

ISED CABid: ES1909
 Lab. Company Number: 4621A

Test Report No:
 72676RRF.002A2

Test Report

USA FCC Part 24

CANADA RSS-133

(*) Identification of item tested	Continuous Positive Airway Pressure (CPAP) Device
(*) Trademark	ResMed
(*) Model and /or type reference	39485
(*) Derived model not tested	39523,39524,39525,39526,39527,39528
Other identification of the product	FCC ID: 2ACHL-AIR11M1U IC: 9103A-AIR11M1U
(*) Features	LTE Cat-M1, BLE HW version: R390-7667 SW version: SW04600
Applicant	ResMed Pty Ltd 1 Elizabeth Macarthur Drive, Bella Vista, NSW, 2153, Australia
Test method requested, standard	USA FCC Part 24 (10-1-21 Edition). CANADA RSS-133 Issue 6, Jan. 2018 Amendment 1. ANSI C63.26-2015. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2023-03-27
Report template No.	FDT08_24 (*) "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 an FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, Company Number: 4621A, with the appropriate scope of accreditation that covers the performed tests in this 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.

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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.
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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 39485 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.



Date: 30-Nov-2022

DECLARATION OF EQUIVALENCE

This document declares that the following designated products are equivalent to the unit under test 39485.

Model Name / Product Code	Marketing Name
39523	AirSense 11 AutoSet USA
39524	AirSense 11 CPAP USA
39525	AirSense 11 Elite USA
39526	AirSense 11 AutoSet CAN
39527	AirSense 11 CPAP CAN
39528	AirSense 11 Elite CAN

All the above stated products and the unit under test - 39485 have the same cellular hardware and firmware.

Applicant:

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

By,



Christopher Jenkins
Title: 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 results.

Usage of samples

Samples undergoing test have been selected by: The client.

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

Control N°	Description	Model	Serial N°	Date of reception
72676/003	Continuous Positive Airway Pressure (CPAP) Device	39485	22222172432	2022/10/03
72676/007	AC/DC Adapter	390000	02GNXL04	2022/10/03
72676/009	Power Cord	-	-	2022/10/03
66427/006	Climate line	AIR11	-	2020/12/29

Sample S/01 has undergone the following test(s): The radiated tests indicated in Appendix A.

- Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
72676/001	Continuous Positive Airway Pressure (CPAP) Device	39485	22222172433	2022/10/03
72676/003	Continuous Positive Airway Pressure (CPAP) Device	39485	22222172432	2022/10/03
72676/007	AC/DC Adapter	390000	02GNXL04	2022/10/03

Sample S/02 has undergone the following test(s): The RF Output Power conducted tests indicated in Appendix A.

- Sample S/03 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
72676/002	Continuous Positive Airway Pressure (CPAP) Device	39485	22222172424	2022/10/03
72676/008	AC/DC Adapter	390000	02GNXH04	2022/10/03
72676/010	Power Cord	-	-	2022/10/03

Sample S/03 has undergone the following test(s): The Modulation Characteristics, Frequency Stability, Occupied Bandwidth, Spurious Emissions at Antenna Terminals, Spurious Emissions at Antenna Terminals at Block Edges conducted tests indicated in Appendix A.

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	☒	☐	☐	☒	☐
	☒	AC: 115V~400Hz 1.5A	☒	☐	☐	☒	☐
	☒	DC: 12V (DC-DC for Vehicle Use)					

	☒	DC: 24V (DC-DC for Vehicle Use)	
Rated Power..... :	-		
Clock frequencies..... :	N/A		
Other parameters..... :	390000 (PSU Model Number)		
Software version..... :	SW04600 (DUT)		
Hardware version..... :	R390-7667		
Dimensions in cm (W x H x D) ... :	138.5 mm x 259.4 mm x 94.5 mm		
Mounting position..... :	☒	Table top equipment	
	☐	Wall/Ceiling mounted equipment	
	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☐	Other:	
Modules/parts..... :	Module/parts of test item		Type
	Wireless Module		SARA-R5
	Bluetooth LE		EFR32BG22
Accessories (not part of the test item)..... :	Description		Type
	-		-
Documents as provided by the applicant..... :	Description		File name
	-		-

⁽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)	2022-10-07
Date (finish)	2023-03-07

Document history

Report number	Date	Description
72676RRF.002	2023-12-29	First release.
72676RRF.002A1	2023-01-31	Second release. The following tests are included: - FCC 24.232 / RSS-133 6.4: RF Output Power.
72676RRF.002A2	2023-03-27	Third release. The following tests are included: - FCC 2.1047 / RSS-132 5.2: Modulation Characteristics. - FCC 22.355 / RSS-132 5.3: Frequency Stability. - FCC 2.1049: Occupied Bandwidth. - FCC 22.917 / RSS-132 5.5: Spurious Emissions at Antenna Terminals. - FCC 24.238 / RSS-133 6.5: Spurious Emissions at Antenna Terminals at Block Edges.

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 semi-anechoic 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 chamber for conducted measurements, 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: Pablo Redondo, Rafael Fernández, Fernando Chito, Miguel Manuel López, Francisco Javier Fernández.

Used instrumentation:

Conducted Measurements

	Last Calibration	Due Calibration
1. Shielded Room ETS LINDGREN S101	N/A	N/A
2. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2022-03	2023-03
3. Attenuator DC, 26.5 GHz, 10 dB, 2W TECHNIWAVE TWSMAG2	2022-05	2023-05
4. Attenuator DC, 26.5 GHz, 6 dB, 2W TECHNIWAVE TWSMAG2	2023-03	2024-03
5. Power Divider, DC-25 GHz TEKTRONIX 5333	2022-02	2023-02
6. Climatic Chamber BINDER MK 56	2022-03	2023-03
7. Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2022-05	2024-05
8. Attenuator 5 dB 2W DC-26.5GHz	2022-07	2023-07

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. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020-10	2023-10
4. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2020-08	2023-08
5. RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2021-12	2022-12
6. Pre-Amplifier G>30dB 17-40GHz BONN ELEKTRONIK BLMA 1840-4A	2022-11	2023-11
7. EMI Test Receiver 2Hz-44GHz, ROHDE AND SCHWARZ ESW44	2021-12	2023-12
8. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	N/A	N/A
9. AC Power Supply CHROMA 6490	2020-12	2022-12
10. EMC/RF Testing SW ROHDE AND SCHWARZ EMC32	N/A	N/A

Testing verdicts

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

Summary

FCC 24 / RSS-133		
Requirement – Test case	Verdict	Remark
FCC 24.232 / RSS-133 6.4: RF Output Power	P	
FCC 2.1047 / RSS-133 6.2: Modulation characteristics	P	
FCC 24.235 / RSS-133 6.3: Frequency stability	P	
FCC 2.1049: Occupied Bandwidth	P	
FCC 24.238 / RSS-133 6.5: Spurious emissions at antenna terminals	P	
FCC 24.238 / RSS-133 6.5: Spurious emissions at antenna terminals at Block Edges	P	
FCC 24.238 / RSS-133 6.5: Radiated Emissions	P	
<u>Supplementary information and remarks:</u> None.		

Appendix A: Test results for FCC 24 / RSS-133

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TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnormal: Preliminary scan determined 115 Vac / 60 Hz as worst case of power supply.
Type of Power Supply: Mains Supply.

ANTENNA (*):

Band	Gain (dBi)	Type of Antenna
LTE 2	+2.5	Ceramic
LTE 25	+2.5	Ceramic

TEST FREQUENCIES:

LTE Band 2. QPSK and 16QAM modulations:

	Channel per Nominal Bandwidth (Frequency, MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	18607 (1850.7)	18615 (1851.5)	18625 (1852.5)	18650 (1855)	18675 (1857.5)	18700 (1860)
Middle	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)
High	19193 (1909.3)	19185 (1908.5)	19175 (1907.5)	19150 (1905)	19125 (1902.5)	19100 (1900)

NOTE: Band 2 is completely included in band 25, so the channels of band 25 were tested to give conformity to the assigned block.

LTE Band 25. QPSK and 16QAM modulations:

	Channel per Nominal Bandwidth (Frequency, MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	26047 (1850.7)	26055 (1851.5)	26065 (1852.5)	26090 (1855)	26115 (1857.5)	26140 (1860)
Middle	26365 (1882.5)	26365 (1882.5)	26365 (1882.5)	26365 (1882.5)	26365 (1882.5)	26365 (1882.5)
High	26683 (1914.3)	26675 (1913.5)	26665 (1912.5)	26640 (1910)	26615 (1907.5)	26590 (1905)

RF Output Power

Limits:

FCC § 2.1046 and § 24.232:

Mobile/portable stations are limited to 2 Watts (33 dBm) Effective Isotropic Radiated Power (E.I.R.P.).
The peak-to-average ratio (PAR) of the transmission shall not exceed 13 dB.

RSS-133 Clause 6.4:

Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the High PAPR during periods of continuous transmission.

Method:

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

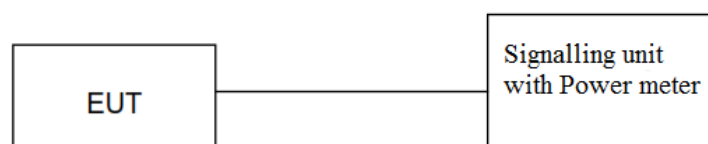
The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

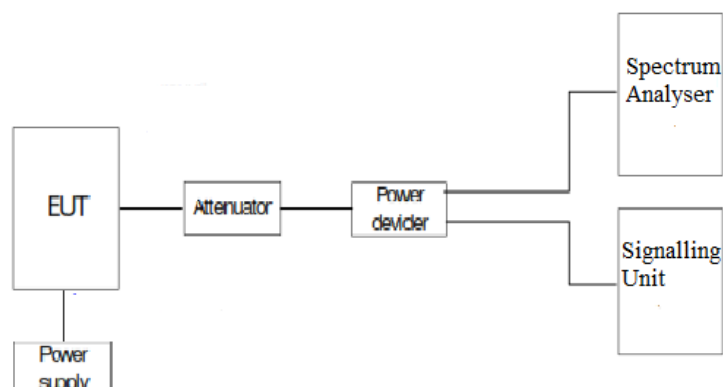
$$\text{E.R.P.} = \text{E.I.R.P.} - 2.15 \text{ dB}$$

Test setup:

1. CONDUCTED AVERAGE POWER:



2. PEAK-TO-AVERAGE POWER RATIO (PAPR) and Conducted Average power:



Results:

1. CONDUCTED AVERAGE POWER:

LTE Band 25:

LTE Band 25. QPSK modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.05	21.93	22.17
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.55	24.43	24.64
Maximum effective radiated power E.R.P. (dBm)	22.04	22.28	22.52
PAPR (dB)	(*)	6.71	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 1. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.3	20.30	22.35
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.08	24.63	24.85
Maximum effective radiated power E.R.P. (dBm)	22.65	22.48	22.7
PAPR (dB)	6.49	7.23	6.31
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 25. QPSK modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.17	22.00	22.20
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.67	24.5	24.7
Maximum effective radiated power E.R.P. (dBm)	22.52	22.35	22.55
PAPR (dB)	(*)	6.86	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.22	22.12	22.20
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.72	24.62	24.70
Maximum effective radiated power E.R.P. (dBm)	22.57	22.47	22.55
PAPR (dB)	7.04	7.12	6.3
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

LTE Band 25. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.08	21.90	22.17
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.58	24.40	24.67
Maximum effective radiated power E.R.P. (dBm)	22.43	22.25	22.52
PAPR (dB)	(*)	6.73	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.20	21.99	22.15
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.7	24.49	24.65
Maximum effective radiated power E.R.P. (dBm)	22.55	22.34	22.50
PAPR (dB)	6.54	7.31	5.99
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 25. QPSK modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	21.93	21.80	22.07
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.43	24.30	24.57
Maximum effective radiated power E.R.P. (dBm)	22.28	22.15	22.42
PAPR (dB)	(*)	6.54	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 1. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.17	21.96	22.25
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.67	24.46	24.75
Maximum effective radiated power E.R.P. (dBm)	22.52	22.31	22.60
PAPR (dB)	6.6	7.24	6.67
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 25. QPSK modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.16	22.13	22.19
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.66	24.63	24.69
Maximum effective radiated power E.R.P. (dBm)	22.51	22.48	22.54
PAPR (dB)	(*)	6.51	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 1. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.19	22.04	22.26
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.69	24.54	24.76
Maximum effective radiated power E.R.P. (dBm)	22.54	22.39	22.61
PAPR (dB)	7.72	6.63	6.76
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

LTE Band 25. QPSK modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.21	22.17	22.14
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.71	24.67	24.64
Maximum effective radiated power E.R.P. (dBm)	22.56	22.52	22.49
PAPR (dB)	(*)	6.31	(*)
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

PAPR Worst Case: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 25. 16QAM modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.5		
Measured maximum average power (dBm) at antenna port	22.27	22.19	22.24
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.77	24.69	24.74
Maximum effective radiated power E.R.P. (dBm)	22.62	22.54	22.59
PAPR (dB)	7.05	7.02	6.6
Measurement uncertainty (dB)	<±0.94		

Average Power Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

PAPR Worst Case: Modulation 16QAM. RB Size: 5. RB Offset: 0.

Verdict

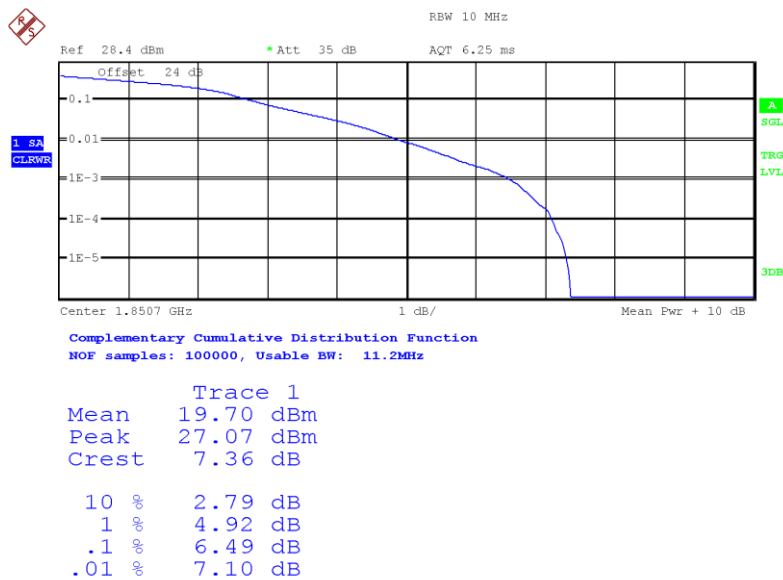
Pass

2. PEAK-TO-AVERAGE POWER RATIO (PAPR)

Worst-case modulation in terms of PAPR is reported below: 16QAM.

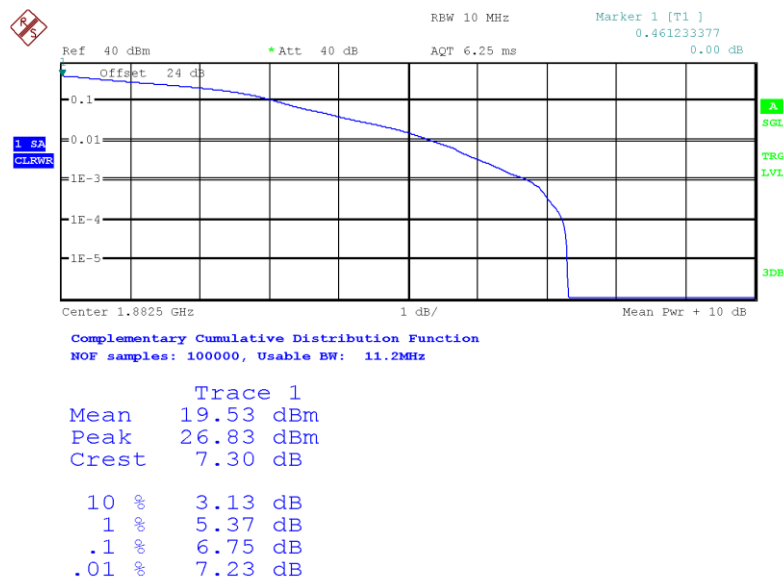
LTE Band 25. Bandwidth = 1.4 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 0.

Low Channel:



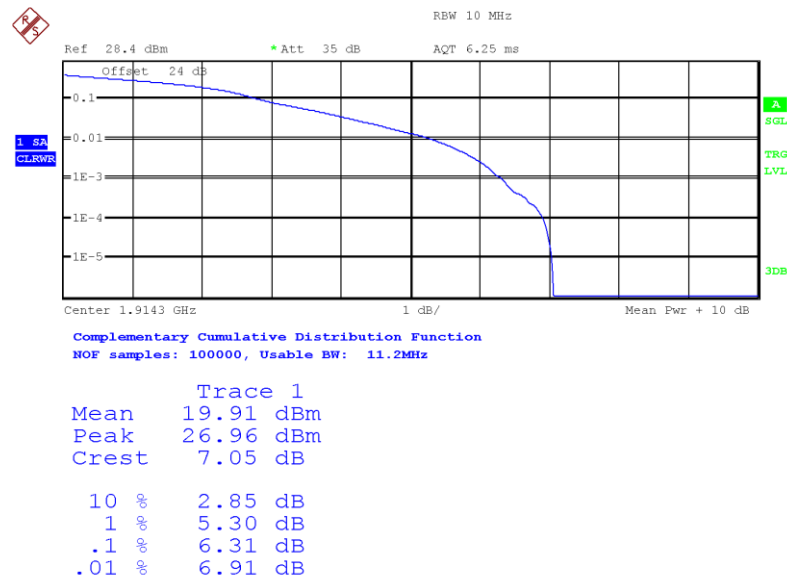
Date: 17.JAN.2023 03:03:01

Middle Channel:



Date: 16.JAN.2023 17:31:34

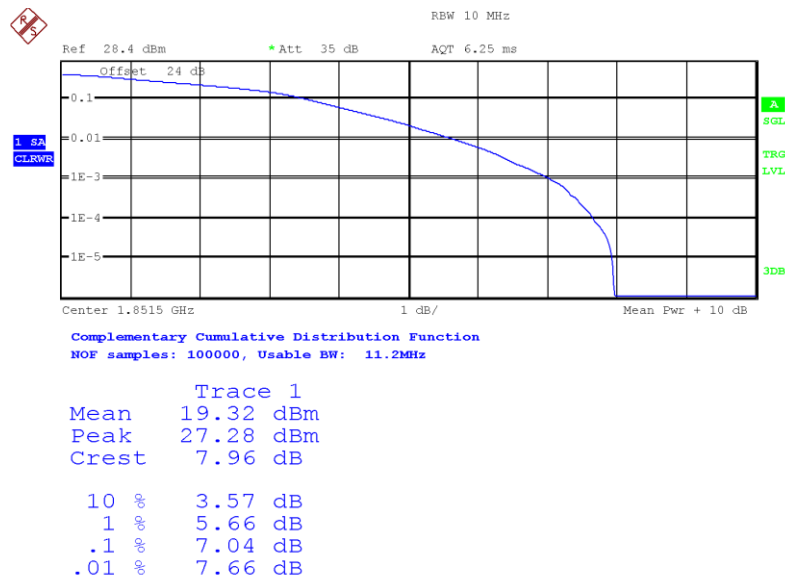
High Channel:



Date: 17.JAN.2023 03:07:21

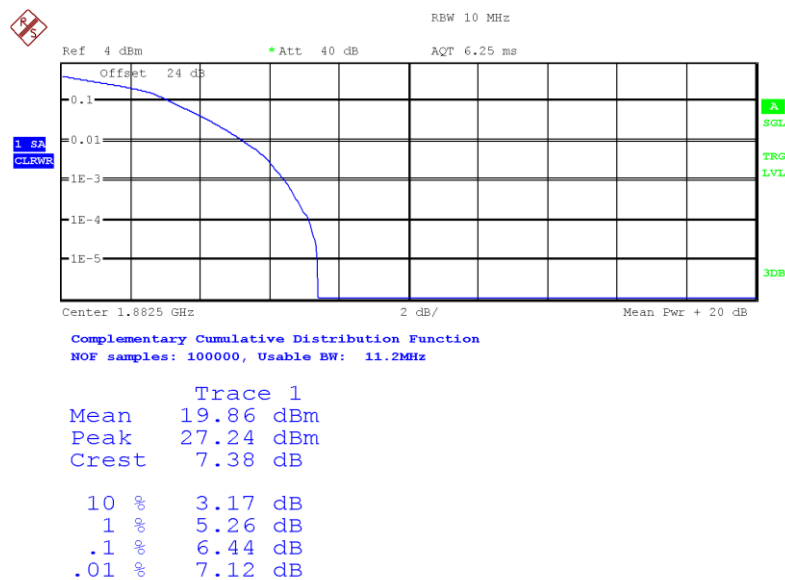
LTE Band 25. Bandwidth = 3 MHz. Modulation 16 QAM. RB Size: 5. RB Offset: 0.

Low Channel:



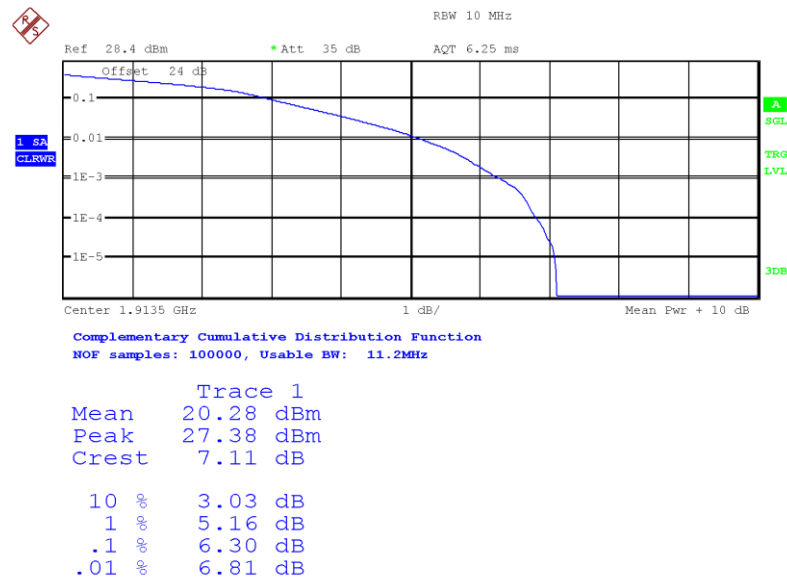
Date: 17.JAN.2023 02:52:41

Middle Channel:



Date: 16.JAN.2023 19:21:44

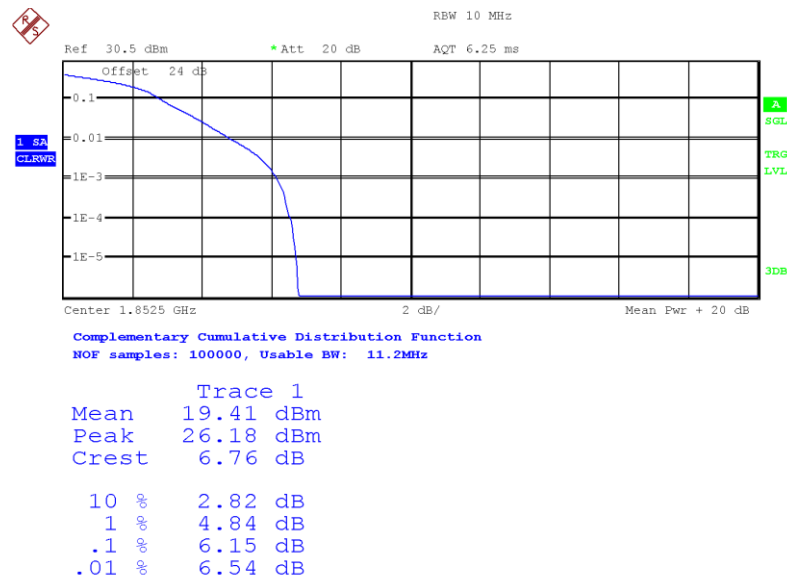
High Channel:



Date: 17.JAN.2023 02:55:24

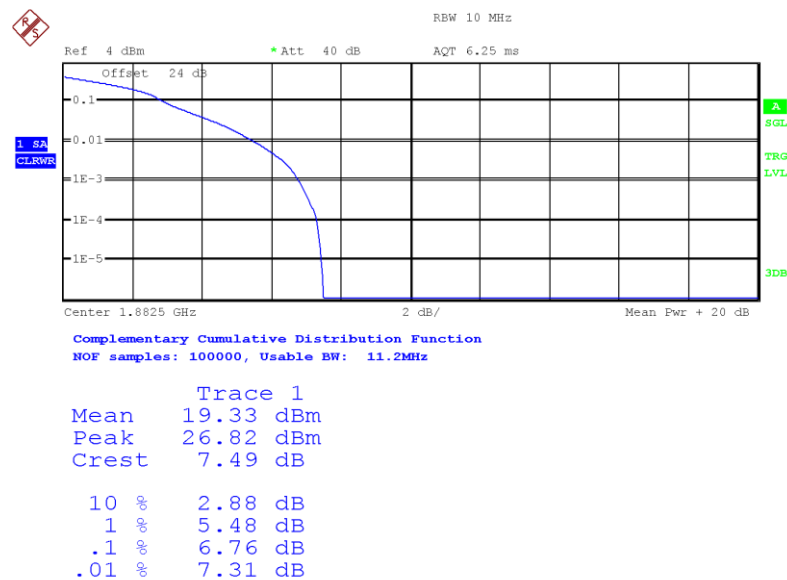
LTE Band 25. Bandwidth = 5 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 0.

Low Channel:



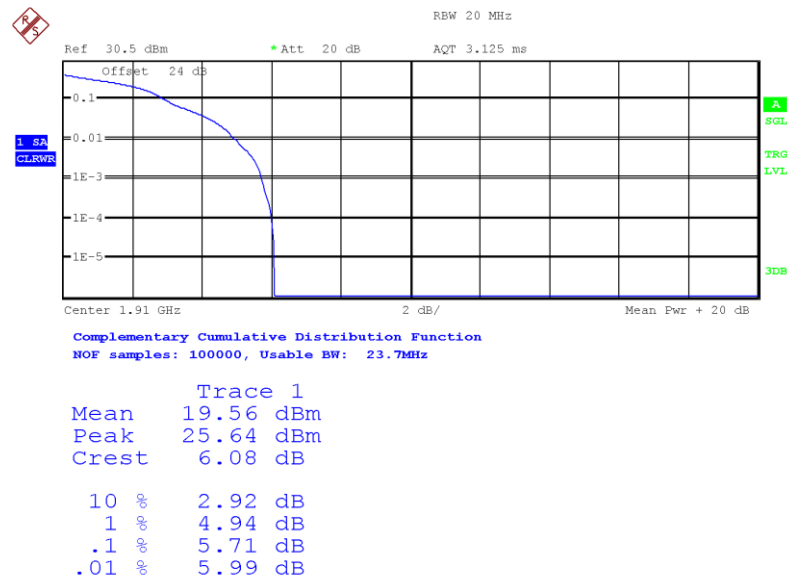
Date: 16.JAN.2023 21:03:10

Middle Channel:



Date: 16.JAN.2023 19:30:51

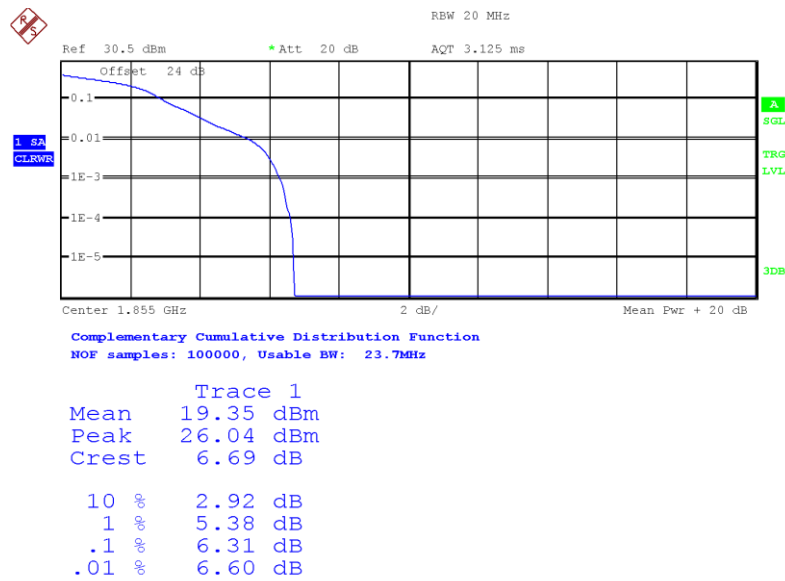
High Channel:



Date: 16.JAN.2023 20:57:58

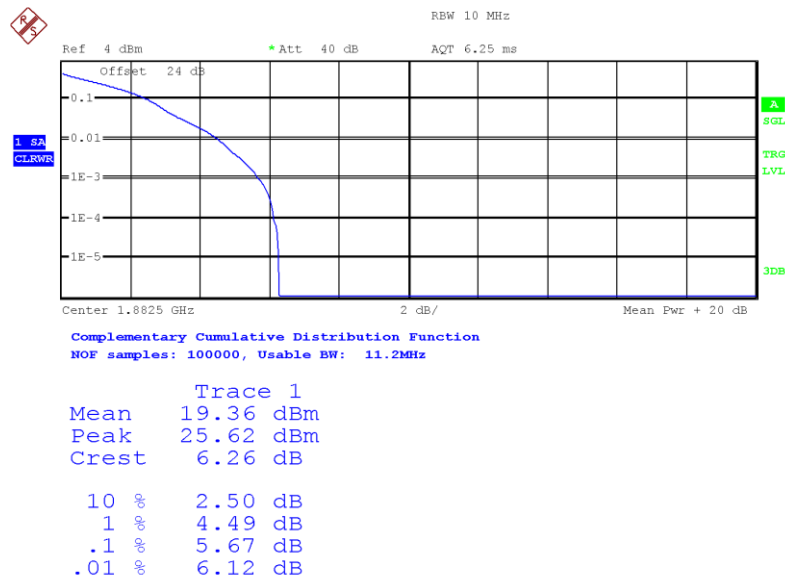
LTE Band 25. Bandwidth = 10 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 0.

Low Channel:



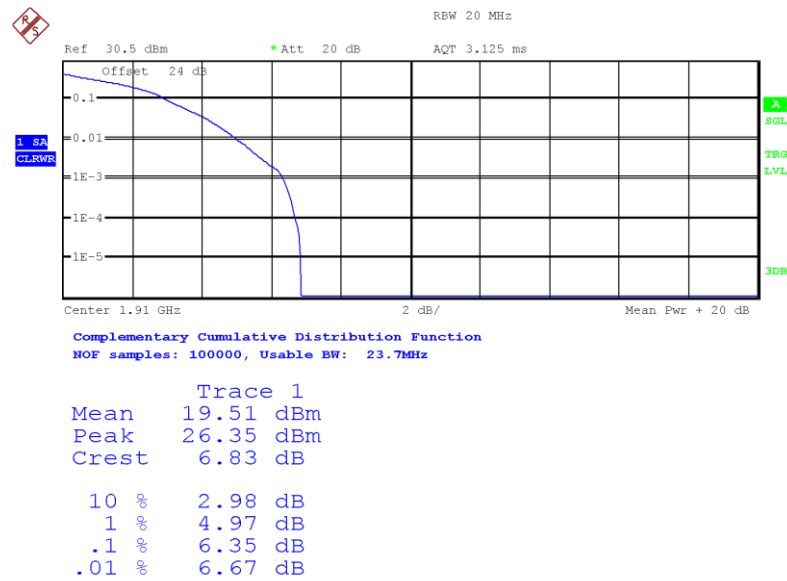
Date: 16.JAN.2023 20:51:18

Middle Channel:



Date: 16.JAN.2023 19:39:30

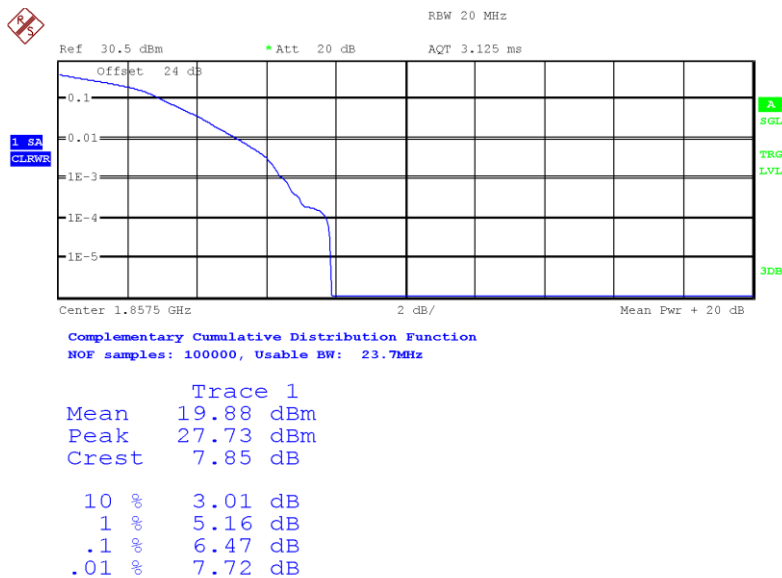
High Channel:



Date: 16.JAN.2023 20:54:52

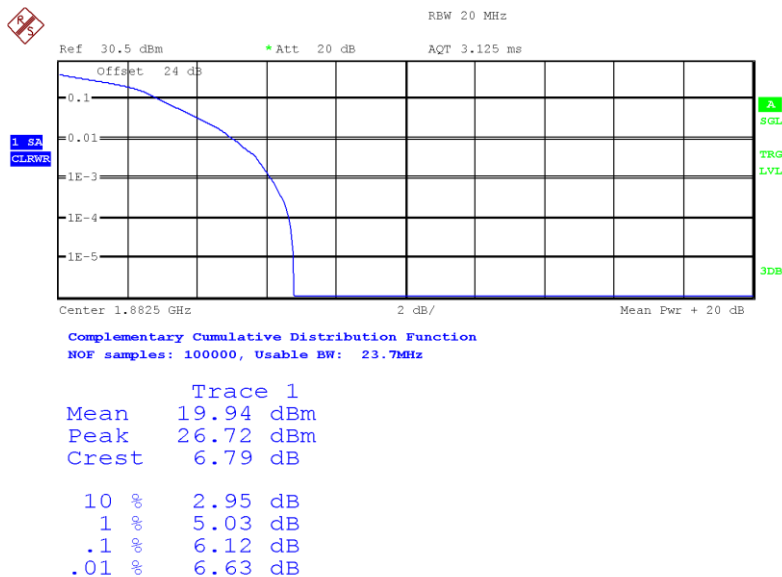
LTE Band 25. Bandwidth = 15 MHz. Modulation 16 QAM. RB Size: 5. RB Offset: 0.

Low Channel:



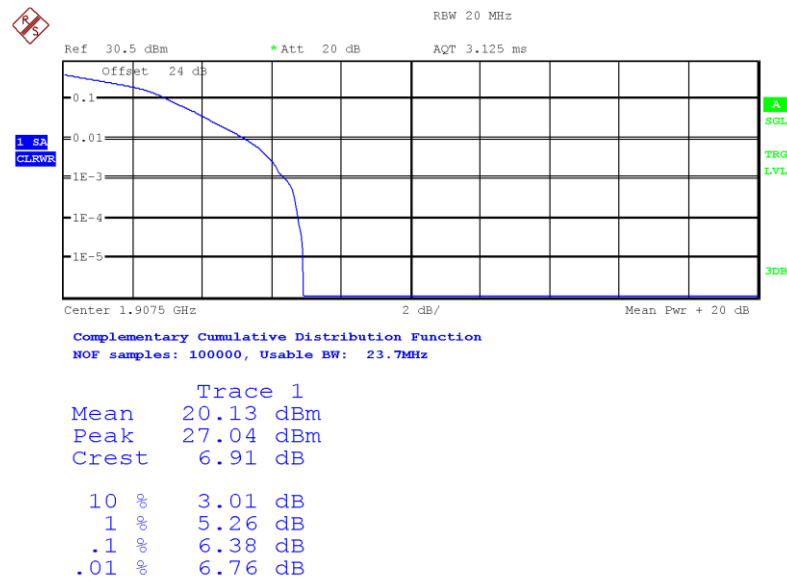
Date: 16.JAN.2023 20:35:37

Middle Channel:



Date: 16.JAN.2023 20:07:02

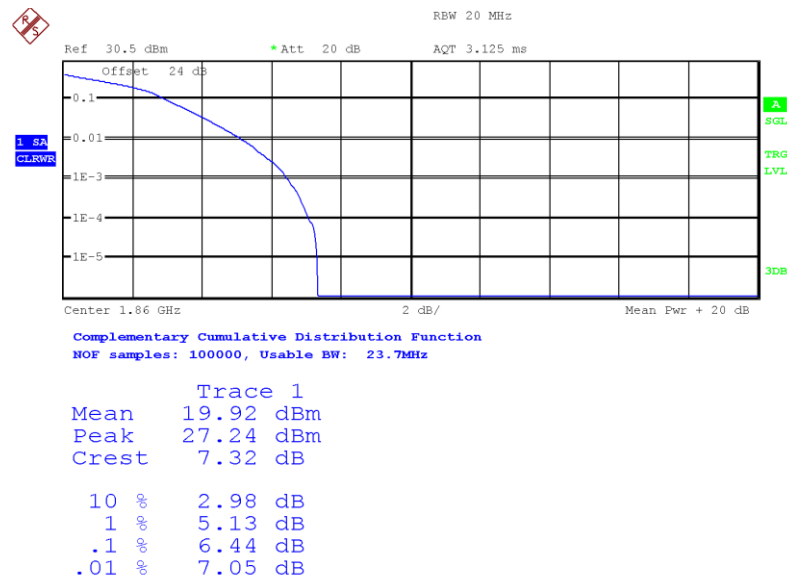
High Channel:



Date: 16.JAN.2023 20:30:54

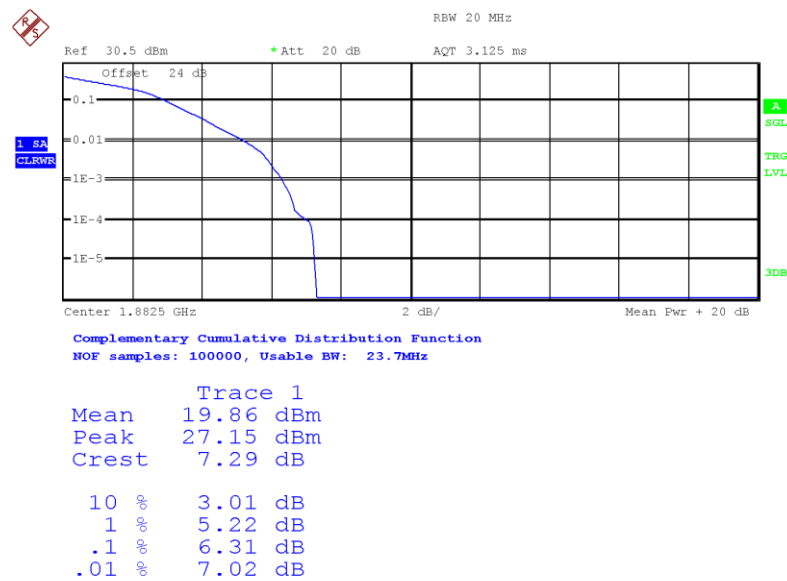
LTE Band 25. Bandwidth = 20 MHz. Modulation 16 QAM. RB Size: 5. RB Offset: 0.

Low Channel:



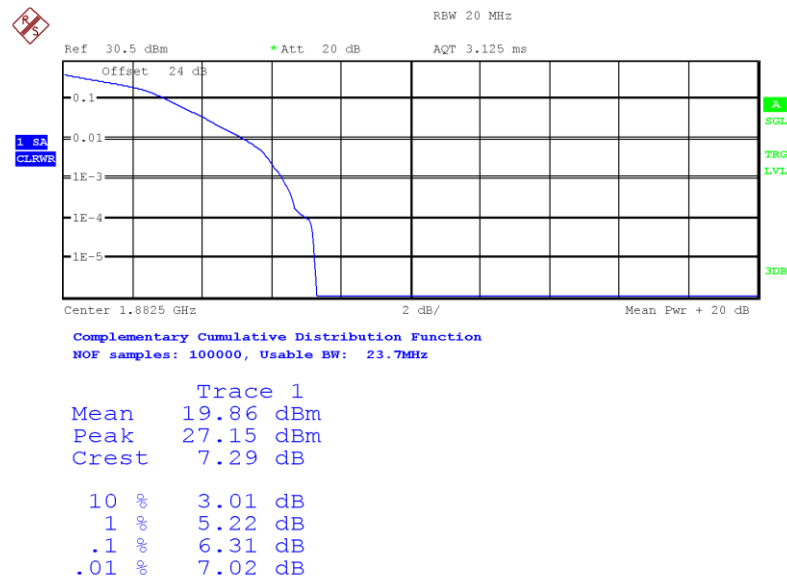
Date: 16.JAN.2023 20:21:28

Middle Channel:



Date: 16.JAN.2023 20:12:52

High Channel:



Date: 16.JAN.2023 20:12:52

Frequency Stability

SPECIFICATION:

FCC §2.1055 and §24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-133, Clause 6.3. The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

METHOD:

The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.

The supply voltage was varied between 85% and 115% of nominal voltage.

The EUT was set in "Radio Resource Control (RRC) mode" on the middle channel using the Universal Radio Communication tester R&S CMW500 and the maximum frequency error was measured using the built-in calibrated frequency meter.

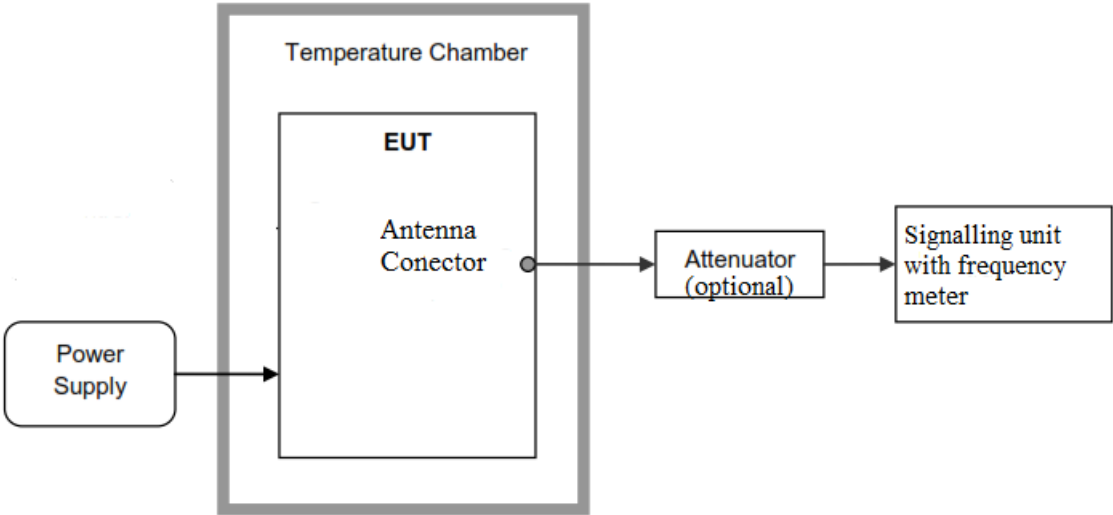
The worst case LTE mode for conducted power was used for the test.

In order to check that the frequency stability is sufficient such that the fundamental emissions stay within the authorized bands of operation, a reference point is established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channels of operation are identified as fL and fH respectively. The worst-case frequency offset determined in the above methods is added or subtracted from the values of fL and fH to check that the resulting frequencies remain within the band.

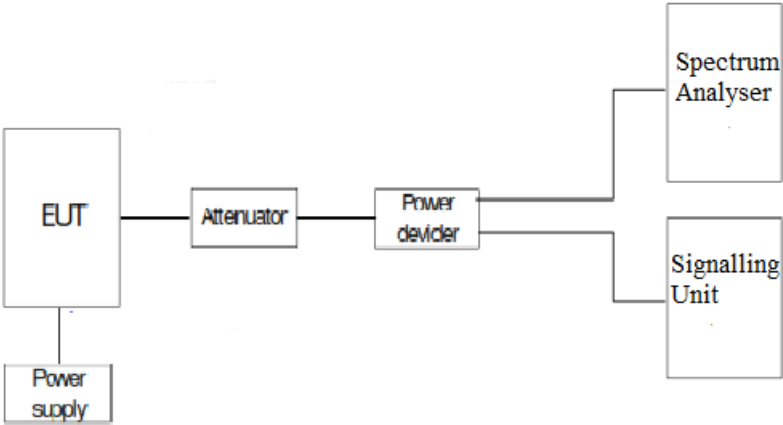
The reference point measurements were made at the RF output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP:

Frequency tolerance:



Reference points f_L and f_H :



RESULTS

LTE Band 25:

1. FREQUENCY TOLERANCE:

- Frequency stability over temperature variations.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	21.69	0.011521912
+40	20.36	0.010815405
+30	20.07	0.010661355
+20	22.26	0.011824701
+10	23.72	0.012600266
0	21.75	0.011553785
-10	21.34	0.011335989
-20	22.34	0.011867198
-30	22.6	0.012005312

- Frequency stability over voltage variations.

Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	240	21.82	0.011590969
Vmin	110	19.99	0.010618858

2. REFERENCE FREQUENCY POINTS f_L AND f_H:

The worst-case frequency offsets added or subtracted per band and bandwidth:

QPSK. Nominal Bandwidth 5 MHz.

f _L (MHz)	1.850015
f _H (MHz)	1.914995

The reference frequency points f_L and f_H stay within the authorized blocks for the band above.

Measurement uncertainty (Hz): <±223.94

Verdict: PASS

Modulation Characteristics

SPECIFICATION:

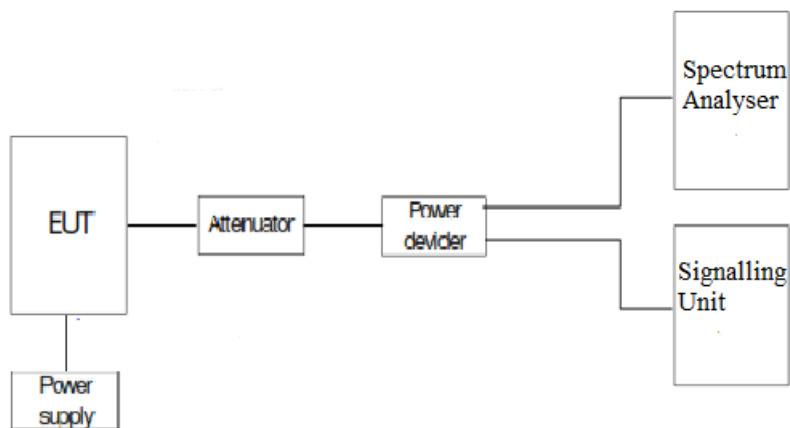
FCC §2.1047.

RSS-133. Clause 6.2. Equipment certified under this standard shall use digital modulation.

METHOD:

For LTE the EUT operates with QPSK and 16QAM modulation modes in which the information is digitised and coded into a bit stream. The RF transmission is multiplexed using *Orthogonal Frequency Division Multiplexing (OFDM)* using different possible arrangement of subcarriers (Resource Blocks RB).

TEST SETUP:

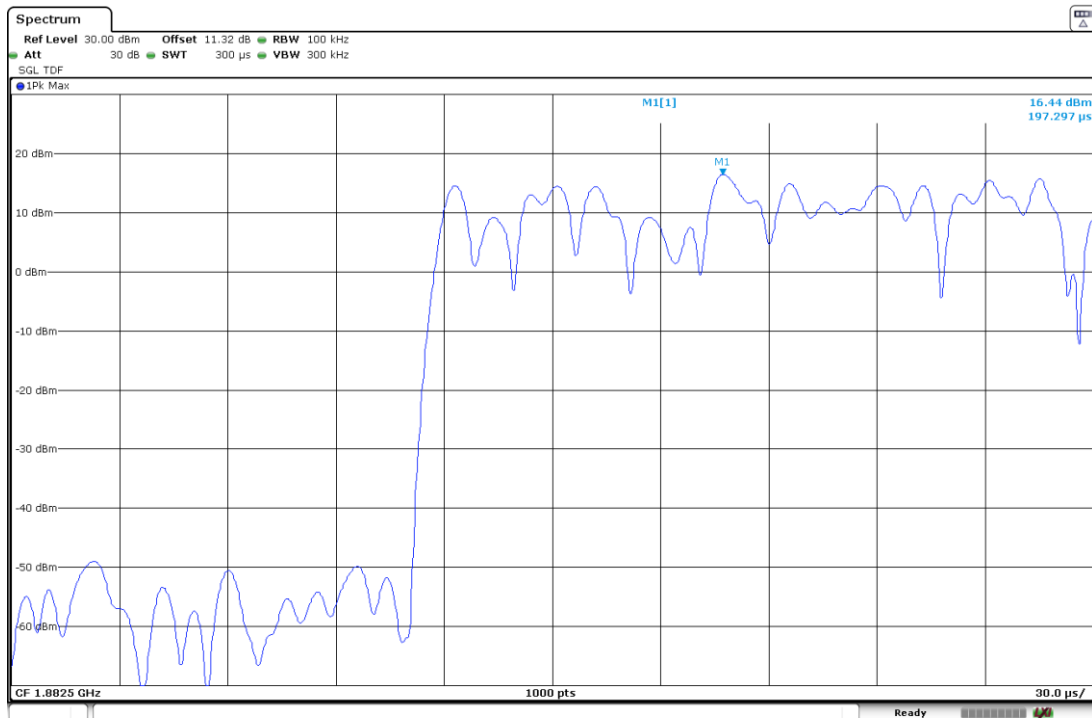


RESULTS:

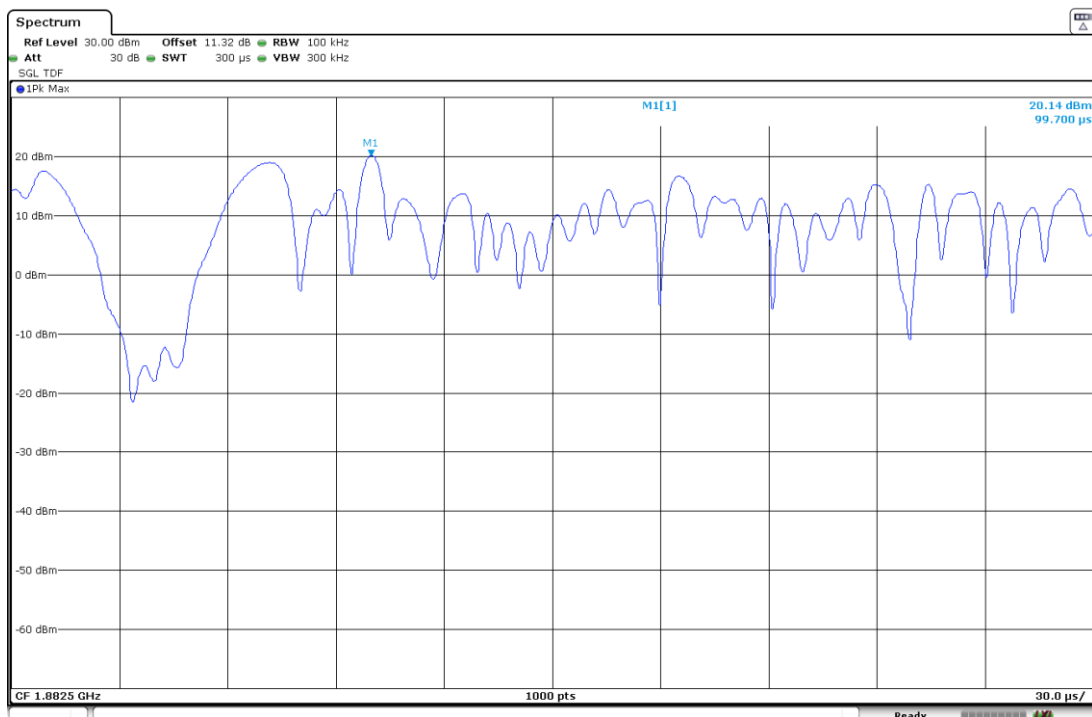
The following plots show the modulation schemes in the EUT.

LTE Band 25:

QPSK. Nominal Bandwidth 1.4 MHz.



16QAM. Nominal Bandwidth 1.4 MHz.



Occupied Bandwidth

SPECIFICATION:

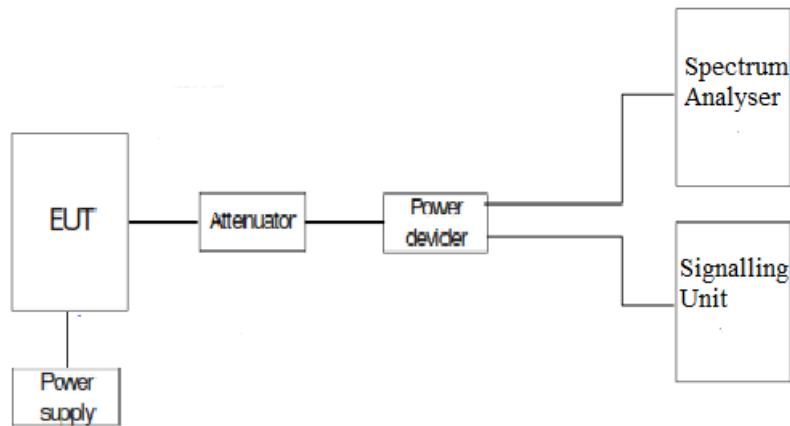
FCC §2.1049. Measurements required: Occupied bandwidth.

RSS-Gen, Clause 6.7.

METHOD:

The occupied bandwidth measurement was performed at the output terminals of the EUT using an attenuator, power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation. The 99% occupied bandwidth and the -26 dBc bandwidth were measured directly using the built-in bandwidth measuring option of spectrum analyser.

TEST SETUP:



RESULTS:

The worst case per modulation is:

LTE Band 25:

LTE Band 25. QPSK MODULATION. Nominal Bandwidth 1.4 MHz. RB Size 6. Offset 0. Narrowband 0. Position 1.

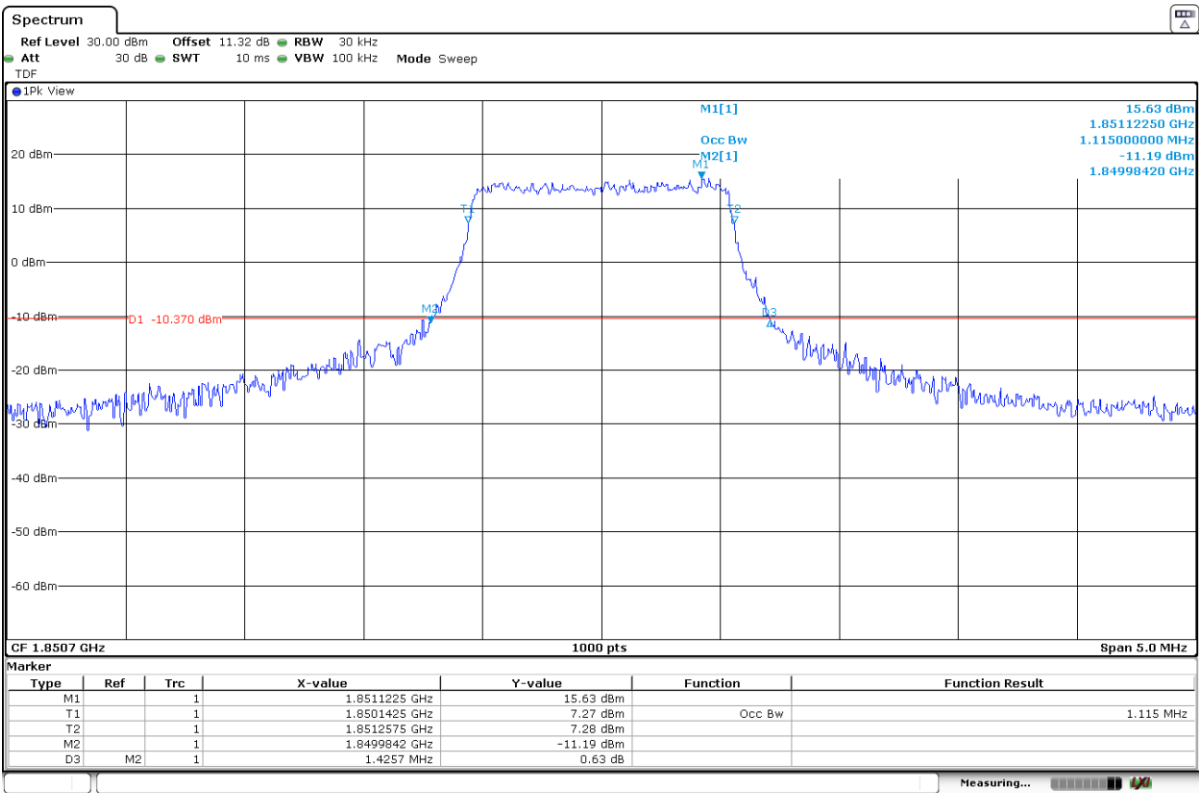
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	1.115000	1.120000	1.110000
-26 dBc Bandwidth (MHz)	1.425700	1.420300	1.392200
Measurement uncertainty (kHz)	<±3.75		

LTE Band 25. 16QAM MODULATION. Nominal Bandwidth 1.4 MHz. RB Size 5. Offset 0. Narrowband 0. Position 1.

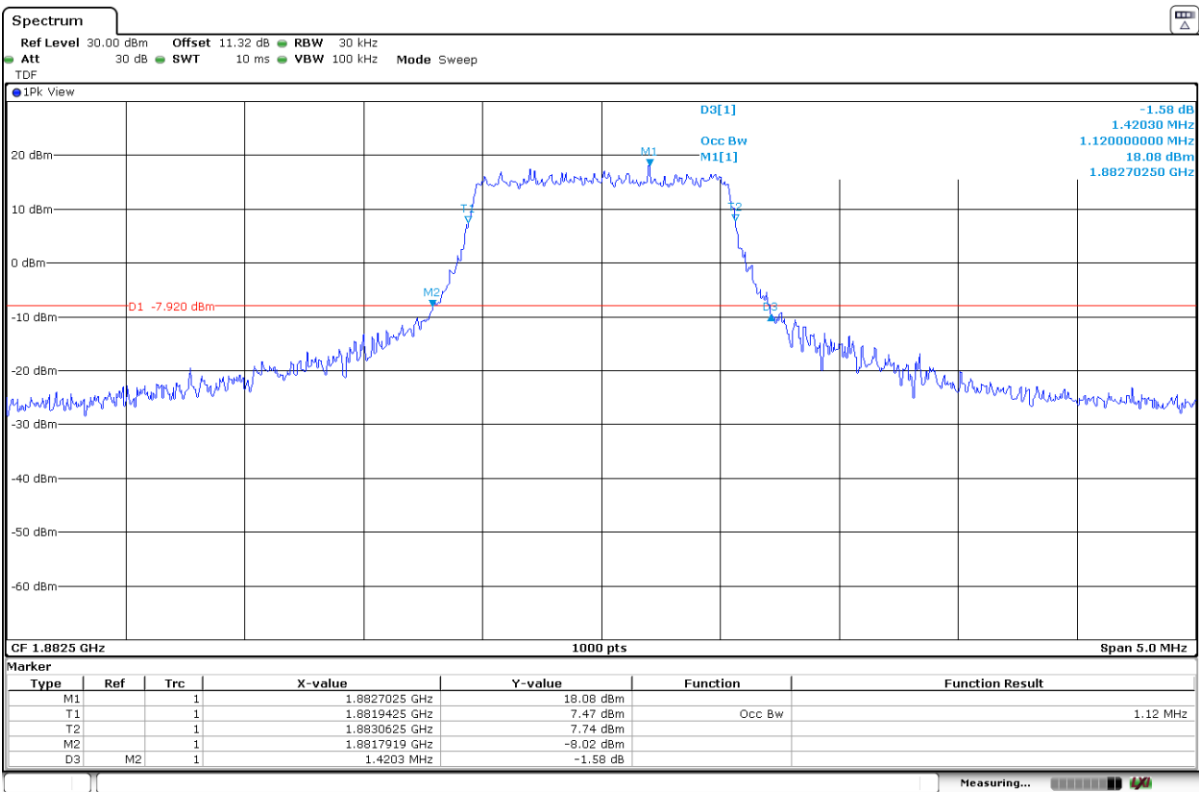
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	0.950000	0.960000	0.950000
-26 dBc Bandwidth (MHz)	1.330700	1.403630	1.344700
Measurement uncertainty (kHz)	<±3.75		

LTE Band 25. QPSK MODULATION. Nominal Bandwidth 1.4 MHz. RB Size 6. Offset 0. Narrowband 0. Position 1.

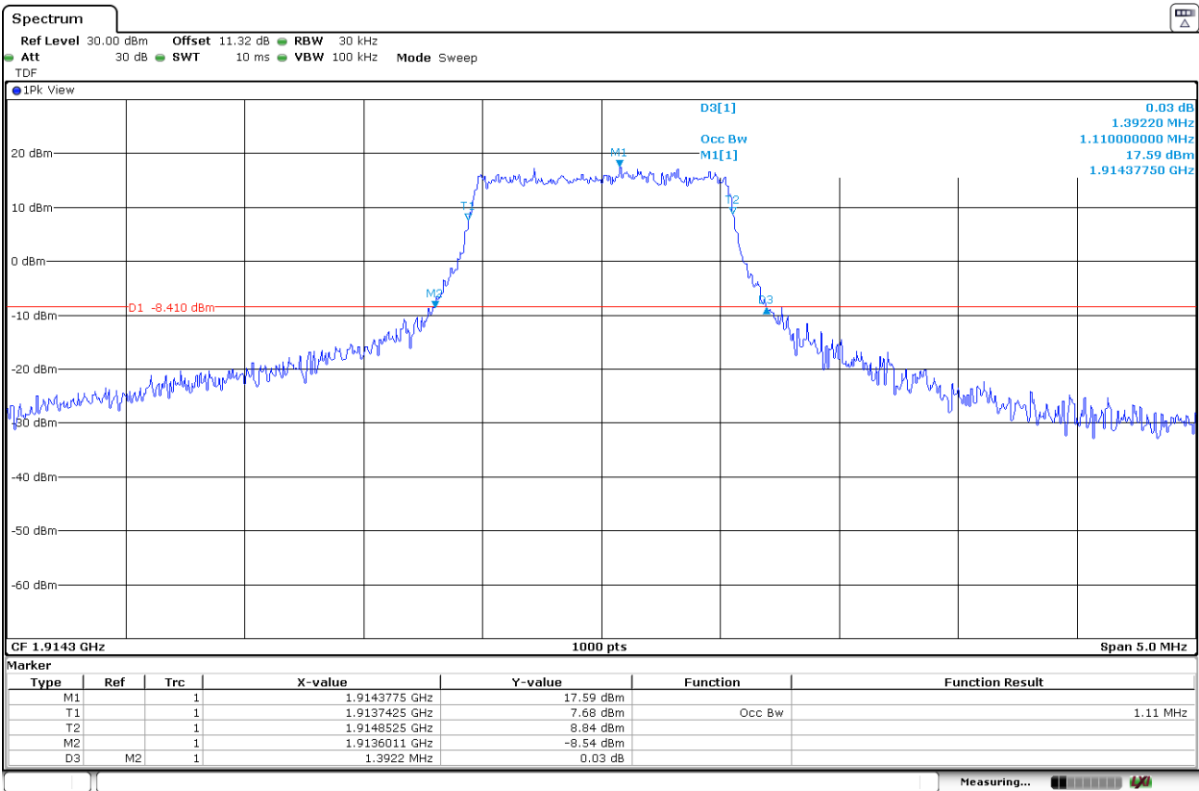
Low Channel:



Middle Channel:

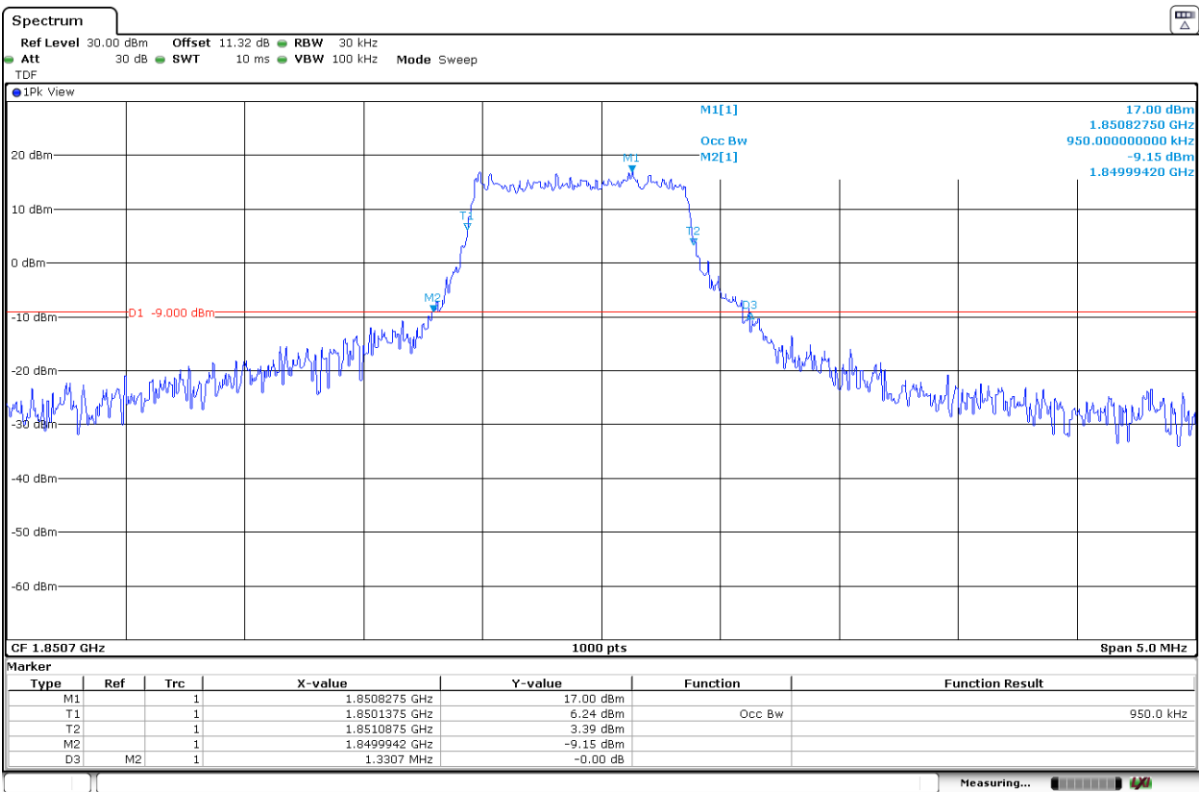


High Channel:

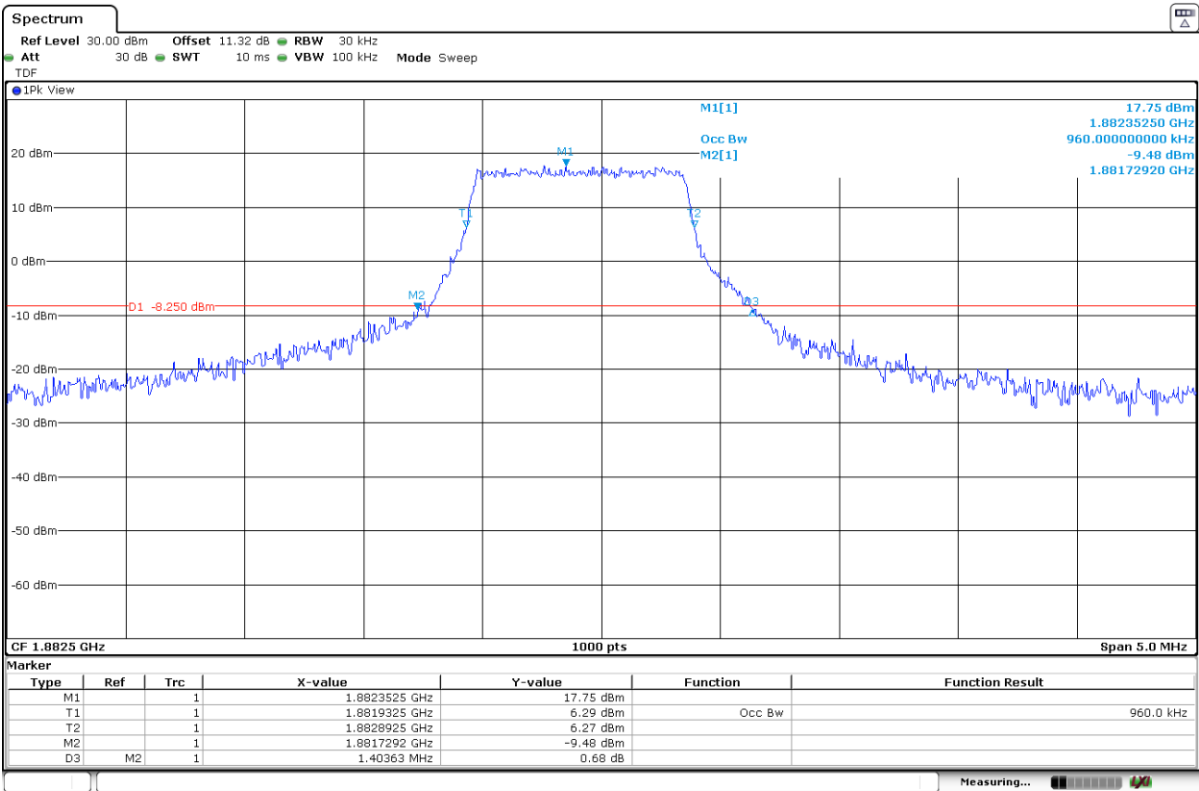


LTE Band 25. 16QAM MODULATION. Nominal Bandwidth 1.4 MHz. RB Size 5. Offset 0. Narrowband 0. Position 1.

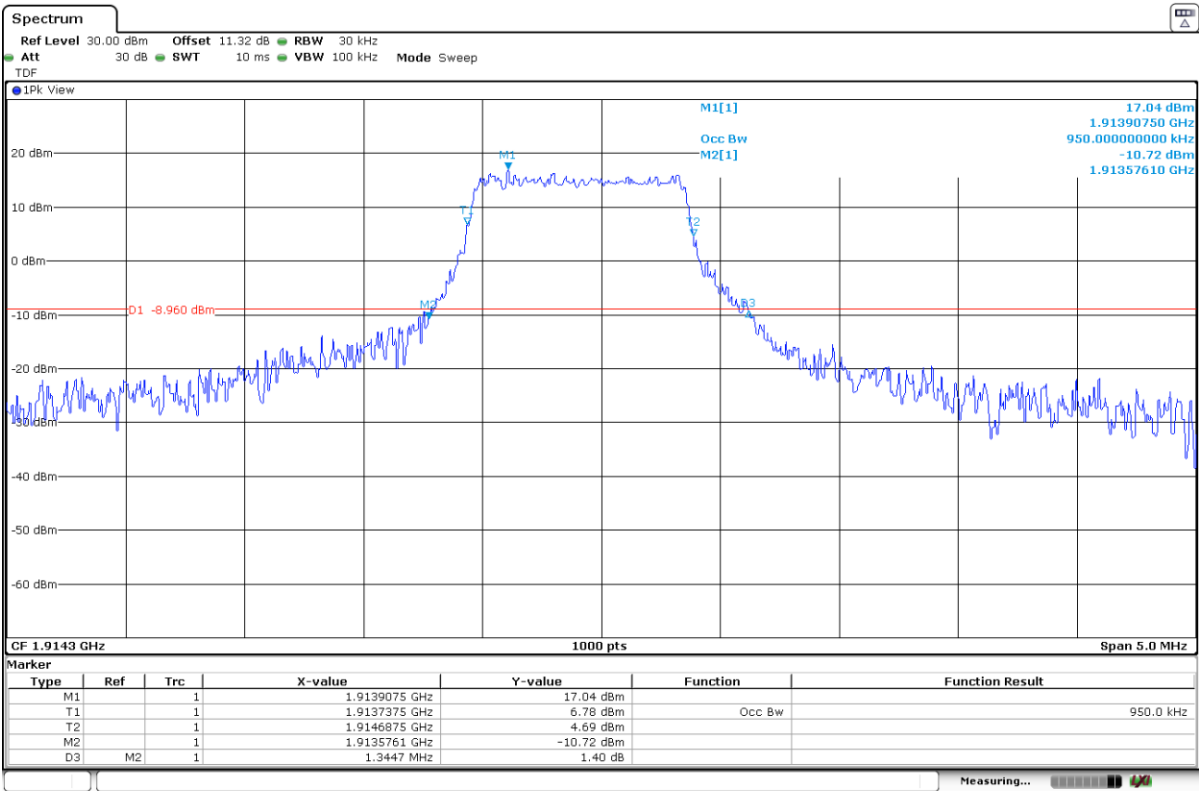
Low Channel:



Middle Channel:



High Channel:



Spurious Emissions at Antenna Terminals

SPECIFICATION:

FCC §2.1051 and §24.238. RSS-133, Clause 6.5.

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

At P_o transmitting power, the specified minimum attenuation becomes $43+10 \log (P_o)$, and the level in dBm relative to P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mW}) - 30] = -13 \text{ dBm}$$

METHOD:

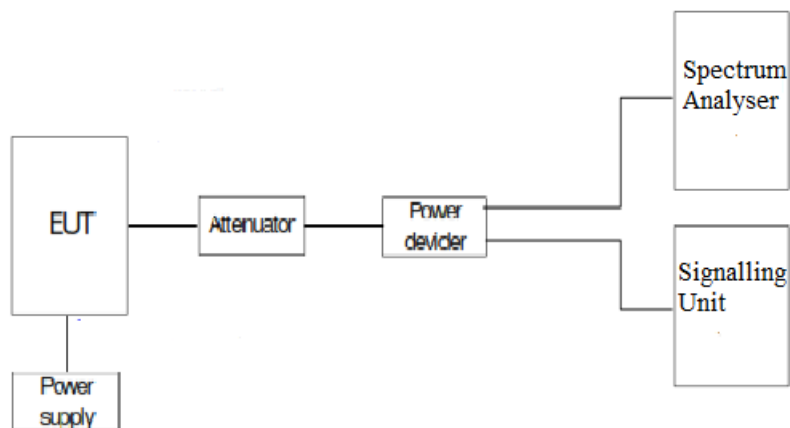
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-Ohm attenuator and a power divider.

The spectrum was investigated from 9 kHz to 20 GHz.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

The configuration of Resource Blocks and modulation which is the worst case for conducted power was used.

TEST SETUP:



RESULTS:

LTE Band 25: 16QAM. Nominal Bandwidth 1.4 MHz. RB Size 5. Offset 0. Narrowband 0. Position 1.

- Low Channel: Spurious frequencies at less than 20 dB below the limit:

Frequency (MHz)	Emission limitations conducted (dBm)
2115.049	-32.28

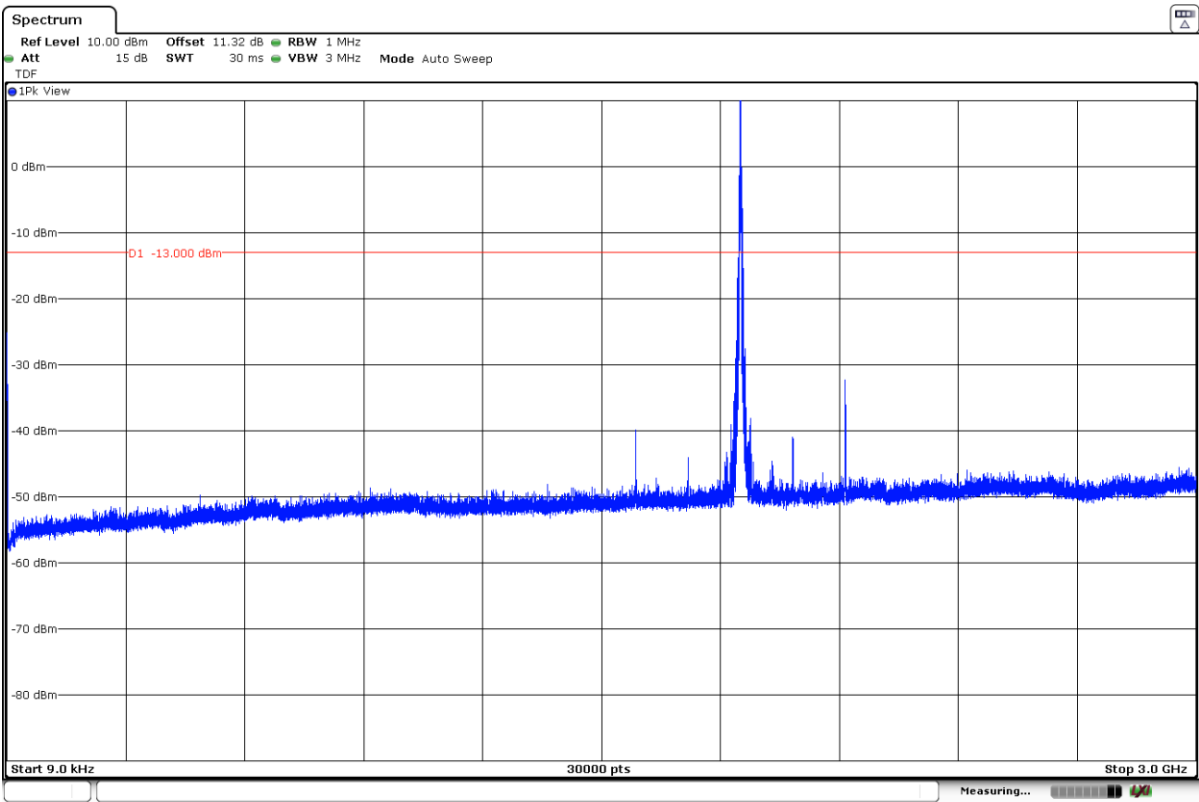
- Middle Channel: No spurious frequencies at less than 20 dB below the limit.
- High Channel: No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB): <±2.76

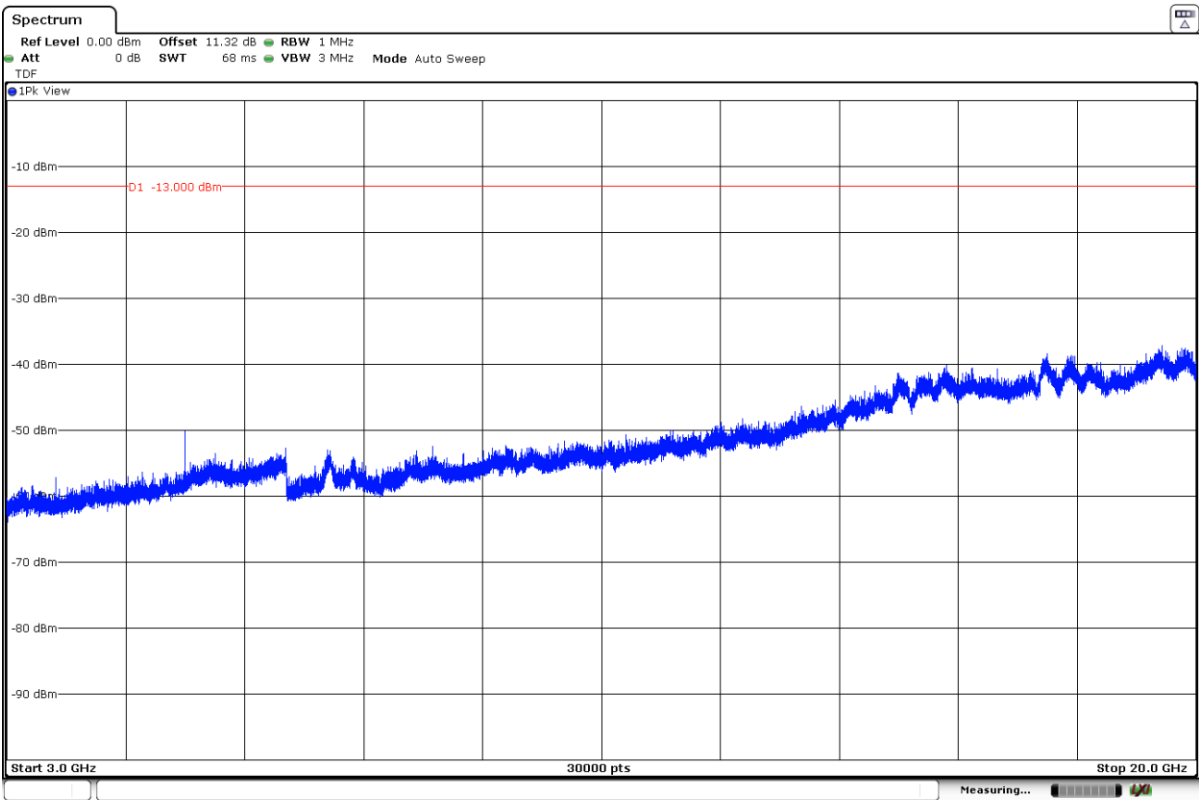
Verdict: PASS

LTE Band 25: 16QAM. Nominal Bandwidth 1.4 MHz. RB Size 5. Offset 0. Narrowband 0. Position 1.

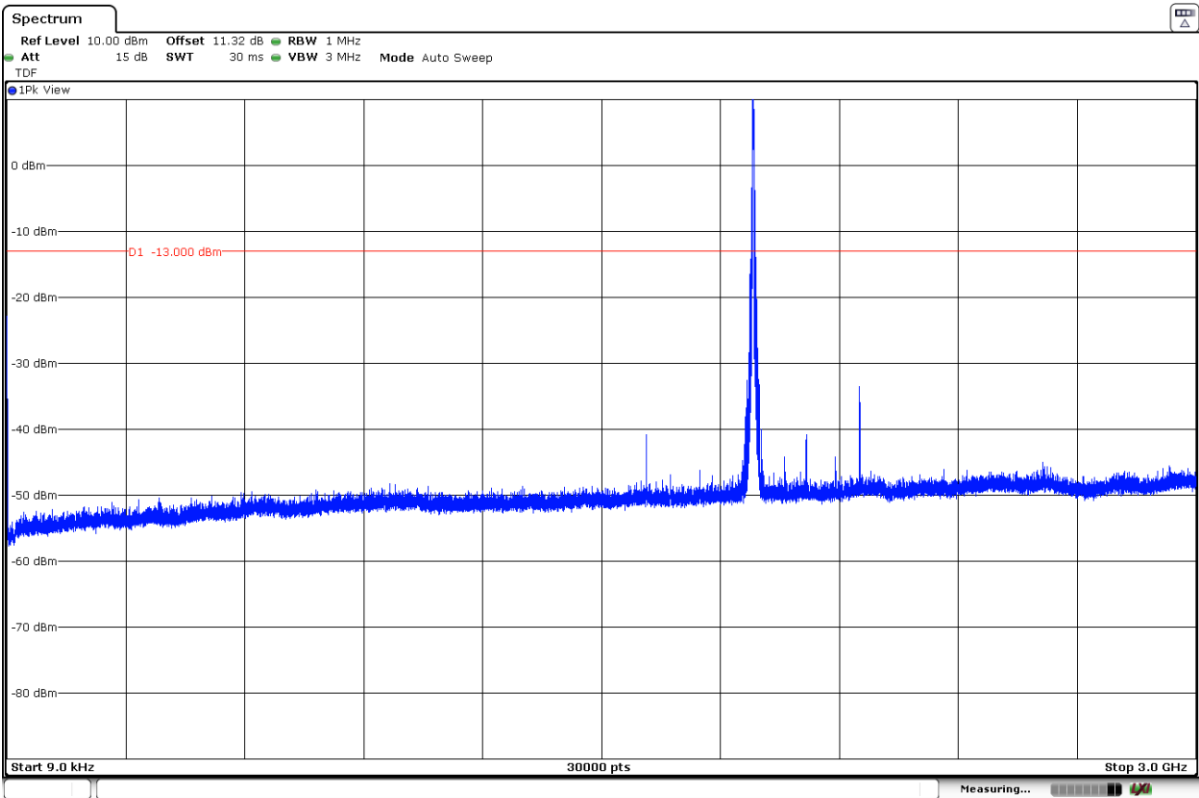
Low Channel:



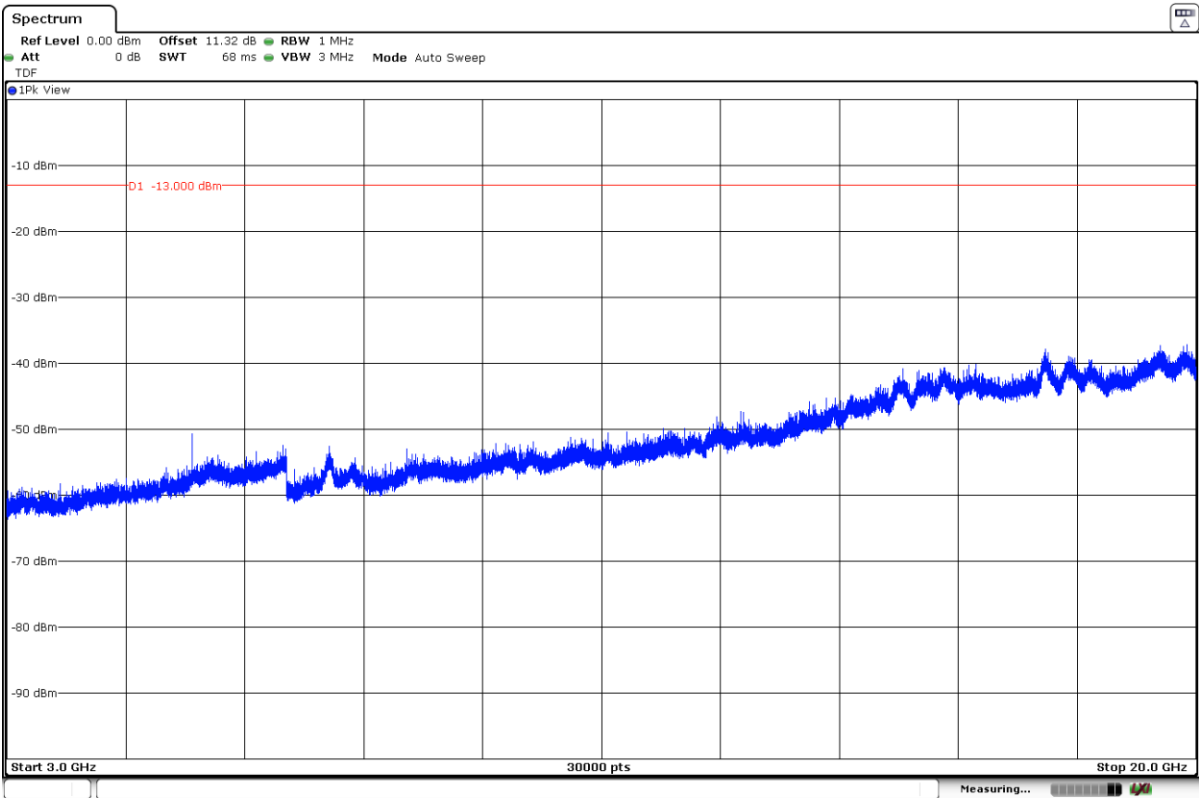
The peak above the limit is the carrier frequency.



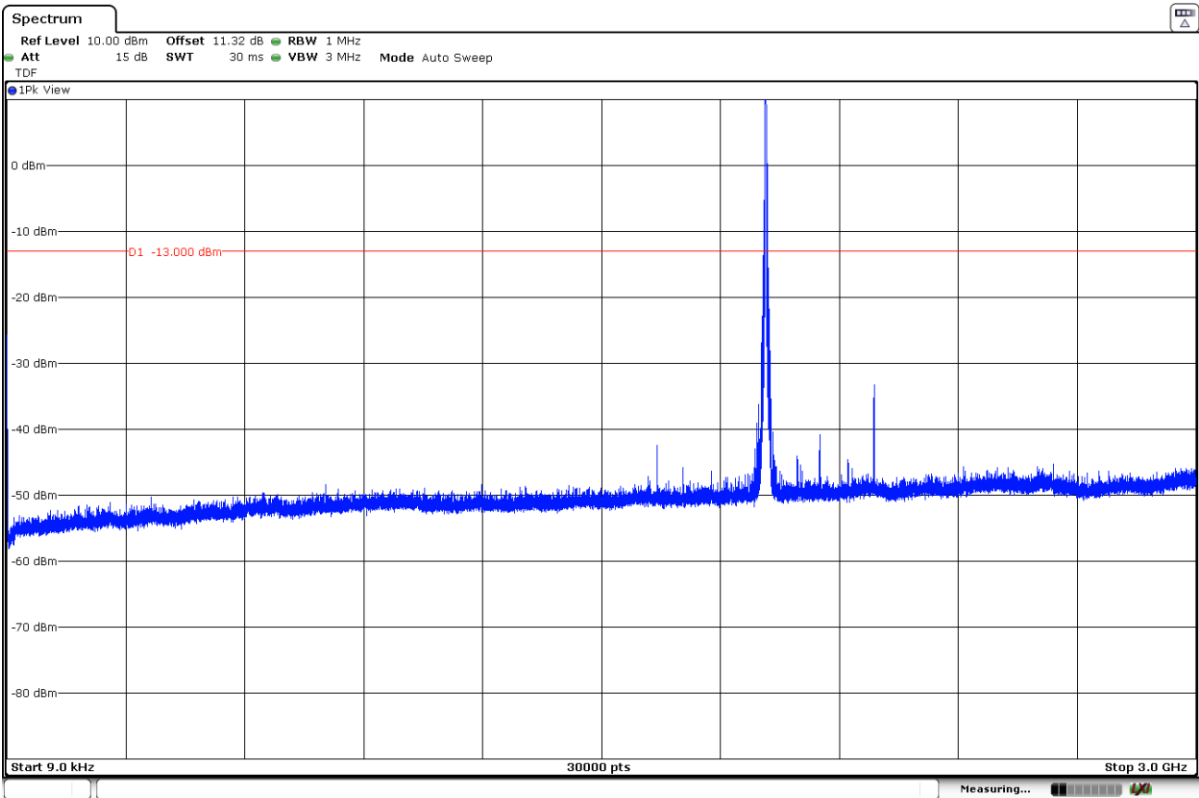
Middle Channel:



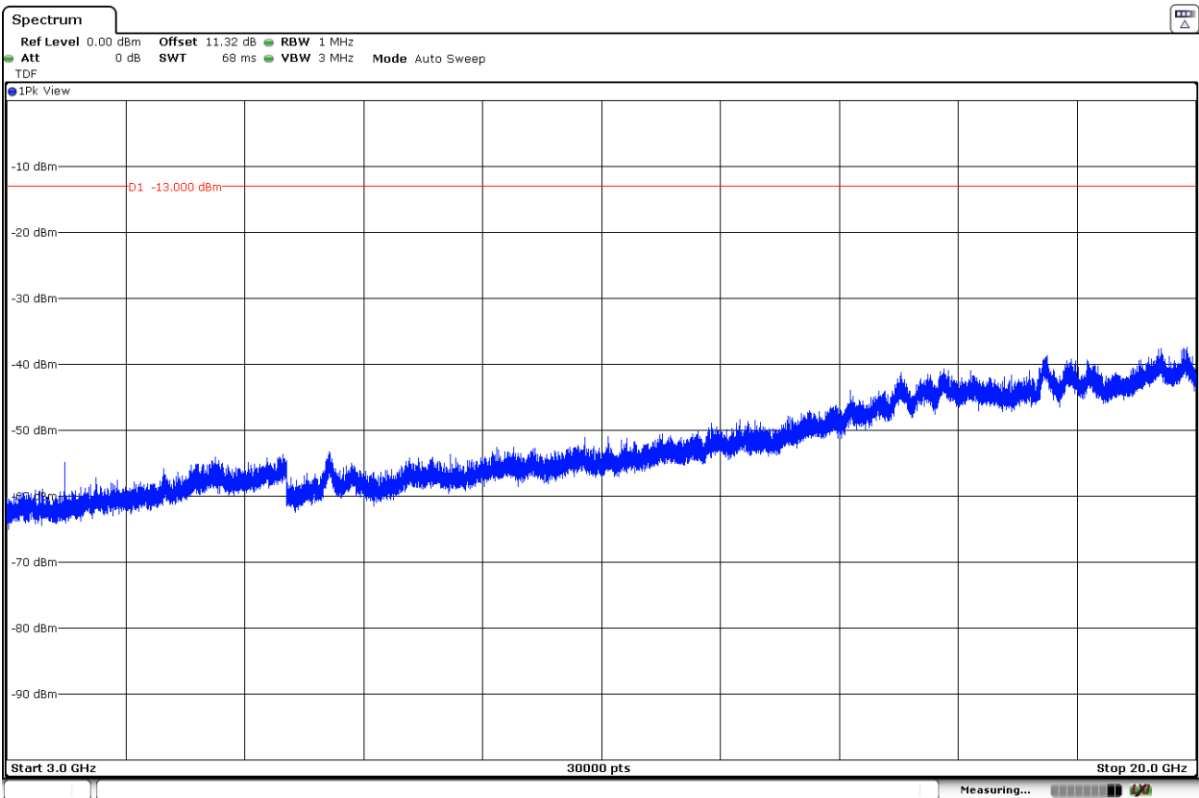
The peak above the limit is the carrier frequency.



High Channel:



The peak above the limit is the carrier frequency.



Spurious Emissions at Antenna Terminals at Block Edges

SPECIFICATION:

FCC §2.1051 and §24.238. RSS-133 Clause 6.5.

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.

At P_o transmitting power, the specified minimum attenuation becomes $43 + 10 \log(P_o)$, and the level in dBm relative to P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log(P_o \text{ in mW}) - 30] = -13 \text{ dBm}$$

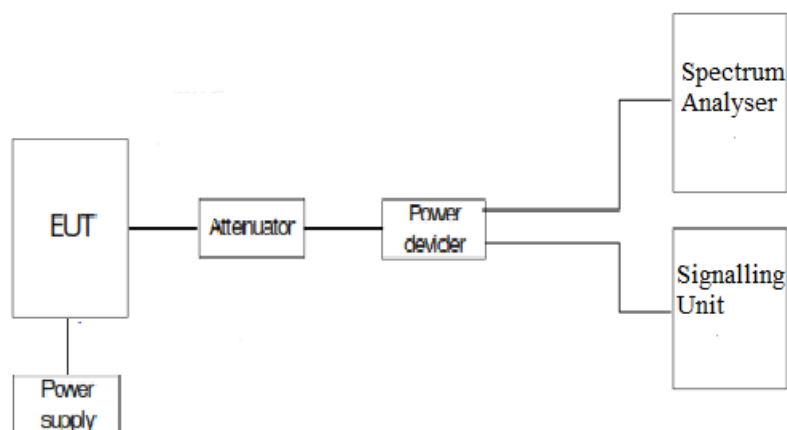
METHOD:

The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-Ohm attenuator and a power splitter.

The reading of the spectrum analyser is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyser.

As stated in FCC part 24.238 / RSS-133 Clause 6.5, in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

TEST SETUP:



RESULTS:

LTE Band 25:

Preliminary measurements determined QPSK as the worst-case modulation in terms of band edge results. The next results are for this worst-case configuration.

Low Block Edge. Narrowband = 0.

LTE QPSK MODULATION:	RB=1. Offset = 0. BW = 1.4 MHz
Maximum measured level at <u>Lowest</u> Block Edge at antenna port (dBm)	-16.17

LTE QPSK MODULATION:	RB = All. Offset = 0. BW = 1.4 MHz
Maximum measured level at <u>Lowest</u> Block Edge at antenna port (dBm)	-21.78

High Block Edge. Narrowband = Max.

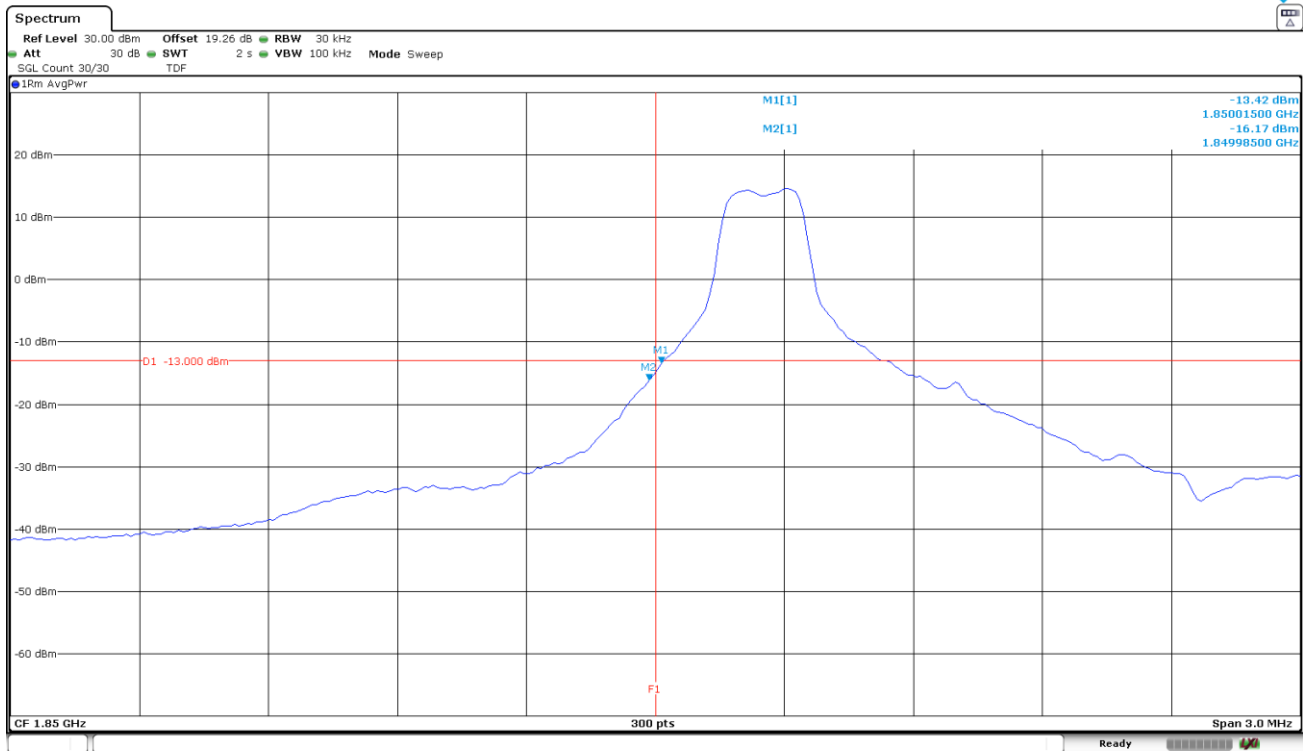
LTE QPSK MODULATION:	RB=1. Offset=Max. BW = 1.4 MHz
Maximum measured level at <u>Highest</u> Block Edge at antenna port (dBm)	-15.02

LTE QPSK MODULATION:	RB = All. Offset = 0. BW = 1.4 MHz
Maximum measured level at <u>Highest</u> Block Edge at antenna port (dBm)	-21.55

Measurement uncertainty (dB) $\leq \pm 2.76$

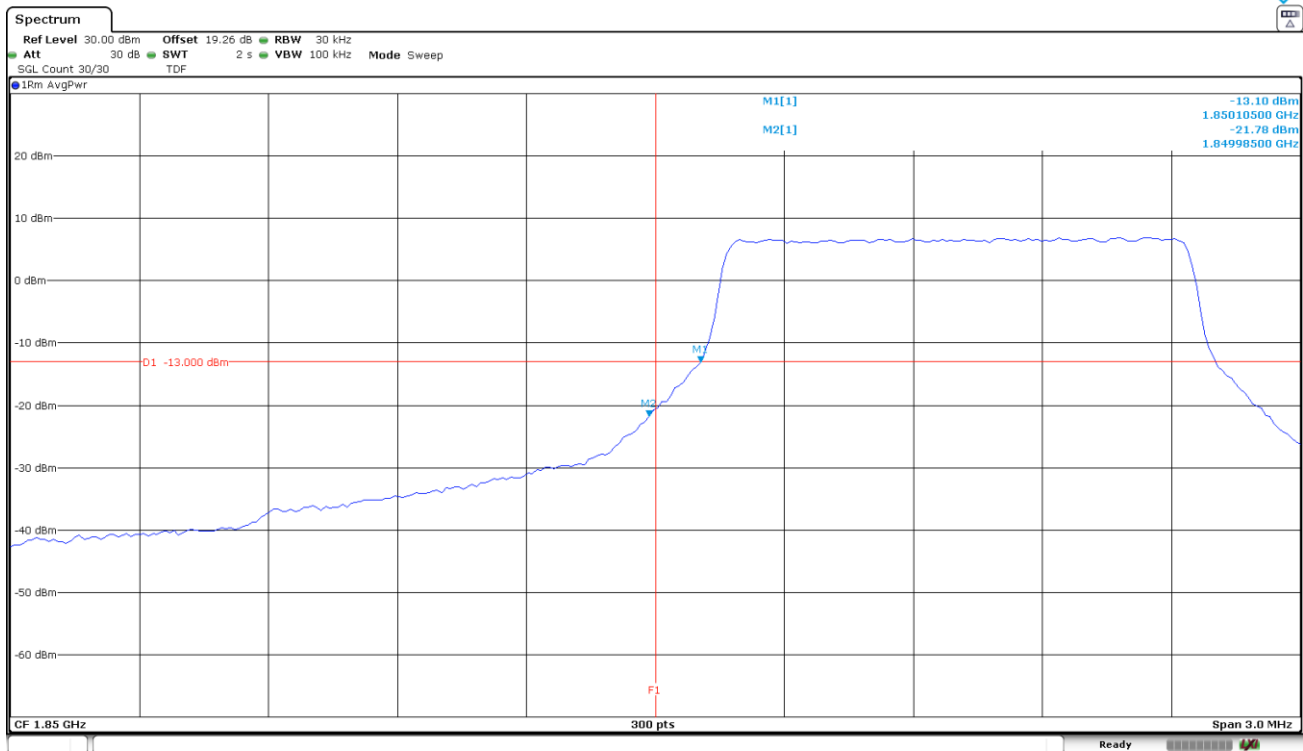
Verdict: PASS

LTE Band 25. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=0. Narrowband=0. Low Block Edge:



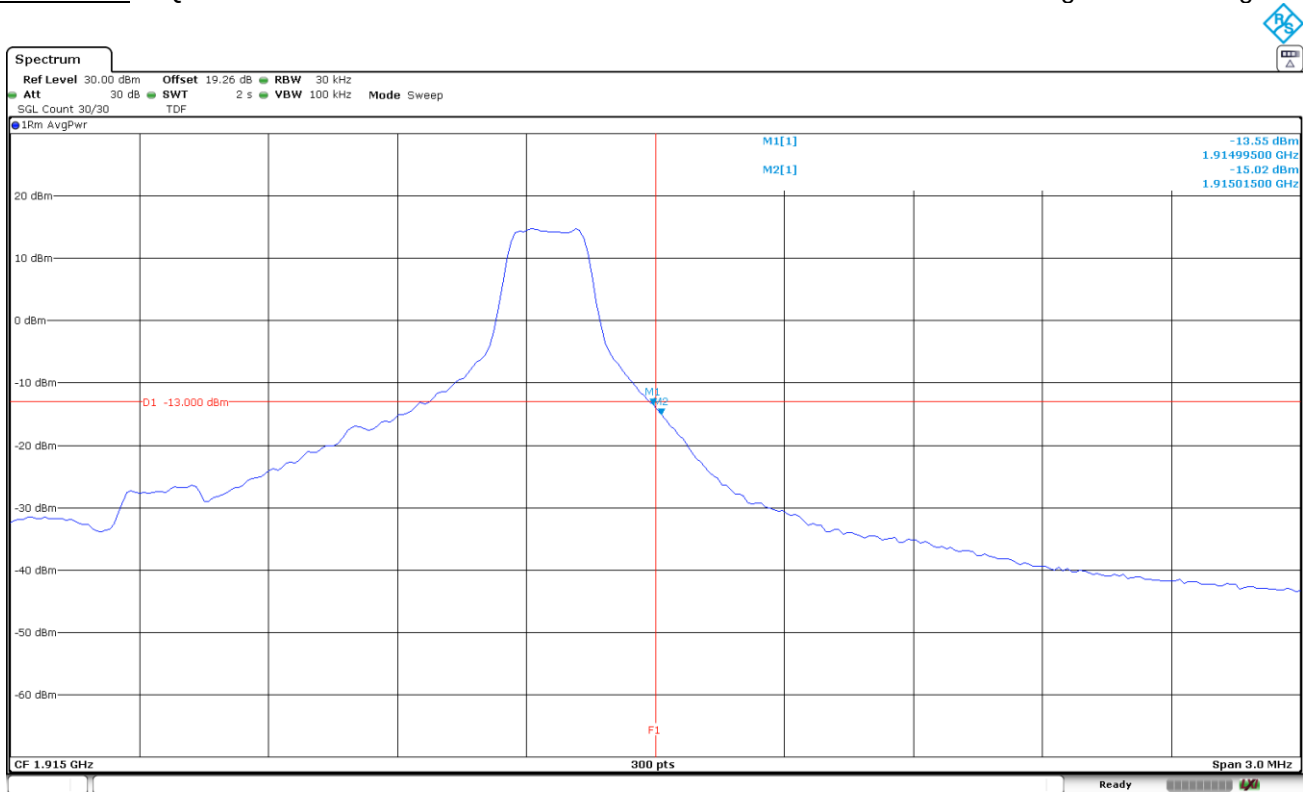
The equipment transmits at the maximum output power

LTE Band 25. QPSK MODULATION. BW=1.4 MHz. RB=All. Offset=0. Narrowband=0. Low Block Edge:



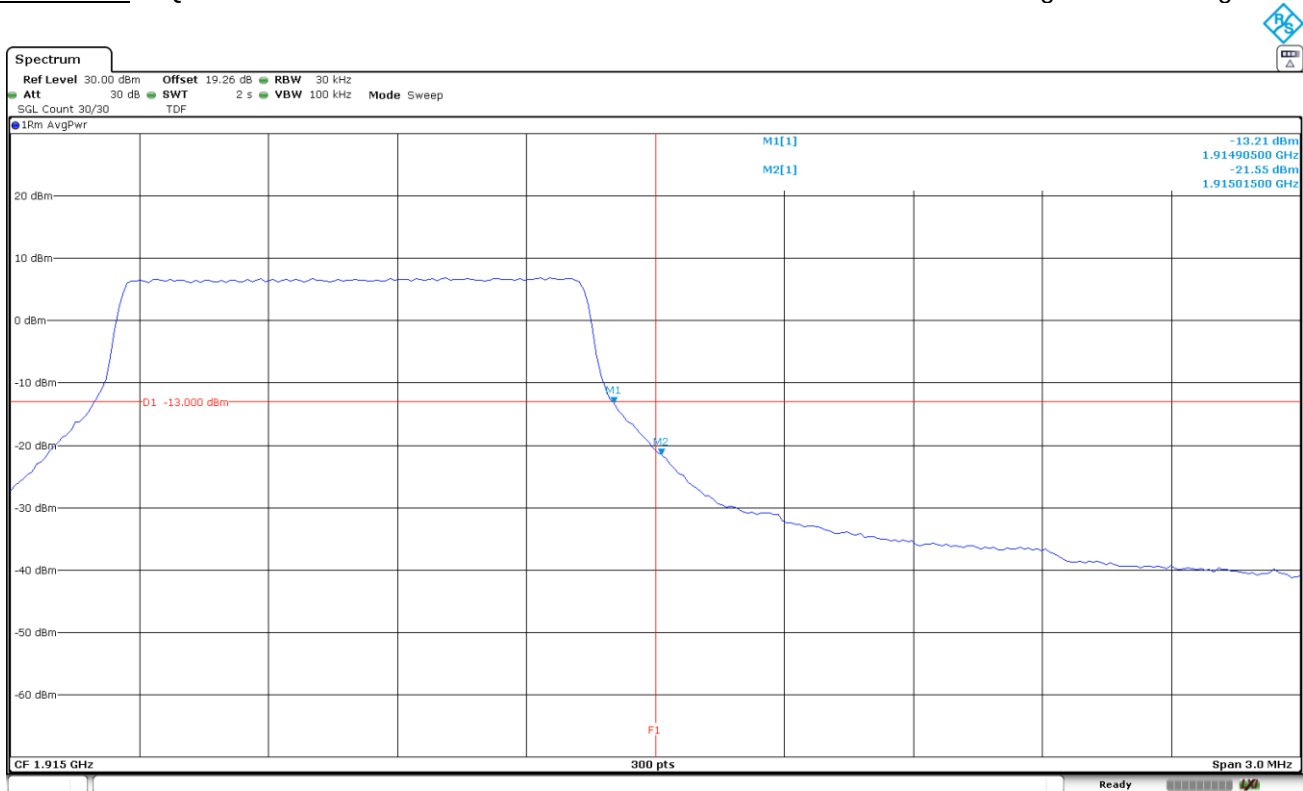
The equipment transmits at the maximum output power

LTE Band 25. QPSK MODULATION. BW=1.4 MHz. RB=1. Offset=Max. Narrowband=0. Highest Block Edge:



The equipment transmits at the maximum output power

LTE Band 25. QPSK MODULATION. BW=1.4 MHz. RB=All. Offset=0. Narrowband=0. Highest Block Edge:



The equipment transmits at the maximum output power

Radiated Emissions

Limits:

* FCC § 24.238. RSS-133 Clause 6.5:

The power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

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 High frequency generated within the equipment.

The EUT was placed on a non-conductive stand at 3-meter distance from the measuring antenna for measurements up to 18 GHz. Measurements above 18 GHz require the distance to be reduced to 1.5 meters.

Detected emissions were maximized at each frequency by rotating the EUT and adjusting the height and polarization of the measuring antenna. The maximum meter reading was recorded.

Measurement Limit:

At P_o transmitting power. the specified minimum attenuation becomes $43+10\log (P_o)$ and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

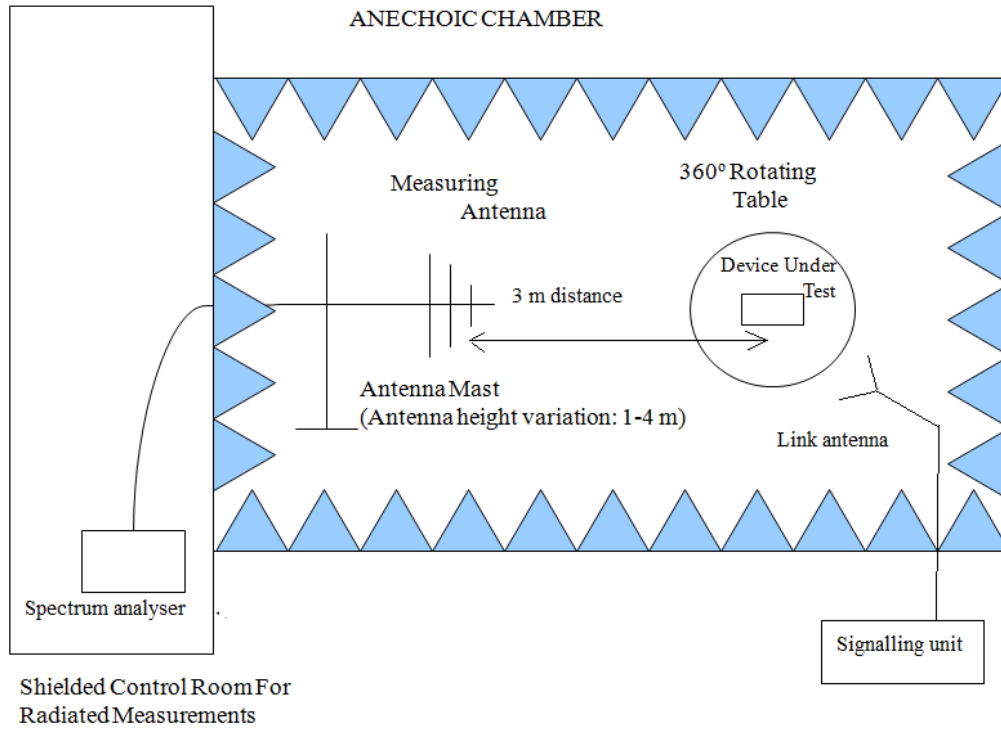
The maximum field strength (dB μ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log(D) - 104.8;$$

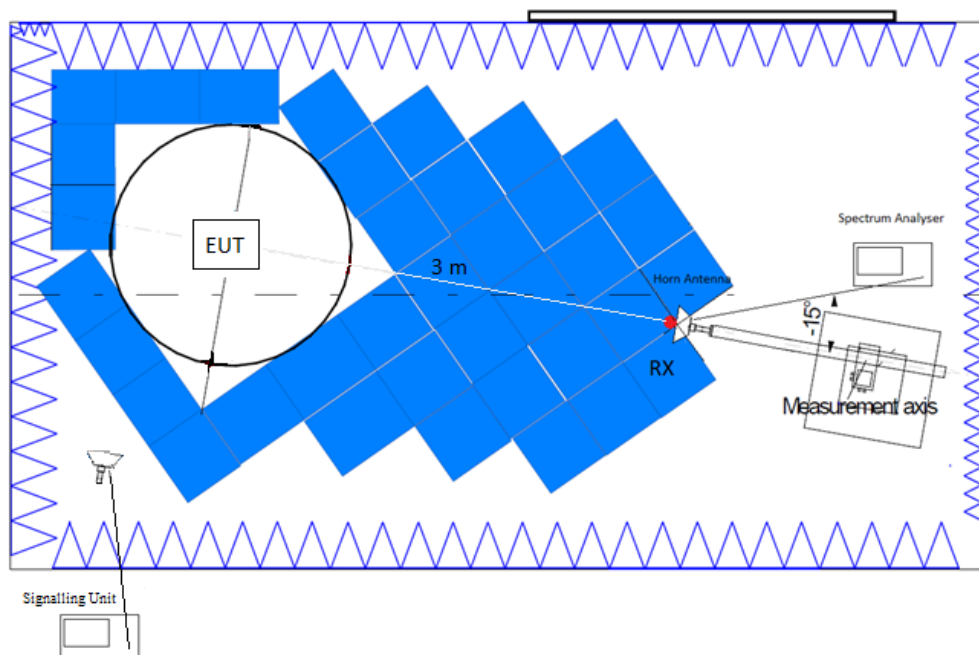
where D is the measurement distance (in the far field region) in m.

Test setup:

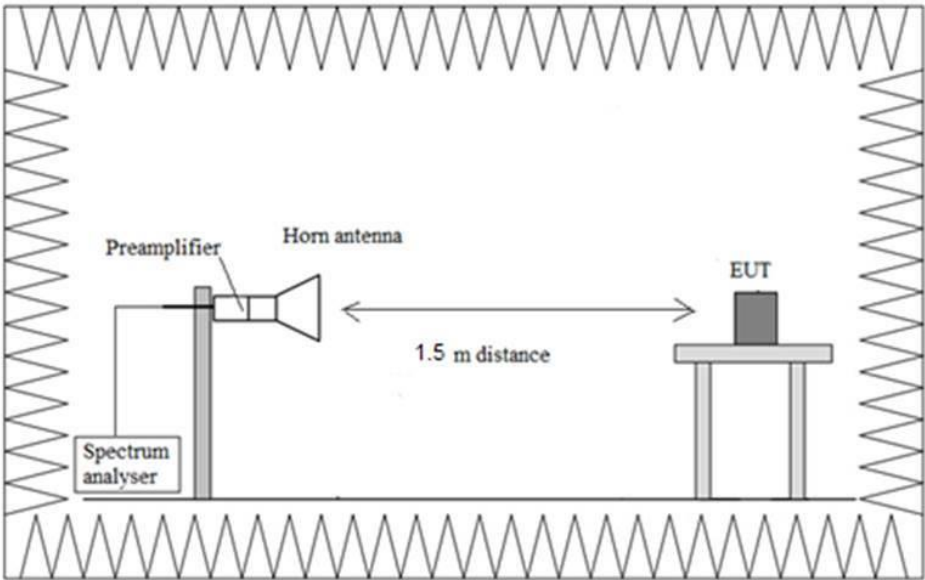
Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz up to 18 GHz:



Radiated measurements above 18 GHz:



Results:

LTE Band 25:

A preliminary scan determined the QPSK modulation, BW=1.4 MHz, RB Size=1, RB Offset=0, Narrow Band=0 as the worst case. The next results are for this worst-case configuration.

- LOW CHANNEL:

Frequency range 30 MHz - 1 GHz:

No spurious signals were found at less than 20 dB below the limit.

Frequency range 1 - 18 GHz:

Spurious signals were found at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
12.939616875	-31.80	H	Peak

Frequency range 18 - 20 GHz:

No spurious signals were found at less than 20 dB below the limit.

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz:

No spurious signals were found at less than 20 dB below the limit.

Frequency range 1 - 18 GHz:

Spurious signals were found at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
11.2923625	-30.29	V	Peak

Frequency range 18 - 20 GHz:

No spurious signals were found at less than 20 dB below the limit.

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

No spurious signals were found at less than 20 dB below the limit.

Frequency range 1 - 18 GHz:

No spurious signals were found at less than 20 dB below the limit.

Frequency range 18 - 20 GHz:

No spurious signals were found at less than 20 dB below the limit.

Measurement uncertainty (dB) $\leq \pm 5.03$ for $f < 1$ GHz
 $\leq \pm 4.32$ for $f \geq 1$ GHz up to 17 GHz
 $\leq \pm 4.58$ for $f \geq 17$ GHz up to 20 GHz

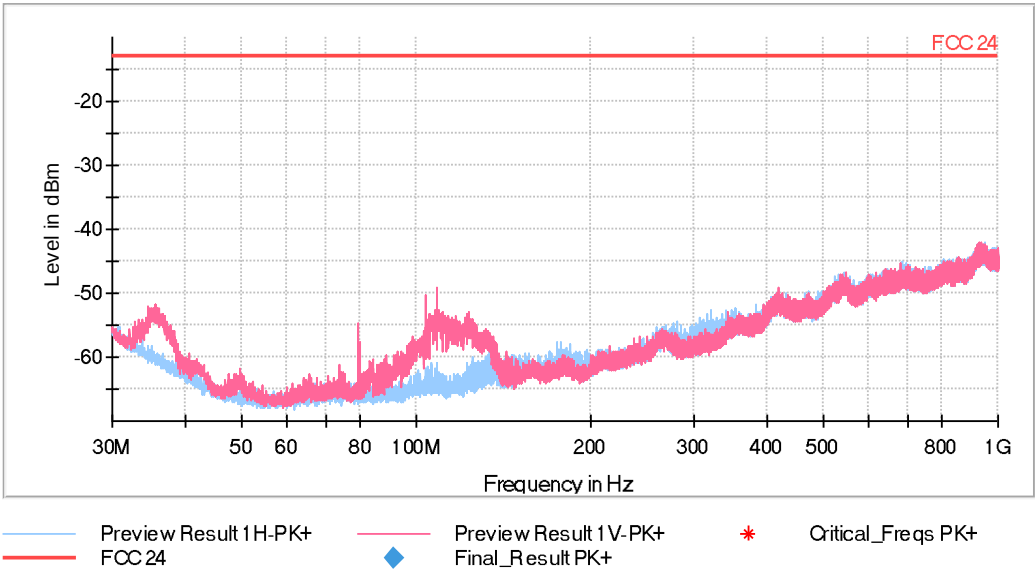
Verdict Pass

Attachments

Measurement settings:

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	1 MHz	1 s	0 dB
1 GHz - 3 GHz	62.5 kHz	PK+	1 MHz	1 s	0 dB
3 GHz - 18 GHz	468.75 kHz	PK+	1 MHz	1 s	0 dB
18 GHz - 20 GHz	62.5 kHz	PK+	1 MHz	1 s	0 dB

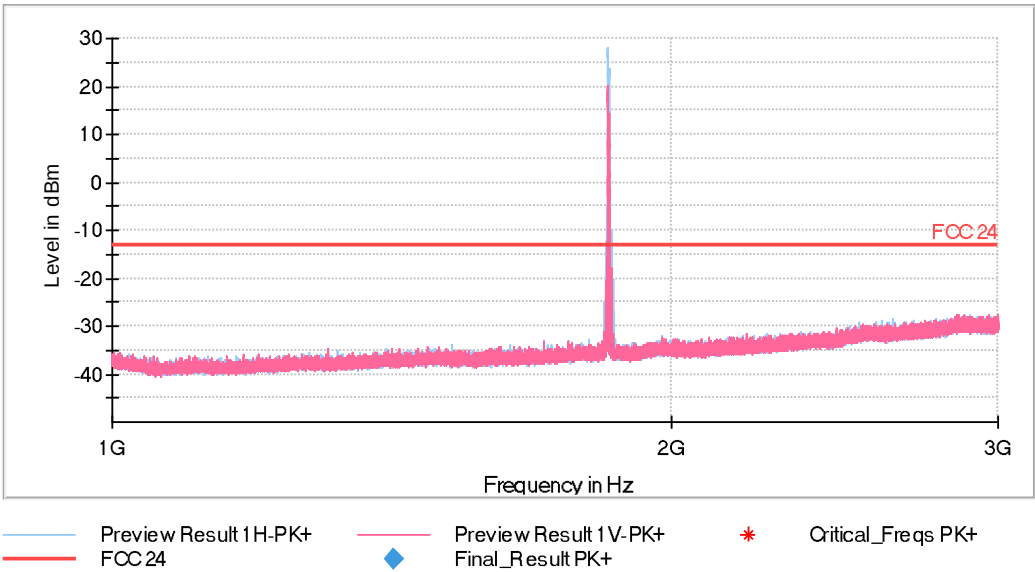
FREQUENCY RANGE 30 MHz - 1 GHz:



This plot is valid for Low, Middle and High Channels

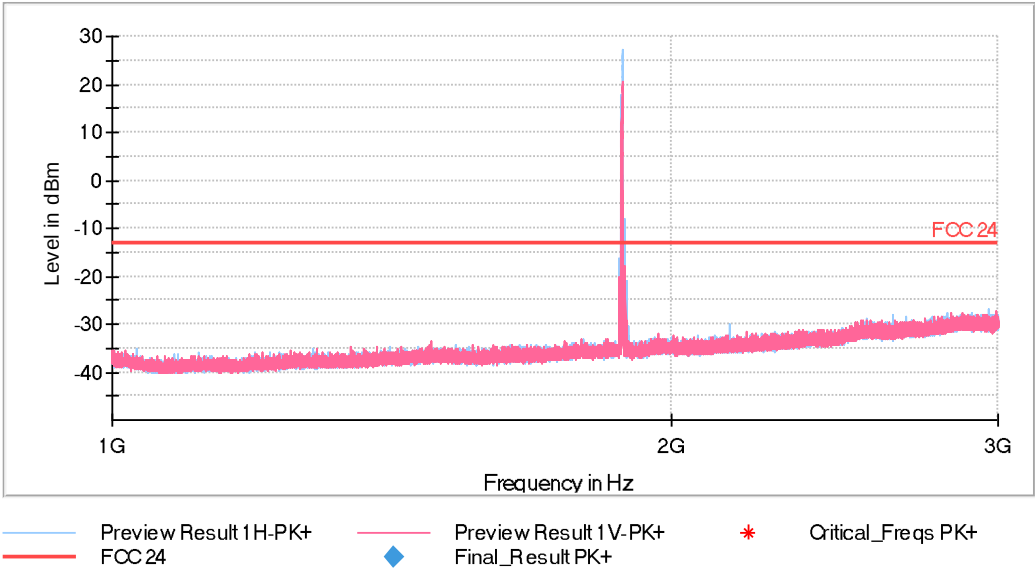
FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:



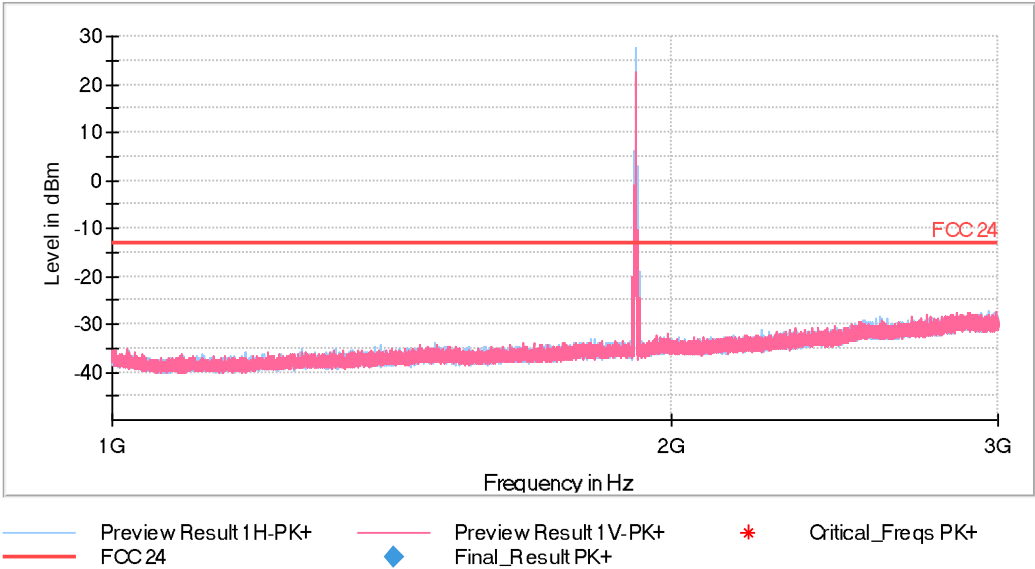
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

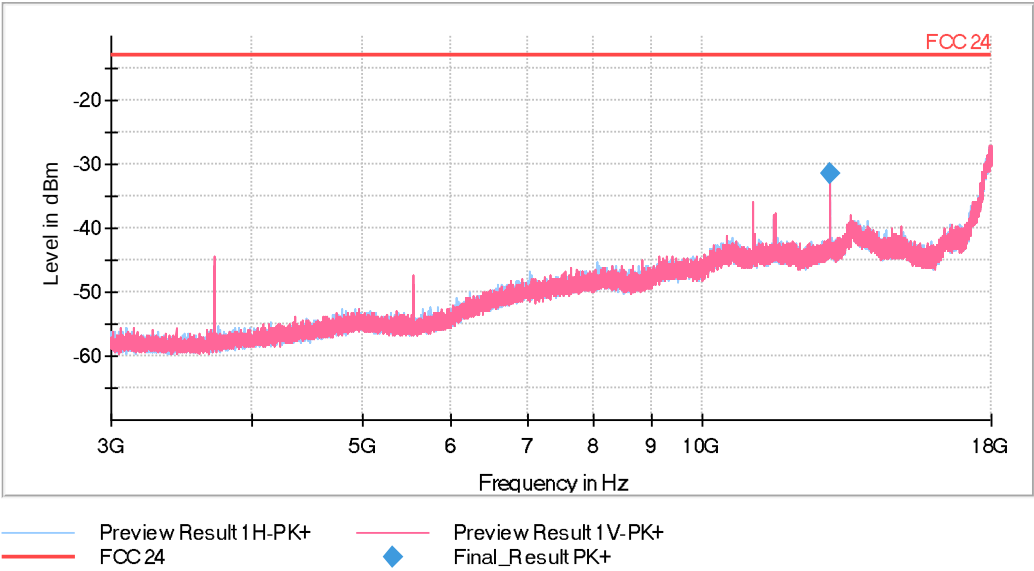
- High Channel:



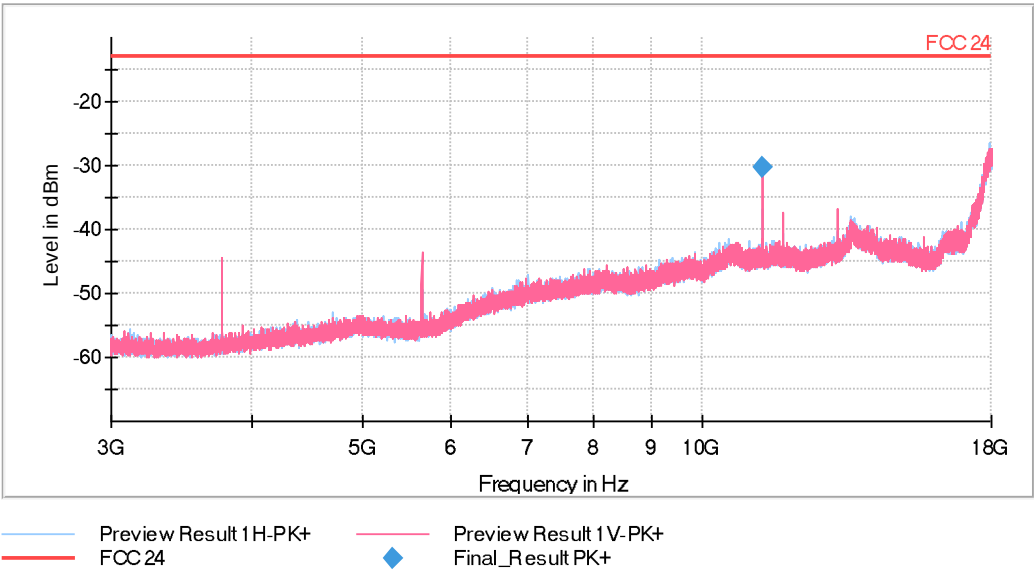
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 18 GHz:

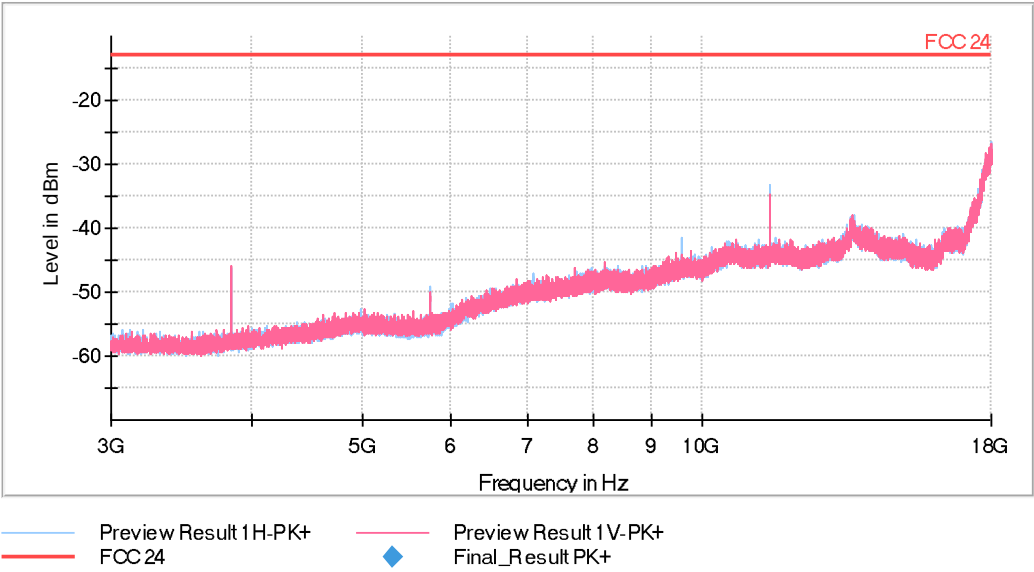
- Low Channel:



- Middle Channel:

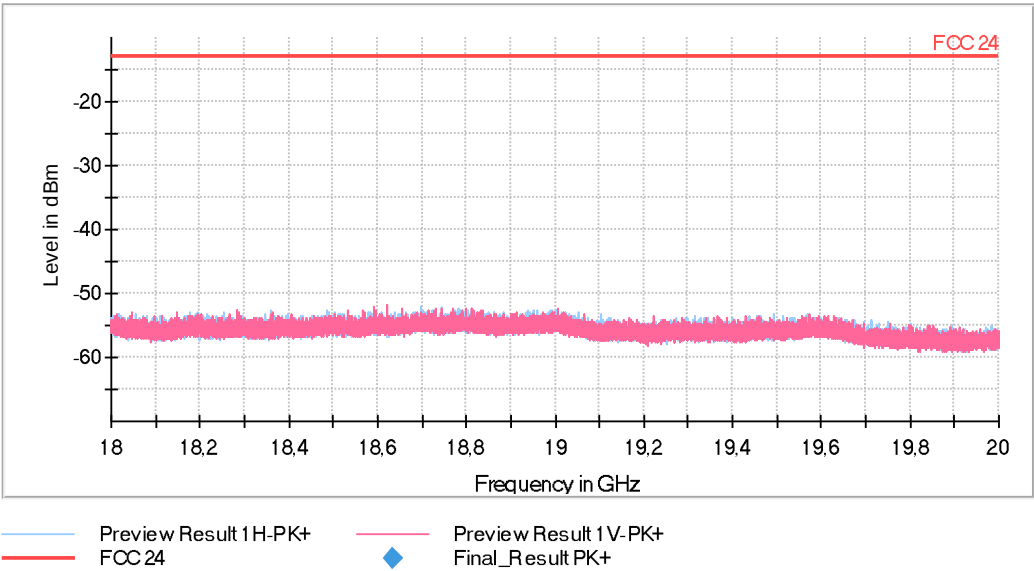


- High Channel:

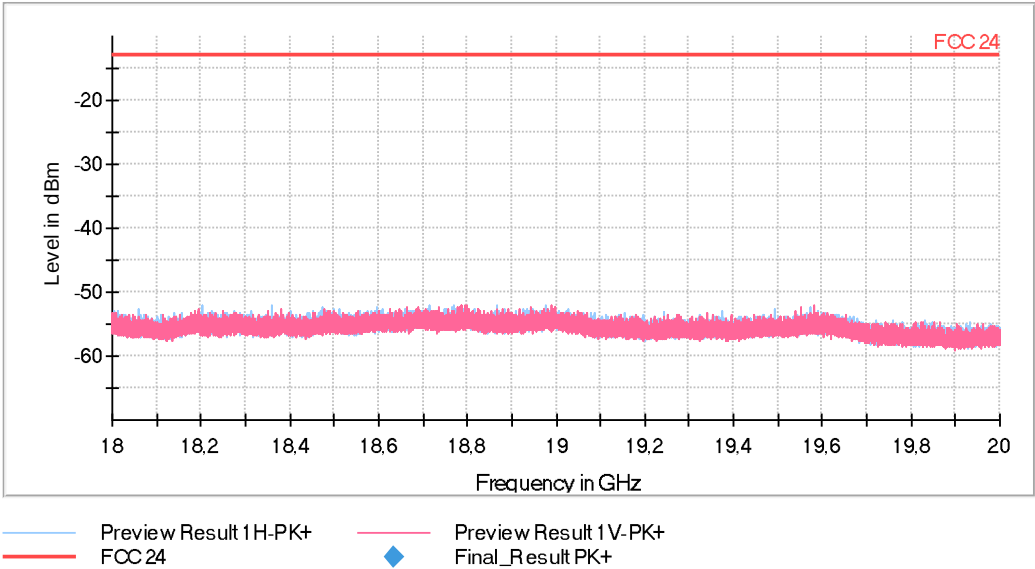


FREQUENCY RANGE 18 - 20 GHz:

- Low Channel:



- Middle Channel:



- High Channel:

