



FCC RF TEST REPORT

Report Number : **RP20170314030_01** Date of Issue: **05 Mar 2016**

FCC ID : **Q78-R8862AS8500**

Model / Serial No. : **ZXSDR R8862A S8500**

Product Type : **Macro Remote Radio Unit**

Applicant : **ZTE Corporation**

Address : **ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,
Nanshan District, Shenzhen, Guangdong, P.R. China**

Production Facility : **ZTE Corporation**

Address : **ZTE Plaza, Keji Road South, Hi-Tech Industrial Park,
Nanshan District, Shenzhen, Guangdong, P.R. China**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : **80**

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.



Table of Content

1	General Information	4
1.1	Notes.....	4
1.2	Testing Laboratory.....	5
1.3	Details of Manufacture.....	5
1.4	Application Details	5
1.5	Test Item.....	5
1.6	Applied Standard	5
2	Summary of Results	6
3	Equipment Specification	7
3.1	Technical specification	7
4	Test Methodology	8
5	Test configuration	9
6	TRANSMITTER OUTPUT POWER	10
6.1	Applicable Standard: FCC §2.1046 §22.913	10
6.2	Test Equipment List and Details.....	10
6.3	Test Procedure	10
6.4	Environmental Conditions.....	10
6.5	Test Result: Pass	10
6.6	Test Mode: Transmitting GSM	10
6.7	Test Data:	10
7	RF EXPLOSURE	25
7.1	Applicable standard: FCC §2.1091 and §1.1037	25
7.2	Limit	25
7.3	Test Data	25
7.4	Test Result: pass.....	25
8	MODULATION CHARACTERISTIC.....	26
8.1	Applicable Standard: FCC §2.1047.....	26
8.2	Test Equipment List and Details.....	26
8.3	Test Procedure	26
8.4	Test Data Environmental Conditions.....	26
8.5	Test Result: Pass	26
8.6	Test Mode: Transmitting GSM	26
8.7	Test Data:	26
9	SPURIOUS RADIATED EMISSIONS	33
9.1	Applicable Standard: FCC CFR 47, §2.1053	33
9.2	Test Equipment List and Details.....	33
9.3	Test Procedure	34
9.4	Test Results Summary: PASS	34
9.5	Environmental Conditions.....	34
9.6	Test data.....	34
10	SPURIOUS EMISSIONS AT ANTENNA TERMINALS.....	37
10.1	Applicable Standard: FCC§2.1051, §22.917.....	37
10.2	Test Equipment List and Details.....	37
10.3	Test Procedure	37
10.4	Test Data Environmental Conditions.....	37
10.5	Test Result: Pass	38
10.6	Test Mode: Transmitting GSM	38
10.7	Test Data:	38
11	OCCUPIED BANDWIDTH.....	62
11.1	Applicable Standard: FCC §2.1049 §22.917.....	62



11.2	Test Equipment List and Details.....	62
11.3	Test Procedure	62
11.4	Environmental Conditions.....	62
11.5	Test Result: Pass	62
11.6	Test Mode: Transmitting GSM	62
11.7	Test Data	62
12	BAND EDGES	69
12.1	Applicable Standard: FCC §2.1051.....	69
12.2	Test Equipment List and Details.....	69
12.3	Test Procedure	69
12.4	Test Data Environmental Conditions.....	69
12.5	Test Result: Pass	69
12.6	Test Mode: Transmitting GSM	69
12.7	Test Data	69
13	12 FREQUENCY STABILITY	78
13.1	Applicable Standard: FCC § 2.1055.....	78
13.2	Test Equipment List and Details.....	78
13.3	Test Procedure	78
13.4	Environmental Conditions.....	78
13.5	Test Result: Pass	78
13.6	Test Mode: Transmitting GSM	78
13.7	Test Data	78
	13.7.1 Frequency Stability Versus Temperature	78



1 General Information

1.1 Notes

It is the test results from all the tests which are performed in the RF Laboratory of Shenzhen Zoom Rel Testing Technology Co., Ltd. The RF Lab was certificated by CNAS and the registration number was L0611.

Test site has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on May 10, 2016.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 373926. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

Prepared By
RF Test Engineer

2017-03-12
Date

Qi Luxing
Name


Signature

Reviewed By
Laboratory Manager

2017-03-12
Date

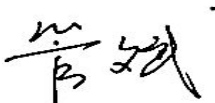
Wu Shuzhong
Name


Signature

Approved by
EMC/RF Project Manager

2017-03-12
Date

Guan Bin
Name


Signature



1.2 Testing Laboratory

Shenzhen Zoom Rel Testing Technology Co., Ltd.

Address: 1/F, B2 Wing, ZTE plaza, Keji Road South, Hi-Tech industrial park, Shenzhen, Guangdong, 518057

Country: China

Phone: +86 755 26770349

FAX: +86 755 26770347

1.3 Details of Manufacture

Manufacture : ZTE Corporation

ADDRESS: ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China

PRODUCT DESCRIPTION: Macro Remote Radio Unit

MANUFACTURERS MODEL/SERIAL NUMBER: ZXSDR R8862A S8500

FCC ID : Q78-R8862AS8500

SAMPLE NUMBER:S20170314030

1.4 Application Details

Date of receipt of order: 2017-01-04

Date of receipt of test item: 2017-01-04

Date of test: 2017-01-04~2017-03-05

1.5 Test Item

Refer to Chapter 2.

1.6 Applied Standard

APPLIED PRODUCT STANDARD	TIA/EIA 603-C:2004
TEST METHODS	FCC 47 CFR Part1:2016 FCC 47 CFR Part2:2016 FCC 47 CFR Part22:2016



2 Summary of Results

FCC RULES	DESCRIPTION OF TEST	RESULT
§2.1046 §22.913	Transmitter output Power	Compliant
§2.1091 §1.1037	RF Exposure	Compliant
§2.1053	Spurious Radiated Emissions	Compliant
§2.1051, §22.917	Spurious Emissions AT Antenna Terminals	Compliant
§2.1049 §22.917	Occupied Bandwidth	Compliant
§2.1051	Band Edge	Compliant
§ 2.1055	Frequency stability	Compliant

3 Equipment Specification

3.1 Technical specification

Size: 422 mm x 218 mm x 133 mm (HxWxD)

Input voltage: -37V~-60V

Frequency range: UL:824MHz~849MHz; DL: 869MHz~894MHz

Max RF output power: 47.7dBm

Gain of the antenna: 15dBi

Appearance of EUT:



fig 1. FIGURE 1 APPEARANCE OF ZXSDR R8862A S8500



4 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2. as well as the following parts:

Part 24 Wireless Communication Services

Applicable Standards: TIA EIA 137-A, TIA EIA 97-D, TIA/EIA 603-C, Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

All radiated and conducted measurement was performed at ZTE Corporation Reliability Testing Center. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

5 Test configuration

The EUT was configured for testing according to TIA/EIA-603C.

The final qualification test was performed with EUT operating at normal mode.

Equipment Modifications

ZTE Corporation has not done any modification on the EUT.

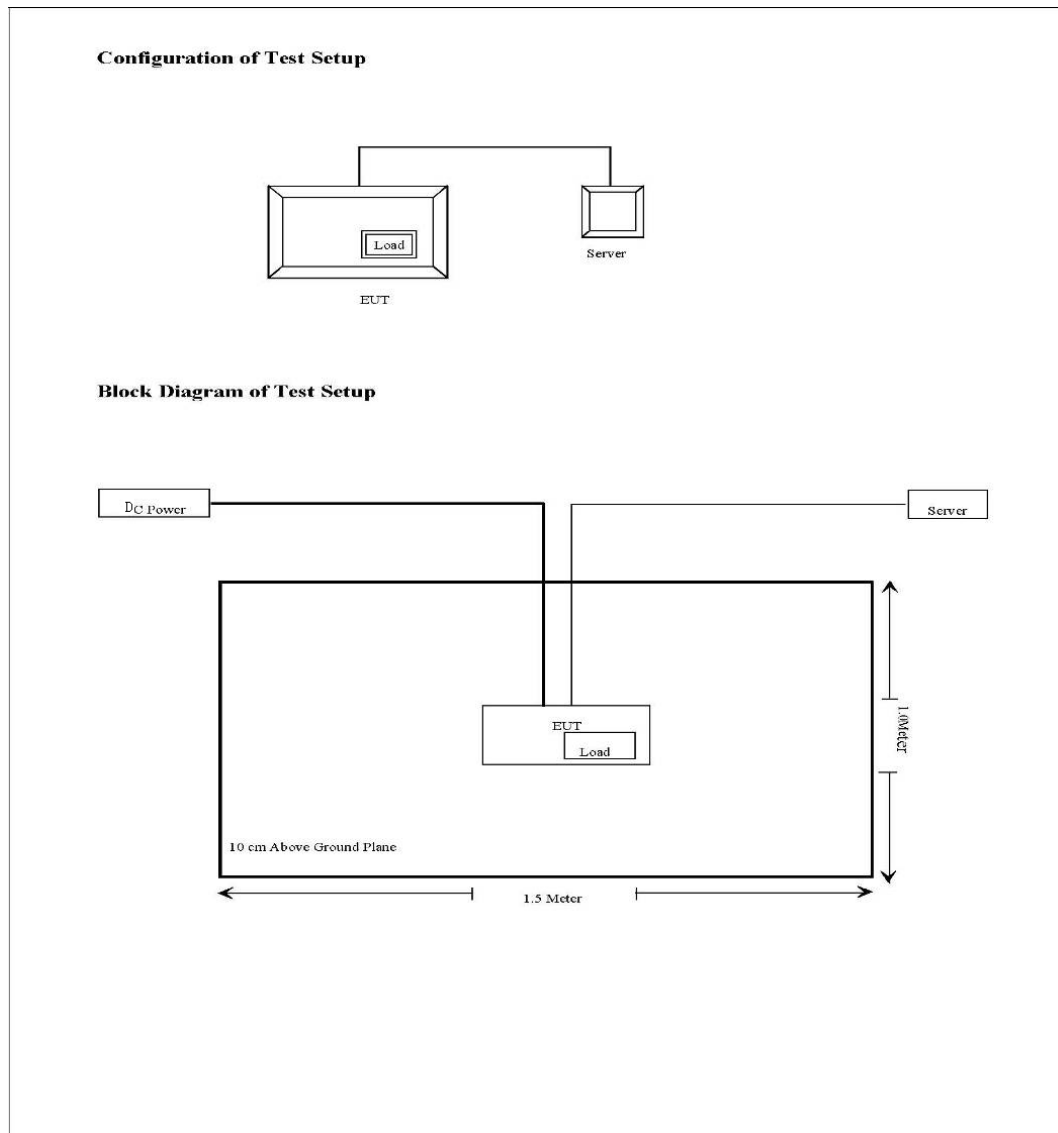


fig 2. Test configuration

6 TRANSMITTER OUTPUT POWER

6.1 Applicable Standard: FCC §2.1046 §22.913

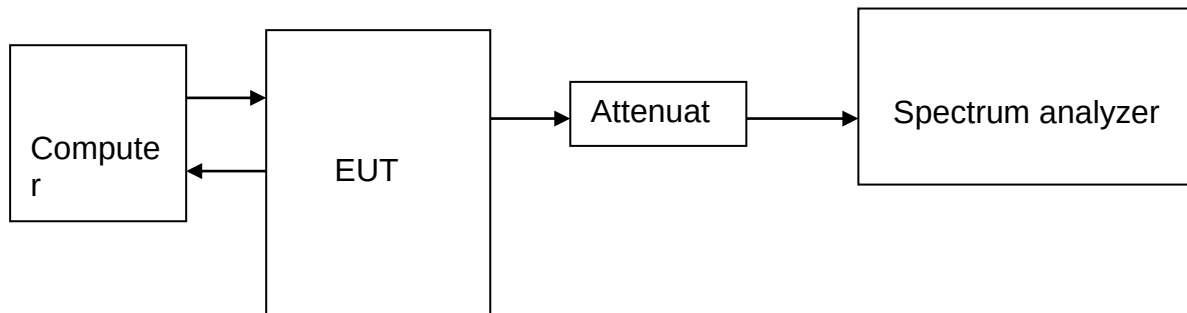
According to FCC §2.1046 & 22.913, the EIRP (equivalent isotropically radiated power) must not exceed 500 Watts.

6.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY52090451	2016-3-15	2017-3-15
DTS	DTS100 40dB Attenuator	DTS100-40dB-N	N/A	N/A	N/A
Hewlett Packard	Hewlett Packard RF Cable	8120-6192	01428251	N/A	N/A

***statement of traceability:** The RF Laboratory of Shenzhen Zoom Rel Testing Technology Co., Ltd attest that all calibration have been performed per the NVLAP requirements, traceable to NIST.

6.3 Test Procedure



The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation. External attenuation Loss is 40dB, Cable Loss is about 3dB

6.4 Environmental Conditions

Temperature:	20 °C
Relative Humidity:	53 %
ATM Pressure:	1009 mbar

6.5 Test Result: Pass

6.6 Test Mode: Transmitting GSM

6.7 Test Data:

Four carriers

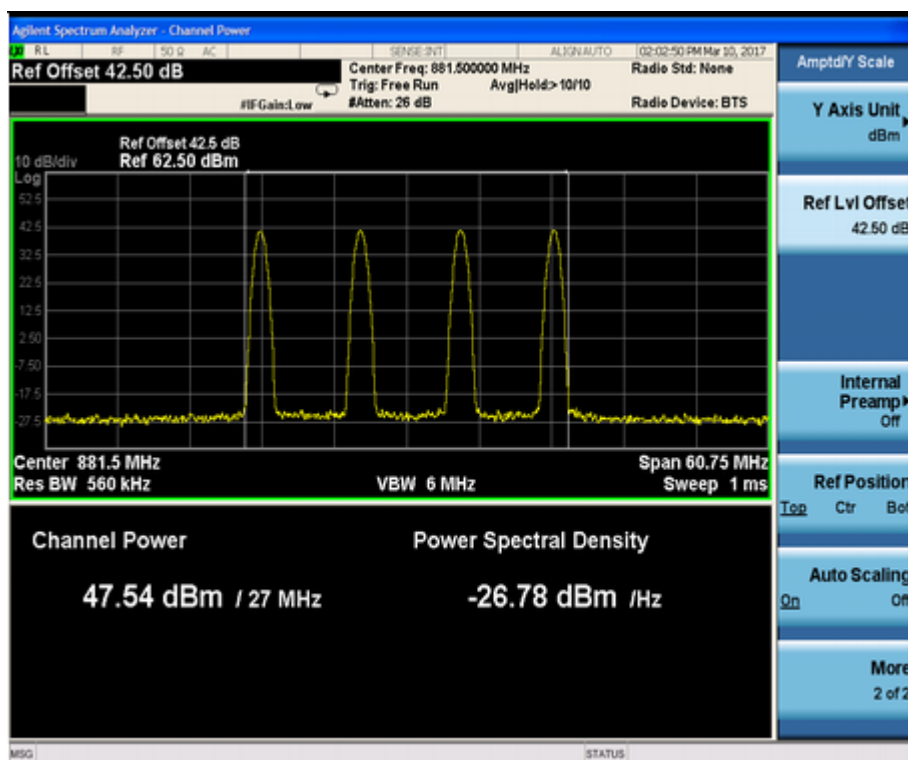
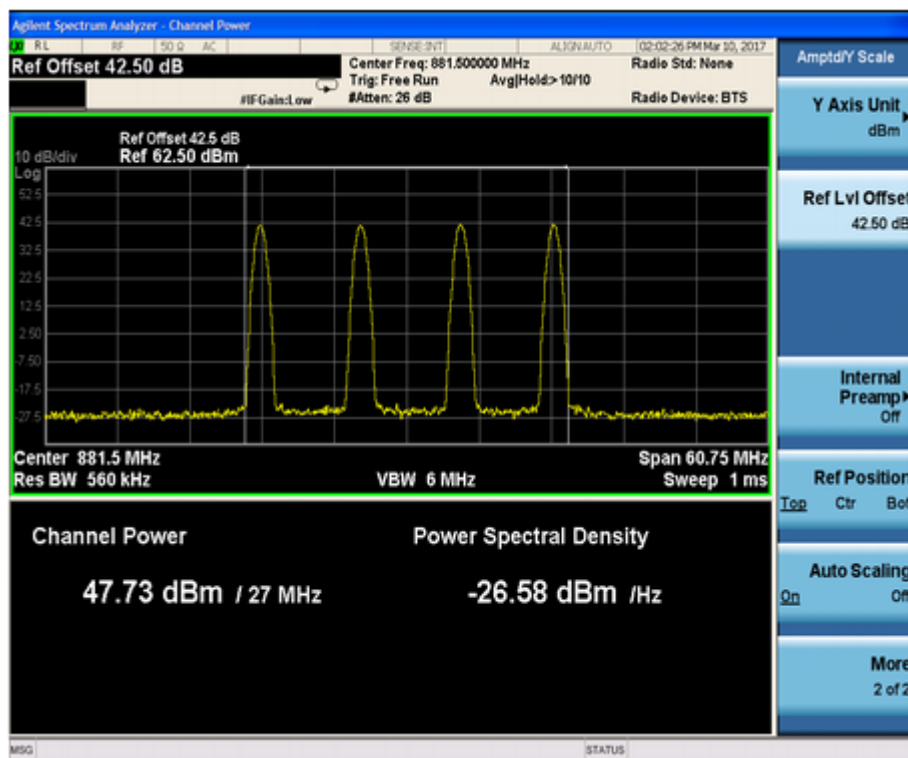
modulation	ANT	Center Freq.	Frequency (MHz)	Max
------------	-----	--------------	-----------------	-----

n		(MHz)		output Power in dBm
8PSK	ANT1	881.5	869.2/877.6/886/893.8	45.59
8PSK	ANT4	881.5	869.2/877.6/886/893.8	45.83



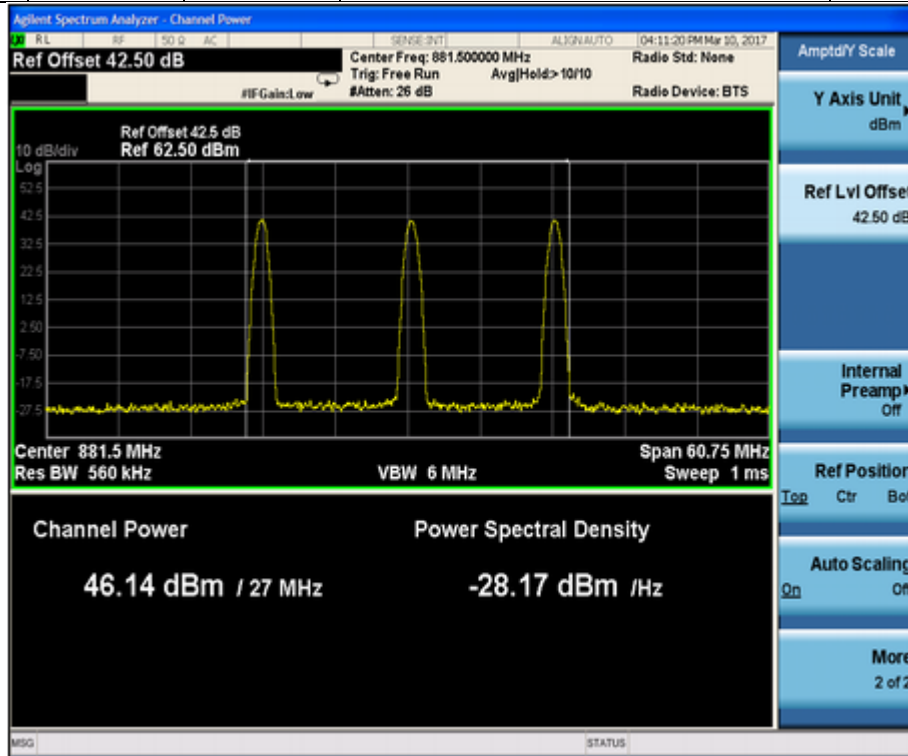
modulation	ANT	Center Freq.	Frequency (MHz)	Max output
------------	-----	--------------	-----------------	------------

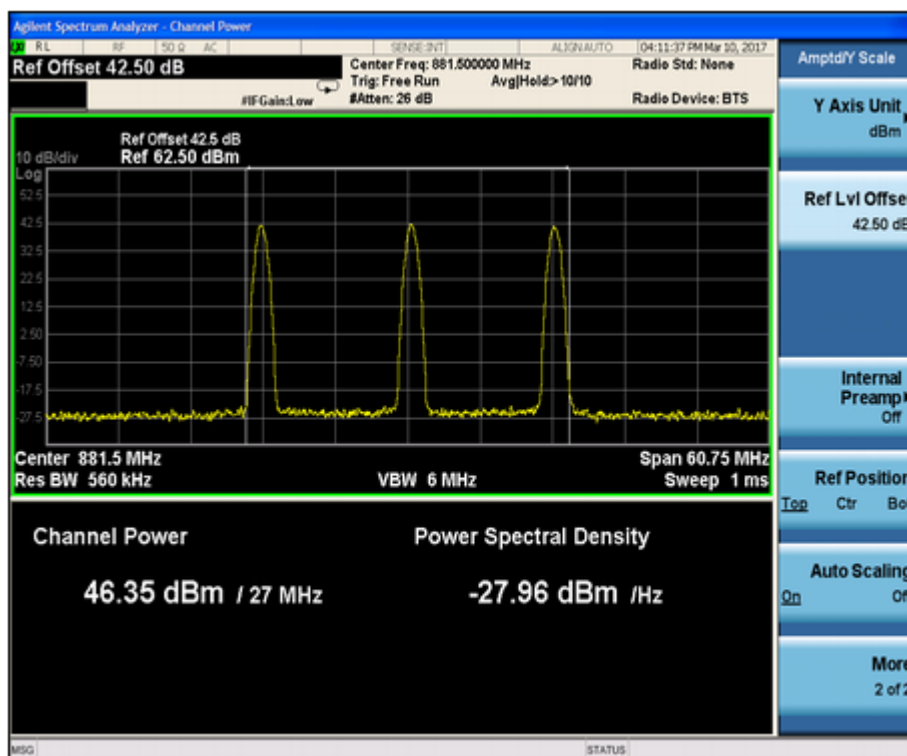
		(MHz)		Power in dBm
GMSK	ANT1	881.5	869.2/877.6/886/893.8	47.73
GMSK	ANT4	881.5	869.2/877.6/886/893.8	47.54



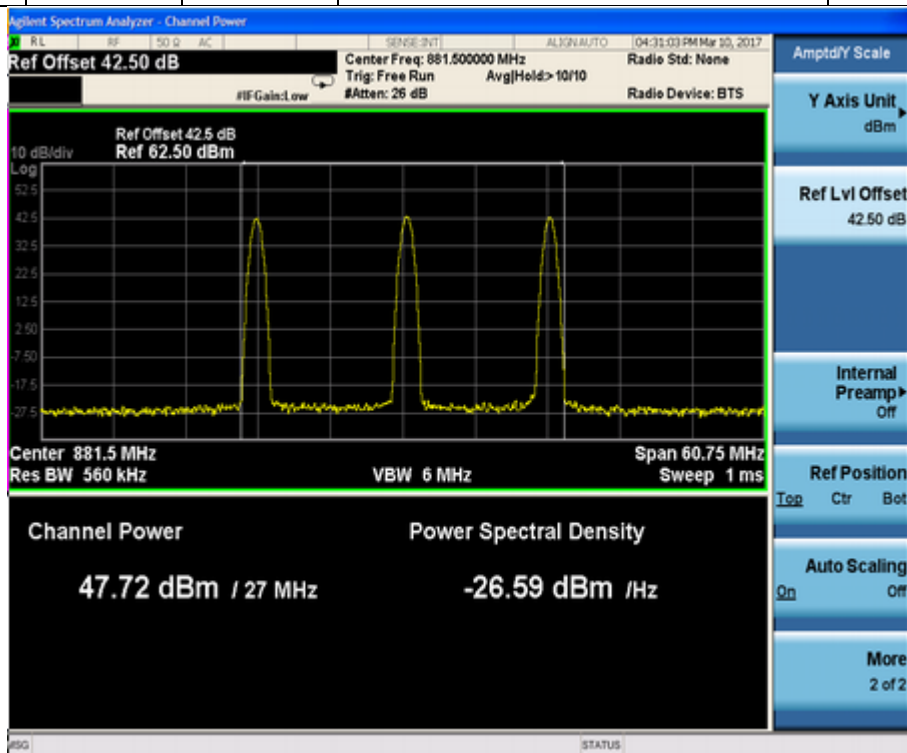
Three carriers

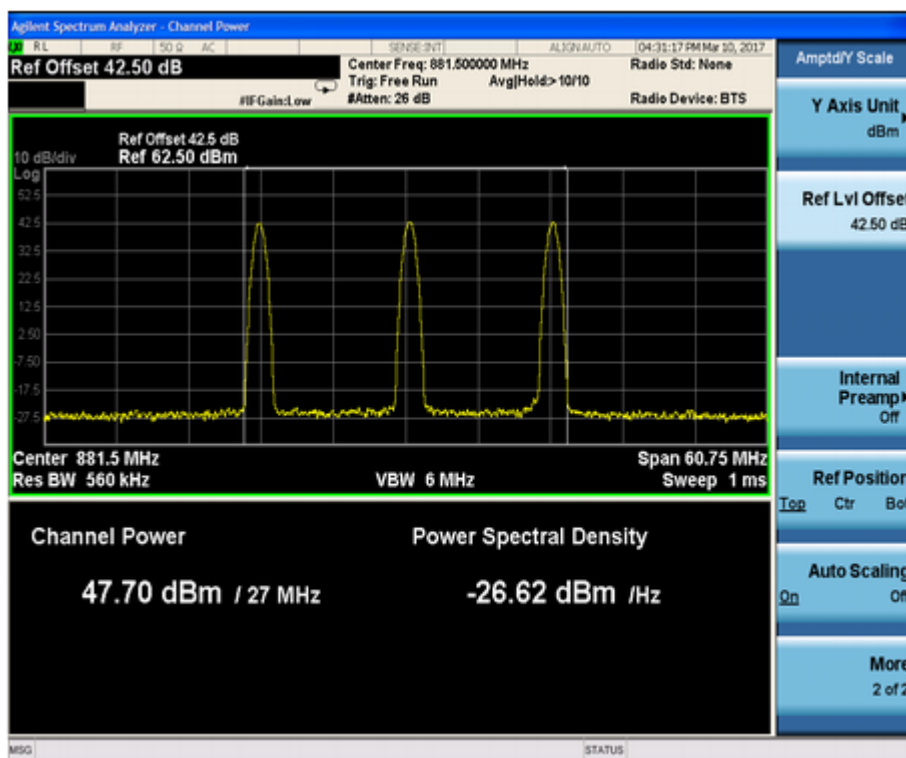
modulation	ANT	Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
8PSK	ANT1	881.5	869.2/881.8/893.8	46.14
8PSK	ANT4	881.5	869.2/881.8/893.8	46.35





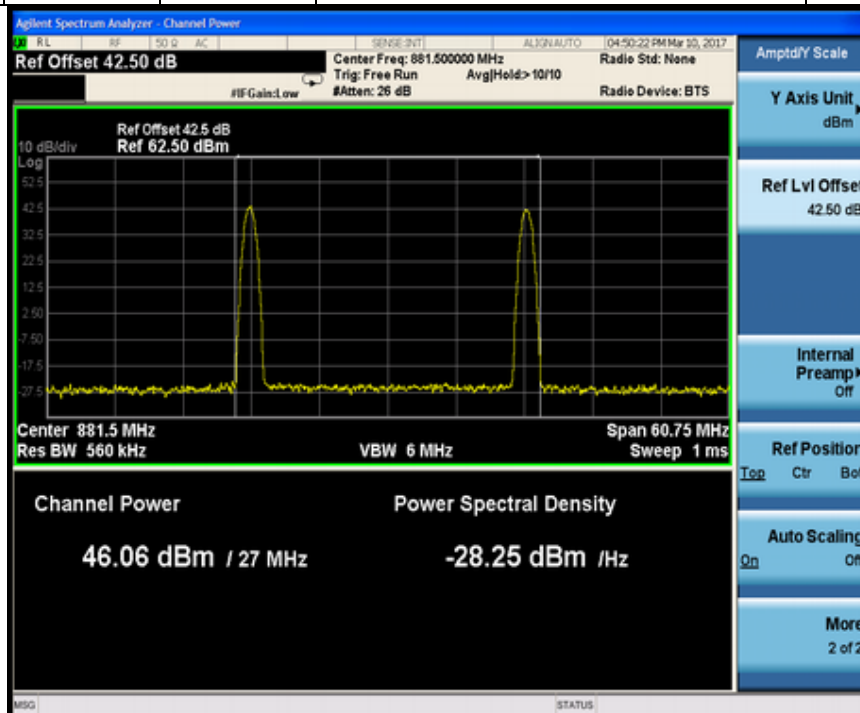
modulation	ANT	Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
GMSK	ANT1	881.5	869.2/881.8/893.8	47.72
GMSK	ANT4	881.5	869.2/881.8/893.8	47.7

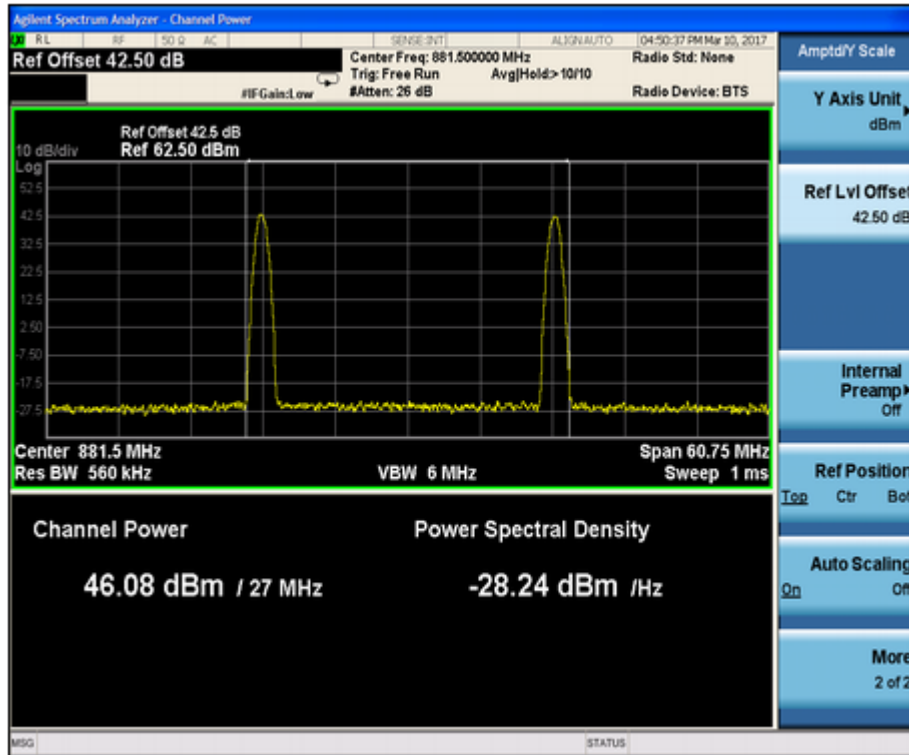




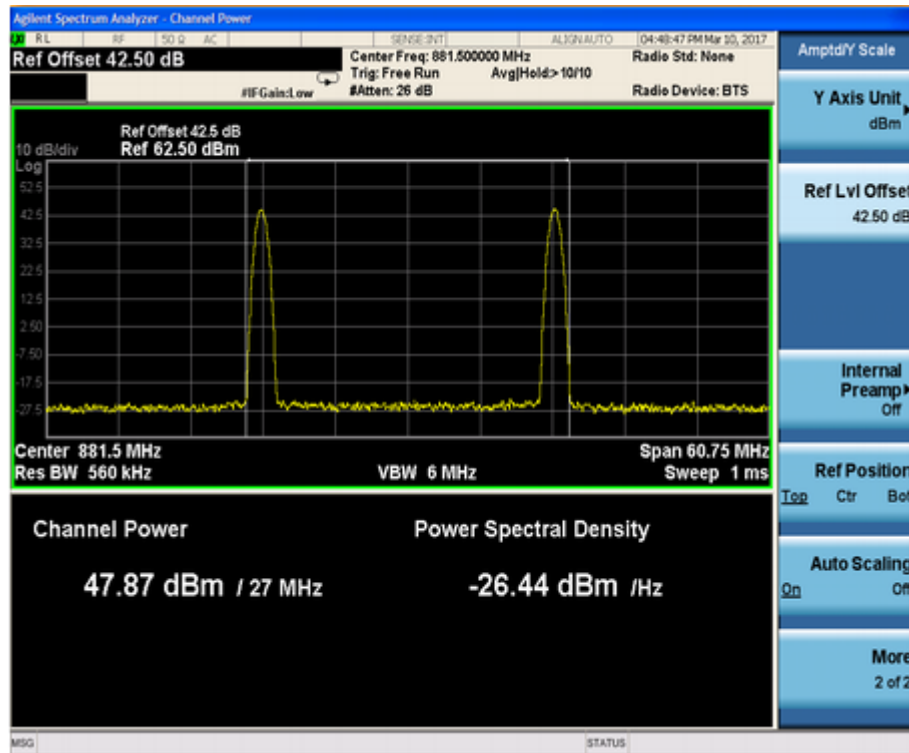
Two carriers

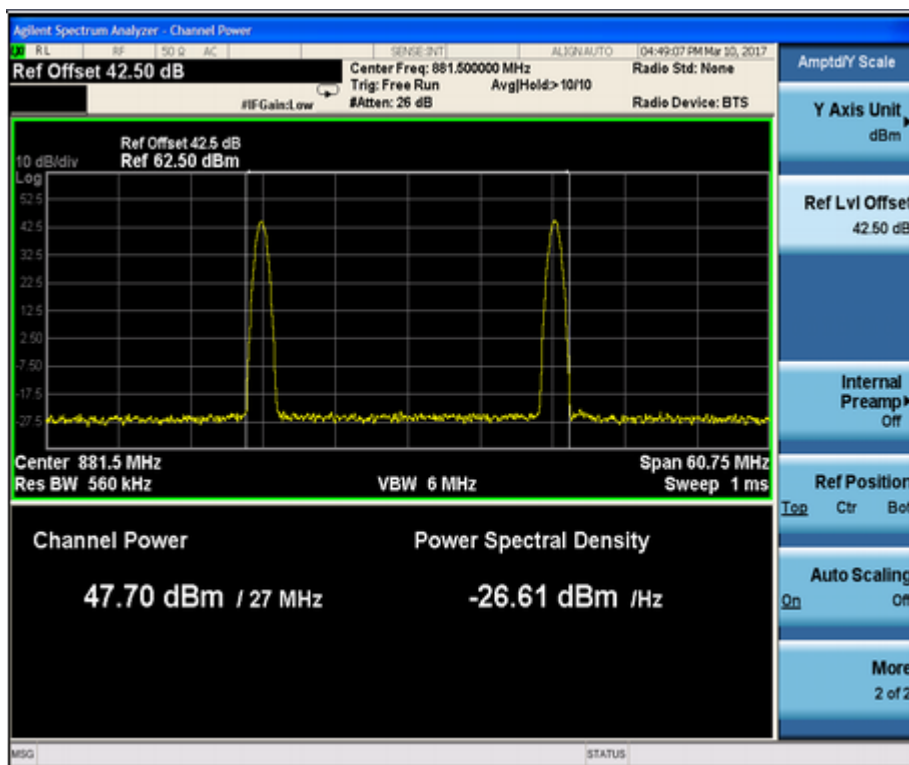
modulation	ANT	Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
8PSK	ANT1	881.5	869.2/893.8	46.06
8PSK	ANT4	881.5	869.2/893.8	46.08





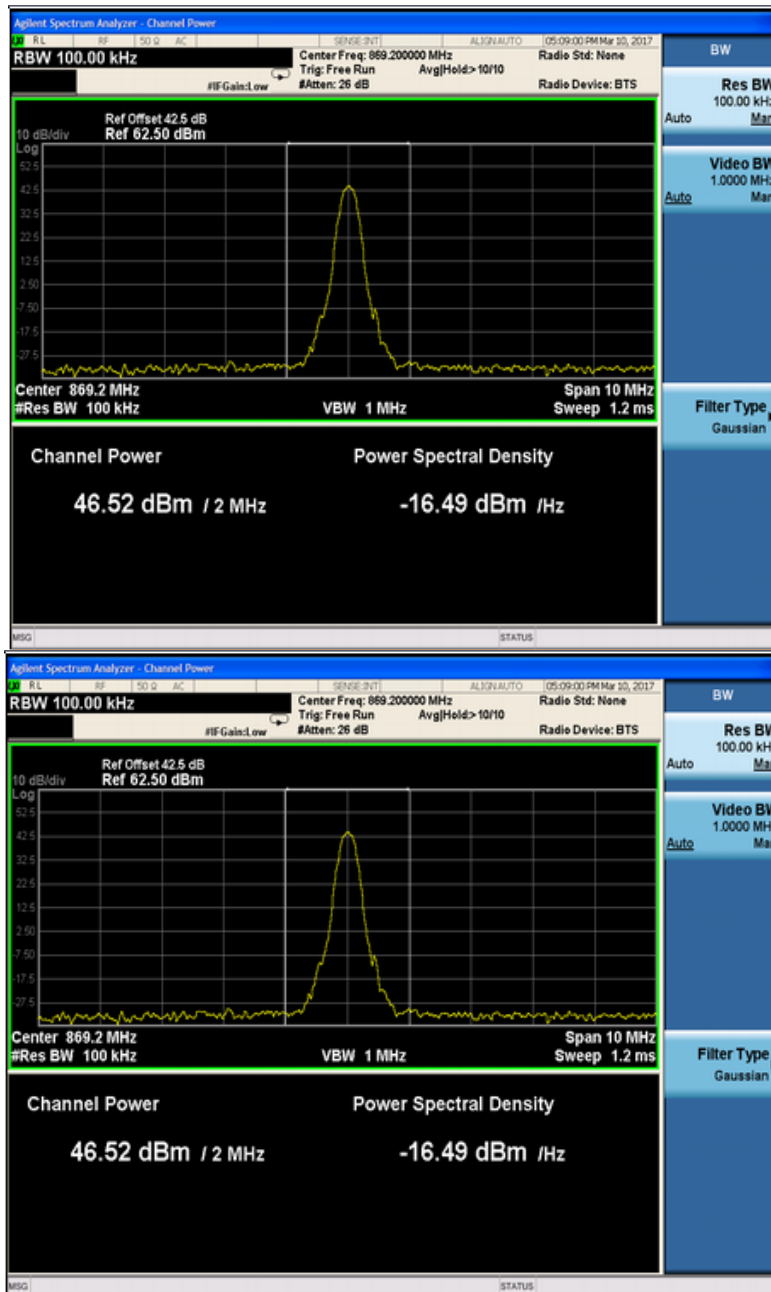
modulation	ANT	Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
GMSK	ANT1	881.5	869.2/893.8	47.87
GMSK	ANT4	881.5	869.2/893.8	47.7

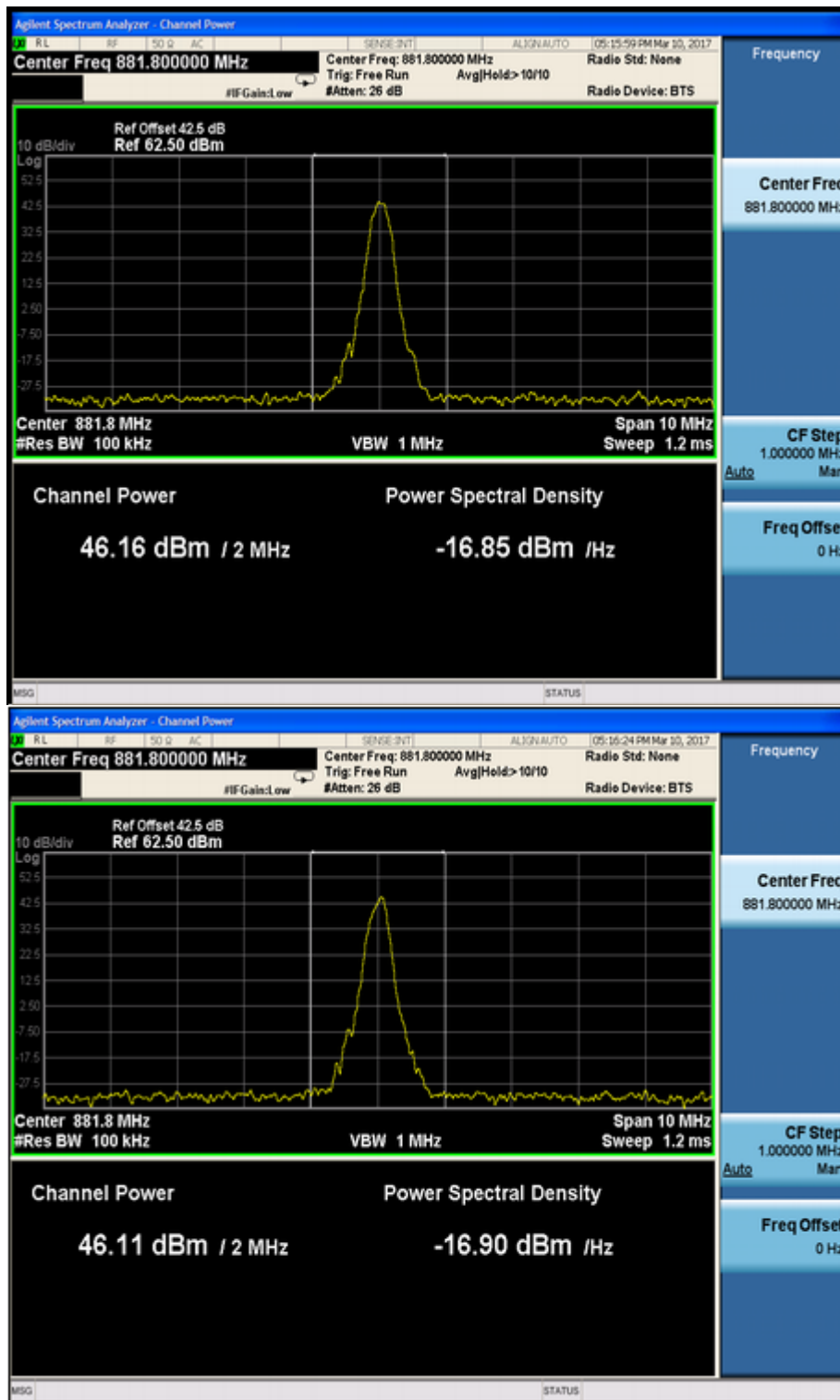


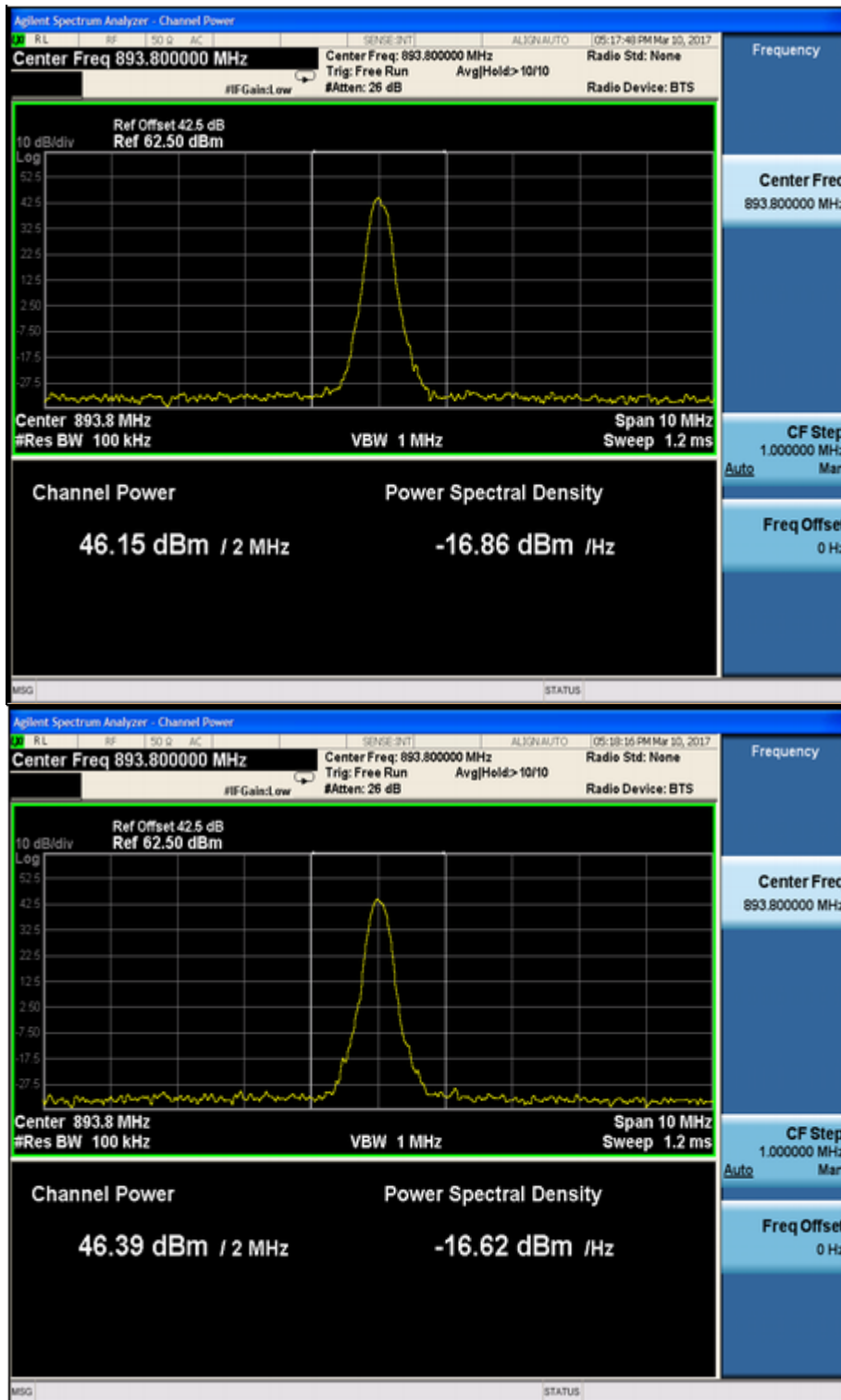


One carrier

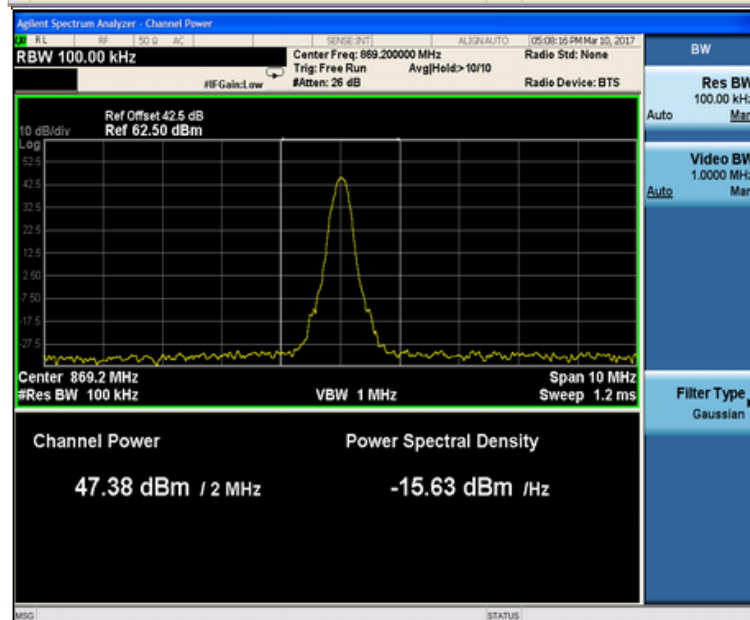
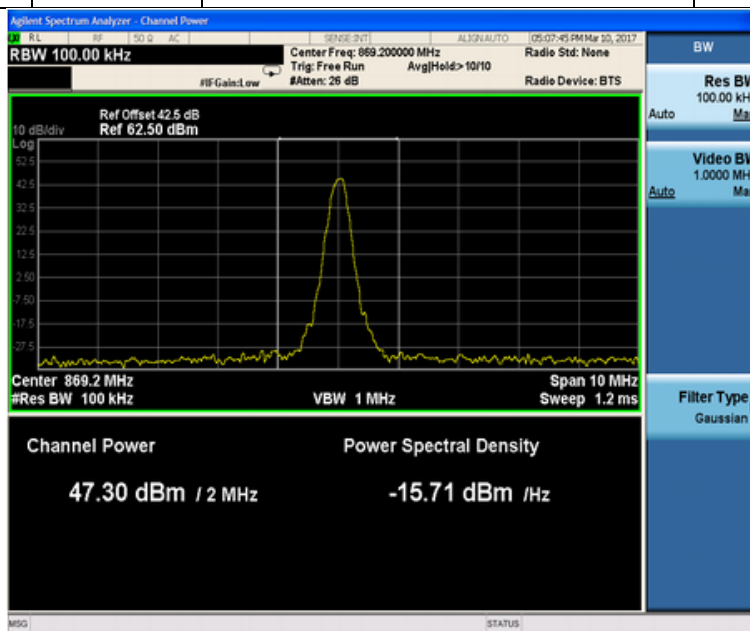
modulation	ANT	Frequency (MHz)	Max output Power in dBm
8PSK	ANT1	869.2	46.52
	ANT4	869.2	46.52
	ANT1	881.8	46.16
	ANT4	881.8	46.11
	ANT1	893.8	46.15
	ANT4	893.8	46.39

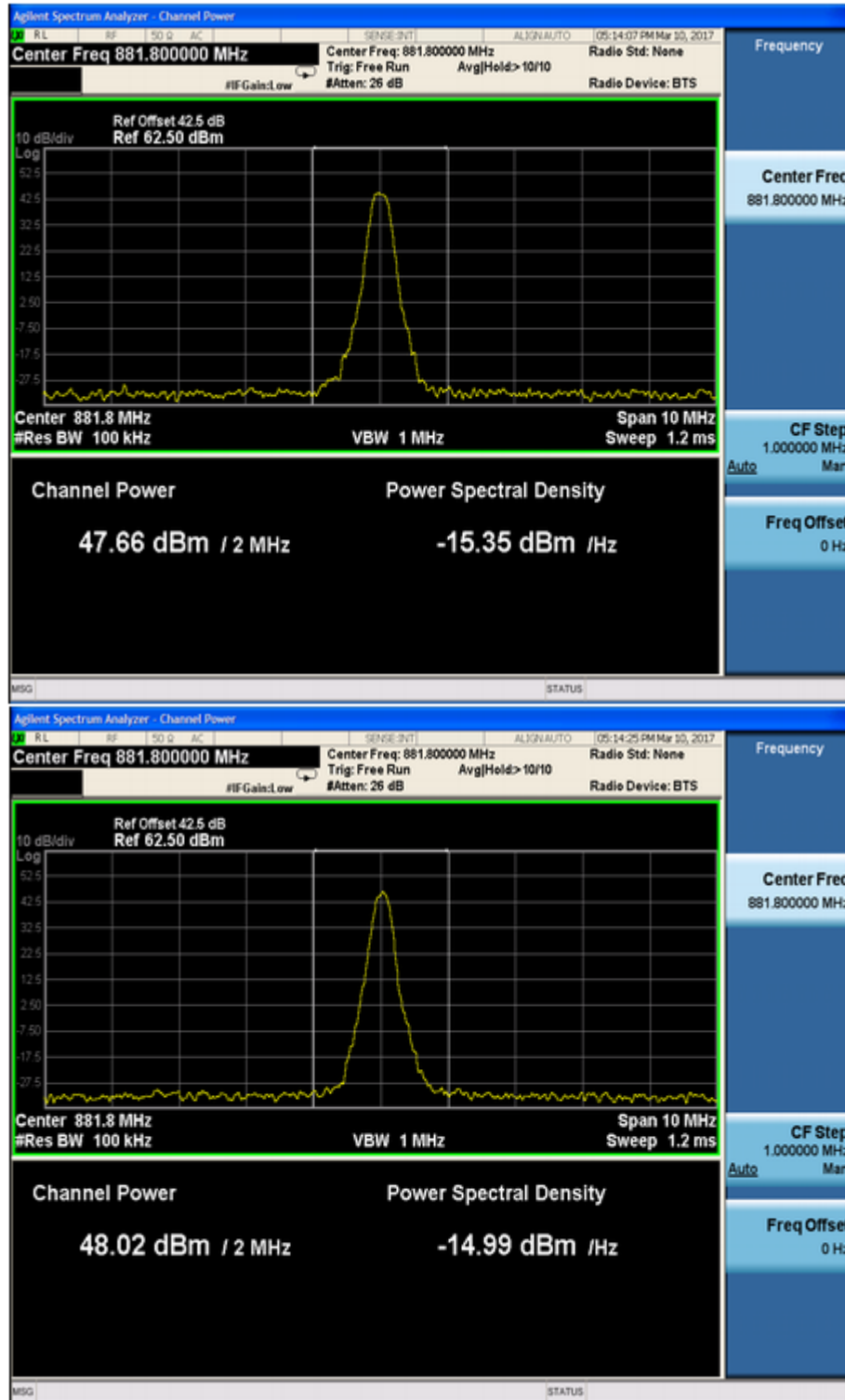


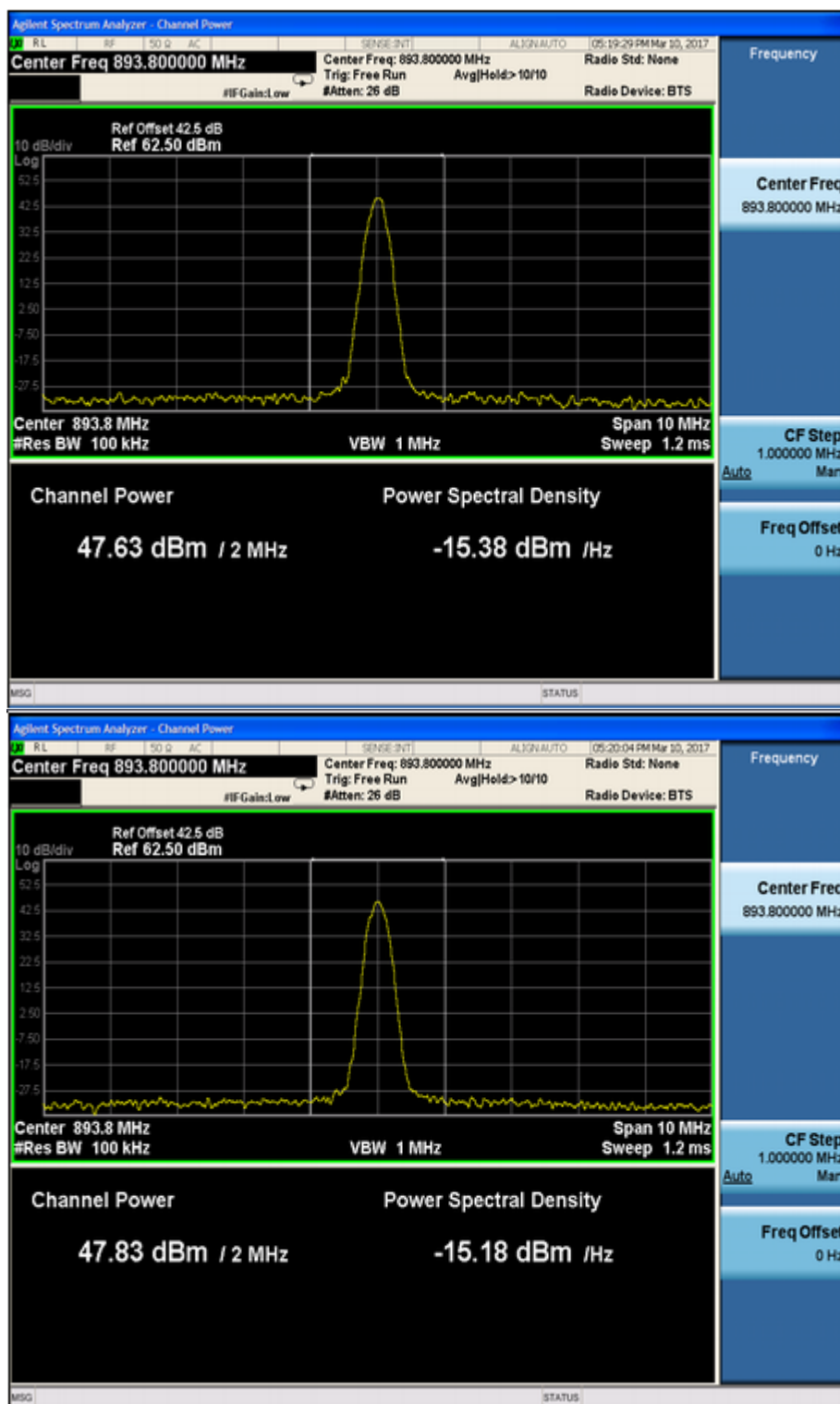




modulation	ANT	Frequency (MHz)	Max output Power in dBm
GMSK	ANT1	869.2	47.3
	ANT4	869.2	47.38
	ANT1	881.8	47.66
	ANT4	881.8	48.02
	ANT1	893.8	47.63
	ANT4	893.8	47.83











7 RF EXPLOSURE

7.1 Applicable standard: FCC §2.1091 and §1.1037

7.2 Limit

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated. Limits for Maximum Permissible Exposure (MPE)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

7.3 Test Data

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \text{EIRP} / 4\pi R^2$$

Where: S = power density

R = distance to the center of radiation of the antenna = $[\text{EIRP} / 4\pi S]^{1/2}$

According to §22.913, the the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 1000 Watts.

Frequency 869MHz is between 300MHz and 1500MHz, and the Maximum

$$S = f/1500 (\text{mW}/\text{cm}^2) = 0.5793$$

$$R = 4.75\text{m}.$$

This equipment should be installed and operated with minimum distance 4.75m between the radiator& your body.

7.4 Test Result: pass



8 MODULATION CHARACTERISTIC

8.1 Applicable Standard: FCC §2.1047

8.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY52090451	2016-3-15	2017-3-15
DTS	DTS100 40dB Attenuator	DTS100-40dB-N	N/A	N/A	N/A
Hewlett Packard	Hewlett Packard RF Cable	8120-6192	01428251	N/A	N/A

***statement of traceability:** The RF Laboratory of Shenzhen Zoom Rel Testing Technology Co., Ltd attest that all calibration have been performed per the NVLAP requirements , traceable to NIST.

8.3 Test Procedure

GSM digital mode is used by EUT.

8.4 Test Data Environmental Conditions

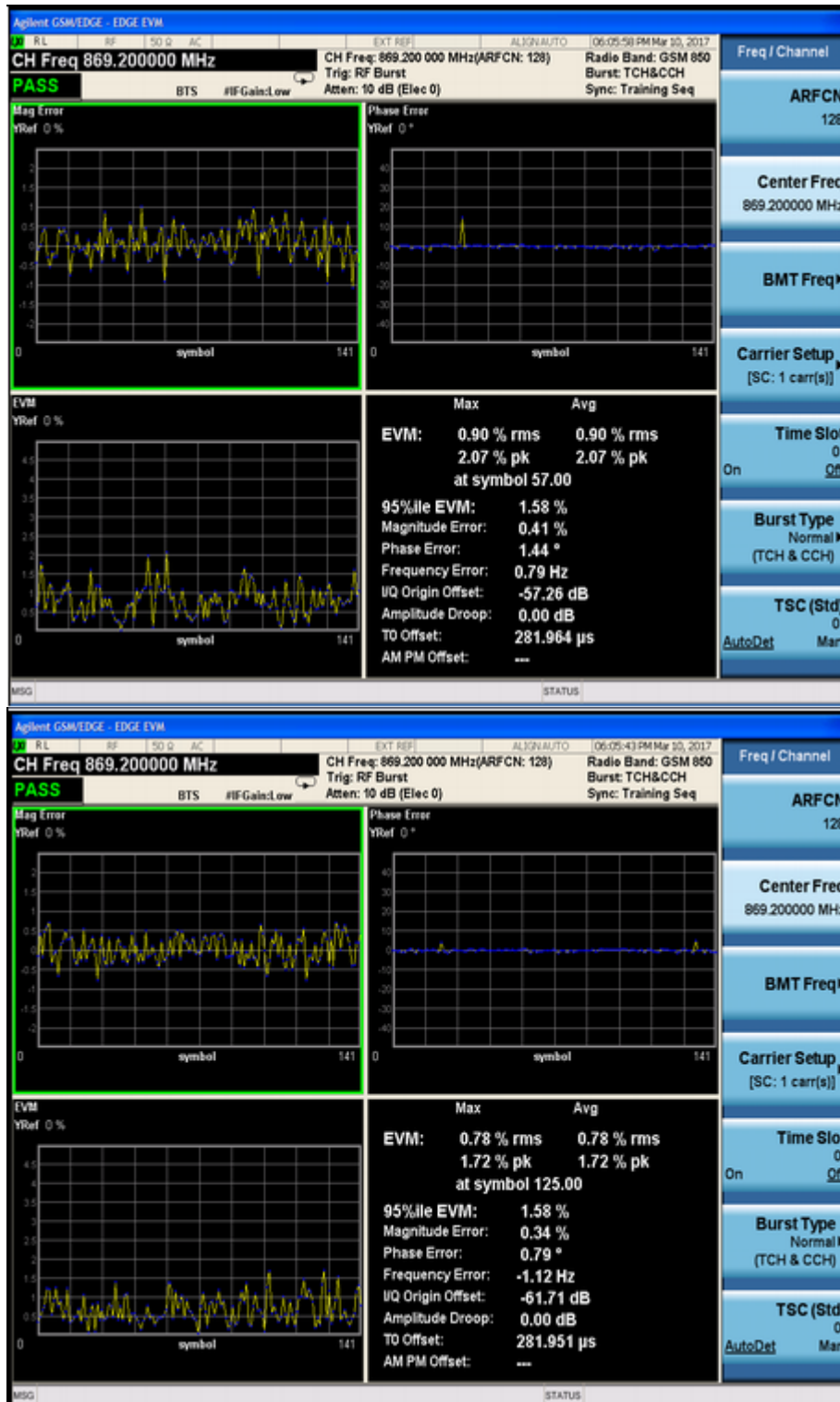
Temperature:	20 °C
Relative Humidity:	53 %
ATM Pressure:	1009 mbar

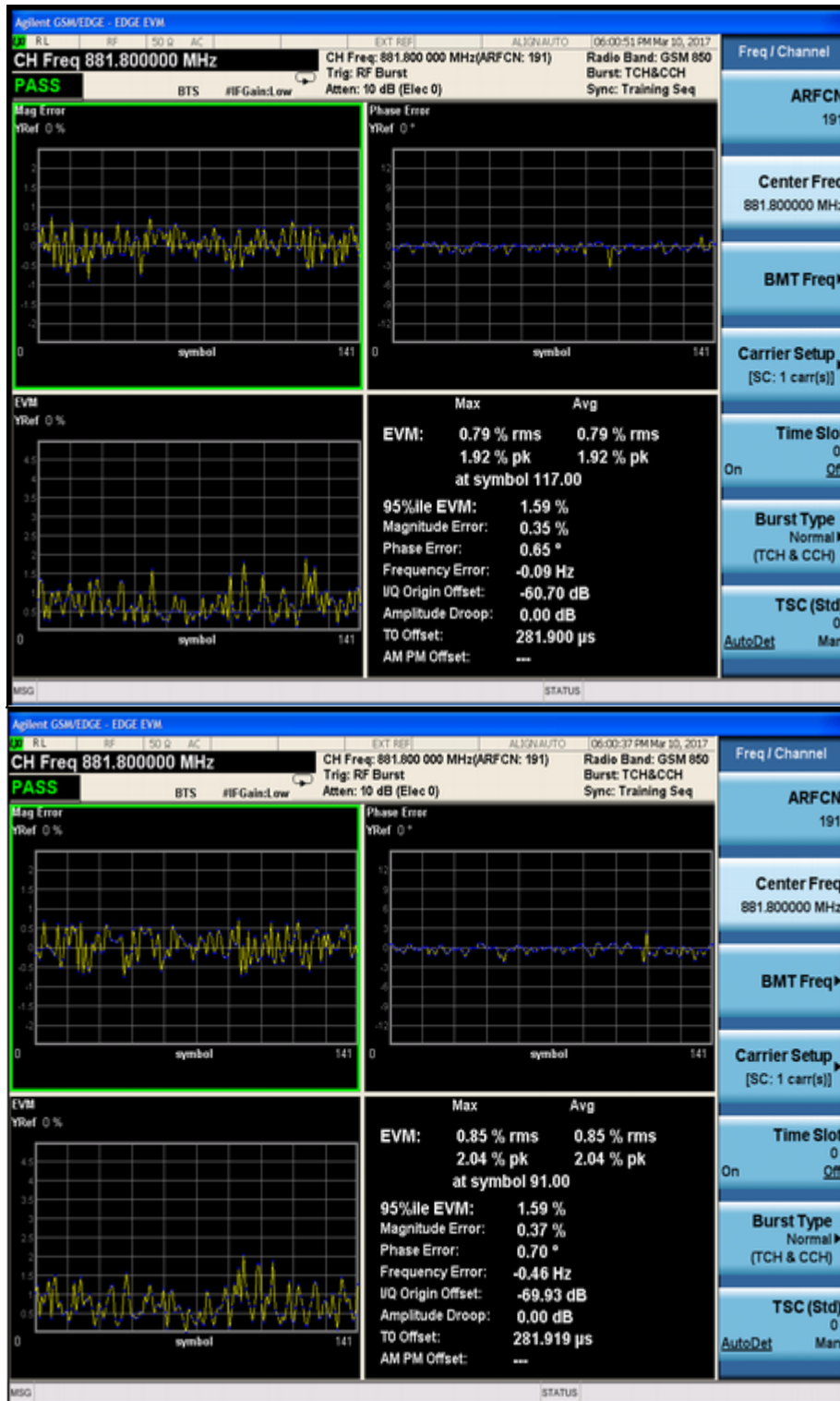
8.5 Test Result: Pass

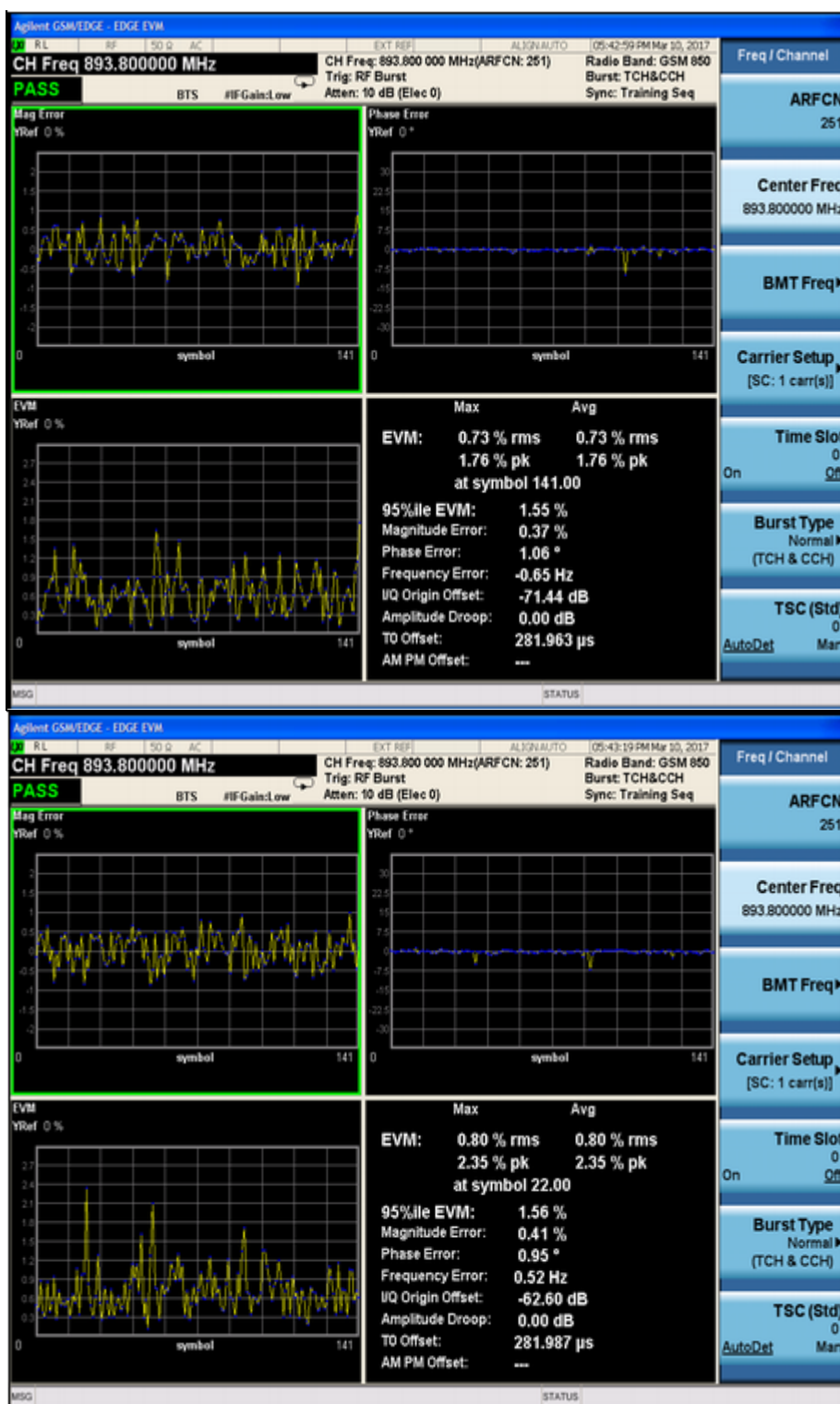
8.6 Test Mode: Transmitting GSM

8.7 Test Data:

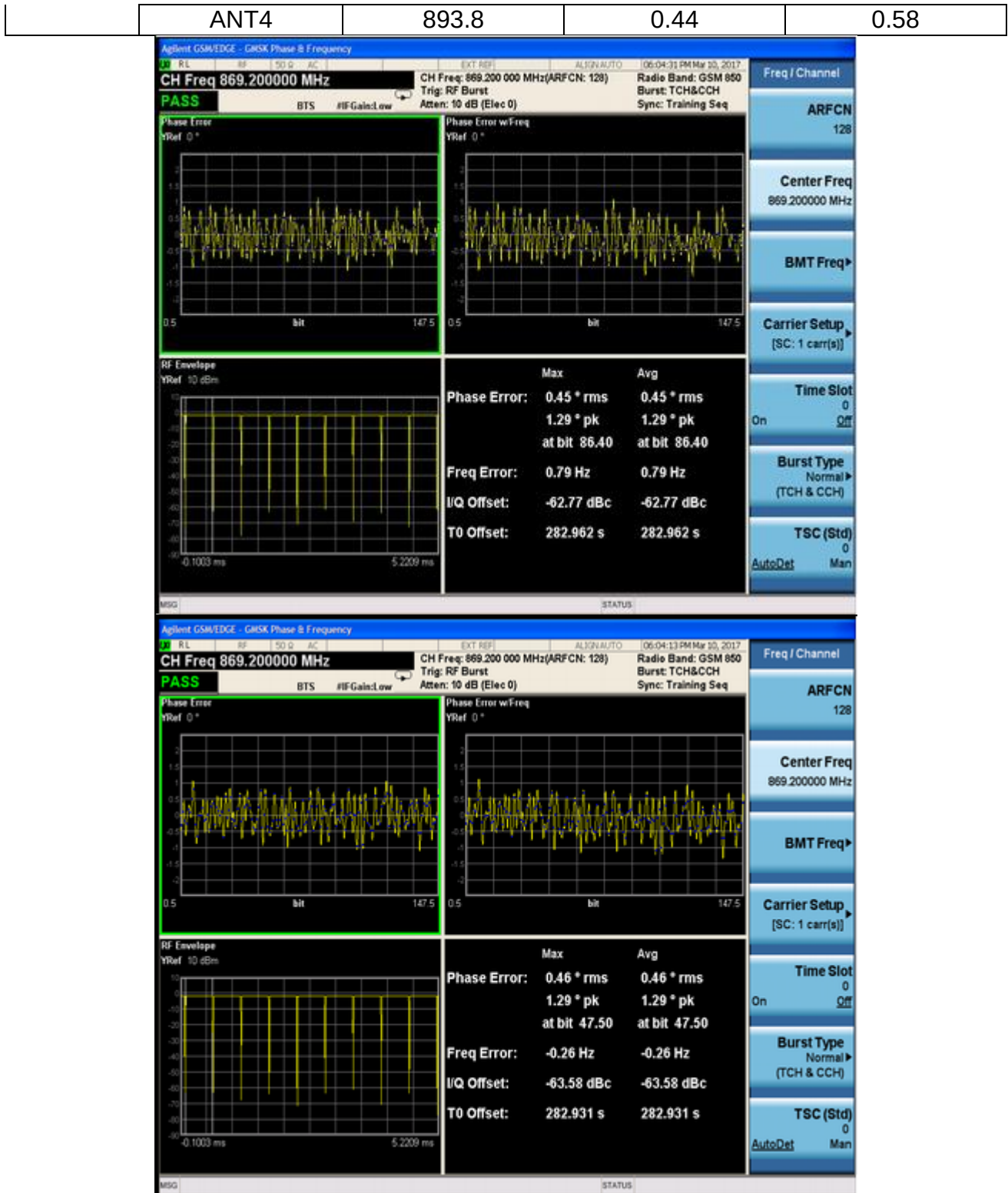
Modulation	ANT	Frequency (MHz)	EVM
8PSK	ANT1	869.2	0.9
	ANT4	869.2	0.78
	ANT1	881.8	0.79
	ANT4	881.8	0.85
	ANT1	893.8	0.73
	ANT4	893.8	0.8

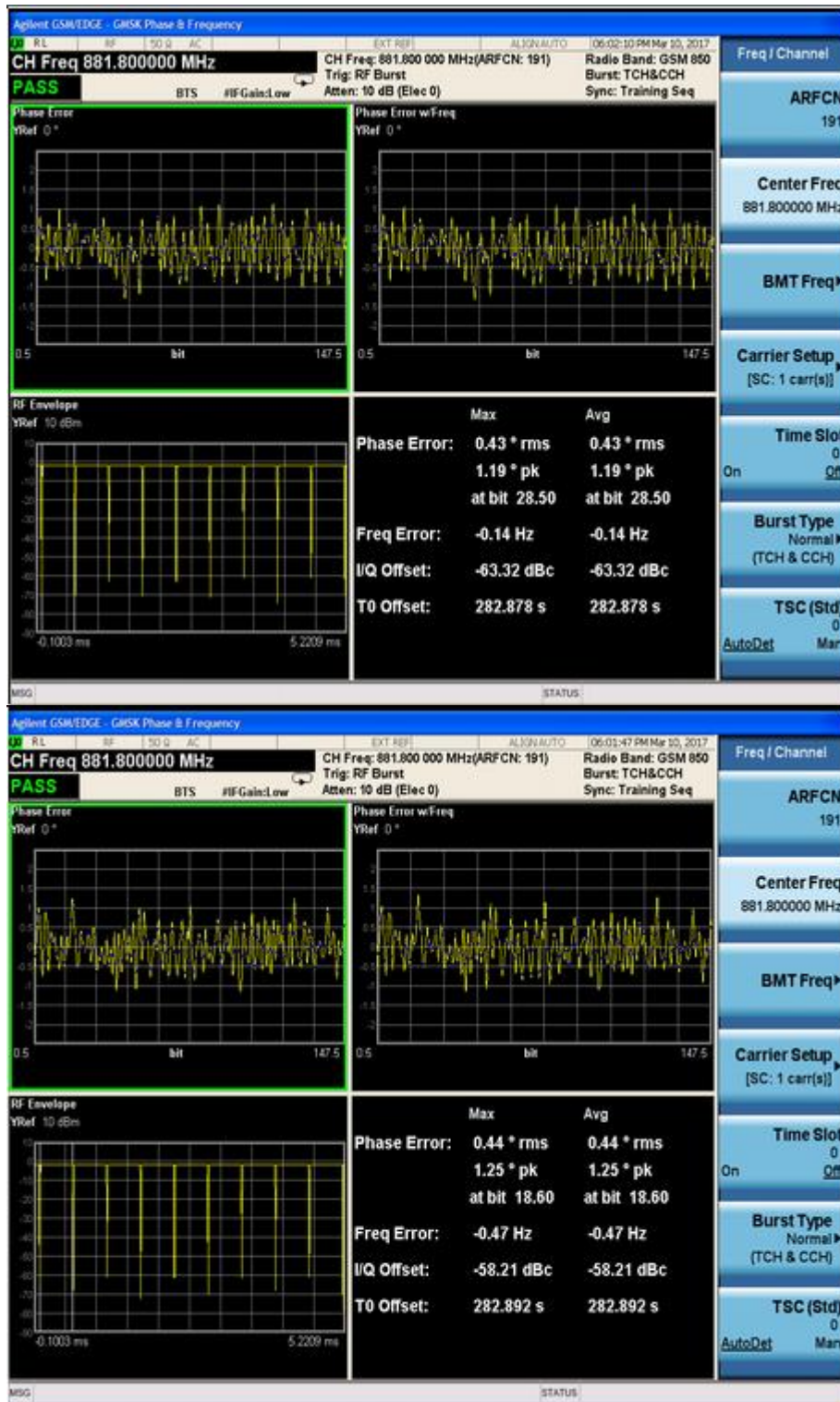


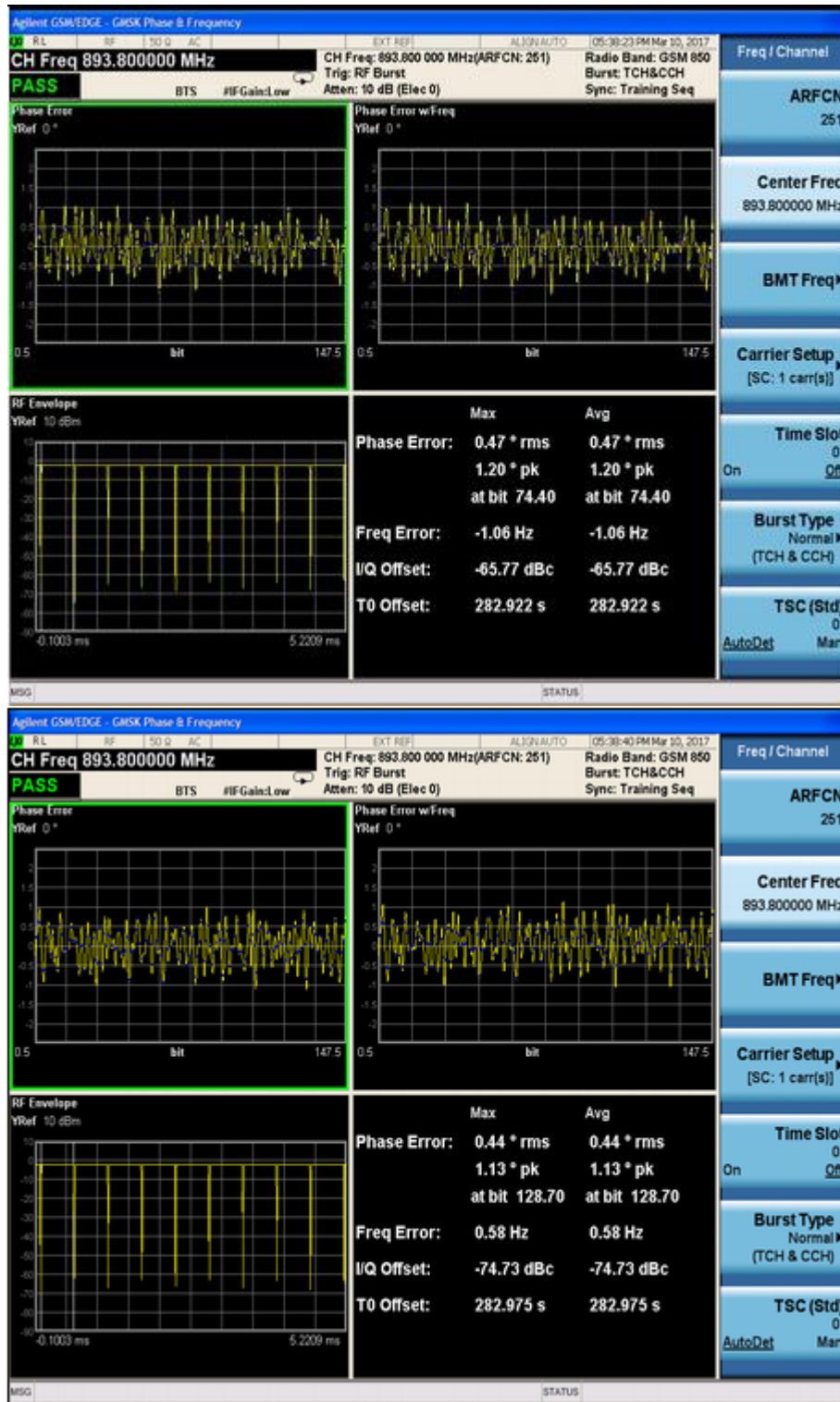




Modulation	ANT	Frequency (MHz)	Phase Error(°)	Frequency Error(Hz)
GMSK	ANT1	869.2	0.45	0.79
	ANT4	869.2	0.46	-0.26
	ANT1	881.8	0.43	-0.14
	ANT4	881.8	0.44	-0.47
	ANT1	893.8	0.47	-1.06







9 SPURIOUS RADIATED EMISSIONS

9.1 Applicable Standard: FCC CFR 47, §2.1053

9.2 Test Equipment List and Details

Manufacturer	9.2.1.1.1 Equipment	Model	Serial Number	Last Cal.	Cal. Interval
Albatross	Anechoic Chamber	3m Site	A00017354		1 year
R&S	EMI Test Receiver	ESI26	100058		1 year
R&S	Log periodic Antenna	HL562	100022		1 year
R&S	Double-Ridged Waveguide Horn Antenna	HF906 TX	100032		1 year

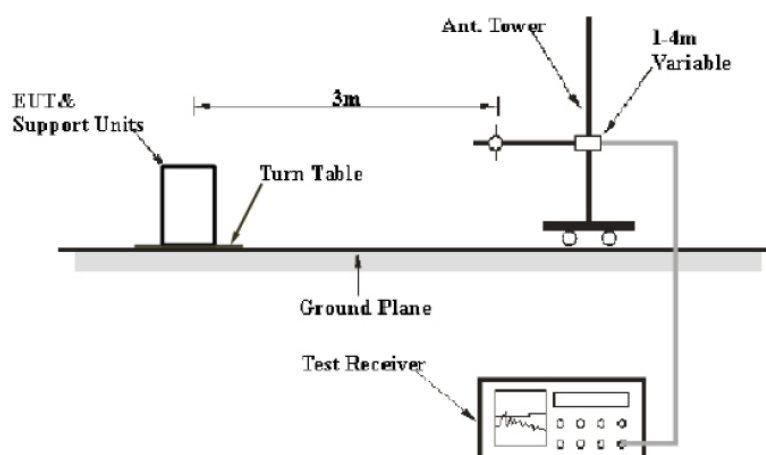
***statement of traceability:** ZTE Corporation Testing lab attest that all calibration have been performed per the NVLAP requirements, traceable to NIST.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiated emissions measurement at the EMC lab of ZTE Corp. is 3.6dB.

EUT Setup



The radiated emission tests were performed in the 3-meter Chamber, using the setup accordance with the FCC part 15.109. The specification used were the FCC 15.109 limits.

9.3 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to teeth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =10 lg (TX pwr in Watts/0.001)-the absolute level

Spurious attenuation limit in dB =43+10 Lg P (power out in Watts)

The resolution bandwidth of the spectrum analyzer was set at 100KHz for 30MHz to 1GHz scanning, set at 1MHz or 3MHz for 1GHz to 20GHz scanning.

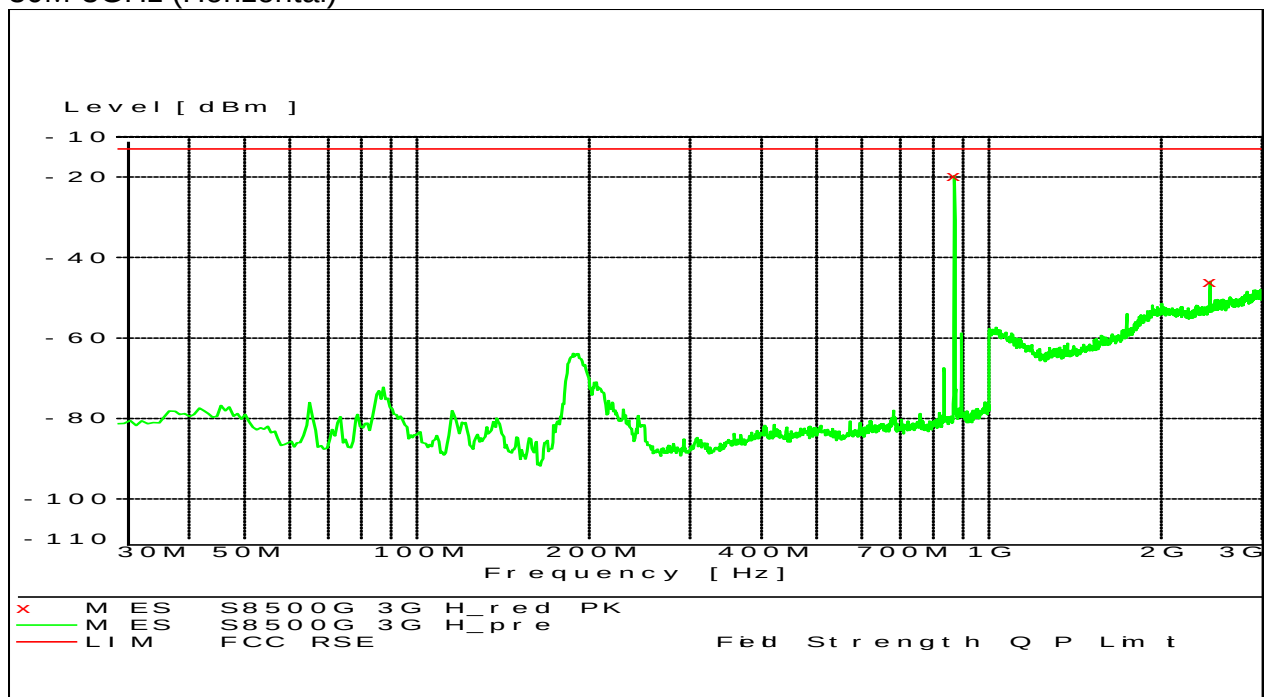
9.4 Test Results Summary: PASS

9.5 Environmental Conditions

Temperature:	26°C
Relative Humidity:	60 %
ATM Pressure:	1009 mbar

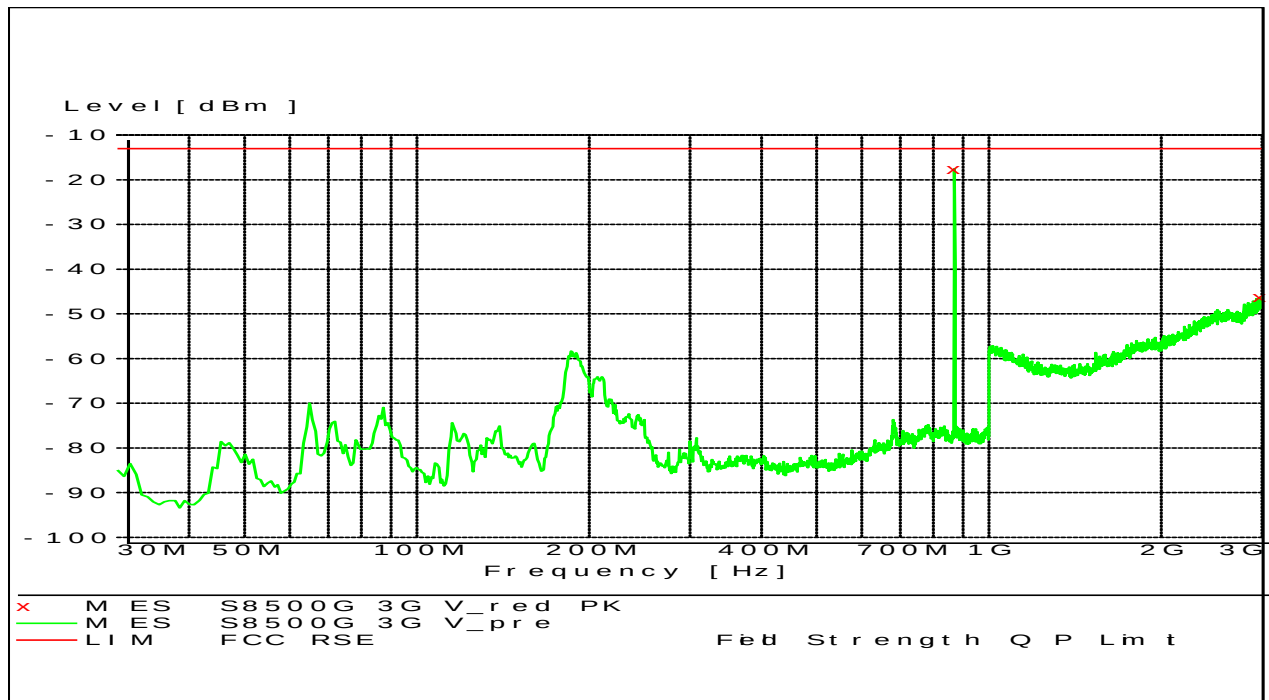
9.6 Test data

30M-3GHz (Horizontal)



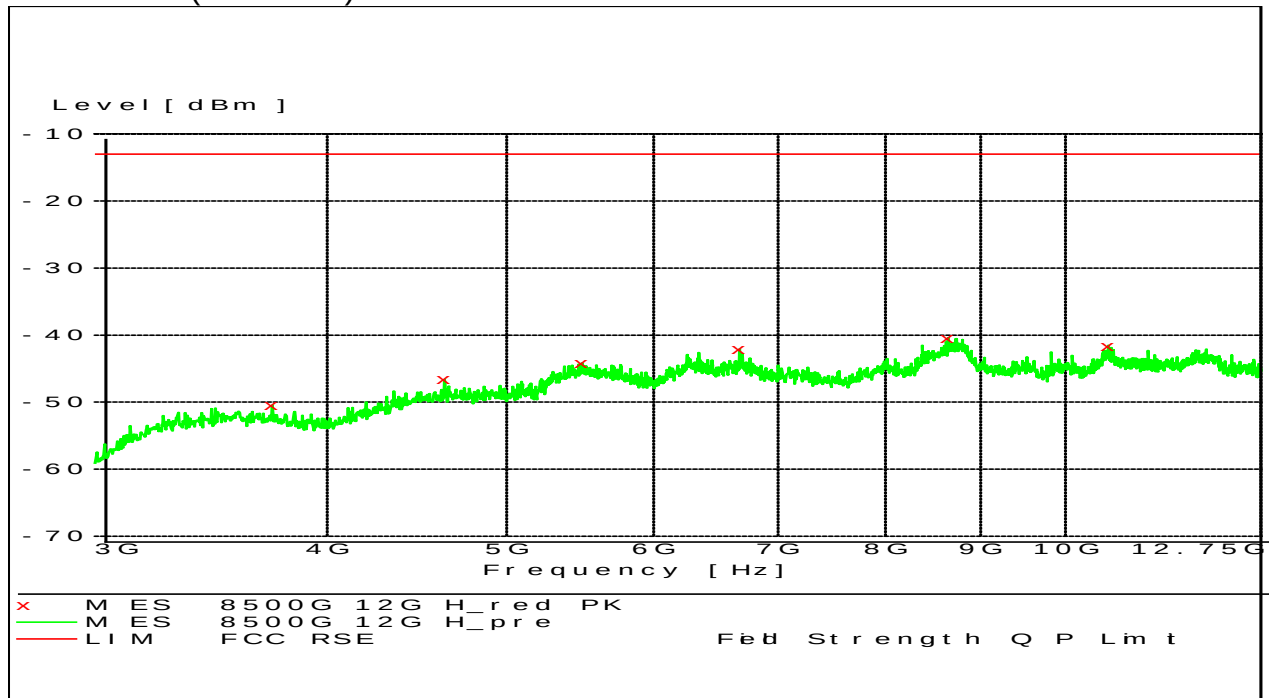
Frequency	Level	Azimuth	Height	Polarisation	Transd	Limit	Margin
MHz	dBm	deg	cm		dBm	dBm	db
870.408000	-19.71	227.70	100.0	HOR	-122.0	-13	6.7
2433.600000	-45.94	330.30	200.0	HOR	-102.8	-13	32.9

30M-3GHz (Vertical)



Frequency	Level	Azimuth	Height	Polarisation	Transd	Limit	Margin
MHz	dBm	deg	cm		dBm	dBm	db
869.632000	-17.63	215.60	100.0	VER	-119.9	-13	4.6
2976.000000	-46.26	293.70	200.0	VER	-97.4	-13	33.3

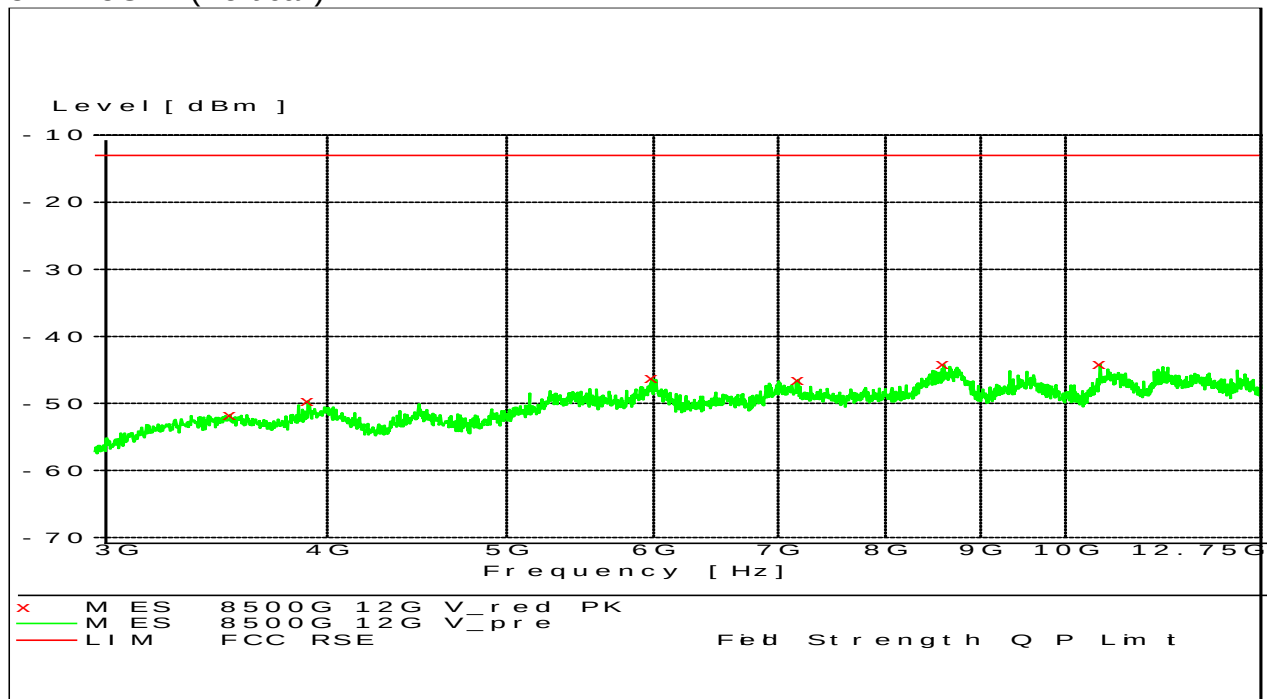
3-12.75GHz (Horizontal)





Frequency	Level	Azimuth	Height	Polarisation	Transd	Limit	Margin
MHz	dBm	deg	cm		dBm	dBm	db
3739.200000	-50.46	73.40	100.0	HOR	-88.7	-13	37.5
4628.800000	-46.60	0.10	100.0	HOR	-84.9	-13	33.6
5489.600000	-44.15	316.80	100.0	HOR	-79.5	-13	31.2
6673.600000	-42.06	185.40	100.0	HOR	-77.6	-13	29.1
8646.800000	-40.43	178.50	100.0	HOR	-73.0	-13	27.4
10555.800000	-41.51	53.10	200.0	HOR	-73.1	-13	28.5

3-12.75GHz (Vertical)



Frequency	Level	Azimuth	Height	Polarisation	Transd	Limit	Margin
MHz	dBm	deg	cm		dBm	dBm	db
3547.200000	-51.63	14.40	100.0	VER	-89.5	-13	38.6
3908.800000	-49.64	285.20	100.0	VER	-88.0	-13	36.6
5988.800000	-46.20	360.00	200.0	VER	-81.4	-13	33.2
7179.400000	-46.47	292.00	100.0	VER	-80.9	-13	33.5
8600.800000	-44.21	84.30	100.0	VER	-77.0	-13	31.2
10445.400000	-44.14	67.50	200.0	VER	-76.9	-13	31.1

10 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

10.1 Applicable Standard: FCC§2.1051, §22.917

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified .

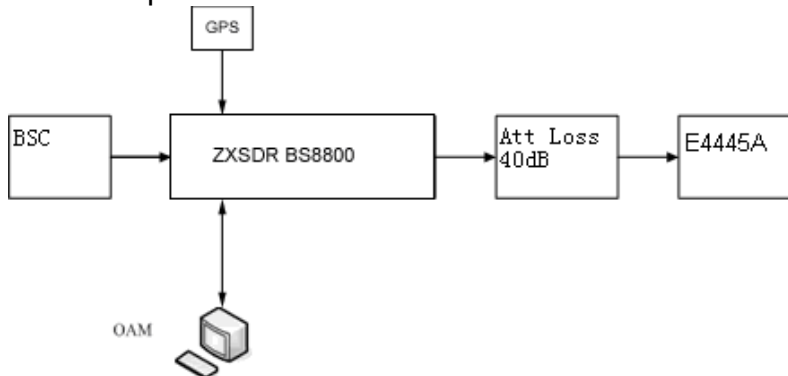
10.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY52090451	2016-3-15	2017-3-15
DST	DST100 30dB Attenuator	DTS100-30dB-N	N/A	N/A	N/A
Hewlett Packard	Hewlett Packard RF Cable	8120-6192	01428251	N/A	N/A

***statement of traceability:** The RF Laboratory of Shenzhen Zoom Rel Testing Technology Co., Ltd attest that all calibration have been performed per the NVLAP requirements , traceable to NIST.

10.3 Test Procedure

EUT Setup:



REMARKS: Attenuator loss (dB)=40dB, Cable Loss (dB)=3dB.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1 kHz for 9KHz to 150KHz scanning, set at 10KHz for 150KHz to 30MHz scanning ,set at 100KHz for 30MHz to 1GHz scanning, set at 1MHz or 3MHz for 1GHz to 22GHz scanning. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

10.4 Test Data Environmental Conditions

Temperature:	20 °C
Relative Humidity:	53 %
ATM Pressure:	1009 mbar

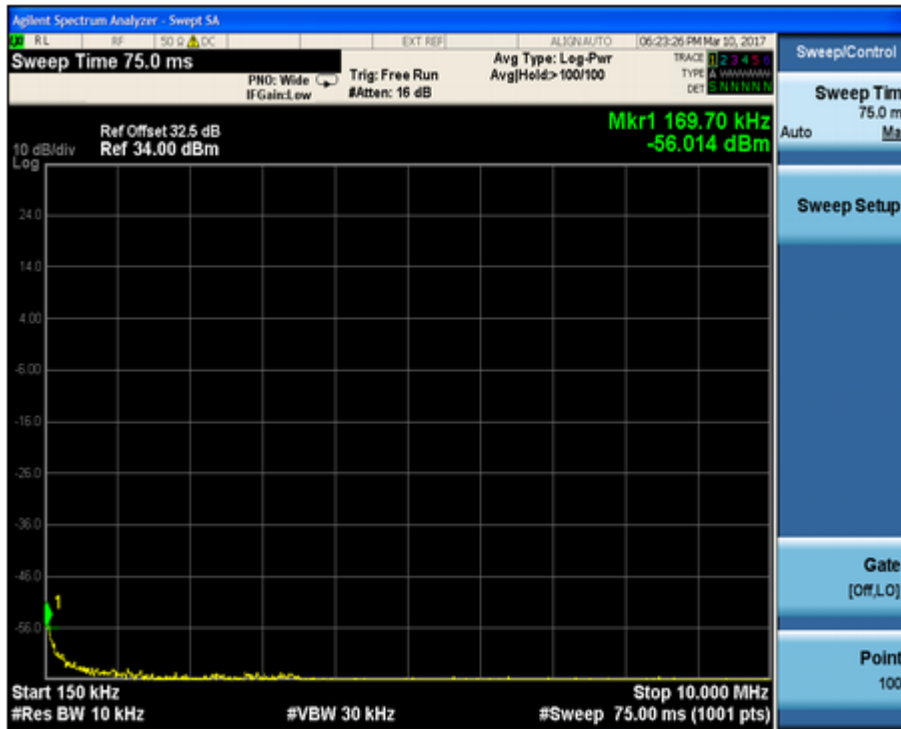
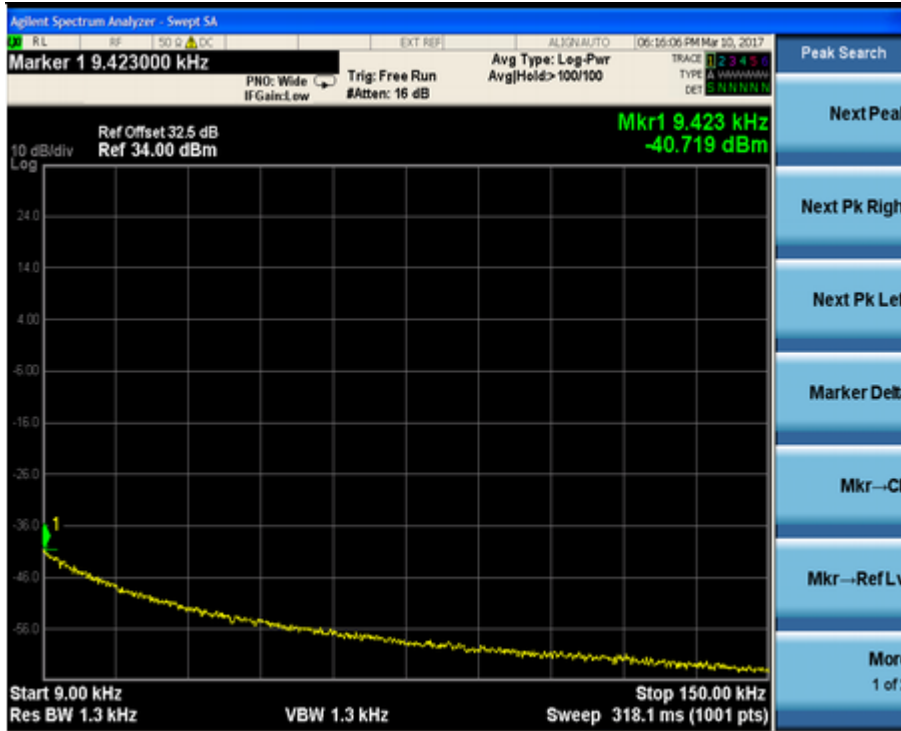
10.5 Test Result: Pass

10.6 Test Mode: Transmitting GSM

10.7 Test Data:

ANT1

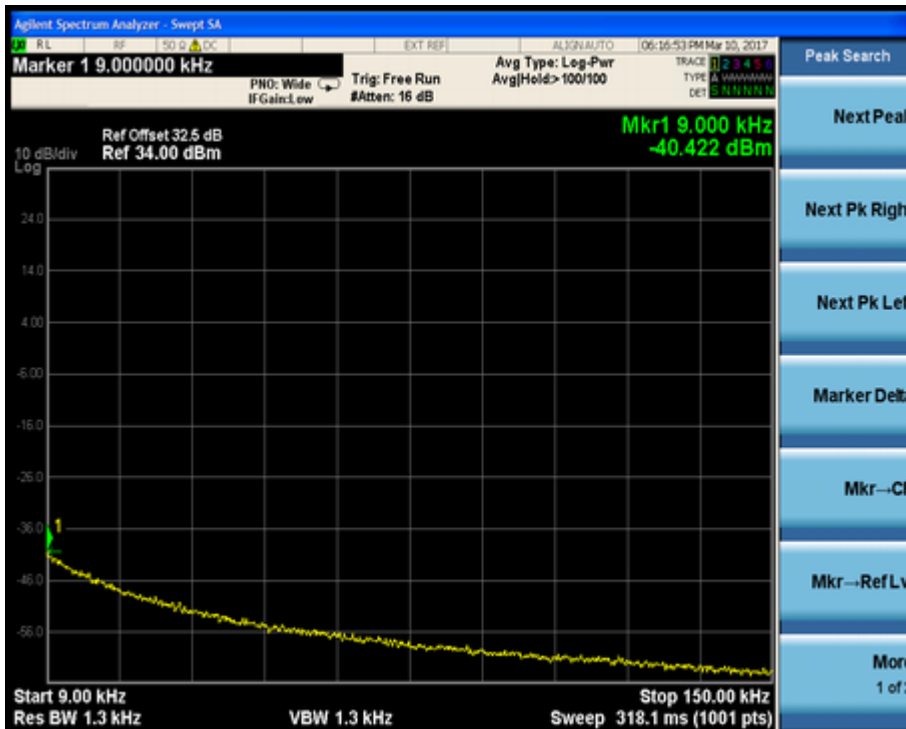
Four Carriers







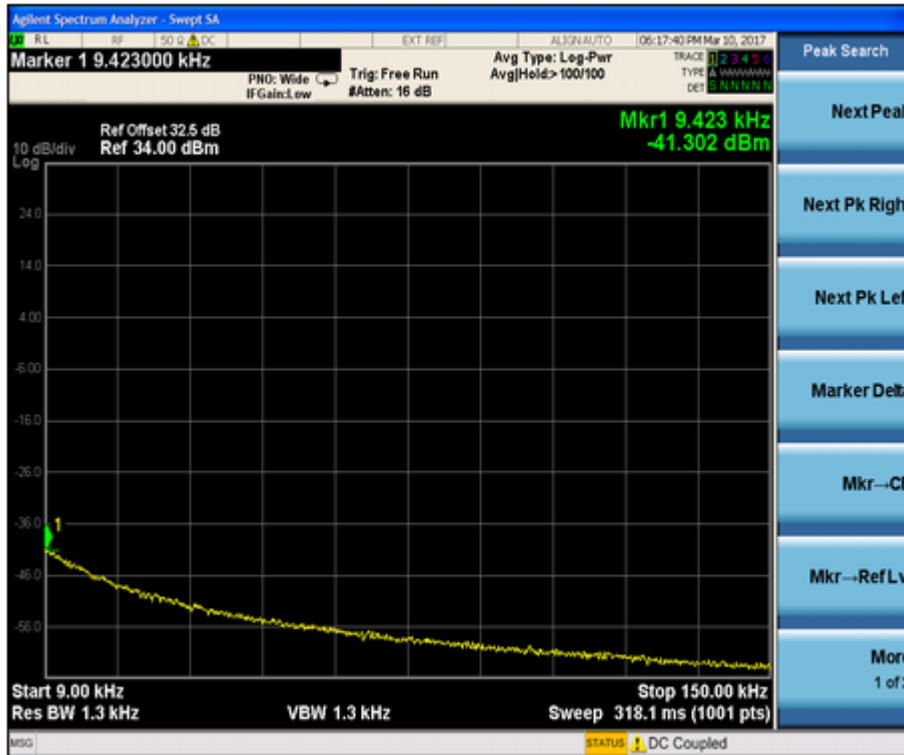
Three Carriers

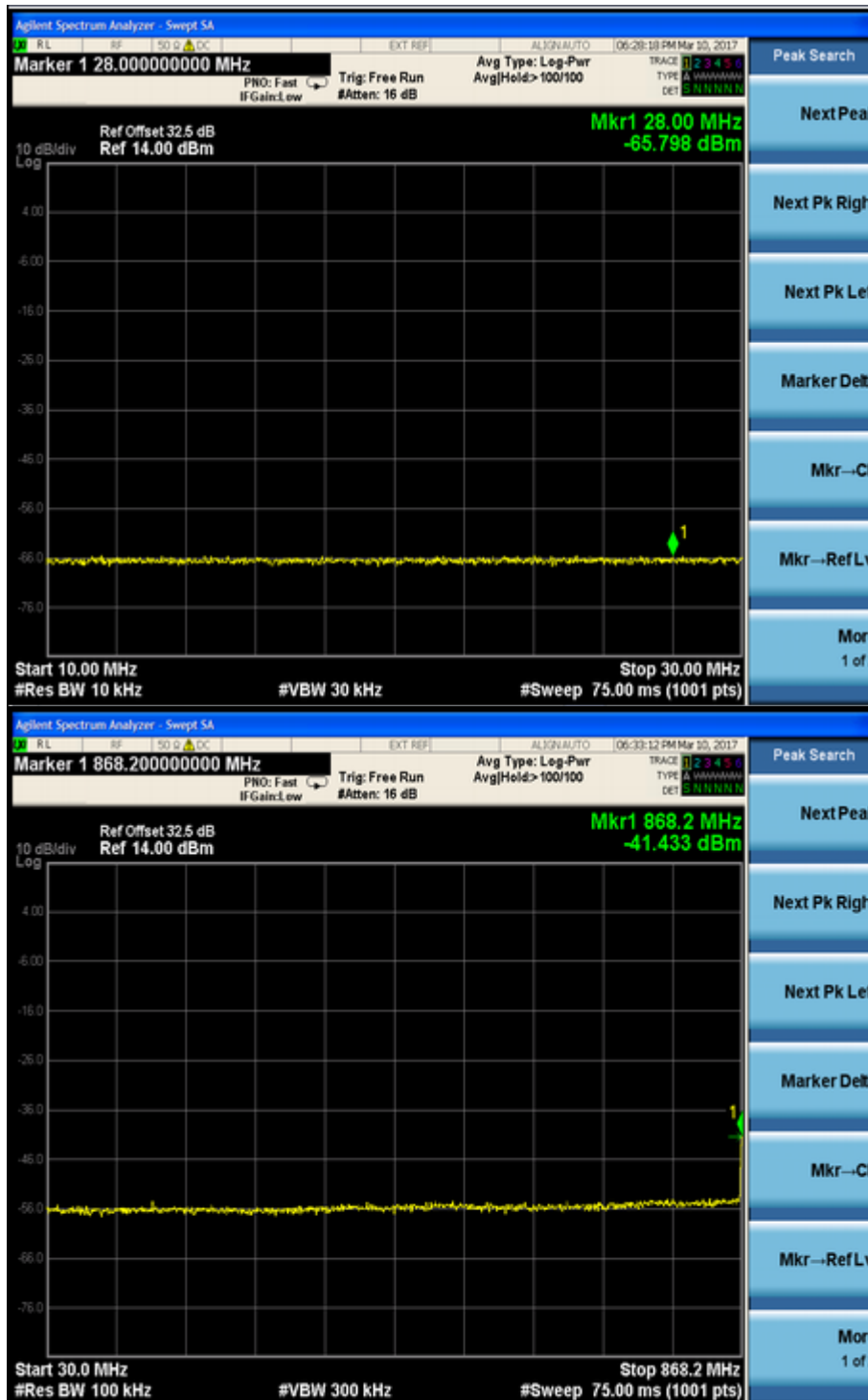






Two Carriers







One Carrier

