

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 24 SUBPART E REQUIREMENT

Product Name:	JUMPY Plus
Brand Name:	JUMPY
Marketing Name:	JUMPY Plus
Model No.:	JR-02-W
Model Difference:	N/A
FCC ID:	2ADZ9-JR-02-W
Report No.:	ER/2016/10072
Issue Date:	Feb. 19, 2016
FCC Rule Part:	2 , 24E
Prepared for:	JOYRAY TECHNOLOGY CO., LTD. Rm. 4, 4F., No.162, Sec. 4, Zhongxiao E. Rd., Da

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VERIFICATION OF COMPLIANCE

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Revision History

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ER/2016/10072	Rev.00	Initial creation of document	Feb. 19, 2016

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Table of Contents

1. GENERAL PRODUCT INFORMATION	6
1.1. Product Description.....	6
1.2. Product Feature of Equipment Under Test.....	7
1.3. Test Methodology of Applied Standards	8
1.4. Test Facility	8
1.5. Special Accessories	8
1.6. Equipment Modifications.....	8
2. SYSTEM TEST CONFIGURATION.....	9
2.1. EUT Configuration	9
2.2. EUT Exercise	9
2.3. Test Procedure.....	9
2.4. Measurement Results Explanation Example	10
2.5. Final Amplifier Voltage and Current Information:	10
2.6. Configuration of Tested System	11
3. SUMMARY OF TEST RESULTS.....	12
4. DESCRIPTION OF TEST MODES	13
4.1. The Worst Test Modes and Channel Details.....	13
5. MEASUREMENT UNCERTAINTY	14
6. RF CONDUCTED OUTPUT POWER MEASUREMENT	15
6.1. Standard Applicable	15
6.2. Test Set-up.....	15
6.3. Measurement Procedure	15
6.4. Measurement Equipment Used	16
6.5. Measurement Result.....	16
7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT	19
7.1. Standard Applicable	19
7.2. Test SET-UP	19
7.3. Measurement Procedure	21
7.4. Measurement Equipment Used	23
7.5. Measurement Result: (Peak) –using option of peak measurement	24
8. OCCUPIED BANDWIDTH MEASUREMENT.....	25
8.1. Standard Applicable	25

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8.2.	Test Set-up	25
8.3.	Measurement Procedure	25
8.4.	Measurement Equipment Used	26
8.5.	Measurement Result	27
9.	OUT OF BAND EMISSION AT ANTENNA TERMINALS	33
9.1.	Standard Applicable	33
9.2.	Test SET-UP	33
9.3.	Measurement Procedure	33
9.4.	Measurement Equipment Used	34
9.5.	Measurement Result:	34
10.	FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	39
10.1.	Standard Applicable	39
10.2.	EUT Setup	39
10.3.	Measurement Procedure:	40
10.4.	Measurement Equipment Used:	41
10.5.	Measurement Result:	42
11.	FREQUENCY STABILITY MEASUREMENT	45
11.1.	Standard Applicable:	45
11.2.	Test Set-up:	45
11.3.	Measurement Procedure:	45
11.4.	Measurement Equipment Used:	46
11.5.	Measurement Result:	47
12.	PEAK TO AVERAGE RATIO	48
12.1.	Standard Applicable	48
12.2.	Test SET-UP	48
12.3.	Measurement Procedure	48
12.4.	Measurement Equipment Used	48
12.5.	Measurement Result	49

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1. GENERAL PRODUCT INFORMATION

1.1. Product Description

General:

Product Name:	JUMPY Plus		
Brand Name:	JUMPY		
Marketing Name:	JUMPY Plus		
Model No.:	JR-02-W		
Model Difference:	N/A		
Software version:	000C		
Hardware version:	DVT		
USB Cable	Model No.: C-01-W Supplier: Foxlink		
Power Supply:	3.7Vdc from Li-ion Polymer rechargeable battery		
	Battery:	Model No.: 443031 Supplier: Highpower	
IMEI:	353454050001967		

GSM / WCDMA:

Cellular Phone Standards Frequency Range and Power	Operating Frequency		Rated Power
	WCDMA/HSUPA/HSDPA /HSPA+ Band II	1852.4MHz – 1907.6MHz	24dBm

Type of Emission:	WCDMA Band II	4M16F9W
	HSDPA Band II	4M22F9W
	HSUPA Band II	4M22F9W

Max ERP/EIRP Power Measurement Result:

	dBm		W
WCDMABAND II	23.79	EIRP	0.239
HSDPABAND II	21.33	EIRP	0.136
HSUPABAND II	21.32	EIRP	0.136

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1.2. Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting WCDMA, Wi-Fi 802.11b/g/n and Bluetooth features, and below is details of information.

Product Feature	
Product Name:	JUMPY Plus
Brand Name:	JUMPY
Marketing Name:	JUMPY Plus
Model No.:	JR-02-W
Model Difference:	N/A
FCC ID:	2ADZ9-JR-02-W
WCDMA Operating Band(s)	FDD Band II
Wi-Fi Specification	802.11b/g/n
Bluetooth Version	V4.1 Single mode

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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1.3. Test Methodology of Applied Standards

FCC 47 CFR Part 2, 24

ANSI / TIA / EIA 603C-C-2004

KDB971168 D01 Power Meas license Digital System v02r02

KDB941225 of the Output power Procedure of (SAR Measurement Procedures for 3G Devices, WCDMA / HSPA) was used for EUT and Base station setting.

TS 151 010-1 is used to set, and measure the output power.

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.

1.4. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803 (TAF code 0513)

FCC Registration Numbers are: 990257

Canada Registration Number: 4620A-5..

1.5. Special Accessories

No special accessories were used during testing.

1.6. Equipment Modifications

There were no modifications incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Measurement at Antenna Port

According to measurement procured TIA/EIA 603C, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured TIA/EIA 603C, The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

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2.4. 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 attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

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

Following shows an offset computation example with cable loss, splitter and attenuator.

High Band: Offset = RF cable loss (dB) + splitter(dB) + attenuation factor(dB)
=1.5+3.2+10=14.7(dB)

2.5. Final Amplifier Voltage and Current Information:

Test Mode	DC voltage (V)	DC current (mA)
WCDMA B2	3.7	322
HSUPA B2	3.7	352
HSDPA B2	3.7	365

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2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)

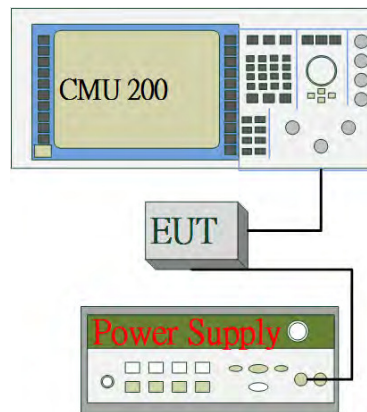


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)



Remote Side

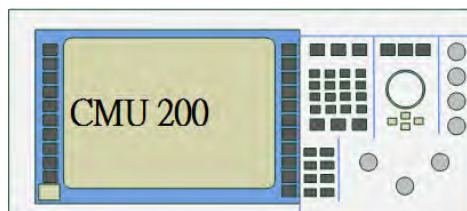


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Model No.	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Tester	R&S	CMU200	102189	shielded	Un-shielded
2.	DC Power Supply	HP	E3640A	KR93300208	N/A	Un-shielded

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §24.232(c)	EIRP measurement	Compliant
§2.1049(h)	Occupied Bandwidth	Compliant
§2.1051 §24.238(a)	Out of Band Emissions at Antenna Terminals and Band Edge	Compliant
§2.1053 §24.238(a)	Field Strength of Spurious Radiation	Compliant
§24.232(d)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §24.235	Frequency Stability	Compliant

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4. DESCRIPTION OF TEST MODES

4.1. The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

BAND	ERP/EIRP	RADIATED EMISSION
WCDMA/HSPA Band II	H-plan	H-plan

WCDMA/HSPA MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
EIRP	9262 to 9538	9262, 9400, 9583	WCDMA/HSPA Band II
FREQUENCY STABILITY	9262 to 9538	9400	WCDMA Band II
OCCUPIED BANDWIDTH	9262 to 9538	9400	WCDMA/HSPA Band II
PEAK TO AVERAGE RATIO	9262 to 9538	9262, 9400, 9583	WCDMA/HSPA Band II
BAND EDGE	9262 to 9538	9262, 9583	WCDMA Band II
CONDUCTED EMISSION	9262 to 9538	9262, 9400, 9583	WCDMA Band II
RADIATED EMISSION	9262 to 9538	9262, 9400, 9583	HSDPA Band II

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
99% Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	30MHz - 180MHz: +/- 3.37dB
	180MHz - 417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	30MHz - 167MHz: +/- 4.22dB
	167MHz - 500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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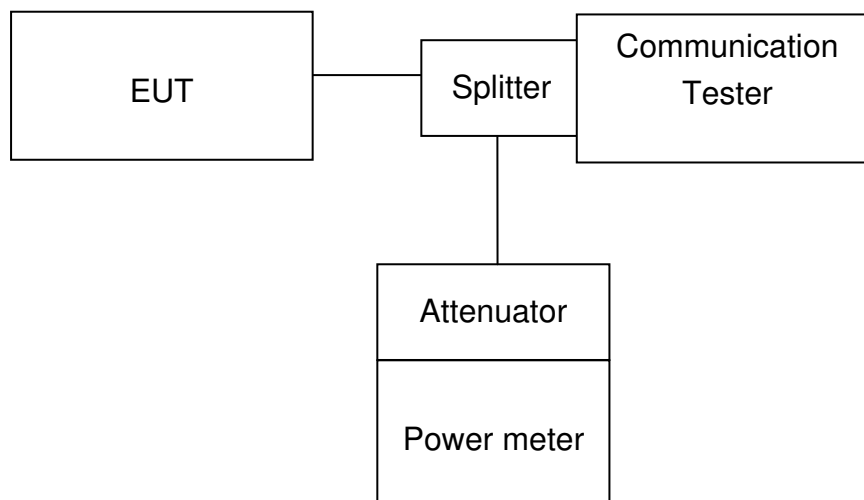
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6. RF CONDUCTED OUTPUT POWER MEASUREMENT

6.1. Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

6.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCDMA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results

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6.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016

6.5. Measurement Result

RF Conducted Output Power

WCDMA MODE:

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V8.4.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7). RMC 12.2kps is used for this testing.

Results:

EUT Mode	Frequency (MHz)	CH	Peak Power (dBm)	Avg. Power (dBm)
WCDMA Band II	1852.4	9262	24.98	21.72
	1880.0	9400	24.49	21.49
	1907.6	9538	24.74	21.35
HSDPA Band II	1852.4	9262	25.25	21.54
	1880.0	9400	24.98	21.49
	1907.6	9538	24.95	21.15
HSUPA Band II	1852.4	9262	24.90	21.04
	1880.0	9400	24.61	20.87
	1907.6	9538	24.49	20.63

Note: The results above reflect max power with all up bits.

Cable loss offset High Band: 1.5dB

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HSDPA Release 6 MODE:

The following 4 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C10.1.4 & C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing.

HSDPA SUB-TEST Setting

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH(FOR HSDPA)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)	RMC (Kbps)
1	2/15	15/15	64	2/15	4/15	0.0	0.0	12.2
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0	12.2
3	15/15	8/15	64	15/8	30/15	1.5	0.5	12.2
4	15/15	4/15	64	15/4	30/15	1.5	0.5	12.2

Note: The recommended HSDPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm) Channel			Power Class 3 Lim- itation (dBm)	Comments
		9262	9400	9538		
HSDPA (B2)	1	21.94	21.74	21.54	20.3dBm – 25.7dBm	Pass
	2	21.65	21.38	21.22	20.3dBm – 25.7dBm	Pass
	3	21.48	21.26	21.05	19.8dBm – 25.7dBm	Pass
	4	21.53	21.30	21.11	19.8dBm – 25.7dBm	Pass

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HSPA (HSDPA & HSUPA) Release 6 MODE

The following 5 Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V8.4.0 specification. All TX RMS power requirements for Power Class 3 were met according to table 5.2AA.5 and 5.2B.5 All UE channels and power ratio's are set according to table C11.1.3 in the 3GPP TS34.121-1 V8.4.0. RMC 12.2kps is used for this testing

HSPA SUB-TEST Setting

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH(FOR HSUPA)

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS}	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (Code s)	CM (dB)	MPR (dB)	AG Index	E-TFCI	RMC (Kbps)
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75	12.2
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67	12.2
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4 4	2	2.0	1.0	15	92	12.2
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71	12.2
5	15/15 (Note 4)	15/15 (Note 4)	64	15/15 (Note 4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81	12.2

Note: The recommended HSUPA MPRs are implemented as per following sub-tests.

Results:

Mode	Sub-test	Avg. Power (dBm)			Power Class 3 Limitation (dBm)	Comments
		9262	9400	9538		
HSUPA(B2)	1	21.68	21.42	21.26	18.8dBm – 25.7dBm	Pass
	2	19.74	19.50	19.30	16.8dBm – 25.7dBm	Pass
	3	20.65	20.48	20.29	17.8dBm – 25.7dBm	Pass
	4	19.79	19.56	19.38	16.8dBm – 25.7dBm	Pass
	5	21.54	21.25	21.15	18.8dBm – 25.7dBm	Pass

WCDMA/HSDPA/HSUPA band II, V

The EUT output power was controlled by simulator. Set Communication Tester CMU200 function key “UE Power Control” and enter max rated power 24dBm. The EUT is going to be set to max output power to 24dBm. Then record the read (see page 16 for measurement data) . The min. power was measures by a function key “minimum power” then record the read. It is -52.3dBm. The power variation can be 0.1dB step by setting.

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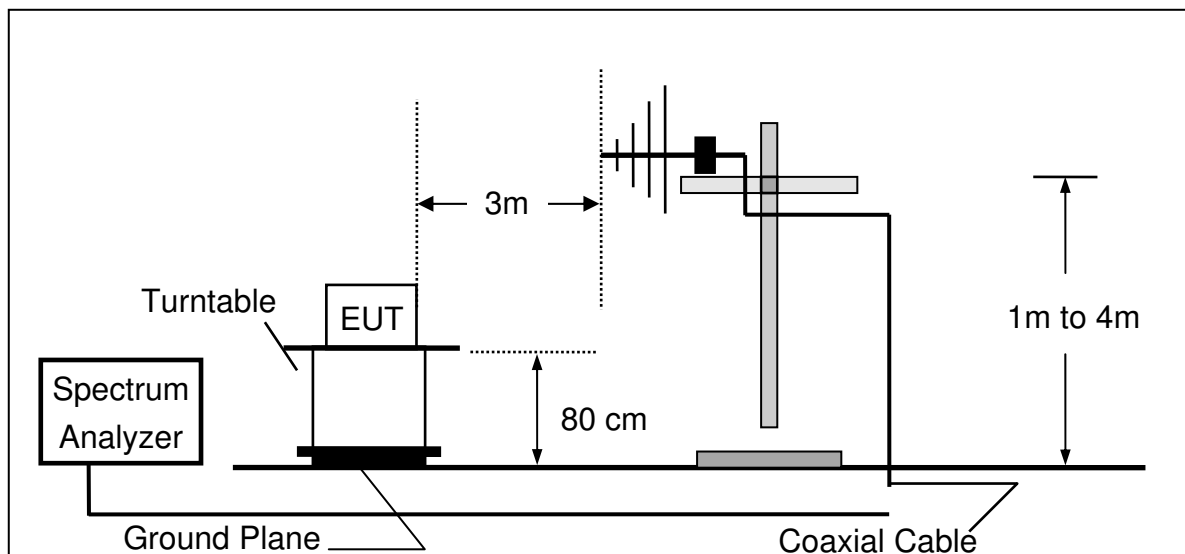
7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT

7.1. Standard Applicable

FCC 24.232(b) Mobile station is limited to 2W.

7.2. Test SET-UP

(A) Radiated Power Test Set-Up, Frequency Below 1000MHz



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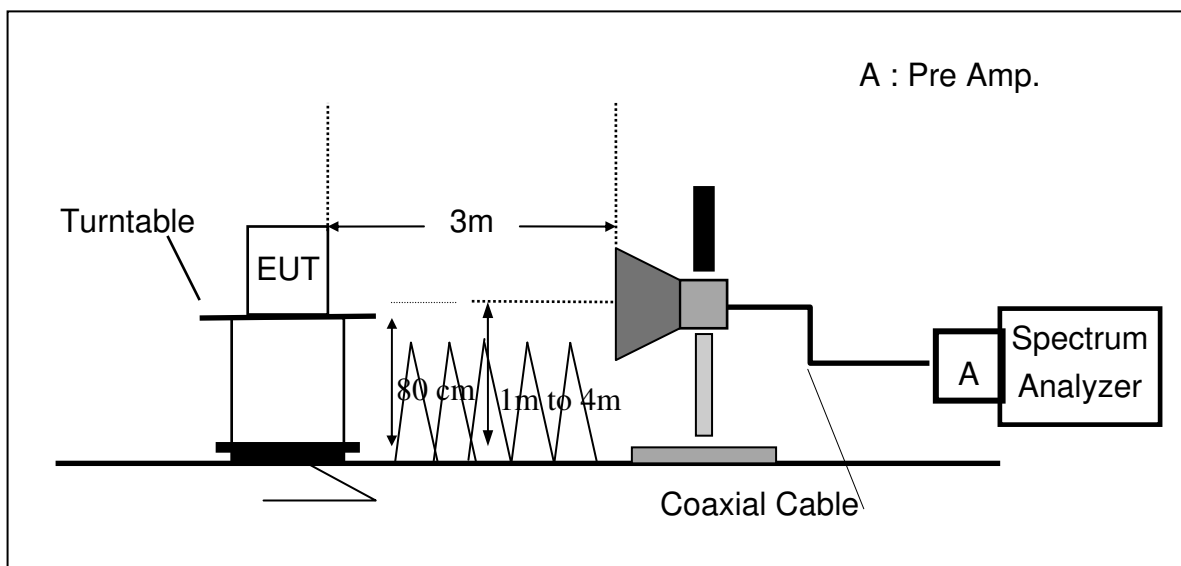
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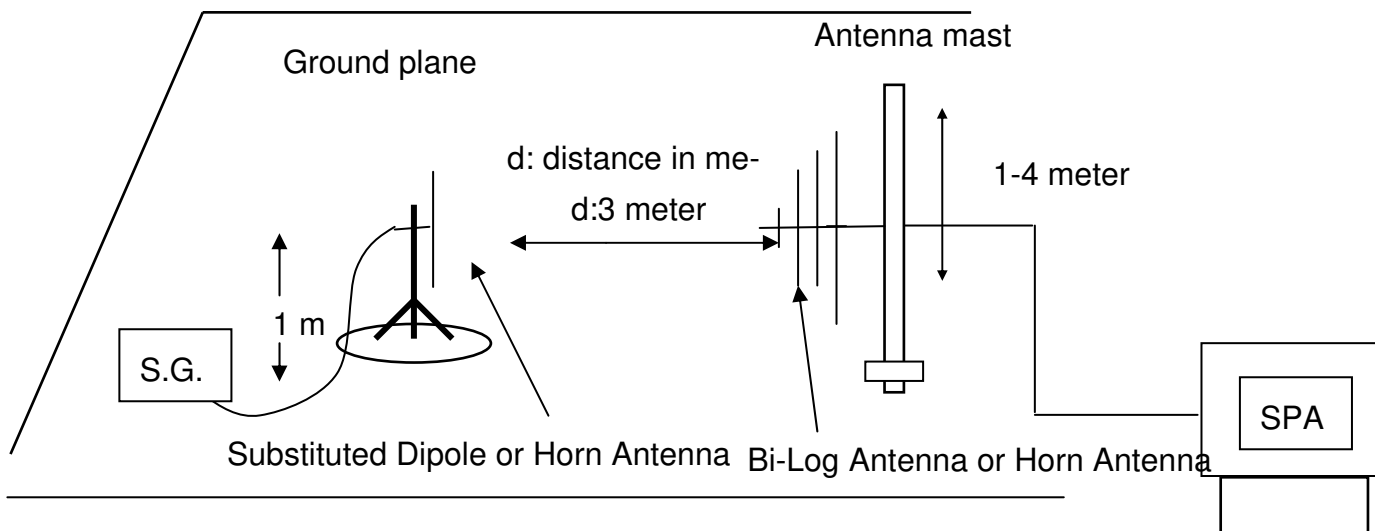
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(B) Radiated Power Test Set-UP Frequency Over 1 GHz



(C) Substituted Method Test Set-UP



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7.3. Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 971168 D01
2. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
3. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated.
4. The testing follows the Measurement Procedure of FCC KDB 971168 D01
5. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step b. Record the power level of S.G.
6. $EIRP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$
7. Spectrum setting:
 - (1) Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and $VBW \geq 3 \times RBW$.
 - (2) KDB 971168 D01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;
 Set span = 2 X occupied BW;
 Set RBW $\approx$ 1~5% of the span, not to exceed 1 MHz
 Set VBW = 3 x RBW;
 Select average power (RMS) detector
 Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt integration time (ex. Point = 601points, then sweep time = $601 \times 10^{-3} = 6s$).

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Activate trace averaging routine over a minimum of 10 sweeps;
Activate marker/span pair and set span = signal or channel bandwidth;
Activate the band/interval power marker function;
Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of $10 \cdot \log(TBW/RBW)$, where TBW is the transmission of UE exceeding the maximum BW UE can extend, and RBW is the resolution BW in spectrum.

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7.4. Measurement Equipment Used

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/04/2015	05/03/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/28/2016	01/27/2017
Bi-log Antenna	SCHWAZBECK	VULB9160	9160-3158	10/26/2015	10/25/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Horn antenna	ETS.LINDGREN	3117	123991	12/12/2015	12/11/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/02/2015	07/01/2016
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017

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7.5. Measurement Result: (Peak) –using option of peak measurement

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit

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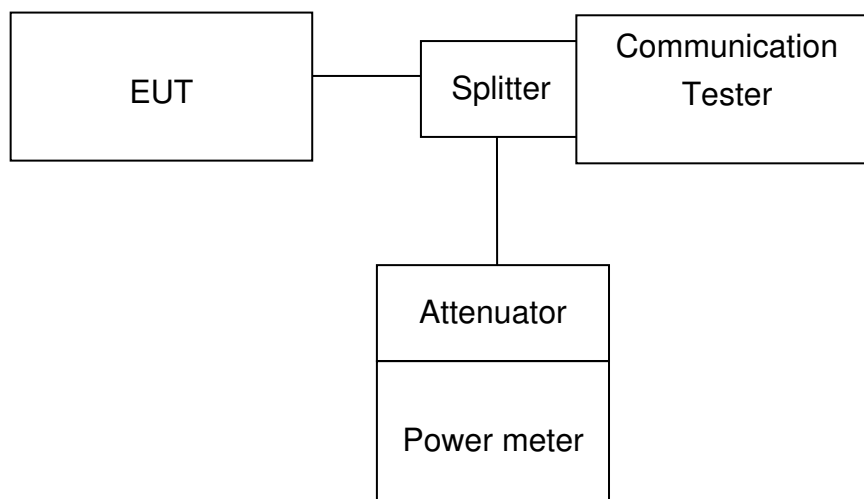
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8. OCCUPIED BANDWIDTH MEASUREMENT

8.1. Standard Applicable

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

8.2. Test Set-up



8.3. Measurement Procedure

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

NOTE: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 26dB BW is arrow-mark

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8.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016

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8.5. Measurement Result

Frequency (MHz)	CH	99% Bandwidth (MHz)	99% Bandwidth (MHz)	99% Bandwidth (MHz)
		WCDMA II	HSDPA II	HSUPA II
1852.4	9262	4.1589	4.2192	4.2175
1880	9400	4.1569	4.2088	4.2145
1907.6	9538	4.1481	4.2168	4.2098

Frequency (MHz)	CH	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)	26dB Bandwidth (MHz)
		WCDMA II	HSDPA II	HSUPA II
1852.4	9262	4.690	4.834	4.833
1880	9400	4.675	4.831	4.848
1907.6	9538	4.690	4.846	4.847

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99% & 26dB Bandwidth Test Data

WCDMA II Channel Low



WCDMA II Channel Mid



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WCDMA II Channel High



HSDPA II Channel Low



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HSDPA II Channel Mid



HSDPA II Channel High



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HSUPA II Channel Low



HSUPA II Channel Mid



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HSUPA II Channel High



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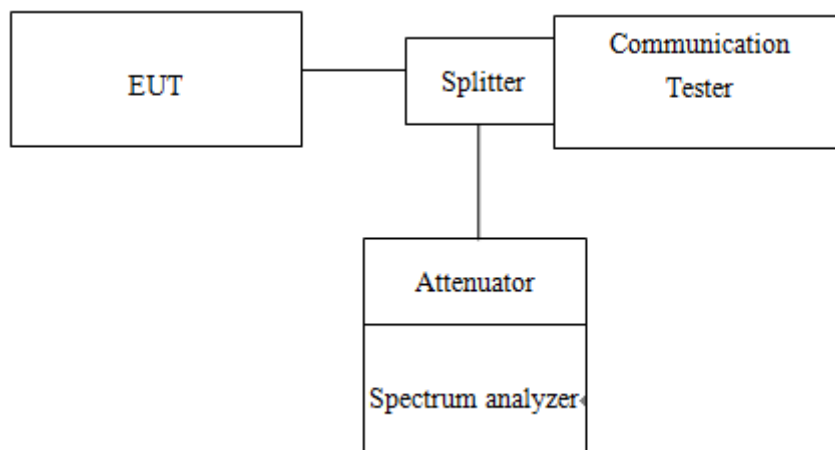
9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

9.1. Standard Applicable

FCC §22.917(a), §24.238(a), the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

§27.53 (m) (4) shall not be less than $55 + 10 \log$ (mean output power in watt) dBc below the mean power output outside a license's frequency block (-25dBm).

9.2. Test SET-UP



9.3. Measurement Procedure

Conducted Emission

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, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

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Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW $\geq$ 1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

9.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016

9.5. Measurement Result:

Refer to next pages.

NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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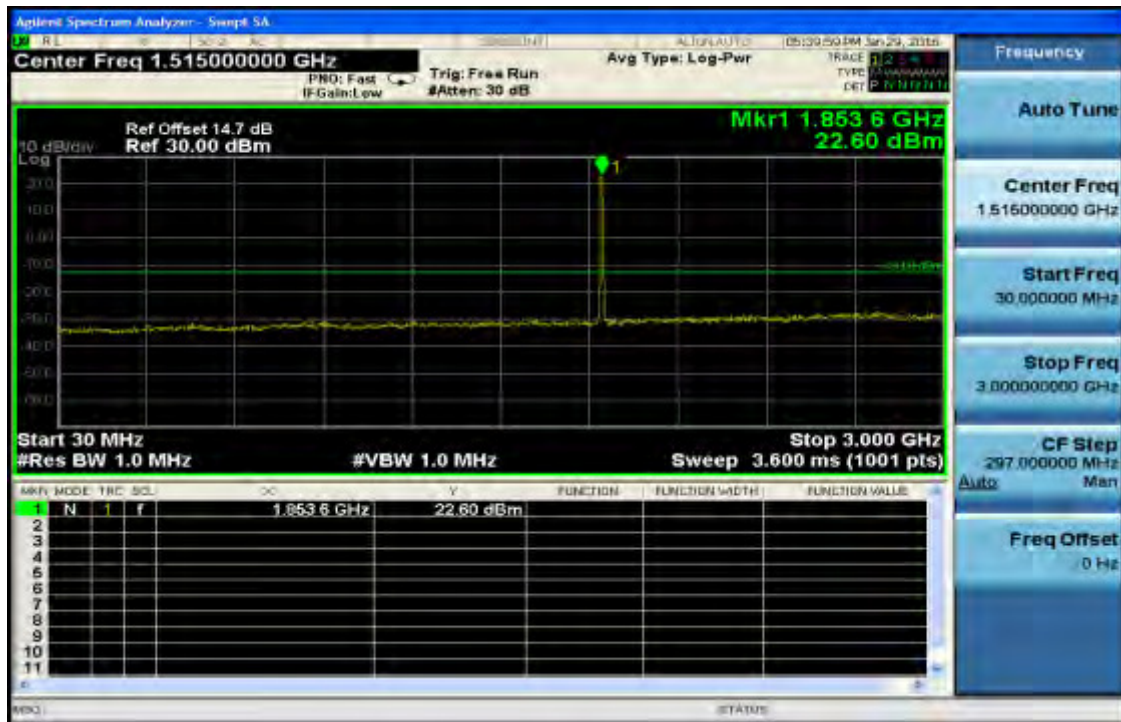
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Out of Band emission at antenna terminals – WCDMA II Channel Lowest



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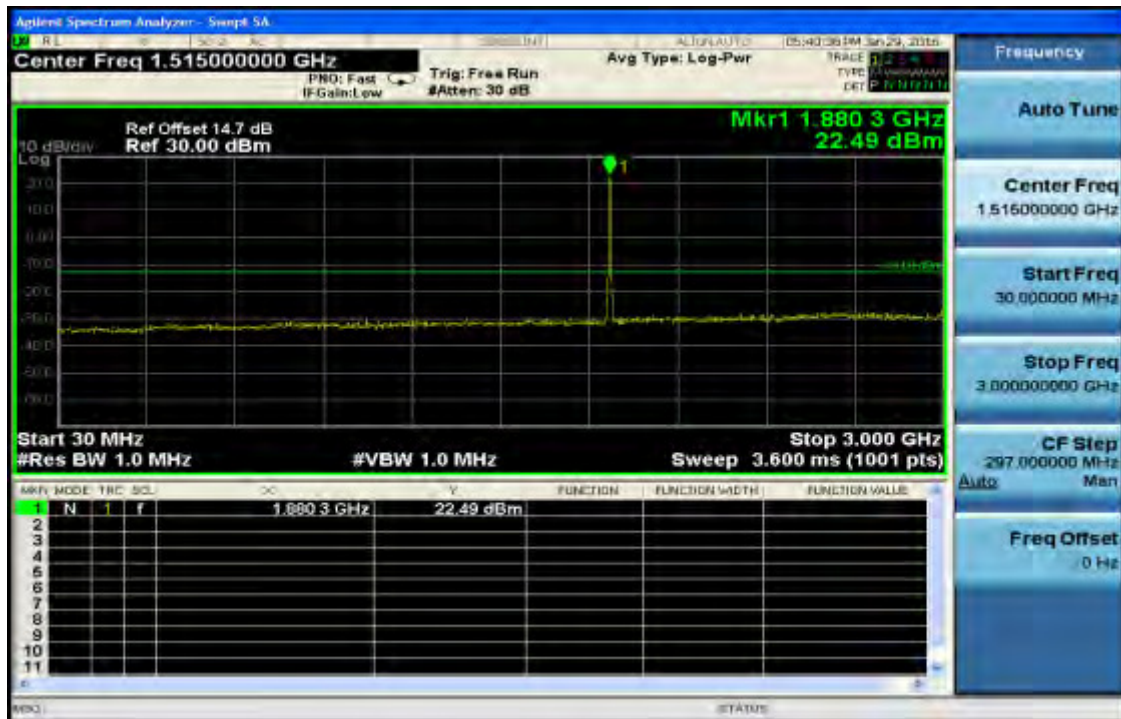
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Out of Band emission at antenna terminals – WCDMA II Channel Mid



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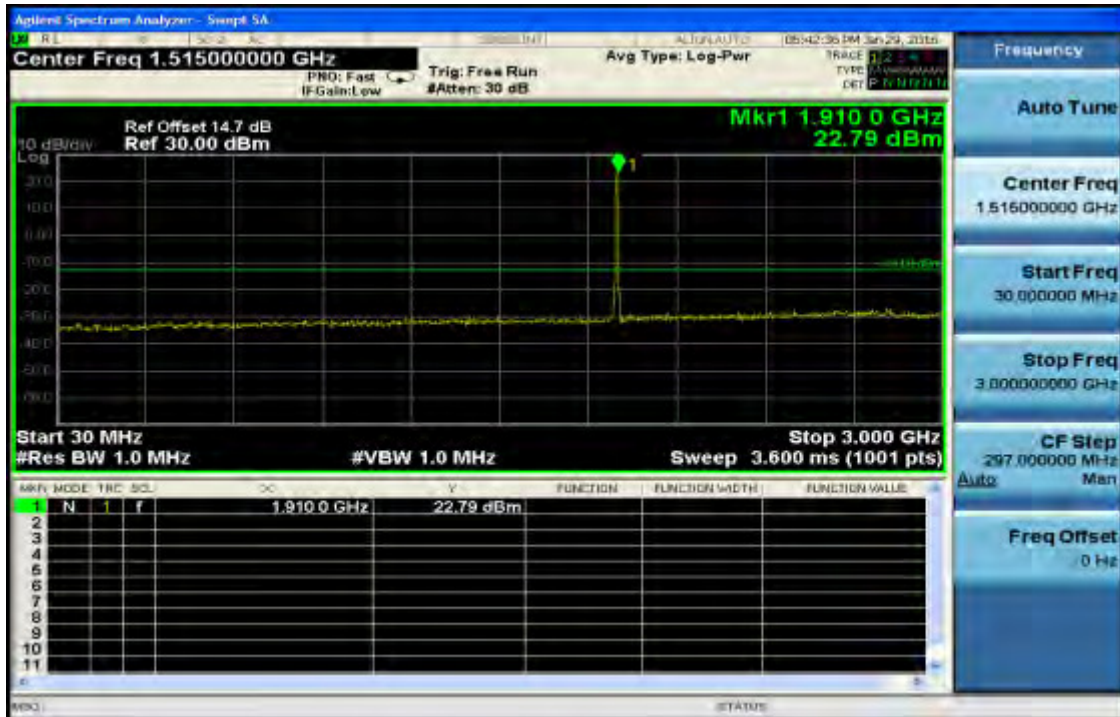
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Out of Band emission at antenna terminals – WCDMA II Channel Highest



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Band edge emission at antenna terminals – WCDMA II Channel Lowest



Band edge emission at antenna terminals – WCDMA II Channel Highest



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10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

10.1. Standard Applicable

According to FCC §2.1053,

FCC §22.917(a) , §24.238(a) , §27.53(g)(h) , §90.691(a)(1) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

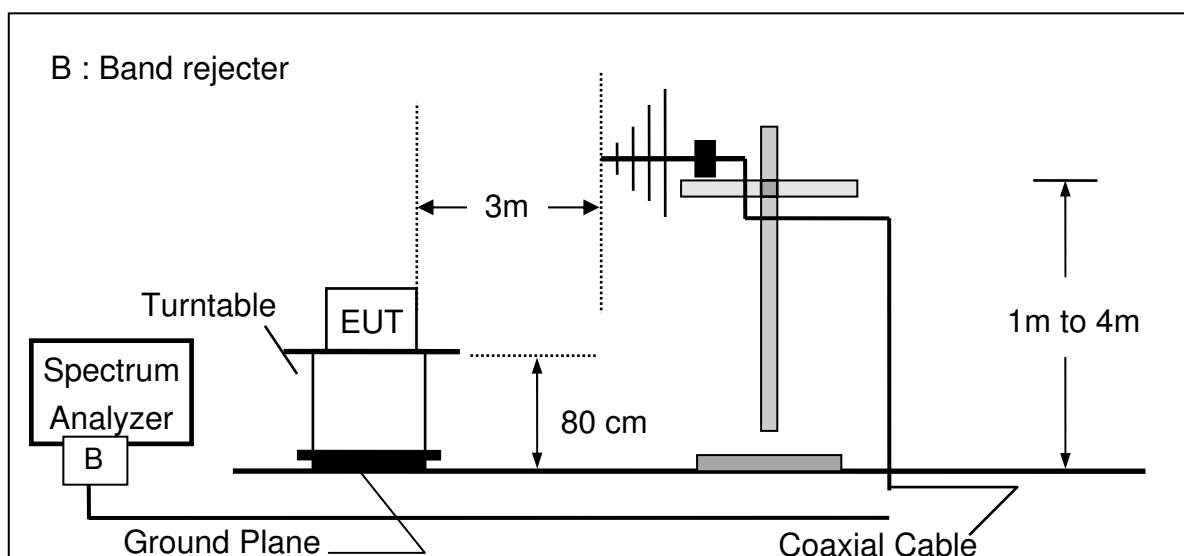
FCC §27.53 (m) (4) shall not be less than $55 + 10 \log$ (mean output power in watt) dBc below the mean power output outside a license's frequency block (-25dBm).

§27.53 (c) (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

§27.53 (f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

10.2. EUT Setup

Radiated Emission Test Set-Up, Frequency Below 1000MHz



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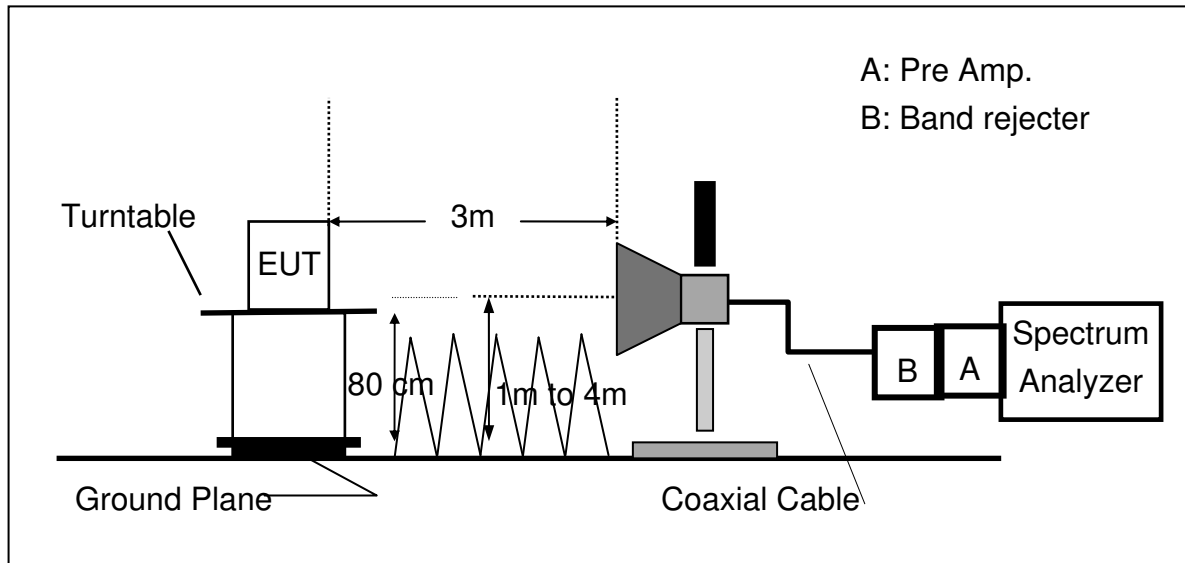
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Radiated Emission Test Set-UP Frequency Over 1 GHz



10.3. Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

$$\text{ERP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBd)} - \text{Cable Loss (dB)}$$

$$\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable Loss (dB)}$$

$$\text{EIRP (dBm)} = \text{SG Level (dBm)} + \text{Antenna Gain (dBi)} + \text{Cable Loss (dB)}$$

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.
“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.
“---” : denotes Noise Floor.

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10.4. Measurement Equipment Used:

ERP, EIRP MEASUREMENT EQUIPMENT List 966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/04/2015	05/03/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/28/2016	01/27/2017
Bi-log Antenna	SCHWAZBECK	VULB9160	9160-3158	10/26/2015	10/25/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Horn antenna	ETS.LINDGREN	3117	123991	12/12/2015	12/11/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/02/2015	07/01/2016
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017

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10.5. Measurement Result:

Radiated Spurious Emission Measurement Result: WCDMA II Mode

Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:04
Fundamental Frequency :	1852.4 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH LOW	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
53.28	S	-48.72	-39.37	-8.29	-1.06	-13.00	-35.72
216.24	S	-61.24	-65.10	5.55	-1.69	-13.00	-48.24
256.01	S	-61.28	-65.25	5.73	-1.77	-13.00	-48.28
337.49	S	-60.01	-64.02	5.95	-1.95	-13.00	-47.01
534.40	S	-63.89	-67.16	5.82	-2.54	-13.00	-50.89
752.65	S	-60.03	-62.31	5.34	-3.06	-13.00	-47.03
3704.80	H	-52.02	-57.88	12.44	-6.58	-13.00	-39.02

Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:08
Fundamental Frequency :	1852.4 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH LOW	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
52.31	S	-56.35	-46.75	-8.55	-1.05	-13.00	-43.35
220.12	S	-63.69	-67.46	5.48	-1.70	-13.00	-50.69
253.10	S	-61.11	-65.01	5.66	-1.76	-13.00	-48.11
367.56	S	-58.84	-62.65	6.00	-2.18	-13.00	-45.84
515.00	S	-65.83	-69.40	5.92	-2.36	-13.00	-52.83
791.45	S	-62.17	-64.73	5.47	-2.90	-13.00	-49.17
3704.80	H	-50.44	-56.30	12.44	-6.58	-13.00	-37.44

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Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:12
Fundamental Frequency :	1880 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH MID	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
52.31	S	-49.26	-39.66	-8.55	-1.05	-13.00	-36.26
220.12	S	-61.68	-65.46	5.48	-1.70	-13.00	-48.68
257.95	S	-60.55	-64.57	5.78	-1.77	-13.00	-47.55
353.01	S	-60.73	-64.67	6.01	-2.07	-13.00	-47.73
547.01	S	-64.53	-67.61	5.75	-2.67	-13.00	-51.53
750.71	S	-61.13	-63.39	5.33	-3.07	-13.00	-48.13
3760.00	H	-52.31	-58.16	12.45	-6.60	-13.00	-39.31

Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:16
Fundamental Frequency :	1880 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH MID	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
52.31	S	-57.30	-47.69	-8.55	-1.05	-13.00	-44.30
220.12	S	-61.80	-65.58	5.48	-1.70	-13.00	-48.80
248.25	S	-61.15	-64.96	5.56	-1.75	-13.00	-48.15
371.44	S	-60.11	-63.90	5.99	-2.21	-13.00	-47.11
542.16	S	-65.59	-68.75	5.78	-2.62	-13.00	-52.59
794.36	S	-62.18	-64.75	5.47	-2.90	-13.00	-49.18
3760.00	H	-49.02	-54.88	12.45	-6.60	-13.00	-36.02

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Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:20
Fundamental Frequency :	1907.6 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH HIGH	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
53.28	S	-48.63	-39.28	-8.29	-1.06	-13.00	-35.63
217.21	S	-61.38	-65.21	5.53	-1.69	-13.00	-48.38
256.01	S	-60.77	-64.74	5.73	-1.77	-13.00	-47.77
345.25	S	-59.71	-63.69	5.99	-2.01	-13.00	-46.71
542.16	S	-63.78	-66.93	5.78	-2.62	-13.00	-50.78
740.04	S	-61.07	-63.24	5.31	-3.14	-13.00	-48.07
3815.20	H	-52.49	-58.33	12.46	-6.63	-13.00	-39.49

Operation Mode :	HSDPA B2	Test Date :	02/04/2016 11:00:23
Fundamental Frequency :	1907.6 MHz	Temp. / Humi. :	21 deg_C / 61 RH
Operation Band :	Tx CH HIGH	Test Engineer :	Tin
EUT Pol. :	H Plane	Measurement Antenna Pol. :	HORIZONTAL

Freq.	Note	EIRP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	Level dBm	Level dBm	Gain dBi	Loss dB	@3m dBm	dB
52.31	S	-56.20	-46.59	-8.55	-1.05	-13.00	-43.20
220.12	S	-61.72	-65.49	5.48	-1.70	-13.00	-48.72
248.25	S	-61.45	-65.26	5.56	-1.75	-13.00	-48.45
376.29	S	-59.43	-63.18	5.99	-2.24	-13.00	-46.43
515.00	S	-65.43	-68.99	5.92	-2.36	-13.00	-52.43
742.95	S	-62.09	-64.28	5.32	-3.12	-13.00	-49.09
3815.20	H	-50.74	-56.57	12.46	-6.63	-13.00	-37.74

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11. FREQUENCY STABILITY MEASUREMENT

11.1. Standard Applicable:

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

11.2. Test Set-up:

Note: Measurement setup for testing on Antenna connector

11.3. Measurement Procedure:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Set chamber temperature to 25

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11.4. Measurement Equipment Used:

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016

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11.5. Measurement Result:

FREQUENCY ERROR vs. VOLTAGE

Reference Frequency: WCDMA Mid Channel 1880 MHz				
Limit: +/- 2.5 ppm = 4700 Hz				
Power Supply Vdc	Environment Temperature (	Frequency	Delta (Hz)	Limit (Hz)

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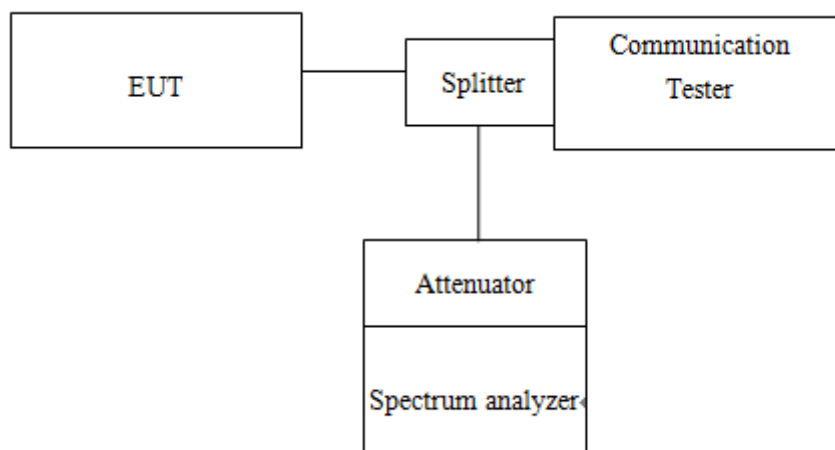
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12. PEAK TO AVERAGE RATIO

12.1. Standard Applicable

The peak-to-average ration (PAR) of the transmission may not exceed 13dB.

12.2. Test SET-UP



12.3. Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly:
2. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth; & internal = 1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

12.4. Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
Radio Communication Analyzer	R&S	CMU200	102189	02/11/2016	02/10/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/06/2015	05/05/2016

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12.5. Measurement Result

Tabular Results:

Frequency (MHz)	CH	Peak-to-Average Ratio (dB)		
		WCDMA II	HSDPA II	HSUPA II
1850.20	9262	3.87	3.63	3.63
1880.00	9400	3.68	3.73	3.58
1909.80	9538	4.02	3.76	3.61

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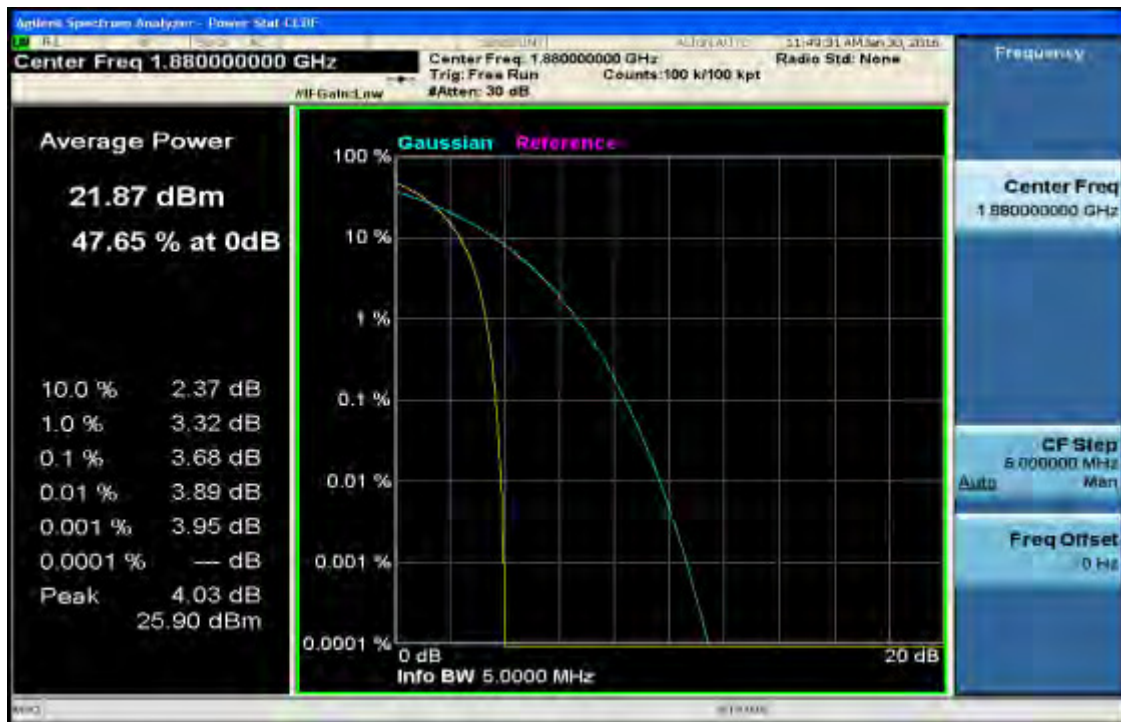
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Measurement Results:

WCDMA Band II Channel Low



WCDMA Band II Channel Mid



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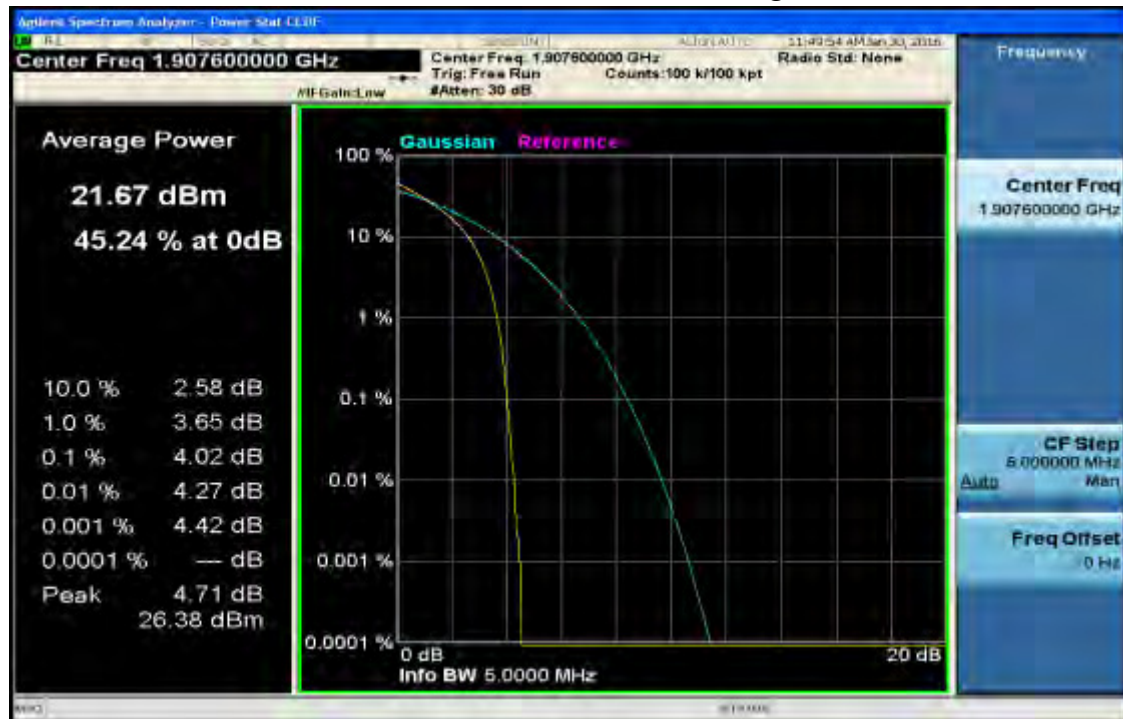
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WCDMA Band II Channel High



HSDPA Band II Channel Low



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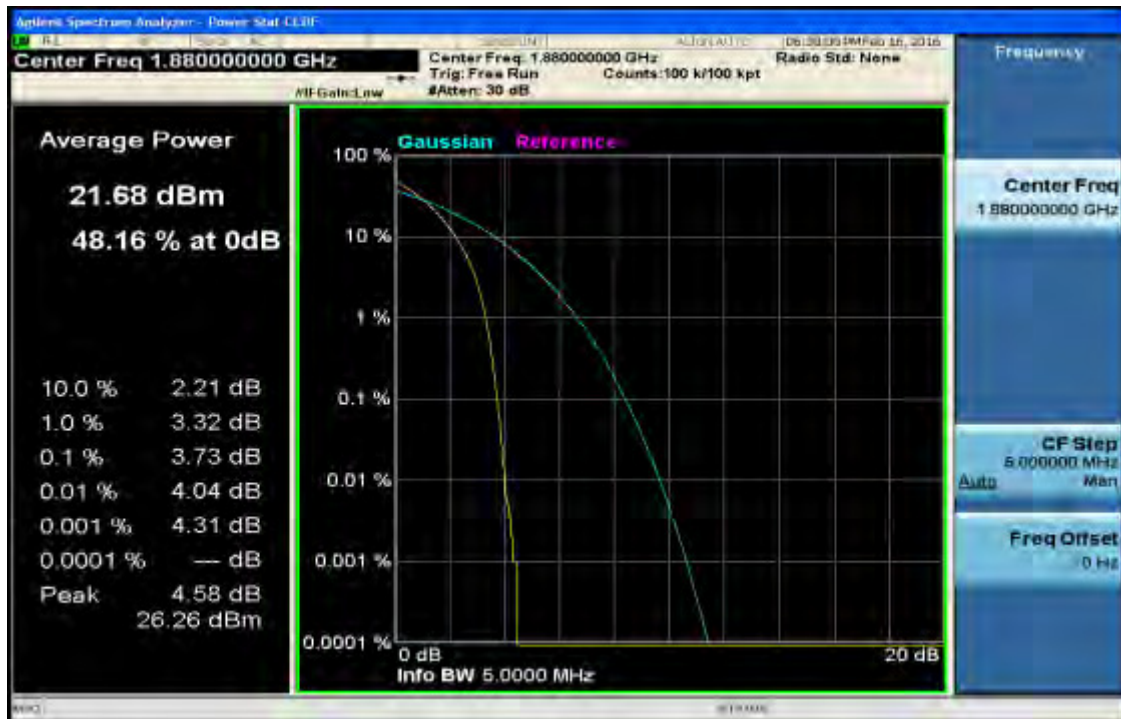
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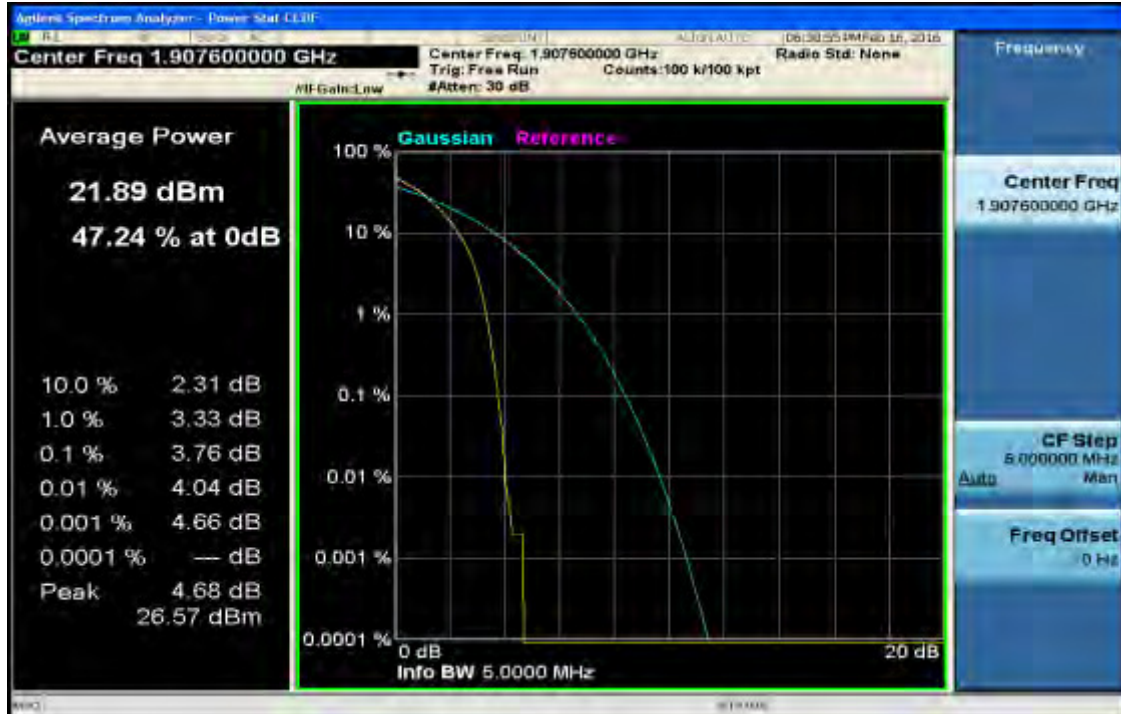
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HSDPA Band II Channel Mid



