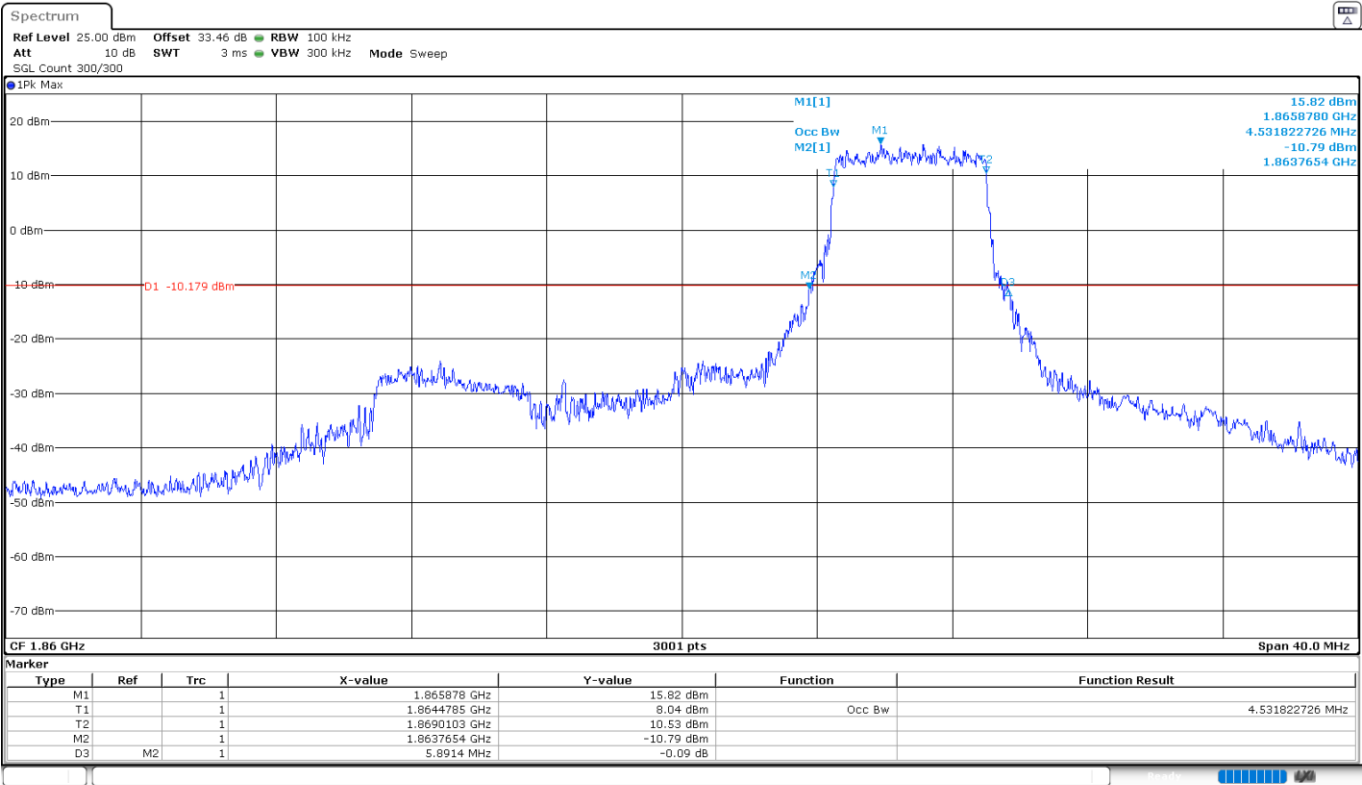
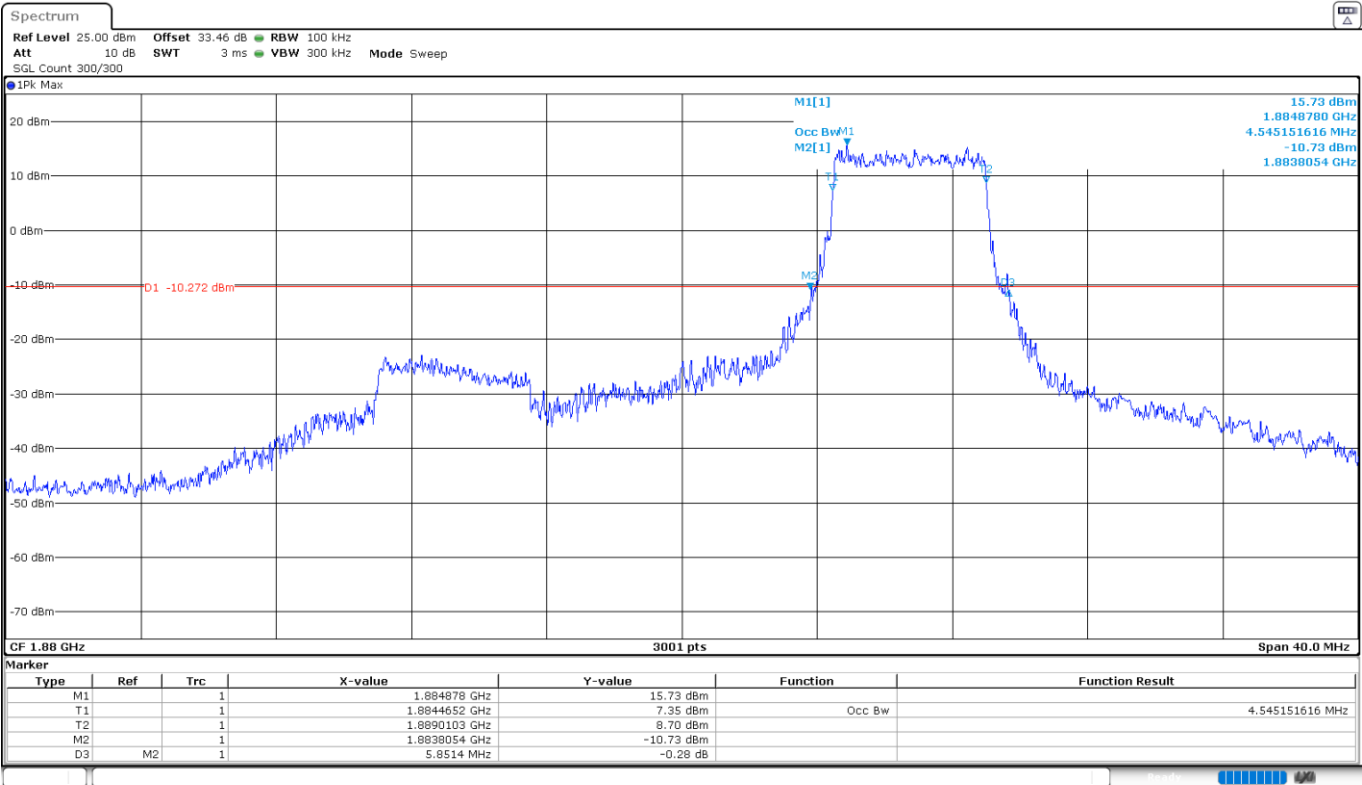


BW=20 MHz. 16QAM. RB Size=max

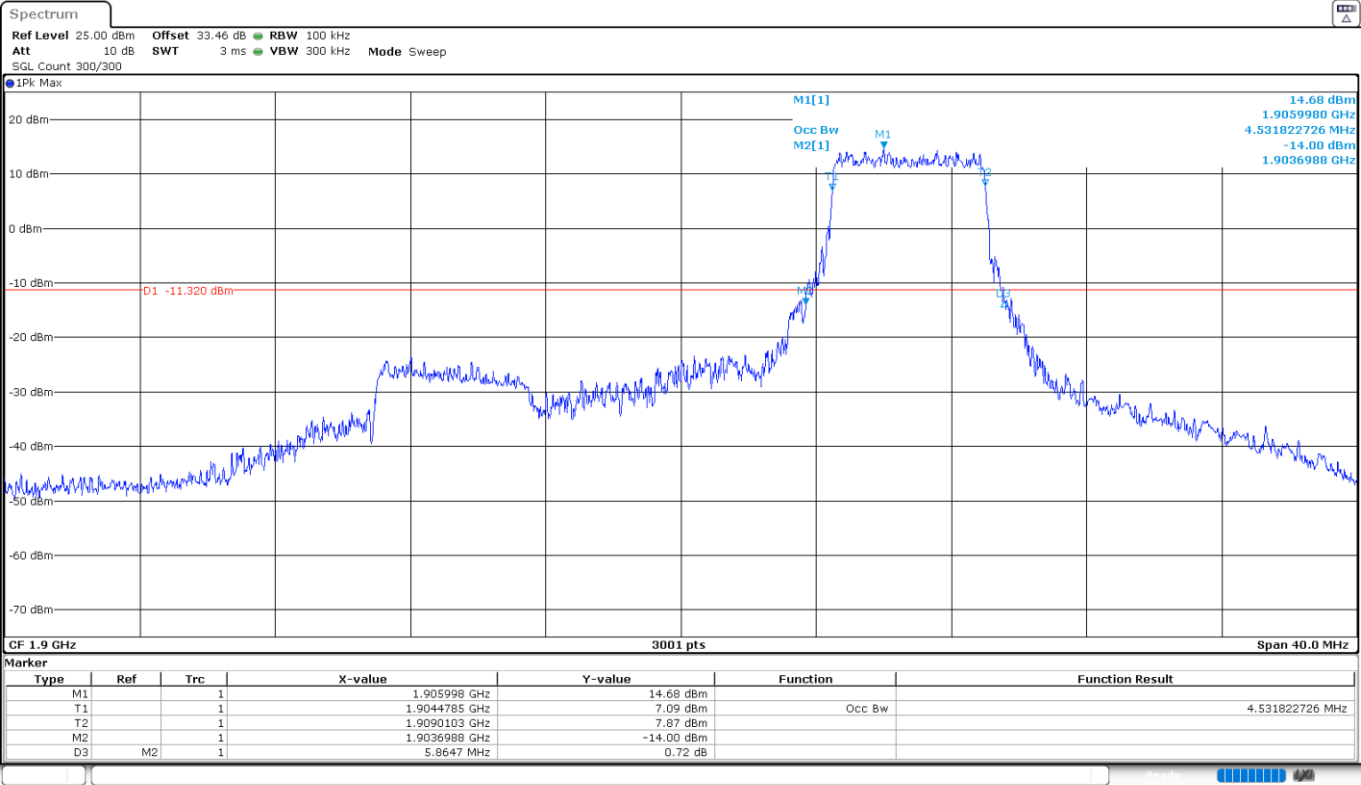
Low Channel:



Middle Channel:



High Channel:



Spurious Emissions at Antenna Terminals

Limits

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

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

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

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

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

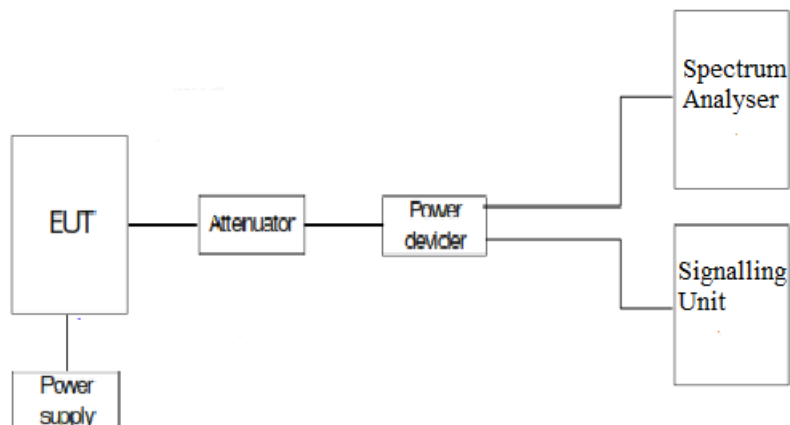
Method

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

The 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-1bis Band 2:

A preliminary scan determined the worst-case:

BW=20 MHz. QPSK. RB Size=1. RB Offset=99.

The next results are for this worst-case configuration.

Frequency range 9 KHz - 20 GHz:

- Low Channel: No spurious signals found.
- Middle Channel: No spurious signals found.
- High Channel: No spurious signals found.

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

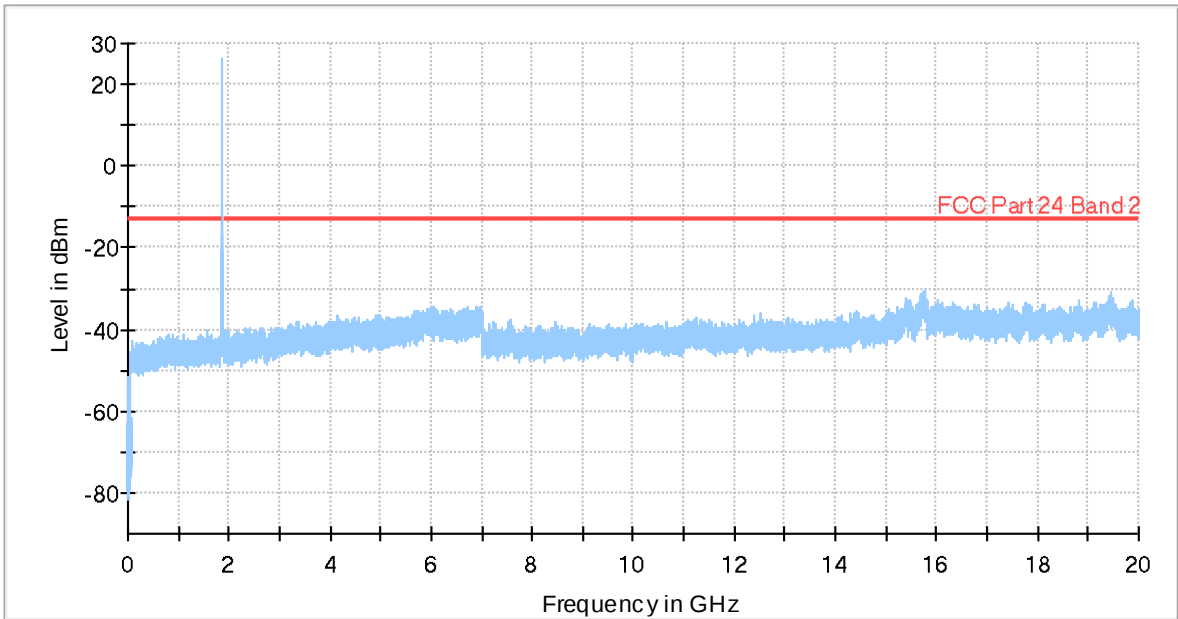
Verdict: PASS

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	303,125 kHz	PK+	1 MHz	Coupled	0 dB
1 GHz - 10 GHz	281,25 kHz	PK+	1 MHz	Coupled	0 dB
10 GHz - 20 GHz	312,5 kHz	PK+	1 MHz	Coupled	0 dB

LTE Cat-1bis Band 2: BW=15 MHz. 16QAM. RB Size=5. RB Offset=0. Narrowband=0.

Low Channel:

Full Spectrum

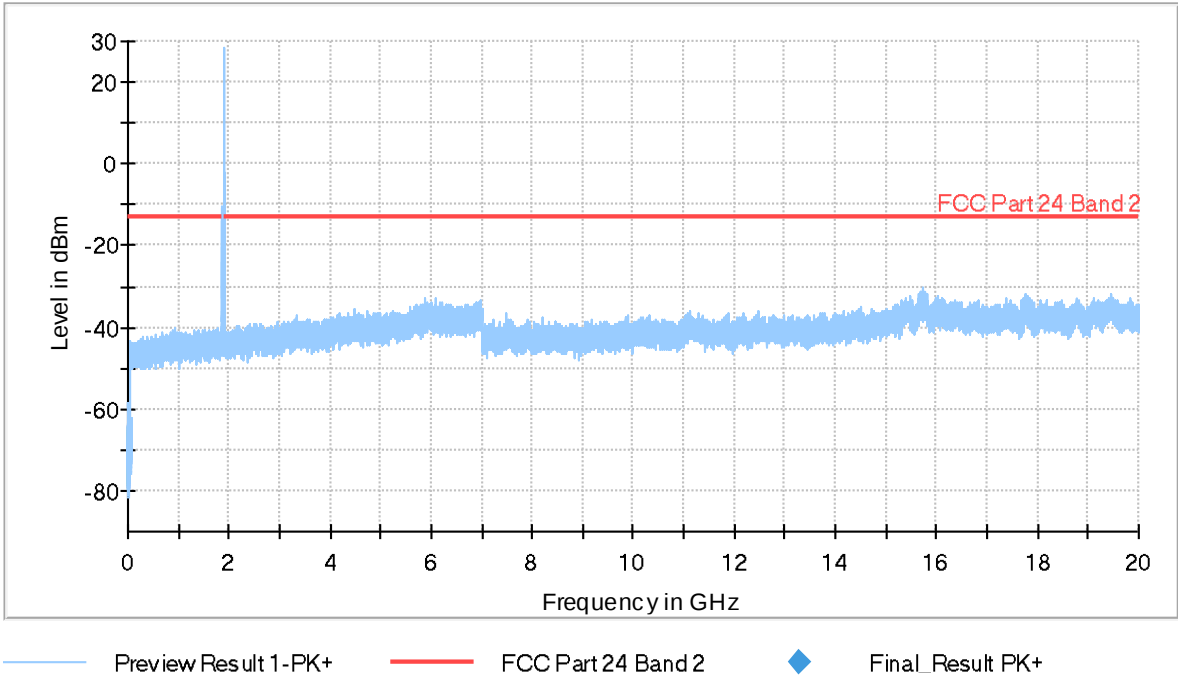


Preview Result 1-PK+ * PK+ FCC Part 24 Band 2 Final_Result PK

The peak above the limit is the carrier frequency.

Middle Channel:

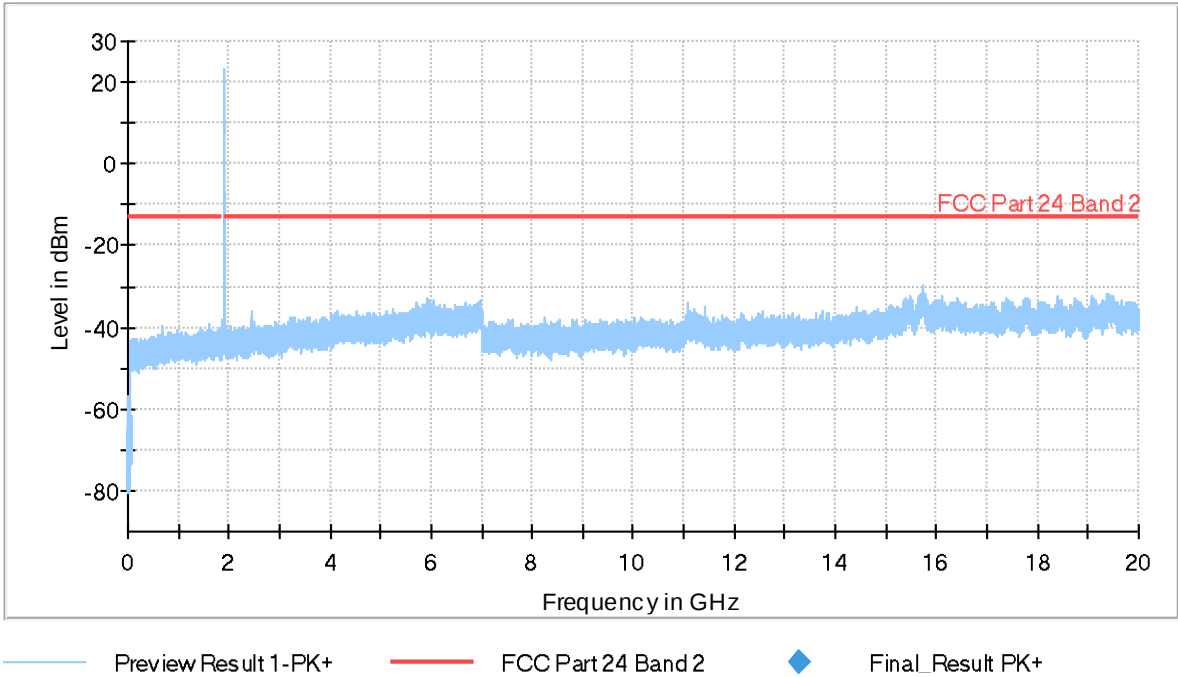
Full Spectrum



The peak above the limit is the carrier frequency.

High Channel:

Full Spectrum



The peak above the limit is the carrier frequency.

Spurious Emissions at Antenna Terminals at Block Edges

Limits

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

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

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

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

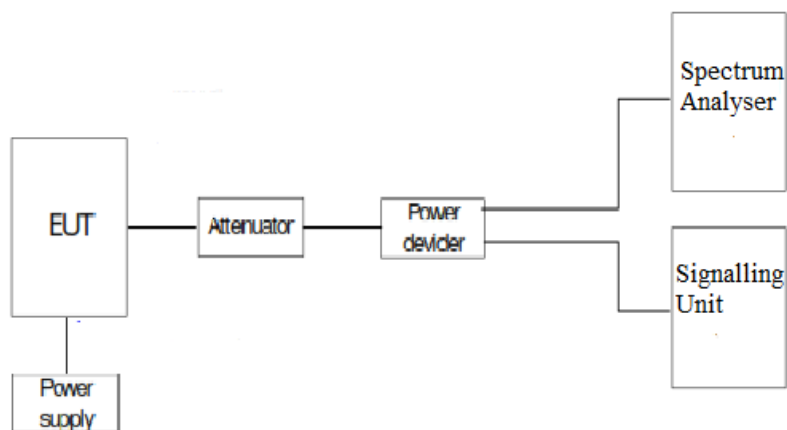
Method

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

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

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

Test Setup



Results

LTE Cat-1bis Band 2:

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

LTE Cat-1bis Band 2. 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	RB=1. Offset =0. BW=20 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-23,34	-21,09	-19,52	-22,03	-24,1	-27,39

LTE Cat-1bis Band 2. QPSK.	RB=5. Offset=0. BW=1.4 MHz	RB=5. Offset=0. BW = 3 MHz	RB=5. Offset=0. BW=5 MHz	RB=5. Offset=0. BW=10 MHz	RB=5. Offset=0. BW=15 MHz	RB=5. Offset=0. BW=20 MHz
Maximum measured level at <u>Low Block Edge</u> at antenna port (dBm)	-27,65	-24,22	-24,69	-26,88	-29,61	-33,17

LTE Cat-1bis Band 2. 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	RB=1. Offset =Max. BW=20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-20,8	-18,92	-17,12	-18,97	-21,09	-24,63

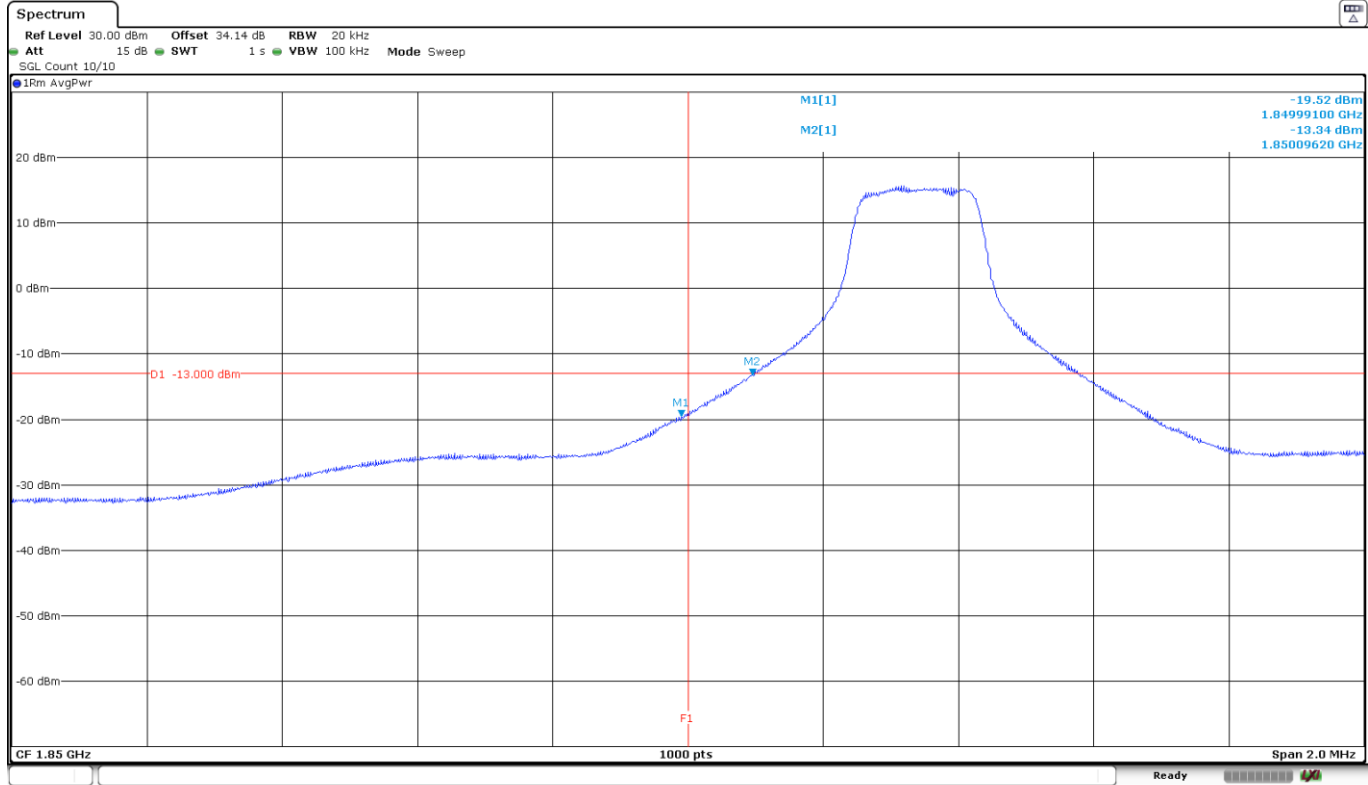
LTE Cat-1bis Band 2. QPSK.	RB=5. Offset=1. BW=1.4 MHz	RB=5. Offset=1. BW = 3 MHz	RB=5. Offset=1. BW=5 MHz	RB=5. Offset=1. BW=10 MHz	RB=5. Offset=1. BW=15 MHz	RB=5. Offset=1. BW=20 MHz
Maximum measured level at <u>High Block Edge</u> at antenna port (dBm)	-24,5	-27,34	-22,59	-27,38	-29,32	-32,86

Measurement uncertainty (dB) $< \pm 2.76$

Verdict

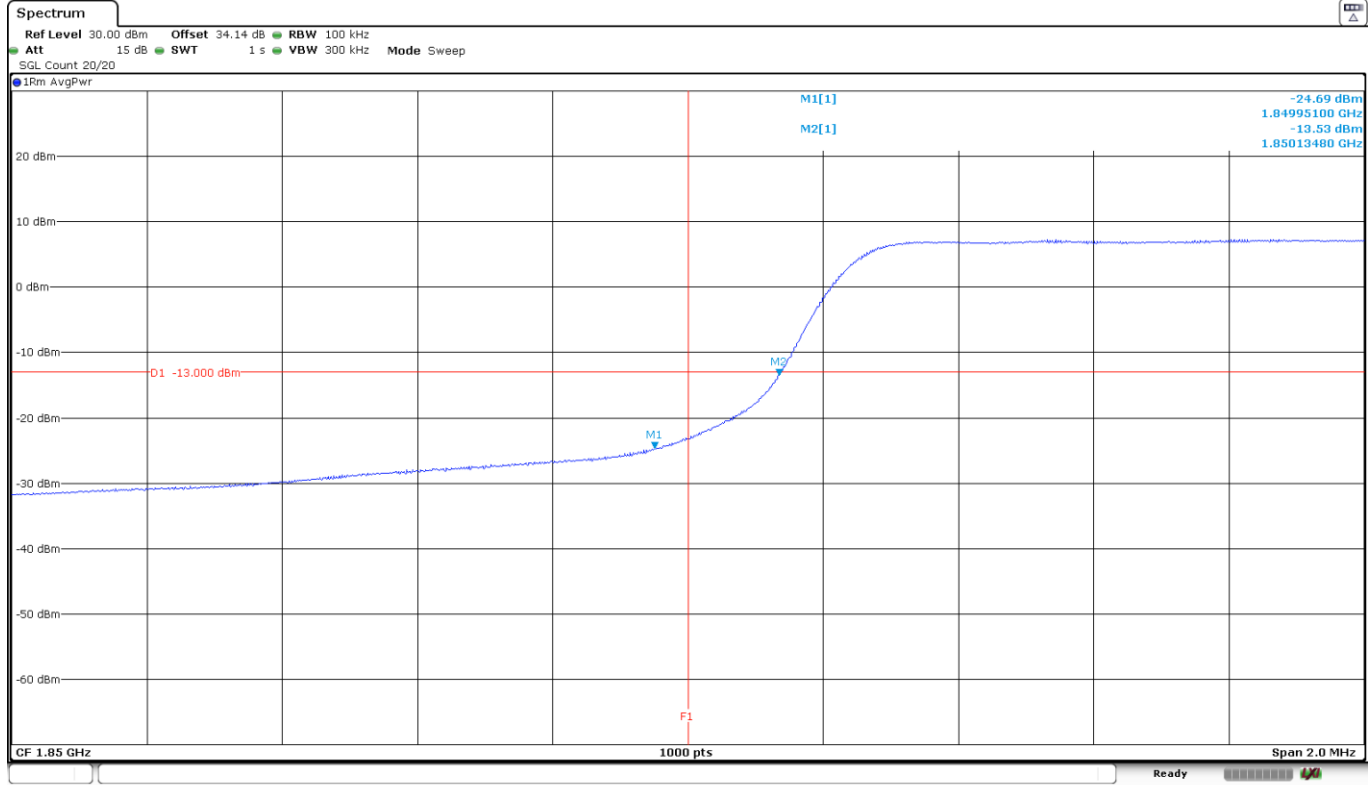
PASS

BW=5 MHz. QPSK. RB Size=1. RB Offset=0. Low Block Edge:



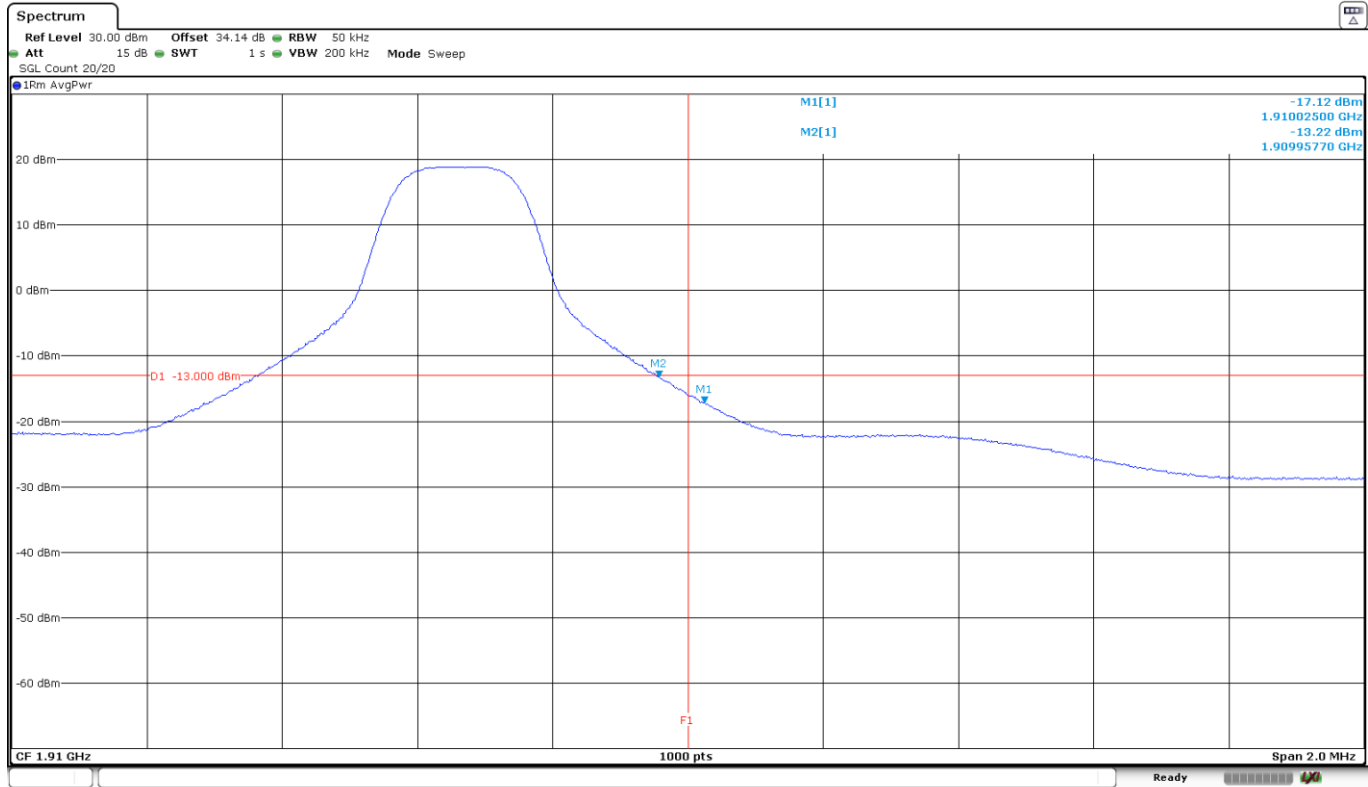
The equipment transmits at the maximum output power.

BW=5 MHz. QPSK. RB Size=5. RB Offset=0. Low Block Edge:



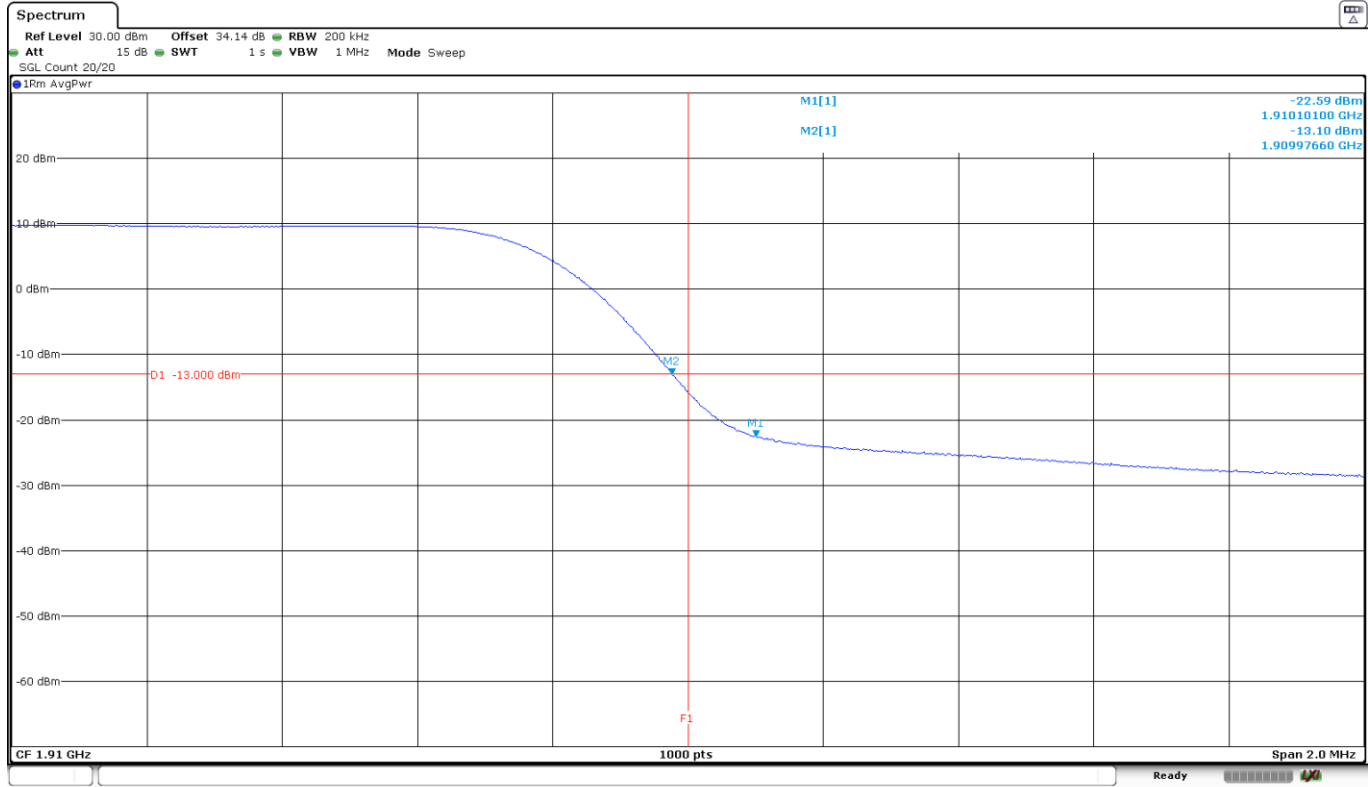
The equipment transmits at the maximum output power.

BW=5 MHz. QPSK. RB Size=1. RB Offset=Max. Narrowband=Max. High Block Edge:



The equipment transmits at the maximum output power.

BW=5 MHz. QPSK. RB Size=5. RB Offset=1. Narrowband=Max. High Block Edge:



The equipment transmits at the maximum output power.

Radiated Emissions

Limits

* FCC § 24.238. RSS-133 Clause 6.5:

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

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

Method

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

The EUT was placed on a non-conductive stand at 3-meter distance from the measuring antenna for measurements up to 17 GHz. Measurements above 17 GHz require the distance to be reduced to 1.5 meters.

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

Measurement Limit:

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

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

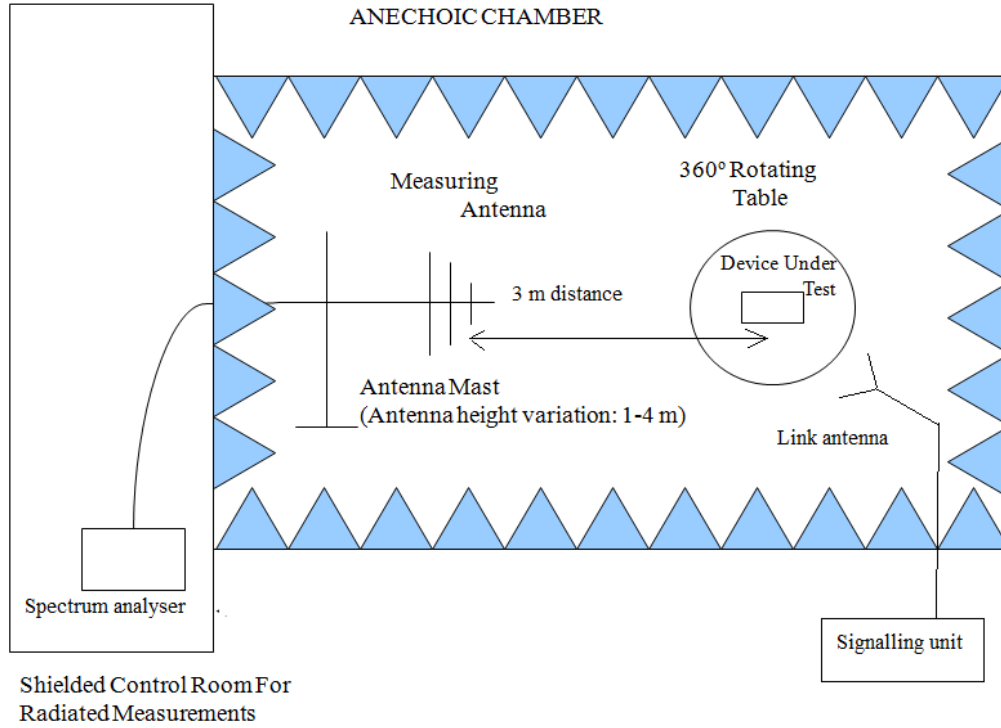
The maximum field strength (dB μ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

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

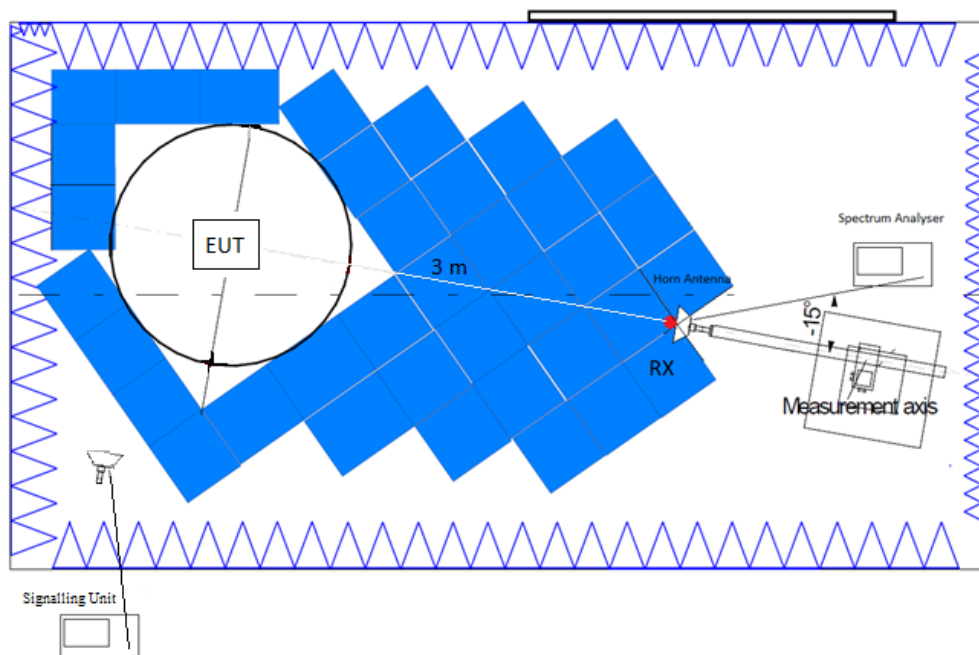
where D is the measurement distance (in the far field region) in m.

Test Setup

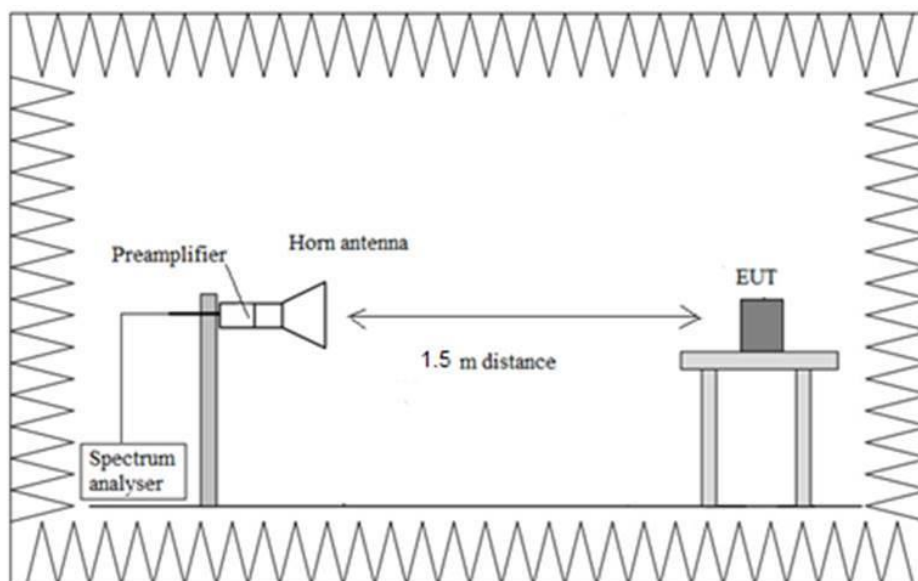
Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz up to 17 GHz:



Radiated measurements above 17 GHz:



Results

LTE Cat-1bis Band 2:

A preliminary scan determined the BW=20 MHz, QPSK, RB Size=1, RB Offset=99 as the worst case. The following results are for this worst-case configuration.

Frequency Range 30 MHz - 1 GHz:

- LOW CHANNEL:

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

- MIDDLE CHANNEL:

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

- HIGH CHANNEL:

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

Frequency Range 1 - 20 GHz:

- LOW CHANNEL:

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

- MIDDLE CHANNEL:

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

- HIGH CHANNEL:

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

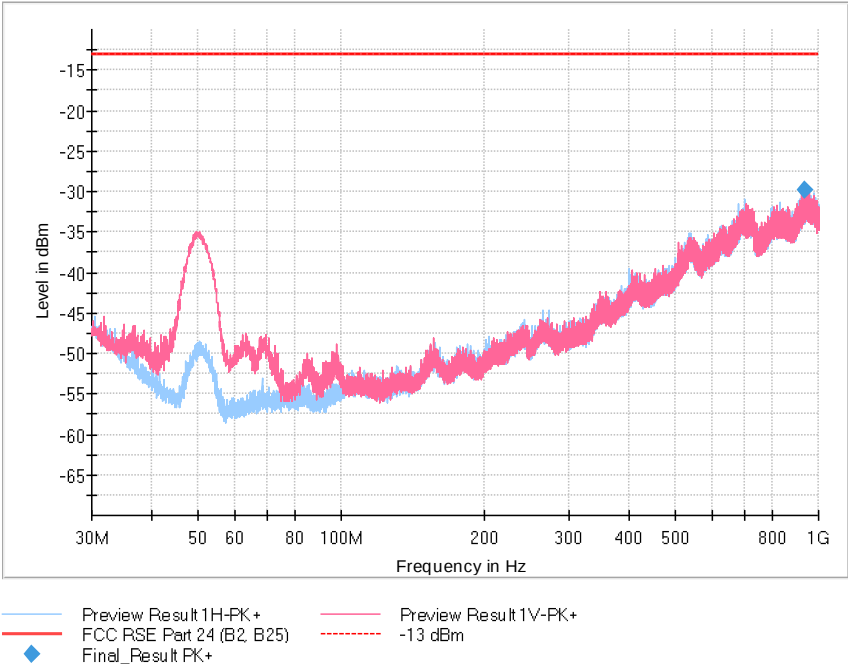
Measurement uncertainty (dB) $< \pm 5.03$ for $f < 1$ GHz
 $< \pm 4.32$ for $f \geq 1$ GHz up to 17 GHz
 $< \pm 4.58$ for $f \geq 17$ GHz up to 20 GHz

Verdict Pass

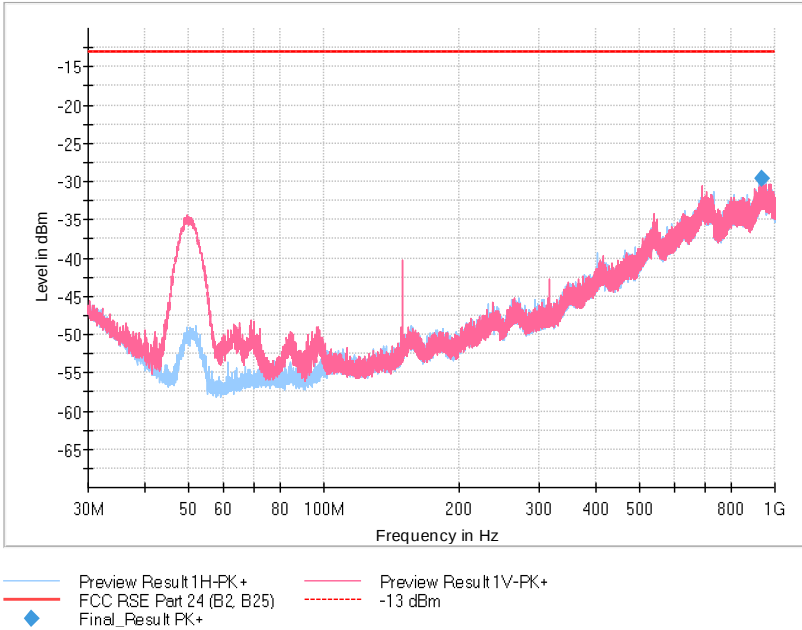
Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	30,312 kHz	PK+	1 MHz	Coupled	0 dB
1 GHz - 3 GHz	62.5 kHz	PK+	1 MHz	1 s	0 dB
3 GHz - 17 GHz	437.5 kHz	PK+	1 MHz	1 s	0 dB
17 GHz - 20 GHz	93.75 kHz	PK+	1 MHz	1 s	0 dB

FREQUENCY RANGE 30 MHz - 1 GHz:

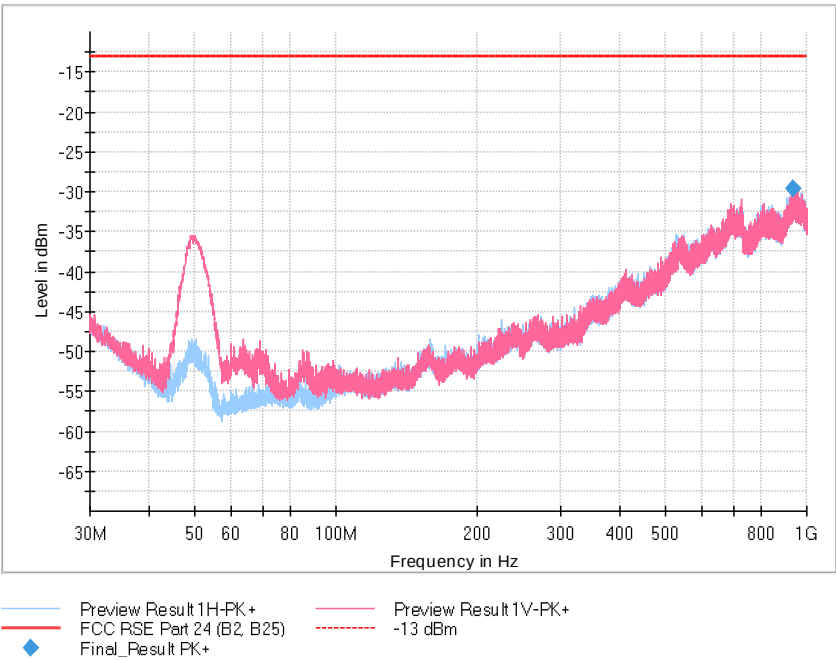
- Low Channel:



- Middle Channel:

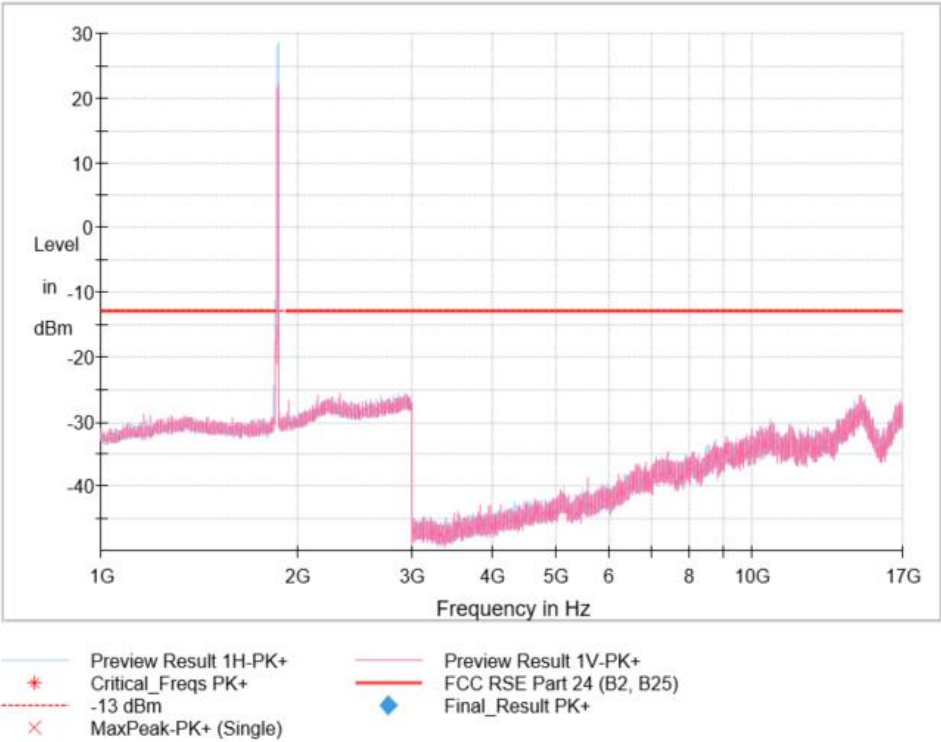


- High Channel:

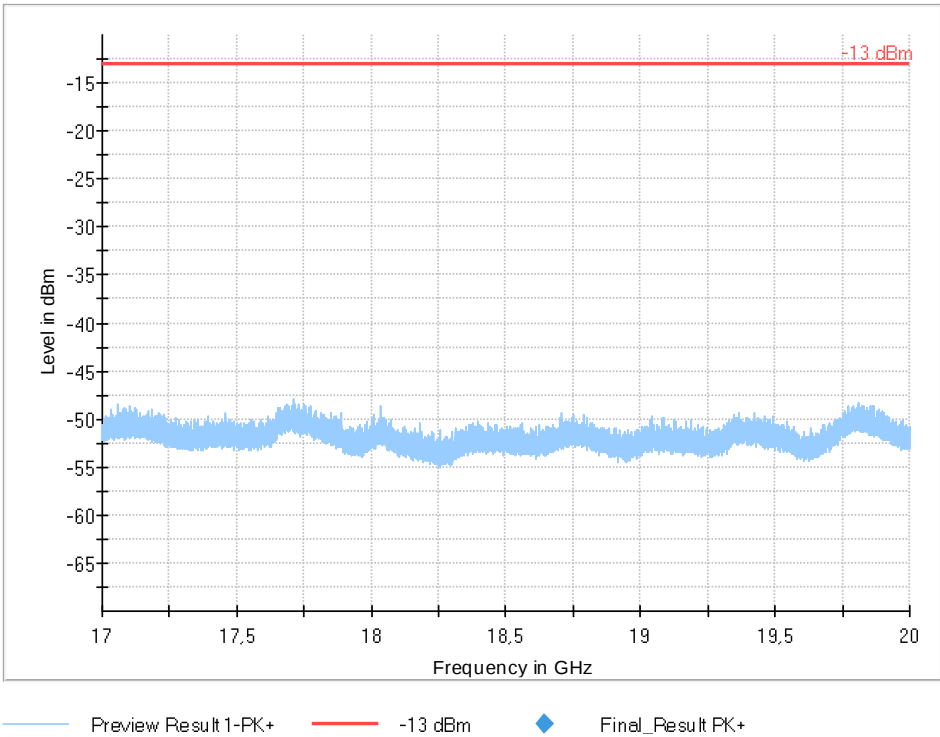


FREQUENCY RANGE 1 - 20 GHz:

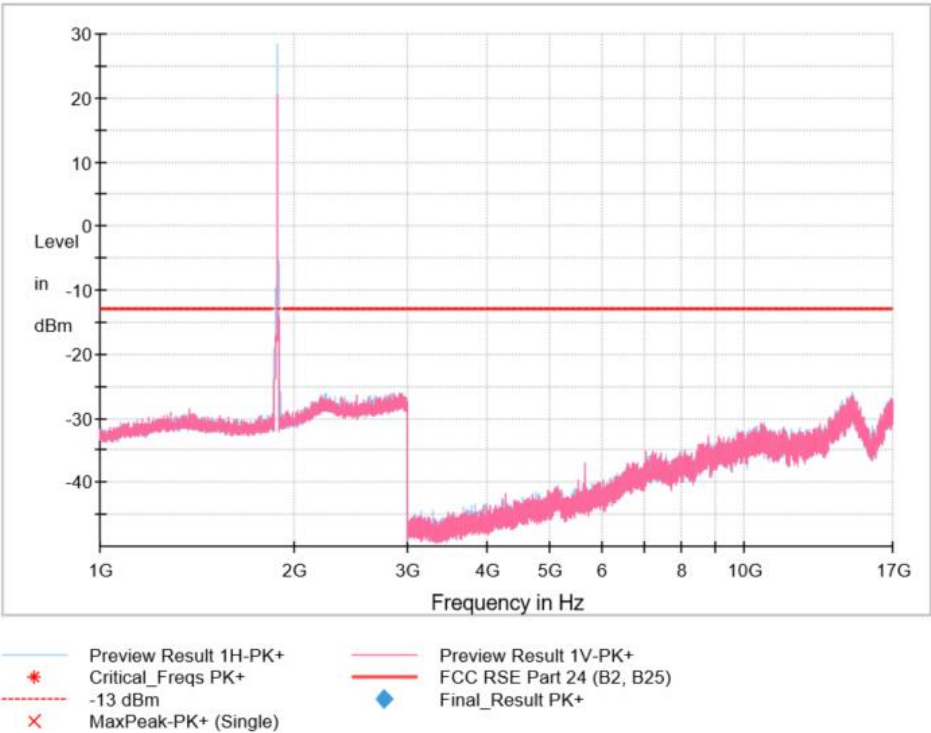
- Low Channel:



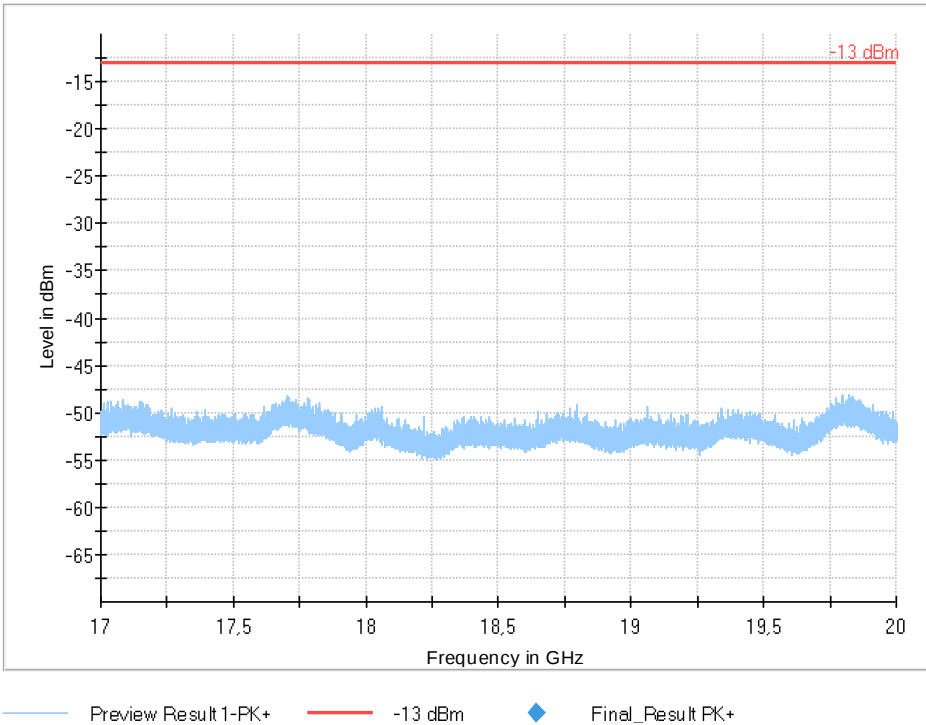
The peak above the limit is the carrier frequency.



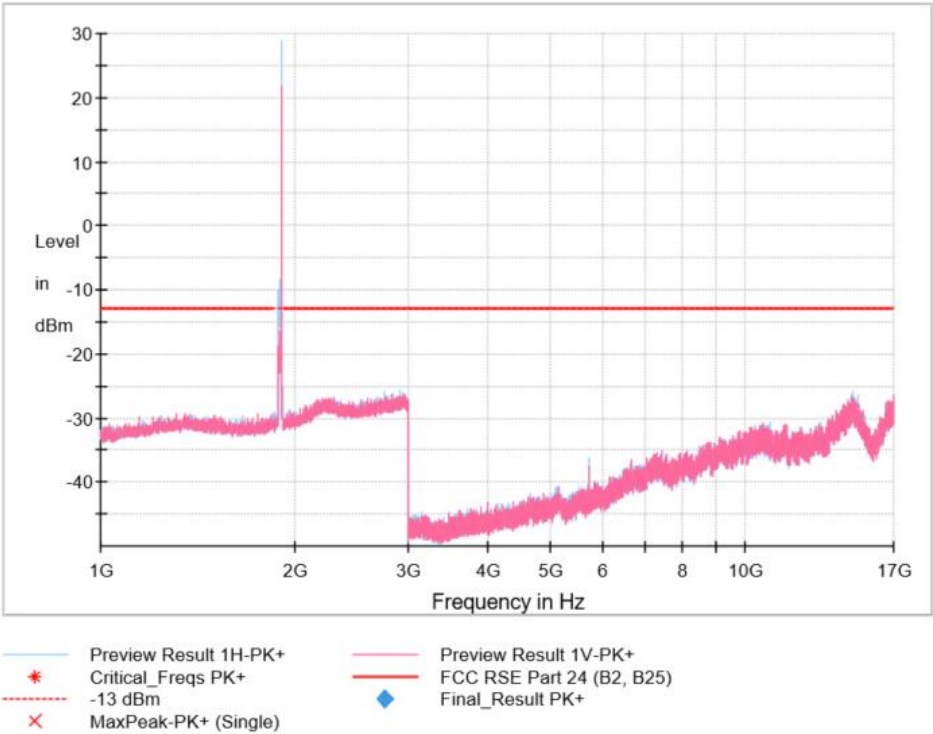
- Middle Channel:



The peak above the limit is the carrier frequency.



- High Channel:



The peak above the limit is the carrier frequency.

