TEST REPORT

Report No.: HK09050758-3

Megabyte Limited

Prepared and Checked by:

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Date: August 24, 2009

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GENERAL INFORMATION

Megabyte Limited
BRAND NAME: megascan, MODEL: M1

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Manufacturer:	N/A
Manufacturer Address:	N/A
Brand Name:	Megascan
Model:	M1
Type of EUT:	Transmitter
Description of EUT:	UHF RFID Reader
Serial Number:	N/A
Date of Sample Submitted:	May 15, 2009
Date of Test:	May 16, 2009 to August 24, 2009
Report No.:	HK09050758-3
Report Date:	August 24, 2009
Environmental Conidtions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

Megabyte Limited
BRAND NAME: megascan, MODEL: M1

TEST SPECIFICATION	REFERENCE	RESULTS
Maximum Peak Output Power	15.247(b), (c) / RSS-210 A8.4	Pass
20 dB Bandwidth	15.247(a) / RSS-210 A8.1	Pass
Number of Hopping Frequencies	15.247(a) / RSS-210 A8.1	Pass
Channel Separation	15.247(a) / RSS-210 A8.1	Pass
Average Channel Occupancy Time	15.247(a) / RSS-210 A8.1	Pass
Out of Band Antenna Conducted Emission	15.247(d) / RSS-210 A8.5	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
Radiated Spurious Emissions	15.247(d) / RSS-210 A8.5	Pass
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 7.2.2	Pass
Antenna Requirement	15.203	Pass (See Note 1)

Note: 1. The EUT must be professional installed.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a UHF RFID reader operating at 902-928 MHz. The EUT is powered by Power Over Ethernet Adaptor. The RFID reader has 17 Antenna Port. But only one antenna port can be activated at the same time. The RFID reader is controlled by computer program through the Ethernet network connection. It employs FHSS technology to transmit RF signal to detect and activate the RFID tags. When the tags are detected, the information in the tags will be shown.

Antenna Type : External

1.2 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The device was powered from 120VAC.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

The EUT exercise program (Network Enable Administrator, Intel Tracer and MWSTWIN.exe) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

Antenna (Model: MRD E42), Power Over Ethernet Adaptor Base Unit (Model: Dlink DWL-P200)

2.4 Equipment Modification

Any modifications installed previous to testing by Megabyte Limited will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

2.5 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

UMPC (provided by applicant), 2x Cat5 LAN cable, 1x coaxial cable with SMA connector.

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBμV/m
RR = RA - AG - AV in dBμV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBμV/m

RR = 18.0 dBμV
LF = 9.0 dB

Level in μV/m = Common Antilogarithm [(27 dBμV/m)/20] = 22.4 μV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 1854.5 MHz

Refer to Radiated Test Setup for Radiated Emission Configuration.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by -4.1 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 9.114 MHz

Refer to Conducted Test Setup for Conducted Emission Configuration.

3.5 Conducted Emission Data

Judgment: Passed by 0.44 dB

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(2):

The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm).

Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 902.75	29.60	912
Middle Channel: 914.75	29.24	840
High Channel: 927.25	28.91	778

EUT dBm max. output level = 29.60 dBm

Limit: ≤ 30 dBm

4.2 Hopping Channel 20dB RF Bandwidth, FCC Rule 15.247(a)(1)(i):

Setting:
• Hopping function turned off
• Span = ~ 2 to 3 times the 20dB bandwidth, centred on a hopping channel
• RBW >= 1% of 20dB bandwidth, VBW >= RBW
• Repeat the test with different mode of operation (e.g. maximum data rate, modulation formats etc)

Frequency (MHz)	20 dB Bandwidth (KHz)
Lowest Channel: 902.75	53.4
Middle Channel: 914.75	53.1
Highest Channel: 927.25	54.6

Limit: ≤500kHz

Refer to the following plots for 20 dB bandwidth sharp:

Plot H2A: Lowest Channel 20 dB RF Bandwidth
Plot H2B: Middle Channel 20 dB RF Bandwidth
Plot H2C: Highest Channel 20 dB RF Bandwidth

4.3 Minimum Number of Hopping Frequencies, FCC Rule 15.247(a)(1)(i):

Setting:
• Hopping function enabled
• Span = frequency band of operation
• RBW >= 1% of the span, VBW >= RBW
• It may be necessary to break the span into sections, in order to show all of the hopping frequencies:

Mode of operation	No. of hopping channels
Normal operation mode	50

Limit: Number of hopping channels ≥ 50

Refer to the following plots for number of hopping frequencies:

Plot H3A – H3C.

4.4 Minimum Hopping Channel Carrier Frequency Separation, FCC Rule 15.247(a)(1):

Setting:
• Hopping function enabled
• Span = wide enough to capture the peaks of two adjacent channels
• RBW >= 1% of the span, VBW >= RBW

Channel Separation (KHz)
500

Limit: 20dB bandwidth of hopping channel: 54.6KHz

Refer to the following plots for number of hopping frequencies:

Plot H4

4.5 Average Channel Occupancy Time, FCC Ref.: 15.247(a)(1)(i):

Setting:
• Hopping function enabled
• Span = zero span, centred at one of the known hopping channels
• RBW = 1MHz, VBW >= RBW
• Repeat the test with different mode of operation (e.g. max. data rate, modulation formats etc)

Average occupancy time in the period of 20s (ms)
398.4

Limit: 0.4 seconds in the period of 20 seconds

Refer to the following plots for number of hopping frequencies:

Plot H5A –H5B

4.6 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

Refer to the following plots for out of band conducted emissions data:

Plot H6A.1 – H6A.2: Lowest Channel Emissions
Plot H6B.1 – H6B.2: Middle Channel Emissions
Plot H6C.1 – H6C.2: Highest Channel Emissions
Plot H6D.1 – H6D.2: Modulation Products Emission at bandedges

The plots showed all spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

4.7 Out of Band Radiated Emissions, FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

See attached data sheet

4.8 Radiated Spurious Emissions

Applicant: Megabyte Limited Date of Test: August 24, 2009
Model: M1
Worst-Case Operating Mode: Transmitter (Lowest Channel)

Table 1-2

Radiated Emissions

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2708.265	50.6	33	30.4	48.0	0	48.0	54.0	-6.0
V	3611.020	44.1	33	33.3	44.4	0	44.4	54.0	-9.6
V	4513.775	43.7	33	34.9	45.6	0	45.6	54.0	-8.4
V	5416.530	43.5	33	35.7	46.2	0	46.2	54.0	-7.8

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2708.265	50.6	33	30.4	48.0	0	48.0	74.0	-26.0
V	3611.020	44.1	33	33.3	44.4	0	44.4	74.0	-29.6
V	4513.775	43.7	33	34.9	45.6	0	45.6	74.0	-28.4
V	5416.530	43.5	33	35.7	46.2	0	46.2	74.0	-27.8

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Megabyte Limited Date of Test: August 24, 2009
Model: M1
Worst-Case Operating Mode: Transmitter (Middle Channel)

Table 3-4

Radiated Emissions

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2744.250	50.6	33	30.4	48.0	0	48.0	54.0	-6.0
V	3659.000	44.6	33	33.3	44.9	0	44.9	54.0	-9.1
V	4573.750	44.2	33	34.9	46.1	0	46.1	54.0	-7.9

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	2744.250	50.6	33	30.4	48.0	0	48.0	74.0	-26.0
V	3659.000	44.6	33	33.3	44.9	0	44.9	74.0	-29.1
V	4573.750	44.2	33	34.9	46.1	0	46.1	74.0	-27.9

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: Megabyte Limited Date of Test: August 24, 2009
Model: M1
Worst-Case Operating Mode: Transmitter (Highest Channel)

Table 5-6

Radiated Emissions

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	1854.500	55.7	33	27.2	49.9	0	49.9	54.0	-4.1
V	2781.750	49.2	33	30.4	46.6	0	46.6	54.0	-7.4
V	3709.000	43.9	33	33.3	44.2	0	44.2	54.0	-9.8
V	4636.250	43.5	33	34.9	45.4	0	45.4	54.0	-8.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	1854.500	55.7	33	27.2	49.9	0	49.9	74.0	-24.1
V	2781.750	49.2	33	30.4	46.6	0	46.6	74.0	-27.4
V	3709.000	43.9	33	33.3	44.2	0	44.2	74.0	-29.8
V	4636.250	43.5	33	34.9	45.4	0	45.4	74.0	-28.6

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

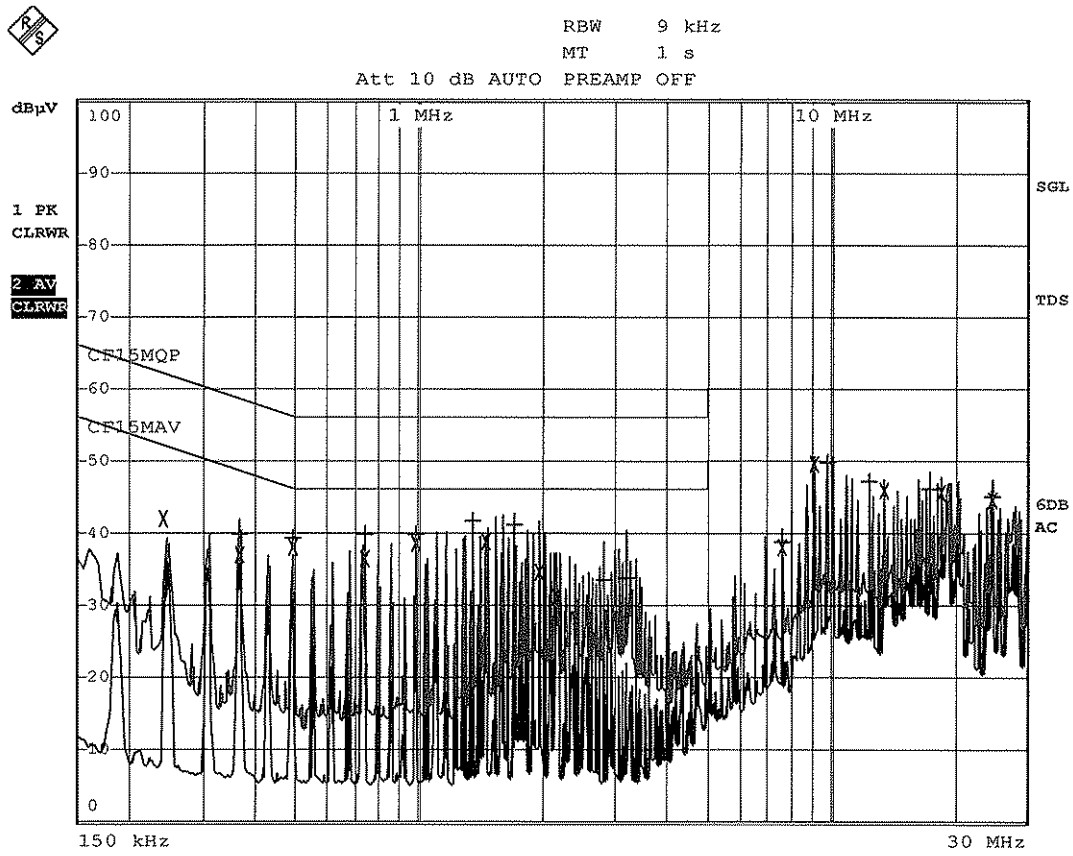
4.9 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Not applicable, duty cycle was not used.