HSDPA Band II Channel High



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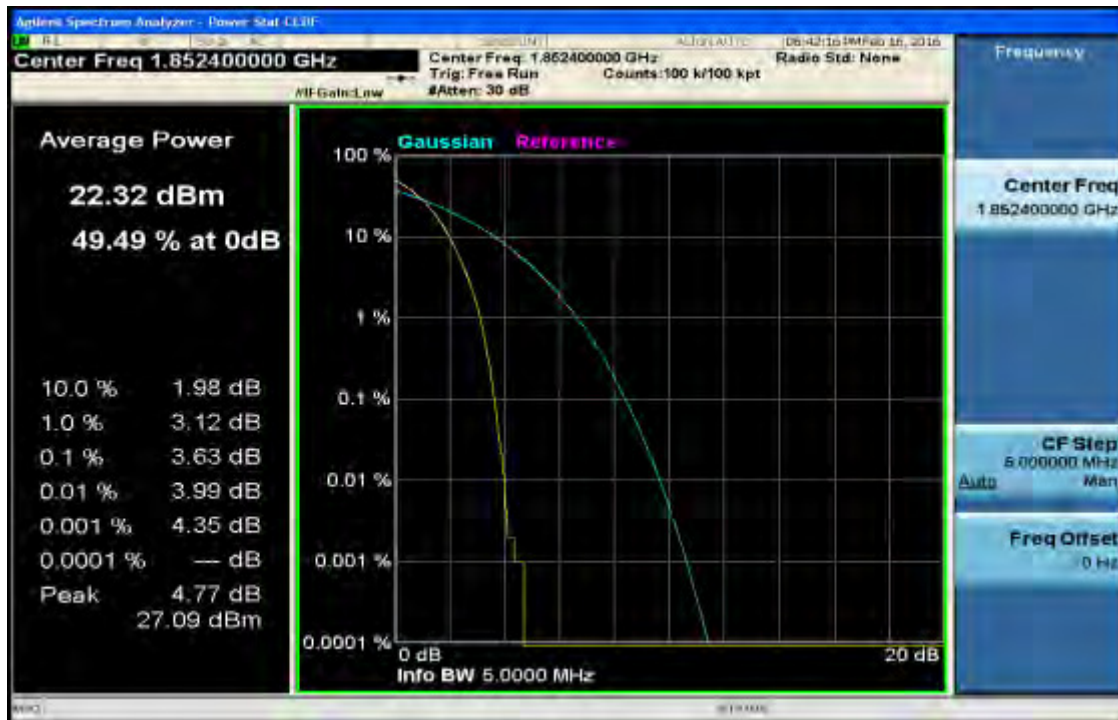
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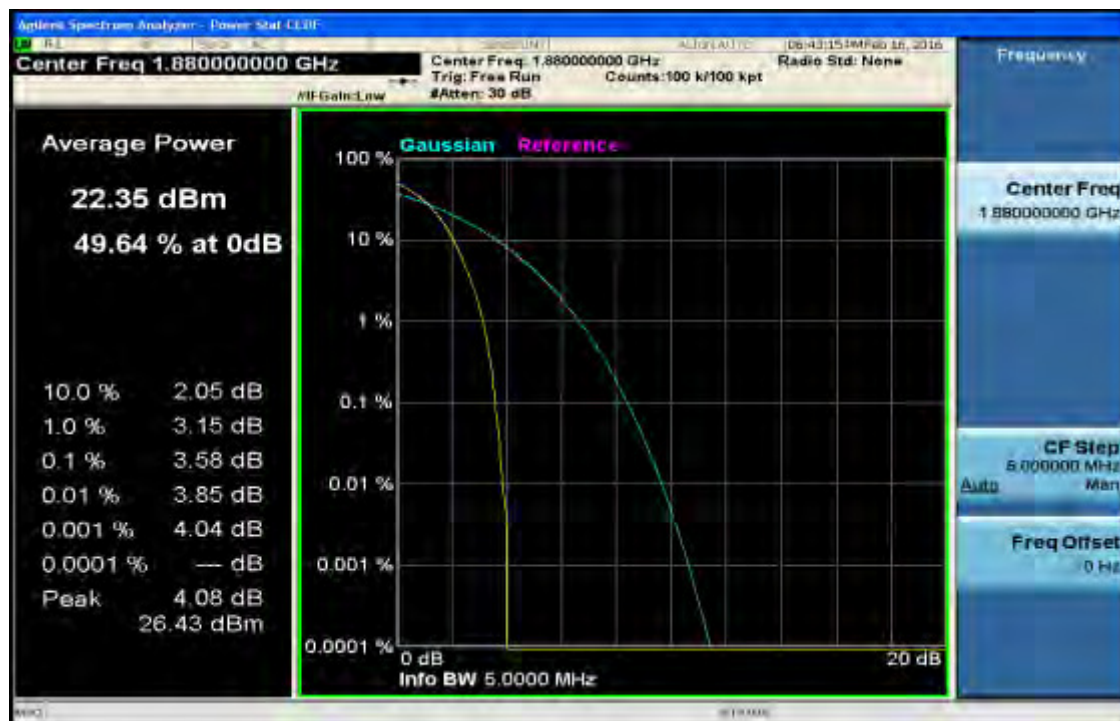
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HSUPA Band II Channel Low



HSUPA Band II Channel Mid



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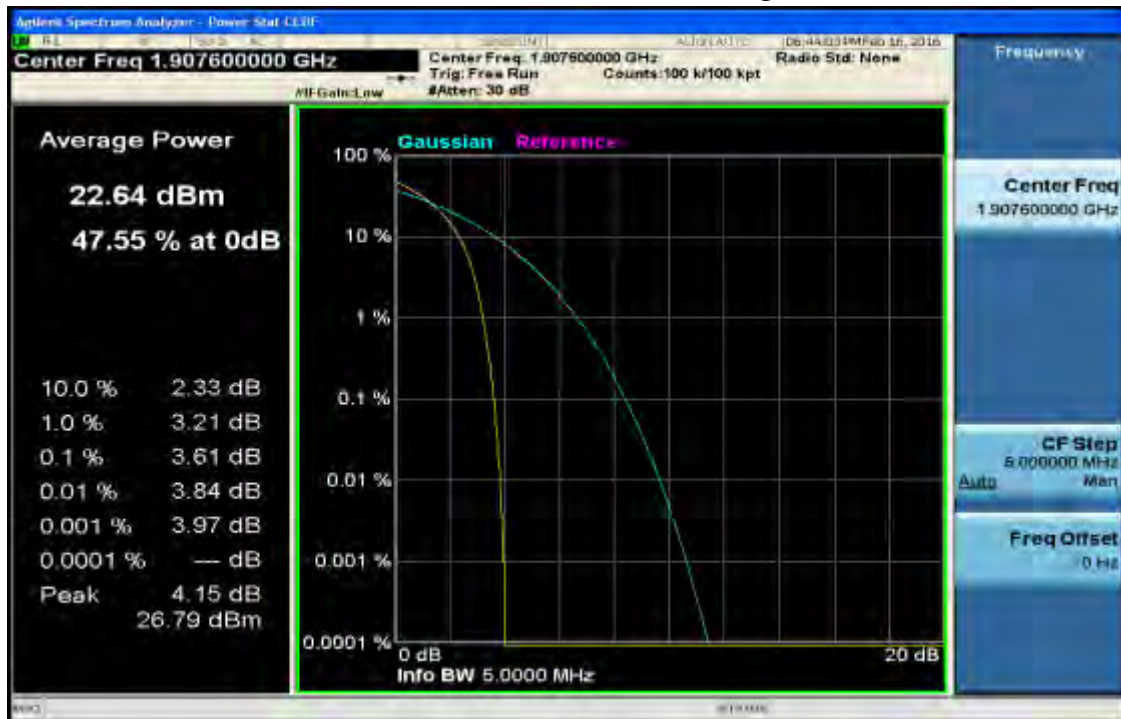
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