FCC 47 CFR PART 22 subpart H

CERTIFICATION TEST REPORT

For

DATA Concentrator Unit

MODEL NUMBER: AJ102

FCC ID: 2AQPUAJ102

REPORT NUMBER: 4788510969.1-4

ISSUE DATE: September 06, 2018

Prepared for

Lin Man Power Technology Inc.,
No.6 3rd street, Meridian Industrial Complex Balibago, Sta. Rosa City , Laguna，Philippine.

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/02/2018	Initial Issue	
1.0	09/06/2018	Retest the OBW of Mid Channel.	Jacky Jiang

Summary of Test Results			
Standard(s) Section FCC	Description	Requirements	Result
§22.913	Effective(Isotropic) Radiated Power of Transmitter	FCC: ERP ≤ 7 W	PASS
§24.232(d)	Peak to Average Radio	≤13dB	PASS
§2.1049(h), §22.917,	Occupied Bandwidth	OBW: No limit EBW: No limit	PASS
§ 2.1051, § 22.917,	Band Edge Compliance	≤ 43+10log$_{10}$(P[W])/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	PASS
§2.1051, §22.917,	Spurious Emission at Antenna Terminal	≤ 43+10log$_{10}$(P[W])/100 kHz, from 9 kHz to 10th harmonics but outside authorized operating frequency ranges.	PASS
§2.1053, §22.917,	Radiated Spurious Emissions	≤ 43+10log$_{10}$(P[W])	PASS
§2.1055, §22.355,	Frequency Stability	≤ ±2.5ppm	PASS

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Lin Man Power Technology Inc.,
Address:	No.6 3rd street, Meridian Industrial Complex Balibago, Sta. Rosa City , Laguna， Philippine.

Manufacturer Information

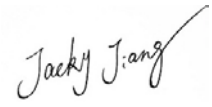
Company Name:	Lin Man Power Technology Inc.,
Address:	No.6 3rd street, Meridian Industrial Complex Balibago, Sta. Rosa City , Laguna， Philippine.

EUT Description

Product Name	Data Concentrator Unit
Brand Name	ENERTEK
Model Name	AJ102
FCC ID	2AQPUAJ102
Date Tested	July 9, 2018~ September 6, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC 47 CFR PART 22 Subpart H	PASS

Tested By:



Jacky Jiang
Engineer Project Associate

Check By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.26-2015 & KDB971168, FCC CFR 47 Part 2, Part 22.

3. FACILITIES AND ACCREDITATIO

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **IC(Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note 1: All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China

Note 2: The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Uncertainty for Conduction emission test	3.32dB (150KHz-30MHz)
	3.72dB (9KHz-150KHz)
Uncertainty for Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	4.10dB(1-6GHz)
	4.40dB (6GHz-18Gz)
	3.54dB (18GHz-26Gz)
Bandwidth	1.1%
Stop Transmitting Time Test	0.6%
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	Data Concentrator Unit	
Model Name	AJ102	
Power Input	3x230V/400V (80% to 120% Un)	
Hardware Version	V5.1	
Software Version	Main application	V2316
	RF application	V3011

5.2. TECHNICAL INFORMATION

	☒ WCDMA Band V	824 MHz ~ 849 MHz (Uplink)	
		869 MHz ~ 894 MHz (Downlink)	
Modulation Mode	QPSK		
WCDMA Release Version	WCDMA Release 99		
HSDPA Release Version	Release 5	HSUPA Release Version	/

5.1. MAXIMUM OUTPUT POWER

Band :WCDMA Band V	Average Power [dBm]		
Channel	4,132	4,182	4,233
Frequency (MHz)	826.4	836.4	846.6
RMC 12.2K	23.64	23.62	23.55
HSDPA Subtest-1	23.72	23.73	23.78
HSDPA Subtest-2	23.70	23.74	23.63
HSDPA Subtest-3	23.43	23.44	23.22
HSDPA Subtest-4	23.46	23.43	23.19

5.2. OPERATING CONDITION OF EUT

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission (Y plane).

Test Mode	Test Modes Description
UMTS/TM1	UMTS system, WCDMA, QPSK modulation

Note: If no any other statement, UMTS/TM1 shall be used RCM 12.2K mode.

5.3. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	52%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	25 °C
Voltage :	VL	184V
	VN	230V
	VH	276V

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.4. TEST CHANNEL LIST

Bands	Channel	Frequency	
		Channel Number	(MHz)
WCDMA Band 5	Low	4132	826.4
	Mid	4182	836.4
	High	4233	846.6

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
	WCDMA Band V	Internal Antenna	2.0

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	FCC ID
1	N/A	N/A	N/A	N/A

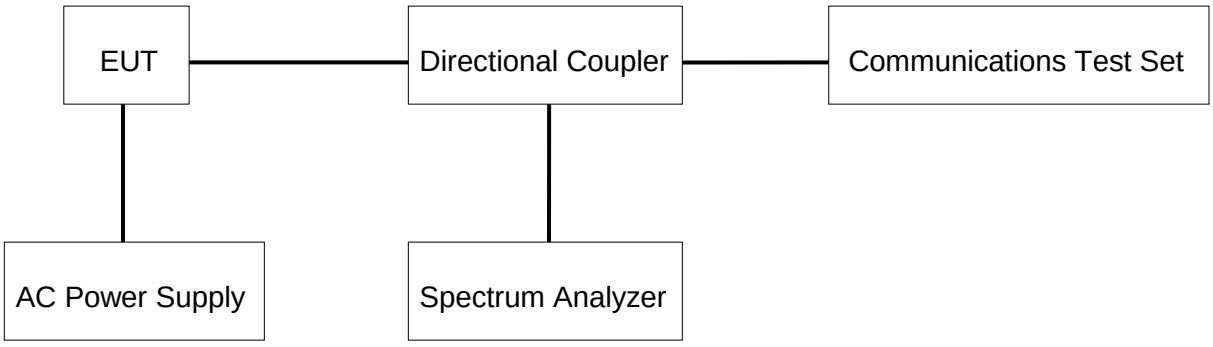
I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

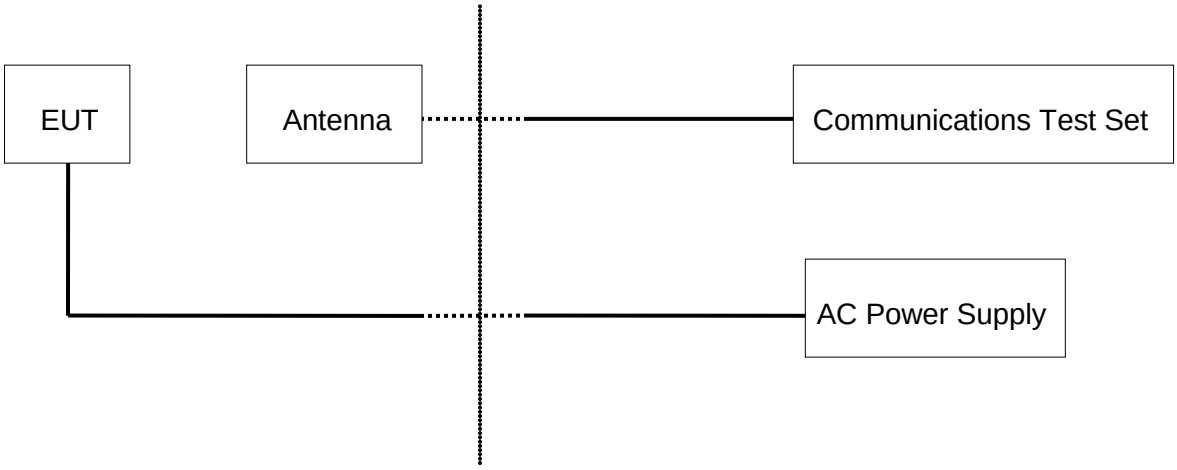
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

CONDUCTED TEST SETUP



RADIATED TEST SETUP



5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Conducted Emissions							
Instrument							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
☑	Two-Line V-Network	R&S	ENV216	101983	Dec.20, 2016	Dec.12, 2017	Dec.11, 2018
☑	Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Feb.10, 2017	Dec.12, 2017	Dec.11, 2018
☑	Wideband Radio Communication Tester	R&S	CMW500	155523	Dec.20, 2016	Dec.13, 2017	Dec.12, 2018
Software							
Used	Description			Manufacturer	Name	Version	
☑	Test Software for Conducted disturbance			Farad	EZ-EMC	Ver. UL-3A1	
Radiated Emissions							
Instrument							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Feb. 24, 2017	Dec.12, 2017	Dec.11, 2018
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Jan.09, 2016	Jan.09, 2016	Jan.09, 2019
☑	Preamplifier	HP	8447D	2944A09099	Feb. 13, 2017	Dec.12, 2017	Dec.11, 2018
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
☑	Horn Antenna	TDK	HRN-0118	130939	Jan. 09, 2016	Jan. 09, 2016	Jan. 09, 2019
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Jan.06, 2016	Jan.06, 2016	Jan.06, 2019
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00066	Jan. 14, 2017	Dec.12, 2017	Dec.11, 2018
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
☑	Loop antenna	Schwarzbeck	1519B	00008	Mar. 26, 2016	Mar. 26, 2016	Mar. 26, 2019
Software							
Used	Description			Manufacturer	Name	Version	
☑	Test Software for Radiated disturbance			Farad	EZ-EMC	Ver. UL-3A1	
Other instruments							
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	Keysight	N9030A	MY554105 12	Dec. 20, 2016	Dec.12, 2017	Dec.11, 2018
☑	Power Meter	Keysight	N9031A	MY554160 24	Dec. 20, 2016	Dec.13, 2017	Dec.12, 2018
☑	Thermostatic and Humidistatic Box	SANMOOD	SG-80-CC-2	2088	Feb.14,2017	Dec.22,2017	Dec.22,2018

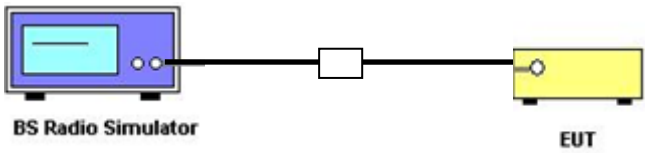
6. FCC PART 2, PART 22H REQUIREMENTS

6.1 CONDUCTED RF OUTPUT POWER

REQUIREMENT

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 the dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range. The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

TEST SETUP



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.

TEST RESULTS

WCDMA Band V Conducted Power Test Verdict

Test Mode	Conducted Power(dBm)		
	Channel 4132	Channel 4182	Channel 4233
	Average	Average	Average
UMTS/TM1 (RMC 12.2K)	23.64	23.62	23.55
UMTS/TM1 (HSDPA Subtest-1)	23.72	23.73	23.78
UMTS/TM1 (HSDPA Subtest-2)	23.70	23.74	23.63
UMTS/TM1 (HSDPA Subtest-3)	23.43	23.44	23.22
UMTS/TM1 (HSDPA Subtest-4)	23.46	23.43	23.19

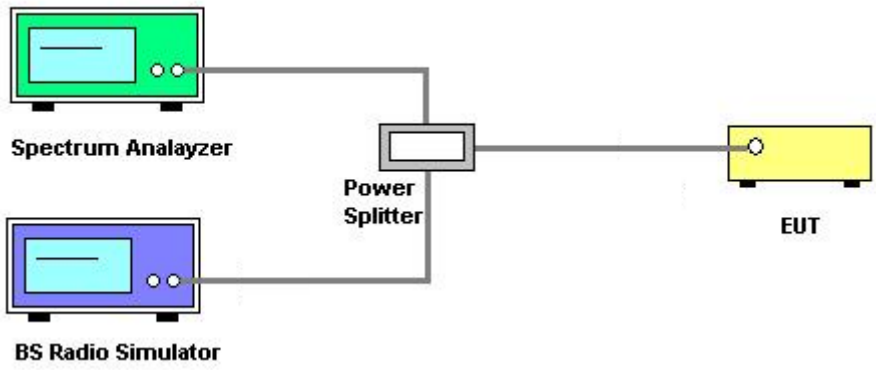
6.2 PEAK TO AVERAGE RADIO

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 13dB.

TEST SETUP



TEST PROCEDURES

1. The EUT was connected to spectrum and system simulator via a power divider.

2. For UMTS signals, set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.

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

4. Record the deviation as Peak to Average Ratio.

TEST RESULTS

Test Result of WCDMA Band V Test Verdict:

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
WCDMA V	UMTS/TM1	Channel 4132	3.04	13	PASS
		Channel 4182	3.03	13	PASS
		Channel 4233	2.77	13	PASS

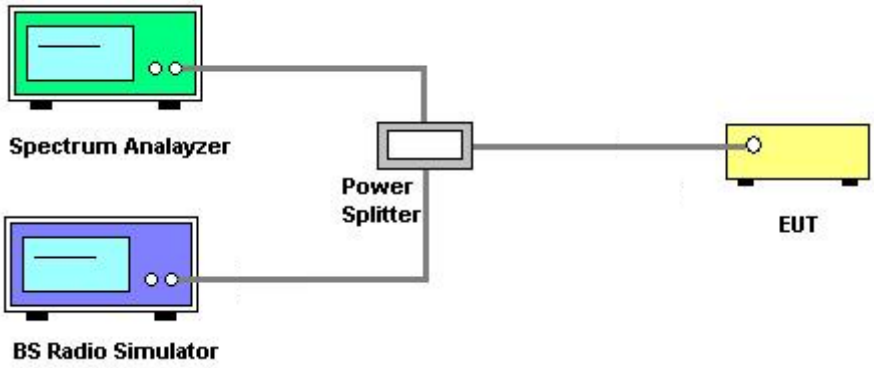
6.3 99% OCCUPIED BANDWIDTH AND 26DB BANDWIDTH

DEFINITION

The 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 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

TEST SETUP



TEST PROCEDURES

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

2. The 26dB and 99% occupied bandwidth (BW) of the middle channel for the highest RF power with full RB sizes were measured.

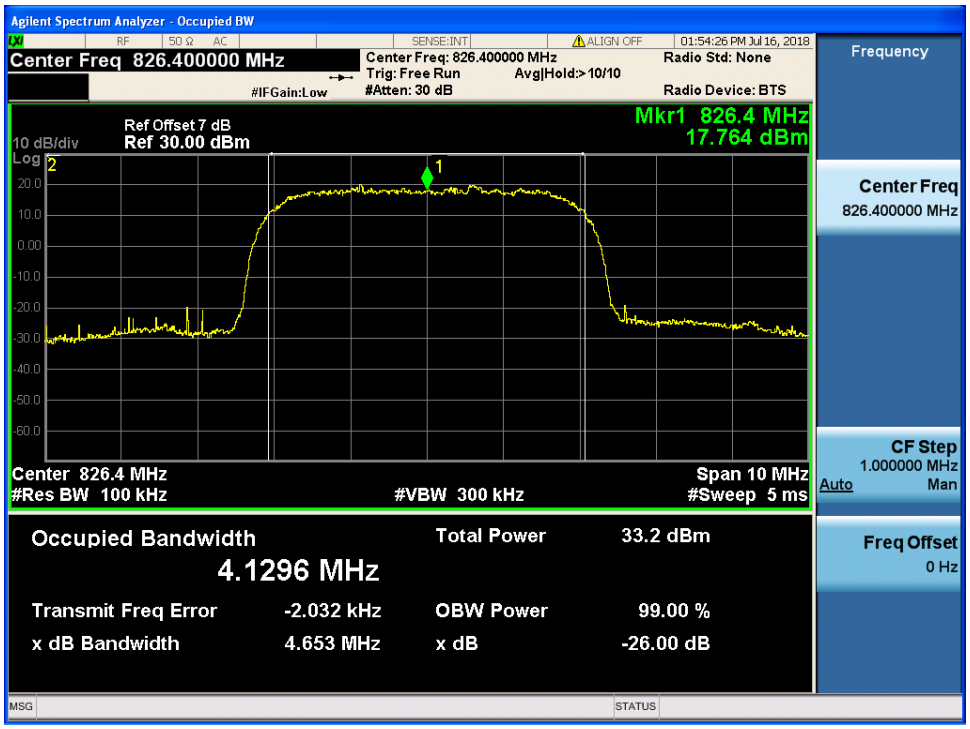
TEST RESULT

Test Result of WCDMA Band V Test Verdict:

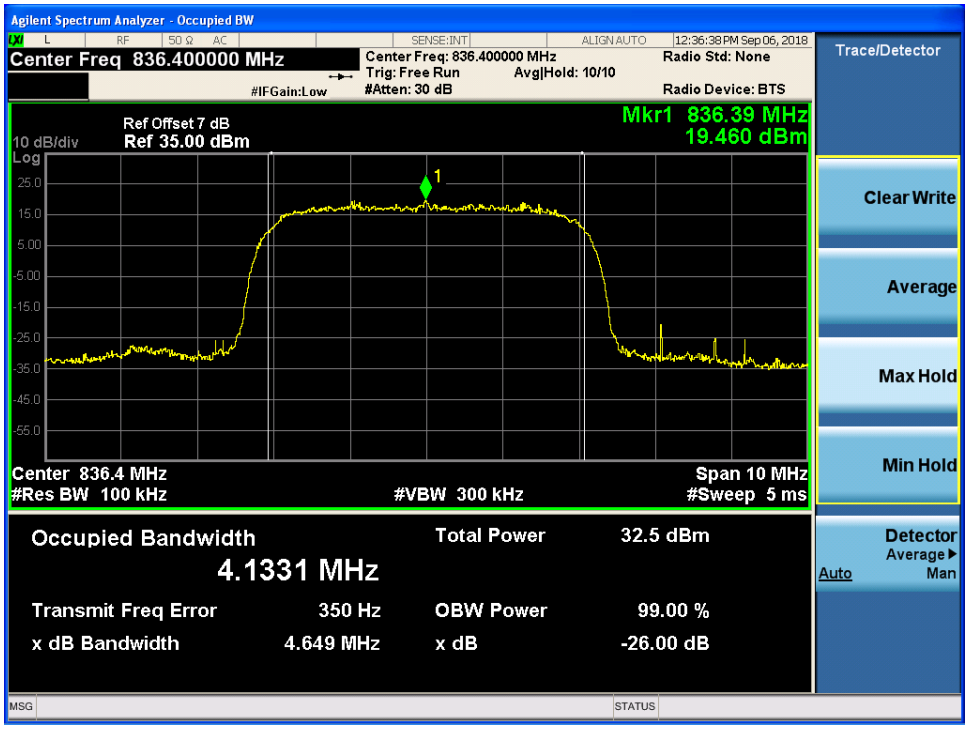
Test Band	Test Mode	Test Channel	99% OBW (MHz)	-26dBc Bandwidth(MHz)
WCDMA V	UMTS/TM1	Channel 4132	4.1296	4.653
		Channel 4182	4.1349	4.649
		Channel 4233	4.1352	4.659

TEST RESULT (PLOTS)

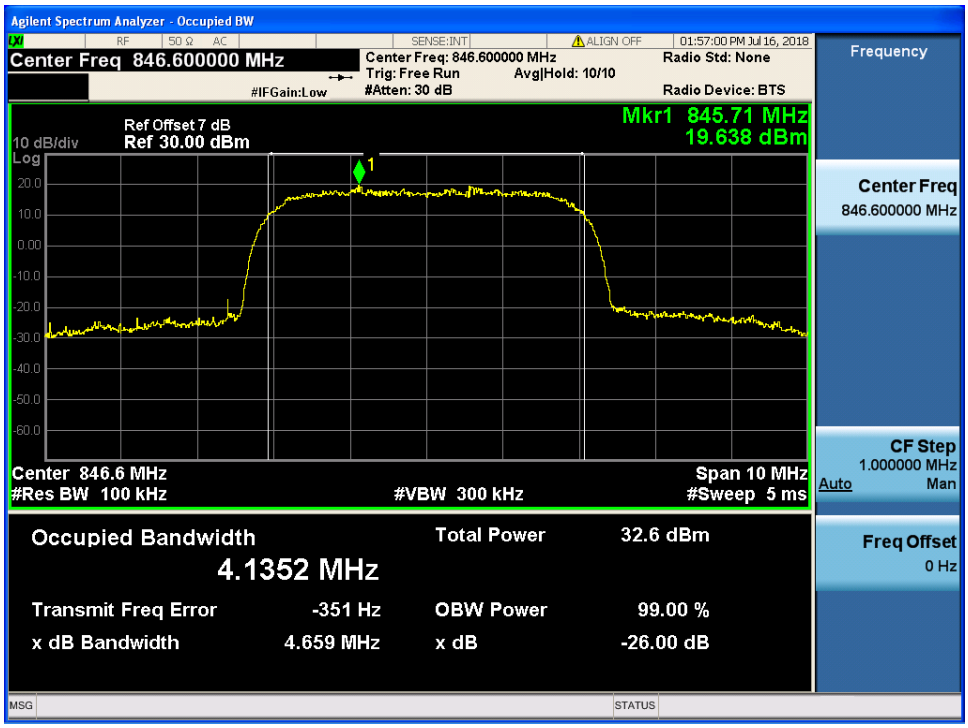
Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Low



Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Mid



Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	High



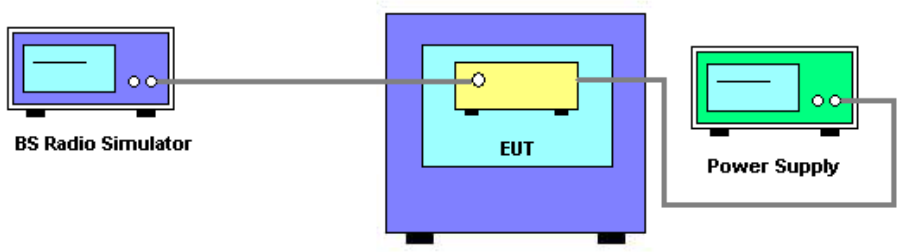
6.4 FREQUENCY STABILITY

REQUIREMENT

According to FCC part 22.355 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The frequency error rate is according to the JTC standard that the frequency error rate shall be accurate to within 2.5 ppm of the received frequency from the base station. The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with the 2.1055(a)(1) –30°C ~ 50°C.

According to FCC part 24.235 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The frequency error rate is according to the JTC standard that the frequency error rate shall be accurate to within 0.1 ppm of the received frequency from the base station. The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with the 2.1055(a)(1) –30°C ~ 50°C.

TEST SETUP



TEST PROCEDURES

1.The EUT was set up in the thermal chamber and connected with the system simulator.

2. 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.

3. With power OFF, the temperature was raised in 10°C step 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.

4. The nominal, highest and lowest extreme voltages were tested, which are specified by the applicant; the normal temperature here used is 25°C.

5. The variation in frequency was measured for the worst case.

TEST RESULT

Test Result of WCDMA Band V Test Verdict:

Test Mode	Test Conditions		Frequency Deviation Middle Channel		
	Power (VDC)	Temperature (°C)	Frequency Error	Frequency Error	Limit
			Hz	ppm	ppm
UMTS/TM1	VN	-30	4.55	0.00266	2.5
		-20	1.08	0.00063	
		-10	-2.70	-0.00319	
		0	1.56	0.00091	
		+10	3.92	0.00229	
		+20	1.21	0.00071	
		+30	3.75	0.00219	
		+40	-1.85	-0.00098	
		+50	0.49	0.00026	
		+60	-4.01	-0.00231	
		+70	1.60	0.00092	
		+80	1.57	0.00091	
		+85	-3.13	-0.00181	
	VL	+25	1.43	0.00169	
	VH	+25	-2.00	-0.00236	

Note: The extreme temperature test was performed in the range -30°C ~85°C as the requirement of costumer.

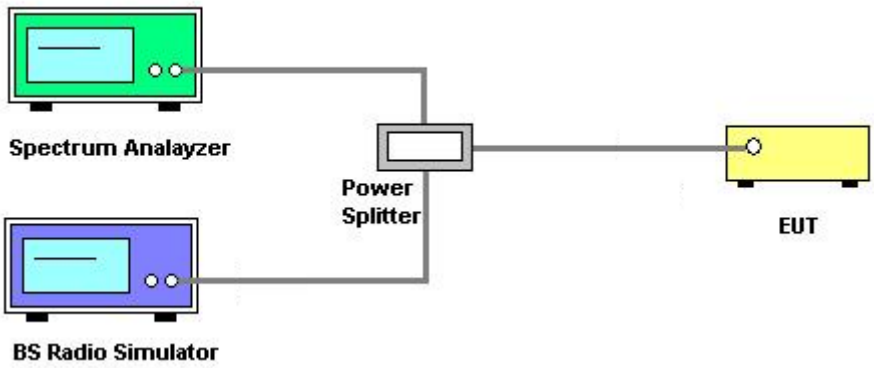
6.5 CONDUCTED OUT OF BAND EMISSIONS

REQUIREMENT

According to FCC 22.917(a) specified that power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 +10 log(P) dB.

According to FCC 24.238(a) specified that power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 +10 log(P) dB .

TEST SETUP



TEST PROCEDURES

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

2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

3. The middle channel for the highest RF power within the transmitting frequency was measured.

4. The conducted spurious emission for the whole frequency range was taken.

5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.

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 + 10log(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 Band 7

The limit line is derived from 55 + 10log(P)dB below the transmitter power P(Watts)

= P(W)- [55 + 10log(P)] (dB)

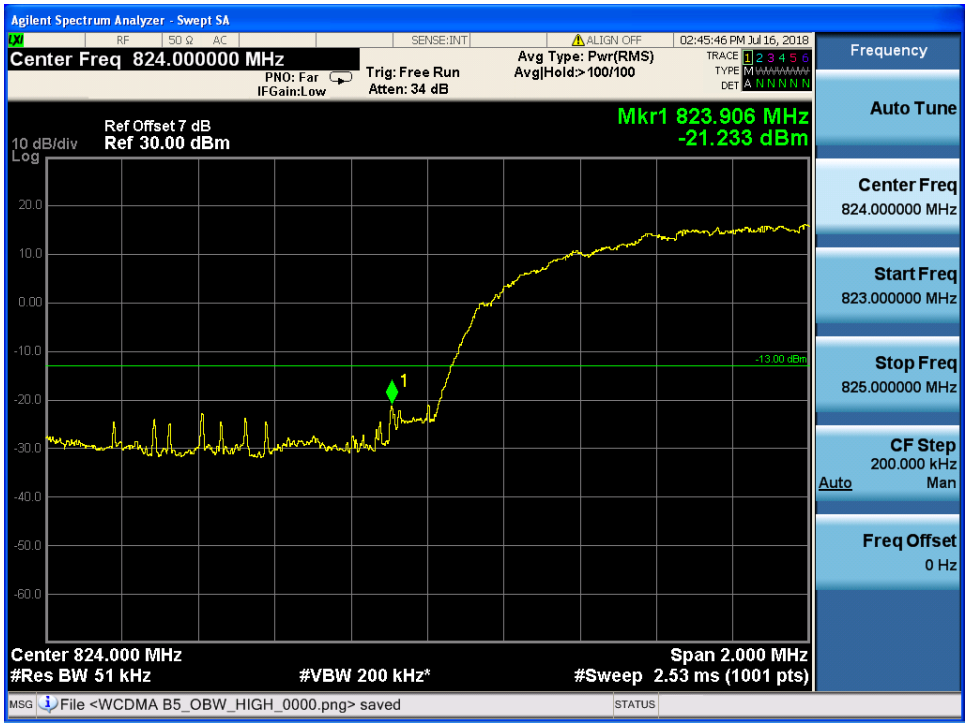
= [30 + 10log(P)] (dBm) - [55 + 10log(P)] (dB)

= -25dBm.

9. For 9KHz to 30MHz: the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

TEST RESULT

Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Low



Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	High

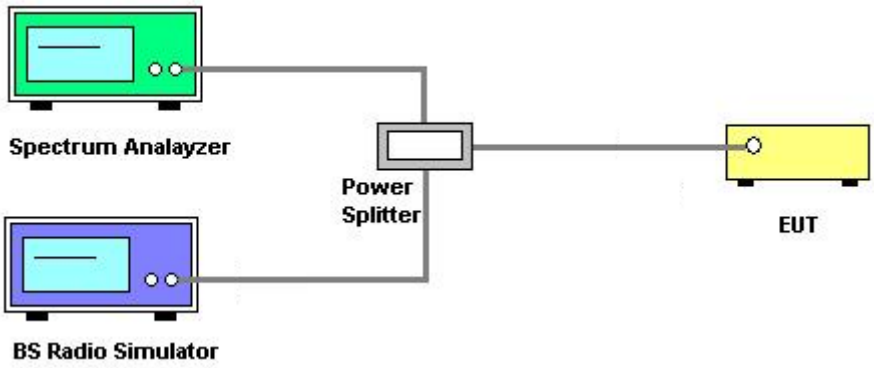
6.6 SPURIOUS EMISSION AT ANTENNA TERMINAL

DESCRIPTION OF CONDUCTED BAND EDGE MEASUREMENT

According to FCC 22.917(a), on any frequency outside a licensee's frequency block within GSM spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit translates in the relevant power range (2 to 0.003W). At 2W(Power Control Level 5) the specified minimum attenuation becomes 43dB and the limit of emission equal to –13dBm.

According to FCC 24.238(a), on any frequency outside a licensee's frequency block within GSM spectrum, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 +10 log (P) dB. The limit translates in the relevant power range (1 to 0.001W). At 1W(Power Control Level 0) the specified minimum attenuation becomes 43dB and the limit of emission equal to –13dBm.

TEST SETUP



TEST PROCEDURES

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

2. The band edges of low and high channels for the highest RF powers were measured. Set RBW>= 1% EBW in the 1MHz band immediately outside and adjacent to the band edge.

3. Set spectrum analyzer with RMS detector.

4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

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

= [30 + 10log (P)] (dBm) - [43 + 10log (P)] (dB)

= -13dBm.

<For Band 7>

The limit line is derived from 55+ 10log (P)dB below the transmitter power P(Watts)

= P(W)- [55 + 10log(P)] (dB)

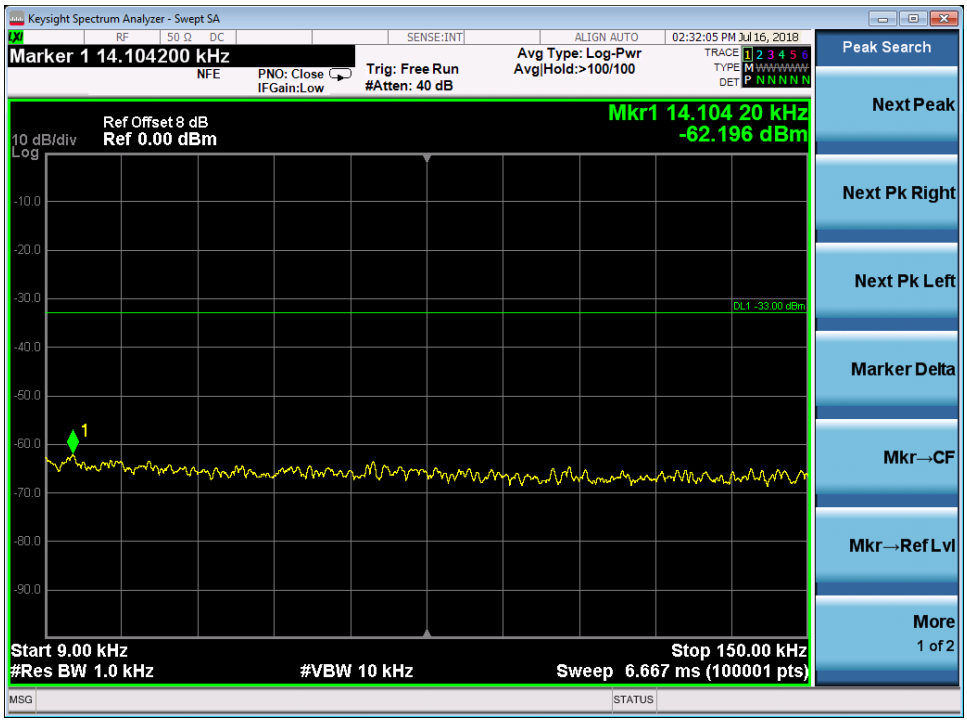
= [30 + 10log (P)] (dBm) - [55 + 10log (P)] (dB)

= -25dBm.

