

ISED CABid: ES1909

Test Report No:
 NIE: 68001RRF.011

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

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.

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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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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

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-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



By: Alexandru Costin Neacsu
Title: Regulatory Product Compliance Expert
Company: Harman Becker
Telephone: 0040728861116
e-mail: costinal Alexandru.Neacsu@harman.com

HARMAN AUTOMOTIVE DIVISION
Harman Becker Automotive Systems GmbH
Becker-Göring-Straße 16
76307 Karlsbad, Germany



By: Victor Negrea
Title: Regulatory Product Compliance Expert
Company: Harman Becker
Telephone: 0040722583663
e-mail: Victor-Lucian.Negrea@harman.com

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	B4250\$0M4907002	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/067	Spoiler Antenna ZB G05/G07	--	0014	2021/07/29
62486/025	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
62486/156	OABR Cable Adapter	--	--	2020/09/28
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 ⁽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				
	<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		

⁽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)	2021-10-21
Date (finish)	2021-10-21

Document history

Report number	Date	Description
68001RRF.011	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: Miguel Manuel López.

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	2020/12	2021/12
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	2020/03	2022/03
9. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	N/A	N/A
10. UXM 5G RF Test Platform KEYSIGHT TECHNOLOGIES E7515B	2020/01	2022/01
11. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2021/11	2023/11

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 for 5G NR SA. And the other module has been tested using an adjacent channel to the 5G with LTE band 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 (*):

5G NR SA & LTE (MIMO 2x2):

5G NR SA Band n2A + LTE Band 2:

Table 4.3.1.1.1.2-1: Test frequencies for NR operating band n2 and SCS 15 kHz

CBW [MHz]	carrier Bandwidth [PRBs]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	point A [MHz]	absolute Frequency A [ARFCN]	offsetToCarrier [Carrier PRBs]	SS block SCS [kHz]	GSCN	absolute Frequency SSB [ARFCN]	k_{SSB}	Offset Carrier CORE SET#0 [RBs] Note 2	CORE SET#0 Index (Offset [RBs]) Note 1	offsetTo PointA (SIB1) [PRBs] Note 1	
5	25	Downlink	Low	1932.5	386500	1930.25	386050	0	15	4829	386410	0	0 (0)	0	
			Mid	1960	392000	1939.39	387878	102		4900	391970	8	1	0 (0)	103
			High	1987.5	397500	1894.53	378906	504		4968	397470	8	1	0 (0)	505
		Uplink	Low	1852.5	370500	1850.25	370050	0	-	-	-	-	-	-	-
			Mid	1880	376000	1787.03	357406	504	-	-	-	-	-	-	-
			High	1907.5	381500	1904.17	380834	6	-	-	-	-	-	-	-
10	52	Downlink	Low	1935	387000	1930.32	386064	0	15	4830	386430	2	0	0 (0)	0
			Mid	1960	392000	1936.96	387392	102		4894	391490	10	1	0 (0)	103
			High	1985	397000	1889.6	377920	504		4955	396490	10	1	0 (0)	505
		Uplink	Low	1855	371000	1850.32	370064	0	-	-	-	-	-	-	-
			Mid	1880	376000	1784.6	356920	504	-	-	-	-	-	-	-
			High	1905	381000	1899.24	379848	6	-	-	-	-	-	-	-
15	79	Downlink	Low	1937.5	387500	1930.39	386078	0	15	4831	386450	4	0	0 (0)	0
			Mid	1960	392000	1934.53	386906	102		4888	391010	0	0	1 (2)	104
			High	1982.5	396500	1884.67	376934	504		4945	395570	8	1	1 (2)	507
		Uplink	Low	1857.5	371500	1850.39	370078	0	-	-	-	-	-	-	-
			Mid	1880	376000	1782.17	356434	504	-	-	-	-	-	-	-
			High	1902.5	380500	1894.31	378862	6	-	-	-	-	-	-	-
20	106	Downlink	Low	1940	388000	1930.46	386092	0	15	4832	386650	6	1	2 (4)	5
			Mid	1960	392000	1932.1	386420	102		4882	390530	2	0	1 (2)	104
			High	1980	396000	1879.74	375948	504		4932	394590	10	1	1 (2)	507
		Uplink	Low	1860	372000	1850.46	370092	0	-	-	-	-	-	-	-
			Mid	1880	376000	1779.74	355948	504	-	-	-	-	-	-	-
			High	1900	380000	1889.38	377876	6	-	-	-	-	-	-	-

Note 1: The CORESET#0 Index and the associated CORESET#0 Offset refers to Table 13-1 in TS 38.213 [22]. The value of CORESET#0 Index is signalled in controlResourceSetZero (pdcch-ConfigSIB1) in the MIB. The offsetToPointA IE is expressed in units of resource blocks assuming 15 kHz subcarrier spacing for FR1 and 60 kHz subcarrier spacing for FR2.

Note 2: The parameter Offset Carrier CORESET#0 specifies the offset from the lowest subcarrier of the carrier and the lowest subcarrier of CORESET#0. It corresponds to the parameter $\Delta F_{\text{offsetCORESET}0\text{-Carrier}}$ in Annex C expressed in number of common RBs.

Module NAD2					Module NAD1			
Test frequencies for n2A.					LTE Band 2			
5G Carrier in Band n2.								
Channel	n2A				Channel	BW (MHz)	Freq. (MHz)	EARFCN
	SCS (kHz)	BW (MHz)	Freq. (MHz)	NR-ARFCN				
Low	15	20	1860	372000	Adjacent channel to Low	15	1877.5	18875
Middle	15	20	1880	376000	Adjacent channel to Middle	15	1897.5	19075
High	15	20	1900	380000	Adjacent channel to High	15	1882.5	18925

NOTE: 5G NR SA Band n2A is completely included in 5G NR SA Band n25A, so the channels of 5G NR SA Band n25A were tested to give conformity to the assigned block.

5G NR SA Band n25A + LTE Band 25:

Table 4.3.1.1.1.25-1: Test frequencies for NR operating band n25 and SCS 15 kHz

CBW [MHz]	carrier Bandwidth [PRBs]	Range	Carrier centre [MHz]	Carrier centre [ARFCN]	point A [MHz]	absolute Frequency Point A [ARFCN]	offsetTo Carrier [Carrier PRBs]	SS block SCS [kHz]	GSCN	absolute Frequency SSB [ARFCN]	k_{SSB}	Offset Carrier CORE SET#0 [RBs] Note 2	CORE SET#0 Index (Offset [RBs]) Note 1	offsetTo PointA (SIB1) [PRBs] Note 1	
5	25	Downlink	Low	1932.5	386500	1930.25	386050	0	15	4829	386410	0	0	0 (0)	0
			Mid	1962.5	392500	1941.89	388378	102		4904	392410	0	0	0 (0)	102
			High	1992.5	398500	1899.53	379906	504		4979	398410	0	0	0 (0)	504
		Uplink	Low	1852.5	370500	1850.25	370050	0		-	-	-	-	-	-
			Mid	1882.5	376500	1789.53	357906	504		-	-	-	-	-	-
			High	1912.5	382500	1909.17	381834	6		-	-	-	-	-	-
10	52	Downlink	Low	1935	387000	1930.32	386064	0	15	4830	386430	2	0	0 (0)	0
			Mid	1962.5	392500	1939.46	387892	102		4898	391930	2	0	0 (0)	102
			High	1990	398000	1894.6	378920	504		4969	397490	10	1	0 (0)	505
		Uplink	Low	1855	371000	1850.32	370064	0		-	-	-	-	-	-
			Mid	1882.5	376500	1787.1	357420	504		-	-	-	-	-	-
			High	1910	382000	1904.24	380848	6		-	-	-	-	-	-
15	79	Downlink	Low	1937.5	387500	1930.39	386078	0	15	4831	386450	4	0	0 (0)	0
			Mid	1962.5	392500	1937.03	387406	102		4892	391450	4	0	0 (0)	102
			High	1987.5	397500	1889.67	377934	504		4956	396510	0	0	1 (2)	506
		Uplink	Low	1857.5	371500	1850.39	370078	0		-	-	-	-	-	-
			Mid	1882.5	376500	1784.67	356934	504		-	-	-	-	-	-
			High	1907.5	381500	1899.31	379862	6		-	-	-	-	-	-
20	106	Downlink	Low	1940	388000	1930.46	386092	0	15	4832	386650	6	1	2 (4)	5
			Mid	1962.5	392500	1934.6	386920	102		4886	390970	6	0	0 (0)	102
			High	1985	397000	1884.74	376948	504		4943	395530	2	0	1 (2)	506
		Uplink	Low	1860	372000	1850.46	370092	0		-	-	-	-	-	-
			Mid	1882.5	376500	1782.24	356448	504		-	-	-	-	-	-
			High	1905	381000	1894.38	378876	6		-	-	-	-	-	-

Note 1: The CORESET#0 Index and the associated CORESET#0 Offset refers to Table 13-1 in TS 38.213 [22]. The value of CORESET#0 Index is signalled in controlResourceSetZero (pdch-ConfigSIB1) in the MIB. The offsetToPointA IE is expressed in units of resource blocks assuming 15 kHz subcarrier spacing for FR1 and 60 kHz subcarrier spacing for FR2.

Note 2: The parameter Offset Carrier CORESET#0 specifies the offset from the lowest subcarrier of the carrier and the lowest subcarrier of CORESET#0. It corresponds to the parameter $\Delta F_{\text{offsetCORESET}0\text{-Carrier}}$ in Annex C expressed in number of common RBs.

Module NAD2					Module NAD1			
Test frequencies for n25A					LTE Band 25			
5G Carrier in Band n25								
Channel	n25A				Channel	BW (MHz)	Freq. (MHz)	EARFCN
	SCS (kHz)	BW (MHz)	Freq. (MHz)	NR-ARFCN				
Low	15	20	1860	372000	Adjacent channel to Low	20	1880	18900
Middle	15	20	1882.5	376500	Adjacent channel to Middle	20	1902.5	19125
High	15	20	1905	381000	Adjacent channel to High	20	1885	18950

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.

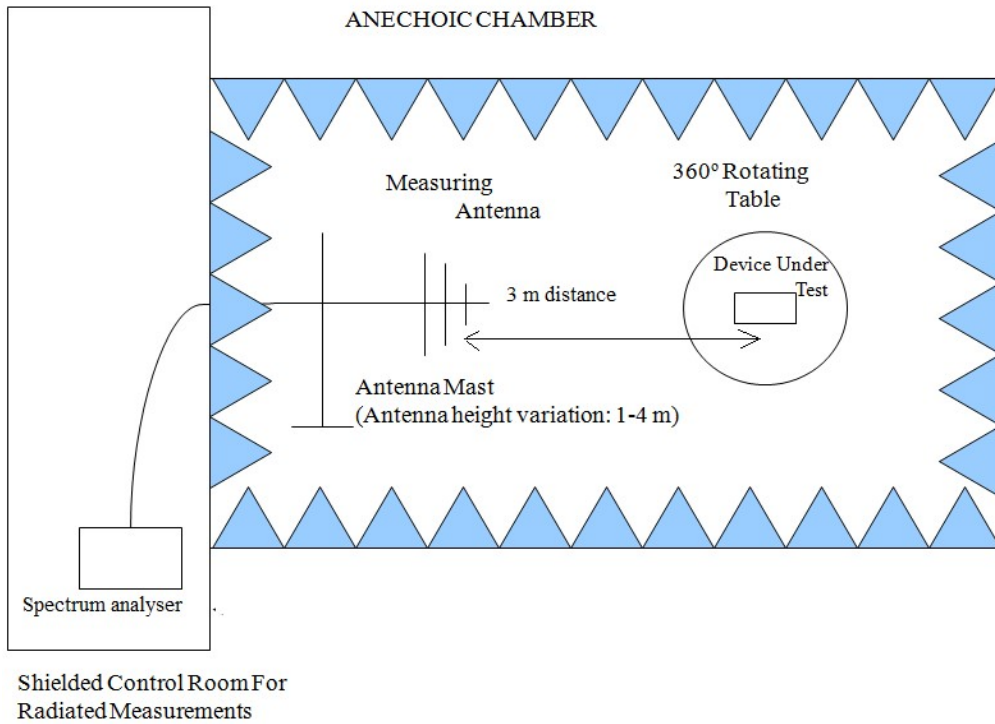
At P_o transmitting power. the specified minimum attenuation becomes $43+10\log (P_o)$. and the level in dBm relative P_o becomes:

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

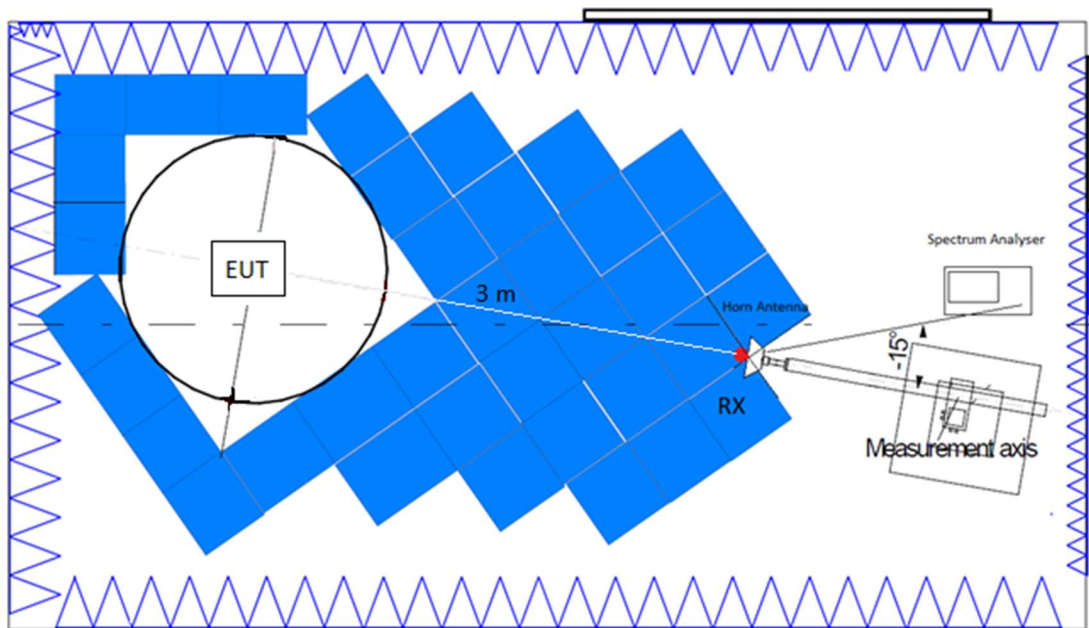
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz or higher were used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

TEST SETUP:

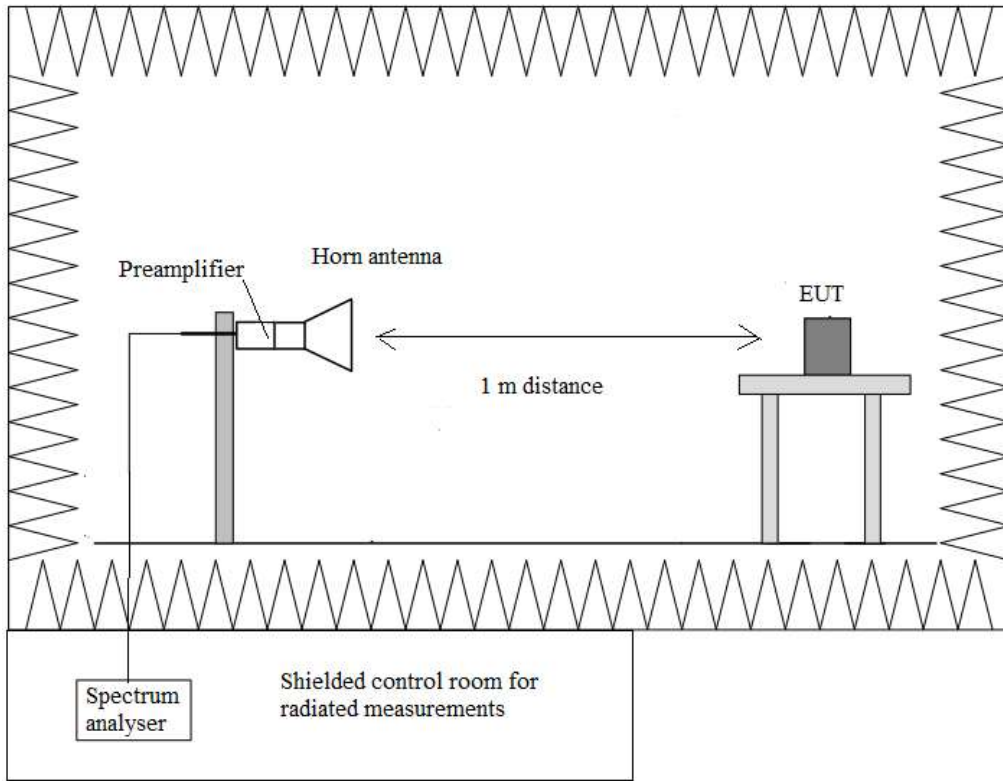
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup $f > 18$ GHz:



RESULTS:

• **5G NR SA Band n25A + LTE Band 25:**

A preliminary scan determined the worst-case:

- 1) 5G NR SA Band n25A (Module NAD2):
n25A: Pi/2 BPSK, BW=20 MHz, SCS=15 kHz, RB=1, Offset=53.
- 2) LTE Band 25 (Module NAD1):
25: QPSK, BW=20 MHz, RB=1, Offset=0.

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:

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.

- 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:

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 GHz-18 GHz:

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

Frequency range 18 - 20 GHz:

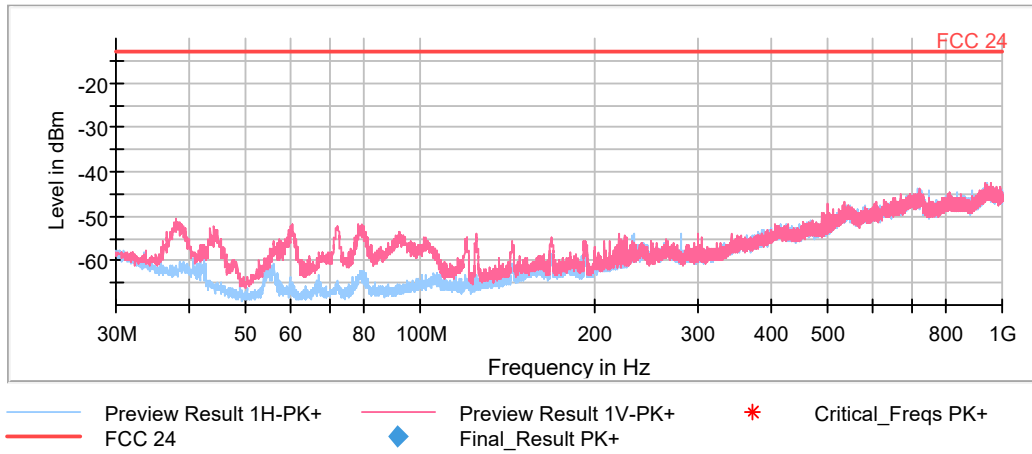
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB) <math><\pm 5.08</math> for $f < 1</math> GHz
<math><\pm 5.13</math> for $f \geq 1</math> GHz up to 17 GHz
<math><\pm 4.82</math> for $f \geq 17</math> GHz up to 20 GHz$$$

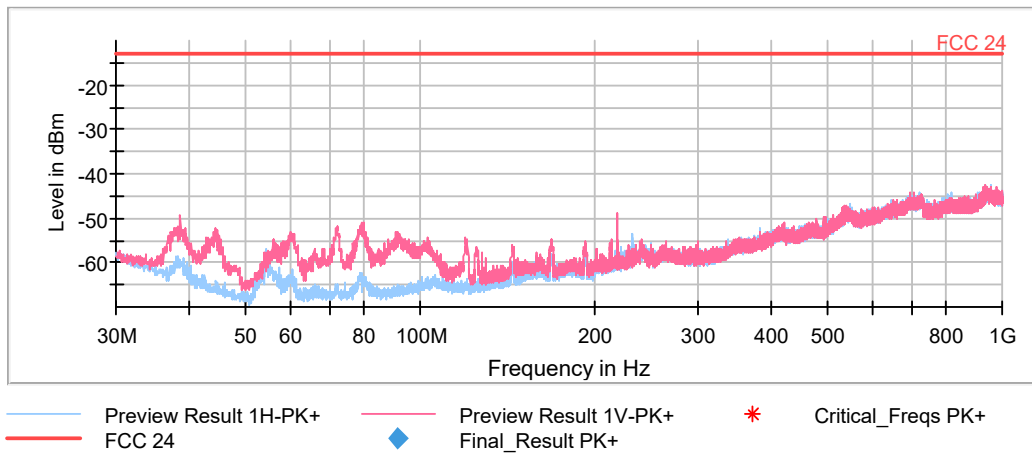
Verdict: PASS

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

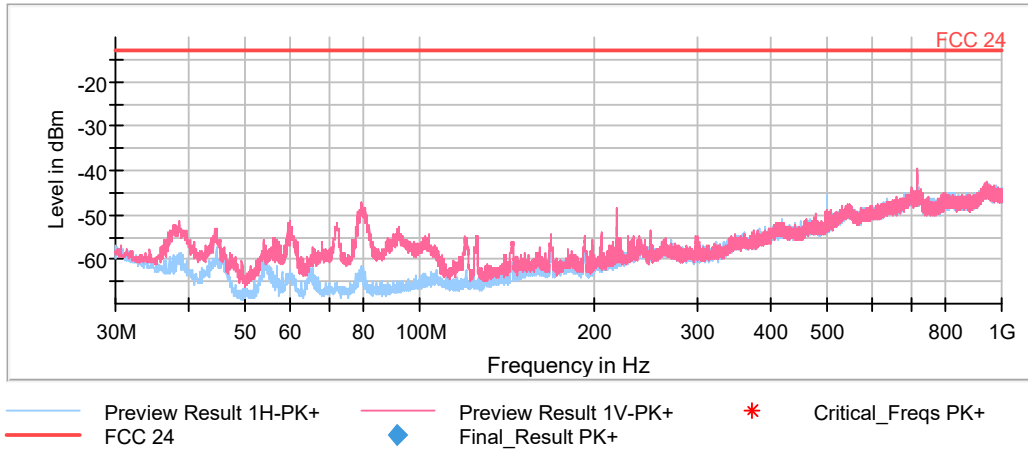
- Low Channel:



- Middle Channel:

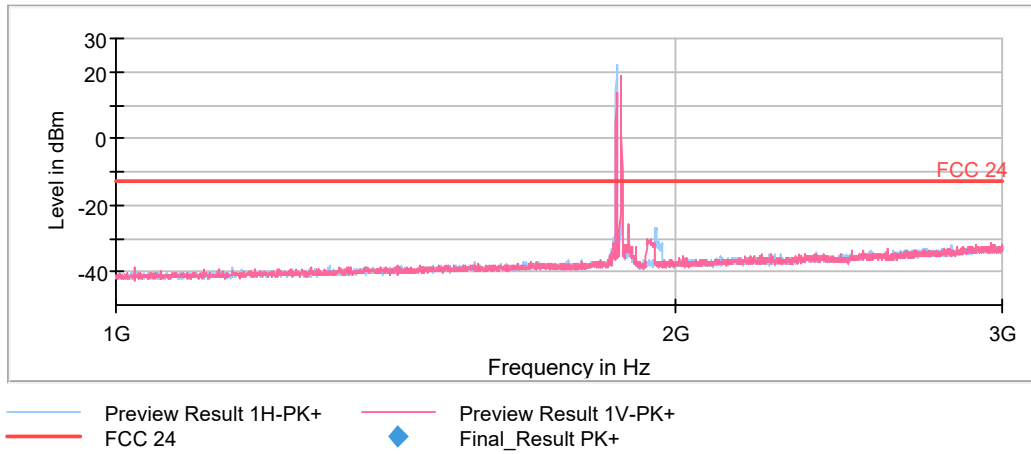


- High Channel:



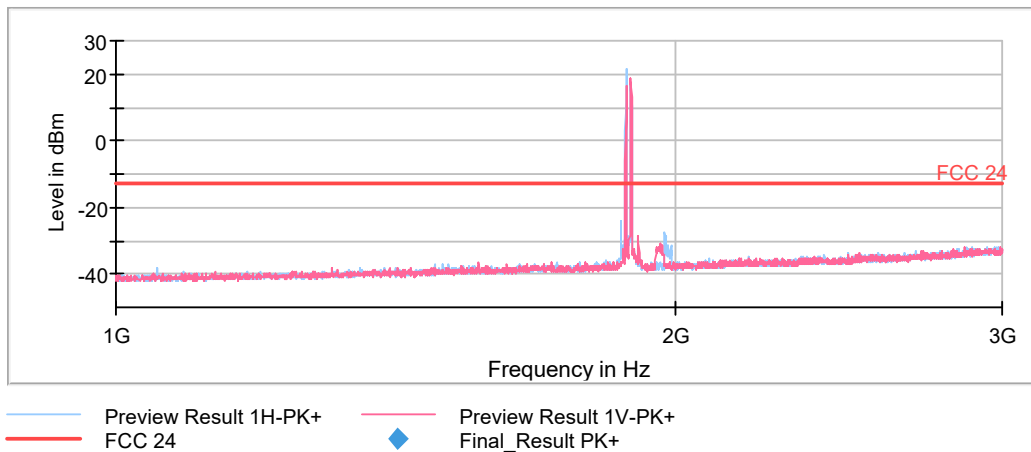
FREQUENCY RANGE 1 - 3 GHz (worst-case):

- Low Channel:



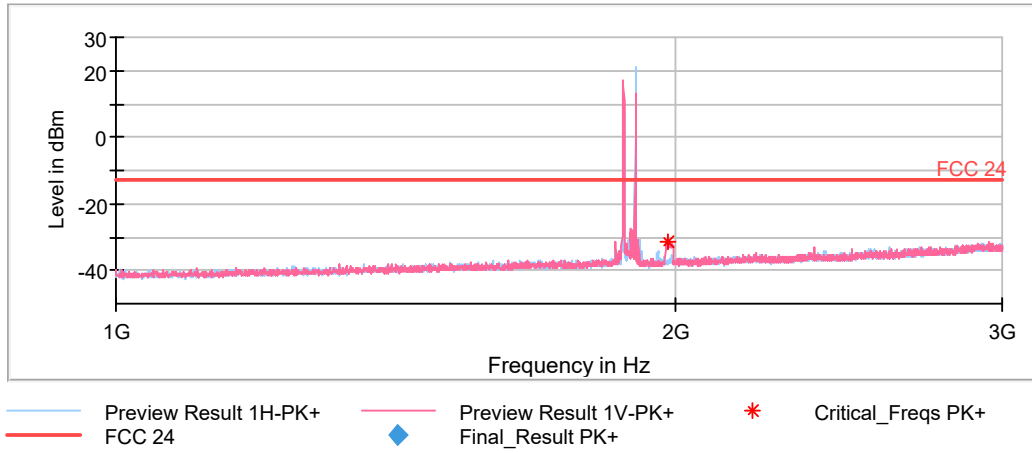
The peaks above the limit are the carrier frequencies. The other peaks at 1940 MHz and 1960 MHz correspond to the downlink signals.

- Middle Channel:



The peaks above the limit are the carrier frequencies. The other peaks at 1962.5 MHz and 1982.5 MHz correspond to the downlink signals.

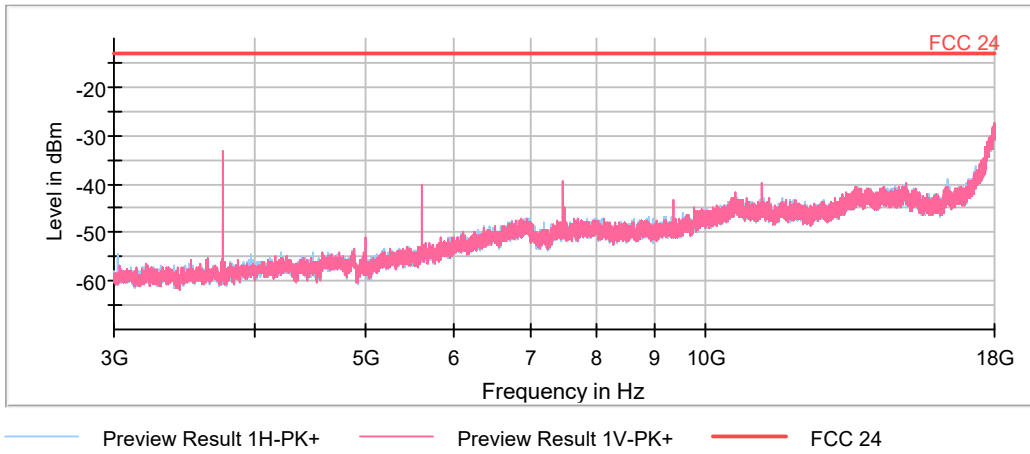
- High Channel:



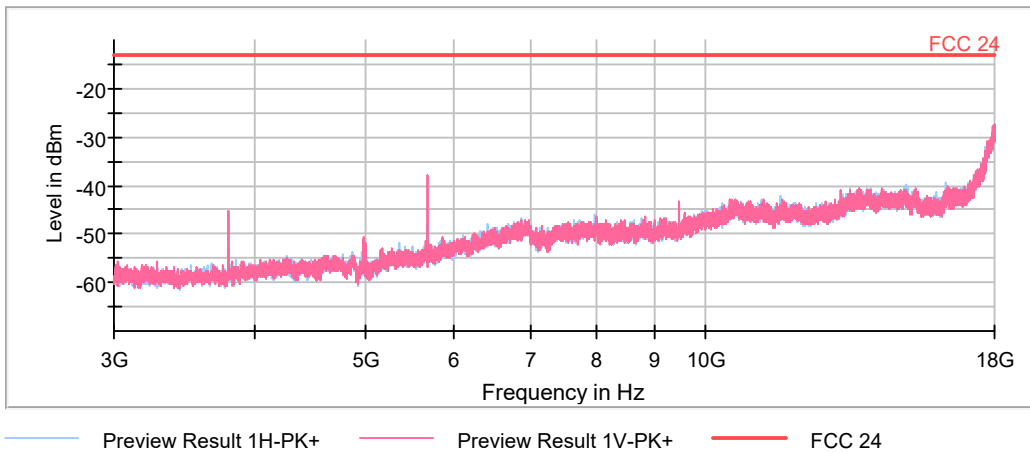
The peaks above the limit are the carrier frequencies. The other peaks at 1965 MHz and 1985 MHz correspond to the downlink signals.

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

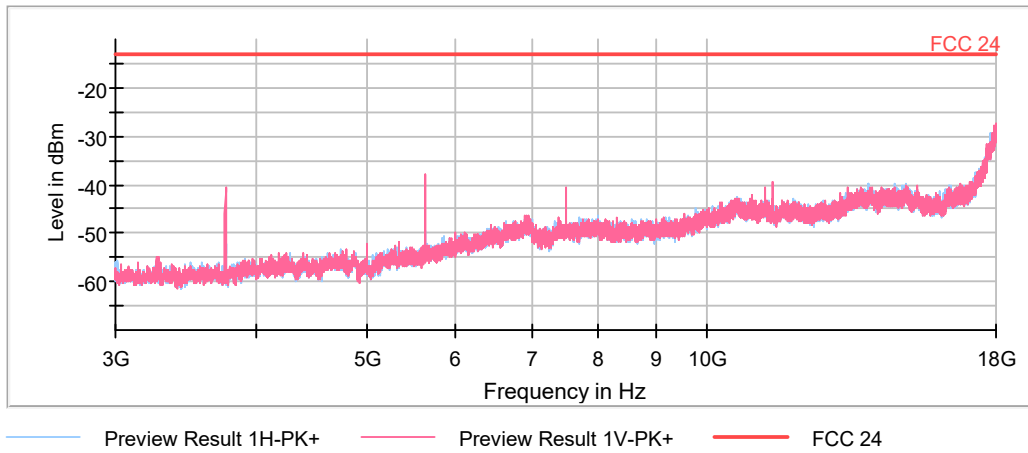
- Low Channel:



- Middle Channel:

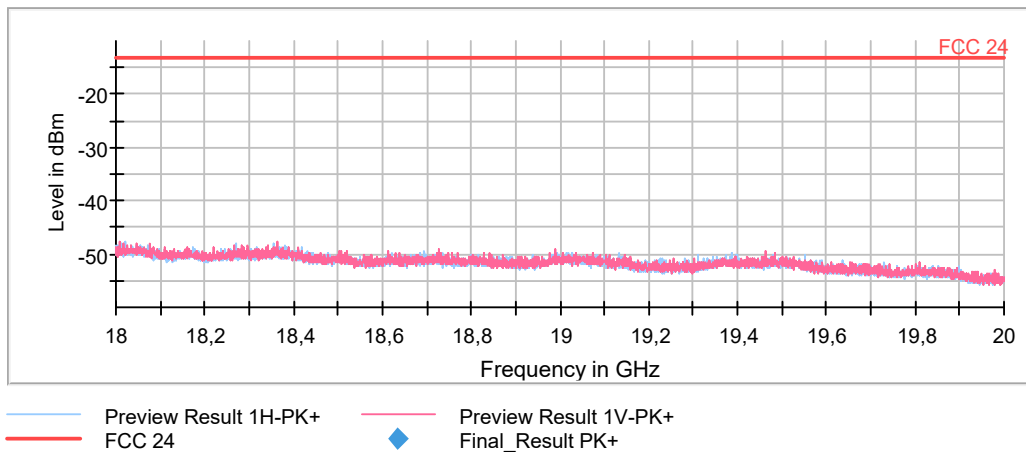


- High Channel:

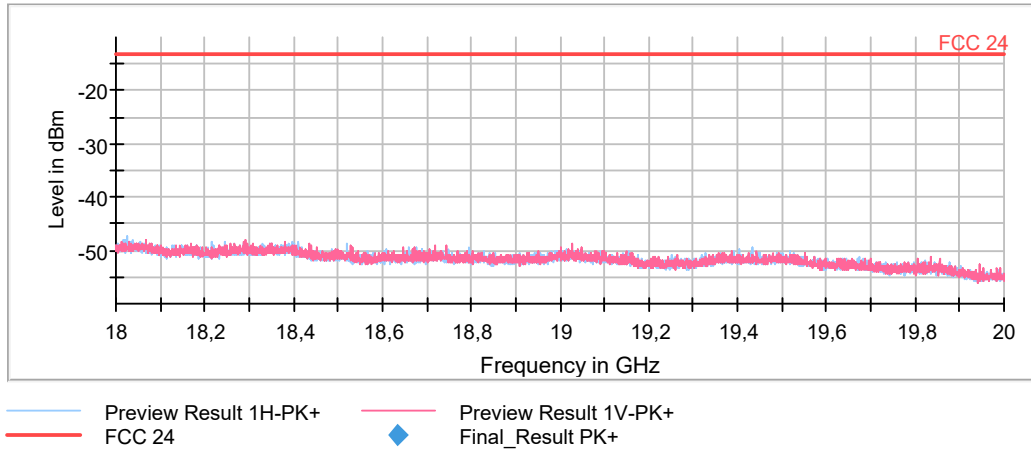


FREQUENCY RANGE 18 - 20 GHz (worst-case):

- Low Channel:



- Middle Channel:



- High Channel:

