

ISED CABid: ES1909

Test Report No:
NIE: 72146RRF.003A1

Partial Test Report

USA FCC Part 27

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

(*) Identification of item tested	CPAP Device
(*) Trademark	ResMed
(*) Model and /or type reference	37089
(*) Derived model not tested	37158, 37159, 37160, 37161, 37162, 37163, 37164, 37165
Other identification of the product	HW version: R379-7135 SW version: SX558 FCC ID: 2ACHL-AIR104GU IC: 9103A-AIR104GU
(*) Features	4G, 3G, 2G
Applicant	ResMed Pty Ltd 1 Elizabeth Macarthur Drive, Bella Vista, NSW, 2153, Australia
Test method requested, standard	USA FCC Part 27 (10-1-20 Edition). CANADA RSS-130 Issue 2, Feb. 2019. CANADA RSS-139 Issue 3, Jul. 2015. CANADA RSS-199 Issue 3, Dec. 2016. ANSI C63.26-2015. ANSI/TIA-603-E: 2016. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2022-10-17
Report template No	FDT08_24 (*) "Data provided by the client"

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Appendix A: Test results for FCC 27 / RSS-130, RSS-139, RSS-1999

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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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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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 37089 is a CPAP device with integrated cellular connectivity.
3. Derived models not tested. These models have been declared by the supplier of the sample as being the same as the model under test.



Date: 13-May-2022

DECLARATION OF EQUIVALENCE

This document declares that the following designated products are equivalent to the unit under test 37089.

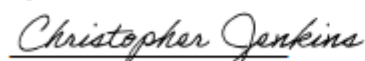
Model Name / Product Code	Marketing Name
37158	AirSense 10 CPAP
37159	AirSense 10 Elite
37160	AirSense 10 AutoSet
37161	AirSense 10 AutoSet FH
37162	AirCurve 10 ASV
37163	AirCurve 10 S
37164	AirCurve 10 VAuto
37165	AirCurve 10 ST

All the above stated products have the same cellular hardware and firmware.

Applicant:

Company Name: ResMed Pty Ltd
Address: 1 Elizabeth Macarthur Drive,
Bella Vista NSW 2153
Australia

By,


Christopher Jenkins

Title: Associate Manager – Systems Engineering
Company: ResMed Pty Ltd
Telephone: +61 2 8884 1517
e-mail: Christopher.jenkins@resmed.com.au

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
72146/001	CPAP Device	37089 AirSense 10	22221362833	2022/05/09
72146/008	Water tub	--	--	2022/05/09
72146/009	Air tube	--	--	2022/05/09
72146/010	AC/DC Adapter	370006	--	2022/05/09
72146/011	Power Cord	--	--	2022/05/09

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

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

Control N°	Description	Model	Serial N°	Date of reception
72146/007	CPAP Device	37089 AirSense 10	22221362874	2022/05/09
72146/008	Water tub	--	--	2022/05/09
72146/009	Air tube	--	--	2022/05/09
72146/010	AC/DC Adapter	370006	--	2022/05/09
72146/011	Power Cord	--	--	2022/05/09

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

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
		Power	☒	☐	☐		
-		☐	☐	☐			
Supplementary information to the ports.....:	-						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	AC: 100–240V, 50–60Hz 1.0–1.5A	☐	☐	☐	☐	☐
	☒	AC: 115V, 400Hz 1.5A, (aircraft)	☐	☐	☐	☐	☐
	☒	DC: 24V, 90W (DC-DC Converter)					
☐	DC:						
Rated Power.....:	53W (57VA) - Typical, 104W (108VA) – Peak						

Clock frequencies..... :	N/A		
Other parameters..... :	-		
Software version..... :	SX558		
Hardware version..... :	R379-7135		
Dimensions in cm (W x H x D) ... :	255 mm X 116 mm X 150 mm		
Mounting position..... :	☒	Table top equipment	
	☐	Wall/Ceiling mounted equipment	
	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☐	Other:	
Modules/parts..... :	Module/parts of test item		Type
	Cellular Module (4G, 3G, 2G)		LARA-R6001
Accessories (not part of the test item)..... :	Description		Type
	-		-
Documents as provided by the applicant..... :	Description		File name
	-		-
			Issue date
			-

Identification of the client

ResMed Pty Ltd
1 Elizabeth Macarthur Drive, Bella Vista, NSW, 2153, Australia

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-05-25
Date (finish)	2022-06-01

Document history

Report number	Date	Description
72146RRF.003	2022-08-26	First release.
72146RRF.003A1	2022-10-17	First modification: update of typos. This modification test report cancels and replaces the test report 72146RRF.003s.

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: Alfonso Gutiérrez, Rafael Fernández.

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	2022/05	2023/05

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 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/10	2023/10
5.	RF Preamplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2021/12	2022/12
6.	EMI Test Receiver 2Hz-44GHz, ROHDE AND SCHWARZ ESW44	2021/12	2023/12
7.	Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
8.	Pre-Amplifier G>30dB 17-40GHz BONN ELEKTRONIK BLMA 1840-4A	2021/09	2022/09
9.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2020/12	2022/12
10.	Wideband Radio Communication Tester ROHDE AND SCHWARZ CMW500	2021/09	2023/09
11.	EMC/RF Testing SW ROHDE AND SCHWARZ EMC32	N/A	N/A

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-139 6.5., RSS-130 4.6., RSS-199 4.4.	RF Output Power	P	
FCC 2.1047 / RSS-139 6.2, RSS-130 4.2, RSS-199 4.1.	Modulation Characteristics	N/M	(1)
FCC 27.54 / RSS-139 6.4., RSS-130 4.5., RSS-199 4.3.	Frequency Stability	N/M	(1)
FCC 2.1049	Occupied Bandwidth	N/M	(1)
FCC 27.53 / RSS-139 6.6., RSS-130 4.7., RSS-199 4.5	Spurious Emissions at Antenna Terminals	N/M	(1)
FCC 27.53 / RSS-139 6.6., RSS-130 4.7., RSS-199 4.5	Radiated Emissions	P	
<u>Supplementary information and remarks:</u>			
(1) Test not requested.			

Appendix A: Test results for FCC 27 / RSS-130, RSS-139, RSS-199

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TEST CONDITIONS

POWER SUPPLY (*):

Vnormal: 24 Vdc
Type of Power Supply: AC-DC Adapter.

ANTENNA GAIN (*):

Low Bands	Gain (dBi)	Type
LTE 12	1.71	Ceramic SMT Antenna
LTE 13	1.71	Ceramic SMT Antenna

Middle Bands	Gain (dBi)	Type
LTE 4	3.03	Ceramic SMT Antenna

High Bands	Gain (dBi)	Type
LTE 7	2.69	Ceramic SMT Antenna
LTE 41	2.69	Ceramic SMT Antenna

(*): Declared by the Applicant.

TEST FREQUENCIES:

LTE Band 4. QPSK and 16QAM modulations:

	Channel (Frequency MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	19957 (1710.7)	19965 (1711.5)	19975 (1712.5)	20000 (1715.0)	20025 (1717.5)	20050 (1720.0)
Middle	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)
High	20393 (1754.3)	20385 (1753.5)	20375 (1752.5)	20350 (1750.0)	20325 (1747.5)	20300 (1745.0)

LTE Band 7. QPSK and 16QAM modulations:

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

LTE Band 12. QPSK and 16QAM modulations:

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

LTE Band 13. QPSK and 16QAM modulations:

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

LTE Band 41. QPSK and 16QAM modulations:

	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)

RF Output Power

SPECIFICATION:

FCC §27.50 (d):

(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(5) Equipment employed must be authorized in accordance with the provisions of §24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

FCC §27.50 (h) (2):

The following power limits shall apply in the BRS and EBS:

Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power

FCC §27.50 (c) (10):

Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

FCC §27.50 (b) (10):

Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

RSS-139 Clause 6.5:

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1710-1780 MHz shall not exceed one watt.

In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the High PAPR during periods of continuous transmission.

RSS-199 Clause 4.4:

The transmitter output power shall be measured in terms of average value.

For mobile subscriber equipment, the e.i.r.p. shall not exceed 2 W. For fixed subscriber equipment, the transmitter output power shall not exceed 2 W and the e.i.r.p. shall be limited to 40 W.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the High PAPR during periods of continuous transmission.

For equipment with multiple antennas, the transmitter output power and e.i.r.p shall be measured according to ANSI C63.26-2015.

RSS-130 Clause 4.6:

4.6.1 General

The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the High PAPR during periods of continuous transmission.

4.6.3 Frequency bands 698-756 MHz and 777-787 MHz

The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

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:

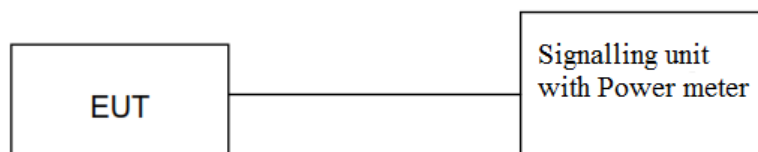
$$E.R.P. = E.I.R.P. - 2.15 \text{ dB}$$

The peak-to-average power ratio (PAPR) is measured using an attenuator, power splitter and spectrum analyser with a Complementary Cumulative Distribution Function implemented.

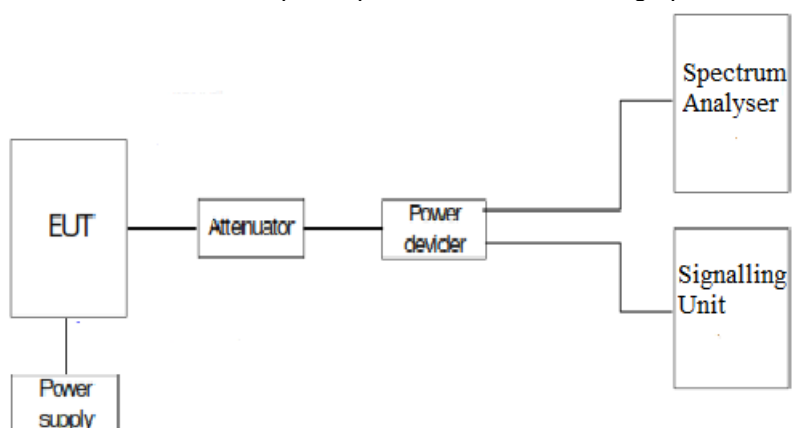
The EUT was controlled via the Universal Radio Communication tester R&S CMW500 selecting maximum transmission power of the EUT and different modes of modulation.

TEST SETUP:

1. CONDUCTED AVERAGE POWER:



2. PEAK-TO-AVERAGE POWER RATIO (PAPR) and Conducted Average power:



RESULTS:

1. AVERAGE POWER:

LTE Band 4:

LTE Band 4. QPSK modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.64	23.71	23.49
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.67	26.74	26.52
Maximum effective radiated power E.R.P. (dBm)	24.52	24.59	24.37
PAPR (dB)	(*)	5.53	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 2.
Worst case PAPR: Modulation QPSK. RB Size: 6. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.67	23.24	22.90
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.70	26.27	25.93
Maximum effective radiated power E.R.P. (dBm)	23.55	24.12	23.78
PAPR (dB)	6.55	6.44	6.39
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 2.
Worst case PAPR: Modulation 16QAM. RB Size: 6. RB Offset: 0.

LTE Band 4. QPSK modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.44	23.55	23.25
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.47	26.58	26.28
Maximum effective radiated power E.R.P. (dBm)	24.32	24.43	24.13
PAPR (dB)	(*)	5.61	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation QPSK. RB Size: 15. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.46	22.72	21.51
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.49	25.75	24.54
Maximum effective radiated power E.R.P. (dBm)	23.34	23.60	22.39
PAPR (dB)	6.57	6.47	6.39
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 7.
Worst case PAPR: Modulation 16QAM. RB Size: 15. RB Offset: 0.

LTE Band 4. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.55	23.53	23.81
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.58	26.56	26.84
Maximum effective radiated power E.R.P. (dBm)	24.43	24.41	24.68
PAPR (dB)	(*)	5.58	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 12.
Worst case PAPR: Modulation QPSK. RB Size: 25. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.45	22.40	23.11
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.48	25.43	26.14
Maximum effective radiated power E.R.P. (dBm)	23.33	23.28	23.99
PAPR (dB)	6.55	6.35	6.36
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 12.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 4. QPSK modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.51	23.55	23.41
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.54	26.58	26.44
Maximum effective radiated power E.R.P. (dBm)	24.39	24.43	24.29
PAPR (dB)	(*)	5.48	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.

Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.51	22.48	22.76
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.54	25.51	25.79
Maximum effective radiated power E.R.P. (dBm)	23.39	23.36	23.64
PAPR (dB)	6.31	6.22	6.14
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.

Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 24.

LTE Band 4. QPSK modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.55	23.47	23.77
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.58	26.50	26.80
Maximum effective radiated power E.R.P. (dBm)	24.43	24.35	24.65
PAPR (dB)	(*)	5.58	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 74.

Worst case PAPR: Modulation QPSK. RB Size: 75. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.49	22.30	23.77
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.52	25.33	26.80
Maximum effective radiated power E.R.P. (dBm)	23.37	23.18	24.65
PAPR (dB)	5.85	5.83	5.83
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 37.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 4. QPSK modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	23.15	23.36	23.22
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.18	26.39	26.25
Maximum effective radiated power E.R.P. (dBm)	24.03	24.24	24.10
PAPR (dB)	(*)	5.42	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.
Worst case PAPR: Modulation QPSK. RB Size: 100. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	3.03	3.03	3.03
Measured maximum average power (dBm) at antenna port	22.27	22.30	22.28
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.30	25.33	25.31
Maximum effective radiated power E.R.P. (dBm)	23.15	23.18	23.16
PAPR (dB)	5.85	5.87	5.87
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 99.

LTE Band 7:

LTE Band 7. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.79	22.82	23.12
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.48	25.51	25.81
Maximum effective radiated power E.R.P. (dBm)	23.33	23.36	23.66
PAPR (dB)	(*)	5.02	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 12.

Worst case PAPR: Modulation QPSK. RB Size: 25. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 7. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	21.74	22.15	21.65
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.43	24.84	24.34
Maximum effective radiated power E.R.P. (dBm)	22.28	22.69	22.19
PAPR (dB)	5.9	5.83	5.71
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 12.

Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 7. QPSK modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.85	22.98	22.81
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.54	25.67	25.50
Maximum effective radiated power E.R.P. (dBm)	23.39	23.52	23.35
PAPR (dB)	(*)	5.06	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.

Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 7. 16QAM modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	21.84	21.74	22.52
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.53	24.43	25.21
Maximum effective radiated power E.R.P. (dBm)	22.38	22.28	23.06
PAPR (dB)	5.75	5.79	5.72
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 7. QPSK modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.56	22.66	23.15
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.25	25.35	25.84
Maximum effective radiated power E.R.P. (dBm)	23.10	23.20	23.69
PAPR (dB)	(*)	5.16	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation QPSK. RB Size: 75. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 7. 16QAM modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.08	20.81	23.15
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.77	23.50	25.84
Maximum effective radiated power E.R.P. (dBm)	22.62	21.35	23.69
PAPR (dB)	(*)	5	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 37.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 7. QPSK modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.69	22.74	22.95
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.38	25.43	25.64
Maximum effective radiated power E.R.P. (dBm)	23.23	23.28	23.49
PAPR (dB)	(*)	5.02	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.

Worst case PAPR: Modulation QPSK. RB Size: 100. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 7. 16QAM modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.03	21.64	21.62
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.72	24.33	24.31
Maximum effective radiated power E.R.P. (dBm)	22.57	22.18	22.16
PAPR (dB)	5.34	5.42	5.35
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.

Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 12:

LTE Band 12. QPSK modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	23.70	24.50	24.18
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.41	26.21	25.89
Maximum effective radiated power E.R.P. (dBm)	23.26	24.06	23.74
PAPR (dB)	(*)	4.94	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.

Worst case PAPR: Modulation QPSK. RB Size: 6. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 12. 16QAM modulation. BW=1.4 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	22.81	23.46	23.16
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.52	25.17	24.87
Maximum effective radiated power E.R.P. (dBm)	22.37	23.02	22.72
PAPR (dB)	5.75	5.77	5.82
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 2.
Worst case PAPR: Modulation 16QAM. RB Size: 6. RB Offset: 0.

LTE Band 12. QPSK modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	23.69	24.16	24.13
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.40	25.87	25.84
Maximum effective radiated power E.R.P. (dBm)	23.25	23.72	23.69
PAPR (dB)	(*)	4.97	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation QPSK. RB Size: 15. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 12. 16QAM modulation. BW=3 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	22.7	23.37	22.98
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.41	25.08	24.69
Maximum effective radiated power E.R.P. (dBm)	22.26	22.93	22.54
PAPR (dB)	5.93	5.8	5.71
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 0.
Worst case PAPR: Modulation 16QAM. RB Size: 15. RB Offset: 0.

LTE Band 12. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	24.27	24.06	24.41
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.98	25.77	26.12
Maximum effective radiated power E.R.P. (dBm)	23.83	23.62	23.97
PAPR (dB)	(*)	5	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 12.

Worst case PAPR: Modulation QPSK. RB Size: 25. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 12. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	22.02	22.94	21.66
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	23.73	24.65	23.37
Maximum effective radiated power E.R.P. (dBm)	21.58	22.50	21.22
PAPR (dB)	5.82	5.72	5.74
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 0.

Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 12. QPSK modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	24.08	24.12	24.19
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.79	25.83	25.90
Maximum effective radiated power E.R.P. (dBm)	23.64	23.68	23.75
PAPR (dB)	(*)	5.13	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.

Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 0.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 12. 16QAM modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	23.5	23.30	22.35
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.21	25.01	24.06
Maximum effective radiated power E.R.P. (dBm)	23.06	22.86	21.91
PAPR (dB)	5.61	5.63	5.61
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 24.

LTE Band 13:

LTE Band 13. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	24.26	24.42	24.30
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.97	26.13	26.01
Maximum effective radiated power E.R.P. (dBm)	23.82	23.98	23.86
PAPR (dB)	(*)	4.98	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 12.
Worst case PAPR: Modulation QPSK. RB Size: 25. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 13. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	1.71	1.71	1.71
Measured maximum average power (dBm) at antenna port	22.75	23.64	22.94
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.46	25.35	24.65
Maximum effective radiated power E.R.P. (dBm)	22.31	23.20	22.5
PAPR (dB)	5.74	5.72	5.77
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 13. QPSK modulation. BW=10 MHz.

Channel	Middle
Maximum declared antenna gain (dBi)	1.71
Measured maximum average power (dBm) at antenna port	24.27
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.98
Maximum effective radiated power E.R.P. (dBm)	23.83
PAPR (dB)	5.02
Measurement uncertainty (dB)	<±0.94

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 0.
(*): Only Middle Channel.

LTE Band 13. 16QAM modulation. BW=10 MHz.

Channel	Middle
Maximum declared antenna gain (dBi)	1.71
Measured maximum average power (dBm) at antenna port	23.7
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.41
Maximum effective radiated power E.R.P. (dBm)	23.26
PAPR (dB)	5.63
Measurement uncertainty (dB)	<±0.94

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 24.
(*): Only Middle Channel.

LTE Band 41:

LTE Band 41. QPSK modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	23.72	24.47	23.83
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26.41	27.16	26.52
Maximum effective radiated power E.R.P. (dBm)	24.26	25.01	24.37
PAPR (dB)	(*)	9.36	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 12.
Worst case PAPR: Modulation QPSK. RB Size: 12. RB Offset: 11.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 41. 16QAM modulation. BW=5 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	22.13	23.16	21.78
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	24.82	25.85	24.47
Maximum effective radiated power E.R.P. (dBm)	22.67	23.70	22.32
PAPR (dB)	9.49	9.39	9.71
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 0.

LTE Band 41. QPSK modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	24.85	24.85	24.83
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	27.54	27.54	27.52
Maximum effective radiated power E.R.P. (dBm)	25.39	25.39	25.37
PAPR (dB)	(*)	8.43	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 0.
(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 41. 16QAM modulation. BW=10 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	23,46	24.03	21,6
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	26,15	26.72	24,29
Maximum effective radiated power E.R.P. (dBm)	24	24.57	22,14
PAPR (dB)	10.58	9.84	10.45
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 24.
Worst case PAPR: Modulation 16QAM. RB Size: 25. RB Offset: 12.

LTE Band 41. QPSK modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	23.25	24.46	22.92
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	25.94	27.15	25.61
Maximum effective radiated power E.R.P. (dBm)	23.79	25	23.46
PAPR (dB)	(*)	9.55	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 75. RB Offset: 0.
Worst case PAPR: Modulation QPSK. RB Size: 36. RB Offset: 37.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 41. 16QAM modulation. BW=15 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	25.02	23.90	24.74
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	27.71	26.59	27.43
Maximum effective radiated power E.R.P. (dBm)	25.56	24.44	25.28
PAPR (dB)		9.10	
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 37.
Worst case PAPR: Modulation 16QAM. RB Size: 1. RB Offset: 0.

LTE Band 41. QPSK modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	24.88	24.49	24.57
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	27.57	27.18	27.26
Maximum effective radiated power E.R.P. (dBm)	25.42	25.03	25.11
PAPR (dB)	(*)	10.32	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation QPSK. RB Size: 1. RB Offset: 49.
Worst case PAPR: Modulation QPSK. RB Size: 50. RB Offset: 24.

(*): Preliminary measurements determined the Middle Channel as the worst case.

LTE Band 4. 16QAM modulation. BW=20 MHz.

Channel	Low	Middle	High
Maximum declared antenna gain (dBi)	2.69	2.69	2.69
Measured maximum average power (dBm) at antenna port	(*)	22.72	(*)
Maximum equivalent isotropically radiated power (E.I.R.P.) (dBm)	(*)	24.41	(*)
Maximum effective radiated power E.R.P. (dBm)	(*)	23.26	(*)
PAPR (dB)	(*)	10.26	(*)
Measurement uncertainty (dB)	<±0.94		

Worst-case AVERAGE POWER: Modulation 16QAM. RB Size: 1. RB Offset: 49.

Worst case PAPR: Modulation 16QAM. RB Size 1. RB Offset: 49.

(*): Preliminary measurements determined the Middle Channel as the worst case.

Verdict: PASS

Radiated Emissions

SPECIFICATION:

1. LTE Band 4. FCC §2.1053 & §27.53 (h) / RSS-139 Clause 6.6.

FCC §27.53 (h):

(1) 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, 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 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.

LTE Band 4 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:

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

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

FCC §27.53 (m) (4):

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 Clause 4.5 (b):

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. FCC §2.1053 & §27.53 (g) / RSS-130 Clause 4.7.

FCC §27.53 (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 Clause 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 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) & (f) / RSS-130 Clause 4.7.

FCC §27.53 (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.

(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.

FCC §27.53 (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 Clause 4.7:

4.7.1. The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate 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 the equipment's operating frequency 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:

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

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

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

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

The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW (-40 dBm)/MHz for wideband signals, and -80 dBW (-50 dBm) for discrete emissions of less than 700 Hz bandwidth.

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 for the frequency range 30 MHz to 18 GHz and at a distance of 1.5 m above 18 GHz up to the 10th harmonic of the highest frequency generated within the equipment for LTE bands 7 and 41.

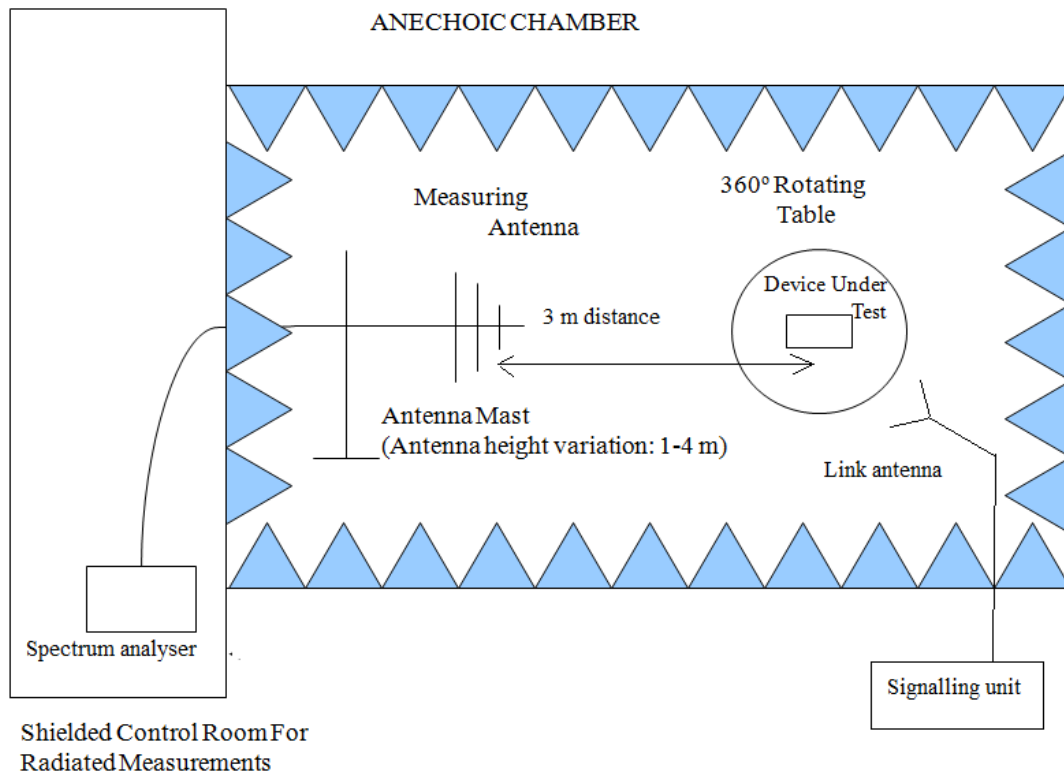
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the height and polarization of the measuring antenna. The maximum meter reading was recorded.

The maximum field strength (dBμV/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:

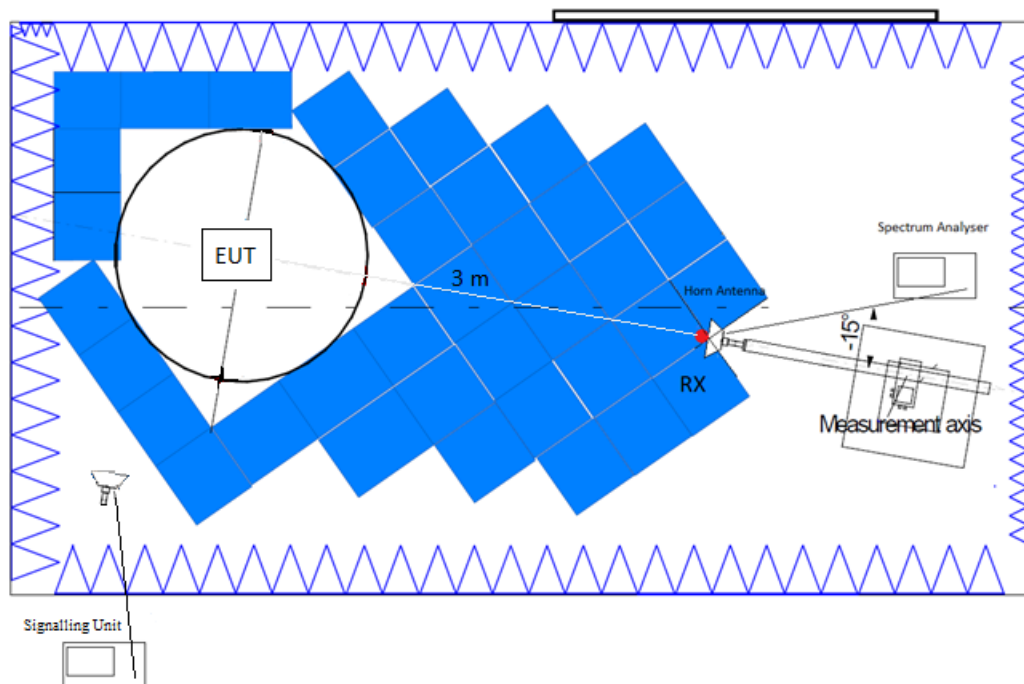
$EIRP (dBm) = E (dB\mu V/m) + 20 \log(D) - 104.8$; where D is the measurement distance (in the far field region) in m. D = 3 m.

TEST SETUP:

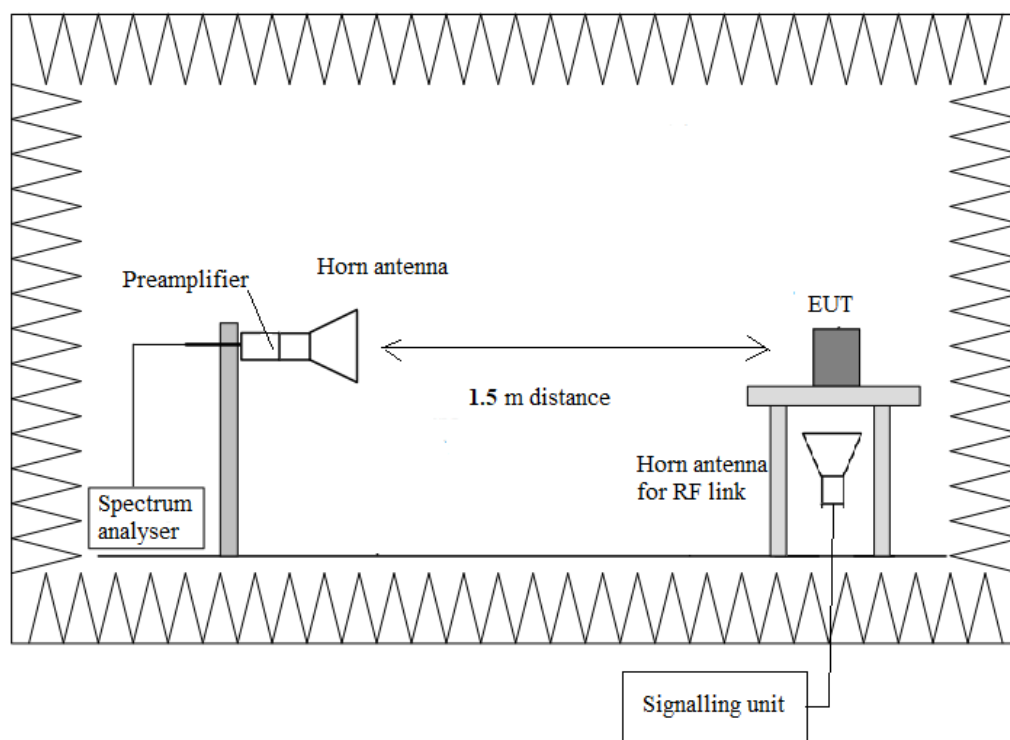
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 18 GHz:



Radiated measurements setup $f > 18$ GHz:



RESULTS:

LTE Band 4:

QPSK and 16QAM modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=24 as the worst-case.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 18 GHz:

The spurious frequencies detected are more than 20 dB below the limit.

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 18 GHz:

The spurious frequencies detected are more than 20 dB below the limit.

- High Channel:

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 18 GHz:

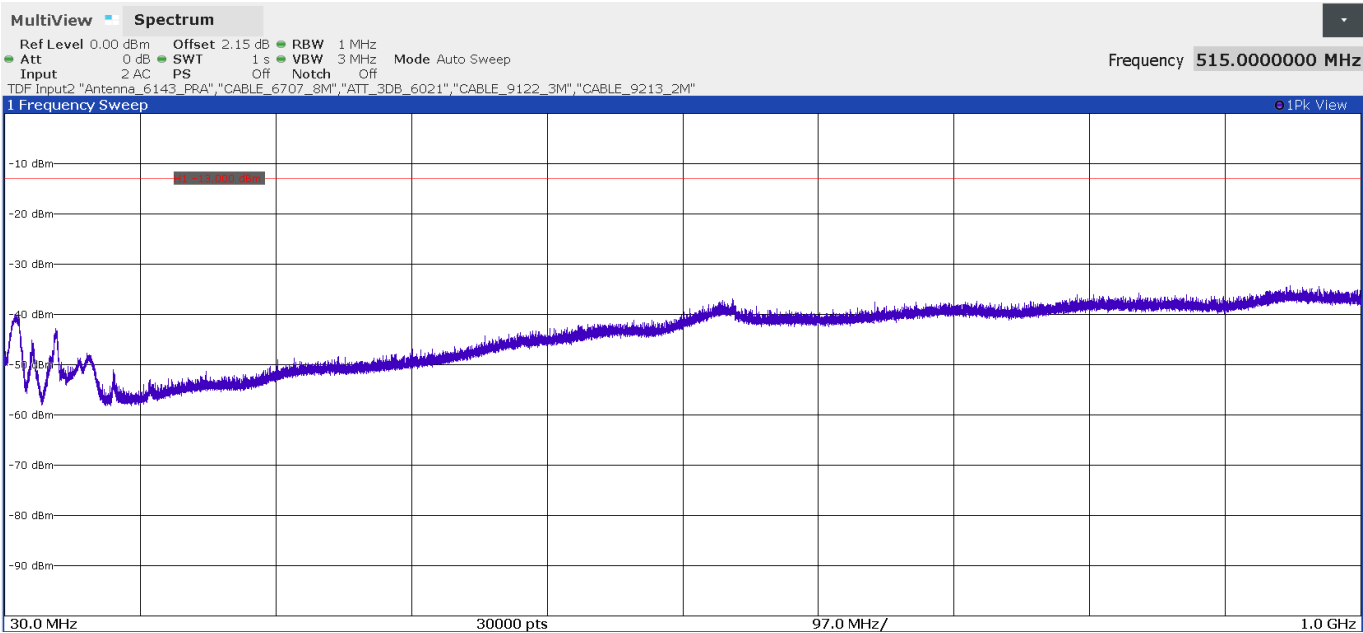
The spurious frequencies detected are more than 20 dB below the limit.

Measurement uncertainty (dB)	<±5.35 for $f < 1\text{GHz}$ <±4.32 for $f \geq 1\text{GHz}$ up to 18 GHz
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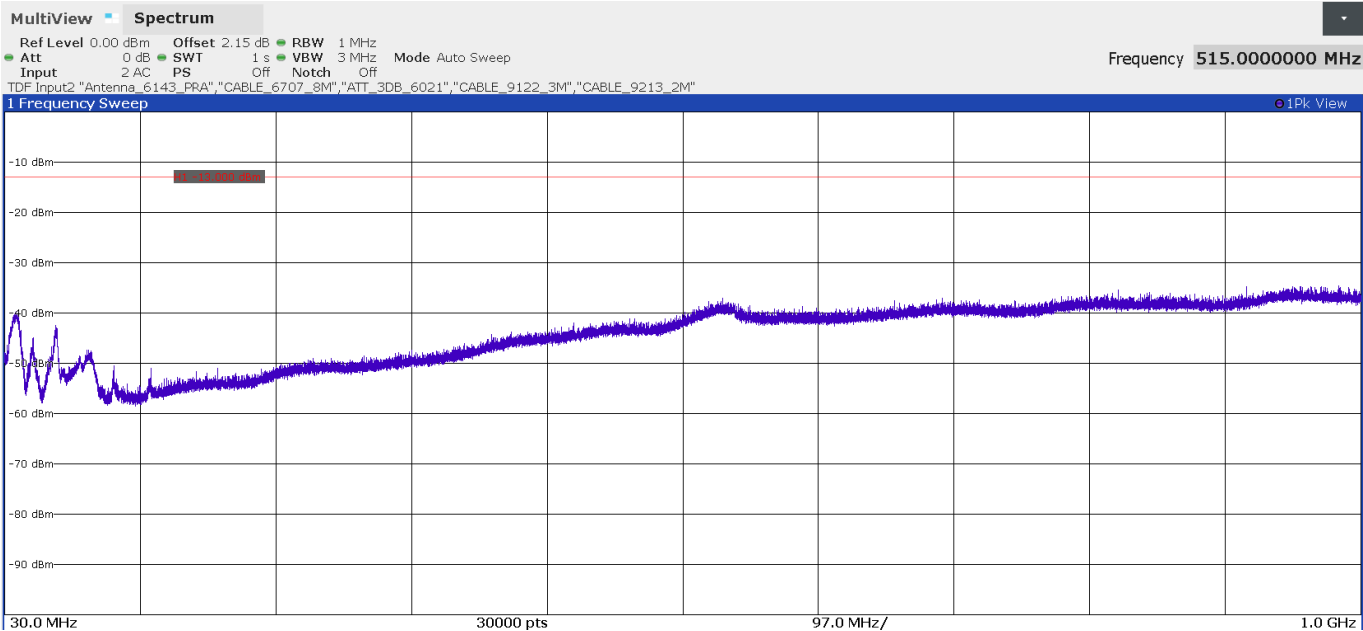
Verdict: PASS

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

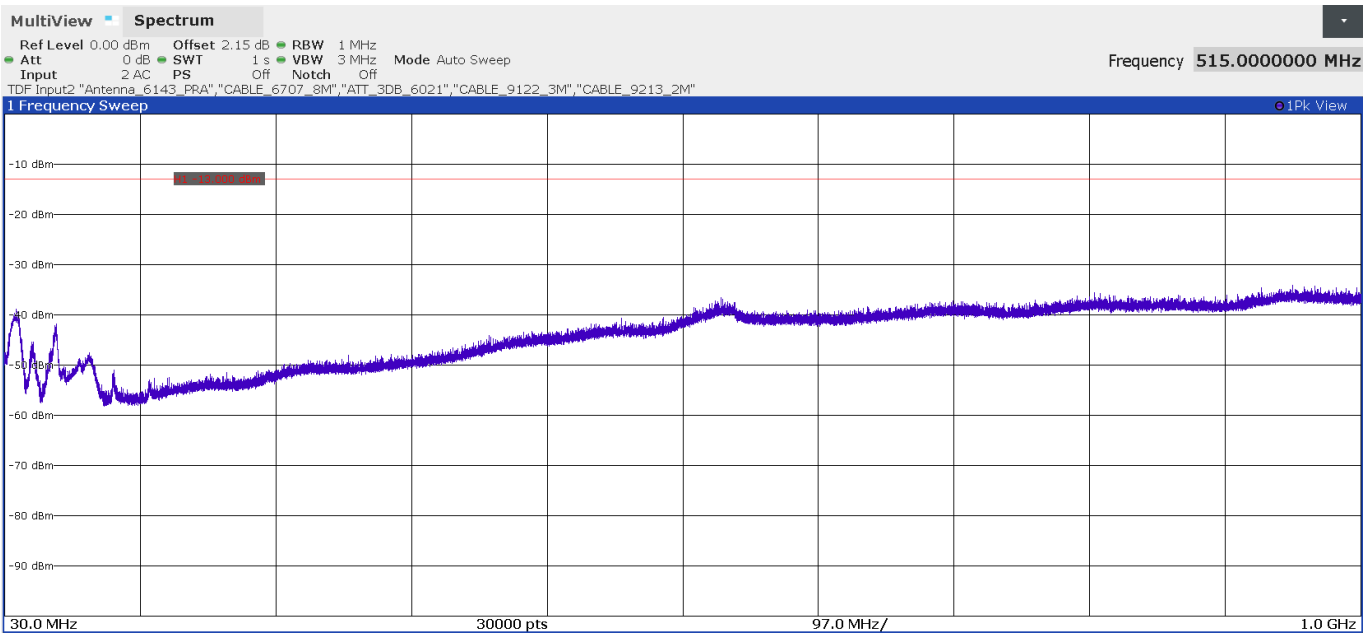
- Low Channel:



- Middle Channel:

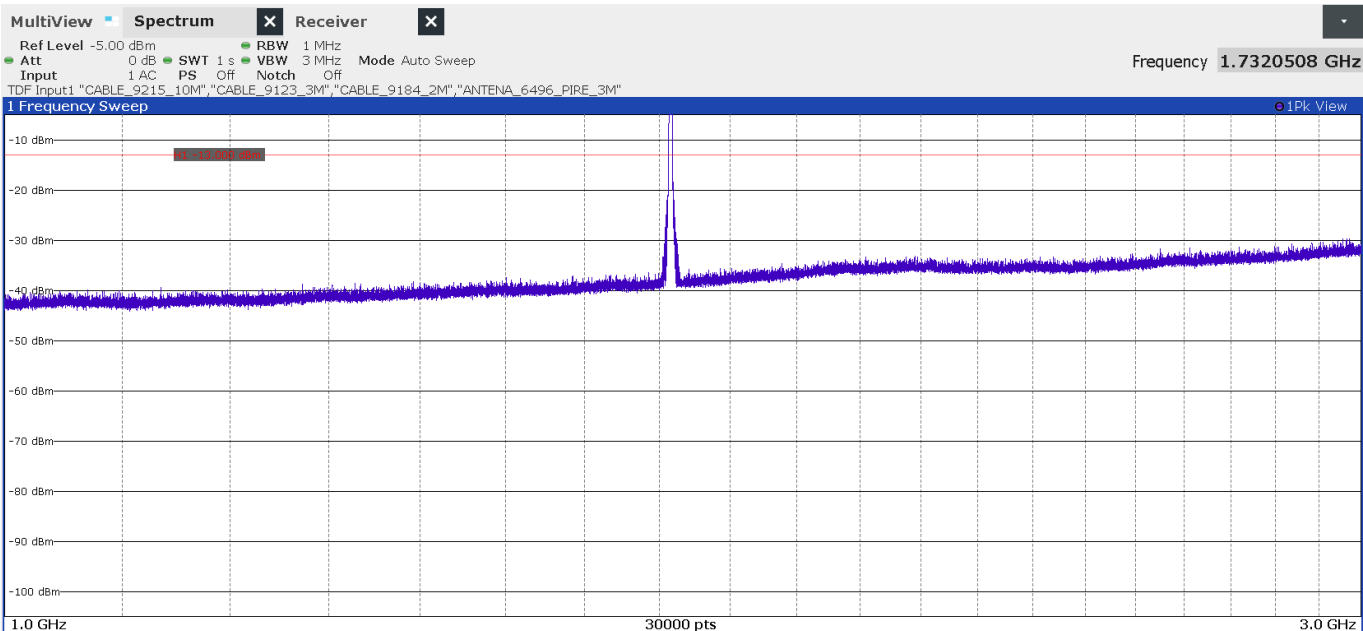


- High Channel:



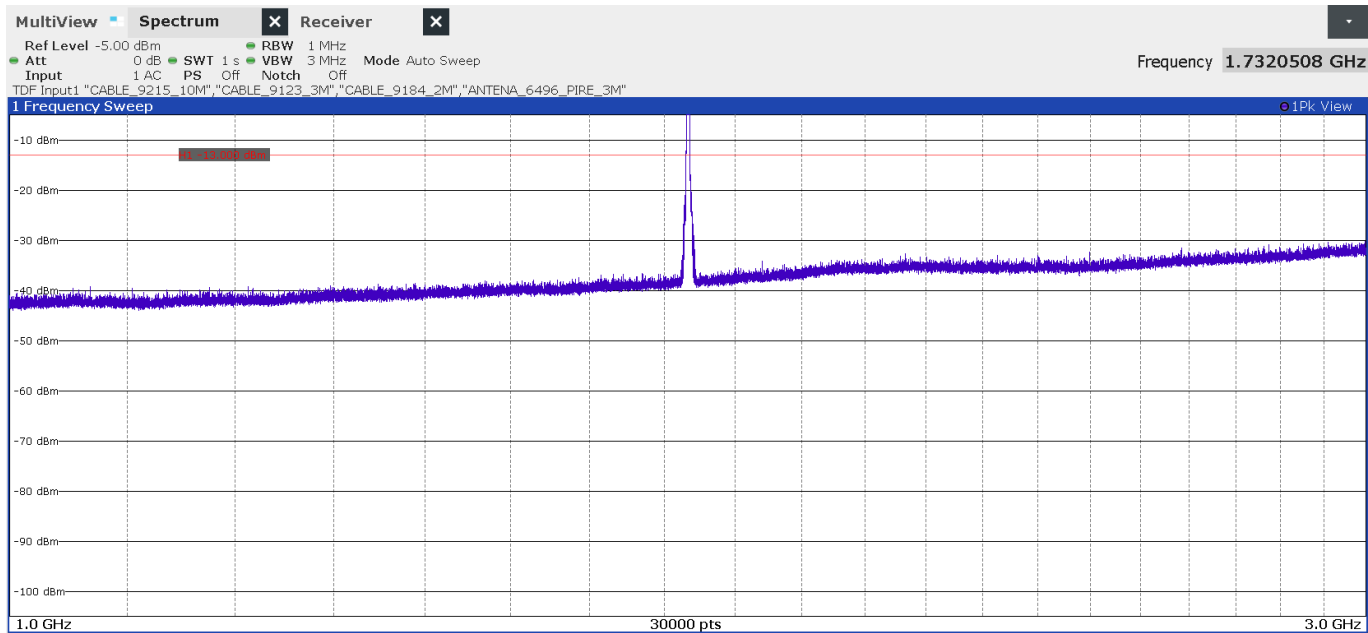
FREQUENCY RANGE 1 - 3 GHz (worst-case):

- Low Channel:



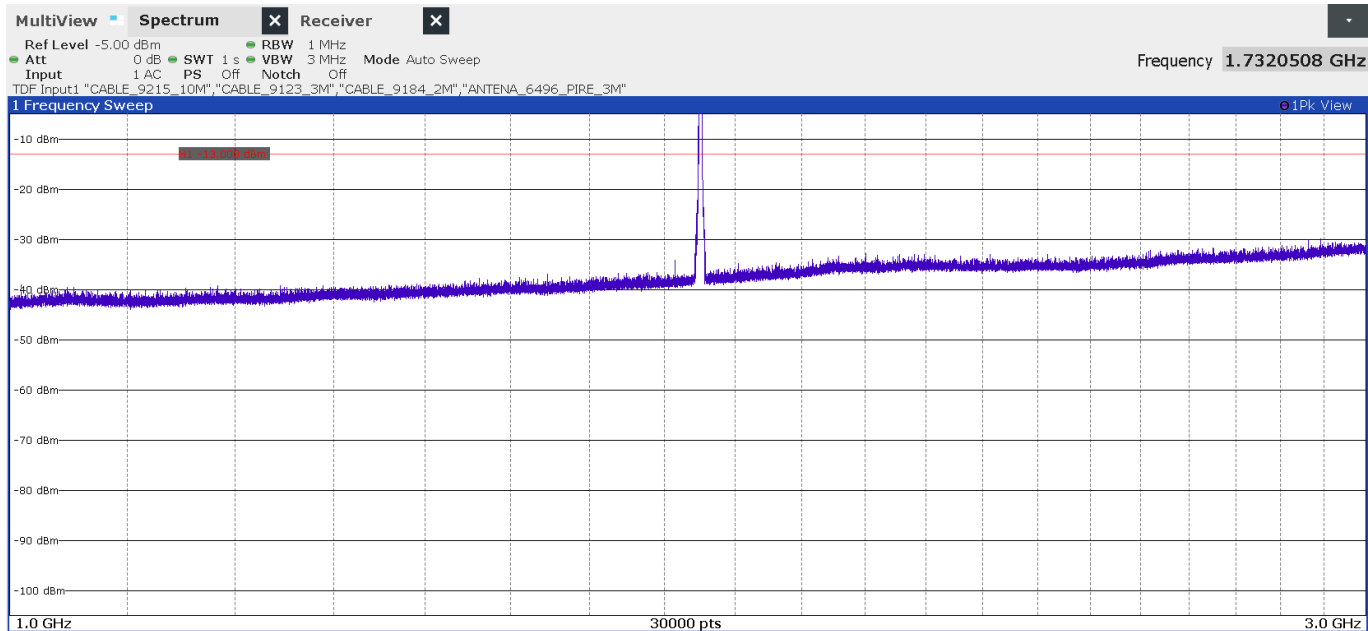
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

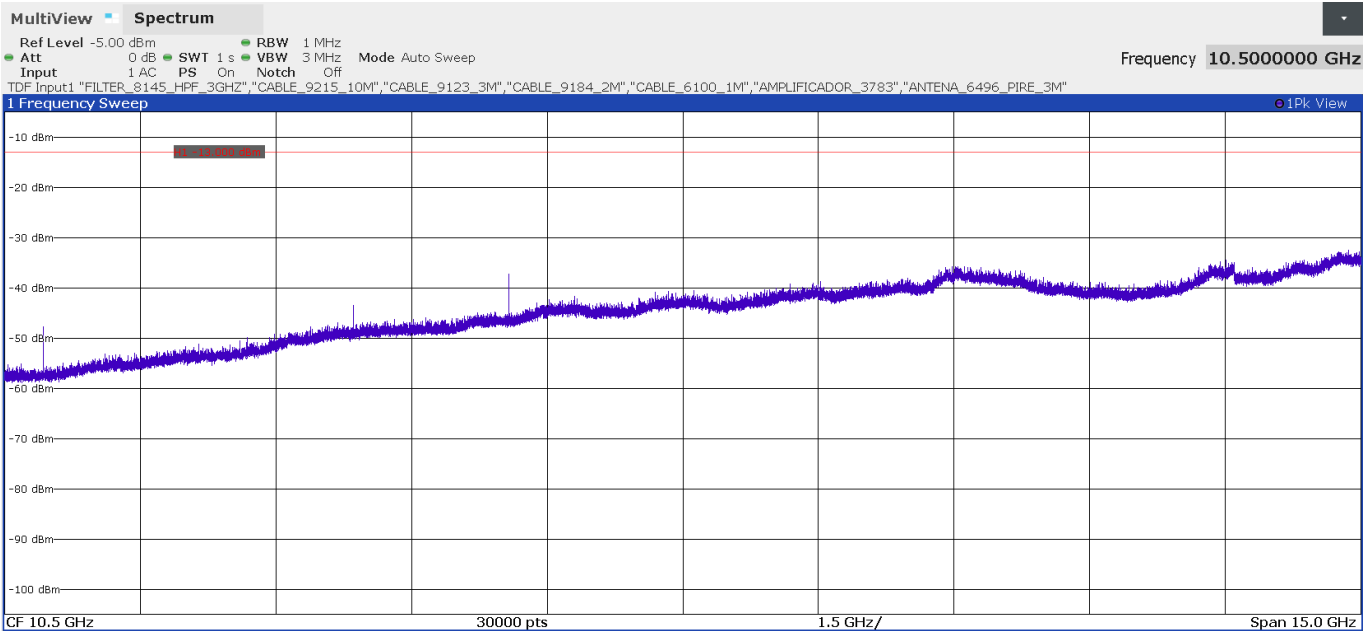
- High Channel:



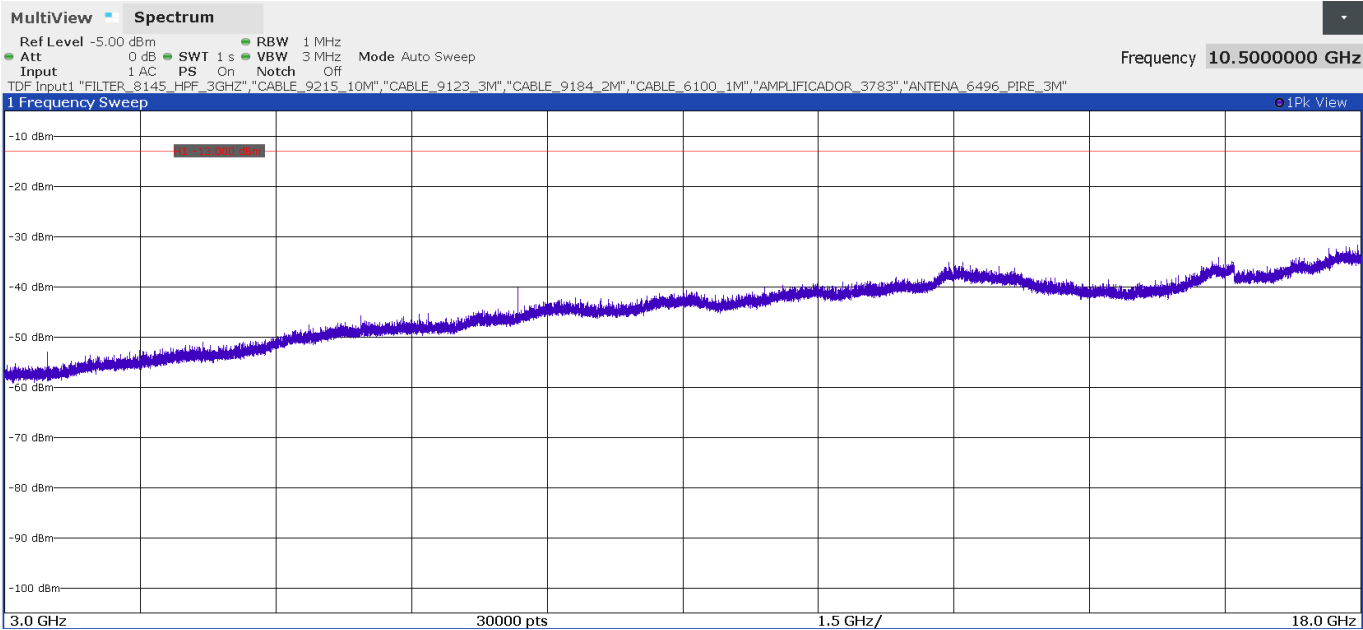
The peak above the limit is the carrier frequency:

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

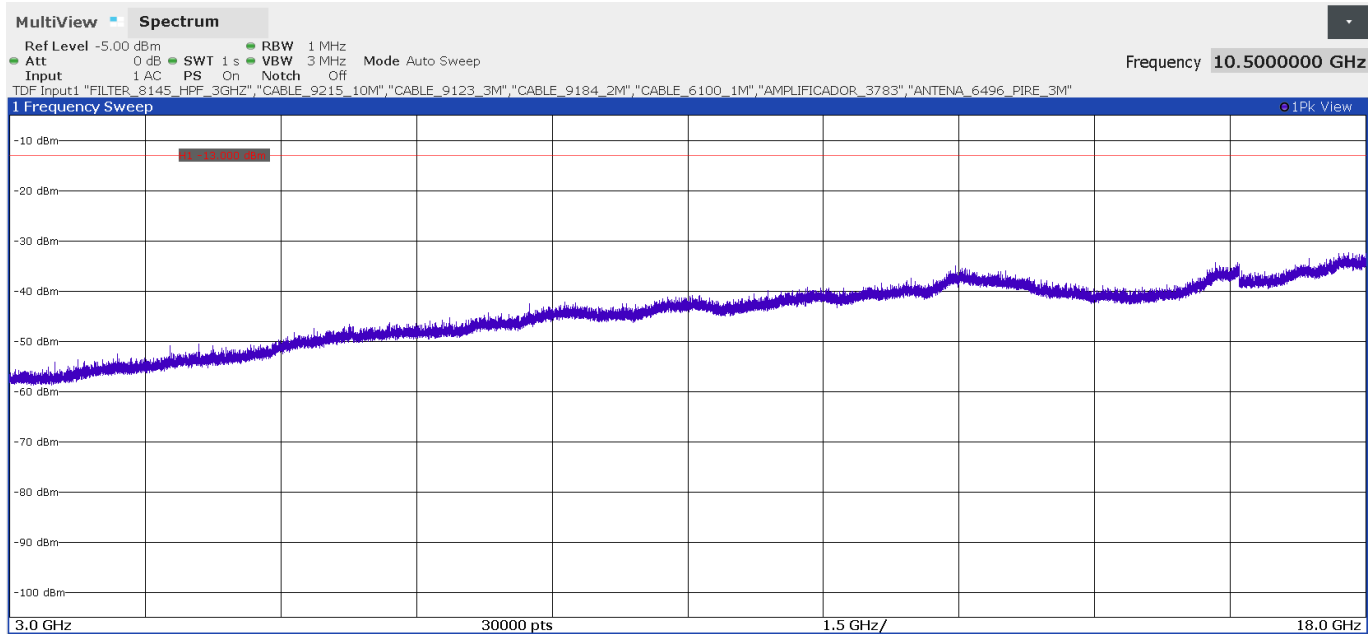
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 7:

QPSK and 16QAM modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=24 as the worst-case.

- Low Channel:

Frequency range 30 MHz - 1 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 26 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 2490.5 – 2496 MHz

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	E.I.R.P (dBm)	Polarization	Detector
2.49486966	-22.14	H	Peak
2.49564724	-22.82	H	Peak

- Middle Channel:

Frequency range 30 MHz - 1 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 26 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 2490.5 – 2496 MHz

No spurious signals found.

- High Channel:

Frequency range 30 MHz - 1 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 1 - 26 GHz

The spurious frequencies detected are more than 20 dB below the limit.

Frequency range 2490.5 – 2496 MHz

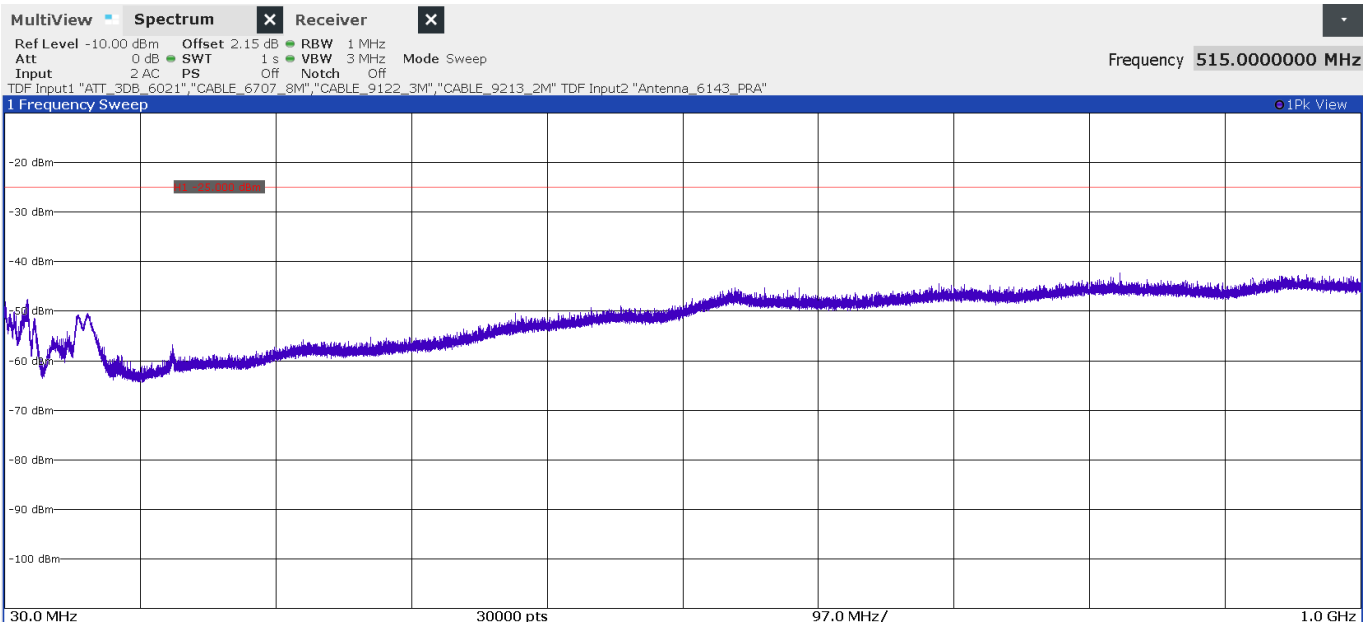
No spurious signals found.

Measurement uncertainty (dB)	<±5.35 for $f < 1\text{GHz}$ <±4.32 for $f \geq 1\text{GHz}$ up to 18 GHz <±5.51 for $f \geq 18\text{GHz}$ up to 26 GHz
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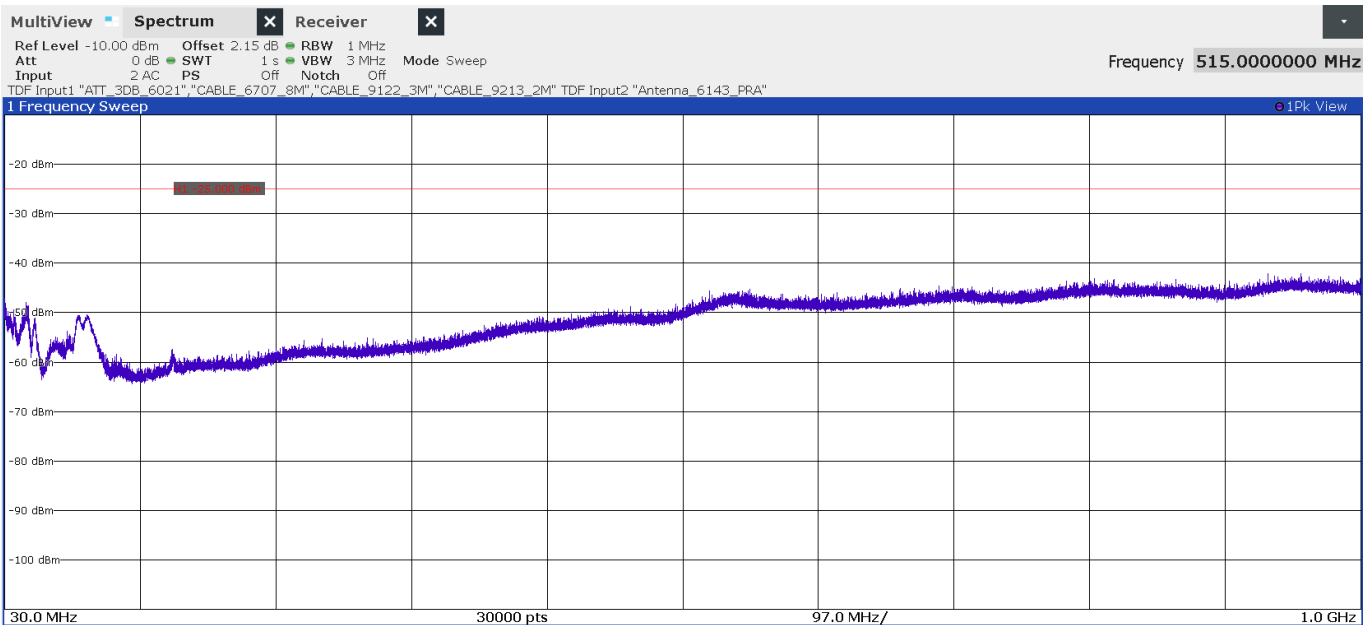
Verdict: PASS

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

- Low Channel:



- Middle Channel:

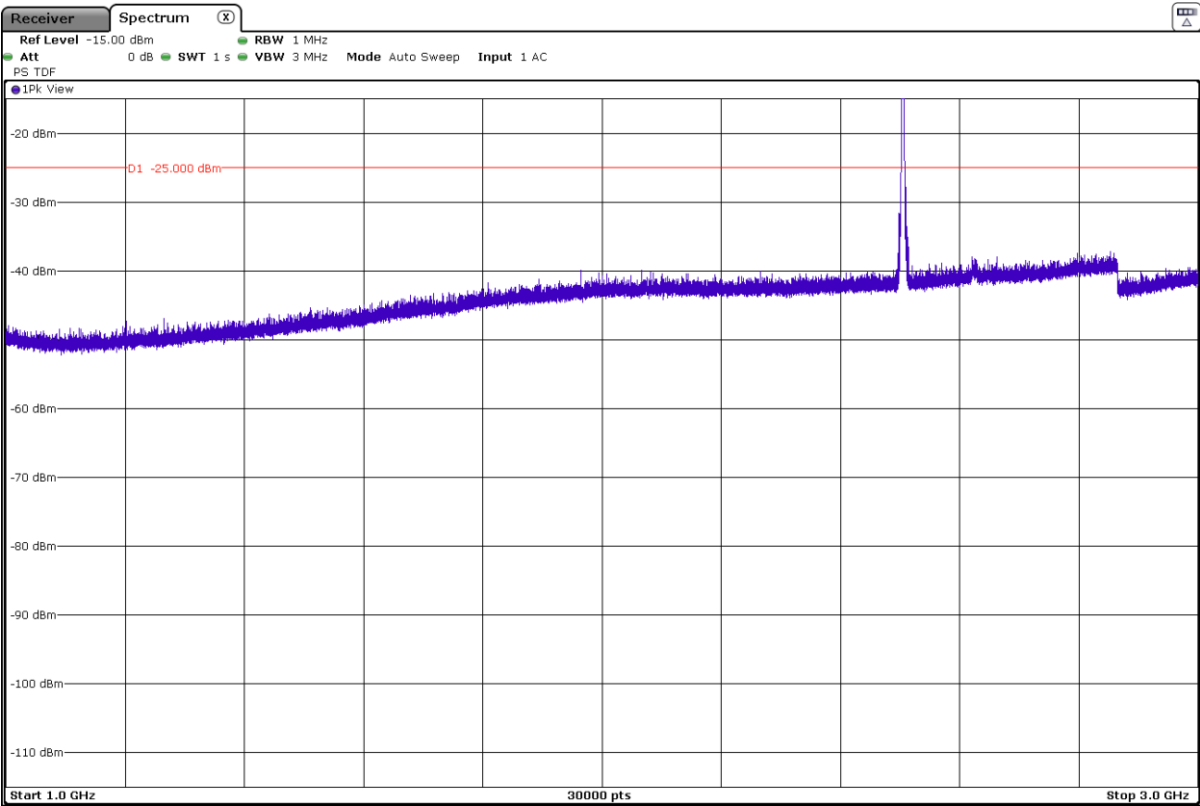


The screenshot shows the Spectrum Analyzer interface with the following settings and data:

- MultiView:** Spectrum (selected), Receiver (closed)
- Ref Level:** -10.00 dBm
- Att:** 0 dB
- Input:** 2 AC PS Off Notch Off
- Offset:** 2.15 dB
- RBW:** 1 MHz
- VBW:** 3 MHz
- Mode:** Sweep
- Frequency:** 515.000000 MHz
- TDF Input1:** "ATT_3DB_6021","CABLE_6707_8M","CABLE_9122_3M","CABLE_9213_2M" TDF Input2 "Antenna_6143_PRA"
- Plot Title:** 1 Frequency Sweep
- Plot View:** 1Pk View
- Y-axis:** Power in dBm, ranging from -100 dBm to -20 dBm.
- X-axis:** Frequency in MHz, ranging from 30.0 MHz to 97.0 MHz.
- Plot Data:** A noisy signal trace showing a general upward trend in power from approximately -60 dBm at 30 MHz to -45 dBm at 97 MHz.

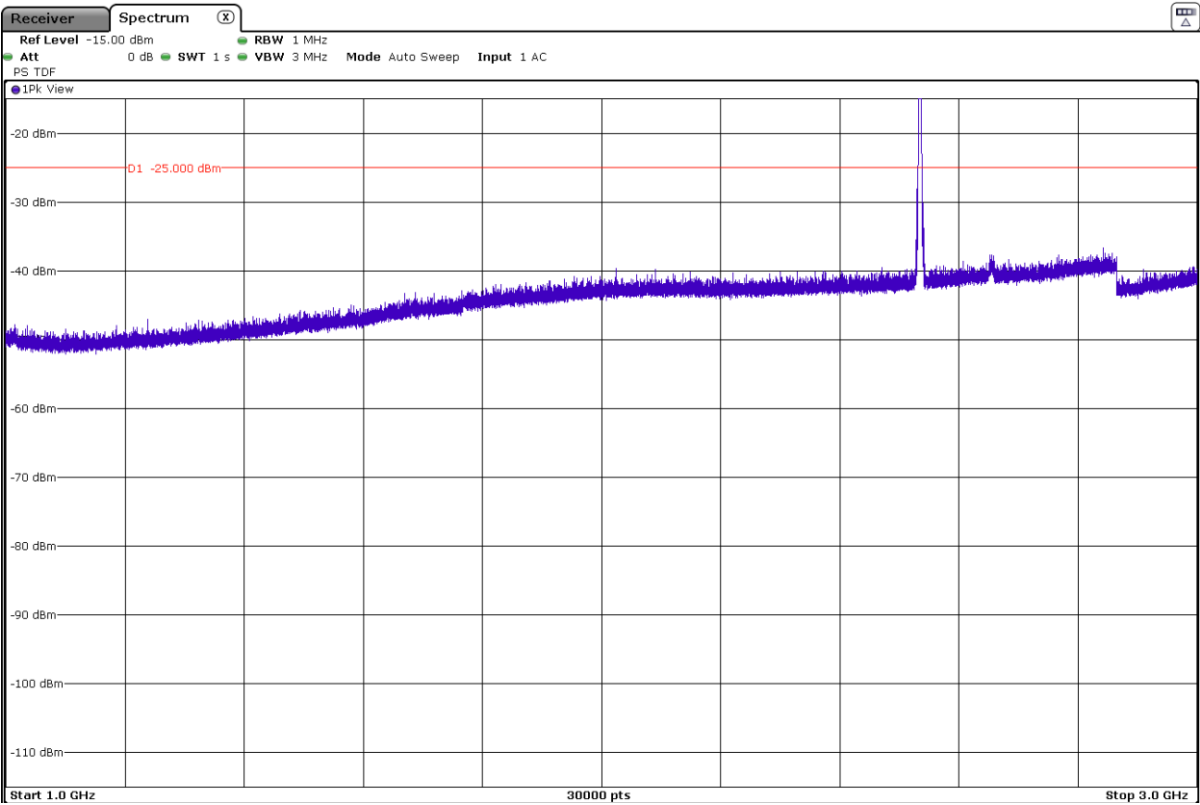
FREQUENCY RANGE 1 - 3 GHz (worst-case):

- Low Channel:



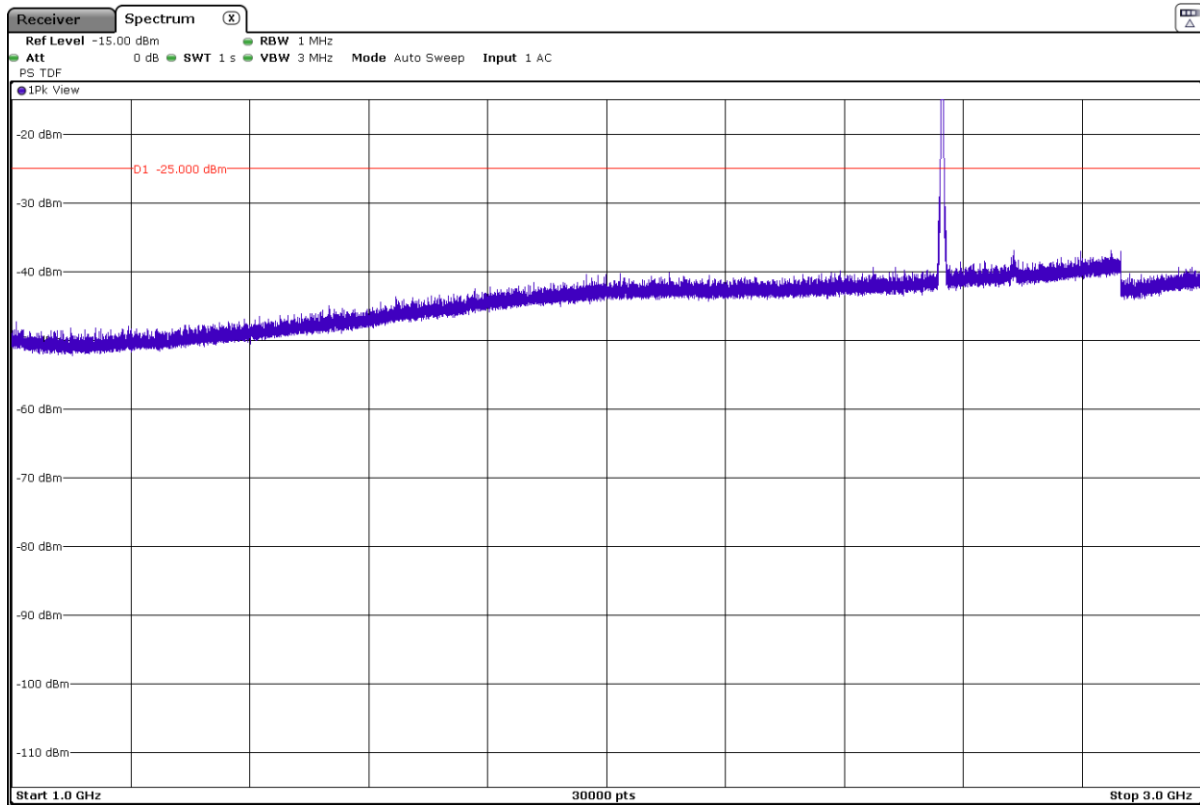
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

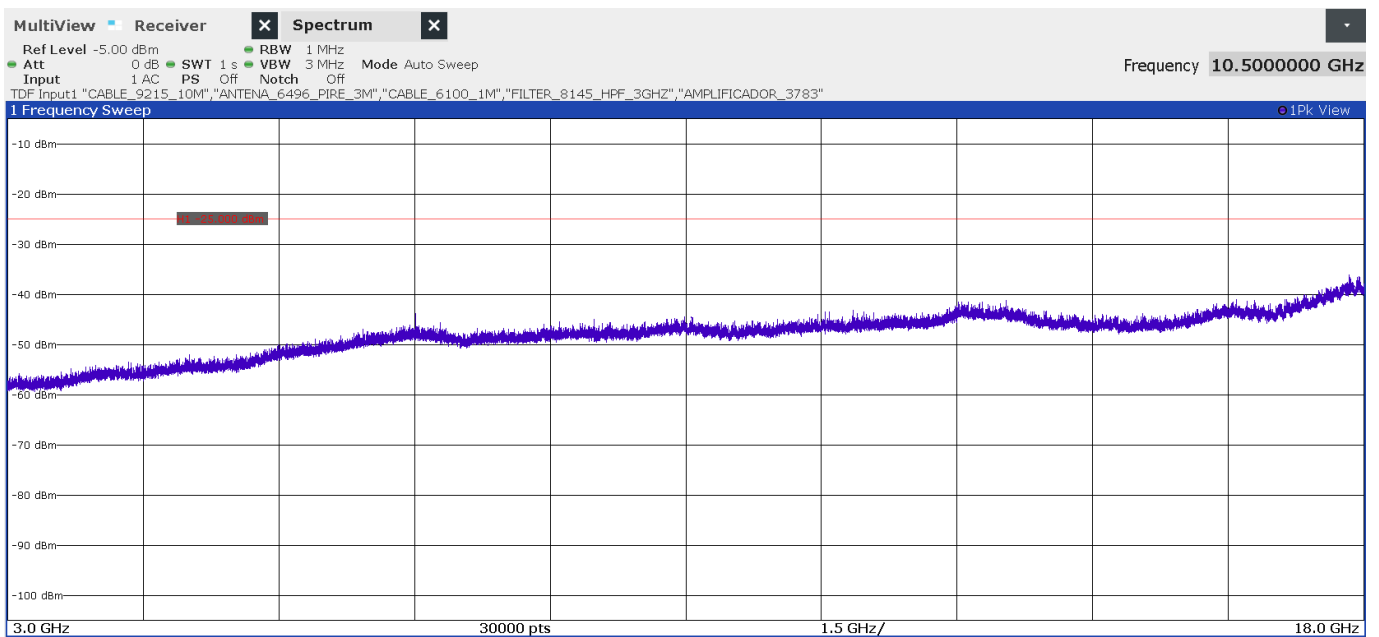
- High Channel:



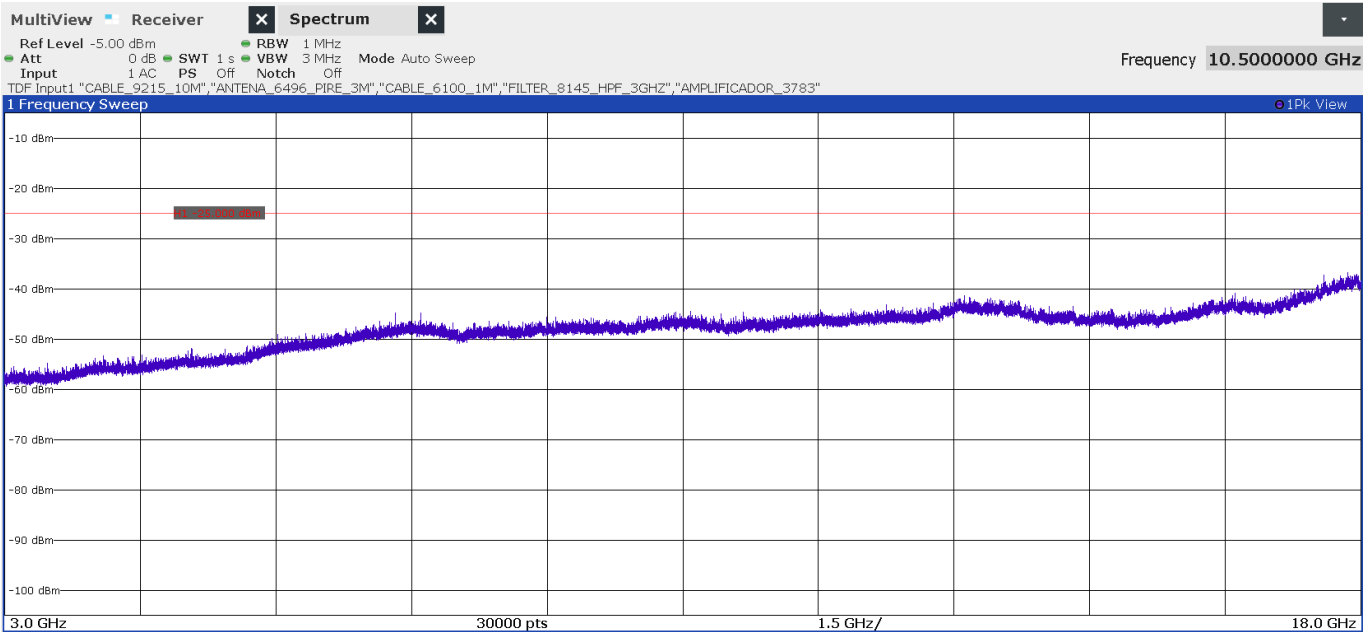
The peak above the limit is the carrier frequency:

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

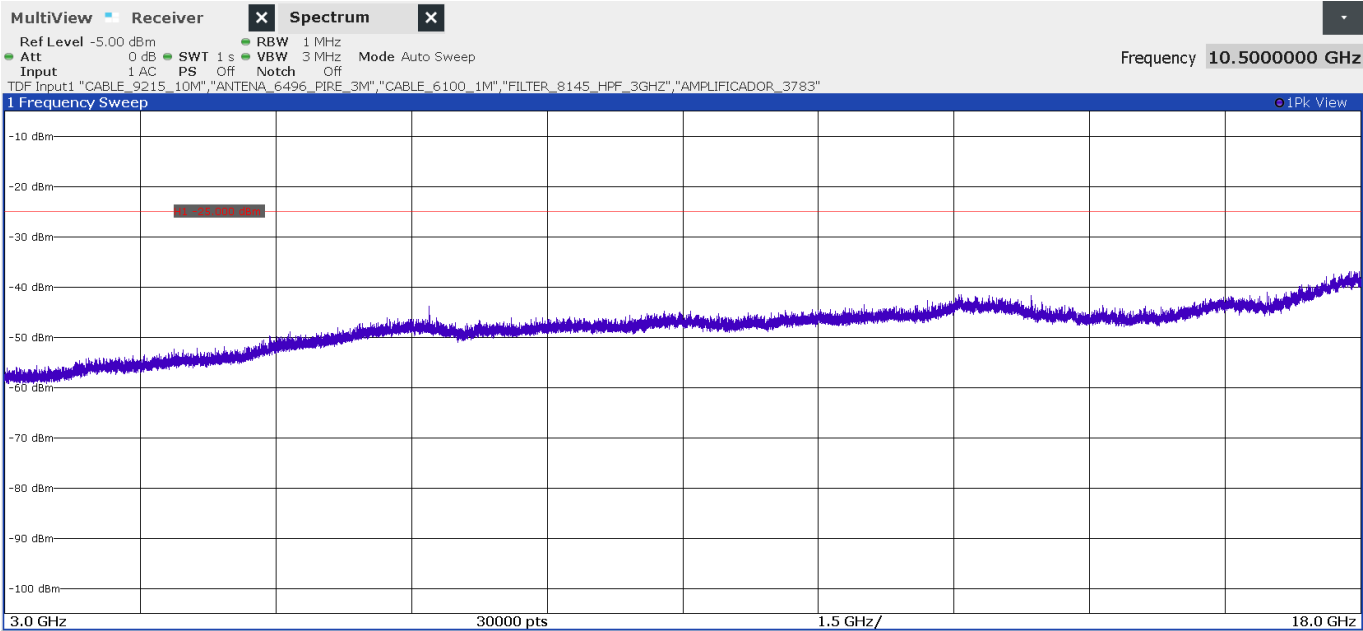
- Low Channel:



- Middle Channel:

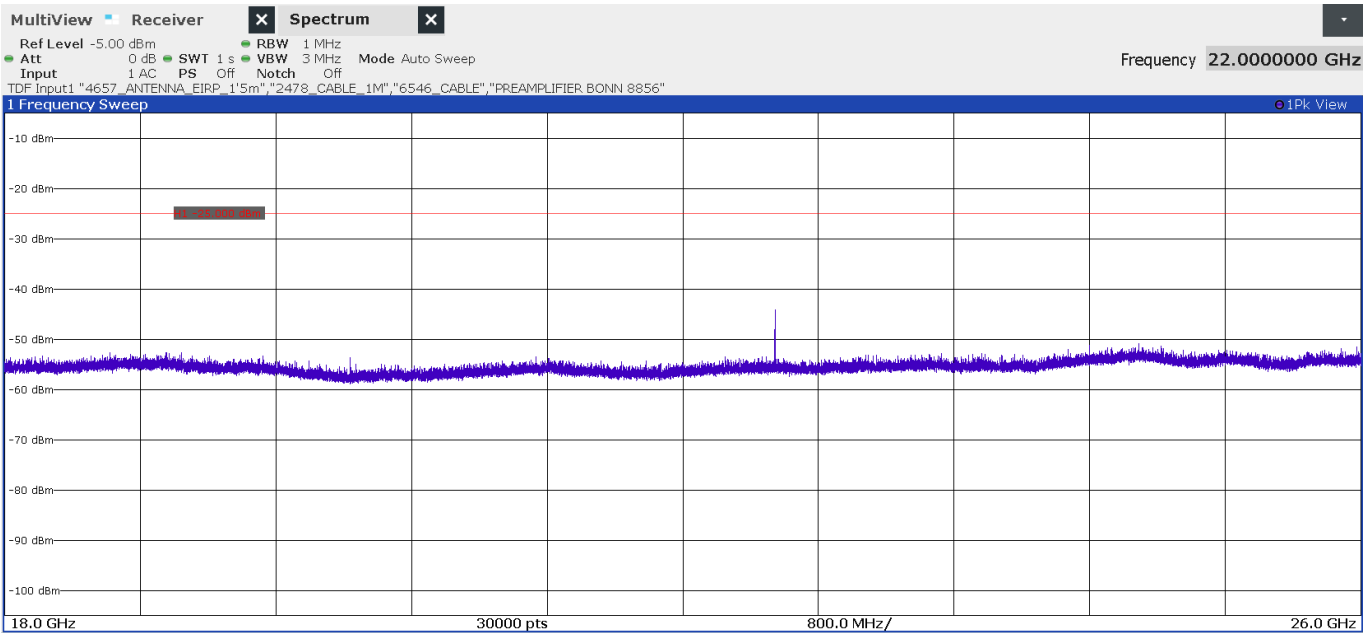


- High Channel:

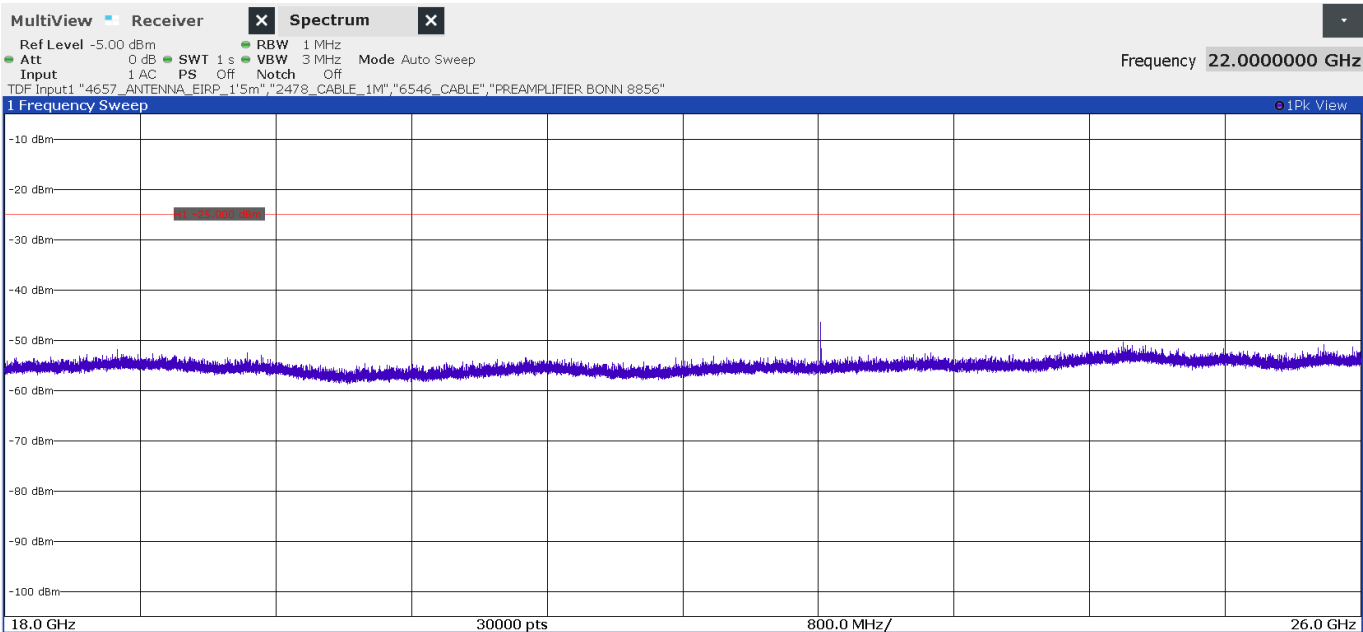


FREQUENCY RANGE 18 - 26 GHz (worst-case):

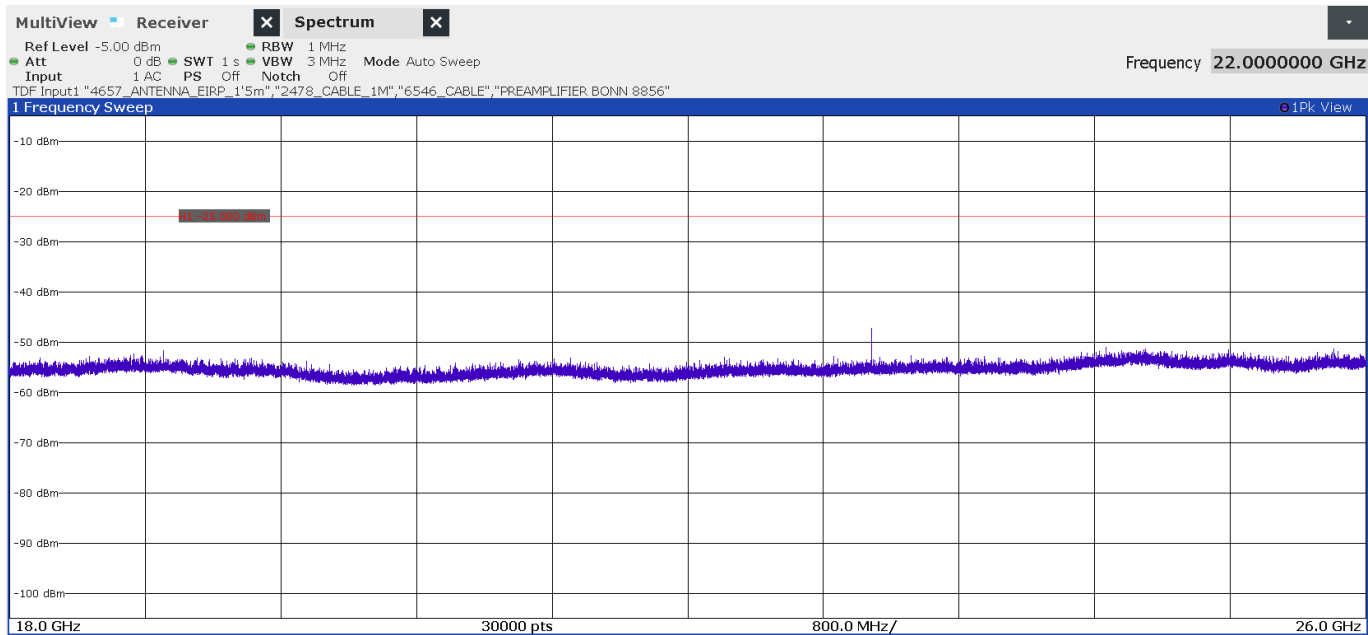
- Low Channel:



- Middle Channel:

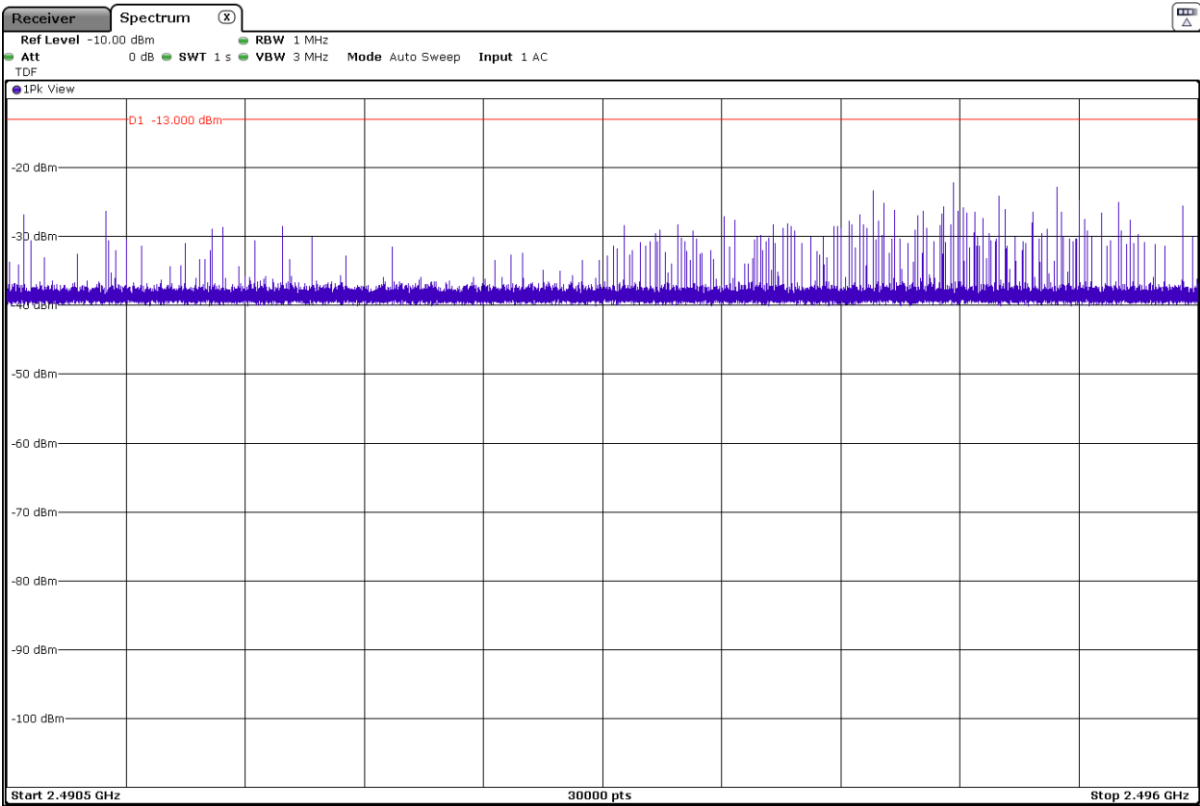


- High Channel:

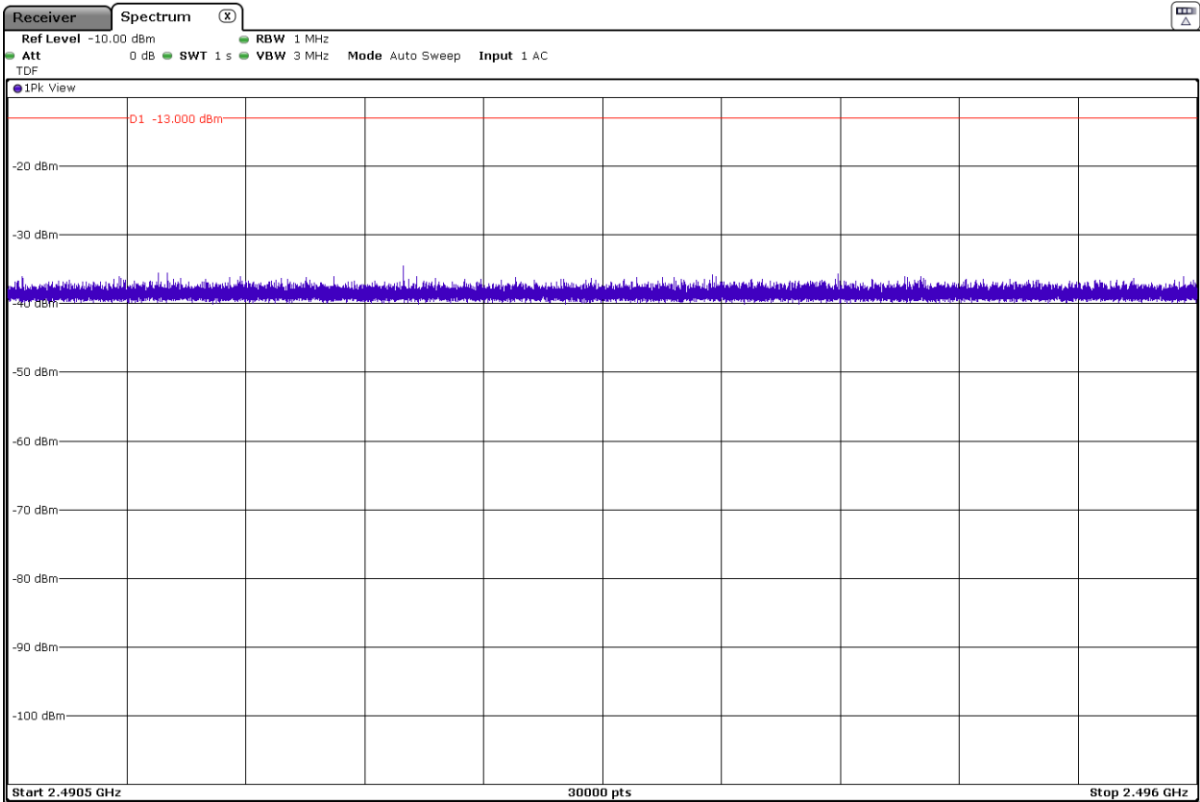


FREQUENCY RANGE 2490.5 - 2496 MHz (worst-case):

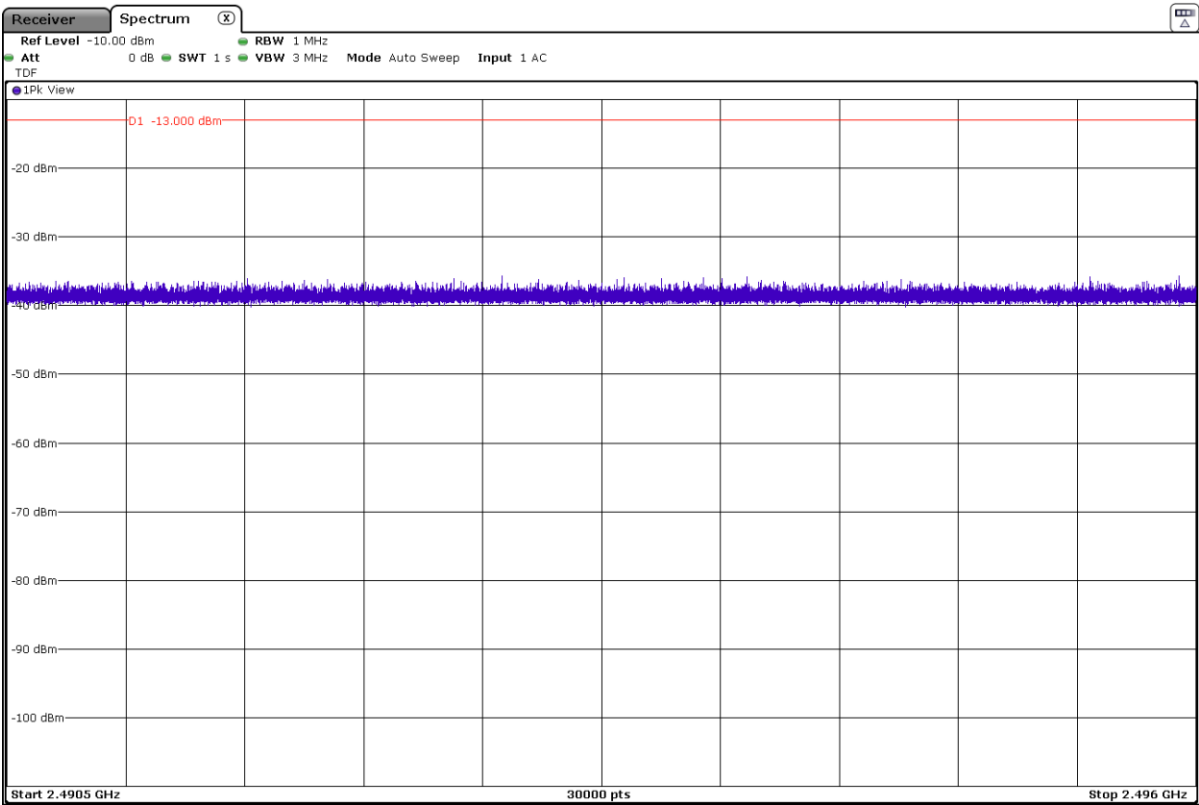
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 12:

QPSK and 16QAM modulations:

A preliminary scan determined the QPSK modulation, BW=1.4 MHz, RB=1, Offset=0 as 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 – 8.5 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 – 8.5 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 – 8.5 GHz

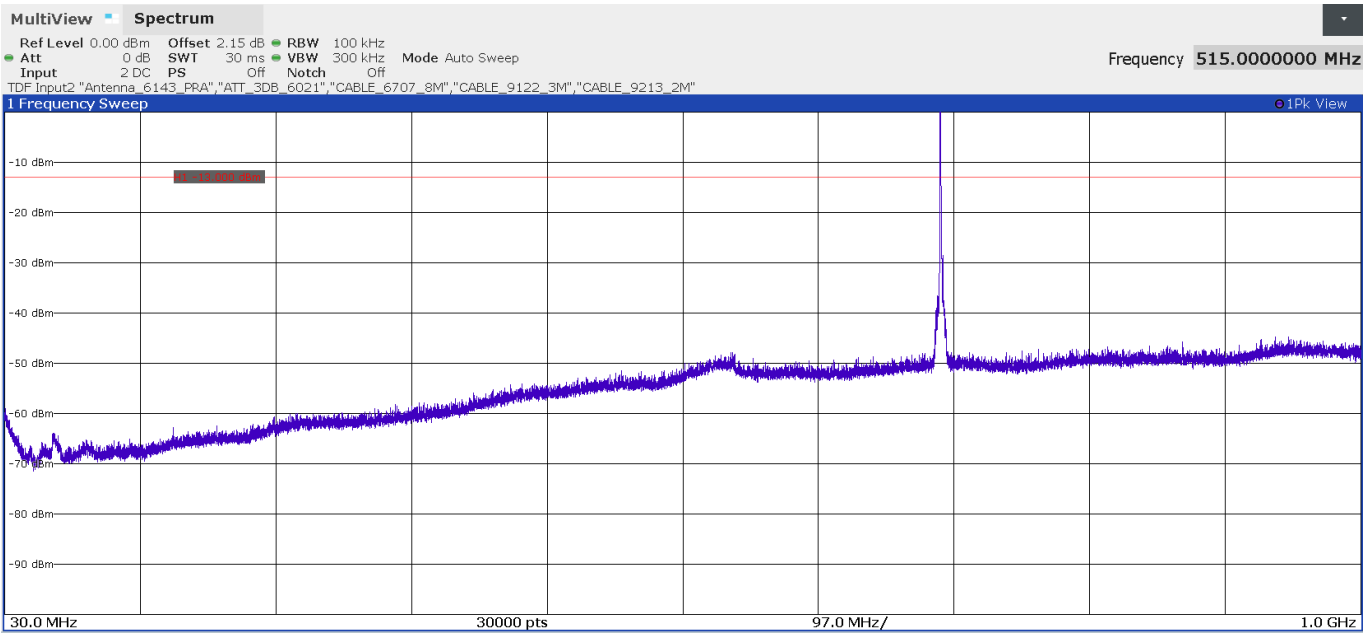
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)	<±5.35 for f < 1GHz <±4.32 for f ≥ 1 GHz up to 8.5 GHz
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Verdict: PASS

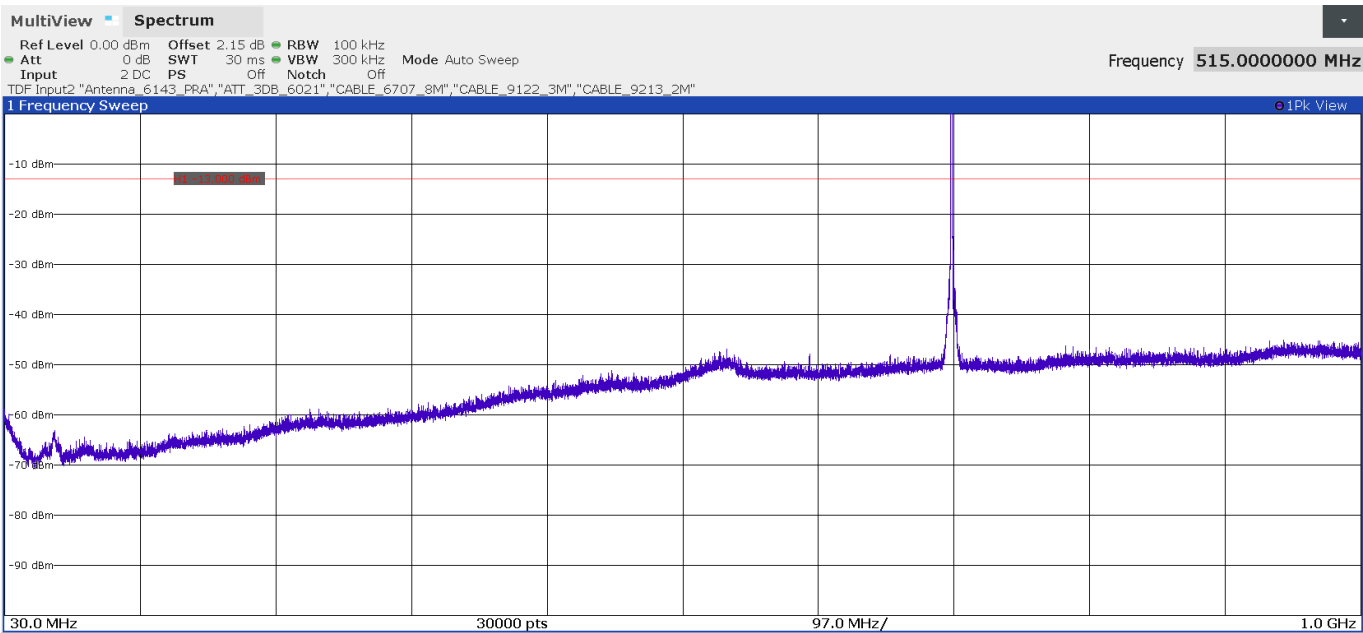
FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

- Low Channel:



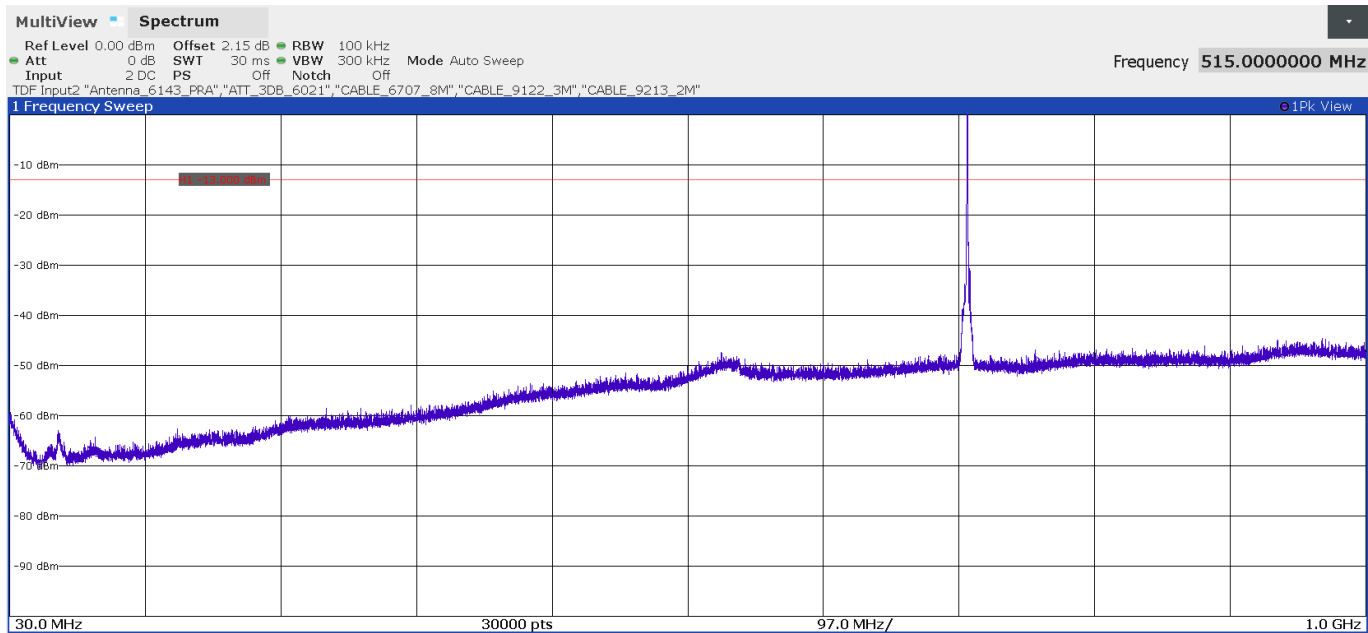
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

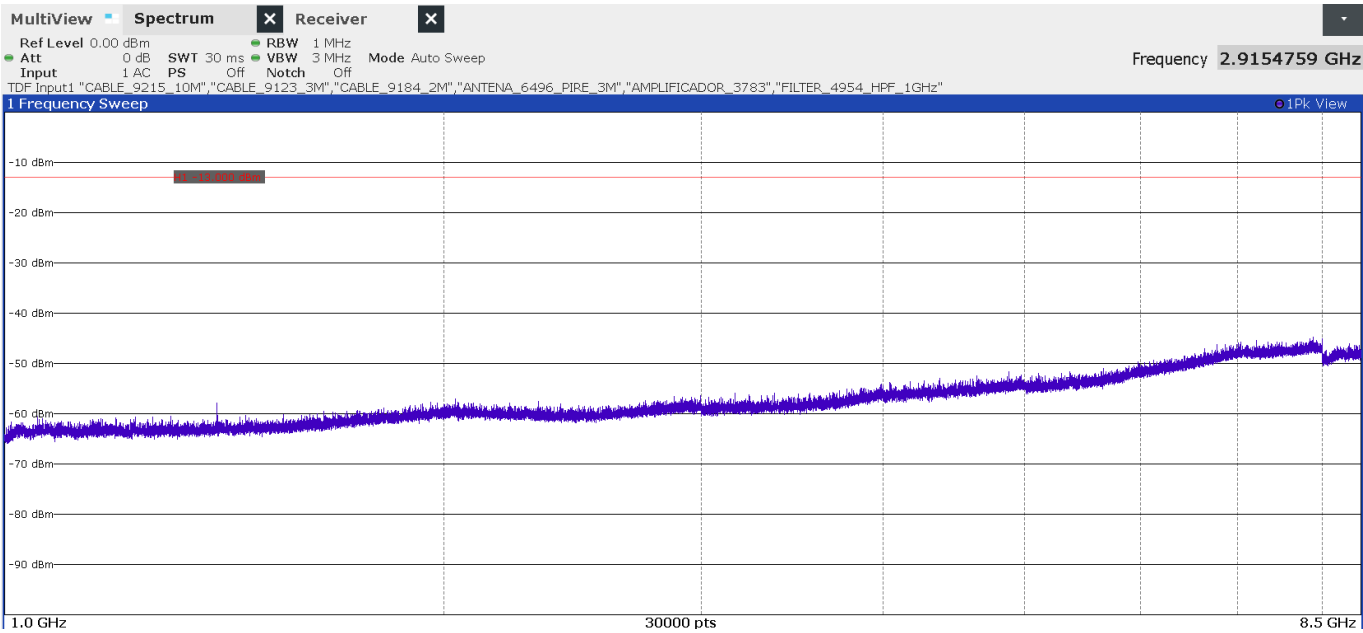
- High Channel:



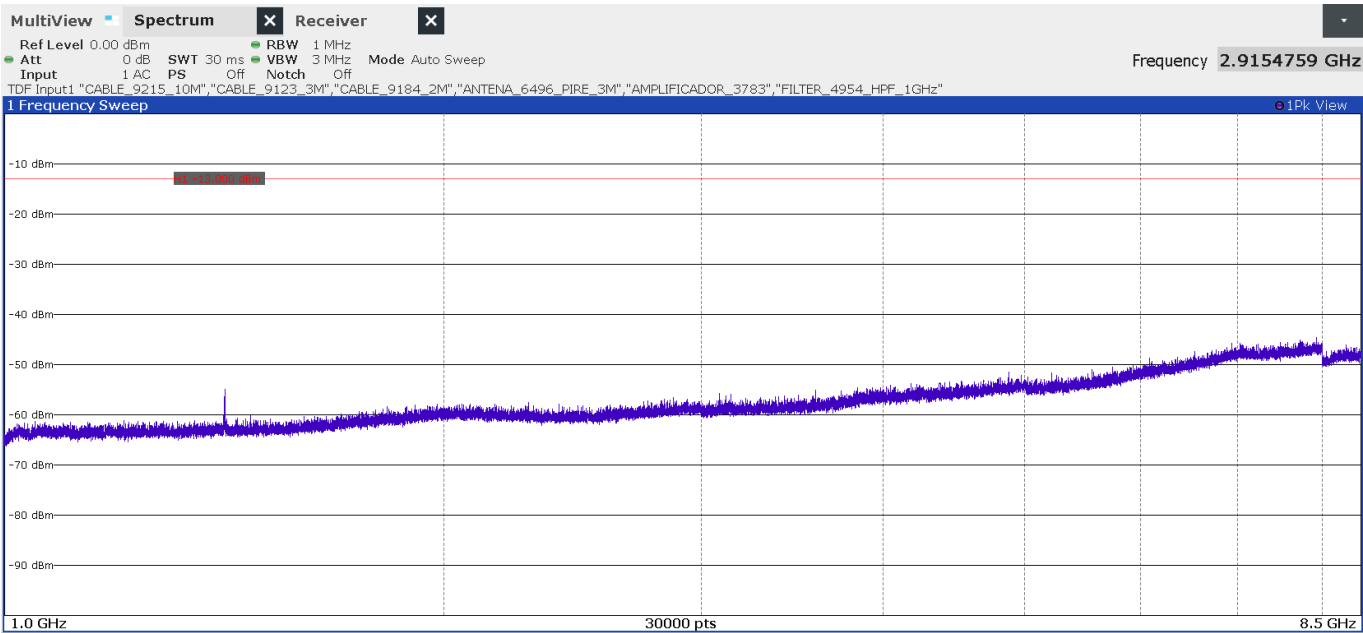
The peak above the limit is the carrier frequency:

FREQUENCY RANGE 1 – 8.5 GHz (worst-case):

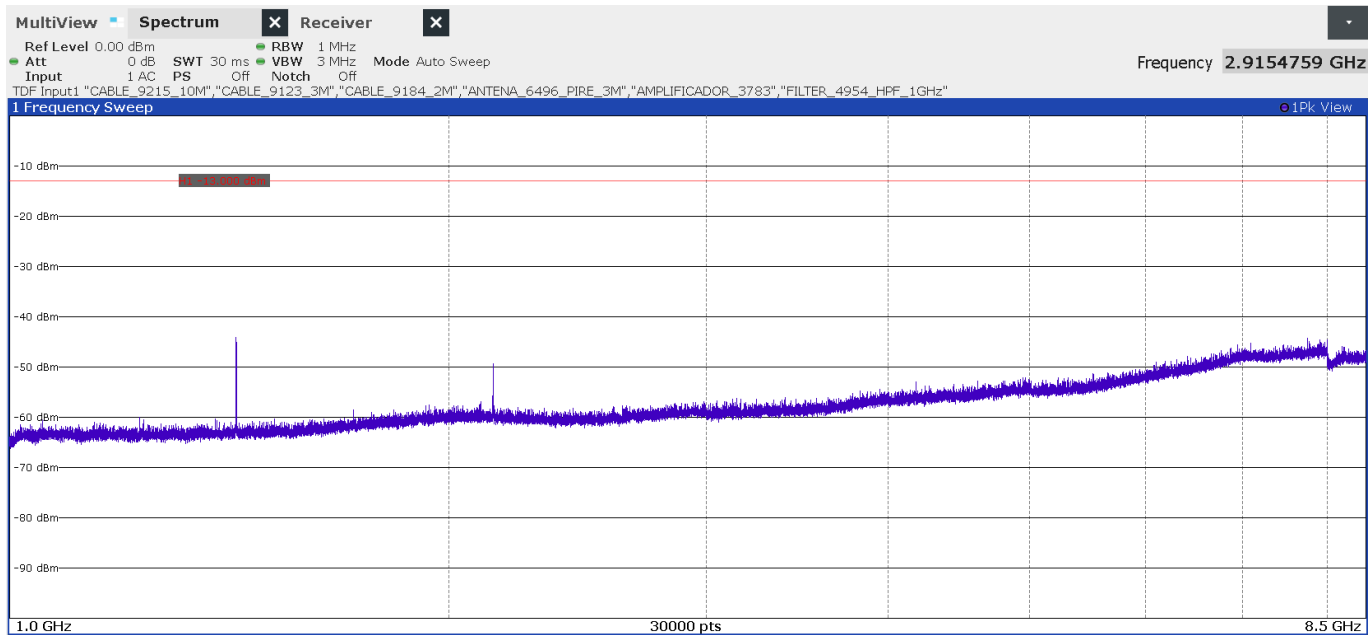
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 13:

QPSK and 16QAM modulations:

A preliminary scan determined the 16QAM modulation, BW=5 MHz, RB=1, Offset=12 as 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 – 8.5 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:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
1.5590162	-56.02	V	Peak

- Middle Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 – 8.5 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:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
1.5638578	-56.98	H	Peak

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 – 8.5 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:

Spurious frequencies at less than 20 dB below the limit:

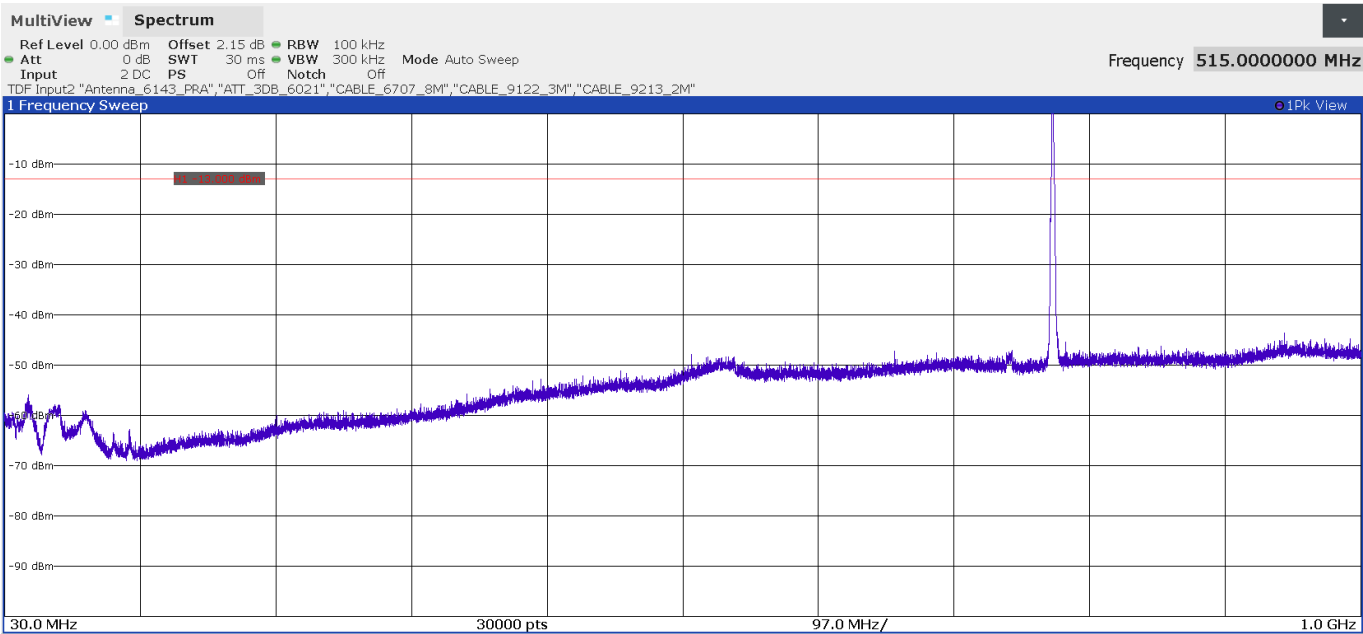
Spurious frequency (GHz)	E.I.R.P (dBm)	Polarization	Detector
1.5687776	-56.5	V	Peak

Measurement uncertainty (dB)	<±5.35 for f < 1GHz <±4.32 for f ≥ 1 GHz up to 8.5 GHz
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Verdict: PASS

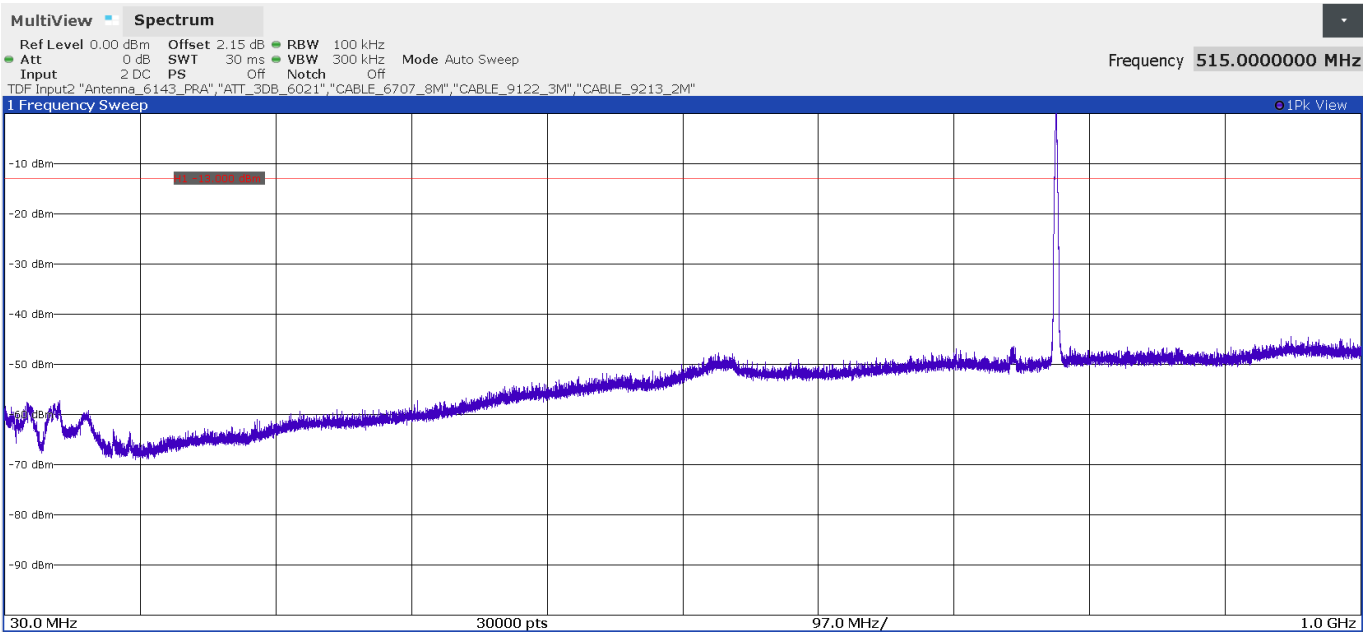
FREQUENCY RANGE 30 MHz - 1 GHz (worst-case):

- Low Channel:



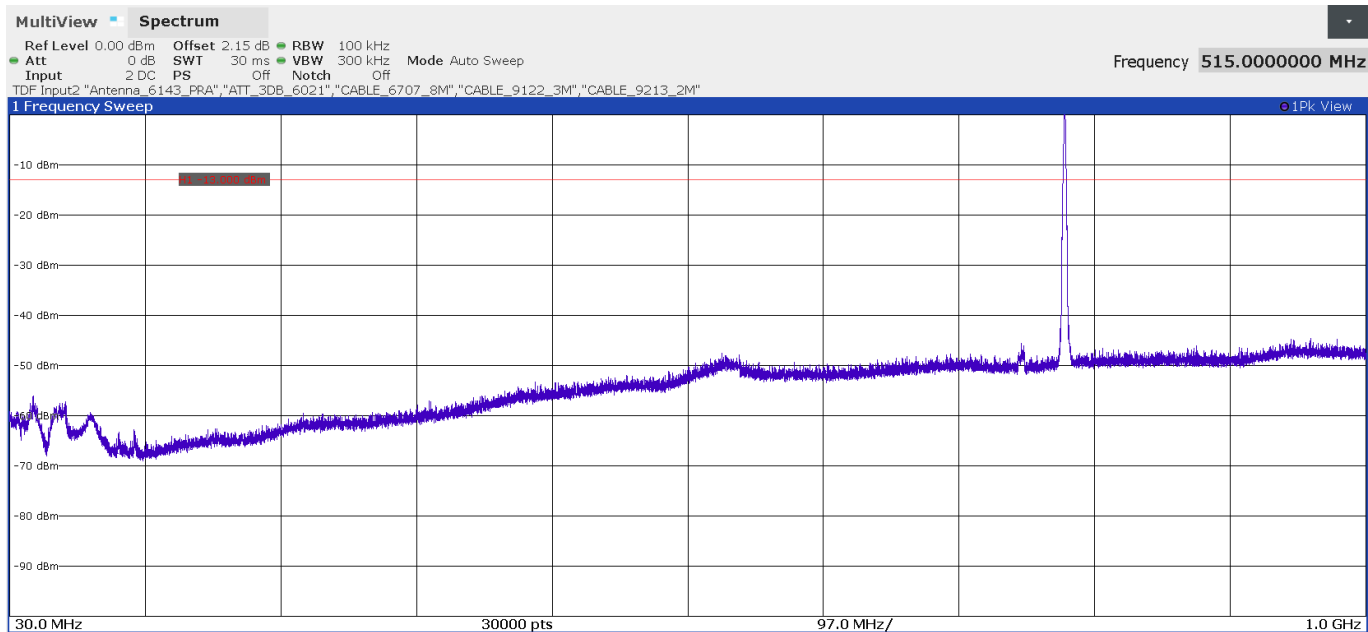
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

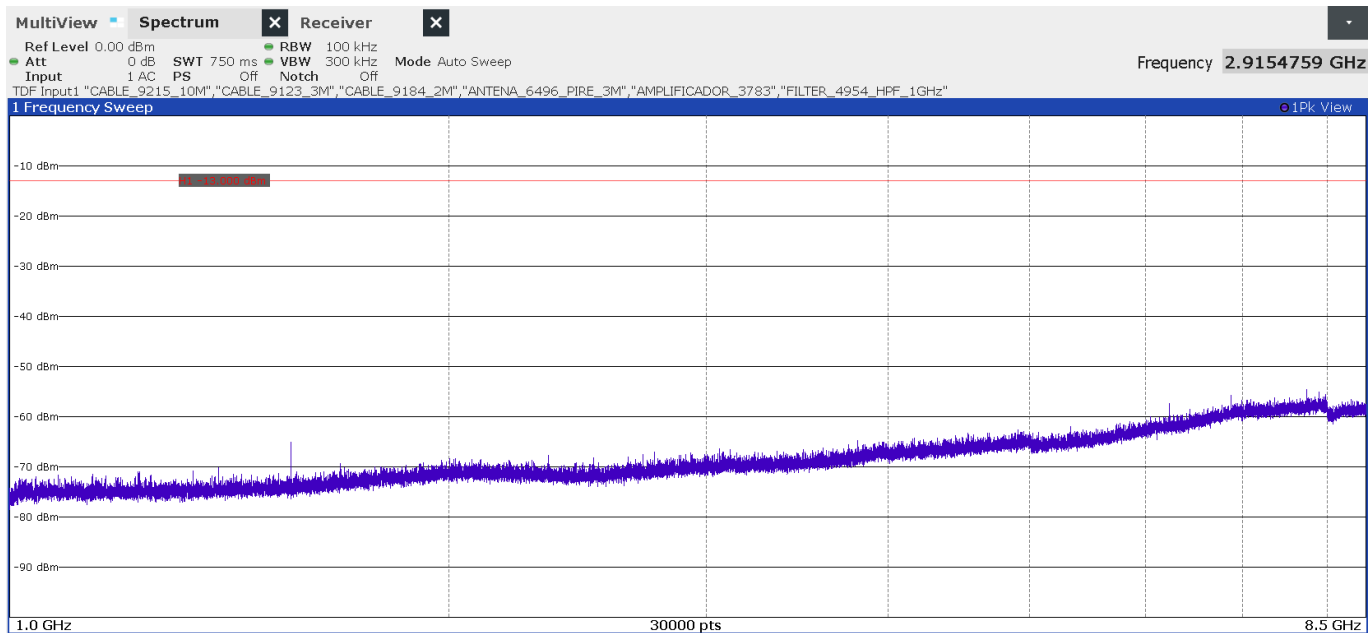
- High Channel:



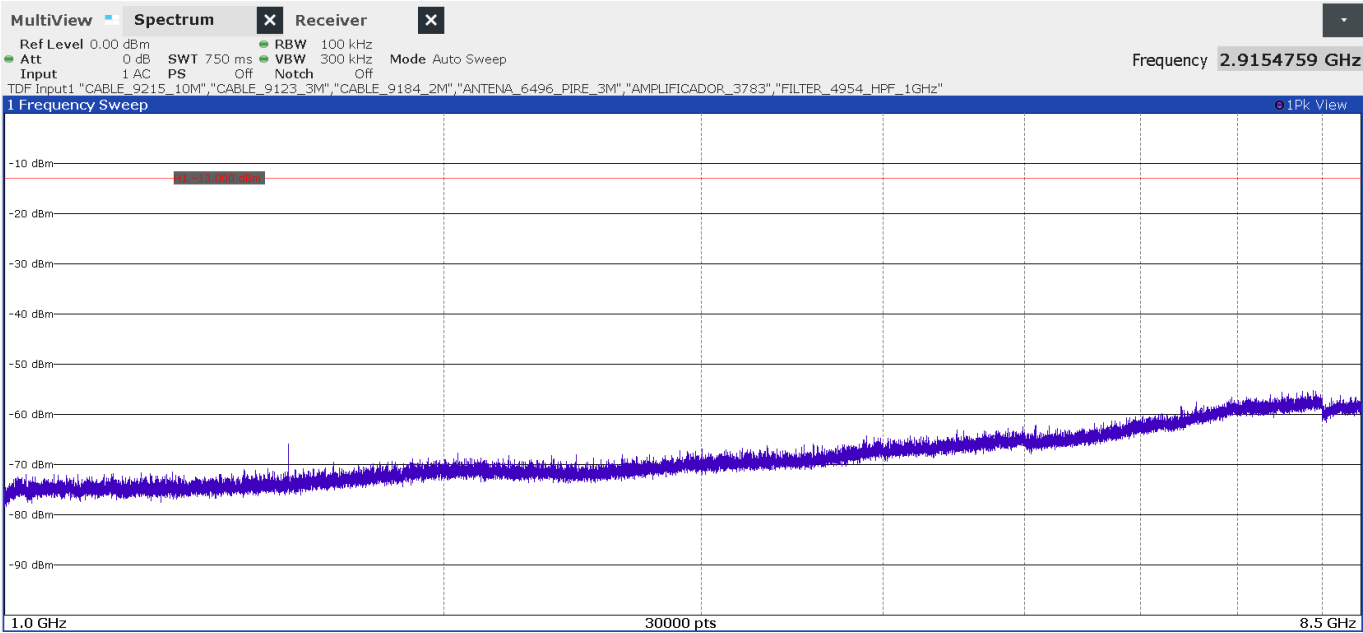
The peak above the limit is the carrier frequency:

FREQUENCY RANGE 1 – 8.5 GHz (worst-case):

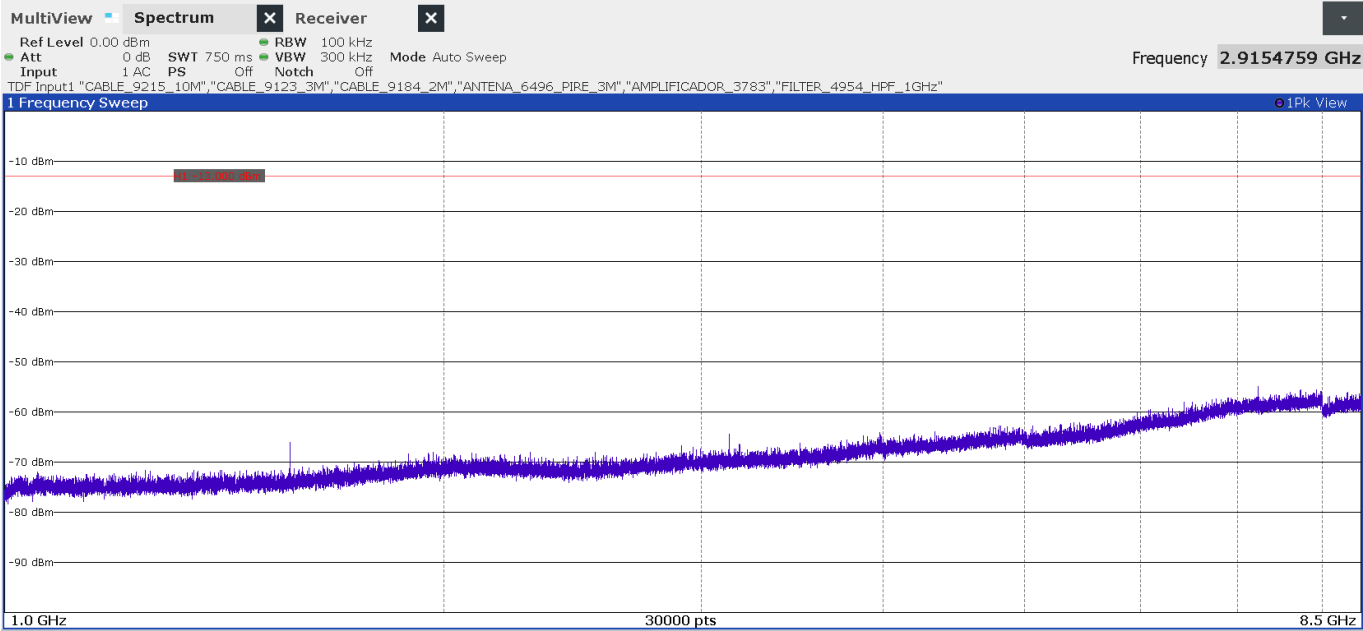
- Low Channel:



- Middle Channel:

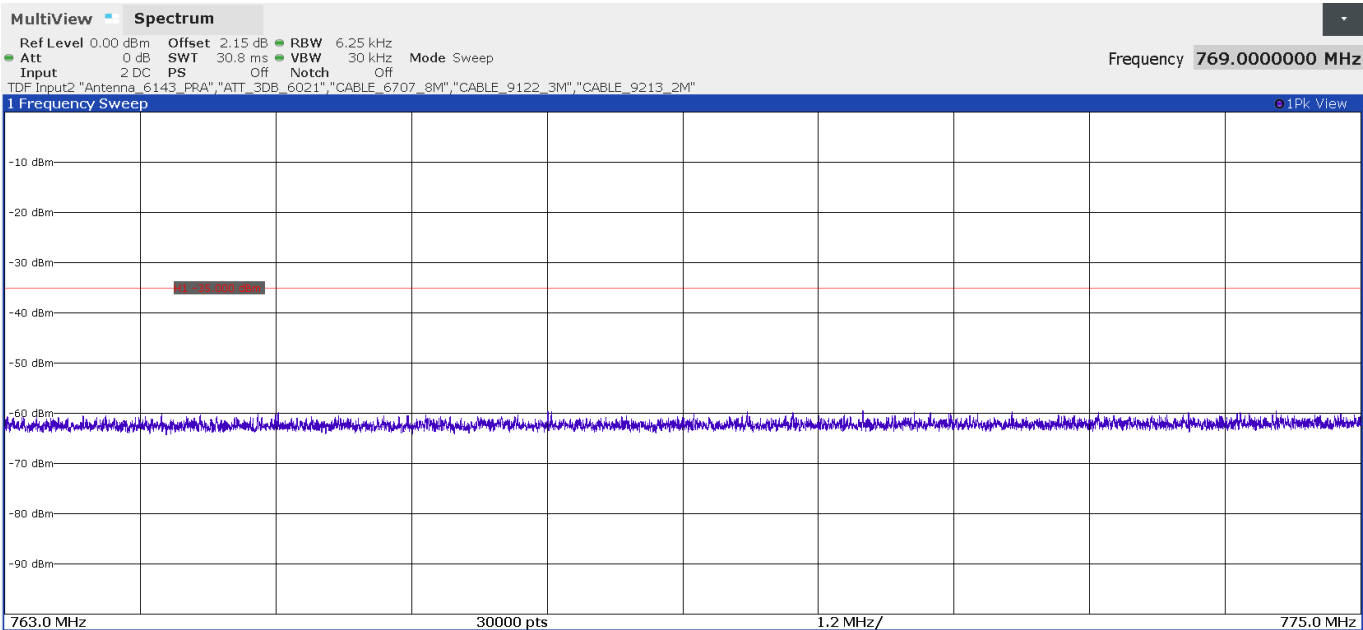


- High Channel:

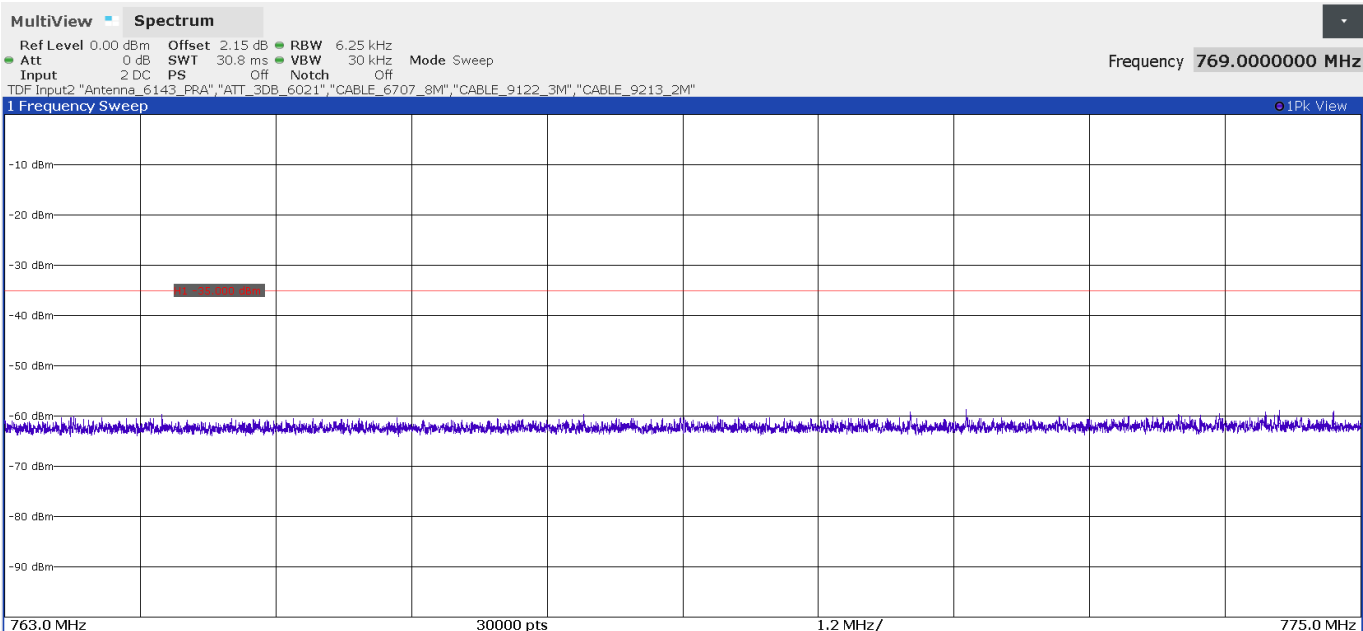


FREQUENCY RANGE 763 - 775 MHz (worst-case):

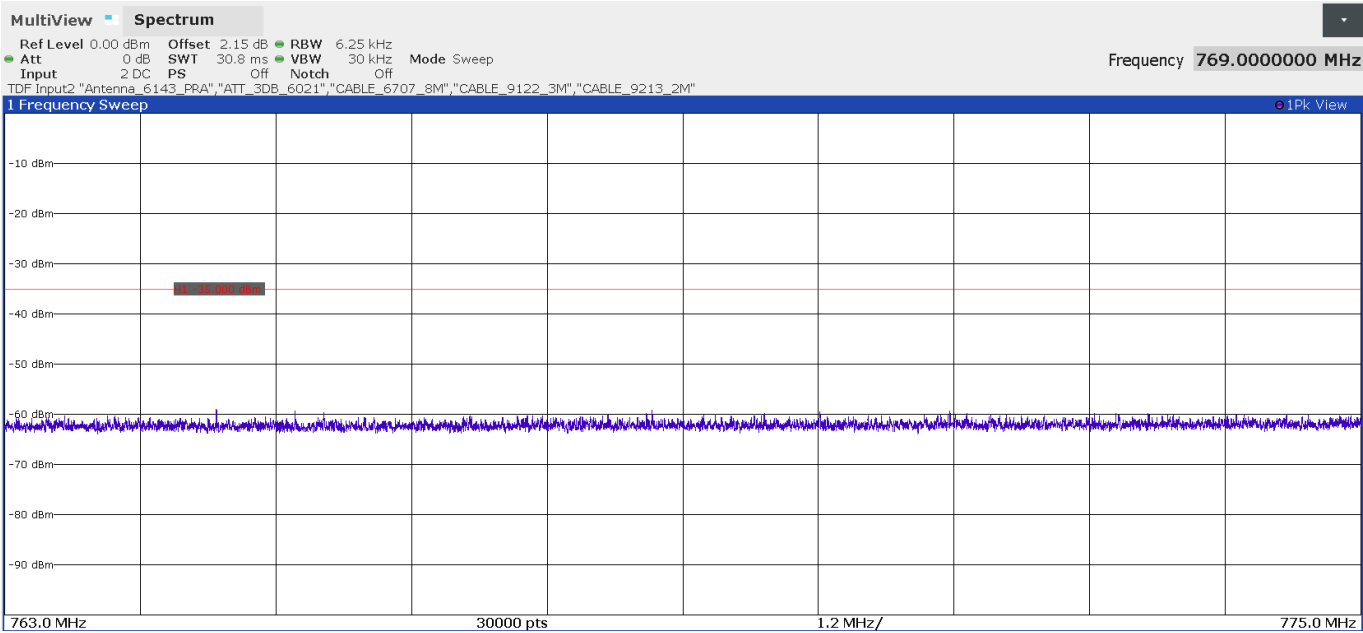
- Low Channel:



- Middle Channel:

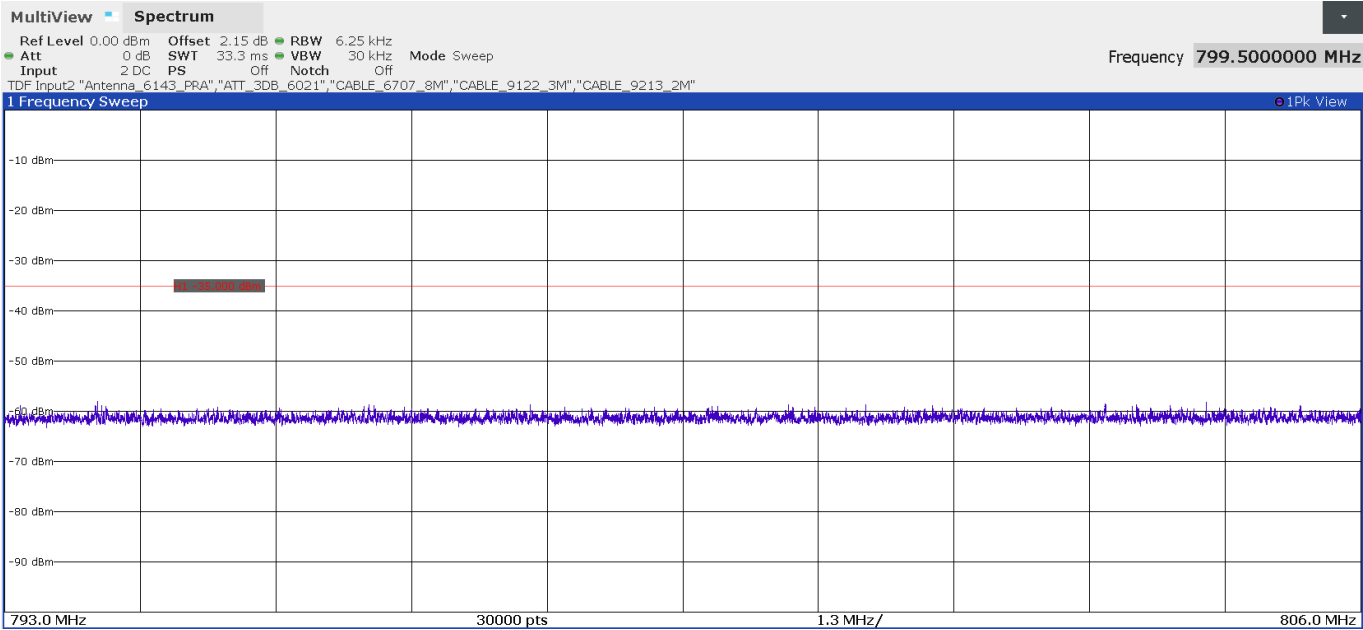


- High Channel:

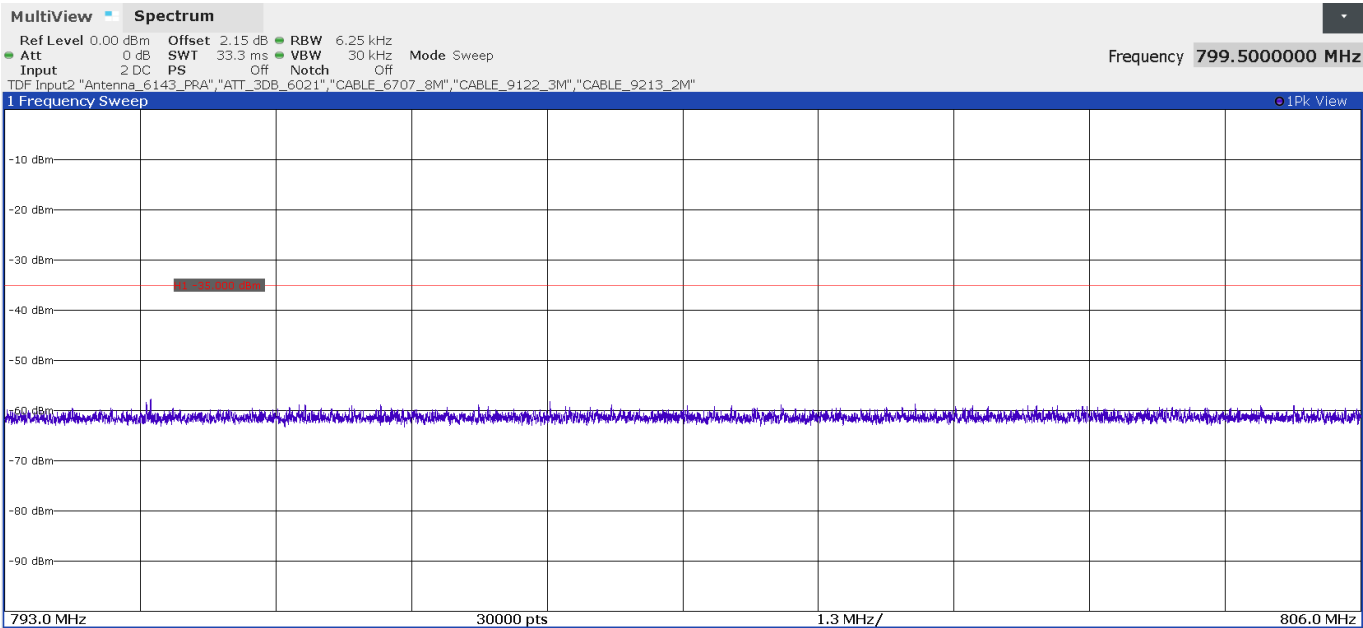


FREQUENCY RANGE 793 - 806 MHz (worst-case):

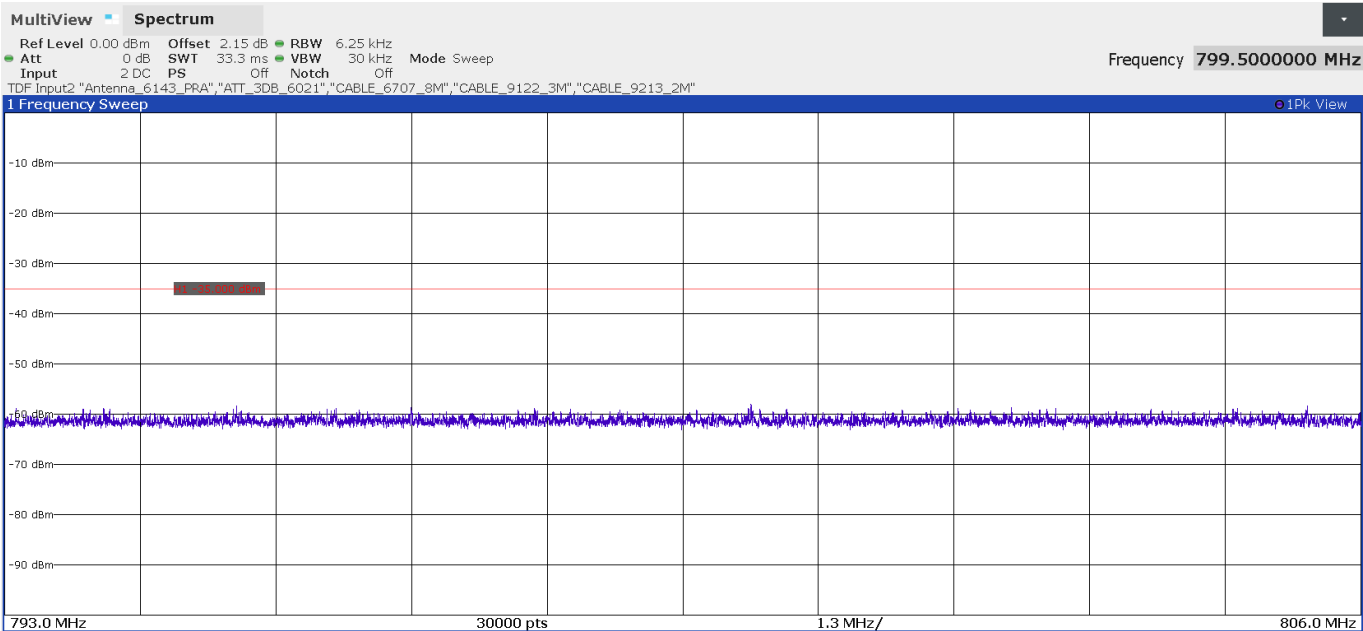
- Low Channel:



- Middle Channel:

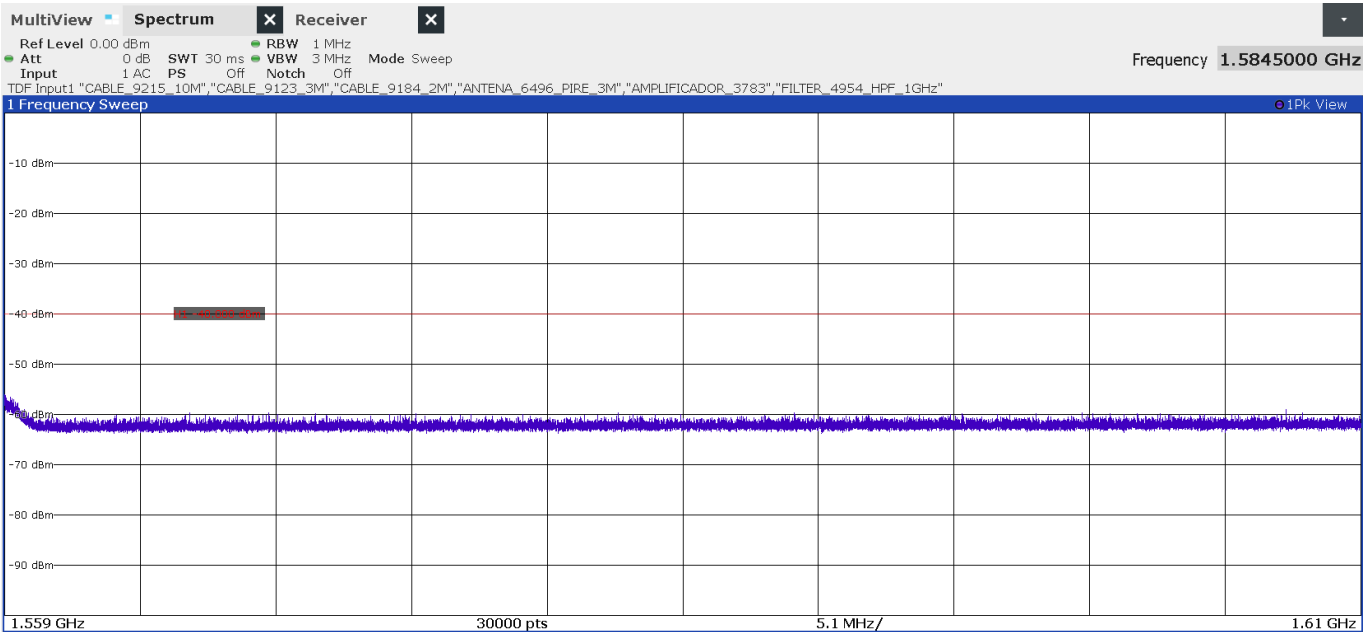


- High Channel:

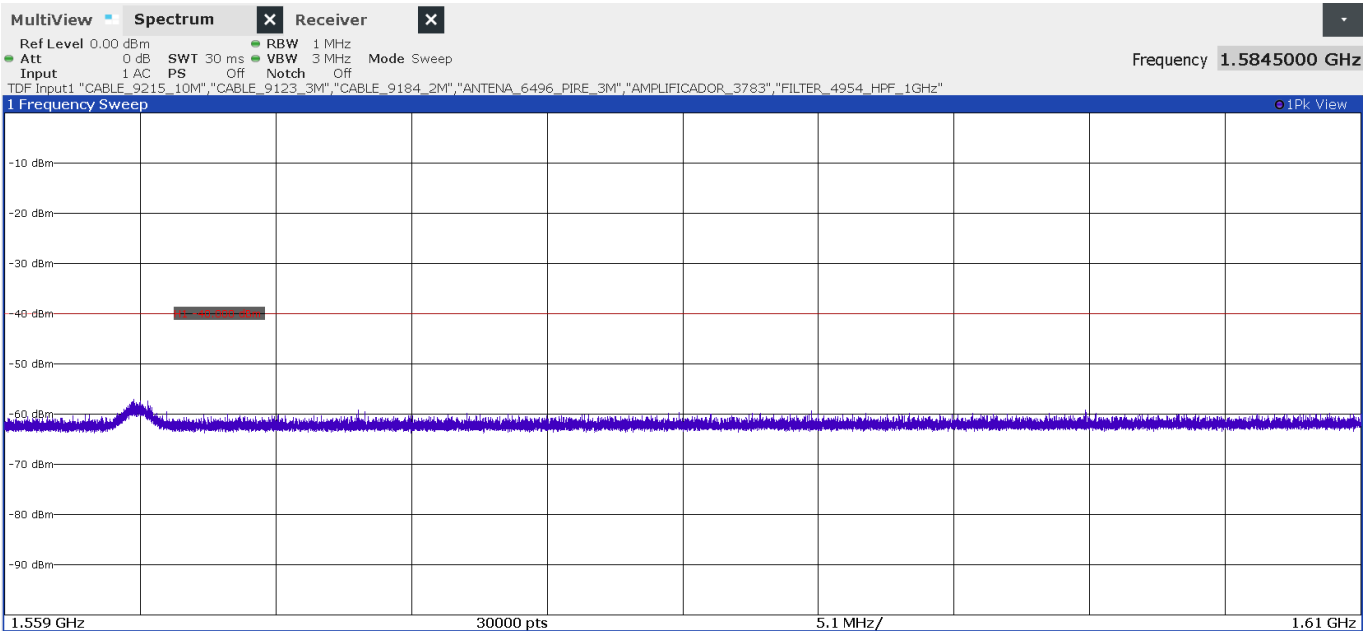


FREQUENCY RANGE 1559 - 1610 MHz (worst-case):

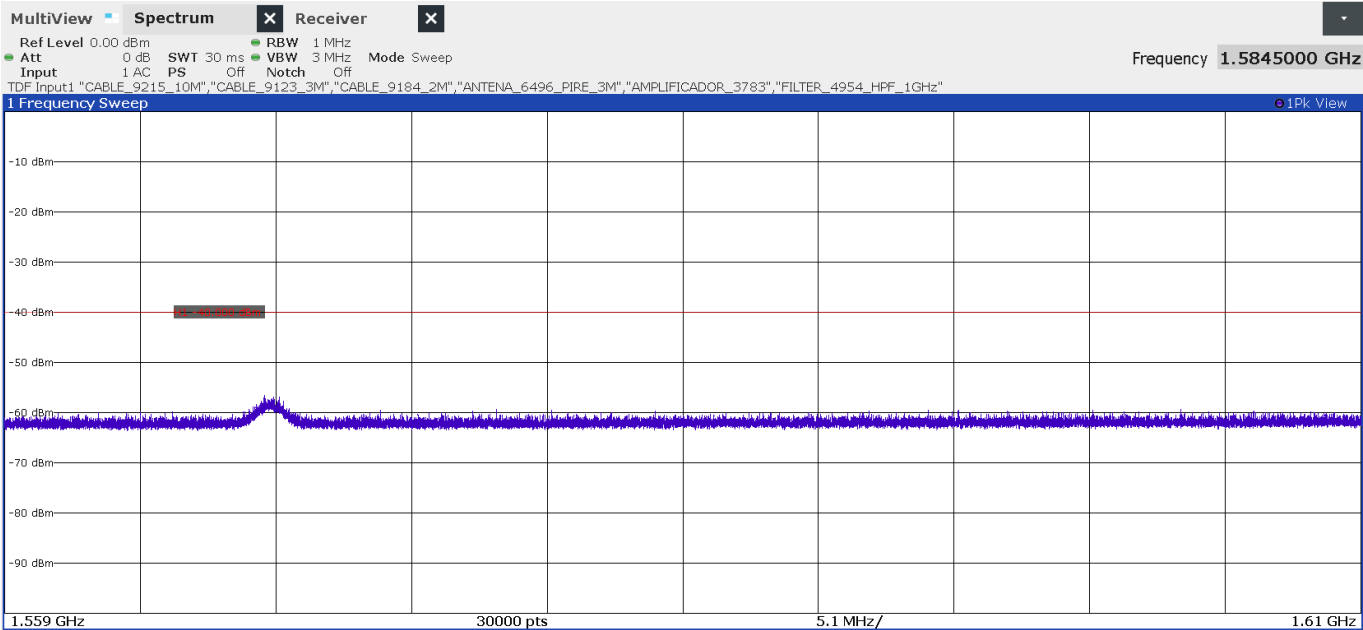
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 41:

QPSK and 16QAM modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=24 as 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 - 27 GHz:

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

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 - 27 GHz:

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

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:

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

Frequency range 1 - 27 GHz:

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

Frequency range 2490.5 - 2496 MHz:

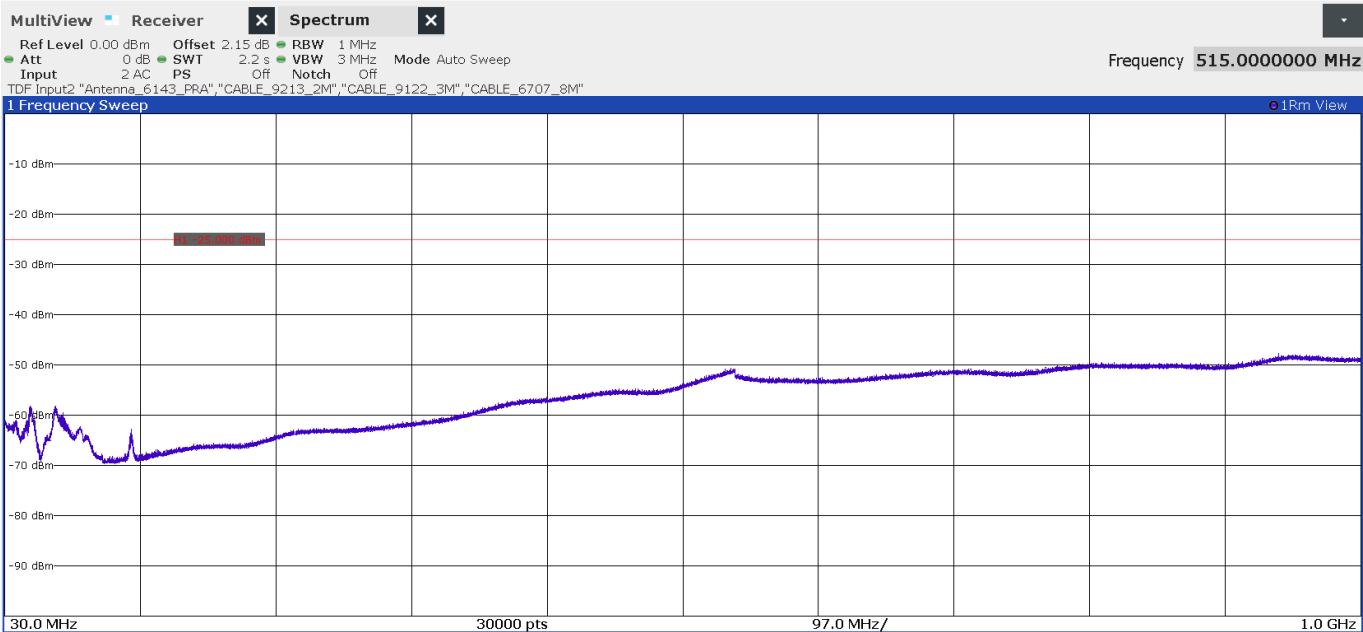
No spurious frequencies at less than 20 dB below the limit.

Measurement uncertainty (dB)	<±5.35 for f < 1GHz <±4.32 for f ≥ 1 GHz up to 18 GHz <±5.51 for f ≥ 18 GHz up to 27 GHz
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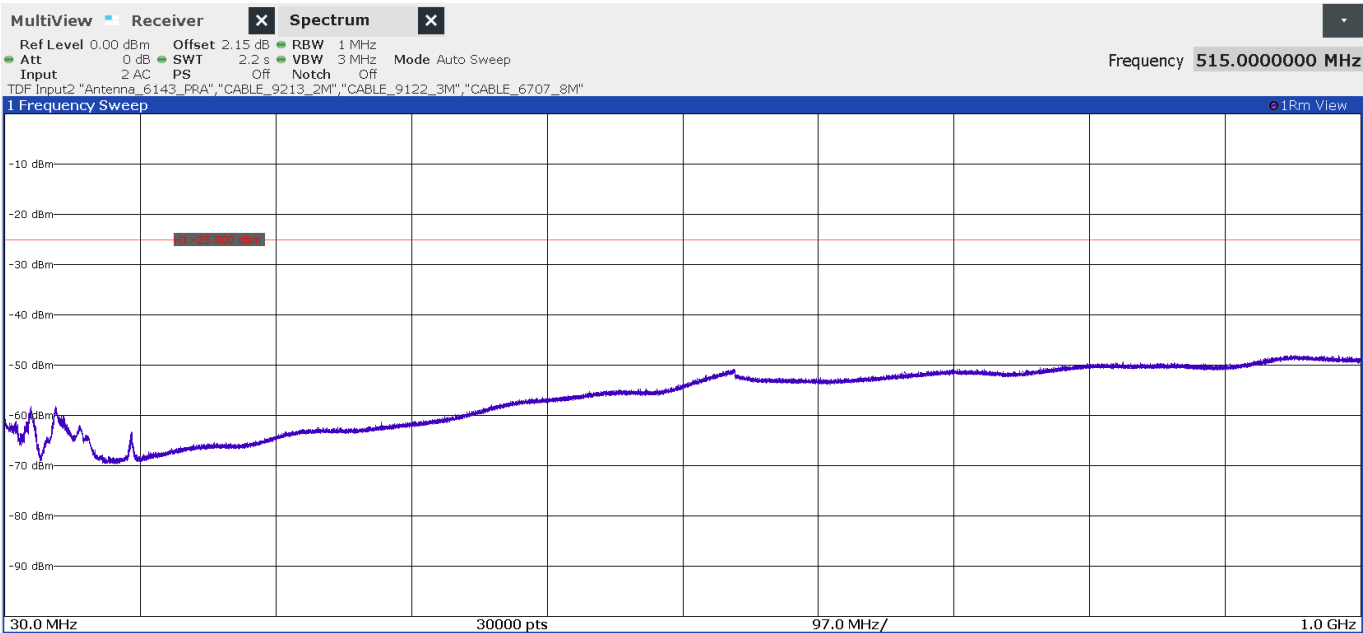
Verdict: PASS

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

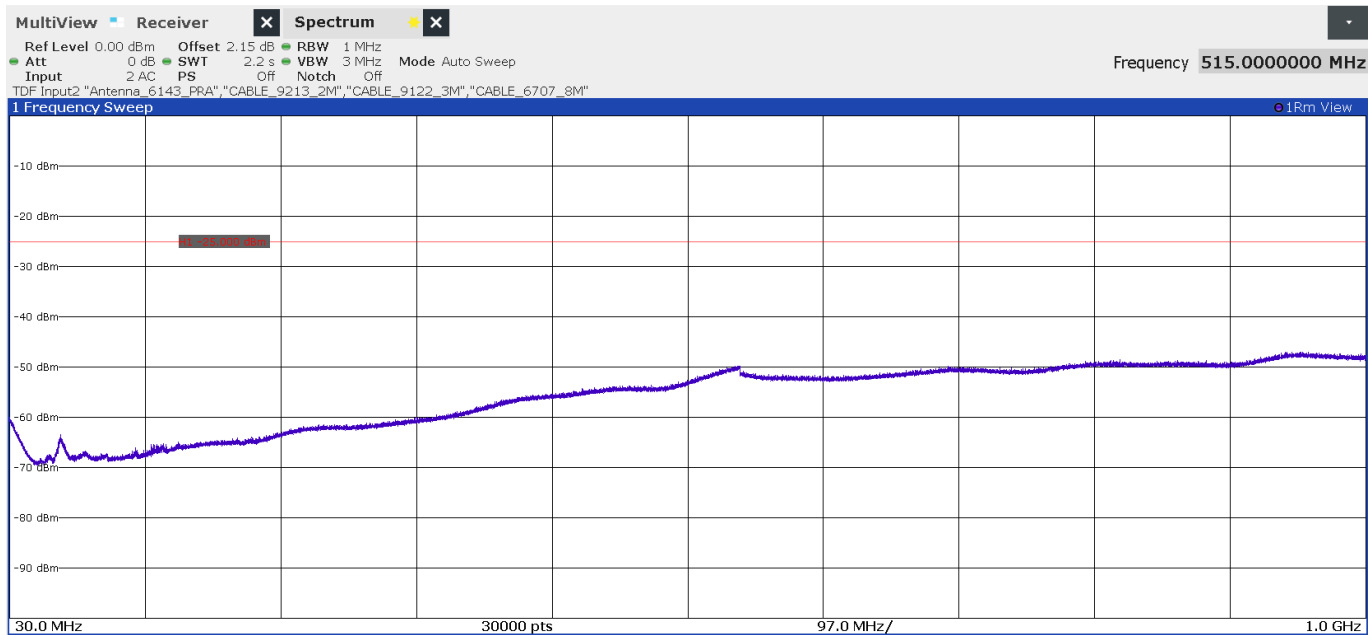
- Low Channel:



- Middle Channel:

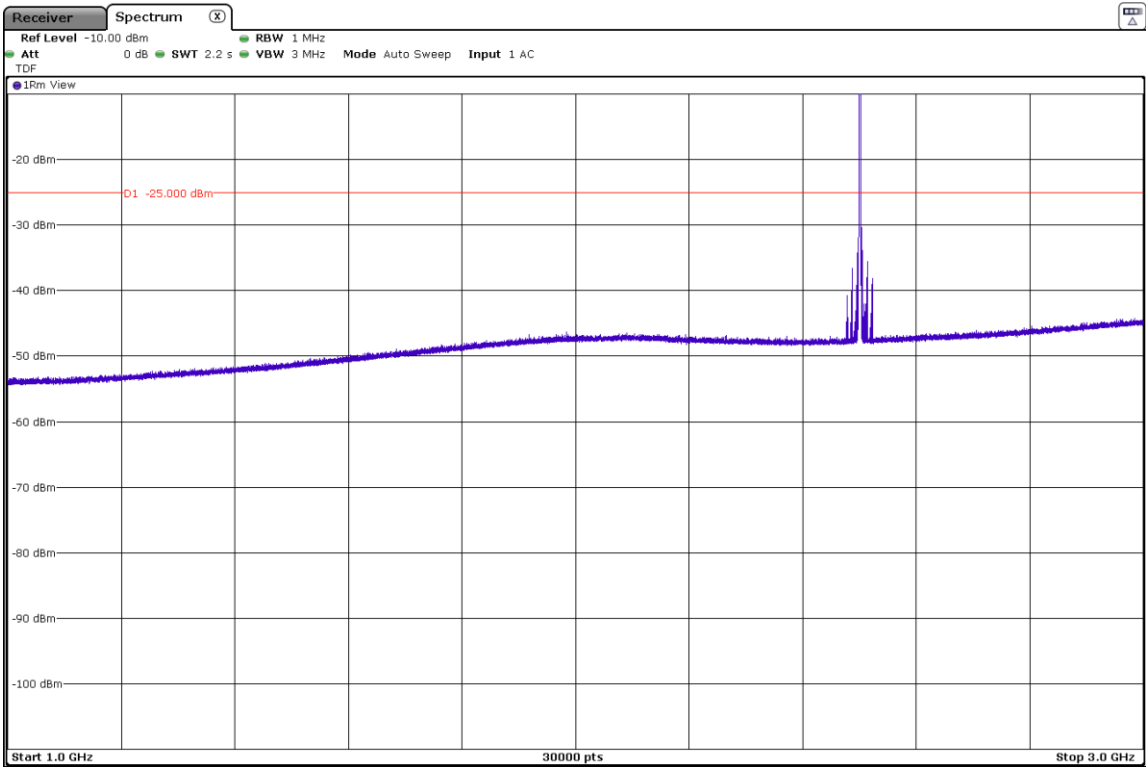


- High Channel:



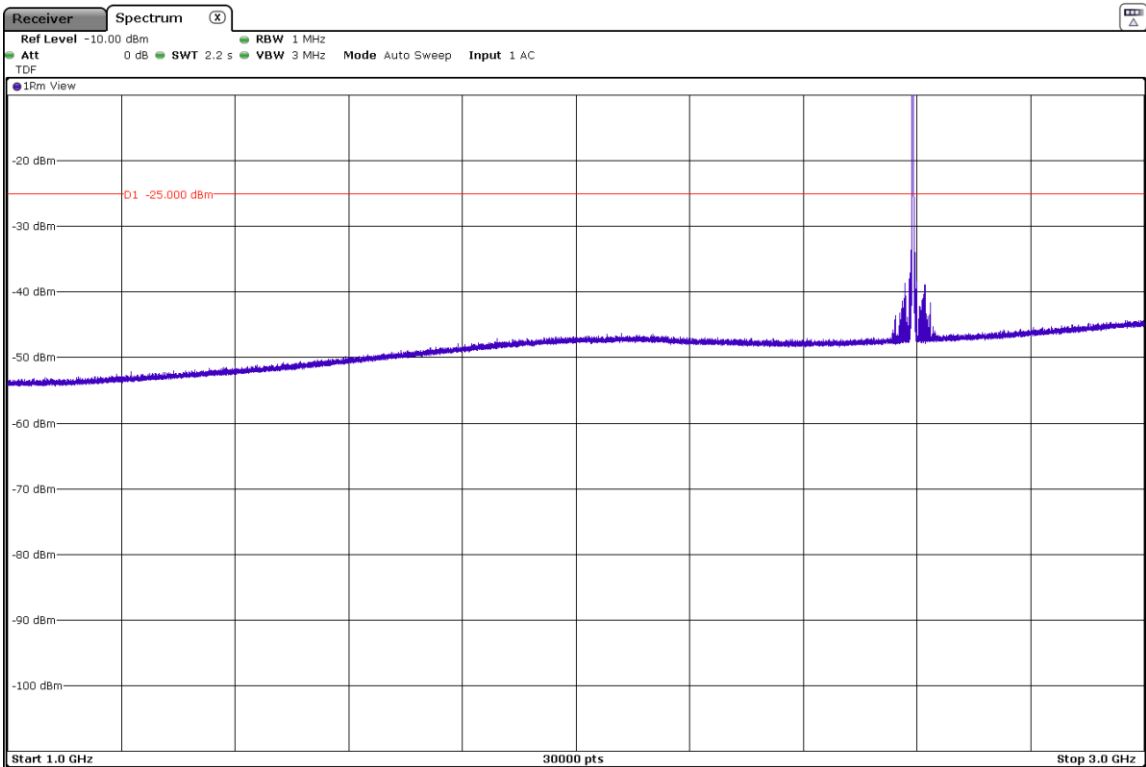
FREQUENCY RANGE 1 - 3 GHz (worst-case):

- Low Channel:



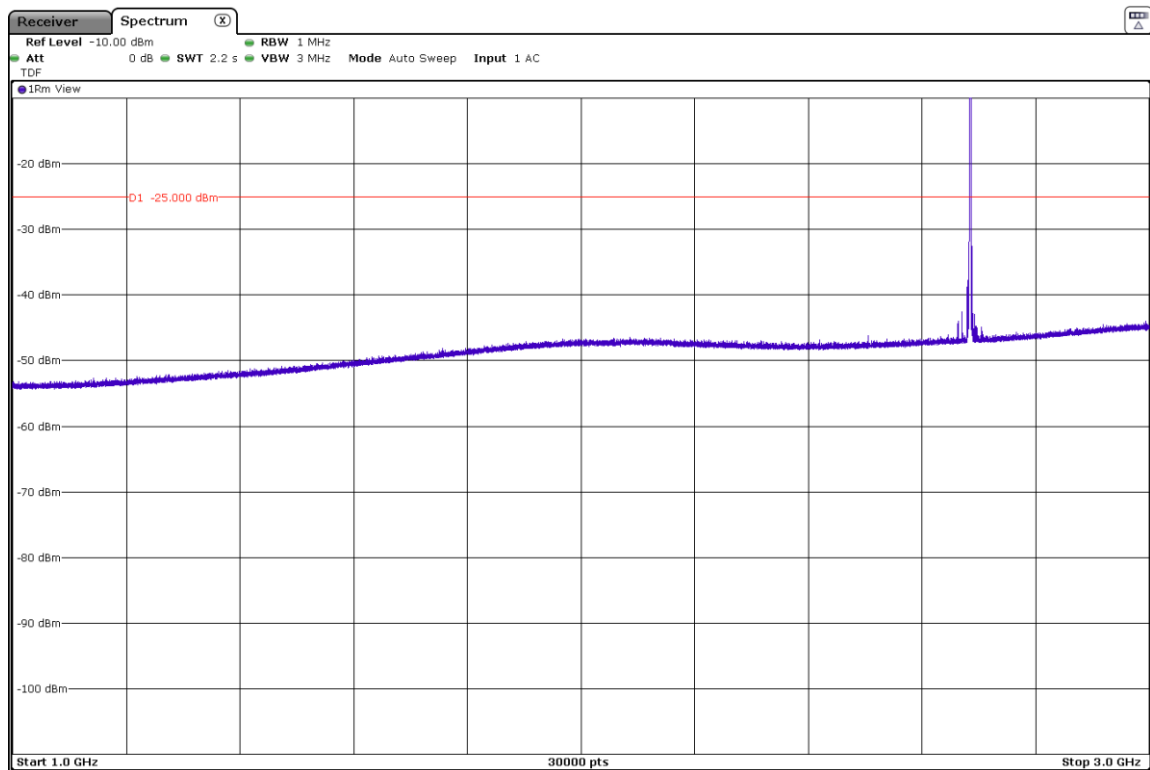
The peaks above the limit is the carrier frequency.

- Middle Channel:



The peaks above the limit is the carrier frequency.

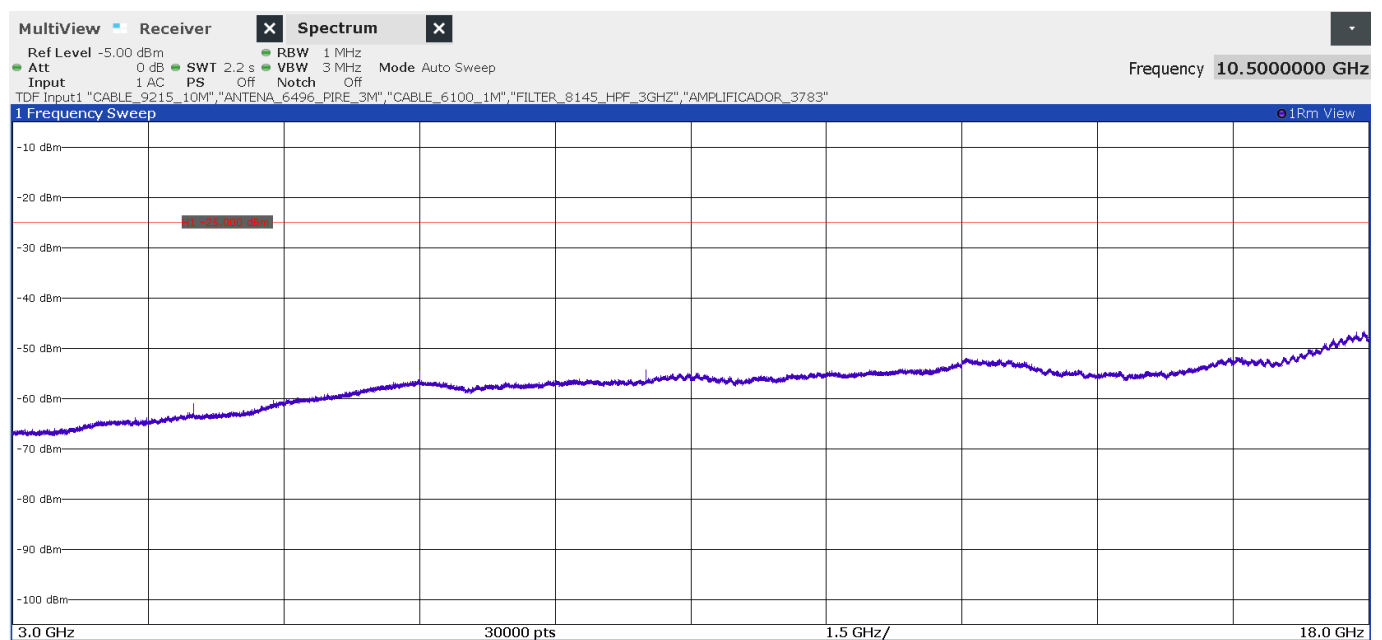
- High Channel:



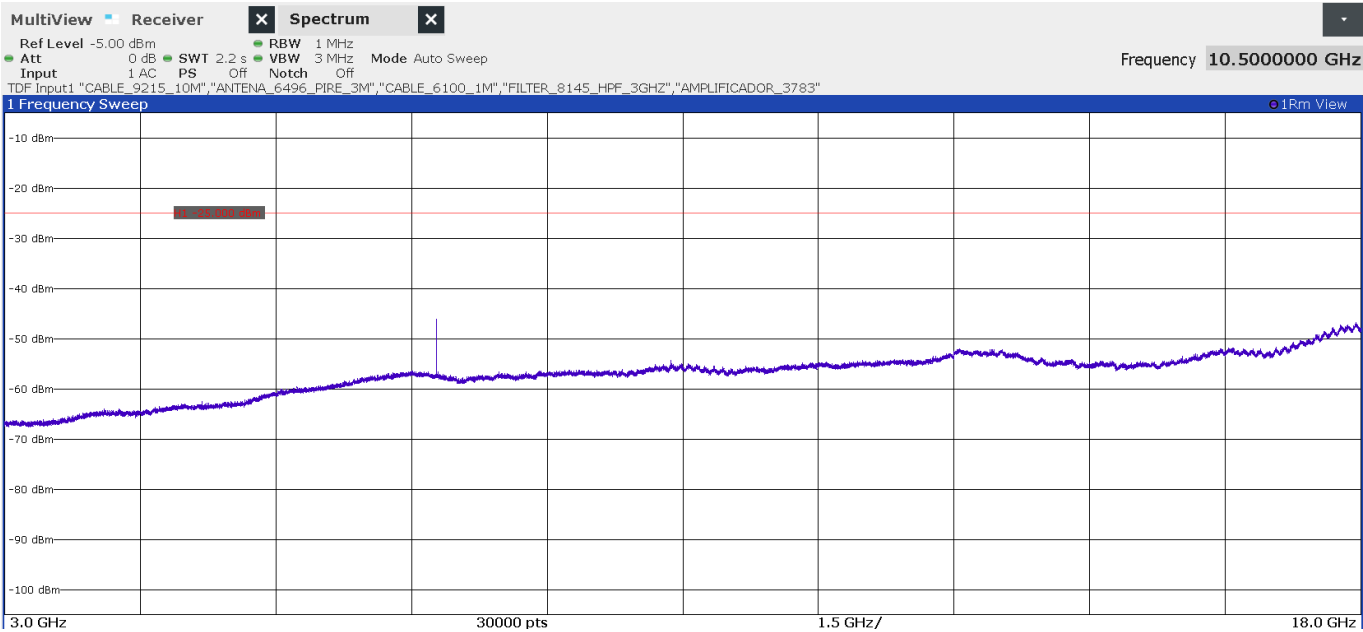
The peaks above the limit is the carrier frequency.

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

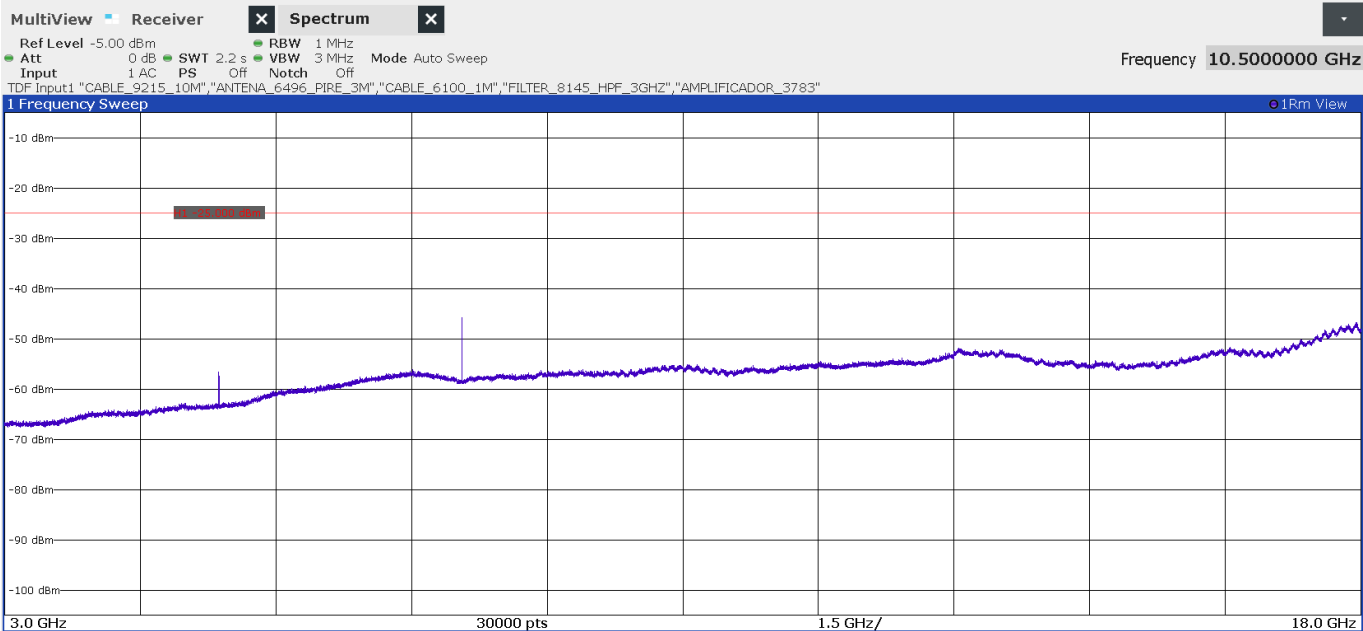
- Low Channel:



- Middle Channel:

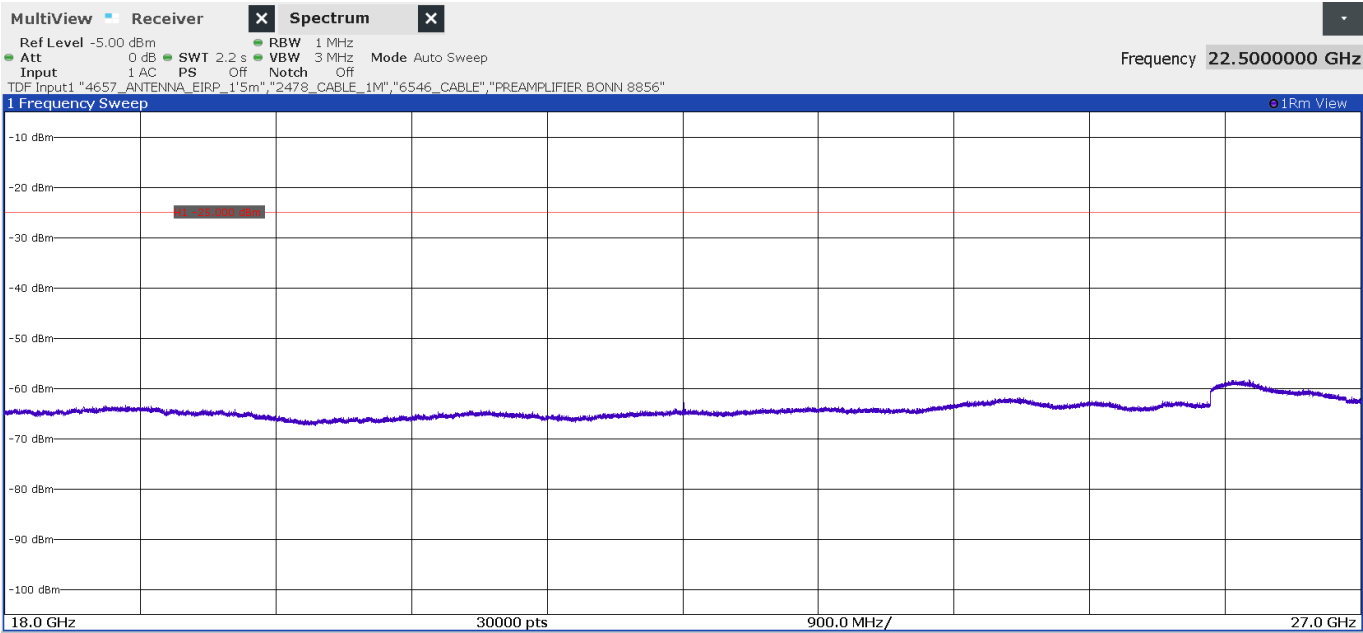


- High Channel:

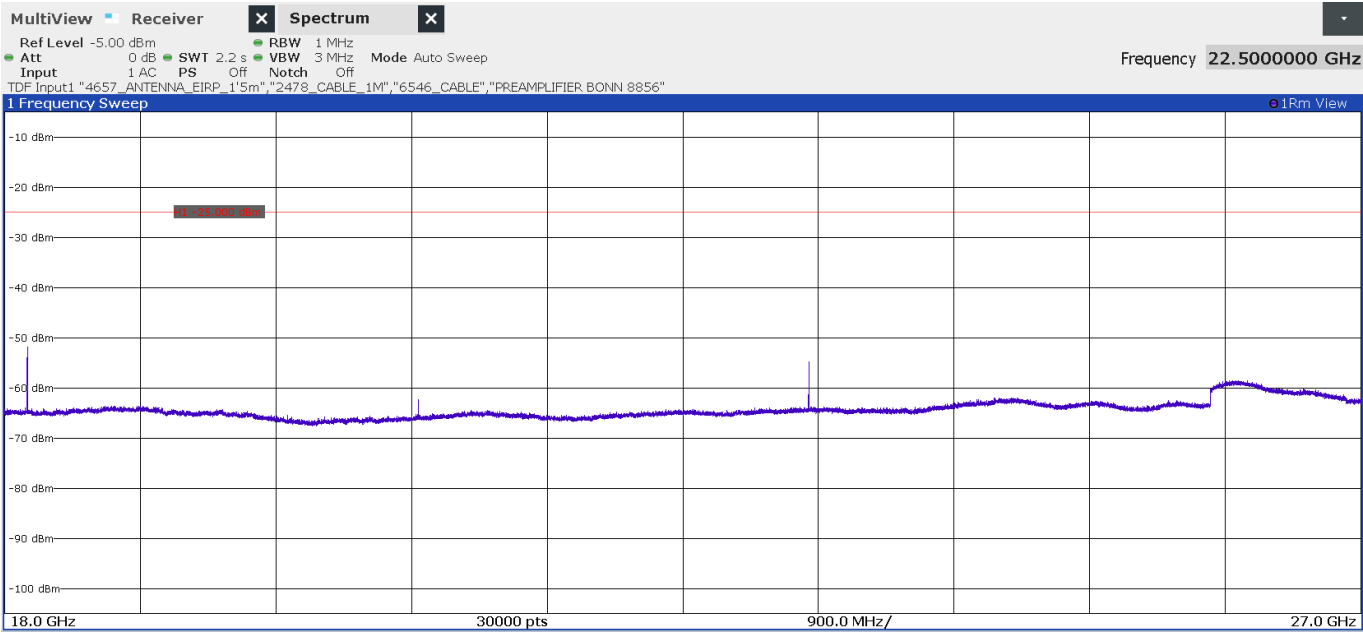


FREQUENCY RANGE 18 - 27 GHz (worst-case):

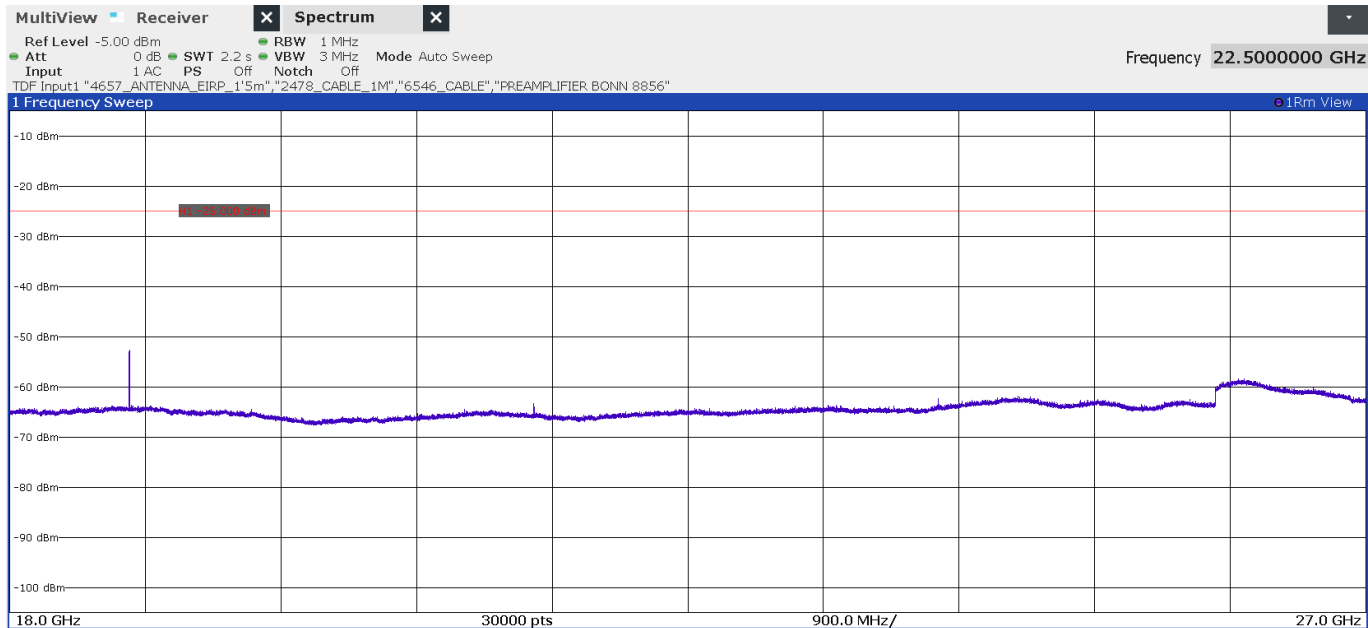
- Low Channel:



- Middle Channel:

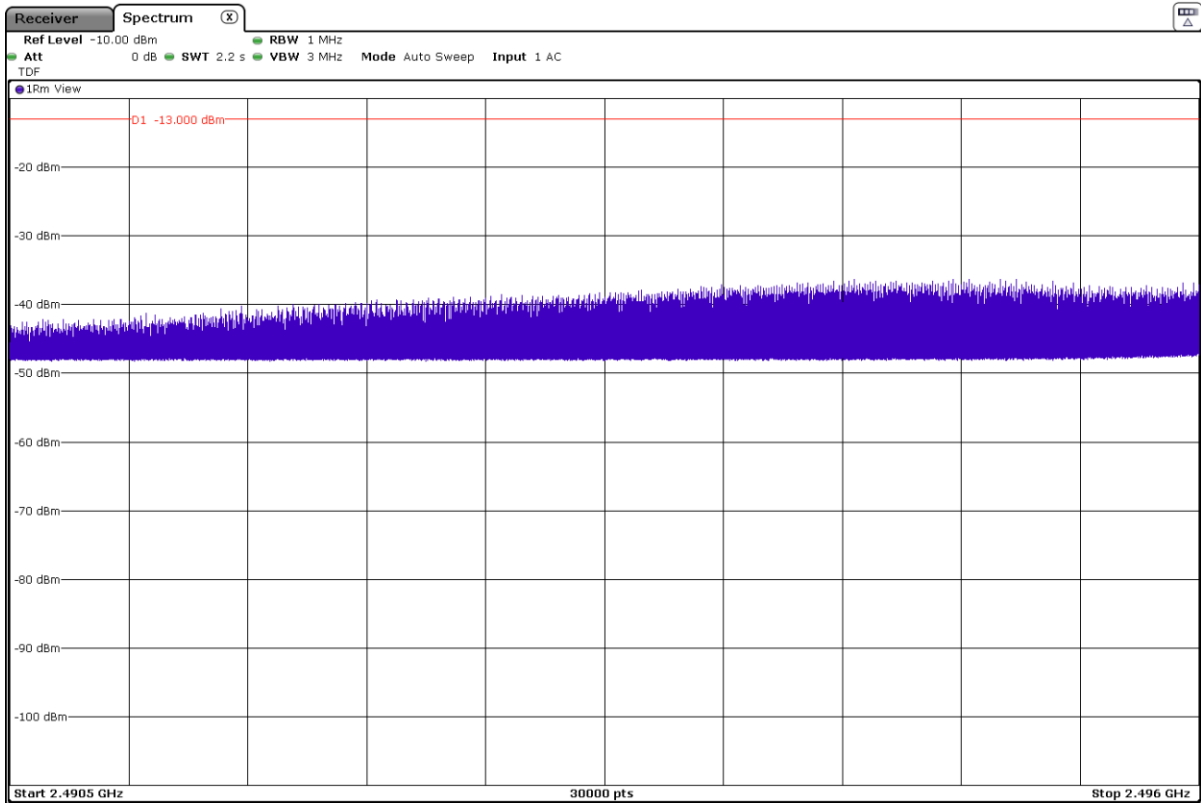


-- High Channel:

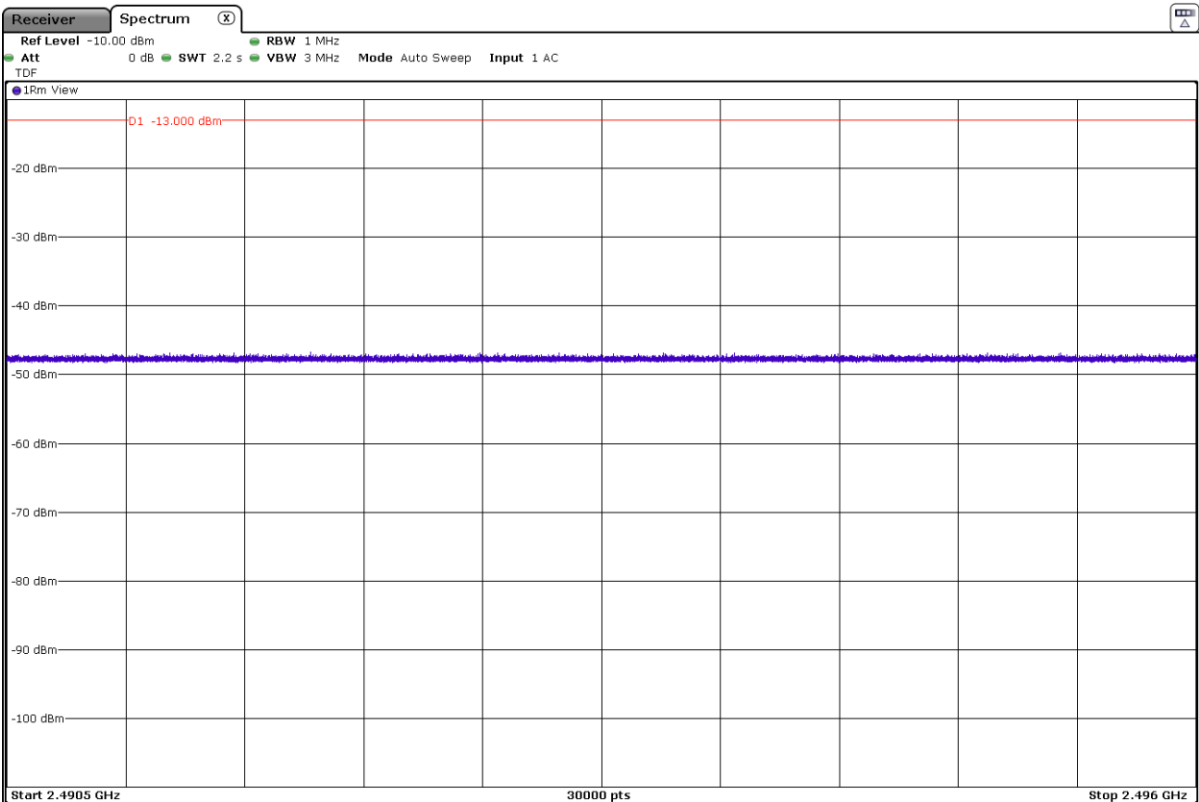


FREQUENCY RANGE 2490.5 - 2496 MHz (worst-case):

- Low Channel:



- Middle Channel:



- High Channel:

