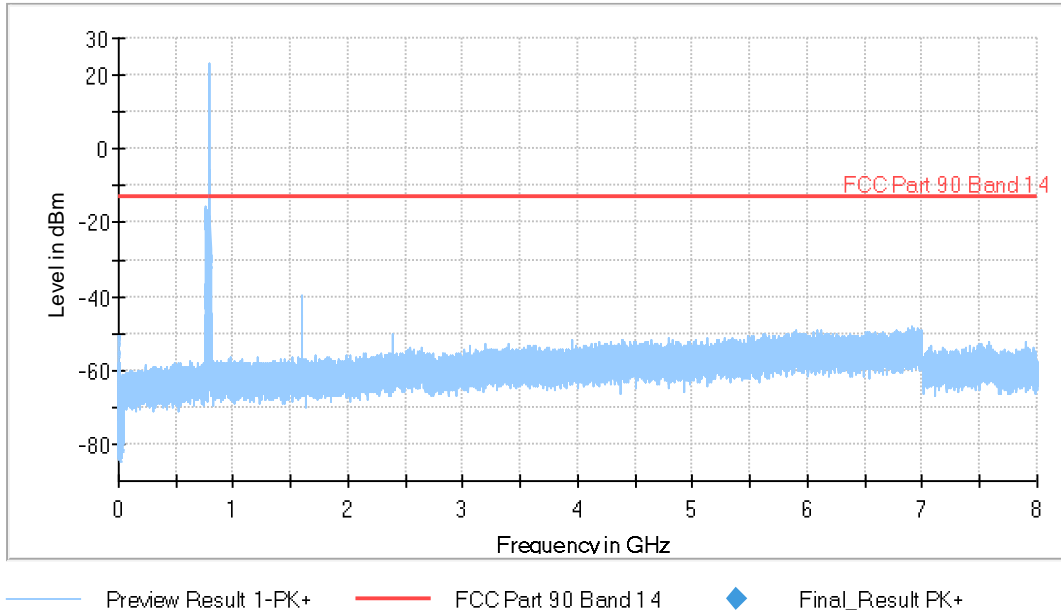
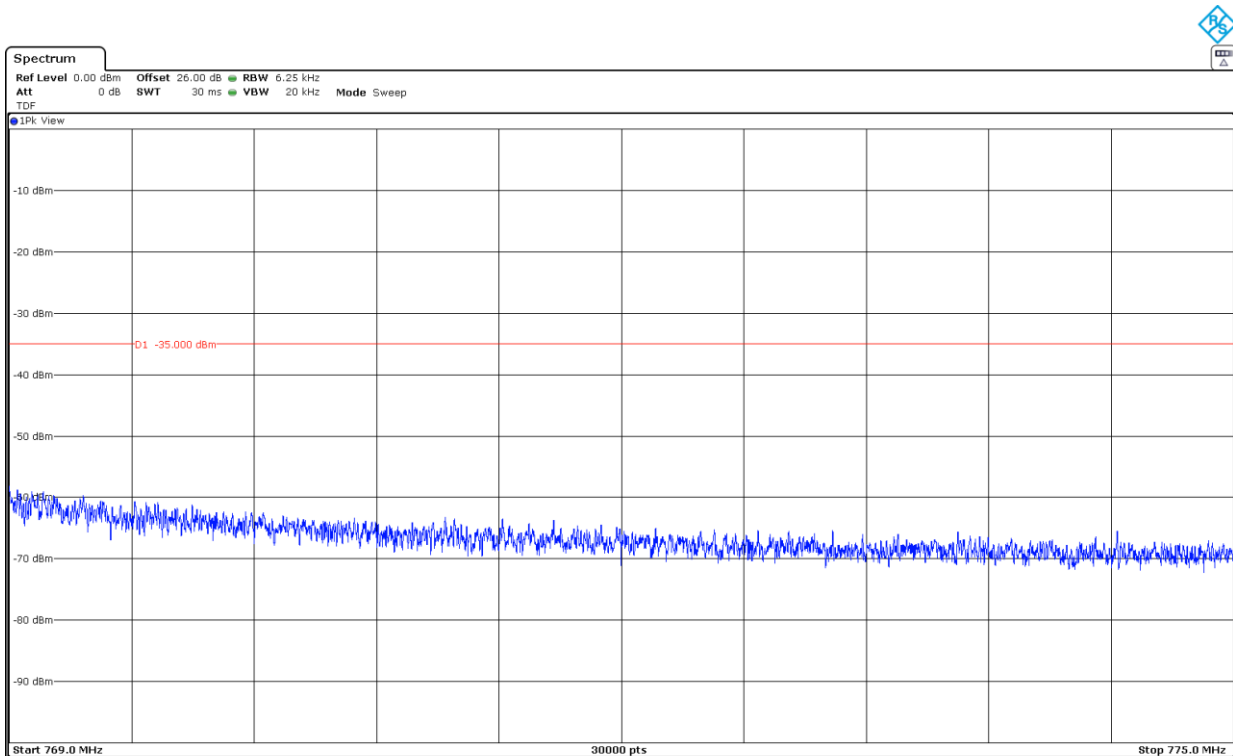


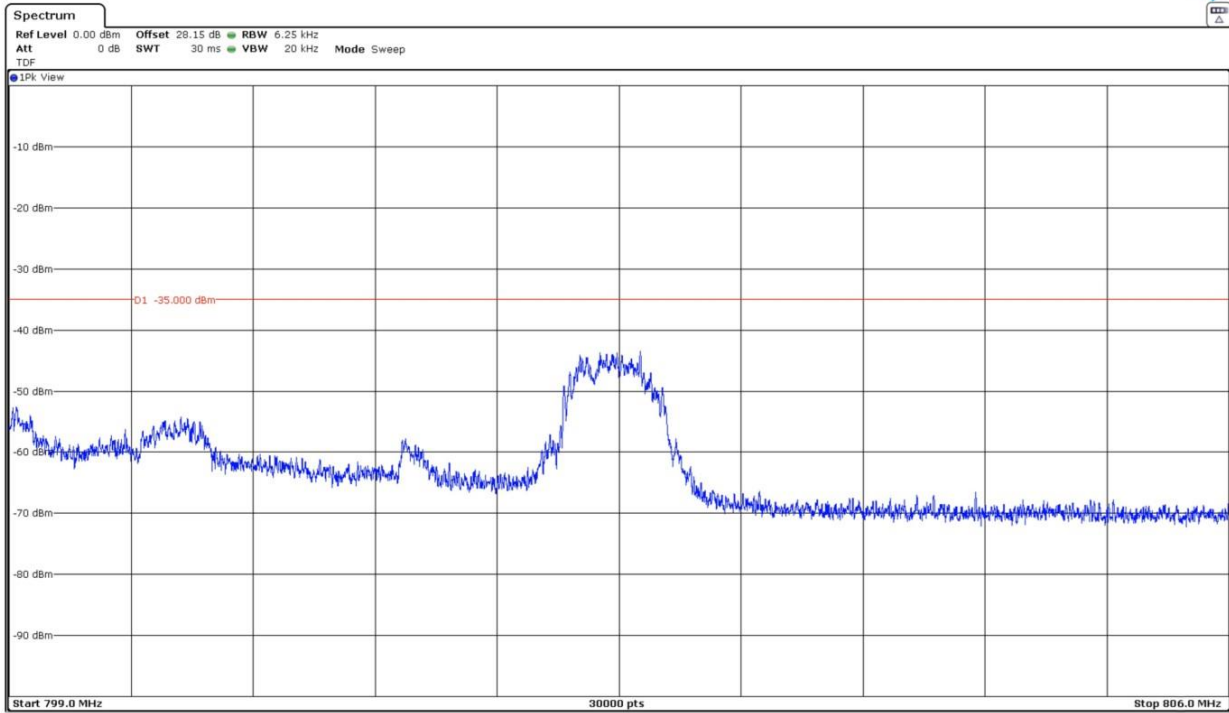
High Channel:

Full Spectrum



The peak above the limit is the carrier frequency.





**LTE Cat-4 Band 26. Sub-band 814-824 MHz:** BW = 5 MHz. QPSK. RB Size=1. RB Offset=24.

**Frequency range 9 KHz - 10 GHz:**

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

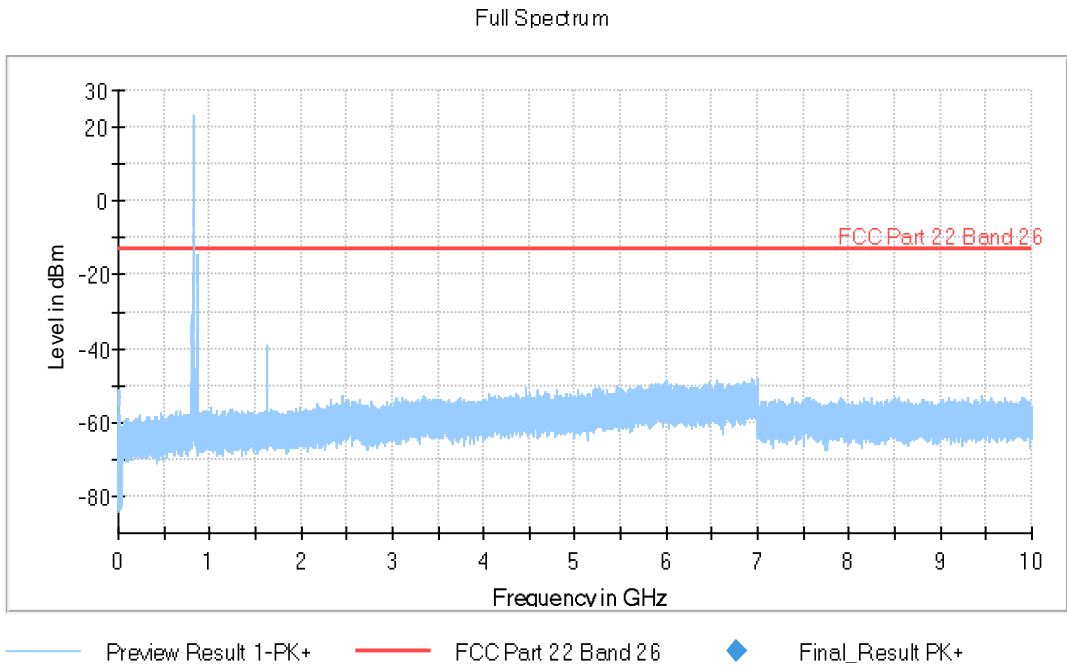
***Verdict***

PASS

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

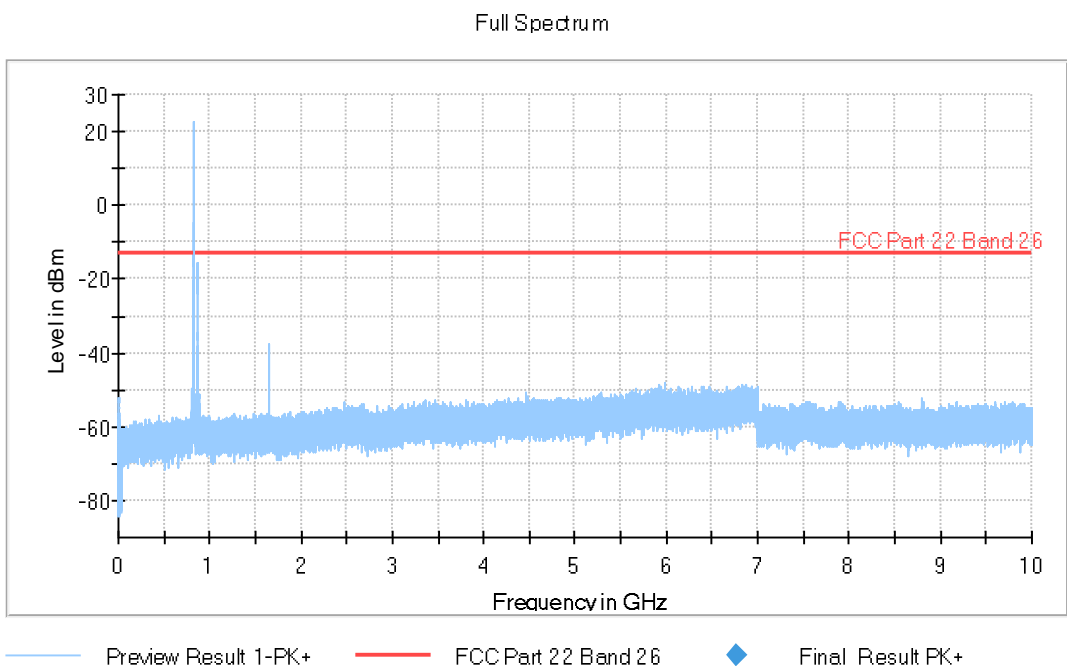
**LTE Cat-4 Band 26. Sub-band 814-824 MHz:** BW = 5 MHz. QPSK. RB Size=1. RB Offset=24.

Low Channel:



The peak above the limit is the carrier frequency.

High Channel:



The peak above the limit is the carrier frequency.

**LTE Cat-4 Band 26. Cross-rule Channel 824 MHz:** BW = 15 MHz. QPSK. RB Size=1. RB Offset=37.

**Frequency range 9 KHz - 10 GHz:**

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

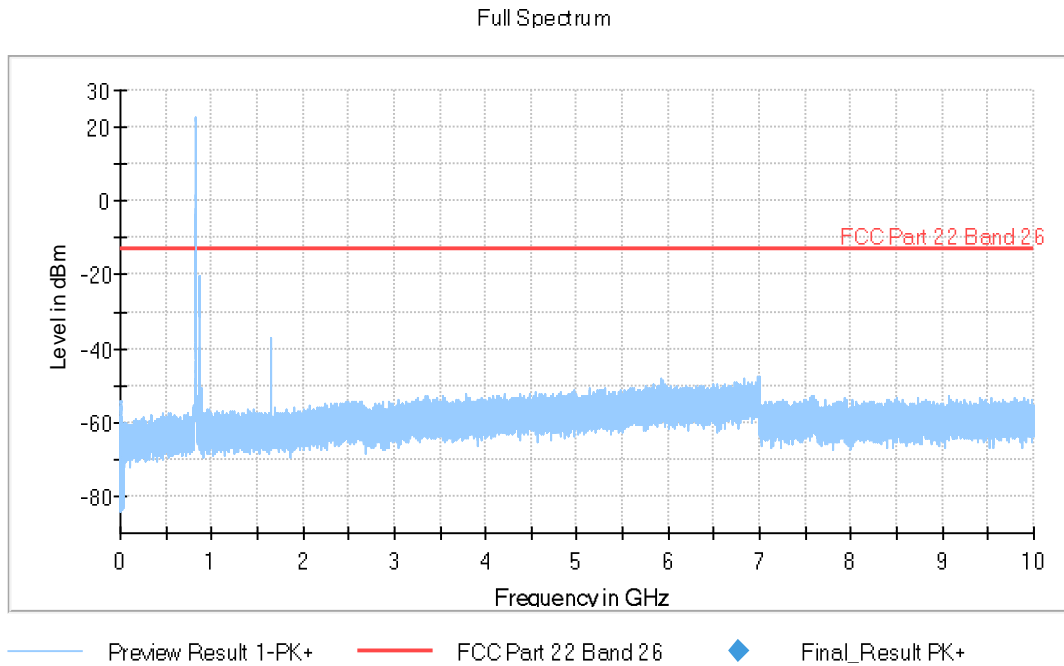
***Verdict***

PASS

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

**LTE Cat-4 Band 26. Cross-rule Channel 824 MHz:** BW = 15 MHz. QPSK. RB Size=1. RB Offset=37.

Single Channel:



The peak above the limit is the carrier frequency.

## Spurious Emissions at Antenna Terminals at Block Edges

### Limits

#### 1. LTE Cat-4 Band 14:

\* FCC § 90.543 (e) (2) (3) & (5):

Transmitters operating in 758-768 MHz and 788-798 MHz bands must meet the emission limitations in (e) of this section.

(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $76 + 10 \log(P)$  dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $65 + 10 \log(P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log(P)$  dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

\* RSS-140 Clause 4.4:

The power of any unwanted emission outside the band 788-798 MHz shall be attenuated below the Transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

- a. For any frequency between 769-775 MHz and 799-806 MHz:
  - i.  $76 + 10 \log(p)$ , dB in a 6.25 kHz band for fixed and base station equipment
  - ii.  $65 + 10 \log(p)$ , dB in a 6.25 kHz band for mobile and portable/hand-held equipment
- b. For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz:  $43 + 10 \log(p)$ , dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

#### 2. LTE Cat-4 Band 26:

\* FCC § 90.691:

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

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

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 +$



$10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where  $f$  is the frequency removed from the center of the outer channel in the block in kilohertz and where  $f$  is greater than 37.5 kHz.

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

### Method

The 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 § 90.543, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

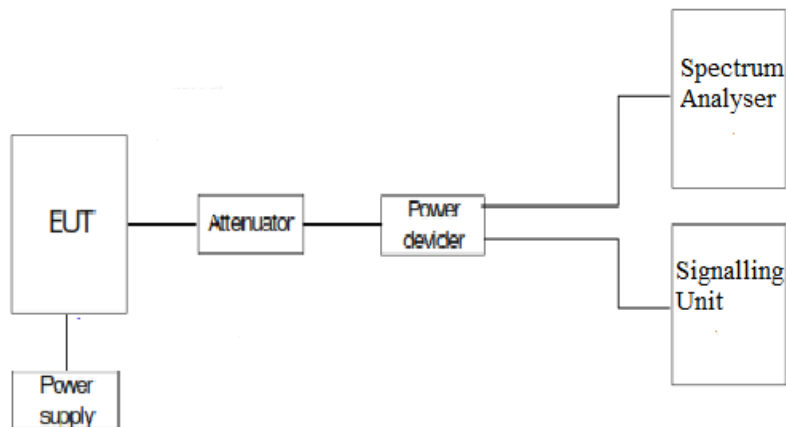
As stated in RSS-140, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

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 14:**

Preliminary measurements determined QPSK, BW=5 MHz as the worst case.

LTE Cat-4 Band 14. QPSK.	RB=1. Offset=0. BW=5 MHz	RB=1. Offset=0. BW=10 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-14.46	-21

LTE Cat-4 Band 14. QPSK.	RB=All. Offset=0. BW=5 MHz	RB=All. Offset=0. BW=10 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-21.24	-26.77

LTE Cat-4 Band 14. QPSK.	RB=1. Offset=Max. BW=5 MHz	RB=1. Offset=Max. BW=10 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-15.17	-21.68

LTE Cat-4 Band 14. QPSK.	RB=All. Offset=0. BW=5 MHz	RB=All. Offset=0. BW=10 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-21.96	-27.26

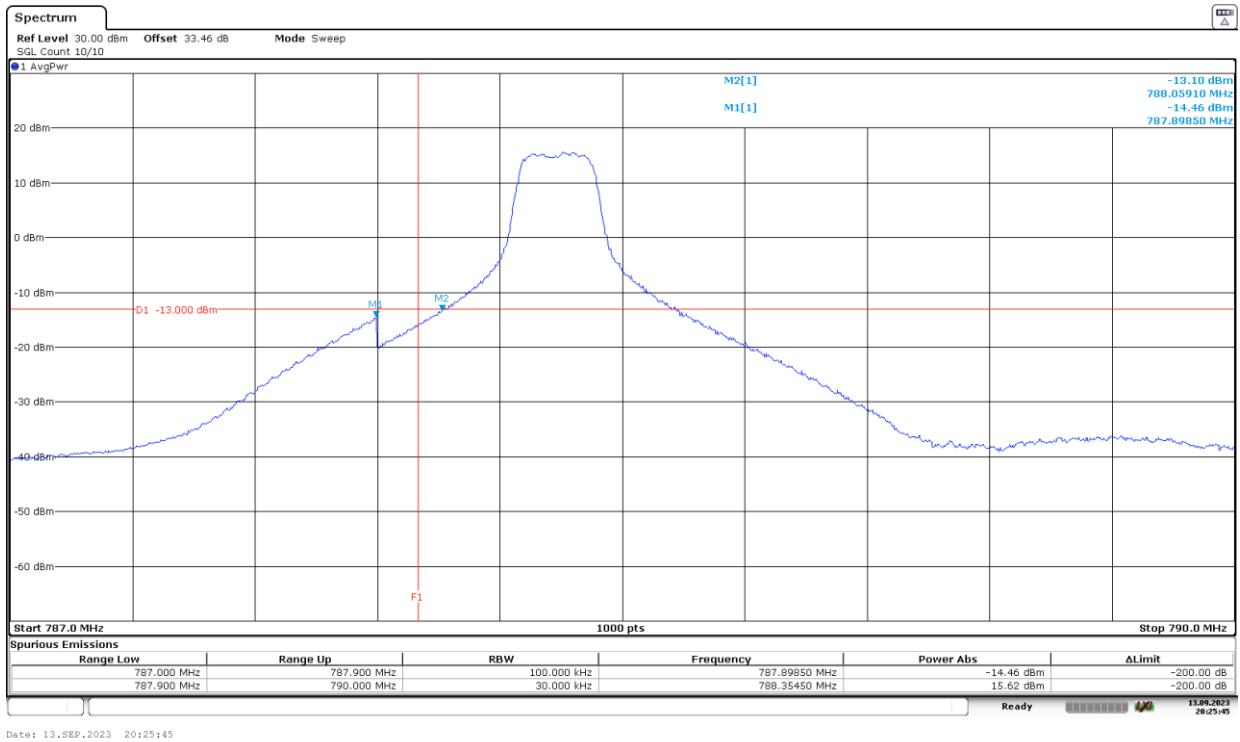
Measurement uncertainty (dB): <math>\pm 2.76</math>

**Verdict**

Pass

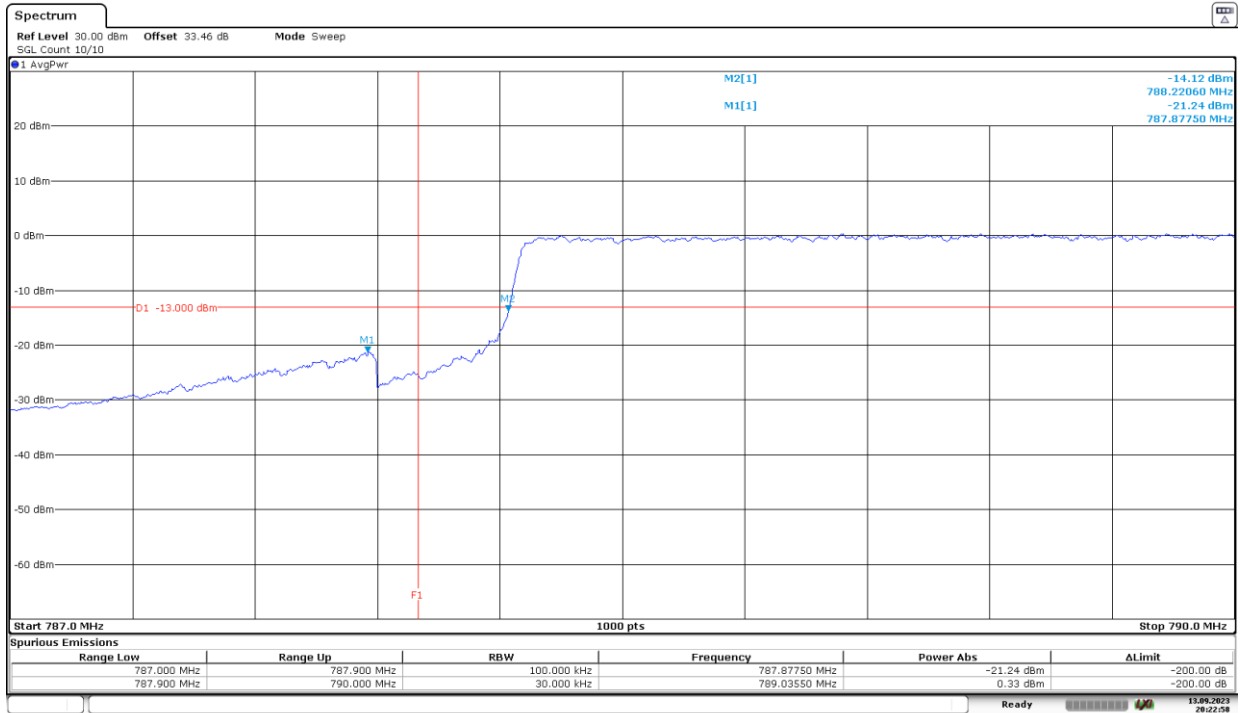
The plots below are for the worst case configuration specified before.

**LTE Cat-4 Band 14: BW=5 MHz. QPSK. RB Size=1. RB Offset=0. Low Block Edge:**



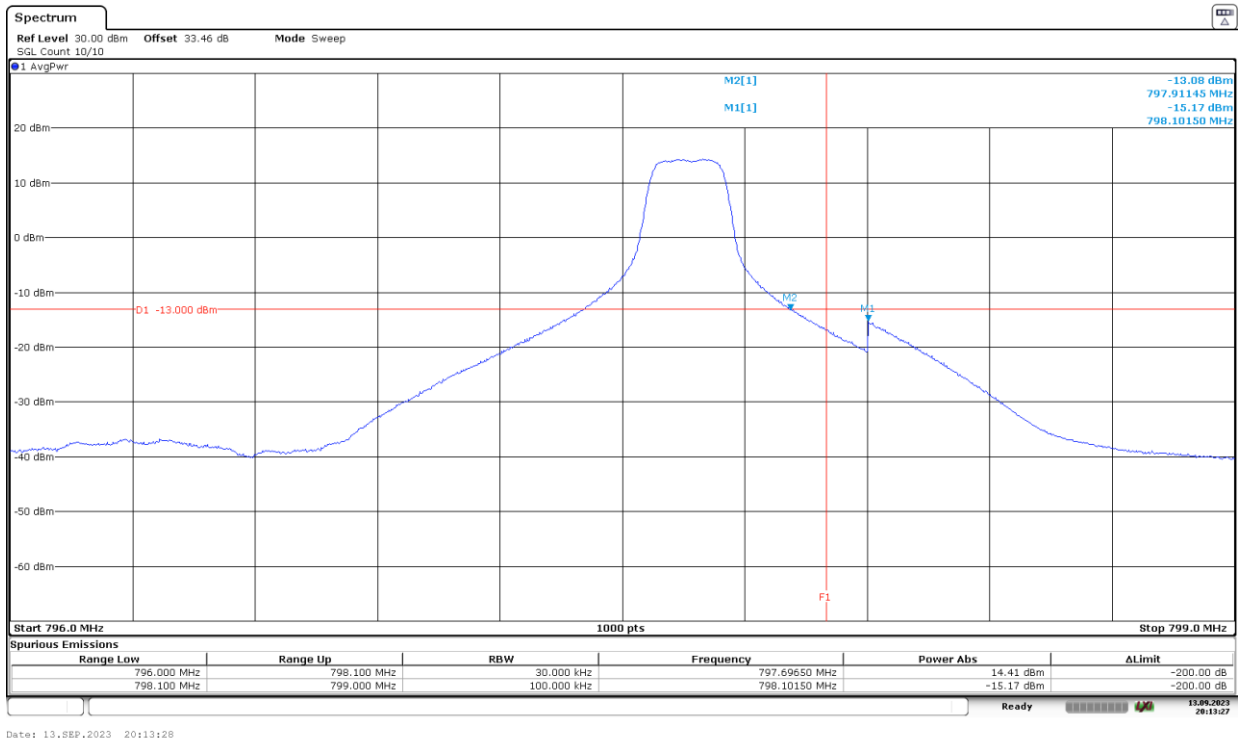
Date: 13.SEP.2023 20:25:45

**LTE Cat-4 Band 14: BW=5 MHz. QPSK. RB Size=All. RB Offset=0. Low Block Edge:**

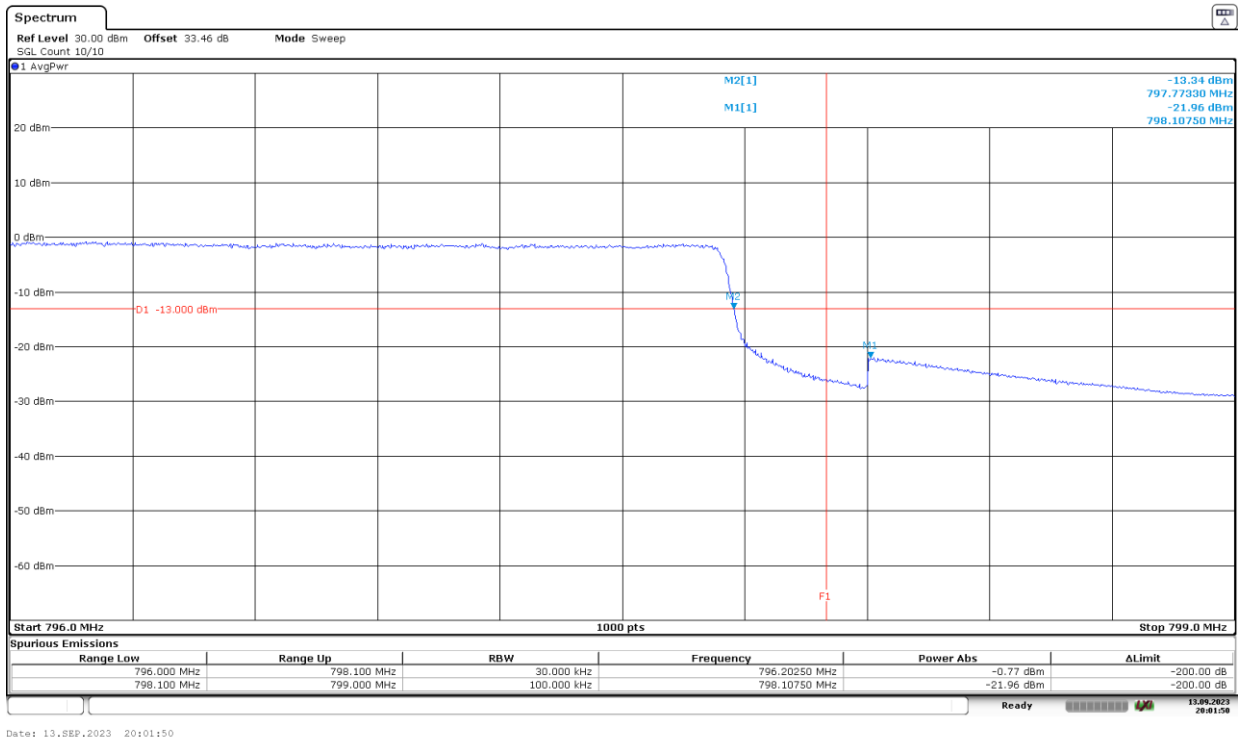


Date: 13.SEP.2023 20:22:59

**LTE Cat-4 Band 14: BW=5 MHz. QPSK. RB Size=1. RB Offset=Max. High Block Edge:**



**LTE Cat-4 Band 14: BW=5 MHz. QPSK. RB Size=All. RB Offset=0. High Block Edge:**



**LTE Cat-4 Band 26. Sub-band 814-824 MHz:**

Preliminary measurements determined the BW=5 MHz, QPSK as the worst case.

