

RF TEST REPORT

Report No.: SET2019-12575

Product: LTE/WCDMA/GSM (GPRS) Multi-Mode Wireless Router

FCC ID: SRQ-MF283U

Model No.: MF283U

Applicant: ZTE Corporation

Address: ZTE Plaza, Keji Road South, Shenzhen, China

Dates of Testing: 09/01/2019 - 09/24/2019

Issued by: CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Lab Location: Building 28/29, East of Shigu, Xili Industrial Zone, Xili Road, Nanshan District, Shenzhen, Guangdong, China.

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Test Report

Product	LTE/WCDMA/GSM(GPRS) Multi-Mode Wireless Router
Brand Name:	ZTE
Trade Name:	ZTE
Applicant:	ZTE Corporation
Applicant Address:	ZTE Plaza, Keji Road South, Shenzhen, China.
Manufacturer	ZTE Corporation
Manufacturer Address:	ZTE Plaza, Keji Road South, Shenzhen, China.
Test Standards:	47 CFR FCC Part 2: Frequency Allocations and Radio Treaty
	Matters; General Rules and Regulations
	47 CFR FCC Part 2/22/24/27
Test Result:	PASS
Test Result: Tested by:	
	Pakin Luo
Tested by:	Robin Luo 2019.09.24
Tested by:	Robin Luo 2019.09.24 Robin Luo, Test Engineer
Tested by:	Robin Luo 2019.09.24 Robin Luo, Test Engineer Chris Yon 2019.09.24
Tested by:	Robin Luo 2019.09.24 Robin Luo, Test Engineer Chris You, Senior Engineer Shuangwan thang
Tested by:	$\frac{2019.09.24}{\text{Robin Luo, Test Engineer}}$ $\frac{2019.09.24}{2019.09.24}$ Chris You, Senior Engineer $\frac{5 \text{huangwan haveg}}{2019.09.24}$
Tested by:	$\frac{2019.09.24}{\text{Robin Luo, Test Engineer}}$ $\frac{2019.09.24}{2019.09.24}$ Chris You, Senior Engineer $\frac{5 \text{huangwan haveg}}{2019.09.24}$



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	(Change History	
Issue	Date	Reason for change	
1.0	2019.09.24	First edition	



1. GENERAL INFORMATION

1.1 EUT Description

EUT Type	LTE/WCDMA/GSM (GPRS) Multi-Mode Wireless Router
EUT supports Radios application	GPRS/EDGE/WCDMA/HSPA
Multi Slot Class	GPRS: Multi slot Class12, EGPRS: Multi slot Class12
	GSM 850MHz:
	Tx: 824.2 - 848.8MHz (at intervals of 200kHz);
	Rx: 869.2 - 893.8MHz (at intervals of 200kHz)
	GSM 1900MHz:
	Tx: 1850.2 - 1909.8MHz (at intervals of 200kHz);
	Rx: 1930.2 - 1989.8MHz (at intervals of 200kHz)
	WCDMA 850MHz
Frequency Range	Tx: 826.4 - 846.6MHz (at intervals of 200kHz);
	Rx: 871.4 - 891.6MHz (at intervals of 200kHz)
	WCDMA 1700MHz
	Tx: 1712.4 - 1752.6MHz (at intervals of 200kHz);
	Rx: 2112.4 - 2152.6MHz (at intervals of 200kHz)
	WCDMA 1900MHz
	Tx: 1852.4 - 1907.6MHz (at intervals of 200kHz);
	Rx: 1932.4 - 1987.6MHz (at intervals of 200kHz)
	GSM 850: 31.9dBm
	GSM 1900: 29.2dBm
Maximum Output Power to	EDGE 850: 25.5dBm
Antenna	EDGE 1900: 24.7dBm
Antenna	WCDMA 850: 22.62dBm
	WCDMA 1700:21.98dBm
	WCDMA 1900: 22.28dBm
	GSM / GPRS:GMSK
	EDGE:GMSK / 8PSK
Type of Modulation	WCDMA: QPSK(Uplink)
	HSDPA:QPSK(Downlink)
	HSUPA:QPSK(Uplink)
Antenna Type	Internal Antenna
	GSM 850/ WCDMA 850: 0.5dBi
Antenna Gain	GSM 1900/ WCDMA 1900: 1.5dBi
	WCDMA 1700:1.5dBi



1.2 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission

Designator

System	Type of Modulation	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP/EIRP(W)
GPRS 850	GMSK	250KGXW	0.0046	1.271
GPRS 1900	GMSK	243KGXW	0.0037	0.748
EDGE 850	8PSK	236KG7W	0.0065	0.335
EDGE 1900	8PSK	241KG7W	0.0039	0.258
WCDMA 850 RMC 12.2Kbps	QPSK	4M18F9W	0.0042	0.167
WCDMA 1900 RMC 12.2Kbps	QPSK	4M18F9W	0.0056	0.173
WCDMA 1700 RMC 12.2Kbps	QPSK	4M18F9W	0.0034	0.139



1.3 Test Standards and Results

1. 47 CFR Part 2, 22(H), 24(E), 27(L)

2. ANSI / TIA / EIA-603-D-2010

3. FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01

Remark:

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

2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

Test detailed items/section required by FCC rules and results are as below:

No.	Section FCC	Description	Limit	Result	
1	2.1046	Conducted Output Power	Reporting Only	PASS	
2	24.232(d) 27.50(d)	Peak to Average Radio	<13dBm	PASS	
3	2.1049 22.917(b) 24.238(b) 27.53(g)	Occupied Bandwidth	Reporting Only	PASS	
4	2.1055 22.355 24.235 27.54	Frequency Stability	$\leq \pm 2.5$ ppm	PASS	
5	2.1051 22.917 24.238 27.53	Conducted Out of Band Emissions	< 43+10log10 (P[Watts])	PASS	
6	2.1051 22.917 24.238 27.53	Band Edge	< 43+10log10 (P[Watts])	PASS	
	22.913	Effective Radiated Power	<7Watts	PASS	
7	24.232	Equivalent Isotropic Radiated Power	<2Watts	PASS	
	27.50(d)	Effective Radiated Power	<1Watts	PASS	



8	2.1053 22.917 24.238 27.53	Radiated Spurious Emissions	< 43+10log10 (P[Watts])	PASS
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1.4 Test Configuration of Equipment under Test

Antenna port conducted and radiated test items were performed according to KDB 971168

D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

- 1. 30 MHz to 9000 MHz for GSM850 and WCDMA Band V.
- 2. 30 MHz to 20000 MHz for GSM1900 and WCDMA Band II.

3. 30 MHz to 18000 MHz for WCDMA Band IV.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes						
Band	Radiated TCs	Conducted TCs				
GSM 850	GPRS Link	GPRS Link				
GSW 850	GPRS Link	GPRS Link				
CCN / 1000	GPRS Link	GPRS Link				
GSM 1900	GPRS Link	GPRS Link				
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link				
WCDMA Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link				
WCDMA Band IV	RMC 12.2Kbps Link	RMC 12.2Kbps Link				

Note: The maximum power levels are chosen to test as the worst case configuration as follows: GSM mode for GMSK modulation,

EDGE multi-slot class 8 mode for 8PSK modulation,

RMC 12.2Kbps mode for WCDMA band V,

RMC 12.2Kbps mode for WCDMA band II, only these modes were used for all tests.

RMC 12.2Kbps mode for WCDMA band IV, only these modes were used for all tests.



