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Kunden-Referenz-Nr.: <i>Client reference No.:</i>	114669 Rev 0	Auftragsdatum: <i>Order date:</i>	2022-06-24	
Auftraggeber: <i>Client:</i>	Tacx b.v. De Boeg 2, Oegstgeest, 2343HK, Netherlands			
Prüfgegenstand: <i>Test item:</i>	NEO Bike Plus			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	A0S4229			
Auftrags-Inhalt: <i>Order content:</i>	Prüfung der Funkparameter nach FCC & ISED <i>Test of radio parameters acc. to FCC & ISED</i>			
Prüfgrundlage: <i>Test specification:</i>	Teilprüfung / Partial test FCC CFR 47 Part 15 Subpart C- §15.247 ISED RSS-247:2017			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2022-09-02 2022-05-17			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003329815-001 to 002			
Prüfzeitraum: <i>Testing period:</i>	2022-09-05 2022-09-30			
Ort der Prüfung: <i>Place of testing:</i>	Nürnberg Nuremberg			
Prüflaboratorium: <i>Testing laboratory:</i>	Wireless Labor Wireless Test Lab			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	 Shrivas Naikar			
Datum: <i>Date:</i>	21.10.2022	Datum: <i>Issue date:</i>	24.10.2022	
Stellung / Position	Sachverständige(r)/Expert	Stellung / Position	Sachverständige(r)/Expert	
Sonstiges / Other:	-			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend 3 = satisfactory	4 = ausreichend 4 = sufficient
* Legende:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = nicht anwendbar N/A = not applicable	4 = sufficient 5 = mangelhaft N/T = nicht getestet 5 = poor N/T = not tested
<p>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. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>				

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Anmerkungen
Remarks

<p>1</p>	<p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfbedingungen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</p>
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- | | |
|---|--|
| 4 | <p>Die Messunsicherheit der in diesem Prüfbericht aufgeführten Messverfahren wird nicht unmittelbar in die Bewertung zur Einhaltung der jeweiligen Grenzwerte mit einbezogen. Es gelten die Anforderungen der Spezifikationen TS 103 051 und TS 100 028-1/-2 in aktueller Form, deren Grundlage der „shared risk“ Ansatz ist. Dieser beschreibt für die jeweilige Norm die maximalen zulässigen Unsicherheitsbeträge unter denen der Messwert als „wahr“ angesehen werden kann. Eine zusätzliche Betrachtung der Messunsicherheit bezüglich des gemessenen Wertes findet bei Unterschreitung der maximalen Unsicherheitsbeträge gemäß den Spezifikationen nicht statt.</p> <p><i>The measurement uncertainty of the measurement methods listed in this test report is not directly included in the assessment of compliance with the respective limit values. The requirements of the specifications TS 103 051 and TS 100 028-1/-2 apply in their current form, based on the "shared risk" approach. For the respective standard, this describes the maximum acceptable uncertainty below which the measured value can be regarded as "true". An additional consideration of the measurement uncertainty with regard to the measured value does not take place if the maximum acceptable uncertainties according to the specifications are not reached.</i></p> |
| 5 | <p>Die Aussage zur Konformität des in diesem Prüfbericht geprüften Produktes wird auf Kundenwunsch nach den Kriterien und Anforderungen der angewendeten Normen durchgeführt. Abweichende Bewertungsbedingungen durch den Kunden werden in den jeweiligen Kapiteln gesondert dokumentiert. Grundsätzlich wird eine Konformitätsbewertung auf Basis der angewendeten Normen durchgeführt, sofern mit dem Kunden keine abweichende Regelung getroffen wurde.</p> <p><i>The statement of conformity of the product tested in this test report is carried out according to the criteria and requirements of the applied standards on customer request. Deviating assessment conditions by the customer are documented separately in the respective chapters. In principle, the assessment of conformity is made on the basis of the standards applied, unless otherwise agreed with the customer.</i></p> |

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Produktbeschreibung
Product description

1	Test item	NEO Bike Plus
2	Typ-No.	A0S4229
3	Identical types	-
4	Test sample obtaining	<input checked="" type="checkbox"/> Sending by customer <input type="checkbox"/> Sampling by TÜV Rheinland Group <input type="checkbox"/> others:
5	Serial-No.	-
6	FCC ID	2AAMI-T8000
7	IC , HVIN and PMN	11353A-T8000, A0S4229 and NEO Bike Plus
8	Description of EUT	<p>The NEO Bike Plus is an indoor cycling trainer and measures speed, cadence and the power that the rider is putting into it.</p> <p>The NEO Bike Plus trainer is also capable of simulating a hill climb and is controlled by a wireless connection over BLE or ANT+.</p>
9	Supported radio technologies	Bluetooth 5.0
10	Max RF output power (measured)	-11.23dBm
11	Operating Frequency (declared)	Bluetooth 5.0: 2402MHz -2480MHz
12	Data Rate (Mbps)	Bluetooth 5.0: 2Mbps
13	Channel Bandwidth (declared)	Bluetooth 5.0: 2MHz
14	Number of Channels	Bluetooth 5.0: 40
15	Modulation	Bluetooth 5.0: GFSK
16	Rated Voltage / Frequency	120Vac/60Hz 5VDC USB power for conducted Sample
17	Antenna Type	<input checked="" type="checkbox"/> Integral antenna <input type="checkbox"/> Dedicated antenna <input type="checkbox"/> Permanent antenna connector
18	Antenna amount of chains	1
19	Antenna Gain (declared)	2dBi

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Produktbeschreibung
Product description

20	Software Version	006-B4229-00 Rev B
21	Hardware Version	013-01068-00 Rev A
22	Used Samples	DUT 1: A003329815-001 Radiated Test mode sample DUT 2: A003329815-002 Conducted Test mode sample
23	Companion Device	-
24	Accessory Devices	PC used to configure the radio's during the testing.
25	Data Cable	USB cable
26	Device supporting temperature range	-20°C to 55°C
27	Environment	Indoor

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FCC 15.247 (a)(1) RSS-247 sec. 5.1	20 dB Bandwidth	Does not apply for DTS equipment	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Number of Hopping Frequencies	Does not apply for DTS equipment	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Time of Occupancy	Does not apply for DTS equipment	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
FCC 15.247 (a)(1) RSS-247 sec. 5.1	Carrier Frequency Separation	Does not apply for DTS equipment	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/T <input type="checkbox"/>
FCC 15.247 (b) RSS-247 sec. 5.4	Maximum Output Power	-	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>
FCC 15.247 (e) RSS-247 sec. 5.2 (b)	Power Spectral Density*	-	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input checked="" type="checkbox"/>
FCC 15.247 (a)(2) RSS-247 sec. 5.2 (a)	6dB Bandwidth*	-	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input checked="" type="checkbox"/>
FCC 15.247 (d) RSS-247 sec. 5.5	Band Edge Measurement*	-	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input checked="" type="checkbox"/>
FCC 15.247 (d) RSS-247 sec. 5.5	Conducted Spurious Emission*	-	P <input type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input checked="" type="checkbox"/>
FCC 15.205, 15.209 RSS-Gen sec. 8.9, 8.10	Radiated Spurious Emission	-	P <input checked="" type="checkbox"/> F <input type="checkbox"/> N/A <input type="checkbox"/> N/T <input type="checkbox"/>

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FCC 15.207
RSS-Gen sec. 8.8

AC Power Conducted Emissions -

P
F
N/A
N/T

Remarks: *-> Only RF power and spurious emission varified for Class 2 Permissive Change filling.

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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	Operating Frequency Range	Supported by the EUT	Evaluated in this report
Bluetooth 5.0	2402 – 2480 MHz	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

RASP 2.8 tool is used for configuration of the device.

1.2 Standard specific classification of the EUT

1.2.1 Applied standards

FCC CFR 47 Part 15 Subpart C - §15.247

ISED RSS-247:2017

1.2.2 Test Methods and Guidance Documents

ANSI C63.10:2013

KDB 558074 D01 DTS Measurement Guidance v05

KDB 662911 D01 Multiple Transmitter Output v02r01

KDB 996369 D04 Module Integration Guide v01

1.2.3 System Type

<input checked="" type="checkbox"/>	DTS (Digital Transmission System)
<input type="checkbox"/>	FHSS (Frequency Hopping Spread Spectrum)

1.2.4 Type of equipment

<input type="checkbox"/>	Table top Equipment
<input checked="" type="checkbox"/>	Floor-Standing Equipment
<input type="checkbox"/>	Equipment that can be used in multiple orientations
<input type="checkbox"/>	Hand held Equipment

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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.

NEO Bike Plus consists of 2 radio boards i.e. 1. Controller board and 2. Display board.

Each board having BT5.0 and ANT+ radio technologies in it.

2.3 Test modes

Mode	Description	Mode configuration
	All Modes (Controller Board)	<input checked="" type="checkbox"/> The auxiliary equipment (PC) was connected to the EUT during the tests to keep the configured settings active. The notebook was placed outside of the FAC. The connection was realized by a shielded feedthrough. <input type="checkbox"/> The auxiliary equipment (XXX) was only connected to the EUT before the tests for the mode configuration. During the test the auxiliary equipment was disconnected from the EUT.
1	Bluetooth 5.0 (TX)	Transmit Power setting 1dBm, Data Rate :2Mbps, Modulation : GFSK Frequency : 2402MHz(Low), 2440MHz(Mid) and 2480MHz (High) Continuous transmission.

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2.4 Worst case Test Modes

The DUT was tested for the RF power configuration as stated in the test report of the product tested in 2019-05-06.

FCC ID: 2AAMI-T8000
IC: 11353A-T8000

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	24
Relative humidity	%	65
Supply voltage	Volts AC	120Vac/60Hz 5VDC USB power for conducted Sample

3.3 Antenna assemblies

Antenna connector is prepared to verify the RF power test in conducted mode with sample no.A003329815-002

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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
	1.7	dB	1GHz-6GHz
Conducted Spurious Emissions (RX/TX)	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	%	-

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4 Test results in detail

4.1 Maximum Output Power

4.1.1 Requirements / Limits

The maximum output power limit is expressed in terms of either maximum peak conducted output power or maximum conducted output power.

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the full signal bandwidth.

The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

	Condition	Limit
<input checked="" type="checkbox"/>	Systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands	<i>FCC Part 15, Subpart C, §15.247 (b) (3)</i> 1 watt. Maximum conducted peak output power: 30 dBm (excluding antenna gain, if antennas with directional gains that do not exceed 6 dBi are used).
<input type="checkbox"/>	Frequency hopping systems operating 2400-2483.5 MHz band.	Employing less than 75 non-overlapping hopping channels <i>FCC Part 15, Subpart C, §15.247 (b) (1)</i> 0.125 watt
<input type="checkbox"/>		Employing at least 75 non-overlapping hopping channels <i>FCC Part 15, Subpart C, §15.247 (b) (1)</i> 1 watt
<input type="checkbox"/>	Frequency hopping systems operating 5725-5850 MHz band.	<i>FCC Part 15, Subpart C, §15.247 (b) (1)</i> 1 watt
<input type="checkbox"/>	Frequency hopping systems operating 902-928 MHz band.	Employing less than 50 but at least 25 hopping channels <i>FCC Part 15, Subpart C, §15.247 (b) (2)</i> 0.25 watt
<input type="checkbox"/>		Employing at least 50 hopping channels <i>FCC Part 15, Subpart C, §15.247 (b) (2)</i> 1 watt
<input type="checkbox"/>	Antenna gain greater than 6dBi	<i>FCC Part 15, Subpart C, §15.247 (b) (4)</i> The conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3), as appropriate, by the amount in dB

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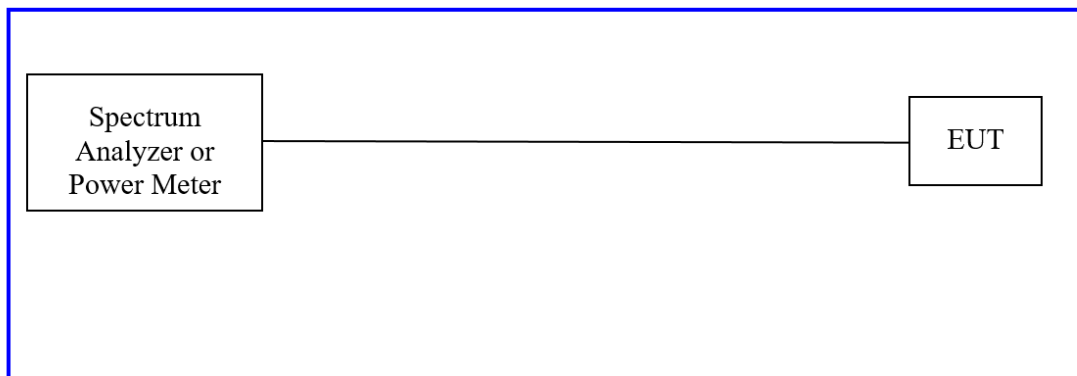
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		that the directional gain of the antenna exceeds 6 dBi
--	--	--

4.1.2 Test Method

Conducted method was used to measure the maximum output power according to ANSI C63.10:2013 clause 11.9.1.1 peak power (RBW > DTS bandwidth). The EUT was connected to the spectrum analyzer via a coax cable with a known loss.



4.1.3 Test setup

EUT		DUT2
Test Condition		Normal conditions
Chamber details		<input type="checkbox"/> 3m Fully Anechoic Chamber (FAC) <input type="checkbox"/> 10m Semi Anechoic Chamber (SAC) <input checked="" type="checkbox"/> Shielded room
Measurement positioning		Distance: EUT height: Antenna height: <input type="checkbox"/> 3m <input type="checkbox"/> 1.5m <input type="checkbox"/> 1.5m <input type="checkbox"/> 10m <input type="checkbox"/> 0.8m <input type="checkbox"/> 1m to 4m – height scan <input checked="" type="checkbox"/> N/A
Companion device		NA
Operation mode		Mode 1
Spectrum Analyzer	Frequency	BT5.0: 2402MHz, 2440MHz, 2480MHz
	Resolution Bandwidth	3MHz

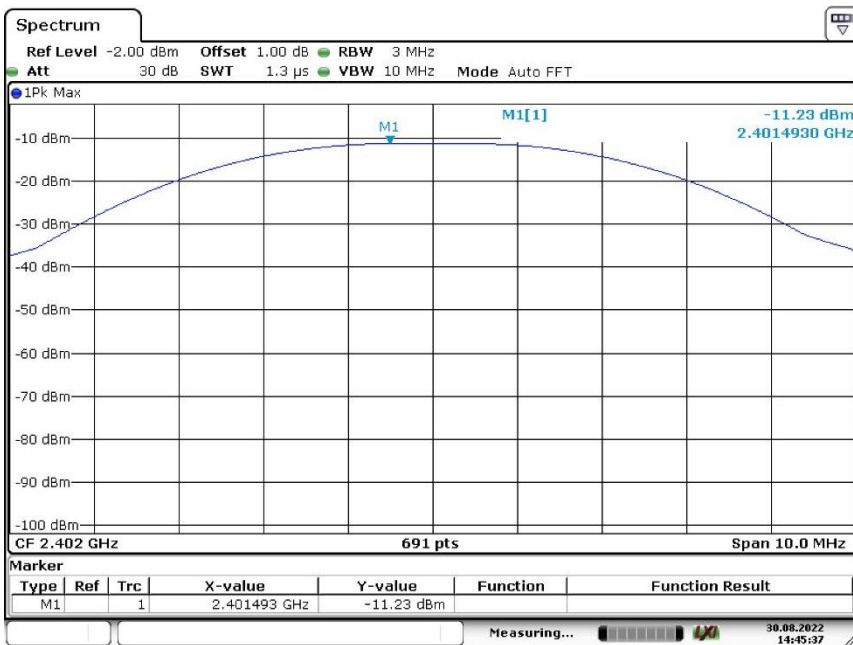
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	Video Bandwidth	10MHz
	Measurement Time	1.3 µs
Further parameters		-
Test engineer		Shrinivas Naikar

4.1.4 Test results



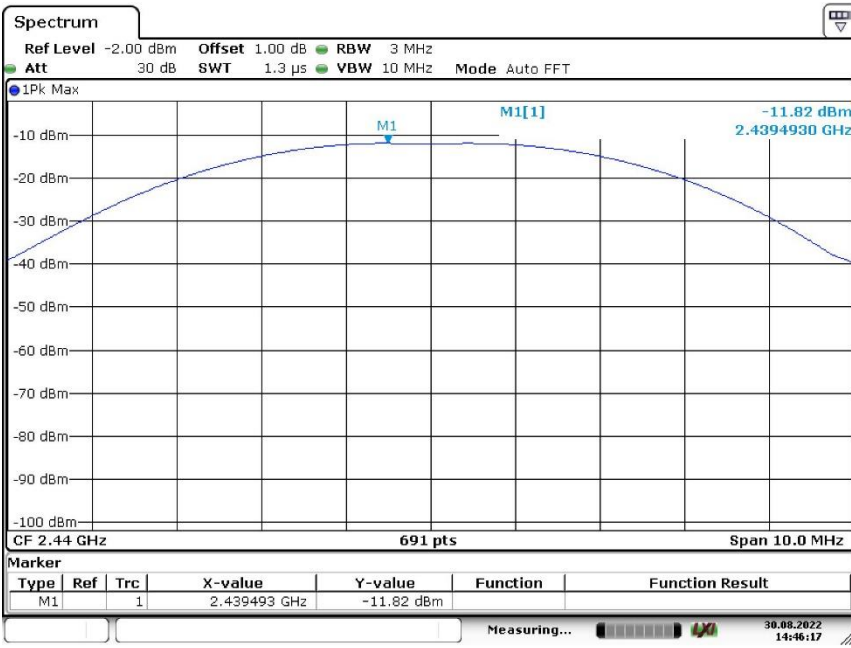
Date: 30.AUG.2022 14:45:37

Display Board_Ch_Low

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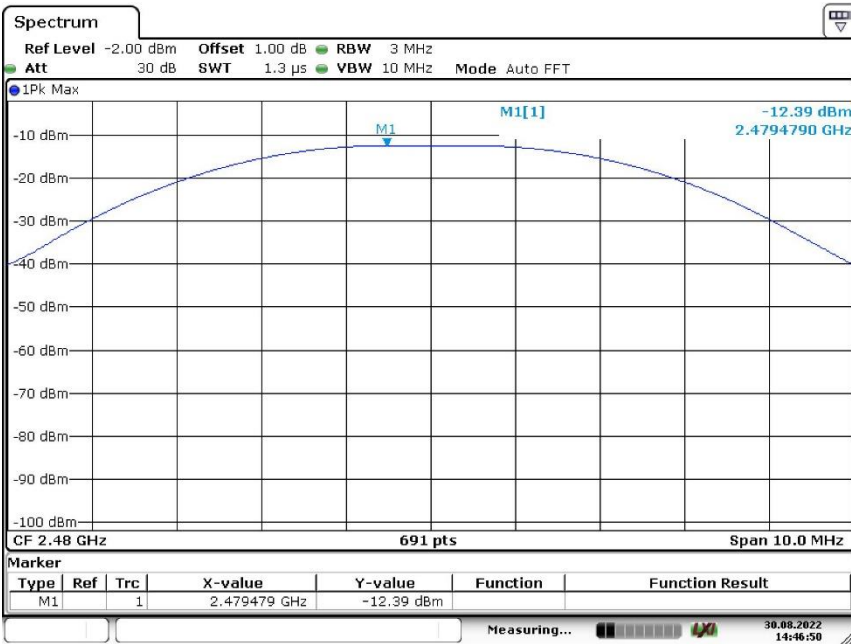
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Date: 30.AUG.2022 14:46:17

Display Board_Ch_Mid



Date: 30.AUG.2022 14:46:49

Display Board_Ch_High

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Board Name	Radio Technology	Channel (MHz)	Output power (dBm)	Limit (dBm)
Display Board	BT5.0	2402	-11.23	30
		2440	-11.82	30
		2480	-12.39	30

Final test result	Pass
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4.2 Radiated Spurious Emissions

4.2.1 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, §15.247(d).

FCC Part 15, Subpart C, §15.247 (d)

... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

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

Frequency [MHz]	Limit [$\mu\text{V}/\text{m}$]	Measurement distance [m]	Limits [$\text{dB}\mu\text{V}/\text{m}$]
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 [$\mu\text{V}/\text{m}$]	Measurement distance [m]	Limits [$\text{dB}\mu\text{V}/\text{m}$]
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:

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

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4.2.2 Test Method

4.2.2.1 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 Polarisation	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)

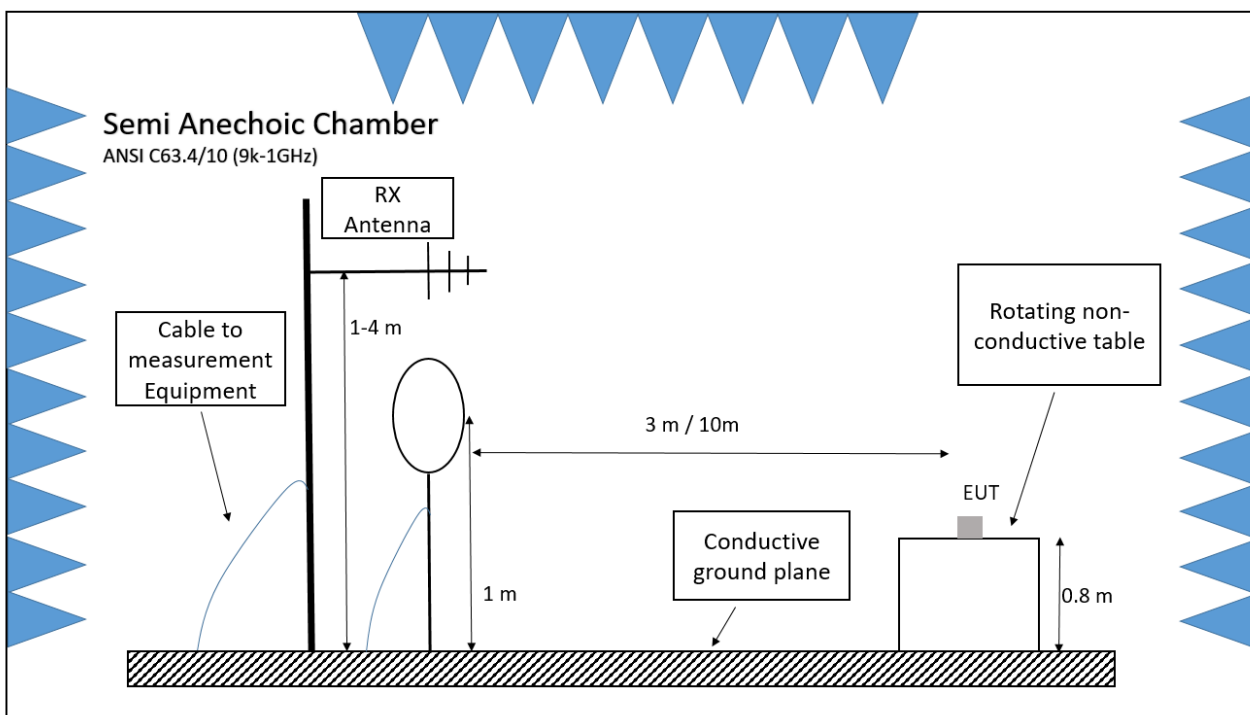
30 MHz - 1 GHz

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 Polarisation	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)

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



1 GHz - 26 GHz

Following Measurement Setup is used:

Test Site	Fully-anechoic chamber
Receiving Antenna	Horn Antenna 3115 (1-18 GHz), BBHA 9170 (18-26 GHz)
Receiving Antenna Height	1.5 m
Receiving Antenna Polarisation	Horizontal– Vertical
EUT Positioner	40 cm x 60 cm non-conductive extension placed on a non-conductive rotating table to place EUT at height 1.5 m
EUT Turn Table Step Size	45°
Spectrum Analyser	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:

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4.2.2.2 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 antenna height scan at 1.5m towards EUT.

For the measurements in the frequency ranges (90-110 kHz, 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:

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

While

$$Corr. = Trd. Corr. + Sig Path + Preamp$$

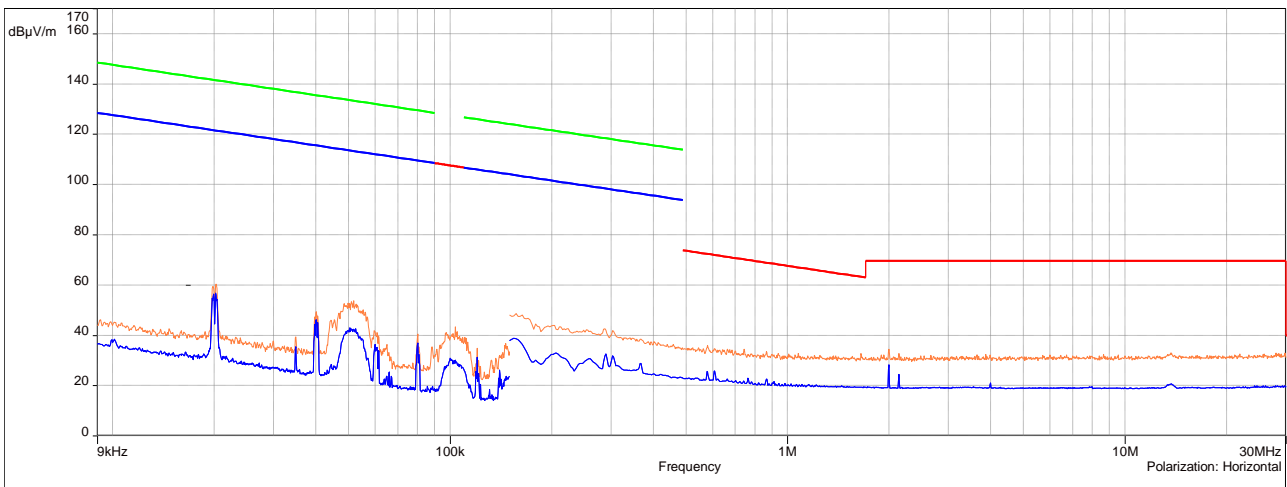
4.2.3 Test Setup

EUT	DUT 1
Test Condition	Normal conditions
Companion device	None
Operation mode	Mode 1 and Mode 2 of controller board and Display board
Further parameters	-
Test engineer	Shrinivas Naikar

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Test documentation

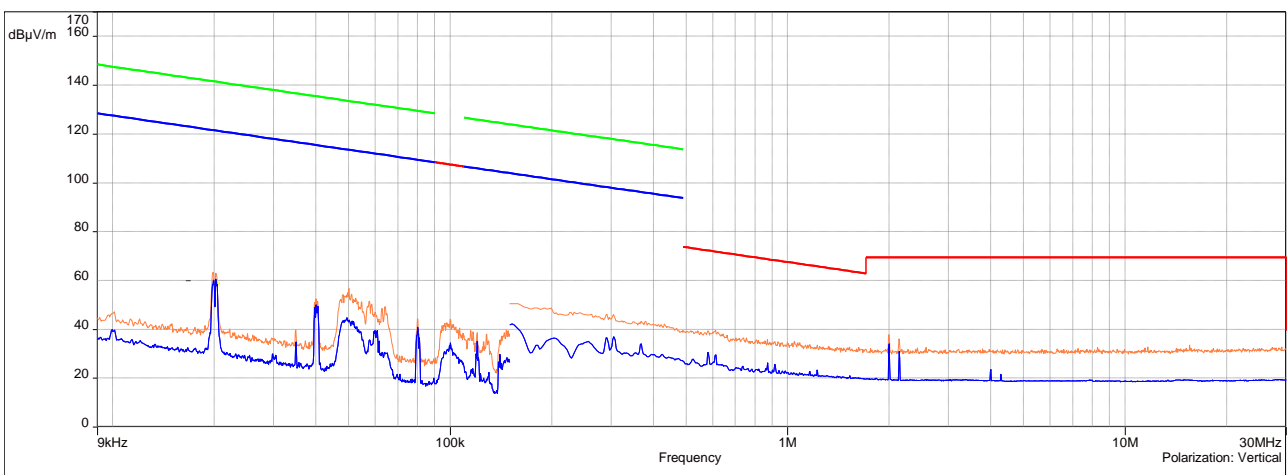
4.2.4 Test results

- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- Peak (Horizontal)
- Avg (Horizontal)



Parallel Polarization_9kHz to 30 MHz

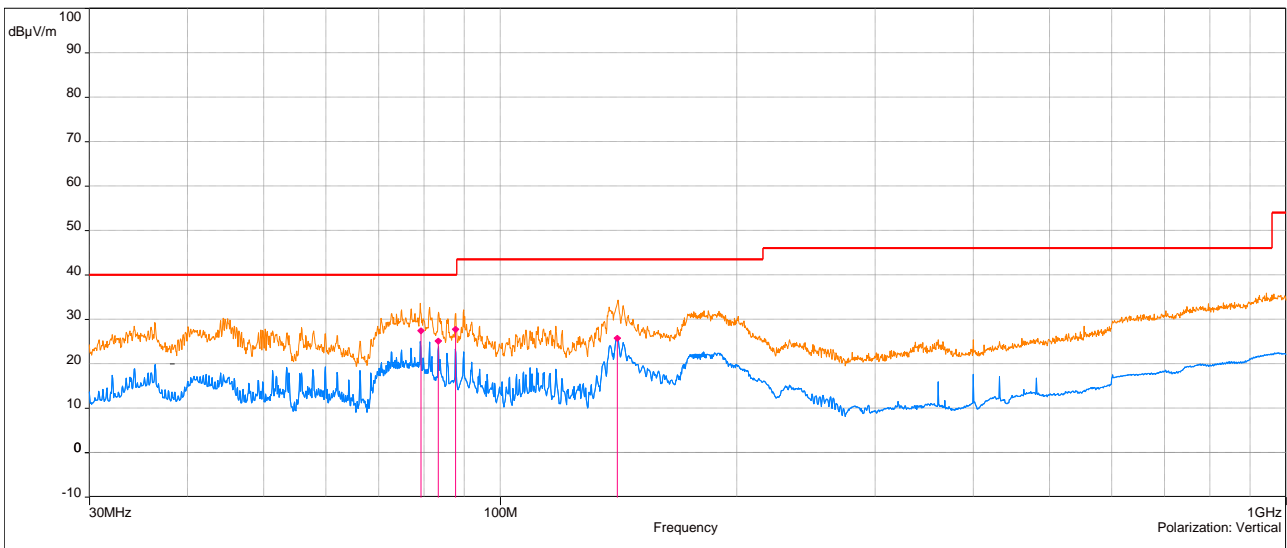
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- ◇ Avg (Manual suspects) (Vertical)
- Peak (Vertical)
- Avg (Vertical)



Parallel Polarization_9kHz to 30 MHz

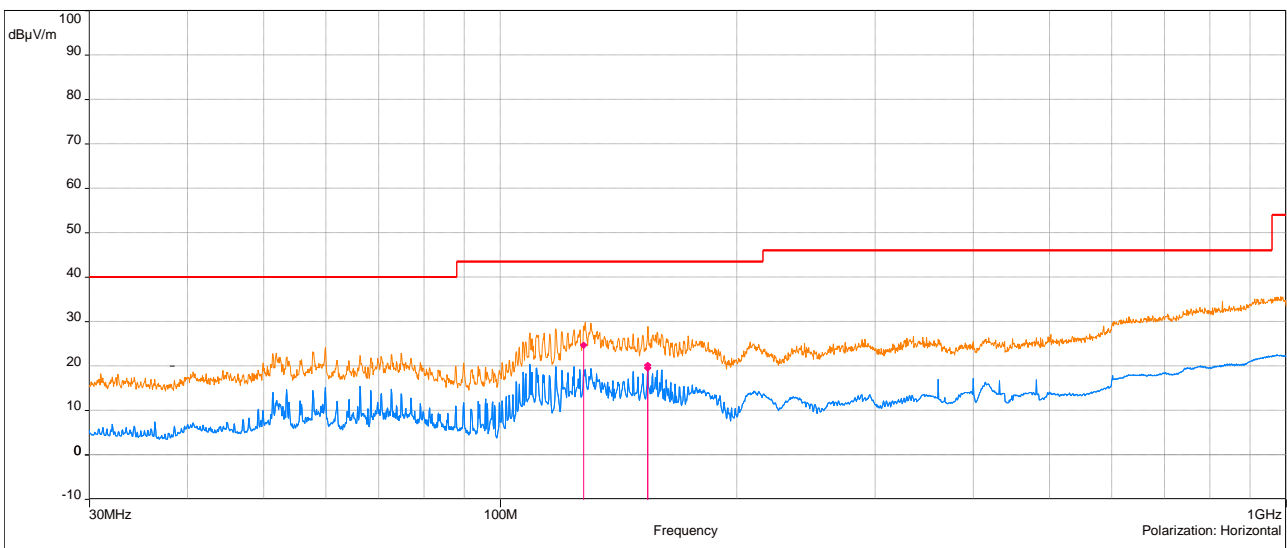
Prüfdokumentation
Test documentation

- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- Peak (Vertical)
- Avg (Vertical)
- ↓ Level (Quasipeak) (Vertical)



30 MHz – 1 GHz_Vertical Polarization with downhill mode

- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- Peak (Horizontal)
- Avg (Horizontal)
- ↓ Level (Quasipeak) (Horizontal)



30 MHz – 1 GHz_Horizontal Polarization with downhill mode

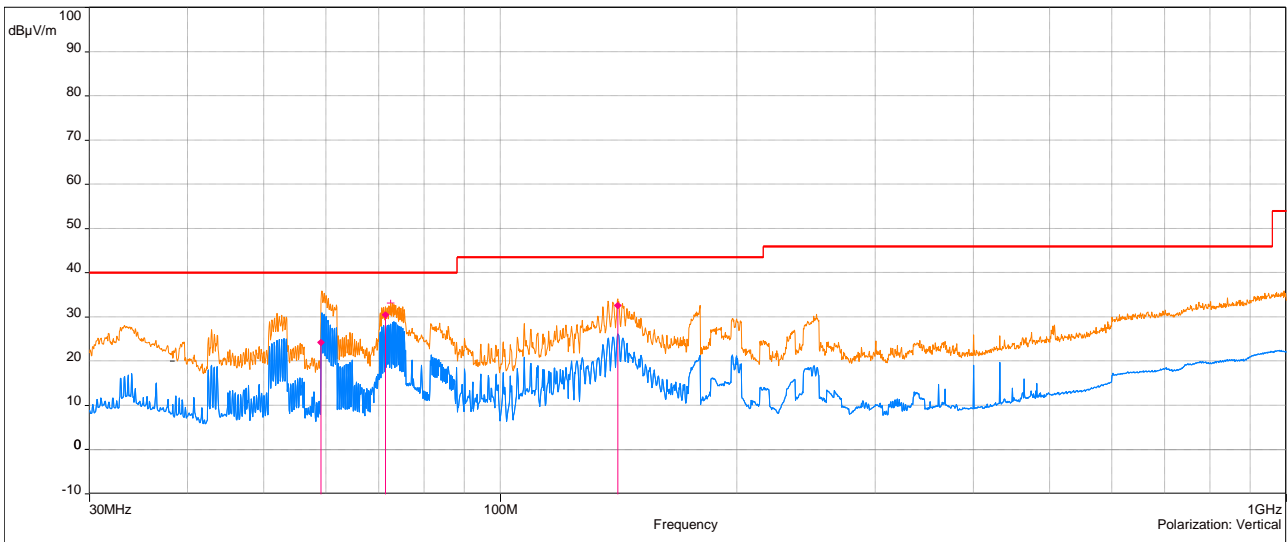
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Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (deg)	Height (m)	Pol	Meas. Time (s)	Corr. (dB)
127.59	24.75	43.50	-18.75	176.70	2.35	Horizontal	1.00	13.49
153.87	20.25	43.50	-23.25	237.00	1.68	Horizontal	1.00	14.86
153.9	19.62	43.50	-23.88	267.40	1.00	Horizontal	1.00	14.86
79.2	27.45	40.00	-12.55	227.60	1.29	Vertical	1.00	10.72
83.4	25.18	40.00	-14.82	254.00	1.58	Vertical	1.00	10.00
87.69	27.80	40.00	-12.20	158.00	1.34	Vertical	1.00	9.25
140.94	25.82	43.50	-17.68	229.20	1.12	Vertical	1.00	14.21

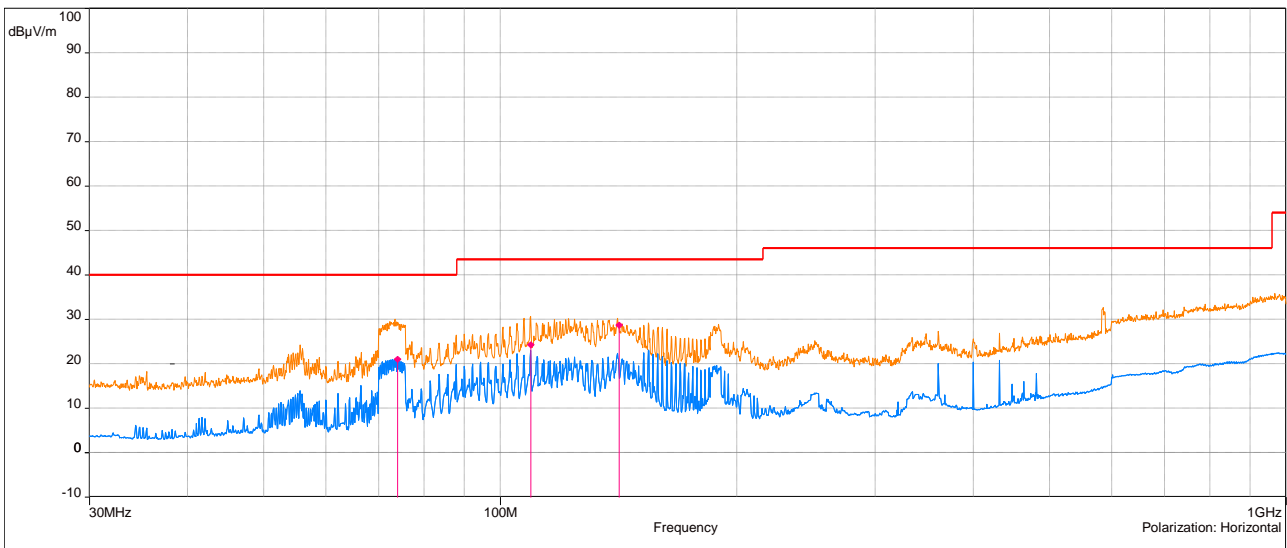
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- Peak (Vertical)
- Avg (Vertical)
- ↑ Peak (Peak/Lim.Q-Peak) (Vertical)
- ↓ Level (Quasipeak) (Vertical)



30MHz – 1 GHz_Vertical Polarization with user cycling Mode

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Test documentation

- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Average/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - QPeak/3.0m/
- FCC/47 CFR Part 15 section 15.209, Radiated emission limits - Peak/3.0m/
- Peak (Horizontal)
- Avg (Horizontal)
- ↓ Level (Quasipeak) (Horizontal)

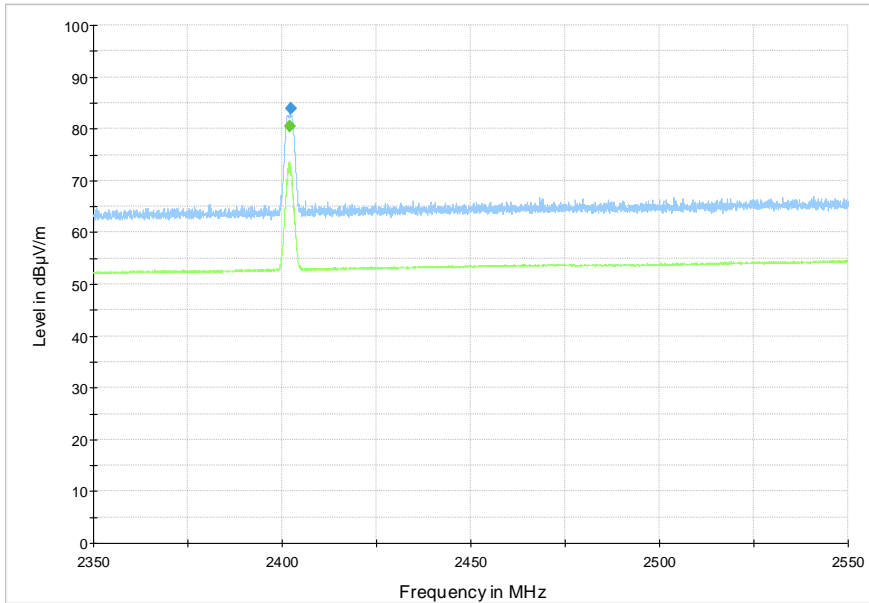


30MHz – 1 GHz_Horizontal Polarization with user cycling Mode

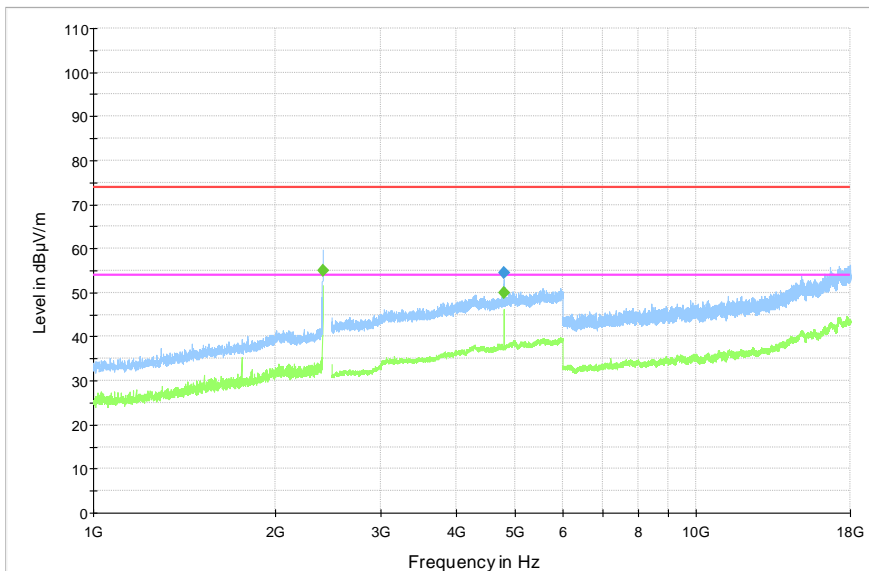
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (deg)	Height (m)	Pol	Meas. Time (s)	Corr. (dB)
73.95	21.06	40.00	-18.94	114.80	2.63	Horizontal	0.02	12.11
109.29	24.36	43.50	-19.14	286.30	2.61	Horizontal	0.02	11.62
141.54	28.73	43.50	-14.77	0.00	1.16	Horizontal	0.02	14.23
59.1	24.27	40.00	-15.73	8.00	2.00	Vertical	0.02	14.14
71.37	30.54	40.00	-9.46	7.10	1.12	Vertical	0.02	12.50
141.06	32.66	43.50	-10.84	13.20	1.11	Vertical	0.02	14.21

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1-18 GHz, Lowest Channel_BT5.0



Preview Result 2-AVG Preview Result 1-PK+ Final_Result PK+ Final_Result AVG



Preview Result 2-AVG Preview Result 1-PK+
FCC_15C_15.209_Radiated Emissions_Peak FCC_15C_15.209_Radiated Emissions_Avg
Final_Result PK+ Final_Result AVG

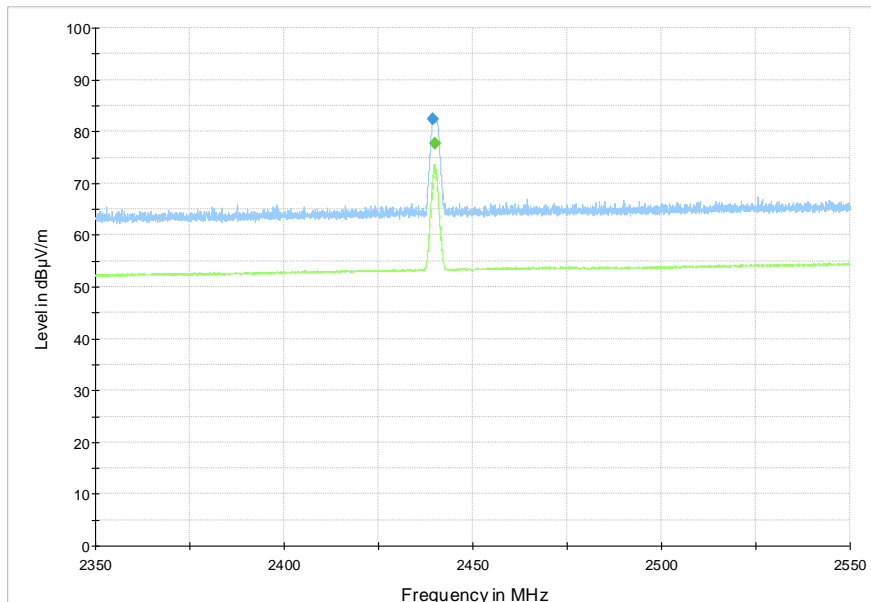
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Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2401.931250	---	80.46	---	---	1000.0	1000.000	150.0	V	312.0	35.1
2402.442500	83.93	---	---	---	1000.0	1000.000	150.0	V	307.0	35.1
2400.000000	---	55.12	54.00	-1.12	1000.0	1000.000	150.0	H	254.0	1.0
4803.936250	54.53	---	74.00	19.47	100.0	1000.000	150.0	V	306.0	7.9
4803.990000	---	50.07	54.00	3.93	100.0	1000.000	150.0	V	311.0	7.9

- 1-18 GHz, Middle Channel_BT5.0

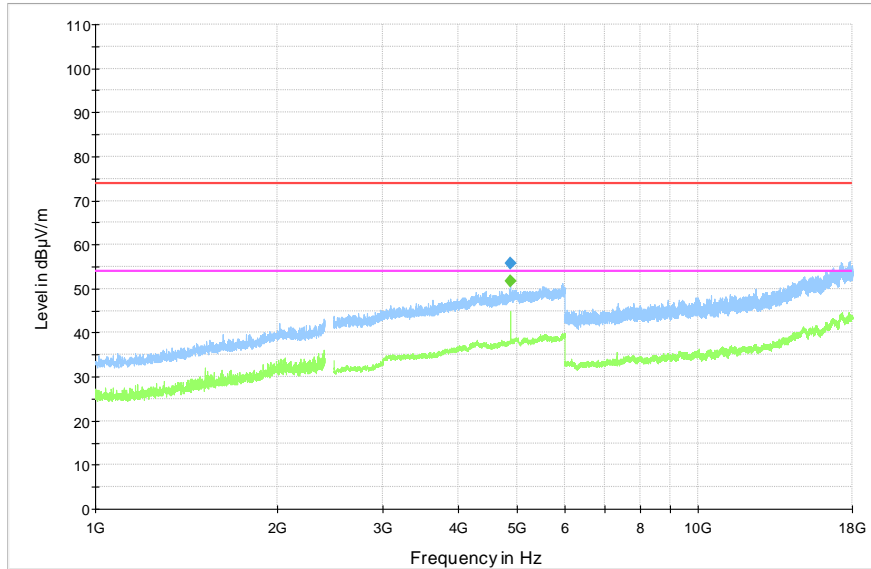


— Preview Result 2-AVG
 — Preview Result 1-PK+
 ◆ Final_Result PK+
 ◆ Final_Result AVG

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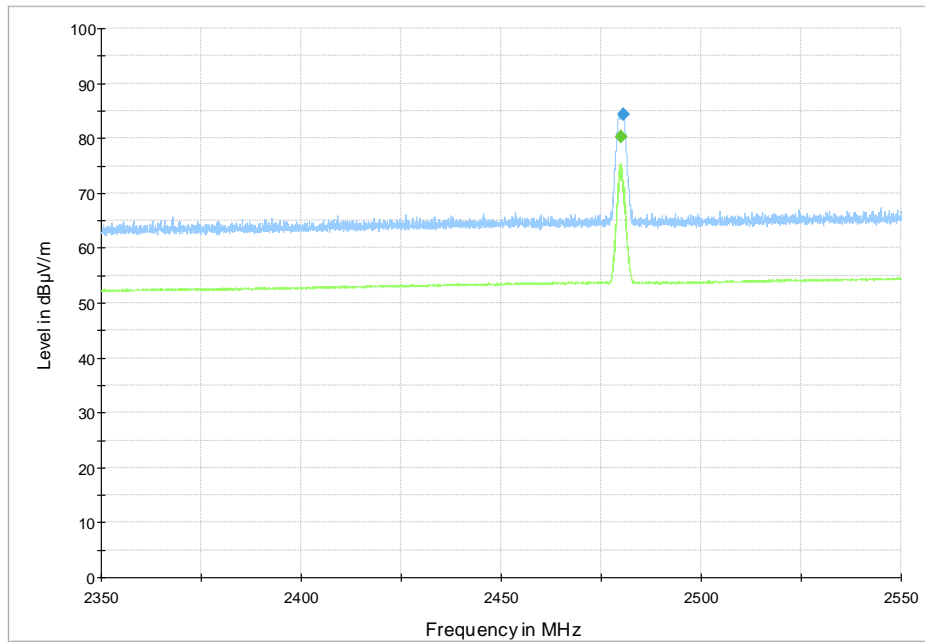


— Preview Result 2-AVG
— FCC_15C_15.209_Radiated Emissions_Peak
— Preview Result 1-PK+
— FCC_15C_15.209_Radiated Emissions_Avg
◆ Final_Result PK+
◆ Final_Result AVG

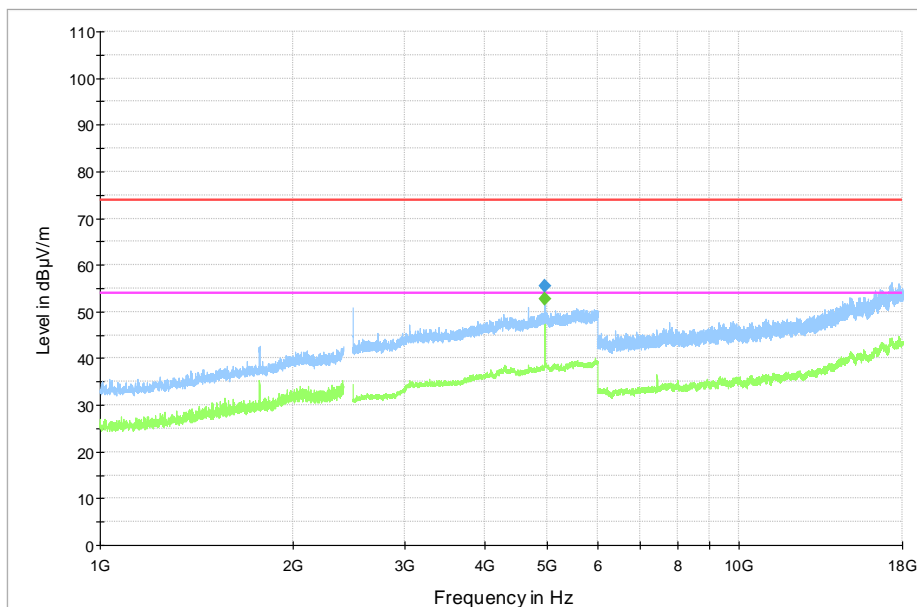
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2439.388750	82.37	---	---	---	1000.0	1000.000	150.0	V	313.0	35.3
2439.931250	---	77.63	---	---	1000.0	1000.000	150.0	V	310.0	35.3
4879.873750	---	51.75	54.00	2.25	1000.0	1000.000	150.0	V	287.0	8.6
4879.927500	55.66	---	74.00	18.34	1000.0	1000.000	150.0	V	287.0	8.6

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- 1-18 GHz, Highest Channel_BT5.0



Preview Result 2-AVG Preview Result 1-PK+ Final_Result PK+ Final_Result AVG



Preview Result 2-AVG Preview Result 1-PK+ FCC_15C_15.209_Radiated Emissions_Peak FCC_15C_15.209_Radiated Emissions_Avg
Final_Result PK+ Final_Result AVG

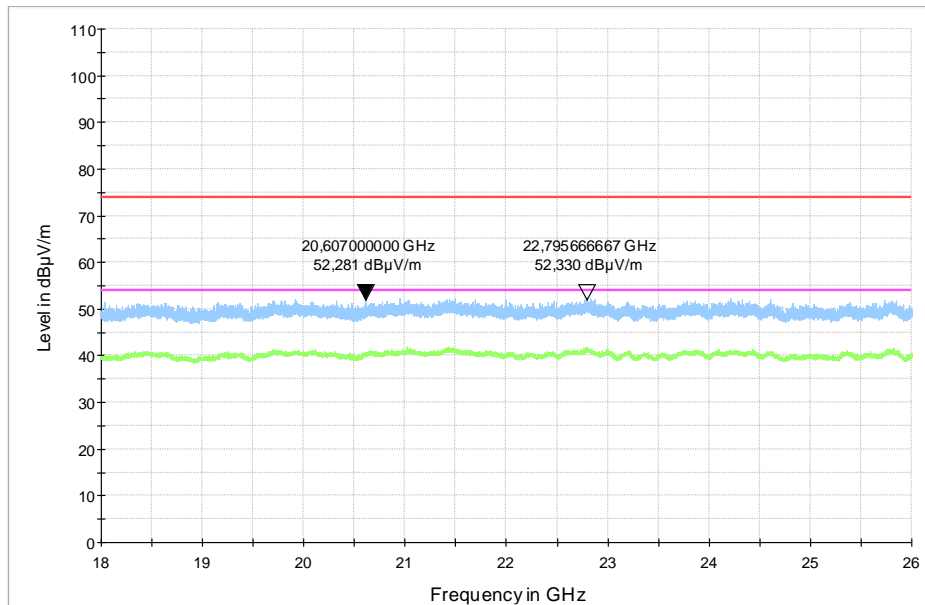
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Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2479.927500	---	80.15	---	---	1000.0	1000.000	150.0	V	313.0	35.6
2480.457500	84.38	---	---	---	1000.0	1000.000	150.0	V	315.0	35.6
4959.788750	55.50	---	74.00	18.50	1000.0	1000.000	150.0	V	295.0	8.7
4959.913750	---	52.62	54.00	1.38	1000.0	1000.000	150.0	V	287.0	8.7

18-25 GHz, Lowest Channel



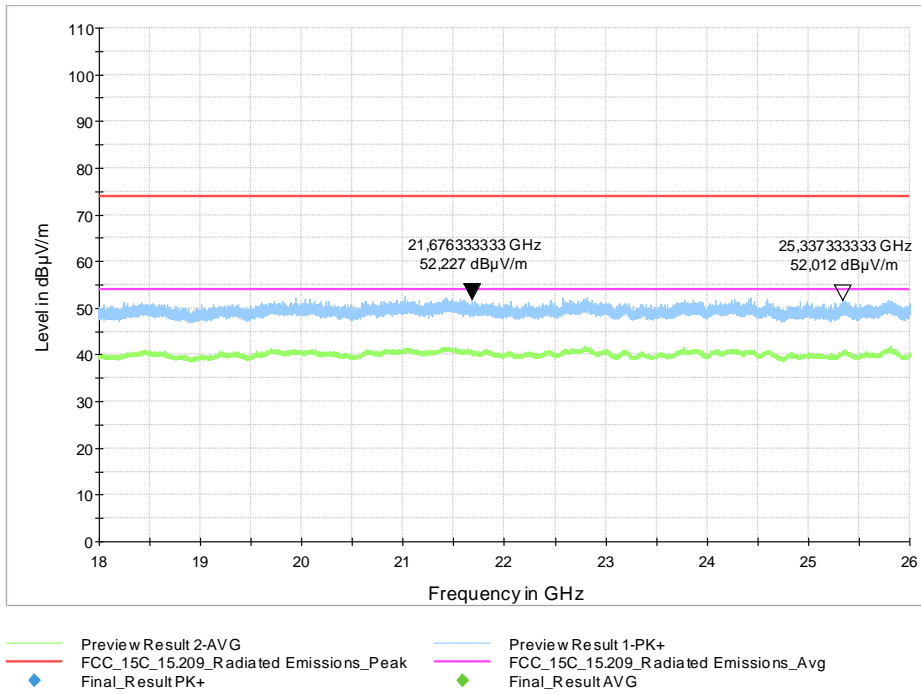
- Preview Result 2-AVG
- FCC_15C_15.209_Radiated Emissions_Peak
- Preview Result 1-PK+
- FCC_15C_15.209_Radiated Emissions_Avg
- Final_Result PK+
- Final_Result AVG

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- 18-25 GHz, Highest Channel



Final test result	Pass
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4.3 AC Power Conducted Emission

4.3.1 Requirements / Limits

AC power-line conducted emission measurements shall be made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz, to determine the line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network.

FCC Part 15, Subpart C, §15.207 (a)

... for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

FCC Part 15, Subpart C, §15.207, Conducted Emission Limits

Frequency [MHz]	Conducted Limit [dB μ V]	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with logarithm of the frequency

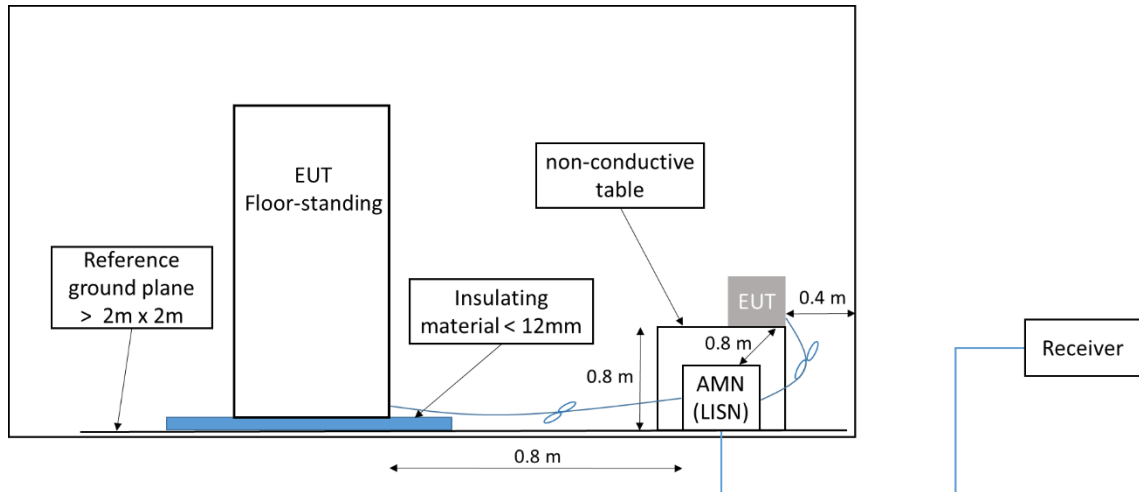
FCC Part 15, Subpart C, §15.207 (c)

... Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

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4.3.2 Test Method

The test setup was made according to ANSI C63.10:2013 clauses 6.2.2 & 6.2.3 as shown in the photograph



The EUT was configured to transmit on the lowest channel since it has the highest output power.

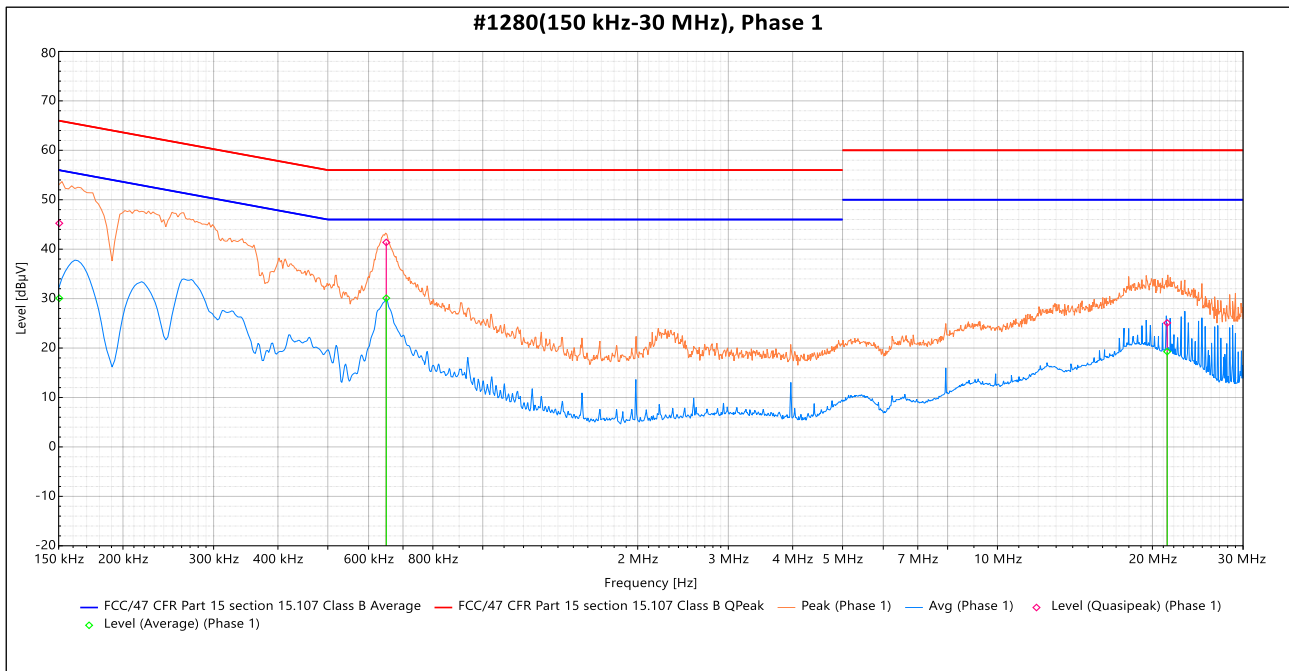
4.3.3 Test Setup

EUT	DUT 1
Test Condition	Normal conditions
Companion device	-
Operation mode	Downhill with BLE&ANT+ Connection
Further parameters	-
Test engineer	Shrinivas Naikar

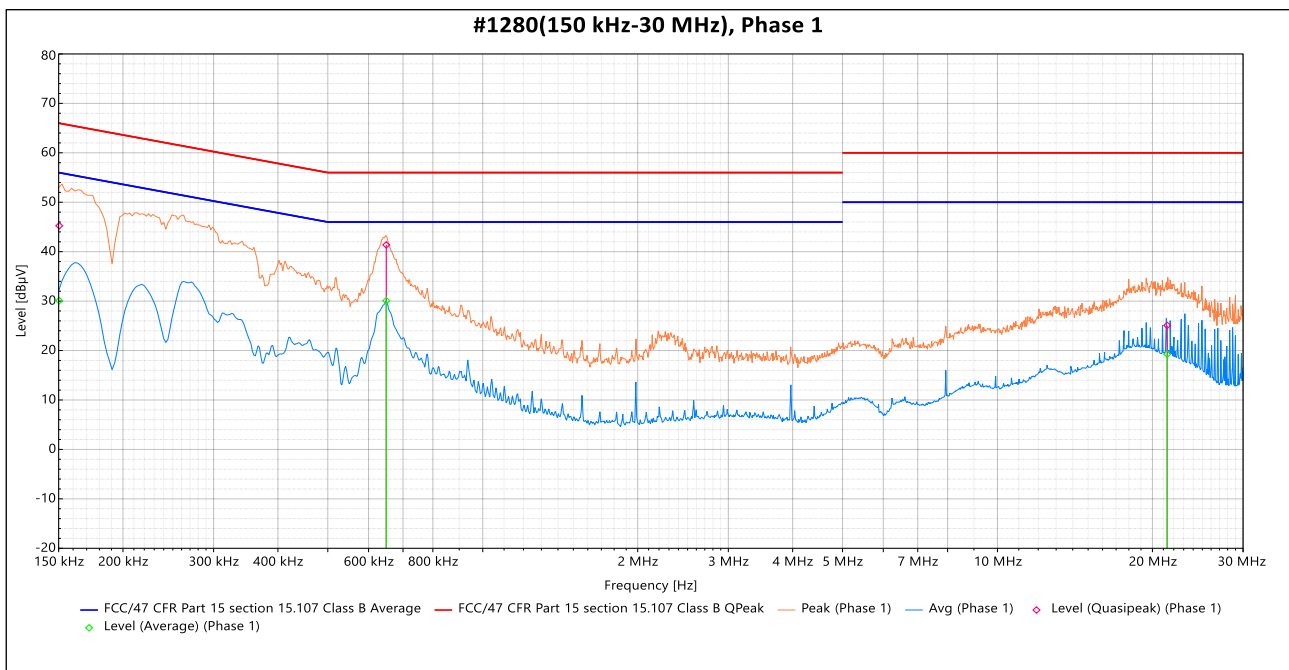
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4.3.4 Test results

- Line: Phase 1



- Line: Neutral



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Frequency (MHz)	Meas. AVG/Q-Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Correction (dB)
0.150	Quasipeak	66.00	-20.76	Phase 1	10.04
0.649	Quasipeak	56.00	-14.63	Phase 1	10.05
21.365	Quasipeak	60.00	-34.92	Phase 1	10.36
0.152	Quasipeak	65.88	-17.53	Neutral	10.04
0.649	Quasipeak	56.00	-14.55	Neutral	10.05
19.082	Quasipeak	60.00	-24.65	Neutral	10.46
0.150	Average	56.00	-25.92	Phase 1	10.04
0.649	Average	46.00	-15.91	Phase 1	10.05
21.365	Average	50.00	-30.72	Phase 1	10.36
0.152	Average	55.88	-18.65	Neutral	10.04
0.649	Average	46.00	-15.77	Neutral	10.05
19.082	Average	50.00	-19.38	Neutral	10.46

Final test result

Pass

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Liste der verwendeten Prüfmittel
List of used test equipment

5 Equipment List

5.1 Hardware

Prüfmittel <i>Test equipment</i>		Prüfmittel-Nr. / ID-Nr. <i>Equipment No. / ID-No.</i>	Letzte Kalibrierung <i>Last calibration</i>	Nächste Kalibrierung <i>Next calibration</i>
Spectrum Analyzer: FSV-30	Rohde & Schwarz	9000268	16.07.2023	16.07.2023
Fully Anechoic Room	Albatross Projects GmbH	2959749	08.10.2021	08.10.2024
RSE-Filtersystem	Rohde & Schwarz	9002802	19.01.2022	19.01.2023
Signal Analyser UXA N9041B	Keysight	2971644	06.04.2022	06.04.2023
Antenna HF907	Rohde & Schwarz	2856263	01.09.2021	01.09.2024
Antenna, Double Ridged Horn Antenna 3116C-PA	ETS LINDGREN	2900393	12.10.2020	12.10.2022
Antenna HFH 2	Rohde & Schwarz	2728893	09.07.2021	09.07.2024
Semi-Anechoic Chamber 30-1000 MHz	Siemens	2729645	15.06.2022	15.06.2025
Antenna VULB 9168	Schwarzbeck	2728136	14.09.2020	04.09.2023
Receiver ESU 8	Rohde & Schwarz	2728844	23.12.2021	23.12.2022
Spectrum Analyser FSU 26	Rohde & Schwarz	2844118	08.2021	02.08.2023
EMC Power supply	Spitzenberger & Spies	2728107	-	27.01.2023
Signal generator	Chroma	9021303	-	18.01.2024

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Liste der verwendeten Prüfmittel
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Device used for AC conducted Emission test

Type	Manufacturer	Model	ID	Last calibration	Next calibration
Turntable	INN-CO	CO 3000	2869231	---	---
Antenna mast	INN-CO	CO 3000	2869231	---	---
Receiver	Rohde & Schwarz	ESU 8	2728844	23.12.2021	23.12.2022
Cable	—	—	LTG_1373	---	---
Cable	—	—	LTG_1800	22.06.2022	22.06.2022
Anechoic chamber	Siemens	SAC 10 (NSA 30-1000MHz)	2729645	19.06.2020	19.06.2023
Antenna	Schwarzbeck	VULB 9168	2728136	14.09.2020	04.09.2023

5.2 Software

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

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6 Change History

Revision Number	List of revisions	Date of issue
DE22QGVH 001	Initial Release	24.10.2022
Note: Latest revision report will replace all previous reports.		

Ende des Prüfberichts
End of Test Report