



TEST REPORT

No.I18Z62307-WMD05

for

Remote Radio Unit AIR 6488 B41

FCC ID: TA8CKRD901108

In accordance with FCC CFR 47 Part 27

Issued Date: 2019-03-13



Note:

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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-WMD05	Rev.0	1 st edition	2019-03-13
I18Z62307-WMD05	Rev.1	Editorial modification in about EUT	2019-03-13

CONTENTS

1. TEST LABORATORY	4
1.1. TESTING LOCATION	4
1.2. PROJECT DATA	4
1.3. SIGNATURE.....	4
2. CLIENT INFORMATION.....	5
2.1. APPLICANT INFORMATION.....	5
2.2. MANUFACTURER INFORMATION.....	5
3. EQUIPMENT UNDER TEST (EUT).....	6
3.1. ABOUT EUT	6
3.2. GENERAL DESCRIPTION	7
3.3. CONFIGURATION DESCRIPTION	8
4. REFERENCE DOCUMENTS	9
4.1. REFERENCE DOCUMENTS FOR TESTING.....	9
5. TEST SETUP	10
6. LABORATORY ENVIRONMENT.....	11
7. SUMMARY OF TEST RESULTS	12
8. TEST EQUIPMENT UTILIZED	13
9. MEASUREMENT UNCERTAINTY	13
ANNEX A: MEASUREMENT RESULTS.....	14
A.1 MAXIMUM OUTPUT POWER AND PEAK TO AVERAGE POWER RATIO - EIRP CALCULATION	14
A.2 OCCUPIED BANDWIDTH	18
A.3 SPURIOUS EMISSIONS AT BAND EDGE	22
A.4 CONDUCTED SPURIOUS EMISSION.....	25
A.5 RADIATED SPURIOUS EMISSION	29
A.6 FREQUENCY STABILITY	33
ANNEX B: ACCREDITATION CERTIFICATE.....	35

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(Shouxian) conducted testing

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

1.2. Project data

Testing Start Date: 2019-02-22

Testing End Date: 2019-03-13

1.3. Signature



Dong Yuan
(Prepared this test report)



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(Reviewed this test report)



Liu Baodian
(Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name: Ericsson (China) Communications Company Ltd.
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Contact: Xiaoying Jiang
Email: Xiaoying.jiang@ericsson.com
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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	TA8CKRD901108
Antenna	YES
Antenna Gain	23dBi
Output power	Maximum 34.95dBm (3.125W) per port for 100MHz channel bandwidth
Power source	-48V DC
Serial Number	D828634051
Hardware Version	R1D
Software Version	UP: CXP2010046/5_R14A62 ; Radio SW: CXP2030020/5_R15A50
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, 64QAM and 256QAM
Supported Channel bandwidth	100MHz
Date of receipt	2019-02-22

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. It can operate in single RAT NR. It can be configured to transmit in MIMO mode, and MIMO mode 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 55 for 100MHz 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-100	1 Carrier	100MHz	2546.01	2593.02	2640.00
NR-MIMO-1C-BE-100	1 Carrier	100MHz	2546.01	N/A	2640.00

N/A – Not Applicable

4. Reference Documents

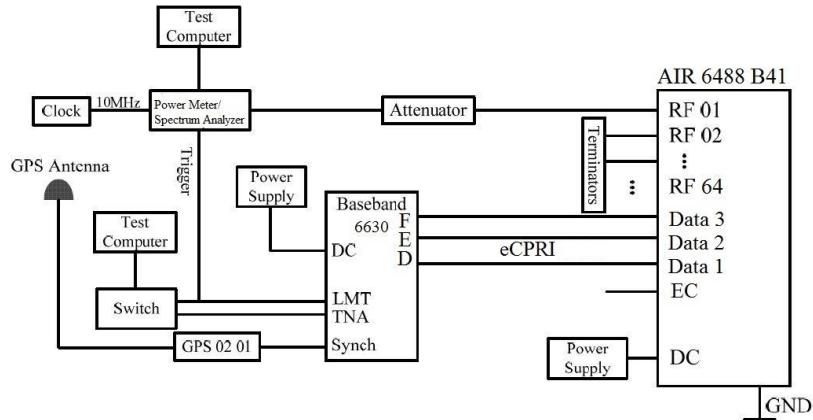
4.1. Reference Documents for testing

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

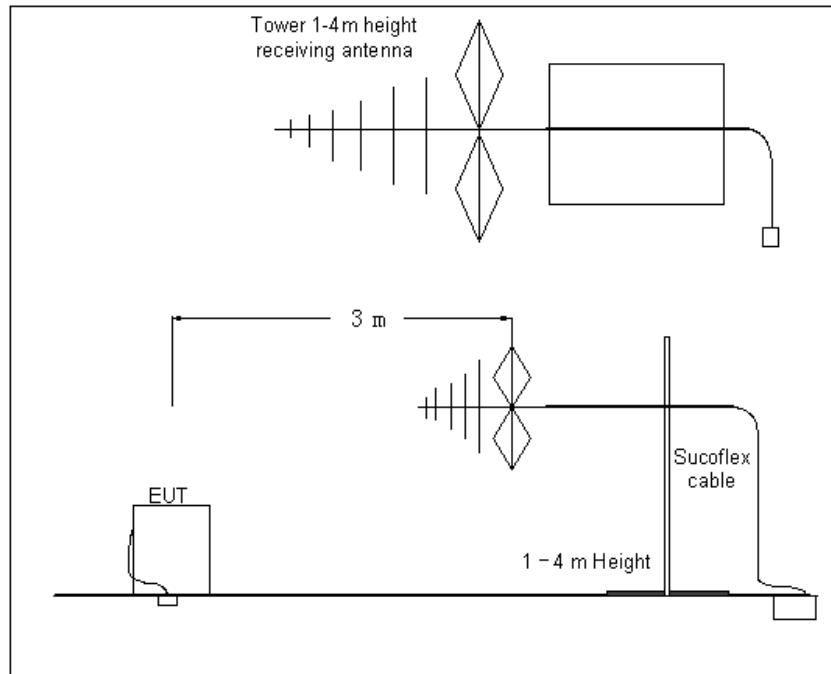
5. TEST SETUP

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	2020-02-22
2	40dB Attenuator	66-40-33	CD4019	Aeroflex / Weinschel	-
3	40dB Attenuator	TSG150R-4-40N11	1511040001	Nanjing Jiexi Technologies	-
4	Spectrum Analyzer	N9030	MY57142378	Keysight	2020-02-02
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:

$$\text{EIRP} \leq 33 \text{ dBW} + 10\log(X/Y) \text{ dBW} + 10 \log(360/\text{Beamwidth}) \text{ dBW}$$

X = 100MHz channel bandwidth

Y = 5.5 or 6 MHz

Beamwidth = 12°

Peak to Average Ratio: ≤13 dB

A.1.4 Measurement result

Configuration NR-MIMO-1C100

Maximum Output Power 34.95dBm per port

Port	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/100.0	34.78	14.78	8.01	34.76	14.76	7.67	34.71	14.70	8.03
2	QPSK/100.0	35.14	15.15	8.01	35.14	15.14	7.67	35.09	15.07	8.01
3	QPSK/100.0	34.80	14.79	8.05	34.84	14.81	7.67	34.79	14.79	8.01
4	QPSK/100.0	35.05	15.05	8.04	35.04	15.03	7.67	35.05	15.06	8.06
5	QPSK/100.0	34.96	14.96	8.02	34.95	14.95	7.67	34.99	14.99	8.08
6	QPSK/100.0	35.23	15.23	8.02	34.93	14.91	7.67	34.88	14.85	8.02
7	QPSK/100.0	35.16	15.17	8.02	35.05	15.05	7.67	35.16	15.16	7.99
8	QPSK/100.0	35.00	15.02	8.02	35.08	15.06	7.66	35.15	15.15	8.03
9	QPSK/100.0	34.59	14.65	7.97	34.75	14.74	7.67	34.64	14.64	8.01
10	QPSK/100.0	34.44	14.44	8.02	34.48	14.48	7.67	34.41	14.41	8.03
11	QPSK/100.0	34.75	14.75	8.02	34.73	14.73	7.67	34.61	14.61	8.03
12	QPSK/100.0	34.55	14.55	7.98	34.56	14.56	7.67	34.47	14.47	8.04
13	QPSK/100.0	34.72	14.72	8.00	34.74	14.74	7.67	34.70	14.70	8.03
14	QPSK/100.0	34.19	14.19	7.99	34.16	14.15	7.67	34.18	14.18	8.03
15	QPSK/100.0	34.78	14.78	8.00	34.52	14.52	7.68	34.60	14.60	8.02
16	QPSK/100.0	34.61	14.62	8.01	34.45	14.45	7.67	34.48	14.48	8.00
17	QPSK/100.0	34.63	14.63	7.96	34.74	14.74	7.66	34.63	14.63	8.00
18	QPSK/100.0	34.48	14.48	7.96	34.54	14.54	7.67	34.53	14.53	7.99
19	QPSK/100.0	34.79	14.79	8.03	34.82	14.82	7.67	34.79	14.79	8.01
20	QPSK/100.0	34.61	14.61	8.00	34.64	14.64	7.66	34.69	14.69	8.04
21	QPSK/100.0	34.65	14.65	7.98	34.66	14.66	7.65	34.67	14.67	7.99
22	QPSK/100.0	34.34	14.34	7.99	34.29	14.29	7.66	34.40	14.40	8.03
23	QPSK/100.0	34.46	14.46	7.98	34.49	14.49	7.65	34.61	14.61	8.03
24	QPSK/100.0	34.79	14.79	8.03	34.86	14.86	7.66	34.82	14.82	8.02
25	QPSK/100.0	34.65	14.65	7.97	34.66	14.66	7.68	34.69	14.69	8.02
26	QPSK/100.0	34.57	14.57	8.00	34.55	14.56	7.67	34.59	14.59	7.98
27	QPSK/100.0	34.51	14.51	8.02	34.52	14.52	7.66	34.44	14.44	8.00
28	QPSK/100.0	34.56	14.56	7.98	34.59	14.59	7.67	34.52	14.52	7.99
29	QPSK/100.0	34.65	14.65	8.02	34.62	14.62	7.67	34.69	14.69	8.00
30	QPSK/100.0	34.48	14.48	7.99	34.40	14.39	7.68	34.42	14.42	7.99
31	QPSK/100.0	34.43	14.43	8.02	34.43	14.43	7.67	34.46	14.46	8.02
32	QPSK/100.0	34.20	14.20	7.96	34.15	14.15	7.67	34.11	14.12	8.05
Total Power 1-32		49.73	29.74	-	49.72	29.72	-	49.71	29.71	-
Total Power 1-32 +23 dB		72.73	52.74	-	72.72	52.72	-	72.71	52.71	-

