FCC Measurement/Technical Report on

Level Probing Radar
Optiwave 15xx series

FCC ID: 2AV6KH
IC: 1991B-H

Test Report Reference: MDE_KROHN_2102_FCC_04

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

Deutsche
Akkreditierungsstelle
D-PL-12140-01-00

Table of Contents

1 APPLIED STANDARDS AND TEST SUMMARY

1.1 APPLIED STANDARDS

Type of Authorization
Certification for an Intentional Radiator.

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-23 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.209 Radiated emission limits; general requirements

§ 15.256 Operation of level probing radars within the bands 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 1.3 Measurement Summary / Signatures.

1.2 FCC-IC CORRELATION TABLE

Correlation of measurement requirements for Level-Probing-Radars equipment from FCC and IC

Measurement	FCC reference	IC reference
Fundamental bandwidth	§ 15.256 (f) (1) (2)	RSS-211 (March 2015): 5.1 (a)
Fundamental emission	§ 15.256 (g)	RSS-211 (March 2015): 5.2 (b)
Unwanted emissions	§ 15.256 (h)	RSS-211 (March 2015): 5.3
Antenna beamwidth	§ 15.256 (i) (B)	RSS-211 (March 2015): 5.2 (a)
Antenna side lobe gain	§ 15.256 (j)	RSS-211 (March 2015): 5.2 (c)
Frequency Stability	§ 15.215 (c)	RSS-211 (March 2015): 5.1 (f)

1.3 MEASUREMENT SUMMARY / SIGNATURES

Local Display Variant

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (f)**

Fundamental bandwidth
The measurement was performed according to ANSI C63.10 (2020) Chapter 9.3 **Final Result**

OP-Mode Radio Technology, OBW, Operating Band, Measurement Parameters	Setup	Date	FCC	IC
FMCW Radar, 4 GHz, 75 GHz - 85 GHz, FCC	S01_BA01	2025-01-08	Passed	-
FMCW Radar, 2 GHz, 75 GHz - 85 GHz, FCC	S01_BA01	2025-01-08	Passed	-
FMCW Radar, 1 GHz, 75 GHz - 85 GHz, FCC	S01_BA01	2025-01-08	Passed	-
FMCW Radar, 4 GHz, 75 GHz - 85 GHz, ISED	S01_BA01	2025-05-27	-	Passed
FMCW Radar, 2 GHz, 75 GHz - 85 GHz, ISED	S01_BA01	2025-05-27	-	Passed
FMCW Radar, 1 GHz, 75 GHz - 85 GHz, ISED	S01_BA01	2025-05-27	-	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (g)**

Fundamental emission
The measurement was performed according to ANSI C63.10 (2020) Chapter 9.8 **Final Result**

OP-Mode Radio Technology, OBW, Operating Band	Setup	Date	FCC	IC
FMCW Radar, 4 GHz, 75 GHz - 85 GHz	S01_BA01	2025-01-08 2025-01-14	Passed	Passed
FMCW Radar, 2 GHz, 75 GHz - 85 GHz	S01_BA01	2025-01-08 2025-01-14	Passed	Passed
FMCW Radar, 1 GHz, 75 GHz - 85 GHz	S01_BA01	2025-01-07 2025-01-08	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (h)**

Unwanted emissions
The measurement was performed according to ANSI C63.10 (2020) Chapter 6.4, 6.5, 6.6 **Final Result**

OP-Mode: outside tank enclosure Radio Technology, OBW, Measurement range	Setup	Date	FCC	IC
FMCW Radar, 4 GHz, 9 kHz – 30 MHz	S01_BA01	2024-12-20	Passed	Passed
FMCW Radar, 4 GHz, 30 MHz – 1 GHz	S01_BA01	2024-12-20	Passed	Passed
FMCW Radar, 4 GHz, 1 GHz – 18 GHz	S01_BA01	2024-12-20	Passed	Passed
FMCW Radar, 4 GHz, 18 GHz – 26 GHz	S01_BA01	2025-01-01	Passed	Passed
FMCW Radar, 4 GHz, 26 GHz – 40 GHz	S01_BA01	2025-01-14	Passed	Passed
FMCW Radar, 4 GHz, 40 GHz – 60 GHz	S01_BA01	2025-01-14	Passed	Passed
FMCW Radar, 4 GHz, 60 GHz – 90 GHz	S01_BA01	2025-01-14	Passed	Passed
FMCW Radar, 4 GHz, 90 GHz – 140 GHz	S01_BA01	2025-01-14	Passed	Passed
FMCW Radar, 4 GHz, 140 GHz – 200 GHz	S01_BA01	2025-01-14	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (i)**

Antenna beamwidth

The measurement was performed according to ETSI EN 302 729 V2.1.1, chapter 6.8 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Band				
FMCW Radar, 75 GHz - 85 GHz	S01_BA01	2024-10-31	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (j)**

Antenna side lobe gain

The measurement was performed according to ETSI EN 302 729 V2.1.1, chapter 6.8 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Band				
FMCW Radar, 75 GHz - 85 GHz	S01_BA01	2024-10-31	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart C §15.256 **§ 15.256 (c)**

Frequency Stability

The measurement was performed according to ANSI C63.10 (2020) Chapter 6.8 **Final Result**

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Band				
FMCW Radar, 75 GHz - 85 GHz	S01_BA01	2025-04-04	Passed	Passed

Standard Variant

47 CFR CHAPTER I FCC PART 15 § 15.256 (h)
Subpart C §15.256

Unwanted emissions
The measurement was performed according to ANSI C63.10 (2020) Chapter 6.4, 6.5, 6.6 **Final Result**

OP-Mode: outside tank enclosure Radio Technology, OBW, Measurement range	**Setup**	**Date**	**FCC**	**IC**
FMCW Radar, 4 GHz, 9 kHz – 30 MHz	S01_CA01	2025-04-12	Passed	Passed
FMCW Radar, 4 GHz, 30 MHz – 1 GHz	S01_CA01	2025-04-12	Passed	Passed
FMCW Radar, 4 GHz, 1 GHz – 26 GHz	S01_CA01	2025-05-08	Passed	Passed
FMCW Radar, 4 GHz, 26 GHz – 40 GHz	S01_CA01	2025-05-05	Passed	Passed
FMCW Radar, 4 GHz, 40 GHz – 60 GHz	S01_CA01	2025-05-05	Passed	Passed
FMCW Radar, 4 GHz, 60 GHz – 90 GHz	S01_CA01	2025-05-07	Passed	Passed
FMCW Radar, 4 GHz, 90 GHz – 140 GHz	S01_CA01	2025-05-12	Passed	Passed
FMCW Radar, 4 GHz, 140 GHz – 200 GHz	S01_CA01	2025-05-19	Passed	Passed

IP68 Variant

47 CFR CHAPTER I FCC PART 15 § 15.256 (h)
Subpart C §15.256

Unwanted emissions
The measurement was performed according to ANSI C63.10 (2020) Chapter 6.4, 6.5, 6.6 **Final Result**

OP-Mode: outside tank enclosure Radio Technology, OBW, Measurement range	**Setup**	**Date**	**FCC**	**IC**
FMCW Radar, 4 GHz, 9 kHz – 30 MHz	S01_DA01	2025-04-12	Passed	Passed
FMCW Radar, 4 GHz, 30 MHz – 1 GHz	S01_DA01	2025-04-12	Passed	Passed
FMCW Radar, 4 GHz, 1 GHz – 26 GHz	S01_DA01	2025-05-08	Passed	Passed
FMCW Radar, 4 GHz, 26 GHz – 40 GHz	S01_DA01	2025-05-05	Passed	Passed
FMCW Radar, 4 GHz, 40 GHz – 60 GHz	S01_DA01	2025-05-05	Passed	Passed
FMCW Radar, 4 GHz, 60 GHz – 90 GHz	S01_DA01	2025-05-07	Passed	Passed
FMCW Radar, 4 GHz, 90 GHz – 140 GHz	S01_DA01	2025-05-12	Passed	Passed
FMCW Radar, 4 GHz, 140 GHz – 200 GHz	S01_DA01	2025-05-19	Passed	Passed

N/A: Not applicable
N/P: Not performed

2 REVISION HISTORY

Report version control			
Version	**Release date**	**Change Description**	**Version validity**
initial	2025-06-11	--	valid

COMMENT: -

(responsible for accreditation scope)
Dipl.-Ing. Daniel Gall

(responsible for testing and report)
Dipl.-Ing. Marco Kullik

7 layers GmbH, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

3 ADMINISTRATIVE DATA

3.1 TESTING LABORATORY

Company Name:	7layers GmbH
Address:	Borsigstr. 11 40880 Ratingen Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no:	DAkkS D-PL-12140-01-00
FCC Designation Number:	DE0015
FCC Test Firm Registration:	929146
ISED CAB Identifier	DE0007; ISED#: 3699A
Responsible for accreditation scope:	Dipl.-Ing. Daniel Gall
Report Template Version:	2023-09-29

3.2 PROJECT DATA

Responsible for testing and report:	Dipl.-Ing. Marco Kullik
Employees who performed the tests:	documented internally at 7Layers
Date of Report:	2025-06-11
Testing Period:	2024-10-31- to 2025-05-27

3.3 APPLICANT DATA

Company Name:	KROHNE Messtechnik GmbH
Address:	Ludwig-Krohne-Str. 5 47058 Duisburg Germany
Contact Person:	Mr. Charalambos Ouzounis

3.4 MANUFACTURER DATA

Company Name:	KROHNE Messtechnik GmbH
Address:	Am Schürmannshütt 19 47411 Moers Germany
Contact Person:	Mr. Charalambos Ouzounis

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Level Probing Radar with BTLE
Product name	Optiwave 15xx series
Type	DN70
Declared EUT data by the supplier	
Voltage Type	DC
Voltage Level	24 V
Tested Modulation Type	FMCW
General product description	The EUT is a Level Probing Radar including Bluetooth Low Energy.
The EUT provides the following ports:	DC Power supply port, appr. 1.6 m cable connected during testing
Signal Sweep Frequency Span	4000 MHz, f_c = 79.0 GHz 2000 MHz, f_c = 78.5 GHz 1000 MHz, f_c = 78.0 GHz
Frequency Sweep Time	339.68 µs
Re-trace time	500 ms
Special software used for testing	For the tests: • Antenna beamwidth • Antenna side lobe gain • Frequency Stability a test mode with pulsed unmodulated test mode on • f_c = 79.00 GHz (antenna measurement) • f_c = 77.02 GHz (frequency stability) was used. For all other tests: ELR_RADIO_APPROVAL software

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT ba01	DE1153004ba01	Radiated sample, Local Display Variant
Sample Parameter	**Value**	
Serial No.	-	
HW Version	Converter: 4008475901d HMI:4009669601a	
SW Version	Converter: 23.07.01 HMI: V0.00.01P31	
Comment	-	

Sample Name	Sample Code	Description
EUT ca01	DE1153004ca01	Radiated sample, Standard Variant
Sample Parameter	**Value**	
Serial No.	-	
HW Version	Converter: 4008475901d	
SW Version	Converter: 23.07.01	
Comment	-	

Sample Name	Sample Code	Description
EUT da01	DE1153004da01	Radiated sample, IP68 Variant
Sample Parameter	**Value**	
Serial No.	-	
HW Version	Converter: 4008475901d	
SW Version	Converter: 23.07.01	
Comment	-	

NOTE:The short description is used to simplify the identification of the EUT in this test report.

4.3 ANCILLARY EQUIPMENT

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Device	**Details (Manufacturer, Type Model, OUT Code)**	**Description**
-	-	-

4.4 AUXILIARY EQUIPMENT

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.
But nevertheless Auxiliary Equipment can influence the test results.

Device	**Details (Manufacturer, Type Model, HW, SW, S/N)**	**Description**
-	-	-

4.5 EUT SETUPS

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	**Combination of EUTs**	**Description and Rationale**
S01_BA01	EUT ba01	DN70, Local Display Variant
S01_CA01	EUT ca01	DN70, Standard Variant
S01_DA01	EUT da01	DN70, IP68 Variant

4.6 OPERATING MODES

This chapter describes the operating modes of the EUTs used for testing.

4.6.1 TEST CHANNELS

FMCW Radar Signals with the following Occupied Bandwidth and centre frequencies were used for testing:

- 4000 MHz, f_c = 79.0 GHz
- 2000 MHz, f_c = 78.5 GHz
- 1000 MHz, f_c = 78.0 GHz

The frequency sweep time and re-trace time was identical for all operating modes (see chapter 4.1).

A test mode with pulsed unmodulated signal on

- f_c = 79.00 GHz was used for the antenna measurements
- f_c = 77.02 GHz was used for the frequency stability test

4.7 PRODUCT LABELLING

4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

5 TEST RESULTS

5.1 FUNDAMENTAL BANDWIDTH

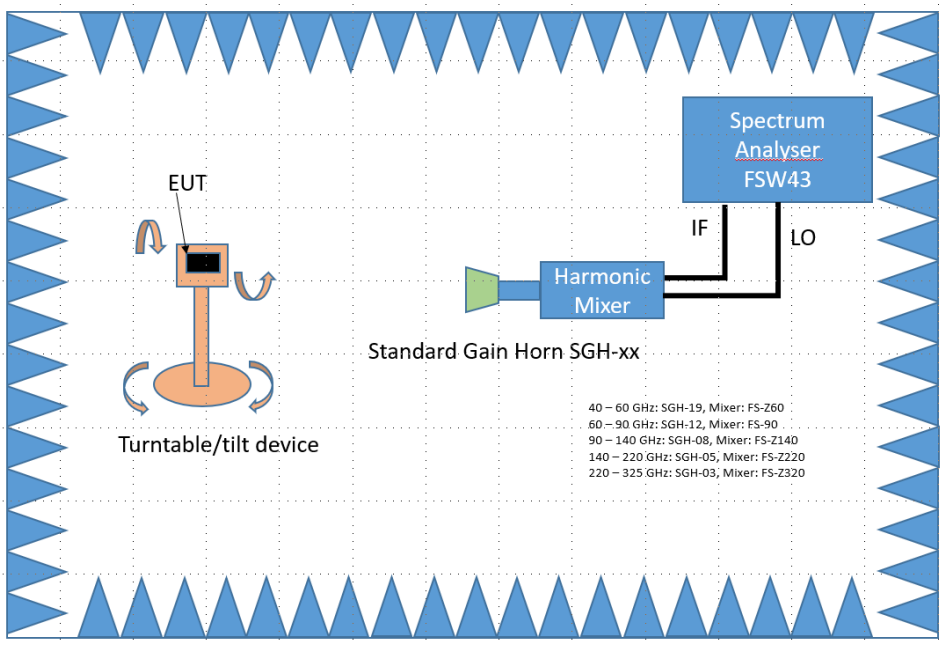
Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10, chapter 9.3

5.1.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the fundamental bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (smallest) emission bandwidth.

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in a fully-anechoic chamber. The LPR and the test antenna were adjusted for maximum main beam coupling.



Test Setup; Radiated Emissions, Output Power, Occupied Bandwidth 40 GHz – 325 GHz

Analyzer settings:

- RBW: prefer 1 % to 5 % of EBW, used settings please see measurement plot
- VBW: appr. 3 x RBW, used settings please see measurement plot
- Span: appr. 1.5 times EBW, used settings please see measurement plot
- Trace: Maxhold
- Sweeps: allow the trace to stabilize
- Sweeptime: 600s
- Detector: Peak

5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.256 (f)(1)(2)
(1) The minimum fundamental emission bandwidth shall be 50 MHz for LPR operation under the provisions of this section.
(2) LPR devices operating under this section must confine their fundamental emission bandwidth within the 5.925-7.250 GHz, 24.05-29.00 GHz, and 75-85 GHz bands under all conditions of operation.

RSS-211: 5.1
(a)The minimum fundamental emission bandwidth shall be 50 MHz.

5.1.3 TEST PROTOCOL

Ambient temperature: 21 – 25 °C
Air Pressure: 996 – 1018 hPa
Humidity: 31 - 42 %

Measurement Parameters: FCC

Operating Band: 75000 - 85000 MHz							
OBW [GHz]	**Lower -10 dB Frequency fL [MHz]**	**Upper -10 dB Frequency fH [MHz]**	**Max Frequency fM [MHz]**	**Center Frequency fC [MHz]**	**Occupied Bandwidth [MHz]**	**Minimum Occupied Bandwidth [MHz]**	**Occupied Bandwidth Margin to Limit [MHz]**
4.00	77007.70	80990.00	78165.80	78998.9	3982.3	50.0	3932.3
2.00	77501.80	79494.10	78149.40	78498.0	1992.3	50.0	1942.3
1.00	77495.80	78504.10	78133.90	78000.0	1008.3	50.0	958.3

Measurement Parameters: FCC

Operating Band: 75000 - 85000 MHz						
OBW [GHz]	**Lower -10 dB Frequency [MHz]**	**Upper -10 dB Frequency [MHz]**	**Lower Band Edge [MHz]**	**Upper Band Edge [MHz]**	**Margin to Lower Limit [MHz]**	**Margin to Upper Limit [MHz]**
4.00	77007.70	80990.00	75000.00	85000.00	2007.70	4010.00
2.00	77501.80	79494.10	75000.00	85000.00	2501.80	5505.90
1.00	77495.80	78504.10	75000.00	85000.00	2495.80	6495.90

Measurement Parameters: ISED

Operating Band: 75000 - 85000 MHz							
OBW [GHz]	**Lower -10 dB Frequency fL [MHz]**	**Upper -10 dB Frequency fH [MHz]**	**Max Frequency fM [MHz]**	**Center Frequency fC [MHz]**	**Occupied Bandwidth [MHz]**	**Minimum Occupied Bandwidth [MHz]**	**Occupied Bandwidth Margin to Limit [MHz]**
4.00	77017.00	80978.00	78345.70	78997.5	3961.0	50.0	3911.0
2.00	77514.00	79486.00	78365.10	78500.0	1972.0	50.0	1922.0
1.00	77506.50	78493.50	78301.70	78000.0	987.0	50.0	937.0

Measurement Parameters: ISED

Operating Band: 75000 - 85000 MHz						
OBW [GHz]	**Lower -10 dB Frequency [MHz]**	**Upper -10 dB Frequency [MHz]**	**Lower Band Edge [MHz]**	**Upper Band Edge [MHz]**	**Margin to Lower Limit [MHz]**	**Margin to Upper Limit [MHz]**
4.00	77017.00	80978.00	75000.00	85000.00	2017.00	4022.00
2.00	77514.00	79486.00	75000.00	85000.00	2514.00	5514.00
1.00	77506.50	78493.50	75000.00	85000.00	2506.50	6506.50

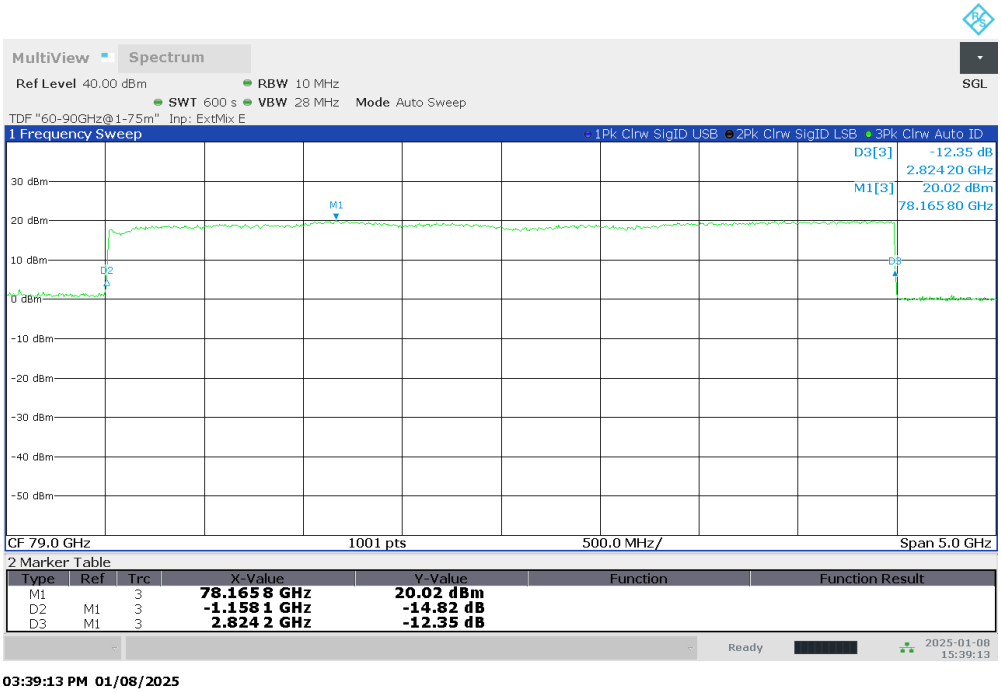
COMMENT:

- Measurement was performed with activated sweep function.

Remark:Please see next sub-clause for the measurement plots.

5.1.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, Measurement Parameters = FCC
(S01_BA01)



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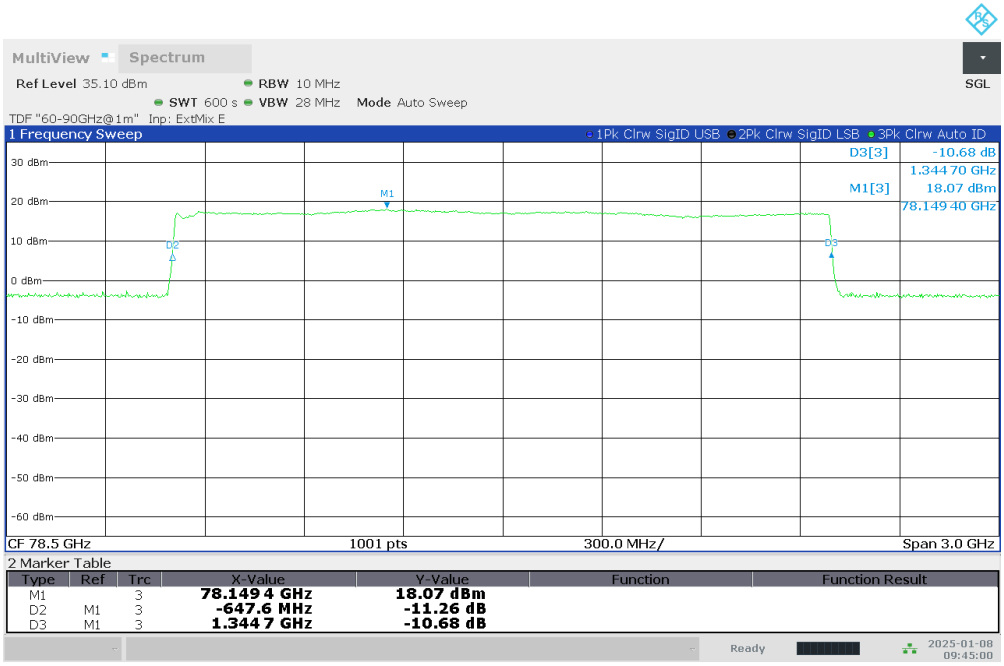
Radio Technology = FMCW Radar, OBW = 2 GHz, Operating Band = 75 GHz – 85 GHz, Measurement Parameters = FCC
(S01_BA01)



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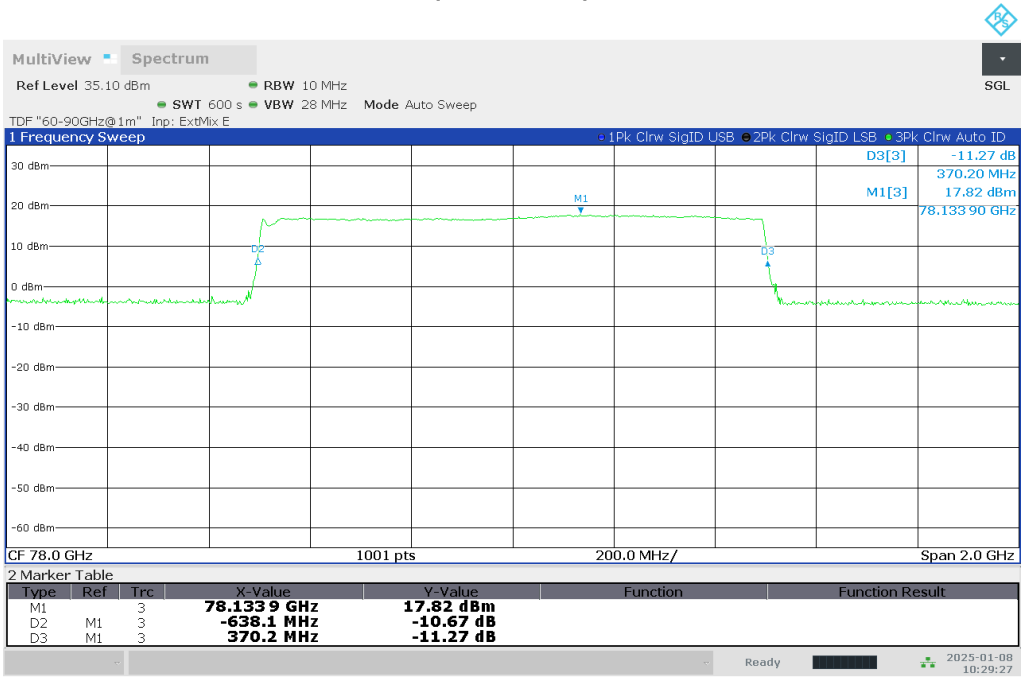
(S01_BA01)



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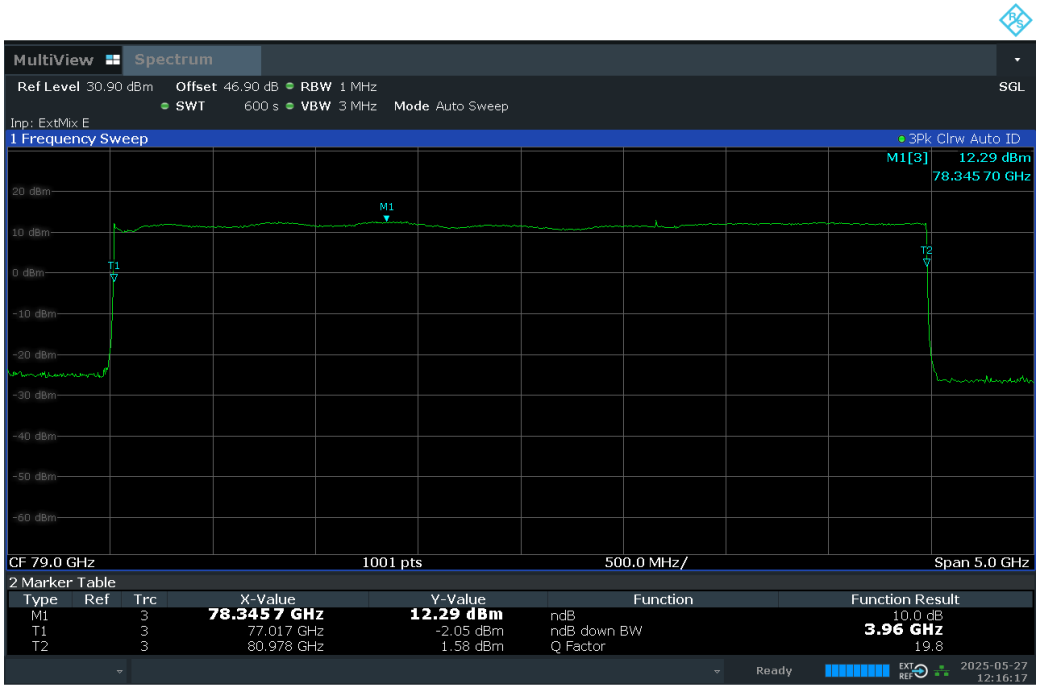
(S01_BA01)



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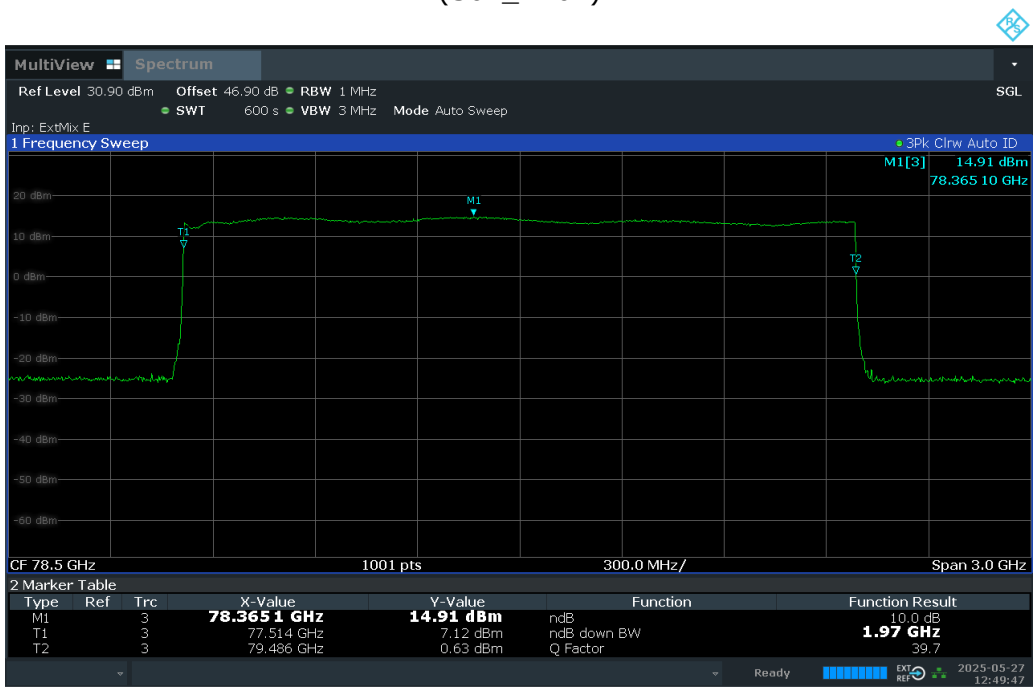
Radio Technology = FMCW Radar, OBW = 2 GHz, Operating Band = 75 GHz – 85 GHz, Measurement Parameters = ISED
(S01_BA01)



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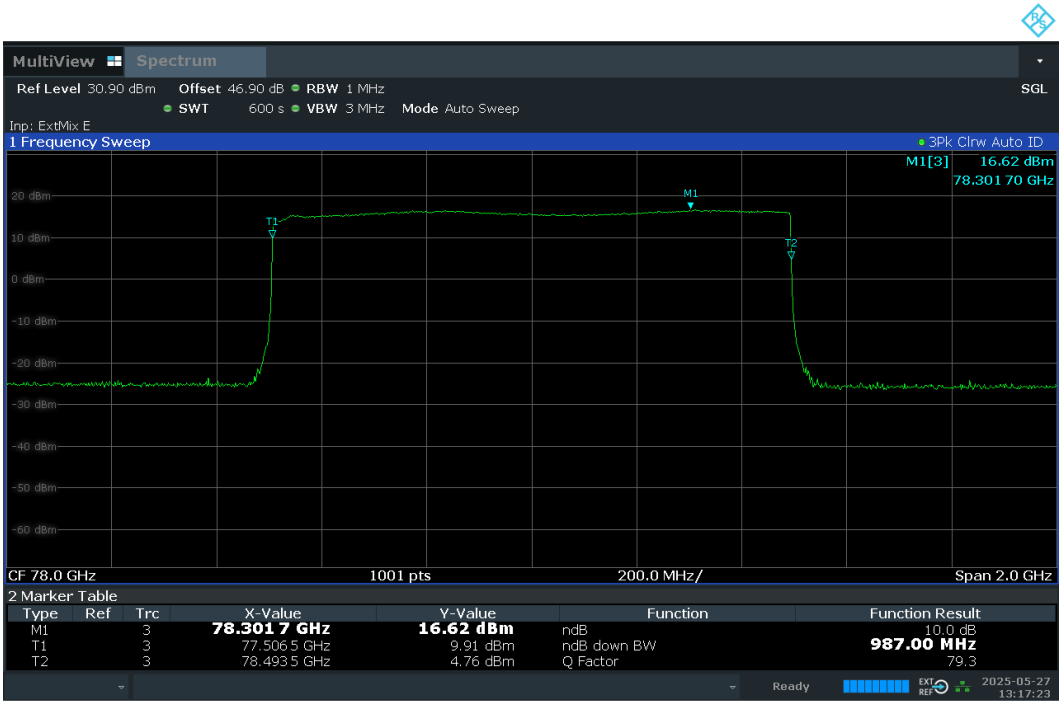
Radio Technology = FMCW Radar, OBW = 1 GHz, Operating Band = 75 GHz – 85 GHz, Measurement Parameters = ISED
(S01_BA01)



5.1.5 TEST EQUIPMENT USED

- Radiated Emissions FAC FCC

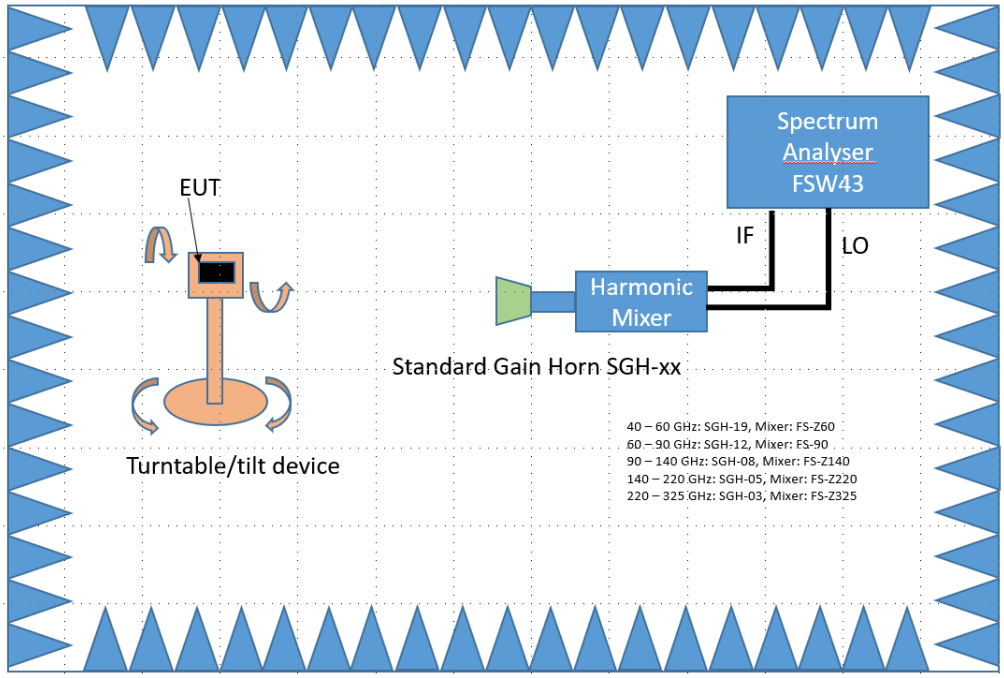
5.2 FUNDAMENTAL EMISSION

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10, chapter 9.8 (Annex L)

5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in a fully-anechoic chamber. The LPR and the test antenna were adjusted for maximum main beam coupling.



Test Setup; Radiated Emissions, Output Power, Occupied Bandwidth 40 GHz – 325 GHz

Analyzer settings (EIRP in 1 MHz):

- RBW: 1 MHz
- VBW: 3 MHz
- Span: 5 GHz / 3 GHz / 2 GHz
- Trace: Maxhold
- Sweeps: allow the trace to stabilize
- Sweeptime: 1.6 s
- Detector: RMS

Analyzer settings (EIRP in 50 MHz):

- Resolution Bandwidth (RBW): 50 MHz
- Video Bandwidth (VBW): 50 MHz
- Span: 5 GHz
- Trace: Maxhold
- Sweeps: allow the trace to stabilize
- Sweeptime: 600 s
- Detector: Peak

FMCW desensitization according Annex L of ANSI 63.10 (2020), Corrigendum 1:

FMCW desensitization for peak detection:

$$\alpha = \frac{1}{\left(1+\left[\left(\frac{2\times\ln(2)}{\pi}\right)^2 \times \left(\frac{BW_{Chirp}}{T_{Chirp}\times RBW^2}\right)^2\right]\right)^{0.25}}$$

Calculation for all OBW with:

- BW_{Chirp} = 4 GHz, 2 GHz, 1 GHz
- T_{Chirp} = 339 µs
- RBW = 50 MHz

α = 0.0 dB

FMCW desensitization for average detection:
There is no desensitization for average detection.

Sweep time for peak detection:

Theoretically if the analyser sweep time is adjusted to a minimum of (Signal Period) × (Span) / (RBW), therefore the instrument is essentially (within ± 0.5 RBW) tuned to any particular frequency for at least one entire period of the signal, a 100% probability of detection will be achieved. However practical considerations such as the lack of synchronization between the timing of the FMCW Chirp and the analyser sweep/sampling, FMCW Chirp stability, analyser sweep time accuracy and stability, analyser sampling rate accuracy and stability, etc. indicate that a sweep time of exactly one signal period is insufficient. A nominal sweep time of 2 × (Signal Period) × (Span) / (RBW) ought to be sufficient, and may be necessary for signals where the duty cycle approaches 100%. Nevertheless, a suitable sweep time can be determined by increasing the sweep time until the displayed signal amplitude no longer increases.

Sweep time set to 600 s

Sweep time for average detection

Theoretically if the analyser sweep time is adjusted to N × (Signal Period) × (Span) / (RBW), where N is a positive integer, the instrument will correctly measure the average value at any given frequency. Due to the same practical considerations discussed above for the probability of detection, averaging is subject to additional errors. These are particularly evident when N is not an integer. The sweep time of the analyser must be slow enough that analyser dwells at each horizontal bin point for multiple EUT periods to help ensure a reasonable measurement accuracy.

Sweep time calculated to 1.6 s

5.2.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.256 (g)

Fundamental emissions limits. (1) All emission limits provided in this section are expressed in terms of Equivalent Isotropic Radiated Power (EIRP).

The EIRP level is to be determined from the maximum measured power within a specified bandwidth.

(i) The EIRP in 1 MHz is computed from the maximum power level measured within any 1-MHz bandwidth using a power averaging detector;

(ii) The EIRP in 50 MHz is computed from the maximum power level measured with a peak detector in a 50-MHz bandwidth centered on the frequency at which the maximum average power level is realized and this 50 MHz bandwidth must be contained within the authorized operating bandwidth. For a RBW less than 50 MHz, the peak EIRP limit (in dBm) is reduced by 20 log(RBW/50) dB where RBW is the resolution bandwidth in megahertz. The RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than the RBW. If the RBW is greater than 3 MHz, the application for certification filed shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

(3) The EIRP limits for LPR operations in the bands authorized by this rule section are provided in Table 1. The emission limits in Table 1 are based on boresight measurements (i.e., measurements performed within the main beam of an LPR antenna).

Table 1

Frequency band of operation (GHz)	Average emission limit (EIRP in dBm measured in 1 MHz)	Peak emission limit (EIRP in dBm measured in 50 MHz)
5.925 – 7.250	-33	7
24.05 – 29.00	-14	26
75 - 85	-3	34

RSS-211: 5.2
(b) For average emission limits, LPR devices shall not exceed the limits provided in Table 1 measured in a 1 MHz measurement bandwidth with an average detector. For peak emission limits, LPR devices shall not exceed the limits provided in Table 1 measured in a 50 MHz measurement bandwidth with a peak detector.

5.2.3 TEST PROTOCOL

Ambient temperature: 21 – 25 °C
Air Pressure: 996 – 1018 hPa
Humidity: 31 - 42 %

Peak Measurement (EIRP)

Operating Band: 75000 - 85000 MHz				
OBW [GHz]	**Highest Peak Emission Power EIRP [dBm]**	**Highest Peak Emission Frequency [MHz]**	**Peak Limit [dBm]**	**Margin to Power Limit EIRP [dBm]**
4.00	21.1	80773.2000	34.0	12.9
2.00	20.1	78215.3000	34.0	13.9
1.00	20.0	78087.9000	34.0	14.0

Average Measurement (EIRP)

Operating Band: 75000 - 85000 MHz				
OBW [GHz]	**Highest Average Emission Power EIRP [dBm]**	**Highest Average Emission Frequency [MHz]**	**Average Limit [dBm]**	**Margin to Power Limit EIRP [dBm]**
4.00	-15.8	79658.3000	-3.0	12.8
2.00	-13.9	78102.7000	-3.0	10.9
1.00	-7.2	78160.6000	-3.0	4.2

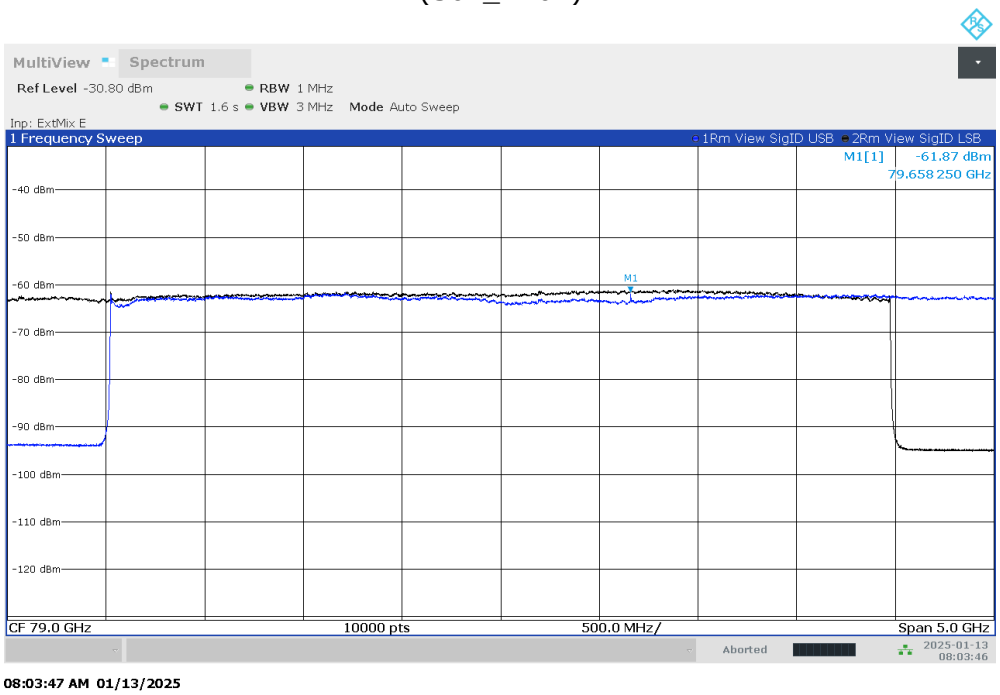
COMMENT:

- Measurement was performed with activated sweep function.

Remark: Please see next sub-clause for the measurement plots.

5.2.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, Average (S01_BA01)



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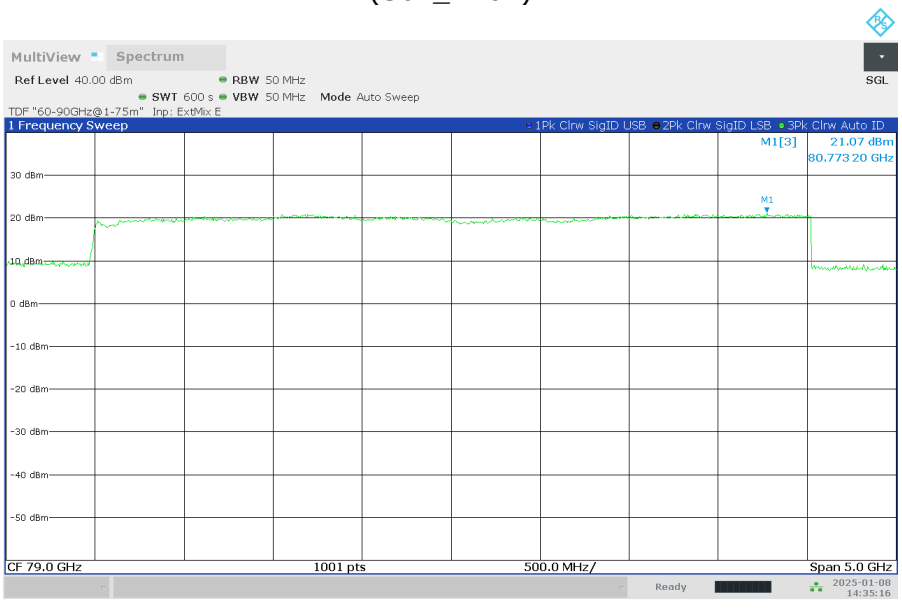
Remark: For the 4 GHz OBW, the automatic signal ID function of the spectrum analyser does not produced suitable result, because all mirror frequencies fall directly in wanted signal. For this reason, a plot is given both mixer conversions. An offset of 46.1 dB must be added!

- Blue Line: Lower sub-band plot, with calibrated mixer conversion factor for used IF
- Black Line: Upper sub-band plot, with not calibrated mixer conversion factor for used IF.

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, Peak (S01_BA01)



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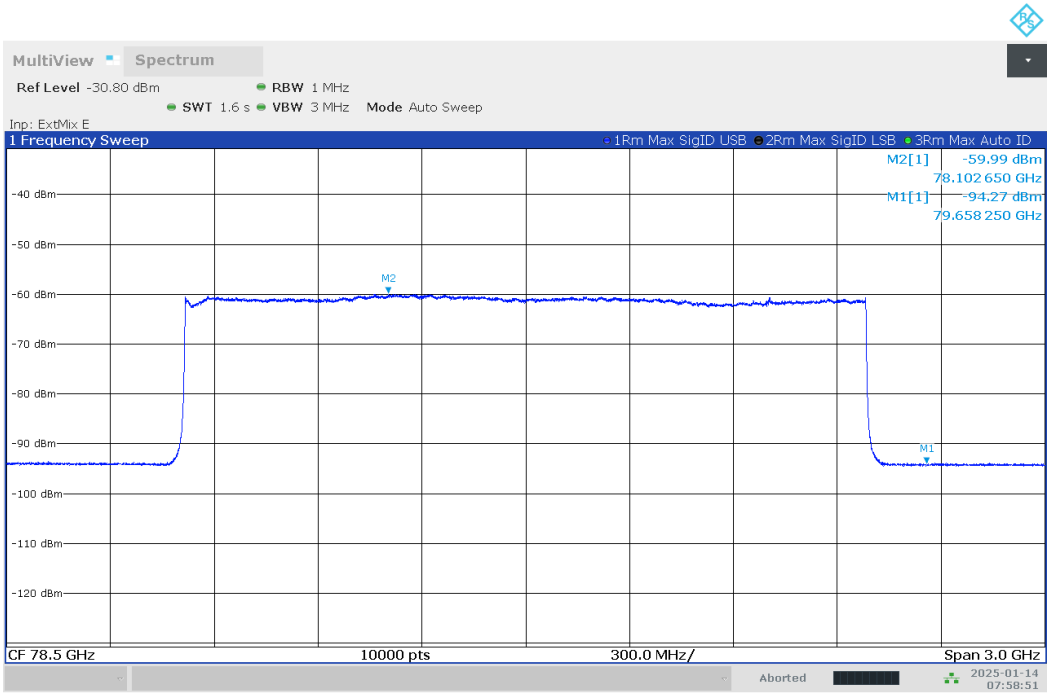
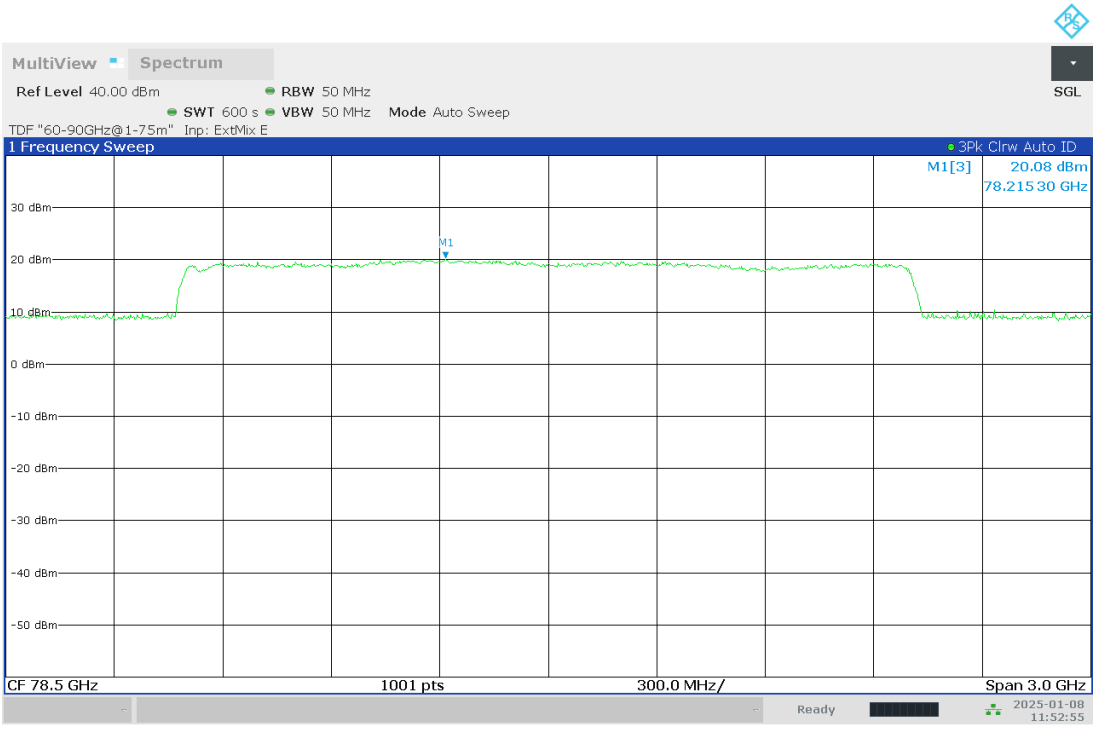
Radio Technology = FMCW Radar, OBW = 2 GHz, Operating Band = 75 GHz – 85 GHz, Average (S01_BA01)

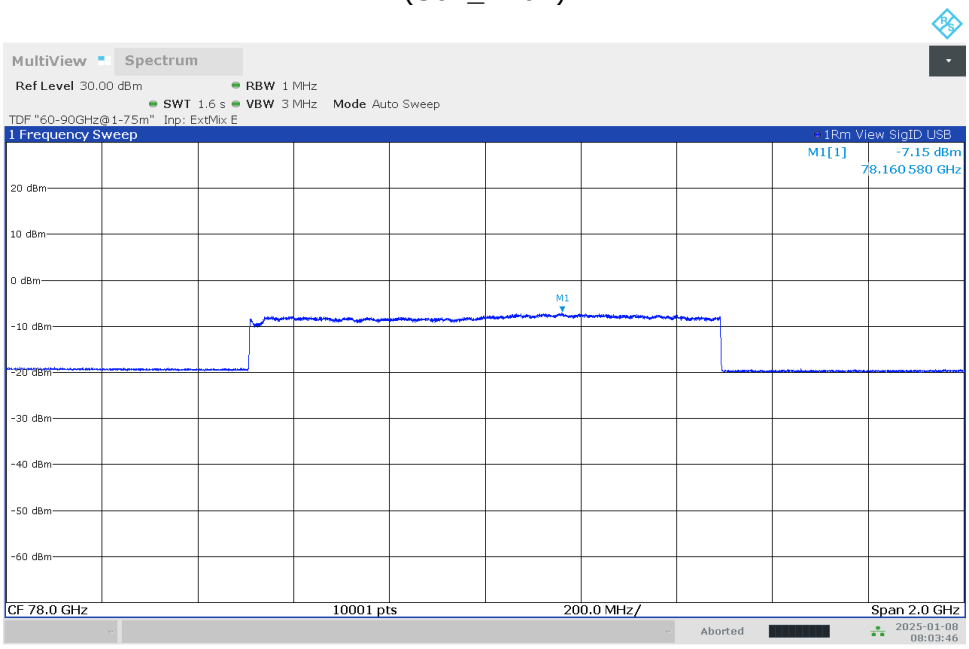


An offset of 46.1 dB must be added!

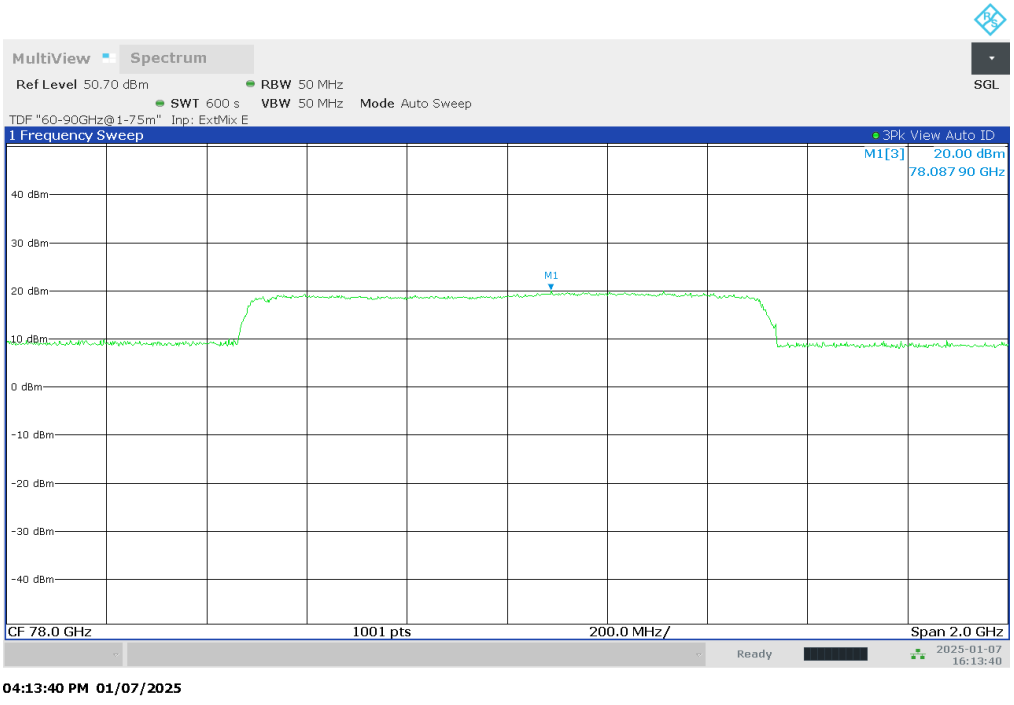
Radio Technology = FMCW Radar, OBW = 2 GHz, Operating Band = 75 GHz – 85 GHz, Peak (S01_BA01)



Radio Technology = FMCW Radar, OBW = 1 GHz, Operating Band = 75 GHz – 85 GHz, Average (S01_BA01)



Radio Technology = FMCW Radar, OBW = 1 GHz, Operating Band = 75 GHz – 85 GHz, Peak (S01_BA01)



5.2.5 TEST EQUIPMENT USED

- Radiated Emissions FAC FCC

5.3 UNWANTED EMISSIONS

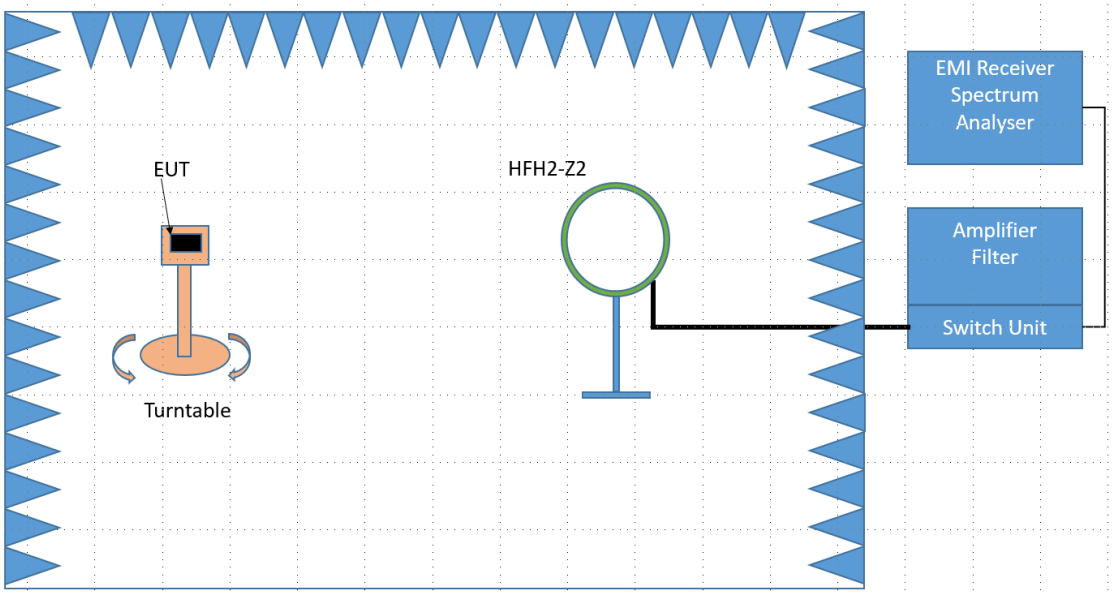
Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.3.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The measurement procedure is implemented into the EMI test software EMC32 from R&S. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered from a DC power source.

1. Measurement up to 30 MHz
The Loop antenna HFH2-Z2 is used.



Test Setup; Spurious Emission Radiated (SAC), 9 kHz- 30 MHz

Step 1: pre measurement

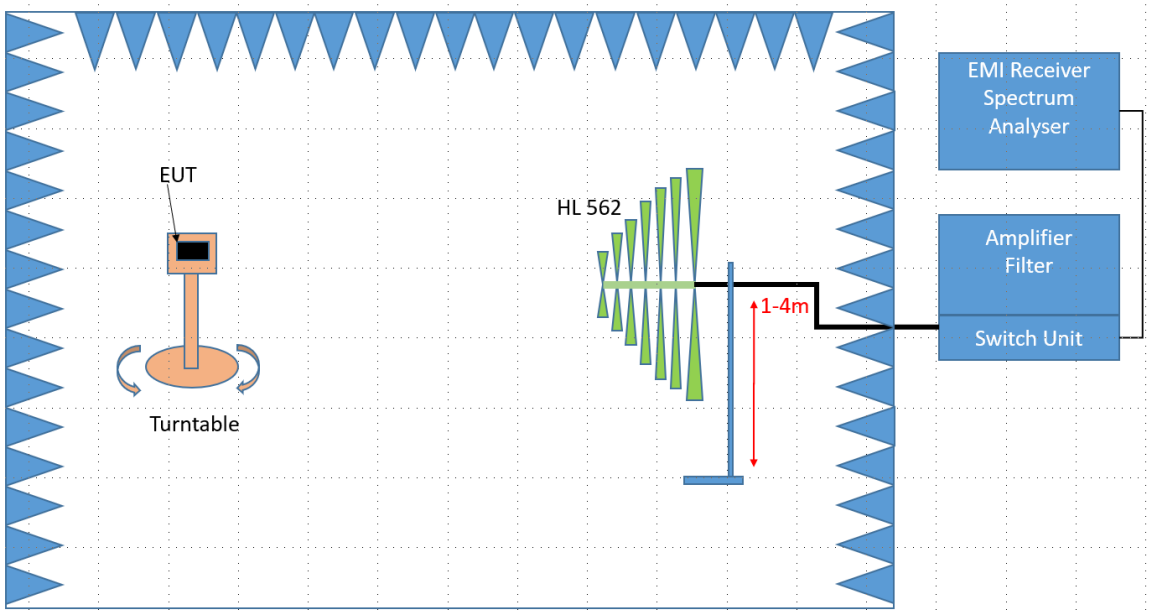
- Anechoic chamber
- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 MHz and 0.15 – 30 MHz
- Frequency steps: 0.05 kHz and 2.25 kHz
- IF–Bandwidth: 0.2 kHz and 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.

- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 0.2 - 10 kHz
- Measuring time / Frequency step: 1 s

2. Measurement above 30 MHz and up to 1 GHz



Test Setup; Spurious Emission Radiated (SAC), 30 MHz- 1GHz

Step 1: Preliminary scan
This is a preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: –180° to 90°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

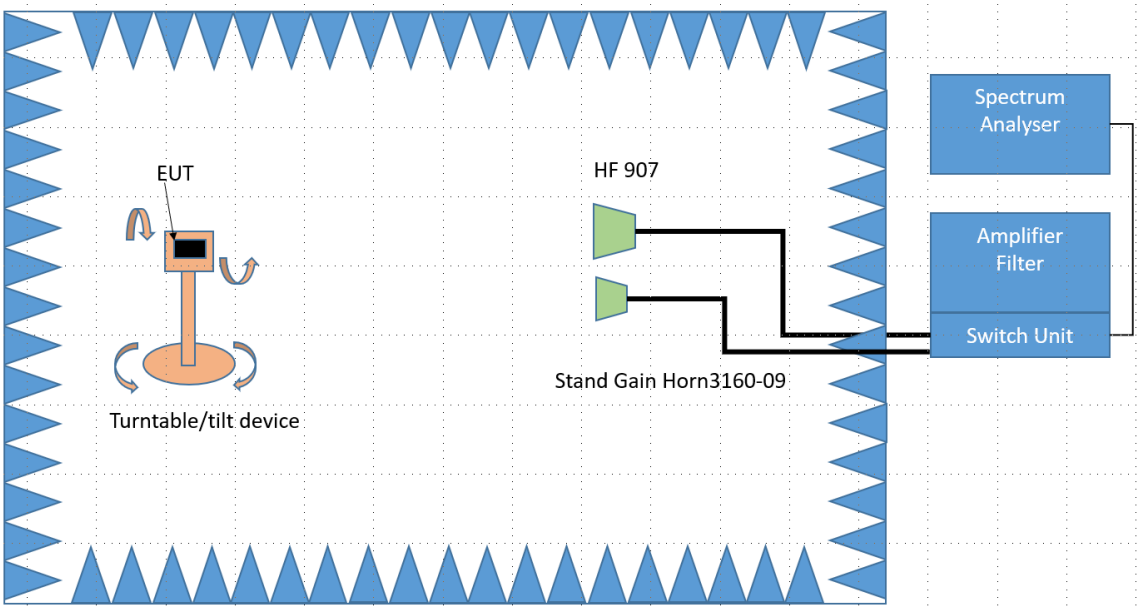
Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: Adjustment measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ± 45° around this value. During this action, the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position, the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action, the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: ± 45 ° around the determined value
- Height variation range: ± 100 cm around the determined value
- Antenna Polarisation: max. value determined in step 1

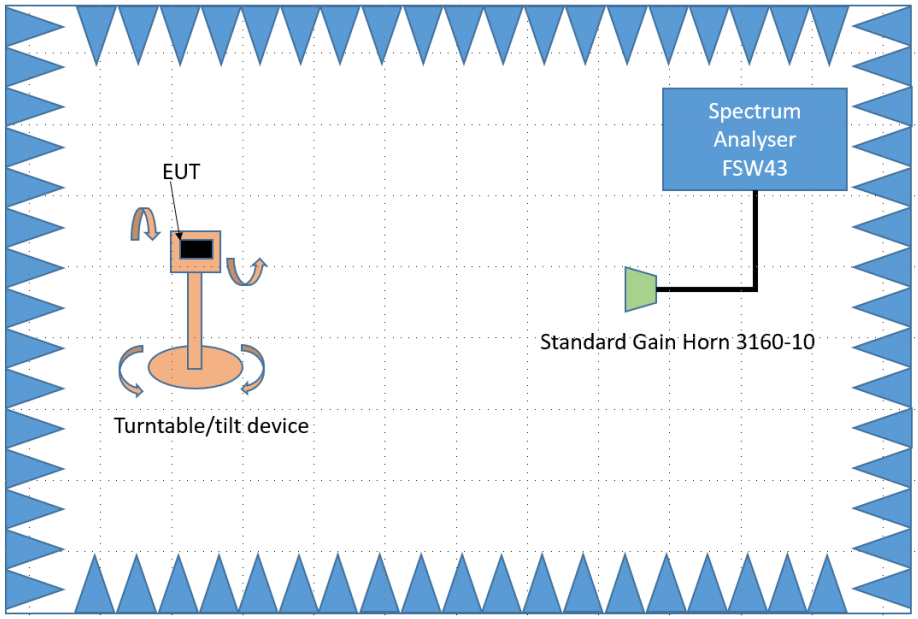
Step 3: Final measurement with QP detector
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

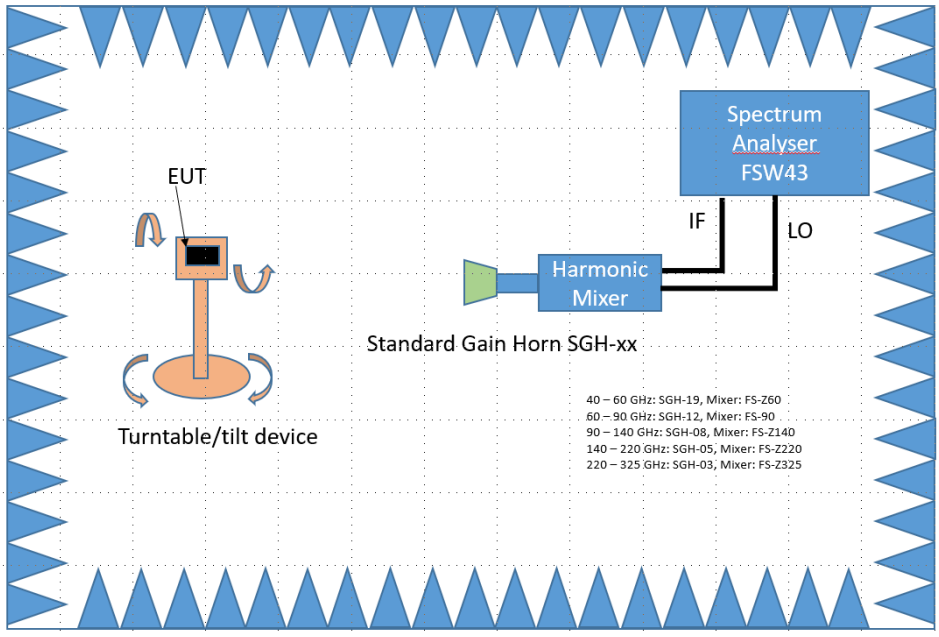
3. Measurement above 1 GHz



Test Setup; Spurious Emission Radiated (FAC), 1 GHz-26.5 GHz



Test Setup; Spurious Emission Radiated (FAC), 26.5 – 40 GHz



Test Setup; Radiated Emissions, Output Power, Occupied Bandwidth 40 GHz – 325 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

Step 1:

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.
All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.
The turn table step size (azimuth angle) for the preliminary measurement is 45 °.
Antenna distance:
1 GHz – 26 GHz: 3 m
26 GHz – 40 GHz: 1 m
40 GHz – 200 GHz: 0.5 m

Step 2:

Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size ± 45° for the elevation axis is performed.
The turn table azimuth will slowly vary by ± 22.5°.
The elevation angle will slowly vary by ± 45°
EMI receiver settings (for all steps):
- Detector: Average
- IF Bandwidth = 1 MHz

Step 3:

Spectrum analyser settings for step 3:
- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

5.3.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.256 (h)
.*Unwanted emissions limits.* Unwanted emissions from LPR devices shall not exceed the general emission limit in §15.209 of this chapter.

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according to FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 - 26000	500@3m	3	54.0@3m
26000 - 40000	500@3m	1	54.0@3m
above 40000	500@3m	0.5	54.0@3m

The measured values above 26 GHz are corrected with an inverse linear distance extrapolation factor (20 dB/decade).
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

RSS-211: 5.3
(a) The device shall be installed inside a closed container or in a still pipe by qualified installers.
(b) The leakage of the RF field outside the container at 3 m from the container or still pipe walls shall not exceed the values outlined in Table. The levels shall be assessed using the procedures defined in ETSI EN 302 372.

Frequency Band [GHz]	Maximum Average EIRP (in dBm/MHz) Outside Tank Enclosure Structure Inside the Operating Frequency Range
5.65 – 8.50	-41.3
8.50 - 10.55	-41.3
24.05 – 29.00	-41.3
75 - 85	-41.3

5.3.3 TEST PROTOCOL

Local Display Variant (S01_BA01)

Ambient temperature: 21–25 °C
Air Pressure: 996–1018 hPa
Humidity: 31–42 %

Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detector	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]
41.4	24.9	QP	120	46.0	21.1
200.0	31.6	QP	120	46.0	14.4
239.6	17.9	QP	120	46.0	28.1
289.1	18.6	QP	120	46.0	27.5
338.8	24.8	QP	120	46.0	21.2
363.4	16.2	QP	120	46.0	29.8
454.5	15.8	QP	120	46.0	30.2
640.0	42.3	QP	120	46.0	3.7
784.9	27.3	QP	120	46.0	18.7
19400.8	51.5	PEAK	1000	74.0	22.5
19514.8	36.0	AV	1000	54.0	18.0
19514.8	56.1	PEAK	1000	74.0	17.9
19560.8	50.2	PEAK	1000	74.0	23.8
19568.4	52.9	PEAK	1000	74.0	21.1
19708.4	53.6	PEAK	1000	74.0	20.4
25512.4	51.8	PEAK	1000	74.0	22.2
62365.0	70.0 *)	PEAK	1000	74.0	4.0
87717.0	69.4 *)	PEAK	1000	74.0	4.6

*) antenna horizontal
#) Antenna vertical

Standard Variant (S01_CA01)

Ambient temperature: 21–25 °C
Air Pressure: 996–1018 hPa
Humidity: 31–42 %

Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detector	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]
81.2	18.9	QP	120	46.0	27.1
308.6	22.4	QP	120	46.0	23.6
328.9	24.4	QP	120	46.0	21.6
373.7	25.3	QP	120	46.0	20.7
422.3	24.0	QP	120	46.0	22.0
440.0	35.8	QP	120	46.0	10.2
747.5	29.3	QP	120	46.0	16.7
767.4	26.3	QP	120	46.0	19.7
800.0	40.3	QP	120	46.0	5.7

*) antenna horizontal
#) Antenna vertical

IP68Variant (S01_DA01)

Ambient temperature: 21–25 °C
Air Pressure: 996–1018 hPa
Humidity: 31–42 %

Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detector	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]
308.7	21.0	QP	120	46.0	25.0
333.0	20.9	QP	120	46.0	25.1
349.3	22.6	QP	120	46.0	23.4
381.8	19.3	QP	120	46.0	26.7
719.3	27.4	QP	120	46.0	18.6
768.5	33.0	QP	120	46.0	13.1
800.0	39.5	QP	120	46.0	6.5

*) antenna horizontal
#) Antenna vertical

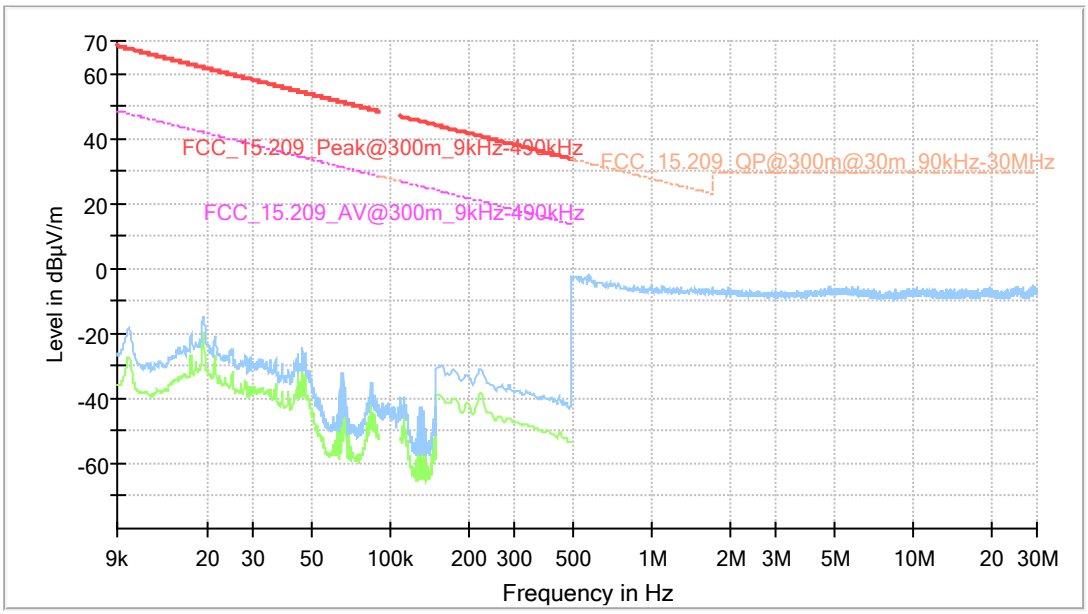
Remark: Please see next sub-clause for the measurement plot.

5.3.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Local Display Variant

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, (S01_BA01)

9 kHz – 30 MHz



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
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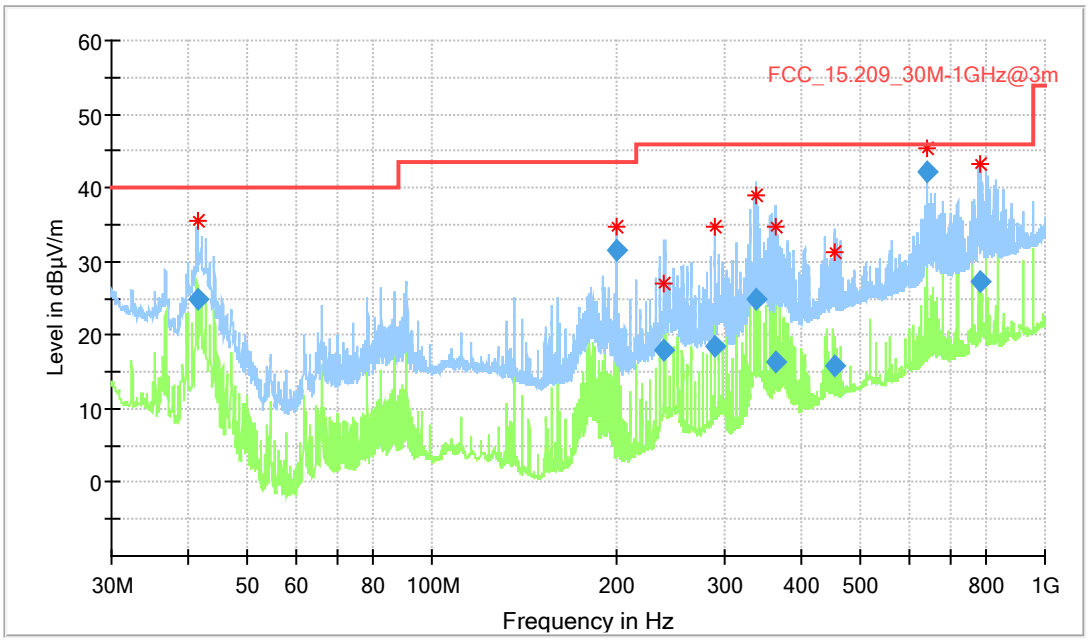
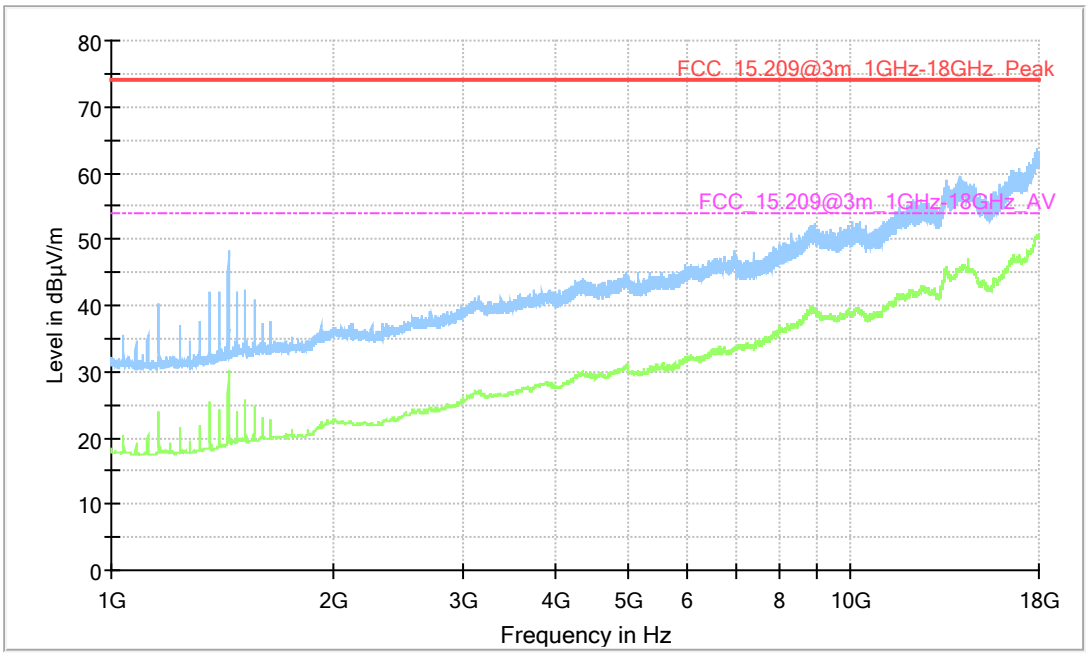
30 MHz – 1 GHz



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.370000	24.91	40.00	15.09	1000.0	120.000	122.0	V	-43.0	13.0
200.010000	31.60	43.50	11.90	1000.0	120.000	114.0	H	92.0	10.6
239.610000	17.93	46.00	28.07	1000.0	120.000	217.0	V	163.0	12.4
289.110000	18.55	46.00	27.45	1000.0	120.000	168.0	V	-196.0	14.2
338.760000	24.82	46.00	21.18	1000.0	120.000	147.0	V	-169.0	15.9
363.360000	16.24	46.00	29.76	1000.0	120.000	107.0	H	-104.0	16.8
454.500000	15.78	46.00	30.22	1000.0	120.000	108.0	H	-23.0	19.7
639.990000	42.26	46.00	3.74	1000.0	120.000	119.0	H	93.0	23.6
784.860000	27.28	46.00	18.72	1000.0	120.000	106.0	H	-95.0	26.0

1 GHz – 18 GHz



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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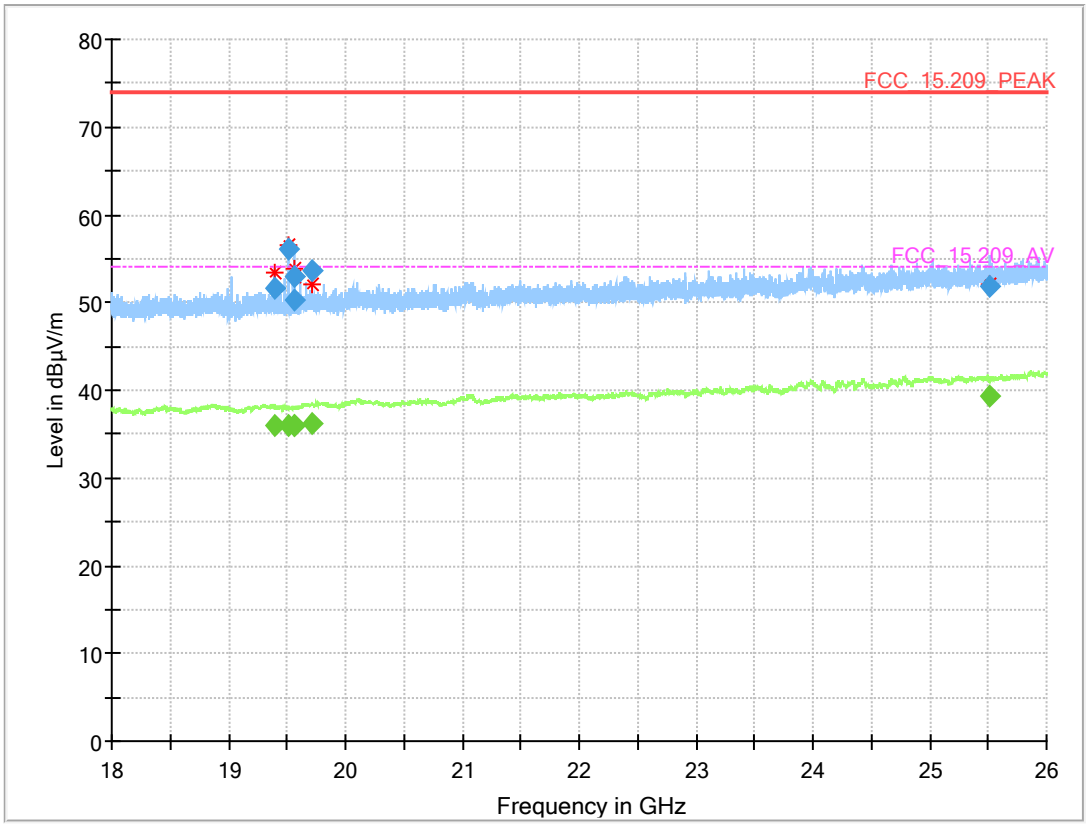
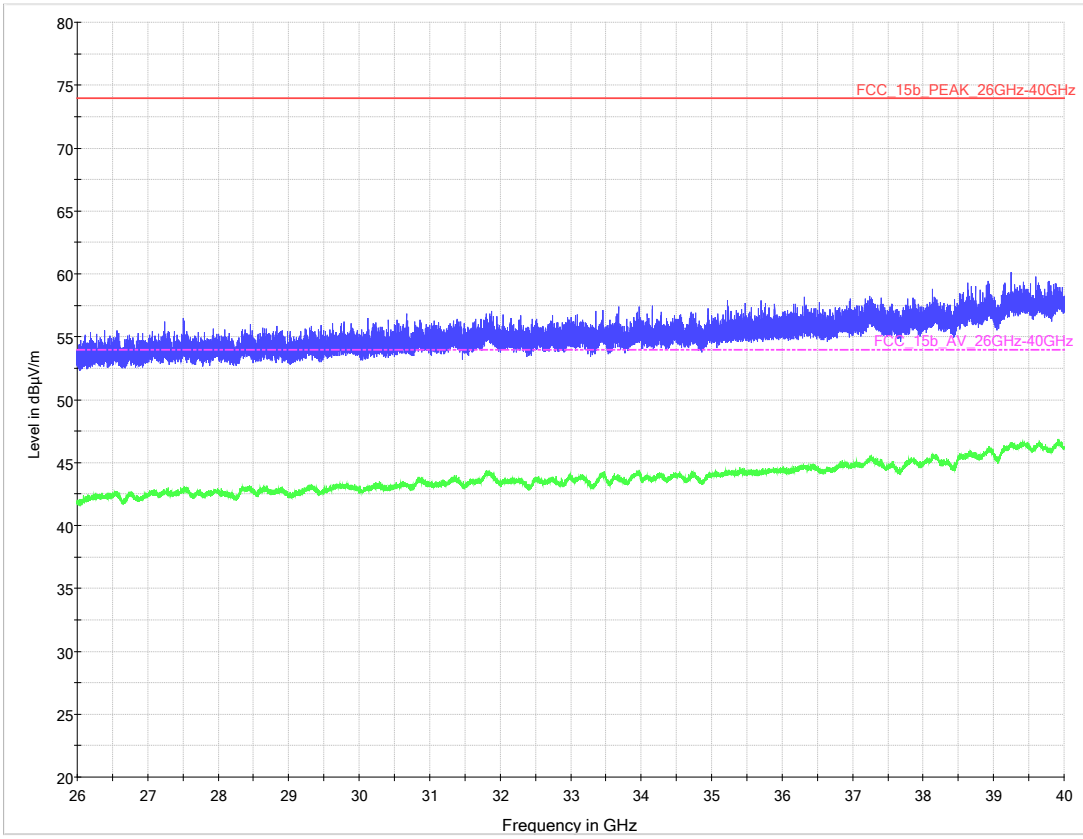
18 GHz – 26 GHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
19400.800	---	36.0	54.00	17.99	1000.0	1000.000	150.0	V	-1.0	-12.0	17.2
19400.800	51.5	---	74.00	22.49	1000.0	1000.000	150.0	V	-1.0	-12.0	17.2
19514.800	---	36.0	54.00	18.03	1000.0	1000.000	150.0	V	122.0	92.0	17.4
19514.800	56.1	---	74.00	17.95	1000.0	1000.000	150.0	V	122.0	92.0	17.4
19560.800	---	35.9	54.00	18.05	1000.0	1000.000	150.0	V	22.0	15.0	17.3
19560.800	50.2	---	74.00	23.79	1000.0	1000.000	150.0	V	22.0	15.0	17.3
19568.400	---	36.0	54.00	18.00	1000.0	1000.000	150.0	V	-154.0	15.0	17.3
19568.400	52.9	---	74.00	21.14	1000.0	1000.000	150.0	V	-154.0	15.0	17.3
19708.400	---	36.2	54.00	17.82	1000.0	1000.000	150.0	H	150.0	3.0	17.5
19708.400	53.6	---	74.00	20.40	1000.0	1000.000	150.0	H	150.0	3.0	17.5
25512.400	---	39.3	54.00	14.73	1000.0	1000.000	150.0	V	86.0	15.0	20.8
25512.400	51.8	---	74.00	22.23	1000.0	1000.000	150.0	V	86.0	15.0	20.8

26 GHz – 40 GHz



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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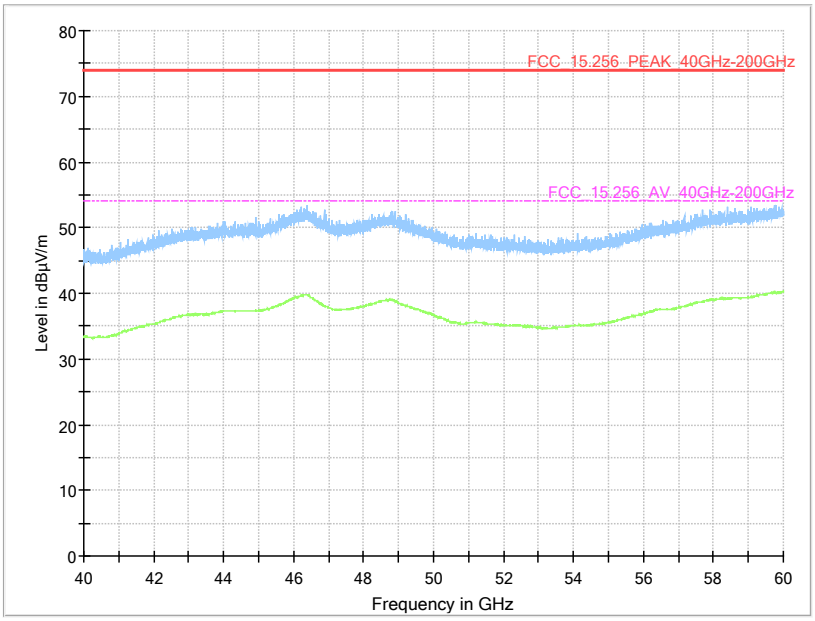
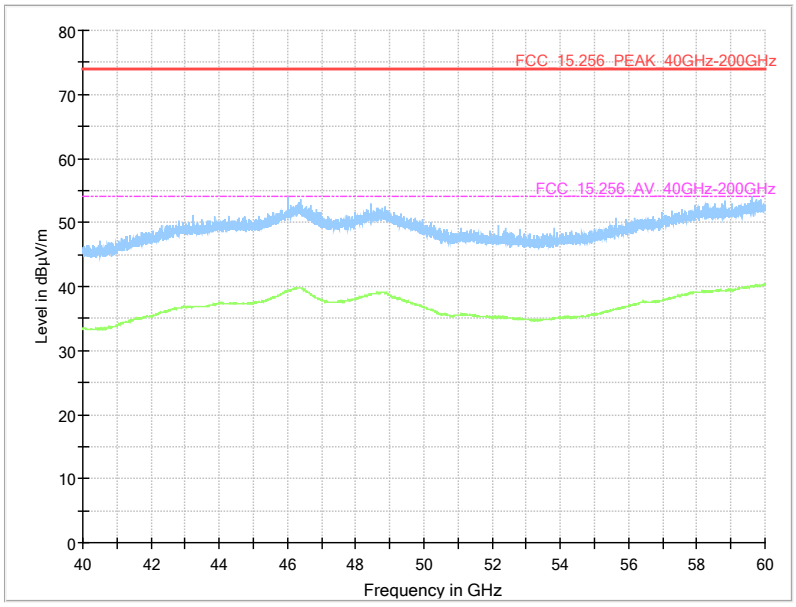
40 GHz – 60 GHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB/m)
---	---	---	---	---	---	---		---	---	---

Antenna horizontal

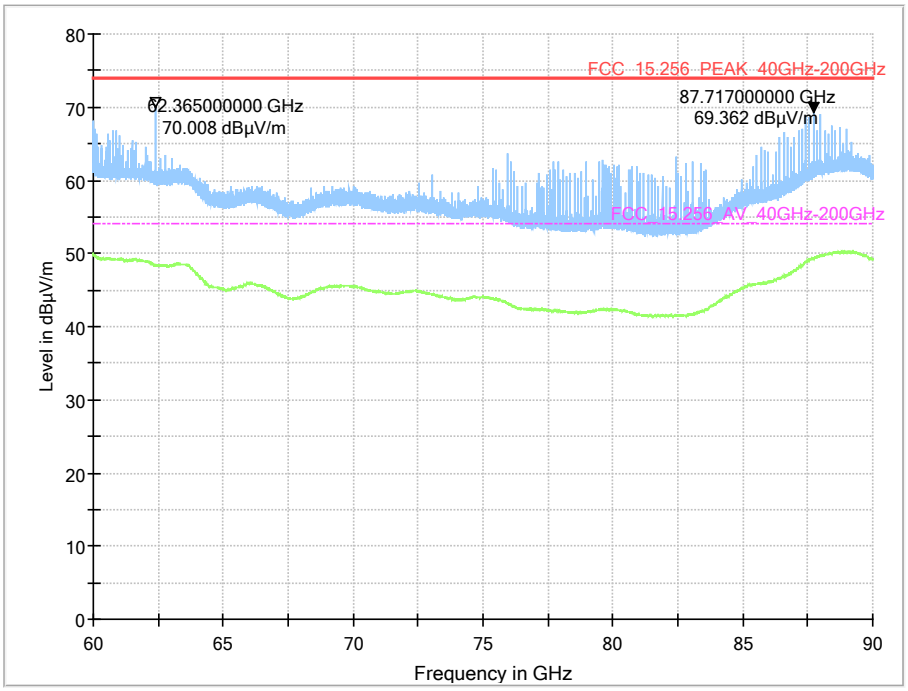


Final_Result

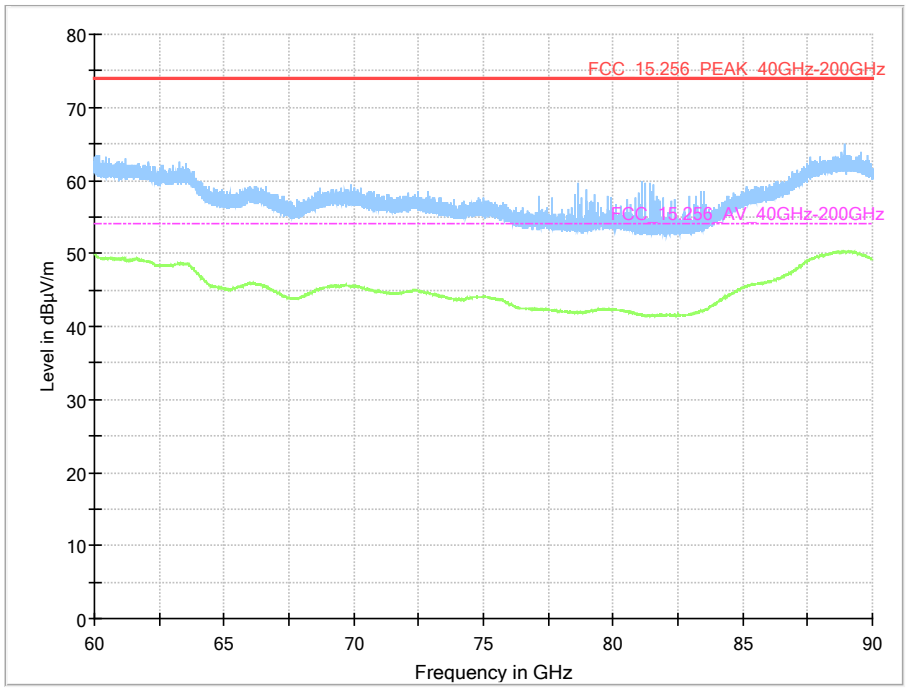
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB/m)
---	---	---	---	---	---	---		---	---	---

Antenna vertical

60 GHz – 90 GHz



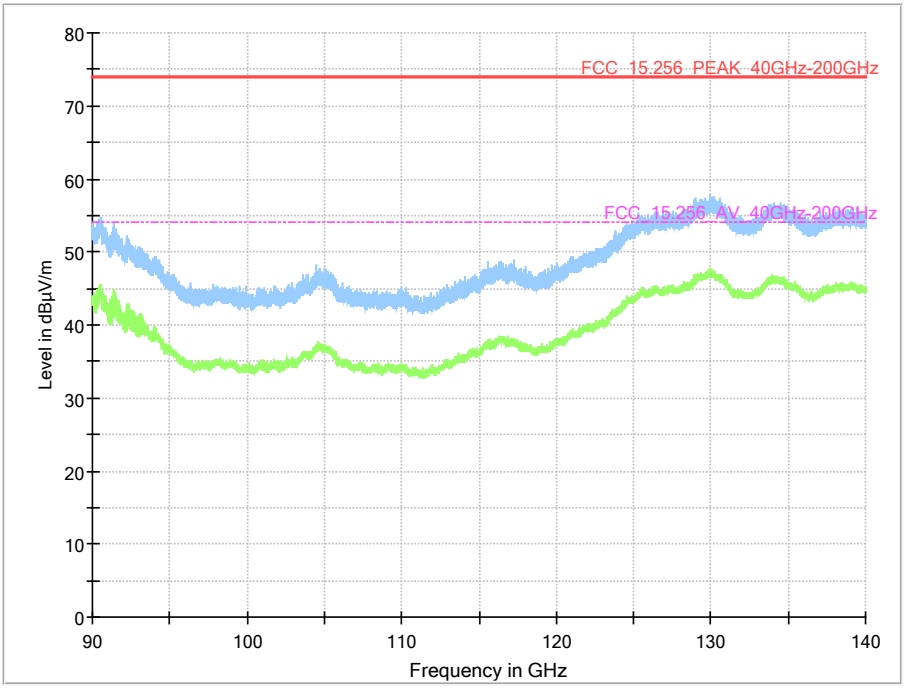
Antenna horizontal



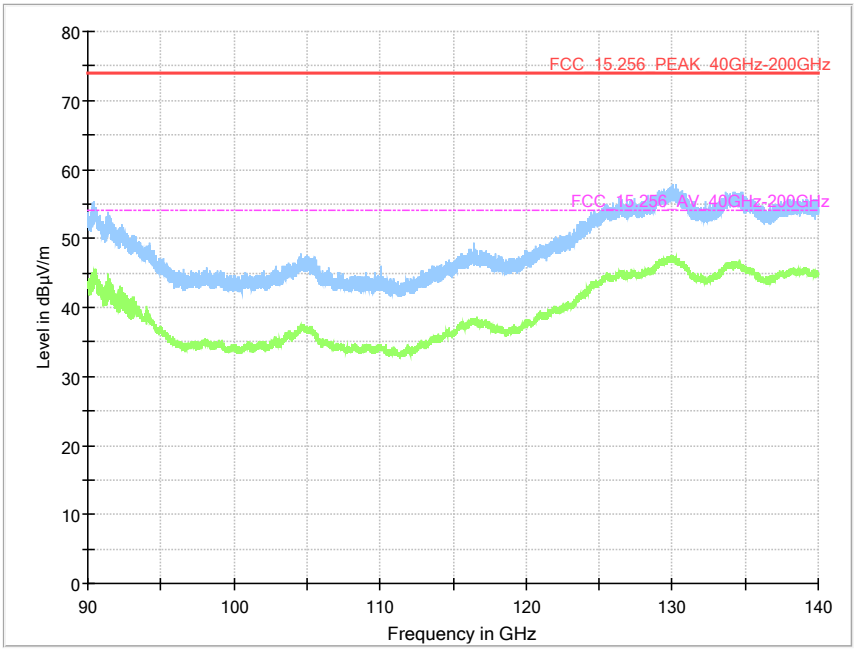
Antenna vertical

The peaks in the frequency range 77 – 81 GHz are the wanted signal and are not regarded for this test case.

90 GHz – 140 GHz

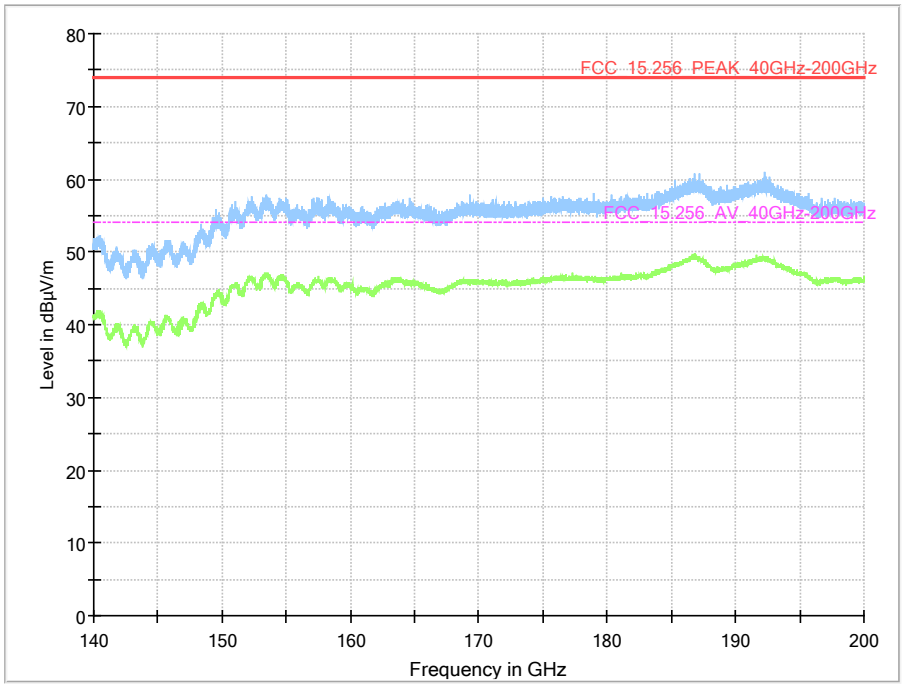


Antenna horizontal

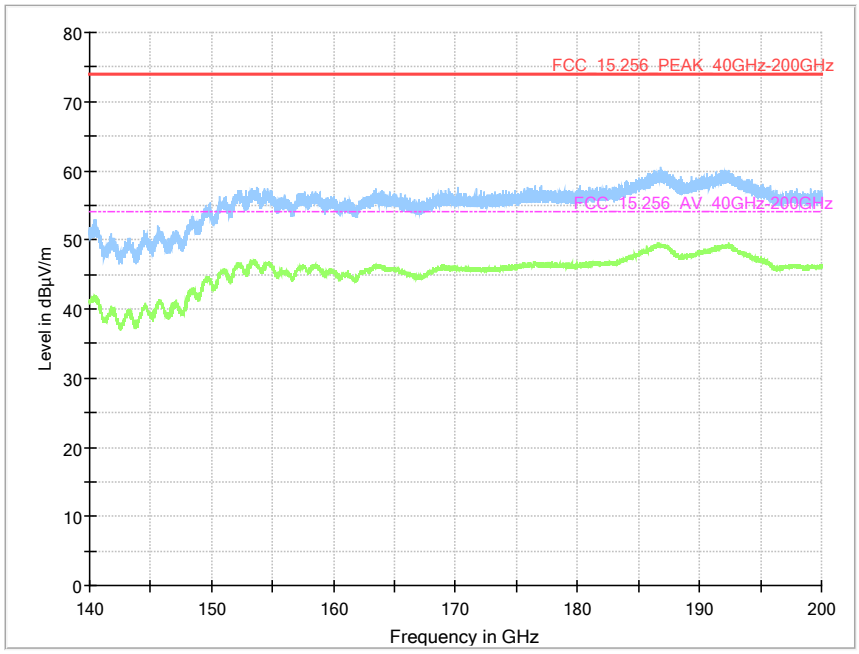


Antenna vertical

140 GHz – 200 GHz



Antenna horizontal

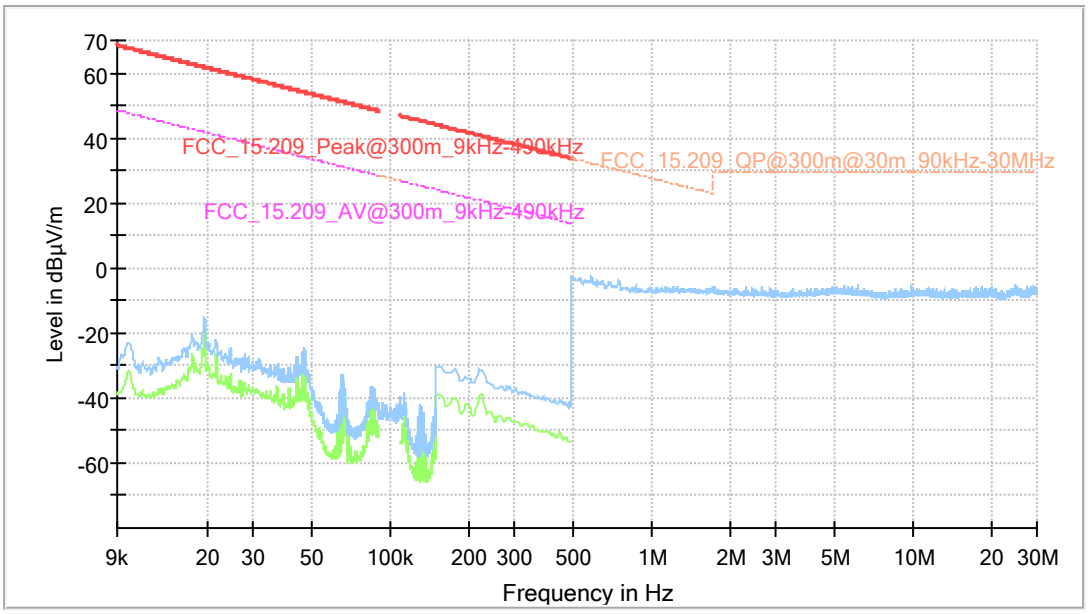


Antenna vertical

Standard Variant

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, (S01_CA01)

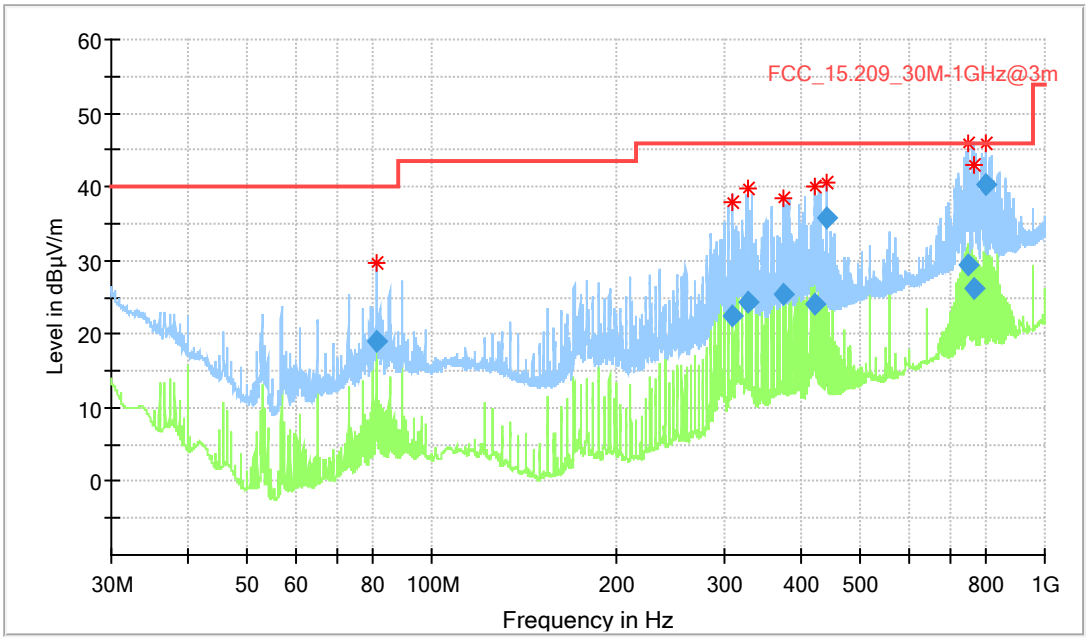
9 kHz – 30 MHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---	---	---

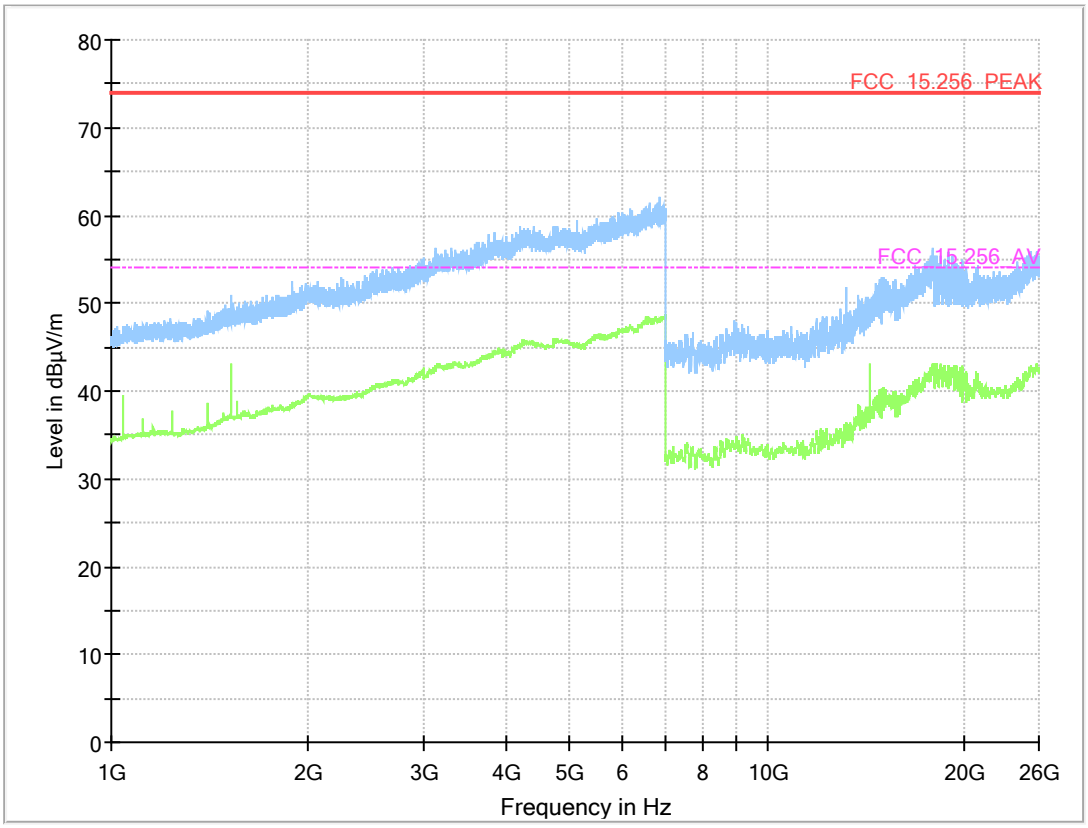
30 MHz – 1 GHz



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
81.240000	18.89	40.00	21.11	1000.0	120.000	125.0	V	1.0	10.7
308.580000	22.36	46.00	23.64	1000.0	120.000	113.0	H	6.0	14.9
328.890000	24.44	46.00	21.56	1000.0	120.000	105.0	H	-5.0	15.7
373.680000	25.29	46.00	20.71	1000.0	120.000	105.0	H	159.0	17.2
422.280000	23.97	46.00	22.03	1000.0	120.000	230.0	H	-52.0	18.7
439.980000	35.81	46.00	10.19	1000.0	120.000	211.0	H	-60.0	19.2
747.480000	29.33	46.00	16.67	1000.0	120.000	103.0	H	-45.0	25.5
767.400000	26.27	46.00	19.73	1000.0	120.000	179.0	H	-40.0	25.7
799.980000	40.34	46.00	5.66	1000.0	120.000	103.0	H	134.0	26.3

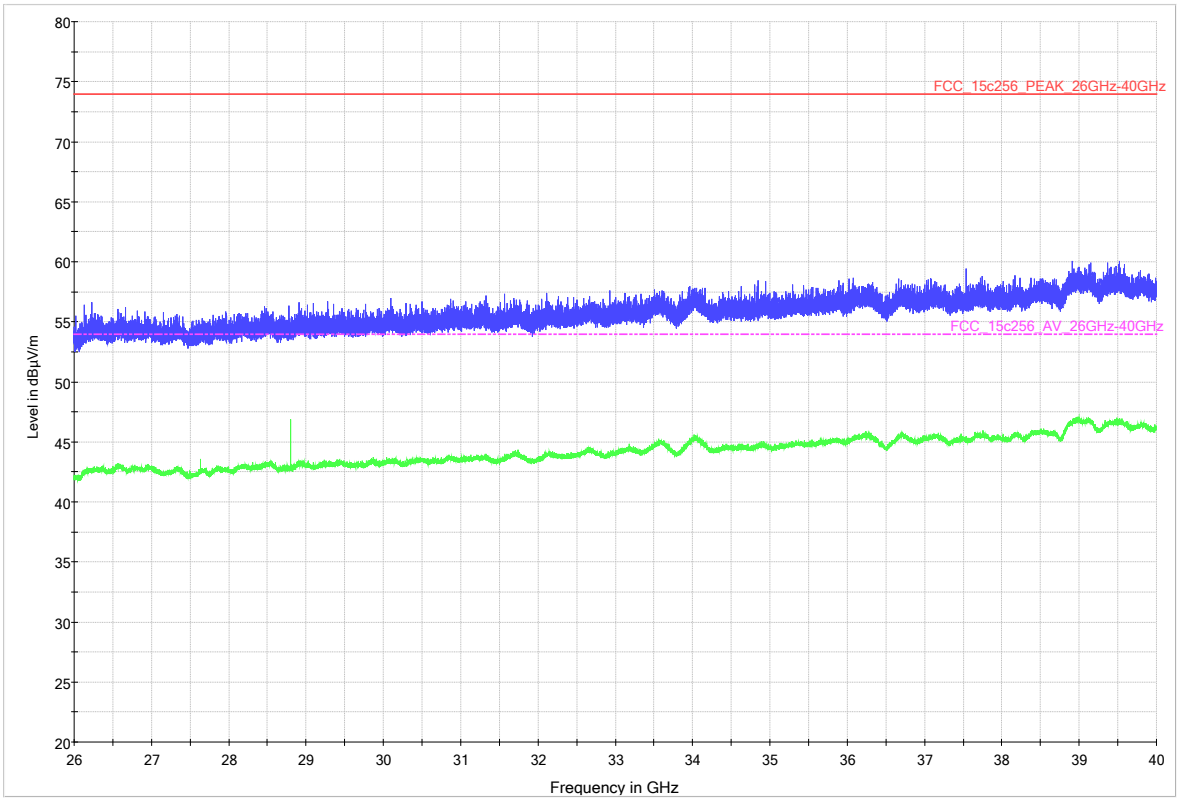
1 GHz – 26 GHz



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
---	---	---	---	---	---	---	---		---	---	---

26 GHz – 40 GHz



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
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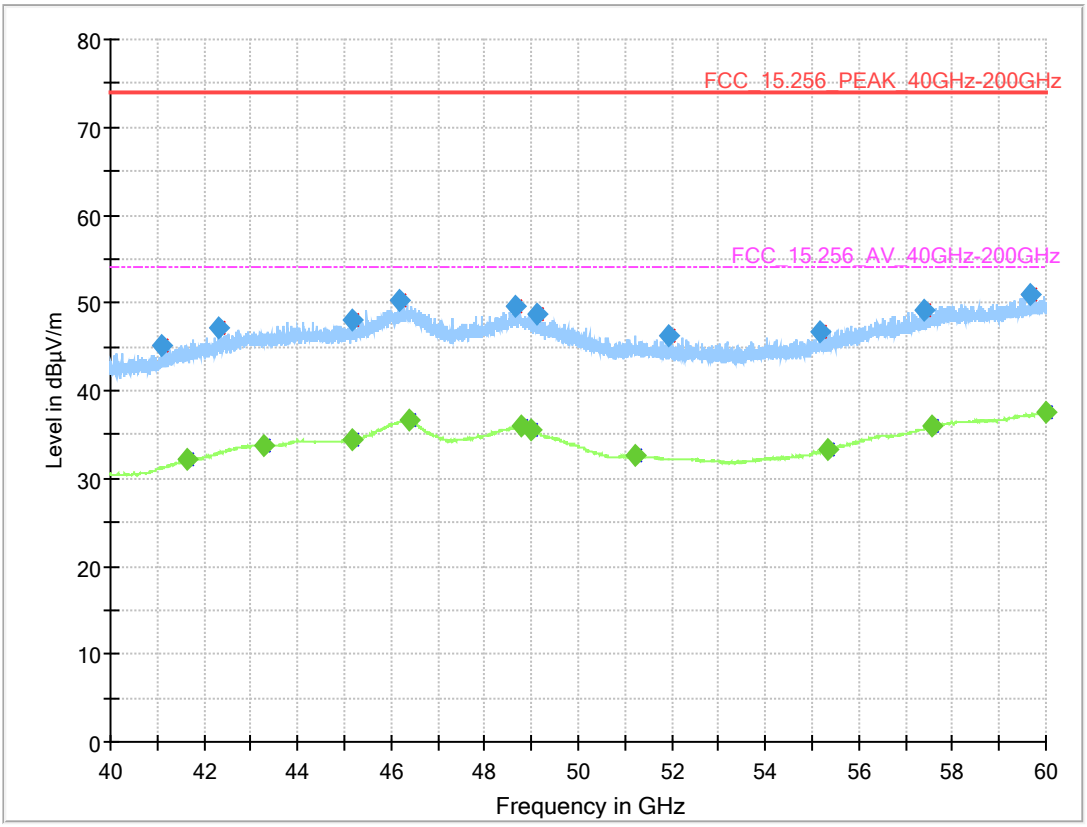
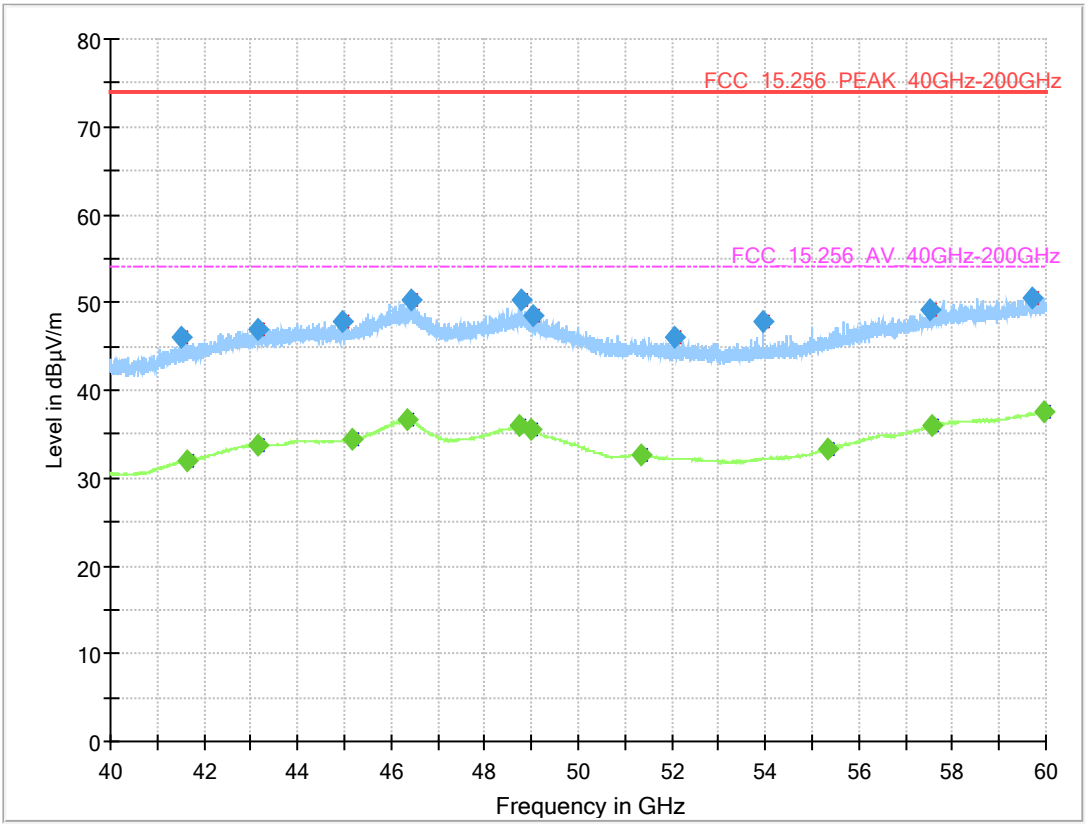
40 GHz – 60 GHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB/m)
41098.000	45.2	74.00	28.79	30000.0	1000.000	150.0	H	-90.0	90.0	24.2
41636.000	---	54.00	21.90	30000.0	1000.000	150.0	H	135.0	0.0	24.2
42324.000	47.1	74.00	26.94	30000.0	1000.000	150.0	H	-135.0	0.0	24.3
43292.000	---	54.00	20.16	30000.0	1000.000	150.0	H	135.0	0.0	24.4
45148.000	48.0	74.00	26.00	30000.0	1000.000	150.0	H	45.0	0.0	24.6
45166.000	---	54.00	19.54	30000.0	1000.000	150.0	H	-135.0	90.0	24.6
46194.000	50.3	74.00	23.69	30000.0	1000.000	150.0	H	-180.0	90.0	24.7
46384.000	---	54.00	17.28	30000.0	1000.000	150.0	H	-90.0	90.0	24.8
48676.000	49.7	74.00	24.34	30000.0	1000.000	150.0	H	0.0	90.0	25.0
48788.000	---	54.00	18.00	30000.0	1000.000	150.0	H	90.0	90.0	25.0
48990.000	---	54.00	18.57	30000.0	1000.000	150.0	H	45.0	90.0	25.1
49098.000	48.7	74.00	25.35	30000.0	1000.000	150.0	H	135.0	90.0	25.1
51214.000	---	54.00	21.28	30000.0	1000.000	150.0	H	45.0	0.0	25.3
51914.000	46.2	74.00	27.83	30000.0	1000.000	150.0	H	-135.0	0.0	25.4
55172.000	46.6	74.00	27.36	30000.0	1000.000	150.0	H	-180.0	90.0	25.9
55324.000	---	54.00	20.78	30000.0	1000.000	150.0	H	-45.0	0.0	25.9
57376.000	49.2	74.00	24.77	30000.0	1000.000	150.0	H	-180.0	90.0	26.2
57578.000	---	54.00	17.98	30000.0	1000.000	150.0	H	-45.0	0.0	26.2
59644.000	50.9	74.00	23.14	30000.0	1000.000	150.0	H	-135.0	90.0	26.5
59998.000	---	54.00	16.50	30000.0	1000.000	150.0	H	135.0	90.0	26.5

Antenna horizontal

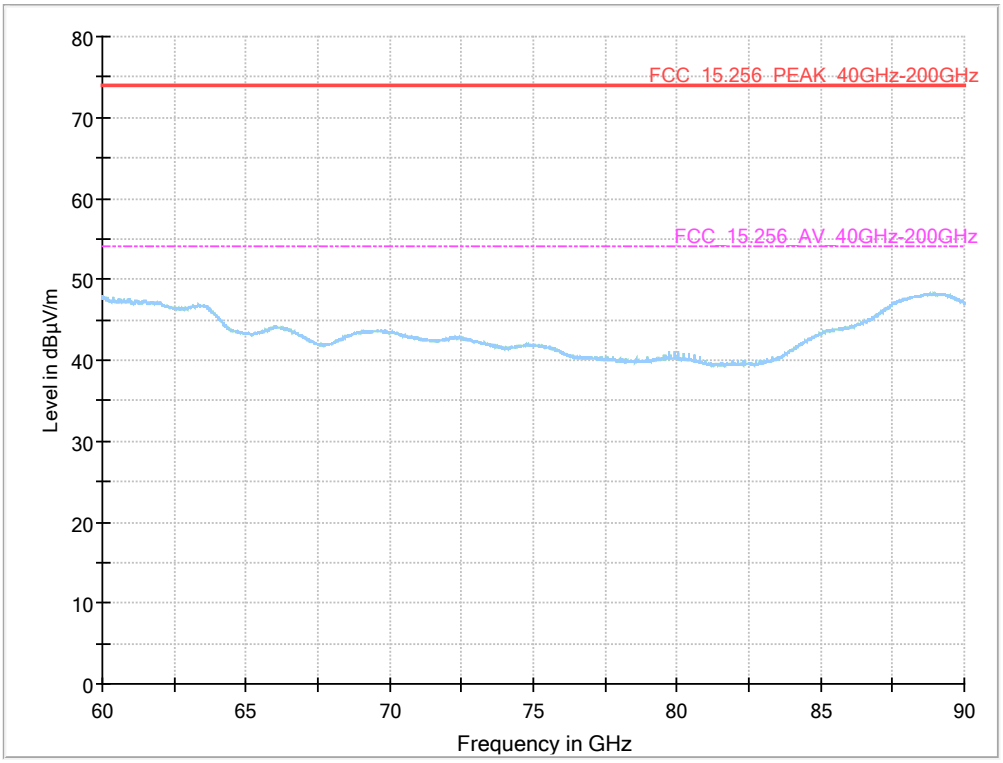


Final_Result

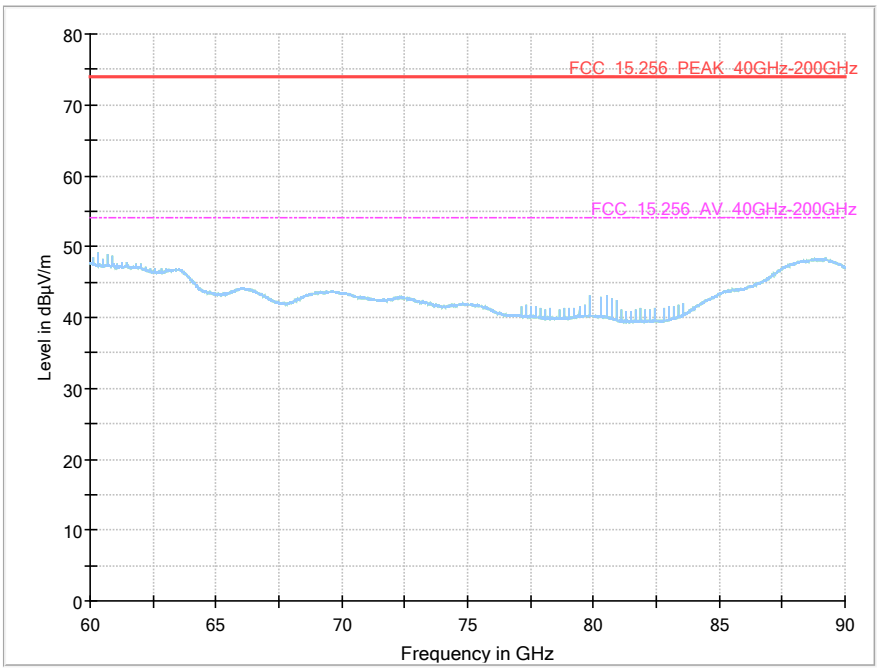
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation	Corr. (dB/m)
41496.000	45.9	74.00	28.07	30000.0	1000.000	150.0	H	-45.0	90.0	24.2
41650.000	---	54.00	21.94	30000.0	1000.000	150.0	H	-45.0	0.0	24.2
43134.000	---	54.00	20.20	30000.0	1000.000	150.0	H	0.0	90.0	24.4
43150.000	46.9	74.00	27.08	30000.0	1000.000	150.0	H	-45.0	90.0	24.4
44976.000	47.9	74.00	26.10	30000.0	1000.000	150.0	H	90.0	90.0	24.6
45166.000	---	54.00	19.60	30000.0	1000.000	150.0	H	135.0	90.0	24.6
46332.000	---	54.00	17.35	30000.0	1000.000	150.0	H	45.0	0.0	24.8
46426.000	50.2	74.00	23.83	30000.0	1000.000	150.0	H	90.0	90.0	24.8
48722.000	---	54.00	18.03	30000.0	1000.000	150.0	H	135.0	90.0	25.0
48794.000	50.3	74.00	23.68	30000.0	1000.000	150.0	H	45.0	90.0	25.0
49002.000	---	54.00	18.57	30000.0	1000.000	150.0	H	135.0	90.0	25.1
49048.000	48.6	74.00	25.45	30000.0	1000.000	150.0	H	90.0	0.0	25.1
51324.000	---	54.00	21.31	30000.0	1000.000	150.0	H	90.0	0.0	25.4
52044.000	46.1	74.00	27.89	30000.0	1000.000	150.0	H	45.0	90.0	25.5
53942.000	47.9	74.00	26.15	30000.0	1000.000	150.0	H	0.0	0.0	25.7
55326.000	---	54.00	20.74	30000.0	1000.000	150.0	H	135.0	0.0	25.9
57532.000	49.1	74.00	24.89	30000.0	1000.000	150.0	H	90.0	90.0	26.2
57562.000	---	54.00	17.93	30000.0	1000.000	150.0	H	-90.0	90.0	26.2
59686.000	50.6	74.00	23.39	30000.0	1000.000	150.0	H	135.0	90.0	26.5
59944.000	---	54.00	16.55	30000.0	1000.000	150.0	H	-90.0	0.0	26.5

Antenna vertical

60 GHz – 90 GHz



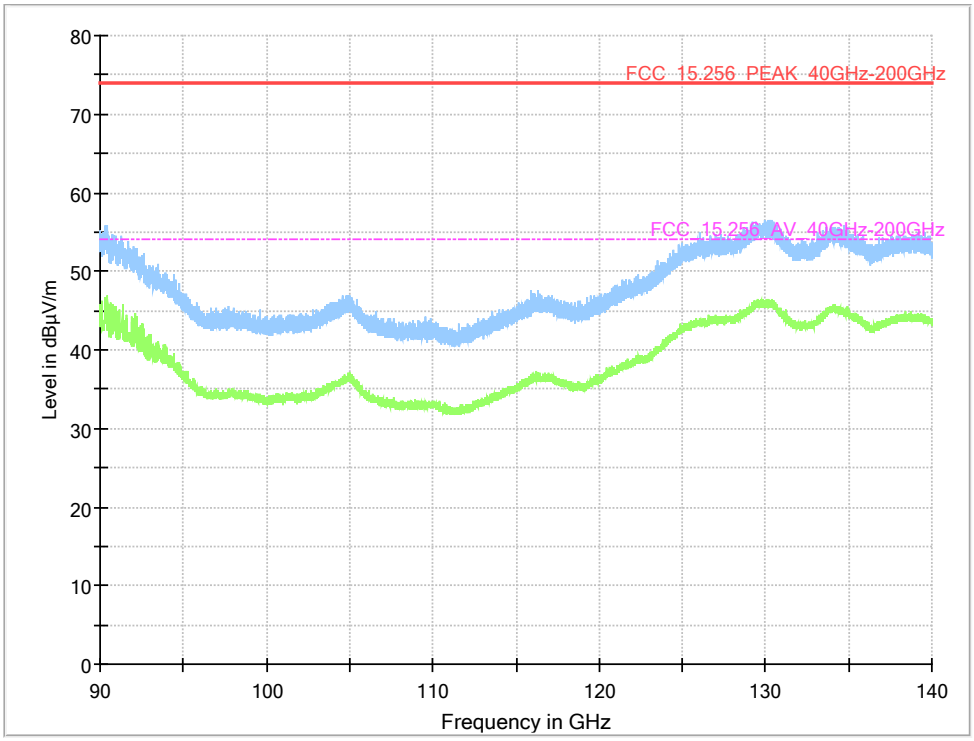
Antenna horizontal



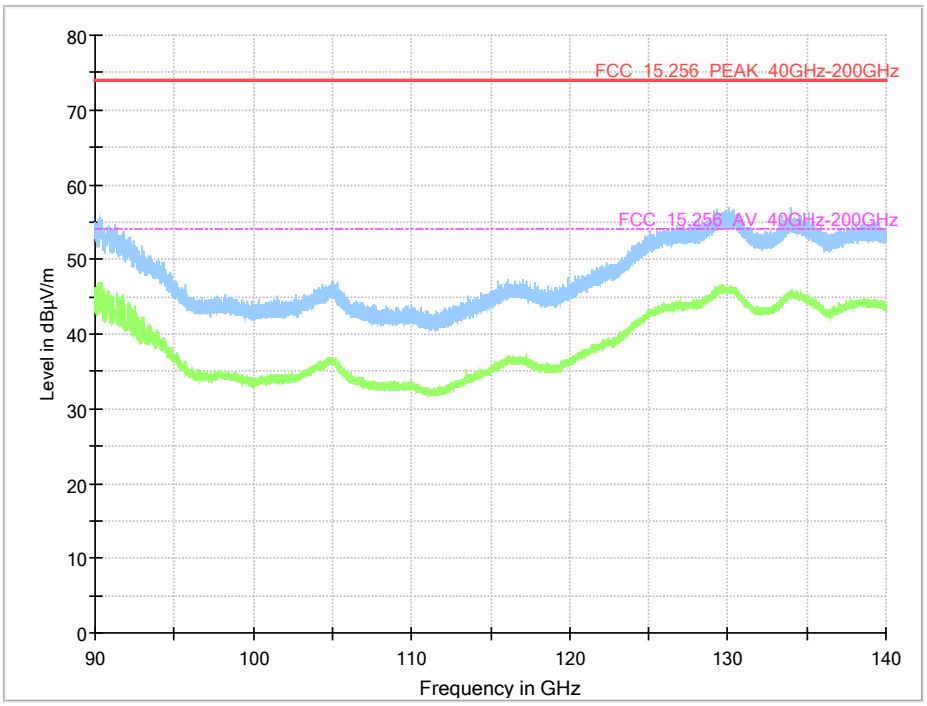
Antenna vertical

The peaks in the frequency range 77 – 81 GHz are the wanted signal and are not regarded for this test case.

90 GHz – 140 GHz

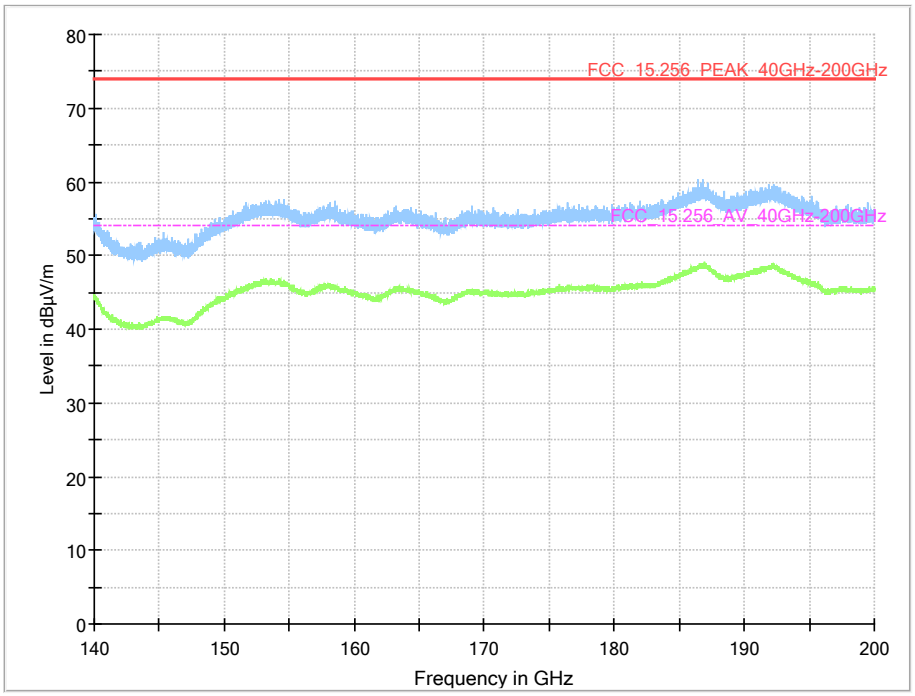


Antenna horizontal

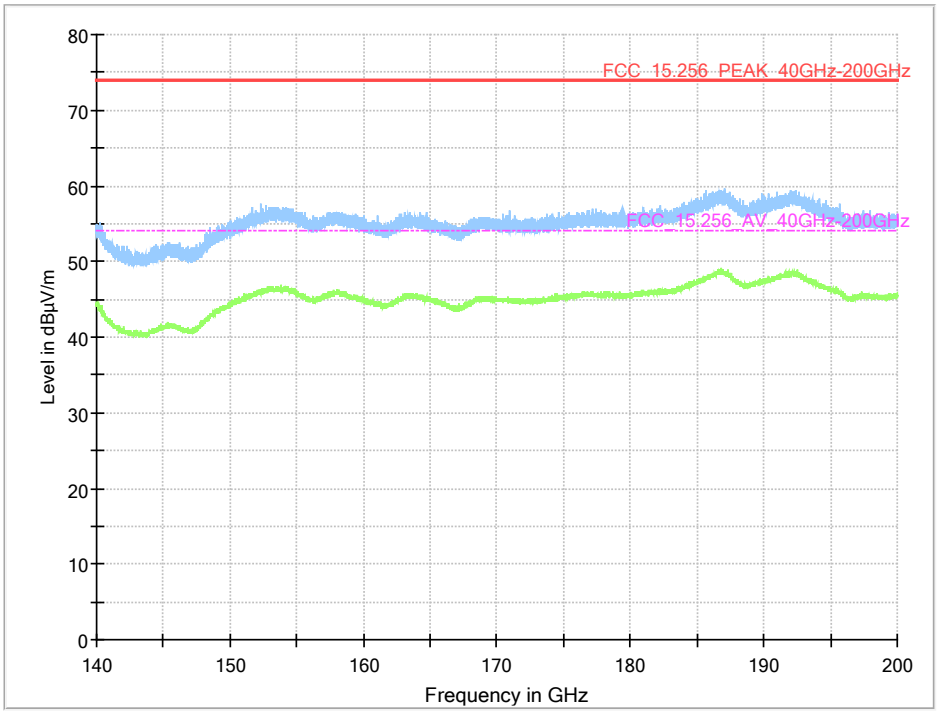


Antenna vertical

140 GHz – 200 GHz



Antenna horizontal

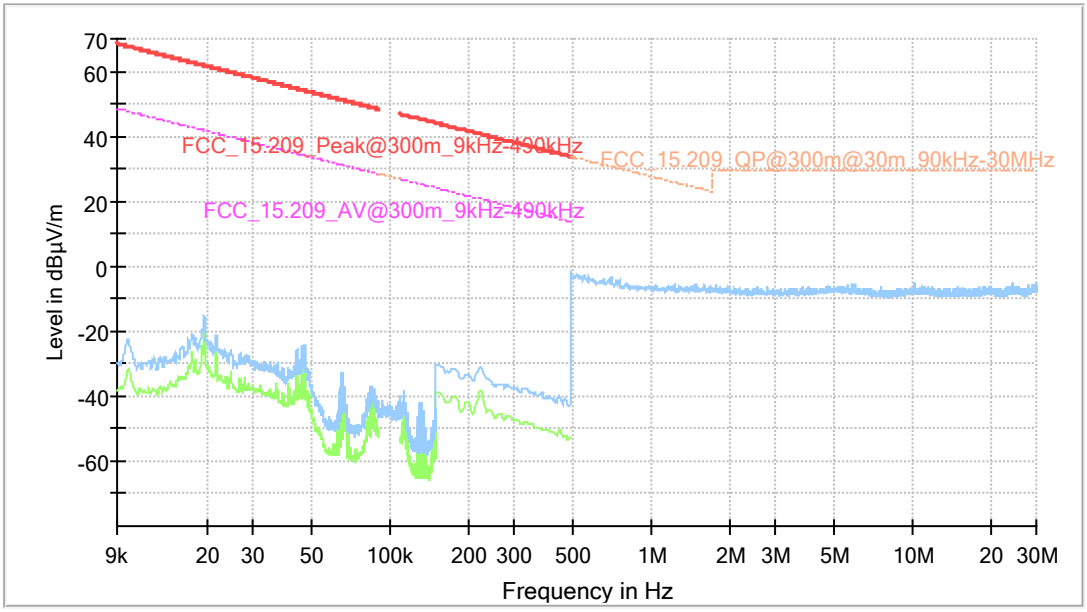


Antenna vertical

IP68 Variant

Radio Technology = FMCW Radar, OBW = 4 GHz, Operating Band = 75 GHz – 85 GHz, (S01_DA01)

9 kHz – 30 MHz



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
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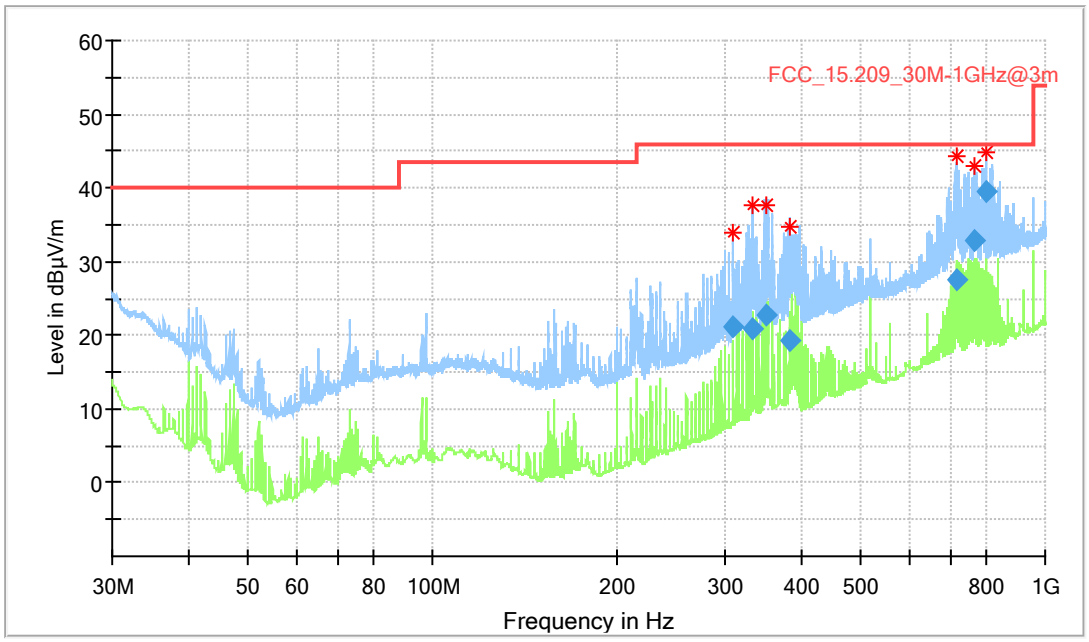
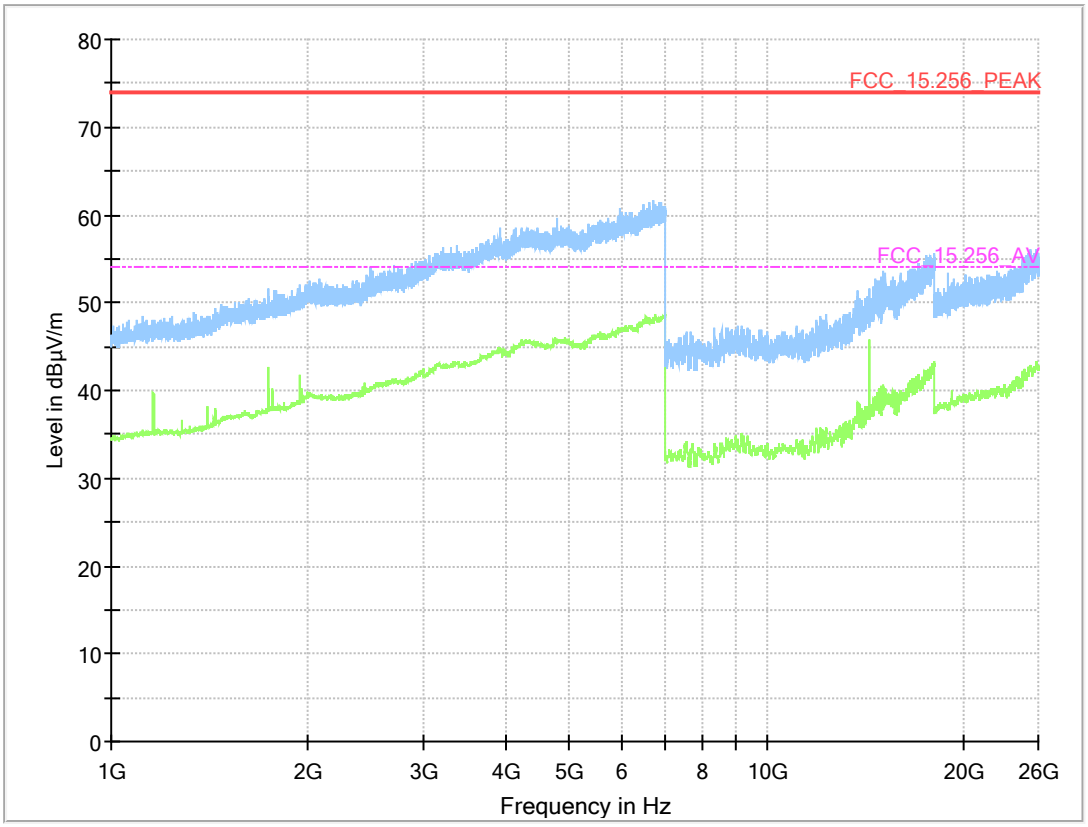
30 MHz – 1 GHz



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
308.730000	21.02	46.00	24.98	1000.0	120.000	107.0	H	117.0	14.9
333.000000	20.92	46.00	25.08	1000.0	120.000	110.0	H	-195.0	15.8
349.260000	22.63	46.00	23.37	1000.0	120.000	103.0	H	-193.0	16.2
381.780000	19.31	46.00	26.69	1000.0	120.000	108.0	H	-192.0	17.4
719.340000	27.40	46.00	18.60	1000.0	120.000	106.0	H	111.0	25.1
768.480000	32.95	46.00	13.05	1000.0	120.000	102.0	H	109.0	25.8
799.980000	39.48	46.00	6.52	1000.0	120.000	115.0	H	104.0	26.3

1 GHz – 26 GHz



Final´Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/m)
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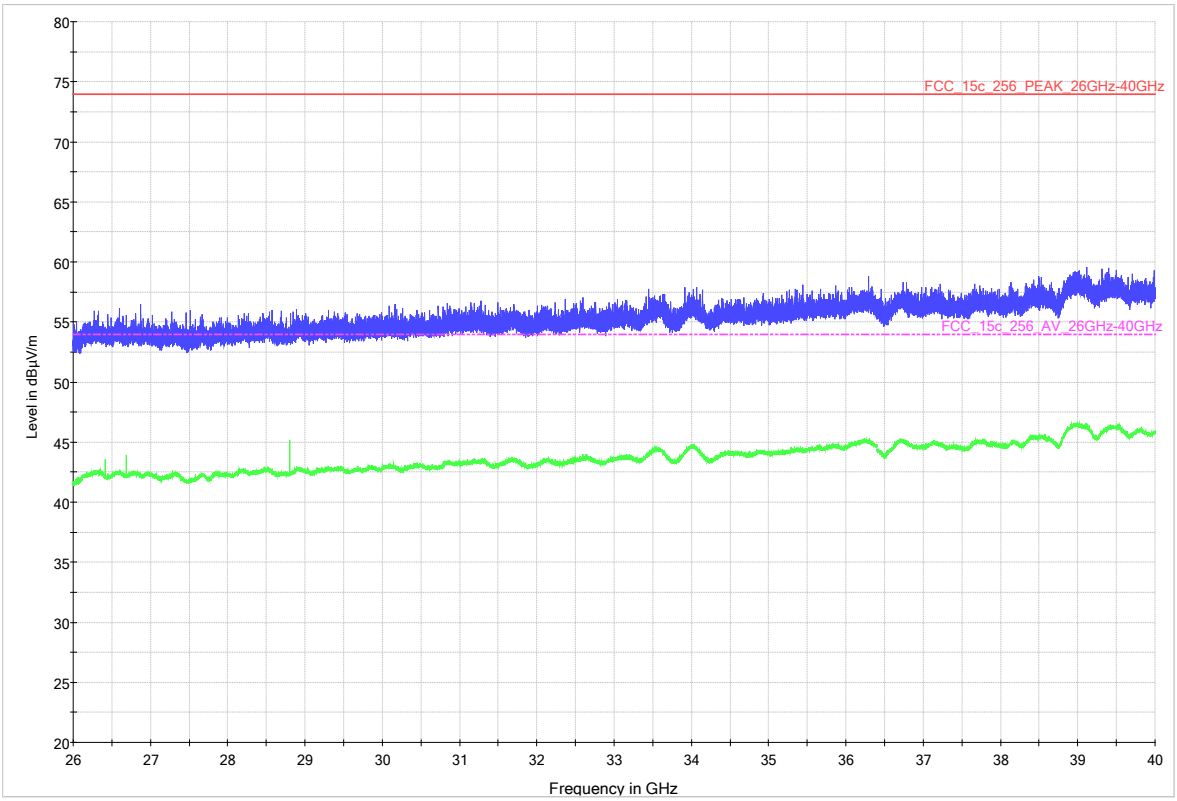
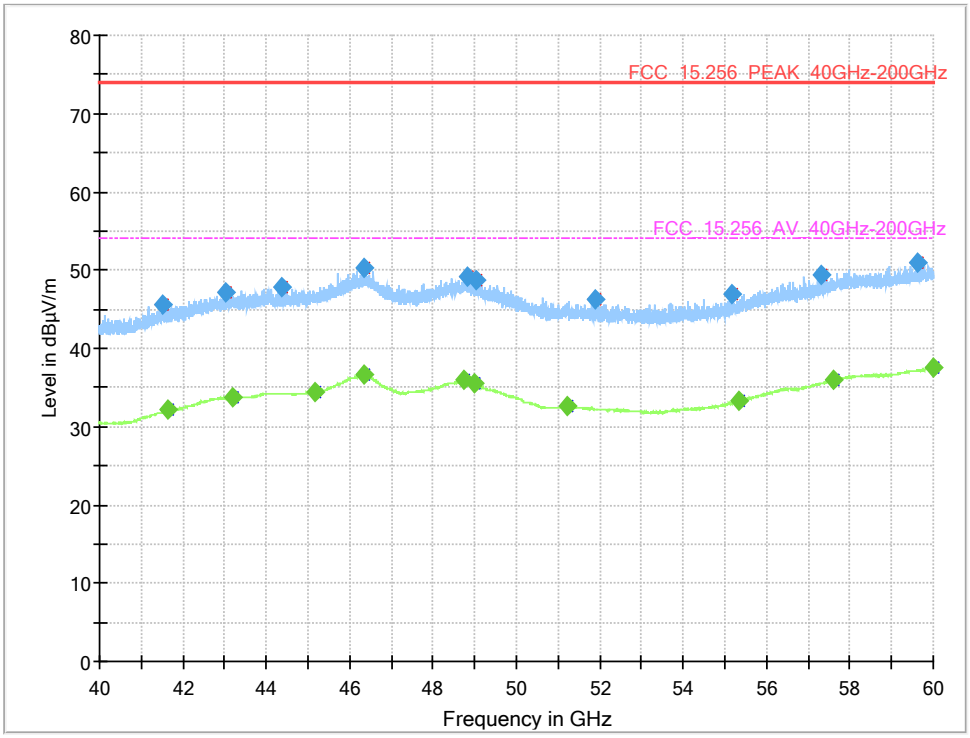
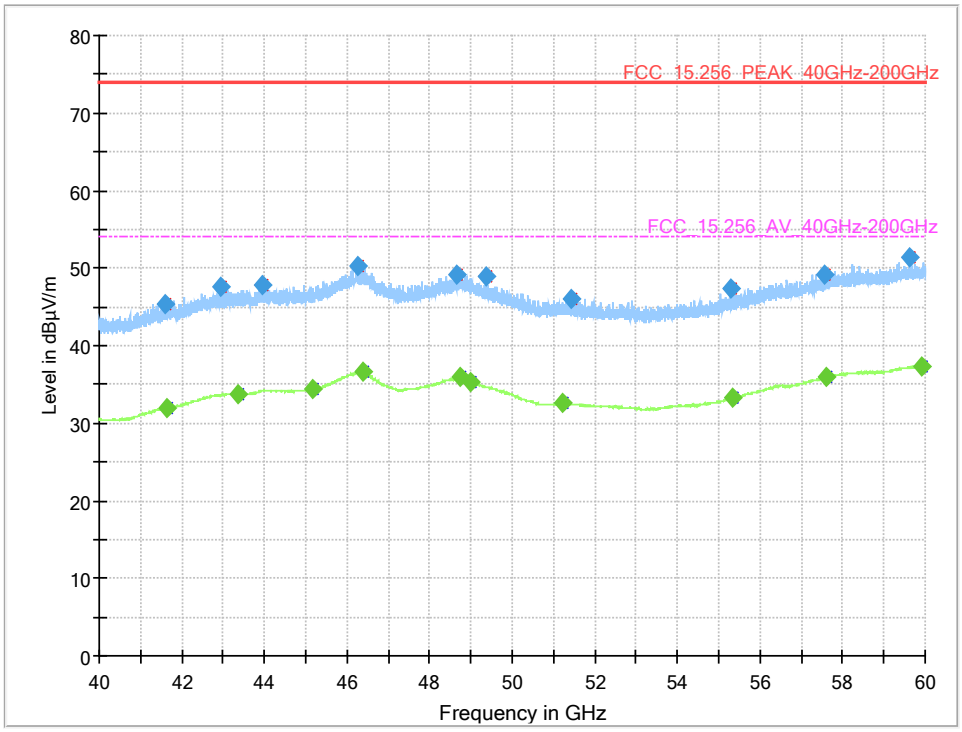
26 GHz – 40 GHz


FCC_15c_256_PEAK_26GHz-40GHz
FCC_15c_256_AV_26GHz-40GHz
Level in dBµV/m
Frequency in GHz
80
75
70
65
60
55
50
45
40
35
30
25
20
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

40 GHz – 60 GHz

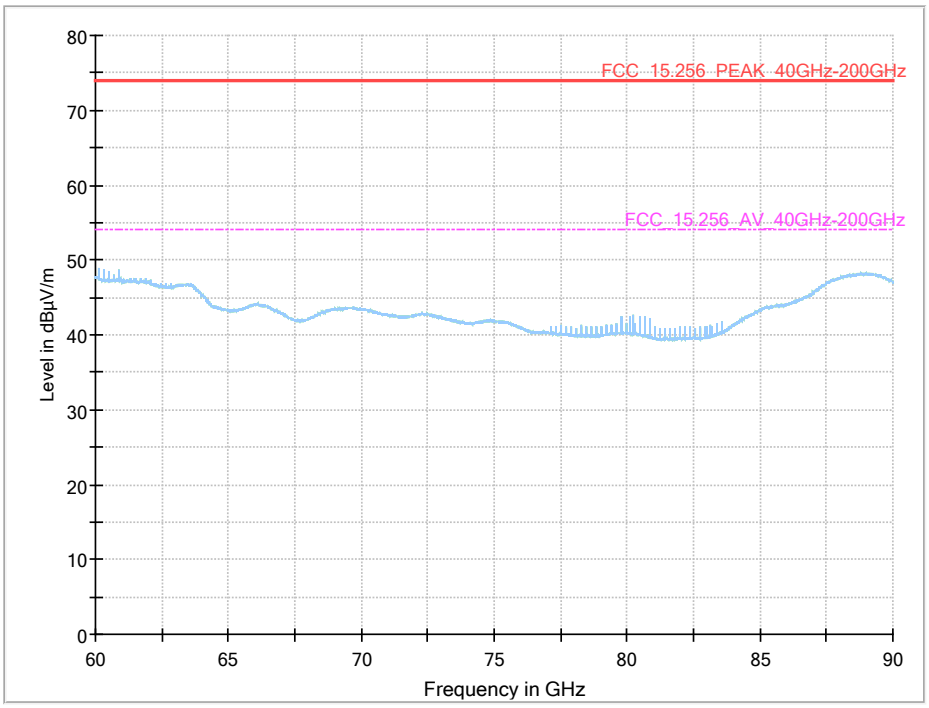


Antenna horizontal

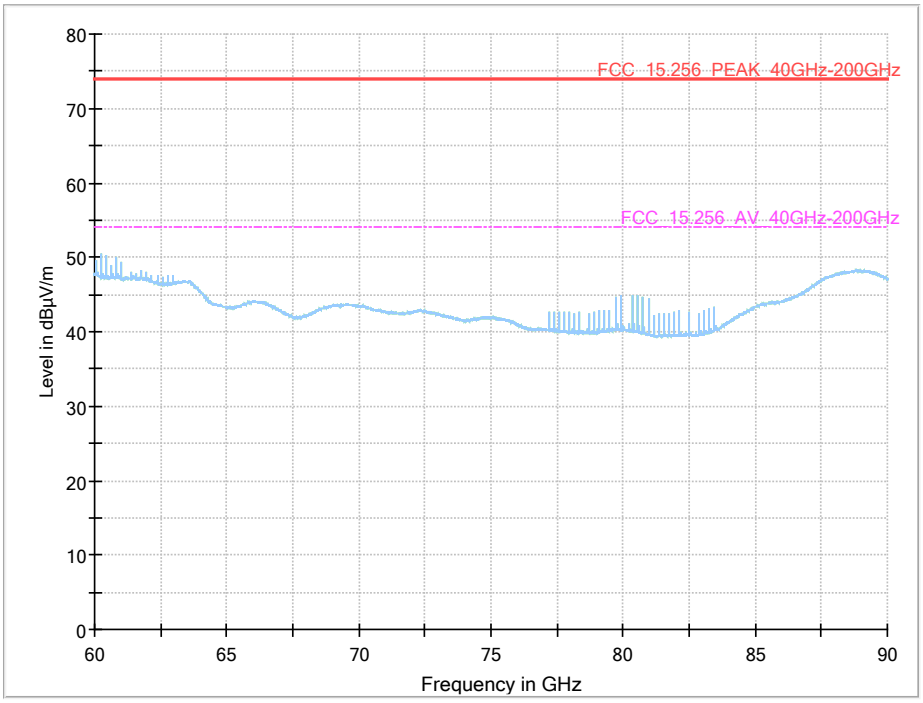


Antenna vertical

60 GHz – 90 GHz



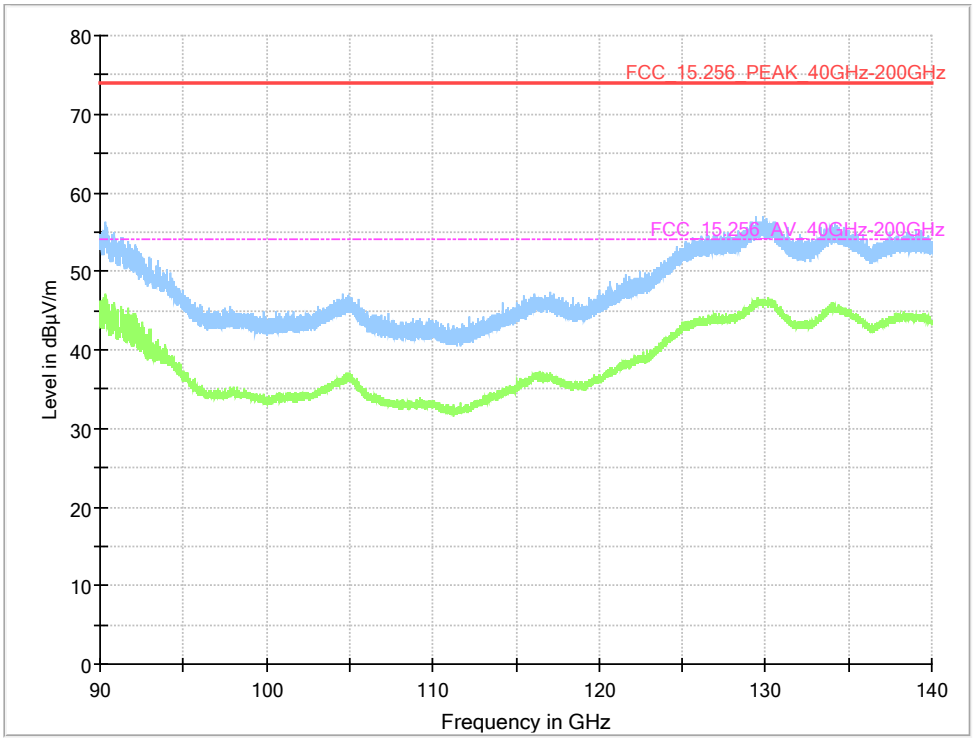
Antenna horizontal



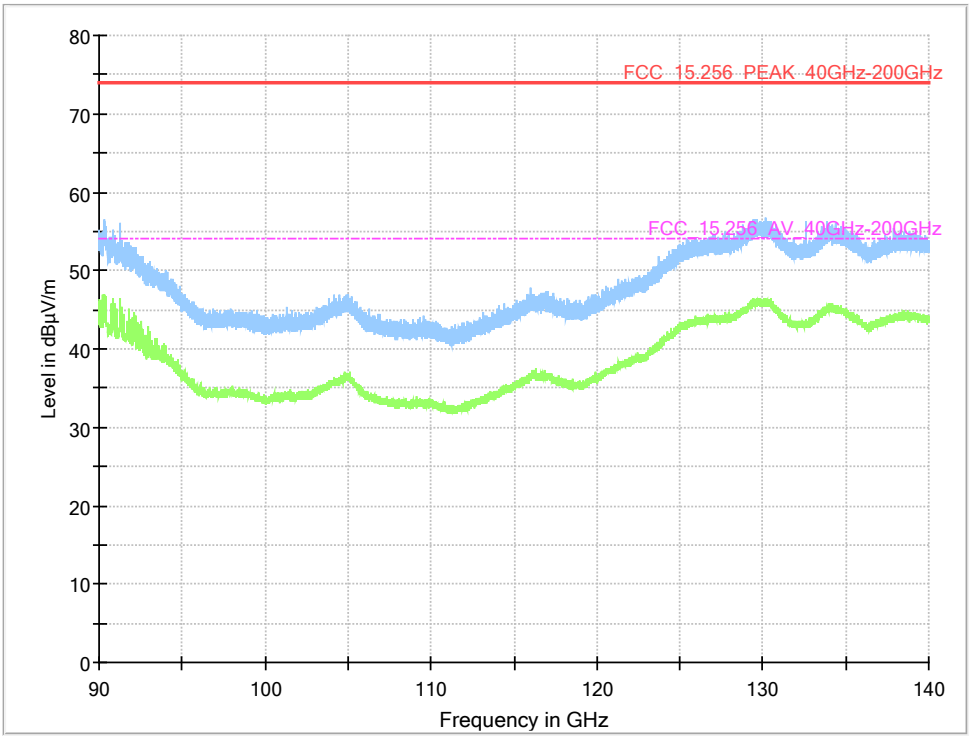
Antenna vertical

The peaks in the frequency range 77 – 81 GHz are the wanted signal and are not regarded for this test case.

90 GHz – 140 GHz

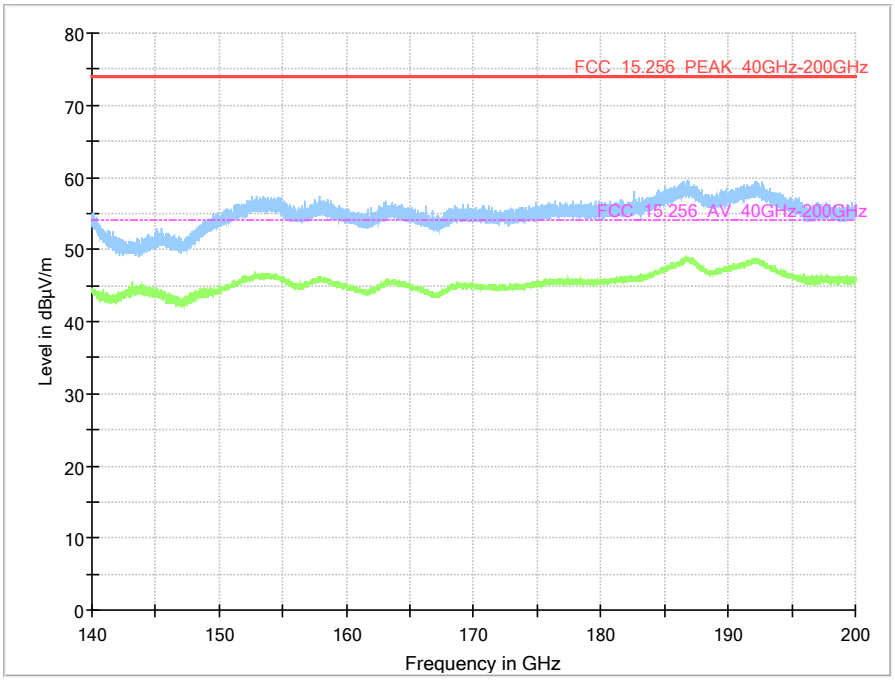


Antenna horizontal

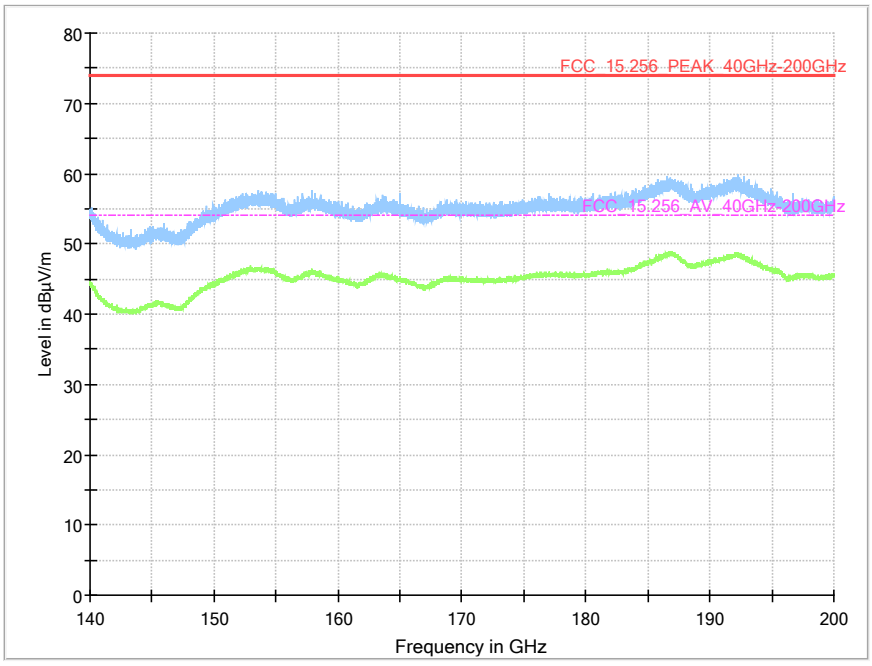


Antenna vertical

140 GHz – 200 GHz



Antenna horizontal



Antenna vertical

5.3.5 TEST EQUIPMENT USED

- Radiated Emissions SAC H-Field
- Radiated Emissions SAC
- Radiated Emissions FAC FCC

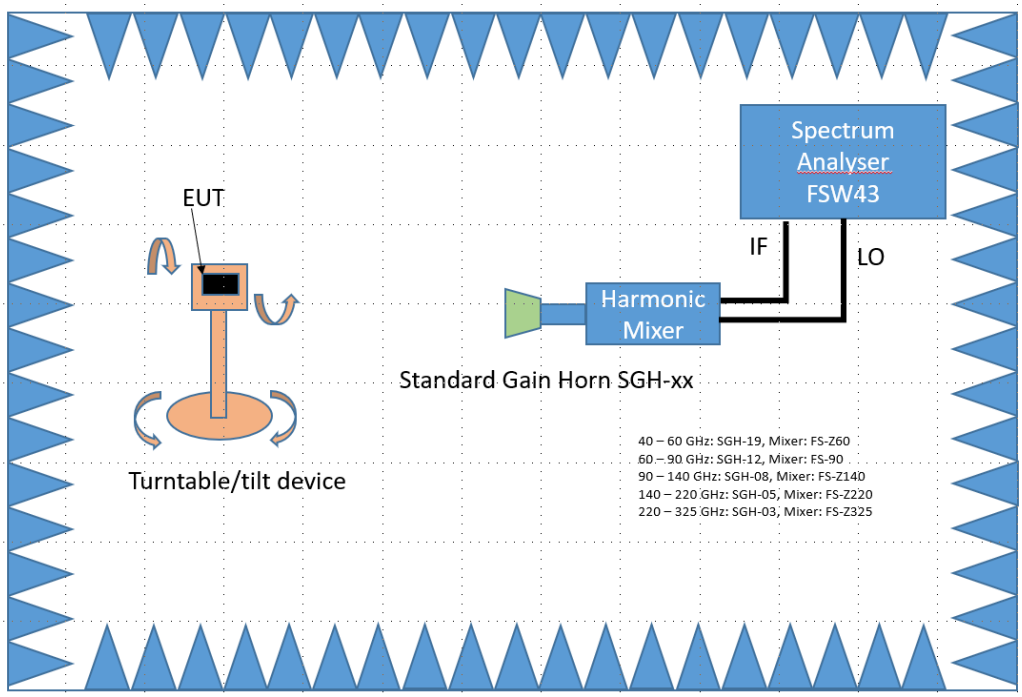
5.4 ANTENNA BEAMWIDTH

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ETSI EN 302 729

5.4.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.



Test Setup; Antenna Measurements 40 GHz – 325 GHz

All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the measurement the turn table step size (azimuth angle) for the measurement is 1 °, the Turntable angle range: –180° to +180°.

Analyzer settings:

- Resolution Bandwidth (RBW): 1000 kHz
- Video Bandwidth (VBW): 3000 kHz
- Span: zero-span
- Trace: Maxhold
- Sweeps: single
- Sweeptime: 1 s
- Detector: Peak

5.4.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.256 (i) (B)

(i) Antenna beamwidth.

(A) LPR devices operating under the provisions of this section within the 5.925-7.250 GHz and 24.05-29.00 GHz bands must use an antenna with a −3 dB beamwidth no greater than 12 degrees.

(B) LPR devices operating under the provisions of this section within the 75-85 GHz band must use an antenna with a −3 dB beamwidth no greater than 8 degrees.

RSS-211: 5.2

(a) For devices operating in open-air environments, the antenna shall have a maximum half-power beamwidth of 12° for the bands 5.65-8.5 GHz and 24.05-29 GHz, and a maximum half-power beamwidth of 8° for the band 75-85 GHz.

5.4.3 TEST PROTOCOL

Ambient temperature: 22°C
Air Pressure: 1004 hPa
Humidity: 36 %

Antenna horizontal:

Normalized Azimuth [deg]	Normalized Level [dB]	Half-Power Beamwidth Limit [dbc]	Side-Lobe Gain Limit [dbc]	Margin to Half-Power Limit [dB]	Margin to Side-Lobe Limit [dB]
0.0	0.0	#N/A	#N/A	#N/A	#N/A
1.0	0.0	#N/A	#N/A	#N/A	#N/A
2.0	-7.1	#N/A	#N/A	#N/A	#N/A
3.0	-7.1	#N/A	#N/A	#N/A	#N/A
4.0	-3.9	#N/A	#N/A	#N/A	#N/A
5.0	-3.9	-3	#N/A	-0.9	#N/A
6.0	-11.6	-3	#N/A	-8.6	#N/A
7.0	-16.9	-3	#N/A	-13.9	#N/A
8.0	-16.9	-3	#N/A	-13.9	#N/A
9.0	-14.3	-3	#N/A	-11.3	#N/A
10.0	-13.6	-3	#N/A	-10.6	#N/A
11.0	-14.9	-3	#N/A	-11.9	#N/A
12.0	-14.9	-3	#N/A	-11.9	#N/A
13.0	-23.6	-3	#N/A	-20.6	#N/A
14.0	-20.4	-3	#N/A	-17.4	#N/A
15.0	-20.4	-3	#N/A	-17.4	#N/A
16.0	-33.5	-3	#N/A	-30.5	#N/A
17.0	-33.6	-3	#N/A	-30.6	#N/A
18.0	-21.9	-3	#N/A	-18.9	#N/A
19.0	-21.9	-3	#N/A	-18.9	#N/A
20.0	-24.7	-3	#N/A	-21.7	#N/A
21.0	-24.7	-3	#N/A	-21.7	#N/A
22.0	-26.1	-3	#N/A	-23.1	#N/A
23.0	-26.1	-3	#N/A	-23.1	#N/A
24.0	-25.1	-3	#N/A	-22.1	#N/A
25.0	-25.1	-3	#N/A	-22.1	#N/A
26.0	-35.9	-3	#N/A	-32.9	#N/A
27.0	-31.8	-3	#N/A	-28.8	#N/A
28.0	-27.7	-3	#N/A	-24.7	#N/A
29.0	-32.2	-3	#N/A	-29.2	#N/A
30.0	-39.1	-3	#N/A	-36.1	#N/A
31.0	-28.5	-3	#N/A	-25.5	#N/A
32.0	-27.2	-3	#N/A	-24.2	#N/A
33.0	-28.6	-3	#N/A	-25.6	#N/A
34.0	-28.5	-3	#N/A	-25.5	#N/A
35.0	-34.5	-3	#N/A	-31.5	#N/A
36.0	-34.7	-3	#N/A	-31.7	#N/A
37.0	-35.2	-3	#N/A	-32.2	#N/A
38.0	-35.1	-3	#N/A	-32.1	#N/A

39.0	-33.2	-3	#N/A	-30.2	#N/A
40.0	-33.4	-3	#N/A	-30.4	#N/A
41.0	-32.6	-3	#N/A	-29.6	#N/A
42.0	-32.6	-3	#N/A	-29.6	#N/A
43.0	-35.5	-3	#N/A	-32.5	#N/A
44.0	-38.3	-3	#N/A	-35.3	#N/A
45.0	-37.5	-3	#N/A	-34.5	#N/A
46.0	-36.0	-3	#N/A	-33.0	#N/A
47.0	-36.0	-3	#N/A	-33.0	#N/A
48.0	-37.5	-3	#N/A	-34.5	#N/A
49.0	-38.8	-3	#N/A	-35.8	#N/A
50.0	-38.6	-3	#N/A	-35.6	#N/A
51.0	-40.4	-3	#N/A	-37.4	#N/A
52.0	-40.5	-3	#N/A	-37.5	#N/A
53.0	-45.5	-3	#N/A	-42.5	#N/A
54.0	-45.7	-3	#N/A	-42.7	#N/A
55.0	-45.6	-3	#N/A	-42.6	#N/A
56.0	-45.6	-3	#N/A	-42.6	#N/A
57.0	-45.5	-3	#N/A	-42.5	#N/A
58.0	-45.6	-3	#N/A	-42.6	#N/A
59.0	-41.9	-3	#N/A	-38.9	#N/A
60.0	-41.1	-3	#N/A	-38.1	#N/A
61.0	-39.4	-3	-38	-36.4	-1.4
62.0	-41.0	-3	-38	-38.0	-3.0
63.0	-41.0	-3	-38	-38.0	-3.0
64.0	-45.1	-3	-38	-42.1	-7.1
65.0	-42.1	-3	-38	-39.1	-4.1
66.0	-51.9	-3	-38	-48.9	-13.9
67.0	-51.1	-3	-38	-48.1	-13.1
68.0	-45.2	-3	-38	-42.2	-7.2
69.0	-45.3	-3	-38	-42.3	-7.3
70.0	-49.1	-3	-38	-46.1	-11.1
71.0	-49.5	-3	-38	-46.5	-11.5
72.0	-49.2	-3	-38	-46.2	-11.2
73.0	-49.3	-3	-38	-46.3	-11.3
74.0	-51.4	-3	-38	-48.4	-13.4
75.0	-51.8	-3	-38	-48.8	-13.8
76.0	-51.3	-3	-38	-48.3	-13.3
77.0	-51.8	-3	-38	-48.8	-13.8
78.0	-51.5	-3	-38	-48.5	-13.5
79.0	-51.0	-3	-38	-48.0	-13.0
80.0	-46.6	-3	-38	-43.6	-8.6
81.0	-46.1	-3	-38	-43.1	-8.1
82.0	-51.6	-3	-38	-48.6	-13.6
83.0	-51.3	-3	-38	-48.3	-13.3
84.0	-49.9	-3	-38	-46.9	-11.9
85.0	-49.8	-3	-38	-46.8	-11.8
86.0	-50.8	-3	-38	-47.8	-12.8
87.0	-50.8	-3	-38	-47.8	-12.8
88.0	-51.8	-3	-38	-48.8	-13.8

89.0	-50.6	-3	-38	-47.6	-12.6
90.0	-50.7	-3	-38	-47.7	-12.7
91.0	-51.8	-3	-38	-48.8	-13.8
92.0	-51.7	-3	-38	-48.7	-13.7
93.0	-51.7	-3	-38	-48.7	-13.7
94.0	-49.6	-3	-38	-46.6	-11.6
95.0	-49.7	-3	-38	-46.7	-11.7
96.0	-47.7	-3	-38	-44.7	-9.7
97.0	-47.8	-3	-38	-44.8	-9.8
98.0	-50.0	-3	-38	-47.0	-12.0
99.0	-48.3	-3	-38	-45.3	-10.3
100.0	-50.2	-3	-38	-47.2	-12.2
101.0	-48.4	-3	-38	-45.4	-10.4
102.0	-48.5	-3	-38	-45.5	-10.5
103.0	-44.9	-3	-38	-41.9	-6.9
104.0	-45.2	-3	-38	-42.2	-7.2
105.0	-45.3	-3	-38	-42.3	-7.3
106.0	-51.0	-3	-38	-48.0	-13.0
107.0	-50.9	-3	-38	-47.9	-12.9
108.0	-52.1	-3	-38	-49.1	-14.1
109.0	-51.8	-3	-38	-48.8	-13.8
110.0	-48.3	-3	-38	-45.3	-10.3
111.0	-48.9	-3	-38	-45.9	-10.9
112.0	-49.5	-3	-38	-46.5	-11.5
113.0	-49.6	-3	-38	-46.6	-11.6
114.0	-51.8	-3	-38	-48.8	-13.8
115.0	-45.6	-3	-38	-42.6	-7.6
116.0	-51.6	-3	-38	-48.6	-13.6
117.0	-50.9	-3	-38	-47.9	-12.9
118.0	-50.1	-3	-38	-47.1	-12.1
119.0	-52.0	-3	-38	-49.0	-14.0
120.0	-52.2	-3	-38	-49.2	-14.2
121.0	-49.3	-3	-38	-46.3	-11.3
122.0	-49.1	-3	-38	-46.1	-11.1
123.0	-48.7	-3	-38	-45.7	-10.7
124.0	-48.6	-3	-38	-45.6	-10.6
125.0	-47.4	-3	-38	-44.4	-9.4
126.0	-47.4	-3	-38	-44.4	-9.4
127.0	-45.9	-3	-38	-42.9	-7.9
128.0	-46.3	-3	-38	-43.3	-8.3
129.0	-51.3	-3	-38	-48.3	-13.3
130.0	-51.2	-3	-38	-48.2	-13.2
131.0	-47.9	-3	-38	-44.9	-9.9
132.0	-47.4	-3	-38	-44.4	-9.4
133.0	-51.5	-3	-38	-48.5	-13.5
134.0	-51.8	-3	-38	-48.8	-13.8
135.0	-48.0	-3	-38	-45.0	-10.0
136.0	-50.3	-3	-38	-47.3	-12.3
137.0	-51.3	-3	-38	-48.3	-13.3
138.0	-48.3	-3	-38	-45.3	-10.3

139.0	-48.3	-3	-38	-45.3	-10.3
140.0	-51.2	-3	-38	-48.2	-13.2
141.0	-50.0	-3	-38	-47.0	-12.0
142.0	-48.5	-3	-38	-45.5	-10.5
143.0	-48.8	-3	-38	-45.8	-10.8
144.0	-52.1	-3	-38	-49.1	-14.1
145.0	-51.1	-3	-38	-48.1	-13.1
146.0	-51.6	-3	-38	-48.6	-13.6
147.0	-51.5	-3	-38	-48.5	-13.5
148.0	-51.3	-3	-38	-48.3	-13.3
149.0	-46.1	-3	-38	-43.1	-8.1
150.0	-46.2	-3	-38	-43.2	-8.2
151.0	-51.6	-3	-38	-48.6	-13.6
152.0	-52.1	-3	-38	-49.1	-14.1
153.0	-49.5	-3	-38	-46.5	-11.5
154.0	-49.4	-3	-38	-46.4	-11.4
155.0	-44.5	-3	-38	-41.5	-6.5
156.0	-44.6	-3	-38	-41.6	-6.6
157.0	-44.8	-3	-38	-41.8	-6.8
158.0	-45.1	-3	-38	-42.1	-7.1
159.0	-50.0	-3	-38	-47.0	-12.0
160.0	-41.7	-3	-38	-38.7	-3.7
161.0	-40.3	-3	-38	-37.3	-2.3
162.0	-38.7	-3	-38	-35.7	-0.7
163.0	-41.6	-3	-38	-38.6	-3.6
164.0	-44.0	-3	-38	-41.0	-6.0
165.0	-43.9	-3	-38	-40.9	-5.9
166.0	-40.1	-3	-38	-37.1	-2.1
167.0	-40.3	-3	-38	-37.3	-2.3
168.0	-45.6	-3	-38	-42.6	-7.6
169.0	-46.3	-3	-38	-43.3	-8.3
170.0	-47.4	-3	-38	-44.4	-9.4
171.0	-47.7	-3	-38	-44.7	-9.7
172.0	-42.3	-3	-38	-39.3	-4.3
173.0	-42.5	-3	-38	-39.5	-4.5
174.0	-45.5	-3	-38	-42.5	-7.5
175.0	-45.7	-3	-38	-42.7	-7.7
176.0	-47.9	-3	-38	-44.9	-9.9
177.0	-47.7	-3	-38	-44.7	-9.7
178.0	-50.4	-3	-38	-47.4	-12.4
179.0	-50.1	-3	-38	-47.1	-12.1
180.0	-51.2	-3	-38	-48.2	-13.2
181.0	-45.9	-3	-38	-42.9	-7.9
182.0	-46.0	-3	-38	-43.0	-8.0
183.0	-48.9	-3	-38	-45.9	-10.9
184.0	-48.3	-3	-38	-45.3	-10.3
185.0	-47.8	-3	-38	-44.8	-9.8
186.0	-48.4	-3	-38	-45.4	-10.4
187.0	-51.8	-3	-38	-48.8	-13.8
188.0	-51.8	-3	-38	-48.8	-13.8

189.0	-51.0	-3	-38	-48.0	-13.0
190.0	-51.6	-3	-38	-48.6	-13.6
191.0	-51.4	-3	-38	-48.4	-13.4
192.0	-50.3	-3	-38	-47.3	-12.3
193.0	-50.3	-3	-38	-47.3	-12.3
194.0	-51.1	-3	-38	-48.1	-13.1
195.0	-47.5	-3	-38	-44.5	-9.5
196.0	-48.6	-3	-38	-45.6	-10.6
197.0	-48.8	-3	-38	-45.8	-10.8
198.0	-51.1	-3	-38	-48.1	-13.1
199.0	-51.2	-3	-38	-48.2	-13.2
200.0	-44.4	-3	-38	-41.4	-6.4
201.0	-44.5	-3	-38	-41.5	-6.5
202.0	-43.9	-3	-38	-40.9	-5.9
203.0	-44.0	-3	-38	-41.0	-6.0
204.0	-46.0	-3	-38	-43.0	-8.0
205.0	-45.9	-3	-38	-42.9	-7.9
206.0	-44.4	-3	-38	-41.4	-6.4
207.0	-44.6	-3	-38	-41.6	-6.6
208.0	-44.7	-3	-38	-41.7	-6.7
209.0	-43.4	-3	-38	-40.4	-5.4
210.0	-43.7	-3	-38	-40.7	-5.7
211.0	-41.7	-3	-38	-38.7	-3.7
212.0	-41.9	-3	-38	-38.9	-3.9
213.0	-44.7	-3	-38	-41.7	-6.7
214.0	-43.4	-3	-38	-40.4	-5.4
215.0	-41.8	-3	-38	-38.8	-3.8
216.0	-41.7	-3	-38	-38.7	-3.7
217.0	-38.6	-3	-38	-35.6	-0.6
218.0	-39.3	-3	-38	-36.3	-1.3
219.0	-40.1	-3	-38	-37.1	-2.1
220.0	-42.9	-3	-38	-39.9	-4.9
221.0	-42.2	-3	-38	-39.2	-4.2
222.0	-40.2	-3	-38	-37.2	-2.2
223.0	-39.3	-3	-38	-36.3	-1.3
224.0	-40.7	-3	-38	-37.7	-2.7
225.0	-40.6	-3	-38	-37.6	-2.6
226.0	-41.8	-3	-38	-38.8	-3.8
227.0	-41.5	-3	-38	-38.5	-3.5
228.0	-41.7	-3	-38	-38.7	-3.7
229.0	-44.8	-3	-38	-41.8	-6.8
230.0	-44.7	-3	-38	-41.7	-6.7
231.0	-45.4	-3	-38	-42.4	-7.4
232.0	-45.8	-3	-38	-42.8	-7.8
233.0	-39.2	-3	-38	-36.2	-1.2
234.0	-39.3	-3	-38	-36.3	-1.3
235.0	-41.2	-3	-38	-38.2	-3.2
236.0	-41.1	-3	-38	-38.1	-3.1
237.0	-38.8	-3	-38	-35.8	-0.8
238.0	-38.9	-3	-38	-35.9	-0.9

239.0	-43.3	-3	-38	-40.3	-5.3
240.0	-39.7	-3	-38	-36.7	-1.7
241.0	-42.3	-3	-38	-39.3	-4.3
242.0	-48.8	-3	-38	-45.8	-10.8
243.0	-48.9	-3	-38	-45.9	-10.9
244.0	-46.4	-3	-38	-43.4	-8.4
245.0	-48.4	-3	-38	-45.4	-10.4
246.0	-50.7	-3	-38	-47.7	-12.7
247.0	-51.2	-3	-38	-48.2	-13.2
248.0	-45.4	-3	-38	-42.4	-7.4
249.0	-49.7	-3	-38	-46.7	-11.7
250.0	-49.7	-3	-38	-46.7	-11.7
251.0	-44.2	-3	-38	-41.2	-6.2
252.0	-43.7	-3	-38	-40.7	-5.7
253.0	-46.0	-3	-38	-43.0	-8.0
254.0	-46.1	-3	-38	-43.1	-8.1
255.0	-42.9	-3	-38	-39.9	-4.9
256.0	-43.1	-3	-38	-40.1	-5.1
257.0	-38.7	-3	-38	-35.7	-0.7
258.0	-38.5	-3	-38	-35.5	-0.5
259.0	-42.1	-3	-38	-39.1	-4.1
260.0	-42.0	-3	-38	-39.0	-4.0
261.0	-39.2	-3	-38	-36.2	-1.2
262.0	-39.0	-3	-38	-36.0	-1.0
263.0	-39.8	-3	-38	-36.8	-1.8
264.0	-39.6	-3	-38	-36.6	-1.6
265.0	-39.7	-3	-38	-36.7	-1.7
266.0	-40.3	-3	-38	-37.3	-2.3
267.0	-40.8	-3	-38	-37.8	-2.8
268.0	-38.7	-3	-38	-35.7	-0.7
269.0	-38.7	-3	-38	-35.7	-0.7
270.0	-41.8	-3	-38	-38.8	-3.8
271.0	-41.9	-3	-38	-38.9	-3.9
272.0	-38.4	-3	-38	-35.4	-0.4
273.0	-38.5	-3	-38	-35.5	-0.5
274.0	-42.3	-3	-38	-39.3	-4.3
275.0	-40.7	-3	-38	-37.7	-2.7
276.0	-40.6	-3	-38	-37.6	-2.6
277.0	-42.9	-3	-38	-39.9	-4.9
278.0	-40.7	-3	-38	-37.7	-2.7
279.0	-43.1	-3	-38	-40.1	-5.1
280.0	-42.7	-3	-38	-39.7	-4.7
281.0	-39.5	-3	-38	-36.5	-1.5
282.0	-43.3	-3	-38	-40.3	-5.3
283.0	-45.1	-3	-38	-42.1	-7.1
284.0	-45.0	-3	-38	-42.0	-7.0
285.0	-46.4	-3	-38	-43.4	-8.4
286.0	-46.4	-3	-38	-43.4	-8.4
287.0	-44.7	-3	-38	-41.7	-6.7
288.0	-44.9	-3	-38	-41.9	-6.9

289.0	-43.4	-3	-38	-40.4	-5.4
290.0	-43.5	-3	-38	-40.5	-5.5
291.0	-42.7	-3	-38	-39.7	-4.7
292.0	-43.0	-3	-38	-40.0	-5.0
293.0	-40.7	-3	-38	-37.7	-2.7
294.0	-40.8	-3	-38	-37.8	-2.8
295.0	-45.0	-3	-38	-42.0	-7.0
296.0	-45.0	-3	-38	-42.0	-7.0
297.0	-39.6	-3	-38	-36.6	-1.6
298.0	-39.3	-3	-38	-36.3	-1.3
299.0	-45.0	-3	-38	-42.0	-7.0
300.0	-42.1	-3	#N/A	-39.1	#N/A
301.0	-39.9	-3	#N/A	-36.9	#N/A
302.0	-39.8	-3	#N/A	-36.8	#N/A
303.0	-47.4	-3	#N/A	-44.4	#N/A
304.0	-47.8	-3	#N/A	-44.8	#N/A
305.0	-42.1	-3	#N/A	-39.1	#N/A
306.0	-42.0	-3	#N/A	-39.0	#N/A
307.0	-44.3	-3	#N/A	-41.3	#N/A
308.0	-44.8	-3	#N/A	-41.8	#N/A
309.0	-38.0	-3	#N/A	-35.0	#N/A
310.0	-37.9	-3	#N/A	-34.9	#N/A
311.0	-38.1	-3	#N/A	-35.1	#N/A
312.0	-38.2	-3	#N/A	-35.2	#N/A
313.0	-37.2	-3	#N/A	-34.2	#N/A
314.0	-37.2	-3	#N/A	-34.2	#N/A
315.0	-37.6	-3	#N/A	-34.6	#N/A
316.0	-34.5	-3	#N/A	-31.5	#N/A
317.0	-32.8	-3	#N/A	-29.8	#N/A
318.0	-33.5	-3	#N/A	-30.5	#N/A
319.0	-33.5	-3	#N/A	-30.5	#N/A
320.0	-34.2	-3	#N/A	-31.2	#N/A
321.0	-33.9	-3	#N/A	-30.9	#N/A
322.0	-34.0	-3	#N/A	-31.0	#N/A
323.0	-35.1	-3	#N/A	-32.1	#N/A
324.0	-35.2	-3	#N/A	-32.2	#N/A
325.0	-29.8	-3	#N/A	-26.8	#N/A
326.0	-29.8	-3	#N/A	-26.8	#N/A
327.0	-28.2	-3	#N/A	-25.2	#N/A
328.0	-28.3	-3	#N/A	-25.3	#N/A
329.0	-36.6	-3	#N/A	-33.6	#N/A
330.0	-36.6	-3	#N/A	-33.6	#N/A
331.0	-30.3	-3	#N/A	-27.3	#N/A
332.0	-30.4	-3	#N/A	-27.4	#N/A
333.0	-29.0	-3	#N/A	-26.0	#N/A
334.0	-24.9	-3	#N/A	-21.9	#N/A
335.0	-24.9	-3	#N/A	-21.9	#N/A
336.0	-30.0	-3	#N/A	-27.0	#N/A
337.0	-29.9	-3	#N/A	-26.9	#N/A
338.0	-23.2	-3	#N/A	-20.2	#N/A

339.0	-23.2	-3	#N/A	-20.2	#N/A
340.0	-24.9	-3	#N/A	-21.9	#N/A
341.0	-24.9	-3	#N/A	-21.9	#N/A
342.0	-24.9	-3	#N/A	-21.9	#N/A
343.0	-24.9	-3	#N/A	-21.9	#N/A
344.0	-21.4	-3	#N/A	-18.4	#N/A
345.0	-21.4	-3	#N/A	-18.4	#N/A
346.0	-22.2	-3	#N/A	-19.2	#N/A
347.0	-22.2	-3	#N/A	-19.2	#N/A
348.0	-14.2	-3	#N/A	-11.2	#N/A
349.0	-13.5	-3	#N/A	-10.5	#N/A
350.0	-14.9	-3	#N/A	-11.9	#N/A
351.0	-14.9	-3	#N/A	-11.9	#N/A
352.0	-16.2	-3	#N/A	-13.2	#N/A
353.0	-16.2	-3	#N/A	-13.2	#N/A
354.0	-5.6	-3	#N/A	-2.6	#N/A
355.0	-5.6	-3	#N/A	-2.6	#N/A
356.0	-4.8	#N/A	#N/A	#N/A	#N/A
357.0	-4.8	#N/A	#N/A	#N/A	#N/A
358.0	-2.1	#N/A	#N/A	#N/A	#N/A
359.0	-2.1	#N/A	#N/A	#N/A	#N/A

Antenna vertical:

Normalized Azimuth [deg]	Normalized Level [dB]	Half-Power Beamwidth Limit [dbc]	Side-Lobe Gain Limit [dbc]	Margin to Half-Power Limit [dB]	Margin to Side-Lobe Limit [dB]
0.0	0.0	#N/A	#N/A	#N/A	#N/A
1.0	-2.0	#N/A	#N/A	#N/A	#N/A
2.0	-6.0	#N/A	#N/A	#N/A	#N/A
3.0	-11.6	#N/A	#N/A	#N/A	#N/A
4.0	-11.1	#N/A	#N/A	#N/A	#N/A
5.0	-9.1	-3	#N/A	-6.1	#N/A
6.0	-9.6	-3	#N/A	-6.6	#N/A
7.0	-12.5	-3	#N/A	-9.5	#N/A
8.0	-12.4	-3	#N/A	-9.4	#N/A
9.0	-18.1	-3	#N/A	-15.1	#N/A
10.0	-18.2	-3	#N/A	-15.2	#N/A
11.0	-18.7	-3	#N/A	-15.7	#N/A
12.0	-18.8	-3	#N/A	-15.8	#N/A
13.0	-30.2	-3	#N/A	-27.2	#N/A
14.0	-30.1	-3	#N/A	-27.1	#N/A
15.0	-30.4	-3	#N/A	-27.4	#N/A
16.0	-30.4	-3	#N/A	-27.4	#N/A
17.0	-36.3	-3	#N/A	-33.3	#N/A
18.0	-43.0	-3	#N/A	-40.0	#N/A
19.0	-43.0	-3	#N/A	-40.0	#N/A
20.0	-36.5	-3	#N/A	-33.5	#N/A
21.0	-36.3	-3	#N/A	-33.3	#N/A

22.0	-43.9	-3	#N/A	-40.9	#N/A
23.0	-43.8	-3	#N/A	-40.8	#N/A
24.0	-36.8	-3	#N/A	-33.8	#N/A
25.0	-37.0	-3	#N/A	-34.0	#N/A
26.0	-38.4	-3	#N/A	-35.4	#N/A
27.0	-38.5	-3	#N/A	-35.5	#N/A
28.0	-37.3	-3	#N/A	-34.3	#N/A
29.0	-37.4	-3	#N/A	-34.4	#N/A
30.0	-31.4	-3	#N/A	-28.4	#N/A
31.0	-31.4	-3	#N/A	-28.4	#N/A
32.0	-30.7	-3	#N/A	-27.7	#N/A
33.0	-31.8	-3	#N/A	-28.8	#N/A
34.0	-34.0	-3	#N/A	-31.0	#N/A
35.0	-34.0	-3	#N/A	-31.0	#N/A
36.0	-42.3	-3	#N/A	-39.3	#N/A
37.0	-42.7	-3	#N/A	-39.7	#N/A
38.0	-43.1	-3	#N/A	-40.1	#N/A
39.0	-49.4	-3	#N/A	-46.4	#N/A
40.0	-49.4	-3	#N/A	-46.4	#N/A
41.0	-42.7	-3	#N/A	-39.7	#N/A
42.0	-42.9	-3	#N/A	-39.9	#N/A
43.0	-38.3	-3	#N/A	-35.3	#N/A
44.0	-38.5	-3	#N/A	-35.5	#N/A
45.0	-38.3	-3	#N/A	-35.3	#N/A
46.0	-38.3	-3	#N/A	-35.3	#N/A
47.0	-36.2	-3	#N/A	-33.2	#N/A
48.0	-36.1	-3	#N/A	-33.1	#N/A
49.0	-35.3	-3	#N/A	-32.3	#N/A
50.0	-34.4	-3	#N/A	-31.4	#N/A
51.0	-34.4	-3	#N/A	-31.4	#N/A
52.0	-33.5	-3	#N/A	-30.5	#N/A
53.0	-33.7	-3	#N/A	-30.7	#N/A
54.0	-33.8	-3	#N/A	-30.8	#N/A
55.0	-34.4	-3	#N/A	-31.4	#N/A
56.0	-34.4	-3	#N/A	-31.4	#N/A
57.0	-37.0	-3	#N/A	-34.0	#N/A
58.0	-36.8	-3	#N/A	-33.8	#N/A
59.0	-39.1	-3	#N/A	-36.1	#N/A
60.0	-39.4	-3	#N/A	-36.4	#N/A
61.0	-38.7	-3	-38	-35.7	-0.7
62.0	-38.3	-3	-38	-35.3	-0.3
63.0	-38.4	-3	-38	-35.4	-0.4
64.0	-40.0	-3	-38	-37.0	-2.0
65.0	-39.5	-3	-38	-36.5	-1.5
66.0	-40.2	-3	-38	-37.2	-2.2
67.0	-43.8	-3	-38	-40.8	-5.8
68.0	-43.6	-3	-38	-40.6	-5.6
69.0	-42.1	-3	-38	-39.1	-4.1
70.0	-45.6	-3	-38	-42.6	-7.6
71.0	-42.9	-3	-38	-39.9	-4.9

72.0	-43.0	-3	-38	-40.0	-5.0
73.0	-50.5	-3	-38	-47.5	-12.5
74.0	-50.2	-3	-38	-47.2	-12.2
75.0	-47.2	-3	-38	-44.2	-9.2
76.0	-47.9	-3	-38	-44.9	-9.9
77.0	-49.5	-3	-38	-46.5	-11.5
78.0	-49.0	-3	-38	-46.0	-11.0
79.0	-44.4	-3	-38	-41.4	-6.4
80.0	-44.8	-3	-38	-41.8	-6.8
81.0	-45.3	-3	-38	-42.3	-7.3
82.0	-45.7	-3	-38	-42.7	-7.7
83.0	-45.8	-3	-38	-42.8	-7.8
84.0	-45.7	-3	-38	-42.7	-7.7
85.0	-45.1	-3	-38	-42.1	-7.1
86.0	-46.7	-3	-38	-43.7	-8.7
87.0	-46.3	-3	-38	-43.3	-8.3
88.0	-44.9	-3	-38	-41.9	-6.9
89.0	-45.1	-3	-38	-42.1	-7.1
90.0	-43.1	-3	-38	-40.1	-5.1
91.0	-43.2	-3	-38	-40.2	-5.2
92.0	-45.0	-3	-38	-42.0	-7.0
93.0	-44.8	-3	-38	-41.8	-6.8
94.0	-42.9	-3	-38	-39.9	-4.9
95.0	-43.2	-3	-38	-40.2	-5.2
96.0	-46.3	-3	-38	-43.3	-8.3
97.0	-45.9	-3	-38	-42.9	-7.9
98.0	-43.6	-3	-38	-40.6	-5.6
99.0	-41.6	-3	-38	-38.6	-3.6
100.0	-41.7	-3	-38	-38.7	-3.7
101.0	-44.4	-3	-38	-41.4	-6.4
102.0	-45.6	-3	-38	-42.6	-7.6
103.0	-44.8	-3	-38	-41.8	-6.8
104.0	-43.5	-3	-38	-40.5	-5.5
105.0	-43.3	-3	-38	-40.3	-5.3
106.0	-45.9	-3	-38	-42.9	-7.9
107.0	-45.8	-3	-38	-42.8	-7.8
108.0	-42.1	-3	-38	-39.1	-4.1
109.0	-42.1	-3	-38	-39.1	-4.1
110.0	-41.0	-3	-38	-38.0	-3.0
111.0	-40.8	-3	-38	-37.8	-2.8
112.0	-42.3	-3	-38	-39.3	-4.3
113.0	-42.1	-3	-38	-39.1	-4.1
114.0	-46.7	-3	-38	-43.7	-8.7
115.0	-50.2	-3	-38	-47.2	-12.2
116.0	-44.8	-3	-38	-41.8	-6.8
117.0	-41.6	-3	-38	-38.6	-3.6
118.0	-41.6	-3	-38	-38.6	-3.6
119.0	-41.2	-3	-38	-38.2	-3.2
120.0	-41.8	-3	-38	-38.8	-3.8
121.0	-41.8	-3	-38	-38.8	-3.8

122.0	-44.6	-3	-38	-41.6	-6.6
123.0	-44.3	-3	-38	-41.3	-6.3
124.0	-46.5	-3	-38	-43.5	-8.5
125.0	-46.7	-3	-38	-43.7	-8.7
126.0	-45.5	-3	-38	-42.5	-7.5
127.0	-45.3	-3	-38	-42.3	-7.3
128.0	-46.8	-3	-38	-43.8	-8.8
129.0	-47.4	-3	-38	-44.4	-9.4
130.0	-51.3	-3	-38	-48.3	-13.3
131.0	-51.4	-3	-38	-48.4	-13.4
132.0	-48.8	-3	-38	-45.8	-10.8
133.0	-47.7	-3	-38	-44.7	-9.7
134.0	-45.6	-3	-38	-42.6	-7.6
135.0	-46.3	-3	-38	-43.3	-8.3
136.0	-46.1	-3	-38	-43.1	-8.1
137.0	-47.9	-3	-38	-44.9	-9.9
138.0	-48.5	-3	-38	-45.5	-10.5
139.0	-50.0	-3	-38	-47.0	-12.0
140.0	-49.0	-3	-38	-46.0	-11.0
141.0	-50.5	-3	-38	-47.5	-12.5
142.0	-50.8	-3	-38	-47.8	-12.8
143.0	-50.8	-3	-38	-47.8	-12.8
144.0	-50.4	-3	-38	-47.4	-12.4
145.0	-47.2	-3	-38	-44.2	-9.2
146.0	-47.4	-3	-38	-44.4	-9.4
147.0	-47.6	-3	-38	-44.6	-9.6
148.0	-45.3	-3	-38	-42.3	-7.3
149.0	-48.6	-3	-38	-45.6	-10.6
150.0	-48.4	-3	-38	-45.4	-10.4
151.0	-47.0	-3	-38	-44.0	-9.0
152.0	-50.8	-3	-38	-47.8	-12.8
153.0	-51.6	-3	-38	-48.6	-13.6
154.0	-48.7	-3	-38	-45.7	-10.7
155.0	-48.2	-3	-38	-45.2	-10.2
156.0	-49.4	-3	-38	-46.4	-11.4
157.0	-49.6	-3	-38	-46.6	-11.6
158.0	-46.5	-3	-38	-43.5	-8.5
159.0	-46.5	-3	-38	-43.5	-8.5
160.0	-43.7	-3	-38	-40.7	-5.7
161.0	-44.1	-3	-38	-41.1	-6.1
162.0	-42.7	-3	-38	-39.7	-4.7
163.0	-42.8	-3	-38	-39.8	-4.8
164.0	-43.7	-3	-38	-40.7	-5.7
165.0	-47.4	-3	-38	-44.4	-9.4
166.0	-48.2	-3	-38	-45.2	-10.2
167.0	-51.3	-3	-38	-48.3	-13.3
168.0	-48.9	-3	-38	-45.9	-10.9
169.0	-49.9	-3	-38	-46.9	-11.9
170.0	-49.5	-3	-38	-46.5	-11.5
171.0	-49.2	-3	-38	-46.2	-11.2

172.0	-49.5	-3	-38	-46.5	-11.5
173.0	-47.7	-3	-38	-44.7	-9.7
174.0	-47.4	-3	-38	-44.4	-9.4
175.0	-41.8	-3	-38	-38.8	-3.8
176.0	-41.6	-3	-38	-38.6	-3.6
177.0	-40.7	-3	-38	-37.7	-2.7
178.0	-40.6	-3	-38	-37.6	-2.6
179.0	-41.3	-3	-38	-38.3	-3.3
180.0	-41.3	-3	-38	-38.3	-3.3
181.0	-43.6	-3	-38	-40.6	-5.6
182.0	-43.8	-3	-38	-40.8	-5.8
183.0	-42.9	-3	-38	-39.9	-4.9
184.0	-41.0	-3	-38	-38.0	-3.0
185.0	-41.5	-3	-38	-38.5	-3.5
186.0	-45.5	-3	-38	-42.5	-7.5
187.0	-45.3	-3	-38	-42.3	-7.3
188.0	-49.7	-3	-38	-46.7	-11.7
189.0	-48.7	-3	-38	-45.7	-10.7
190.0	-51.3	-3	-38	-48.3	-13.3
191.0	-51.6	-3	-38	-48.6	-13.6
192.0	-51.4	-3	-38	-48.4	-13.4
193.0	-51.1	-3	-38	-48.1	-13.1
194.0	-51.5	-3	-38	-48.5	-13.5
195.0	-50.7	-3	-38	-47.7	-12.7
196.0	-51.9	-3	-38	-48.9	-13.9
197.0	-50.9	-3	-38	-47.9	-12.9
198.0	-51.4	-3	-38	-48.4	-13.4
199.0	-49.9	-3	-38	-46.9	-11.9
200.0	-51.9	-3	-38	-48.9	-13.9
201.0	-52.0	-3	-38	-49.0	-14.0
202.0	-51.3	-3	-38	-48.3	-13.3
203.0	-49.7	-3	-38	-46.7	-11.7
204.0	-50.2	-3	-38	-47.2	-12.2
205.0	-50.0	-3	-38	-47.0	-12.0
206.0	-51.8	-3	-38	-48.8	-13.8
207.0	-49.4	-3	-38	-46.4	-11.4
208.0	-50.8	-3	-38	-47.8	-12.8
209.0	-52.0	-3	-38	-49.0	-14.0
210.0	-51.6	-3	-38	-48.6	-13.6
211.0	-48.7	-3	-38	-45.7	-10.7
212.0	-48.9	-3	-38	-45.9	-10.9
213.0	-46.7	-3	-38	-43.7	-8.7
214.0	-47.8	-3	-38	-44.8	-9.8
215.0	-45.3	-3	-38	-42.3	-7.3
216.0	-44.8	-3	-38	-41.8	-6.8
217.0	-42.8	-3	-38	-39.8	-4.8
218.0	-42.7	-3	-38	-39.7	-4.7
219.0	-44.7	-3	-38	-41.7	-6.7
220.0	-44.9	-3	-38	-41.9	-6.9
221.0	-47.4	-3	-38	-44.4	-9.4

222.0	-47.5	-3	-38	-44.5	-9.5
223.0	-45.6	-3	-38	-42.6	-7.6
224.0	-45.6	-3	-38	-42.6	-7.6
225.0	-45.6	-3	-38	-42.6	-7.6
226.0	-44.7	-3	-38	-41.7	-6.7
227.0	-42.3	-3	-38	-39.3	-4.3
228.0	-41.7	-3	-38	-38.7	-3.7
229.0	-42.0	-3	-38	-39.0	-4.0
230.0	-43.4	-3	-38	-40.4	-5.4
231.0	-43.6	-3	-38	-40.6	-5.6
232.0	-45.3	-3	-38	-42.3	-7.3
233.0	-46.9	-3	-38	-43.9	-8.9
234.0	-42.4	-3	-38	-39.4	-4.4
235.0	-39.9	-3	-38	-36.9	-1.9
236.0	-39.2	-3	-38	-36.2	-1.2
237.0	-39.4	-3	-38	-36.4	-1.4
238.0	-40.3	-3	-38	-37.3	-2.3
239.0	-42.9	-3	-38	-39.9	-4.9
240.0	-45.2	-3	-38	-42.2	-7.2
241.0	-45.1	-3	-38	-42.1	-7.1
242.0	-44.2	-3	-38	-41.2	-6.2
243.0	-43.8	-3	-38	-40.8	-5.8
244.0	-43.7	-3	-38	-40.7	-5.7
245.0	-43.1	-3	-38	-40.1	-5.1
246.0	-42.7	-3	-38	-39.7	-4.7
247.0	-50.1	-3	-38	-47.1	-12.1
248.0	-50.3	-3	-38	-47.3	-12.3
249.0	-45.4	-3	-38	-42.4	-7.4
250.0	-45.4	-3	-38	-42.4	-7.4
251.0	-51.8	-3	-38	-48.8	-13.8
252.0	-51.0	-3	-38	-48.0	-13.0
253.0	-42.4	-3	-38	-39.4	-4.4
254.0	-42.7	-3	-38	-39.7	-4.7
255.0	-43.4	-3	-38	-40.4	-5.4
256.0	-47.9	-3	-38	-44.9	-9.9
257.0	-51.8	-3	-38	-48.8	-13.8
258.0	-48.9	-3	-38	-45.9	-10.9
259.0	-48.8	-3	-38	-45.8	-10.8
260.0	-45.3	-3	-38	-42.3	-7.3
261.0	-45.8	-3	-38	-42.8	-7.8
262.0	-46.3	-3	-38	-43.3	-8.3
263.0	-45.9	-3	-38	-42.9	-7.9
264.0	-42.6	-3	-38	-39.6	-4.6
265.0	-45.4	-3	-38	-42.4	-7.4
266.0	-44.8	-3	-38	-41.8	-6.8
267.0	-46.0	-3	-38	-43.0	-8.0
268.0	-45.7	-3	-38	-42.7	-7.7
269.0	-47.0	-3	-38	-44.0	-9.0
270.0	-47.0	-3	-38	-44.0	-9.0
271.0	-45.8	-3	-38	-42.8	-7.8

272.0	-45.7	-3	-38	-42.7	-7.7
273.0	-47.5	-3	-38	-44.5	-9.5
274.0	-48.2	-3	-38	-45.2	-10.2
275.0	-43.6	-3	-38	-40.6	-5.6
276.0	-43.7	-3	-38	-40.7	-5.7
277.0	-47.8	-3	-38	-44.8	-9.8
278.0	-48.2	-3	-38	-45.2	-10.2
279.0	-49.5	-3	-38	-46.5	-11.5
280.0	-52.0	-3	-38	-49.0	-14.0
281.0	-51.9	-3	-38	-48.9	-13.9
282.0	-45.3	-3	-38	-42.3	-7.3
283.0	-45.2	-3	-38	-42.2	-7.2
284.0	-44.6	-3	-38	-41.6	-6.6
285.0	-47.5	-3	-38	-44.5	-9.5
286.0	-48.1	-3	-38	-45.1	-10.1
287.0	-43.3	-3	-38	-40.3	-5.3
288.0	-46.5	-3	-38	-43.5	-8.5
289.0	-45.5	-3	-38	-42.5	-7.5
290.0	-41.2	-3	-38	-38.2	-3.2
291.0	-40.9	-3	-38	-37.9	-2.9
292.0	-39.5	-3	-38	-36.5	-1.5
293.0	-39.5	-3	-38	-36.5	-1.5
294.0	-40.7	-3	-38	-37.7	-2.7
295.0	-40.7	-3	-38	-37.7	-2.7
296.0	-43.1	-3	-38	-40.1	-5.1
297.0	-43.7	-3	-38	-40.7	-5.7
298.0	-40.6	-3	-38	-37.6	-2.6
299.0	-43.3	-3	-38	-40.3	-5.3
300.0	-37.6	-3	#N/A	-34.6	#N/A
301.0	-37.6	-3	#N/A	-34.6	#N/A
302.0	-37.7	-3	#N/A	-34.7	#N/A
303.0	-37.7	-3	#N/A	-34.7	#N/A
304.0	-42.3	-3	#N/A	-39.3	#N/A
305.0	-42.5	-3	#N/A	-39.5	#N/A
306.0	-37.0	-3	#N/A	-34.0	#N/A
307.0	-37.0	-3	#N/A	-34.0	#N/A
308.0	-35.5	-3	#N/A	-32.5	#N/A
309.0	-35.4	-3	#N/A	-32.4	#N/A
310.0	-37.5	-3	#N/A	-34.5	#N/A
311.0	-37.7	-3	#N/A	-34.7	#N/A
312.0	-41.8	-3	#N/A	-38.8	#N/A
313.0	-42.2	-3	#N/A	-39.2	#N/A
314.0	-40.4	-3	#N/A	-37.4	#N/A
315.0	-42.0	-3	#N/A	-39.0	#N/A
316.0	-40.8	-3	#N/A	-37.8	#N/A
317.0	-45.0	-3	#N/A	-42.0	#N/A
318.0	-44.8	-3	#N/A	-41.8	#N/A
319.0	-49.9	-3	#N/A	-46.9	#N/A
320.0	-48.8	-3	#N/A	-45.8	#N/A
321.0	-46.9	-3	#N/A	-43.9	#N/A

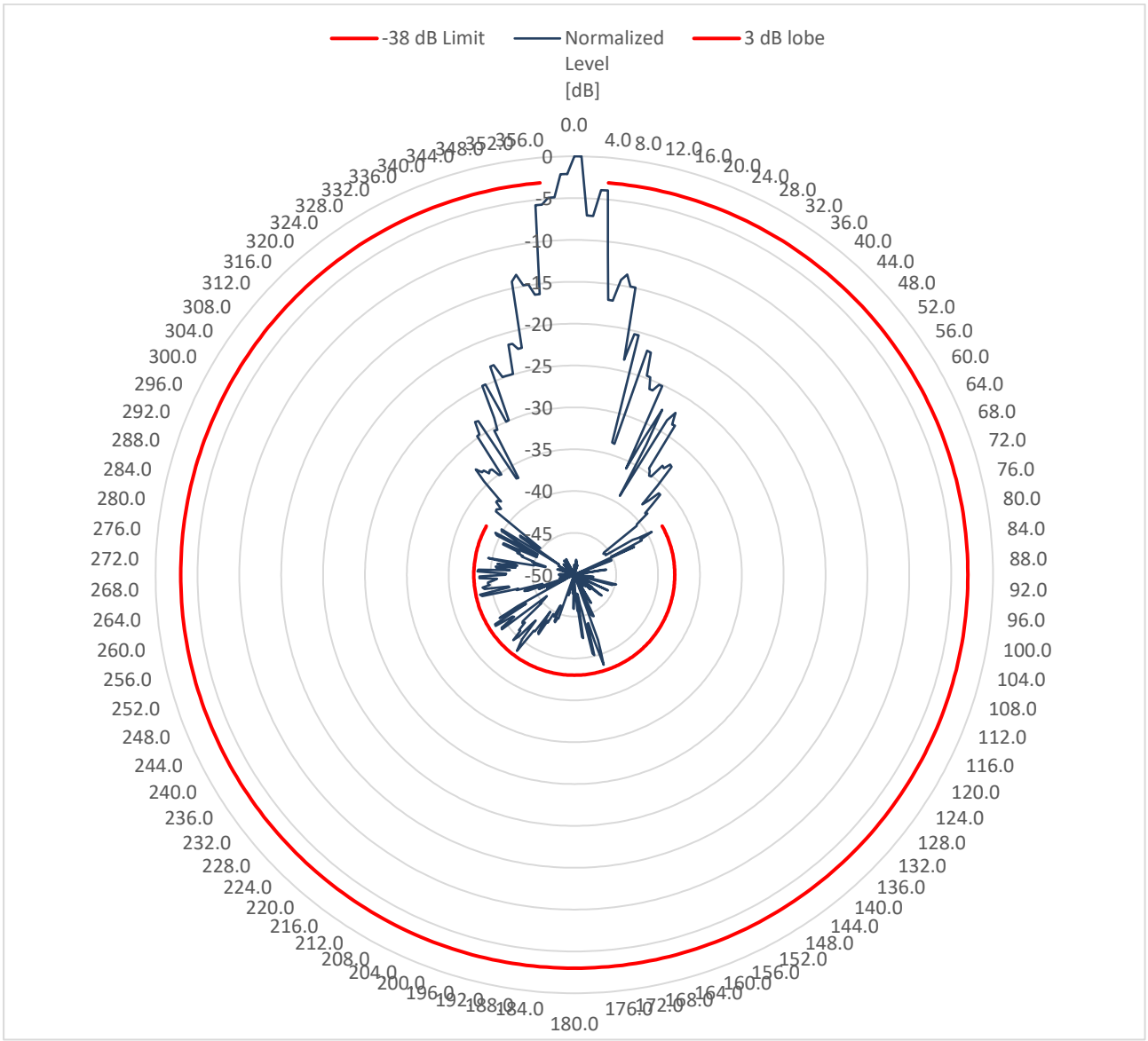
322.0	-47.1	-3	#N/A	-44.1	#N/A
323.0	-39.3	-3	#N/A	-36.3	#N/A
324.0	-39.3	-3	#N/A	-36.3	#N/A
325.0	-35.5	-3	#N/A	-32.5	#N/A
326.0	-35.5	-3	#N/A	-32.5	#N/A
327.0	-33.8	-3	#N/A	-30.8	#N/A
328.0	-33.9	-3	#N/A	-30.9	#N/A
329.0	-36.2	-3	#N/A	-33.2	#N/A
330.0	-36.4	-3	#N/A	-33.4	#N/A
331.0	-45.2	-3	#N/A	-42.2	#N/A
332.0	-41.6	-3	#N/A	-38.6	#N/A
333.0	-39.2	-3	#N/A	-36.2	#N/A
334.0	-38.5	-3	#N/A	-35.5	#N/A
335.0	-38.5	-3	#N/A	-35.5	#N/A
336.0	-42.7	-3	#N/A	-39.7	#N/A
337.0	-42.6	-3	#N/A	-39.6	#N/A
338.0	-38.4	-3	#N/A	-35.4	#N/A
339.0	-38.4	-3	#N/A	-35.4	#N/A
340.0	-42.0	-3	#N/A	-39.0	#N/A
341.0	-42.2	-3	#N/A	-39.2	#N/A
342.0	-36.2	-3	#N/A	-33.2	#N/A
343.0	-36.2	-3	#N/A	-33.2	#N/A
344.0	-30.8	-3	#N/A	-27.8	#N/A
345.0	-31.2	-3	#N/A	-28.2	#N/A
346.0	-31.2	-3	#N/A	-28.2	#N/A
347.0	-21.5	-3	#N/A	-18.5	#N/A
348.0	-18.4	-3	#N/A	-15.4	#N/A
349.0	-18.4	-3	#N/A	-15.4	#N/A
350.0	-17.1	-3	#N/A	-14.1	#N/A
351.0	-17.1	-3	#N/A	-14.1	#N/A
352.0	-11.3	-3	#N/A	-8.3	#N/A
353.0	-11.3	-3	#N/A	-8.3	#N/A
354.0	-9.1	-3	#N/A	-6.1	#N/A
355.0	-9.1	-3	#N/A	-6.1	#N/A
356.0	-8.1	#N/A	#N/A	#N/A	#N/A
357.0	-8.1	#N/A	#N/A	#N/A	#N/A
358.0	-0.8	#N/A	#N/A	#N/A	#N/A
359.0	-0.8	#N/A	#N/A	#N/A	#N/A

Rmark: Please see next sub-clause for the measurement plot.

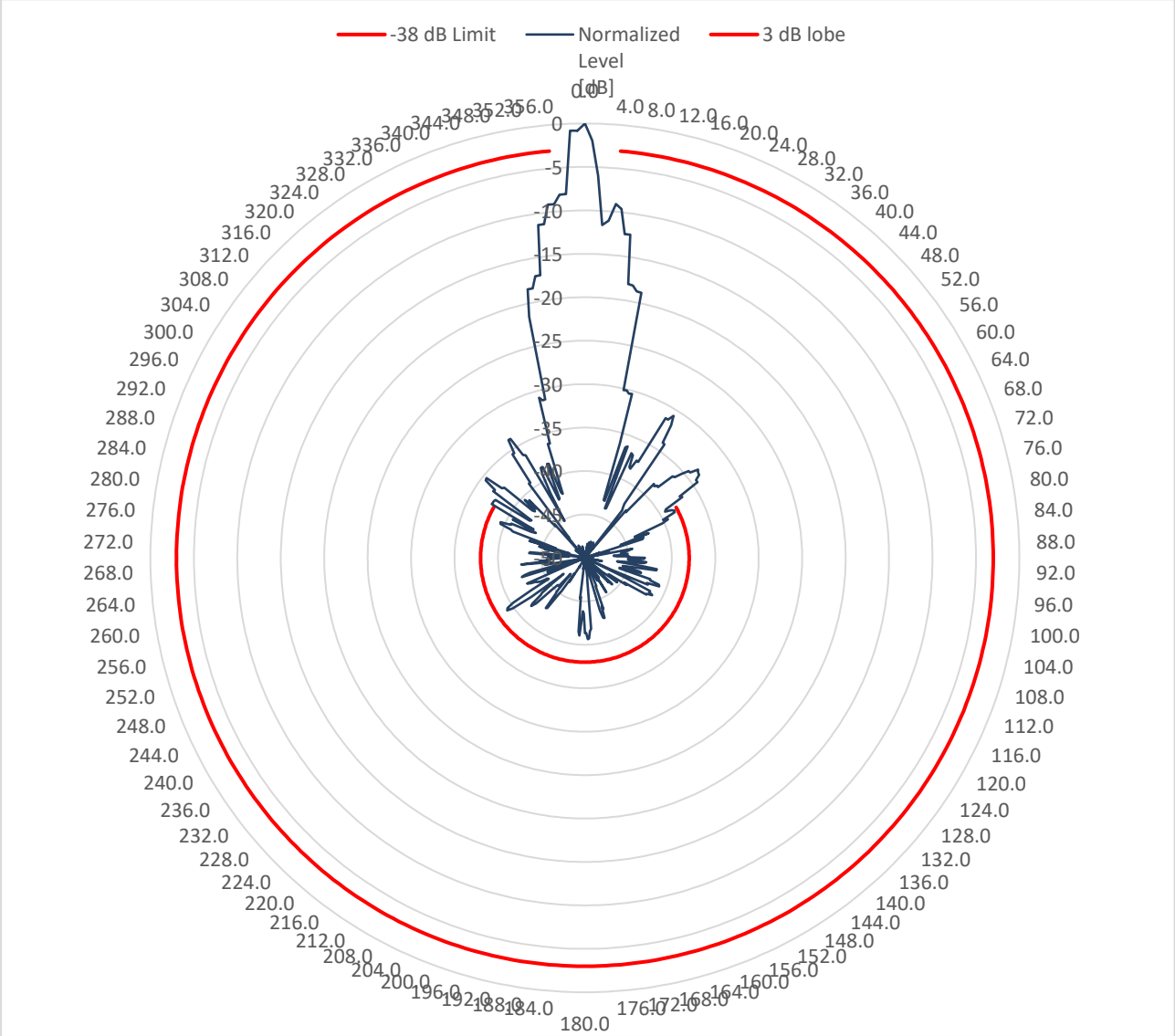
5.4.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

S01_BA01

Antenna horizontal:



Antenna vertical:



5.4.5 TEST EQUIPMENT USED

- Radiated Emissions FAC FCC

5.5 ANTENNA SIDE LOBE GAIN

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ETSI 302 729

5.5.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.
All steps were performed with one height (1.5 m) of the receiving antenna only.
The EUT is turned during the measurement the turn table step size (azimuth angle) for the measurement is 1 °, the Turntable angle range: –180° to +180°.

Analyzer settings:

- Resolution Bandwidth (RBW): 1000 kHz
- Video Bandwidth (VBW): 3000 kHz
- Span: zero-span
- Trace: Maxhold
- Sweeps: single
- Sweeptime: 1 s
- Detector: Peak

5.5.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.256 (j)

Antenna side lobe gain. LPR devices operating under the provisions of this section must limit the side lobe antenna gain relative to the main beam gain for off-axis angles from the main beam of greater than 60 degrees to the levels provided in Table.

Antenna Side Lobe Gain Limits

Frequency range (GHz)	Antenna side lobe gain limit relative to main beam gain (dB)
5.925 – 7.250	-22
24.05 – 29.00	-27
75 - 85	-38

RSS-211: 5.2

(c)LPR devices must limit the antenna side lobe gain relative to the main beam gain for off-axis angles from the main beam of greater than 60° for the levels provided in Table.

Frequency range (GHz)	Antenna side lobe gain limit relative to main beam gain (dB)
5.925 – 7.250	-22
24.05 – 29.00	-27
75 - 85	-38

5.5.3 TEST PROTOCOL

For test results please refer to Chapter 5.4 Antenna Beamwidth

5.5.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, “WORST CASE”)

For test results please refer to Chapter 5.4 Antenna Beamwidth

5.5.5 TEST EQUIPMENT USED

- Radiated Emissions FAC FCC

5.6 FREQUENCY STABILITY

Standard **FCC Part 15 Subpart C**

The test was performed according to:
ANSI C63.10

5.6.1 TEST DESCRIPTION

As specified in Section 15.215(c), the bandwidth of the fundamental emission must be contained within the frequency band over the temperature range -20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage. Frequency stability is to be measured according to Section 2.1055 at the highest and lowest frequency of operation and with the modulation that produces the widest emission bandwidth.

5.6.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.215 (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. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. 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 the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

RSS-211: 5.1

(b) The fundamental emission bandwidth shall be confined within the designated device operating bands under all conditions.

5.6.3 TEST PROTOCOL

Ambient temperature: 24°C
Air Pressure: 1010 hPa
Humidity: 50 %

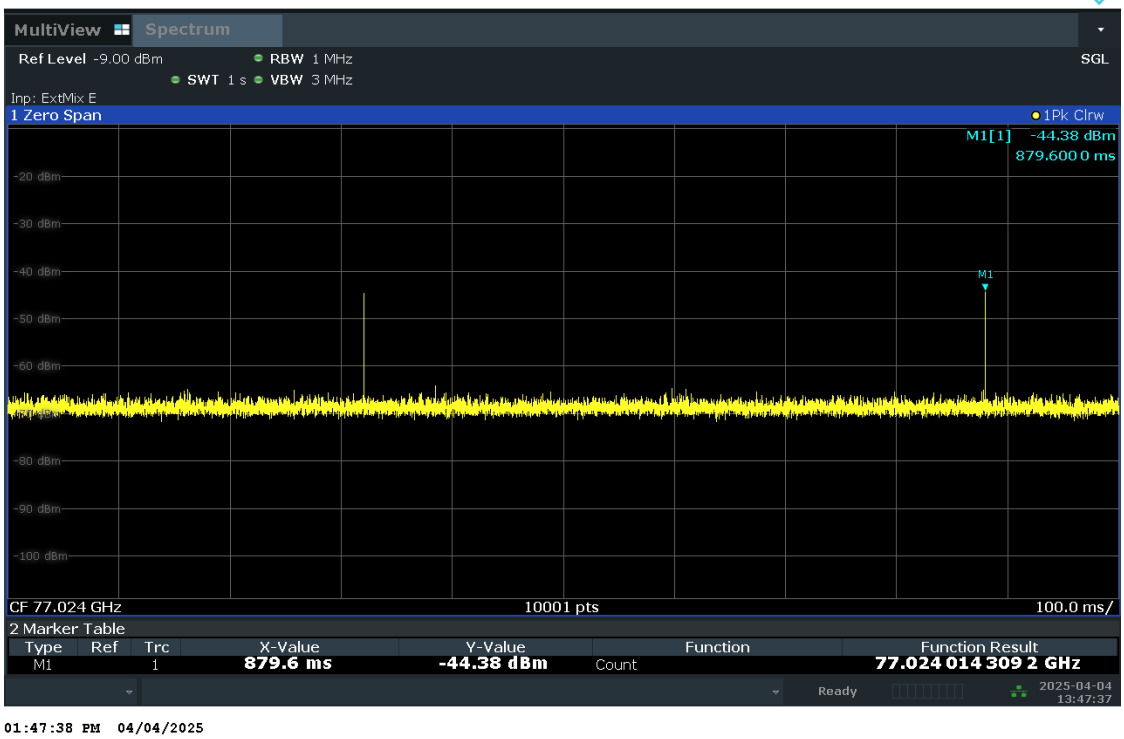
Temp [°C]	Voltage [V]	Nominal Frequency [GHz]	Time after power on [sec]	Measured Frequency [GHz]	Deviation [Hz]
-30	14.0	77.02400	0	77.0240014527	1.453
-30	14.0	77.02400	120	77.0239938043	6.196
-30	14.0	77.02400	300	77.0239969129	3.087
-30	30.0	77.02400	0	77.0239954283	4.572
-30	30.0	77.02400	120	77.0239908422	9.158
-30	30.0	77.02400	300	77.0239980497	1.950
-20	14.0	77.02400	0	77.0240040819	4.082
-20	14.0	77.02400	120	77.0240022051	2.205
-20	14.0	77.02400	300	77.0239991236	0.876
-20	30.0	77.02400	0	77.0239971662	2.834
-20	30.0	77.02400	120	77.0239931982	6.802
-20	30.0	77.02400	300	77.0240048701	4.870
-10	14.0	77.02400	0	77.0240035052	3.505
-10	14.0	77.02400	120	77.0239976652	2.335
-10	14.0	77.02400	300	77.0239993217	0.678
-10	30.0	77.02400	0	77.0239997036	0.296
-10	30.0	77.02400	120	77.0239886668	11.333
-10	30.0	77.02400	300	77.0240026737	2.674
0	14.0	77.02400	0	77.0239975469	2.453
0	14.0	77.02400	120	77.0239916368	8.363
0	14.0	77.02400	300	77.0239916045	8.396
0	30.0	77.02400	0	77.0240071548	7.155
0	30.0	77.02400	120	77.0240028073	2.807
0	30.0	77.02400	300	77.0239939120	6.088
10	14.0	77.02400	0	77.0239988010	1.199
10	14.0	77.02400	120	77.0239914456	8.554
10	14.0	77.02400	300	77.0239958801	4.120
10	30.0	77.02400	0	77.0239982258	1.774
10	30.0	77.02400	120	77.0239915466	8.453
10	30.0	77.02400	300	77.0239958431	4.157
20	14.0	77.02400	0	77.0240019755	1.975
20	**14.0**	**77.02400**	**120**	**77.0240143092**	**14.309**
20	14.0	77.02400	300	77.0239961580	3.842
20	30.0	77.02400	0	77.0240067805	6.781
20	30.0	77.02400	120	77.0239999079	0.092
20	30.0	77.02400	300	77.0239962187	3.781
30	14.0	77.02400	0	77.0239993444	0.656
30	14.0	77.02400	120	77.0240024775	2.478

30	14.0	77.02400	300	77.0239997044	0.296
30	30.0	77.02400	0	77.0239993351	0.665
30	30.0	77.02400	120	77.0240034155	3.416
30	30.0	77.02400	300	77.0239983897	1.610
40	14.0	77.02400	0	77.0239932440	6.756
40	14.0	77.02400	120	77.0239985934	1.407
40	14.0	77.02400	300	77.0239872213	12.779
40	30.0	77.02400	0	77.0240048629	4.863
40	30.0	77.02400	120	77.0240026509	2.651
40	30.0	77.02400	300	77.0239998766	0.123
50	14.0	77.02400	0	77.0240065875	6.587
50	14.0	77.02400	120	77.0240004485	0.449
50	14.0	77.02400	300	77.0239964522	3.548
50	30.0	77.02400	0	77.0240011943	1.194
50	30.0	77.02400	120	77.0239989818	1.018
50	30.0	77.02400	300	77.0239991955	0.805
60	14.0	77.02400	0	77.0240023843	2.384
60	14.0	77.02400	120	77.0239972982	2.702
60	14.0	77.02400	300	77.0239996910	0.309
60	30.0	77.02400	0	77.0240045879	4.588
60	30.0	77.02400	120	77.0239918003	8.200
60	30.0	77.02400	300	77.0240038547	3.855
70	14.0	77.02400	0	77.0240000224	0.022
70	14.0	77.02400	120	77.0239921872	7.813
70	14.0	77.02400	300	77.0240002271	0.227
70	30.0	77.02400	0	77.0240011551	1.155
70	30.0	77.02400	120	77.0239970103	2.990
70	30.0	77.02400	300	77.0240005323	0.532
80	14.0	77.02400	0	77.0240007603	0.760
80	14.0	77.02400	120	77.0239998324	0.168
80	14.0	77.02400	300	77.0239949947	5.005
80	30.0	77.02400	0	77.0239925110	7.489
80	30.0	77.02400	120	77.0240032645	3.264
80	30.0	77.02400	300	77.0239901010	9.899

Remark: Please see next sub-clause for the measurement plot.

5.6.4 MEASUREMENT PLOT (SHOWING THE HIGHEST VALUE, "WORST CASE")

Voltage = 14.0 V; Temperature = 20 °C, time after power on = 120 sec
(S01_BA01)



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5.6.5 TEST EQUIPMENT USED

- Radiated Emissions FAC FCC

6 TEST EQUIPMENT

6.1 TEST EQUIPMENT HARDWARE

1 Radiated Emissions FAC FCC
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	Opus10 TPR (8253.00)	ThermoAirpressure Datalogger 13	Lufft Mess- und Regeltechnik GmbH	ID 13936	2023-12	2025-12
1.2	FS-Z60	Harmonic Mixer 40 - 60 GHz	Rohde & Schwarz Messgerätebau GmbH	100178	2023-06	2026-06
1.3	FS-Z220	Harmonic Mixer 140 - 220 GHz	Rohde & Schwarz Messgerätebau GmbH	101005	2023-05	2026-05
1.4	FS-Z325	Harmonic Mixer 220 - 325 GHz	Rohde & Schwarz Messgerätebau GmbH	101006	2023-05	2026-05
1.5	SGH-05	Standard Gain / Pyramidal Horn Antenna (140 - 220 GHz)	Millitech	075	N/A	N/A
1.6	AMF-7D00101800-30-10P-R	Broadband Amplifier 100 MHz - 18 GHz	Miteq		N/A*)	N/A*)
1.7	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-	N/A	N/A
1.8	Anechoic Chamber 03	FAR, 8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	N/A	N/A
1.9	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785	N/A*)	N/A*)
1.10	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2023-04 2024-12	2025-04 2026-12
1.11	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronic GmbH	00083069	N/A	N/A
1.12	SGH-19	Standard Gain / Pyramidal Horn Antenna (40 - 60 GHz)	Millitech	093	N/A	N/A
1.13	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright Instruments GmbH	09	N/A*)	N/A*)
1.14	WRCD1879.8-0.2/40-10EE	Notch Filter Ultra Stable	Wainwright Instruments GmbH	16	N/A*)	N/A*)
1.15	Chroma 6404	AC Source	Chroma ATE INC.	64040001304	N/A	N/A
1.16	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368	N/A*)	N/A*)

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.17	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronic GmbH	00086675	N/A	N/A
1.18	MA3000-0800-XP-ET	Bore Sight Antenna Mast	innco systems GmbH	none	N/A	N/A
1.19	SGH-08	Standard Gain / Pyramidal Horn Antenna (90 - 140 GHz)	Millitech	064	N/A	N/A
1.20	SGH-12	Standard Gain / Pyramidal HornAntenna (60 - 90 GHz)	Millitech	326	N/A	N/A
1.21	JUN-AIR Mod. 6-15	Air Compressor	JUN-AIR Deutschland GmbH	612582	N/A	N/A
1.22	FS-Z140	Harmonic Mixer 90 -140 GHz	Rohde & Schwarz Messgerätebau GmbH	101007	2023-05	2026-05
1.23	TD1.5-10kg	EUT Tilt Device (Rohacell)	Maturo GmbH	TD1.5-10kg/024/3790709	N/A	N/A
1.24	SGH-03	Standard Gain / Pyramidal Horn Antenna (220 - 325 GHz)	Millitech	060	N/A	N/A
1.25	FS-Z90	Harmonic Mixer 60 - 90 GHz	Rohde & Schwarz Messgerätebau GmbH	101686	2023-06	2026-06
1.26	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2024-10	2027-10
1.27	Temperature Chamber VT 4002	Temperature Chamber Vötsch 03	Vötsch	58566002150010	2024-07	2026-07

2 Radiated Emissions SAC H-Field

Radiated emission tests in the H-Field in a semi anechoic room

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	N5000/NP	Filter for EUT, 2 Lines, 250 V, 16 A	ETS-LINDGREN	241515	N/A	N/A
2.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2023-12	2025-12
2.3	ESW44	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	101603	2024-03	2026-03
2.4	Anechoic Chamber 01	SAC/FAR, 10.58 m x 6.38 m x 6.00 m	Frankonia Germany EMC Solution GmbH	none	N/A	N/A
2.5	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2023-08	2025-08
2.6	Opus10 THI (8152.00)	T/H Logger 10	Lufft Mess- und Regeltechnik GmbH	12488	2023-12	2025-12
2.7	EP 1200/B, NA/B1	AC Source, Amplifier with integrated variable Oscillator	Spitzenberger & Spies GmbH & Co. KG	B6278	N/A	N/A
2.8	DS 420S	Turn Table 2 m diameter	HD GmbH	420/573/99	N/A	N/A
2.9	HFH2-Z2	Loop Antenna + 3 Axis Tripod	Rohde & Schwarz GmbH & Co. KG	829324/006	2024-04	2027-04
2.10	CS-RUB6	Rubidium Frequency Standard	Rohde & Schwarz GmbH & Co. KG	100321	2023-10	2025-10

3 Radiated Emissions SAC

Radiated emission tests in a semi anechoic room

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
3.1	N5000/NP	Filter for EUT, 2 Lines, 250 V, 16 A	ETS-LINDGREN	241515	N/A	N/A
3.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2023-12	2025-12
3.3	ESW44	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	101603	2024-03	2026-03
3.4	Anechoic Chamber 01	SAC/FAR, 10.58 m x 6.38 m x 6.00 m	Frankonia Germany EMC Solution GmbH	none	N/A	N/A
3.5	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2023-08	2025-08
3.6	Opus10 THI (8152.00)	T/H Logger 10	Lufft Mess- und Regeltechnik GmbH	12488	2023-12	2025-12
3.7	EP 1200/B, NA/B1	AC Source, Amplifier with integrated variable Oscillator	Spitzenberger & Spies GmbH & Co. KG	B6278	N/A	N/A
3.8	DS 420S	Turn Table 2 m diameter	HD GmbH	420/573/99	N/A	N/A
3.9	HL562E ULTRALOG	Biconical-log-per Antenna (30 MHz - 6 GHz)	Rohde & Schwarz GmbH & Co. KG	102299	2024-07	2027-07
3.10	CS-RUB6	Rubidium Frequency Standard	Rohde & Schwarz GmbH & Co. KG	100321	2023-10	2025-10
3.11	AM 4.0	Antenna Mast 4 m	Maturo GmbH	AM4.0/180/1192 0513	N/A	N/A
2.12	MA4985-XP-ET	Bore Sight Antenna Mast	innco systems GmbH	none	N/A	N/A

The calibration interval is the time interval between “Last Calibration” and “Calibration Due”

N/A*) -> internally validated before use.

6.2 TEST EQUIPMENT SOFTWARE

Semi-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
INNCO Mast Controller	1.02.62
MATURO Mast Controller	12.19
MATURO Turn-Table Controller	30.10
Fully-Anechoic Chamber:	
Software	Version
EMC32 Measurement Software	10.60.10
MATURO Turn-Unit Controller	11.10
MATURO Mast Controller	12.10
MATURO Turntable Controller	12.11
INNCO Mast Controller	1.02.62
TS 8997	
WMC32 Measurement Software	11.40.00
Conducted AC Emissions:	
Software	Version
EMC32 Measurement Software	10.60.20

7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

Frequency		Corr.	LISN insertion loss ESH3-Z5	cable loss (incl. 10 dB atten-uator)
MHz		dB	dB	dB
0.15		10.1	0.1	10.0
5		10.3	0.1	10.2
7		10.5	0.2	10.3
10		10.5	0.2	10.3
12		10.7	0.3	10.4
14		10.7	0.3	10.4
16		10.8	0.4	10.4
18		10.9	0.4	10.5
20		10.9	0.4	10.5
22		11.1	0.5	10.6
24		11.1	0.5	10.6
26		11.2	0.5	10.7
28		11.2	0.5	10.7
30		11.3	0.5	10.8

Sample calculation

U_{LISN} (dB µV) = U (dB µV) + Corr. (dB)
U = Receiver reading
LISN Insertion loss = Voltage Division Factor of LISN
Corr. = sum of single correction factors of used LISN, cables, switch units (if used)
Linear interpolation will be used for frequencies in between the values in the table.

7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

Frequency	AF HFH-Z2)	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-40 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
distance correction = -40 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values

7.3 ANTENNA R&S HL562 (30 MHZ – 1 GHZ)

(d_{Limit} = 3 m)

Frequency	AF R&S HL562	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
30	18.6	0.6	0.29	0.04	0.23	0.02	0.0	3	3
50	6.0	0.9	0.39	0.09	0.32	0.08	0.0	3	3
100	9.7	1.2	0.56	0.14	0.47	0.08	0.0	3	3
150	7.9	1.6	0.73	0.20	0.59	0.12	0.0	3	3
200	7.6	1.9	0.84	0.21	0.70	0.11	0.0	3	3
250	9.5	2.1	0.98	0.24	0.80	0.13	0.0	3	3
300	11.0	2.3	1.04	0.26	0.89	0.15	0.0	3	3
350	12.4	2.6	1.18	0.31	0.96	0.13	0.0	3	3
400	13.6	2.9	1.28	0.35	1.03	0.19	0.0	3	3
450	14.7	3.1	1.39	0.38	1.11	0.22	0.0	3	3
500	15.6	3.2	1.44	0.39	1.20	0.19	0.0	3	3
550	16.3	3.5	1.55	0.46	1.24	0.23	0.0	3	3
600	17.2	3.5	1.59	0.43	1.29	0.23	0.0	3	3
650	18.1	3.6	1.67	0.34	1.35	0.22	0.0	3	3
700	18.5	3.6	1.67	0.42	1.41	0.15	0.0	3	3
750	19.1	4.1	1.87	0.54	1.46	0.25	0.0	3	3
800	19.6	4.1	1.90	0.46	1.51	0.25	0.0	3	3
850	20.1	4.4	1.99	0.60	1.56	0.27	0.0	3	3
900	20.8	4.7	2.14	0.60	1.63	0.29	0.0	3	3
950	21.1	4.8	2.22	0.60	1.66	0.33	0.0	3	3
1000	21.6	4.9	2.23	0.61	1.71	0.30	0.0	3	3

(d_{Limit} = 10 m)

30	18.6	-9.9	0.29	0.04	0.23	0.02	-10.5	10	3
50	6.0	-9.6	0.39	0.09	0.32	0.08	-10.5	10	3
100	9.7	-9.2	0.56	0.14	0.47	0.08	-10.5	10	3
150	7.9	-8.8	0.73	0.20	0.59	0.12	-10.5	10	3
200	7.6	-8.6	0.84	0.21	0.70	0.11	-10.5	10	3
250	9.5	-8.3	0.98	0.24	0.80	0.13	-10.5	10	3
300	11.0	-8.1	1.04	0.26	0.89	0.15	-10.5	10	3
350	12.4	-7.9	1.18	0.31	0.96	0.13	-10.5	10	3
400	13.6	-7.6	1.28	0.35	1.03	0.19	-10.5	10	3
450	14.7	-7.4	1.39	0.38	1.11	0.22	-10.5	10	3
500	15.6	-7.2	1.44	0.39	1.20	0.19	-10.5	10	3
550	16.3	-7.0	1.55	0.46	1.24	0.23	-10.5	10	3
600	17.2	-6.9	1.59	0.43	1.29	0.23	-10.5	10	3
650	18.1	-6.9	1.67	0.34	1.35	0.22	-10.5	10	3
700	18.5	-6.8	1.67	0.42	1.41	0.15	-10.5	10	3
750	19.1	-6.3	1.87	0.54	1.46	0.25	-10.5	10	3
800	19.6	-6.3	1.90	0.46	1.51	0.25	-10.5	10	3
850	20.1	-6.0	1.99	0.60	1.56	0.27	-10.5	10	3
900	20.8	-5.8	2.14	0.60	1.63	0.29	-10.5	10	3
950	21.1	-5.6	2.22	0.60	1.66	0.33	-10.5	10	3
1000	21.6	-5.6	2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Tables show an extract of values.

7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, atten-uator & pre-amp)	cable loss 4 (to receiver)		
MHz	dB (1/m)	dB	dB	dB	dB	dB		
1000	24.4	-19.4	0.99	0.31	-21.51	0.79		
2000	28.5	-17.4	1.44	0.44	-20.63	1.38		
3000	31.0	-16.1	1.87	0.53	-19.85	1.33		
4000	33.1	-14.7	2.41	0.67	-19.13	1.31		
5000	34.4	-13.7	2.78	0.86	-18.71	1.40		
6000	34.7	-12.7	2.74	0.90	-17.83	1.47		
7000	35.6	-11.0	2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, atten-uator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	
3000	31.0	-23.4	0.47	1.87	0.53	-27.58	1.33	
4000	33.1	-23.3	0.56	2.41	0.67	-28.23	1.31	
5000	34.4	-21.7	0.61	2.78	0.86	-27.35	1.40	
6000	34.7	-21.2	0.58	2.74	0.90	-26.89	1.47	
7000	35.6	-19.8	0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.	cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre-amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB	dB
7000	35.6	-57.3	0.56	1.28	-62.72	2.66	0.94	1.46
8000	36.3	-56.3	0.69	0.71	-61.49	2.84	1.00	1.53
9000	37.1	-55.3	0.68	0.65	-60.80	3.06	1.09	1.60
10000	37.5	-56.2	0.70	0.54	-61.91	3.28	1.20	1.67
11000	37.5	-55.3	0.80	0.61	-61.40	3.43	1.27	1.70
12000	37.6	-53.7	0.84	0.42	-59.70	3.53	1.26	1.73
13000	38.2	-53.5	0.83	0.44	-59.81	3.75	1.32	1.83
14000	39.9	-56.3	0.91	0.53	-63.03	3.91	1.40	1.77
15000	40.9	-54.1	0.98	0.54	-61.05	4.02	1.44	1.83
16000	41.3	-54.1	1.23	0.49	-61.51	4.17	1.51	1.85
17000	42.8	-54.4	1.36	0.76	-62.36	4.34	1.53	2.00
18000	44.2	-54.7	1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Tables show an extract of values.

7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency	AF EMCO 3160-09	Corr.	cable loss 1 (inside chamber)	cable loss 2 (pre-amp)	cable loss 3 (inside chamber)	cable loss 4 (switch unit)	cable loss 5 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB
18000	40.2	-23.5	0.72	-35.85	6.20	2.81	2.65
18500	40.2	-23.2	0.69	-35.71	6.46	2.76	2.59
19000	40.2	-22.0	0.76	-35.44	6.69	3.15	2.79
19500	40.3	-21.3	0.74	-35.07	7.04	3.11	2.91
20000	40.3	-20.3	0.72	-34.49	7.30	3.07	3.05
20500	40.3	-19.9	0.78	-34.46	7.48	3.12	3.15
21000	40.3	-19.1	0.87	-34.07	7.61	3.20	3.33
21500	40.3	-19.1	0.90	-33.96	7.47	3.28	3.19
22000	40.3	-18.7	0.89	-33.57	7.34	3.35	3.28
22500	40.4	-19.0	0.87	-33.66	7.06	3.75	2.94
23000	40.4	-19.5	0.88	-33.75	6.92	3.77	2.70
23500	40.4	-19.3	0.90	-33.35	6.99	3.52	2.66
24000	40.4	-19.8	0.88	-33.99	6.88	3.88	2.58
24500	40.4	-19.5	0.91	-33.89	7.01	3.93	2.51
25000	40.4	-19.3	0.88	-33.00	6.72	3.96	2.14
25500	40.5	-20.4	0.89	-34.07	6.90	3.66	2.22
26000	40.5	-21.3	0.86	-35.11	7.02	3.69	2.28
26500	40.5	-21.1	0.90	-35.20	7.15	3.91	2.36

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency	AF EMCO 3160-10	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
26.5	43.4	-11.2	4.4				-9.5	3	1.0
27.0	43.4	-11.2	4.4				-9.5	3	1.0
28.0	43.4	-11.1	4.5				-9.5	3	1.0
29.0	43.5	-11.0	4.6				-9.5	3	1.0
30.0	43.5	-10.9	4.7				-9.5	3	1.0
31.0	43.5	-10.8	4.7				-9.5	3	1.0
32.0	43.5	-10.7	4.8				-9.5	3	1.0
33.0	43.6	-10.7	4.9				-9.5	3	1.0
34.0	43.6	-10.6	5.0				-9.5	3	1.0
35.0	43.6	-10.5	5.1				-9.5	3	1.0
36.0	43.6	-10.4	5.1				-9.5	3	1.0
37.0	43.7	-10.3	5.2				-9.5	3	1.0
38.0	43.7	-10.2	5.3				-9.5	3	1.0
39.0	43.7	-10.2	5.4				-9.5	3	1.0
40.0	43.8	-10.1	5.5				-9.5	3	1.0

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7.7 ANTENNA SGH-19 (40 GHZ – 60 GHZ)

Frequency	AF SGH-19	Corr.		cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	Harmonic Mixer FS-Z60	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB		dB	dB	dB	dB	dB	m	m
40.0	39.6	3.8					19.4	-15.6	3	0.5
41.0	39.7	2.7					18.3	-15.6	3	0.5
42.0	39.8	3.3					18.9	-15.6	3	0.5
43.0	39.9	2.7					18.3	-15.6	3	0.5
44.0	40.1	4.0					19.6	-15.6	3	0.5
45.0	40.2	3.8					19.4	-15.6	3	0.5
46.0	40.3	4.0					19.6	-15.6	3	0.5
47.0	40.4	4.3					19.9	-15.6	3	0.5
48.0	40.5	3.5					19.1	-15.6	3	0.5
49.0	40.6	3.2					18.8	-15.6	3	0.5
50.0	40.8	3.6					19.2	-15.6	3	0.5
51.0	40.9	2.6					18.2	-15.6	3	0.5
52.0	41.1	1.5					17.1	-15.6	3	0.5
53.0	41.1	0.1					15.7	-15.6	3	0.5
54.0	41.3	-1.0					14.6	-15.6	3	0.5
55.0	41.4	-0.8					14.8	-15.6	3	0.5
56.0	41.5	-1.2					14.4	-15.6	3	0.5
57.0	41.6	-0.8					14.8	-15.6	3	0.5
58.0	41.8	-0.9					14.7	-15.6	3	0.5
59.0	41.9	0.0					15.6	-15.6	3	0.5
60.0	42.1	1.3					16.9	-15.6	3	0.5

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7.8 ANTENNA SGH-12 (60 GHZ – 90 GHZ)

Frequency	AF SGH-12	Corr.	cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	Harmonic Mixer FS-Z90	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB	dB	dB	dB	dB	dB	m	m
60.0	43.3	8.2				24.4	-15.6	3	0.5
61.5	43.4	7.3				23.8	-15.6	3	0.5
63.0	43.5	4.2				22.9	-15.6	3	0.5
64.5	43.6	4.2				19.8	-15.6	3	0.5
66.0	43.7	2.0				19.8	-15.6	3	0.5
67.5	43.8	3.4				17.6	-15.6	3	0.5
69.0	43.9	3.2				19.0	-15.6	3	0.5
70.5	44.0	2.4				18.8	-15.6	3	0.5
72.0	44.1	1.6				18.0	-15.6	3	0.5
73.5	44.2	1.7				17.2	-15.6	3	0.5
75.0	44.4	0.1				17.3	-15.6	3	0.5
76.5	44.5	-0.5				15.7	-15.6	3	0.5
78.0	44.6	-0.5				15.1	-15.6	3	0.5
79.5	44.7	-1.6				15.1	-15.6	3	0.5
81.0	44.8	-1.7				14.0	-15.6	3	0.5
82.5	45.0	-0.3				13.9	-15.6	3	0.5
84.0	45.1	2.2				15.3	-15.6	3	0.5
85.5	45.2	3.7				17.8	-15.6	3	0.5
87.0	45.4	5.9				19.3	-15.6	3	0.5
88.5	45.5	5.2				21.5	-15.6	3	0.5
90.0	45.6	8.2				20.8	-15.6	3	0.5

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7.9 ANTENNA SGH-08 (90 GHZ – 140 GHZ)

Frequency	AF SGH-19	Corr.		cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	Harmonic Mixer FS-Z140	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB		dB	dB	dB	dB	dB	m	m
90.0	46.9	12.2					27.8	-15.6	3	0.5
92.5	47.0	10.8					26.4	-15.6	3	0.5
95.0	47.1	9.2					24.8	-15.6	3	0.5
97.5	47.2	7.5					23.1	-15.6	3	0.5
100.0	47.3	5.8					21.4	-15.6	3	0.5
102.5	47.4	6.0					21.6	-15.6	3	0.5
105.0	47.6	7.0					22.6	-15.6	3	0.5
107.5	47.7	5.8					21.4	-15.6	3	0.5
110.0	47.8	4.7					20.3	-15.6	3	0.5
112.5	47.9	4.1					19.7	-15.6	3	0.5
115.0	48.0	6.8					22.4	-15.6	3	0.5
117.5	48.2	7.3					22.9	-15.6	3	0.5
120.0	48.3	7.5					23.1	-15.6	3	0.5
122.5	48.4	10.4					26.0	-15.6	3	0.5
125.0	48.6	13.6					29.2	-15.6	3	0.5
127.5	48.7	15.5					31.1	-15.6	3	0.5
130.0	48.9	18.1					33.7	-15.6	3	0.5
132.5	49.0	13.5					29.1	-15.6	3	0.5
135.0	49.2	14.6					30.2	-15.6	3	0.5
137.5	49.3	14.1					29.7	-15.6	3	0.5
140.0	49.4	11.5					27.1	-15.6	3	0.5

Sample calculation

E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

7.10 ANTENNA SGH-05 (140 GHZ – 200 GHZ)

Frequency	AF SGH-19	Corr.		cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	Harmonic Mixer FS-Z140	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit)	d_{used} (meas. distance (used)
GHz	dB (1/m)	dB		dB	dB	dB	dB	dB	m	m
140.0	50.8	15.1					30.7	-15.6	3	0.5
142.0	50.8	11.0					26.6	-15.6	3	0.5
144.0	50.9	11.1					26.7	-15.6	3	0.5
146.0	50.9	12.1					27.7	-15.6	3	0.5
148.0	51.0	13.1					28.7	-15.6	3	0.5
150.0	51.0	15.4					31.0	-15.6	3	0.5
152.0	51.1	15.0					30.6	-15.6	3	0.5
154.0	51.1	16.9					32.5	-15.6	3	0.5
156.0	51.2	15.1					30.7	-15.6	3	0.5
158.0	51.3	15.3					30.9	-15.6	3	0.5
160.0	51.3	14.5					30.1	-15.6	3	0.5
162.0	51.4	14.2					29.8	-15.6	3	0.5
164.0	51.4	15.4					31.0	-15.6	3	0.5
166.0	51.5	13.5					29.1	-15.6	3	0.5
168.0	51.6	14.0					29.6	-15.6	3	0.5
170.0	51.6	15.1					30.7	-15.6	3	0.5
172.0	51.7	14.3					29.9	-15.6	3	0.5
174.0	51.8	14.7					30.3	-15.6	3	0.5
176.0	51.8	14.8					30.4	-15.6	3	0.5
178.0	51.9	14.6					30.2	-15.6	3	0.5
180.0	51.9	14.9					30.5	-15.6	3	0.5
182.0	52.0	14.7					30.3	-15.6	3	0.5
184.0	52.1	15.6					31.2	-15.6	3	0.5
186.0	52.1	16.8					32.4	-15.6	3	0.5
188.0	52.2	15.2					30.8	-15.6	3	0.5
190.0	52.3	16.8					32.4	-15.6	3	0.5
192.0	52.3	16.1					31.7	-15.6	3	0.5
194.0	52.4	14.8					30.4	-15.6	3	0.5
196.0	52.5	15.1					30.7	-15.6	3	0.5
198.0	52.6	13.8					29.4	-15.6	3	0.5
200.0	52.6	13.7					29.3	-15.6	3	0.5
202.0	52.7	14.0					29.6	-15.6	3	0.5
204.0	52.8	13.7					29.3	-15.6	3	0.5
206.0	52.8	13.4					29.0	-15.6	3	0.5
208.0	52.9	13.4					29.0	-15.6	3	0.5
210.0	53.0	13.9					29.5	-15.6	3	0.5
212.0	53.1	12.9					28.5	-15.6	3	0.5
214.0	53.2	13.1					28.7	-15.6	3	0.5
216.0	53.2	13.5					29.1	-15.6	3	0.5
218.0	53.3	14.5					30.1	-15.6	3	0.5
220.0	53.4	14.0					29.6	-15.6	3	0.5

Sample calculation

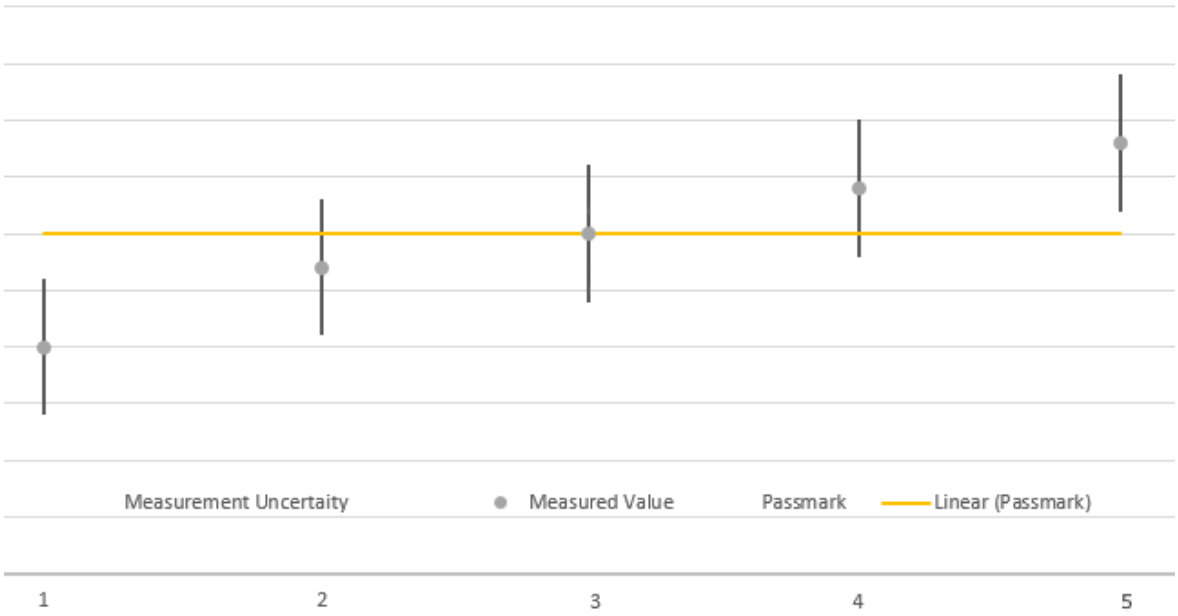
E (dB µV/m) = U (dB µV) + AF (dB 1/m) + Corr. (dB)
U = Receiver reading
AF = Antenna factor
Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
Linear interpolation will be used for frequencies in between the values in the table.
distance correction = -20 * LOG (d_{Limit}/ d_{used})
Linear interpolation will be used for frequencies in between the values in the table.
Table shows an extract of values.

8 MEASUREMENT UNCERTAINTIES

Test Case	Parameter	Uncertainty
AC Power Line	Power	± 3.4 dB
Field Strength of spurious radiation	Power	± 5.5 dB
10 dB Bandwidth	Power Frequency	± 5.5 dB ± 100.0 kHz
Frequency Stability	Frequency	± 25 Hz
Output Power	Power	± 5.5 dB

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor) k = 1.96. This means, that the true value is in the corresponding interval with a probability of 95 %.

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor) k = 1.96. This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	on pass mark	within pass mark	Passed
4	above pass mark	within pass mark	Failed
5	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so-called shared risk principle.

9 PHOTO REPORT

Please see separate photo report.

**********END OF REPORT**********