

FCC MEASUREMENT AND TEST REPORT

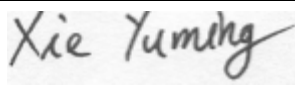
For

ZTE Corporation

ZTE Plaza, Hi-tech Park, Nanshan District, Shenzhen,
Guangdong, China 518057

FCC ID: Q78-R8119F851719A

Mar 02, 2017

This Report Concerns: <input checked="" type="checkbox"/> Original Report		Equipment Type: Macro Radio Remote Unit
Test Engineer:	Jennie.He	
Report No.:	RP20170504027-1	
Test Date:	Feb 28 – Mar 2, 2017	
Reviewed By:	Xie Yuming	
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Note: The test report is specially limited to the above company and this particular sample only. It may not be duplicated without prior written consent of ZRT EMC Shenzhen Laboratory. This report must not be used by the client to claim product certification, approval, or endorsement by any agency of the US Government.

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1 GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The ZXSDR R8119 F851719A is an RRU product of the new-type active indoor distribution system, and supports UL multi-mode. The ZXSDR R8119 F851719A is a valuable supplement to the traditional indoor distribution system that is based on passive components and feeders, and can satisfy users' higher requirements for indoor data services in the era of big data. R8119, pBridge and BBU together constitute an active distributed system indoors.

Technical specification:

Size: 230mm(Diameter)*43.5mm(Depth)

Input voltage: PoE power supply, DC: -48V DC (from -37V to -60V)

Frequency range: 1930MHz to 1990MHz,

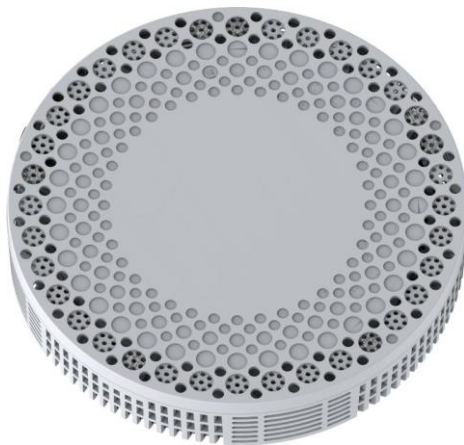
Working temperature: -10 to +45 °C

Max RF output power: 20dBm

Gain of the antenna: 9.5dBi

Modulation type of emission: UMTS is QPSK, 16QAM, 64QAM;

Appearance of EUT:



Objective

This Type approval report is prepared on behalf of ZRT EMC Shenzhen Laboratory in accordance with Part 1, Part 2, Part 15, Part 24 of the Federal Communication Commissions rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

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 ZRT EMC Shenzhen Laboratory. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by ZTE Corporation to collect test data is located in the ZTE Plaza, Hi-tech Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China, Tel: +86-755-26770000, Fax: +86-755-26771999. Test site at ZTE Corporation 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 June 10, 2011. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 0007895832. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 SYSTEM TEST CONFIGURATION

Description of Test Configuration

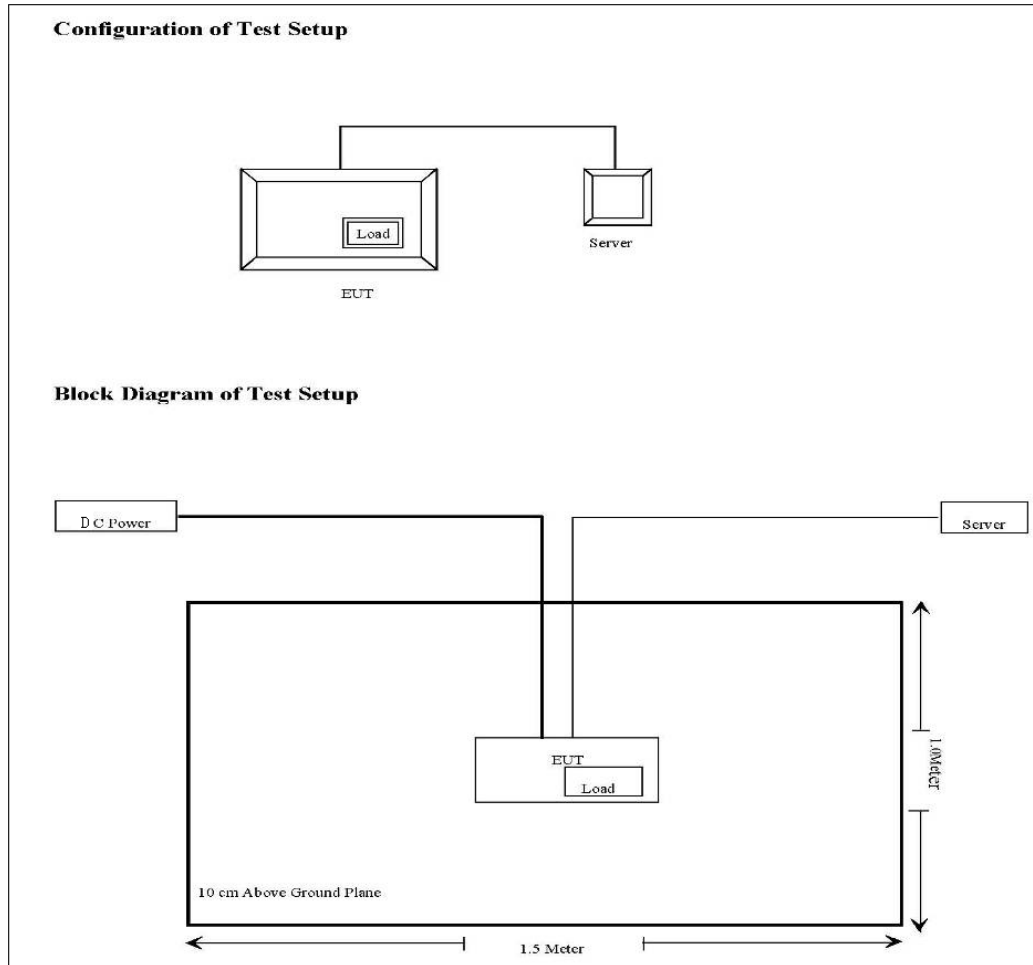
Justification

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.



3 TEST RESULTS

3.1 TRANSMITTER OUTPUT POWER

Applicable Standard: FCC §2.1046 §24.232

According to FCC §2.1046 & §24.232, the EIRP (equivalent isotropically radiated power) must not exceed 1640 Watts.

According to RSS-133, SRSP 510 5.1.1 the EIRP (equivalent isotropically radiated power) must not exceed 3280Watts/MHz for base station transmitters operating in the band of 1930 MHz to 1995MHz with the antenna height above average terrain up to 300 meters. If used in urban area, the limit should be 1640Watts/MHz.

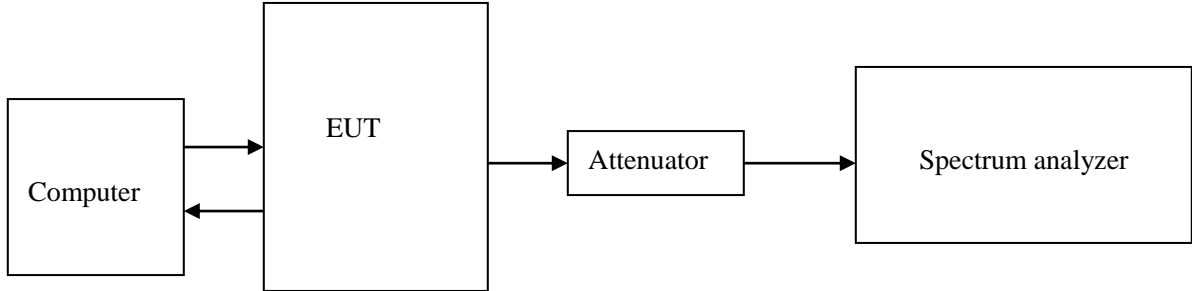
Note: EIRP= Max output Power+ Antenna gain- Cable Loss

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

***statement of traceability:** ZRT EMC Shenzhen Laboratory attest that all calibration have been performed per the NVLAP requirements , traceable to NIST.

Test Procedure



The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation. External attenuation Loss is 30dB, Cable Loss is about 1dB.

