



Test report No:
NIE: 66136RRF.001

Test Report

Reference Standard:
USA FCC Part 24
CANADA RSS-133

(*) Identification of item tested	LTE Wireless module
(*) Trademark	Telit
(*) Model and /or type reference	LE910C1-SAX
Other identification of the product	HW version: 1.10 SW version: M0F.313002 FCC ID: R17LE910CXSA IC: 5131A-LE910CXSA
(*) Features	GNSS, Audio: VoLTE
Applicant	Telit Wireless Solutions Co., LTD 13th Fl., Shinyoung Securities Bld, 6, Gukjegeumyung-ro 8-gil, Yeongdeungpo-gu, Seoul, 07330, South Korea
Test method requested, standard	USA FCC Part 24 (10-1-19 Edition). CANADA RSS-133 Issue 6, Jan. 2018. ANSI C63.26: 2015. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Carlos Luque RF Lab. Supervisor
Date of issue	2020-11-03
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification S.A.U. 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.

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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 LE910C1-SAX is a LTE Wireless module with LTE Cat.1; LTE bands: FDD B2, B4, B12, B66; Data Capability: LTE CAT1 10/5 Mb;

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
66136/011	LTE Wireless module	LE910C1-SAX	--	2020/09/23
66136/017	Antenna	--	--	2020/09/23
66136/018	Antenna	--	--	2020/09/23
66136/020	Antenna	--	--	2020/09/23

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
66136/012	Cradle	--	--	2020/09/23
66136/026	Power Cable DC	--	--	2020/09/23

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
66136/011	LTE Wireless module	LE910C1-SAX	--	2020/09/23

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
66136/012	Cradle	--	--	2020/09/23
66136/026	Power Cable DC	--	--	2020/09/23

Sample S/02 has undergone the following test(s): The 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⁾	
	Main(Primary) port		x	☐	☐	☐	
	Diversity port		x	☐	☐	☐	
	GNSS port		x	☐	☐	☐	
				☐	☐	☐	
				☐	☐	☐	
Supplementary information to the ports.....:		SMA type connectors					
Rated power supply 3.4~4.2V, typ 3.8V	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.4~4.2V, typ 3.8V					
	☐	DC:					
Rated Power	0.2W						
Clock frequencies.....:	19.2MHz						
Other parameters							
Software version	M0F.313002						
Hardware version	1.10						
Dimensions in cm (W x H x D)	28.2 x 28.2 x 2.2mm						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Variable equipment					
Modules/parts.....:	Module/parts of test item		Type	Manufacturer			
Accessories (not part of the test item)	Description		Type	Manufacturer			
Documents as provided by the applicant	Description		File name	Issue date			
	Hardware_Design_Guide		LE910Cx_Hardware_Design_Guide	2020-07-31			

(3) Only for Medical Equipment

Identification of the client

Telit Wireless Solutions Co., LTD
13th Fl., Shinyoung Securities Bld, 6, Gukjegeumyung-ro 8-gil, Yeongdeungpo-gu, Seoul, 07330, South Korea

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-09-23
Date (finish)	2020-10-02

Document history

Report number	Date	Description
66136RRF.001	2020-11-03	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 %

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: Miguel Manuel López, Cristina Calle, Javier Miguel Nadales.

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	2020/04	2021/04
3. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
4. Digital multimeter FLUKE 179	2020/06	2021/06
5. Chamber HERAEUS VMT 04/35	2020/07	2022/07
6. RF Attenuator 10 dB, 5W, DC-40 GHz Aeroflex Weinschel 75A-10-11	2020/05	2021/05
7. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
8. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2019/09	2021/09
9. Signal Analyzer 20 Hz to 8 GHz ROHDE AND SCHWARZ FSQ8	2020/10	2022/10

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. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
4. Broadband Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
5. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
6. RF Preamplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
7. Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
8. Preamplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK, BLNA 0160-01N	2020/02	2021/02
9. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
10. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
11. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/04	2021/04
12. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
13. Digital multimeter FLUKE 179	2020/06	2021/06

Testing verdicts

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

Summary

FCC PART 24 / RSS-133 PARAGRAPH		
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: Radiated Emissions	P	
<u>Supplementary information and remarks:</u>		
None.		

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TEST CONDITIONS

POWER SUPPLY (V):

Vn: 3.80 Vdc
Vmin: 3.23 Vdc
Vmax: 4.37 Vdc

Type of Power Supply: DC Voltage from external power supply.

The subscripts 'n', 'min' and 'max' indicate voltage test conditions (normal, minimum and maximum respectively), as declared by the applicant.

ANTENNA:

MIDDLE Band	GAIN	ANTENNA TYPE
LTE Band 2	+3.5 dBi	External (Dipole)

TEST FREQUENCIES:

LTE Band 2. QPSK AND 16QAM MODULATIONS:

	Channel (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: LTE Category 1 device, so for BW=10 MHz, 15 MHz and 20 MHz the 16QAM modulation does not support transmission in RB=All.

RF Output Power

SPECIFICATION:

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.:

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

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

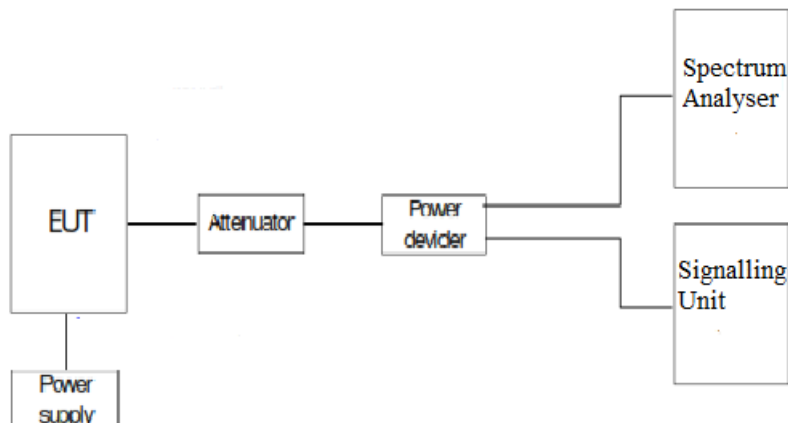
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP:

1. CONDUCTED AVERAGE POWER:



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



RESULTS:

1. CONDUCTED AVERAGE POWER

LTE BAND 2:

LTE BAND 2. QPSK MODULATION. Bandwidth = 1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.67	22.61	22.77
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.17	26.11	26.27
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 3. RB Offset: 1.

(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 6, RB Offset: 0 as the worst case. The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	21.64	22.15	21.74
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.14	25.65	25.24
PAPR (dB)	5.98	5.72	5.59
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 3. RB Offset: 1.

Worst case PAPR: Modulation 16QAM. RB Size: 6. RB Offset: 0.

LTE BAND 2. QPSK MODULATION. Bandwidth = 3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.79	22.38	22.76
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.29	25.88	26.26
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.

(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 15, RB Offset: 0 as the worst case. The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.15	21.43	21.93
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.65	24.93	25.43
PAPR (dB)	6.09	5.85	5.79
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation 16QAM. RB Size: 15. RB Offset: 0.

LTE BAND 2. QPSK MODULATION. Bandwidth = 5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.56	22.51	22.6
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.06	26.01	26.1
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.
(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 25, RB Offset: 0 as the worst case.
The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	21.93	21.77	21.53
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.43	25.27	25.03
PAPR (dB)	6.07	5.61	5.74
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE BAND 2. QPSK MODULATION. Bandwidth = 10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.46	22.68	22.84
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.96	26.18	26.34
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.

(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 25, RB Offset: 0 as the worst case. The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	21.55	21.65	22.59
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.05	25.15	26.09
PAPR (dB)	5.83	5.48	5.75
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.

Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE BAND 2. QPSK MODULATION. Bandwidth = 15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.79	22.66	22.83
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.29	26.16	26.33
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 37.

(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 1, RB Offset: 0 as the worst case. The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.27	22.23	22.12
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.77	25.73	25.62
PAPR (dB)	5.1	5.08	5.29
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 37.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE BAND 2. QPSK MODULATION. Bandwidth = 20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	22.67	22.61	22.63
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.17	26.11	26.13
PAPR (dB)	(*)	(*)	(*)
Measurement uncertainty (dB)	<±1.58		

Worst case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 49.
(*): Preliminary measurements determined that the modulation 16QAM, RB Size: 1, RB Offset: 99 as the worst case. The results in the next tables shows the results for this configuration.

LTE BAND 2. 16QAM MODULATION. Bandwidth = 20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.5	3.5	3.5
Measured maximum average power (dBm) at antenna port	21.73	21.08	21.63
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.23	24.58	25.13
PAPR (dB)	5.3	5.37	5.1
Measurement uncertainty (dB)	<±1.58		

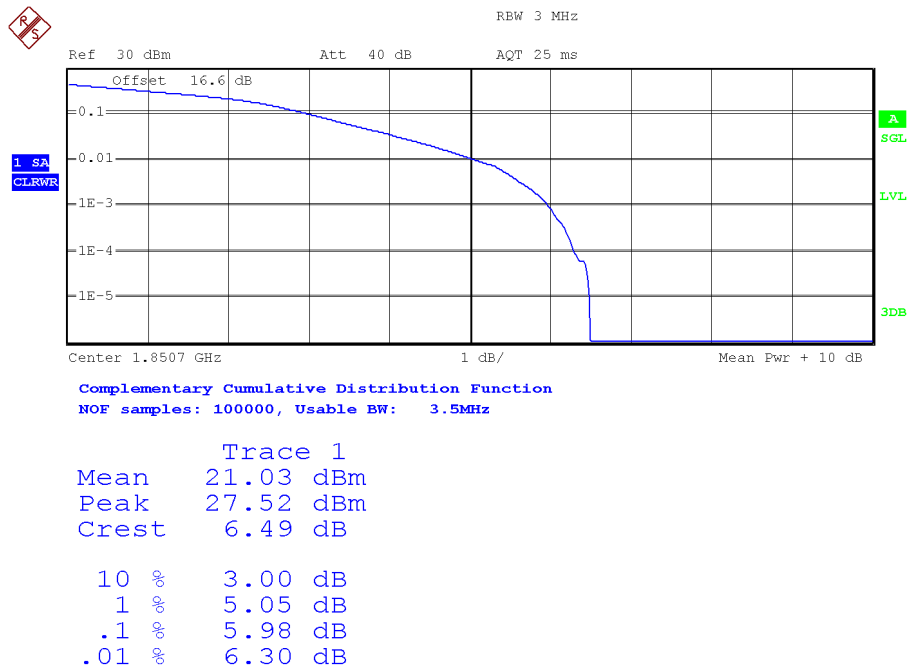
Worst case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 99.

Verdict: PASS

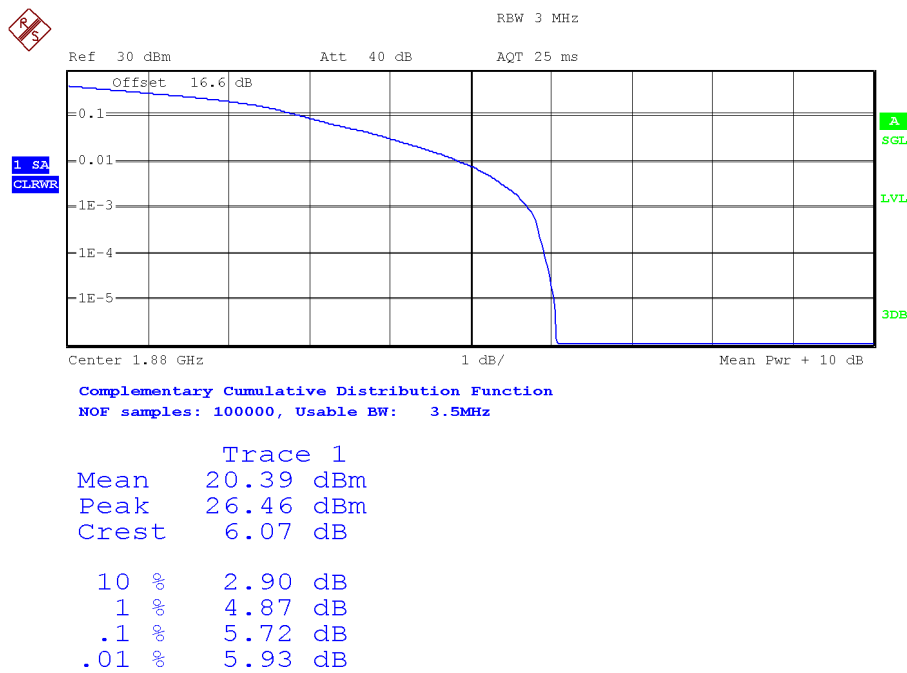
1. PEAK-TO-AVERAGE POWER RATIO (PAPR):

LTE Band 2. Bandwidth = 1.4 MHz. Modulation 16 QAM. RB Size: 6. RB Offset: 0.

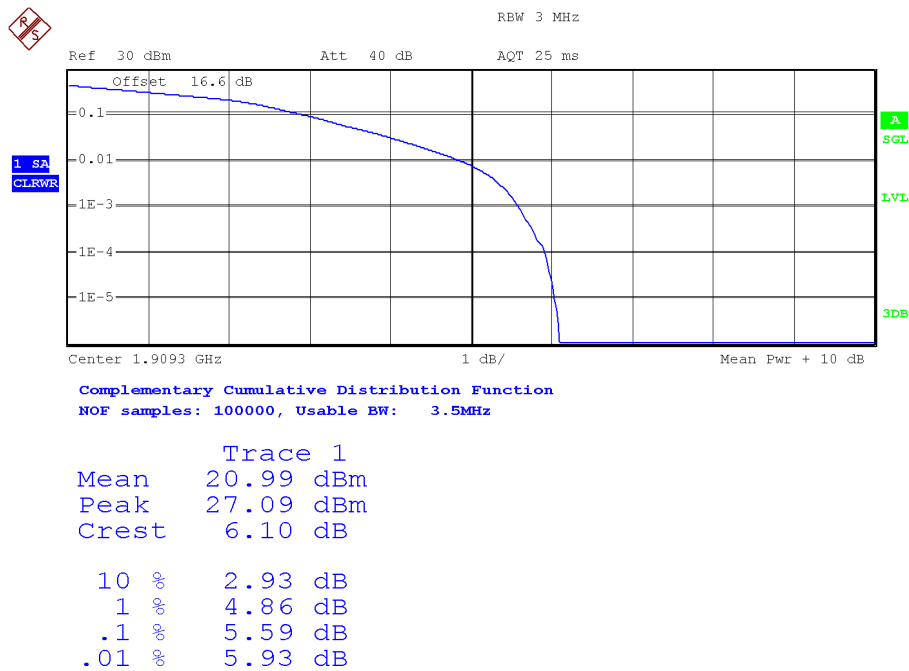
Low Channel:



Middle Channel:

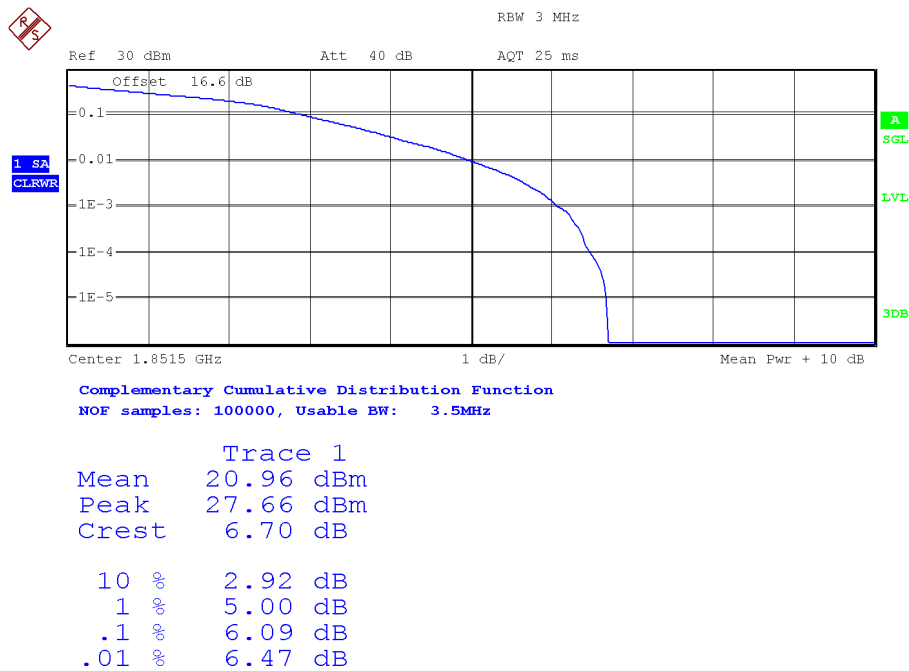


High Channel:

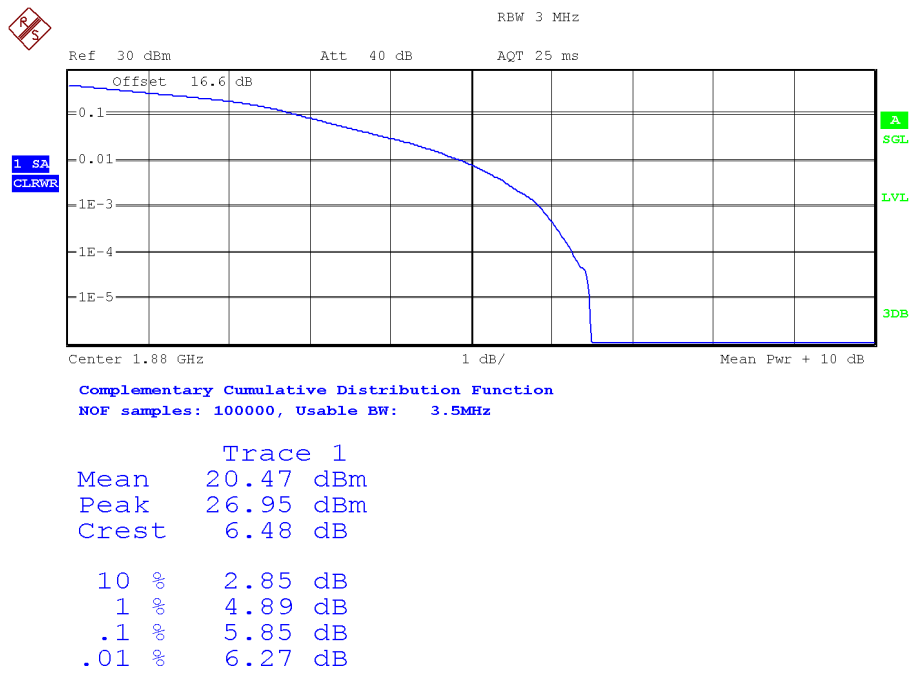


LTE Band 2. Bandwidth = 3 MHz. Modulation 16 QAM. RB Size: 15. RB Offset: 0.

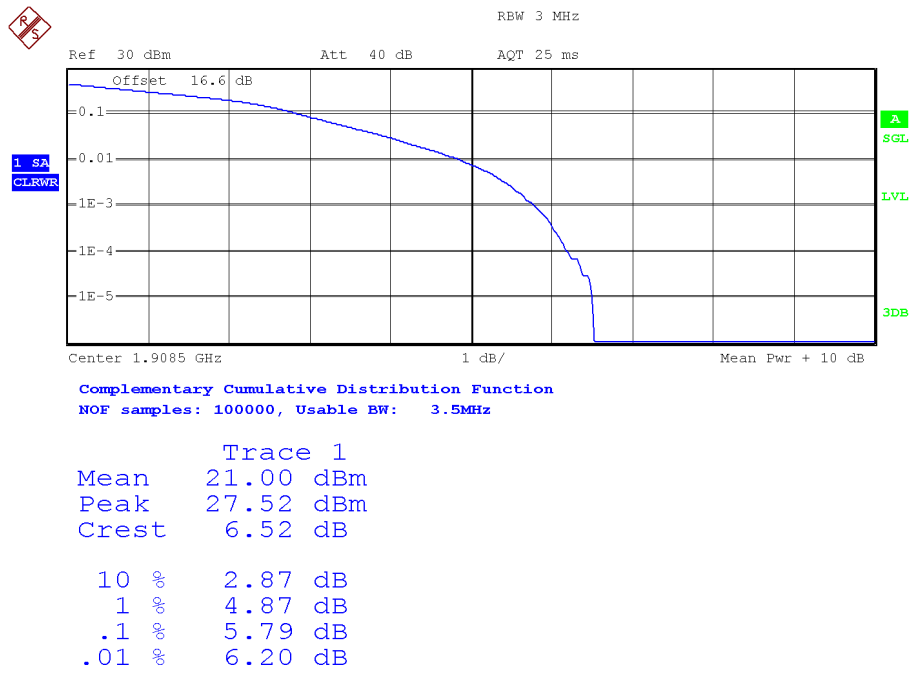
Low Channel:



Middle Channel:

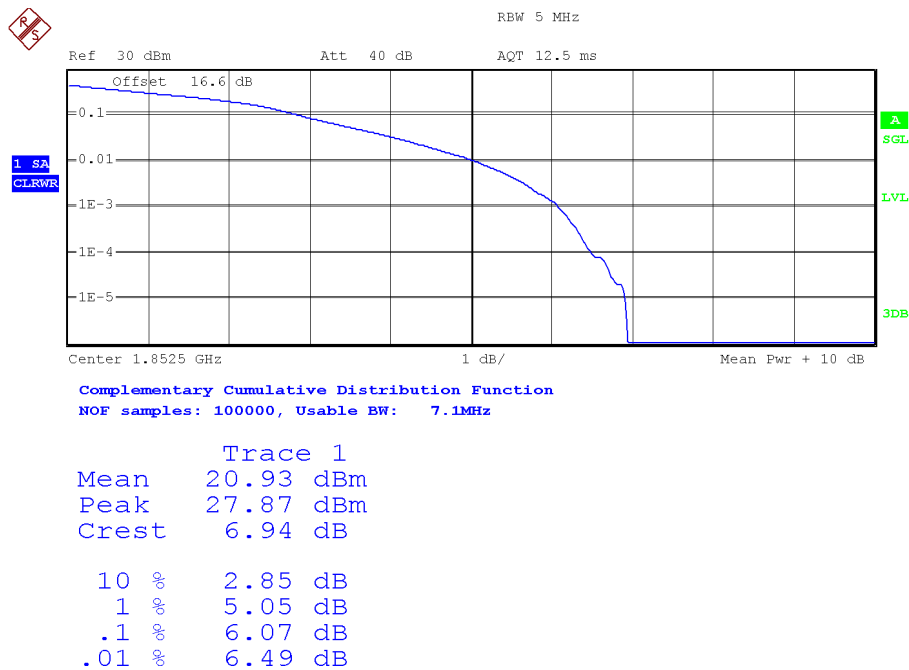


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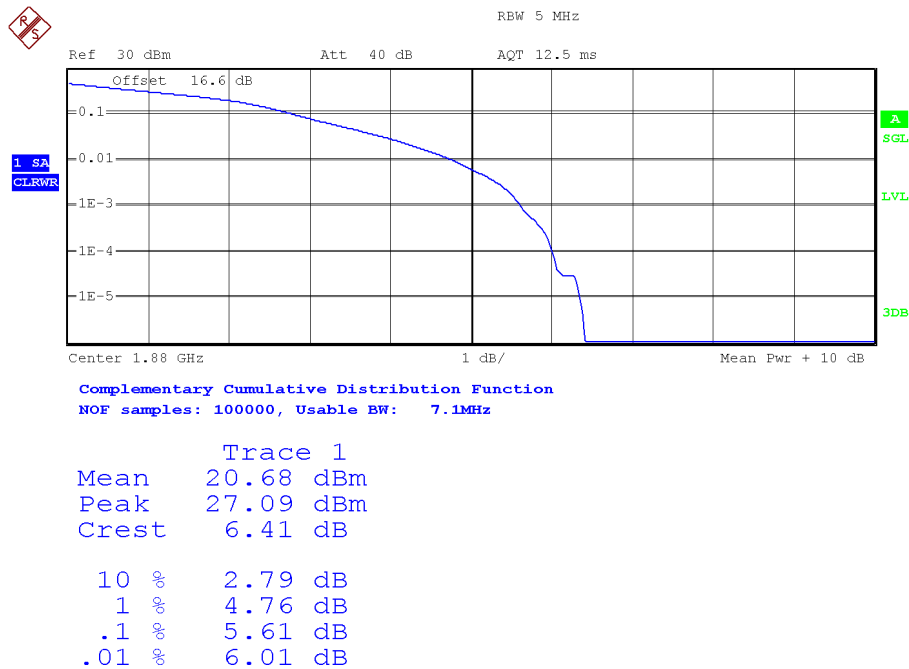


LTE Band 2. Bandwidth = 5 MHz. Modulation 16 QAM. RB Size: 25. RB Offset: 0.

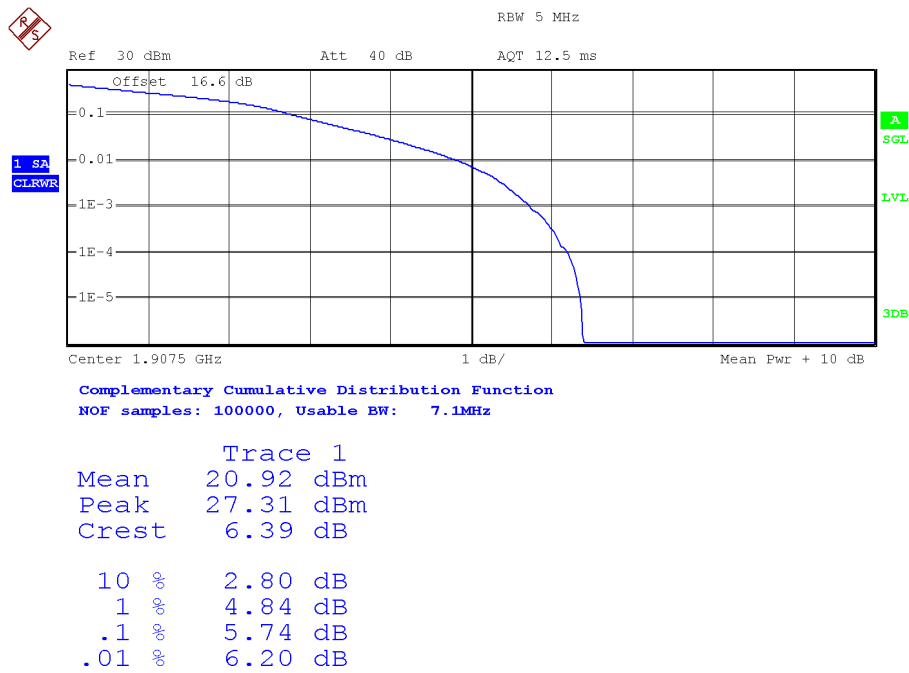
Low Channel:



Middle Channel:

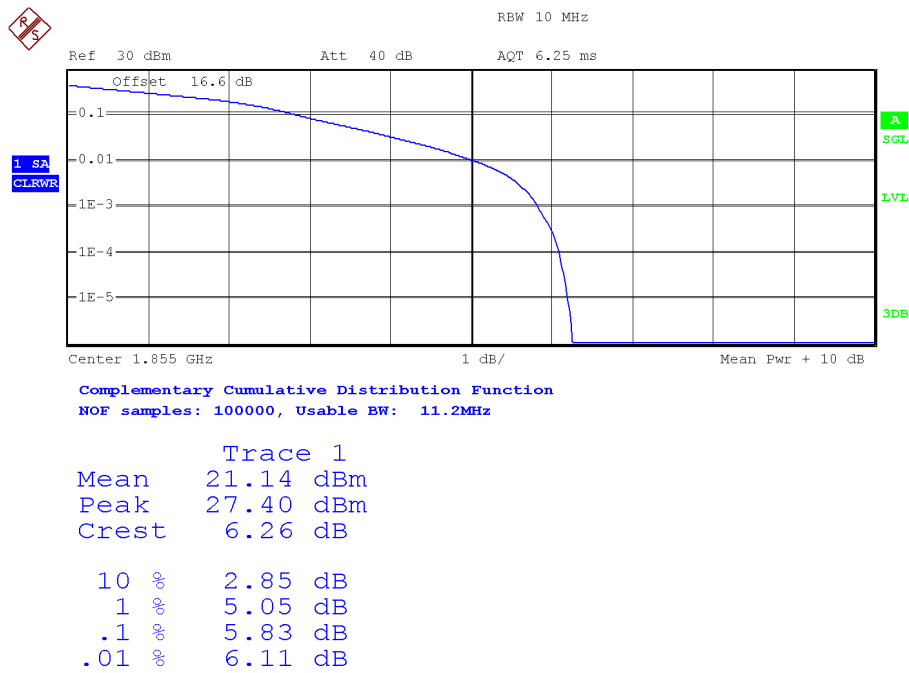


High Channel:

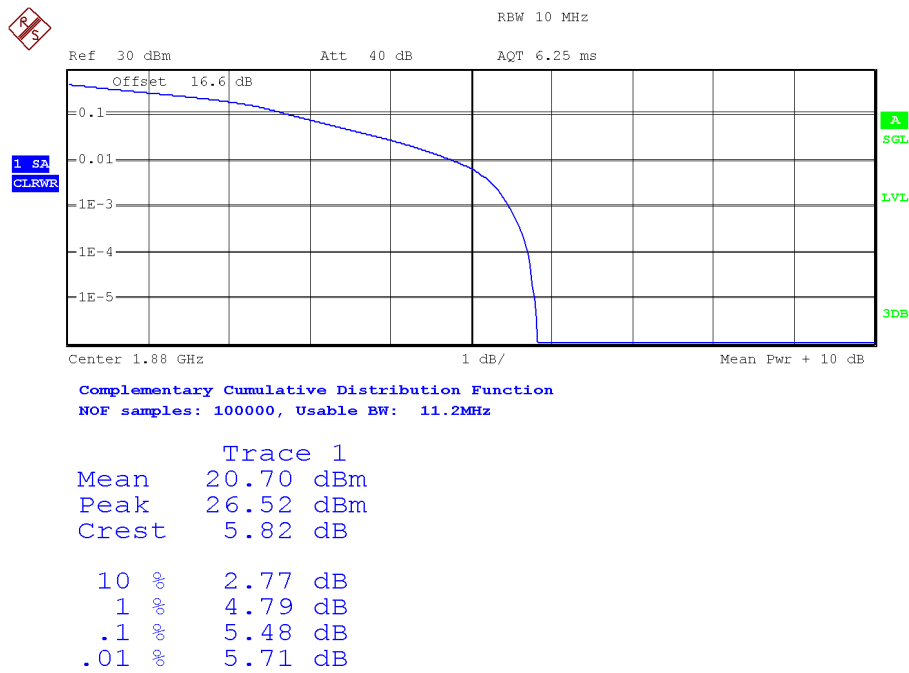


LTE Band 2. Bandwidth = 10 MHz. Modulation 16 QAM. RB Size: 25. RB Offset: 0.

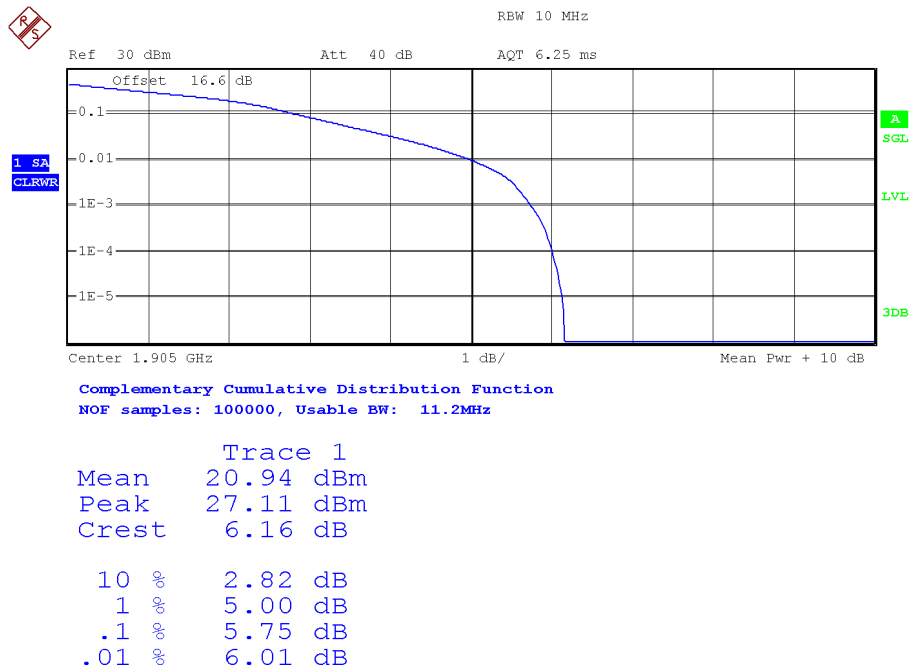
Low Channel:



Middle Channel:

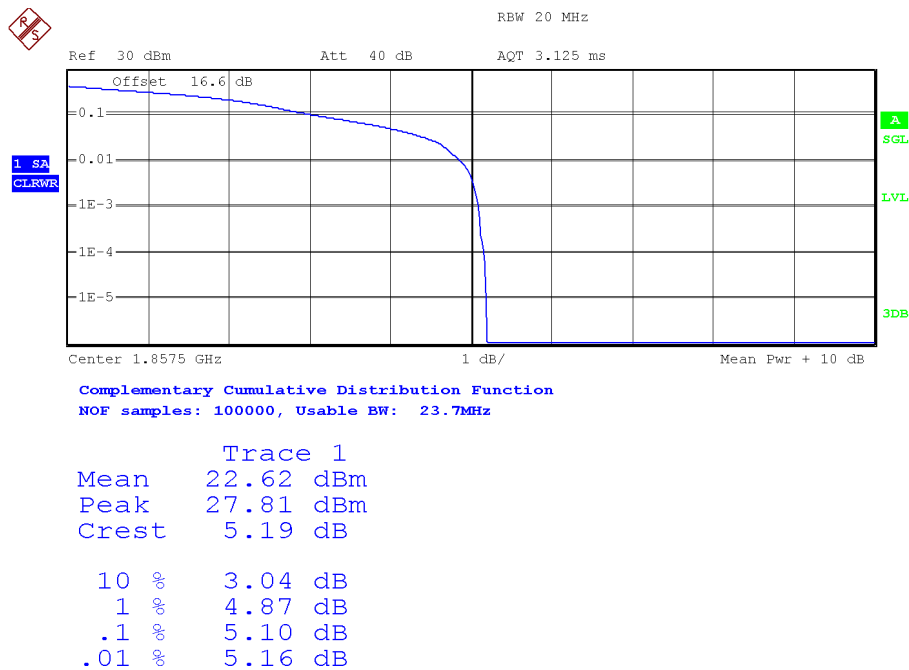


High Channel:

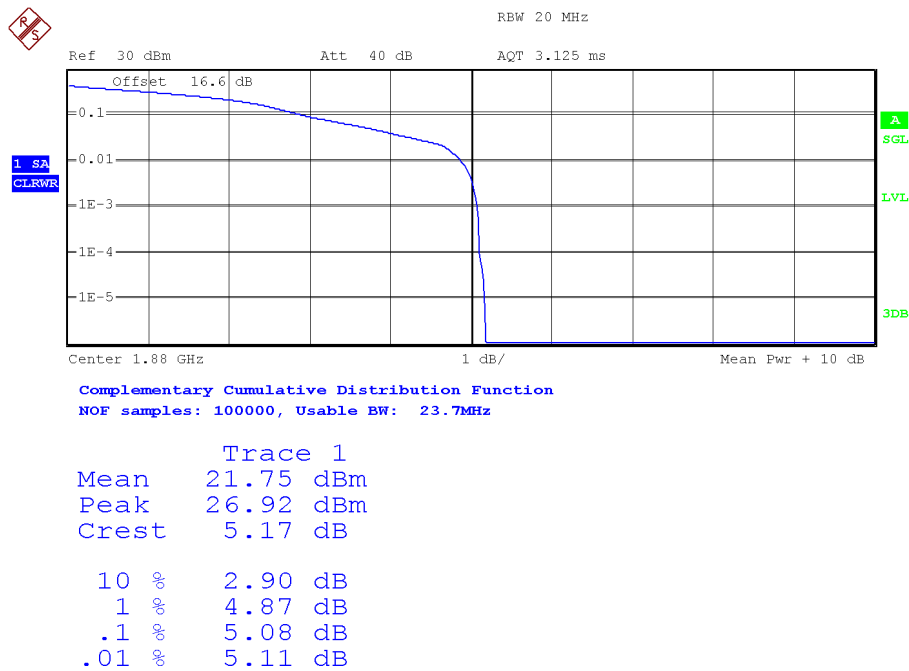


LTE Band 2. Bandwidth = 15 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 0.

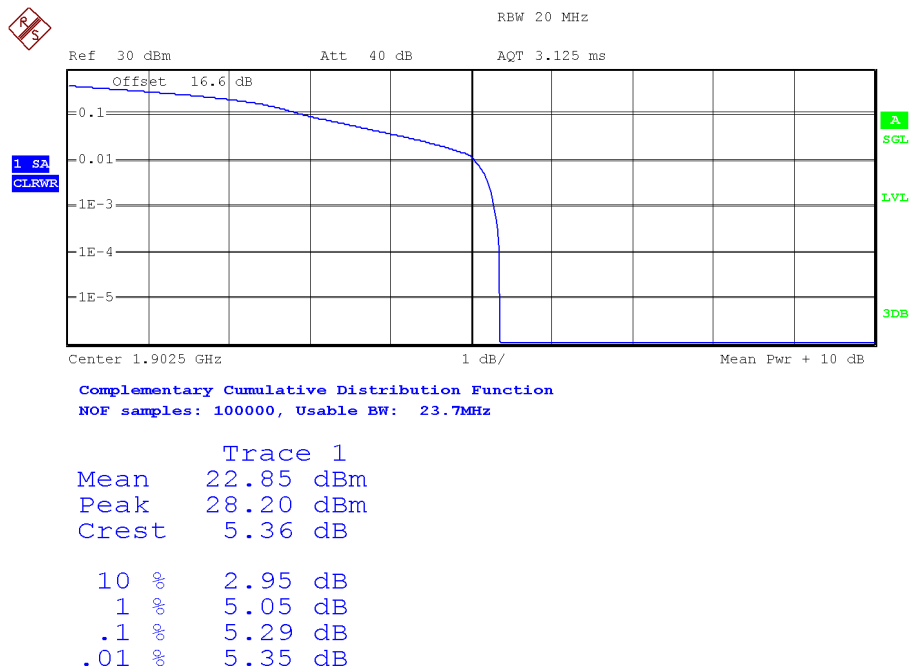
Low Channel:



Middle Channel:

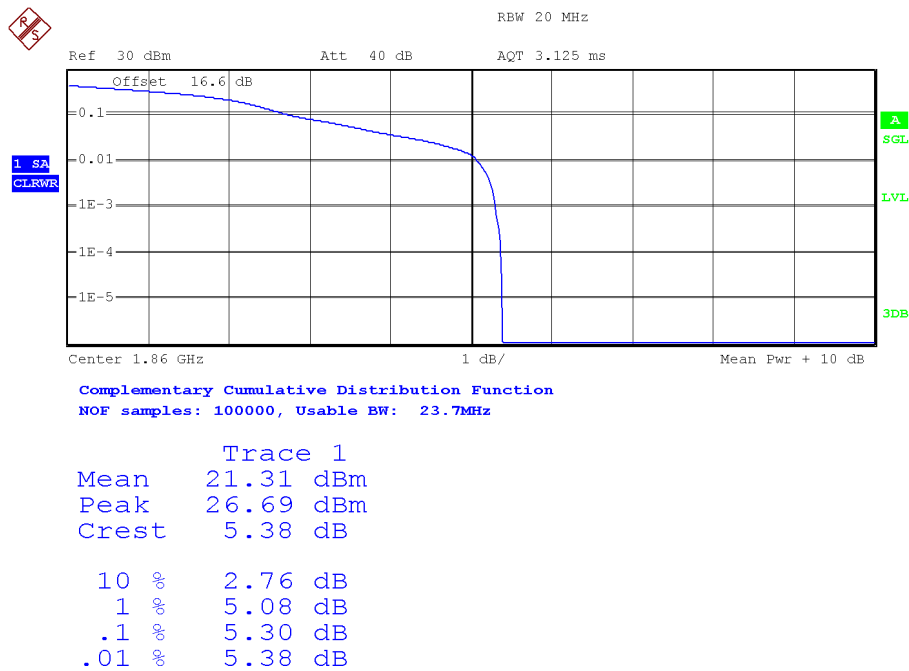


High Channel:

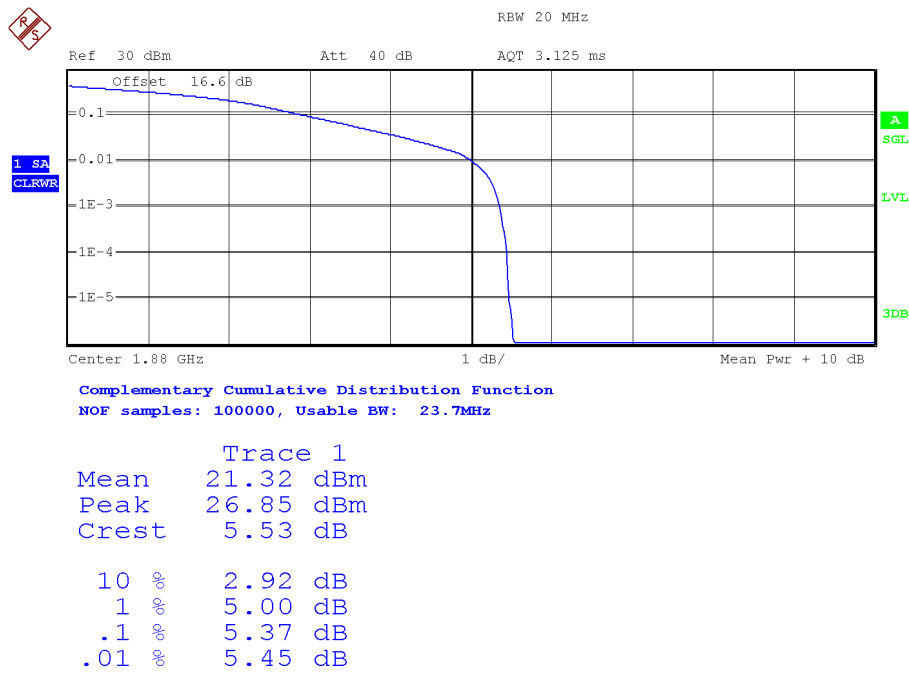


LTE Band 2. Bandwidth = 20 MHz. Modulation 16 QAM. RB Size: 1. RB Offset: 99.

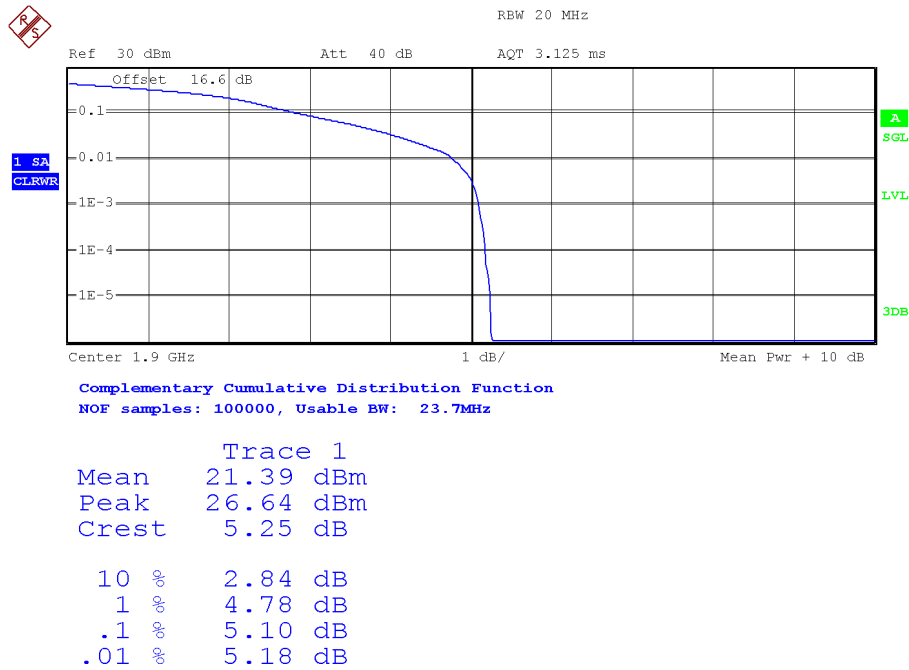
Low Channel:



Middle Channel:



High Channel:



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" in 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.

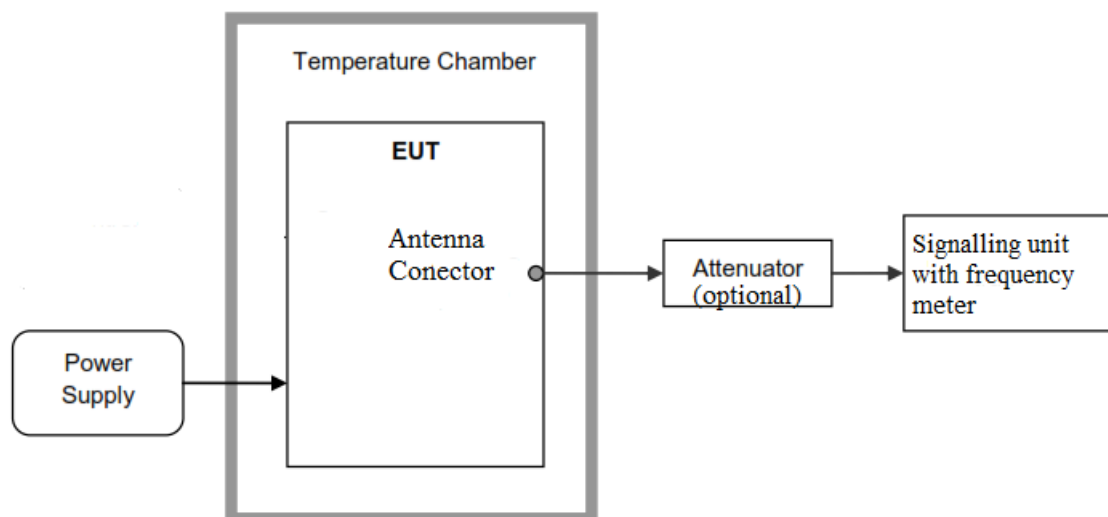
The worst case LTE mode for conducted power was used for the test.

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 High Channel 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.

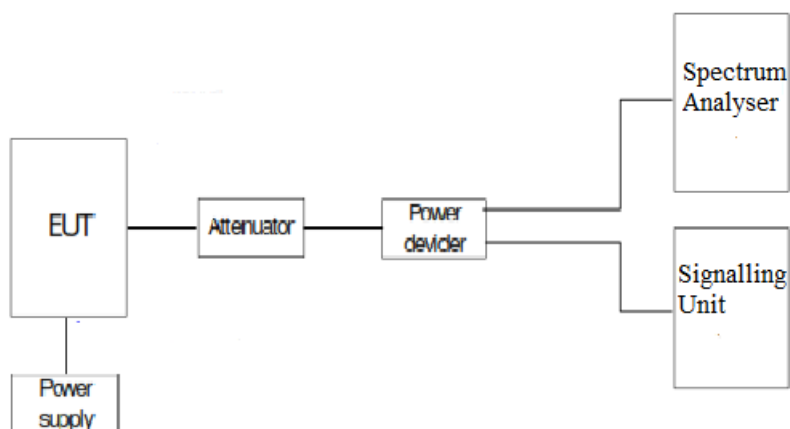
The reference point measurements were made at the RF output terminals of the EUT using an attenuator. Power splitter and spectrum analyser. The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP:

1. Frequency Tolerance:



2. Reference Frequency Points f_L and f_H :



RESULTS:

1. Frequency Tolerance:

- Frequency Stability over Temperature Variations:**

LTE Band 2. QPSK MODULATION. BW = 10 MHz.

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+50	-4.25	-0.002260638
+40	-2.31	-0.001228723
+30	-4.15	-0.002207447
+20	-5.69	-0.003026596
+10	-3.33	-0.001771277
0	-2.57	-0.001367021
-10	-1.73	-0.000920213
-20	-2.26	-0.001202128
-30	-4.01	-0.002132979

- Frequency Stability over Voltage Variations.**

LTE Band 2. QPSK MODULATION. BW = 10 MHz.

Battery Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4.37	-4.78	-0.002542553
Vmin	3.23	-4.49	-0.002388298

2. Reference Frequency Points f_L and f_H :

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

LTE Band 2:

	QPSK MODULATION BW = 10 MHz
f_L (MHz)	1850.1395
f_H (MHz)	1909.8606

Measurement uncertainty (kHz)	<±11.17
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The reference frequency points f_L and f_H stay within the authorized blocks for all the bands above.

Verdict: PASS

Modulation Characteristics

SPECIFICATION:

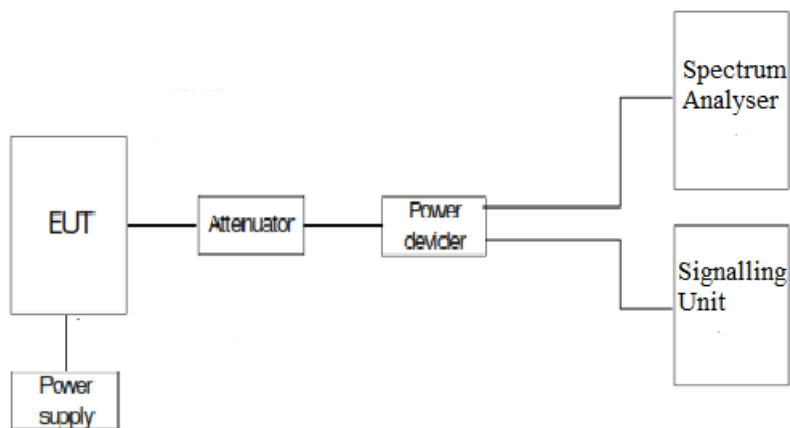
FCC §2.1047.

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).

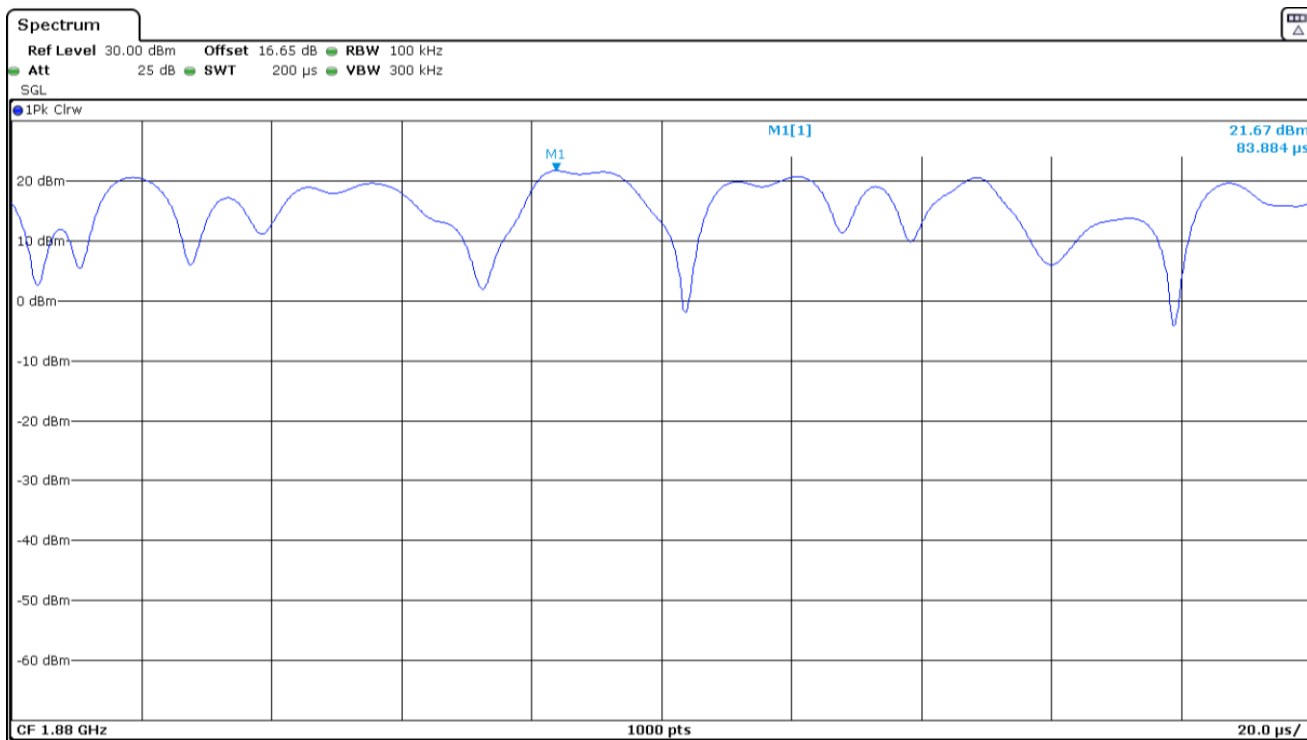
TEST SETUP:



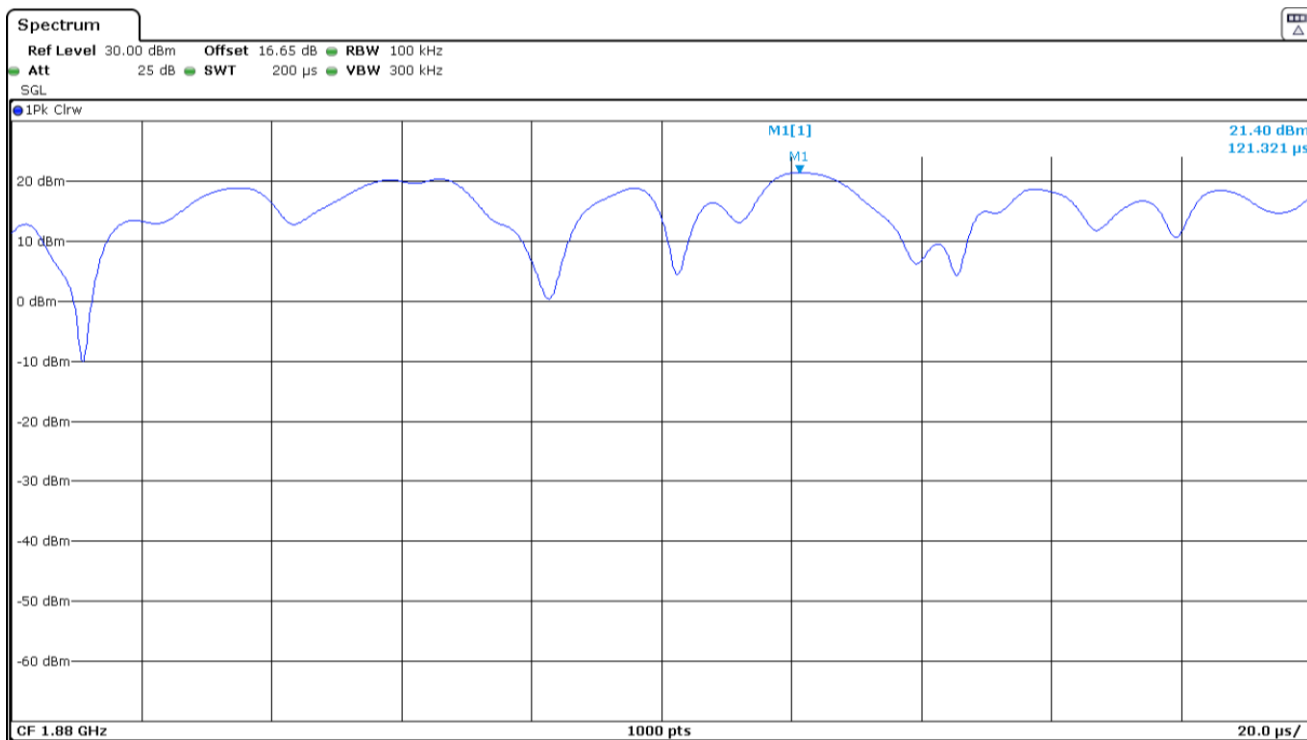
RESULTS:

The following plots show the modulation schemes in the EUT.

LTE Band 2 QPSK MODULATION. BW = 10 MHz.



LTE Band 2. 16QAM MODULATION. BW = 10 MHz.



Occupied Bandwidth

SPECIFICATION:

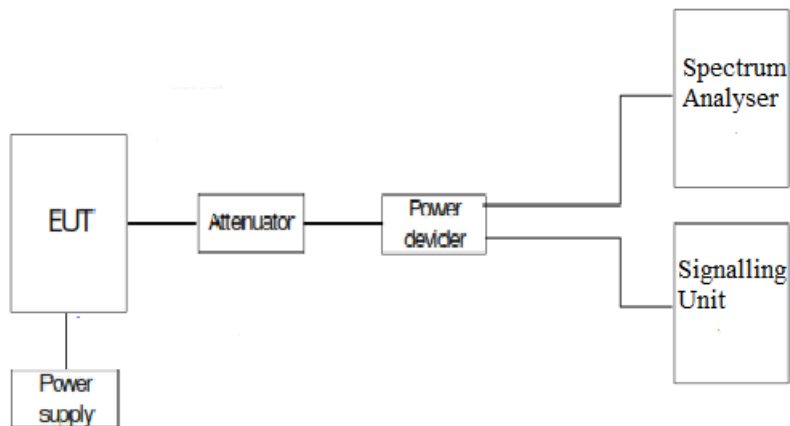
FCC §2.1049. Measurements required: Occupied bandwidth.

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:

LTE Bands: The worst case of Occupied Bandwidth corresponds to all Resource Blocks (RB) with Offset 0, regardless the nominal bandwidth selected.

LTE Band 2:

LTE Band 2. QPSK MODULATION. BW = 1.4 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	1.089	1.097	1.100
-26 dBc Bandwidth (MHz)	1.300	1.302	1.338
Measurement uncertainty (kHz)	<±5.25		

LTE Band 2. 16QAM MODULATION. BW = 1.4 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	1.094	1.107	1.094
-26 dBc Bandwidth (MHz)	1.305	1.323	1.304
Measurement uncertainty (kHz)	<±5.25		

LTE Band 2. QPSK MODULATION. BW = 3 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	2.738	2.744	2.744
-26 dBc Bandwidth (MHz)	3.065	3.083	3.082
Measurement uncertainty (kHz)	<±15.03		

LTE Band 2. 16QAM MODULATION. BW = 3 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	2.730	2.742	2.726
-26 dBc Bandwidth (MHz)	3.073	3.063	3.072
Measurement uncertainty (kHz)	<±15.03		

LTE Band 2. QPSK MODULATION. BW = 5 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4.537	4.513	4.497
-26 dBc Bandwidth (MHz)	5.082	5.016	5.015
Measurement uncertainty (kHz)	<±17.34		

LTE Band 2. 16QAM MODULATION. BW = 5 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4.513	4.506	4.493
-26 dBc Bandwidth (MHz)	5.071	5.020	4.992
Measurement uncertainty (kHz)	<±17.34		

LTE Band 2. QPSK MODULATION. BW = 10 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	9.033	9.027	9.033
-26 dBc Bandwidth (MHz)	10.182	10.205	10.065
Measurement uncertainty (kHz)	<±46.21		

LTE Band 2. 16QAM MODULATION. BW = 10 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4,547	4,533	4,527
-26 dBc Bandwidth (MHz)	5,351	5,232	5,303
Measurement uncertainty (kHz)	<±46.21		

LTE Band 2. QPSK MODULATION. BW = 15 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	13.460	13.430	13.410
-26 dBc Bandwidth (MHz)	14.901	14.680	14.680
Measurement uncertainty (kHz)	<±51.99		

LTE Band 2. 16QAM MODULATION. BW = 15 MHz.

Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4,530	4,530	4,530
-26 dBc Bandwidth (MHz)	5,304	5,287	5,357
Measurement uncertainty (kHz)	<±51.99		

LTE Band 2. QPSK MODULATION. BW = 20 MHz.

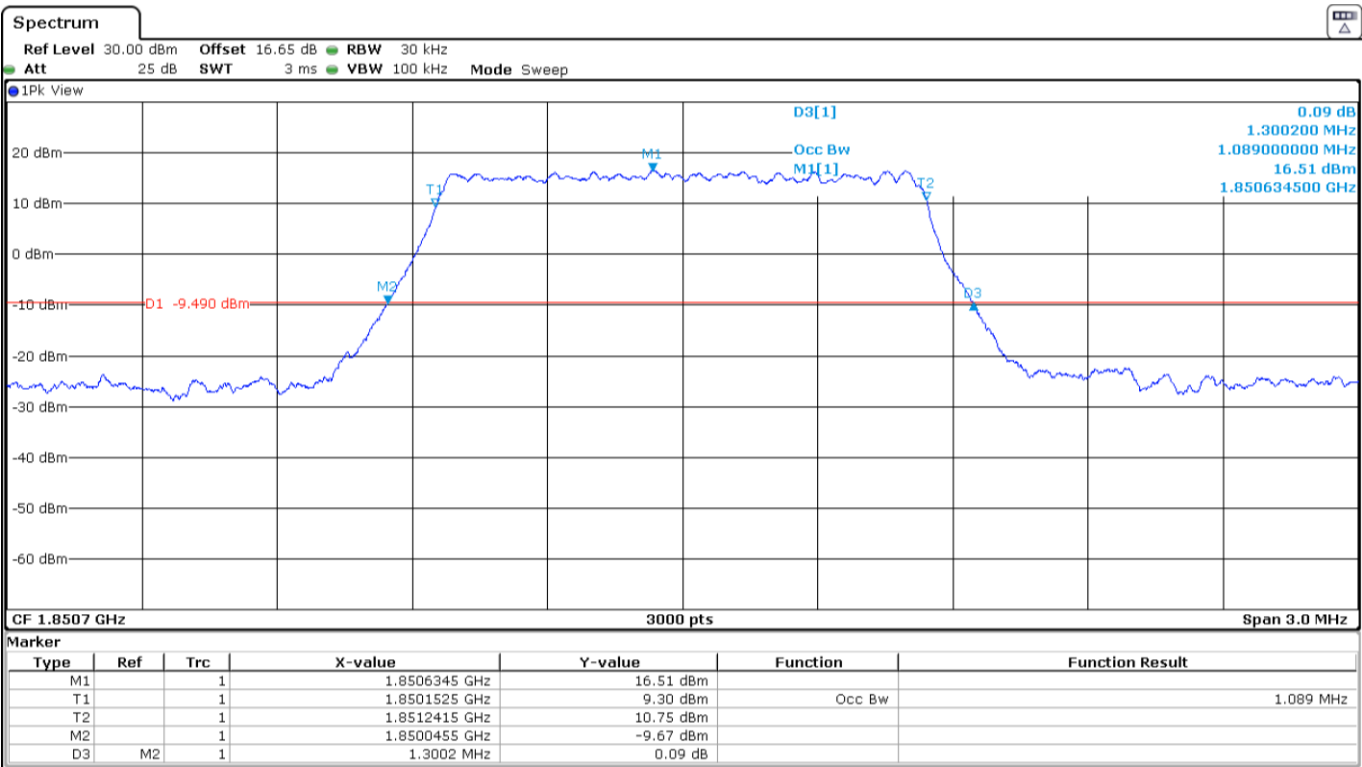
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	17.880	17.893	17.853
-26 dBc Bandwidth (MHz)	19.277	19.472	19.251
Measurement uncertainty (kHz)	<±57.76		

LTE Band 2. 16QAM MODULATION. BW = 20 MHz.

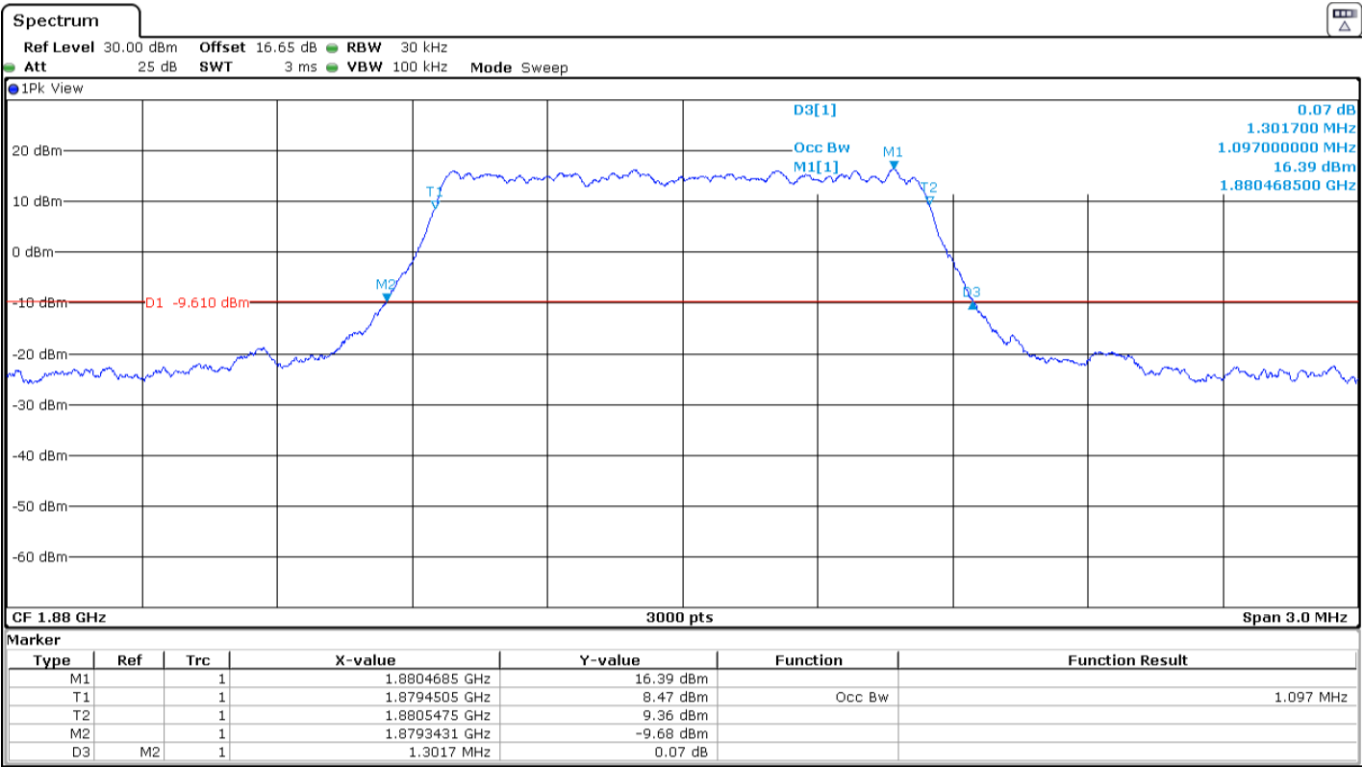
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4,573	4,573	4,547
-26 dBc Bandwidth (MHz)	5,486	5,486	5,486
Measurement uncertainty (kHz)	<±57.76		

LTE Band 2. QPSK MODULATION. BW = 1.4 MHz.

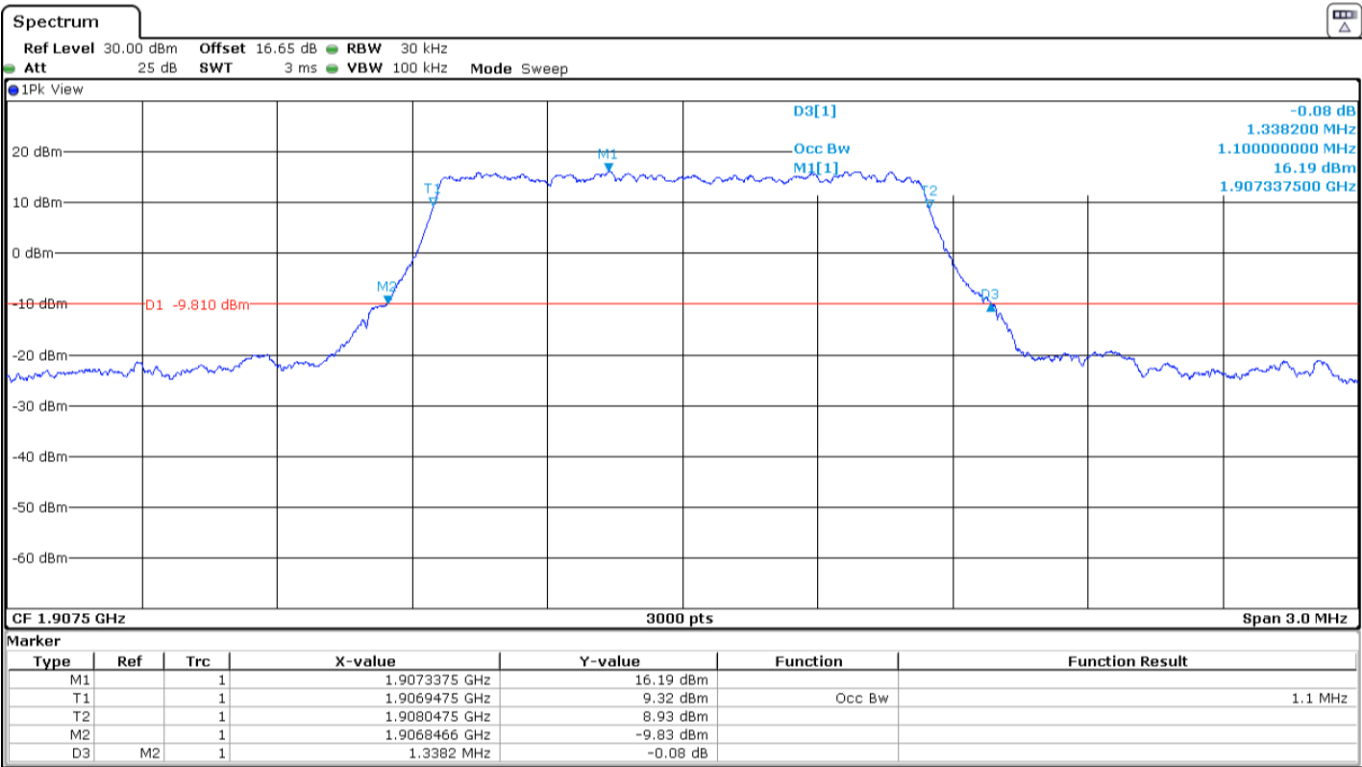
Low Channel:



Middle Channel:

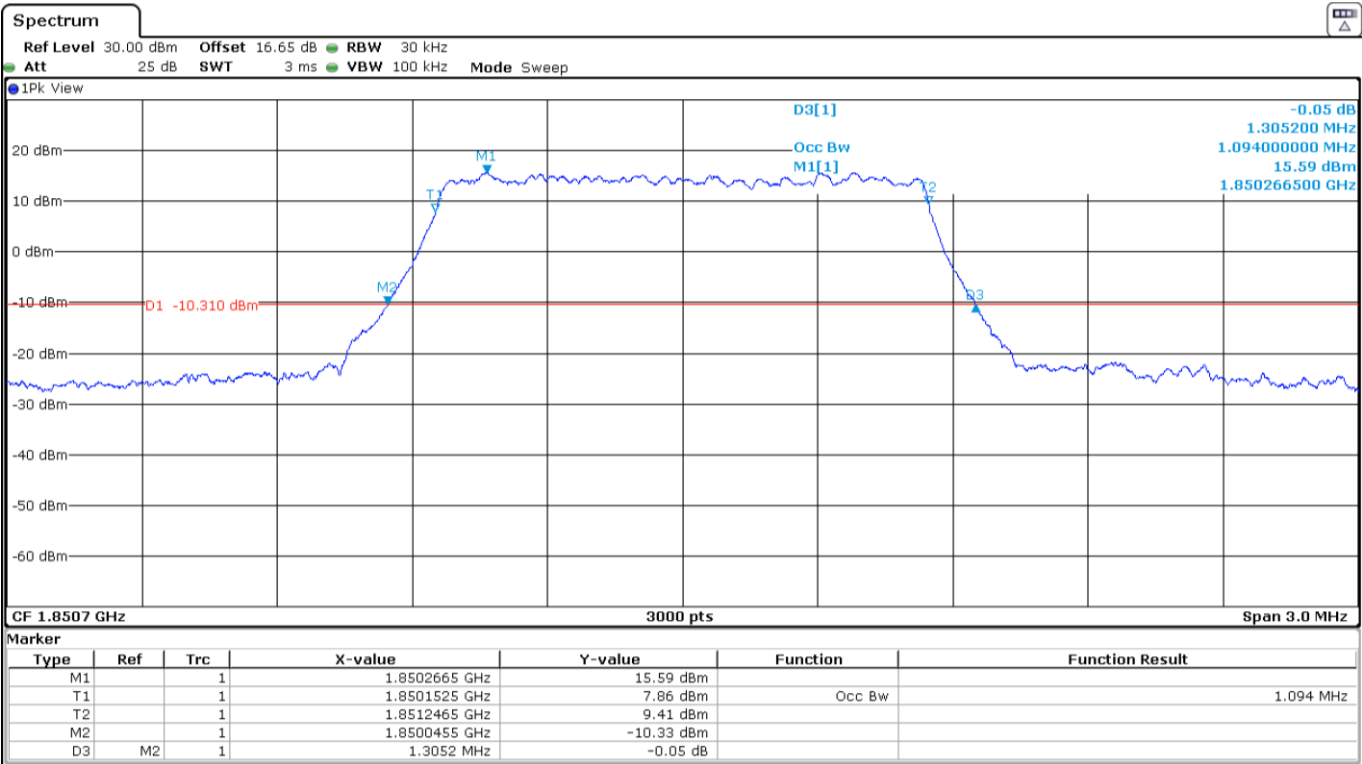


High Channel:

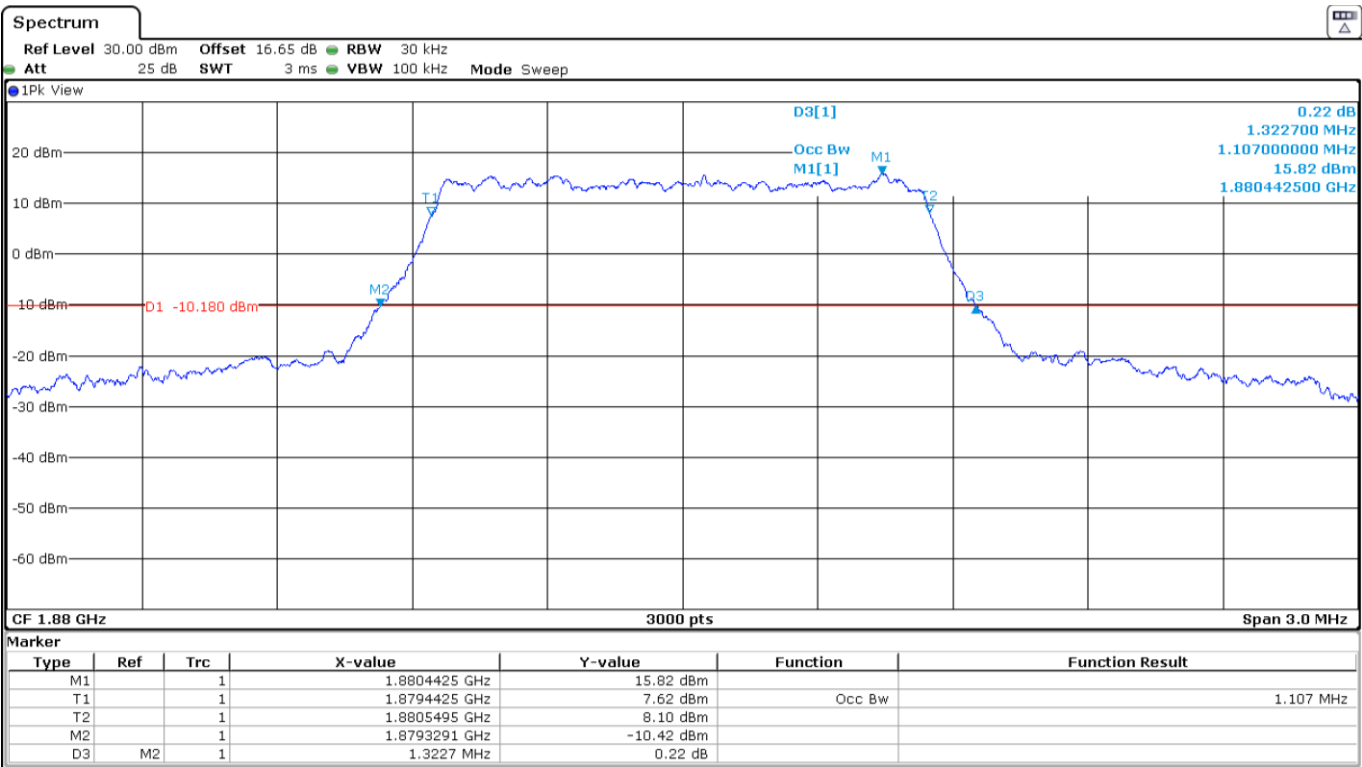


LTE Band 2. 16QAM MODULATION. BW = 1.4 MHz.

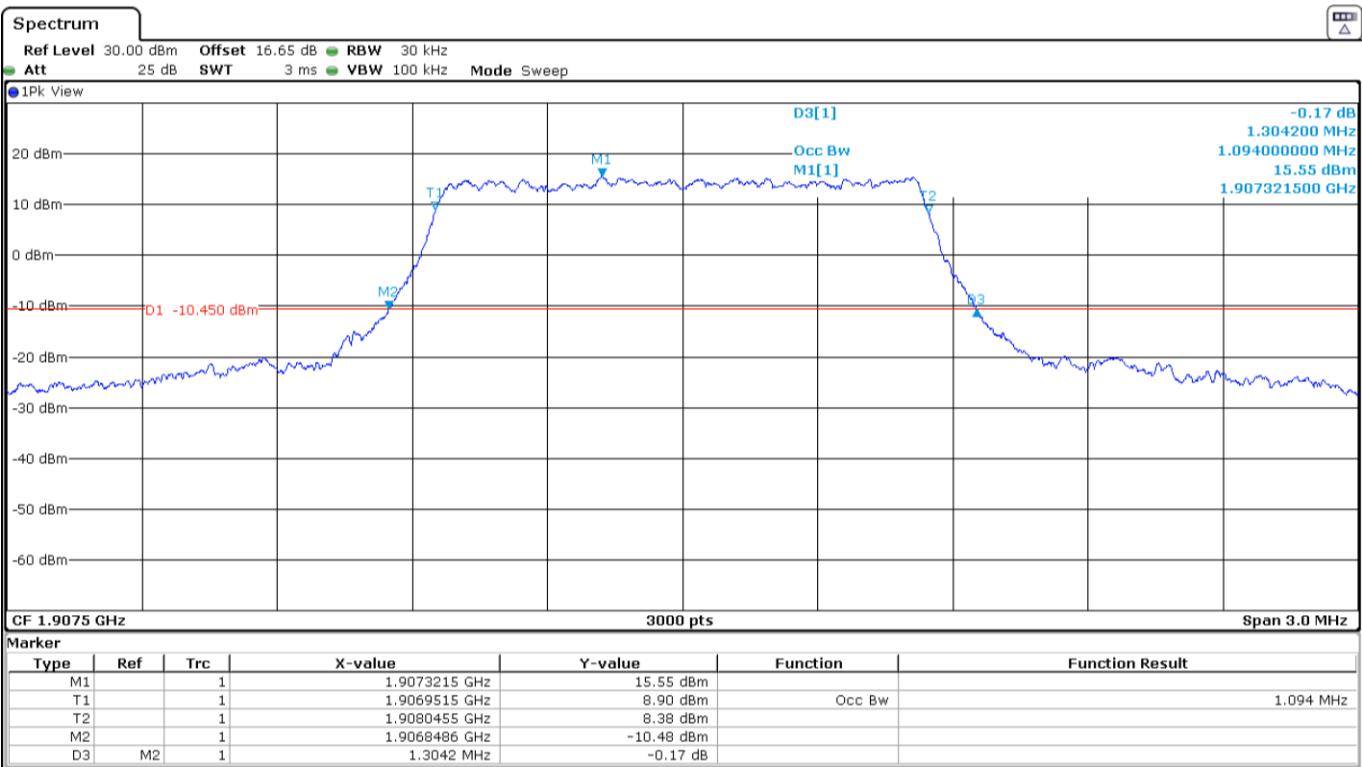
Low Channel:



Middle Channel:

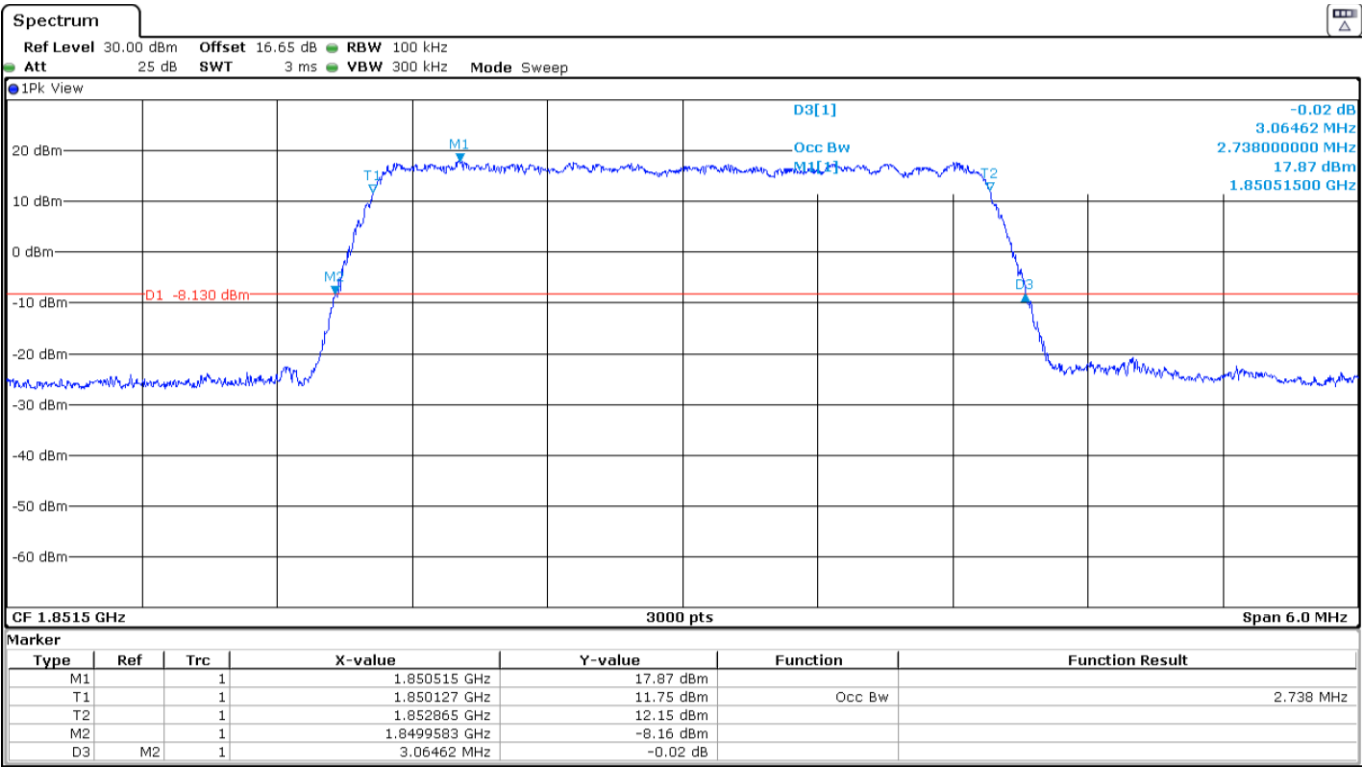


High Channel:

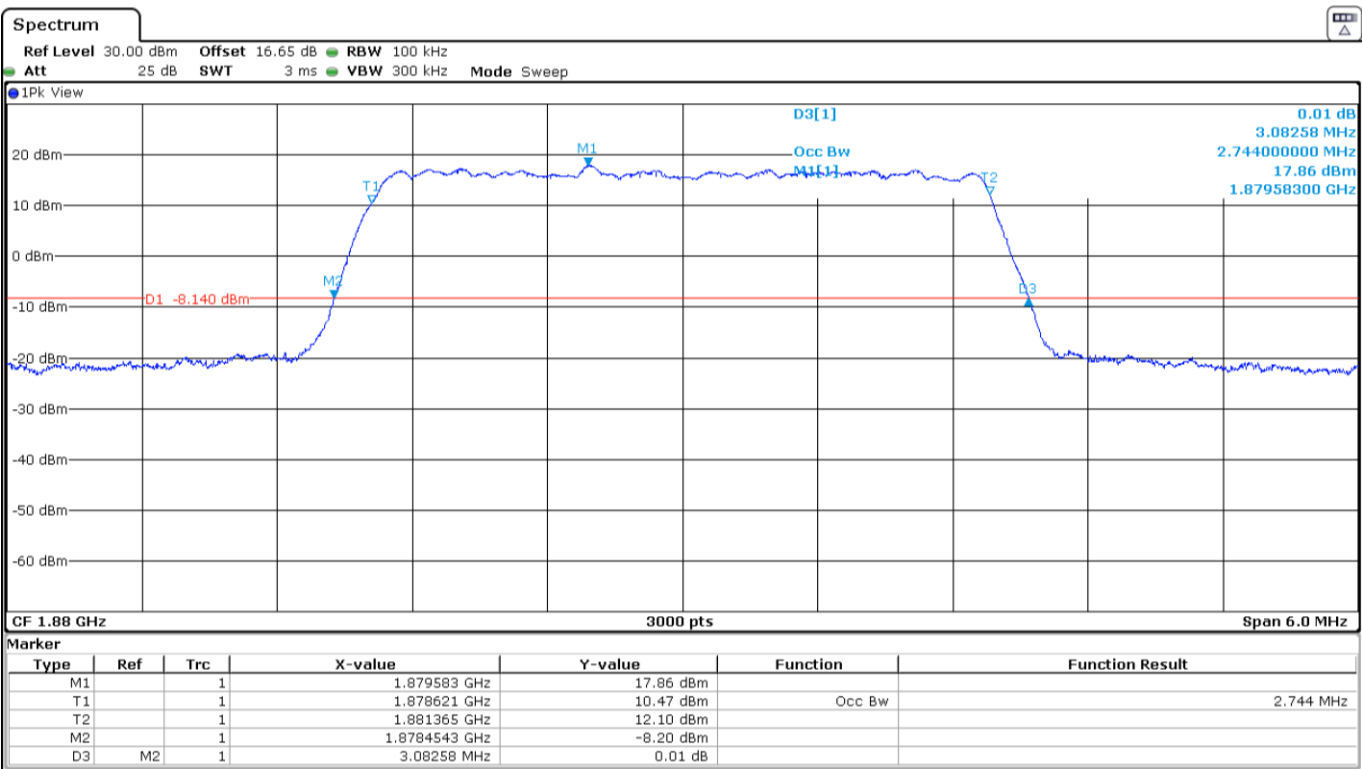


LTE Band 2. QPSK MODULATION. BW = 3 MHz.

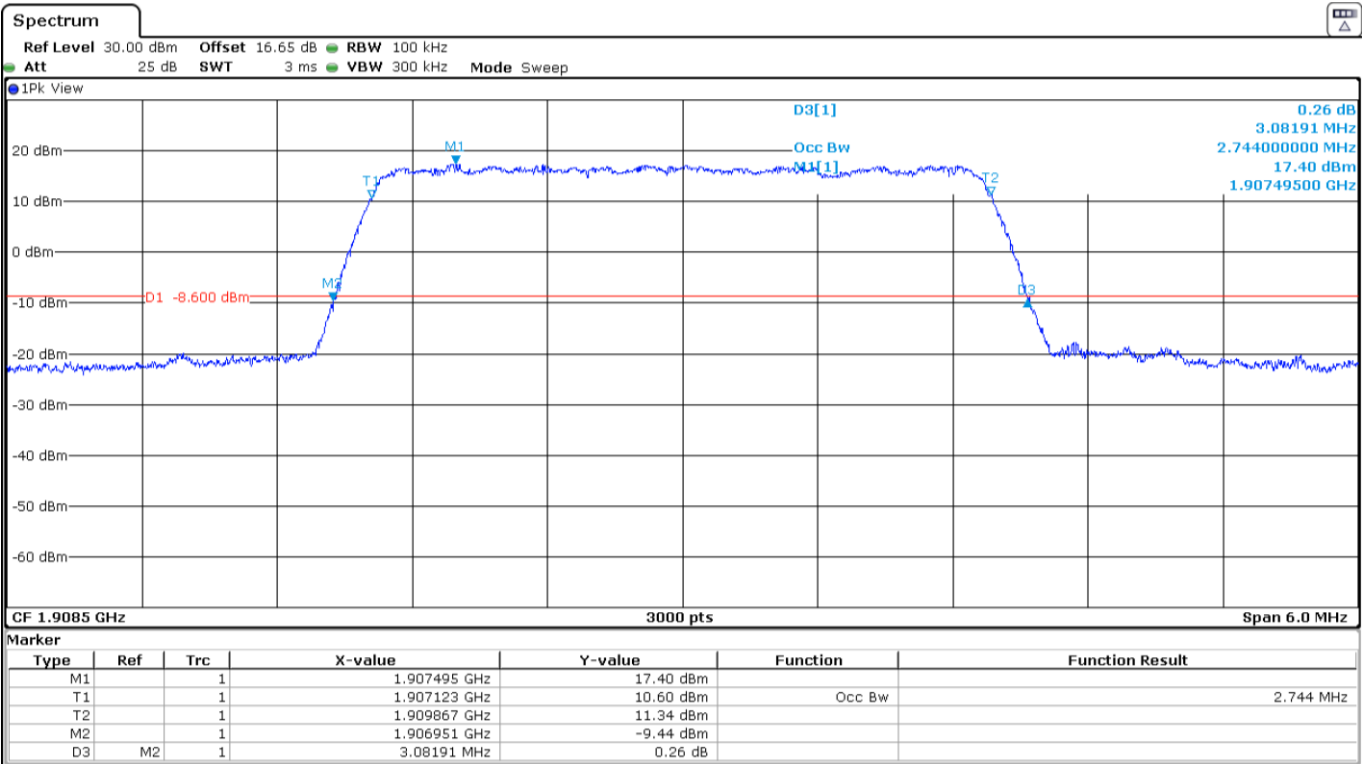
Low Channel:



Middle Channel:

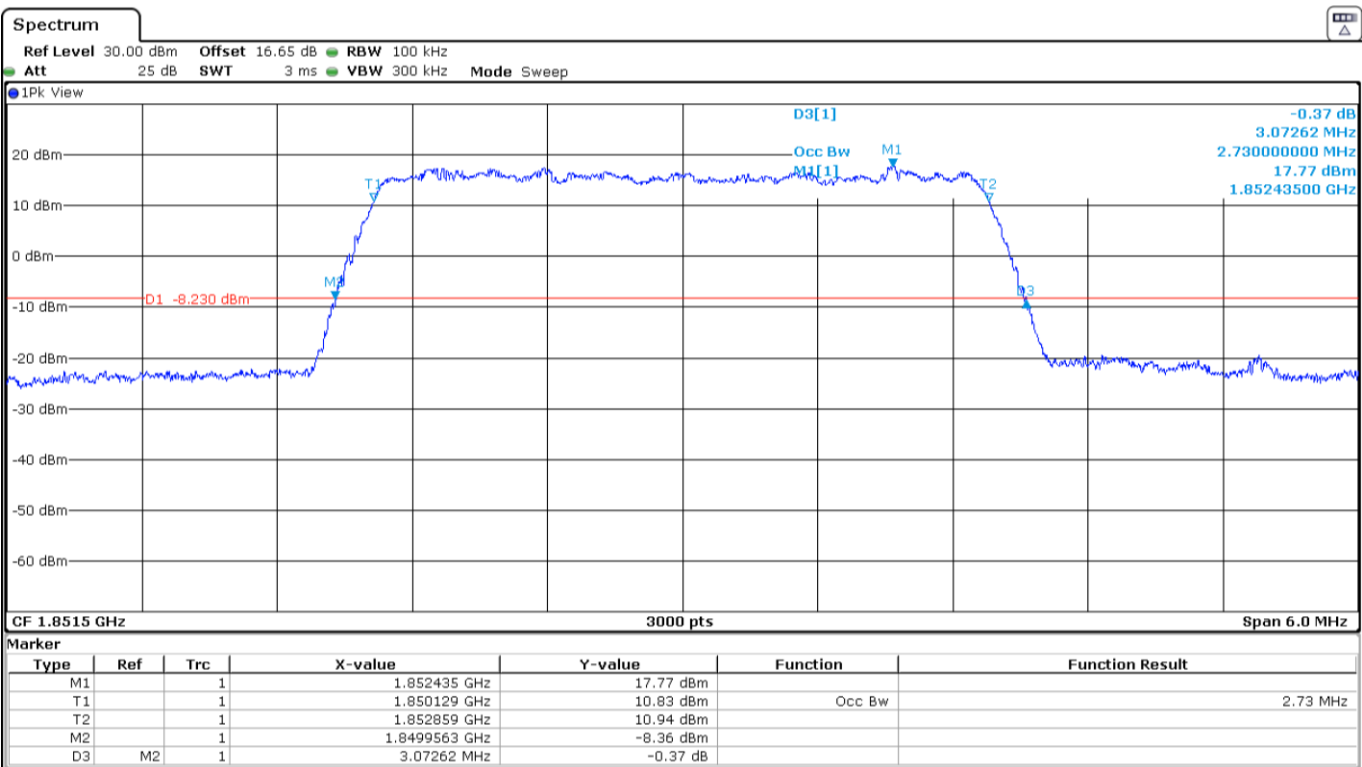


High Channel:

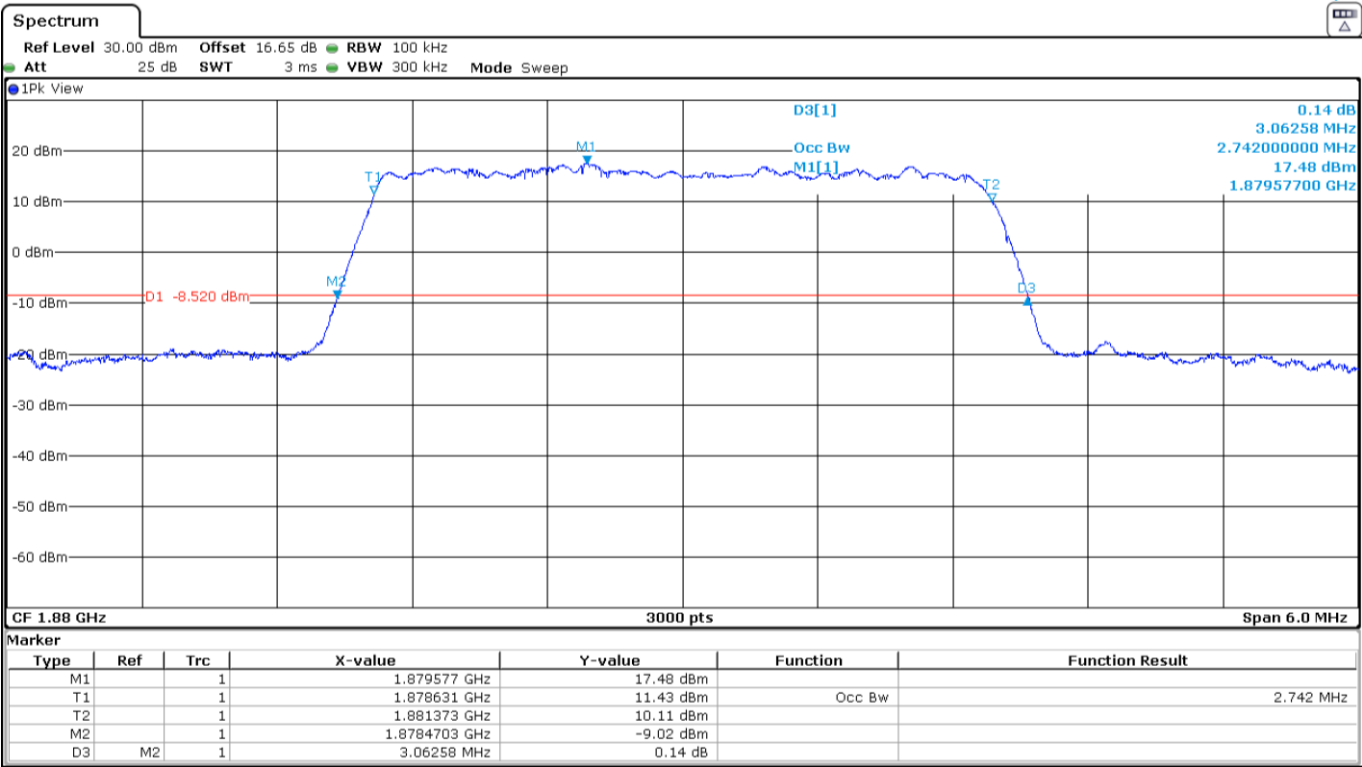


LTE Band 2. 16QAM MODULATION. BW = 3 MHz.

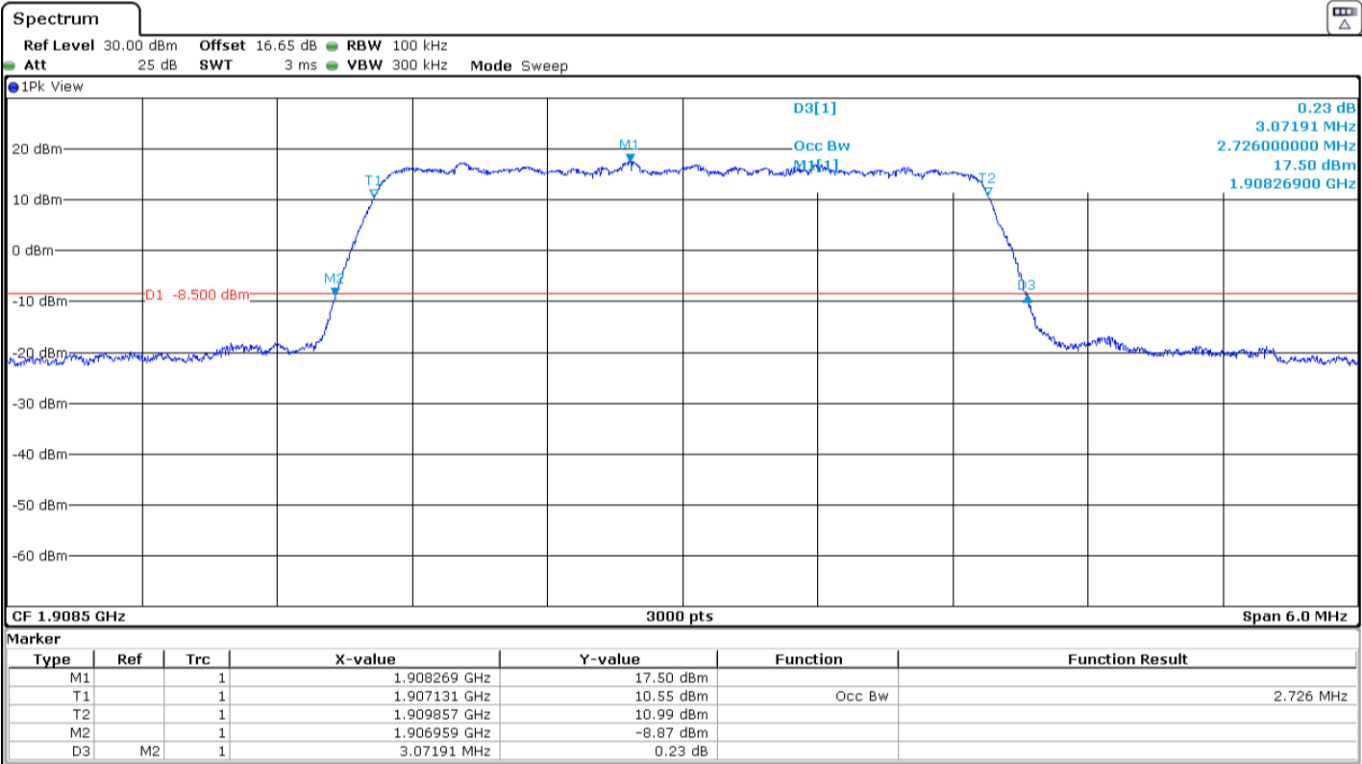
Low Channel:



Middle Channel:

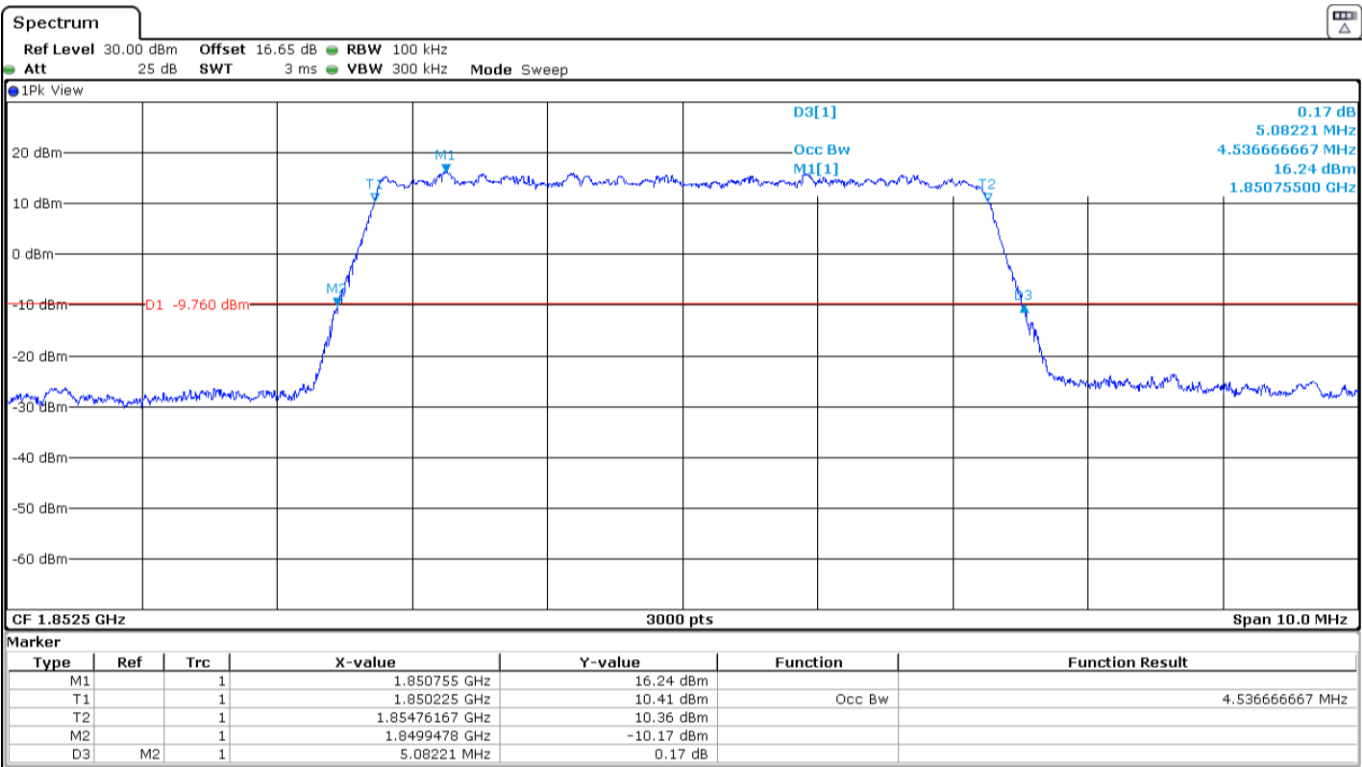


High Channel:

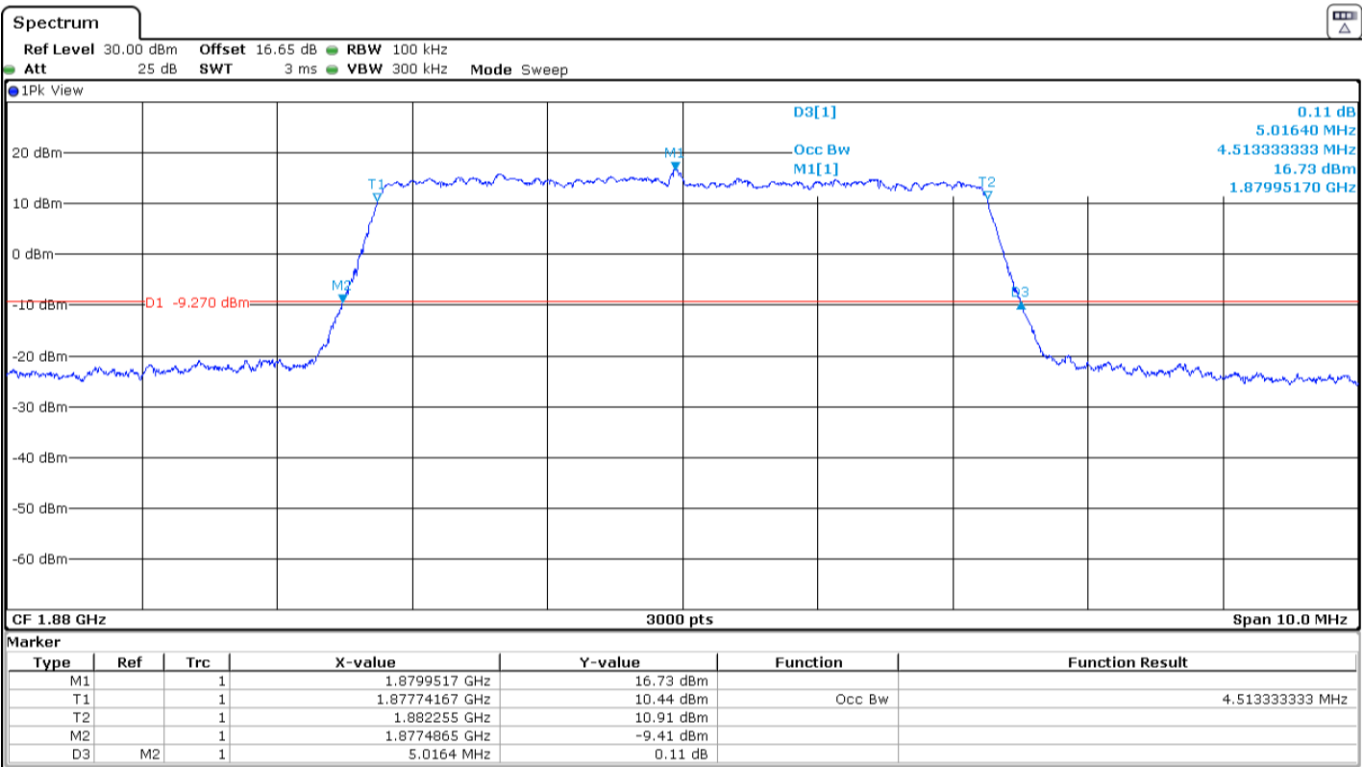


LTE Band 2. QPSK MODULATION. BW = 5 MHz.

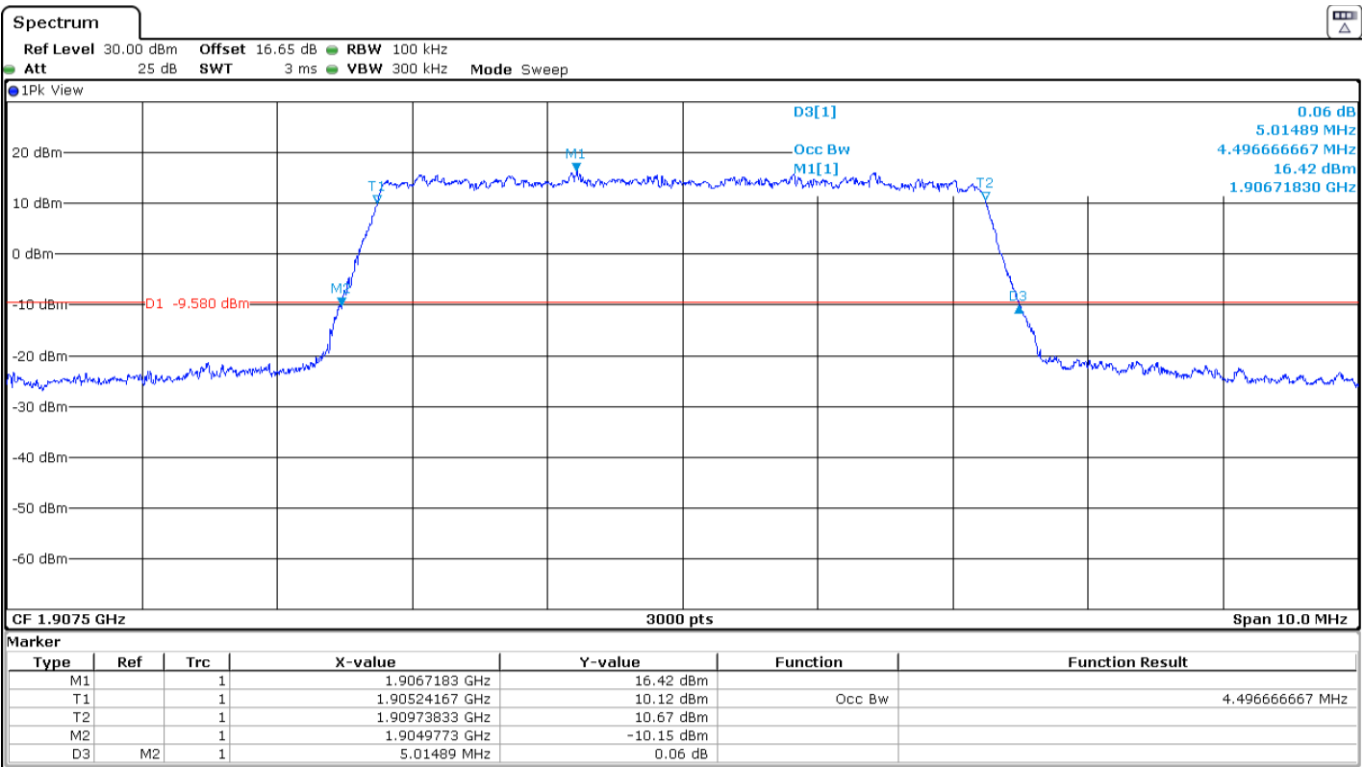
Low Channel:



Middle Channel:

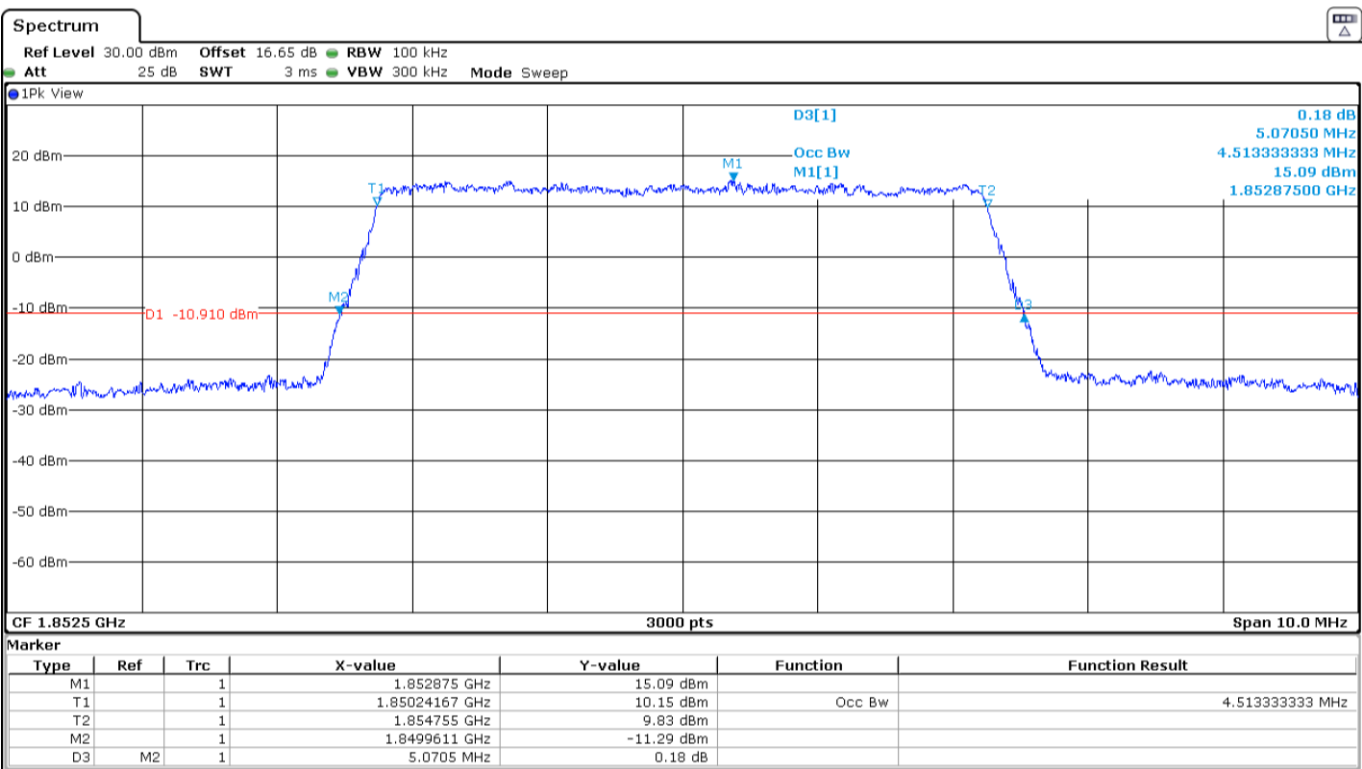


High Channel:

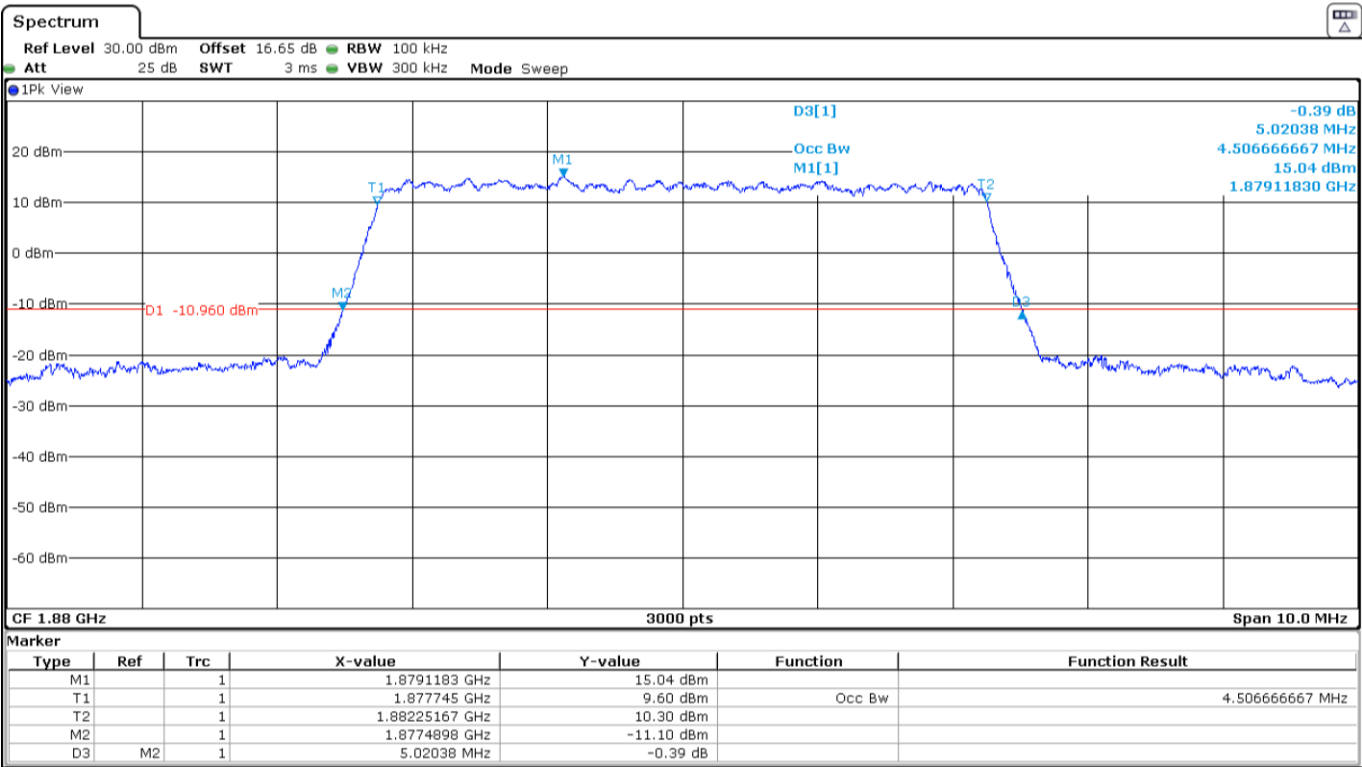


LTE Band 2. 16QAM MODULATION. BW = 5 MHz.

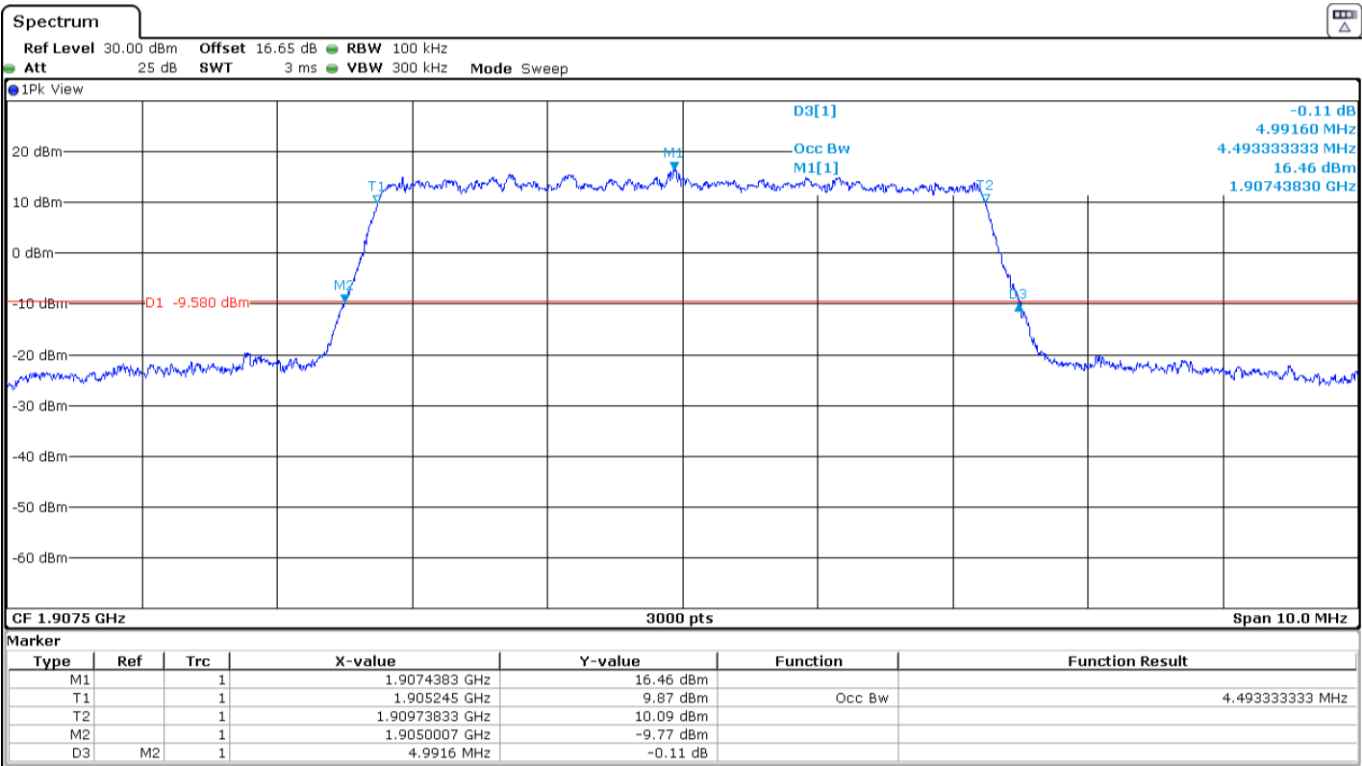
Low Channel:



Middle Channel:

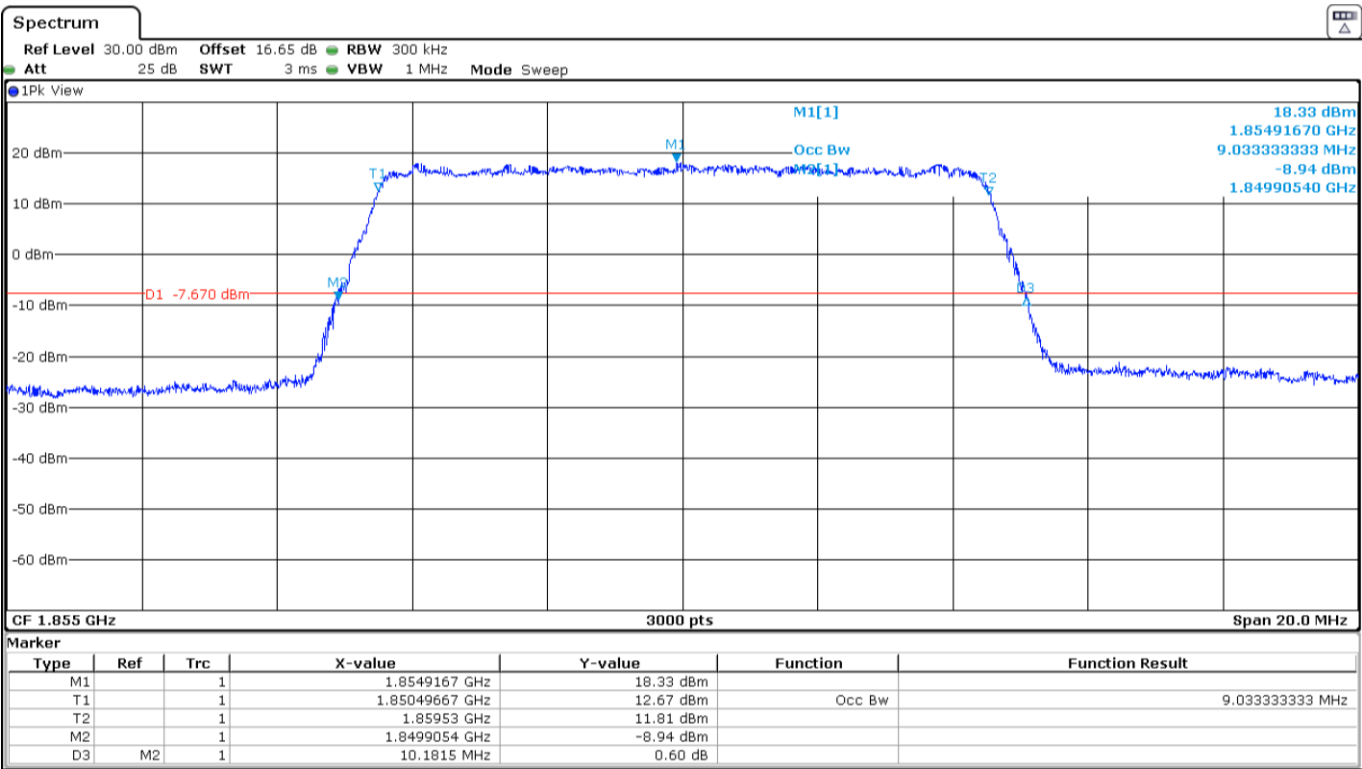


High Channel:

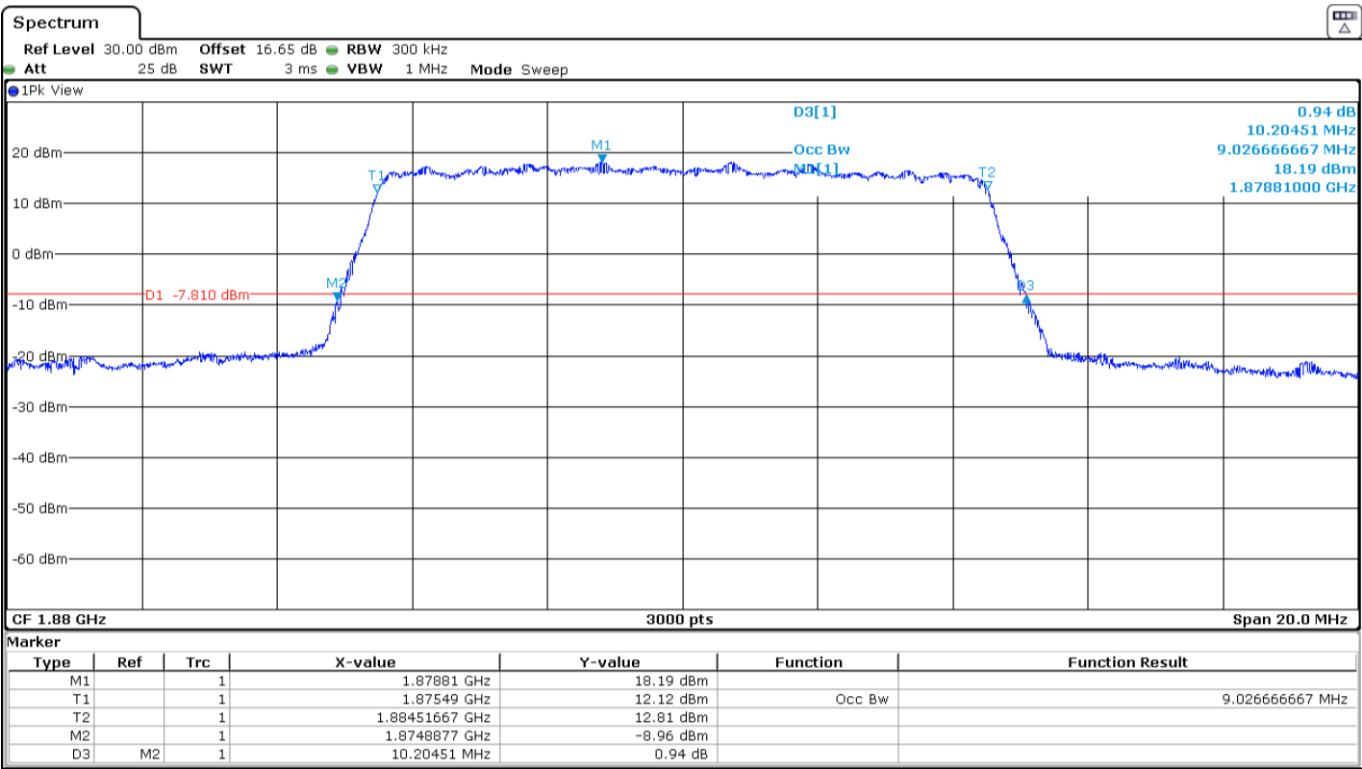


LTE Band 2. QPSK MODULATION. BW = 10 MHz.

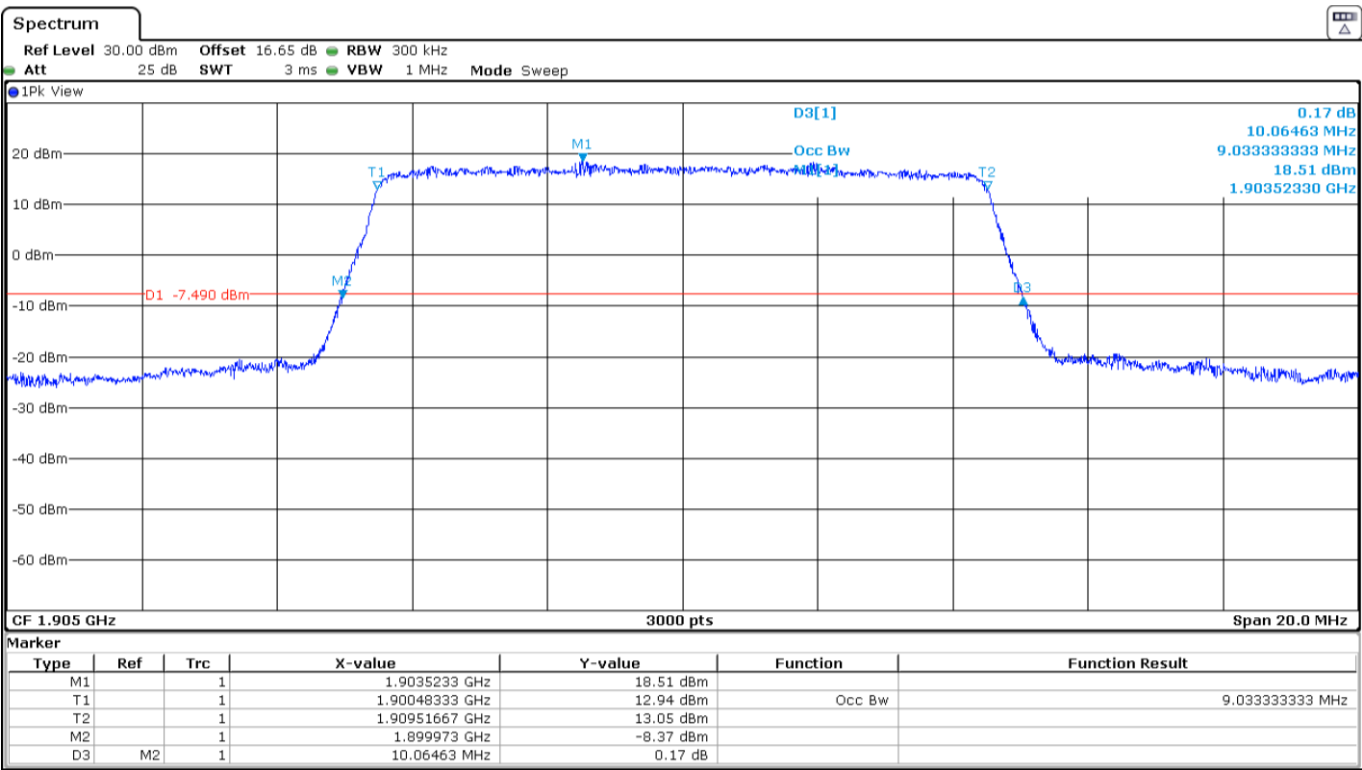
Low Channel:



Middle Channel:

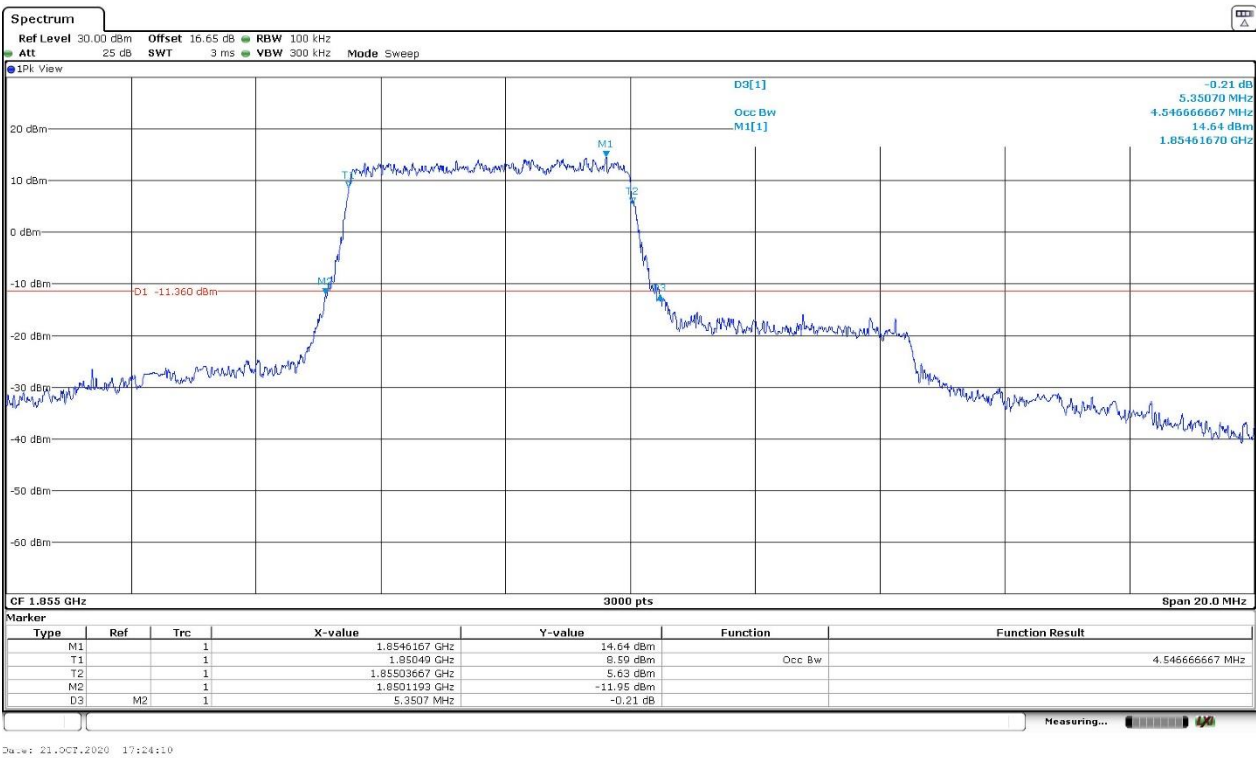


High Channel:

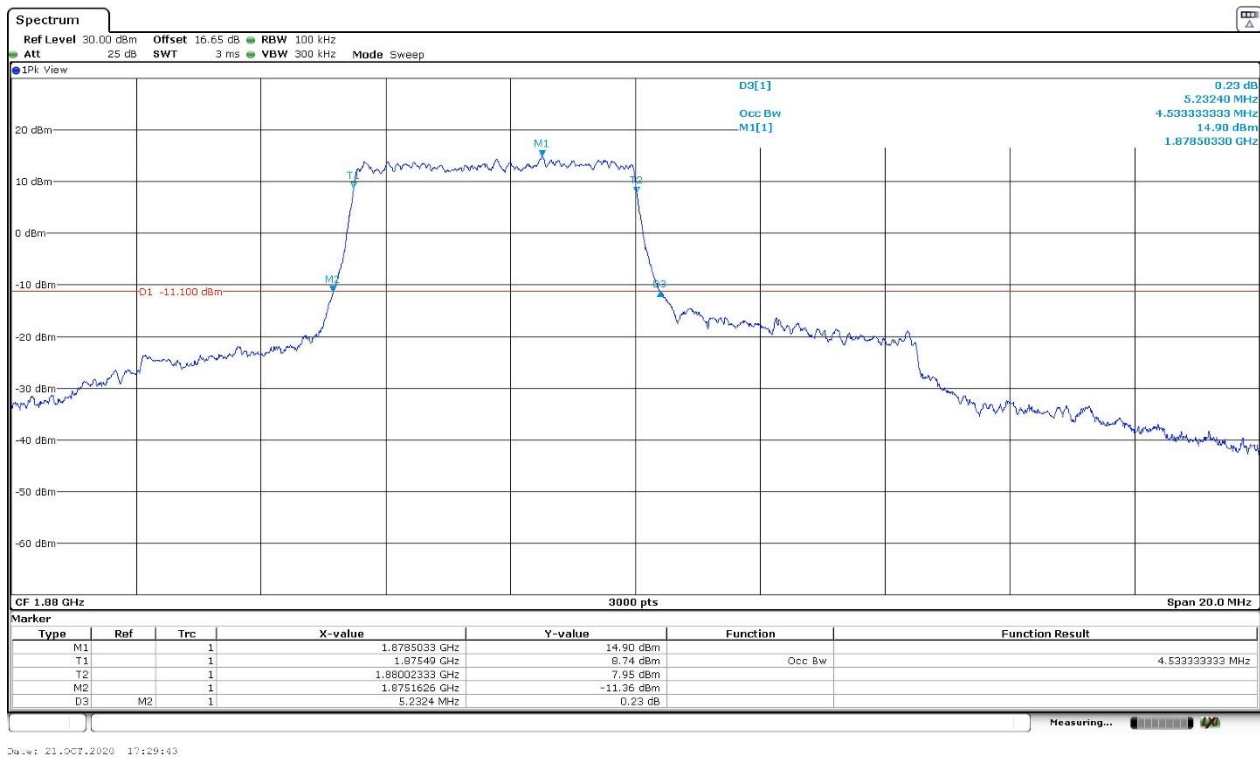


LTE Band 2. 16QAM MODULATION. BW = 10 MHz.

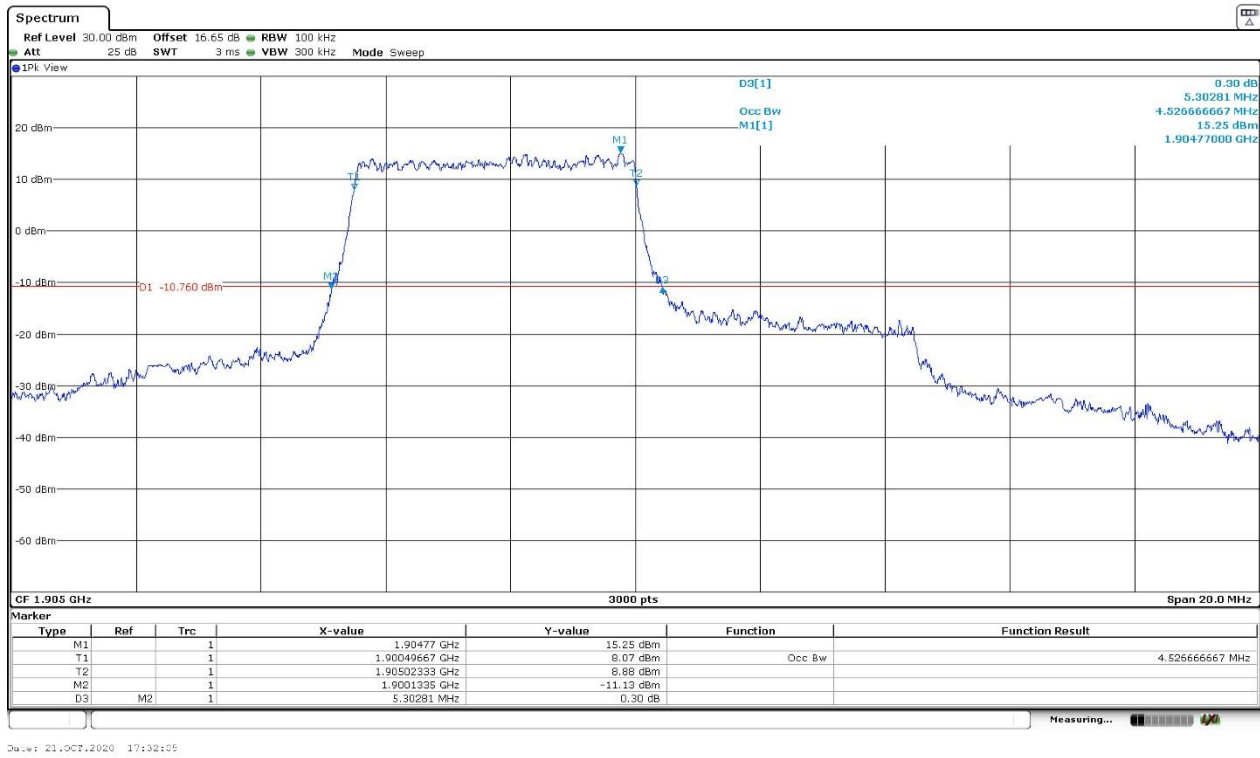
Low Channel:



Middle Channel:

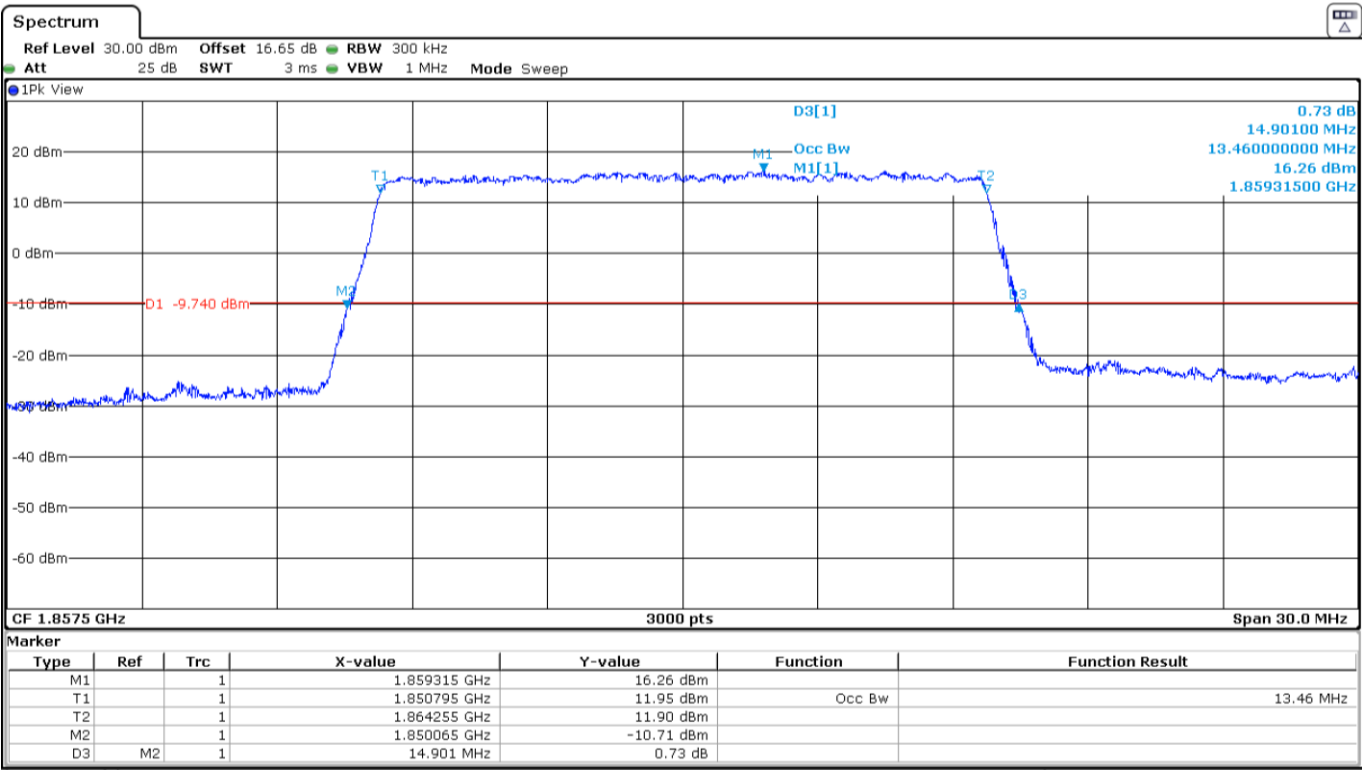


High Channel:

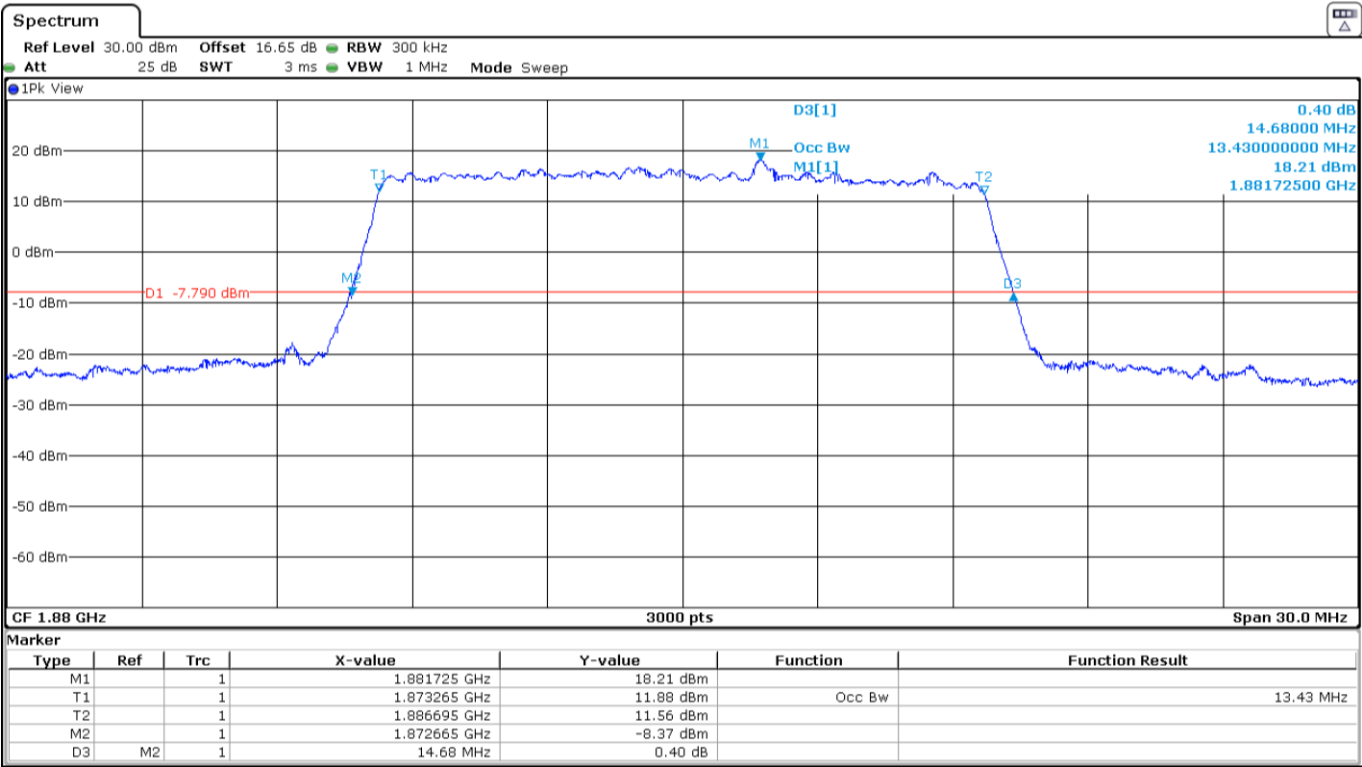


LTE Band 2. QPSK MODULATION. BW = 15 MHz.

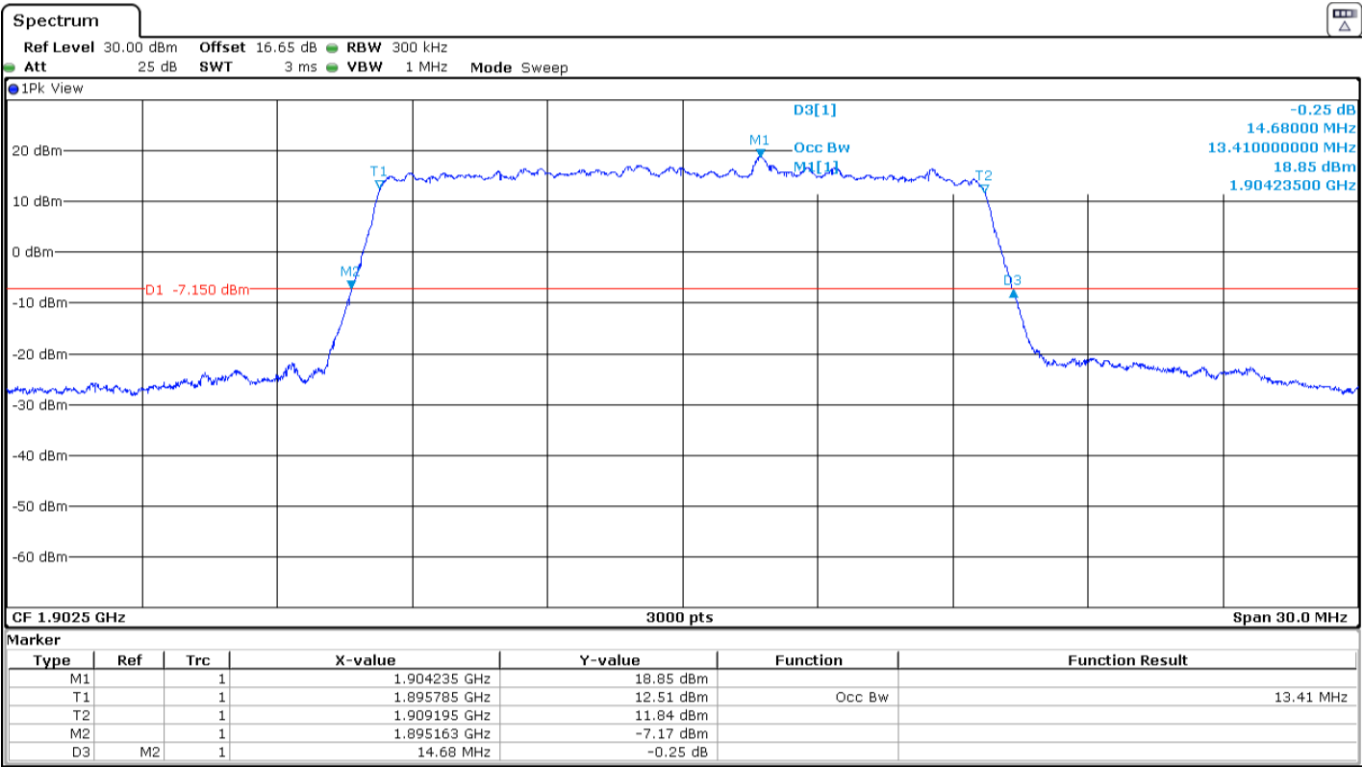
Low Channel:



Middle Channel:

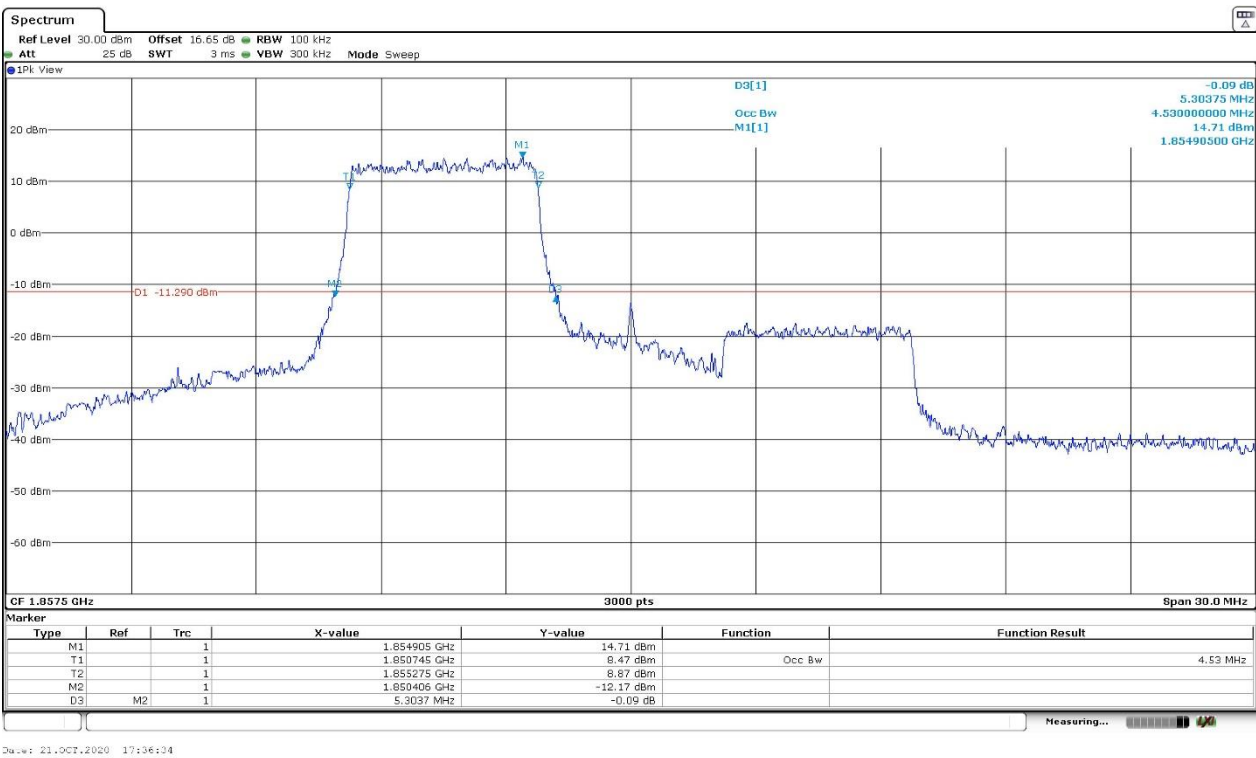


High Channel:

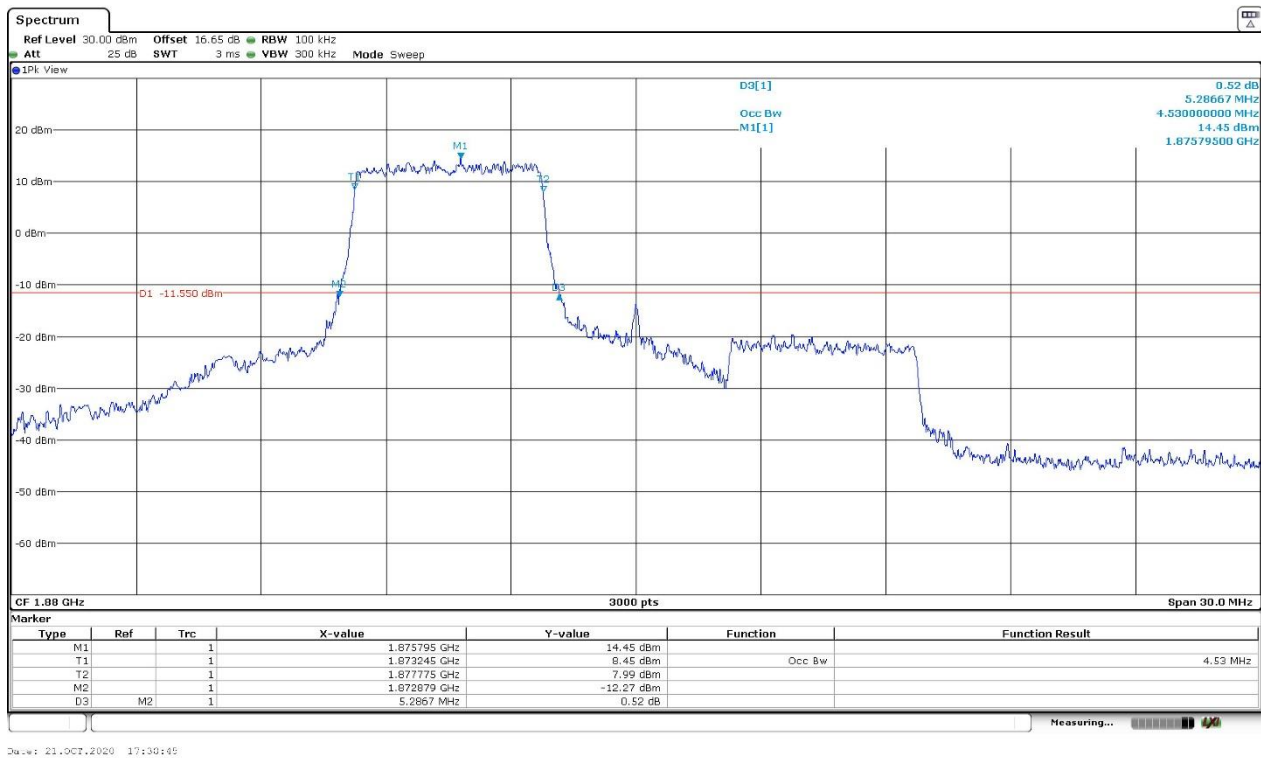


LTE Band 2. 16QAM MODULATION. BW = 15 MHz.

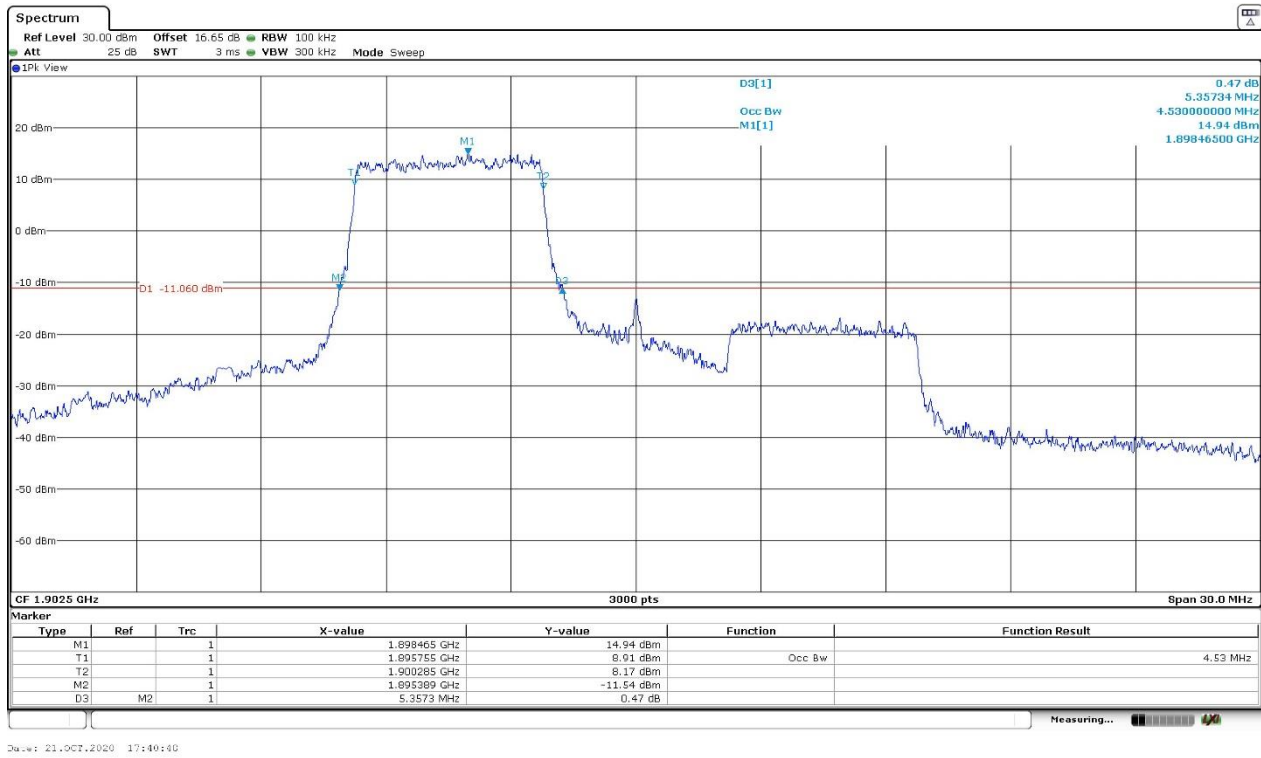
Low Channel:



Middle Channel:

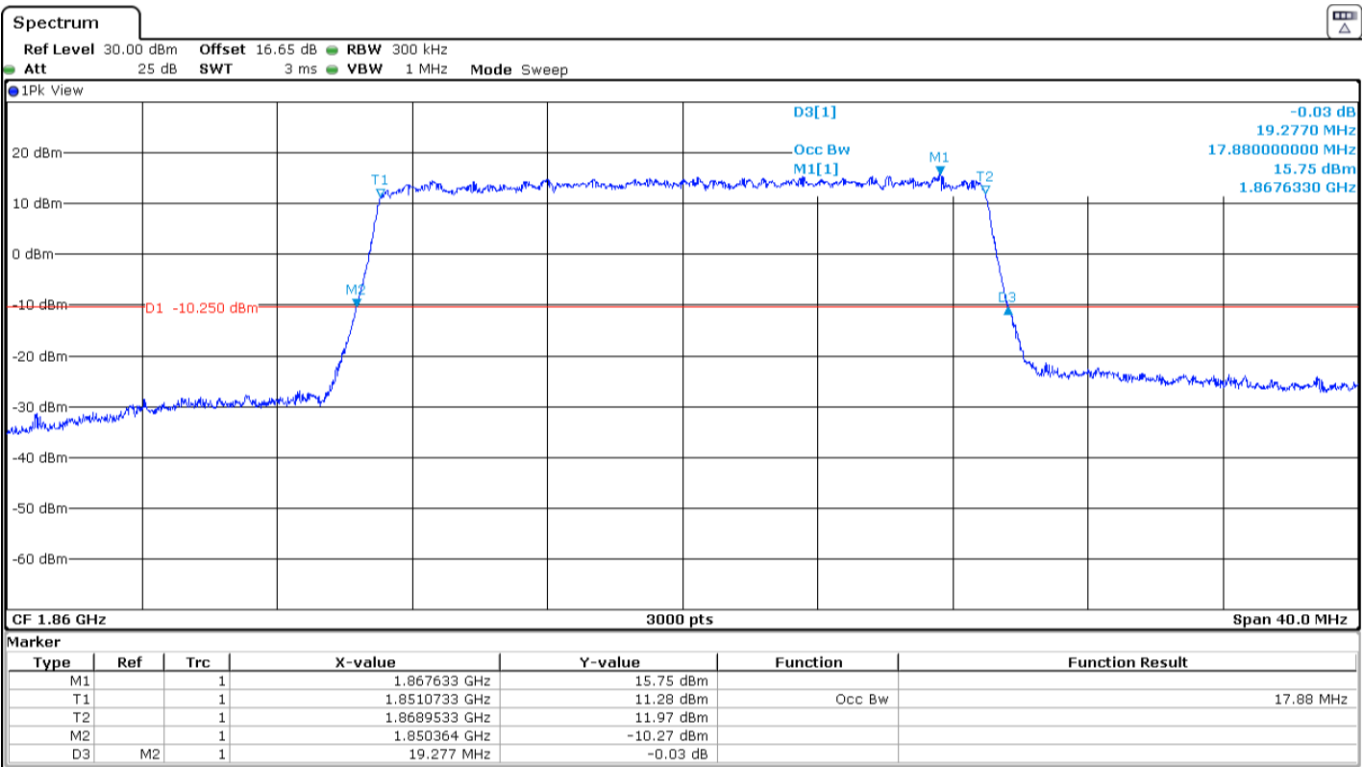


High Channel:



LTE Band 2. QPSK MODULATION. BW = 20 MHz.

Low Channel:



Middle Channel:

