

ISED CABid: ES1909

Test Report No:  
 NIE: 68001RRF.003

## Partial Test Report

Reference Standard:  
 USA FCC Part 24  
 CANADA RSS-133

(*) Identification of item tested	Telematic control unit with wireless technologies, used in automotive industry
(*) Trademark	BMW
(*) Model and /or type reference	WAVE-11-HAF-R2
(*) Derived model not tested	WAVE-11-HIGH-R2
Other identification of the product	Type: B424 HW version: D5 SW version: 21411A.004_045_017 IMEI TAC: 35011736 (OEM modem), 35894272 (CUS modem) Contains FCC ID: T8GSAN9000 Contains FCC ID: T8GSAN9001 Contains IC: 6434A-SAN9000 Contains IC: 6434A-SAN9001
(*) Features	GSM, UMTS, LTE, 5G, GNSS
Applicant	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD, GERMANY
Test method requested, standard	USA FCC Part 24 (10-1-20 Edition). CANADA RSS-133 Issue 6, Jan. 2018. - Radiated Emissions. ANSI C63.26-2015. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager
Date of issue	2022-01-11
Report template No	FDT08_23 (*) "Data provided by the client"

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## Competences and guarantees

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DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document. **IMPORTANT:** No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

## General conditions

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1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

## Uncertainty

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Uncertainty (factor  $k=2$ ) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

## Data provided by the client

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The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the model WAVE-11-HAF-R2 is a Telematics control unit with wireless technologies, used in automotive, equipped with 2 modems, OEM and customer. The project name WAVE has the meaning "Wireless Access in Vehicular Environment" and thus describes the key features of this device as Communication and Data Interface. This unit was designed for automotive usage and contains the following features: GSM, UMTS, LTE, 5G, and GNSS.

3. Derived model not tested. These models have been declared by the supplier of the sample as being the same as the model under test.

**HARMAN AUTOMOTIVE DIVISION**  
HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH  
BECKER-GÖRING-STRASSE 16  
76307 KARLSBAD, GERMANY



### Declaration of similarity

To whom it may concern,

We, **Harman Becker Automotive Systems GmbH**, located in  
**Becker-Goering-Str. 16; 76307 Karlsbad, Germany**

Hereby declare that the following units: **WAVE-11-HIGH-R2** and **WAVE-11-HAF-R2** have integrated the same NAD modules, are using same schematic and same PCB layout.

The only difference between the two models is that **WAVE-11-HIGH-R2** is equipped with chipset U-Blox UBX-F9940, where **WAVE-11-HAF-R2** is equipped with chipset ST-Micro STA9100MGA & STA5635S.

Where only one of the aforementioned variants has been used as DUT, shall remain valid and applicable for these two models described.

This declaration is intended to be included in the test reports where applies

Regards



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DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

## Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
68001/009	Telematic control unit with wireless technologies, used in automotive industry (Type B424)	WAVE-11-HAF-R2	B4250S0M4907002	2021/08/10
68000C/083	Antenna (DA WAVE HIGH US 5G ROW)	DA05DI20	--	2021/08/27
62486/024	Antenna Box	AB01-I20-01	--	2020/09/22
62486/027	Antenna Box	AB01-I20-01	--	2020/09/22
68000C/065	Spoiler Antenna (FSA-WAVE-5G Links)	FS01DI20	--	2021/10/28
62486/026	Antenna Box	AB01-I20-01	--	2020/09/22
62486/062	RF Harness	--	--	2020/09/22

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
68000C/009	Battery	607492	--	2021/07/29
62486/048	RF Cable for 4-Fakra	--	--	2020/09/22
62486/055	OABR Cable	--	--	2020/09/22
62486/047	RF Cable for 4-Fakra	--	--	2020/09/22
62486/162	OABR 1000 BaseT Converter	--	--	2020/09/28
62486/070	I-Box OABR Adapter	--	--	2020/09/22
62486/101	SOS Button (E-Call)	9385	11221	2020/09/28
62486/042	Antenna ground planes for roof	--	--	2020/09/22

Sample S/01 has undergone the following test(s): The Radiated tests indicated in the Appendix A.

## Test sample description

Ports.....:	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient <sup>(3)</sup>
	RF connector –code D violet trunk/roof)	Port not used for SOP2021 (it has V2X interfaces and gateway for SDARS signal towards another ECU)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	RF connector – code C blue (trunk/roof)	>5m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	NanoMQS 20pol	>5m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NanoMQS 10pol	>8m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	HDBT MATENet 2-Pol (Roof/Trunk)	>5m	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Antenna Connector grey (Roof)	<0.5m	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Supplementary information to the ports.....:	-				
Rated power supply .....	Voltage and Frequency				
	<input checked="" type="checkbox"/>	DC: 12V car battery / attenuator (4,5 V ≤ UB ≤ 18 V; UB typical: 12 V)			
Rated Power..... :	12V DC				
Clock frequencies..... :	25MHz;26MHz;32,768kHz;49,58MHz;				
Other parameters .....	See Technical description				
Software version..... :	21411A.004_045_017				
Hardware version .....	D5				
Dimensions in cm (W x H x D) ... :	160x18x112 mm				
Mounting position .....	<input type="checkbox"/>	Table top equipment			
	<input type="checkbox"/>	Wall/Ceiling mounted equipment			
	<input type="checkbox"/>	Floor standing equipment			
	<input type="checkbox"/>	Hand-held equipment			
	<input checked="" type="checkbox"/>	Other: automotive telematics control unit			
Modules/parts..... :	Module/parts of test item		Type	Manufacturer	
	-				
Accessories (not part of the test item) .....	Description		Type	Manufacturer	
	Cable Harness		-		
	2G/3G4G/5G Antenna		-	Hirschmann/ Molex	
	E-CALL button/LED		-		
	SOS Loudspeaker		-		

	Wake-up unit Box	-	
Documents as provided by the applicant..... :	Description	File name	Issue date
	Technical Description		

<sup>(3)</sup> Only for Medical Equipment

## Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH  
 BECKER-GOERING-STR. 16, 76307 KARLSBAD, GERMANY

## Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-09-27
Date (finish)	2020-10-05

## Document history

Report number	Date	Description
68001RRF.003	2022-01-11	First release.

## Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

## Remarks and comments

The tests have been performed by the technical personnel: Alfonso Gutiérrez, Miguel Manuel López, Javier Miguel Nadales.

Used instrumentation:

### Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N/A	N/A
2. Shielded Room ETS LINDGREN S101	N/A	N/A
3. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2020/08	2023/08
4. Biconical/Log Antenna 30MHz - 6 GHz ETS LINDGREN 3142E	2020/10	2023/10
5. Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
6. RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
7. Pre-Amplifier G>30dB 17-40GHz BONN ELEKTRONIK BLMA 1840-4A	2021/09	2022/09
8. Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2019/10	2021/10
9. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
10. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/07	2021/07
11. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
12. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N/A	N/A
13. Digital Multimeter FLUKE 175	2020/11	2021/11



## Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

## Summary

FCC PART 24 / RSS-133 PARAGRAPH		
Requirement – Test case	Verdict	Remark
FCC 24.232 / RSS-133 6.4: RF output power	N/M	(1)
FCC 2.1047 / RSS-133 6.2: Modulation characteristics	N/M	(1)
FCC 24.235 / RSS-133 6.3: Frequency stability	N/M	(1)
FCC 2.1049: Occupied Bandwidth	N/M	(1)
FCC 24.238 / RSS-133 6.5: Spurious emissions at antenna terminals	N/M	(1)
FCC 24.238 / RSS-133 6.5: Radiated Emissions	P	
<u>Supplementary information and remarks:</u>		
(1) Test not requested.		

## Appendix A: Test results for FCC Part 24 / RSS-133

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## TEST CONDITIONS

The module with the highest antenna gain has been tested using the worst-case obtained for conducted output power. And the other module has been tested using an adjacent channel with a setting that would allow communication in the same band to both modules simultaneously.

(\*): Data provided by the Applicant.

### POWER SUPPLY (\*):

Vnominal: 12 Vdc  
 Type of Power Supply: External DC (vehicle battery).

### TEST FREQUENCIES (\*):

2G Band 1900 MHz. GPRS and EDGE modulations. MIMO 2x2:

Module NAD1		Module NAD2	
Low Channel (512)	1850.2 MHz	Adjacent channel to Low Channel (513)	1850.4 MHz
Middle Channel (662)	1880.2 MHz	Adjacent channel to Middle Channel (663)	1880.4 MHz
High Channel (810)	1909.8 MHz	Adjacent channel to High Channel (809)	1909.6 MHz

3G Band II. WCDMA and HSUPA modulations. MIMO 2x2:

Module NAD1		Module NAD2	
Low Channel (9262)	1852.4 MHz	Adjacent channel to Low Channel (9287)	1857.4 MHz
Middle Channel (9400)	1880.0 MHz	Adjacent channel to Middle Channel (9425)	1885 MHz
High Channel (9538)	1907.6 MHz	Adjacent channel to High Channel (9513)	1902.6 MHz

LTE Band 2. QPSK and 16QAM modulations. MIMO 2x2:

	Channel (Frequency)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	18607 (1850.7 MHz)	18615 (1851.5 MHz)	18625 (1852.5 MHz)	18650 (1855 MHz)	18675 (1857.5 MHz)	18700 (1860 MHz)
Middle	18900 (1880 MHz)	18900 (1880 MHz)	18900 (1880 MHz)	18900 (1880 MHz)	18900 (1880 MHz)	18900 (1880 MHz)
High	19193 (1909.3 MHz)	19185 (1908.5 MHz)	19175 (1907.5 MHz)	19150 (1905 MHz)	19125 (1902.5 MHz)	19100 (1900 MHz)

NOTE: LTE Band 2 is completely included in LTE Band 25, so the channels of Band 25 were tested to give conformity to the assigned block.

