



RF TEST REPORT

Report No.: SET2015-08574

Product: EYE1

FCC ID: 2AE44EYE1

Model No.: EYE1

Applicant: Sioeye LLC

Address: 4265 San Felipe #1100 Houston TX 77027 USA

Dates of Testing: 06/02/2015 — 06/19/2015

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District,
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Test Report

Product: EYE1

Brand Name: SIOEYE

Trade Name: SIOEYE

Applicant: Sioeye LLC

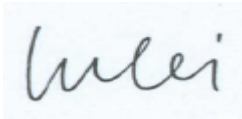
Applicant Address: 4265 San Felipe #1100 Houston TX 77027 USA

Manufacturer: CK Telecom Limited

Manufacturer Address: Technology Road.High-Tech Development Zone.
Heyuan, Guangdong,P.R.China.

Test Standards: 47 CFR Part 2(10-1-12 Edition) Frequency
Allocations and Radio Treaty Matters; General
Rules and Regulations
47 CFR Part 22(10-1-12 Edition) Public Mobile
Services
47 CFR Part 24(10-1-12 Edition) Personal
Communications Services

Test Result: PASS

Tested by: 
2015.06.19
Lu Lei, Test Engineer

Reviewed by: 
2015.06.19
Zhu Qi, Senior Engineer

Approved by: 
2015.06.19
Wu Li'an, Manager



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Change History		
Issue	Date	Reason for change
1.0	2015-06-19	First edition



1. GENERAL INFORMATION

1.1 EUT Description

EUT Type	EYE1
Hardware Version	HICAM-V2.0
Software Version	HICAM01A-S10A_Sioeye_L2EN_140_150618
EUT supports Radios application	WCDMA/HSPA/HSPA+/LTE WLAN2.4GHz 802.11b/g/n (HT20/HT40) Bluetooth v3.0+EDR Bluetooth v4.0 LE
Frequency Range	WCDMA 850MHz Tx: 826.4 - 846.6MHz (at intervals of 200kHz); Rx: 871.4 - 891.6MHz (at intervals of 200kHz) WCDMA 1900MHz Tx: 1852.4 - 1907.6MHz (at intervals of 200kHz); Rx: 1932.4 - 1987.6MHz (at intervals of 200kHz)
Maximum Output Power to Antenna	WCDMA Band II: 22.86dBm WCDMA Band V: 22.84dBm
Modulation Type	QPSK/16QAM
Antenna Type	PIFA Antenna

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

FCC Rule	System	Type of Modulation	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP/EIRP
Part 22	WCDMA Band V RMC 12.2Kbps	QPSK	4M22F9W	0.06	0.302W
Part 24	WCDMA Band II RMC 12.2Kbps	QPSK	4M24F9W	0.03	0.293W

1.3 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 2, Part 22, Part 24 for the EUT FCC ID Certification:

1. 47 CFR Part 2, 22(H), 24(E)
2. ANSI / TIA / EIA-603-C-2004
3. FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

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

No.	Section	Description	Limit	Result
1	2.1046	Conducted RF Output Power	Reporting Only	PASS
2	24.232(d)	Peak to Average Ratio	< 13dBm	PASS
3	2.1049, 22.917(b) 24.238(b)	99% Occupied Bandwidth and 26dB Bandwidth	Reporting Only	PASS
4	2.1055, 22.355 24.235	Frequency Stability	< 2.5ppm	PASS
5	2.1051 22.917(a) 24.238(a)	Conducted Out of Band Emissions	< 43+10log10(P[Watts])	PASS
6	2.1051 22.917(a) 24.238(a)	Band Edge	< 43+10log10(P[Watts])	PASS
7	22.913(a)(2)	Effective Radiated Power	< 7Watts	PASS
	24.232(c)	Equivalent Isotropic Radiated Power	< 2Watts	PASS
8	2.1053 22.917(a) 24.238(a)	Field Strength of Spurious Radiation	< 43+10log10(P[Watts])	PASS

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.

1.4 Test Configuration of Equipment Under Test

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

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

Radiated emissions were investigated as following frequency range:



1. 30 MHz to 9000 MHz for WCDMA Band V.
2. 30 MHz to 20000 MHz for WCDMA Band II.

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
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link
WCDMA Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link

Note: The maximum power levels are chosen to test as the worst case configuration as follows:

RMC 12.2Kbps mode for WCDMA band V,

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

1.5 Facilities and Accreditations

1.5.1 Test Facilities

CNAS-Lab Code: L1659

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.

FCC-Registration No.: 406086

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. Registration 406086, valid time is until October 28, 2017.

IC-Registration No.: 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 July. 15, 2013, valid time is until July. 15, 2016.

1.5.2 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 REQUIREMENTS

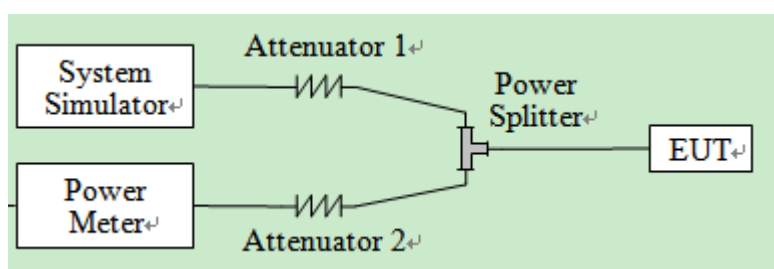
2.1 Conducted RF Output Power

2.1.1 Requirement

According to FCC section 2.1046(a), for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

2.1.2 Test Description

1. Test Setup:



The EUT, which is powered by 3.8V DC power, is coupled to the Power Meter and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
System Simulator	Agilent	E5515C	MY47510547	2014.07.21	2015.07.20
Power Meter	R&S	NRV2	1020.1809.02	2015.06.02	2016.06.02
Power Sensor	R&S	NRV-Z4	823.3618.03	2015.06.02	2016.06.02
Attenuator 1	Resent	10dB	(n.a.)	2015.06.02	2016.06.02
Attenuator 2	Resent	3dB	(n.a.)	2015.06.02	2016.06.02

2.1.3 Test Results

Here the lowest, middle and highest channels are selected to perform testing to verify the conducted RF output power of the EUT.



1. WCDMA Model Test Verdict:

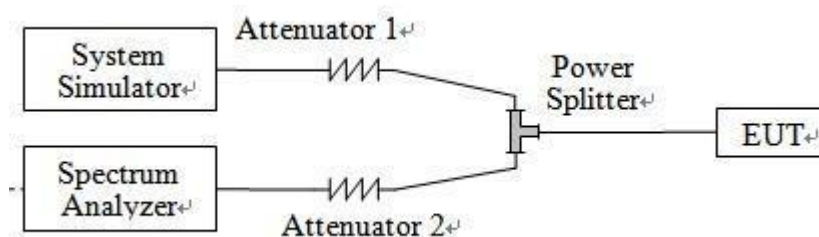
Item	band	WCDMA 850			WCDMA 1900		
	ARFCN	4132	4183	4233	9262	9400	9538
	subtest	dBm			dBm		
WCDMA	non	22.84	22.76	22.61	22.63	22.86	22.79
HSDPA	1	22.41	22.08	22.18	22.18	22.08	22.08
	2	22.19	22.01	22.09	22.07	22.01	22.00
	3	21.68	21.91	21.78	21.85	21.89	21.95
	4	21.79	21.54	21.61	21.77	21.94	21.83
HSUPA	1	22.04	22.07	22.17	22.14	22.07	21.97
	2	21.99	22.14	22.21	22.03	21.89	21.74
	3	21.86	22.09	22.08	22.17	22.01	22.08
	4	22.05	22.04	22.33	21.99	21.51	21.74
	5	22.23	22.16	22.11	22.05	22.25	22.08
HSPA+	1	22.23	22.18	22.25	22.01	22.05	22.07

2.2 Peak to Average Ratio

2.2.1 Definition

According to FCC section 2.1049 and FCC 24.232(d), the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

2.2.2 Test Description



Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
System Simulator	R&S	CMW500	149333	2014.07.21	2015.07.20
Spectrum Analyzer	R&S	FSP40	100341	2014.07.07	2015.07.06
Attenuator 1	Resent	10dB	(n.a.)	2015.06.02	2015.06.02
Attenuator 2	Resent	3dB	(n.a.)	2015.06.02	2015.06.02

2.2.3 Test Verdict

Here the lowest, middle and highest channels are selected to perform testing to verify the peak-to-average ratio.

Test procedures:

A. For GSM/EGPRS operating mode:

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

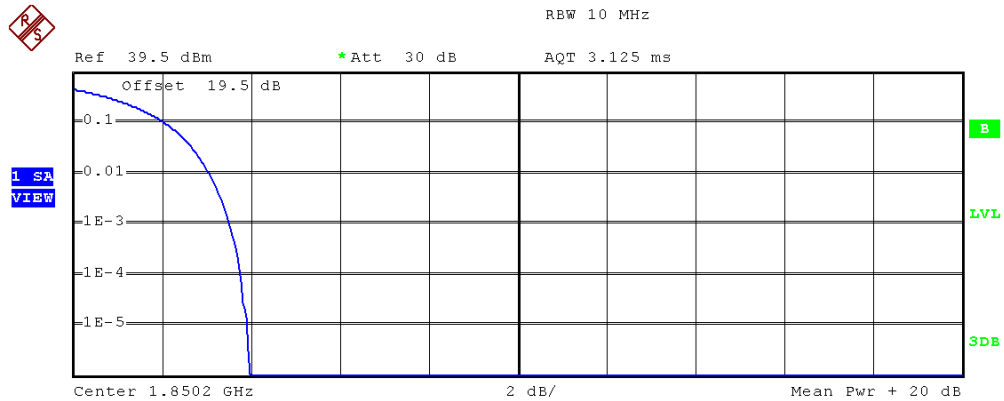
B. For UMTS operating mode:

- Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
- The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1%.
- Record the deviation as Peak to Average Ratio.

1. Test Verdict:

Band	Channel	Frequency (MHz)	Peak to Average ratio		Limit	Verdict
			dBm	Refer to Plot	dBm	
WCDMA 1900MHz	9262	1852.4	3.52	Plot A1 to A3	13	PASS
	9400	1880.0	3.20			PASS
	9538	1907.6	3.20			PASS

2. WCDMA Model Test Plots:



Complementary Cumulative Distribution Function (100000 samples)

Trace 1

Mean 14.36 dBm

Peak 18.32 dBm

Crest 3.96 dB

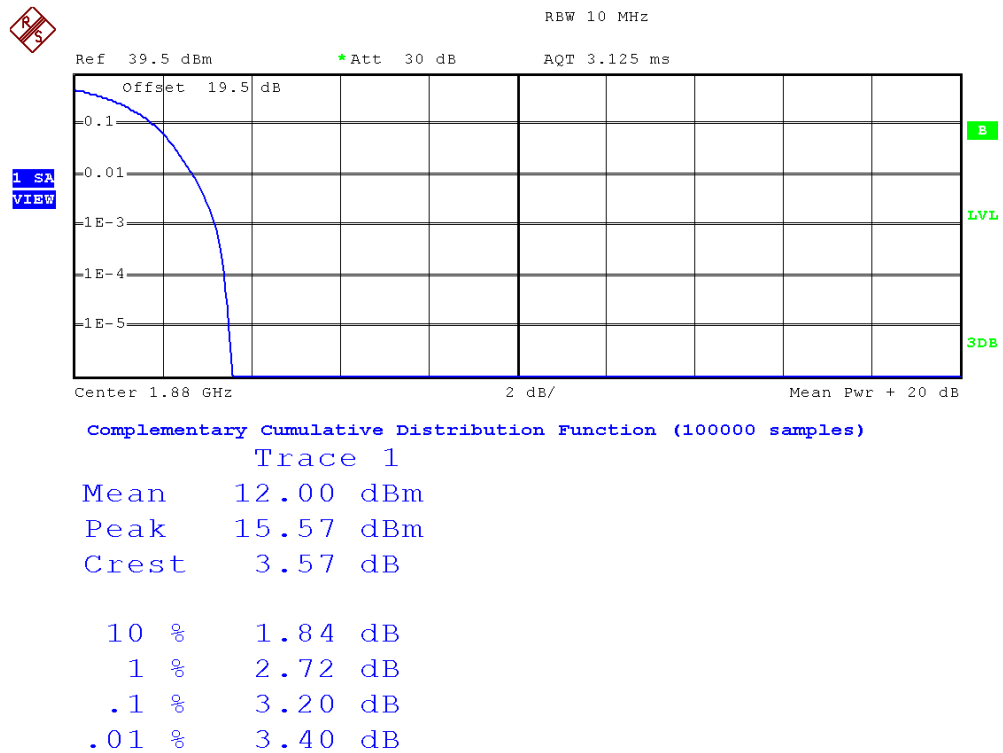
10 % 2.08 dB

1 % 3.08 dB

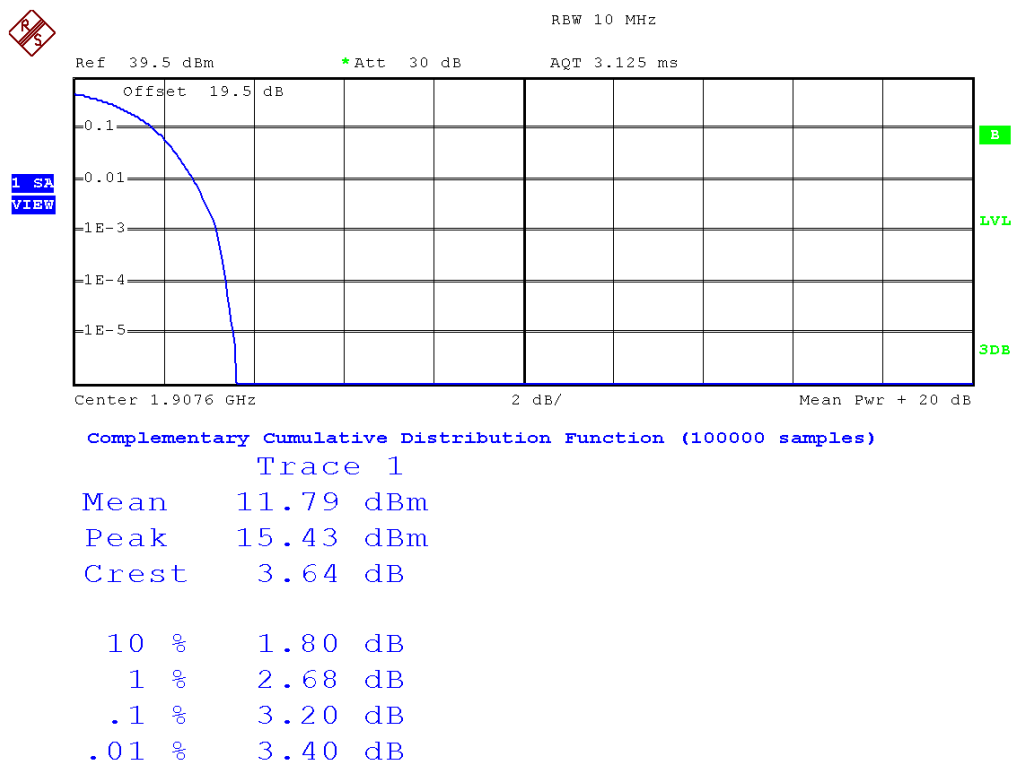
.1 % 3.52 dB

.01 % 3.80 dB

(Plot C1: WCDMA 1900MHz Channel = 9262)



(Plot C2: WCDMA 1900MHz Channel = 9400)



(Plot C3: WCDMA 1900MHz Channel = 9538)

2.3 99% Occupied Bandwidth and 26dB Bandwidth

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 Test Description

See section 2.1.2 of this report.

2.3.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r01 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 Verdict

Here the lowest, middle and highest channels are selected to perform testing to verify the 99% occupied bandwidth.

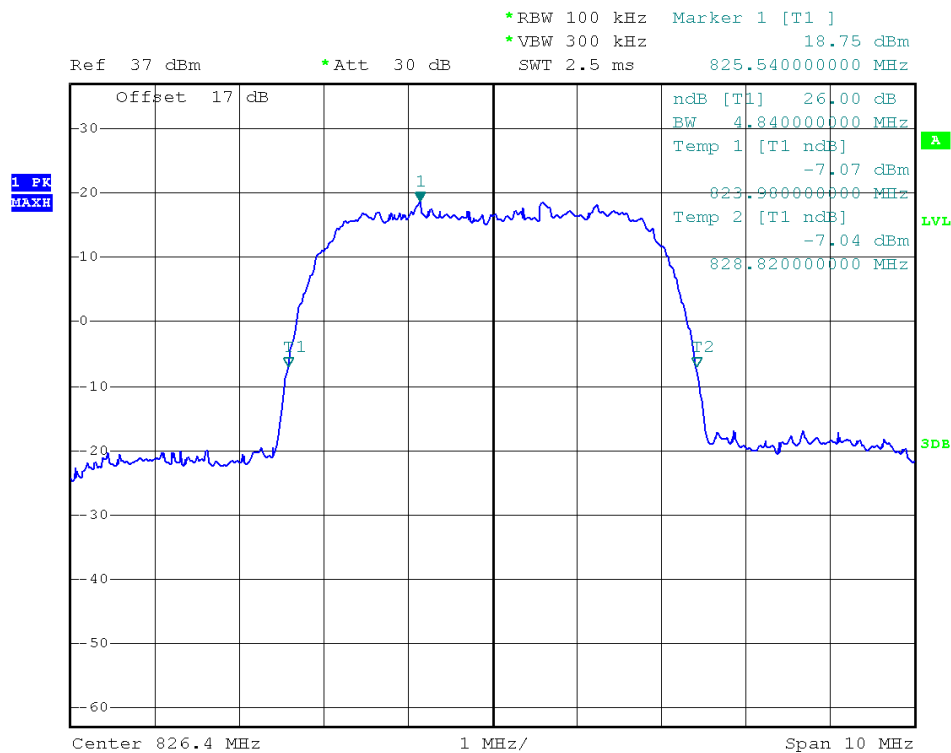
1. Test Verdict:

Band	Channel	Frequency (MHz)	26dB bandwidth	99% Occupied Bandwidth	Refer to Plot
WCDMA Band V (RMC 12.2Kbps)	4132	826.4	4.84MHz	4.22MHz	Plot A1-A2
	4183	836.6	4.86MHz	4.22MHz	Plot A3-A4
	4233	846.6	4.86MHz	4.18MHz	Plot A5-A6

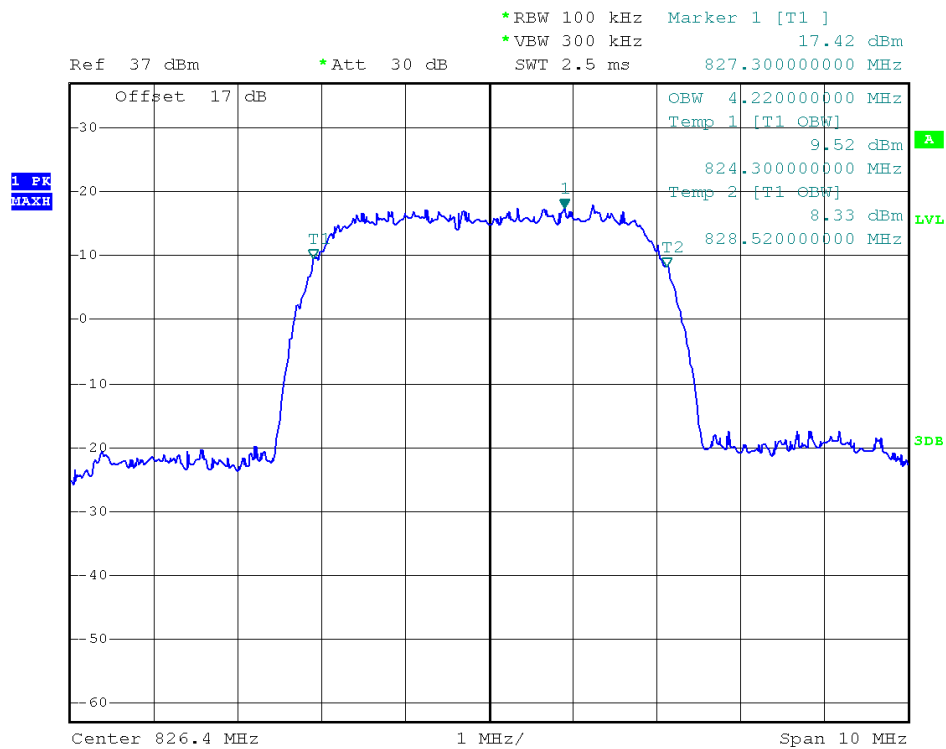


Band	Channel	Frequency (MHz)	26dB bandwidth	99% Occupied Bandwidth	Refer to Plot
WCDMA Band II (RMC 12.2Kbps)	9262	1852.4	4.88MHz	4.22MHz	Plot B1-B2
	9400	1880	4.90MHz	4.22MHz	Plot B3-B4
	9538	1907.6	4.86MHz	4.24MHz	Plot B5-B6

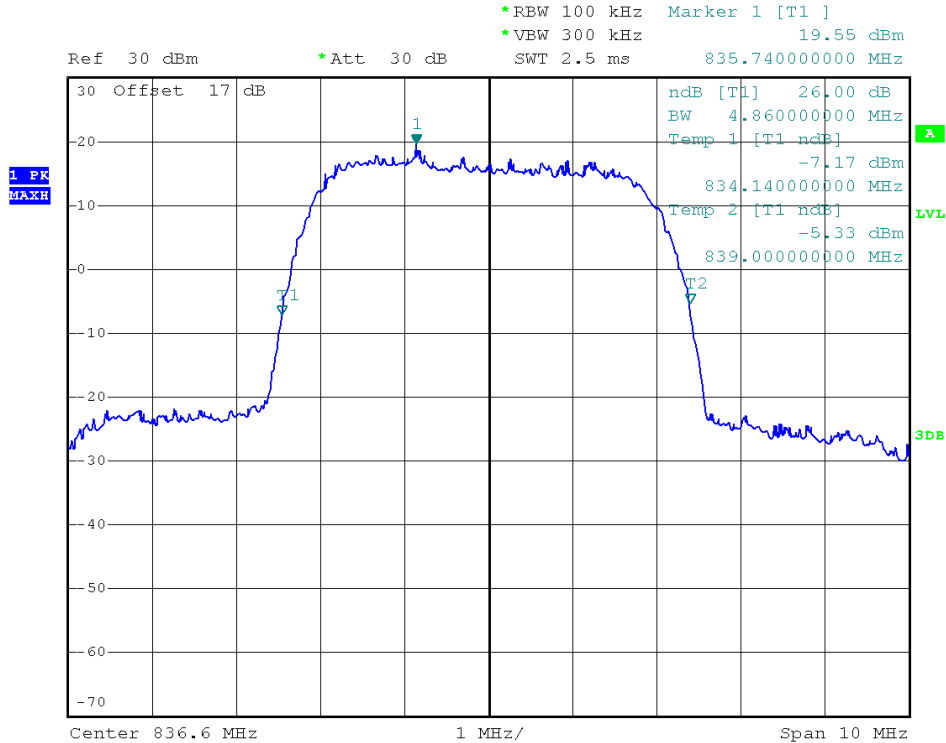
2. Test Plots:



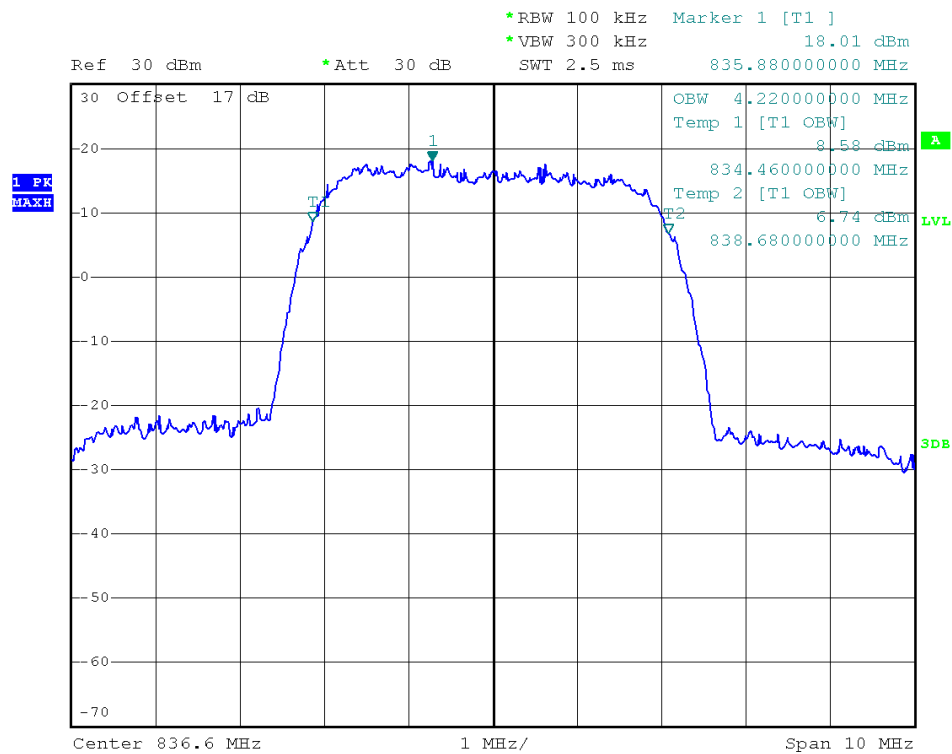
(Plot A1: WCDMA 850MHz Channel = 4132)



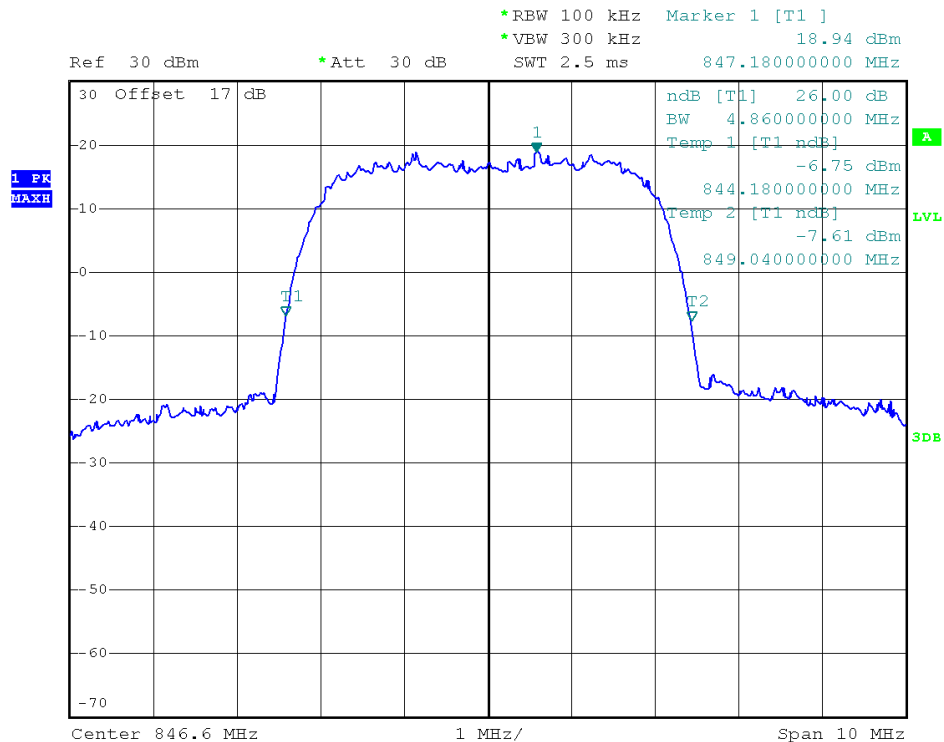
(Plot A2: WCDMA 850MHz Channel = 4132)



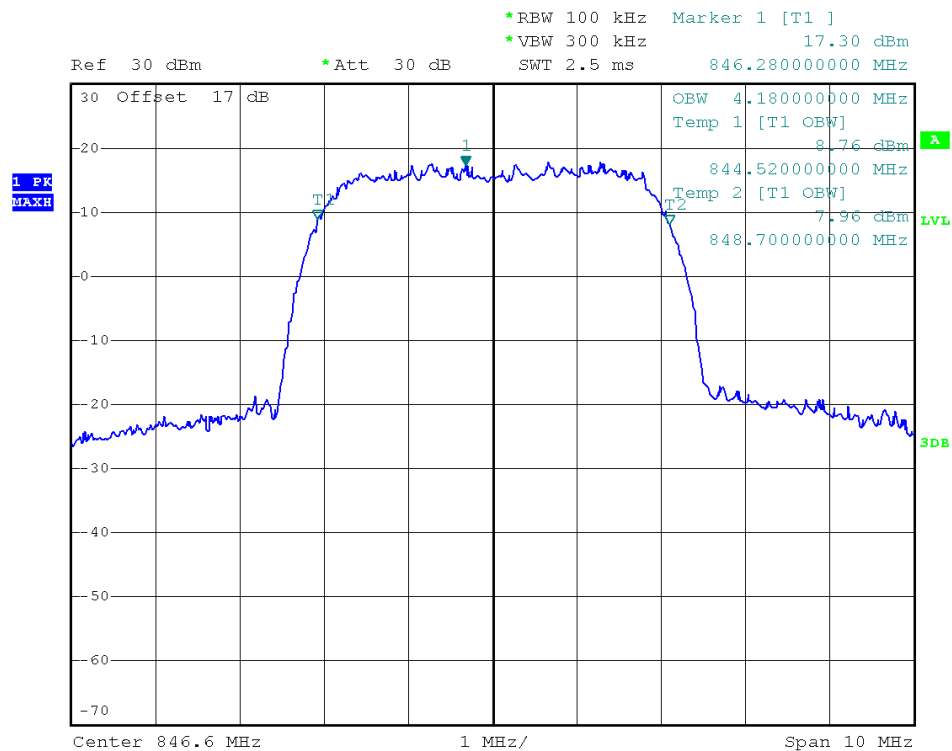
(Plot A3: WCDMA 850 MHz Channel = 4183)



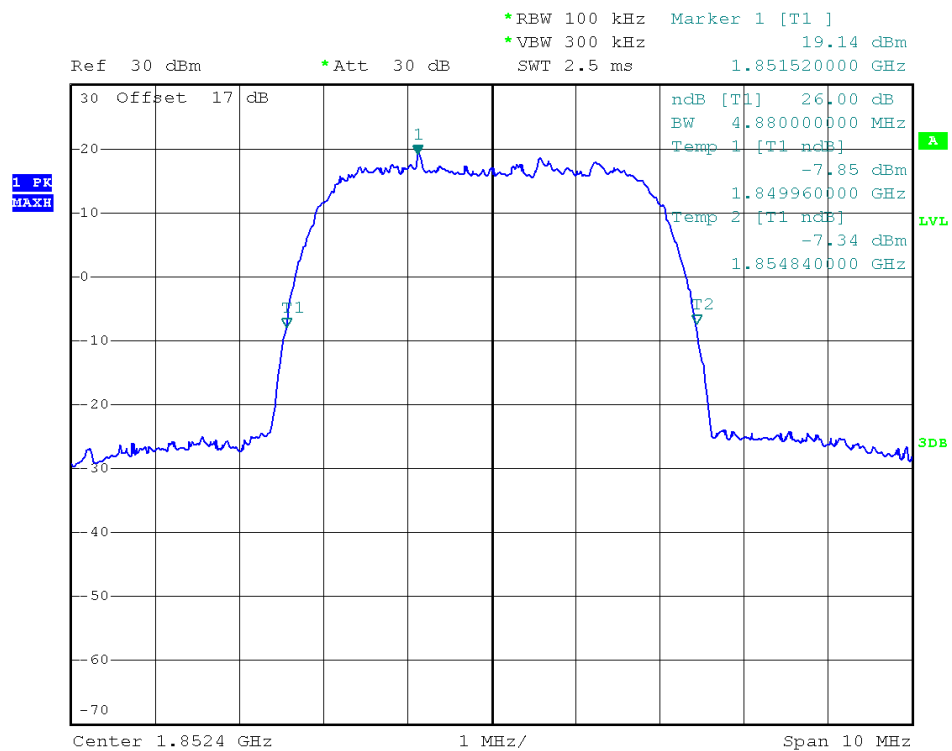
(Plot A4: WCDMA 850 MHz Channel = 4183)



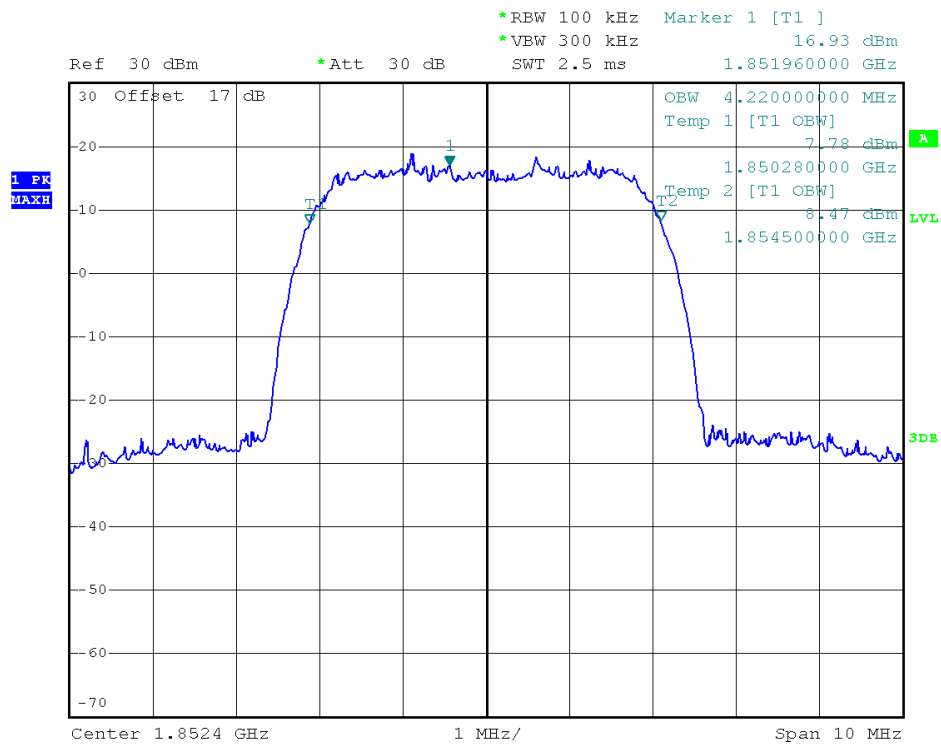
(Plot A5: WCDMA 850MHz Channel = 4233)



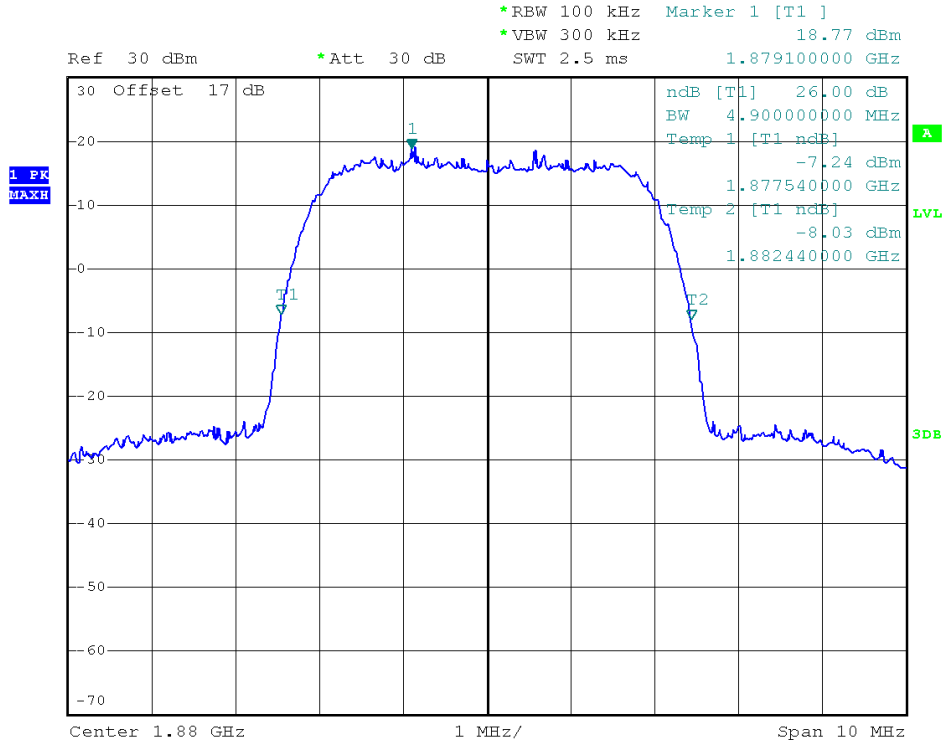
(Plot A6: WCDMA 850MHz Channel = 4233)



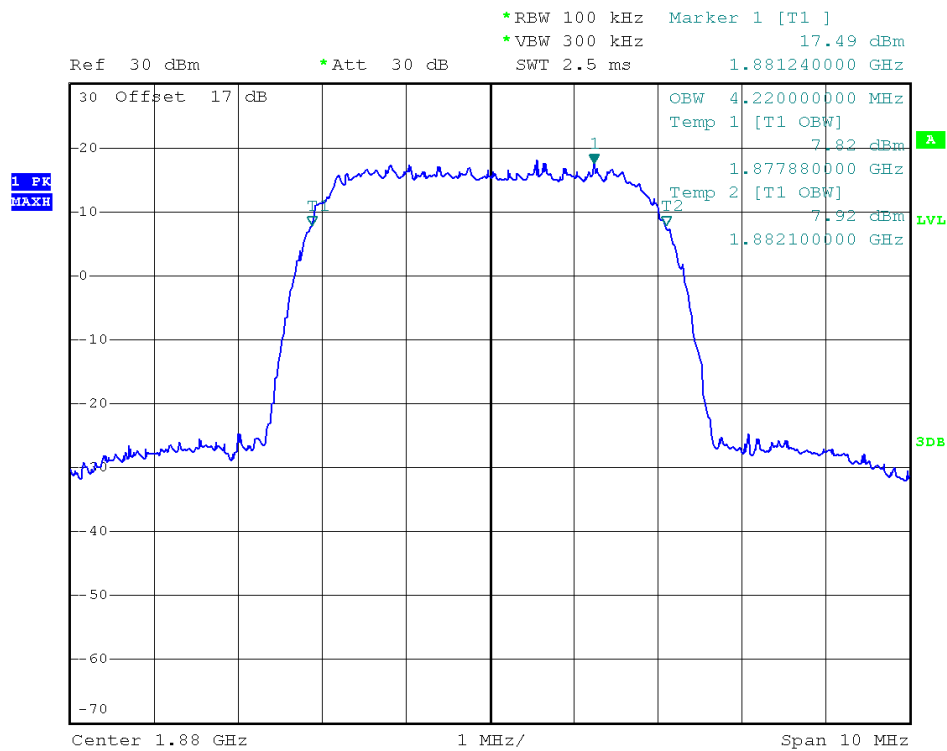
(Plot B1: WCDMA 1900MHz Channel = 9262)



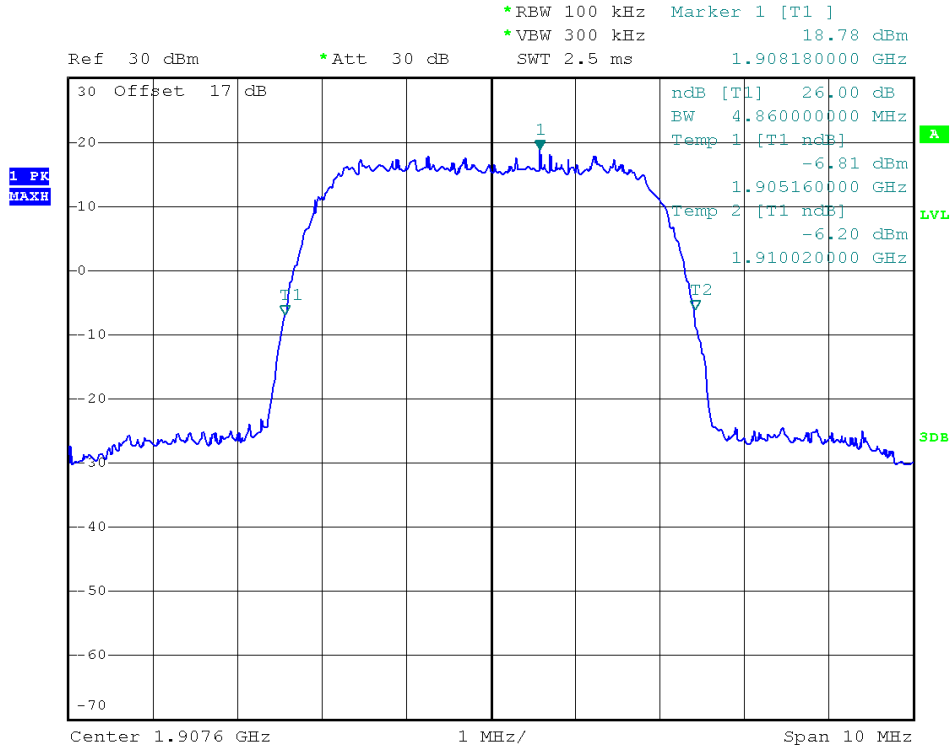
(Plot B2: WCDMA 1900MHz Channel = 9262)



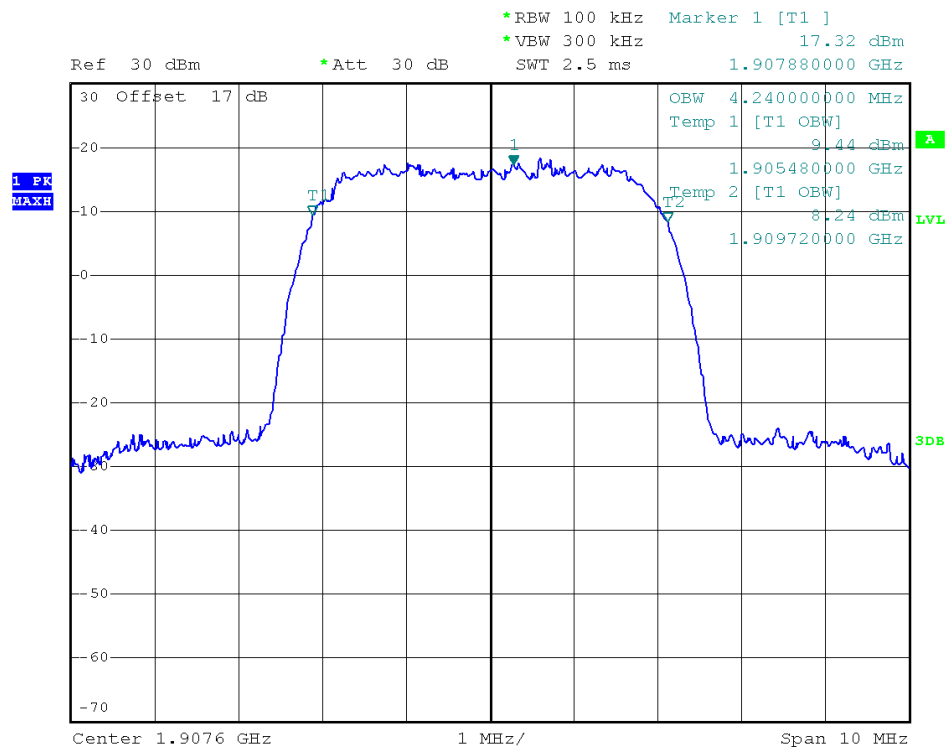
(Plot B3: WCDMA 1900 MHz Channel = 9400)



(Plot B4: WCDMA 1900 MHz Channel = 9400)



(Plot B5: WCDMA1900MHz Channel = 9538)



(Plot B6: WCDMA1900MHz Channel = 9538)

2.4 Frequency Stability

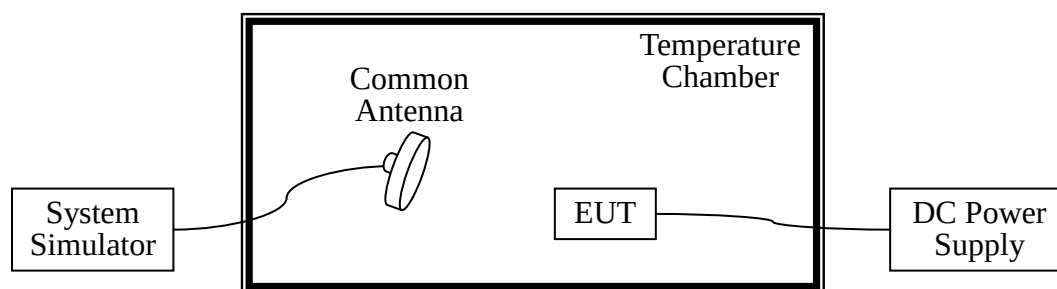
2.4.1 Requirement

According to FCC section 22.355 and FCC section 24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. According to FCC section 2.1055, the test conditions are:

- The temperature is varied from -30°C to $+50^{\circ}\text{C}$ at intervals of not more than 10°C .
- For hand carried battery powered equipment, the primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacture. The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

2.4.2 Test Description

1. Test Setup:



The EUT, which is powered by the DC 3.8V Power Supply directly, is located in the Temperature Chamber. The EUT is commanded by the System Simulator (SS) to operate at the maximum output power i.e. A call is established between the EUT and the SS via a Common Antenna.

2. Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Data	Cal. Due Data
System Simulator	R&S	CMW500	149333	2014.07.21	2015.07.20
DC Power Supply	Good Will	GPS-3030D D	EF920938	2015.06.02	2016.06.02
Temperature Chamber	YinHe Experimental Equip.	HL4003T	(n.a.)	2015.06.02	2016.06.02
Cable	SUNHNER	SUCOFLEX 100	/	2015.06.02	2016.06.02

2.4.3 Test Verdict

The nominal, highest and lowest extreme voltages are separately 3.8VDC, 4.2VDC and 3.6VDC, which are specified by the applicant; the normal temperature here used is 25°C .

1. WCDMA Band V

Test Conditions		Frequency Deviation Middle Channel 836.6MHz		
Power (VDC)	Temperature (°C)	Frequency Error	Frequency Error	Limit
		Hz	ppm	ppm
3.8	-30	21.02	0.03	2.5
	-20	43.08	0.05	
	-10	20.65	0.02	
	0	-3.32	0	
	+10	42.75	0.05	
	+20	-2.32	0	
	+30	23.12	0.02	
	+40	11.33	0.01	
	+55	-17.55	0.01	
4.2	+25	38.10	0.05	2.5
3.6	+25	-12.06	0.01	

2. WCDMA Band II

Test Conditions		Frequency Deviation Middle Channel 1880.0MHz		
Power (VDC)	Temperature (°C)	Frequency Error	Frequency Error	Limit
		Hz	ppm	ppm
3.8	-30	52.17	0.03	2.5
	-20	28.14	0.01	
	-10	33.27	0.02	
	0	24.72	0.01	
	+10	11.91	0.01	
	+20	19.59	0.01	
	+30	48.08	0.03	
	+40	31.98	0.02	
	+55	41.83	0.02	
4.2	+25	22.23	0.01	2.5
3.6	+25	44.12	0.02	

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 Test Description

See section 2.1.2 of this report.

2.5.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r01 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)
 $= P(W) - [43 + 10\log(P)]$ (dB)
 $= [30 + 10\log(P)]$ (dBm) - $[43 + 10\log(P)]$ (dB)
 $= -13\text{dBm}$.

2.5.4 Test Result

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the out of band emissions.

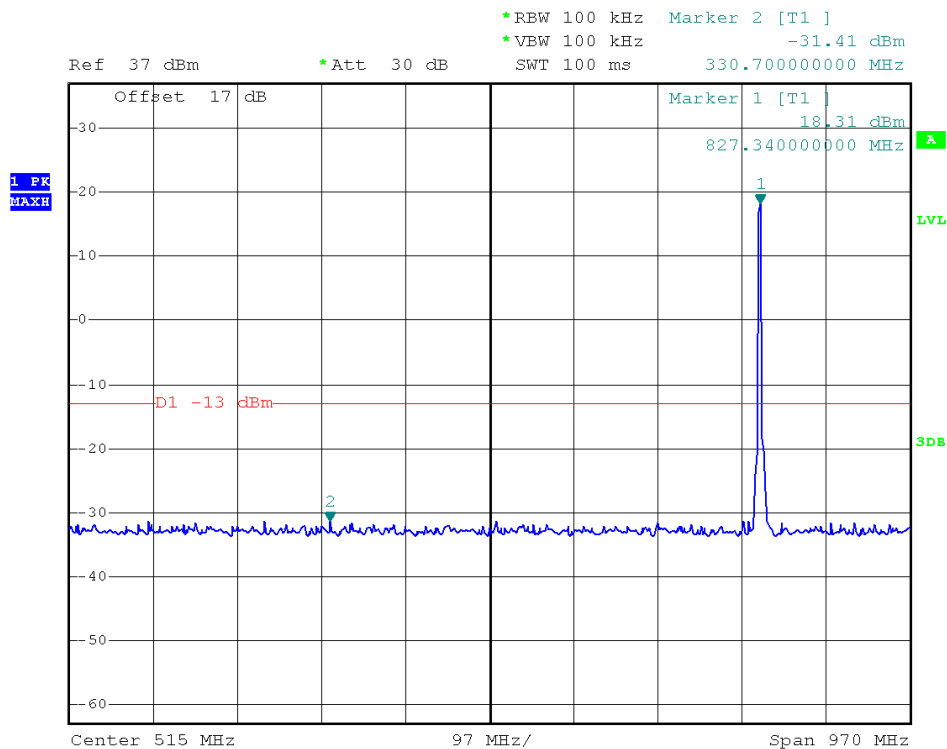
1. Test Verdict:

Band	Channel	Test Mode	Frequency (MHz)	Measured Max. Spurious Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
WCDMA Band V	4132	RMC	826.4	-28.74	Plot A1toA1.1	-13	PASS
	4183	12.2Kbps	836.6	-27.13	Plot A2toA2.1		PASS
	4233	(QPSK)	846.6	-28.00	Plot A3toA3.1		PASS

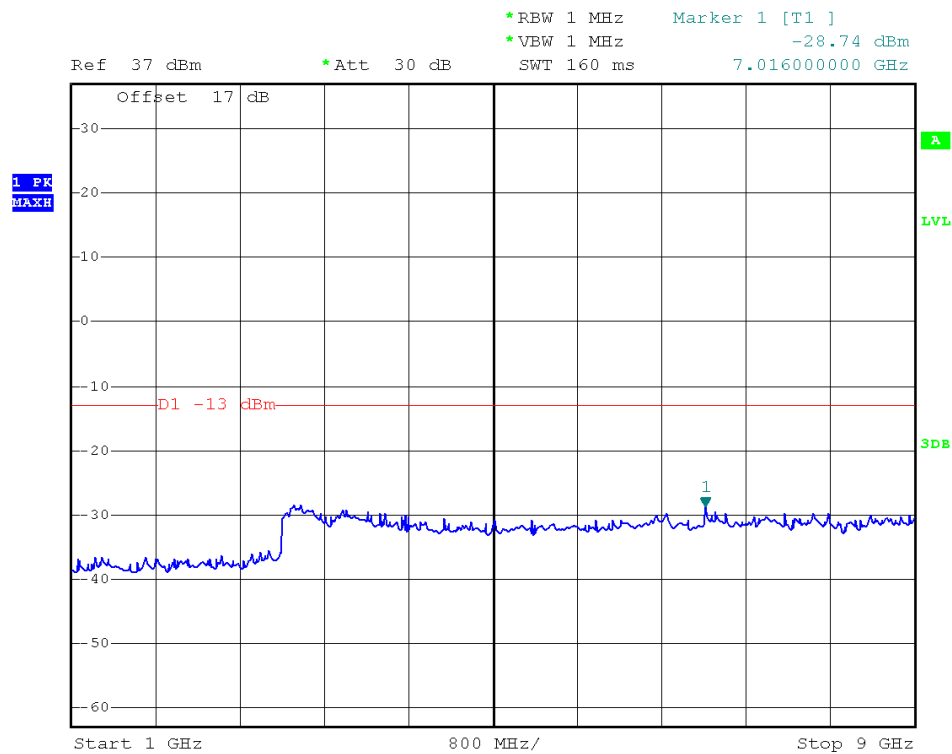
Band	Channel	Test Mode	Frequency (MHz)	Measured Max. Spurious Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
WCDMA Band II	9262	RMC	1852.4	-20.47	Plot B1toB1.1	-13	PASS
	9400	12.2Kbps	1880	-18.84	Plot B2toB2.1		PASS
	9538	(QPSK)	1907.6	-21.06	Plot B3toB3.1		PASS

2. Test Plots for the Whole Measurement Frequency Range:

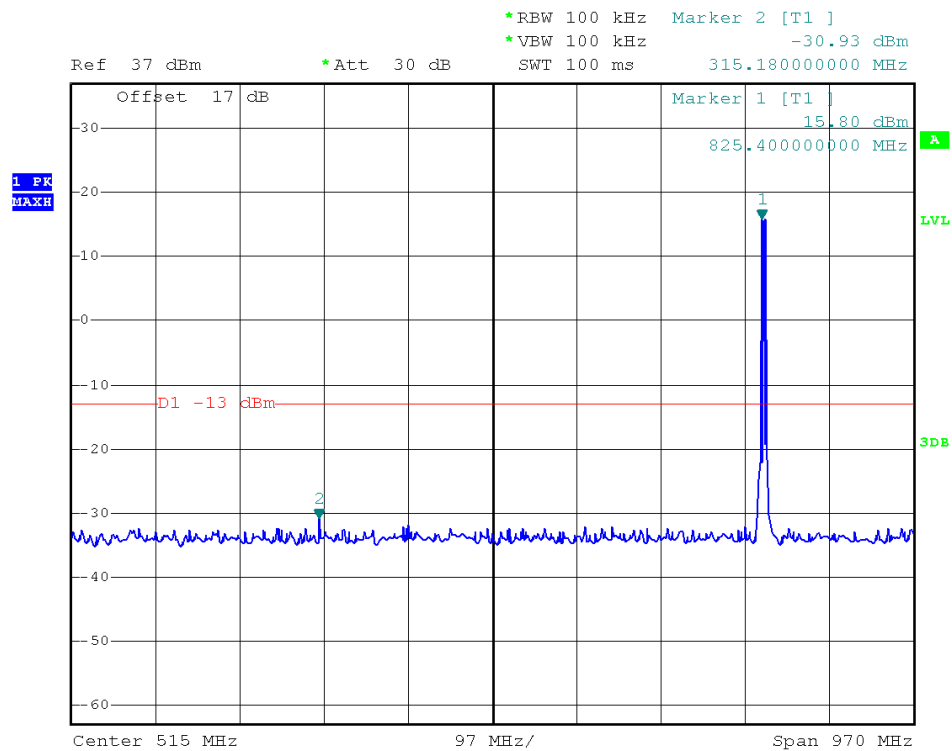
Note: the power of the EUT transmitting frequency should be ignored.



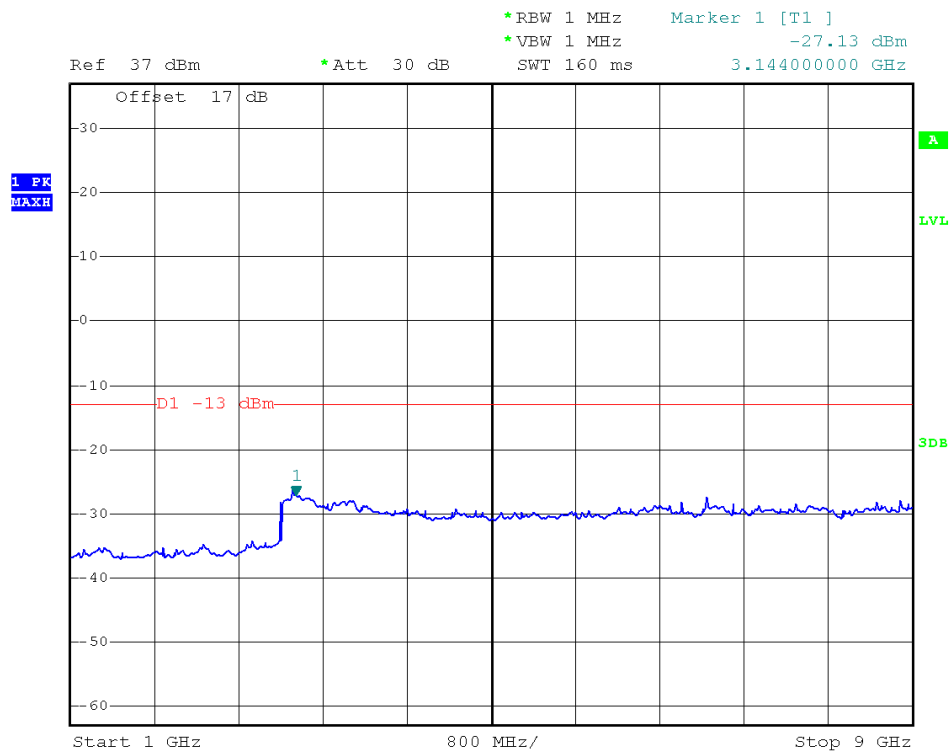
(Plot A1: WCDMA Band V Channel = 4132, 30MHz to 1GHz)



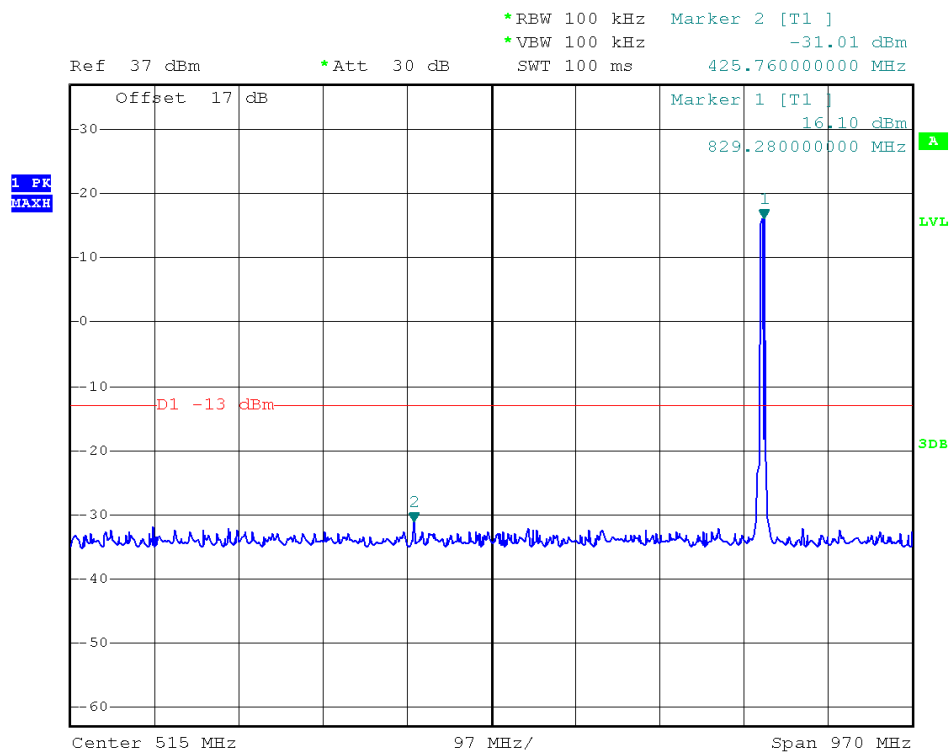
(Plot A1.1: WCDMA Band V Channel = 4132, 1GHz to 9GHz)



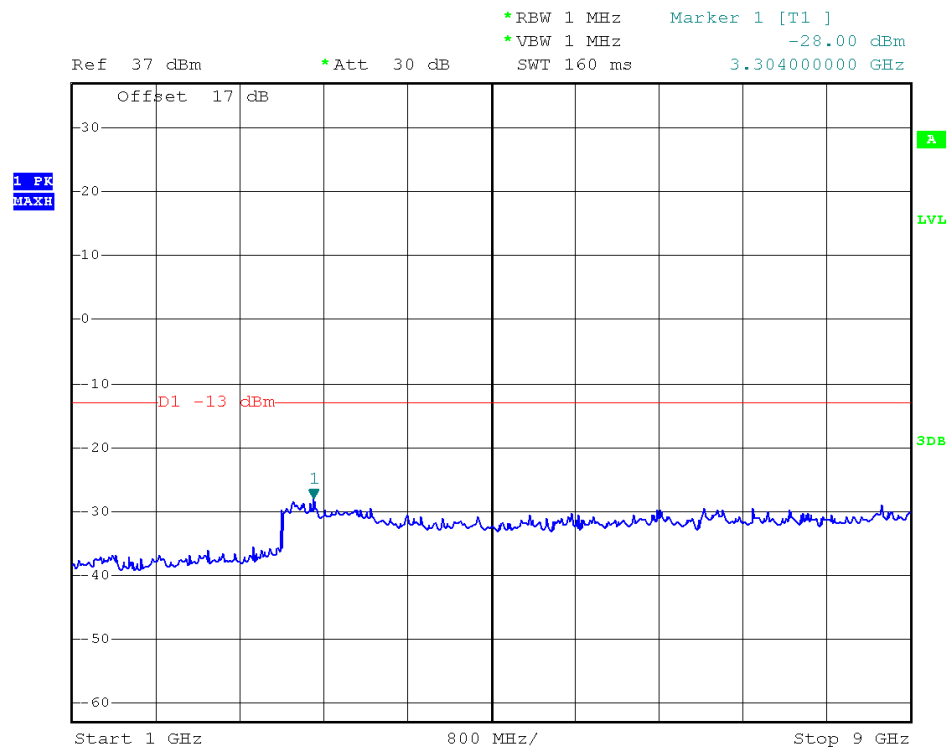
(Plot A2: WCDMA Band V Channel = 4183, 30MHz to 1GHz)



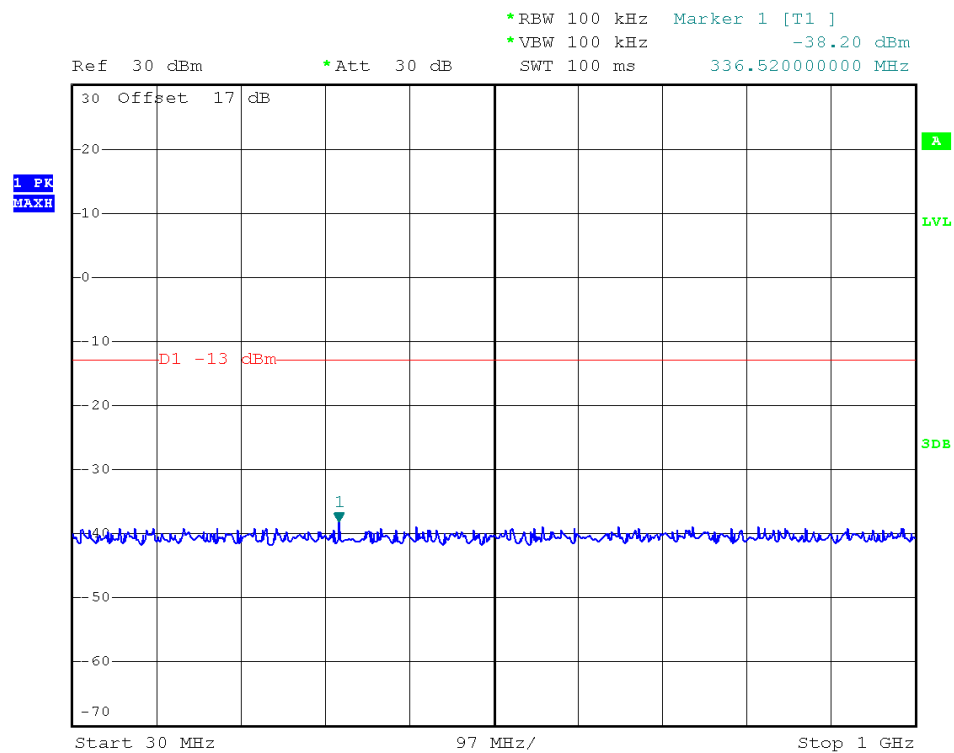
(Plot A2.1: WCDMA Band V Channel = 4183, 1GHz to 9GHz)



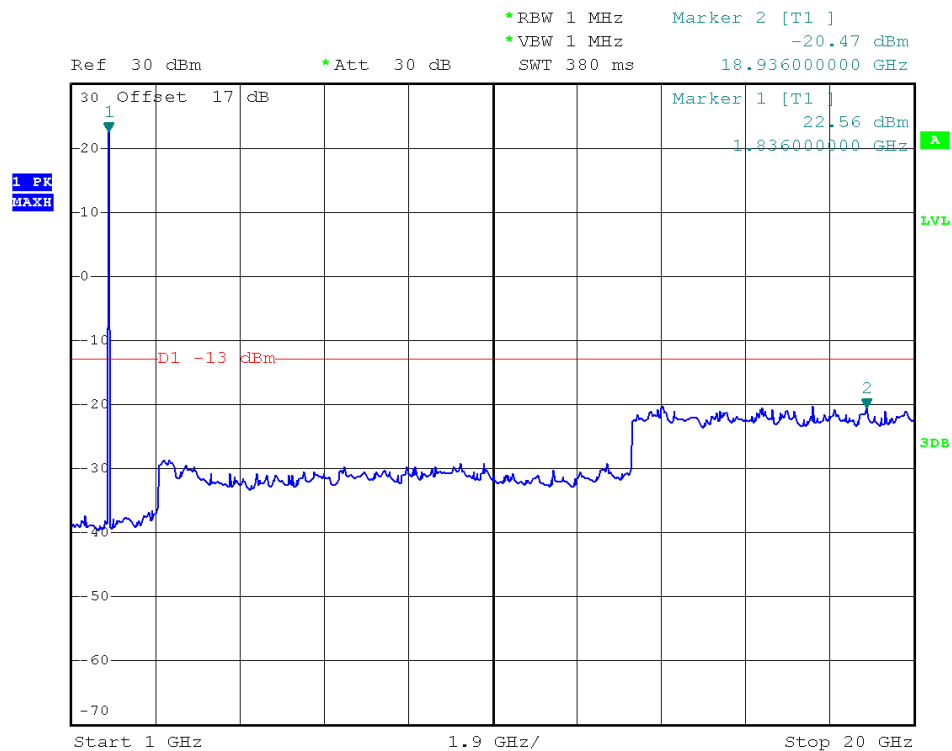
(Plot A3: WCDMA Band V Channel = 4233, 30MHz to 1GHz)



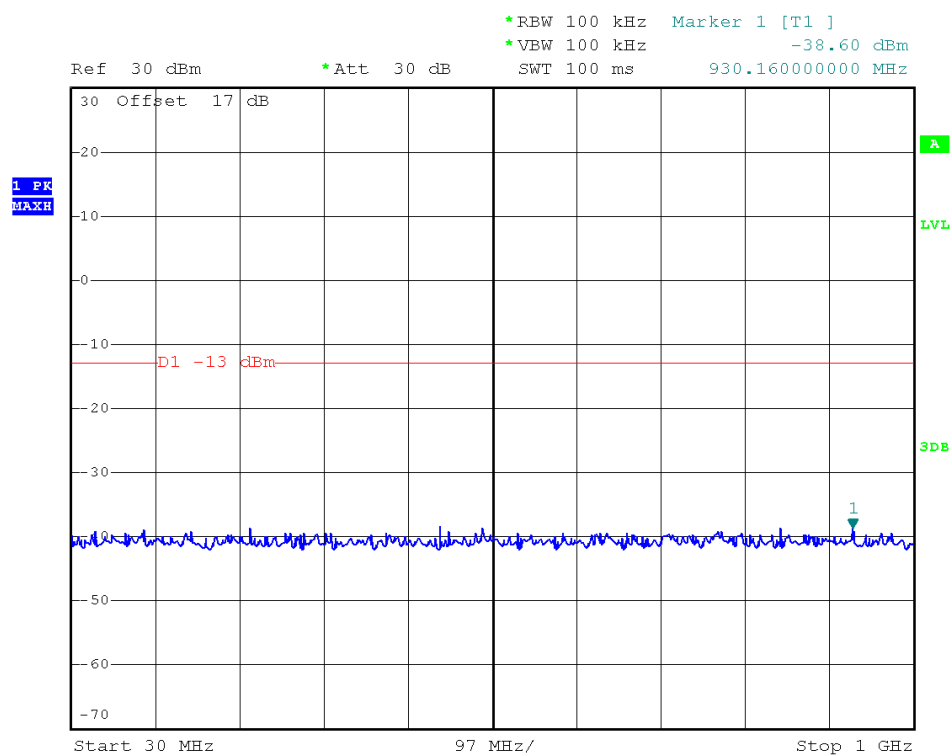
(Plot A3.1: WCDMA Band V Channel = 4233, 1GHz to 9GHz)



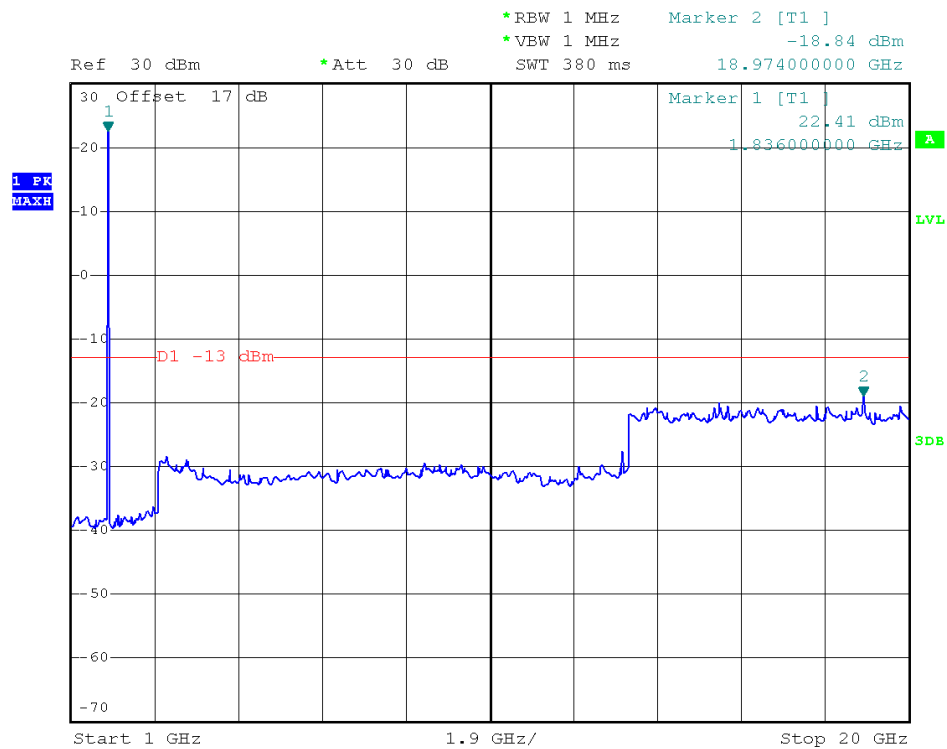
(Plot B1: WCDMA Band II Channel = 9262, 30MHz to 1GHz)



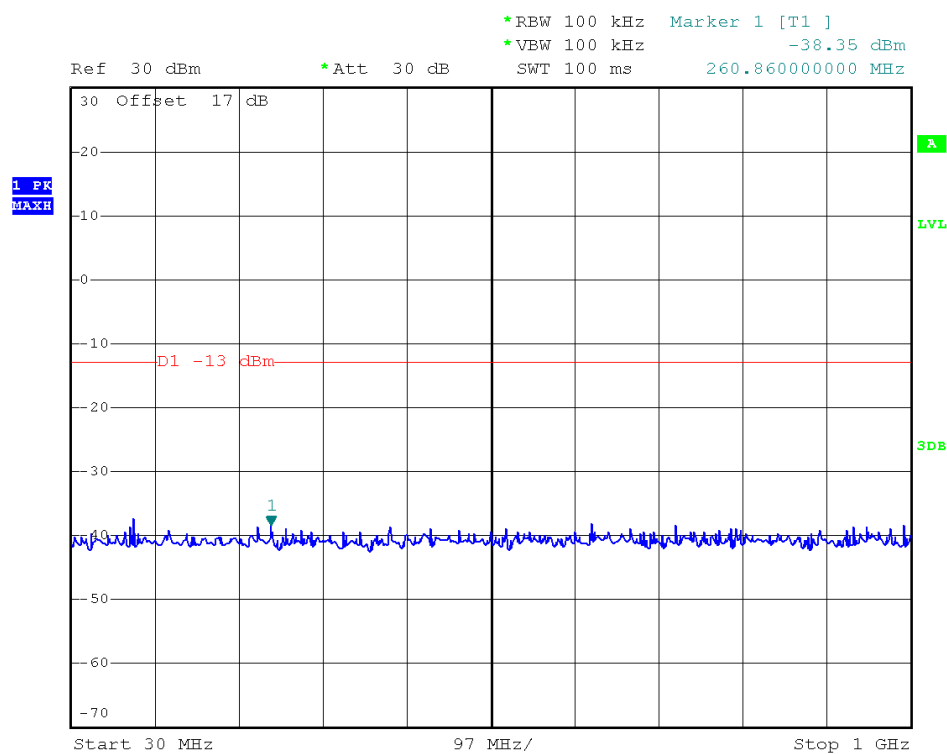
(Plot B1.1: WCDMA Band II Channel = 9262, 1GHz to 20GHz)



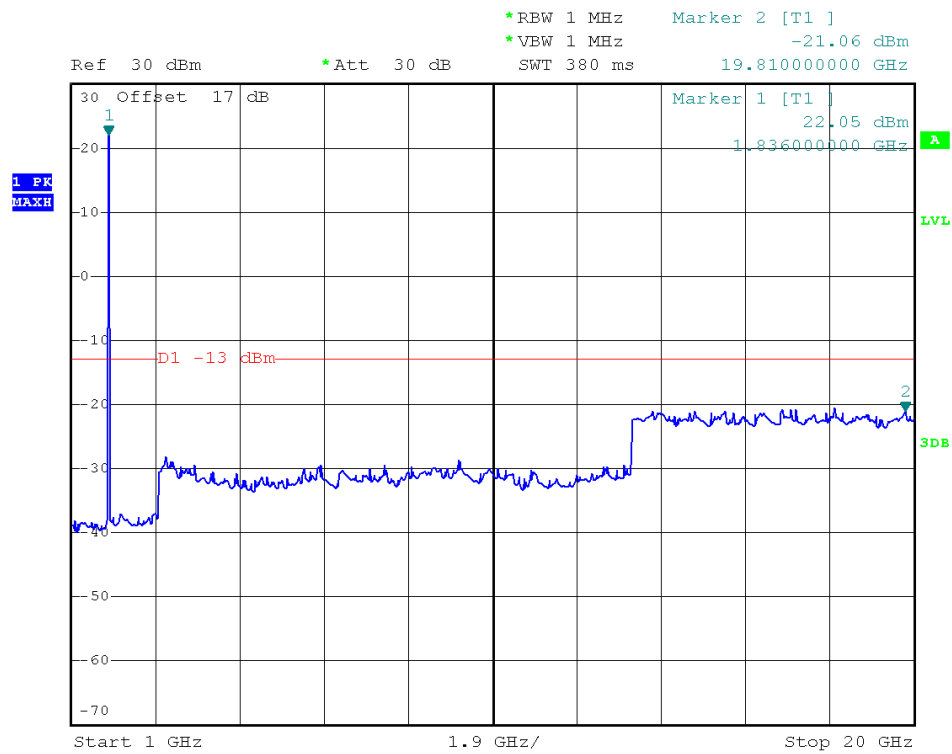
(Plot B2: WCDMA Band II Channel = 9400, 30MHz to 1GHz)



(Plot B2.1: WCDMA Band II Channel = 9400, 1GHz to 20GHz)



(Plot B3: WCDMA Band II Channel = 9538, 30MHz to 1GHz)



(Plot B3.1: WCDMA Band II Channel = 9538 1GHz to 20GHz)

2.6 Band Edge

2.6.1 Requirement

According to FCC section 22.917(b) and FCC section 24.238(b), in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth (26dB emission bandwidth) of the fundamental emission of the transmitter may be employed.

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

2.6.2 Test Description

See section 2.1.2 of this report.

2.6.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r01 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 band edges of low and high channels for the highest RF powers were measured.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
 $= P(W) - [43 + 10\log(P)] \text{ (dB)}$
 $= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$
 $= -13\text{dBm}.$

2.6.4 Test Result

The lowest and highest channels are tested to verify the band edge emissions.

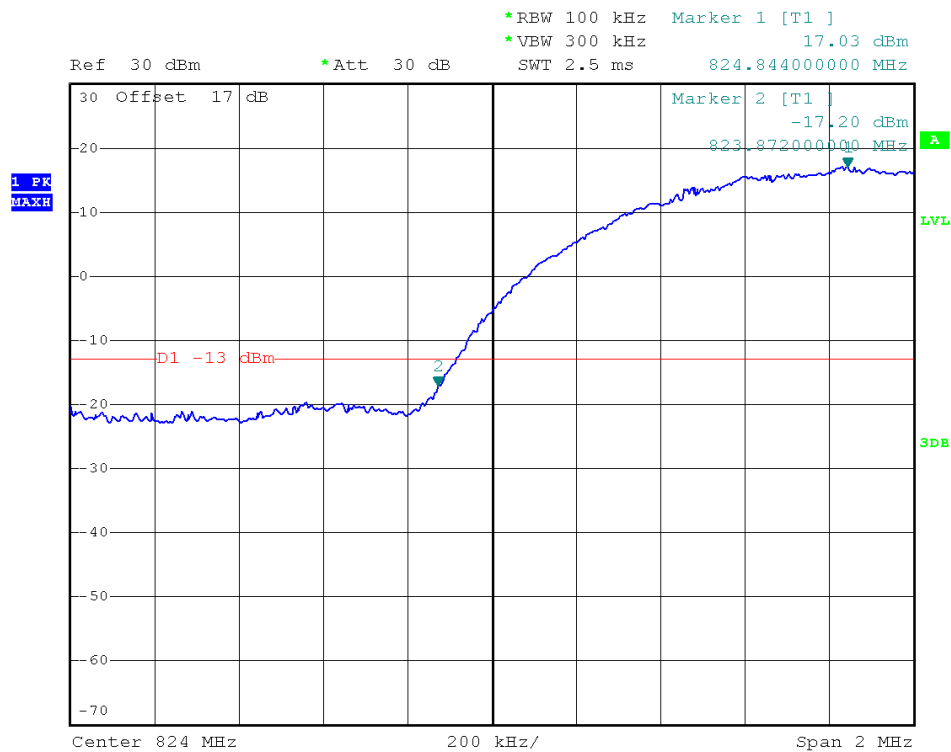
1. Test Verdict:

Band	Channel	Frequency (MHz)	Measured Max. Band Edge Emission (dBm)	Refer to Plot	Limit (dBm)	Verdict
WCDMA 850MHz	4132	826.4	-17.20	Plat A	-13	PASS
	4233	846.6	-16.08	Plot B		PASS
WCDMA	9262	1852.4	-16.44	Plat C	-13	PASS

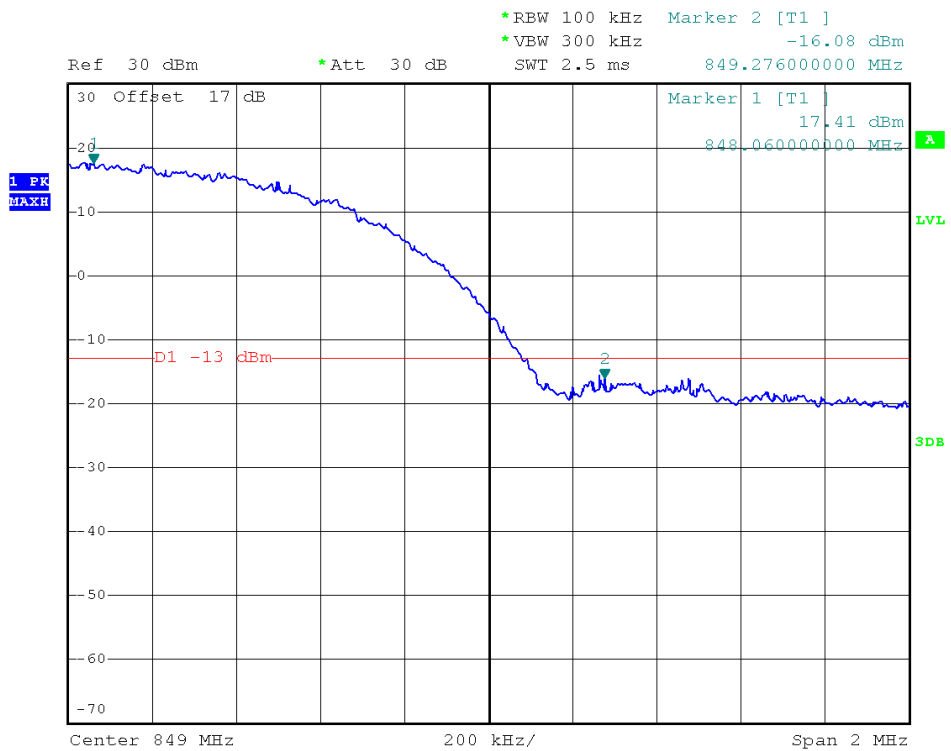


1900MHz	9538	1907.6	-16.84	Plot D		PASS
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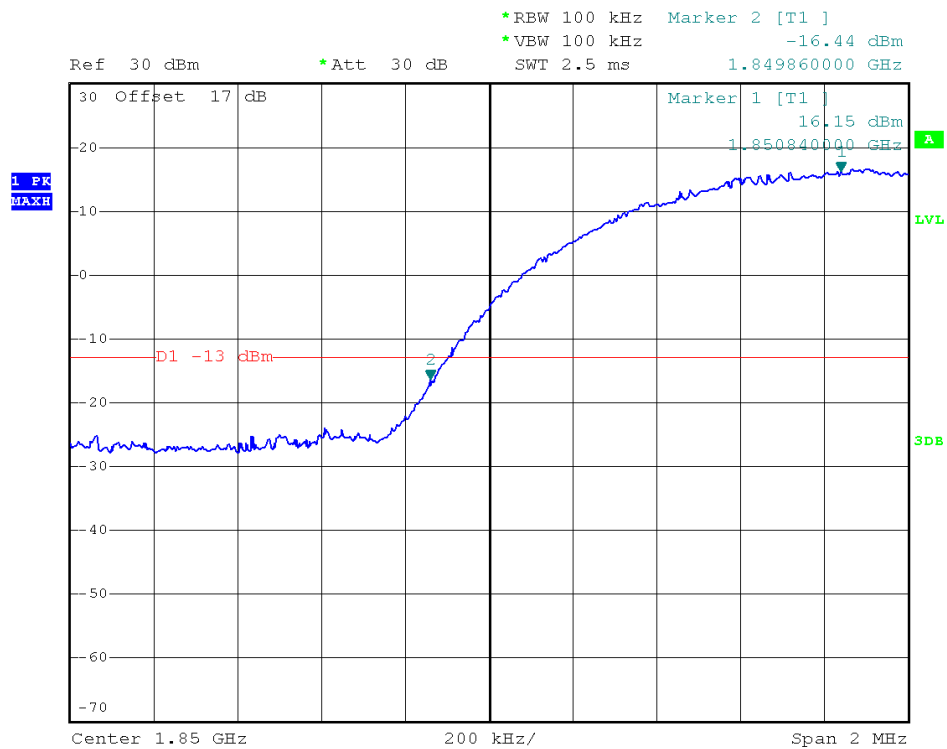
2. Test Plots:



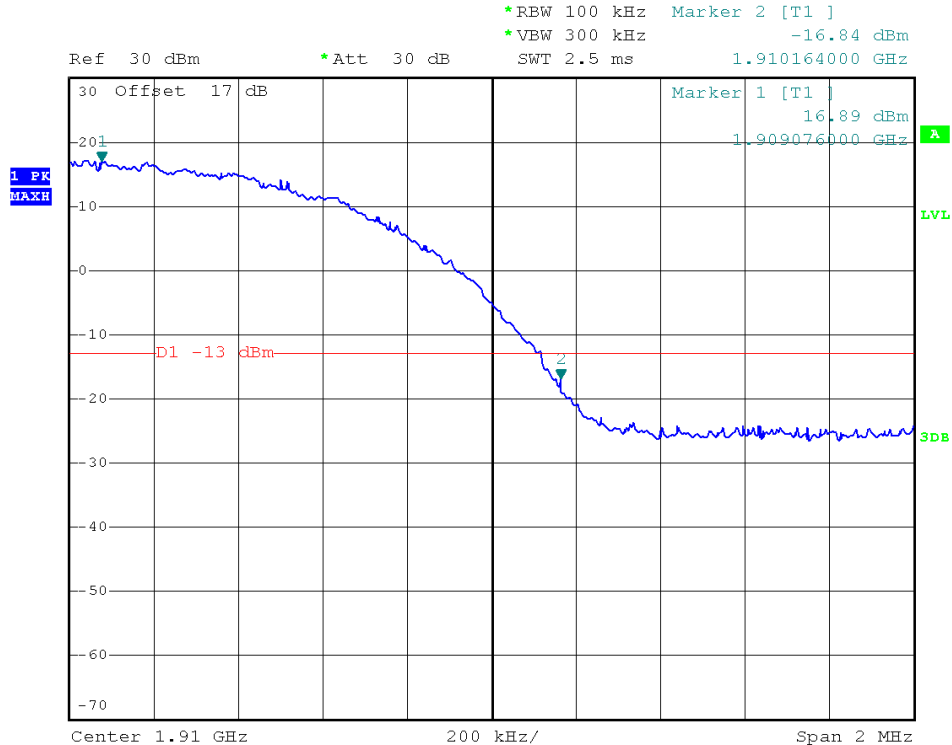
(Plot A: WCDMA 850 Channel = 4132)



(Plot B: WCDMA 850 Channel = 4233)



(Plot C: WCDMA 1900 Channel = 9262)



(Plot D: WCDMA 1900 Channel = 9538)

