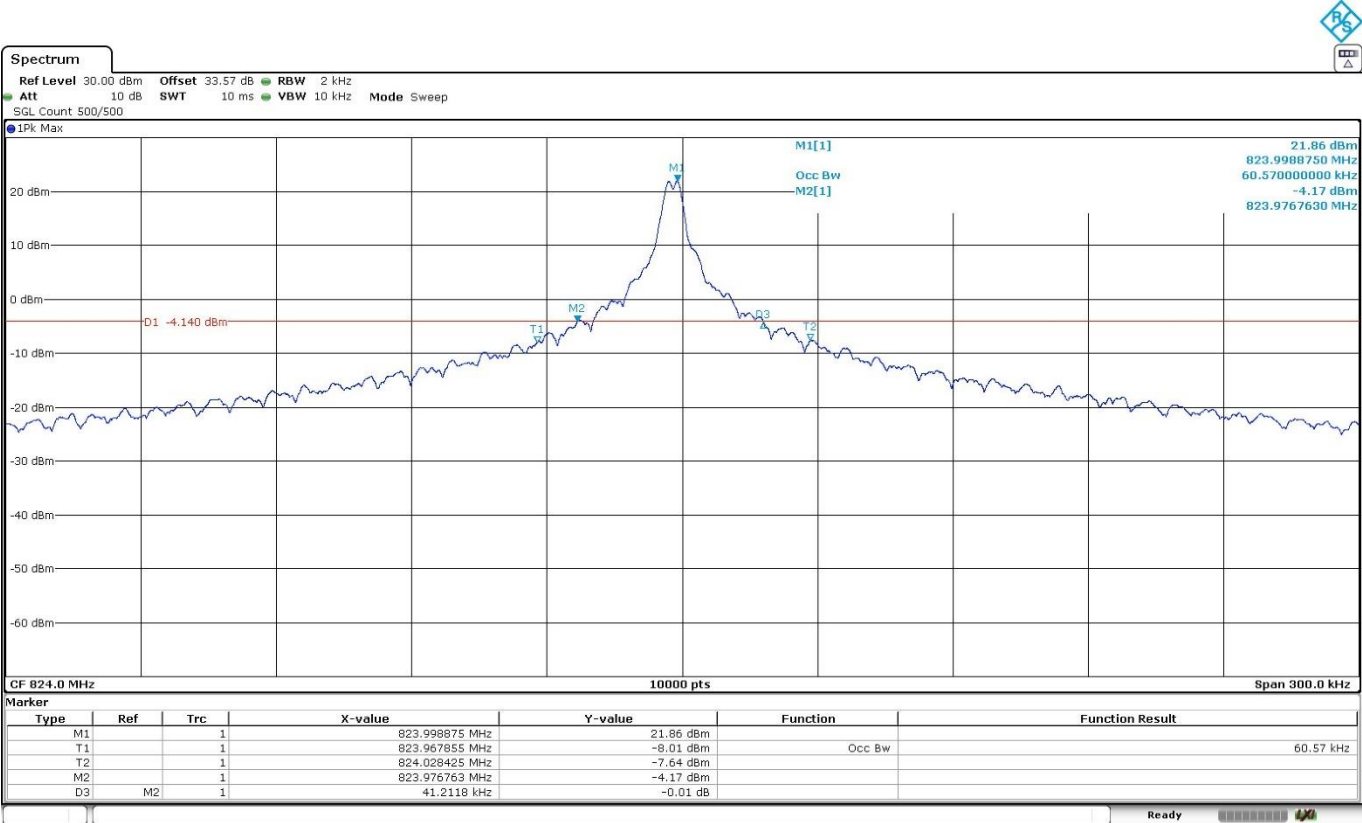
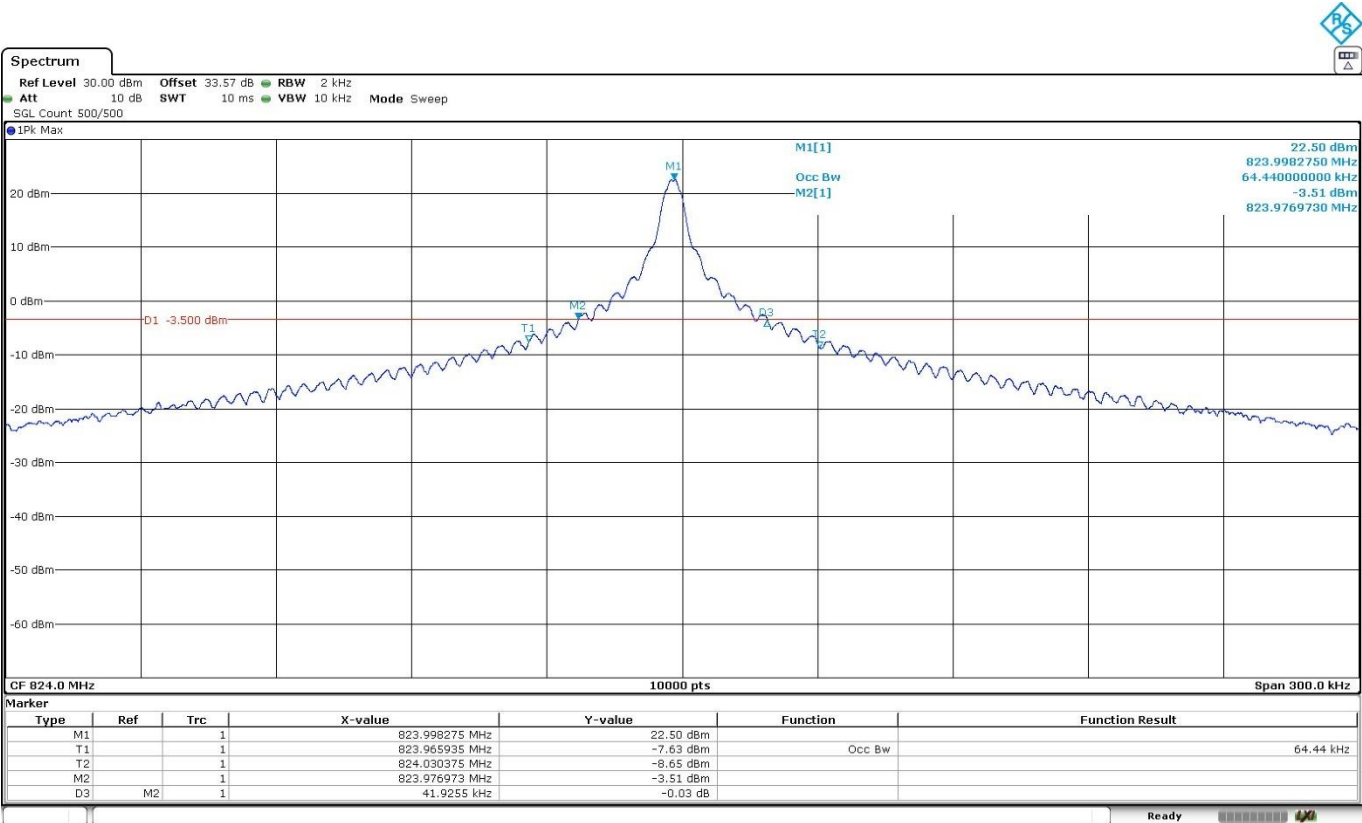


LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz: Pi/2-BPSK. BW=3.75 kHz. Tone Number=1. Tone Offset=23.
MSC/TBS=0.



LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz: Pi/4-QPSK. BW=3.75 kHz. Tone Number=1. Tone Offset=23.
MSC/TBS=3.



LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz. Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=5. MSC/TBS=0.

	Single Channel
99% Occupied Bandwidth (MHz)	125.70000
-26 dBc Bandwidth (MHz)	123.44300
Measurement uncertainty (kHz)	<±4.67

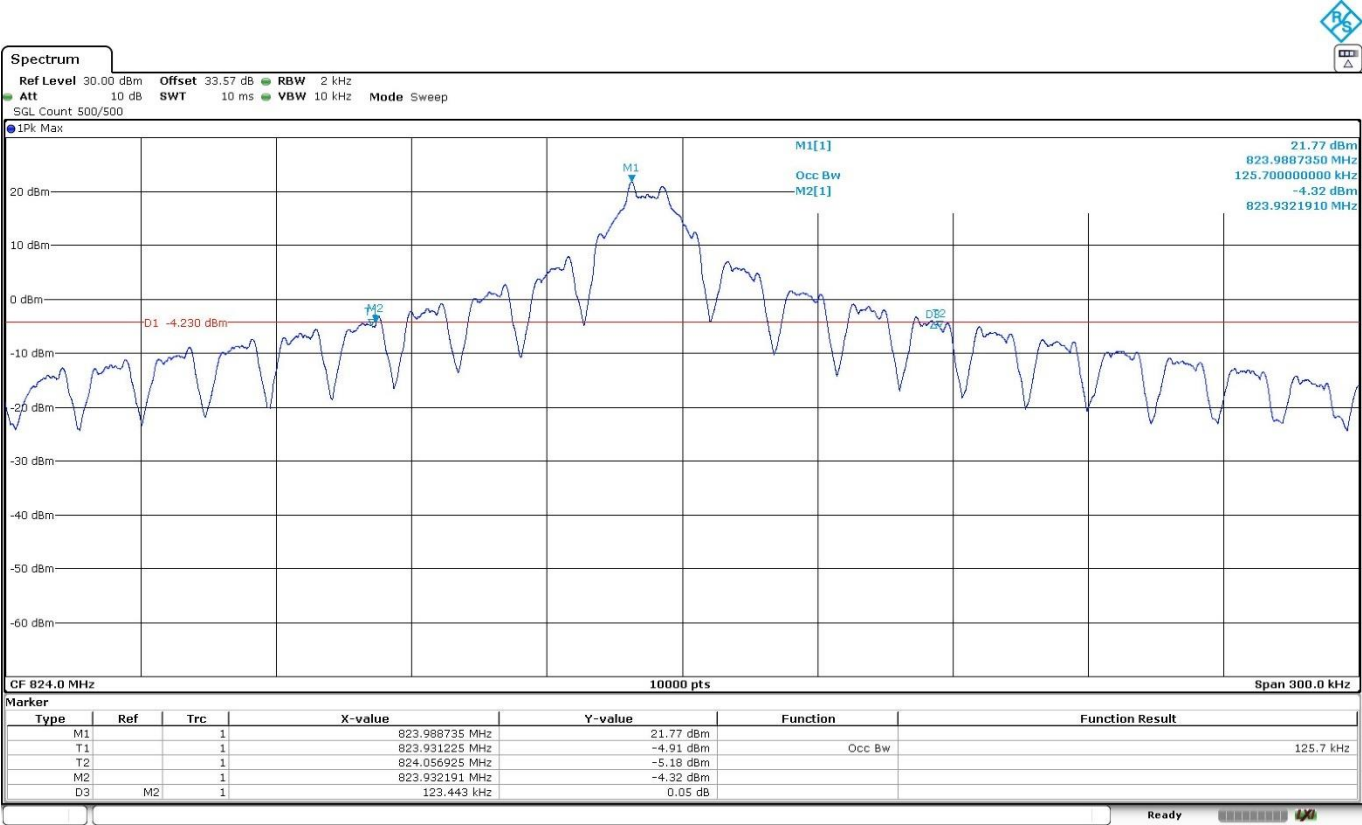
LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz. Pi/4-QPSK. BW=15 kHz. Tone Number=1. Tone Offset=5. MSC/TBS=3.

	Single Channel
99% Occupied Bandwidth (MHz)	127.35000
-26 dBc Bandwidth (MHz)	158.06920
Measurement uncertainty (kHz)	<±4.67

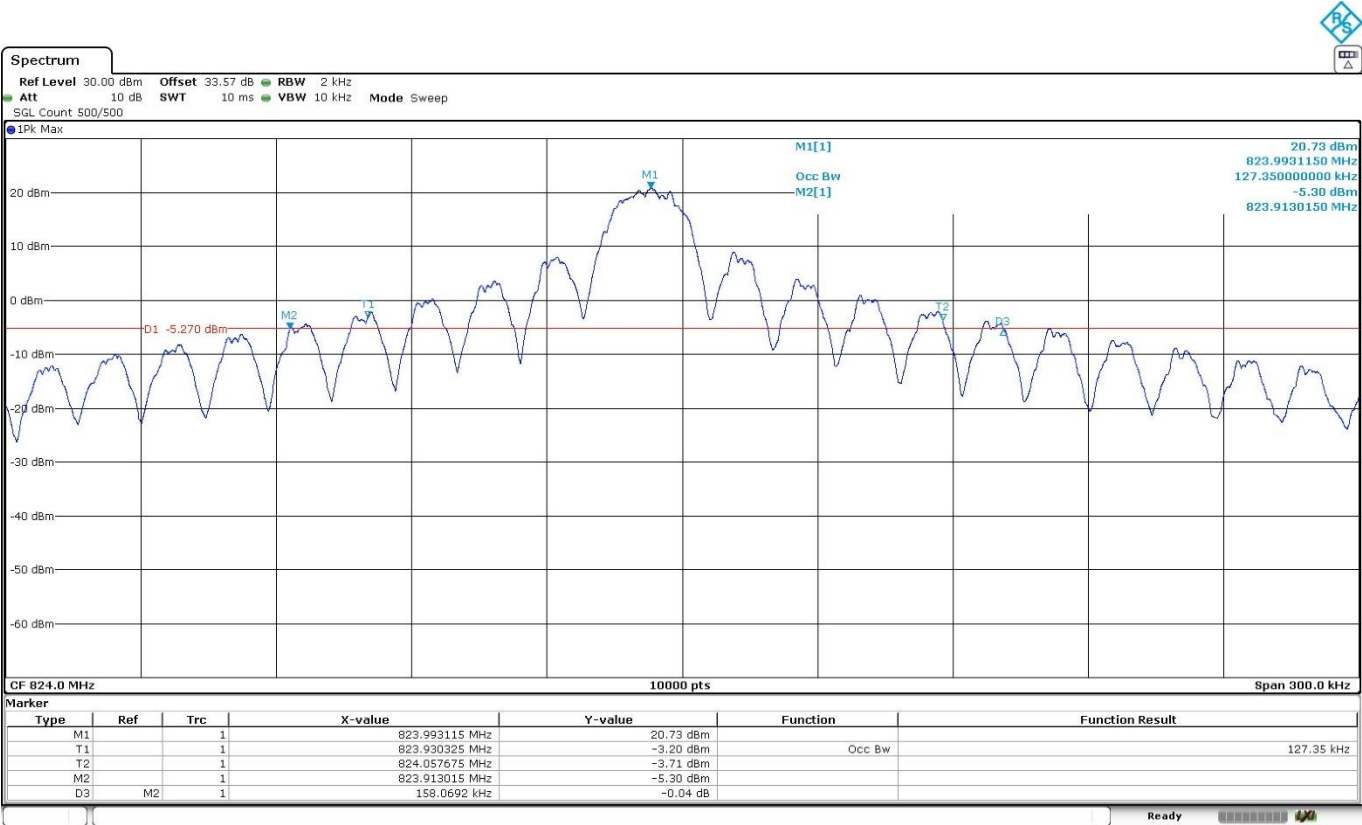
LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz. QPSK. BW=15 kHz. Tone Number=12. Tone Offset=0. MSC/TBS=5.

	Single Channel
99% Occupied Bandwidth (MHz)	188.75000
-26 dBc Bandwidth (MHz)	307.24260
Measurement uncertainty (kHz)	<±4.67

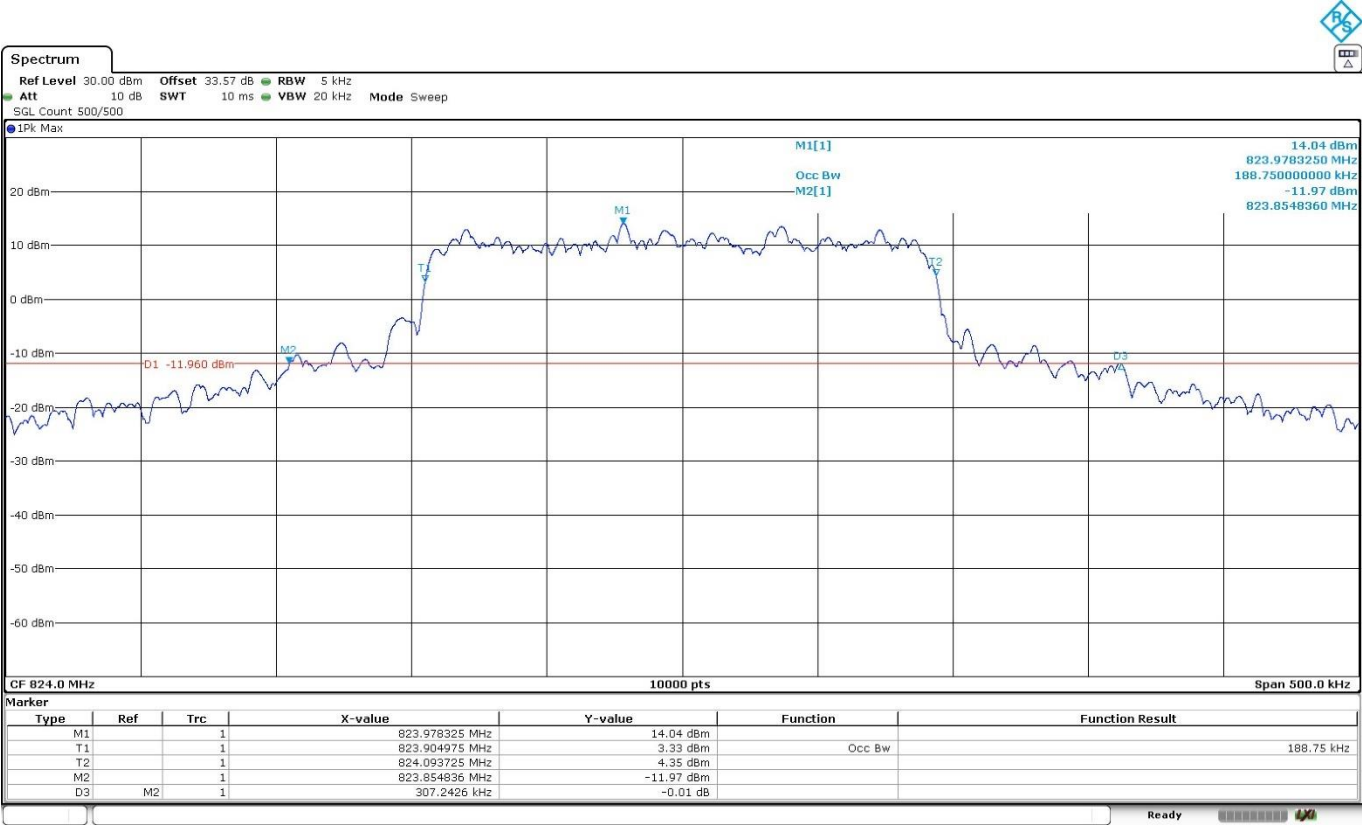
LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz: Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=5.
MSC/TBS=0.



LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz: Pi/4-QPSK. BW=15 kHz. Tone Number=1. Tone Offset=5.
MSC/TBS=3.



LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz: QPSK. BW=15 kHz. Tone Number=12. Tone Offset=0.
MSC/TBS=5.



Spurious emissions at antenna terminals

Limits

FCC §2.1051. Measurements required: Spurious emissions at antenna terminals.

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

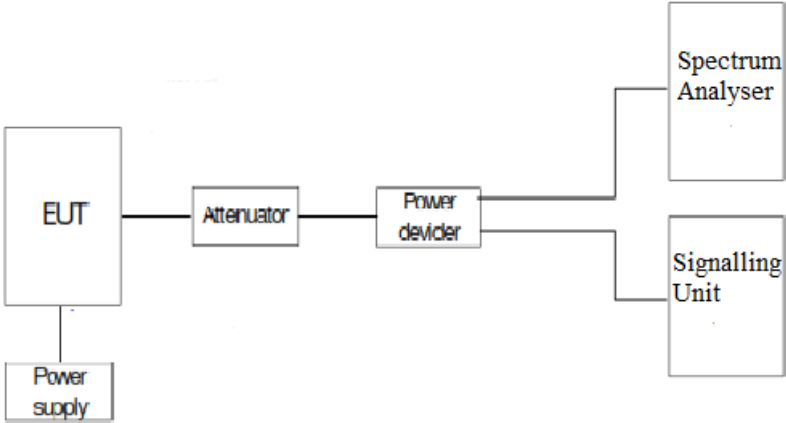
Measurement Limit:

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:

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

Test Setup



Results

LTE Cat NB1 Band 26. Sub-band 814-824 MHz:

A preliminary scan determined the worst-case:

Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=0.

The next results are for this worst-case configuration,

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.

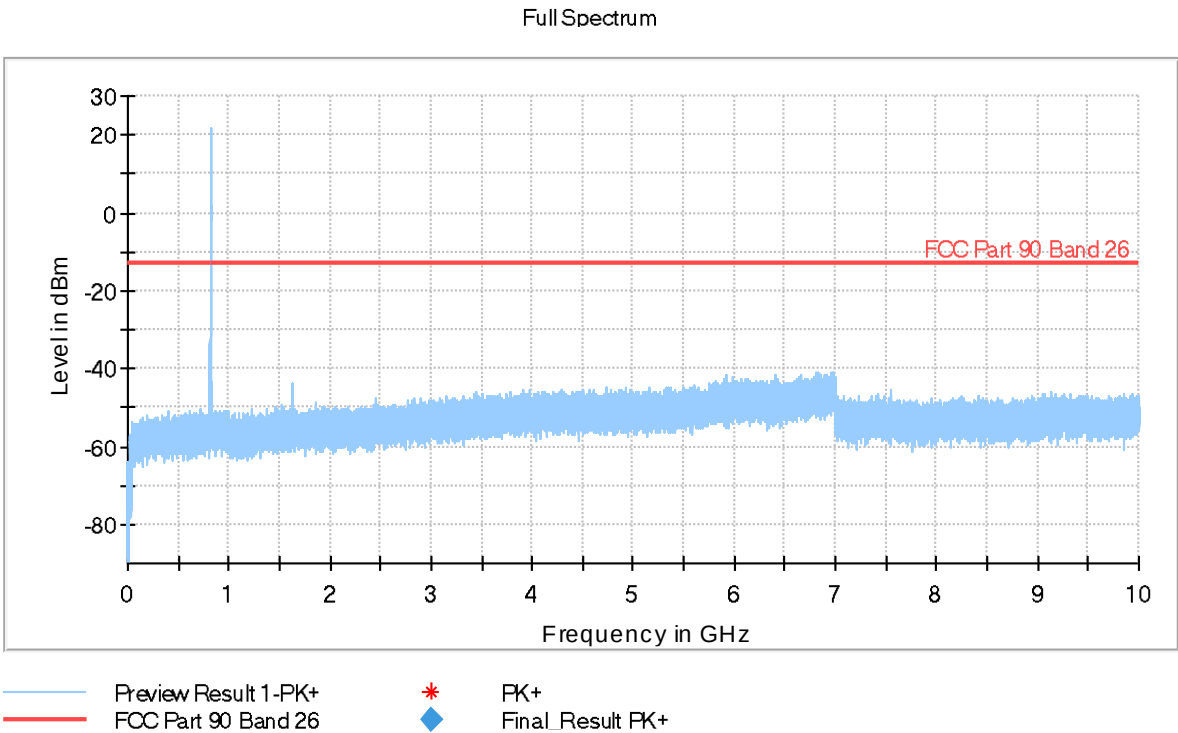
Verdict

PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
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 - 2 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
2 GHz - 3 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
3 GHz - 4 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
4 GHz - 5 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
5 GHz - 6 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
6 GHz - 7 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
7 GHz - 8 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
8 GHz - 9 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
9 GHz - 10 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB

LTE Cat NB1 Band 26. Sub-band 814-824 MHz:
Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=0.

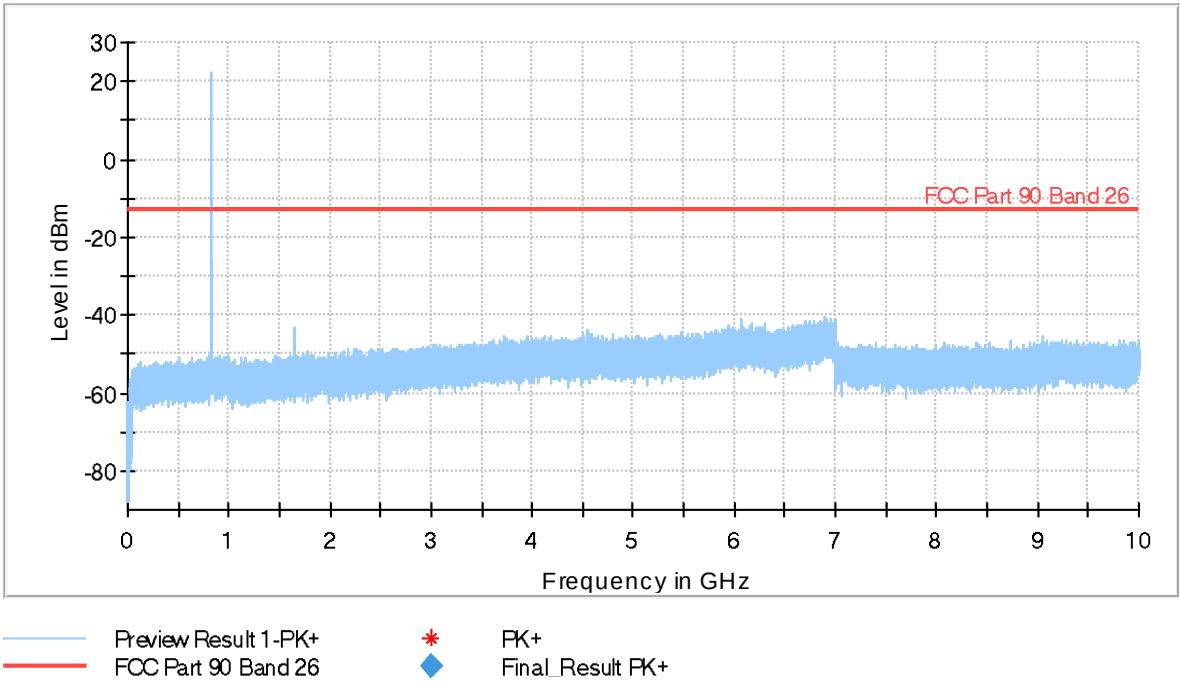
Low Channel:



The peak above the limit is the carrier frequency.

High Channel:

Full Spectrum



The peak above the limit is the carrier frequency.

LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz:

A preliminary scan determined the worst-case:

Pi/4-QPSK. BW=3.75 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=3.

The next results are for this worst-case configuration,

Frequency range 9 KHz - 10 GHz:

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

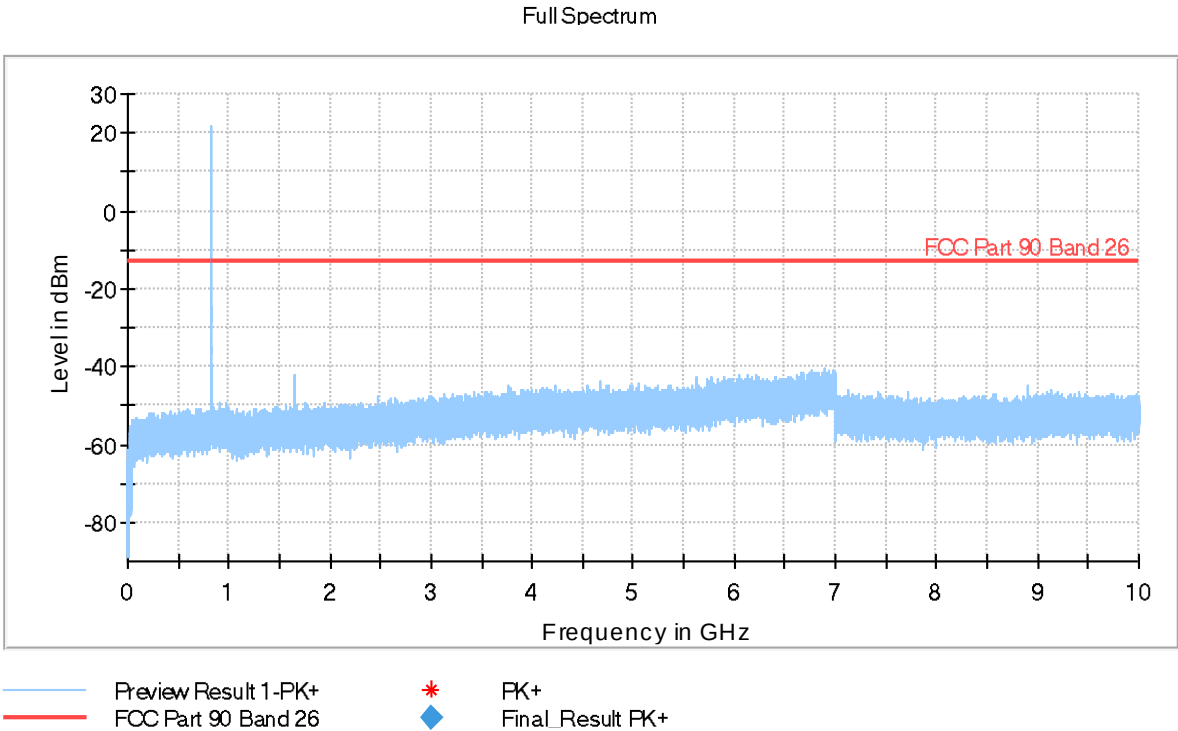
Verdict

PASS

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
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 - 2 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
2 GHz - 3 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
3 GHz - 4 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
4 GHz - 5 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
5 GHz - 6 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
6 GHz - 7 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
7 GHz - 8 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
8 GHz - 9 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB
9 GHz - 10 GHz	31.25 kHz	PK+	100 kHz	Coupled	0 dB

LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz:
Pi/4-QPSK. BW=3.75 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=3.

Single Channel:



The peak above the limit is the carrier frequency.

Spurious Emissions at Antenna Terminals at Block Edges

Limits

FCC §2.1051. Measurements required: Spurious emissions at antenna terminals.

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.

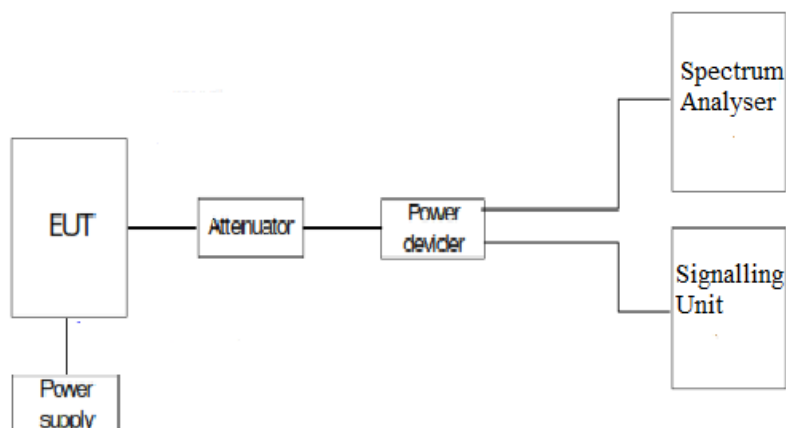
The reading of the spectrum analyser is corrected with the path loss of the connection between the output terminal of the EUT and the input of the spectrum analyzer.

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

At P_o transmitting power, the specified minimum attenuation $43 + 10 \log_{10} p$ (watts) for any frequency removed from the EA licensee's frequency block greater than 37.5 kHz becomes:

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

Test Setup



Results

LTE Cat NB1 Band 26. Sub-band 814-824 MHz:

Preliminary measurements determined the worst-case. Results attached are for this worst-case configuration.

LTE Cat NB1 Band 26	Pi/2-BPSK BW=3.75 kHz Tone Number=1 Tone Offset=0 MSC/TBS=0	Pi/2-BPSK BW=15 kHz Tone Number=1 Tone Offset=0 MSC/TBS=0	QPSK BW=15 kHz Tone Number=12 Tone Offset=0 MSC/TBS=5
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-19.14	-18.37	-19.69

LTE Cat NB1 Band 26	Pi/2-BPSK BW=3.75 kHz Tone Number=1 Tone Offset=47 MSC/TBS=0	Pi/2-BPSK BW=15 kHz Tone Number=1 Tone Offset=11 MSC/TBS=0	QPSK BW=15 kHz Tone Number=12 Tone Offset=0 MSC/TBS=5
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-20.22	-19.66	-21.9

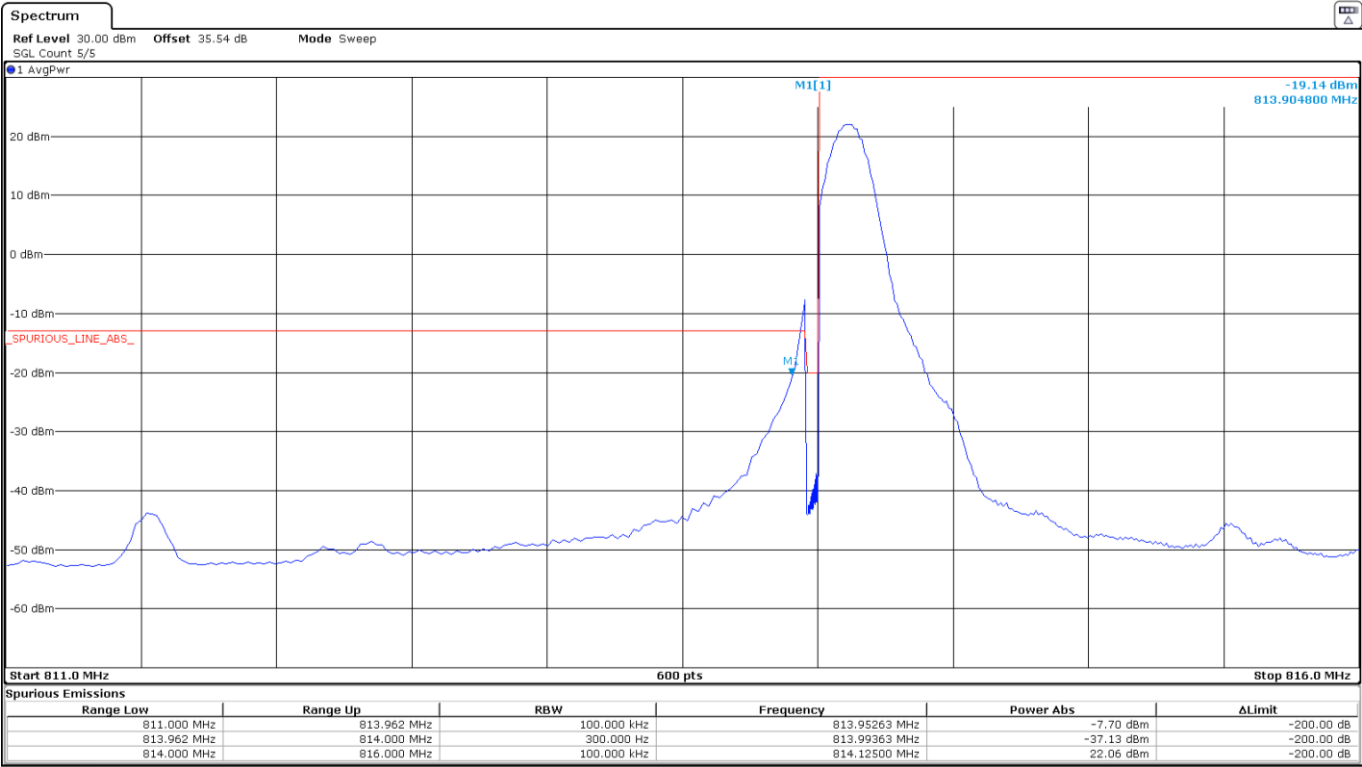
Measurement uncertainty (dB): <±2.76

Verdict

Pass

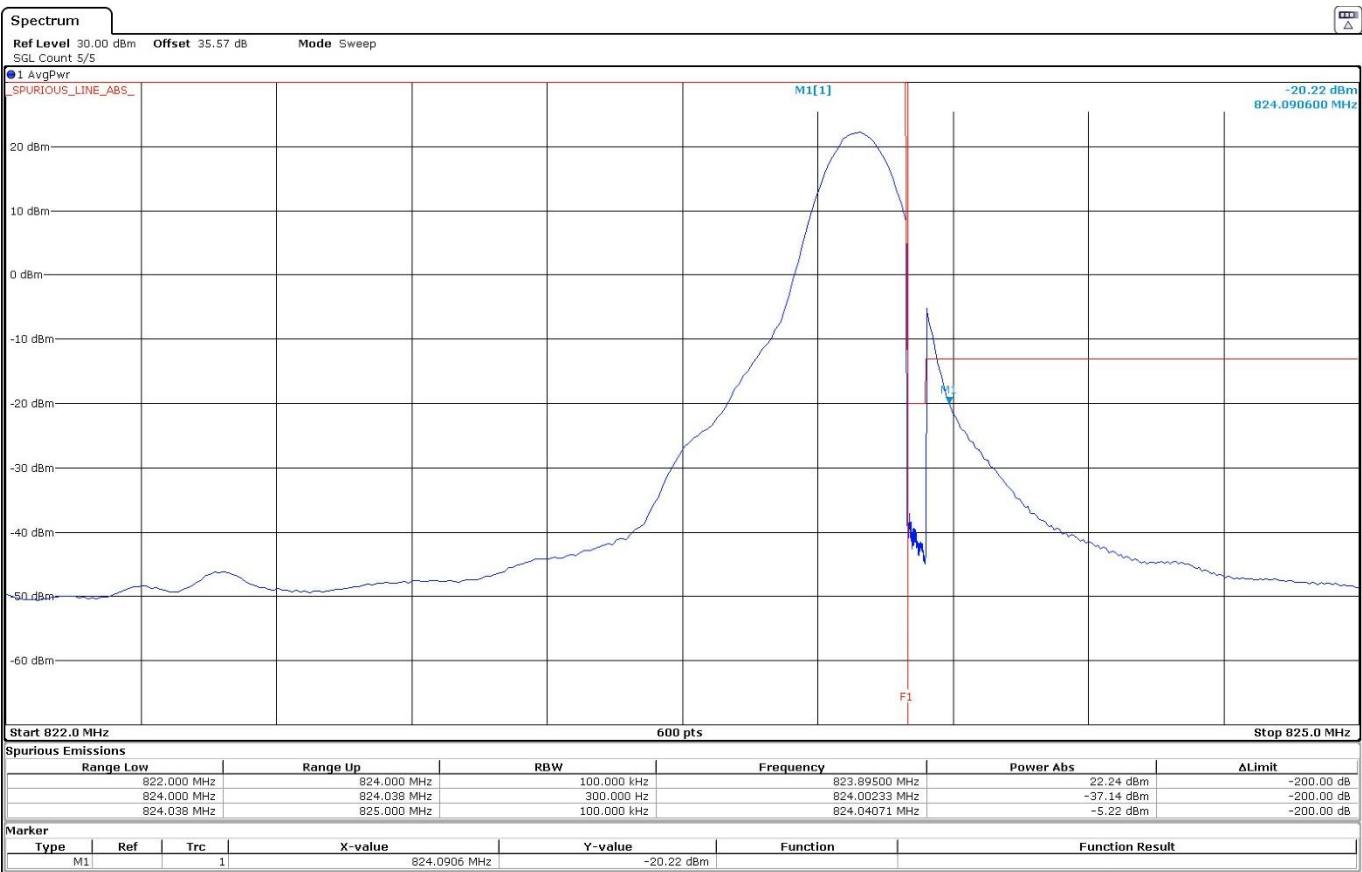
LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK
Offset=0. MSC/TBS=0. Low Channel:

Pi/2-BPSK. BW=3.75 kHz. Tone Number=1. Tone

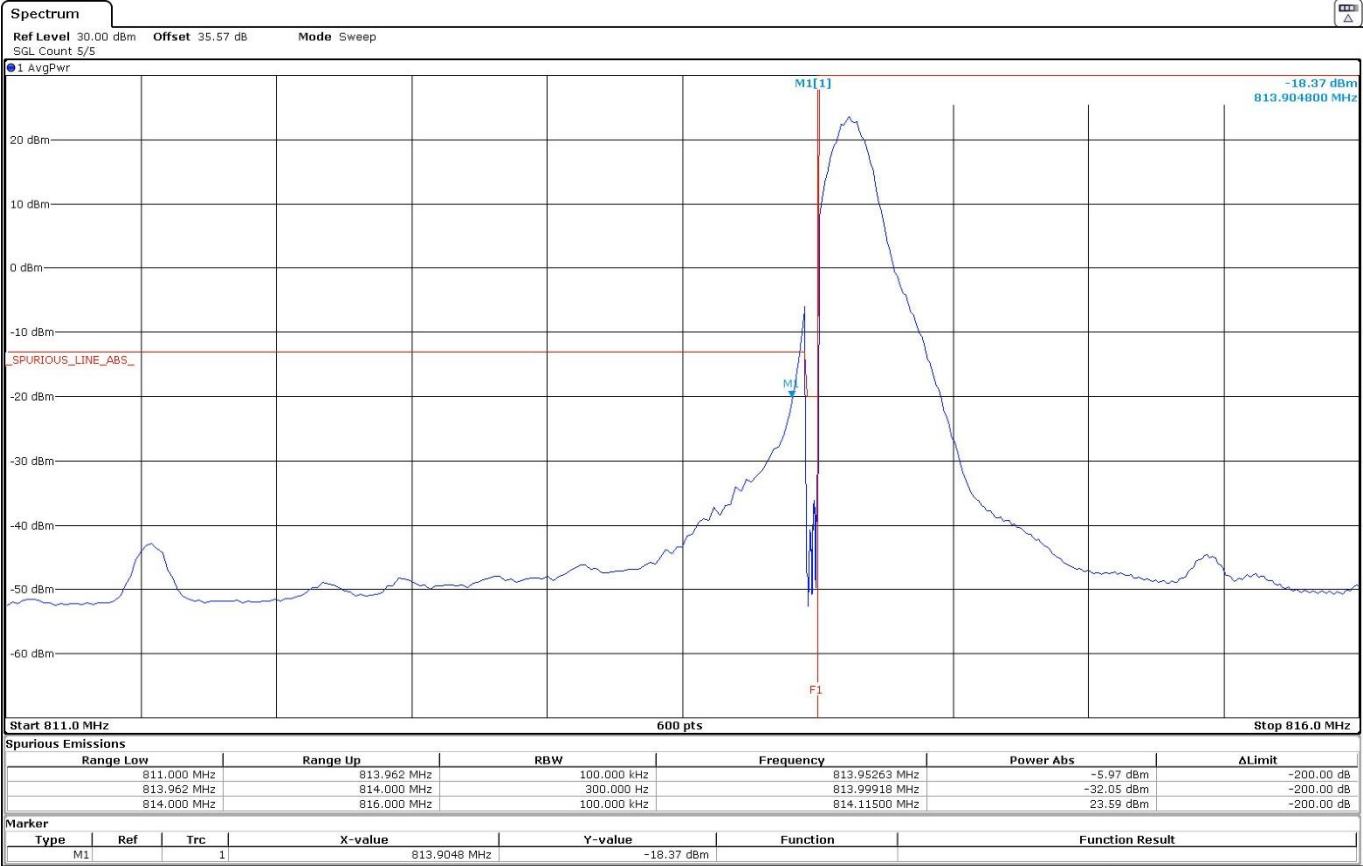


LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK:
Offset=47. MSC/TBS=0. High Channel:

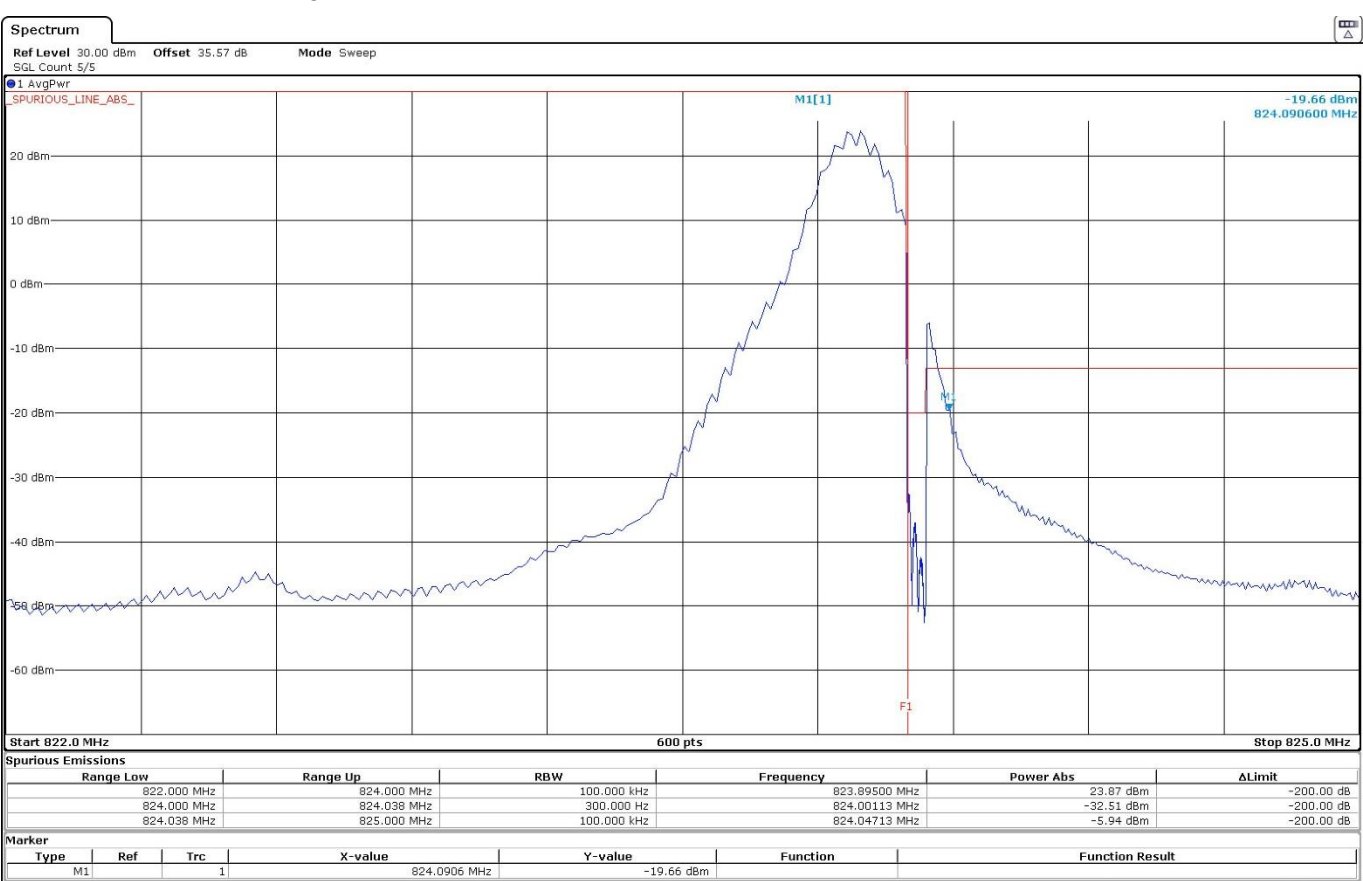
Pi/2-BPSK. BW=3.75 kHz. Tone Number=1. Tone



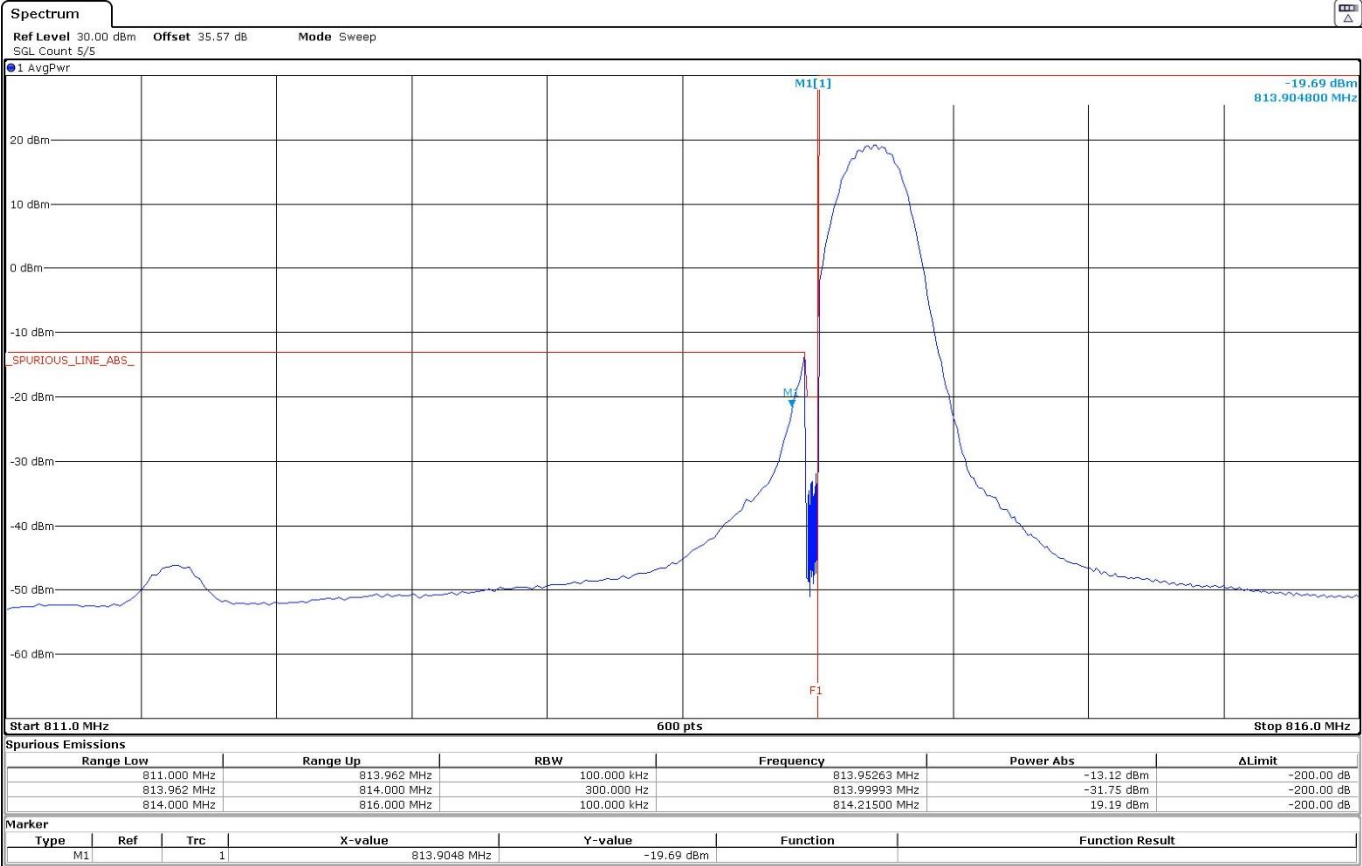
LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK: Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=0. Low Channel:



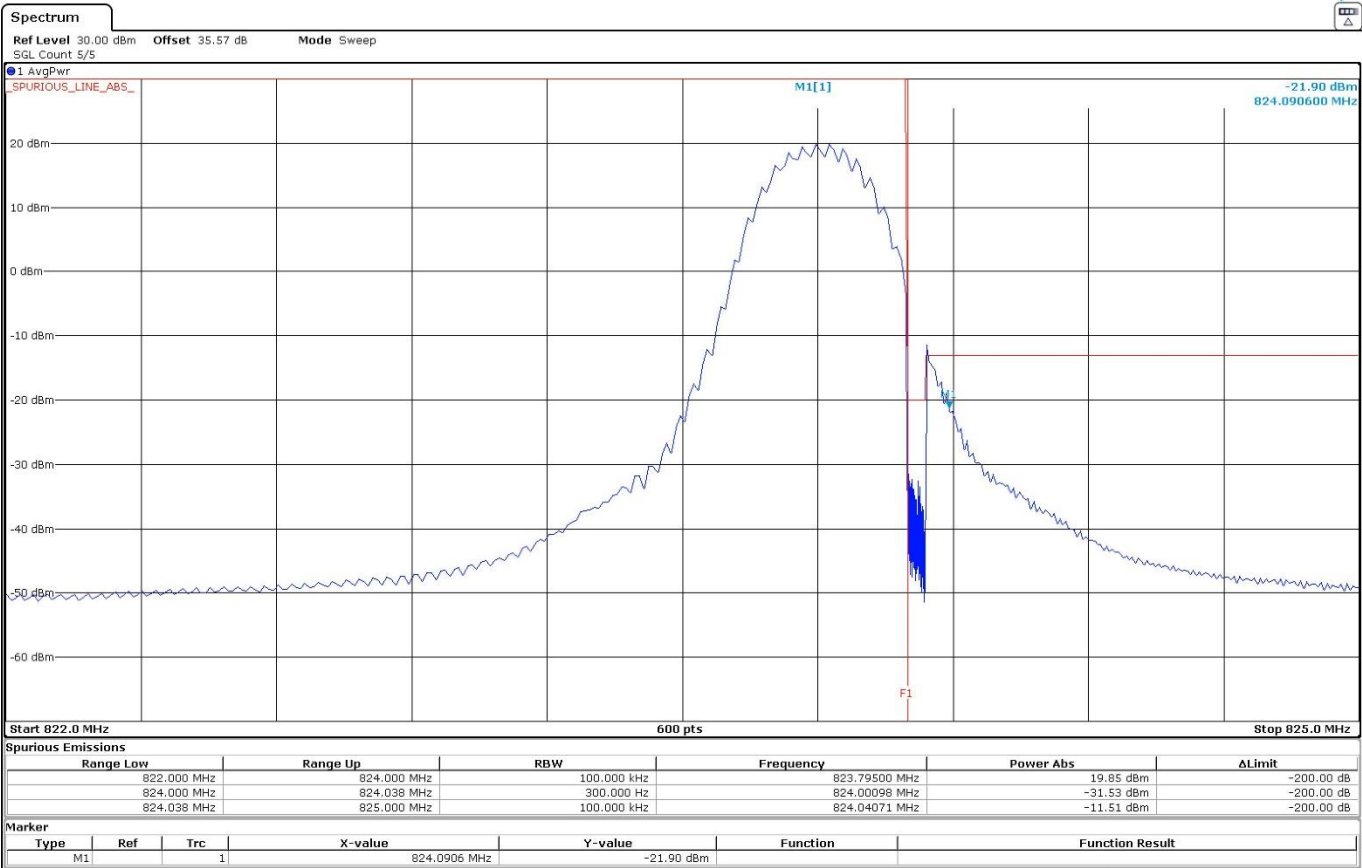
LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK: Pi/2-BPSK. BW=15 kHz. Tone Number=1. Tone Offset=0. MSC/TBS=0. High Channel:



LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK: QPSK. BW=15 kHz. Tone Number=12. Tone Offset=0. MSC/TBS=5. Low Channel:



LTE Cat NB1 Band 26. Sub-band 814-824 MHz. EA MASK: QPSK. BW=15 kHz. Tone Number=12. Tone Offset=0. MSC/TBS=5. High Channel:



Radiated Emissions

Limits

FCC §90.691:

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.

Method

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

The EUT was placed on a non-conductive stand at 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:

At P_o transmitting power, the specified minimum attenuation $43 + 10 \log_{10} p$ (watts) for any frequency removed from the EA licensee's frequency block greater than 37.5 kHz becomes:

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

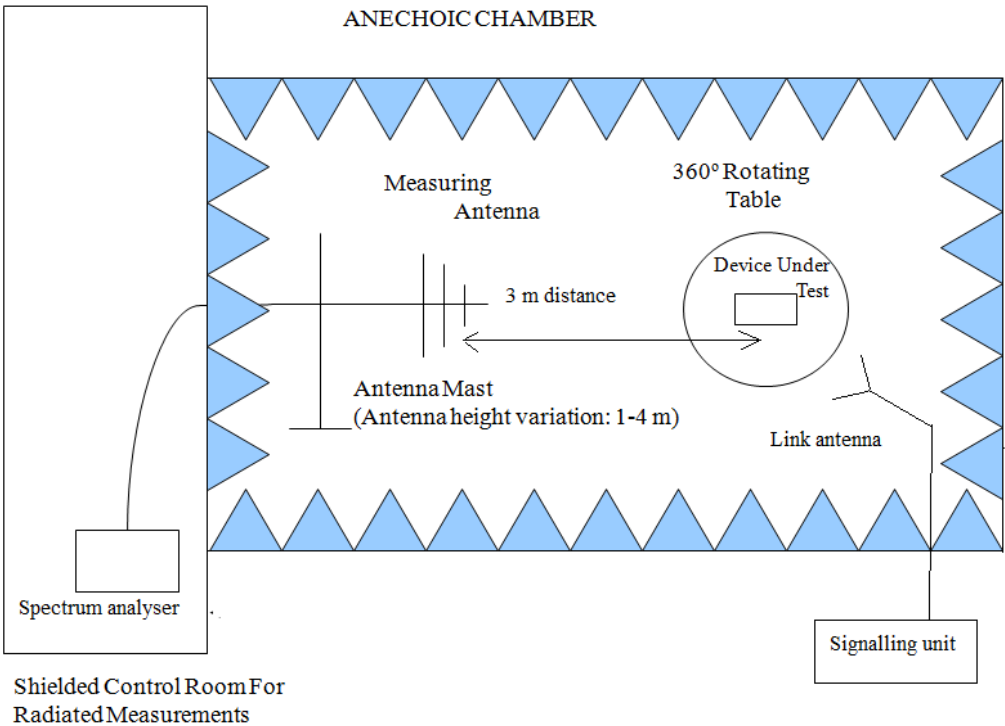
The maximum field strength (dB μ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

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

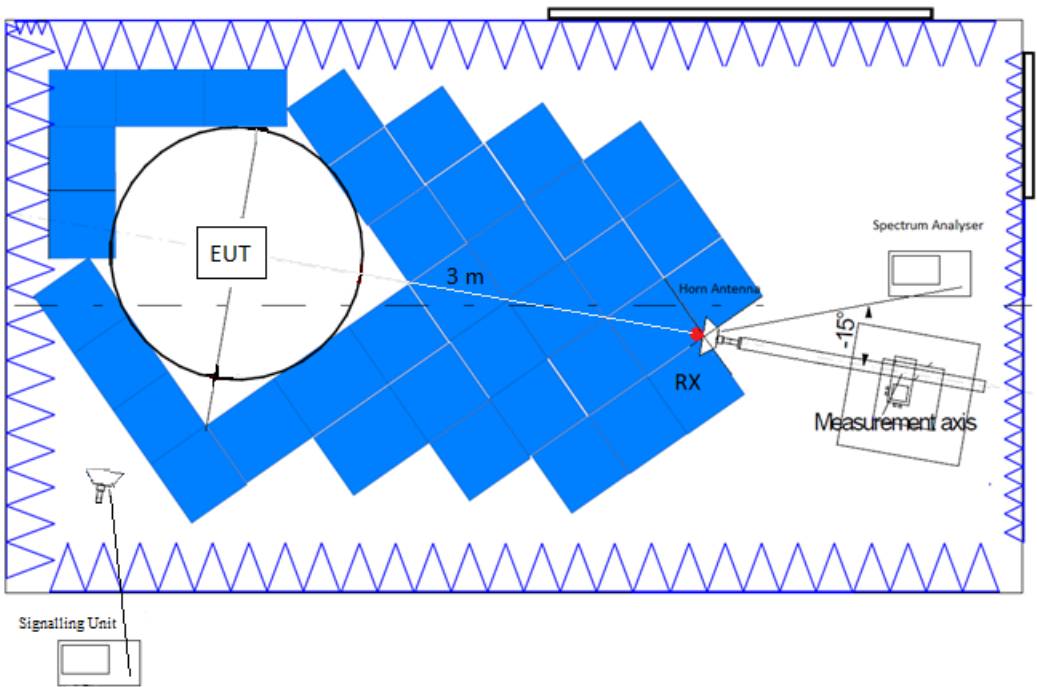
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

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 ANSI C63.26.

LTE Cat NB1 Band 26. Sub-band 814-824 MHz:

A preliminary scan determined the Pi/2-BPSK, BW=15 kHz, Tone Number=1, Tone Offset=0, MSC/TBS=0 as the worst case. The following results are for this worst-case configuration.

Frequency range 30 MHz - 1 GHz

- LOW CHANNEL:

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

- HIGH CHANNEL:

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

Frequency range 1 - 8.5 GHz

- LOW CHANNEL:

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

- HIGH CHANNEL:

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

Measurement uncertainty (dB): < ± 5.35 for $f \geq 30$ MHz up to 1 GHz
< ± 4.32 for $f \geq 1$ GHz up to 8.5 GHz

Verdict

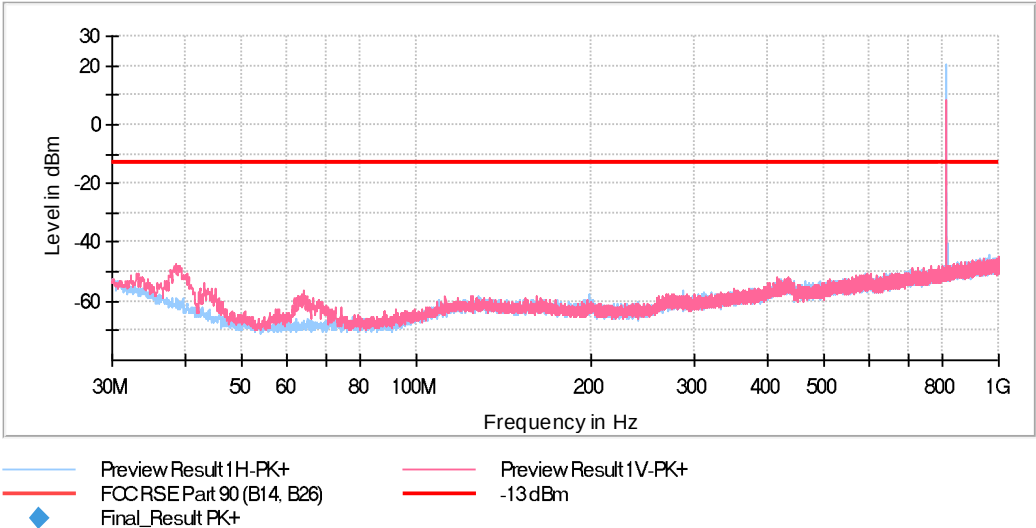
Pass

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 8.5 GHz	234.375 kHz	PK+	1 MHz	1 s	0 dB

LTE Cat NB1 Band 26. Sub-band 814-824 MHz:

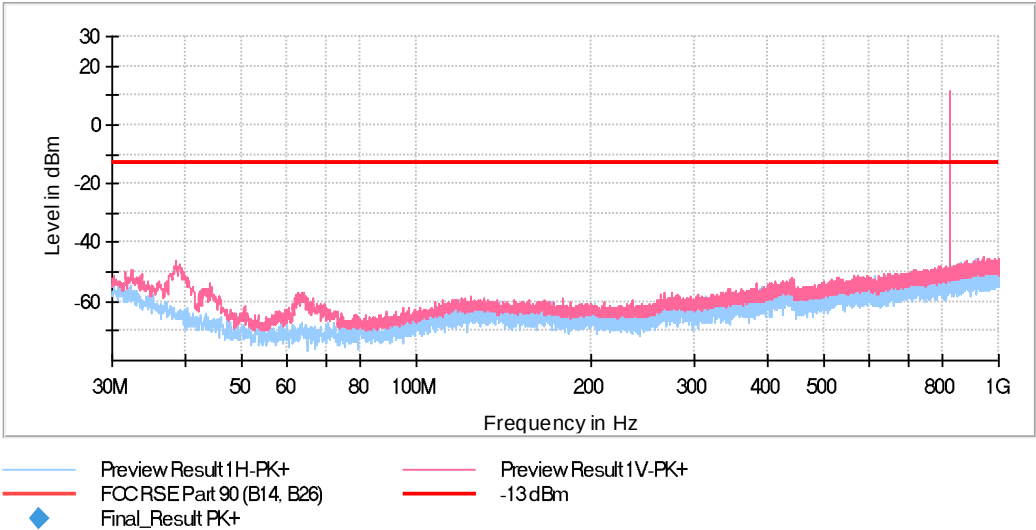
FREQUENCY RANGE 30 MHz - 1 GHz:

- LOW CHANNEL:



The peak above the limit is the carrier frequency:
LTE Cat NB1 Band 26. Sub-band 814-824 MHz, 814.2 MHz

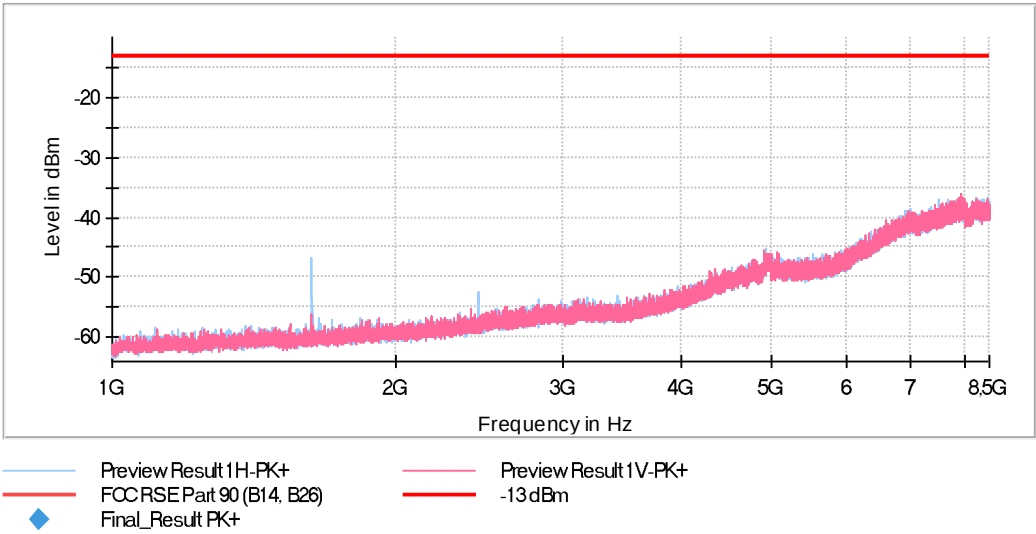
- HIGH CHANNEL:



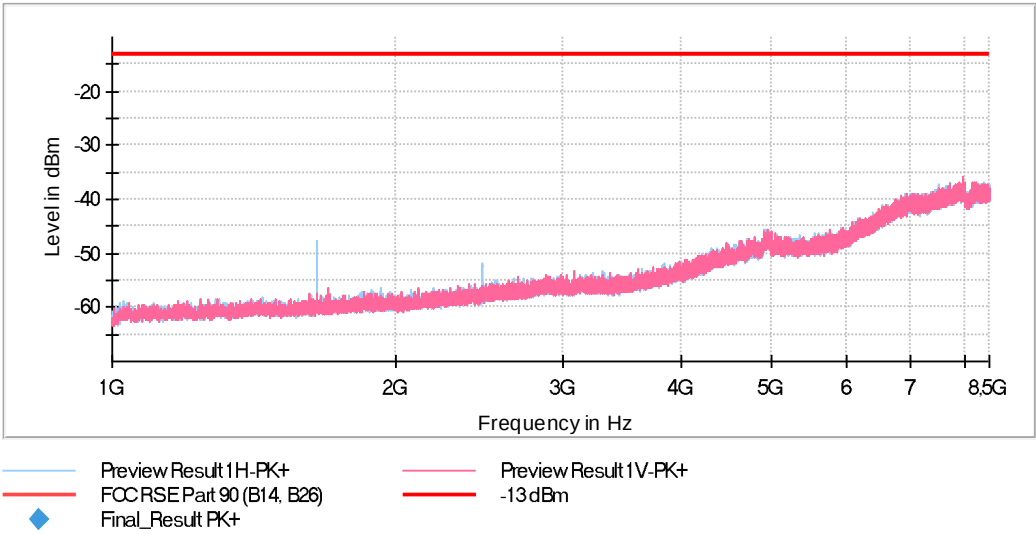
The peak above the limit is the carrier frequency:
LTE Cat NB1 Band 26. Sub-band 814-824 MHz, 823.8 MHz

FREQUENCY RANGE 1 - 8.5 GHz:

- LOW CHANNEL:



- HIGH CHANNEL:



LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz:

A preliminary scan determined the Pi/4-QPSK, BW=3.75 kHz, Tone Number=1, Tone Offset=0, MSC/TBS=3 as the worst case. The following results are for this worst-case configuration.

- 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 - 8.5 GHz:

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

Measurement uncertainty (dB): < ± 5.35 for $f \geq 30$ MHz up to 1 GHz
< ± 4.32 for $f \geq 1$ GHz up to 8.5 GHz

Verdict

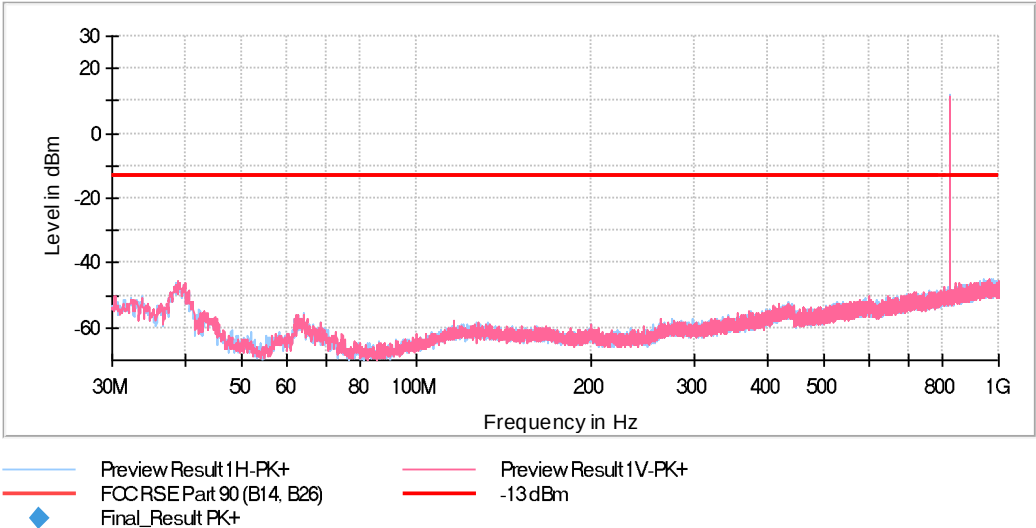
Pass

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30.312 kHz	PK+	100 kHz	Coupled	0 dB
1 GHz - 8.5 GHz	234.375 kHz	PK+	1 MHz	1 s	0 dB

LTE Cat NB1 Band 26. Cross-rule Channel 824 MHz:

FREQUENCY RANGE 30 MHz - 1 GHz:

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



The peak above the limit is the carrier frequency:
LTE Cat NB1 Band 26 Sub-band 814-824 MHz, 824 MHz

FREQUENCY RANGE 1 - 8.5 GHz:

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