LTE Band 25. QPSK AND 16QAM modulations. MIMO 2x2:

	Channel (Frequency)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	<b>BW = 15 MHz</b>	BW = 20 MHz
Low	26047 (1850.7 MHz)	26055 (1851.5 MHz)	26065 (1852.5 MHz)	26090 (1855 MHz)	26115 (1857.5 MHz)	26140 (1860 MHz)
Middle	26365 (1882.5 MHz)	26365 (1882.5 MHz)	26365 (1882.5 MHz)	26365 (1882.5 MHz)	26365 (1882.5 MHz)	26365 (1882.5 MHz)
High	26683 (1914.3 MHz)	26675 (1913.5 MHz)	26665 (1912.5 MHz)	26640 (1910 MHz)	26615 (1907.5 MHz)	26590 (1905 MHz)

Module NAD1		Module NAD2	
Low Channel (26115)	1857.5 MHz	Adjacent channel to Low Channel (26265)	1872.5 MHz
Middle Channel (26365)	1882.5 MHz	Adjacent channel to Middle Channel (26515)	1897.5 MHz
High Channel (26615)	1907.5 MHz	Adjacent channel to High Channel (26465)	1892.5 MHz

## 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 highest frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 18 GHz and at 1 m distance for measurements above 18 GHz.

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

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:

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

### 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.

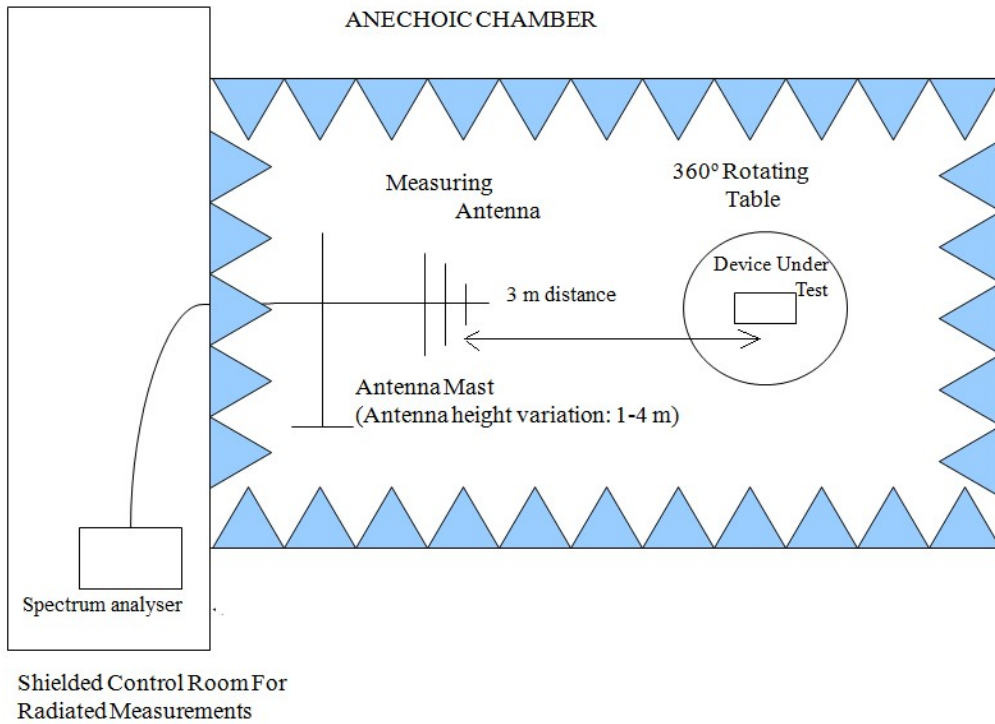
At  $P_o$  transmitting power. the specified minimum attenuation becomes  $43+10\log (P_o)$ . and the level in dBm relative  $P_o$  becomes:

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

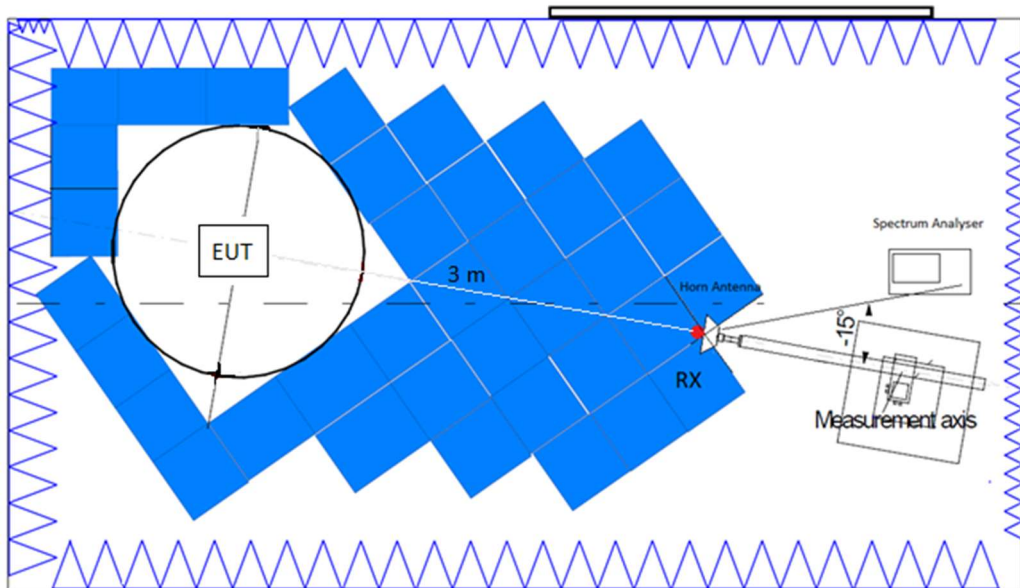
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz or higher were used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

**TEST SETUP:**

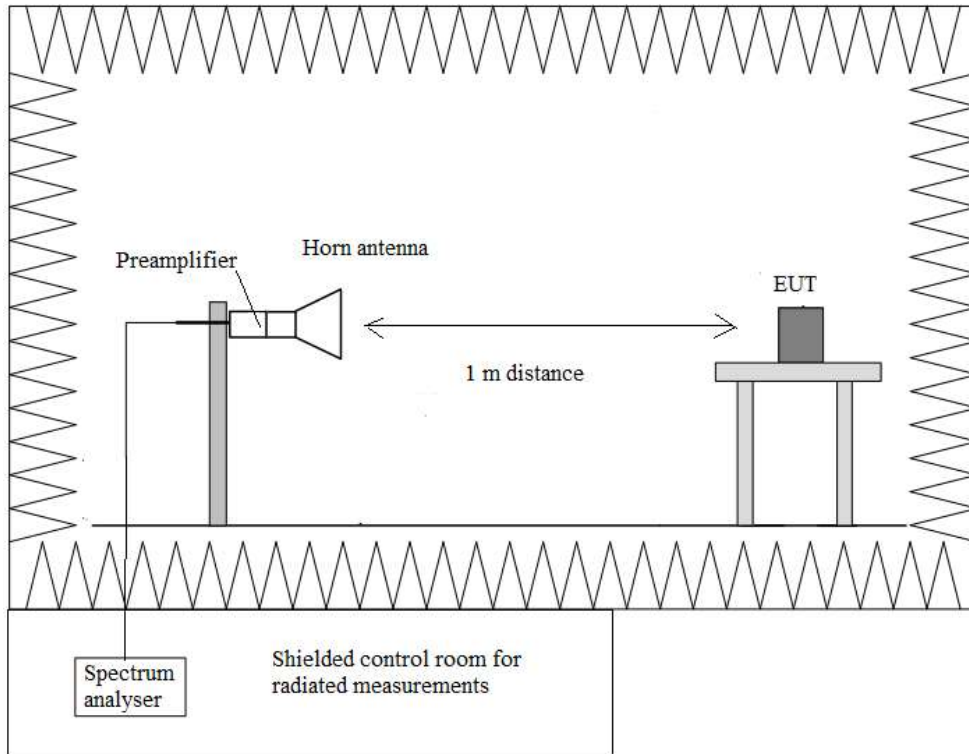
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup  $f > 18$  GHz:





RESULTS:

**2G Band 1900 MHz:**

GPRS and EDGE modulations: A preliminary scan determined the EDGE modulation as the worst-case. The following results are the ones of the worst-case.

**- LOW CHANNEL:**

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

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

**Frequency range 1 - 18 GHz:**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
3.7	-20.47	V	Peak

**Frequency range 18 - 20 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 - 18 GHz:**

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

**Frequency range 18 - 20 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 - 18 GHz:**

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

**Frequency range 18 - 20 GHz:**

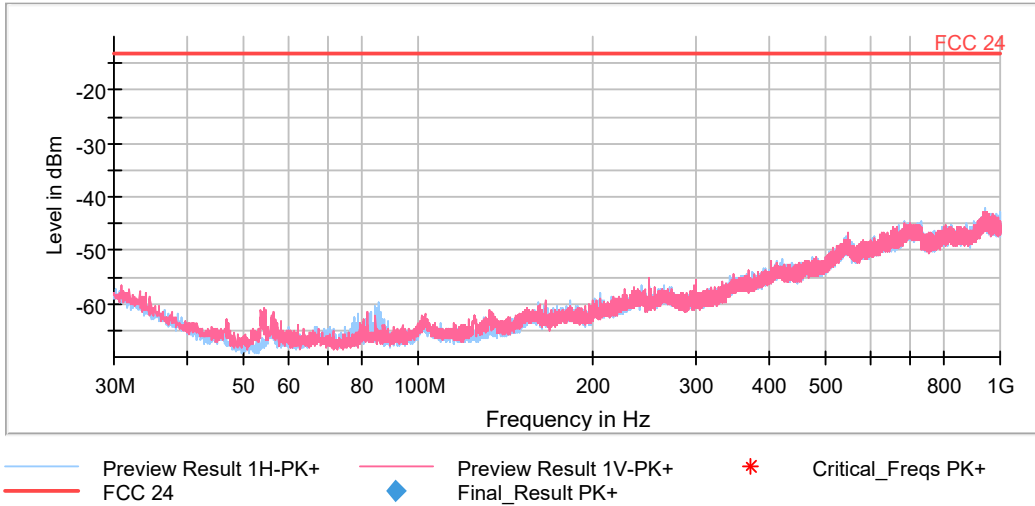
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB)	<± 5.08 for f < 1 GHz <± 5.13 for f ≥ 1 GHz up to 17 GHz <± 4.82 for f ≥ 17 GHz up to 20 GHz
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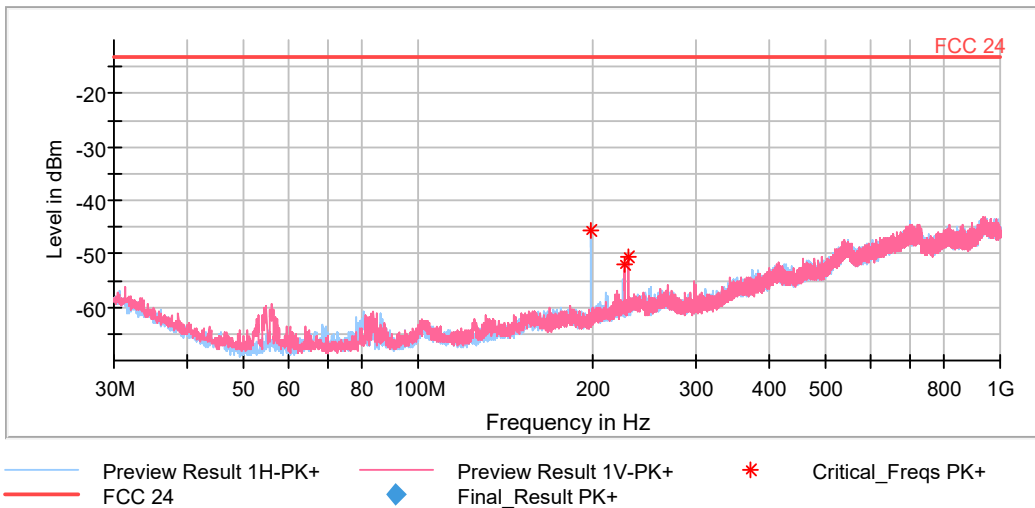
Verdict: PASS

**FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):**

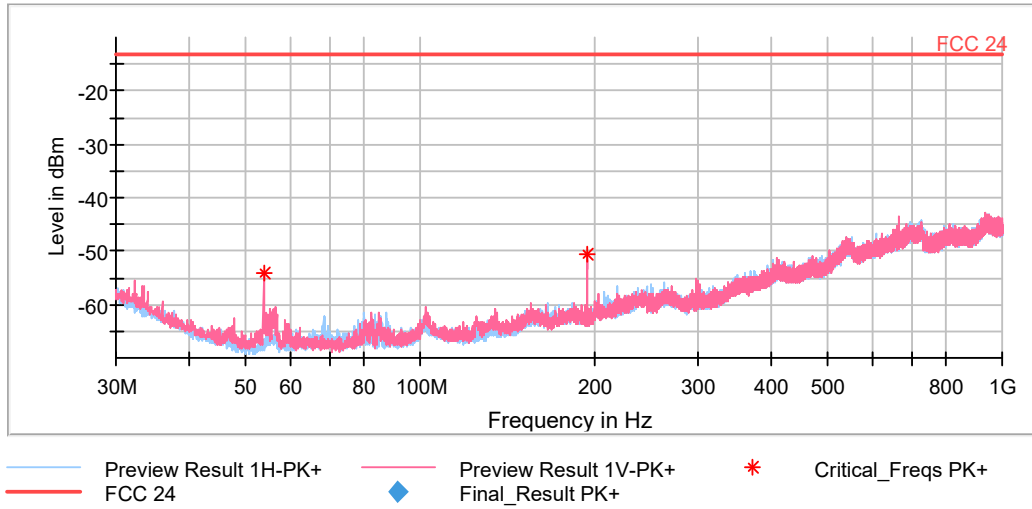
- Low Channel:



- Middle Channel:

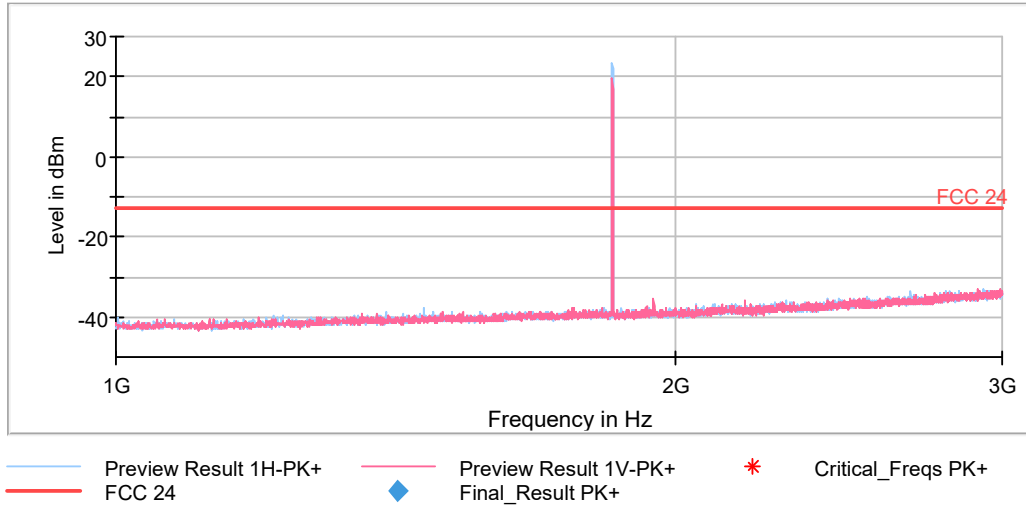


- High Channel:



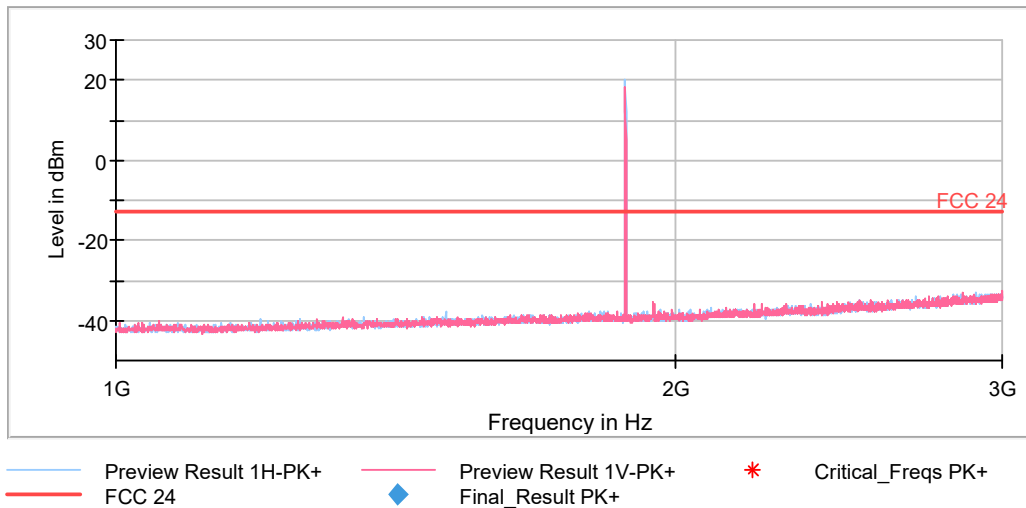
**FREQUENCY RANGE 1 - 3 GHz (worst-case):**

- Low Channel:



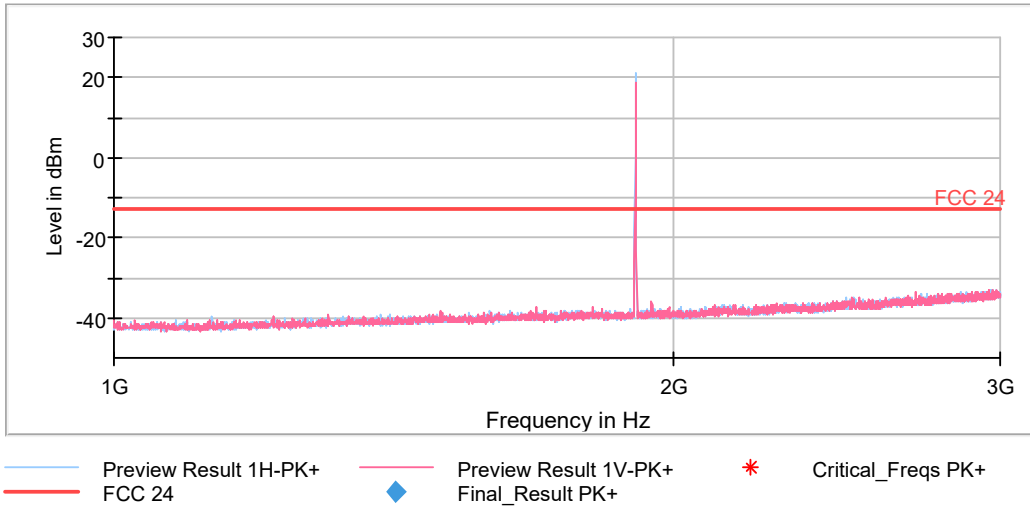
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

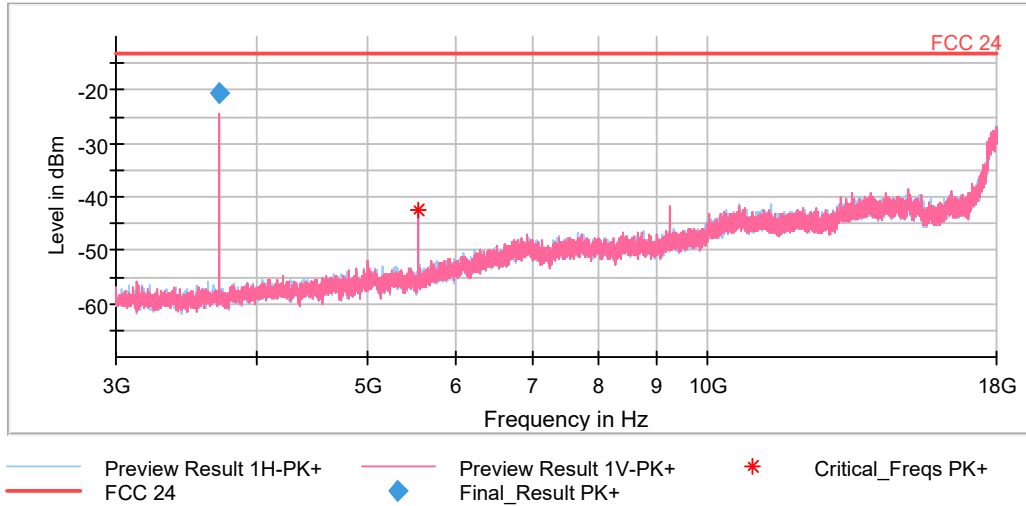
- High Channel:



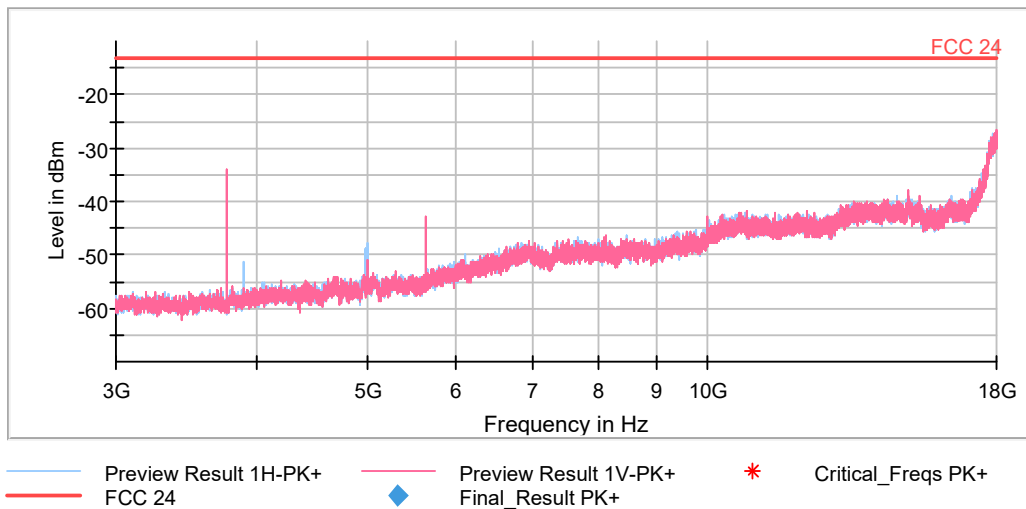
The peak above the limit is the carrier frequency.

**FREQUENCY RANGE 3 - 18 GHz (worst-case):**

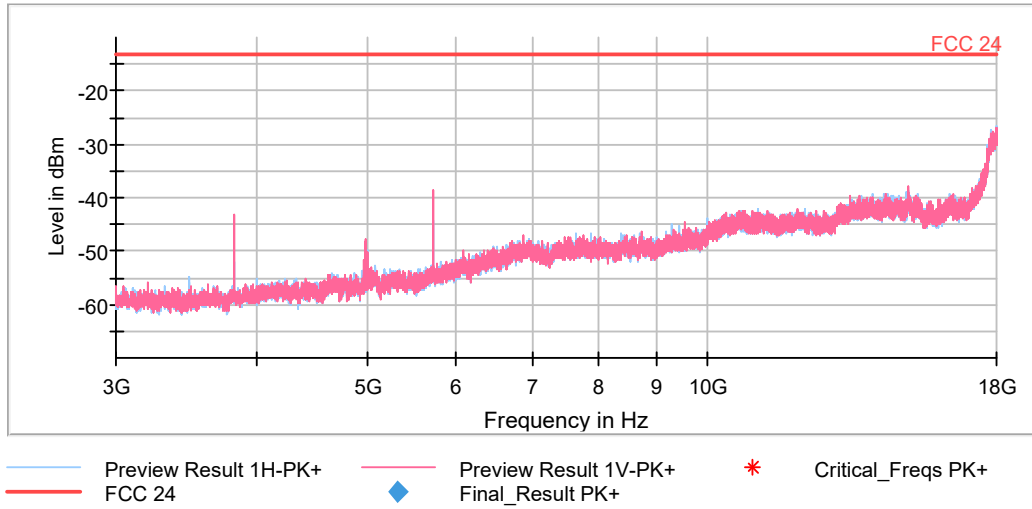
- Low Channel:



- Middle Channel:

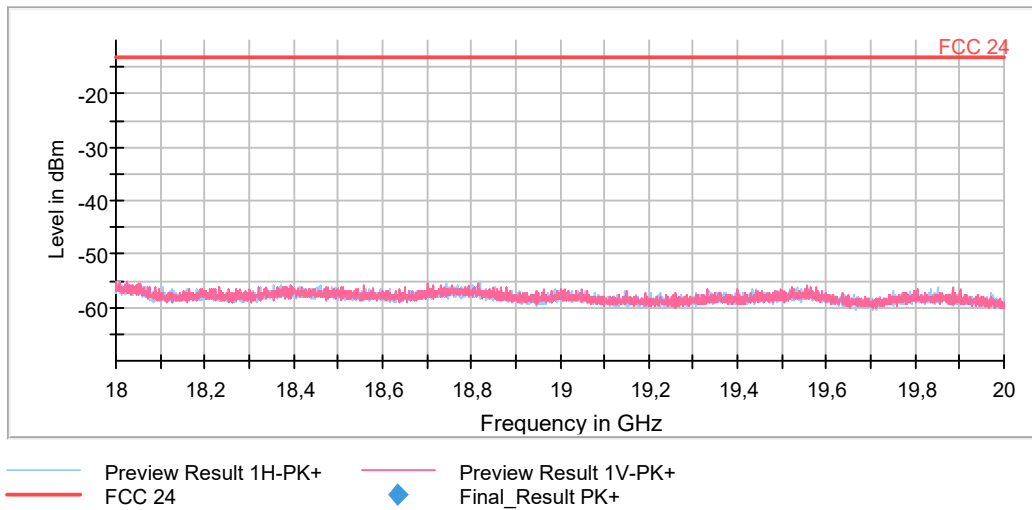


- High Channel:

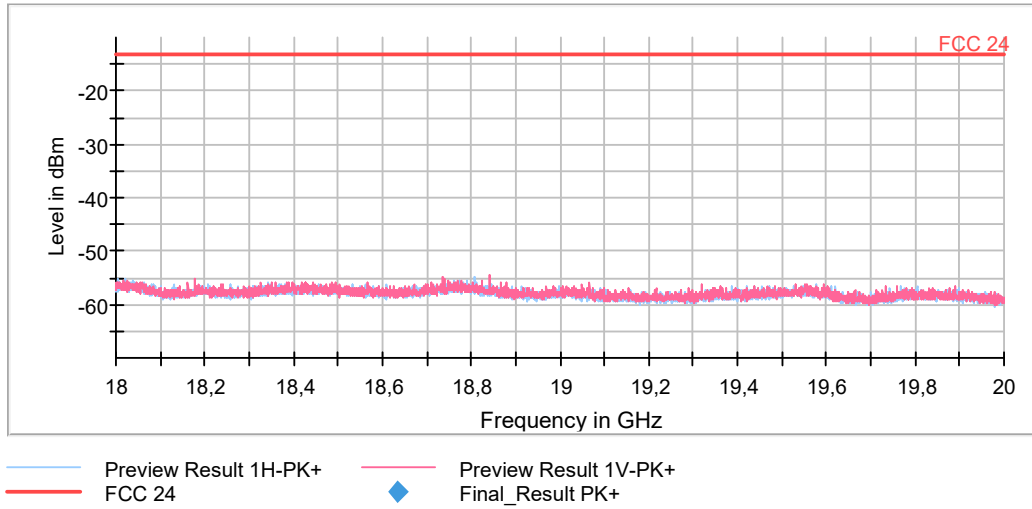


**FREQUENCY RANGE 18 - 20 GHz (worst-case):**

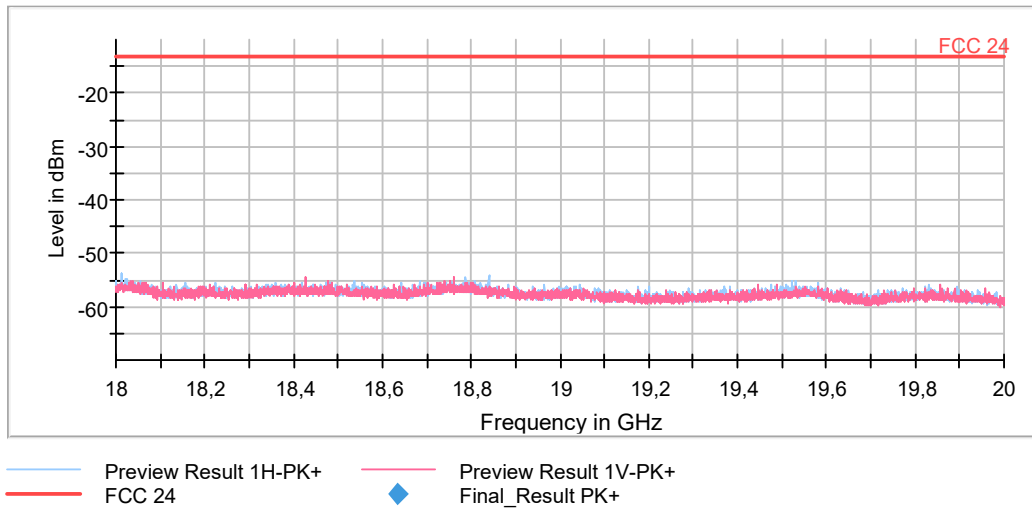
- Low Channel:



- Middle Channel:



- High Channel:





**3G Band II:**

WCDMA and HSUPA modulations: A preliminary scan determined the HSUPA modulation as the worst-case. The following results are the ones of the worst-case.

**- LOW CHANNEL:**

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

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

**Frequency range 1 - 18 GHz:**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
3.702	-29.95	V	Peak

**Frequency range 18 - 20 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 - 18 GHz:**

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

**Frequency range 18 - 20 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 - 18 GHz:**

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

**Frequency range 18 - 20 GHz:**

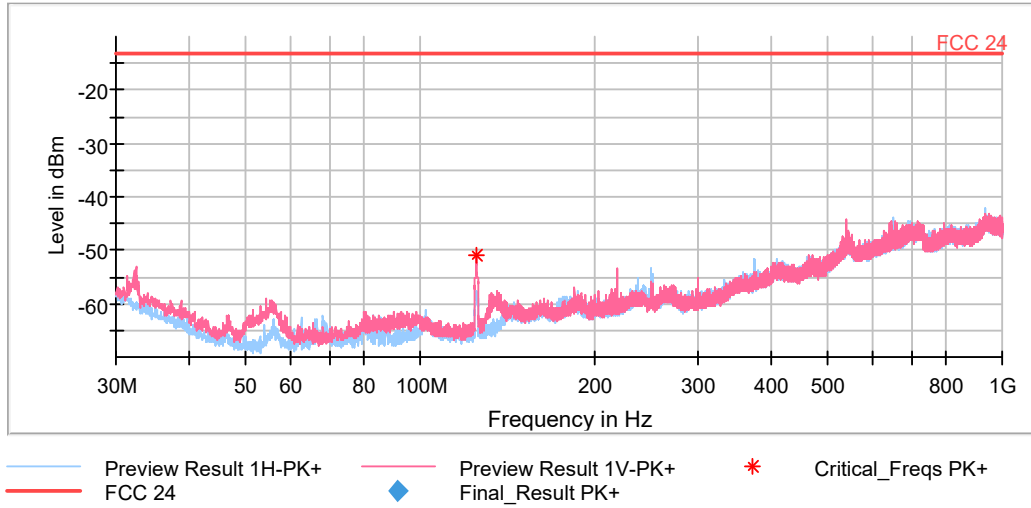
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB)	<± 5.08 for f < 1 GHz <± 5.13 for f ≥ 1 GHz up to 17 GHz <± 4.82 for f ≥ 17 GHz up to 20 GHz
------------------------------	--

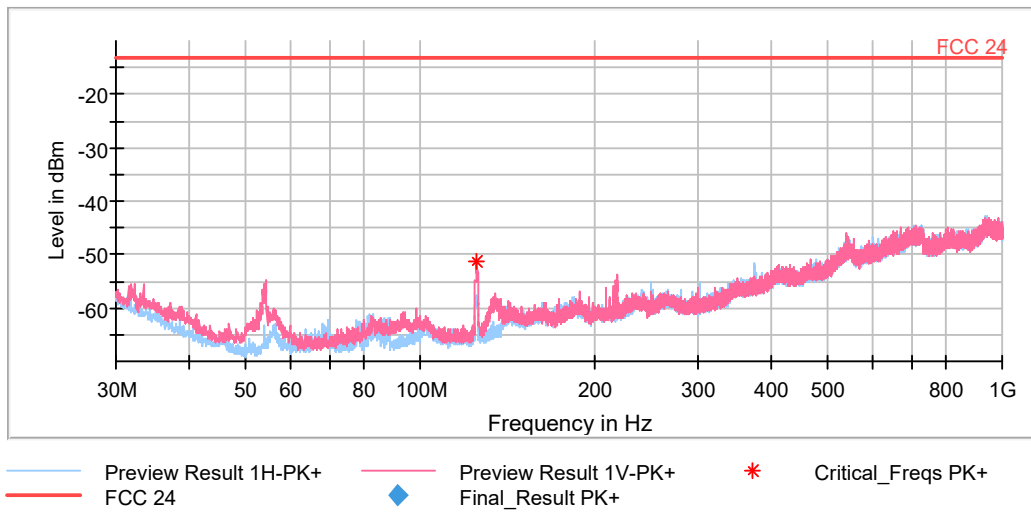
Verdict: PASS

### FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

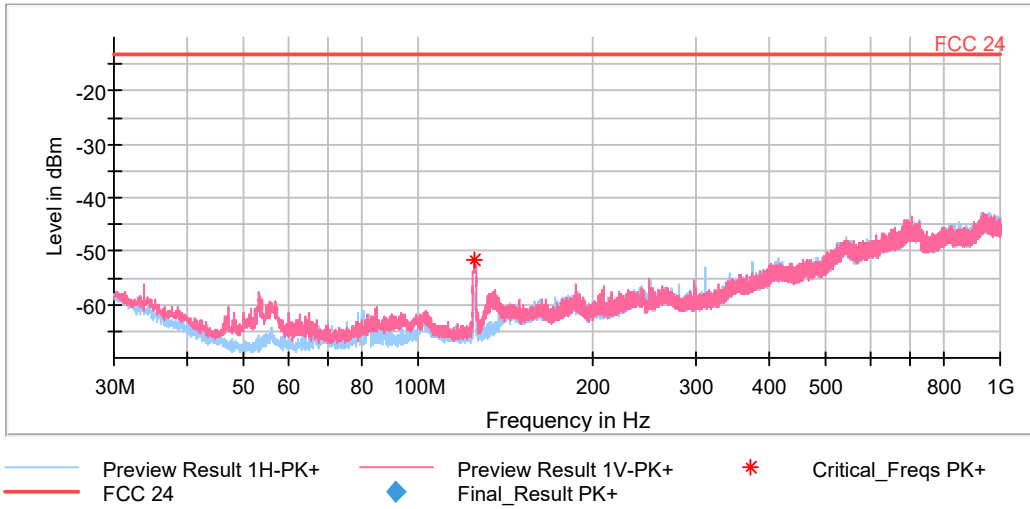
- Low Channel:



- Middle Channel:

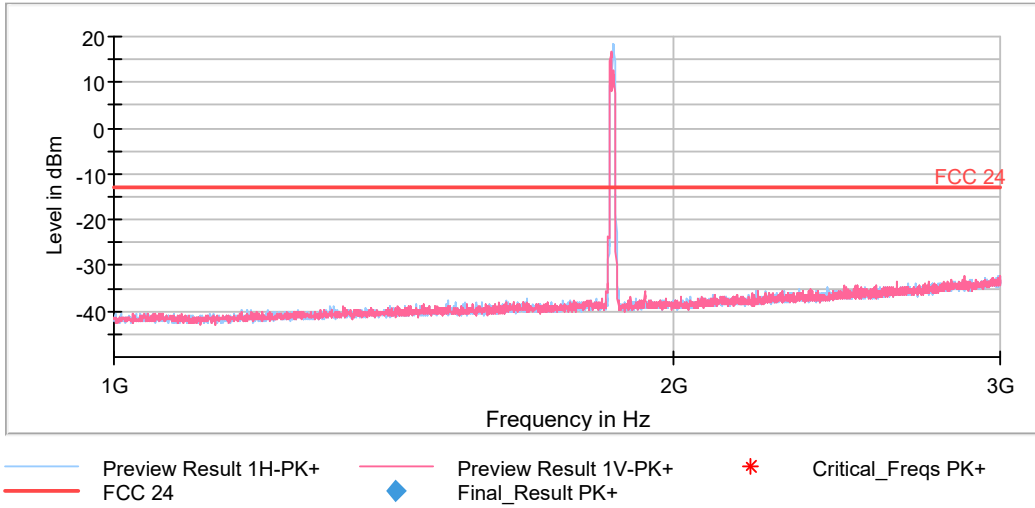


- High Channel:



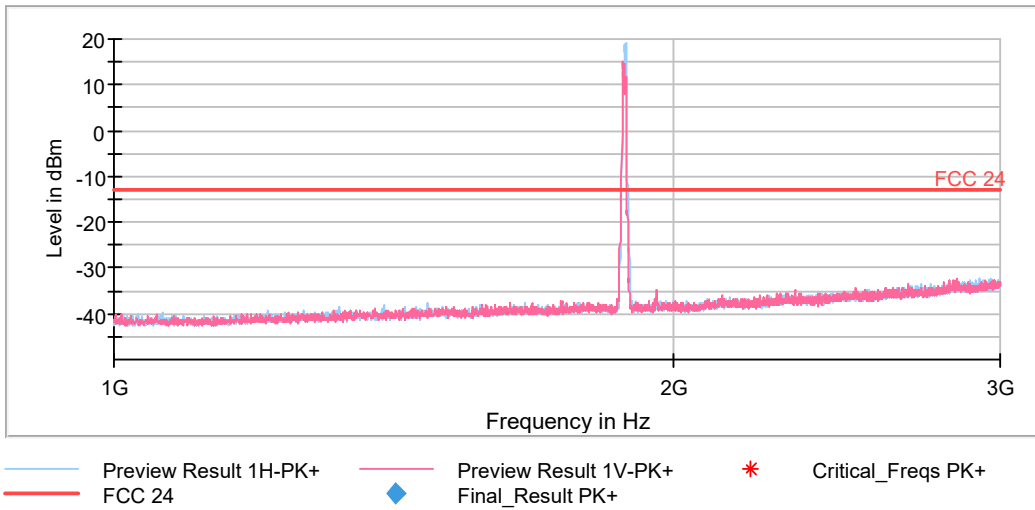
**FREQUENCY RANGE 1 - 3 GHz (worst-case):**

- Low Channel:



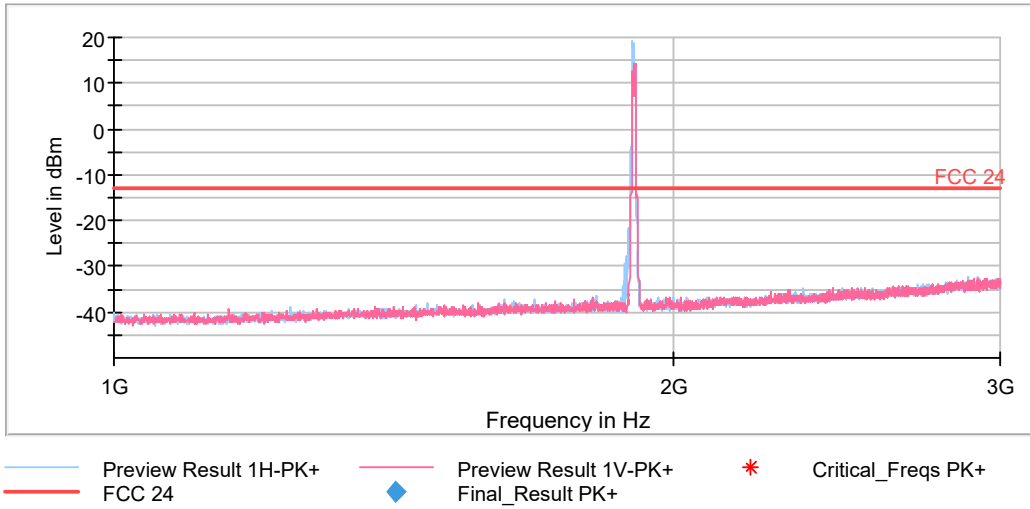
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

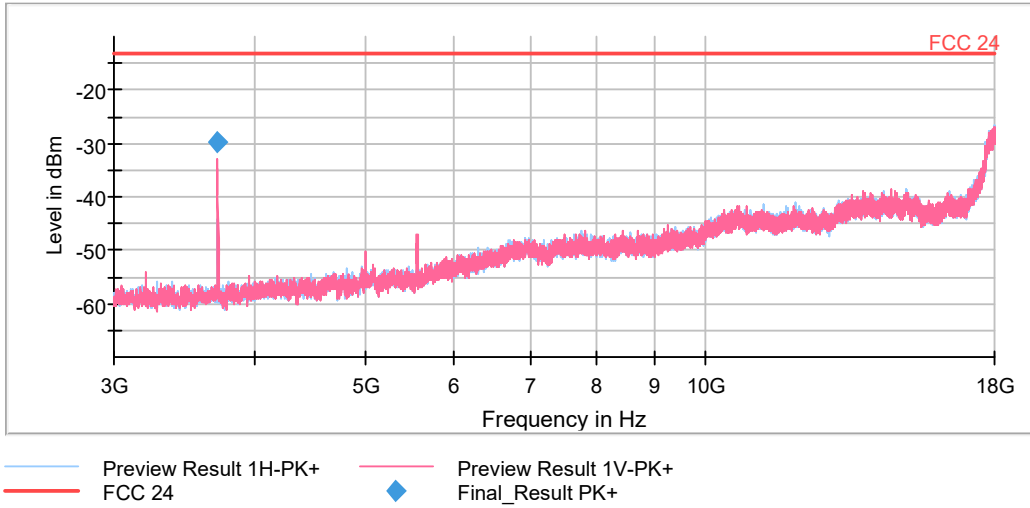
- High Channel:



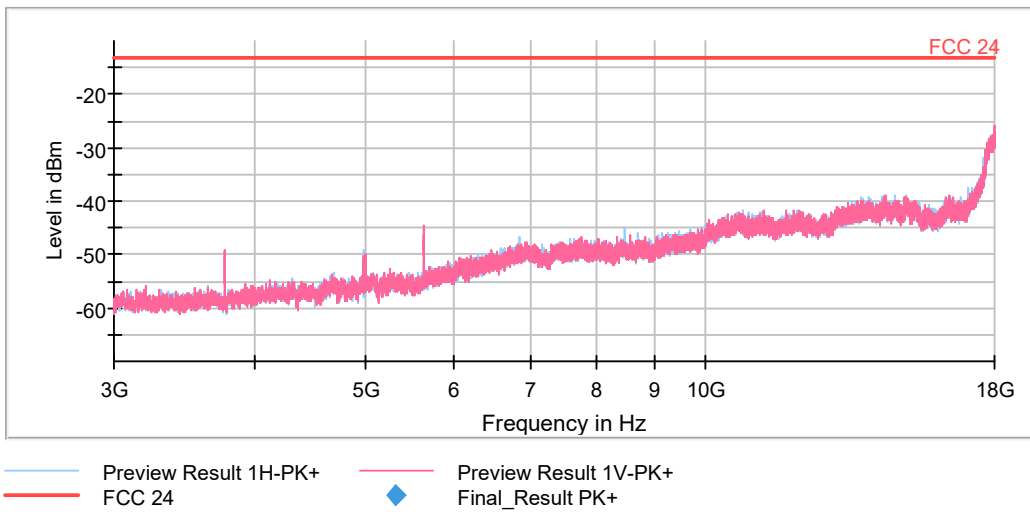
The peak above the limit is the carrier frequency.

### FREQUENCY RANGE 3 - 18 GHz (worst-case):

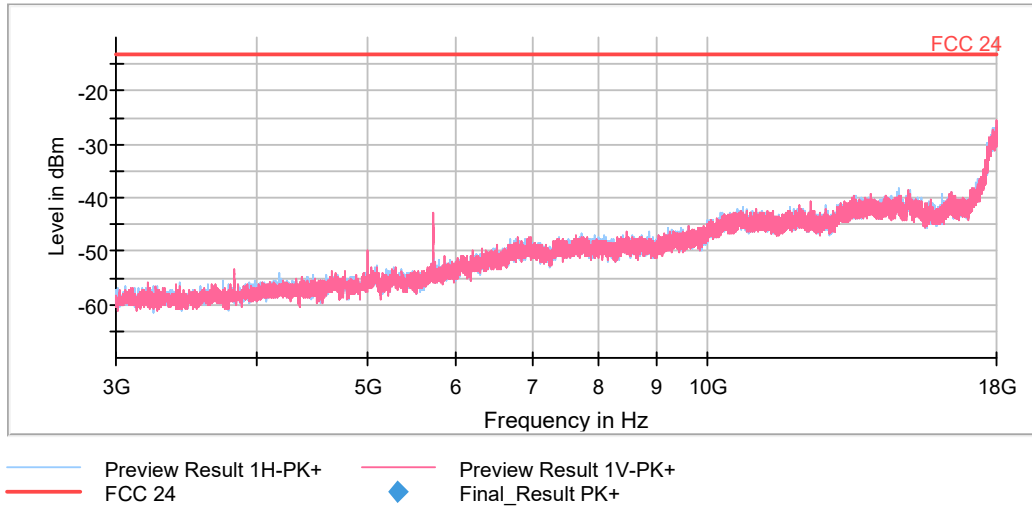
- Low Channel:



- Middle Channel:

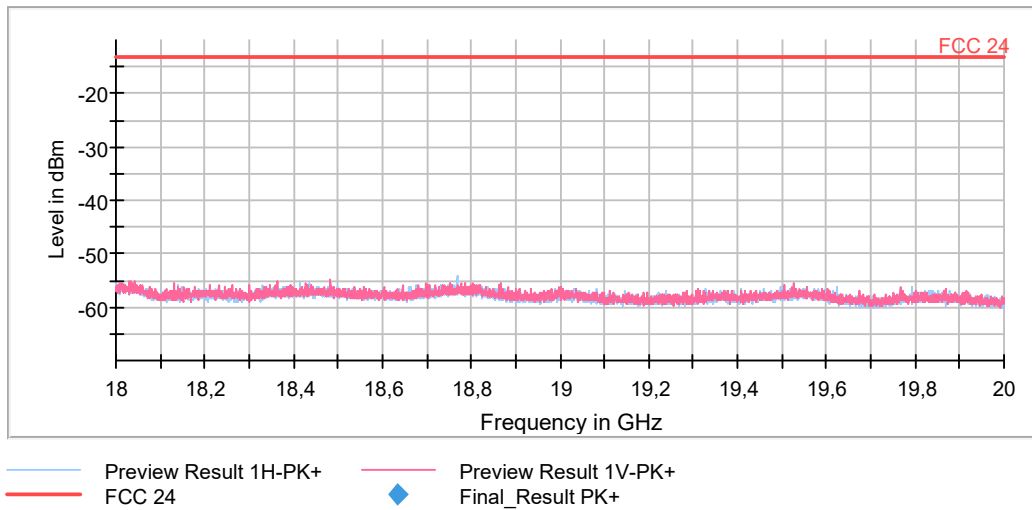


- High Channel:

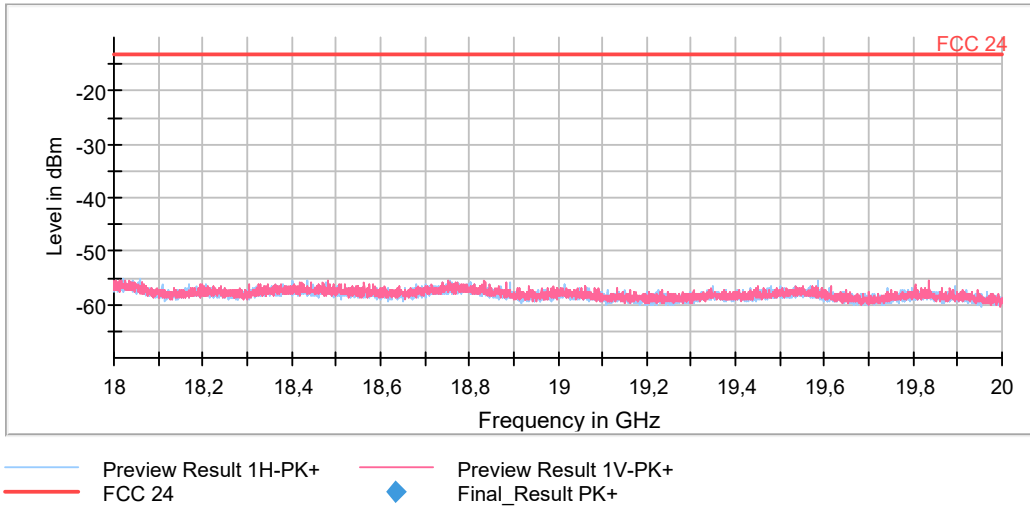


**FREQUENCY RANGE 18 - 20 GHz (worst-case):**

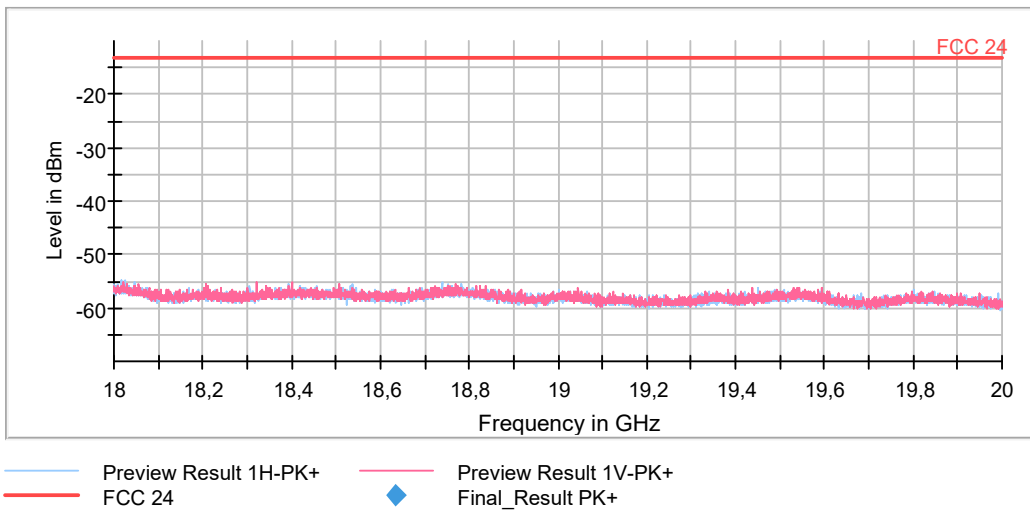
- Low Channel:



- Middle Channel:



- High Channel:





### **LTE Band 25:**

QPSK and QAM modulations: A preliminary scan determined the QPSK modulation, Nominal Bandwidth 15 MHz, Resource Block Size 1, Resource Block Offset 0 as the worst-case. The following results are the ones of the worst-case.

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

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

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

##### **Frequency range 1 - 18 GHz:**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
3.7015	-18.98	V	Peak

##### **Frequency range 18 - 20 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 GHz-18 GHz:**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
3.7515	-32.05	V	Peak

##### **Frequency range 18 - 20 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 GHz-18 GHz:**

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

##### **Frequency range 18 - 20 GHz:**

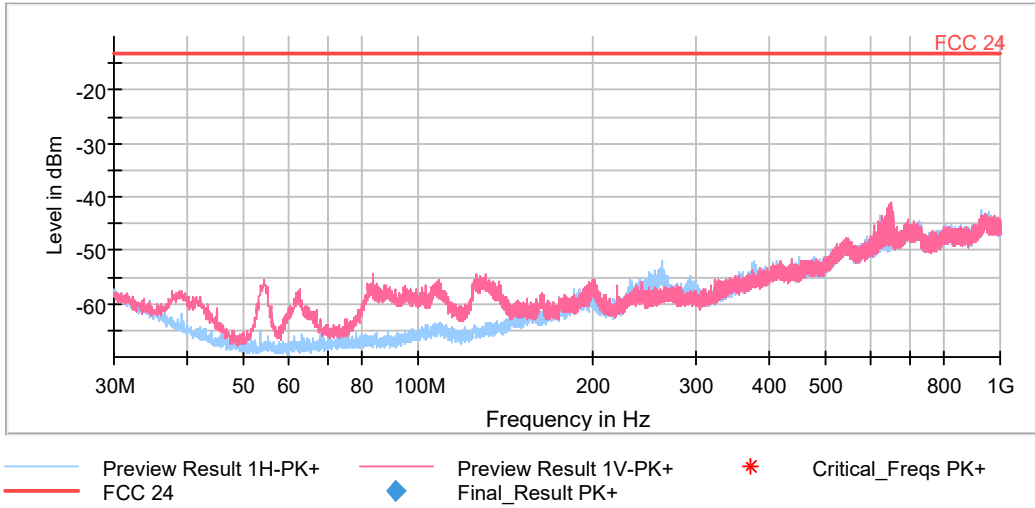
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB)	<± 4.99 for f < 1 GHz <± 4.98 for f ≥ 1 GHz up to 17 GHz <± 5.08 for f ≥ 17 GHz up to 20 GHz
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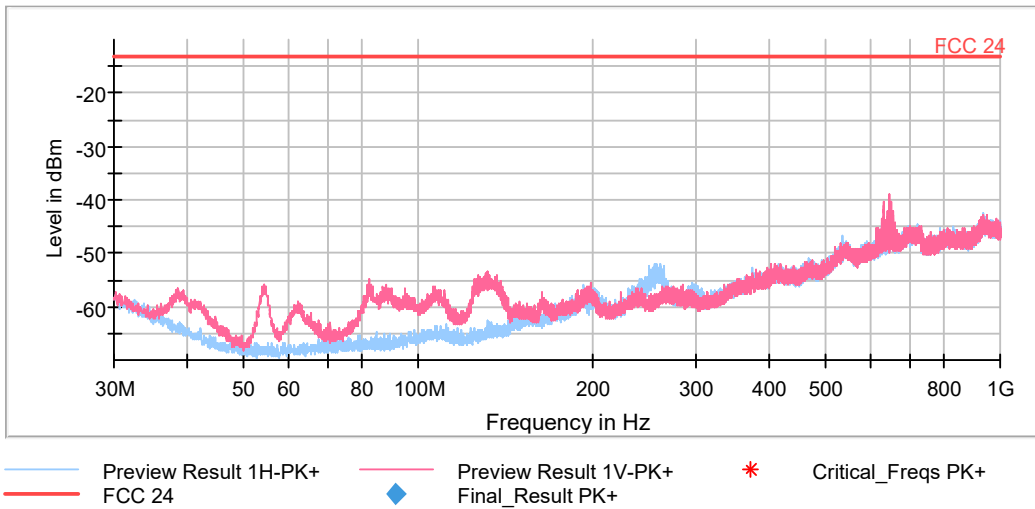
Verdict: PASS

**FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):**

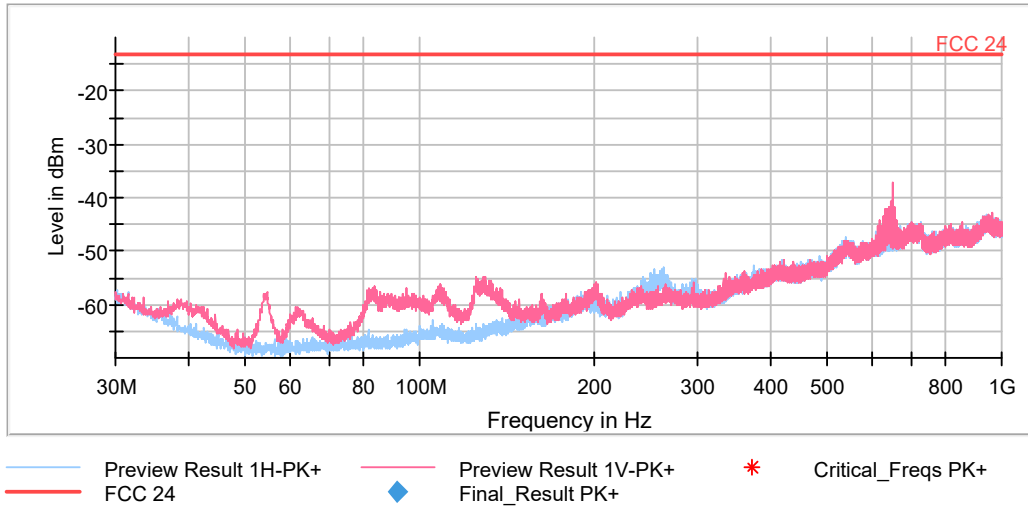
- Low Channel:



- Middle Channel:

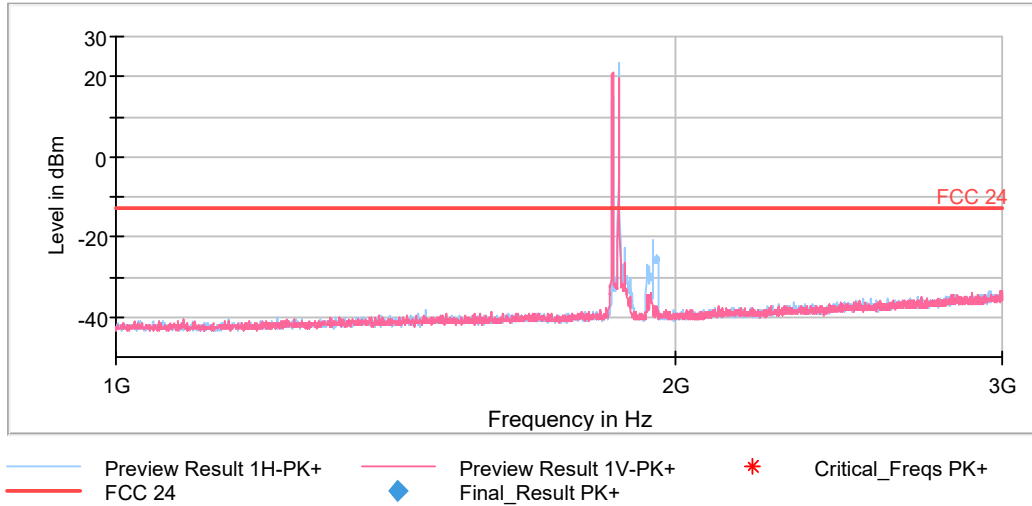


- High Channel:



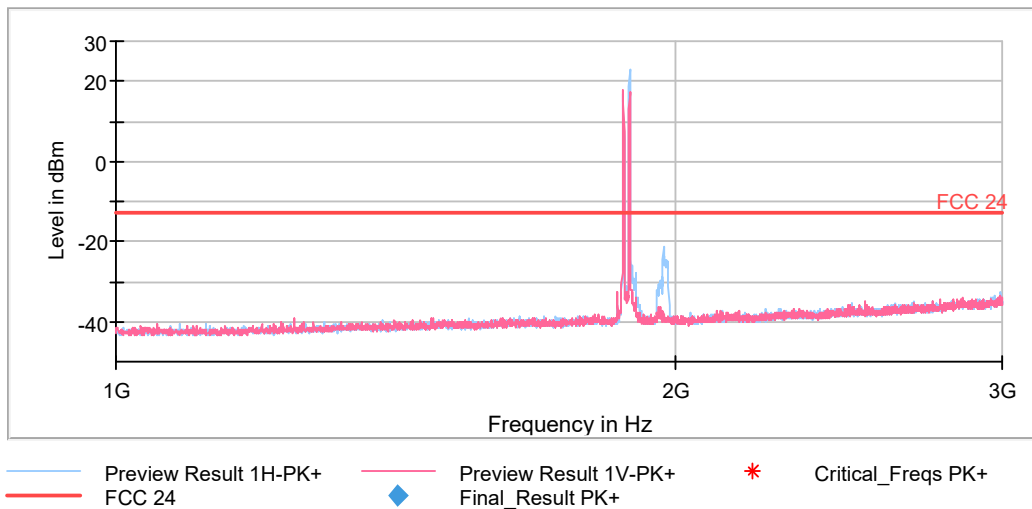
**FREQUENCY RANGE 1 - 3 GHz (worst-case):**

- Low Channel:



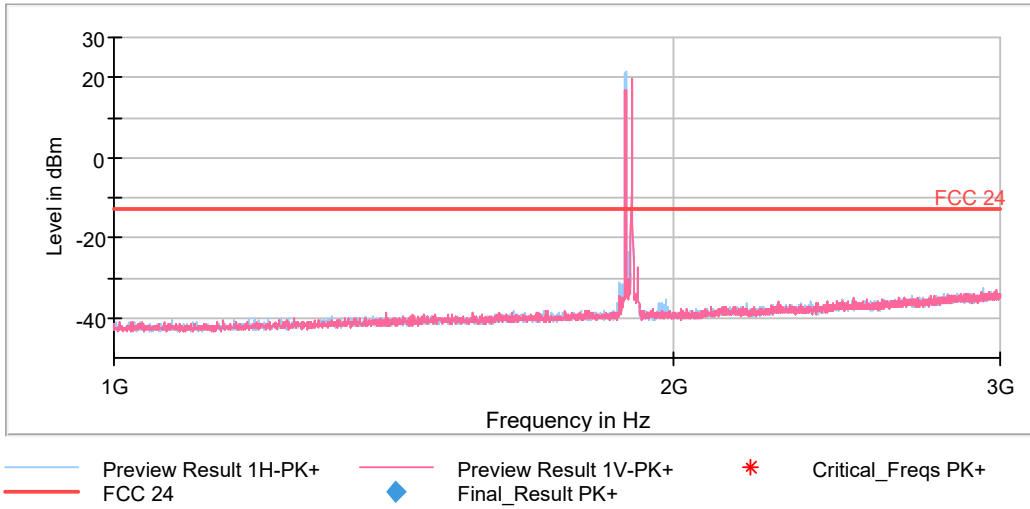
The peaks above the limit are the carrier frequencies. The peaks at 1937.5 and 1952.5 MHz correspond to the downlink signals.

- Middle Channel:



The peaks above the limit are the carrier frequencies. The peaks at 1962.5 and 1977.5 MHz correspond to the downlink signals.

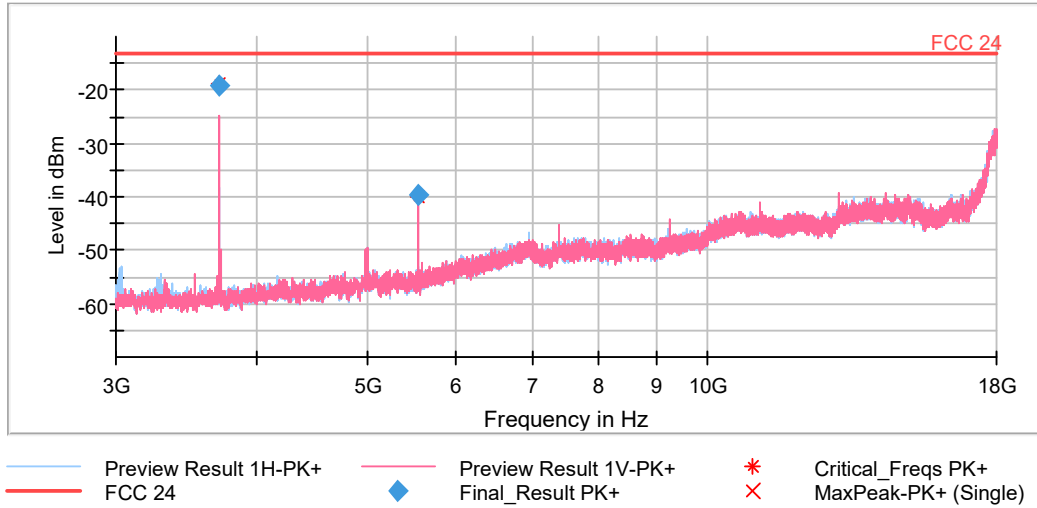
- High Channel:



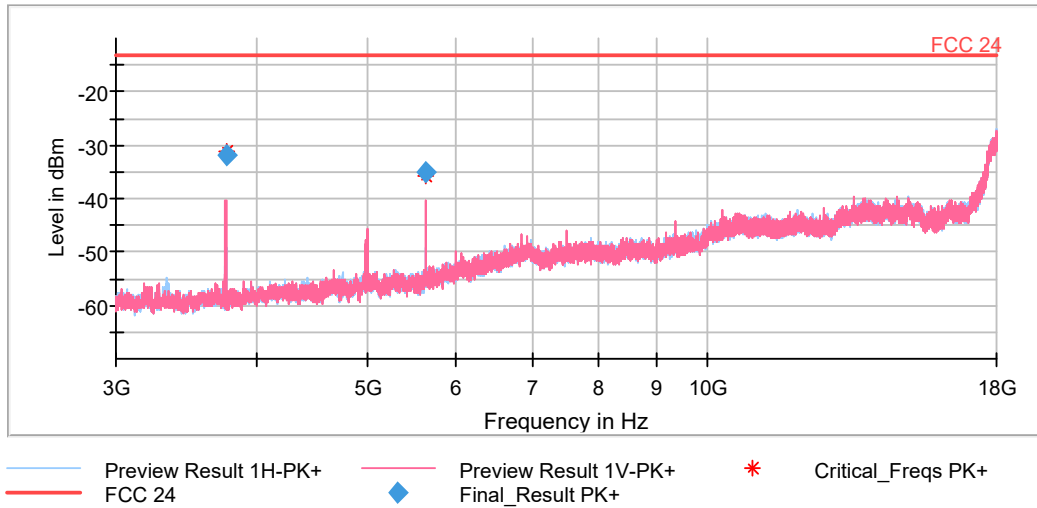
The peaks above the limit are the carrier frequencies.

**FREQUENCY RANGE 3 - 18 GHz (worst-case):**

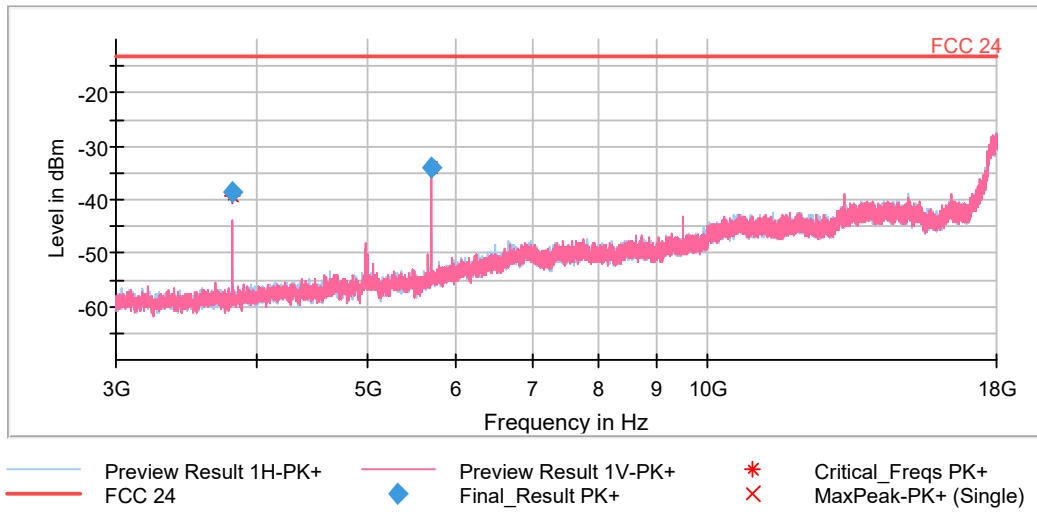
- Low Channel:



- Middle Channel:

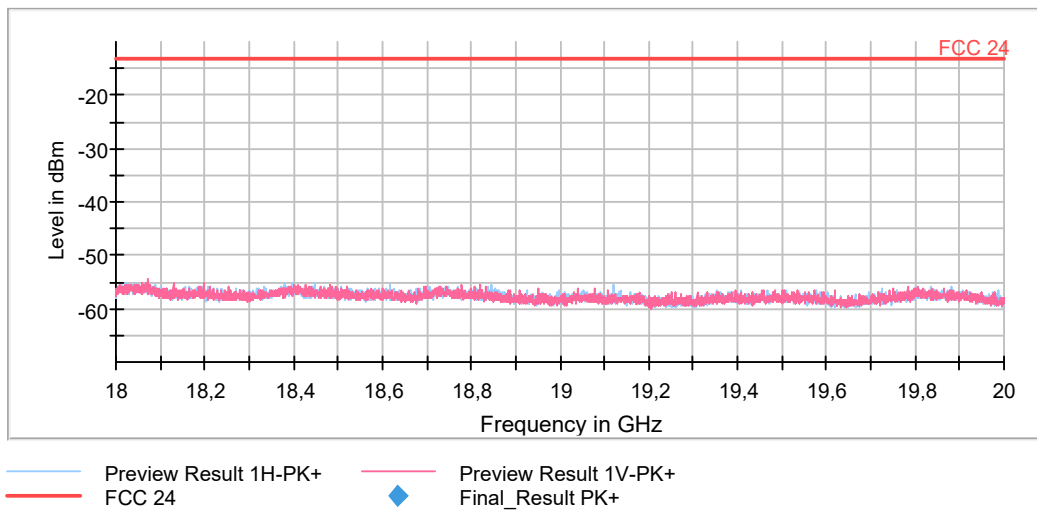


- High Channel:

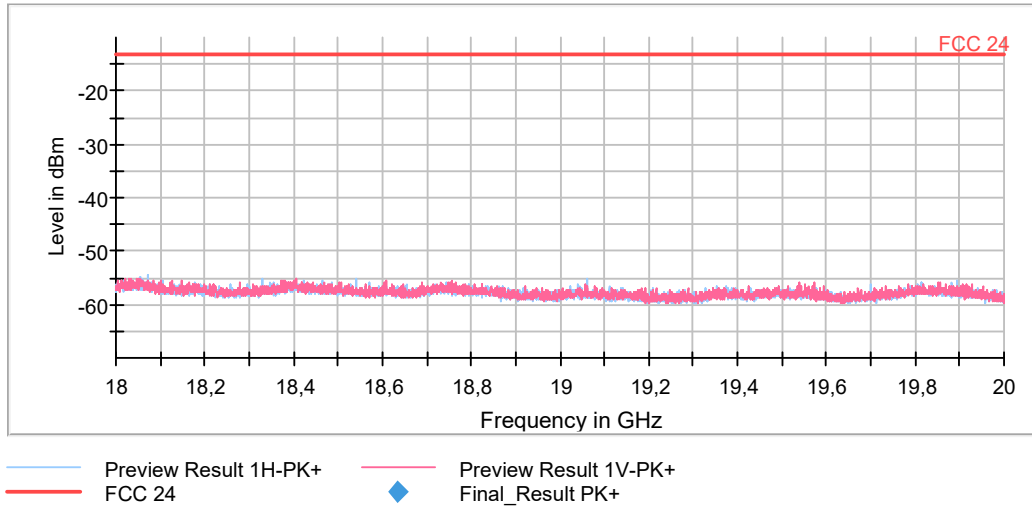


**FREQUENCY RANGE 18 - 20 GHz (worst-case):**

- Low Channel:



- Middle Channel:



- High Channel:

