

Test report No:
 NIE: 62486RRF.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-HIGH-R1
Other identification of the product	HW version: D3 SW version: 20512H.001_047_009 FCC ID: T8GWAVE11HIGHR1 IC: 6434A-WAVE11HIGHR1
(*) 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 (10-1-19 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)	José Carlos Luque RF Lab. Supervisor
Date of issue	2021-02-02
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

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 include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test 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.

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General conditions

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.
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Uncertainty

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

Data provided by the client

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-HIGH-R1 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.

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 Nº	Description	Model	Serial Nº	Date of reception
62486E/106	Telematic Control Unit	WAVE-11-HIGH-R1	B392160L4900519	2020/09/28
62486E/014	Antenna DA Wave 5G US	DA05DI20	--	2020/09/22
62486E/024	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/025	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/026	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/027	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/122	RF Harness	--	--	2020/09/28
62486E/061	Harness 20 pol	--	--	2020/09/22

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/110	Battery Li-ion	11FR1580-2	--	2020/09/28
62486E/044	Antenna ground planes for roof	--	--	2020/09/22
62486E/048	RF Cable for 4-Fakra	--	--	2020/09/22
62486E/057	OABR Cable	--	--	2020/09/22
62486E/066	OABR 1000 BaseT Converter	--	--	2020/09/22
62486E/069	I-Box OABR Adapter	--	--	2020/09/22
62486E/072	Ethernet Cable	--	--	2020/09/22
62486E/090	Speaker	FR7	--	2020/09/28
62486E/097	SOS Pulser (E-Call)	9385	11224	2020/09/28

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 ⁽³⁾		
	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		Reference poles				
			L1	L2	L3	N	PE
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	DC: 12V car battery / attenuator (4,5 V ≤ UB ≤ 18 V; UB typical: 12 V)					
<input type="checkbox"/>	DC:						
Rated Power	12V DC						
Clock frequencies.....	25MHz;26MHz;32,768kHz;49,58MHz;						
Other parameters	See Technical description						
Software version	20512H.001_047_009						
Hardware version	D3						

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		

⁽³⁾ 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)	2020-10-26
Date (finish)	2020-11-09

Document history

Report number	Date	Description
62486RRF.003	2021-02-02	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: José Manuel Jiménez, Miguel Manuel López, Nicolás Salguero, Cristina Calle, Pablo Redondo and Alfonso Gutiérrez.

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. Multi-device Controller EMCO 2090	N.A.	N.A.
4. Antenna Mast ETS LINDGREN 2175 MiniMast	N.A.	N.A.
5. Field Probe Positioner MATURO FPP 2.3-M	N.A.	N.A.
6. Ethernet Temperature and Humidity Logger HW GROUP HWg-STE	2020/04	2021/04
7. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
8. Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2020/04	2023/04
9. Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10. RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
11. Preamplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK, BLNA 0160-01N	2020/02	2021/02
12. Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
13. Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2019/10	2021/10
14. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/07	2021/07
15. DC Power Supply 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
16. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
17. Digital Multimeter FLUKE 175	2020/11	2021/11
18. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
19. RF Preamplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
20. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
21. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
22. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/04	2021/04
23. Low Pass Filter DC - 1 GHz WAINWRIGHT INSTRUMENTS WLK1000-6SS	2020/07	2022/07

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	(2)
<u>Supplementary information and remarks:</u>		
(1) Test not requested. Radiated emissions test only requested. (2) The 62486RRF.001 contains the results of the pre-testing to determine the worst case of the setting of the antennas: <ul style="list-style-type: none"> · Conf #1: MIMO1 Port -> Int BuA Antenna / MIMO2 Port -> MIMO2 Antenna / Antennenbox for NAD#2. · Conf #2: MIMO1 Port -> Int BuA Antenna / MIMO2 Port -> MIMO2 Antenna / FSA antenna for NAD#2. · Conf #3: MIMO1 Port -> MIMO1 Antenna / MIMO2 Port -> MIMO2 Antenna / Antennenbox for NAD#2. · Conf #4: MIMO1 Port -> MIMO2 Antenna / MIMO2 Port -> MIMO2 Antenna / FSA antenna for NAD#2. 		

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

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TEST CONDITIONS

POWER SUPPLY (V):

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

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.

TEST FREQUENCIES:

2G Band 1900 MHz. GPRS and EDGE modulations. MIMO 2x2 (configuration 3):

Module NAD1		Module NAD2	
Low Channel (512)	1850.2 MHz	Adjacent channel to Low Channel (514)	1850.6 MHz
Middle Channel (662)	1880.2 MHz	Adjacent channel to Middle Channel (664)	1880.6 MHz
High Channel (810)	1909.8 MHz	Adjacent channel to High Channel (808)	1909.4 MHz

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

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 (configuration 3):

	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 (configuration 3):

	Channel (Frequency)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	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 (26615)	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 (26440)	1890 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 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:

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

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.

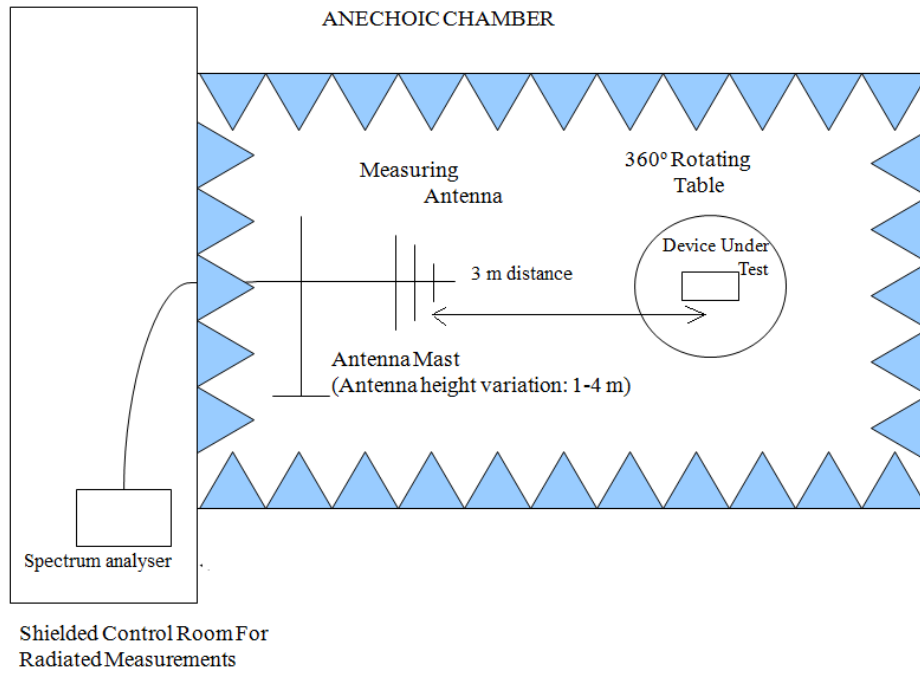
At P_o transmitting power. the specified minimum attenuation becomes $43+10\log (P_o)$. and the level in dBm relative P_o becomes:

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

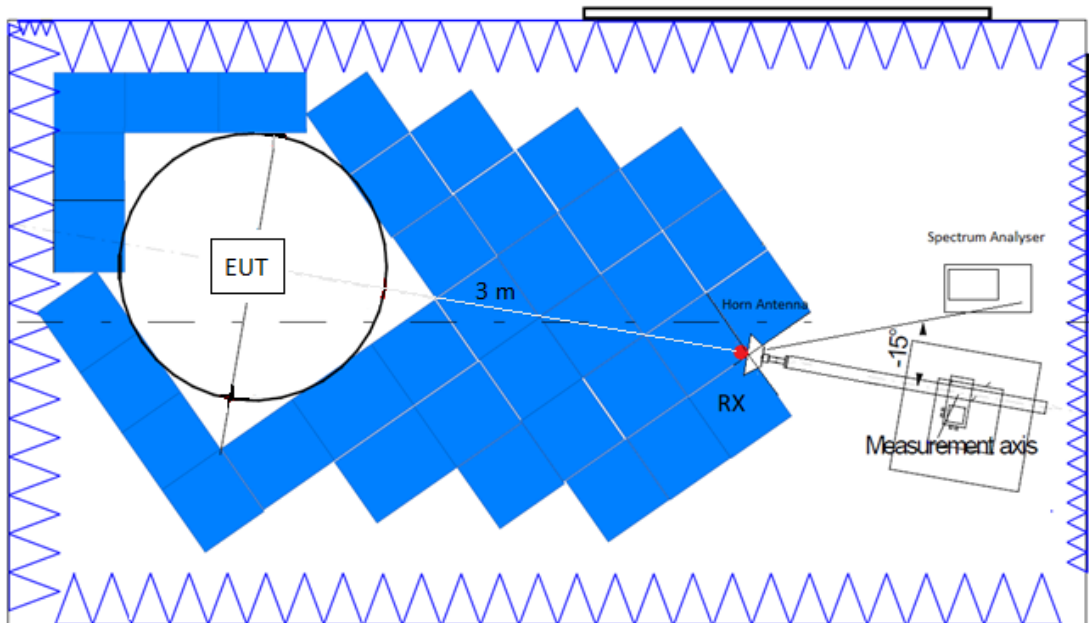
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz or higher were used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

TEST SETUP:

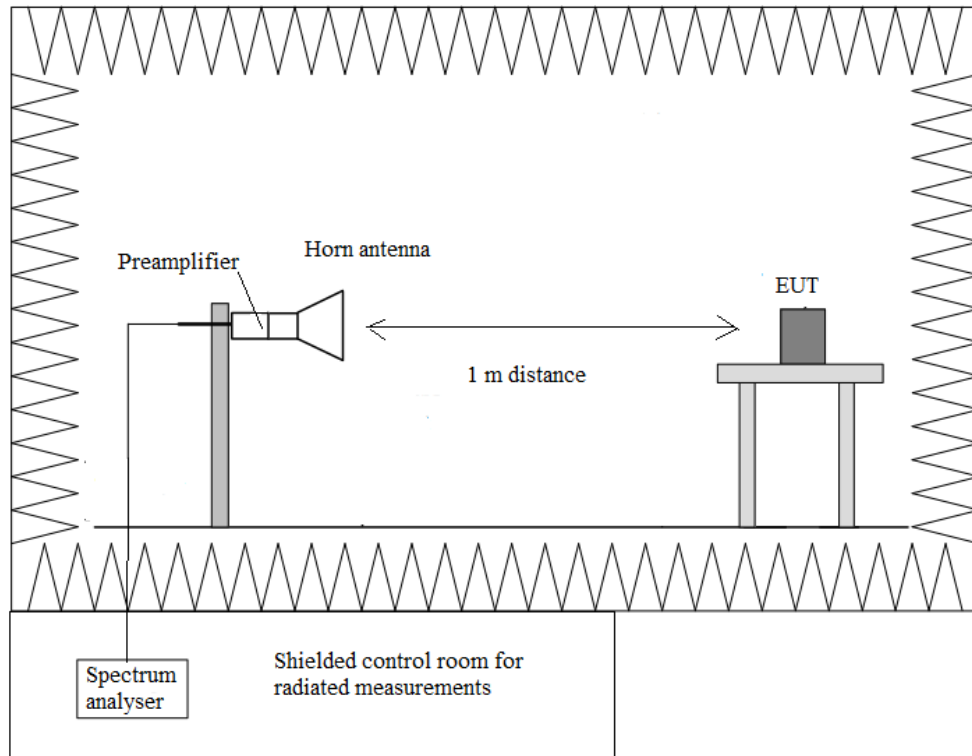
Radiated measurements setup from 30 MHz to 1 GHz:



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 - 17 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.947833	-32.24	H	Peak	<± 5.13

Frequency range 17 - 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 - 17 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.9481	-31.78	H	Peak	<± 5.13

Frequency range 17 - 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 - 17 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.947633	-32.28	H	Peak	<± 5.13

Frequency range 17 - 20 GHz:

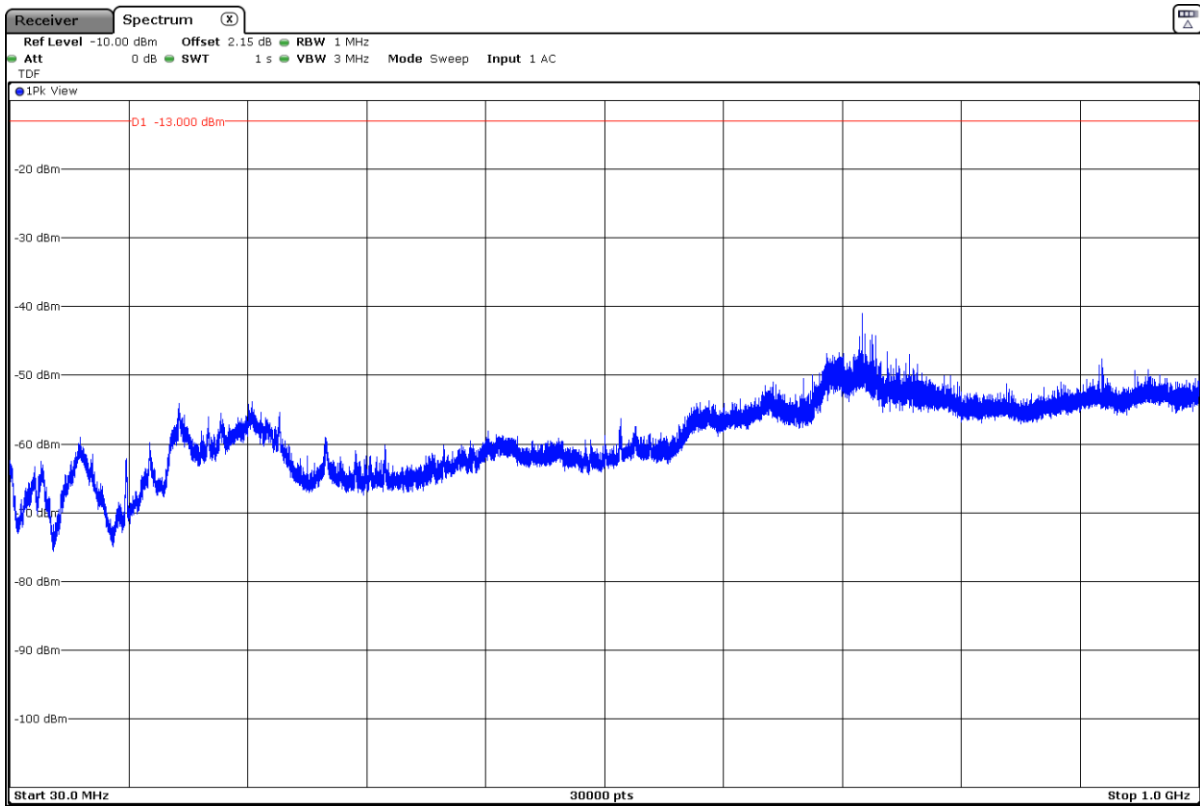
No spurious frequencies at less than 20 dB below the limit.

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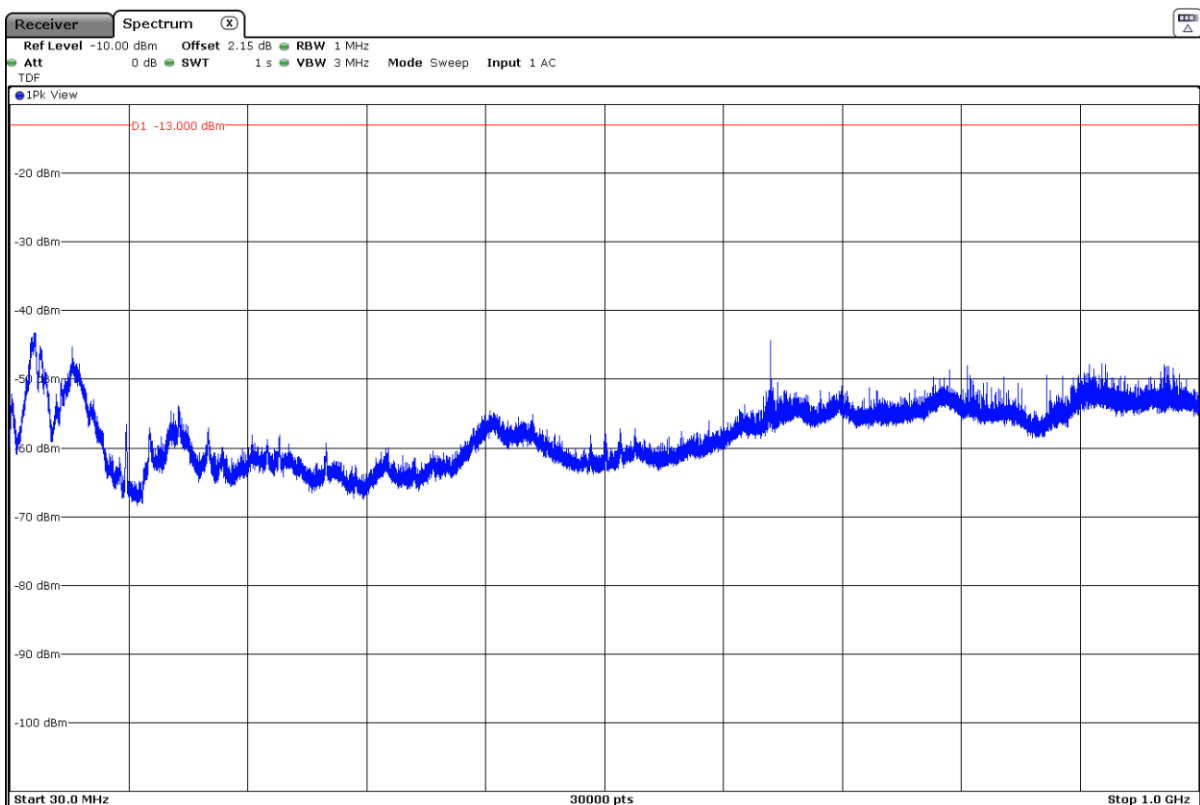
Verdict: PASS

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

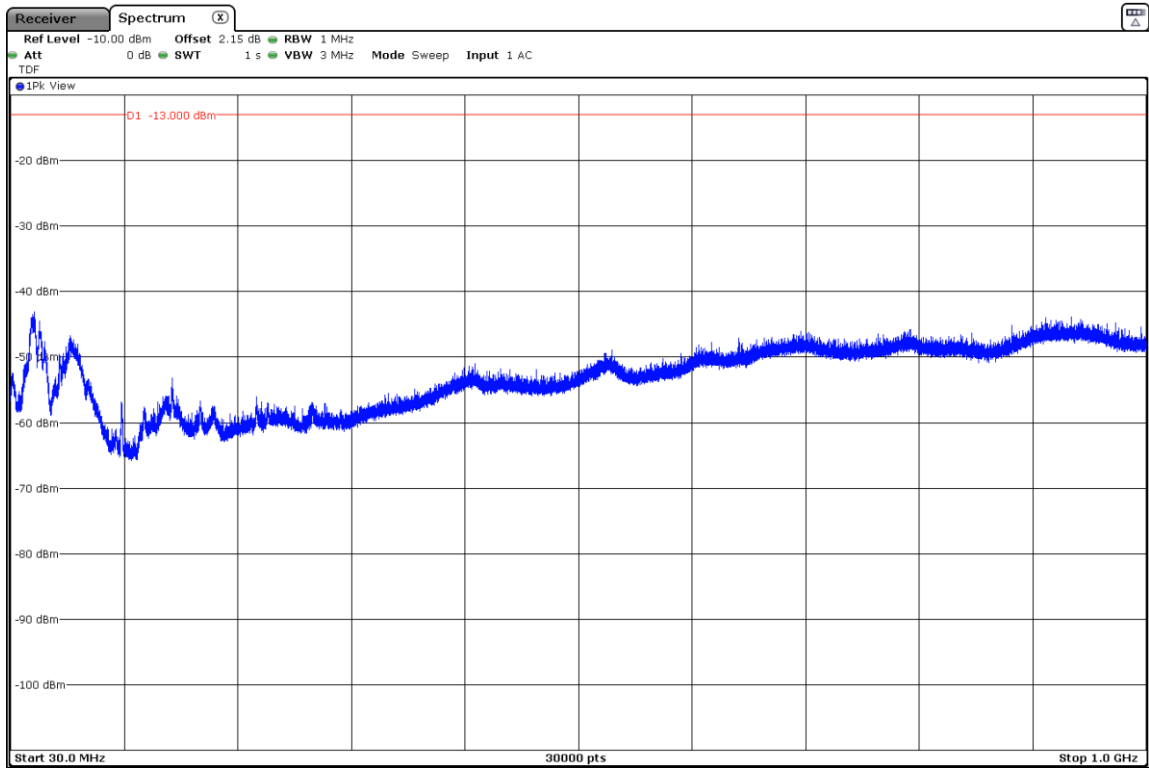
- Low Channel:



- Middle Channel:

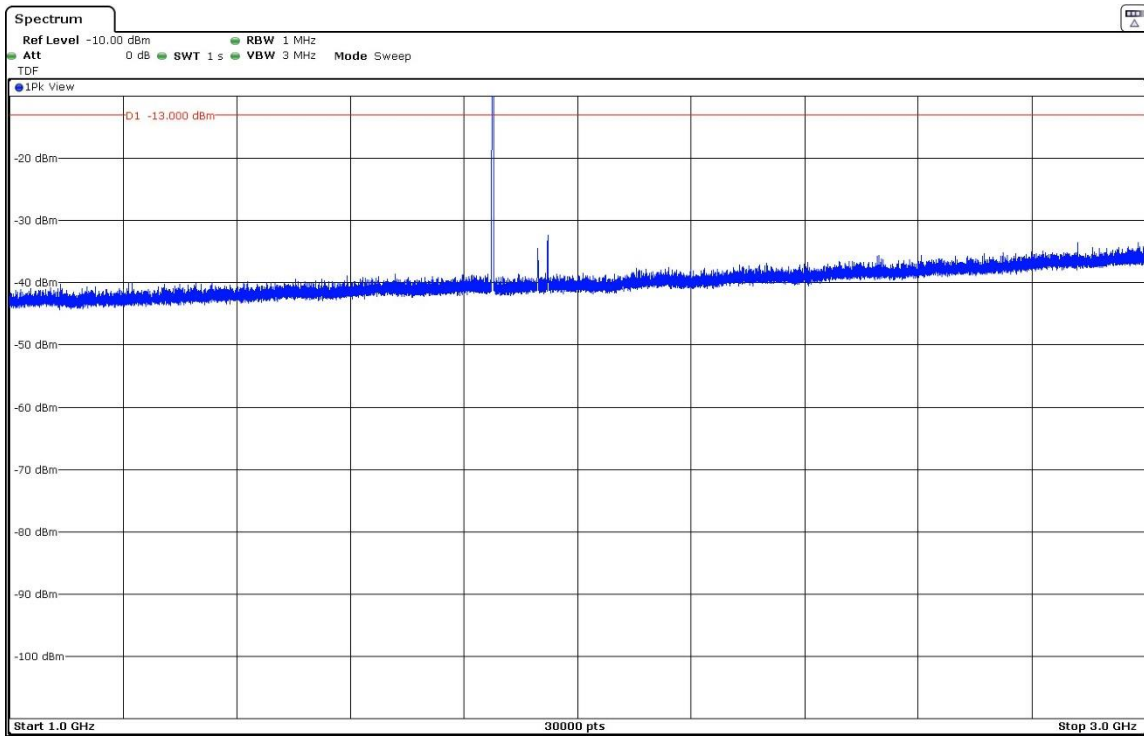


- High Channel:



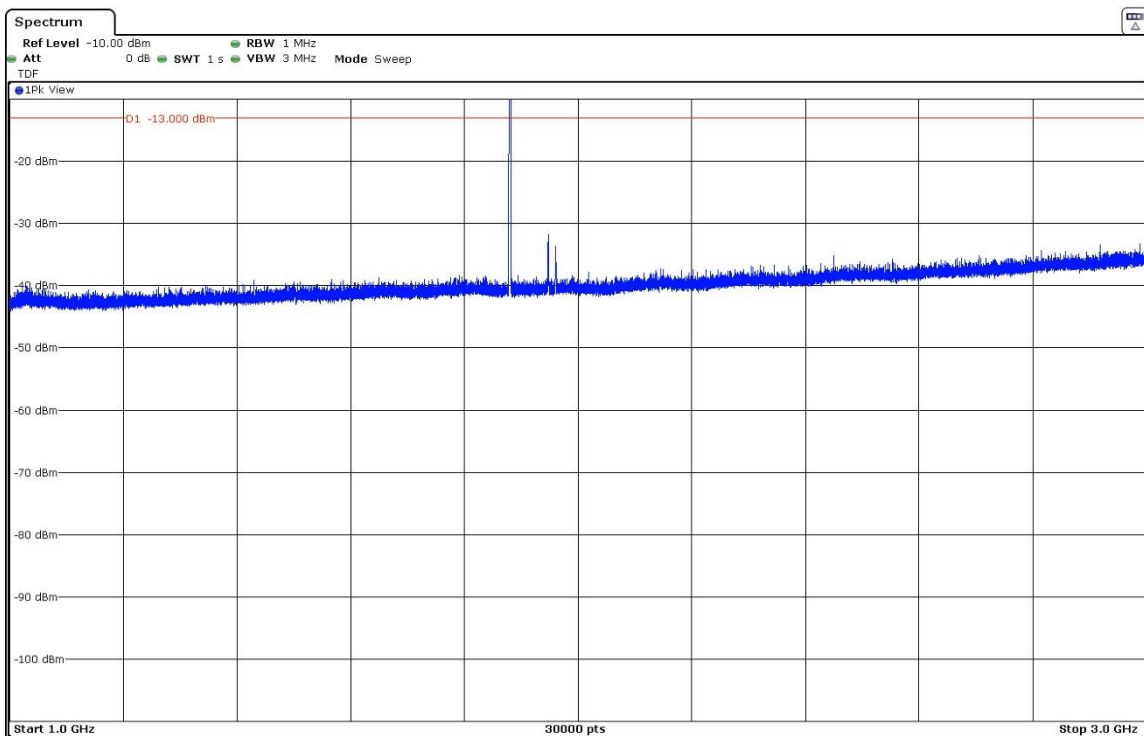
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



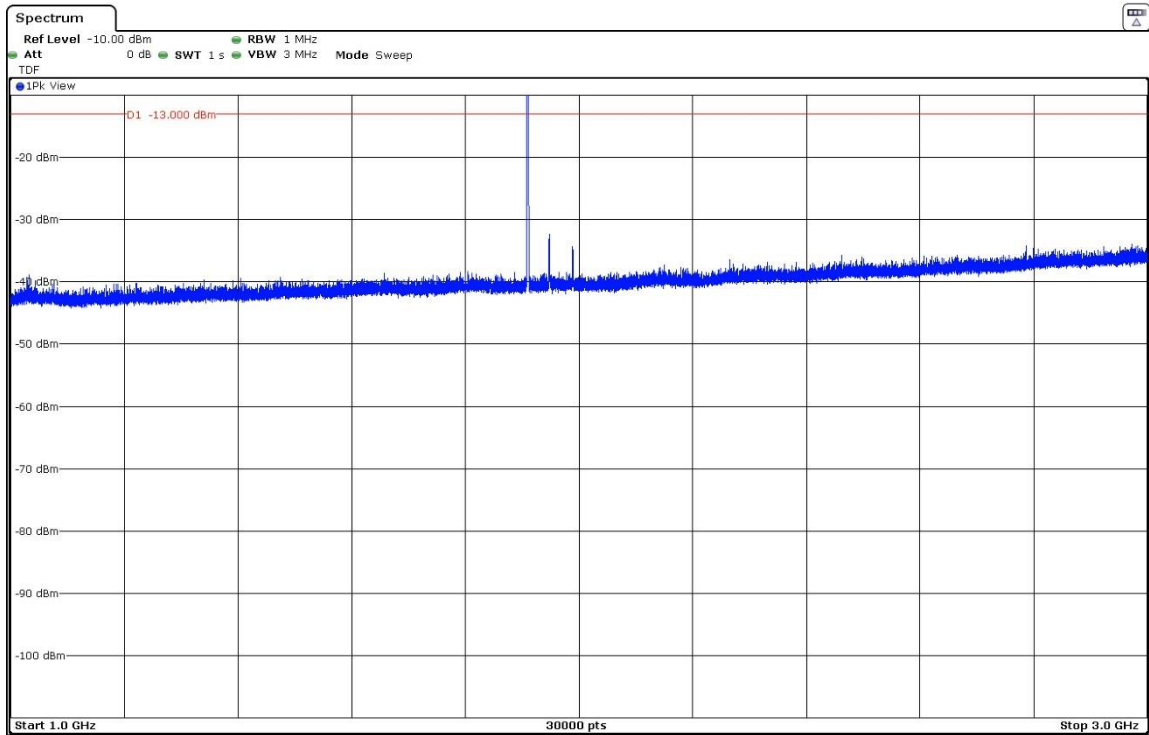
The peak above the limit is the carrier frequency. The peaks at 1930.2MHz and 1930.6MHz correspond to the downlink signals.

- Middle Channel:



The peak above the limit is the carrier frequency. The peaks at 1960.2MHz and 1960.6MHz correspond to the downlink signals.

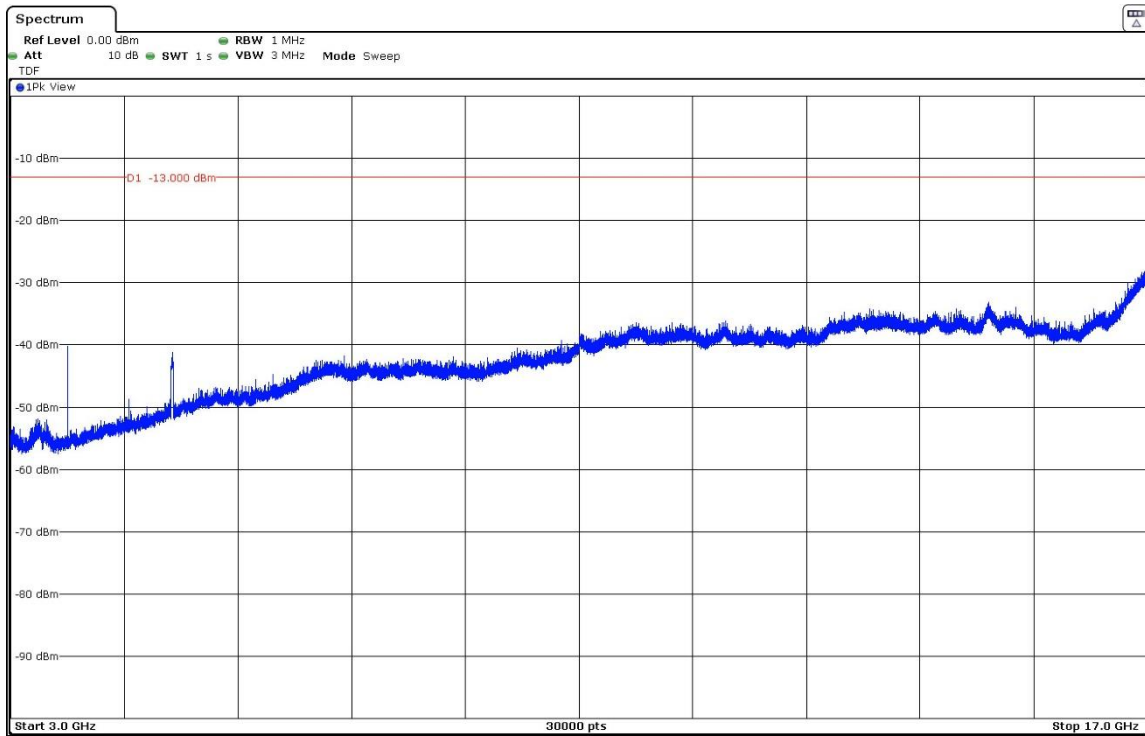
- High Channel:



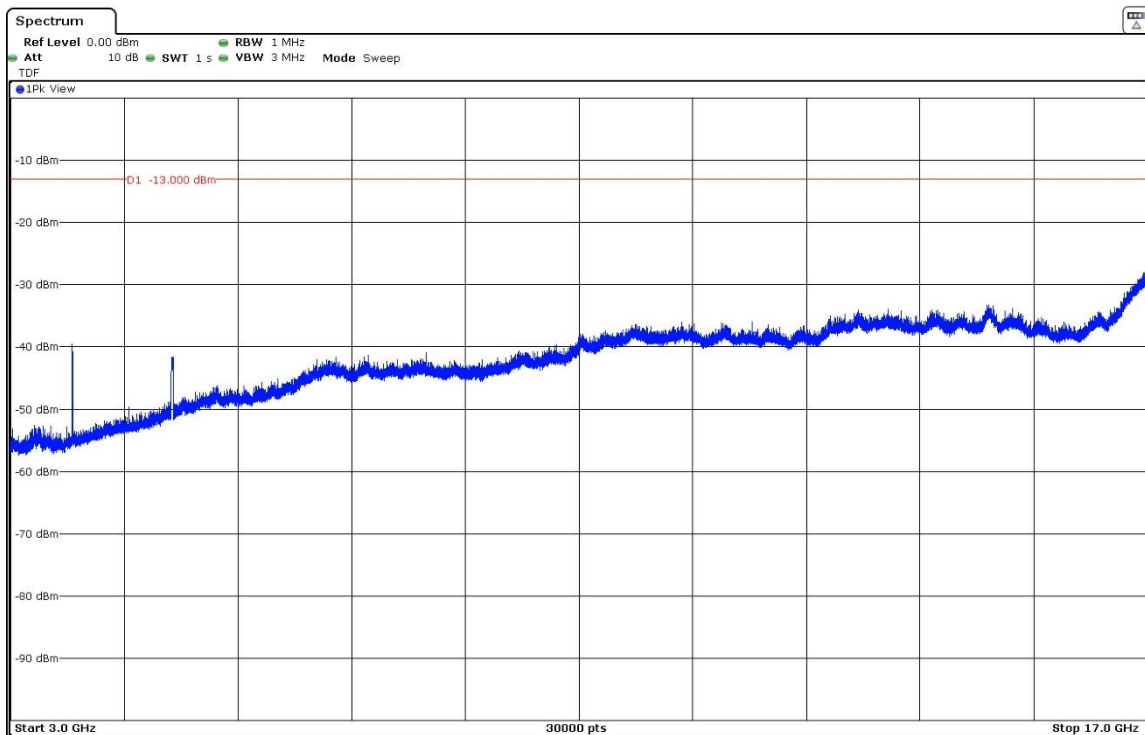
The peak above the limit is the carrier frequency. The peaks at 1989.4MHz and 1989.8MHz correspond to the downlink signals.

FREQUENCY RANGE 3 - 17 GHz (worst case):

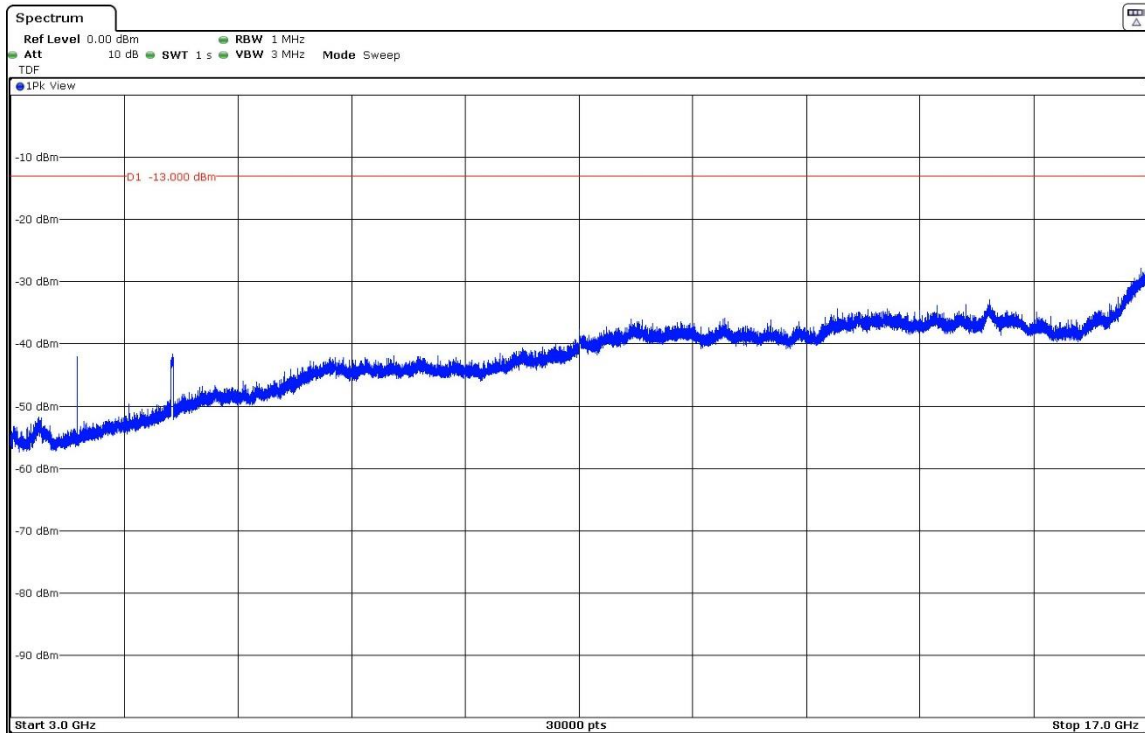
- Low Channel:



- Middle Channel:

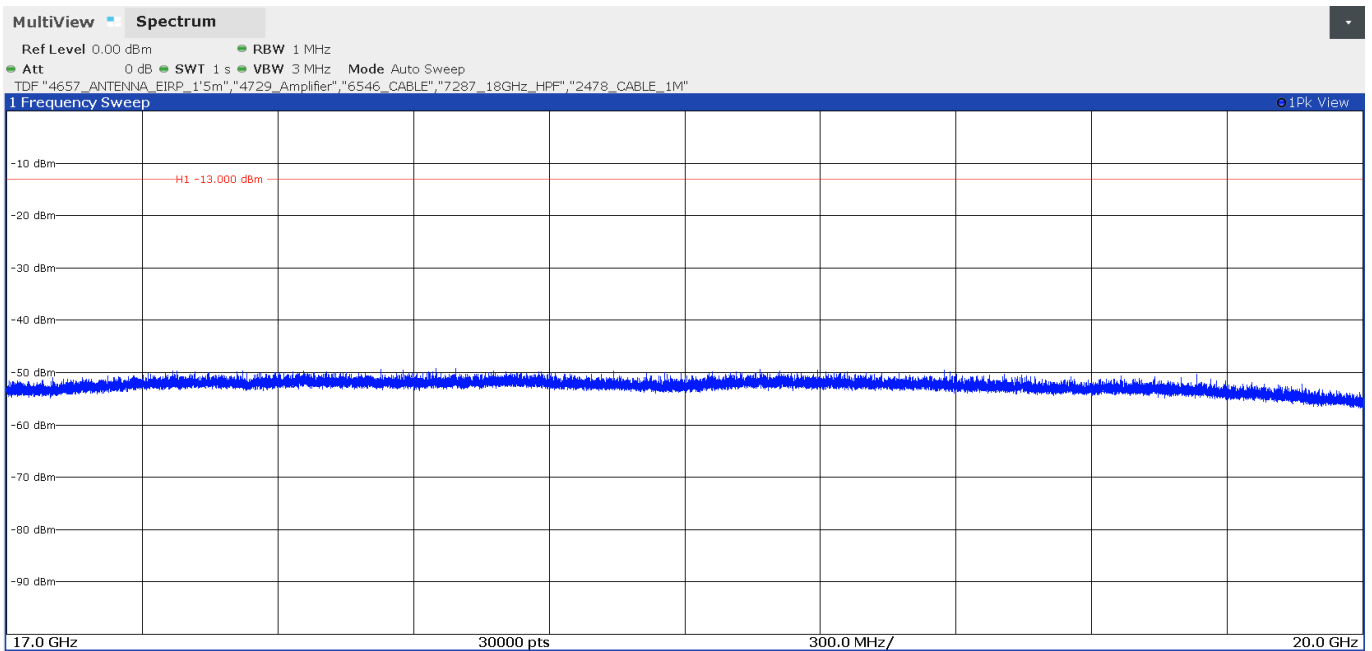


- High Channel:

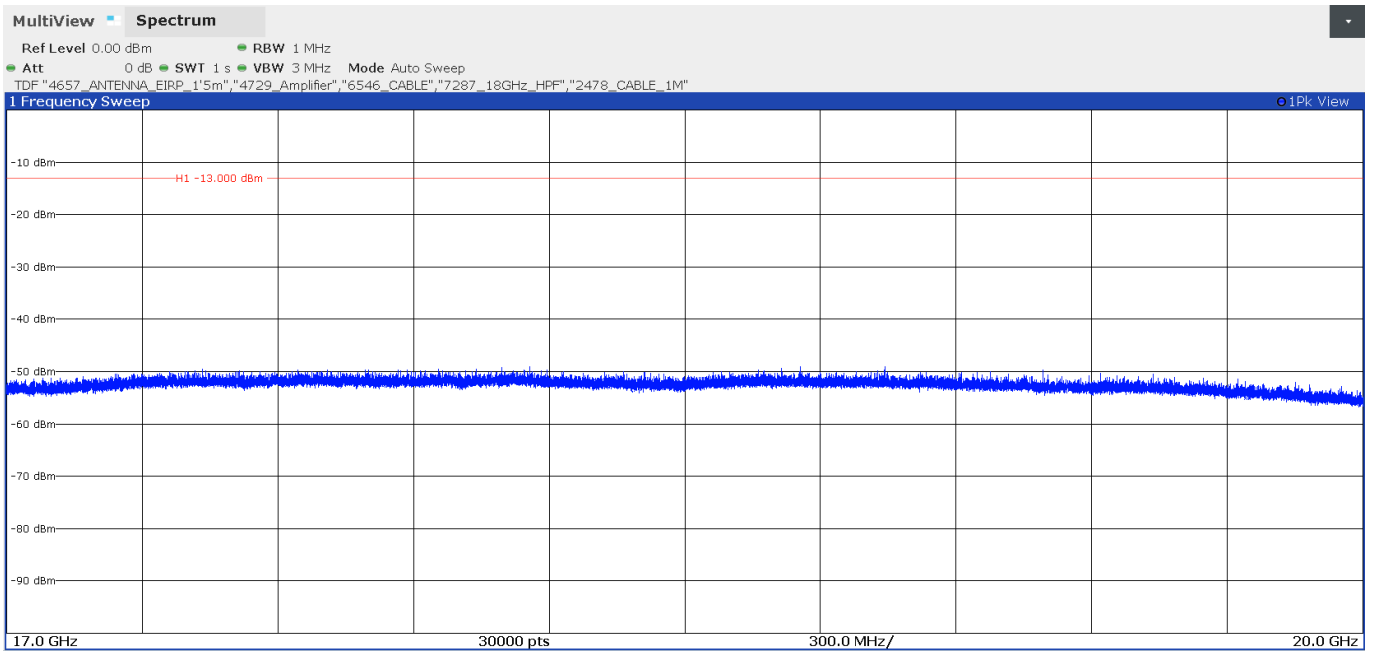


FREQUENCY RANGE 17 - 20 GHz (worst case):

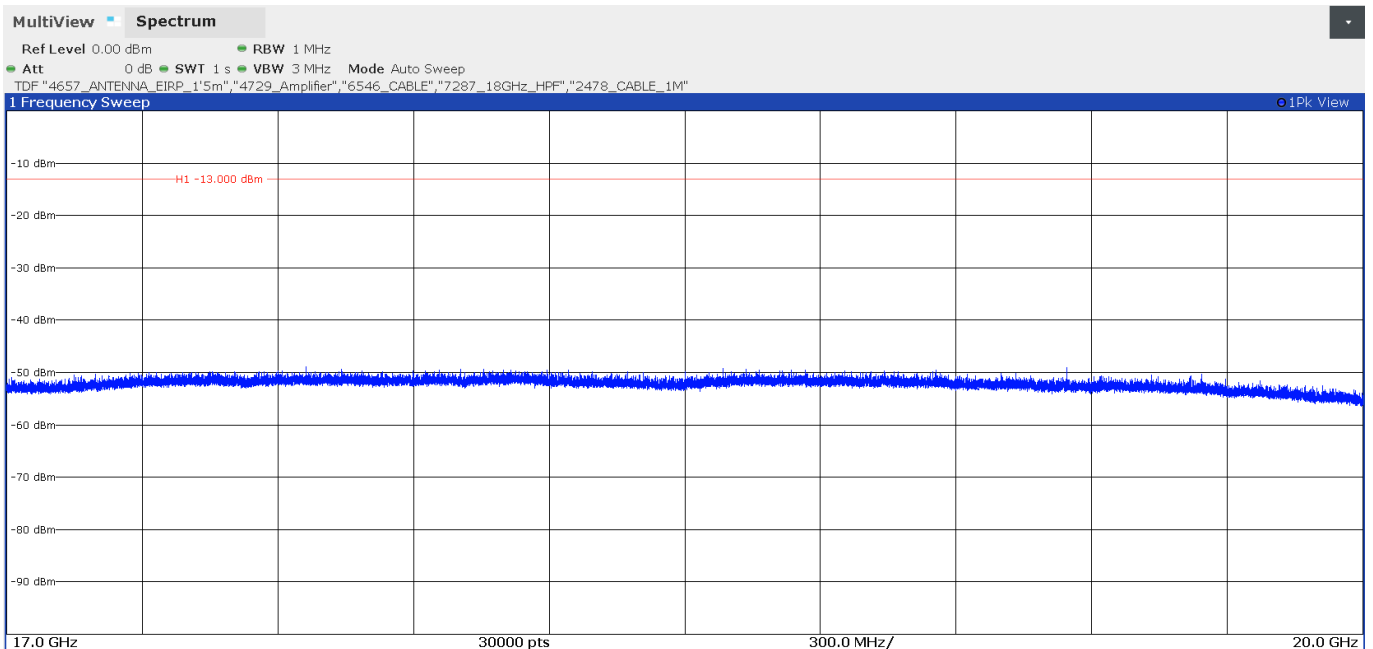
- Low Channel:



- 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	Measurement Uncertainty (dB)
3.7065	-23.62	V	Peak	<± 5.13

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:

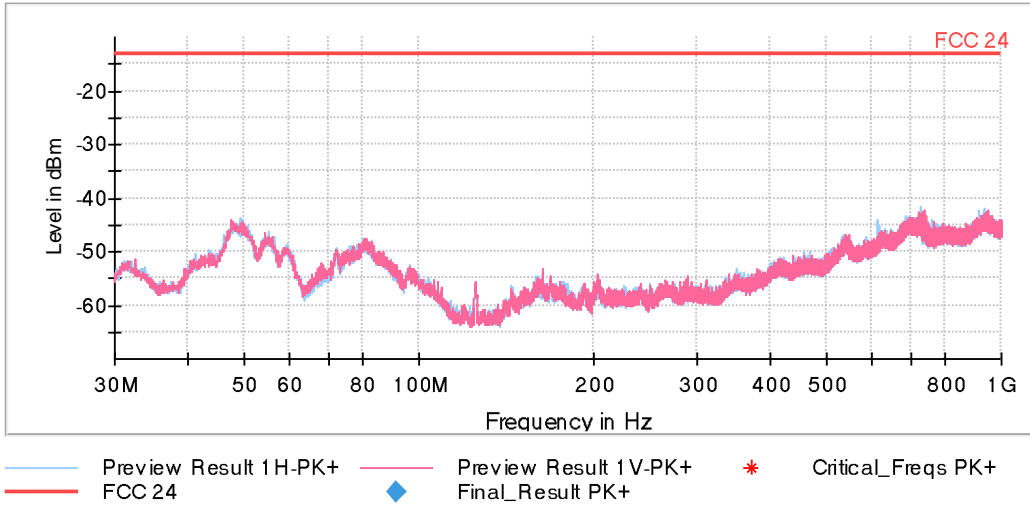
No spurious frequencies at less than 20 dB below the limit.

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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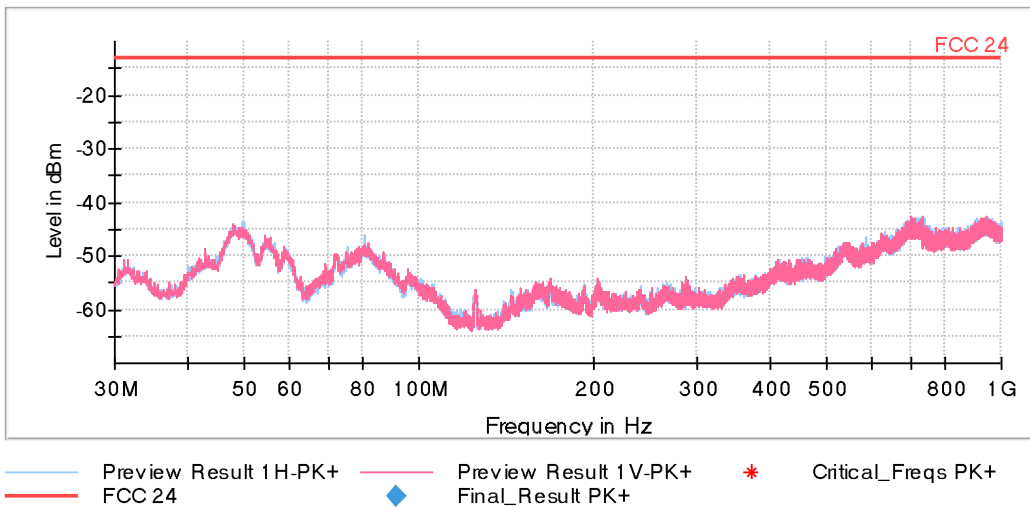
Verdict: PASS

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

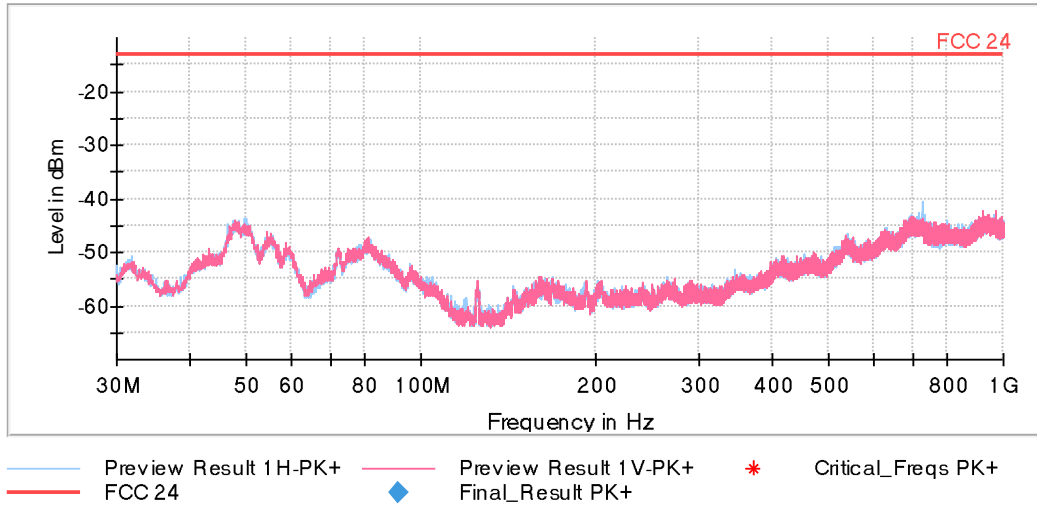
- Low Channel:



- Middle Channel:

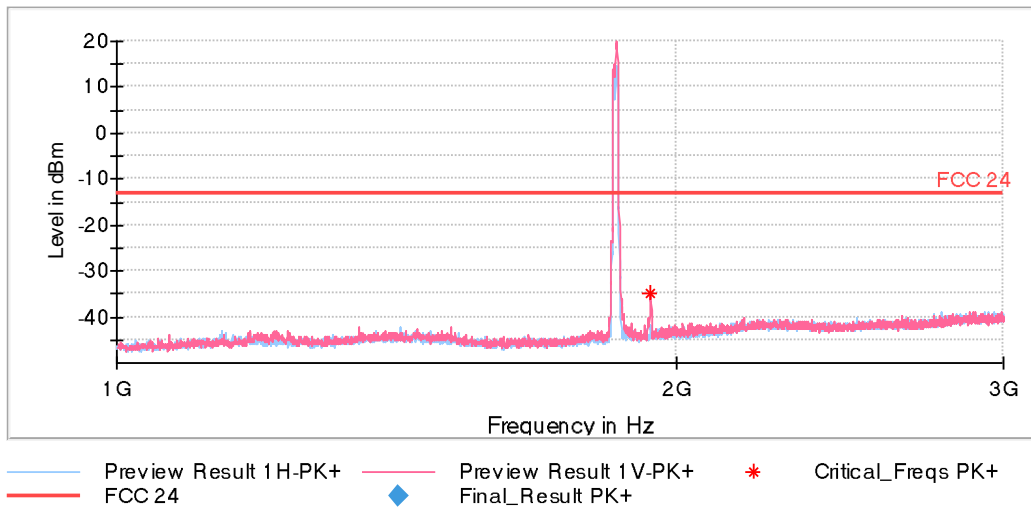


- High Channel:



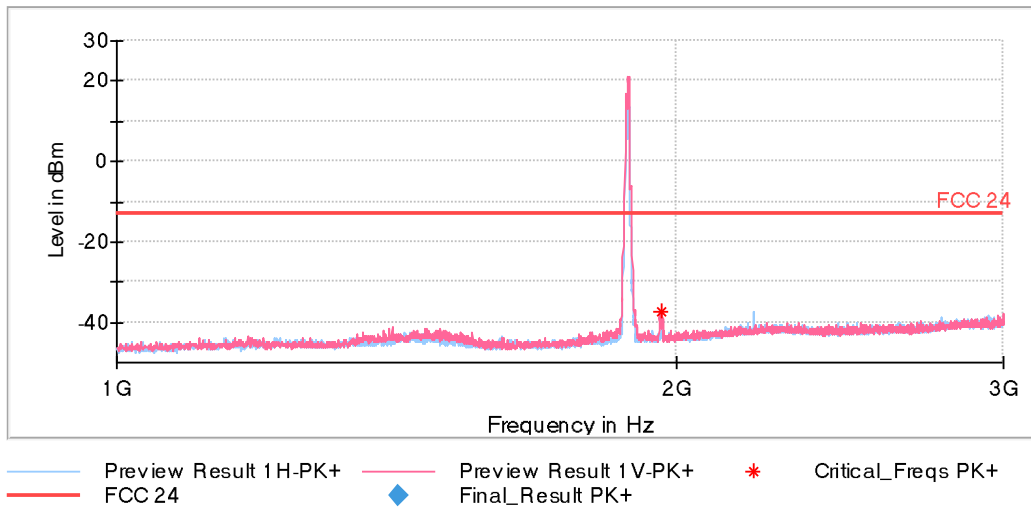
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



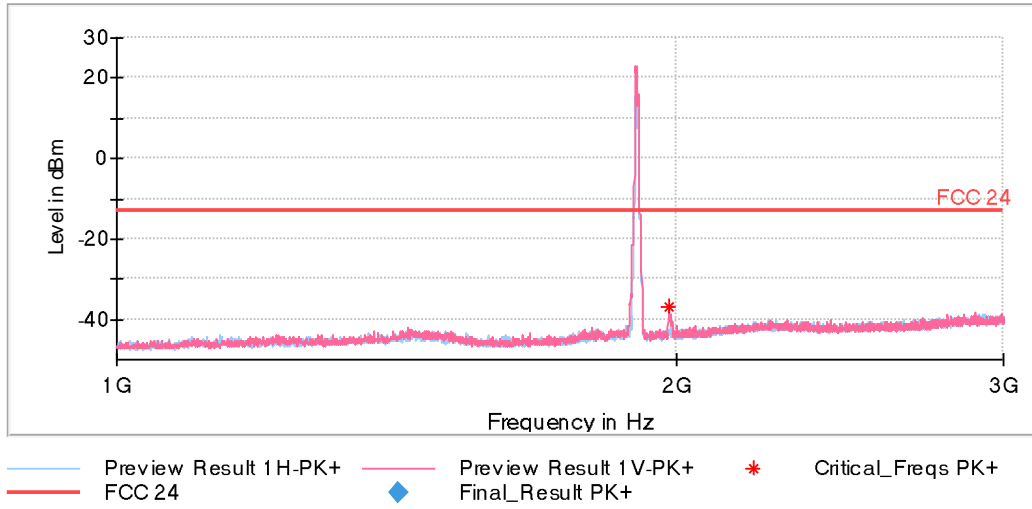
The peak above the limit is the carrier frequency. The peak at 1937.4MHz corresponds to the downlink signal.

- Middle Channel:



The peak above the limit is the carrier frequency. The peak at 1965MHz corresponds to the downlink signal.

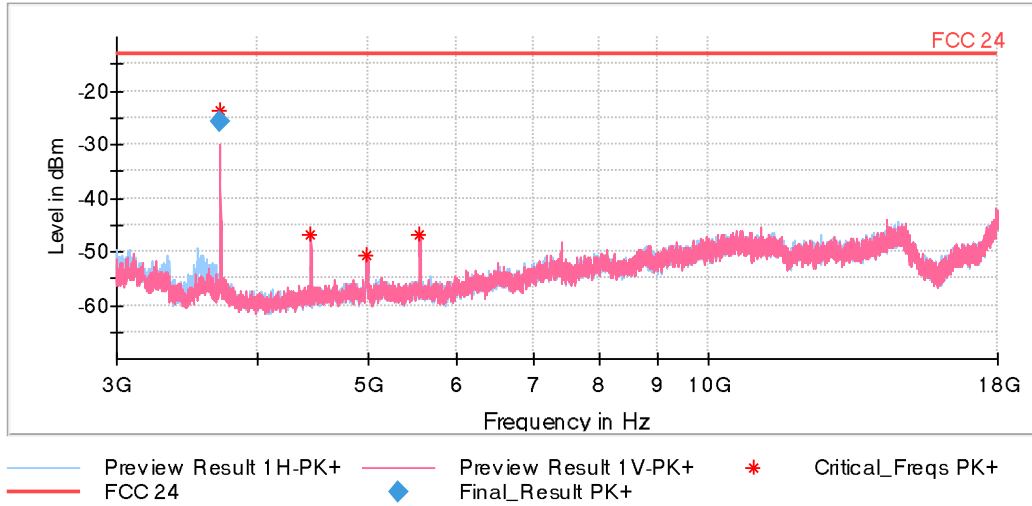
- High Channel:



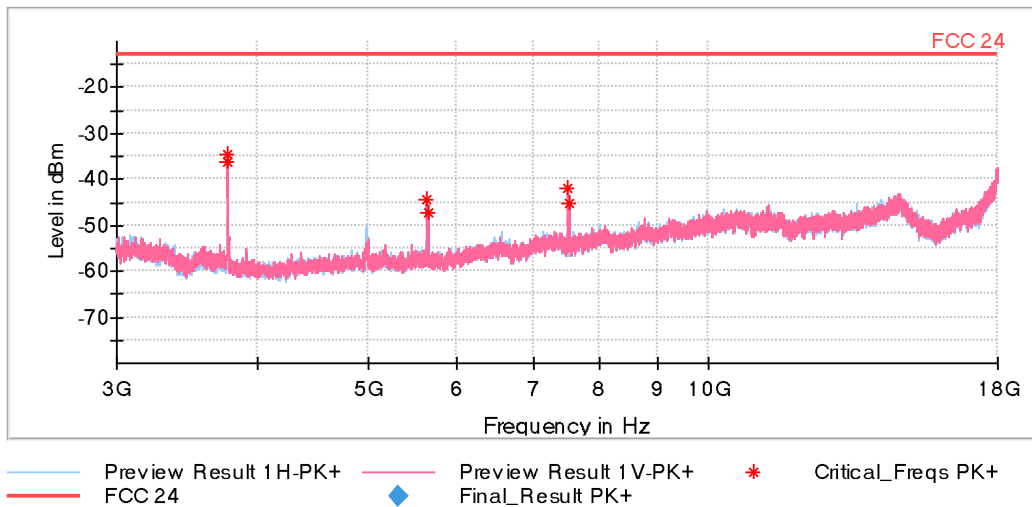
The peak above the limit is the carrier frequency. The peak at 1982.6MHz corresponds to the downlink signal.

FREQUENCY RANGE 3 - 18 GHz (worst case):

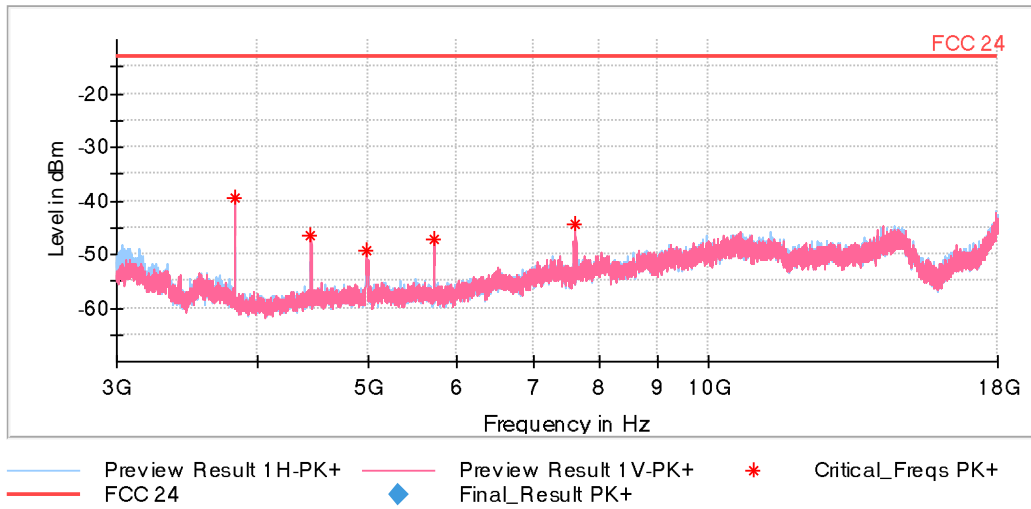
- Low Channel:



- Middle Channel:

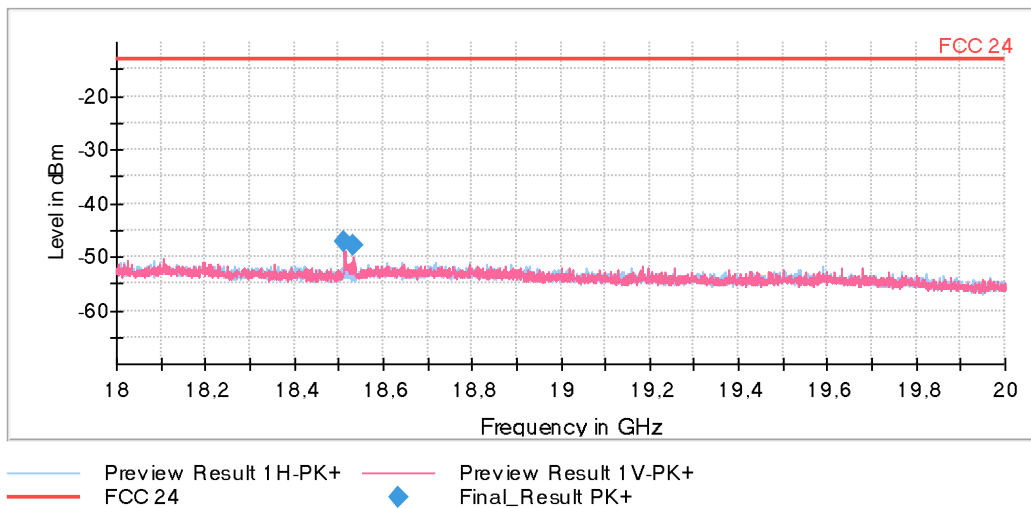


- High Channel:

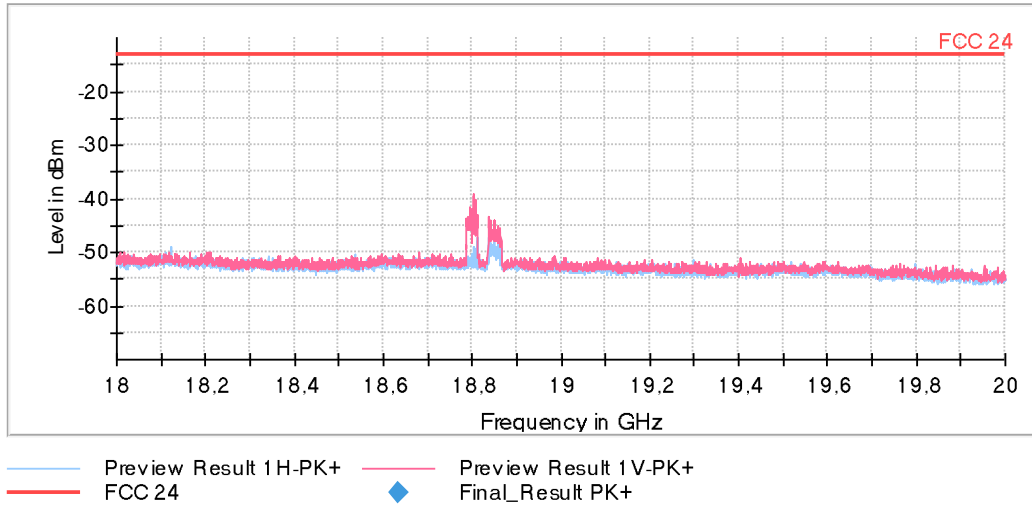


FREQUENCY RANGE 18 - 20 GHz (worst case):

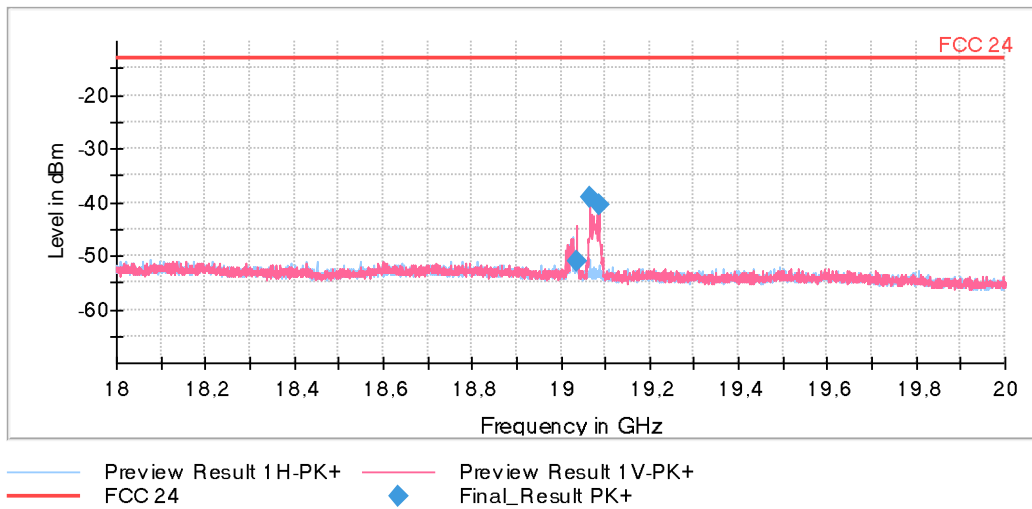
- Low Channel:



- 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 frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
3.7015	-24.02	V	Peak	<± 5.13
3.7275	-28.73	V	Peak	<± 5.13

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 frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
3.751	-26.75	V	Peak	<± 5.13

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:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
3.8015	-30.54	V	Peak	<± 5.13

Frequency range 18 - 20 GHz:

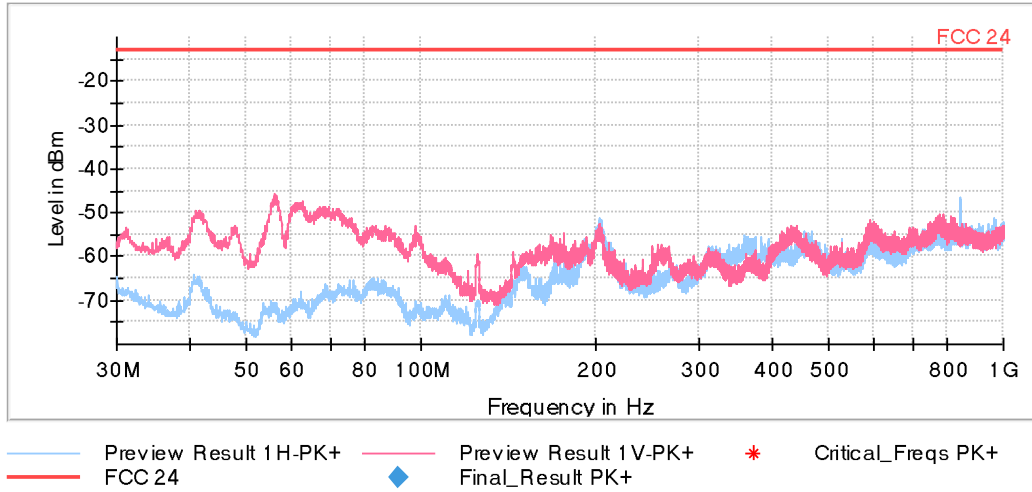
No spurious frequencies at less than 20 dB below the limit.

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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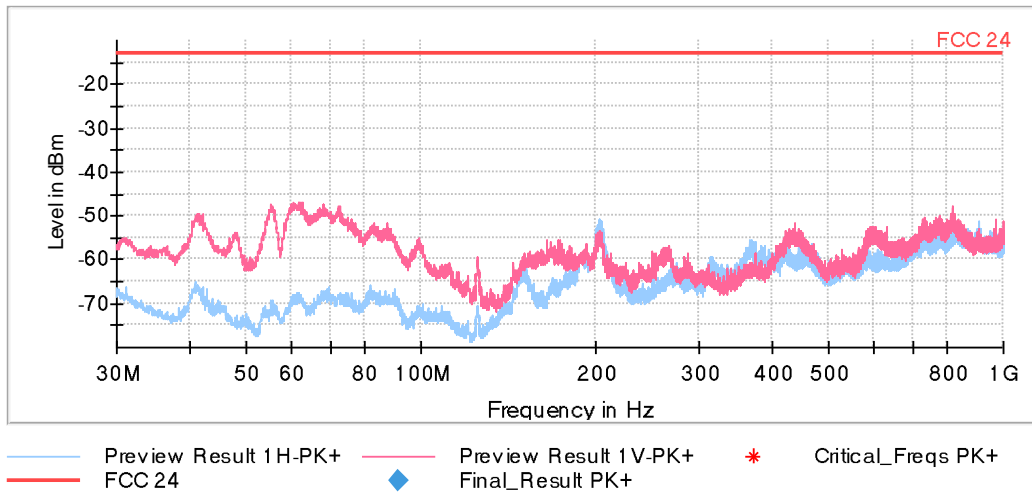
Verdict: PASS

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

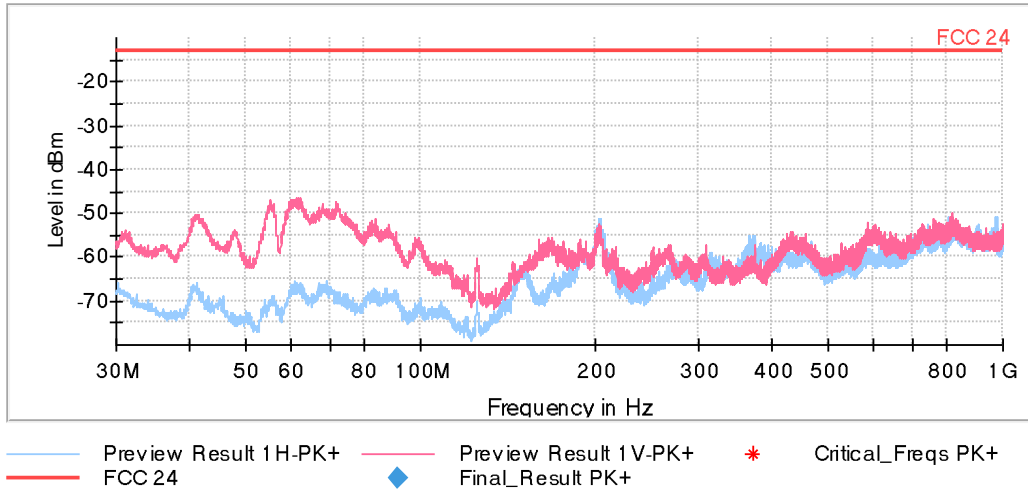
- Low Channel:



- Middle Channel:

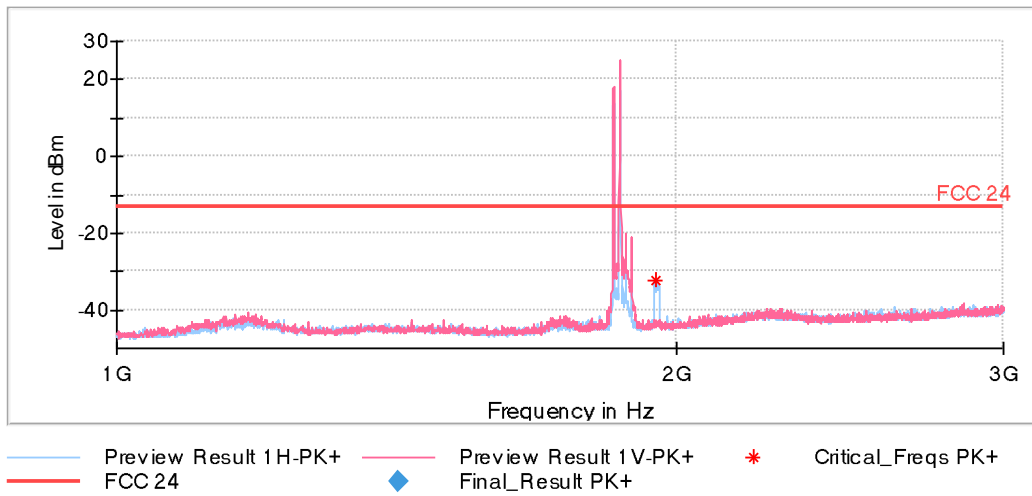


- High Channel:



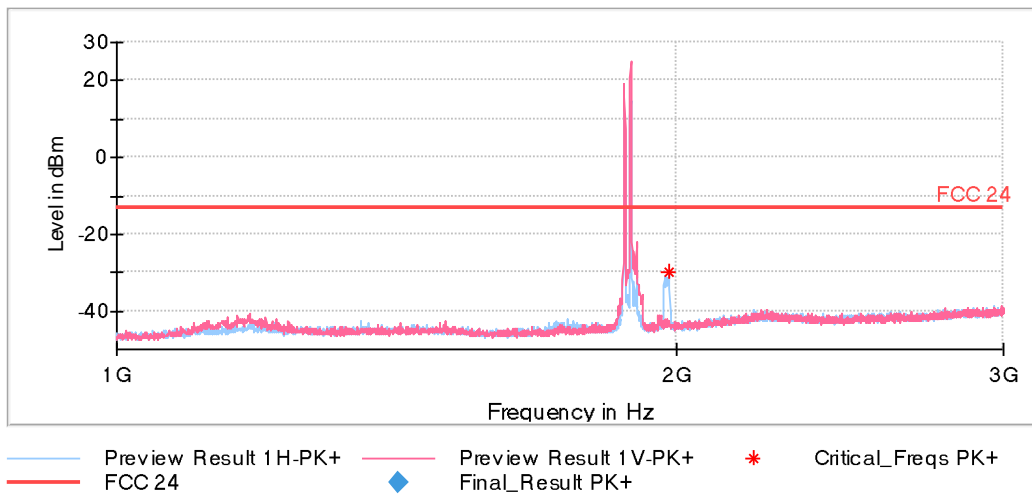
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



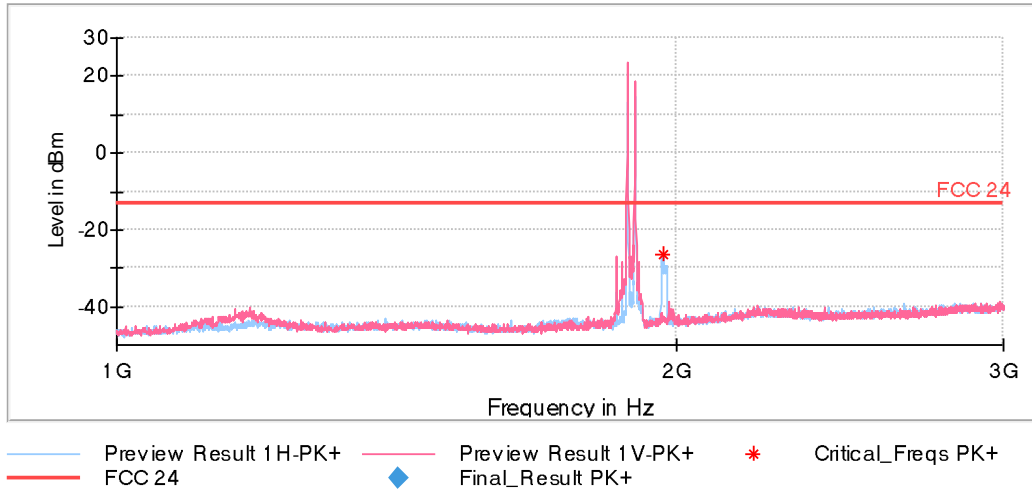
The peak above the limit is the carrier frequency. The peak at 1952.5MHz corresponds to the downlink signal.

- Middle Channel:



The peak above the limit is the carrier frequency. The peak at 1977.5MHz corresponds to the downlink signal.

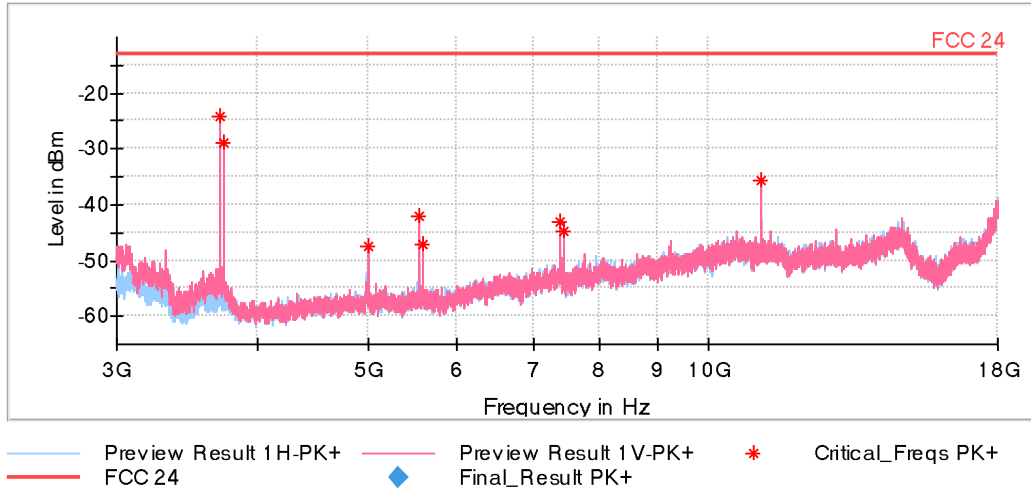
- High Channel:



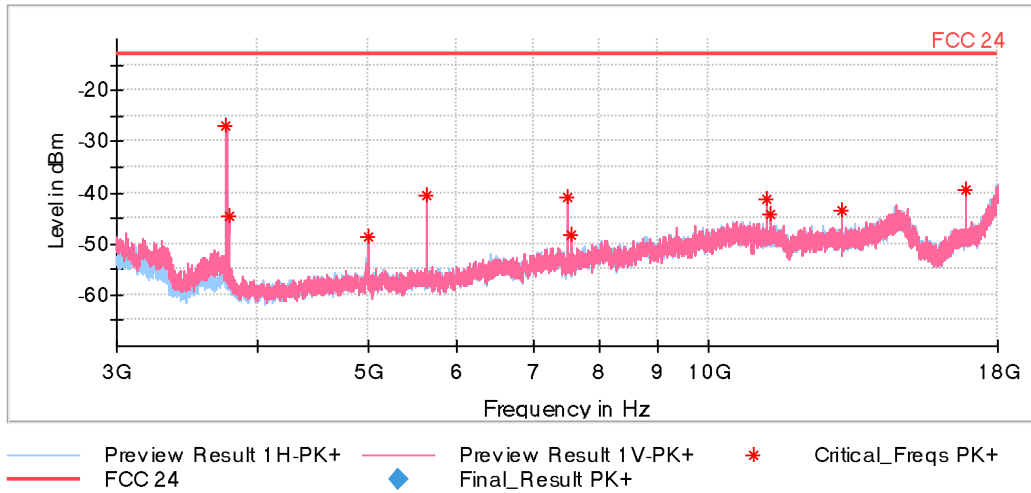
The peak above the limit is the carrier frequency. The peak at 1970MHz corresponds to the downlink signal.

FREQUENCY RANGE 3 - 18 GHz (worst case):

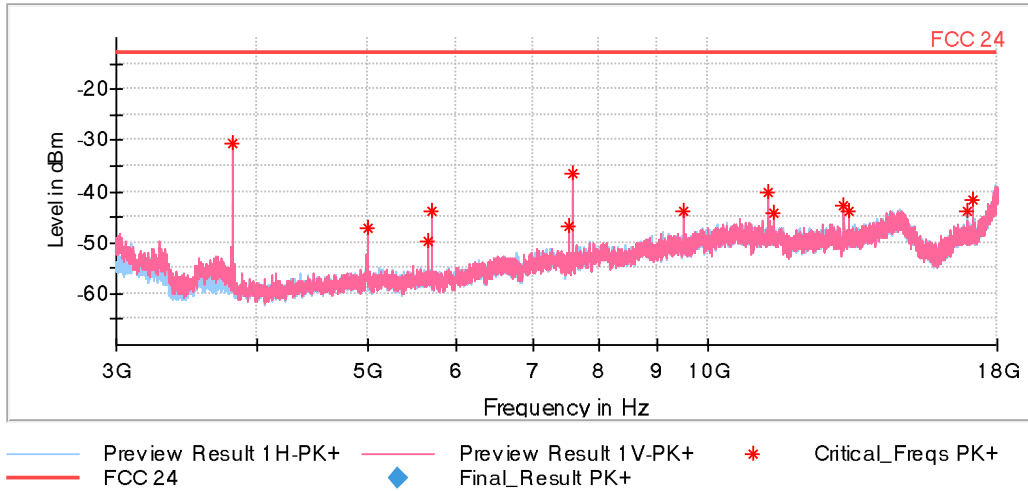
- Low Channel:



- Middle Channel:

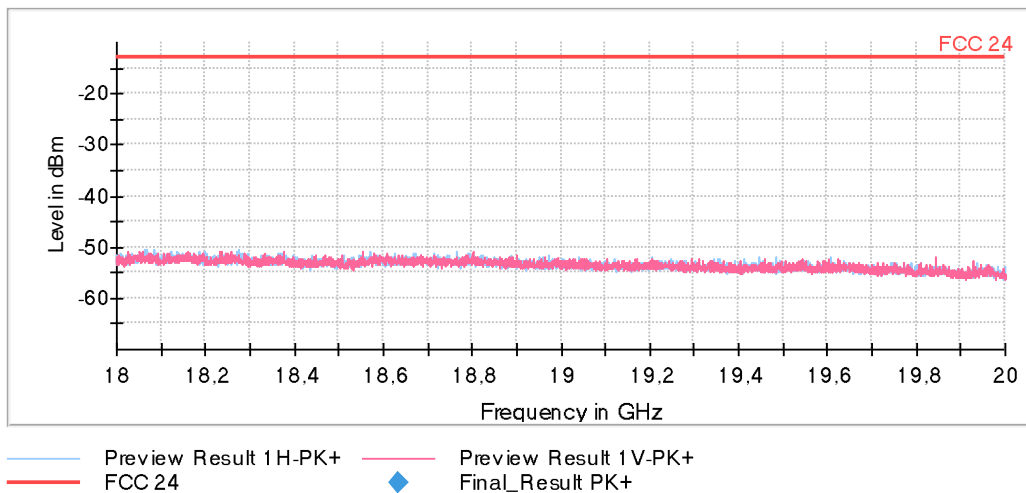


- High Channel:

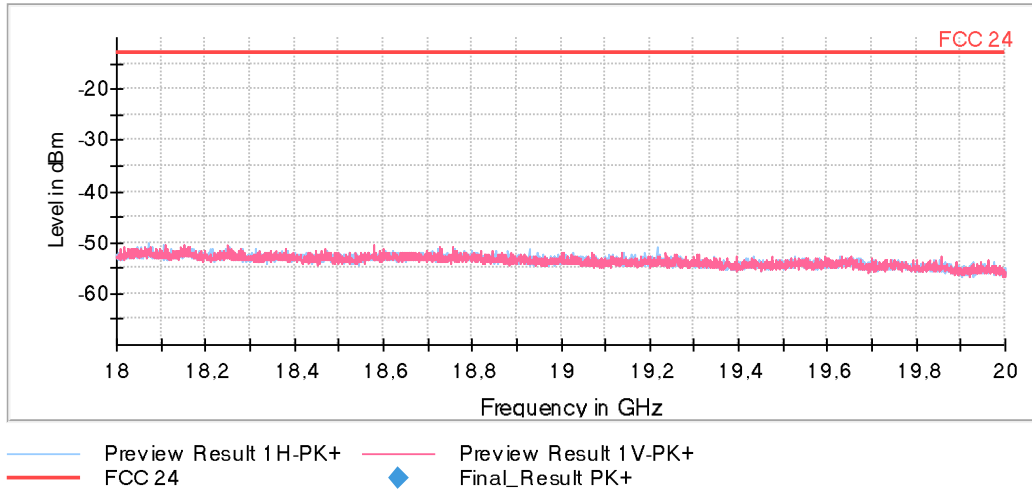


FREQUENCY RANGE 18 - 20 GHz (worst case):

- Low Channel:



- Middle Channel:



- High Channel:

