

Prüfbericht-Nr.: <i>Test report no.:</i>	DE21G86O 002	Auftrags-Nr.: <i>Order no.:</i>	1091956_150	Seite 1 von 41 <i>Page 1 of 41</i>
Kunden-Referenz-Nr.: <i>Client reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	28.06.2021	
Auftraggeber: <i>Client:</i>	Julius Blum GmbH, Industriestrasse 1, 6973 Hoechst, Austria			
Prüfgegenstand: <i>Test item:</i>	Radio Switch			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	23P5020			
Auftrags-Inhalt: <i>Order content:</i>	Prüfung der Funkparameter nach FCC & ISCED <i>Test of radio parameters acc. to FCC & ISCED</i>			
Prüfgrundlage: <i>Test specification:</i>	Vollprüfung / Complete test FCC CFR 47 Part 15 Subpart C- §15.249 ISED RSS-210 Issue 10:2019			
Wareneingangsdatum: <i>Date of sample receipt:</i>	17.08.2021	Photos see Appendix to this report (Appendix A to DE21G86O 002)		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003112620-007/009			
Prüfzeitraum: <i>Testing period:</i>	23.08.2021-01.09.2021			
Ort der Prüfung: <i>Place of testing:</i>	Nürnberg <i>Nuremberg</i>			
Prüflaboratorium: <i>Testing laboratory:</i>	Wireless Labor <i>Wireless Test Lab</i>			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>		genehmigt von: <i>authorized by:</i>		
Datum: <i>Date:</i>	25.10.2021	Datum: <i>Issue date:</i>	25.10.2021	
Stellung / Position	Sachverständige(r)/Expert	Stellung / Position	Dipl. -Ing. Melanie Bense Team Leader Wireless	
Sonstiges / Other: Dieser Prüfbericht DE21G86O 002 ersetzt den Prüfbericht DE21G86O 001 (siehe Änderungsverzeichnis). The test report DE21G86O 002 replaces the test report DE21G86O 001 (see change history).				
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 N/A = nicht anwendbar 4 = sufficient N/A = not applicable
	5 = mangelhaft N/T = nicht getestet 5 = poor 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. <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>				

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Anmerkungen
Remarks

1	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 Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. 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.
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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	Radio Switch
2	Typ-No.	23P5020
3	Test sample obtaining	☒ Sending by customer ☐ Sampling by TÜV Rheinland Group ☐ others:
4	FCC-ID	W95-23P502L00-01
5	IC	8352A-23P502L0001
6	PMN & HVIN	23P5020
7	Description of EUT	Radio Switch to engage motion for the furniture drives.
8	Supported radio technologies	2.4 GHz Proprietary
9	Max RF output power (declared)	0 dBm
10	Operating Frequency (declared)	2404 MHz, 2410 MHz, 2452 MHz
11	Channel Bandwidth (declared)	1050 kHz
12	Number of Channels	3
13	Modulation	GFSK
14	Rated Voltage / Frequency	3V / DC (lithium button cell battery CR2032)
15	Antenna Name	23P502L00.01
16	Antenna Type	☒ Integral antenna ☐ Dedicated antenna ☐ Permanent antenna connector
17	Antenna amount of chains	1
18	Antenna Gain (declared)	-3.4 dBi @ 2404 MHz -2.85 dBi @ 2410 MHz -1.75 dBi @ 2452 MHz
19	Software Version	BAU0157216727
20	Hardware Version	23P502L00.01
21	Used Samples	A003112620-007 → Transmitter conducted sample A003112620-009 → Transmitter radiated sample

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Product description

22	Temperature Range	0 °C to +40 °C
23	Environment	Indoor
24	Pictures of the EUT	
Photos see Appendix to this report (Appendix A to DE21G86O 002)		

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Absatz Clause	Anforderungen – Prüfungen / Requirements - Tests	Bemerkungen / Remarks	Ergebnis Result
FCC 15.203	Antenna Requirement	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.215 (c) RSS-Gen sec. 6.7	20dB Bandwidth and 99% emission bandwidth	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.249 (a) RSS-210 sec. B10 (a)	Field Strength of fundamental and harmonics	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.249 (d),(e) RSS-210 sec. B10 (b)	Radiated Spurious Emission	-	P ☒ F ☐ N/A ☐ N/T ☐
FCC 15.207 RSS-Gen sec. 8.8	AC Power Conducted Emissions	Does not apply for equipment with DC supply voltage	P ☐ F ☐ N/A ☒ N/T ☐

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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
Short range device	2400 MHz - 2483.5 MHz	☒	☒

1.2 Standard specific classification of the EUT

1.2.1 Applied standards

FCC CFR 47 Part 15 Subpart C - §15.249

ISED RSS-210 Issue 10:2019

1.2.2 Test Methods and Guidance Documents

ANSI C63.10:2013

1.2.3 Type of equipment

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

DTM (Direct Test Mode) Firmware installed to allow the configuration of DUT.

2.3 Test modes

Mode	Description	Mode configuration
1	TX Continuous Wave mode	The DUT is connected with USB cable to a PC and configured using ArendApprovalTest.exe software then the transmit mode on a specific channel is selected.
2	TX modulated mode with continuous transmission	

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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
Relative humidity	%	44
Supply voltage	Volts DC	3

3.3 Antenna assemblies

Antenna connector is prepared so tests were done in conducted and radiated mode.

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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 Antenna Requirement

4.1.1 Requirements / Limits

FCC Part 15 Subpart C §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited... further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.1.2 Test Results

The EUT has a permanently attached antenna (the antenna is soldered to a printed circuit board) and therefore this is sufficient to demonstrate compliance with the antenna requirement in section 15.203 according to KDB 353028 D01 Antennas Part 15 Transmitters v01.

Final test result

Pass

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4.2 20 dB bandwidth and 99% emission bandwidth

4.2.1 Requirements / Limits

FCC Part 15 Subpart C §15.215

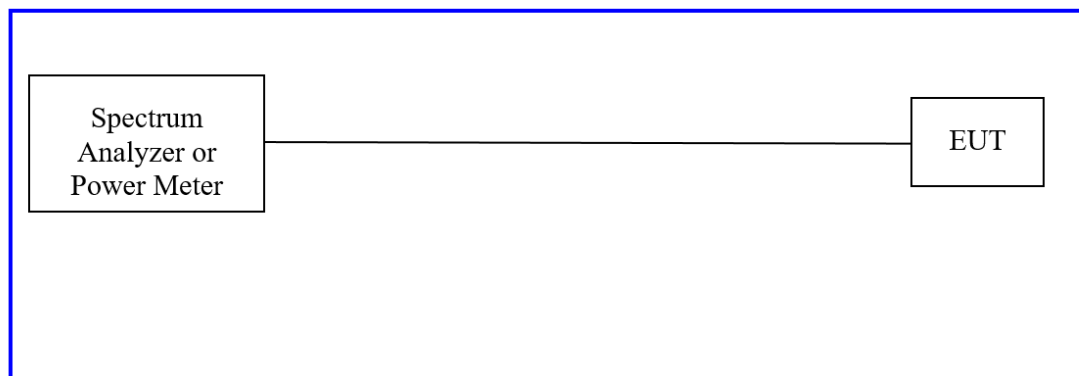
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

RSS 210, Issue 10, sec. 6.7

The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

4.2.2 Test Method

Conducted method was used to measure the 20 dB bandwidth and 99% bandwidth. The 20 dB bandwidth was measured according to ANSI C63.10:2013 clause 6.9.2, and 99% bandwidth was measured according to ANSI C63.10:2013 clause 6.9.3. The EUT was connected to the spectrum analyzer via a coax cable with a known loss.



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4.2.3 Test Setup

EUT		A003112620-007 23P5020
Test Condition		Normal conditions
Chamber details		☐ 3m Fully Anechoic Chamber (FAC) ☐ 10m Semi Anechoic Chamber (SAC) ☒ Shielded room
Measurement positioning		Distance: EUT height: Antenna height: ☐ 3m ☐ 1.5m ☐ 1.5m ☐ 10m ☐ 0.8m ☐ 1m to 4m – height scan
		☒ N/A
Companion device		-
Operation mode		2
Spectrum Analyzer	Centre Frequency	2404MHz, 2410MHz, 2452MHz
	Resolution Bandwidth	10 kHz
	Video Bandwidth	30 kHz
	Span	2 MHz
	Sweep time	189.648 µs
Further parameters		-
Test engineer		M. Sc. Alaa Bustati

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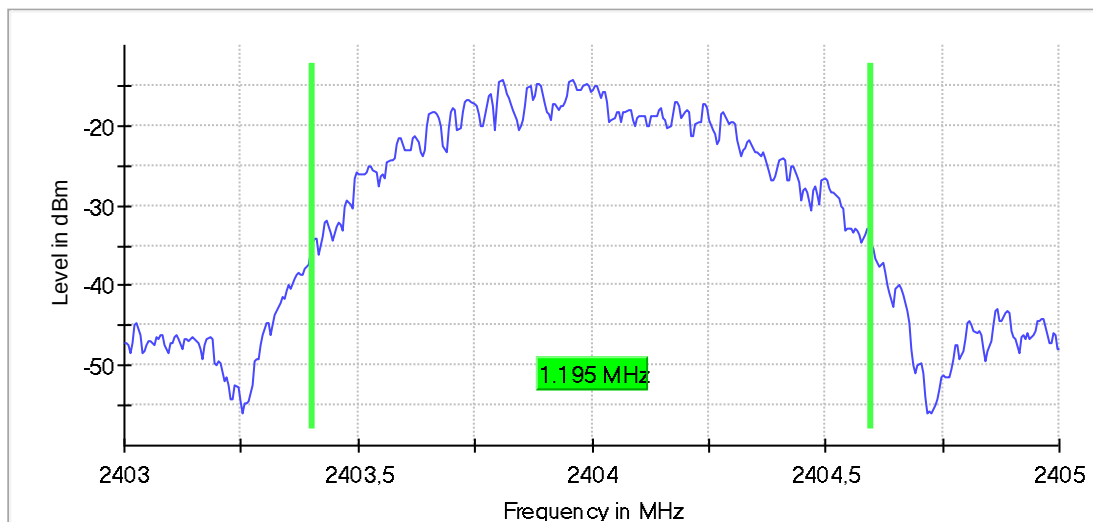
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4.2.4 Test Results

4.2.4.1 20 dB Bandwidth

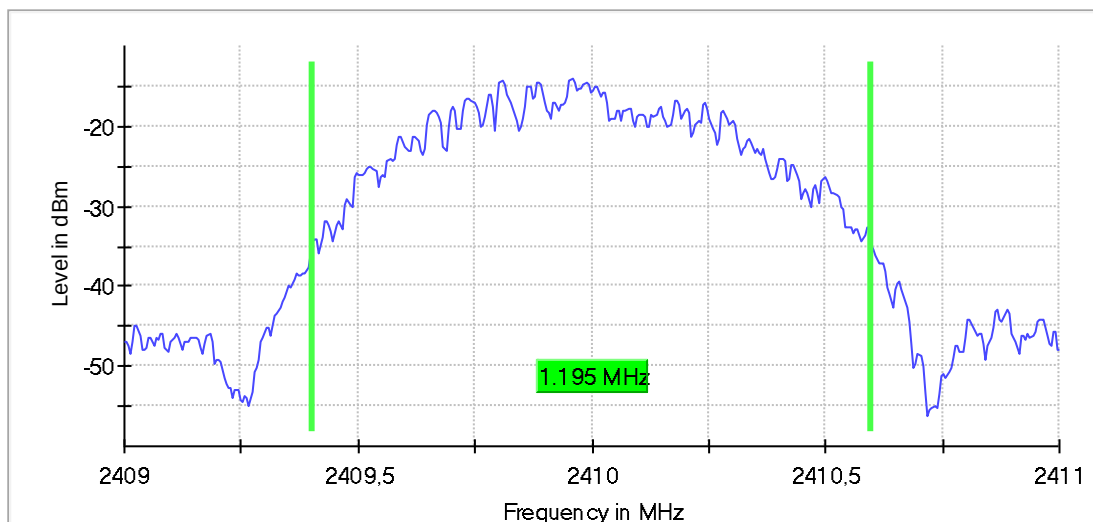
- 2404 MHz

20 dB Bandwidth



- 2410 MHz

20 dB Bandwidth



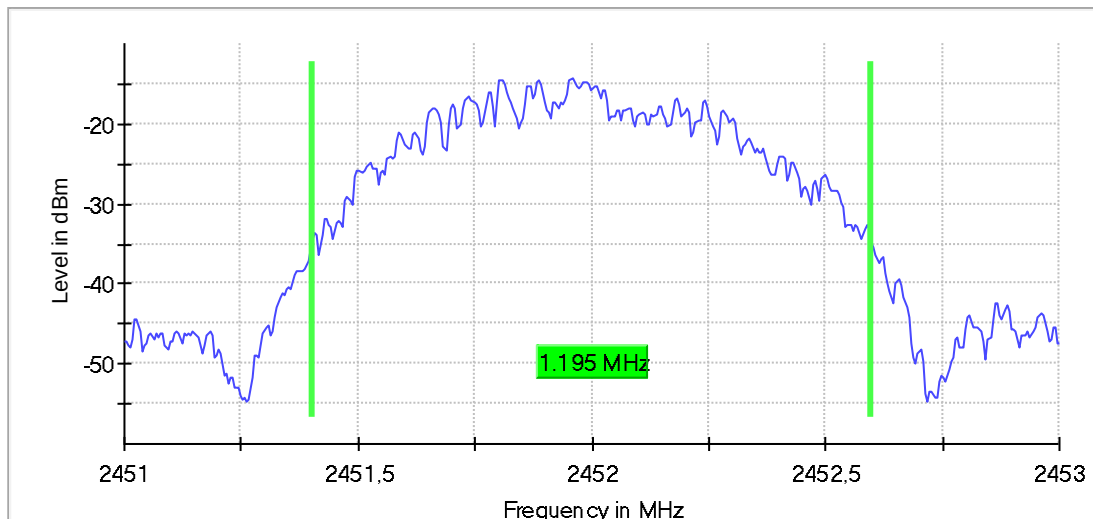
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– 2452 MHz

20 dB Bandwidth

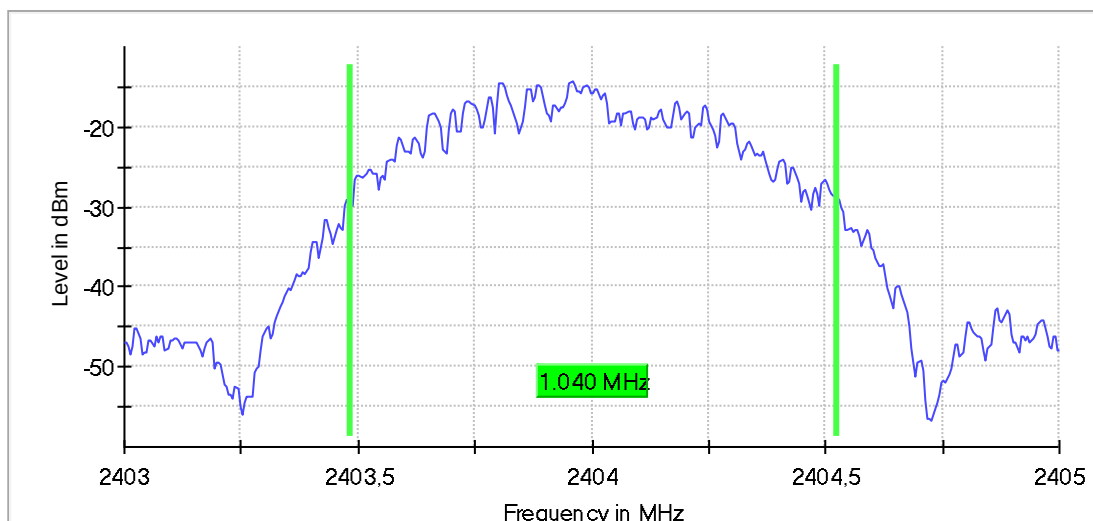


Frequency	20 dB Bandwidth (kHz)	Test Result
2404 MHz	1195	Pass
2410 MHz	1195	
2452 MHz	1195	

4.2.4.2 99% Bandwidth

– 2404 MHz

99 %Bandwidth



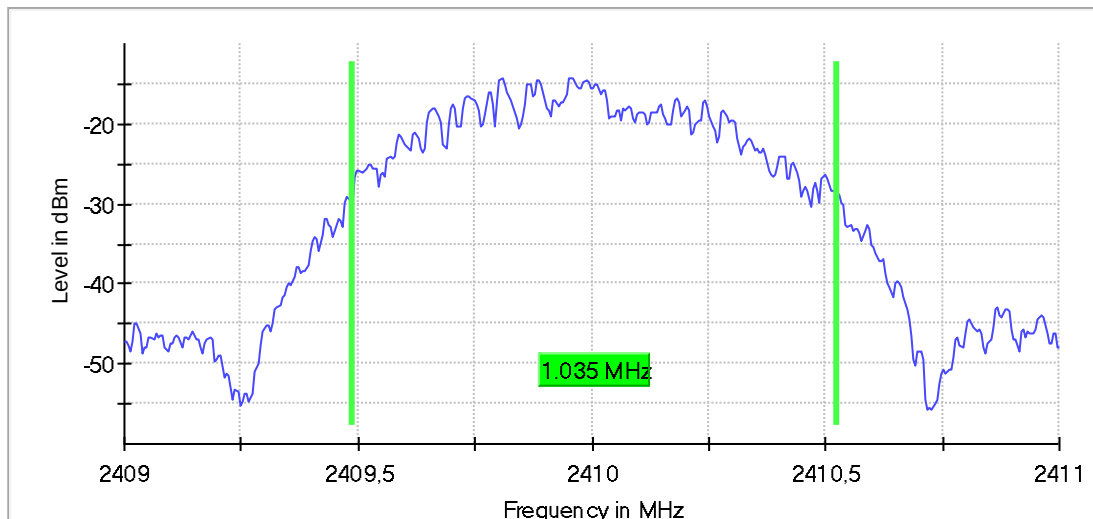
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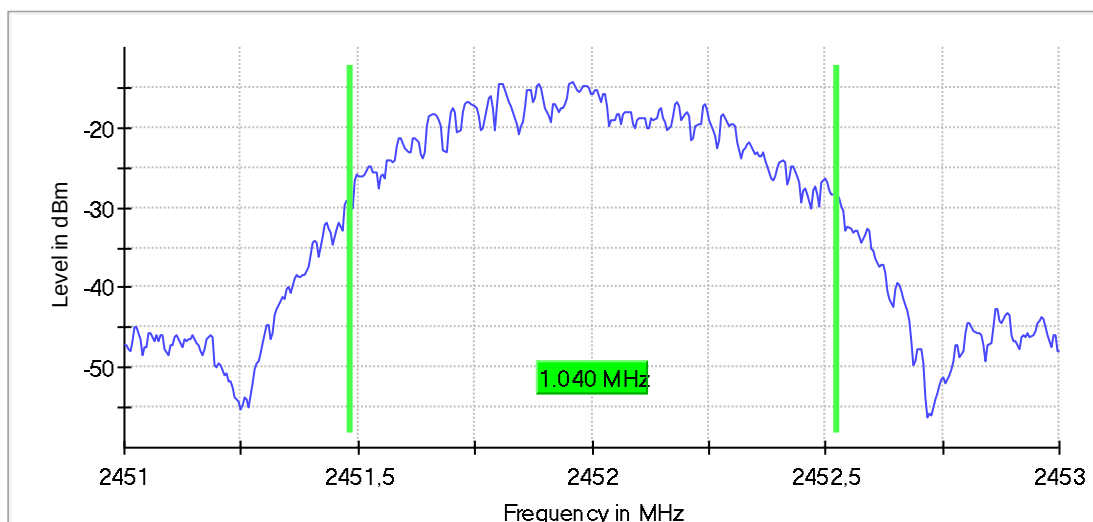
– 2410 MHz

99 %Bandwidth



– 2452 MHz

99 %Bandwidth



Frequency	Bandwidth (kHz)
2404 MHz	1040
2410 MHz	1035
2452 MHz	1040

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4.3 Radiated Emission

4.3.1 Requirements / Limits

4.3.1.1 Field Strength of fundamental and harmonics

FCC Part 15 Subpart C §15.249 (a) / RSS-210 sec. B10 (a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

FCC Part 15 Subpart C §15.249 (c)

Field strength limits are specified at a distance of 3 meters

FCC Part 15 Subpart C §15.249 (e)

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

The followings field strength limits applies to the DUT in dBµV/m

Fundamental Frequency	Average Field strength of fundamental (dBµV/m)	Peak Field strength of fundamental (dBµV/m)	Average Field strength of harmonics (dBµV/m)	Peak Field strength of harmonics (dBµV/m)
2400-2483.5 MHz	94	114	54	74

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4.3.1.2 Radiated Spurious Emission

FCC Part 15 ante Subpart C §15.249 (d) / RSS-210 sec. B10 (b)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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:

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

4.3.2 Test Method

4.3.2.1 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.

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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:

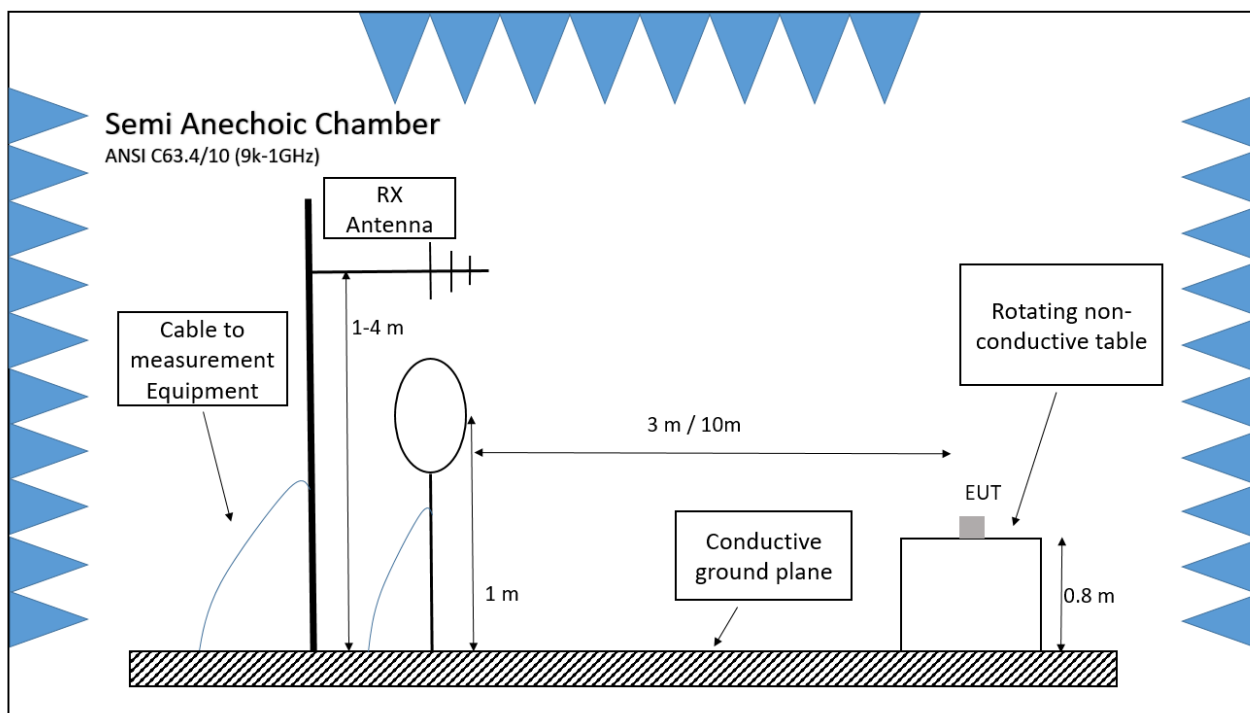
Test Site	Semi-anechoic chamber
Receiving Antenna	Hybrid Antenna VULB 9168
Receiving Antenna height	Varied (1m to 4 m, step size 1m)
Receiving Antenna Polarisation	Horizontal– Vertical
EUT Table	1.0m x 1.5m non-conductive table 80cm above the floor
EUT Turn Table Step Size	45°
Receiver Configurations	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:



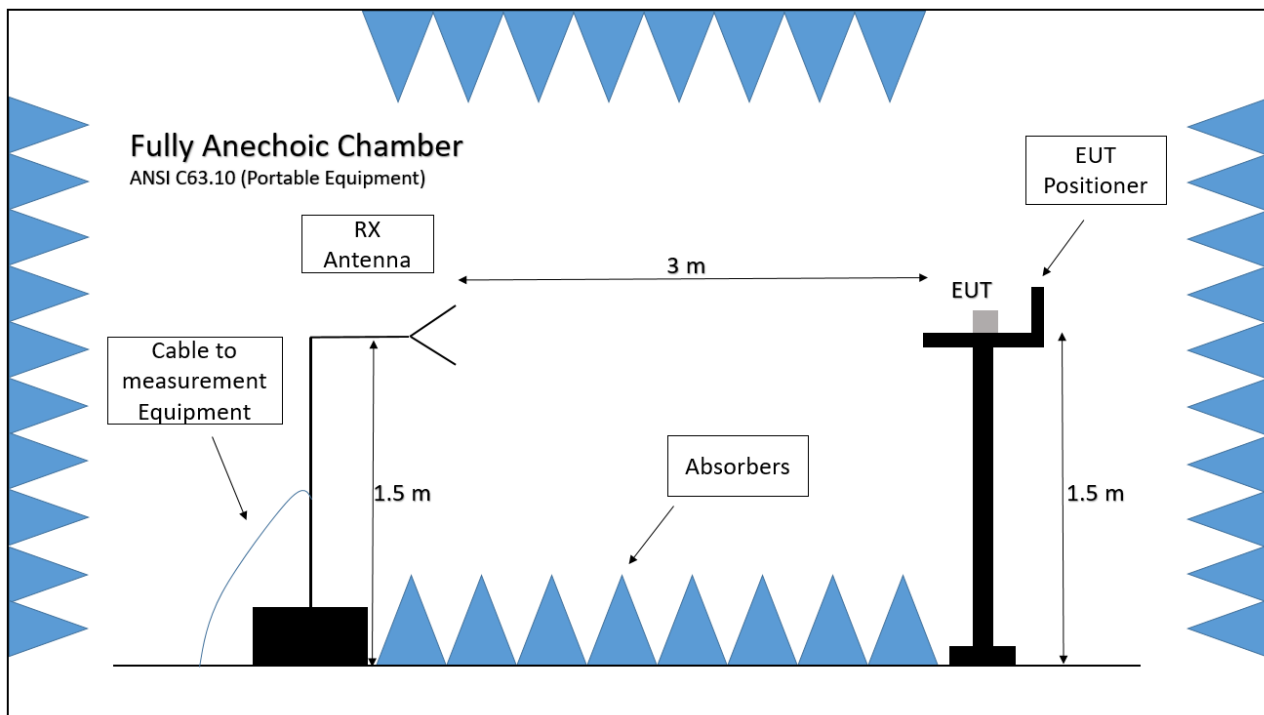
1 GHz - 25 GHz

Following Measurement Setup is used:

Test Site	Fully-anechoic chamber
Receiving Antenna	Horn Antenna HF907 (1-18 GHz), 3116C-PA (18-25 GHz)
Receiving Antenna Height	1.5 m
Receiving Antenna Polarisation	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 Analyser	Average and peak detectors
	RBW: 1 MHz
	Sweep Time : 100 ms

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



4.3.2.2 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, then 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

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

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4.3.3 Test Setup

EUT	A003112620-009 23P5020
Test Condition	Normal conditions
Companion device	-
Operation mode	1
Further parameters	-
Test engineer	Dipl. -Ing. Melanie Bense , M. Sc. Alaa Bustati

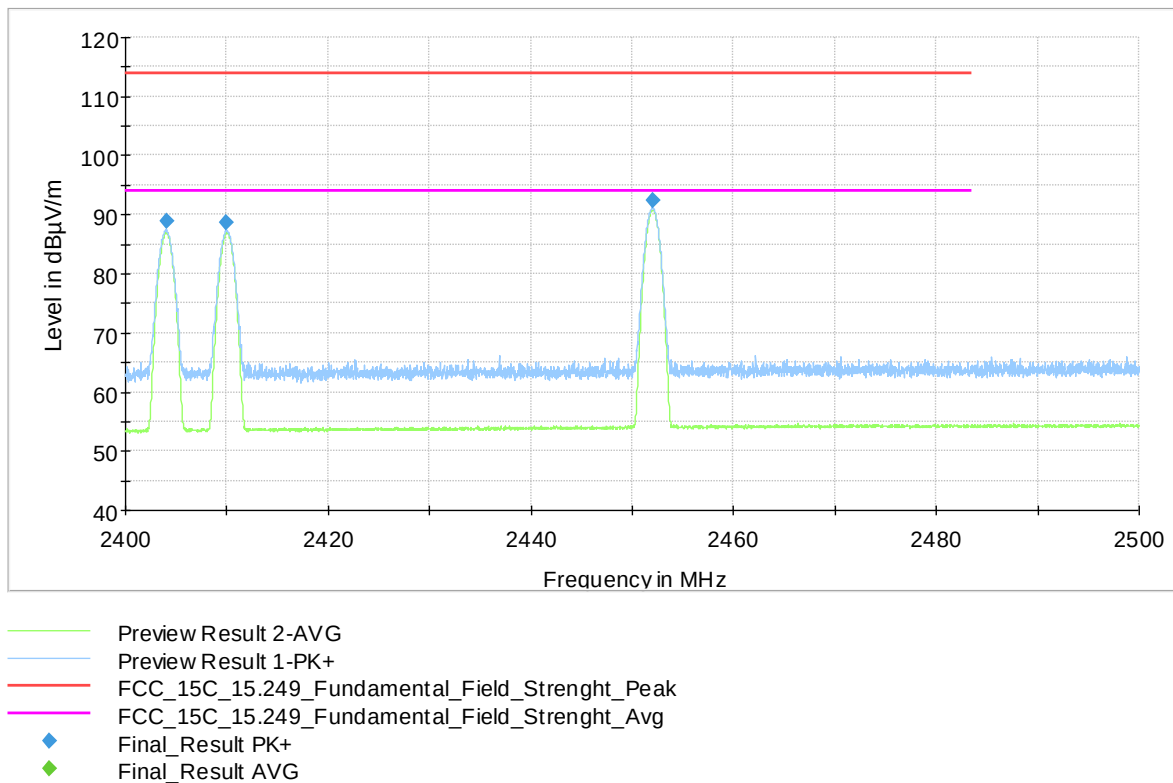
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4.3.4 Test results

4.3.4.1 Field Strength of fundamental



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)
2404.027500	88.81	-	114	25.29	1000.0	1000.000	150.0	V	180.0	67.0	35.3
2404.027500	-	88.81	94	5.19	1000.0	1000.000	150.0	V	180.0	67.0	35.3
2409.945000	88.54	-	114	25.46	1000.0	1000.000	150.0	V	180.0	58.0	35.4
2409.945000	-	88.54	94	5.46	1000.0	1000.000	150.0	V	180.0	58.0	35.4
2452.001250	92.38	-	114	21.62	1000.0	1000.000	150.0	V	181.0	67.0	35.6
2452.001250	-	92.38	94	1.62	1000.0	1000.000	150.0	V	181.0	67.0	35.6

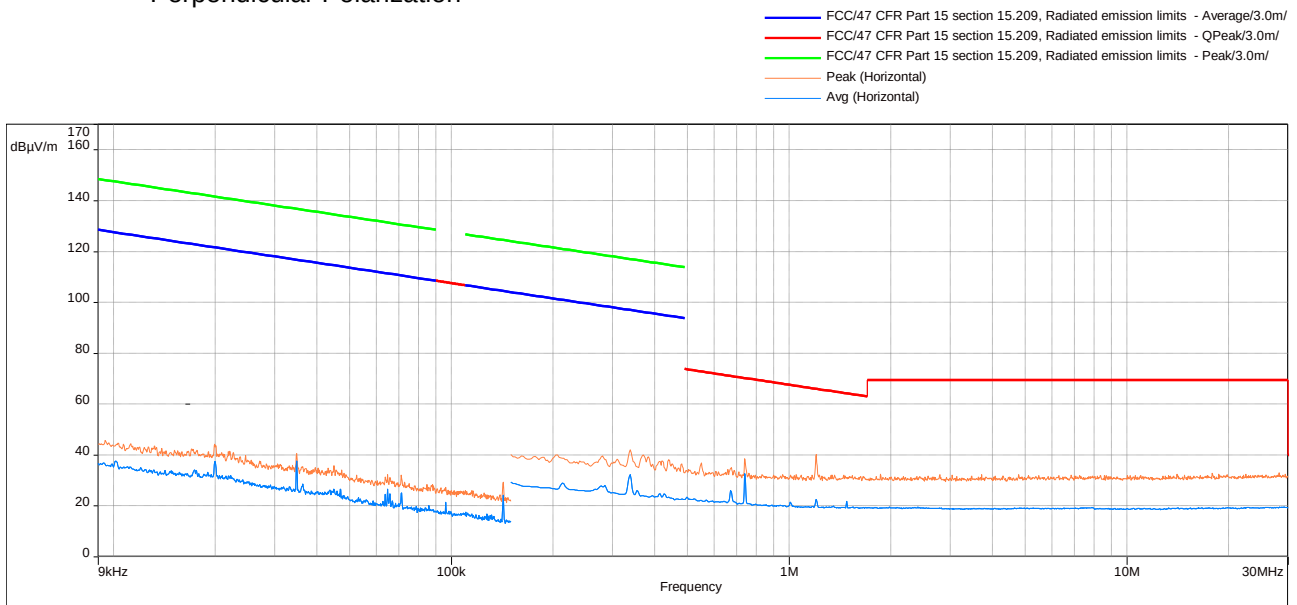
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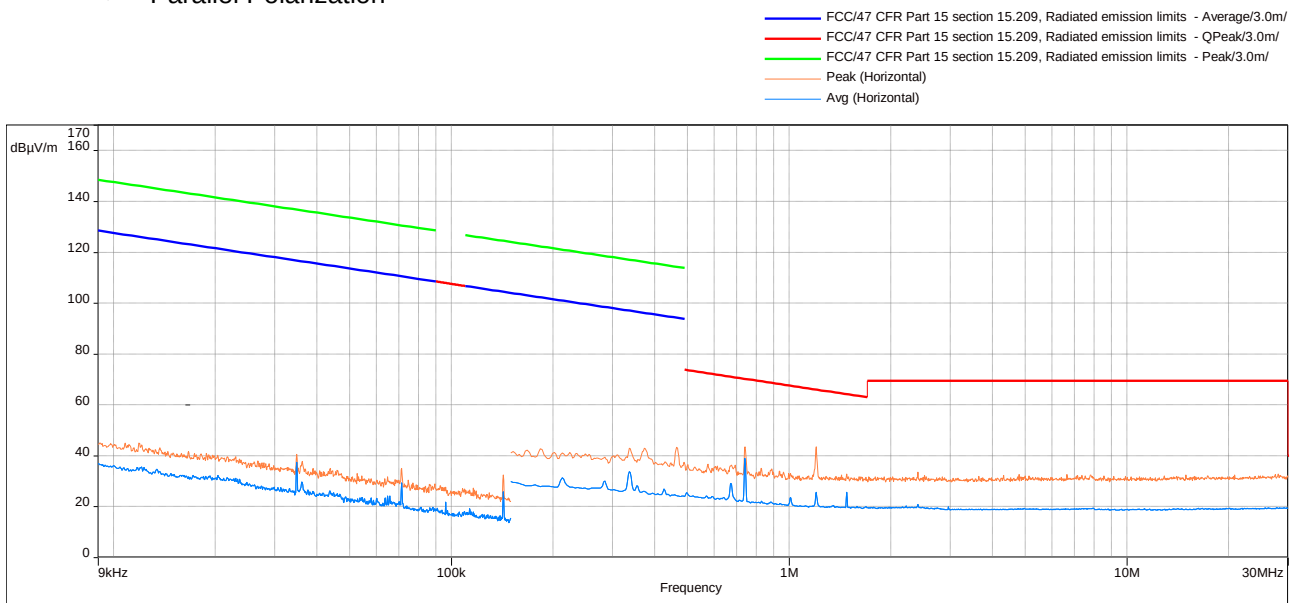
Prüfdokumentation Test documentation

4.3.4.2 Spurious emissions and Field Strength of harmonics

- 9kHz to 30 MHz, 2404 MHz
 - Perpendicular Polarization



- Parallel Polarization



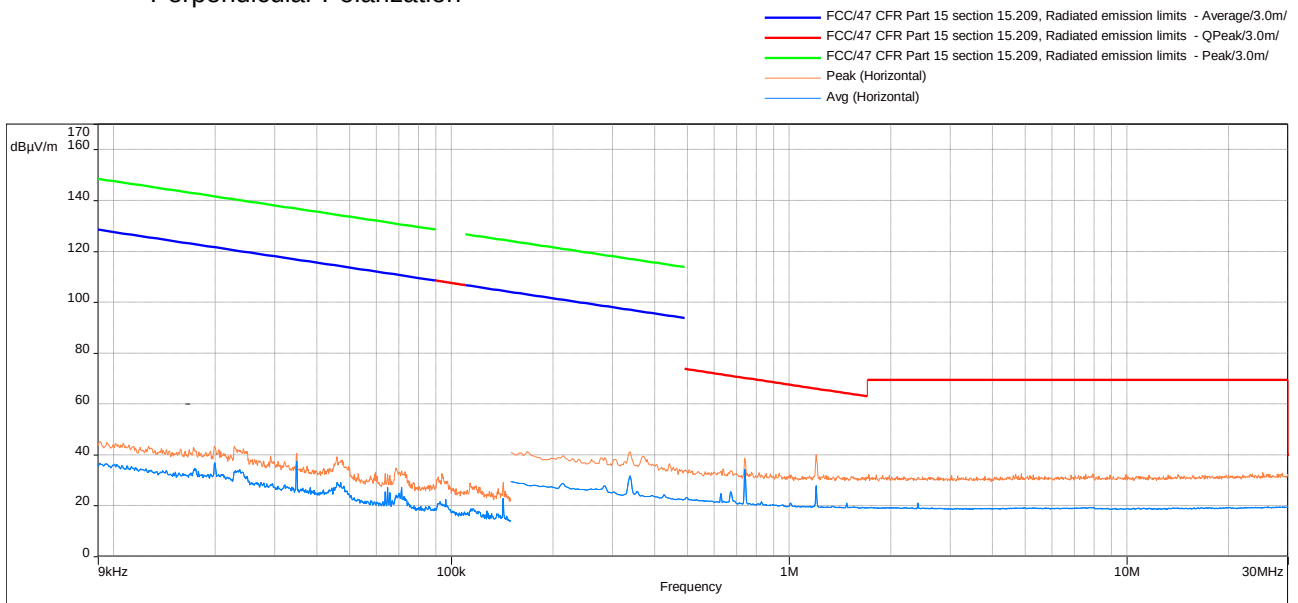
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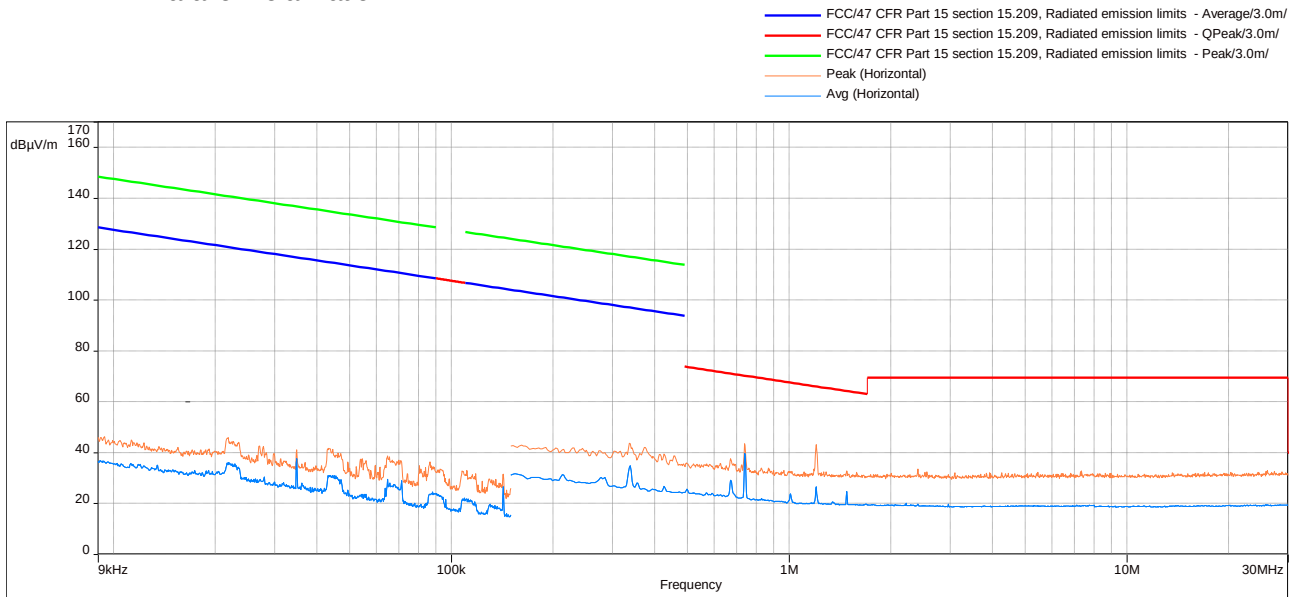
Prüfdokumentation Test documentation

– 9kHz to 30 MHz, 2410 MHz

• Perpendicular Polarization



• Parallel Polarization



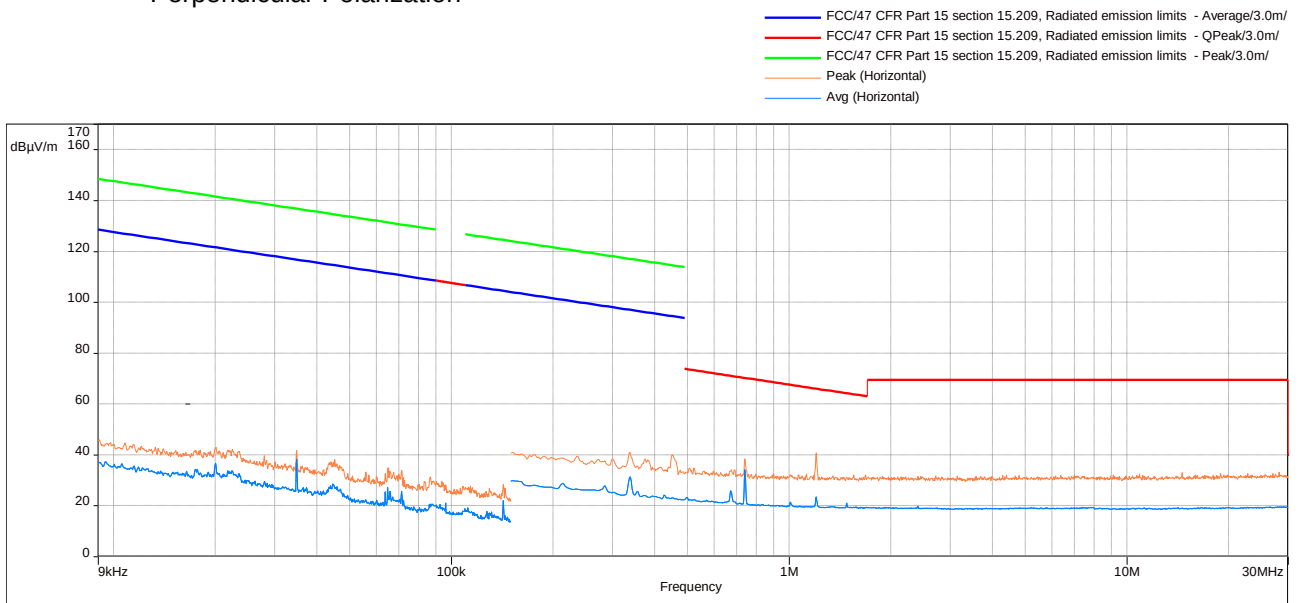
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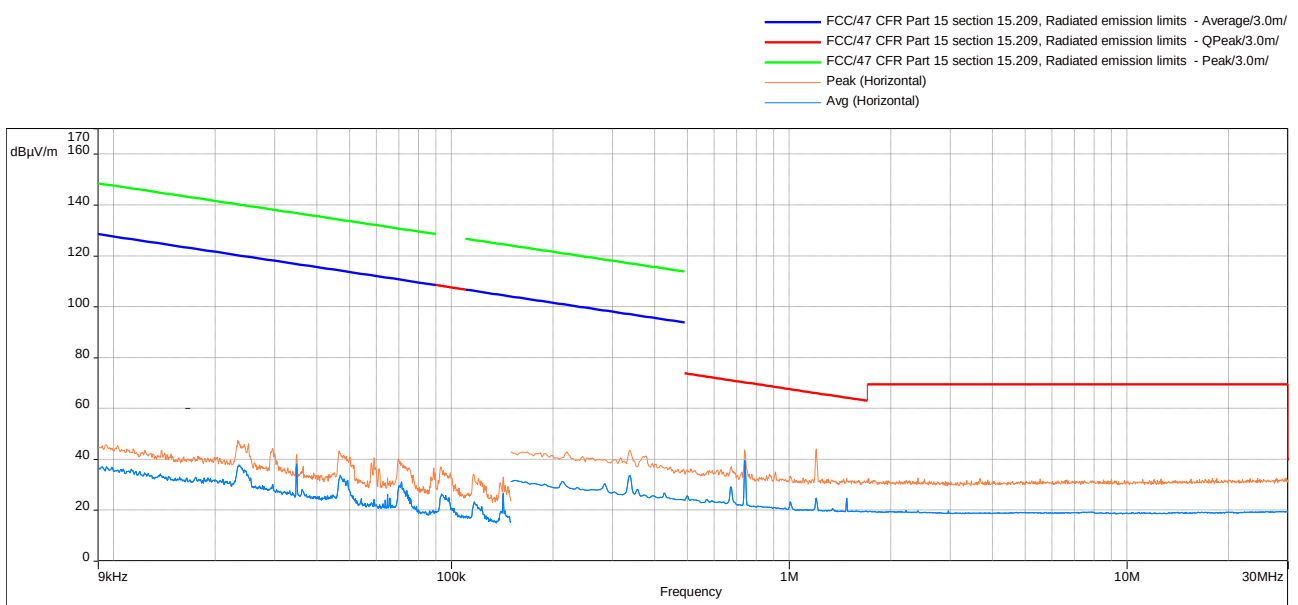
Prüfdokumentation Test documentation

– 9kHz to 30 MHz, 2452 MHz

• Perpendicular Polarization



• Parallel Polarization

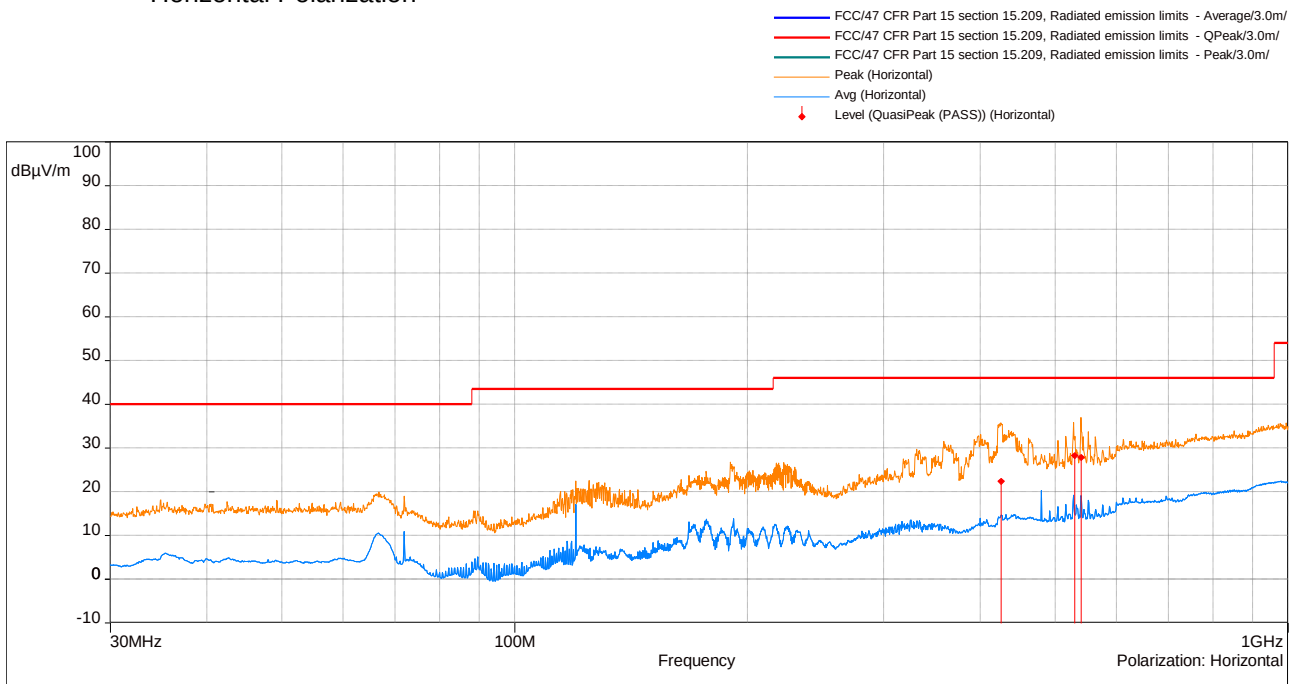


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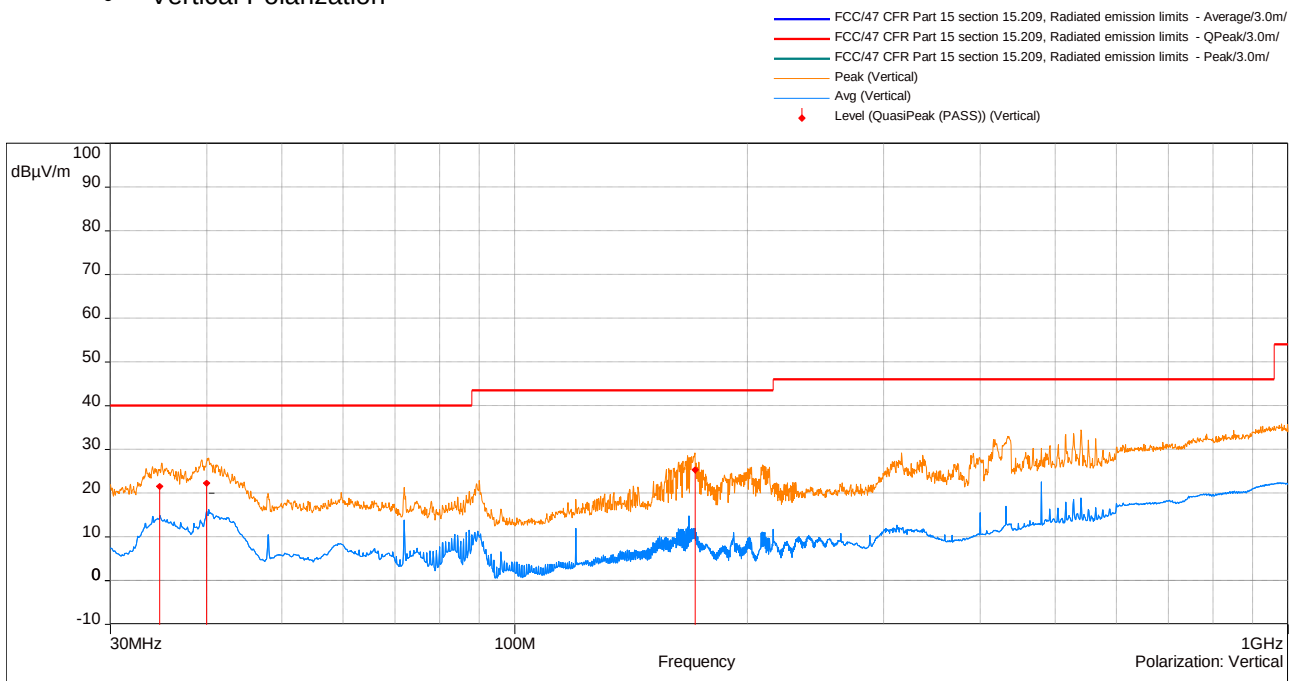
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- 30 MHz – 1 GHz, 2404 MHz
 - Horizontal Polarization



- Vertical Polarization



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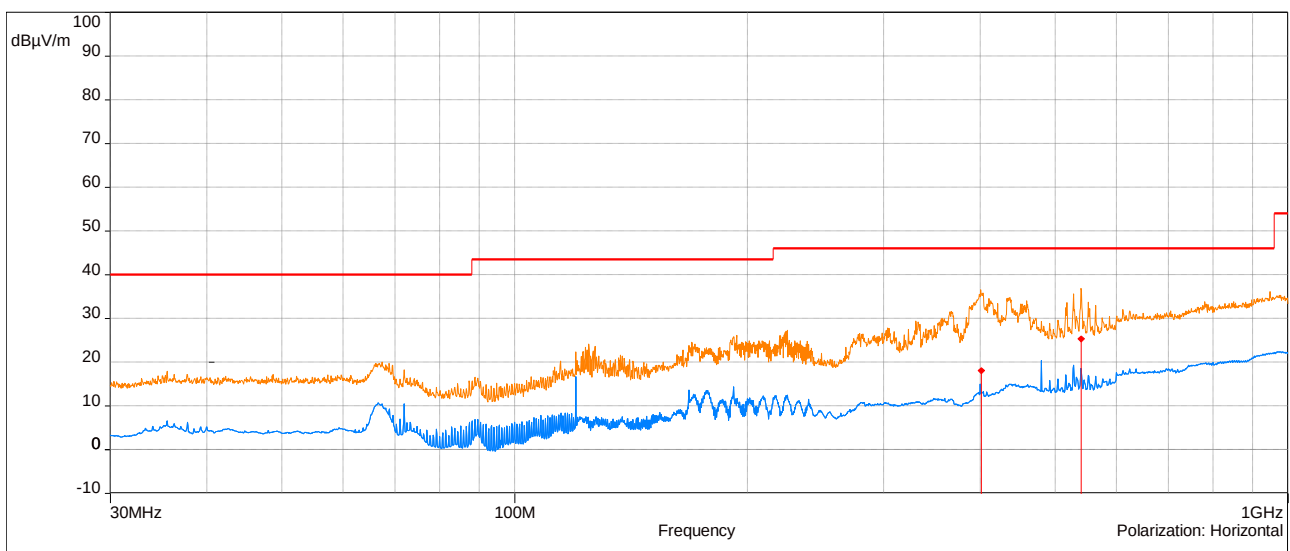
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Frequency (MHz)	SR	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Azimuth (deg)	Height (m)	Pol	Meas. Time (s)	Corr. (dB)
425.19	1	22.47	46.00	-23.53	210.80	1.34	Horizontal	1.00	19.17
529.83	1	28.36	46.00	-17.64	321.90	1.00	Horizontal	1.00	21.74
539.97	1	27.92	46.00	-18.08	339.40	1.00	Horizontal	1.00	21.86
34.74	2	21.55	40.00	-18.45	72.50	1.00	Vertical	1.00	13.50
39.93	2	22.32	40.00	-17.68	91.10	1.05	Vertical	1.00	13.88
171.03	2	25.42	43.50	-18.08	231.00	1.00	Vertical	1.00	14.39

– **30 MHz – 1 GHz, 2410 MHz**

- Horizontal Polarization

 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 (PASS)) (Horizontal)

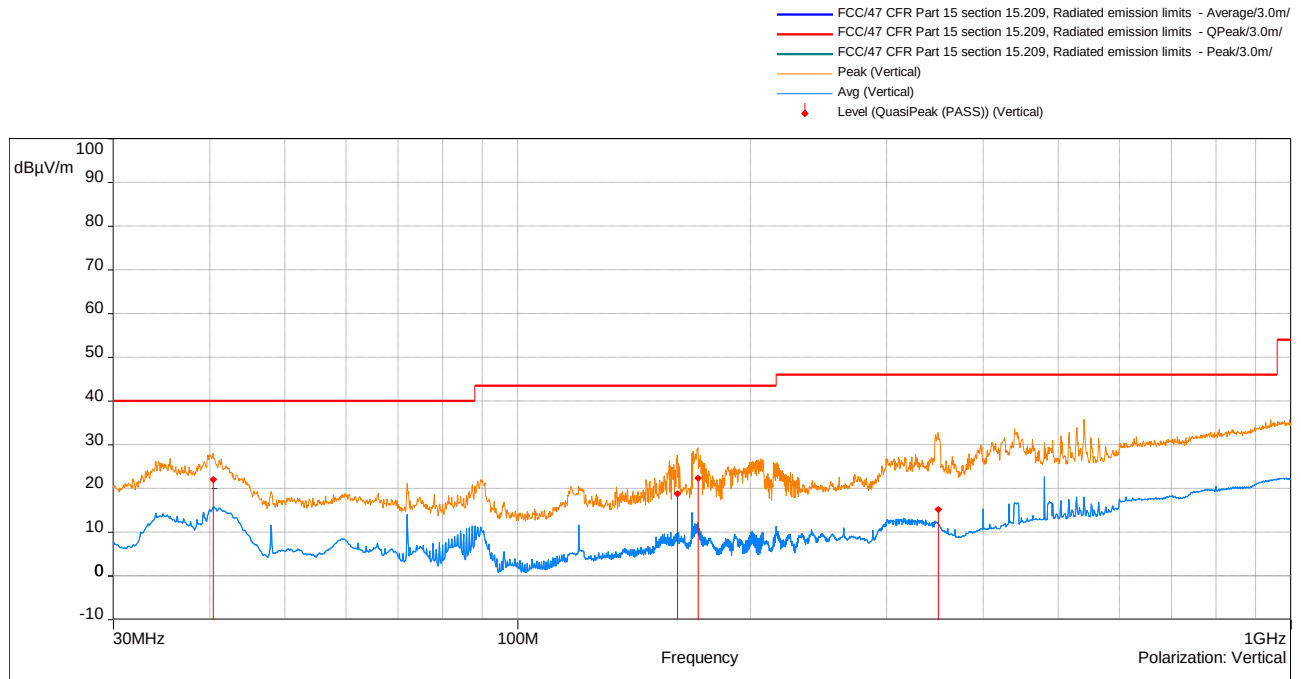


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- Vertical Polarization



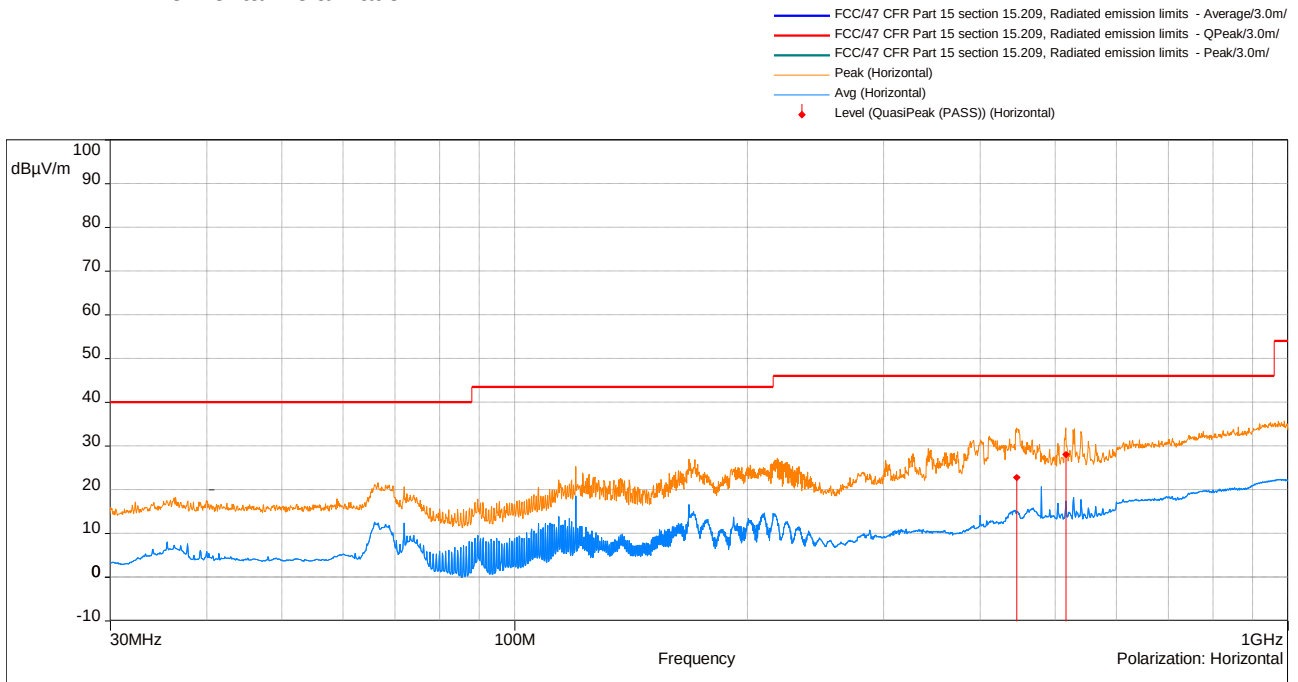
Frequency (MHz)	SR	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Azimuth (deg)	Height (m)	Pol	Meas. Time (s)	Corr. (dB)
400.98	1	18.13	46.00	-27.87	341.60	1.32	Horizontal	1.00	18.36
540.03	1	25.35	46.00	-20.65	279.70	1.98	Horizontal	1.00	21.86
40.38	2	22.07	40.00	-17.93	294.50	1.16	Vertical	1.00	13.93
160.77	2	18.86	43.50	-24.64	237.00	1.00	Vertical	1.00	14.80
171.06	2	22.47	43.50	-21.03	212.90	1.01	Vertical	1.00	14.39
349.92	2	15.23	46.00	-30.77	112.60	1.43	Vertical	1.00	16.89

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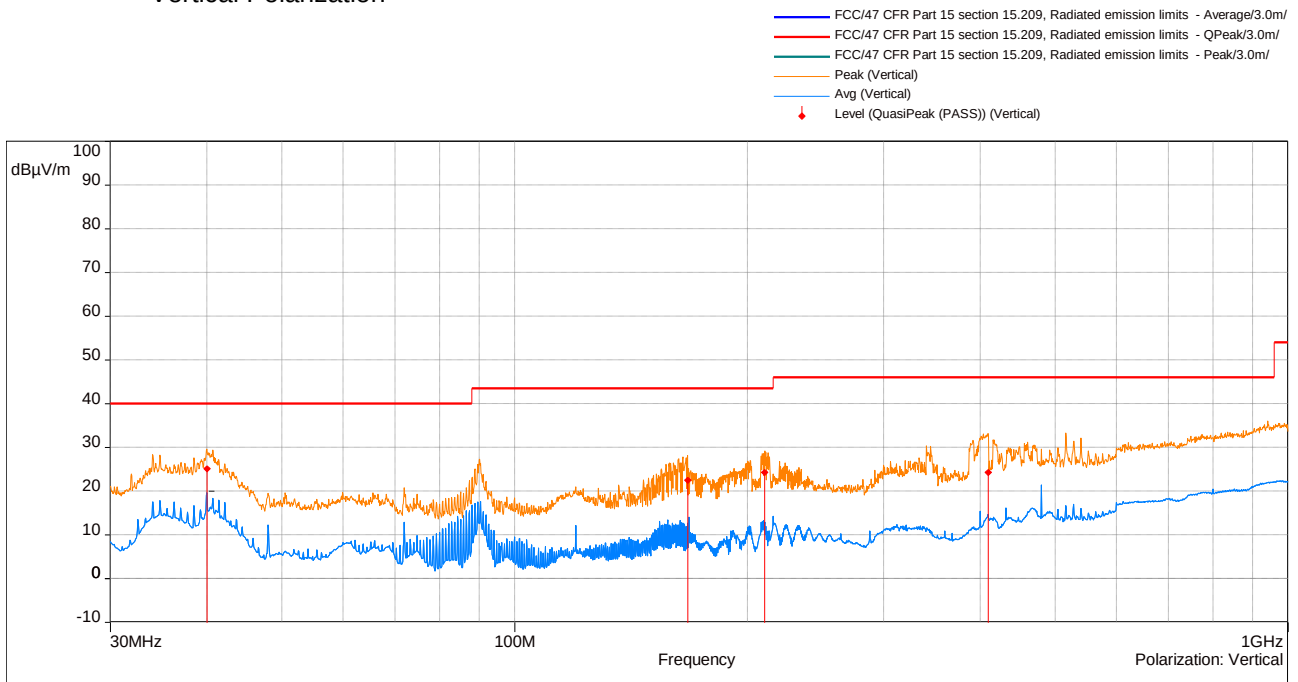
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- 30 MHz – 1 GHz, 2452 MHz
- Horizontal Polarization



- Vertical Polarization



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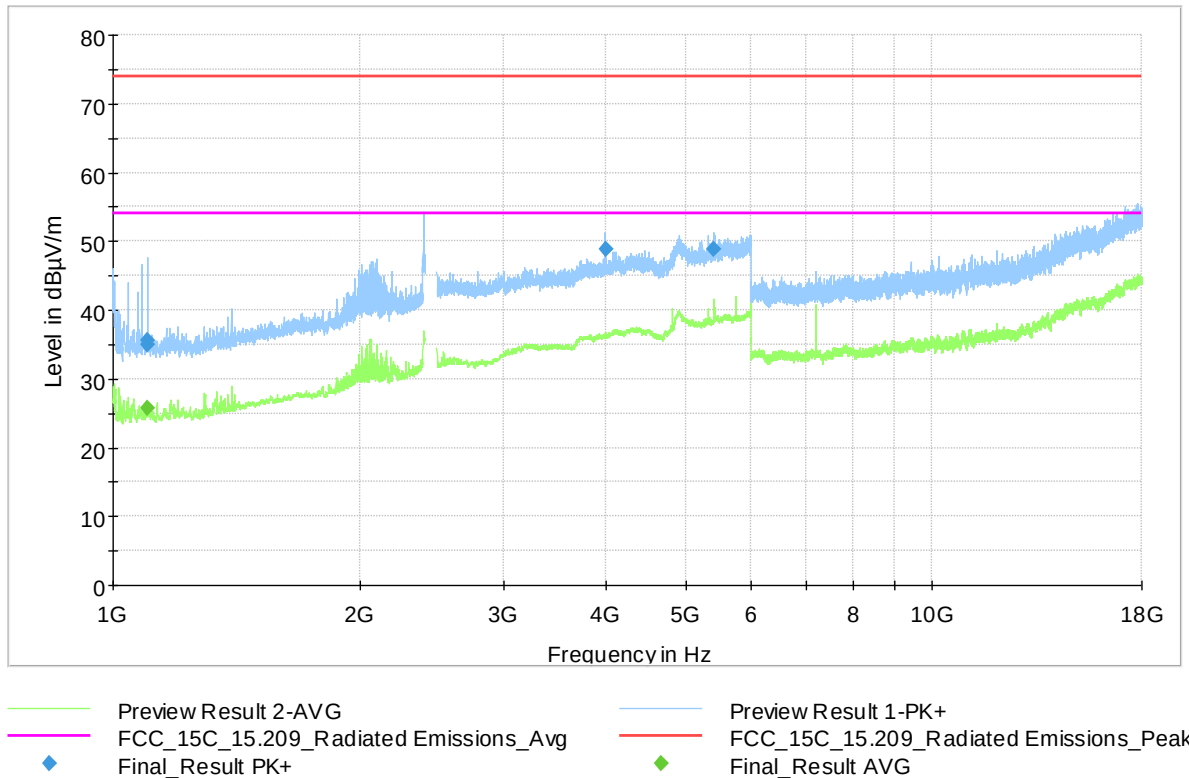
Frequency (MHz)	SR	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Azimuth (deg)	Height (m)	Pol	Meas. Time (s)	Corr. (dB)
445.68	1	22.83	46.00	-23.17	273.40	2.58	Horizontal	1.00	19.76
516.06	1	28.07	46.00	-17.93	77.90	1.18	Horizontal	1.00	21.50
39.99	2	25.17	40.00	-14.83	213.70	1.01	Vertical	1.00	13.89
167.37	2	22.55	43.50	-20.95	178.20	1.03	Vertical	1.00	14.55
210.54	2	24.27	43.50	-19.23	199.20	1.00	Vertical	1.00	11.50
409.62	2	24.31	46.00	-21.69	355.90	1.27	Vertical	1.00	18.50

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– 1-18 GHz, 2404 MHz



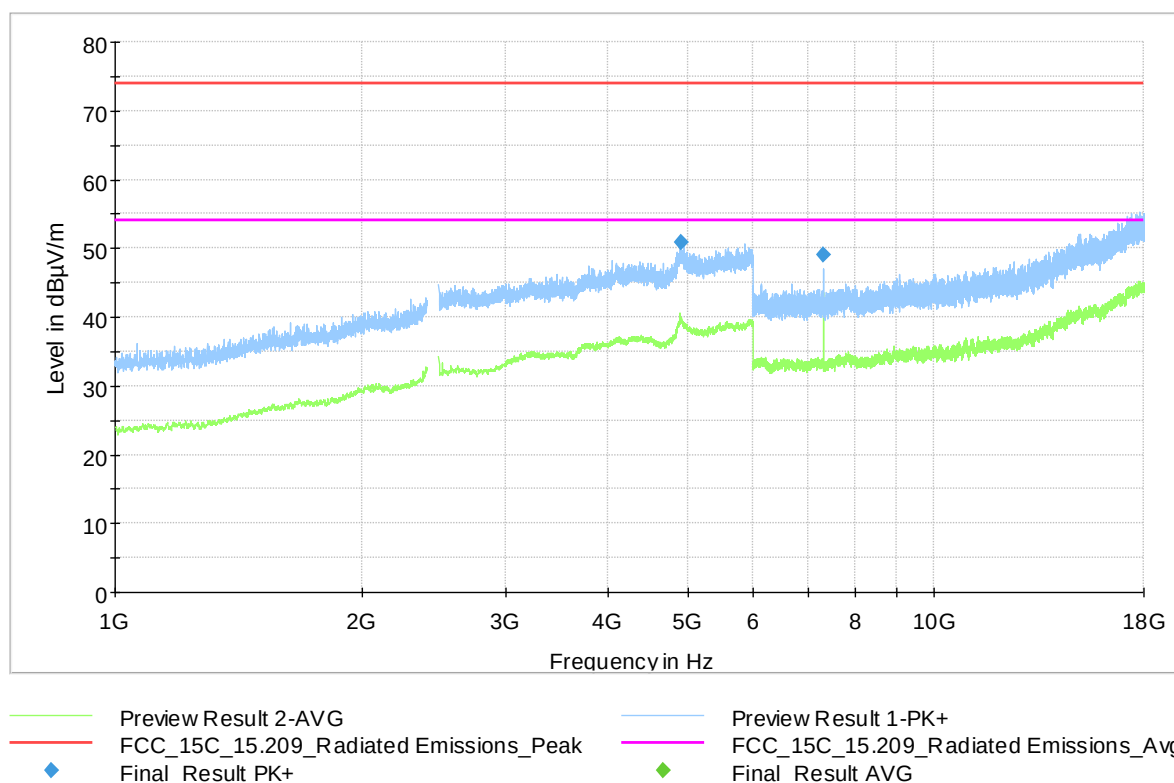
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
1101.500000	35.06	---	74.00	38.94	100.0	1000.000	150.0	V	1.0	0.0	-7.7
1102.228571	35.65	---	74.00	38.35	100.0	1000.000	150.0	V	-13.0	89.0	-7.7
1102.228571	---	25.72	54.00	28.28	100.0	1000.000	150.0	V	202.0	84.0	-7.7
3987.831250	48.94	---	74.00	25.06	100.0	1000.000	150.0	V	234.0	84.0	5.8
5411.676250	48.90	---	74.00	25.10	100.0	1000.000	150.0	V	116.0	293.0	9.7

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– 1-18 GHz, 2410 MHz



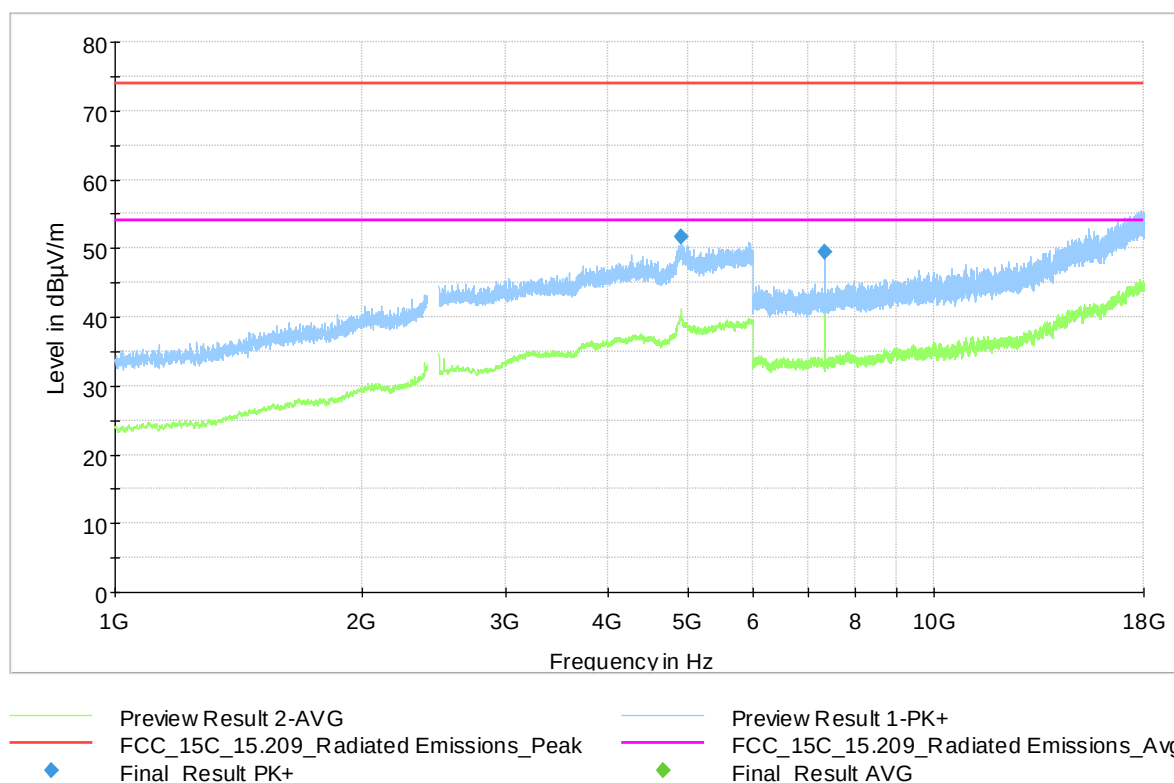
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
4898.107500	50.95	---	74.00	23.05	100.0	1000.000	150.0	V	107.0	73.0	10.3
7320.022500	49.06	---	74.00	24.94	100.0	1000.000	150.0	V	118.0	42.0	-3.5

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– 1-18 GHz, 2452 MHz



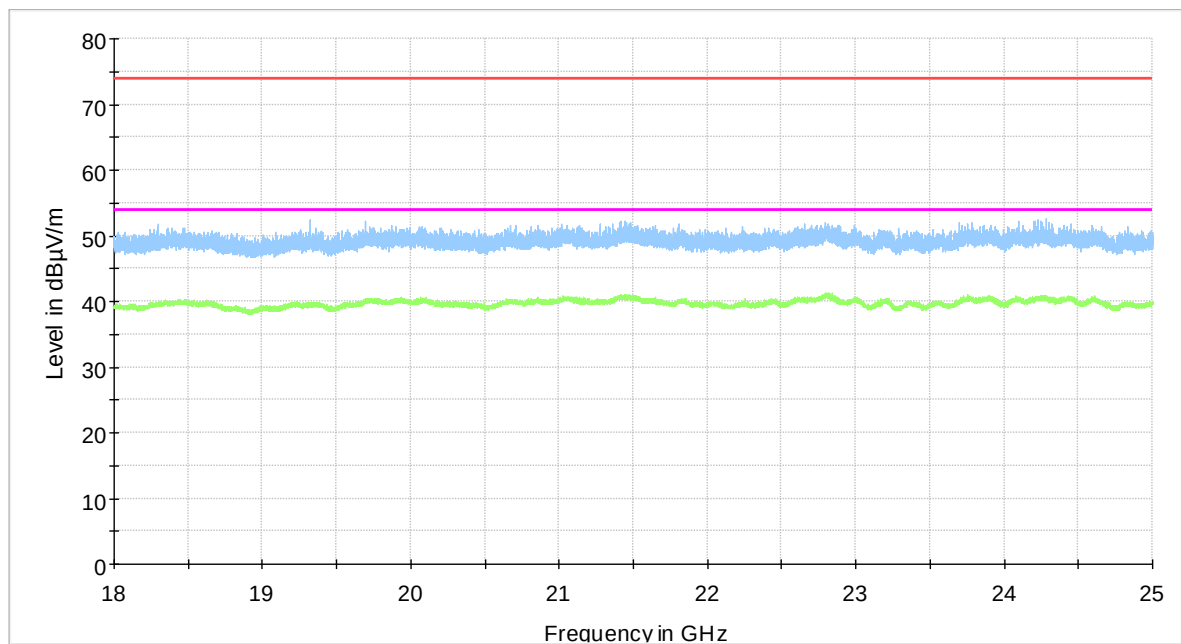
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
4904.655000	51.59	---	74.00	22.41	100.0	1000.000	150.0	V	120.0	95.0	10.3
7355.761458	49.49	---	74.00	24.51	100.0	1000.000	150.0	V	82.0	42.0	-3.5

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– 18-25 GHz, 2404 MHz



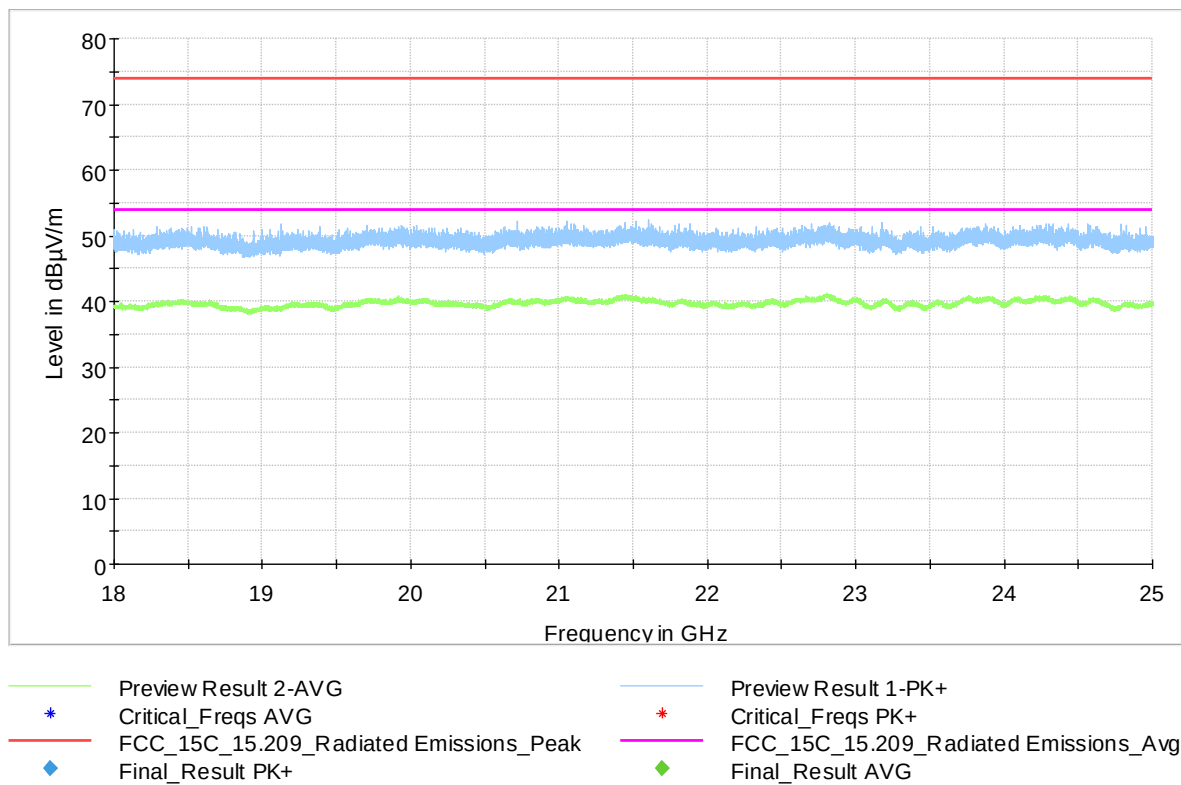
Preview Result 2-AVG	Preview Result 1-PK+
* Critical_Freqs AVG	* Critical_Freqs PK+
— FCC_15C_15.209_Radiated Emissions_Peak	— FCC_15C_15.209_Radiated Emissions_Avg
◆ Final_Result PK+	◆ Final_Result AVG

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– 18-25 GHz, 2410 MHz

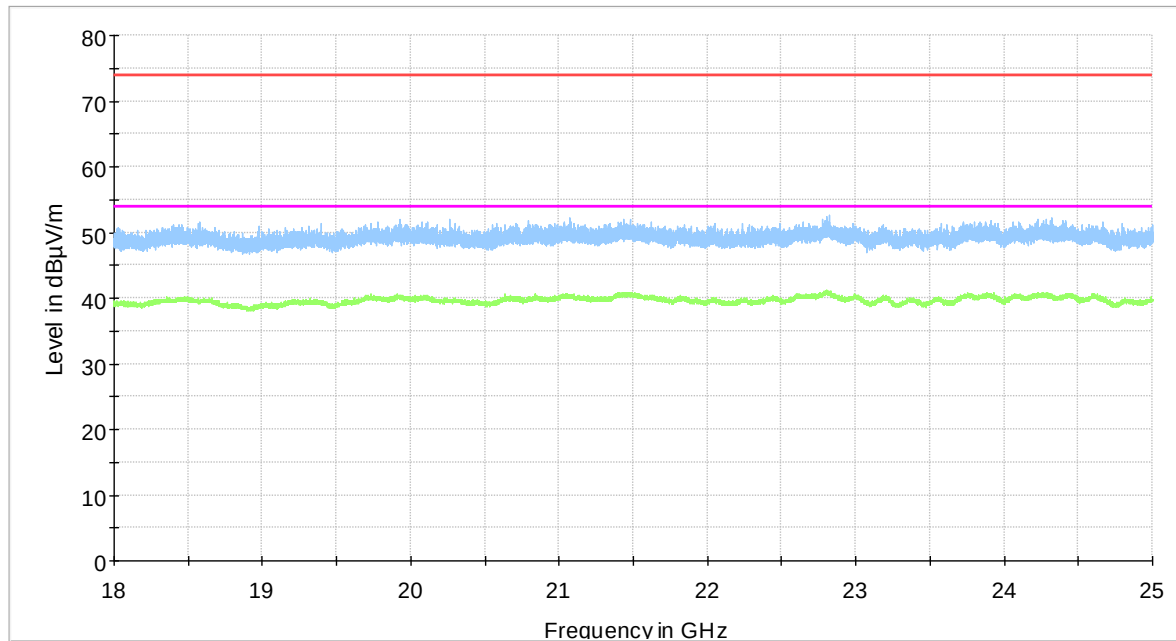


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– 18-25 GHz, 2452 MHz



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

Final test result

Pass

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Fotodokumentation
Photo documentation

5 Test Setup Photo

Photos see Appendix to this report (Appendix B to DE21G86O 002)

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Liste der verwendeten Prüfmittel
List of used test equipment

6 Equipment List

6.1 Hardware

Prüfmittel <i>Test equipment</i>		Prüfmittel-Nr. / <i>ID-Nr.</i> <i>Equipment No.</i> <i>/ ID-No.</i>	Letzte <i>Kalibrierung</i> <i>Last calibration</i>	Nächste <i>Kalibrierung</i> <i>Next calibration</i>
Test System TS8997: Power Meter: OSP-B157 Spectrum Analyzer: FSV-30	Rohde & Schwarz	2728871	08.2020	08.2022
Fully Anechoic Room	Albatross Projects GmbH	2959749	10.2018	10.2021
RSE-Filtersystem	Rohde & Schwarz	9002802	12.2019	01.2022
Signal Analyser UXA N9041B	Keysight	2971644	02.2020	03.2022
Antenna HF907	Rohde & Schwarz	2856263	09.2021	09.2024
Antenna, Double Ridged Horn Antenna 3116C-PA	ETS LINDGREN	2900393	10.2020	10.2022
Antenna HFH 2	Rohde & Schwarz	2728893	07.2021	07.2024
Semi-Anechoic Chamber 30-1000 MHz	Siemens	2729645	06.2020	06.2022
Antenna VULB 9168	Schwarzbeck	2728787	09.2019	09.2022
Receiver ESU 8	Rohde & Schwarz	2728844	12.2020	12.2021

6.2 Software

Test Software	Developer	Version
EMC32	Rohde & Schwarz	10.60.20
BAT-EMC	NEXIO	3.20.0.17

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Änderungsverzeichnis
Change history

7 Change History

Revision Number	List of revisions	Date of issue
DE21G86O 001	Initial Release	16.09.2021
DE21G86O 002	Change of IC and FCC ID	25.10.2021
Note: Latest revision report will replace all previous reports.		

Ende des Prüfberichts
End of Test Report