TEST REPORT

No.I18Z62307-WMD03

for

Remote Radio Unit AIR 6488 B41

FCC ID: TA8BKRD901108

In accordance with FCC CFR 47 Part 27

8aIssued Date: 2019-02-11

TESTING
NVLAP LAB CODE 600118-0

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Test Laboratory:

ISED(IC) accredited test site number: 12389A-1 / 12389B-1

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I18Z62307-WMD03	Rev.0	1st edition	2019-02-11

CONTENTS

1. Test Laboratory

1.1. Testing Location

Location 1:CTTL(Kangding Road) **12389B-1**

Address: No. 18, Kangding Road, Yizhuang, Beijing, P. R. China 100176

Location 2:CTTL(Shouxiang) conducted testing

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China100191

1.2. Project data

Testing Start Date: 2018-12-19

Testing End Date: 2019-01-31

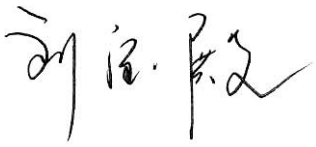
1.3. Signature

Dong Yuan

(Prepared this test report)

Zhou Yu

(Reviewed this test report)



Liu Baodian

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Ericsson (China) Communications Company Ltd.
Address /Post:	Ericsson Tower, No.5 Lize East Street, Chaoyang District, Beijing 100102, P.R.China
Contact:	Xiaoying Jiang
Email:	Xiaoying.jiang@ericsson.com
Telephone:	+86 10 8476 7125

2.2. Manufacturer Information

Company Name:	Ericsson AB
Address /Post:	Isafjordsgatan 10, 164 80 Stockholm Sweden
Contact:	/
Email:	/
Telephone:	/

3. Equipment Under Test (EUT)

3.1. About EUT

Description	Remote Radio Unit
Product Name	AIR 6488 B41
Product Number	KRD 901 108/2, KRD 901 108/21, KRD 901 108/1, KRD 901 108/11 (note)
FCC ID	TA8BKRD901108
Antenna	YES
Antenna Gain	23dBi
Output power	Maximum 33.98dBm (2.5W) per port for 40MHz channel bandwidth Maximum 30.97dBm (1.25W) per port for 20MHz channel bandwidth
Power source	-48V DC
Serial Number	D828356049
Hardware Version	R1C
Software Version	UP: CXP2010046/5_R13A70 ; Radio SW: CXP2030020/4_R14A44 for 40MHz channel bandwidth UP: CXP2010046/5_R12A258 ; Radio SW: CXP2030020/4_R13A67 for 20MHz channel bandwidth
Frequency range	TX/RX: 2496MHz-2690MHz
Number of Antenna ports	64TX /64 RX ports
Maximum RF bandwidth (IBW)	100MHz
Maximum Number of supported carriers per port	1 carrier
Supported modulations	QPSK for 20MHz and 40MHz channel bandwidth, 64QAM and 256QAM for 40MHz channel bandwidth
Supported Channel bandwidth	20MHz and 40MHz
Date of receipt	2018-12-19

Note: The differences between the 4 variants are as below, and others are same.

KRD 901 108/2 with un-security software and RDNB board for testing purpose

KRD 901 108/21 with security software and RDNB board for testing purpose

KRD 901 108/1 with un-security software and antenna

KRD 901 108/11 with security software and antenna

3.2. General Description

The Equipment Under Test (EUT) AIR 6488 B41 is an Ericsson Radio Unit working in the public mobile service 2496-2690 MHz band which provides communication connections to 2496-2690 MHz network. The AIR 6488 B41 operates from a -48V DC supply.

The EUT includes 64 TX/RX ports and it can be configured to transmit in MIMO mode for NR carriers, and MIMO mode for NR was used for measurements as the worst configuration. The complete testing was performed with the EUT transmitting at maximum RF power unless otherwise stated.

A full technical description can be found in the Manufacturer's documentation.

3.3. Configuration Description

The following settings were used to represent all traffic scenarios. The output power was measured on the bottom, middle and top channel of all 64 antenna ports. By measuring the output power from QPSK, 64QAM and 256QAM on one of the antenna ports, it was determined that QPSK was the worst case modulation scheme and was used for all testing. Complete testing was carried out on the worst case antenna port which was established as being the highest output power from the 64 measured ports on worst case modulation scheme. This antenna port was 25 for 40MHz channel bandwidth, 55 for 20MHz channel bandwidth.

The settings below were used for all measurements unless otherwise noted:

NR

Configuration	Carrier	Carrier Bandwidth (MHz)	Carrier Frequency Configuration (MHz)		
			Bottom	Middle	Top
NR-MIMO-1C-20	1 Carrier	20MHz	2506.02	2593.02	2680.02
NR-MIMO-1C-BE-20	1 Carrier	20MHz	2506.02	N/A	2680.02
NR-MIMO-1C-40	1 Carrier	40MHz	2516.01	2593.02	2670.00
NR-MIMO-1C-BE-40	1 Carrier	40MHz	2516.01	N/A	2670.00

N/A – Not Applicable

4. Reference Documents

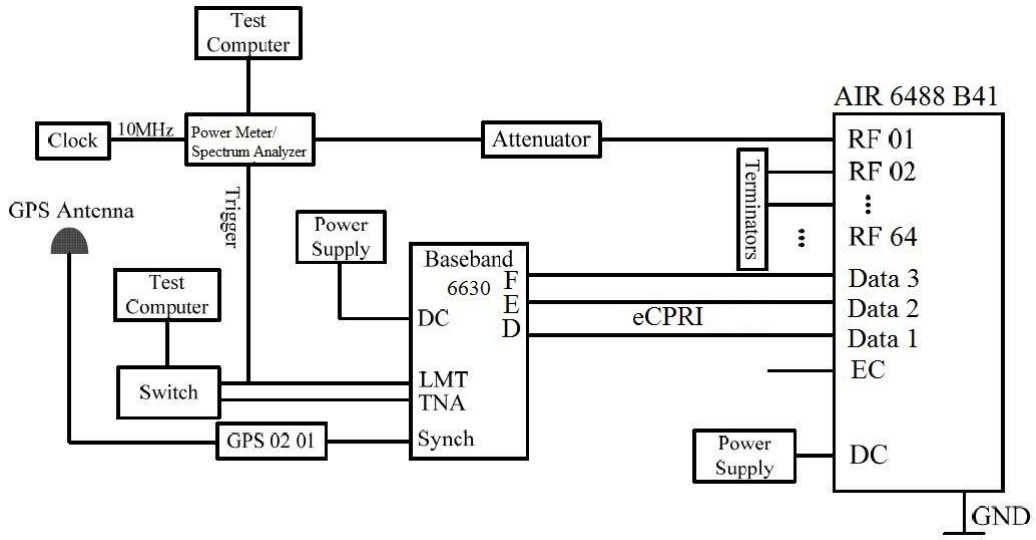
4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 27	MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES	10-1-18 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-17 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz	2014
ANSI 63.26	IEEE/ANSI Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
TIA 102.CAAA-E	Project 25 Digital C4FM/CQPSK Transceiver Measurement Methods	2016
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01
KDB 662911 D01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band	v02r01

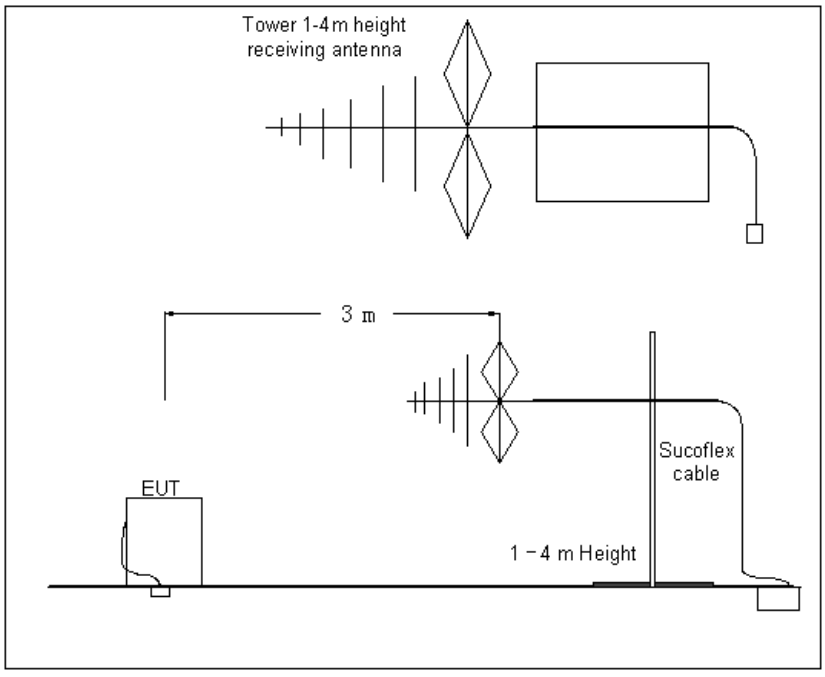
5. TEST SETUP

Test Setup, Conducted Measurement:



No.	Auxiliary Equipment	Model Type	Version
1	Test Computer	HP EliteBook 8540w	-
2	Baseband 6630	KDU 137 848/1	R2C
3	Power supply unit	PCR2000M	-
4	Terminator	SHX 6G	-
5	Attenuator	Aeroflex / Weinschel	-

Test Setup, Radiated Measurement:



6. LABORATORY ENVIRONMENT

Control room / conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω

Semi-anechoic chamber(10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C**,** Max. = 30 ˚C
Relative humidity	Min. = 35 %**,** Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	**<±**3.5 dB, 3 m distance
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

7. SUMMARY OF TEST RESULTS

Items	Test Name	Clause in FCC rules	Verdict
1	Maximum Output Power and Peak to Average Power Ratio - EIRP calculation	27.50(h), 2.1046	Pass
2	Occupied Bandwidth	27.53(m), 2.1049	Pass
3	Spurious Emissions at Band Edge	27.53(m), 2.1051	Pass
4	Conducted Spurious Emission	27.53(m), 2.1051	Pass
5	Radiated Spurious Emission	27.53(m), 2.1053	Pass
6	Frequency Stability	27.54, 2.1055	Pass

8. Test Equipment Utilized

NO.	Description	TYPE	series number	MANUFACTURE	CAL DUE DATE
1	AC Power Supply	PCR2000M	PJ000583	Kikusui	2019-02-24
2	40dB Attenuator	66-40-33	CD4019	Aeroflex / Weinschel	-
3	40dB Attenuator	TSG150R-4-40N11	1511040001	Nanjing Jiexi Technologies	-
4	Spectrum Analyzer	N9030	MY53310464	Keysight	2020-01-21
5	Power Sensor	NRP-Z91	101500	Rohde & Schwarz	2019-11-25
6	Power Sensor	NRP-Z21	102432	Rohde & Schwarz	2019-07-31
7	Power Meter	NRVD	102040	Rohde & Schwarz	2019-05-03
8	EMI Antenna	3115	00167250	ETS-LINDGREN	2020-05-21
9	EMI Antenna	3116	2661	ETS-LINDGREN	2020-07-27
10	EMI Antenna	VULB 9163	9163-514	SCHWARZBECK	2021-01-03
11	Test Receiver	ESU26	100376	Rohde & Schwarz	2019-11-27
12	Climate Chamber	KTHG-415TBS	7353K	QINGSHENG	2020-01-14

9. MEASUREMENT UNCERTAINTY

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

Test Discipline	Measurement Uncertainty
Conducted Maximum Peak Output Power	0.5dB
Occupied Bandwidth	1.1Hz
Conducted Spurious Emissions	2.3dB
Band Edge	2.3dB
Radiated Spurious Emissions	5.4dB
Frequency Stability	$<\pm 1 \times 10^{-7}$

ANNEX A: MEASUREMENT RESULTS

A.1 Maximum Output Power and Peak to Average Power Ratio - EIRP calculation

A.1.1 Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 27, Clause 27.50(h)

A.1.2 Method of Measurements

During the process of testing, the EUT was configured to transmit on maximum power and proper modulation. The transmitter power shall be measured in terms of a root-mean-square (RMS) average value. In case of the EUT was configured to MIMO mode, since the EUT transmits on all antennas simultaneously in the same frequency range, using the Measure-and-Sum approach, the output power at all antennas were tested, and the total output power were then summed mathematically in linear power units according to FCC KDB 662911 D01.

A peak to average ratio measurement is performed at the conducted ports of the EUT for single carrier for single RAT mode. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) was used and 0.1% probability value recorded.

Two polarizations are generated for the beam, 32 ports are used to create each polarization. The antenna gain for each polarization is declared as 23 dBi, therefore the EIRP for each polarization is calculated as the sum of the power over 32 ports plus the antenna gain. This calculation is applied for each polarization and then each polarization EIRP is summed to calculate the overall EIRP.

A.1.3 Limit

Output Power:

EIRP ≤ 33 dBW + 10log(X/Y) dBW + 10 log(360/Beamwidth) dBW = 86 dBm
X = 40MHz channel bandwidth
Y = 5.5 or 6 MHz
Beamwidth = 12°

Peak to Average Ratio: ≤13 dB

A.1.4 Measurement result

Configuration NR-MIMO-1C-20

Maximum Output Power 30.97dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
1	QPSK/20.0	30.30	17.27	8.84	30.33	17.33	8.83	30.35	17.30	8.86
2	QPSK/20.0	30.06	17.05	8.95	30.24	17.24	8.96	30.26	17.25	8.90
3	QPSK/20.0	30.09	17.05	8.85	30.02	17.01	8.83	30.36	17.35	8.88
4	QPSK/20.0	30.21	17.20	8.90	30.44	17.44	8.81	30.55	17.50	8.85
5	QPSK/20.0	30.43	17.42	8.86	30.53	17.56	8.83	30.65	17.60	8.90
6	QPSK/20.0	30.34	17.31	8.83	30.59	17.59	8.83	30.54	17.53	8.88
7	QPSK/20.0	30.33	17.35	8.88	30.47	17.46	8.86	30.45	17.43	8.87
8	QPSK/20.0	30.36	17.35	8.86	30.53	17.51	8.84	30.54	17.52	8.90
9	QPSK/20.0	30.29	17.28	8.85	30.41	17.36	8.86	30.40	17.35	8.89
10	QPSK/20.0	30.19	17.18	8.85	30.27	17.26	8.85	30.42	17.38	8.88
11	QPSK/20.0	30.14	17.14	8.84	30.33	17.32	8.84	30.23	17.23	8.88
12	QPSK/20.0	30.17	17.16	8.84	30.31	17.30	8.86	30.25	17.19	8.89
13	QPSK/20.0	30.56	17.54	8.85	30.74	17.73	8.82	30.60	17.55	8.88
14	QPSK/20.0	30.65	17.66	8.84	30.76	17.74	8.84	30.75	17.71	8.86
15	QPSK/20.0	30.68	17.62	8.84	30.77	17.76	8.84	30.75	17.74	8.88
16	QPSK/20.0	30.45	17.45	8.84	30.67	17.67	8.83	30.80	17.77	8.86
17	QPSK/20.0	30.55	17.53	8.85	30.63	17.62	8.85	30.61	17.60	8.90
18	QPSK/20.0	30.45	17.41	8.86	30.60	17.59	8.84	30.54	17.53	8.89
19	QPSK/20.0	30.63	17.60	8.86	30.75	17.74	8.85	30.66	17.66	8.89
20	QPSK/20.0	30.62	17.63	8.45	30.76	17.75	8.82	30.74	17.70	8.88
21	QPSK/20.0	30.22	17.17	8.84	30.17	17.19	8.83	30.28	17.25	8.89
22	QPSK/20.0	30.83	17.81	8.85	30.86	17.78	8.83	30.98	17.90	8.88
23	QPSK/20.0	30.56	17.55	8.86	30.55	17.55	8.84	30.55	17.53	8.90
24	QPSK/20.0	30.55	17.56	8.87	30.57	17.52	8.84	30.63	17.57	8.89
25	QPSK/20.0	30.87	17.77	8.86	31.02	18.01	8.84	30.97	17.95	8.88
26	QPSK/20.0	30.39	17.36	8.93	30.53	17.53	8.84	30.40	17.45	8.86
27	QPSK/20.0	30.56	17.54	8.90	30.71	17.72	8.83	30.51	17.47	8.87
28	QPSK/20.0	30.55	17.56	8.86	30.69	17.68	8.84	30.47	17.46	8.88
29	QPSK/20.0	30.50	17.47	8.87	30.64	17.62	8.83	30.64	17.63	8.88
30	QPSK/20.0	30.68	17.67	8.84	30.75	17.71	8.84	30.74	17.74	8.86
31	QPSK/20.0	30.40	17.37	8.86	30.43	17.40	8.83	30.48	17.47	8.89
32	QPSK/20.0	30.24	17.27	8.88	30.48	17.45	8.83	30.39	17.39	8.89
Total Power 1-32		45.49	32.47	-	45.61	32.59	-	45.60	32.58	-
Total Power 1-32 +23 dBi		68.49	55.47	-	68.61	55.59	-	68.60	55.58	-
33	QPSK/20.0	30.29	17.27	8.84	30.37	17.37	8.84	30.31	17.30	8.88
34	QPSK/20.0	30.25	17.24	8.83	30.36	17.35	8.82	30.28	17.28	8.87

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
35	QPSK/20.0	30.14	17.12	8.87	30.41	17.40	8.87	30.27	17.26	8.89
36	QPSK/20.0	30.32	17.31	8.85	30.43	17.38	8.81	30.41	17.39	8.90
37	QPSK/20.0	30.52	17.46	8.85	30.51	17.51	8.85	30.53	17.51	8.89
38	QPSK/20.0	30.33	17.30	8.81	30.46	17.46	8.80	30.43	17.42	8.90
39	QPSK/20.0	30.36	17.34	8.85	30.55	17.47	8.84	30.51	17.49	8.89
40	QPSK/20.0	30.43	17.43	8.86	30.48	17.43	8.88	30.46	17.45	8.90
41	QPSK/20.0	30.38	17.32	8.86	30.51	17.50	8.83	30.45	17.43	8.90
42	QPSK/20.0	30.27	17.26	8.90	30.47	17.46	8.79	30.36	17.35	8.87
43	QPSK/20.0	30.39	17.37	8.85	30.52	17.51	8.83	30.44	17.43	8.87
44	QPSK/20.0	30.28	17.25	8.91	30.53	17.52	8.91	30.46	17.45	8.88
45	QPSK/20.0	30.63	17.62	8.87	30.67	17.66	8.83	30.66	17.64	8.87
46	QPSK/20.0	30.65	17.62	8.80	30.63	17.64	8.79	30.71	17.71	8.88
47	QPSK/20.0	30.55	17.49	8.86	30.54	17.53	8.84	30.41	17.40	8.90
48	QPSK/20.0	30.63	17.64	8.83	30.61	17.60	8.83	30.55	17.55	8.89
49	QPSK/20.0	30.71	17.71	8.84	30.71	17.68	8.86	30.63	17.62	8.86
50	QPSK/20.0	30.60	17.59	8.89	30.67	17.67	8.82	30.72	17.71	8.89
51	QPSK/20.0	30.25	17.24	8.85	30.48	17.47	8.87	30.34	17.33	8.85
52	QPSK/20.0	30.60	17.59	8.88	30.78	17.77	8.85	30.60	17.58	8.86
53	QPSK/20.0	30.63	17.65	8.85	30.78	17.78	8.83	30.77	17.77	8.85
54	QPSK/20.0	30.65	17.63	8.83	30.77	17.76	8.83	30.82	17.80	8.86
55	QPSK/20.0	30.78	17.77	8.87	31.10	18.09	8.83	30.93	17.93	8.88
56	QPSK/20.0	30.77	17.75	8.88	31.00	17.97	8.88	30.92	17.87	8.87
57	QPSK/20.0	30.36	17.35	8.85	30.49	17.48	8.84	30.45	17.44	8.88
58	QPSK/20.0	30.07	17.09	8.85	30.40	17.39	8.83	30.33	17.32	8.87
59	QPSK/20.0	30.22	17.20	8.86	30.39	17.38	8.84	30.20	17.19	8.88
60	QPSK/20.0	30.27	17.26	8.84	30.25	17.24	8.80	30.26	17.24	8.88
61	QPSK/20.0	30.41	17.43	8.85	30.69	17.57	8.85	30.51	17.51	8.87
62	QPSK/20.0	30.33	17.30	8.91	30.55	17.54	8.80	30.49	17.48	8.88
63	QPSK/20.0	30.73	17.73	8.85	30.86	17.84	8.83	30.83	17.84	8.87
64	QPSK/20.0	30.21	17.18	8.86	30.35	17.35	8.78	30.27	17.27	8.88
Total Power 33-64		45.49	32.48	-	45.63	32.61	-	45.57	32.55	-
Total Power 33-64 +23 dBi		68.49	55.48	-	68.63	55.61	-	68.57	55.55	-
EIRP		71.50	58.49	-	71.63	58.61	-	71.60	58.58	-

Configuration NR-MIMO-1C-40

Maximum Output Power 33.98dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
1	QPSK/40.0	33.54	17.53	8.26	33.56	17.55	8.30	33.57	17.55	8.29
2	QPSK/40.0	33.52	17.50	8.27	33.52	17.53	8.31	33.56	17.55	8.30
3	QPSK/40.0	33.55	17.53	8.26	33.48	17.47	8.31	33.52	17.50	8.28
4	QPSK/40.0	33.42	17.4	8.28	33.48	17.45	8.32	33.52	17.51	8.29
5	QPSK/40.0	33.66	17.64	8.27	33.58	17.54	8.29	33.69	17.67	8.29
6	QPSK/40.0	33.67	17.66	8.29	33.65	17.61	8.30	33.73	17.71	8.30
7	QPSK/40.0	33.63	17.61	8.26	33.63	17.60	8.31	33.62	17.60	8.30
8	QPSK/40.0	33.64	17.63	8.28	33.59	17.56	8.30	33.71	17.69	8.29
9	QPSK/40.0	33.56	17.54	8.32	33.52	17.50	8.30	33.56	17.57	8.30
10	QPSK/40.0	33.59	17.57	8.31	33.57	17.54	8.31	33.68	17.66	8.29
11	QPSK/40.0	33.40	17.38	8.29	33.40	17.38	8.31	33.43	17.42	8.29
12	QPSK/40.0	33.51	17.50	8.29	33.46	17.45	8.31	33.52	17.50	8.29
13	QPSK/40.0	33.85	17.82	8.28	33.81	17.78	8.30	33.91	17.90	8.29
14	QPSK/40.0	33.86	17.85	8.26	33.90	17.88	8.30	34.01	18.01	8.29
15	QPSK/40.0	33.88	17.85	8.28	33.74	17.72	8.31	33.89	17.86	8.29
16	QPSK/40.0	33.75	17.73	8.28	33.76	17.75	8.31	33.90	17.87	8.30
17	QPSK/40.0	33.89	17.86	8.27	33.70	17.68	8.31	33.75	17.73	8.29
18	QPSK/40.0	33.62	17.60	8.27	33.63	17.57	8.31	33.70	17.69	8.29
19	QPSK/40.0	33.87	17.83	8.27	33.85	17.82	8.31	33.89	17.87	8.29
20	QPSK/40.0	33.90	17.89	8.27	33.75	17.73	8.31	33.90	17.88	8.30
21	QPSK/40.0	33.46	17.44	8.27	33.40	17.26	8.31	33.51	17.52	8.31
22	QPSK/40.0	34.12	18.10	8.28	34.02	18.00	8.31	34.16	18.13	8.31
23	QPSK/40.0	33.83	17.83	8.28	33.72	17.71	8.30	33.87	17.84	8.29
24	QPSK/40.0	33.82	17.79	8.27	33.74	17.73	8.31	33.90	17.88	8.28
25	QPSK/40.0	34.20	18.17	8.27	34.10	18.08	8.31	34.21	18.18	8.28
26	QPSK/40.0	33.67	17.65	8.27	33.66	17.64	8.30	33.75	17.73	8.29
27	QPSK/40.0	33.86	17.84	8.27	33.93	17.91	8.31	33.89	17.88	8.28
28	QPSK/40.0	33.77	17.75	8.27	33.76	17.75	8.31	33.90	17.88	8.28
29	QPSK/40.0	33.84	17.83	8.27	33.75	17.73	8.31	33.95	17.93	8.29
30	QPSK/40.0	33.97	17.95	8.27	33.91	17.88	8.31	34.03	18.01	8.29
31	QPSK/40.0	33.74	17.71	8.27	33.67	17.65	8.31	33.78	17.76	8.29
32	QPSK/40.0	33.67	17.67	8.27	33.77	17.71	8.31	33.81	17.79	8.29
Total Power 1-32		48.78	32.76	-	48.74	32.72	-	48.83	32.81	-
Total Power 1-32 +23 dBi		71.78	55.76	-	71.74	55.72	-	71.83	55.81	-
33	QPSK/40.0	33.55	17.52	8.27	33.54	17.53	8.31	33.58	17.57	8.29
34	QPSK/40.0	33.58	17.56	8.27	33.51	17.49	8.31	33.68	17.66	8.30

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
35	QPSK/40.0	33.59	17.57	8.27	33.43	17.40	8.31	33.58	17.56	8.29
36	QPSK/40.0	33.65	17.64	8.27	33.62	17.60	8.32	33.66	17.64	8.29
37	QPSK/40.0	33.76	17.74	8.27	33.70	17.68	8.33	33.75	17.73	8.29
38	QPSK/40.0	33.72	17.70	8.27	33.67	17.65	8.32	33.69	17.67	8.30
39	QPSK/40.0	33.69	17.64	8.27	33.68	17.66	8.31	33.72	17.70	8.30
40	QPSK/40.0	33.66	17.67	8.27	33.68	17.63	8.31	33.75	17.73	8.30
41	QPSK/40.0	33.80	17.78	8.26	33.75	17.73	8.32	33.65	17.63	8.28
42	QPSK/40.0	33.68	17.65	8.28	33.64	17.62	8.31	33.70	17.68	8.30
43	QPSK/40.0	33.75	17.71	8.28	33.64	17.62	8.31	33.76	17.73	8.29
44	QPSK/40.0	33.55	17.53	8.28	33.59	17.57	8.31	33.73	17.71	8.30
45	QPSK/40.0	33.80	17.76	8.27	33.71	17.71	8.31	33.82	17.80	8.29
46	QPSK/40.0	33.79	17.78	8.27	33.70	17.67	8.31	33.91	17.88	8.29
47	QPSK/40.0	33.76	17.78	8.26	33.70	17.68	8.31	33.81	17.80	8.30
48	QPSK/40.0	33.79	17.77	8.27	33.71	17.69	8.31	33.88	17.88	8.30
49	QPSK/40.0	33.93	17.89	8.27	33.84	17.80	8.31	33.84	17.82	8.29
50	QPSK/40.0	33.78	17.75	8.27	33.60	17.58	8.31	33.75	17.73	8.29
51	QPSK/40.0	33.52	17.50	8.27	33.45	17.42	8.31	33.52	17.50	8.29
52	QPSK/40.0	33.86	17.84	8.27	33.83	17.81	8.31	33.77	17.75	8.29
53	QPSK/40.0	33.86	17.84	8.27	33.78	17.77	8.31	33.90	17.88	8.29
54	QPSK/40.0	33.85	17.82	8.27	33.95	17.93	8.33	34.01	17.99	8.29
55	QPSK/40.0	33.95	17.94	8.26	34.11	18.10	8.32	34.00	17.98	8.29
56	QPSK/40.0	33.89	17.87	8.27	33.96	17.93	8.31	33.89	17.87	8.29
57	QPSK/40.0	33.45	17.43	8.27	33.46	17.44	8.31	33.46	17.43	8.28
58	QPSK/40.0	33.44	17.42	8.26	33.39	17.37	8.31	33.47	17.44	8.29
59	QPSK/40.0	33.36	17.34	8.27	33.43	17.41	8.32	33.33	17.30	8.30
60	QPSK/40.0	33.52	17.49	8.27	33.34	17.32	8.32	33.43	17.41	8.30
61	QPSK/40.0	33.63	17.60	8.26	33.59	17.58	8.33	33.49	17.46	8.28
62	QPSK/40.0	33.50	17.48	8.27	33.49	17.47	8.30	33.50	17.48	8.30
63	QPSK/40.0	33.82	17.80	8.27	33.88	17.85	8.32	33.83	17.81	8.29
64	QPSK/40.0	33.29	17.25	8.27	33.38	17.37	8.31	33.41	17.39	8.31
Total Power 33-64		48.73	32.71	-	48.70	32.68	-	48.75	32.73	-
Total Power 33-64 +23 dBi		71.73	55.71	-	71.70	55.68	-	71.75	55.73	-
EIRP		74.77	58.75	-	74.73	58.71	-	74.80	58.78	-

Maximum Output Power 33.98dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
25	64QAM/40.0	33.98	17.95	8.34	33.88	17.86	8.41	34.00	17.98	8.42

Maximum Output Power 33.98dBm per port

Antenna	Modulation/ Carrier Bandwidth (MHz)	Output Power / Peak to Average Ratio (PAR)								
		Channel position B			Channel position M			Channel position T		
		POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)	POWER (dBm)	POWER (dBm/MHz)	PAR (db)
25	256QAM/40.0	33.88	17.83	8.34	33.79	17.77	8.42	33.98	17.96	8.41

A.2 Occupied Bandwidth

A.2.1 Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 27, Clause 27.53 (m)

A.2.2 Method of Measurements

The EUT was set to transmit at maximum power and testing was carried out on bottom, middle and top channels. Using the Occupied Bandwidth measurement function in the spectrum analyzer, the 26dB bandwidth was measured in accordance with FCC KDB 971168 D01 Clause 4.2.

The measurement method is from KDB 971168 4.2:
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the OBW).
b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
d) Set the detection mode to peak, and the trace mode to max hold.
e) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

A.2.3 Measurement result

Configuration NR-MIMO-1C-20

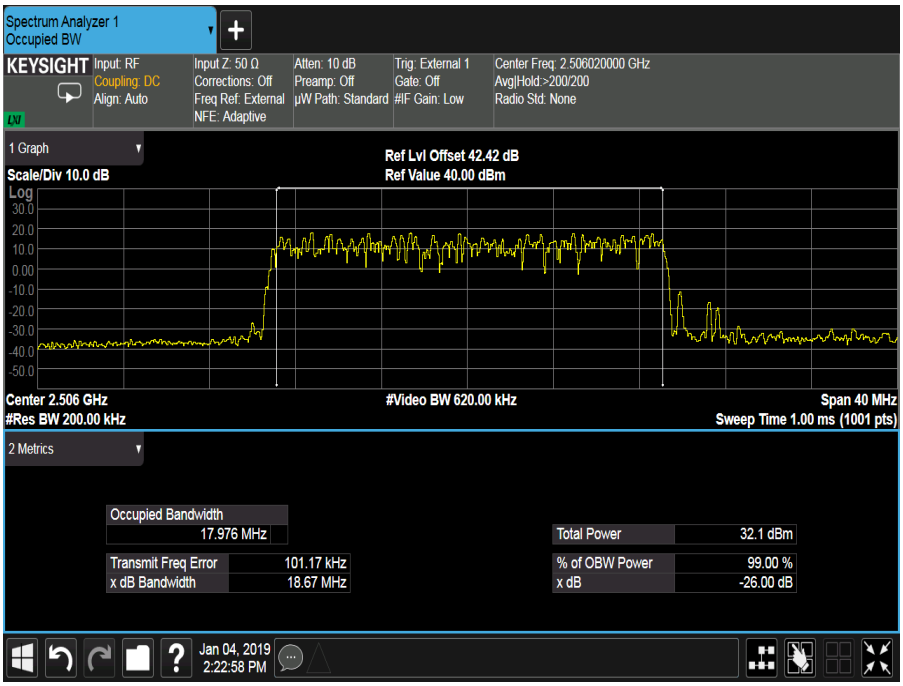
-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
55	QPSK/ 20.0 MHz	18.67	18.67	18.67

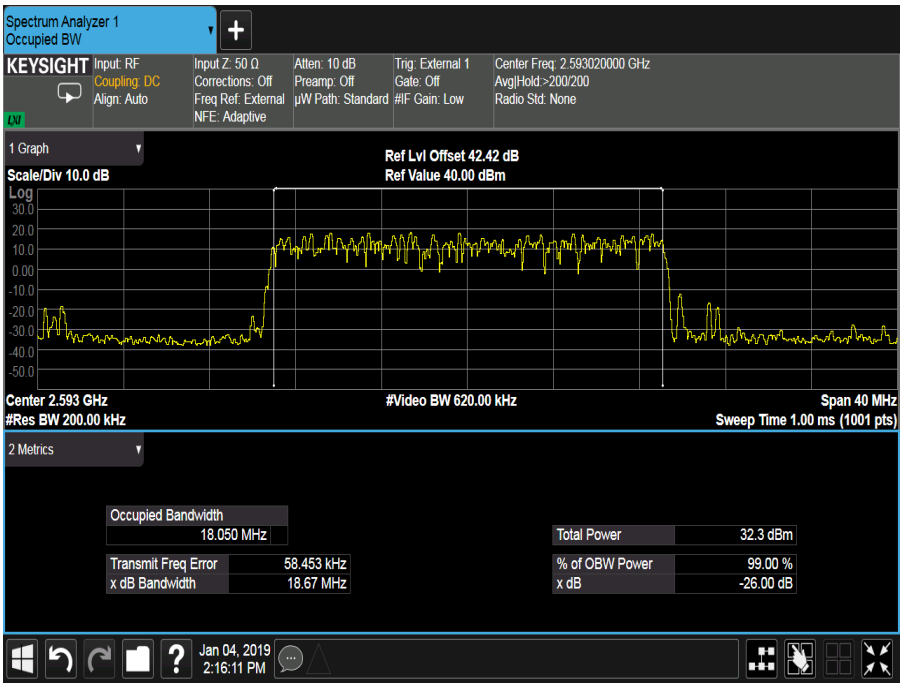
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
55	QPSK/ 20.0 MHz	17.976	18.050	18.059

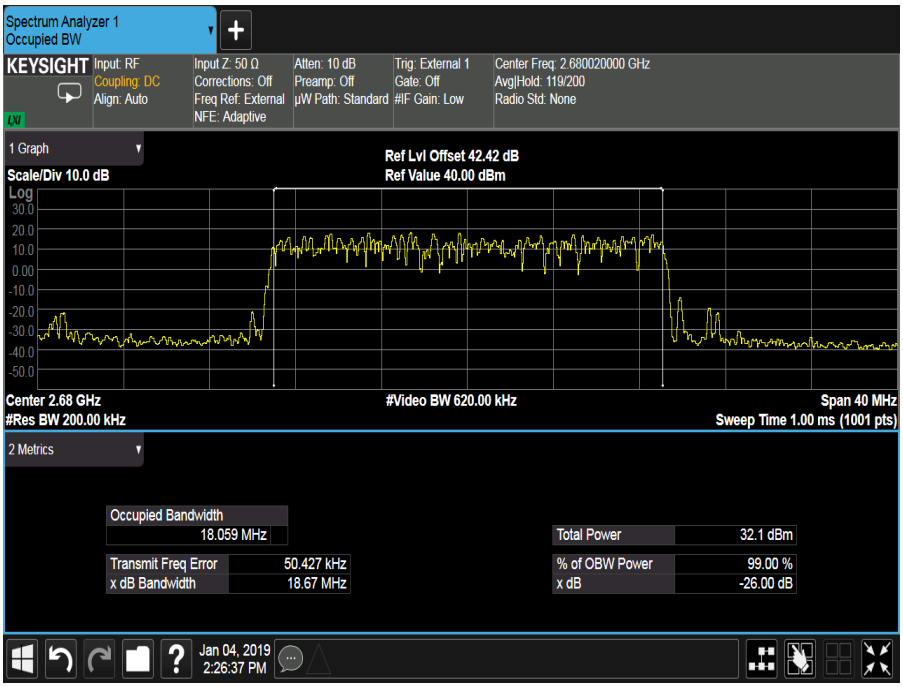
Port 55, QPSK 20.0M Channel position B



Port 55, QPSK 20.0M Channel position M



Port 55, QPSK 20.0M Channel position T



Configuration NR-MIMO-1C-40
-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
25	QPSK/ 40.0 MHz	38.79	39.06	38.96

-26dBc Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)	
		Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
25	40.0 MHz	38.80	39.03

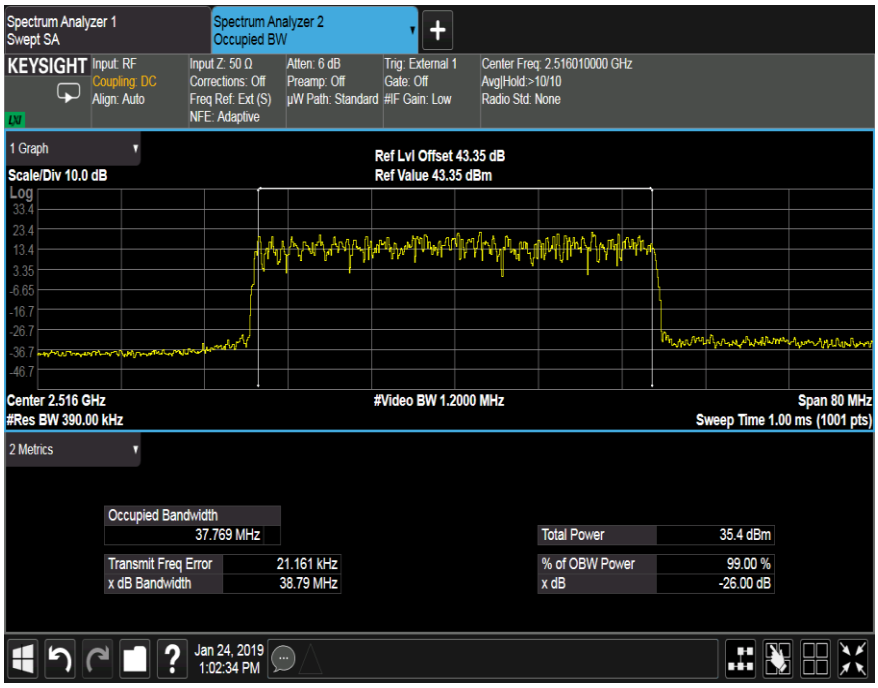
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
25	QPSK/ 40.0 MHz	37.769	37.788	37.756

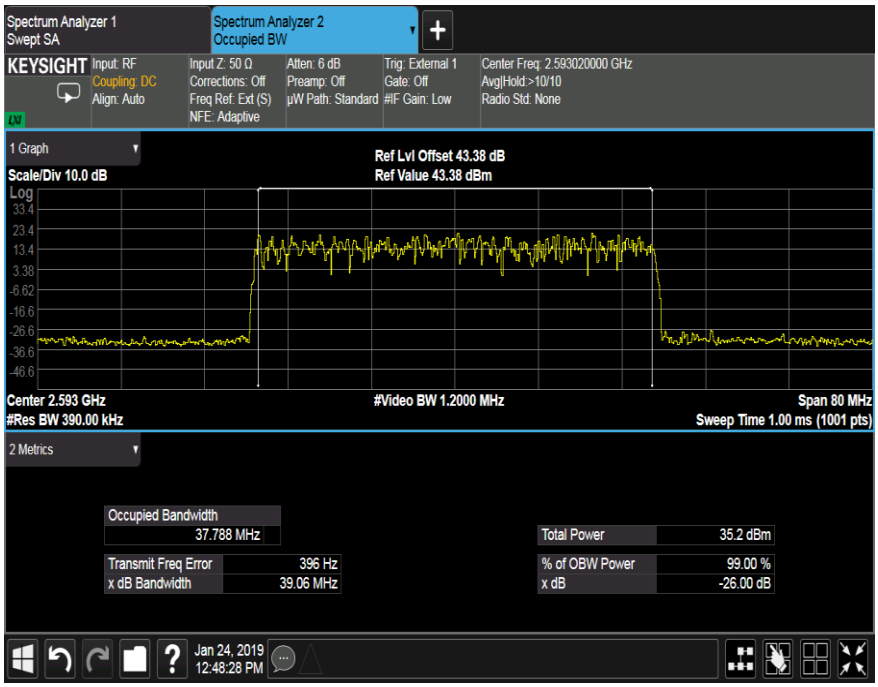
99% Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)	
		Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
25	40.0 MHz	37.447	37.681

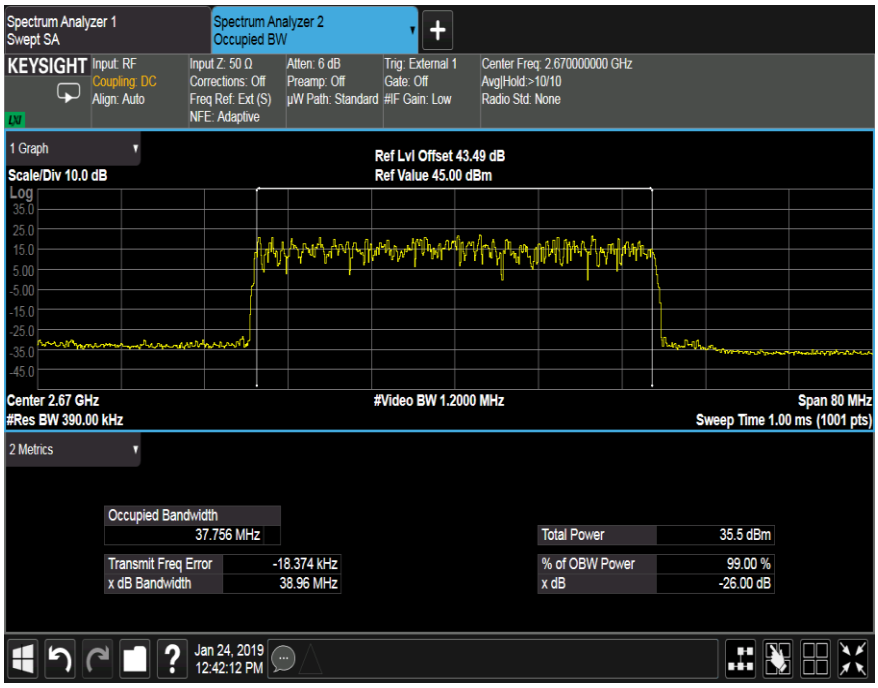
Port 25, QPSK 40.0M Channel position B



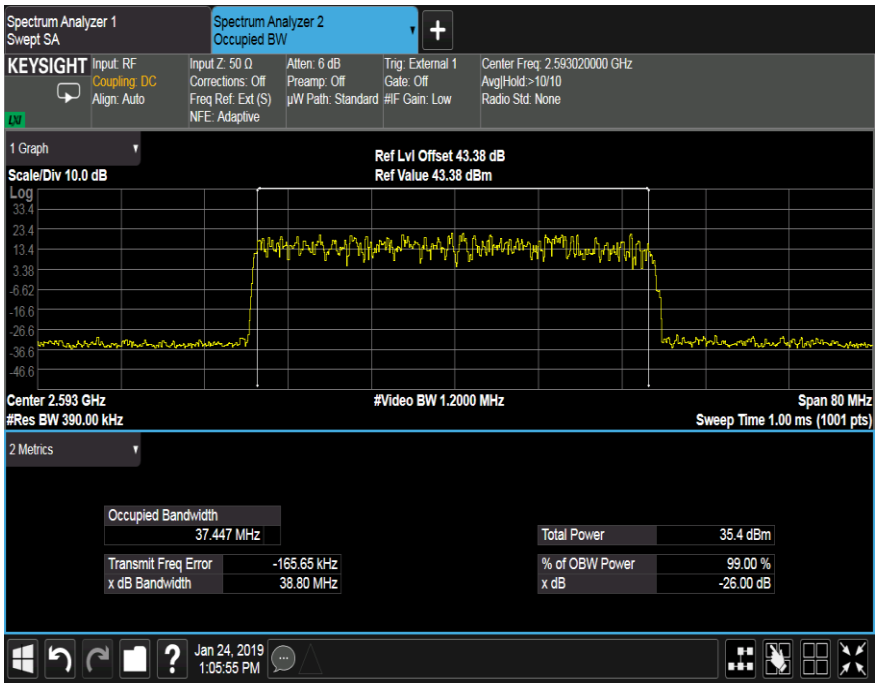
Port 25, QPSK 40.0M Channel position M



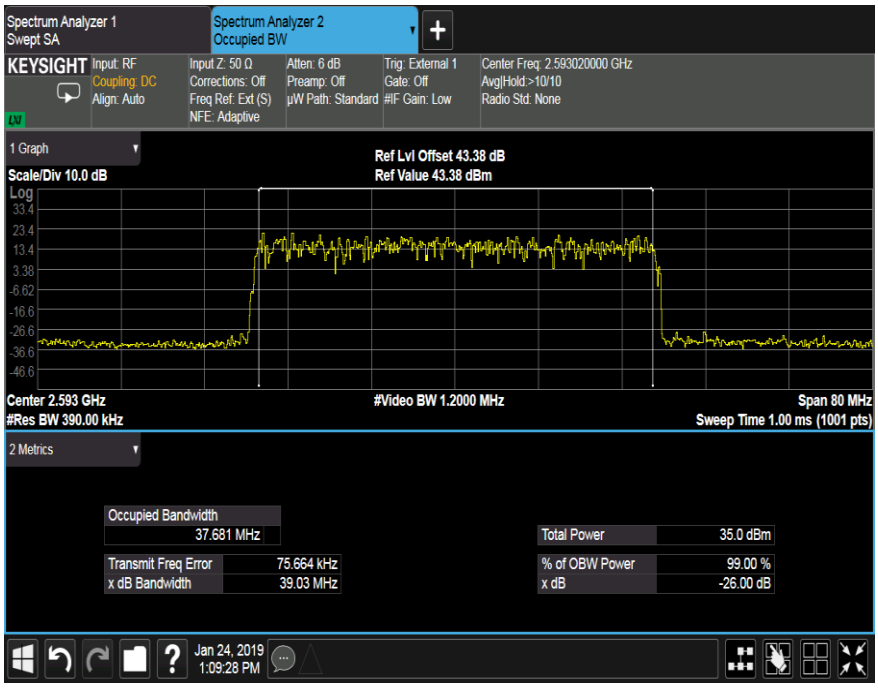
Port 25, QPSK 40.0M Channel position T



Port 25, 64QAM 40.0M Channel Position M



Port 25, 256QAM 40.0M Channel Position M



A.3 Spurious Emissions at Band Edge

A.3.1 Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53(m)

A.3.2 Method of measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

For MIMO mode configurations, the limit was adjusted with a correction of -18.06dB [10Log(1/64)] by using the Measure and Add 10Log(N) dB technique according to KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports . Then the limit was adjusted to -31.06dBm.

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed and a RBW of 1MHz for measurements of emissions > 1MHz away from the band edges.
The limit was adjusted with -13.01dB [10Log(50/1000)] to compensate for the reduced measurement bandwidth 50KHz for emission more than 1MHz away from the band edges. For MIMO mode, the limit of -44.07dBm was used for emission more than 1MHz away from the band edges. Spectrum analyzer detector was set as RMS.

A.3.3 Measurement limit

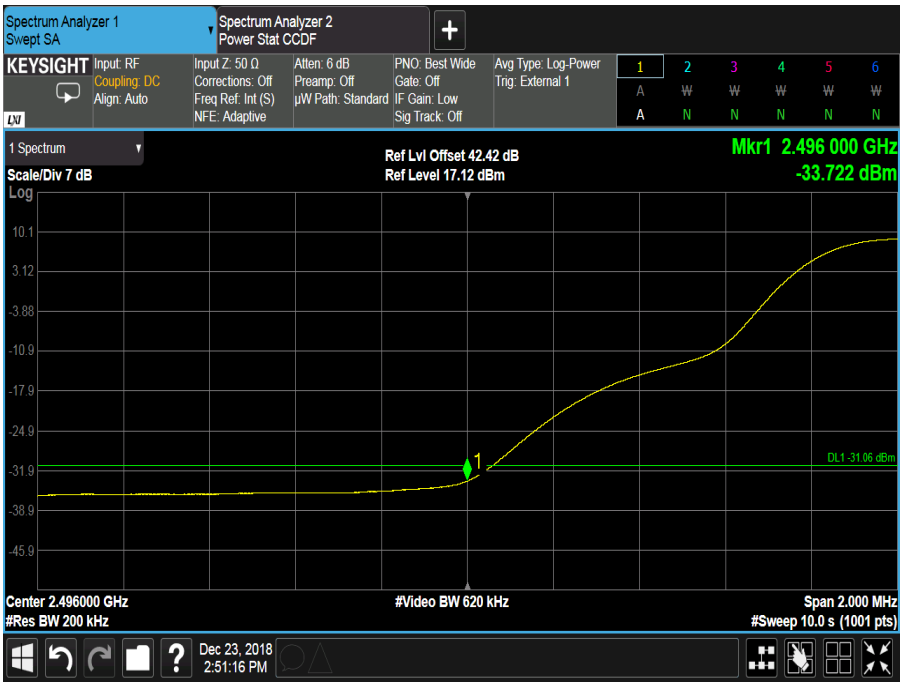
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

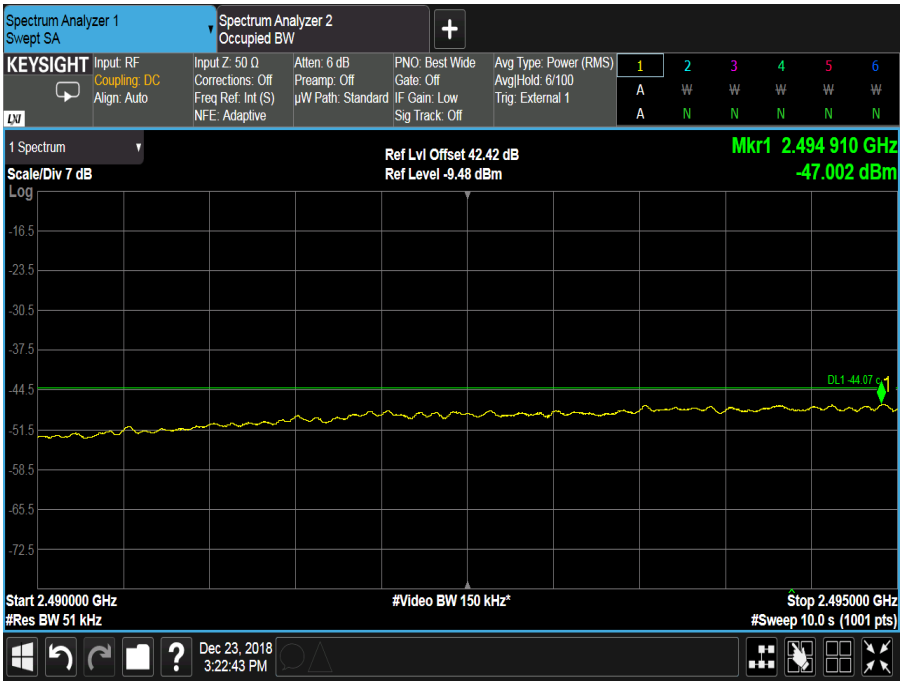
A.3.4 Measurement result

Configuration NR-MIMO-1C-BE-20, QPSK

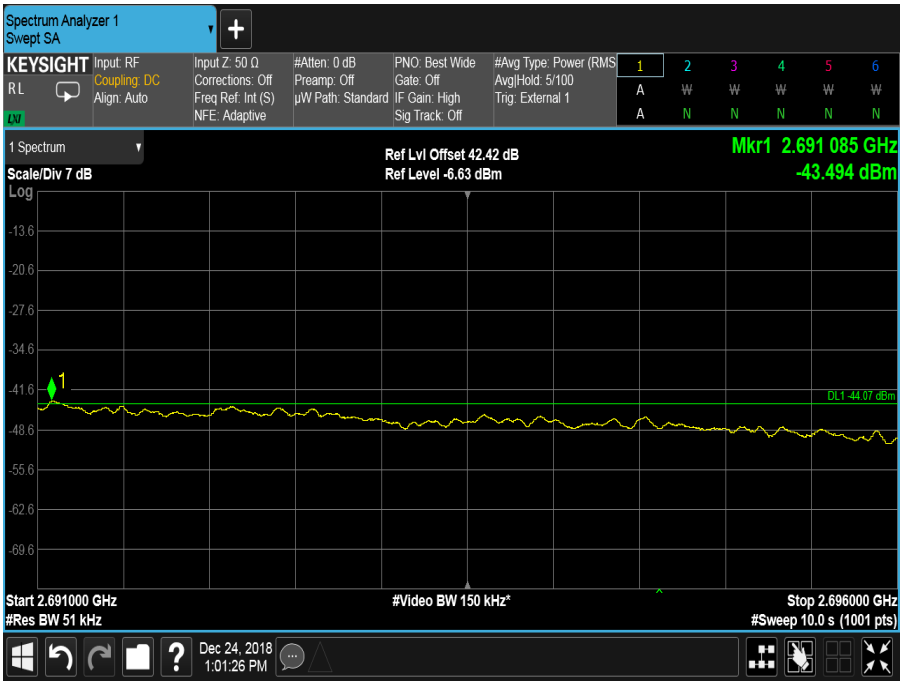
Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 2496.0MHz	20.0 MHz	200	-31.06
		50	-44.07
Channel Position T 2690.0MHz	20.0 MHz	200	-31.06
		50	-44.07

Port 55, Channel Position B, 20.0MHz

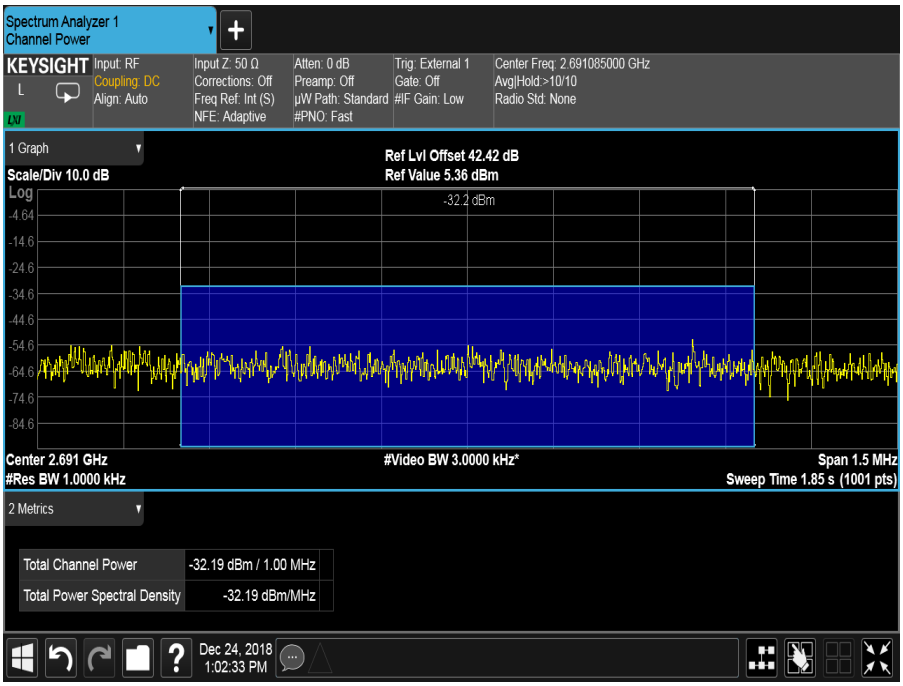




Port 55, Channel Position T, 20.0MHz



The channel power of 1MHz for 2691.085MHz is -32.19dBm, which is within the limit of -31.06dBm.

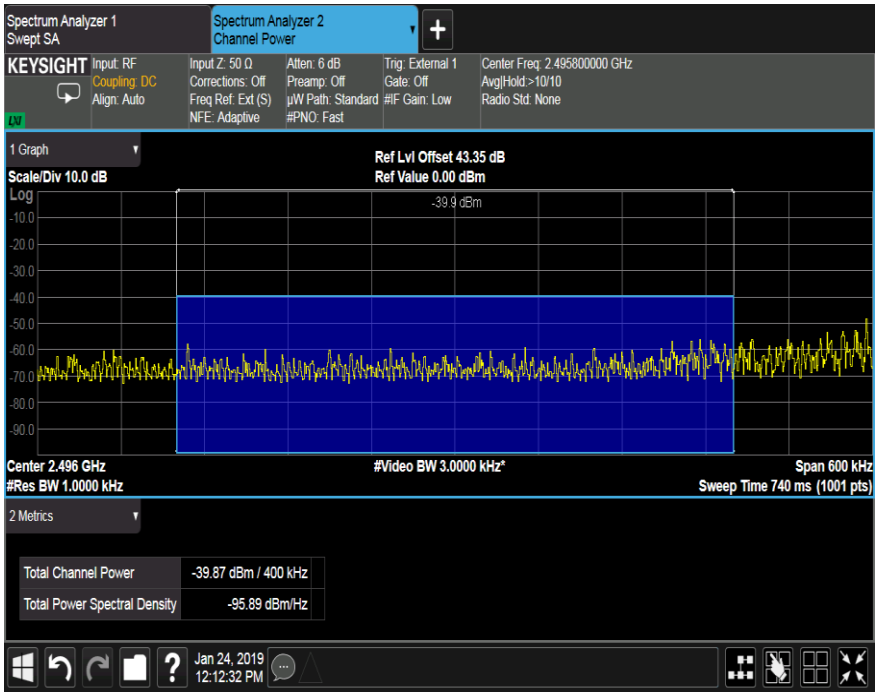


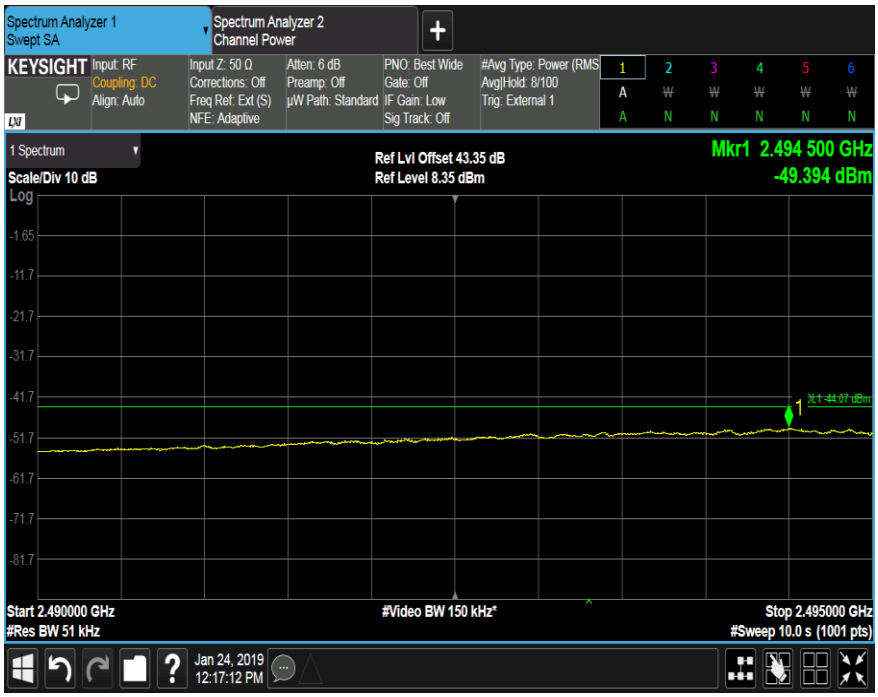
Configuration NR-MIMO-1C-BE-40, QPSK

Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 2496.0MHz	40.0 MHz	400	-31.06
		50	-44.07
Channel Position T 2690.0MHz	40.0 MHz	400	-31.06
		50	-44.07

Port 25, Channel Position B, 40.0MHz

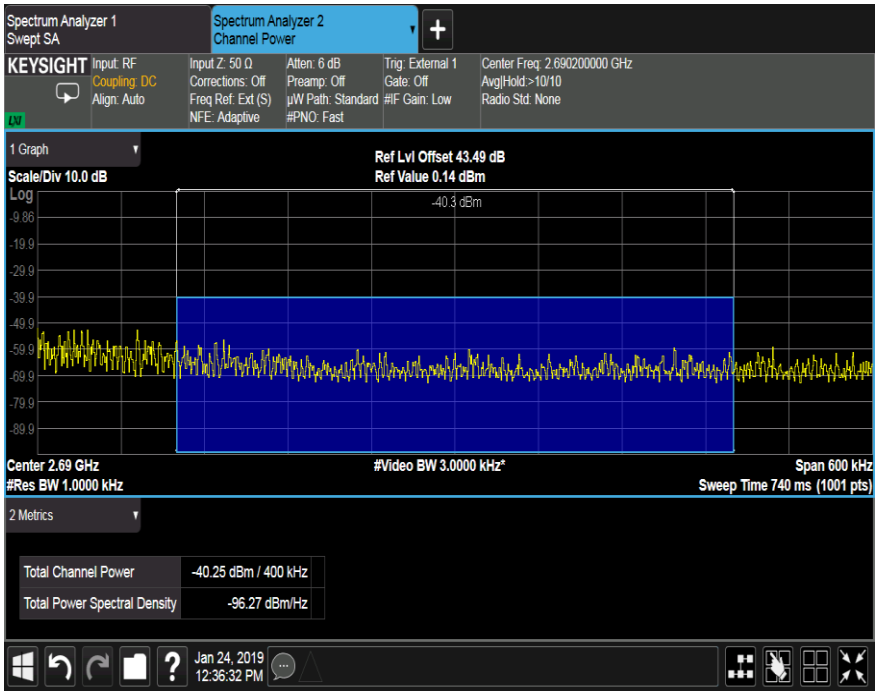
The channel power of 400KHz for 2495.8MHz is -39.87dBm, which is within the limit of -31.06dBm.

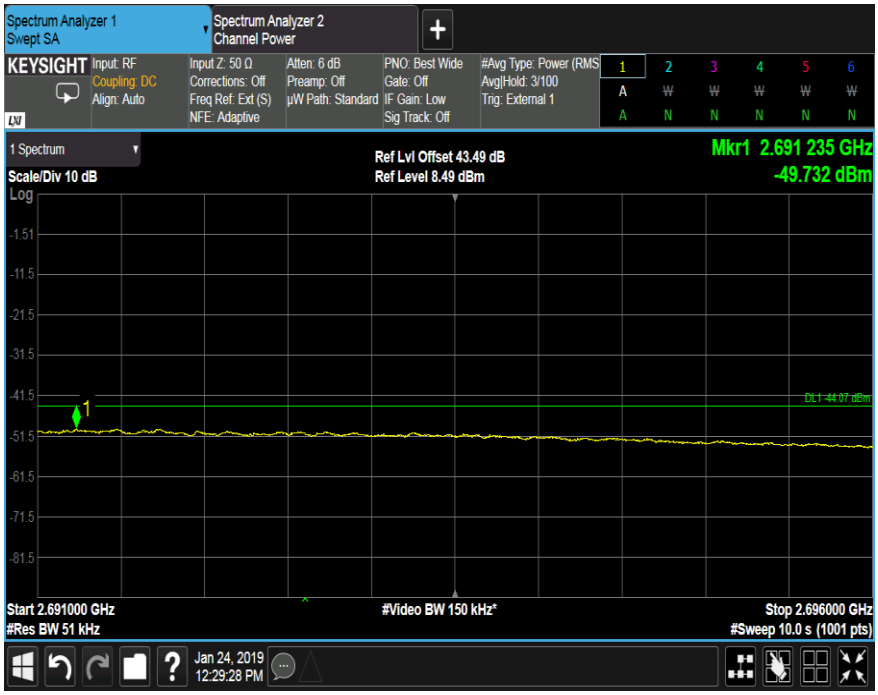




Port 25, Channel Position T, 40.0MHz

The channel power of 400KHz for 2690.2MHz is -40.25dBm, which is within the limit of -31.06dBm.





A.4 Conducted Spurious Emission

A.4.1 Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 27, Clause 27.53(m)

A.4.2 Method of measurement

In accordance with FCC rules, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

The spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 3KHz to 27GHz. The resolution bandwidth of 1MHz was employed for frequency band 3KHz to 27GHz. The spectrum analyzer detector was set to RMS.

For MIMO mode configurations, the limit was adjusted with a correction of -18.06dB [10Log(1/64)] by using the Measure and Add 10Log(N) dB technique according to KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports. Then the limit was adjust to -31.06dBm.

A.4.3 Measurement limit

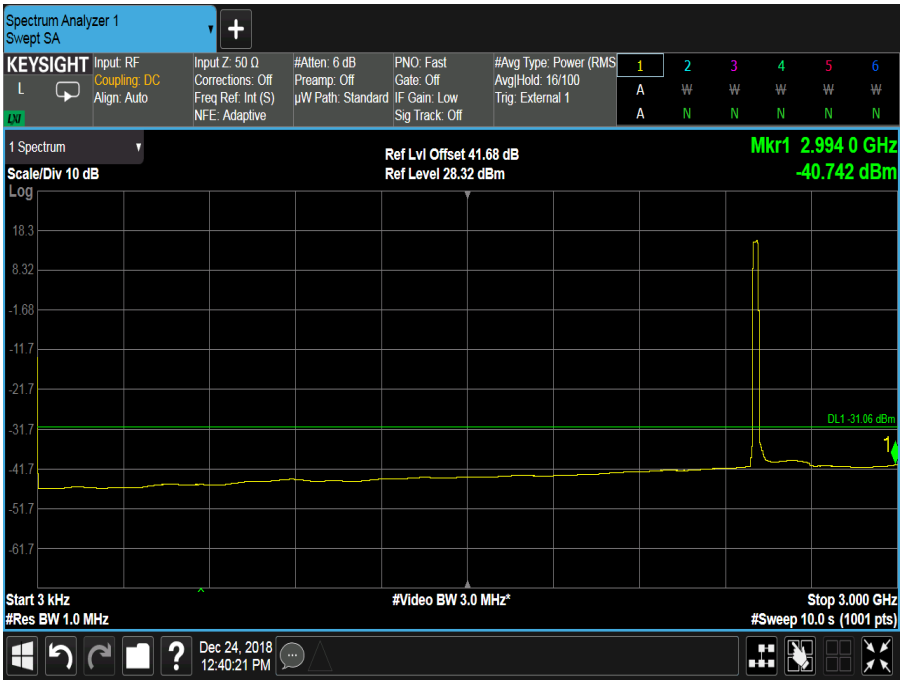
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

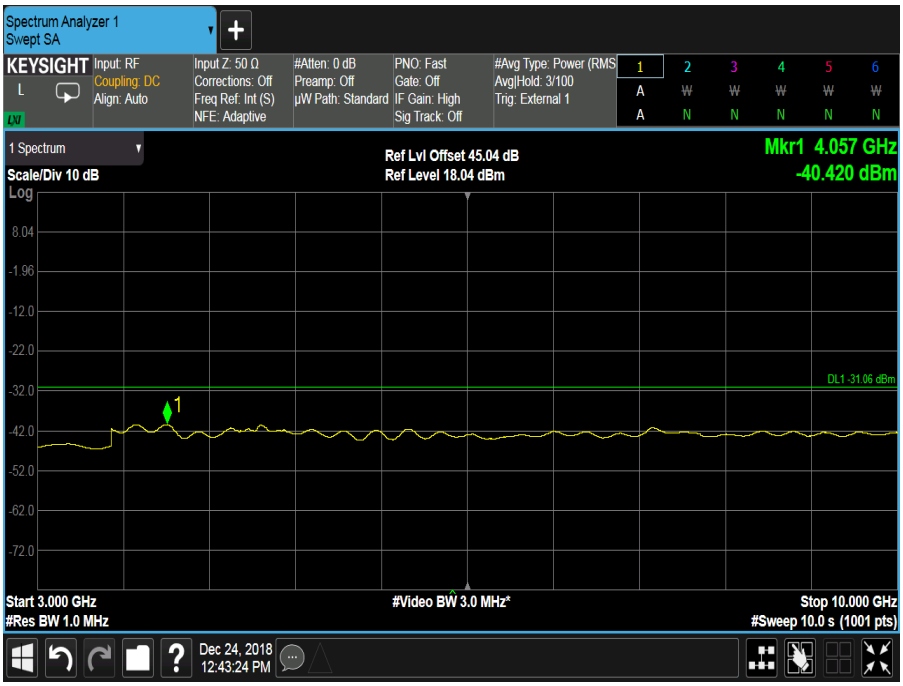
A.4.4 Measurement results

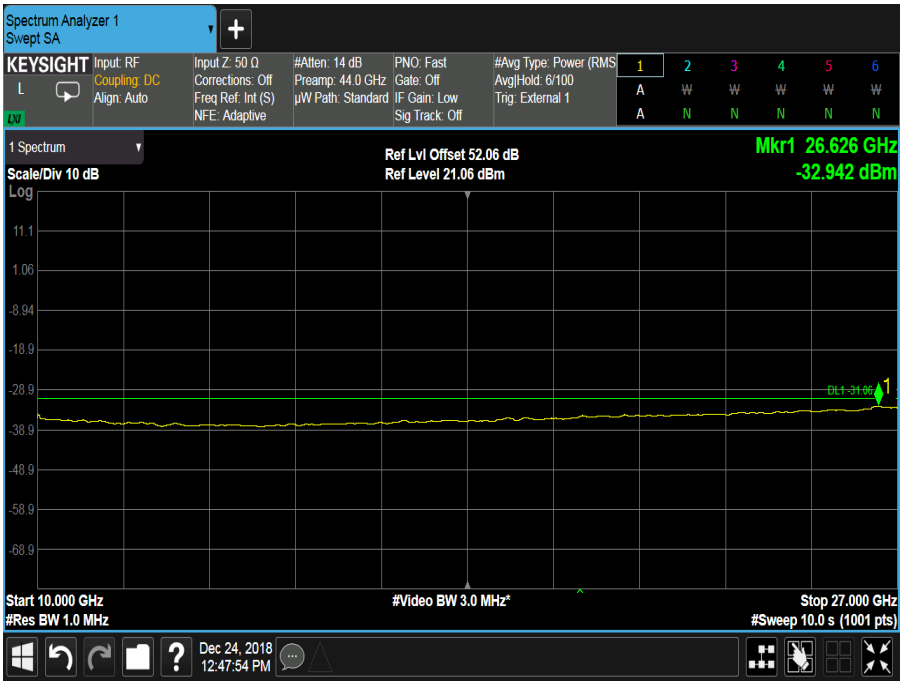
Configuration NR-MIMO-1C-20 QPSK

Channel Bandwidth	RBW (MHz)	Limit (dBm)
20.0 MHz	1.0	-31.06

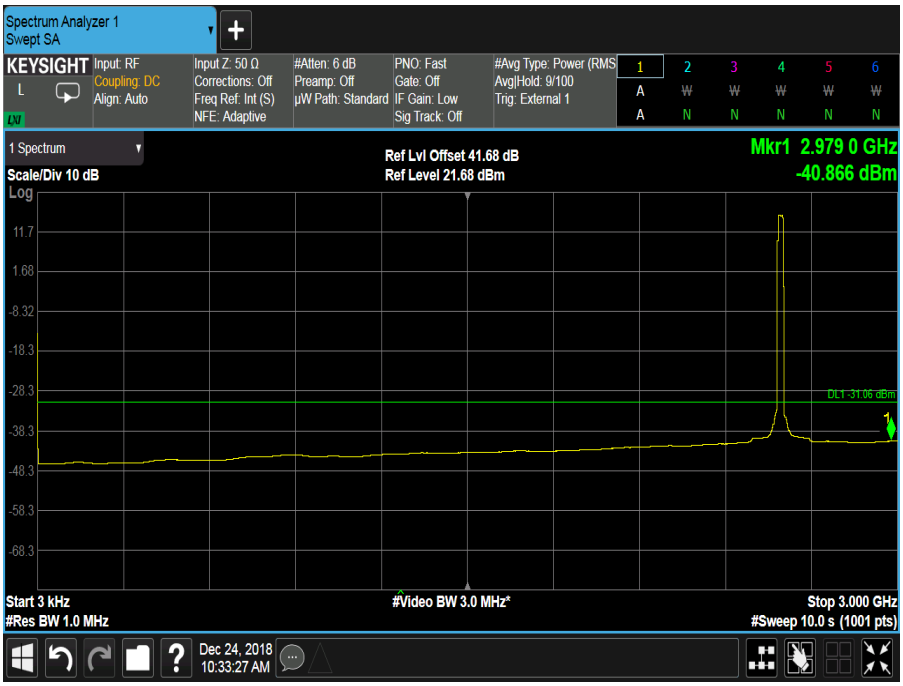
Port 55, Channel Position B 20.0 MHz

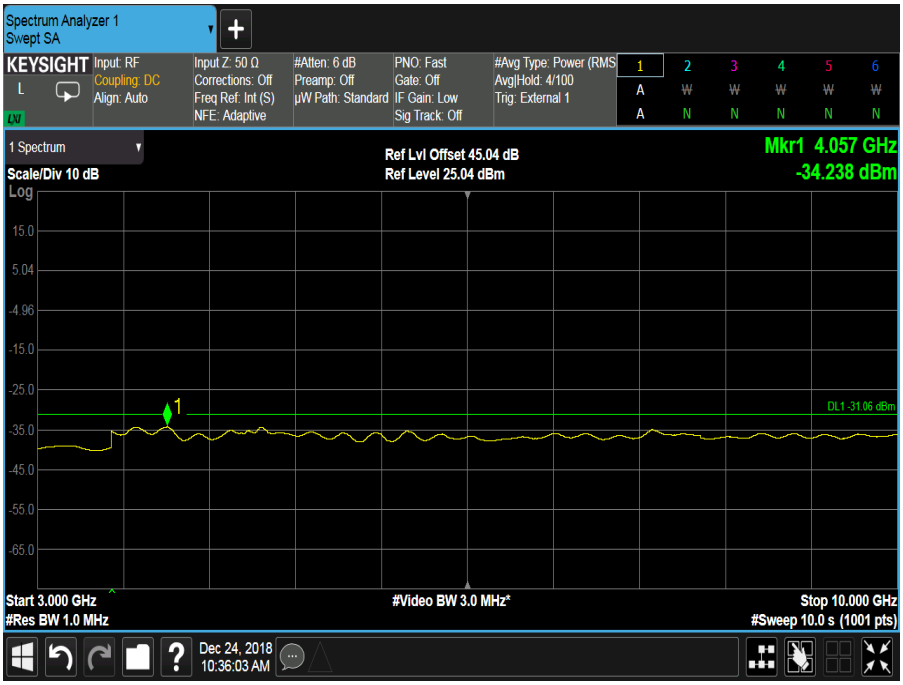


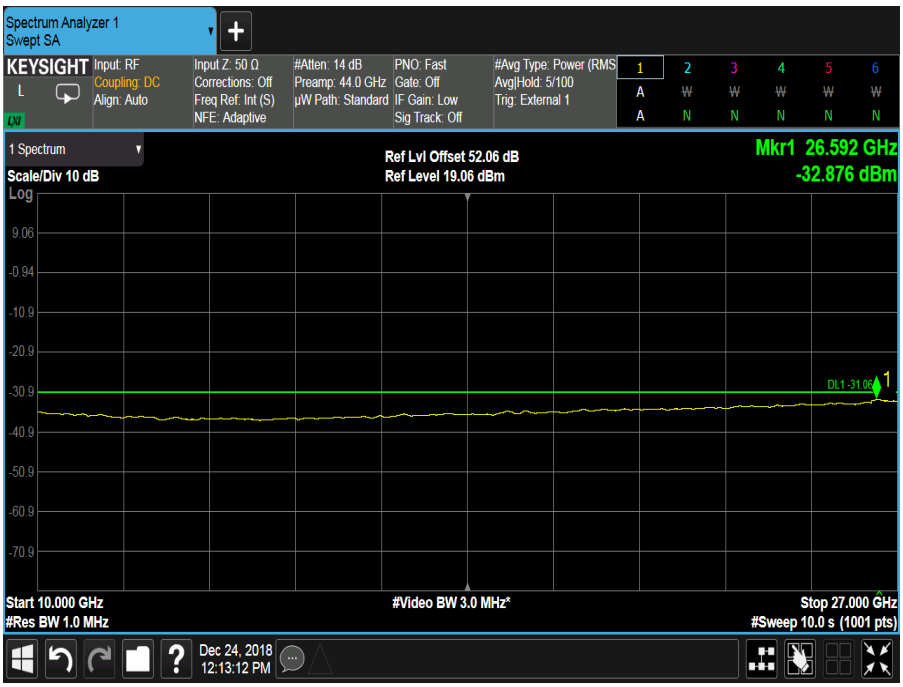




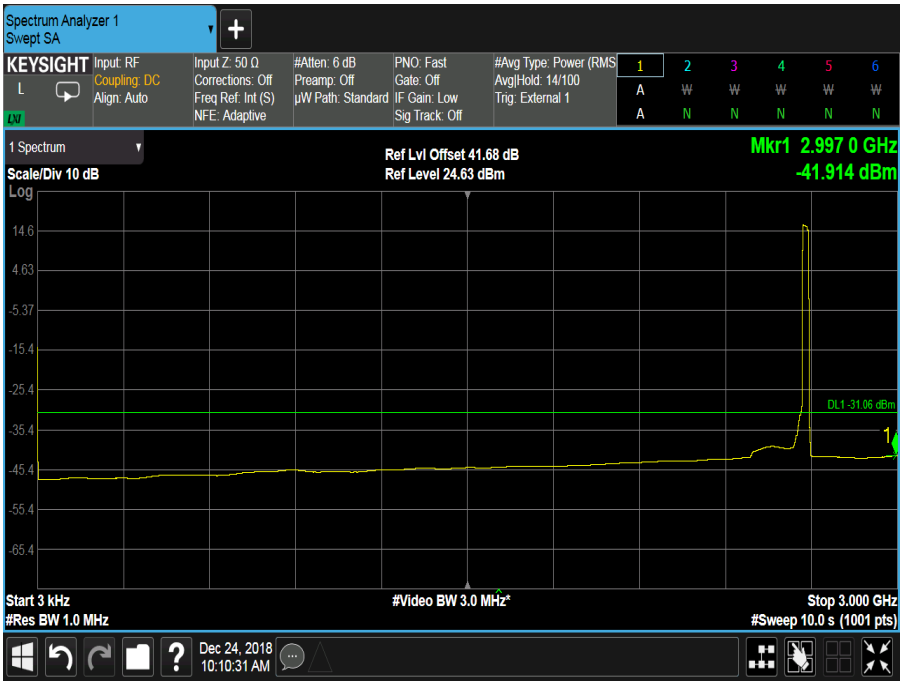
Port 55, Channel Position M 20.0 MHz

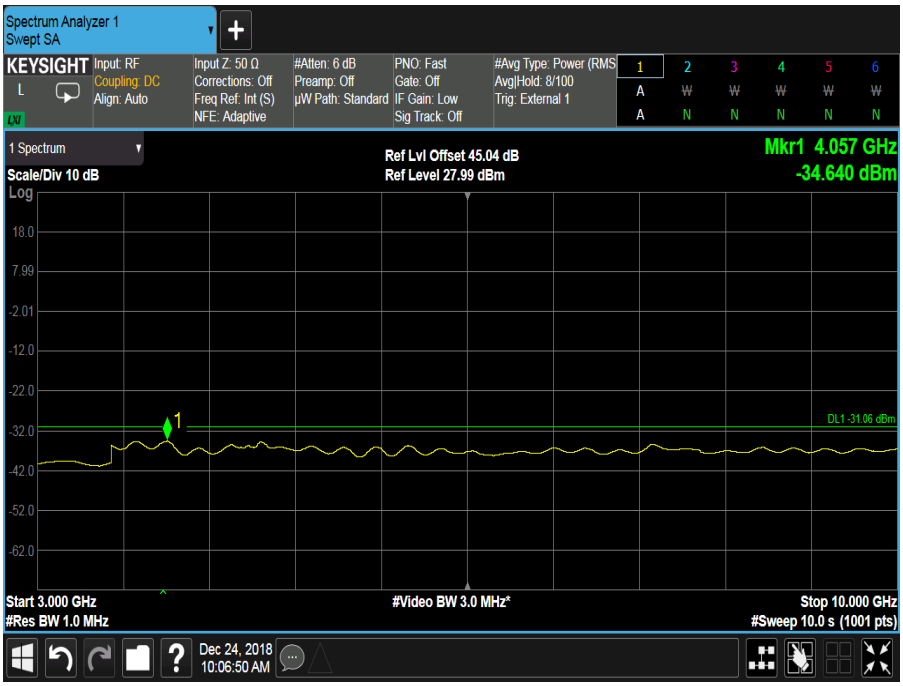


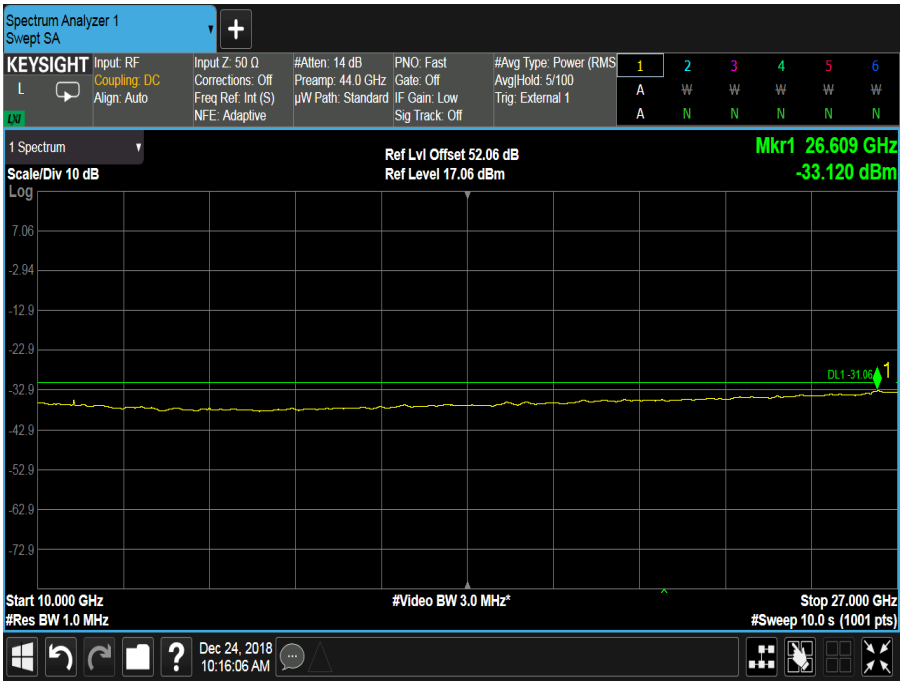




Port 55, Channel Position T 20.0 MHz



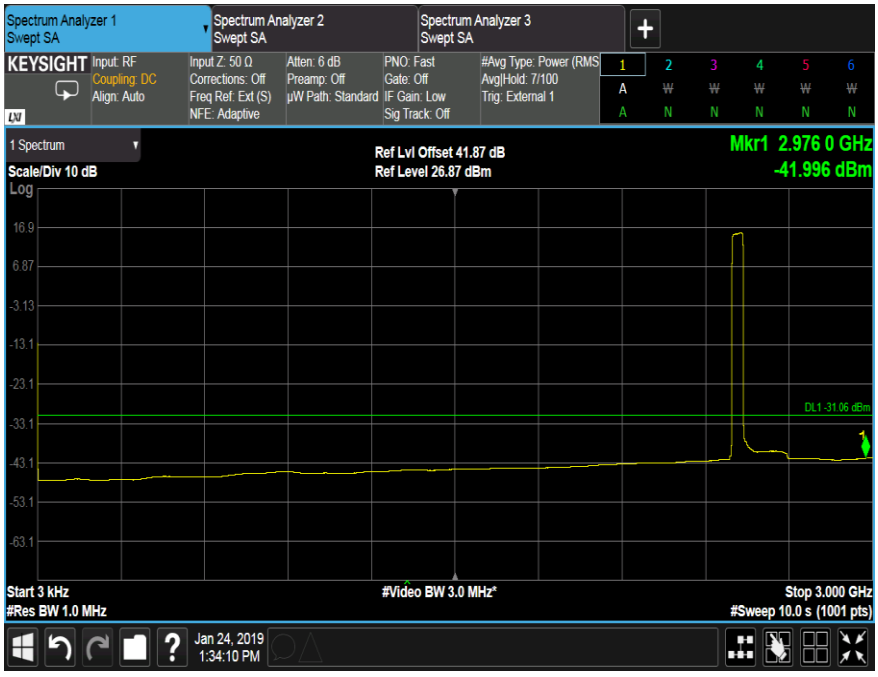


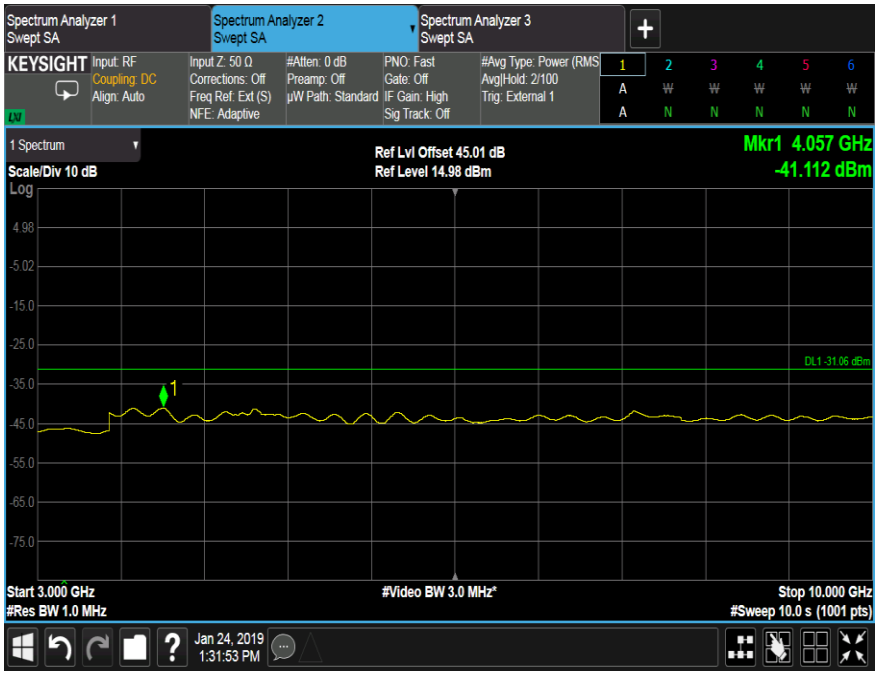


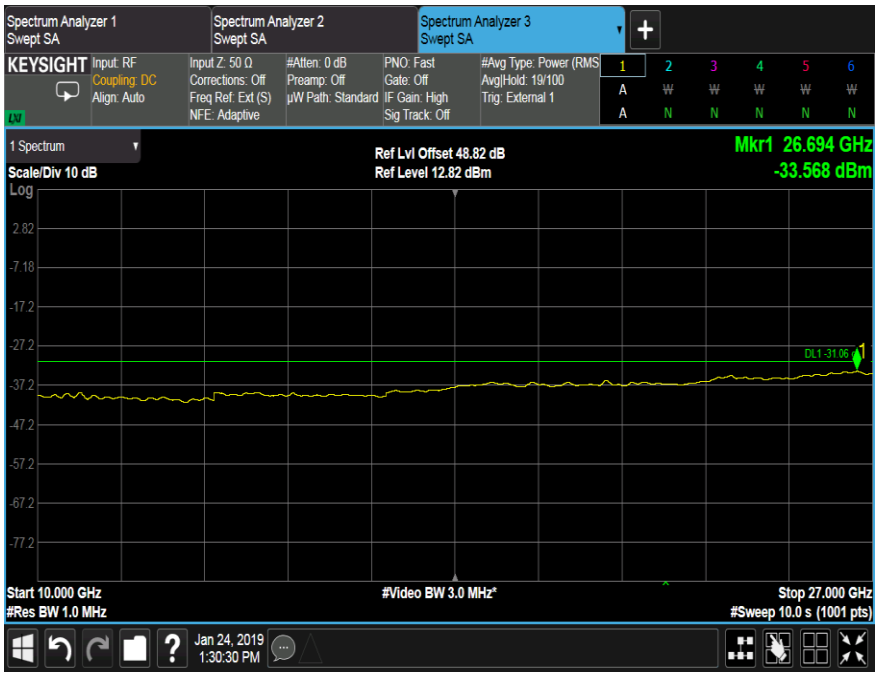
Configuration NR-MIMO-1C-40 QPSK

Channel Bandwidth	RBW (MHz)	Limit (dBm)
40.0 MHz	1.0	-31.06

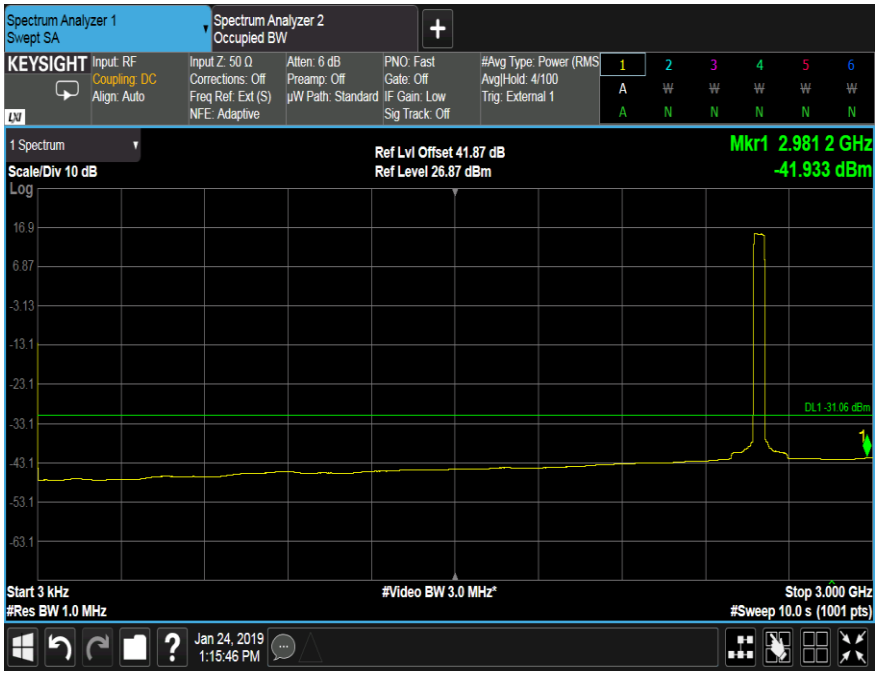
Port 25, Channel Position B 40.0 MHz

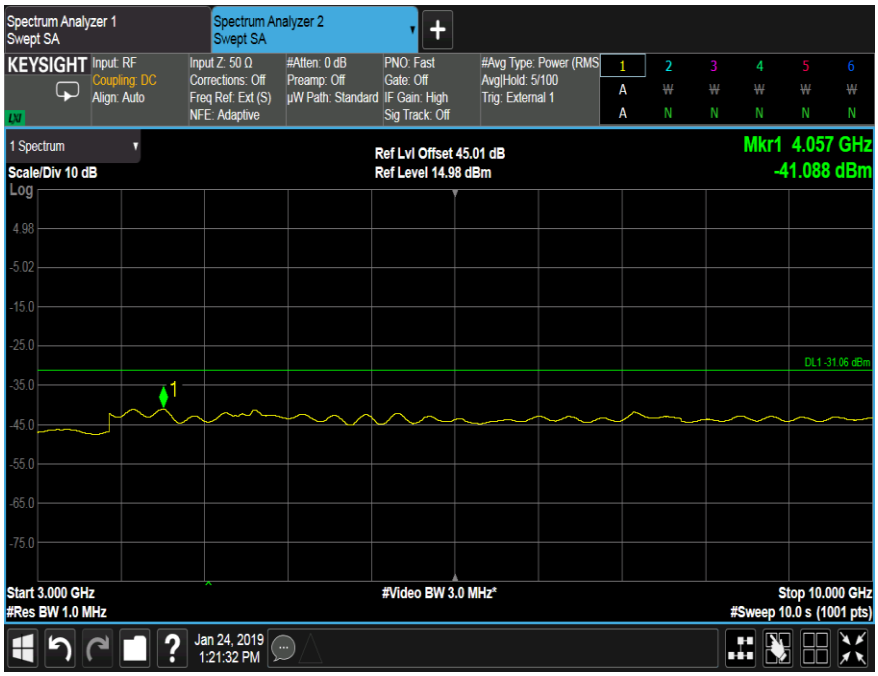


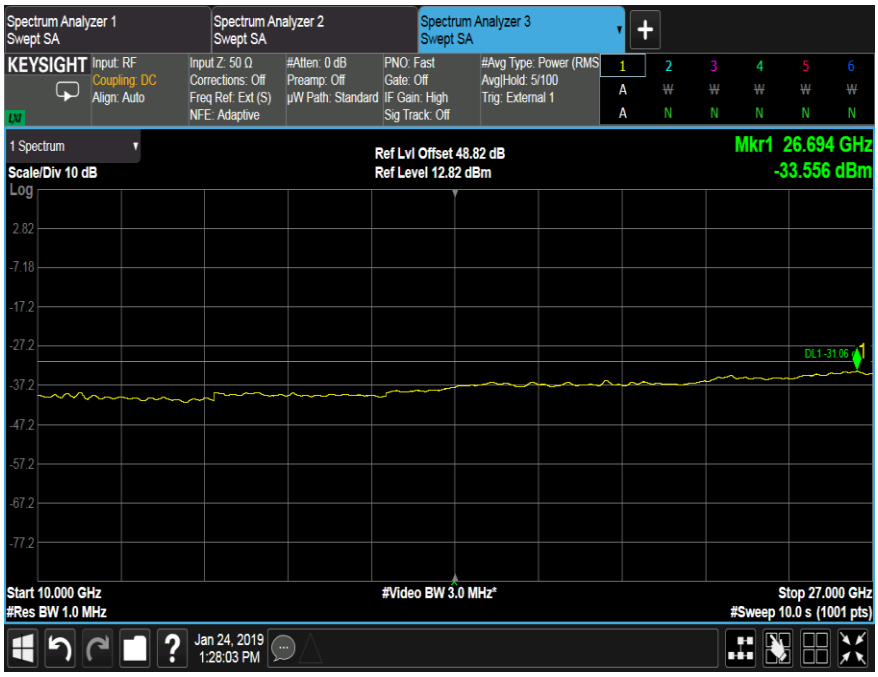




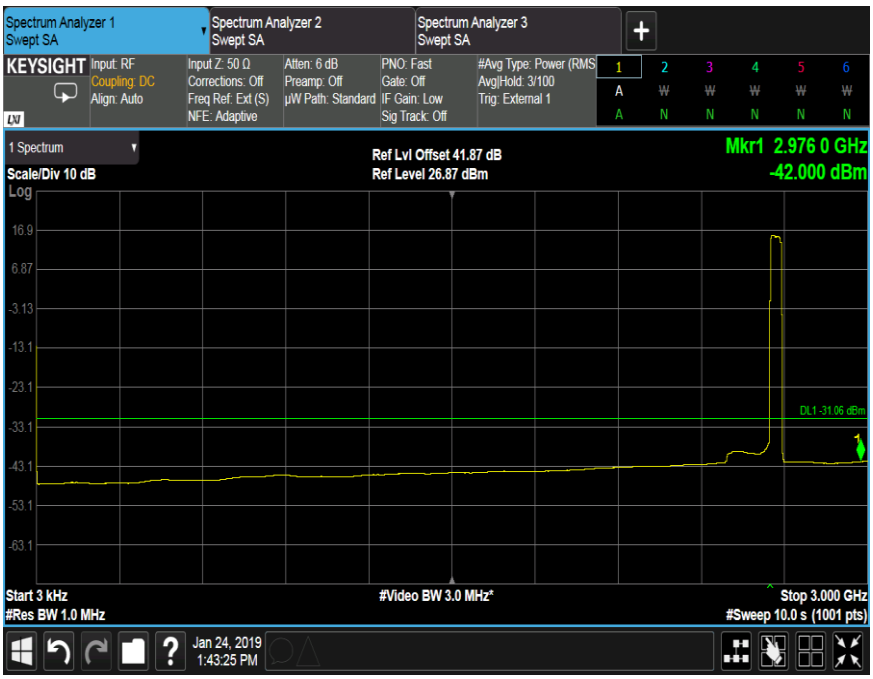
Port 25, Channel Position M 40.0 MHz

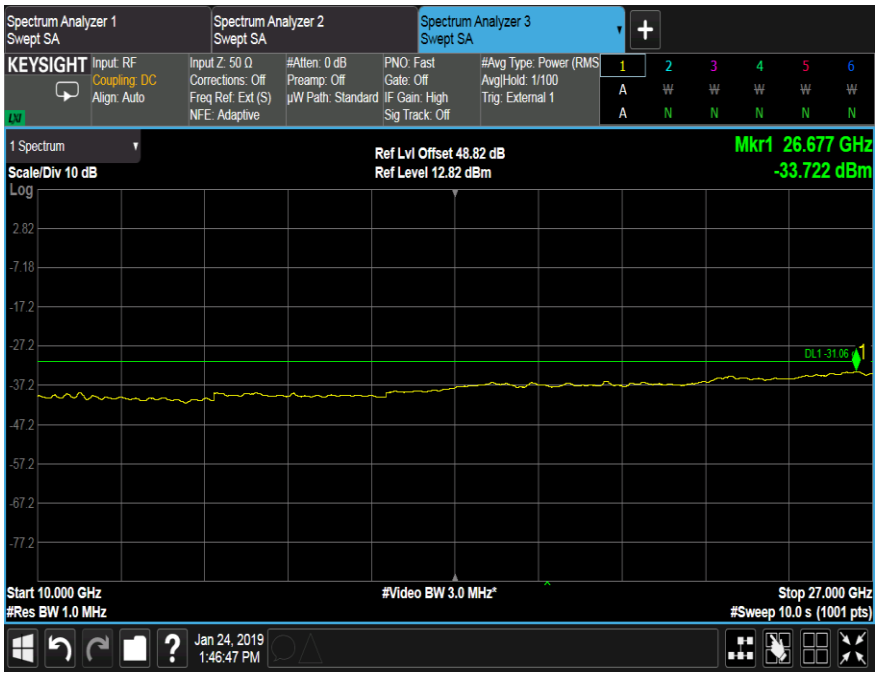






Port 25, Channel Position T 40.0 MHz





A.5 Radiated Spurious Emission

A.5.1 Reference

FCC CFR 47 Part 2, Clause 2.1053
FCC CFR 47 Part 27, Clause 27.53 (m)

A.5.2 Method of measurement

The measurements procedures in TIA-603-E: 2016 are used. This measurement is carried out in semi-anechoic chamber.
A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the measurement antenna in both horizontal and vertical polarisations.
Emissions identified within the range 30MHz to 27GHz were then formally measured using a peak detector as the worst case.
The limits for outside a licensee's frequency band(s) of operation the power of the spurious emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:

Field Strength is measured in dBμV/m

P is measured Transmitter Power in Watts

The EUT was measured with the antenna height varied between 1 and 4 m with the turntable rotated between 0 and 360 degrees. The emission of any outside a licensee's frequencies within 20dB of the limit were measured with the substitution method used according to the standard.
The measurements were performed at a 3m distance unless otherwise stated.

A.5.3 Measurement limit

The field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where

G_i is the antenna gain of ideal half-wave dipoles,

P_o is the power out of the transceiver in W,

d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:

$E_{(v/m)}=(30 \times 1.64 \times 16.56)^{0.5} / 3 = 9.51V/m = 139.57 dB\mu V/m$

As per 24.238 (a) the spurious emission must be attenuated by 43 + 10log (Po) dB this gives:
43 + 10log(16.56) = 55.19 dB
Therefore the limit at 3m measurement distance is:
139.57 – 55.19 = 84.4 dBμV/m
These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

A.5.4 Measurement results

Configuration NR-MIMO-1C-20

Maximum Output Power 49.0 dBm

Channel Position	Channel Frequencies
Channel Position B	2506.02MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-20

Maximum Output Power 49.0 dBm

Channel Position	Channel Frequencies
Channel Position M	2593.02MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-20

Maximum Output Power 49.0 dBm

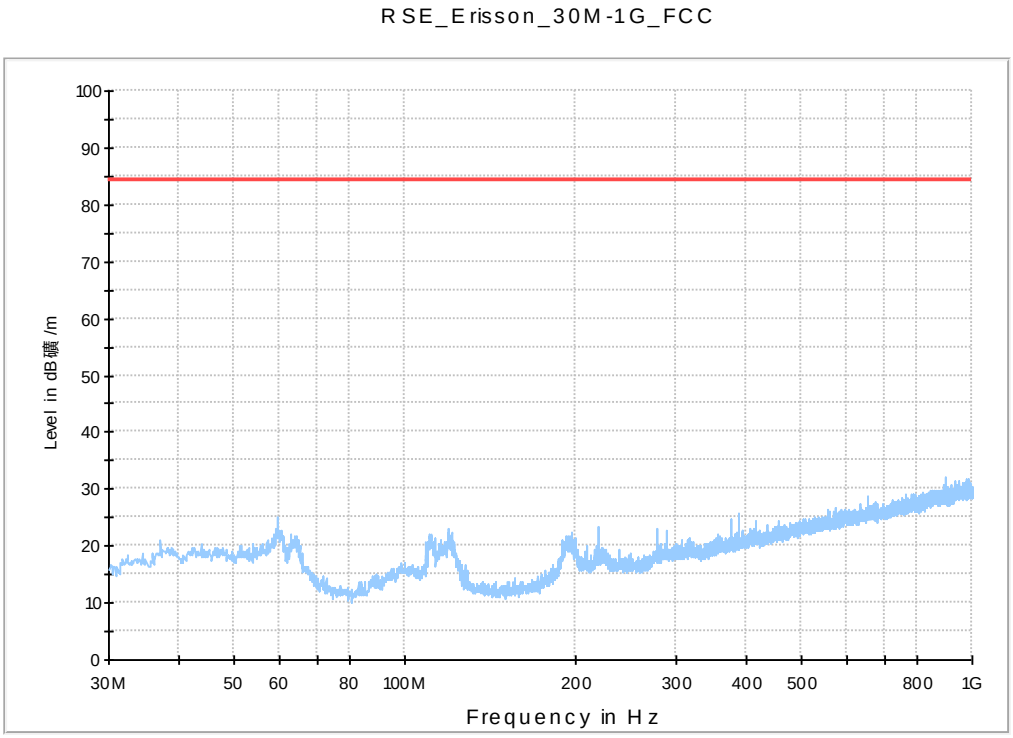
Channel Position	Channel Frequencies
Channel Position T	2680.02MHz

Channel Position T

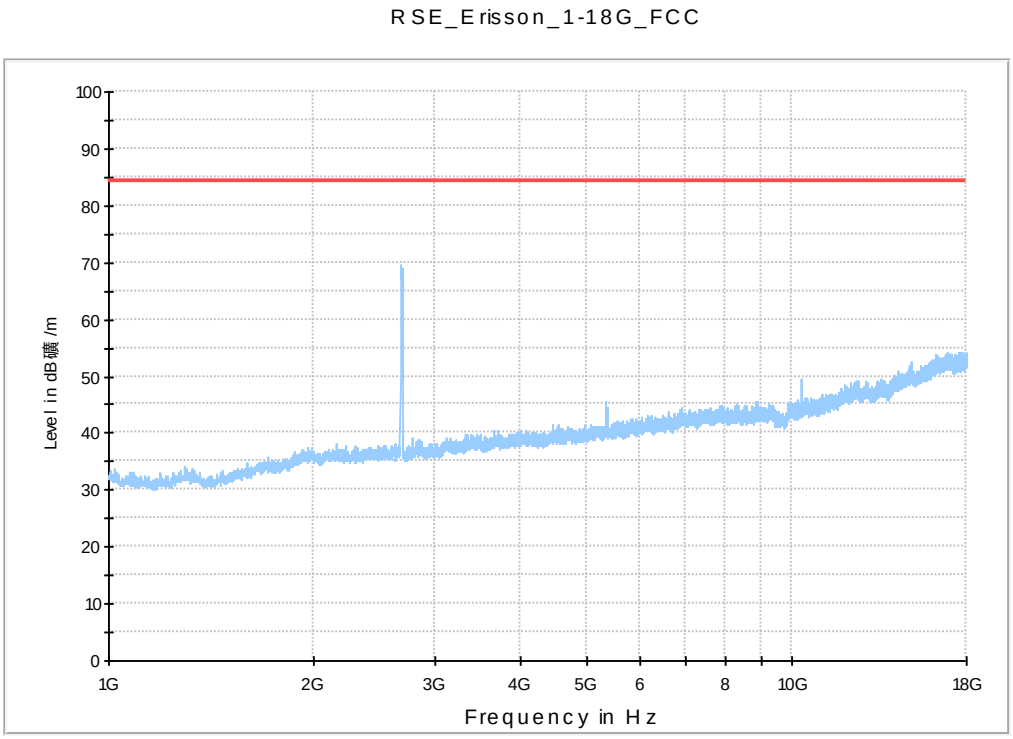
No emissions were detected within 20dB of the limit.

Final Results

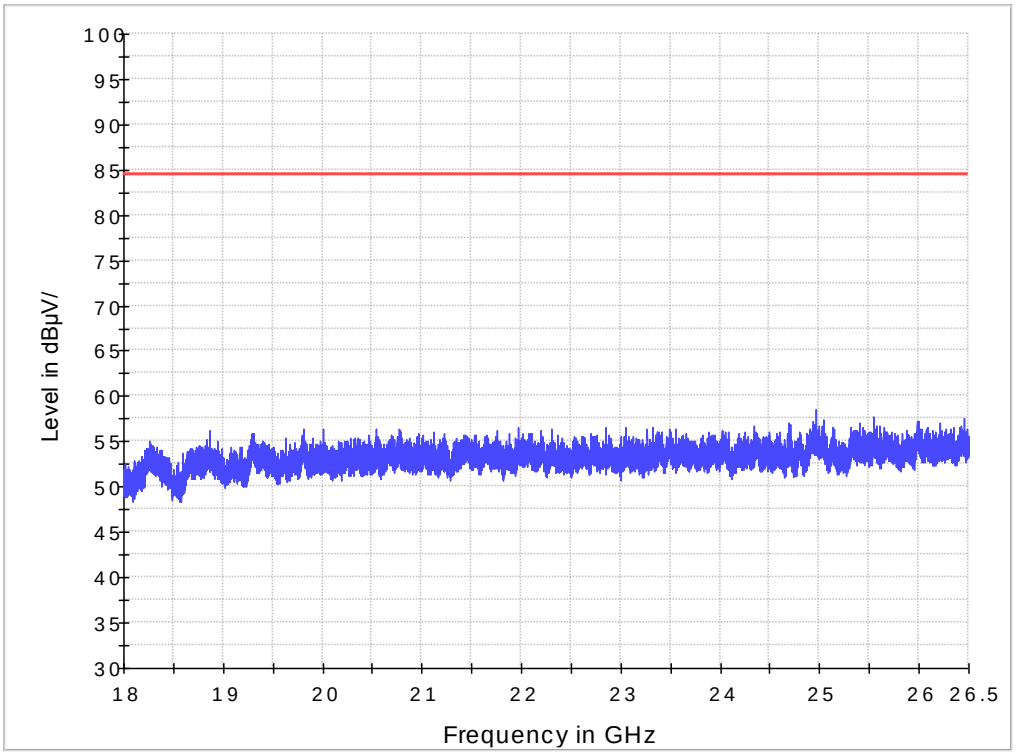
1、Channel Position T –30MHz-1GHz



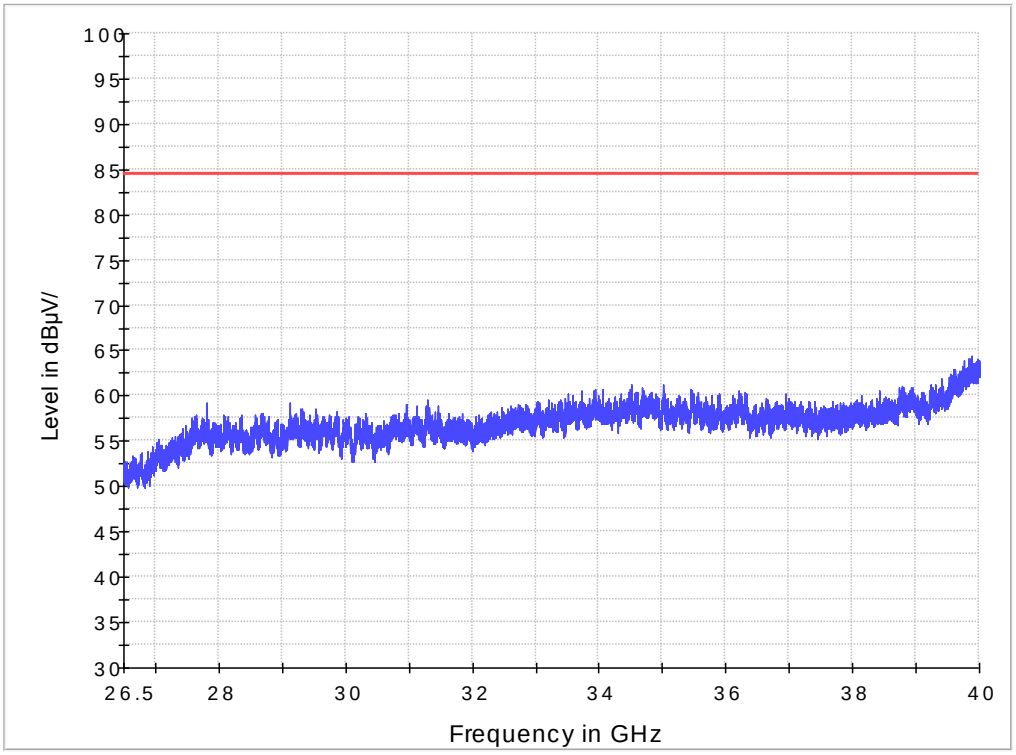
2、Channel Position T –1GHz-18GHz



3、Channel Position T –18GHz-26.5GHz



4、Channel Position T –26.5GHz-40GHz



Configuration NR-MIMO-1C-40, QPSK:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position B	2516.01MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-40, QPSK:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position M	2593.02MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-40, QPSK:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position T	2670.00MHz

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-40, 64QAM:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position B	2516.01MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-40, 64QAM:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position M	2593.02MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-40, 64QAM:

Maximum Output Power 52dBm, LTE Bandwidth 40MHz;

Channel Position	Channel Frequencies
Channel Position T	2670.00MHz

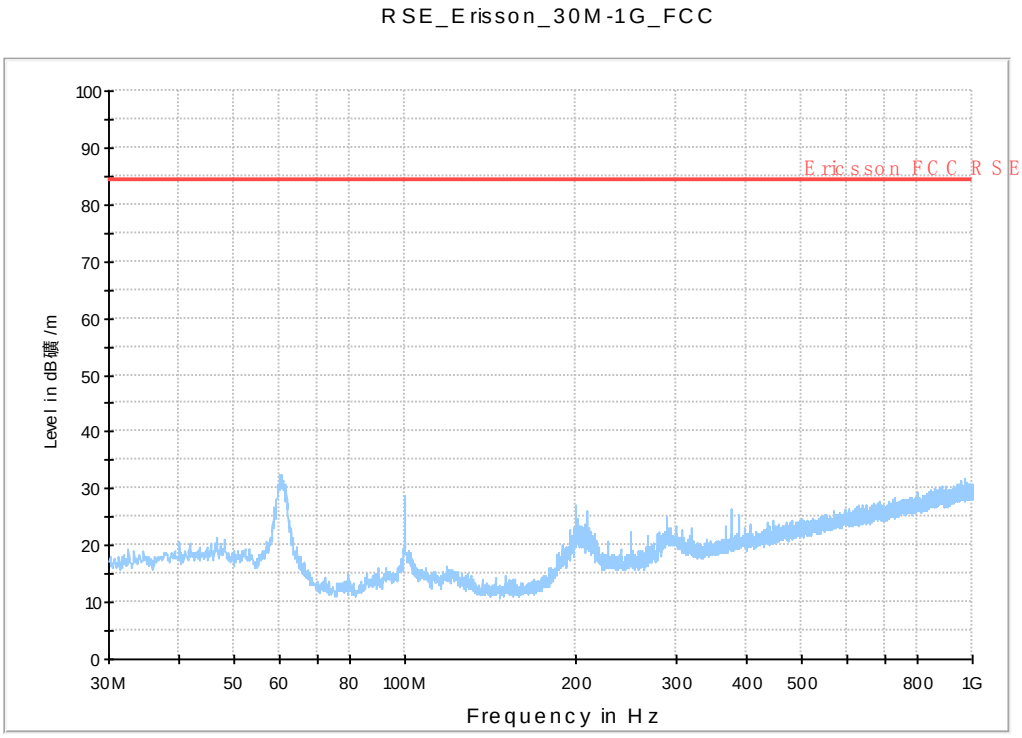
Channel Position T

No emissions were detected within 20dB of the limit.

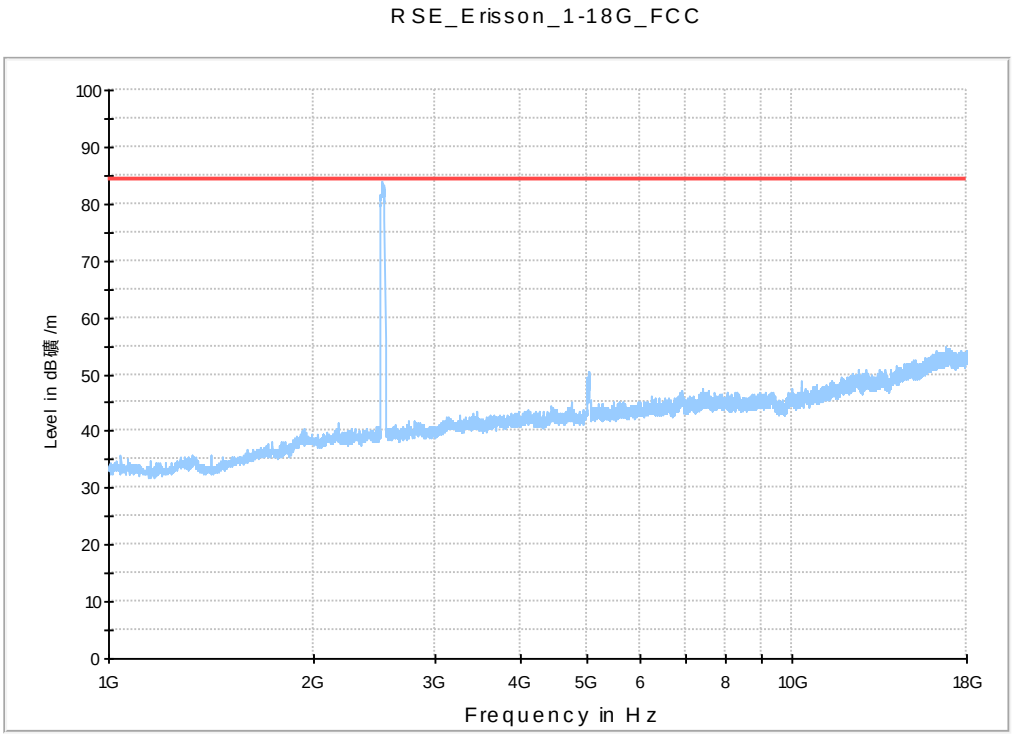
Final Results

Configuration NR-MIMO-1C-40, QPSK

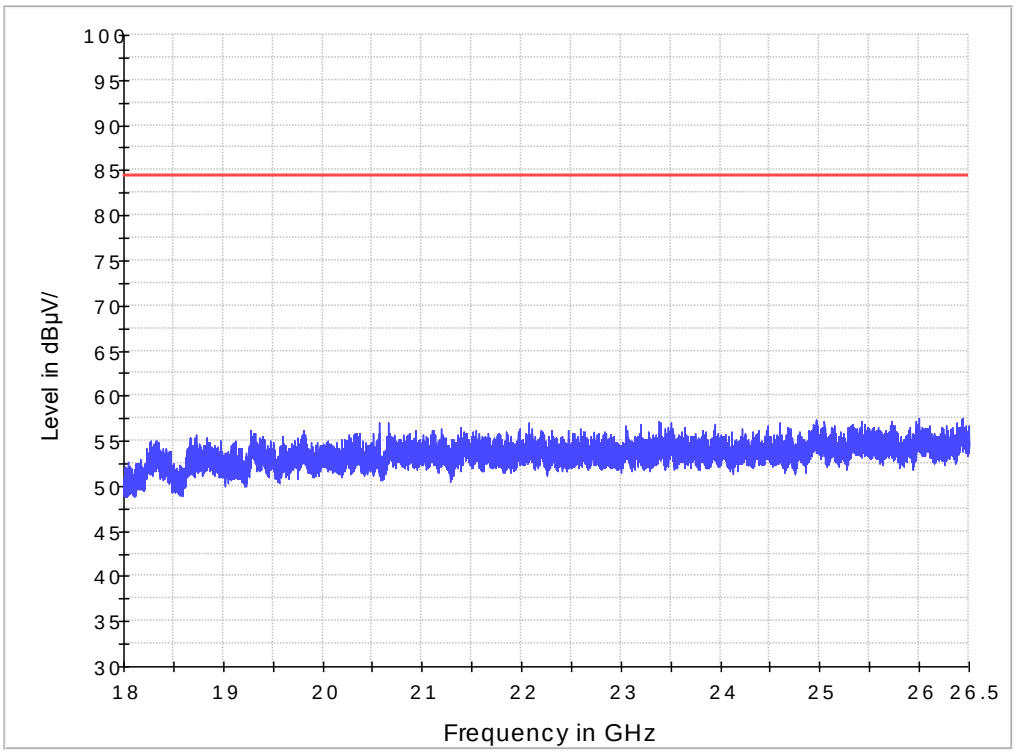
1、Channel Position B –30MHz-1GHz



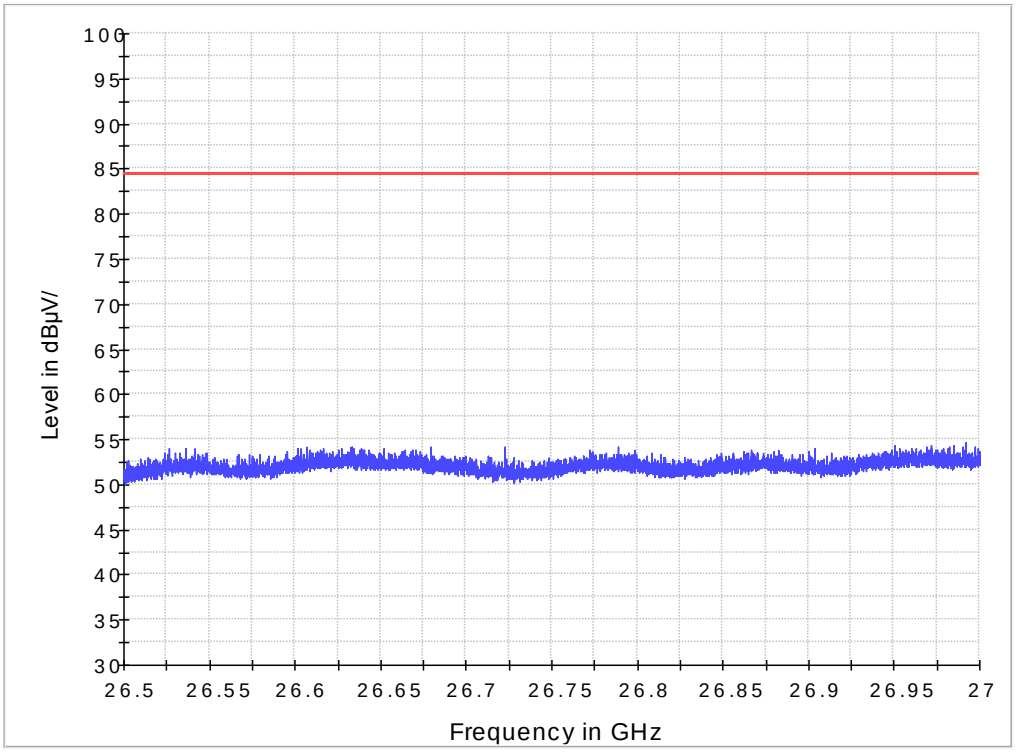
2、Channel Position B –1-18GHz



3、Channel Position B –18-26.5GHz



4、Channel Position B –26.5-27GHz



A.6 Frequency Stability

A.6.1 Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 27, Clause 27.54

A.6.2 Method of measurement

Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48 VDC Power Supply. At each temperature step, the Base Station was configured to transmit a [RAT]* at maximum power on the bottom, middle and top channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal value of -48 VDC. At +20°C, the Base Station was configured to transmit a [RAT]* at maximum power on the bottom, middle and top channel of the operating band. The average of 200 transmission bursts was measured and the result recorded.

[RAT]*:
NR - QPSK modulation

A.6.3 Measurement limit

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

A.6.4 Measurement results

Frequency Error – Temperature Variation

Configuration NR-MIMO-1C-20

Maximum Output Power 30.97dBm per port, Channel Bandwidth 20MHz

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	-6.32	-5.73	7.67
	-20	-6.93	6.57	7.21
	-10	5.76	-8.23	-7.34
	0	4.36	-7.31	6.54
	10	7.89	8.72	7.92
	20	6.72	7.36	8.47
	30	9.06	8.34	-5.32
	40	4.74	-5.82	8.74
	50	-5.31	-7.21	7.46

Configuration NR-MIMO-1C-40

Maximum Output Power 33.98dBm per port, Channel Bandwidth 40MHz

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	-5.83	-5.53	6.17
	-20	4.52	6.72	6.24
	-10	-4.56	-5.76	-6.52
	0	-5.18	-4.76	5.63
	10	4.45	-7.21	6.21
	20	-4.79	-6.57	5.92
	30	-5.27	-6.83	6.49
	40	-7.76	-6.58	5.76
	50	6.83	-5.45	6.06

Frequency Error – Voltage Variation

Configuration NR-MIMO-1C-20

Maximum Output Power 30.97dBm per port, Channel Bandwidth 20MHz

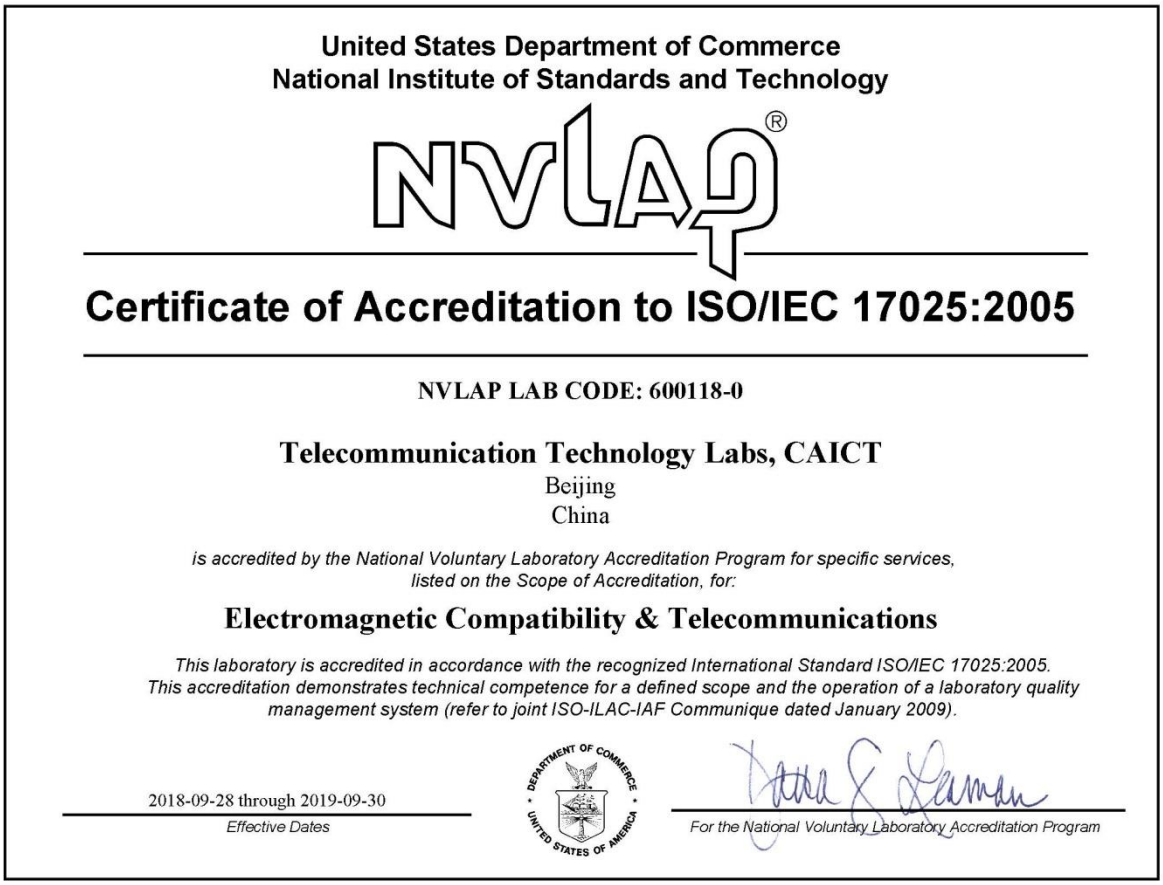
Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-40.8	20	6.84	-6.71	7.72
-48	20	-4.07	9.23	8.61
-55.2	20	-8.34	7.46	-8.5

Configuration NR-MIMO-1C-40

Maximum Output Power 33.98dBm per port, Channel Bandwidth 40MHz

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-40.8	20	5.96	-4.79	4.91
-48	20	6.21	-6.44	6.96
-55.2	20	-5.21	4.87	5.72

ANNEX B: Accreditation Certificate



United States Department of Commerce
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NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2018-09-28 through 2019-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

*****END OF REPORT*****