

Test report No:
 NIE: 65531RRF.004

Partial Test report

REFERENCE STANDARD: USA FCC Part 90

(*) Identification of item tested	Vaisala Beacon Edge Gateway EGW501
(*) Trademark	VAISALA
(*) Model and /or type reference	EGW501
Other identification of the product	SW version: V0708_01.002.01.002 HW version: B FCC ID: 2AO39-EGW501 IC: 23830-EGW501
(*) Features	GSM, WCDMA, LTE
Applicant	Vaisala Oyj Vanha Nurmijärventie 21, 01670 Vantaa FINLAND
Test method requested, standard	USA FCC Part 90 (10-1-19 Edition). 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	2021-01-13
Report template No	FDT08_23 (*) "Data provided by the client"

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Competences and guarantees

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

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification 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 EGW501 is a compact weather station for environmental monitoring. The complete solution provides measurements, data collection, and data visualization in one package. Vaisala Beacon Station includes Vaisala Beacon Edge Gateway EGW501, a multi parameter Vaisala Weather Transmitter WXT536, powering equipment, and mounting accessories. To maximize ease-of-use, the station comes with a data plan and a variety of service packages to choose from.

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
65531/003	Vaisala Beacon Station BWS500	EGW501	S3240004	2020/10/01
65531/038	Power Supply Unit	PSU501	S3926080	2020/10/14

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Date of reception
65531/013	Load	--	--	2020/10/01
65531/017	DC out cable	--	--	2020/10/01
65531/021	DC in cable	--	--	2020/10/01
65531/039	Power Cable	--	--	2020/10/14

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

- Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
65531/003	Vaisala Beacon Station BWS500	EGW501	S3240004	2020/10/01
65531/006	Weather Transmitter	WXT536	S3240235	2020/10/01
65531/038	Power Supply Unit	PSU501	S3926080	2020/10/14

Auxiliary elements used with the Sample S/02:

Control Nº	Description	Model	Serial Nº	Date of reception
65531/013	Load	--	--	2020/10/01
65531/015	WXT cable	--	--	2020/10/01
65531/017	DC out cable	--	--	2020/10/01
65531/021	DC in cable	--	--	2020/10/01
65531/039	Power Cable	--	--	2020/10/14

Sample S/02 has undergone the following test(s): All radiated tests indicated in Appendix A.

Test sample description

Ports..... :	Port name and description	Cable					
		Specified length [m]	Attached during test	Shielded			
	PSU501	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
	PSU502	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
	WXT	10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Supplementary information to the ports..... :	Connecting power cable to gateway turns station automatically on if power is available from battery or other power source. Other ports reserved future use.						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	<input checked="" type="checkbox"/>	AC: 100 – 240 V	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	DC: 9 – 32 V						
Rated Power	--						
Clock frequencies.....:	max. 2GHz						
Other parameters	--						
Software version	V0708_01.002.01.002						
Hardware version	B						
Dimensions in cm (L x W x D).....:	306 x 184 x 156						
Mounting position	<input type="checkbox"/>	Table top equipment					
	<input checked="" type="checkbox"/>	Wall/Ceiling mounted equipment					
	<input type="checkbox"/>	Floor standing equipment					
	<input type="checkbox"/>	Hand-held equipment					
	<input type="checkbox"/>	Other:					
Modules/parts.....:	Module/parts of test item		Type	Manufacturer			
	--						
Accessories (not part of the test item)	Description		Type	Manufacturer			
	PSU501, AC power supply		PSU501	Vaisala Oyj			
	PSU502, DC solar power supply		PSU502	Vaisala Oyj			
	WXT536, Weather transmitter		WXT536	Vaisala Oyj			
Documents as provided by the applicant	Description		File name	Issue date			
	--						

Identification of the client

Vaisala Oyj
Vanha Nurmijärventie 21, 01670 Vantaa FINLAND

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-10-28
Date (finish)	2020-12-02

Document history

Report number	Date	Description
65531RRF.004	2021-01-13	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 %

In the chamber for conducted measurements, 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 Jimenez, Pablo Redondo and Nicolás Salguero.

Used instrumentation:

Conducted Measurements

	Last Calibration	Due Calibration
1. Shielded Room ETS LINDGREN S101	N.A.	N.A.
2. Wideband Radio Communication tester ROHDE AND SCHWARZ CMW500	2020/07	2021/07
3. Digital Multimeter FLUKE 179	2020/10	2021/10

Radiated Measurements

	Last Cal. date	Cal. due date
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. Biconical/Log Antenna ETS LINDGREN 3142E	2020/04	2023/04
4. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
5. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
6. RF Pre-amplifier 1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2020/05	2021/05
7. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSW 50	2020/07	2022/07
8. Digital Multimeter FLUKE 175	2020/11	2021/11

Testing verdicts

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

Summary

FCC PART 90 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 90.635 (b): RF output power	P	(2)
Clause 2.1047: Modulation characteristics	N/M	(1)
Clause 90.213: Frequency stability	N/M	(1)
Clause 2.1049: Occupied Bandwidth	N/M	(1)
Clause 90.691: Spurious emissions at antenna terminals	N/M	(1)
Clause 90.691: Radiated emissions	P	(2)
<u>Supplementary information and remarks:</u> (1) Test not requested. (2) RF Output Power and Radiated emissions tests were tested in the worst case		

Appendix A: Test results for FCC PART 90

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TEST CONDITIONS

POWER SUPPLY (V):

Vnominal = 110 Vac

Type of power supply = AC voltage

ANTENNA:

Type of antenna = Integral antenna.

Declared Gain for antenna = +1.60 dBi.

TEST FREQUENCIES:

LTE. QPSK AND 16QAM MODULATION (BAND 26)

	Channel (Frequency, MHz)				
	BW = 1.4 MHz	BW = 3 MHz	BW=5 MHz	BW=10 MHz	BW=15 MHz
Lowest	26697 (814.70)	26705 (815.5)	26715 (816.50)	26740 (819.00)	N/A
Middle	26740 (819.00)	26740 (819.00)	26740 (819.00)		N/A
Highest	26783 (823.30)	26775 (822.50)	26765 (821.50)		N/A

Results show below were performed in the worst case of modulation, and combination between bandwidth and Resource Blocks through a preliminary scan.

RF Output Power

SPECIFICATION:

FCC §90.635 (b):

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

METHOD:

The conducted RF output power measurements were made at the RF output terminals of the EUT using the power meter of the Universal Radio Communication tester R&S CMW500, selecting maximum transmission power of the EUT and different modes of modulation.

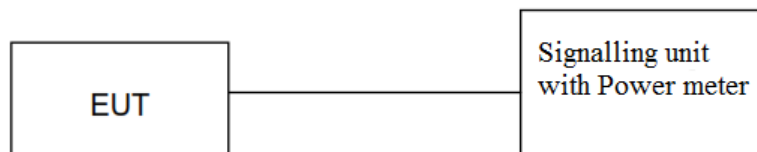
The maximum equivalent isotropically radiated power (e.i.r.p.) is calculated by adding the declared maximum antenna gain (dBi).

The maximum effective radiated power e.r.p. is calculated from the maximum equivalent isotropically radiated power (e.i.r.p.) by subtracting 2.15 dB:

$$\text{E.R.P.} = \text{E.I.R.P.} - 2.15 \text{ dB}$$

TEST SETUP:

CONDUCTED AVERAGE POWER:



RESULTS:

CONDUCTED AVERAGE POWER:

LTE Band 26:

LTE BAND 26. QPSK MODULATION. Bandwidth = 10 MHz.

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=24 as the worst case. The following tables show the results for the worst case modulation.

Channel	Lowest	Middle	Highest
Maximum declared antenna gain (dBi)	N/A	1.60	N/A
Measured maximum average power (dBm) at antenna port	N/A	22.90	N/A
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	N/A	24.50	N/A
Maximum effective radiated power E.R.P. (dBm)	N/A	22.35	N/A
Measurement uncertainty (dB)	<±0.941		

LTE Band 26. 16QAM MODULATION. Bandwidth = 1.4 MHz.

A preliminary scan determined the 16QAM modulation, BW=1.4 MHz, RB=3, Offset=1 as the worst case. The following tables show the results for the worst case modulation.

Channel	Lowest	Middle	Highest
Maximum declared antenna gain (dBi)	1.60	1.60	1.60
Measured maximum average power (dBm) at antenna port	22.43	23.01	22.81
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.03	24.61	24.41
Maximum effective radiated power E.R.P. (dBm)	21.88	22.46	22.26
Measurement uncertainty (dB)	<±0.941		

Radiated emissions

SPECIFICATION:

FCC §90.691:

(a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \text{ Log}_{10}(f/6.1)$ decibels or $50 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

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 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna. Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

Measurement Limit:

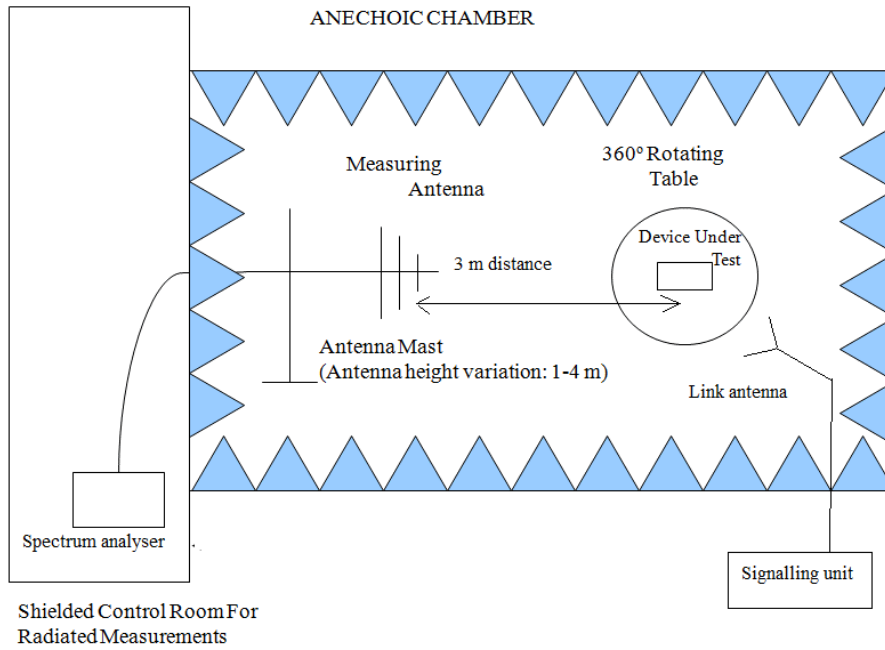
According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. P in watts.

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

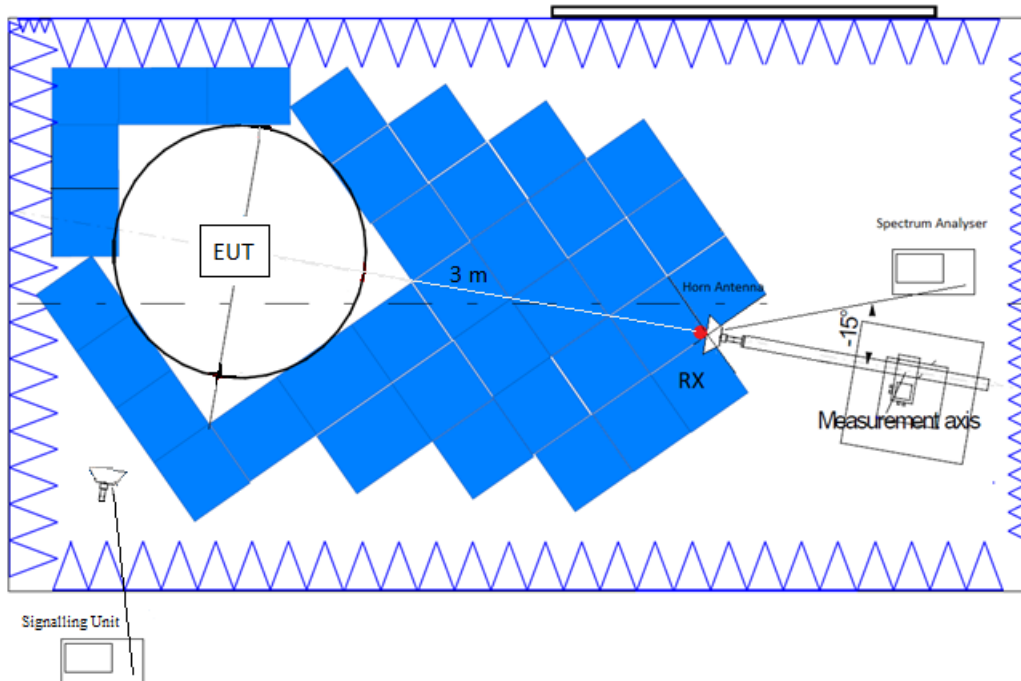
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

TEST SETUP:

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS:

LTE Band 26:

QPSK:

A preliminary scan determined BW=10 MHz, RB Size=1, RB Offset=24 as the worst case. The following tables and plots show the results for the worst case modulation.

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
34.899	Peak	-31.74	V
813.485	Peak	-31.78	V
825.287	Peak	-25.89	H
830.913	Peak	-30.09	H

Frequency range 1 - 10GHz

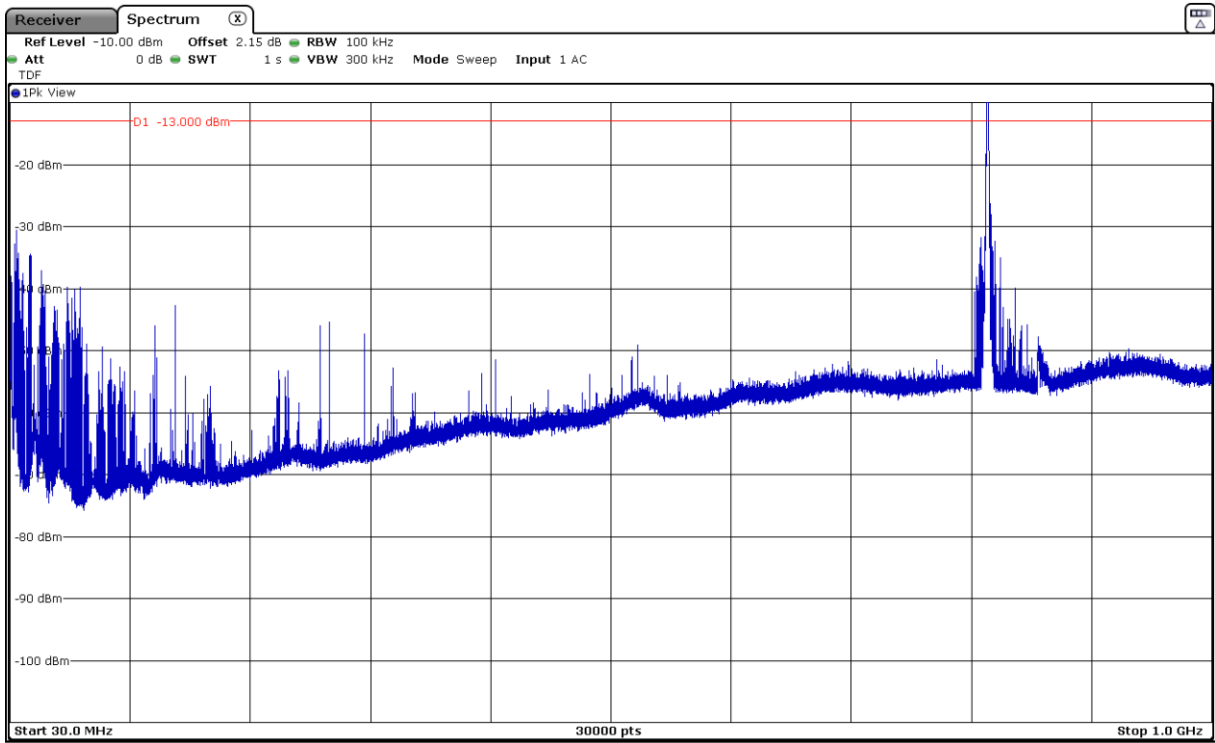
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB) < ± 4.65 for $f < 1$ GHz
< ± 4.98 for $f \geq 1$ GHz

Verdict: PASS

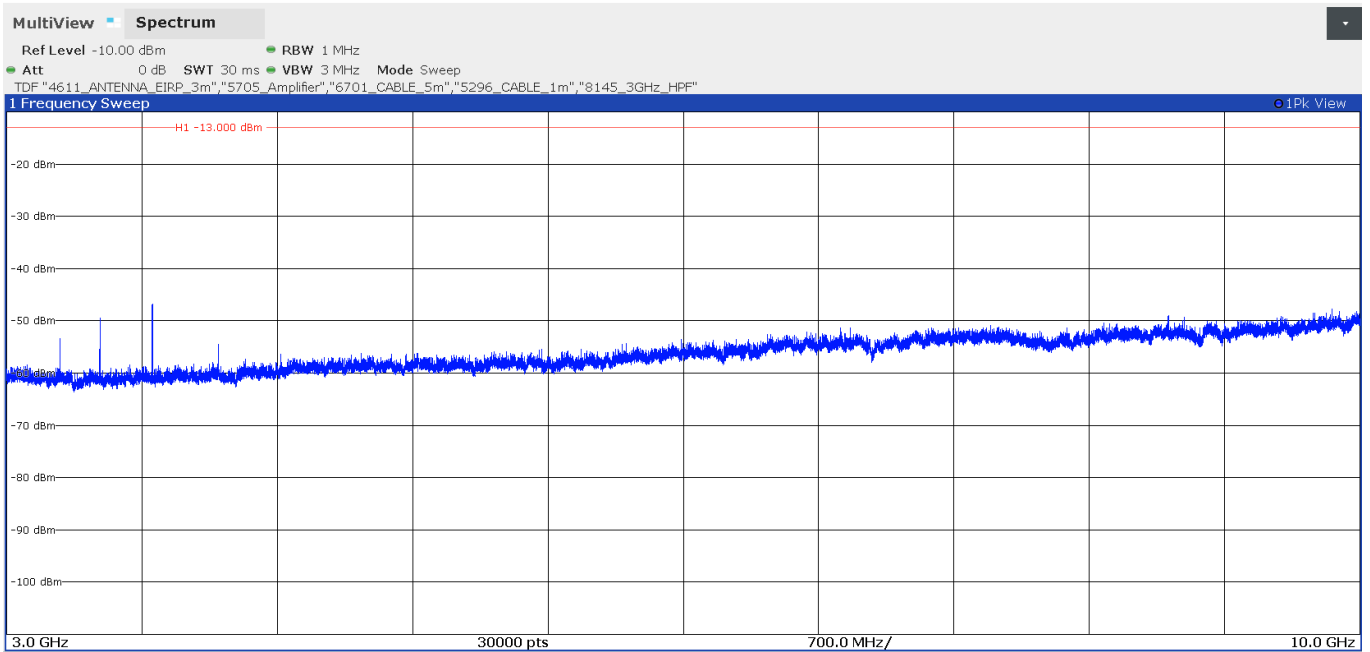
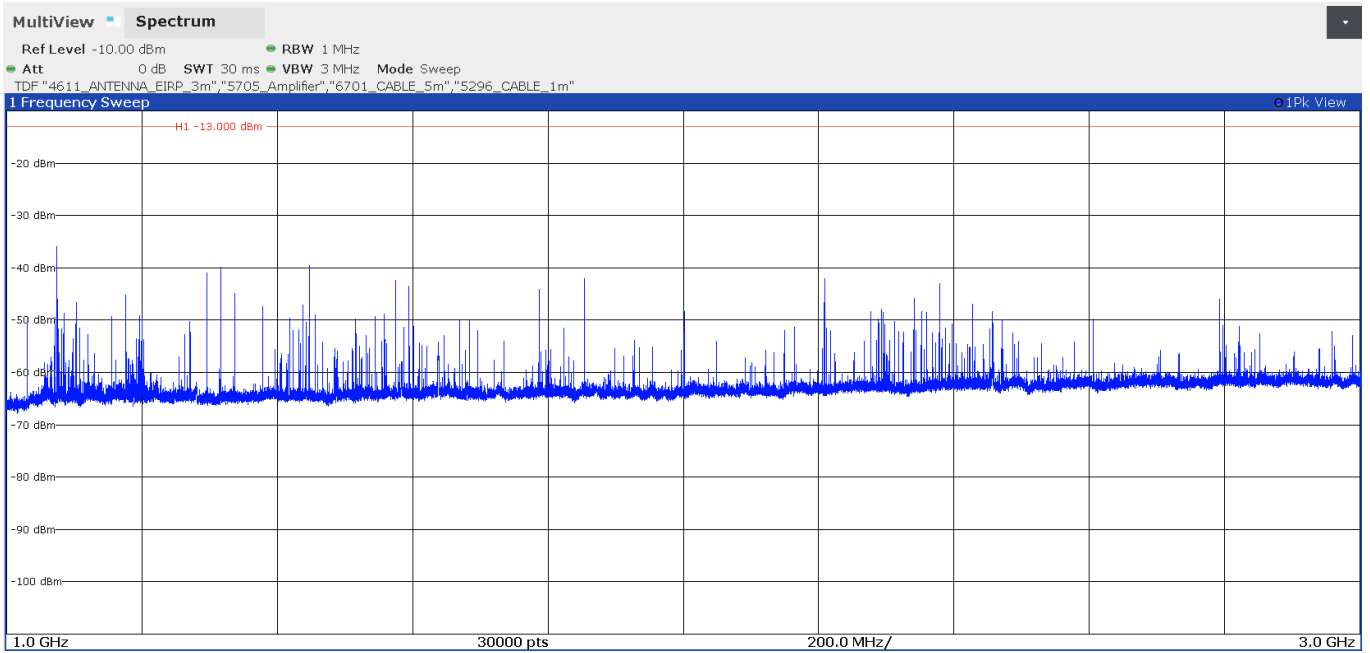
FREQUENCY RANGE 30 MHz - 1 GHz

- Middle Channel:



FREQUENCY RANGE 1 - 10 GHz

- Middle Channel:



16QAM:

A preliminary scan determined BW=1.4 MHz, RB Size=3, RB Offset=1 as the worst case. The following tables and plots show the results for the worst case modulation.

- LOW CHANNEL:

Frequency range 30 MHz - 1 GHz

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

Frequency range 1 - 10GHz

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

- MIDDLE CHANNEL:

Frequency range 30 MHz - 1 GHz

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
826.710	Peak	-32.35	V
828.747	Peak	-26.64	H

Frequency range 1 - 10GHz

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

- HIGH CHANNEL:

Frequency range 30 MHz - 1 GHz

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
813.130	Peak	-32.11	H
820.049	Peak	-31.40	V
827.486	Peak	-32.75	V
836.086	Peak	-31.98	H

Frequency range 1 - 10GHz

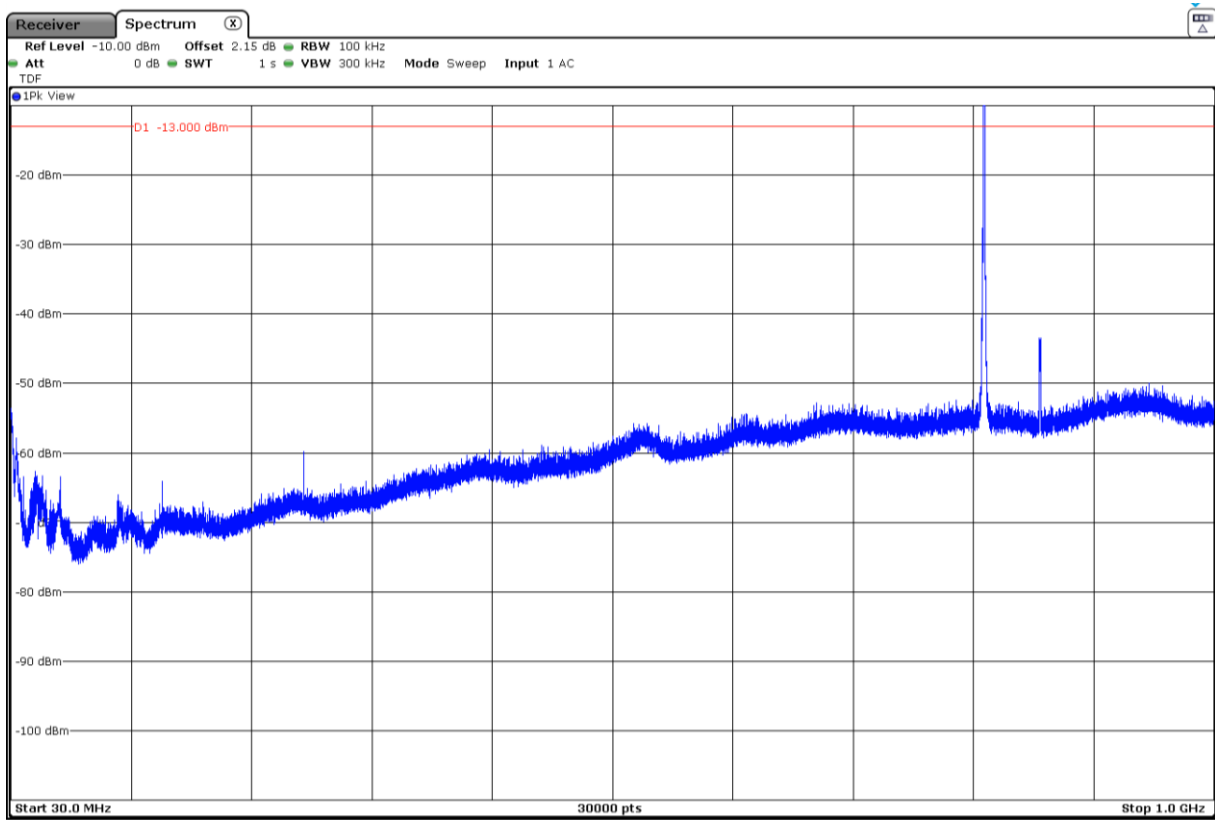
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB) < ±4.65 for f < 1 GHz
< ±4.98 for f ≥ 1 GHz

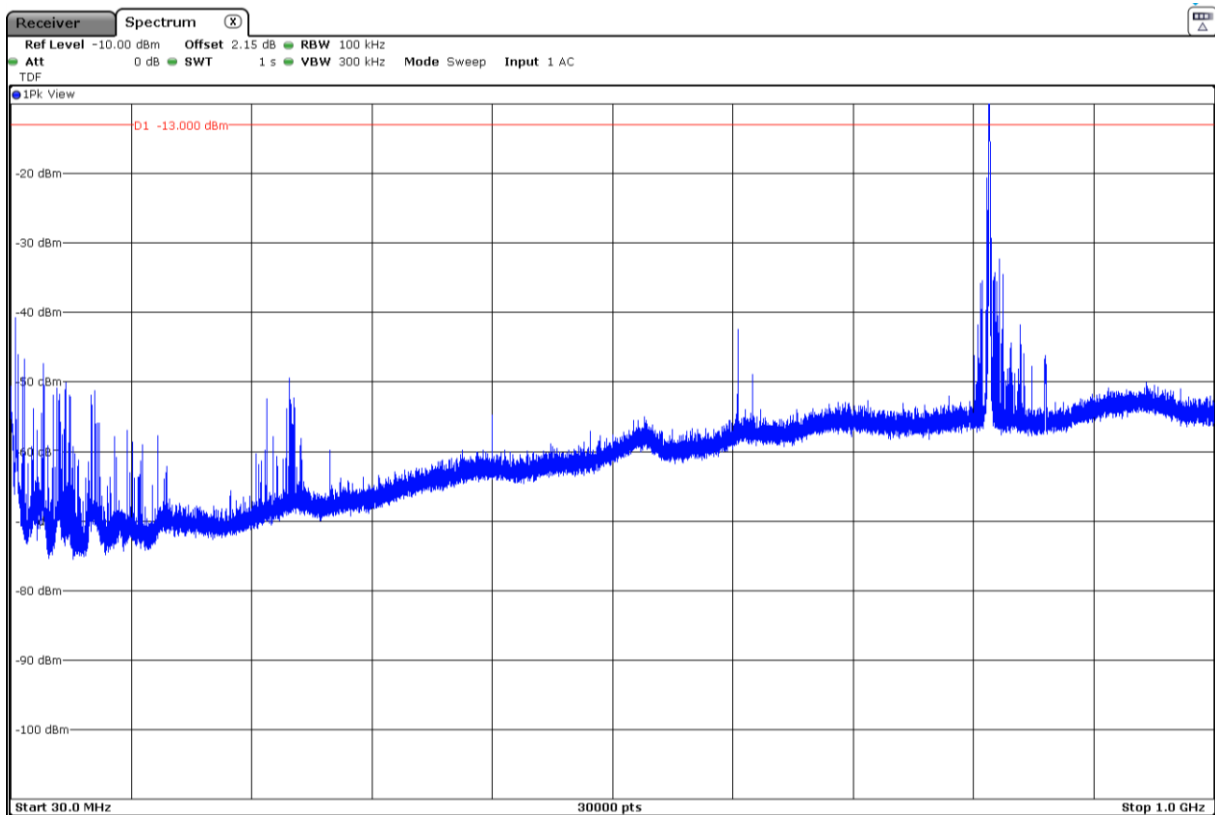
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz

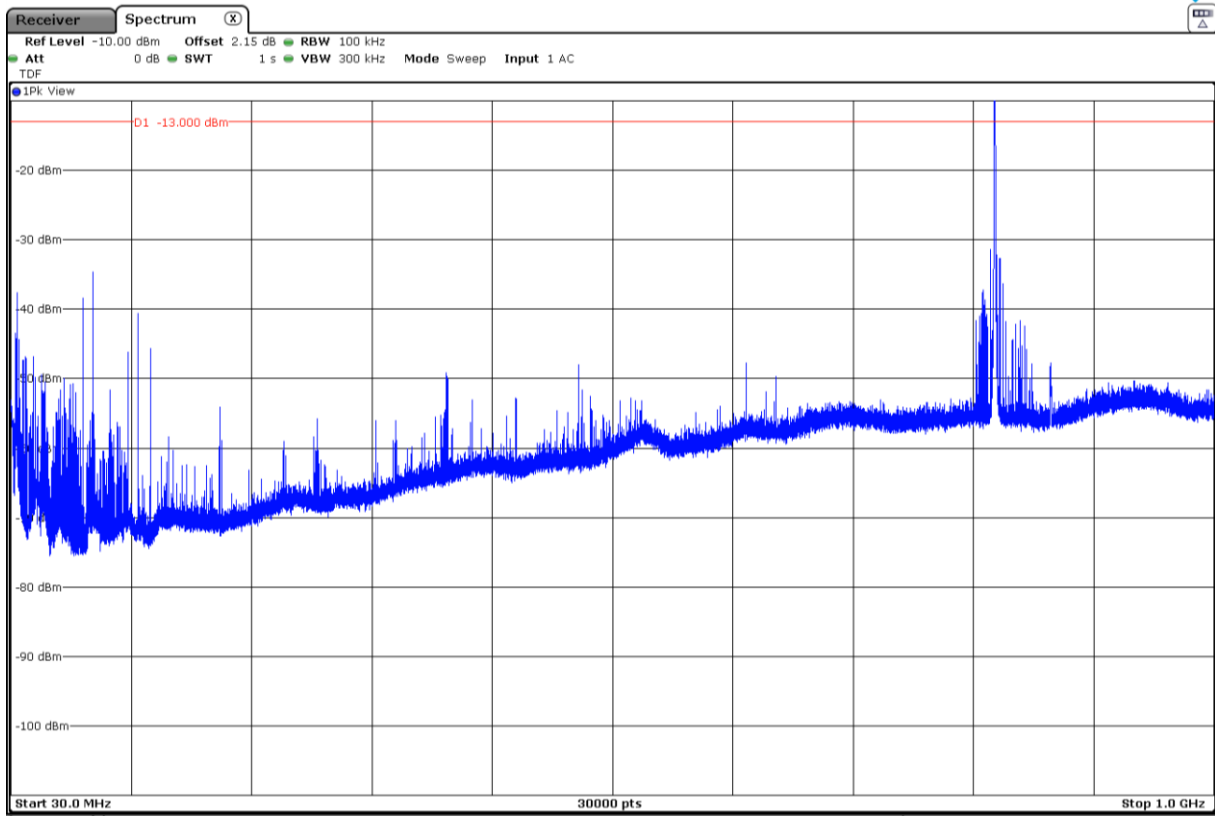
- Lowest Channel:



- Middle Channel:

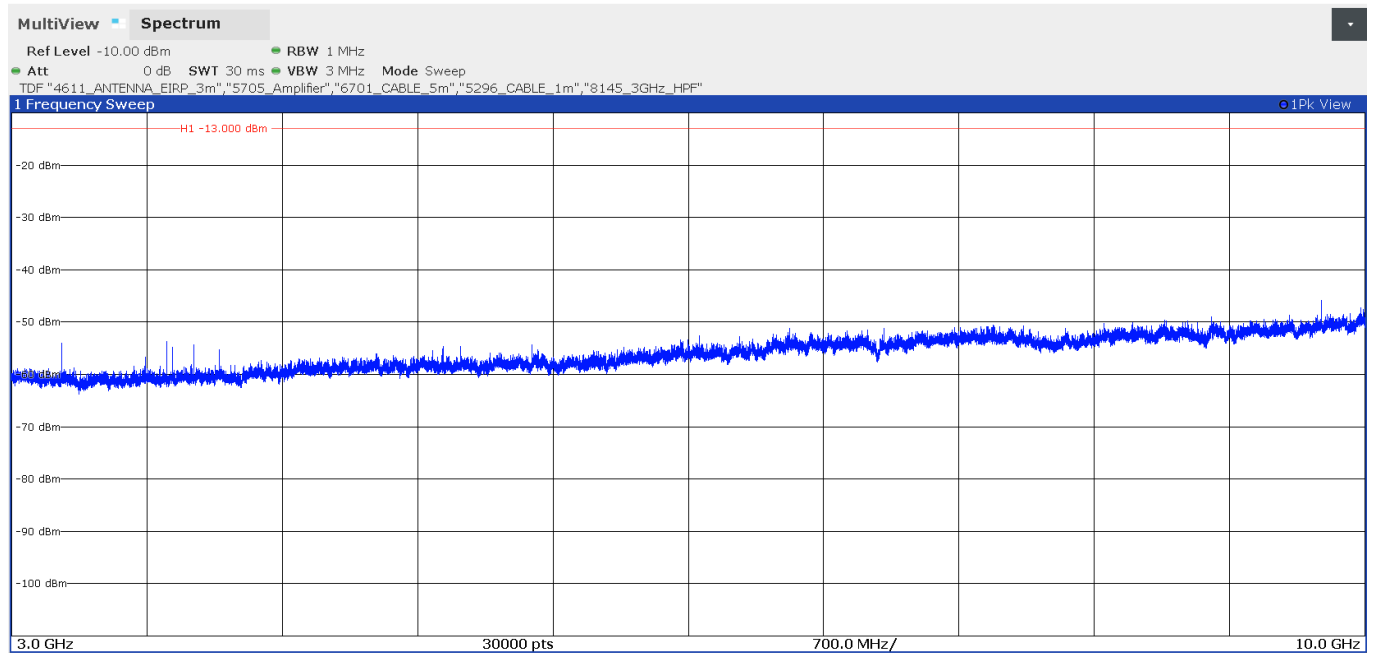
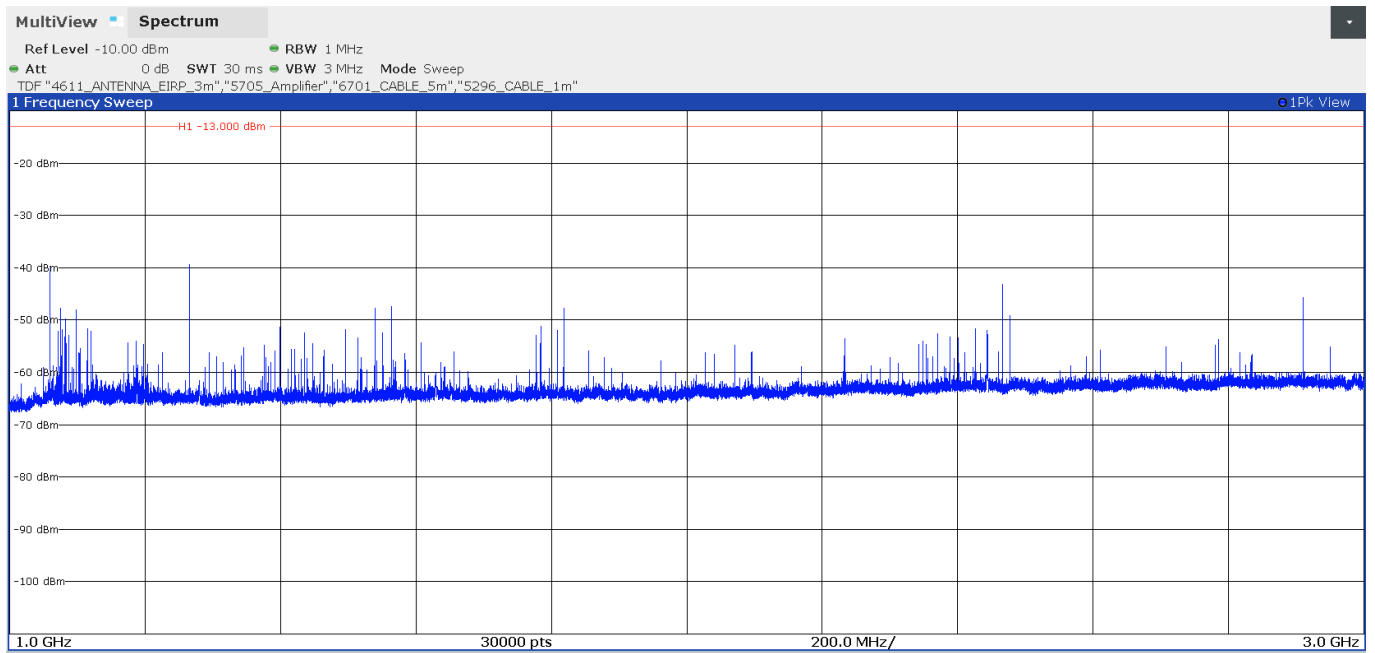


- High Channel:

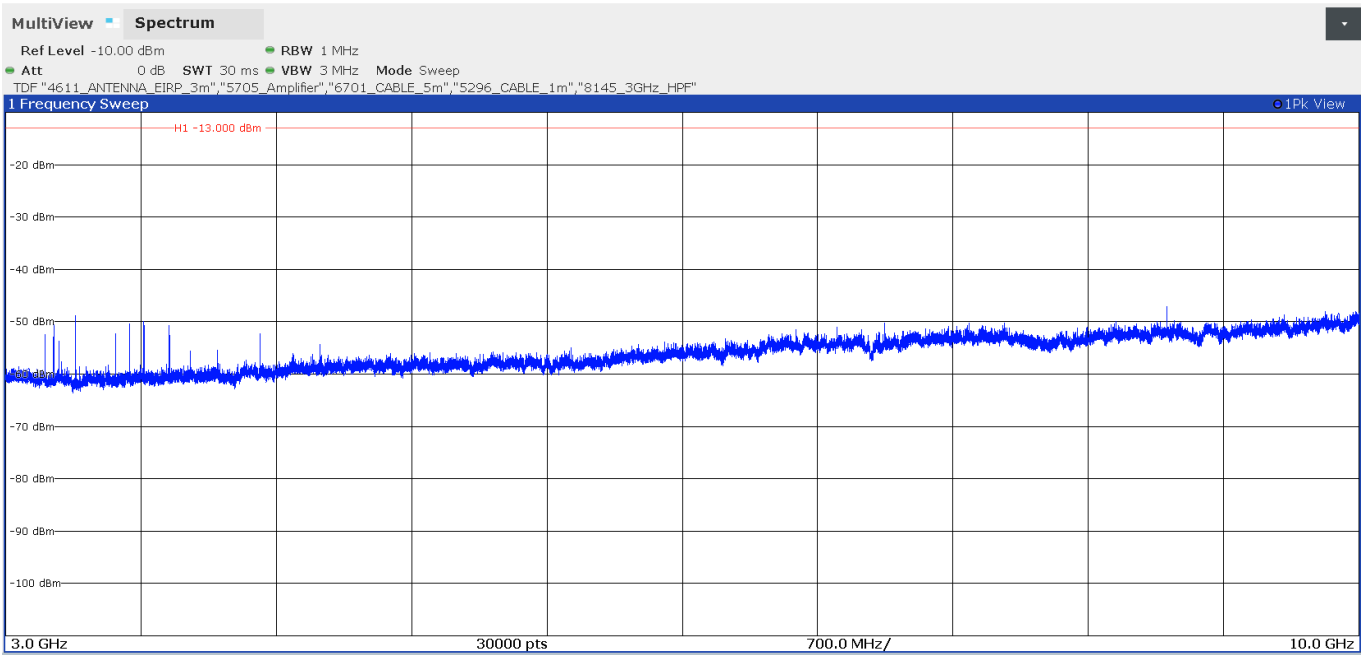
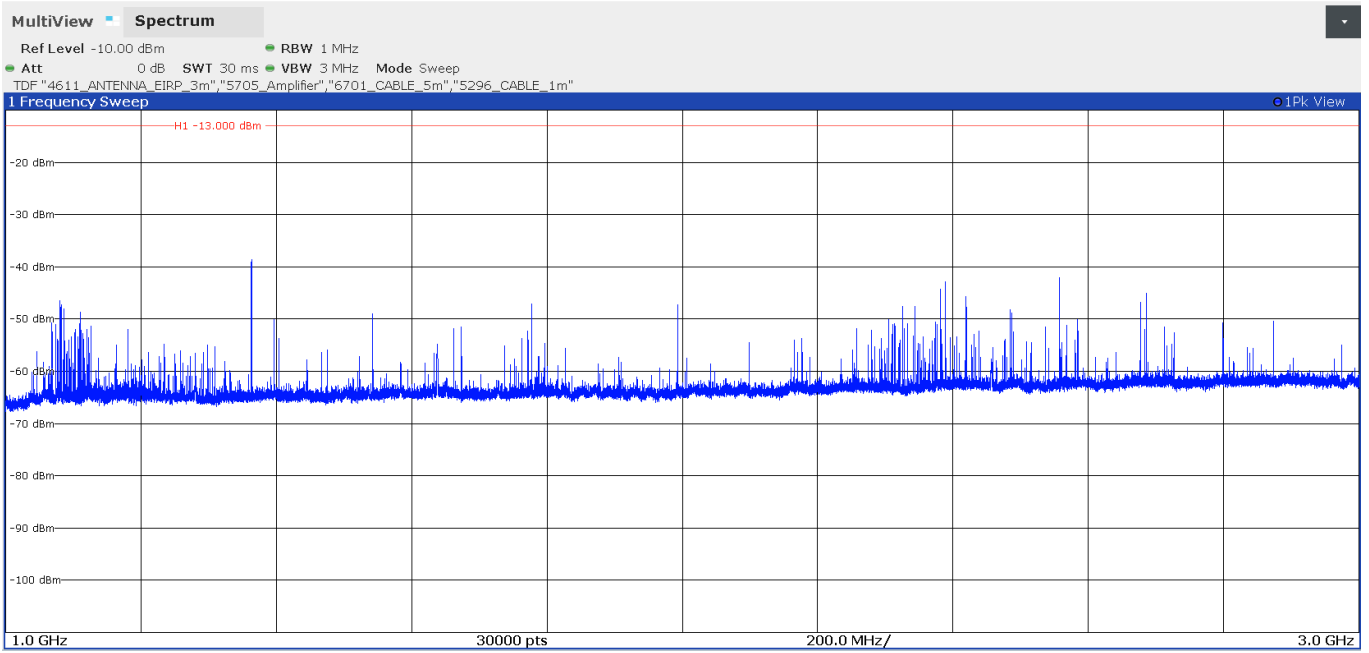


FREQUENCY RANGE 1 - 10 GHz

- Lowest Channel:



- Middle Channel:



- Highest Channel:

