

TEST REPORT

Report No.: SHATBL2407020W09

Applicant : Shanghai AllyNav Technology Co.,Ltd.

Product Name : Orchard Sparying Robot

Brand Name : N/A

Model Name : Aries300N

FCC ID : 2AT4H-ARIES300N

Test Standard : 47 CFR Part 2, 22, 24, 27

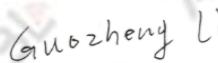
Date of Test : 2024.08.14-2025.02.25

Report Prepared by :



(Emily)

Report Approved by :



(Guozheng Li)

Authorized Signatory :



(Terry Yang)



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REVISION HISTORY

Rev.	Issue Date	Revisions	Revised by
00	2025.02.25	Initial Release	Guozheng Li

DECLARATION OF REPORT

1. The device has been tested by ATBL, and the test results show that the equipment under test (EUT) is in compliance with the requirements of FCC. And it is applicable only to the tested sample identified in the report.
2. This report shall not be reproduced except in full, without the written approval of ATBL, this document only be altered or revised by ATBL, personal only, and shall be noted in the revision of the document.
3. The general information of EUT in this report is provided by the customer or manufacture, ATBL is only responsible for the test data but not for the information provided by the customer or manufacture.
4. The results in this report is only apply to the sample as tested under conditions. The customer or manufacturer is responsible for ensuring that the additional production units of this model have the same electrical and mechanical components.

SUMMARY OF TEST RESULT

Report Section	Standard Section	Test Item	Limit	Judgment	Remark
3.1	§2.1046	Conducted Output Power	-	Report Only	--
	§24.232(c)	Equivalent Isotropic Radiated Power (Band 2)	EIRP < 2Watt	PASS	
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	EIRP < 1Watt		
	§22.913(a)(5)	Effective Radiated Power(Band 5)	ERP < 7Watt		
	§27.50(b)(10) §27.50(c)(10)	Effective Radiated Power(Band 12)	EIRP < 3Watt		
	§27.50(h)(2)	Equivalent Isotropic Radiated Power(Band 41)	EIRP < 2Watt		
3.2	§24.232(d)	Peak-to-Average Ratio	<13 dB	PASS	--
3.3	§2.1049	Occupied Bandwidth	-	Report Only	--
3.4	§2.1051 §22.917(a) §24.238(a) §27.53(h) §27.53(g)	Conducted Band Edge Measurement (Band 2) (Band 4) (Band 5)	< 43+10log10(P[Watts])	PASS	--
	§2.1051 §27.53(c)(2)(4) §27.53(g)	Conducted Band Edge Measurement (Band 12)			
	§27.53(m)(4)	Conducted Band Edge Measurement (Band 41)	§27.53(m)(4)		
3.5	§2.1051 §22.917(a) §24.238(a) §27.53(h) §27.53(g)	Conducted Spurious Emission (Band 2) (Band 4) (Band 5)	< 43+10log10(P[Watts])	PASS	--
	§2.1051 §27.53(c)(2)(4) §27.53(g)	Conducted Spurious Emission (Band 12)			
	§2.1051 §27.53(m)(4)	Conducted Spurious Emission (Band 41)	< 55+10log10(P[Watts])		
3.6	§2.1055 §22.355	Frequency Stability Temperature & Voltage	< 2.5 ppm for Part 22	PASS	--
	§2.1055 §24.235 §27.54		Within Authorized Band		
3.7	§2.1053 §22.917(a) §24.238(a) §27.53(h) §27.53(g)	Radiated Spurious Emission (Band 2) (Band 4) (Band 5)	< 43+10log10(P[Watts])	PASS	Note(1)
	§2.1053 §27.53(c)2 §27.53(f) §27.53(g)	Radiated Spurious Emission (Band 12)			
	§2.1053 §27.53(m)(4)	Radiated Spurious Emission (Band 41)	< 55+10log10(P[Watts])		

Note:

(1)The data content is provided by Industrial Internet Innovation Center (Shanghai) Co.,Ltd.(A2LA number: #3682.01)

1. GENERAL DESCRIPTION

1.1. Applicant

Name : Shanghai AllyNav Technology Co.,Ltd.
Address : Room 201, Buliding 1,No 215, Gaoguang RD,Qingpu District,Shanghai,China

1.2. Manufacturer

Name : Shanghai AllyNav Technology Co.,Ltd.
Address : Room 201, Buliding 1,No 215, Gaoguang RD,Qingpu District,Shanghai,China

1.3. Factory

Name : Shanghai AllyNav Technology Co.,Ltd.
Address : Room 201, Buliding 1,No 215, Gaoguang RD,Qingpu District,Shanghai,China

1.4. General Information of EUT

General Information	
Equipment Name	Orchard Sparying Robot
Brand Name	N/A
Model Name	Aries300N
Series Model	Aries300N-1
Model Difference	The model is changed according to the difference of overseas customers, and its composition and key parts are exactly the same
Sample No	202400515007001
Power Input	DC 48V
Adapter	N/A
Battery	Model: Lead acid battery Brand: TianNeng Capacity: 10-19AH
Hardware Version	Aries300N-1
Software Version	1.2.2.25RC
Antenna Type	PCB antenna
Connecting I/O Port(s)	Refer to the remark below.

Remark:

The above information of EUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.5. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature	Normal Temperature(TN):	25°C
	High Temperature(TH):	60°C
	Low Temperature(TL):	-20°C
Voltage	Normal Voltage(VN):	48V
	High Voltage(VH):	52.8V
	Low Voltage(VL):	45.6V
Other	Relative Humidity	52 %
	Air Pressure	101 kPa

1.6. Equipment Specification

Standards-related Product Specification		
Frequency		
Band	Tx Frequency Range	Rx Frequency Range
☒ Band 2	1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
☒ Band 4	1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
☒ Band 5	824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
☒ Band 12	699MHz ~ 716 MHz	729MHz ~ 746 MHz
☒ Band 41	2555MHz ~ 2655 MHz	2555MHz ~ 2655 MHz
Bandwidth		
Band	Bandwidth	
☒ Band 2	1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz	
☒ Band 4	1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz	
☒ Band 5	1.4MHz / 3MHz / 5MHz / 10MHz	
☒ Band 12	1.4MHz / 3MHz / 5MHz / 10MHz	
☒ Band 41	5MHz / 10MHz / 15MHz / 20MHz	
Antenna Gain		
Band	Antenna Gain	
☒ Band 2	2.3 dBi	
☒ Band 4	0.5 dBi	
☒ Band 5	1.1 dBi	
☒ Band 12	-7.5 dBi	
☒ Band 41	1.7 dBi	
Maximum Output Power to Antenna		
Band	Maximum Output Power	
☒ Band 2	23.14 dBm	
☒ Band 4	22.95 dBm	
☒ Band 5	22.78 dBm	
☒ Band 12	23.27 dBm	
☒ Band 41	28.20 dBm	
Type of Modulation		
☒ QPSK	☒ 16QAM	☒ 64QAM ☐ 256QAM

EmissionDesignator					
Band	Bandwidth (MHz)	Chanel	Max power (dBm)	ERP (dBm)	
Band2	20	18900	22.20	22.35	18M0W7D
	20	18900	22.97	23.12	18M0G7D
	5	18625	22.48	22.63	4M50W7D
	3	18900	23.14	23.29	2M71G7D
Band4	20	20300	21.60	19.95	17M9W7D
	20	20300	22.38	20.73	18M0G7D
	5	20375	22.02	20.37	4M50W7D
	10	20350	22.95	21.30	8M97G7D
Band5	10	20450	21.96	20.91	8M97W7D
	10	20600	22.61	21.56	8M97G7D
	3	20415	22.00	20.95	2M71W7D
	3	20630	22.78	21.73	2M72G7D
Band12	10	23060	22.39	12.74	9M01W7D
	10	23130	23.27	13.62	8M97G7D
	5	23095	22.46	12.81	4M52W7D
Band41	20	41140	21.59	21.14	18M00W7D
	20	40340	22.39	21.94	18M00G7D

Note:

The maximum ERP/EIRP is calculated from max output power and max antenna gain, only the maximum ERP/EIRP is shown in the report.

1.7. Modification of EUT

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

1.8. Laboratory Information

Company Name	:	Shanghai ATBL Technology Co., Ltd.
Company Address	:	5F., Unit 1, No.8, Free Trade One Life Science and Sci-Tech Industrial Park, No.160, Basheng Road, Pudong New District, Shanghai, China
Telephone	:	+86(0)21-51298625

1.9. Applicable Standards

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

47 CFR Part 2, 22, 24, 27

ANSI C63.26-2015

FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark:

All test items were verified and recorded according to the standards and without any deviation during the test.

2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

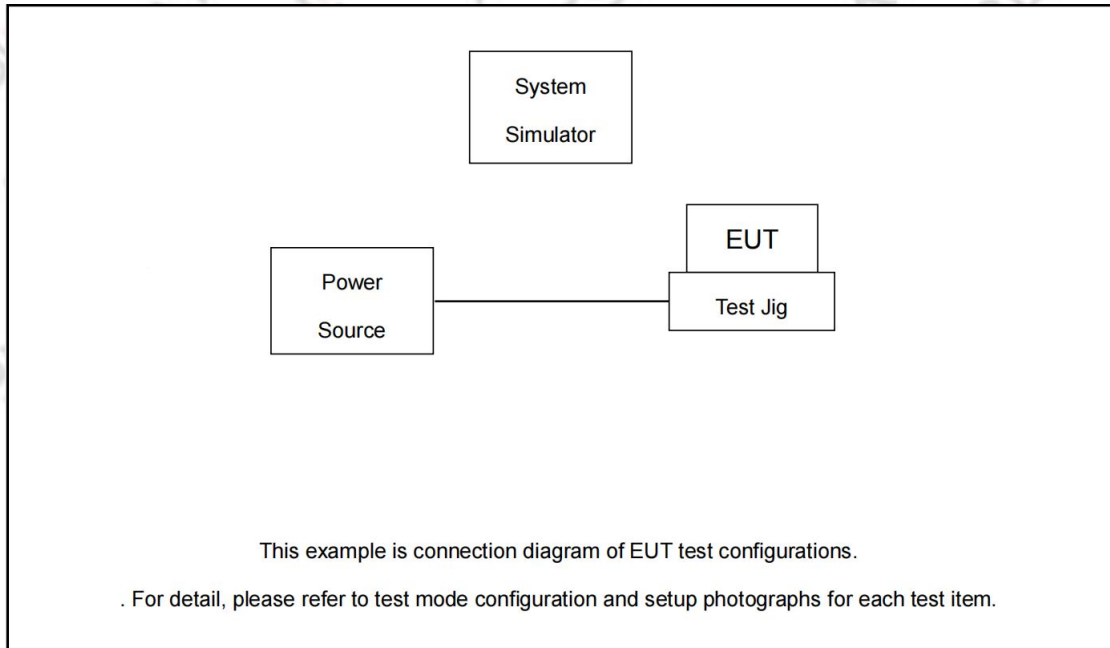
2.1. Test Mode

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.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission. (X-Plane)

Test Items	Band	Bandwidth (MHz)						Modulation				RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Max. Output Power	2	√	√	√	√	√	√	√	√			√		√	√	√	√
	4	√	√	√	√	√	√	√	√			√		√	√	√	√
	5	√	√	√	√			√	√			√		√	√	√	√
	12	√	√	√	√	√	√	√	√			√		√	√	√	√
	41	√	√	√	√	√	√	√	√			√		√	√	√	√
Peak-to-Average Ratio	2						√	√	√					√		√	
	4						√	√	√					√		√	
	5				√			√	√					√		√	
	12						√	√	√					√		√	
	41																
26dB and 99% Bandwidth	2	√	√	√	√	√	√	√	√					√		√	
	4	√	√	√	√	√	√	√	√					√		√	
	5	√	√	√	√	√		√	√					√		√	
	12	√	√	√	√	√	√	√	√					√		√	
	41			√	√	√	√	√	√					√		√	
Conducted Band Edge	2	√	√	√	√	√	√	√	√			√		√	√		√
	4	√	√	√	√	√	√	√	√			√		√	√		√
	5	√	√	√	√	√		√	√			√		√	√		√
	12	√	√	√	√	√	√	√	√			√		√	√		√
	41			√	√	√	√	√	√			√		√	√		√
Conducted Spurious Emission	2	√	√	√	√	√	√	√				√			√	√	√
	4	√	√	√	√	√	√	√				√			√	√	√
	5	√	√	√	√	√		√				√			√	√	√
	12	√	√	√	√	√	√	√				√			√	√	√
	41			√	√	√	√	√				√			√	√	√
Frequency Stability	2				√			√						√		√	
	4				√			√						√		√	
	5				√			√						√		√	
	12				√			√						√		√	
	41				√			√						√		√	
E.R.P / E.I.R.P	2	√	√	√	√	√	√	√	√			√		√	√	√	√
	4	√	√	√	√	√	√	√	√			√		√	√	√	√
	5	√	√	√	√			√	√			√		√	√	√	√
	12	√	√	√	√	√	√	√	√			√		√	√	√	√
	41	√	√	√	√	√	√	√	√			√		√	√	√	√
Radiated Spurious Emission	2	Worst Case													√	√	√
	4	Worst Case													√	√	√
	5	Worst Case													√	√	√
	12	Worst Case													√	√	√
	41	Worst Case													√	√	√
Note	1. The mark “√” means that this configuration is chosen for testing. 2. When a cell is empty, it means it is not supported or does not require testing. 3. 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. 4. The UE category is 1, so bandwidth greater than 5M does not support 16QAM.																

2.2. Connection Diagram of Test System



2.3. Support Unit used in test configuration and system

NO.	Unit	Brand	Model	Description
1	DC Power Supply	GWINSTEK	GPD-2303S	GEV915433
2	SIM Card	N/A	N/A	N/A

2.4. Frequency List of Low/Middle/High Channels

LTE Band 2 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	18700	18900	19100
	Frequency	1860	1880	1900
15	Channel	18675	18900	19125
	Frequency	1857.5	1880	1902.5
10	Channel	18650	18900	19150
	Frequency	1855	1880	1905
5	Channel	18625	18900	19175
	Frequency	1852.5	1880	1907.5
3	Channel	18615	18900	19185
	Frequency	1851.5	1880	1908.5
1.4	Channel	18607	18900	19193
	Frequency	1850.7	1880	1909.3

LTE Band 4 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	20050	20175	20300
	Frequency	1720	1732.5	1745
15	Channel	20025	20175	20325
	Frequency	1717.5	1732.5	1747.5
10	Channel	20000	20175	20350
	Frequency	1715	1732.5	1750
5	Channel	19975	20175	20375
	Frequency	1712.5	1732.5	1752.5
3	Channel	19965	20175	20385
	Frequency	1711.5	1732.5	1753.5
1.4	Channel	19957	20175	20393
	Frequency	1710.7	1732.5	1754.3

LTE Band 5 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	20450	20525	20600
	Frequency	829	836.5	844
5	Channel	20425	20525	20625
	Frequency	826.5	836.5	846.5
3	Channel	20415	20525	20635
	Frequency	825.5	836.5	847.5
1.4	Channel	20407	20525	20643
	Frequency	824.7	836.5	848.3

LTE Band 12 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	23060	23095	23130
	Frequency	704	707.5	711
5	Channel	23035	23095	23155
	Frequency	701.5	707.5	713.5
3	Channel	23025	23095	23165
	Frequency	700.5	707.5	714.5
1.4	Channel	23017	23095	23173
	Frequency	699.7	707.5	715.3

LTE Band 41(2555MHz-2655MHz) Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	40340	40740	41140
	Frequency	2555.19	2595.19	2635.19
15	Channel	40315	40740	41165
	Frequency	2552.69	2595.19	2637.69
10	Channel	40290	40740	41190
	Frequency	2550.19	2595.19	2640.19
5	Channel	40265	40740	41215
	Frequency	2547.69	2595.19	2642.69

2.5. Equipment List

2.5.1. For Conducted Test

Equipment Name	Manufacturer	Model	Serial No.	Calibration Until	Calibration DUE Until	Cal. Interval
Power meter	Anritsu	ML2496A	1935001	2024.07.18	2025.07.17	1 year
Power sensor	Anritsu	MA2411B	1911006	2024.07.18	2025.07.17	1 year
Power sensor	Keysight	U2021XA	MY59120004	2024.07.18	2025.07.17	1 year
Adjustable Attenuator	Agilent	8494B	MY42144015	2024.07.18	2025.07.17	1 year
Adjustable Attenuator	Agilent	8496B	MY42143776	2024.07.18	2025.07.17	1 year
Environmental Test Chamber	KSON	THS-B6C-150	9159K	2024.03.28	2025.03.27	1 year
Signal analyzer	Keysight	N9020A	MY50510136	2024.07.18	2025.07.17	1 year
Vector signal generator	Keysight	N5182B	MY57300196	2024.07.18	2025.07.17	1 year
Vector signal generator	Agilent	N5182A	MY50143555	2024.07.18	2025.07.17	1 year
Analog signal generator	Keysight	N5173B	MY60403026	2024.07.18	2025.07.17	1 year
Wideband radio communication tester	R&S	CMW500	101331	2024.07.18	2025.07.17	1 year
Spectrum analyzer	R&S	FSV40-N	101761	2024.07.18	2025.07.17	1 year
Switch Box	N/A	RFSW3003328	RFSW201019	N/A	N/A	1 year
Thermometer	DeLi	N/A	N/A	2024.07.18	2025.07.17	1 year
Test Software	FALA	LZ-RF	N/A	N/A	N/A	1 year
Test Software	Cesheng	WCS-WCN	N/A	N/A	N/A	N/A
Test Software	MaiWei	MW-Test	N/A	N/A	N/A	N/A

2.5.2. For Radiated Spurious Emission

Equipment Name	Manufacturer	Model	Serial No.	Calibration Until	Calibration DUE Until	Cal. Interval
Universal Radio Communication Tester	R&S	CMW500	104178	2024.10.09	2025.10.08	1 year
Test Receiver	R&S	ESR7	102399	2024.06.07	2025.06.06	1 year
Test Receiver	R&S	FSW43	101943	2024.08.21	2025.08.20	1 year
Loop Antenna	COM-POWER	AL-130R	121083	2024.08.31	2025.08.30	1 year
Trilog Antenna	Schwarzbeck	VULB9162	00426	2024.08.02	2025.08.01	1 year
Double Ridged Guide Antenna	ETS	ETS-3117	00135885	2024.03.26	2025.03.25	1 year
Horn Antenna	R&S	QMS-00880	24715	2024.08.03	2025.08.02	1 year
EMI Test Software	R&S	EMC32 V10.60.20	N/A	N/A	N/A	N/A
Antenna Tower	Top Precision	TPMDC-LF	N/A	N/A	N/A	N/A
Antenna Tower	Top Precision	TPMDC-HF	N/A	N/A	N/A	N/A

2.6. Measurement Uncertainty

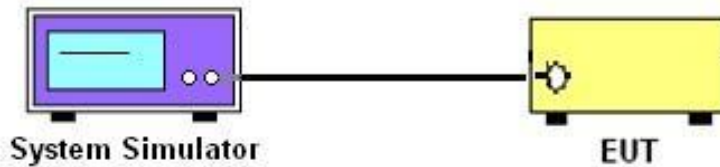
The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Output Power	1.266dB
2	Power spectral density	1.282dB
3	Conducted spurious emissions	1.73dB
4	Conducted Frequency Stability	10.14Hz
5	RF Cable Loss	1.22dB
6	Radiated Spurious Emission 9KHz-30MHz	2.35dB
7	Radiated Spurious Emission 30MHz-1GHz	3.60dB
8	Radiated Spurious Emission 1GHz-18GHz	5.40dB
9	Radiated Spurious Emission 18GHz - 40GHz	8.20dB

3. TEST RESULT

3.1. Conducted Output Power and ERP/EIRP

3.1.1. Test Setup



3.1.2. 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 LTE Band 5 and Band 26.

The ERP of mobile transmitters must not exceed 3 Watts for LTE Band 71.

The EIRP of mobile transmitters must not exceed 2 Watts for LTE Band 2 and Band 25

The EIRP of mobile transmitters must not exceed 1 Watts for LTE Band 4 and Band 66.

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.

3.1.3. Test Procedures

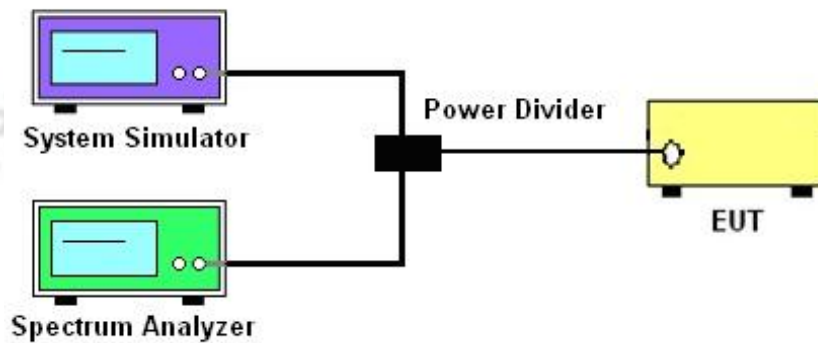
1. The testing follows ANSI C63.26 Section 5.2.
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

3.1.4. Test Result of Conducted Output Power and ERP/EIRP

Please refer to the Appendix A.

3.2. Peak-to-Average Ratio

3.2.1. Test Setup



3.2.2. Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.2.3. Test Procedures

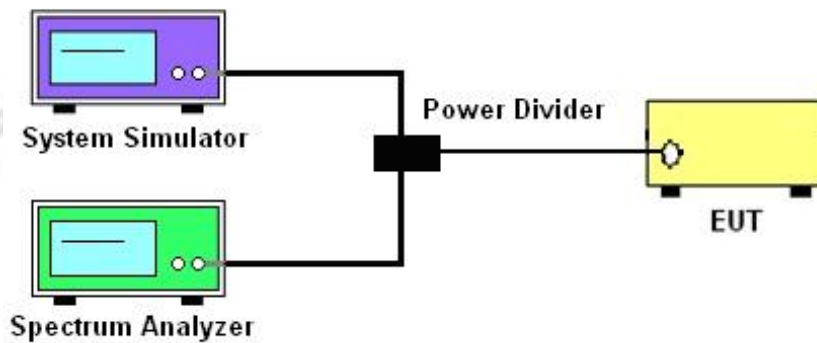
1. The testing follows ANSI C63.26 Section 5.2.3.4 (CCDF).
2. The EUT was connected to spectrum and system simulator via a power divider.
3. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
4. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
5. Record the deviation as Peak to Average Ratio.

3.2.4. Test Result of Peak-to-Average Ratio

Please refer to the Appendix A.

3.3. Occupied Bandwidth

3.3.1. Test Setup



3.3.2. Description of Occupied Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

3.3.3. Test Procedures

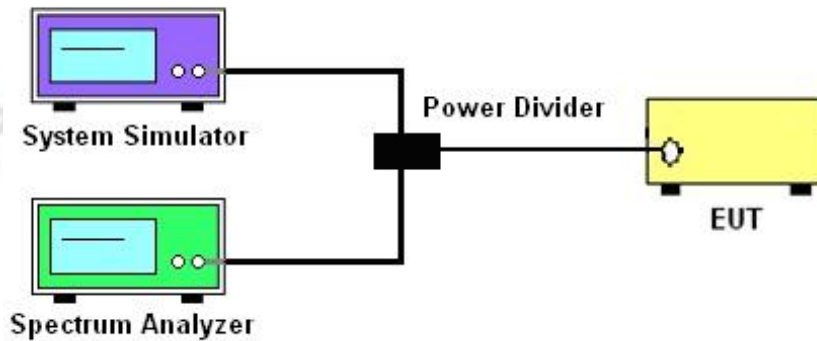
1. The testing follows ANSI C63.26 Section 5.4.
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between two and five times the anticipated OBW.
4. The nominal resolution bandwidth (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.
5. Set the detection mode to peak, and the trace mode to max hold.
6. Determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace.(this is the reference value)
7. Determine the “-26 dB down amplitude” as equal to (Reference Value – X).
8. Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB down amplitude” determined in step 6. If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.
9. Use the 99 % power bandwidth function of the spectrum analyzer and report the measured bandwidth.

3.3.4. Test Result of Occupied Bandwidth

Please refer to the Appendix A.

3.4. Conducted Band Edge

3.4.1. Test Setup



3.4.2. Description of Conducted Band Edge Measurement

22.917(a):

For operations in the 824 – 849 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 100kHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

24.238 (a):

For operations in the 1850-1910 and 1930-1990 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 1MHz bandwidth. However, 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.

27.53 (g):

For operations in the 600MHz band and 698 -746 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 100 kHz bandwidth. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

27.53 (h):

For operations in the 1710 – 1755 MHz and 1710 – 1780 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.4.3. Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The band edges of low and high channels for the highest RF powers were measured.
4. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
5. Beyond the 1 MHz band from the band edge, RBW=1MHz was used or a narrower RBW was used and the measured power was integrated over the full required measurement bandwidth of 1 MHz.
6. Set spectrum analyzer with RMS detector.
7. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
8. Checked that all the results comply with the emission limit line.

Example:

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

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}$$

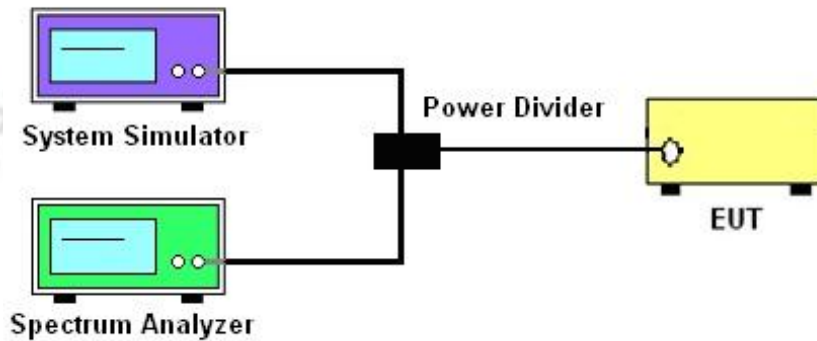
9. When using the integration method, the starting frequency of the integration shall be centered at one-half of the RBW away from the band edge.

3.4.4. Test Result of Conducted Band Edge

Please refer to the Appendix A.

3.5. Conducted Spurious Emission

3.5.1. Test Setup



3.5.2. Description of Conducted Spurious Emission Measurement

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

It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10th harmonic.

3.5.3. Test Procedures

1. The testing follows ANSI C63.26 section 5.7
2. The EUT was connected to spectrum analyzer and system simulator via a power divider.
3. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
4. The middle channel for the highest RF power within the transmitting frequency was measured.
5. The conducted spurious emission for the whole frequency range was taken.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz.
7. Set spectrum analyzer with RMS detector.
8. Taking the record of maximum spurious emission.
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band
10. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

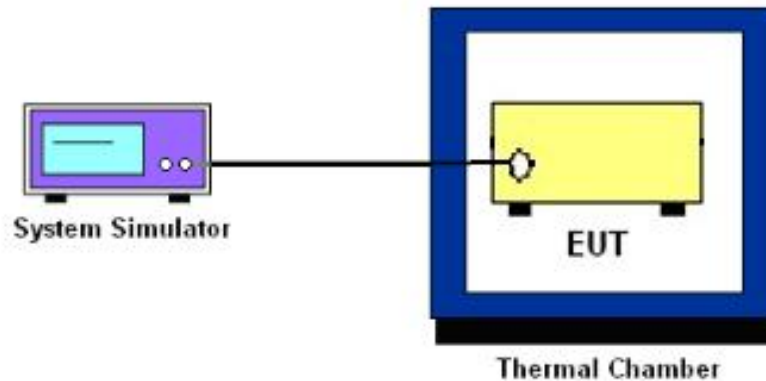
$$= P(W) - [43 + 10\log(P)] \text{ (dB)} = [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}.$$

3.5.4. Test Result of Conducted Spurious Emission

Please refer to the Appendix A.

3.6. Frequency Stability

3.6.1. Test Setup



3.6.2. Description of Frequency Stability Measurement

The frequency stability shall be measured by variation of ambient temperature and variation of primary supply voltage to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ ($\pm 2.5\text{ppm}$) of the center frequency.

3.6.3. Test Procedures for Temperature Variation

1. The testing follows ANSI C63.26 section 5.6.4.
2. The EUT was set up in the thermal chamber and connected with the system simulator.
3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
4. With power OFF, the temperature was raised in 10°C step up to 50°C . The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

3.6.4. Test Procedures for Voltage Variation

1. The testing follows ANSI C63.26 section 5.6.5
2. The EUT was placed in a temperature chamber at $20\pm 5^{\circ}\text{C}$ and connected with the system simulator.
3. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value for other than hand carried battery equipment.
4. For hand carried, battery powered equipment, reduce the primary ac or dc supply voltage to the battery operating end point, which shall be specified by the manufacturer.
5. The variation in frequency was measured for the worst case.

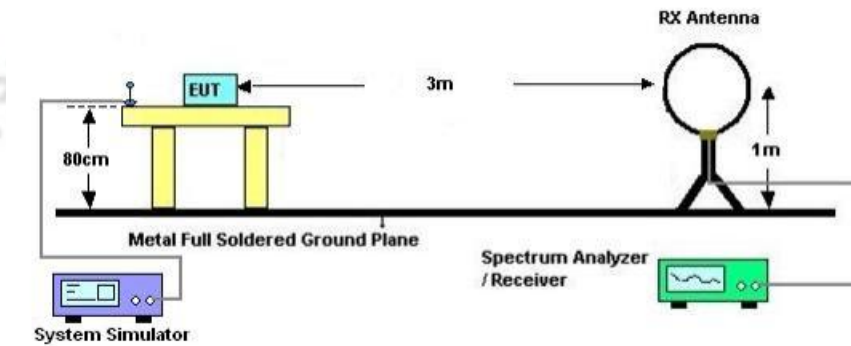
3.6.5. Test Result of Frequency Stability

Please refer to the Appendix A.

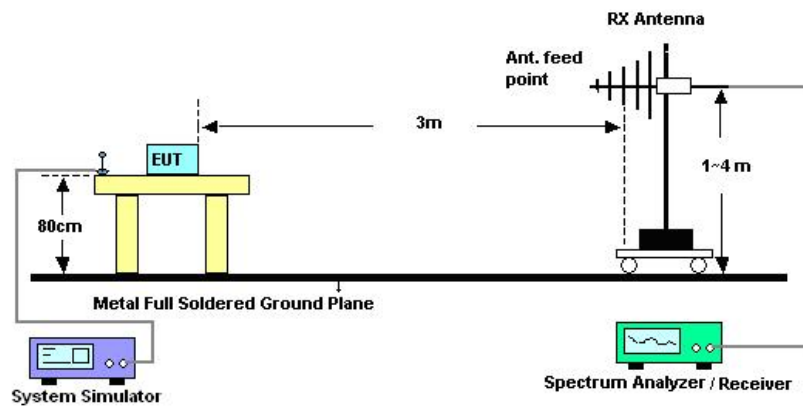
3.7. Radiated Spurious Emission

3.7.1. Test Setup

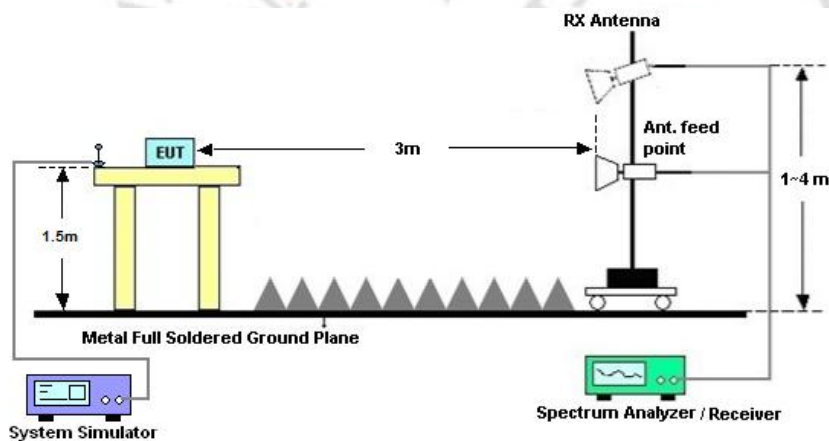
3.7.1.1. For radiated test below 30MHz



3.7.1.2. For radiated test from 30MHz to 1GHz



3.7.1.3. For radiated test above 1GHz



3.7.2. Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI C63.26.

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.

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

3.7.3. Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
2. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
6. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
7. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
8. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
9. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

13. In the 50Ω test system at a distance of 3 meters, the compensation coefficient for free space path loss is approximately 95.2 dB, so the limit is:

$$= -13 \text{ dBm} + 95.2$$

$$= 82.2 \text{ dB}\mu\text{V/m}.$$

3.7.4. Test Result of Radiated Spurious Emission

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

The frequency which above 30 MHz, please refer to the Appendix B.

4. TEST SETUP PHOTOGRAPHS

Please refer to the Appendix C.

5. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

External Photos Please refer to the Appendix D.

Internal Photos Please refer to the Appendix E.

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