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)
33	QPSK/100.0	34.37	14.35	7.99	34.36	14.36	7.67	34.28	14.28	8.02
34	QPSK/100.0	34.28	14.28	8.00	34.22	14.22	7.68	34.72	14.72	8.03
35	QPSK/100.0	34.74	14.74	8.03	34.68	14.68	7.68	34.62	14.62	8.00
36	QPSK/100.0	34.38	14.38	8.03	34.57	14.57	7.67	34.43	14.43	8.02
37	QPSK/100.0	34.44	14.44	7.97	34.28	14.28	7.66	34.47	14.47	8.01
38	QPSK/100.0	34.60	14.60	8.03	34.85	14.85	7.68	34.68	14.68	8.01
39	QPSK/100.0	34.21	14.21	8.02	34.15	14.15	7.67	34.19	14.19	8.02
40	QPSK/100.0	34.19	14.19	7.99	34.21	14.21	7.67	34.15	14.15	8.03
41	QPSK/100.0	34.79	14.79	8.05	34.65	14.65	7.67	34.73	14.73	7.99
42	QPSK/100.0	34.51	14.51	7.99	34.45	14.44	7.67	34.43	14.42	8.00
43	QPSK/100.0	34.66	14.66	8.00	34.83	14.83	7.67	34.61	14.61	7.98
44	QPSK/100.0	34.60	14.60	8.02	34.81	14.81	7.68	34.68	14.68	8.02
45	QPSK/100.0	34.40	14.40	8.02	34.48	14.48	7.67	34.41	14.41	8.00
46	QPSK/100.0	34.66	14.66	8.00	34.66	14.66	7.67	34.75	14.75	8.01
47	QPSK/100.0	34.65	14.65	8.04	34.83	14.83	7.67	34.63	14.63	8.03
48	QPSK/100.0	34.60	14.60	8.02	34.78	14.78	7.66	34.67	14.67	8.05
49	QPSK/100.0	34.63	14.63	7.98	34.76	14.76	7.67	34.80	14.80	8.02
50	QPSK/100.0	34.65	14.65	8.02	34.70	14.70	7.67	34.75	14.76	8.02
51	QPSK/100.0	34.49	14.49	8.01	34.60	14.60	7.67	34.58	14.58	7.98
52	QPSK/100.0	34.82	14.82	8.02	34.89	14.89	7.67	34.89	14.89	8.07
53	QPSK/100.0	34.58	14.58	8.00	34.69	14.69	7.67	34.74	14.74	8.08
54	QPSK/100.0	34.50	14.50	8.06	34.56	14.56	7.67	34.60	14.60	7.99
55	QPSK/100.0	35.44	15.40	7.98	35.23	15.20	7.66	35.31	15.29	8.01
56	QPSK/100.0	34.86	14.86	8.05	34.70	14.70	7.66	34.72	14.72	8.01
57	QPSK/100.0	34.22	14.22	7.97	34.28	14.28	7.67	34.22	14.22	8.01
58	QPSK/100.0	34.27	14.27	8.02	34.33	14.33	7.67	34.31	14.31	8.04
59	QPSK/100.0	34.55	14.55	8.03	34.53	14.53	7.68	34.48	14.48	7.99
60	QPSK/100.0	34.55	14.55	8.00	34.45	14.46	7.68	34.49	14.49	8.01
61	QPSK/100.0	34.30	14.31	8.02	34.29	14.30	7.67	34.28	14.28	8.07
62	QPSK/100.0	34.65	14.65	8.02	34.61	14.61	7.67	34.66	14.66	8.03
63	QPSK/100.0	34.47	14.46	8.04	34.42	14.42	7.66	34.34	14.34	7.98
64	QPSK/100.0	34.54	14.54	7.99	34.56	14.56	7.67	34.39	14.40	8.00
Total Power 33-64		49.61	29.61	-	49.63	29.63	-	49.62	29.62	-
Total Power 33-64 +23 dBi		72.61	52.61	-	72.63	52.63	-	72.62	52.62	-
EIRP		75.68	55.69	-	75.69	55.69	-	75.68	55.68	-

Port	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)
55	64QAM/100.0	35.33	15.31	7.98	35.20	15.19	7.78	35.29	25.29	8.00
55	256QAM/100.0	35.43	15.44	7.99	36.21	15.26	7.67	35.30	15.39	8.01

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.
- 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 $10\log(\text{OBW} / \text{RBW})$ below the reference level.
- d) Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

A.2.3 Measurement result

Configuration NR-MIMO-1C-100

-26dBc Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
55	QPSK/ 100.0 MHz	99.93	99.96	99.89

-26dBc Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)	
		Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
55	100.0 MHz	99.97	99.98

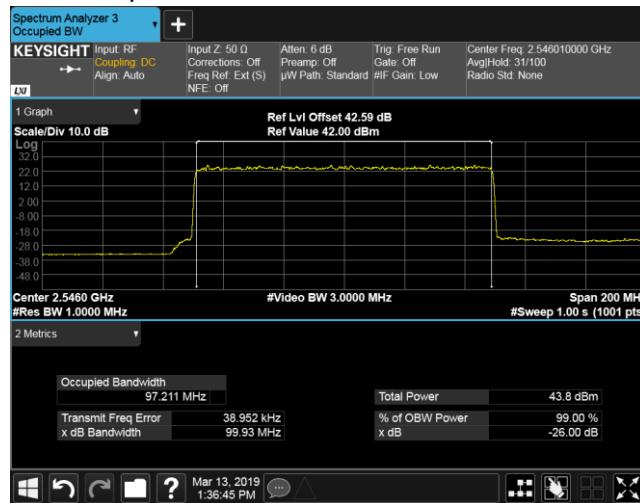
99% Occupied Bandwidth

Antenna	Modulation / Bandwidth	Occupied Bandwidth (MHz)		
		Channel Position B	Channel Position M	Channel Position T
55	QPSK/ 100.0 MHz	97.211	97.373	97.211

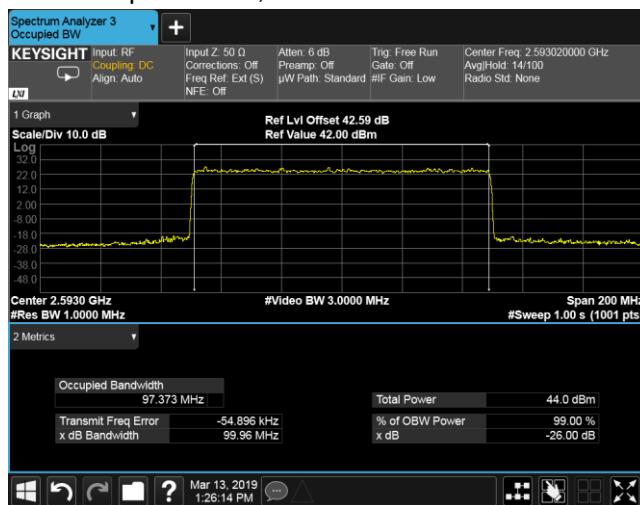
99% Occupied Bandwidth

Antenna	Bandwidth	Occupied Bandwidth (MHz)	
		Modulation 64QAM/ Channel Position M	Modulation 256QAM/ Channel Position M
55	100.0 MHz	97.371	97.370

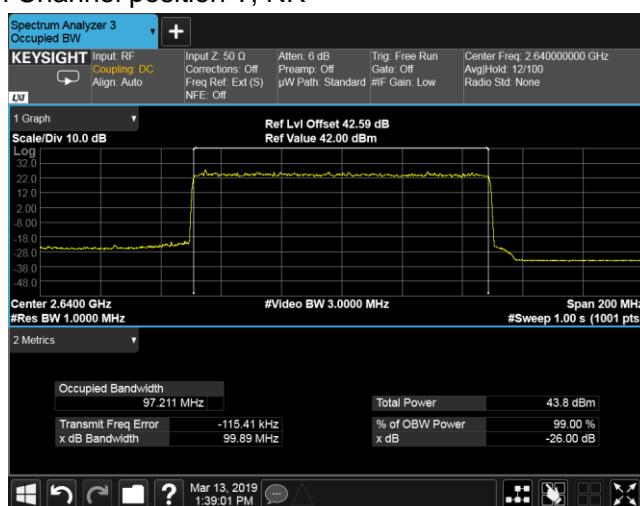
Port 55, QPSK 100.0M Channel position B, NR



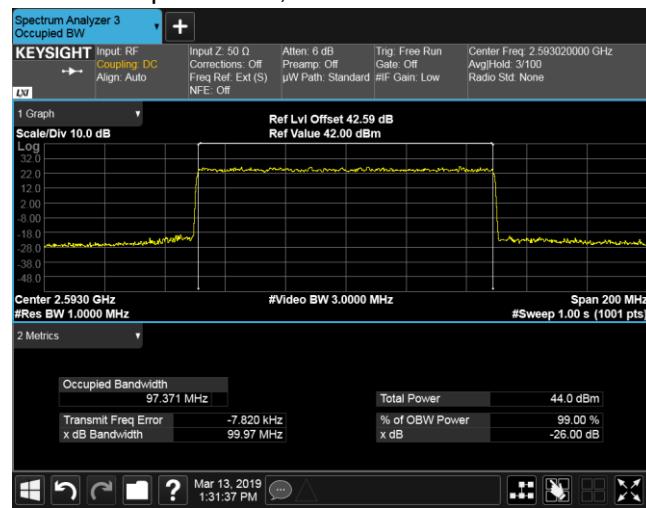
Port 55, QPSK 100.0M Channel position M, NR



Port 55, QPSK 100.0M Channel position T, NR



Port 55, 64QAM 100.0M Channel position M, NR



Port 55, 256QAM 100.0M Channel position M, NR



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 $43 + 10\log(P)$ dB.

For MIMO mode configurations, the limit was adjusted with a correction of -18.06dB [$10\log(1/64)$] by using the Measure and Add $10\log(N)$ 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 $> 1\text{MHz}$ away from the band edges.

The limit was adjusted with -13.01dB [$10\log(50/1000)$] to compensate for the reduced measurement bandwidth 50KHz. For MIMO mode, the limit of -44.07dBm was used. Spectrum analyzer detector was set as RMS.

