DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

ISED CABid: ES1909

Test report No:
NIE: 68649RRF.003

Partial Test report

USA FCC Part 15.31(h), Part 22, Part 24, Part 27, Part 90, Part 15.209, Part 15.247
CANADA IC RSS-130, RSS-132, RSS-133, RSS-139, RSS-247, RSS-Gen

(*) Identification of item tested	Continuous Positive Airway Pressure (CPAP) Device
(*) Trademark	ResMed
(*) Model and /or type reference	39001
(*) Derived model not tested	USA variants: 39485, 39486, 39487 Canada variants: 39488, 39489, 39490
Other identification of the product	HW version: 1.0 SW version: SW04600 FCC ID: 2ACHL-AIR11M1 IC: 9103A-AIR11M1
(*) Features	LTE Cat-M1, BLE
Applicant	ResMed Pty Ltd 1 Elizabeth Macarthur Drive, Bella Vista, NSW, 2153
Test method requested, standard	USA FCC Part 15.31(h) (10-1-20 Edition): Measurement standard. USA FCC Part 22 (10-1-20 Edition): Public Mobile Services. USA FCC Part 24 (10-1-20 Edition): Personal Communications Services. USA FCC Part 27 (10-1-20 Edition): Miscellaneous Wireless Communications Services. USA FCC Part 90 (10-1-20 Edition): Private Land Mobile Radio Services. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. CANADA IC RSS-130 Issue 2, Feb 2019. CANADA IC RSS-132 Issue 3, Jan. 2013. CANADA IC RSS-133 Issue 6 Amendment 1, Jan. 2018. CANADA IC RSS-139 Issue 3, Jul. 2015. CANADA IC RSS-199 Issue 3, Dec 2016

	CANADA IC RSS-Gen Issue 5 (March 2019). CANADA IC RSS-247 Issue 2, Feb 2017. Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. ANSI C63.26-2015.
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager  2021.09.28 16:23:58 +02'00'
Date of issue	2021-09-28
Report template No	FDT08_23 (*) “Data provided by the client”

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DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample of the model 39001 is a CPAP device with integrated cellular and Bluetooth connectivity.

3. Derived models not tested. These models have been declared by the supplier of the sample as being the same as the model under test.

ResMed
Changing lives with every breath

Date: 24 Aug 2021

DECLARATION OF EQUIVALENCE

This document declares that the following designated products are equivalent to the units under test **39001** and **39002**.

USA Variants:

Model Name / Product Code	Marketing Name
39485	AirSense 11 AutoSet
39486	AirSense 11 CPAP
39487	AirSense 11 Elite

Canada Variants:

Model Name / Product Code	Marketing Name
39488	AirSense 11 AutoSet
39489	AirSense 11 CPAP
39490	AirSense 11 Elite

All the above stated products have the same hardware, cellular firmware and Bluetooth firmware.

Applicant:
Company Name: ResMed Pty Ltd
Address: 1 Elizabeth Macarthur Drive,
Bella Vista NSW 2153
Australia

By,

Christopher Jenkins
Title: Associate Manager – Systems Engineering
Company: ResMed Pty Ltd
Telephone: +61 2 8884 1517
e-mail: Christopher.jenkins@resmed.com.au

ResMed Pty Ltd 1 Elizabeth Macarthur Drive, Bella Vista NSW 2153, Australia
T +61 2 8884 1000 E Christopher.jenkins@ResMed.com.au ResMed.com

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
68649/003	Continuous Positive Airway Pressure (CPAP) Device	39001	22201142551	2021/07/29
68649/007	AC/DC adapter	39000	00003D00	2021/07/29
63467B/015	Climate Line	--	--	2020/10/14

Sample S/01 has undergone the following test(s): The Radiated tests indicated in the Appendixes A, B & C.

Test sample description

Ports…… :	Port name and description	Cable				
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)	
	Power		☒	☐	☐	
Supplementary information to the ports…… :	--					
Rated power supply .....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☒	AC: 100-240V~50-60 Hz 2.0A	☒	☐	☐	☒	☐
Rated Power .....:	24 VDC ± 1 VDC, 2.71A					
Clock frequencies.....:	N/A					
Other parameters .....:	390000 (PSU Model Number)					
Software version .....:	SW04600 (DUT)					
Hardware version .....:	1.0 (DUT)					
Dimensions in cm (W x H x D) ....:	138.5 mm x 259.4 mm x 94.5 mm					
Mounting position .....:	☒	Table top equipment				
Modules/parts.....:	Module/parts of test item		Type		Manufacturer	
	Wireless Module		EXS62-W		Thales	
	Bluetooth LE		EFR32BG1		SiLabs	
Accessories (not part of the test item) .....:	Description		Type		Manufacturer	
	--					
Documents as provided by the applicant.....:	Description		File name		Issue date	
	--					

(3) Only for Medical Equipment

Identification of the client

ResMed Pty Ltd
1 Elizabeth Macarthur Drive,
Bella Vista, NSW, 2153

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-09-03
Date (finish)	2021-09-06

Document history

Report number	Date	Description
68649RRF.003	2021-09-28	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: José Manuel Jiménez.

Used instrumentation:

Radiated Measurements

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	Shielded Room ETS LINDGREN S101	N.A.	N.A.
3.	Hybrid Bilog Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/10	2023/10
4.	Pre-amplifier G>40dB 10MHz-6GHz Bonn Elektronik BLNA 0160-01N	2021/03	2022/03
5.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
6.	Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2020/08	2023/08
7.	Pre-amplifier, G>30 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
8.	Signal and spectrum analyzer 10Hz-40GHz Rhode and Schwarz FSV40	2019/10	2021/10
9.	Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10.	Pre-amplifier G>30dB 18-40 GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11
11.	AC Power Supply 135/270 V, 5/10/20/40 A ELGAR CS-AC35(351SL)	2019/09	2022/09
12.	Digital Multimeter FLUKE 175	2020/11	2021/11

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured :	N/M

Summary

FCC PART 15 / FCC PART 22 / FCC PART 24 / FCC PART 27 / FCC PART 27 / RSS-247 / RSS-130 / RSS-132 / RSS-133 / RSS-139 / RSS-199 / RSS-Gen PARAGRAPH			
Requirement – Test case		**Verdict**	**Remark**
FCC 15.31 (h), FCC 15.209 (a), FCC 15.247 (d), RSS-Gen 8.9, RSS-247 5.5 FCC 22.917 / RSS-132 5.5 FCC 24.238 / RSS-133 6.5 FCC 27.53 / RSS-139 6.6 / RSS-130 4.7 FCC 90.691	Emission limitations radiated (Transmitter)	P	(1)
Supplementary information and remarks: (1) Only Co-location radiated spurious emission test was requested.			

Appendix A: Test results FCC Part 22 & 90, 15.247, 15.209 / RSS-132, RSS-247

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TEST CONDITIONS

POWER SUPPLY (V):

Vnominal: 230 Vac

Type of Power Supply: AC external supply power.

ANTENNA:

Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 5: +5.17 dBi
Maximum Declared Gain for LTE Band 26: +5.17 dBi

TEST FREQUENCIES:

	CELLULAR LTE (Bands 5 and 26)	
Band:	LTE Band 5	
Frequency Range:	824 – 849 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 20525	836.5
Band:	LTE Band 26 (Part 90)	
Frequency Range:	814 – 824 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 26740	819.0
Band:	LTE Band 26 (Part 22)	
Frequency Range:	824 – 849 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 26915	836.5

	BLUETOOTH	
Mode:	Low Energy	
Channel Spacing:	1 MHz	
Frequency Range:	2400 MHz to 2483.5 MHz	
Transmit Channel:	Channel	Transmit Channel:
	17	2440

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the signalling unit to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each radio:

The following configurations were selected based on preliminary testing that identified those corresponding to the worst cases:

* Cellular LTE: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LTE band configuration as this channel was found to transmit higher EIRP than all the other LTE channels.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth Low Energy / Middle Channel and GFSK mode configuration.

Simultaneous transmission modes selected:

1. Cellular LTE Band 5, Bluetooth Low Energy Co-Location with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 5 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

2. Cellular LTE Band 26 (Part 90), Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 26 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

3. Cellular LTE Band 26 (Part 22), Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 26 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK

Radiated emissions

SPECIFICATION:

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

1. LTE Band 5 & 26 (Part 22). FCC §2.1053 & §22.917 / RSS-132 Clause 5.5.

FCC §22.917:

> (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-132 Clause 5.5:

> i. In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p (watts).
>
> ii. After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

2. LTE Band 26 (Part 90). FCC §90.691:

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency of the co-located radios up to 26 GHz.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

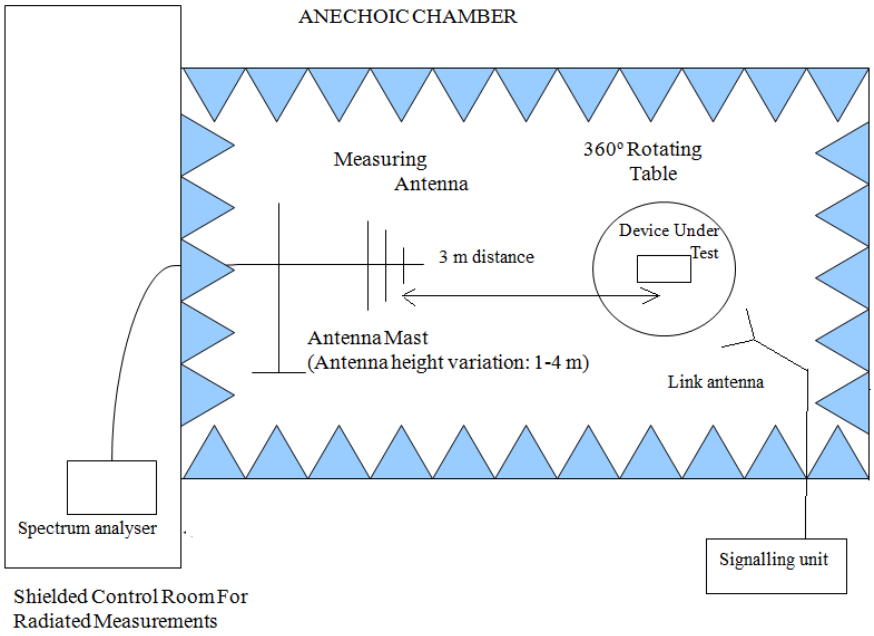
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

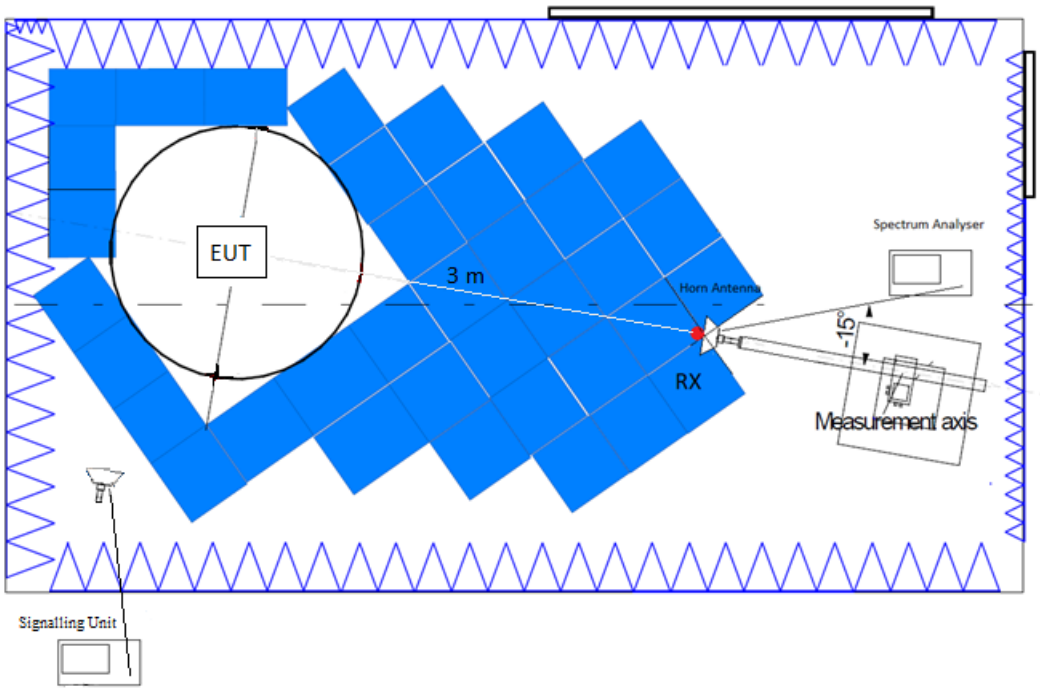
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

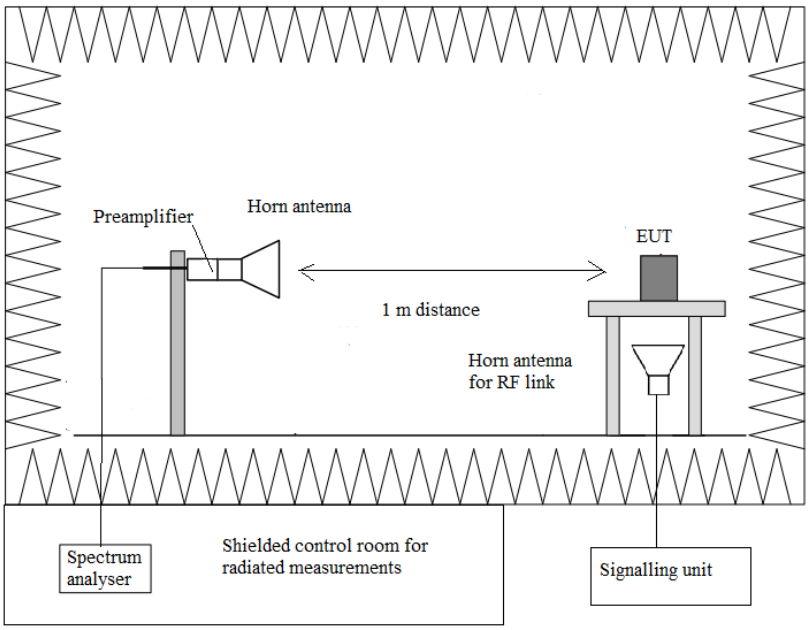
Radiated measurements below 1 GHz.



Radiated measurements setup between 1 GHz to 17 GHz.



Radiated measurements above 17 GHz.



RESULTS:

1. **Co-Location mode LTE Band 5, Bluetooth Low Energy:**

QPSK & 16QAM:
A preliminary scan determined the 16QAM modulation as the worst case.

LTE Band 5: Middle Channel (836.5 MHz), BW=10 MHz, RB=5, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 8.365 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
8.365 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

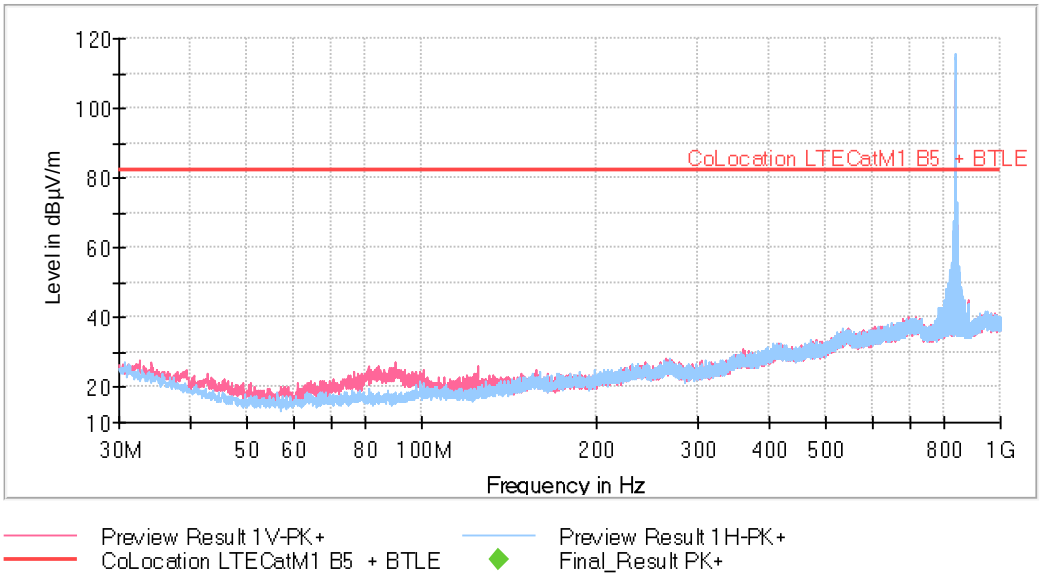
Frequency range 1 - 26 GHz

No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)
<±4.89 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

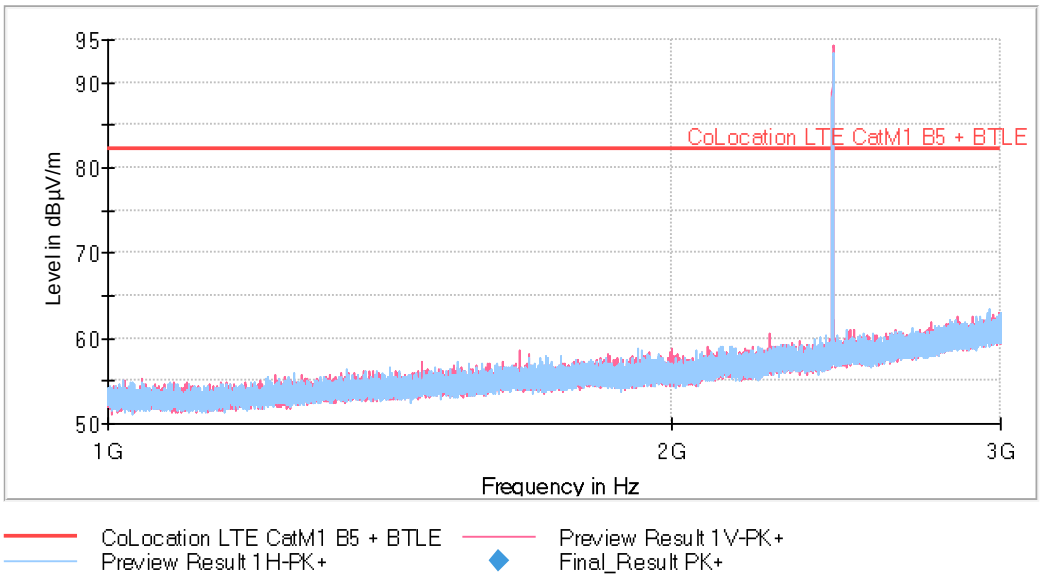
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



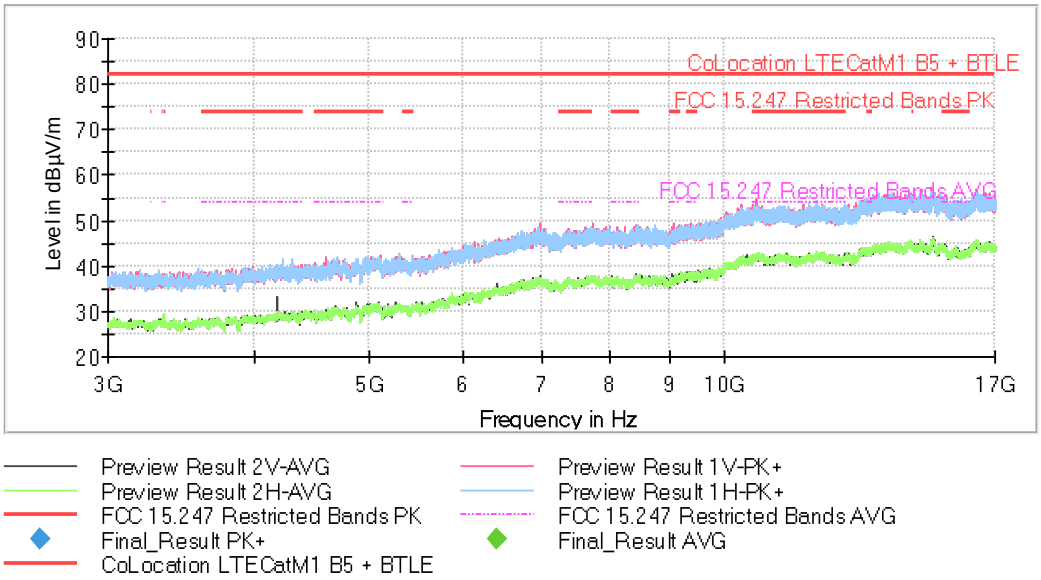
The peak above the limit is the Carrier frequency LTE Band 5 (836.5 MHz).

FREQUENCY RANGE 1 – 3GHz

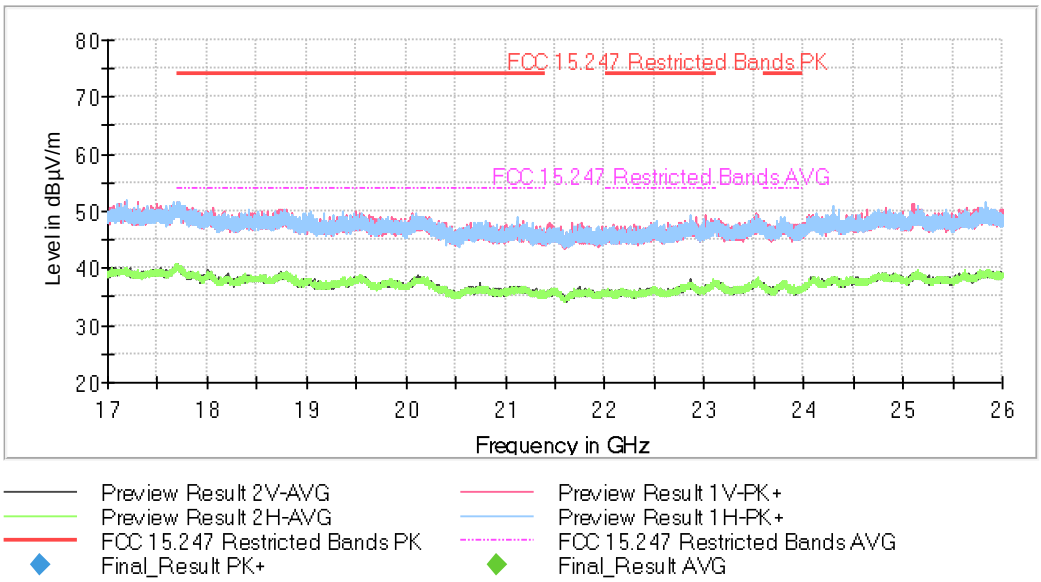


The peak above the limit is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz



2. Co-Location mode LTE Band 26, Bluetooth Low Energy:

QPSK & 16QAM:
A preliminary scan determined the 16QAM modulation as the worst case.

LTE Band 25: Middle Channel (819.0 MHz), BW=10 MHz, RB=1, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 8.19 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
8.19 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

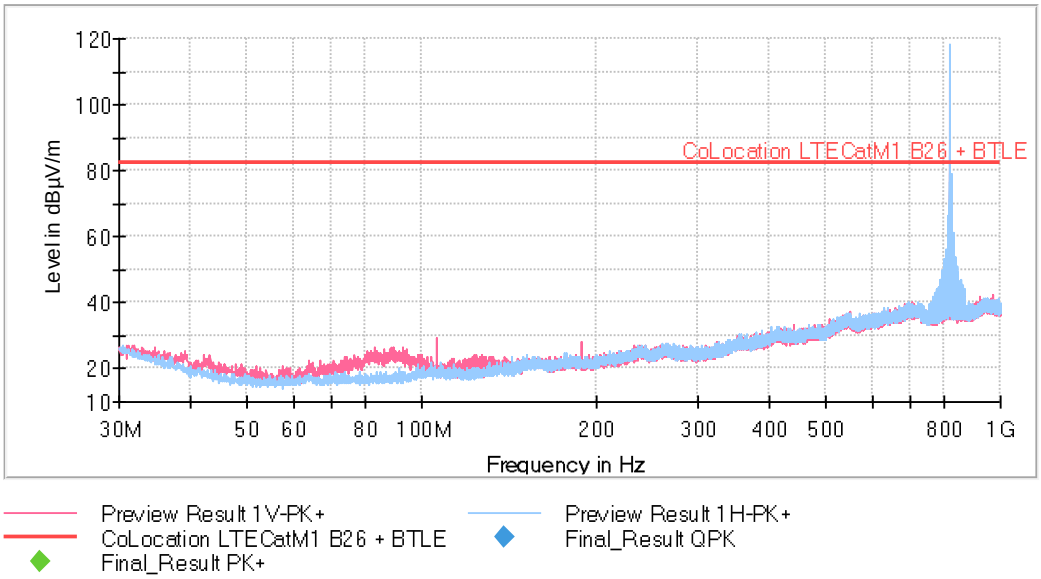
Frequency range 1 - 26 GHz

No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)
<±4.89 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

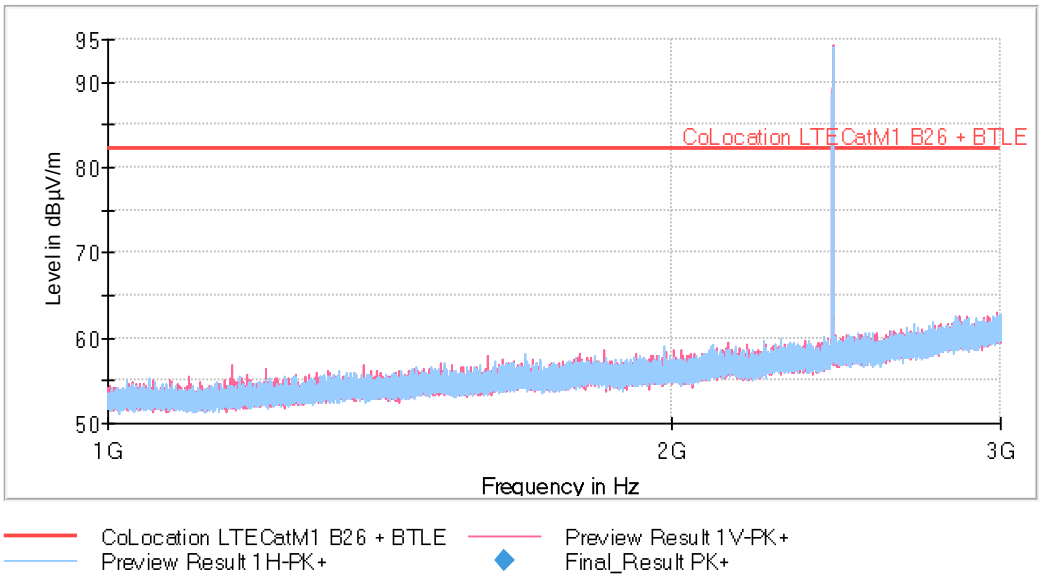
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



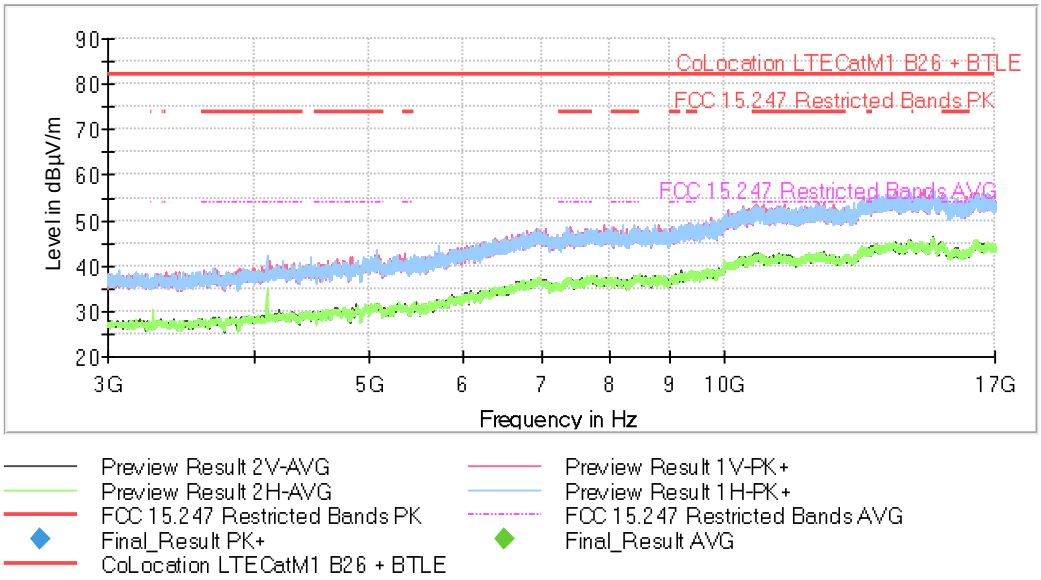
The peak above the limit is the Carrier frequency LTE Band 26 (819.0 MHz).

FREQUENCY RANGE 1 – 3 GHz

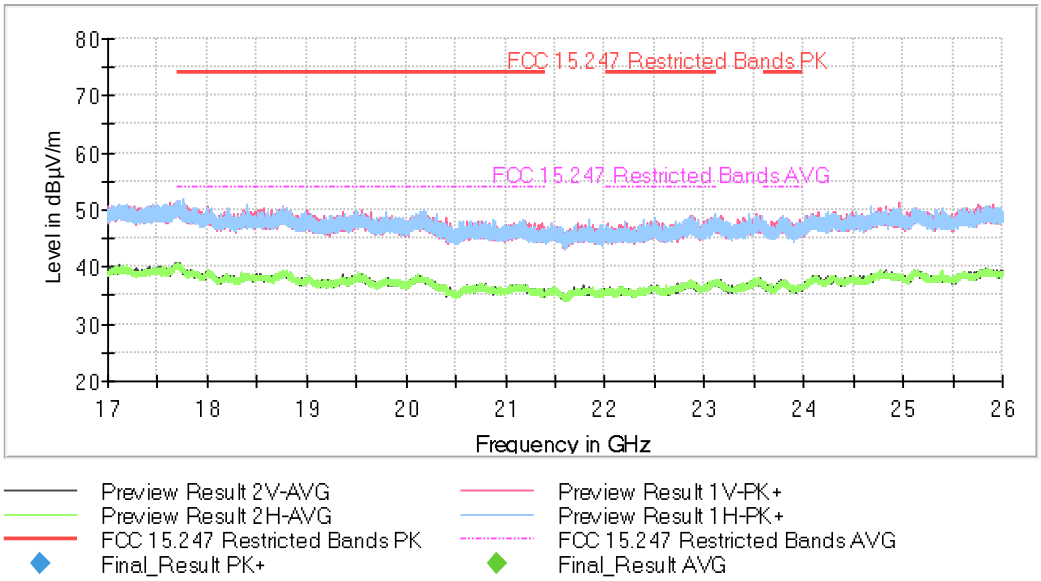


The peak above the limit is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz



3. Co-Location mode LTE Band 26, Bluetooth Low Energy:

QPSK & 16QAM:
A preliminary scan determined the 16QAM modulation as the worst case.

LTE Band 26: Middle Channel (836.5 MHz), BW=15 MHz, RB=6, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 8.365 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
8.365 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

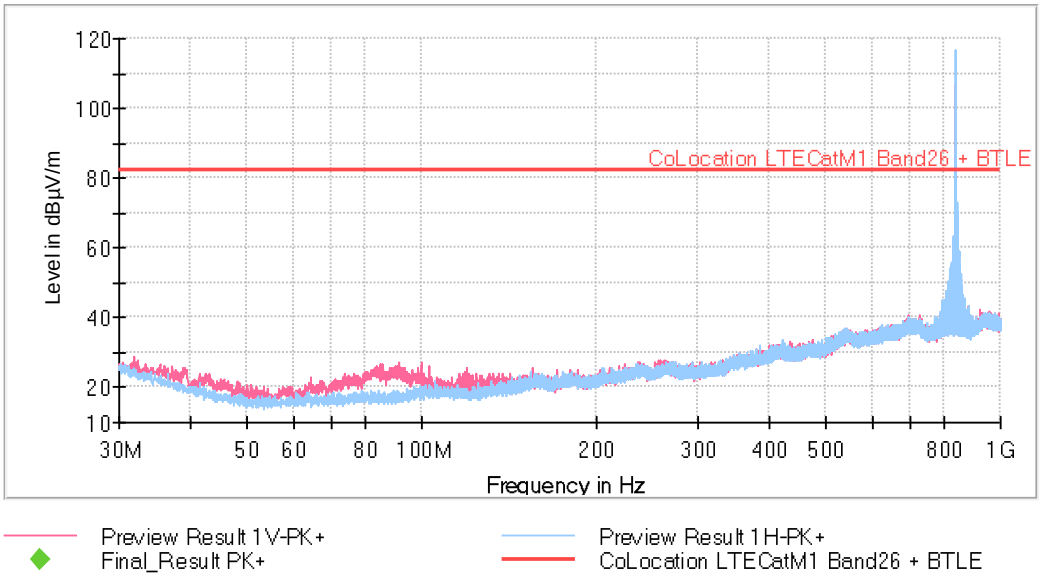
Frequency range 1 - 26 GHz

No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)
<±4.89 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

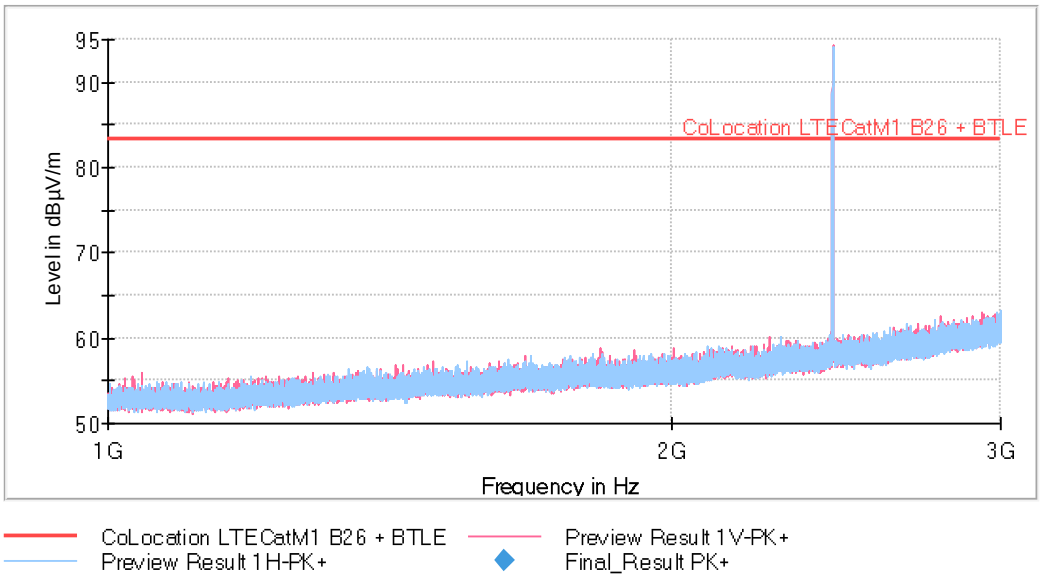
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



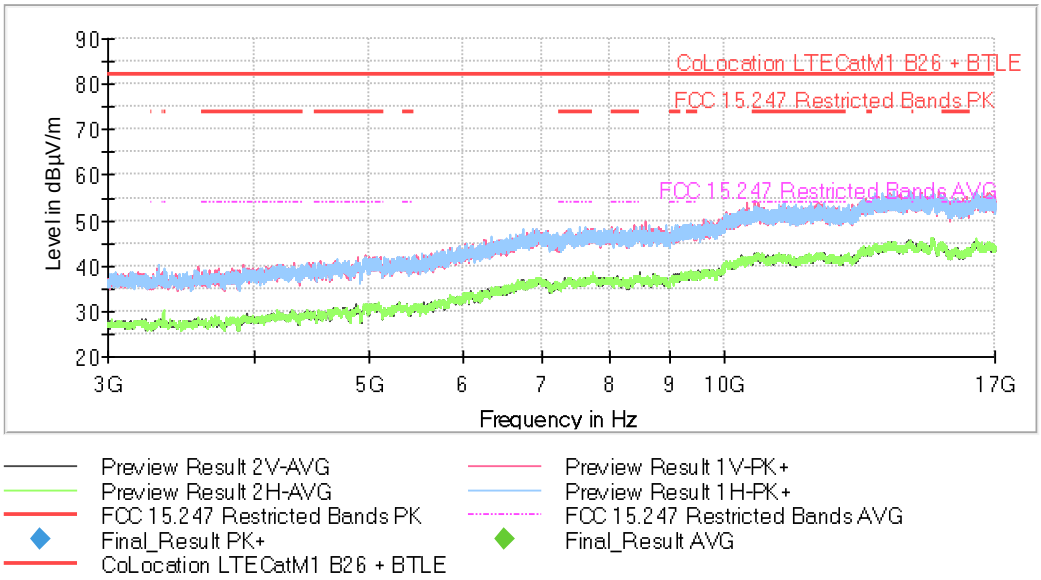
The peak above the limit is the Carrier frequency LTE Band 26 (836.5 MHz).

FREQUENCY RANGE 1 – 3 GHz

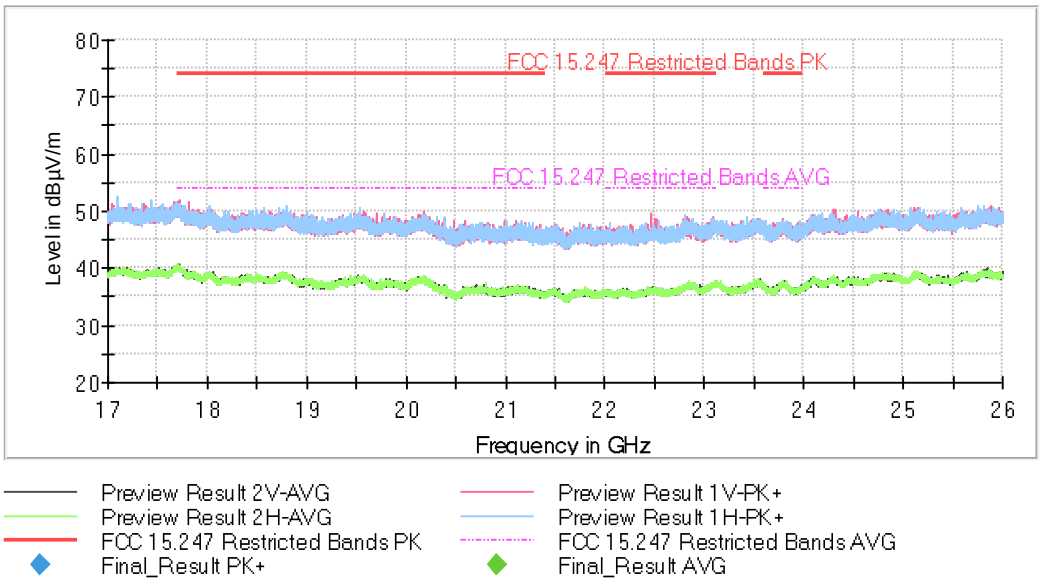


The peak above the limit is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz



Appendix B: Test results FCC Part 24, 15.247, 15.209 / RSS-133, RSS-247

INDEX

TEST CONDITIONS

POWER SUPPLY (V):

Vnominal: 230 Vac

Type of Power Supply: AC external supply power.

ANTENNA:

Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 25: +2.17 dBi

TEST FREQUENCIES:

	CELLULAR LTE Band 25	
Band:	LTE Band 25	
Frequency Range:	1850-1915 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Mid: 23095	1882.5

	BLUETOOTH	
Mode:	Low Energy	
Channel Spacing:	1 MHz	
Frequency Range:	2400 MHz to 2483.5 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	17	2440

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the signalling unit to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each radio:

The following configurations were selected based on preliminary testing that identified those corresponding to the worst cases:

* Cellular LTE: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LTE band configuration as this channel was found to transmit higher EIRP than all the other LTE channels.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth Low Energy / Middle Channel and GFSK mode configuration.

Simultaneous transmission modes selected:

1. Cellular LTE Band 25, Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE Band 25 / MIddle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

Radiated emissions

SPECIFICATION:

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

1. LTE Band 25. FCC §2.1053 & §24.238 / RSS-133 Clause 6.5.

FCC §24.238:

> (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-133 Clause 6.5:

> i. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts).
>
> ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency of the co-located radios up to 26 GHz.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

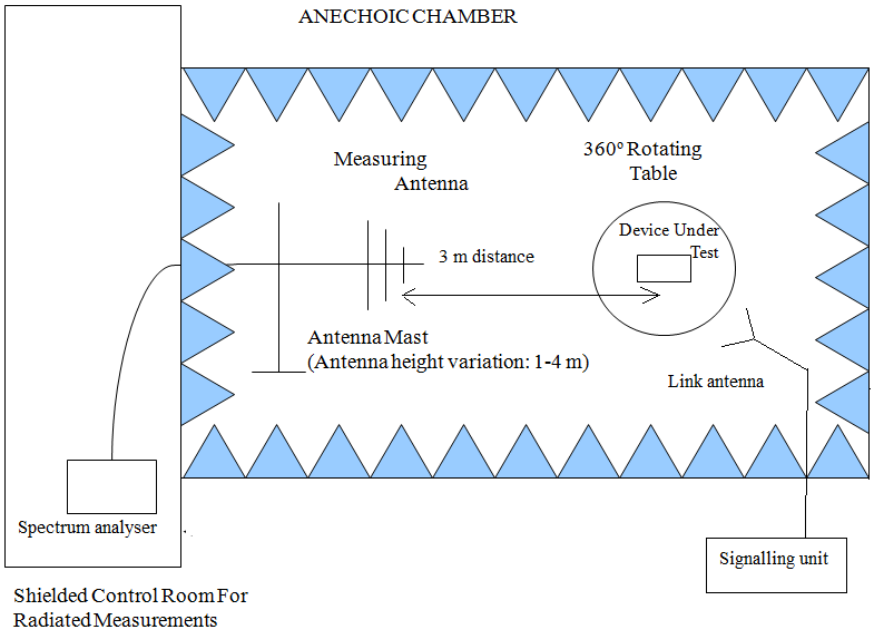
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

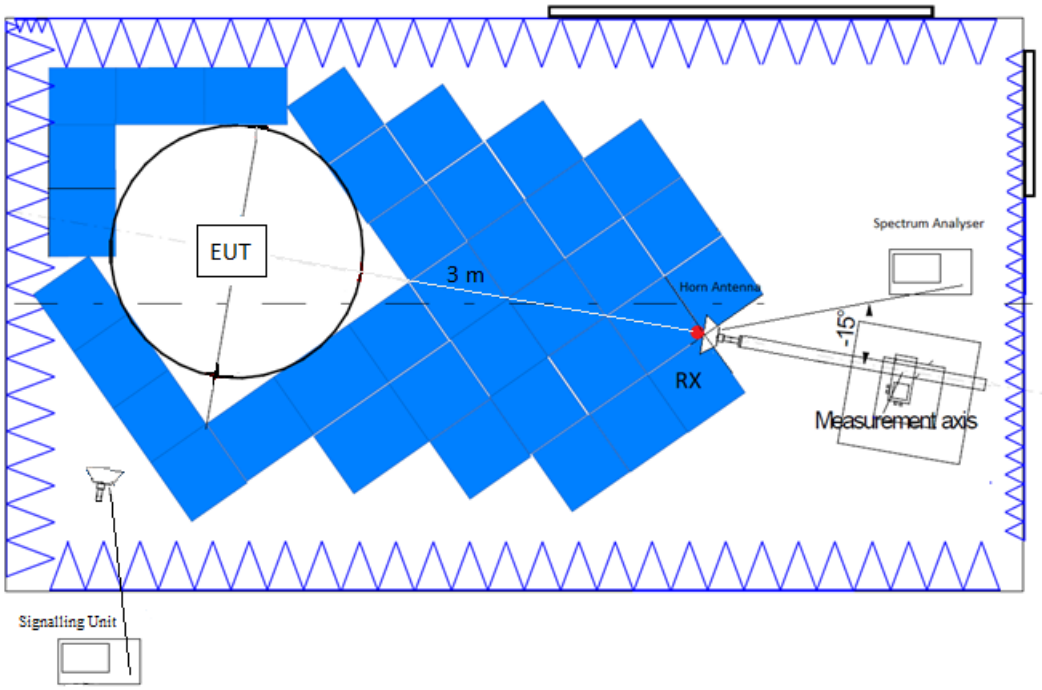
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

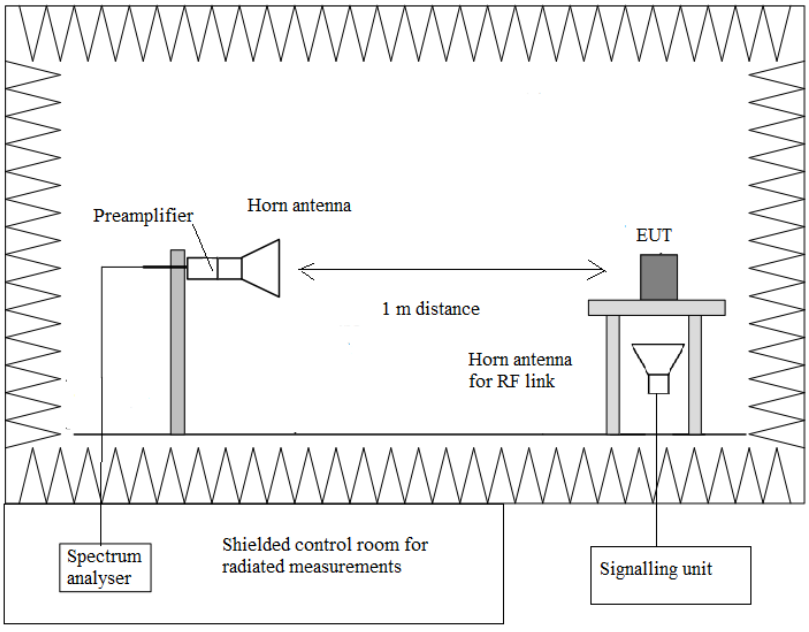
Radiated measurements below 1 GHz.



Radiated measurements setup between 1 GHz to 17 GHz.



Radiated measurements above 17 GHz.



RESULTS:

1. **Co-Location mode LTE Band 25, Bluetooth Low Energy:**

QPSK & 16QAM:
A preliminary scan determined the QPSK modulation as the worst case.

LTE Band 25: Middle Channel (1882.5 MHz), BW=5 MHz, RB=1, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 18.825 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
18.825 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies at less than 20 dB below the limit.

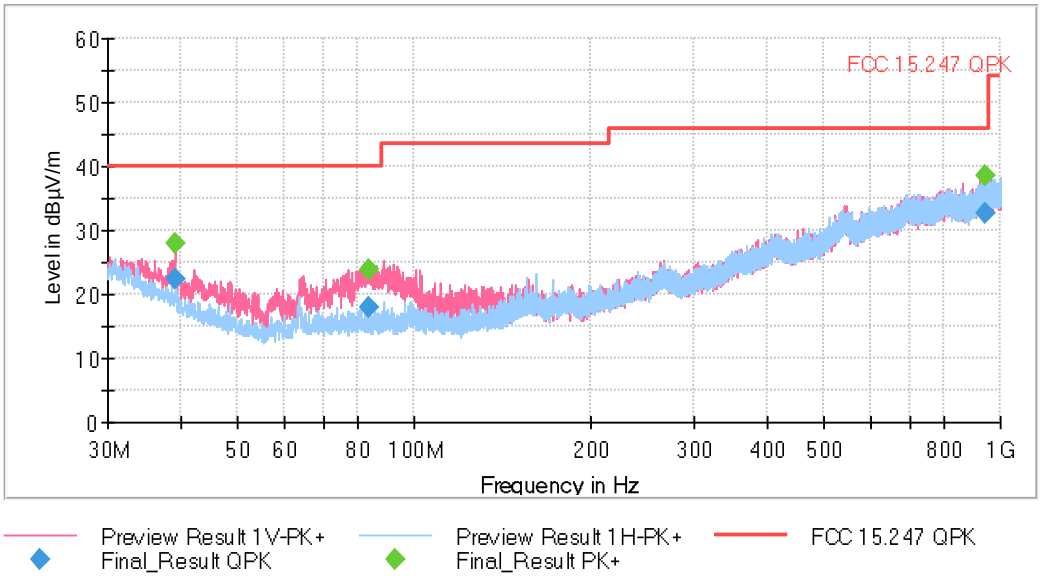
Frequency range 1 - 26 GHz

No spurious frequencies at less than 20 dB below the limit.

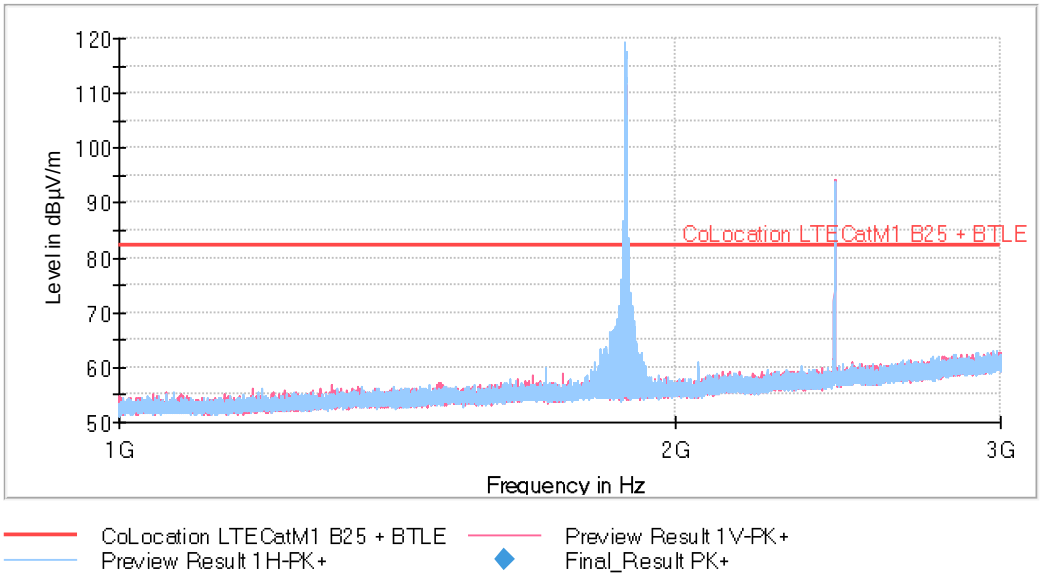
Measurement uncertainty (dB)
<±5.17 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



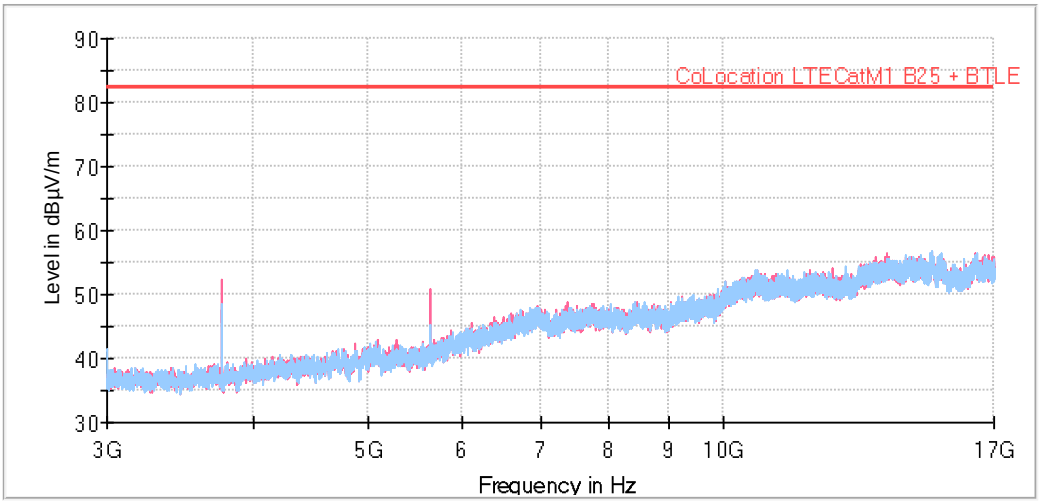
FREQUENCY RANGE 1 – 3GHz



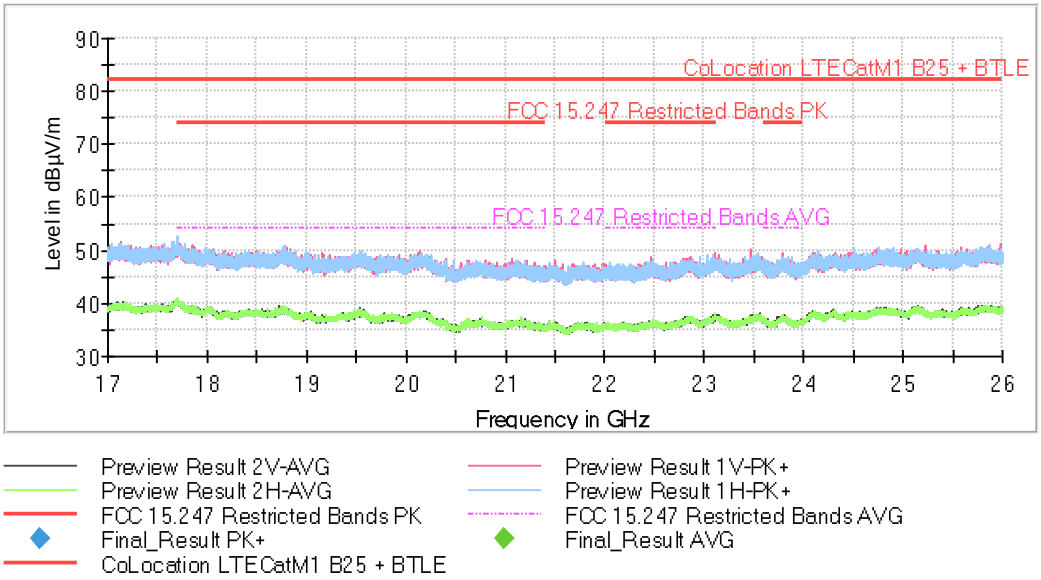
The peak above the limit on the left is the Carrier frequency LTE Band 25 (1882.5 MHz).

