

Test report No:
NIE: 63467RRF.001

Partial Test report

USA FCC 15.31(h), 22, 24, 27, 15.209, 15.247
CANADA 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	39000 AirSense 11
(*) Derived model not tested	39420 AirSense 11 AutoSet, 39421 AirSense 11 CPAP, 39422 AirSense 11 Elite, 39423 AirSense 11 AutoSet, 39424 AirSense 11 CPAP, 39425 AirSense 11 Elite.
Other identification of the product	HW Version: 1.0 SW Version: SW04600 FCC ID: 2ACHL-AIR114G IC: 9103A-AIR114G
(*) Features	4G LTE Cat 1, 3G, BLE
Applicant	RESMED Pty Ltd 1 Elizabeth Macarthur Drive, BELLA VISTA, NSW, 2153, AUSTRALIA
Test method requested, standard	USA FCC Part 15.31(h) (10-1-19 Edition). Measurement standard. USA FCC Part 22 (10-1-19 Edition). Public Mobile Services. USA FCC Part 24 (10-1-19 Edition). Personal Communications Services. USA FCC Part 27 (10-1-19 Edition). Miscellaneous Wireless Communications Services. USA FCC Part 15.209 (10-1-19 Edition). Radiated emission limits; general requirements. USA FCC Part 15.247 (10-1-19 Edition). Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. CANADA RSS-130 Issue 2, Feb. 2019. CANADA RSS-132 Issue 3, Jan. 2013. CANADA RSS-133 Issue 6 Amendment 1, Jan. 2018. CANADA RSS-139 Issue 3, Jul. 2015. CANADA RSS-Gen Issue 5 (March 2019). CANADA RSS-247 Issue 2 (February 2017). -Transmitter out of band radiated emissions with simultaneous transmissions. 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 Martín EMC Consumer & RF Lab. Manager
Date of issue	2021-02-03
Report template No	FDT08_23
	(*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

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 AirSense 11 is a CPAP device with integrated cellular and Bluetooth connectivity.
3. Derived model not tested. These models have been declared by the supplier of the sample as being the same as the model under test.



Date: 20 December 2020

DECLARATION OF EQUIVALENCE

This document declares that the following designated products (model/name) are equivalent to the unit under test 39000.

For the USA:

39420 AirSense 11 AutoSet
39421 AirSense 11 CPAP
39422 AirSense 11 Elite

For Canada:

39423 AirSense 11 AutoSet
39424 AirSense 11 CPAP
39425 AirSense 11 Elite

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

Applicant

Company name: ResMed Pty Ltd. ACN 003 765 142
Address: 1 Elizabeth Macarthur Drive
Bella Vista
NSW 2153
Australia
Telephone No: +61 2 8884 1000

By:



Christopher Jenkins

Title: Associate Manager – Systems Engineering

Email: 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 results.

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
63467/008	Continuous Positive Airway Pressure (CPAP) Device	39000 AirSense 11	22201142044	2020/10/01
63467/011	AC/DC adapter	--	0000C200	2020/10/01
63467/014	ClimateLine	AIR11	--	2020/10/14

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

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Power		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :	--						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input checked="" type="checkbox"/>	AC: 100-240V~, 50-60Hz	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	DC:					
Rated Power	24Vdc, 2.71A						
Clock frequencies..... :	--						
Other parameters	--						
Software version	SW04600						
Hardware version	1.0						
Dimensions in cm (W x H x D)	--						
Mounting position	<input checked="" type="checkbox"/>	Table top equipment					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		
	ELS61-US		Cellular		Thales		
	EFR32BG1		Bluetooth LE		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, Australia

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-10-20
Date (finish)	2020-10-21

Document history

Report number	Date	Description
63467RRF.001	2021-02-03	First release.

Environmental conditions

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Alfonso Gutiérrez, José Manuel Jiménez and Cristina Calle.

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 Sunol Sciences Corporation JB6	2018/10	2021/10
4.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
5.	Broadband Horn Antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2020/08	2023/08
6.	RF Pre-amplifier 1-18 GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
7.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2019/10	2021/10
8.	Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2020/05	2023/05
9.	RF Pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02

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 / RSS-247 / RSS-130 / RSS-132 / RSS-133 / RSS-139 / RSS-Gen PARAGRAPH		
Requirement – Test case	Verdict	Remark
FCC 15.31 (h), 15.209 (a), 15.247 (d) / RSS-Gen 8.9, RSS-247 5.5 FCC 22.917 / RSS-132 Clause 5.5 FCC 24.238 / RSS-133 Clause 6.5 FCC 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6. Emission limitations radiated (Transmitter)	P	(1)
<u>Supplementary information and remarks:</u> (1) Only co-location radiated spurious emission test was requested		

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

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TEST CONDITIONS

POWER SUPPLY:

Vnominal: 230 Vac
Type of Power Supply: AC voltage.

ANTENNA:

Type of Antennas: Internal
Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 5: +2.2 dBi

TEST FREQUENCIES:

Based on preliminary testing that identified those corresponding to the worst cases (with the highest E.I.R.P.):

	CELLULAR LTE (Band 5)	
Band:	LTE Band 5	
Frequency Range:	824 – 849 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Middle: 20525	836.5

	Bluetooth LE	
Mode:	GFSK	
Channel Spacing:	1 MHz	
Frequency Range:	2400 - 2483.5 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	High: 39	2480

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 SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Selected Transmission Modes for 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: Cellular LTE Band 5 / Middle Channel configuration.
These channels were 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 / High Channel and GFSK mode configuration.

TESTED SIMULTANEOUS TRANSMISSION MODES:

- * **Co-location mode LTE Band 5, Bluetooth Low Energy**, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE Band 5 / Middle Channel and Bluetooth Low Energy / High 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 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 $43 + 10 \log_{10} p$ (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 $43 + 10 \log_{10} p$ (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz 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 till 26 GHz.

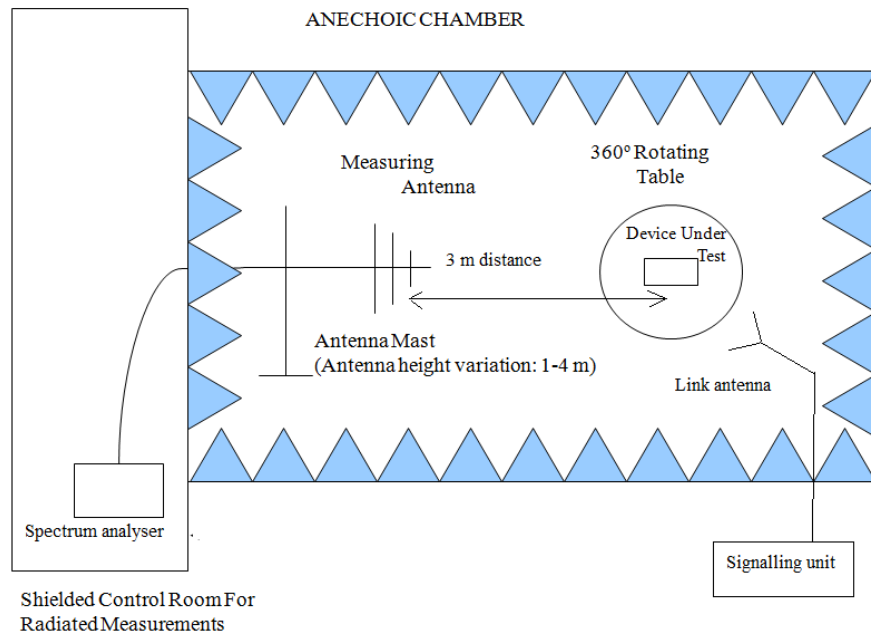
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 17 GHz and at 1 m distance for measurements above 17 GHz. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. 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.

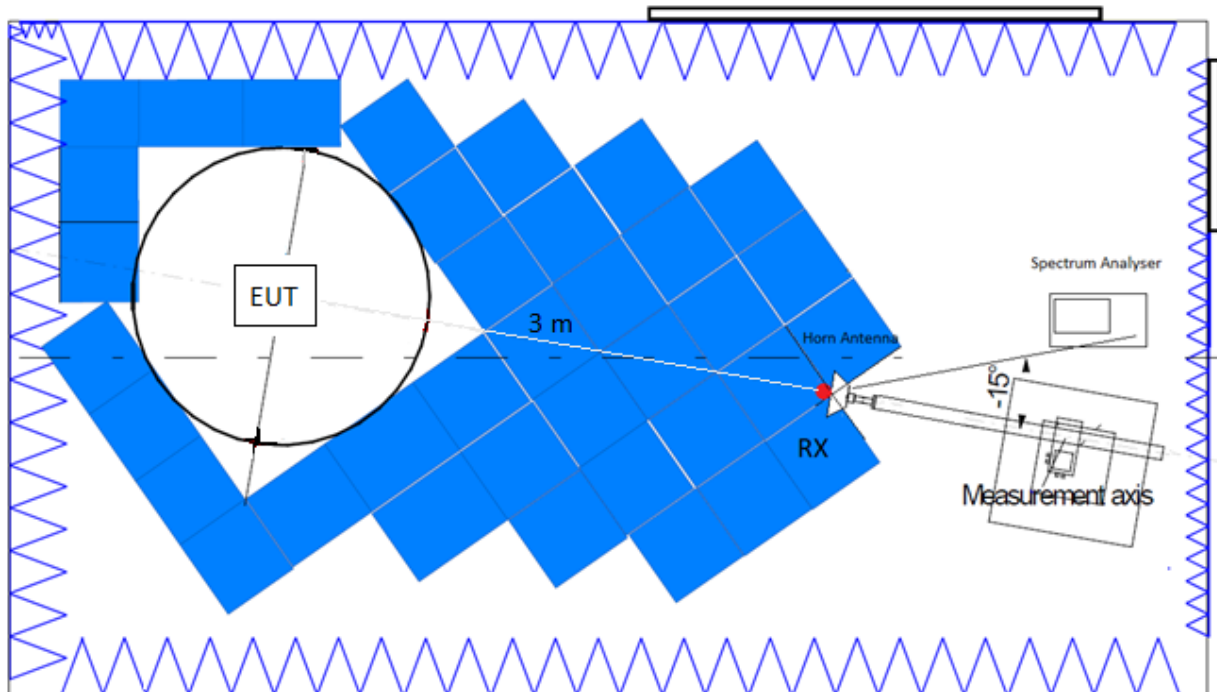
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

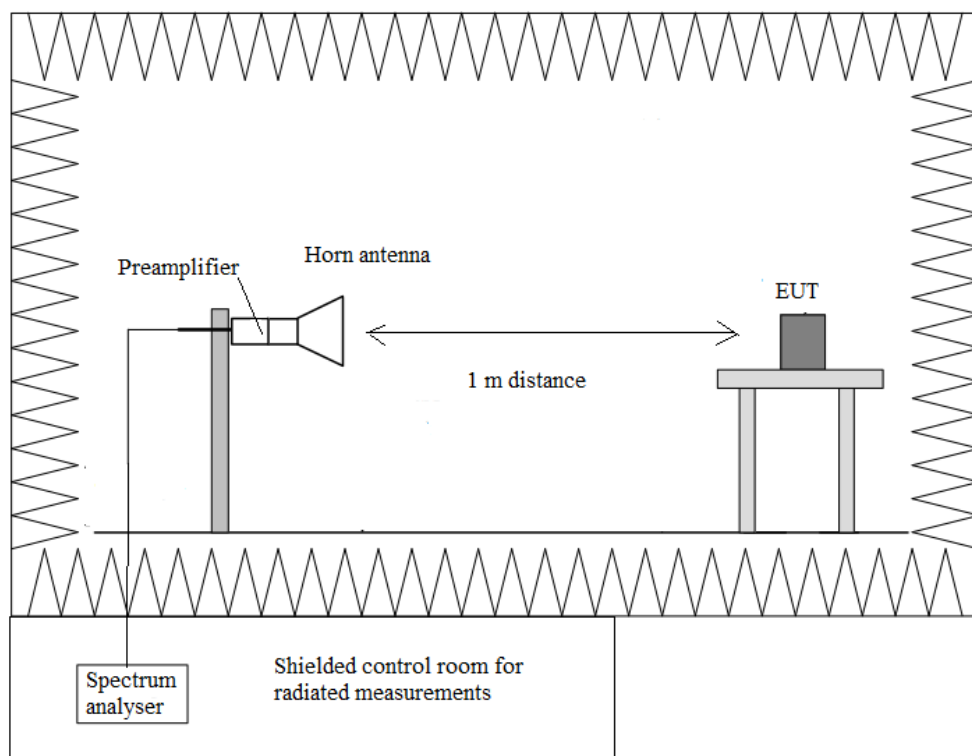
Radiated measurements below 1 GHz.



Radiated measurements setup from 1GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



RESULTS:

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

QPSK & 16QAM:

A preliminary scan determined the QPSK modulation as the worst case.

LTE Band 5: BW: 1.4 MHz. Middle Channel (836.5 MHz). RB Size: 1. RB Offset: 0.
Bluetooth Low Energy: High Channel (2480 MHz). GFSK.

LIMIT: The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 8.37 GHz	Peak	$43 + 10 \log (P) \text{ dB} = -13 \text{ dBm} \rightarrow 82.23 \text{ dB}\mu\text{V/m}$
8.37 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.

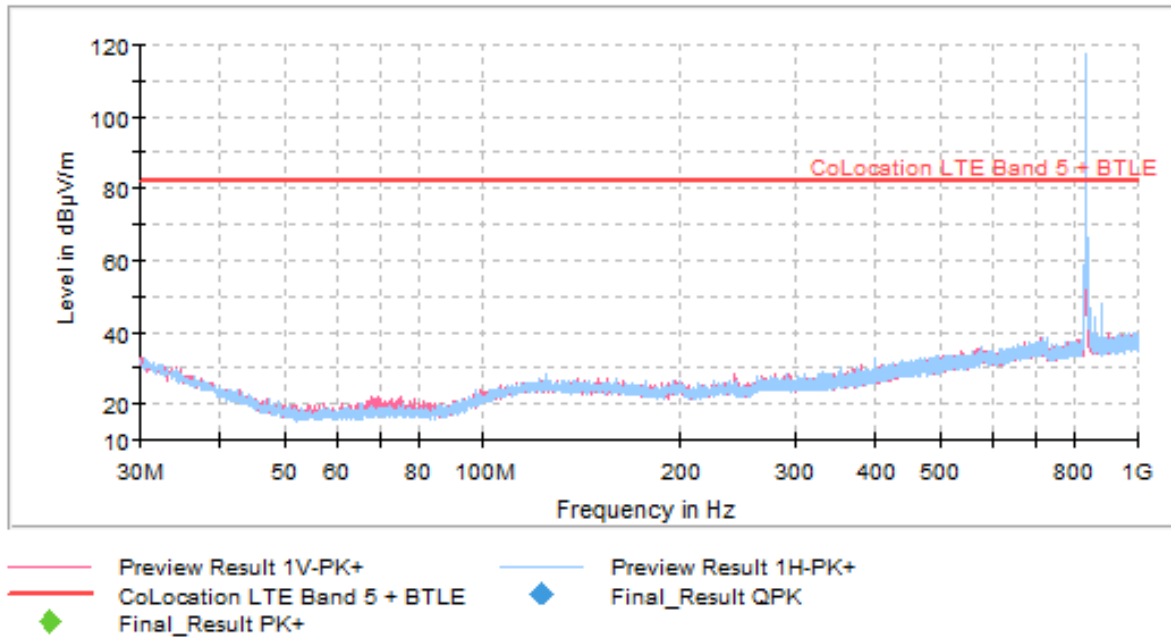
Frequency range 1 - 26 GHz

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

Measurement uncertainty (dB)	$< \pm 4.86$ for $f < 1 \text{ GHz}$ $< \pm 4.11$ for $f \geq 1 \text{ GHz}$ up to 3 GHz $< \pm 5.13$ for $f \geq 3 \text{ GHz}$ up to 17 GHz $< \pm 4.82$ for $f \geq 17 \text{ GHz}$
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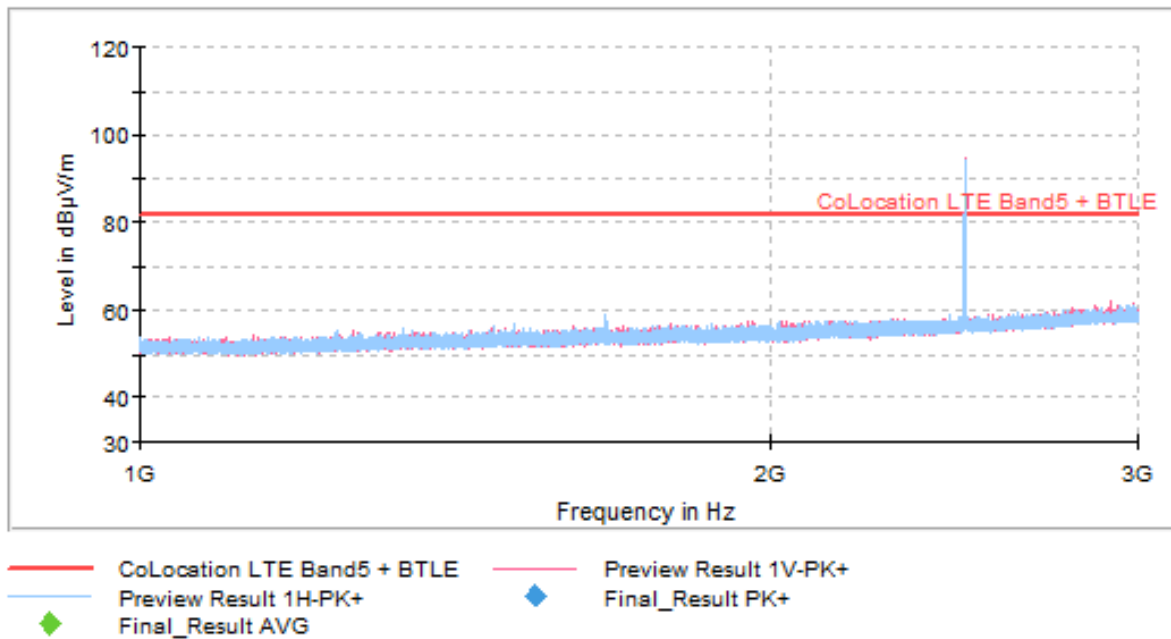
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



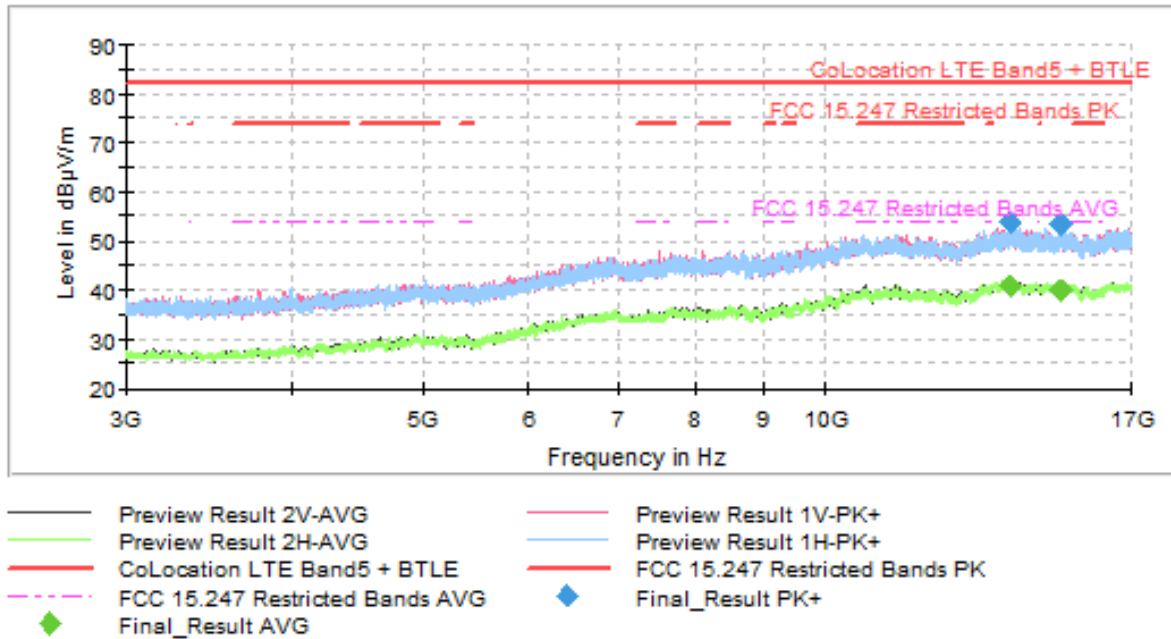
The peak above the limit is the LTE Band 5 carrier frequency.

FREQUENCY RANGE 1 - 3 GHz

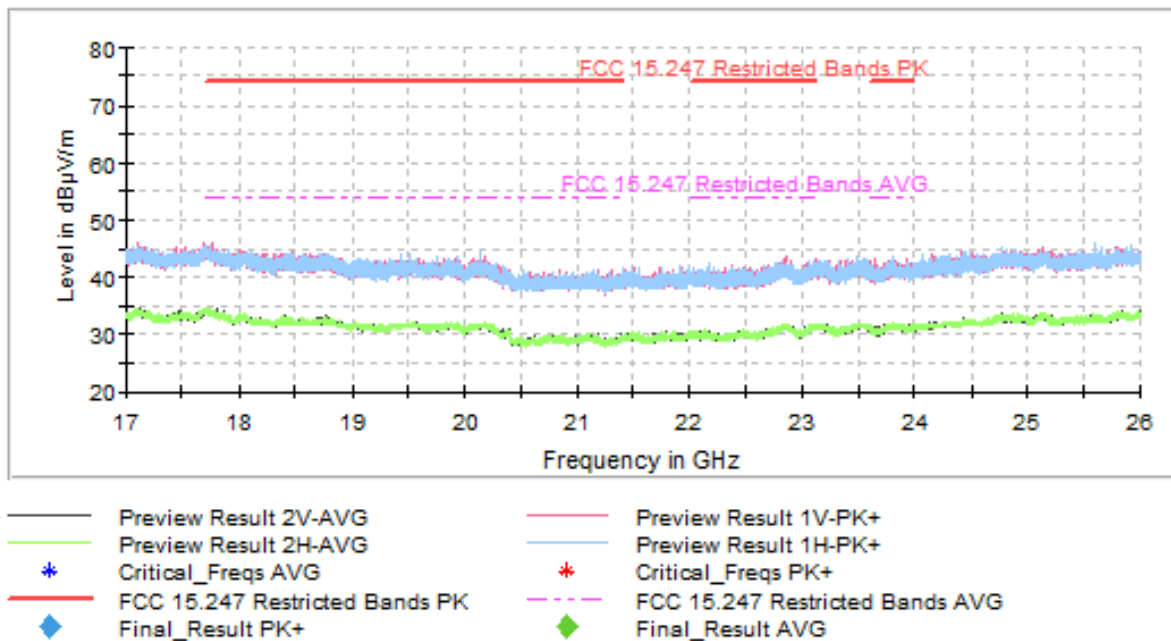


The peak above the limit is the Bluetooth carrier frequency.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz



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

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TEST CONDITIONS

POWER SUPPLY:

Vnominal: 230 Vac
Type of Power Supply: AC voltage.

ANTENNA:

Type of Antennas: Internal
Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 2: +2.5 dBi

TEST FREQUENCIES:

Based on preliminary testing that identified those corresponding to the worst cases (with the highest E.I.R.P.):

	CELLULAR LTE (Band 2)	
Band:	LTE Band 2	
Frequency Range:	1850 – 1910 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Low: 18700	1860

	BLUETOOTH	
Mode:	Low Energy	
Channel Spacing:	1 MHz	
Frequency Range:	2400 - 2483.5 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	High: 39	2480

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 SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Selected Transmission Modes for 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: Cellular LTE Band 2 / Low Channel configuration.
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 / High Channel and GFSK mode configuration.

TESTED SIMULTANEOUS TRANSMISSION MODES:

* **Co-location mode LTE Band 2, Bluetooth Low Energy**, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE Band 2 / Low Channel and Bluetooth Low Energy / High 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 2.

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 $43 + 10 \log_{10}(P)$ (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 $43 + 10 \log_{10}(P)$ (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 till 26 GHz.

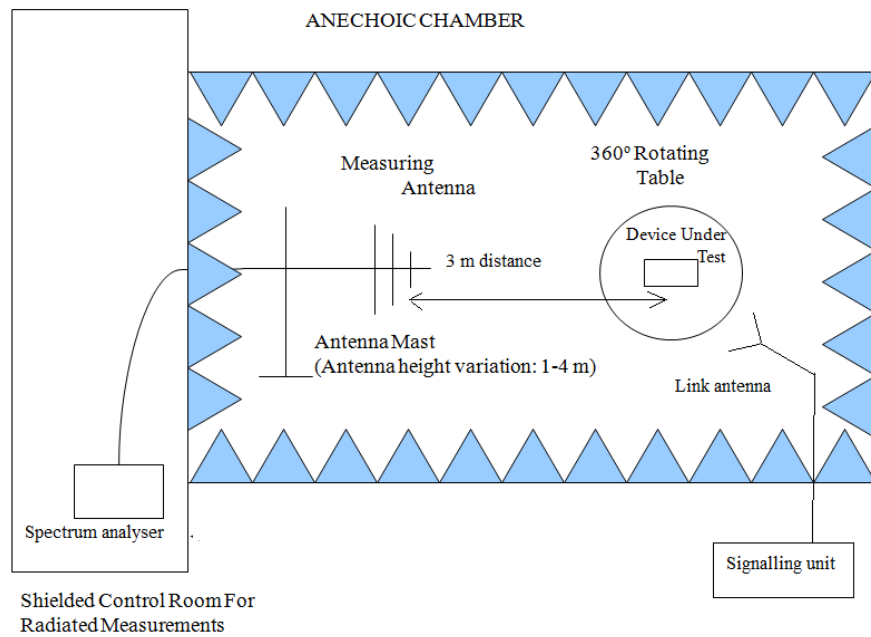
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 17 GHz and at 1 m distance for measurements above 17 GHz. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. 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.

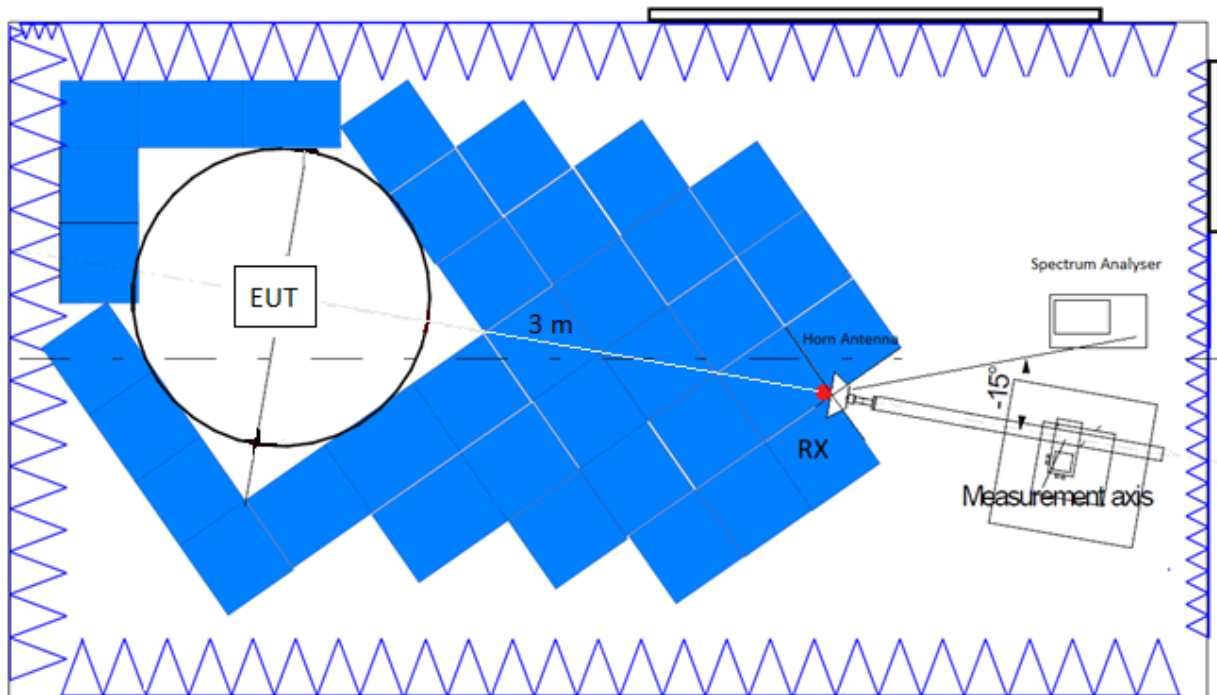
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

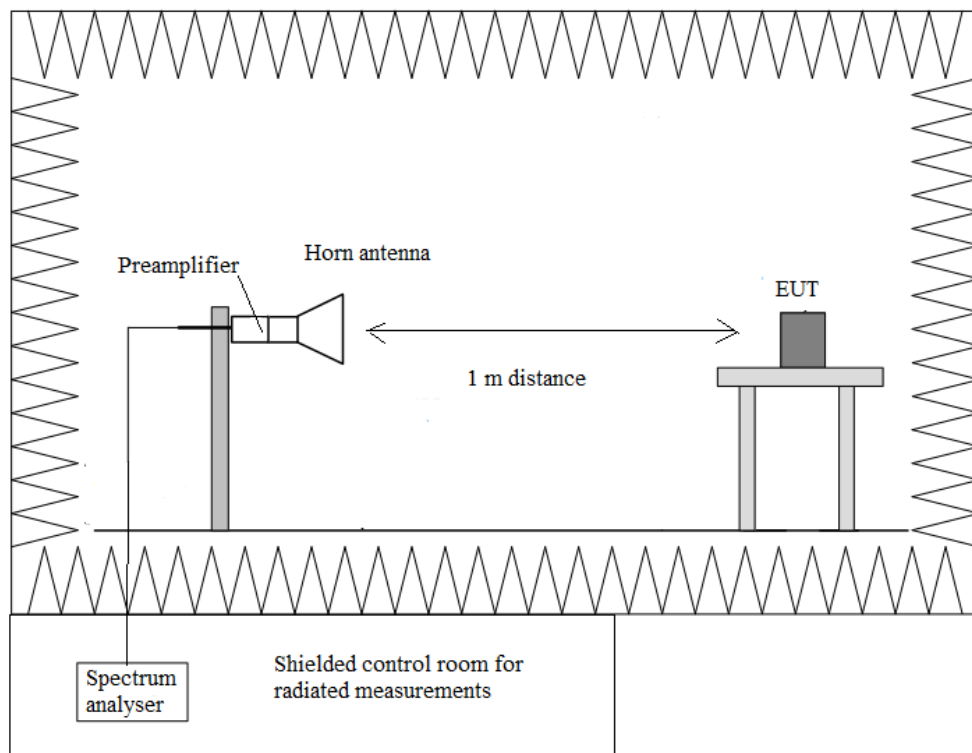
Radiated measurements below 1 GHz.



Radiated measurements setup from 1GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



RESULTS:

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

QPSK & 16QAM:

A preliminary scan determined the QPSK modulation as the worst case.

LTE Band 2: BW: 20 MHz. Low Channel (1860 MHz). RB Size: 1. RB Offset: 0.
Bluetooth Low Energy: High Channel (2480 MHz).

LIMIT: The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 18.6 GHz	Peak	$43 + 10 \log (P) \text{ dB} = -13 \text{ dBm} \rightarrow 82.23 \text{ dBµV/m}$
18.6 GHz 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.

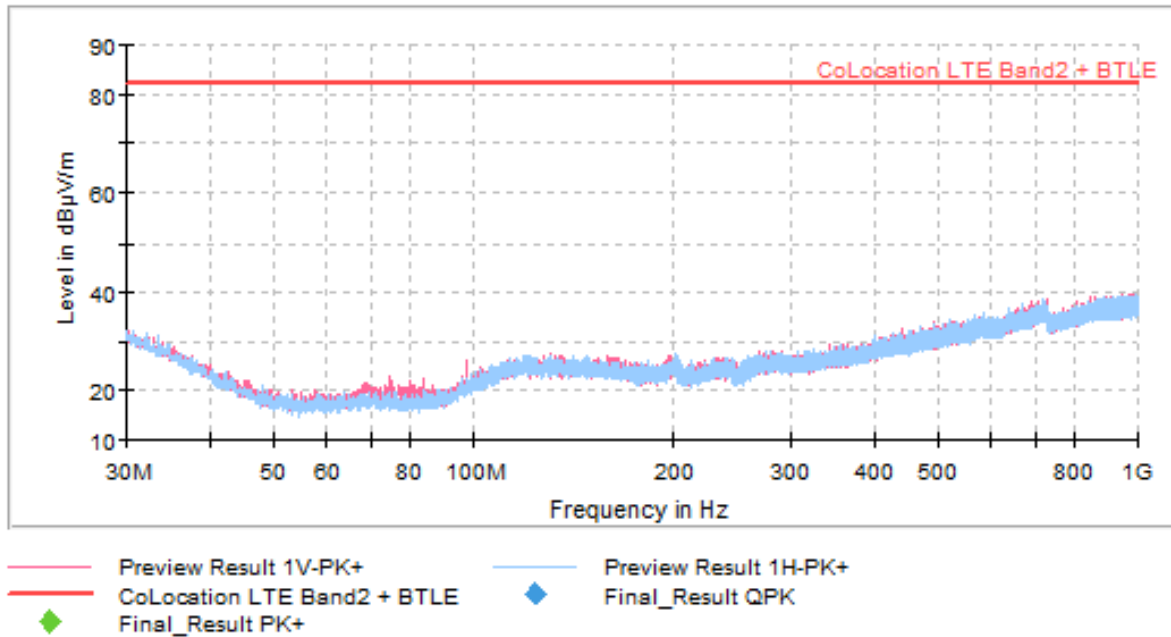
Frequency range 1 – 26 GHz

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

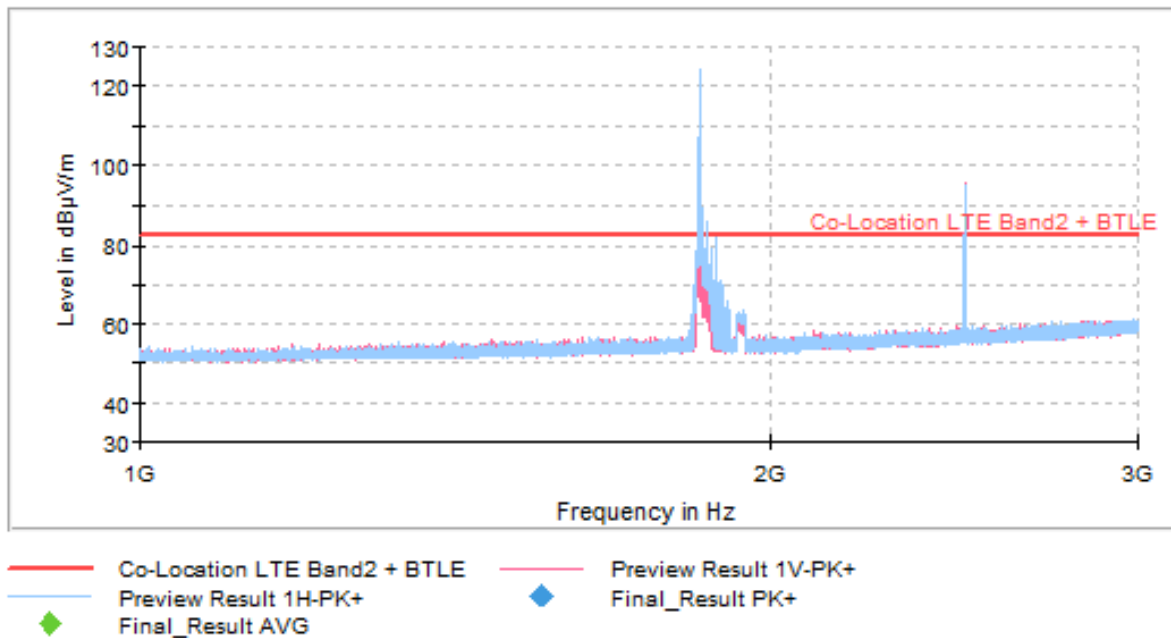
Measurement uncertainty (dB)	$< \pm 4.86$ for $f < 1 \text{ GHz}$ $< \pm 4.11$ for $f \geq 1 \text{ GHz}$ up to 3 GHz $< \pm 5.13$ for $f \geq 3 \text{ GHz}$ up to 17 GHz $< \pm 4.82$ for $f \geq 17 \text{ GHz}$
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Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

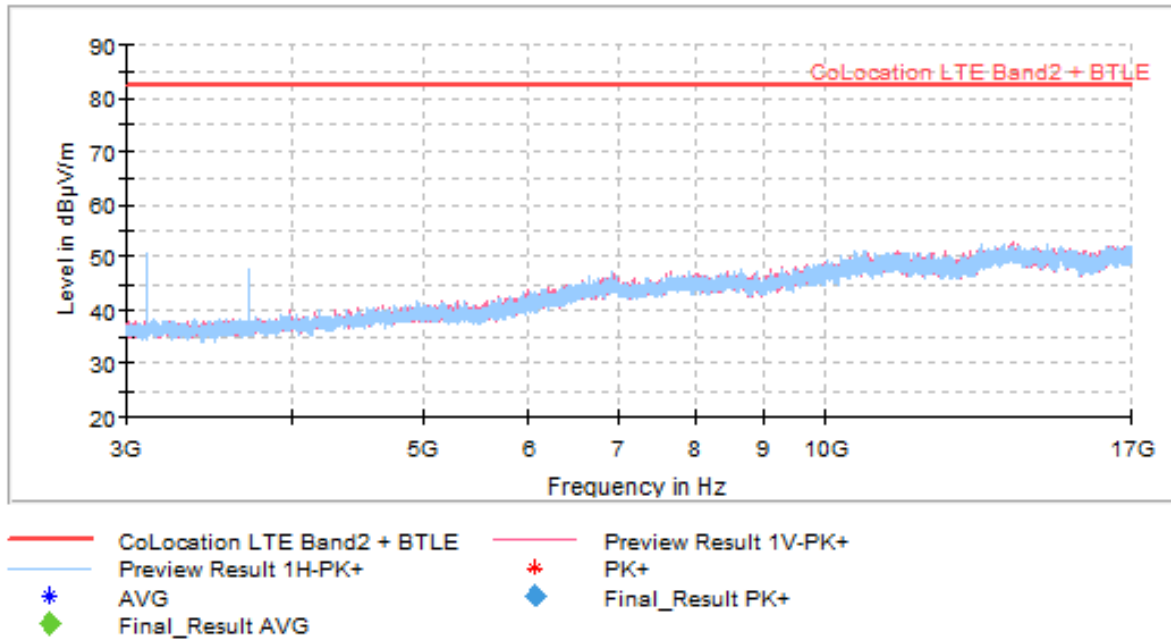


FREQUENCY RANGE 1 - 3 GHz

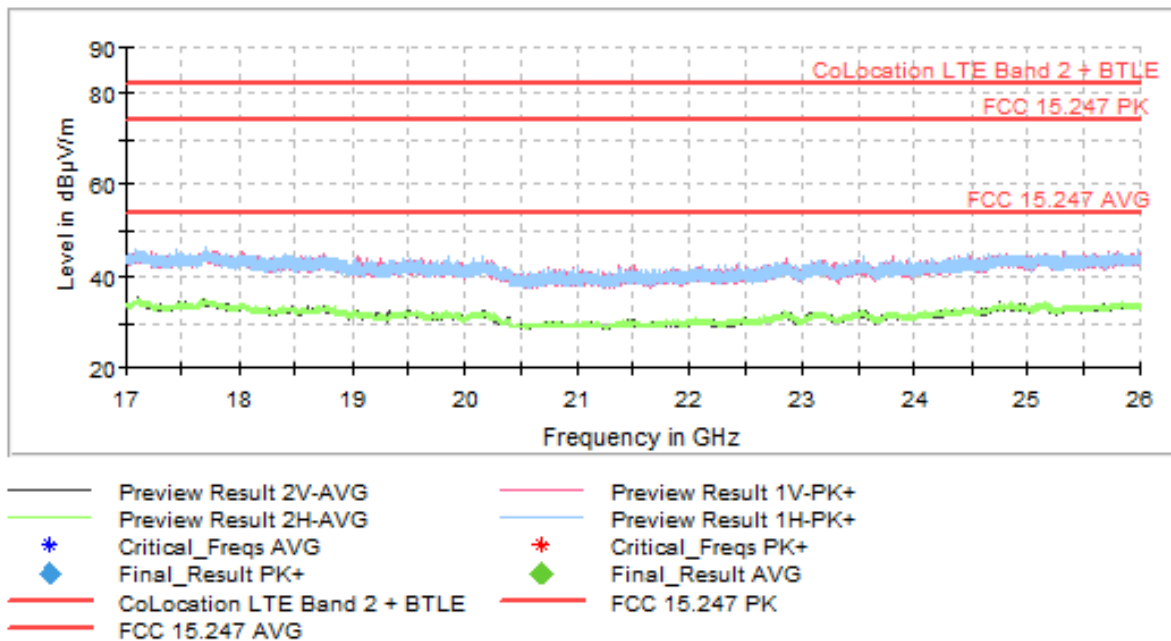


The peaks above the limit are the LTE Band 2 and the Bluetooth carrier frequencies.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz



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

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TEST CONDITIONS

POWER SUPPLY:

Vnominal: 230 Vac
Type of Power Supply: AC voltage.

ANTENNA:

Type of Antennas: Internal
Maximum Declared Gain for Bluetooth LE: +1.98 dBi
Maximum Declared Gain for LTE Band 4: +4.5 dBi
Maximum Declared Gain for LTE Band 12: +2.0 dBi

TEST FREQUENCIES:

Based on preliminary testing that identified those corresponding to the worst cases (with the highest E.I.R.P.):

	CELLULAR LTE (Bands 4, 12)	
Band:	LTE Band 4	
Frequency Range:	1710 – 1755 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Low: 20025	1717.5
Band:	LTE Band 12	
Frequency Range:	699 – 716 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	Low: 23017	699.7

	BLUETOOTH	
Mode:	Low Energy	
Channel Spacing:	1 MHz	
Frequency Range:	2400 – 2483.5 MHz	
Transmit Channel:	Channel	Channel Frequency (MHz)
	High: 39	2480

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 SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

Selected Transmission Modes for 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 Cellular LTE Band 4 / Low Channel as this channel was found to transmit higher EIRP than all the other channels.

* Cellular LTE: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Cellular LTE Band 12 / Low Channel as this channel was found to transmit higher EIRP than all the other channels.

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

TESTED SIMULTANEOUS TRANSMISSION MODES:

* **Co-location mode LTE Band 4, Bluetooth Low Energy**, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE Band 4 / Low Channel and Bluetooth Low Energy / High Channel and GFSK.

* **Co-location mode LTE Band 12, Bluetooth Low Energy**, with the EUT configured to simultaneously transmit two signals at maximum output power, Cellular LTE Band 12 / Low Channel and Bluetooth Low Energy / High 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 4.

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 MHz, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ 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 $43 + 10 \log_{10} p$ (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 $43 + 10 \log_{10} P$ (watts) dB.

2. LTE Band 12.

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 Issue 2 Clause 4.7.1:

4.7.1. 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 $43 + 10 \log_{10} p$ (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.

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 till 26 GHz.

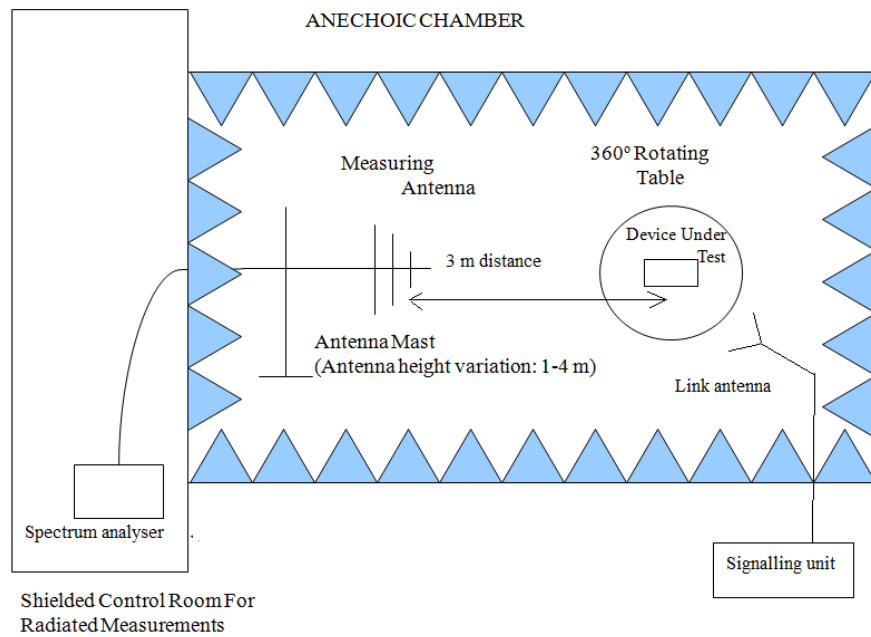
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 17 GHz and at 1 m distance for measurements above 17 GHz. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. 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.

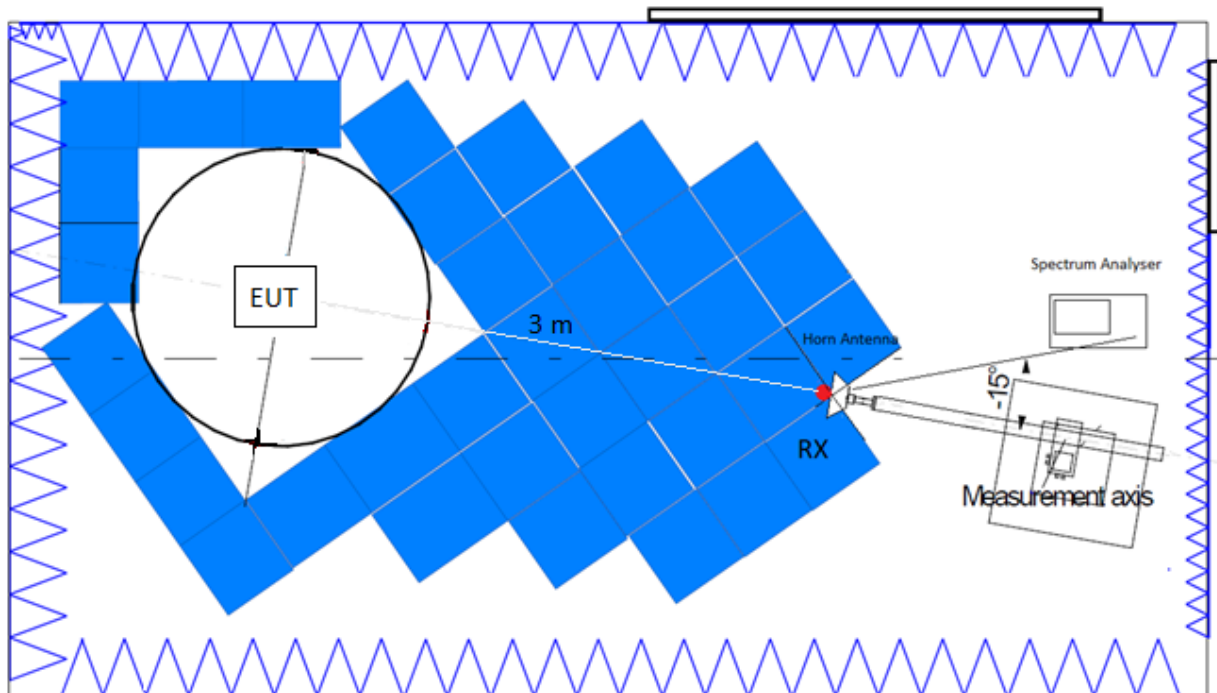
These measurements have been performed in order to check the impact of the Co-Location of all radio interfaces (that can be transmitting simultaneously).

TEST SETUP:

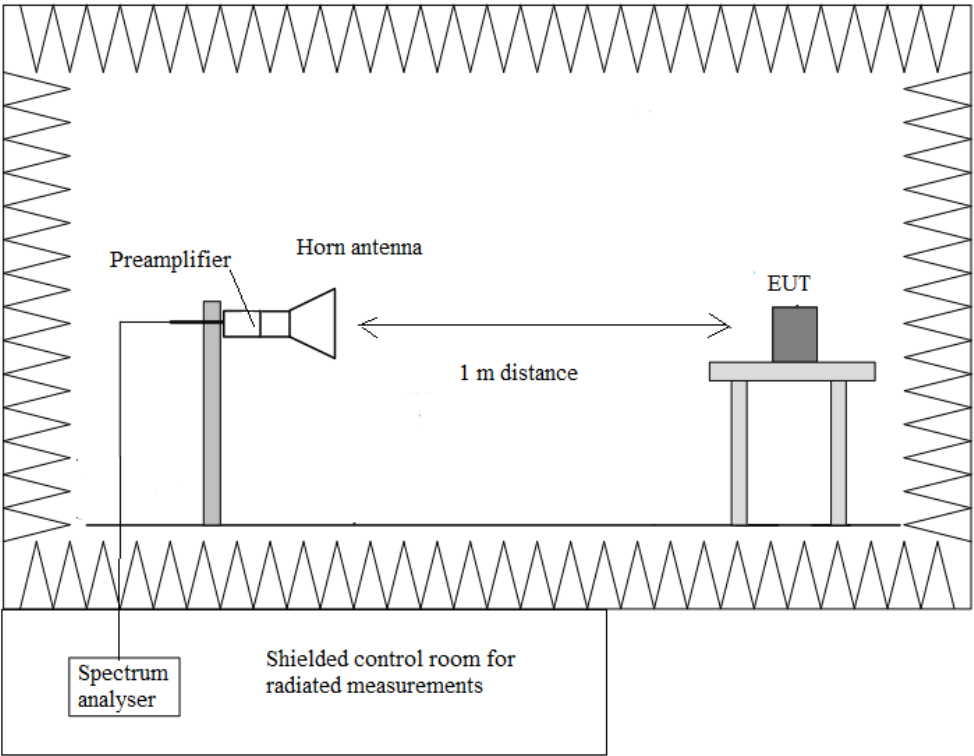
Radiated measurements below 1 GHz.



Radiated measurements setup from 1GHz to 17 GHz:



Radiated measurements setup $f > 17\text{ GHz}$:



RESULTS:

Co-Location mode LTE Band 4, Bluetooth Low Energy.

QPSK and 16QAM:

A preliminary scan determined QPSK modulation as the worst case.

LTE Band 4: BW: 15 MHz. Low Channel (1717.5 MHz). RB Size: 1. RB Offset: 0.
Bluetooth Low Energy: High Channel (2480 MHz).

LIMIT: The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 17.18 GHz	Peak	$43 + 10 \log (P) \text{ dB} = -13 \text{ dBm} \rightarrow 82.23 \text{ dBµV/m}$
17.18 GHz 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.

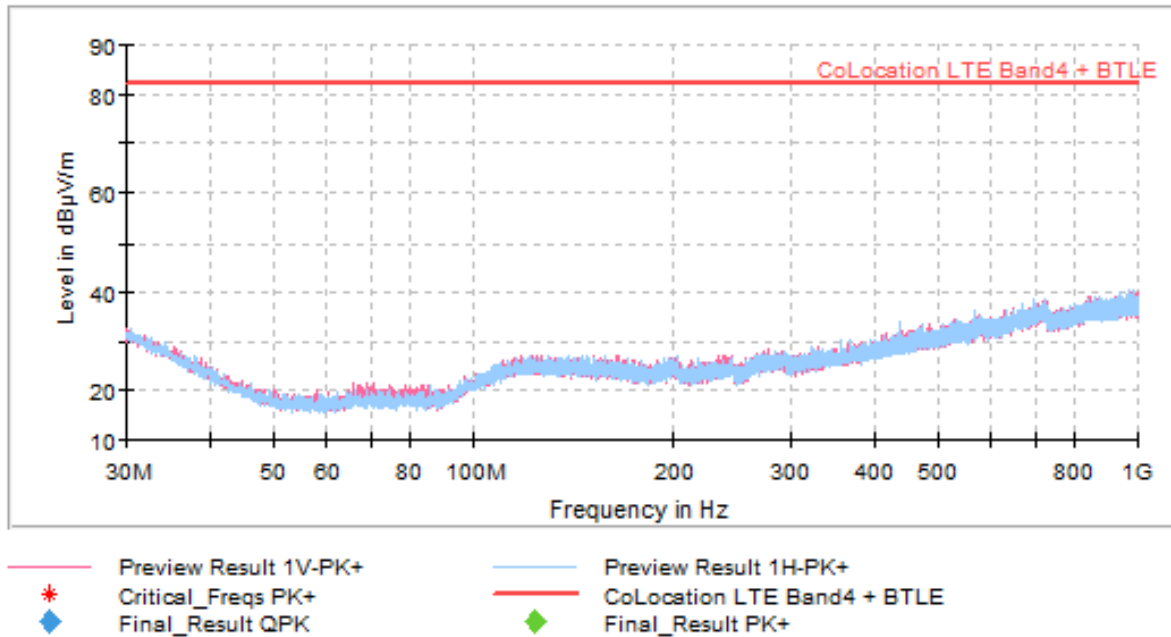
Frequency range 1 - 26 GHz

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

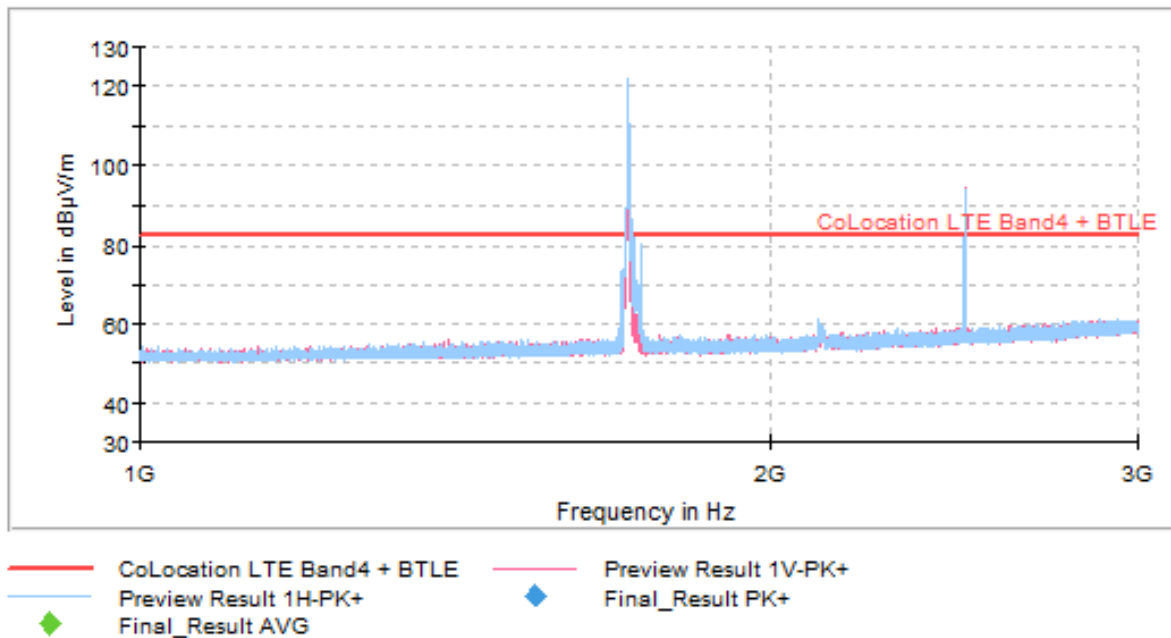
Measurement uncertainty (dB)	$< \pm 4.86$ for $f < 1 \text{ GHz}$ $< \pm 4.11$ for $f \geq 1 \text{ GHz}$ up to 3 GHz $< \pm 5.13$ for $f \geq 3 \text{ GHz}$ up to 17 GHz $< \pm 4.82$ for $f \geq 17 \text{ GHz}$
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Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

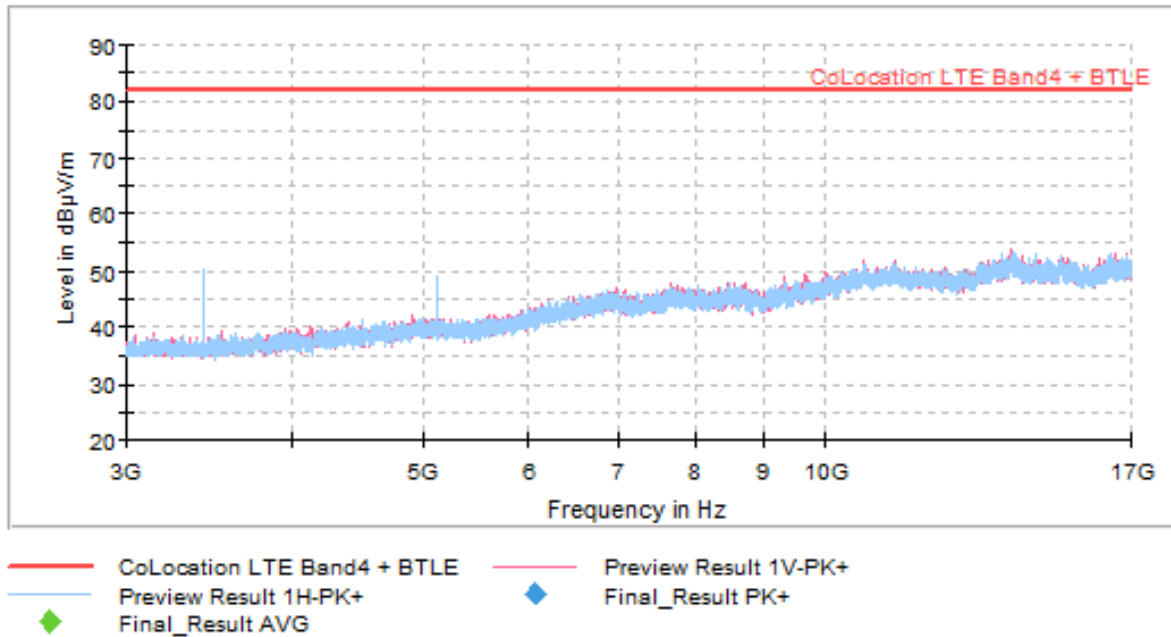


FREQUENCY RANGE 1 - 3 GHz

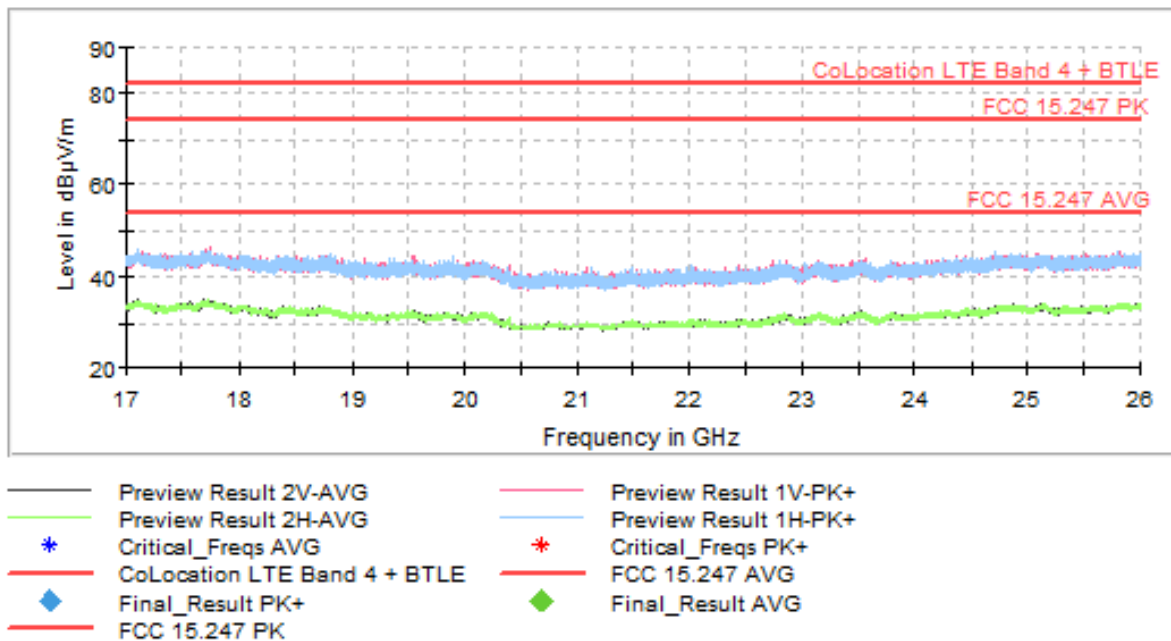


The peak above the limit is the LTE Band 4 and the Bluetooth carrier frequency.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz



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: BW: 1.4 MHz. Low Channel (699.7 MHz). RB Size: 1. RB Offset: 0.
Bluetooth Low Energy: High Channel (2480 MHz).

LIMIT: The limit of the test is determined by:

Frequency Range	Detector	Limit at 3m (dBµV/m)
30 MHz to 7 GHz	Peak	$43 + 10 \log (P) \text{ dB} = -13 \text{ dBm} \rightarrow 82.23 \text{ dBµV/m}$
7 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.

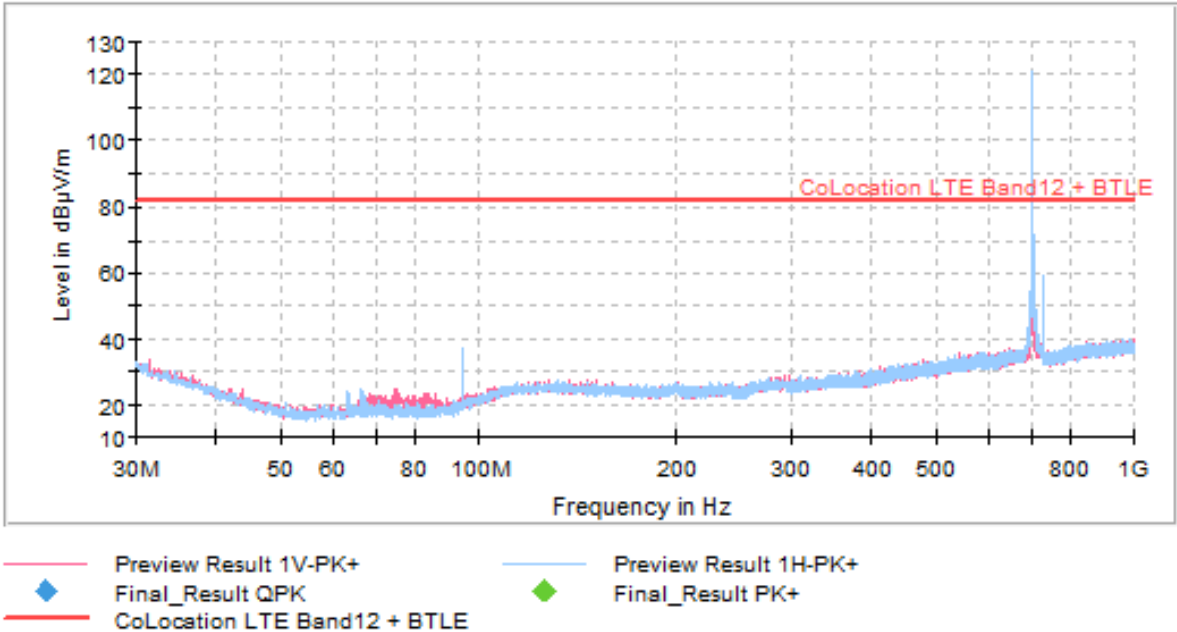
Frequency range 1 - 26 GHz

No spurious frequencies closest to the limit.

Measurement uncertainty (dB)	$< \pm 4.86$ for $f < 1 \text{ GHz}$ $< \pm 4.11$ for $f \geq 1 \text{ GHz}$ up to 3 GHz $< \pm 5.13$ for $f \geq 3 \text{ GHz}$ up to 17 GHz $< \pm 4.82$ for $f \geq 17 \text{ GHz}$
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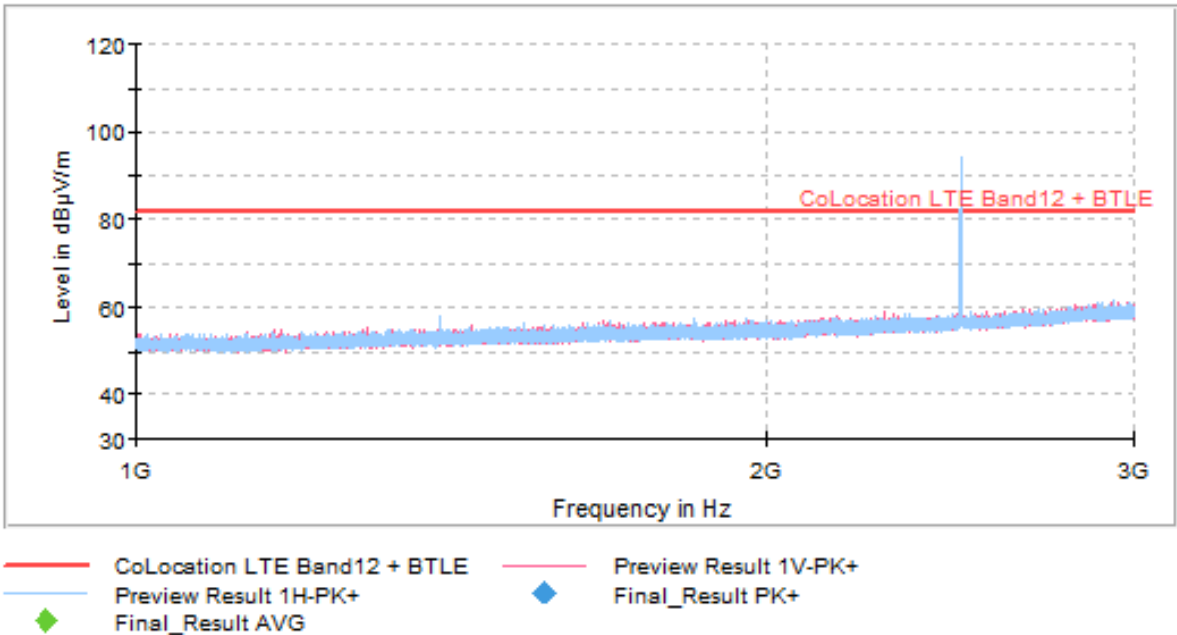
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz



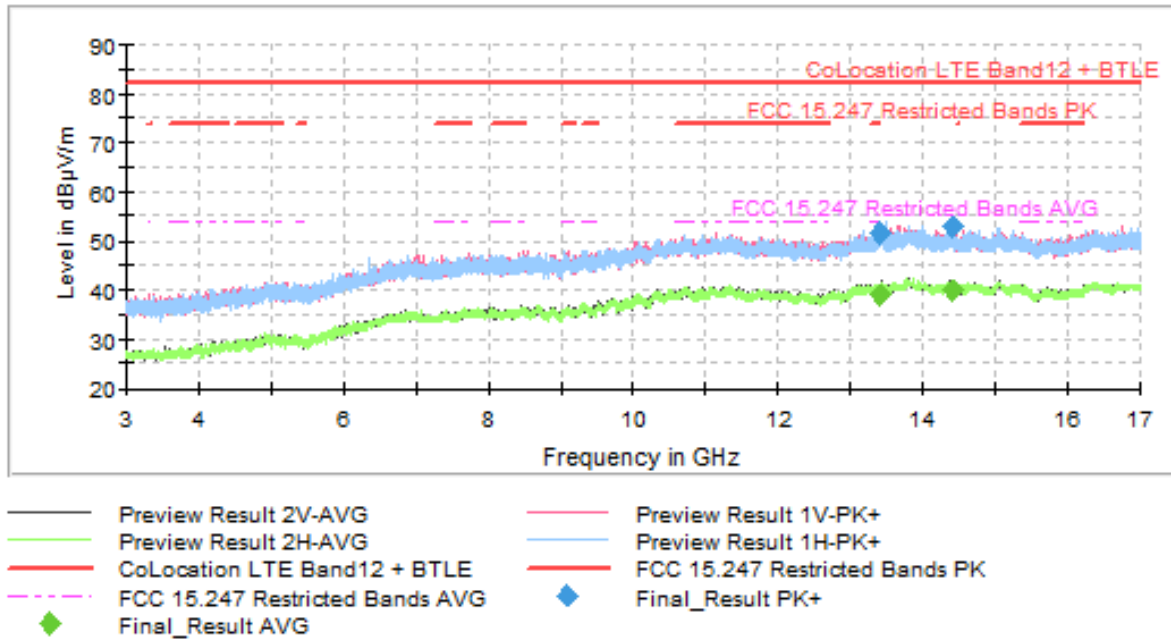
The peak above the limit is the LTE Band 12 carrier frequency.

FREQUENCY RANGE 1 - 3 GHz



The peak above the limit is the Bluetooth carrier frequency.

FREQUENCY RANGE 3 - 17 GHz



FREQUENCY RANGE 17 - 26 GHz