A.3.3 Measurement limit

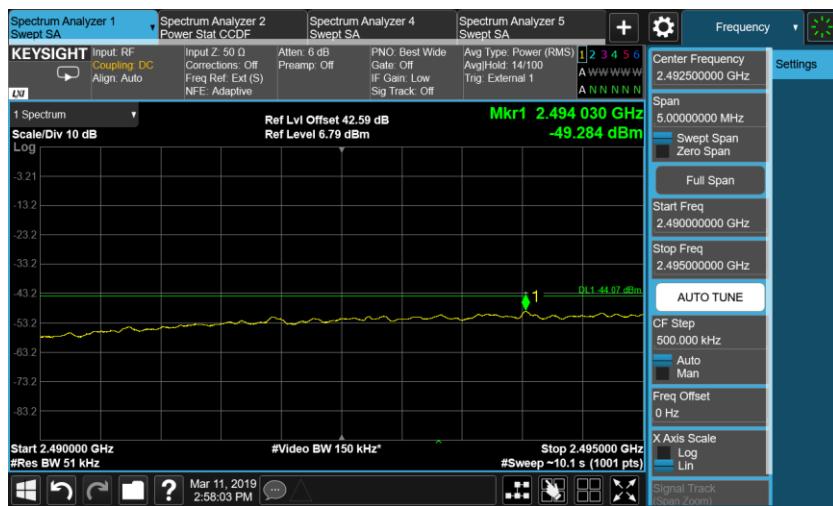
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

A.3.4 Measurement result

Configuration NR-MIMO-1C-BE, QPSK

Band Edge Frequency	Channel Bandwidth	RBW(KHz)	Limit(dBm)
Channel Position B 2496.0MHz	NR 100.0 MHz	50	-44.07
Channel Position T 2690.0MHz	NR 100.0 MHz	50	-44.07

Port 55, Channel Position B, 100.0MHz



Port 55, Channel Position T, 100.0MHz



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 [$10\log(1/64)$] by using the Measure and Add $10\log(N)$ 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 .

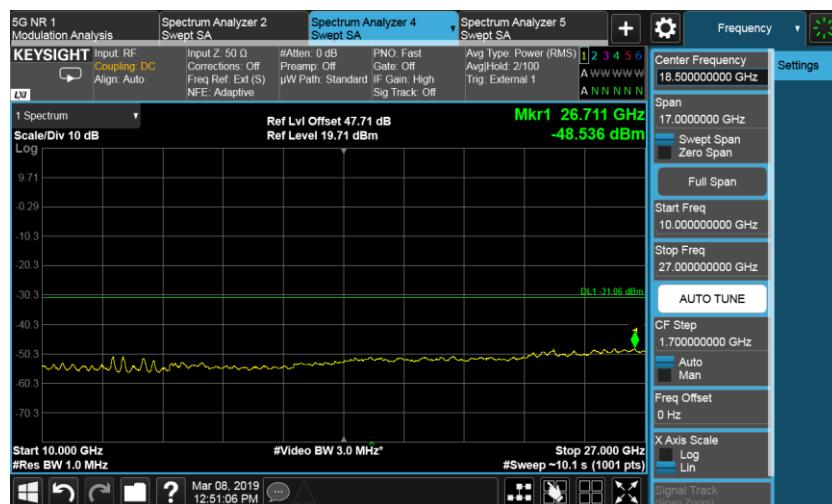
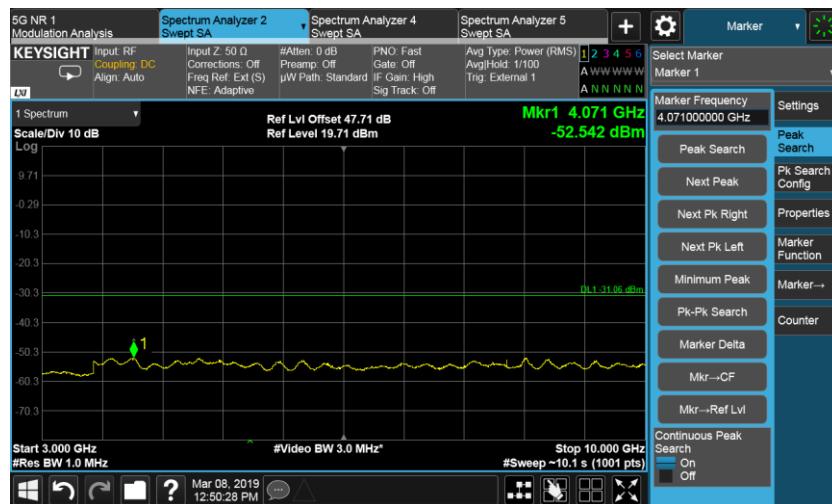
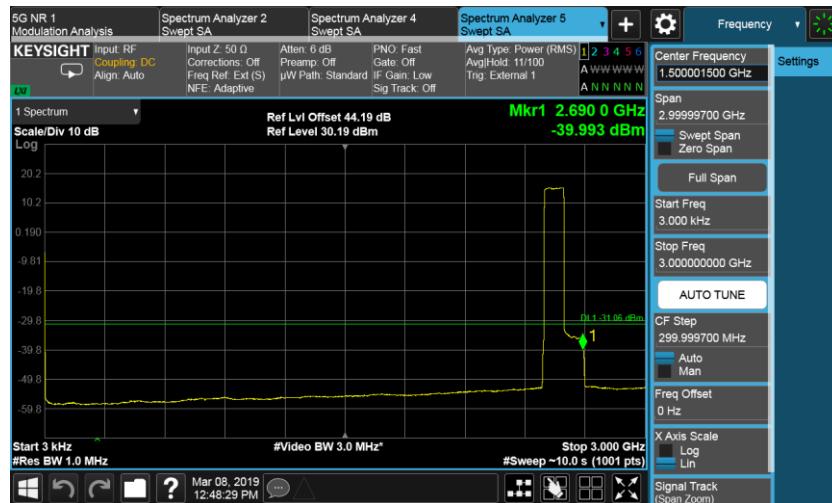
A.4.3 Measurement limit

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 $43 + 10\log(P)$ dB.

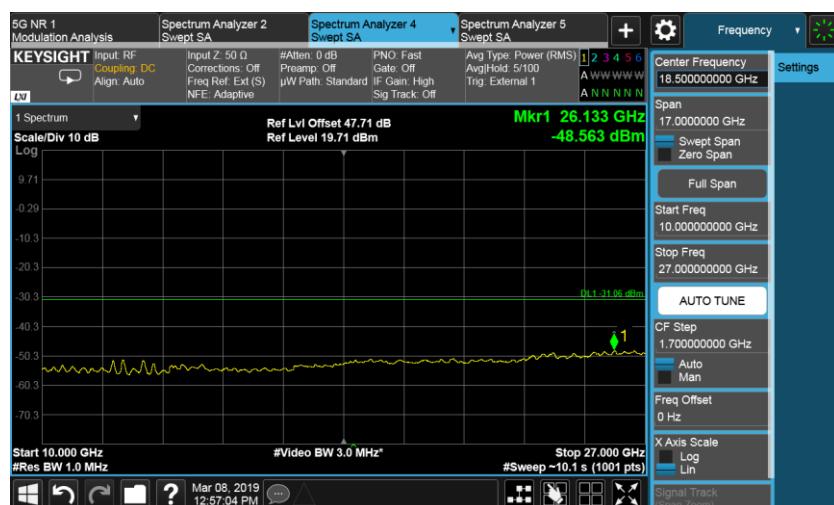
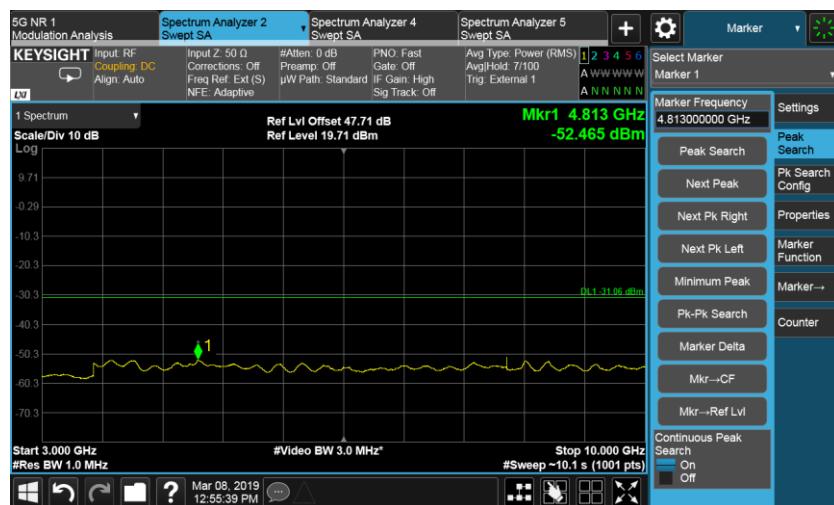
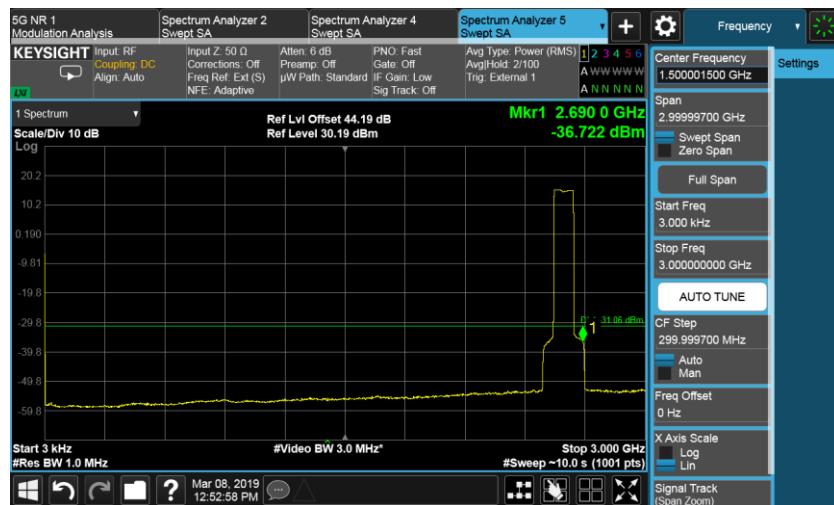
A.4.4 Measurement results

Configuration NR-MIMO-1C-100, QPSK

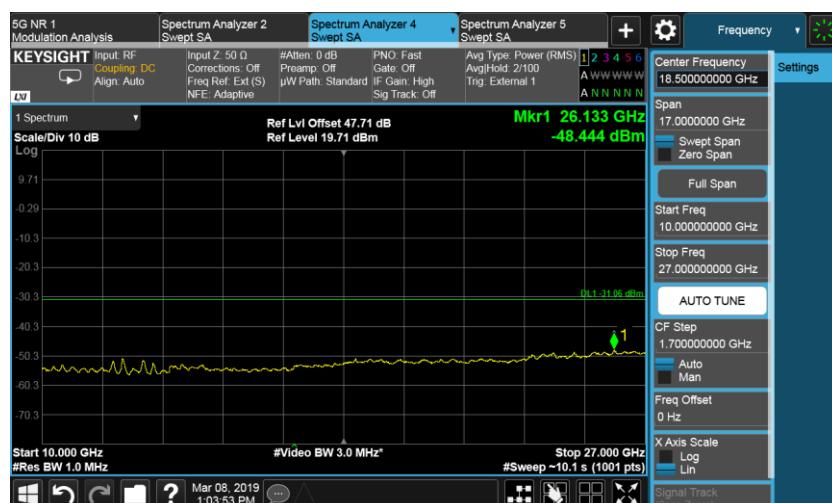
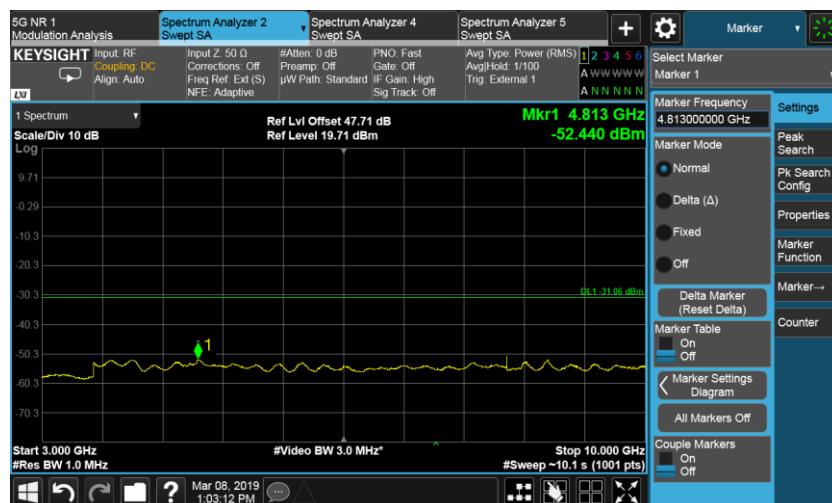
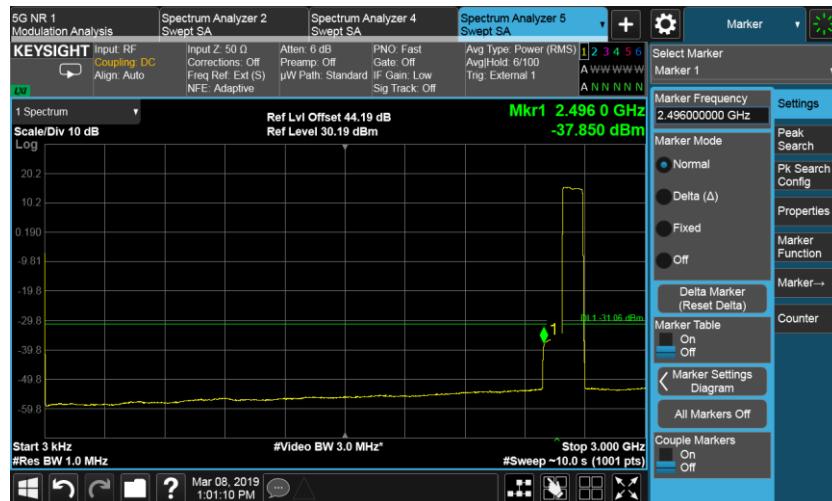
Port 55, Channel Position B



Port 55, Channel Position M



Port 55, Channel Position T



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 dB μ V/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:

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

As per 24.238 (a) the spurious emission must be attenuated by 43 + 10log (Po) dB this gives:

$$43 + 10\log(16.56) = 55.19 \text{ dB}$$

Therefore the limit at 3m measurement distance is:

$$139.57 - 55.19 = 84.4 \text{ dB}\mu\text{V/m}$$

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-100, NR 100.0M,QPSK;:

Maximum Output Power 53.0 dBm ;

Channel Position	Channel Frequencies
Channel Position B	2546.01

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-100, NR 100.0M,QPSK;:

Maximum Output Power 53.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	2593.02

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-100, NR 100.0M,QPSK;:

Maximum Output Power 53.0 dBm ;

Channel Position	Channel Frequencies
Channel Position T	2640

No emissions were detected within 20dB of the limit.

Configuration NR-MIMO-1C-100, NR 100.0M,64QAM;:

Maximum Output Power 53.0 dBm ;

Channel Position	Channel Frequencies
Channel Position B	2546.01

No emissions were detected within 20dB of the limit.

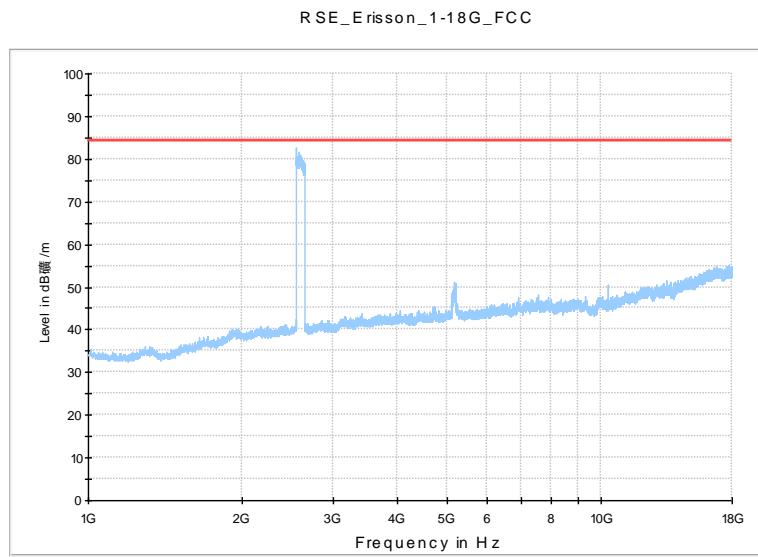
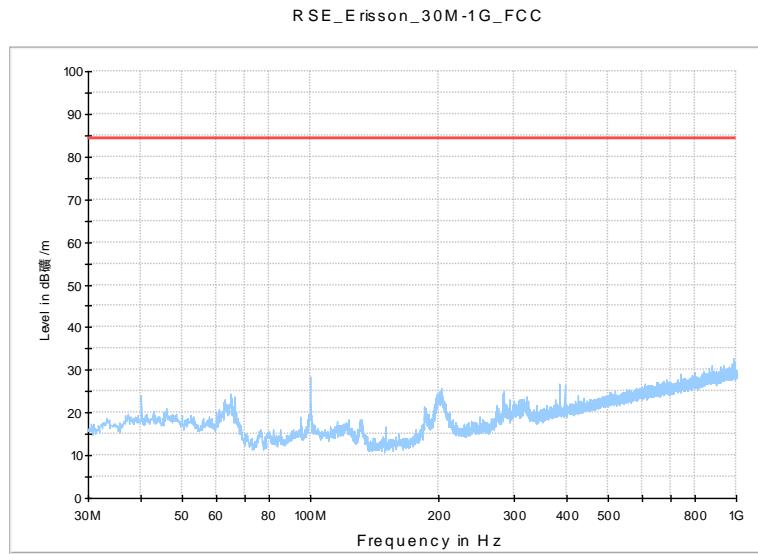
Configuration NR-MIMO-1C-100, NR 100.0M,256QAM;:

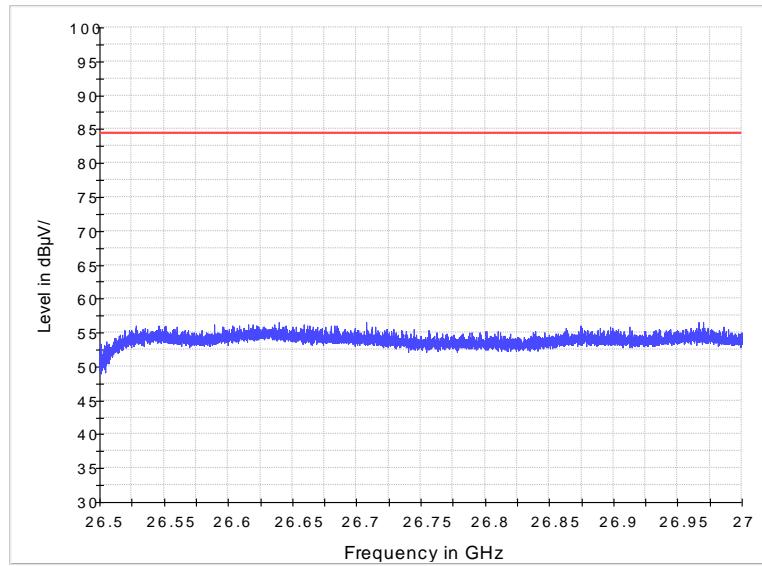
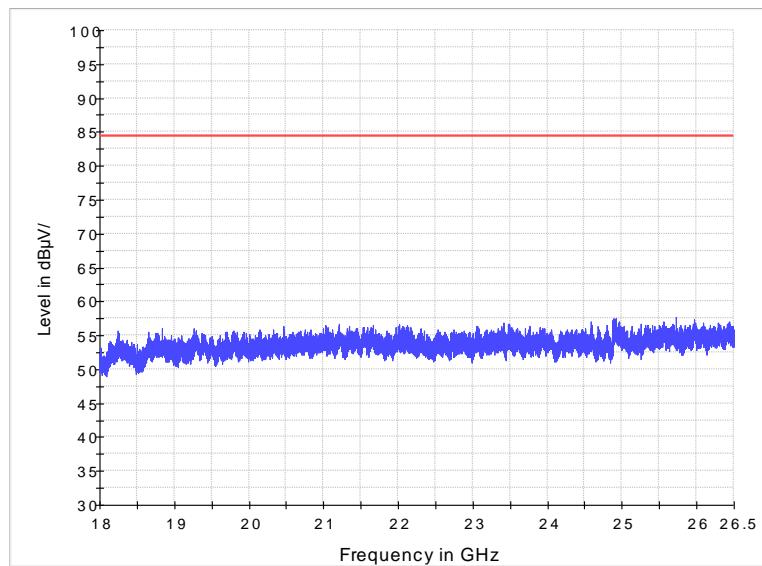
Maximum Output Power 53.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	2593.02

No emissions were detected within 20dB of the limit.

Final Results





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-100

Maximum Output Power 34.95dBm per port, Channel Bandwidth 100MHz

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	-15.13	-10.34	9.43
	-20	14.15	12.24	-14.52
	-10	-12.06	-10.52	-7.86
	0	-9.19	-11.02	-14.68
	10	-10.92	-11.08	12.79
	20	-9.27	-12.38	-8.57
	30	10.06	-10.96	-11.76
	40	12.75	9.32	10.41
	50	10.43	9.07	11.89

Frequency Error – Voltage Variation

Configuration NR-MIMO-1C-100

Maximum Output Power 34.95dBm per port, Channel Bandwidth 100MHz

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-40.8	20	11.16	10.20	9.65
-48	20	9.58	8.52	9.32
-55.2	20	10.86	9.95	10.57

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

**Certificate of Accreditation to ISO/IEC 17025:2005**

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 Communiqué dated January 2009).*

2018-09-28 through 2019-09-30

Effective Dates



For the National Voluntary Laboratory Accreditation Program



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