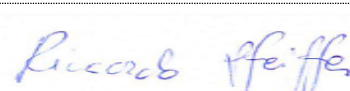


RAPPORTO DI PROVA

TEST REPORT

Rif. / Ref. n.	FCCTR_179148-2	Data Emissione / Issue Date:	25/01/2024	Pagine / Pages:	60
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Scopo delle prove <i>Test object</i>	Prove di tipo in accordo alla Norme <i>Type test according to Standards</i> 47 CFR FCC part 15 - Subpart C - §15.247; RSS-247 Issue 2:2017				
Richiedente <i>Applicant</i>	Meta System S.p.A. Via Galimberti 9 - 42124 Reggio Emilia – Italy Tel.: +39 0522364256				
Marchio commerciale <i>Trade mark</i>					
Fabbricante <i>Manufacturer</i>	Meta System S.p.A.				
Prodotto <i>Product</i>	MotorCycle Alarm				
Modello testato <i>Testing model</i>	DEF.COM 3.2 B				
Identificativo FCC/IC <i>FCC/IC ID</i>	FCC ID: P3ODEF3 IC ID: 4429A-DEF3				
Data ricevimento campioni <i>Date of test samples receipt</i>	21/01/2022				
Campioni verificati <i>No. of tested samples</i>	3 – Sampled by the manufacturer				
Data verifiche <i>Testing date</i>	From 24/01/2022 to 01/02/2022				
Conformity Assessment Body <i>Identifier (CABID)</i>	IT0005				
Identificativo FCC del sito di prova <i>FCC designation number</i>	IT0012				
Sito di prova <i>Testing site</i>	PRSLAB S.r.l. Unipersonale - Via Campagna 92 - 22020 Faloppio - Como - Italy				
Esito delle valutazioni <i>Assessment results</i>	CONFORME / COMPLIANT				
Verifiche effettuate da <i>Verifications carried out by</i>	Daniele AOSANI Tecnico Laboratorio <i>Laboratory Engineer</i>				
Approvato <i>Approved by</i>	Riccardo PFEIFFER Responsabile Laboratorio <i>Laboratory Manager</i>				

I risultati delle prove riportati nel presente rapporto di prova si riferiscono solo ai campioni esaminati. *The test results reported in this test report shall refer only to the samples tested. Il campione è stato fornito dal cliente ed i risultati si riferiscono al campione così come ricevuto. The sample has been provided by the customer and the results apply to the sample as received. Questo Report non può essere riprodotto in modo parziale, salvo espressa autorizzazione scritta da parte del Laboratorio. This report may not be partially reproduced, except with the prior written permission of the issuing Laboratory*

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0. RELEASE CONTROL RECORD

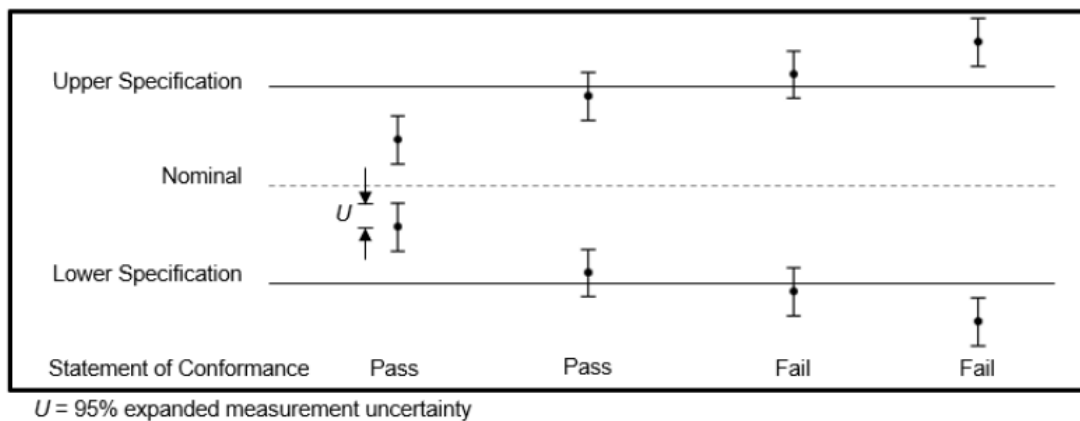
TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
FCCTR_179148-0	Original release	12/04/2022
FCCTR_179148-1	Some editorial changes at pag. 1,11,14,16,18,20,23,27,38	22/01/2024
FCCTR_179148-2	Some editorial changes at pag. 12,18	25/01/2024

This document is valid in last revision that deletes and replaces the previous one

1. DECISION RULE

PRS LAB specifies that, if the decision rules of conformity of the test results are not indicated in detail in the standard/s object of tests, it takes as a decision rule for the declaration of conformity the simple binary system ($w = 0$) stated in the ILAC-G8-09:2019 document.

The decision rule is applicable for all parts of standard



Statements of conformity are reported as:

- Pass: the measured value is below the acceptance limit, $AL=TL$.
- Fail: the measured value is above the acceptance limit, $AL=TL$.

Definitions

- Guard Band (w): interval between a tolerance limit and a corresponding acceptance limit where length $w=|TL-AL|$.
- Tolerance Limit (TL) (Specification Limit): specified upper or lower bound of permissible values of a property.
- Acceptance Limit (AL): specified upper or lower bound of permissible measured quantity values.

2. INFORMATION PROVIDED BY CUSTOMER

- None

3. GENERAL REMARKS

- None

4. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

4.1 EUT Identification

DESCRIPTION	MotorCycle Alarm
MODEL NAME	DEF.COM 3.2 B
FCC IDENTIFICATION	P3ODEF3
IC IDENTIFICATION	4429A-DEF3
SERIAL NO.	Prototype
PRS LAB INTERNAL REFERENCE	BC 17/2022 1/3 – Sample CH0 BC 17/2022 2/3 – Sample CH19 BC 17/2020 3/3 – Sample CH39
TRADEMARK	
MANUFACTURER	Meta System S.p.A.
COUNTRY OF MANUFACTURER	Italy
SINGLE UNIT OR SYSTEM	Single
POWER SOURCE	Vehicle battery
POWER SUPPLY NOMINAL VOLTAGE	12 V  (Negative GND)
ABSORBED CURRENT	1,8mA
BACKUP BATTERY	Rechargeable Ni-MH Button
BACKUP BATTERY CHARACTERISTICS	7.2V - 150mAh
OPERATING TEMPERATURE	-40°C ÷ +85°C
DIMENSIONS	See photography documentation
ENVIRONMENT	☐ FIXED-USE; ☒ VEHICLE USE; ☐ PORTABLE USE
HIGHEST INTERNAL FREQUENCY	☐ <108MHz; ☐ 108MHz<F<500MHz; ☐ 500MHz<F<1GHz; ☒ F>1GHz; F = 2480MHz

4.2 Bluetooth Low Energy module technical data

MODULE MANUFACTURER	 TEXAS INSTRUMENTS
MODULE TYPE	CC2642R
ETS CATEGORY	Bluetooth Low Energy
FREQUENCY BAND	2400 ÷ 2483.5MHz
NUMBER OF CHANNELS	40
CHANNEL BANDWIDTH	2MHz
CHANNEL SEPARATION	2MHz
TRANSFER RATE	2Mbps
SENSITIVITY	-97dBm
TYPE OF MODULATION	GFSK
ANTENNA TYPE	PCB printed
ANTENNA GAIN	1.9 dBi

4.2.1 Channel List Bluetooth Low Energy

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

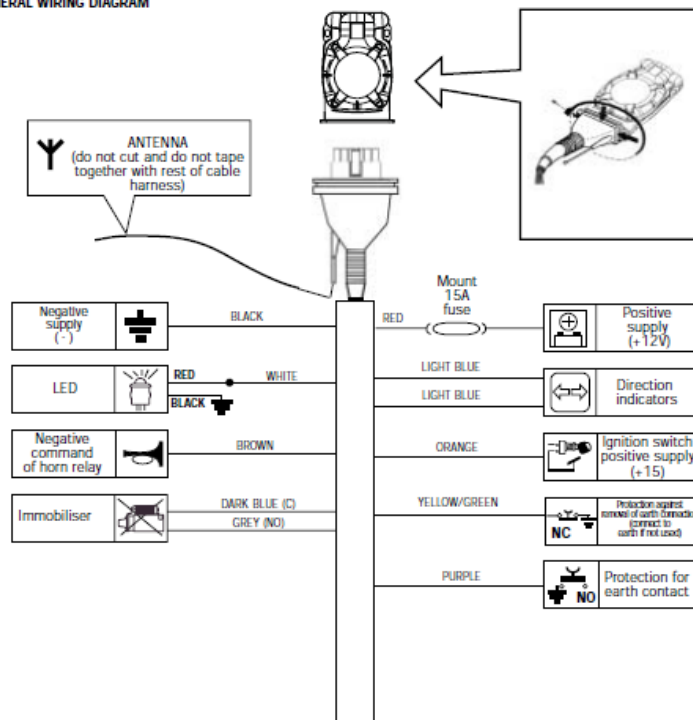
4.3 Ports identification

PORT	DESCRIPTION	CONNECTION	NOTES
☒ Enclosure	Plastic	Screw	---
☐ AC Power input	Port not present	---	---
☒ DC Power input	12Vdc	Cable	>3mt
☒ Signal/Control port	See table bellow	Cable	>3mt
☐ Telecomm. port	Port not present	---	---
☒ Antenna Port	External PCB printed	Cable ---	---

Note:

During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.

Fig.1 GENERAL WIRING DIAGRAM



4.4 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test:

- None

4.5 Auxiliary equipment

- None

5. REFERENCE STANDARDS

CODE OF FEDERAL REGULATIONS	DESCRIPTION
Title 47 Part 15 Subpart B § 15.247	Radio Frequency Devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
RSS Gen Issue 5:2018 + A1:2019 + A2:2021	General Requirements for Compliance of Radio Apparatus
RSS 247 Issue 2:2017	Licence-Exempt Radio Apparatus: Category I Equipment
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices

6. OPERATING TEST MODES AND TEST CONDITIONS

In the following table there are the operating conditions adopted during tests identified by an indicator (#) at which has been referred the item “Operating condition of the equipment under test”

OPERATING CONDITION	DESCRIPTION
#1	Continuous transmission at maximum power in modulated carrier on channel 0 Sample with PRS LAB identification n° BC 17/2022 1/3
#2	Continuous transmission at maximum power in modulated carrier on channel 19 Sample with PRS LAB identification n° BC 17/2022 2/3
#3	Continuous transmission at maximum power in modulated carrier on channel 39 Sample with PRS LAB identification n° BC 17/2022 3/3

Special Test Software: Special SW supplied by the manufacturer to generate continuous transmission of the product on the desired channel.

Special Hardware Used: None

Transmitter Test Antenna: The EUT has been tested with the antenna fitted in a manner typical of normal intended use as dedicated antenna equipment as described with the test results.

7. SUMMARY OF TEST RESULTS

SUMMARY OF TEST RESULTS				
Port	Test ¹	Reference Standard	Operating Condition	Results
Antenna port	Antenna requirement	FCC Part 15 §15.203 RSS Gen Issue 5:2018 + A1:2019 + A2:2021 § 6.8	---	Compliant
	Maximum Peak Output Power	FCC Part 15 §15.247 (b)(I) RSS 247 Issue 2:2017 § 5.4(d)	#1, #2, #3	Within the limits
	6 dB Bandwidth	FCC Part 15 §15.247 (a)(II) RSS 247 Issue 2:2017 § 5.2(a)	#1, #2, #3	Within the limits
	Power Spectral Density	FCC Part 15 §15.247 (e) RSS 247 Issue 2:2017 § 5.2(b)	#1, #2, #3	Within the limits
	Band-Edge	FCC Part 15 § 15.247 (d) RSS 247 Issue 2:2017 § 5.5	#1, #3	Within the limits
	RF radiated Spurious Emissions at the Transmitter Antenna Terminal	FCC Part 15 § 15.247 (d) RSS 247 Issue 2:2017 § 5.5	#1, #2, #3	Within the limits
	Transmitter Radiated Emissions	FCC Part 15§ 15.247 (d) RSS 247 Issue 2:2017 § 5.5	#1, #2, #3	Within the limits
	Transmitter Frequency Stability	RSS Gen Issue 5:2018 + A1:2019 + A2:2021 § 6.11	#1, #2, #3	Compliant

Note: FCC classifies Bluetooth LE as a system using digital modulation techniques.

¹All tests are performed with the device in position shown in the photographic documentation.

8. UNITS OF MEASUREMENTS

Conducted EMI Data is in dB μ V; dB referenced to one microvolt
Radiated EMI Data is in dB μ V/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength,
FSM = Field Strength Measured,
A.F. = Receive antenna factor,
Gain = amplification gains and/or cable losses.

$RFS (dB\mu V/m @ 3m) = FSM (dB\mu V) + A.F. (dB/m) - Gain (dB)$

9. TEST RESULTS

ANTENNA REQUIREMENTS	10
MAXIMUM PEAK OUTPUT POWER	11
6dB CHANNEL BANDWIDTH	14
BAND EDGE	18
POWER SPECTRAL DENSITY	20
RF RADIATED SPURIOUS EMISSIONS AT THE TRANSMITTER ANTENNA TERMINAL	23
TRANSMITTER RADIATED EMISSIONS < 1GHz	27
TRANSMITTER RADIATED EMISSIONS > 1GHz	38

TEST 1.	ANTENNA REQUIREMENTS
REFERENCE DOCUMENT	RSS Gen Issue 5:2018 + A1:2019 + A2:2021 § 6.8 According to §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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sec. 15.211, Sec. 15.213, Sec. 15.217, Sec. 15.219, or Sec. 15.221. 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 Sec. 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

Antenna Requirements
The EUT has a PCB printed antenna
RESULT: COMPLIANT

TEST 2.	MAXIMUM PEAK OUTPUT POWER
REFERENCE DOCUMENT	According to §15.247(b) (I) & RSS 247 Issue 2:2017 § 5.4(d) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

• TEST LOCATION	Semi-Anechoic Chamber					
• DISTANCE OF MEASUREMENT	3m					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
	Semi-Anechoic Chamber	Siemens	B83117-D6019-T232	003-005-134/94C	02/2021	02/2022
	Horn antenna	Electro Metrics	EM-6961	100437	10/2020	10/2023
	Power Sensor	Keysight	U2022XA + U2032A	MY57030003	03/2022	03/2024
	Software EMC	Rohde & Schwarz	EMC32-E	V 8.40.0	N.A.	
• TESTED PORT	Antenna					
• TEST METHOD	ANSI C63.10:2013 section 11.9					
• FREQUENCY RANGE	Carrier					
• UNCERTAINTY OF MEASURE	Level of confidence = 95% (k=2)					
	Expanded uncertainty = 3 dB					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3

RESULT: WITHIN THE LIMITS

MEASUREMENT PARAMETER

Resolution bandwidth	1MHz
Video bandwidth	3MHz
Span	5MHz
Sweep time	Auto couple
Detector	Peak
Trace-Mode	Max. hold

TEST DESCRIPTION

Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency.