LTE Cat-4 Band 26. 16QAM.	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
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-18.96	-14.01	-13.98	-20.49

LTE Cat-4 Band 26. 16QAM.	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
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-25.04	-25.46	-21.48	-28.65

LTE Cat-4 Band 26. 16QAM.	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
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-17.49	-13.7	-13.5	-20.37

LTE Cat-4 Band 26. 16QAM.	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
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-23.12	-24.61	-21.52	-27.13

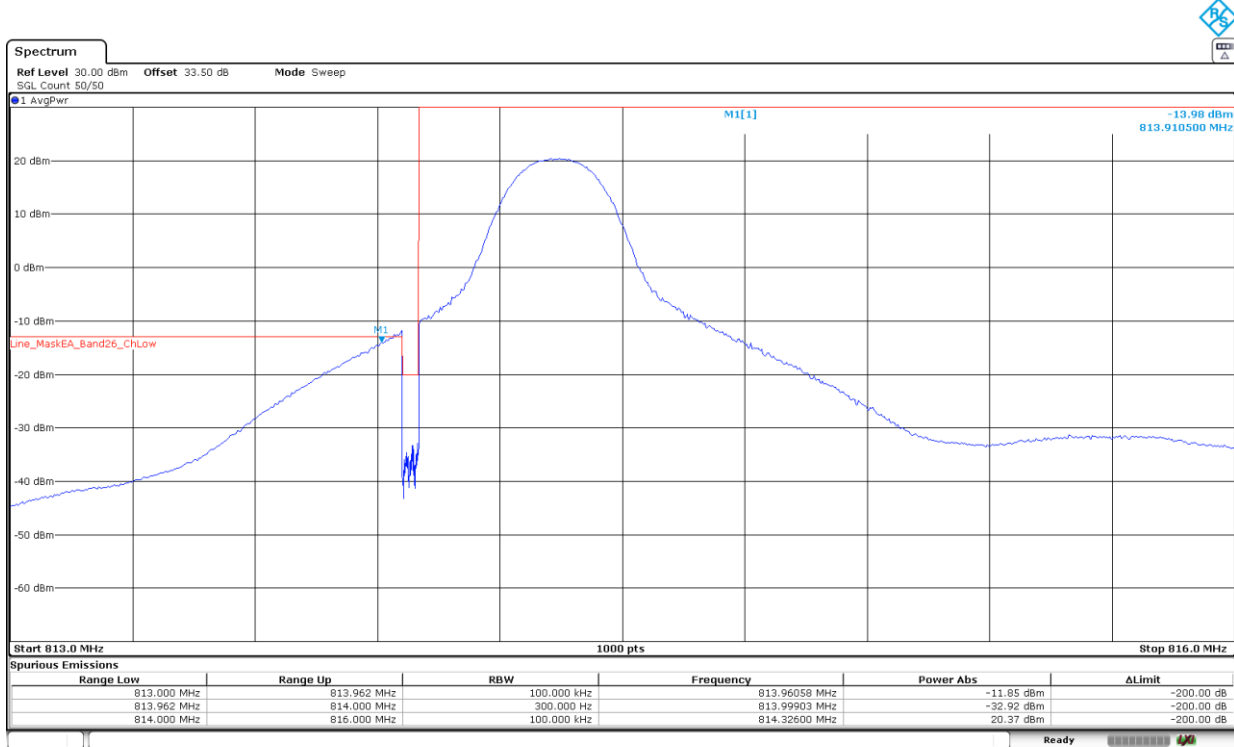
Measurement uncertainty (dB): <±2.76

**Verdict**

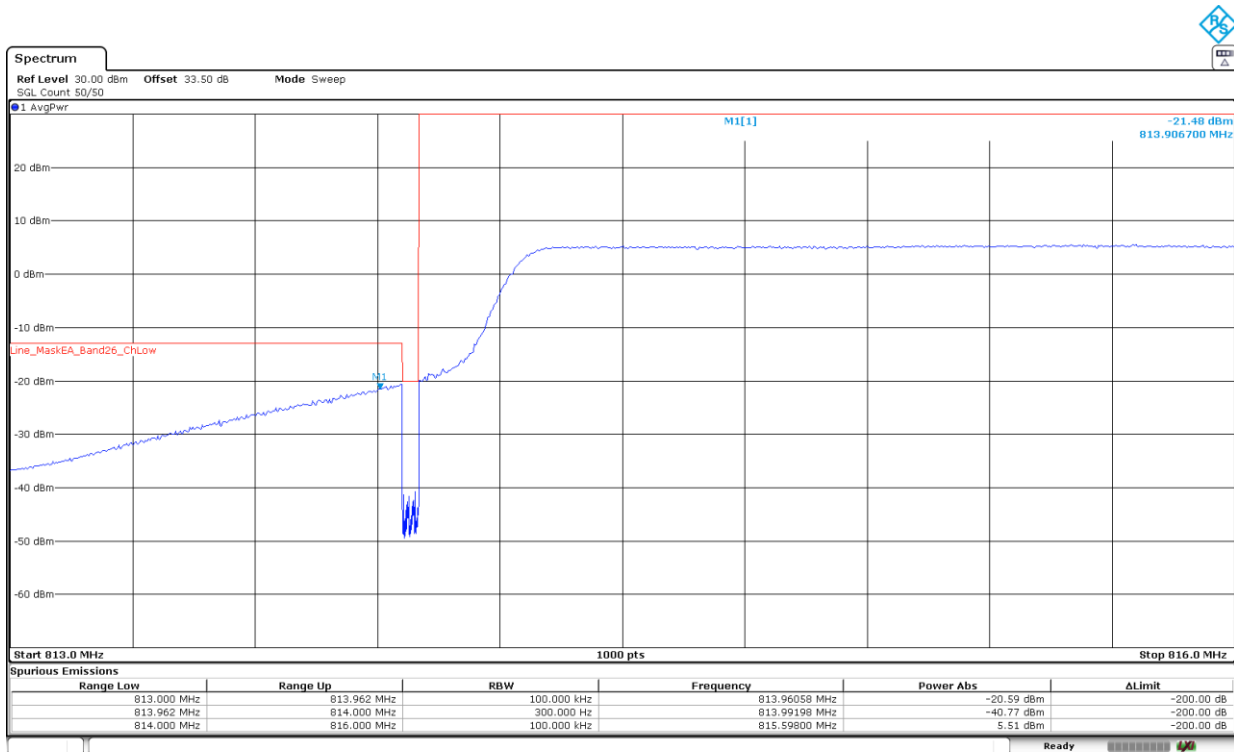
Pass

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

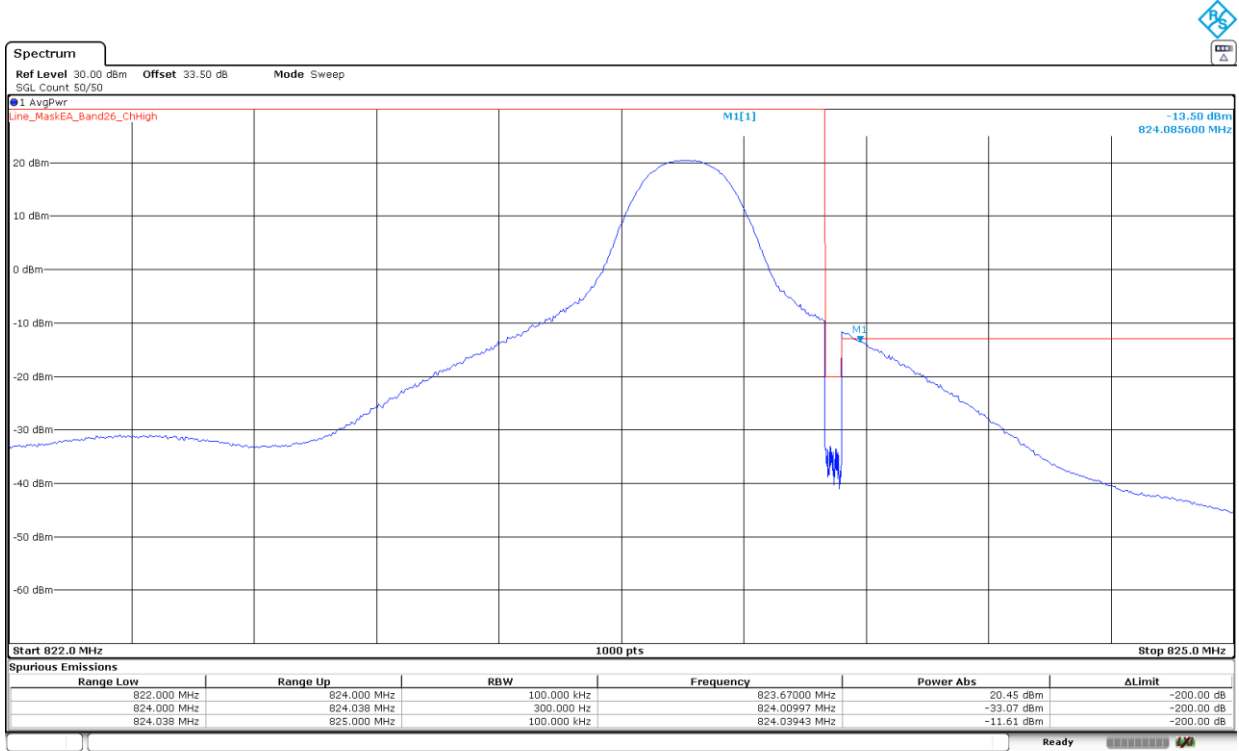
**LTE Cat-4 Band 26. Sub-band 814-824 MHz. EA MASK: BW=5 MHz. RB Size=1. RB Offset=0. Low Block Edge:**



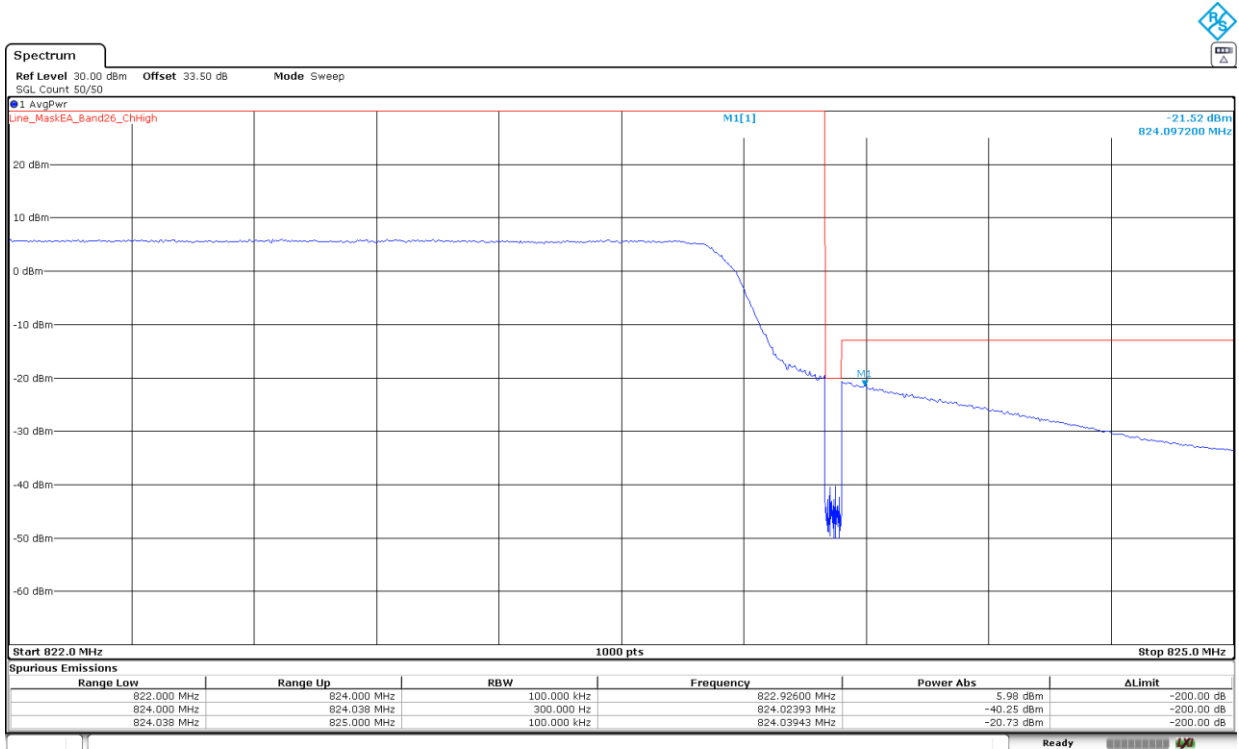
**LTE Cat-4 Band 26. Sub-band 814-824 MHz. EA MASK: BW=5 MHz. RB Size=All. RB Offset=0. Low Block Edge:**



**LTE Cat-4 Band 26. Sub-band 814-824 MHz. EA MASK: BW=5 MHz. RB Size=1. RB Offset=Max. High Block Edge:**



**LTE Cat-4 Band 26. Sub-band 814-824 MHz. EA MASK: BW=5 MHz. RB Size=All. RB Offset=0. High Block Edge:**



## Radiated Emissions

### Limits

#### 1. LTE Cat-4 Band 14:

\* FCC § 90.543 (e) (2) (3) & (5):

Transmitters operating in 758-768 MHz and 788-798 MHz bands must meet the emission limitations in (e) of this section.

(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least  $43 + 10 \log (P)$  dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

\* RSS-140 Clause 4.4:

The power of any unwanted emission outside the band 788-798 MHz shall be attenuated below the Transmitter output power P in dBW as follows, where p is the transmitter output power in watts:

- a. For any frequency between 769-775 MHz and 799-806 MHz:
  - i.  $76 + 10 \log (p)$ , dB in a 6.25 kHz band for fixed and base station equipment
  - ii.  $65 + 10 \log (p)$ , dB in a 6.25 kHz band for mobile and portable/hand-held equipment
- b. For any frequency between 775-788 MHz, above 806 MHz, and below 758 MHz:  $43 + 10 \log (p)$ , dB in a bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency bands 758-768 MHz and 788-798 MHz, a resolution bandwidth of 30 kHz may be employed.

#### 2. LTE Cat-4 Band 26:

\* FCC § 90.691:

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

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at



least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where  $f$  is the frequency removed from the center of the outer channel in the block in kilohertz and where  $f$  is greater than 12.5 kHz.

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

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

### **Method**

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the High frequency generated within the equipment.

For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT was placed on a RF-transparent table or support at a nominal height of 80 cm above the reference ground plane, at a 3 meter distance from the measuring antenna.

For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table or support at a nominal height of 1.5 m above the ground plane, 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 (dB $\mu$ 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:

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

According to specification, the power of emissions shall be attenuated below the transmitter power ( $P$ ) by a factor not less  $65 + 10 \log(P)$  dB in a 6.25 kHz band segment.  $P$  in watts.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $65 + 10 \log(P_o)$ , and the level in dBm relative  $P_o$  becomes:

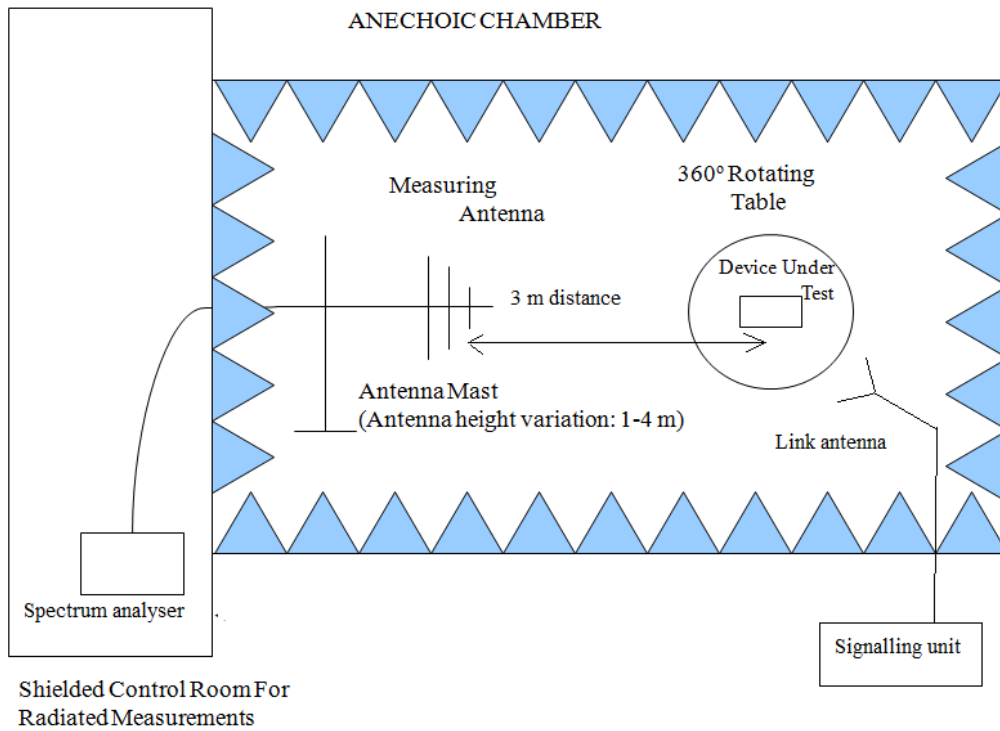
$$P_o \text{ (dBm)} - [65 + 10 \log(P_o \text{ in mwatts}) - 30] = -35 \text{ dBm}$$

For the LTE Cat-4 Band 14, a resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

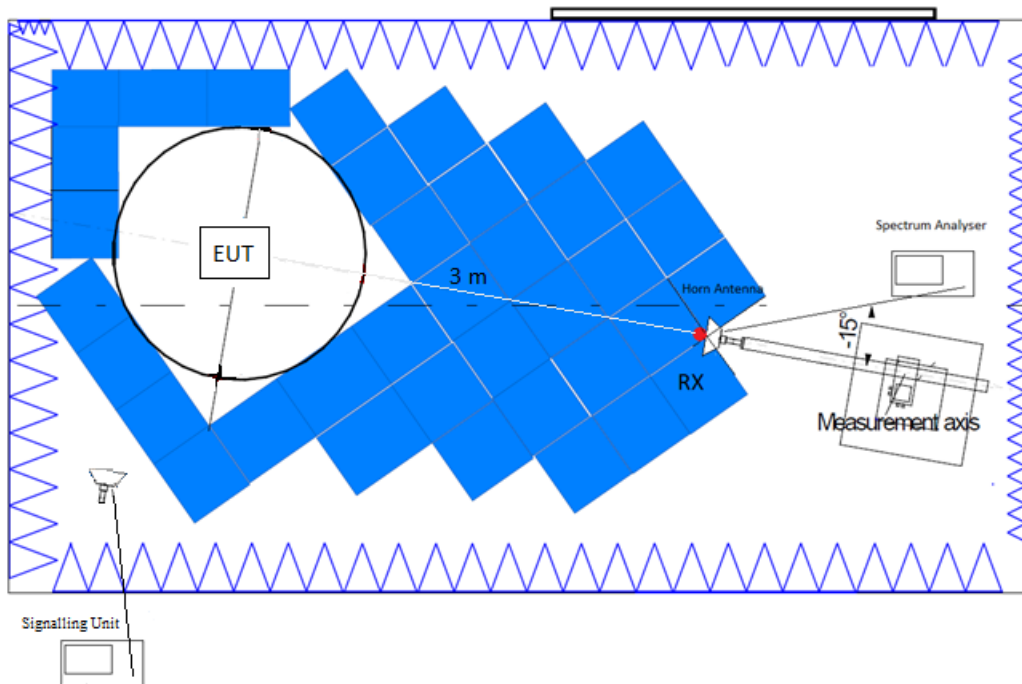
For the LTE Cat-4 Band 26, a resolution bandwidth / video bandwidth of 1 MHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

### Test Setup

Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz:



## Results

Measurements required on one frequency near top channel and one frequency near bottom channel, according to FCC § 15.31 (m).

### LTE Cat-4 Band 14:

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

#### - LOW CHANNEL:

##### Frequency range 30 MHz - 1 GHz

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector
771.5	-32.13	V	Peak
783.99	-27.77	H	Peak
787.7443	-29.53	H	Peak
801.3799	-51.89	H	Peak

##### Frequency range 1 - 10 GHz

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
1.5787107	-56.75	V	Peak
1.5805059	-57.45	H	Peak

#### - HIGH CHANNEL:

##### Frequency range 30 MHz - 1 GHz

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector
772.8739	-54.64	H	Peak
799.0017	-50.15	H	Peak
799.7815	-52.18	H	Peak

##### Frequency range 1 - 10 GHz

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
1.5944187	-49.83	H	Peak

Measurement uncertainty (dB): <  $\pm 5.35$  for  $f \geq 30$  MHz up to 1 GHz  
 <  $\pm 4.32$  for  $f \geq 1$  GHz up to 10 GHz

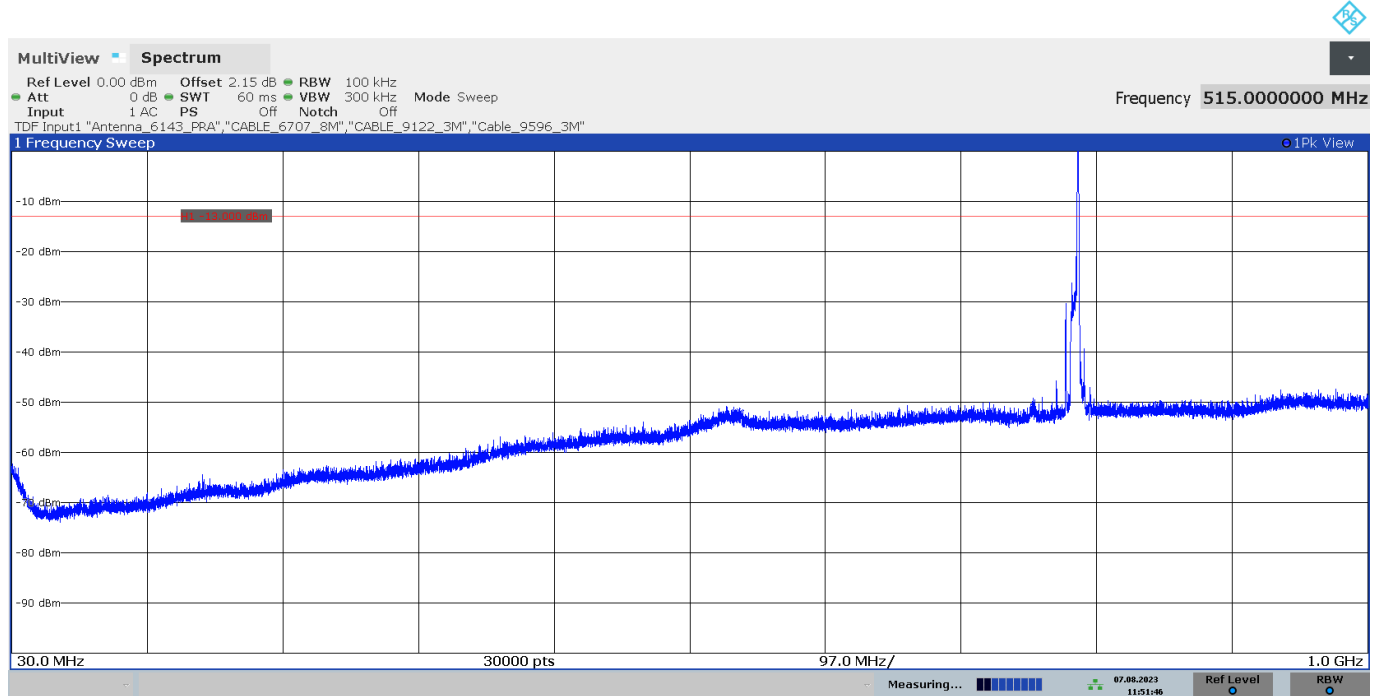
## Verdict

Pass

**LTE Cat-4 Band 14:**

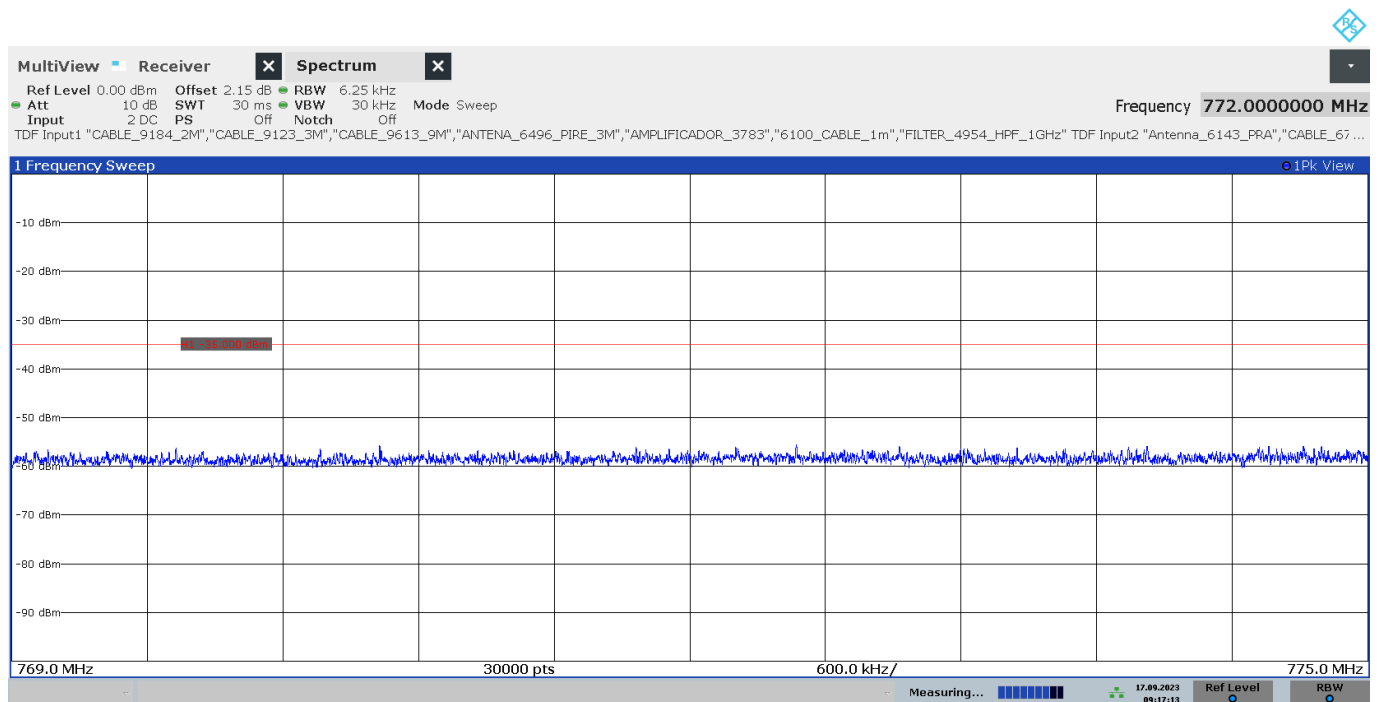
**FREQUENCY RANGE 30 MHz - 1 GHz:**

**- LOW CHANNEL:**

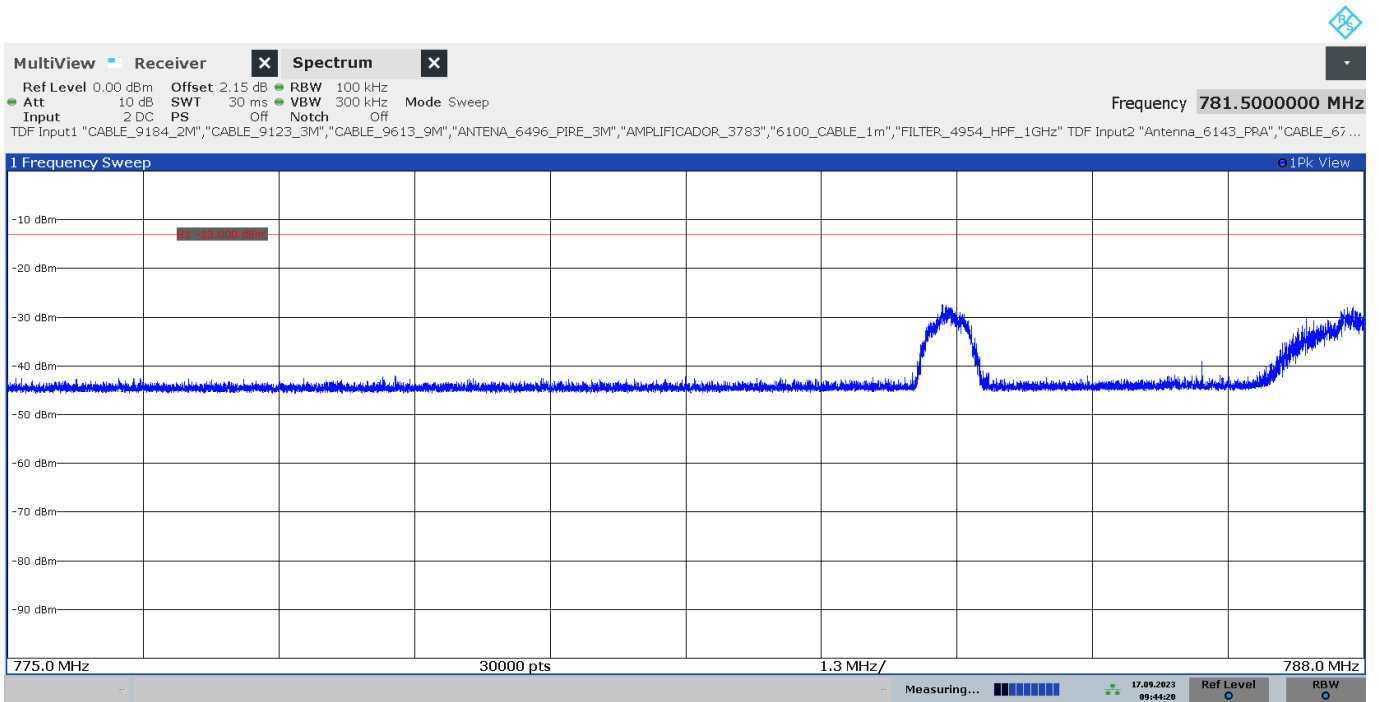


11:51:46 07.08.2023

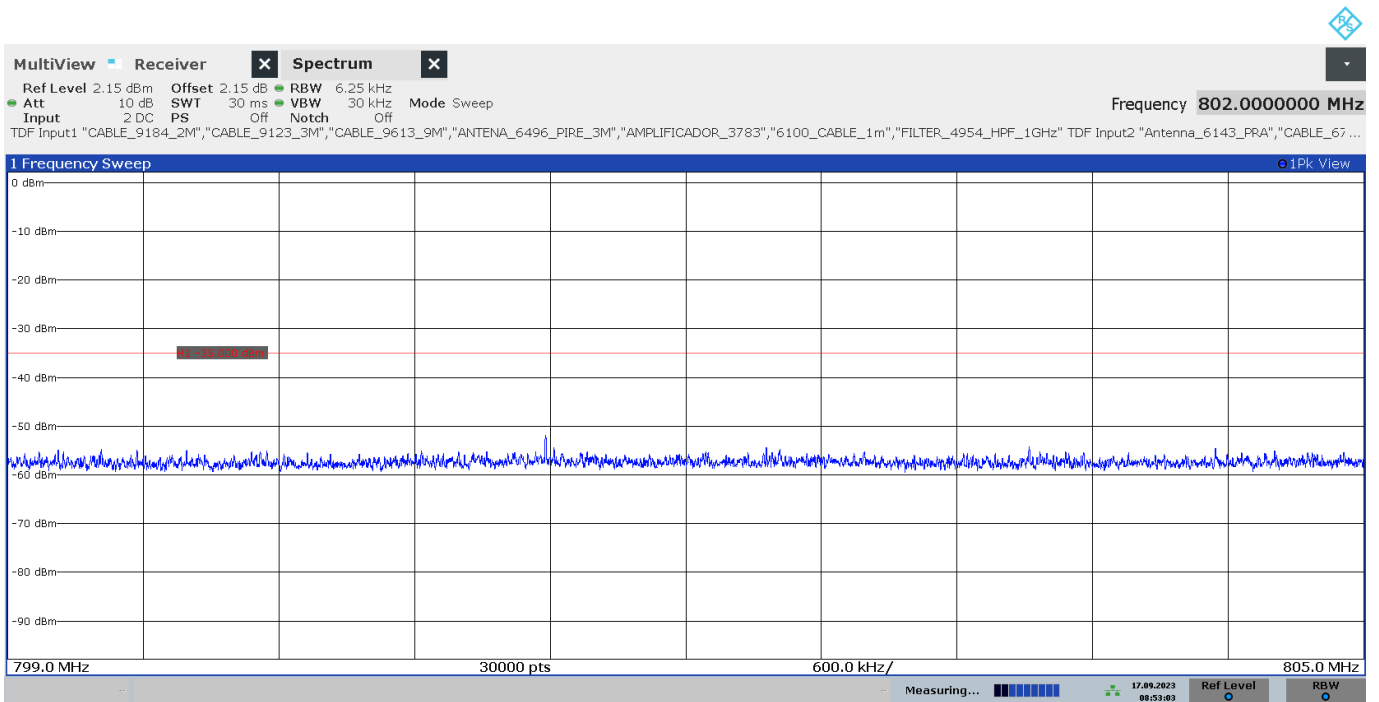
The peak above the limit is the carrier frequency:  
 LTE Cat-4 Band 14, 790.5 MHz



09:17:13 17.09.2023

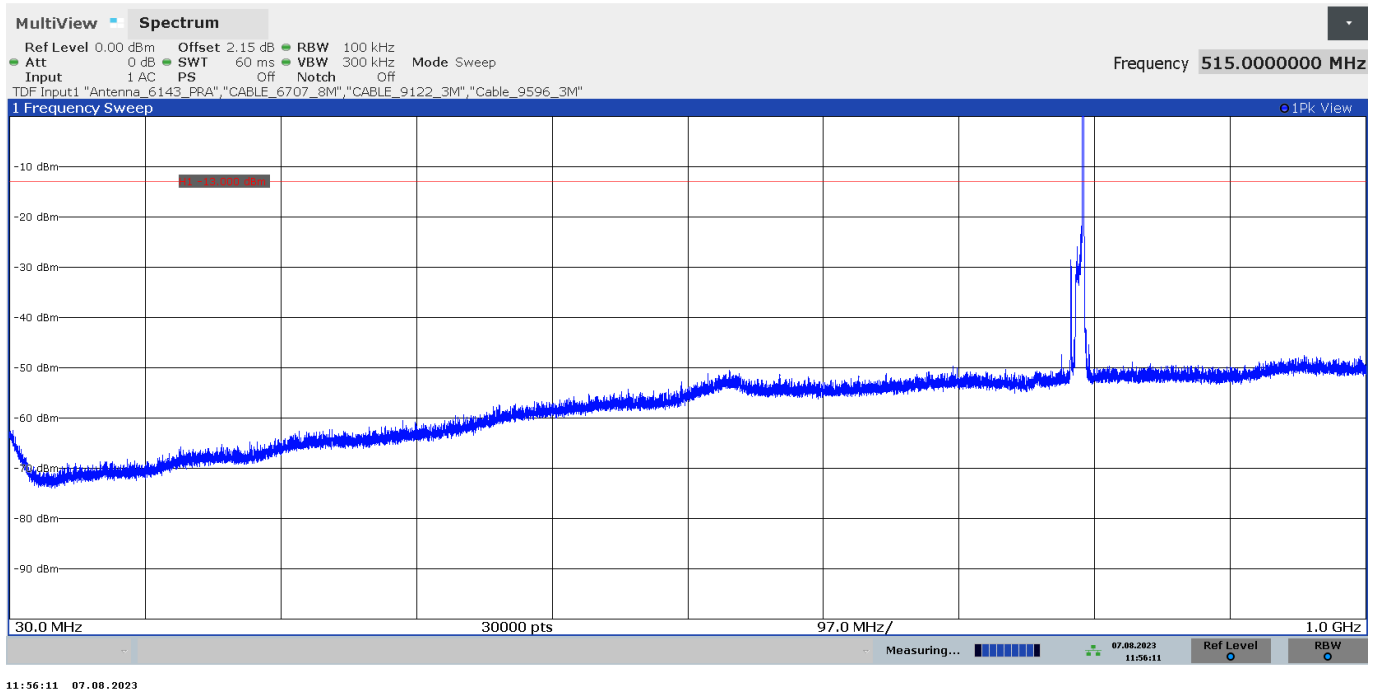


09:44:20 17.09.2023

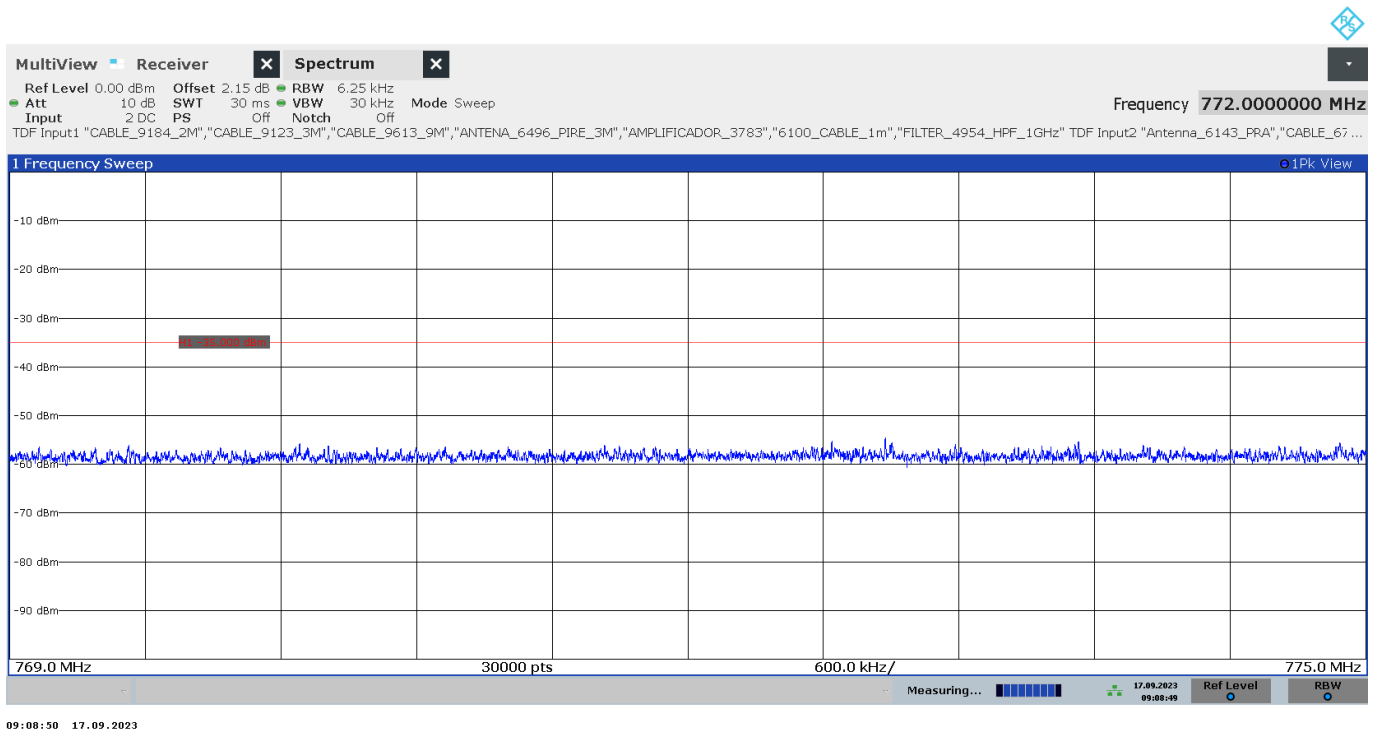


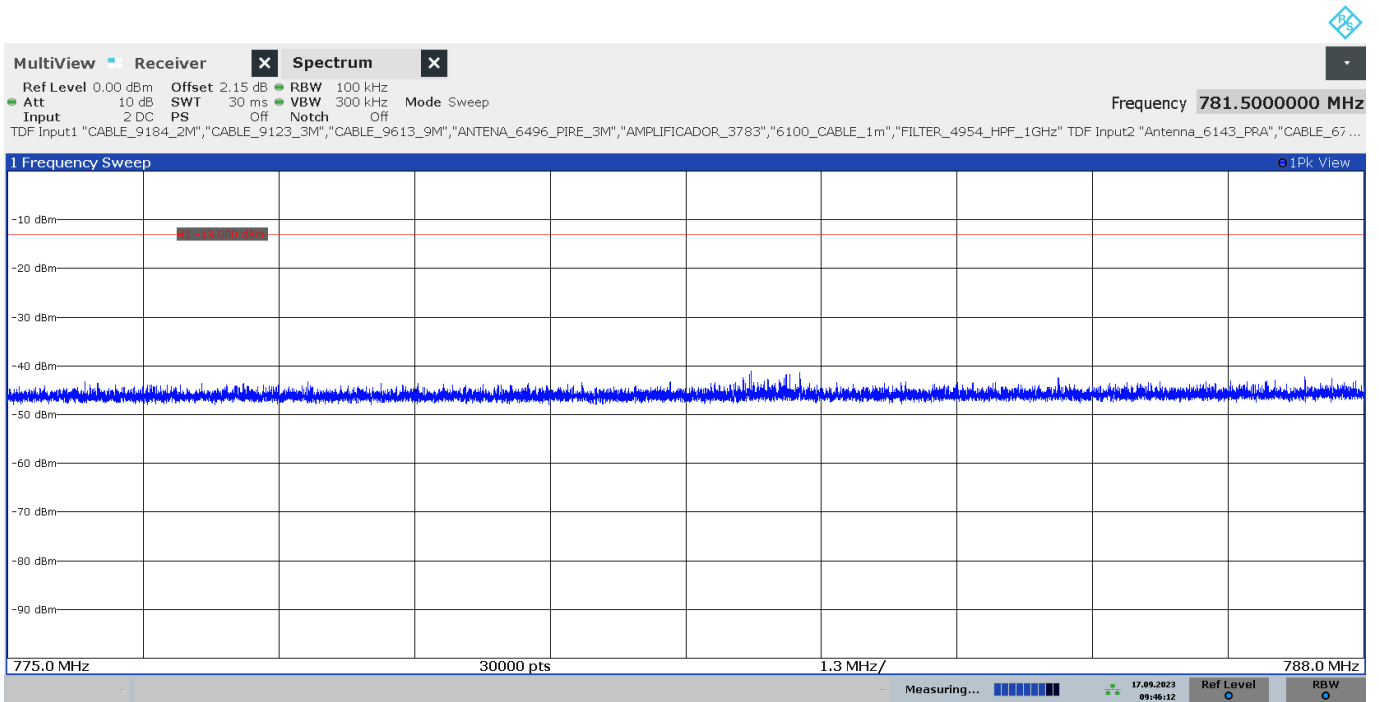
09:53:03 17.09.2023

- HIGH CHANNEL:

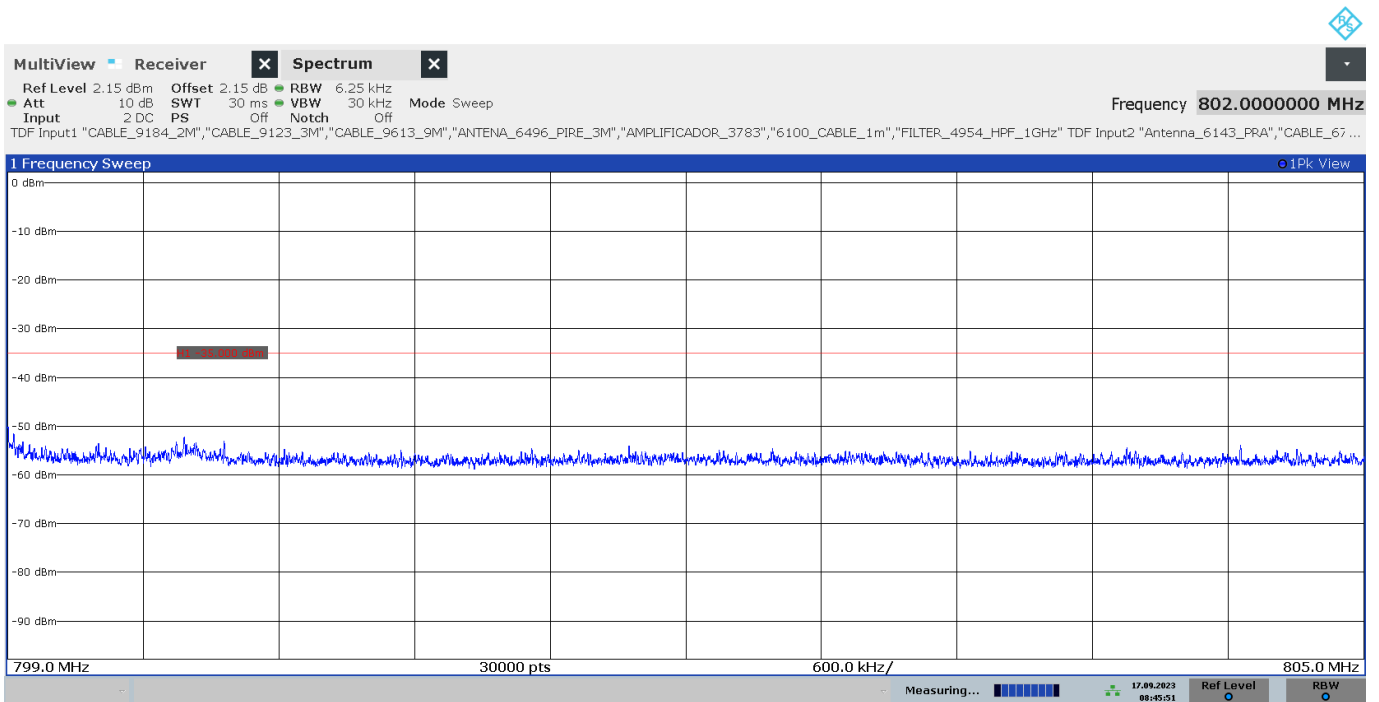


The peak above the limit is the carrier frequency:  
 LTE Cat-4 Band 14, 795.5 MHz





09:46:12 17.09.2023

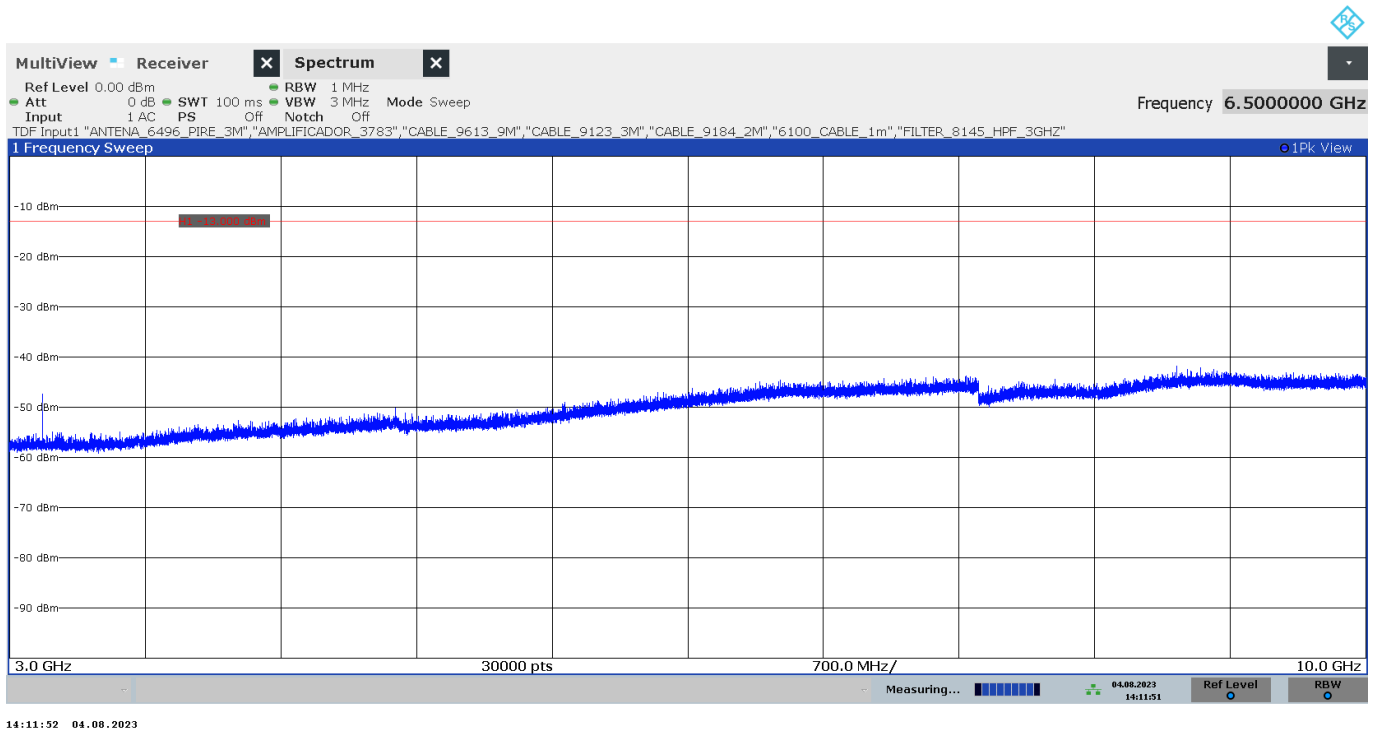
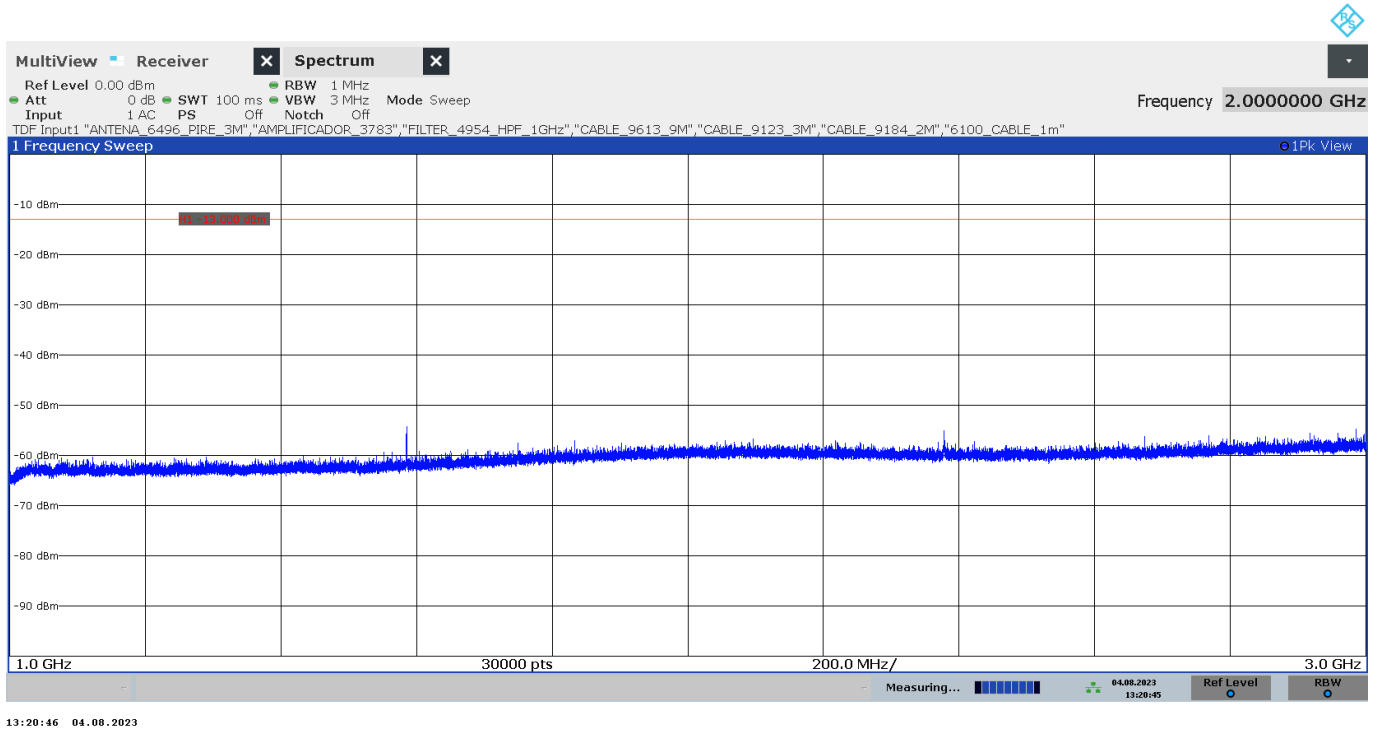


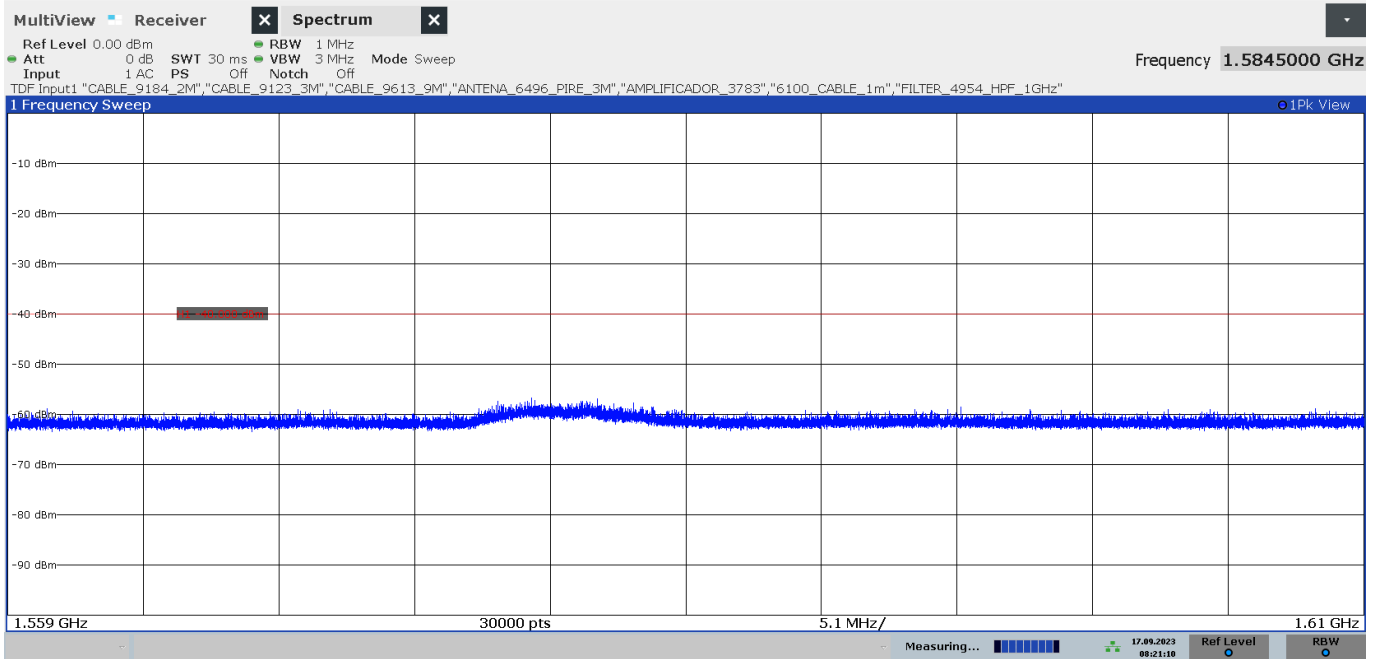
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**FREQUENCY RANGE 1 - 10 GHz:**

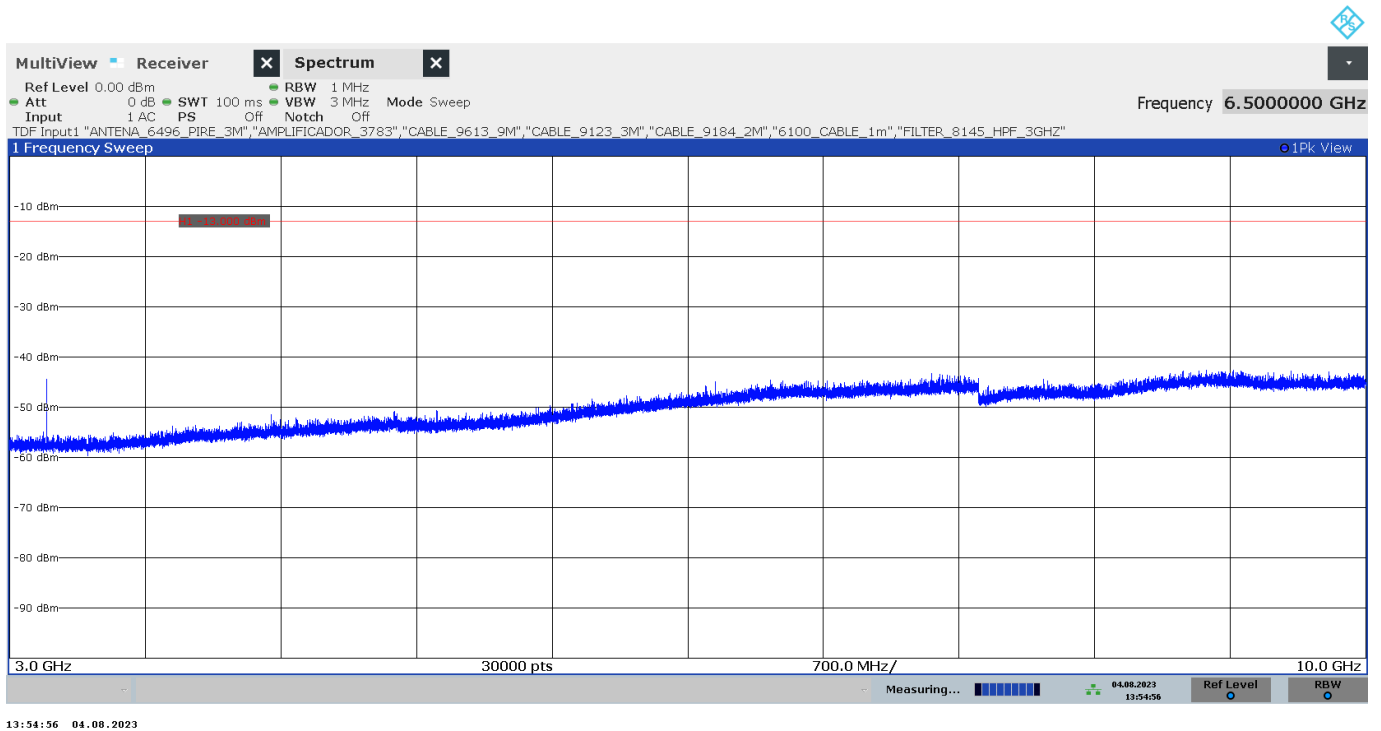
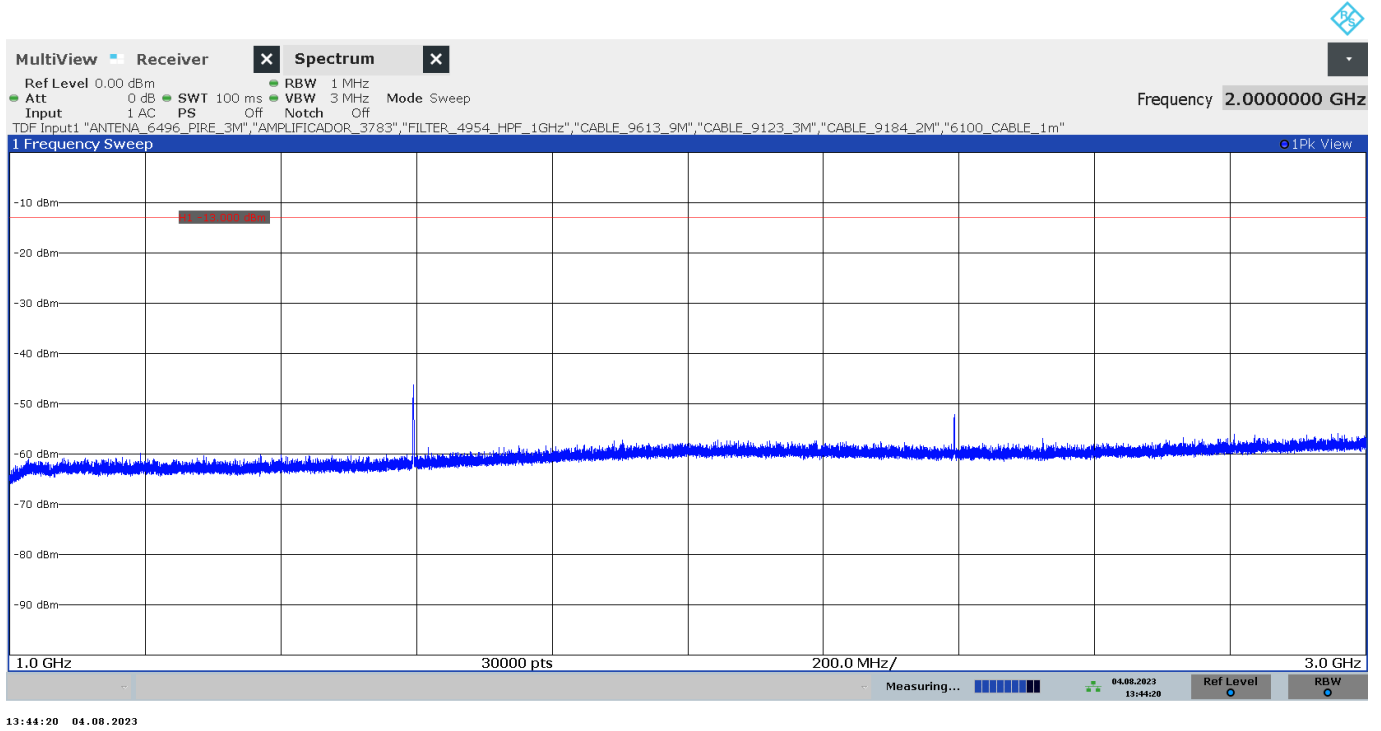
- LOW CHANNEL:

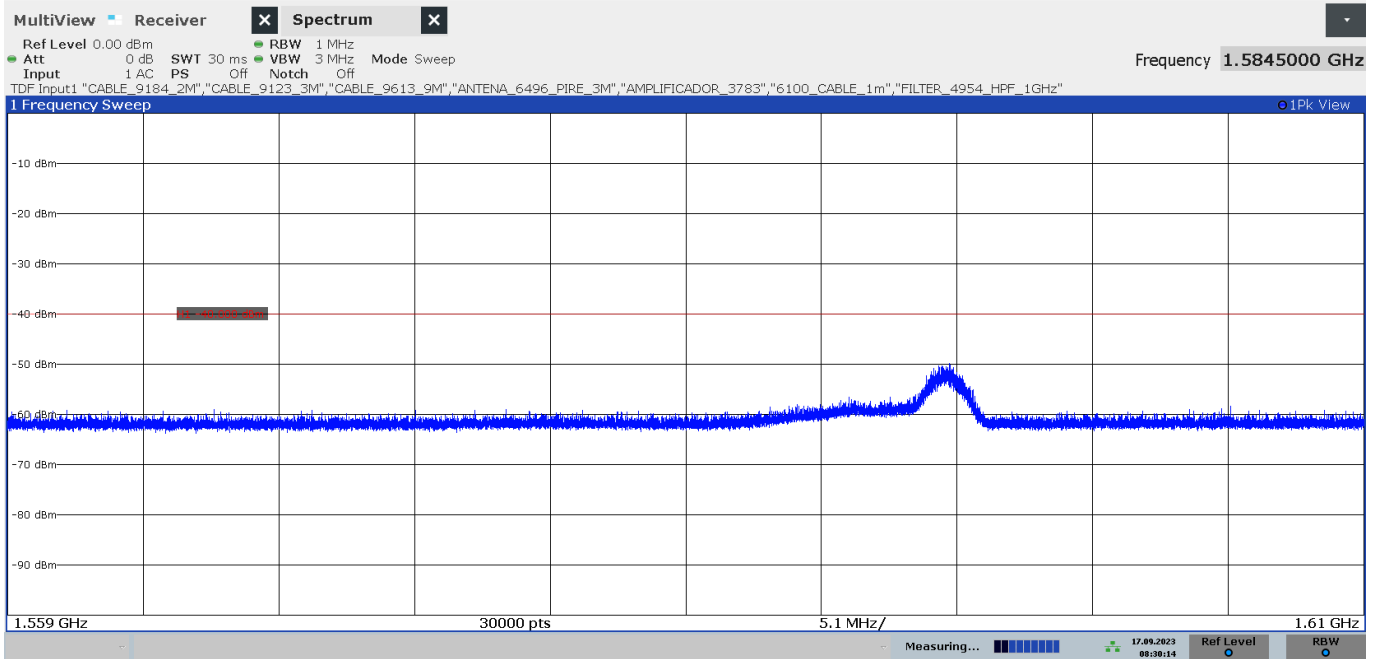




08:21:11 17.09.2023

- HIGH CHANNEL:





08:30:15 17.09.2023

### **LTE Cat-4 Band 26. Sub-band 814-824 MHz:**

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

#### **- LOW CHANNEL:**

##### **Frequency range 30 MHz - 1 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector
827.13	-28.13	H	Peak

##### **Frequency range 1 - 10 GHz**

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

#### **- HIGH CHANNEL:**

##### **Frequency range 30 MHz - 1 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector
814.908	-27.65	V	Peak
832.346	-28.31	H	Peak

##### **Frequency range 1 - 10 GHz**

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

Measurement uncertainty (dB): <  $\pm 5.35$  for  $f \geq 30$  MHz up to 1 GHz  
<  $\pm 4.32$  for  $f \geq 1$  GHz up to 10 GHz

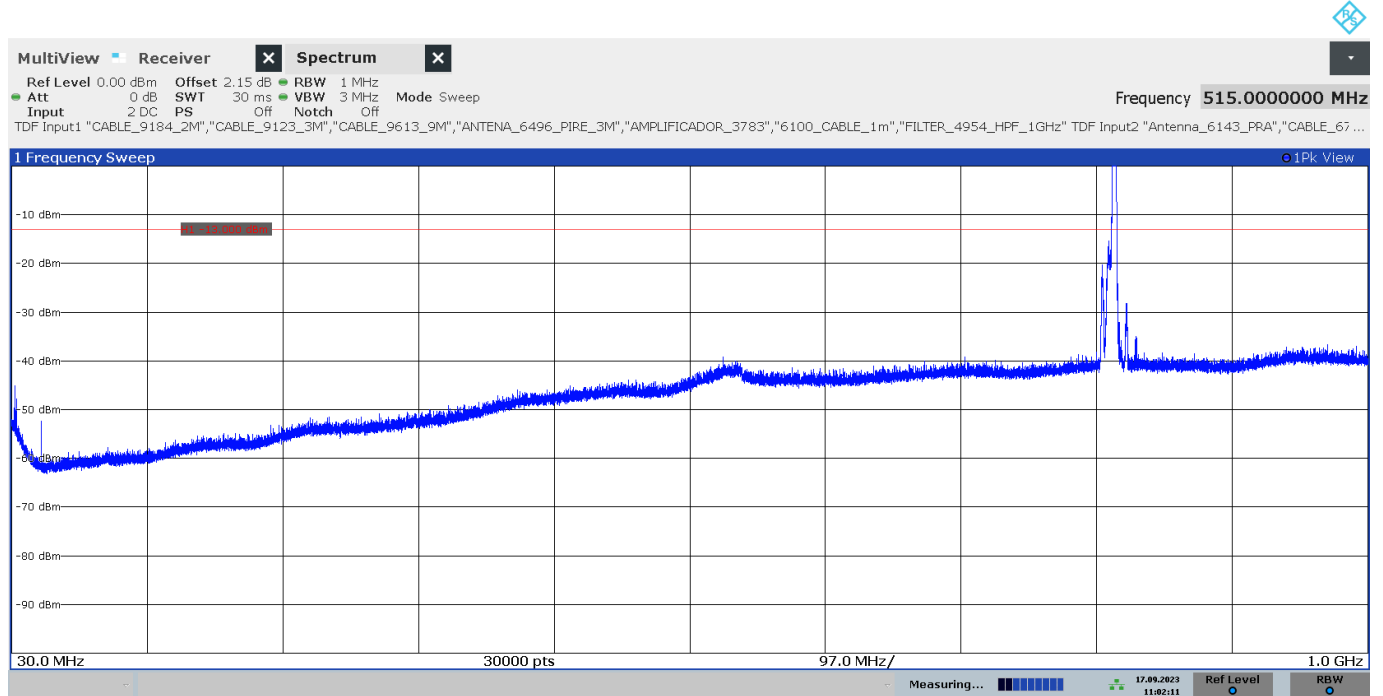
#### **Verdict**

Pass

**LTE Cat-4 Band 26. Sub-band 814-824 MHz:**

**FREQUENCY RANGE 30 MHz - 1 GHz:**

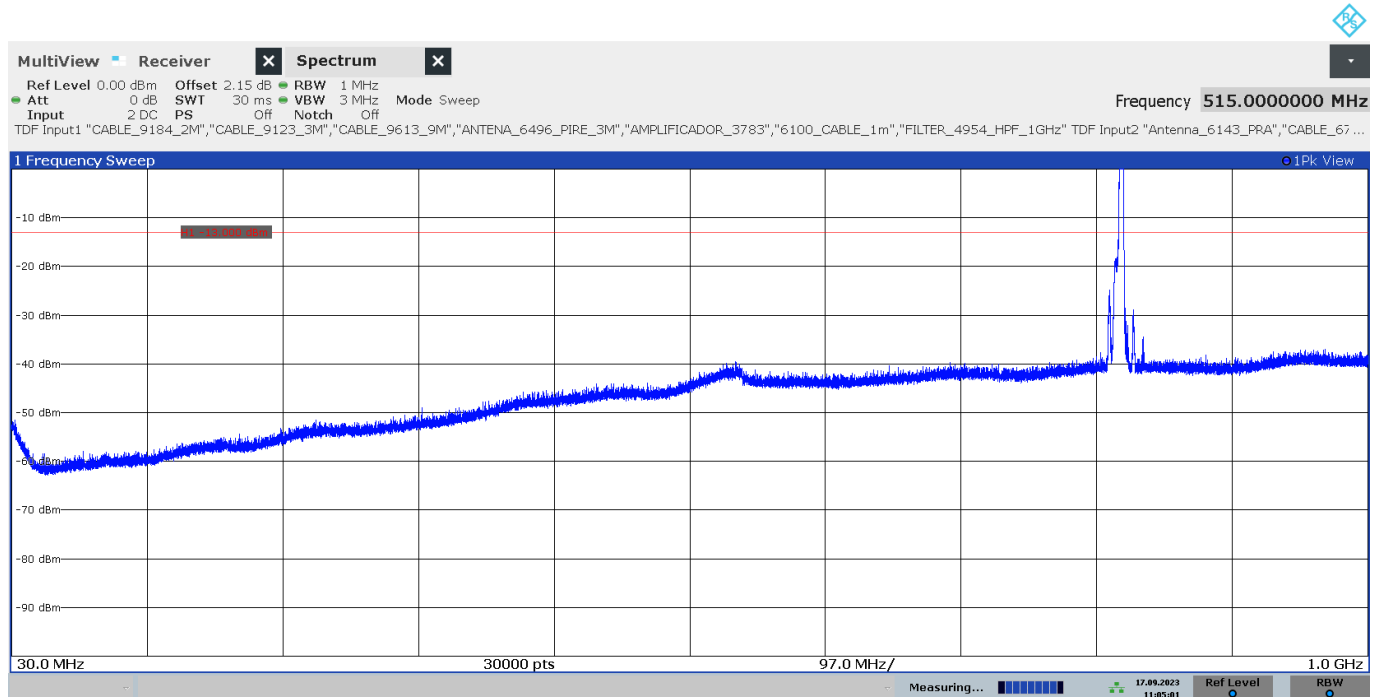
- LOW CHANNEL:



11:02:12 17.09.2023

The peak above the limit is the carrier frequency:  
 LTE Cat-4 Band 26, 816.5 MHz

- HIGH CHANNEL:

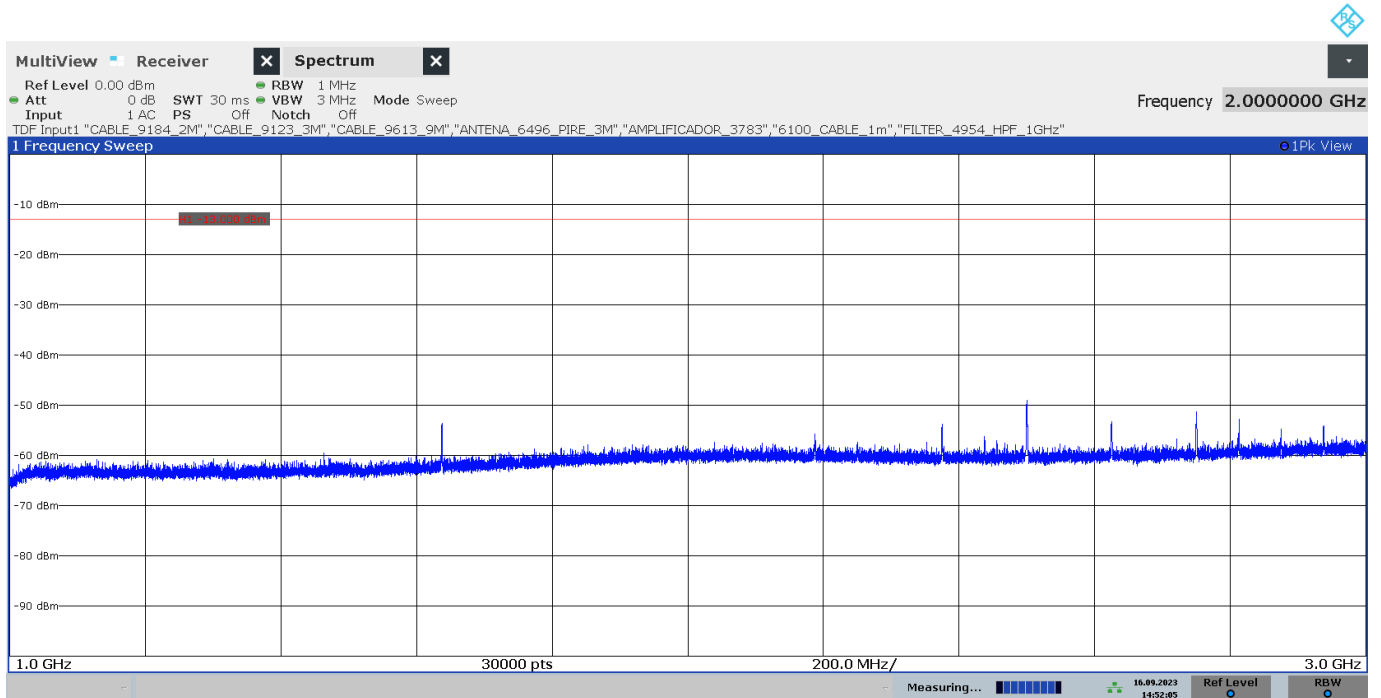


11:05:02 17.09.2023

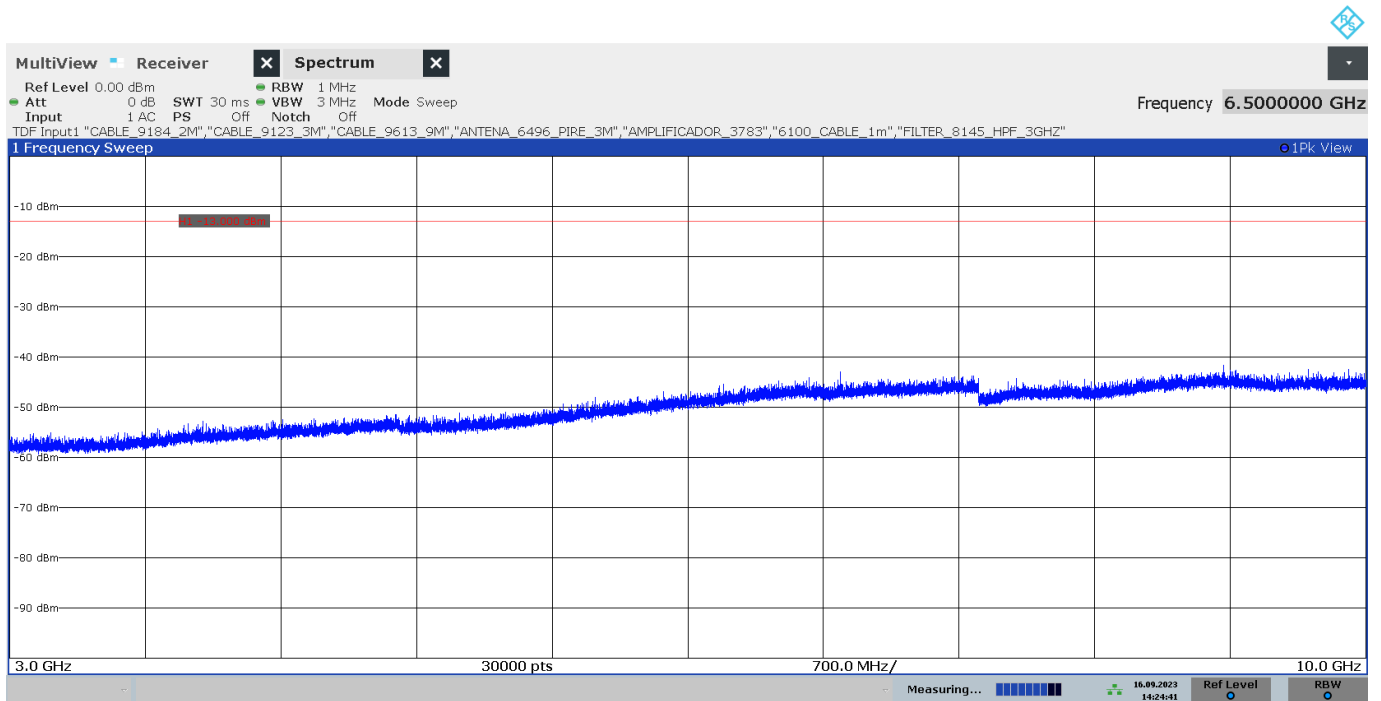
The peak above the limit is the carrier frequency:  
 LTE Cat-4 Band 26, 821.5 MHz

**FREQUENCY RANGE 1 - 10 GHz:**

- LOW CHANNEL:

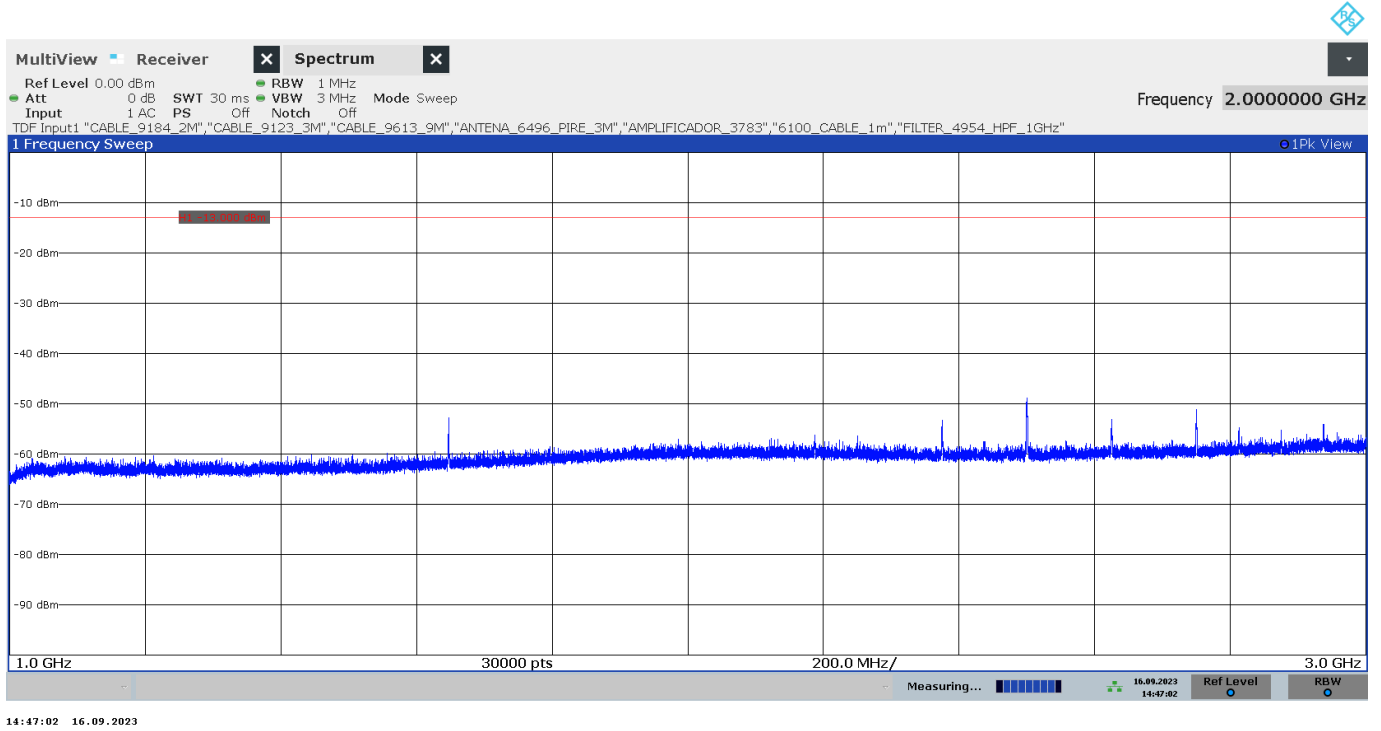


14:52:05 16.09.2023

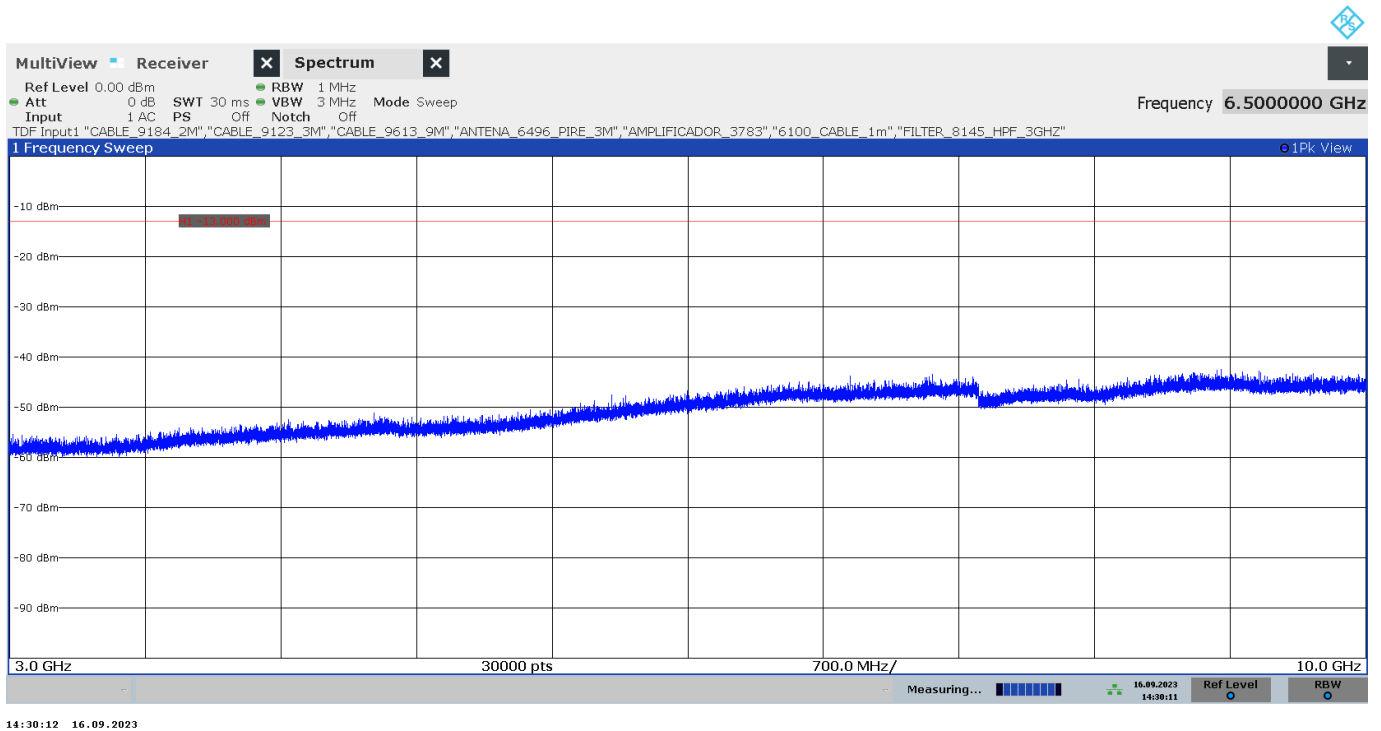


14:24:42 16.09.2023

- HIGH CHANNEL:



14:47:02 16.09.2023



14:30:12 16.09.2023



### **LTE Cat-4 Band 26. Cross-rule Channel 824 MHz:**

A preliminary scan determined the QPSK, BW=15 MHz, RB Size=1, RB Offset=37 as the worst case. The next results are for this worst case configuration.

#### **- SINGLE CHANNEL (Cross-rule Channel 824 MHz):**

##### **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): <  $\pm 5.35$  for  $f \geq 30$  MHz up to 1 GHz  
<  $\pm 4.32$  for  $f \geq 1$  GHz up to 10 GHz

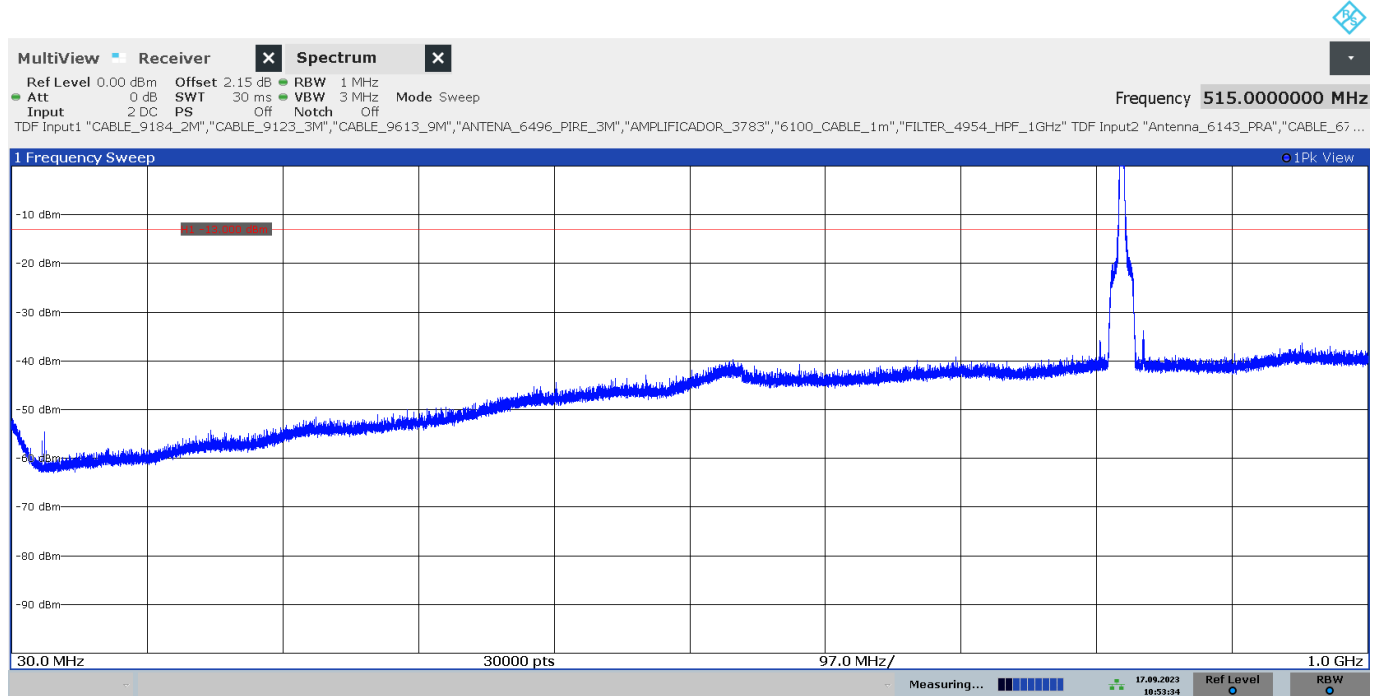
#### ***Verdict***

Pass

**LTE Cat-4 Band 26. Cross-rule Channel 824 MHz:**

**FREQUENCY RANGE 30 MHz - 1 GHz:**

- SINGLE CHANNEL (Cross-rule Channel 824 MHz):

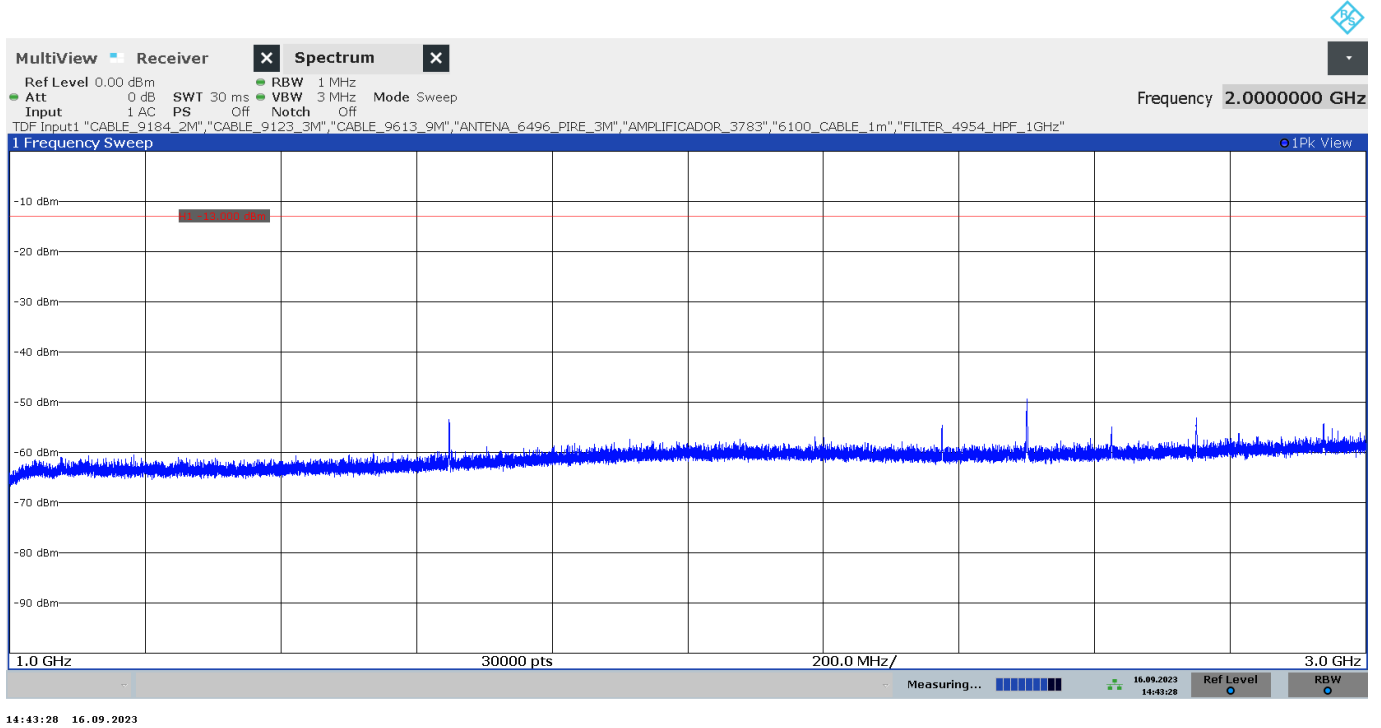


10:53:34 17.09.2023

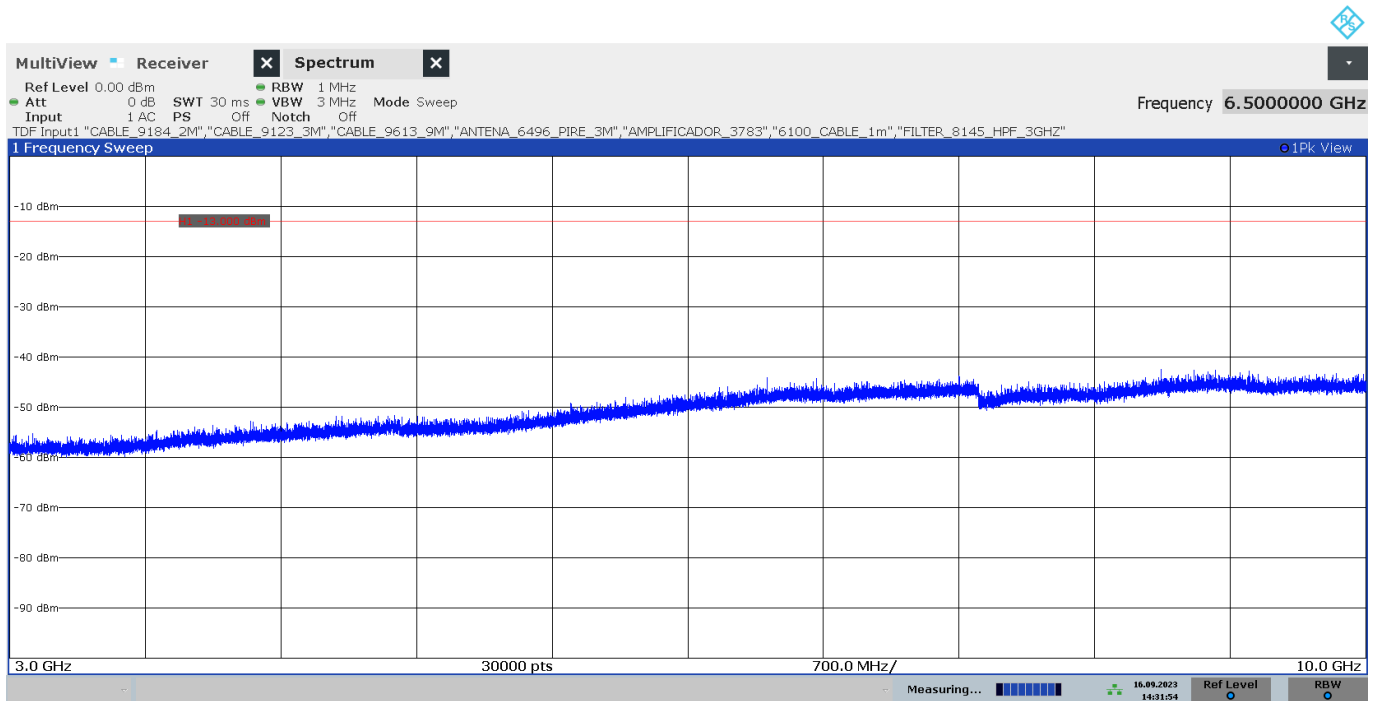
The peak above the limit is the carrier frequency:  
LTE Cat-4 Band 26, 824 MHz

### FREQUENCY RANGE 1 - 10 GHz:

- SINGLE CHANNEL (Cross-rule Channel 824 MHz):



14:43:28 16.09.2023



14:31:55 16.09.2023