

Appendix A: Test results for FCC 22 / RSS-132

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TEST CONDITIONS

(*): Declared by the Applicant.

POWER SUPPLY (*):

Vnominal: 3.2 Vdc
Vminimum: 3.3 Vdc
Vmaximum: 4.6 Vdc

Type of Power Supply: DC External.

ANTENNA (*):

LOW Bands	GAIN	ANTENNA TYPE
LTE Cat-4 Band 5	-1.1 dBi	External (reference 2JW1183-C952B)
LTE Cat-4 Band 26	-1.1 dBi	External (reference 2JW1183-C952B)

TEST FREQUENCIES:

LTE Cat-4 Band 5. QPSK and 16QAM:

	Channel (Frequency MHz)			
	BW=1.4 MHz	BW=3 MHz	BW=5 MHz	BW=10 MHz
Low	20407 (824.70)	20415 (825.50)	20425 (826.50)	20450 (829.00)
Middle	20525 (836.50)	20525 (836.50)	20525 (836.50)	20525 (836.50)
High	20643 (848.30)	20635 (847.50)	20625 (846.50)	20600 (844.00)

NOTE: The 824-849 MHz sub-band of the LTE Cat-4 Band 5 is completely included in the LTE Cat-4 Band 26, so the LTE Cat-4 Band 26 channels were tested to give conformity to the assigned block.

LTE Cat-4 Band 26 sub-band 824-849 MHz. QPSK and 16QAM:

	Channel (Frequency MHz)				
	BW=1.4 MHz	BW=3 MHz	BW=5 MHz	BW=10 MHz	BW=15 MHz
Low	26797 (824.70)	26805 (825.50)	26815 (826.50)	26840 (829.00)	26865 (831.50)
Middle	26915 (836.50)	26915 (836.50)	26915 (836.50)	26915 (836.50)	26915 (836.50)
High	27033 (848.30)	27025 (847.50)	27015 (846.50)	26990 (844.00)	26965 (841.50)

RF Output Power

Limits

* FCC §2.1046 and FCC §22.913. The Effective Radiated Power (E.R.P.) of mobile transmitter and auxiliary test transmitter must not exceed 7 Watts (38.45 dBm E.R.P.).

* RSS-132. Clause 5.4. The transmitter output power shall be measured in terms of average power. The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

The effective isotropic radiated power (e.i.r.p.) shall not exceed the limits specified in SRSP-503 for base station equipment.

In addition, the peak-to-average power ratio (PAPR) of the transmitter 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 R&S 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:

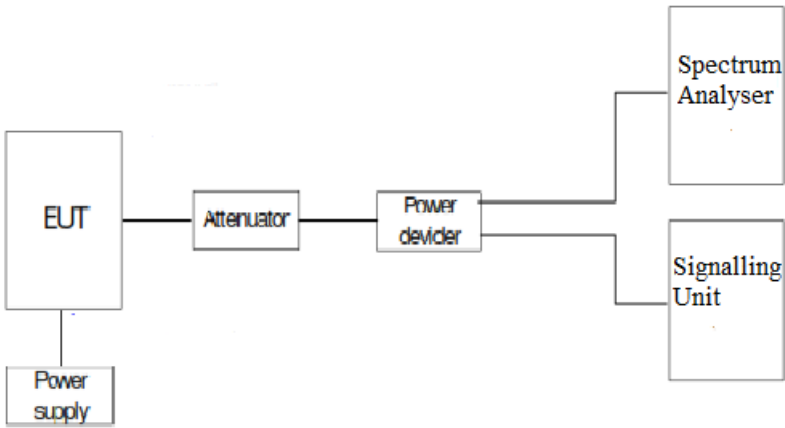
$$\text{E.R.P.} = \text{E.I.R.P.} - 2.15 \text{ dB}$$

Test Setup

1. CONDUCTED AVERAGE POWER:



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



Results

1. CONDUCTED AVERAGE POWER:

LTE Cat-4 Band 26:

Preliminary measurements determined the worst case of RF Power is BW=5 MHz, High Channel, QPSK, RB Size=1, RB Offset=24.

BANDWIDTH (MHz)	CHANNEL	FREQUENCY (MHz)	MODULATION	RB SIZE	RB OFFSET	AVERAGE POWER (dBm)
5	Low 26815	826.5	QPSK	1	0	22.8
				1	12	22.5
				1	24	22.48
				12	0	21.78
				12	6	21.6
				12	11	21.54
				25	0	21.57
			16-QAM	1	0	21.84
				1	12	21.58
				1	24	21.38
				12	0	20.7
				12	6	20.55
				12	11	20.52
				25	0	20.63
	Middle 26915	836.5	QPSK	1	0	22.49
				1	12	22.75
				1	24	22.71
				12	0	21.55
				12	6	21.64
				12	11	21.62
				25	0	21.69
			16-QAM	1	0	21.72
				1	12	21.76
				1	24	21.93
				12	0	20.58

	High 27015	846.5	QPSK	12	6	20.68
				12	11	20.63
				25	0	20.7
				1	0	22.59
				1	12	22.82
				1	24	23.52
				12	0	21.7
				12	6	21.76
				12	11	22.08
			16-QAM	25	0	21.95
				1	0	21.69
				1	12	21.95
				1	24	22.74
				12	0	20.75
				12	6	20.8
				12	11	21.13
				25	0	21.05

BW=5 MHz. QPSK:

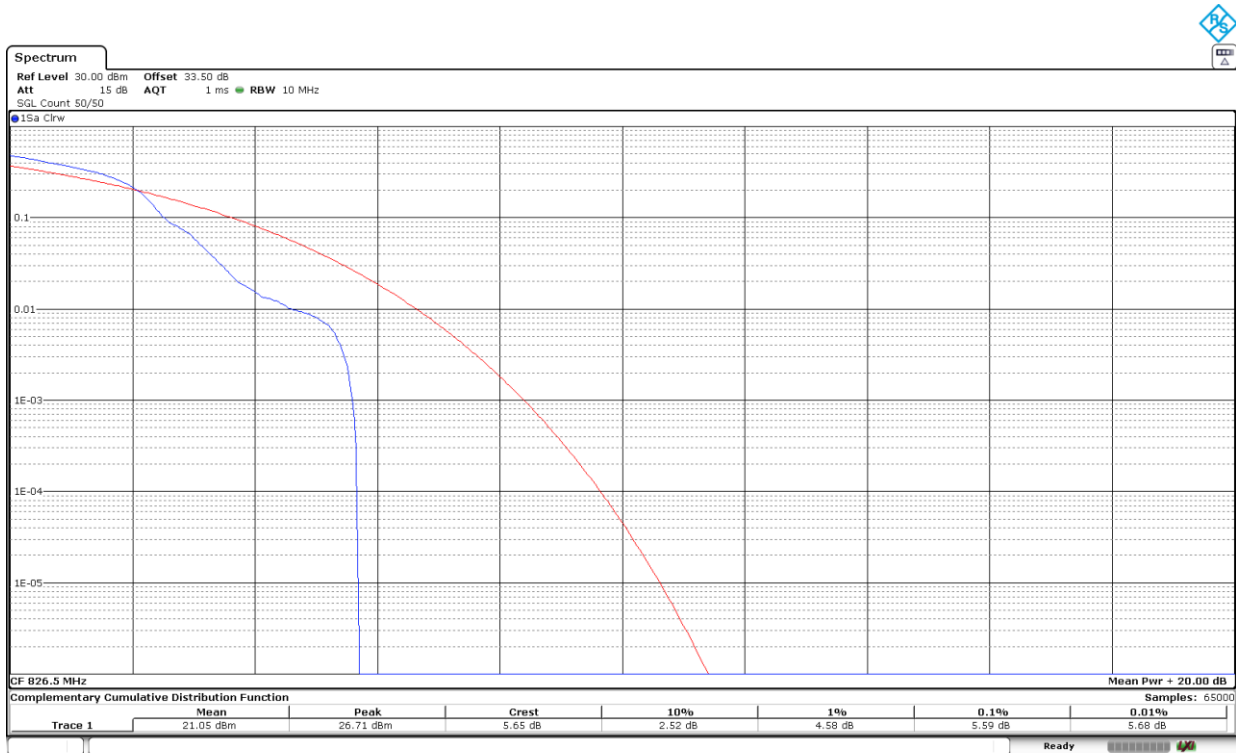
MAX POWER	QPSK COND. POWER AVG (dBm)	ANTENNA GAIN (dBi)	RAD. POWER AVG EIRP(dBm)
LOW	22.8	-1.1	21.7
MIDDLE	22.75	-1.1	21.65
HIGH	23.52	-1.1	22.42
MAX:	23.52		22.42

BW=5 MHz. 16QAM:

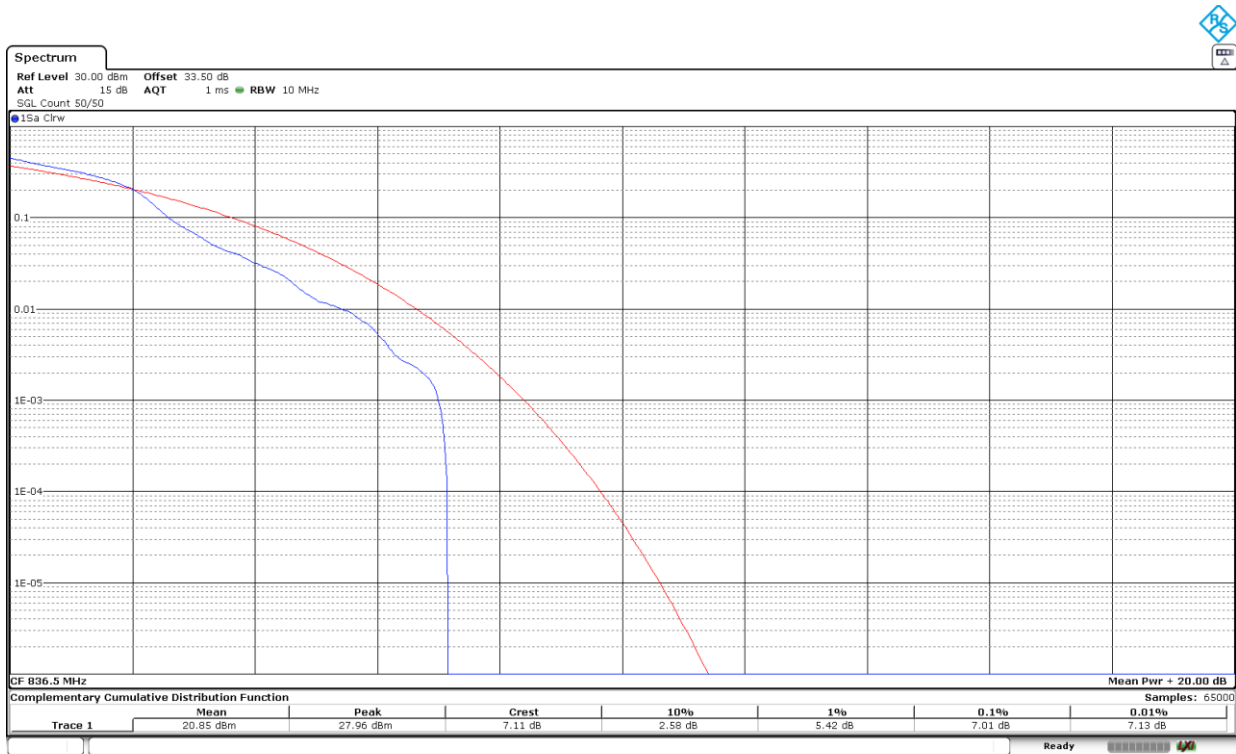
MAX POWER	16QAM COND. POWER AVG (dBm)	ANTENNA GAIN (dBi)	RAD. POWER AVG EIRP(dBm)
LOW	21.84	-1.1	20.74
MIDDLE	21.93	-1.1	20.83
HIGH	22.74	-1.1	21.64
MAX:	22.74		21.64

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

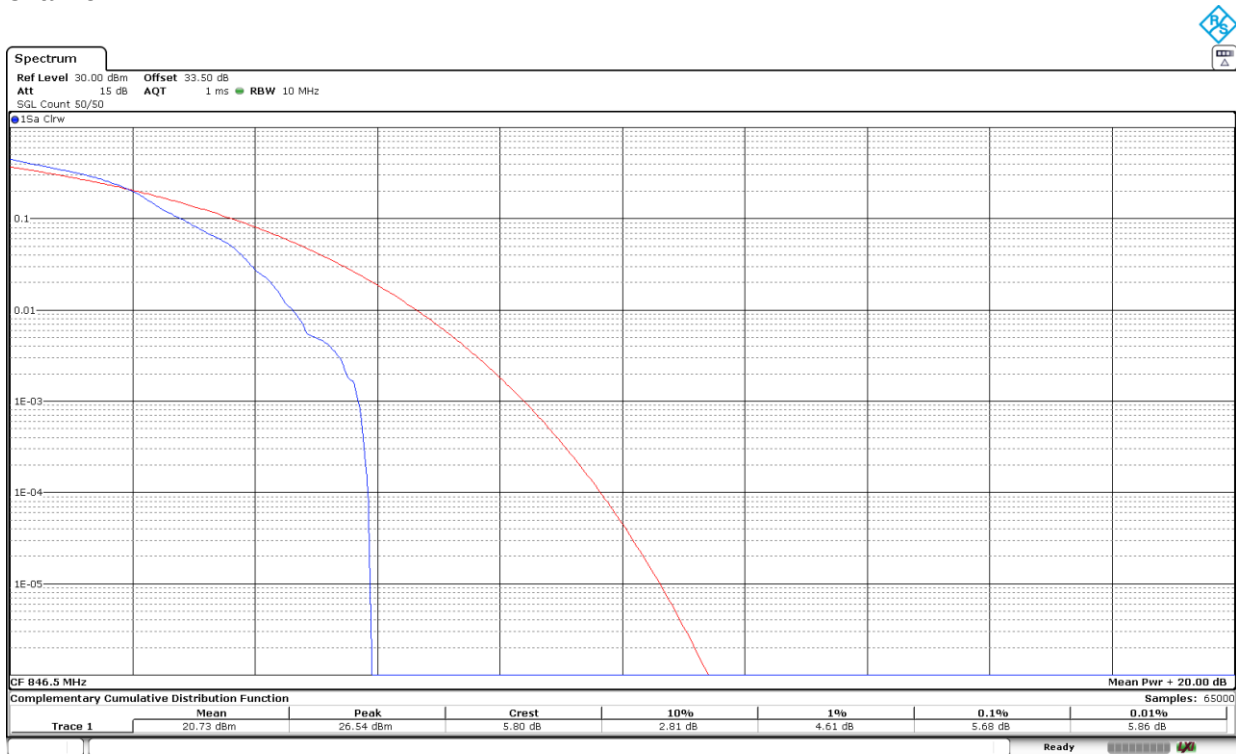
LTE Cat-4 Band 26:
Preliminary measurements determined the worst-case of PAPR is BW=5 MHz, Middle Channel, 16QAM, RB Size=1, RB Offset=0.
Low Channel:



Middle Channel:



High Channel:



16QAM	Low	Middle	High
PAPR (dB)	5.59	7.01	5.68

Measurement uncertainty (dB) <±1.11

Verdict

Pass

Frequency Stability

Limits

- * FCC §2.1055 and §22.355. ± 2.5 ppm for mobile stations operating in the range 821 to 896 MHz.
- * RSS-132. Clause 5.3. The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within each of the sub-bands when tested at the temperature and supply voltage variations specified in RSS-Gen.

Method

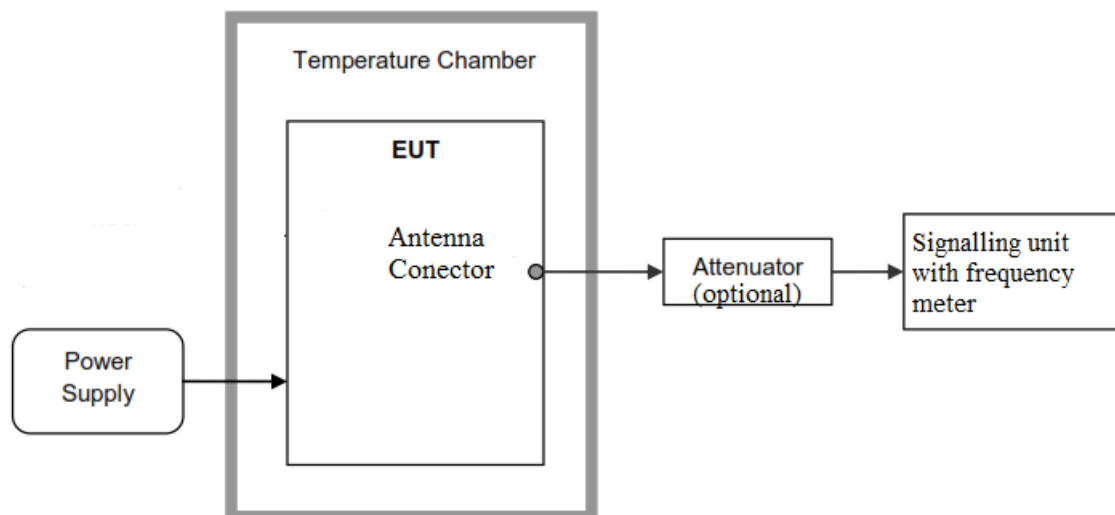
The frequency tolerance measurements over temperature variations were made over the temperature range of -30°C to $+50^{\circ}\text{C}$. The EUT was placed inside a climatic chamber and the temperature was raised hourly in 10°C steps from -30°C up to $+50^{\circ}\text{C}$.
The supply voltage was varied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



Results

LTE Cat-4 Band 26:

The worst case modulation in terms of Frequency Stability is BW=1.4 MHz, QPSK, RB Size=1, RB Offset=0.

1. Frequency Tolerance:

- Frequency Stability over Temperature Variations:

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
+65	-1,56	-0,001864913
+60	-7,16	-0,008559474
+50	1.18	0.00141064
+40	0.05	5.97729E-05
+30	-1.23	-0.001470412
+20	0.28	0.000334728
+10	1.05	0.00125523
0	-0.64	-0.000765093
-10	0.65	0.000777047
-20	-1.45	-0.001733413
-30	-1.84	-0.002199641
-40	0,32	0,000382546

- Frequency Stability over Voltage Variations.

Supply voltage	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
Vmax	4,6	1,1	0,001315003
Vmin	3,2	-1,65	-0,001972504

2. Reference Frequency Points f_L and f_H:

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

f _L (MHz)	824.0620
f _H (MHz)	848.9369

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

Measurement uncertainty (Hz) <± 249.55

Verdict

Pass

Modulation Characteristics

Limits

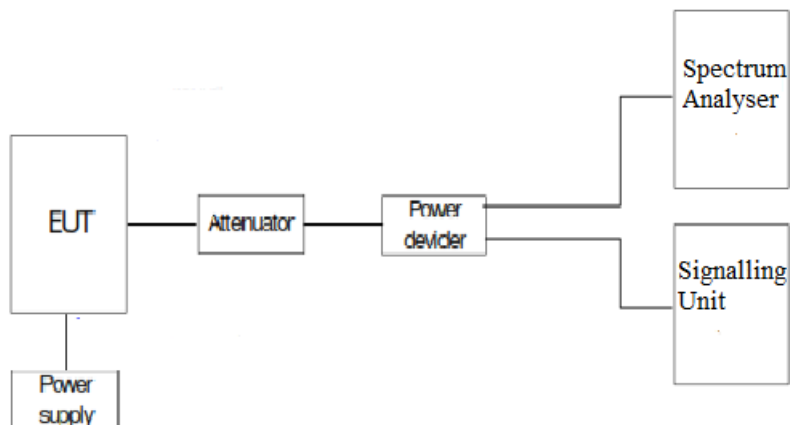
FCC §2.1047.

RSS-132. Clause 5.2: Equipment certified under this standard shall use digital modulation.

Method

For LTE the EUT operates with QPSK and 16QAM modes in which the information is digitized 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).

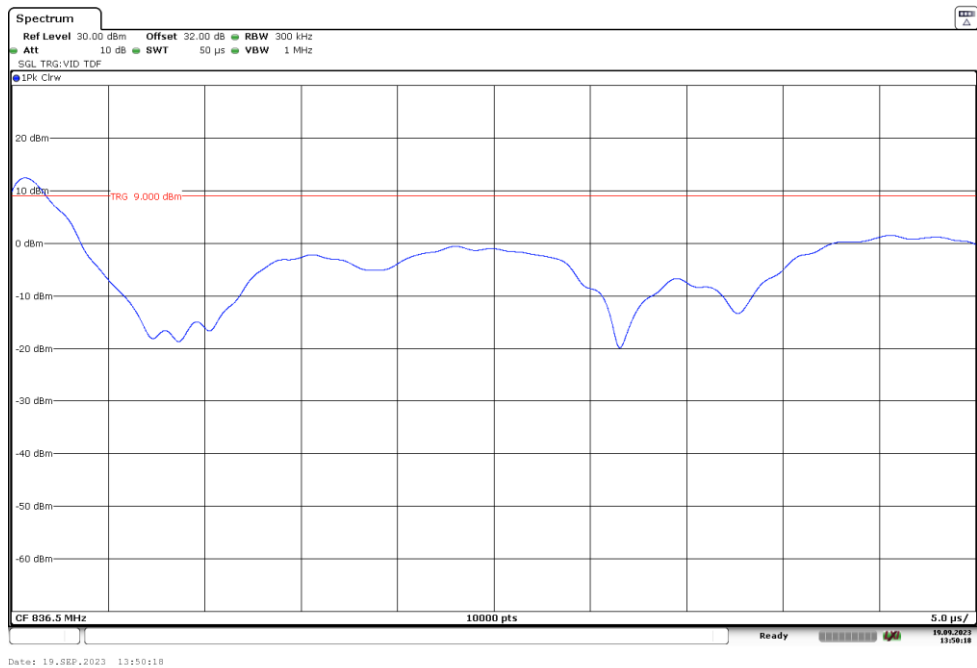
Test Setup



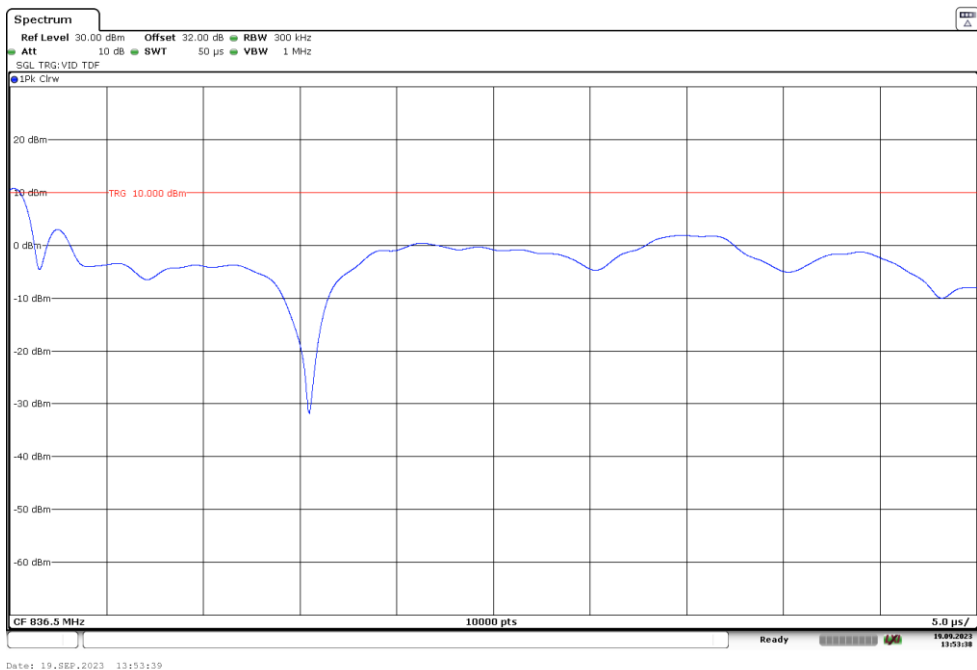
Results

The following plots show the modulation schemes in the EUT.

LTE Cat-4 Band 26: BW = 1.4 MHz. QPSK. RB Size=1. RB Offset=0.



LTE Cat-4 Band 26: BW = 1.4 MHz. 16QAM. RB Size=1. RB Offset=0.



Occupied Bandwidth

Limits

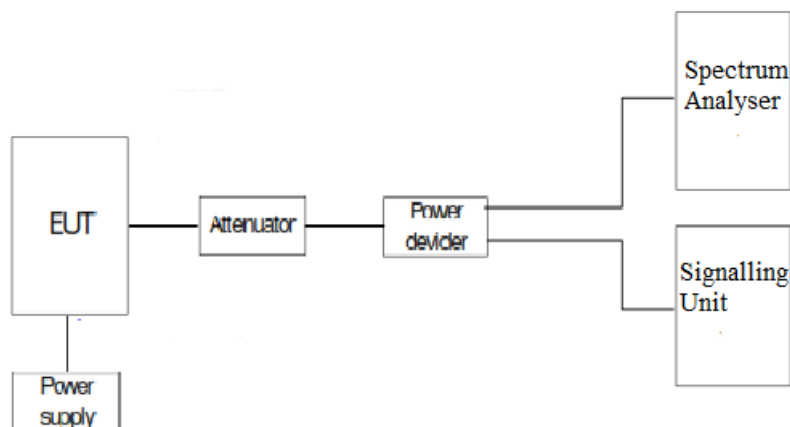
FCC §2.1049. Measurements required: Occupied bandwidth.

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 of occupied bandwidth corresponds to Resource Block (RB) Size All and Offset 0 regardless the nominal bandwidth selected.

LTE Cat-4 Band 26:

LTE Cat-4 Band 26. BW=1.4 MHz. QPSK. RB Size=All. RB Offset=0.

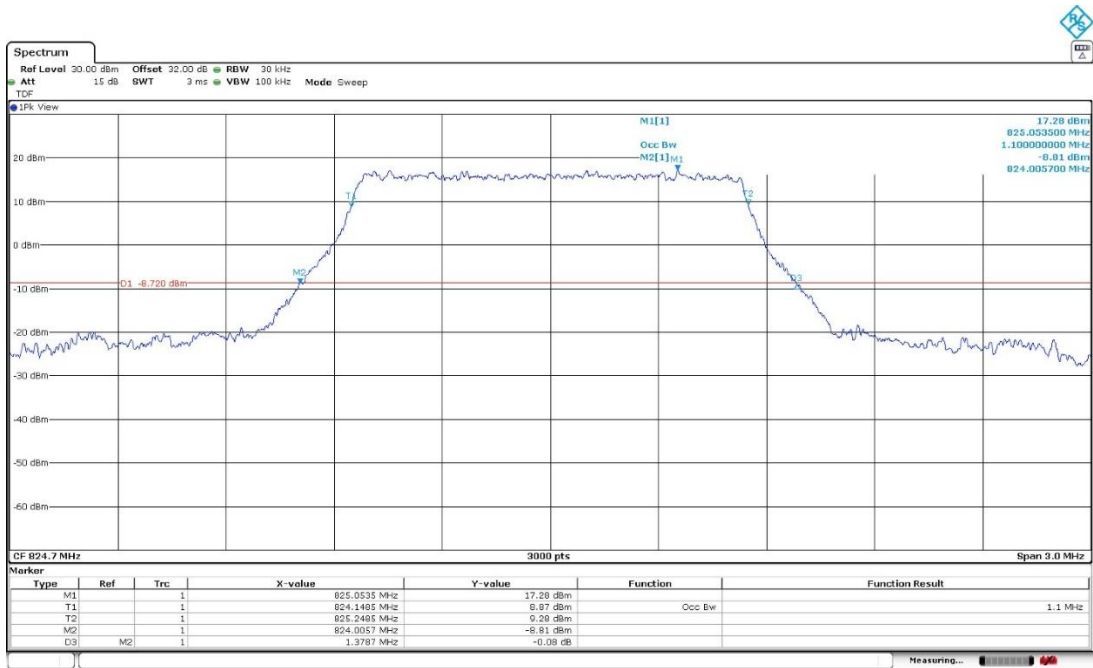
	Low Channel	Middle Channel	High Channel
99% Occupied Bandwidth (kHz)	1.100	1.1000	1.110
-26 dBc Bandwidth (MHz)	1.379	1.3878	1.380
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=1.4 MHz. 16QAM. RB Size=All. RB Offset=0.

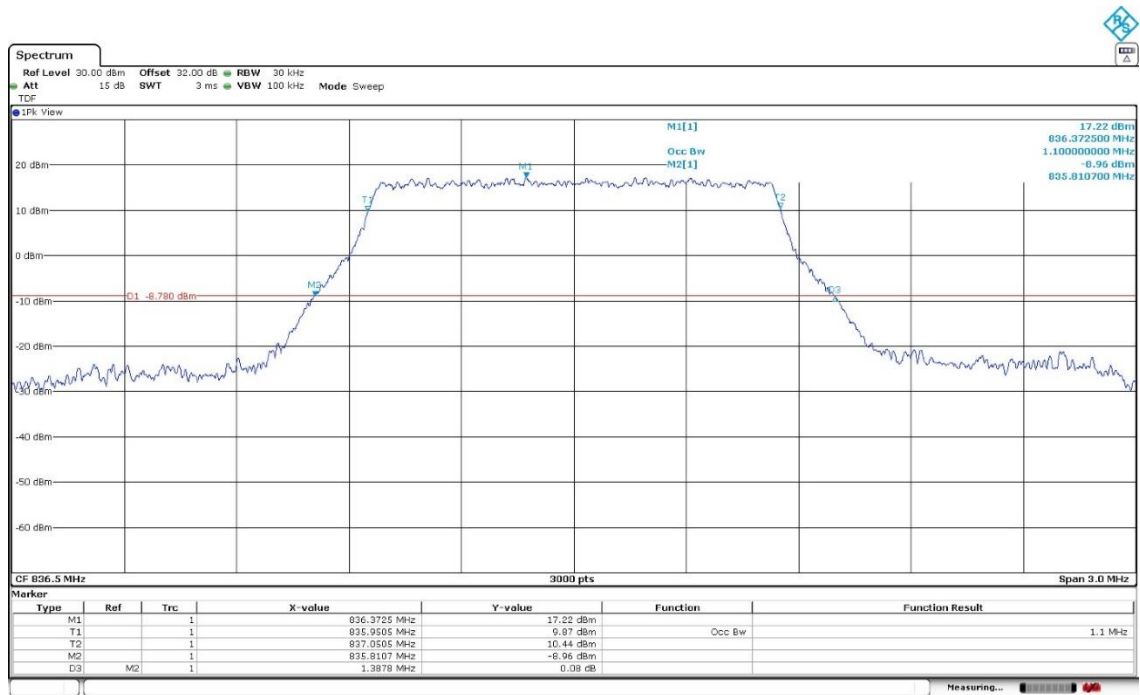
	Low Channel	Middle Channel	High Channel
99% Occupied Bandwidth (kHz)	1.114	1.104	1.106
-26 dBc Bandwidth (MHz)	1.390	1.398	1.382
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=1.4 MHz. QPSK. RB Size=All.

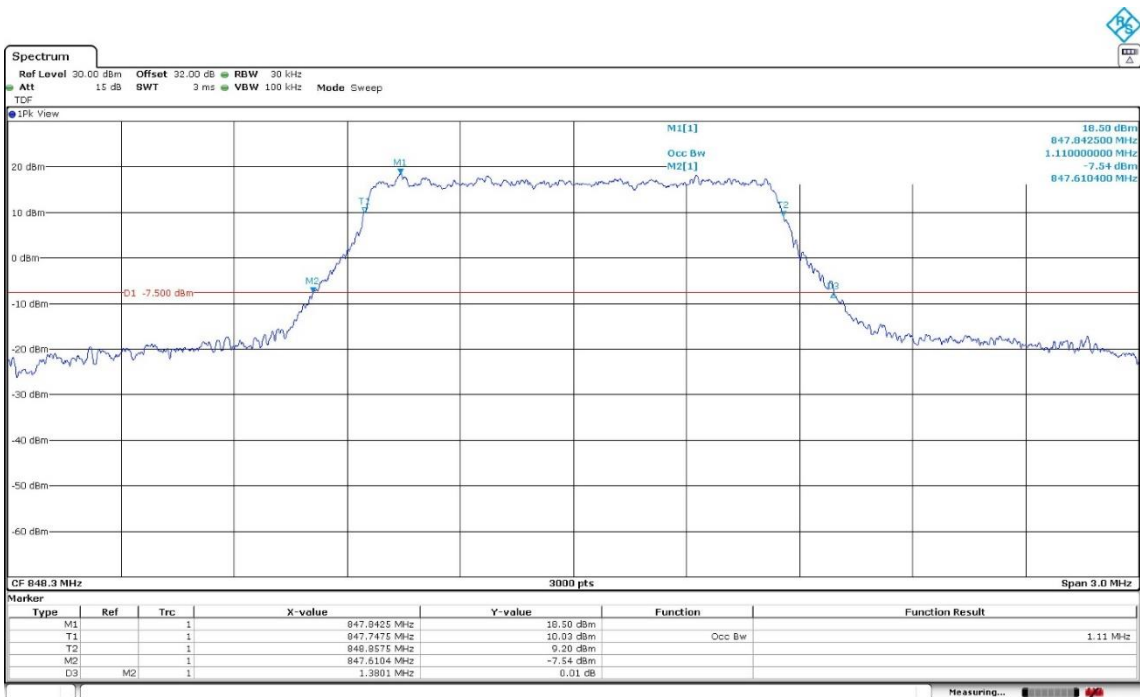
Low Channel:



Middle Channel:

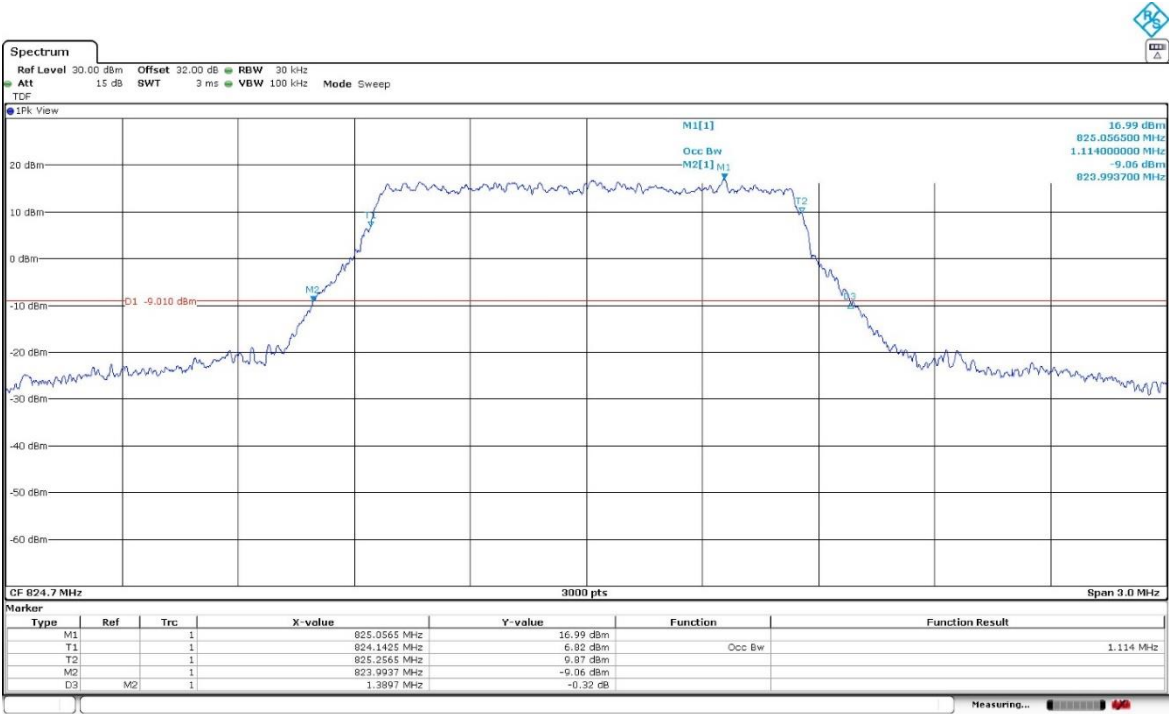


High Channel:

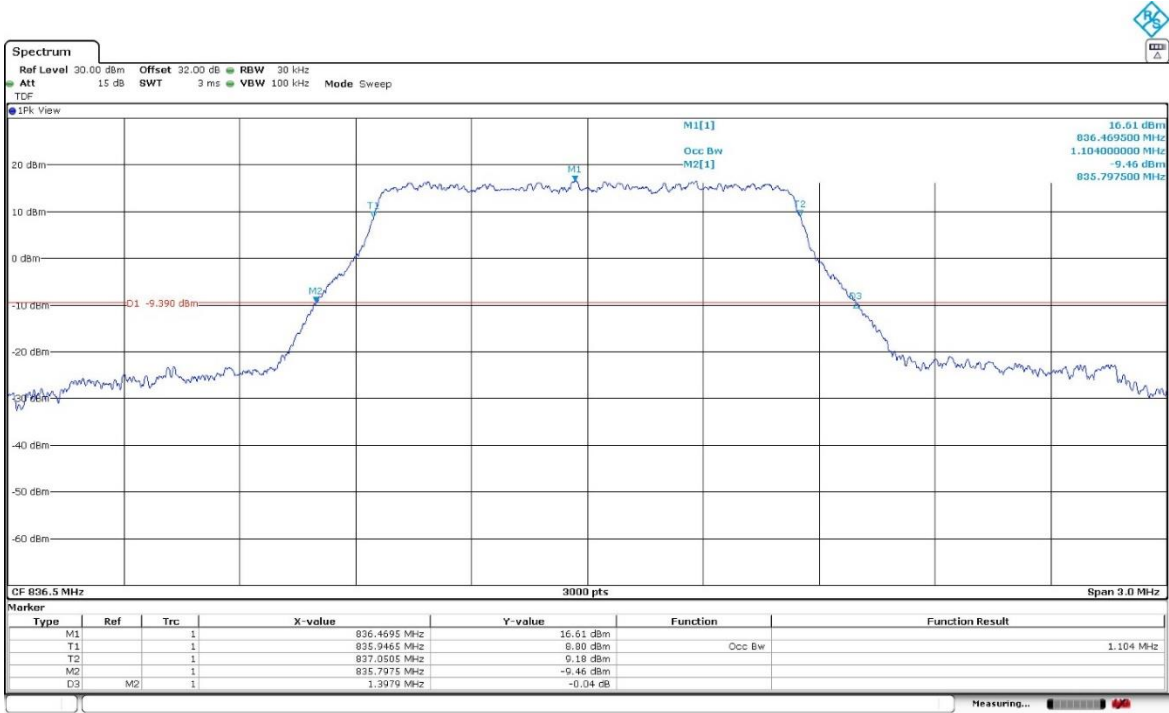


LTE Cat-4 Band 26. BW=1.4 MHz. 16QAM. RB Size=All.

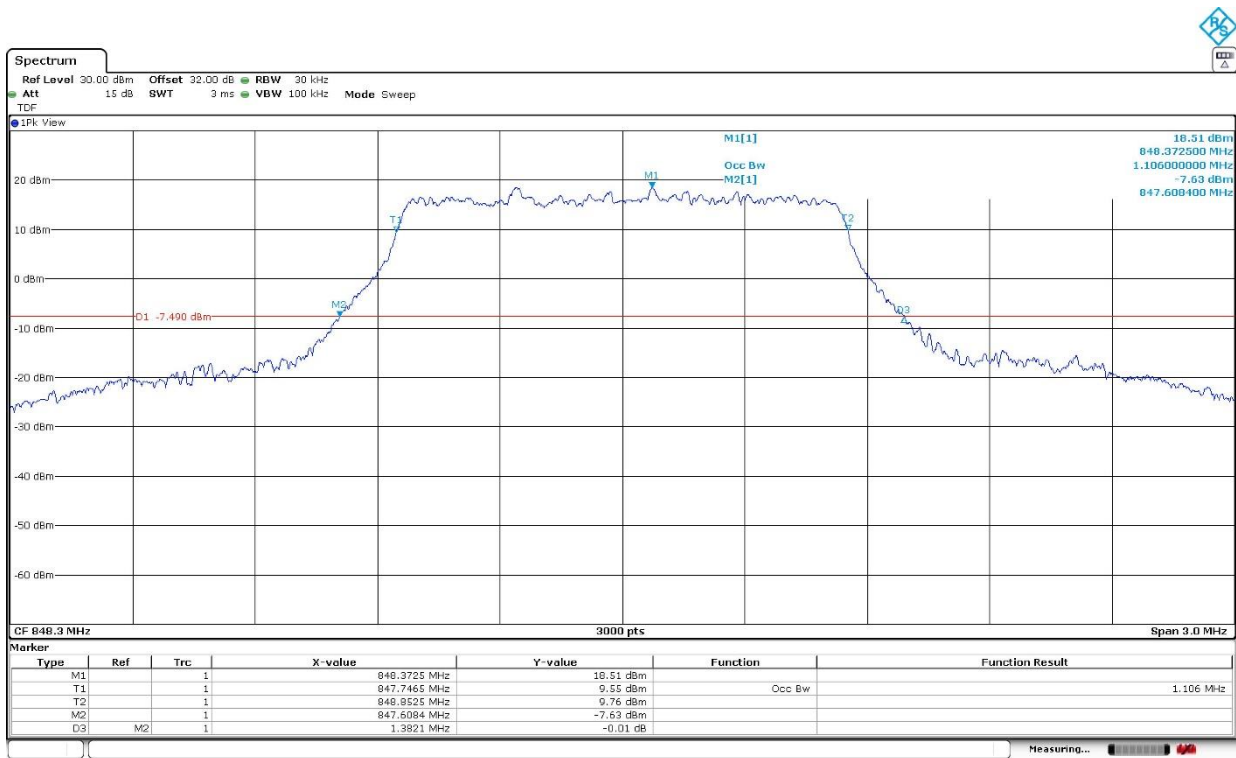
Low Channel:



Middle Channel:



High Channel:



LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size=All.

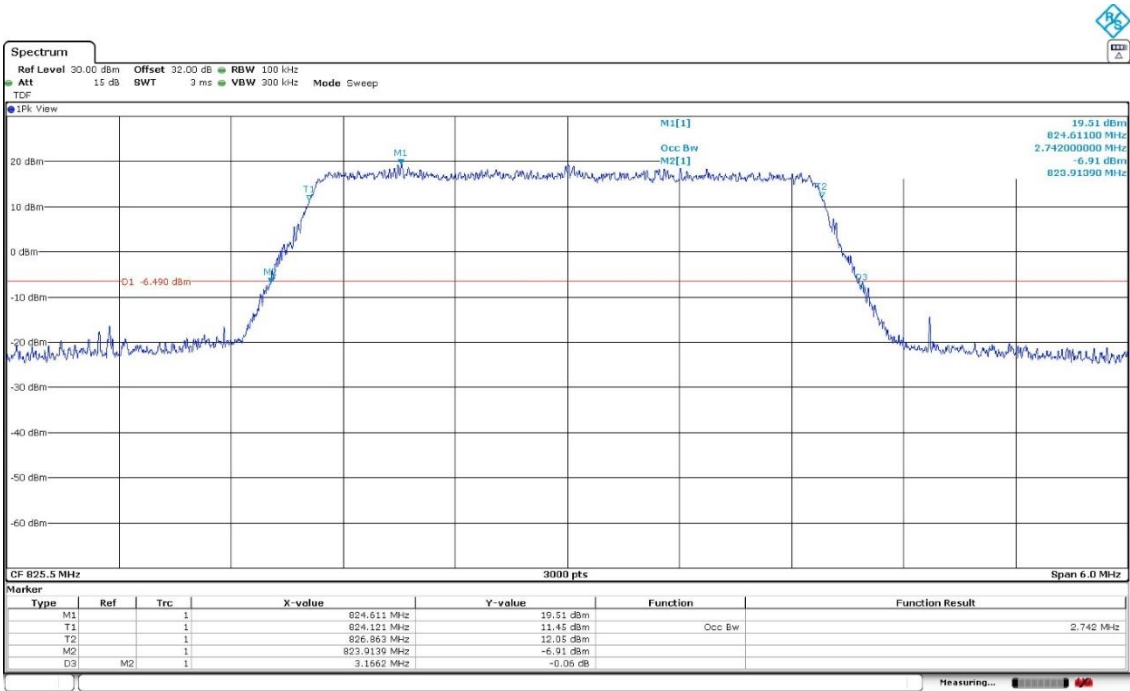
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	2.742	2.746	2.748
-26 dBc Bandwidth (MHz)	3.166	3.188	3.218
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=3 MHz. 16QAM. RB Size=All.

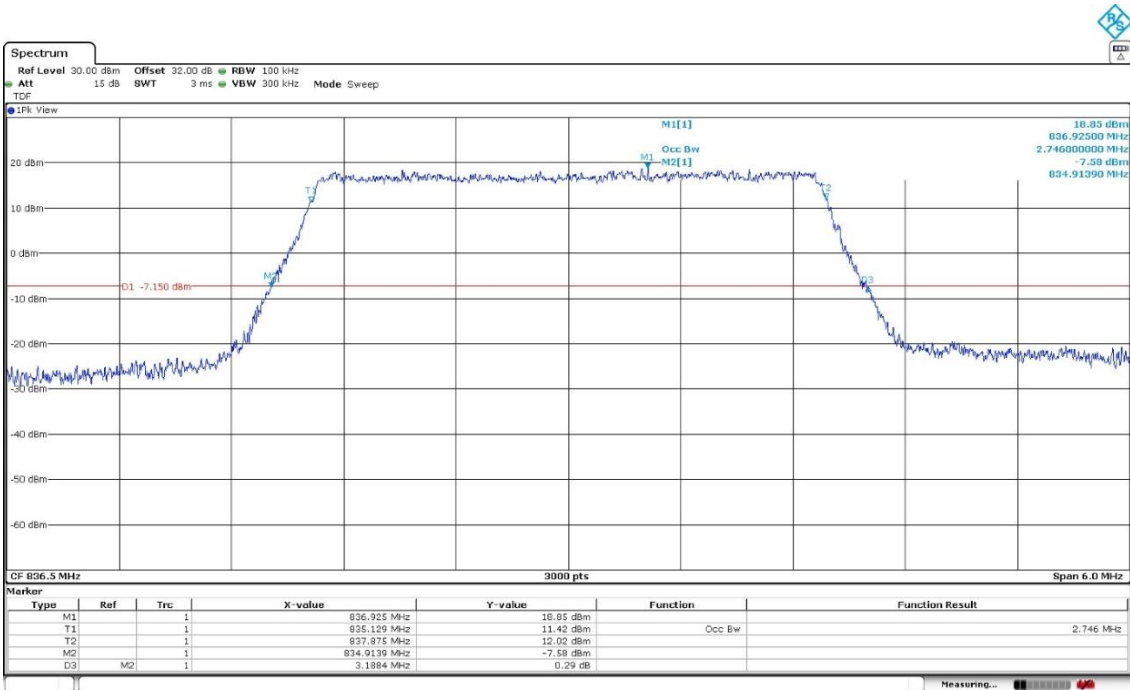
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	2.742	2.746	2.750
-26 dBc Bandwidth (MHz)	3.188	3.788	3.172
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size=All.

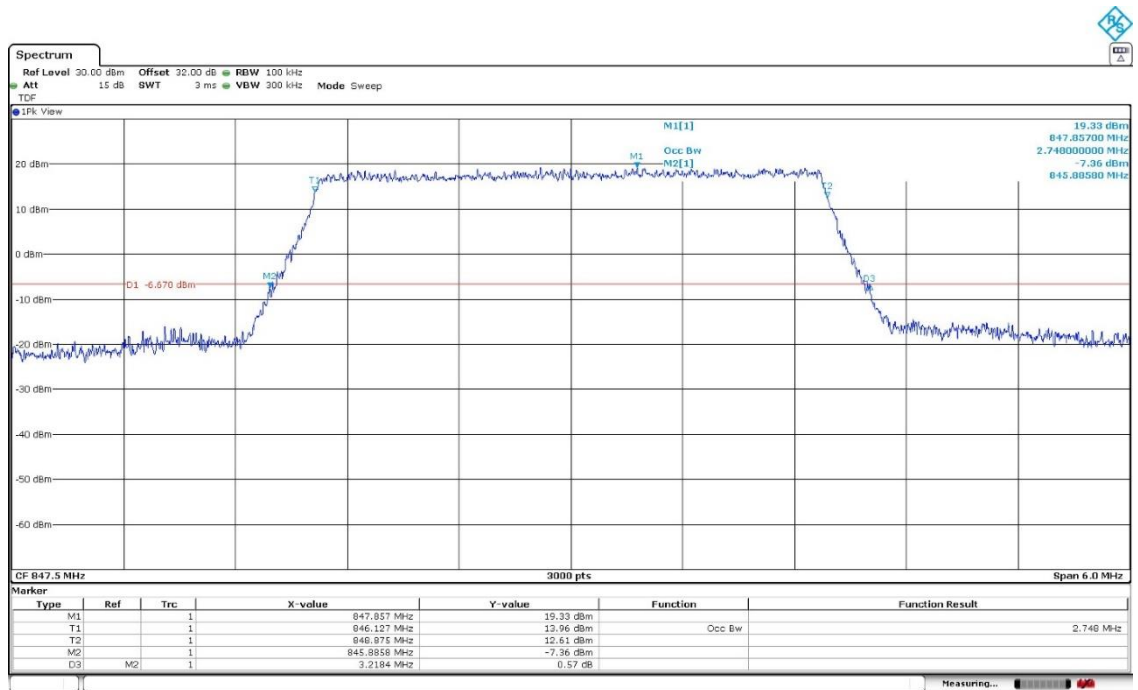
Low Channel:



Middle Channel:

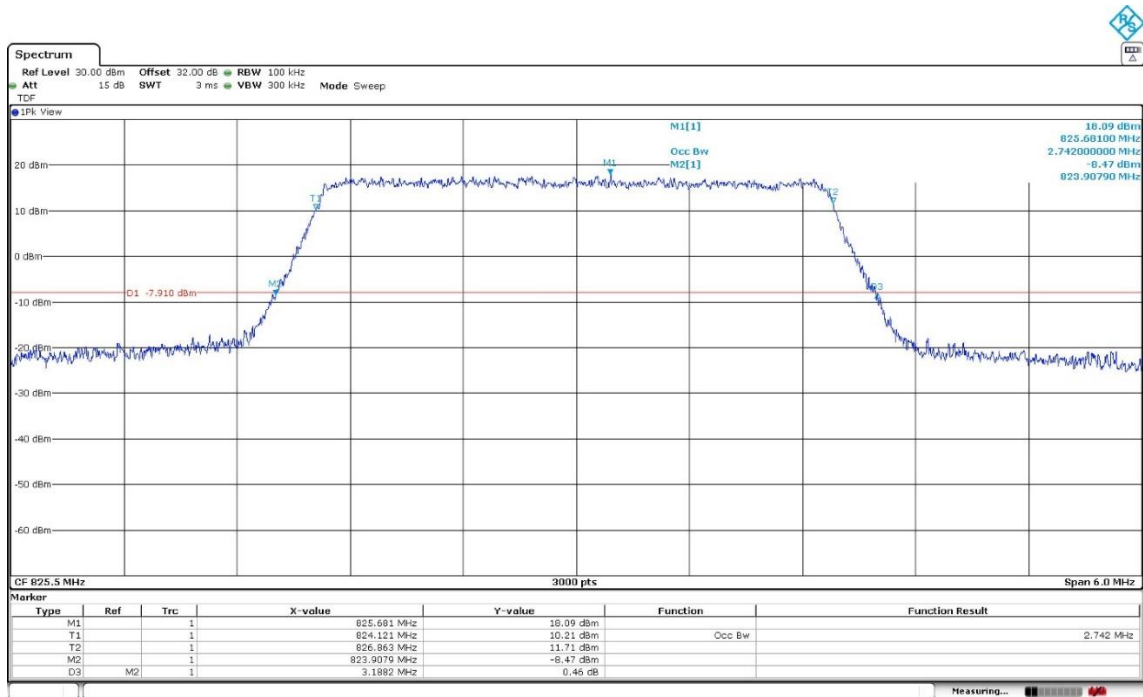


High Channel:

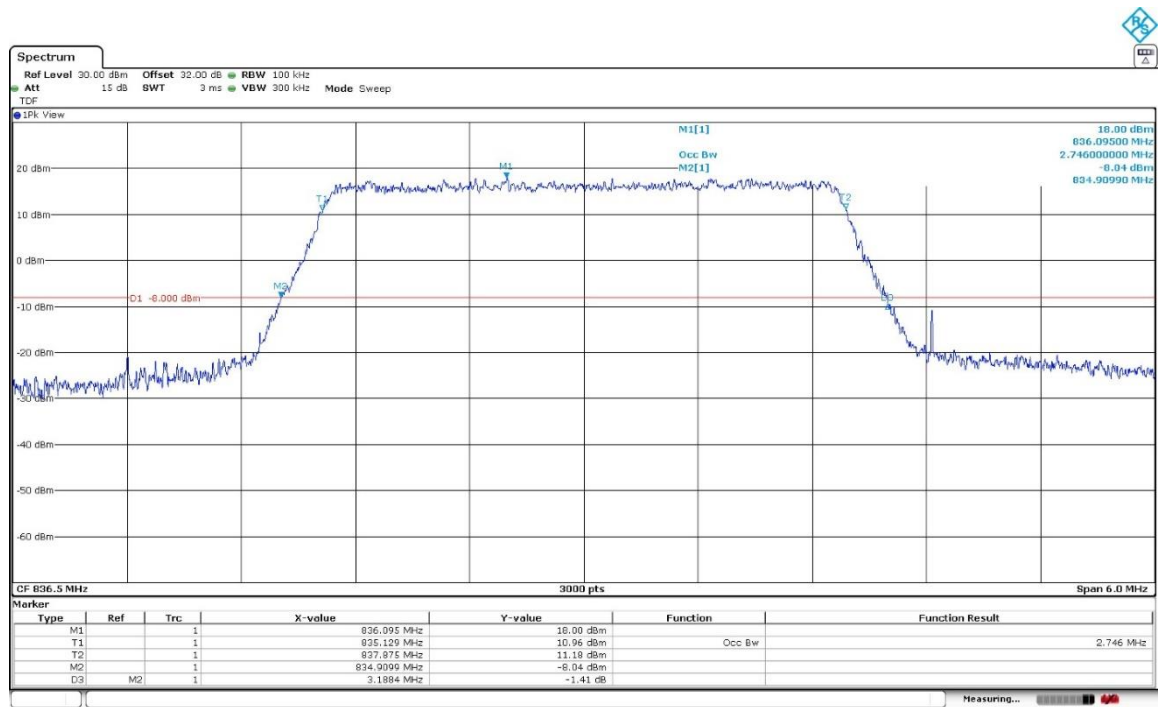


LTE Cat-4 Band 26. BW=3 MHz. 16QAM. RB Size=All.

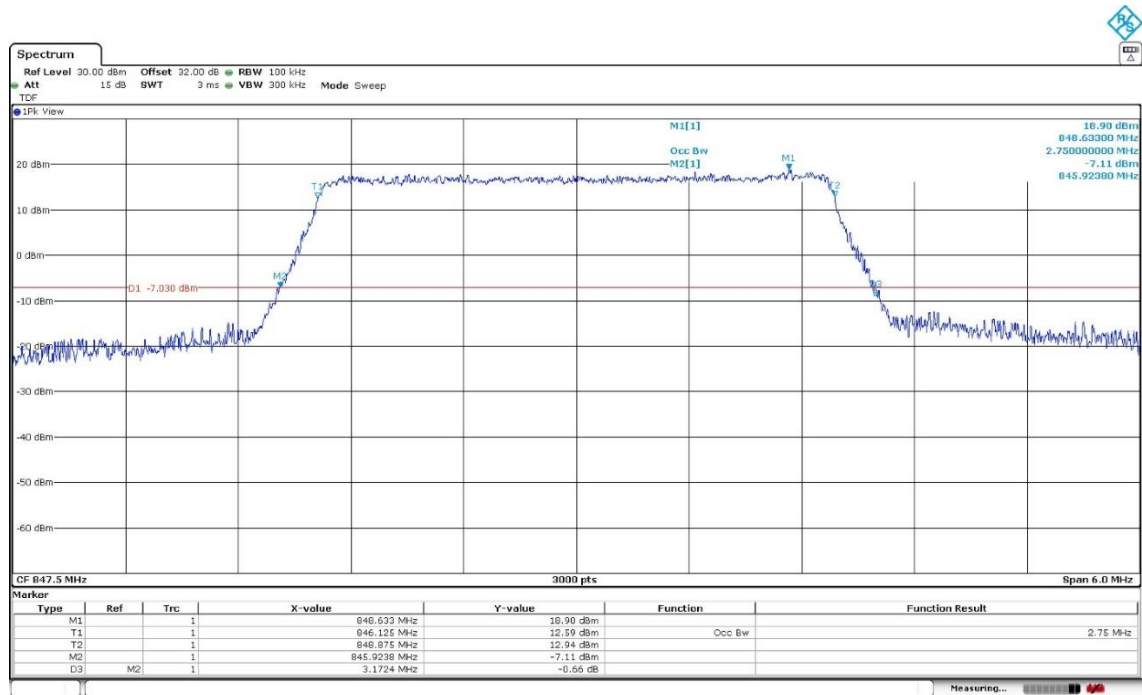
Low Channel:



Middle Channel:



High Channel:



LTE Cat-4 Band 26. BW=5 MHz. QPSK. RB Size=All. RB Offset=0.

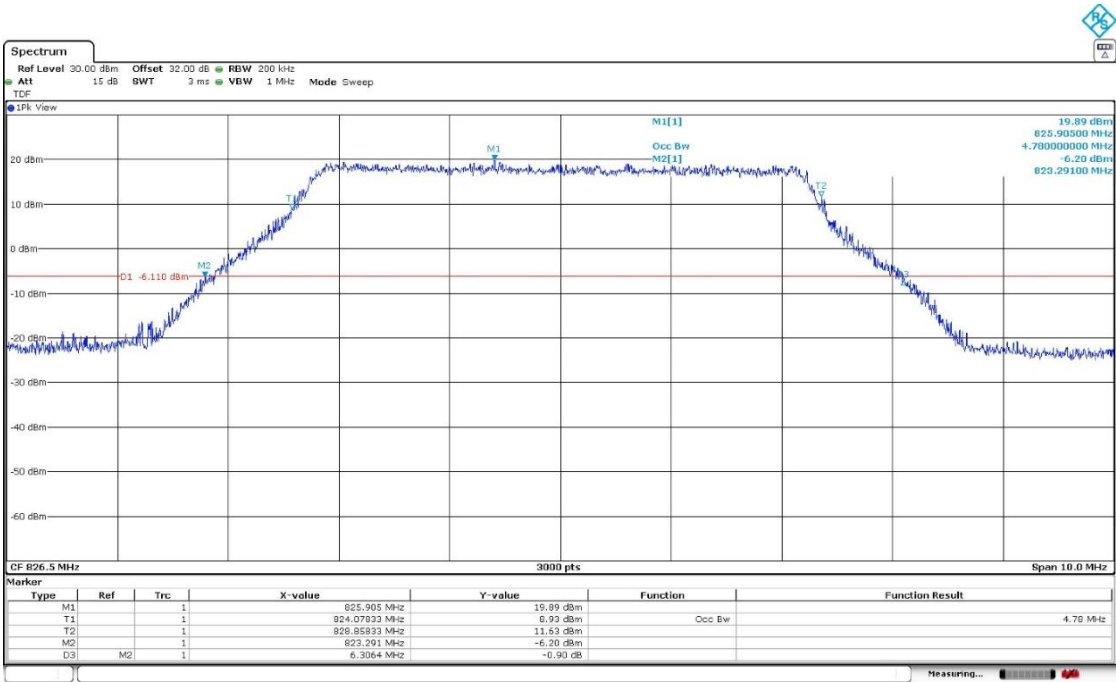
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4.780	4.797	4.823
-26 dBc Bandwidth (MHz)	6.306	6.266	6.324
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=5 MHz. 16QAM. RB Size=All. RB Offset=0.

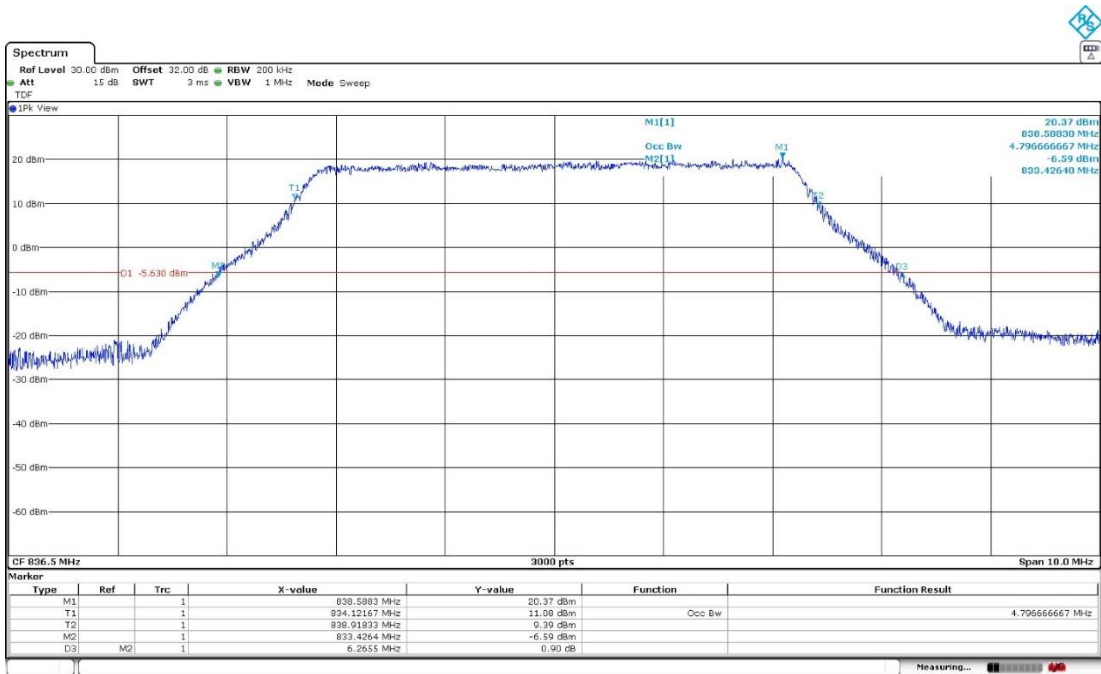
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	4.810	4.760	4.803
-26 dBc Bandwidth (MHz)	6.290	6.256	6.354
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=5 MHz. QPSK. RB Size=All.

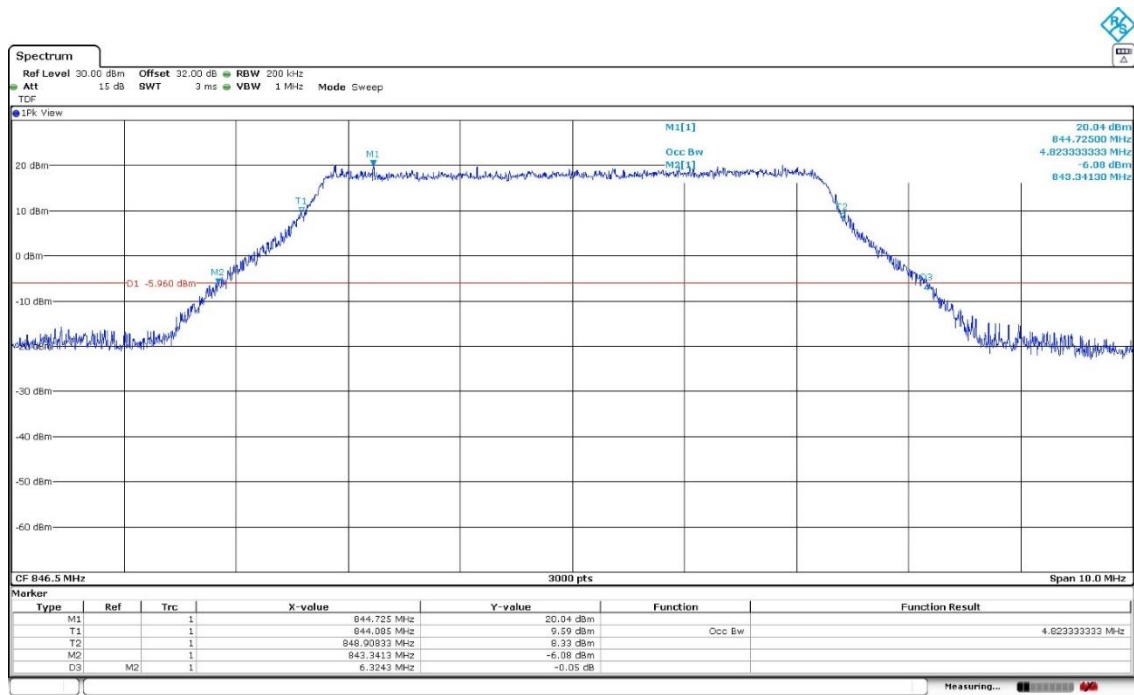
Low Channel:



Middle Channel:

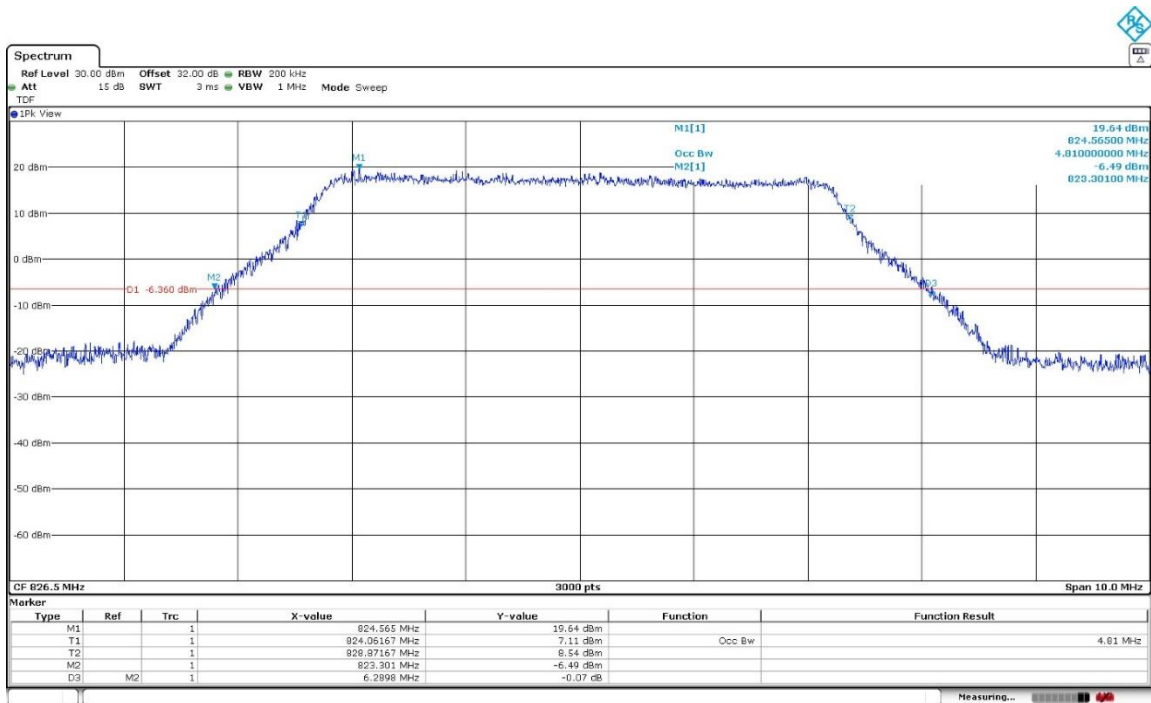


High Channel:

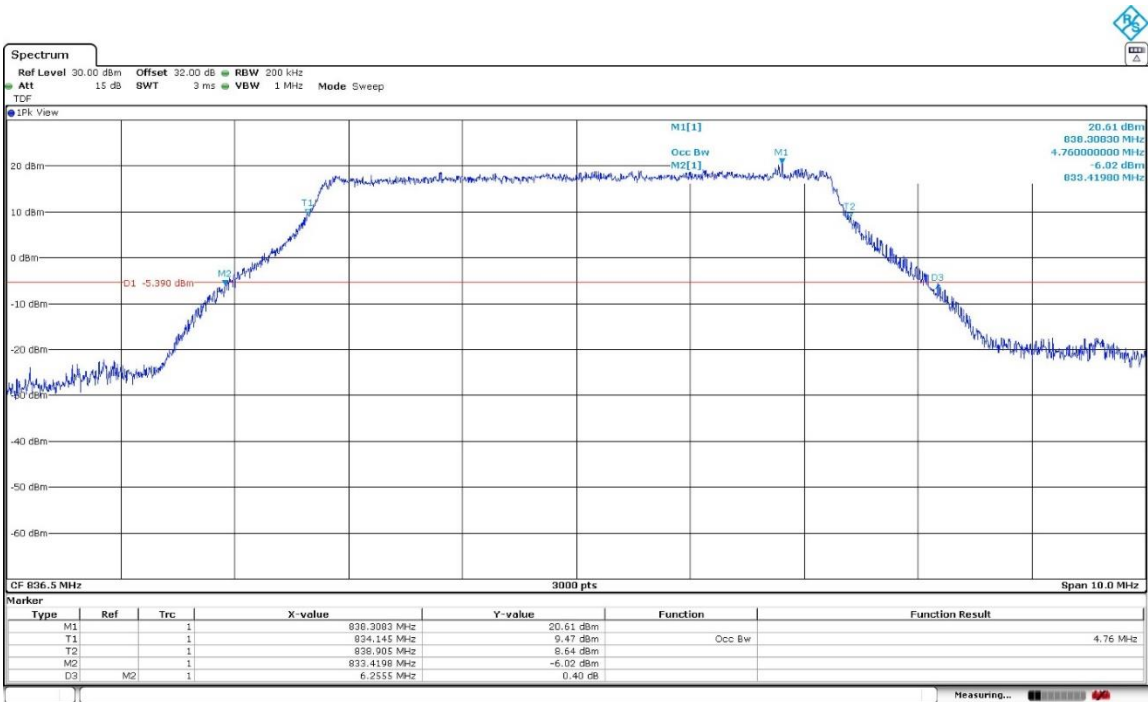


LTE Cat-4 Band 26. BW=5 MHz. 16QAM. RB Size=All.

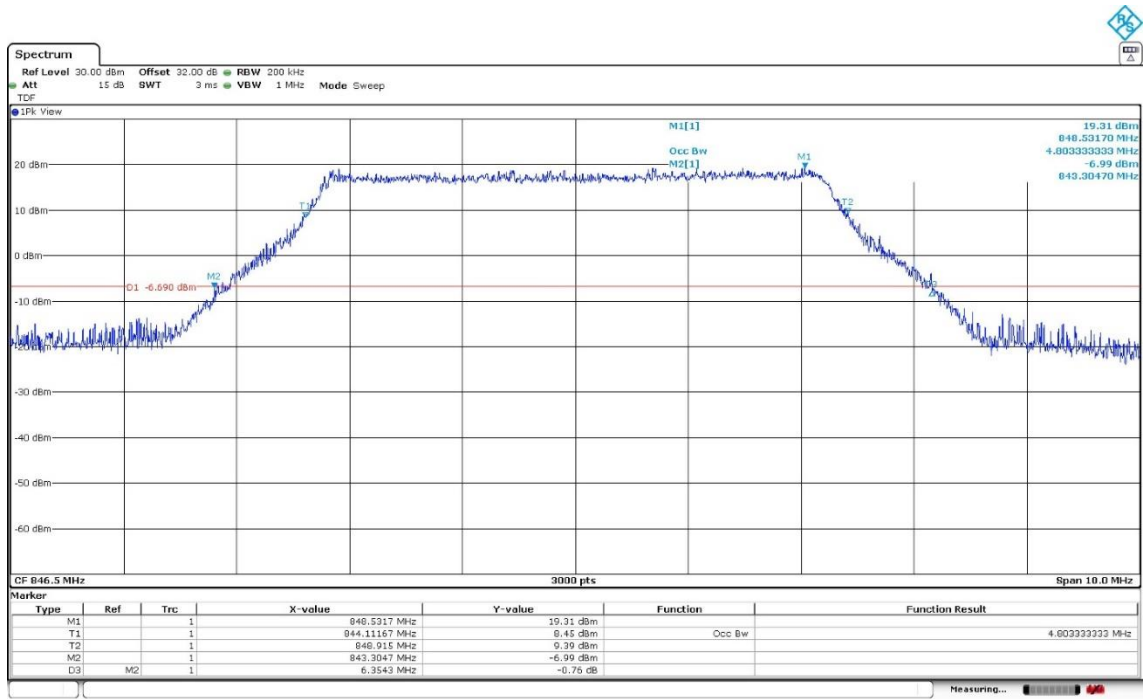
Low Channel:



Middle Channel:



High Channel:



LTE Cat-4 Band 26. BW=10 MHz. QPSK. RB Size=All. RB Offset=0.

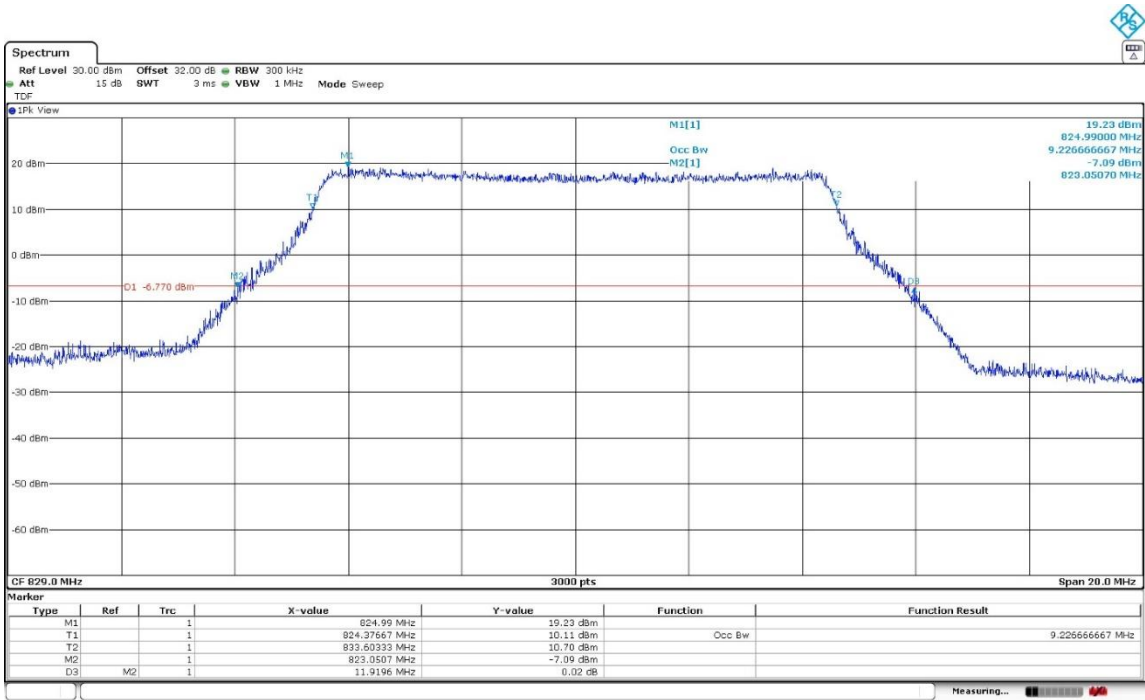
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	9.227	9.107	9.273
-26 dBc Bandwidth (MHz)	11.920	11.381	11.597
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=10 MHz. 16QAM. RB Size=All. RB Offset=0.

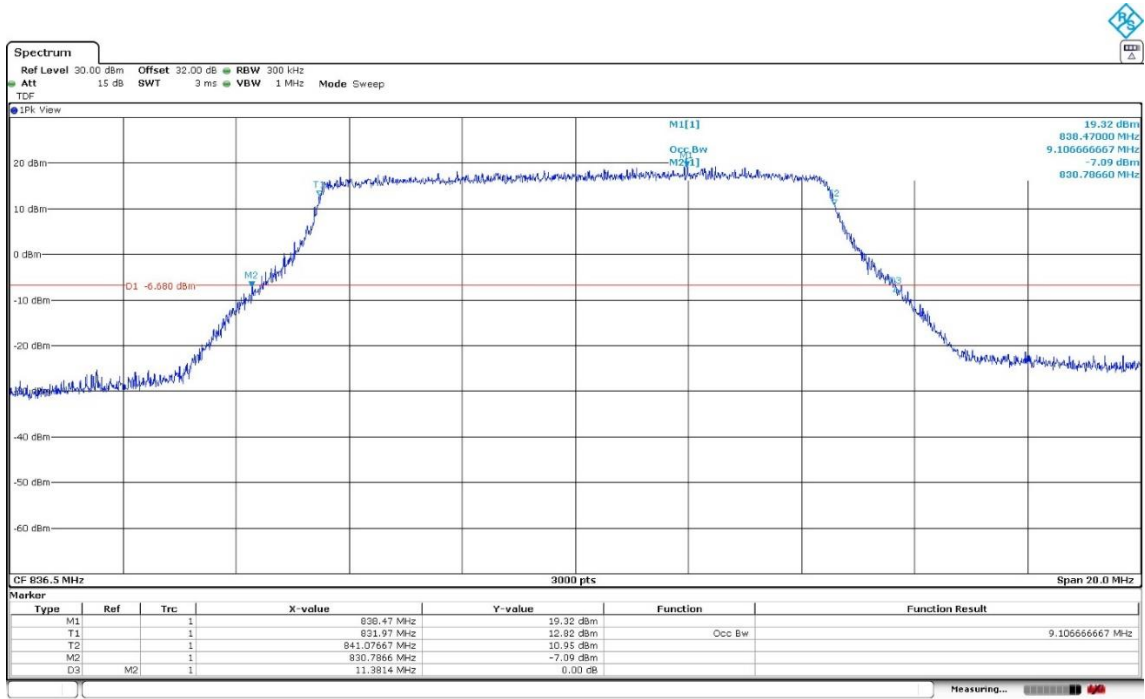
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	9.200	9.120	9.240
-26 dBc Bandwidth (MHz)	11.766	11.341	11.737
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=10 MHz. QPSK. RB Size=All.

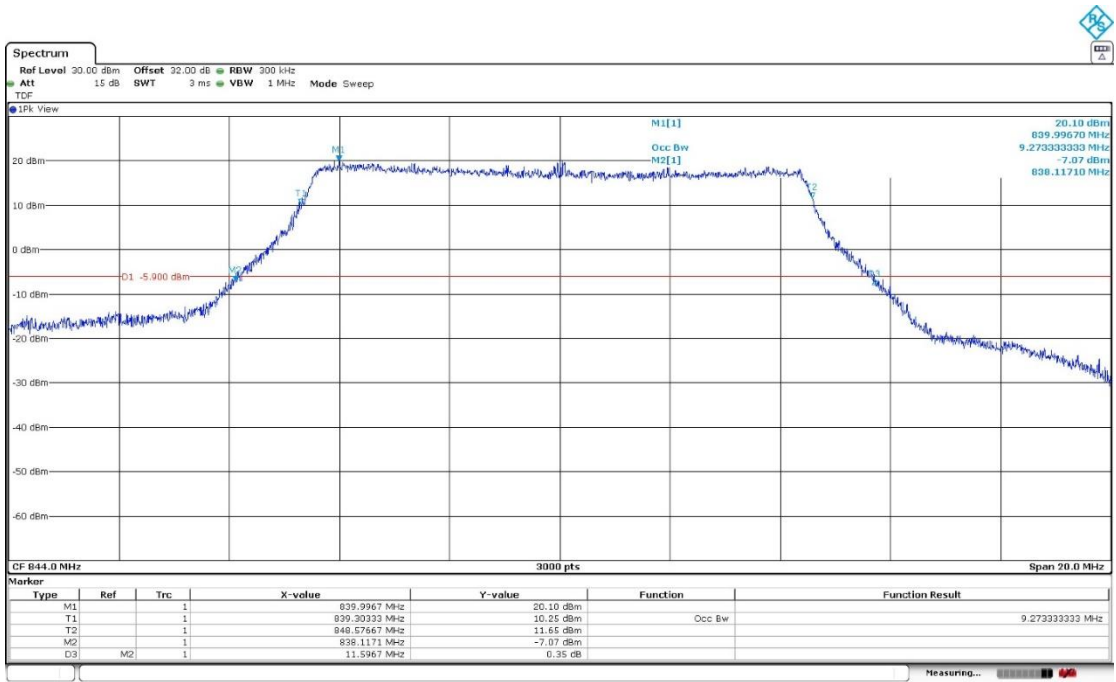
Low Channel:



Middle Channel:

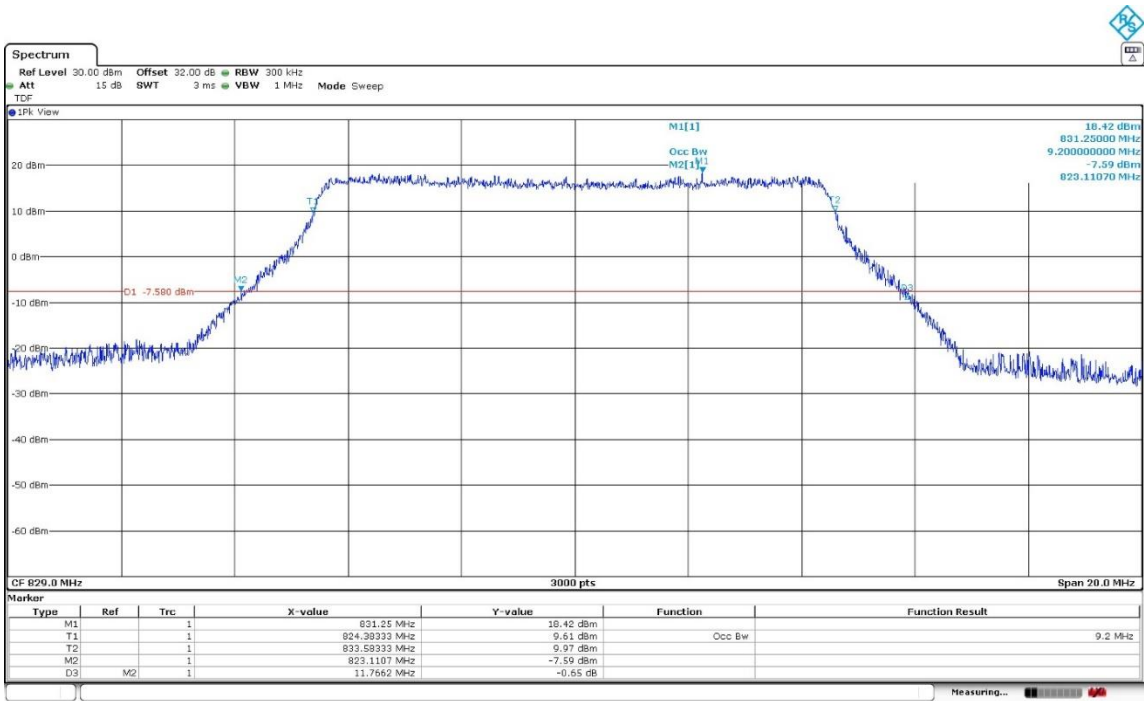


High Channel:

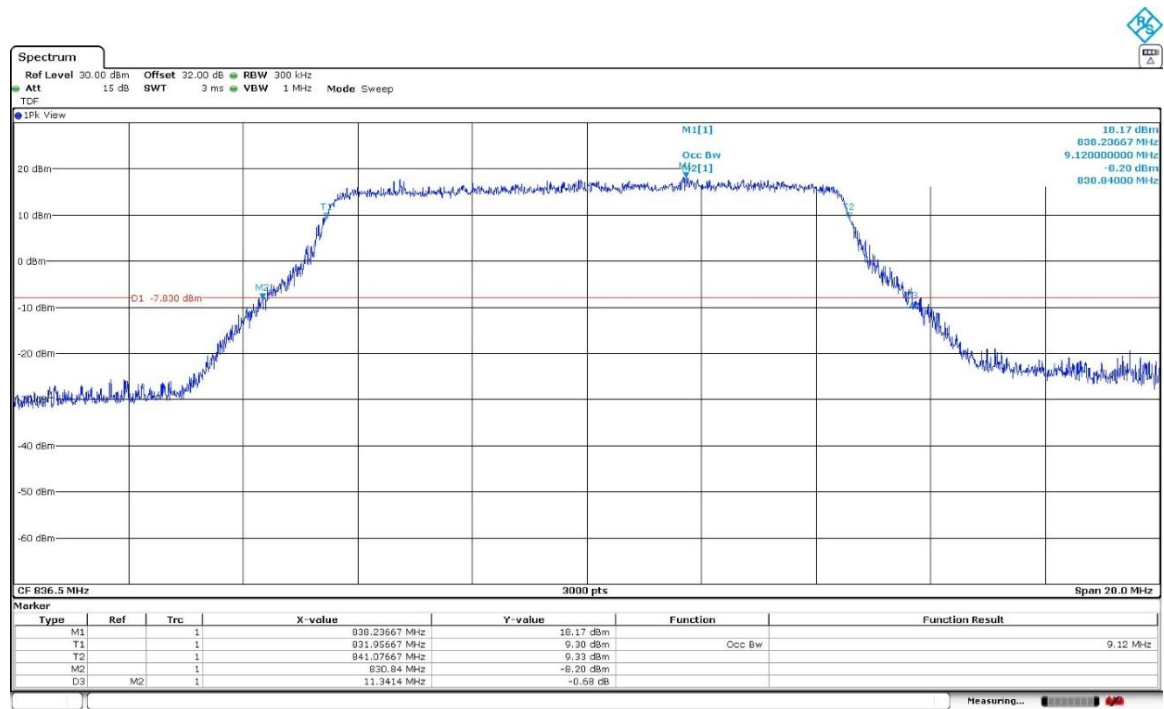


LTE Cat-4 Band 26. BW=10 MHz. 16QAM. RB Size=All.

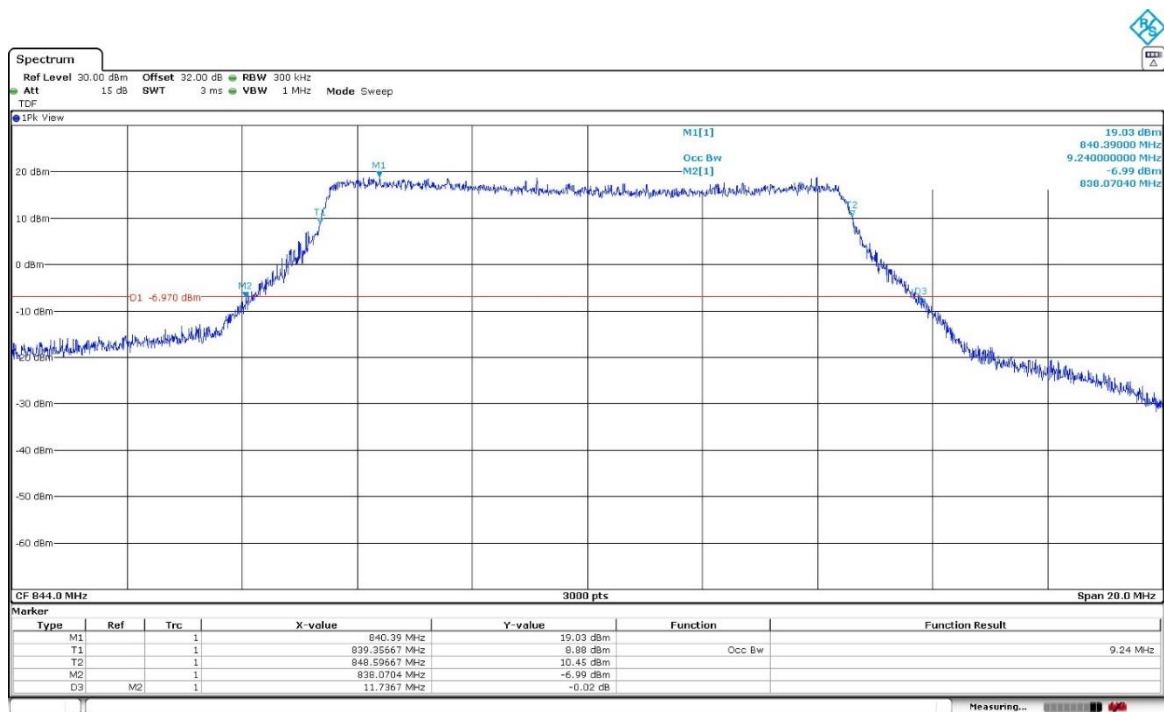
Low Channel:



Middle Channel:



High Channel:



LTE Cat-4 Band 26. BW=15 MHz. QPSK. RB Size=All. RB Offset=0.

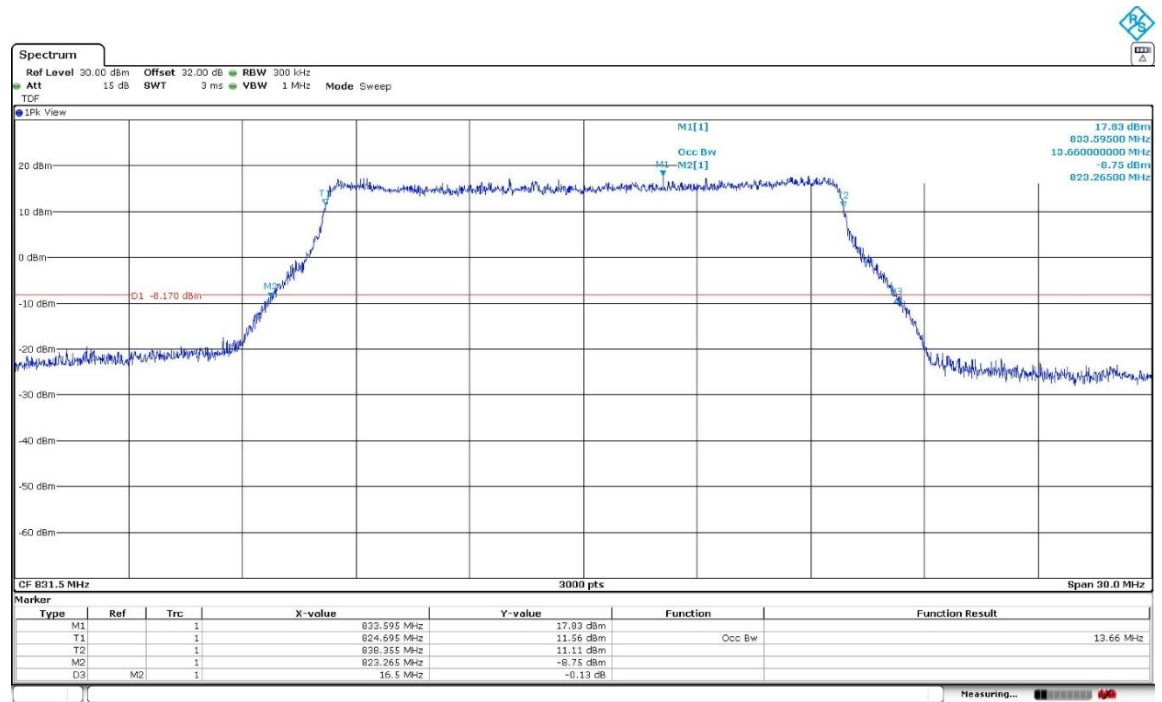
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	13.660	13.540	13.570
-26 dBc Bandwidth (MHz)	16.500	16.378	16.441
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=15 MHz. 16QAM. RB Size=All. RB Offset=0.

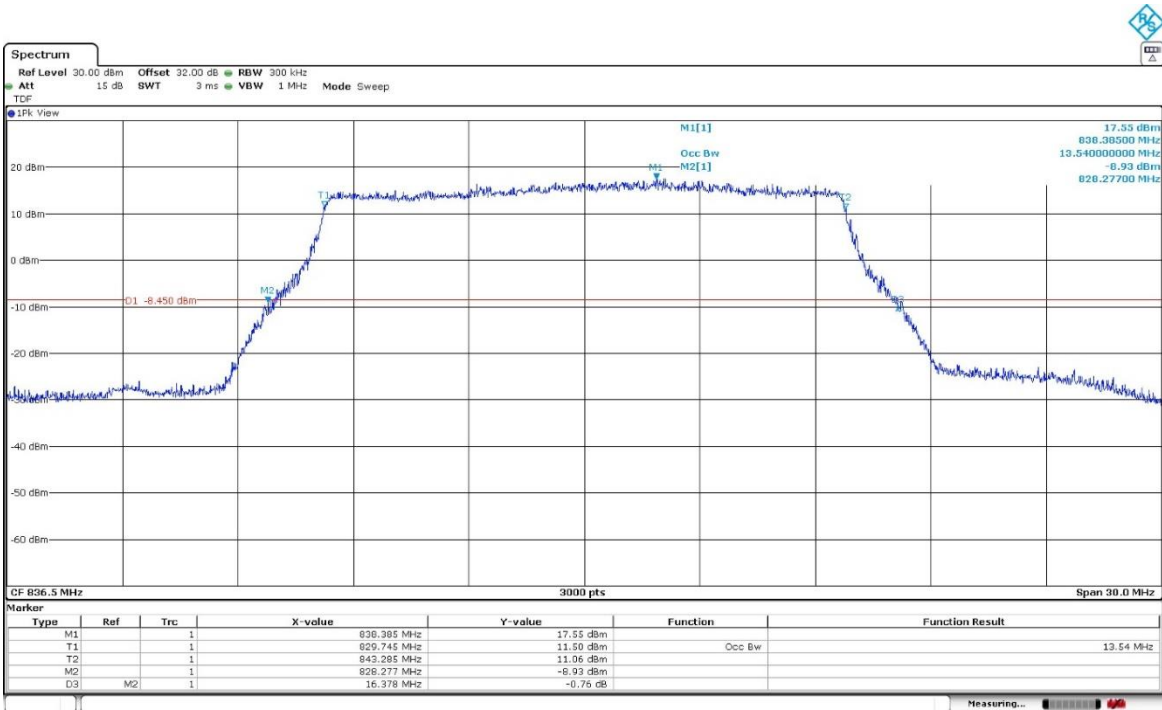
Channel	Low	Middle	High
99% Occupied Bandwidth (MHz)	13.670	13.510	13.590
-26 dBc Bandwidth (MHz)	16.540	16.428	16.521
Measurement uncertainty (kHz)	<±3.75		

LTE Cat-4 Band 26. BW=15 MHz. QPSK. RB Size=All.

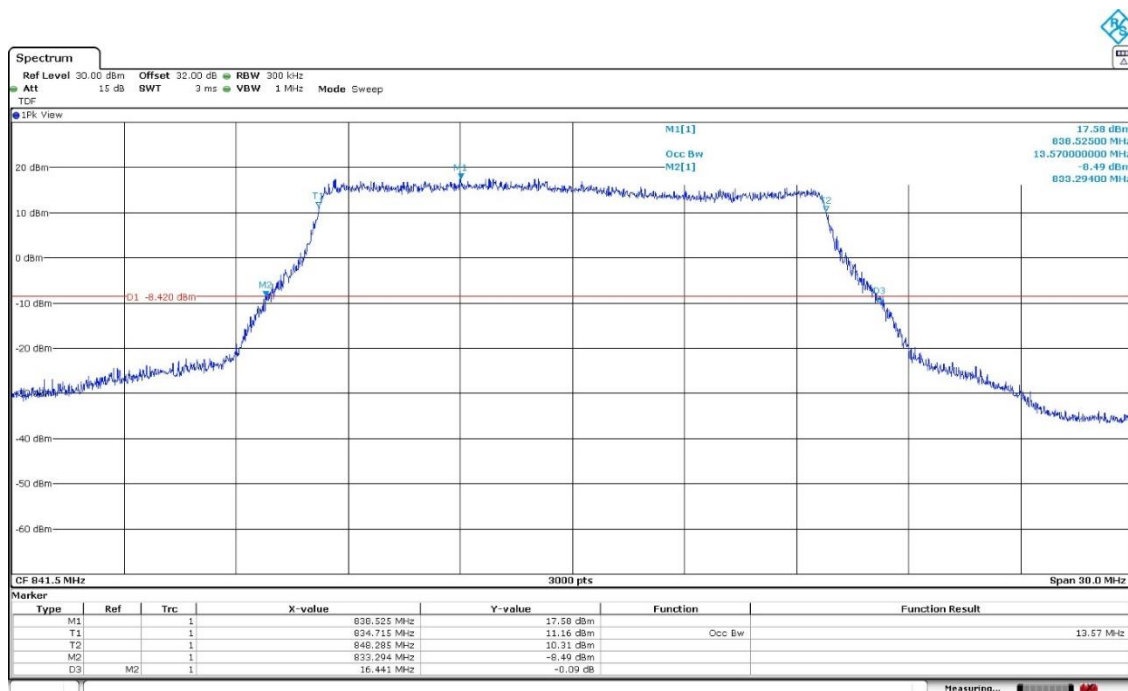
Low Channel:



Middle Channel:

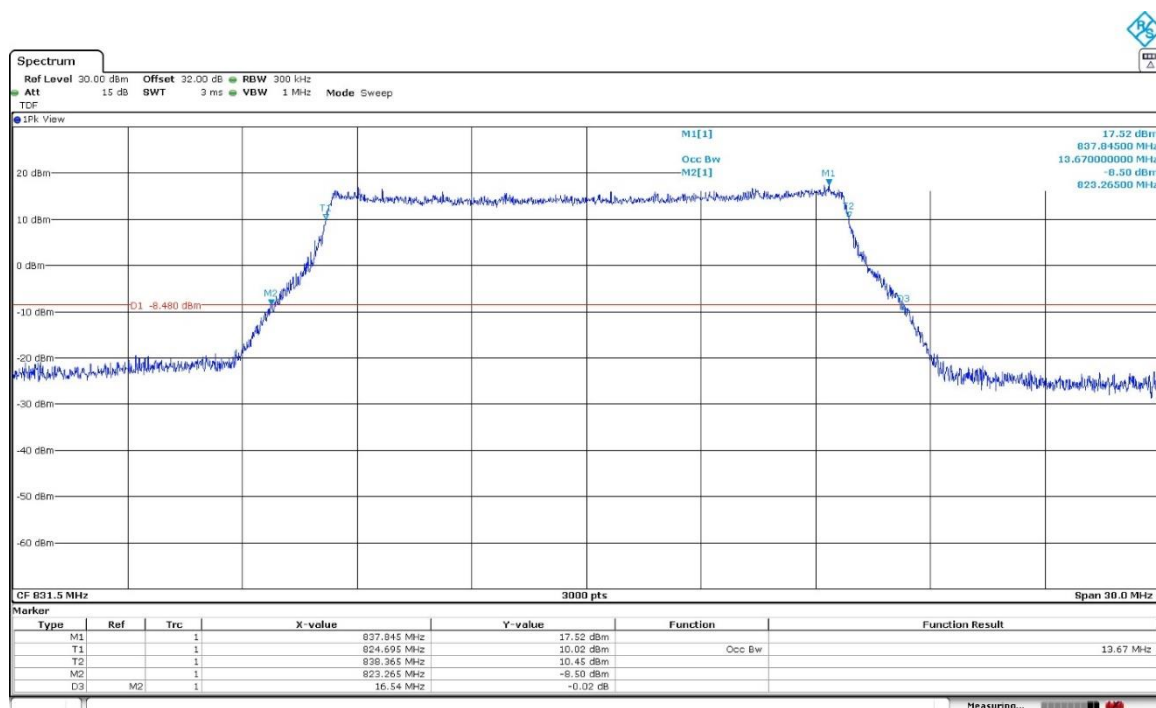


High Channel:

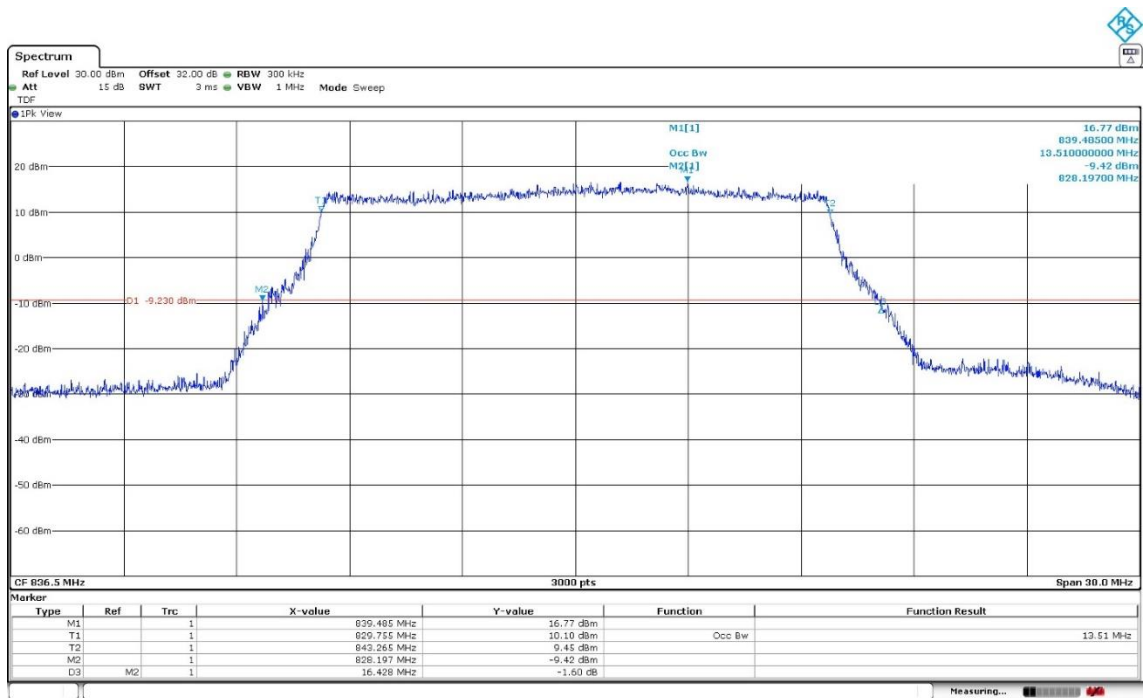


LTE Cat-4 Band 26. BW=15 MHz. 16QAM. RB Size=All.

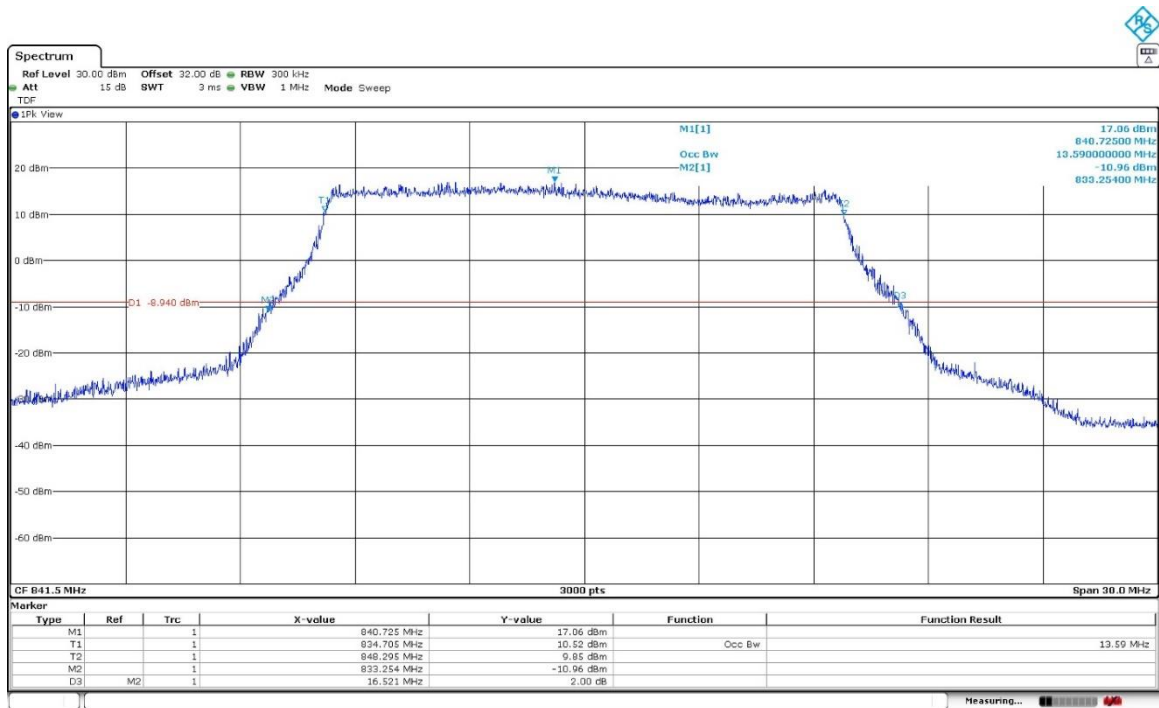
Low Channel:



Middle Channel:



High Channel:



Spurious emissions at antenna terminals

Limits

FCC §2.1051 and §22.917. RSS-132 Clause 5.5.

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.

In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater.
In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

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

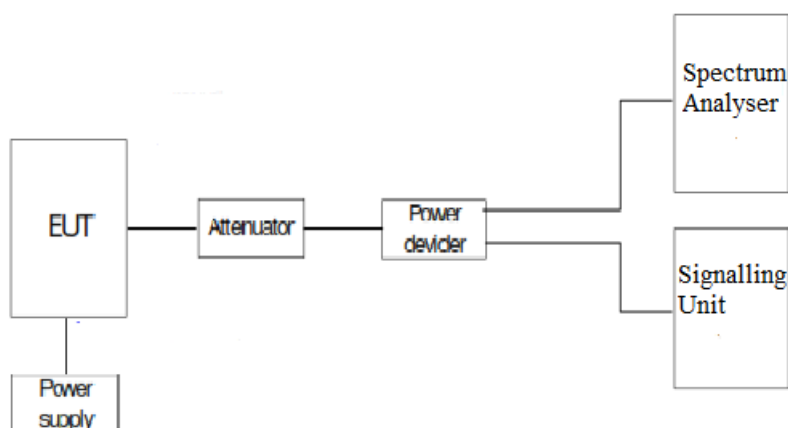
The EUT RF output connector was connected to a spectrum analyser and to the Universal Radio Communication tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-Ohm attenuator and a power divider.

The spectrum was investigated from 9 kHz to 10 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 Cat-4 Band 26:

A preliminary scan determined the worst-case:

BW=5 MHz. QPSK. RB Size=1. RB Offset=24.

The next results are for this worst-case configuration.

Frequency range 9 KHz - 10 GHz:

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

Spurious frequency (MHz)	P (dBm)
1677.531250	-32.82

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

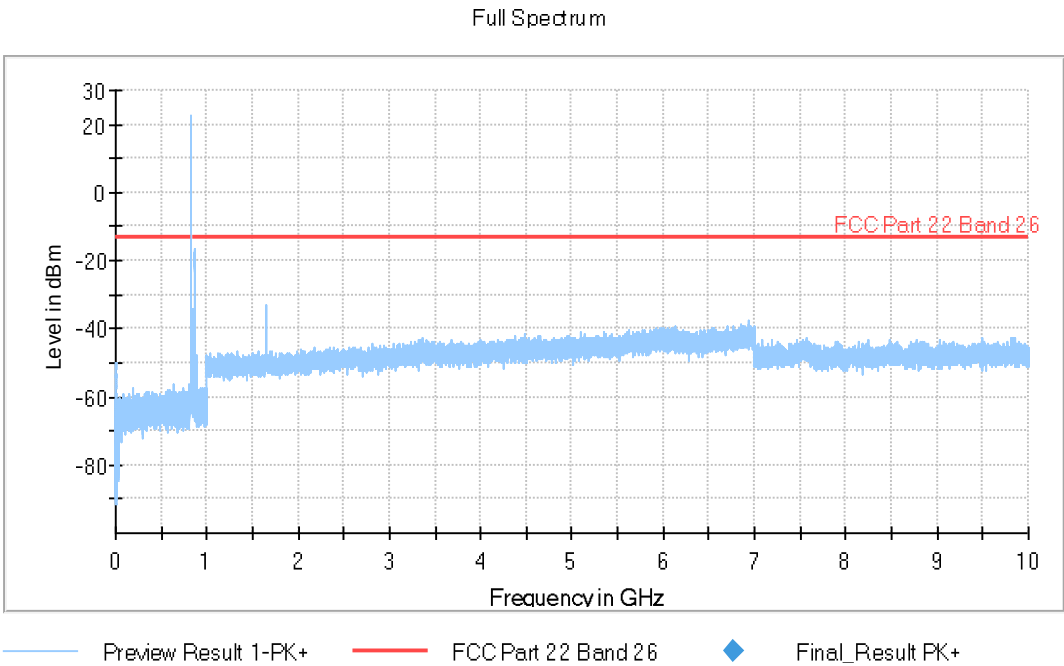
Measurement uncertainty (dB): $<\pm 2.76$

Verdict: PASS

LTE Cat-4 Band 26: BW=5 MHz. QPSK. RB Size=1. RB Offset=24.

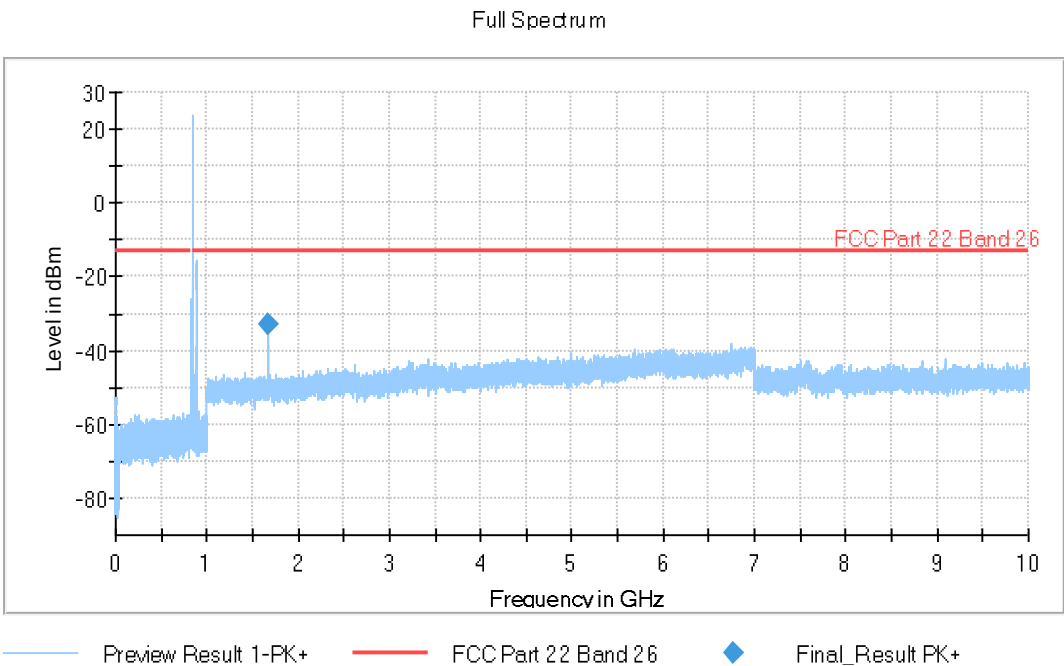
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [FSV 40]					
9 kHz - 150 kHz	14.1 Hz	PK+	300 Hz	Coupled	0 dB
150 kHz - 30 MHz	932.812 Hz	PK+	10 kHz	Coupled	0 dB
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 10 GHz	281.25 kHz	PK+	1 MHz	Coupled	0 dB

Low Channel:



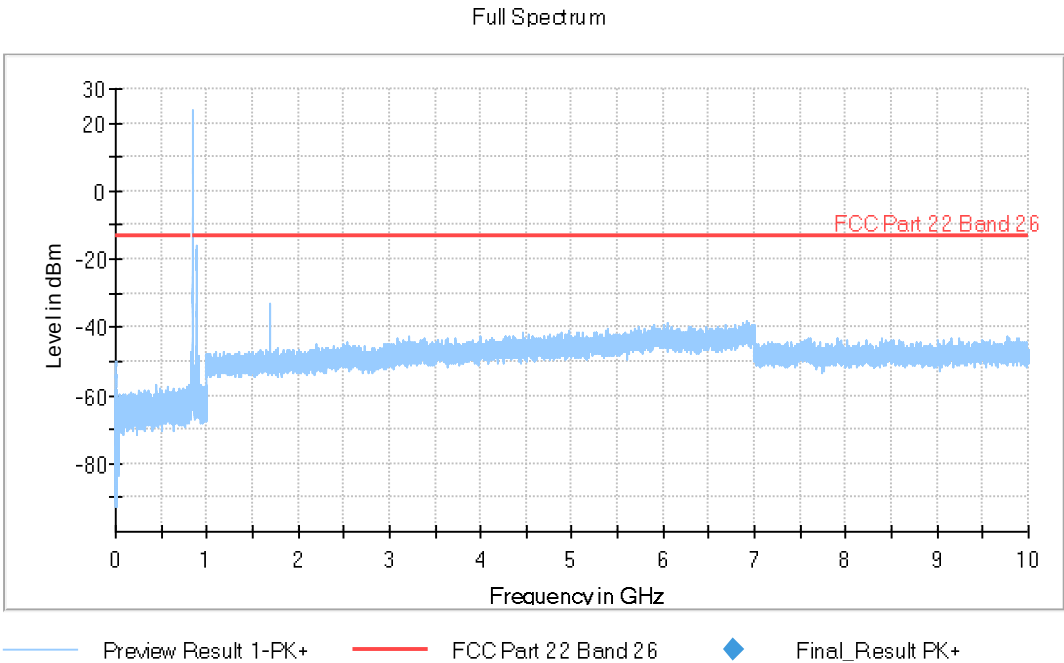
The peak above the limit is the carrier frequency.

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

Limits

FCC § 2.1051 and § 22.917:

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.

Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

RSS-132. Clause 5.5:

Mobile and base station equipment shall comply with the limits below.

In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands, 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).

Method

The EUT RF output connector was connected to a spectrum analyzer 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 path loss of the connection between the output terminal of the EUT and the input of the spectrum analyzer.

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

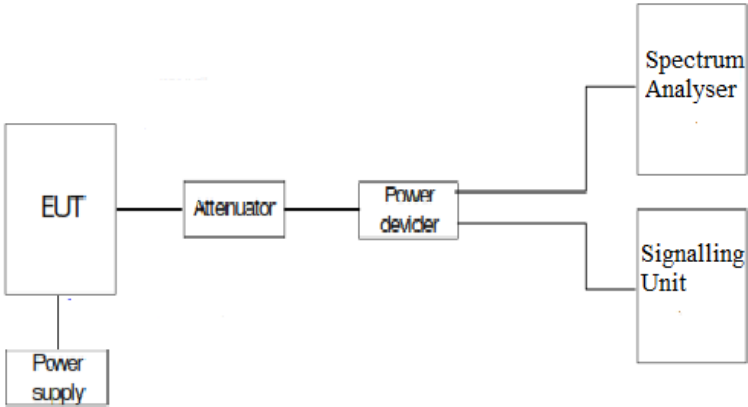
As stated in FCC part 22.917 / RSS-132 Clause 5.5, in the 1 MHz bands immediately outside and adjacent to the frequency block or band a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

Measurement Limit:

At P_o transmitting power, the specified minimum attenuation $43 + 10 \log_{10} p$ (watts) becomes:

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

Test Setup



Results

LTE Cat-4 Band 26:

Preliminary measurements determined QPSK, BW=3 MHz as the worst case.

LTE Cat-4 Band 26. QPSK.	RB=1. Offset=0. BW=1.4 MHz	RB=1. Offset =0. BW = 3 MHz	RB=1. Offset =0. BW=5 MHz	RB=1. Offset =0. BW=10 MHz	RB=1. Offset =0. BW=15 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-21.59	-18.62	-21.84	-27.56	-30.6

LTE Cat-4 Band 26. QPSK.	RB=All. Offset=0. BW=1.4 MHz	RB= All. Offset=0. BW = 3 MHz	RB= All. Offset=0. BW=5 MHz	RB= All. Offset=0. BW=10 MHz	RB= All. Offset=0. BW=15 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-25.26	-23.48	-19.37	-22.71	-25.82

LTE Cat-4 Band 26. QPSK.	RB=1. Offset=Max. BW=1.4 MHz	RB=1. Offset =Max. BW = 3 MHz	RB=1. Offset =Max. BW=5 MHz	RB=1. Offset =Max. BW=10 MHz	RB=1. Offset =Max. BW=15 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-20.61	-18.48	-20.24	-27.49	-30.19

LTE Cat-4 Band 26. QPSK.	RB=All. Offset=0. BW=1.4 MHz	RB= All. Offset=0. BW = 3 MHz	RB= All. Offset=0. BW=5 MHz	RB= All. Offset=0. BW=10 MHz	RB= All. Offset=0. BW=15 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-24.54	-24.42	-19.68	-23.05	-25.63

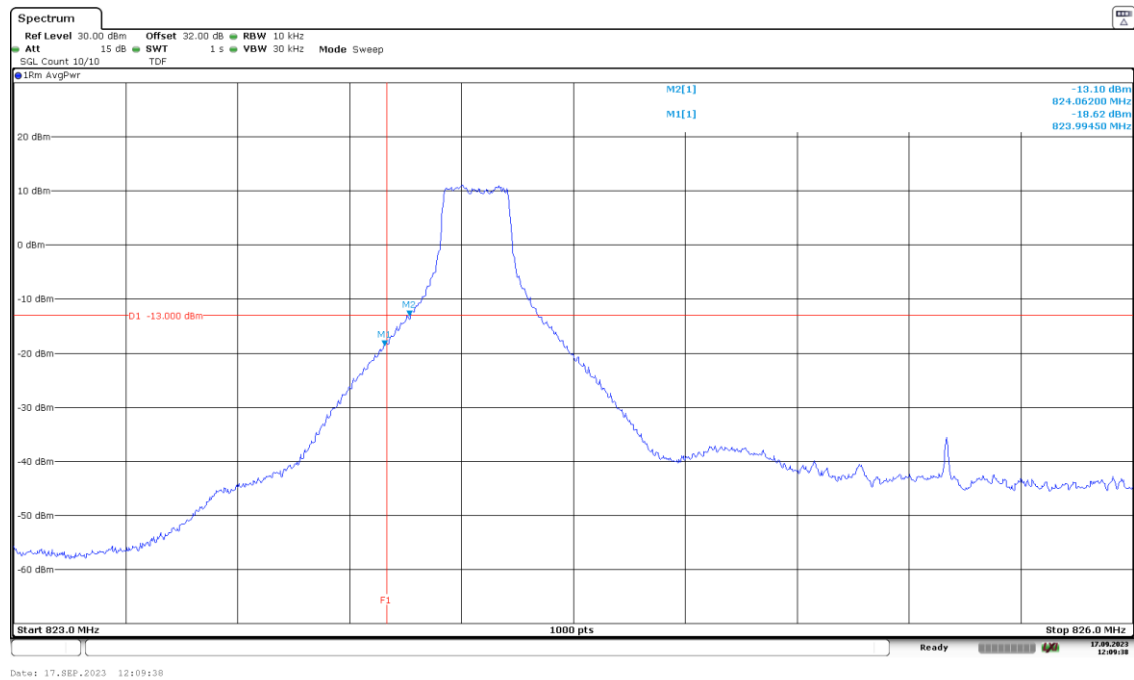
Measurement uncertainty (dB): <±2.76

Verdict

Pass

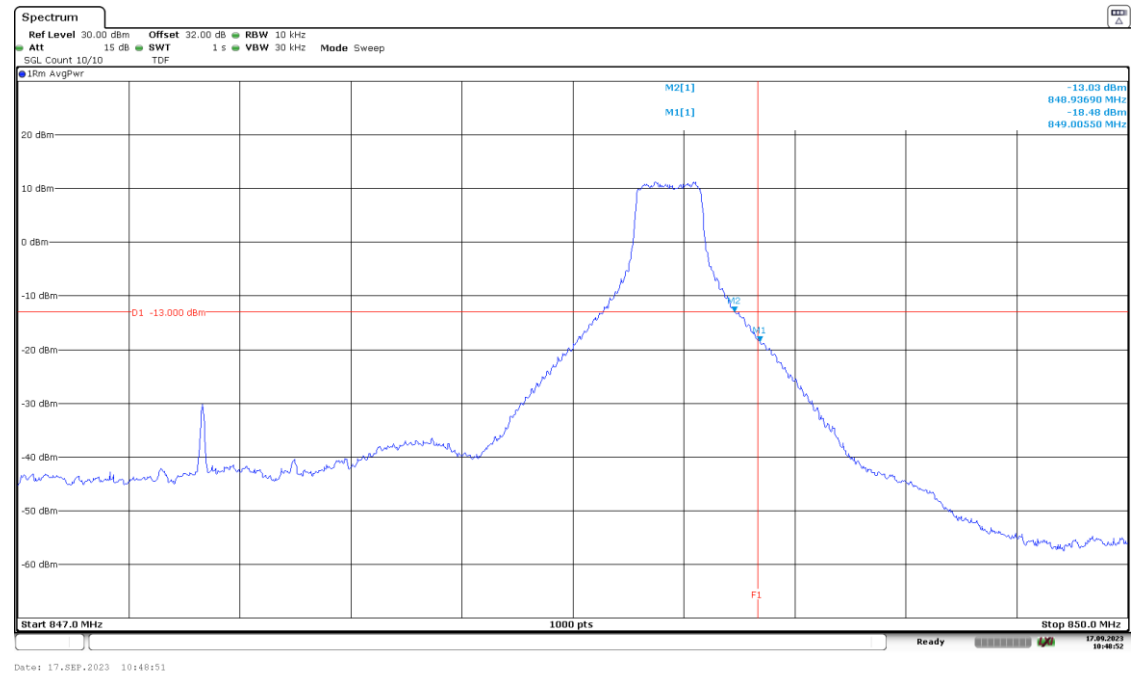
The plots below are for the worst case configuration specified before.

LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size= 1. RB Offset = 0. Low Block Edge:



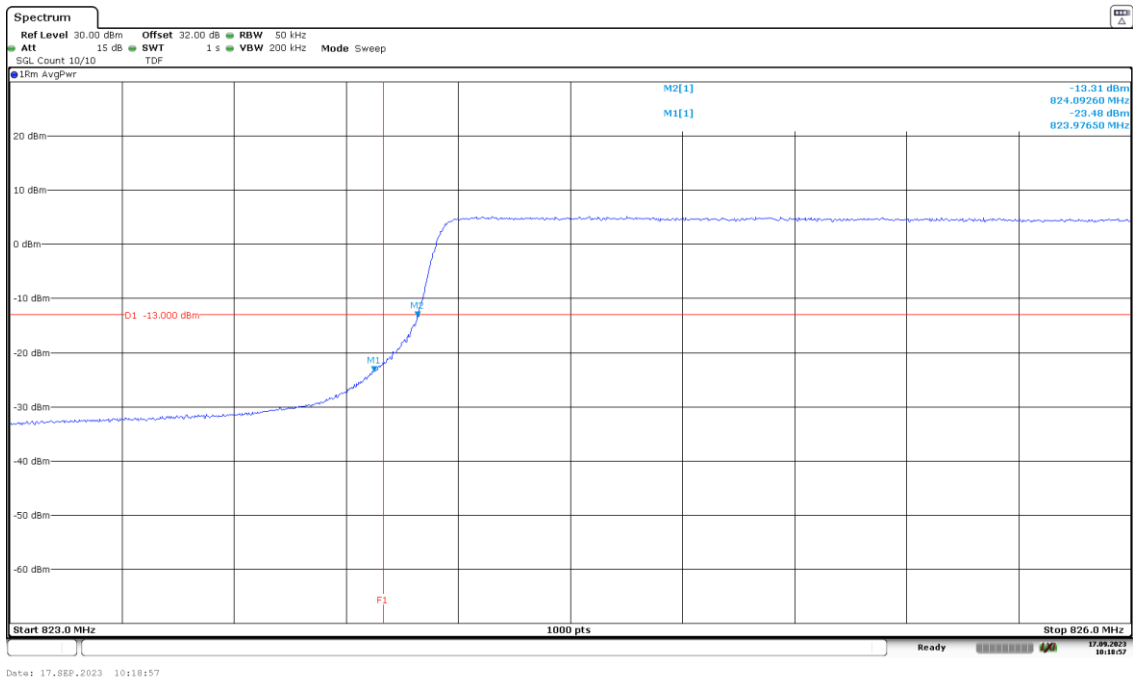
The equipment transmits at the maximum output power.

LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size=1. RB Offset=Max. High Block Edge:



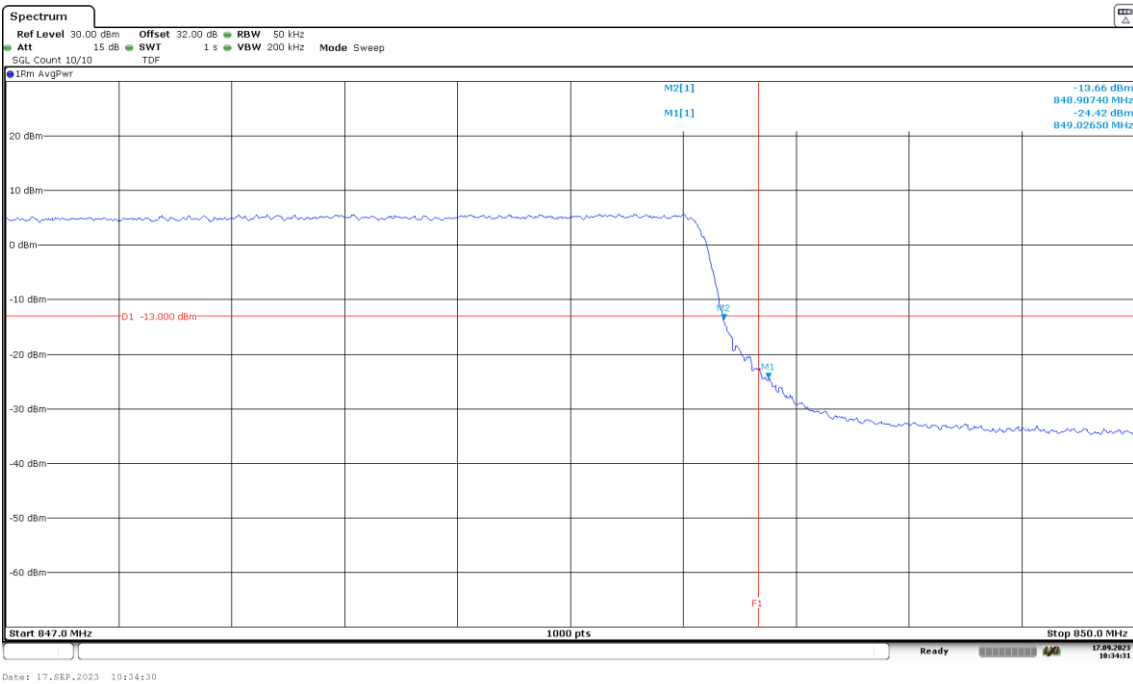
The equipment transmits at the maximum output power.

LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size=All. RB Offset=0. Low Block Edge:



The equipment transmits at the maximum output power.

LTE Cat-4 Band 26. BW=3 MHz. QPSK. RB Size=All. RB Offset=0. High Block Edge:



The equipment transmits at the maximum output power.

Verdict: PASS

Radiated emissions

Limits

- * FCC §2.1051 and §22.917: 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. 5.5: Mobile and base station equipment shall comply with the limits in (i) and (ii) below.
- 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).
 - 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 HIGH frequency generated within the equipment.

The EUT was placed on a 80 centimeters high non-conductive stand at a 3 meter distance from the measuring antenna.

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

Measurement Limit:

According to specification, 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.

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

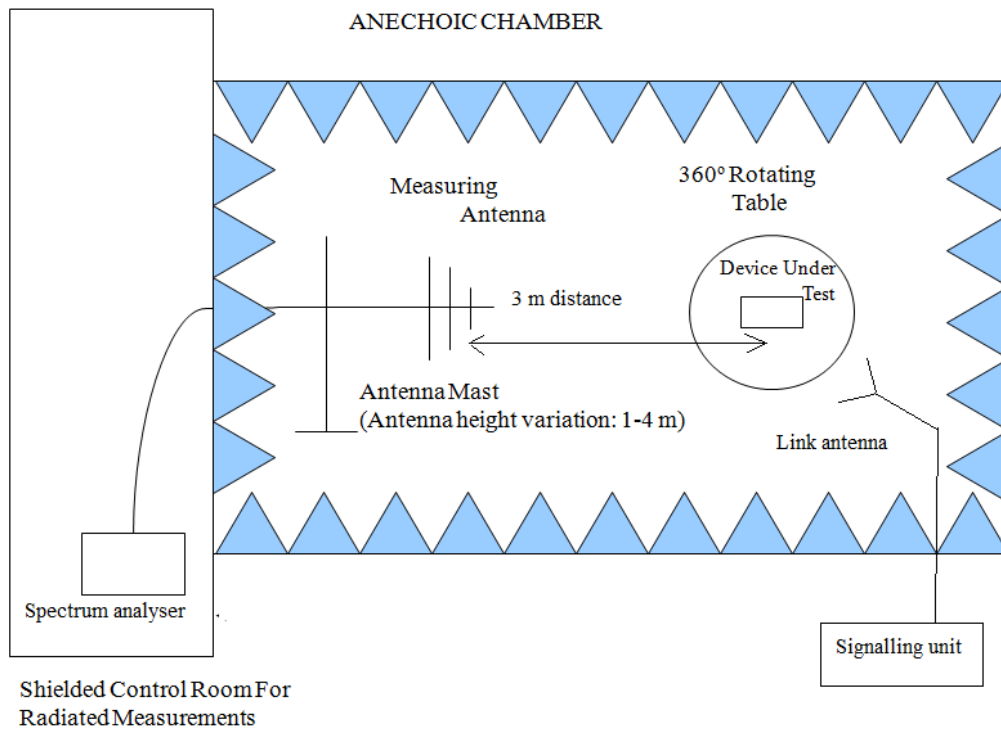
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

The maximum field strength (dBμV/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:

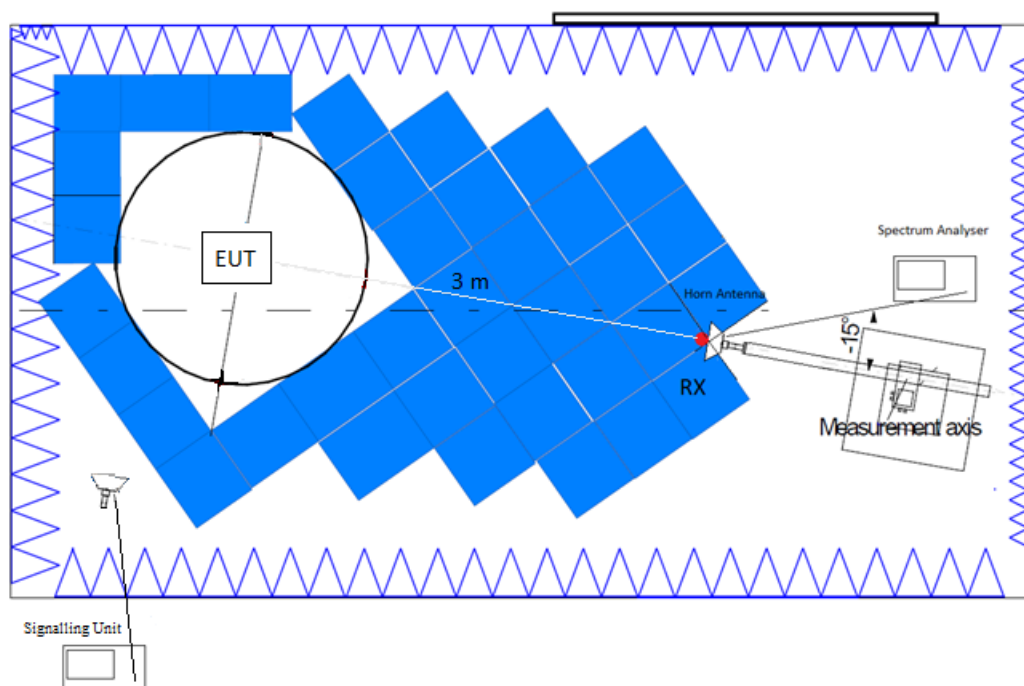
$EIRP \text{ (dBm)} = E \text{ (dBμV/m)} + 20 \log(D) - 104.8$; where D is the measurement distance (in the far field region) in m. $D = 3 \text{ m}$

Test Setup

Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz:



Results

LTE Cat-4 Band 26:

A preliminary scan determined the BW=5 MHz, QPSK, RB Size=1, RB Offset=24 as the worst case. The following results are for this worst-case configuration.

- LOW CHANNEL:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 10 GHz:

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

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 10 GHz:

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

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 10 GHz:

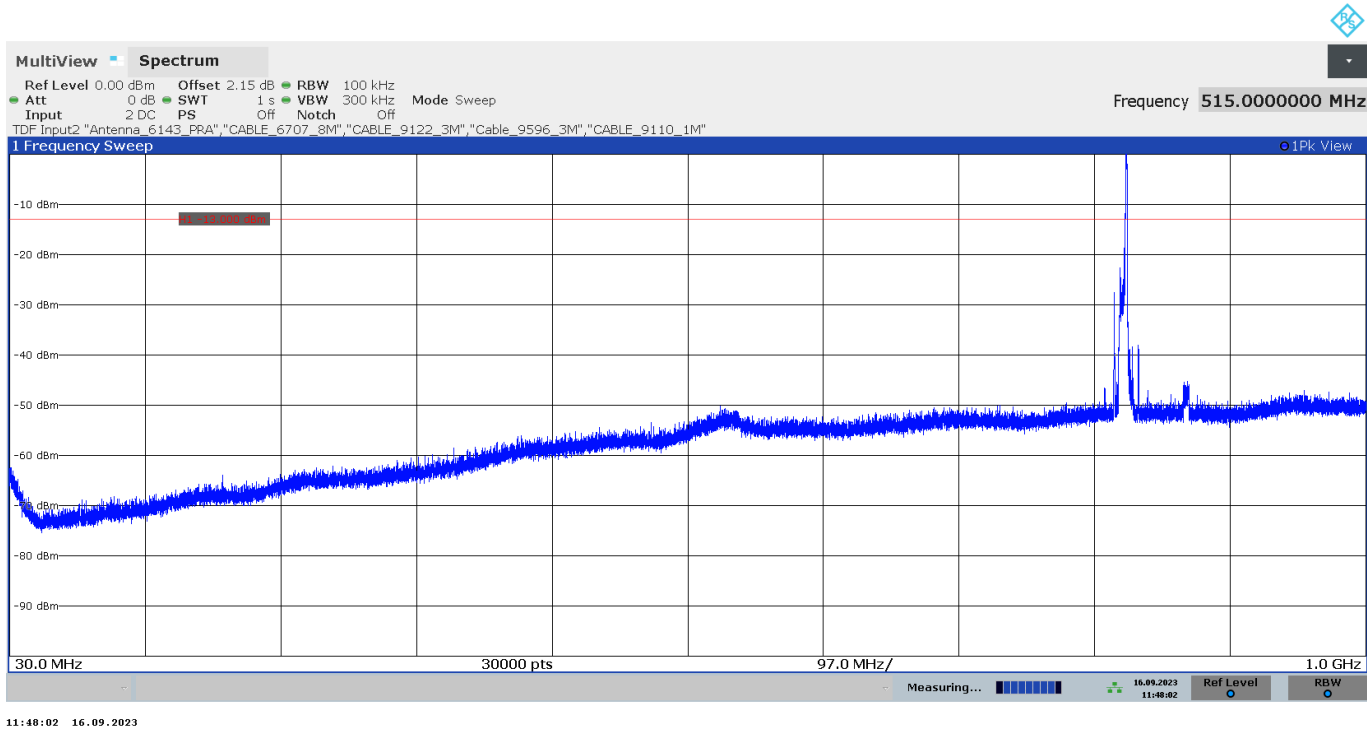
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB): $<\pm 5.03$ for $f \geq 30$ MHz up to 1 GHz
 $<\pm 4.32$ for $f \geq 1$ GHz up to 8.5 GHz

Verdict: PASS

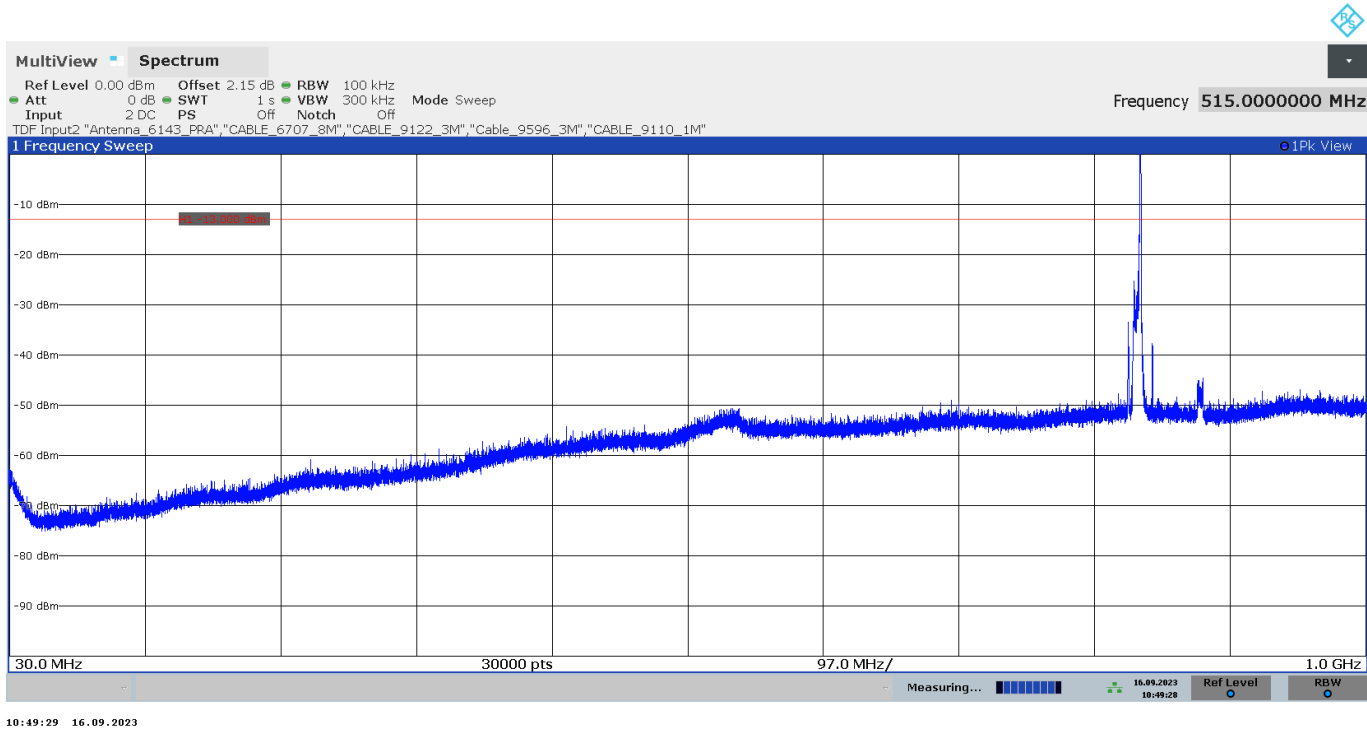
FREQUENCY RANGE 30 MHz - 1 GHz:

- LOW CHANNEL:



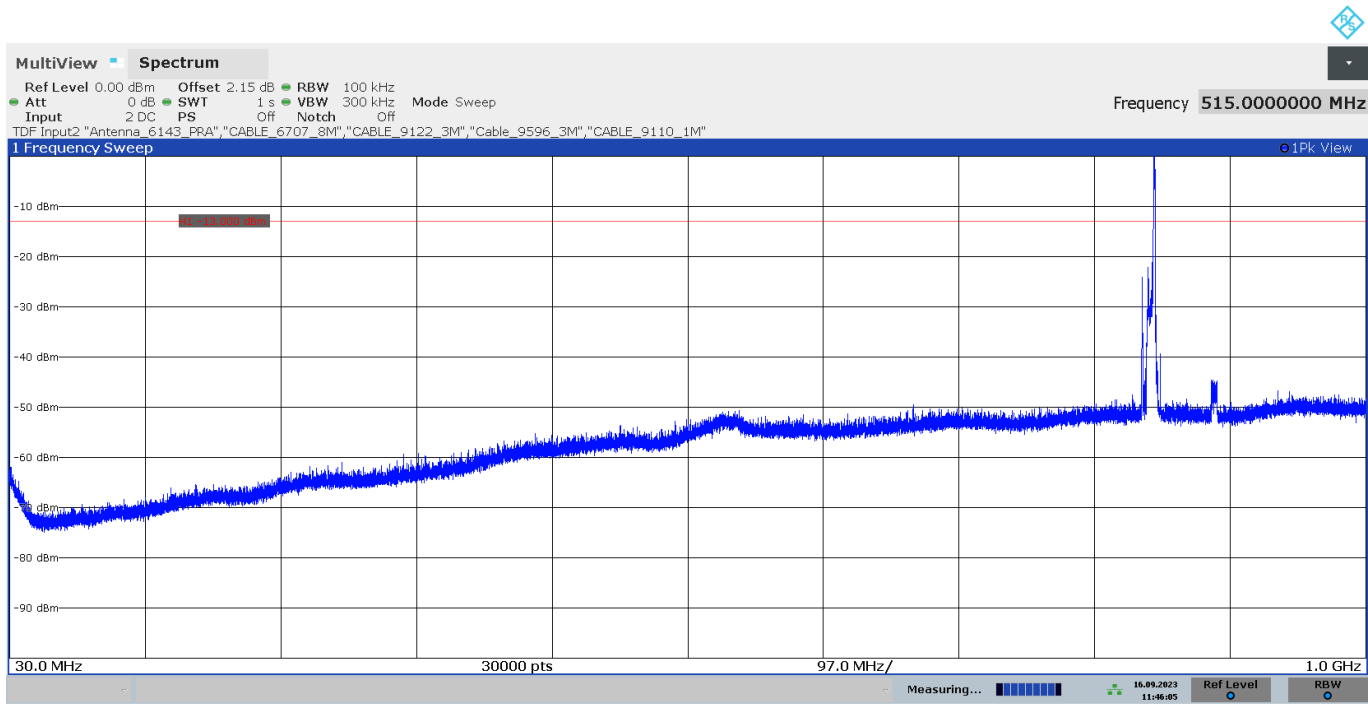
The peak above the limit is the carrier frequency.

- MIDDLE CHANNEL:



The peak above the limit is the carrier frequency.

- HIGH CHANNEL:

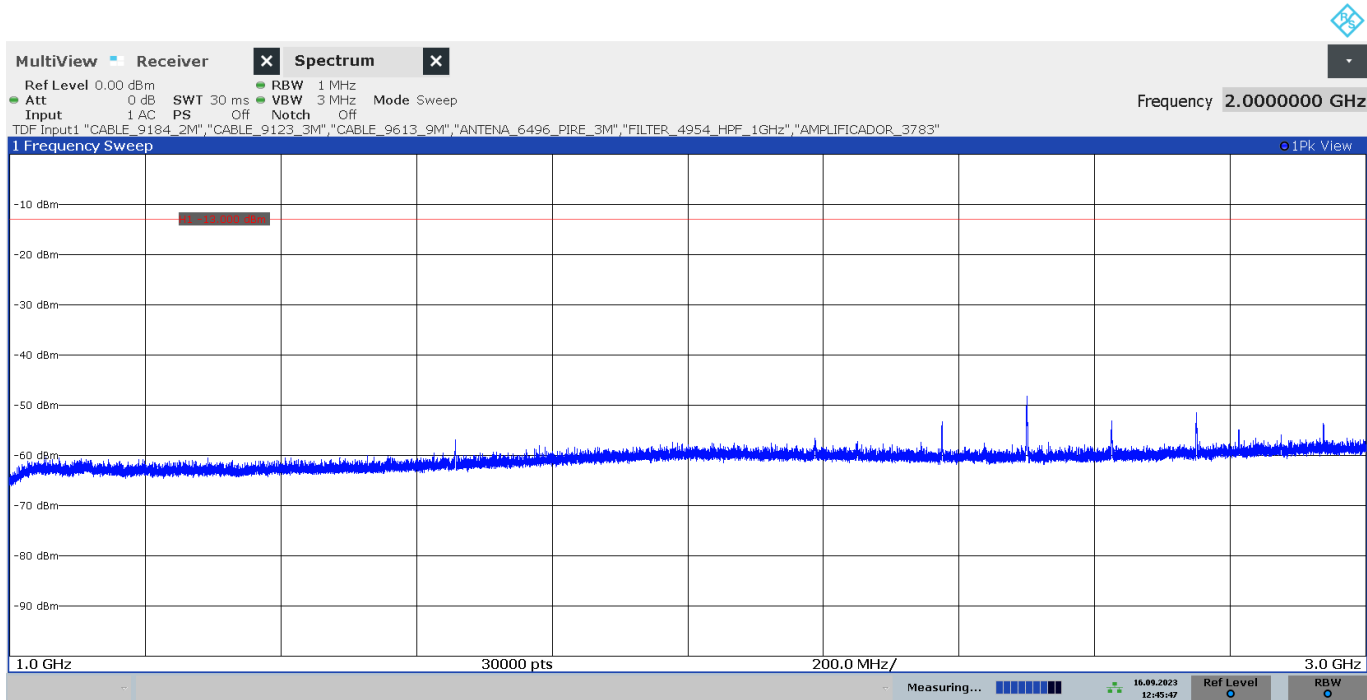


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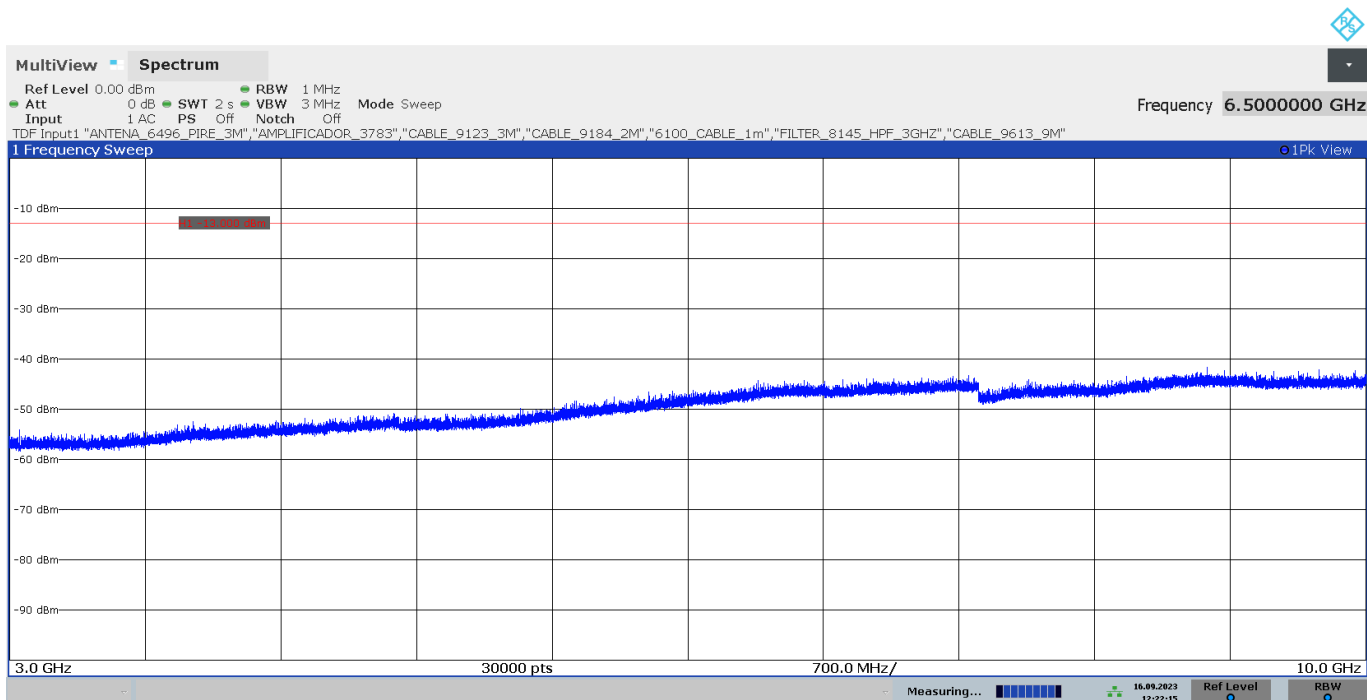
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 - 10 GHz:

- LOW CHANNEL:

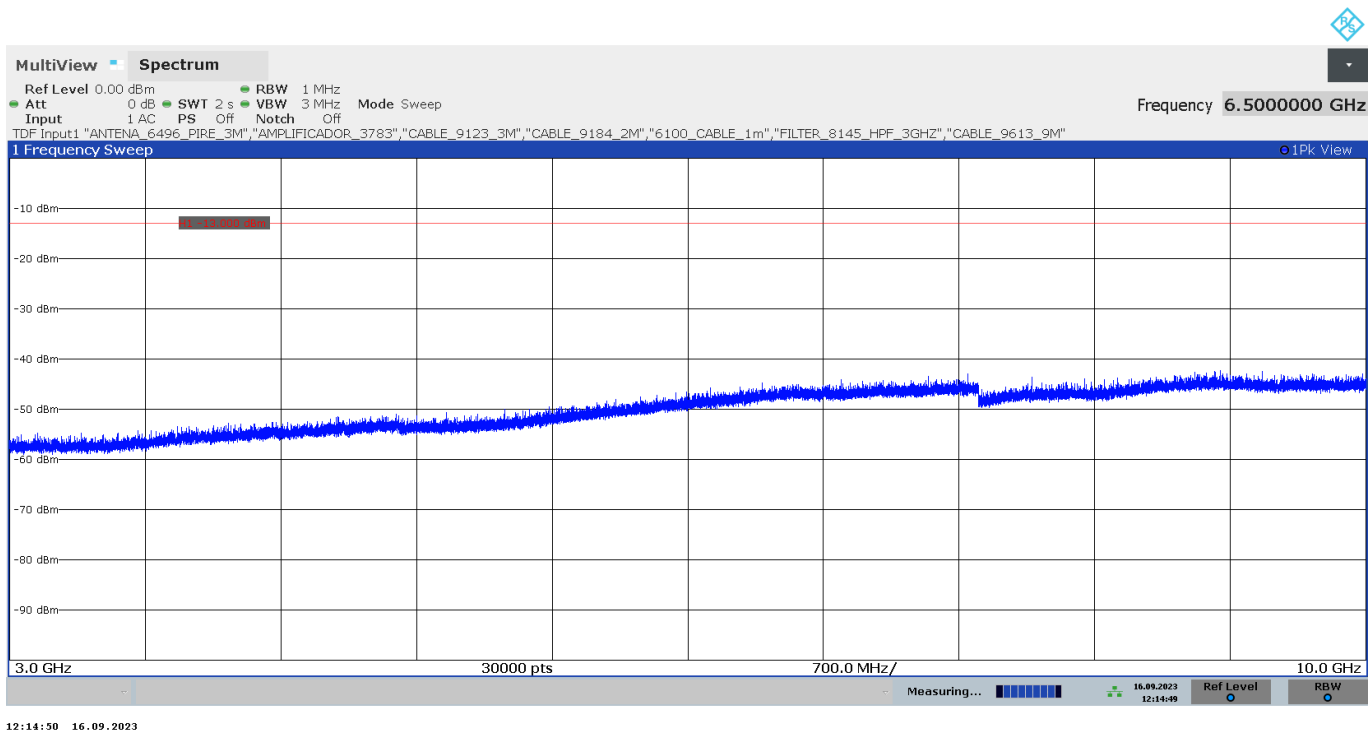
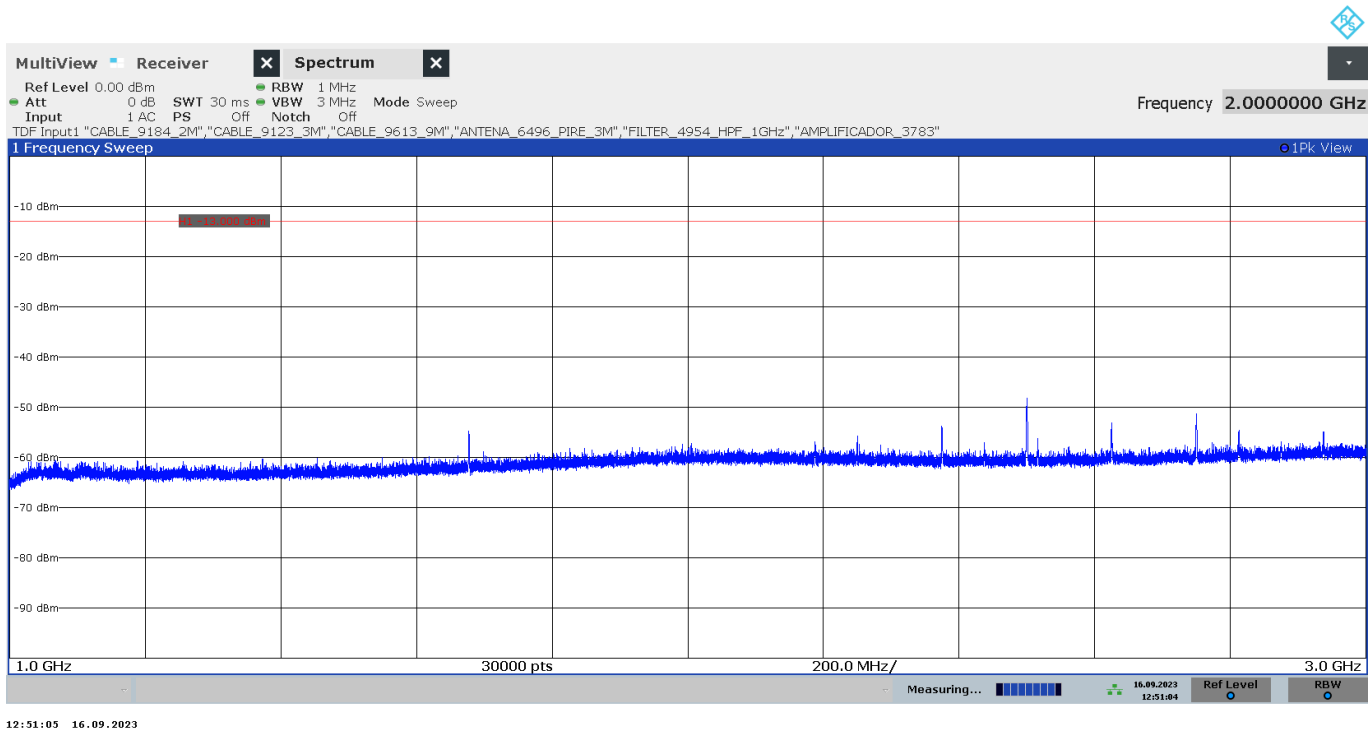


12:45:48 16.09.2023



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- MIDDLE CHANNEL:



- HIGH CHANNEL:

