Product Service

Choose certainty.
Add value.

Report On

FCC Testing of the
Nokia LTE Nokia 7705 SAR-Hmc NA(3HE12473AAA) Base Station in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 96E
COMMERCIAL-IN-CONFIDENCE

FCC ID: AS57705SARHMC-2
Contain FCC ID:2AU8H-MG401

PREPARED BY	APPROVED BY	DATED
Jose Martinez Test Personnel	Scott Drysdale Authorised Signatory	11 March 2022

Product Service

CONTENTS

Section		Page No
1	**REPORT INFORMATION**	**2**
1.1	Report Details	3
1.2	Brief Summary of Results	4
1.3	Configuration Description	5
1.4	Declaration of Build Status	6
1.5	Product Information	7
1.6	Test Setup	11
1.7	Test Conditions	12
1.8	Deviation From The Standard	12
1.9	Modification Record	12
1.10	Alternative Test Site	12
2	**TEST DETAILS**	**13**
2.1	Peak Output Power and Peak to Average Ratio - Conducted	14
2.2	Occupied Bandwidth	24
2.3	Band Edge	30
2.4	Transmitter Spurious Emissions	39
2.5	Frequency Stability	44
3	**TEST EQUIPMENT USED**	**55**
3.1	Test Equipment Used	56
3.2	Measurement Uncertainty	58
4	**ACCREDITATION, DISCLAIMERS AND COPYRIGHT**	**59**
4.1	Accreditation, Disclaimers and Copyright	60

ANNEX A Module Lists A.2

SECTION 1

REPORT INFORMATION

1.1 REPORT DETAILS

Manufacturer	Nokia Canada Inc
Address	600 March Road Ottawa Ontario K2K 2E6 Canada
Product Name	Nokia 7705 SAR-Hmc NA
Product Number	3HE12473AAA
Serial Number(s)	MG40119490100702
Software Version	TIMOS-B-21-10.B1-7
Hardware Version	V.1.2
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2017 FCC CFR 47 Part 96: 11/29/2021
Product Name	NOKIA 7705 SAR-HMC NA
Start of Test	17 November, 2021
Finish of Test	23 February 2022
Name of Tester	Jose Martinez
Report issue / Revisions	Issue 1 –11 March 2022
Related Document(s)	KDB 971168 D01 v03r01 KDB 662911 D01 v02r01 KDB 940660 D01 Part 96 CBRS Eqpt v01 ANSI C63.26:2015

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate compliance with FCC CFR 47 Part 96. The sample tested was found to comply with the requirements defined in the applied rules.

Tester

Jose Martinez

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 96E is shown below.

Table 1 –Test Summary

Section	Specification Clause		Test Description	Result
	FCC CFR 47 Part 2	FCC CFR 47 Part 96		
2.1	§2.1046	§96.41 (b)(c)(g)	Peak Output Power and Peak to Average Ratio – Conducted, PSD	Pass
2.2	§2.1049	§96.41 (e)(3)	Occupied Bandwidth	Pass
2.3	§2.1051	§96.41 (e)(3)	Band Edge	Pass
2.4	§2.1051	§96.41 (e)(1)	Transmitter Spurious Emissions	Pass
2.5	§2.1055(d)	-	Frequency Stability	Pass
2.6	§2.1051	-	Radiated Spurious Emission	Pass

1.3 CONFIGURATION DESCRIPTION

1.3 CONFIGURATION DESCRIPTION

The NOKIA 7705 SAR-HMC NA (3HE12473AAA) LTE Test Model according to Table 3 in Band 48 (3550 MHz – 3700 MHz).

The LTE Test Models (as defined in 3GPP TS 36.141) were used to represent QPSK, and 16QAM modulation, respectively.

TX test cases: Maximum Conducted Output Power, Maximum Power Spectral Density, Spurious Emissions at Antenna Terminals (±1MHz) and Conducted Spurious Emissions, measurements were performed on the RF Port. All testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

The EUT was powered via Nokia HV powers supply.

1.4 DECLARATION OF BUILD STATUS

Table 2 – Declaration

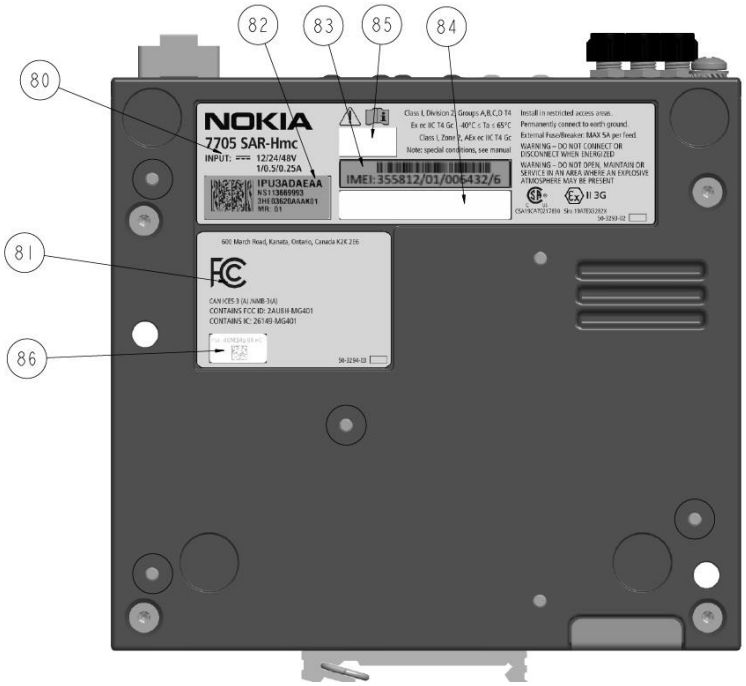
MAIN EUT	
MANUFACTURING DESCRIPTION	Radio Dot
MANUFACTURER	Nokia
TYPE	Remote Radio Base Station
PART NUMBER	152540482166
SERIAL NUMBER	MG40119490100702
HARDWARE VERSION	V.1.2
SOFTWARE VERSION	TIMOS-B-21-10.B1-7
TRANSMITTER OPERATING RANGE	B48 3550 – 3700 MHz (TDD)
RECEIVER OPERATING RANGE	B48 3550 – 3700 MHz (TDD)
COUNTRY OF ORIGIN	China
INTERMEDIATE FREQUENCIES	DL: 110 – 150MHz, UL: 40 – 80MHz
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	LTE 5M00 W7D 10M0 W7D 15M0 W7D 20M0 W7D
MODULATION TYPES: (i.e. GMSK, QPSK)	LTE: QPSK, 16QAM
Antenna Gain	7.0
HIGHEST INTERNALLY GENERATED FREQUENCY	3.7 GHz
OUTPUT POWER (W or dBm)	20dBm
FCC ID	AS57705SARHMC-2
INDUSTRY CANADA ID	NA
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The Nokia 7705 SAR-Hm series includes feature-rich IP/MPLS service routers in a ruggedized and compact platform. With these routers, operators are able to support IP VPN, VPLS, and VPWS services over wireless networks, enabling an end-to-end, seamless, IP/MPLS service offering between wireless and wired devices. This enables critical infrastructure operators to fully realize the promise of smart grids, smart cities, and public safety mobile broadband to enhance safety, efficiency and responsiveness. The 7705 SAR-Hm series can be used in fixed or mobile locations for a variety of applications, such as supervisory control and data acquisition (SCADA), security monitoring, workforce voice and data connectivity in offices or vehicles, mass transit, fleet management, and vehicle remote control and monitoring.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) NOKIA 7705 SAR-HMC NA (3HE12473AAA) is an Nokia radio Unit working in the public mobile service (3550-3700 MHz) band which provides communication connections to (Band) network. The NOKIA 7705 SAR-HMC NA (3HE12473AAA) operates from a Nokia HV PSU 100V-240V.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturer's documentation.



EUT – 3D Rending

1.5.2 EUT configurations

Table 3 – EUT Test Configurations

Test No.	BW (MHz)	Resource Block	Resource Block Offset	MOD	Test No.	BW (MHz)	Resource Block	Resource Block Offset	MOD
1	20	1	0	QPSK	29	**10**	1	0	QPSK
2		1	49		30		1	25	
3		1	99		31		1	49	
4		50	0		32		25	0	
5		50	24		33		25	12	
6		50	50		34		25	25	
7		100	0		35		50	0	
8		1	0	16-QAM	36		1	0	16-QAM
9		1	49		37		1	25	
10		1	99		37		1	49	
11		50	0		38		25	0	
12		50	24		39		25	12	
13		50	50		40		25	25	
14		100	0		41		50	0	
15	15	1	0	QPSK	42	5	1	0	QPSK
16		1	37		43		1	12	
17		1	74		44		1	24	
18		36	0		45		12	0	
19		36	20		46		12	7	
20		36	39		47		12	13	
21		75	0		48		25	0	
22		1	0	16-QAM	49		1	0	16-QAM
23		1	37		50		1	12	
24		1	74		51		1	24	
25		36	0		52		12	0	
26		36	20		52		12	7	
27		36	39		53		12	13	
28		75	0		54		25	0	
Note 1. Bold letters, the worst-case scenario of test cases according to power conducted measurements									

1.5.3 Test Procedure

1.5.3.1 TDD Synchronization

Gate View Sweep Time (ms)	Gate Delay (ms)	Gate length (ms)	Sweep Time (s)
6.4	2.7	2.9	5s

1.5.3.1 Conducte Power

Spectrum Analyzer	Setting
RBW	1- 5% of OBW
VBW	3 x OBW
Span	1.5 x OBW
Seep	>2xSpan/RBW
Detector	RMS
BP integration	10MHz
Detector	RMS
Trace mode	Trace Averaging (RMS) over 100 sweeps

1.5.4 Frenquncy List

Table 4 – EUT Frequency per BW

BW(MHz)	Lowest (MHz)	Middle (MHz)	Highest (MHz)
20	3560.0	3625.0	3690.0
15	3557.5	3625.0	3692.5
10	3555.0	3625.0	3695.0
5	3552.5	3625.0	3697.5

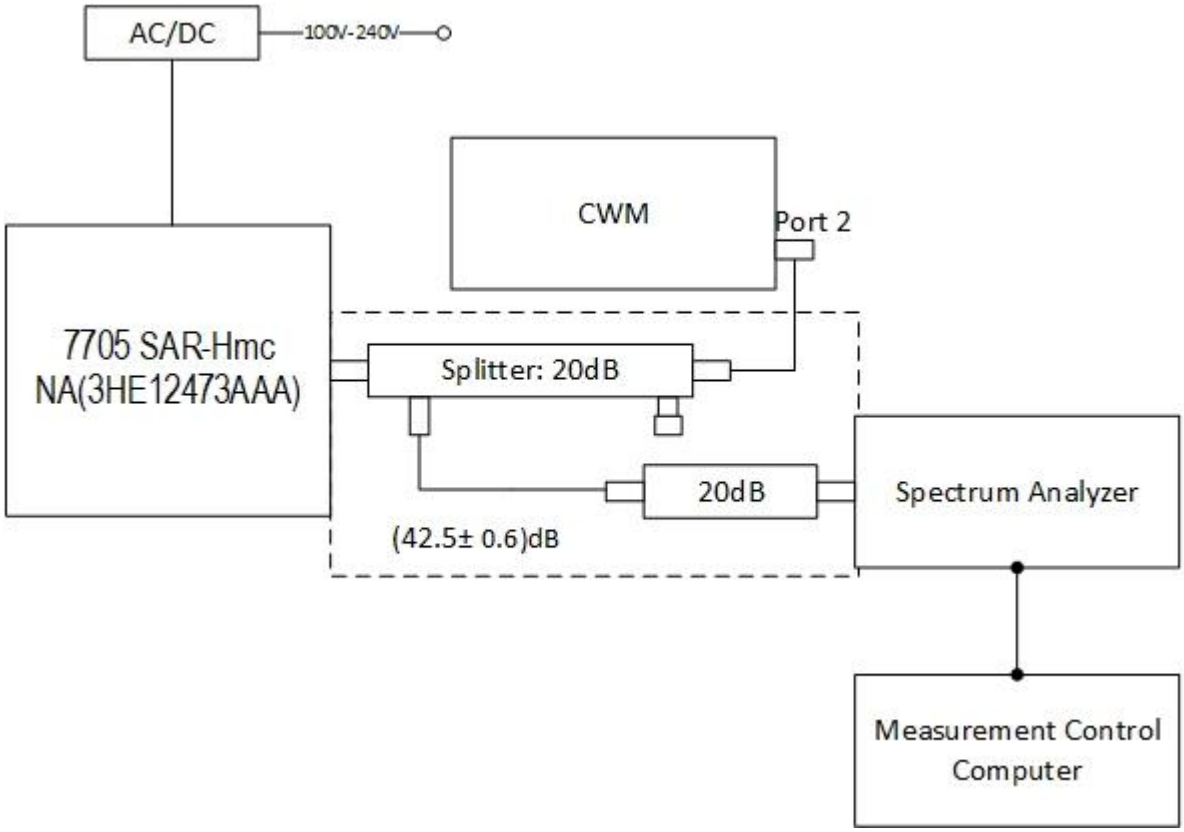
1.5.5 Worst-Case Scenario

Testing was performed for all configuratoins All EUT configurations were measured and only the worst-case scenario for each measurement is presented in graph format.

Table 5 – Worst Case QPSK of Power Conducted Measurements of Table 3

20MHz		15MHz		10MHz		5MHz	
(dBm/1MHz)	(dBm/10MHz)	(dBm/1MHz)	(dBm/10MHz)	(dBm/1MHz)	(dBm/10MHz)	(dBm/1MHz)	(dBm/10MHz)
6.81	16.87	7.93	18.03	10.98	20.42	12.91	19.34

1.6 TEST SETUP



1.7 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or a chamber as appropriate.

FCC Measurement Facility Accreditation Designation Number: CA6845
TUV SUD Canada (Ottawa)

1.8 DEVIATION FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.9 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.10 ALTERNATIVE TEST SITE

Under our Accreditation, TÜV SÜD Canada, Laval conducted the following tests at Nokia in Ottawa.

Test Name	Name of Engineer(s)
Peak Output Power and Peak to Average Ratio – Conducted, PSD	Jose Martinez
Occupied Bandwidth	Jose Martinez
Band Edge	Jose Martinez
Transmitter Spurious Emissions	Jose Martinez
Frequency Stability	Jose Martinez
Radiated Emissions	Christopher Richer

SECTION 2

TEST DETAILS

2.1 PEAK OUTPUT POWER AND PEAK TO AVERAGE RATIO - CONDUCTED

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 96, Clause 96.41 (b)(c)(g)

2.1.2 Date of Test and Modification State

14 January 2021 – Modification State 0
03 February 2021 – Modification State 0

2.1.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.4 Environmental Conditions

Ambient Temperature	21°C
Relative Humidity	20%

2.1.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01, clause 5.2.1 and summed in accordance with FCC KDB 662911 D01. EIRP values were calculated by adding the Port A and Port B antenna gain of 2.6 dBi and the Port C and Port D antenna gain of 3.1 dBi

2.1.6 Test Results

2.1.6.1 Worst-case measurements

Table 6 – Worst-Case: QPSK Modulation – Conducted Power Measurements of test cases in Table 3

Bandwidth (MHz)	Conducted Average Power (dBm/1MHz)	Conducted Average Power (dBm/10MHz)	EIRP (dBm/1MHz) <Note 1>	Limit (dBm/1MHz) <Note 2>	EIRP (dBm/10MHz) <Note 1>	Limit (dBm/10MHz) <Note 2>	Results
20	6.81 <Note 3>	16.87 <Note 3>	13.81	20	23.87	30	Pass
15	7.93 <Note 4>	18.03 <Note 4>	14.93	20	25.03	30	Pass
10	10.98 <Note 5>	20.42 <Note 5>	17.98	20	27.42	30	Pass
5	12.91 <Note 6>	19.38 <Note 6>	19.91	20	26.38	30	Pass

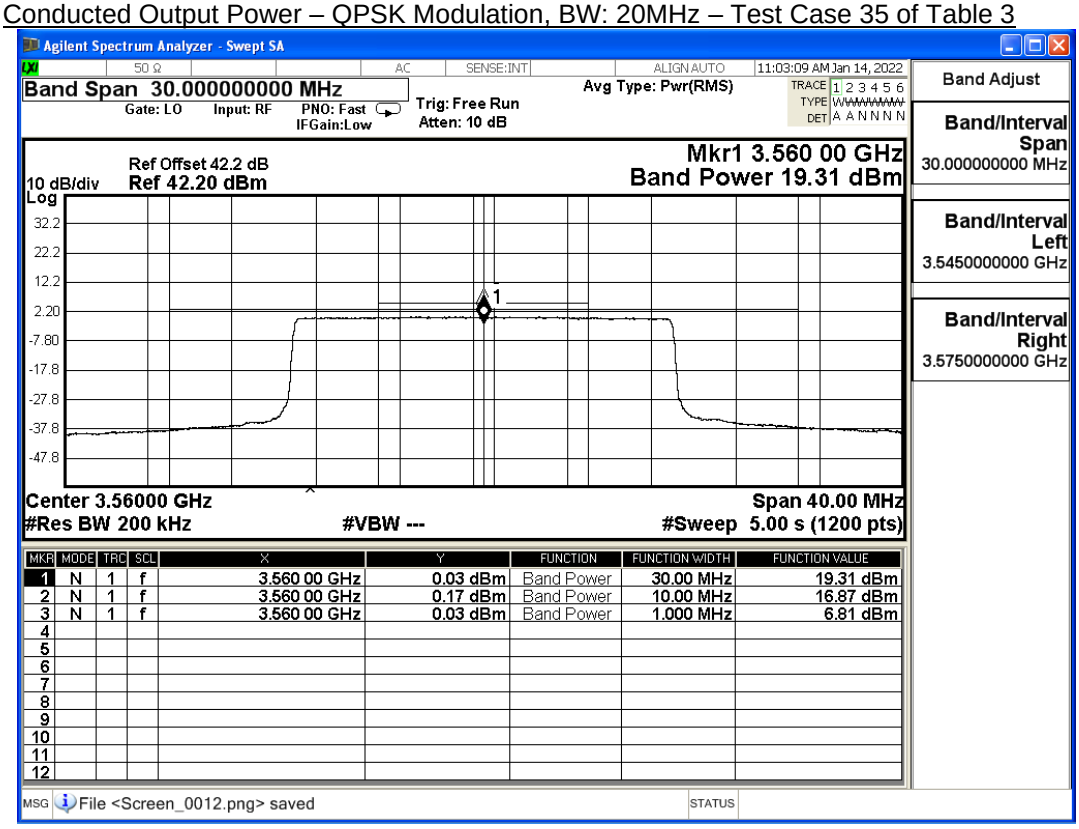
Note 1. EIRP (worst case) = Power (dBm/10MHz) + Gain(7.0 dBi) as per section 2.3 in 412172 D01
Note 2. Limit according Category A CBSD of § 96.41 (b)
Note 3. Test case # 5 of Table 3 (Frequency: 3560Mz).
Note 4. Test case # 21 of Table 3 (Frequency: 3557.5MHz)
Note 5. Test case # 35 of Table 3 (Frequency: 3695MHz)
Note 6. Test case #48 of Table 3 (Frequency: 3697.5MHz)

Table 7 – PARP – Worst-Case: QPSK Modulation

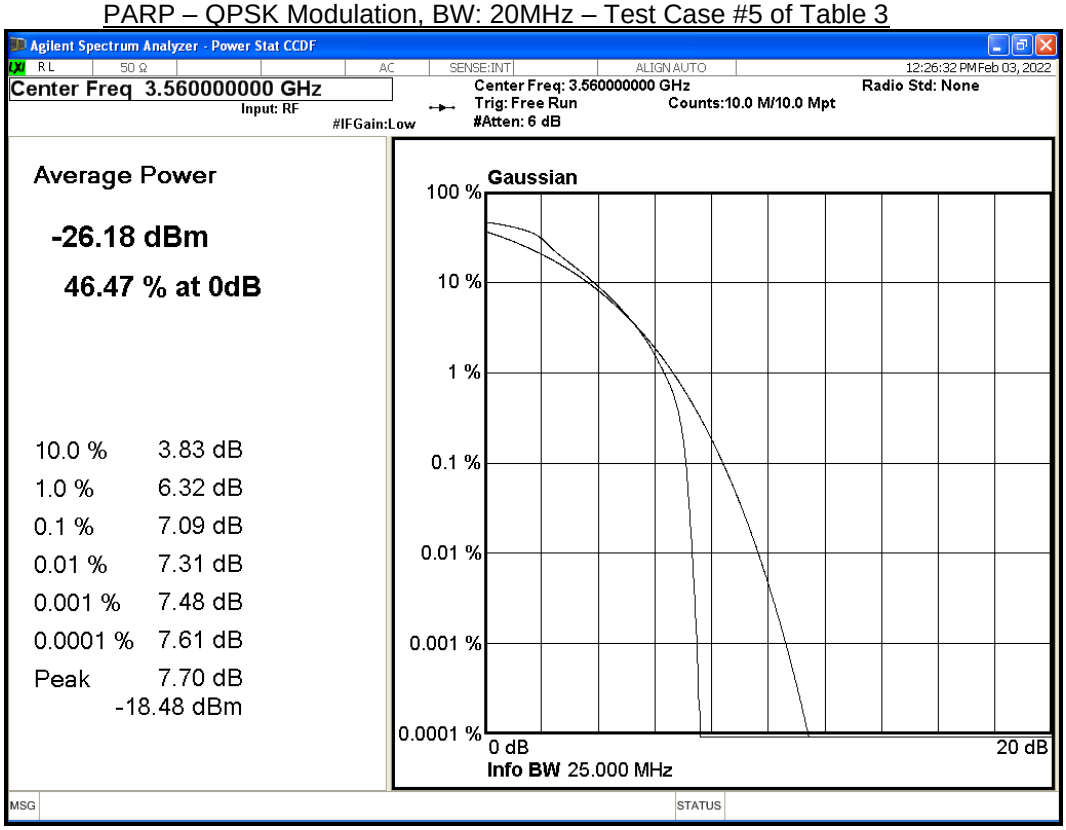
Bandwidth (MHz)	PAPR (@.1%)	Limit	Result
20	7.1	13	Pass
15	6.7	13	Pass
10	6.4	13	Pass
5	6.1	13	Pass

2.1.6.1.1.1 Lower Channel: 3560MHz

Conducted Output Power – QPSK Modulation, BW: 20MHz – Test Case 35 of Table 3

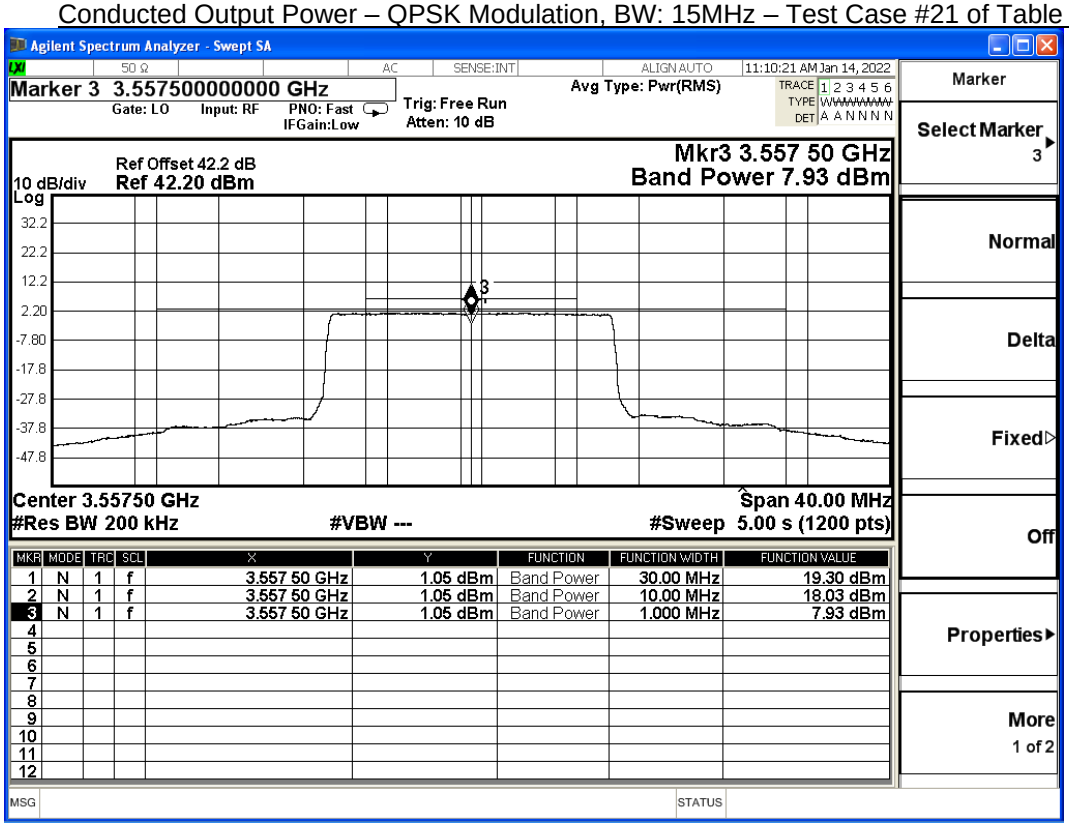


PARP – QPSK Modulation, BW: 20MHz – Test Case #5 of Table 3

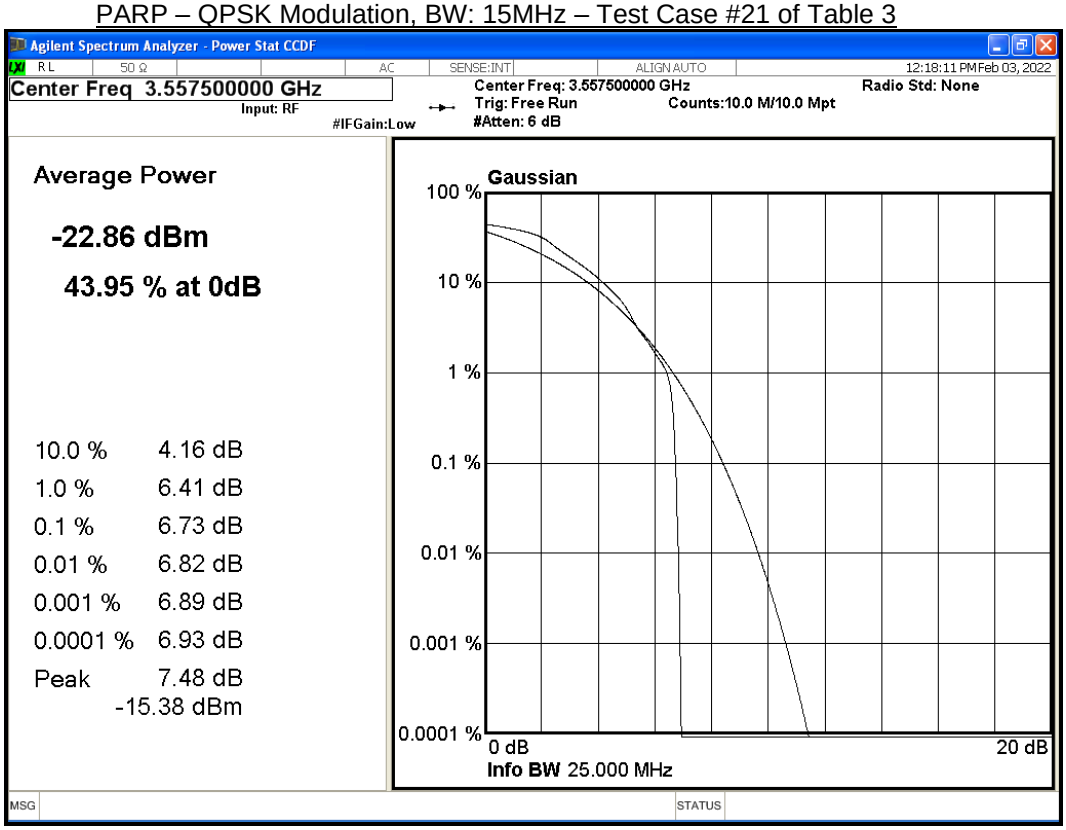


2.1.6.1.1.2 Lower Channel: 3557.5MHz

Conducted Output Power – QPSK Modulation, BW: 15MHz – Test Case #21 of Table 3

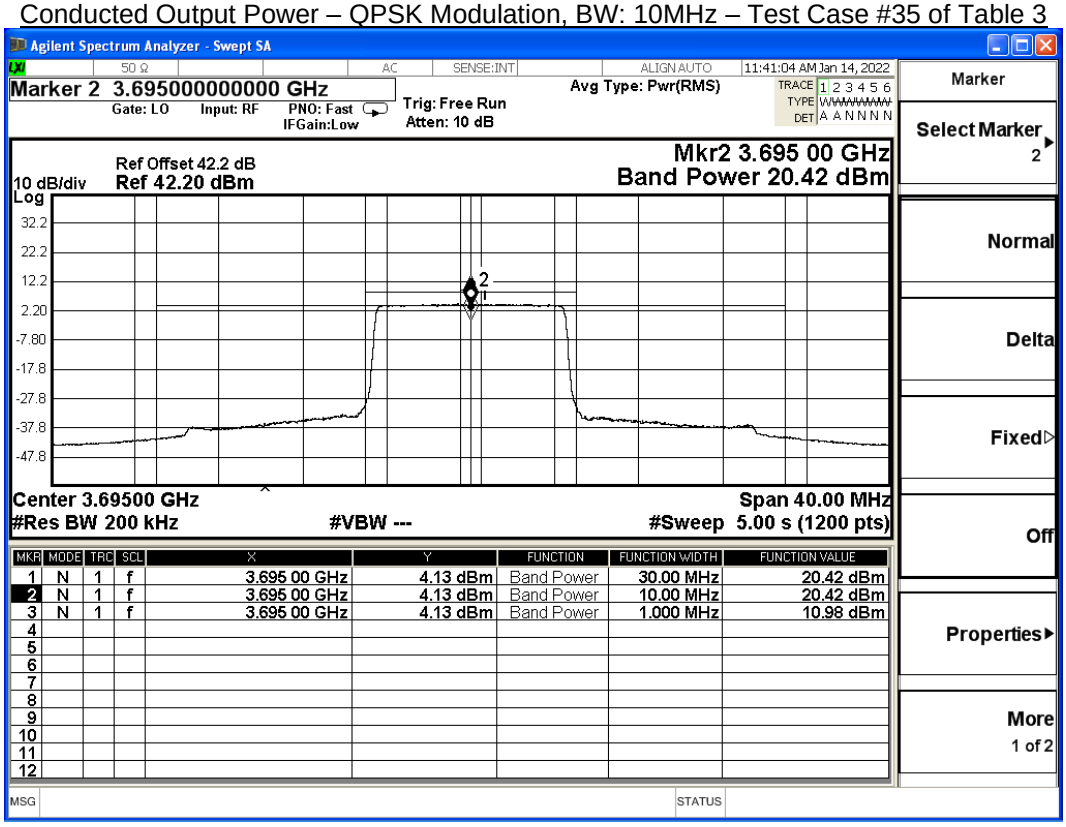


PARP – QPSK Modulation, BW: 15MHz – Test Case #21 of Table 3

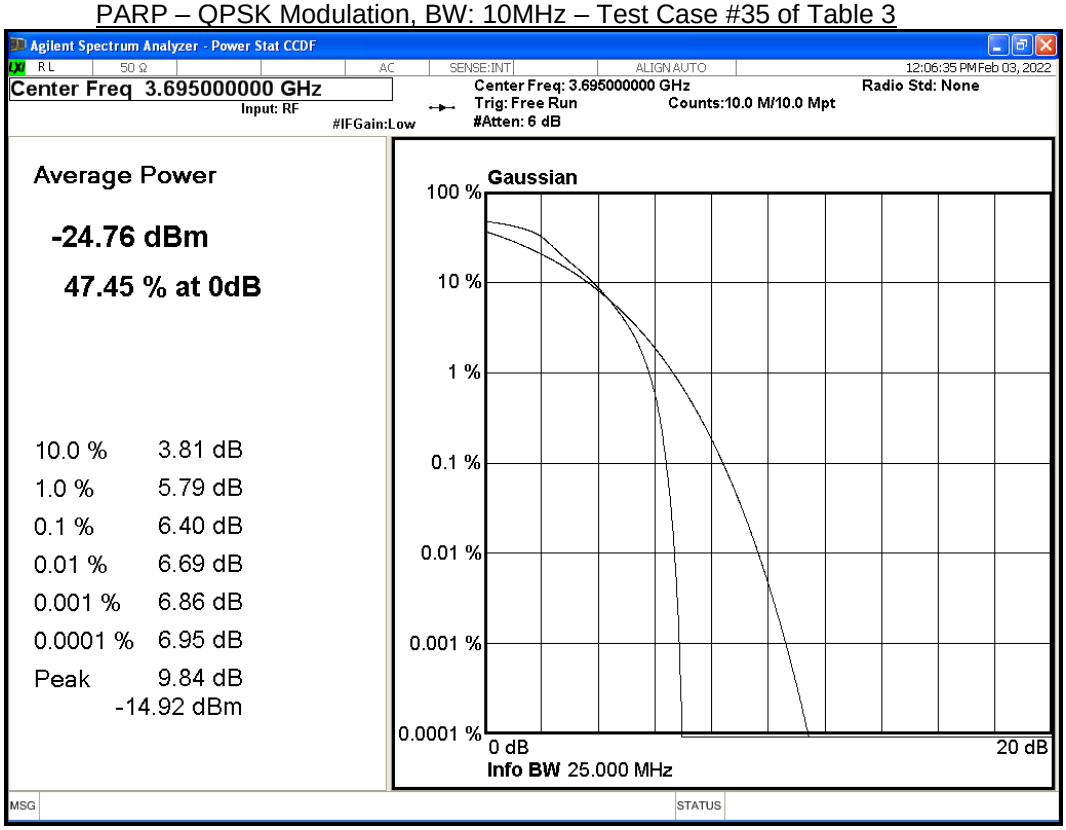


2.1.6.1.2 Bottom Channel: 3695MHz

Conducted Output Power – QPSK Modulation, BW: 10MHz – Test Case #35 of Table 3

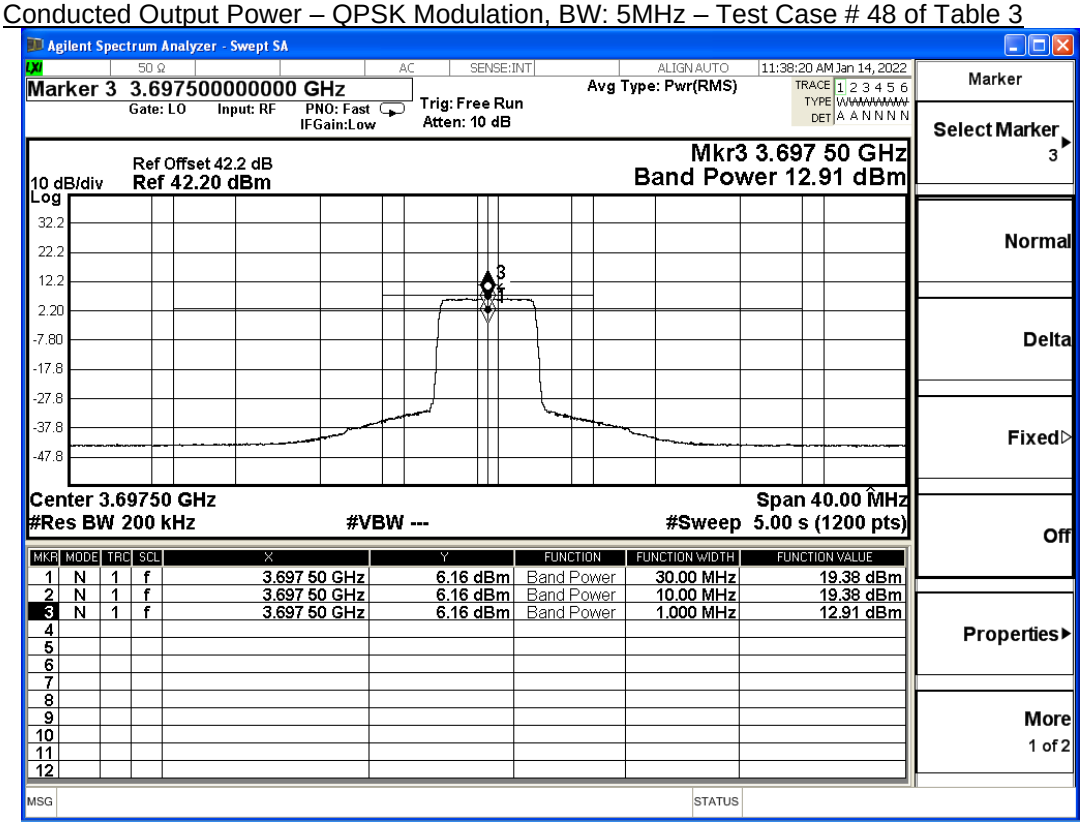


PARP – QPSK Modulation, BW: 10MHz – Test Case #35 of Table 3

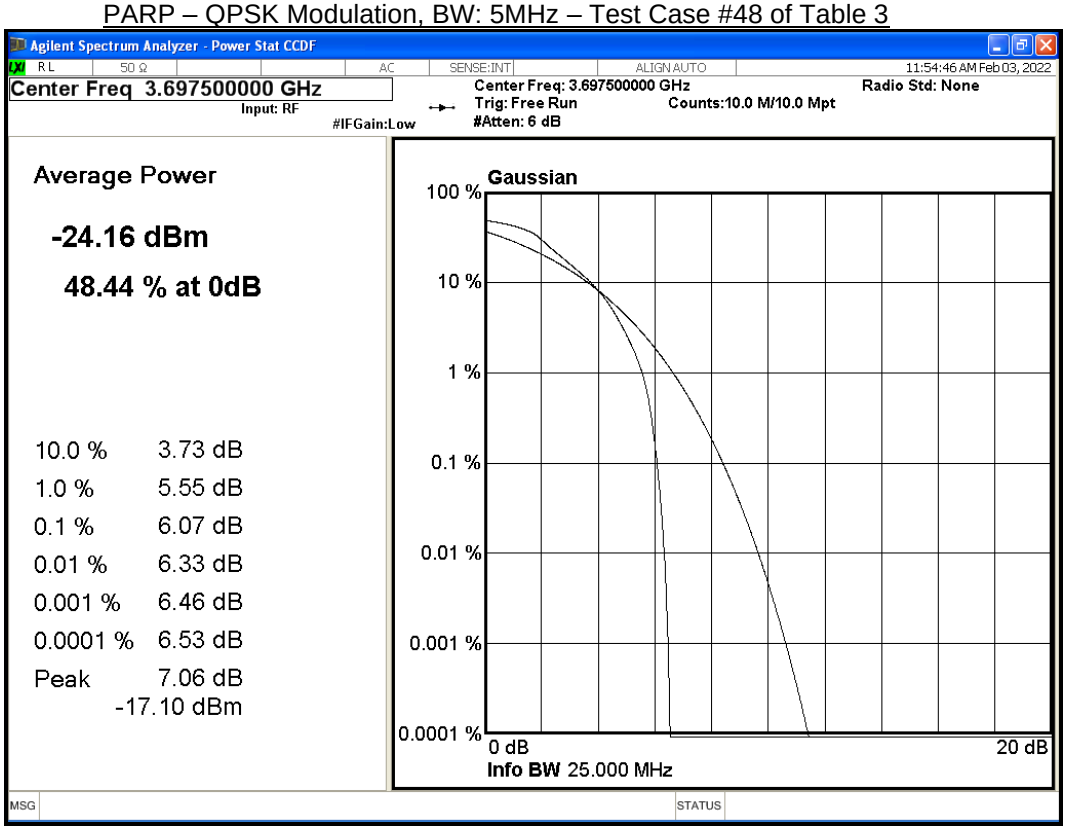


2.1.6.1.3 Top Channel: 3697.5MHz

Conducted Output Power – QPSK Modulation, BW: 5MHz – Test Case # 48 of Table 3



PARP – QPSK Modulation, BW: 5MHz – Test Case #48 of Table 3



2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 96, Clause 96.41 (e)(3)

2.2.2 Date of Test and Modification State

17 Novemberl 2021 - Modification State 0
18 Novemberl 2021 - Modification State 0
25 Novemberl 2021 - Modification State 0
26 Novemberl 2021 - Modification State 0
29 Novemberl 2021 - Modification State 0

2.2.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.4 Environmental Conditions

Ambient Temperature	22°C
Relative Humidity	19%

2.2.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

2.2.6 Test Results

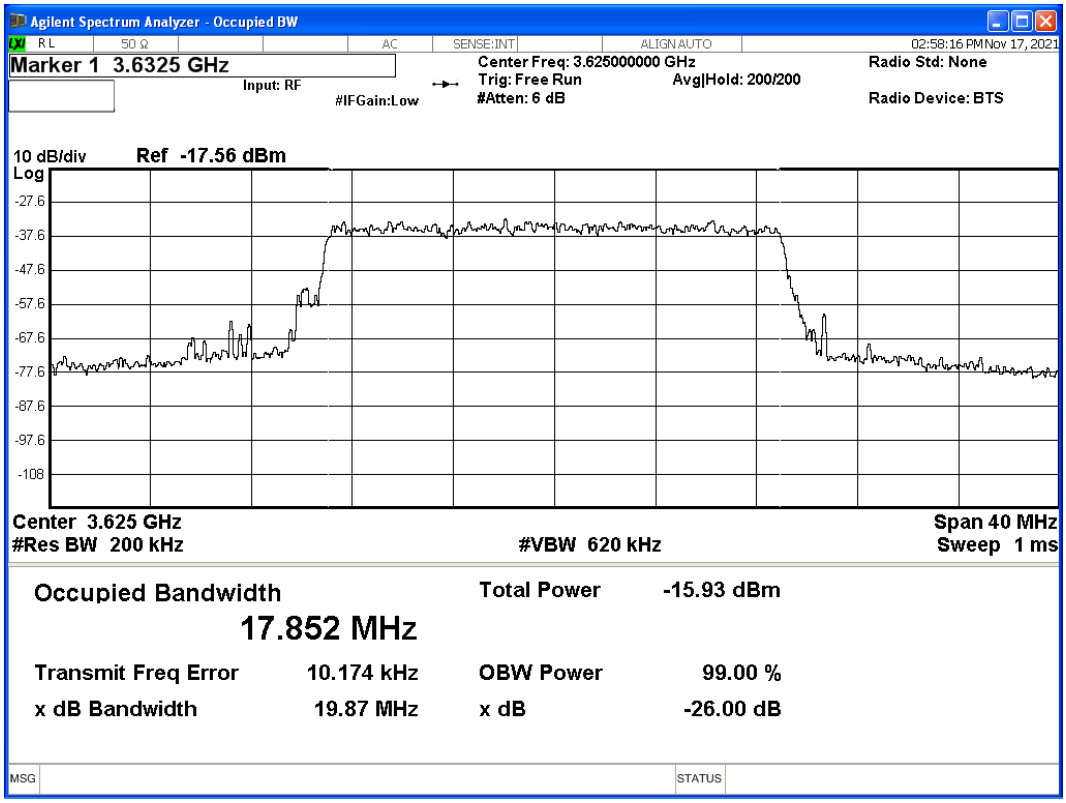
Maximum Output Power 18 dBm/10MHz

Table 8 – Worst Case of OBW of Measurements of tests cases in Table 3

20(MHz)	15 (MHz)	10 (MHz)	5 (MHz)
QPSK	QPSK	QPSK	QPSK
17.9 Note 1	13.4 Note 2	8.9 Note 3	4.5 Note 4
Note 1. Test case No. 7 in Table 3 Note 2. Test case No. 21 in Table 3 Note 3. Test case No. 35 in Table 3 Note 4. Test case No. 49 in Table 3			

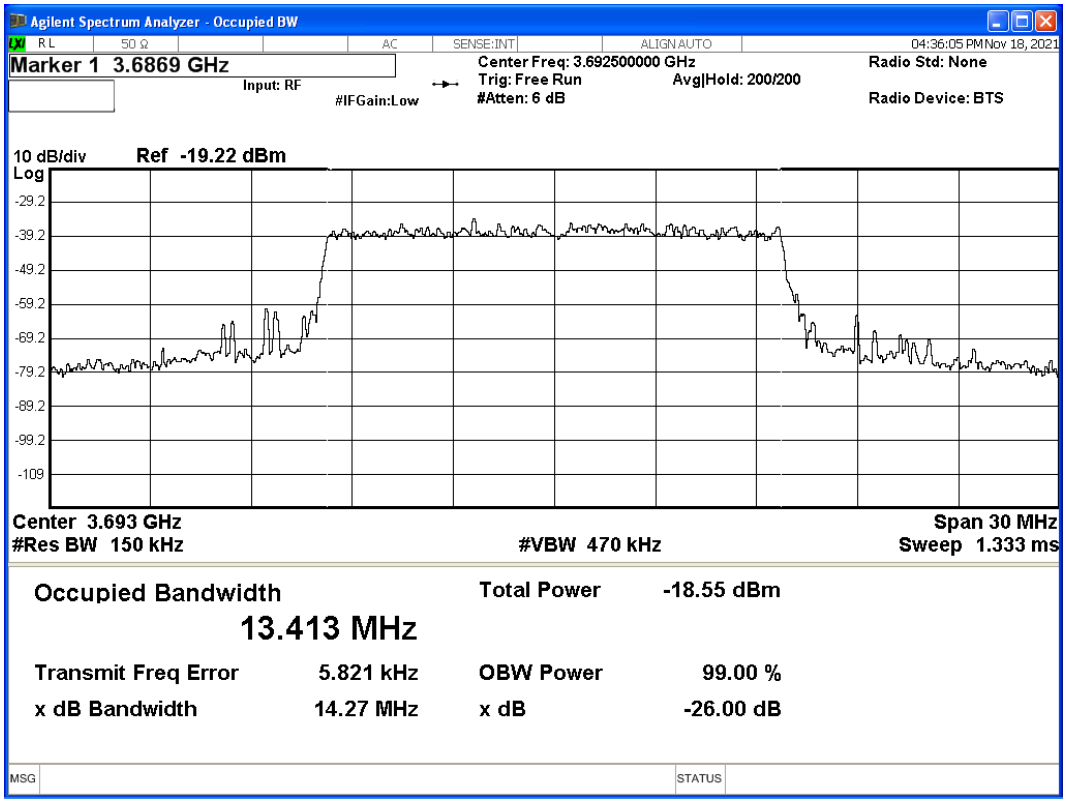
2.2.6.1 OBW – Test Case No.7 in Table 3

2.2.6.1.1 Middle Channel: 3625MHz



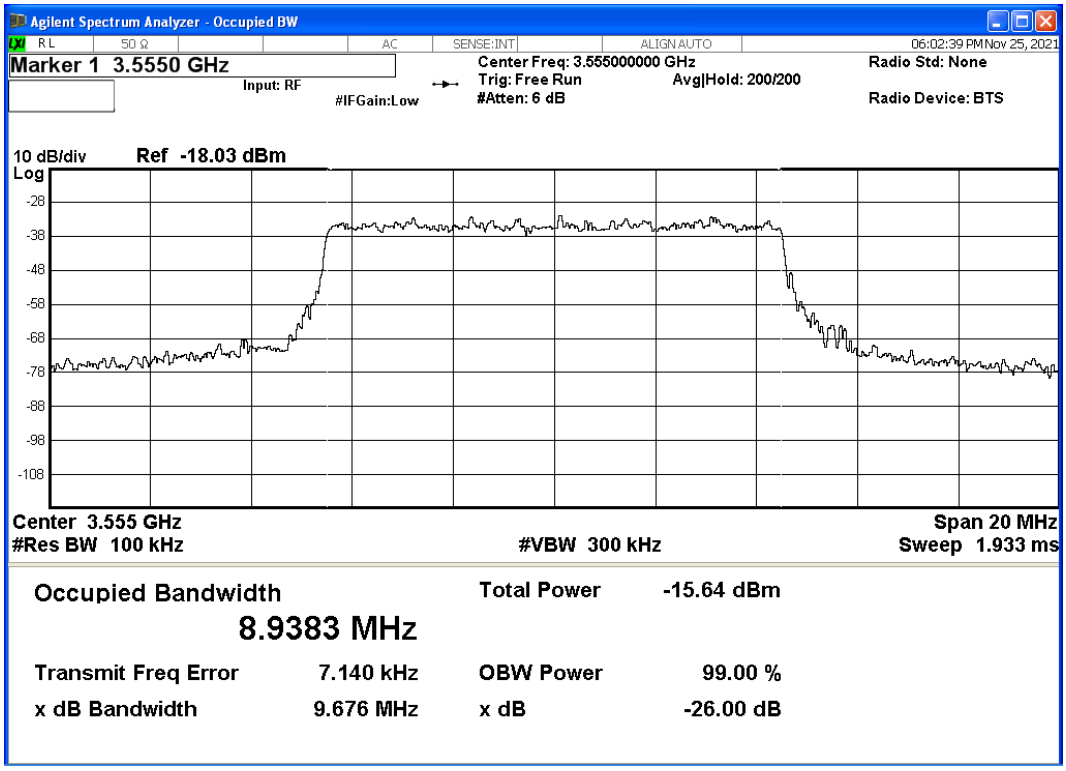
2.2.6.2 OBW – Test Case No.21 in Table 3:

2.2.6.2.1 Bottom Channel: 3692.5MHz

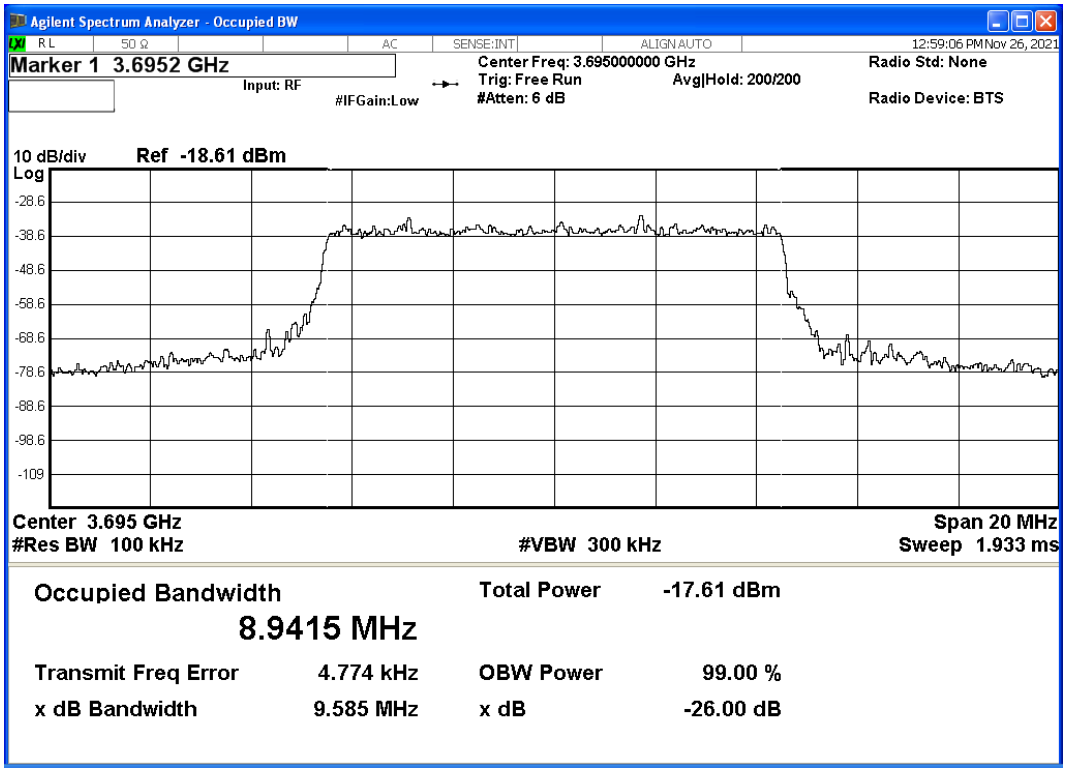


2.2.6.3 OBW – Test Case No.35 in Table 3:

2.2.6.3.1 Bottom Channel: 3555MHz

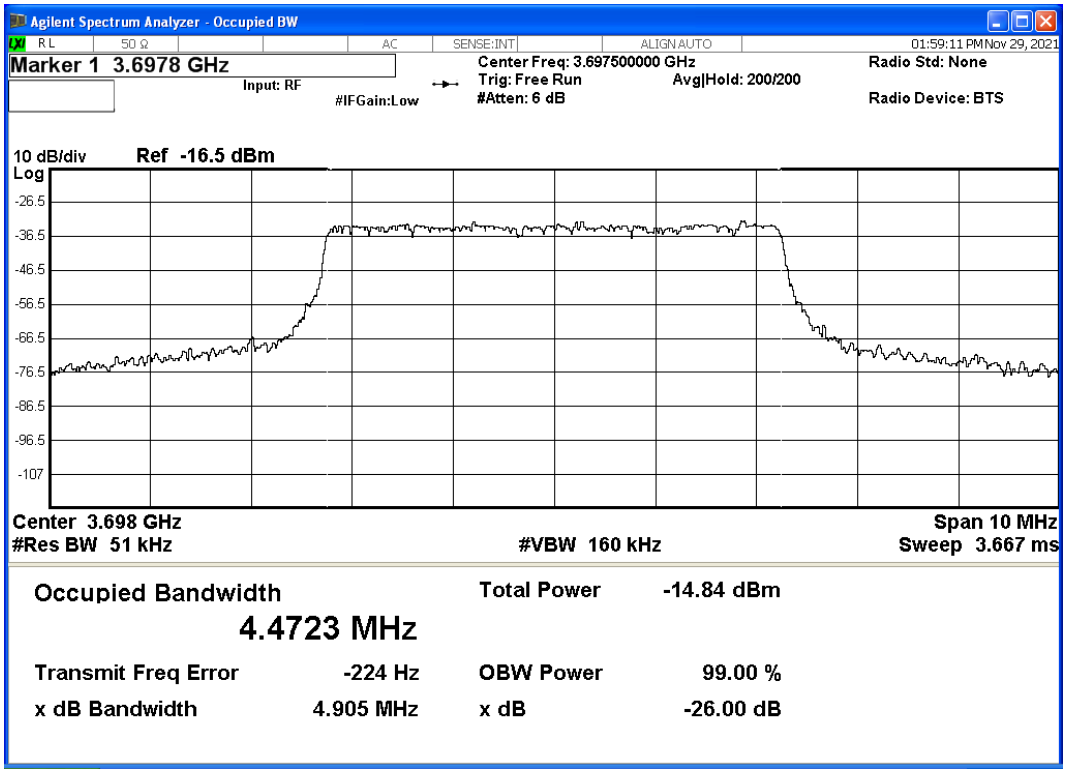


2.2.6.3.2 High Channel: 3695MHz



2.2.6.4 OBW – Test Case No.49 in Table 3:

2.2.6.4.1 High Channel: 3697.5MHz



2.3 BAND EDGE

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 96, Clause 96.41 (e)(3)

2.3.2 Date of Test and Modification State

17 November, 2021- Modification State 0
18 November, 2021- Modification State 0
25 November, 2021- Modification State 0
29 November, 2021- Modification State 0

2.3.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.4 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	15%

2.3.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.
The EUT was connected to a Spectrum Analyser via an attenuator and switching box. The path loss between the EUT and the Spectrum Analyser was measured using a Network Analyser. The measured path loss was entered as a Reference Level Offset in the Spectrum Analyser. The Spectrum Analyser RBW was adjusted to be at least 1% of the measured 26dB Bandwidth. Using an RMS detector, the frequency spectrum up to 1MHz away from the Band Edge was investigated.

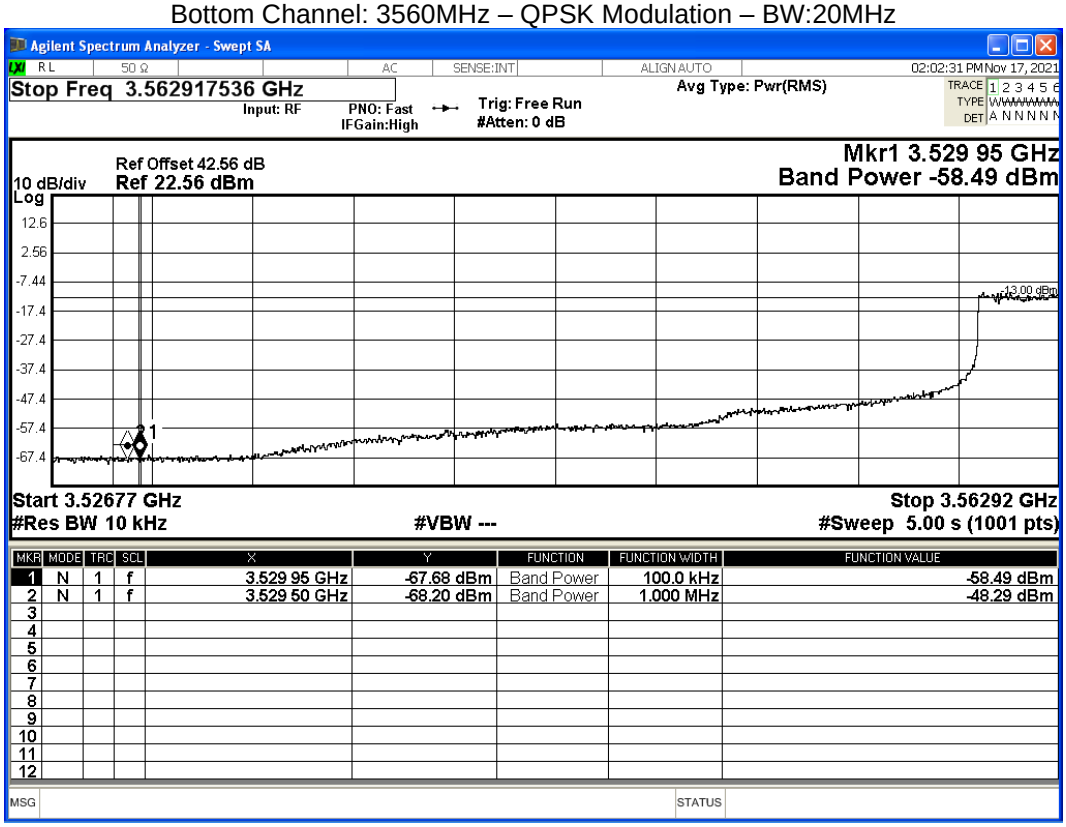
The worst-case scenarios are given in Table 7: 20MHz OBW (test case No.7 & No.14); for 15MHz OBW (test case No.21 & 28); for 10MHz OBW (test case No.35 & 42) and for 5MHz OBW (test case No. 49 & 56).

2.3.6 Test Results

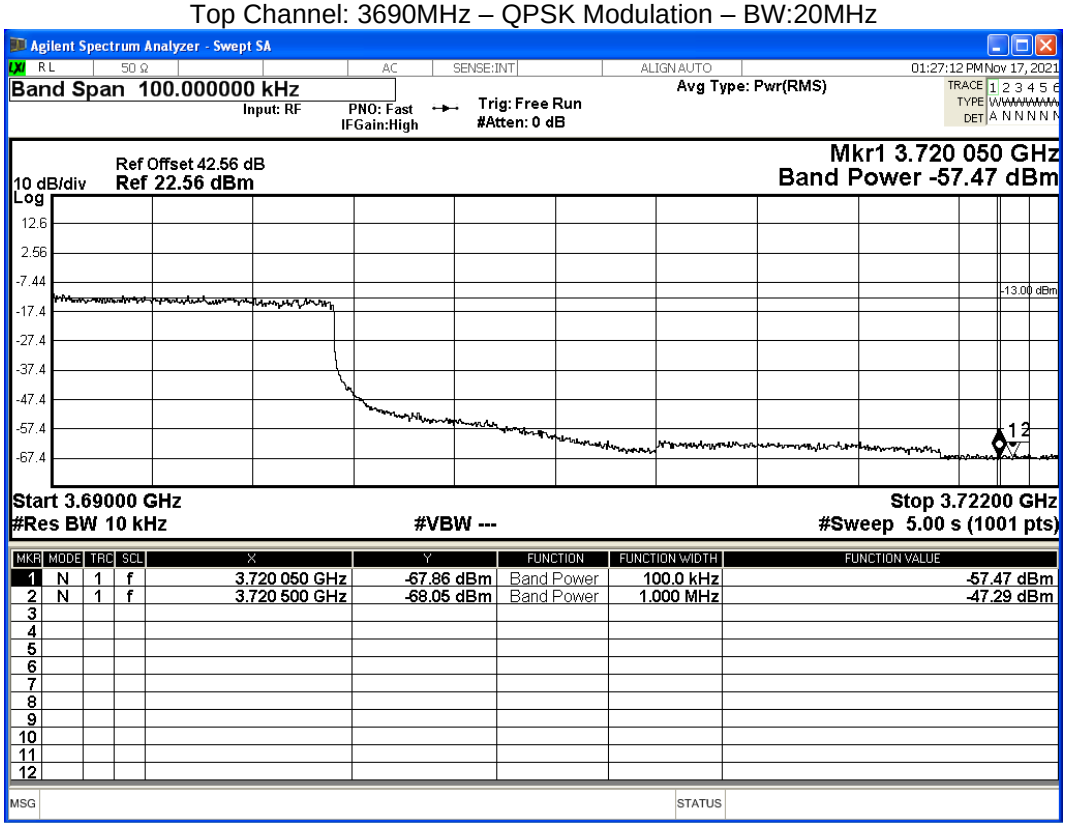
Maximum Output Power 19 dBm

2.3.6.1 Test case No. 6 in Table 3

Bottom Channel: 3560MHz – QPSK Modulation – BW:20MHz

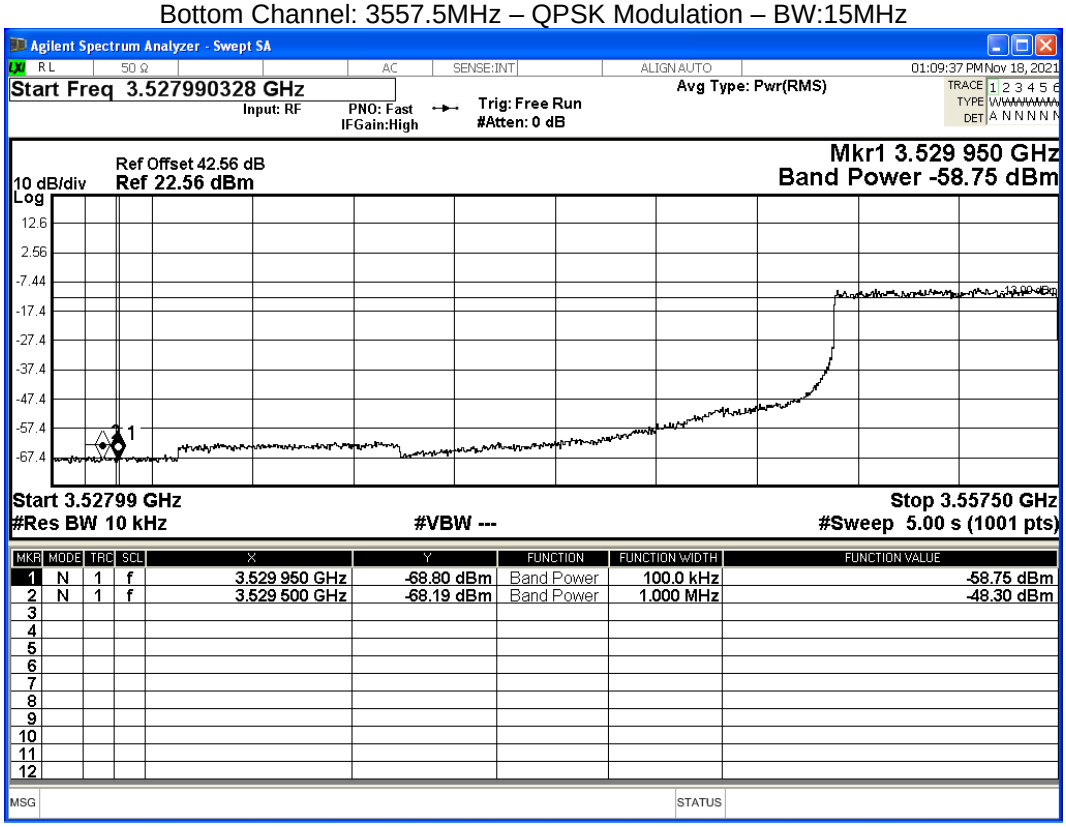


Top Channel: 3690MHz – QPSK Modulation – BW:20MHz

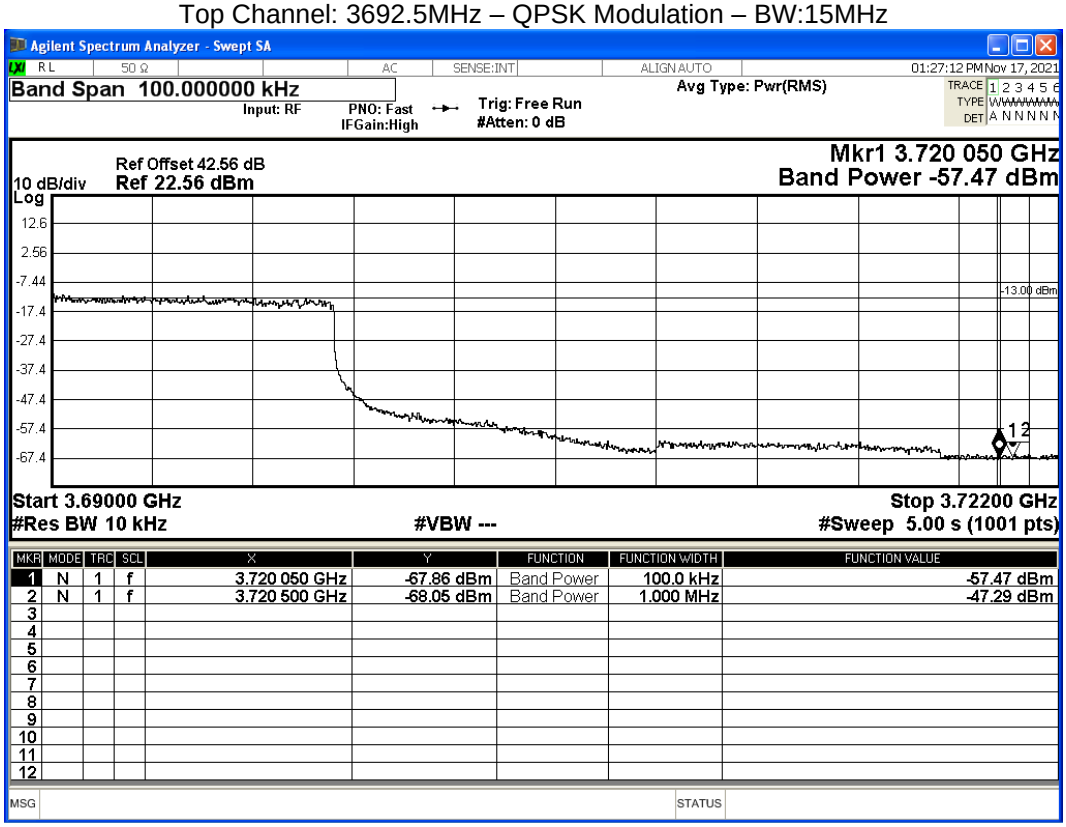


2.3.6.2 Test case No. 16 in Table 3

Bottom Channel: 3557.5MHz – QPSK Modulation – BW:15MHz

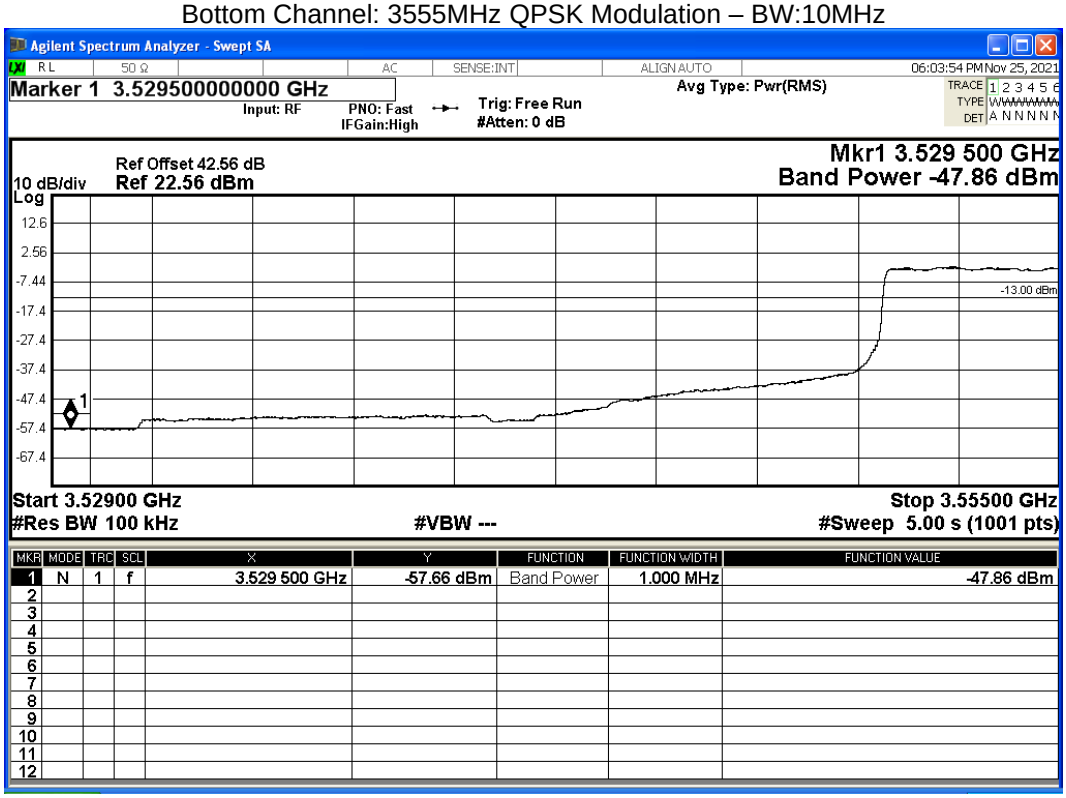


Top Channel: 3692.5MHz – QPSK Modulation – BW:15MHz



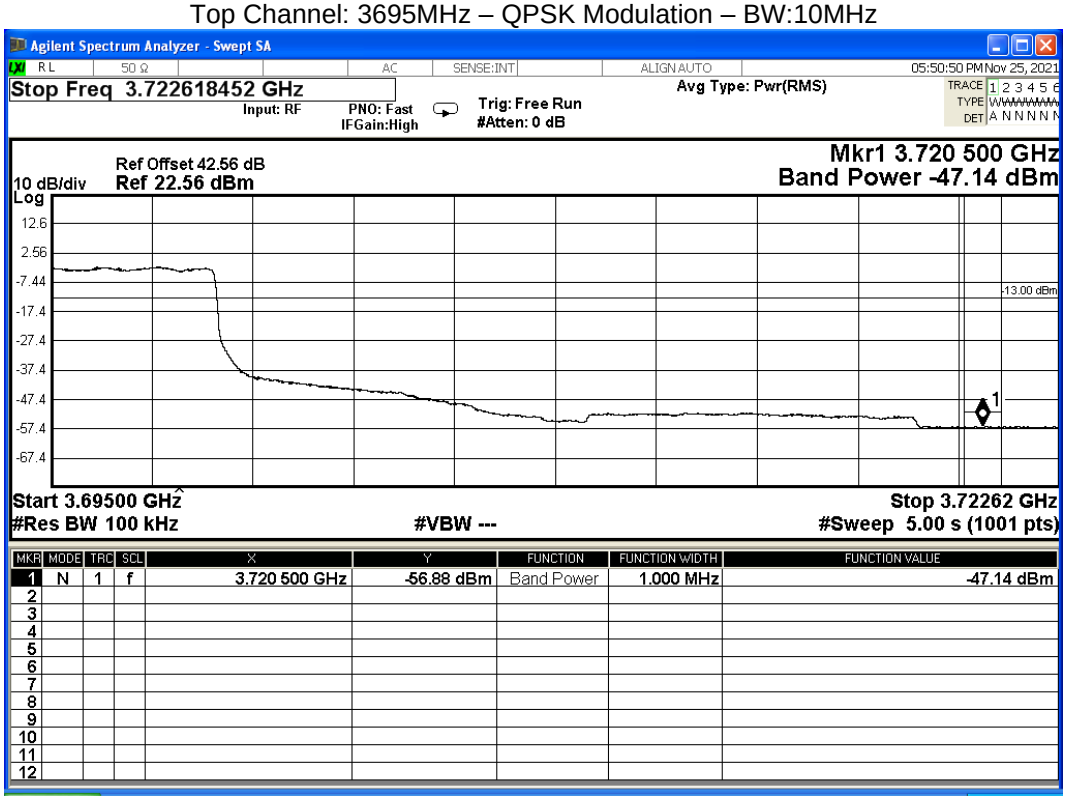
2.3.6.3 Test case No. 35 in Table 3

Bottom Channel: 3555MHz QPSK Modulation – BW:10MHz



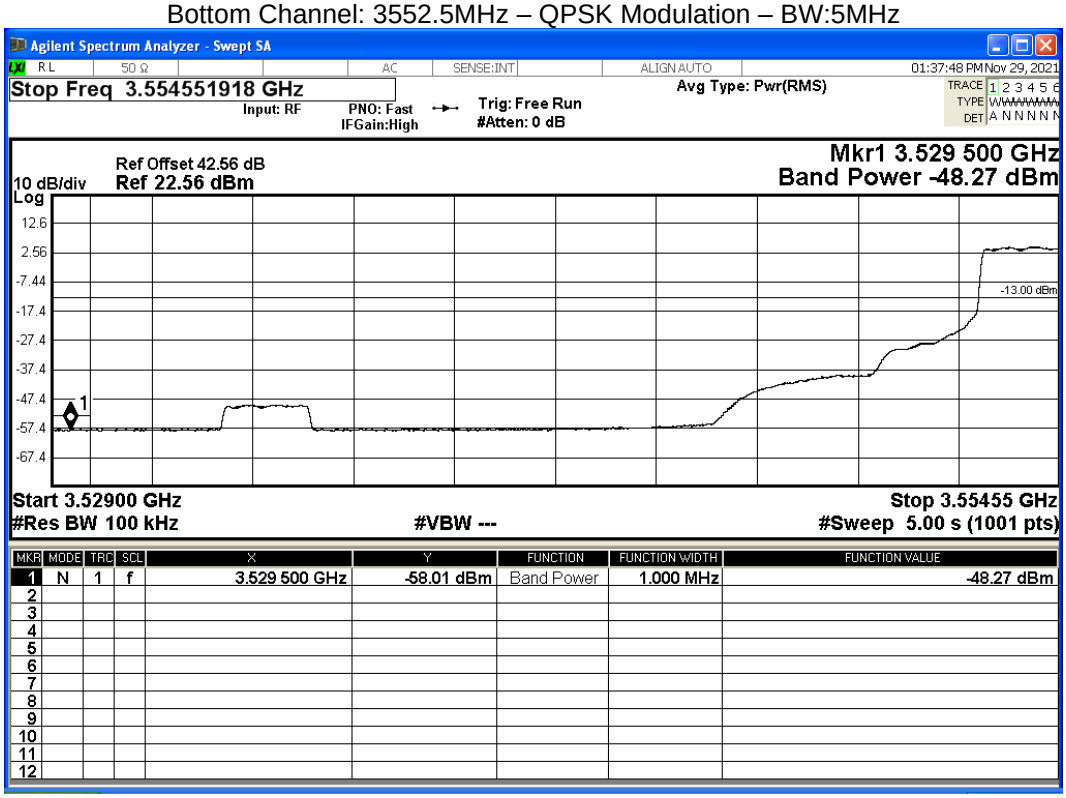
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.529 500 GHz	-57.66 dBm	Band Power	1.000 MHz	-47.86 dBm
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Top Channel: 3695MHz – QPSK Modulation – BW:10MHz



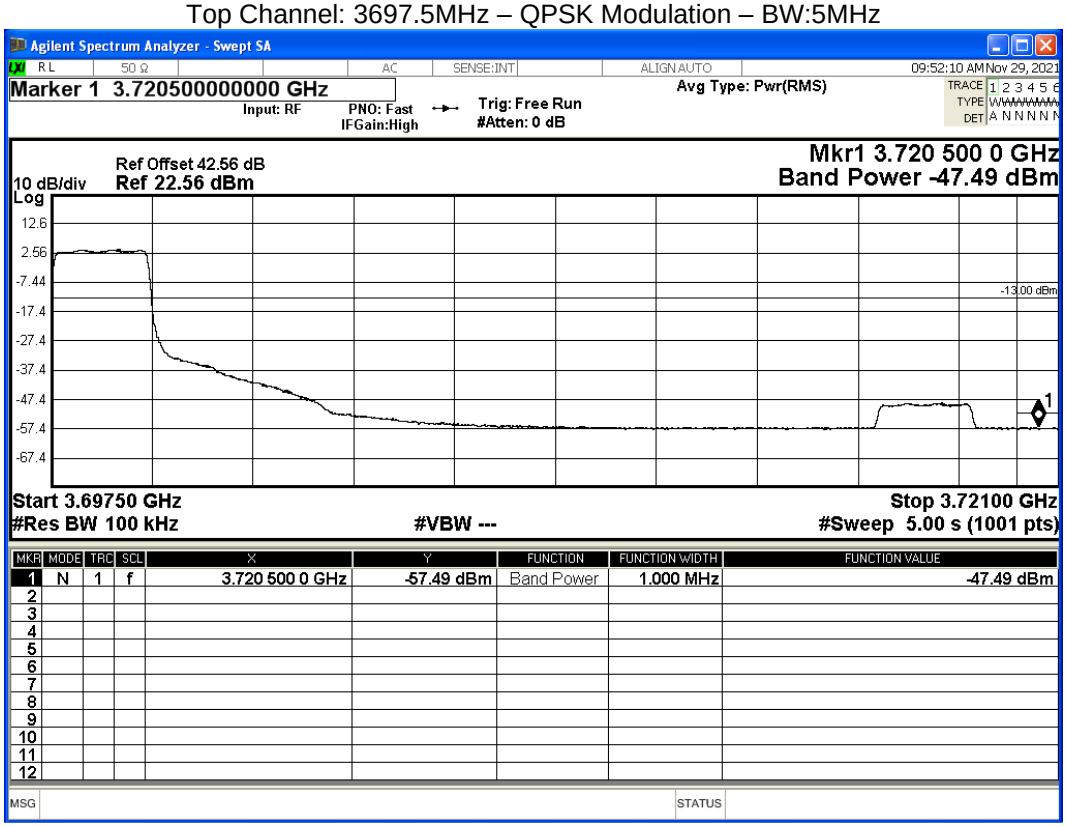
2.3.6.4 Test case No. 48 in Table 3

Bottom Channel: 3552.5MHz – QPSK Modulation – BW:5MHz



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.529 500 GHz	-58.01 dBm	Band Power	1.000 MHz	-48.27 dBm
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Top Channel: 3697.5MHz – QPSK Modulation – BW:5MHz



2.4 TRANSMITTER SPURIOUS EMISSIONS

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 96, Clause 96.41 (e)(1)

2.4.2 Date of Test and Modification State

17 November 2021 - Modification State 0
18 November 2021 - Modification State 0

2.4.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.4 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	35%

2.4.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.
The EUT was connected to a Spectrum Analyser via an attenuator and switching box. Prior to testing, a Network Analyser was used to calibrate the path loss between the EUT and the Spectrum Analyser. The worst-case path loss in the measured ranges was entered as a reference level offset. Over the measured ranges, the RBW was set to 1MHz with a VBW of 3MHz. All measurement results are specified as average with an RMS detector being used in conjunction with a trace setting of Max Hold. Measurements were performed in configurations of the EUT as reported below.

Testing was performed with a test limit of -40 dBm/MHz (for emissions < 3530 MHz and > 3720 MHz).

Testing was performed on this port with a test limit of -25 dBm/MHz (for emissions within 10 MHz of the carrier).

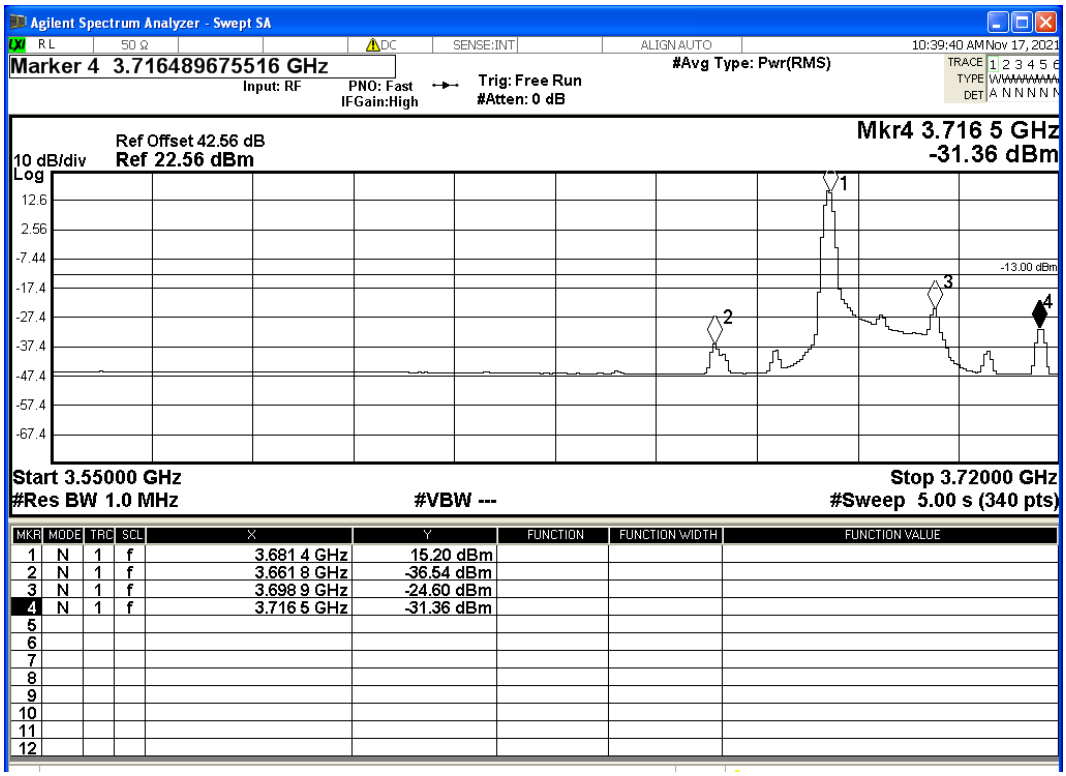
The worst-case test cases were: No.1; 3;5;7;9;11 and 13.

2.4.6 Test Results

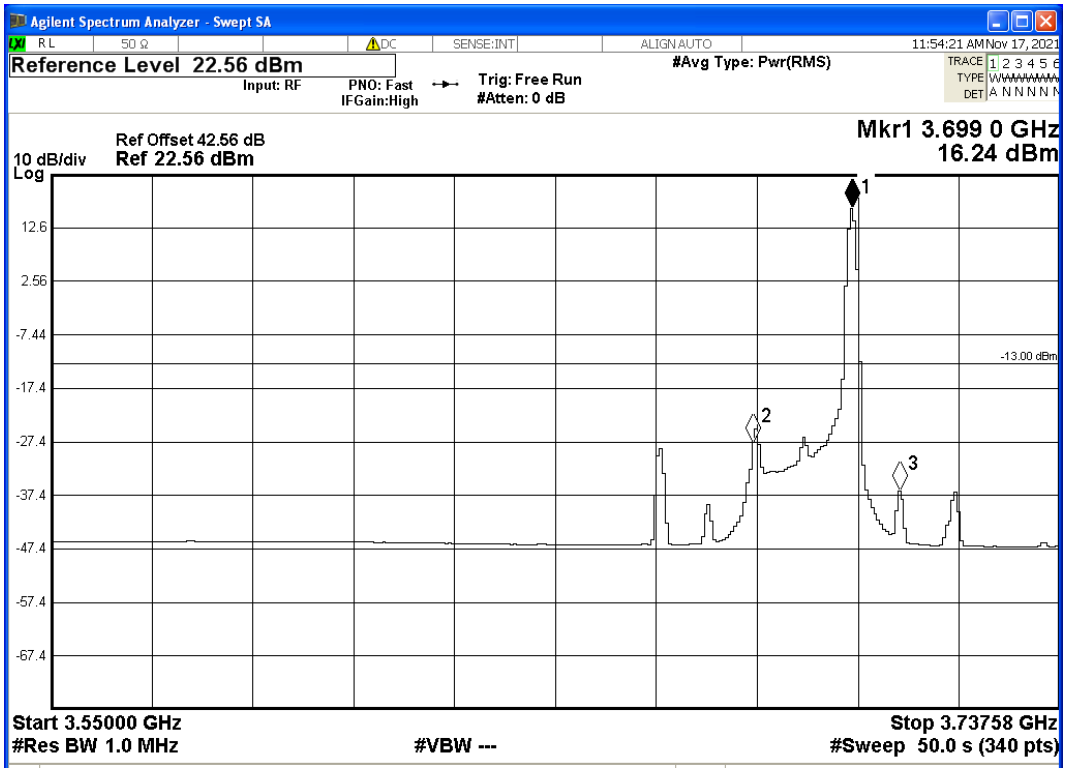
Maximum Output Power 18 dBm

Range Frequency (MHz)	Limit (dBm)	Result
0.009 to 3530	-40	Pass <Note 1>
3530 to 3650	-25	Pass
3650 to 3660	-13	Pass
3700 to 3710	-13	Pass
3710 to 3720	-25	Pass
3720 to 40000	-40	Pass <Note 2>
Note 1. The device was scanned from 9kHz to 3530MHz with no emission (peak values less than 6Bd from the limit) was found Note 2. The device was scanned up to 40Ghz with no emission (peak values less than 6Bd from the limit) was found		

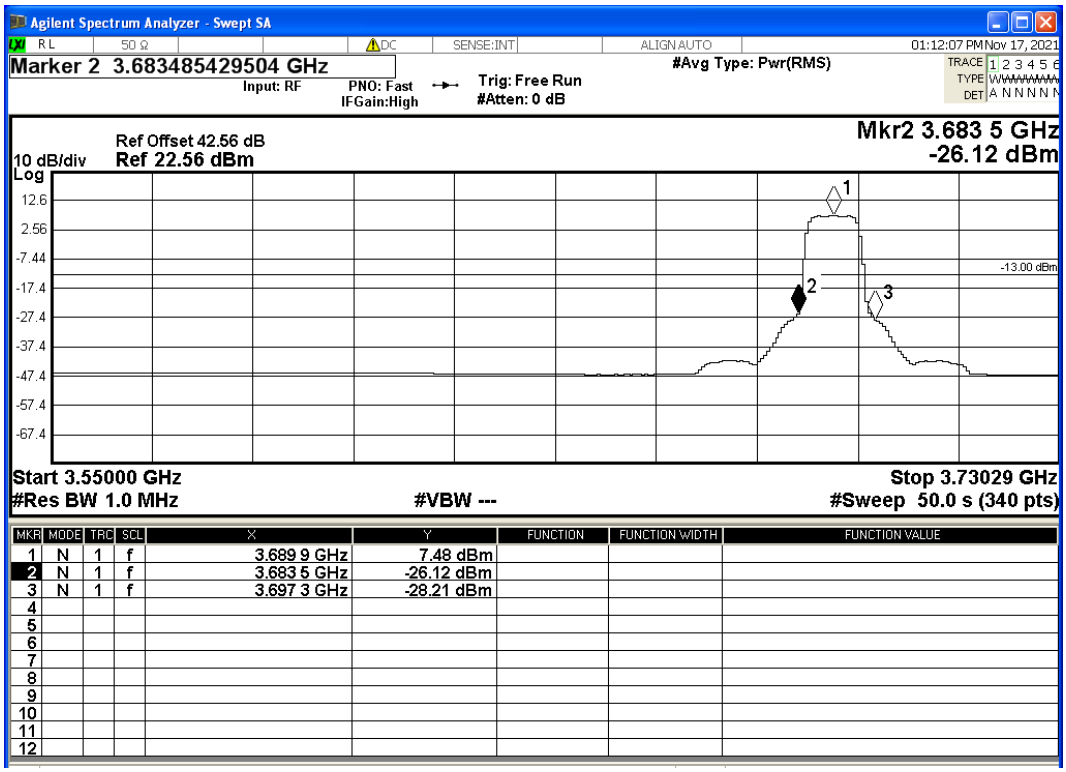
2.4.6.1 Worst-Case test No. 1 – Top Channel: 3690MHz



2.4.6.2 Worst-Case test No. 3 – Top Channel: 3690MHz

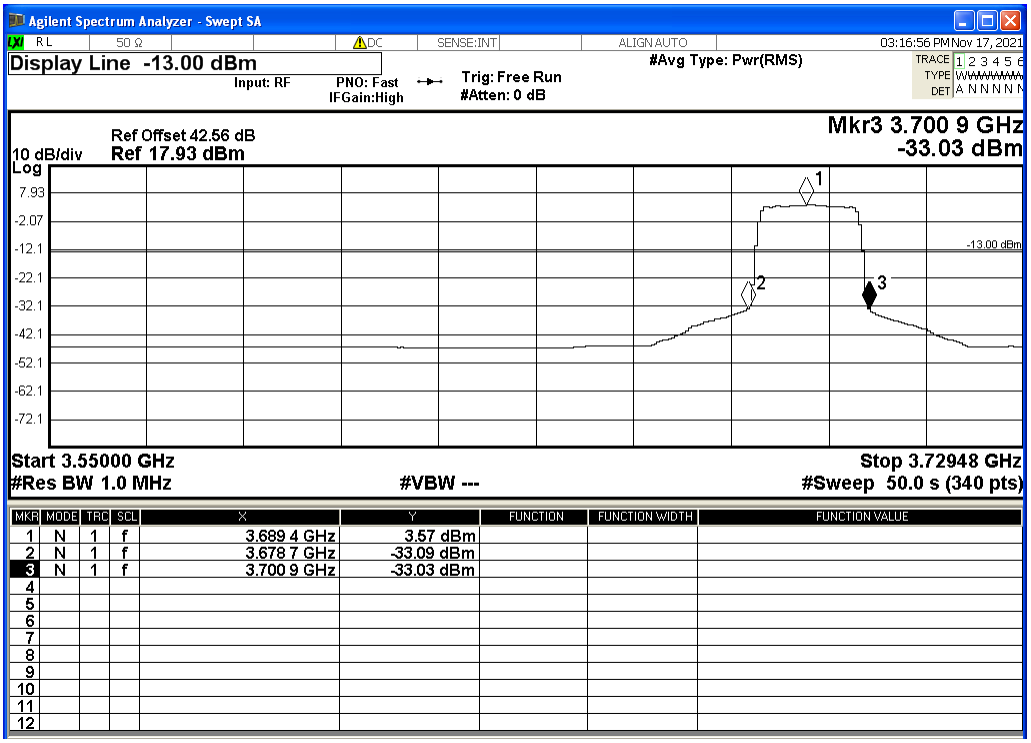


2.4.6.3 Wost-Case test No. 5 – Top Channel: 3690MHz

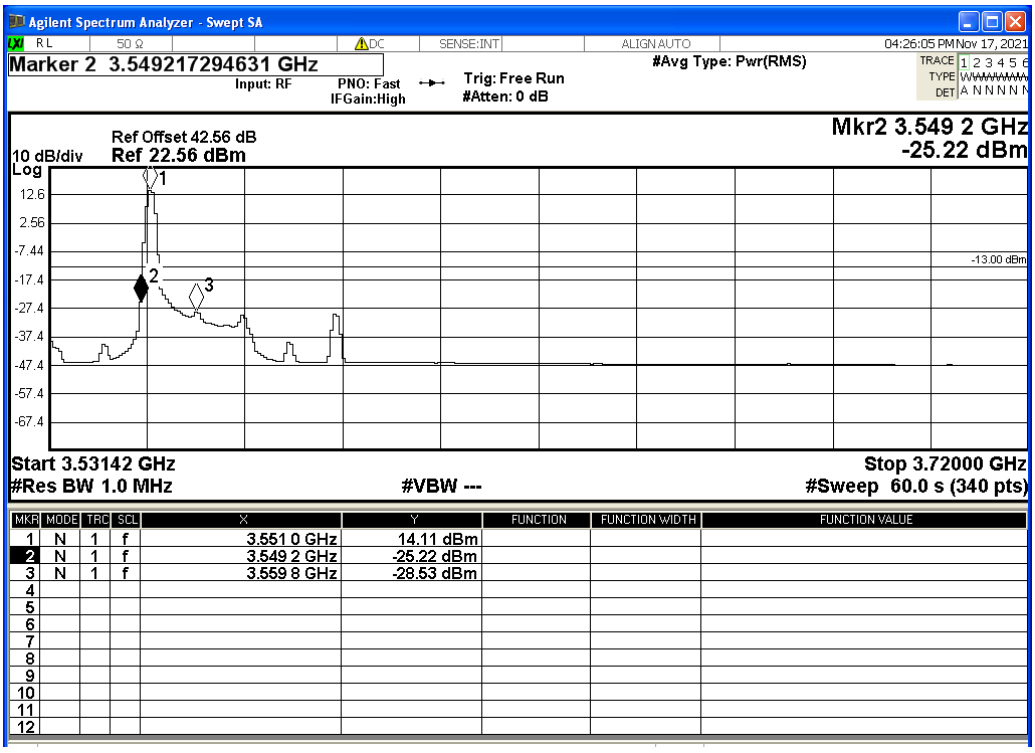


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	3.689 9 GHz	7.48 dBm			
2	N	1	f	3.683 5 GHz	-26.12 dBm			
3	N	1	f	3.697 3 GHz	-28.21 dBm			
4								
5								
6								
7								
8								
9								
10								
11								
12								

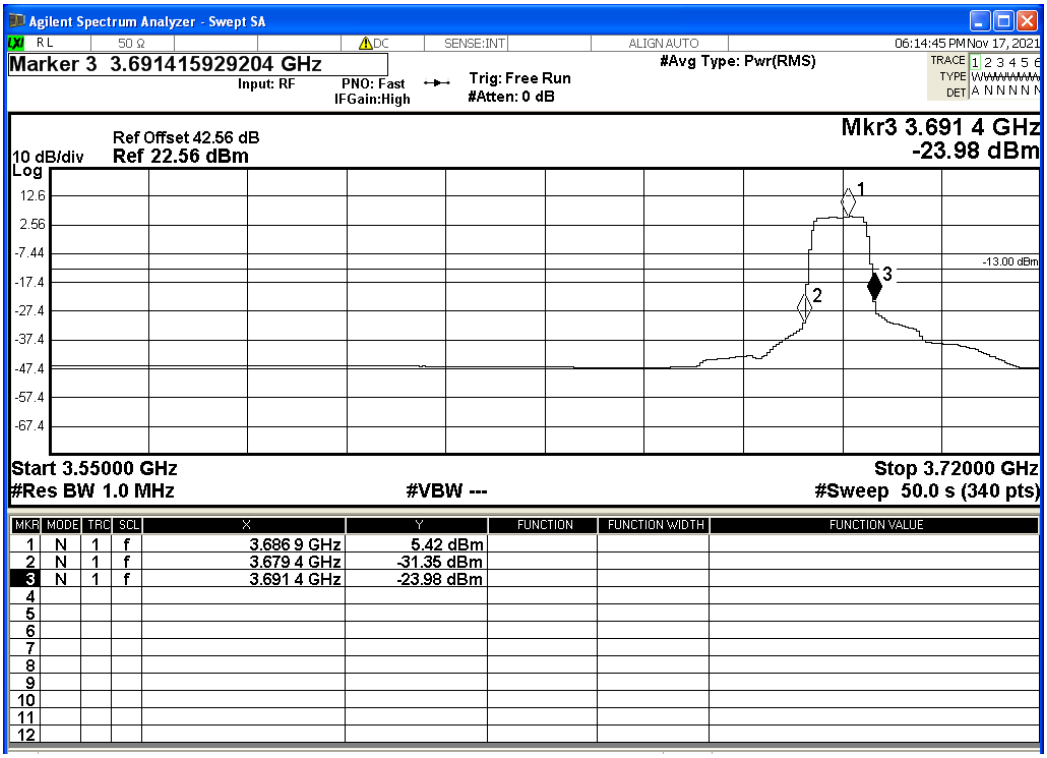
2.4.6.4 Wost-Case test No. 7 – Top Channel : 3690MHz



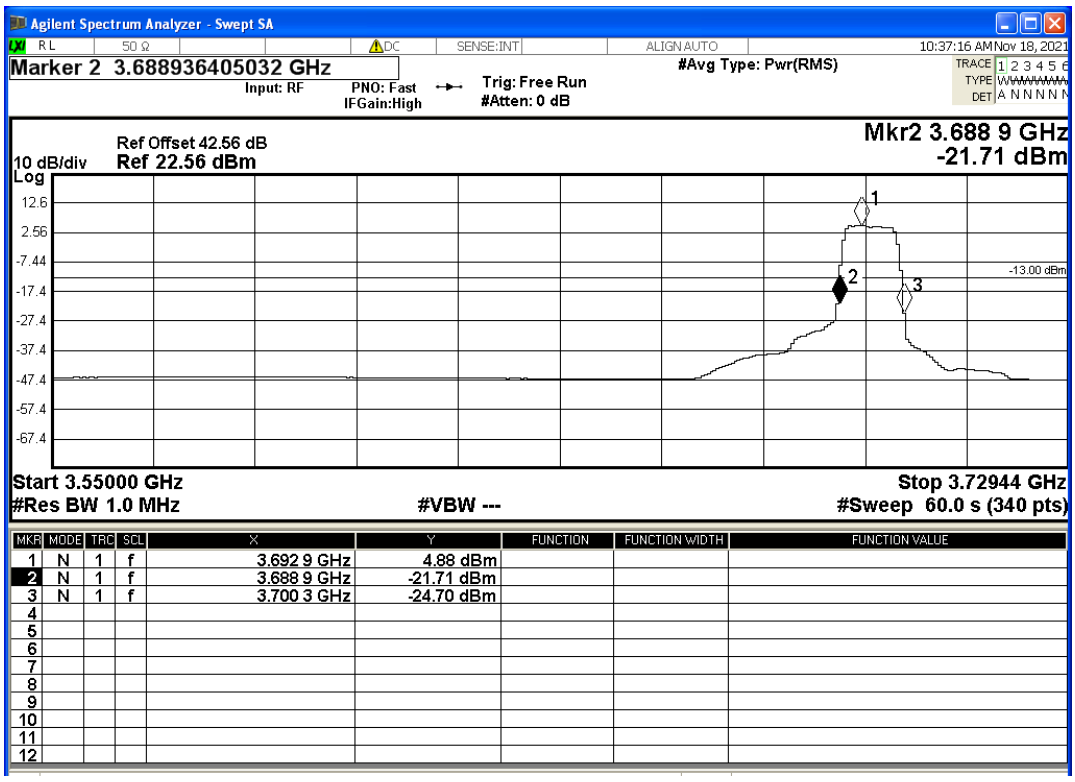
2.4.6.5 Wost-Case test No. 9: Bottom Channel – 3560MHz



2.4.6.6 Wost-Case test No. 11: Bottom Channel – 3560MHz



2.4.6.7 Wost-Case test No. 13 – Top Channel : 3590MHz



2.5 FREQUENCY STABILITY

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 96, Clause 27.54

2.5.2 Date of Test and Modification State

29 November 2021 - Modification State 0

2.5.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.4 Environmental Conditions

Ambient Temperature	22°C
Relative Humidity	30%

2.5.5 Test Method

All measurements were made in accordance with FCC KDB 971168 D01.

2.5.6 Test Results

Worst Case Scenario

Maximum Output Power 18dBm

Table 9 – Worst Case of Frequency Stability Measurement (Test Case No. 2 in Table 3)

Temperature	Voltage (AC)	Frequency Error (Hz)	Limit ppm <Note 2>	Error/Freq ppm	Result
-30°C	115	Note 1	±1.5	0.0012	Pass
-20°C	115	87.24	±1.5	0.0010	Pass
-10°C	115	34.21	±1.5	0.0004	Pass
0°C	115	31.0	±1.5	0.0003	Pass
+10°C	115	20.50	±1.5	0.0002	Pass
+20°C	115	22.7	±1.5	0.0003	Pass
+20°C	90	21.22	±1.5	0.0002	Pass
+20°C	132	13.17	±1.5	0.0001	Pass
+30°C	115	16.34	±1.5	0.0002	Pass
+40°C	115	18.30	±1.5	0.0002	Pass
+55°C	115	4.62	±1.5	0.00005	Pass
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation					

2.6 RADIATED EMISSION

2.6.1 Specification Reference

FCC CFR 47 Part §2.1051
FCC CFR 47 Part 96.41

2.6.2 Date of Test and Modification State

22 November 2021 – Modification State 0
23 November 2021 – Modification State 0
23 February 2022 – Modification State 0

2.6.3 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.4 Environmental Conditions

Ambient Temperature	23.1°C
Relative Humidity	13.4%

2.6.5 Test Method

All measurements were made in accordance with:
- 971168 D01 Power Meas License Digital Systems v03r01 Clause 5.6
- 971168 D01 Power Meas License Digital Systems v03r01 Clause 7

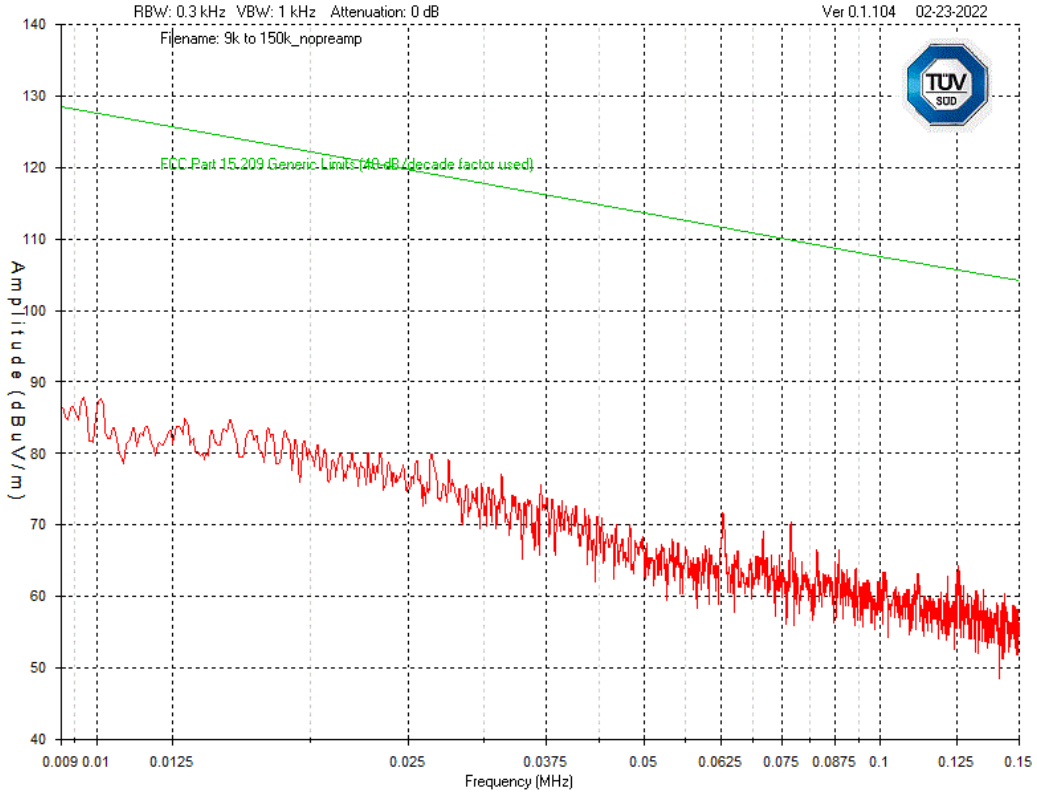
Measurements were performed in configurations of the EUT as reported below. Testing was performed with RF on with a test limit of FCC 15 Subpart B Class A at 3m.

2.6.6 Test Results

A summary of the test result is depicted in the table below.

Table 10 – Radiated Emission Measurement (Test Case No. 7 in Table 3)

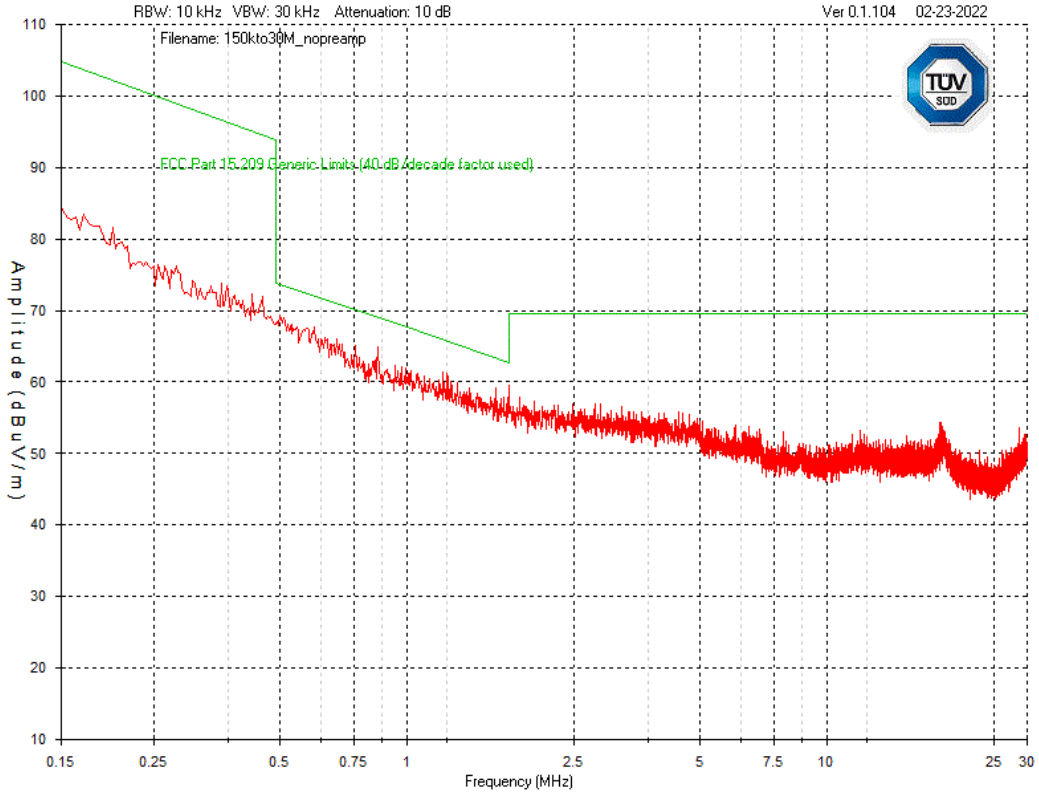
Range Frequency (MHz)	**Limit** <Note 1> dBµV/m	**Result**
0.009 to 0.150	40dB/decade	Pass
0.15 to 30	40dB/decade	Pass
30 to 1000	49.5	Pass
1000 to 4000	59.96	Pass
4000 to 10 000	59.96	Pass
10 000 to 18 000	59.96	Pass
18 000 to 26 500	69.54	Pass
26 500 to 40 000	69.54	Pass
Note 1. Only the most restringing detector level (or limit in the range) is provided		



Spurious Radiation

Spurious Radiation Emission – 9kHz to 150kHz

Note: No significant emission (i.e., less than 10dB below the limit) was noted.



Spurious Radiation

Spurious Radiation Emission – 150kHz to 30MHz

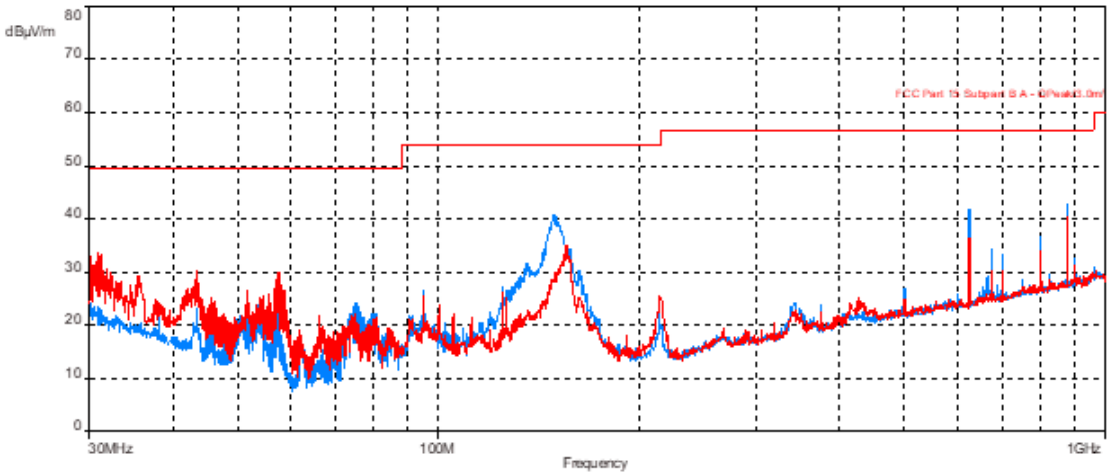
Note: No significant emission was noted.

Product Service

Spurious Radiation (Distance 3m)
Spurious Radiation Emission – 30MHz to 1GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C1 30-1000 MHz 3m Number :122 Execution date: 11/22/2021 10:53:49 AM	
Limit	FCC Part 15 Subpart B
Class	Class: A
Test Plan Number	7169010408
Configuration Information	Test Case No.7
Results	Pass
Model	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Tested by	CR
Comments	-



Red=Vertical, Blue=Horizontal

QuasiPeak (7)

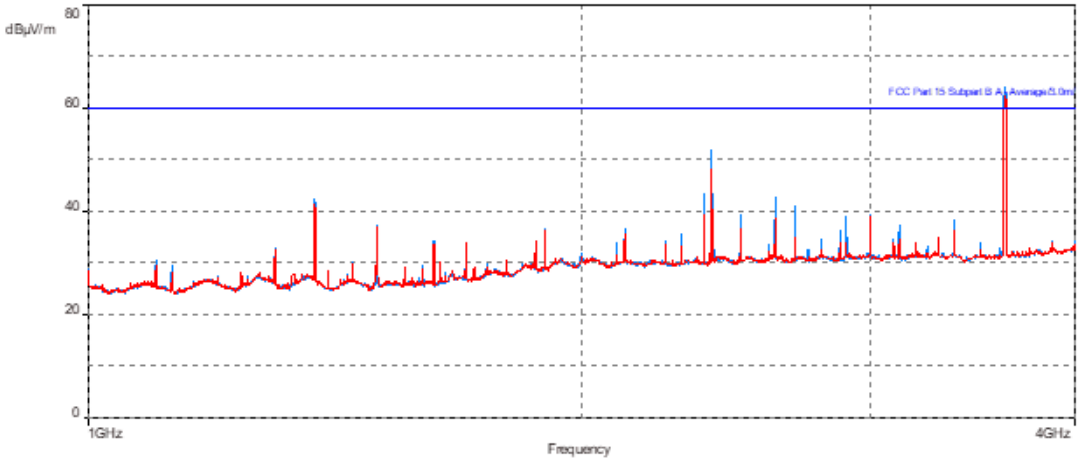
Frequency (MHz)	SR	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (m) (dB)	Azimuth (°) (dB)	Polarization (dB)	Correction (dB)
30.85368556	1	32.80	49.54	-16.74	1.17	356.75	Vertical	-3.24
148.6364905	2	39.28	54.08	-14.80	1.00	0.00	Horizontal	-9.67
155.9527531	1	34.02	54.08	-20.06	1.00	203.75	Vertical	-10.03
625.0231185	2	40.88	56.80	-15.92	1.00	127.25	Horizontal	-0.47
625.0229582	1	36.88	56.80	-19.92	3.73	228.00	Vertical	-0.47
875.032311	2	40.73	56.80	-16.07	1.87	335.75	Horizontal	4.03
875.032311	1	40.86	56.80	-15.94	1.00	41.00	Vertical	4.03

Product Service

Spurious Radiation (Distance 3m)
Spurious Radiation Emission – 1GHz to 4GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C2 1-4 GHz 3m Number :123 Execution date: 11/22/2021 1:01:03 PM	
Limit	FCC Part 15 Subpart B
Class	Class: A
Test Plan Number	7169010408
Configuration Information	Test Case No.7
Results	Pass
Model	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Tested by	CR
Comments	-



Red=Vertical, Blue=Horizontal

Finals

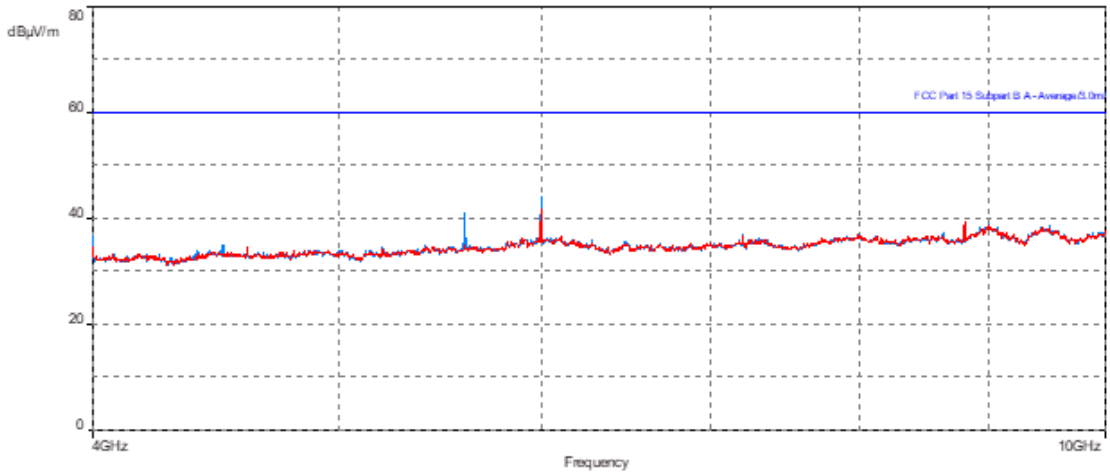
AVG (6)

Frequency (MHz)	S R	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (m) (dB)	Azimuth (°) (dB)	Polarizatio n (dB)	Correction (dB)
1375.050321	2	42.02	59.96	-17.94	2.14	41.00	Horizontal	-9.34
1375.051282	1	39.93	59.96	-20.03	3.00	362.00	Vertical	-9.34
2400.088782	2	50.69	59.96	-9.27	2.01	312.00	Horizontal	-4.96
2400.087821	1	46.84	59.96	-13.12	1.04	218.25	Vertical	-4.96
3624.38141	1	53.40	59.96	-6.56	1.46	341.00	Vertical	-3.71
3624.994231	2	53.23	59.96	-6.73	1.00	31.25	Horizontal	-3.71

Spurious Radiation
Spurious Radiation Emission – 4GHz to 10GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C3 4-10 GHz 3m Number :124 Execution date: 11/22/2021 3:14:34 PM	
Limit	FCC Part 15 Subpart B
Class	Class: A
Test Plan Number	7169010408
Configuration Information	Test Case No.7
Results	Pass
Model	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Tested by	CR
Comments	-



Red=Vertical, Blue=Horizontal

Finals

AVG (3)

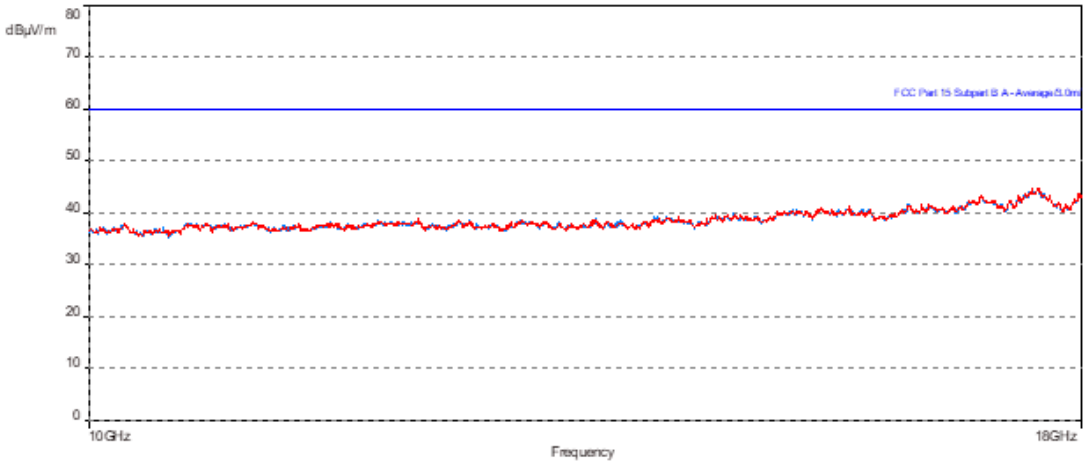
Frequency (MHz)	S R	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (m) (dB)	Azimuth (°) (dB)	Polarizatio n (dB)	Correction (dB)
5600.209615	2	37.29	59.96	-22.67	2.21	23.75	Horizontal	0.74
6000.223718	2	43.77	59.96	-16.19	3.55	55.25	Horizontal	2.81
6000.224038	1	39.82	59.96	-20.14	2.21	11.00	Vertical	2.81

Product Service

Spurious Radiation
Spurious Radiation Emission – 10GHz to 18GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C4 10-18 GHz 3m Number :125 Execution date: **11/23/2021 9:38:44 AM**	
Limit	FCC Part 15 Subpart B
Class	Class: A
Test Plan Number	7169010408
Configuration Information	Test Case No.7
Results	Pass
Model	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Tested by	CR
Comments	-



Red=Vertical, Blue=Horizontal

Finals

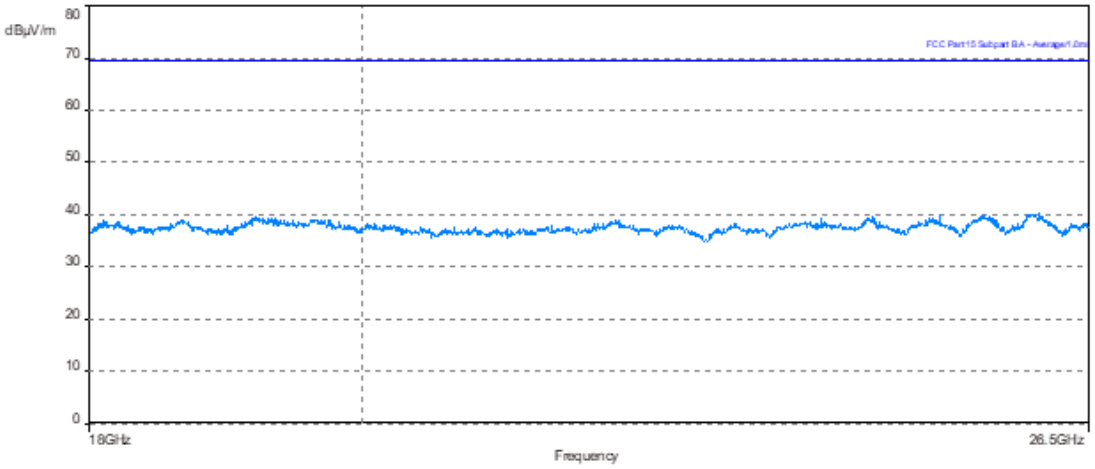
AVG (2)

Frequency (MHz)	S R	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (m) (dB)	Azimuth (°) (dB)	Polarizatio n (dB)	Correction (dB)
17473.75803	2	40.53	59.96	-19.43	4.00	24.75	Horizontal	16.79
17542.97627	1	41.12	59.96	-18.84	4.00	16.50	Vertical	16.72

Spurious Radiation
Spurious Radiation Emission – 18GHz to 26.5GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C6 18-26 GHz 1m Number :127 Execution date: **11/23/2021 12:06:39 PM**	
Limit	Class: A
Class	7169010408
Test Plan Number	Test Case No.7
Configuration Information	Pass
Results	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Model	CR
Tested by	Class: A
Comments	-



Red=Vertical, Blue=Horizontal

Finals

Meas. Avg (1)

Frequency (MHz)	SR	Meas.Avg (dBµV/m)	Limit (dBµV/m)	Meas. - Lim. (dB)	Polarization / Comments	Correction (dB)
25009.66668	1	36.17	69.54	-33.37	Horizontal /	-13.34

Meas. peak (1)

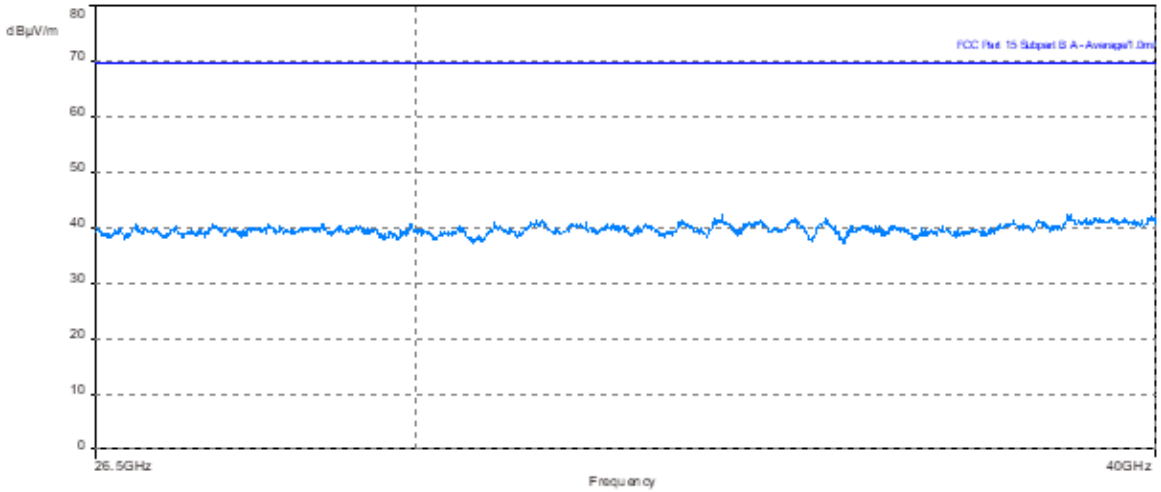
Frequency (MHz)	SR	Meas.Peak (dBµV/m)	Limit (dBµV/m)	Meas. - Lim. (dB)	Polarization / Comments	Correction (dB)
25009.66668	1	49.46	89.50	-40.04	Horizontal /	-13.34

Product Service

Spurious Radiation
Spurious Radiation Emission – 26.5GHz to 40GHz

"TÜV SÜD, by release of this raw data, does not imply that the tested product has demonstrated compliance to any standard. The raw data provided may not be complete and may require additional processing. If raw data provided includes engineering data, testing may not have been done according to a standard test method. "

Emi CC test:C7 26-40 GHz 1m Number :128 Execution date: **11/23/2021 12:09:08 PM**	
Limit	FCC Part 15 Subpart B
Class	7169010408
Test Plan Number	Test Case No.7
Configuration Information	Pass
Results	Nokia 7705 SAR-Hmc NA(3HE12472AA)
Model	CR
Tested by	Class: A
Comments	-



Red=Vertical, Blue=Horizontal

Finals

Meas. Avg (1)

Frequency (MHz)	SR	Meas.Avg (dBµV/m)	Limit (dBµV/m)	Meas. - Lim. (dB)	Polarization / Comments	Correction (dB)
33794.51218	1	39.19	69.54	-30.35	Horizontal /	-12.93

Meas. peak (1)

Frequency (MHz)	SR	Meas.Peak (dBµV/m)	Limit (dBµV/m)	Meas. - Lim. (dB)	Polarization / Comments	Correction (dB)
33794.51218	1	52.58	89.50	-36.92	Horizontal /	-12.93

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Bilog Antenna	TESEQ	CBL 6111D	SSG013965	2021-05-04	2022-05-04
Horn Antenna 3MCH 00003	ETS	3117	LAVE04211	2021-03-30	2022-03-30
EMI Receiver	Rohde & Schwarz	ESU26	SSG013729	2021-03-31	2022-03-31
Spectrum analyzer	Rohde & Schwarz	ESU-40	LAVE04092	2020-07-17	2022-07-17
Coaxial Cable	Huber & Suhner	106A	SSG012455	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	106A	SSG012711	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	104PEA	SSG012041	2021-01-05	2022-01-05
Coaxial Cable	Huber & Suhner	ST18/Nm/Nm/36	SSG012785	2021-01-06	2022-01-06
Coaxial Cable	Micro-Coax	UFA 210B-1-1500-504504	SSG012376	2021-01-06	2022-01-06
Pre-Amplifier	Hp	8447D	SSG013045	2021-01-29	2022-01-29
Pre-Amplifier	BNR	LNA	SSG012594	2021-04-12	2022-04-12
Pre-Amplifier	BNR	LNA	SSG012360	2020-11-16	2021-11-16
Power Supply	Hewlett Packard	6216A	SSG013063	not required	not required
N/A: No applicable O/P Mon – Output monitored with Calibrated Equipment					

Instrument	Manufacturer	Type No.	Serial No	Calibration Period (months)	Calibration Due
Frequency Stability					
THG	Fluke	77 IV	34770264	12	18-Apr-2019
DVM	VWR	61161-378	170120564	24	17-Feb-2019
Power Supply	Xantrex	XKW 60-50	E00109863	O/P Mon	-
Spectrum Analyser	Keysight	N9030A	MY55410202	12	26-Sep-2019
Attenuator	Pasternack	PE7004-10	N/S	O/P Mon	-
Switching Control Unit	Hewlett Packard	11713A	3748A060876	O/P Mon	-
RF Switch Unit	Nokia	RARFSW 4x1	001	O/P Mon	-
Power Supply	Leader	730-3D	9801135	O/P Mon	-
Receiver	Rohde & Schwarz	ESU40	1001162	24	20-Apr-2019
Climatic Chamber	Burnsco	RTC-37P-3-3	07-07	O/P Mon	-

N/A – Not Applicable
O/P Mon – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Conducted Maximum Peak Output Power	30 MHz to 20 GHz Amplitude	± 0.1 dB
Conducted Emissions	30 MHz to 20 GHz Amplitude	± 2.3 dB
Frequency Stability	30 MHz to 2 GHz	± 5.0 Hz
Occupied Bandwidth	Up to 20 MHz Bandwidth	± 1.1 Hz
Band Edge	30 MHz to 20 GHz Amplitude	± 2.3 dB

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

Testing Laboratory
Certificate #2955.19

This report relates only to the actual item/items tested.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.

Product Service

ANNEX A

MODULE LIST

Configuration RF 1A/1B			
Product	Product No	R-State	Serial No
CT10	LPC102487/1	R1C	T01F311639
SUP 6601	1/BFL 901 009/1	R3B	BR81278870
IRU 2242	KRC 161 444/2	R2A	C829960698
NOKIA 7705 SAR-HMC	3HE12473AAA	R1C	TD3T428788
Software Version:	CXP 901 3268/14	Revision:	R70AK

Configuration RF 2A/2B:			
Product	Product No	R-State	Serial No
CT10	LPC102487/1	R1C	T01F311639
SUP 6601	1/BFL 901 009/1	R3B	BR81278870
IRU 2242	KRC 161 444/2	R2A	C829960688
NOKIA 7705 SAR-HMC	3HE12473AAA	R1C	TD3T428788
Software Version:	CXP 901 3268/14	Revision:	R70AK