Environmental Conditions

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

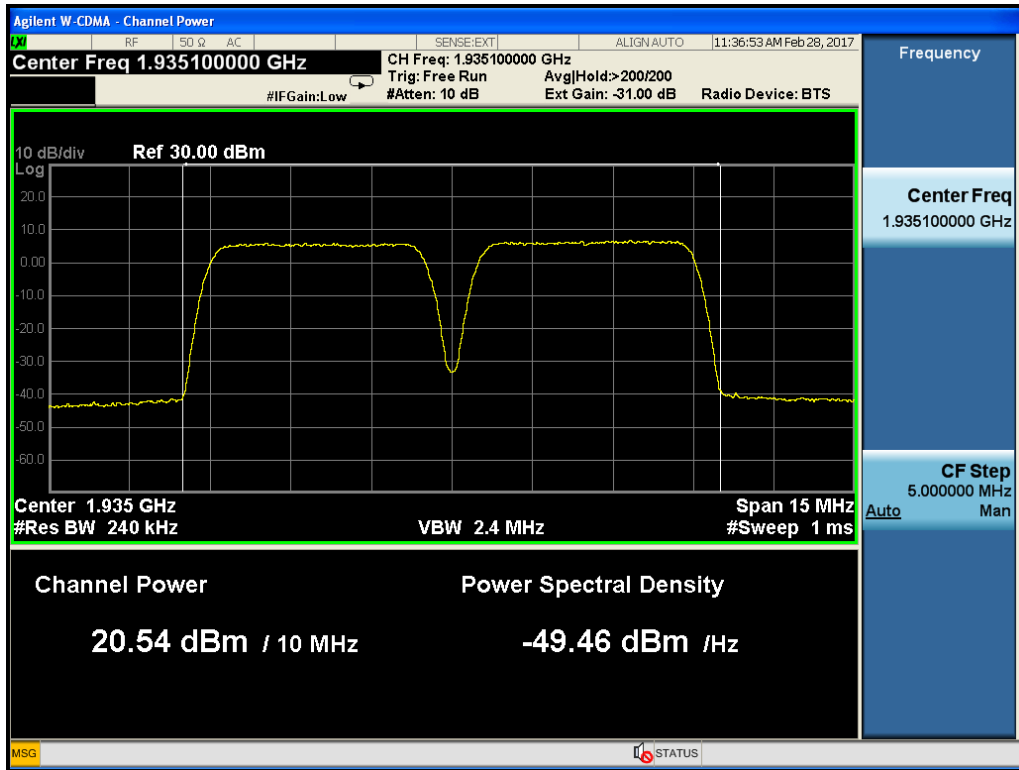
Test Result: Pass

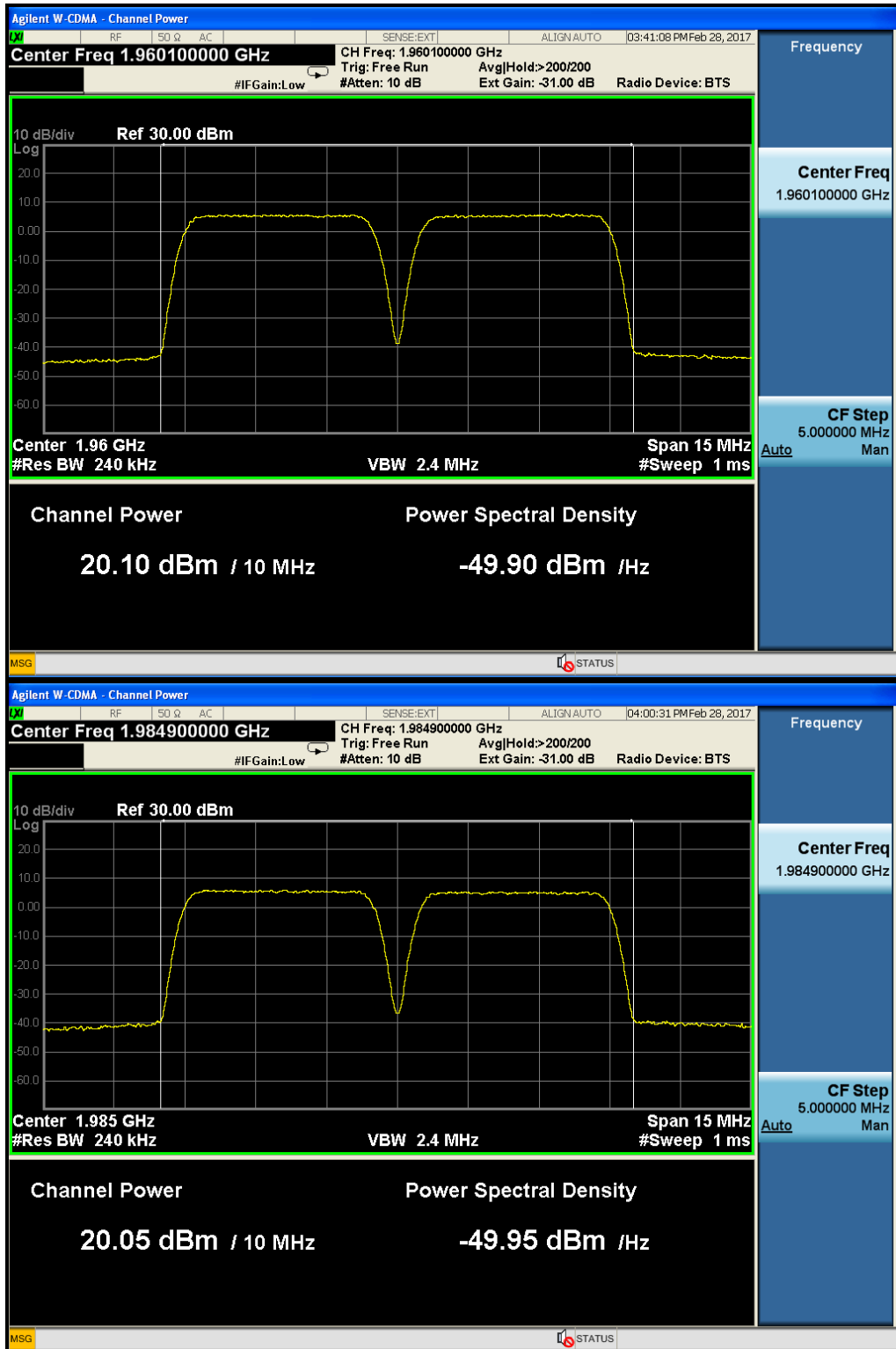
Test Mode: Transmitting UMTS

Test Data:

Two carriers

Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
1935.1	1932.6/1937.6	20.54
1960.1	1957.6/1962.6	20.10
1984.9	1982.4/1987.4	20.05

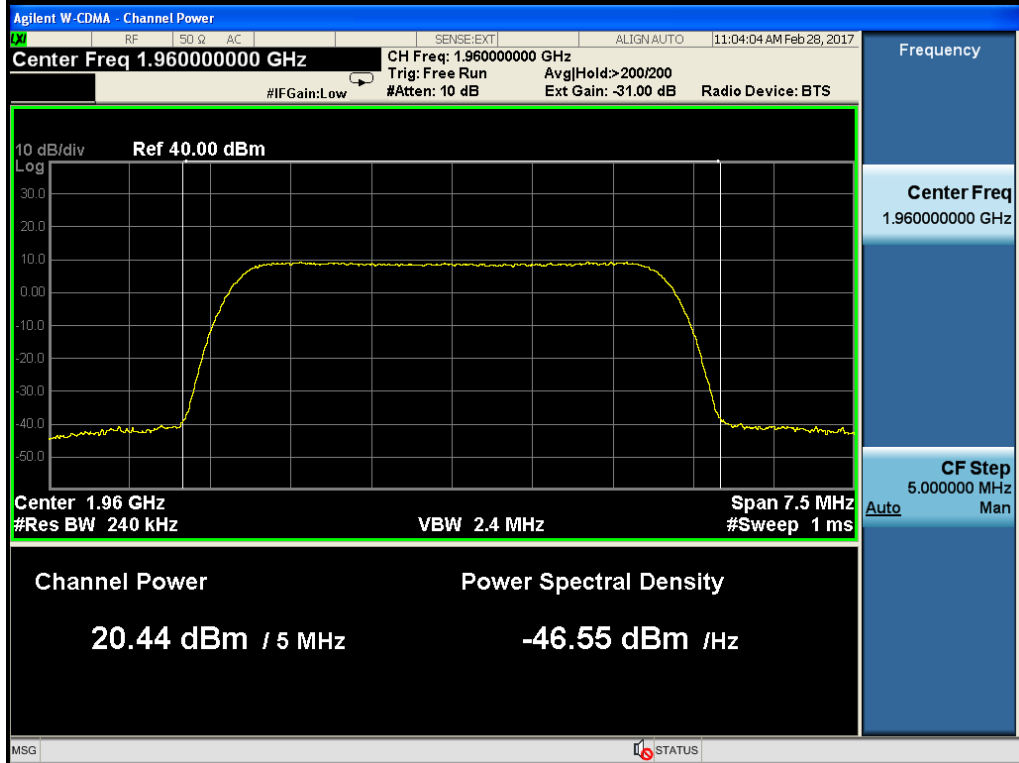
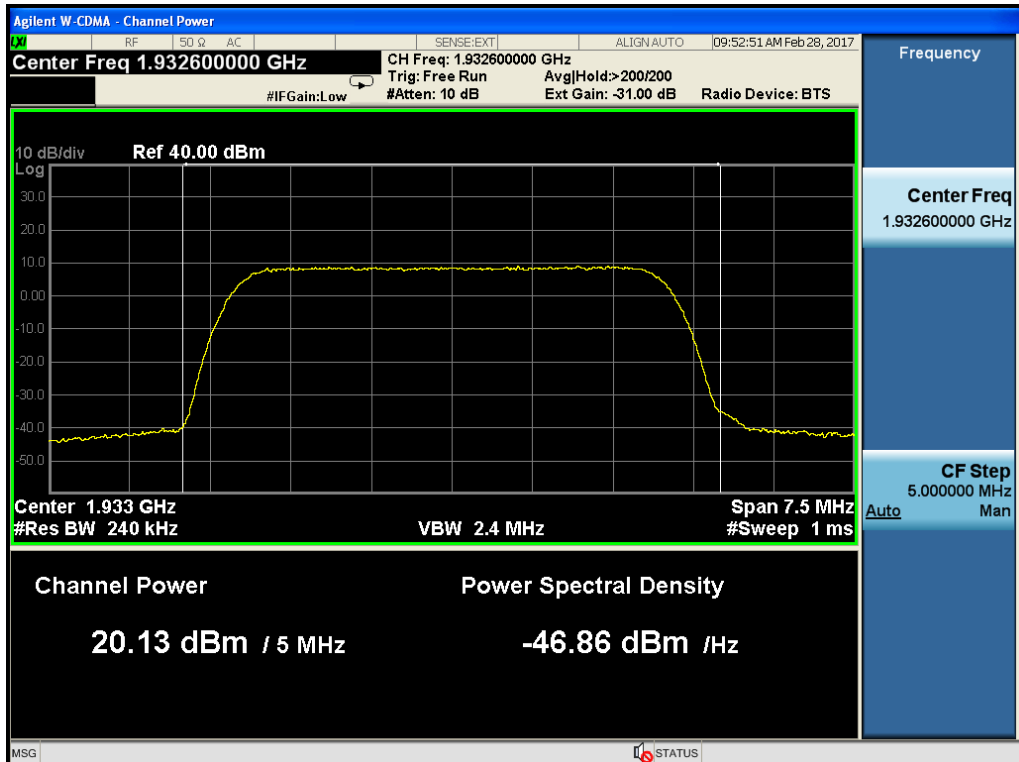


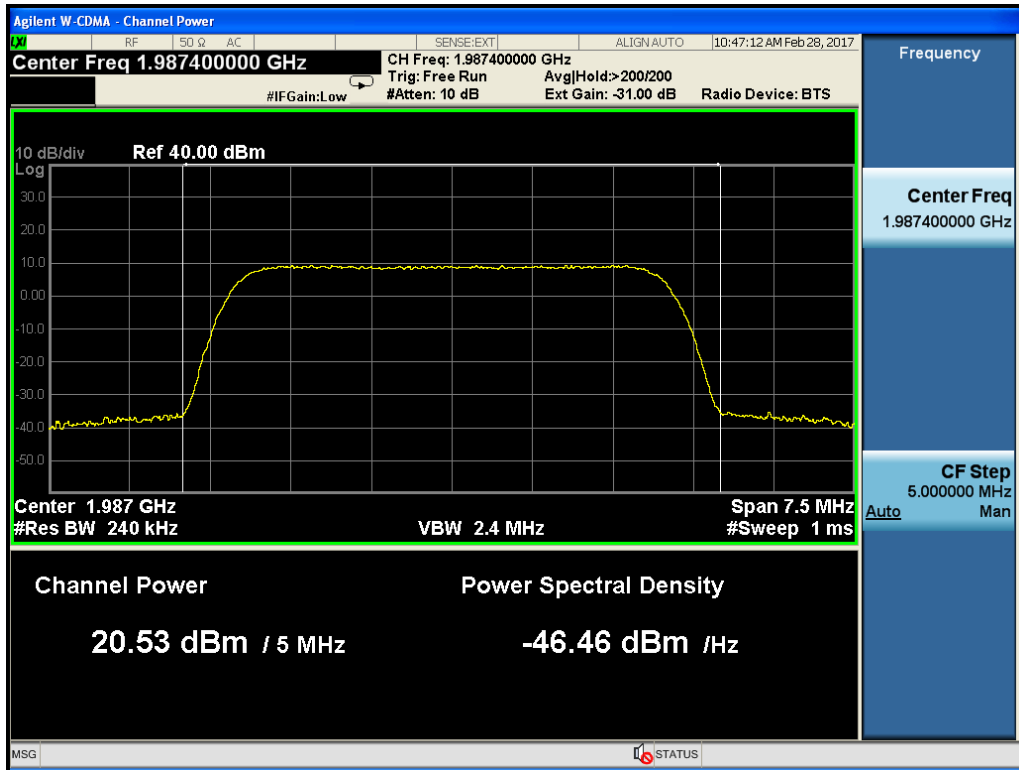


One carrier

Center Freq. (MHz)	Frequency (MHz)	Max output Power in dBm
-----------------------	-----------------	----------------------------

1932.6	1932.6	20.13
1960	1960	20.44
1987.4	1987.4	20.53





3.2 RF EXPOSURE

Applicable standard: FCC §2.1091 and §1.1310

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

Test Data

Predication of MPE limit at a given distance
 Equation from page 18 of OET Bulletin 65, Edition 97-01
 $S = EIRP / 4\pi R^2$
 Where: S = power density
 EIRP = equivalent isotropically radiated power=ERP+2.15dB
 $R = \text{distance to the center of radiation of the antenna} = [(ERP+2.15 \text{ dB}) / 4\pi S]^{1/2}$

Maximum EIRP, In general, the equivalent isotropically radiated power (EIRP) of base transmitters and cellular repeaters must not exceed 1640 Watts.
 Frequency is between 1500MHz and 100,000MHz, and the Maximum S=1.0mW/cm², so R=3.61m.
 This equipment should be installed and operated with minimum distance 3.61m between the radiator& your body.

Test Result: pass

3.3 MODULATION CHARACTERISTIC

Applicable Standard: FCC §2.1047

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

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

Test Procedure

UMTS digital mode is used by EUT.

Test Data Environmental Conditions

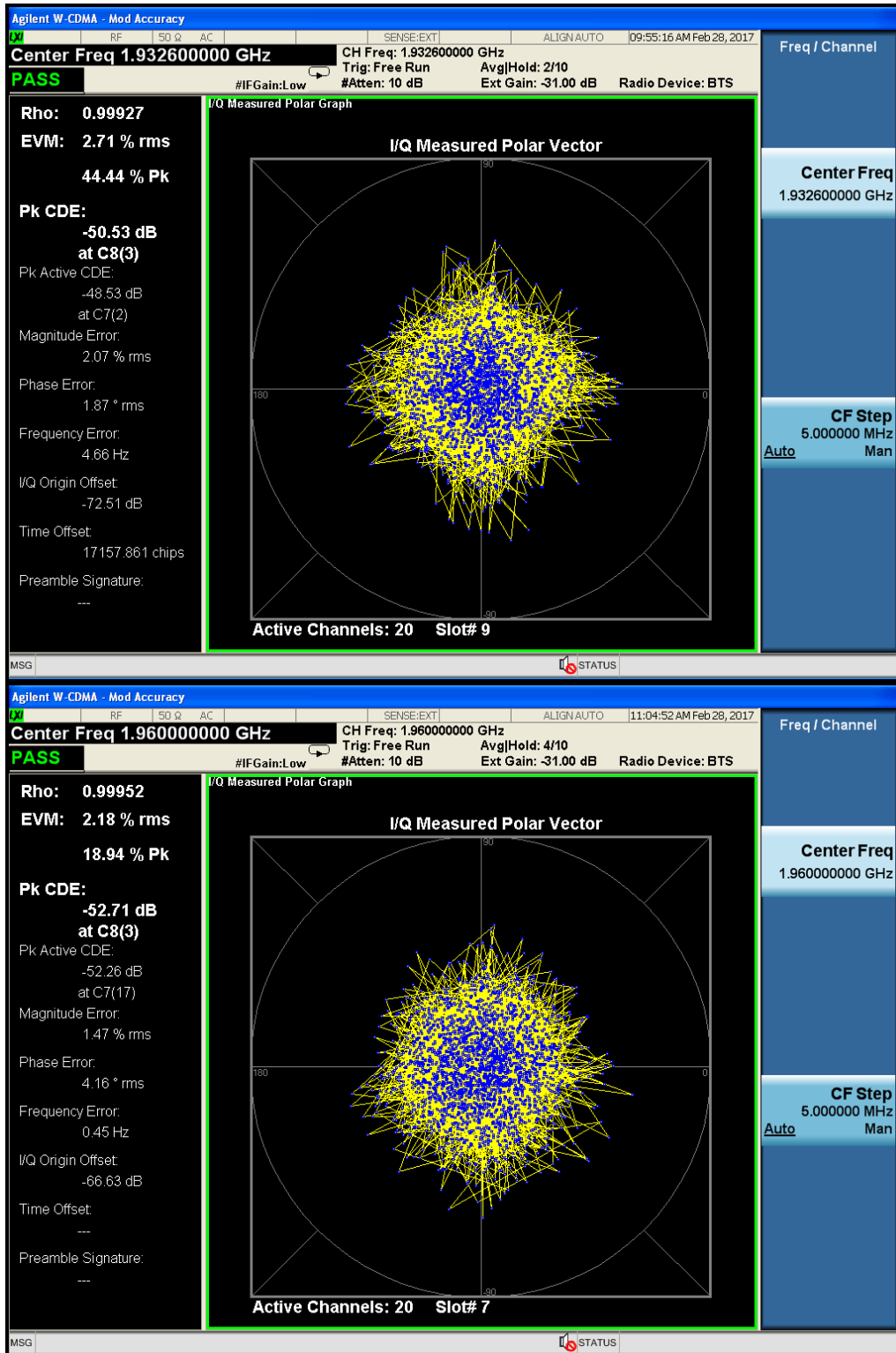
Temperature:	20 °C
Relative Humidity:	53 %
ATM Pressure:	1009 mbar

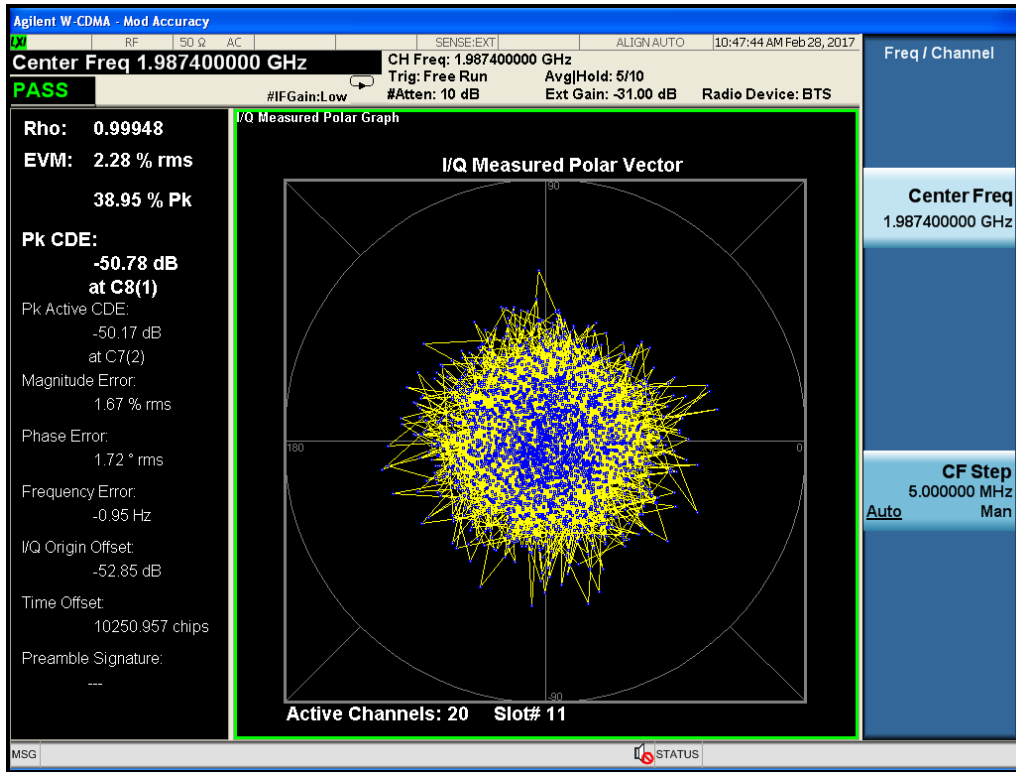
Test Result: Pass

Test Mode: Transmitting UMTS

Test Data:

Frequency (MHz)	EVM(%rms)
1932.6	2.71
1960	2.18
1987.4	2.28





3.4 SPURIOUS RADIATED EMISSIONS

Applicable Standard: FCC CFR 47, §2.1053

Test Equipment List and Details

Manufacturer	Equipment	Model	Serial Number	Last Cal.	Cal. Interval
R&S	SIGNAL GENERATOR	SMR20	A00017351	2017-09-09	1 year
Albatross	Anechoic Chamber	3m Site	A00017354	2017-12-01	1 year
R&S	EMI Test Receiver	ESIB26	100058	2017-10-29	1 year
R&S	Ultra Breitband Antennas	HL562	100022	2017-7-29	1 year
R&S	Double-Ridged Waveguide Horn Antenna	HF906	100032	2017-7-29	1 year

R&S	Double-Ridged Waveguide Horn Antenna	HF906	100446	2017-7-29	1 year
SCHWARZ-BECK K	Biconical Antenna	VUBA9117	9117-122	2017-7-29	1 year

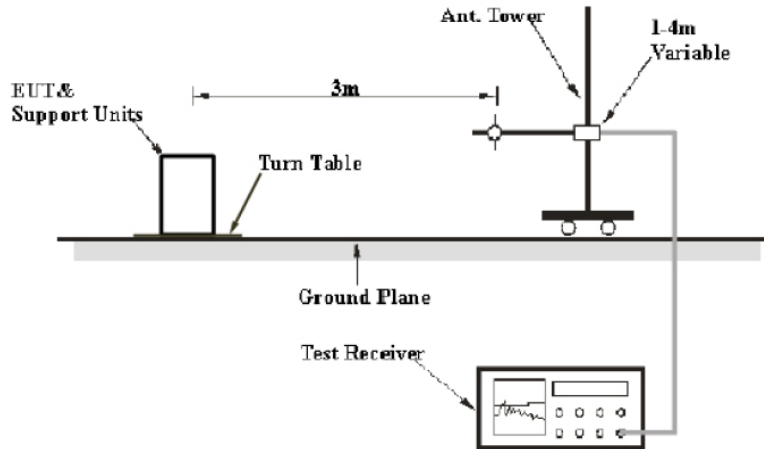
***statement of traceability:** ZTE Corporation Testing lab attest that all calibration have been performed per the NVLAP requirements, traceable to NIST.

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 2.1053. The specification used was the FCC 2.1053 limits.

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.

Test Results Summary: PASS

Environmental Conditions

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

Test data

Frequency (MHz)	MaxPeak-MaxHold (dBm)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Limit (dBm)	Margin (dB)
49.691	-46.2	150	V	150	-106.8	-13	33.2
57.1115	-57.5	150	V	199	-105.5	-13	44.5
110.2675	-67.1	150	V	47	-107.7	-13	54.1
386.96	-64.3	150	V	249	-105.2	-13	51.3
430.0765	-58.4	150	V	338	-106	-13	45.4
1271.846154	-59.8	150	V	163	-93.7	-13	46.8
3071.92	-44	150	V	333	-82.8	-13	31
3919.36	-42.6	150	V	204	-79	-13	29.6
5879.733333	-37.8	150	V	345	-99.4	-13	24.8
7759.933333	-38.3	150	V	227	-96.8	-13	25.3
16210.33333	-44.4	150	V	177	-85.2	-13	31.4
16426.86667	-44.5	150	V	177	-86.1	-13	31.5
17235.6	-42	150	V	97	-81.9	-13	29
17605.2	-41.8	150	V	295	-80.5	-13	28.8
17939.33333	-40.5	150	V	75	-79.5	-13	27.5
70.0125	-60.8	150	H	350	-111.7	-13	47.8
275.7495	-61.5	150	H	245	-107.4	-13	48.5
436.042	-55.1	150	H	235	-106.2	-13	42.1
3071.92	-41.8	150	H	20	-82.6	-13	28.8
7759.933333	-41	150	H	166	-96.6	-13	28
17605.66667	-40.5	150	H	0	-79.5	-13	27.5

Radiation emission spurious

3.5 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard: FCC§2.1051, §24.238

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

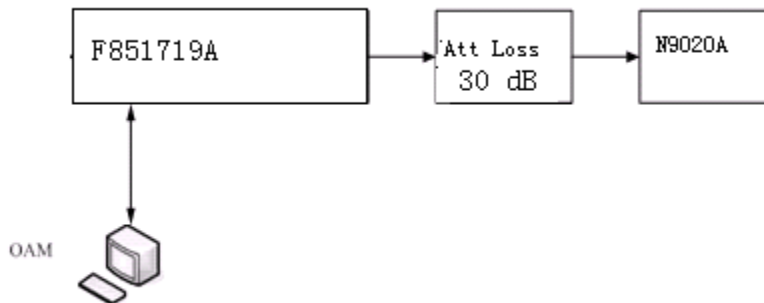
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

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

Test Procedure

EUT Setup:



REMARKS: Attenuator loss (dB)=30dB, Cable Loss (dB)=1dB.

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 1MHz for 30MHz to 1GHz scanning, set at 1MHz for 1GHz to 20GHz scanning. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Data Environmental Conditions

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

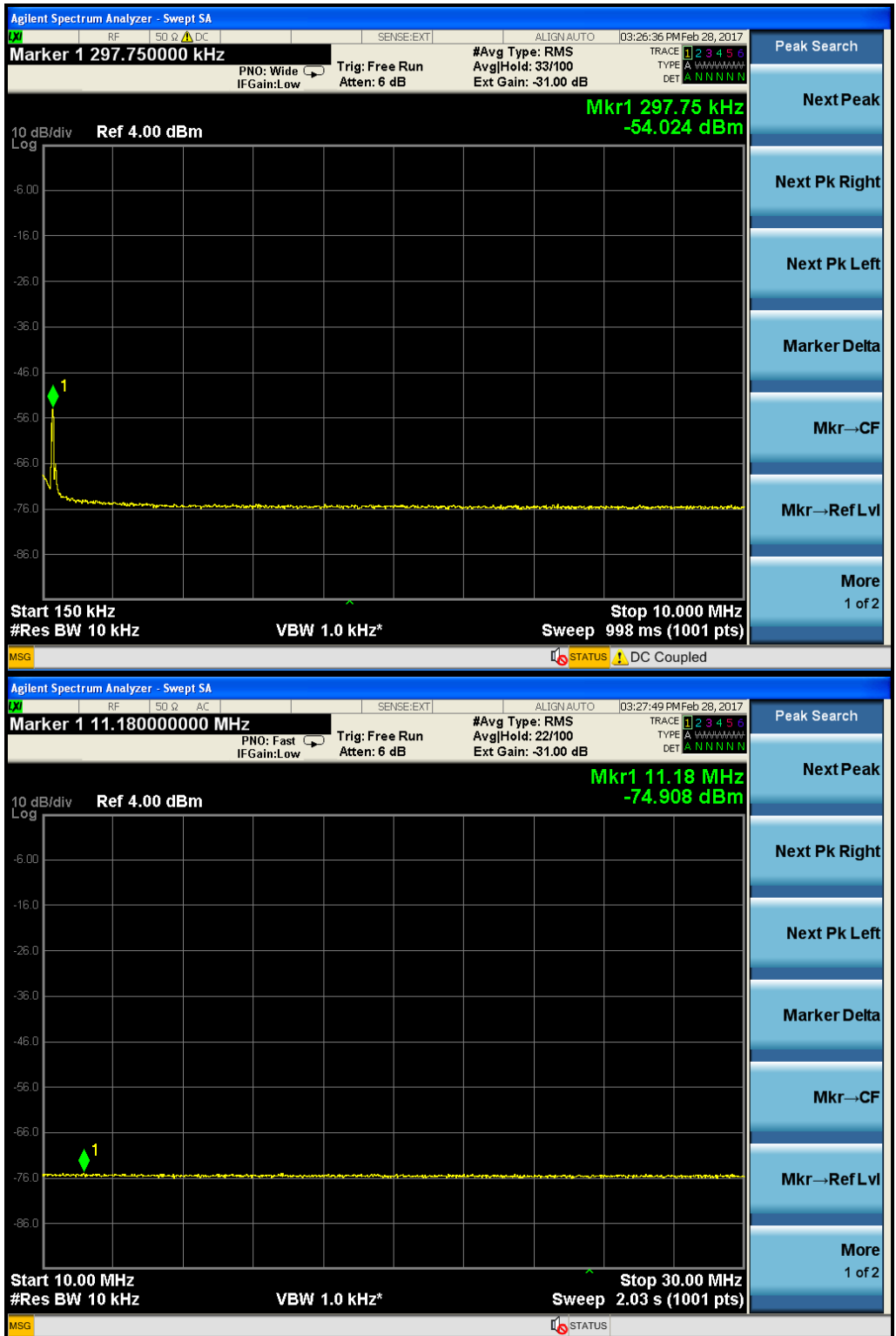
Test Result: Pass

Test Mode: Transmitting UMTS

Test Data:

Two carrier (working in bottom frequency)



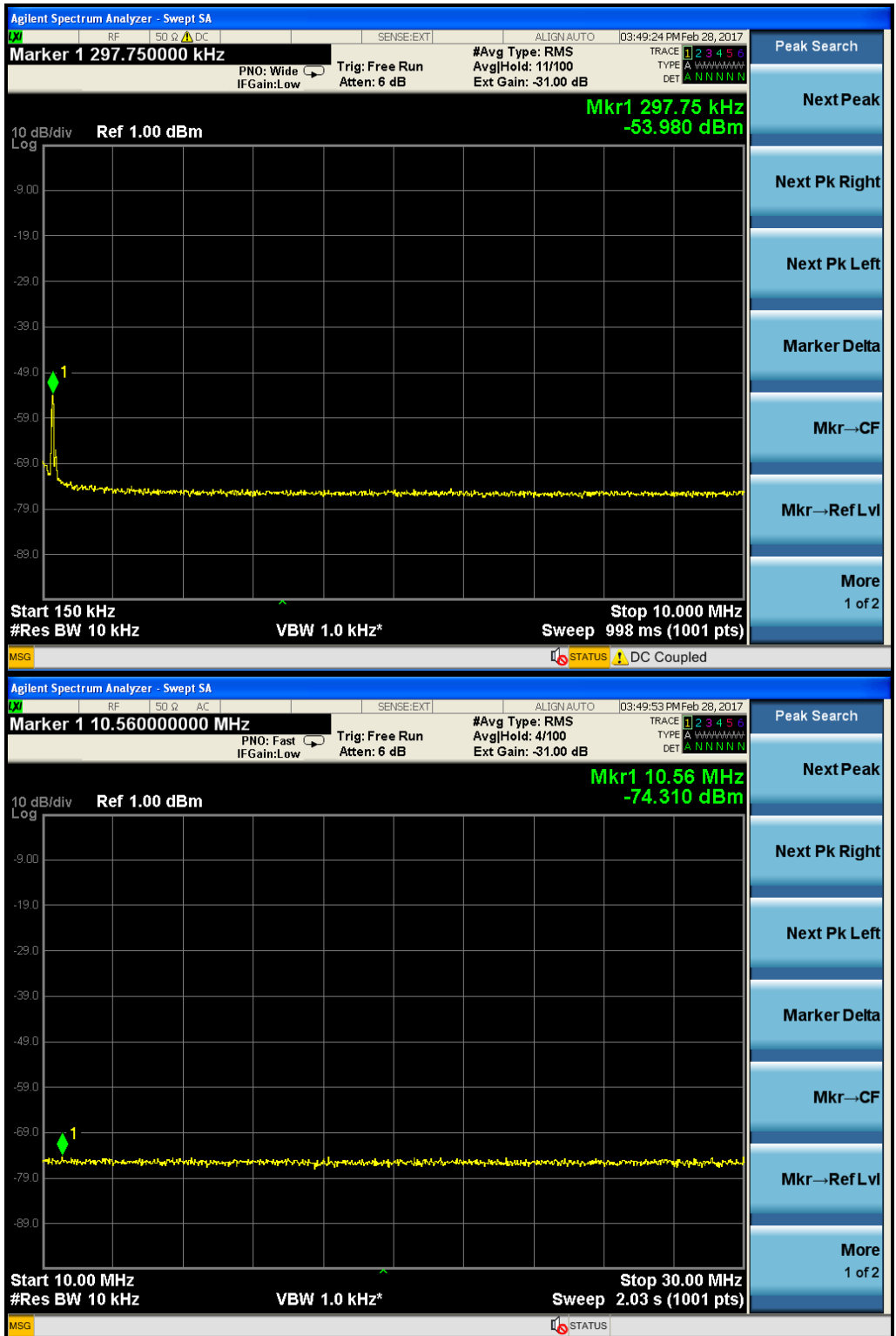






Two carriers (working in middle frequency)



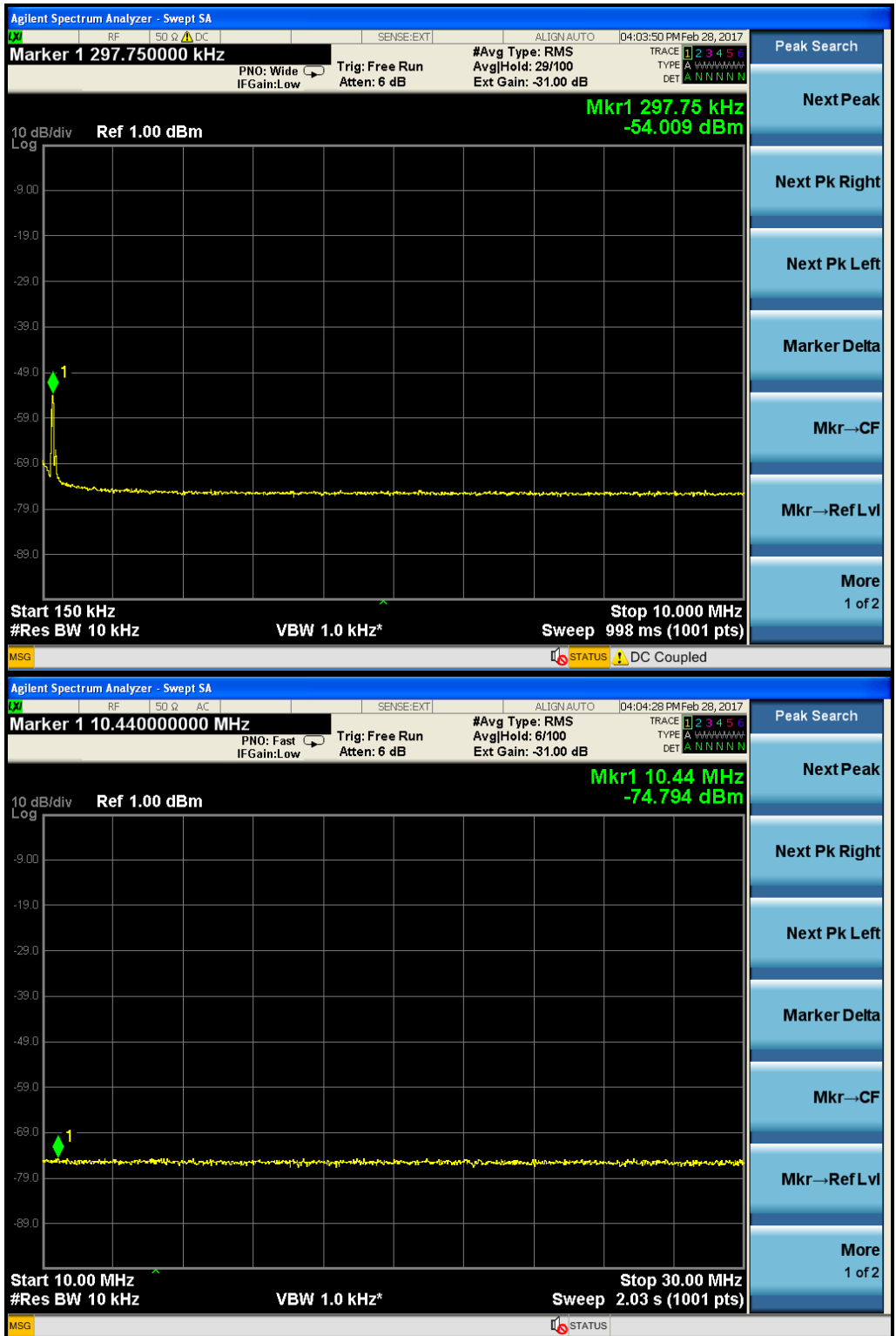






Two carriers (working in top frequency)



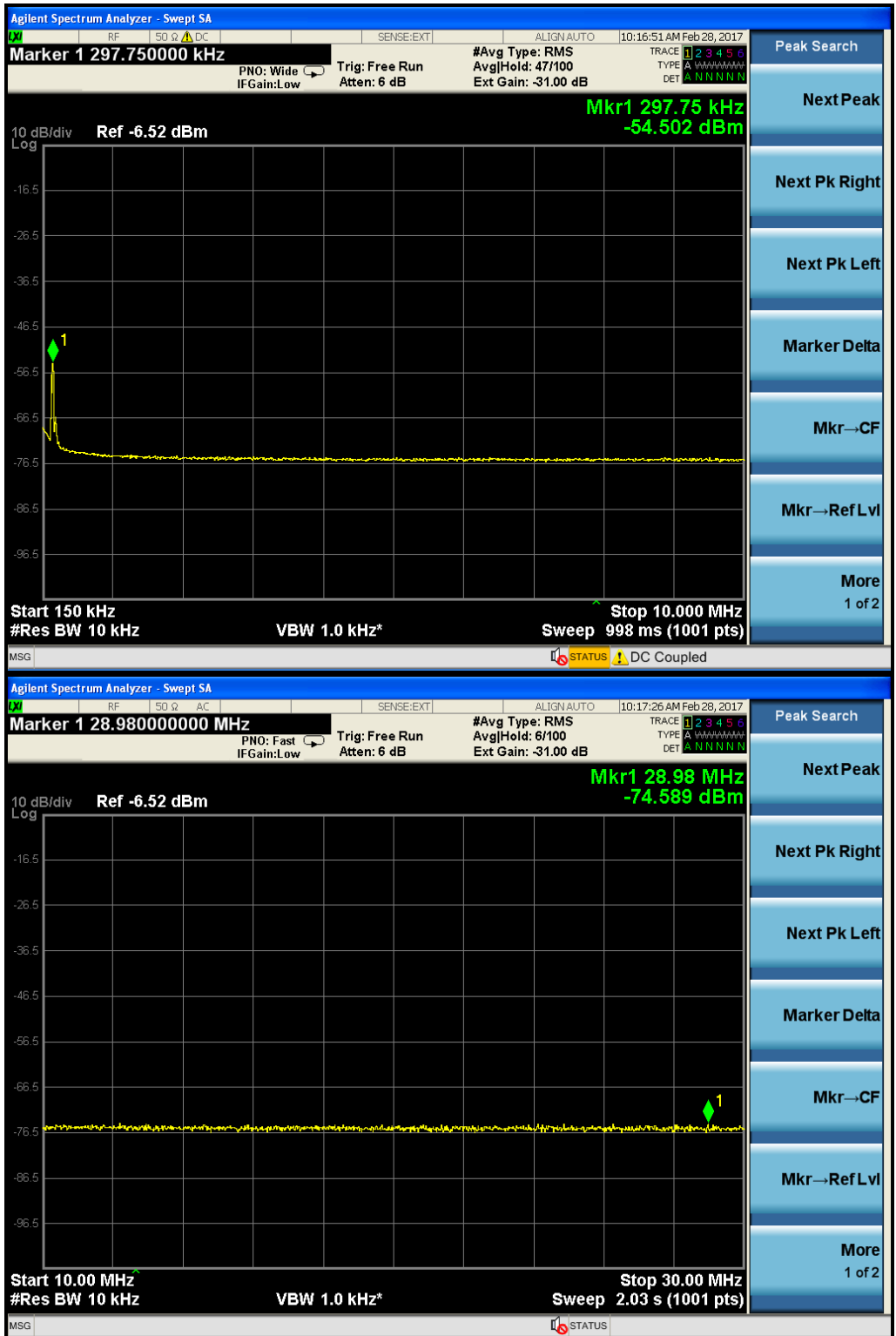


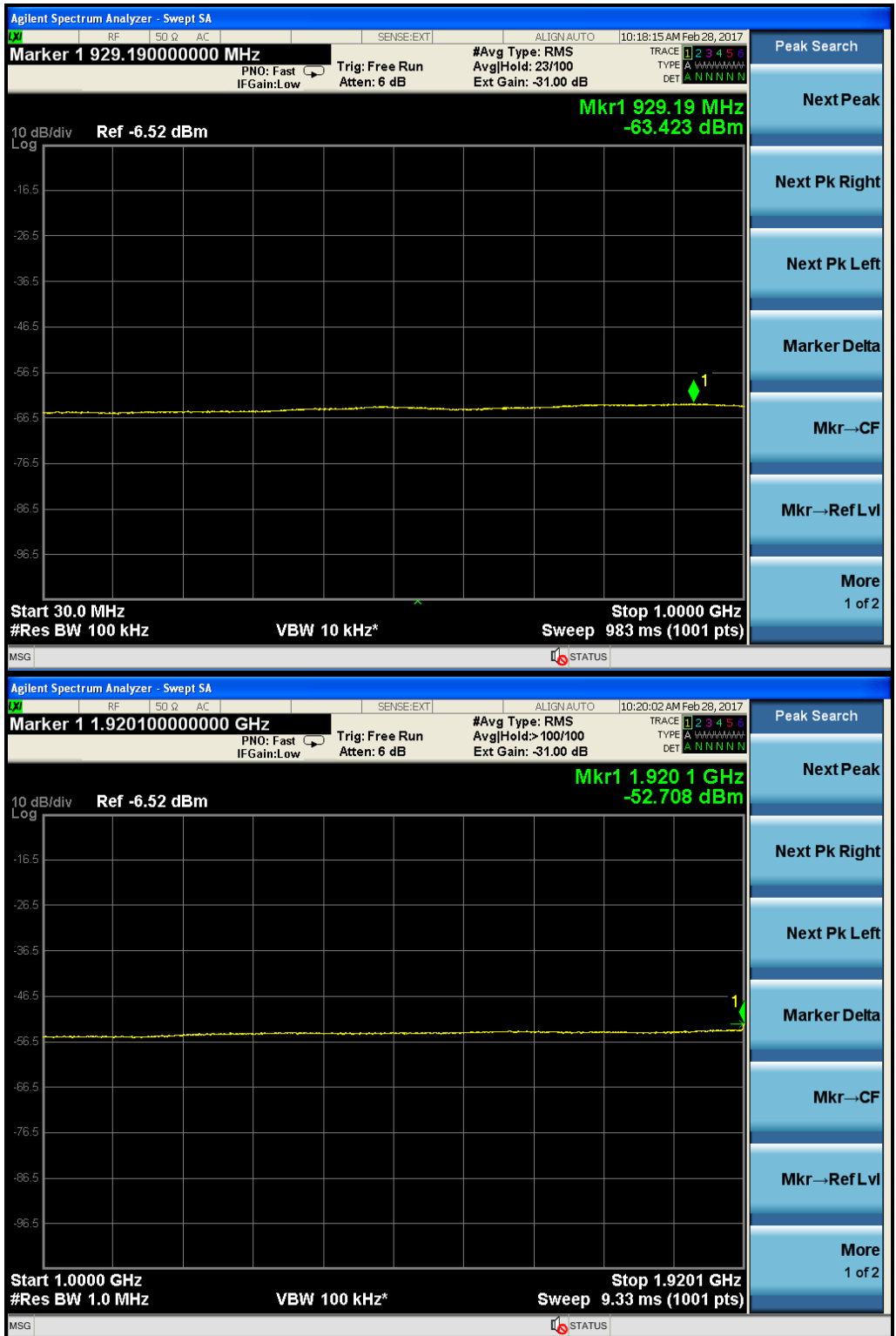




One carrier (working in bottom frequency)



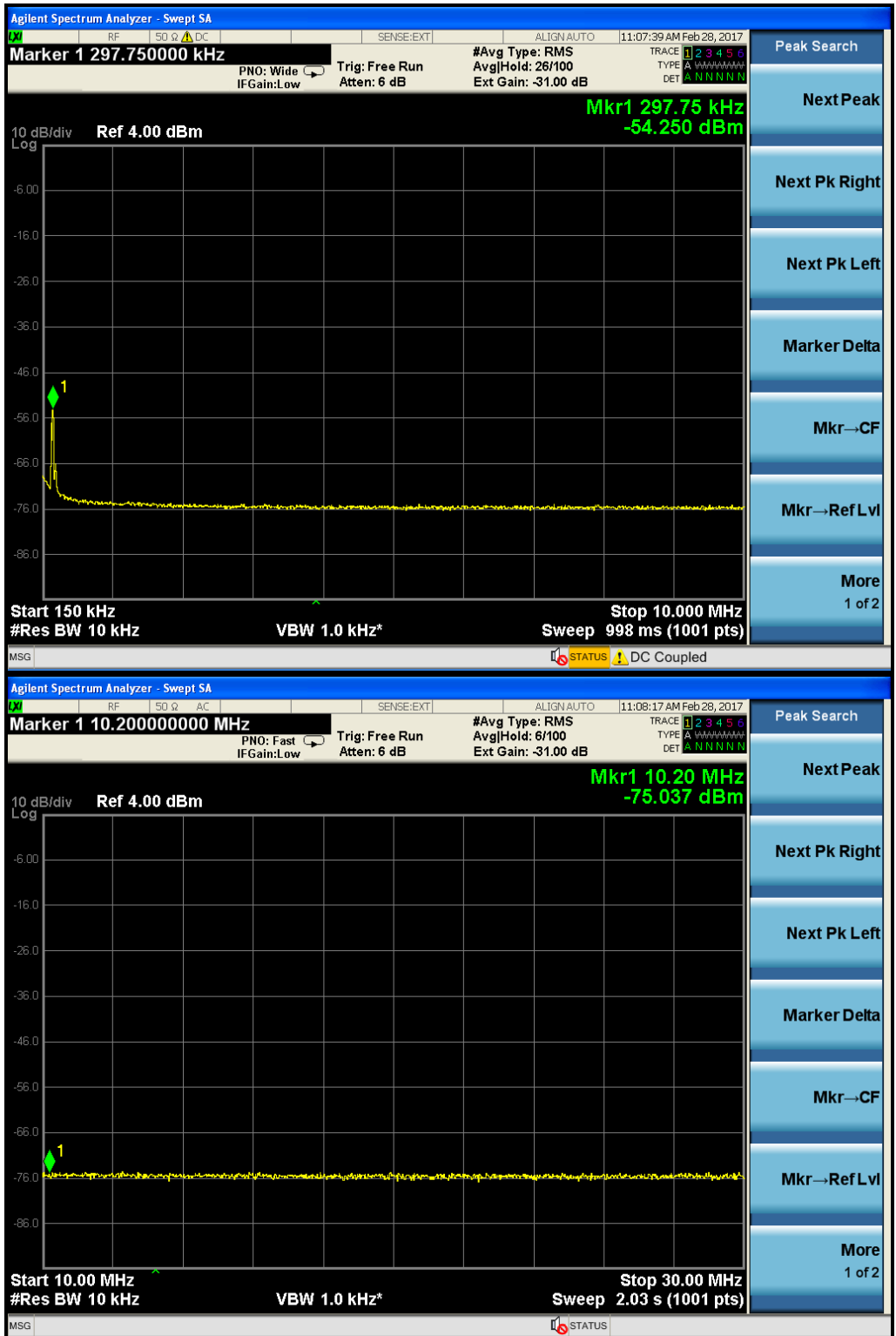






One carrier (working in middle frequency)



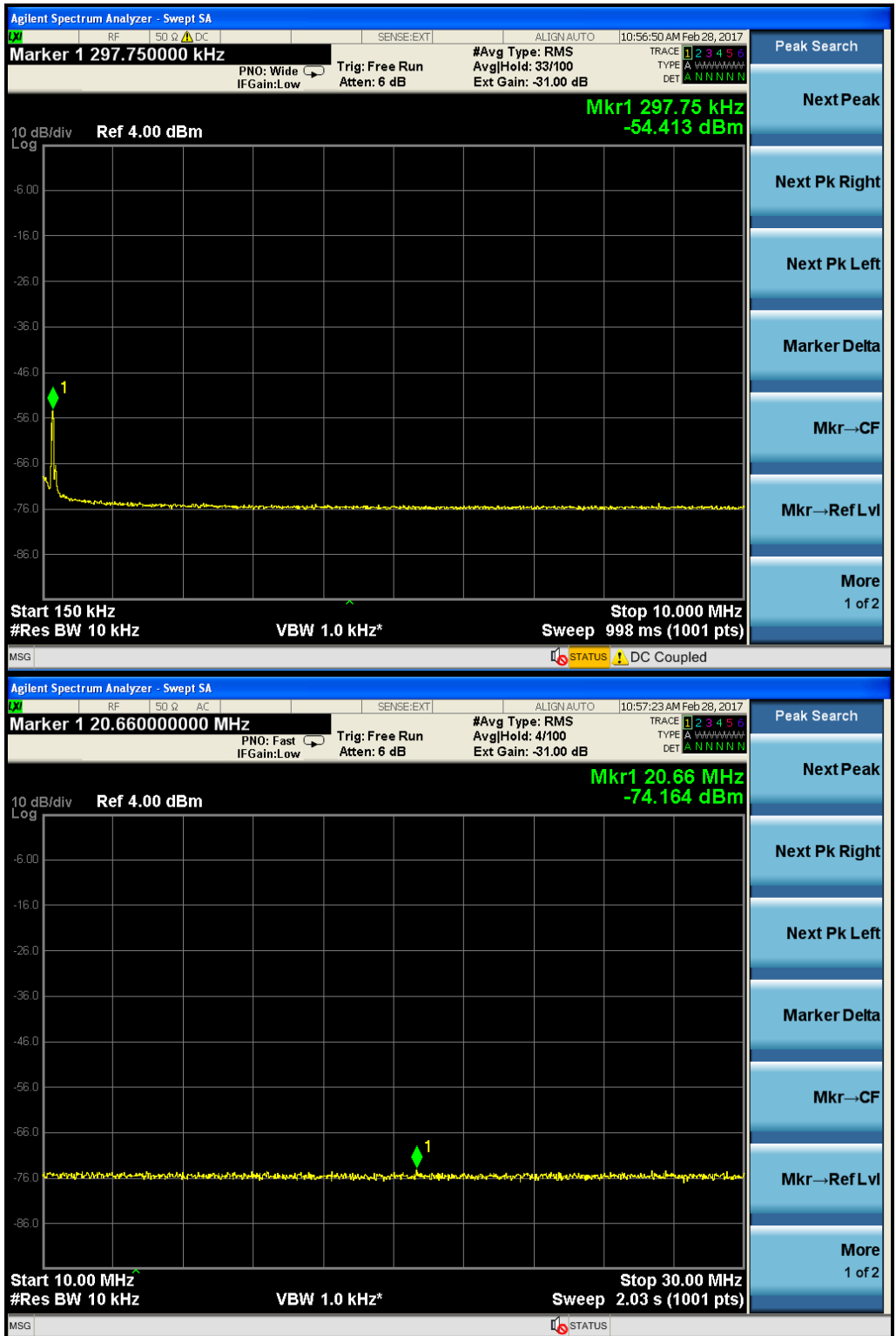






One carrier (working in top frequency)









3.6 OCCUPIED BANDWIDTH

Applicable Standard: FCC §2.1049 §24.229 §24.238

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

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

Test Procedure

The RF out of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation. The resolution bandwidth of the spectrum analyzer was set at 1% of the span or higher and 99%Power bandwidth was recorded.

Environmental Conditions

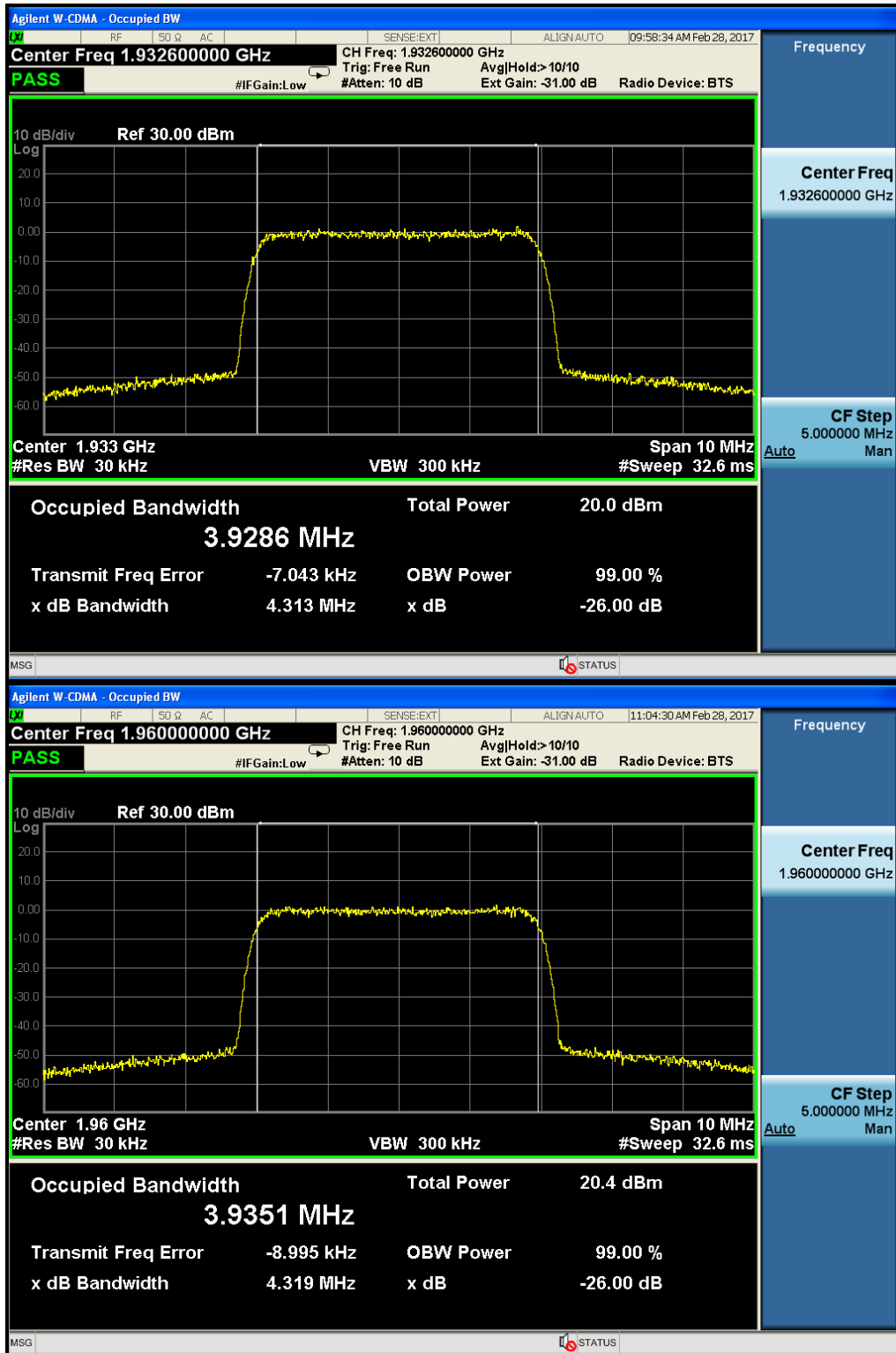
Temperature:	20 ° C
Relative Humidity:	53%
ATM Pressure:	1009mbar

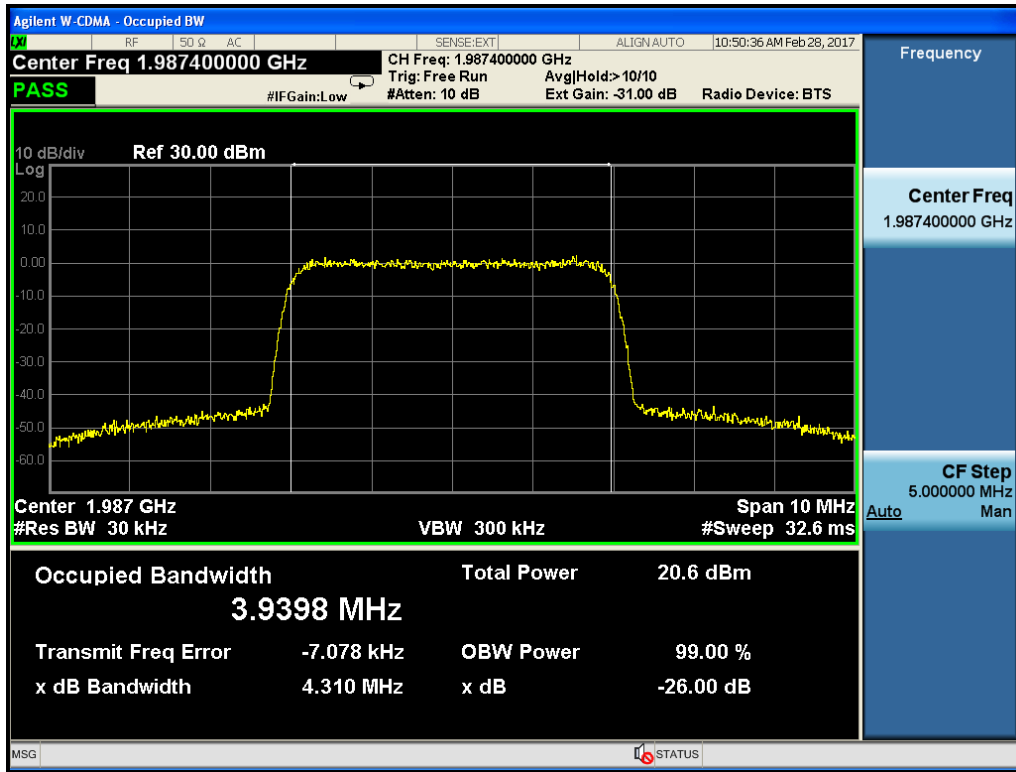
Test Result: Pass

Test Mode: Transmitting UMTS

Test Data

Frequency (MHz)	99% Power Bandwidth (MHz)	Limit (MHz)
1932.6/1960/1987.4	3.9286/3.9351/3.9398	<4.2





3.7 BAND EDGES

Applicable Standard: FCC §2.1051 §24.238

According to §2.1051 and §24.238, 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. The limit (dBm) should $< P - (43 + 10 \log(P)) = -13 \text{ dBm}$.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

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

Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.

Test Data Environmental Conditions

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

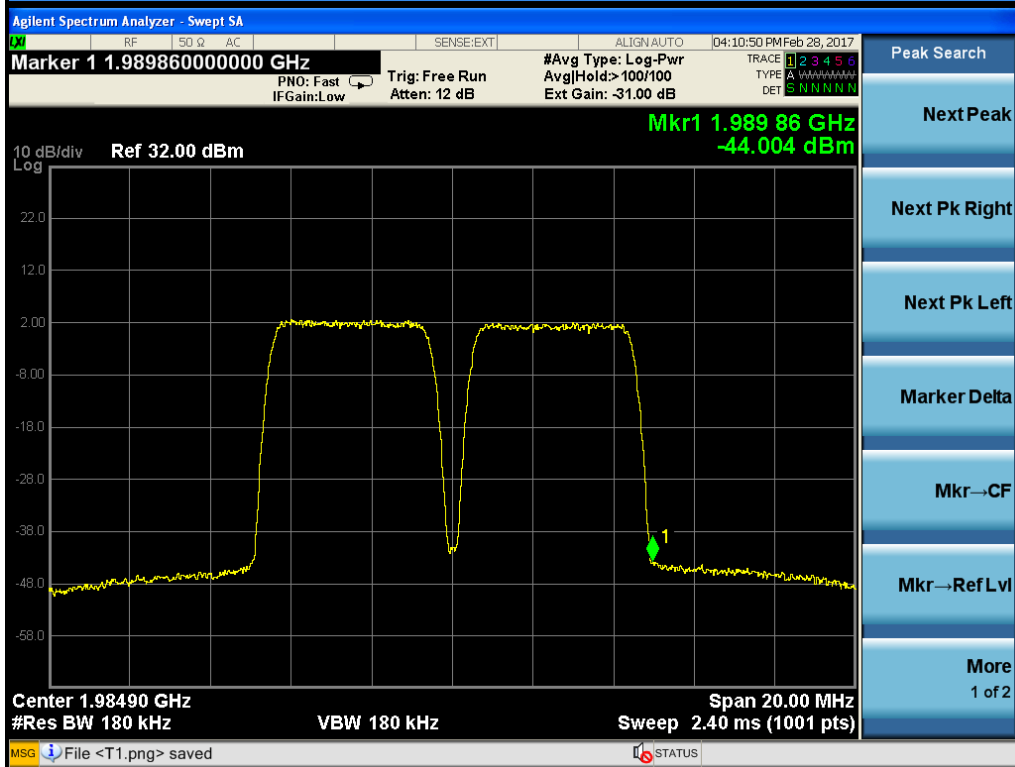
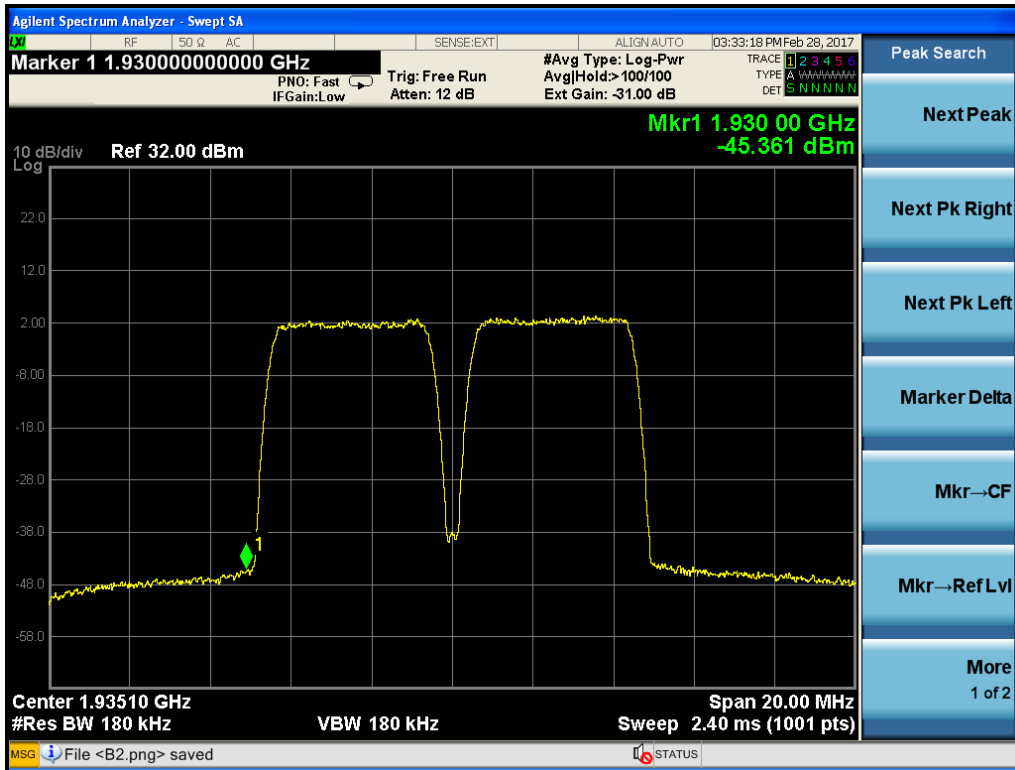
Test Result: Pass

Test Mode: Transmitting UMTS

Test Data

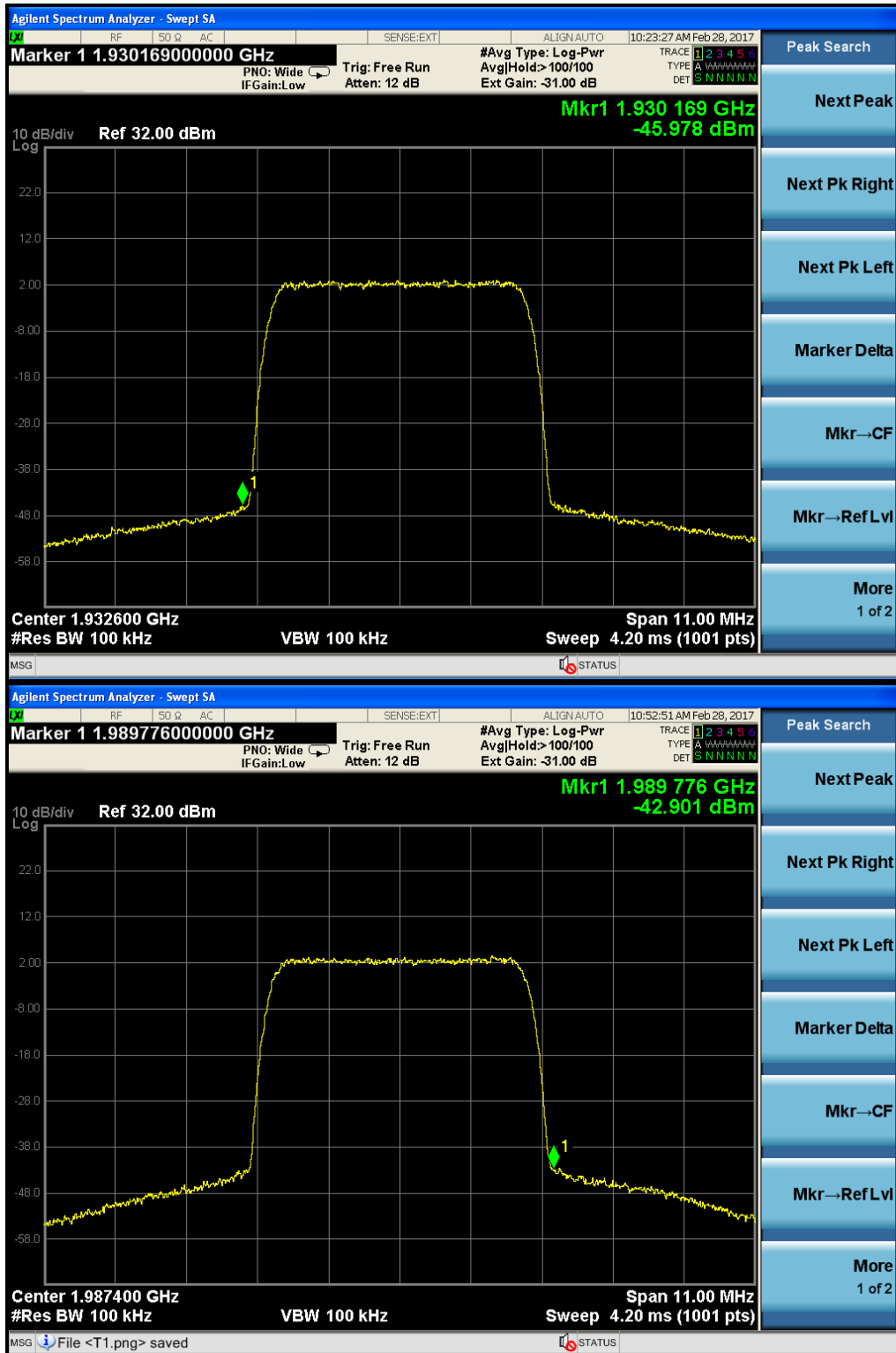
Two carriers

Frequency channel	Max bandedge Emission (dBm)	Limit (dBm)
1932.6/1937.6	-45.361	-13.00
1982.4/1987.4	-44.004	-13.00



One carrier

Frequency channel	Max bandedge Emission (dBm)	Limit (dBm)
1932.6	-45.978	-13.00
1987.4	-42.901	-13.00



3.8 FREQUENCY STABILITY

Applicable Standard: FCC § 2.1055 § 24.235

Requirements: FCC § 2.1055 (a)(d) .The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
GZ-ESPEC	Temperature Chamber	EW0470	06113028	2017-1-26	2018-1-26
Agilent	MXA Series Spectrum Analyzer	N9020A	MY51160170	2016-8-20	2017-8-19
Atten	30dB Attenuator	ATSI150-4-40	11300100204204	2016-7-11	2017-7-11
Forstar	Forstar RF Cable	002	1034	2016-9-8	2017-9-7

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

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC power supply and the RF output was connected to a Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. The AC leads and RF output cable exited the chamber through an opening made for the purpose. After the temperature stabilized for approximately 150 minutes, the frequency output was recorded from the counter.

Environmental Conditions

Normal condition:	25° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

Test Result: Pass

Test Mode: Transmitting UMTS

Test Data

Frequency Stability Versus Temperature

Frequency Stability vs. Temperature					
Temperature °C	PoE power supply V/DC	Frequency Measure Error Hz	Error ppm	Limit ppm	Result
B(1932.6MHz)					
-30	-48	4.37	0.002261	0.1	PASS
-25	-48	-3.35	-0.00173	0.1	PASS
-20	-48	5.27	0.00273	0.1	PASS
-15	-48	5.21	0.00269	0.1	PASS
-10	-48	-5.08	-0.002628	0.1	PASS
-5	-48	5.37	0.002778	0.1	PASS
0	-48	-4.35	-0.002250	0.1	PASS
5	-48	5.07	0.002623	0.1	PASS
10	-48	5.23	0.002706	0.1	PASS
15	-48	-6.96	-0.003601	0.1	PASS
20	-48	4.83	0.002499	0.1	PASS
25	-48	-5.96	-0.003083	0.1	PASS
30	-48	-5.68	-0.002939	0.1	PASS
35	-48	4.7	0.002431	0.1	PASS
40	-48	4.37	0.002261	0.1	PASS
45	-48	-4.55	-0.002354	0.1	PASS
50	-48	4.25	0.00219	0.1	PASS
M(1960MHz)					
-30	-48	3.21	0.00163	0.1	PASS
-25	-48	2.56	0.00131	0.1	PASS
-20	-48	4.56	0.00232	0.1	PASS
-15	-48	3.27	0.00167	0.1	PASS
-10	-48	-5.92	-0.003020	0.1	PASS

-5	-48	5.17	0.002637	0.1	PASS
0	-48	4.45	0.002270	0.1	PASS
5	-48	-5.03	-0.002566	0.1	PASS
10	-48	-3.21	-0.001637	0.1	PASS
15	-48	-7.82	-0.003989	0.1	PASS
20	-48	5.24	0.002673	0.1	PASS
25	-48	1.78	0.000908	0.1	PASS
30	-48	6.21	0.003168	0.1	PASS
35	-48	3.25	0.001658	0.1	PASS
40	-48	4.25	0.002168	0.1	PASS
45	-48	5.23	0.002668	0.1	PASS
50	-48	-6.13	0.313	0.1	PASS
T (1987.4MHz)					
-30	-48	2.78	0.00139	0.1	PASS
-25	-48	3.56	0.00179	0.1	PASS
-20	-48	-6.02	-0.00302	0.1	PASS
-15	-48	-2.53	-0.00127	0.1	PASS
-10	-48	2.45	0.001232	0.1	PASS
-5	-48	3.21	0.001615	0.1	PASS
0	-48	-2.56	-0.001288	0.1	PASS
5	-48	-7.65	-0.00384	0.1	PASS
10	-48	-3.32	-0.001670	0.1	PASS
15	-48	-5.2	-0.002616	0.1	PASS
20	-48	-2.78	-0.001398	0.1	PASS
25	-48	8.56	0.004307	0.1	PASS
30	-48	3.56	0.001791	0.1	PASS
35	-48	2.78	0.00139	0.1	PASS
40	-48	6.21	0.00312	0.1	PASS
45	-48	6.35	0.00319	0.1	PASS
50	-48	4.23	0.00213	0.1	PASS

Frequency Stability Versus Voltage

Frequency Stability vs. Voltage					
Voltage Vac	Temperature	Frequency Measure Error Hz	Error ppm	Limit ppm	Result
B(1932.6MHz)					
90	20	3.6	0.001863	0.1	
115	20	-3.3	-0.00171	0.1	PASS
140	20	-4.7	-0.00243	0.1	PASS
165	20	-5.2	-0.00269	0.1	PASS

190	20	-4.6	-0.00238	0.1	PASS
215	20	-2.8	-0.00145	0.1	PASS
264	20	3.5	0.001811	0.1	PASS
M(1960MHz)					
90	20	3.7	0.001888	0.1	PASS
115	20	-3.8	-0.00194	0.1	PASS
140	20	-3.3	-0.00168	0.1	PASS
165	20	4.8	0.002449	0.1	PASS
190	20	-3.8	-0.00194	0.1	PASS
215	20	-4.9	-0.0025	0.1	PASS
264	20	5.6	0.002857	0.1	PASS
T(1987.4MHz)					
90	20	-3.5	-0.00176	0.1	PASS
115	20	4.2	0.002113	0.1	PASS
140	20	-3.7	-0.00186	0.1	PASS
165	20	2.9	0.001459	0.1	PASS
190	20	2.8	0.001409	0.1	PASS
215	20	-4.3	-0.00216	0.1	PASS
264	20	-3.1	-0.00156	0.1	PASS