1.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6B and 10dB attenuator.

Example:

Offset (dB) = RF cable loss(dB) + attenuator factor(dB).

= 7.5 + 10 = 17.5(dB)

1.6 Facilities and Accreditations

1.6.1 Test Facilities

NVLAP Lab Code: 201008-0

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

FCC- Designation Number: CN5031

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2019.

ISED Registration: 11185A-1

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Aug. 03, 2019

1.6.2 Test Environment Conditions

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

Temperature (°C):	15°C-35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa



2. 47 CFR PART 2, PART 22H & 24E 27L REQUIREMENTS

2.1 Conducted RF Output Power

2.1.1 Definition

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

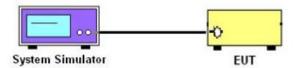
2.1.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.1.3 Test Procedures

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

2.1.4 Test Setup







2.1.5 Test Results of Conducted Output Power

1. Test Verdict:

Band	Channel	Frequency (MHz)	Measured Output Power dBm	Verdict
CDDS	128	824.2	31.70	PASS
GPRS 850MHz	190	836.6	31.90	PASS
830IVITIZ	251	848.8	31.02	PASS
GPRS	512	1850.2	29.00	PASS
1900MHz	661	1880.0	28.70	PASS
1900MHZ	810	1909.8	29.20	PASS
EDCE	128	824.2	25.00	PASS
EDGE 850MHz	190	836.6	25.30	PASS
830IVITZ	251	848.8	25.50	PASS
EDCE	512	1850.2	24.20	PASS
EDGE 1900MHz	661	1880.0	24.70	PASS
1900101112	810	1909.8	24.30	PASS

Note 1: For the GPRS model, all the slots were tested and just the worst data was record in this report.



2. WCDMA Model Test Verdict:

	band	WC	WCDMA 850			WCDMA 1900			WCDMA1700		
Item	Frequency	4132	4183	4233	9262	9400	9538	1313	1413	1513	
	Subtest		dBm			dBm			dBm		
WCDMA	RMC 12.2Kbps	22.55	22.62	22.46	22.28	22.08	21.99	21.44	21.98	21.31	
	1	22.32	22.23	22.24	22.12	22.31	22.32	21.24	21.43	21.45	
HSDPA	2	21.75	21.69	21.87	21.78	21.67	21.24	21.15	21.36	21.25	
	3	21.23	21.20	21.22	21.32	21.32	21.11	21.12	21.21	21.06	
	4	21.14	21.18	21.13	21.29	21.29	21.04	21.10	21.08	21.00	
	1	22.42	22.53	22.45	22.27	22.13	21.85	21.74	21.56	21.32	
	2	21.89	21.75	21.88	21.97	21.89	21.69	21.25	21.15	21.16	
HSUPA	3	21.52	21.53	21.47	21.62	21.35	21.32	21.17	21.16	21.13	
	4	21.23	21.24	21.28	21.27	21.24	21.19	20.85	20.85	20.87	
	5	21.21	21.20	21.23	21.13	21.08	21.10	20.66	20.65	20.49	



2.2 Peak to Average Radio

2.2.1 Definition

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

2.2.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.7.1.

2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.

3. For GSM/EGPRS operating modes:

a. Set EUT in maximum power output.

b. Set the RBW = 1MHz, VBW = 3MHz, Peak detector on spectrum analyzer for first trace.

c. Set the RBW = 1MHz, VBW = 3MHz, RMS detector on spectrum analyzer for second

trace.

d. The wanted burst signal is triggered by spectrum analyzer, and measured respectively the peak level and Mean level without burst-off time, after system simulator has synchronized with the spectrum analyzer.

4. For UMTS operating modes:

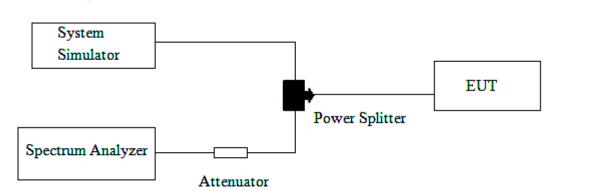
a. Set the CCDF (Complementary Cumulative Distribution Function) option on the spectrum analyzer.

b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

5. Record the deviation as Peak to Average Ratio.



2.2.4 Test Setup



2.2.5 Test Results of Peak-to-Average Ratio

Dend	Channal	Frequency	Peak to Average radio	Limit	Mandiat
Band	Channel	(MHz)	dB	dB	Verdict
CDDS	512	1850.2	0.3		PASS
GPRS	661	1880.0	0.8	13	PASS
1900MHz	810	1909.8	0.2		PASS
EDGE	512	1850.2	3.9		PASS
_	661	1880.0	3.9	13	PASS
1900MHz	810	1909.8	3.8		PASS
	9262	1852.4	3.31		PASS
WCDMA	9400	1880.0	3.23	13	PASS
1900MHz	9538	1907.6	3.15		PASS
	1312	1712.4	3.14		PASS
WCDMA	1412	1732.4	3.15	13	PASS
1700MHz	1513	1752.6	3.27		PASS



2.3 99% Occupied Bandwidth and 26dB Bandwidth Measurement

2.3.1 Definition

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The emission bandwidth is defined as the width of the signal between two points, located at the 2 sides of the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

2.3.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.3.3 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 4.2.

2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.

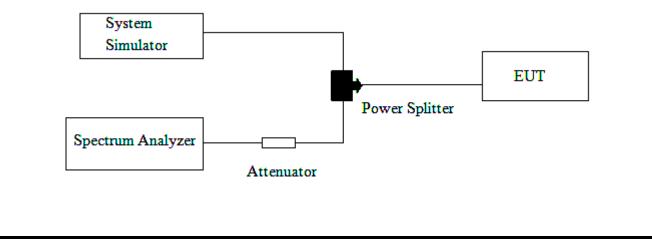
3. The RF output of the EUT was connected to the spectrum analyzer by RF cable and attenuator.

The path loss was compensated to the results for each measurement.

4. The 99% occupied bandwidth were measured, set RBW= 1% of span, VBW= 3*RBW, sample detector, trace maximum hold.

5. The 26dB bandwidth were measured, set RBW= 1% of EBW, VBW= 3*RBW, peak detector, trace maximum hold.

2.3.4 Test Setup





Band	Channel	Frequency (MHz)	26dB bandwidth (KHz)	99% Occupied Bandwidth (KHz)	Refer to Plot
	128	824.2	318.5	249.62	Plot A1
GSM 850MHz	190	836.6	312.1	246.11	Plot A2
	251	848.8	314.2	246.17	Plot A3
	512	1850.2	308.6	243.35	Plot B1
GSM 1900MHz	661	1880.0	306.6	239.72	Plot B2
	810	1909.8	306.8	242.83	Plot B3
	128	824.2	309.9	235.5	Plot C1
EDGE 850MHz	190	836.6	309.9	236	Plot C2
	251	848.8	309.5	233.86	Plot C3
	512	1850.2	308.4	238.53	Plot D1
EDGE 1900MHz	661	1880.0	309.4	241.15	Plot D2
	810	1909.8	309.8	240.1	Plot D3
	4132	826.4	4692	4176.8	Plot E1
WCDMA 850MHz	4183	836.6	4693	4166.5	Plot E2
	4233	846.6	4689	41700	Plot E3
	9262	1852.4	4683	4138.8	Plot F1
WCDMA 1900MHz	9400	1880	4681	4176.3	Plot F2
	9538	1907.6	4690	4162.2	Plot F3
	1312	1712.4	4697	4166.9	Plot G1
WCDMA 1700MHz	1412	1732.4	4680	4178	Plot G2
	1513	1752.6	4685	4173.1	Plot G3

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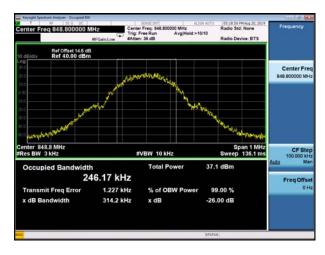
2.3.6 Test Results (Plots) of 99% Occupied Bandwidth and 26dB Bandwidth



(Plot A1: GSM 850MHz Channel = 128 Occupied bandwidth)



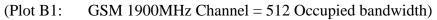
(Plot A2: GSM 850MHz Channel = 190 Occupied bandwidth)

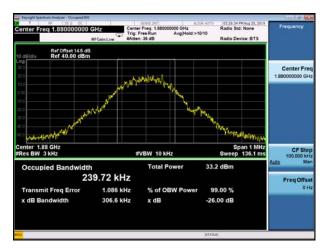


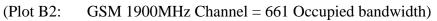
(Plot A3: GSM 850MHz Channel = 251 Occupied bandwidth)

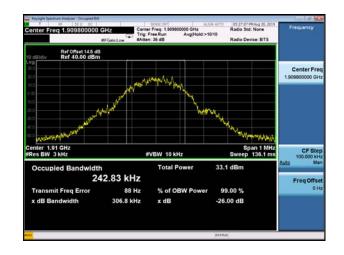


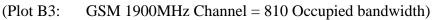






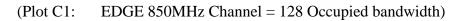




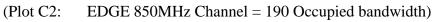


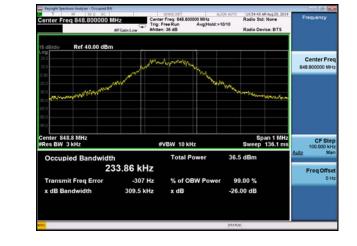


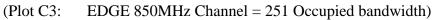
Center Fire Center S24.2 MHz Res BW 3 Mtz Cocupied Bandwidth 235.50 KHz Center S25.50 KHz Center S24.2 MHz Sweep 136.0 dBm Center S24.2 MHz Sweep 136.0 dBm	Transmit x dB Ban	t Freq Erro Idwidth	ſ	673 309.9	3 Hz kHz	% of O x dB	BW Power		00 % 00 dB		UN.
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B dBlaty Ref 40.00 dBm Center Fin B 24 200000 Mi B 24 200000 Mi B 24 20000 Mi B 24 20000 Mi B 24 20000 Mi B 24 20000 Mi	Res BW 3	kHz			#\				Sweep	an 1 MHz 136.1 ms	CF Step 100.000 kH Auto Mar
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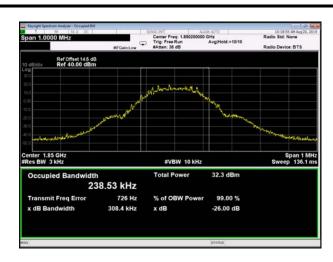


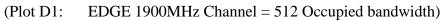




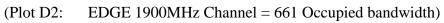


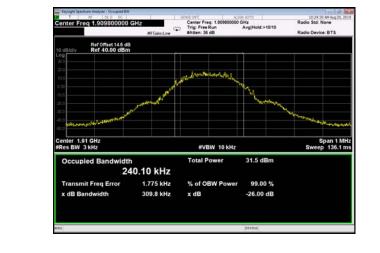








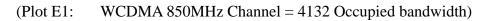


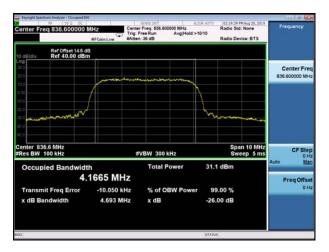


(Plot D3: EDGE 1900MHz Channel = 810 Occupied bandwidth)



Transmit F x dB Bande	req Error	768 MH: 5.514 kH 4.692 MH	z % of Ol	BW Power	99.00 % 26.00 dB		Freq Offse 0 H
Occupied	Bandwidth		Total P	ower 3	0.6 dBm	Ê	luto <u>Ma</u>
Center 826,4 #Res BW 100			#VBW 300	kHz	Span Swee	10 MHz 2p 5 ms	CF Ste
60.0							
and and and a							
20.0	www			4	Annale		
10.0	/						
0.00		1					
20.0		-	Anna the second and Proper	aurena .			826.400000 MH
20. 20 0							Center Fre
10 dB/div	ef Offset 14.5 dB						
		(T)	Trig: Free Run Atten: 36 dB	Avg(Hold>10/10	Radio Devic	: BTS	
Center Fred S	26.400000 M	Hz	Center Freq: 826.400	ALISY AU	Radio Std: 1	None	Frequency





```
(Plot E2: WCDMA 850MHz Channel = 4183 Occupied bandwidth)
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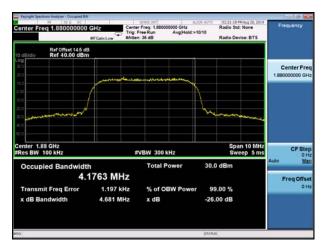


(Plot E3: WCDMA 850MHz Channel = 4233 Occupied bandwidth)

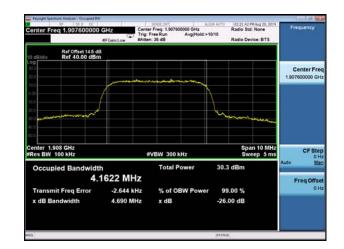


BW 300.00 kHz		SENSE INT ALIS r Freq: 1.852400000 GHz Free Run Avg/Hold > 10	Radio Std: None	119	BW
	#FGain:Low #Atter	n: 32 dB	Radio Device: BTS	Auto	Res BW 100.00 kHs Mar
o dB/div Ref 40.00 dBm					Video BV
20	man			Auto	300.00 kH
0.00	1				
00 01					
00 pour and menula of			Mannan .	-	
enter 1.852 GHz Res BW 100 kHz	#	VBW 300 kHz	Span 10 M Sweep 5 n	Hz ns	Filter Type
Occupied Bandwidti		Total Power	32.7 dBm		Gaussian
	1388 MHz				
Transmit Freq Error	9.842 kHz	% of OBW Power	99.00 %		
x dB Bandwidth	4.683 MHz	x dB	-26.00 dB		





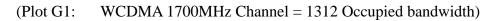


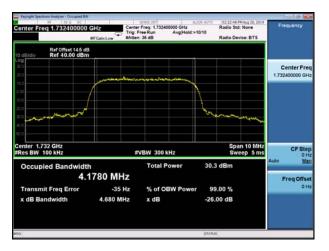


(Plot F3: WCDMA 1900MHz Channel = 9538 Occupied bandwidth)

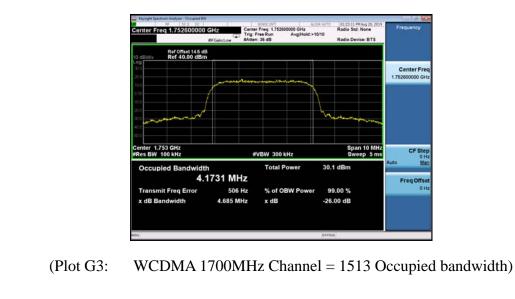


FRes BW 100 kHz #VBW 300 kHz Sweep 5 ms Occupied Bandwidth Total Power 30.5 dBm	Transmit Freq Error x dB Bandwidth	4.1669 M 1.435 4.697	kHz	% of OB x dB	W Power		0.00 % 00 dB		Fi	req Offse 0 H
Center Tr.712 CH/2 Res BW 100 kHz SWEPS 500 KHz SWEPS 500 CF 500				Total Po	ower	30.5	5 dBm		Auto	Ma
			#	VBW 300 k	Hz			ep 5 ms		CF Ste
Trig: Free Run Aug/Holds > 1010 Radio Device: B TS Ref Offset 14.5 dB Ref 40.00 dBm Center Fre Titl: Free Run Aug/Holds > 1010 Radio Device: B TS TITL: Free R	41.0 63.0									
Center Fire Trig: Free Run AvgiHold:>1010 Radio Device: BTS 10 BFGalation B Center Fire 00 Center Fire Center Fire 17.12400000 Gr	200 monormon on	V				5	min	and the second		
Trig: Free Run ArgiHolds-1010 Radio Device: BTS Ref 40.00 dBm Center Fre Trig: See Run Center Fre Trig: Free Run ArgiHolds-1010 Radio Device: BTS Center Fre Trig: See Run Trig		1								
Center Fra	0.00	A				1				
Trig: Free Run Arg/Hold-1010 BFGalt.Low ArgHold-1010 Ref Offset 14.6 v0 Ref 40,00 dBm Center Fn Center Fn		James and the second	and marries	mouthtern	m				1.7124	00000 Gi
Trig: Free Run Avg/Hold>1010 BifGainLow Affan: 36 dB Ref Offees 14.6 dB Ref 40.00 dBm	30.0									
Trig: Free Run Avg/Hold>10/10	to dB/div Ref 40.00 d	S dB Bm								
	center Freq 1,7124000		Trig: F	ree Run		10/10				





⁽Plot G2: WCDMA 1700MHz Channel = 1412 Occupied bandwidth)





2.4 Frequency Stability

2.4.1 Requirement

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

2.4.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3 Test Procedures for Temperature Variation

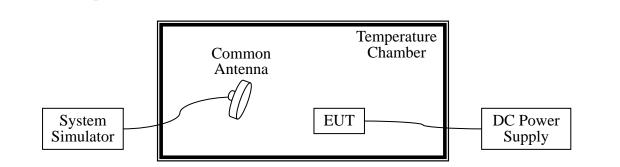
- 1. The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.
- 2. The EUT was set up in the thermal chamber and connected with the system simulator.
- 3. With power OFF, the temperature was decreased to -30°C and the EUT was stabilized before testing. Power was applied and the maximum change in frequency was recorded within one minute.
- 4. With power OFF, the temperature was raised in 10°C steps up to 50°C. The EUT was stabilized at each step for at least half an hour. Power was applied and the maximum frequency change was recorded within one minute.

2.4.4 Test Procedures for Voltage Variation

- 1. The testing follows FCC KDB 971168 D01 v03r01 Section 9.0.
- 2. The EUT was placed in a temperature chamber at 25±5° C and connected with the system simulator.
- 3. The power supply voltage to the EUT was varied from BEP to 115% of the nominal value measured at the input to the EUT.
- 4. The variation in frequency was measured for the worst case.



2.4.5 Test Setup



2.4.6 Test Results of Frequency Stability

GSM 850MHz Band

Band:		GP	RS850	Channel:	190
Limit(ppm):		2.5		Frequency:	836.6MHz
D	T (GPRS	EDGE	
Power (VDC)	Temperatu	ire	Deviation	Deviation	Result
(VDC)	(°C)		(ppm)	(ppm)	
	-30		0.0012	0.0021	
	-20		0.0046	0.0039	
	-10		0.0038	0.0065	
	0		0.0028	0.0012	
24	+10		0.0010	0.0033	
	+20	0.0009		0.0037	PASS
	+30		0.0009	0.0029	
	+40		0.0017	0.0041	
	+50		0.0036	0.0052	
26.4	+25		0.0015	0.0005	
21.6	+25		0.0042	0.0049	



GSM 1900MHz Band

Band:		GP	PRS 1900	Channel:	661
Limit(ppm):		2.5	5	Frequency:	1880.0MHz
Power	Temperatu	ıre	GPRS Deviation	EDGE Deviation	Result
(VDC)	(°C)		(ppm)	(ppm)	Kesut
	-30		0.0025	0.0036	
	-20		0.0032	0.0033	
	-10	0.0031		0.0024	
	0		0.0022	0.0016	
24	+10		0.0019	0.0026	
	+20		0.0024	0.0032	PASS
	+30		0.0037	0.0024	
+40			0.0022	0.0015	
	+50		0.0030	0.0039	
26.4	26.4 +25		0.0032	0.0022	
21.6	+25		0.0027	0.0032	

WCDMA 850MHz Band

Band:	WCDMA Bar	nd V Channel:	4183
Limit(ppm)	2.5	Frequency:	836.6MHz
Power (VDC)	Temperature (°C)	RMC 12.2Kbps Deviation (ppm)	Result
	-30 -20	0.0031 0.0018	
24	-10 0	0.0026	
24	+10 +20 +30	0.0042 0.0035 0.0026	PASS
	+30 +40 +50	0.0020	
26.4	+30	0.0032	
21.6	+25	0.0009	



WCDMA 1900MHz Band Channel: 9400 Band: WCDMA Band II Limit(ppm): 2.5 Frequency: 1880.0MHz RMC 12.2Kbps Temperature Power Deviation Result (VDC) (°C) (ppm) -30 0.0033 -20 0.0027 -10 0.0019 0 0.0029 +1024 0.0027 +200.0009 PASS +300.0012 +400.0056 0.0027 +5026.4 +250.0020 21.6 +250.0019

WCDMA 1700MHz Band

Band:		WCDMA	Band IV	Channel:	1412
Limit(ppm):		2.5		Frequency:	1732.4MHz
Power (VDC)	1		-	IC 12.2Kbps Deviation (ppm)	Result
		-30 -20 -10		0.0032 0.0018 0.0025	
24		0 +10		0.0019 0.0014	
	+20 +30			0.0009 0.0012	 PASS
26.4		+40 +50 +25		0.0034 0.0009 0.0012	
21.6		+25		0.0029	



2.5 Conducted Out of Band Emissions

2.5.1 Requirement

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

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

2.5.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

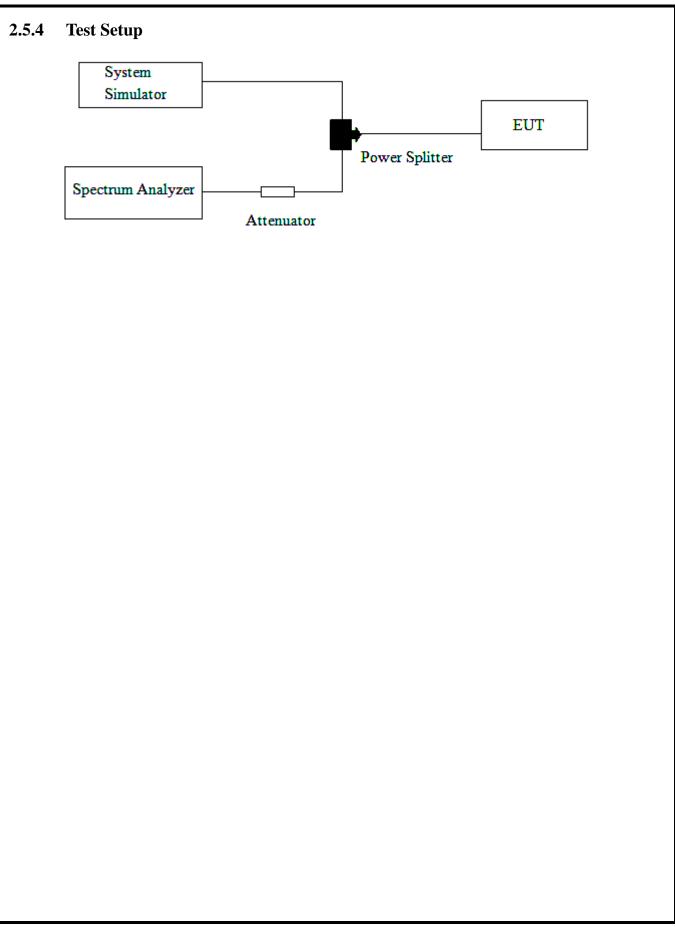
2.5.3 Test Procedures

- 1. The testing follows FCC KDB 971168 D01 v03r01 Section 6.0.
- 2. The EUT was connected to the spectrum analyzer and system simulator via a power divider.
- 3. The RF output of EUT was connected to the spectrum analyzer by an RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 4. The middle channel for the highest RF power within the transmitting frequency was measured.
- 5. The conducted spurious emission for the whole frequency range was taken.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
- 7. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

= P(W) - [43 + 10log(P)] (dB)

- = [30 + 10log(P)] (dBm) [43 + 10log(P)] (dB)
- = -13dBm.
- 8. For 9KHz to 30MHz: the amplitude of spurious emissions are attenuated by more than 20dB below the permissible value has no need to be reported.

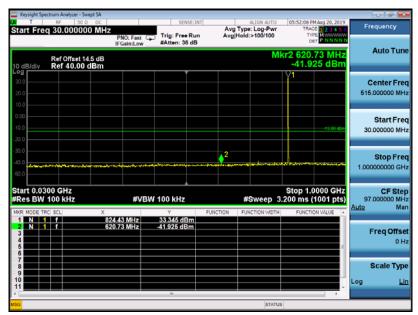


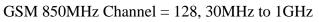




2.5.5 Test Result (Plots) of Conducted Spurious Emission

Note: For 9 KHz to 30MHz: the amplitude of spurious emissions is attenuated by more than 20dB below the permissible value, so we didn't provide the test result here.







GSM 850MHz Channel = 128, 1GHz to 9GHz



RF 50 Q DC 30.000000 M	PNO: Fast C	Trig: Free Run	Avg	ALIGN AUTO Type: Log-Pwr Hold:>100/100	TRACI	123456	Freque	ency
		WAILEN. OU UD		M			Au	o Tun
					∲1			erFre 000 M⊢
								art Fre 000 MF
	L 1/10-11-1	and the second second		2		مول مما بال الله 4		op Fre
	#VB	W 100 kHz		#Sweep 3	Stop 1.0 200 ms (1	001 pts)	97.000	
1	837.04 MHz 695.42 MHz	¥ 33.200 dBm -42.227 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	_	Ma Offs 0 H
								le Typ
	1 30.000000 MK Ref Offset 14.5 dB Ref 40.00 dBm	30.000000 MHz PNC: Fast C IFGainLow Ref Offset 14.5 dB Ref 40.00 dBm 00 GHz 100 KHz #VB 1 SCL X 1 SSL X 1 SSL 0 MHz	30.000000 MHz Trig: Free Run I'GainLow Trig: Free Run Ref Offset 14.5 dB #Atten: 36 dB Ref Offset 14.5 dB I'GainLow Ref 40.00 dBm I'GainLow 00 GHz I'GainLow 100 GHz #VBW 100 kHz SCL X Y I'GainLow Y	30.000000 MHz PNC: Fast Control of the state of the stat	30.000000 MHz PN0: Fast Trig: Free Run Avg Type: Log-Pwr I'GainLow Trig: Free Run Avg Hold>100/100 Ref Offset 14.5 dB MI Ref 40.00 dBm MI I'GainLow I'GainLow OG GHz I'GainLow I'G HTz #VBW 100 kHz I'GainLow Y Public State I'GainLow	30.000000 MHz Trig: Free Run If GainLow Trig: Free Run #Atten: 36 dB Avg Type: Log-Pwr Avg Hold>100100 Trig: Free Run by Type: Log-Pwr Avg Hold>100100 Trig: Free Run by Type: Log-Pwr Avg Hold>100100 Trig: Free Run by Type: Log-Pwr Type: Log-Pwr Avg Hold>100100 Trig: Free Run by Type: Log-Pwr Type: Log-Pwr Avg Hold>100100 Trig: Free Run by Type: Log-Pwr Type:	30.000000 MHz PRO: Fast IFGainLow Trig: Free Run #Atten: 36 dB Avg/Hold:>100/100 Trig: 23 & 56 Avg/Hold:>100/100 Ref Offset 14.5 dB Ref 40.00 dBm MKr2 695.42 MHz -42.227 dBm MKr2 695.42 MHz -42.227 dBm 00 GHz 100 KHz #VBW 100 kHz #Sweep 3.200 ms (1001 pts) 15 SCL X Y 1 -42.227 dBm 1 -42.227 dBm	30.000000 MHz Trig: Free Run If Gain:Low Trig: Free Run #Atten: 36 dB Avg Type: Log-Pwr Avg[Hold::100/100 TriAcc press of the press of

GSM 850MHz Channel = 190, 30MHz to 1GHz



GSM 850MHz Channel = 190, 1GHz to 9GHz



Frequency	Aug 20, 2019	05:51:17 PM	ALIGN AUTO		SENSE:IN		50 Q DC		T	XI	
requency	E 1 2 3 4 5 6 E M	TYP	Type: Log-Pwr Hold:>100/100	Avg	Trig: Free Run #Atten: 36 dB	PNO: Fast G	000 MHz	30.000	t Fre	Star	
Auto Tu	52 MHz 37 dBm		Mk					Ref Offset 14.5 dB			
Center Fr 515.000000 M		Ŷ1								30.0 20.0	
Start Fr 30.000000 Mi										0.00 -10.0 -20.0	
Stop Fr 1.000000000 G	*****		¢2	fer 4.1,ut gjerendeljur	ويسوعفوه ومهوال مروم			****	at-1-1,000	-30.0 -40.0 -50.0	
CF Ste 97.000000 M		Stop 1.0 200 ms (*	#Sweep 3.		100 kHz	#VB\		00 GHz 100 kHz			
<u>Auto</u> M	N VALUE	FUNCTIO	FUNCTION WIDTH	FUNCTION	۲ 33.241 dBm	9.65 MHz	×	C SCL	MODE TR	MKR 1	
Freq Offs 01	=				-41.387 dBm	4.52 MHz			N 1	2 3 4 5 6	
Scale Ty										7 8 9	
Log <u>L</u>	-									10 11	
			STATUS							180	

GSM 850MHz Channel = 251, 30MHz to 1GHz

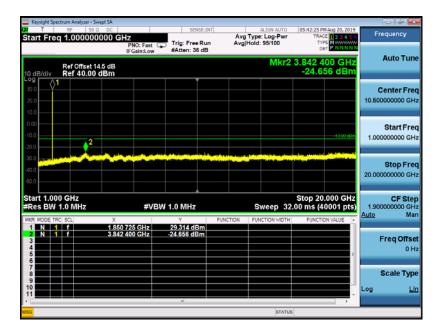


GSM 850MHz Channel = 251, 1GHz to 9GHz



T	ectrum Analyzer - Swept SA RF 50 Ω DC		SEN	ISE:INT		ALIGN AUTO		MAUg 20, 2019 2 1 2 3 4 5 6		quency
start Fre	q 30.000000 MHz	PNO: Fast G	Trig: Free #Atten: 36		Avg Hold:	>100/100	TYP			
10 dB/div	Ref Offset 14.5 dB Ref 40.00 dBm					M		74 MHz 26 dBm	ľ í	Auto Tun
30.0										enter Fre DOODOO MH
10.0										Start Fre
•10.0								-13.00 dBn		Stop Fre
-20.0									97.0 <u>Auto</u>	CF Ste 000000 M⊢ Ma
	Helannstaten Jasunt ann speak	on gason control or	gradiange	البامهورميروال	sienen heter	لوجانبهم	1 actainment		F	req Offse 0 H
-50.0									s	cale Typ
Start 0.03 #Res BW	300 GHz 100 kHz	#VBW	/ 100 kHz			Sween 3	Stop 1.0	0000 GHz 1001 pts)	Log	Ц

GSM 1900MHz Channel = 512, 30MHz to 1GHz

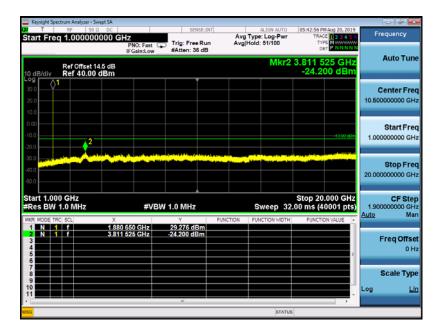


GSM 1900MHz Channel = 512, 1GHz to 20GHz



Т	pectrum Analyzer - Swept SA RF 50 Q DC 2Q 30.000000 MHz	PNO: Fast	SENSE: Trig: Free R	Avg	ALIGN AUTO Type: Log-Pwr Hold:>100/100	05:40:33 PM Aug 20, 2019 TRACE 1 2 3 4 5 6 TYPE M	Freque	
10 dB/div	Ref Offset 14.5 dB	IFGain:Low	#Atten: 36 d			kr1 755.56 MHz -40.155 dBm	Aut	o Tun
30.0							Cent 515.000	erFre 000 M⊦
10.0							Sta 30.0000	nt Fre
10.00						-13.00 dBm	Sto 1.000000	op Fr 000 Gi
20.0							97.0000 Auto	F Ste
40.0	nalistan tai-hathardistrin	abyer and the provides	Mc ^{an} aismosteriky	Autodinational	م) معلولية محيولية المراجع	u	Freq	Offs 0 F
50.0								le Typ
	300 GHz / 100 kHz	#VBW	100 kHz		Sweep 3	Stop 1.0000 GHz 3.200 ms (1001 pts)		-

GSM 1900MHz Channel = 661, 30MHz to 1GHz

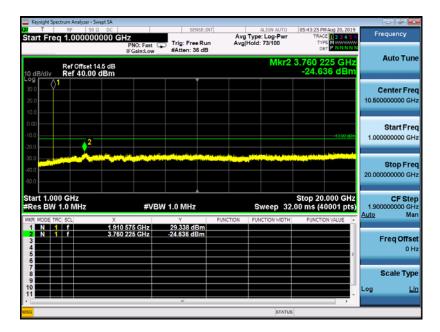


GSM 1900MHz Channel = 661, 1GHz to 20GHz



T	ectrum Analyzer - Swept SA RF 50 Q DC eq 30.000000 MHz	PNO: Fast	SENSE:INT	Avg Type Avg Hold:	LIGN AUTO	05:40:44 PM Aug 20, 2019 TRACE 1 2 3 4 5 6 TYPE M	Frequency
10 dB/div	Ref Offset 14.5 dB Ref 40.00 dBm	IFGain:Low	#Atten: 36 dB			cr1 897.18 MHz -39.750 dBm	Auto Ti
30.0							Center F 515.000000 1
20.0							Start F 30.000000 1
0.00						-13.00 dBm	Stop F 1.000000000
20.0							CF S 97.000000 r Auto
-40.0	and the states of the states o	ten pranto standa	Howayalan	แป่นรังคว ามสถ าปส	n startforder	1 Martin Wooddaladhadaraa	Freq Off (
-50.0							Scale T
Start 0.03 #Res BW		#VBW	100 kHz		Sweep 3	Stop 1.0000 GHz 200 ms (1001 pts)	Log

GSM 1900MHz Channel = 810, 30MHz to 1GHz



GSM 1900MHz Channel = 810, 1GHz to 20GHz



T	ctrum Analyzer - Swept SA RF 50 Ω DC Q 30.000000 MH:	PNO: Fast C IFGain:Low	Trig: Free Ru #Atten: 36 dB	n	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	TRA	M Aug 20, 2019 25 1 2 3 4 5 6 PE M W NNNNN ET P NNNNN	Fre	quency
10 dB/div	Ref Offset 14.5 dB Ref 40.00 dBm				М		23 MHz 28 dBm		Auto Tun
30.0 20.0								-	enter Fre
0.00							-10.00 dDn		Start Fre
-30.0 -40.0 -50.0	whether Marent Maren and Barthar and	and the second secon		2	a a construction of the state o	and a common			Stop Fre
Start 0.03 #Res BW		#VB	↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓		#Sweep 3	Stop 1.0 2.00 ms (0000 GHz 1001 pts)		CF Ste
MKR MODE TR 1 N 1 2 N 1 3 4 5 6	1 8	24.43 MHz 72.23 MHz	Y 32.569 dBm -40.228 dBm	FUNCTI	DN FUNCTION WIDTH	FUNCT)	ON VALUE	<u>Auto</u> F	Mi req Offs 0 I
7 8 9								S Log	cale Typ
11			11				-	Log	L

EDGE 850MHz Channel = 128, 30MHz to 1GHz



EDGE 850MHz Channel = 128, 1GHz to 9GHz



T	trum Analyzer - Swept SA RF 50 Ω DC 30.000000 M		Trig: Free Run #Atten: 36 dB	Avg	ALIGN AUTO Type: Log-Pwr Hold:>100/100	TYPE	Aug 20, 2019 1 2 3 4 5 6 M P N N N N N		Jency
0 dB/div	Ref Offset 14.5 dE Ref 40.00 dBm				M	kr2 596.4 -42.94	l8 MHz 8 dBm	Au	uto Tun
30.0 20.0 10.0						1 			nter Fre 0000 MF
0.00									tart Fre
30.0 40.0 50.0	per an	المرمورية وروايين وحريروهان	ala la como como poda,	2	ad an a disposition of the second	and mentioned		S 1.00000	top Fr 0000 GI
tart 0.030 Res BW 1		#VB	W 100 kHz		#Sweep 3	Stop 1.00 2.00 ms (1	001 pts)	97.00	CF St 0000 M
N 1 2 N 1 3 4 5 6 6 6	1	837.04 MHz 596.48 MHz	Y 28.691 dBm -42.948 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE A	<u>Auto</u> Fre	M e q Offs 0 I
7 8 9								Sc	ale Ty
10							-	Log	L

EDGE 850MHz Channel = 190, 30MHz to 1GHz



EDGE 850MHz Channel = 190, 1GHz to 9GHz



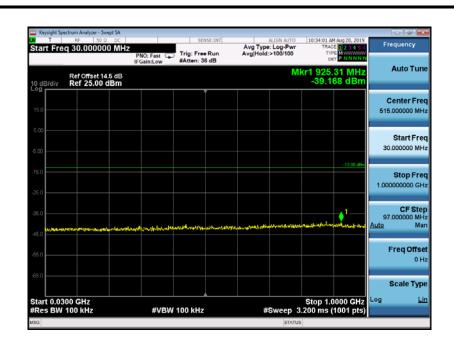
T	um Analyzer - Swep RF 50 Ω 30.000000	DC	Trig: Free Ru #Atten: 36 dB	Avg in Avg	ALIGN AUTO g Type: Log-Pwr Hold:>100/100	TRACI	Aug 20, 2019	Frequer	_
0 dB/div	Ref Offset 14. Ref 40.00 d				M	kr2 530. -43.65	52 MHz 50 dBm	Auto	Tun
- 0 g 30.0 20.0						01		Cente 515.0000	
0.00								Star 30.0000	
30.0 -40.0 50.0	*****************	mystrad a Constraint of State of State of State			าปรูป-เหลือสามารถการให้		Ageren de segles	Stoj 1.0000000	
Start 0.030 Res BW 1		#VE	W 100 kHz		#Sweep 3	Stop 1.0 2.00 ms (1	000 GHz 1001 pts)	CI 97.0000 Auto	F Ste DO MI
MKR MODE TRC 1 N 1 2 N 1 3 4 5 6	1	X 848.68 MHz 530.52 MHz	Y 29.197 dBm -43.650 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	Freq	
7 2 2 8 9 2 2 10 2 2								Scale	е Тур Ц

EDGE 850MHz Channel = 251, 30MHz to 1GHz

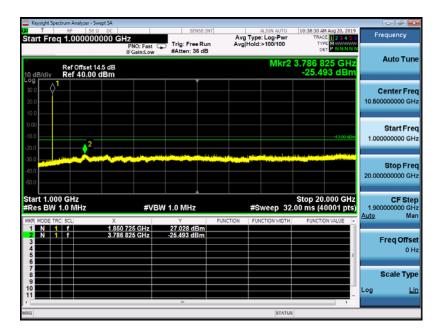


EDGE 850MHz Channel = 251, 1GHz to 9GHz



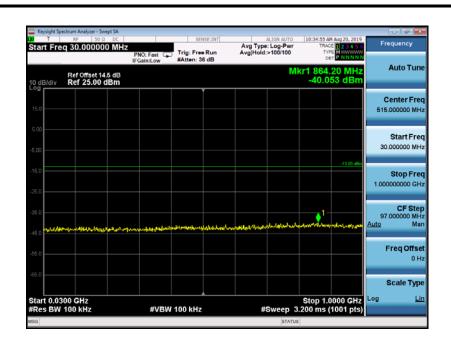


EDGE 1900MHz Channel = 512, 30MHz to 1GHz

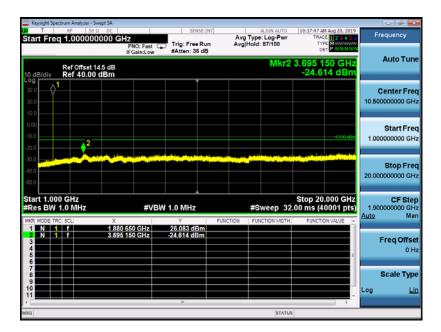


EDGE 1900MHz Channel = 512, 1GHz to 20GHz



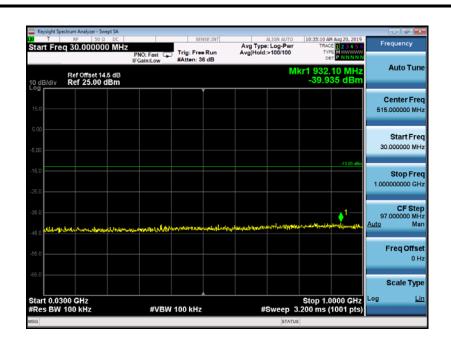


EDGE 1900MHz Channel = 661, 30MHz to 1GHz



EDGE 1900MHz Channel = 661, 1GHz to 20GHz





EDGE 1900MHz Channel = 810, 30MHz to 1GHz

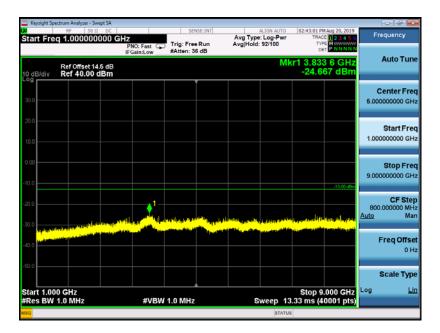


EDGE 1900MHz Channel = 810, 1GHz to 20GHz



XI I	RF 50 87 87	DC D	SENSE:IN	Ave	ALIGN AUTO Type: Log-Pwr Hold:>100/100	TRACE	Aug 20, 2019	Frequ	ency
10 dB/div	Ref Offset 1 Ref 40.00		#Atten: 36 dB		М	kr2 880.0		Au	ito Tun
30.0 20.0						¢¹			ter Fre 0000 M⊢
-10.0							-10.00 dDn		art Fre
-30.0	4. A. Marine	n. 1 _{0-a} llage and 114-all allage and	Lan Statement and Add	(na)-se arianes	and and a state of the state of		***	St 1.000000	op Fre
Start 0.03 #Res BW	300 GHz 100 kHz	#VI	BW 100 kHz		Sweep 3	Stop 1.0 .200 ms (1	000 GHz 1001 pts)	97.000	CF Ste
MKR MODE T	RC SCL	× 825.40 MHz	Y 19.472 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u>	M
2 N 3 4 5	1 f	880.69 MHz	-40.612 dBm				=	Fre	q Offs 0 I
7 8 9								Sca	ale Typ
10								Log	L
80					STATU	5			-

WCDMA850MHz Channel = 4132, 30MHz to 1GHz

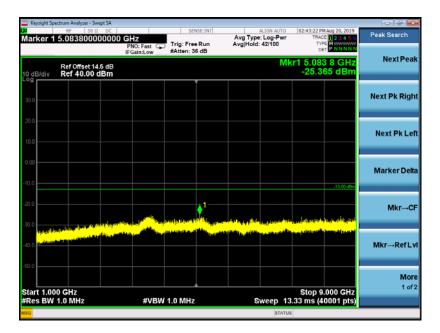


WCDMA850MHz Channel = 4132, 1GHz to 9GHz



2	RF 50 Ω 8 9 30.00000	DC	Trig: Free Run #Atten: 36 dB	Avg n Avg	ALIGN AUTO Type: Log-Pwr Hold:>100/100	02:46:12 PM Aug 20 TRACE 1 2 3 TYPE M	456 Frequency
10 dB/div	Ref Offset 14 Ref 40.00	1.5 dB	MALEN. OF GD		M	kr2 902.03 N -41.133 d	
30.0 20.0						⊘ ¹	Center Fre 515.000000 MH
-10.0						-10.0	Start Fre
-30.0	a.,1/11.48~	den gaar oo waa da waa da da waa		an may kan a share da a	a santa parte de destados	2	Stop Fre
	300 GHz / 100 kHz	#VE	BW 100 kHz		Sweep 3	Stop 1.0000 (200 ms (1001	GHz CF Ste pts) 97.000000 Mi Auto Mi
MKR MODE T 1 N 2 N 3 4 5 6	1 1	X 836.07 MHz 902.03 MHz	Y 20.438 dBm -41.133 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offs
7 8 9							Scale Typ

WCDMA850MHz Channel = 4183, 30MHz to 1GHz

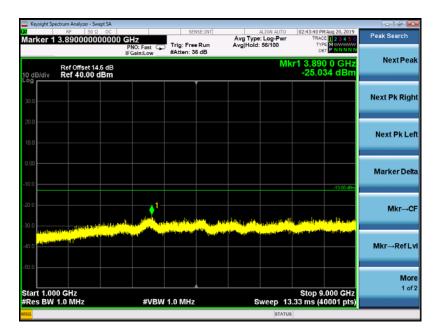


WCDMA850MHz Channel = 4183, 1GHz to 9GHz



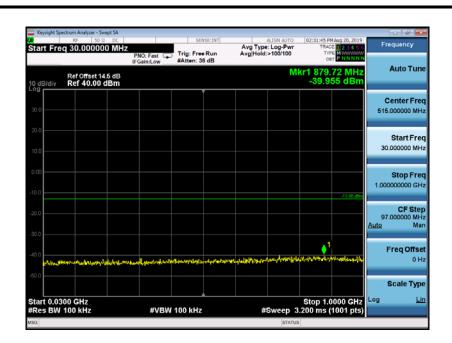
N I	ctrum Analyzer - Swe RF 50 Ω q 30.000000	DC		Avs	ALIGN AUTO 3 Type: Log-Pwr Hold:>100/100	TRA	PM Aug 20, 2019 4CE 1 2 3 4 5 6 YPE M	_	quency
10 dB/div	Ref Offset 14. Ref 40.00 d	5 dB	WARKIN OF US		M		.04 MHz 705 dBm		Auto Tur
30.0 20.0 10.0						¢'			enter Fre
-10.0							-10.00 dDn	30.	Start Fre
-40.0 -60.0	egenden staten teles en	1	n	و المرد الم المرسود		Λ_	2	1.000	Stop Fre
Start 0.03 #Res BW		#V	BW 100 kHz		Sweep 3	Stop 1. 200 ms	.0000 GHz (1001 pts)	97. Auto	CF Ste 000000 Mi
	IC SCL	× 847.71 MHz 934.04 MHz	Y 18.377 dBm -41.705 dBm	FUNCTION	FUNCTION WIDTH	FUNCT	TION VALUE		Freq Offs 0 I
7 8 9									Scale Tyj
								tog	Scale T

WCDMA850MHz Channel = 4233, 30MHz to 1GHz

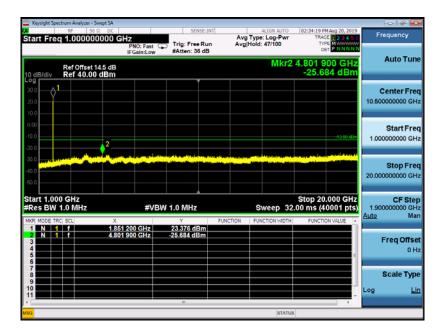


WCDMA850MHz Channel = 4233, 1GHz to 9GHz



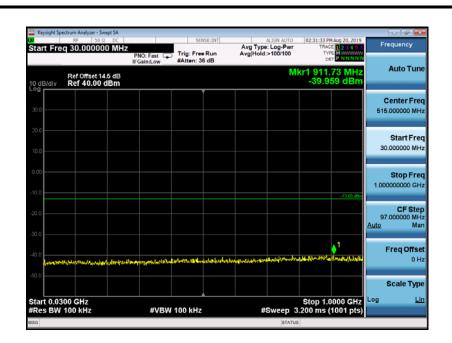


WCDMA1900MHz Channel = 9262, 30MHz to 1GHz

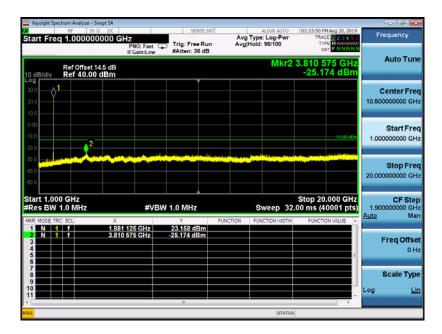


WCDMA1900MHz Channel = 9262, 1GHz to 20GHz



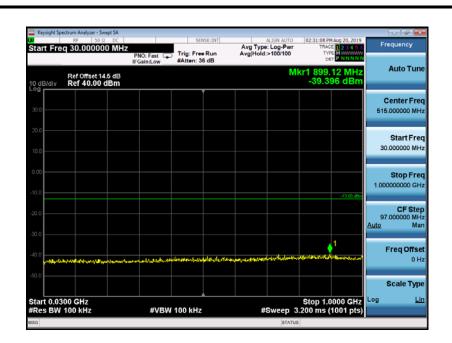


WCDMA1900MHz Channel = 9400, 30MHz to 1GHz

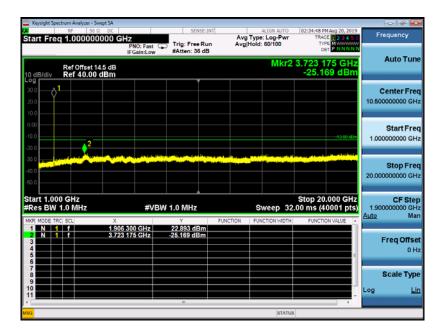


WCDMA1900MHz Channel = 9400, 1GHz to 20GHz



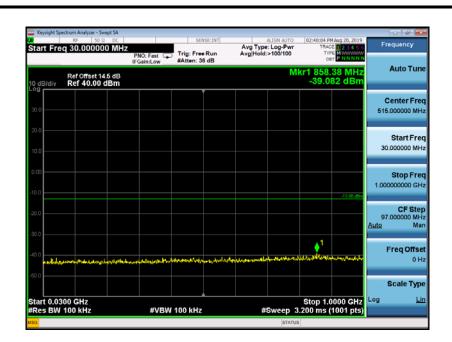


WCDMA1900MHz Channel = 9538, 30MHz to 1GHz

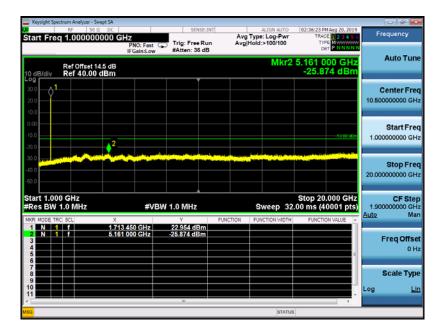


WCDMA1900MHz Channel = 9538 1GHz to 20GHz





WCDMA1700MHz Channel = 1312, 30MHz to 1GHz



WCDMA1700MHz Channel = 1312, 1GHz to 18GHz