



# FCC RADIO TEST REPORT

**FCC ID** : 2AJN7-TP00128AUC  
**Equipment** : Notebook Computer  
**Brand Name** : Lenovo  
**Model Name** : TP00128A  
**Applicant** : LC Future Center Limited Taiwan Branch  
7F., No. 780, Bei'an Rd., Zhongshan Dist.,  
Taipei City 104, Taiwan  
**Manufacturer** : LCFC (HeFei) Electronics Technology Co., Ltd.  
No. 3188-1, Yungu Road (Hefei Export  
Processing Zone), Hefei Economics &  
Technology Development Area, Anhui, CHINA  
**Standard** : FCC 47 CFR Part 2, 22(H), 24(E), 27

Equipment: Foxconn T99W175 tested inside of Lenovo Notebook Computer.

The product was received on Nov. 06, 2020 and testing was started from Nov. 20, 2020 and completed on Nov. 23, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

*Louis Wu*

Approved by: Louis Wu

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan



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### History of this test report

Report No.	Version	Description	Issued Date
FG0N0620C	01	Initial issue of report	Jan. 08, 2021
FG0N0620C	02	Add power table	Feb. 23, 2021
FG0N0620C	03	Add remark description in test mode	Feb. 26, 2021



### Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power	Reporting only	-
	§22.913 (a)(2)	Effective Radiated Power (n5)	Pass	
	§27.50 (c)(10)	Effective Radiated Power (n12) (n71)		
	§24.232 (c) §27.50 (h)(2)	Equivalent Isotropic Radiated Power (n2) (n7) (n38) (n41)		
	§27.50 (d)(4)	Equivalent Isotropic Radiated Power (n66)		
-	§24.232 (d) §27.50 (d)(5)	Peak-to-Average Ratio	-	See Note
-	§2.1049	Occupied Bandwidth	-	See Note
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g) §27.53 (h)	Conducted Band Edge Measurement (n2) (n5) (n12) (n66) (n71)	-	See Note
	§2.1051 §27.53 (m)(4)	Conducted Band Edge Measurement (n7) (n38) (n41)		
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g) §27.53 (h)	Conducted Spurious Emission (n2) (n5) (n12) (n66) (n71)	-	See Note
	§2.1051 §27.53 (m)(4)	Conducted Spurious Emission (n7) (n38) (n41)		
-	§2.1055 §22.355 §24.235 §27.54	Frequency Stability Temperature & Voltage	-	See Note



Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
4.2	§2.1053 §22.917 (a) §24.238 (a) §27.53 (g) §27.53 (h)	Radiated Spurious Emission (n2) (n5) (n12) (n66) (n71)	Pass	Under limit 17.96 dB at 5686.000 MHz
	§2.1051 §27.53 (m)(4)	Radiated Spurious Emission (n7) (n38) (n41)		

**Note:** The module (Model: T99W175) makes no difference after verifying output power, this report reuses test data from the module report.

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**

**Report Producer: Vivian Hsu**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
<b>Equipment</b>	Notebook Computer
<b>Brand Name</b>	Lenovo
<b>Model Name</b>	TP00128A
<b>FCC ID</b>	2AJN7-TP00128AUC
<b>EUT supports Radios application</b>	WCDMA/HSPA/LTE/5G NR/GNSS/NFC/UWB
<b>EUT Stage</b>	Production Unit

**Remark:**

1. The above EUT's information was declared by manufacturer.
2. Equipment: Foxconn T99W175 tested inside of Lenovo Notebook Computer.

WWAN Antenna Information				
<b>Main Antenna</b>	<b>Manufacturer</b>	Amphenol	<b>Peak gain (dBi)</b>	1.62
	<b>Part number</b>	TKC114-16-000-C	<b>Type</b>	PIFA
<b>MIMO 2 Antenna</b>	<b>Manufacturer</b>	Amphenol	<b>Peak gain (dBi)</b>	1.52
	<b>Part number</b>	TKC113-16-000-C	<b>Type</b>	PIFA

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.
2. All test items were performed with Main Antenna.

## 1.2 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
<b>Tx Frequency</b>	5G NR n2: 1852.5 MHz ~ 1907.5 MHz 5G NR n5: 826.5 MHz ~ 846.5 MHz 5G NR n7: 2502.5 MHz ~ 2567.5 MHz 5G NR n12: 701.5 MHz ~ 713.5 MHz 5G NR n38: 2572.5 MHz ~ 2617.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 1712.5 MHz ~ 1777.5 MHz 5G NR n71: 668.0 MHz ~ 693.0 MHz
<b>Rx Frequency</b>	5G NR n2: 1932.5 MHz ~ 1987.5 MHz 5G NR n5: 871.5 MHz ~ 891.5 MHz 5G NR n7: 2502.5 MHz ~ 2567.5 MHz 5G NR n12: 731.5 MHz ~ 743.5 MHz 5G NR n38: 2572.5 MHz ~ 2617.5 MHz 5G NR n41: 2506.02 MHz ~ 2679.99 MHz 5G NR n66: 2112.5 MHz ~ 2197.5 MHz 5G NR n71: 668.0 MHz ~ 693.0 MHz
<b>Bandwidth</b>	5G NR n2: 5MHz / 10MHz / 15MHz / 20MHz 5G NR n5: 5MHz / 10MHz / 15MHz / 20MHz 5G NR n7: 5MHz / 10MHz / 15MHz / 20MHz 5G NR n12: 5MHz / 10MHz / 15MHz 5G NR n38: 5MHz / 10MHz / 15MHz / 20MHz 5G NR n41: 20MHz / 40MHz / 50MHz / 60MHz / 80MHz / 90MHz / 100MHz 5G NR n66: 5MHz / 10MHz / 15MHz / 20MHz 5G NR n71: 5MHz / 10MHz / 15MHz / 20MHz
<b>Maximum Output Power to Antenna</b>	<b>&lt;Ant. 0&gt;</b> 5G NR n2 : 22.65 dBm 5G NR n5 : 23.62 dBm 5G NR n12 : 23.77 dBm 5G NR n66 : 23.78 dBm 5G NR n71 : 23.82 dBm <b>&lt;Ant. 2&gt;</b> 5G NR n2 : 23.43 dBm 5G NR n7 : 23.49 dBm 5G NR n38 : 23.62 dBm 5G NR n41 : 23.48 dBm 5G NR n41 : 25.51 dBm for HPUE 5G NR n66 : 23.95 dBm
<b>Type of Modulation</b>	PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

## 1.3 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.4 Testing Location

<b>Test Site</b>	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No.52 , Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan
<b>Test Site No.</b>	<b>Sporton Site No.</b>
	TH05-HY
<b>Test Engineer</b>	Jacky Wang
<b>Temperature</b>	23~25°C
<b>Relative Humidity</b>	52~55%

<b>Test Site</b>	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan
<b>Test Site No.</b>	<b>Sporton Site No.</b>
	03CH12-HY
<b>Test Engineer</b>	Jack Cheng, Lance Chiang and Chuan Chu
<b>Temperature</b>	22.3~26.4°C
<b>Relative Humidity</b>	58~66%

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW1190 and TW0007

## 1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ FCC 47 CFR Part 2, 22(H), 24(E), 27
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.





## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

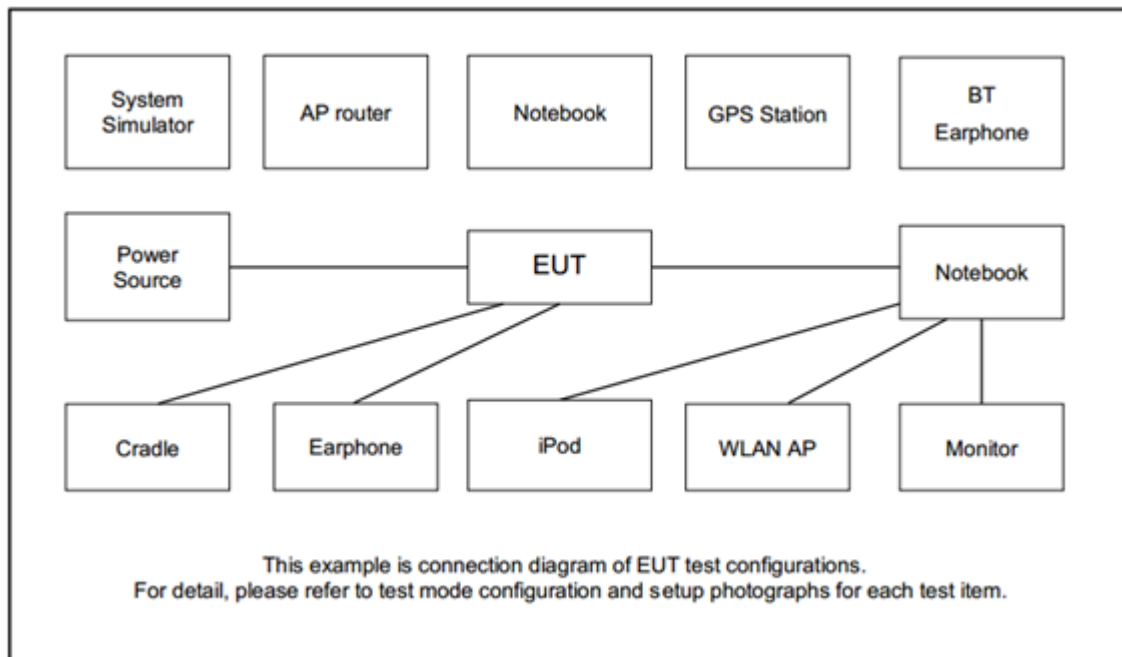
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in Tablet Type (three orthogonal panels, X, Y, Z) and Notebook Type. The worst cases (Notebook Type with Accessory for 5G NR n66 ; Y Plane with Accessory for 5G NR n5, n2, n12, n41) were recorded in this report.

Test Items	NR	Bandwidth (MHz)						Modulation					RB #			Test Channel			
		5	10	15	20	40	50	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H	
Max. Output Power	n2				v	-	-	v	v	v	v	v	v	v	v	v	v	v	v
	n5				v	-	-	v	v	v	v	v	v	v		v	v	v	v
	n7				v	-	-	v	v	v	v	v	v	v		v	v	v	v
	n12			v	-	-	-	v	v	v	v	v	v	v		v	v	v	v
	n66				v	-	-	v	v	v	v	v	v	v		v	v	v	v
	n71				v	-	-	v	v	v	v	v	v	v		v	v	v	v
E.R.P / E.I.R.P	n2				v	-	-	v	v	v	v	v		Max Power					
	n5				v	-	-	v	v	v	v	v							
	n7				v	-	-	v	v	v	v	v							
	n12			v	-	-	-	v	v	v	v	v							
	n66				v	-	-	v	v	v	v	v							
	n71				v	-	-	v	v	v	v	v							
Radiated Spurious Emission	n2			v		-	-	v					v			v	v	v	
	n5		v			-	-	v					v			v	v	v	
	n12		v			-	-	v					v			v	v	v	
	n66			v		-	-	v					v			v	v	v	
Remark	<ol style="list-style-type: none"> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> <li>The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.</li> <li>Test combination is EN-DC 5A-n2A, EN-DC 66A-n5A, EN-DC 2A-n12A., EN-DC 12A-n66A.</li> <li>For radiated measurement, pre-scanned in two modes, DFT-s OFDM and CP OFDM. The worst cases (DFT-s OFDM) were recorded in this report.</li> <li>All the 5G NR Sub-carrier only support 15kHz.</li> </ol>																		

Test Items	NR	Bandwidth (MHz)								Modulation					RB #			Test Channel			
		10	20	40	50	60	80	90	100	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H	
Max. Output Power	n38		v							v	v	v	v	v	v			v	v	v	
	n41								v	v	v	v	v	v	v		v	v	v	v	
Radiated Spurious Emission	n41		v							v						v			v	v	v
Remark	<ol style="list-style-type: none"> <li>The mark "v" means that this configuration is chosen for testing</li> <li>The mark "-" means that this bandwidth is not supported.</li> <li>The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.</li> <li>Test combination is EN-DC 2A-n41A.</li> <li>For radiated measurement, pre-scanned in two modes, DFT-s OFDM and CP OFDM. The worst cases (DFT-s OFDM) were recorded in this report.</li> <li>All the 5G NR Sub-carrier only support 30kHz.</li> </ol>																				

## 2.2 Connection Diagram of Test System



## 2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0m	N/A
2.	System Simulator	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m
3.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m

## 2.4 Frequency List of Low/Middle/High Channels

5G NR Band n2 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	371500	376000	380500
	Frequency	1857.5	1880	1902.5

5G NR Band n5 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	165800	167300	168800
	Frequency	829	836.5	844

5G NR Band n12 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	140800	141500	142200
	Frequency	704	707.5	711

5G NR Band n41 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	501201	518601	535998
	Frequency	2506.005	2593.005	2679.99

5G NR Band n66 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	343500	349000	354500
	Frequency	1717.5	1745	1772.5

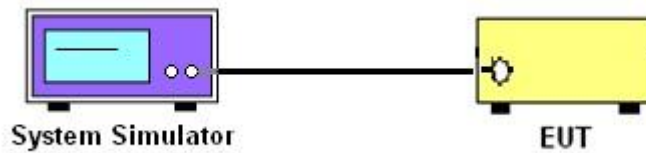
### 3 Conducted Test Items

#### 3.1 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.1 Test Setup

##### 3.1.2 Conducted Output Power



##### 3.1.3 Test Result of Conducted Test

Please refer to Appendix A.

## 3.2 Conducted Output Power and ERP/EIRP

### 3.2.1 Description of the Conducted Output Power Measurement and ERP/EIRP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for 5G NR n5

The ERP of mobile transmitters must not exceed 3 Watts for 5G NR n12 and n71

The EIRP of mobile transmitters must not exceed 2 Watts for 5G NR n2 and n41 and n7

The EIRP of mobile transmitters must not exceed 1 Watts for 5G NR n66

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_C$ ,  $ERP = EIRP - 2.15$ , where

$P_T$  = transmitter output power in dBm

$G_T$  = gain of the transmitting antenna in dBi

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

### 3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

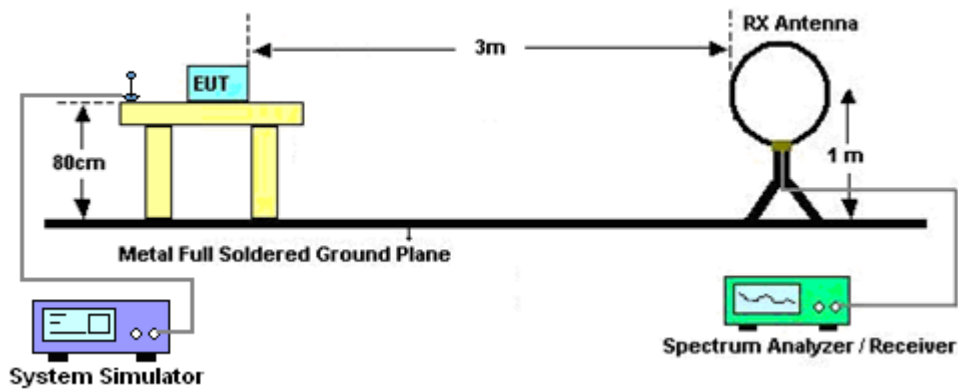
## 4 Radiated Test Items

### 4.1 Measuring Instruments

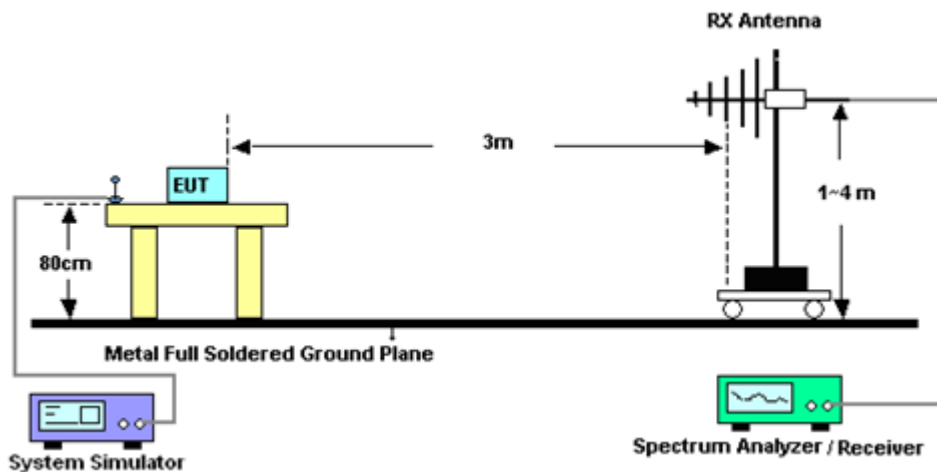
See list of measuring instruments of this test report.

#### 4.1.1 Test Setup

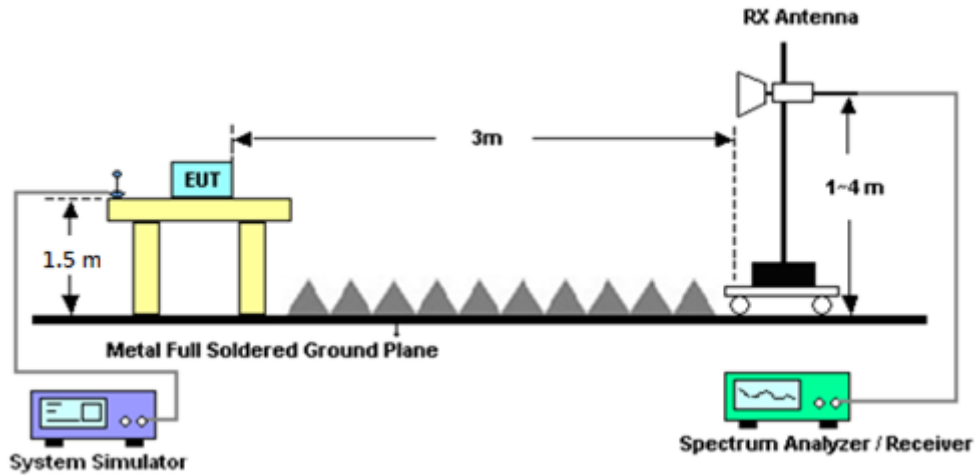
For radiated test below 30MHz



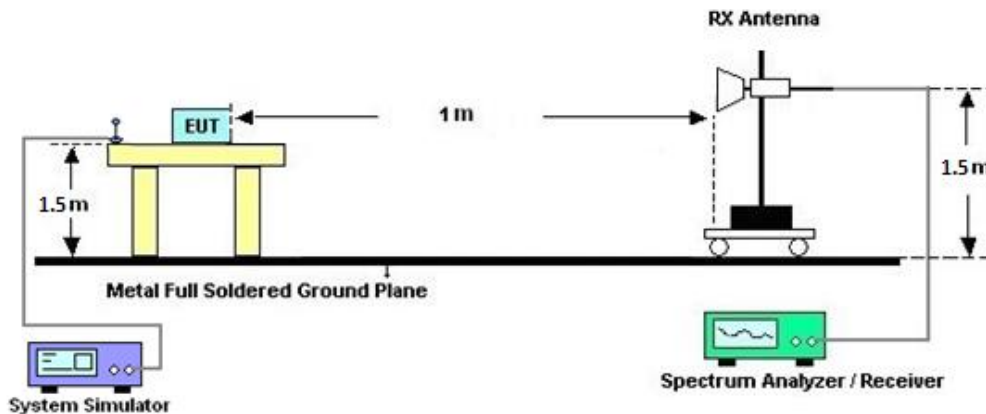
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



#### 4.1.2 Test Result of Radiated Test

Please refer to Appendix B.

**Note:**

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.



## 4.2 Radiated Spurious Emission Measurement

### 4.2.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB.

For 5G NR n41

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least  $55 + 10 \log (P)$  dB.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

### 4.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a turntable 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from  $43 + 10\log(P)$ dB below the transmitter power P(Watts)

For 5G NR n41

The limit line is derived from  $55 + 10\log(P)$ dB below the transmitter power P(Watts)

EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain

ERP (dBm) = EIRP - 2.15





## 5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Nov. 20, 2020~ Nov. 23, 2020	Dec. 25, 2020	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01 N-06	40103 & 07	30MHz~1GHz	Apr. 29, 2020	Nov. 20, 2020~ Nov. 23, 2020	Apr. 28, 2021	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-121 2	1GHz~18GHz	May 20, 2020	Nov. 20, 2020~ Nov. 23, 2020	May 19, 2021	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-124 1	1GHz ~ 18GHz	Jul. 15, 2020	Nov. 20, 2020~ Nov. 23, 2020	Jul. 14, 2021	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 584	18GHz~40GHz	Dec. 10, 2019	Nov. 20, 2020~ Nov. 23, 2020	Dec. 09, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 980	18GHz ~ 40GHz	Jan. 10, 2020	Nov. 20, 2020~ Nov. 23, 2020	Jan. 09, 2021	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2020	Nov. 20, 2020~ Nov. 23, 2020	Mar. 24, 2021	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY572801 20	1GHz~26.5GHz	Jul. 20, 2020	Nov. 20, 2020~ Nov. 23, 2020	Jul. 19, 2021	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55-3 03K	171000180 0054002	1GHz~18GHz	Feb. 07, 2020	Nov. 20, 2020~ Nov. 23, 2020	Feb. 06, 2021	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Nov. 20, 2020~ Nov. 23, 2020	Dec. 12, 2020	Radiation (03CH12-HY)
Spectrum Analyzer	Agilent	N9010A	MY542004 85	10Hz~44GHz	Feb. 10, 2020	Nov. 20, 2020~ Nov. 23, 2020	Feb. 09, 2021	Radiation (03CH12-HY)
Signal Generator	Anritsu	MG3694C	163401	0.1Hz~40GHz	Feb. 15, 2020	Nov. 20, 2020~ Nov. 23, 2020	Feb. 14, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4 PE	9kHz~30MHz	Mar. 12, 2020	Nov. 20, 2020~ Nov. 23, 2020	Mar. 11, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Dec. 12, 2019	Nov. 20, 2020~ Nov. 23, 2020	Dec. 11, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 25, 2020	Nov. 20, 2020~ Nov. 23, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz~40GHz	Feb. 25, 2020	Nov. 20, 2020~ Nov. 23, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP140349	N/A	Oct. 02, 2020	Nov. 20, 2020~ Nov. 23, 2020	Oct. 01, 2021	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 20, 2020~ Nov. 23, 2020	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500- B	N/A	1m~4m	N/A	Nov. 20, 2020~ Nov. 23, 2020	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 20, 2020~ Nov. 23, 2020	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-00098 9	N/A	N/A	Nov. 20, 2020~ Nov. 23, 2020	N/A	Radiation (03CH12-HY)
Base Station	Anritsu	MT8820C	620138176 6	N/A	Jun. 29, 2020	Nov. 21, 2020	Jun. 28, 2021	Conducted (TH05-HY)
Base Station	Keysight	E5515C	MY502672 36	N/A	Mar. 18, 2020	Nov. 21, 2020	Mar. 17, 2021	Conducted (TH05-HY)



## 6 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.07
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### Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.21
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### Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.80
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## Appendix A. Test Results of Conducted Test

### Conducted Output Power(Average power) and ERP/EIRP

NR n2_ANT.0 Maximum Average Power [dBm] (GT - LC = 0.5 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	22.52	22.65	22.47	23.15	0.2065
20	1	104		22.40	22.58	22.37		
20	50	25		22.13	22.26	21.99		
20	1	1	QPSK	22.26	22.48	22.28		
20	1	104		22.44	22.63	22.42		
20	50	25		21.56	21.74	21.50		
20	1	1	16-QAM	21.32	21.46	21.21	21.96	0.1570
20	1	1	64-QAM	20.17	20.37	20.19		
20	1	1	256-QAM	17.78	17.99	17.80		
Limit	EIRP < 2W			Result			Pass	

NR n5_ANT.0 Maximum Average Power [dBm] (GT - LC = -0.43 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	ERP (dBm)	ERP(W)
20	1	1	PI/2 BPSK	23.58	23.62	23.44	21.04	0.1271
20	1	104		23.14	23.17	23.03		
20	100	0		22.91	22.93	22.84		
20	1	1	QPSK	23.26	23.36	23.24		
20	1	104		23.08	23.05	22.93		
20	100	0		22.35	22.46	22.26		
20	1	1	16-QAM	22.58	22.61	22.37	20.03	0.1007
20	1	1	64-QAM	20.62	21.02	20.65		
20	1	1	256-QAM	18.83	19.16	18.76		
Limit	ERP < 7W			Result			Pass	

NR n7_ANT.2 Maximum Average Power [dBm] (GT - LC = 0.36 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	23.49	23.35	23.24	23.85	0.2427
20	1	104		23.27	23.17	23.10		
20	100	0		22.86	22.78	22.77		
20	1	1	QPSK	23.30	23.19	22.98		
20	1	104		23.13	23.04	22.89		
20	100	0		22.52	22.34	22.26		
20	1	1	16-QAM	22.49	22.44	22.30	22.85	0.1928
20	1	1	64-QAM	21.28	21.24	21.11		
20	1	1	256-QAM	18.98	18.87	18.76		
Limit	EIRP < 2W			Result			Pass	



NR n12_ANT.0 Maximum Average Power [dBm] (GT - LC = -1.66 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	ERP (dBm)	ERP(W)
15	1	1	PI/2 BPSK	23.77	23.75	23.70	19.96	0.0991
15	1	77		23.21	23.15	23.05		
15	75	0		22.97	22.89	22.86		
15	1	1	QPSK	23.58	23.46	23.48	18.94	0.0783
15	75	0		22.50	22.44	22.41		
15	1	1	16-QAM	22.75	22.70	22.56		
15	1	1	64-QAM	21.34	21.33	21.35	18.94	0.0783
15	1	1	256-QAM	19.11	19.10	18.95		
Limit	ERP < 3W			Result			Pass	

NR n38_ANT.2 Maximum Average Power [dBm] (GT - LC = 0.96 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	23.57	23.62	23.51	24.58	0.2871
20	1	1	QPSK	22.76	22.74	22.83		
20	1	1	16-QAM	22.33	22.42	22.43	23.39	0.2183
20	1	1	64-QAM	21.14	21.07	21.14		
20	1	1	256-QAM	19.09	19.07	19.07		
Limit	EIRP < 2W			Result			Pass	



NR n41_ANT.2 Maximum Average Power [dBm] (GT - LC = 1.62 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
100	1	1	PI/2 BPSK	23.48	23.37	23.35	25.10	0.3236
100	1	271		22.86	22.96	22.80		
100	270	0		23.01	23.02	23.09		
100	1	1	QPSK	23.25	23.27	23.07	23.88	0.2443
100	1	271		22.82	22.92	22.94		
100	1	1	16-QAM	22.08	22.19	22.26	23.88	0.2443
100	1	1	64-QAM	21.02	21.05	21.05		
100	1	1	256-QAM	19.15	19.23	19.22		
Limit	EIRP < 2W			Result			Pass	

NR n66_ANT.0 Maximum Average Power [dBm] (GT - LC = 0.8 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	23.78	23.54	23.66	24.58	0.2871
20	1	104		23.56	23.12	23.30		
20	100	0		23.23	22.78	23.35		
20	1	1	QPSK	23.31	23.32	23.39	23.72	0.2355
20	1	104		23.38	23.34	23.55		
20	100	0		22.81	22.22	22.64		
20	1	1	16-QAM	22.92	22.41	22.91	23.72	0.2355
20	1	1	64-QAM	21.36	21.01	21.30		
20	1	1	256-QAM	19.31	18.74	19.43		
Limit	EIRP < 1W			Result			Pass	

NR n71_ANT.0 Maximum Average Power [dBm] (GT - LC = -1.91 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	ERP (dBm)	ERP(W)
20	1	1	PI/2 BPSK	23.82	23.70	23.71	19.76	0.0946
20	1	104		23.70	23.49	23.46		
20	100	0		23.33	23.12	23.11		
20	1	1	QPSK	23.51	23.49	23.42	18.68	0.0738
20	1	104		23.52	23.40	23.35		
20	100	0		22.87	22.70	22.65		
20	1	1	16-QAM	22.74	22.71	22.71	18.68	0.0738
20	1	1	64-QAM	21.23	21.29	21.13		
20	1	1	256-QAM	19.25	19.35	19.15		
Limit	ERP < 3W			Result			Pass	

NRn41_HPUE_ANT.2 Maximum Average Power [dBm] (GT - LC = 1.62 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
100	1	1	PI/2 BPSK	25.51	25.36	25.38	27.13	0.5164
100	1	271		25.25	25.24	25.17		
100	270	0		25.38	25.43	25.35		
100	1	1	16-QAM	24.73	24.71	24.68	26.35	0.4315
100	1	1	64-QAM	23.47	23.45	23.45		
100	1	1	256-QAM	21.67	21.58	21.54		
Limit	EIRP < 2W			Result			Pass	



NR n2_ANT.2 Maximum Average Power [dBm] (GT - LC = 0.5 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	23.43	23.20	23.37	23.93	0.2472
20	1	104		23.25	23.12	23.29		
20	100	0		22.80	22.66	22.82		
20	1	1	QPSK	23.32	23.09	23.19		
20	1	104		23.29	23.03	23.24		
20	100	0		22.34	22.19	22.38		
20	1	1	16-QAM	22.17	22.04	22.08	22.67	0.1849
20	1	1	64-QAM	20.49	20.45	20.63		
20	1	1	256-QAM	18.85	18.68	18.70		
Limit	EIRP < 2W			Result			Pass	

NR n66_ANT.2 Maximum Average Power [dBm] (GT - LC = 0.8 dB)								
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest	EIRP (dBm)	EIRP(W)
20	1	1	PI/2 BPSK	23.95	23.57	23.53	24.75	0.2985
20	1	104		23.75	23.28	23.32		
20	100	0		23.19	22.78	22.75		
20	1	1	QPSK	23.72	23.43	23.27		
20	1	104		23.55	23.21	23.14		
20	100	0		22.69	22.26	22.23		
20	1	1	16-QAM	22.63	22.29	22.32	23.43	0.2203
20	1	1	64-QAM	21.27	20.97	20.82		
20	1	1	256-QAM	19.29	18.85	18.90		
Limit	EIRP < 1W			Result			Pass	



Appendix B. Test Results of Radiated Test

EN-DC 66A-n5A

EN-DC 66A-n5A / 10MHz / PI/2 BPSK									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	1648	-42.56	-13	-29.56	-71.01	-48.15	0.92	8.66	H
	2472	-38.97	-13	-25.97	-72.54	-46.34	1.14	10.66	H
	3296	-37.43	-13	-24.43	-72.8	-45.97	1.32	12.01	H
									H
									H
									H
	1648	-43.85	-13	-30.85	-71.77	-49.44	0.92	8.66	V
	2472	-38.66	-13	-25.66	-72.38	-46.03	1.14	10.66	V
	3296	-36.91	-13	-23.91	-72.75	-45.45	1.32	12.01	V
									V
									V
									V
Middle	1672	-42.95	-13	-29.95	-71.48	-48.63	0.93	8.75	H
	2504	-39.09	-13	-26.09	-72.72	-46.49	1.15	10.70	H
	3336	-37.63	-13	-24.63	-72.88	-46.26	1.33	12.11	H
									H
									H
									H
	1672	-43.32	-13	-30.32	-71.22	-49.00	0.93	8.75	V
	2504	-38.59	-13	-25.59	-72.43	-45.99	1.15	10.70	V
	3336	-36.95	-13	-23.95	-72.66	-45.58	1.33	12.11	V
									V
									V
									V



Highest	1688	-42.74	-13	-29.74	-71.32	-48.47	0.93	8.81	H
	2536	-39.22	-13	-26.22	-72.85	-46.65	1.16	10.74	H
	3376	-38.07	-13	-25.07	-73.2	-46.78	1.34	12.20	H
									H
									H
									H
									H
	1688	-43.71	-13	-30.71	-71.6	-49.44	0.93	8.81	V
	2536	-39.13	-13	-26.13	-72.89	-46.56	1.16	10.74	V
	3376	-37.40	-13	-24.40	-72.97	-46.11	1.34	12.20	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.





EN-DC 5A-n2A

EN-DC 5A-n2A / 15MHz / PI/2 BPSK									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	3700	-36.91	-13	-23.91	-74.26	-48.12	1.41	12.62	H
	5554	-31.04	-13	-18.04	-74.09	-42.60	1.74	13.30	H
	7407	-47.45	-13	-34.45	-74.5	-56.76	1.94	11.25	H
									H
									H
									H
									H
	3700	-37.00	-13	-24.00	-74.49	-48.21	1.41	12.62	V
	5554	-32.08	-13	-19.08	-74.66	-43.64	1.74	13.30	V
	7407	-47.47	-13	-34.47	-74.37	-56.78	1.94	11.25	V
									V
									V
									V
									V
Middle	3748	-36.69	-13	-23.69	-74.29	-47.91	1.42	12.65	H
	5620	-31.85	-13	-18.85	-74.86	-43.41	1.74	13.30	H
	7495	-47.45	-13	-34.45	-74.04	-56.57	1.99	11.11	H
									H
									H
									H
									H
	3748	-36.22	-13	-23.22	-74.02	-47.44	1.42	12.65	V
	5620	-32.20	-13	-19.20	-74.85	-43.76	1.74	13.30	V
	7495	-47.43	-13	-34.43	-73.99	-56.55	1.99	11.11	V
									V
									V
									V
									V



Highest	3790	-35.84	-13	-22.84	-73.67	-47.08	1.44	12.67	H
	5686	-30.96	-13	-17.96	-74.28	-42.53	1.73	13.30	H
	7583	-48.10	-13	-35.10	-74.2	-57.21	2.00	11.12	H
									H
									H
									H
									H
	3790	-36.01	-13	-23.01	-74.09	-47.25	1.44	12.67	V
	5686	-32.24	-13	-19.24	-75.03	-43.81	1.73	13.30	V
	7583	-48.29	-13	-35.29	-74.34	-57.40	2.00	11.12	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



**EN-DC 2A-n12A**

EN-DC 2A-n12A / 10MHz / PI/2 BPSK									
Channel	Frequency ( MHz )	ERP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	1400	-51.25	-13	-38.25	-70.82	-55.90	0.84	7.64	H
	2096	-49.19	-13	-36.19	-71.81	-56.11	1.06	10.13	H
	2800	-47.67	-13	-34.67	-72.11	-55.36	1.22	11.06	H
									H
									H
									H
									H
	1400	-52.34	-13	-39.34	-70.68	-56.99	0.84	7.64	V
	2099	-50.78	-13	-37.78	-72.30	-57.71	1.06	10.14	V
	2800	-47.42	-13	-34.42	-71.80	-55.11	1.22	11.06	V
									V
									V
									V
									V
Middle	1408	-51.55	-13	-38.55	-71.09	-56.23	0.85	7.68	H
	2112	-49.50	-13	-36.50	-72.41	-56.44	1.06	10.16	H
	2816	-47.79	-13	-34.79	-72.29	-55.49	1.23	11.08	H
									H
									H
									H
									H
	1408	-52.96	-13	-39.96	-71.28	-57.64	0.85	7.68	V
	2112	-50.31	-13	-37.31	-72.10	-57.25	1.06	10.16	V
	2816	-48.15	-13	-35.15	-72.61	-55.85	1.23	11.08	V
									V
									V
									V
									V



Highest	1416	-51.62	-13	-38.62	-71.13	-56.34	0.85	7.71	H
	2120	-49.08	-13	-36.08	-72.13	-56.03	1.07	10.17	H
	2824	-47.85	-13	-34.85	-72.38	-55.56	1.23	11.09	H
									H
									H
									H
									H
	1416	-52.80	-13	-39.80	-71.10	-57.52	0.85	7.71	V
	2120	-50.20	-13	-37.20	-72.12	-57.15	1.07	10.17	V
	2824	-47.97	-13	-34.97	-72.47	-55.68	1.23	11.09	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



EN-DC 12A-n66A

EN-DC 12A-n66A / 15MHz / PI/2 BPSK									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	3420	-57.14	-13	-44.14	-73.06	-68.10	1.35	12.31	H
	5135	-53.41	-13	-40.41	-75.36	-64.55	1.65	12.79	H
	6843	-48.79	-13	-35.79	-74.16	-59.17	1.74	12.12	H
									H
									H
									H
									H
	3420	-56.98	-13	-43.98	-73.32	-67.94	1.35	12.31	V
	5135	-53.54	-13	-40.54	-75.24	-64.68	1.65	12.79	V
	6843	-49.51	-13	-36.51	-74.48	-59.89	1.74	12.12	V
									V
									V
									V
									V
Middle	3476	-56.70	-13	-43.70	-73.16	-67.79	1.36	12.44	H
	5219	-52.73	-13	-39.73	-74.72	-63.97	1.67	12.91	H
	6955	-48.20	-13	-35.20	-74.14	-58.44	1.73	11.96	H
									H
									H
									H
									H
	3476	-56.05	-13	-43.05	-72.88	-67.14	1.36	12.44	V
	5219	-52.98	-13	-39.98	-74.79	-64.22	1.67	12.91	V
	6955	-48.94	-13	-35.94	-74.41	-59.18	1.73	11.96	V
									V
									V
									V
									V
								V	



Highest	3532	-55.86	-13	-42.86	-72.8	-67.01	1.37	12.52	H
	5296	-52.80	-13	-39.80	-75.07	-64.13	1.69	13.01	H
	7067	-47.56	-13	-34.56	-73.93	-57.60	1.76	11.79	H
									H
									H
									H
									H
	3532	-55.80	-13	-42.80	-72.99	-66.95	1.37	12.52	V
	5296	-53.02	-13	-40.02	-75.01	-64.35	1.69	13.01	V
	7067	-48.28	-13	-35.28	-74.23	-58.32	1.76	11.79	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



EN-DC 2A-n41A

EN-DC 2A-n41A / 20MHz / PI/2 BPSK									
Channel	Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading (dBm)	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	4992	-52.36	-25	-27.36	-74.36	-63.35	1.61	12.60	H
	7488	-47.25	-25	-22.25	-73.66	-56.39	1.98	11.12	H
	9990	-44.42	-25	-19.42	-74	-53.33	2.40	11.30	H
									H
									H
									H
									H
	4992	-52.61	-25	-27.61	-74.15	-63.60	1.61	12.60	V
	7488	-47.49	-25	-22.49	-73.86	-56.63	1.98	11.12	V
	9990	-43.84	-25	-18.84	-74.19	-52.75	2.40	11.30	V
									V
									V
									V
									V
Middle	5166	-53.04	-25	-28.04	-74.99	-64.22	1.65	12.83	H
	7752	-47.92	-25	-22.92	-73.83	-57.05	2.03	11.15	H
	10377	-44.05	-25	-19.05	-74.57	-52.66	2.39	11.00	H
									H
									H
									H
									H
	5166	-53.39	-25	-28.39	-75.13	-64.57	1.65	12.83	V
	7752	-48.03	-25	-23.03	-73.7	-57.16	2.03	11.15	V
	10377	-44.25	-25	-19.25	-74.75	-52.86	2.39	11.00	V
									V
									V
									V
									V



Highest	5340	-52.32	-25	-27.32	-74.74	-63.70	1.70	13.08	H
	8016	-46.24	-25	-21.24	-73.4	-55.41	2.06	11.23	H
	10683	-43.06	-25	-18.06	-73.92	-51.47	2.49	10.90	H
									H
									H
									H
									H
	5340	-52.62	-25	-27.62	-74.7	-64.00	1.70	13.08	V
	8016	-46.52	-25	-21.52	-73.57	-55.69	2.06	11.23	V
	10683	-43.33	-25	-18.33	-73.95	-51.74	2.49	10.90	V
									V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.