

Test report No:
 NIE: 62486RRF.004

Partial Test Report

Reference Standard:

USA FCC Part 27

CANADA RSS-130, RSS-139, RSS-199

(*) 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 27 (10-1-19 Edition). CANADA RSS-130 Issue 2, Feb. 2019. CANADA RSS-139 Issue 3, Jul. 2015. CANADA RSS-199 Issue 3, Dec. 2016. - 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

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General conditions

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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 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/104	Telematic Control Unit	WAVE-11-HIGH-R1	B392100L4900531	2020/09/28
62486E/012	Antenna	DA05DI20	--	2020/09/22
62486E/036	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/037	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/038	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/039	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/060	Harness 20 pol	--	--	2020/09/22

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/109	Battery Li-ion	11FR1580-2	--	2020/09/28
62486E/042	Antenna ground planes for roof	--	--	2020/09/22
62486E/045	RF Cable for 4-Fakra	--	--	2020/09/22
62486E/056	OABR Cable	--	--	2020/09/22
62486E/064	OABR 1000 BaseT Converter	--	--	2020/09/22
62486E/067	I-Box OABR Adapter	--	--	2020/09/22
62486E/071	Ethernet Cable	--	--	2020/09/22

Sample S/01 has undergone the following test(s): The Radiated tests of the Middle Channel of the 3G Band IV indicated in the Appendix A.

- Sample S/02 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/012	Antenna	DA05DI20	--	2020/09/22
62486E/036	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/037	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/038	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/039	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/060	Harness 20 pol	--	--	2020/09/22

Auxiliary elements used with the Sample S/02:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/110	Battery Li-ion	11FR1580-2	--	2020/09/28
62486E/042	Antenna ground planes for roof	--	--	2020/09/22
62486E/045	RF Cable for 4-Fakra	--	--	2020/09/22
62486E/056	OABR Cable	--	--	2020/09/22
62486E/064	OABR 1000 BaseT Converter	--	--	2020/09/22
62486E/067	I-Box OABR Adapter	--	--	2020/09/22
62486E/071	Ethernet Cable	--	--	2020/09/22

Sample S/02 has undergone the following test(s): The Radiated tests of the Low Channel and the High Channel of the 3G Band IV indicated in the Appendix A.

- Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/105	Telematic Control Unit	WAVE-11-HIGH-R1	B392120L4900533	2020/09/28
62486E/012	Antenna	DA05DI20	--	2020/09/22
62486E/036	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/037	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/038	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/039	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/060	Harness 20 pol	--	--	2020/09/22

Auxiliary elements used with the Sample S/03:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/109	Battery Li-ion	11FR1580-2	--	2020/09/28
62486E/042	Antenna ground planes for roof	--	--	2020/09/22
62486E/045	RF Cable for 4-Fakra	--	--	2020/09/22
62486E/056	OABR Cable	--	--	2020/09/22
62486E/064	OABR 1000 BaseT Converter	--	--	2020/09/22
62486E/067	I-Box OABR Adapter	--	--	2020/09/22
62486E/071	Ethernet Cable	--	--	2020/09/22

Sample S/03 has undergone the following test(s): The Radiated tests of the LTE Band 7, the LTE Band 12, the LTE Band 13, the subranges 30 MHz - 1 GHz and 1-3 GHz of the LTE Band 41, the LTE Band 66 indicated in the Appendix A.

- Sample S/04 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/304	Telematic Control Unit	WAVE-11-HIGH-R1	B392I+0L4900520	2020/11/10
62486E/012	Antenna	DA05DI20	--	2020/09/22
62486E/036	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/037	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/038	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/039	Antenna Box	AB01-I20-01	--	2020/09/22
62486E/256	Harness	--	--	2020/09/30

Auxiliary elements used with the Sample S/04:

Control Nº	Description	Model	Serial Nº	Date of reception
62486E/110	Battery Li-ion	11FR1580-2	--	2020/09/28
62486E/042	Antenna ground planes for roof	--	--	2020/09/22
62486E/045	RF Cable for 4-Fakra	--	--	2020/09/22
62486E/056	OABR Cable	--	--	2020/09/22
62486E/064	OABR 1000 BaseT Converter	--	--	2020/09/22
62486E/067	I-Box OABR Adapter	--	--	2020/09/22
62486E/071	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/04 has undergone the following test(s): The Radiated tests for the subrange 3-27 GHz of the LTE Band 41, the LTE Band 71 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	D3						
Hardware version	20512H.001_047_009						

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)	2021-02-02

Document history

Report number	Date	Description
62486RRF.004	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: Nicolás Salguero, Cristina Calle, Pablo Redondo, Alfonso Gutiérrez, Miguel Manuel López and Verónica García.

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. Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
8. Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
9. Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
10. RF Preamplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
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. Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2020/07	2022/07
14. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
15. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
16. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/07	2021/07
17. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/09	2021/09
18. Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2020/04	2021/04
19. Low Pass Filter DC - 1 GHz WAINWRIGHT INSTRUMENTS WLK1000-6SS	2020/07	2022/07
20. High Pass Filter 3 - 18 GHz TEMSTRON / TEMWELL ST-3GA2833-HS	2020/05	2021/05
21. High Pass Filter 1.1 - 8 GHz, WAINWRIGHT INSTRUMENTS WHK10-990-1100-8000-40SS	2019/06	2021/06
22. DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
23. Digital Multimeter FLUKE 175	2020/11	2021/11
24. Attenuator 3dB, 2W, DC-18GHz, TECHNIWAVE TWTS2G	2020/01	2021/01

Testing verdicts

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

Summary

FCC PART 27 / RSS-130, RSS-139, RSS-199 PARAGRAPH		
Requirement – Test case	Verdict	Remark
FCC 27.50 / RSS-130 4.6., RSS-139 6.5., RSS-199 4.4.: RF output power	N/M	(1)
FCC 2.1047 / RSS-130 4.2., RSS-139 6.2., RSS-199 4.1.: Modulation characteristics	N/M	(1)
FCC 27.54 / RSS-130 4.3., RSS-139 6.4., RSS-199 4.3.: Frequency stability	N/M	(1)
FCC 2.1049 / RSS-Gen 6.7., RSS-139 6.4., RSS-199 4.3.: Occupied Bandwidth	N/M	(1)
FCC 27.53 / RSS-130 4.7., RSS-139 6.6., RSS-199 4.5.: Spurious emissions at antenna terminals	N/M	(1)
FCC 27.53 / RSS-130 4.7., RSS-139 6.6., RSS-199 4.5.: 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 27 / RSS-130, RSS-139, RSS-199

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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:

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

Module NAD1		Module NAD2	
Low Channel (1312)	1712.4 MHz	Adjacent channel to Low Channel (1337)	1717.4 MHz
Middle Channel (1762)	1732.5 MHz	Adjacent channel to Middle Channel (1787)	1737.5 MHz
High Channel (1513)	1752.6 MHz	Adjacent channel to High Channel (1488)	1747.6 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

LTE Band 4. QPSK and QAM 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	19957 (1710.7 MHz)	19965 (1711.5 MHz)	19975 (1712.5 MHz)	20000 (1715.0 MHz)	20025 (1717.5 MHz)	20050 (1720.0 MHz)
Middle	20175 (1732.5 MHz)	20175 (1732.5 MHz)	20175 (1732.5 MHz)	20175 (1732.5 MHz)	20175 (1732.5 MHz)	20175 (1732.5 MHz)
High	20393 (1754.3 MHz)	20385 (1753.5 MHz)	20375 (1752.5 MHz)	20350 (1750.0 MHz)	20325 (1747.5 MHz)	20300 (1745.0 MHz)

NOTE: This band is completely included in the LTE Band 66, so the channels of the LTE Band 66 were tested to give conformity to the assigned block.

LTE Band 7. QPSK and QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)			
	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	20775 (2502.5 MHz)	20800 (2505.0 MHz)	20825 (2507.5 MHz)	20850 (2510.0 MHz)
Middle	21100 (2535.0 MHz)	21100 (2535.0 MHz)	21100 (2535.0 MHz)	21100 (2535.0 MHz)
High	21425 (2567.5 MHz)	21400 (2565.0 MHz)	21375 (2562.5 MHz)	21350 (2560.0 MHz)

Note: Common used channels.

Module NAD1		Module NAD2	
Low Channel (20800)	2505 MHz	Adjacent channel to Low Channel (20950)	2520 MHz
Middle Channel (21100)	2535 MHz	Adjacent channel to Middle Channel (21250)	2550 MHz
High Channel (21400)	2565 MHz	Adjacent channel to High Channel (21250)	2550 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

LTE Band 12. QPSK and QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)			
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz
Low	23017 (699.7 MHz)	23025 (700.5 MHz)	23035 (701.5 MHz)	23060 (704.0 MHz)
Middle	23095 (707.5 MHz)	23095 (707.5 MHz)	23095 (707.5 MHz)	23095 (707.5 MHz)
High	23173 (715.3 MHz)	23165 (714.5 MHz)	23155 (713.5 MHz)	23130 (711.0 MHz)

Note: Common used channels.

Module NAD1 (BW=5MHz or 3MHz)		Module NAD2(BW=10MHz)	
Adjacent to channel low (23145)	711.5 MHz	Low channel (23060)	704.0 MHz
Adjacent to channel mid (23160)	714 MHz	Middle channel (23095)	707.5 MHz
Adjacent to channel high (23055)	703.5 MHz	High channel (23130)	711.0 MHz

LTE Band 13. QPSK and QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)	
	BW = 5 MHz	BW = 10 MHz
Low	23205 (779.5 MHz)	N/A
Middle	23230 (782.0 MHz)	23230 (782.0 MHz)
High	23255 (784.5 MHz)	N/A

Note: Common used channels.

Module NAD1		Module NAD2	
Low Channel (23205)	779.5 MHz	Adjacent channel to Low Channel (23250)	784 MHz
No combination without overlapping the carriers.			
High Channel (23255)	784.5 MHz	Adjacent channel to High Channel (23210)	780 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

LTE Band 17. QPSK and QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)	
	BW = 5 MHz	BW = 10 MHz
Low	23755 (706.5 MHz)	23780 (709 MHz)
Middle	23790 (710 MHz)	23790 (710 MHz)
High	23825 (713.5 MHz)	23800 (711 MHz)

NOTE: This band is completely included in the LTE Band 12, so the channels of the LTE Band 12 were tested to give conformity to the assigned block.

LTE Band 29. NOTE: Downlink only.

LTE Band 30. NOTE: The equipment only use the downlink of the band.

LTE Band 41. QPSK and QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)			
	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	39675 (2498.50 MHz)	39700 (2501.00 MHz)	39725 (2503.50 MHz)	39750 (2506.00 MHz)
Middle	40620 (2593.00 MHz)	40620 (2593.00 MHz)	40620 (2593.00 MHz)	40620 (2593.00 MHz)
High	41565 (2687.50 MHz)	41540 (2685.00 MHz)	41515 (2682.50 MHz)	41490 (2680.00 MHz)

Note: Common used channels.

Module NAD1		Module NAD2	
Low Channel (39750)	2506 MHz	Adjacent channel to Low Channel (39950)	2526 MHz
Middle Channel (40620)	2593 MHz	Adjacent channel to Middle Channel (40920)	2623 MHz
High Channel (41490)	2680 MHz	Adjacent channel to High Channel (41190)	2650 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

LTE Band 66. QPSK and QAM 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	131979 (1710.7 MHz)	131987 (1711.5 MHz)	131997 (1712.5 MHz)	132022 (1715.0 MHz)	132047 (1717.5 MHz)	132072 (1720.0 MHz)
Middle	132322 (1745.0 MHz)	132322 (1745.0 MHz)	132322 (1745.0 MHz)	132322 (1745.0 MHz)	132322 (1745.0 MHz)	132322 (1745.0 MHz)
High	132665 (1779.3 MHz)	132657 (1778.5 MHz)	132647 (1777.5 MHz)	132622 (1775.0 MHz)	132597 (1772.5 MHz)	132572 (1770.0 MHz)

Module NAD1		Module NAD2	
Low Channel (131987)	1711.5 MHz	Adjacent channel to Low Channel (132017)	1714.5 MHz
Middle Channel (132322)	1745 MHz	Adjacent channel to Middle Channel (132352)	1748 MHz
High Channel (132657)	1778.5 MHz	Adjacent channel to High Channel (132627)	1775.5 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

LTE Band 71. QPSK and 16QAM modulations. MIMO 2x2 (configuration 3):

	Channel (Frequency)			
	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	133147 (665.50 MHz)	133172 (668.00 MHz)	133197 (670.50 MHz)	133222 (673.00 MHz)
Middle	133297 (680.50 MHz)	133297 (680.50 MHz)	133297 (680.50 MHz)	133297 (680.50 MHz)
High	133447 (695.50 MHz)	133422 (693.00 MHz)	133397 (690.50 MHz)	133372 (688.00 MHz)

Note: Common used channels.

Module NAD1		Module NAD2	
Low Channel (133197)	670.5 MHz	Adjacent channel to Low Channel (133322)	683 MHz
Middle Channel (133297)	680.5 MHz	Adjacent channel to Middle Channel (133422)	693 MHz
High Channel (133397)	690.5 MHz	Adjacent channel to High Channel (133271)	677.9 MHz

Note: Tested channels due to the characteristics of the simultaneous transmission of both modules.

Radiated emissions

SPECIFICATION:

1. 3G Band IV and LTE Band 66. FCC §2.1053 & §27.53 (h) / RSS-139 Issue 3 Clause 6.6.

FCC §27.53 (h):

(h) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

RSS-139 Issue 3 Clause 6.6:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} P$ (watts) dB.

2. LTE Band 7 and LTE Band 41. FCC §2.1053 & §27.53 (m) (4) / RSS-199 Issue 3 Clause 4.5 (b).

FCC §27.53 (m) (4):

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

RSS-199 Issue 3 Clause 4.5 (b):

4.5. In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

- i. $40 + 10 \log_{10} p$ from the channel edges to 5 MHz away
- ii. $43 + 10 \log_{10} p$ between 5 MHz and X MHz from the channel edges, and
- iii. $55 + 10 \log_{10} p$ at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than $43 + 10 \log_{10} p$ on all frequencies between 2490.5 MHz and 2496 MHz, and $55 + 10 \log_{10} p$ at or below 2490.5 MHz.

In (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

LTE Band 7 and LTE Band 41 MEASUREMENT LIMIT:

On all frequencies between the channel edge and 5 megahertz from the channel edge:

At P_o transmitting power, the specified minimum attenuation becomes $40+10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [40 + 10 \log (P_o \text{ in mwatts}) - 30] = -10 \text{ dBm}$$

On all frequencies between 5 megahertz and X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section; and between 2490.5 MHz and 2496 MHz:

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

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

On all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section; and below 2490.5 MHz: At P_o transmitting power, the specified minimum attenuation becomes $55+10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [55 + 10 \log (P_o \text{ in mwatts}) - 30] = -25 \text{ dBm}$$

3. LTE Band 12 and LTE Band 71. FCC §2.1053 & §27.53 (g) / RSS-130 Issue 2 Clause 4.7.

FCC §27.53 (g):

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

RSS-130 Issue 2 Clause 4.7:

4.7.1. The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

LTE Band 12 and LTE Band 71 MEASUREMENT LIMIT:

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

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

4. LTE Band 13. FCC §2.1053 & §27.53 (c) (2) (4) & (f) / RSS-130 Issue 2 Clause 4.7.

FCC §27.53 (c) (2) (4) & (f):

(c) (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB.

(c) (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW (-40 dBm)/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW (-50 dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-130 Issue 2 Clause 4.7:

4.7.1. The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

4.7.2. In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

a. the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

- i. $76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment and
- ii. $65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment

b. the e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

LTE Band 13 MEASUREMENT LIMIT:

On any frequency outside the 776-788 MHz at least:

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

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

On all frequencies between 763-775 MHz and 793-806 MHz not less than:

At P_o transmitting power, the specified minimum attenuation becomes $65+10 \log (P_o)$, and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} - [65 + 10 \log (P_o \text{ in mwatts}) - 30] = -35 \text{ dBm}$$

Emissions in the band 1559-1610 MHz for wideband signal:

At P_o transmitting power, shall be limited to -70 dBW (-40 dBm)/MHz equivalent isotropically radiated power (EIRP), and the level in dBm relative P_o becomes:

$$P_o \text{ (dBm)} = -40 \text{ dBm}$$

METHOD:

The measurement was performed with the EUT inside an anechoic chamber.

The spectrum was scanned from 30 MHz to at least the 10th harmonic of the High frequency generated within the equipment.

The EUT was placed on a non-conductive stand at 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.

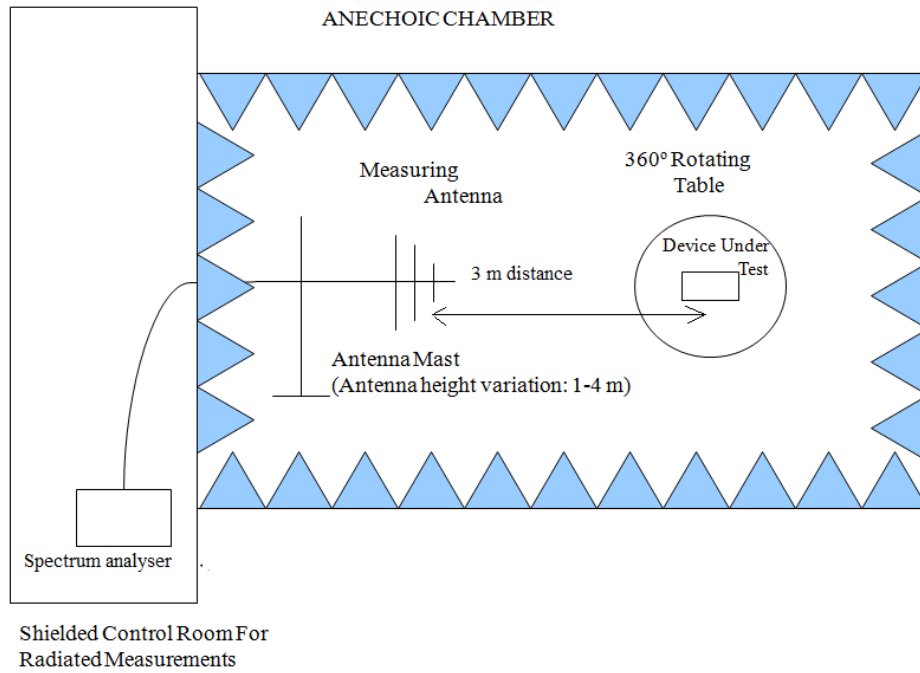
The maximum field strength (dB μ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

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

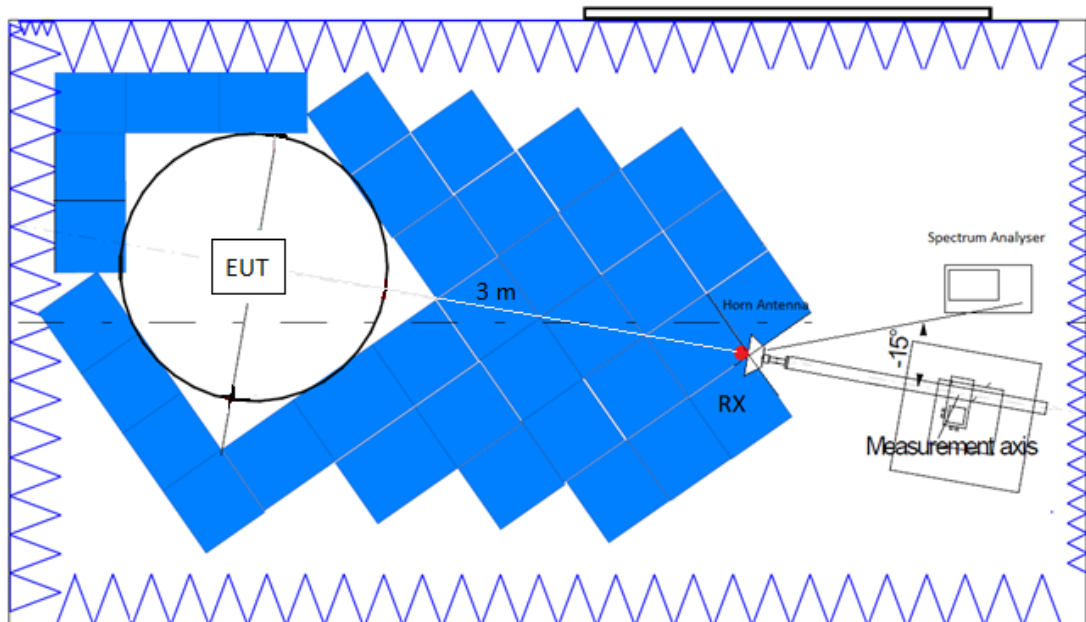
A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz or higher were used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

TEST SETUP:

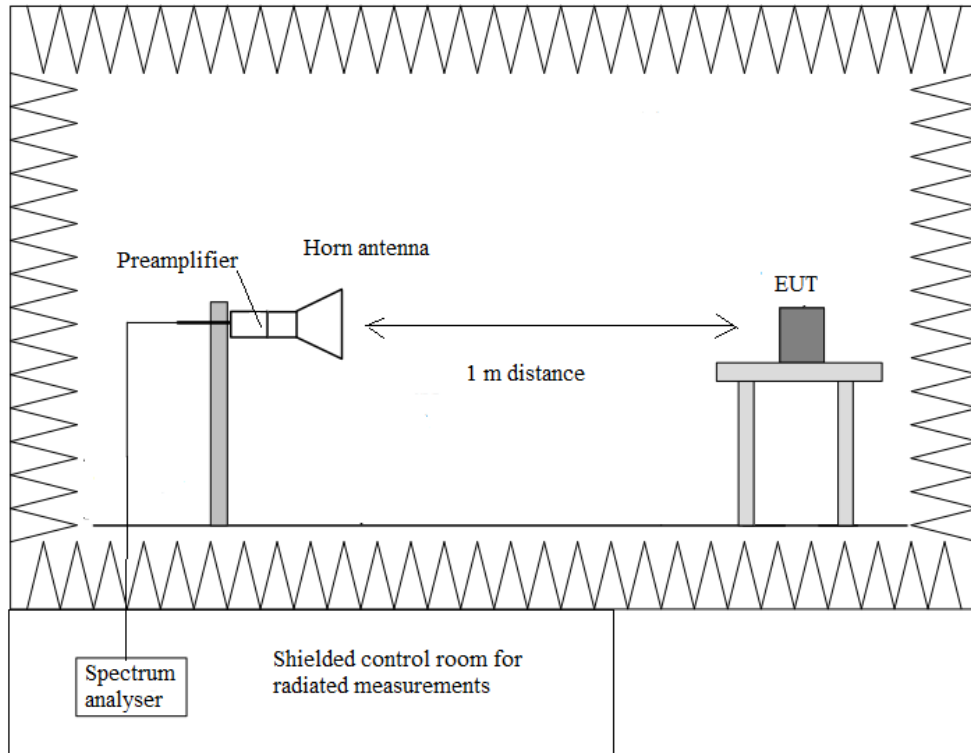
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup $f > 18$ GHz:



RESULTS:

3G Band IV:

WCDMA and HSUPA modulations: A preliminary scan determined the HSUPA modulation, modules NAD1 and NAD2, 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:

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.

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

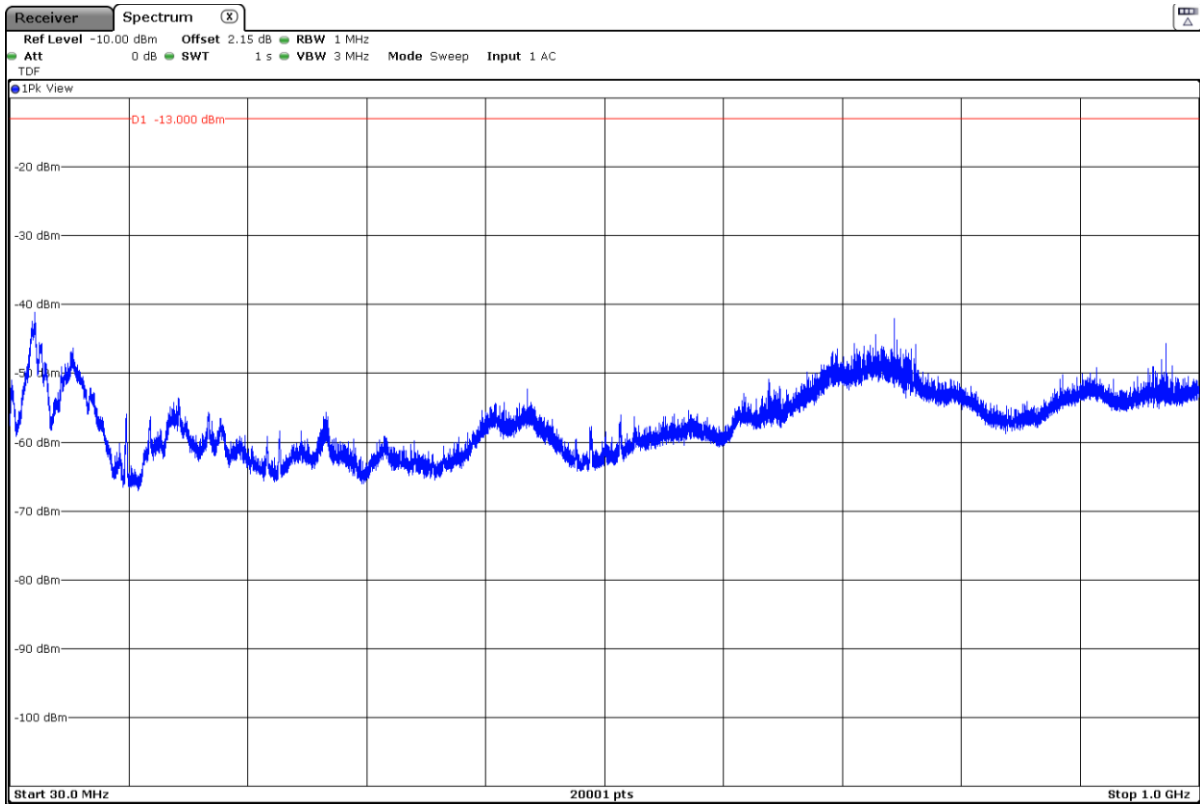
No spurious frequencies at less than 20 dB below the limit.

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 18 GHz
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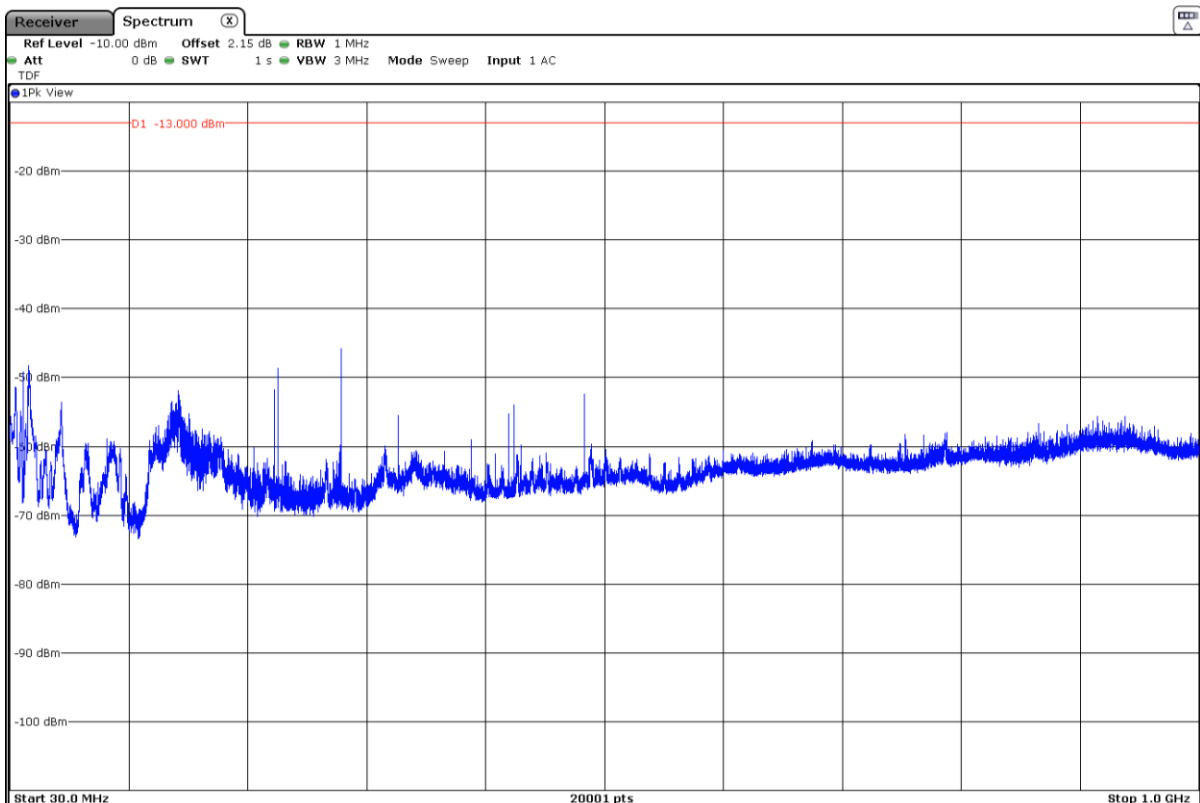
Verdict: PASS

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

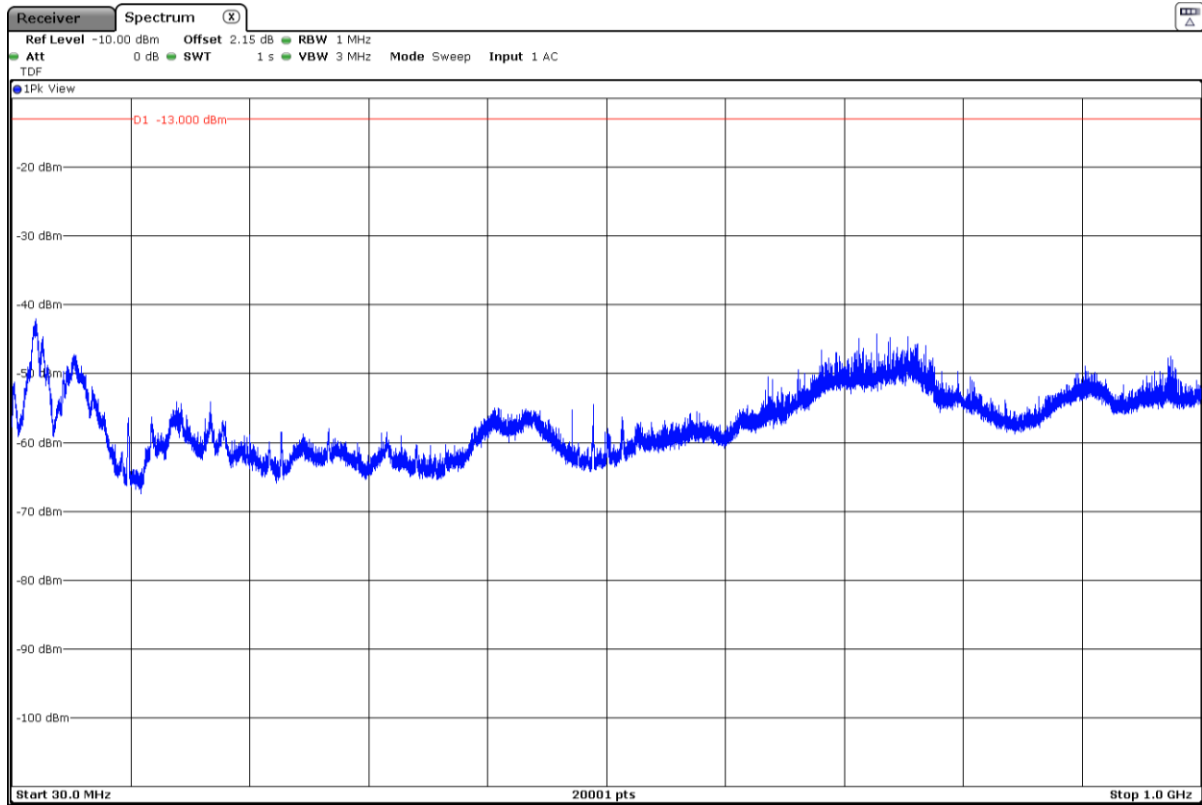
- Low Channel:



- Middle Channel:

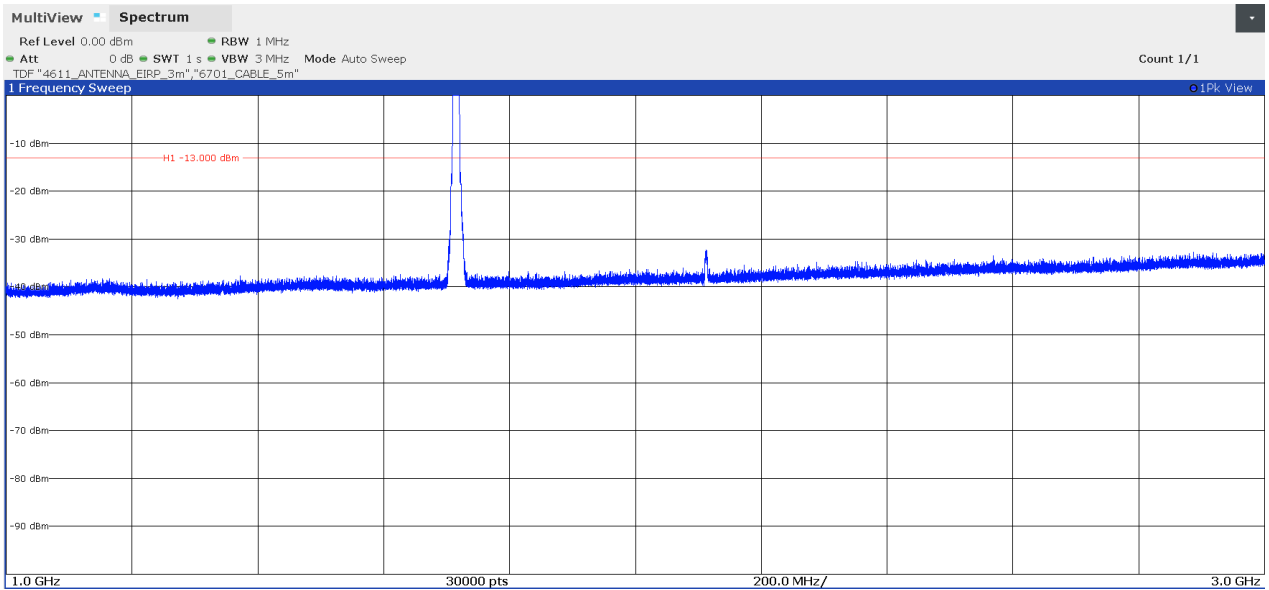


- High Channel:



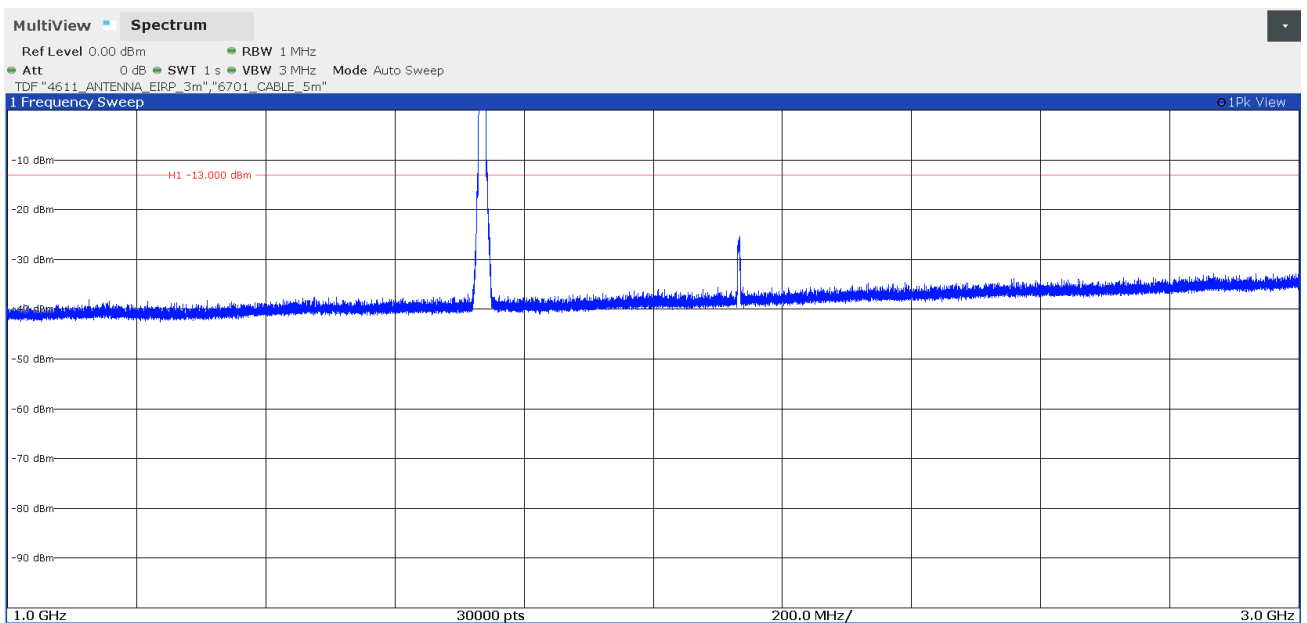
FREQUENCY RANGE 1 - 3 GHz (worst mode):

- Low Channel:



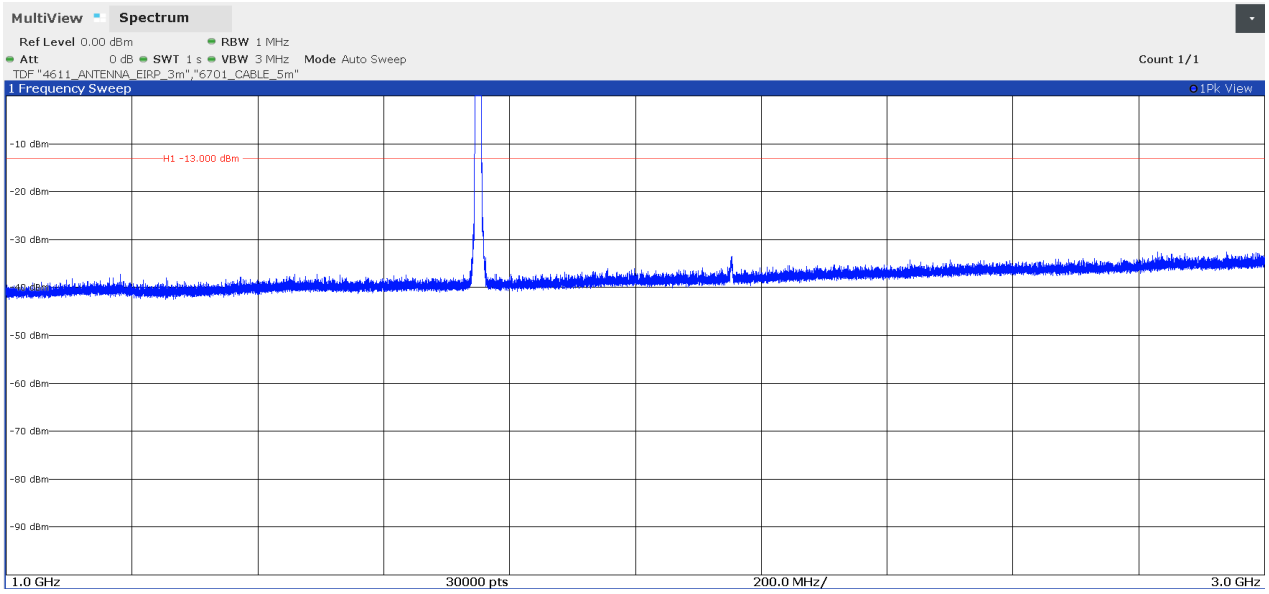
The peak above the limit is the carrier frequency. The peak at 2112.4MHz corresponds to the downlink signal.

- Middle Channel:



The peak above the limit is the carrier frequency. The peak at 2132.5MHz corresponds to the downlink signal.

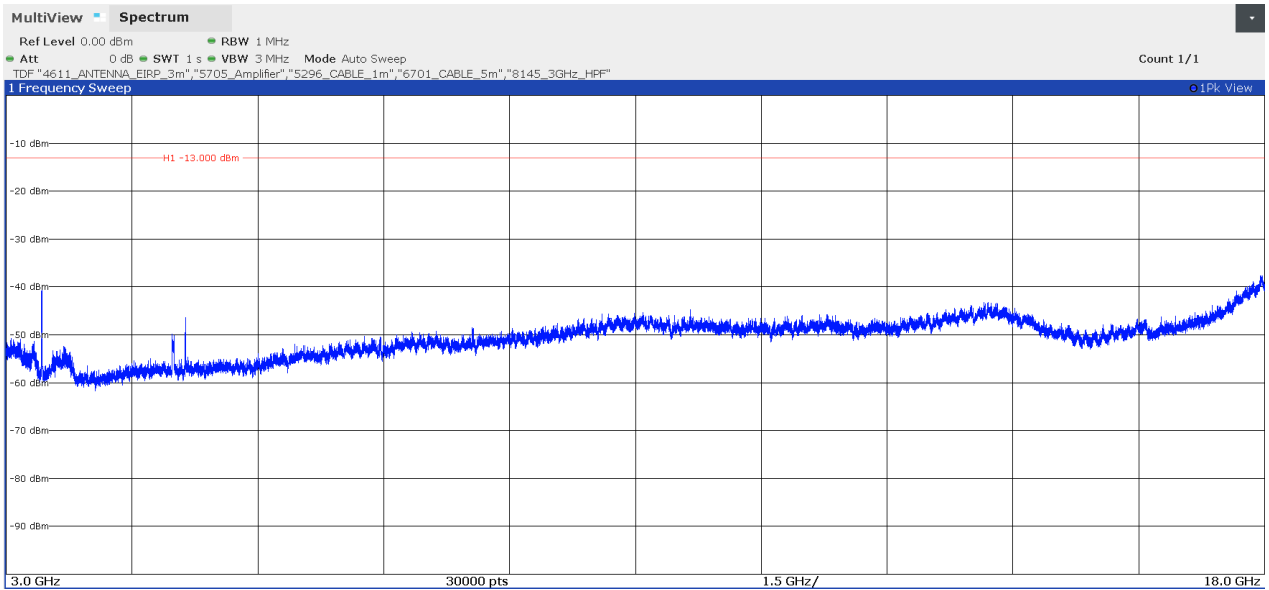
- High Channel:



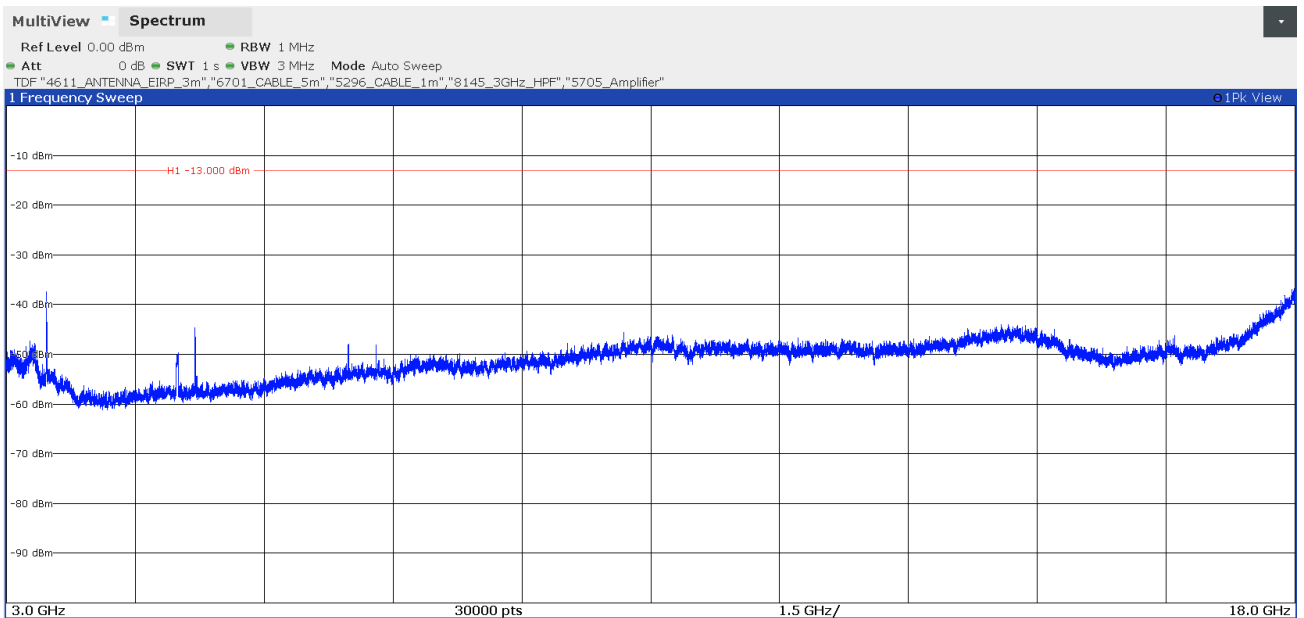
The peak above the limit is the carrier frequency. The peak at 2152.5MHz corresponds to the downlink signal.

FREQUENCY RANGE 3 - 18 GHz (worst mode):

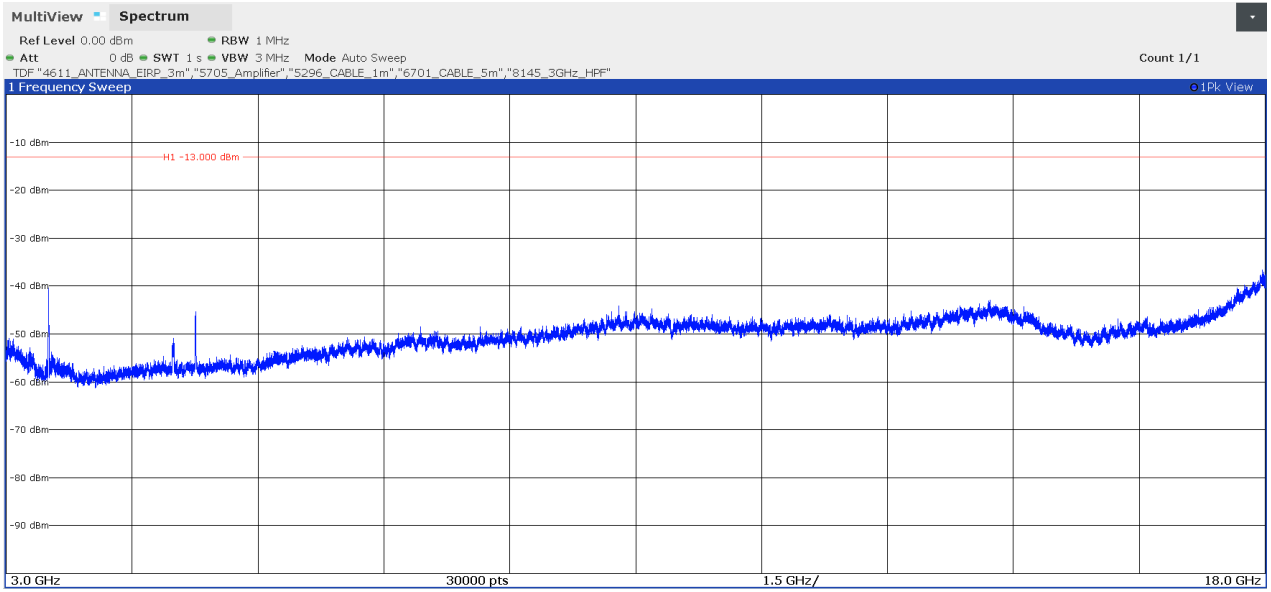
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 7:

QPSK and QAM modulations: A preliminary scan determined the QPSK modulation, modules NAD1 and NAD2
 Nominal Bandwidth 10 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 - 26 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.170633	-38.97	V	Peak	<±4.98
1.739633	-39.85	V	Peak	<±4.98
5.00125	-36.54	V	Peak	<±4.98
5.04125	-42.95	V	Peak	<±4.98
7.50175	-26.97	V	Peak	<±4.98

Frequency range 2490.5 - 2496 MHz:

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 - 26 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.173233	-39.18	V	Peak	<±4.98
5.06125	-37.28	V	Peak	<±4.98
5.09125	-42.36	V	Peak	<±4.98
7.59175	-27.5	V	Peak	<±4.98
10.18275	-41.95	V	Peak	<±4.98

Frequency range 2490.5 - 2496 MHz:

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

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
55.43	-44.89	V	Peak	<±4.99

Frequency range 1 - 26 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.187833	-39.27	V	Peak	<±4.98
5.12125	-37.4	V	Peak	<±4.98
7.68175	-30.61	V	Peak	<±4.98
10.18225	-42.6	V	Peak	<±4.98
12.80275	-42.72	V	Peak	<±4.98

Frequency range 2490.5 - 2496 MHz:

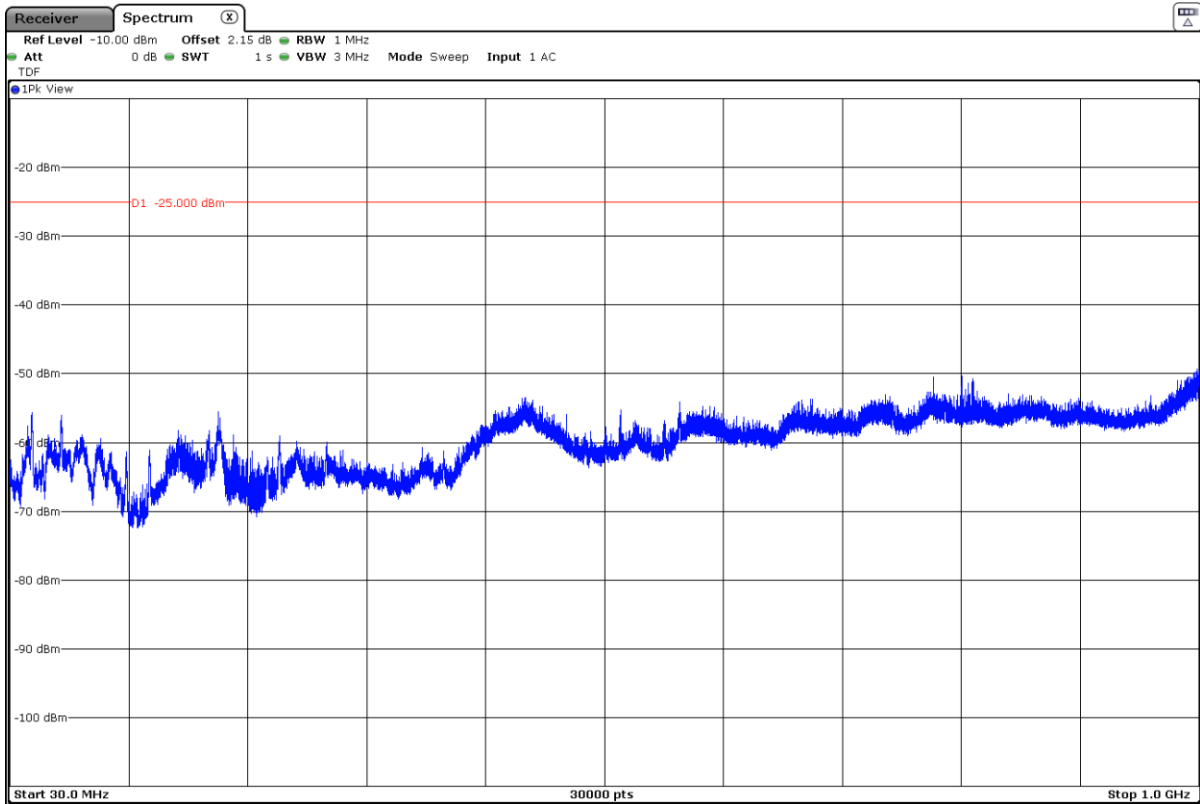
No spurious frequencies at less than 20 dB below the limit.

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 26 GHz
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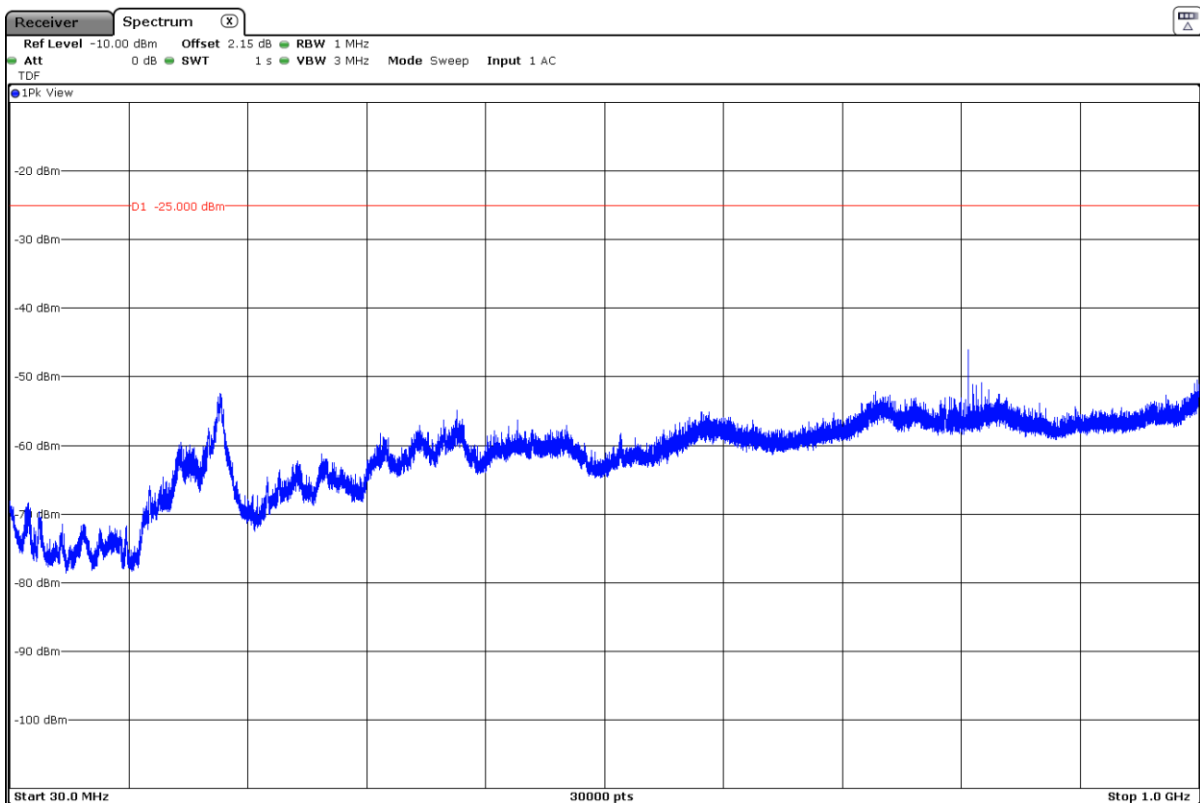
Verdict: PASS

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

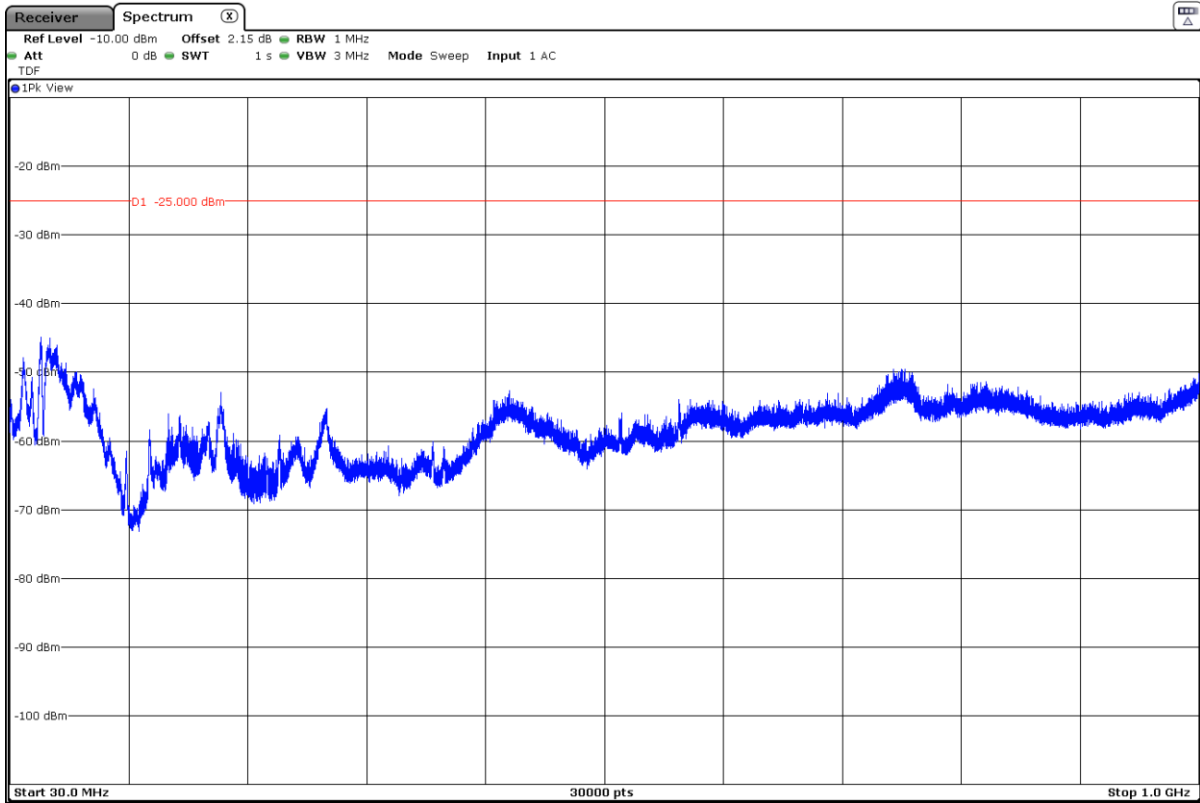
- Low Channel:



- Middle Channel:

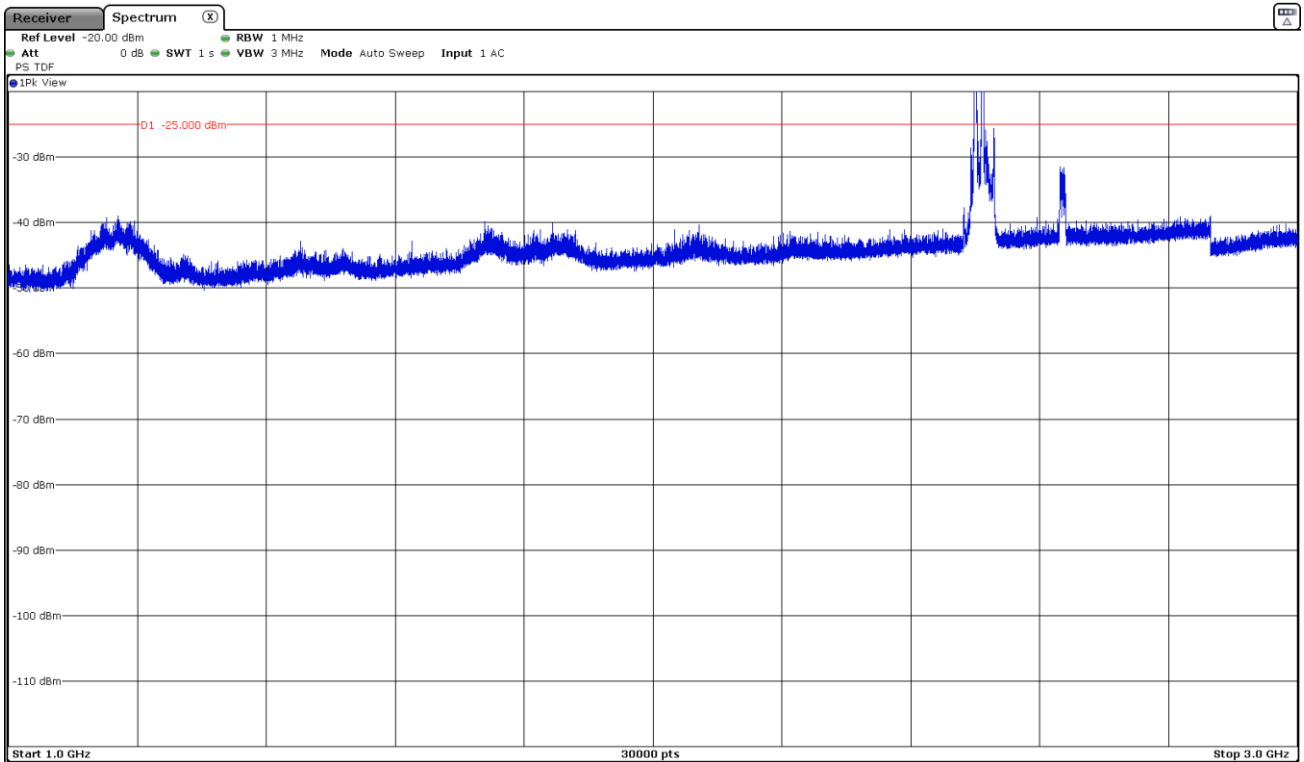


- High Channel:



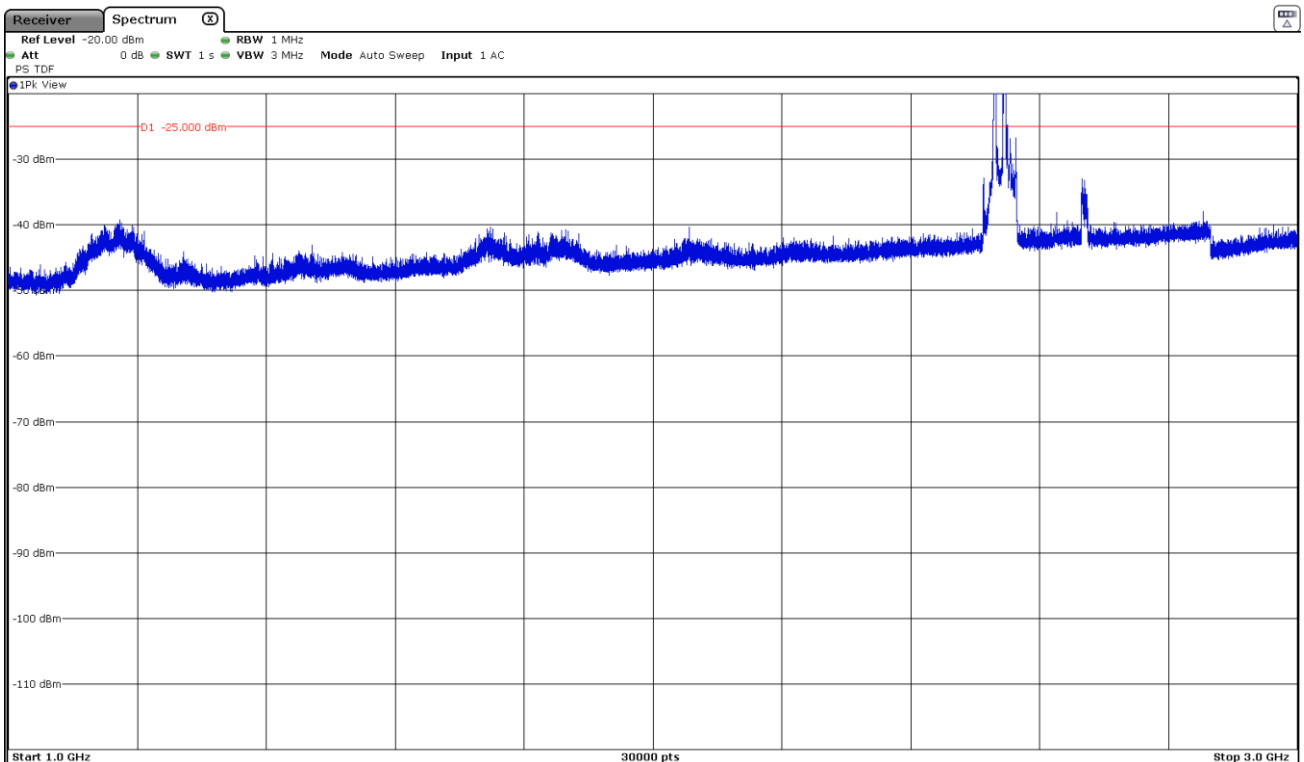
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



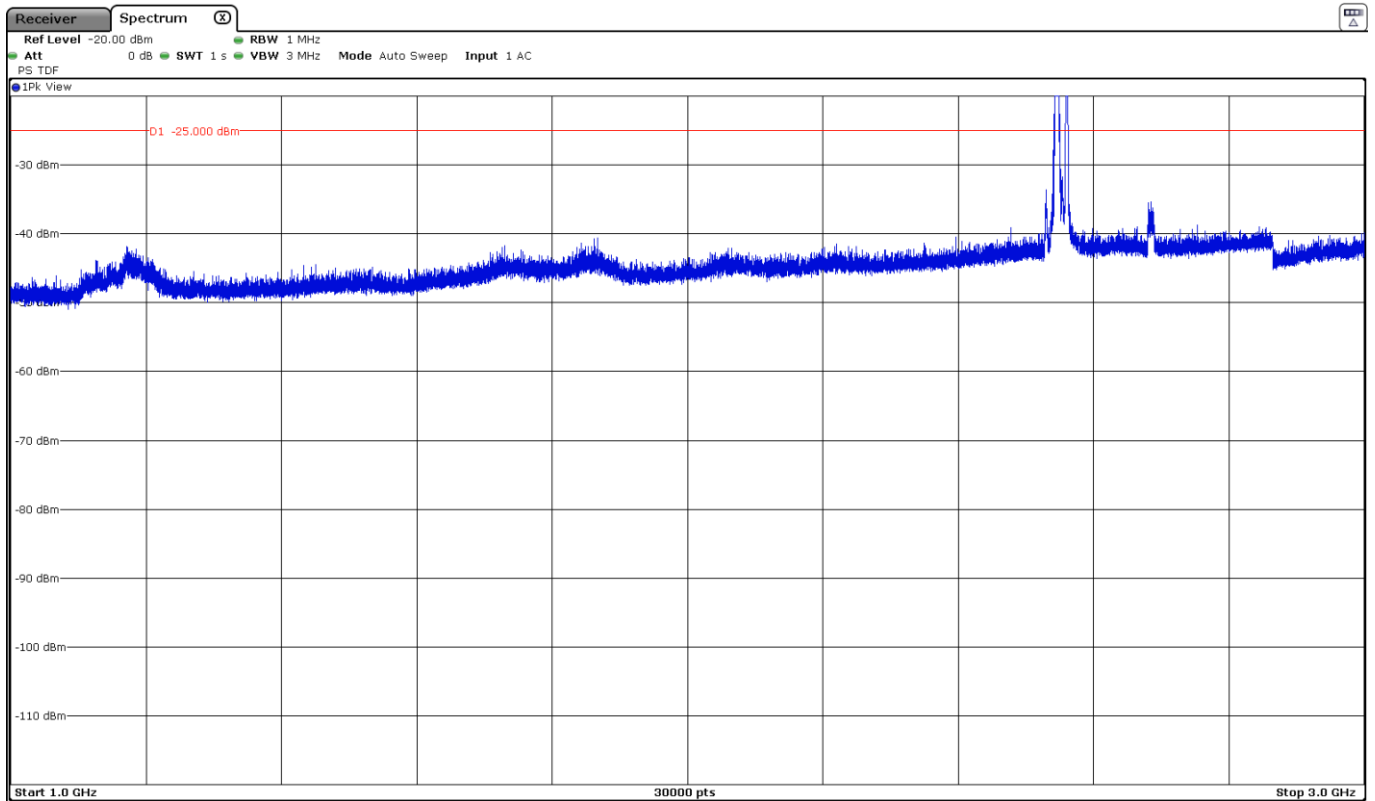
The peak above the limit is the carrier frequency. The peaks at 2625MHz and 2640MHz correspond to the downlink signals.

- Middle Channel:



The peak above the limit is the carrier frequency. The peaks at 2625MHz and 2640MHz correspond to the downlink signals.

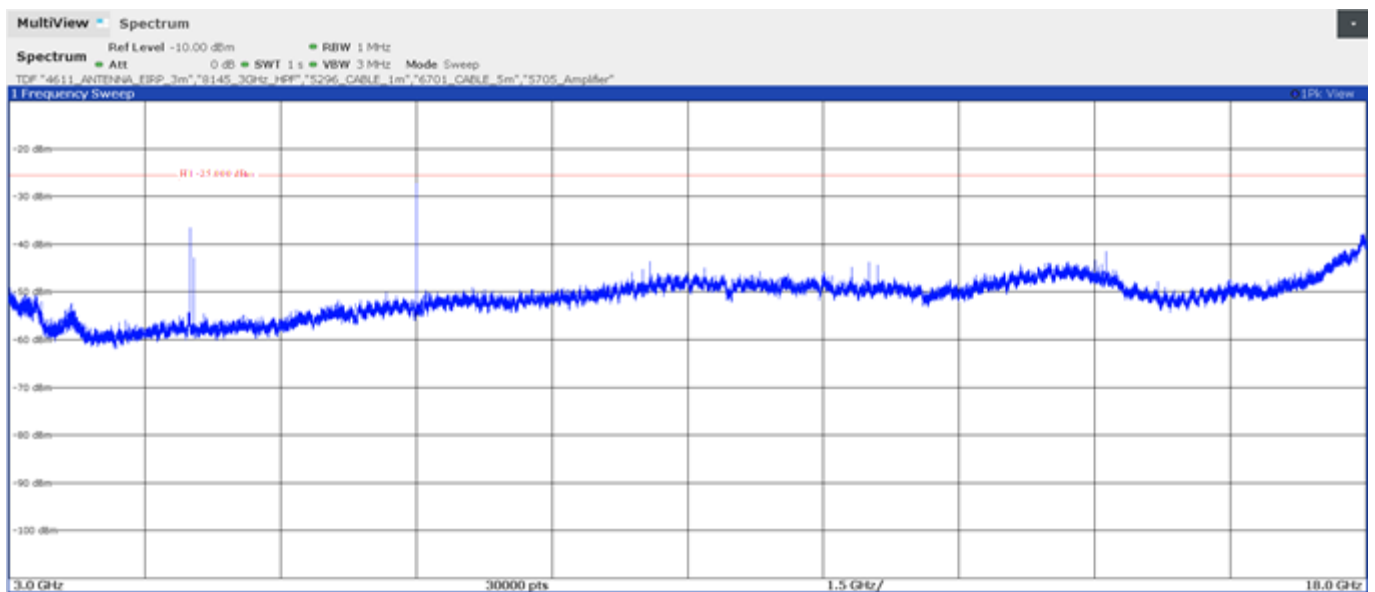
- High Channel:



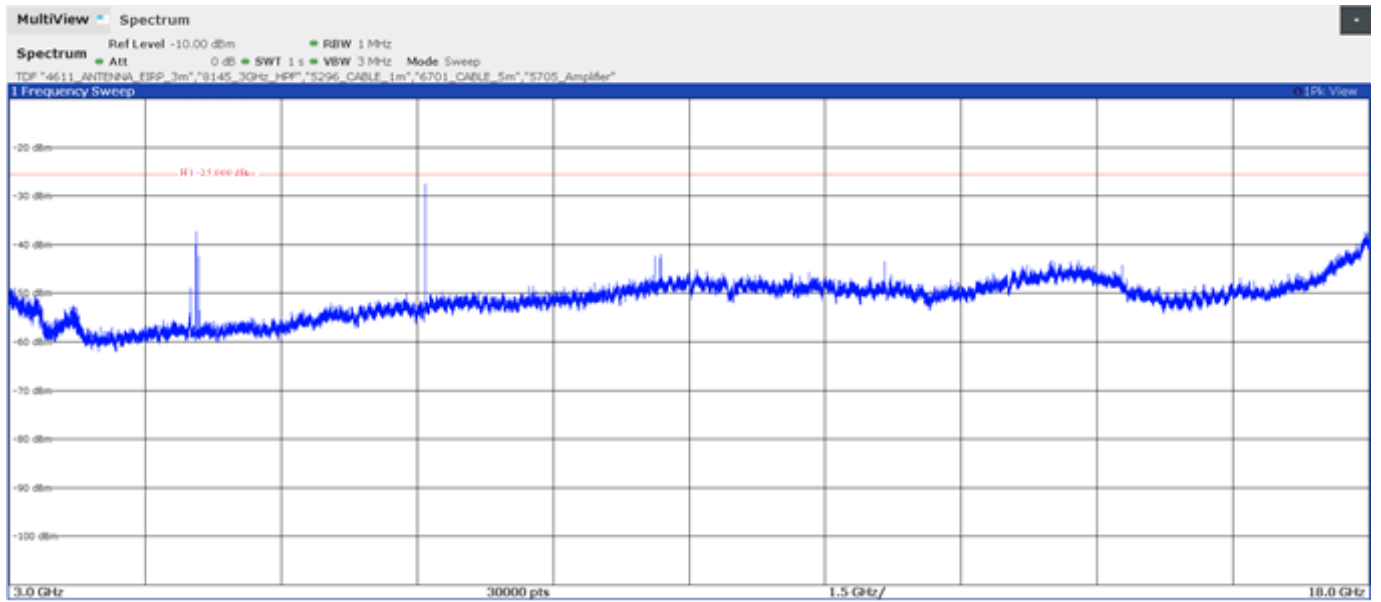
The peak above the limit is the carrier frequency. . The peaks at 2685MHz corresponds to the downlink signal.

FREQUENCY RANGE 3 - 18 GHz (worst case):

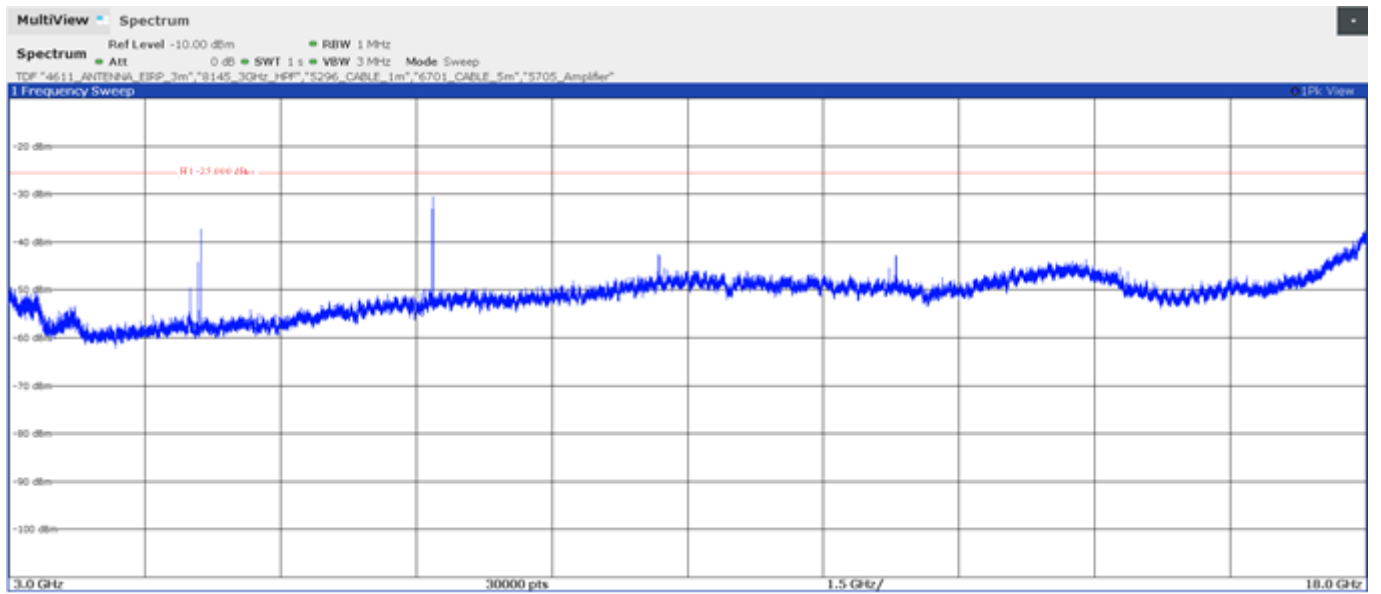
- Low Channel:



- Middle Channel:

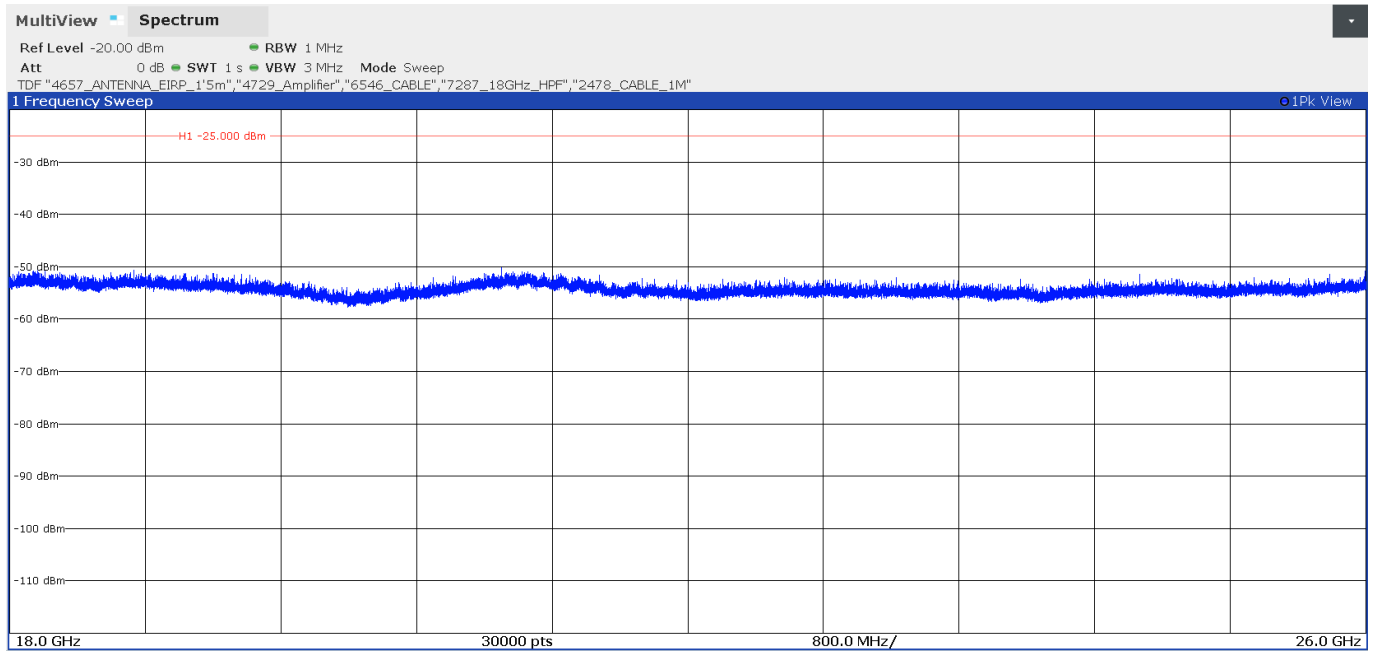


- High Channel:

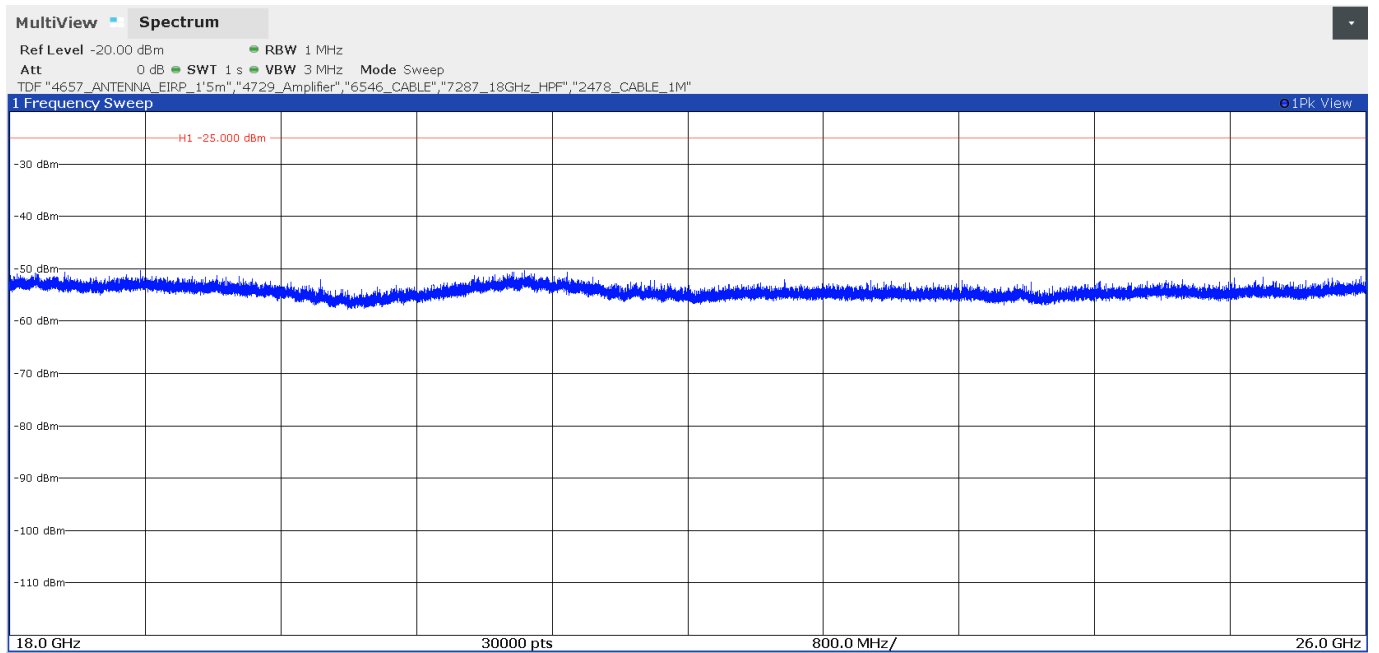


FREQUENCY RANGE 18 - 26 GHz (worst case):

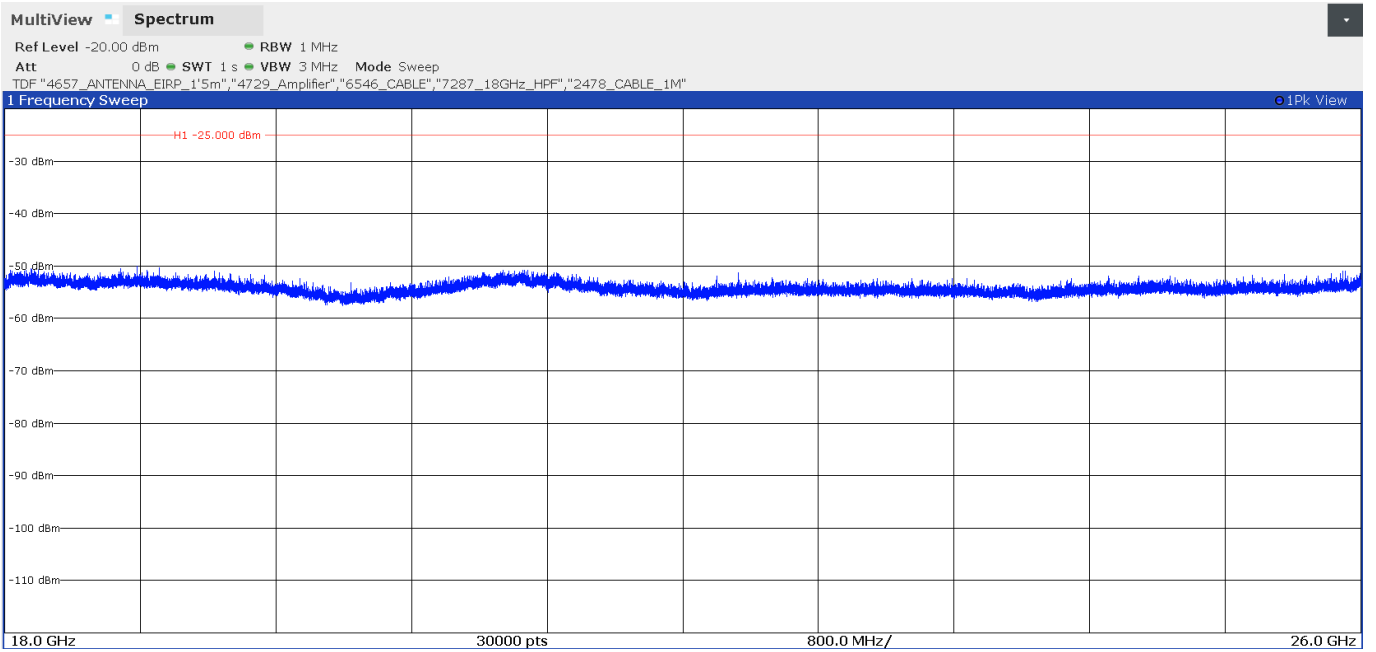
- Low Channel:



- Middle Channel:

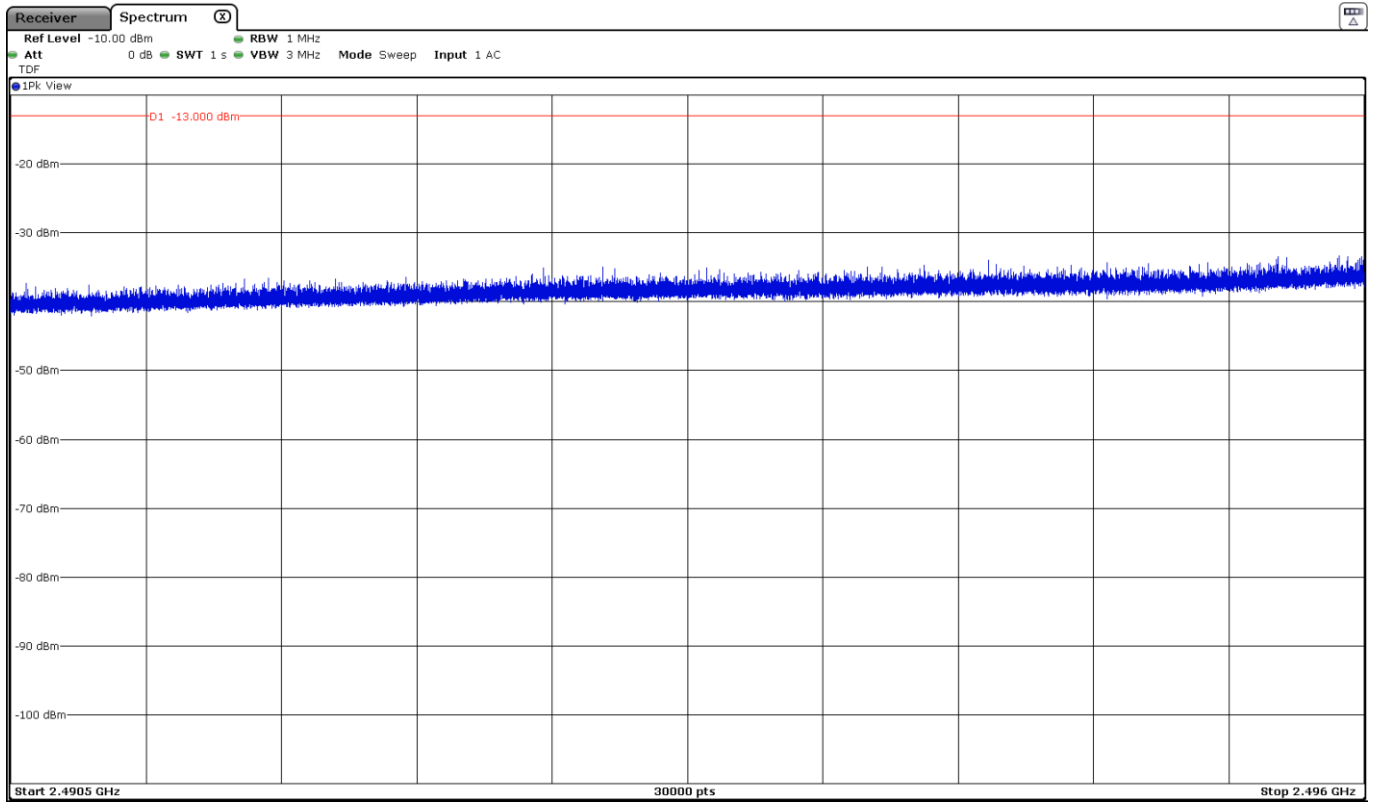


- High Channel:

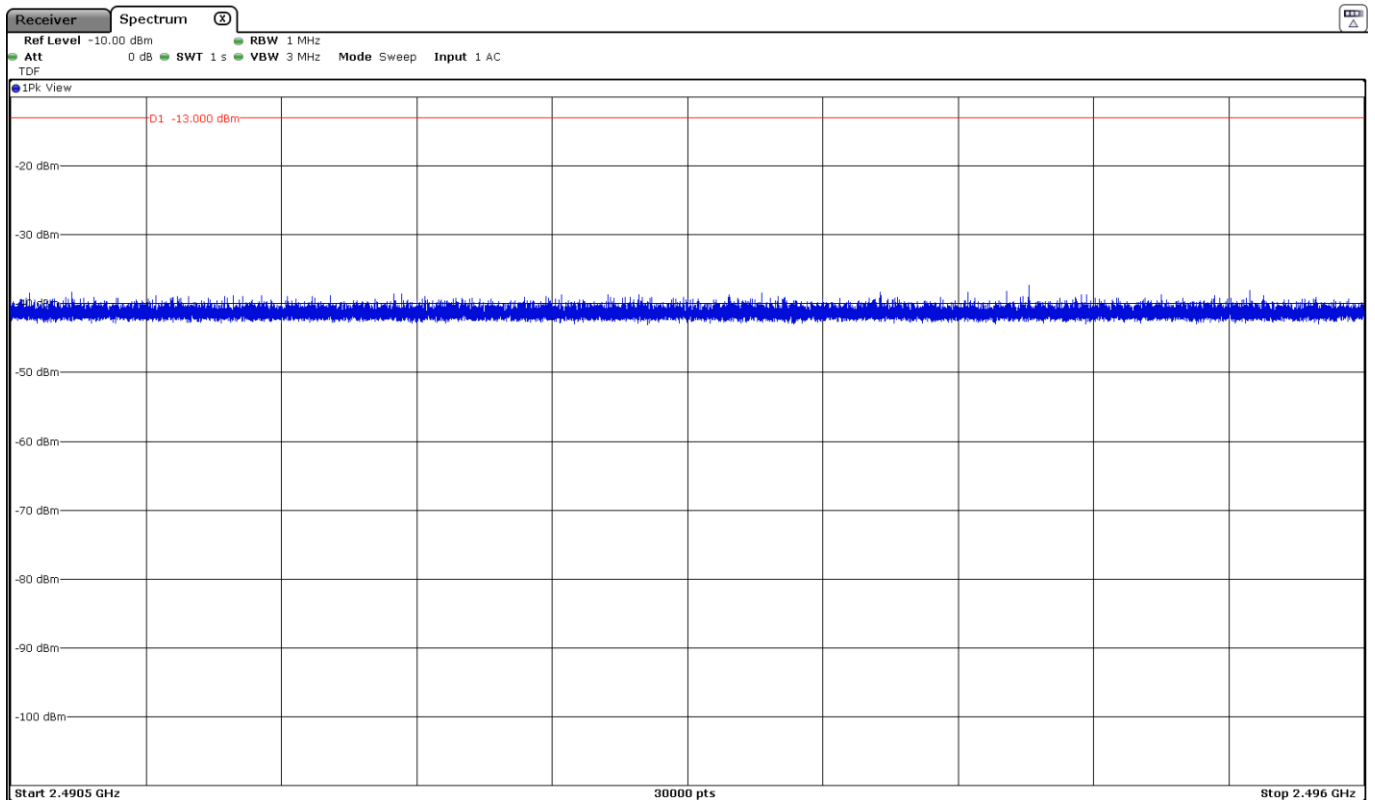


FREQUENCY RANGE 2490.5 - 2496 MHz (worst case):

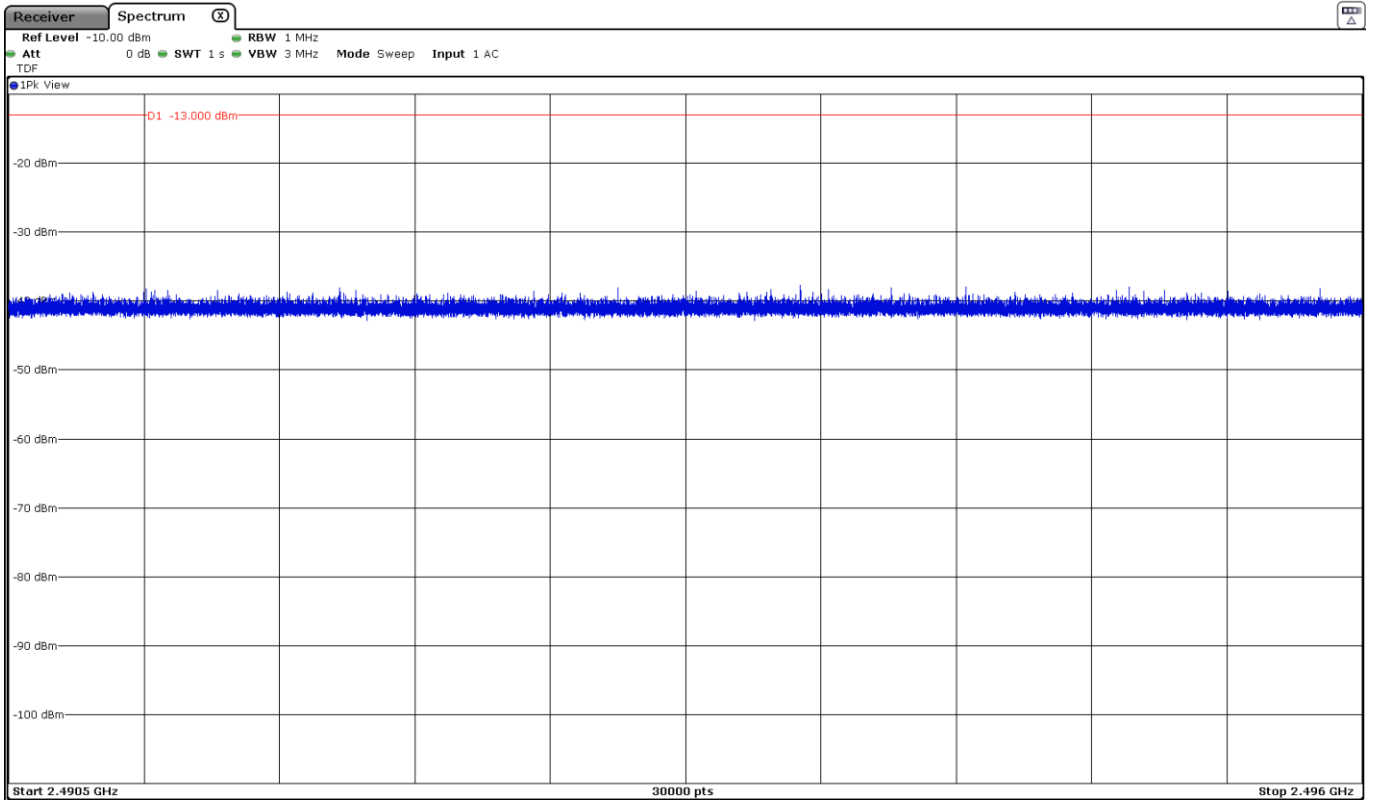
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 12:

QPSK and modulations: A preliminary scan determined the QPSK modulation, module NAD1 Nominal Bandwidth 5MHz or 3 MHz and module NAD2 Nominal Bandwidth 10 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 - 8 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 - 8 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 - 8 GHz:

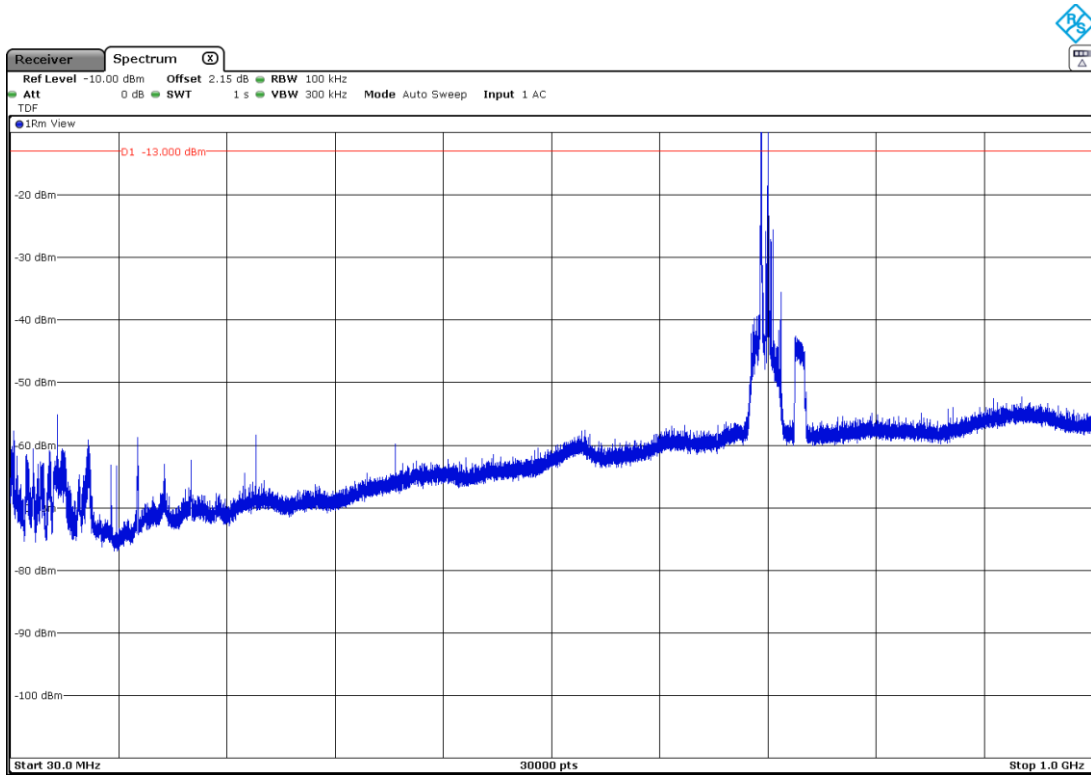
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB)	<± 4.99 for f < 1 GHz <± 4.98 for f ≥ 1 GHz up to 8 GHz
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Verdict: PASS

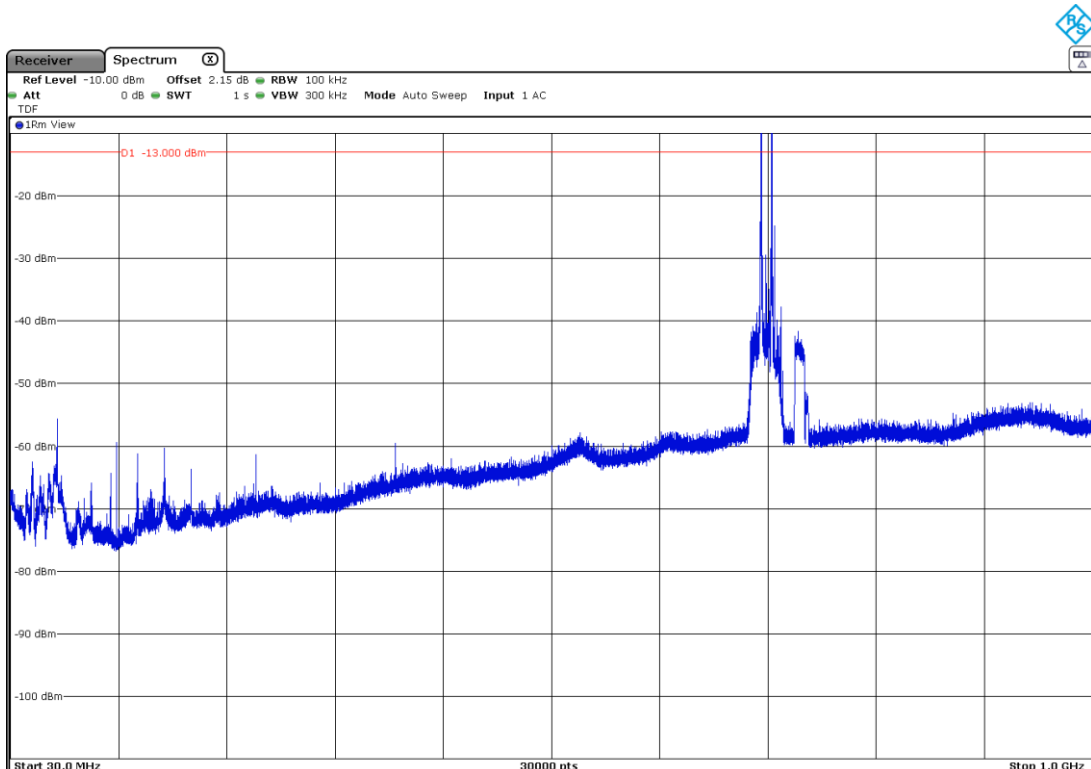
FREQUENCY RANGE 30 MHz - 1 GHz (worst mode):

- Low Channel:



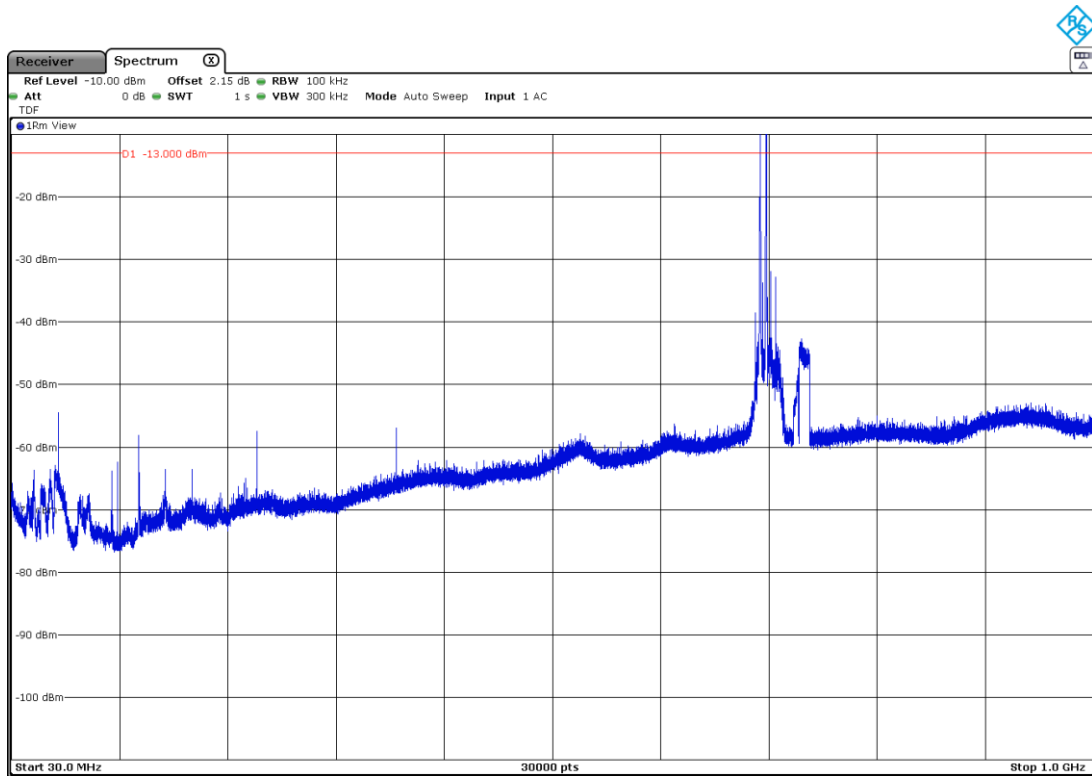
The peaks above the limit are the carrier frequencies. The peak at 734MHz corresponds to the downlink signal.

- Middle Channel:



The peaks above the limit are the carrier frequencies. The peak at 737.5MHz corresponds to the downlink signal.

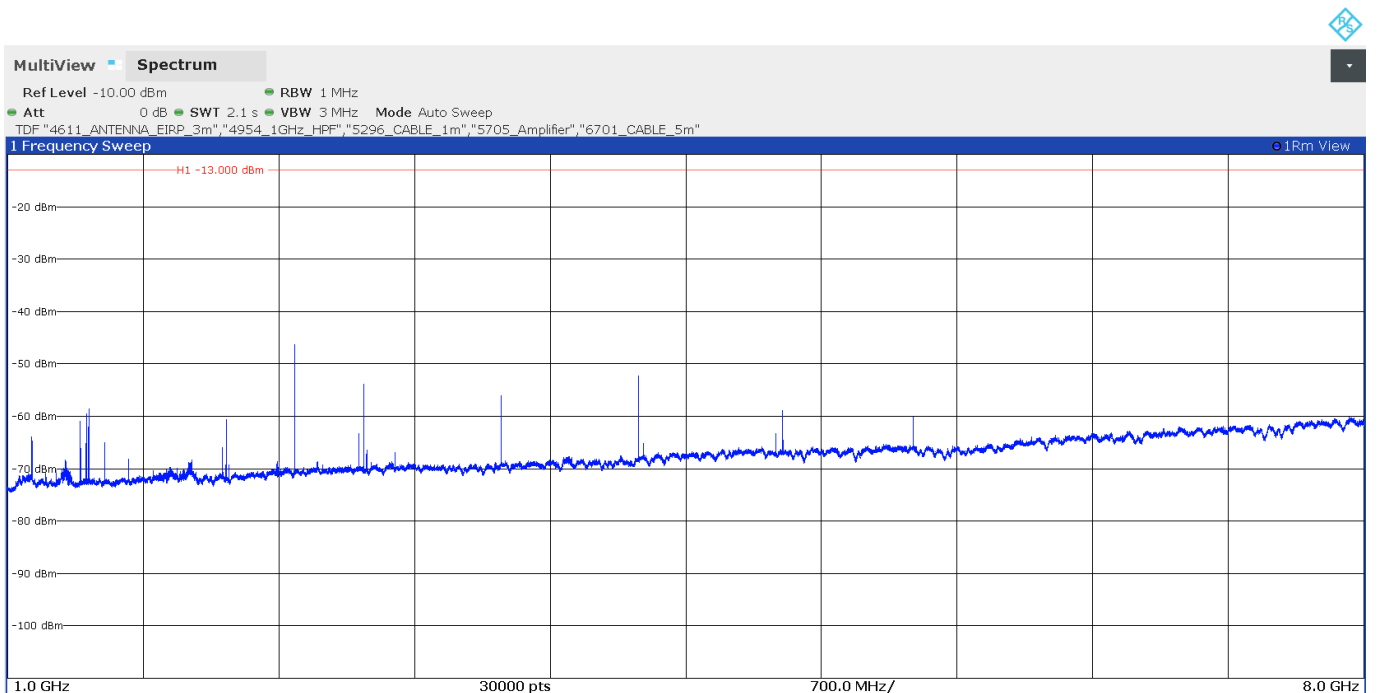
- High Channel:



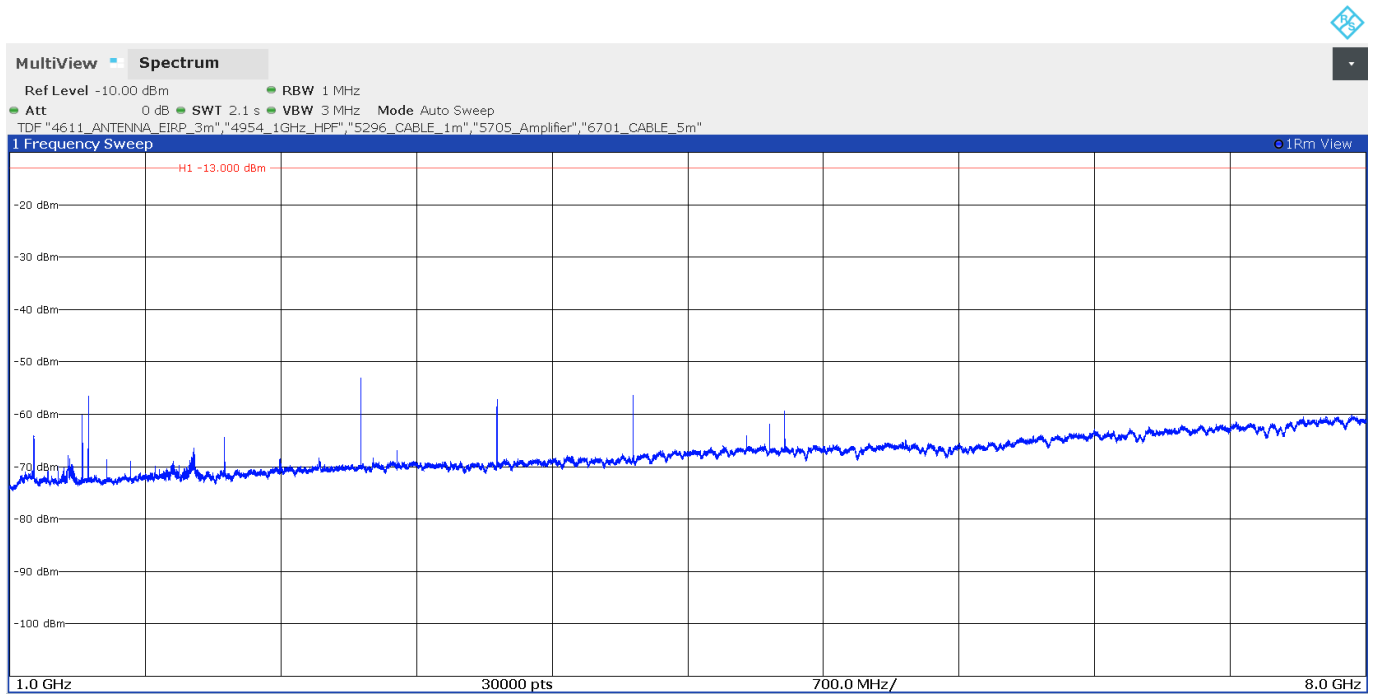
The peaks above the limit are the carrier frequencies. The peak at 741MHz corresponds to the downlink signal.

FREQUENCY RANGE 1 - 8 GHz (worst mode):

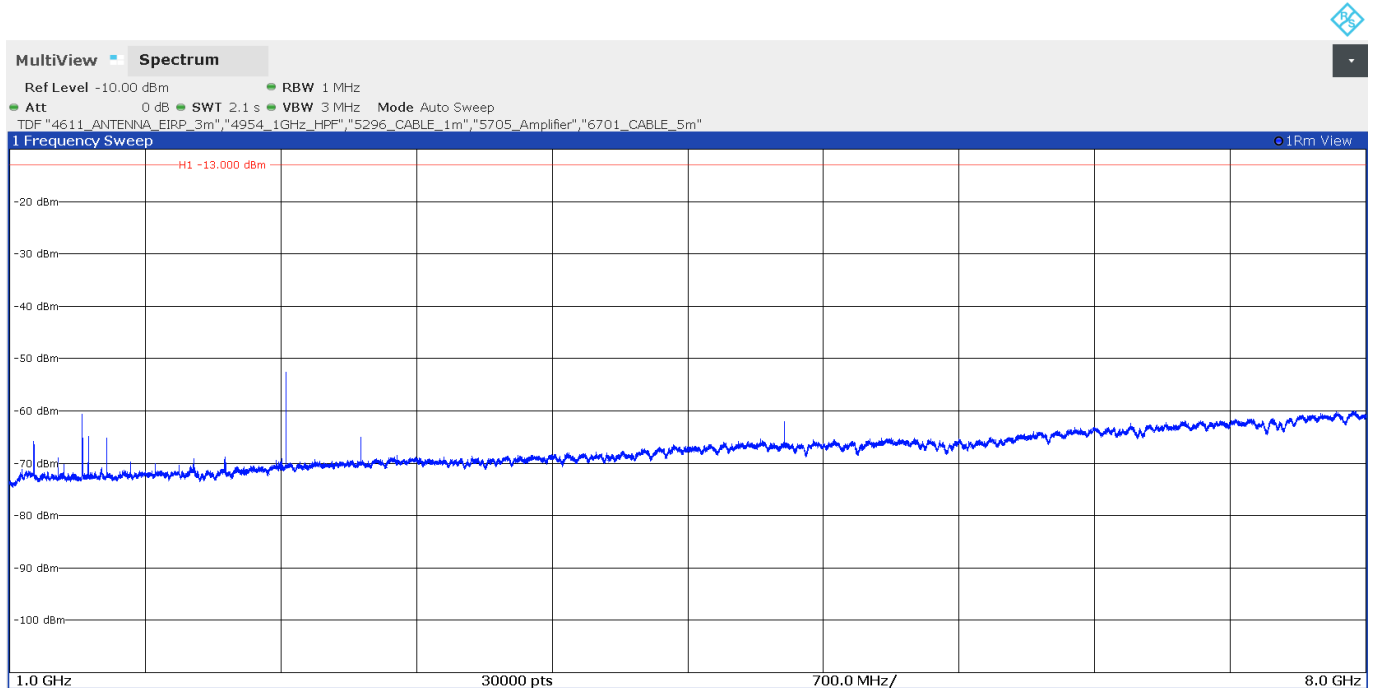
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 13:

QPSK and QAM modulations: A preliminary scan determined the QPSK modulation, modules NAD1 and NAD2
Nominal Bandwidth 5 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 - 8 GHz:

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

Frequency range 763 - 775 MHz:

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

Frequency range 793 - 806 MHz:

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

Frequency range 1559 - 1610 MHz:

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 - 8 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
3.12952	-30.57	V	Peak	<±4.98

Frequency range 763 - 775 MHz:

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

Frequency range 793 - 806 MHz:

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

Frequency range 1559 - 1610 MHz:

Spurious frequencies at less than 20 dB below the limit:

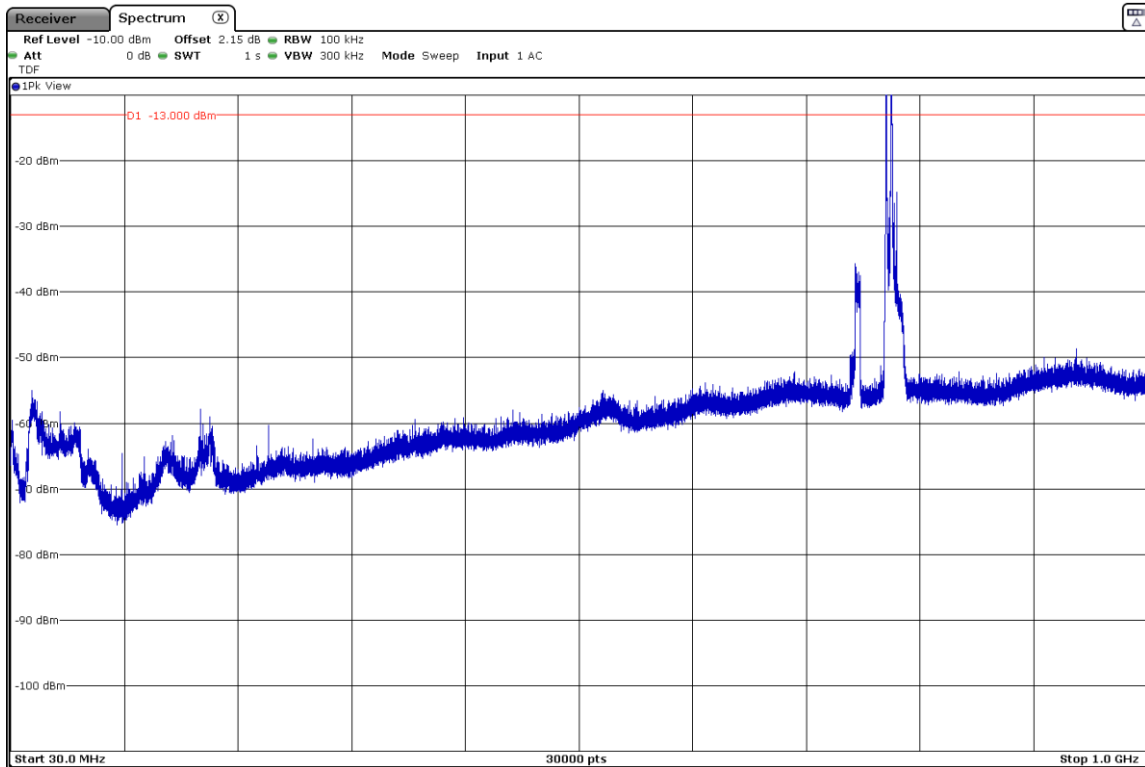
Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
1.5645259	-42.18	V	Peak	<±4.98

Measurement Uncertainty (dB)	<±4.99 for f < 1 GHz <±4.98 for f ≥ 1 GHz up to 18 GHz
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Verdict: PASS

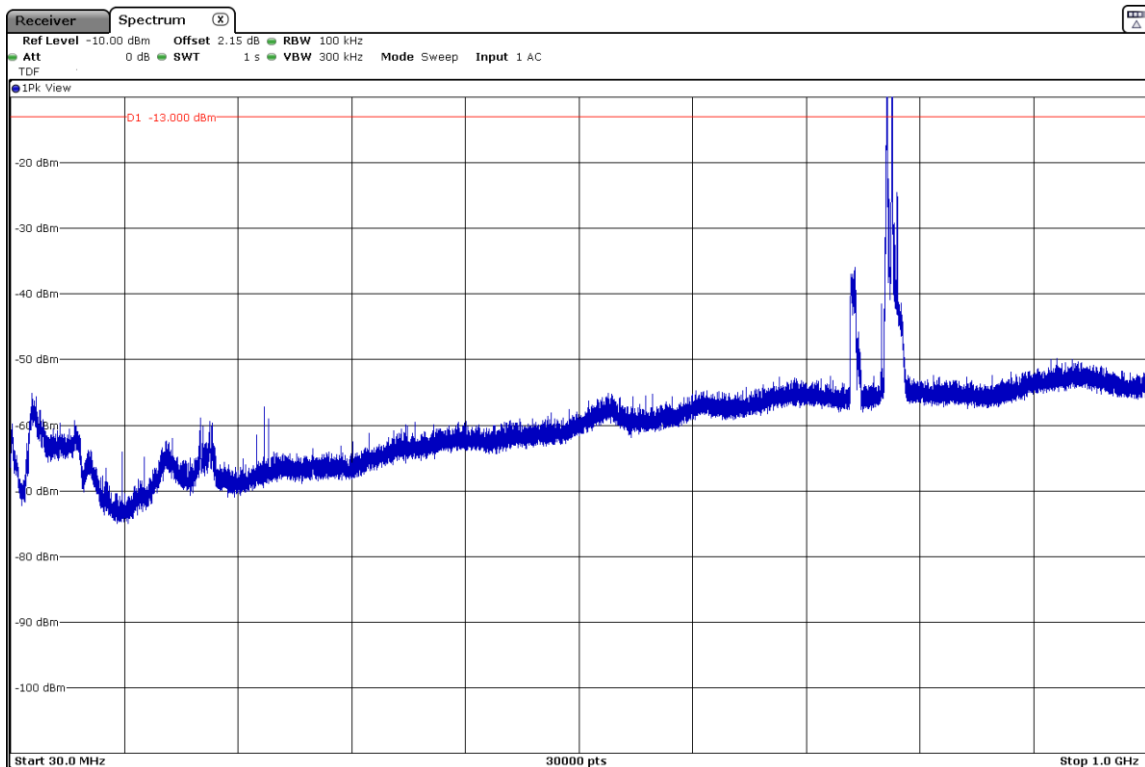
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

- Low Channel:



The peaks above the limit are the carrier frequencies. The peaks at 748MHz and 753MHz correspond to the downlink signals.

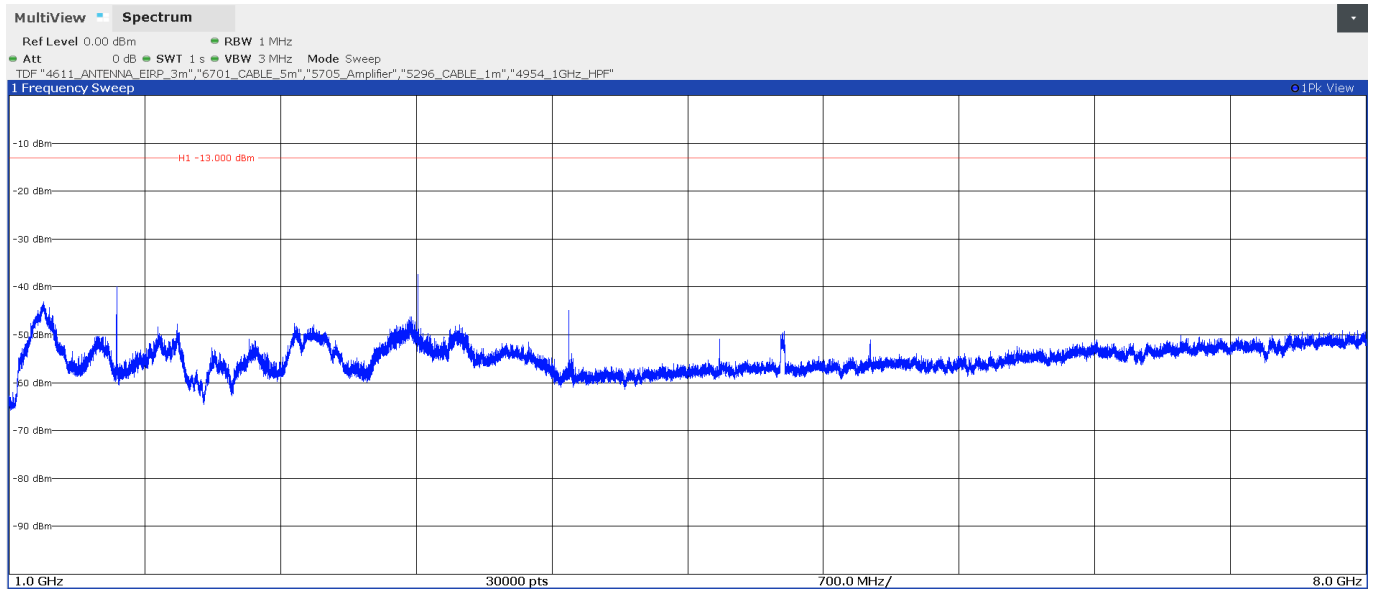
- High Channel:



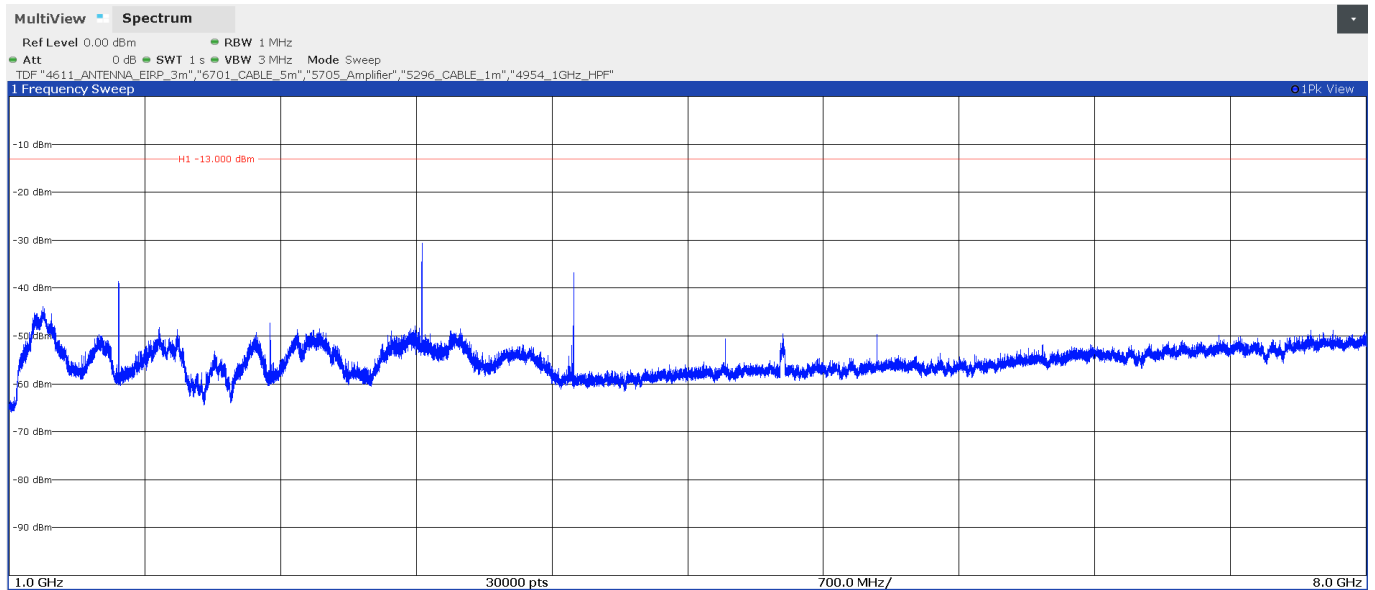
The peaks above the limit are the carrier frequencies. The peaks at 749MHz and 753.5MHz correspond to the downlink signals.

FREQUENCY RANGE 1 - 8 GHz (worst case):

- Low Channel:

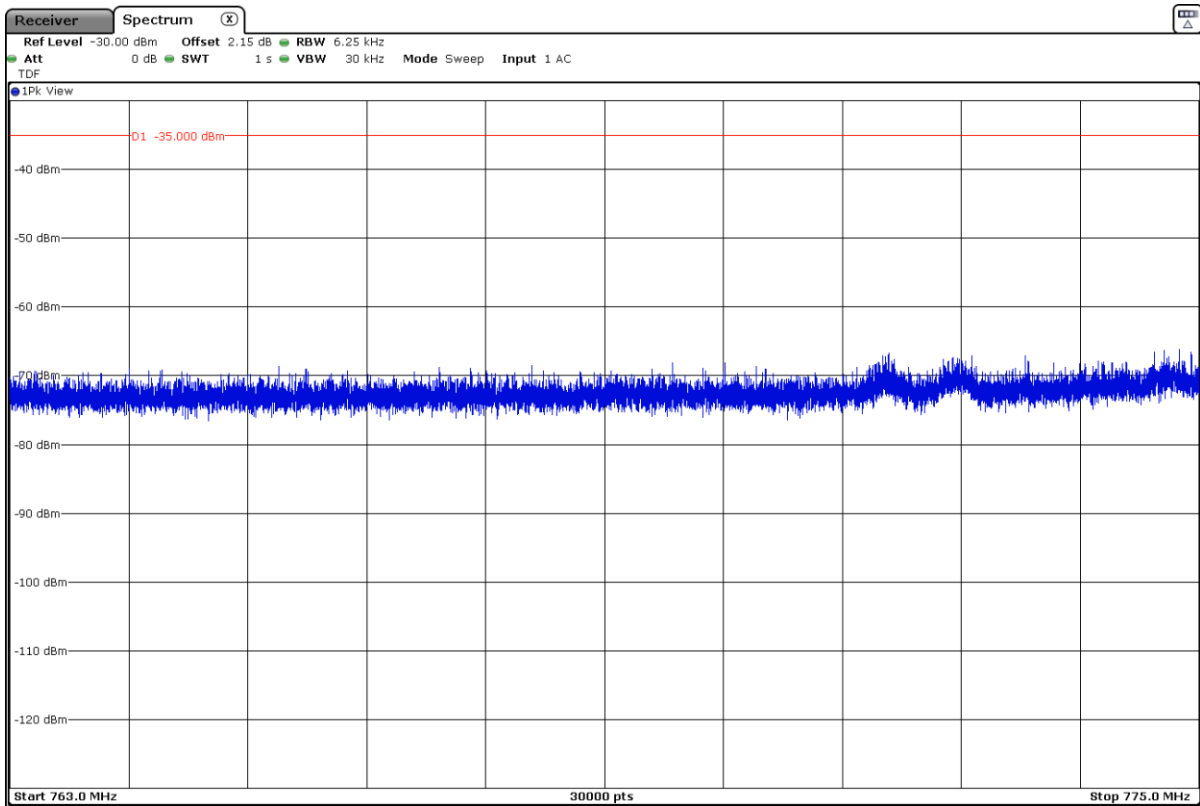


- High Channel:

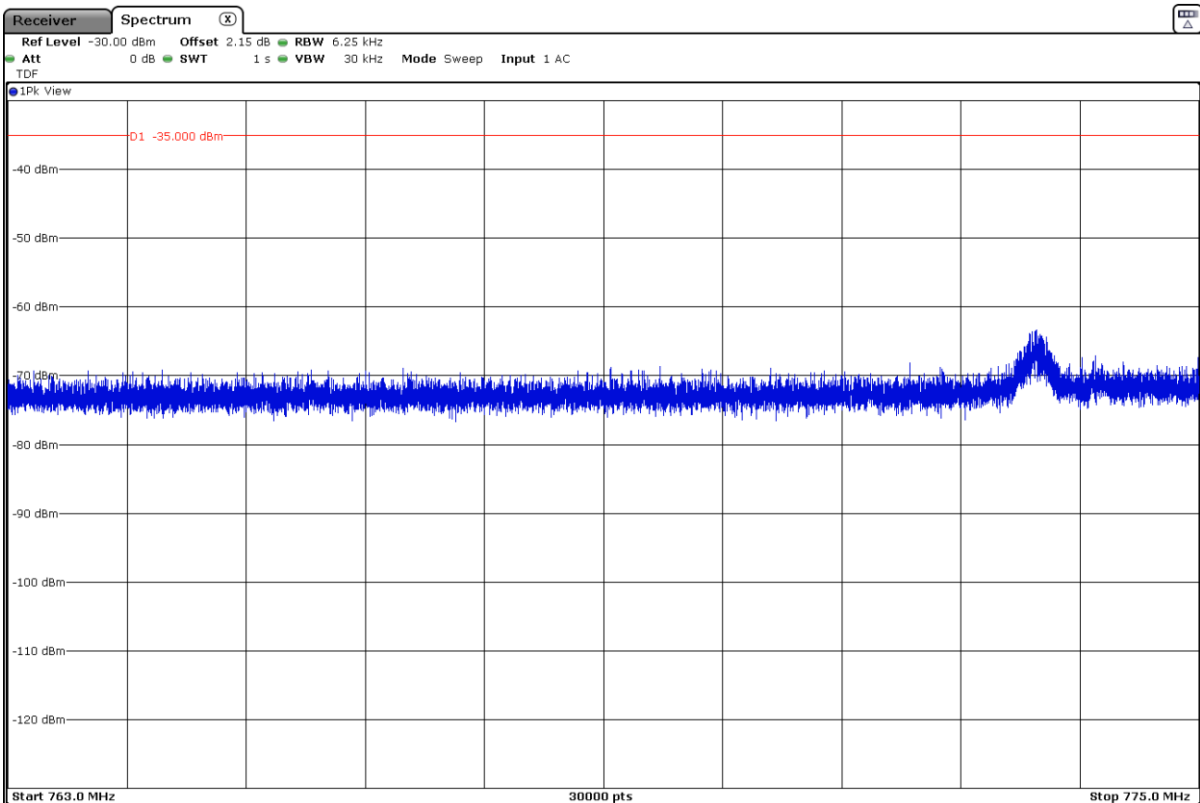


FREQUENCY RANGE 763 - 775 MHz (worst case):

- Low Channel:

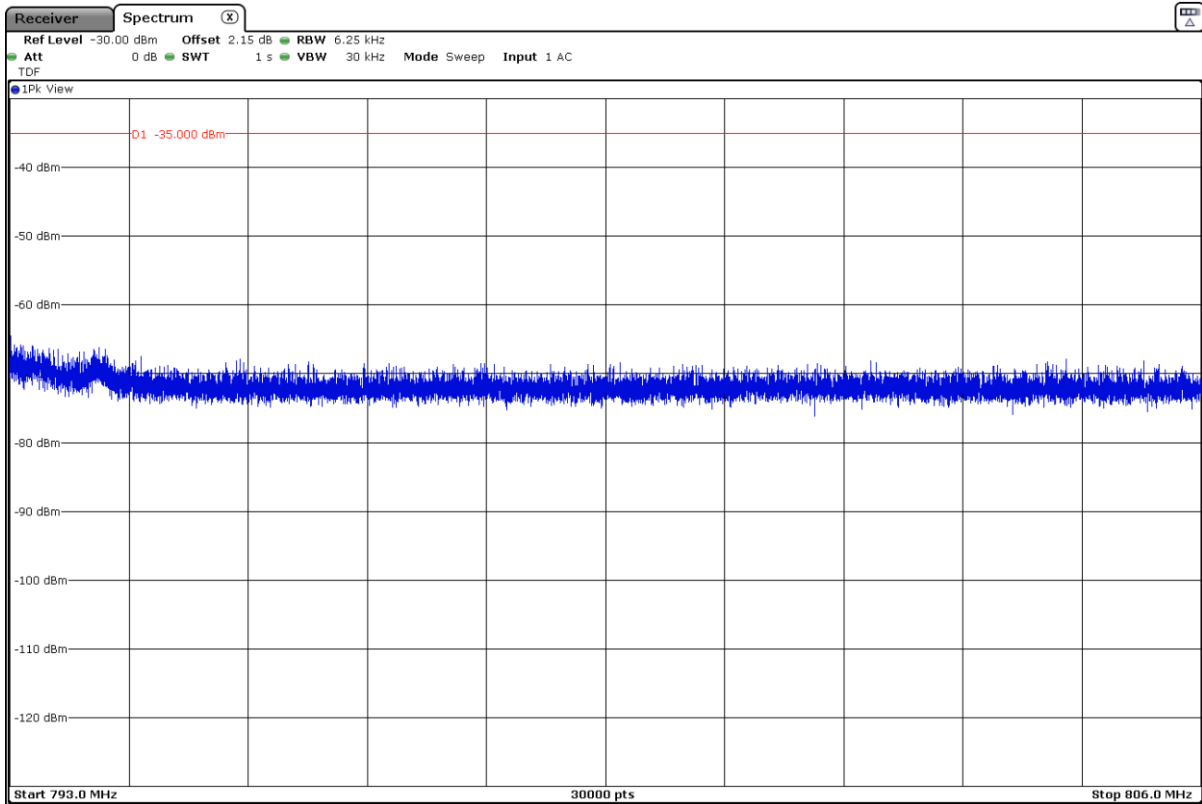


- High Channel:

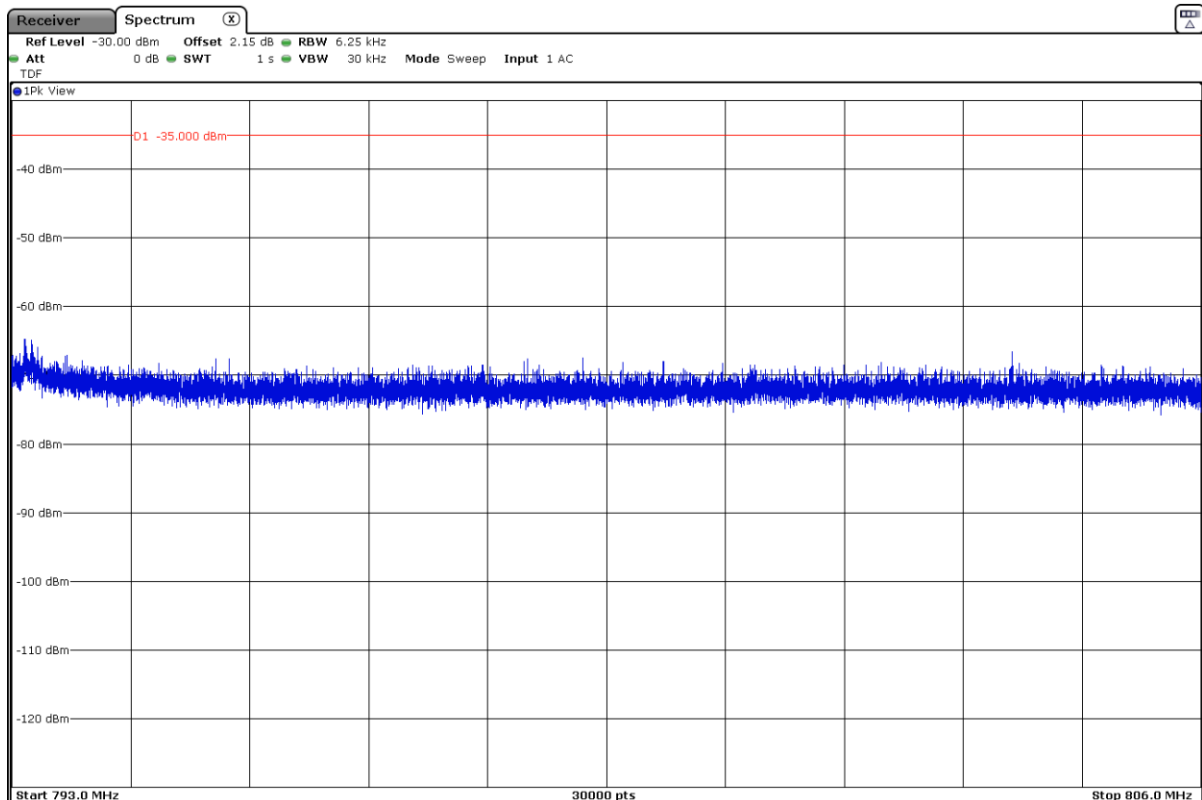


FREQUENCY RANGE 793 - 806 MHz (worst case):

- Low Channel:

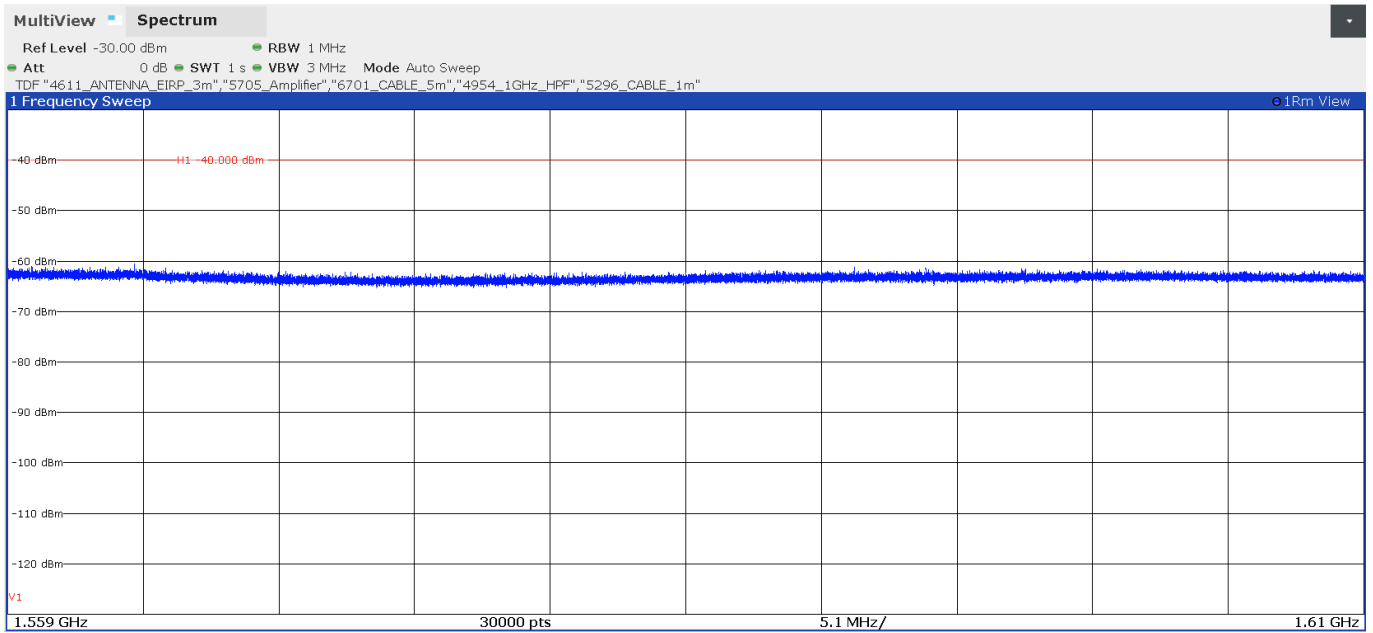


- High Channel:

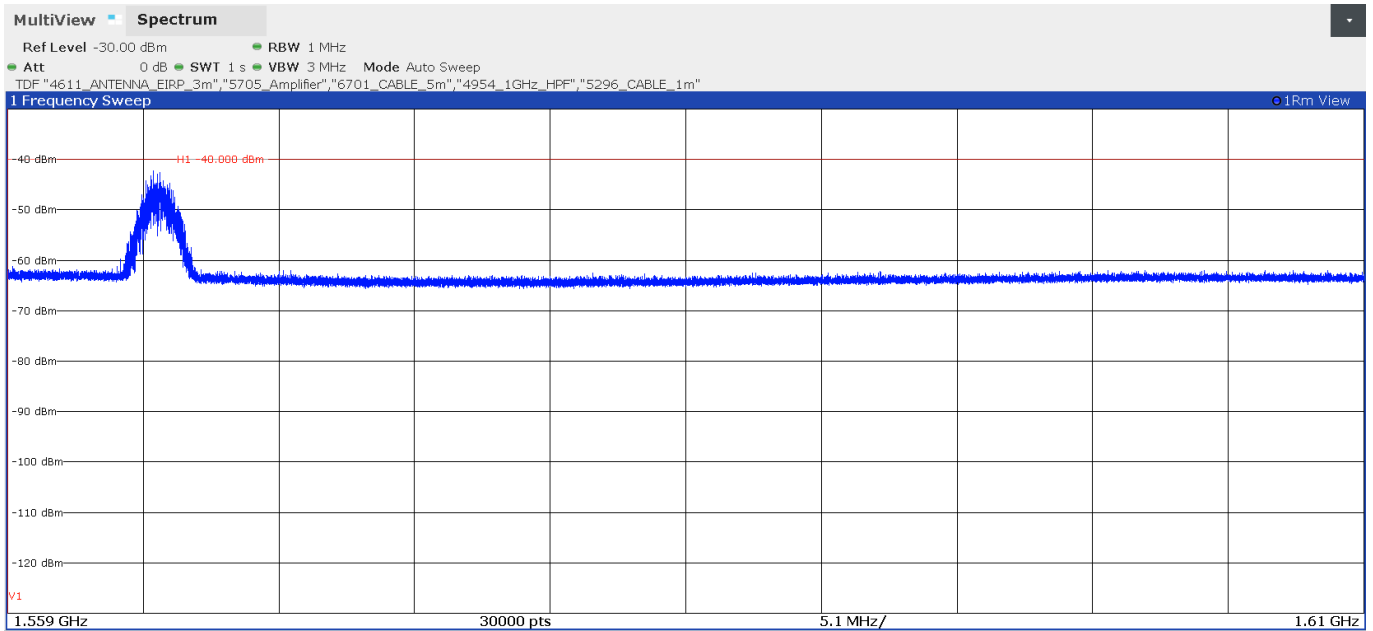


FREQUENCY RANGE 1559 - 1610 MHz (worst case):

- Low Channel:



- High Channel:



LTE Band 41:

QPSK and QAM modulations: A preliminary scan determined the QPSK modulation, modules NAD1 and NAD2
 Nominal Bandwidth 20 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:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
55.333	-44.91	V	Peak	<±4.99

Frequency range 1 - 27 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
2.4937	-33.37	V	RMS	<±4.98
2.4951	-30.35	V	RMS	<±4.98

Frequency range 2490.5 - 2496 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
2.4942328	-28.91	V	RMS	<±4.98
2.4949978	-25.65	V	RMS	<±4.98
2.4956275	-28.1	V	RMS	<±4.98
2.4957655	-27.05	V	RMS	<±4.98
2.4959915	-25.17	V	RMS	<±4.98

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
56.627	-44.15	V	Peak	<±4.99

Frequency range 1 - 27 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
7.75225	-43.06	V	RMS	<±4.98

Frequency range 2490.5 - 2496 MHz:

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

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
56.659	-44.1	V	Peak	<±4.99

Frequency range 1 - 27 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
8.00725	-40.57	V	RMS	<±4.98

Frequency range 2490.5 - 2496 MHz:

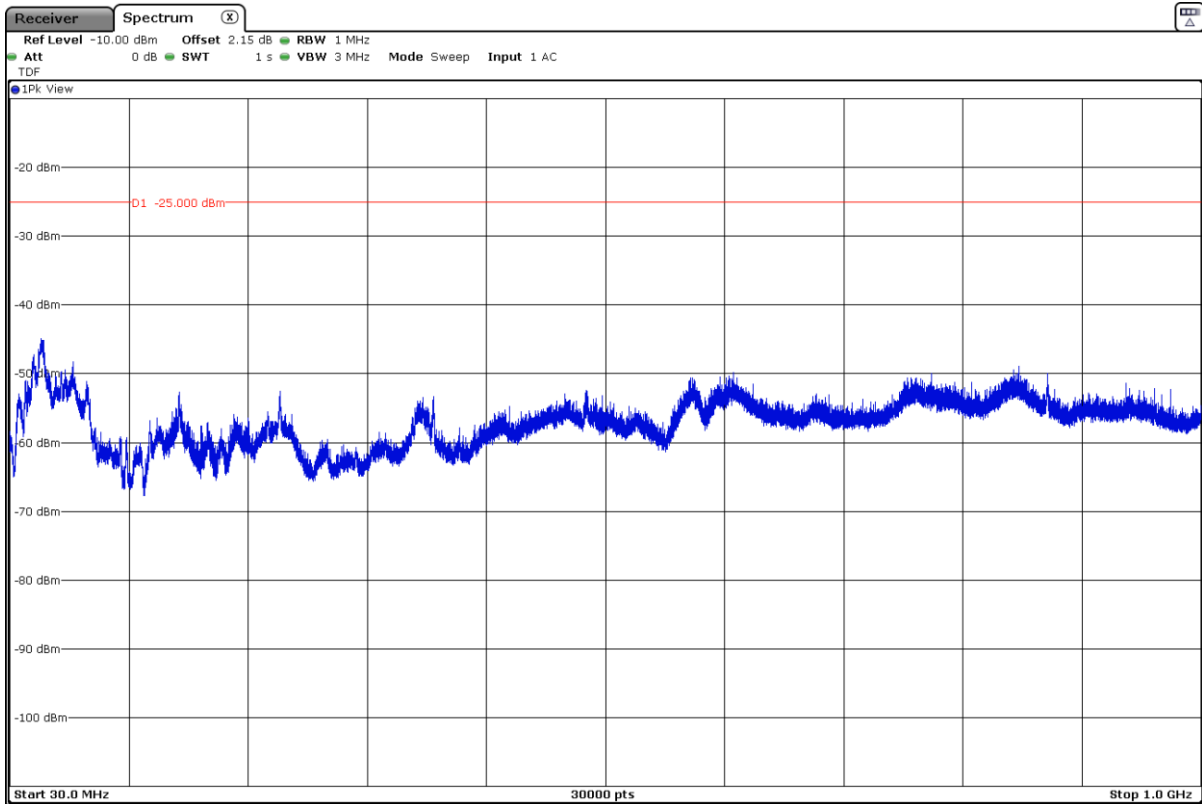
No spurious frequencies at less than 20 dB below the limit.

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 26 GHz
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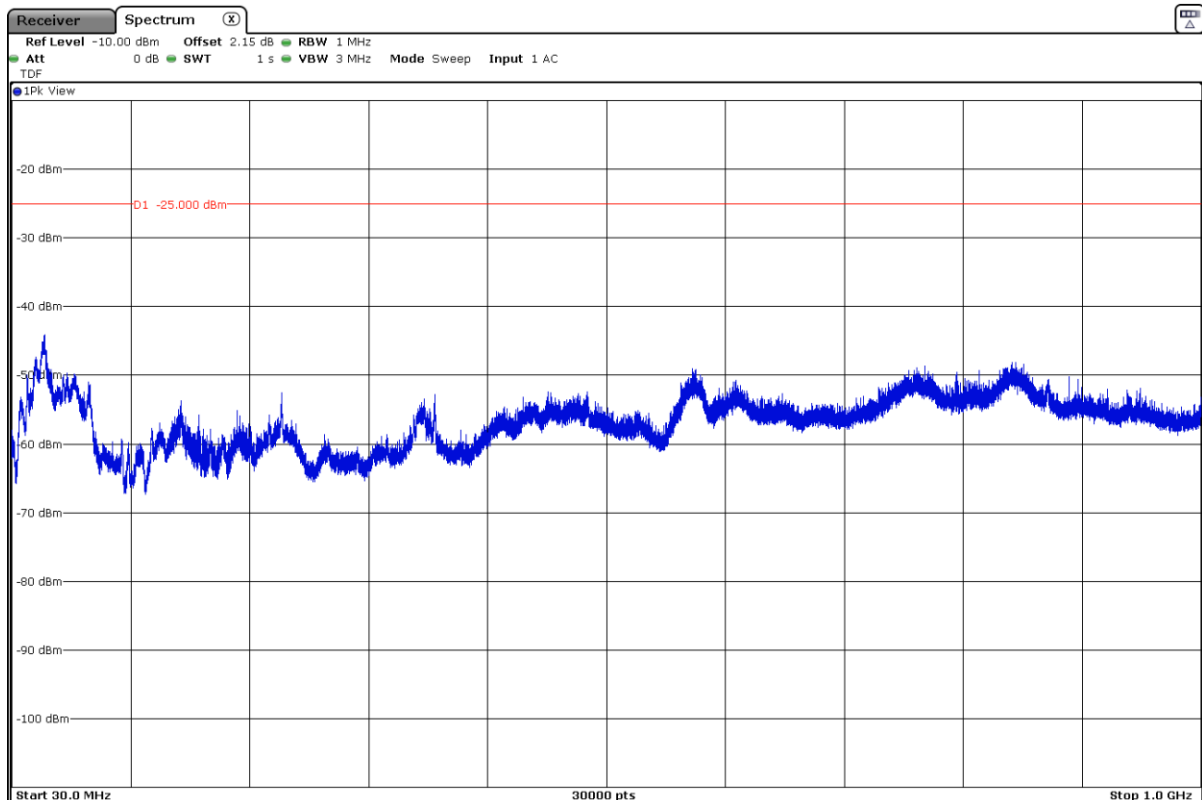
Verdict: PASS

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

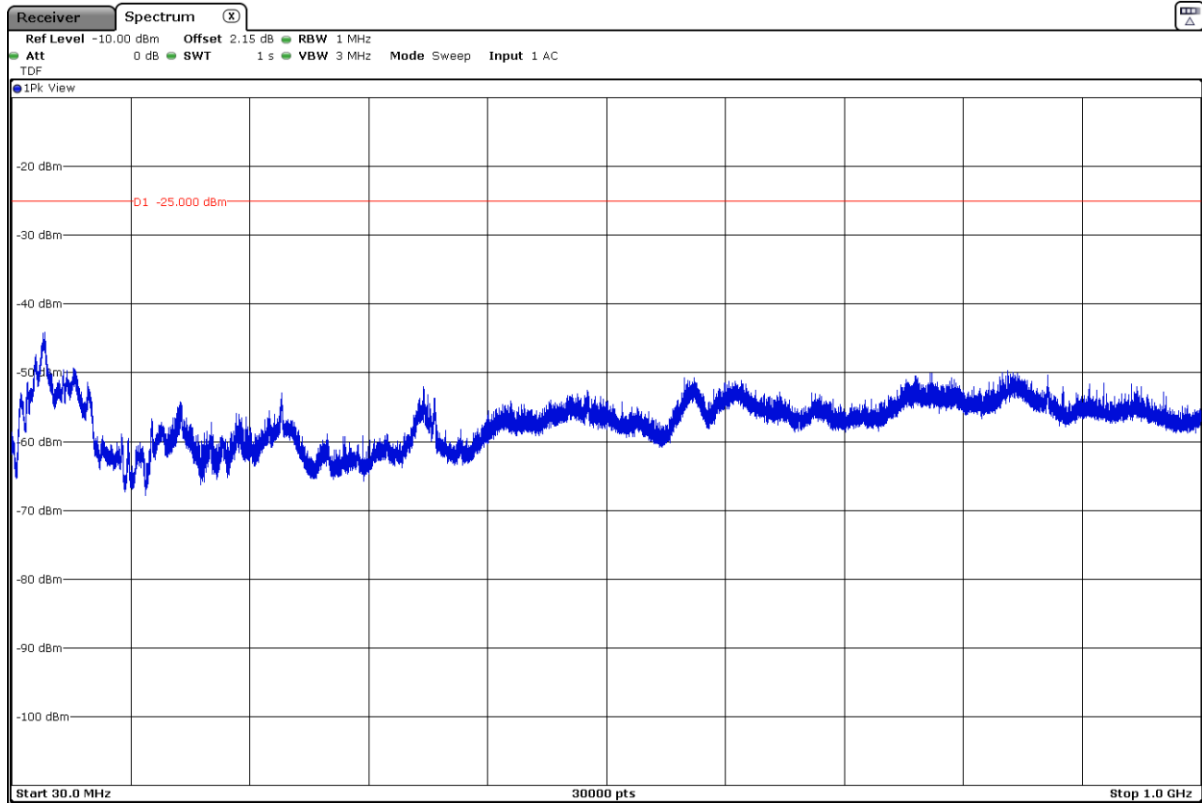
- Low Channel:



- Middle Channel:

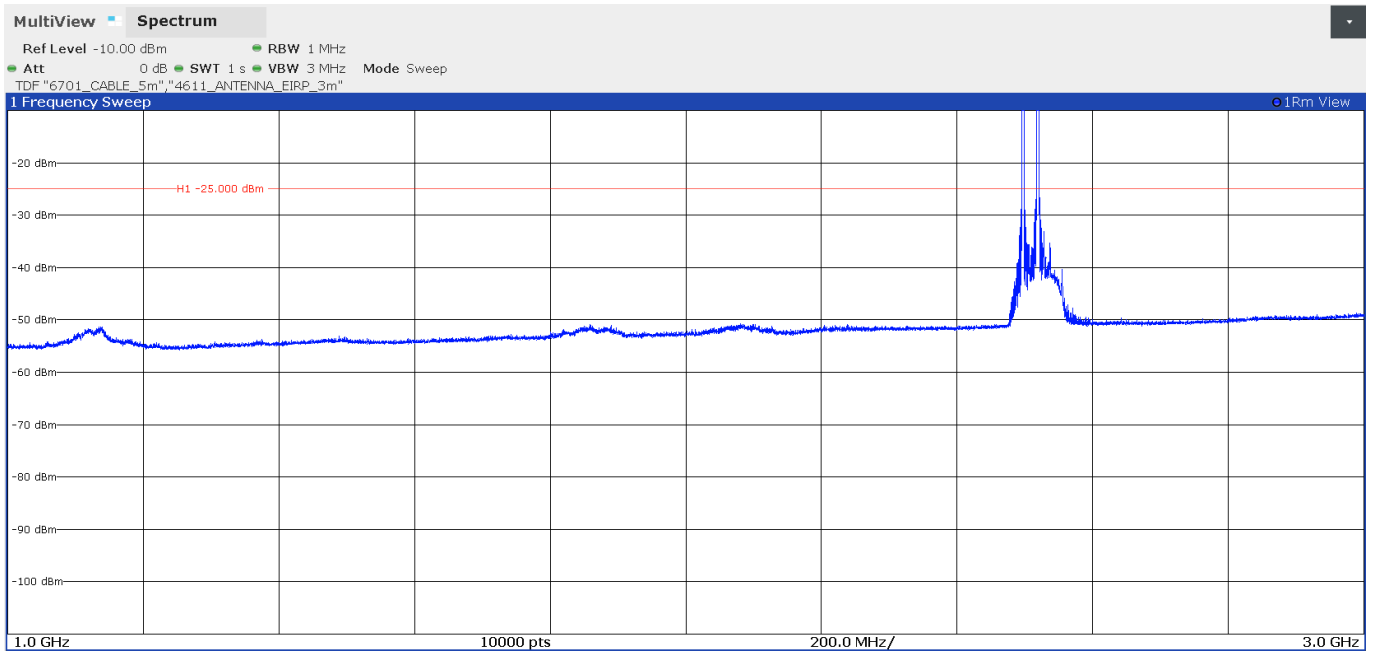


- High Channel:



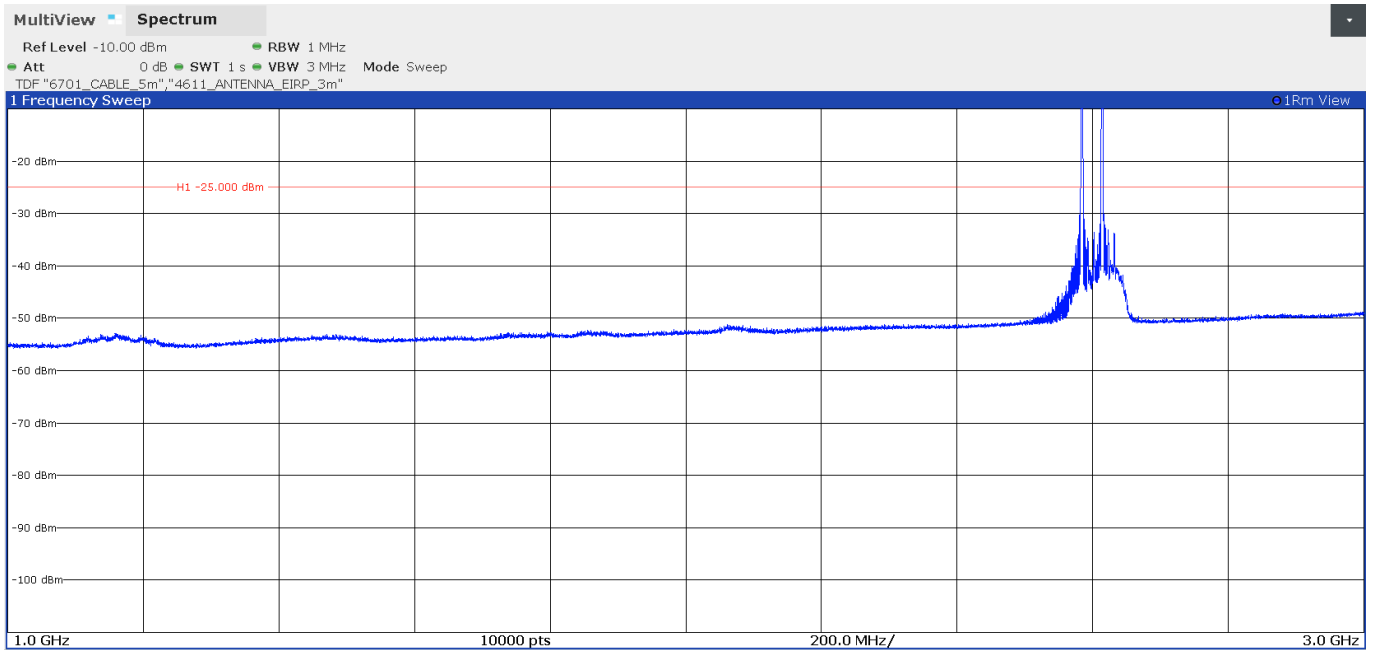
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



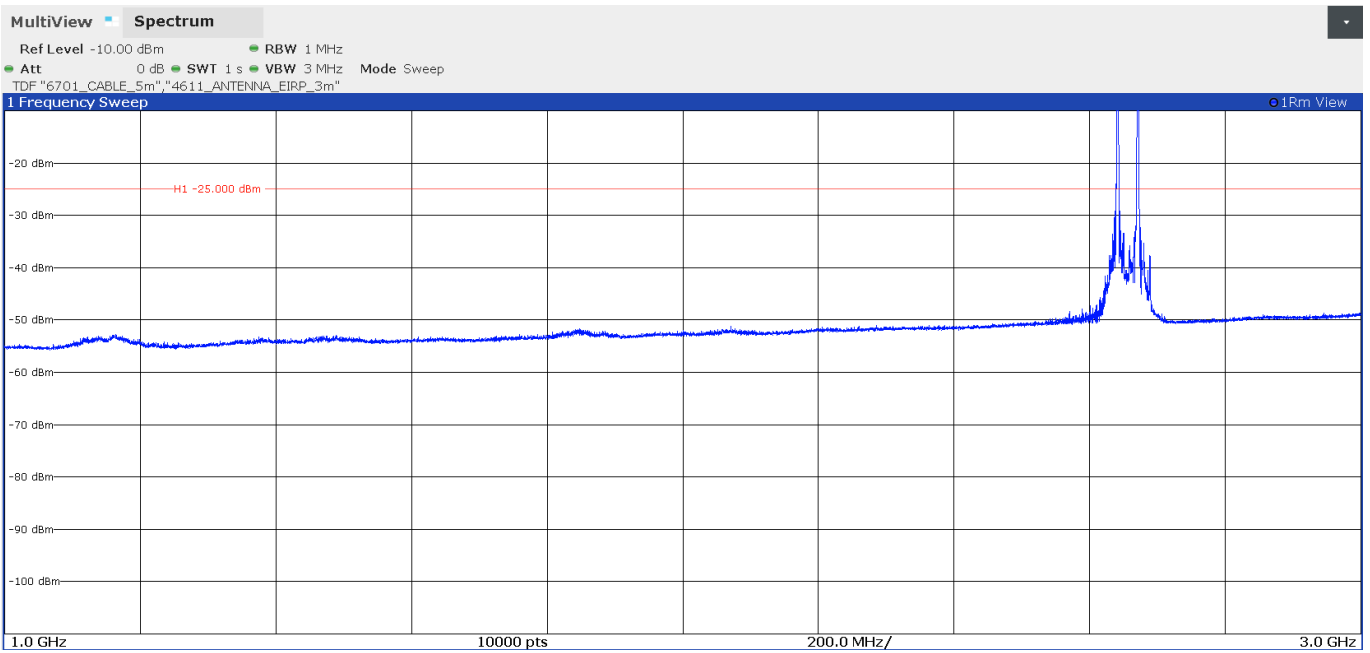
The peaks above the limit are the carrier frequencies.

- Middle Channel:



The peaks above the limit are the carrier frequencies.

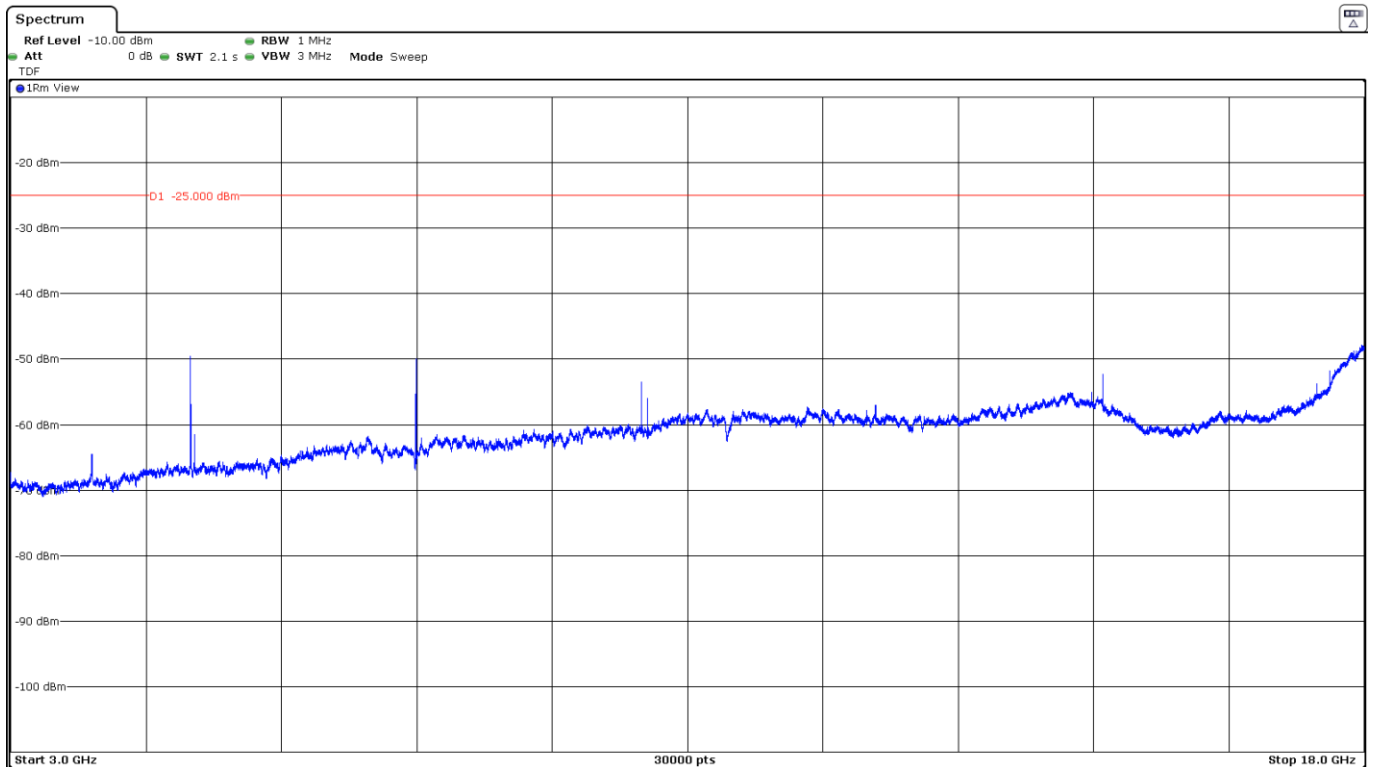
- High Channel:



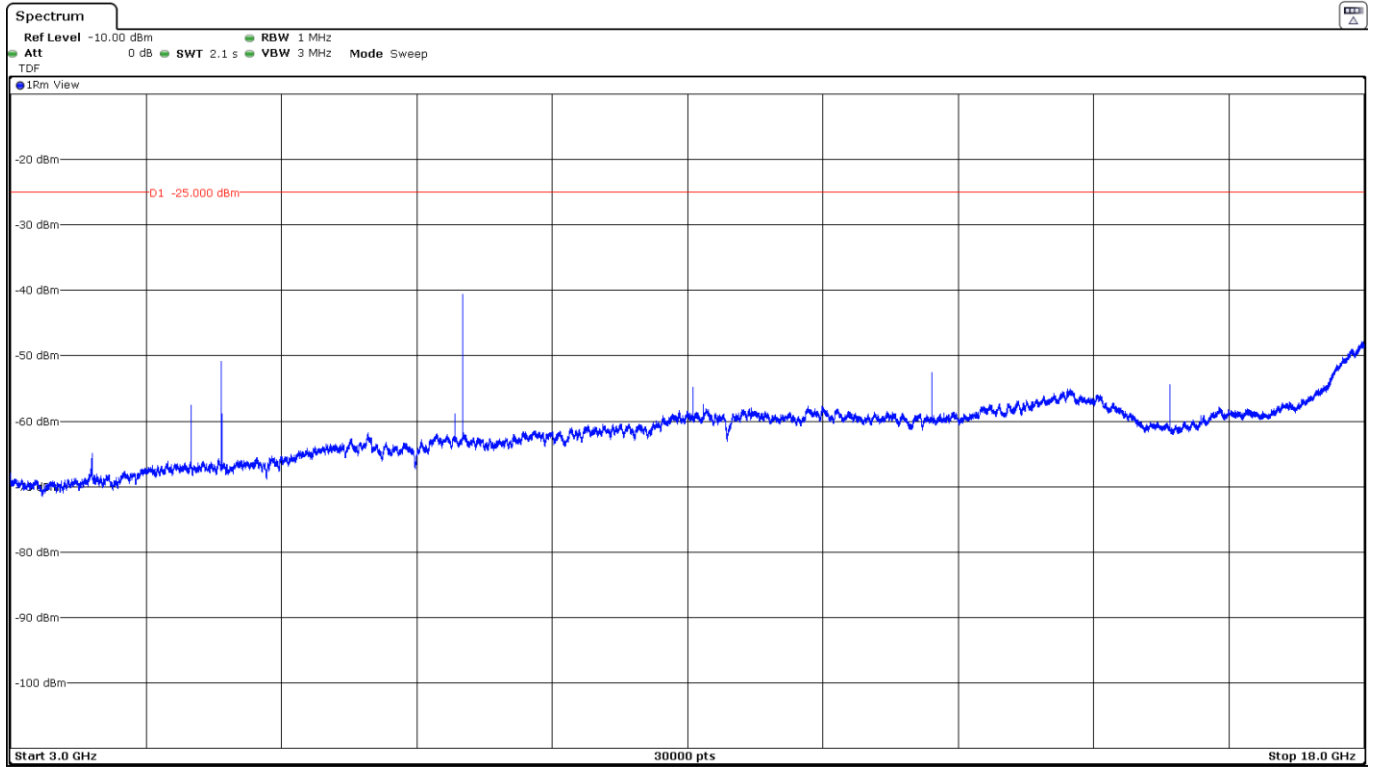
The peaks above the limit are the carrier frequencies.

FREQUENCY RANGE 3 - 18 GHz (worst case):

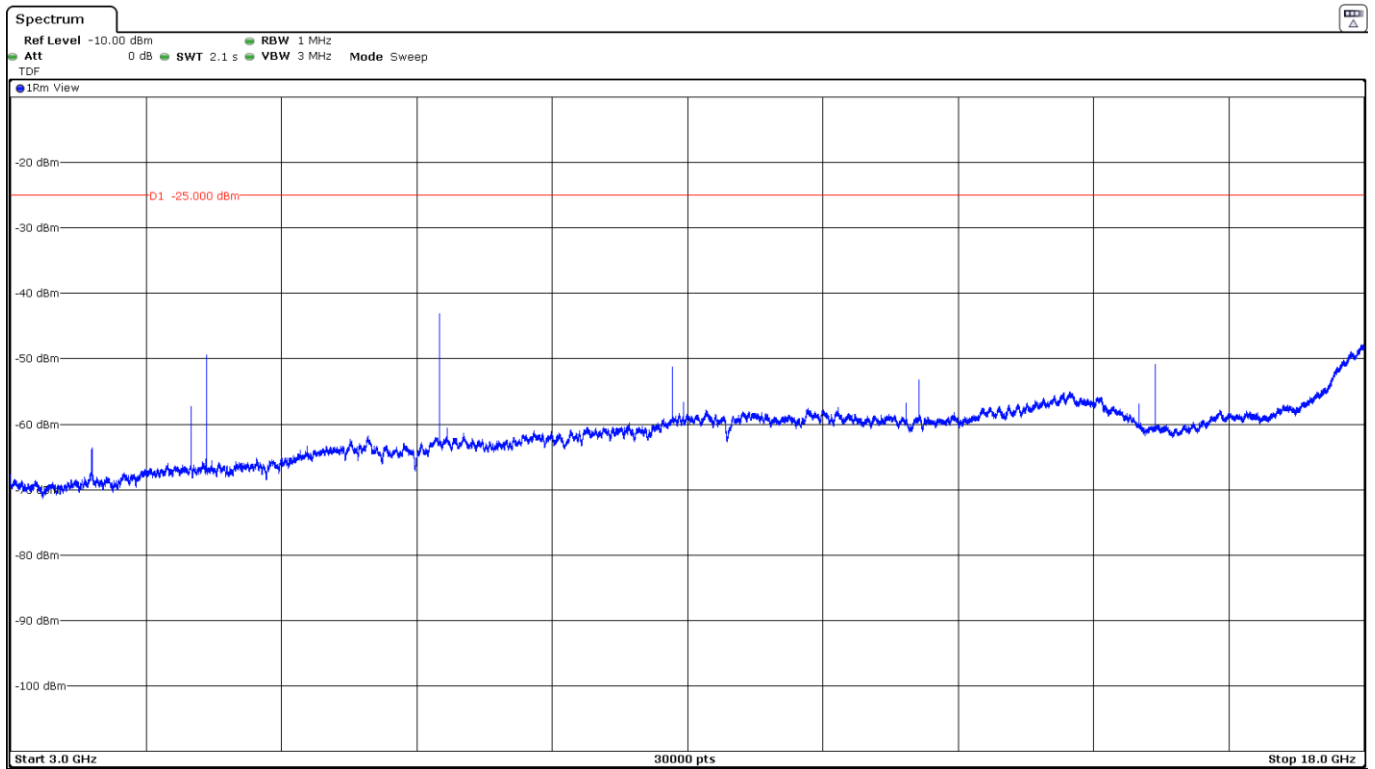
- Low Channel:



- Middle Channel:

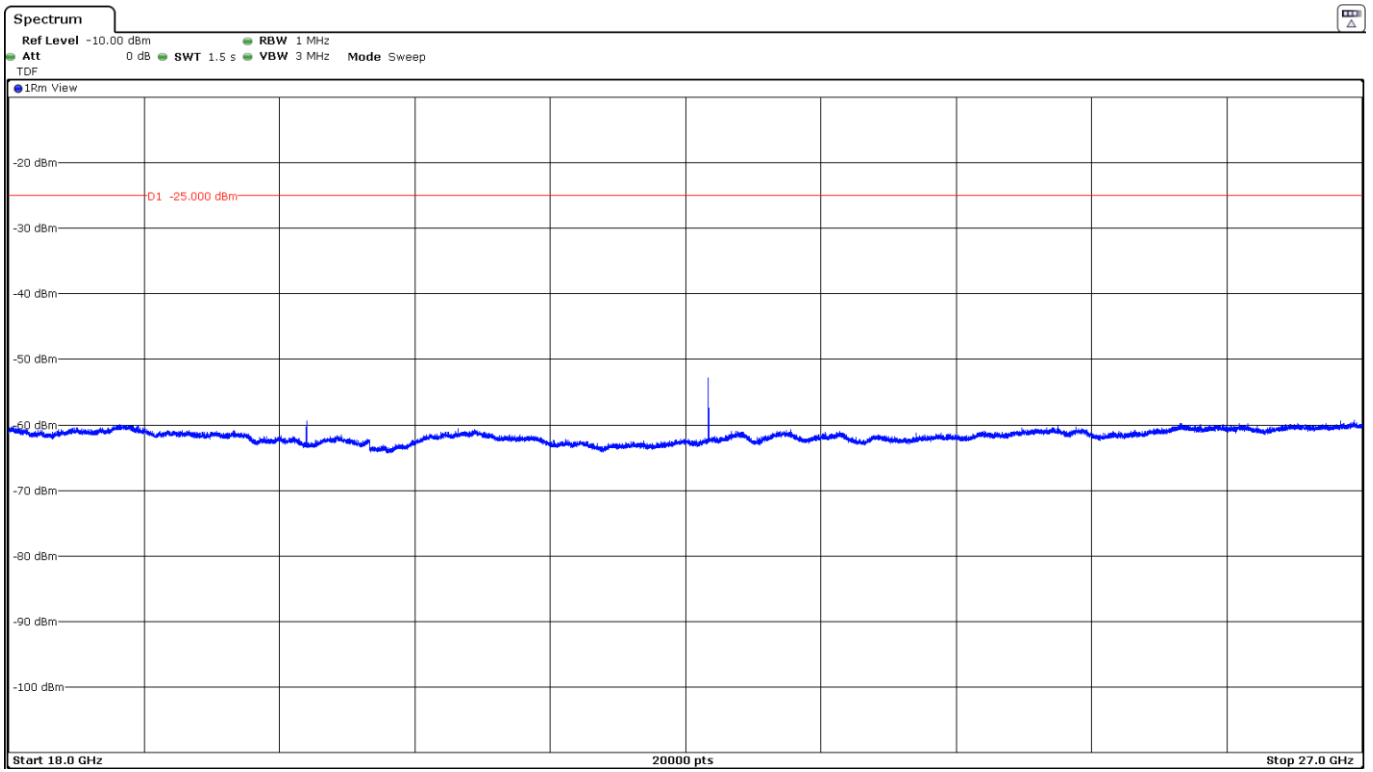


- High Channel:

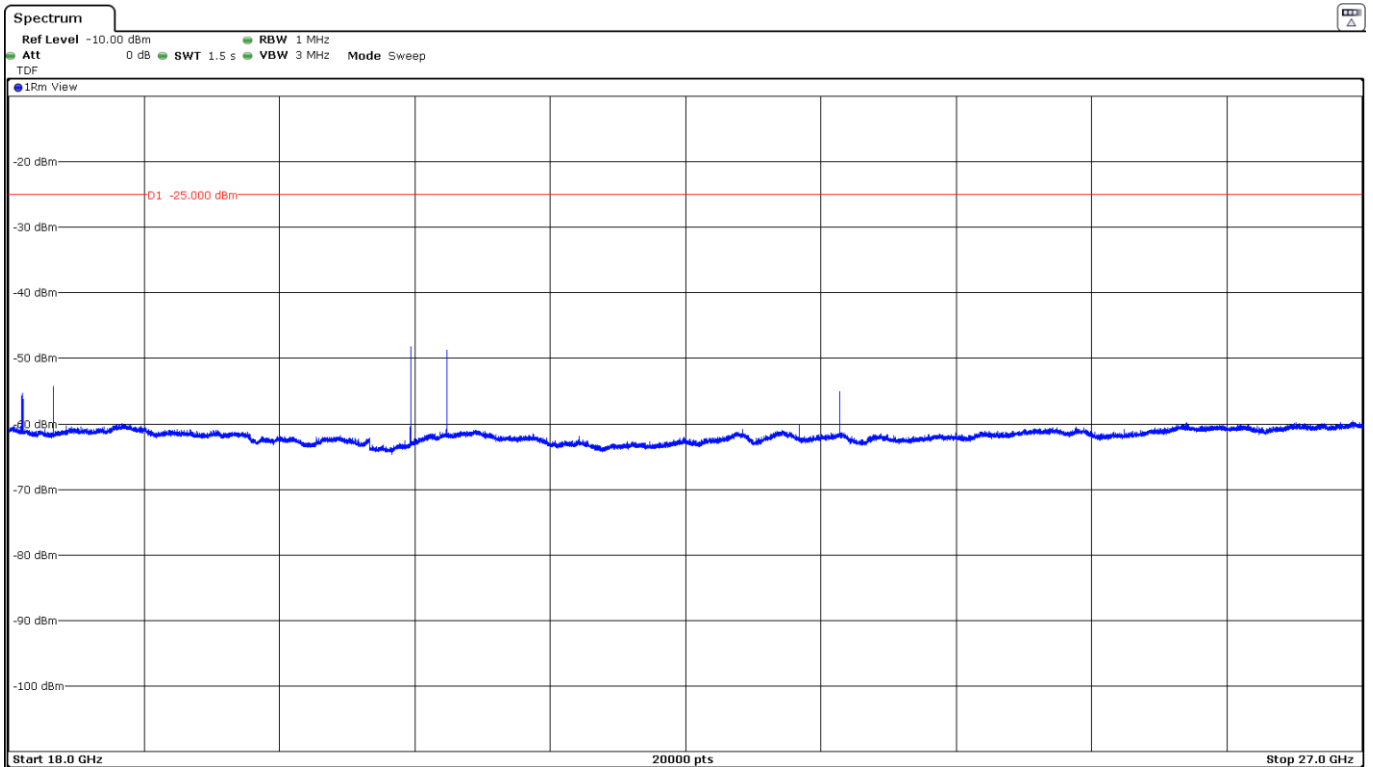


FREQUENCY RANGE 18 - 27 GHz (worst case):

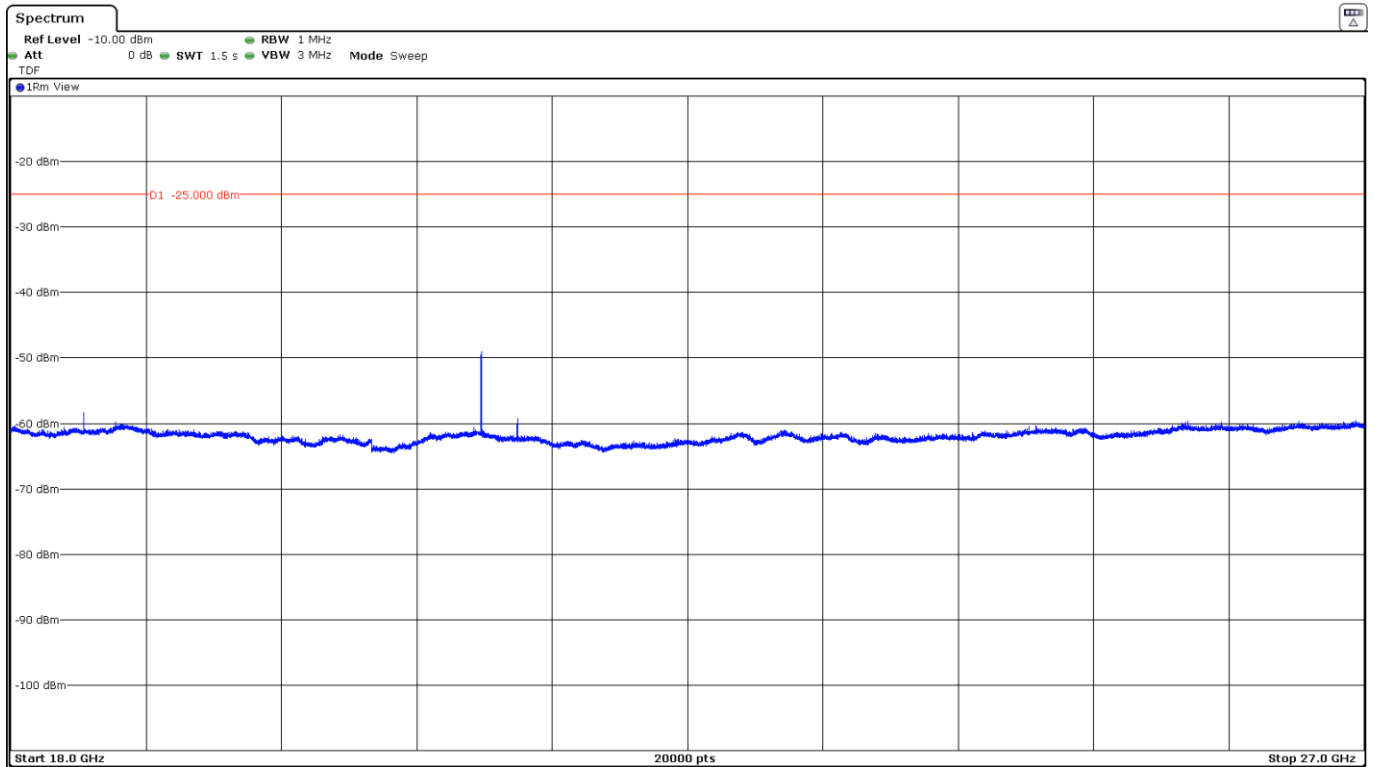
- Low Channel:



- Middle Channel:



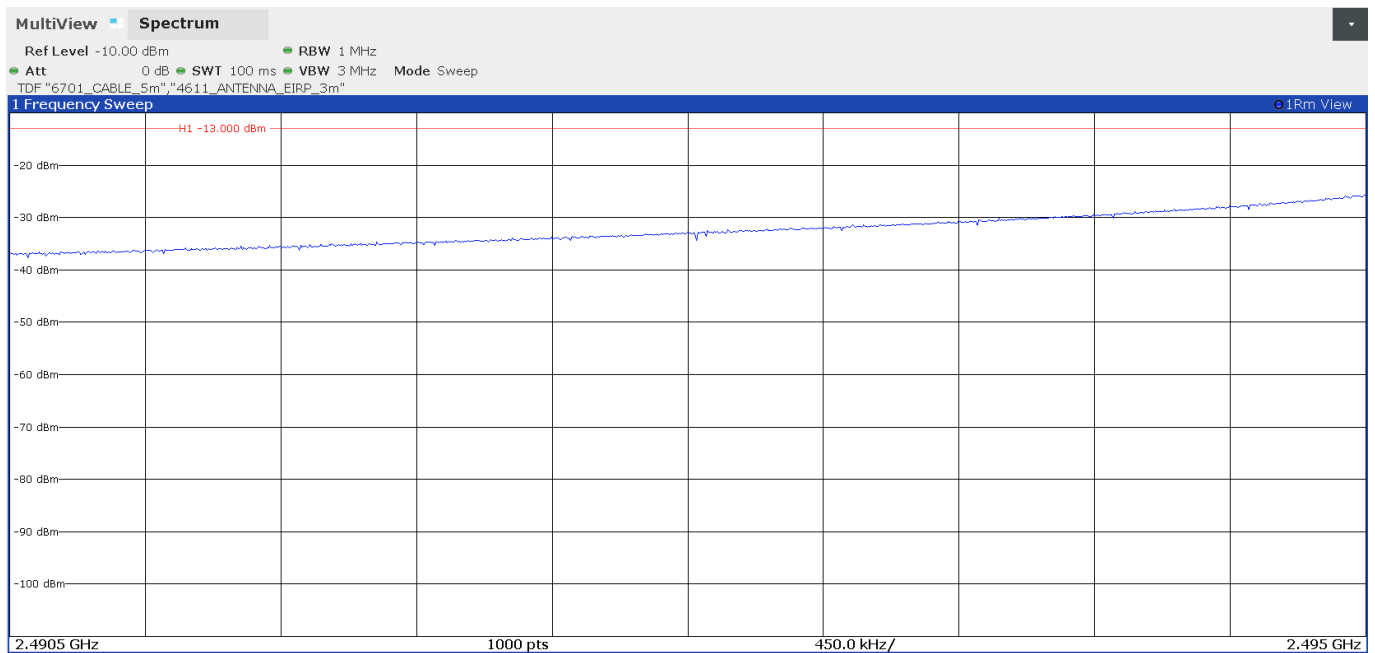
- High Channel:



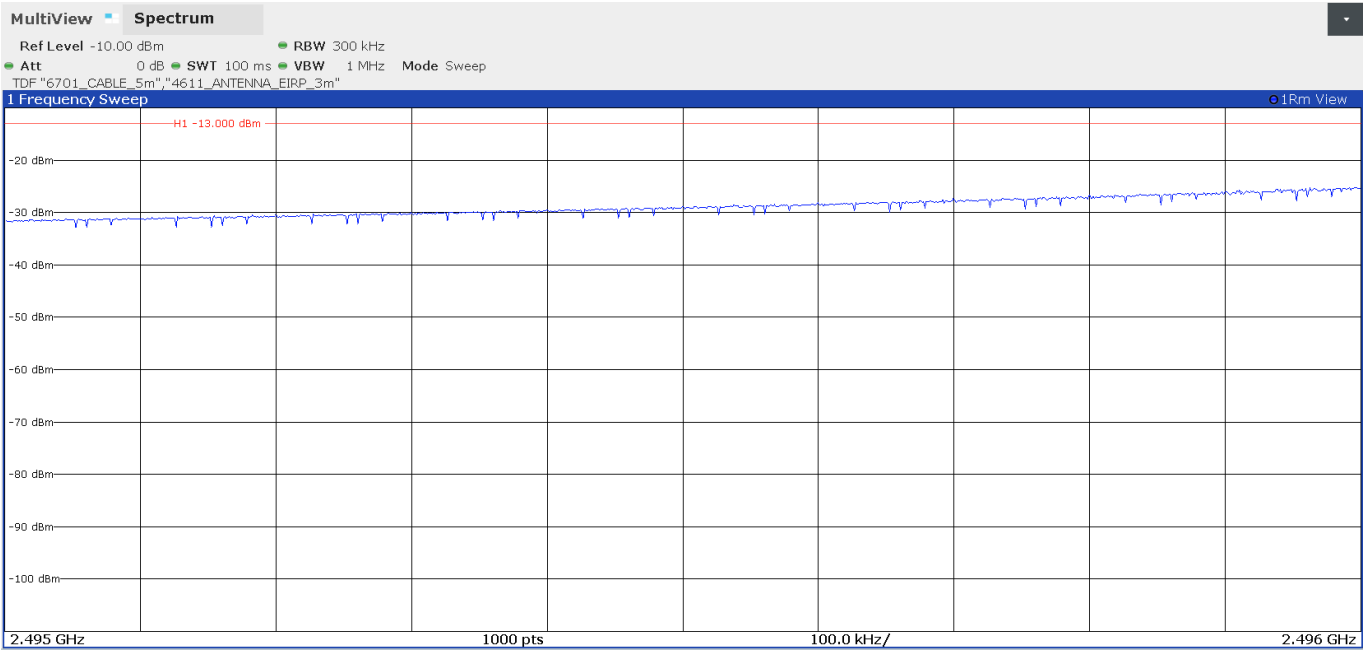
This plot shows the results of the scan using RMS detector.

FREQUENCY RANGE 2490.5 - 2496 MHz (worst case):

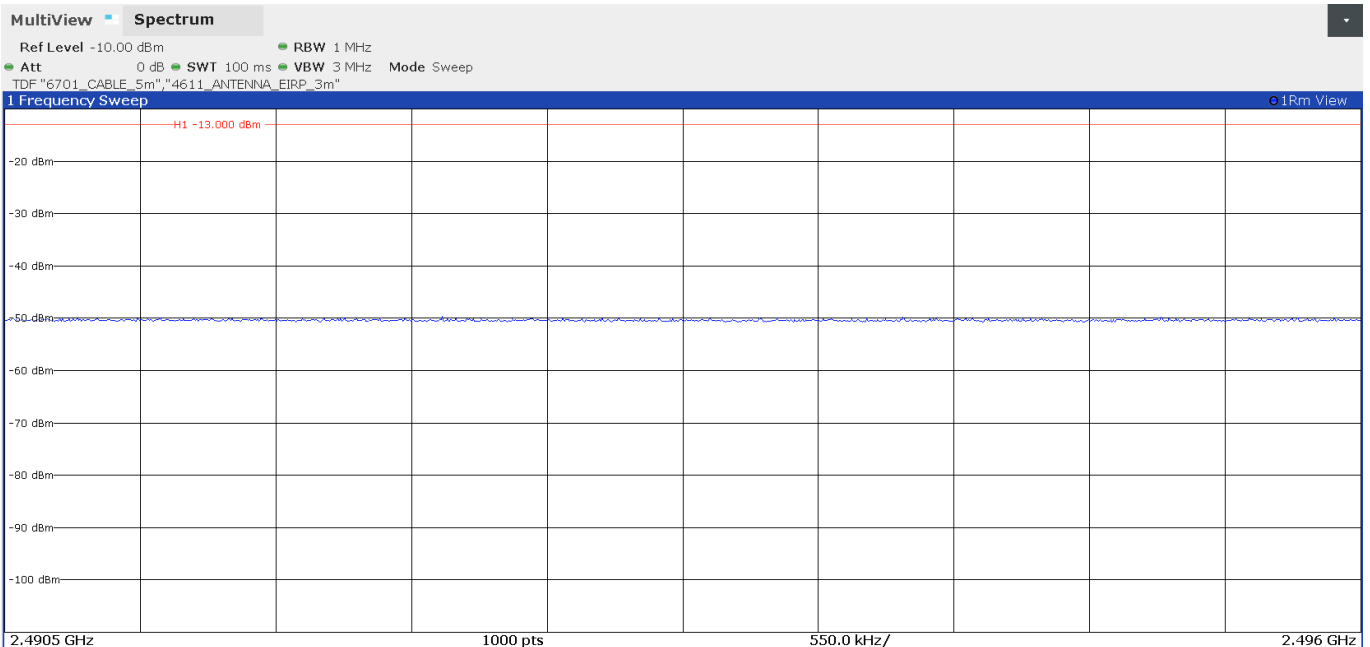
- Low Channel:



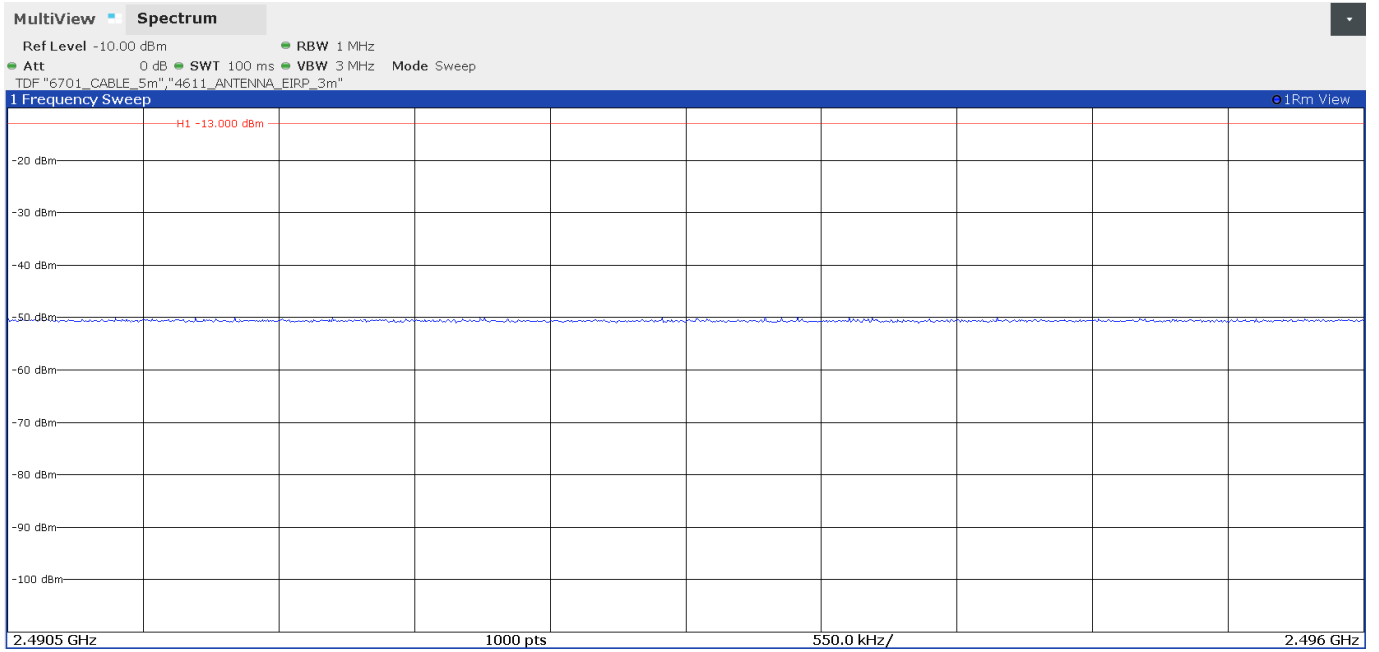
This plot shows the results of the scan using RMS detector.



- Middle Channel:



- High Channel:



LTE Band 66:

QPSK and 16QAM modulations: A preliminary scan determined the QPSK modulation, modules NAD1 and NAD2 Nominal Bandwidth 3 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	Measurement Uncertainty (dB)
1.7011	-27.07	V	Peak	<± 4.98
3.42025	-30.35	V	Peak	<± 4.98

- 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.

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

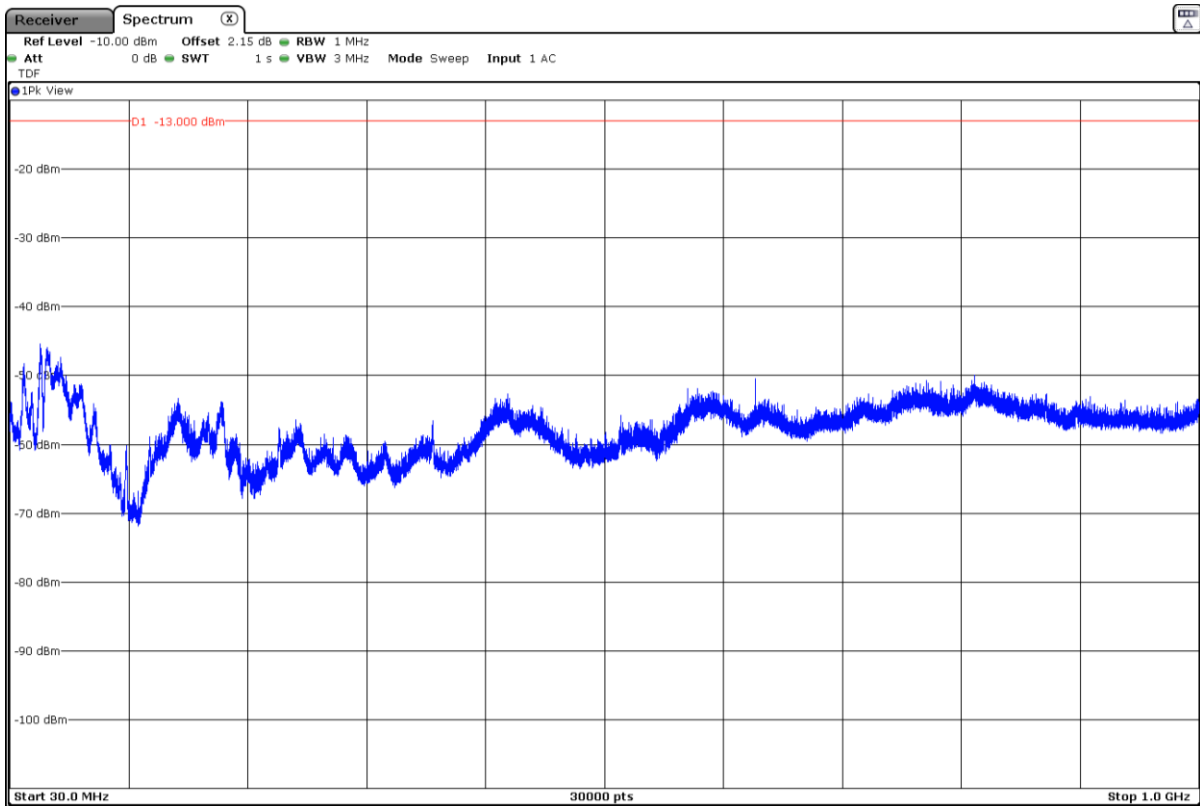
No spurious frequencies at less than 20 dB below the limit.

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 18 GHz
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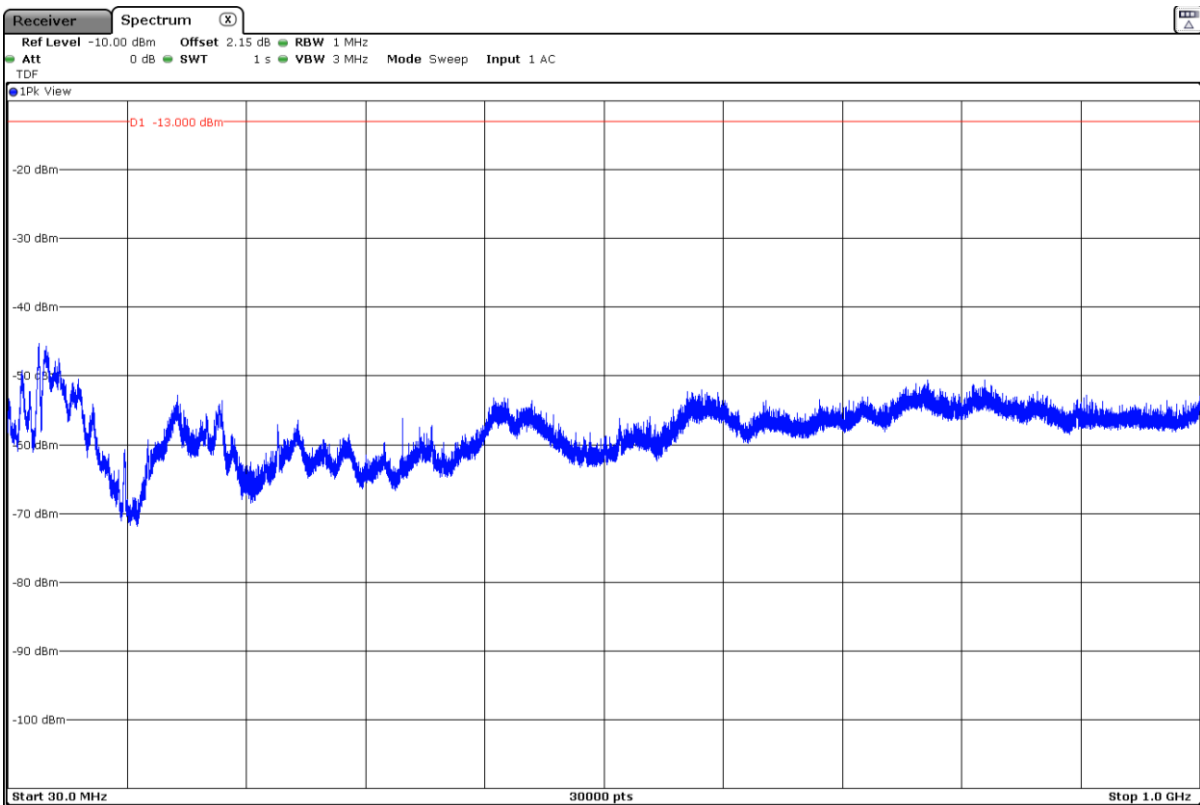
Verdict: PASS

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

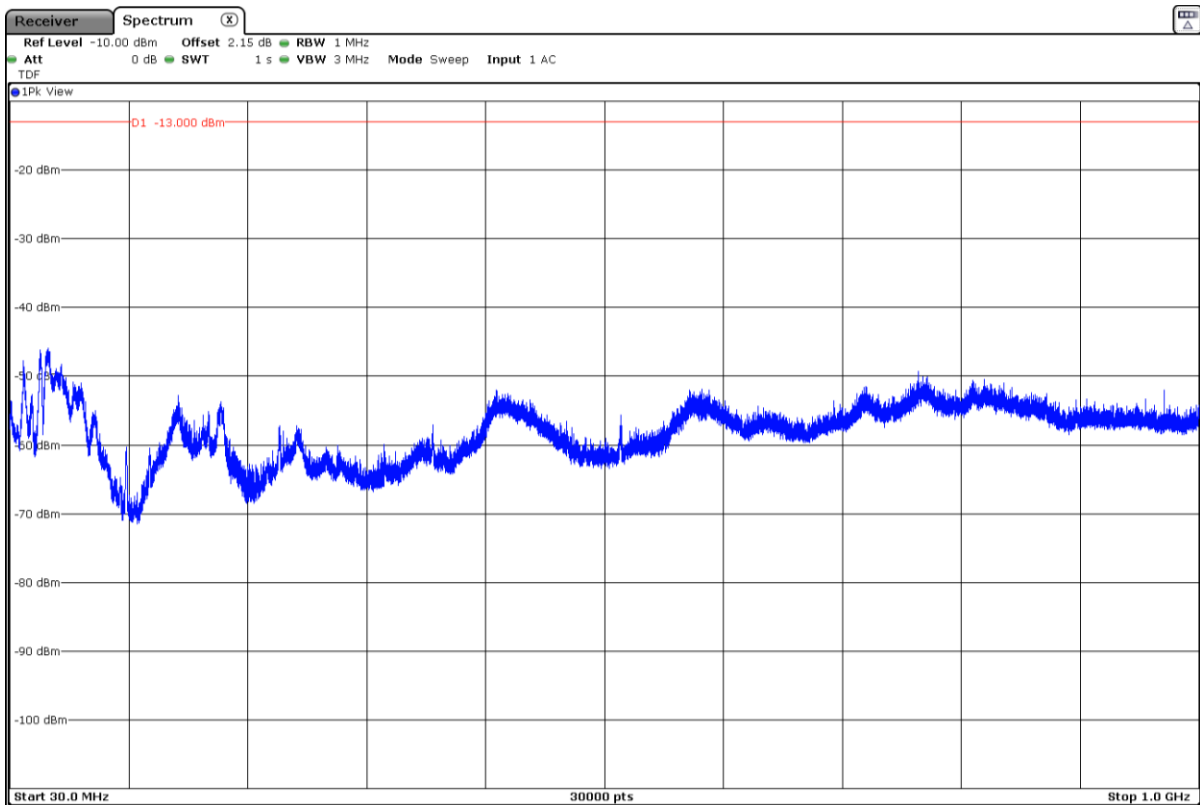
- Low Channel:



- Middle Channel:

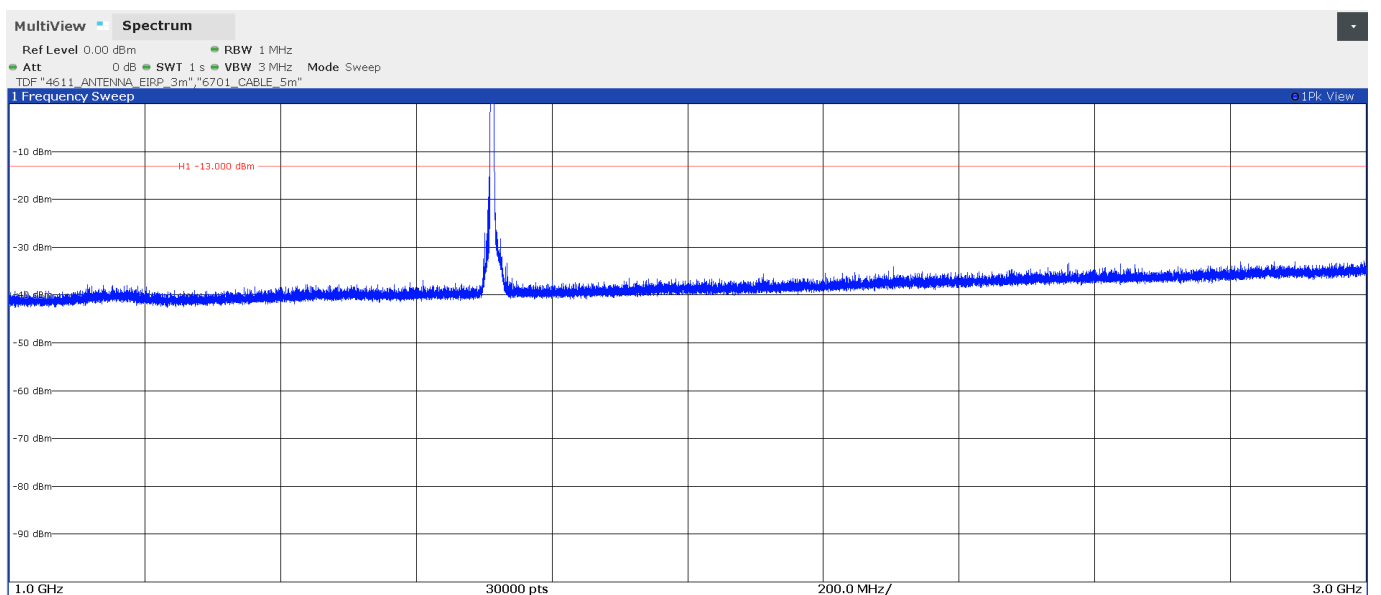


- High Channel:



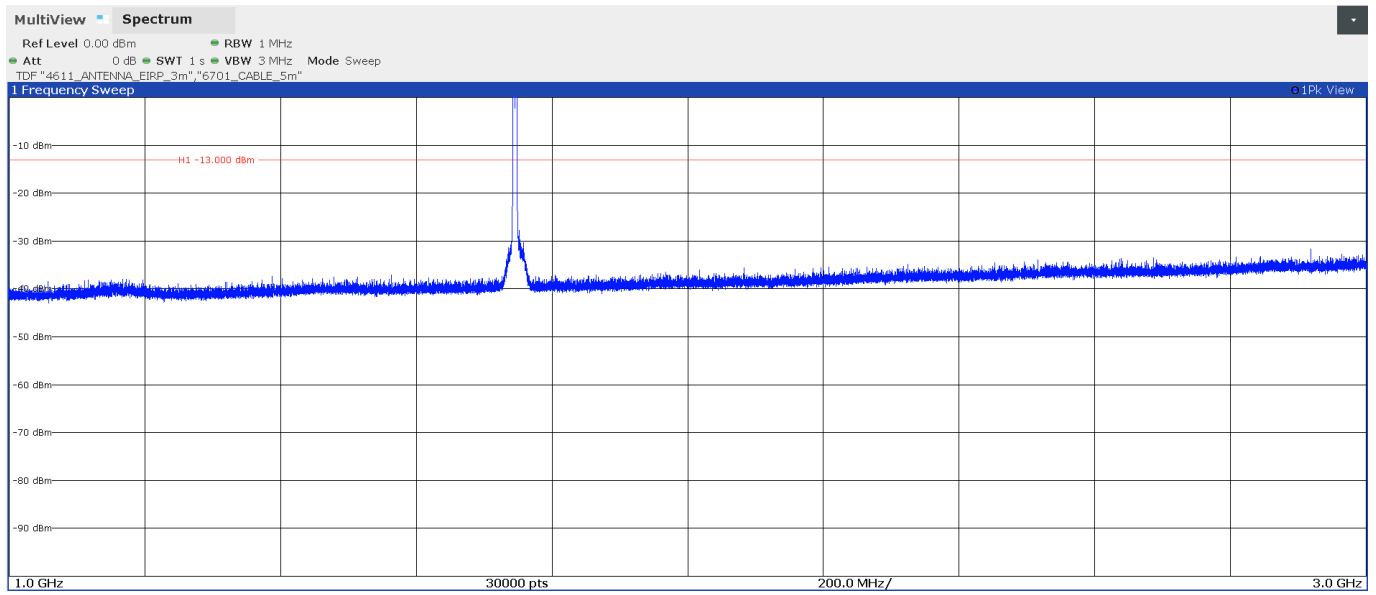
FREQUENCY RANGE 1 - 3 GHz (worst mode):

- Low Channel:



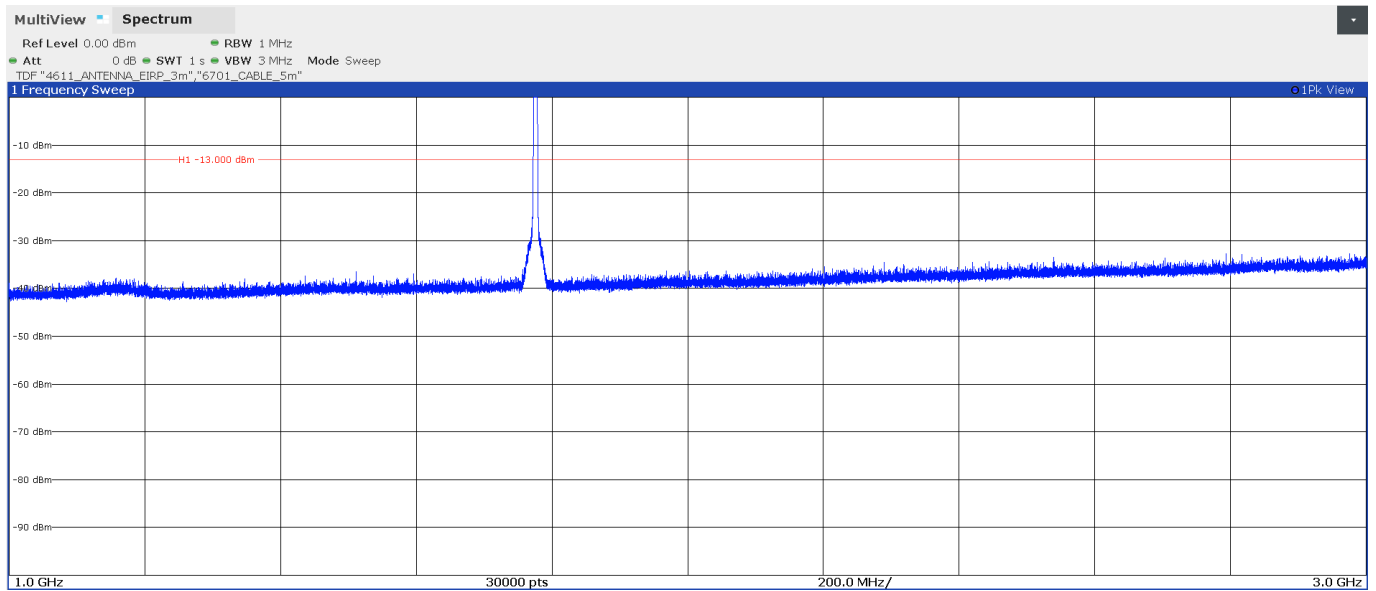
The peaks above the limit are the carrier frequencies.

- Middle Channel:



The peaks above the limit are the carrier frequencies.

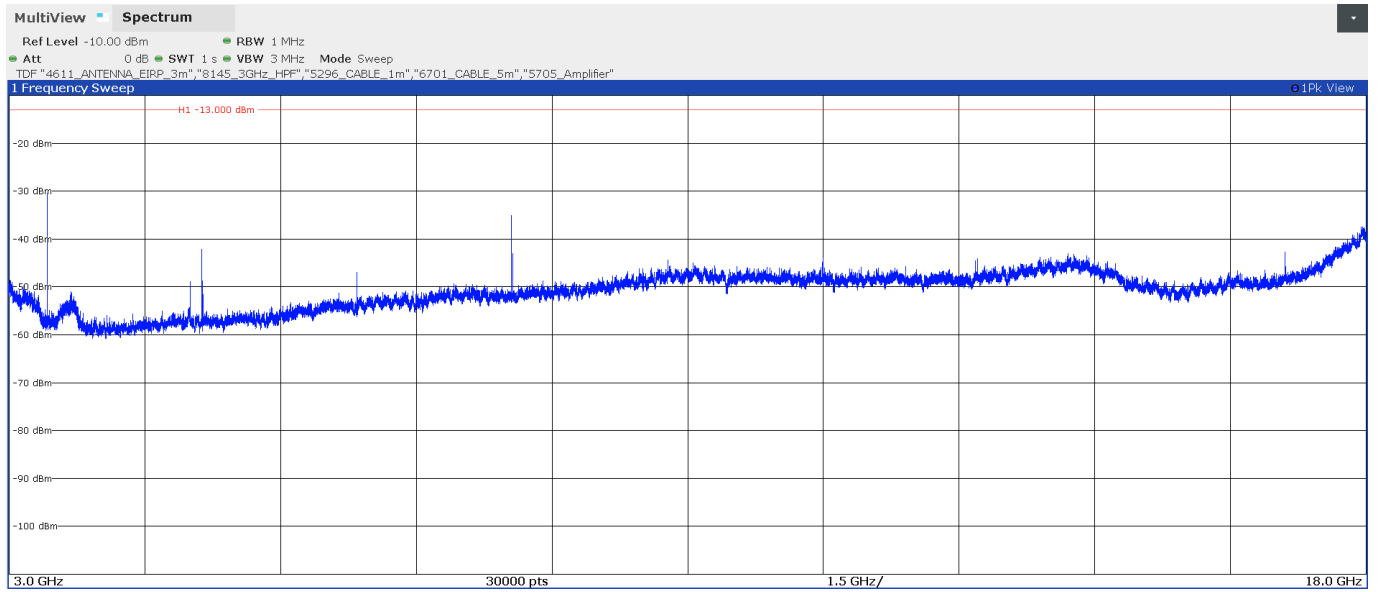
- High Channel:



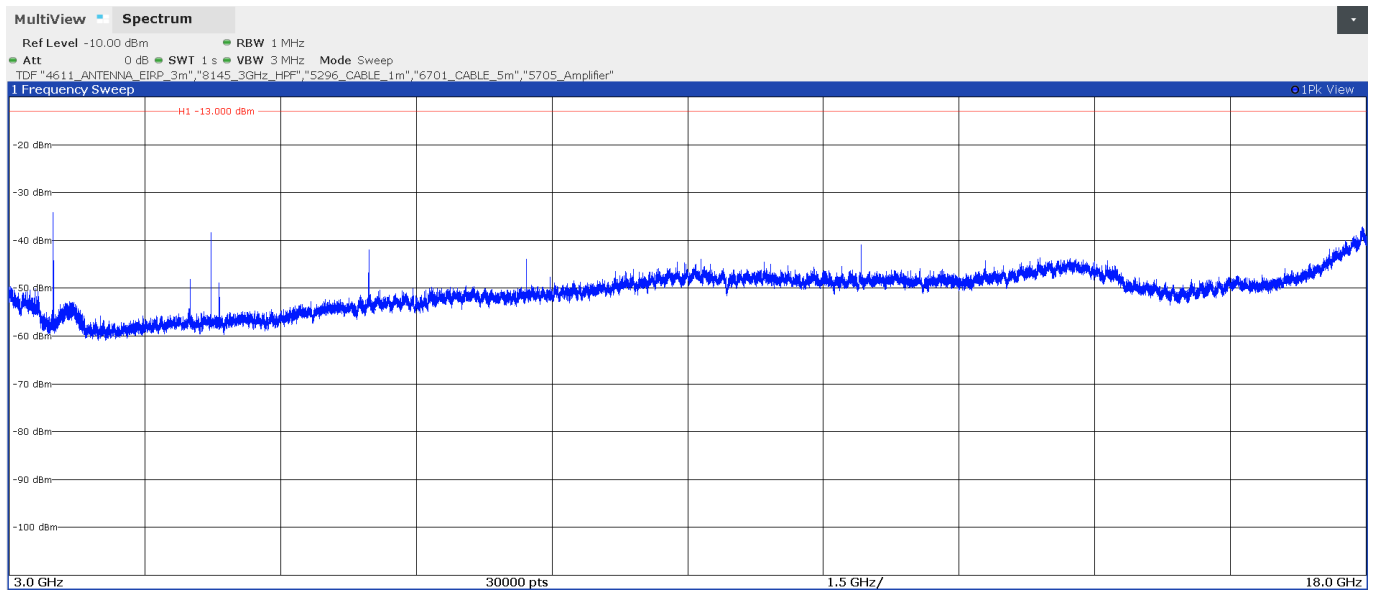
The peaks above the limit are the carrier frequencies.

FREQUENCY RANGE 3 - 18 GHz (worst mode):

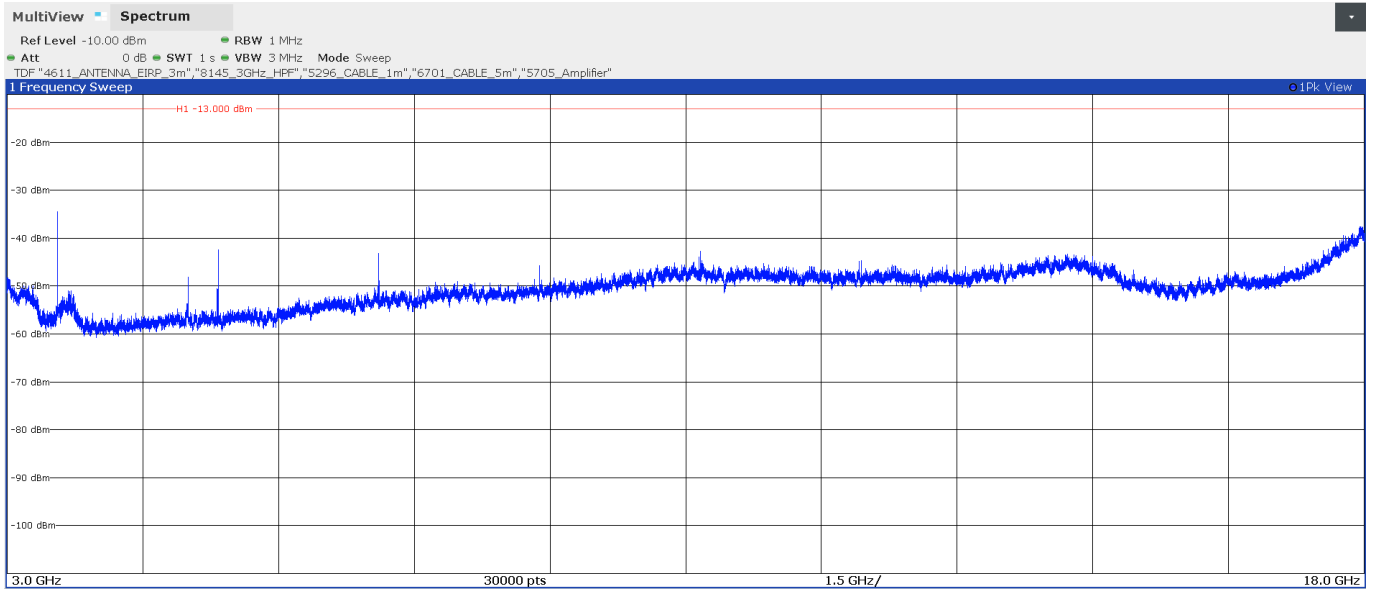
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 71:

QPSK and 16QAM modulations: A preliminary scan determined the QPSK modulation, module NAD1 Nominal Bandwidth 15 MHz and module NAD2 Nominal Bandwidth 10 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 - 8 GHz:

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

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector	Measurement Uncertainty (dB)
660.387	-31.75	V	Peak	<± 4.99
706.139	-26.3	V	Peak	<± 4.99

Frequency range 1 - 8 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 - 8 GHz:

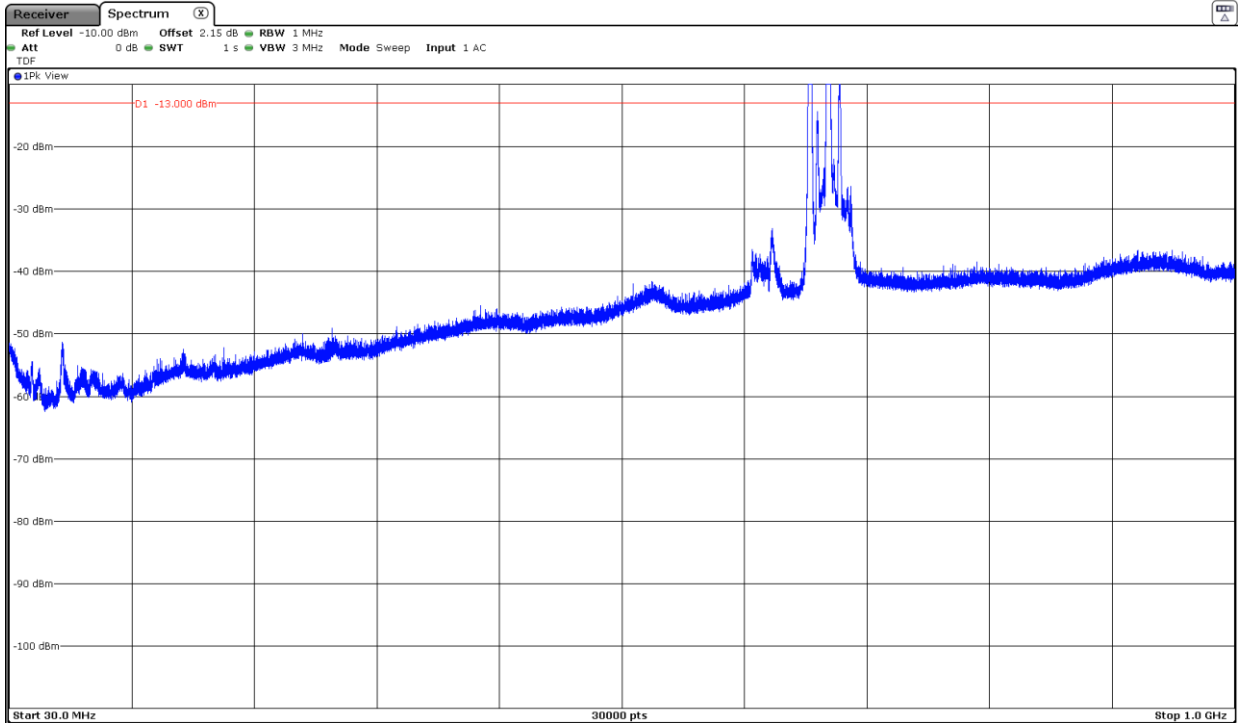
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB)	<± 4.99 for f < 1 GHz <± 4.98 for f ≥ 1 GHz up to 8 GHz
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Verdict: PASS

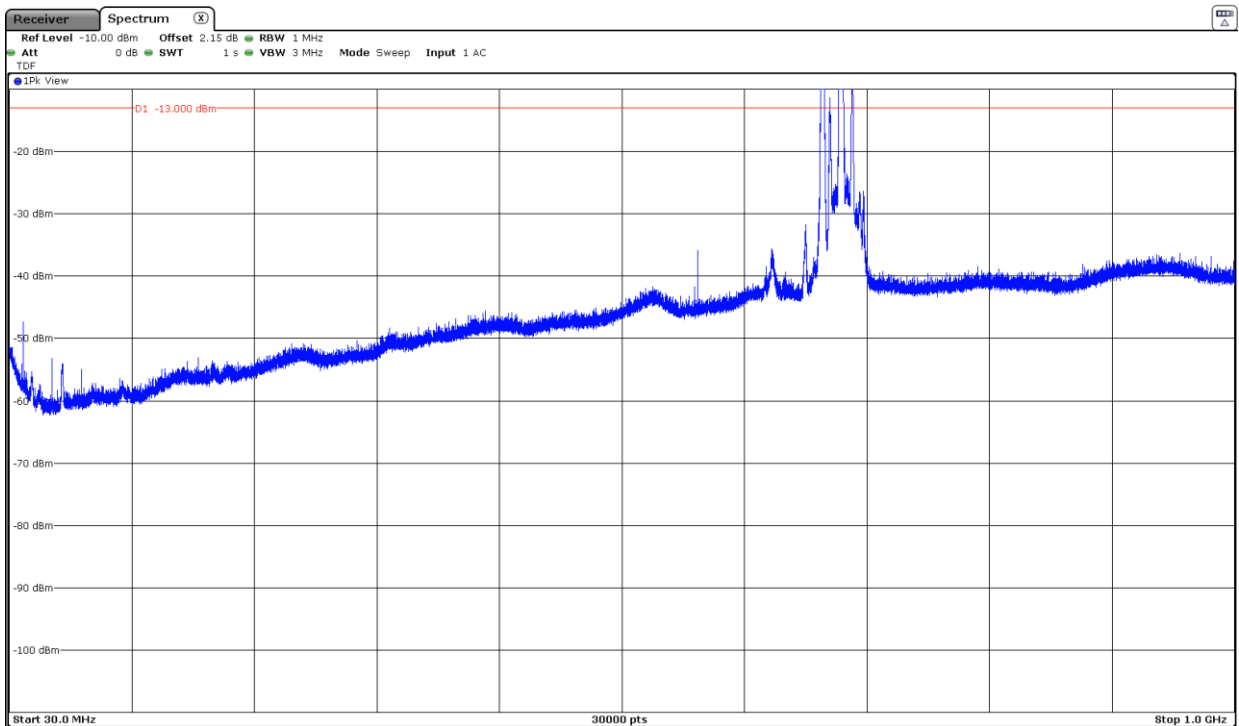
FREQUENCY RANGE 30 MHz - 1 GHz (worst mode):

- Low Channel:



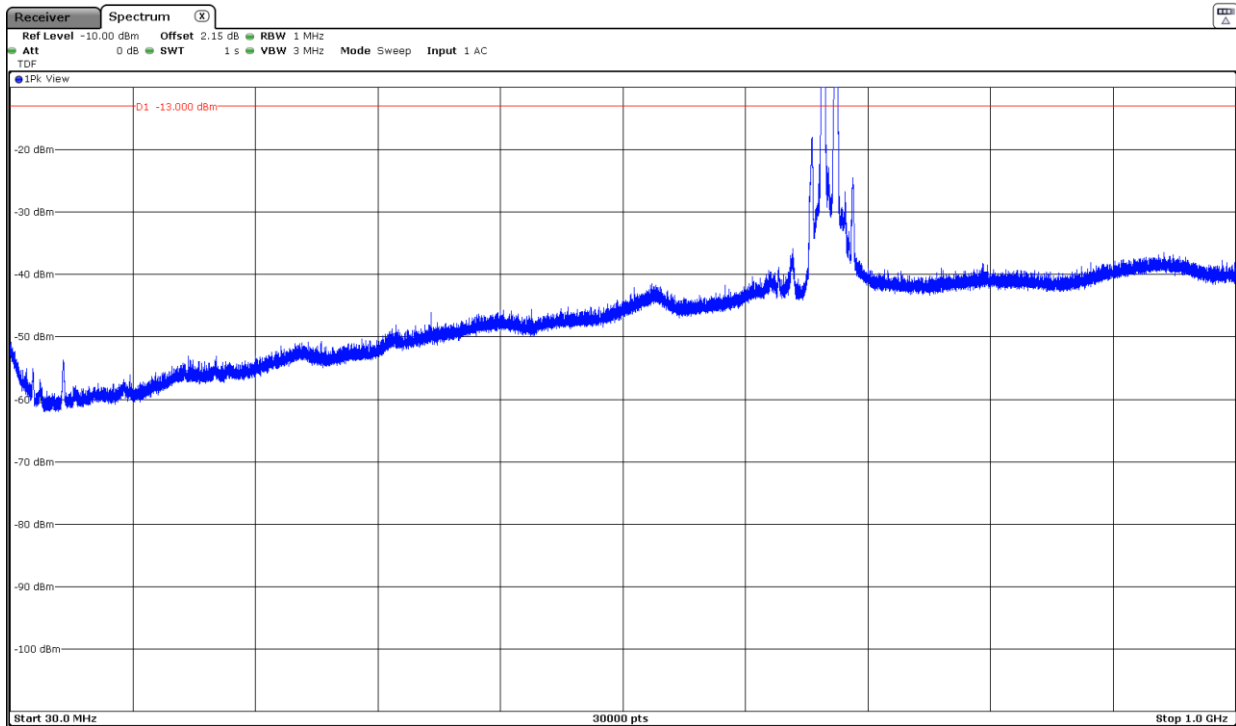
The peaks above the limit are the carrier frequencies and the downlink signals.

- Middle Channel:



The peaks above the limit are the carrier frequencies and the downlink signals.

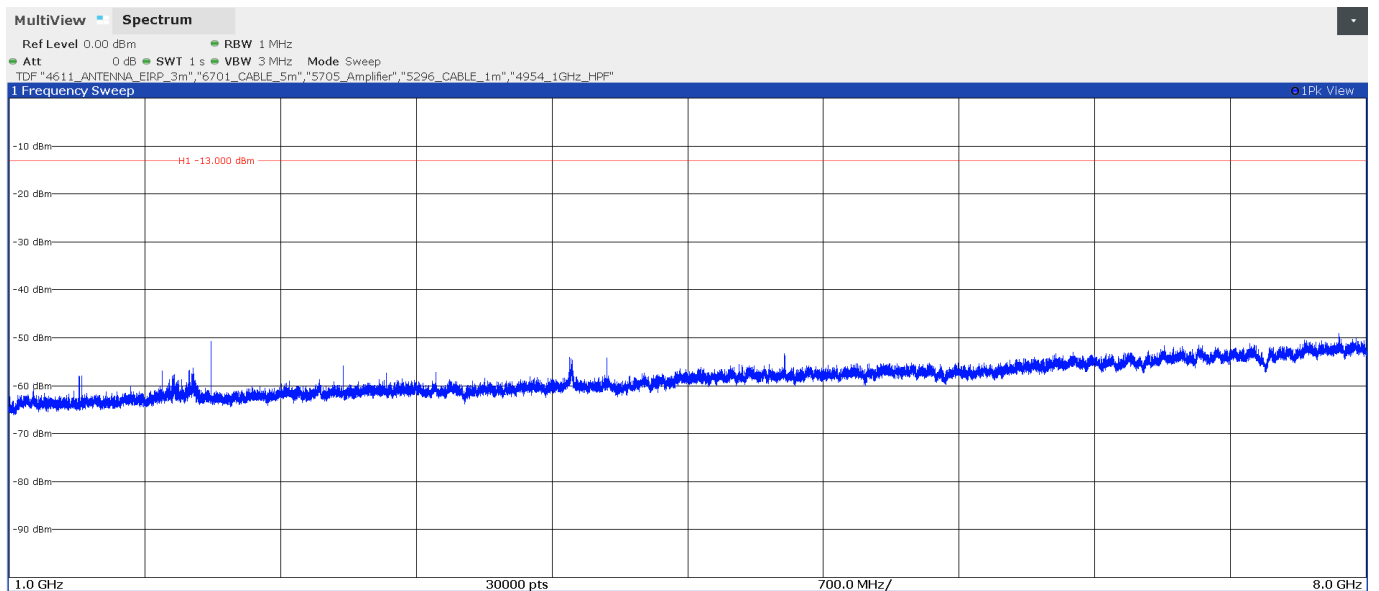
- High Channel:



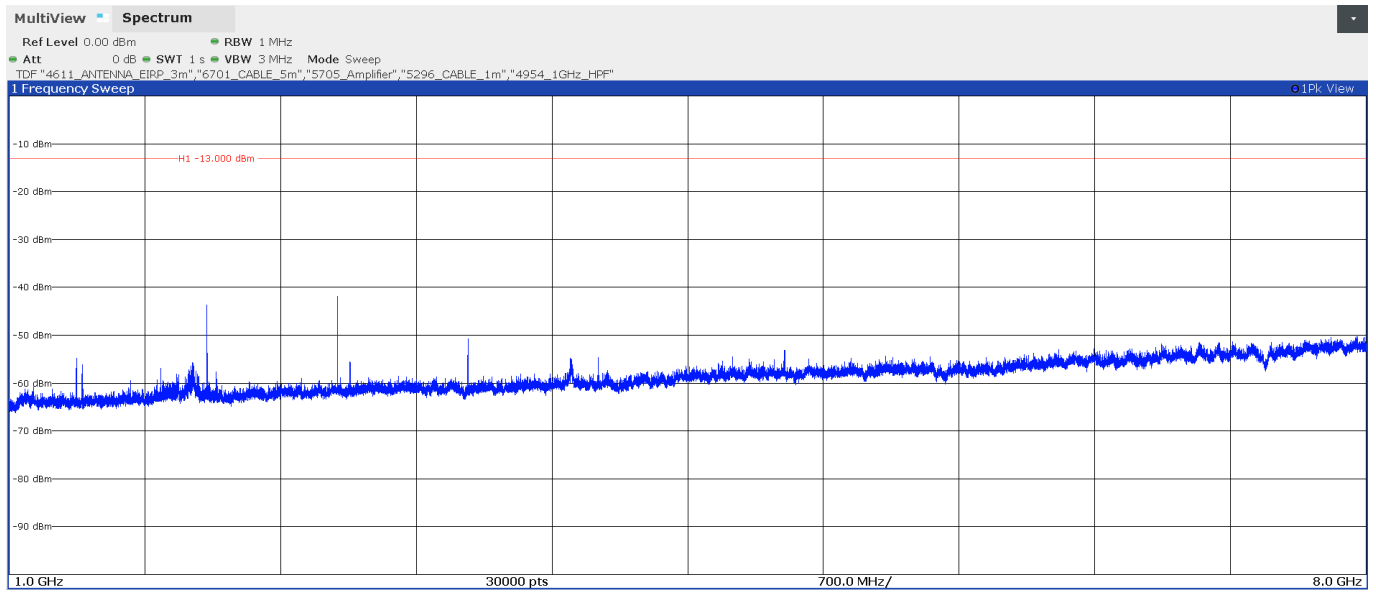
The peaks above the limit are the carrier frequencies and the downlink signals.

FREQUENCY RANGE 1 - 8 GHz (worst mode):

- Low Channel:



- Middle Channel:



- High Channel:

