Prüfbericht-Nr.: *Test report no.:*	**DE246UXJ 001**	**Auftrags-Nr.:** *Order no.:*	1151516 50	Seite 1 von 33 *Page 1 of 33*
Kunden-Referenz-Nr.: *Client reference no.:*	8320104705	**Auftragsdatum:** *Order date:*	2023-10-09	
Auftraggeber: *Client:*	Bosch Rexroth AG, Fornsbacher Str. 92, 71540 Murrhardt, Germany			
Prüfgegenstand: *Test item:*	Electronical Torque Wrench			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	OPEX 100 Nm			
Auftrags-Inhalt: *Order content:*	Prüfung der Funkparameter nach FCC & ISED Test of radio parameters acc. to FCC & ISED			
Prüfgrundlage: *Test specification:*	Teilprüfung / Partial test FCC CFR 47 Part 15 Subpart E- §15.407 ISED RSS-247 Issue 3 2023			
Wareneingangsdatum: *Date of sample receipt:*	2024-01-18	There are no photos of the EUT in this report acc. to the confidentiality letter. For Photo documentation please refer to Report numbers DE24ZCGB 001, DE24CSAG 001, DE24QI6V 001,		
Prüfmuster-Nr.: *Test sample no:*	A003734791-001 to 002			
Prüfzeitraum: *Testing period:*	2024-05-17 - 2024-05-31			
Ort der Prüfung: *Place of testing:*	Nürnberg *Nuremberg*			
Prüflaboratorium: *Testing laboratory:*	Wireless Labor *Wireless Test Lab*			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von: *tested by:*	X	**genehmigt von:** *authorized by:*	X
Datum: *Date:* 2024-06-11	Signed by: Shrinivas Naikar	**Ausstellungsdatum:** *Issue date:* 2024-06-11	Signiert von: Patrick Reusch
Stellung / Position:	Sachverständige(r)/Expert	**Stellung** / Position:	Sachverständige(r)/Expert

Sonstiges / *Other:*	USA/FCC: C2PC filing for adding new host system. Canada/ISED: C4PC filing for adding new host system. Host device integrated with FCC & IC certificate radio module.

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

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Anmerkungen

Remarks

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4	Die Entscheidungsregel für Konformitätserklärungen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. *The decision rule for statements of conformity in this test report is based on the “Zero Guard Band Rule” and “Simple Acceptance” in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report.*

Produktbeschreibung
Product description

1	**Test item**	Electronical Torque Wrench			
2	**Typ-No.**	OPEX 100 Nm			
3	**Test sample obtaining**	☒ Sampling by customer ☐ Sampling by TÜV Rheinland Group ☐ others:			
4	**Serial-No.**				
5	**Supported radio technologies**	Wi-Fi 2.4GHz and Wi-Fi 5GHz			
6	**Evaluated in this Report**	Wi-Fi 5GHz			
7	**Description of EUT**	Electronic torque wrench for tightening screw connections in an industrial environment.			
8	**Max RF output power (measured) (Refer to module test report)**	**Protocol**	**Frequency (MHz)**	**FCC**	**IC**
		Wi-Fi 2.4GHz	2412 to 2462	24.72 dBm	
		Wi-Fi 5GHz	5180 to 5240	18.41 dBm	22,53 dBm (e.i.r.p)
			5260 to 5320	18.41 dBm	17,98 dBm
			5500 to 5700	18.01 dBm	18.01 dBm
			5745 to 5825	18.26 dBm	18.26 dBm
9	**Operating Frequency (declared)**	**Protocol**	**Band**	**Frequency (MHz)**	
		Wi-Fi 2.4GHz	2.4GHz	2412 to 2462	
		Wi-Fi 5GHz	UNII 1	5180 to 5240	
			UNII 2a	5260 to 5320	
			UNII 2c	5500 to 5700	
			UNII 3	5745 to 5825	
10	**Number of Channels and Bandwidth (declared)**	**Protocol**	**Bandwidth (MHz)**	**No. of Channels**	
		Wi-Fi 2.4GHz	20MHz	11	
		Wi-Fi 5GHz	20MHz	24	
			40MHz	11	
11	**Modulation**	WiFi a/b/g/n: DSS/OFDM			
12	**Rated Voltage / Frequency (Device)**	3,6 V DC/5000 mAh Battery Docking adaptor: 9V DC/2.22amps			
13	**Input/output Voltage of the AC-DC adaptor**	Input:110V AC/60Hz Output: 9V DC/2.22amps			
14	**Radio Module Name**	xPico 200 Series Wi-Fi IOT Gateway			
15	**FCC-ID (Radio module)**	R68XPICO200			
16	**IC-ID (Radio module)**	3867A-XPICO200			
17	**Radio module Report Number**	**Protocol**	**FCC**	**IC**	
		Wi-Fi 2.4GHz	RF170513E01	IC170513E01	
		Wi-Fi 5GHz	RF170513E01-1 and RF170513E01-4	IC170513E01-1 and IC170513E01-4	
18	**Antenna Name**	PCB Antenna			
19	**Antenna Type**	☒ Integral antenna (designed as a fixed part of the EUT) ☐ Dedicated antenna (removable, obligation to be used) ☐ Permanent antenna connector			
20	**Antenna number of chains**	1			

Produktbeschreibung
Product description

21	**Antenna Gain (declared)**	Wi-Fi 2.4GHz: 2.5 dBi Wi-Fi 5GHz: 5 dBi
22	**Firmware**	240700
23	**Hardware**	V1.000
24	**Provided Samples**	A003734791-001 to 02
25	**Radiated measurements sample**	A003734791-001
26	**Companion Device** used for radio connection with the EUT	EUT in Test Mode. Therefore, no Companion Device was used.
27	**Auxiliary equipment** used to set up the EUT	TUV lab laptop was used to configure the radio.
28	**Accessory Devices** used together with the EUT	Docking Station, Power Adaptor and USB Type C Cable
29	**Data Cable**	One type C USB cable
30	**I/O Ports**	N/A
31	**Temperature Range**	+0°C to +40° C
32	**Environment**	Indoor and Outdoor
33	**Identical Types**	gwk Werkzeuge & Kalibrierung GWK Norbert Gerlach GmbH & Co. KG Elektronische Schraubsysteme Geschäftsleitung gwk Norbert Gerlach GmbH & Co.KG, In der Steinbach 2, 55758 Schauren Bosch Rexroth AG Fornsbacher Str. 92 71540 Murrhardt We, company GWK, herewith unitarily confirm that all variants of the electronic torque wrenches, which are available under the brand names Operator22 of company GWK and OPEX of company Bosch Rexroth AG, are completely identical with regard to the electronic hardware. The divergences in the brand appearance are limited solely to the external appearance and do not show any differences in the technical equipment. The divergences in the body sizes only concern the mechanical construction of the measuring equipment. The strain gages used are identical throughout. The adaptation to higher torques is only done by software due to different tube thicknesses and lengths. The different sizes of the torque/angle wrenches are specified by the respective supplier as follows: Bosch Rexroth AG / GWK Norbert Gerlach GmbH & Co. KG OPEX 30 Nm / Operator22, 30 Nm OPEX 60 Nm / Operator22, 60 Nm OPEX 100 Nm / Operator22, 100 Nm OPEX 200 Nm / Operator22, 200 Nm OPEX 300 Nm / Operator22, 300 Nm OPEX 400 Nm / Operator22, 400 Nm OPEX 600 Nm / Operator22, 600 Nm OPEX 800 Nm / Operator22, 800 Nm Dirk Wendt Geschäftsführender Gesellschafter gwk Norbert Gerlach GmbH & Co.KG In der Steinbach 2 55758 Schauren Germany Geschäftsführer: Gerlach Verwaltungs GmbH, HRA 11769 Amtsgericht Bad Kreuznach, HRB 11188 Tel.: +49 (0)6785 2904860 Fax: +49 (0)6785 2904861 E-Mail: info@gwkgerlach.de USt -ID-Nr.: DE219859909 Bankverbindung: Volksbank Hunsrück-Nahe Kontonummer: 6700382 Bankleitzahl: 56061472 Swift/BIC Code: GENODED1KHK IBAN-Nummer: DE75560614720006700382 WEEE-Reg.-Nr.: DE16923115 TÜV SÜD Zertifiziertes Managementsystem

Absatz *Clause*	**Anforderungen – Prüfungen /** *Requirements - Tests*	**Bemerkungen /** *Remarks*	**Ergebnis** *Result*
FCC 15.407 (a) RSS-247 sec. 6.2	Maximum Output Power	No retest necessary, as transmitter output power has been certified based on conducted power.	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.407 (a) RSS-247 sec. 6.2	Power Spectral Density	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.407 (e) RSS-247 sec. 6.2.4.1	6dB Bandwidth	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.205, 15.209 RSS-Gen sec. 8.9, 8.10	Out of Band Emissions: U-NII-1 Restricted Band Edge	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.407 (b) RSS-247 sec. 6.2	Out of Band Emissions: Unrestricted Band Edge	-	P ☐ F ☐ N/A ☐ N/T ☒
FCC 15.407 (b) RSS-247 sec. 6.2	TX Spurious Emissions in non-restricted bands	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.205, 15.209 RSS-Gen sec. 8.9, 8.10	TX Spurious Emissions in restricted bands	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.207 RSS-Gen sec. 8.8	AC Power Conducted Emissions	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.407 (g) RSS-Gen sec. 6.11	Frequency Stability	Manufacturer declaration	P ☐ F ☐ N/A ☐ N/T ☒

Prüfdokumentation

Test documentation

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1 EUT Classification

1.1 Wireless technologies and frequencies supported by the EUT

The named technologies are only those falling in the specification of the applied standard.

Technology	Frequency Range (TX)	Supported by the EUT	Evaluated in this report
BLE	2400 – 2483.5 MHz	☐	☐
802.11b	2400 – 2483.5 MHz	☒	☐
802.11g	2400 – 2483.5 MHz	☒	☐
802.11n (20MHz)	2400 – 2483.5 MHz	☒	☐
802.11n (40MHz)	2400 – 2483.5 MHz	☐	☐
802.11a/g/n (20MHz)	5150 – 5850 MHz	☒	☒
802.11n (40MHz)	5150 – 5850 MHz	☒	☒

1.2 Report References.

Protocol	**Product Test Report Reference**
WLAN 2.4GHz	DE24GVPK 001
WLAN 5GHz – This Report	DE246UXJ 001
EUT External Photos	DE24CSAG 001
EUT Internal Photos	DE24QI6V 001
EUT test setup Photos	DE24ZCGB 001

1.3 Standard specific classification of the EUT

1.3.1 Applied standards

FCC CFR 47 Part 15 Subpart E - §15.407

ISED RSS-247 Issue 3 2023

1.3.2 Test Methods and Guidance Documents

ANSI C63.10:2013

KDB 789033 D02 General U-NII Test Procedures New Rules v02r01

KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 996369 D04 Module Integration Guide v01

1.3.3 System Type

☒	U-NII Client with-out radar detection device
☐	U-NII Access point
☐	U-NII Client device and Acceess point
☐	U-NII Fixed point to point

1.3.4 Type of equipment

☐	Tabletop Equipment
☐	Floor-Standing Equipment
☐	Equipment that can be used in multiple orientations
☒	Hand held Equipment

2 General

2.1 Registration

The measurement facilities for conducted and radiated disturbance measurements of the TÜV Rheinland LGA Products have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. Measurement data will be accepted in conjunction with applications for Certification under Parts 15 and 18 of the Commission's Rules.

FCC Registration Number: 939976
Bundesnetzagentur Registration Number: BNetzA-CAB-17/21-16

The measurement facilities are also recognized by Innovation, Science and Economic Development (ISED) Canada to test to Canadian radio equipment requirements.

Company Number: 11235A
CAB Identifier: DE0018

2.2 Equipment modifications

No modifications were found to be necessary in order to perform the tests or to achieve compliance.

2.3 Test modes

Mode	Description	Mode configuration
Alles Modes		The auxiliary equipment was connected to the EUT during the tests to keep the configured settings active. The USB Cable was grounded and filtered at the point of feed-trough
Mode 1: TX-Mode		The continuous transmission was enabled on different channels, as specified in section 2.4 of this report. The appropriate commands provided by the customer were used to configure the radio and used "OP_xp200-cmd_teraterm - Wi-Fi - opsigned.bat" software/tool for the configuration.
Mode 2: RX-Mode		Not Applicable

2.4 Worst case Test Modes

The DUT was tested in its worst-case configuration as stated in the test report of the radio module xPico 200 Series Wi-Fi IOT Gateway.

Following configurations were used for the test cases:

Test case	Frequency	Channel	Bandwidth	Mode	Power level Settings	
					FCC	ISED
Radiated Spurious Emissions and restricted bands of operation	5180	36	20	a	Default	58
	5320	64	20	a	Default	60
	5180	36	20	n	57	
	5320	64	20	n	Default	61
	5190	38	40	n	54	
	5825	165	20	n	Default	

3 Test conditions

3.1 General

The DUT was tested standalone on the transmit test mode in normal test conditions.

3.2 Normal test conditions

Environmental condition	Parameter	Range
Temperature	°C	21-24
Relative humidity	%	20-60

3.3 Antenna assemblies

No antenna connector is prepared so tests were done in radiated mode.

3.4 Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the quality system acc. to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation.

The manufacturer has the sole responsibility of continued compliance of the device.

Test	Value	Unit	Range
Frequency Error	$2,7 * 10^{-8}$	Hz	-
Frequency Stability under low voltage conditions			
Time	$1,1 * 10^{-9}$	s	-
Conducted Carrier Power	1.0	dB	9k-1GHz
Conducted Spurious Emissions (RX/TX)	1.7	dB	1GHz-6GHz
	2.8	dB	6GHz-40GHz
Occupied Bandwidth (OBW)	0.1	%	-
TX Power Spectral Density	4.2	mW	9kHz - 6GHz
	1.6	dB	9kHz - 6GHz
Dwell Time	$4,6 * 10^{-7}$	Hz	-
Frequency Separation			-
Measurement of conducted emissions at the power supply connection to LISN	2.3	dB	9kHz – 150kHz
	2.2	dB	150kHz – 30MHz
Measurement of the field strength at distance 3m	1.6	dB	9k-150kHz
	4.5	dB	30-1000MHz
	5	dB	1-6GHz
	5.3	dB	6-40GHz
Temperature	0.8	K	-
Humidity	4	%	-
Voltage (AC/DC)	1.0	%	-

4 Test results in detail.

4.1 Radiated Spurious Emissions Common power level used for FCC and ISED.

4.1.1 Requirements / Limits

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode. The emissions shall not exceed the values in FCC Part 15, Subpart C §15.205, §15.209 and RSS-Gen sec. 8.9, 8.10.

FCC Part 15, Subpart E, §15.407 (b)

(8) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209..

(9) The provisions of § 15.205 apply to intentional radiators operating under this section..

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

Frequency [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 FCC 15.31 (f)(2).

Frequency [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 - 40000	500@3m	3	54.0@3m

§15.35(b) ..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor:

$$\text{Limit [dB}\mu\text{V/m]} = 20 \log (\text{Limit [}\mu\text{V/m]} / 1\mu\text{V/m})$$

4.1.2 Test Method

4.1.2.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. Preliminary emission profile testing was performed inside the anechoic chamber. The receiving antenna was placed at a distance of 3m for all measurements. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT. The different measurement setup for each frequency range are shown below.

9 kHz - 30 MHz

Following Measurement Setup is used:

Test Site	Semi-anechoic chamber
Receiving Antenna	Loop antenna (HFH 2)
Receiving Antenna Height	1 m
Receiving Antenna Polarization	Parallel – Perpendicular
EUT Table	1.0m x 1.5m non-conductive table 80cm above the floor
EUT Turn Table Step Size	22.5°
Receiver Configurations	Average and peak detectors
	RBW: 200Hz (9 - 150 kHz) and 9 kHz (150 kHz – 30 MHz)
	Step Size: 50Hz (9-150kHz) and 2.25kHz (150k-30MHz)
	Sweep Time: 100ms (FFT)

30 MHz - 1 GHz

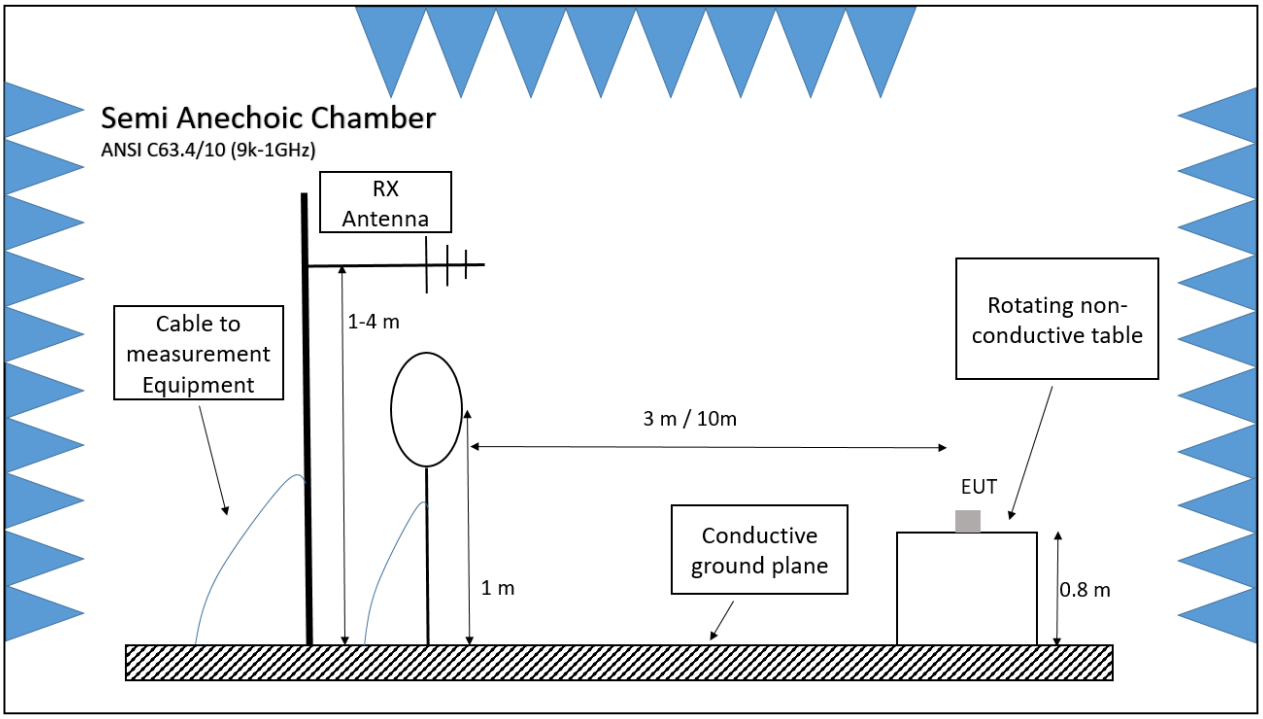
Following Measurement Setup is used:

Test Site	Semi-anechoic chamber
Receiving Antenna	Hybrid Antenna VULB 9168
Receiving Antenna height	Varied (1m to 4 m, step size 1m)
Receiving Antenna Polarization	Horizontal– Vertical
EUT Table	1.0m x 1.5m non-conductive table 80cm above the floor
EUT Turn Table Step Size	45°
Receiver Configurations	Peak detector
	RBW :120 kHz
	Step Size: 30kHz (30-1000MHz)
	Sweep Time: 100 ms (FFT)

Prüfdokumentation

Test documentation

For Measurements below 1 GHz, the EUT was positioned as shown in the setup photograph:

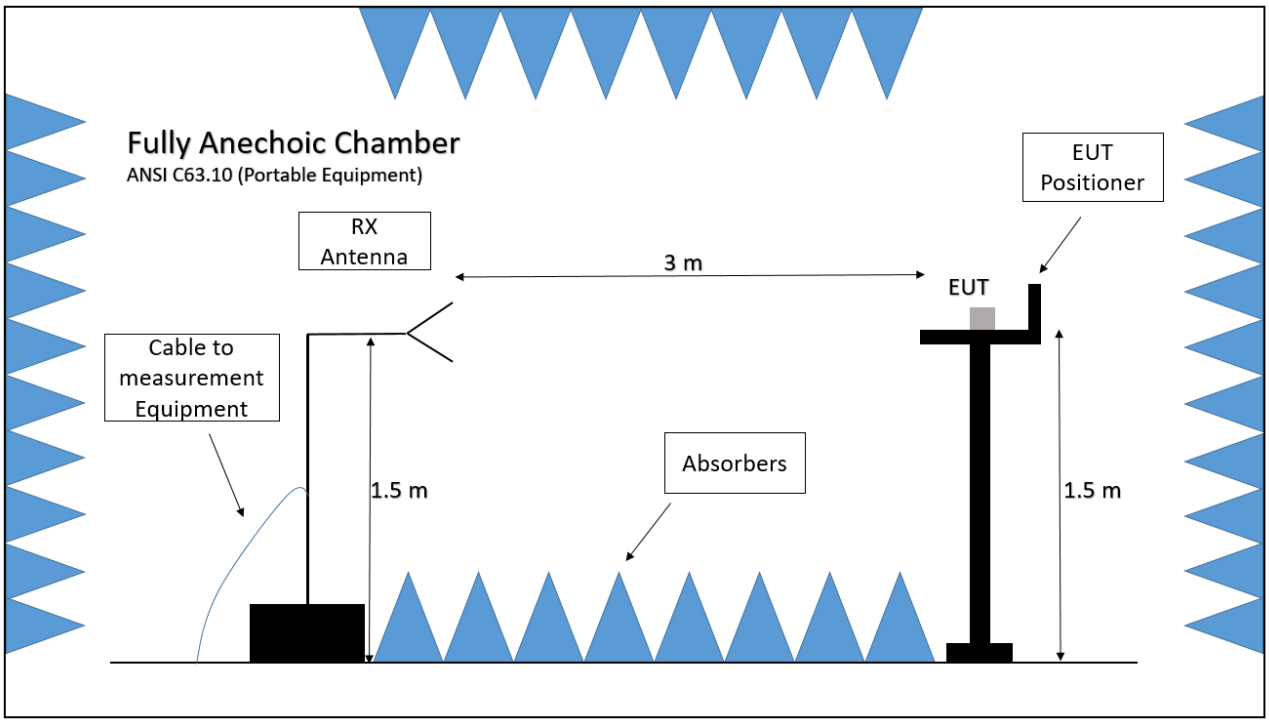


1 GHz - 40 GHz

Following Measurement Setup is used:

Test Site	Fully-anechoic chamber
Receiving Antenna	Horn Antenna HF907 (1-18 GHz), 3116C-PA (18-40 GHz)
Receiving Antenna Height	1.5 m
Receiving Antenna Polarization	Horizontal– Vertical
EUT Positioner	40 cm x 60 cm non-conductive positioner 1.5 m above the floor / Step size,elevation angle 45°
EUT Turn Table Step Size	45°
Spectrum Analyzer	Average and peak detectors
	RBW: 1 MHz
	Sweep Time: 100 ms

For Measurements over 1 GHz, the EUT was positioned as shown in the setup photograph:



4.1.2.2 Final Test

The placement of EUT and cables were the same as for preliminary testing. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked. For the measurements in the frequency range 30 MHz to 1 GHz for each measured frequency the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. For measurement above 1 GHz the turntable and positioner step sizes were set to a range of 22° and the antenna height is fixed.

For the measurements in the frequency ranges (90-110kHz, 490 kHz-1 GHz) quasi-peak detector is used, while average and peak detectors are used in other ranges.Final testing was performed on an SVSWR compliant test site.

The final average electric field value (E_{final}) is calculated in the final measurement table using the following equation:

$$E_{final} = \text{RawRec} + \text{Corr.}$$

While $\text{Corr.} = \text{Trd. Corr.} + \text{Sig Path} + \text{Preamp}$

Prüfdokumentation

Test documentation

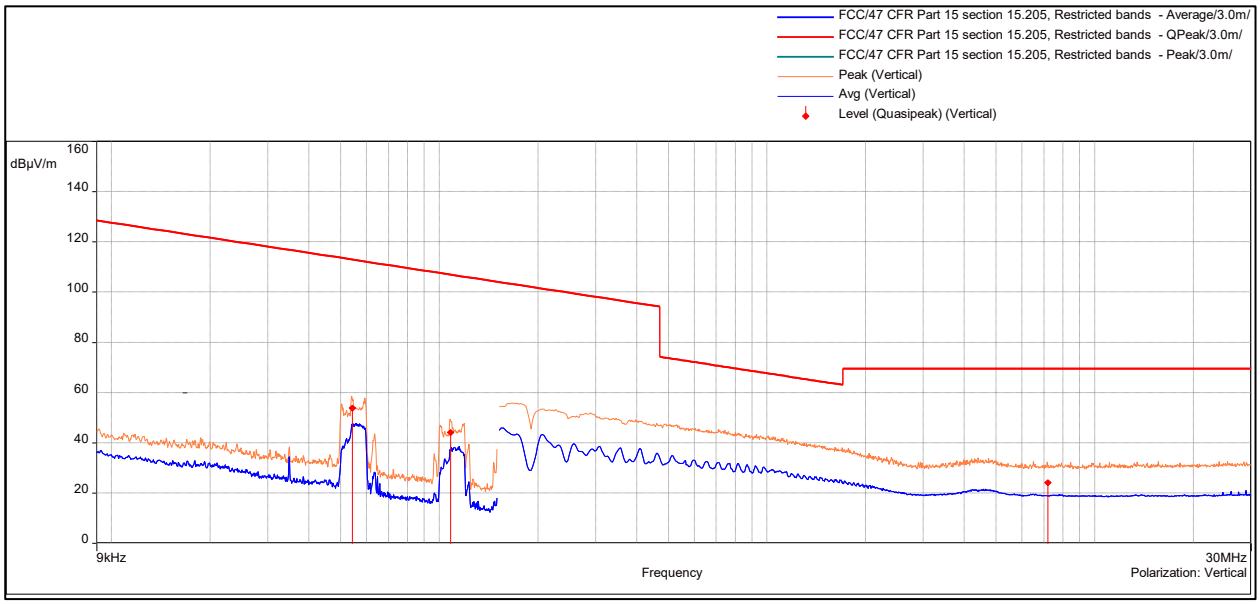
4.1.3 Test Setup

EUT	A003734791-001
Test Condition	Normal conditions
Companion device	EUT in Test Mode. Therefore, no Companion Device was used.
Operation mode	☒ 1: TX-Mode ☐ 2: RX-Mode ☐ 3: N/A ☐ 4: N/A
Further parameters	-
Test engineer	Shrinivas Naikar

4.1.4 Worst case test results for radiated spurious emission and restricted bands of operation.

4.1.4.1 9 kHz to 30 MHz,

Perpendicular Polarization

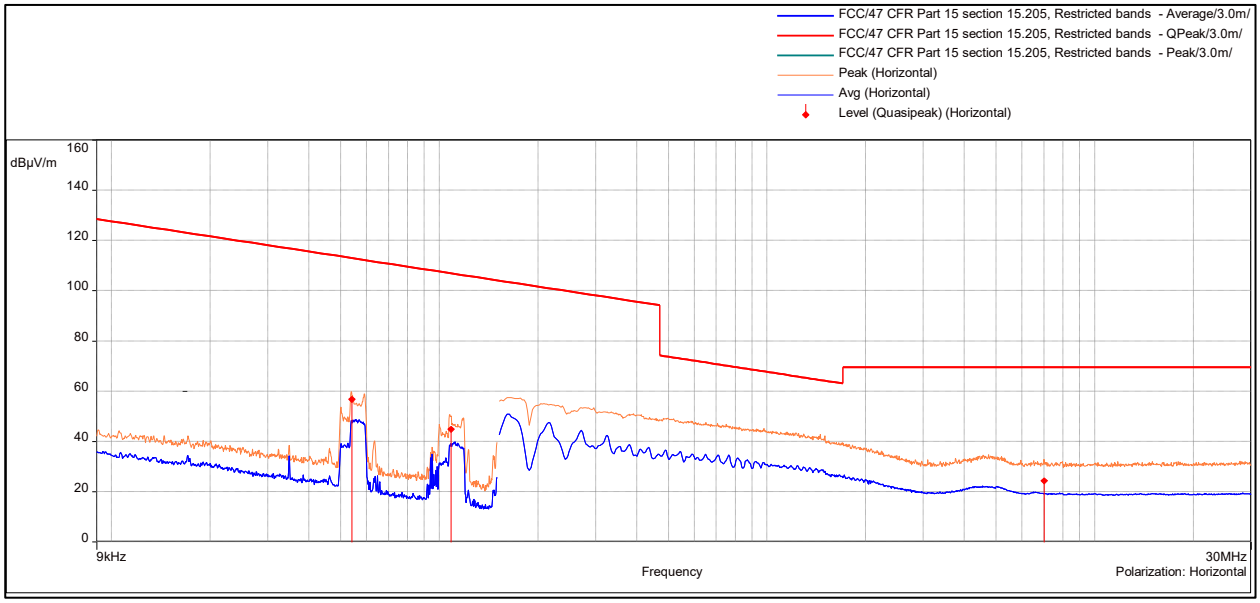


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height	Azimuth	Correction (dB)
0.0541429	53.83	112.94	-59.11	1.50	176.90	20.07
0.1079653	44.26	106.96	-62.70	1.50	184.50	20.02
7.1788813	24.28	69.50	-45.22	1.50	322.80	20.29

Prüfdokumentation

Test documentation

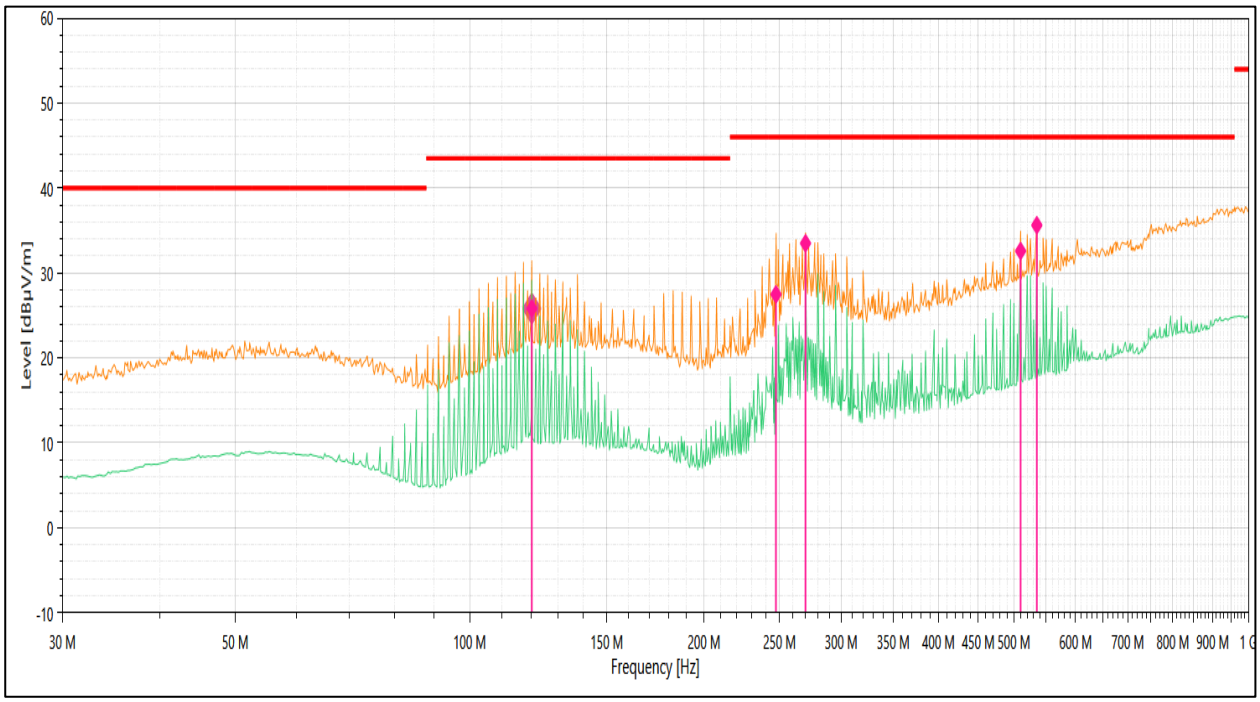
Parallel Polarization



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height	Azimuth	Measuring time	Correction (dB)
0.053983	56.85	112.96	-56.11	1.50	212.30	1.00	20.07
0.108383	44.96	106.92	-61.96	1.50	209.20	1.00	20.02
6.99607	24.46	69.50	-45.04	1.50	223.70	1.00	20.29

4.1.4.2 30 MHz to 1 GHz, Lowest Channel

Horizontal Polarization

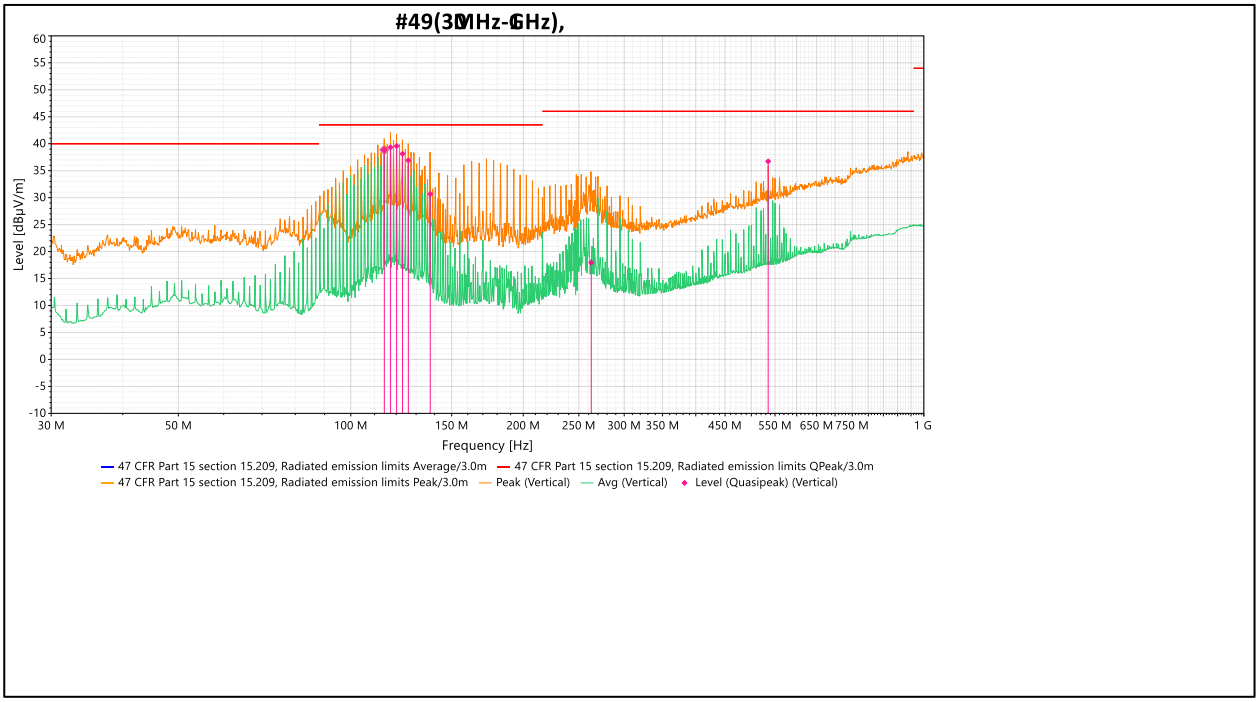


Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Height (m)	Azimuth (deg)	Corr. (dB)
120.1912	25.81	43.50	-17.69	Horizontal	4.00	323.70	19.06
247.4102	27.49	46.00	-18.51	Horizontal	1.80	71.60	19.77
270.0112	33.49	46.00	-12.51	Horizontal	1.17	294.60	20.89
510.0219	32.59	46.00	-13.41	Horizontal	1.00	87.00	27.59
535.0216	35.62	46.00	-10.38	Horizontal	1.75	67.20	28.04

Prüfdokumentation

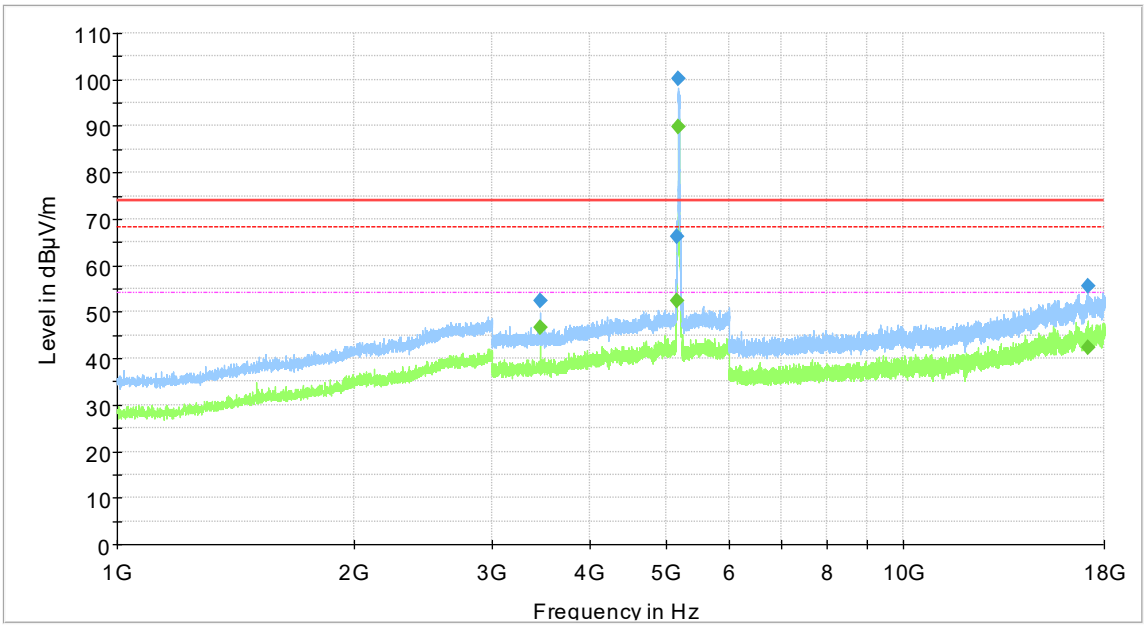
Test documentation

Vertical Polarization



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Height (m)	Azimuth (deg)	Corr. (dB)
114.4140	38.87	43.50	-4.63	Vertical	1.02	29.50	18.42
117.3336	39.34	43.50	-4.16	Vertical	1.00	74.10	18.74
120.2104	39.56	43.50	-3.94	Vertical	1.02	20.90	19.06
123.1064	38.12	43.50	-5.38	Vertical	1.02	72.30	19.21
126.0116	36.92	43.50	-6.58	Vertical	1.03	126.10	19.45
137.6017	30.67	43.50	-12.83	Vertical	1.17	195.50	20.12
262.8157	17.96	46.00	-28.04	Vertical	1.15	246.50	20.48
535.0200	36.73	46.00	-9.27	Vertical	1.00	326.60	28.04

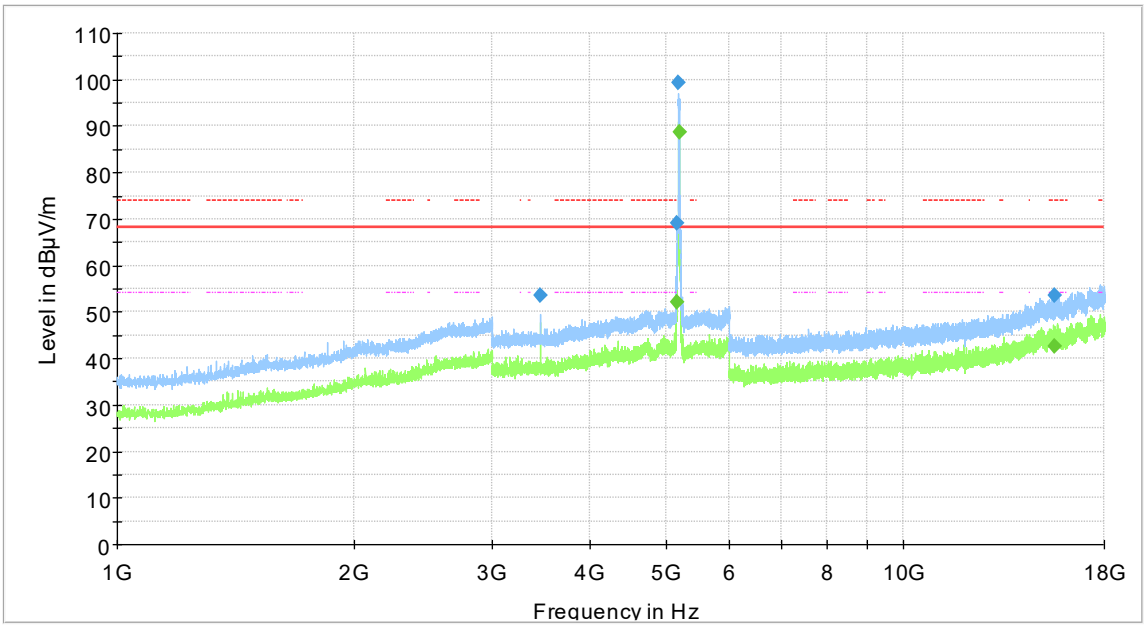
4.1.4.3 1 to 40 GHz, Frequency:5180 MHz, a-Mode, BW:20MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3453.310	---	46.54	68.23	21.69	5000.0	1000.000	150.0	H	78.0	75.0	3.7
3453.440	52.37	---	68.23	15.86	5000.0	1000.000	150.0	H	86.0	93.0	3.7
5149.400	---	52.36	54.00	1.64	5000.0	1000.000	150.0	H	81.0	93.0	10.2
5149.550	66.09	---	74.00	7.91	5000.0	1000.000	150.0	H	82.0	45.0	10.2
5173.330	---	89.96	Fundamental Frequency			1000.000	150.0	H	78.0	45.0	10.1
5175.460	100.12	---	Fundamental Frequency			1000.000	150.0	H	77.0	90.0	10.1
17176.370	---	42.33	68.23	25.90	5000.0	1000.000	150.0	H	97.0	45.0	10.2
17176.540	55.50	---	68.23	12.73	5000.0	1000.000	150.0	H	119.0	6.0	10.2

Note: No harmonics found above 18GHz

4.1.4.4 1 to 40 GHz, Frequency:5180 MHz, n-Mode, BW:20MHz



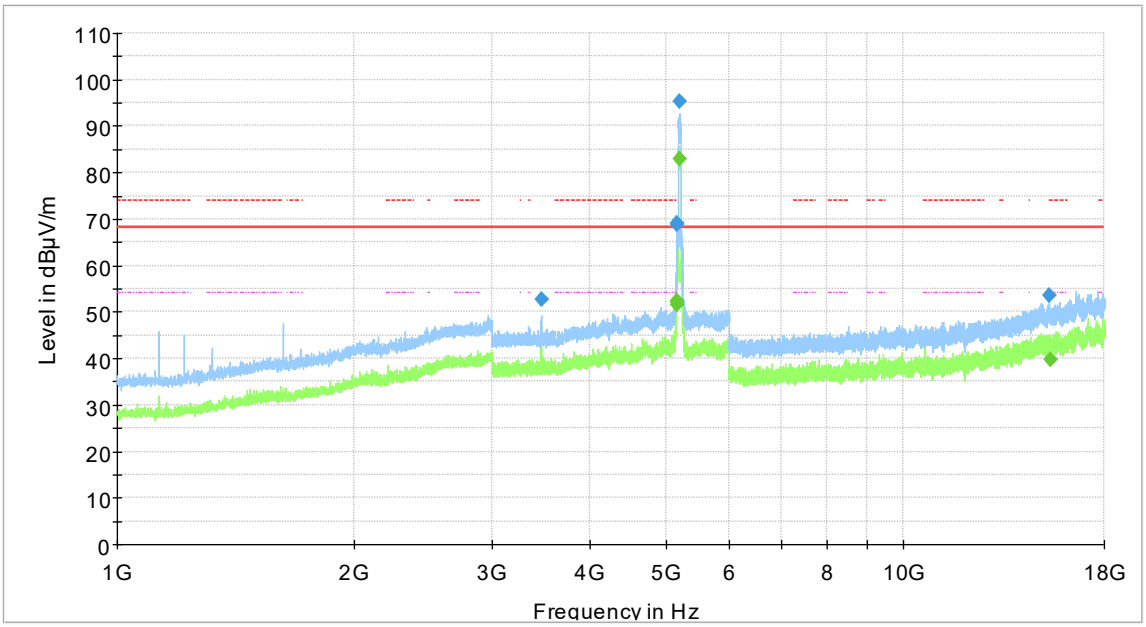
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3453.327	53.70	---	68.20	14.50	5000.0	1000.000	150.0	H	86.0	75.0	3.7
5150.000	---	52.09	54.00	1.91	5000.0	1000.000	150.0	H	82.0	91.0	10.2
5150.000	69.07	---	74.00	4.93	5000.0	1000.000	150.0	H	77.0	90.0	10.2
5173.947	99.39	---	Fundamental Frequency			1000.000	150.0	H	78.0	45.0	10.1
5182.745	---	88.57	Fundamental Frequency			1000.000	150.0	H	77.0	45.0	10.1
15540.55	---	42.66	54.00	11.34	5000.0	1000.000	150.0	H	65.0	84.0	6.0
15563.18	53.70	---	68.20	14.50	5000.0	1000.000	150.0	H	63.0	91.0	6.2

Note: No harmonics found above 18GHz

Prüfdokumentation

Test documentation

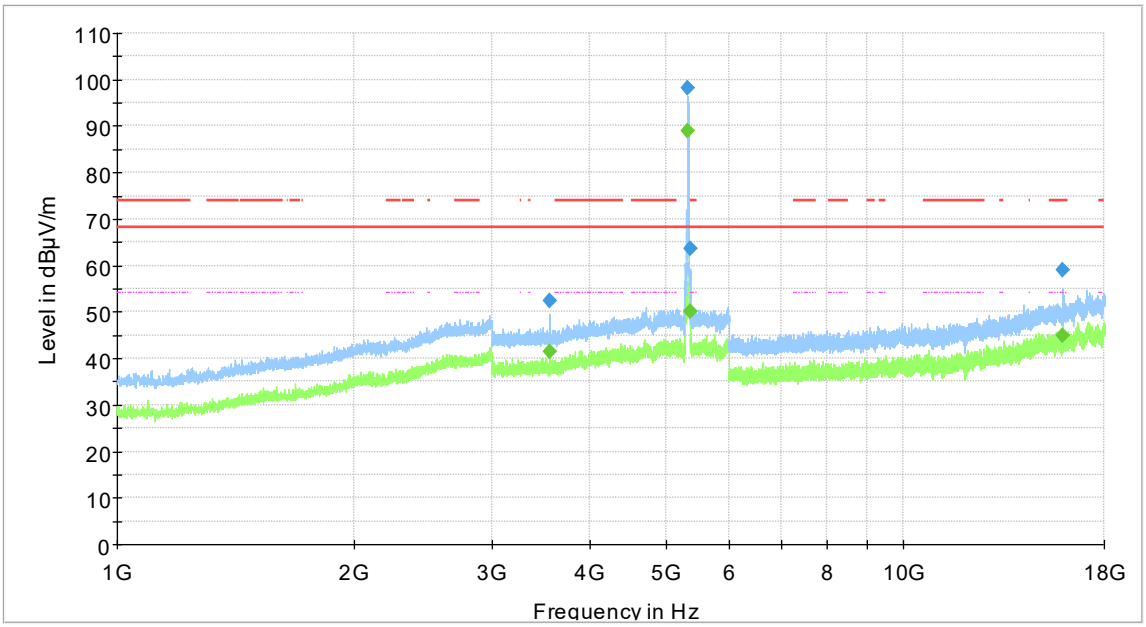
4.1.4.5 1 to 40 GHz, Frequency:5190 MHz, n-Mode, BW:40MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3459.953	52.73	---	68.20	15.47	5000.0	1000.000	150.0	H	82.0	92.0	3.7
5146.500	---	51.60	54.00	2.40	5000.0	1000.000	150.0	V	19.0	0.0	10.2
5146.500	68.85	---	74.00	5.15	5000.0	1000.000	150.0	V	19.0	0.0	10.2
5148.232	---	52.02	54.00	1.98	5000.0	1000.000	150.0	V	18.0	16.0	10.2
5149.000	69.14	---	74.00	4.86	5000.0	1000.000	150.0	V	19.0	0.0	10.2
5149.240	---	52.31	54.00	1.69	5000.0	1000.000	150.0	V	19.0	16.0	10.2
5186.793	95.32	---	Fundamenta Frequency			1000.000	150.0	H	76.0	45.0	10.1
5192.500	---	82.89	Fundamental Frequency			1000.000	150.0	H	83.0	90.0	10.1
15333.066	53.42	---	68.20	14.78	5000.0	1000.000	150.0	V	191.0	24.0	5.8
15377.339	---	39.82	68.20	28.38	5000.0	1000.000	150.0	V	137.0	-28.0	5.7

Note: No harmonics found above 18GHz

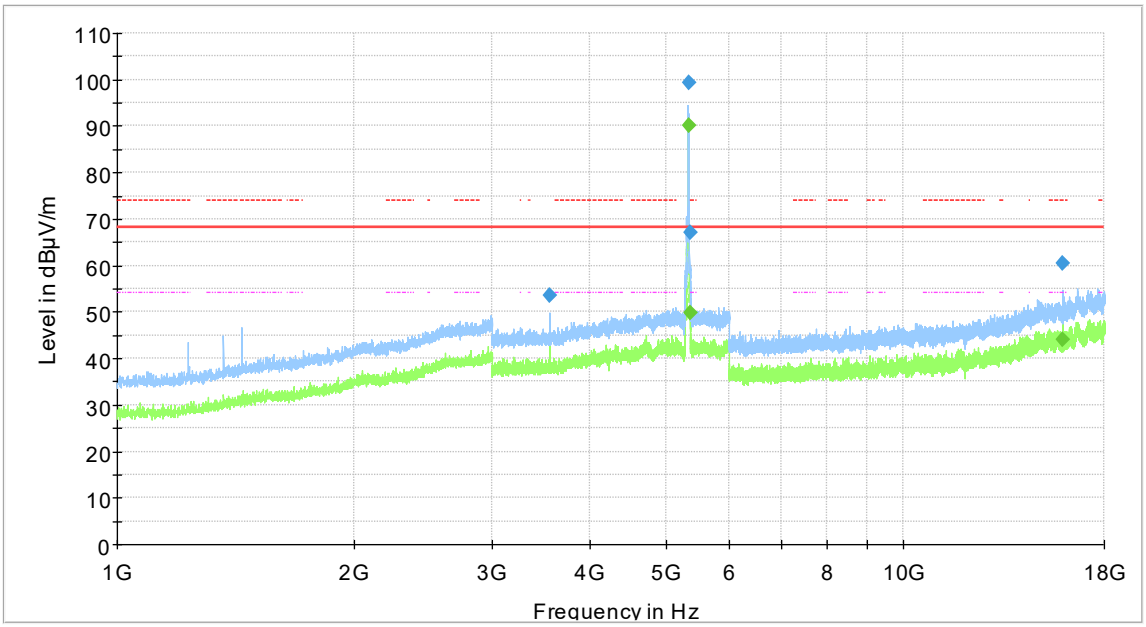
4.1.4.6 1 to 40 GHz, Frequency:5320 MHz, a-Mode, BW:20MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3547.000	---	41.45	68.20	26.75	5000.0	1000.000	150.0	V	44.0	12.0	3.9
3547.000	52.42	---	68.20	15.78	5000.0	1000.000	150.0	H	91.0	90.0	3.9
5322.669	98.25	---	Fundamental Frequency			1000.000	150.0	V	16.0	3.0	10.2
5325.500	---	88.98	Fundamental Frequency			1000.000	150.0	V	18.0	0.0	10.2
5350.000	63.57	---	74.00	10.43	5000.0	1000.000	150.0	V	17.0	-45.0	10.4
5350.000	---	50.13	54.00	3.87	5000.0	1000.000	150.0	V	18.0	9.0	10.4
15955.500	59.05	---	68.20	9.15	5000.0	1000.000	150.0	H	72.0	90.0	6.6
15956.606	---	44.83	68.20	23.37	5000.0	1000.000	150.0	H	64.0	100.0	6.6

Note: No harmonics found above 18GHz

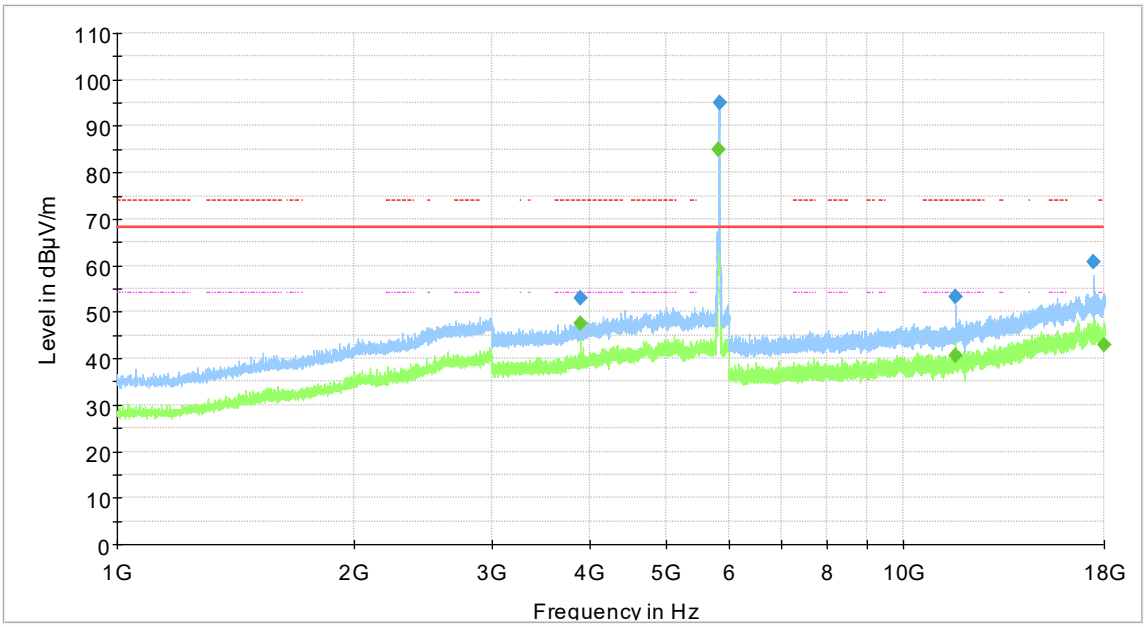
4.1.4.7 1 to 40 GHz, Frequency:5320 MHz, n-Mode, BW:20MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3546.659	53.67	---	68.20	14.53	5000.0	1000.000	150.0	H	91.0	76.0	3.9
5327.449	99.48	---	Fundamental Frequency			1000.000	150.0	V	19.0	11.0	10.2
5327.744	---	90.23	Fundamental Frequency			1000.000	150.0	H	82.0	45.0	10.2
5350.000	67.01	---	74.00	6.99	5000.0	1000.000	150.0	V	15.0	8.0	10.4
5350.493	---	49.87	54.00	4.13	5000.0	1000.000	150.0	V	19.0	11.0	10.4
15953.892	60.37	---	68.20	7.83	5000.0	1000.000	150.0	H	67.0	91.0	6.6
15961.710	---	44.20	68.20	24.00	5000.0	1000.000	150.0	H	65.0	87.0	6.7

Note: No harmonics found above 18GHz

4.1.4.8 1 to 40 GHz, Frequency:5825 MHz, n-Mode, BW:20MHz



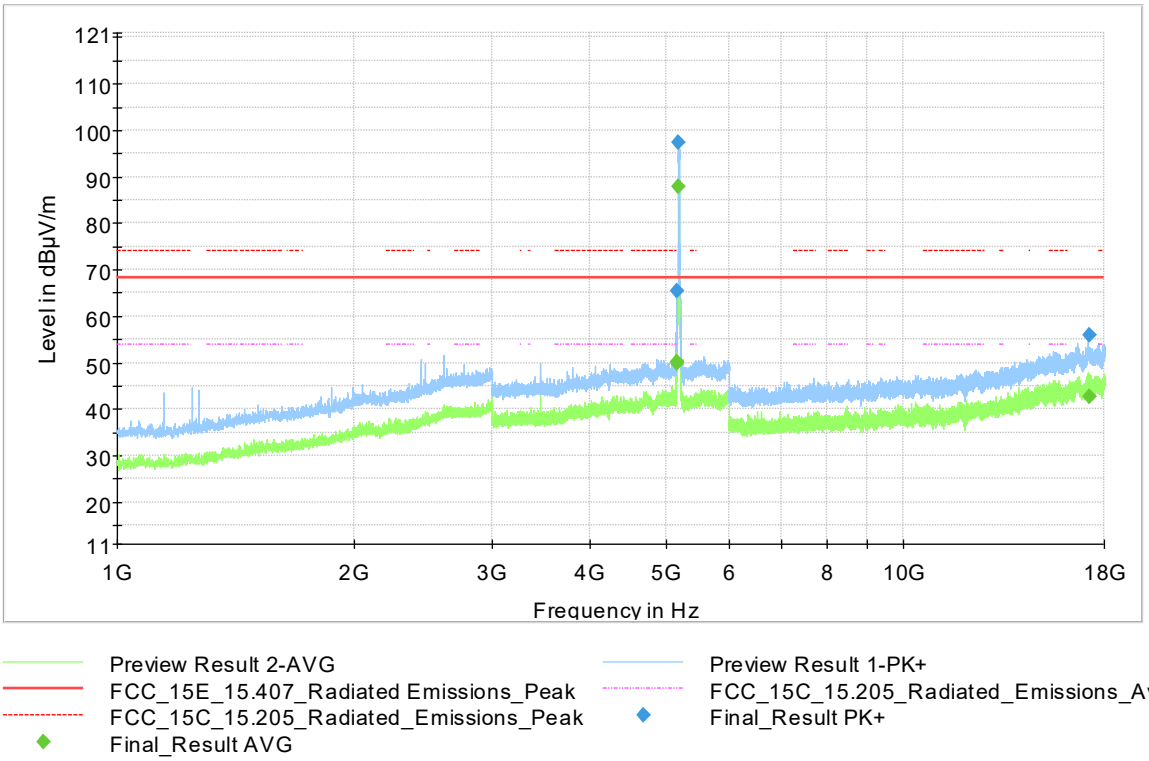
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3883.357	---	47.62	68.20	20.58	5000.0	1000.000	150.0	H	96.0	81.0	5.6
3883.357	52.85	---	68.20	15.35	5000.0	1000.000	150.0	V	23.0	0.0	5.6
5823.500	---	85.04	Fundamental Frequency			1000.000	150.0	V	238.0	0.0	11.6
5830.693	94.94	---	Fundamental Frequency			1000.000	150.0	V	232.0	-6.0	11.7
11645.835	53.27	---	68.20	14.93	5000.0	1000.000	150.0	V	230.0	-28.0	1.7
11647.000	---	40.54	68.20	27.66	5000.0	1000.000	150.0	V	232.0	-3.0	1.7
17456.887	60.78	---	68.20	7.42	5000.0	1000.000	150.0	H	61.0	90.0	10.2
17974.413	---	42.94	68.20	25.26	5000.0	1000.000	150.0	V	97.0	45.0	12.2

Note: No harmonics found above 18GHz

Final test result	Pass

4.2 Radiated Spurious Emissions, power level used for ISED.

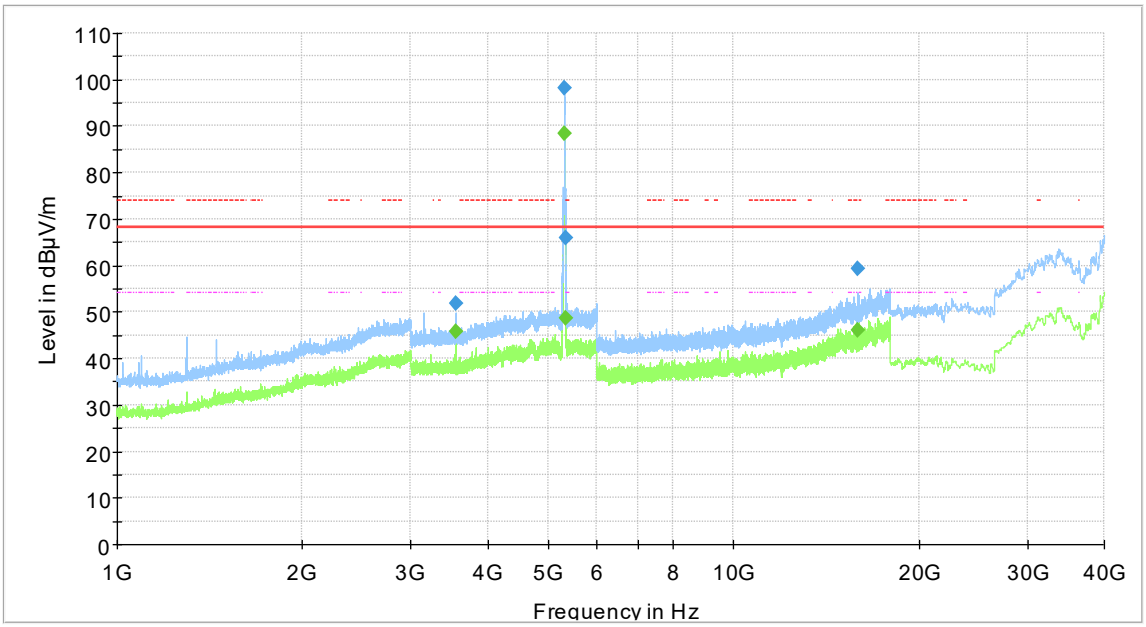
4.2.1.1 1 to 40 GHz, Frequency:5180 MHz, a-Mode, BW:20MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
5150.000	65.51	---	74.00	8.49	5000.0	1000.000	150.0	V	23.0	0.0	10.2
5150.000	---	50.11	54.00	3.89	5000.0	1000.000	150.0	V	20.0	4.0	10.2
5174.500	---	87.75	Fundamental Frequency			1000.000	150.0	V	17.0	0.0	10.1
5179.371	97.50	---	Fundamental Frequency			1000.000	150.0	V	20.0	-3.0	10.1
17220.900	55.87	---	68.20	12.33	5000.0	1000.000	150.0	H	255.0	3.0	10.5
17220.900	---	42.75	68.20	25.45	5000.0	1000.000	150.0	V	72.0	106.0	10.5

Note: No harmonics found above 18GHz

4.2.1.2 1 to 40 GHz, Frequency:5320 MHz, n-Mode, BW:20MHz

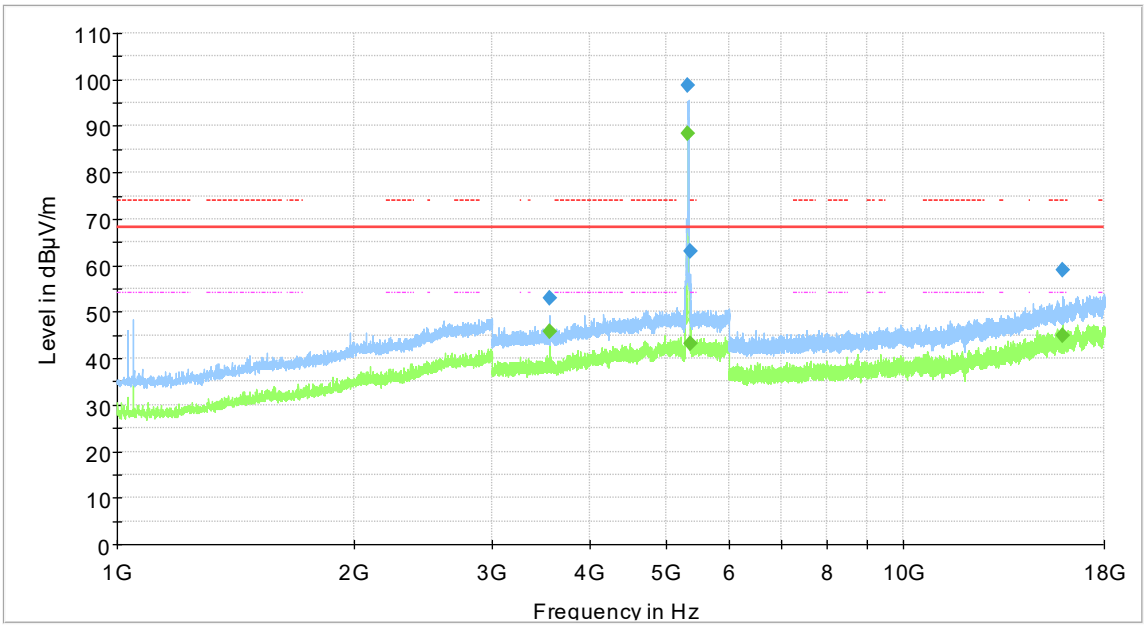


Preview Result 2-AVG
FCC_15E_15.407_Radiated Emissions_Peak
FCC_15C_15.205_Radiated_Emissions_Peak
Final_Result AVG
Preview Result 1-PK+
FCC_15C_15.205_Radiated_Emissions_Avg
Final_Result PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3547.000	---	45.89	68.20	22.31	5000.0	1000.000	150.0	H	98.0	90.0	3.9
3547.035	51.88	---	68.20	16.32	5000.0	1000.000	150.0	H	76.0	89.0	3.9
5322.500	---	88.37	Fundamental Frequency			1000.000	150.0	V	21.0	0.0	10.2
5326.778	98.26	---	Fundamental Frequency			1000.000	150.0	V	17.0	10.0	10.2
5350.000	65.99	---	74.00	8.01	5000.0	1000.000	150.0	V	16.0	0.0	10.4
5350.000	---	48.57	54.00	5.43	5000.0	1000.000	150.0	V	22.0	10.0	10.4
15955.816	---	46.11	68.20	22.09	5000.0	1000.000	150.0	H	66.0	92.0	6.6
15962.201	59.19	---	68.20	9.01	5000.0	1000.000	150.0	H	64.0	92.0	6.7

Note: No harmonics found above 18GHz

4.2.1.3 1 to 40 GHz, Frequency:5320 MHz, a-Mode, BW:20MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3546.603	52.98	---	68.20	15.22	5000.0	1000.000	150.0	H	90.0	70.0	3.9
3547.000	---	45.73	68,20	22.47	5000.0	1000.000	150.0	H	80.0	90.0	3.9
5314.500	---	88.30	Fundamental Frequency			1000.000	150.0	V	19.0	0.0	10.2
5318.299	98.76	---	Fundamental Frequency			1000.000	150.0	V	18.0	13.0	10.2
5350.000	---	43.12	54.00	10.88	5000.0	1000.000	150.0	H	14.0	90.0	10.4
5350.000	63.13	---	74.00	10.87	5000.0	1000.000	150.0	V	52.0	0.0	10.4
15959.488	58.96	---	68.20	9.24	5000.0	1000.000	150.0	H	67.0	91.0	6.6
15960.411	---	45.00	68.20	23.20	5000.0	1000.000	150.0	H	63.0	90.0	6.7

Note: No harmonics found above 18GHz

Final test result	Pass

4.3 AC Power Conducted Emission

Note: This test is covered under FCC Part B test report of this product. Please refer the report number DE24E7WJ 001 for detailed results.

Final test result	Pass

5 Application form

The following information was provided by the customer and form the basis for the execution of the tests and the assessment of conformity. The given information can affect the results of both.

No application form was provided.

Liste der verwendeten Prüfmittel
List of used test equipment

6 Equipment List

6.1 Hardware

Prüfmittel Test equipment		**Prüfmittel-Nr. / ID-Nr.** Equipment No. / ID-No.	**Nächste Kalibrierung** Next calibration
Fully Anechoic Room	Albatross Projects GmbH	2959749	08.10.2024
Spectrum Analyzer FSU 26	Rohde & Schwarz	2844118	04.08.2025
EMI test receiver ESI 40	Rohde & Schwarz	2728600	14.10.2024
RSE-Filtersystem	Rohde & Schwarz	9002802	-
Antenna HF907 1-18GHz	Rohde & Schwarz	2856263	01.09.2024
Horn Antenna 3116C-PA 18-40GHz	ETS LINDGREN	2900393	19.12.2025
Semi-Anechoic Chamber 30-1000 MHz	Siemens	2729645	15.06.2025
Receiver ESU 8	Rohde & Schwarz	2728844	23.02.2025
Antenna HFH 2 (Loop) 9kHz-30MHz	Rohde & Schwarz	2728893	09.07.2024
Antenna VULB 9168 30MHz – 1GHz	Schwarzbeck	2728136	05.10.2026

6.2 Software

Test Software	**Developer**	**Version**
EMC32	Rohde & Schwarz	10.60.20
BAT-EMC	NEXIO	2022.0.8.0

Änderungsverzeichnis

Change history

7 Change History

Revision Number	List of revisions	Date of issue
DE246UXJ 001	Initial Release	2024-06-11
Note: Latest revision report will replace all previous reports.		

Ende des Prüfberichts

End of Test Report