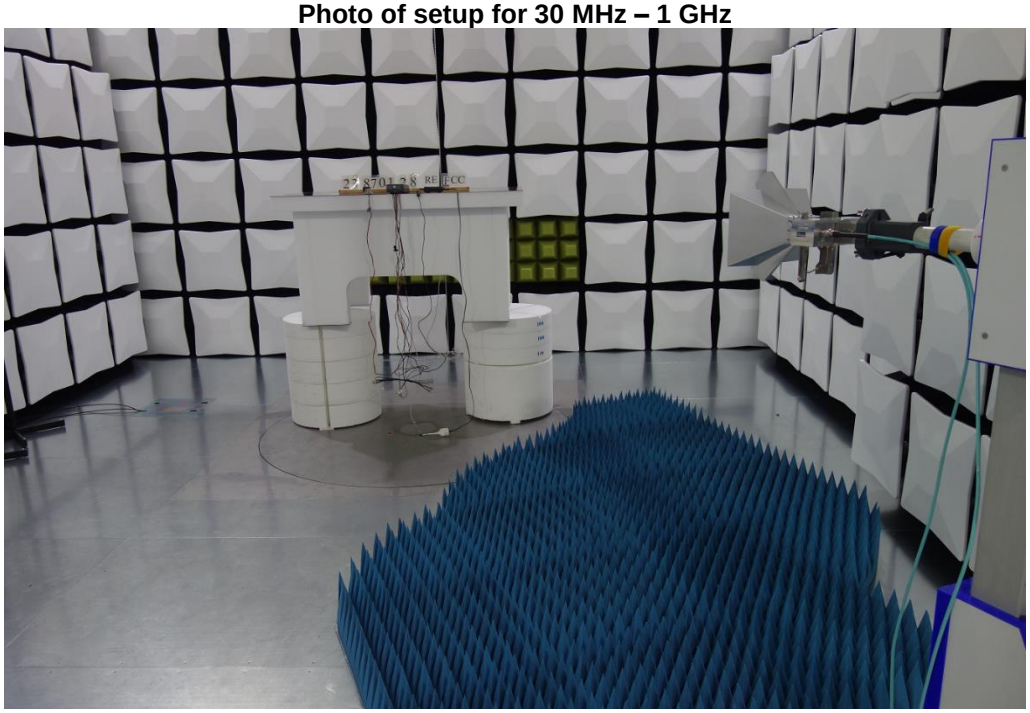


Photo of setup for 1 GHz – 18 GHz

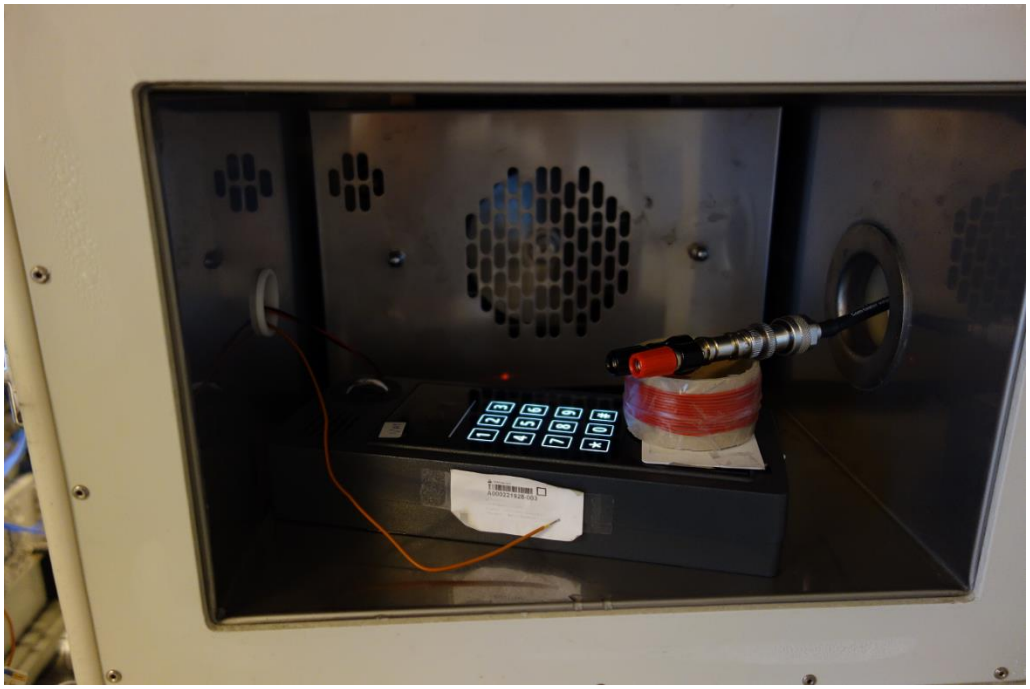
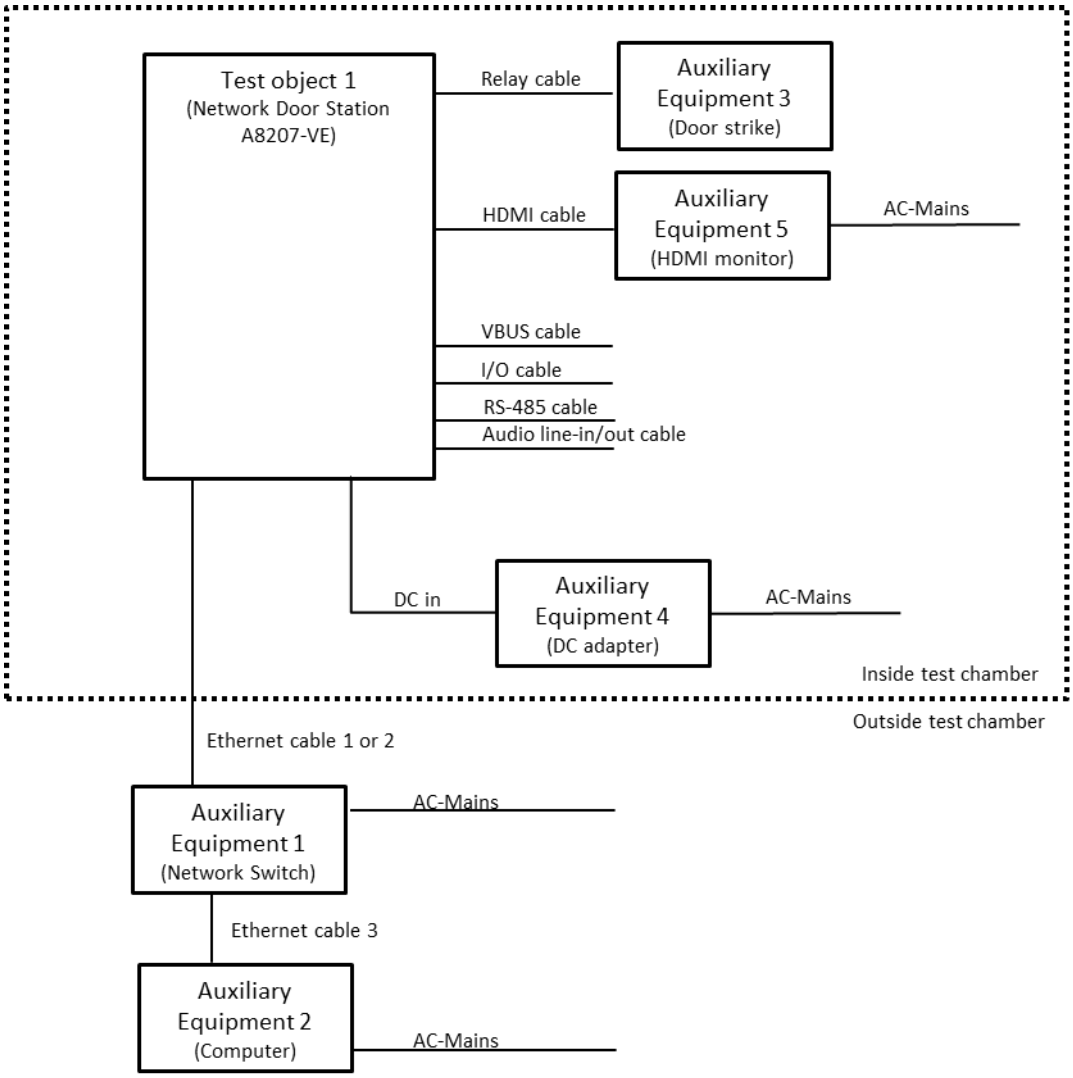


Photo of EUT in Climate chamber

Photo of test setup with climate chamber

9 APPENDIX 2: SCHEMATIC OF TEST SETUP

9.1 DC-in setup diagram for AXIS A8X07-VE