4.10 AC Line Conducted Emission, FCC Rule 15.207:

Phase:	Live / Neutral
Model No.:	M1
Worst Case:	TX mode



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	244.5 kHz	41.81	N gnd	-10.12
1	Quasi Peak	366 kHz	39.72	N gnd	-18.86
2	CISPR Average	366 kHz	36.97	N gnd	-11.62
1	Quasi Peak	492 kHz	39.32	N gnd	-16.80
2	CISPR Average	492 kHz	38.02	N gnd	-8.10
1	Quasi Peak	735 kHz	39.82	N gnd	-16.17
2	CISPR Average	739.5 kHz	36.46	N gnd	-9.54
1	Quasi Peak	982.5 kHz	39.78	N gnd	-16.21
2	CISPR Average	982.5 kHz	38.33	N gnd	-7.66
1	Quasi Peak	1.3515 MHz	41.66	N gnd	-14.33
2	CISPR Average	1.4595 MHz	38.74	L1 gnd	-7.25
1	Quasi Peak	1.7205 MHz	41.00	N gnd	-14.99
2	CISPR Average	1.968 MHz	34.47	N gnd	-11.52
2	CISPR Average	2.1525 MHz	31.04	N gnd	-14.95
1	Quasi Peak	2.823 MHz	33.38	N gnd	-22.61
1	Quasi Peak	3.192 MHz	33.66	N gnd	-22.33
1	Quasi Peak	7.656 MHz	38.80	N gnd	-21.19
2	CISPR Average	7.656 MHz	38.02	L1 gnd	-11.97
2	CISPR Average	9.114 MHz	49.55	N gnd	-0.44
1	Quasi Peak	9.843 MHz	49.73	N gnd	-10.26

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	12.3945 MHz	47.21	L1 gnd	-12.78
2	CISPR Average	13.488 MHz	45.86	N gnd	-4.13
1	Quasi Peak	17.502 MHz	46.17	L1 gnd	-13.82
2	CISPR Average	18.5955 MHz	45.47	L1 gnd	-4.52
1	Quasi Peak	24.792 MHz	45.09	N gnd	-14.90
2	CISPR Average	24.792 MHz	44.43	N gnd	-5.56

5.0 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003. A typical or an unmodulated CW signal at the operating frequency of the EUT has been supplied to the EUT for all measurements. Such a signal is supplied by a signal generator and an antenna in close proximity to the EUT. The signal level is sufficient to stabilize the local oscillator of the EUT.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

5.0 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

6.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Biconical Antenna	Log Periodic Antenna
Registration No.	EW-0014	EW-0954	EW-0446
Manufacturer	R&S	EMCO	EMCO
Model No.	ESVS30	3104C	3146
Calibration Date	Jun. 01, 2009	Sep. 30, 2008	Oct. 02, 2008
Calibration Due Date	Jun. 01, 2010	Mar. 30, 2010	Apr. 02, 2010

Equipment	Spectrum Analyzer	Double Ridged Guide Antenna
Registration No.	EW-2188	EW-1015
Manufacturer	AGILENTTECH	EMCO
Model No.	E4407B	3115
Calibration Date	Dec. 18, 2008	Jul. 28, 2008
Calibration Due Date	Dec. 18, 2009	Jan. 28, 2010

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2500	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI	ENV-216
Calibration Date	Sep. 02, 2008	Sep. 19, 2008
Calibration Due Date	Sep. 02, 2009	Sep. 19, 2009

3) 15.247

Equipment	Spectrum Analyzer	RF Power Meter with Power Sensor
Registration No.	EW-2253	EW-2270
Manufacturer	ROHDESCHWARZ	AGILENTTECH
Model No.	FSP40	N1911A
Calibration Date	Aug. 12, 2008	Oct. 18, 2008
Calibration Due Date	Aug. 12, 2009	Oct. 18, 2009