RF MEASUREMENT REPORT

FCC ID:	YY3-14249P
Application:	Handheld Group AB
Product:	Nautiz X9
Model No.:	NX9V2-RF1-AS0, NX9V2-RF1-A00
Brand Name:	Handheld
FCC Rule Part(s):	Part 2, 22 (H), 24 (E)
Test Date:	October 20 ~ November 29, 2021

Reviewed By: Kevin Guo

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2109RSU034-U5	Rev. 01	Initial Report	11-29-2021	

CONTENTS

1. General Information

1.1. Applicant

Handheld Group AB

Strandgaton 40 531 30 LIDKÖPING Sweden

1.2. Manufacturer

Handheld Group AB

Strandgaton 40 531 30 LIDKÖPING Sweden

1.3. Testing Facility

☒	**Test Site - MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site - MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site - MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Equipment Description

Product Name	Nautiz X9
Model No.	NX9V2-RF1-AS0, NX9V2-RF1-A00
Brand Name	Handheld
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Version	Bluetooth v5.0 Dual Mode
Wi-Fi Specification	802.11a/b/g/n/ac
GSM Bands	GSM850 / 1900
WCDMA Bands	Band II / IV / V
LTE Bands	FDD Band: 2, 4, 5,12, 17 TDD Band: 41
NFC Specification	13.56MHz
GNSS Specification	GPS / GLONASS / Beidou / Galileo
Software version	V000.06.00
Hardware version	DVT
Antenna Information	Refer to section 1.7
IMEI No.	Conducted Measurement: 358591250000136 Radiated Measurement: 35859125000698
Accessories	
Battery	Brand Name: Handheld Model: NX9V2-1004 Capacity: Typical 3.8V, 4800mAh, 18.24Wh
Power Adapter	MFR: Phihong Technology Co. Ltd. Model: PSAF10R-050Q Input: AC 100-240V~0.3A, 50-60Hz Output: DC 5V-2.0A
Micro USB Cable	Length: Shielded, 1.0m
Remark: 1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

Note:

1. Model Difference Description (declared by the manufacturer)

Model Number	Model Difference	Note
NX9V2-RF1-AS0	Support Barcode	--
NX9V2-RF1-A00	Not Barcode	Remove barcode hardware

2.The difference does not affect the RF test result, so we selected NX9V2-RF1-AS0 for all RF testing.

1.5. Radio Specification

T_X Frequency Range	GSM 850: 824M~849M, PCS 1900: 1850M~1910M
R_X Frequency Range	GSM 850: 869M~894M, PCS 1900: 1930M~1990M

1.6. Maximum Power, Frequency Tolerance, and Emission Designator

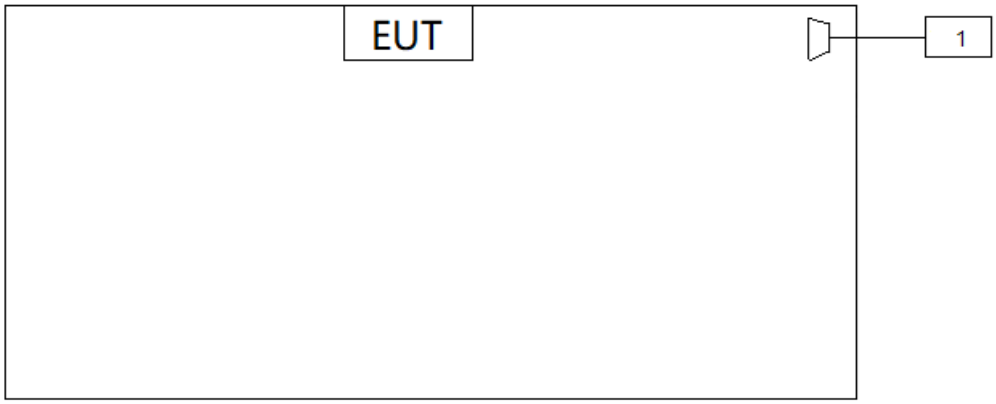
System	Modulation	Maximum Power (W)	Frequency Tolerance (ppm)	Emission Designator
GSM 850	GMSK	0.1905	-0.0047	246KGXW
GSM 850_GPRS	GMSK	0.2178	-0.0032	249KGXW
GSM 850_EGPRS	8PSK	0.0667	-0.0052	246KG7W
PCS 1900	GMSK	0.7430	0.0035	250KGXW
PCS 1900_GPRS	GMSK	0.9462	-0.0077	246KGXW
PCS 1900_EGPRS	8PSK	0.4236	-0.0047	250KG7W

1.7. Antenna Details

Technology	Frequency Range (MHz)	Antenna Type	Max Peak Gain (dBi)
GSM 850	824 ~ 849	FPC Antenna	-6.34
PCS 1900	1850 ~ 1910		1.07

2. Test Configuration

2.1. Test System Connnection Diagram



Product		Manufacturer	Model No.
1	Wideband Radio Communication Tester	R&S	CMW 500

2.2. Applied Standards

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

- ANSI C63.26:2015
- FCC CFR 47 Part 22, Part 24
- FCC KDB 971168 D01 v03r01: Power Meas License Digital Systems
- FCC KDB 971168 D02 v02r01: Misc Rev Approv License Devices
- FCC KDB 412172 D01 v01r01: Determining ERP and EIRP

2.3. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20% ~ 75%RH

3. Measuring Instrument

No.	Instrument	Manufacturer	Model No.	Asset No.	Last Cali. Date	Cali. Due Date	Test Site
1	Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2022/10/10	WZ-TR3
2	EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2022/1/12	SIP-AC1/SIP-AC2/SIP-AC3
3	Vibration Test System	DongLing	ES-1-150	MRTSUE06206	1 year	2022/8/8	WZ-TR3
4	Thermohygrometer	testo	608-H1	MRTSUE06362	1 year	2022/2/25	WZ-SR6
5	Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2022/6/28	WZ-TR3
6	Shielding Room	HUAMING	WZ-SR6	MRTSUE06443	/	/	WZ-SR6
7	Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2022/6/24	SIP-AC1/SIP-AC2/SIP-AC3/SIP-SR1
8	Signal Analyzer	Keysight	N9020B	MRTSUE06583	1 year	2022/10/10	WZ-SR6
9	Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06599	1 year	2022/10/20	SIP-AC2
10	Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2022/10/11	SIP-AC2
11	Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2022/10/31	SIP-AC1/SIP-AC2/SIP-AC3/SIP-SR1
12	Signal Analyzer	Keysight	N9020B	MRTSUE06604	1 year	2022/9/7	SIP-AC1/SIP-AC2/SIP-AC3/SIP-SR1
13	Signal Generator	Keysight	N5173B	MRTSUE06606	1 year	2021/12/3	WZ-SR6
14	EMI Test Receiver	R&S	ESR3	MRTSUE06613	1 year	2022/6/24	SIP-AC1/SIP-AC2/SIP-AC3
15	Thermohygrometer	testo	608-H1	MRTSUE06623	1 year	2021/12/3	SIP-AC2
16	Thermohygrometer	testo	608-H1	MRTSUE06624	1 year	2021/12/3	SIP-AC2
17	Preamplifier	EMCI	EMC001330	MRTSUE06643	1 year	2022/1/14	SIP-AC1/SIP-AC2/SIP-AC3
18	Preamplifier	EMCI	EMC051845SE	MRTSUE06644	1 year	2022/11/8	SIP-AC2
19	TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2022/8/5	SIP-AC2
20	Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06648	1 year	2022/11/9	SIP-AC2/SIP-AC4
21	Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2021/12/24	SIP-AC2
22	Loop Antenna	Schwarzbeck	FMZB 1519 B	MRTSUE06937	1 year	2022/3/9	SIP-AC1/SIP-AC2/SIP-AC3
23	5G Wireless Test Platform	Keysight	E7515B	MRTSUE06942	1 year	2022/3/29	WZ-SR6

No.	Instrument	Manufacturer	Model No.	Asset No.	Last Cali. Date	Cali. Due Date	Test Site
24	Radio Communication Analyzer	Anritsu	MT8821C	MRTSUE06960	1 year	2022/7/1	WZ-SR6
25	Radio Communication Test Station	Anritsu	MT8000A	MRTSUE06961	1 year	2022/7/1	WZ-SR6

Software	Version	Function
EMI Software	V3	EMI Test Software

4. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Radiated Spurious Emissions
Measurement Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): Horizontal: 9kHz ~ 300MHz: 5.04dB 300MHz ~ 1GHz: 4.95dB 1GHz ~ 40GHz: 6.40dB Vertical: 9kHz ~ 300MHz: 5.24dB 300MHz ~ 1GHz: 6.03dB 1GHz ~ 40GHz: 6.40dB
Conducted Spurious Emissions
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.13dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 0.28%
Frequency Stability
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 76.2Hz

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Verdict
2.1049	Occupied Bandwidth	Conducted	Pass
2.1055, 22.355, 24.235	Frequency Stability		Pass
22.913(a)(5)	Equivalent Radiated Power		Pass
24.232(c)	Equivalent Isotropic Radiated Power		Pass
2.1051, 22.917(a), 24.238(a)	Band Edge		Pass
2.1051, 22.917(a), 24.232(d)	Peak to Average Ratio		Pass
24.238(a)	Spurious Emission		Pass
2.1053, 22.917(a), 24.238(a)	Spurious Emission	Radiated	Pass

Notes:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. All supported modulation types were evaluated. The worst-case emission of modulation was selected. Therefore, the Frequency Stability, Channel Band Edge, Radiated & Conducted Spurious Emission were presented worst-case in the test report.

5.2. Occupied Bandwidth Measurement

5.2.1. Test Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

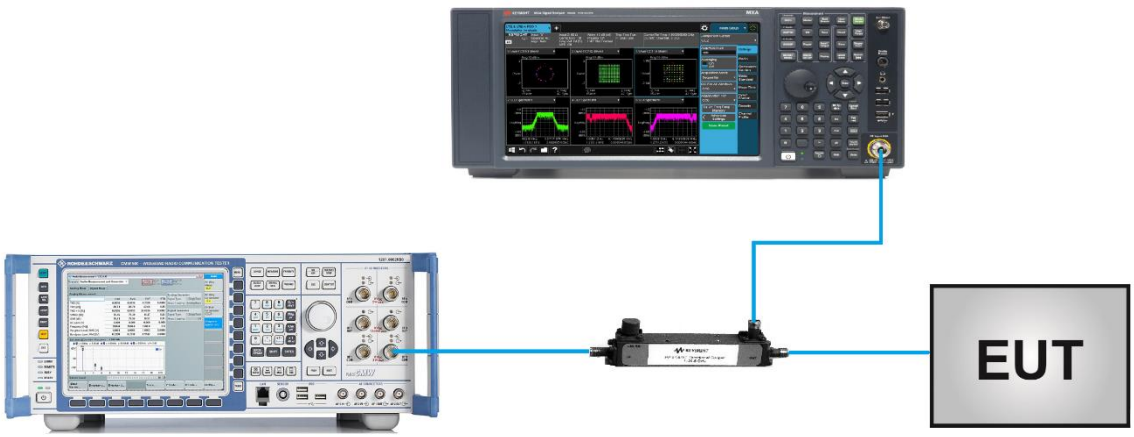
5.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.4

5.2.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency
2. RBW = The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW
3. VBW ≥ 3 × RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4. Test Setup



5.2.5. Test Result

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	GSM 850

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	824.2	0.245
Middle	836.4	0.246
High	848.8	0.245

99% Bandwidth	
Low Channel	Middle Channel
	
High Channel	
	

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	GSM 850_GPRS

Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	824.2	0.247
Middle	836.4	0.242
High	848.8	0.249

99% Bandwidth

Low Channel

Middle Channel

High Channel

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	GSM 850_EGPRS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	824.2	0.245
Middle	836.4	0.246
High	848.8	0.245

99% Bandwidth

Low Channel

Middle Channel

High Channel

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	PCS 1900

Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	1850.2	0.247
Middle	1880.0	0.250
High	1909.8	0.243

99% Bandwidth

Low Channel

Middle Channel

High Channel

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	PCS 1900_GPRS

Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	1850.2	0.246
Middle	1880.0	0.244
High	1909.8	0.244

99% Bandwidth

Low Channel

Middle Channel

High Channel

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/06	Test Band	PCS 1900_EGPRS

Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	1850.2	0.243
Middle	1880.0	0.250
High	1909.8	0.243

99% Bandwidth

Low Channel

Middle Channel

High Channel

5.3. Frequency Stability Measurement

5.3.1. Test Limit

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 ±0.00025% (±2.5ppm) of the center frequency.

5.3.2. Test Procedure

ANSI C63.26-2015 - Section 5.6

5.3.3. Test Setting

Frequency Stability Under Temperature Variations:

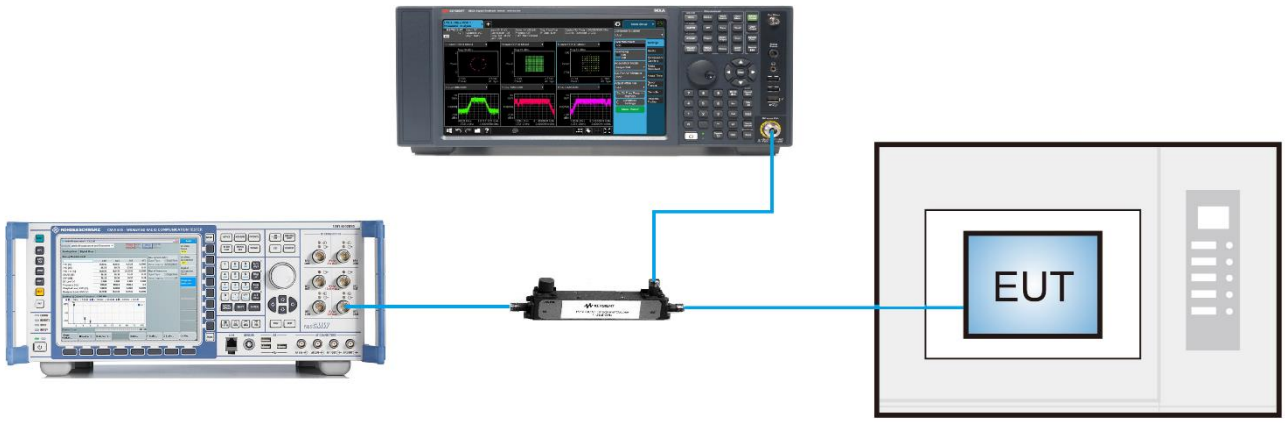
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to High. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the Low temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, recordthe maximum frequency change.

5.3.4. Test Setup



5.3.5. Test Result

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	GSM 850

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0039
	- 20	0.0015
	- 10	-0.0030
	0	-0.0047
	+ 10	-0.0025
	+ 20	-0.0034
	+ 30	-0.0002
	+ 40	-0.0047
	+ 50	-0.0032
4.4	+ 20	-0.0012
3.6	+ 20	-0.0010

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	GSM 850_GPRS

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	-0.0010
	- 20	-0.0030
	- 10	-0.0019
	0	0.0027
	+ 10	0.0010
	+ 20	-0.0005
	+ 30	-0.0003
	+ 40	-0.0011
	+ 50	-0.0032
4.4	+ 20	-0.0013
3.6	+ 20	-0.0022

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	GSM 850_EGPRS

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0010
	- 20	0.0008
	- 10	-0.0033
	0	-0.0045
	+ 10	-0.0045
	+ 20	-0.0046
	+ 30	-0.0002
	+ 40	-0.0052
	+ 50	-0.0033
4.4	+ 20	-0.0008
3.6	+ 20	-0.0007

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	PCS 1900

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0012
	- 20	0.0015
	- 10	0.0035
	0	0.0012
	+ 10	0.0005
	+ 20	0.0026
	+ 30	0.0012
	+ 40	0.0031
	+ 50	0.0018
4.4	+ 20	-0.0015
3.6	+ 20	0.0021

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	PCS 1900_GPRS

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0028
	- 20	0.0023
	- 10	0.0015
	0	0.0022
	+ 10	0.0021
	+ 20	0.0046
	+ 30	0.0077
	+ 40	0.0067
	+ 50	0.0023
4.4	+ 20	0.0012
3.6	+ 20	0.0038

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

Test Site	WZ-TR3	Test Engineer	Candy Luo
Test Date	2021/11/20	Test Band	PCS 1900_EGPRS

Power (Vdc)	Temp. (°C)	Frequency Tolerance (ppm)
3.8	- 30	0.0008
	- 20	0.0025
	- 10	0.0040
	0	0.0007
	+ 10	0.0010
	+ 20	0.0047
	+ 30	0.0002
	+ 40	0.0027
	+ 50	0.0037
4.4	+ 20	0.0027
3.6	+ 20	0.0020

Note: Normal Voltage =3.8V; Battery End point (BEP) =3.6V.

5.4. Equivalent Isotropically Radiated Power Measurement

5.4.1. Test Limit

PCS 1900:

Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

GSM 850:

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

5.4.2. Test Procedure

ANSI C63.26-2015 - Section 5.2

5.4.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

ERP or EIRP = P_{Meas} + G_T

where

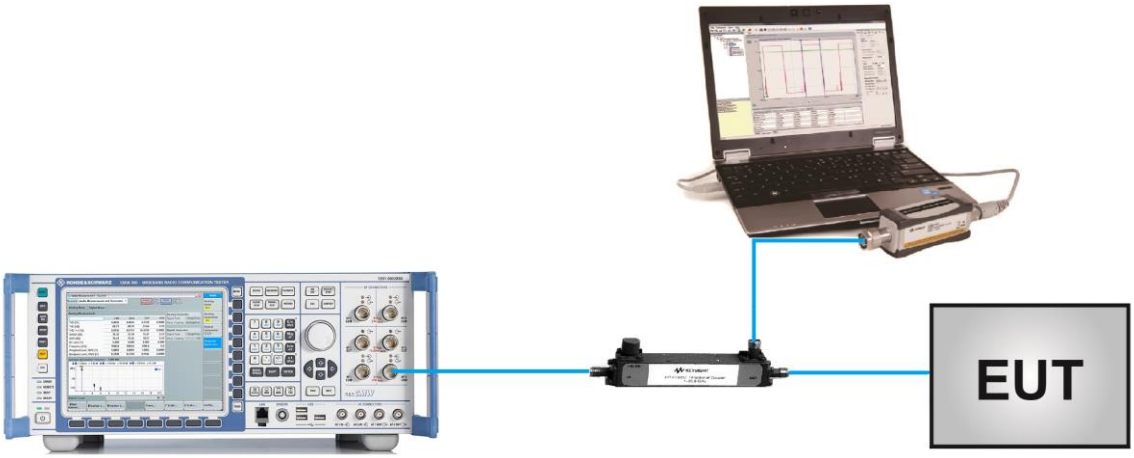
ERP or EIRP effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, e.g., dBm or dBW)

P_{Meas} measured transmitter output power or PSD, in dBm or dBW

G_T gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

ERP = EIRP -2.15

5.4.4. Test Setup



5.4.5. Test Result

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/10	Test Band	GSM 850

Mode	Slot	Conducted Power (dBm)			Antenna Gain (dBi)	ERP (dBm)		
		GSM 850 Channel				GSM 850 Channel		
		128	189	251		128	189	251
GSM	/	30.49	31.06	31.29	-6.34	22.00	22.57	22.80
GPRS	1	30.77	31.40	31.87	-6.34	22.28	22.91	23.38
	2	30.12	30.73	31.22	-6.34	31.63	22.24	22.73
	3	30.12	30.73	31.22	-6.34	19.92	20.58	21.11
	4	28.41	29.07	29.60	-6.34	18.78	19.44	19.95
EGPRS	1	24.64	25.21	25.84	-6.34	16.15	16.72	17.35
	2	23.29	23.89	24.55	-6.34	14.80	15.40	16.06
	3	21.08	21.62	22.30	-6.34	12.59	13.13	13.81
	4	19.89	20.38	20.99	-6.34	11.40	11.89	12.50
Limit	38.45dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)-2.15

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/10	Test Band	PCS 1900

Mode	Slot	Conducted Power (dBm)			Antenna Gain (dBi)	EIRP (dBm)		
		PCS 1900 Channel				PCS 1900 Channel		
		512	661	810		512	661	810
GSM	/	27.64	26.45	27.50	1.07	28.71	27.52	28.57
GPRS	1	28.61	28.69	28.68	1.07	29.68	29.76	29.75
	2	27.88	27.96	27.95	1.07	28.95	29.03	29.02
	3	26.09	26.16	26.15	1.07	27.16	27.23	27.22
	4	24.97	25.07	25.05	1.07	26.04	26.14	26.12
EGPRS	1	25.20	25.07	25.04	1.07	26.27	26.14	26.11
	2	23.65	23.90	23.59	1.07	24.72	24.97	24.66
	3	22.02	21.94	21.62	1.07	23.09	23.01	22.69
	4	20.89	20.81	20.43	1.07	21.96	21.88	21.50
Limit	33.01dBm							

Note: The EIRP (dBm) = Output Power (dBm) + Antenna Gain (dBi)

5.5. Band Edge Measurement

5.5.1. Test Limit

For operations in the 824 ~ 849 MHz and 1850 ~ 1910 MHz, the FCC limit is 43 + 10log10(P[$_{Watts}$]) dB below the transmitter power P(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.

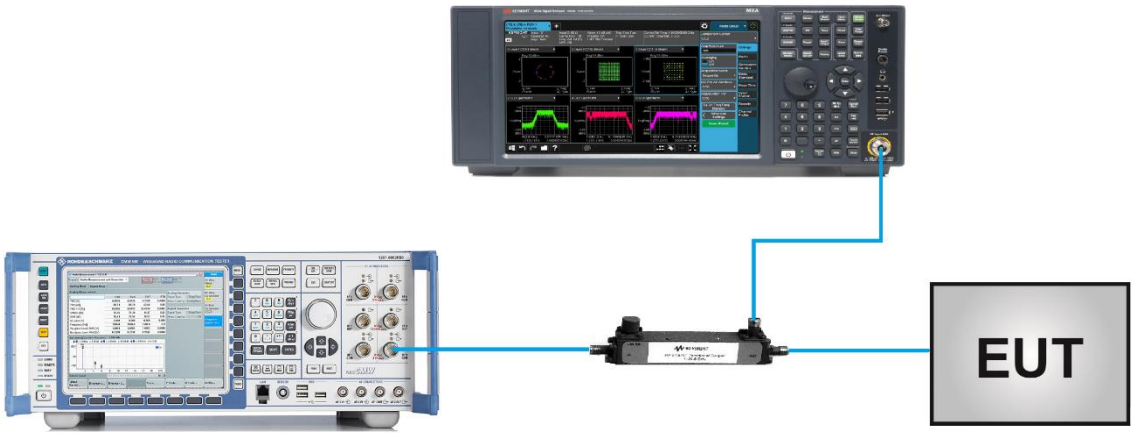
5.5.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

5.5.3. Test Setting

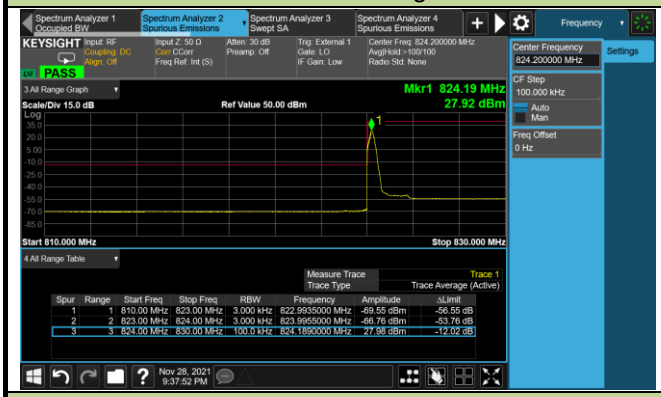
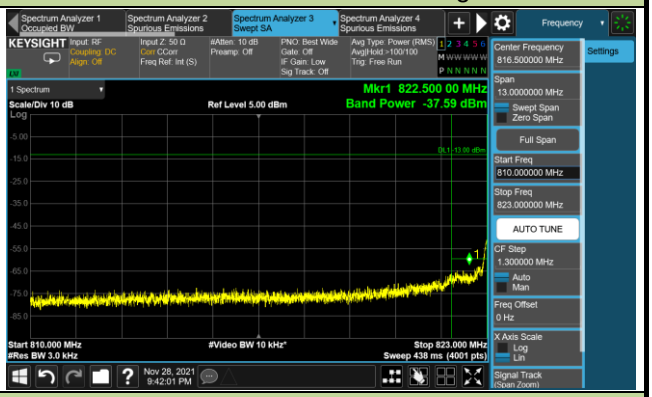
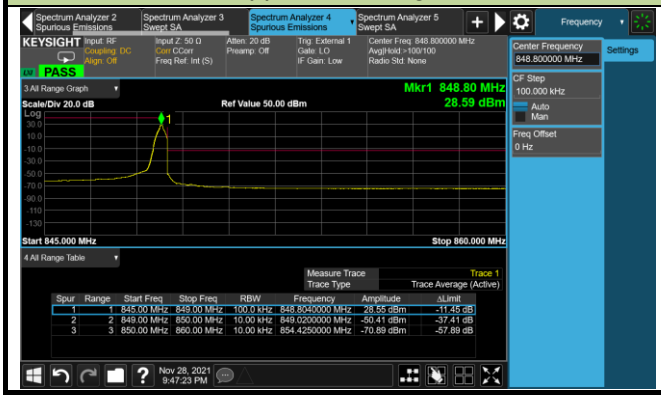
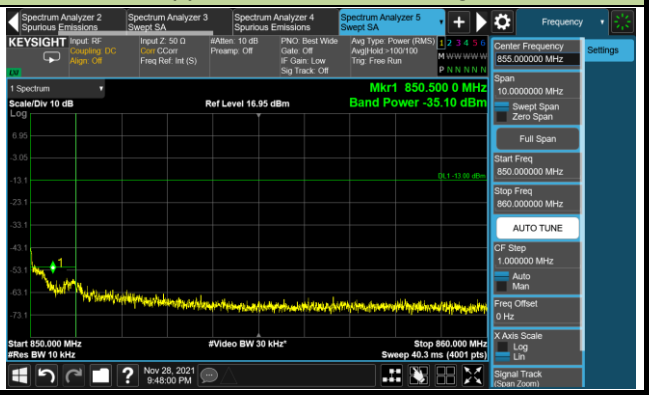
1. Set the analyzer frequency to low or high channel
2. RBW ≥ The nominal RBW shall be in the range of 1% of the anticipated OBW (in the 1MHz band immediately outside and adjacent to the band edge). For improvement of the accuracy in the measurement of the average power of a noise-like emission, a RBW narrower than the specified reference bandwidth can be used (generally limited to no less than 1% of the OBW), provided that a subsequent integration is performed over the full required measurement bandwidth. This integration should be performed using the spectrum analyzer’s band power functions.
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

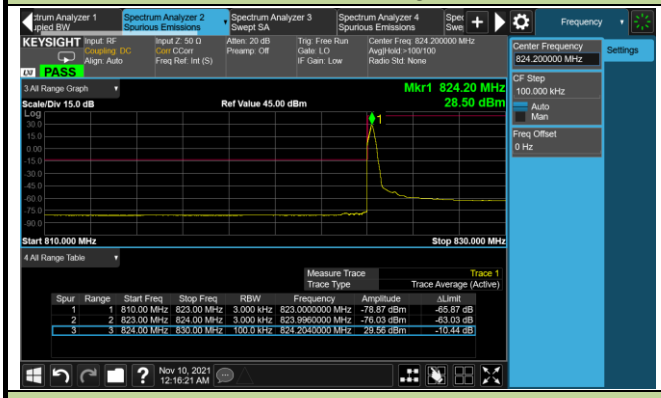
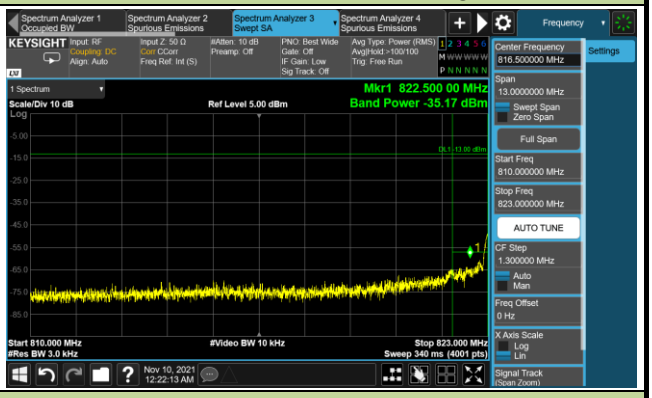
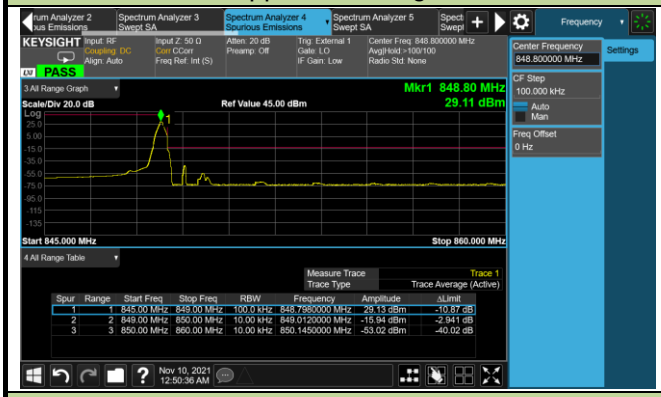
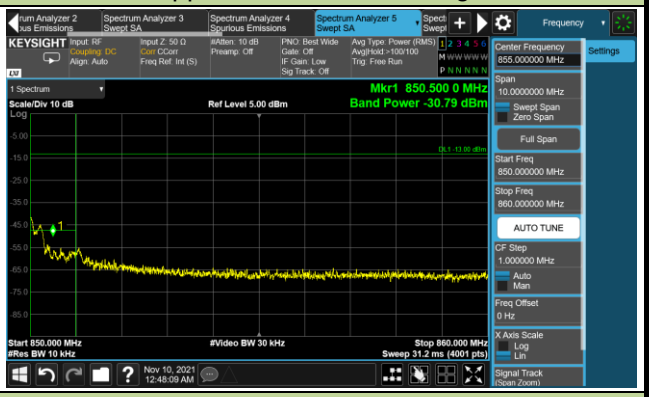
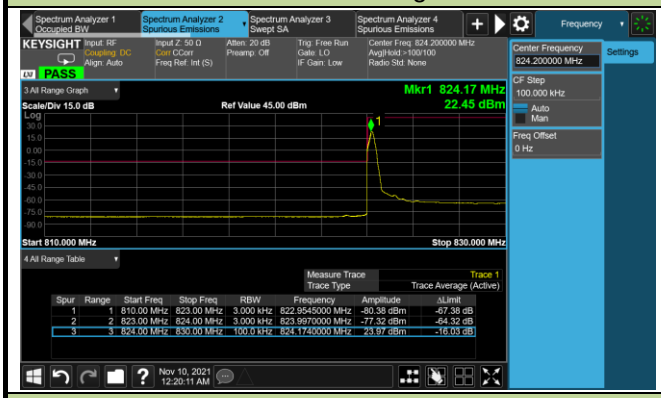
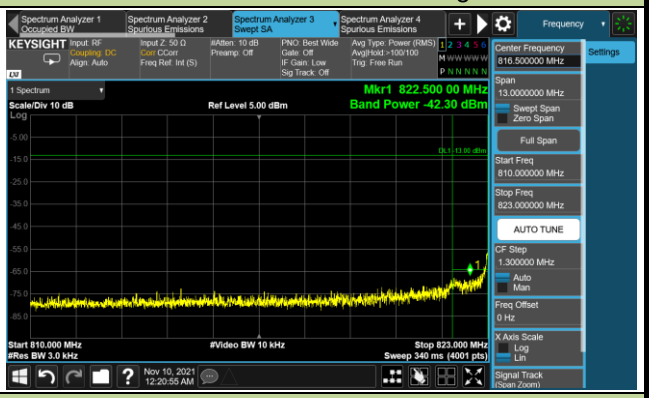
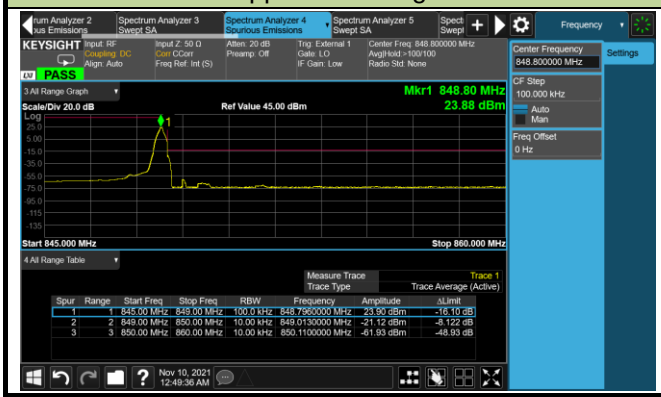
5.5.4. Test Setup



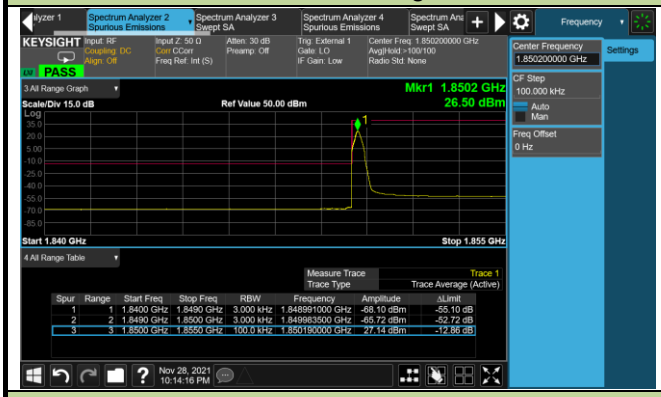
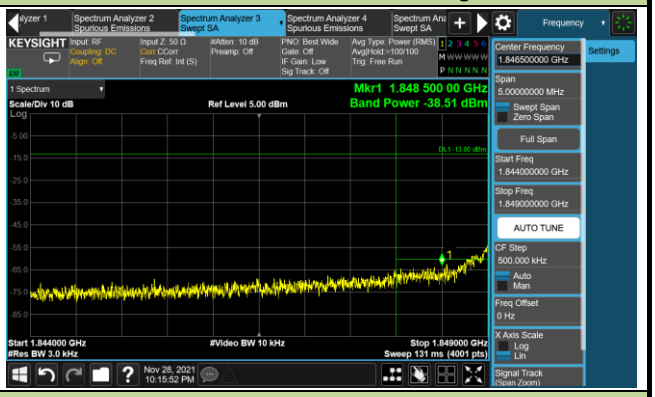
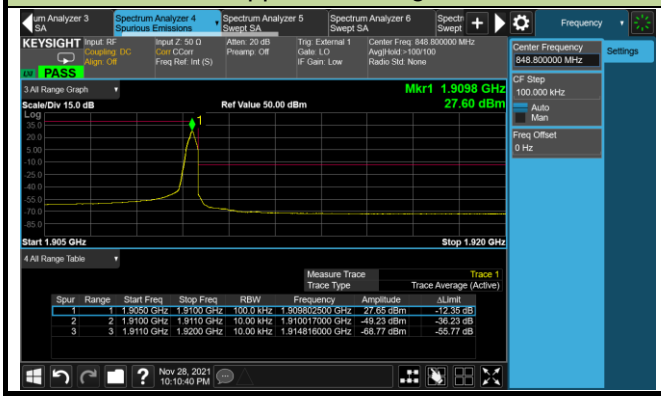
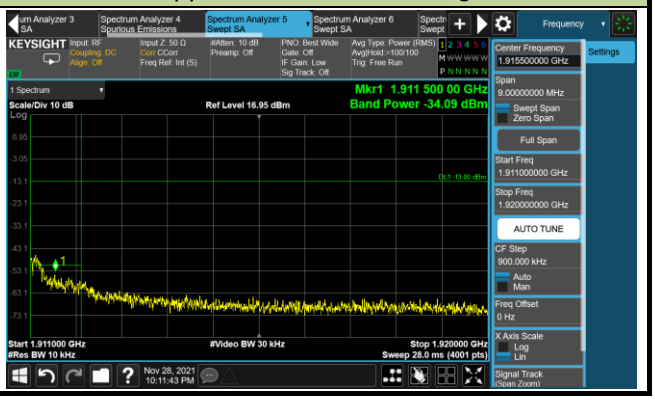
5.5.5. Test Result

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/10	Test Band	GSM 850

GSM 850	
Lower Band Edge	Lower Extended Band Edge
	
Upper Band Edge	Upper Extended Band Edge
	

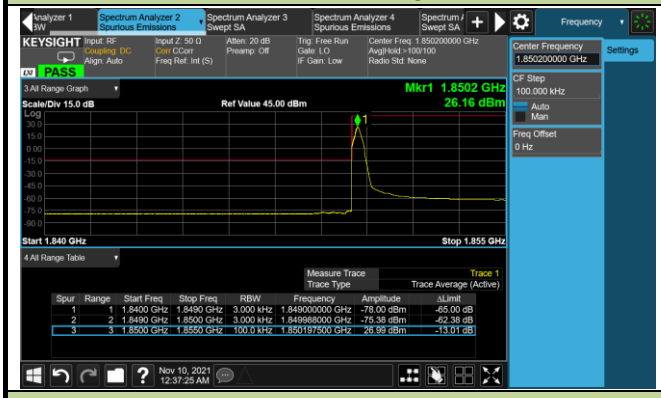
GSM 850_GPRS	
Lower Band Edge	Lower Extended Band Edge
	
Upper Band Edge	Upper Extended Band Edge
	
GSM 850_EGPRS	
Lower Band Edge	Lower Extended Band Edge
	
Upper Band Edge	Upper Extended Band Edge
	

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/10	Test Band	PCS 1900

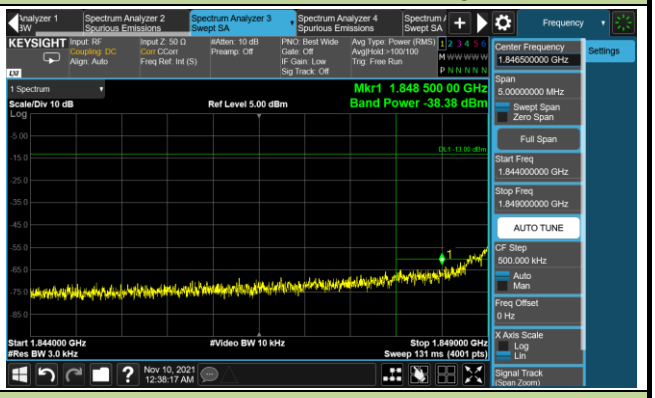
PCS 1900	
Lower Band Edge	Lower Extended Band Edge
	
Upper Band Edge	Upper Extended Band Edge
	

PCS 1900_GPRS

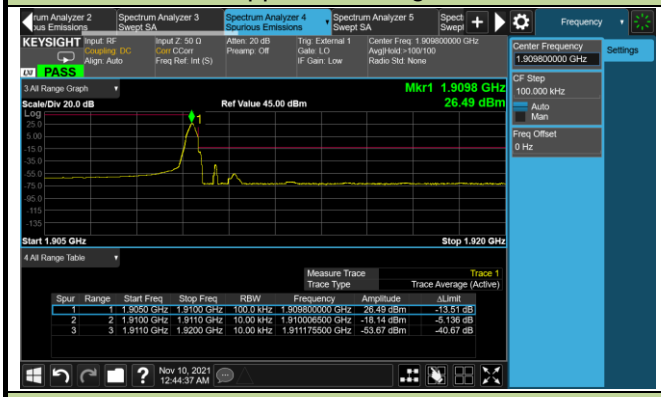
Lower Band Edge



Lower Extended Band Edge



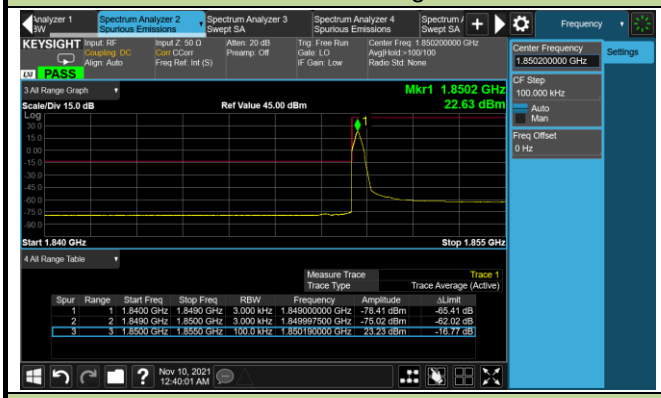
Upper Band Edge



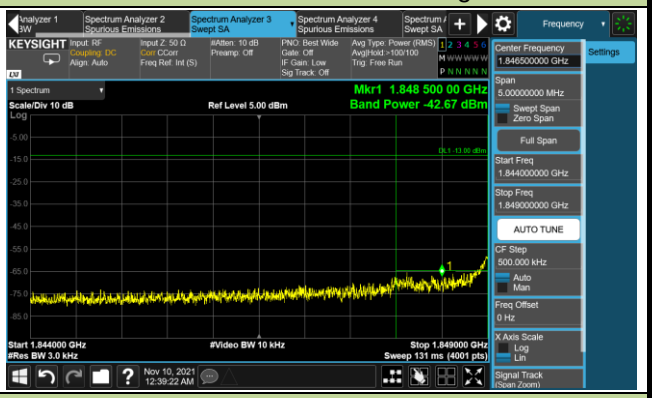
Upper Extended Band Edge

PCS 1900_EGPRS

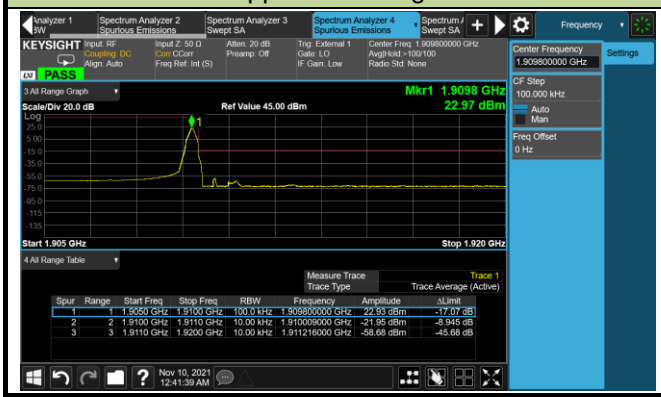
Lower Band Edge



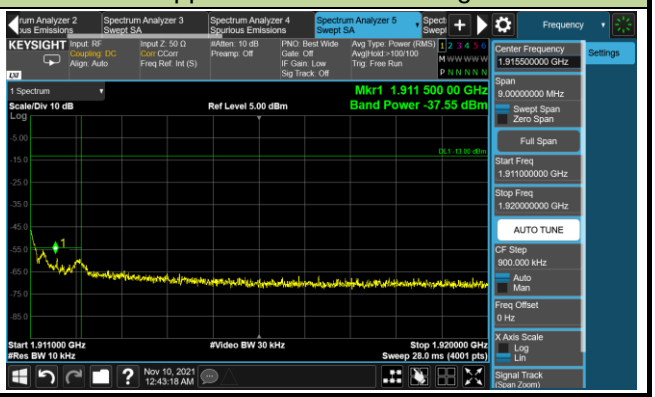
Lower Extended Band Edge



Upper Band Edge



Upper Extended Band Edge



5.6. Peak to Average Ratio Measurement

5.6.1. Test Limit

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

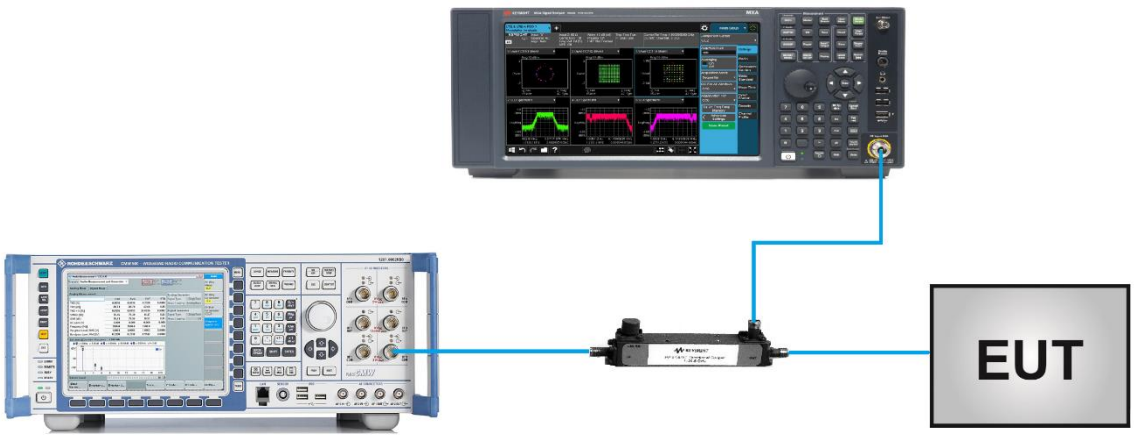
5.6.2. Test Procedure

ANSI C63.26-2015 - Section 5.2.3.4 (CCDF).

5.6.3. Test Setting

1. Set the resolution / measurement bandwidth ≥ signal's occupied bandwidth
2. Set the number of counts to a value that stabilizes the measured CCDF curve
3. Record the maximum PARR level associated with a probability of 0.1%

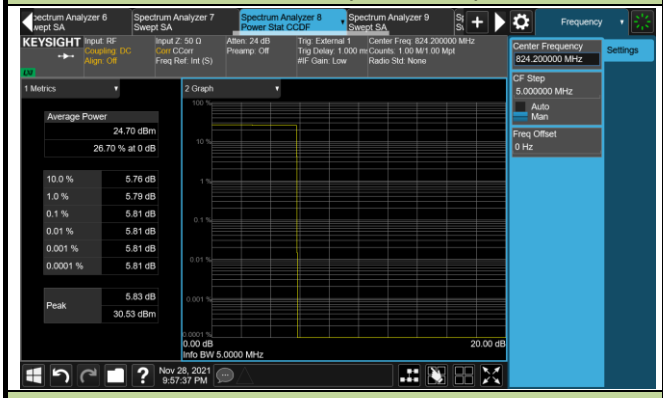
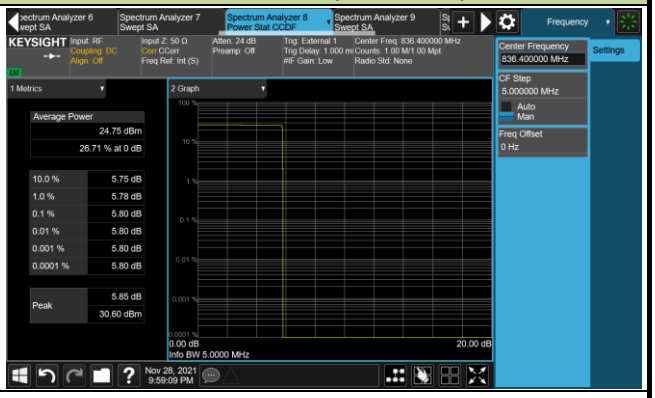
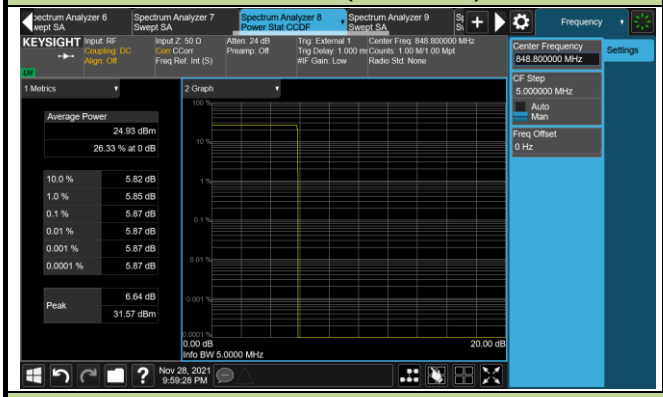
5.6.4. Test Setup

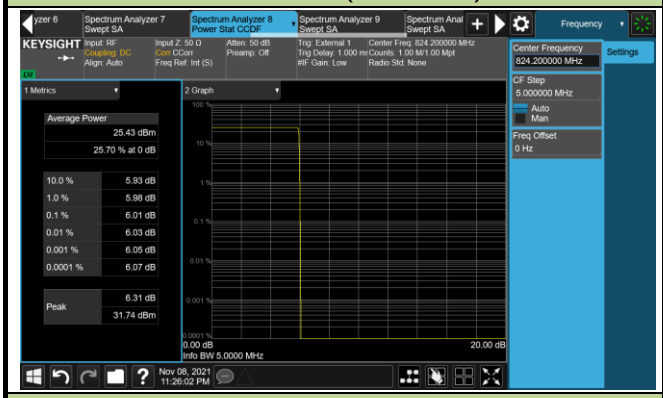
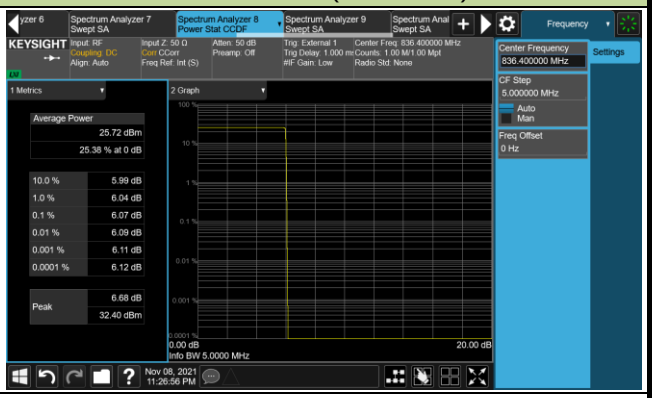
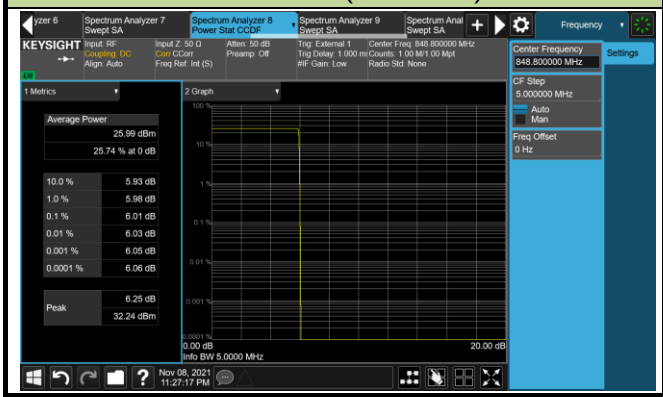


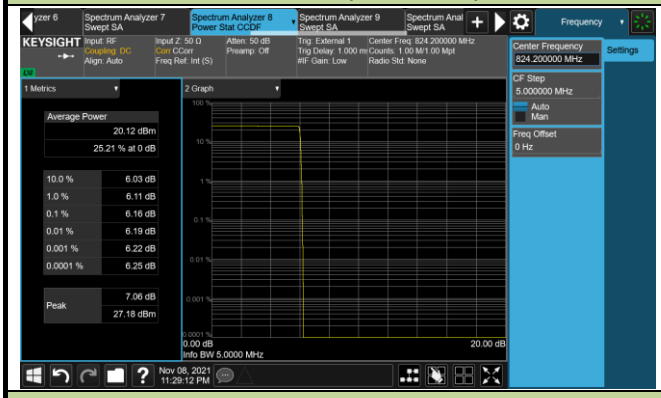
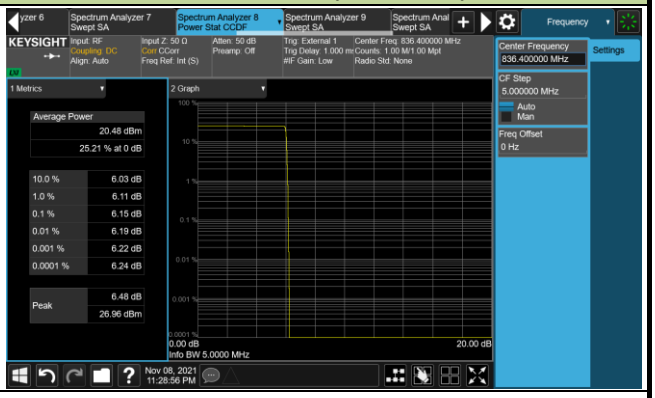
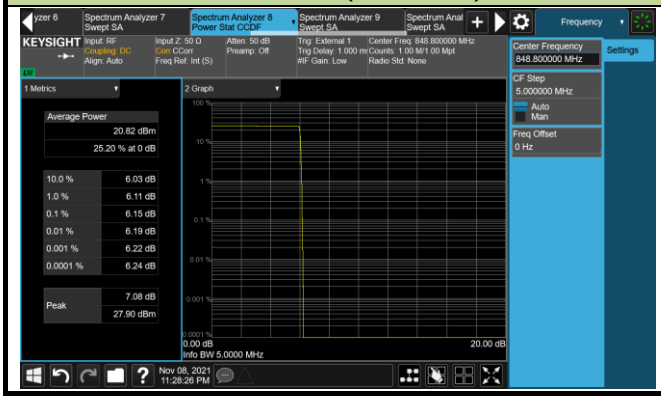
5.6.5. Test Result

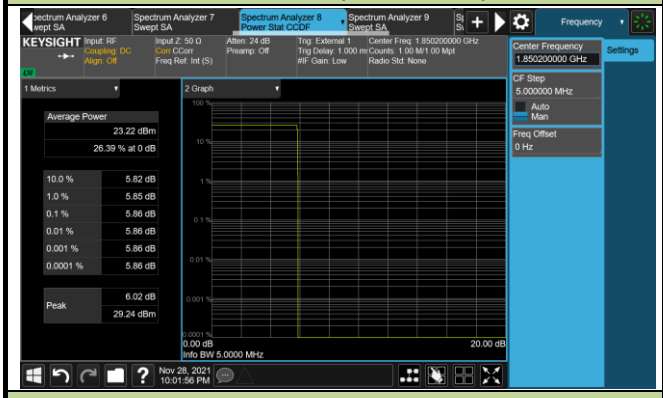
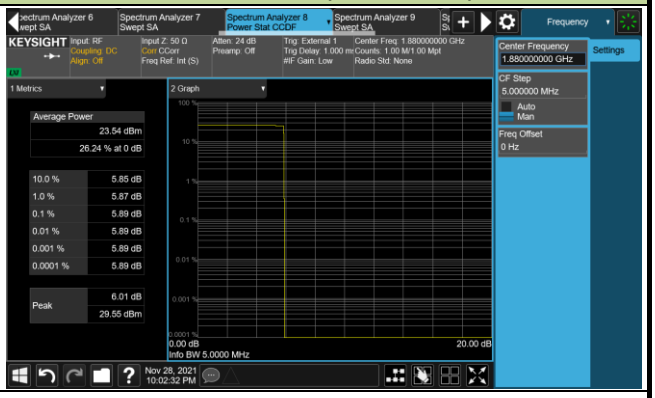
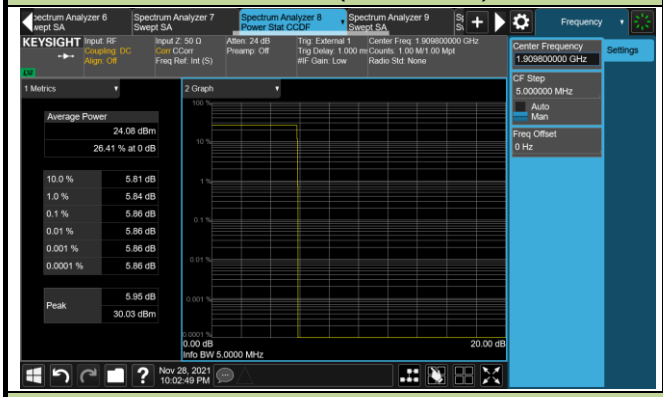
Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/08	Test Band	GSM 850, PCS 1900

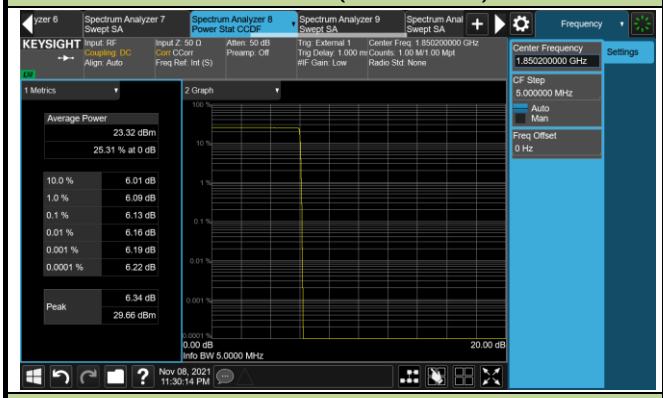
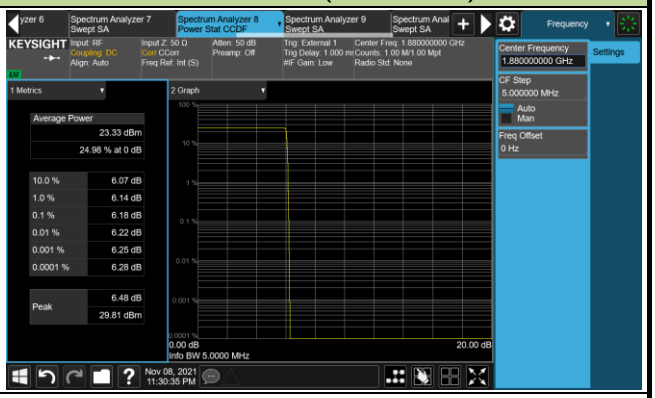
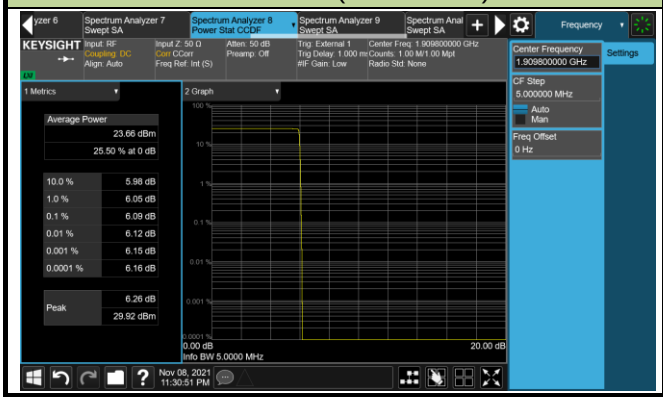
Channel No.	Frequency (MHz)	Channel Bandwidth (KHz)	Peak to Average Ratio (dB)	Limit (dB)
GSM 850				
128	824.2	200	5.81	≤ 13.00
189	836.4	200	5.80	≤ 13.00
251	848.8	200	5.87	≤ 13.00
GSM 850_GPRS				
128	824.2	200	6.01	≤ 13.00
189	836.4	200	6.07	≤ 13.00
251	848.8	200	6.01	≤ 13.00
GSM 850_EGPRS				
128	824.2	200	6.16	≤ 13.00
189	836.4	200	6.15	≤ 13.00
251	848.8	200	6.15	≤ 13.00
PCS 1900				
512	1850.2	200	5.86	≤ 13.00
661	1880.0	200	5.89	≤ 13.00
810	1909.8	200	5.86	≤ 13.00
PCS 1900_GPRS				
512	1850.2	200	6.13	≤ 13.00
661	1880.0	200	6.18	≤ 13.00
810	1909.8	200	6.09	≤ 13.00
PCS 1900_EGPRS				
512	1850.2	200	6.20	≤ 13.00
661	1880.0	200	6.25	≤ 13.00
810	1909.8	200	6.28	≤ 13.00

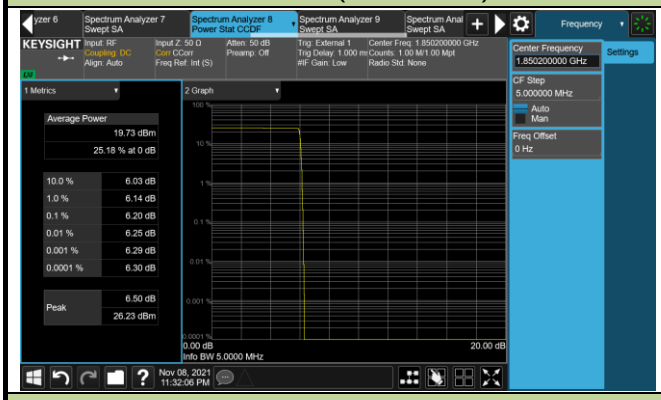
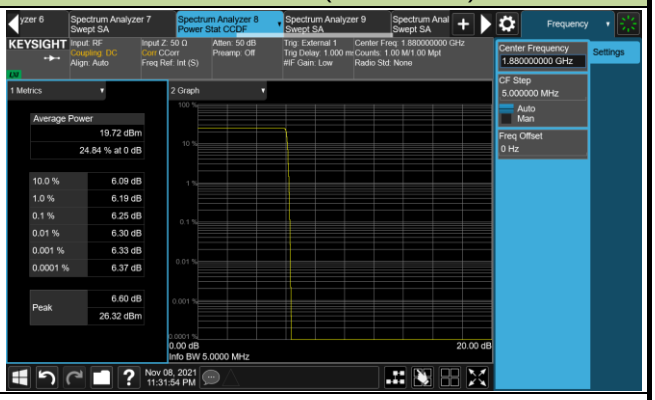
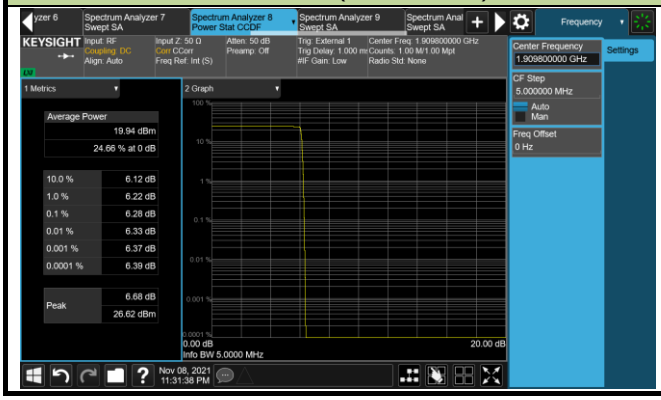
GSM 850	
Channel 128 (824.2MHz)	Channel 189 (836.4MHz)
	
Channel 254 (848.8MHz)	
	

GSM 850_GPRS	
Channel 128 (824.2MHz)	Channel 189 (836.4MHz)
	
Channel 254 (848.8MHz)	
	

GSM 850_EGPRS	
Channel 128 (824.2MHz)	Channel 189 (836.4MHz)
	
Channel 254 (848.8MHz)	
	

PCS 1900	
Channel 512 (1850.2MHz)	Channel 661 (1880.0MHz)
	
Channel 810 (1909.8MHz)	
	

PCS 1900_GPRS	
Channel 512 (1850.2MHz)	Channel 661 (1880.0MHz)
	
Channel 810 (1909.8MHz)	
	

PCS 1900_EGPRS	
Channel 512 (1850.2MHz)	Channel 661 (1880.0MHz)
	
Channel 810 (1909.8MHz)	
	

5.7. Conducted Spurious Emission Measurement

5.7.1. Test Limit

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the Low frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

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

5.7.2. Test Procedure

ANSI C63.26-2015 - Section 5.7

5.7.3. Test Setting

1. Set the analyzer frequency to low, mid, high channel.
2. RBW = 1MHz
3. VBW ≥ 3*RBW
4. Sweep time = auto
5. Detector = power averaging (rms)
6. Set sweep trigger to “free run.”
7. User gate triggered such that the analyzer only sweeps when the device is transmitting at full power.
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time.

5.7.4. Test Setup

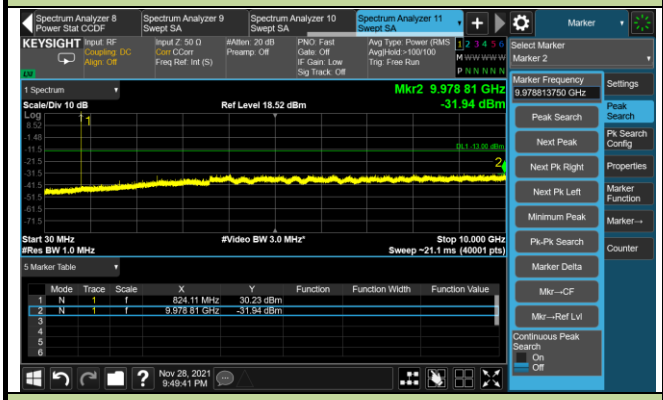
5.7.5. Test Result

Test Site	WZ-SR6	Test Engineer	Candy Luo
Test Date	2021/11/08 ~ 2021/11/29	Test Band	GSM 850, PCS 1900

Mode	Frequency (MHz)	Frequency Range (MHz)	Max Spurious Emissions (dBm)	Limit (dBm)
GSM 850	824.2	30 ~ 10000	-31.94	≤ -13.00
	836.4	30 ~ 10000	-32.49	≤ -13.00
	848.8	30 ~ 10000	-32.81	≤ -13.00
GSM 850 GPRS	824.2	30 ~ 10000	-35.70	≤ -13.00
	836.4	30 ~ 10000	-36.14	≤ -13.00
	848.8	30 ~ 10000	-36.21	≤ -13.00
GSM 850 EGPRS	824.2	30 ~ 10000	-33.42	≤ -13.00
	836.4	30 ~ 10000	-33.65	≤ -13.00
	848.8	30 ~ 10000	-32.98	≤ -13.00
PCS 1900	1850.2	30 ~ 20000	-28.41	≤ -13.00
	1880.0	30 ~ 20000	-27.75	≤ -13.00
	1909.8	30 ~ 20000	-28.23	≤ -13.00
PCS 1900 GPRS	1850.2	30 ~ 20000	-35.70	≤ -13.00
	1880.0	30 ~ 20000	-36.14	≤ -13.00
	1909.8	30 ~ 20000	-36.21	≤ -13.00
PCS 1900 EGPRS	1850.2	30 ~ 20000	-33.42	≤ -13.00
	1880.0	30 ~ 20000	-33.65	≤ -13.00
	1909.8	30 ~ 20000	-32.98	≤ -13.00

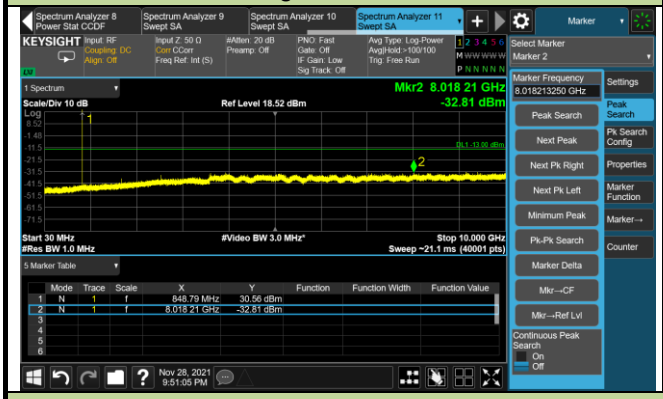
GSM 850

Low Channel



Middle Channel

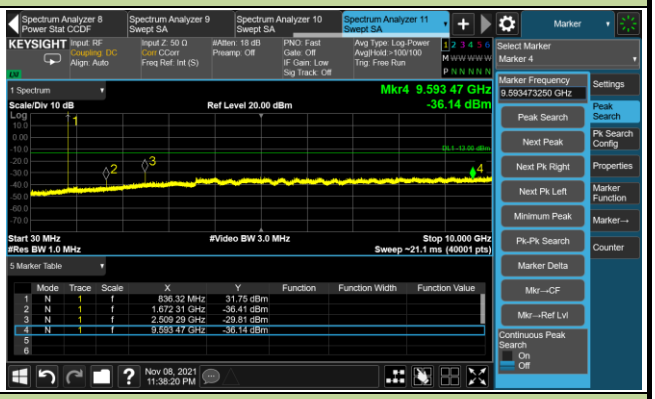
High Channel



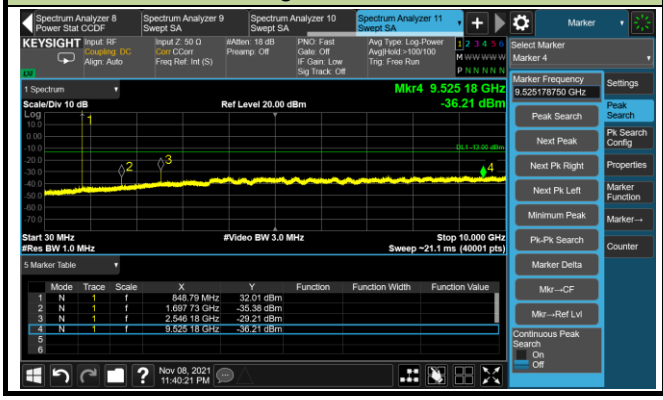
GSM 850_GPRS

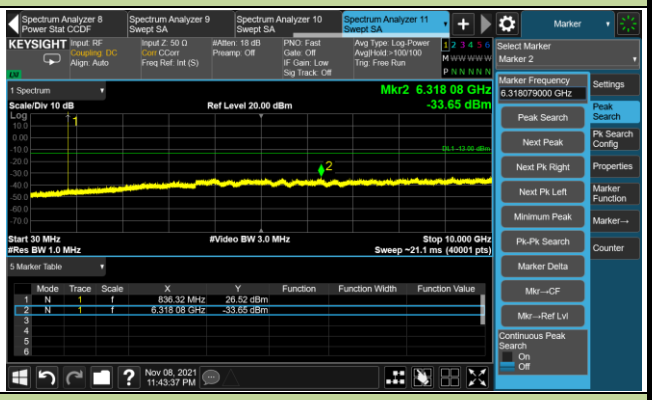
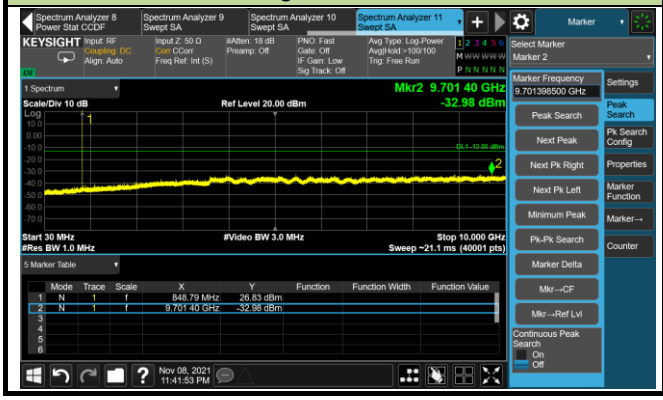
Low Channel

Middle Channel



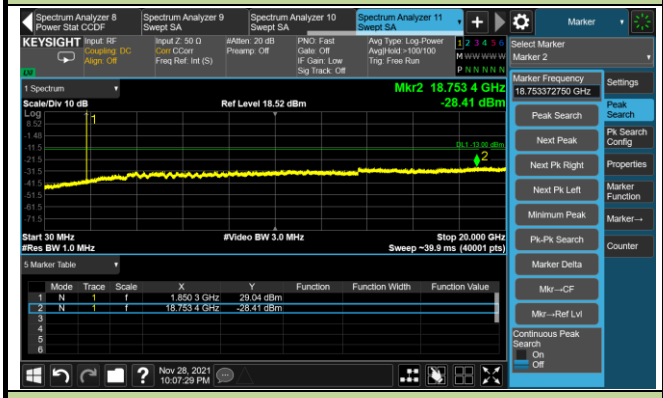
High Channel



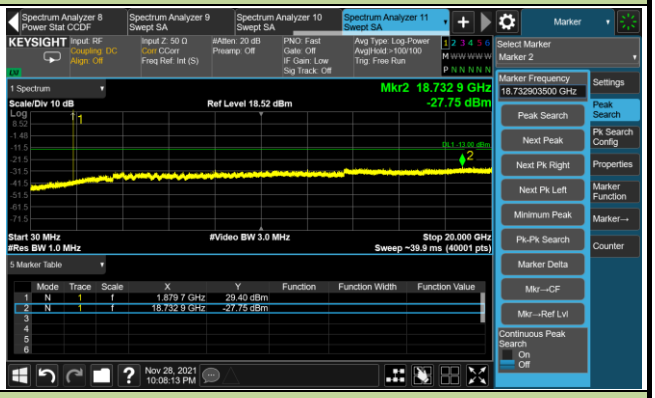
GSM 850_EGPRS	
Low Channel	Middle Channel
	
High Channel	
	

PCS 1900

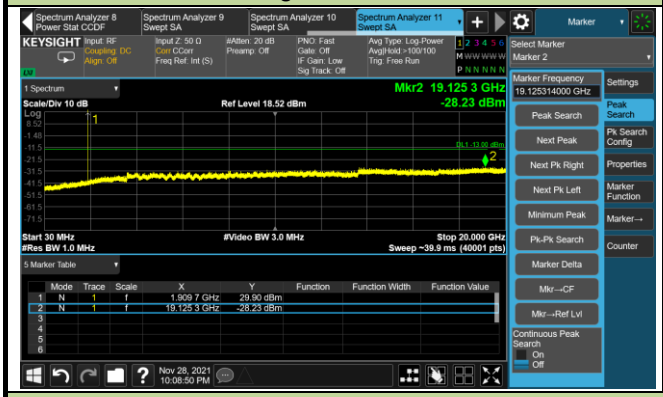
Low Channel



Middle Channel



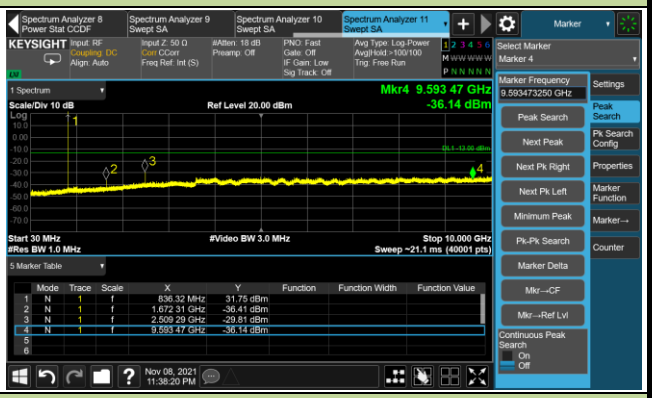
High Channel



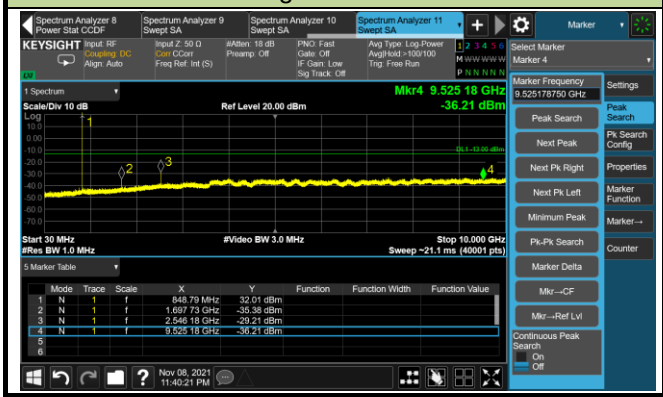
PCS 1900_GPRS

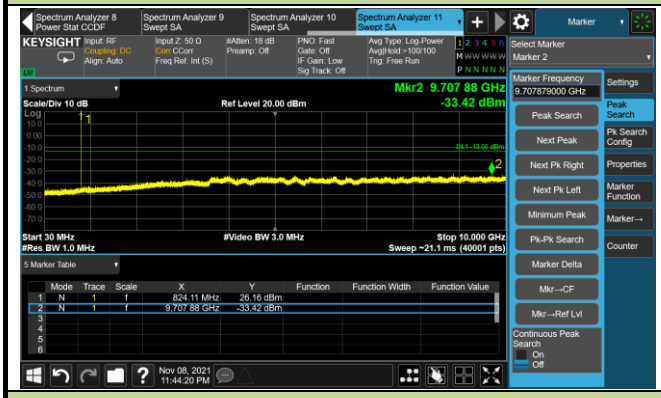
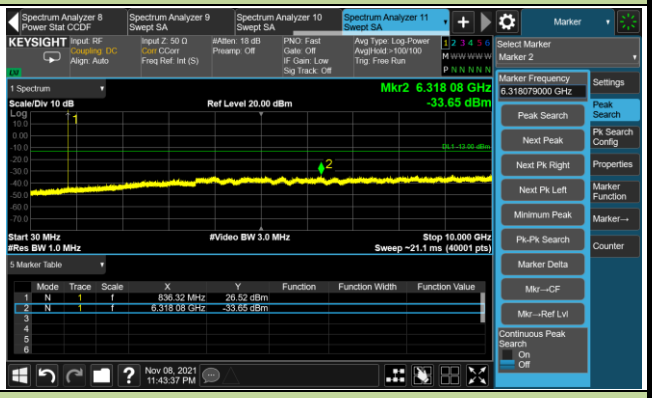
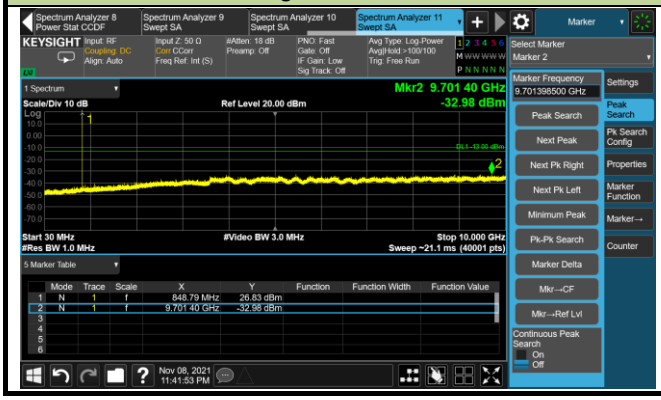
Low Channel

Middle Channel



High Channel



PCS 1900_EGPRS	
Low Channel	Middle Channel
	
High Channel	
	

5.8. Radiated Spurious Emission Measurement

5.8.1. Test Limit

Out of band emissions: The powerof any emission outside of theauthorized operating frequency ranges must be attenuated below the transmitting power (P) by a factorof at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

E (dBμV/m) = EIRP (dBm) - 20 log D + 104.8; where D is the measurement distance in meters. The emission limit equal to 82.3dBμV/m.

5.8.2. Test Procedure

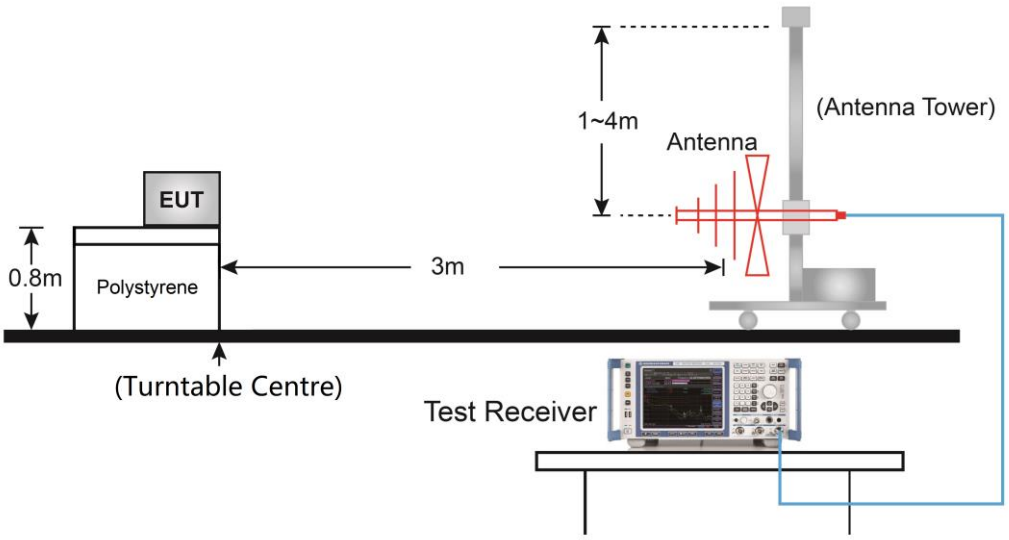
ANSI C63.26-2015 - Section 5.2.7 & 5.5

5.8.3. Test Setting

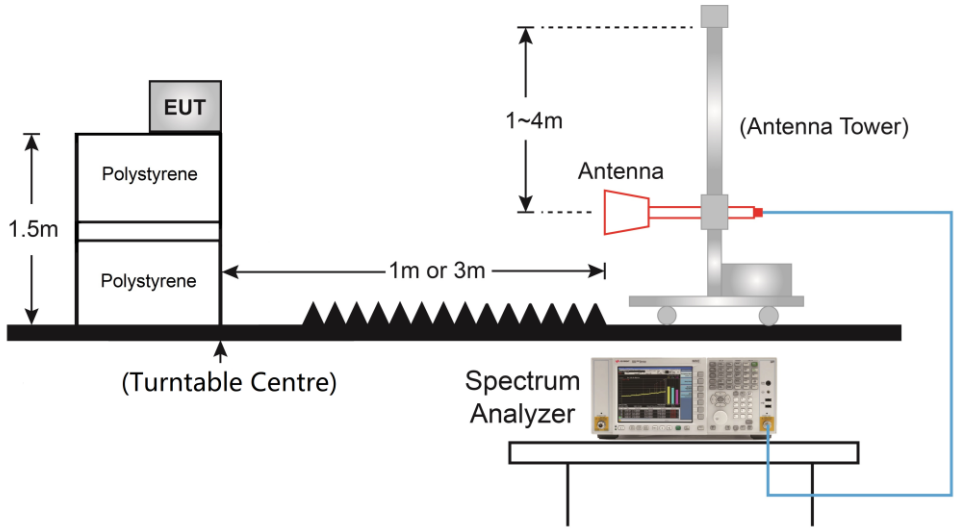
1. RBW = 1MHz
2. VBW ≥ 3*RBW
3. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period)
4. Detector = Peak
5. Trace mode = max hold
6. The trace was allowed to stabilize

5.8.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.8.5. Test Result

Test Site	SIP-AC2	Test Engineer	White Wang
Test Date	2021/11/10 ~ 2021/11/13	Test Band	GSM 850

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
771.57	1.82	28.75	30.57	82.30	-51.73	Peak	Horizontal
973.81	2.21	30.83	33.04	82.30	-49.26	Peak	Horizontal
745.86	1.58	28.55	30.13	82.30	-52.17	Peak	Vertical
980.60	1.86	30.92	32.78	82.30	-49.52	Peak	Vertical
1646.00	78.69	-18.64	60.05	82.30	-22.25	Peak	Horizontal
2479.00	64.42	-15.00	49.42	82.30	-32.88	Peak	Horizontal
1646.00	73.13	-18.64	54.49	82.30	-27.81	Peak	Vertical
2479.00	62.78	-15.00	47.78	82.30	-34.52	Peak	Vertical
Middle Channel							
869.05	9.45	29.86	39.31	82.30	-42.99	Peak	Horizontal
953.44	2.26	30.55	32.81	82.30	-49.49	Peak	Horizontal
869.05	8.32	29.86	38.18	82.30	-44.12	Peak	Vertical
958.29	1.33	30.55	31.88	82.30	-50.42	Peak	Vertical
1680.00	74.62	-18.17	56.45	82.30	-25.85	Peak	Horizontal
2513.00	67.07	-14.97	52.10	82.30	-30.20	Peak	Horizontal
1680.00	72.42	-18.17	54.25	82.30	-28.05	Peak	Vertical
2513.00	69.22	-14.97	54.25	82.30	-28.05	Peak	Vertical
High Channel							
869.05	9.94	29.86	39.80	82.30	-42.50	Peak	Horizontal
983.51	1.87	30.96	32.83	82.30	-49.47	Peak	Horizontal
42.61	5.33	17.88	23.21	82.30	-59.09	Peak	Vertical
966.54	1.99	30.71	32.70	82.30	-49.60	Peak	Horizontal
1697.00	69.71	-17.90	51.81	82.30	-30.49	Peak	Horizontal
2547.00	67.42	-14.83	52.59	82.30	-29.71	Peak	Vertical
1697.00	72.22	-17.90	54.32	82.30	-27.98	Peak	Vertical
2547.00	69.56	-14.83	54.73	82.30	-27.57	Peak	Horizontal

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Test Site	SIP-AC2	Test Engineer	White Wang
Test Date	2021/11/10 ~ 2021/11/13	Test Band	PCS 1900

Frequency (MHz)	Reading Level (dBμV)	Factor (dB/m)	Measure Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Polarization
Low Channel							
30.49	4.40	17.00	21.40	82.30	-60.90	Peak	Horizontal
967.51	1.80	30.73	32.53	82.30	-49.77	Peak	Horizontal
88.20	14.64	13.02	27.66	82.30	-54.64	Peak	Vertical
943.26	2.22	30.47	32.69	82.30	-49.61	Peak	Vertical
3703.00	65.22	-9.30	55.92	82.30	-26.38	Peak	Horizontal
9245.00	49.67	0.61	50.28	82.30	-32.02	Peak	Horizontal
3703.00	59.98	-9.30	50.68	82.30	-31.62	Peak	Vertical
5556.00	51.47	-5.62	45.85	82.30	-36.45	Peak	Vertical
Middle Channel							
53.28	2.51	18.29	20.80	82.30	-61.50	Peak	Horizontal
151.74	2.49	18.12	20.61	82.30	-61.69	Peak	Horizontal
54.74	2.20	18.21	20.41	82.30	-61.89	Peak	Vertical
160.47	2.21	18.06	20.27	82.30	-62.03	Peak	Vertical
3754.00	55.78	-9.04	46.74	82.30	-35.56	Peak	Horizontal
5641.00	54.51	-5.49	49.02	82.30	-33.28	Peak	Horizontal
3754.00	57.53	-9.04	48.49	82.30	-33.81	Peak	Vertical
5641.00	53.13	-5.49	47.64	82.30	-34.66	Peak	Vertical
High Channel							
49.40	1.99	18.65	20.64	82.30	-61.66	Peak	Horizontal
153.68	1.71	18.13	19.84	82.30	-62.46	Peak	Horizontal
50.37	1.55	18.52	20.07	82.30	-62.23	Peak	Vertical
147.37	2.26	17.98	20.24	82.30	-62.06	Peak	Vertical
3822.00	59.54	-9.29	50.25	82.30	-32.05	Peak	Horizontal
5726.00	53.73	-5.45	48.28	82.30	-34.02	Peak	Horizontal
3822.00	56.81	-9.29	47.52	82.30	-34.78	Peak	Vertical
5726.00	50.28	-5.45	44.83	82.30	-37.47	Peak	Vertical

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB/m).

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

6. Conclusion

The data collected relate only the item(s) tested and show that unit is compliance with FCC Rules.

The End