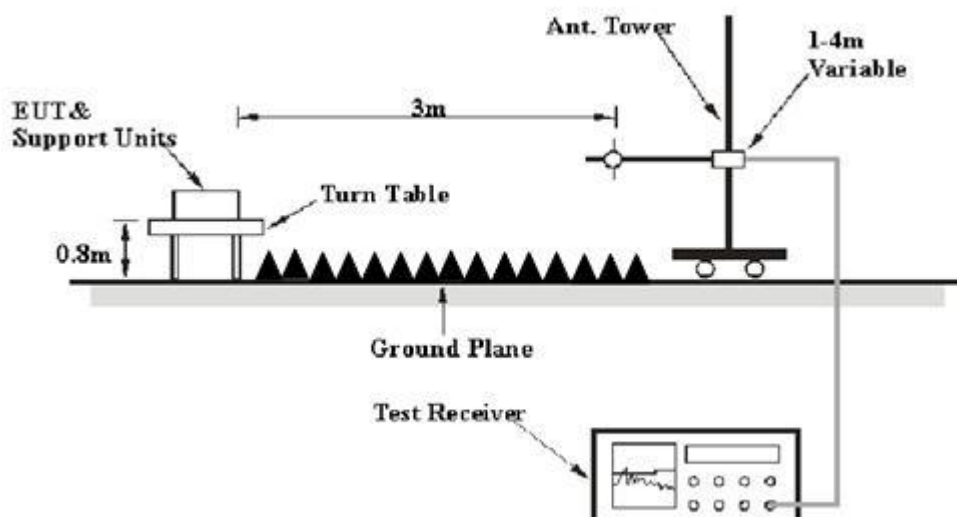
2.7 Transmitter Radiated Power (EIRP/ERP)

2.7.1 Requirement

The substitution method, in ANSI / TIA / EIA-603-C-2004, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. The ERP of mobile transmitters must not exceed 7 Watts (Cellular Band) and the EIRP of mobile transmitters are limited to 2 Watts (PCS Band) and 1 Watts (AWS Band).

2.7.2 Test Description

1. Test Setup:



The EUT, which is powered by the DC 3.8V Power Supply directly, is located in a 3m Full-Anechoic Chamber; the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading.

A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power, and only the test result of the maximum output power was recorded.

Equipments List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
System Simulator	R&S	CMW500	149333	2014.07.21	2015.07.20
EMI Test Receiver	R&S	ESIB26	100130	2014.07.07	2015.07.06
Full-Anechoic Chamber	Albatross~ Projects	12.8m*6.8m *6.4m	A0412372	2015.01.05	2016.01.04
Double ridge horn antenna(1GHz~18G Hz)	R&S	HF906	100150	2015.06.02	2016.06.02
Broadband antenna (30MHz~1GHz)	R&S	HL562	101341	2015.06.02	2016.06.02
Cable	SUNHNER	SUCOFLEX 100	/	2015.06.02	2016.06.02
Cable	SUNHNER	SUCOFLEX 104	/	2015.06.02	2016.06.02

2.7.3 Test Procedures

- The testing follows FCC KDB 971168 v02r01 Section 5.2.1. (for CDMA/WCDMA), Section 5.2.2.2 (for GSM/GPRS/EDGE) and ANSI / TIA-603-C-2004 Section 2.2.17.
- The EUT was placed on a turntable 1.5 meters high in a fully anechoic chamber.
- The EUT was placed 3 meters from the receiving antenna, which was mounted on the antenna tower.
- GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;
UMTS operating modes: Set RBW= 100 kHz, VBW= 300 kHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per KDB 971168 D01.
- The table was rotated 360 degrees to determine the position of the highest radiated power.
- The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
- Taking the record of maximum ERP/EIRP.
- A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
- The conducted power at the terminal of the dipole antenna is measured.
- Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
- $ERP/EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$
 P_s (dBm): Input power to substitution antenna.

Gs (dBi or dBd): Substitution antenna Gain.

$$E_t = R_t + AF \quad E_s = R_s + AF$$

AF (dB/m): Receive antenna factor

Rt: The highest received signal in spectrum analyzer for EUT.

Rs: The highest received signal in spectrum analyzer for substitution antenna.

2.7.4 Test Result

Test Notes:

1. This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, HSUPA and HSPA+ capabilities. All configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2Kbps.
2. This unit was tested with its standard battery.
3. The worst case test configuration was found in the vertical positioning where the EUT is laying on its side. The data reported in the tables below were measured in this test setup.

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured ERP dBm	Limit dBm	Verdict
WCDMA 850MHz	4132	826.4	V	24.74	38.5	PASS
	4175	835	V	24.79		PASS
	4233	846.6	V	24.80		PASS

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured ERP dBm	Limit dBm	Verdict
WCDMA 850MHz	4132	826.4	H	24.68	38.5	PASS
	4175	835	H	24.65		PASS
	4233	846.6	H	24.71		PASS

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured EIRP dBm	Limit dBm	Verdict
WCDMA 1900MHz	9262	1852.4	V	24.54	33	PASS
	9400	1880	V	24.67		PASS
	9538	1907.6	V	24.59		PASS



Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured EIRP dBm	Limit dBm	Verdict
WCDMA 1900MHz	9262	1852.4	H	24.51	33	PASS
	9400	1880	H	24.60		PASS
	9538	1907.6	H	24.54		PASS

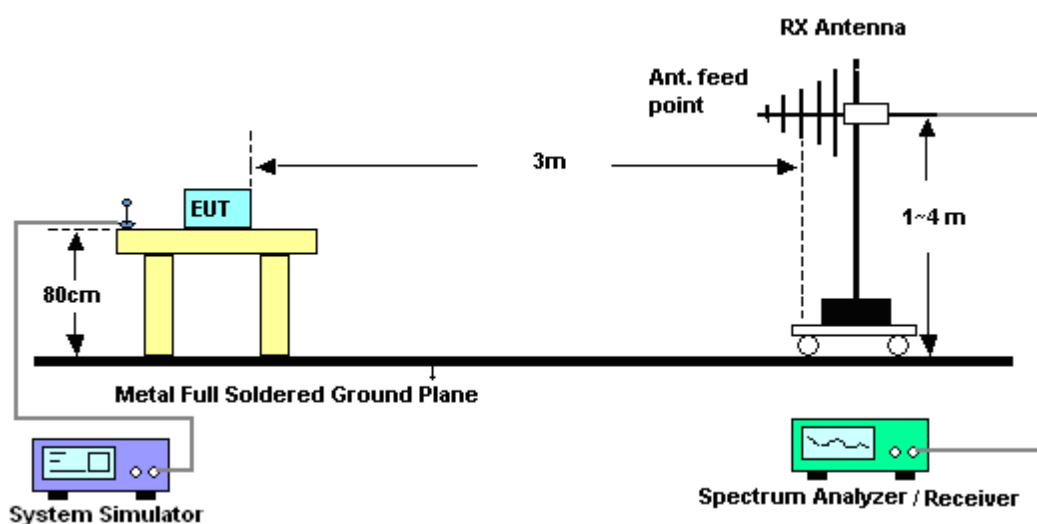
2.8 Radiated Out of Band Emissions

2.8.1 Requirement

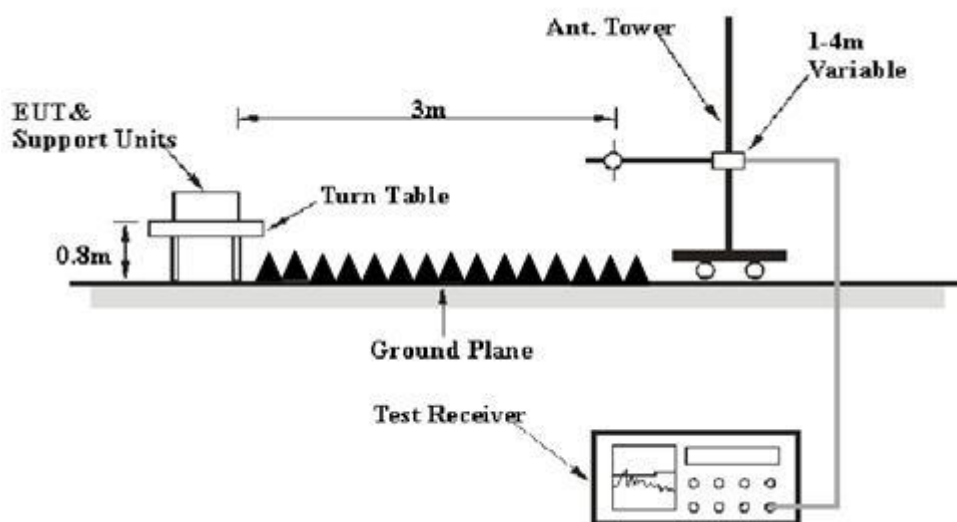
According to FCC section 22.917(a) and section 24.238(a), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \cdot \log(P)$ dB. This calculated to be -13dBm.

2.8.2 Test Description

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



Equipment List:

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due Date
System Simulator	R&S	CMW500	149333	2014.07.21	2015.07.20
EMI Test Receiver	R&S	ESIB26	100130	2014.07.07	2015.07.06
Full-Anechoic Chamber	Albatross~ Projects	12.8m*6.8m *6.4m	A0412372	2015.01.05	2016.01.04
Double ridge horn antenna(1GHz~18G Hz)	R&S	HF906	100150	2015.06.02	2016.06.02
Broadband antenna (30MHz~1GHz)	R&S	HL562	101341	2015.06.02	2016.06.02
Horn antenna (18GHz~26.5GHz)	R&S	HM118	101286	2015.06.02	2016.06.02
Cable	SUNHNER	SUCOFLEX 100	/	2015.06.02	2016.06.02
Cable	SUNHNER	SUCOFLEX 104	/	2015.06.02	2016.06.02

2.8.3 Test Procedures

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.

3. Radiated Emissions Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 1GHz – 40GH is $\pm 6.0\text{dB}$ (for EUTs < 0.5m X 0.5m X 0.5m).

4. Environmental Conditions
 - Temperature 23°C
 - Relative Humidity 49%
 - Atmospheric Pressure 1010mbar

5. The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.
6. 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.

7. 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.

8. Sample Calculation:

EUT Field Strength (dBm) = Reading (Signal generator) + Antenna Gain (substitution antenna) - Cable loss (From Signal Generator to substitution antenna)

9. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$

$$= -13\text{dBm}.$$

2.8.4 Test Result

WCDMA Band V (Low Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
1652.8	-43.15	H	5.51	1.12	-38.76	-13	Pass
1652.8	-42.95	V	5.51	1.12	-38.56	-13	Pass
317.6	-54.35	H	3.13	0.52	-51.74	-13	Pass
539.2	-54.64	V	3.51	0.62	-51.75	-13	Pass

WCDMA Band V (Middle Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
1670	-42.35	H	5.51	1.12	-37.96	-13	Pass
1670	-43.04	V	5.51	1.12	-38.65	-13	Pass
317.1	-55.28	H	3.13	0.52	-52.67	-13	Pass
537.5	-54.37	V	3.51	0.62	-51.48	-13	Pass



WCDMA Band V (High Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
1693.2	-42.66	H	5.51	1.12	-38.27	-13	Pass
1693.2	-42.54	V	5.51	1.12	-38.15	-13	Pass
316.9	-54.97	H	3.13	0.52	-52.36	-13	Pass
539.7	-55.71	V	3.51	0.62	-52.82	-13	Pass

WCDMA Band II (Low Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
3704.8	-43.83	H	8.65	2.45	-37.63	-13	Pass
3704.8	-42.75	V	8.65	2.45	-36.55	-13	Pass
317.8	-56.39	H	3.13	0.52	-53.78	-13	Pass
537.6	-55.14	V	3.51	0.62	-52.25	-13	Pass

WCDMA Band II (Middle Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
3760	-44.14	H	8.65	2.45	-37.94	-13	Pass
3760	-45.02	V	8.65	2.45	-38.82	-13	Pass
317.9	-54.33	H	3.13	0.52	-51.72	-13	Pass
541.6	-55.18	V	3.51	0.62	-52.29	-13	Pass

WCDMA Band II (High Channel)							
Frequency (MHz)	Substituted level(dBm)	Polarity (H/V)	Antenna Gain(dBi)	Cable Loss (dB)	Corrected Reading (dBm)	Limit (dBm)	Result
3815.2	-45.24	H	8.65	2.45	-39.04	-13	Pass
3815.2	-44.15	V	8.65	2.45	-37.95	-13	Pass
315.6	-56.32	H	3.13	0.52	-53.71	-13	Pass
538.3	-55.52	V	3.51	0.62	-52.63	-13	Pass

** END OF REPORT **