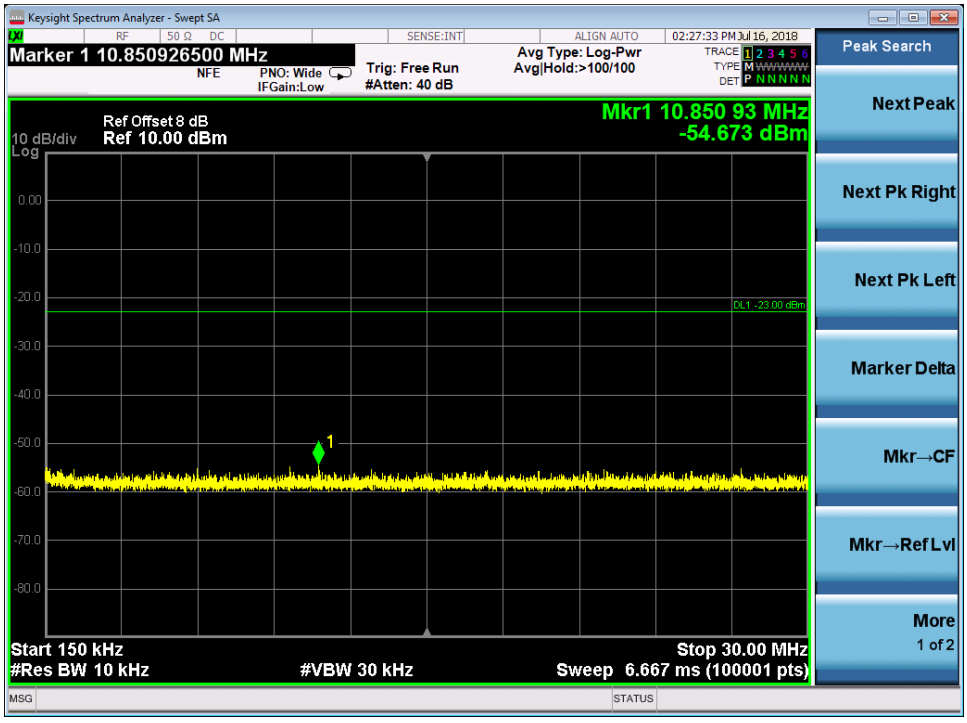
TEST RESULT

Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Low

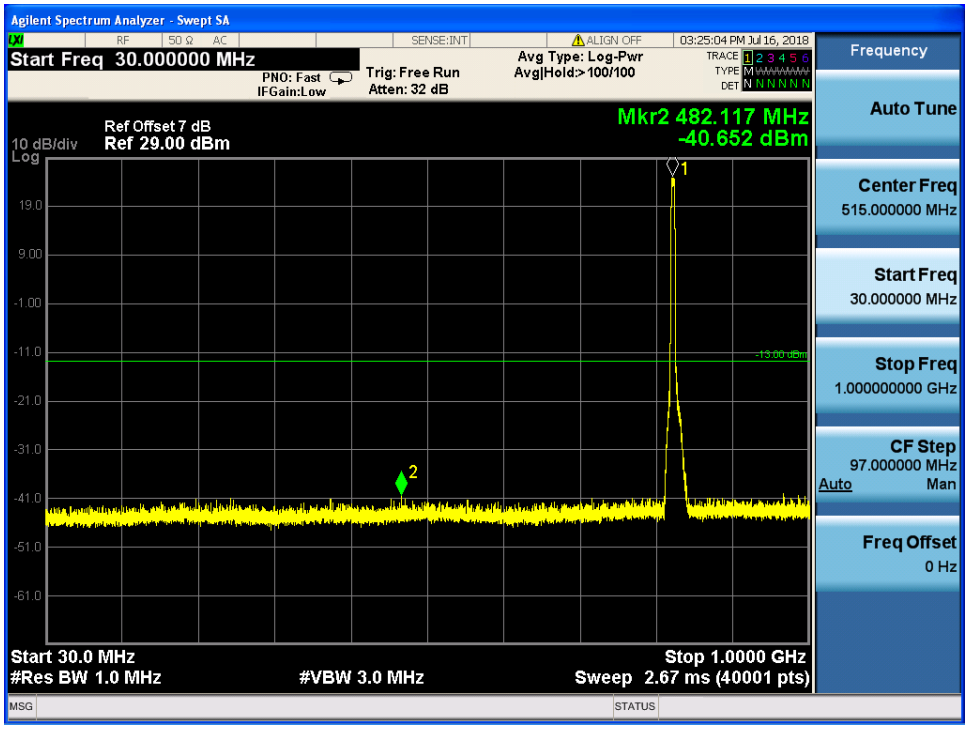
9KHz to 150KHz Test Plot



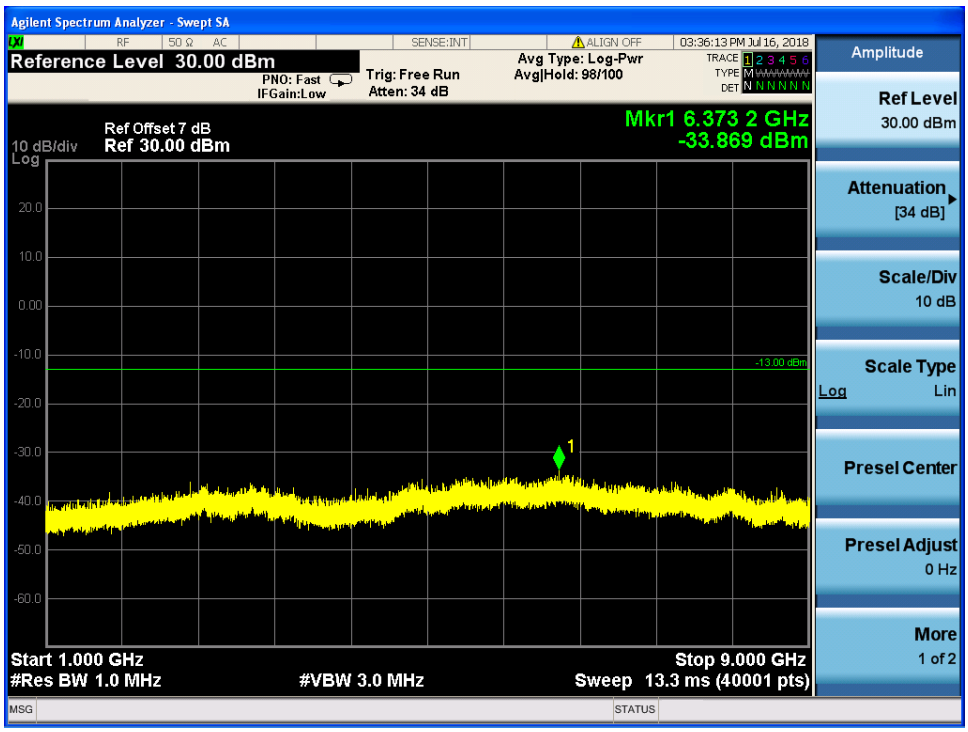
150KHz to 30MHz Test Plot



30MHz to 1GHz Test Plot

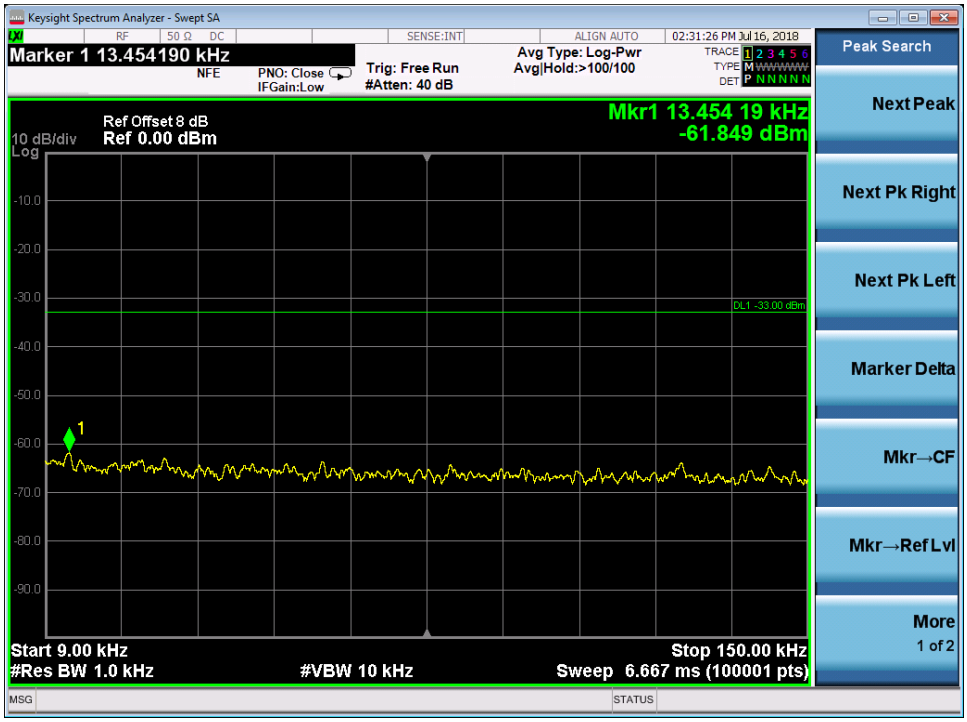


1GHz to 9GHz Test Plot

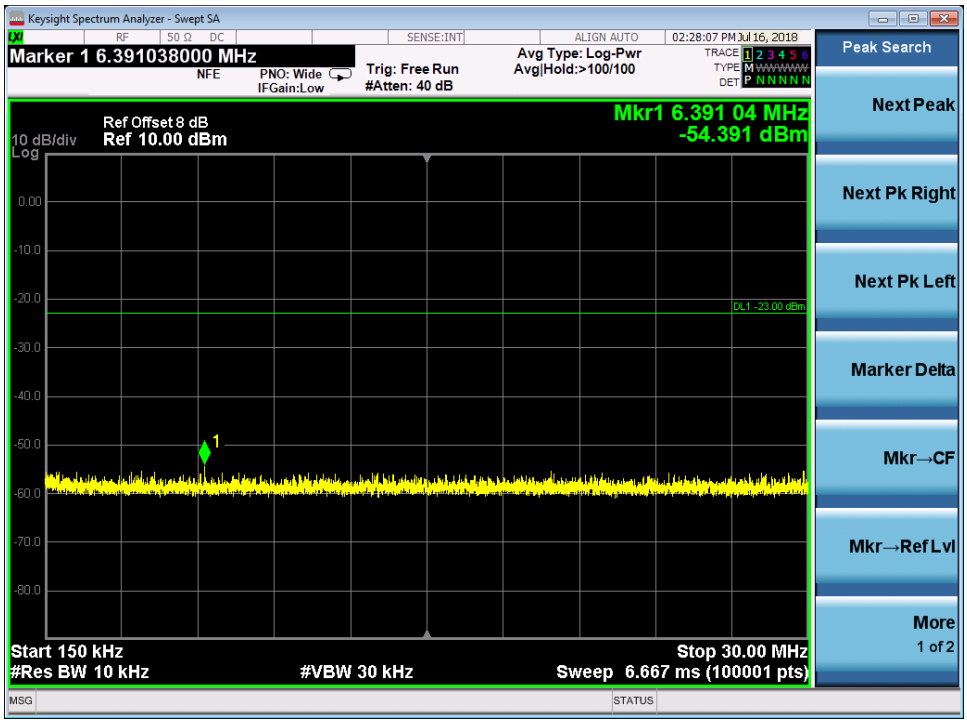


Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Mid

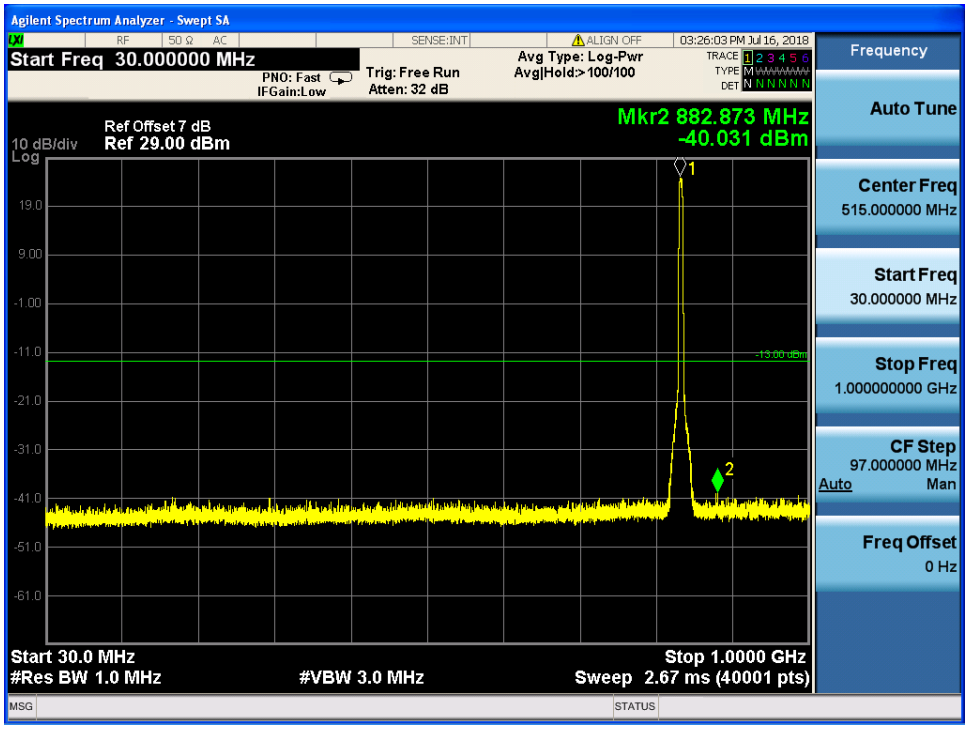
9KHz to 150KHz Test Plot



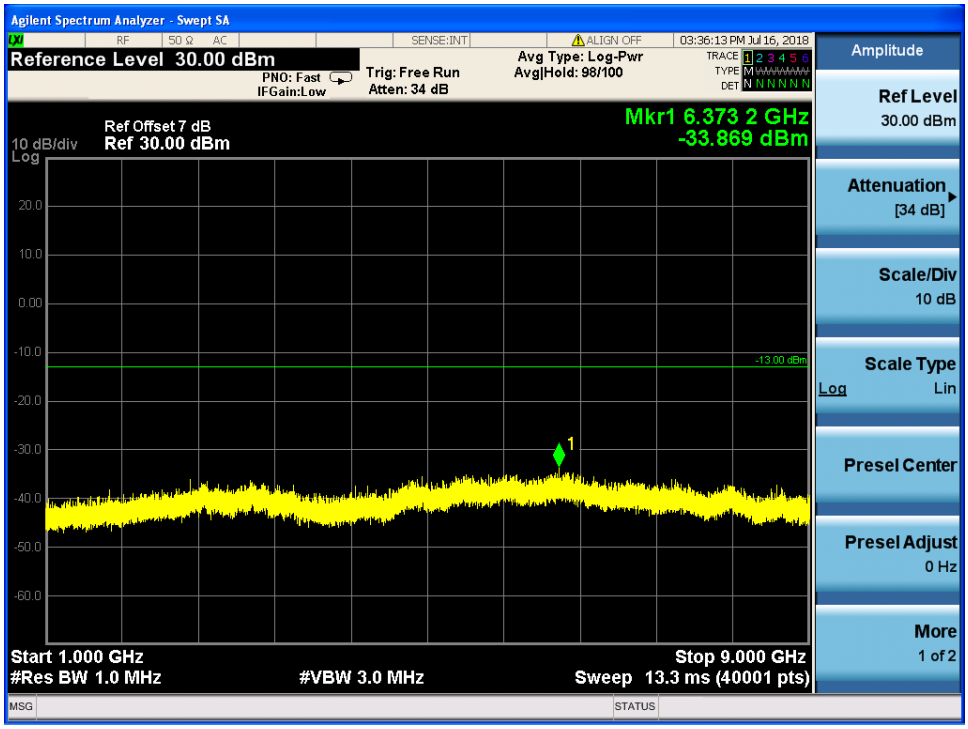
150KHz to 30MHz Test Plot



30MHz to 1GHz Test Plot

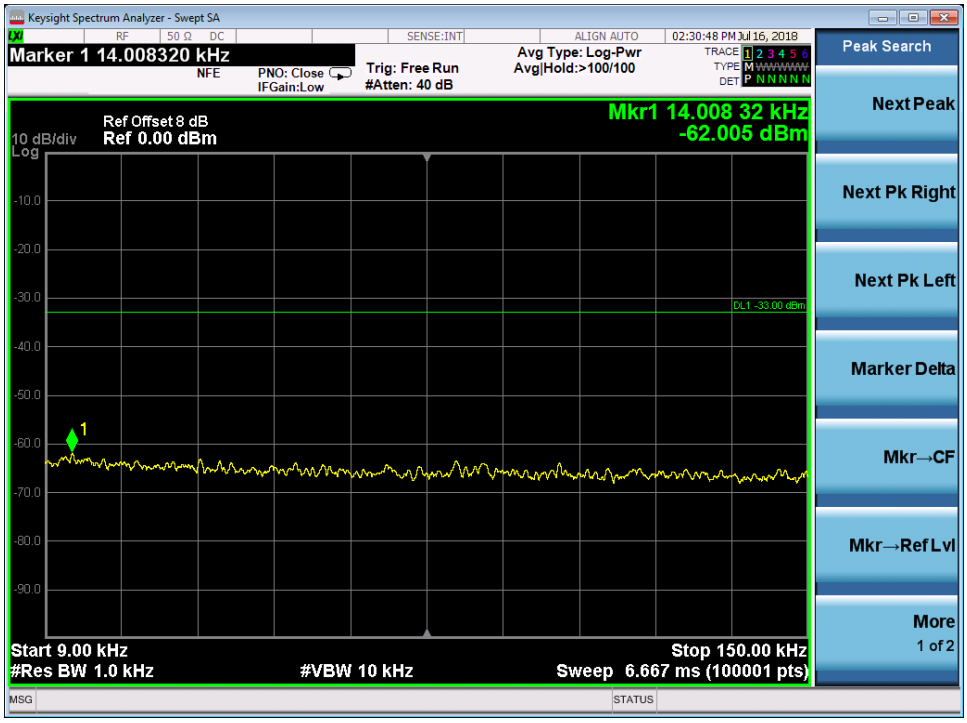


1GHz to 9GHz Test Plot

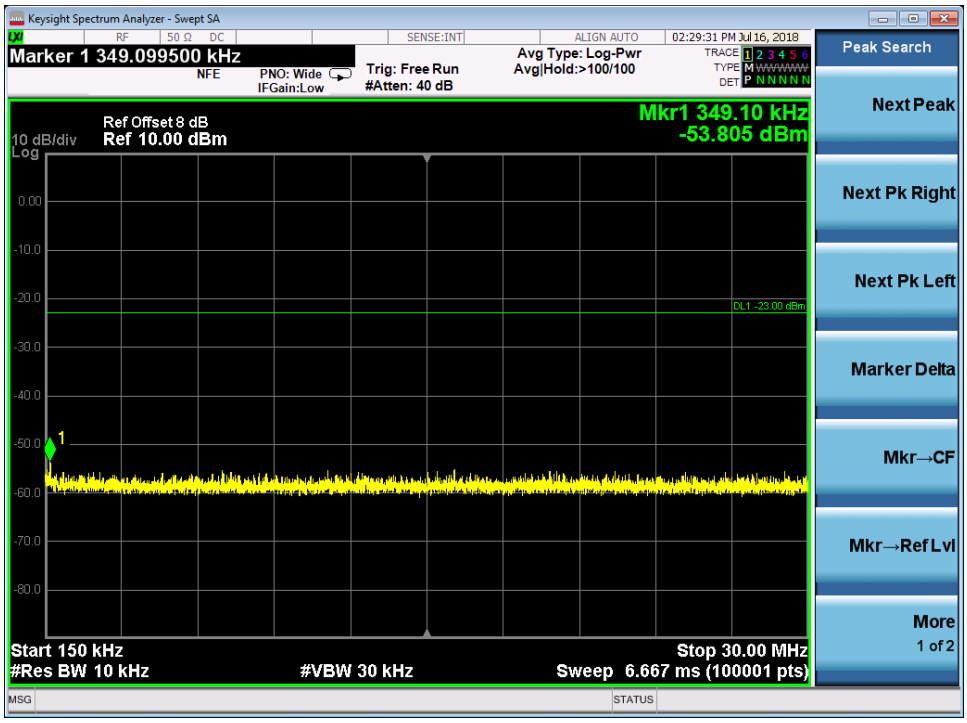


Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	High

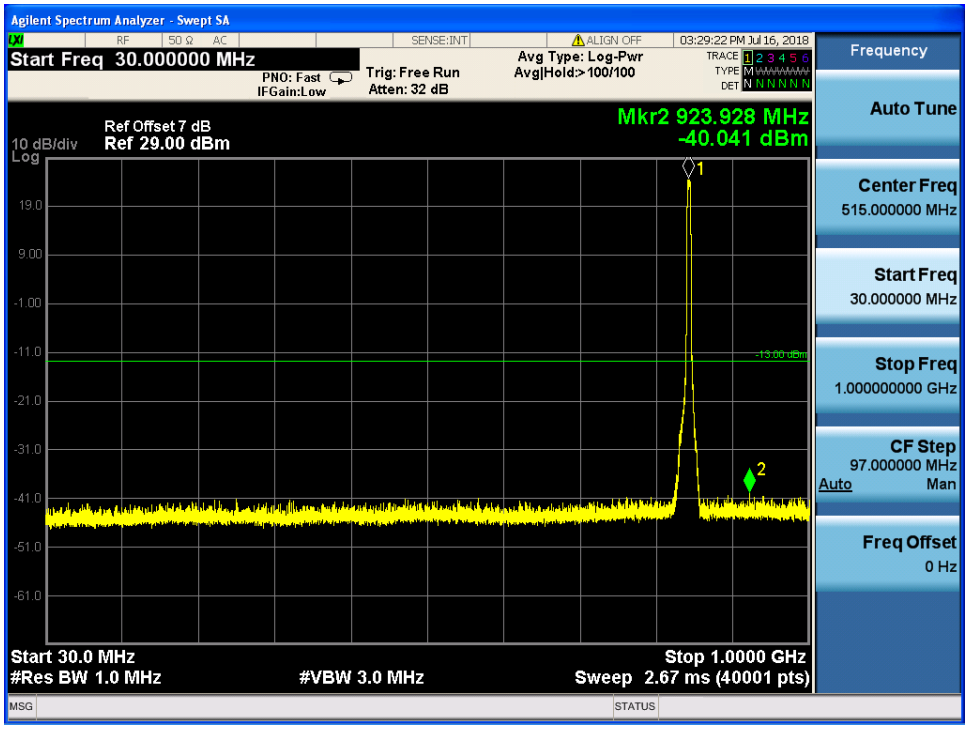
9KHz to 150KHz Test Plot



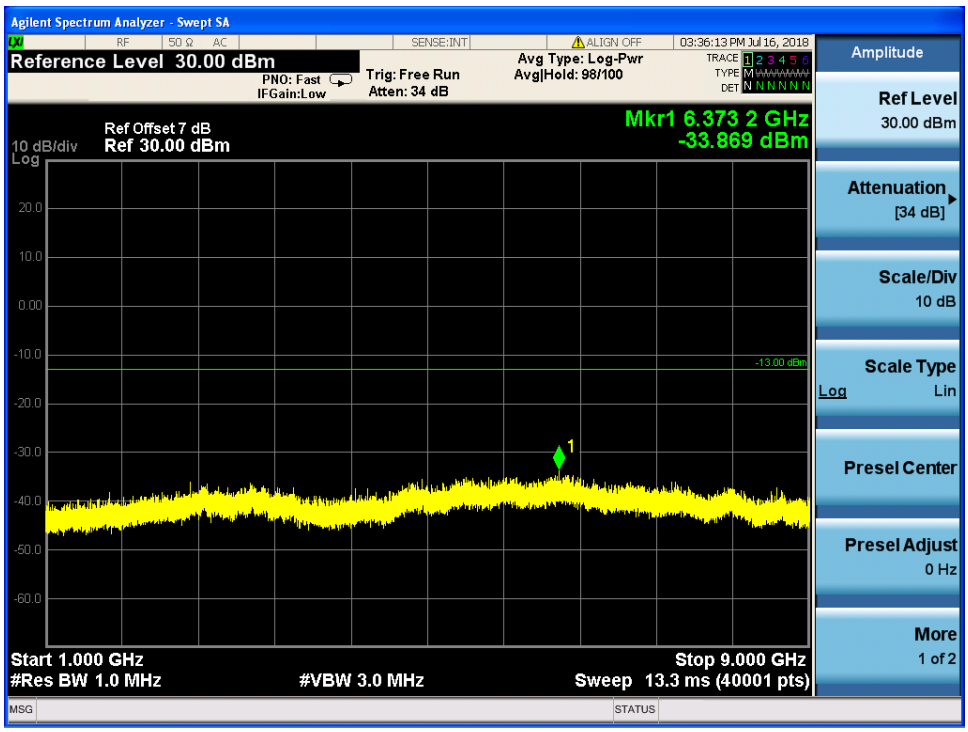
150KHz to 30MHz Test Plot



30MHz to 1GHz Test Plot



1GHz to 9GHz Test Plot



6.7 TRANSMITTER RADIATED POWER (EIRP/ERP)

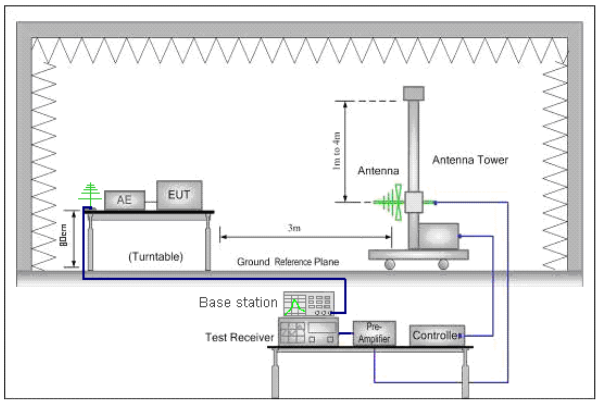
REQUIREMENT

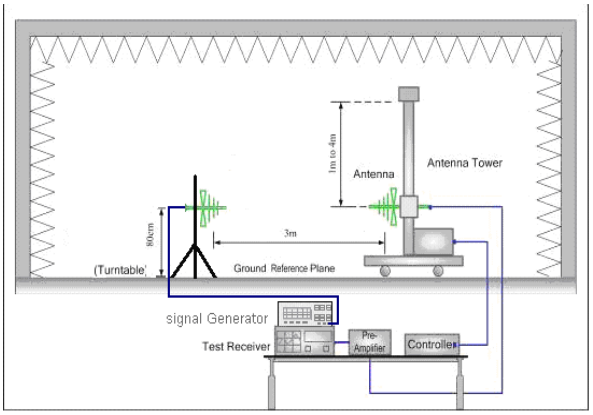
The Radiated Peak Output Power shall be according to the specific rule Part 22.913(a) that "Mobile/Portable station are limited to 7 watts e.r.p."

The Radiated Peak Output Power shall be according to the specific rule Part 24.232(b) that "Mobile/Portable station are limited to 2 watts e.i.r.p."

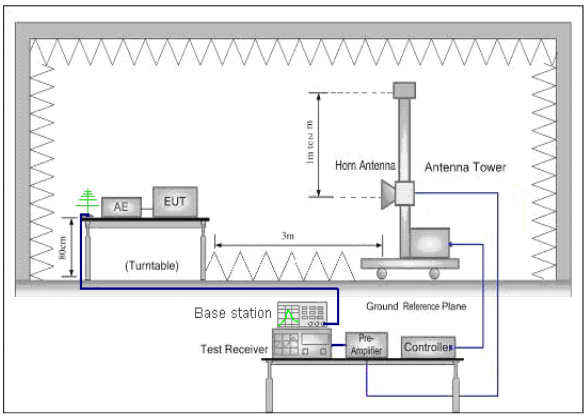
TEST SETUP

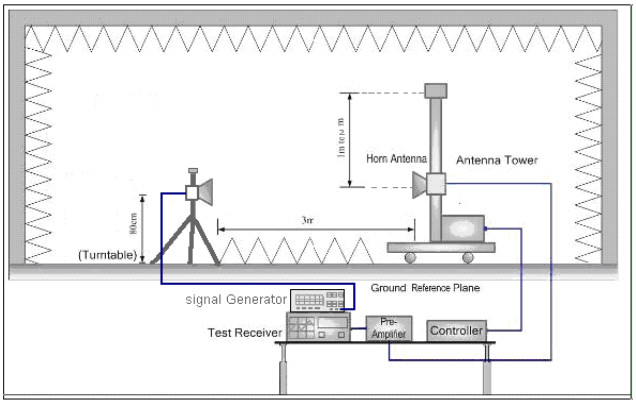
Test Setup for Below 1G





Test Setup for Above 1G





TEST PROCEDURES

Below 1GHz test procedure as below:

1). The EUT was powered ON and placed on a 0.8m high table in a semi-anechoic chamber. The antenna of the transmitter was extended to its maximum length.

2). Adjust the settings of the Universal Radio Communication Tester to set the EUT to its maximum power at the required channel.

3). Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.

4).The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

5).The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.

6). A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 4) is obtained for this set of conditions.

7).The output power into the substitution antenna was then measured.

8). Steps 5) and 6) were repeated with both antennas polarized.

9). Calculate power in dBm by the following formula:

ERP (dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

EIRP=ERP+2.15dB

Where:

Pg is the generator output power into the substitution antenna.

10).Test the EUT in the low channel, the middle channel the High channel.

11). The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, Only the test worst case mode is recorded in the report.

12). Repeat above procedures until all frequencies measured was complete.

Above 1GHz test procedure as below:

1). The EUT was powered ON and placed on a 0.8m high table in a semi-anechoic chamber. The antenna of the transmitter was extended to its maximum length.

2). Adjust the settings of the Universal Radio Communication Tester to set the EUT to its maximum power at the required channel.

3). Set the spectrum analyzer to the channel frequency. Set the analyzer to measure peak hold with the required settings.

4).The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.

5).The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.

6). A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 4) is obtained for this set of conditions.

7).The output power into the substitution antenna was then measured.

8). Steps 5) and 6) were repeated with both antennas polarized.

9). Calculate power in dBm by the following formula:

EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)

EIRP=ERP+2.15dB

Where:

Pg is the generator output power into the substitution antenna.

3). Test the EUT in the lowest channel, the middle channel the Highest channel

4). The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, Only the test worst case mode is recorded in the report.

5). Repeat above procedures until all frequencies measured was complete.

TEST RESULT

WCDMA Band V Test Result							
Test Mode	Channel	Meas. Level (dBm)	Substitution Antenna Type	SGP (dBm)	Substitution Gain(dBd)	Cable Loss (dB)	Substitution Level(ERP) / dBm
UMTS	Low	21.44	Dipole	21.48	2.00	2.05	21.43
UMTS	Mid	22.76	Dipole	22.80	2.00	2.05	22.75
UMTS	High	23.10	Dipole	23.16	2.00	2.05	23.11

Note:
1: For getting the ERP (Efficient Radiated Power) in substitution method, the following formula should be taken to calculate it, ERP [dBm] = SGP [dBm] – Cable Loss [dB] + Gain [dBd]
2: SGP=Signal Generator Level
3: RBW > emission bandwidth, VBW > 3 x RBW. Detector: RMS

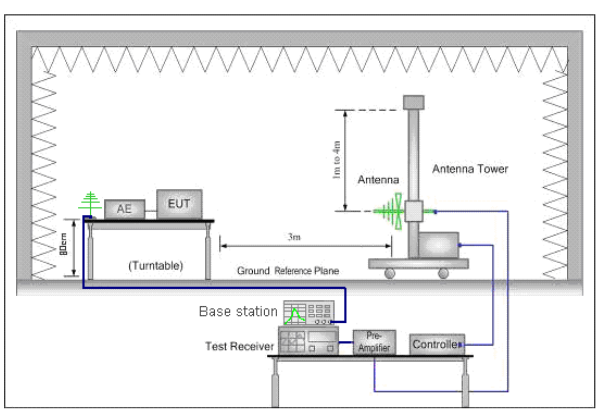
6.8 RADIATED OUT OF BAND EMISSIONS

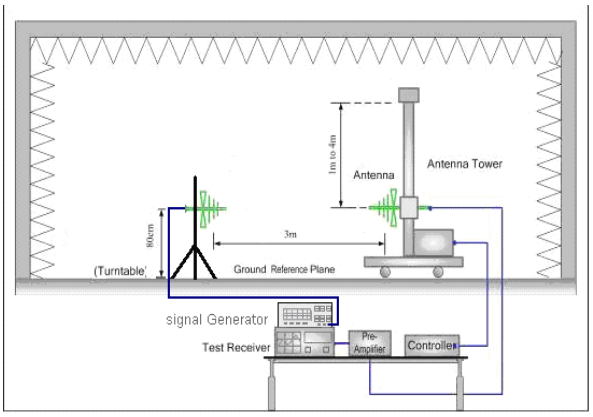
REQUIREMENT

In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10p(watts).

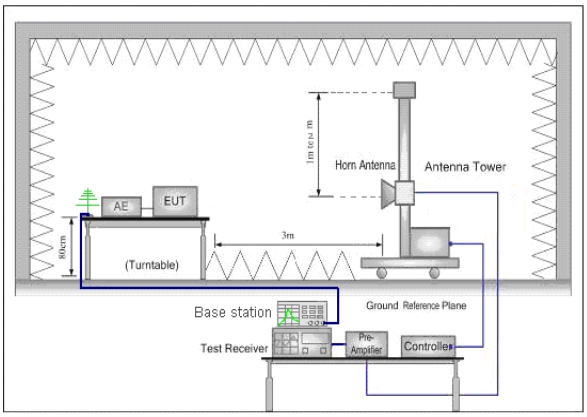
TEST SETUP

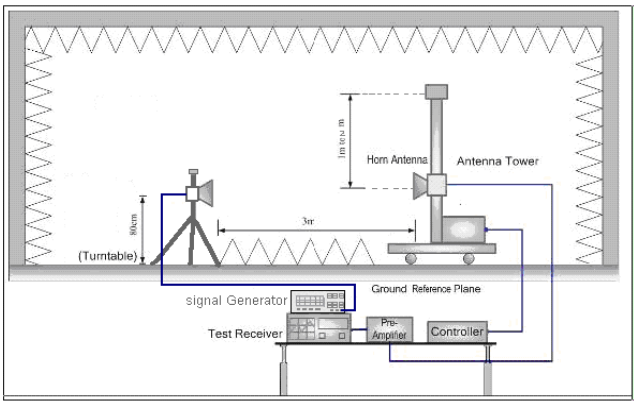
Test Setup for Below 1G





Test Setup for Above 1G





TEST PROCEDURES

Below 1GHz test procedure as below:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.

2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.

3. The table was rotated 360 degrees to determine the position of the highest spurious emission.

4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.

5. Taking the record of maximum spurious emission.

6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.

7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.

8. Taking the record of output power at antenna port.

9. Repeat step 7 to step 8 for another polarization.

10. Calculate power in dBm by the following formula:

ERP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBd)

Where:

Pd is the dipole equivalent power, Pg is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to Pg [dBm] – cable loss [dB]. The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10log10(Power [Watts]).

Above 1GHz test procedure as below:

1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.

2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.

3. The table was rotated 360 degrees to determine the position of the highest spurious emission.

4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.

5. Taking the record of maximum spurious emission.

6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.

7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.

8. Taking the record of output power at antenna port.

9. Repeat step 7 to step 8 for another polarization.

10. Calculate power in dBm by the following formula:

EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi)

EIRP=ERP+2.15dB

Where:

Pg is the generator output power into the substitution antenna.

10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

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

= [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

= -13dBm.

Note:

1. Test the EUT in the low channel, the middle channel the High channel.

2. All Spurious Emission tests were performed in X, Y, Z axis direction and low, middle, high channel. And only the worst Y axis test condition was recorded in this test report.

3. The spectrum is measured from 9 KHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz and peak detector for above 1G.

4. For 9KHz to 30MHz: the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

TEST RESULT

Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Low

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
180.35	-56.49	-13.00	-43.49	Horizontal
239.52	-57.82	-13.00	-44.82	Horizontal
299.66	-57.62	-13.00	-44.62	Horizontal
408.3	-53.97	-13.00	-40.97	Horizontal
496.57	-58.76	-13.00	-45.76	Horizontal
719.67	-61.19	-13.00	-48.19	Horizontal
1648.00	-25.07	-13.00	-12.07	Horizontal
2476.00	-49.36	-13.00	-36.36	Horizontal
3304.00	-52.44	-13.00	-39.44	Horizontal
4123.00	-41.13	-13.00	-28.13	Horizontal
4951.00	-50.77	-13.00	-37.77	Horizontal
5788.00	-45.24	-13.00	-32.24	Horizontal

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
36.79	-60.07	-13.00	-47.07	Vertical
103.72	-60.38	-13.00	-47.38	Vertical
239.52	-61.49	-13.00	-48.49	Vertical
408.3	-54.47	-13.00	-41.47	Vertical
496.57	-54.79	-13.00	-41.79	Vertical
794.36	-62.78	-12.00	-50.78	Vertical
1648.00	-27.97	-13.00	-14.97	Vertical
2125.00	-53.42	-13.00	-40.42	Vertical
2476.00	-43.41	-13.00	-30.41	Vertical
3304.00	-53.63	-13.00	-40.63	Vertical
4123.00	-43.37	-13.00	-30.37	Vertical
4960.00	-48.67	-13.00	-35.67	Vertical

Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	Mid

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
50.37	-43.50	-13.00	-30.50	Horizontal
97.90	-43.75	-13.00	-30.75	Horizontal

427.70	-37.16	-13.00	-24.16	Horizontal
584.84	-33.41	-13.00	-20.41	Horizontal
683.78	-30.26	-13.00	-17.26	Horizontal
993.21	-26.80	-13.00	-13.80	Horizontal
1666.00	-24.67	-13.00	-11.67	Horizontal
2503.00	-37.20	-13.00	-24.20	Horizontal
3349.00	-49.21	-13.00	-36.21	Horizontal
4186.00	-39.47	-13.00	-26.47	Horizontal
5023.00	-49.01	-13.00	-36.01	Horizontal

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
99.84	-43.50	-13.00	-30.50	Vertical
296.75	-40.59	-13.00	-27.59	Vertical
480.08	-36.52	-13.00	-23.52	Vertical
625.58	-31.13	-13.00	-18.13	Vertical
699.30	-30.38	-13.00	-17.38	Vertical
962.17	-26.68	-13.00	-13.68	Vertical
1684.00	-27.00	-13.00	-14.00	Vertical
2530.00	-41.89	-13.00	-28.89	Vertical
3385.00	-51.84	-13.00	-38.84	Vertical
3565.00	-41.76	-13.00	-28.76	Vertical
4240.00	-49.40	-13.00	-36.40	Vertical
5932.00	-45.86	-13.00	-32.86	Vertical

Band	WCDMA Band V	Test Mode	UMTS/TM1	Channel	High

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
64.69	-41.84	-13.00	-28.84	Horizontal
111.51	-45.75	-13.00	-32.75	Horizontal
440.40	-38.91	-13.00	-25.91	Horizontal
599.42	-31.77	-13.00	-18.77	Horizontal
701.04	-29.72	-13.00	-16.72	Horizontal
1684.00	-26.28	-13.00	-13.28	Horizontal
2530.00	-50.01	-13.00	-37.01	Horizontal
3385.00	-47.21	-13.00	-34.21	Horizontal
3565.00	-52.32	-13.00	-39.32	Horizontal
4240.00	-39.18	-13.00	-26.18	Horizontal

5932.00	-49.26	-13.00	-36.26	Horizontal

Frequency (MHz)	Level (dB)	Limit Line (dB)	Over Limit (dB)	Polarization
109.01	-42.87	-13.00	-29.87	Vertical
314.47	-40.48	-13.00	-27.48	Vertical
490.03	-35.18	-13.00	-22.18	Vertical
632.37	-31.62	-13.00	-18.62	Vertical
712.41	-32.00	-13.00	-19.00	Vertical
981.32	-28.05	-13.00	-15.05	Vertical
1684.00	-25.81	-13.00	-12.81	Vertical
2539.00	-52.26	-13.00	-39.26	Vertical
3385.00	-48.60	-13.00	-35.60	Vertical
4240.00	-38.60	-13.00	-25.60	Vertical
5041.00	-51.45	-13.00	-38.45	Vertical
5923.00	-47.82	-13.00	-34.82	Vertical

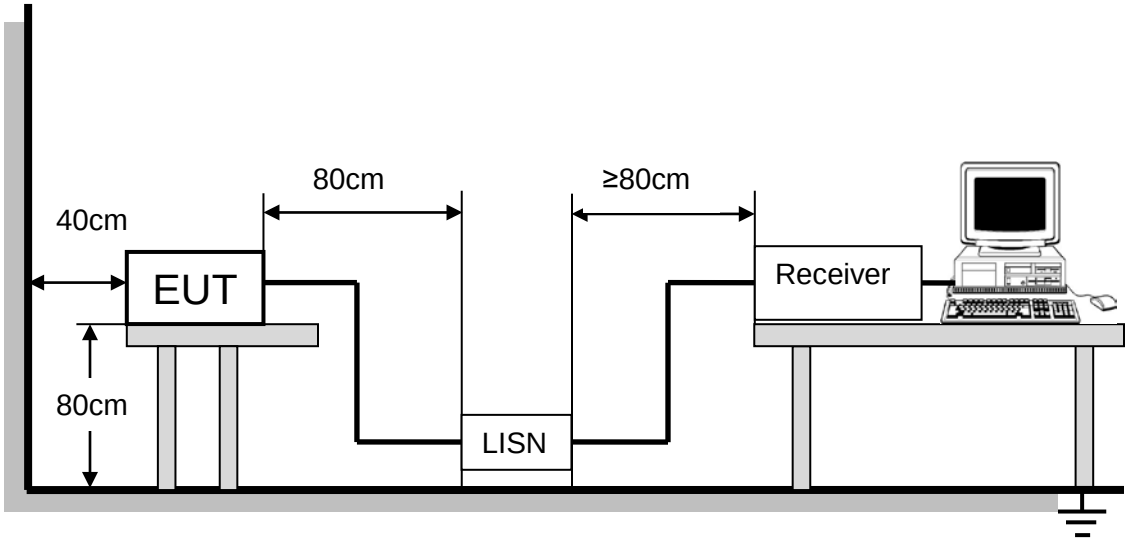
7. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a)

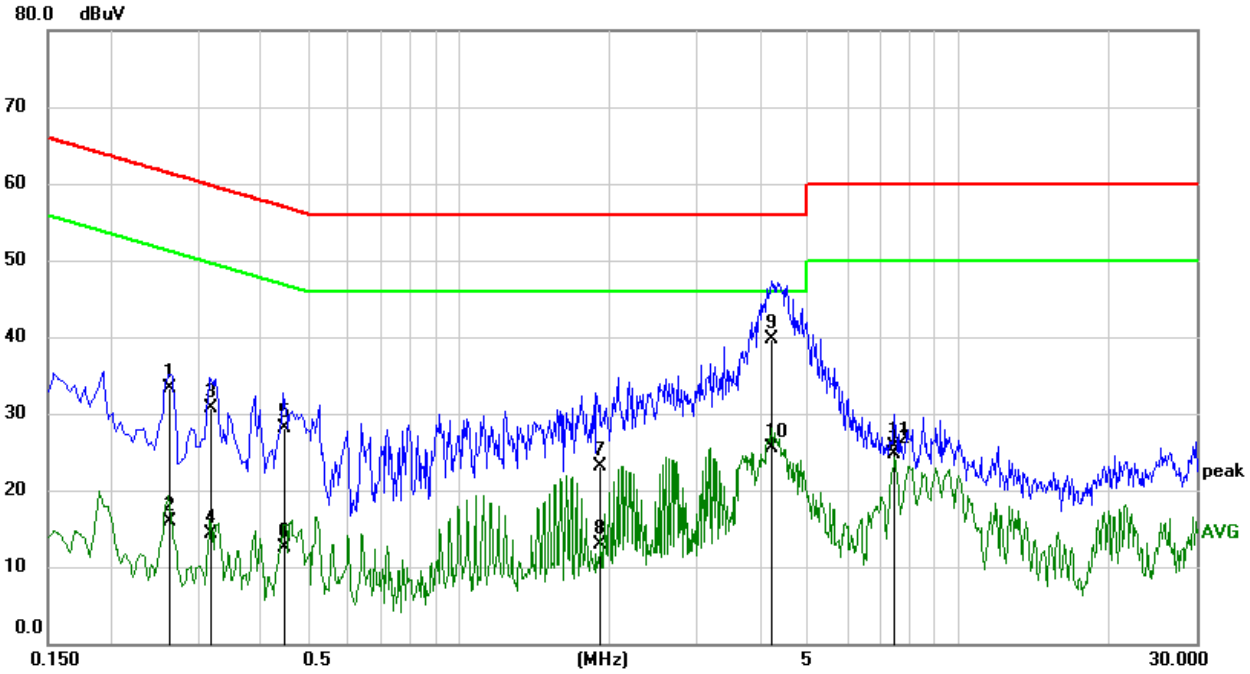
FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

TEST SETUP AND PROCEDURE



The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

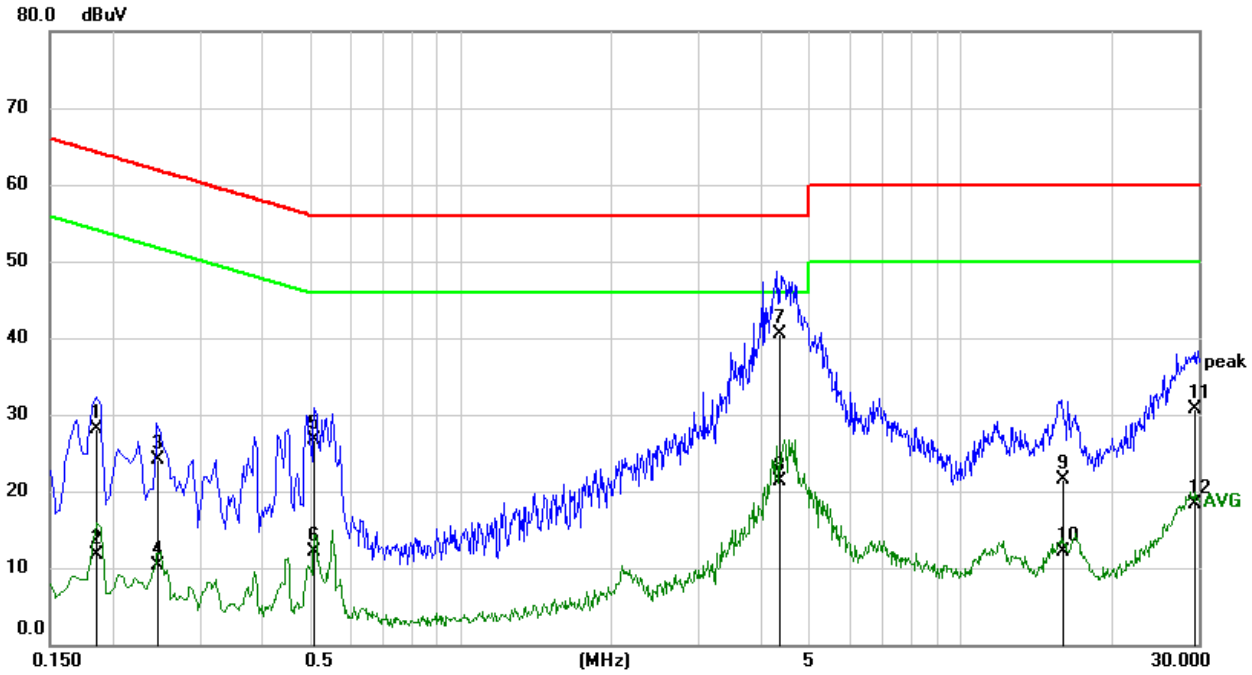
LINE L1 RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2640	23.70	9.63	33.33	61.30	-27.97	QP
2	0.2640	6.25	9.63	15.88	51.30	-35.42	AVG
3	0.3197	21.03	9.63	30.66	59.71	-29.05	QP
4	0.3197	4.69	9.63	14.32	49.71	-35.39	AVG
5	0.4474	18.43	9.63	28.06	56.92	-28.86	QP
6	0.4474	2.91	9.63	12.54	46.92	-34.38	AVG
7	1.9176	13.53	9.66	23.19	56.00	-32.81	QP
8	1.9176	3.29	9.66	12.95	46.00	-33.05	AVG
9	4.2399	30.02	9.69	39.71	56.00	-16.29	QP
10	4.2399	15.86	9.69	25.55	46.00	-20.45	AVG
11	7.4400	15.96	9.82	25.78	60.00	-34.22	QP
12	7.4400	14.83	9.82	24.65	50.00	-25.35	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

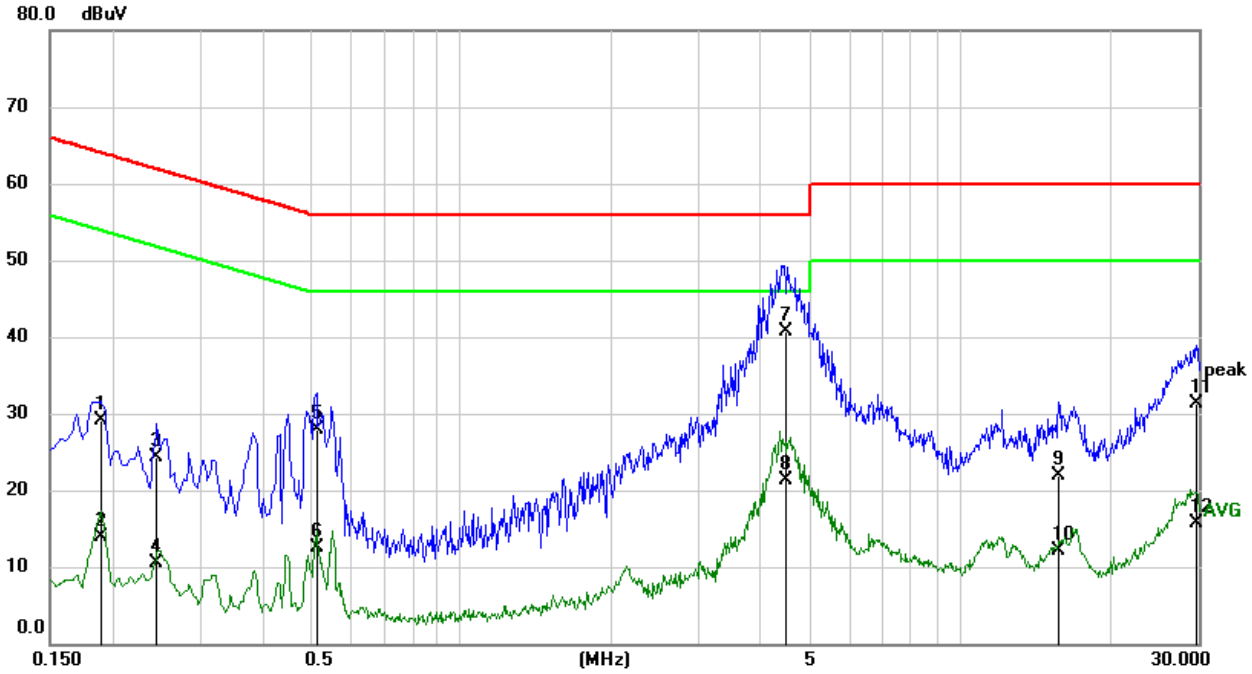
LINE L2 RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1849	18.48	9.63	28.11	64.26	-36.15	QP
2	0.1849	2.12	9.63	11.75	54.26	-42.51	AVG
3	0.2475	14.52	9.63	24.15	61.84	-37.69	QP
4	0.2475	0.71	9.63	10.34	51.84	-41.50	AVG
5	0.5097	17.03	9.63	26.66	56.00	-29.34	QP
6	0.5097	2.46	9.63	12.09	46.00	-33.91	AVG
7	4.3422	30.77	9.70	40.47	56.00	-15.53	QP
8	4.3422	11.55	9.70	21.25	46.00	-24.75	AVG
9	16.0937	11.74	9.82	21.56	60.00	-38.44	QP
10	16.0937	2.36	9.82	12.18	50.00	-37.82	AVG
11	29.5872	20.69	9.97	30.66	60.00	-29.34	QP
12	29.5872	8.29	9.97	18.26	50.00	-31.74	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

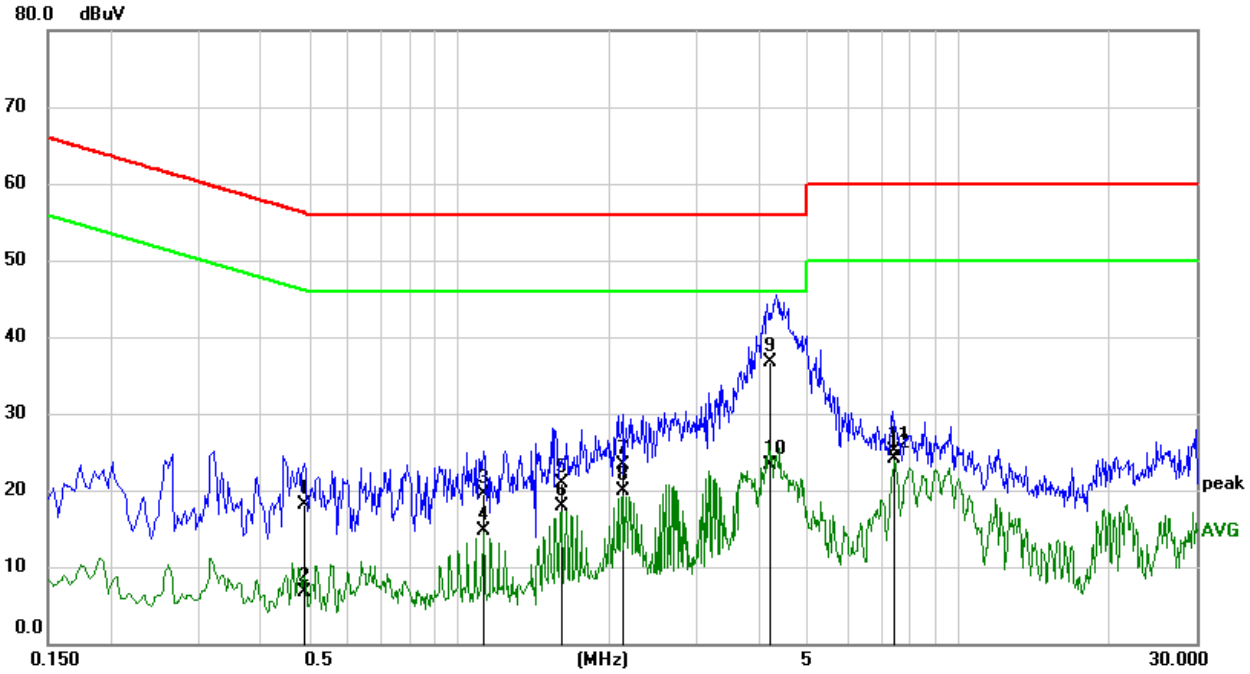
LINE L3 RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1911	19.50	9.63	29.13	63.99	-34.86	QP
2	0.1911	4.21	9.63	13.84	53.99	-40.15	AVG
3	0.2458	14.70	9.63	24.33	61.90	-37.57	QP
4	0.2458	0.87	9.63	10.50	51.90	-41.40	AVG
5	0.5126	18.23	9.63	27.86	56.00	-28.14	QP
6	0.5126	2.93	9.63	12.56	46.00	-33.44	AVG
7	4.4764	31.06	9.70	40.76	56.00	-15.24	QP
8	4.4764	11.56	9.70	21.26	46.00	-24.74	AVG
9	15.7913	12.02	9.82	21.84	60.00	-38.16	QP
10	15.7913	2.23	9.82	12.05	50.00	-37.95	AVG
11	29.7608	21.31	9.97	31.28	60.00	-28.72	QP
12	29.7608	5.76	9.97	15.73	50.00	-34.27	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

LINE N RESULTS (LOW CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4899	8.39	9.63	18.02	56.17	-38.15	QP
2	0.4899	-2.97	9.63	6.66	46.17	-39.51	AVG
3	1.1199	9.82	9.64	19.46	56.00	-36.54	QP
4	1.1199	4.99	9.64	14.63	46.00	-31.37	AVG
5	1.5999	11.27	9.65	20.92	56.00	-35.08	QP
6	1.5999	8.17	9.65	17.82	46.00	-28.18	AVG
7	2.1199	13.65	9.66	23.31	56.00	-32.69	QP
8	2.1199	10.28	9.66	19.94	46.00	-26.06	AVG
9	4.2401	27.00	9.69	36.69	56.00	-19.31	QP
10	4.2401	13.65	9.69	23.34	46.00	-22.66	AVG
11	7.4400	15.35	9.82	25.17	60.00	-34.83	QP
12	7.4400	14.25	9.82	24.07	50.00	-25.93	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

Note: All the channels had been tested, but only the worst data recorded in the report.

END OF REPORT