The peak above the limit on the right is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 18 GHz



FREQUENCY RANGE 18 - 26 GHz



Appendix C: Test results FCC Part 27, 15.247, 15.209 / RSS-139, RSS-130, RSS-247

INDEX

TEST CONDITIONS

POWER SUPPLY (V):

Vnominal: 230 Vac

Type of Power Supply: AC external supply power.

ANTENNA:

Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 12: +3.17 dBi
Maximum Declared Gain for LTE Band 13: +3.17 dBi
Maximum Declared Gain for LTE Band 66: +2.17 dBi

TEST FREQUENCIES:

	CELLULAR LTE (Bands 12, 13 and 66)	
Band:	LTE Band 12	
Frequency Range:	699 – 716 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 23095	707.5
Band:	LTE Band 13	
Frequency Range:	777 – 787 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 23230	782.0
Band:	LTE Band 66	
Frequency Range:	777 – 787 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 132322	1745.0

	BLUETOOTH	
Mode:	Low Energy	
Channel Spacing:	1 MHz	
Frequency Range:	2400 MHz to 2483.5 MHz	
Transmit Channel:	Channel	Transmit Channel:
	17	2440

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 DTS Meas Guidance v05r02 dated April 2, 2019.

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

During transmitter test the EUT was being controlled by the signalling unit to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Transmission modes selected with each radio:

The following configurations were selected based on preliminary testing that identified those corresponding to the worst cases:

* Cellular LTE: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in LTE band configuration as this channel was found to transmit higher EIRP than all the other LTE channels.

* Bluetooth Low Energy: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Bluetooth Low Energy / Middle Channel and GFSK mode configuration.

Simultaneous transmission modes selected:

1. Cellular LTE Band 12, Bluetooth Low Energy Co-Location with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 12 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

2. Cellular LTE Band 13, Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 13 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

3. Cellular LTE Band 66, Bluetooth Low Energy Co-Location, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE in Band 66 / Middle Channel and Bluetooth Low Energy / Middle Channel and GFSK.

Radiated emissions

SPECIFICATION:

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

1. LTE Band 12. FCC §2.1053 & §27.53 (f) / RSS-130 Clause 4.6.

FCC §27.53 (g):

> (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

RSS-130 Clause 4.6.:

The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

2. LTE Band 13. FCC §2.1053 & §27.53 (f) & (g) / RSS-130 Clause 4.7.

FCC §27.53 (f) & (g):

> (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
>
> (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-130 Clause 4.7.:

> The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.
>
> In addition to the limit outlined in Section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:
>
> (a) The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:
>
> (i) 76 + 10 log10 p(watts), dB, for base and fixed equipment, and
>
> (ii) 65 + 10 log10 p(watts), dB, for mobile and portable equipment.

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

3. LTE Band 66. FCC §2.1053 & §27.53 (h) / RSS-139 Clause 6.6.

FCC §27.53 (h):

> (h) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

RSS-139 Clause 6.6.:

> i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 p (watts) dB.
>
> ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 P (watts) dB.

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency of the co-located radios up to 26 GHz.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna.
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

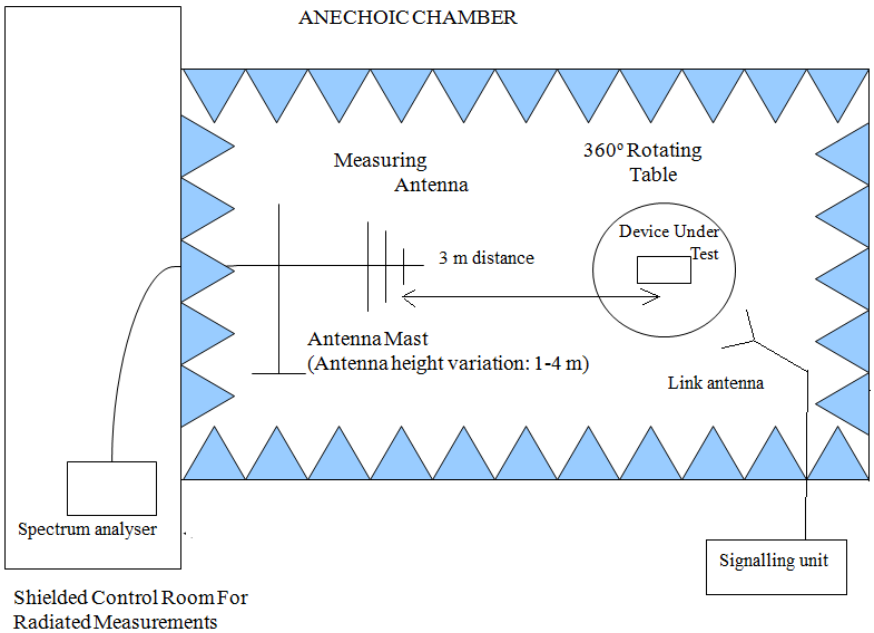
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

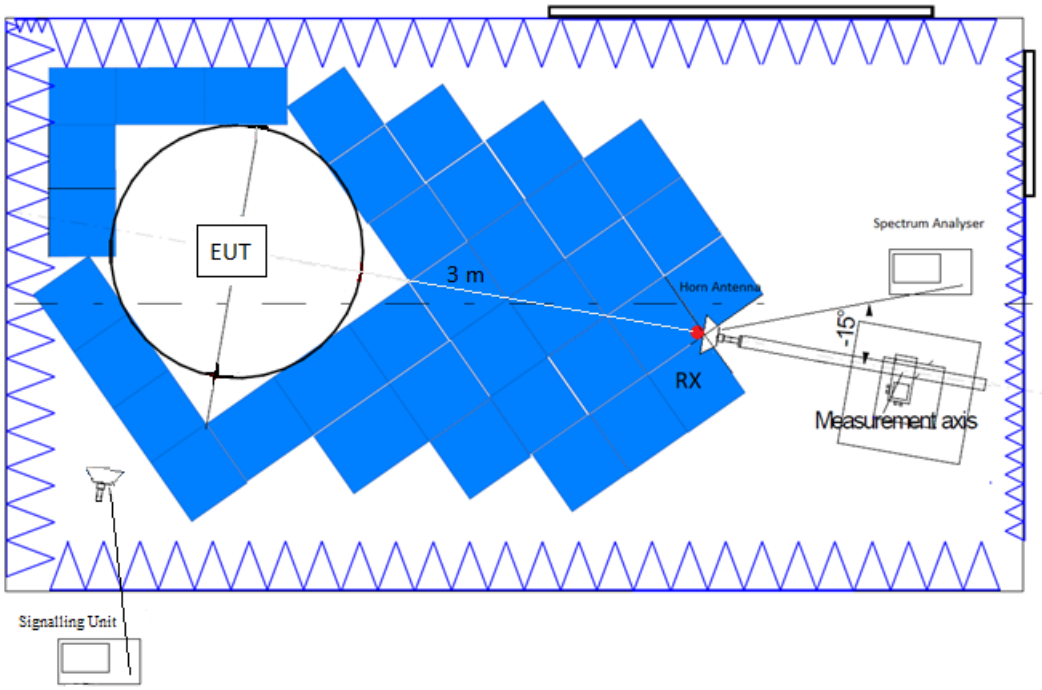
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

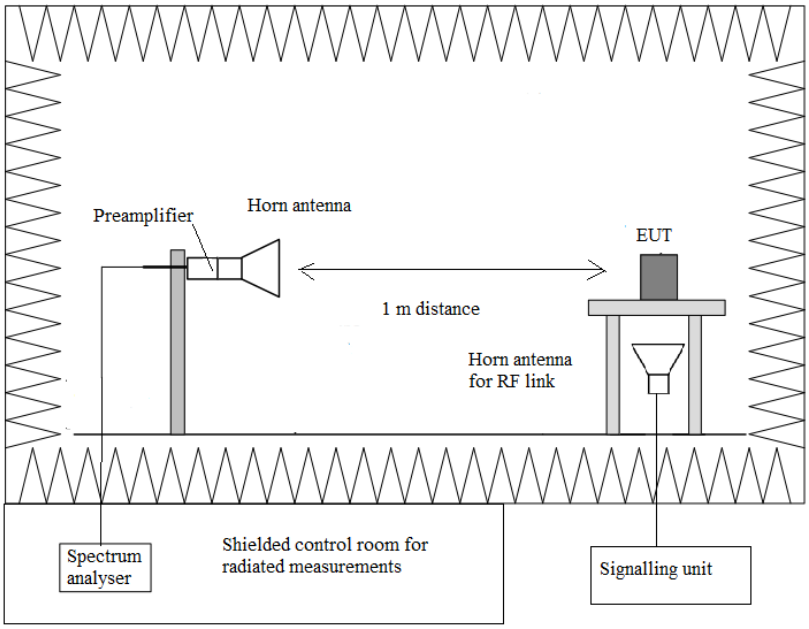
Radiated measurements below 1 GHz.



Radiated measurements setup between 1 GHz to 17 GHz.



Radiated measurements above 17 GHz.



RESULTS:

1. **Co-Location mode LTE Band 12, Bluetooth Low Energy.**

QPSK & 16QAM:
A preliminary scan determined the QPSK modulation as the worst case.

LTE Band 12: Middle Channel (707.5 MHz), BW=5 MHz, RB=1, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 7.075 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
7.075 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies detected at less than 20 dB below the limit.

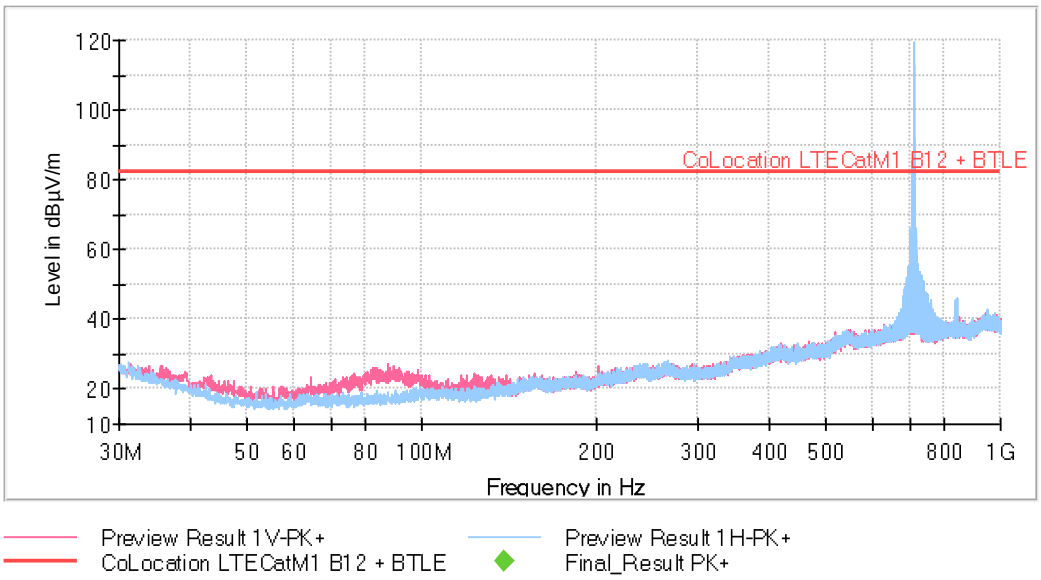
Frequency range 1 - 26 GHz

No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB)
<±4.89 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

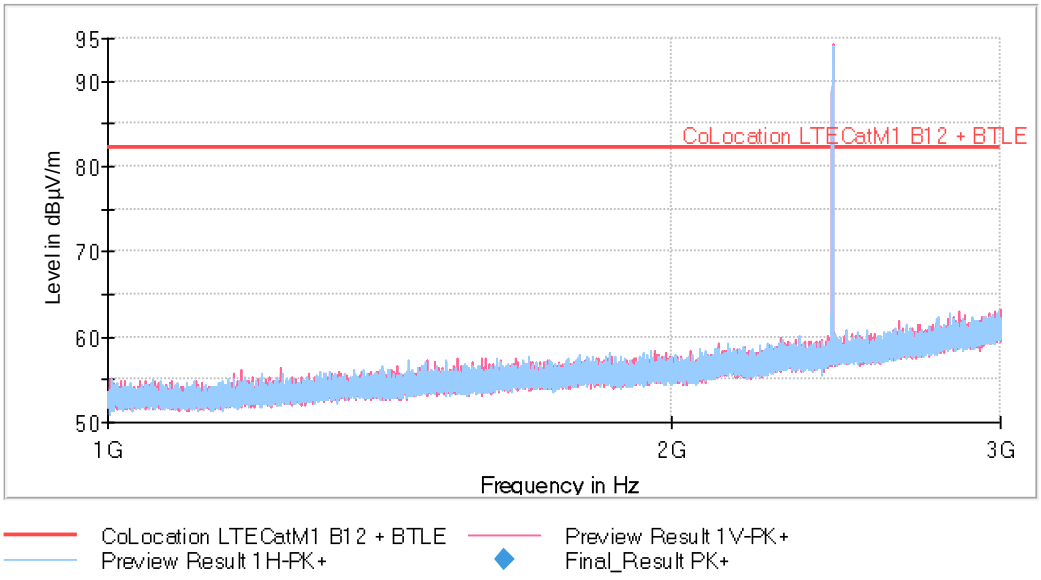
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



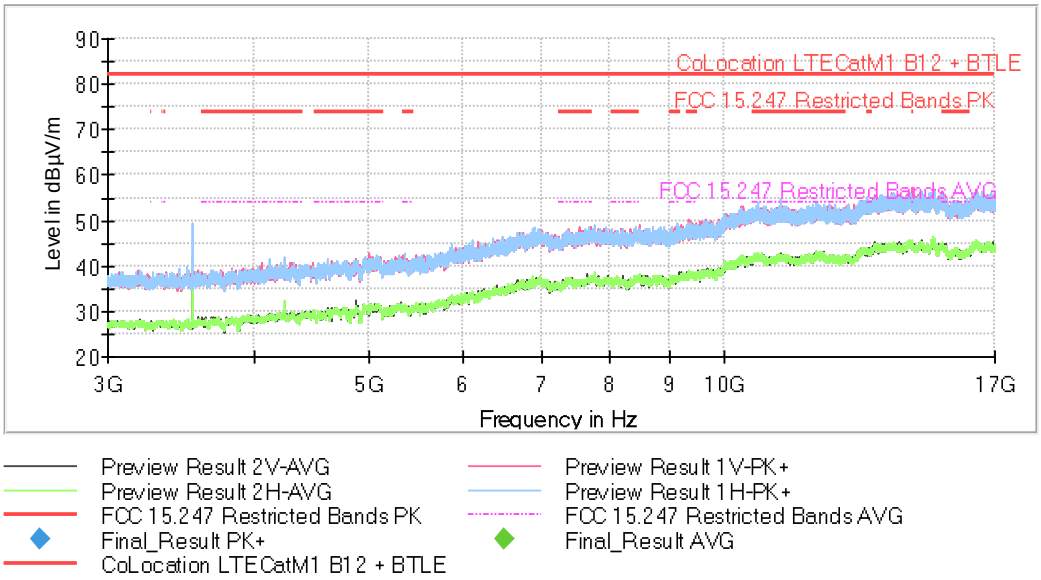
The peak above the limit is the Carrier frequency LTE Band 12 (707.5 MHz)

FREQUENCY RANGE 1 – 3 GHz

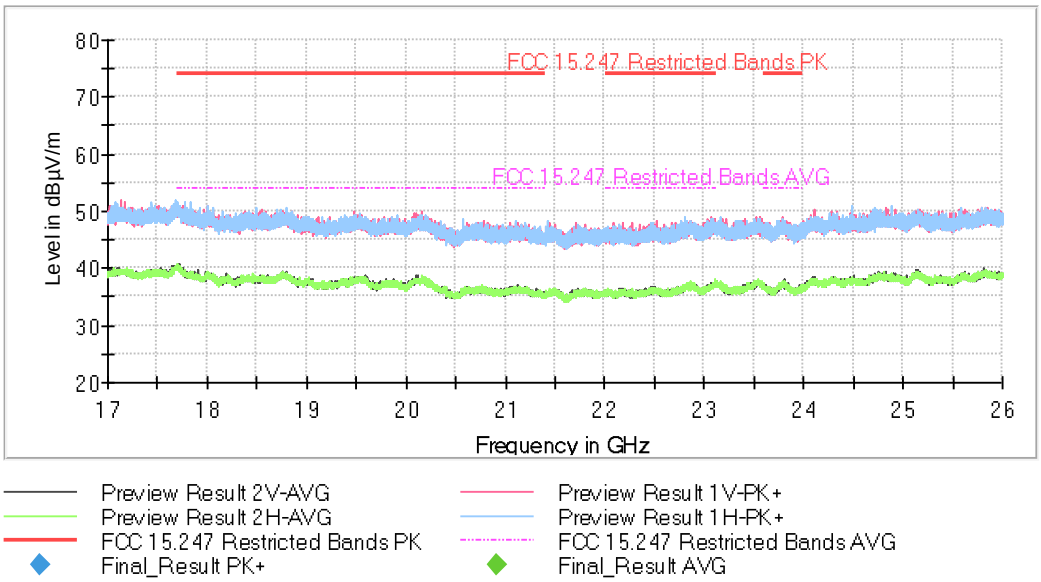


The peak above the limit is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz



2. Co-Location mode LTE Band 13, Bluetooth Low Energy.

QPSK & 16QAM:
A preliminary scan determined the 16QAM modulation as the worst case.

LTE Band 13: Middle Channel (782.0 MHz), BW=5 MHz, RB=1, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 7.82 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
7.82 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies detected at less than 20 dB below the limit.

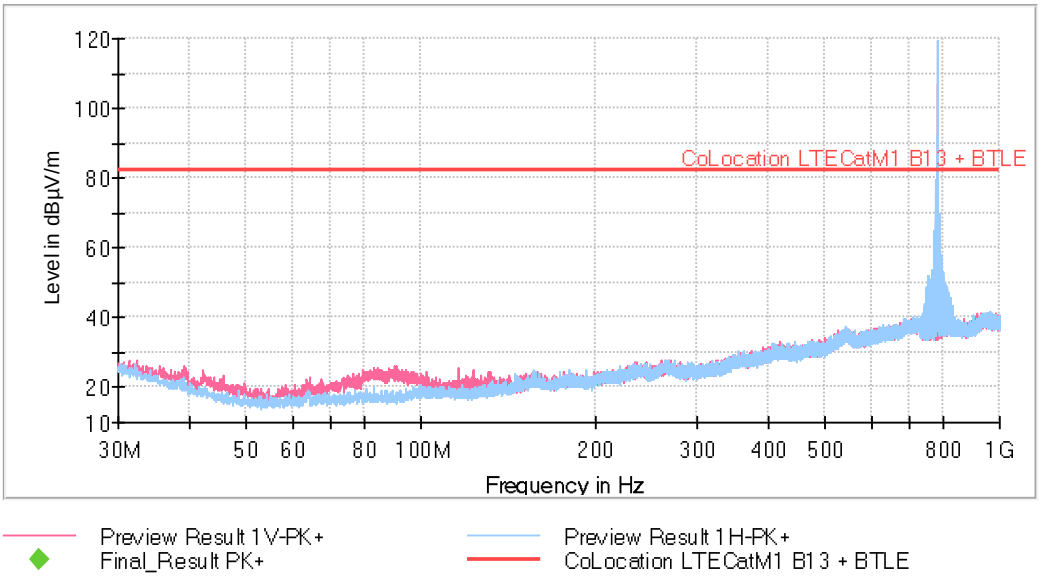
Frequency range 1 - 26 GHz

No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB)
<±4.89 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

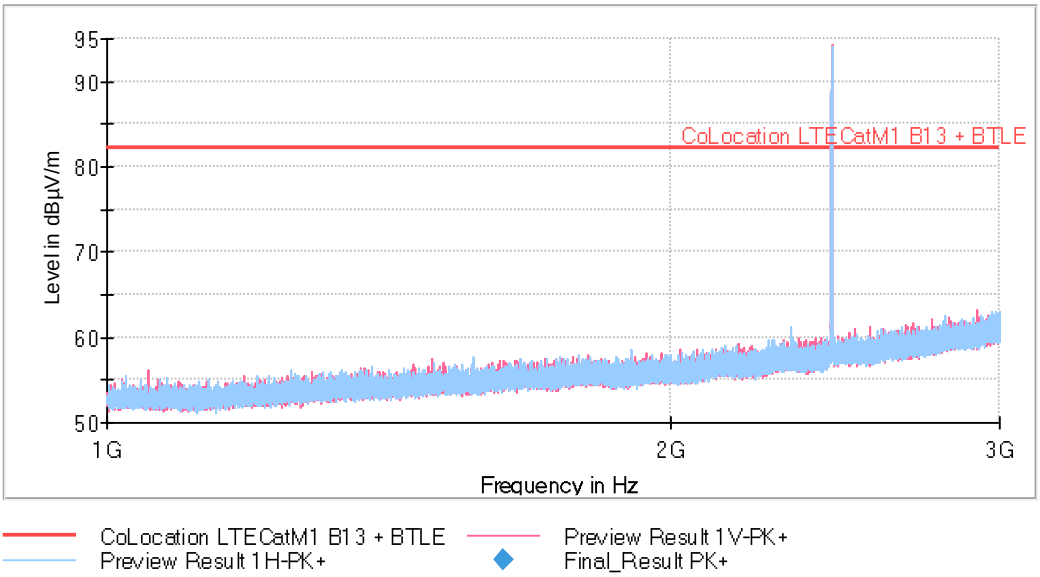
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



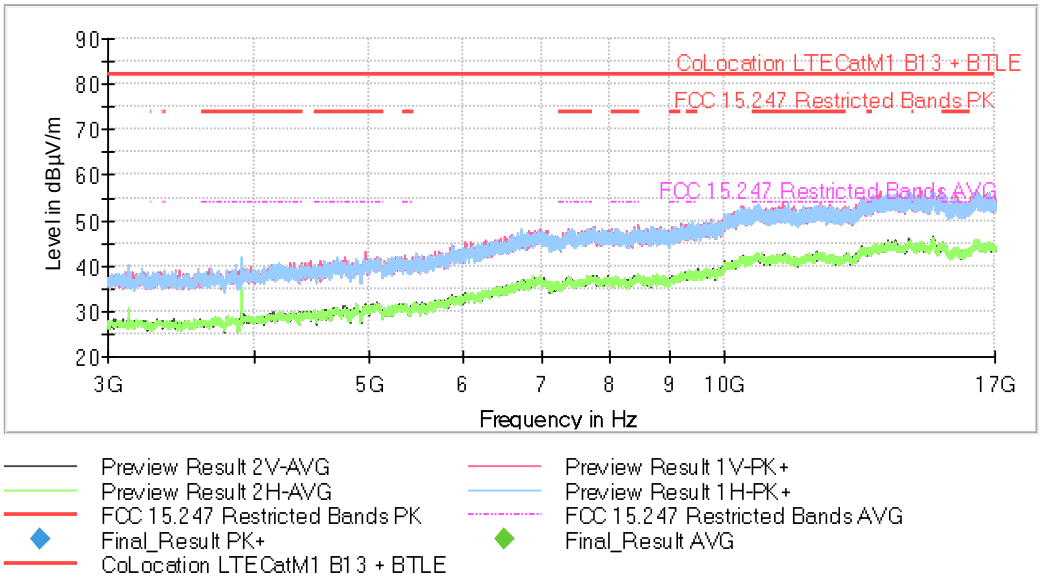
The peak above the limit is the Carrier frequency LTE Band 13 (782.0 MHz).

FREQUENCY RANGE 1 – 3 GHz

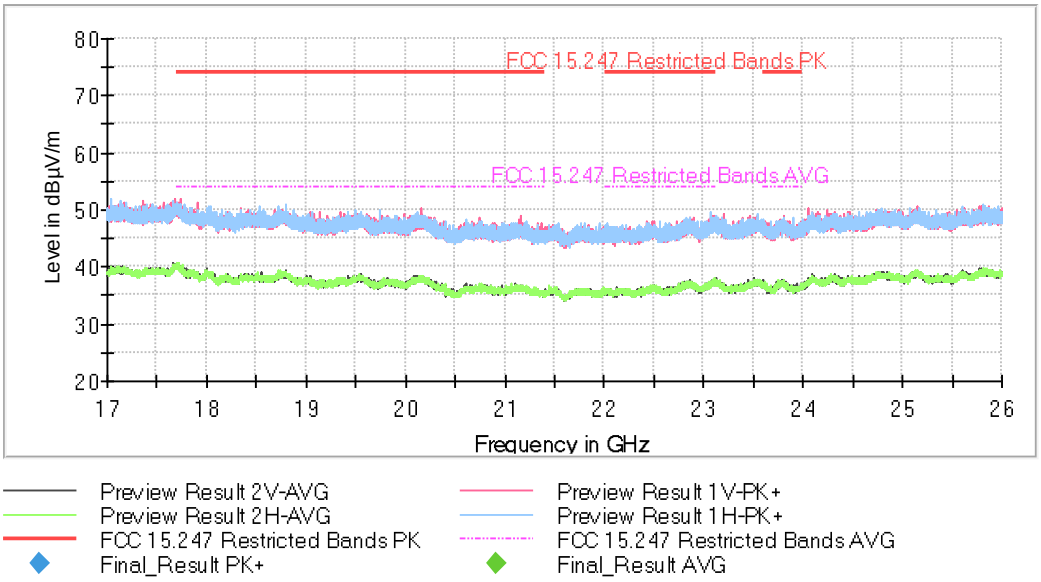


The peak above the limit is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz



3. Co-Location mode LTE Band 66, Bluetooth Low Energy.

QPSK & 16QAM:
A preliminary scan determined the 16QAM modulation as the worst case.

LTE Band 66: Middle Channel (1745.0 MHz), BW=20 MHz, RB=1, Offset=0.
Bluetooth Low Energy: Middle Channel (2440 MHz).

LIMIT: The spurious frequencies were measured at 3 meter. The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 17.45 GHz	Peak	43 + 10 log (P) dB = -13 dBm → 82.23 dBµV/m
17.45 to 26 GHz	Peak	74 dBµV/m (*)
	Average	54 dBµV/m (*)

(*) Radiated emissions which fall in the restricted bands, as defined in §15.205(a).

Frequency range 30 MHz - 1 GHz

No spurious frequencies detected at less than 20 dB below the limit.

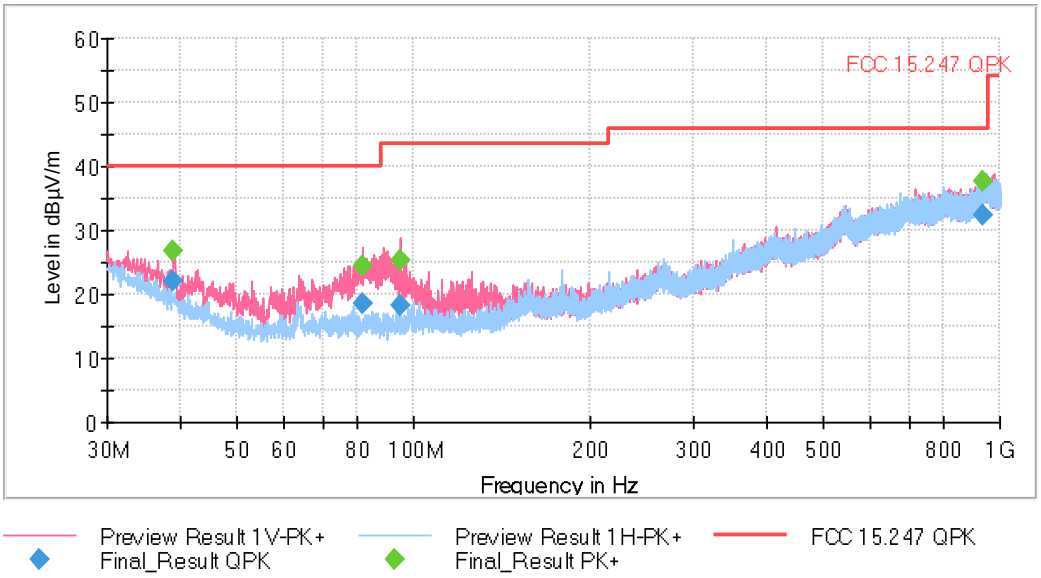
Frequency range 1 - 26 GHz

No spurious frequencies detected at less than 20 dB below the limit.

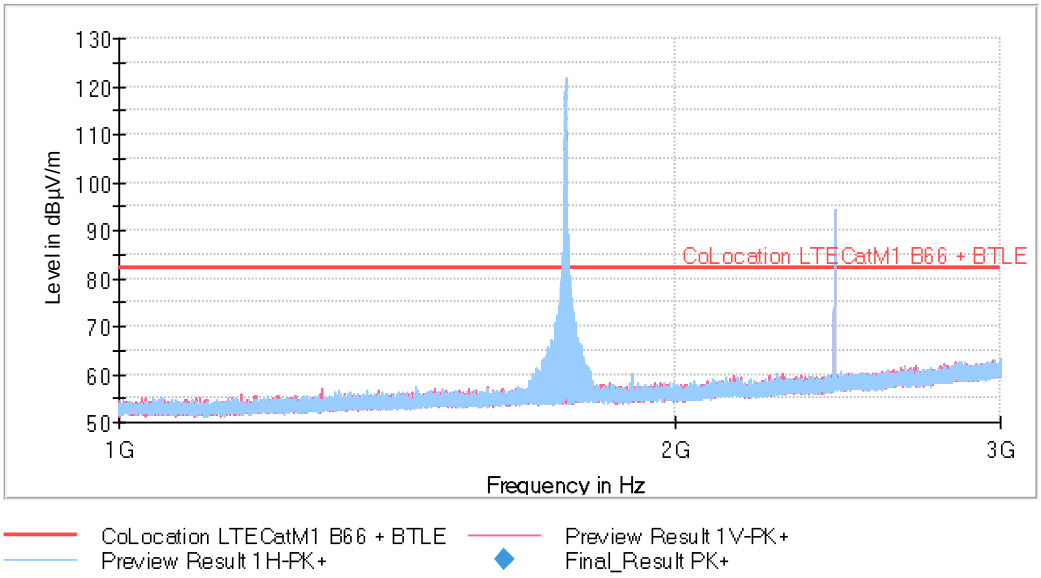
Measurement uncertainty (dB)
<±5.17 for f < 1GHz
<±4.11 for f ≥ 1 GHz up to 3 GHz
<±5.13 for f ≥ 3 GHz up to 17 GHz
<±4.81 for f ≥ 17 GHz up to 26 GHz

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



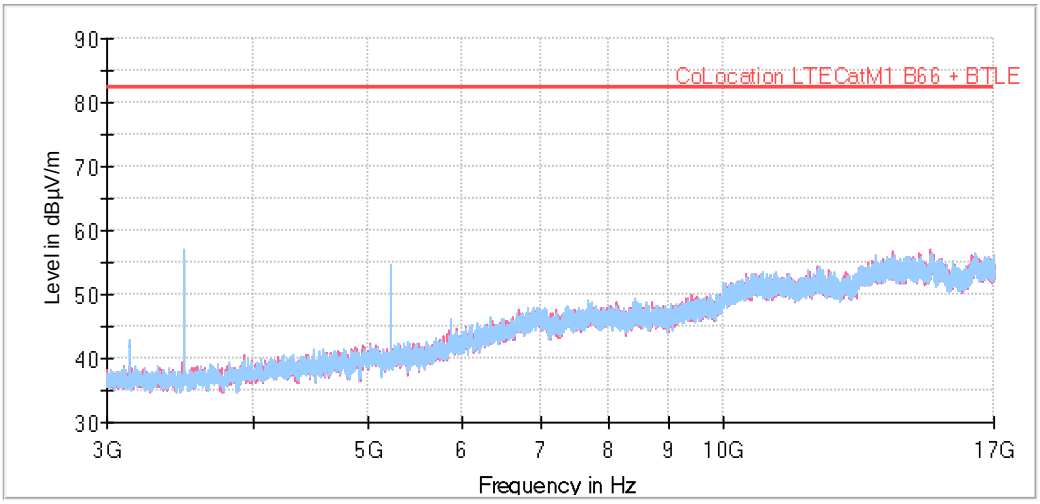
FREQUENCY RANGE 1 – 3 GHz



The peak above the limit on the left is the Carrier frequency LTE Band 66 (1745.0 MHz).

The peak above the limit on the right is the Carrier frequency Bluetooth Low Energy (2440 MHz).

FREQUENCY RANGE 3 – 17 GHz



FREQUENCY RANGE 17 - 26 GHz