

# EMC TEST REPORT

**Report No. : EME-051278**

**Model No. : G-663**

**Issued Date : Jan. 19, 2006**

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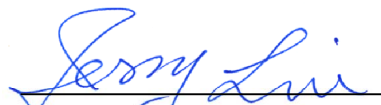
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Project Engineer



Kevin Chen

Reviewed By



Jerry Liu

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**Summary of Tests****802.11G WIRELESS LAN MODULE -Model: G-663  
FCC ID: I88G663**

Test	Reference	Results
Minimum 6dB Bandwidth test	15.247(a)(2)	Complies
Maximum Output Power test	15.247(b)	Complies
Radiated Spurious Emission test	15.205, 15.209	Complies
Power Spectrum Density test	15.247(e)	Complies
Emission on the Band Edge test	15.247(d)	Complies
AC Power Line Conducted Emission test	15.207	Complies

## 1. General information

### 1.1 Identification of the EUT

Applicant	: ZyXEL Communications Corporation
Product	: 802.11G WIRELESS LAN MODULE
Model No.	: G-663
FCC ID.	: I88G663
Frequency Range	: 2412MHz ~ 2462MHz
Channel Number	: 11 channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: DSSS, OFDM
Rated Power	: 3.3Vdc from Notebook PC
Power Cord	: N/A
Sample Received	: Nov. 18, 2005
Test Date(s)	: Nov. 24, 2005 ~ Jan. 10, 2006

A FCC DoC report has been generated for the client.

### 1.2 Additional information about the EUT

The EUT is an 802.11G WIRELESS LAN MODULE, and was defined as information technology equipment.

The EUT meets special requirements for full modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

### 1.3 Antenna description

The EUT has six types of antenna, the antenna are affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

The detail please refer to the following table:

	Antenna 1	Antenna 2	Antenna 3	Antenna 4	Antenna 5	Antenna 6
Antenna Gain:	2.1dBi max (Including cable loss)	3.0dBi max	3.0dBi max	5.0dBi max	2.95dBi max (including cable loss)	2.95dBi max
Antenna Type:	Dipole	Dipole	Dipole	Dipole	Dipole	Dipole
Connector Type:	MHF	RP-SMA (M)	SMA Plug Reverse	SMA Straight Plug Reverse	HRS	I-PEX

Verifying six types of antenna. The worst case was found at Antenna 4.

### 1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	IBM	634588V	BN3R1VC	FCC DoC Approved
Key Board	IBM	37L2548	0095996	FCC DoC Approved
MODEM	LEMEL	MD-56KVT-100	00V230A00078422	FCC DoC Approved
Mouse	Logitech	850693-0001	LAZ82706831	FCC DoC Approved
PRINTER	HP	DeskJet 400	TH8611K30S	FCC DoC Approved

## **2. Test specifications**

### **2.1 Test standard**

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205, §15.207, §15.209, §15.247 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

### **2.2 Operation mode**

The EUT was supplied with 3.3Vdc from PC and it was running in operating mode.

Plug the EUT into PC via extension card, then turn on the PC power and run the test program "Radioscope" under windows OS, which provide by manufacturer.

The EUT worked in the status of continuously transmitting.

With individual verifying, the maximum output power was found at 11Mbps data rate for 802.11b mode and 12Mbps data rate for 802.11g mode. The final tests were executed under these conditions and recorded in this report individually.

### 2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/17/2006
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	08/07/2006
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/24/2006
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	11/01/2006
Horn Antenna	SCHWARZBECK	1GHz~18GHz	BBHA 9120 D	EC371	12/22/2007
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2007
Bilog Antenna	SCHWARZBECK	25MHz~2GHz	VULB 9168	EC347	12/23/2007
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	12/29/2006
Pre-Amplifier	MITEQ	26GHz~40GHz	828825	EC374	01/29/2006
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/ MA2491A	EC396	11/10/2006
Controller	HDGmbH	N/A	CM 100	EP346	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP347	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	04/17/2006

Note: 1. The above equipments are within the valid calibration period.

2. The test antennas (receiving antenna) are calibration per 3 years.

### 3. Minimum 6dB Bandwidth test

#### 3.1 Operating environment

Temperature: 25  
 Relative Humidity: 55 %  
 Atmospheric Pressure: 1023 hPa

#### 3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 100kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

#### 3.3 Measured data of Minimum 6dB Bandwidth test results

##### Test Mode: 802.11b (DSSS Modulation) operating mode

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412	11.6232	> 500kHz
6 (middle)	2437	11.7435	> 500kHz
11 (highest)	2462	11.6232	> 500kHz

##### Test Mode: 802.11g (OFDM Modulation) operating mode

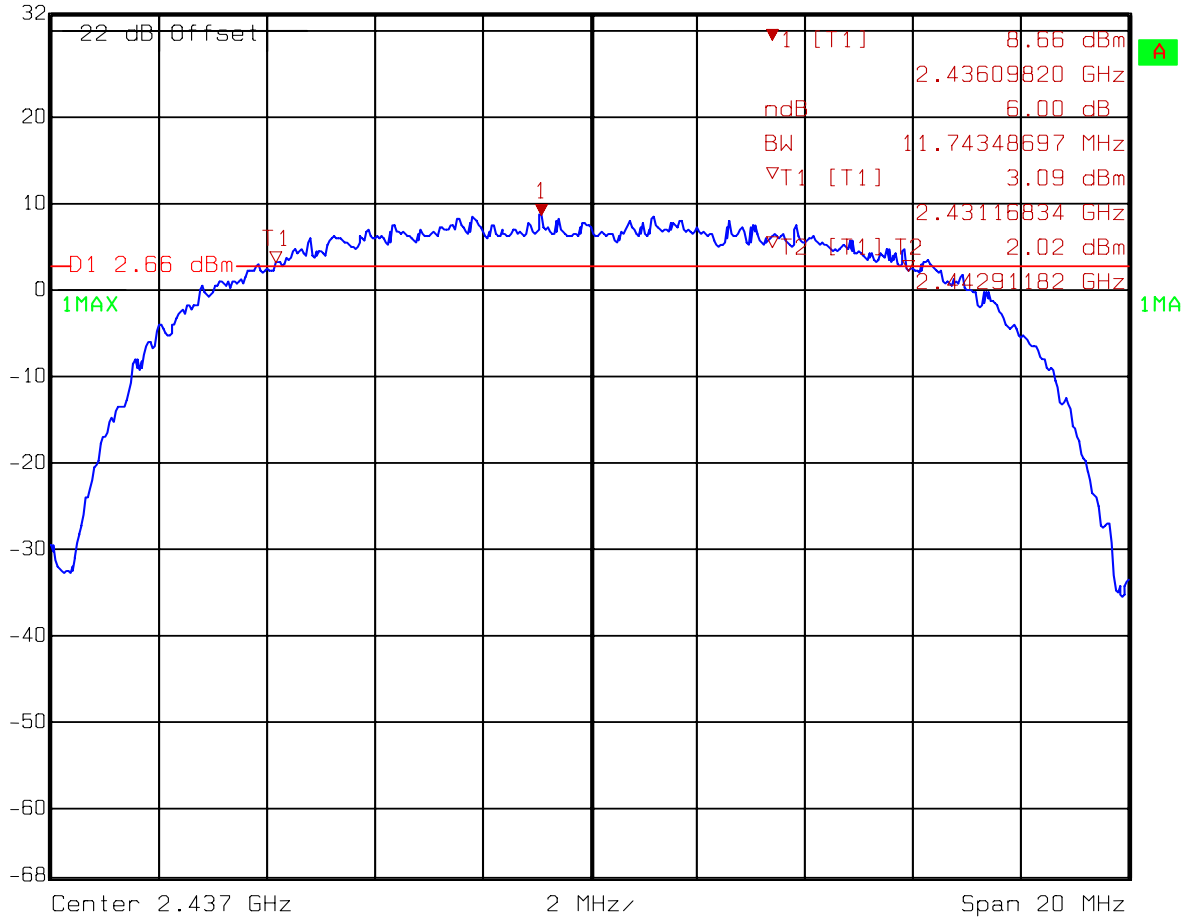
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412	16.5531	> 500kHz
6 (middle)	2437	16.5531	> 500kHz
11 (highest)	2462	16.5531	> 500kHz

Please see the plot below.





	<p>Ref Lvl 32 dBm</p>	<p>Marker 1 [T1 ndB]</p> <p>ndB 6.00 dB</p> <p>BW 11.74348697 MHz</p>	<p>RBW 100 kHz</p> <p>VBW 100 kHz</p> <p>SWT 5 ms</p>	<p>RF Att 20 dB</p>		<p>Unit dBm</p>
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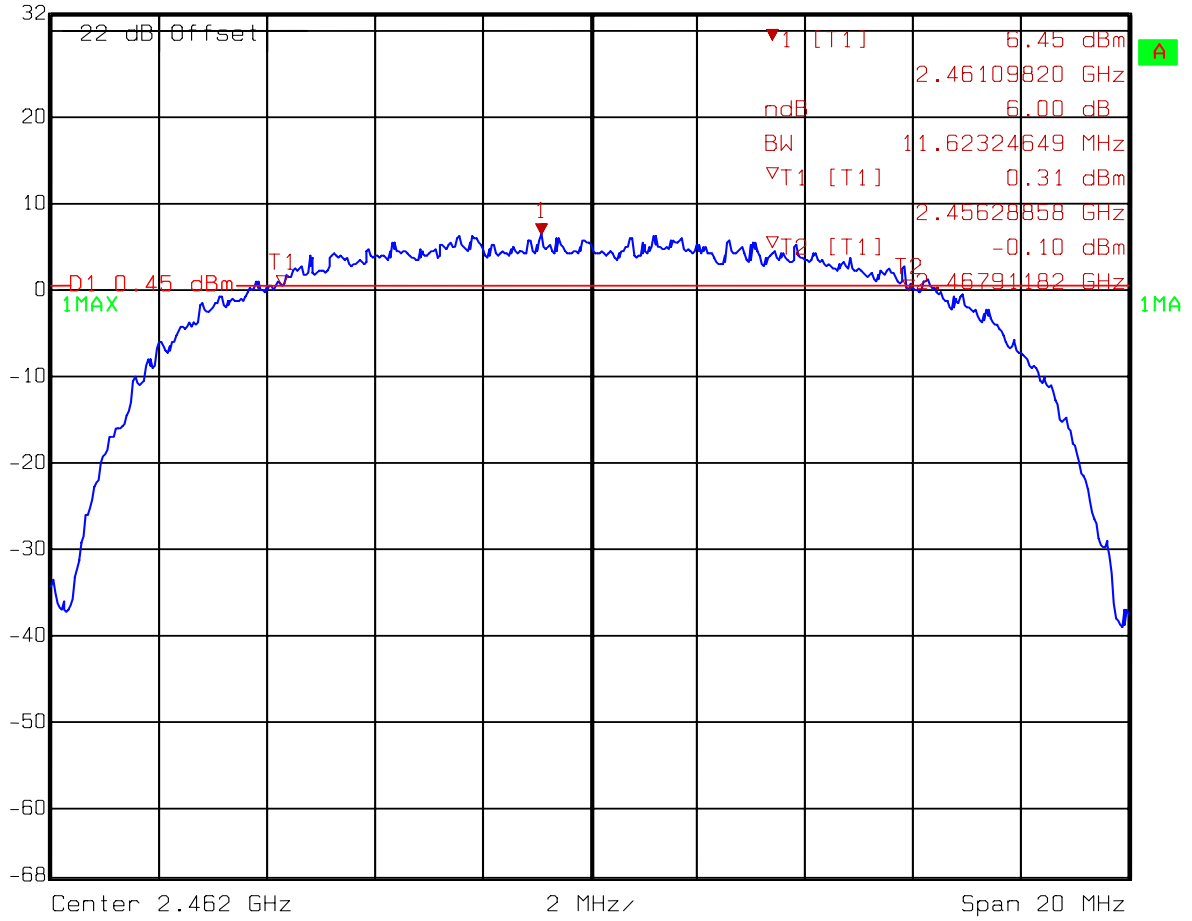


Comment A: 6dB Bandwidth at 11b\_ch6

EC365

Date: 24.NOV.2005 10:56:05

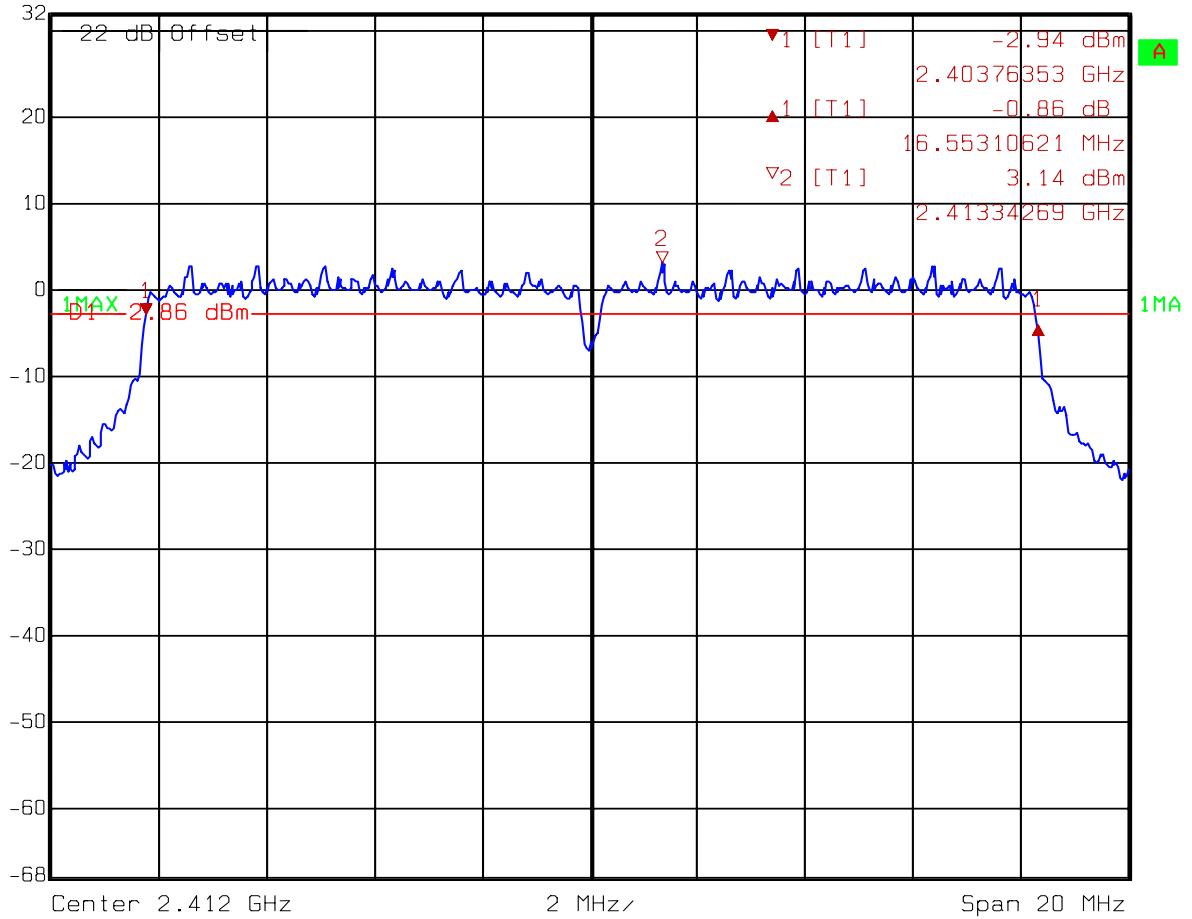
	Ref Lvl	Marker 1 [T1 ndB]	RBW	100 kHz	RF Att	20 dB
	32 dBm	ndB	VBW	100 kHz		
		6.00 dB	SWT	5 ms	Unit	dBm
		BW				
		11.62324649 MHz				



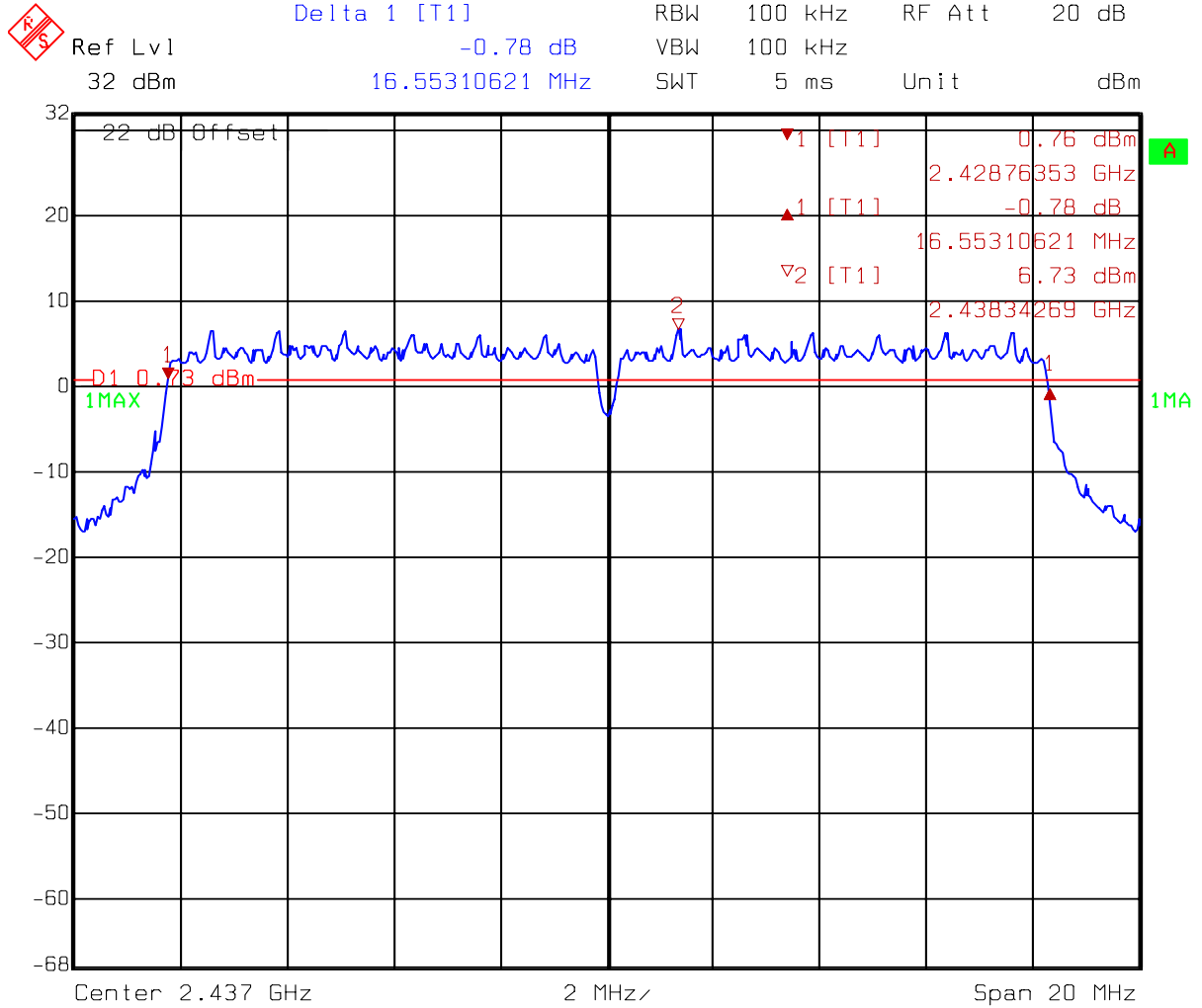
Comment A: 6dB Bandwidth at 11b\_ch11  
EC365  
Date: 24.NOV.2005 10:57:39

### Test Mode: 802.11g(OFDM Modulation) operating mode

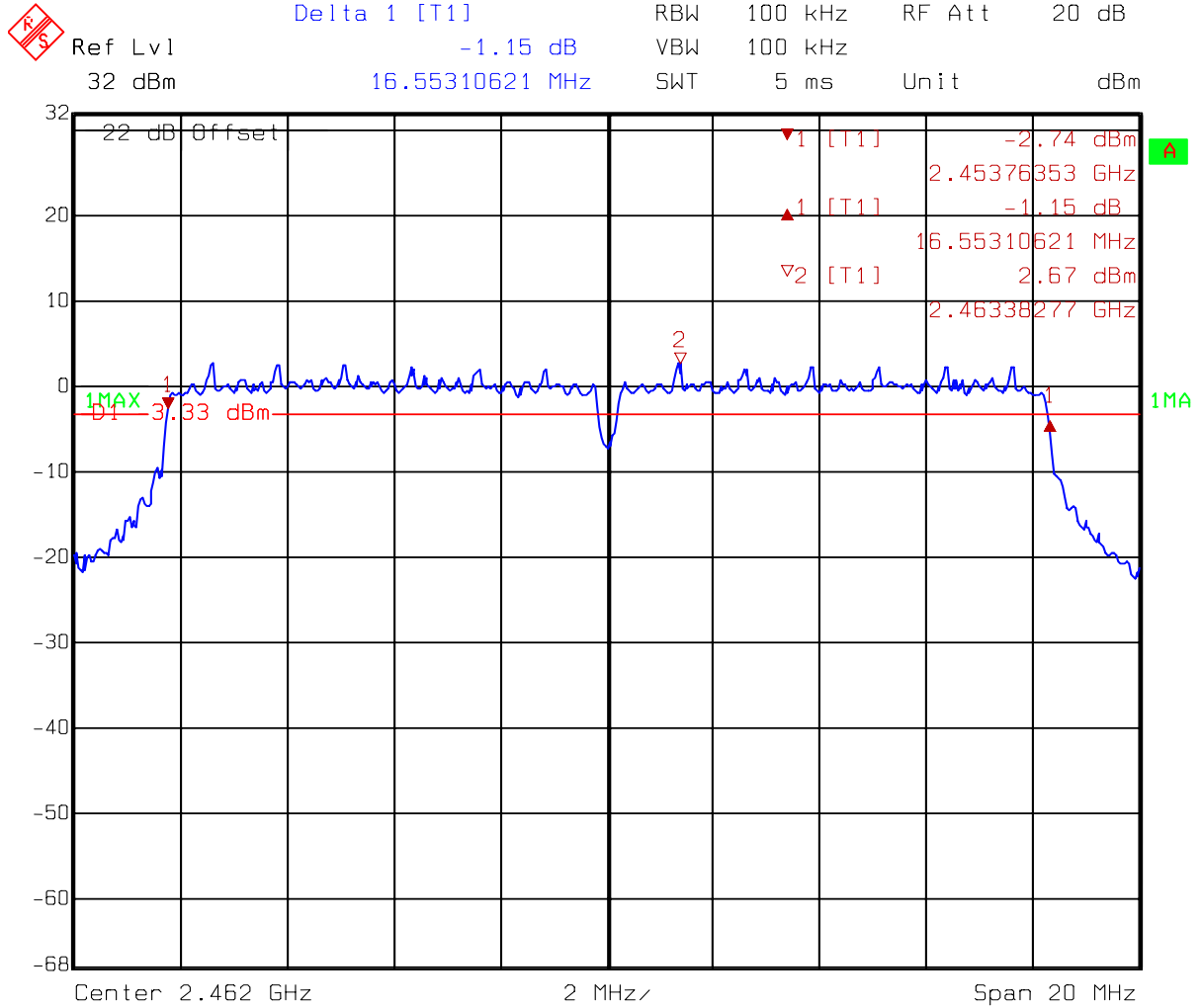
		Delta 1 [T1]	RBW	100 kHz	RF Att	20 dB
	Ref Lvl	-0.86 dB	VBW	100 kHz		
	32 dBm	16.55310621 MHz	SWT	5 ms	Unit	dBm



Comment A: 6dB Bandwidth at 11g\_ch1  
EC365  
Date: 24.NOV.2005 11:05:51



Comment A: 6dB Bandwidth at 11g\_ch6  
EC365  
Date: 24.NOV.2005 11:03:39



Comment A: 6dB Bandwidth at 11g\_ch11  
EC365  
Date: 24.NOV.2005 11:00:50

#### 4. Maximum Output Power test

##### 4.1 Operating environment

Temperature: 22  
 Relative Humidity: 56 %  
 Atmospheric Pressure: 1023 hPa

##### 4.2 Test setup & procedure

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (0.7 dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

##### 4.3 Measured data of Maximum Output Power test results

###### Test Mode: 802.11b (DSSS Modulation) operating mode

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1 (lowest)	2412	0.7	17.72	18.42	69.50	1
6 (middle)	2437	0.7	21.37	22.07	161.06	1
11 (highest)	2462	0.7	17.77	18.47	70.31	1

Remark:

Conducted Peak Output Power = Reading + C.L.

###### Test Mode: 802.11g (OFDM Modulation) operating mode

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1 (lowest)	2412	0.7	21.35	22.05	160.32	1
6 (middle)	2437	0.7	25.06	25.76	376.70	1
11 (highest)	2462	0.7	21.86	22.56	180.30	1

Remark:

Conducted Peak Output Power = Reading + C.L.

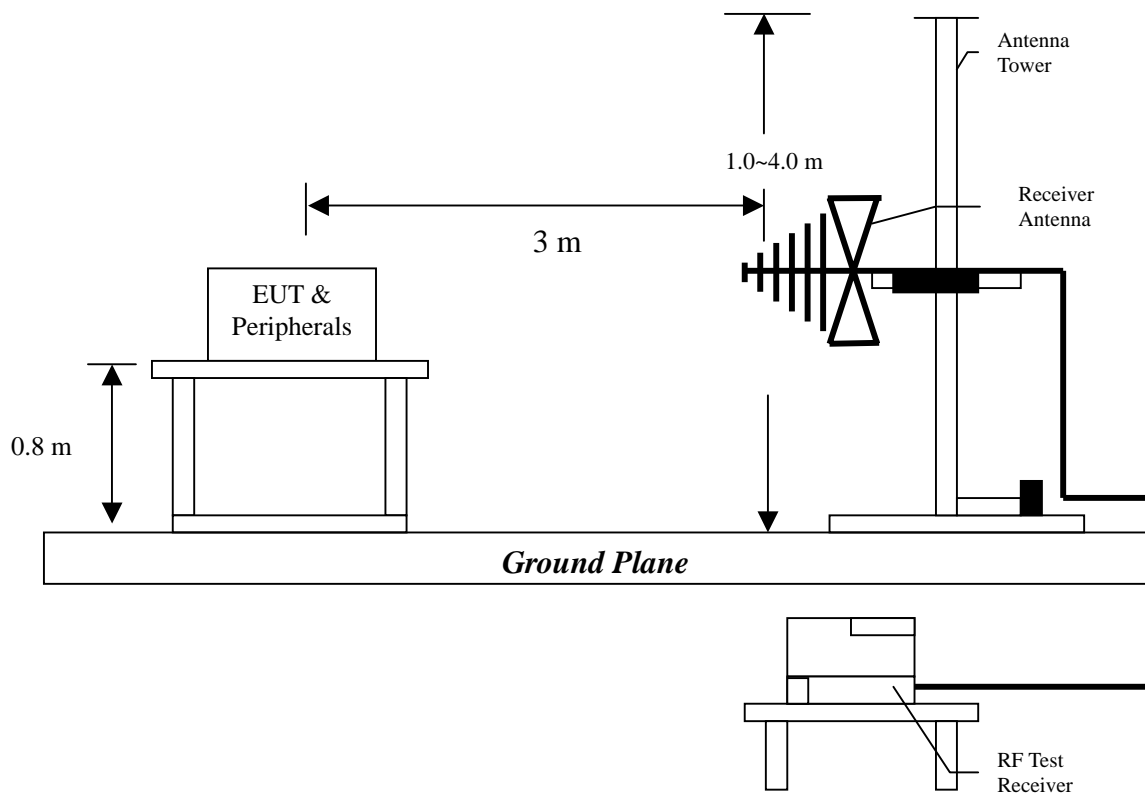
## 5. Radiated Emission test

### 5.1 Operating environment

Temperature: 23  
Relative Humidity: 53 %  
Atmospheric Pressure: 1023 hPa

### 5.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.



The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

### 5.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB $\mu$ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is 4.98 dB.

### 5.4 Radiated spurious emission test data

**The radiated spurious emissions at**

Frequency(MHz)	Margin
959.260	-3.27
959.260	-3.58
959.260	-3.28
959.260	-3.42
959.260	-3.90
959.260	-3.46

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

#### 5.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : G-663  
 Test Condition : 802.11b Tx at channel 1

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	480.080	QP	18.43	9.97	28.40	46.00	-17.61	121	328
V	559.620	QP	19.53	5.30	24.83	46.00	-21.17	123	266
V	658.560	QP	21.50	3.83	25.33	46.00	-20.67	115	178
V	718.700	QP	22.29	4.92	27.21	46.00	-18.80	145	122
V	879.720	QP	24.35	4.11	28.46	46.00	-17.55	139	69
V	989.260	QP	25.49	5.83	31.32	54.00	-22.68	154	79
H	480.080	QP	18.64	13.00	31.64	46.00	-14.36	156	78
H	559.620	QP	19.72	11.00	30.72	46.00	-15.28	147	159
H	718.700	QP	22.44	12.07	34.51	46.00	-11.49	159	98
H	798.240	QP	23.52	10.21	33.73	46.00	-12.27	166	312
H	879.720	QP	24.62	16.10	40.72	46.00	-5.29	175	255
H	959.260	QP	25.54	17.19	42.73	46.00	-3.27	169	146

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : G-663  
 Test Condition : 802.11b Tx at channel 6

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	398.600	QP	16.40	12.13	28.53	46.00	-17.47	124	159
V	480.080	QP	18.43	13.88	32.31	46.00	-13.70	133	89
V	658.560	QP	21.50	13.61	35.11	46.00	-10.89	100	65
V	718.700	QP	22.29	13.06	35.35	46.00	-10.66	105	44
V	879.720	QP	24.35	10.40	34.75	46.00	-11.26	132	177
V	959.260	QP	25.34	12.12	37.46	46.00	-8.55	115	136
H	359.800	QP	15.48	13.62	29.10	46.00	-16.91	177	45
H	398.600	QP	16.74	15.87	32.61	46.00	-13.39	205	266
H	439.340	QP	18.12	15.42	33.54	46.00	-12.46	169	321
H	718.700	QP	22.44	12.22	34.66	46.00	-11.34	129	96
H	879.720	QP	24.62	15.89	40.51	46.00	-5.50	185	82
H	959.260	QP	25.54	16.88	42.42	46.00	-3.58	201	315

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : G-663  
 Test Condition : 802.11b Tx at channel 11

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	480.080	QP	18.43	13.28	31.71	46.00	-14.30	125	48
V	559.620	QP	19.53	10.64	30.17	46.00	-15.83	131	274
V	658.560	QP	21.50	13.40	34.90	46.00	-11.10	122	315
V	718.700	QP	22.29	12.89	35.18	46.00	-10.83	149	94
V	879.720	QP	24.35	10.29	34.64	46.00	-11.37	119	255
V	959.260	QP	25.34	11.86	37.20	46.00	-8.81	134	185
H	439.340	QP	18.12	15.64	33.76	46.00	-12.24	205	75
H	480.080	QP	18.64	13.80	32.44	46.00	-13.56	183	88
H	559.620	QP	19.72	11.67	31.39	46.00	-14.61	156	154
H	718.700	QP	22.44	12.07	34.51	46.00	-11.49	179	91
H	879.720	QP	24.62	15.82	40.44	46.00	-5.57	149	125
H	959.260	QP	25.54	17.18	42.72	46.00	-3.28	161	51

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : G-663  
 Test Condition : 802.11g Tx at channel 1

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	398.600	QP	16.40	11.84	28.24	46.00	-17.76	105	310
V	439.340	QP	17.64	11.64	29.28	46.00	-16.72	113	74
V	480.080	QP	18.43	13.40	31.83	46.00	-14.18	126	188
V	507.240	QP	18.56	10.24	28.80	46.00	-17.21	147	195
V	658.560	QP	21.50	12.95	34.45	46.00	-11.55	132	244
V	959.260	QP	25.34	11.66	37.00	46.00	-9.01	122	36
H	439.340	QP	18.12	15.65	33.77	46.00	-12.23	143	49
H	559.620	QP	19.72	10.80	30.52	46.00	-15.48	176	76
H	718.700	QP	22.44	11.87	34.31	46.00	-11.69	156	155
H	798.240	QP	23.52	10.92	34.44	46.00	-11.56	149	326
H	879.720	QP	24.62	15.90	40.52	46.00	-5.49	151	211
H	959.260	QP	25.54	17.04	42.58	46.00	-3.42	168	193

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : G-663  
 Test Condition : 802.11g Tx at channel 6

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBUV)	Corrected Level (dBUV/m)	Limit @ 3 m (dBUV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	439.340	QP	17.64	11.91	29.55	46.00	-16.45	136	71
V	480.080	QP	18.43	13.10	31.53	46.00	-14.48	143	211
V	658.560	QP	21.50	14.25	35.75	46.00	-10.25	125	23
V	718.700	QP	22.29	12.78	35.07	46.00	-10.94	154	129
V	879.720	QP	24.35	10.77	35.12	46.00	-10.89	163	69
V	959.260	QP	25.34	11.67	37.01	46.00	-9.00	142	48
H	359.800	QP	15.48	14.07	29.55	46.00	-16.46	124	244
H	398.600	QP	16.74	16.18	32.92	46.00	-13.08	167	89
H	439.340	QP	18.12	15.10	33.22	46.00	-12.78	148	183
H	718.700	QP	22.44	13.66	36.10	46.00	-9.90	129	156
H	879.720	QP	24.62	16.31	40.93	46.00	-5.08	187	249
H	959.260	QP	25.54	16.56	42.10	46.00	-3.90	193	355

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

EUT : G-663  
 Test Condition : 802.11g Tx at channel 11

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
V	439.340	QP	17.64	11.76	29.40	46.00	-16.60	132	89
V	480.080	QP	18.43	13.32	31.75	46.00	-14.26	149	233
V	658.560	QP	21.50	13.91	35.41	46.00	-10.59	131	241
V	718.700	QP	22.29	14.16	36.45	46.00	-9.56	155	188
V	879.720	QP	24.35	10.83	35.18	46.00	-10.83	161	165
V	960.000	QP	25.34	8.82	34.16	46.00	-11.85	139	329
H	559.620	QP	19.72	12.32	32.04	46.00	-13.96	133	350
H	639.160	QP	21.55	10.39	31.94	46.00	-14.07	158	177
H	718.700	QP	22.44	12.19	34.63	46.00	-11.37	152	289
H	798.240	QP	23.52	10.09	33.61	46.00	-12.39	135	300
H	879.720	QP	24.62	15.68	40.30	46.00	-5.71	182	353
H	959.260	QP	25.54	17.00	42.54	46.00	-3.46	195	49

Remark:

1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

**5.4.2 Measurement results: frequency above 1GHz**

EUT : G-663  
 Test Condition : 802.11b Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4824.00	PK	V	36.07	37.77	54.46	56.16	74	-17.84	102.00	98.00
4824.00	AV	V	36.07	37.77	40.52	42.22	54	-11.78	102.00	98.00
4824.00	PK	H	36.07	37.77	43.45	45.15	54	-8.85	100.00	45.00

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is :

For PK:

1GHz-3GHz: 20dBuV  
 3GHz-14GHz: 27dBuV  
 14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV  
 3GHz-14GHz: 16dBuV  
 14GHz-26.5GHz: 28dBuV



EUT : G-663  
 Test Condition : 802.11b Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4874.00	PK	V	36.07	37.77	51.14	52.84	74	-21.16	100.00	102.00
4874.00	AV	V	36.07	37.77	37.1	38.8	54	-15.2	100.00	102.00
4874.00	PK	H	36.07	37.77	-	-	54	-	-	-

**Remark:**

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is:

For PK:

1GHz-3GHz: 20dBuV  
 3GHz-14GHz: 27dBuV  
 14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV  
 3GHz-14GHz: 16dBuV  
 14GHz-26.5GHz: 28dBuV

EUT : G-663  
 Test Condition : 802.11b Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4924.00	PK	V	36.07	37.77	43.3	45	54	-9	103.00	89.00
4924.00	PK	H	36.07	37.77	-	-	54	-	-	-

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is:

For PK:

- 1GHz-3GHz: 20dBuV
- 3GHz-14GHz: 27dBuV
- 14GHz-26.5GHz: 39dBuV

For AV:

- 1GHz-3GHz: 10dBuV
- 3GHz-14GHz: 16dBuV
- 14GHz-26.5GHz: 28dBuV

EUT : G-663  
Test Condition : 802.11g Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4824.00	PK	V	36.07	37.77	-	-	54	-	-	-
4824.00	PK	H	36.07	37.77	-	-	54	-	-	-

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is :

For PK:

- 1GHz-3GHz: 20dBuV
- 3GHz-14GHz: 27dBuV
- 14GHz-26.5GHz: 39dBuV

For AV:

- 1GHz-3GHz: 10dBuV
- 3GHz-14GHz: 16dBuV
- 14GHz-26.5GHz: 28dBuV

EUT : G-663  
Test Condition : 802.11g Tx at channel 6

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4874.00	PK	V	36.07	37.77	-	-	54	-	-	-
4874.00	PK	H	36.07	37.77	-	-	54	-	-	-

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is:

For PK:

- 1GHz-3GHz: 20dBuV
- 3GHz-14GHz: 27dBuV
- 14GHz-26.5GHz: 39dBuV

For AV:

- 1GHz-3GHz: 10dBuV
- 3GHz-14GHz: 16dBuV
- 14GHz-26.5GHz: 28dBuV

EUT : G-663  
 Test Condition : 802.11g Tx at channel 11

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)	Ant. high (cm)	Turn Table angle (degree)
4924.00	PK	V	36.07	37.77	-	-	54	-	-	-
4924.00	PK	H	36.07	37.77	-	-	54	-	-	-

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.

Noise floor level is:

For PK:

- 1GHz-3GHz: 20dBuV
- 3GHz-14GHz: 27dBuV
- 14GHz-26.5GHz: 39dBuV

For AV:

- 1GHz-3GHz: 10dBuV
- 3GHz-14GHz: 16dBuV
- 14GHz-26.5GHz: 28dBuV

## 6. Power Spectrum Density test

### 6.1 Operating environment

Temperature: 23  
 Relative Humidity: 53 %  
 Atmospheric Pressure 1023 hPa

### 6.2 Test setup & procedure

The power spectrum density per FCC §15.247(e) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 150kHz, and the sweep time set at 500 seconds. Power Density was read directly correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

### 6.3 Measured data of Power Spectrum Density test results

#### Test Mode: 802.11b (DSSS Modulation) operating mode

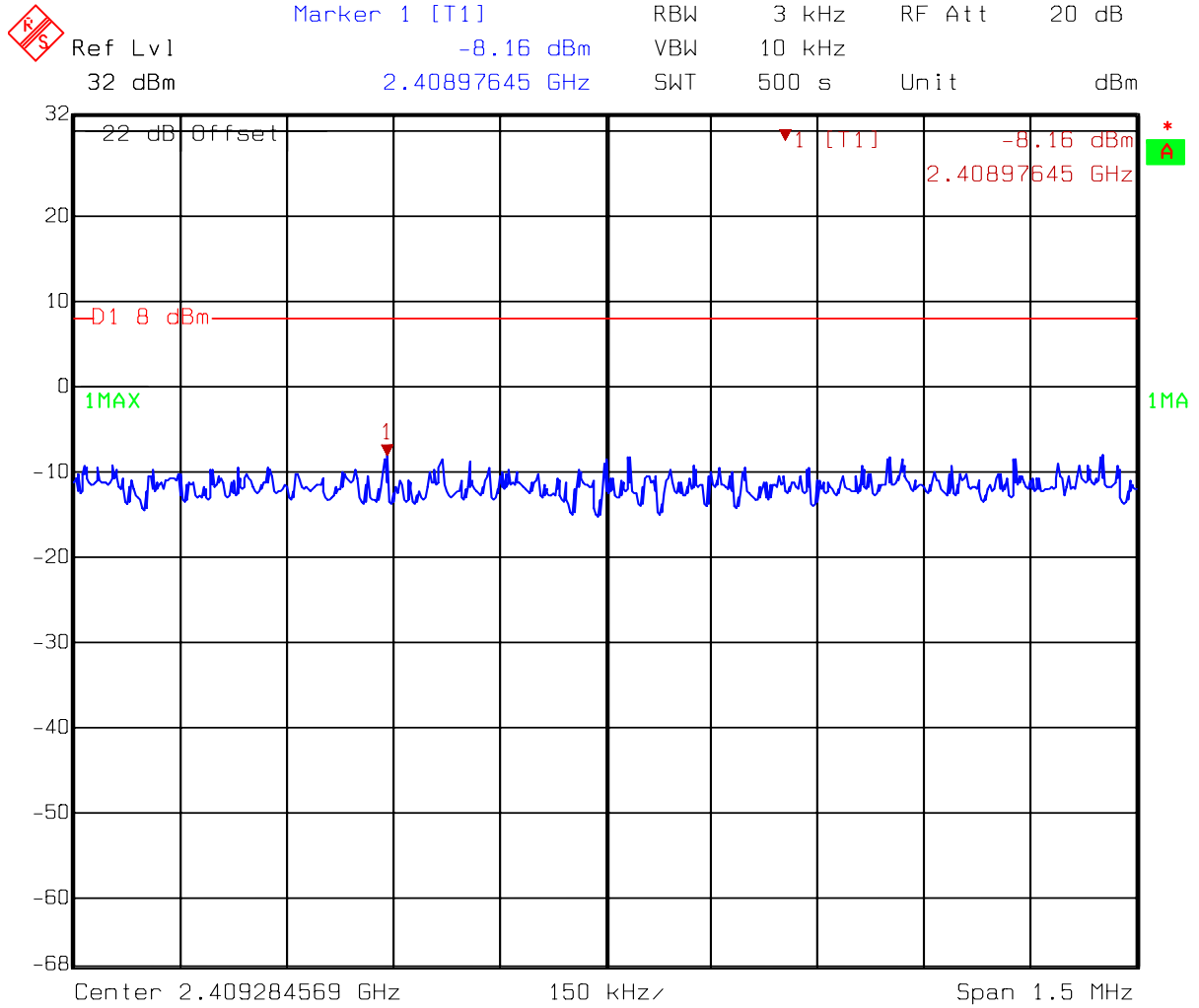
Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
1 (lowest)	2412	-8.16	8
6 (middle)	2437	-6.07	8
11 (highest)	2462	-8.22	8

#### Test Mode: 802.11g (OFDM Modulation) operating mode

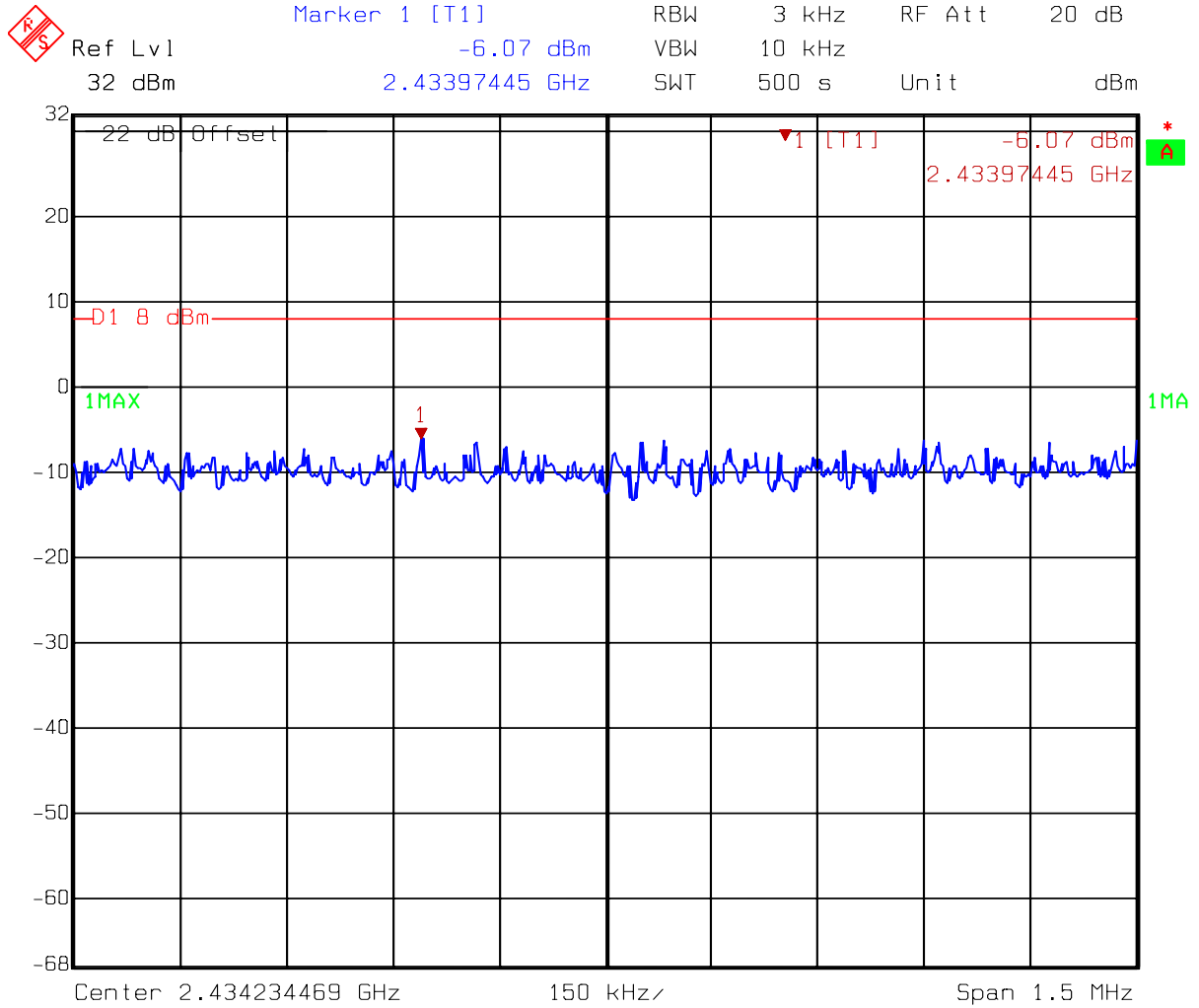
Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
1 (lowest)	2412	-9.14	8
6 (middle)	2437	-5.06	8
11 (highest)	2462	-10.51	8

Please see the plot below.

## Test Mode: 802.11b (DSSS Modulation) operating mode

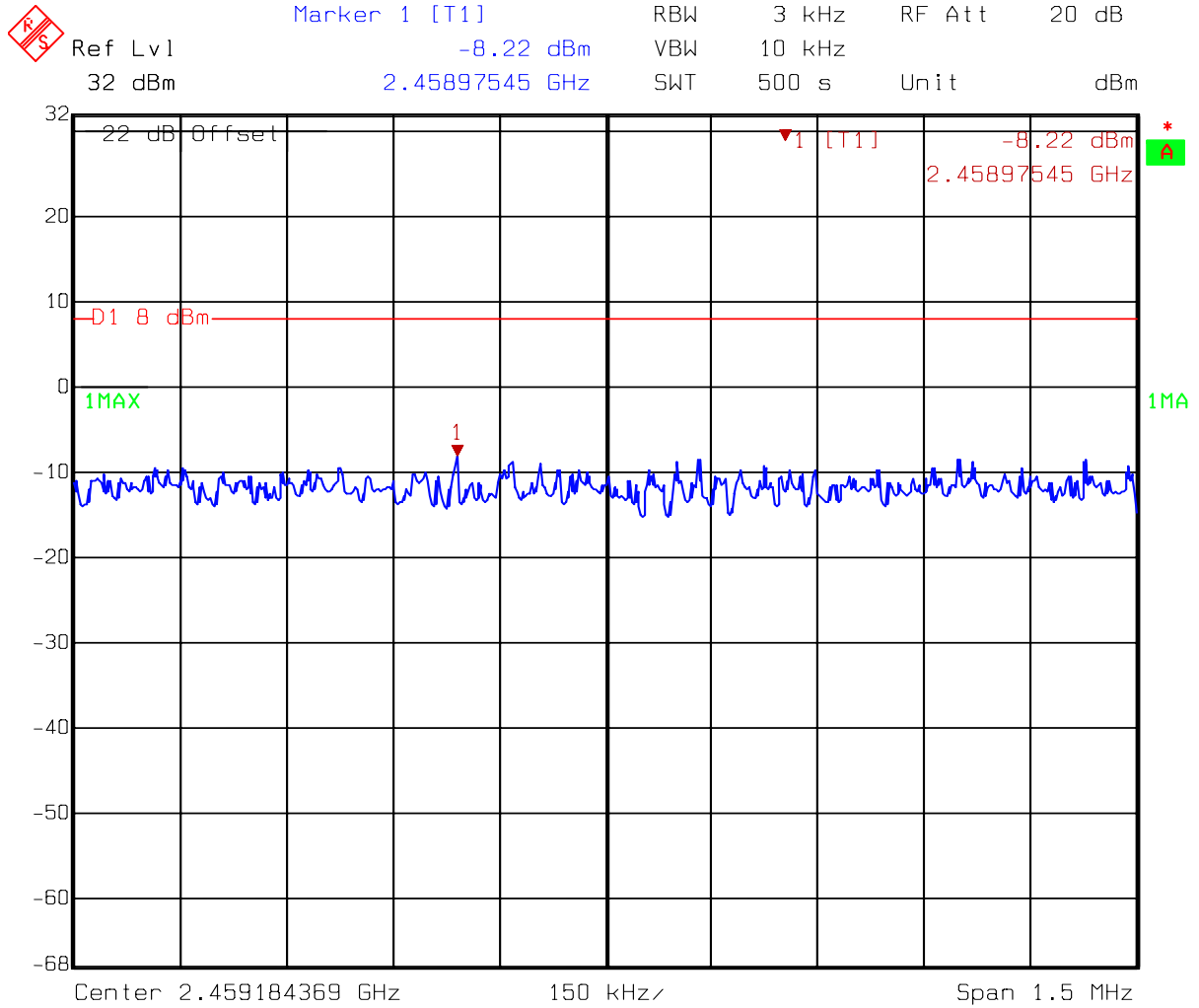


Comment A: Power Density at 11b\_ch1EC365  
Date: 24.NOV.2005 11:37:42



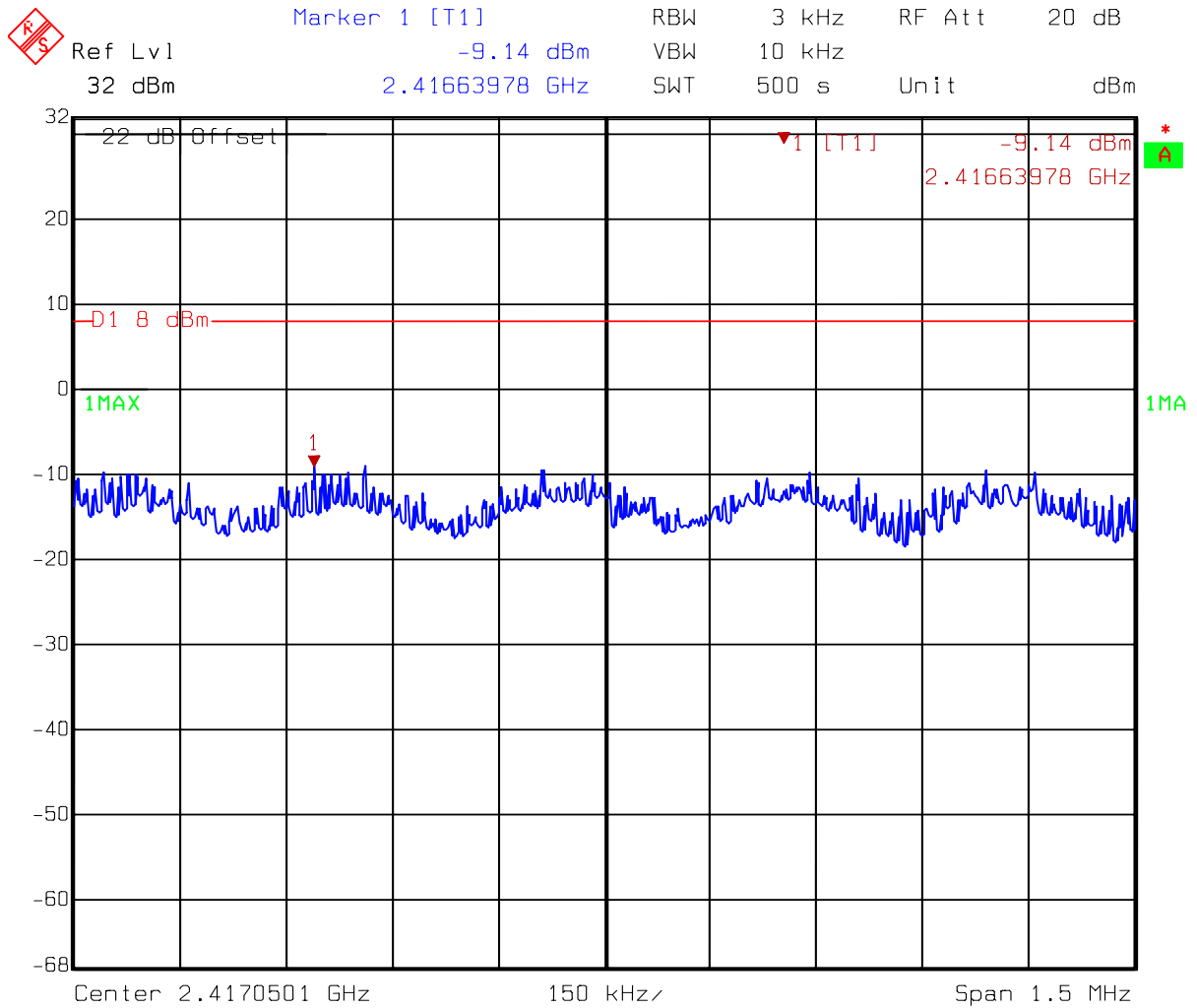
Comment A: Power Density at 11b\_ch6EC365  
Date: 24.NOV.2005 11:35:53



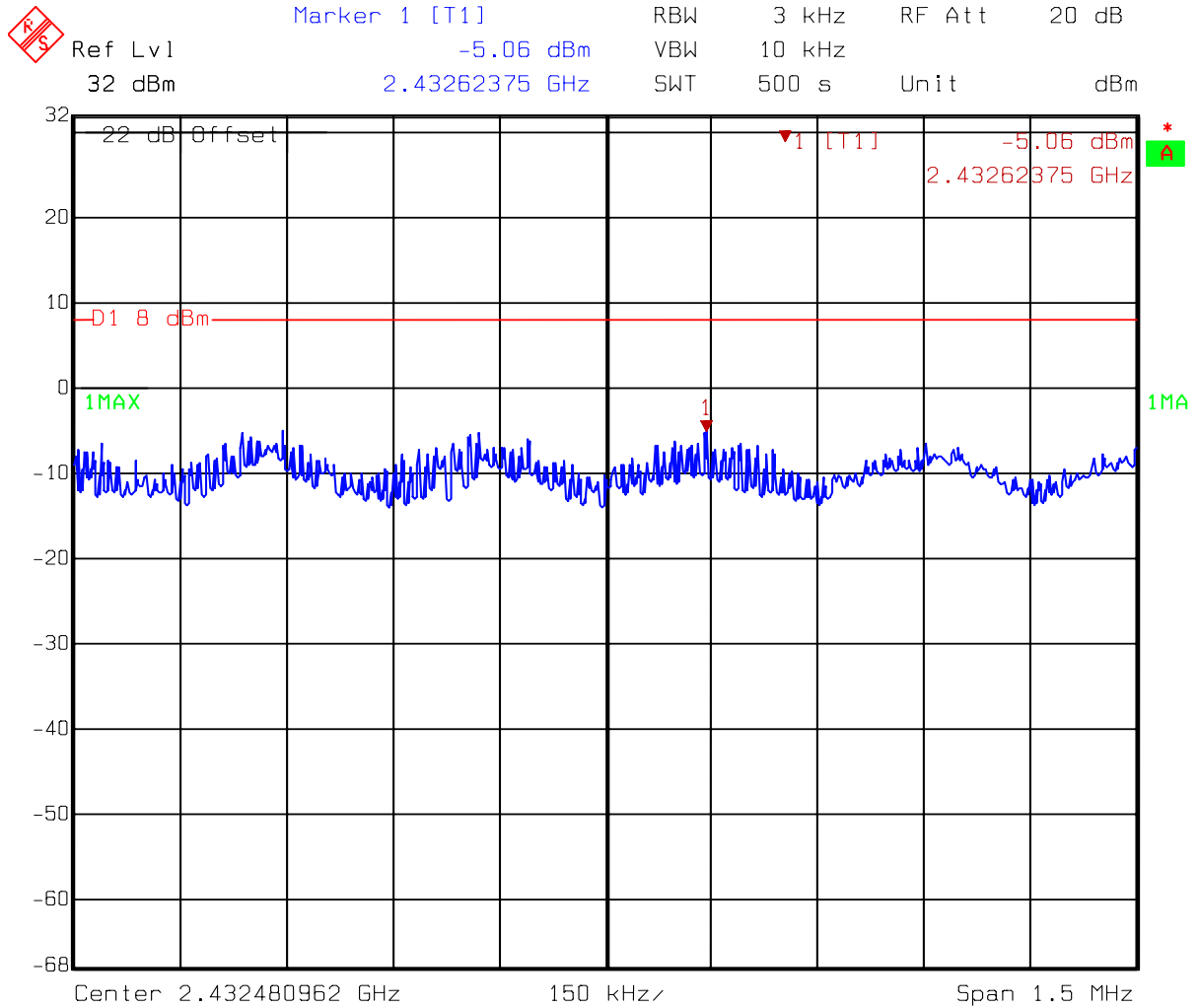


Comment A: Power Density at 11b\_ch11EC365  
 Date:            24.NOV.2005 11:32:32

## Test Mode: 802.11g (OFDM Modulation) operating mode



Comment A: Power Density at 11g\_ch1  
EC365  
Date: 24.NOV.2005 11:10:42



Comment A: Power Density at 11g\_ch6  
EC365  
Date: 24.NOV.2005 11:13:48



## 7. Emission on the band edge

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

### 7.1 Operating environment

Temperature:	23	
Relative Humidity:	56	%
Atmospheric Pressure	1023	hPa

### 7.2 Test setup & procedure

The output of EUT was connected to spectrum analyzer via a 50ohm cable.

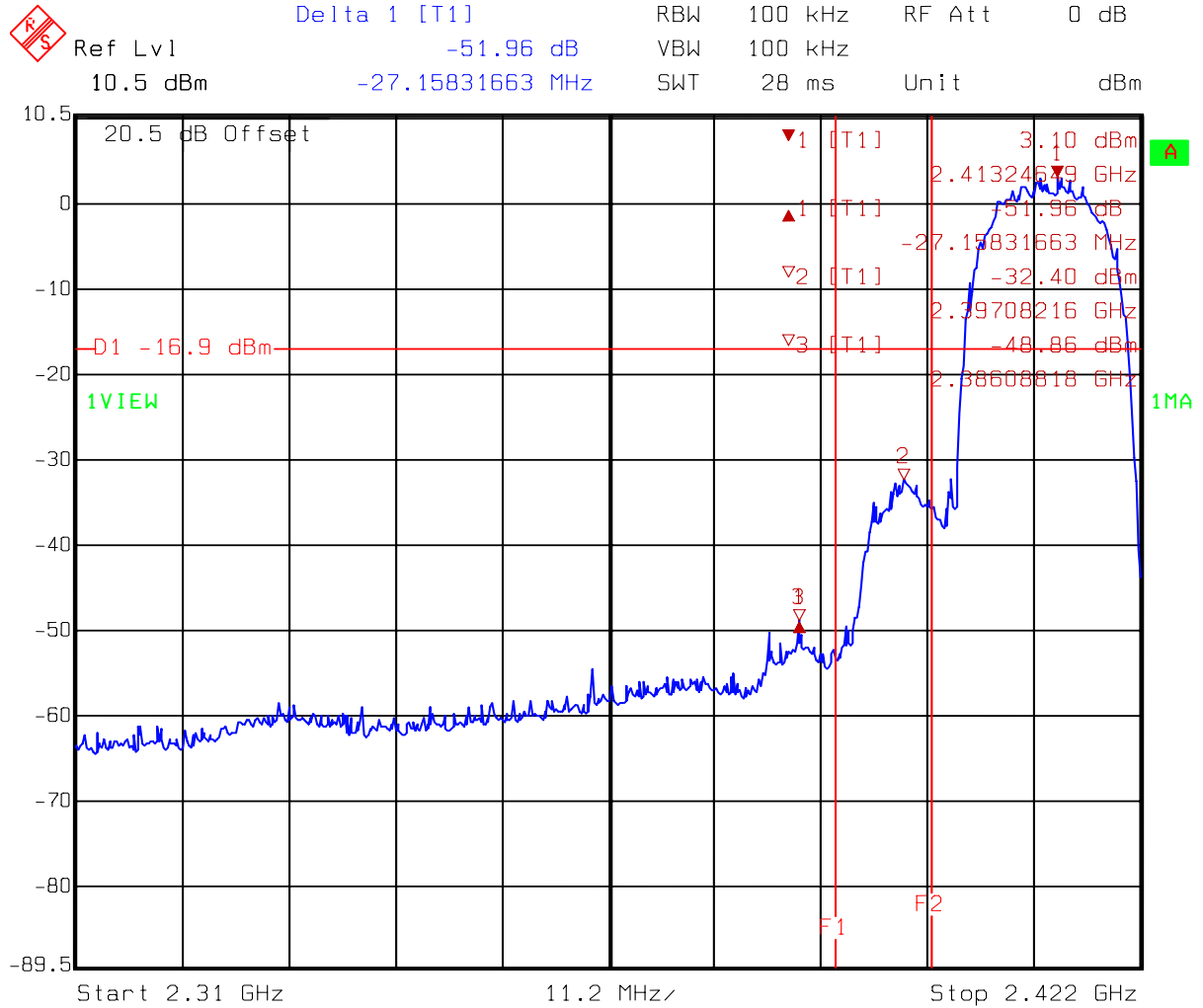
The setting of spectrum analyzer is:

Peak:	RBW = 100kHz ;	VBW = 100kHz
Average:	RBW = 1MHz ;	VBW = 10Hz

## 7.3 Test Result

### 7.3.1 Conducted Method

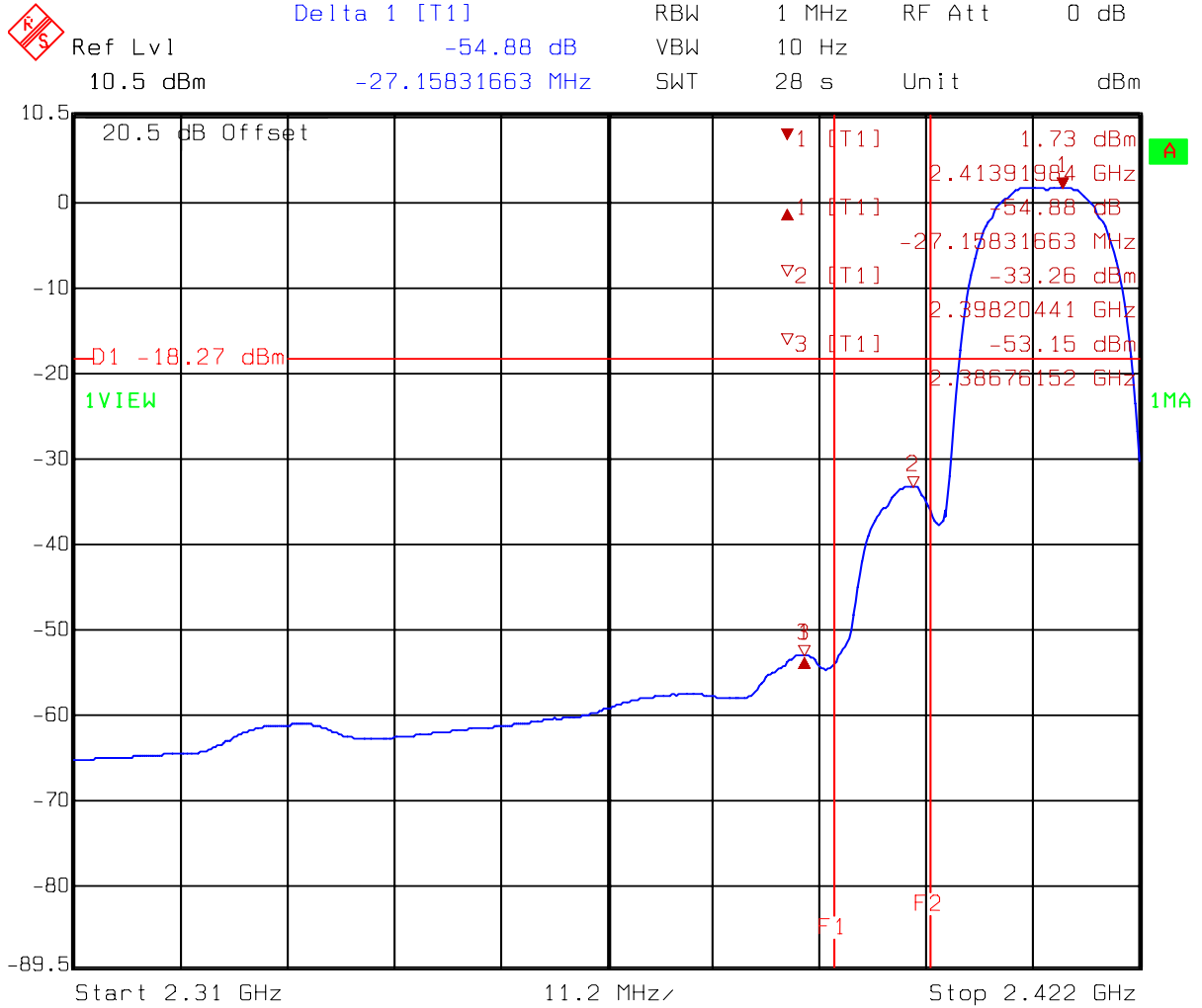
**Test Mode: 802.11b(DSSS Modulation) operating mode**



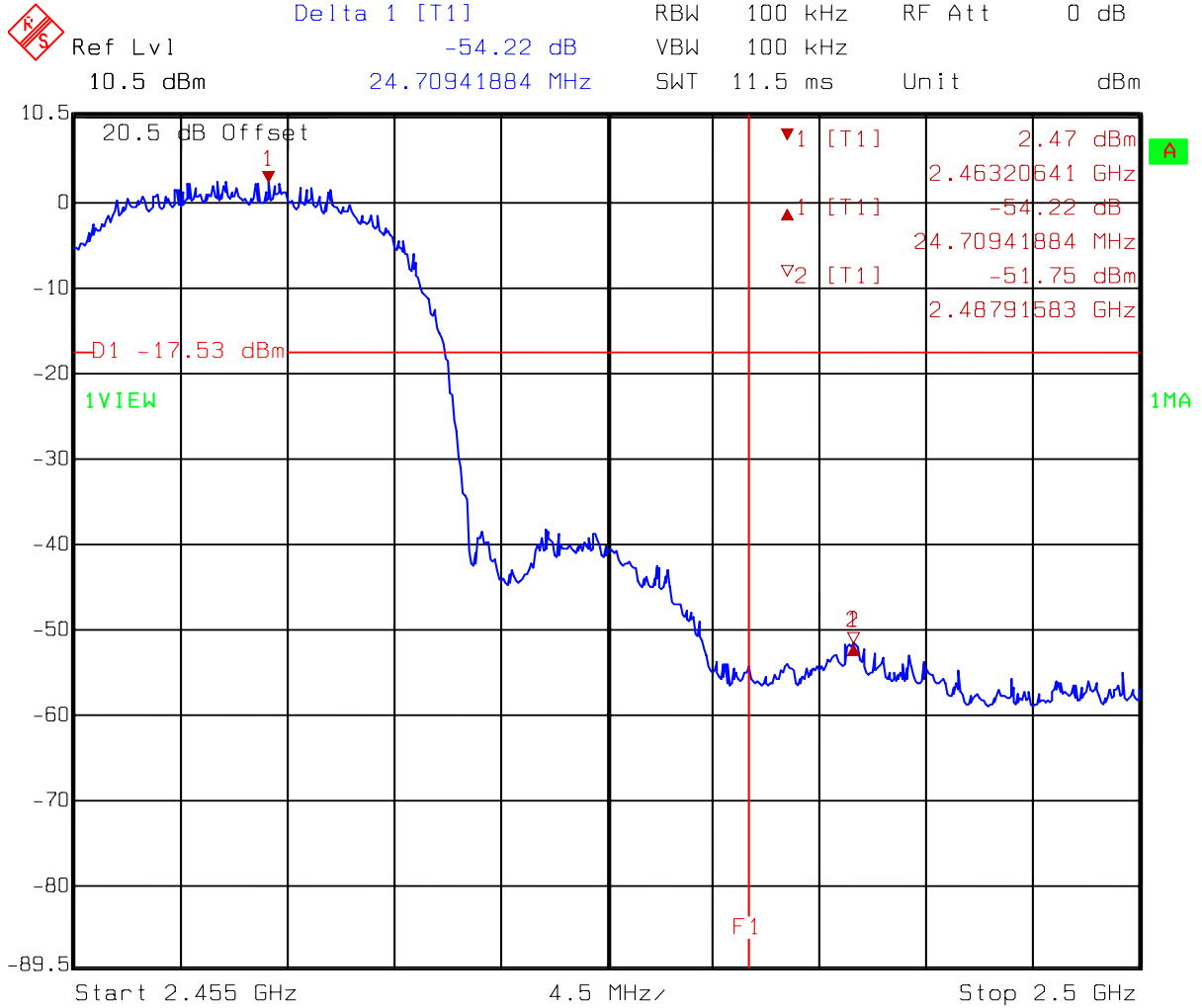
Comment A: Band-edge test at low channel (PK detector)

802.11b F1=2390MHz F2=2400MHz

Date: 28.NOV.2005 16:00:49



Comment A: Band-edge test at low channel (AV detector)  
 802.11b F1=2390MHz F2=2400MHz  
 Date: 28.NOV.2005 16:04:03

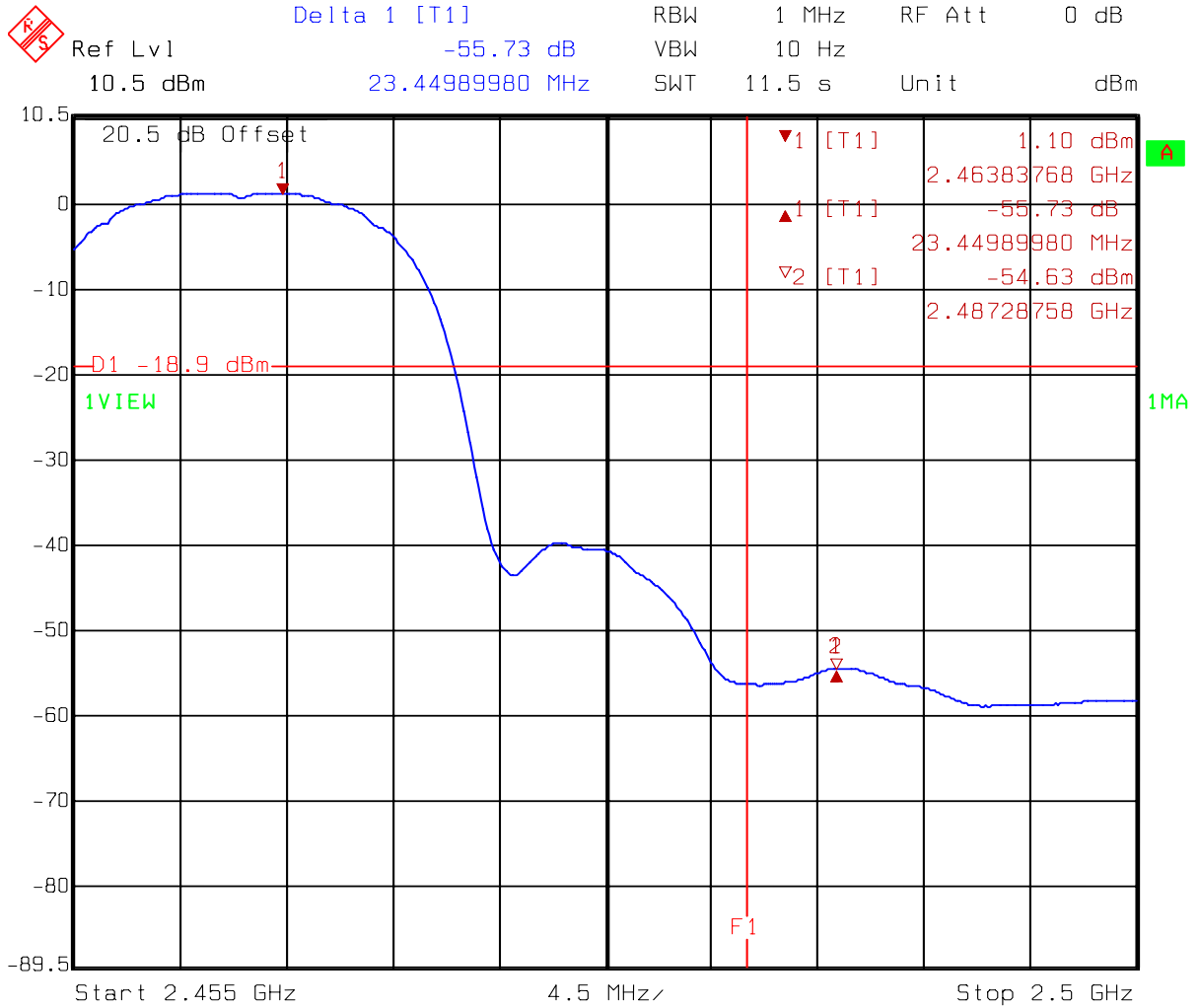


Comment A: Band-edge test at high channel (PK detector)

802.11b F1=2483.5MHz

Date: 28.NOV.2005 16:21:16



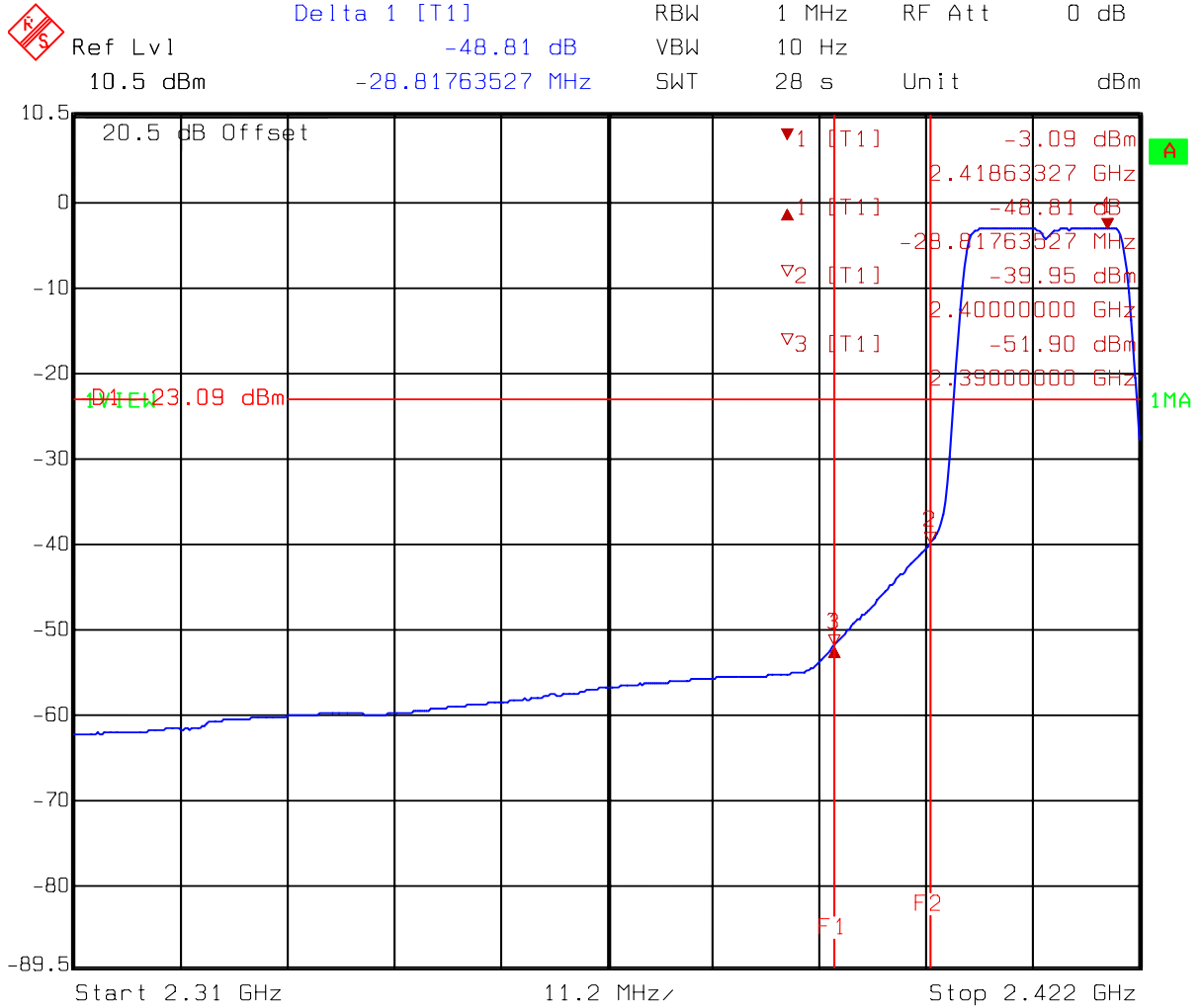


Comment A: Band-edge test at high channel (AV detector)

802.11b F1=2483.5MHz

Date: 28.NOV.2005 16:33:18

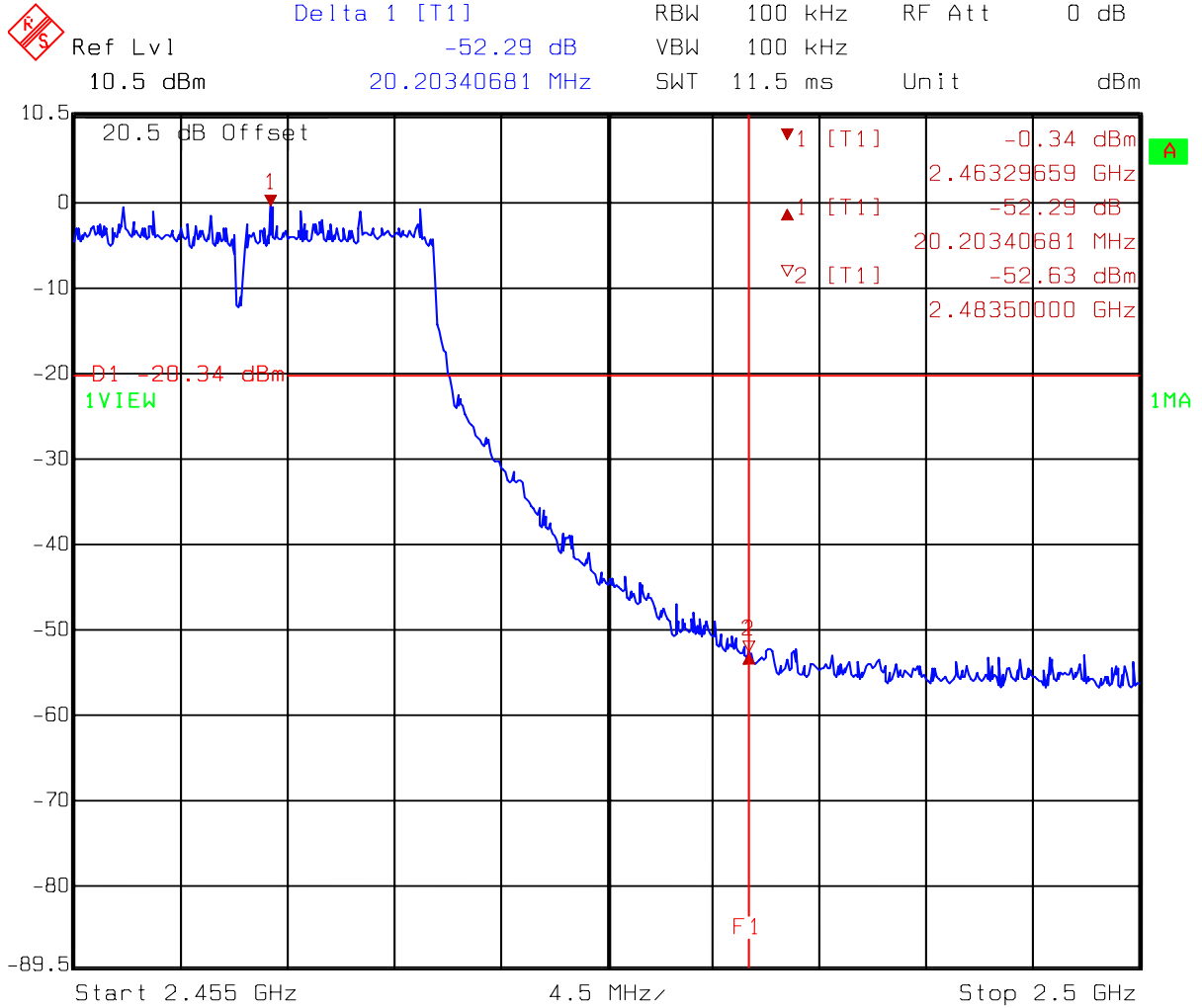




Comment A: Band-edge test at low channel (AV detector)

802.11g F1=2390MHz F2=2400MHz

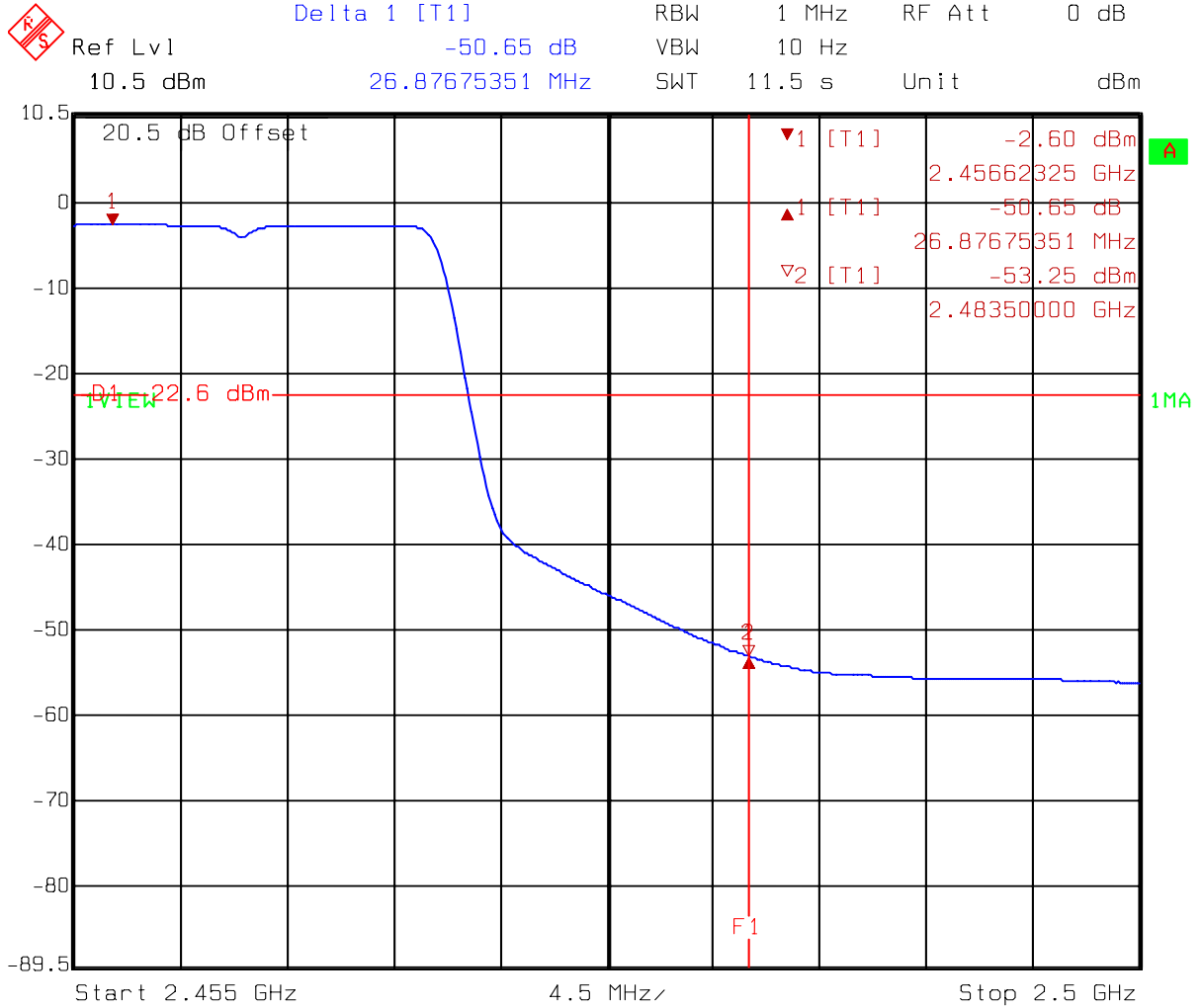
Date: 28.NOV.2005 15:50:51



Comment A: Band-edge test at high channel (PK detector)

802.11g F1=2483.5MHz

Date: 28.NOV.2005 16:30:12



Comment A: Band-edge test at high channel (AV detector)

802.11g F1=2483.5MHz

Date:            28.NOV.2005 16:27:52

**7.3.2 Radiated Method**

**Test Mode: 802.11b operating mode**

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B			
1 (lowest)	PK	113.78	51.96	61.82	74	-12.18
	AV	105.64	54.88	50.76	54	-3.24
11 (highest)	PK	112.57	54.22	58.35	74	-15.65
	AV	104.48	55.73	48.75	54	-5.25

Remark: 1.  $C = A - B$

2.  $E = C - D$

**Test Mode: 802.11g operating mode**

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B			
1 (lowest)	PK	112.55	52.98	59.57	74	-14.43
	AV	101.01	48.81	52.2	54	-1.8
11 (highest)	PK	113.45	52.29	61.16	74	-12.84
	AV	101.41	50.65	50.76	54	-3.24

Remark: 1.  $C = A - B$

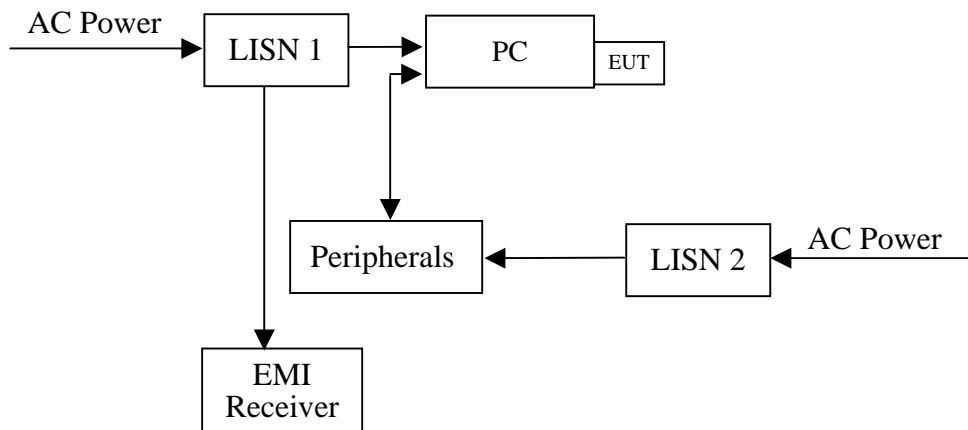
2.  $E = C - D$

## 8. Power Line Conducted Emission test §FCC 15.207

### 8.1 Operating environment

Temperature: 25  
Relative Humidity: 59 %  
Atmospheric Pressure 1023 hPa

### 8.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement. The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

**8.3 Emission limit**

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

\*Decreases with the logarithm of the frequency.

**8.4 Uncertainty of Conducted Emission**

Expanded uncertainty (k=2) of conducted emission measurement is  $\pm 2.6$  dB.



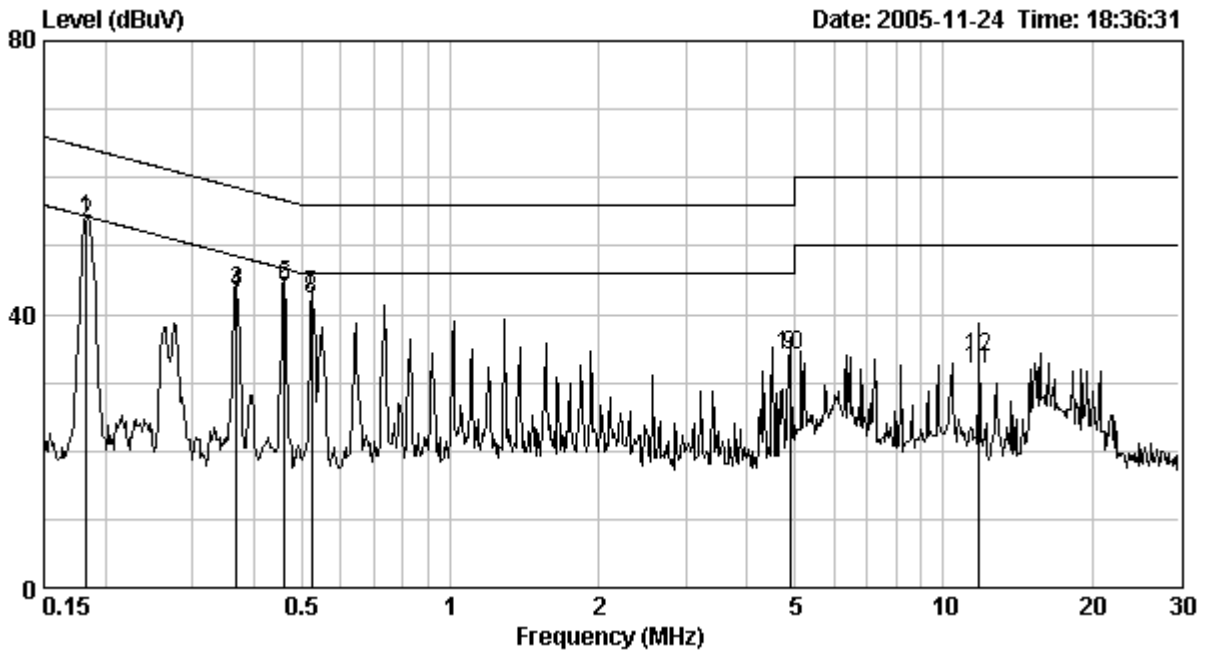
## 8.5 Power Line Conducted Emission test data

Phase : Line  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 1

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	53.87	64.35	53.35	54.35	-10.48	-1.00
0.369	0.10	43.21	58.52	43.39	48.52	-15.31	-5.13
0.461	0.10	43.88	56.67	44.20	46.67	-12.79	-2.47
0.524	0.10	42.81	56.00	42.25	46.00	-13.19	-3.75
4.879	0.23	33.89	56.00	34.00	46.00	-22.11	-12.00
11.816	0.51	31.86	60.00	33.61	50.00	-28.14	-16.39

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

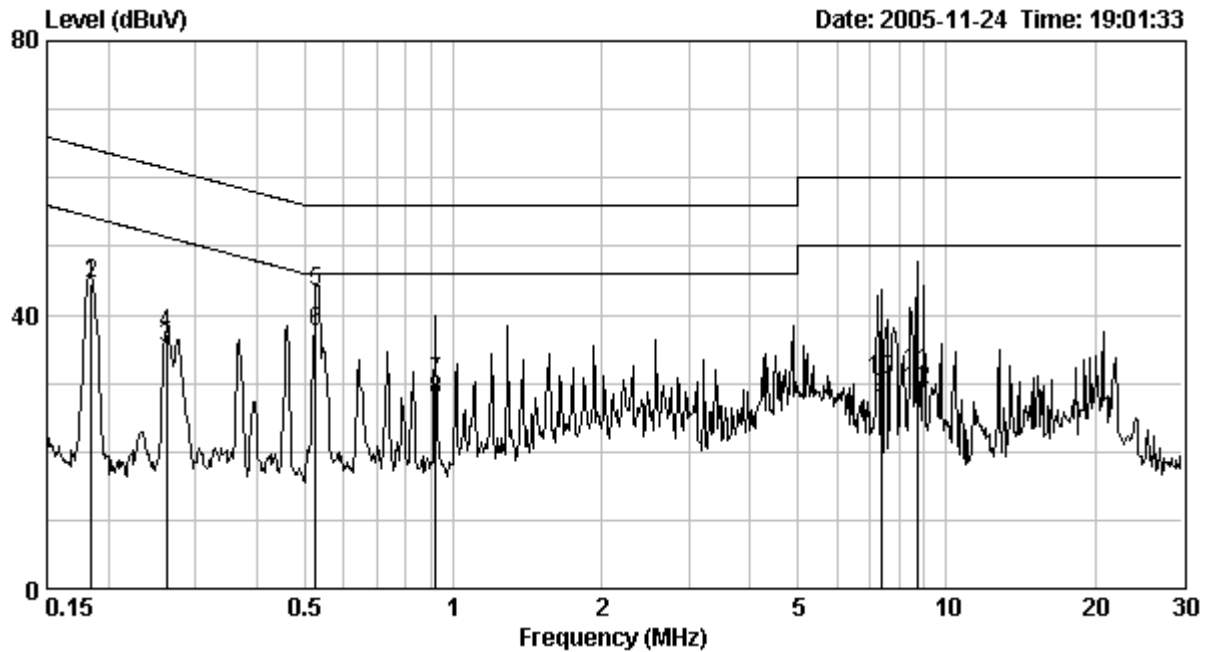


Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 1

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.185	0.10	44.60	64.28	44.66	54.28	-19.68	-9.62
0.262	0.10	37.13	61.37	35.27	51.37	-24.24	-16.10
0.525	0.10	43.30	56.00	37.52	46.00	-12.70	-8.48
0.923	0.10	30.14	56.00	27.61	46.00	-25.86	-18.39
7.364	0.20	30.50	60.00	27.78	50.00	-29.50	-22.22
8.746	0.20	31.67	60.00	29.09	50.00	-28.33	-20.91

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

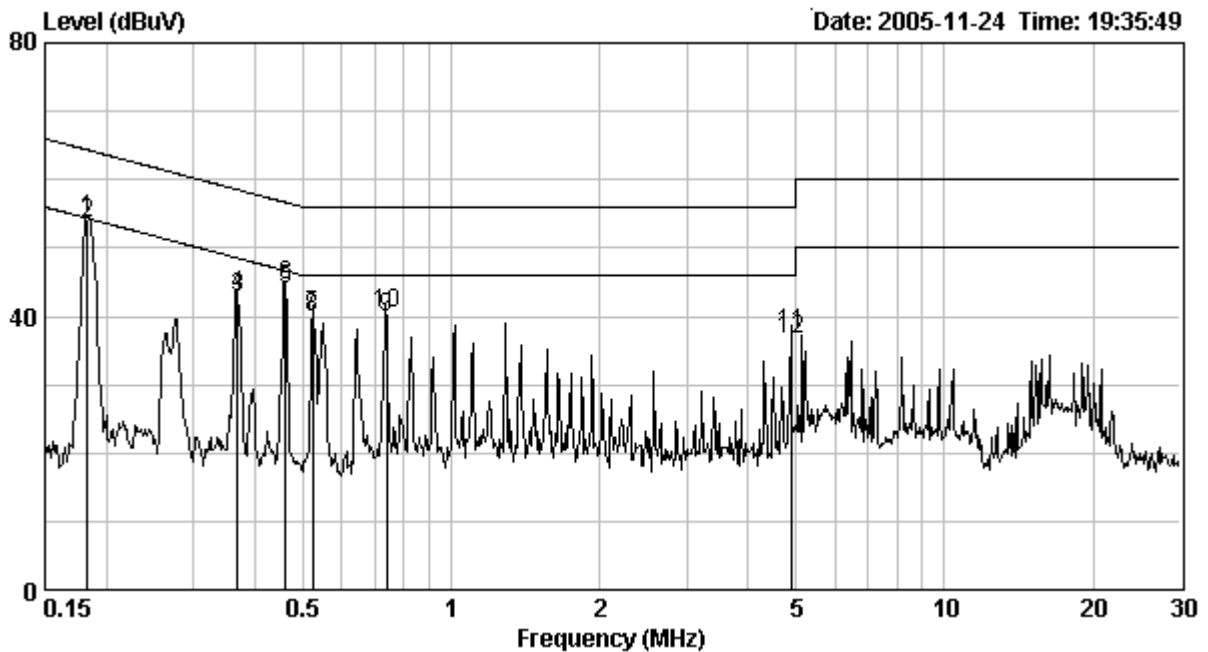


Phase : Line  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 6

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	54.09	64.35	53.54	54.35	-10.26	-0.81
0.369	0.10	42.82	58.52	43.20	48.52	-15.70	-5.32
0.461	0.10	44.10	56.67	44.54	46.67	-12.57	-2.13
0.524	0.10	40.16	56.00	39.80	46.00	-15.84	-6.20
0.738	0.10	39.96	56.00	40.30	46.00	-16.04	-5.70
4.879	0.23	37.46	56.00	36.72	46.00	-18.54	-9.28

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

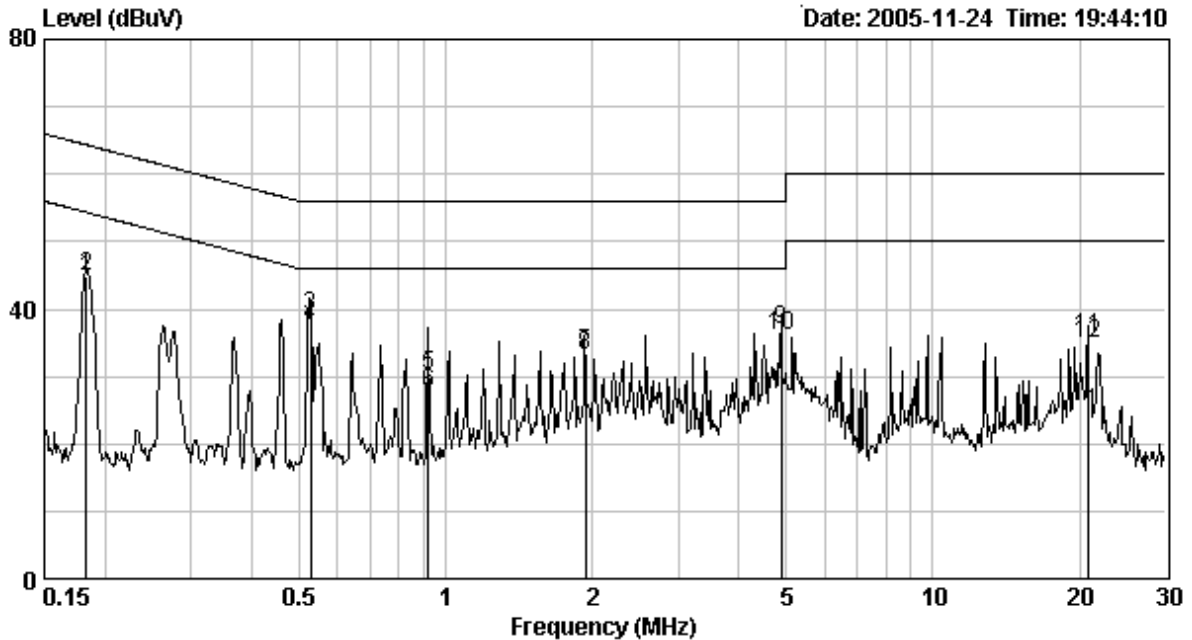


Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 6

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	44.58	64.35	44.88	54.35	-19.77	-9.47
0.528	0.10	38.89	56.00	37.58	46.00	-17.11	-8.42
0.923	0.10	30.10	56.00	27.61	46.00	-25.90	-18.39
1.936	0.10	33.45	56.00	33.18	46.00	-22.55	-12.82
4.879	0.20	36.95	56.00	36.07	46.00	-19.05	-9.93
20.805	0.62	35.72	60.00	34.93	50.00	-24.28	-15.07

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

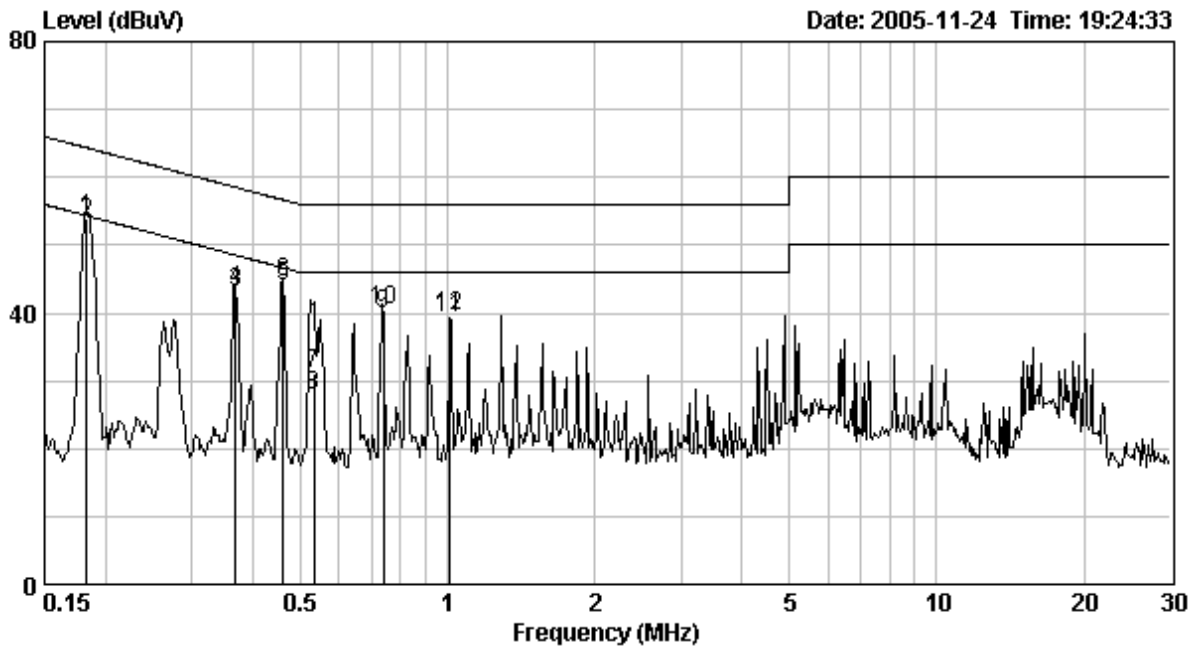


Phase : Line  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 11

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	54.01	64.35	53.47	54.35	-10.34	-0.88
0.369	0.10	42.96	58.52	43.33	48.52	-15.56	-5.19
0.461	0.10	44.04	56.67	44.48	46.67	-12.63	-2.19
0.532	0.10	31.19	56.00	27.71	46.00	-24.81	-18.29
0.738	0.10	39.98	56.00	40.30	46.00	-16.02	-5.70
1.013	0.10	39.26	56.00	39.66	46.00	-16.74	-6.34

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

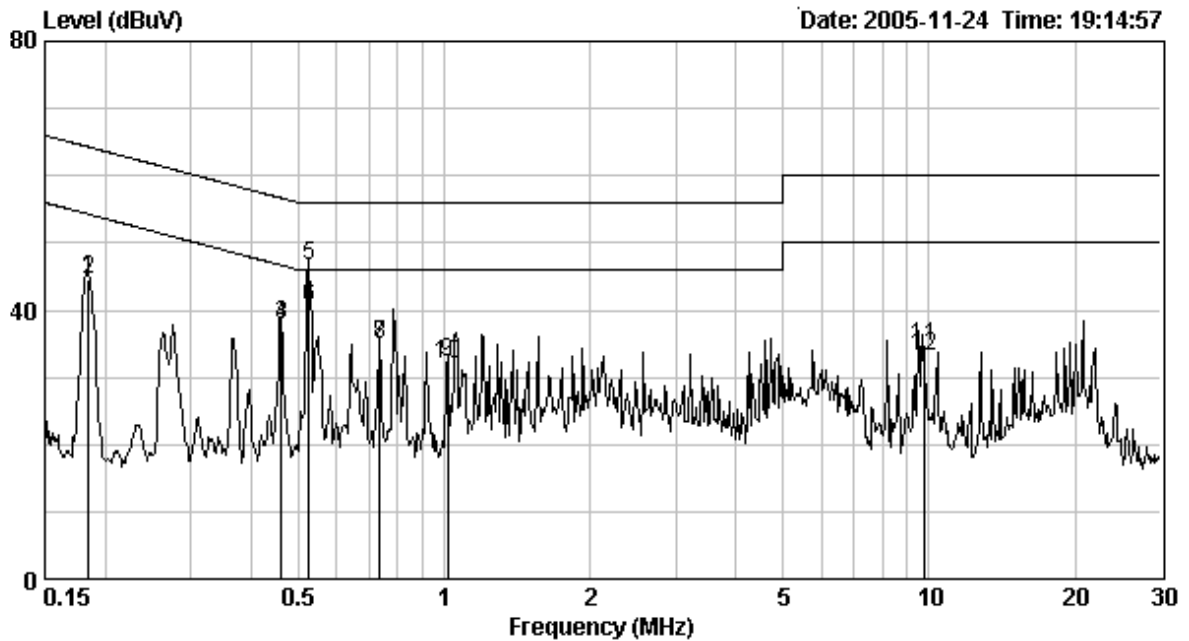


Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11b Tx at channel 11

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.185	0.10	44.48	64.28	44.66	54.28	-19.80	-9.62
0.461	0.10	37.66	56.67	37.76	46.67	-19.01	-8.91
0.525	0.10	46.65	56.00	40.55	46.00	-9.35	-5.45
0.736	0.10	34.76	56.00	34.89	46.00	-21.24	-11.11
1.015	0.10	32.12	56.00	31.93	46.00	-23.88	-14.07
9.759	0.20	34.46	60.00	32.99	50.00	-25.54	-17.01

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

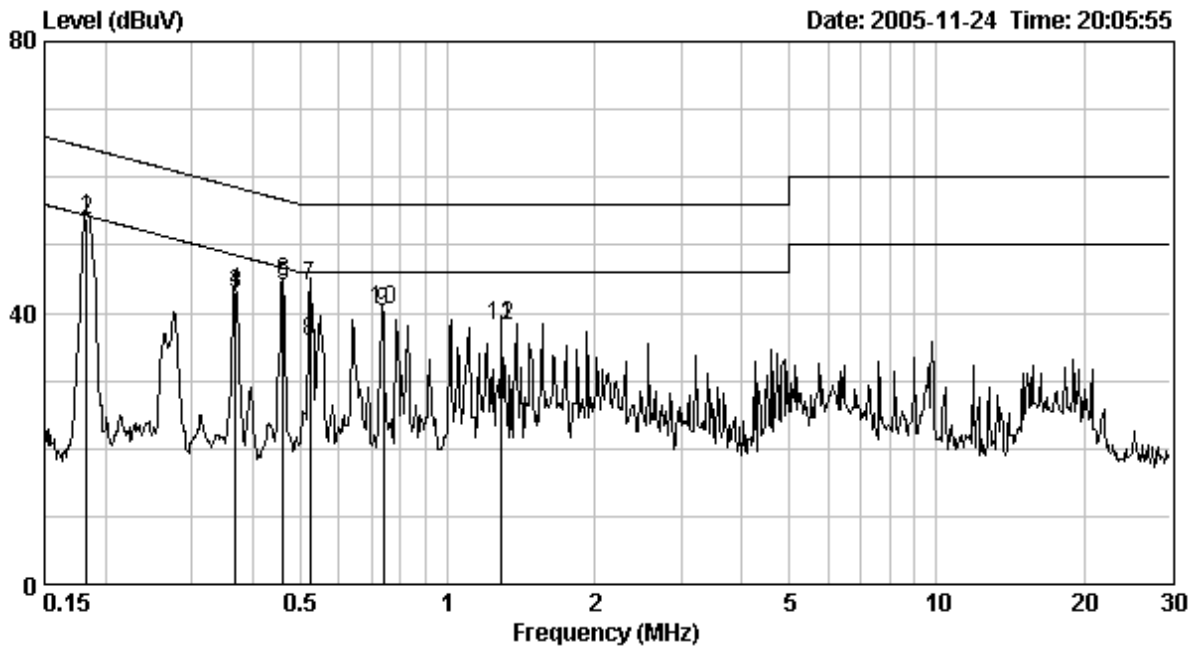


Phase : Line  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 1

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	54.05	64.35	53.54	54.35	-10.30	-0.81
0.369	0.10	42.92	58.52	42.95	48.52	-15.60	-5.57
0.461	0.10	44.10	56.67	44.48	46.67	-12.57	-2.19
0.524	0.10	43.98	56.00	35.80	46.00	-12.02	-10.20
0.738	0.10	40.08	56.00	40.43	46.00	-15.92	-5.57
1.290	0.10	38.13	56.00	38.13	46.00	-17.87	-7.87

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

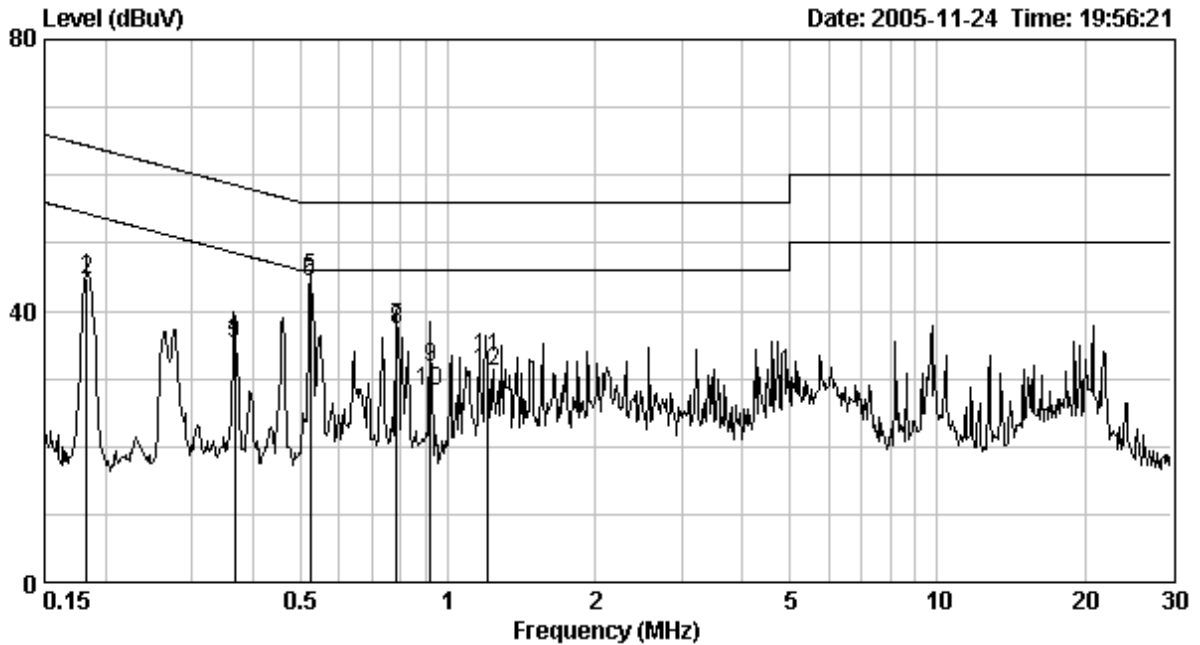


Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 1

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level Av (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	44.62	64.35	44.93	54.35	-19.73	-9.42
0.366	0.10	35.11	58.59	35.66	48.59	-23.48	-12.93
0.524	0.10	44.85	56.00	44.30	46.00	-11.15	-1.70
0.787	0.10	37.50	56.00	37.16	46.00	-18.50	-8.84
0.923	0.10	31.72	56.00	28.27	46.00	-24.28	-17.73
1.208	0.10	33.04	56.00	31.14	46.00	-22.96	-14.86

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



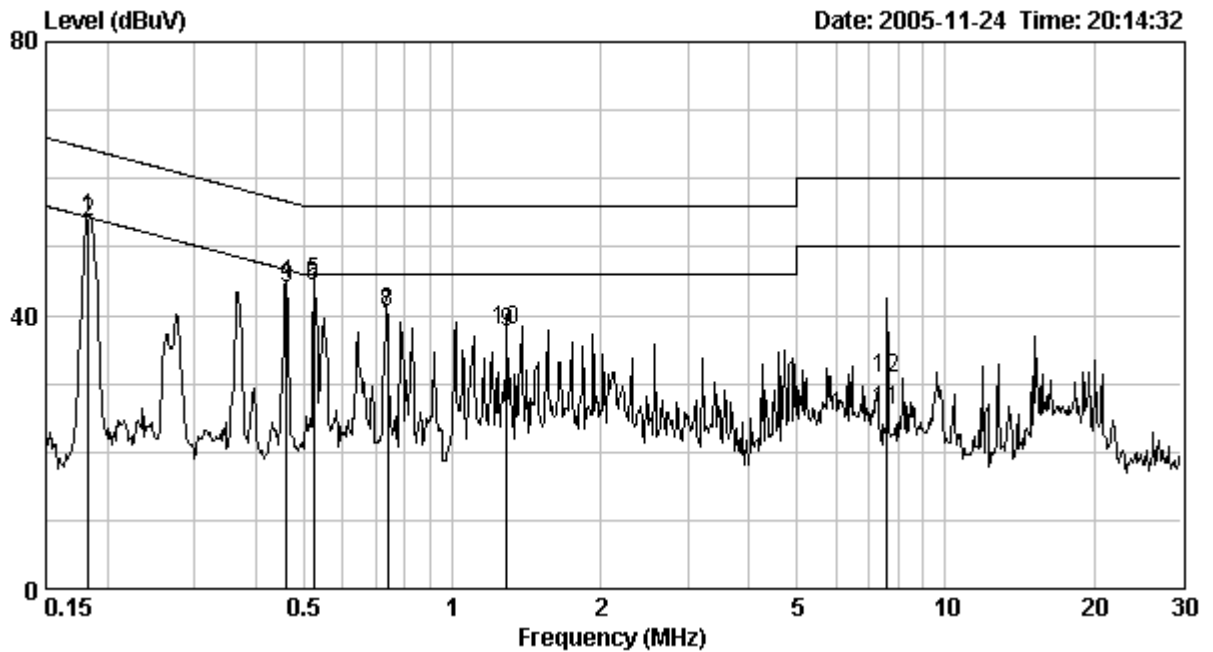


Phase : Line  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 6

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	54.07	64.35	53.54	54.35	-10.28	-0.81
0.461	0.10	44.10	56.67	44.43	46.67	-12.57	-2.24
0.524	0.10	44.91	56.00	44.30	46.00	-11.09	-1.70
0.738	0.10	40.08	56.00	40.30	46.00	-15.92	-5.70
1.290	0.10	37.58	56.00	37.78	46.00	-18.42	-8.22
7.621	0.32	25.99	60.00	30.84	50.00	-34.01	-19.16

**Remark:**

1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

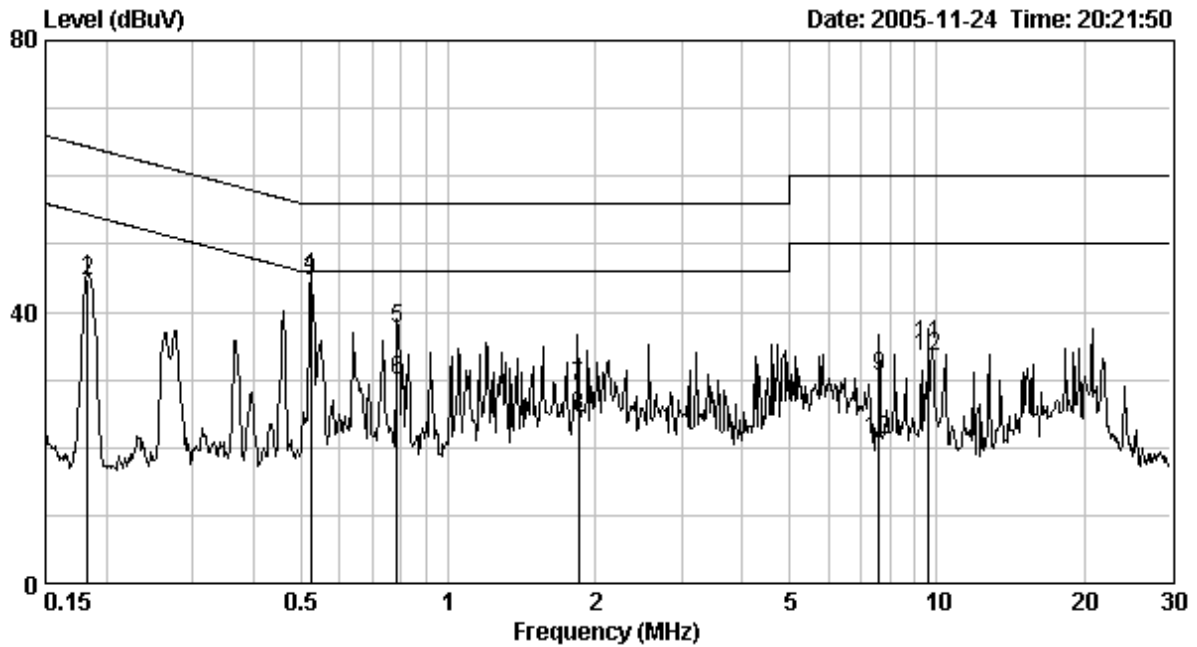


Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 6

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	44.66	64.35	44.98	54.35	-19.69	-9.37
0.524	0.10	45.01	56.00	44.46	46.00	-10.99	-1.54
0.787	0.10	37.48	56.00	29.94	46.00	-18.52	-16.06
1.846	0.10	29.05	56.00	24.62	46.00	-26.95	-21.38
7.623	0.20	30.34	60.00	21.12	50.00	-29.66	-28.88
9.605	0.20	35.21	60.00	33.53	50.00	-24.79	-16.47

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

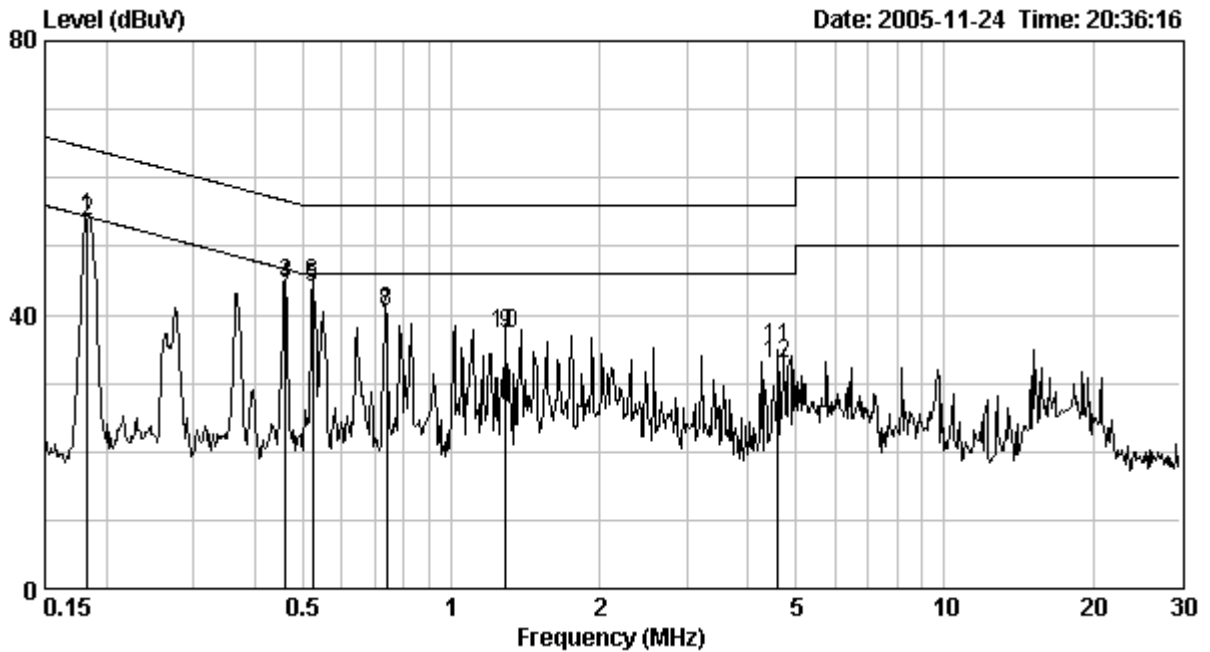


Phase : Line  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 11

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	54.25	64.35	53.68	54.35	-10.10	-0.67
0.461	0.10	44.22	56.67	44.59	46.67	-12.45	-2.08
0.524	0.10	44.55	56.00	43.88	46.00	-11.45	-2.12
0.738	0.10	40.04	56.00	40.30	46.00	-15.96	-5.70
1.290	0.10	37.26	56.00	37.18	46.00	-18.74	-8.82
4.607	0.22	35.28	56.00	32.81	46.00	-20.72	-13.19

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase : Neutral  
 EUT : G-663  
 Test Condition : 802.11g Tx at channel 11

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
						Qp	Av
0.183	0.10	44.66	64.35	44.98	54.35	-19.69	-9.37
0.524	0.10	45.01	56.00	44.46	46.00	-10.99	-1.54
0.787	0.10	37.48	56.00	29.94	46.00	-18.52	-16.06
1.846	0.10	29.05	56.00	24.62	46.00	-26.95	-21.38
7.623	0.20	30.34	60.00	21.12	50.00	-29.66	-28.88
9.605	0.20	35.21	60.00	33.53	50.00	-24.79	-16.47

**Remark:**

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