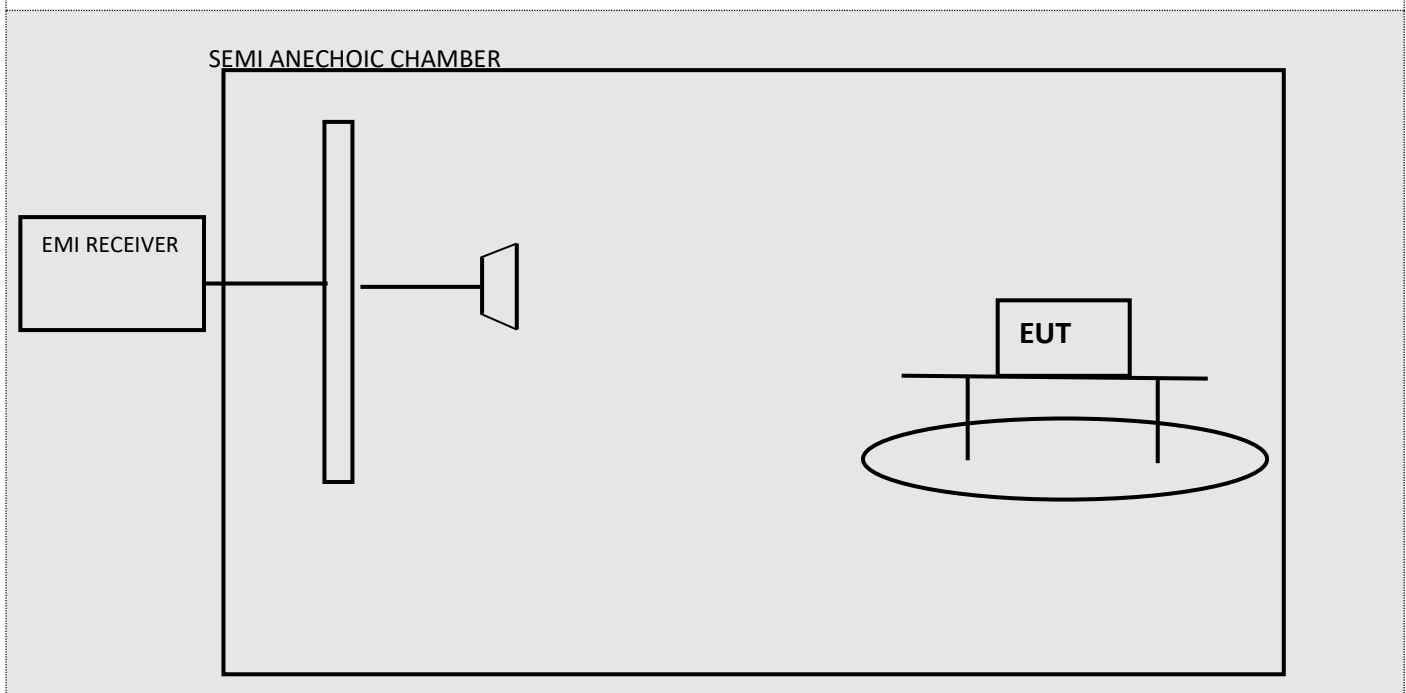
The EUT is placed at test table.

For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m

Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM



TEST RESULTS

Channel	Frequency (MHz)	EIRP (dBm)	Antenna Gain (dBi)	Max Conducted Output power (dBm)	Limit (dBm)	Result
0	2402	-6.80	1.9	-8.70	30	WITHIN THE LIMITS
19	2440	-8.12	1.9	-10.12		
39	2480	-8.10	1.9	-10.10		
Note: ---						

TEST 3.	6dB CHANNEL BANDWIDTH 99% CHANNEL BANDWIDTH
REFERENCE DOCUMENT	According to §15,247(a)(II) & RSS 247 Issue 2:2017 § 5.2(a) Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands, The minimum 6 dB bandwidth shall be at least 500 kHz.

• TEST LOCATION	Radio test area					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
• TESTED PORT	Antenna					
• TEST METHOD	ANSI C63.10:2013 section 6.9					
	ANSI C63.10:2013 section 11.8.1					
• FREQUENCY RANGE	Carrier					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3

RESULT: COMPLIANT

MEASUREMENT PARAMETER

Resolution bandwidth	100kHz
Video bandwidth	300kHz
Span	5MHz
Sweep time	Auto couple
Detector	Peak
Trace-Mode	Max. hold

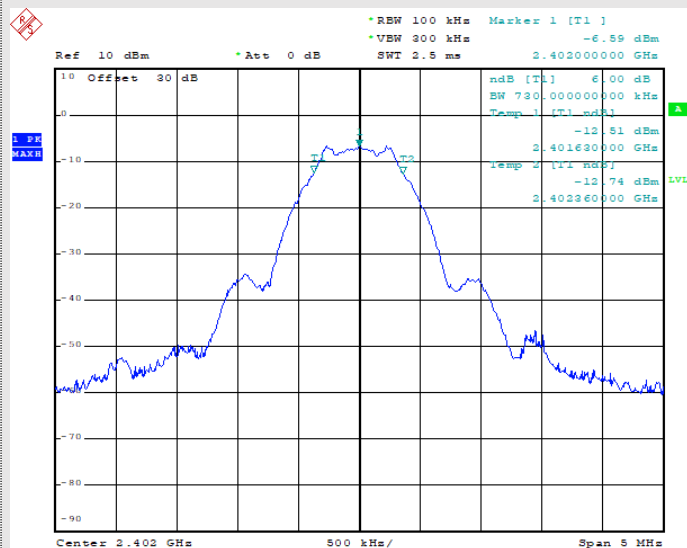
TEST DESCRIPTION

Allow the trace to stabilize.

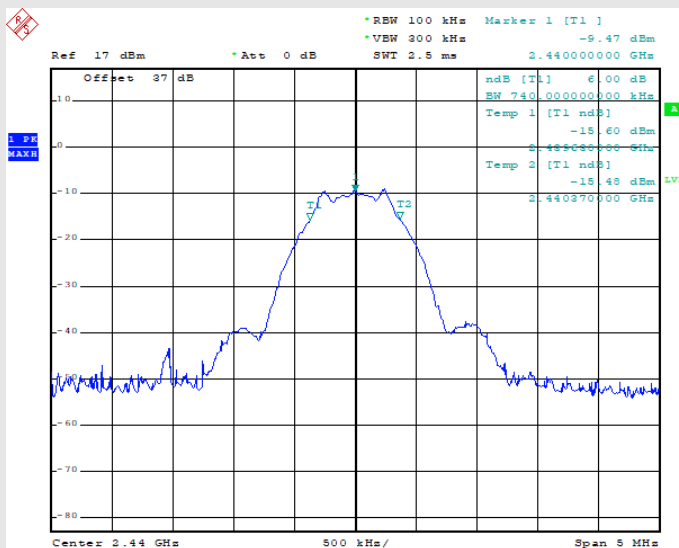
Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

TEST RESULTS – 6dB Bandwidth

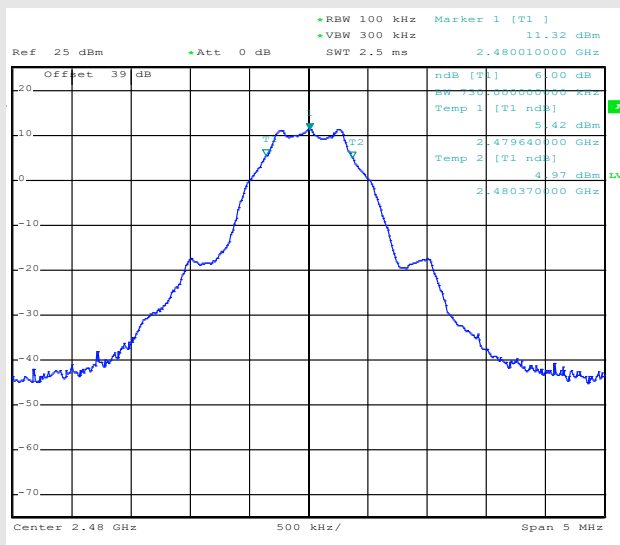
Channel: 0



Channel: 19



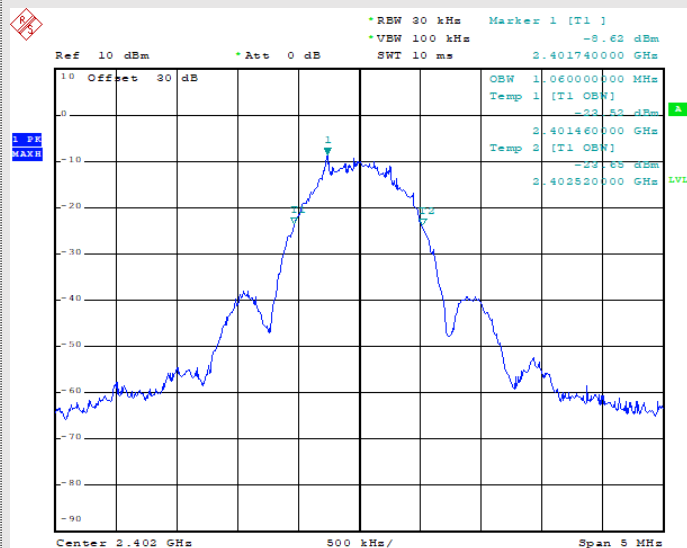
Channel: 39



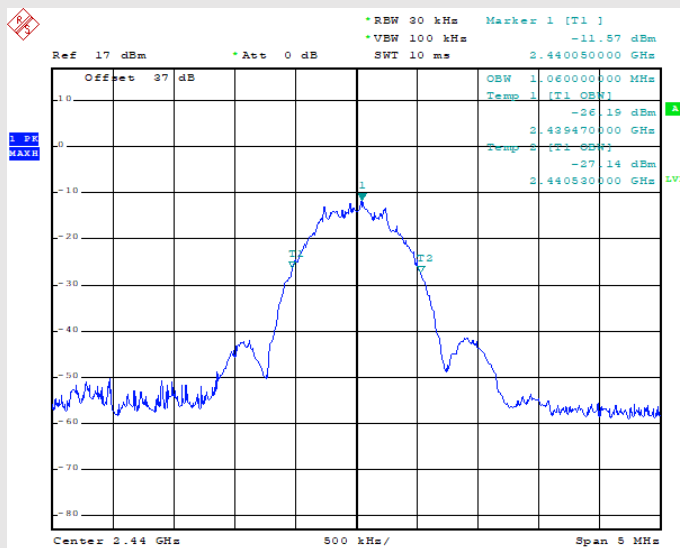
Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limits (kHz)	Result
0	2402	720	>500	COMPLIANT
19	2440	740	>500	COMPLIANT
39	2480	730	>500	COMPLIANT

TEST RESULTS – 99% Occupied Bandwidth

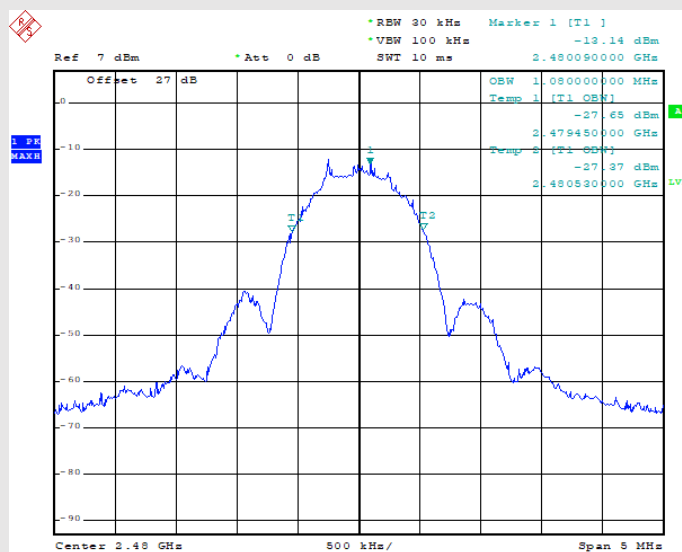
Channel: 0



Channel: 19



Channel: 39



Channel	Frequency (MHz)	99% Bandwidth (kHz)	Result
0	2402	1060	COMPLIANT
19	2440	1060	COMPLIANT
39	2480	1080	COMPLIANT

TEST 4.	BAND EDGE
REFERENCE DOCUMENT	According to §15,247(d) & RSS 247 Issue 2:2017 § 5.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Sec, 15,209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec, 15,205(a), must also comply with the radiated emission limits specified in Sec, 15,209(a) (see Sec, 15,205(c)).

• TEST LOCATION	Radio test area					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
• TESTED PORT	Antenna					
• TEST METHOD	ANSI C63.10:2013 section 6.10 ANSI C63.10:2013 section 11.13.2					
• FREQUENCY RANGE	Carrier					

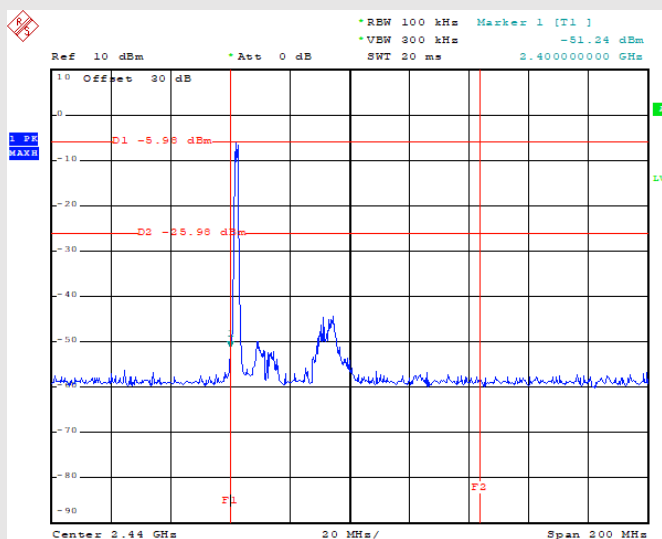
TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #3

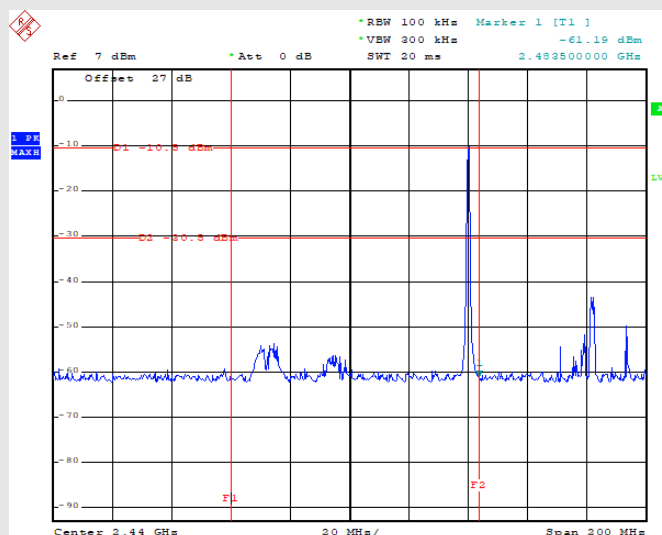
RESULT: COMPLIANT

TEST RESULTS

LOWER BAND-EDGE CH 0



UPPER BAND-EDGE CH 39



TEST 5.	POWER SPECTRAL DENSITY
REFERENCE DOCUMENT	According to §15,247) (e) & RSS 247 Issue 2:2017 § 5.2 (b) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

• TEST LOCATION	Radio test area					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
• TESTED PORT	Antenna					
• TEST METHOD	ANSI C63.10:2013 section 11.10.2					
• FREQUENCY RANGE	Carrier					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3

RESULT: COMPLIANT

MEASUREMENT PARAMETER

Resolution bandwidth	100kHz
Video bandwidth	300kHz
Span	2MHz
Sweep time	Auto couple
Detector	Peak
Trace-Mode	Max. hold

TEST DESCRIPTION

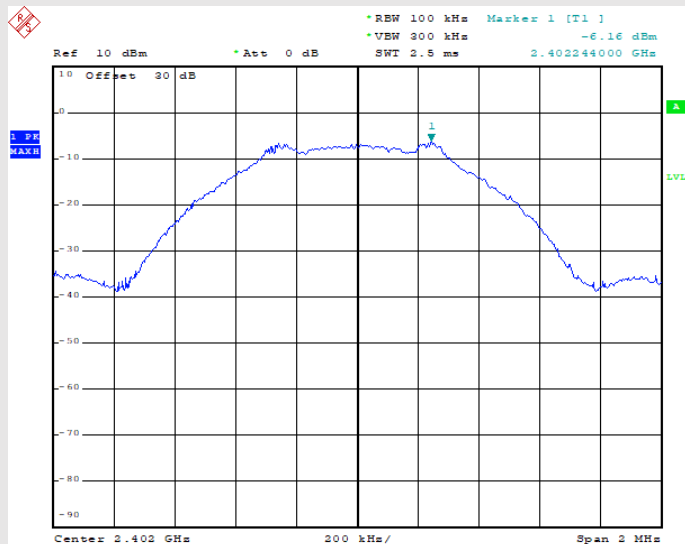
Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

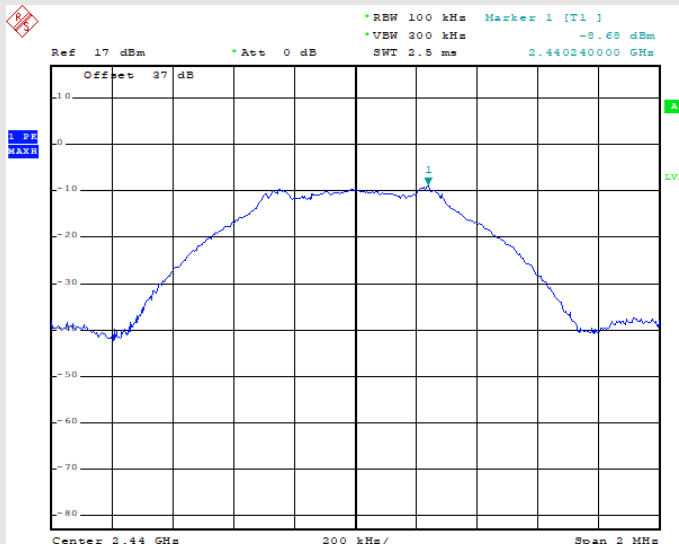
If measured value exceeds limit, reduce RBW (no less than 3 kHz or 100kHz if a RMS detector was used) and repeat

TEST RESULTS

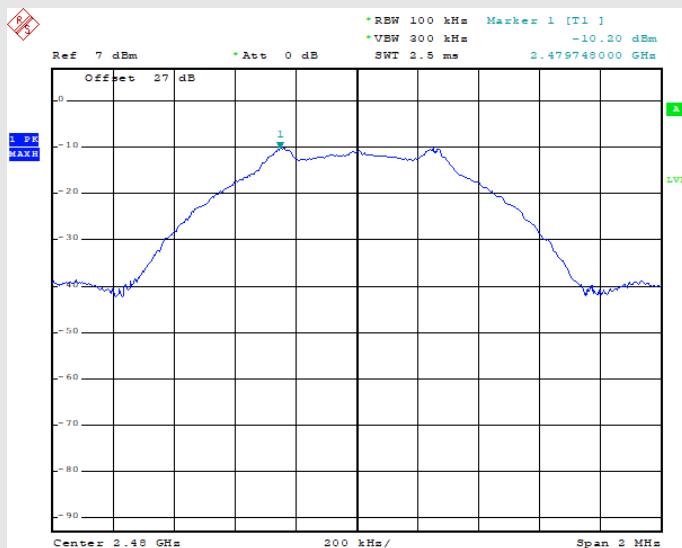
Channel: 0



Channel: 19



Channel: 39



Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)	Result
0	2402	-6.16	8	14.16	COMPLIANT
12	2426	-8.68	8	16.68	COMPLIANT
39	2480	-10.20	8	18.20	COMPLIANT

TEST 6.

RF RADIATED SPURIOUS EMISSIONS AT THE TRANSMITTER ANTENNA TERMINAL

REFERENCE DOCUMENT

According to § 15.247 (d) and § 15.209 (a) & RSS 247 Issue 2:2017 § 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 Db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 Db instead of 20 Db. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

• TEST LOCATION	Radio test area					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
• TESTED PORT	Enclosure					
• TEST METHOD	ANSI C63.10:2013 section 11.11					
• FREQUENCY RANGE	9kHz – 26GHz					
• LIMITS	Acc. To ref. Std.					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

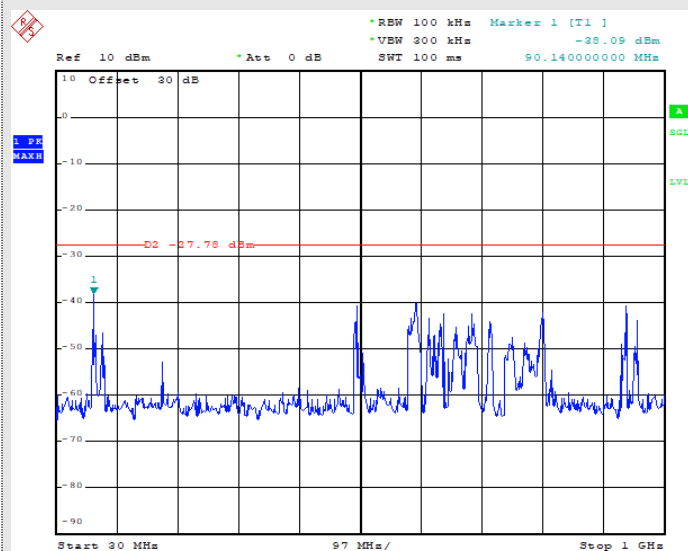
OPERATING CONDITION :#1, #2, #3

RESULT: **WITHIN THE LIMITS**

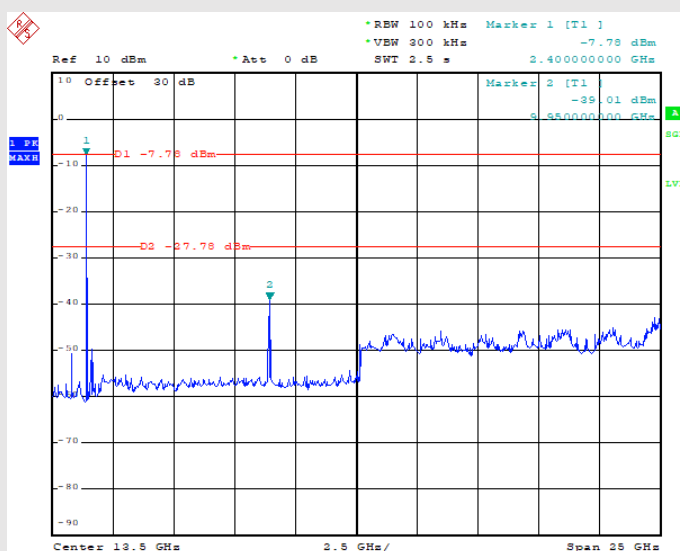
TEST RESULTS

Channel: 0

Frequency range: 30MHz – 1GHz



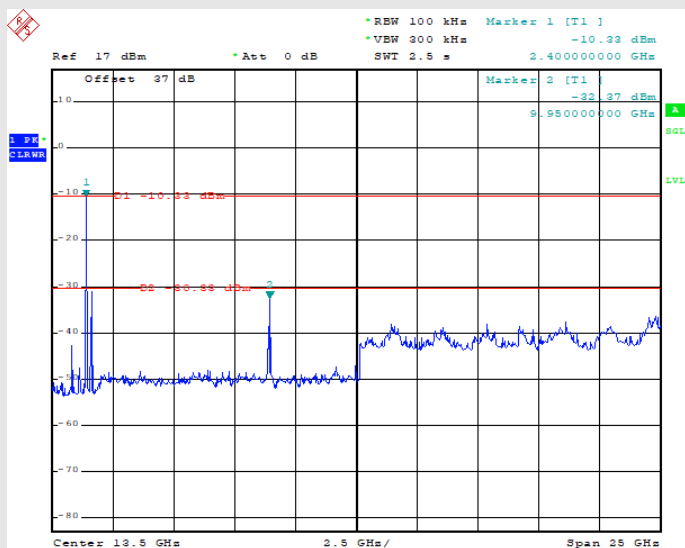
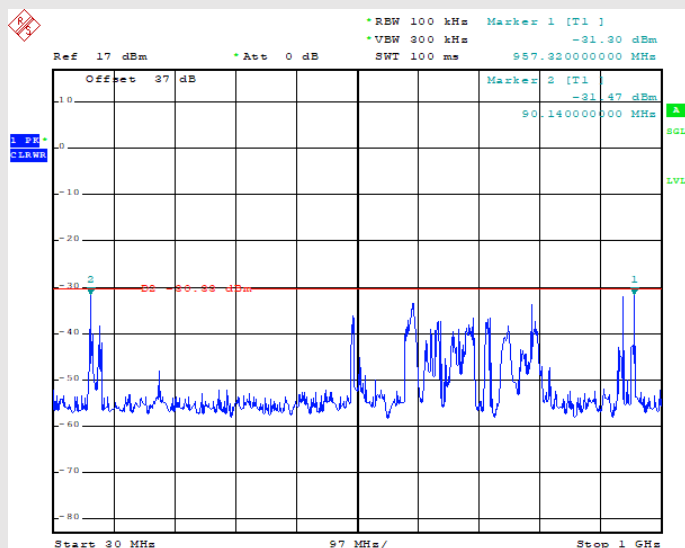
Frequency range: 1GHz – 26GHz



Channel: 19

Frequency range: 30MHz – 1GHz

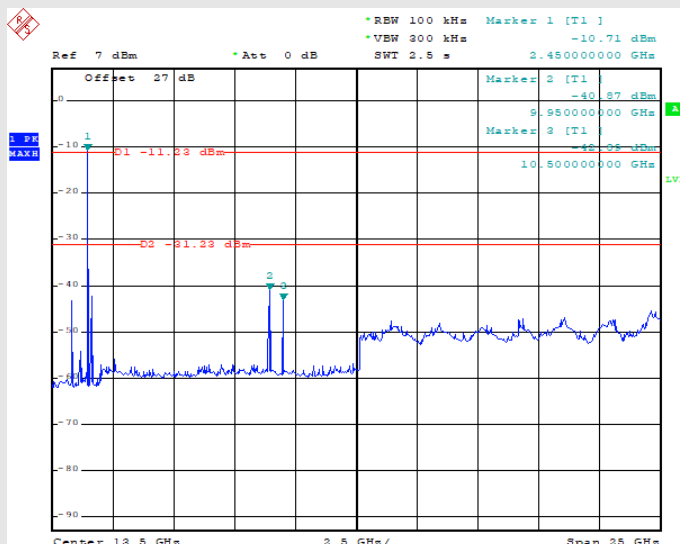
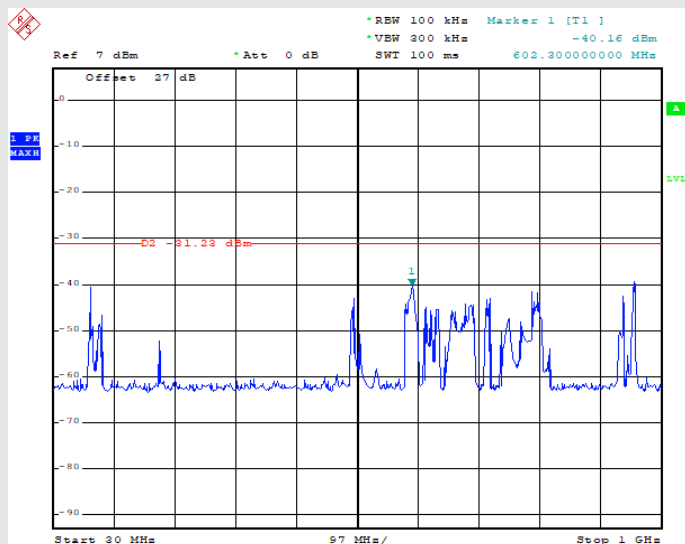
Frequency range: 1GHz – 26GHz



Channel: 39

Frequency range: 30MHz – 1GHz

Frequency range: 1GHz – 26GHz



TEST 7.	TRANSMITTER RADIATED EMISSIONS < 1GHZ
REFERENCE DOCUMENT	According to § 15.247 (d) and § 15.209 (a) & RSS 247 Issue 2:2017 § 5.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 Db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 Db instead of 20 Db. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

• TEST LOCATION	Semi-Anechoic Chamber					
• DISTANCE OF MEASUREMENT	3m					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
	Semi-Anechoic Chamber	Siemens	B83117-D6019-T232	003-005-134/94C	02/2021	02/2022
	Loop antenna	Rohde & Schwarz	HFH 2-Z2	841801/012	03/2020	03/2023
	Bi-log antenna	Chase	CBL6111C	2717	03/2019	03/2022
	Software EMC	Rohde & Schwarz	EMC32-E	V 8.40.0	N.A.	
• TESTED PORT	Enclosure					
• TEST METHOD	ANSI C63.10:2013 section 11.12.1					
• FREQUENCY RANGE	9kHz – 1GHz					
• LIMITS	Acc. To ref. Std.					
• UNCERTAINTY OF MEASURE	Level of confidence = 95% (k=2)					
	Expanded uncertainty 9kHz – 30MHz = 4,18 dB					
	Expanded uncertainty 30MHz – 1GHz = 5,72 dB					

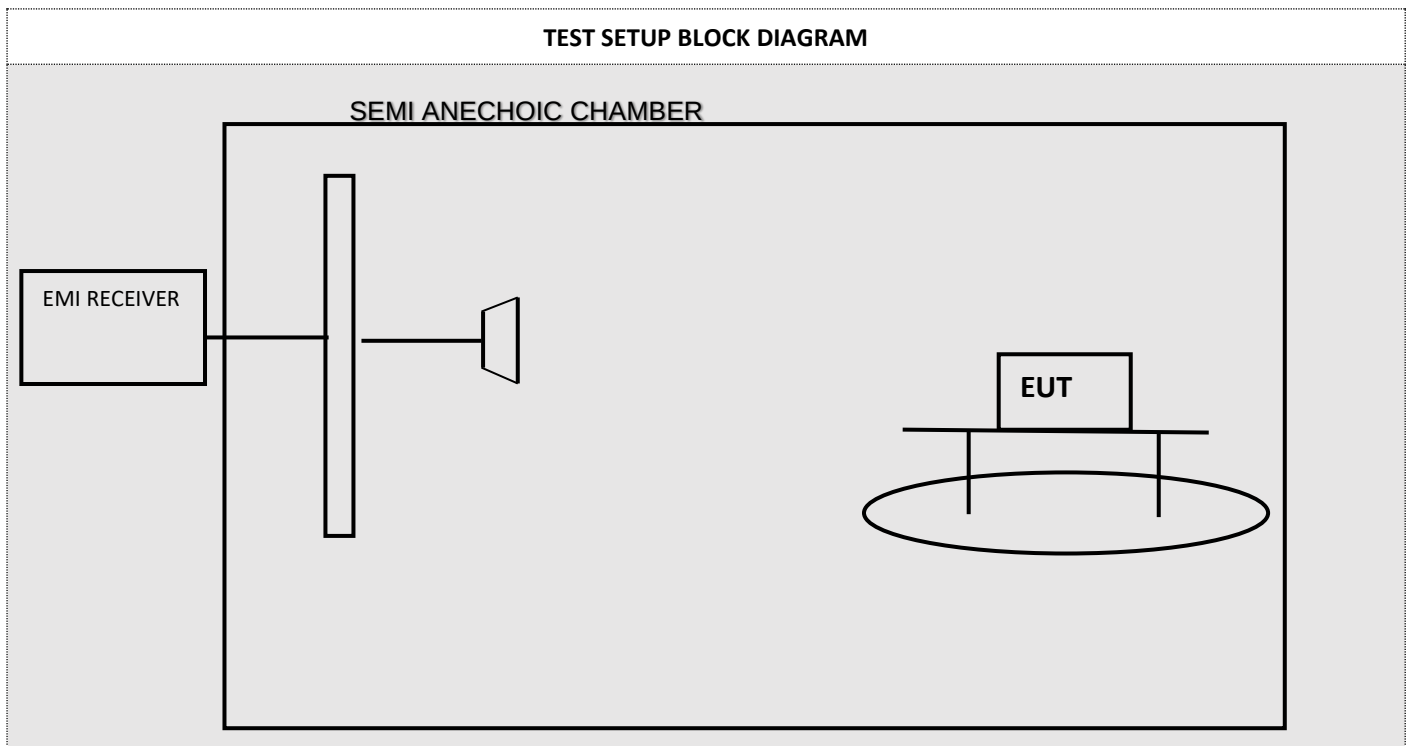
TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3

RESULT: **WITHIN THE LIMITS**

MEASUREMENT PARAMETER		
Frequency Range:	9kHz – 30MHz	30MHz – 1GHz
Resolution bandwidth:	200Hz	100kHz
Video bandwidth:	1kHz	300kHz
Span:	See plots below	See plots below
Sweep time	Auto couple	Auto couple
Detector:	Peak	Peak
Trace-Mode:	Max. hold	Max. hold

TEST DESCRIPTION
Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table height is 80 cm above the reference ground plane. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

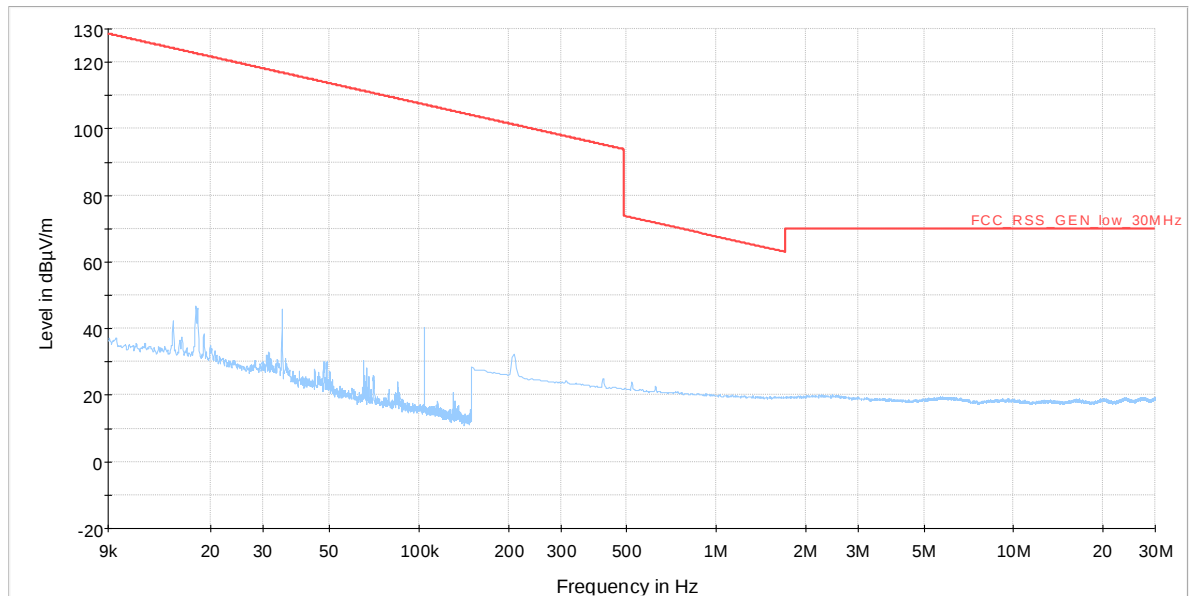


TEST RESULTS

Channel 0

RX Antenna Polarization: ---

Frequency Range: 9kHz – 30MHz

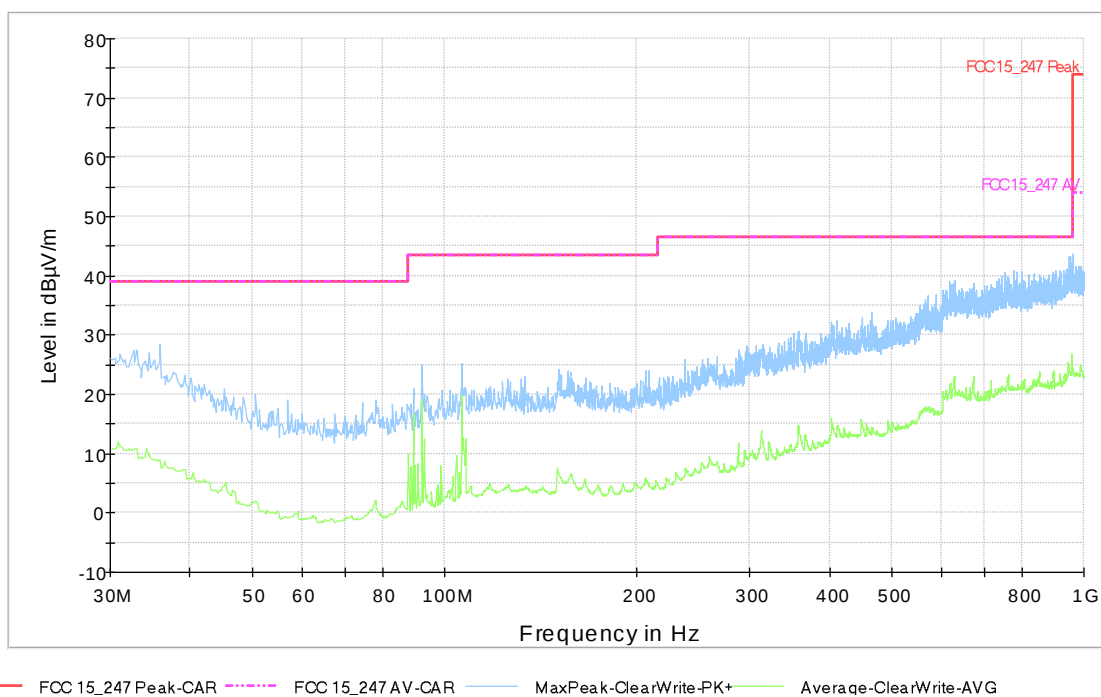


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 30MHz – 1GHz

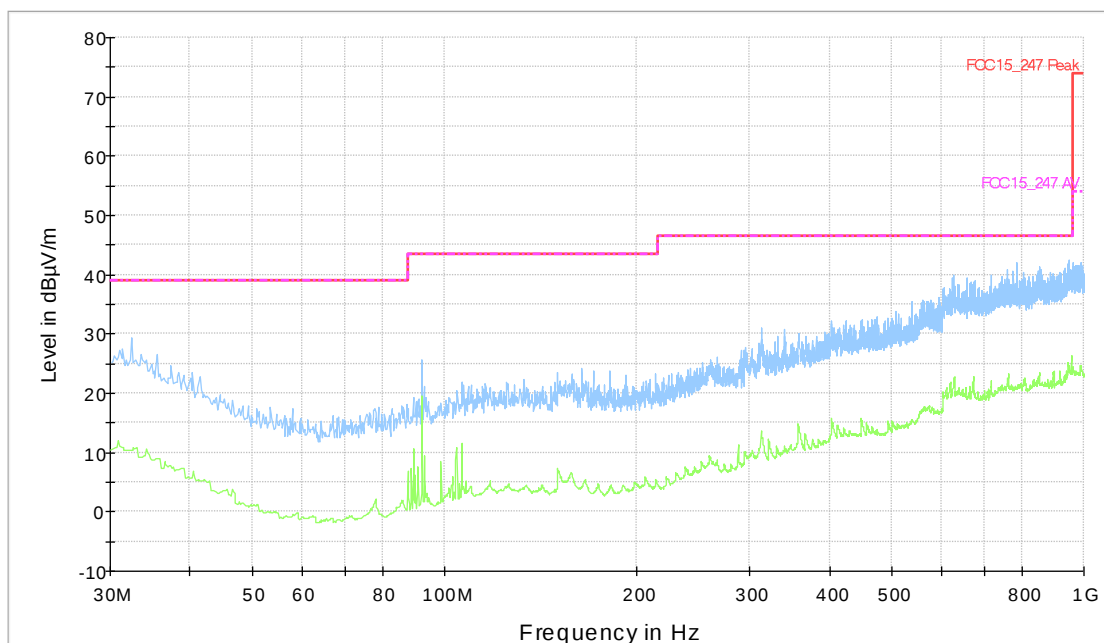


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 30MHz – 1GHz



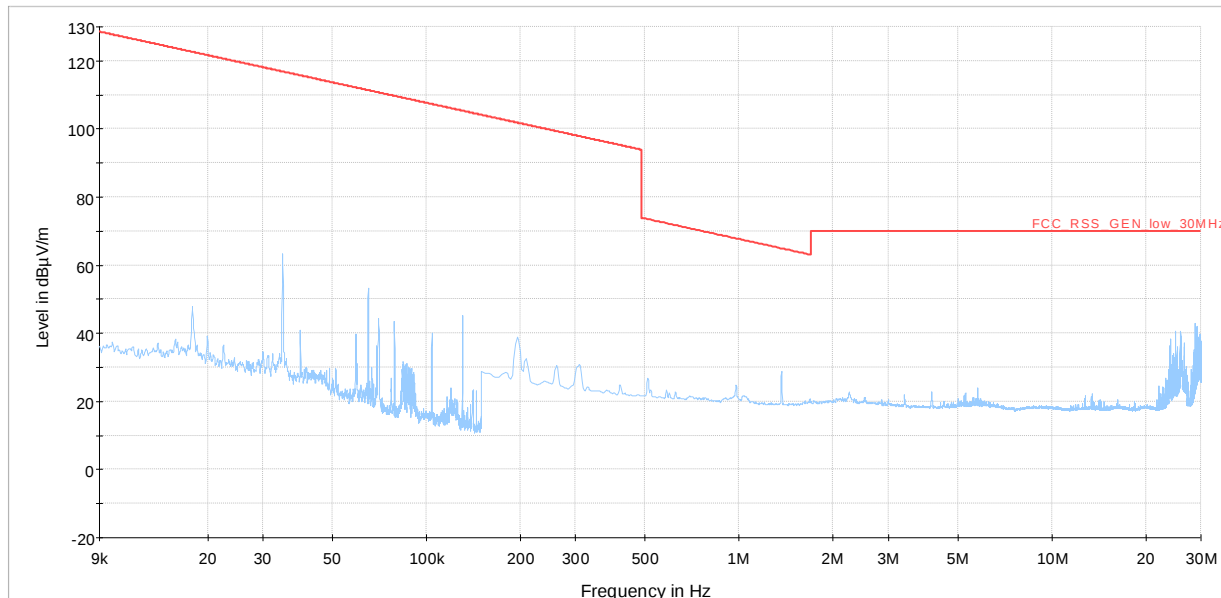
Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

Channel 19

RX Antenna Polarization: ---

Frequency Range: 9kHz – 30MHz



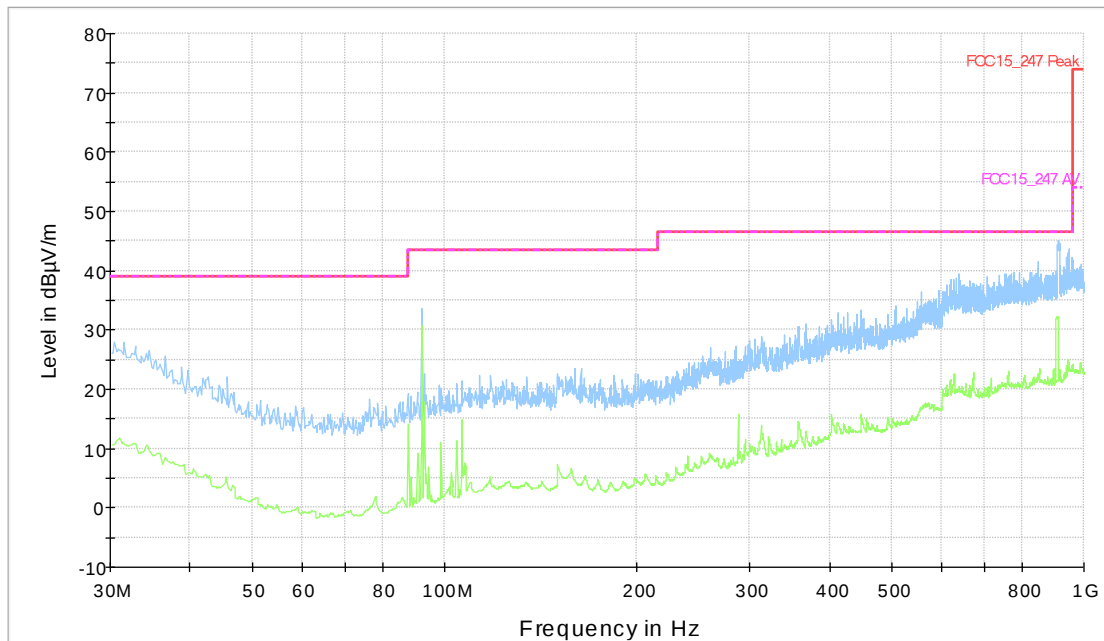
FCC_RSS_GEN_low_30MHz Average-ClearWrite-AVG

Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 30MHz – 1GHz

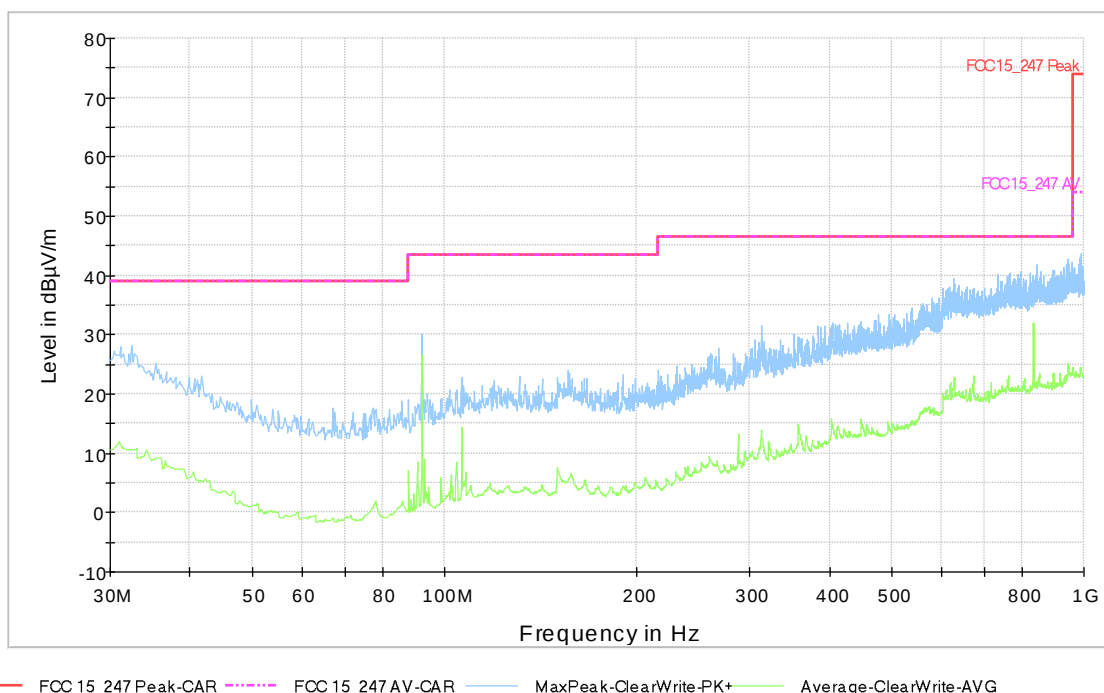


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 30MHz – 1GHz



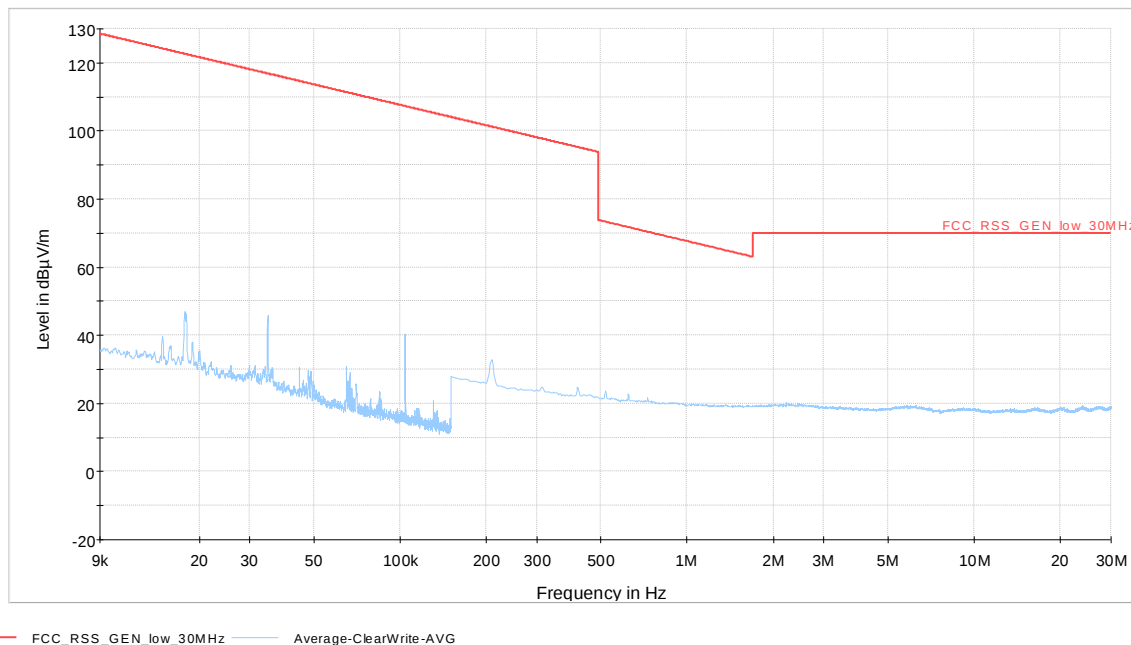
Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

Channel 39

RX Antenna Polarization: ---

Frequency Range: 9kHz – 30MHz

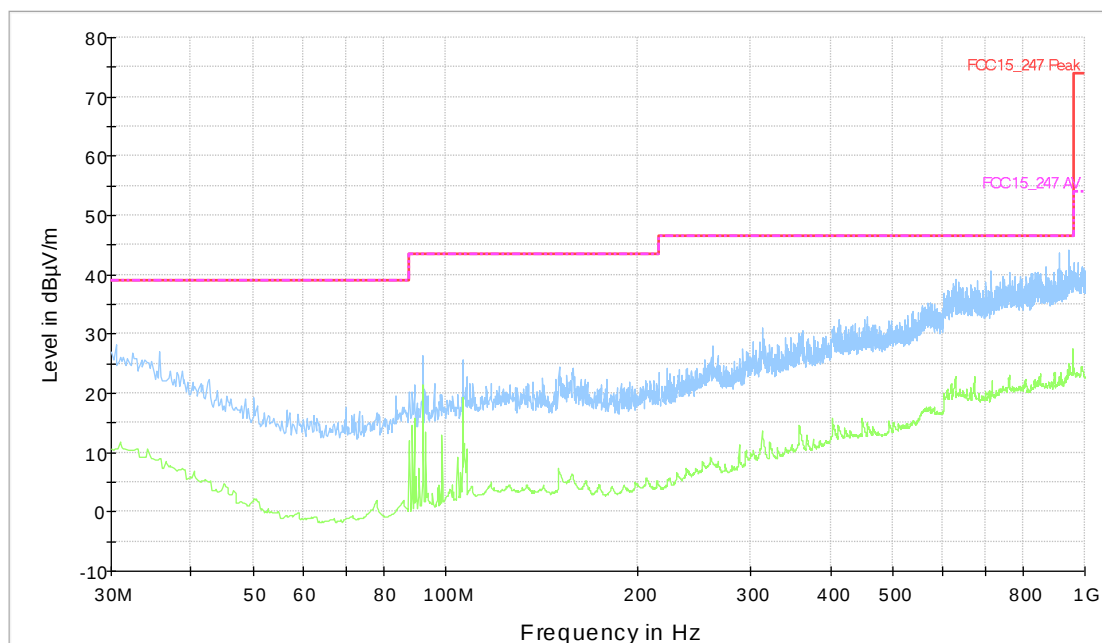


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 30MHz – 1GHz



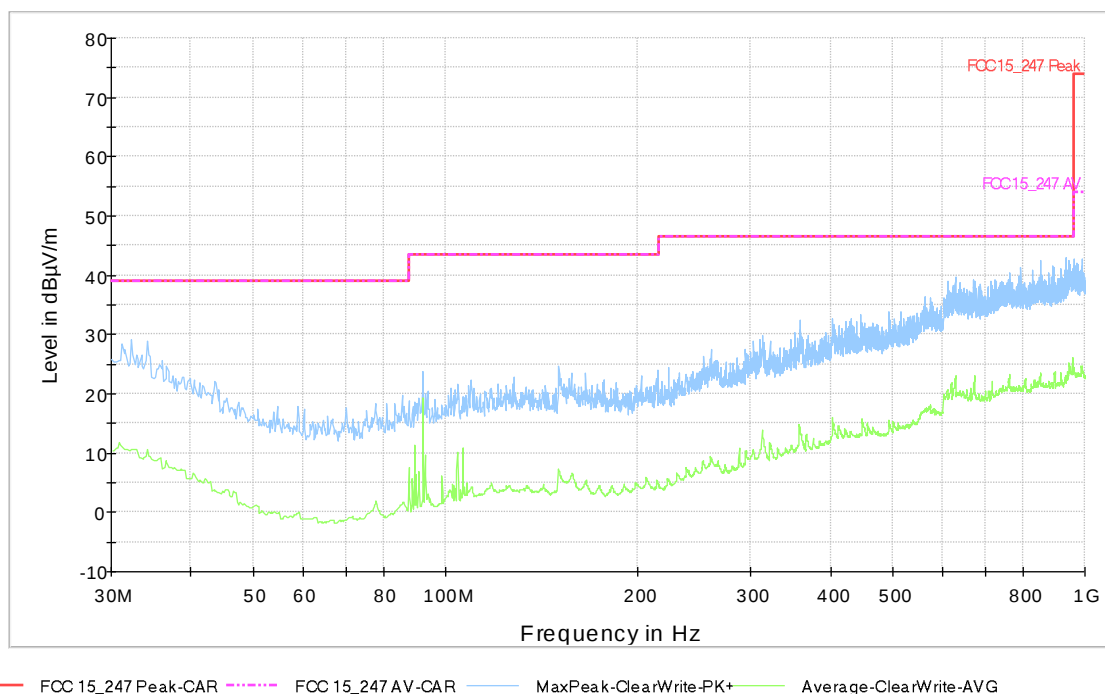
FOC 15_247 Peak-CAR FOC 15_247 AV-CAR MaxPeak-ClearWrite-PK+ Average-ClearWrite-AVG

Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 30MHz – 1GHz



Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

TEST 8.

TRANSMITTER RADIATED EMISSIONS > 1GHZ

REFERENCE DOCUMENT

According to § 15.247 (d) and § 15.209 (a) & RSS 247 Issue 2:2017 § 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 Db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 Db instead of 20 Db. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

• TEST SETUP	Acc. To ref. Std.					
• TEST LOCATION	Semi-Anechoic Chamber					
• DISTANCE OF MEASUREMENT	3m					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
	Semi-Anechoic Chamber	Siemens	B83117-D6019-T232	003-005-134/94C	02/2021	02/2022
	Horn antenna	Electro Metrics	EM-6961	100437	10/2020	10/2023
	Horn antenna + Low Noise Preamplifier	Bonn Elektronik	BLMA 1840-1A	262WL80452	04/2021	04/2023
	High pass filter	Waineright	WHK 2,8/15G	1	10/2021	10/2023
	Software EMC	Rohde & Schwarz	EMC32-E	V 8.40.0	N.A.	
• TESTED PORT	Antenna					
• TEST METHOD	ANSI C63.10:2013 section 11.12.1					
• FREQUENCY RANGE	1GHz –26GHz					
• LIMITS	Acc. To ref. Std.					
• UNCERTAINTY OF MEASURE	Level of confidence = 95% (k=2)					
	Expanded uncertainty 1GHz – 18GHz = 5,15 dB					
	Expanded uncertainty 18GHz – 26GHz = 5,82 dB					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION: #1, #2, #3

RESULT: **WITHIN THE LIMITS**

MEASUREMENT PARAMETER 1GHz - 26GHz

Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Span:	See plots below
Sweep time	Auto couple
Detector:	Peak
Trace-Mode:	Max. hold

TEST DESCRIPTION

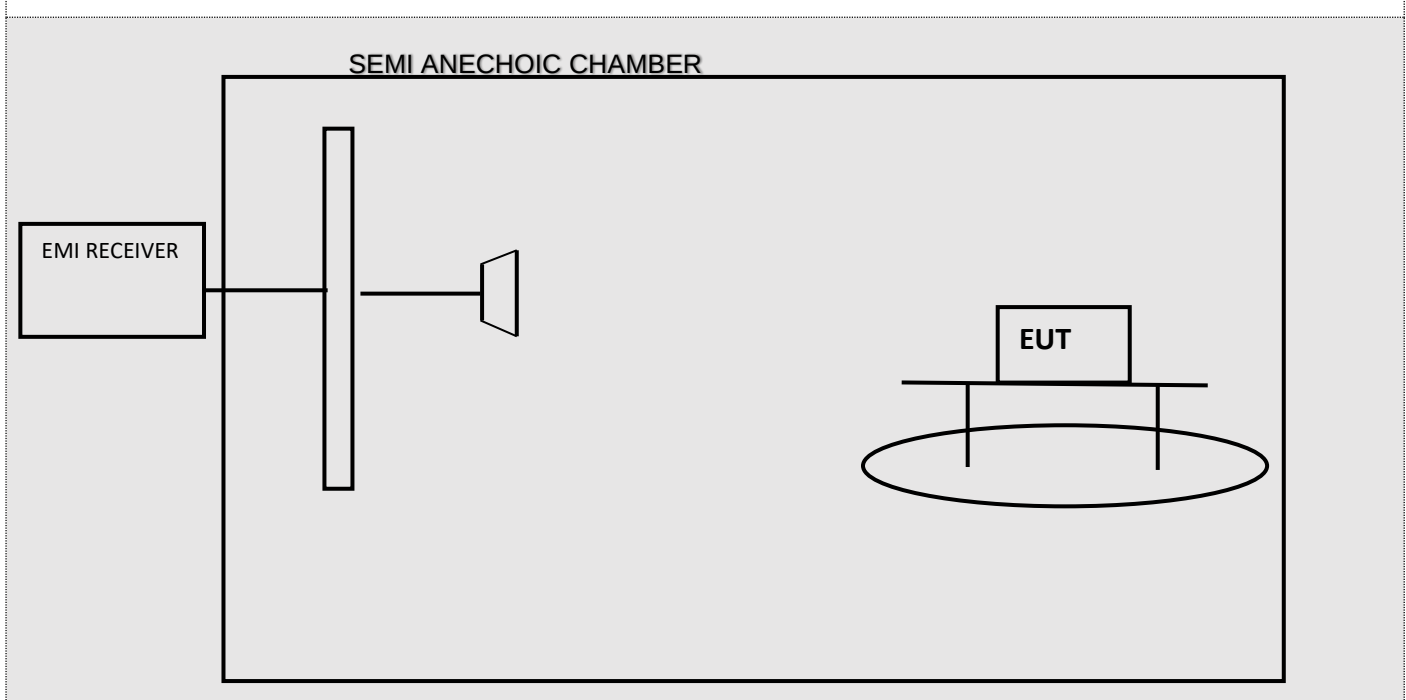
Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously - rotating, remotely - controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency.

The EUT is placed at test table height is 1.5 m

Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m~4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3m.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

TEST SETUP BLOCK DIAGRAM

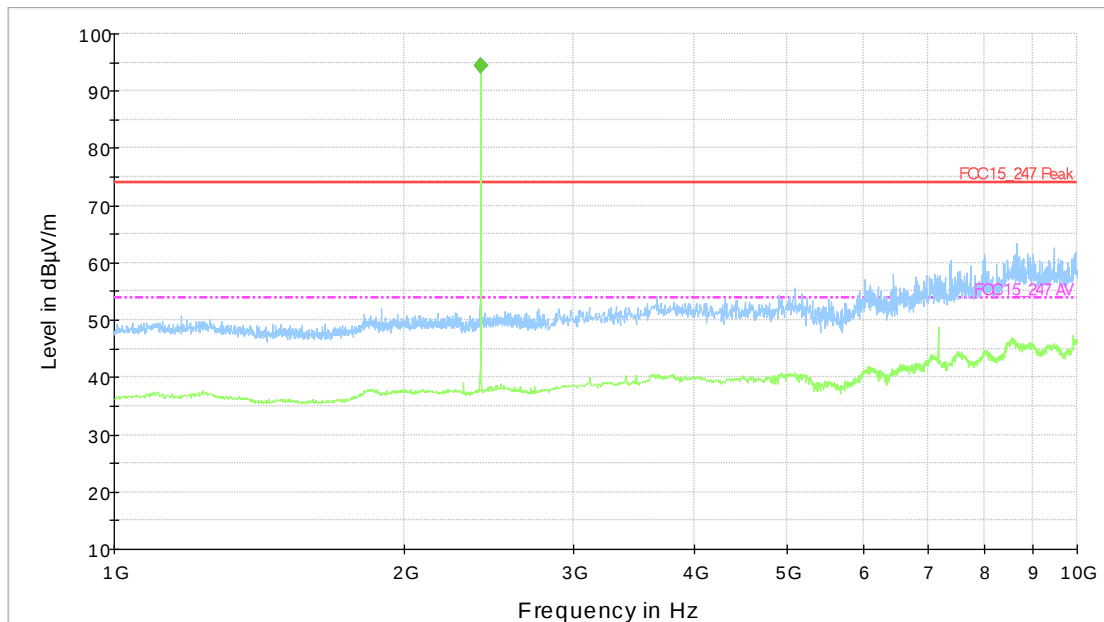


TEST RESULTS

Channel 0

RX Antenna Polarization: Vertical

Frequency Range: 1GHz – 10GHz



— FCC 15_247 Peak-CAR — FCC 15_247 AV-CAR — Preview Result 1-PK+
— Preview Result 2-AVG — Final Result 1-PK+ — Final Result 2-AVG

Final Result:

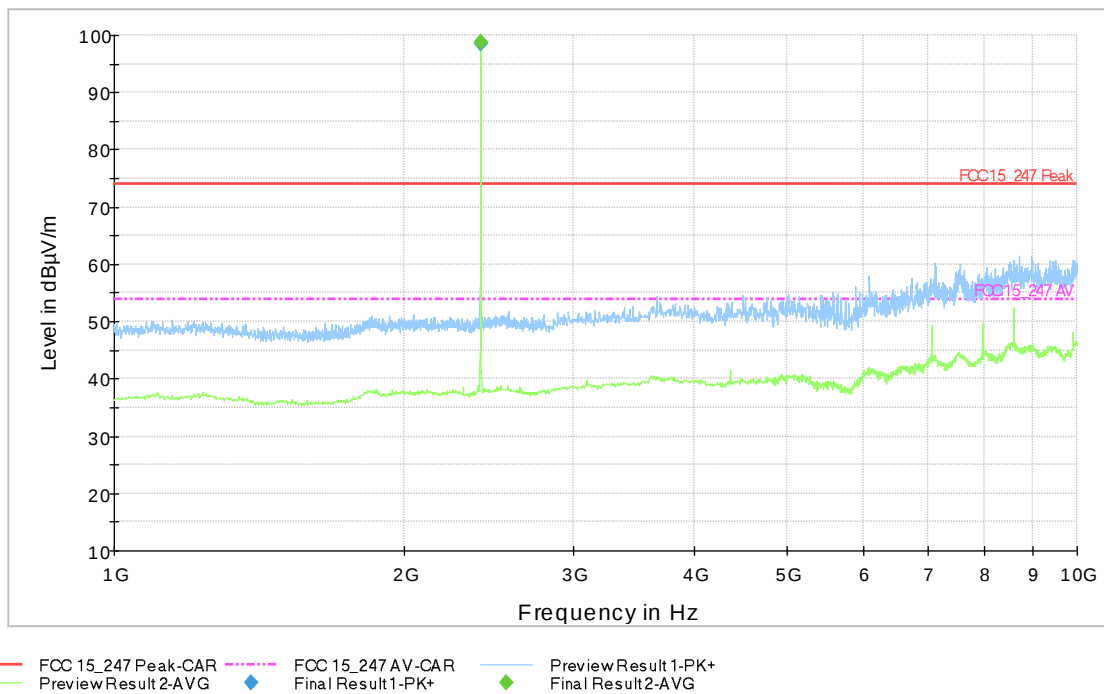
Frequency (MHz)	MaxPeak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2402.000000	94.5	126.8	172.0	-20.50	74.00

Frequency (MHz)	Average (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2402.000000	94.5	127.8	172.0	-40.50	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Horizontal

Frequency Range: 1GHz – 10GHz



Final Result:

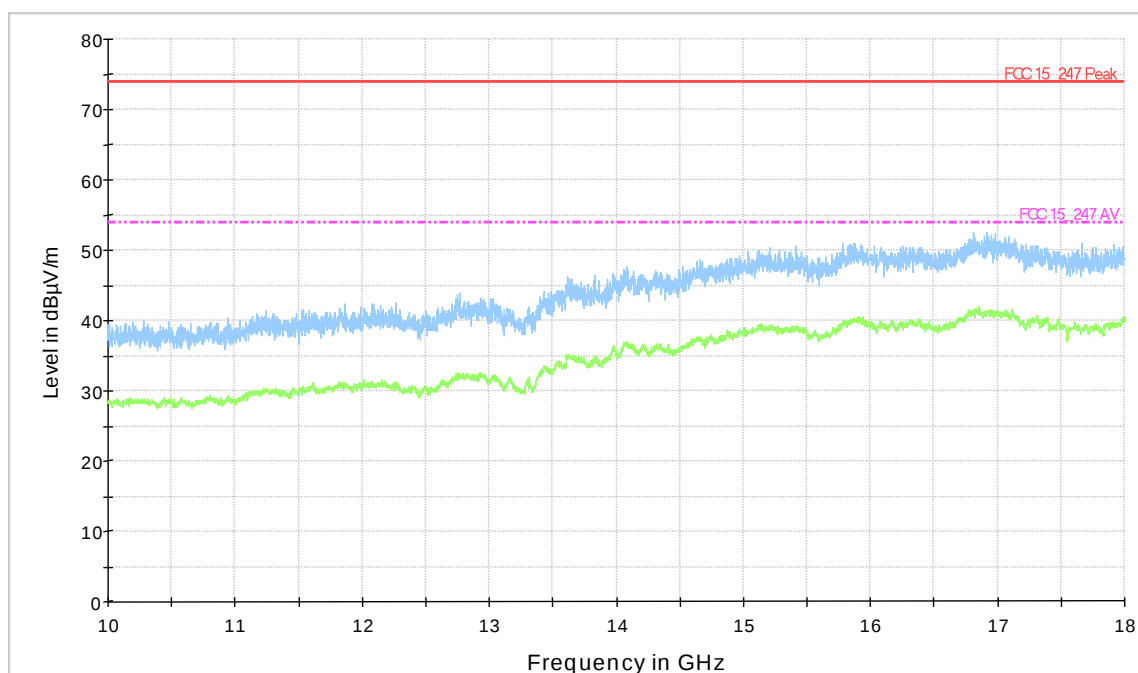
Frequency (MHz)	MaxPeak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2402.000000	98.6	254.5	180.0	-24.60	74.00

Frequency (MHz)	Average (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2402.000000	98.8	223.5	183.0	-44.80	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Vertical

Frequency Range: 10GHz – 18GHz

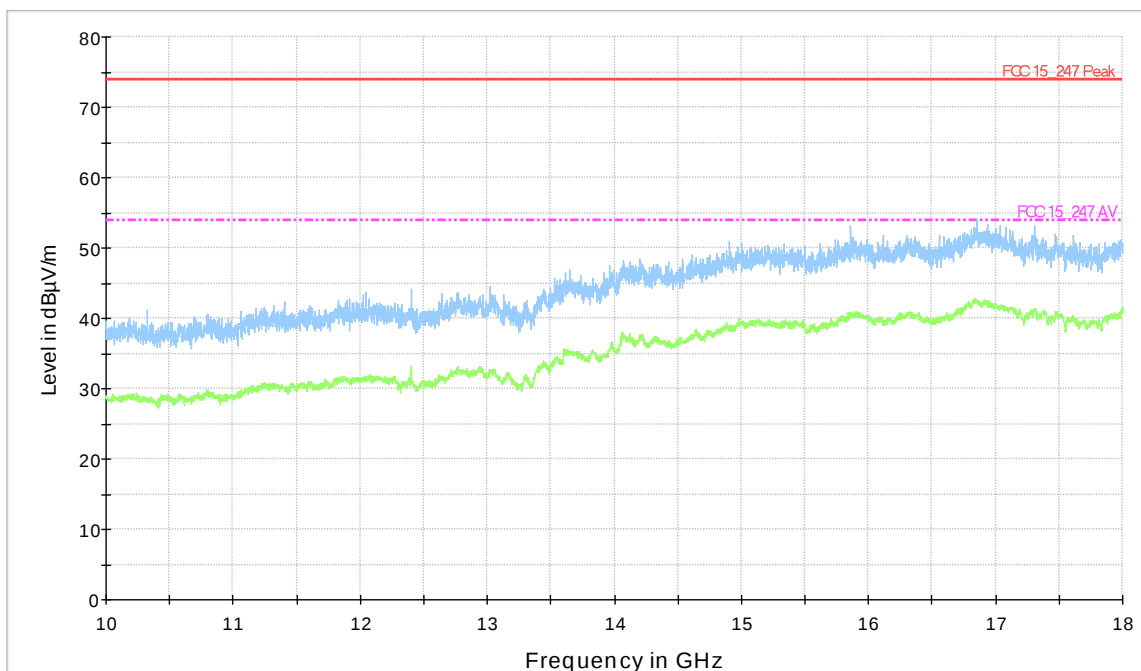


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 10GHz – 18GHz

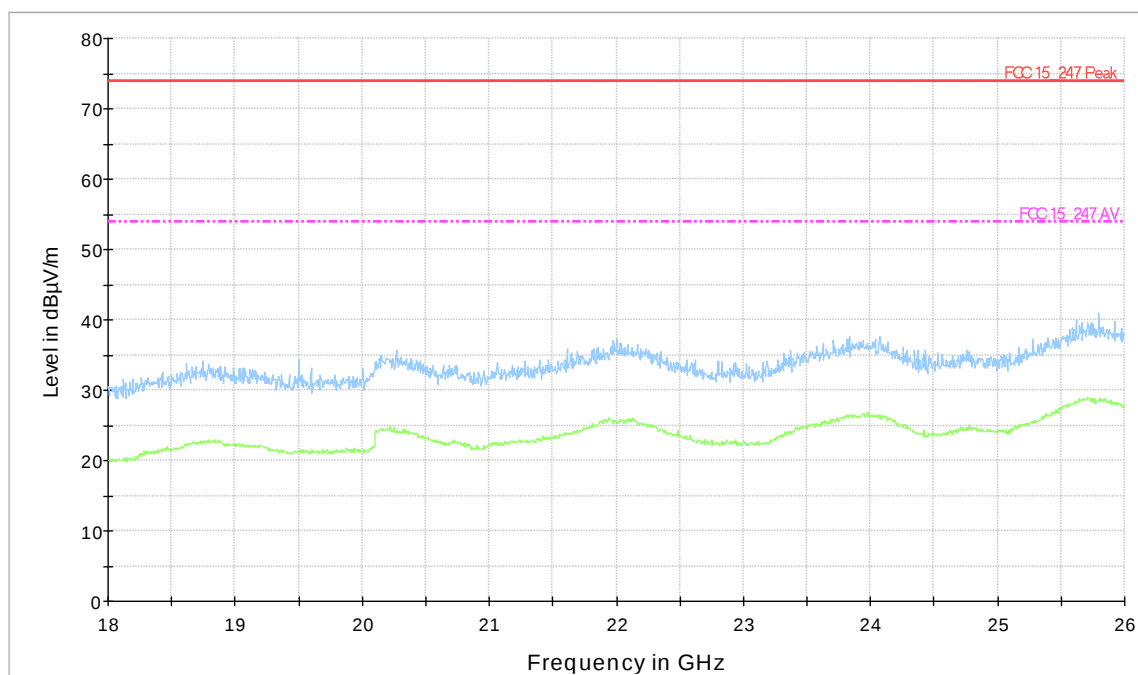


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 18GHz – 26GHz

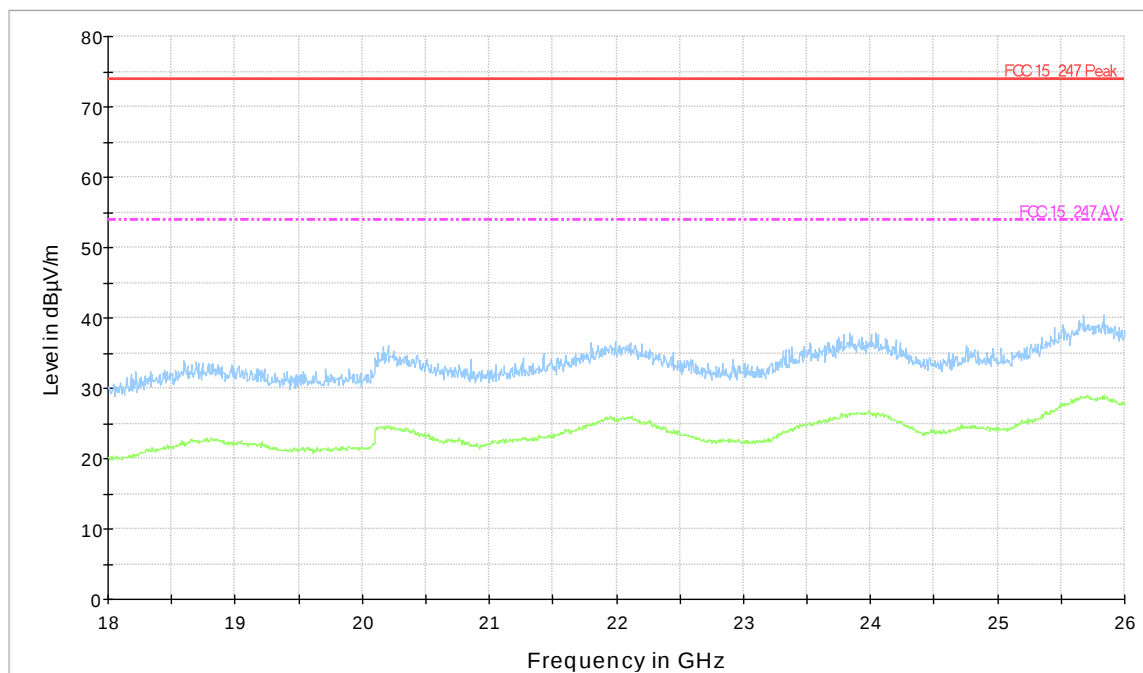


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 18GHz – 26GHz



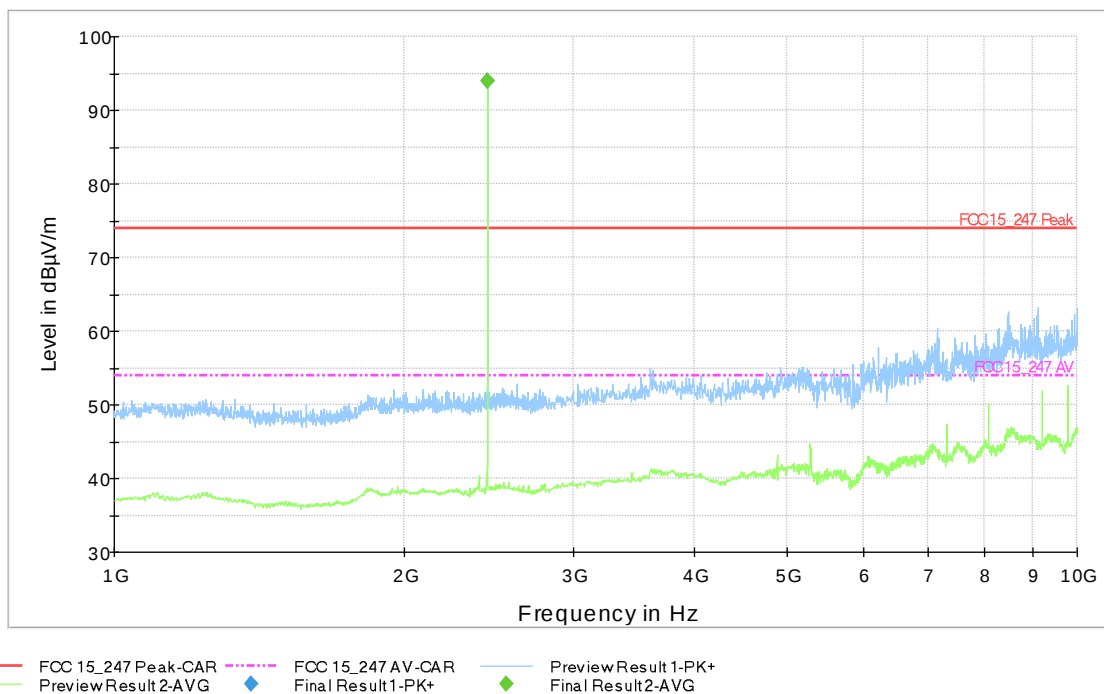
Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

Channel 19

RX Antenna Polarization: Vertical

Frequency Range: 1GHz – 10GHz



Final Result:

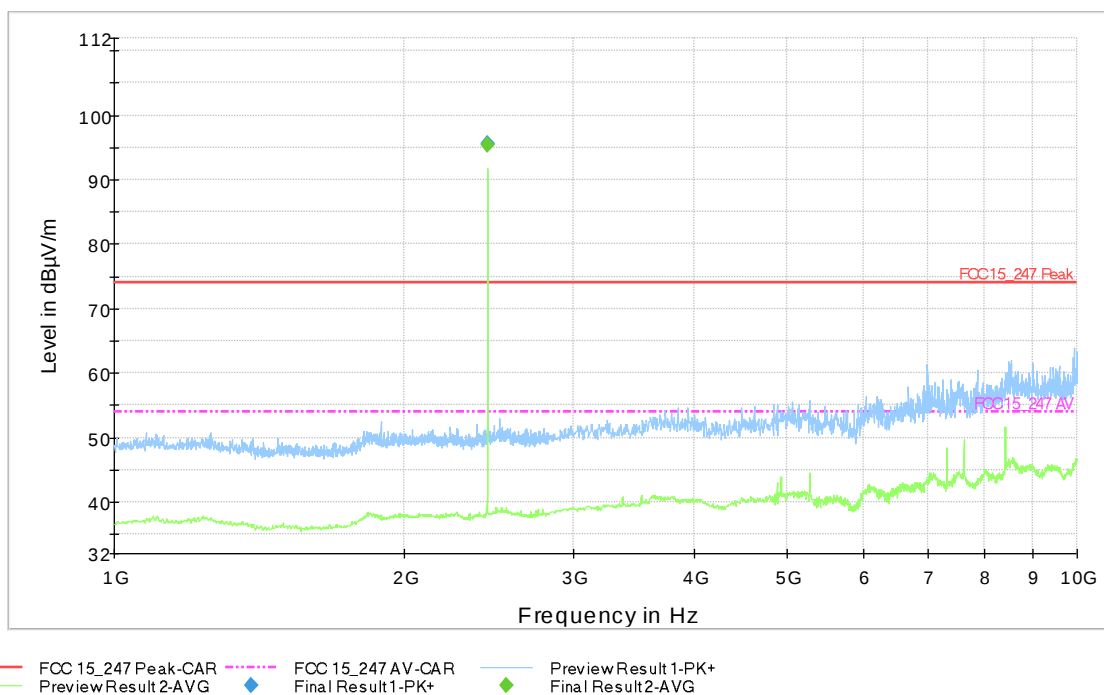
Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2440.000000	94.0	126.9	7.0	-20.00	74.00

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBµV/m)
2440.000000	94.0	126.8	7.0	-40.00	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Horizontal

Frequency Range: 1GHz – 10GHz



Final Result:

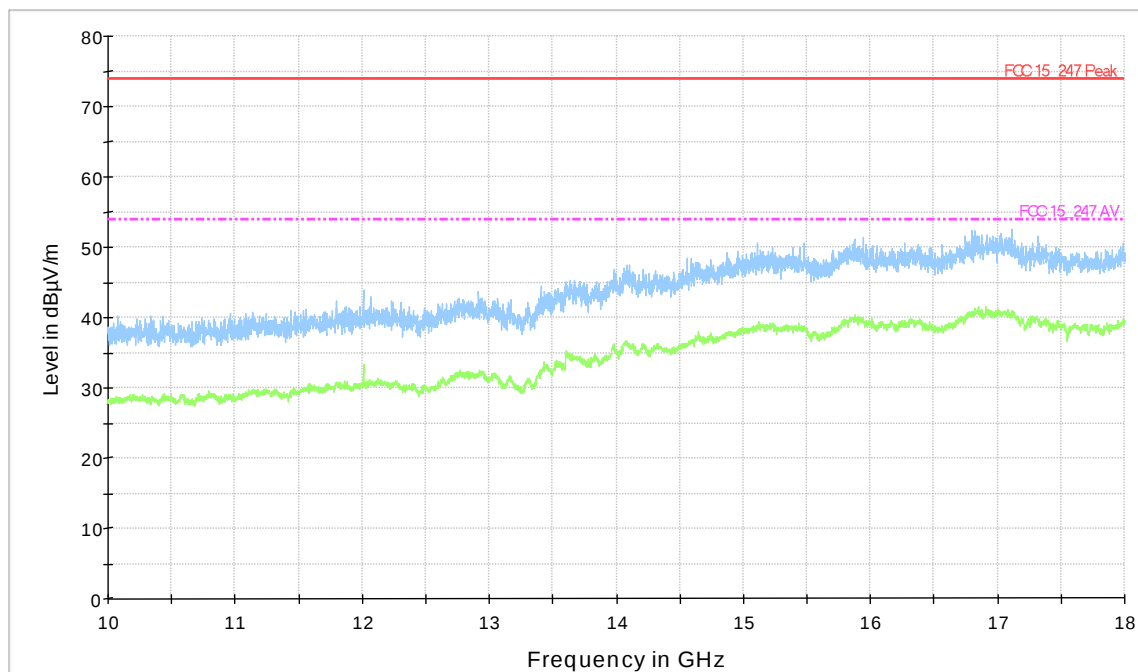
Frequency (MHz)	MaxPeak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2440.000000	95.5	271.5	187.0	-21.50	74.00

Frequency (MHz)	Average (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2440.000000	95.3	273.4	187.0	-41.30	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Vertical

Frequency Range: 10GHz – 18GHz

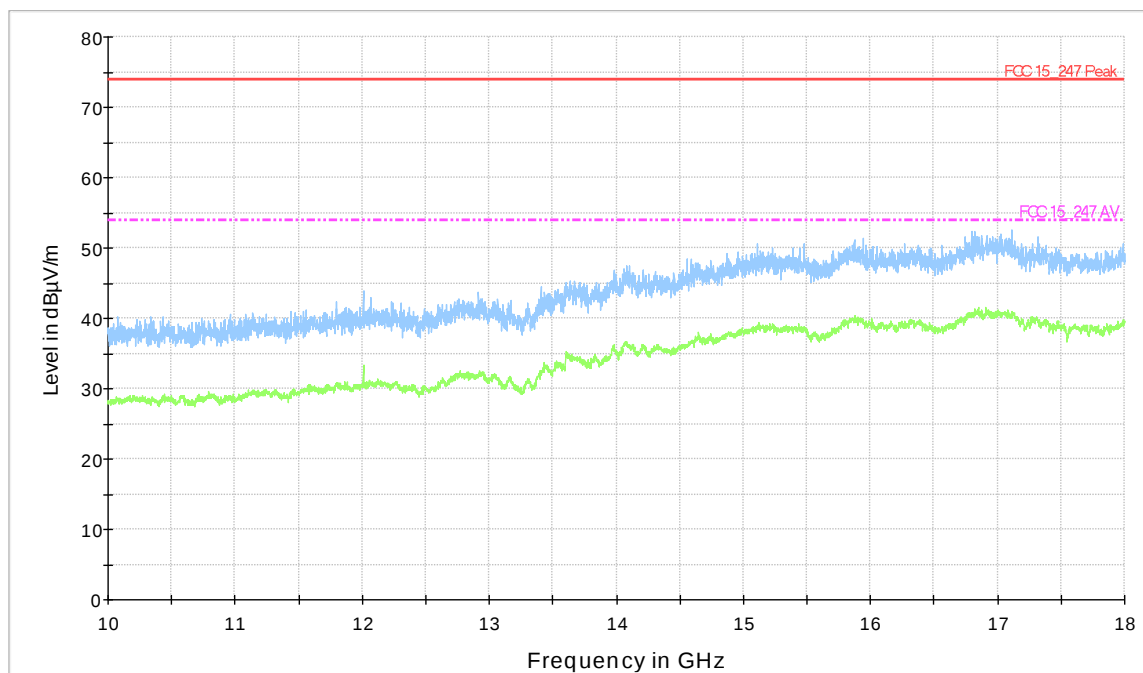


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 10GHz – 18GHz

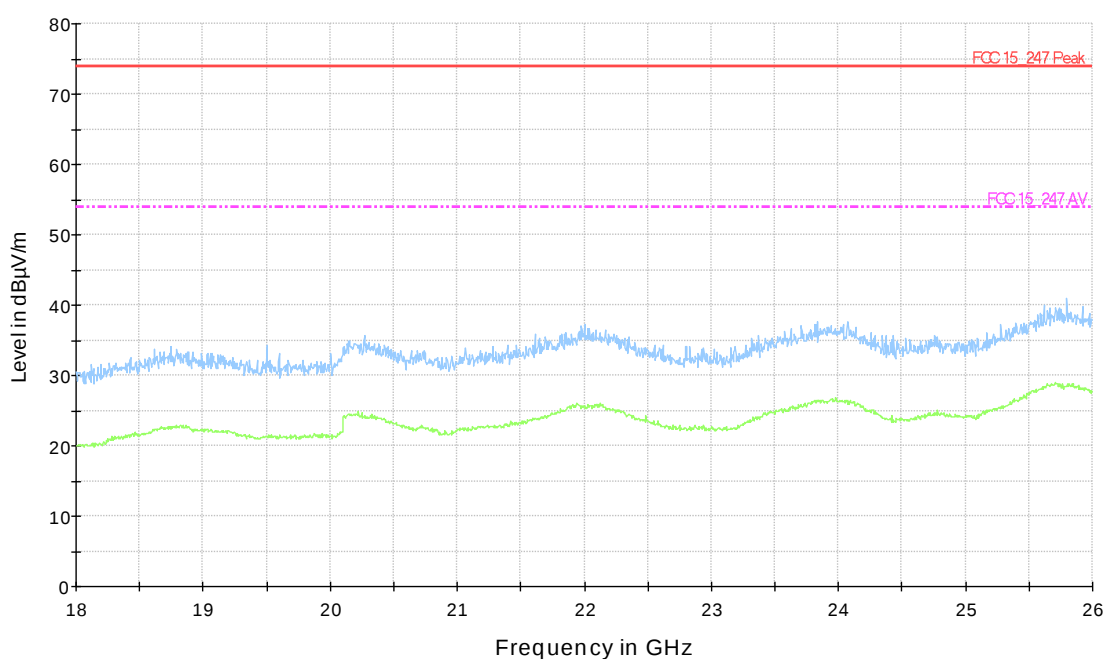


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 18GHz – 26GHz

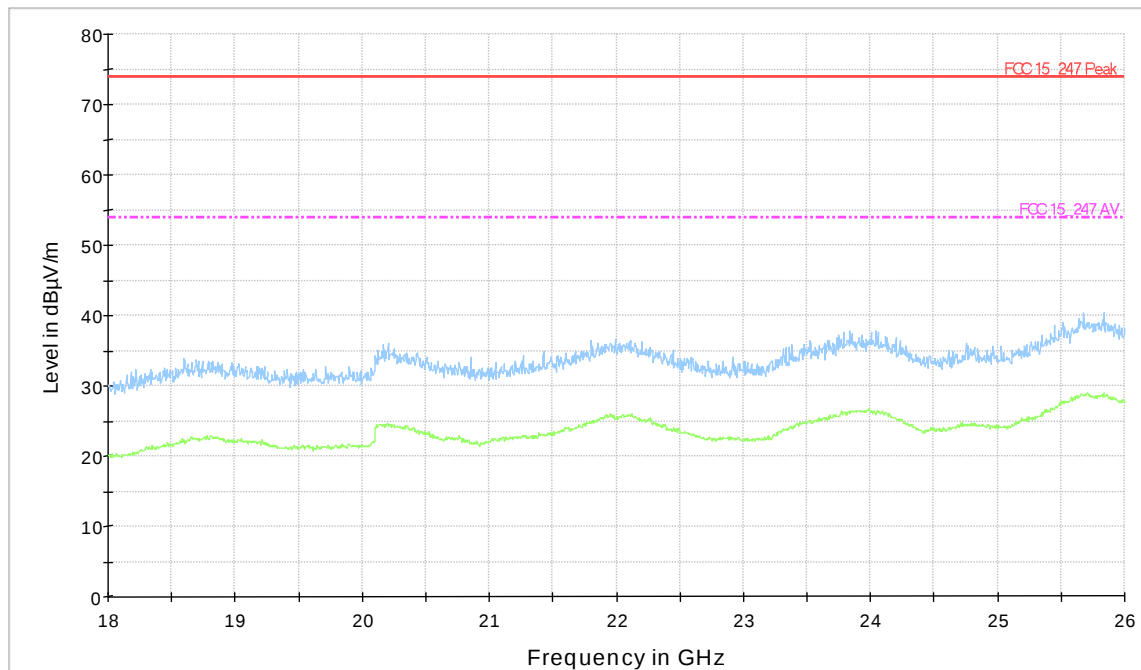


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 18GHz – 26GHz



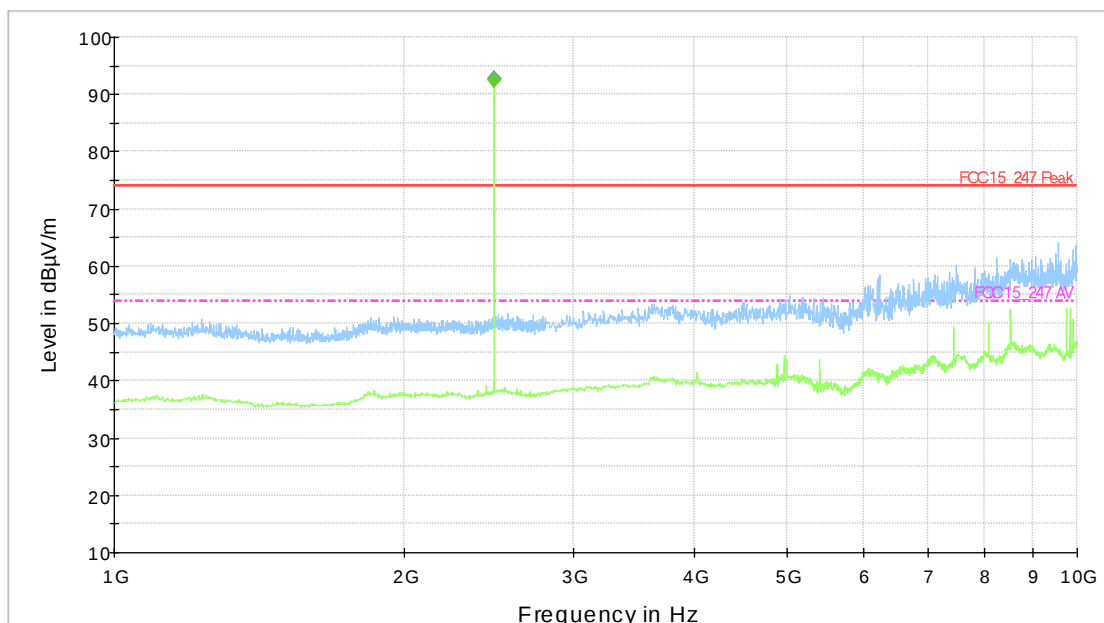
Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

Channel 39

RX Antenna Polarization: Vertical

Frequency Range: 1GHz – 10GHz



— FCC 15_247 Peak-CAR — FCC 15_247 AV-CAR — PreviewResult 1-PK+
— PreviewResult 2-AVG ◆ Final Result 1-PK+ ◆ Final Result 2-AVG

Final Result:

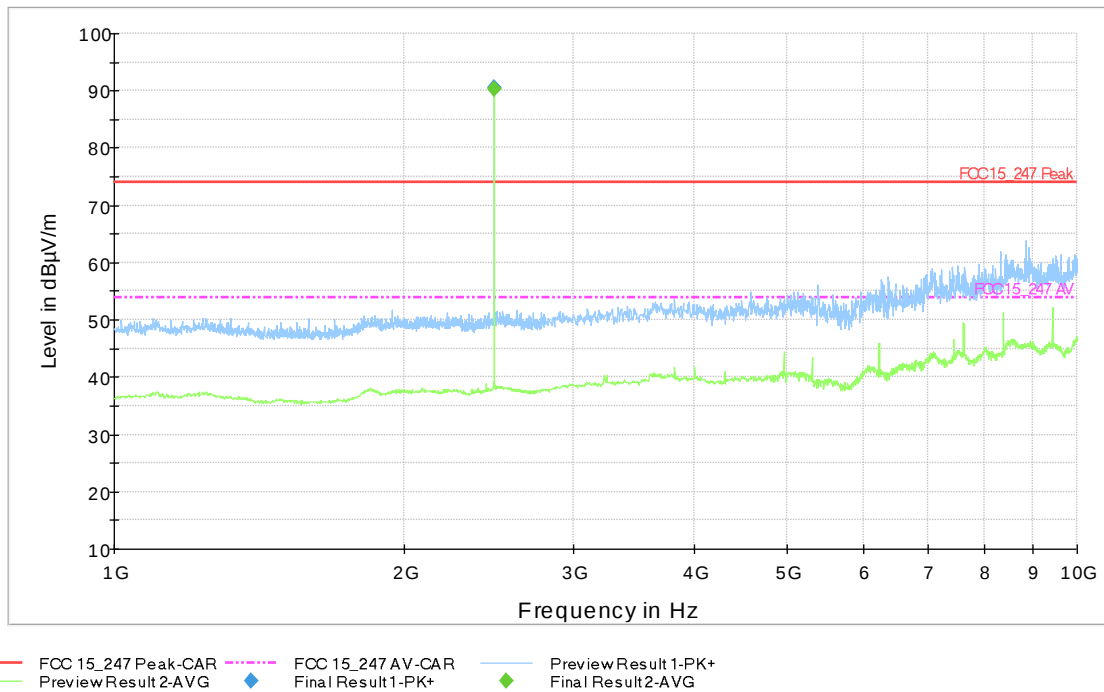
Frequency (MHz)	MaxPeak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2480.000000	92.7	254.5	187.0	-18.70	74.00

Frequency (MHz)	Average (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2480.000000	92.6	253.5	187.0	-38.60	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Horizontal

Frequency Range: 1GHz – 10GHz



Final Result:

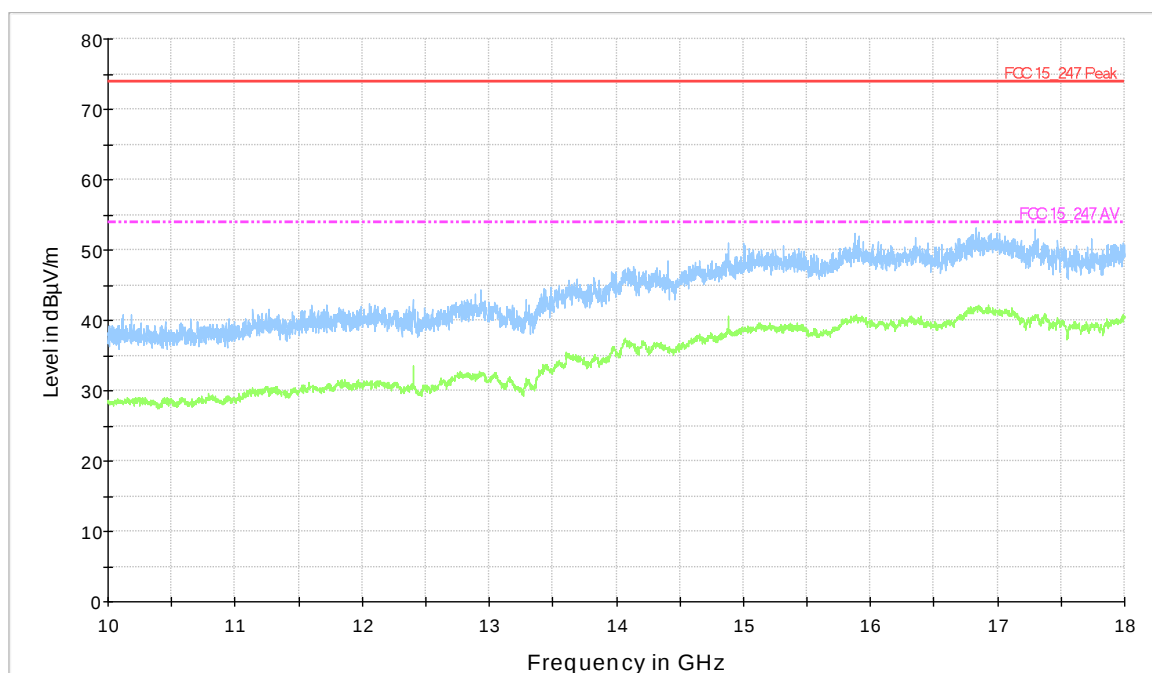
Frequency (MHz)	MaxPeak (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2480.000000	90.4	107.4	93.0	-16.40	74.00

Frequency (MHz)	Average (dBμV/m)	Height (cm)	Azimuth (deg)	Margin (dB)	Limit (dBμV/m)
2480.000000	90.3	107.3	91.0	-36.30	54.00

Note: Peaks out of limits are due to the BLE carrier.

RX Antenna Polarization: Vertical

Frequency Range: 10GHz – 18GHz

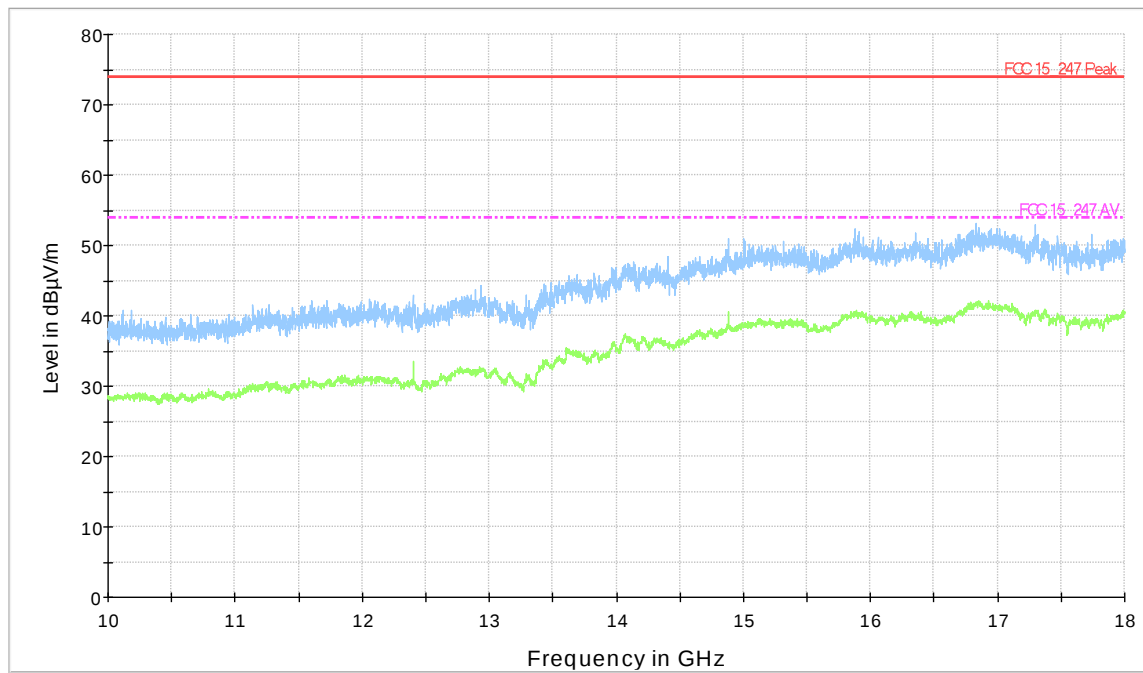


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 10GHz – 18GHz

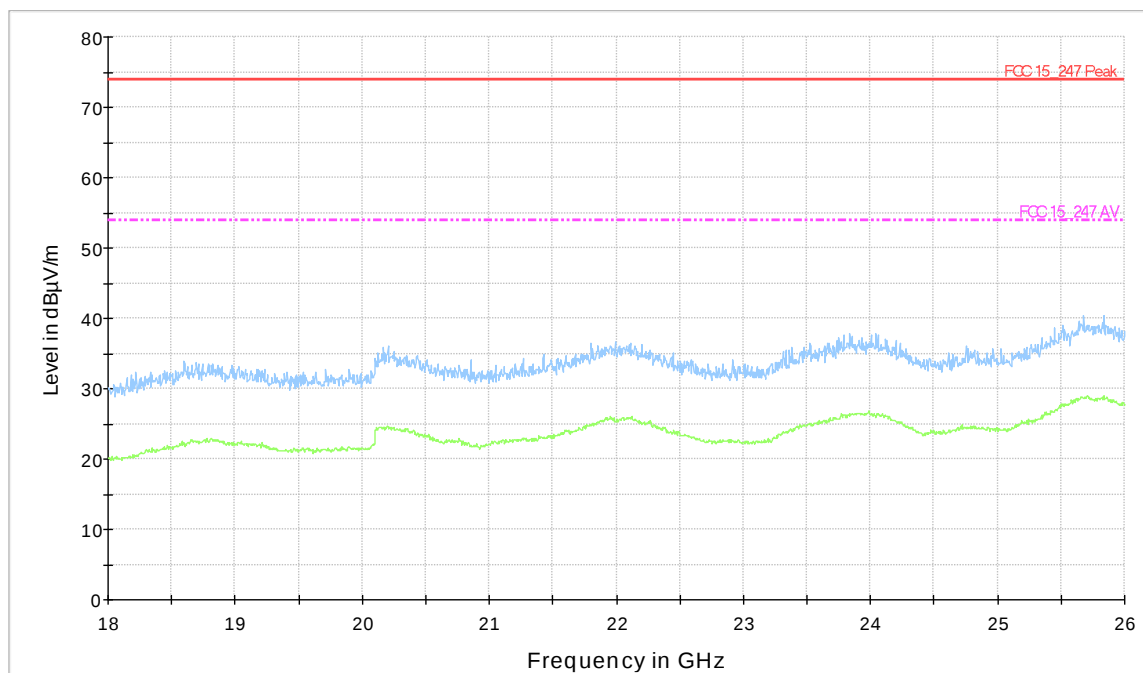


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Vertical

Frequency Range: 18GHz – 26GHz

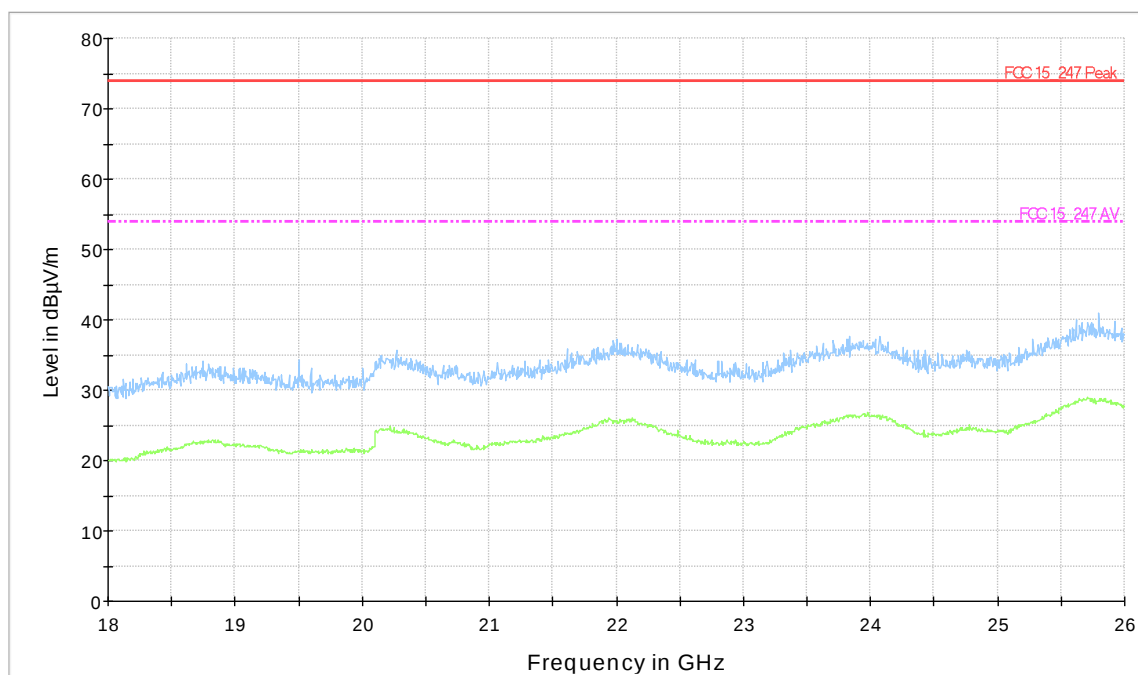


Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

RX Antenna Polarization: Horizontal

Frequency Range: 18GHz – 26GHz



Final Result:

Note: All emissions are below 10dB from the limit, for this reason no further assessments were carried out on the individual points

TEST 9.

TRANSMITTER FREQUENCY STABILITY

REFERENCE DOCUMENT

According to RSS Gen Issue 5:2018 + A1:2019 + A2:2021 § 6.11

• TEST LOCATION	Radio test area					
• TYPE OF MEASUREMENT	Radiated					
• TEST EQUIPMENT USED FOR TEST	Instrument	Manufacturer	Model	Serial n°	Calibrated On	Due to
	MXE Emi Receiver	Keysight	N9038A	MY57290150	07/2021	07/2022
• TESTED PORT	Antenna					
• FREQUENCY RANGE	Carrier					

TEST CONDITIONS	REQUIRED	MEASURED
Ambient temperature	23°C ± 5°C	24 °C
Ambient humidity	25 - 75%rH	45%
Pressure	85 - 106kPa (860mbar - 1060mbar)	960 mbar

OPERATING CONDITION :#1, #2, #3

RESULT: **COMPLIANT**

Measurement Result

Channel	Voltage (V)	Temperature (°C)	Frequency (MHz)	Variation at the reference value (MHz)	Maximum variation (MHz)	Result
0	12.00	+20	2401.766190	---	±1	COMPLIANT
		-20	2401.788571	+0.022381		
		+50	2401.769048	+0.002858		
	10.30	+20	2401.764762	-0.001428		
	13.70	+20	2401.767354	-0.001164		
19	12.00	+20	2439.763333	---	±1	COMPLIANT
		-20	2439.796667	+0.033334		
		+50	2439.770000	+0.006667		
	10.30	+20	2439.765714	+0.002381		
	13.70	+20	2439.796201	-0.032868		
39	12.00	+20	2479.768095	---	±1	COMPLIANT
		-20	2479.796190	+0.028095		
		+50	2479.770952	+0.002857		
	10.30	+20	2479.765714	-0.002381		
	13.70	+20	2479.782143	-0.014048		

END OF TEST REPORT