

Radiated Emissions

SPECIFICATION:

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.

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 1 meter 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:

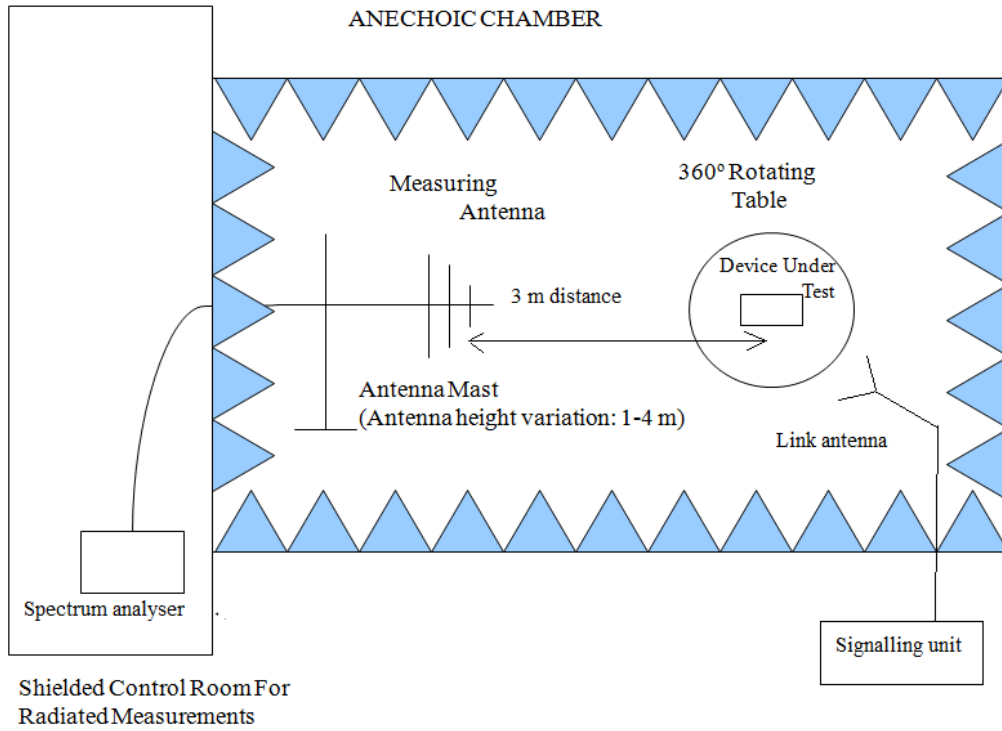
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

The maximum field strength (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:

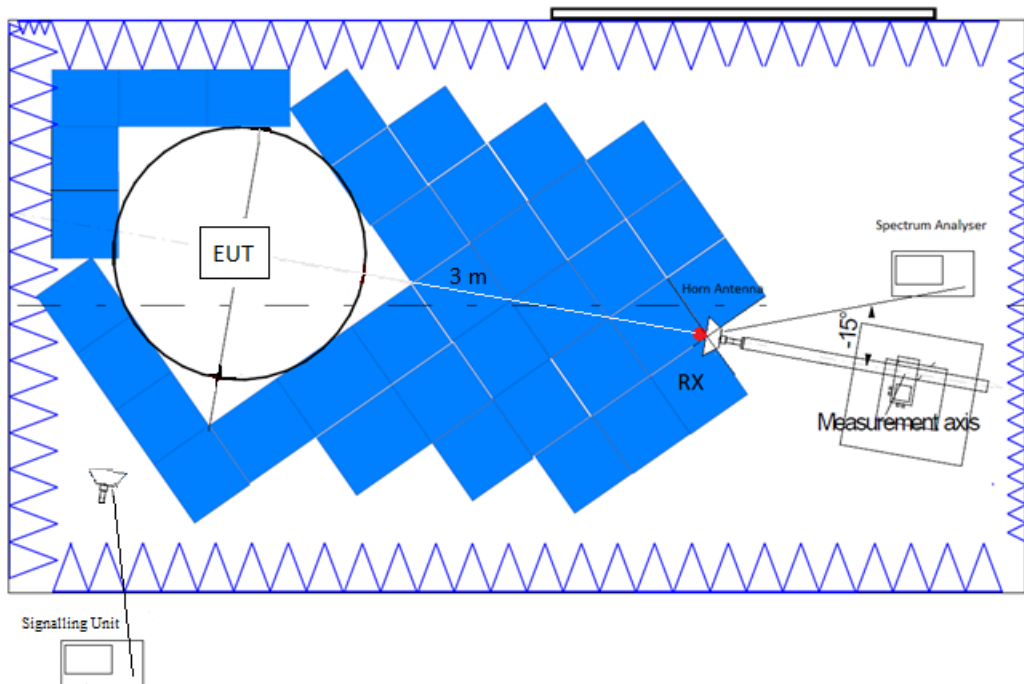
$EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log(D) - 104.8$; where D is the measurement distance (in the far field region) in m. D = 3 m.

TEST SETUP:

Radiated measurements below 1 GHz:



Radiated measurements above 1 GHz:



RESULTS:

2G Band 1900 MHz:

GPRS and EDGE modulations:

A preliminary scan determined the GPRS modulation as the worst case. The following tables and plots show the results for GPRS modulation.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

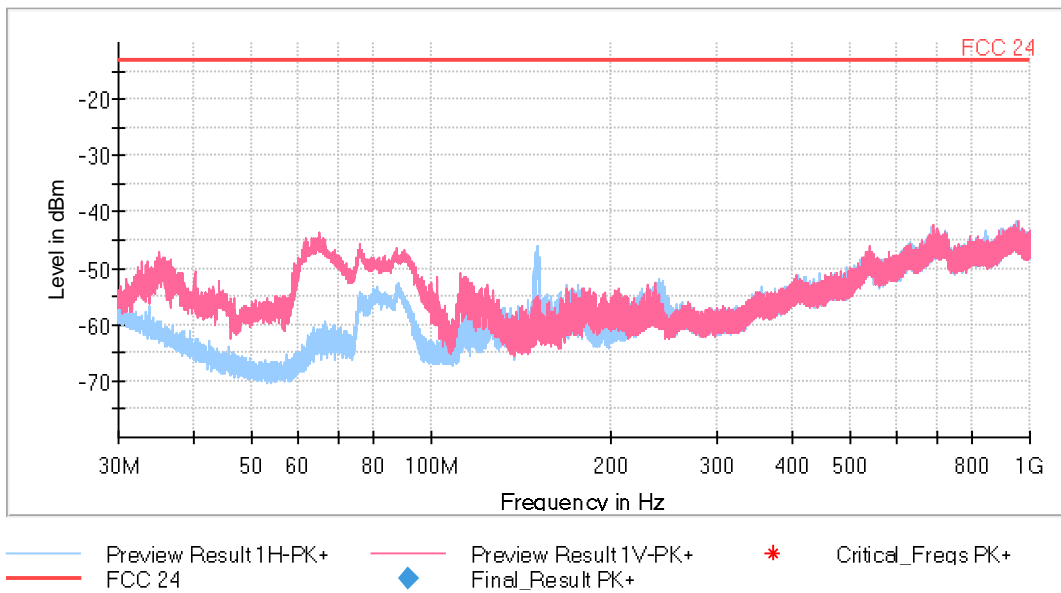
Verdict: PASS

Measurement uncertainty (dB)	<±5.35 for f < 1GHz <±4.32 for f ≥ 1 GHz up to 18 GHz <±5.51 for f ≥ 18 GHz up to 20 GHz
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Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7] 30 MHz - 1 GHz	9,7 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 1 GHz - 3 GHz	20 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 3 GHz - 18 GHz	150 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 18 GHz - 20 GHz	200 kHz	PK+	1 MHz	1 s	0 dB

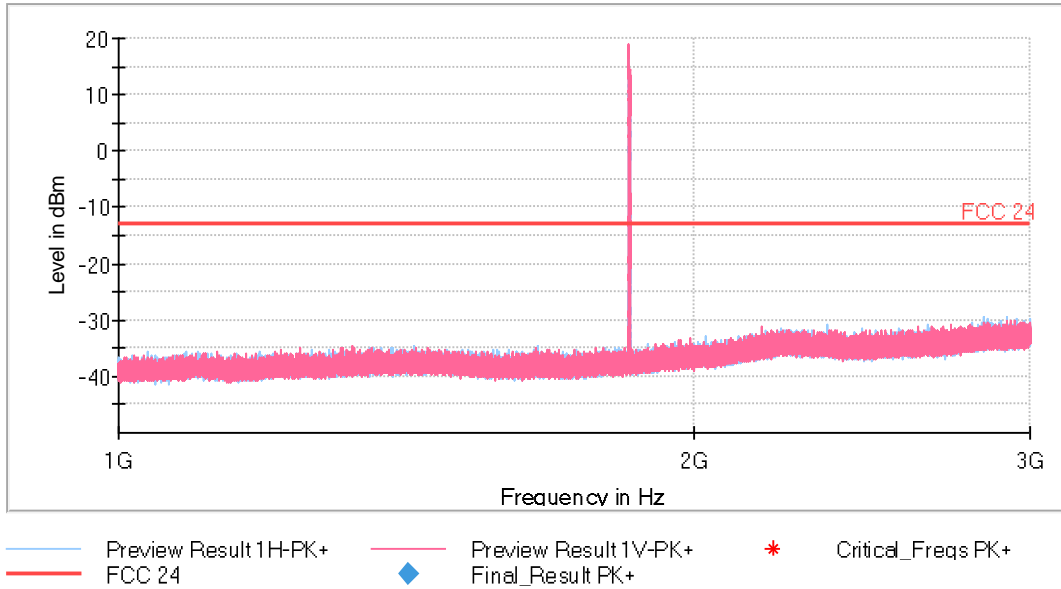
FREQUENCY RANGE 30 MHz - 1 GHz:

This plot is valid for the Low, Middle and High Channels:



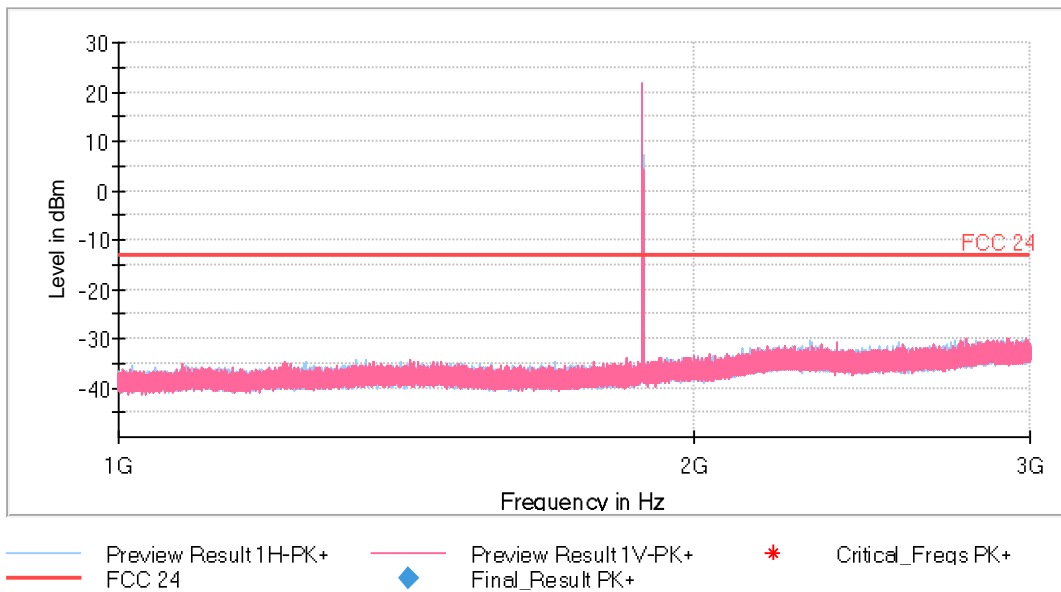
FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:



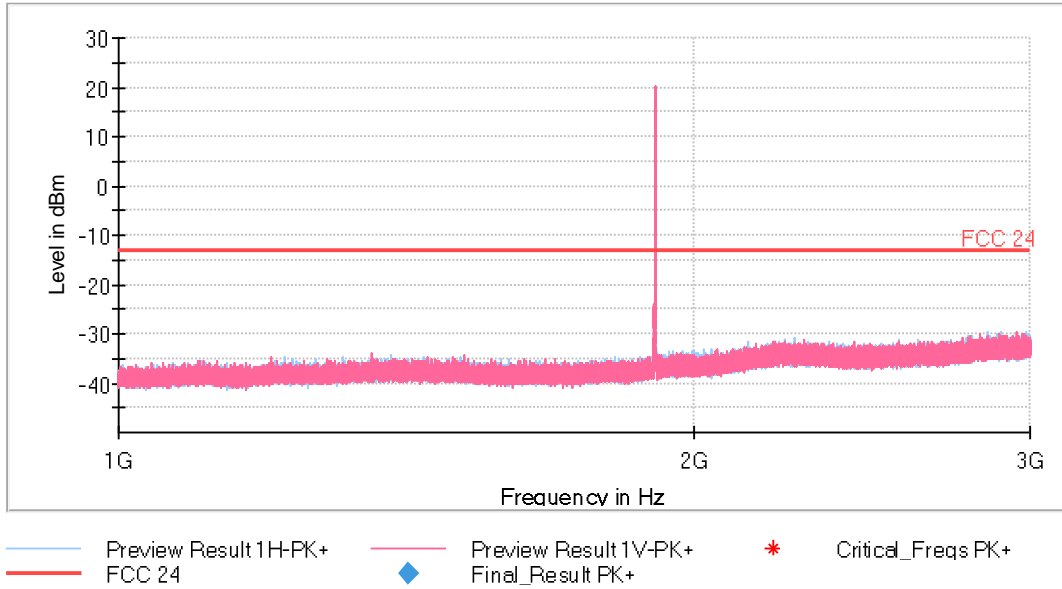
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

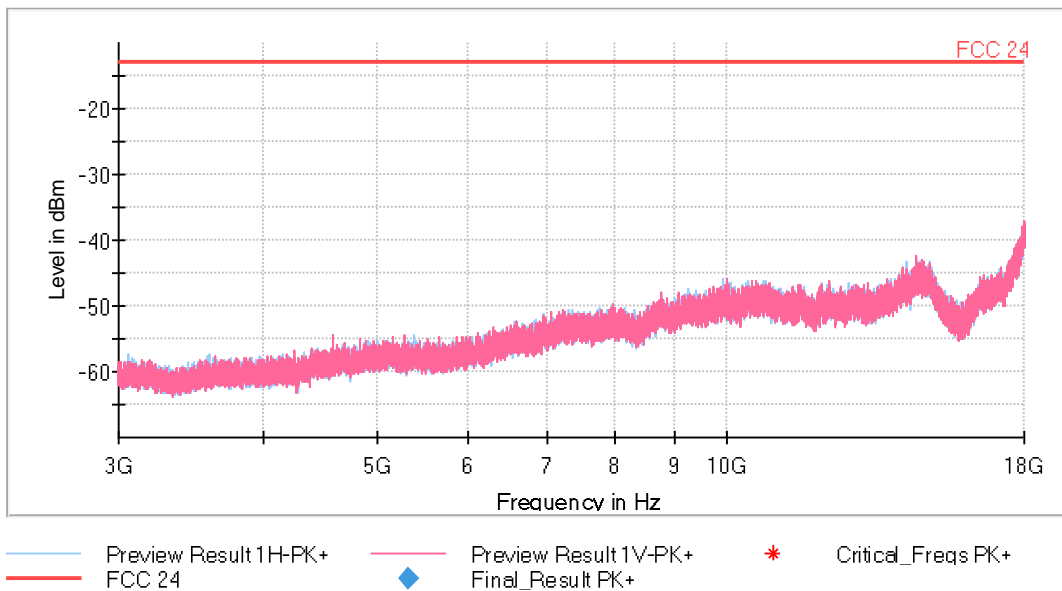
- High Channel:



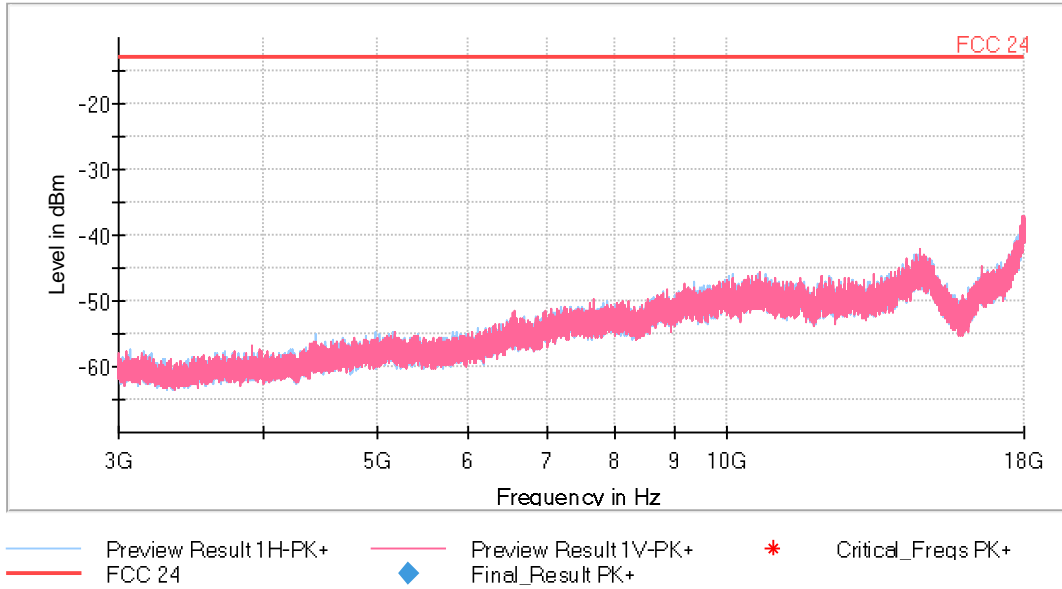
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 18 GHz:

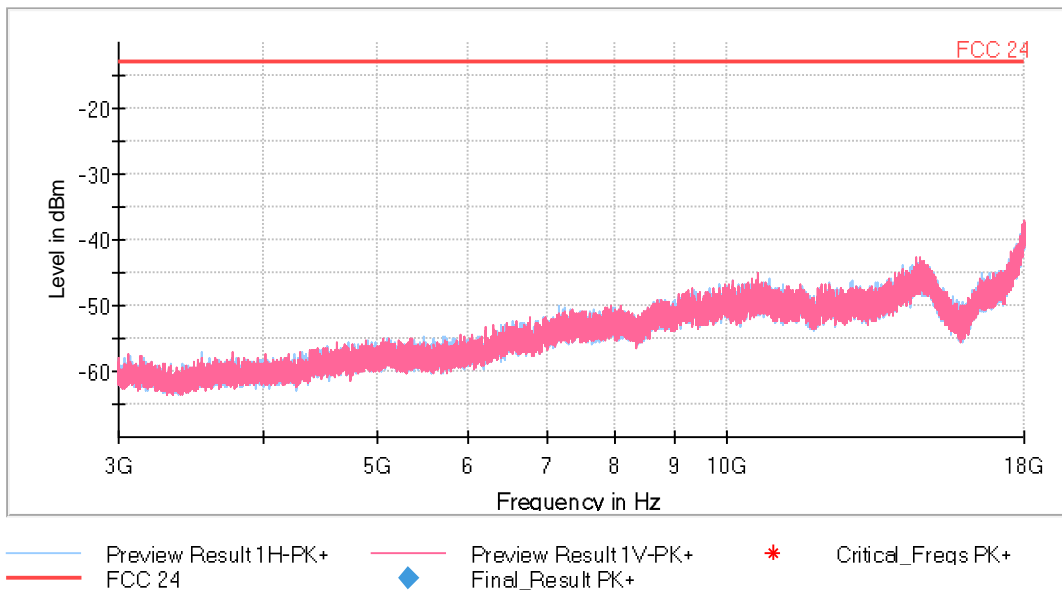
- Low Channel:



- Middle Channel:

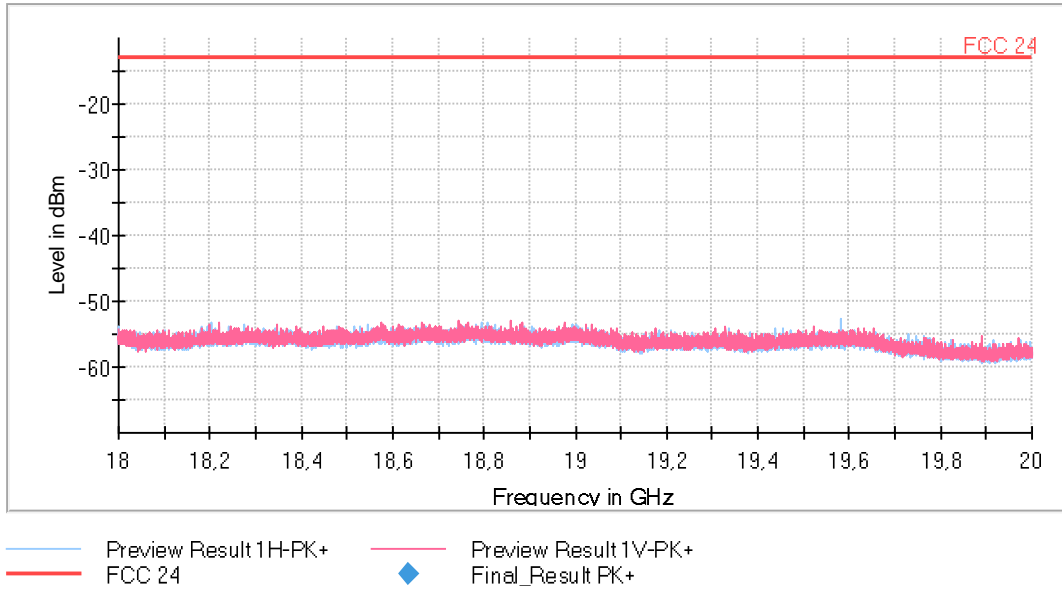


- High Channel:

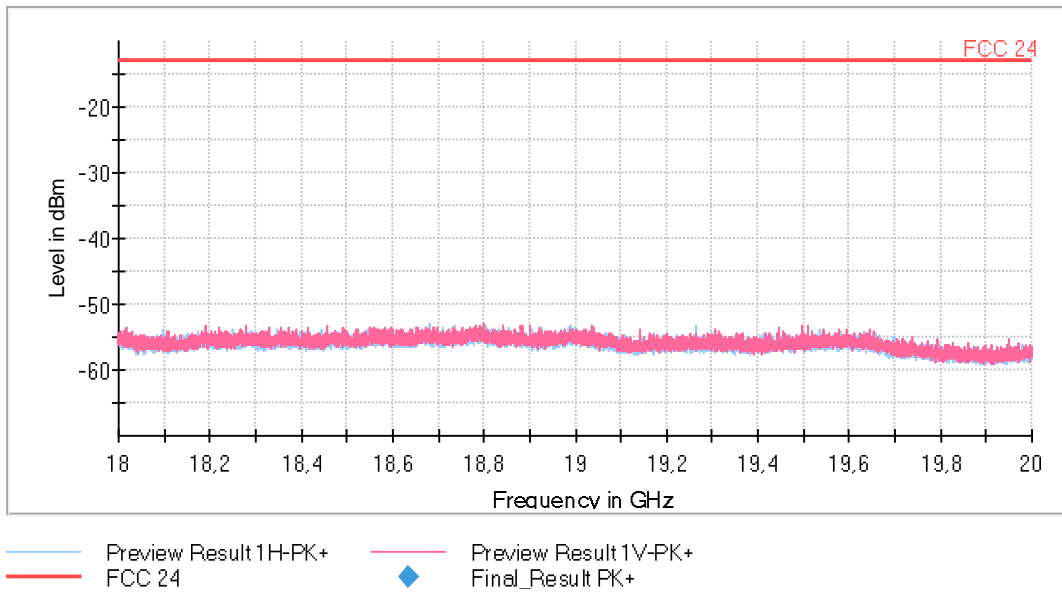


FREQUENCY RANGE 18 - 20 GHz:

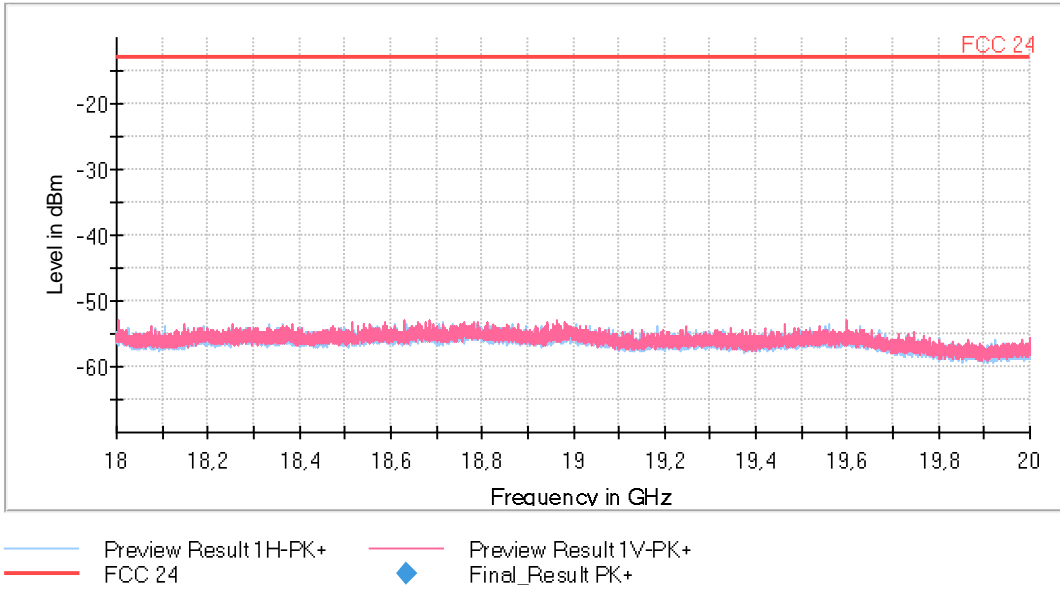
- Low Channel:



- Middle Channel:



- High Channel:



3G Band II:

WCDMA and HSUPA modulations:

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for HSUPA modulation.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

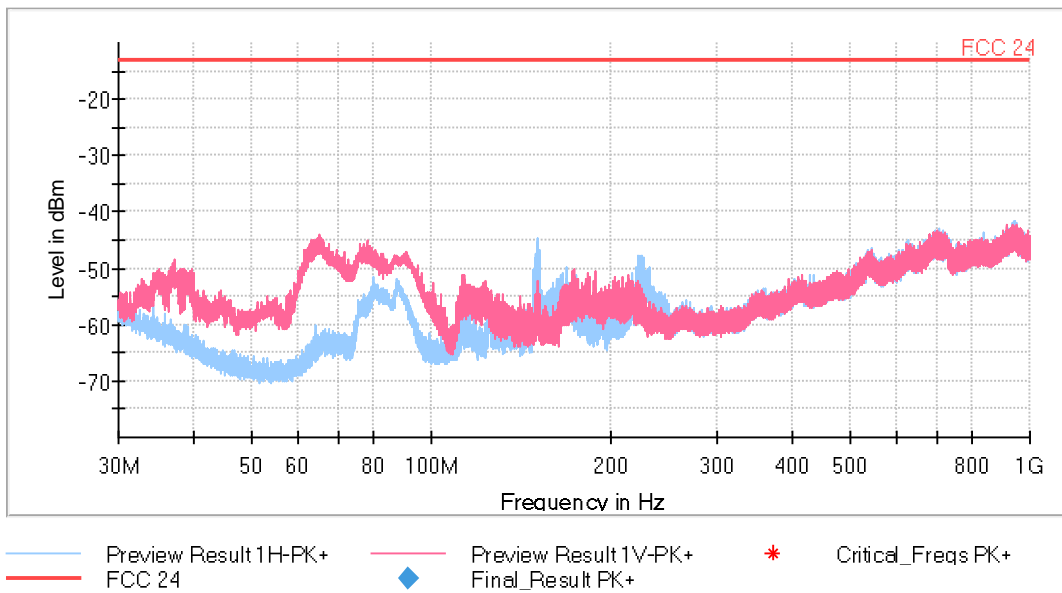
Verdict: PASS

Measurement uncertainty (dB)	<±5.35 for $f < 1\text{GHz}$ <±4.32 for $f \geq 1\text{GHz}$ up to 18 GHz <±5.51 for $f \geq 18\text{GHz}$ up to 20 GHz
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Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7] 30 MHz - 1 GHz	9,7 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 1 GHz - 3 GHz	20 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 3 GHz - 18 GHz	150 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [FSW 50] 18 GHz - 20 GHz	200 kHz	PK+	1 MHz	1 s	0 dB

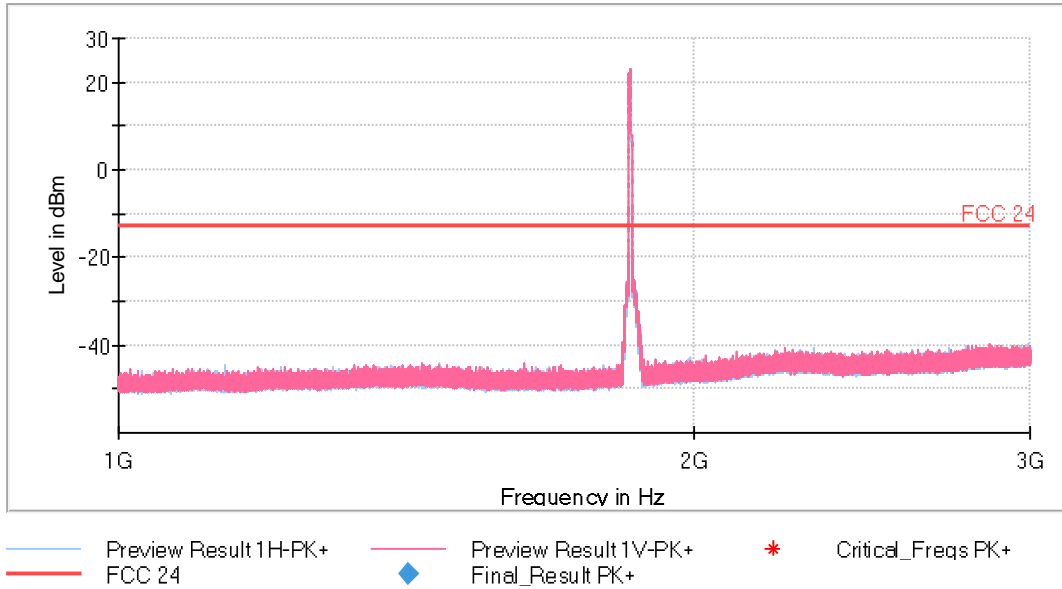
FREQUENCY RANGE 30 MHz - 1 GHz

This plot is valid for the Low, Middle and High Channels:



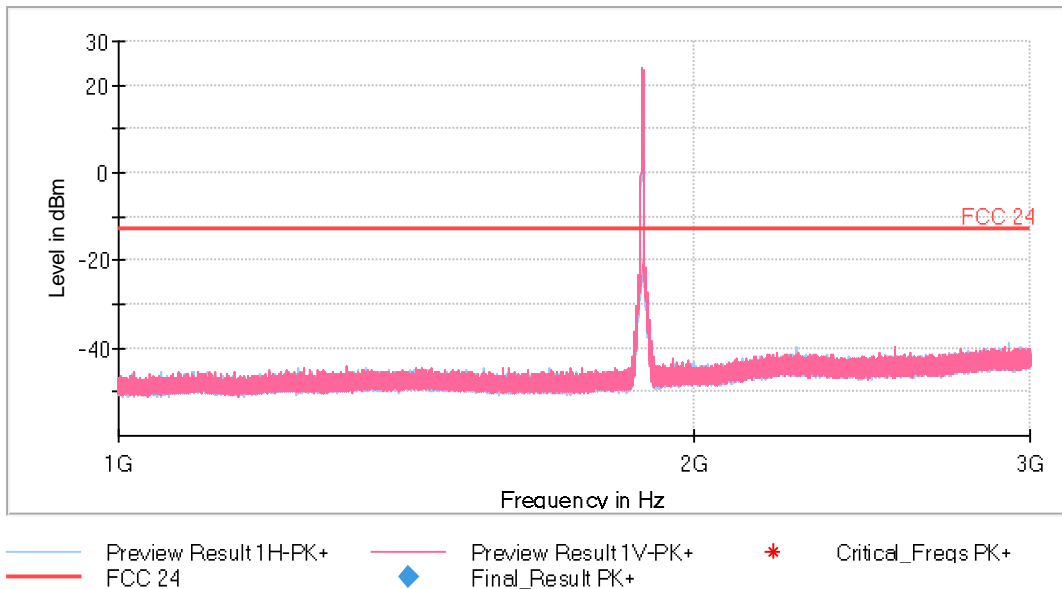
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



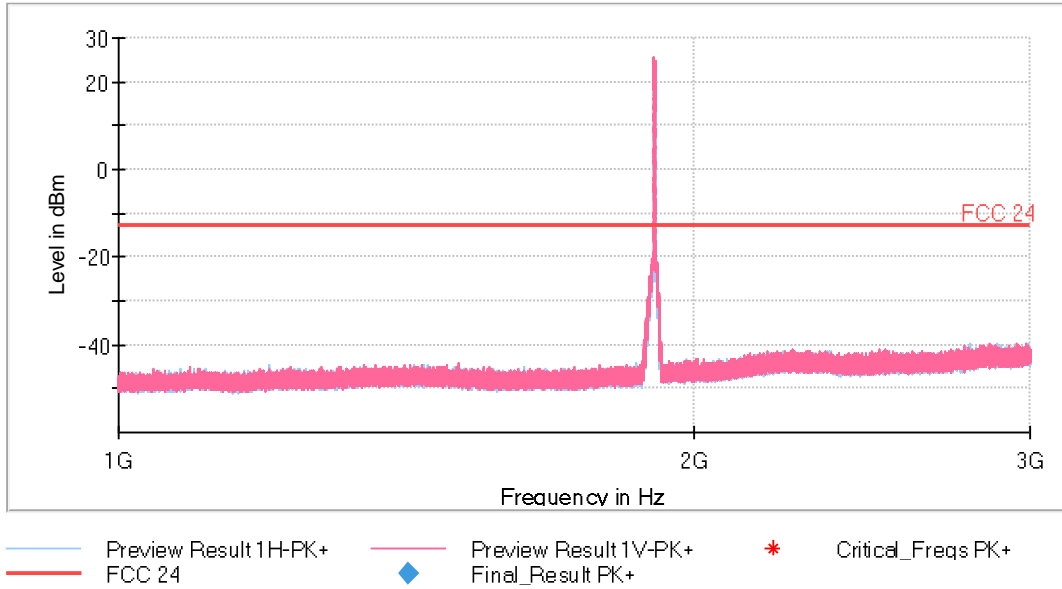
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

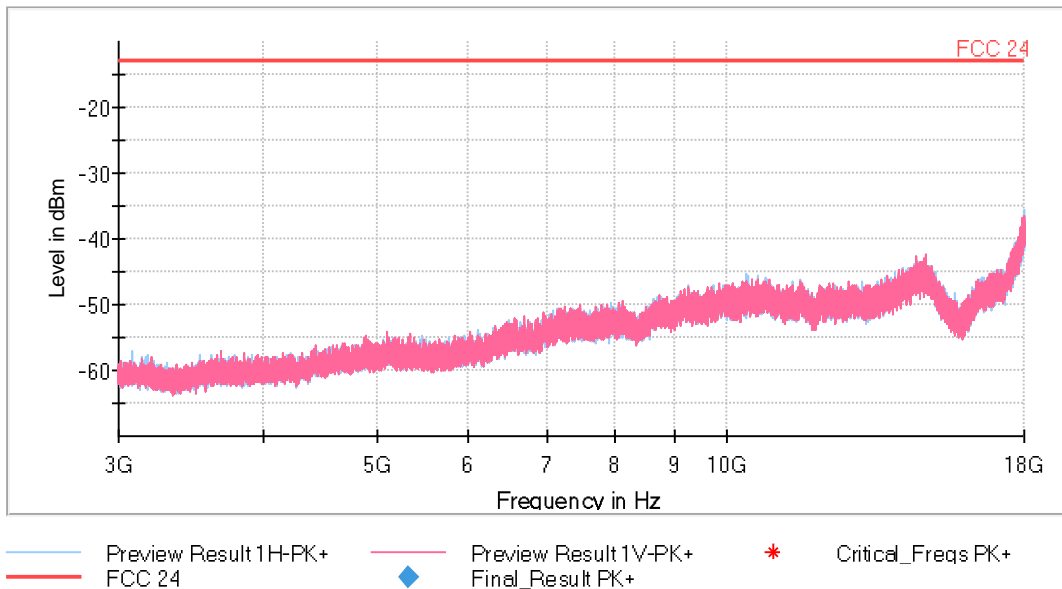
- High Channel:



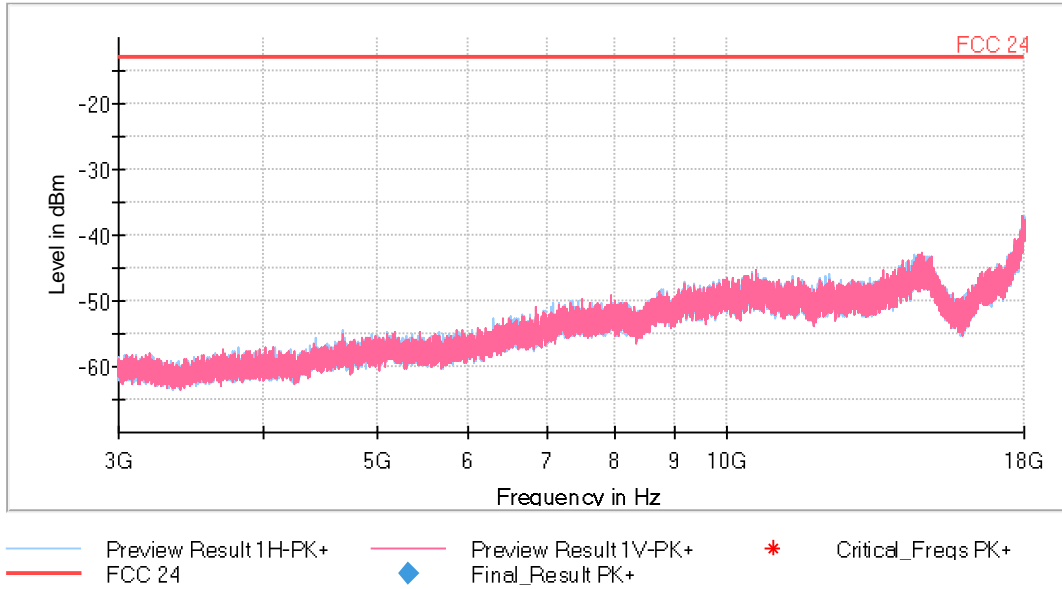
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 18 GHz

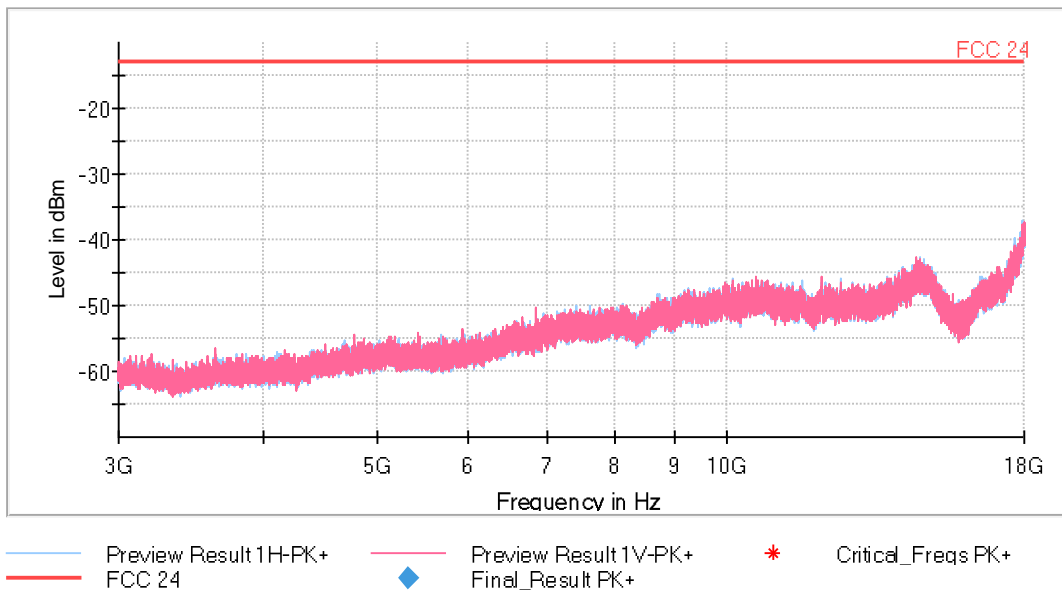
- Low Channel:



- Middle Channel:

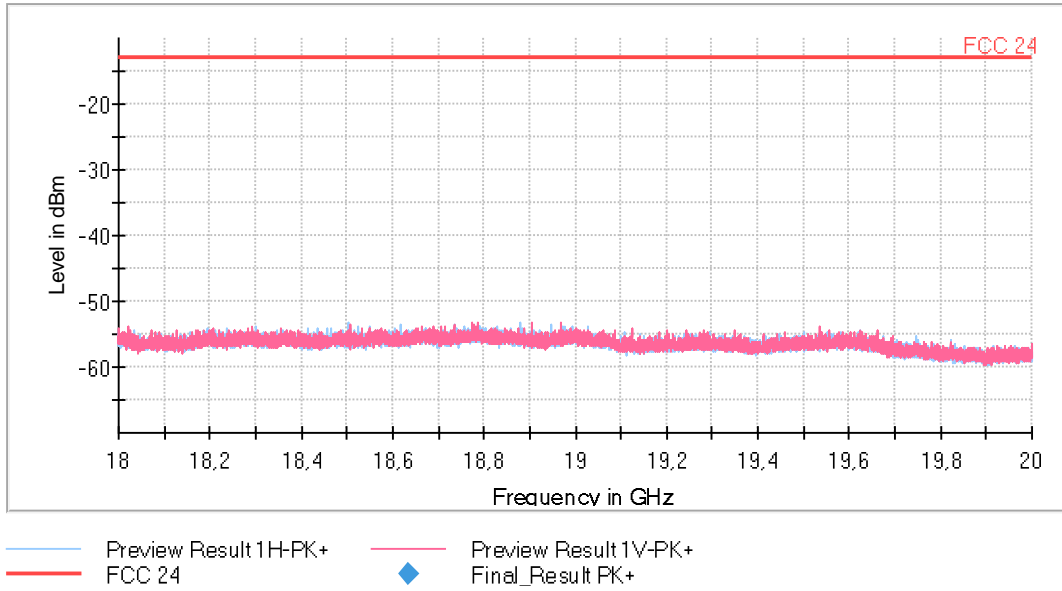


- High Channel:

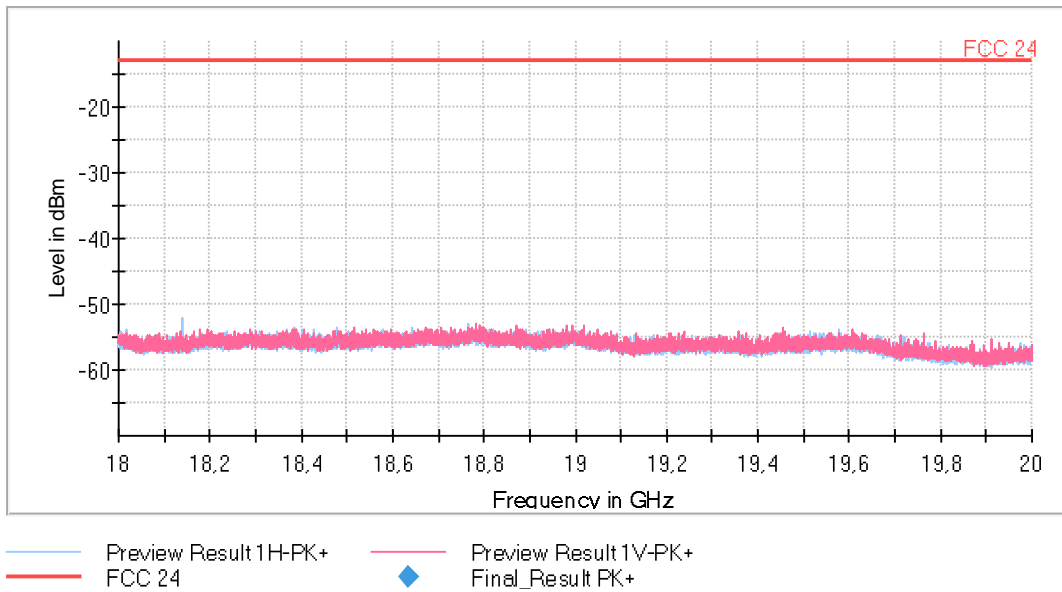


FREQUENCY RANGE 18 - 20 GHz

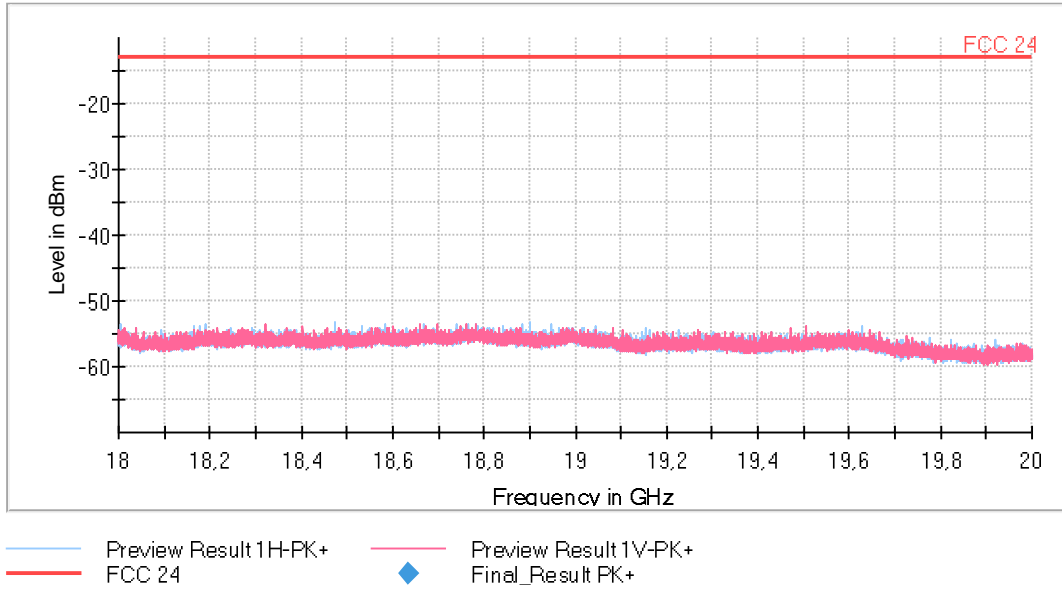
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 2:

QPSK modulation:

A preliminary scan determined the QPSK modulation, BW=15 MHz, RB Size=1, RB Offset=37 as the worst case. The following tables and plots show the results for the worst case modulation.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

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

Frequency range 18 - 20 GHz:

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

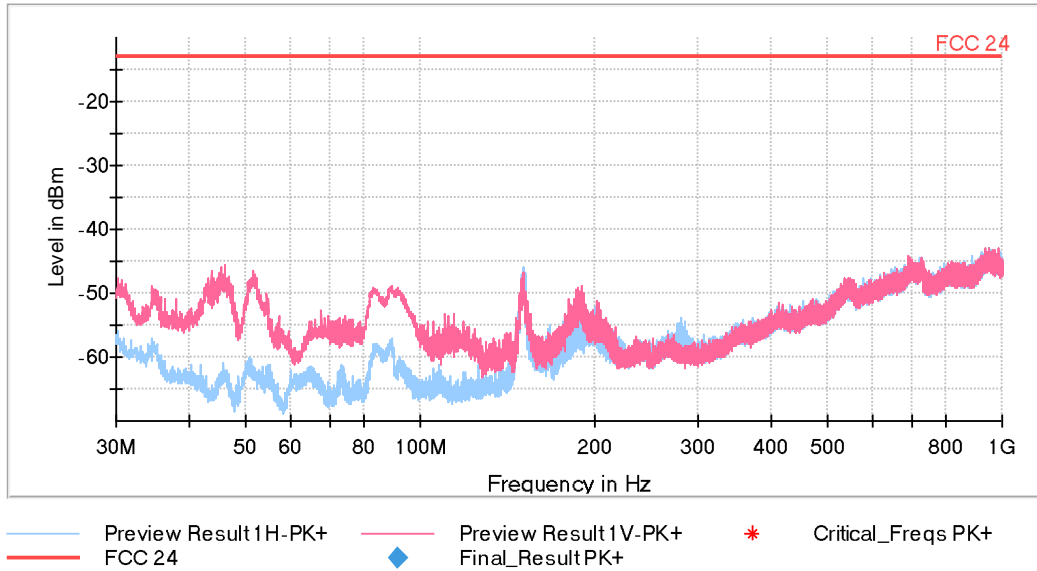
Verdict: PASS

Measurement uncertainty (dB)	<±5.35 for $f < 1$ GHz <±4.32 for $f \geq 1$ GHz up to 18 GHz <±5.51 for $f \geq 18$ GHz up to 20 GHz
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Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [ESR 7] 30 MHz - 1 GHz	30,312 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [ESW 44] 1 GHz - 3 GHz	62,5 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [ESW 44] 3 GHz - 18 GHz	468,75 kHz	PK+	1 MHz	1 s	0 dB
Receiver: [ESW 44] 18 GHz - 20 GHz	62,5 kHz	PK+	1 MHz	1 s	0 dB

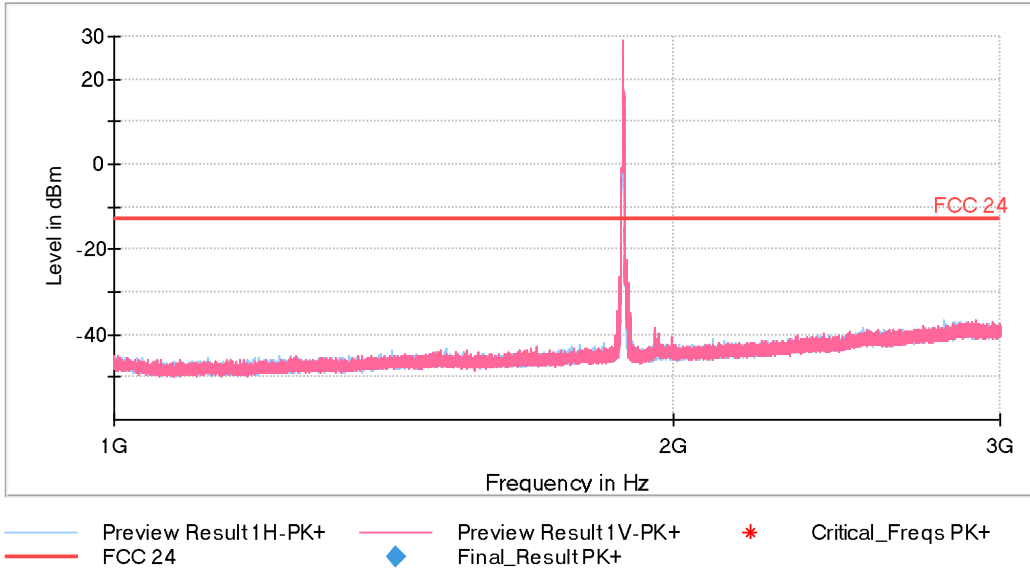
FREQUENCY RANGE 30 MHz - 1 GHz

This plot is valid for the Low, Middle and High Channels:

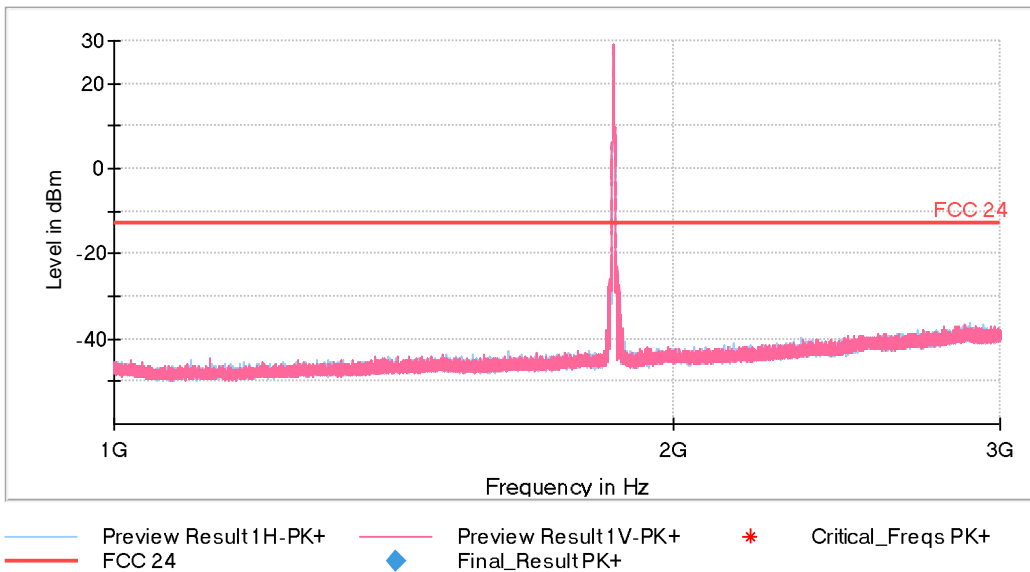


FREQUENCY RANGE 1 - 3 GHz

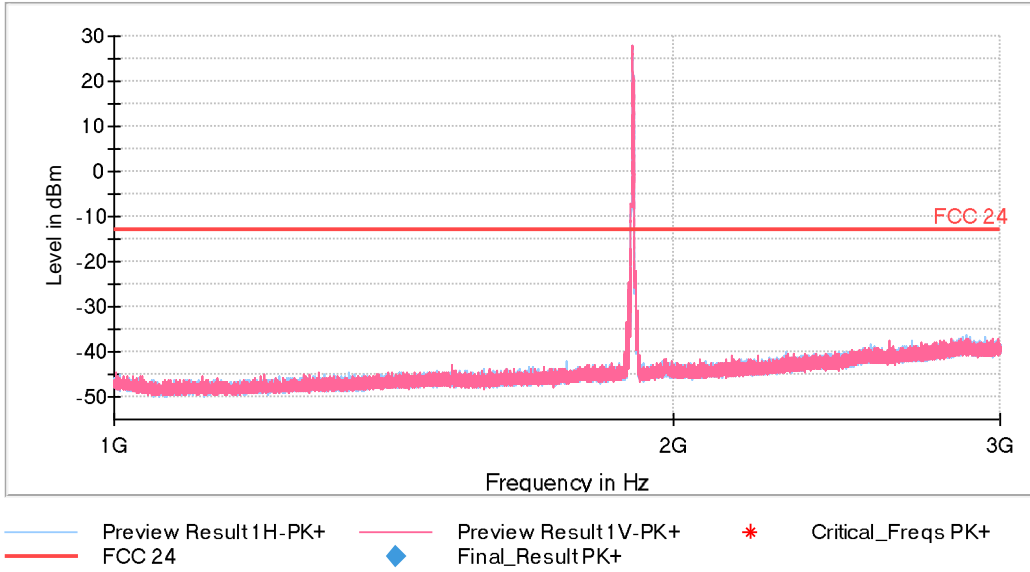
- Low Channel:



- Middle Channel:

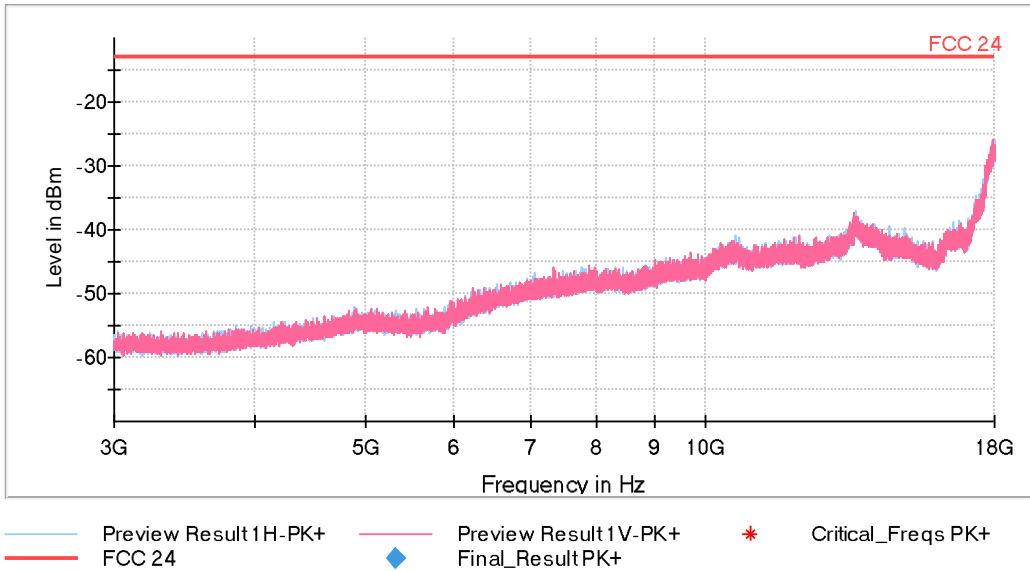


- High Channel:

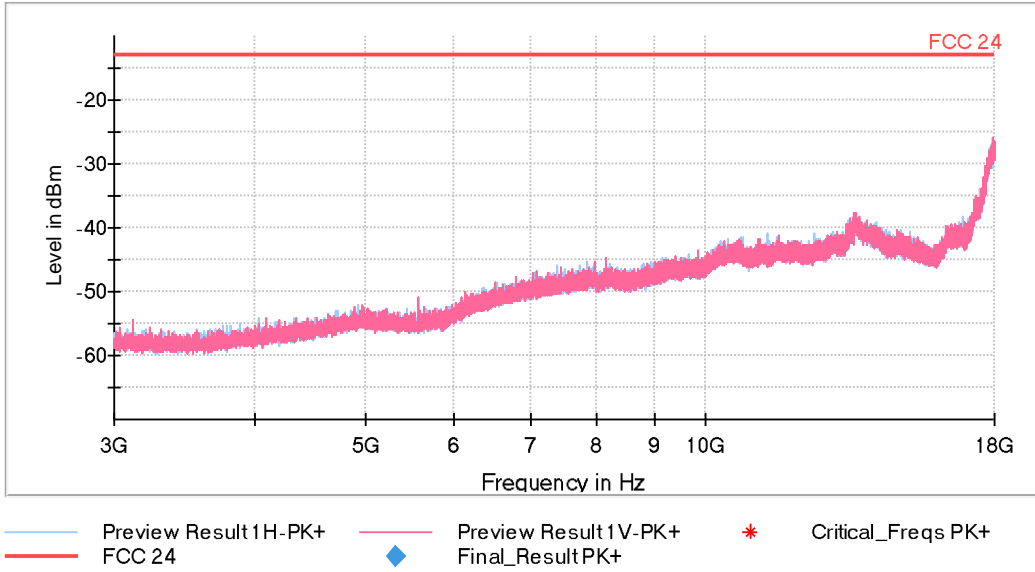


FREQUENCY RANGE 3 - 18 GHz

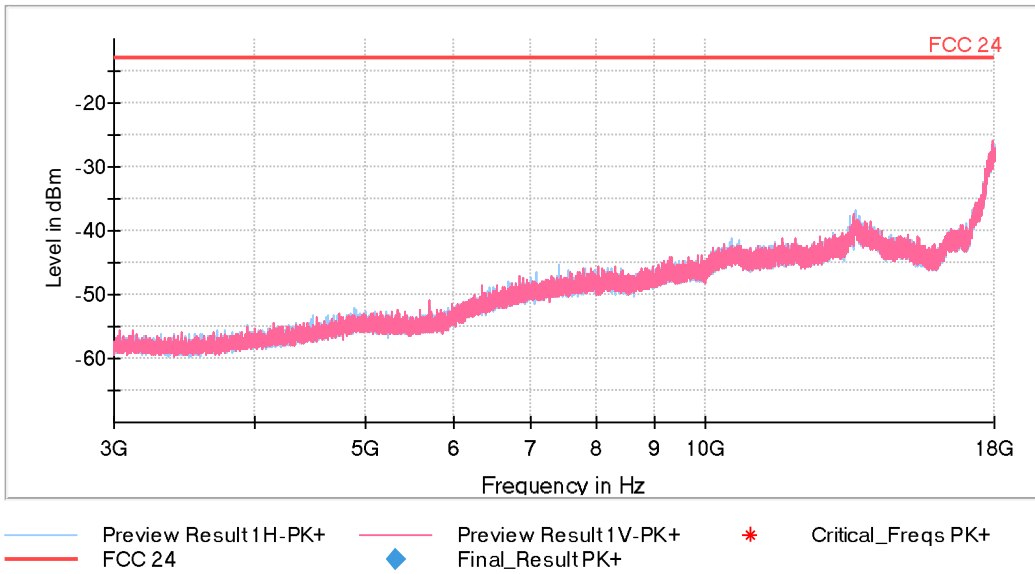
- Low Channel:



- Middle Channel:

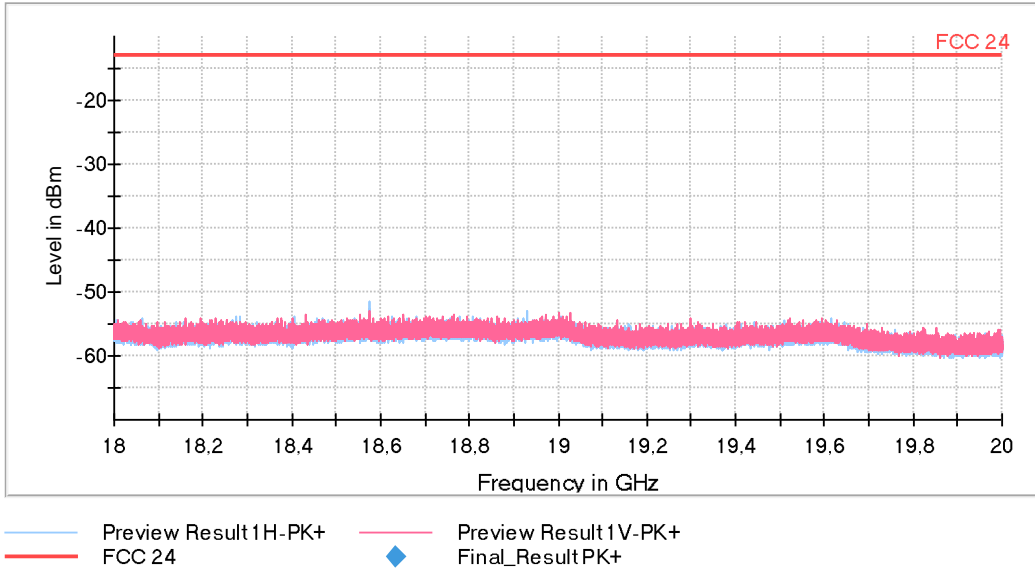


- High Channel:

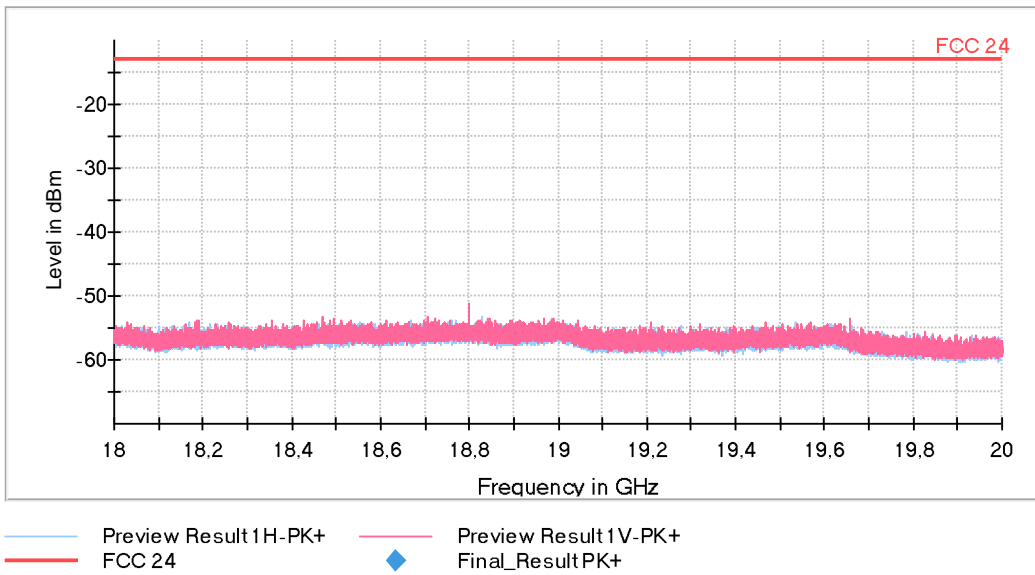


FREQUENCY RANGE 18 - 20 GHz

- Low Channel:



- Middle Channel:



- High Channel:

