

Radio Test Report

FCC Licensed Device-4G

Applicant's name : Shenzhen Zhiyu Vehicle Industry Co., Ltd
Address : 1001, Building B, No. 7 Huanping Road, Central Community, Pingdi Street, Longgang District, Shenzhen
Manufacture's Name : Shenzhen Zhiyu Vehicle Industry Co., Ltd
Address : 1001, Building B, No. 7 Huanping Road, Central Community, Pingdi Street, Longgang District, Shenzhen

Product description

Trader mark : ENGWE
Product Name: : EPAC Bicycle
Model and/or type reference : EP-2 3.0
Serial Model : N/A
Rating(s) : charger input: 100-240VAC, 50/60Hz, 3A Max
Output: DC 54.6V $\approx$ 8A
Battery: DC 48V 14.25Ah 684Wh

Standards : 47 CFR Part 22H, 47 CFR Part 24E, 47 CFR Part 27

FCC ID : 2BU5R-EP230

The EUT described above has been tested by us with the listed standards and found in compliance with the FCC requirements. It is possible to use FCC marking to demonstrate the compliance with this FCC requirements.

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Date of Test

Date (s) of performance of tests : 2026-03-23 ~ 2026-05-07
Date of Issue : 2026-05-07
Test Result : **Pass**

Prepared by:

Jide Huang

Project Engineer

Reviewed by:

Eason Zhou

Project Supervisor

Approved by:

Technical Director





REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2026-05-07	Valid	Initial Release



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1. TEST SUMMARY

No.	Test Item	Basic Standard	Requirement	Result
1	Effective (Isotropic) Radiated Power Output	47 CFR Part 27	47 CFR Part 2.1046, Part 27.50(b)(1)(2)(3)(4)(5) 47 CFR Part 2.1046, Part 27.50(c)(1)(2)(3)(4) 47 CFR Part 2.1046, Part 27.50(d)(1)(2)	PASS
2	Peak To Average Ratio	47 CFR Part 27	47 CFR Part 2.1046, Part 27.50	PASS
3	Bandwidth	47 CFR Part 22H 47 CFR Part 24E 47 CFR Part 27	47 CFR Part 2.1049(h)	PASS
4	Out of Band Emission	47 CFR Part 27	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)	PASS
5	Spurious Unwanted Emission	47 CFR Part 27	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)	PASS
6	Field Strength of Radiated Emission-Below 1GHz	47 CFR Part 27	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)	PASS
7	Field Strength of Radiated Emission-Above 1GHz	47 CFR Part 27	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)	PASS
8	Frequency Stability	47 CFR Part 27	47 CFR Part 2.1055, Part 27.54	PASS

2. MEASUREMENT UNCERTAINTY

The report 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	RF output power, conducted	$\pm 1.19\text{dB}$
2	Occupied Channel Bandwidth	$\pm 3.5\%$
3	Power Spectral Density, Conducted	$\pm 0.72\text{dB}$
4	All emissions, radiated (30MHz - 1GHz)	$\pm 3.94\text{dB}$
5	All emissions, radiated (1GHz - 18GHz)	$\pm 4.66\text{dB}$
6	All emissions, radiated (18GHz - 40GHz)	$\pm 4.31\text{dB}$



3. TEST FACILITY

Shenzhen VOP Testing Technology Co., Ltd.

Add:103, Building 5, Wanyan Industrial Park Qiaotou Community, Fuhai Street, Baoan District Shenzhen, Guangdong
People's Republic of China

FCC :Designation Number:CN1438,Certificate Number: 7579.01

3.1. Deviation from Standard

None

3.2. Abnormalities from Standard Conditions

None



4. GENERAL INFORMATION

4.1. General Description of EUT

Manufacturer:	Shenzhen Zhiqu Vehicle Industry Co., Ltd
Manufacturer Address:	1001, Building B, No. 7 Huanping Road, Central Community, Pingdi Street, Longgang District, Shenzhen
EUT Name:	EPAC Bicycle
Model No:	EP-2 3.0
Serial Model:	N/A
Brand Name:	ENGWE
Difference Description:	N/A
Operation Frequency:	FDD LTE Band 2: TX1850-1910 MHz ;RX1930-1990 MHz FDD LTE Band 4:TX 1710-1755 MHz ;RX 2110-2155 MHz FDD LTE Band 5:TX 824-849 MHz ;RX 869-894 MHz FDD LTE Band 12: TX 699-716 MHz ;RX 729-746 MHz FDD LTE Band 13: TX 777-787 MHz ;RX 746-756 MHz FDD LTE Band 66: TX 1710-1780 MHz ;RX 2110-2180 MHz FDD LTE Band 71:TX 663-698 MHz ;RX 617-652 MHz
Support Bands:	Band2,Band4,Band5,Band12,Band13,Band66,Band71
Modulation Type:	QPSK, 16QAM
Antenna type:	PCB antenna
Bluetooth Version:	N/A
Antenna Gain:	Band2:2.13 dBi, Band4:0.51 dBi, Band5:-3.24 dBi, Band12:-2.08 dBi, Band13:-1.06 dBi, Band66:0.51dBi, Band71:-5.05 dBi
Hardware Version:	V.1.01
Software Version:	R00A01V05
Power Supply:	charger input: 100-240VAC, 50/60Hz, 3A Max Output: DC 54.6V $\approx$ 8A Battery: DC 48V 14.25Ah 684Wh
Maximum Output Power:	24.76 dBm

Note:

- 1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report. Due to the incorrect antenna information, a series of problems such as the accuracy of the test results will be borne by the customer.

4.2. EUT 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

LTE Band 4 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
	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 13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	23230	-

LTE Band 13 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
	Frequency	-	782	-
5	Channel	23205	23230	23255
	Frequency	779.5	782	784.5

LTE Band 66 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	132072	132322	132572
	Frequency	1720	1745	1770
15	Channel	132047	132322	132597
	Frequency	1717.5	1745	1772.5
10	Channel	132022	132322	132622
	Frequency	1715	1745	1775
5	Channel	131997	132322	132647
	Frequency	1712.5	1745	1777.5
3	Channel	131987	132322	132657
	Frequency	1711.5	1745	1778.5
1.4	Channel	131979	132322	132665
	Frequency	1710.7	1745	1779.3

LTE Band 71 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
20	Channel	133222	133322	133372
	Frequency	673.0	680.5	688.0

LTE Band 71 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	133197	133297	133397
	Frequency	670.5	680.5	690.5
10	Channel	133172	133272	133422
	Frequency	668.0	678.0	693.0
5	Channel	133147	133247	133447
	Frequency	665.5	675.5	695.5



4.3. EUT Test Mode

Test Items	Band	Bandwidth (MHz)						Modulation		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM
Effective (Isotropic) Radiated	2	V	V	V	V	V	V	V	V	

Power Output	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
Peak To Average Ratio	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
Bandwidth	71	-	-	V	V	V	V	V	V	
	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
Out of Band Emission	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
Spurious Unwanted Emission	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
Frequency Stability	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
Radiated Spurious Emission	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
	2	V	V	V	V	V	V	V	V	
	4	V	V	V	V	V	V	V	V	
	5	V	V	V	V	-	-	V	V	
	12	V	V	V	V	-	-	V	V	
	13	-	-	V	V	-	-	V	V	
	66	V	V	V	V	V	V	V	V	
	71	-	-	V	V	V	V	V	V	
Radiated Spurious Emission	2	Worst Case								
	4	Worst Case								

	5	Worst Case
	12	Worst Case
	13	Worst Case
	66	Worst Case
	71	Worst Case
Node	1. The mark "v " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RBsize/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported	

4.4. Auxiliary Equipment Used During Test

No.	Equipment	Manufacturer	Model No.	Serial No.	Remark
1	HP laptop	HP	DESKTOP-G3N DKR3	N/A	N/A



5. EQUIPMENTS LIST FOR ALL TEST ITEMS

Frequency Stability Effective (Isotropic) Radiated Power Output Peak To Average Ratio Bandwidth Out of Band Emission Spurious Unwanted Emission						
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	EMI test receiver ESCI	R&S	ESPI-7	100754	2026-03-17	2028-03-16
2	Log periodic antenna	SCHWARZBECK	VULB9163	01790	2025-10-24	2026-10-23
3	preamplifier	QUANJUDA	LNA18	2503130032	2025-07-07	2026-07-06
4	spectrum analyzer	Agilent	N9020A	MY51287427	2025-07-07	2026-07-06
5	Terminal tester	R&S	CMW500	129734	2025-07-07	2026-07-06
6	Vector signal generator	Agilent	N5182A	MY50145556	2025-07-07	2026-07-06
7	RF automatic control unit	TST	CBOX-Full	2752539	2025-07-14	2026-07-13
8	High frequency antenna	Schwarzbeck	9120D-1141	03260	2025-10-19	2026-10-18
9	High-frequency horn antenna	Schwarzbeck	HA-018040L	25098408	2025-10-31	2026-10-30
10	preamplifier	HCT	HC180400-50 G25	25098401	2025-09-19	2026-09-18
11	spectrum analyzer	R&S	FSV40	101373	2025-12-24	2026-12-23
12	preamplifier	SCHWARZBECK	8447D	2944A08081	2026-03-17	2028-03-16

Field Strength of Radiated Emission-Below 1GHz						
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	EMI test receiver ESCI	R&S	ESPI-7	100754	2026-03-17	2028-03-16
2	Log periodic antenna	SCHWARZBECK	VULB9163	01790	2025-10-24	2026-10-23
3	preamplifier	SCHWARZBECK	8447D	2944A08081	2026-03-17	2028-03-16

Field Strength of Radiated Emission-Above 1GHz						
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	preamplifier	QUANJUDA	LNA18	2503130032	2025-07-07	2026-07-06
2	High frequency antenna	Schwarzbeck	9120D-1141	03260	2025-10-19	2026-10-18

3	High-frequency horn antenna	Schwarzbeck	HA-018040L	25098408	2025-10-31	2026-10-30
4	preamplifier	HCT	HC180400-50 G25	25098401	2025-09-19	2026-09-18
5	spectrum analyzer	R&S	FSV40	101373	2025-12-24	2026-12-23



6. TEST RESULTS

6.1. Effective (Isotropic) Radiated Power Output

Test Requirement:	47 CFR Part 2.1046, Part 27.50(b)(1)(2)(3)(4)(5) 47 CFR Part 2.1046, Part 27.50(c)(1)(2)(3)(4) 47 CFR Part 2.1046, Part 27.50(d)(1)(2)
Test Limit:	(1) Fixed and base stations transmitting a signal in the 757-758 and 775-776 MHz bands must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section. (2) Fixed and base stations transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section. (3) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section. (4) Fixed and base stations transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section. (5) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 746-757 MHz and 776-787 MHz bands with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section. (1) Fixed and base stations transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section; (2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics

	from the Bureau of the Census, and transmitting a signal with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts ERP in accordance with Table 2 of this section; (3) Fixed and base stations transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section; (4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section; (1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to: (i) An equivalent isotropically radiated power (EIRP) of 3280 watts when transmitting with an emission bandwidth of 1 MHz or less; (ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz. (2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to: (i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less; (ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.
Test Method:	ANSI C63.26-2015, Section 5.2.4.2
Procedure:	If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98%), then the following options can be implemented to facilitate measurement of the average power with an average power meter: a) A gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only during active transmission bursts at maximum output power levels. b) A conventional average power meter with no signal gating capability can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than or equal to $\pm 2\%$) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to $[10 \log (1/\text{duty cycle})]$. See

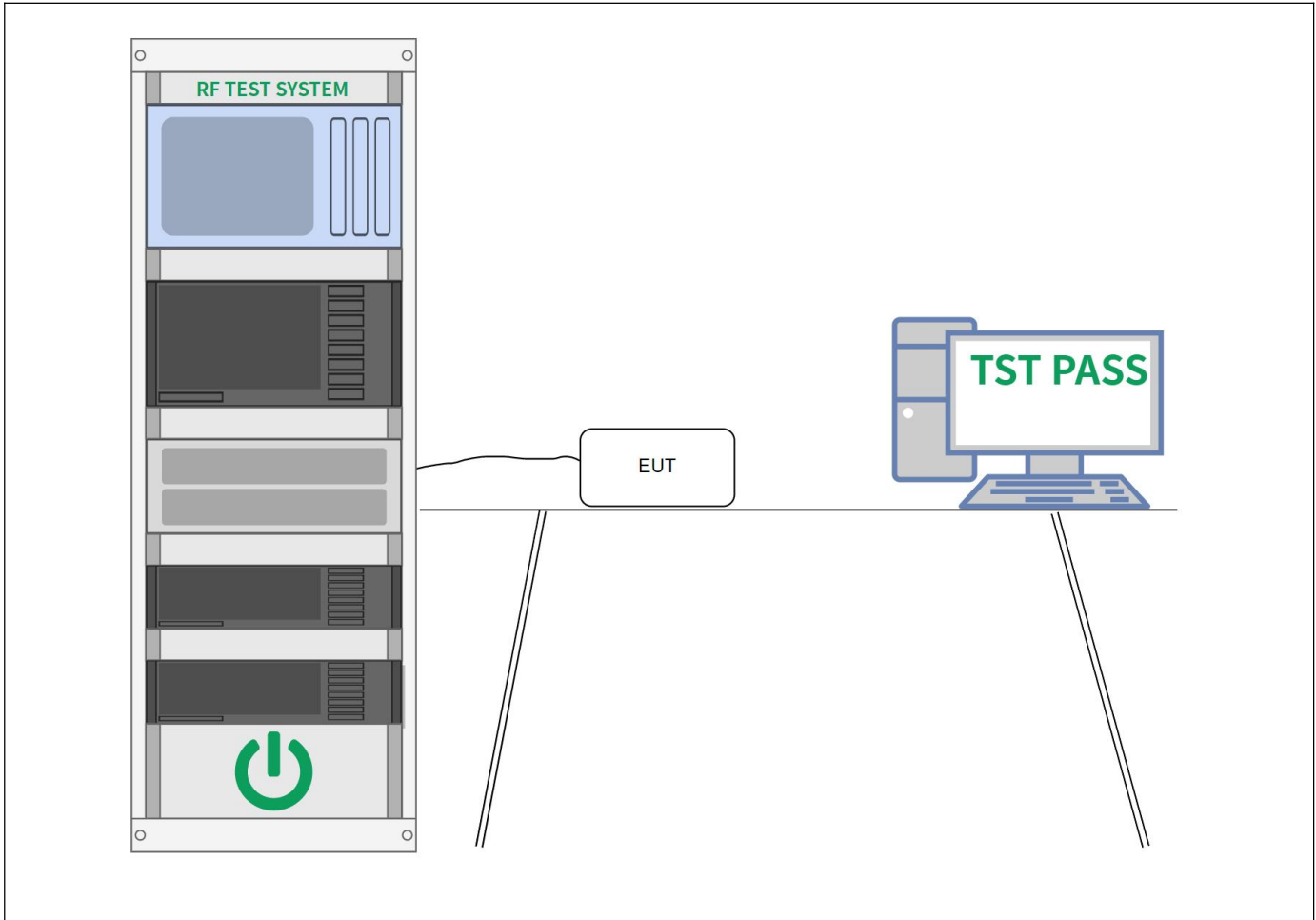
5.2.4.3.4 for guidance with respect to measuring the transmitter duty cycle.

6.1.1. EUT Operation

Operating Environment:

Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.1.2. Test Setup Diagram:



6.1.3. Test Data

Please Refer to Appendix A for Details.

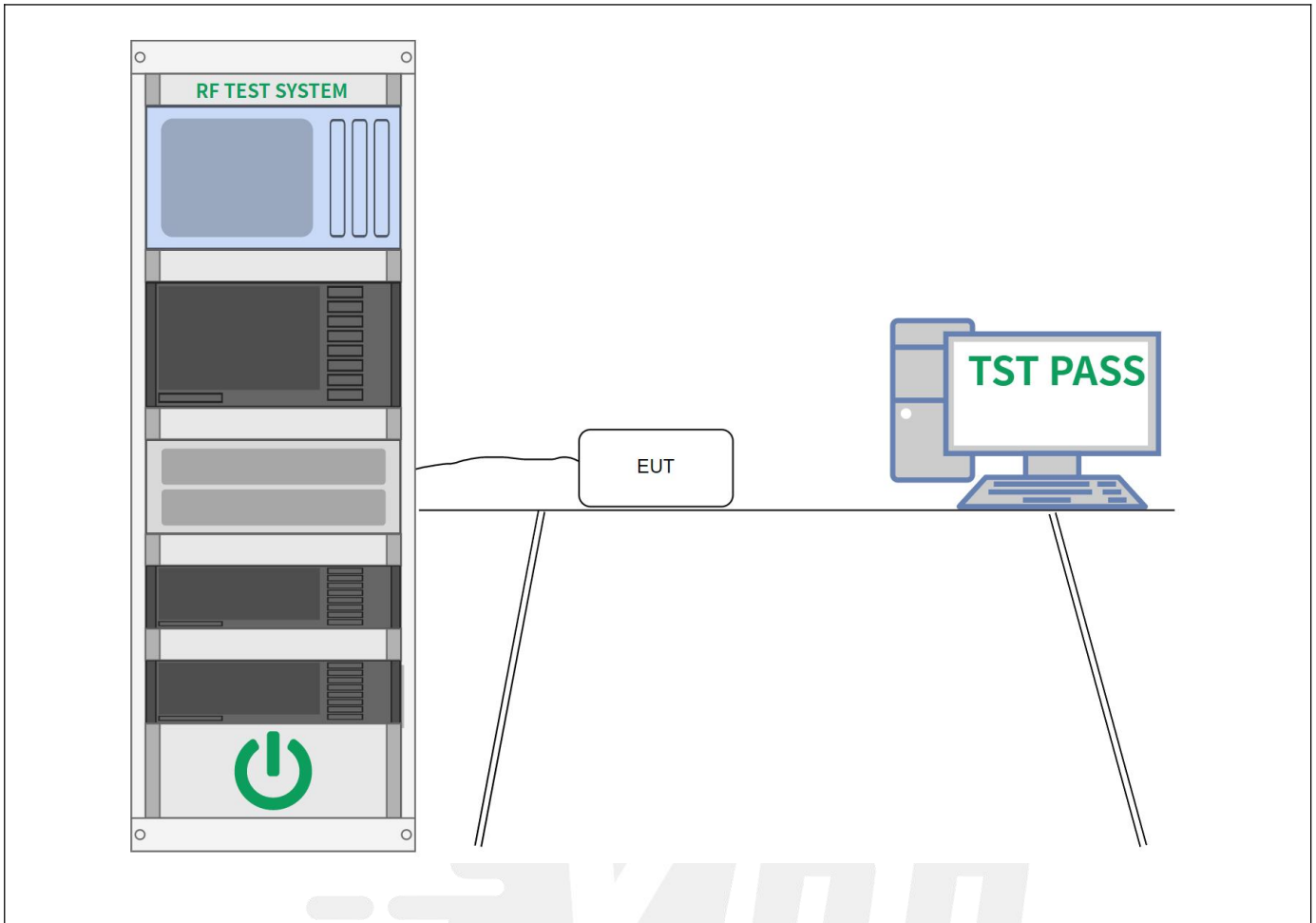
6.2. Peak To Average Ratio

Test Requirement:	47 CFR Part 2.1046, Part 27.50
Test Limit:	The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.
Test Method:	ANSI C63.26-2015, Section 5.2.3.4
Procedure:	a) Set resolution/measurement bandwidth $\geq$ OBW or specified reference bandwidth. b) Set the number of counts to a value that stabilizes the measured CCDF curve. c) Set the measurement interval as follows: 1) For continuous transmissions, set to the greater of $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ or 1 ms. 2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration. 3) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers. d) Record the maximum PAPR level associated with a probability of 0.1%. e) The peak power level is calculated from the sum of the PAPR value from step d) to the measured average power.

6.2.1. EUT Operation

Operating Environment:					
Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.2.2. Test Setup Diagram:



6.2.3. Test Data

Please Refer to Appendix A for Details.

6.3. Bandwidth

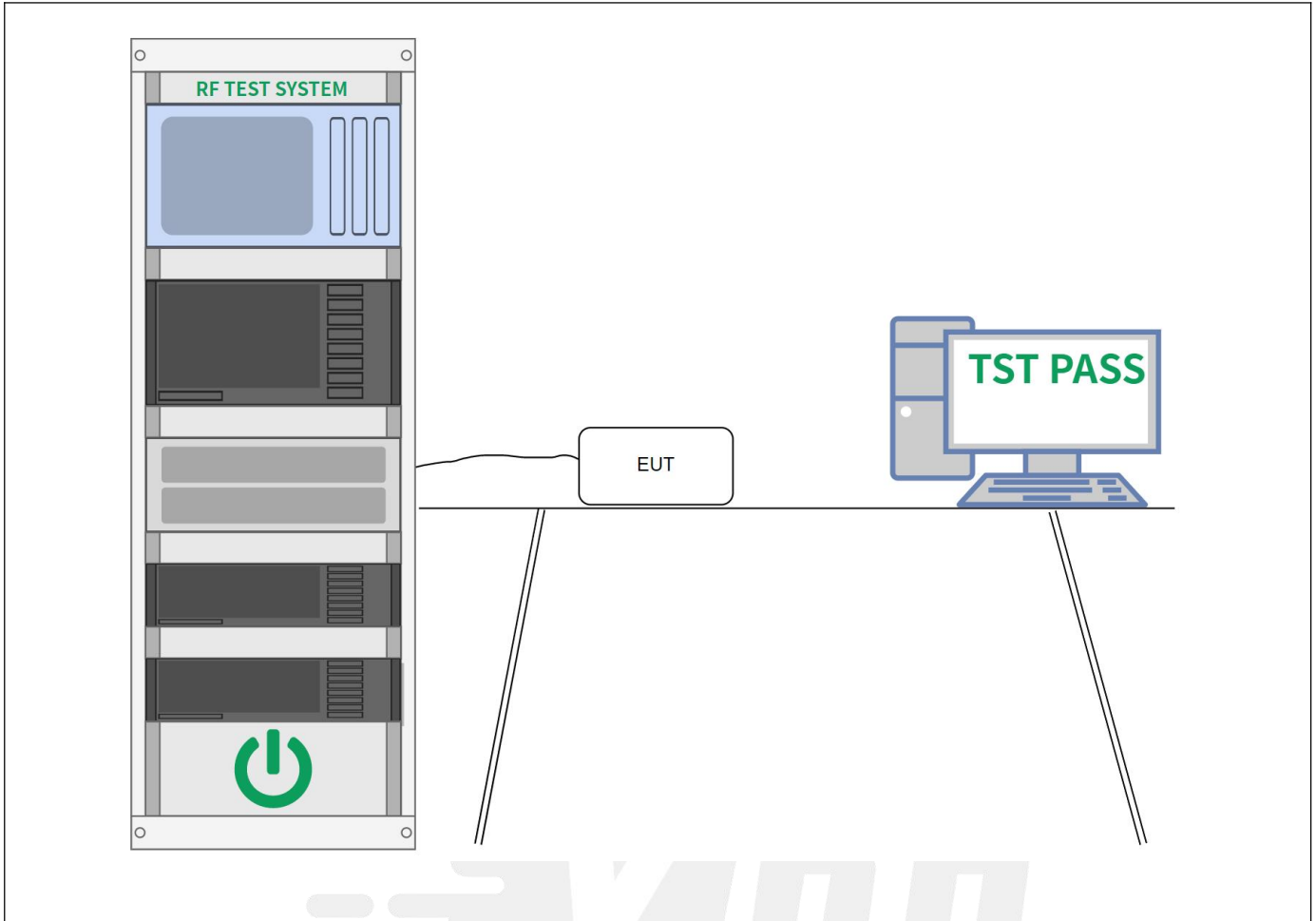
Test Requirement:	47 CFR Part 2.1049(h)
Test Limit:	OBW: No limit, only for report use. EBW: No limit, only for report use.
Test Method:	ANSI C63.26-2015, Section 5.4
Procedure:	OBW: a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of $1.5 \times$ OBW is sufficient). b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times$ RBW. c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3. NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances. d) Set the detection mode to peak, and the trace mode to max - hold. e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies. f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s). EBW: a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement. b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times$ RBW. c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3. NOTE—Step a), step b), and step c) may require iteration to adjust within the specified tolerances. d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level. e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

	f) Determine the reference value by either of the following: 1) 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). 2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier. g) Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta - marker measurement function. h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i). i) 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 amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers. The spectral envelope can cross the “-X dB amplitude” at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the “-X dB amplitude.” j) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).
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6.3.1. EUT Operation

Operating Environment:					
Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.3.2. Test Setup Diagram:



6.3.3. Test Data

Please Refer to Appendix A for Details.

6.4. Out of Band Emission

Test Requirement:	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)
Test Limit:	(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations; (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation. (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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. (h) (1) $10 \log (P)$ dB. (2) (i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band. (ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10} (P)$ dB. (iii) For operations in the 1915-1920 MHz band, the power of any emission between

	1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB. (iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB.
Test Method:	47 CFR Part 27 ANSI C63.26-2015, Section 5.7.3
Procedure:	Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency. b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out - of - band (band - edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained. c) Set the number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows: 1) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) $> (\text{number of points in sweep}) \times (\text{symbol period})$ (e.g., by a factor of $10 \times \text{symbol period} \times \text{number of points}$). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols 2) If the device cannot transmit continuously (duty cycle $< 98\%$), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time $> (\text{number of points in sweep}) \times (\text{symbol period})$ but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time. 3) If the device cannot be configured to transmit continuously (duty cycle $< 98\%$) and a free - running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time $> (\text{number of points in sweep}) \times (\text{transmitter period})$ (i.e., the transmit on - time + the off - time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This

assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$).

4) If the device cannot be configured to transmit continuously and a free - running sweep must be used, and if the transmissions exhibit a non - constant duty cycle (duty cycle variations $> \pm 2\%$), set the sweep time so that the averaging is performed over the on - period by setting the sweep time $> (\text{symbol period}) \times (\text{number of points})$, while also maintaining the sweep time $< (\text{transmitter on - time})$. The trace mode shall be set to max hold, since not every display point will be averaged only over just the on - time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.

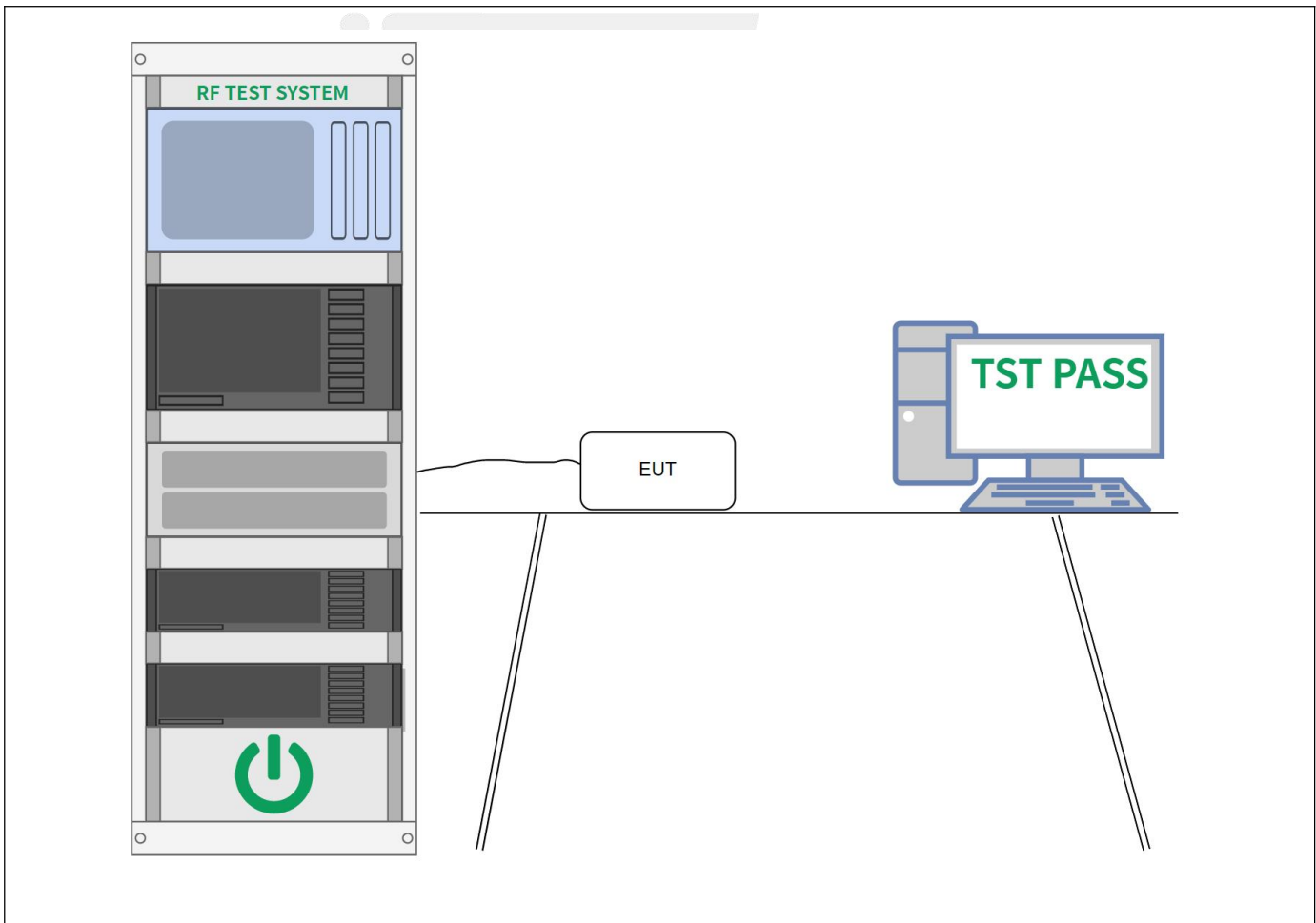
e) The test report shall include the plots of the measuring instrument display and the measured data.

f) See Annex I for example emission mask plots.

6.4.1. EUT Operation

Operating Environment:					
Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.4.2. Test Setup Diagram:



6.4.3. Test Data

Please Refer to Appendix A for Details.



6.5. Spurious Unwanted Emission

Test Requirement:	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)
Test Limit:	(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations; (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation. (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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. (h) (1) $10 \log (P)$ dB. (2) (i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band. (ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10} (P)$ dB. (iii) For operations in the 1915-1920 MHz band, the power of any emission between

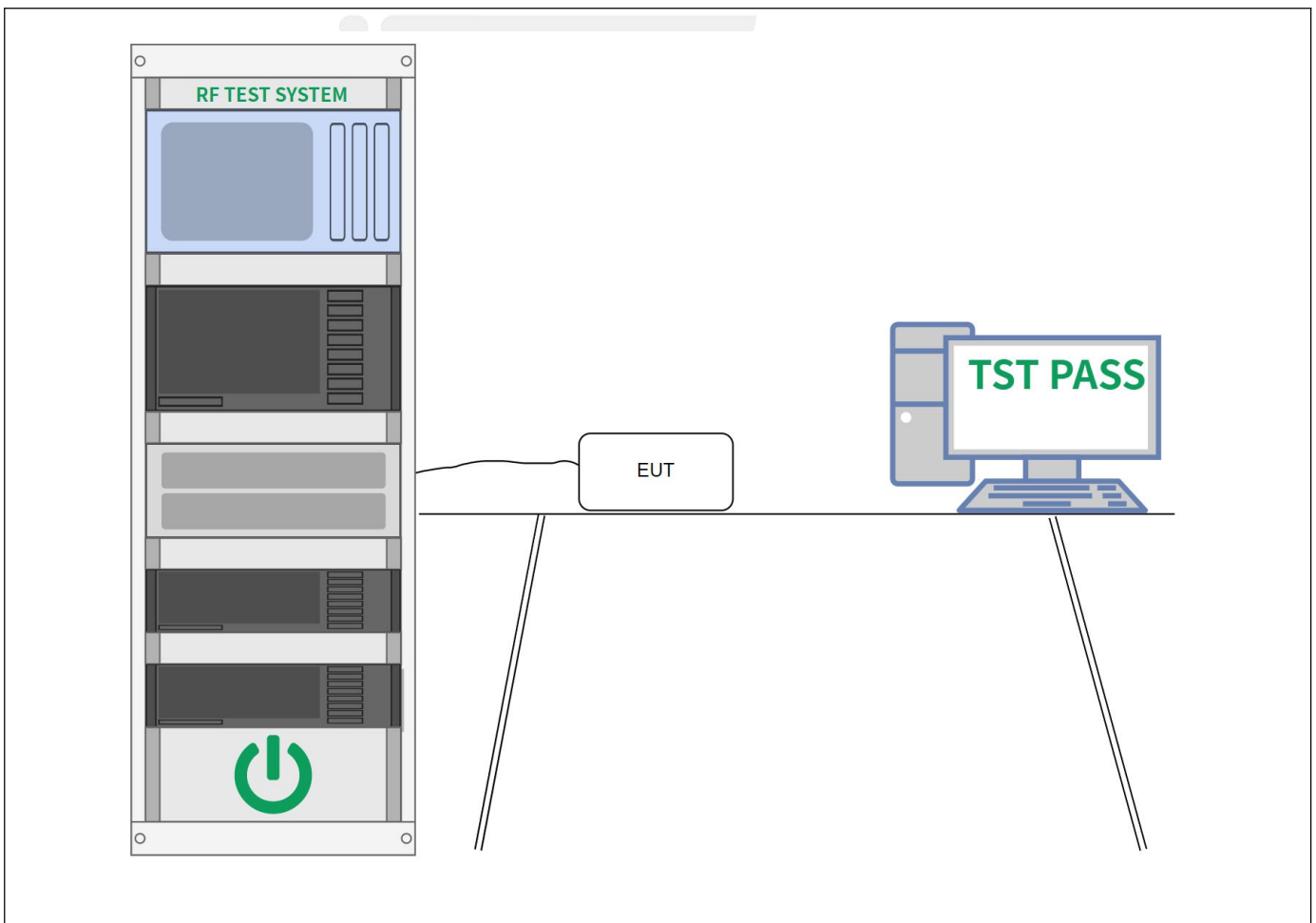
	1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB. (iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB.
Test Method:	47 CFR Part 27 ANSI C63.26-2015, Section 5.7.3
Procedure:	Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency. b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out - of - band (band - edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained. c) Set the number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows: 1) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) $> (\text{number of points in sweep}) \times (\text{symbol period})$ (e.g., by a factor of $10 \times \text{symbol period} \times \text{number of points}$). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols 2) If the device cannot transmit continuously (duty cycle $< 98\%$), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time $> (\text{number of points in sweep}) \times (\text{symbol period})$ but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time. 3) If the device cannot be configured to transmit continuously (duty cycle $< 98\%$) and a free - running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time $> (\text{number of points in sweep}) \times (\text{transmitter period})$ (i.e., the transmit on - time + the off - time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This

	assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$). 4) If the device cannot be configured to transmit continuously and a free - running sweep must be used, and if the transmissions exhibit a non - constant duty cycle (duty cycle variations $> \pm 2\%$), set the sweep time so that the averaging is performed over the on - period by setting the sweep time $> (\text{symbol period}) \times (\text{number of points})$, while also maintaining the sweep time $< (\text{transmitter on - time})$. The trace mode shall be set to max hold, since not every display point will be averaged only over just the on - time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured. e) The test report shall include the plots of the measuring instrument display and the measured data. f) See Annex I for example emission mask plots.
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6.5.1. EUT Operation

Operating Environment:					
Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.5.2. Test Setup Diagram:



6.5.3. Test Data

Please Refer to Appendix A for Details.



6.6. Field Strength of Radiated Emission-Below 1GHz

Test Requirement:	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)
Test Limit:	(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations; (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation. (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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. (h) (1) $10 \log (P)$ dB. (2) (i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band. (ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10} (P)$ dB. (iii) For operations in the 1915-1920 MHz band, the power of any emission between

	1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB. (iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB.
Test Method:	47 CFR Part 27 ANSI C63.26-2015, Section 5.7.3
Procedure:	Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency. b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out-of-band (band-edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained. c) Set the number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows: 1) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) $> (\text{number of points in sweep}) \times (\text{symbol period})$ (e.g., by a factor of $10 \times \text{symbol period} \times \text{number of points}$). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols 2) If the device cannot transmit continuously (duty cycle $< 98\%$), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time $> (\text{number of points in sweep}) \times (\text{symbol period})$ but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time.

3) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a freerunning sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$).

4) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > $\pm 2\%$), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.

e) The test report shall include the plots of the measuring instrument display and the measured data.

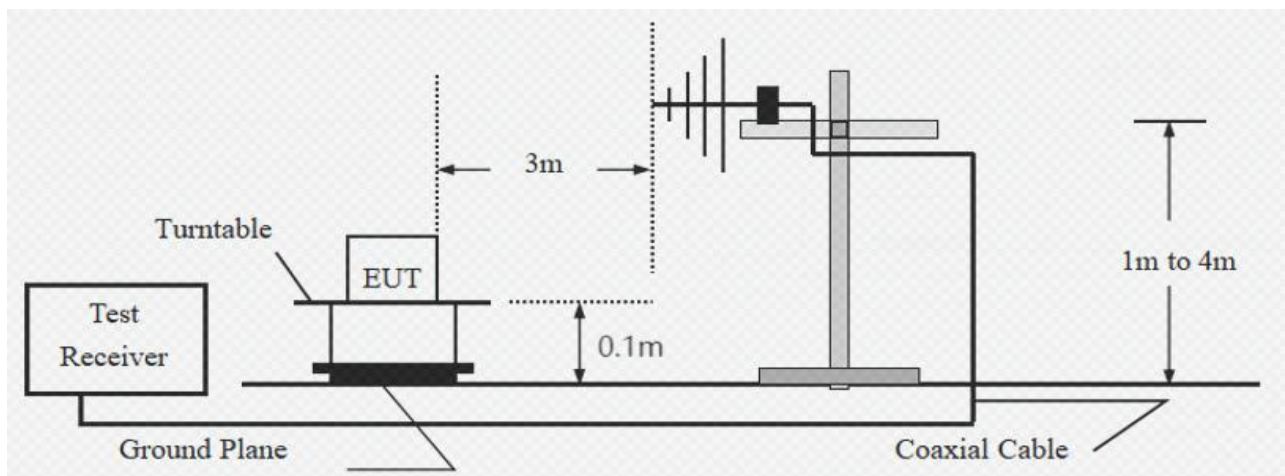
f) See Annex I for example emission mask plots.

6.6.1. EUT Operation

Operating Environment:

Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.6.2. Test Setup Diagram:



6.6.3. Test Data

The low frequency, which started from 30MHz to 1GHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

Please Refer to Appendix B for Details.



6.7. Field Strength of Radiated Emission-Above 1GHz

Test Requirement:	47 CFR Part 2.1051, Part 27.53(c)(1)(2)(3)(4), Part 27.53(f) 47 CFR Part 2.1051, Part 27.53(g) 47 CFR Part 2.1051, Part 27.53(h)(1)(2)
Test Limit:	(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB; (3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations; (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations; (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation. (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. 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. (h) (1) $10 \log (P)$ dB. (2) (i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in § 27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band. (ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10} (P)$ dB. (iii) For operations in the 1915-1920 MHz band, the power of any emission between

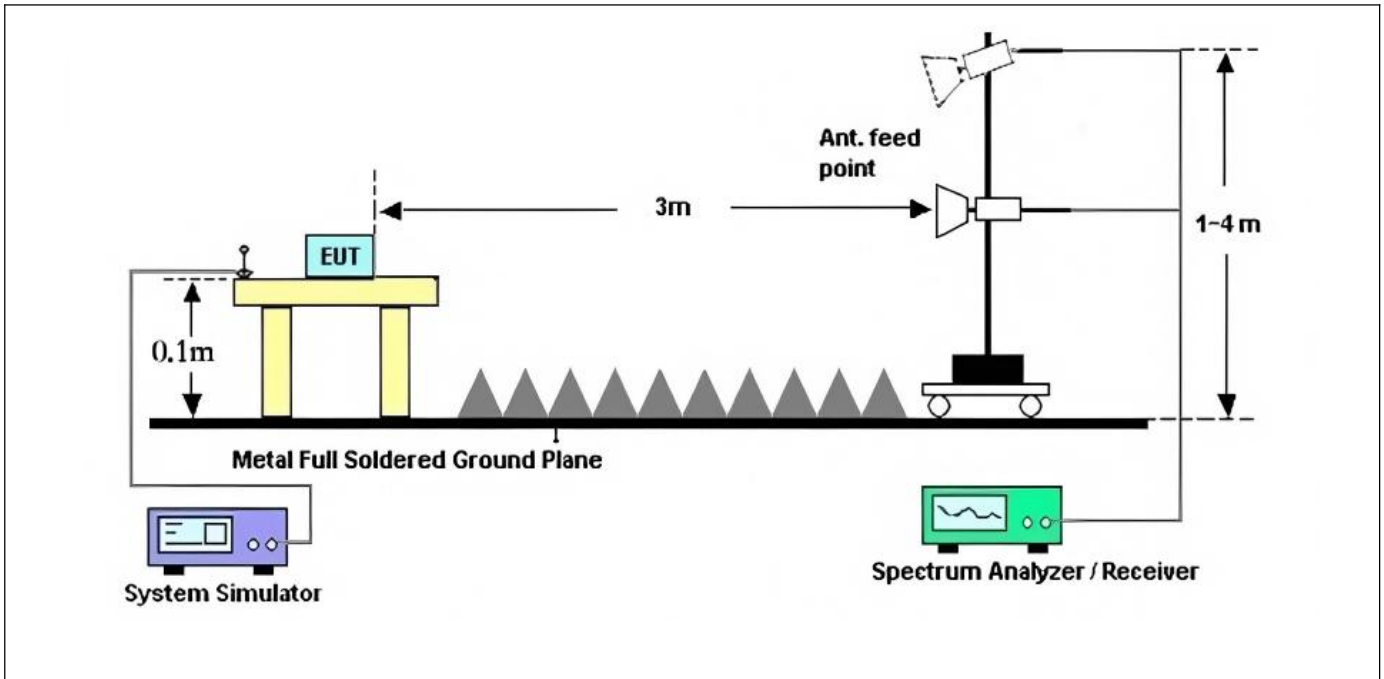
	1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB. (iv) For operations in the 1995-2000 MHz band, the power of any emission between 2005-2020 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB.
Test Method:	47 CFR Part 27 ANSI C63.26-2015, Section 5.7.3
Procedure:	Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (a) Set the spectrum analyzer center frequency to the block, band, or channel edge frequency. b) Set the span wide enough to capture the fundamental emission closest to the authorized block or band edge, and to include all modulation products that spill into the immediately adjacent frequency band. In some cases, it may be possible to set the center frequency and span so as to encompass the fundamental emission and the unwanted out-of-band (band-edge) emissions on either side of the authorized block, band, or channel. This can be accomplished with a single (slow) sweep, if adequate overload protection and sufficient dynamic range can be maintained. c) Set the number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$. d) Sweep time should be auto for peak detection. For rms detection the sweep time should be set as follows: 1) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) $> (\text{number of points in sweep}) \times (\text{symbol period})$ (e.g., by a factor of $10 \times \text{symbol period} \times \text{number of points}$). Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols 2) If the device cannot transmit continuously (duty cycle $< 98\%$), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time $> (\text{number of points in sweep}) \times (\text{symbol period})$ but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time.

	3) If the device cannot be configured to transmit continuously (duty cycle < 98%) and a freerunning sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$). 4) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > $\pm 2\%$), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured. e) The test report shall include the plots of the measuring instrument display and the measured data. f) See Annex I for example emission mask plots.
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6.7.1. EUT Operation

Operating Environment:					
Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.7.2. Test Setup Diagram:



6.7.3. Test Data

Please Refer to Appendix B for Details.



6.8. Frequency Stability

Test Requirement:	47 CFR Part 2.1055, Part 27.54
Test Limit:	The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.
Test Method:	ANSI C63.26-2015, Section 5.6
Procedure:	Frequency stability over variations in temperature: - Supply the EUT with a nominal 60 Hz ac voltage, dc voltage, or install a new or fully charged battery in the EUT. - If possible a dummy load should be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable - length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible. - Turn on the EUT, and tune it to the center frequency of the operating band. - Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible, make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away). NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument. - Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits. - Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit. - Set the temperature control on the chamber to the highest temperature specified in the regulatory requirements for the type of device, and allow the oscillator heater and the chamber temperature to stabilize. Unless otherwise instructed by the regulatory authority, this temperature should be 50 °C. - While maintaining a constant temperature inside the environmental chamber, turn on the EUT and allow sufficient time for the EUT temperature to stabilize. - Measure the frequency. - Switch off the EUT, but do not switch off the oscillator heater. - Lower the chamber temperature to the next level that is required by the standard and allow the temperature inside the chamber to stabilize. Unless otherwise instructed by the regulators, this temperature step should be 10 °C. - Repeat step h) through step k) down to the lowest specified temperature. Unless otherwise instructed by the regulators, this temperature should be - 30 °C. When the frequency stability limit is stated as being sufficient such that the fundamental

emissions stay within the authorized bands of operation, a reference point shall be established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as fL and fH respectively. The worst - case frequency offset determined in the above methods shall be added or subtracted from the values of fL and fH and the resulting frequencies must remain within the band.

m) The following additional information is required for equipment incorporating heater type crystal oscillators to be used in mobile stations except for battery powered, hand carried, and portable equipment having mean output power lower than the threshold specified.

- 1) Measurement data showing variation in transmitter output frequency from a cold start and the elapsed time necessary for the frequency to stabilize within the applicable tolerance. Tests shall be made after temperature stabilization at each of the ambient temperature levels required by the standard.
- 2) Beginning at each temperature level specified, the frequency shall be measured within 60 s after application of primary power to the transmitter and at intervals of no more than 60 s thereafter until 10 min have elapsed or until sufficient measurements are obtained to indicate clearly that the frequency has stabilized within the applicable tolerance, whichever time period is greater.
- 3) The elapsed time necessary for the frequency to stabilize within the applicable tolerance from each beginning temperature level as determined from the tests specified in this paragraph shall be specified in the instruction book for the transmitter furnished to the user.
- 4) When it is impracticable to subject the complete transmitter to this test because of its physical dimensions or power rating, only its frequency determining and stabilizing portions need be tested.

Frequency stability when varying supply voltage:

- a) Couple the transmitter output to the measuring instrument through a suitable attenuator and coaxial cable. If connection to the EUT output is not possible make the measurement by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away)
- b) Supply the EUT with nominal ac or dc voltage. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.
- c) Turn on the EUT, and couple its output to a frequency counter or other frequency - measuring instrument.
- d) Tune the EUT to the center frequency of the operating band. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is

strong enough to allow measurement of the operating or fundamental frequency of the EUT). Adjust the detector bandwidth and span settings to achieve a resolution capable of accurate frequency measurements over the applicable frequency stability limits.

NOTE—An instrument that has an adequate level of accuracy as specified by the procuring or regulatory authority is the recommended measuring instrument.

e) Measure the frequency.

f) Unless otherwise specified, vary primary supply voltage from 85% to 115% of the nominal value for other than hand carried battery equipment.

g) 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.

h) Repeat the frequency measurement.

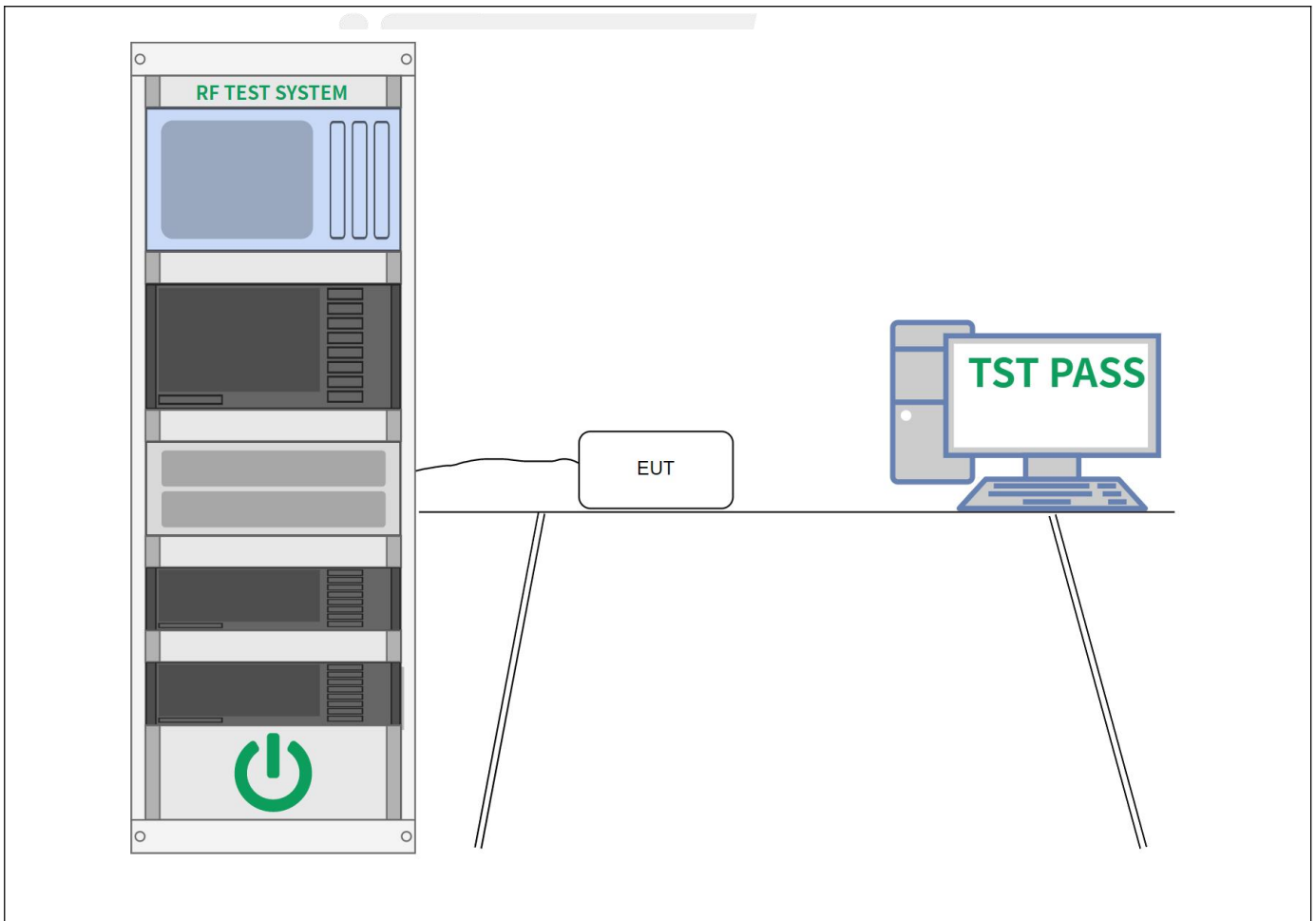
NOTE—For band - edge compliance, it can be required to make these measurements at the low and high channel of the operating band.

6.8.1. EUT Operation

Operating Environment:

Temperature:	24 °C	Humidity:	54 %	Atmospheric Pressure:	101.1 kPa
Pre test mode:	TM1, TM2, TM3, TM4, TM5, TM6				
Final test mode:	TM1, TM2, TM3, TM4, TM5, TM6				

6.8.2. Test Setup Diagram:



6.8.3. Test Data

Please Refer to Appendix A for Details.



7. TEST SETUP PHOTOS

Field Strength of Radiated Emission-Below 1GHz



Field Strength of Radiated Emission-Above 1GHz



Appendix B

Radiated Spurious Emission(Only the worst set of data was presented)

LTE Band 2 / 20MHz / QPSK									
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)
Middle	3742.18	-48.09	-13	-35.09	-63.80	-54.84	5.85	12.60	H
	5613.27	-57.56	-13	-44.56	-76.32	-63.36	7.30	13.10	H
	7484.36	-55.05	-13	-42.05	-79.94	-58.20	8.35	11.50	H
	3742.18	-43.25	-13	-30.25	-58.58	-50.00	5.85	12.60	V
	5613.27	-54.81	-13	-41.81	-73.05	-60.61	7.30	13.10	V
	7484.36	-51.22	-13	-38.22	-76.5	-54.37	8.35	11.50	V

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

LTE Band 4/20MHz/QPSK									
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)
Middle	3465.23	-55.60	-13	-42.60	-62.50	-53.00	5.60	12.50	H
	5197.50	-57.80	-13	-44.80	-69.80	-59.50	7.00	13.00	H
	6930.11	-54.20	-13	-41.20	-65.50	-56.00	8.10	11.80	H
	3465.23	-52.30	-13	-39.30	-59.20	-50.00	5.60	12.50	V
	5197.50	-55.10	-13	-42.10	-67.10	-57.00	7.00	13.00	V
	6930.11	-51.50	-13	-38.50	-62.80	-53.50	8.10	11.80	V

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

LTE Band 5 / 10MHz / QPSK									
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)
Middle	1664.18	-50.61	-13	-37.61	-58.03	-53.86	4.00	9.40	H
	2496.27	-63.27	-13	-50.27	-74.73	-66.84	4.88	10.60	H
	3328.36	-63.05	-13	-50.05	-77.22	-67.98	5.52	12.60	H
	1664.18	-45.30	-13	-32.30	-52.86	-48.55	4.00	9.40	V
	2496.27	-58.31	-13	-45.31	-69.86	-61.88	4.88	10.60	V
	3328.36	-55.19	-13	-42.19	-69.34	-60.12	5.52	12.60	V

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

LTE Band 12 / 10MHz / QPSK									
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)
Middle	1406	-49.32	-13	-36.32	-57.82	-52.57	4.00	9.40	H
	2109	-60.53	-13	-47.53	-71.33	-64.10	4.88	10.60	H
	2812	-63.62	-13	-50.62	-76.79	-68.55	5.52	12.60	H
	1406	-43.32	-13	-30.32	-51.71	-46.57	4.00	9.40	V
	2109	-57.68	-13	-44.68	-68.71	-61.25	4.88	10.60	V
	2812	-61.11	-13	-48.11	-74.21	-66.04	5.52	12.60	V

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

LTE Band 13 / 5MHz / QPSK									
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)
Middle	1559.5	-57.19	-42.15	-15.04	-66.40	-60.44	4.00	9.40	H
	2339.25	-61.81	-13	-48.81	-73.84	-65.38	4.88	10.60	H
	3119	-61.24	-13	-48.24	-76.40	-66.17	5.52	12.60	H
	1559.5	-54.94	-42.15	-12.79	-63.92	-58.19	4.00	9.40	V
	2339.25	-60.07	-13	-47.07	-72.11	-63.64	4.88	10.60	V
	3119	-61.52	-13	-48.52	-76.49	-66.45	5.52	12.60	V

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

LTE Band 66 / 20MHz / QPSK									
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)
Middle	3472	-57.35	-13	-44.35	-71.79	-64.20	5.65	12.50	H
	5208	-61.48	-13	-48.48	-80.61	-67.15	7.13	12.80	H
	6944	-56.88	-13	-43.88	-79.87	-60.28	8.40	11.80	H
	3472	-54.10	-13	-41.10	-68.57	-60.95	5.65	12.50	V
	5208	-61.27	-13	-48.27	-80.01	-66.94	7.13	12.80	V
	6944	-55.31	-13	-42.31	-78.57	-58.71	8.40	11.80	V

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

LTE Band 71 / 20MHz / QPSK									
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)
Middle	1343	-40.72	-13	-27.72	-48.30	-43.97	4.00	9.40	H
	2014.5	-64.40	-13	-51.40	-74.21	-67.97	4.88	10.60	H
	2686	-64.35	-13	-51.35	-76.96	-69.28	5.52	12.60	H
	1343	-38.03	-13	-25.03	-45.54	-41.28	4.00	9.40	V
	2014.5	-56.51	-13	-43.51	-66.43	-60.08	4.88	10.60	V
	2686	-64.33	-13	-51.33	-76.82	-69.26	5.52	12.60	V

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

End of the report