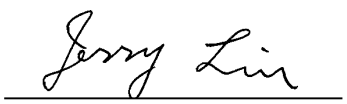
EMC
TEST REPORT

Report No. : EME-030944
Model No. : WLC-100M
Issued Date : Aug. 27, 2003

Applicant : Cellvision Systems Inc.
18F-7, No. 79 Sec. 1, Hsin Taiwu Road Hsichih,
Taipei, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

Project Engineer



Jerry Liu

Reviewed By

Elton Chen

Table of Contents

Summary of Tests

Wireless ISA module-Model: WLC-100M
FCC ID: QTRWLC10001

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(d)	Complies
Power Line Conducted Emission test	15.207	Complies

1. General information

1.1 Identification of the EUT

Applicant	: Cellvision Systems Inc.
Product	: Wireless ISA module
Model No.	: WLC-100M
FCC ID.	: QTRWLC10001
Frequency Range	: 2412~2462 MHz
Channel Number	: 11 Channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: CCK (11Mps, 5.5Mbps), DQPSK (2Mbps), DBPSK (1Mbps)
Rated Power	: 3.3Vdc from PC/Notebook
Power Cord	: N/A
Sample Received	: Aug. 13, 2003
Test Date(s)	: Aug. 13, 2003 to Aug. 22, 2003

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

WLC-100M is designed for Printer Server series, IP Camera series and Internet Video Server gives user wireless access the web and network resource without the wire.

It provides high-speed access to network resources and has built-in 40/64-bit and 128 bit of WEP (Wired Equivalent Privacy) data encryption. With Direct Spread Spectrum Signaling (DSSS), domain access control, WEP encryption and group security, the modules will safeguard all user's wireless data transmissions from user's nosy neighbors.

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"

The EUT can be equipped with two kinds of antenna. The tests are based on the module with antenna separated. And the combinations are listed as below:

Item	Type of EUT	Definition in this report
1	Module with Dipole antenna	antenna A
2	Module with PIFA antenna	antenna B

(please refer to External photo as file name “Exterior photo.pdf)

We only measured the Radiated Spurious test and Band-edge test for antenna A and antenna B and recorded in this report individually for each antenna.

1.3 Antenna description

For Dipole antenna:

The antenna is 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.

Antenna Gain : 2.15dBi (max)
Antenna Type : Dipole
Connector Type : SMA, Female, Reverse

For PIFA antenna:

The EUT uses a permanently connected antenna.

Antenna Gain : -2dBi (peak)
Antenna Type : PIFA
Connector Type : N/A

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
PC	N/A	N/A	N/A	N/A
Key Board	IBM	37L2548	0095996	FCC DoC Approved
Monitor	IBM	6331-0LN	23-NW855	ARSCM560S
Mouse	Logitech	850693-0001	LAZ82706831	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved

Remark: Client provided The PC.

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 C63.4/1992.

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

We conducted the Radiated Spurious Emission test and Band-edge test for these two kinds of antenna individually and recorded in this report.
We measured the Dipole antenna (antenna A) for all test items.

The EUT was transmitted continuously during all the test.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	Feb. 18, 2003
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 24, 2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 19, 2003
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	100186	Oct. 9, 2002
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2002
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 20, 2003
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3111	June 20, 2003
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A
Microwave Amplifier	Agilent	2GHz~26.5GHz	8348A	3111A00567	Dec. 20, 2002
Crystal Detector	Agilent	10MHz~18GHz	8472B	MY42240243	N/A
Signal Generator	Rohde & Schwarz	20MHz~27GHz	SMR27	100036	Aug. 15, 2003
Two Channel Digital Storage Oscilloscope	Tektronix	N/A	TDS1012	C031679	Aug. 16, 2003

Note:
1. The calibration interval of the above instruments is 12 months.

3. Minimum 6dB Bandwidth test

3.1 Operating environment

Temperature:	25	℃
Relative Humidity:	54	%
Atmospheric Pressure	1023	hPa

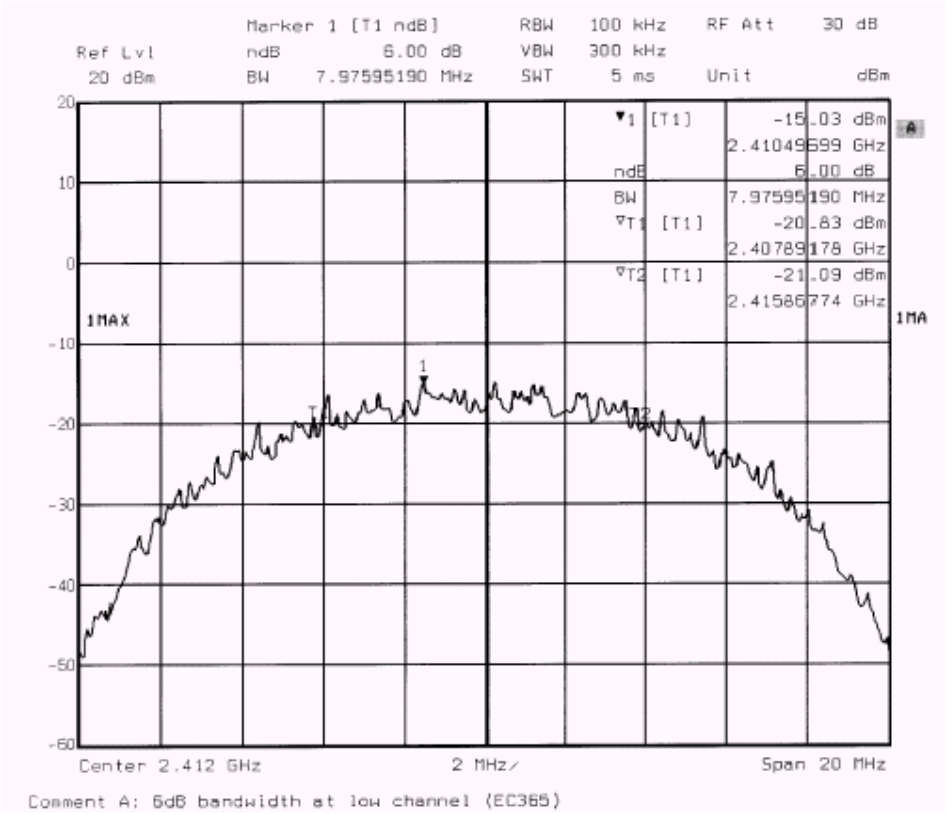
3.2 Test setup & procedure

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 300kHz, 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

Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
Low	2412	7.976	＞500kHz
Middle	2437	7.735	＞500kHz
High	2462	7.776	＞500kHz

Please see the plot below.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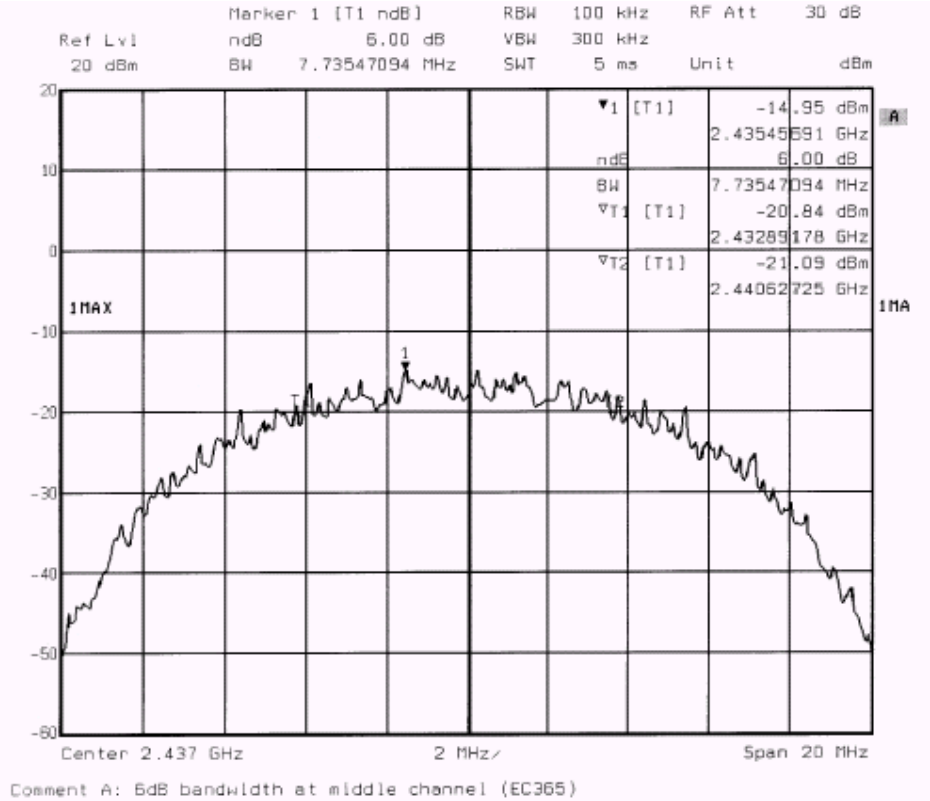
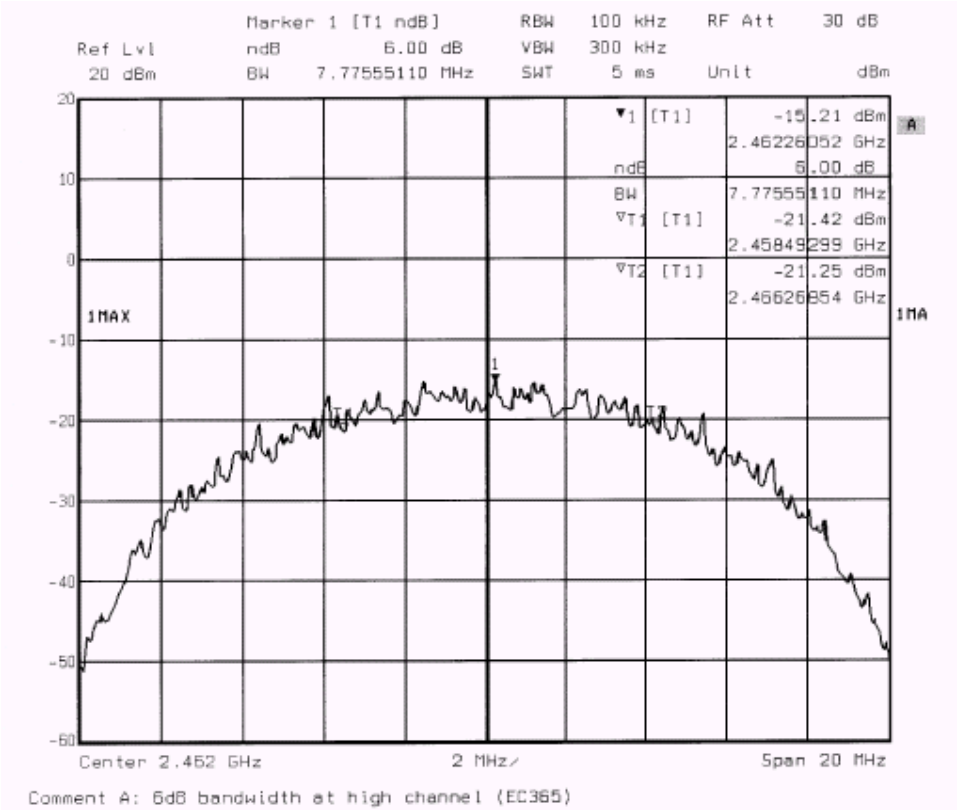
Ref Lvl
20 dBm
ndB 6.00 dB
BW 7.97595190 MHz
RBW 100 kHz
VBW 300 kHz
SWT 5 ms
RF Att 30 dB
Unit dBm
T1 [T1] -15.03 dBm
2.41049599 GHz
ndB 6.00 dB
BW 7.97595190 MHz
T1 [T1] -20.83 dBm
2.40789178 GHz
T2 [T1] -21.09 dBm
2.41586774 GHz
1MAX
1MA
A
20
10
0
-10
-20
-30
-40
-50
-60
Center 2.412 GHz
2 MHz/
Span 20 MHz
Comment A: 6dB bandwidth at low channel (EC365)


Marker 1 [T1 ndB]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
ndB 6.00 dB
VBW 300 kHz
20 dBm
BW 7.73547094 MHz
SWT 5 ms
Unit dBm
▼1 [T1] -14.95 dBm
2.43545691 GHz
ndB 6.00 dB
BW 7.73547094 MHz
▽T1 [T1] -20.84 dBm
2.43289178 GHz
▽T2 [T1] -21.09 dBm
2.44062725 GHz
1MAX
1MA
A
20
10
0
-10
-20
-30
-40
-50
-60
Center 2.437 GHz
2 MHz/
Span 20 MHz
Comment A: 6dB bandwidth at middle channel (EC365)


Marker 1 [T1 ndB]
RBW 100 kHz
RF Att 30 dB
Ref Lvl
ndB 6.00 dB
VBW 300 kHz
20 dBm
BW 7.77555110 MHz
SWT 5 ms
Unit dBm
▼1 [T1] -15.21 dBm
2.46226052 GHz
ndB 6.00 dB
BW 7.77555110 MHz
▽T1 [T1] -21.42 dBm
2.45849299 GHz
▽T2 [T1] -21.25 dBm
2.46626854 GHz
A
1MAX
1MA
20
10
0
-10
-20
-30
-40
-50
-60
Center 2.462 GHz
2 MHz/
Span 20 MHz
Comment A: 6dB bandwidth at high channel (EC365)

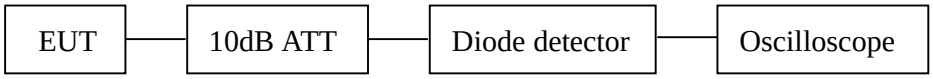
4. Maximum Output Power test

4.1 Operating environment

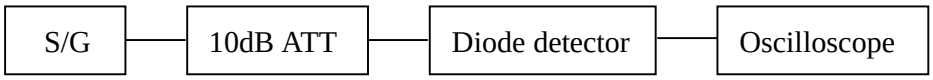
Temperature:	22	℃
Relative Humidity:	60	%
Atmospheric Pressure	1023	hPa

4.2 Test setup & procedure

A:



B:



1. The output of the transmitter via a 10 dB attenuator and coupled to a diode detector.
2. The output of the diode detector connected to the vertical channel of and oscilloscope. The observed trace of the oscilloscope shall be recorded as “A”.
3. The transmitter replaced by a signal generator. The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
4. The output of the signal generator raised to reach the peak of trace “A” named X.
5. The signal generator output level X (dBm) is the transmitter peak output power.

4.3 Measured data of Maximum Output Power test results

Channel	Frequency (MHz)	Reading (dBm)	Output Power		Limit (W)
			(dBm)	(mW)	
Lowest	2412	15.73	15.73	37.41	1
Middle	2437	16.03	16.03	40.09	1
Highest	2462	15.93	15.93	39.17	1

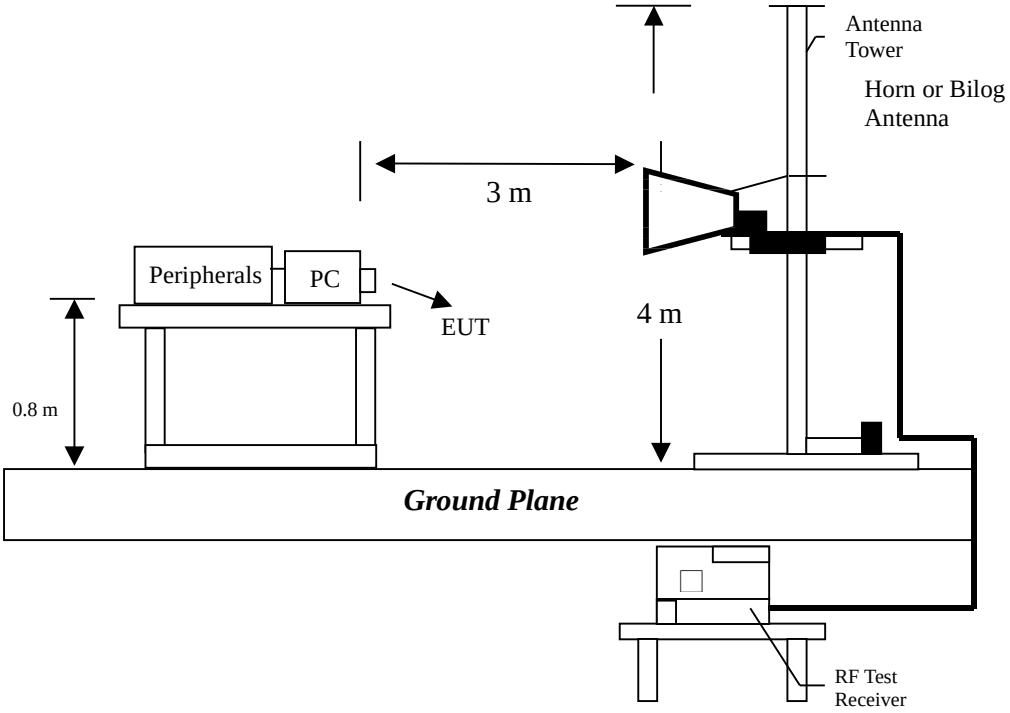
5. Radiated Emission test

5.1 Operating environment

Temperature:	25	℃	(10-40℃)
Relative Humidity:	55	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

5.2 Test setup & procedure

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



Radiated emissions were invested 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 three 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 μ 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.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.02 dB.

5.4 Radiated spurious emission test data

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

EUT : WLC-100M
Worst Case Condition : Tx at low channel with antenna A

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
142.8000	QP	V	14.41	7.79	22.20	43.50	-21.30	133	142
432.0100	QP	V	17.71	12.31	30.02	46.00	-15.98	100	142
500.7600	QP	V	18.60	14.09	32.69	46.00	-13.31	100	202
736.3400	QP	V	23.12	4.44	27.56	46.00	-18.44	137	136
800.2000	QP	V	24.29	7.69	31.98	46.00	-14.02	155	60
901.6700	QP	V	25.10	7.69	32.79	46.00	-13.21	127	350
200.4300	QP	H	11.52	25.19	36.71	43.50	-6.79	110	125
219.9800	QP	H	11.82	25.19	37.01	46.00	-8.99	100	121
263.9900	QP	H	13.48	29.50	42.98	46.00	-3.02	104	130
300.6200	QP	H	14.47	14.06	28.53	46.00	-17.47	100	133
500.1600	QP	H	18.58	19.42	38.00	46.00	-8.00	100	159
802.1600	QP	H	24.27	2.92	27.19	46.00	-18.81	205	200

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

EUT : WLC-100M
Worst Case Condition : Tx at low channel with antenna B

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
264.7000	QP	V	13.50	15.30	28.80	46.00	-17.20	120	133
307.4000	QP	V	14.64	16.50	31.14	46.00	-14.86	108	186
439.3000	QP	V	17.85	16.30	34.15	46.00	-11.85	110	210
501.4000	QP	V	18.62	14.10	32.72	46.00	-13.28	128	360
736.2000	QP	V	23.12	10.20	33.32	46.00	-12.68	160	187
802.1000	QP	V	24.27	10.10	34.37	46.00	-11.63	130	330
220.1000	QP	H	11.83	22.30	34.13	46.00	-11.87	105	147
264.7000	QP	H	13.50	21.00	34.50	46.00	-11.50	100	131
301.6000	QP	H	14.49	15.10	29.59	46.00	-16.41	110	125
307.4000	QP	H	14.64	19.60	34.24	46.00	-11.76	100	130
400.5000	QP	H	16.94	15.40	32.34	46.00	-13.66	100	145
501.4000	QP	H	18.62	12.40	31.02	46.00	-14.98	180	350

Remark:
1.Corrected Level = Reading Level + Correction Factor
2.Correction Factor = Antenna Factor + Cable Loss

5.4.2 Measurement results: frequency above 1GHz

The radiated spurious emissions at

Frequency(MHz)	Margin
9648	-3.62

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

EUT : WLC-100M
Test Condition : Tx at low channel with antenna A

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7236	PK	V	34.32	38.42	49.99	54.09	74	-19.91	187	57
7236	AV	V	34.32	38.42	36.43	40.53	54	-13.47	187	57
9648	PK	V	35.808	41.35	52.168	57.71	74	-16.29	174	341
9648	AV	V	35.808	41.35	44.838	50.38	54	-3.62	174	341
7236	PK	H	34.32	38.42	49.11	53.21	74	-20.79	150	85
7236	AV	H	34.32	38.42	35.08	39.18	54	-14.82	150	85
9648	PK	H	35.808	41.35	51.998	57.54	74	-16.46	144	356
9648	AV	H	35.808	41.35	42.198	47.74	54	-6.26	144	356

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

The radiated spurious emissions at

Frequency(MHz)	Margin
9748	-3.52

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

EUT : WLC-100M
Test Condition : Tx at middle channel with antenna A

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7311	PK	V	34.32	38.42	50.81	54.91	74	-19.09	197	41
7311	AV	V	34.32	38.42	37.93	42.03	54	-11.97	197	41
9748	PK	V	35.808	41.35	53.608	59.15	74	-14.85	159	337
9748	AV	V	35.808	41.35	44.938	50.48	54	-3.52	159	337
7311	PK	H	34.32	38.42	48.28	52.38	74	-21.62	141	292
7311	AV	H	34.32	38.42	35.65	39.75	54	-14.25	141	292
9748	PK	H	35.808	41.35	52.028	57.57	74	-16.43	135	248
9748	AV	H	35.808	41.35	41.938	47.48	54	-6.52	135	248

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

EUT : WLC-100M
Test Condition : Tx at high channel with antenna A

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7386	PK	V	34.32	38.42	49.9	54	74	-20	165	45
7386	AV	V	34.32	38.42	37.27	41.37	54	-12.63	165	45
9848	PK	V	35.919	41.55	52.339	57.97	74	-16.03	148	25
9848	AV	V	35.919	41.55	43.129	48.76	54	-5.24	148	25
7386	PK	V	34.32	38.42	48.23	52.33	74	-21.67	162	300
7386	AV	V	34.32	38.42	35.55	39.65	54	-14.35	162	300
9848	PK	V	35.919	41.55	51.559	57.19	74	-16.81	158	283
9848	AV	V	35.919	41.55	42.409	48.04	54	-5.96	158	283

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

EUT : WLC-100M
Test Condition : Tx at low channel with antenna B

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7236	PK	V	34.32	38.42	52.65	56.75	74	-17.25	182	314
7236	AV	V	34.32	38.42	40.55	44.65	54	-9.35	182	314
7236	PK	H	34.32	38.42	51.73	55.83	74	-18.17	129	310
7236	AV	H	34.32	38.42	39.68	43.78	54	-10.22	129	310

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

EUT : WLC-100M
Test Condition : Tx at middle channel with antenna B

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7311	PK	V	34.32	38.42	52.73	56.83	74	-17.17	198	316
7311	AV	V	34.32	38.42	40.6	44.7	54	-9.3	198	316
7311	PK	H	34.32	38.42	52.81	56.91	74	-17.09	187	315
7311	AV	H	34.32	38.42	40.85	44.95	54	-9.05	187	315

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

EUT : WLC-100M
Test Condition : Tx at high channel with antenna B

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
7386	PK	V	34.32	38.42	50.78	54.88	74	-19.12	173	236
7386	AV	V	34.32	38.42	38.75	42.85	54	-11.15	173	236
7386	PK	H	34.32	38.42	50.54	54.64	74	-19.36	147	314
7386	AV	H	34.32	38.42	39.44	43.54	54	-10.46	147	314

Remark:
1. Corrected Level = Reading Level + Correction Factor－Preamp
2. Correction Factor = Antenna Factor + Cable Loss
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.

For PK:
1GHz-3GHz: 50dBuV
3GHz-14GHz: 54dBuV
14GHz-26.5GHz: 60dBuV

For AV:
1GHz-3GHz: 41.5dBuV
3GHz-14GHz: 46dBuV
14GHz-26.5GHz: 46.5dBuV

6. Power Spectrum Density test

6.1 Operating environment

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

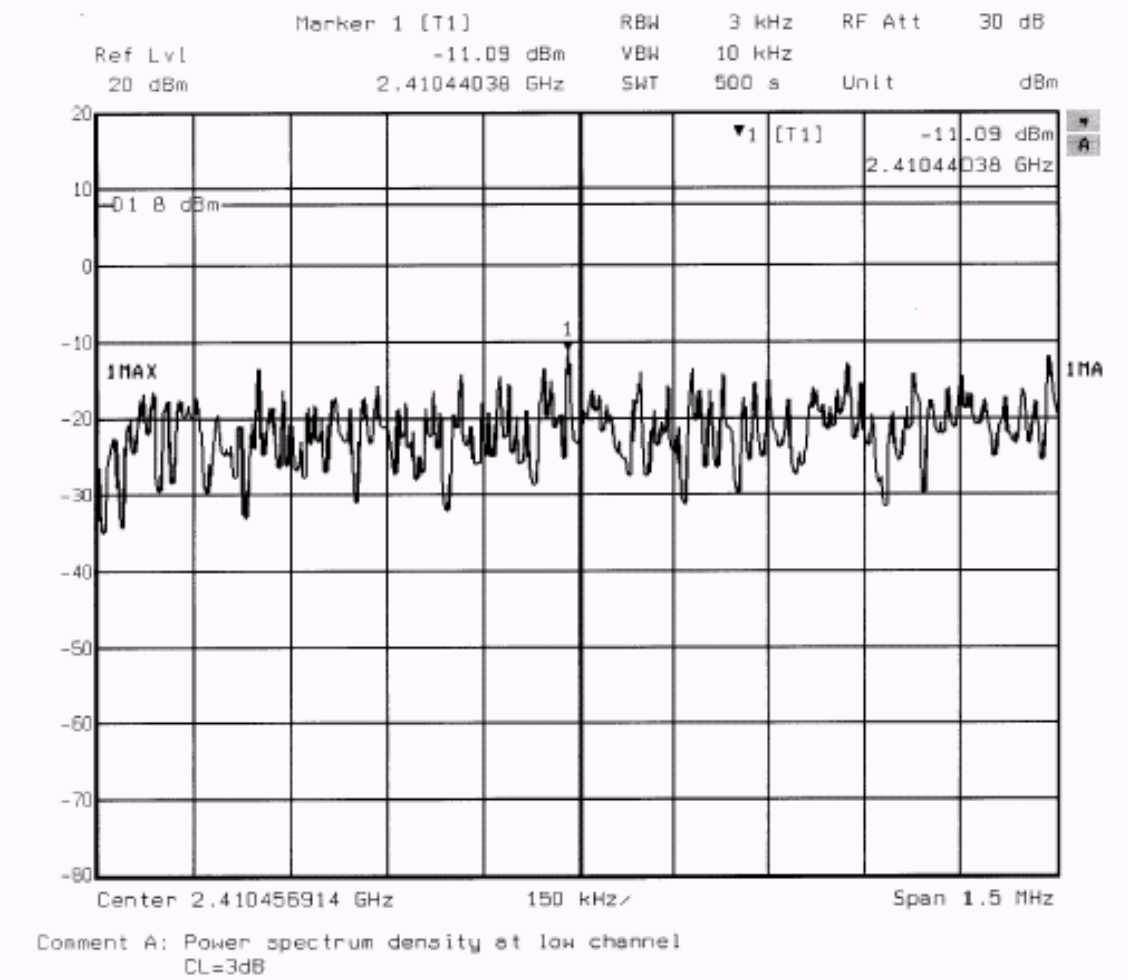
6.2 Test setup & procedure

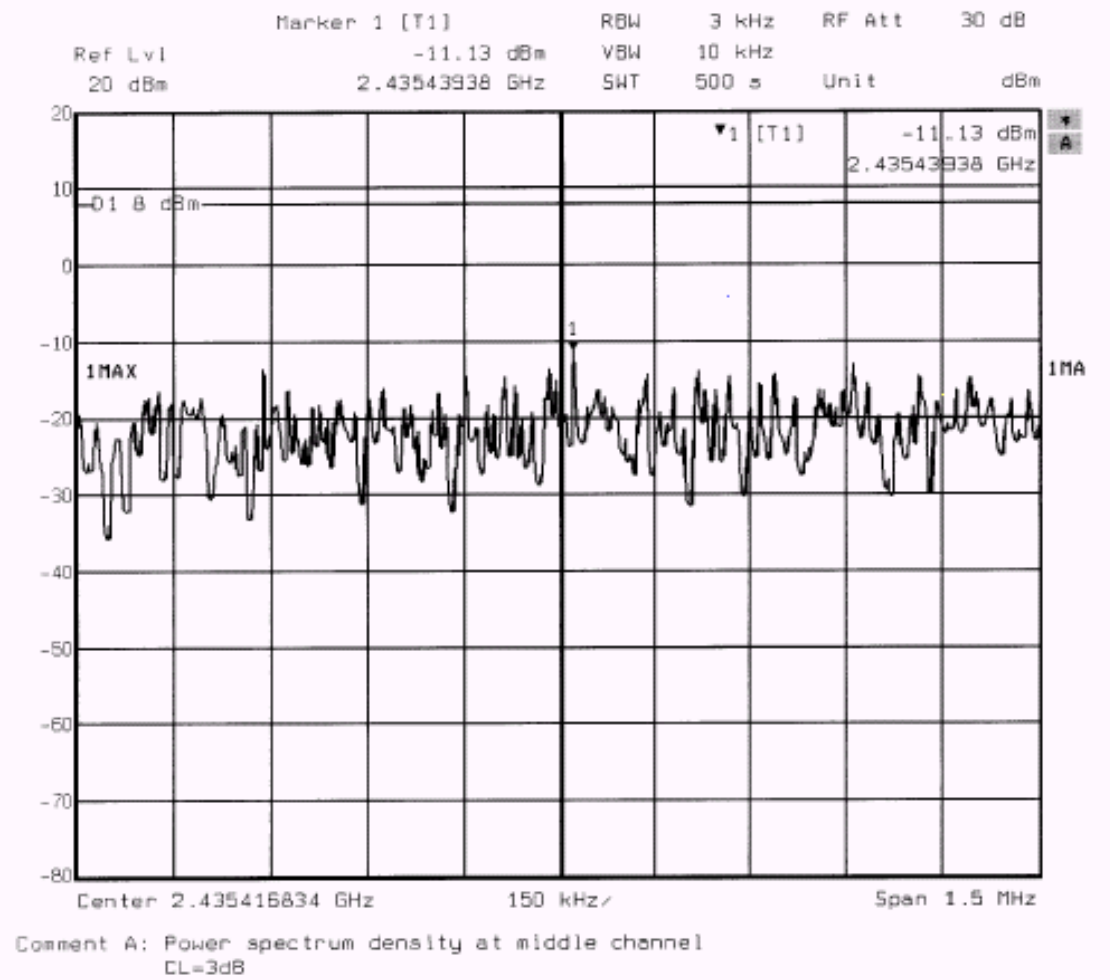
The power spectrum density per FCC §15.247(d) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 1.5 MHz, and the sweep time set at 500 seconds. Power Density was read directly and cable loss (2dB) 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.

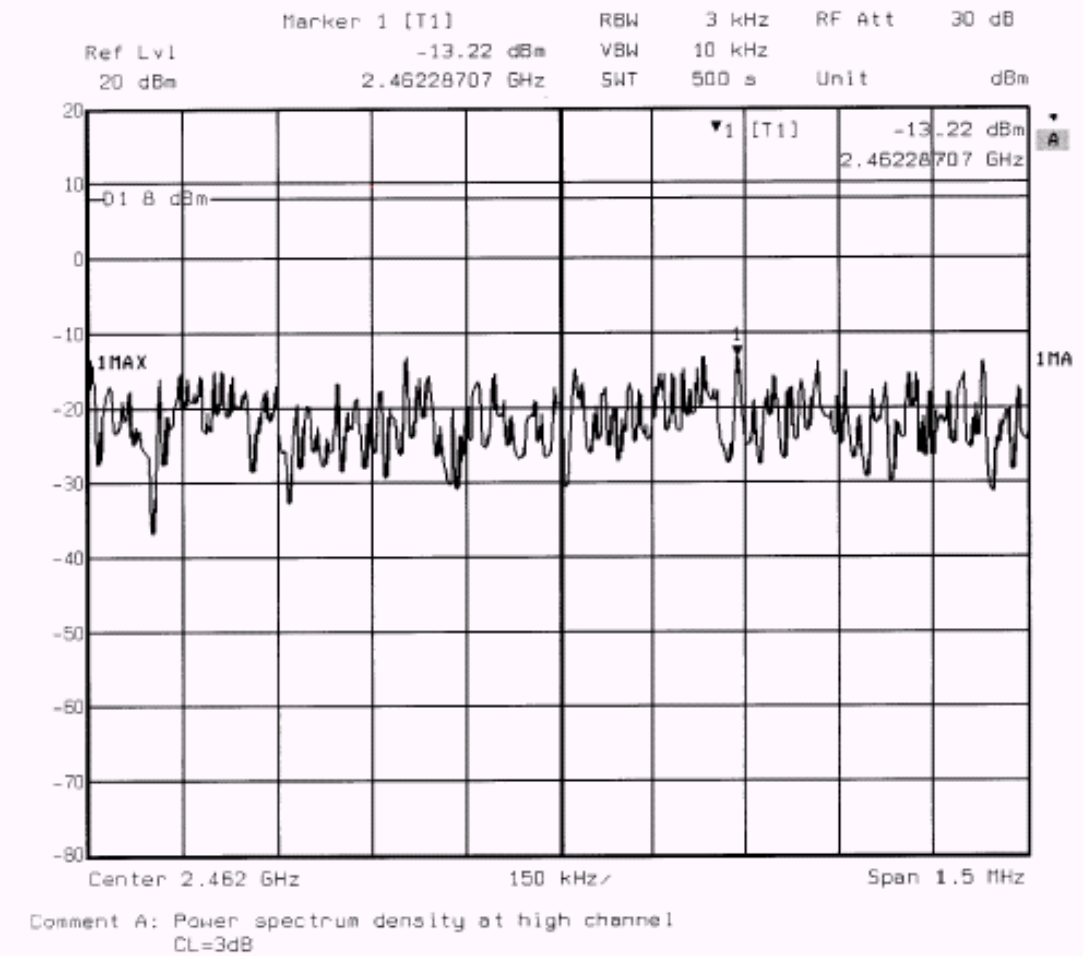
6.3 Measured data of Power Spectrum Density test results

Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
Low	2410.44	-8.09	8
Middle	2435.44	-8.13	8
High	2462.29	-10.33	8

Please see the plot below.


Marker 1 [T1]
RBW 3 kHz
RF Att 30 dB
Ref Lvl
-11.09 dBm
VBW 10 kHz
20 dBm
2.41044038 GHz
SWT 500 s
Unit dBm
▼1 [T1]
-11.09 dBm
2.41044038 GHz
D1 8 dBm
1MAX
1MA
Center 2.410456914 GHz
150 kHz/
Span 1.5 MHz
Comment A: Power spectrum density at low channel
CL=3dB


Marker 1 [T1]
RBW 3 kHz
RF Att 30 dB
Ref Lvl
-11.13 dBm
VBW 10 kHz
20 dBm
2.43543938 GHz
SWT 500 s
Unit dBm
1 [T1] -11.13 dBm
2.43543938 GHz
D1 8 dBm
1MAX
1MA
Center 2.435416834 GHz
150 kHz/
Span 1.5 MHz
Comment A: Power spectrum density at middle channel
CL=3dB

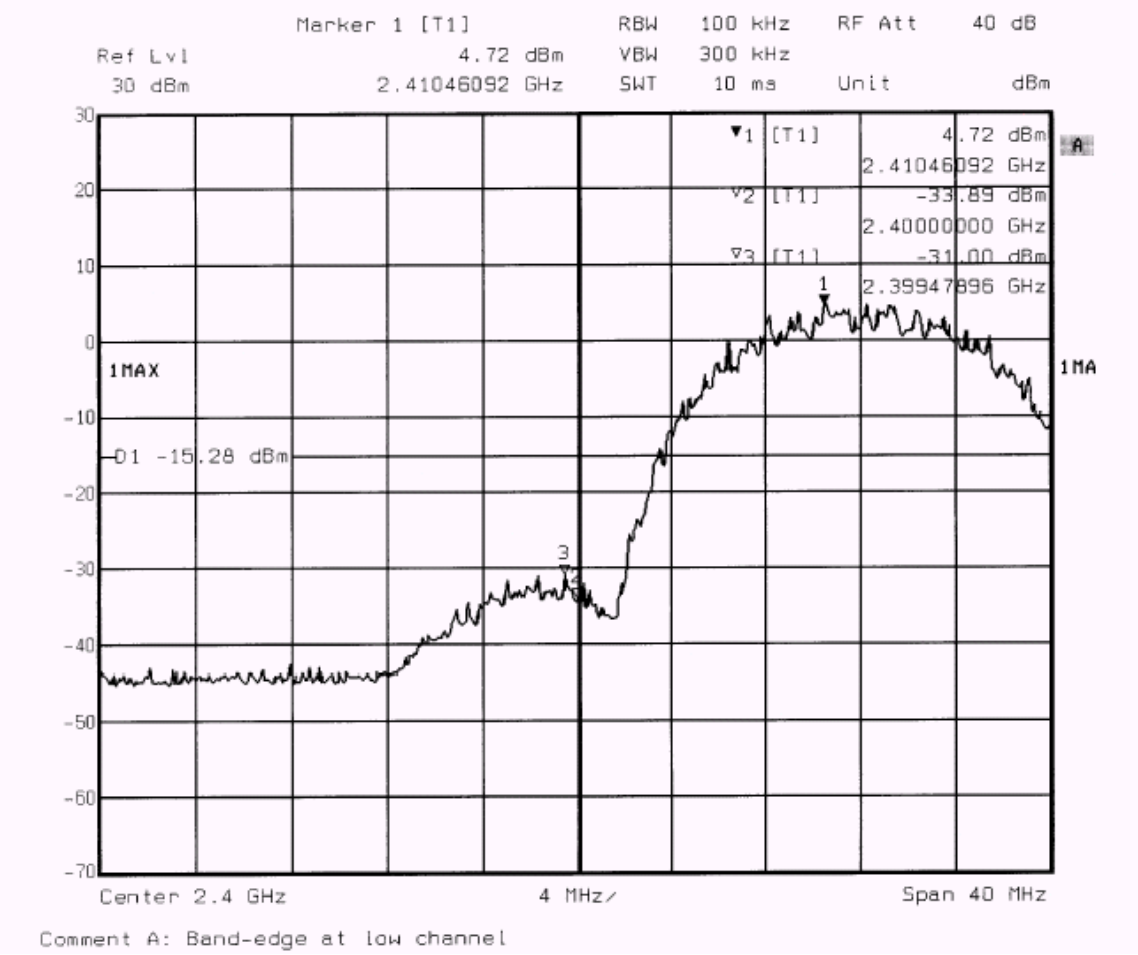

Marker 1 [T1]
RBW 3 kHz
RF Att 30 dB
Ref Lvl
-13.22 dBm
VBW 10 kHz
20 dBm
2.46228707 GHz
SWT 500 s
Unit dBm
1 [T1]
-13.22 dBm
2.46228707 GHz
A
D1 8 dBm
1MAX
1MA
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
150 kHz/
Span 1.5 MHz
Comment A: Power spectrum density at high channel
CL=3dB

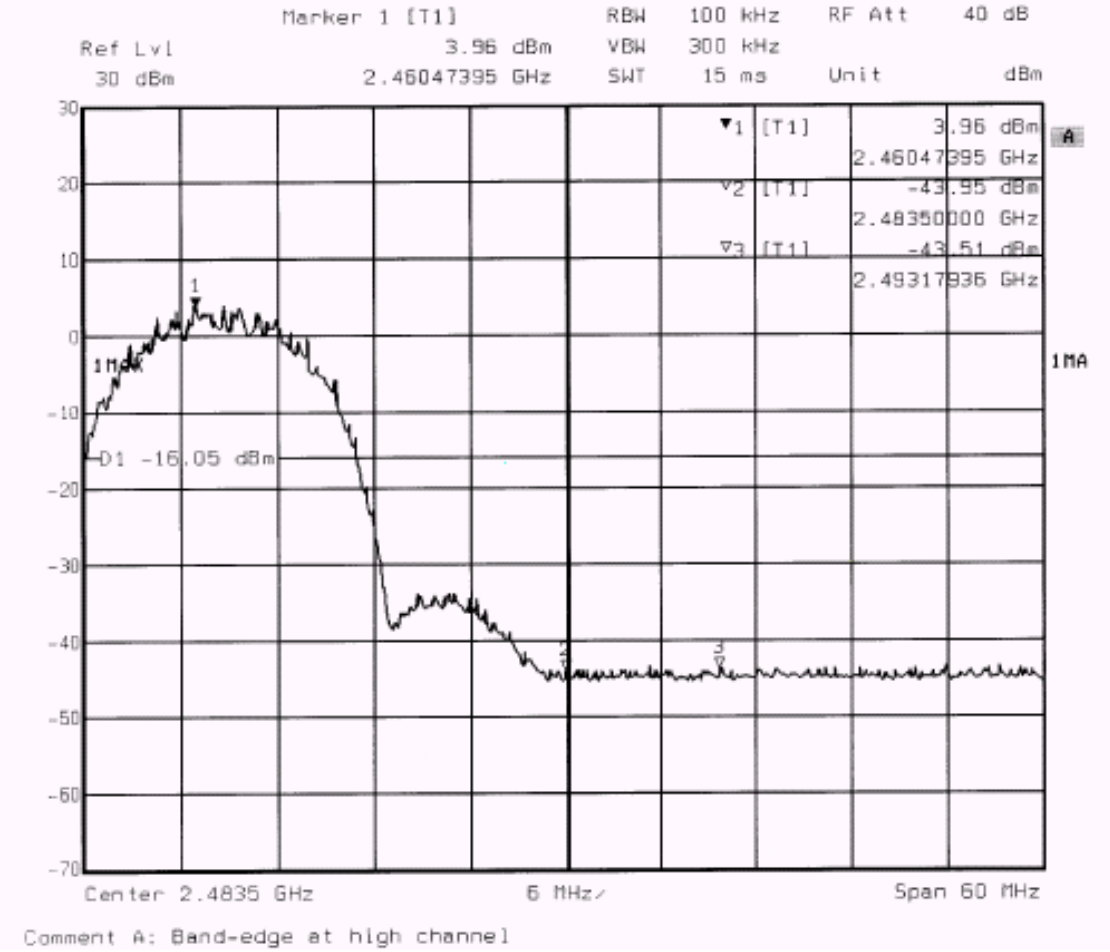
7. Emission on the band edge §FCC 15.247(C)

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.

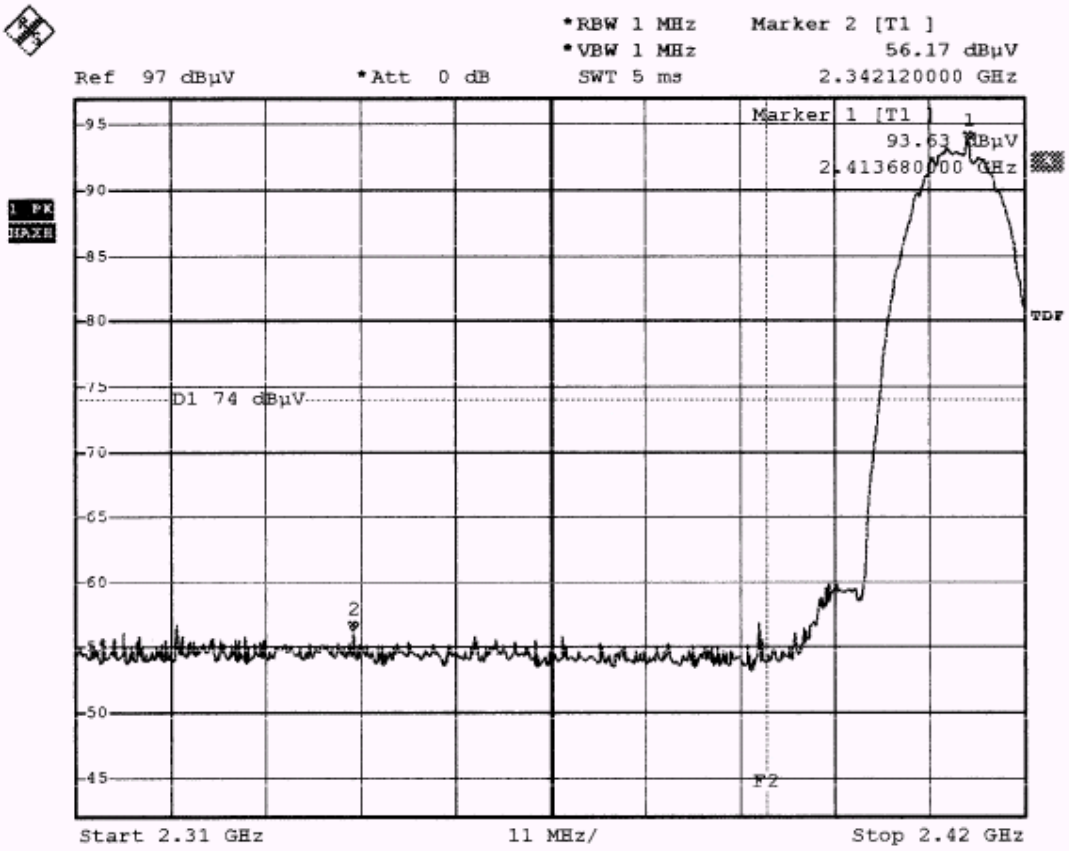
Please see the plot below.

7.1 Band-edge (Conducted method)

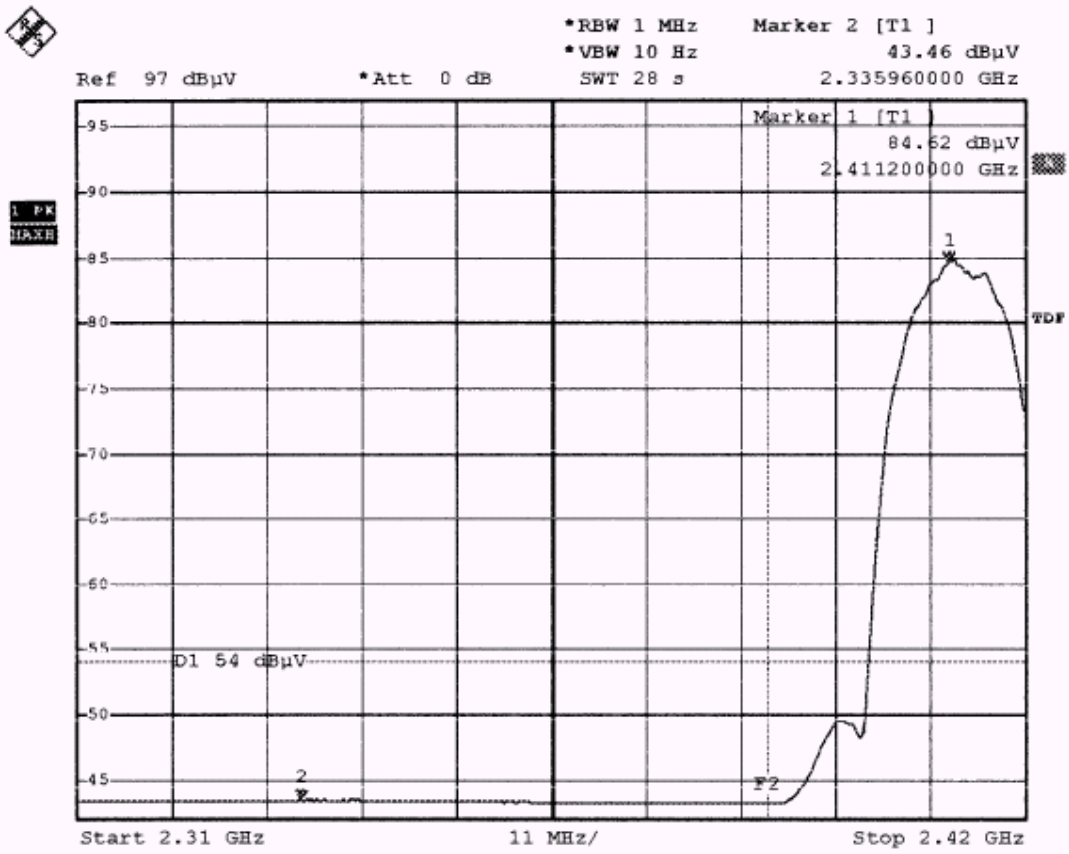



Marker 1 [T1]
RBW 100 kHz
RF Att 40 dB
Ref Lvl
3.96 dBm
VBW 300 kHz
30 dBm
2.46047395 GHz
SWT 15 ms
Unit dBm
▼1 [T1] 3.96 dBm
2.46047395 GHz
▽2 [T1] -43.95 dBm
2.48350000 GHz
▽3 [T1] -43.51 dBm
2.49317936 GHz
A
1MA
D1 -16.05 dBm
Center 2.4835 GHz
6 MHz/
Span 60 MHz
Comment A: Band-edge at high channel

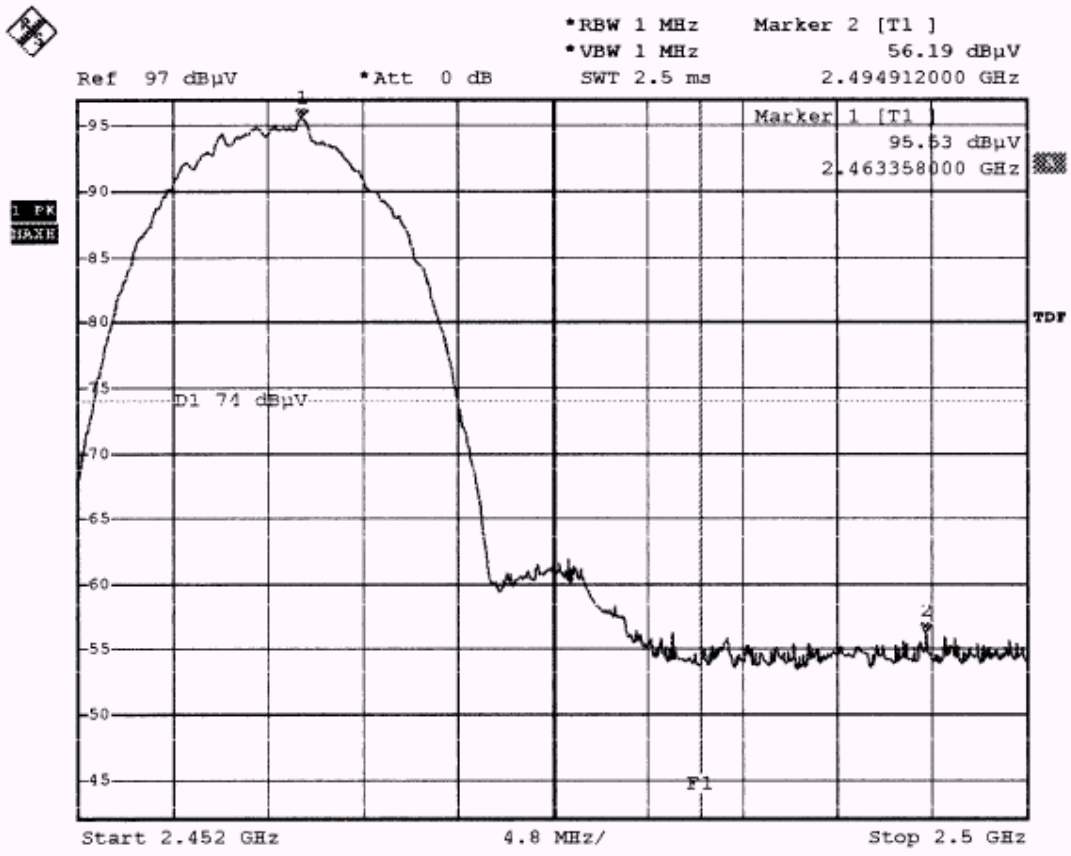
7.2 Band-edge (Radiated method)



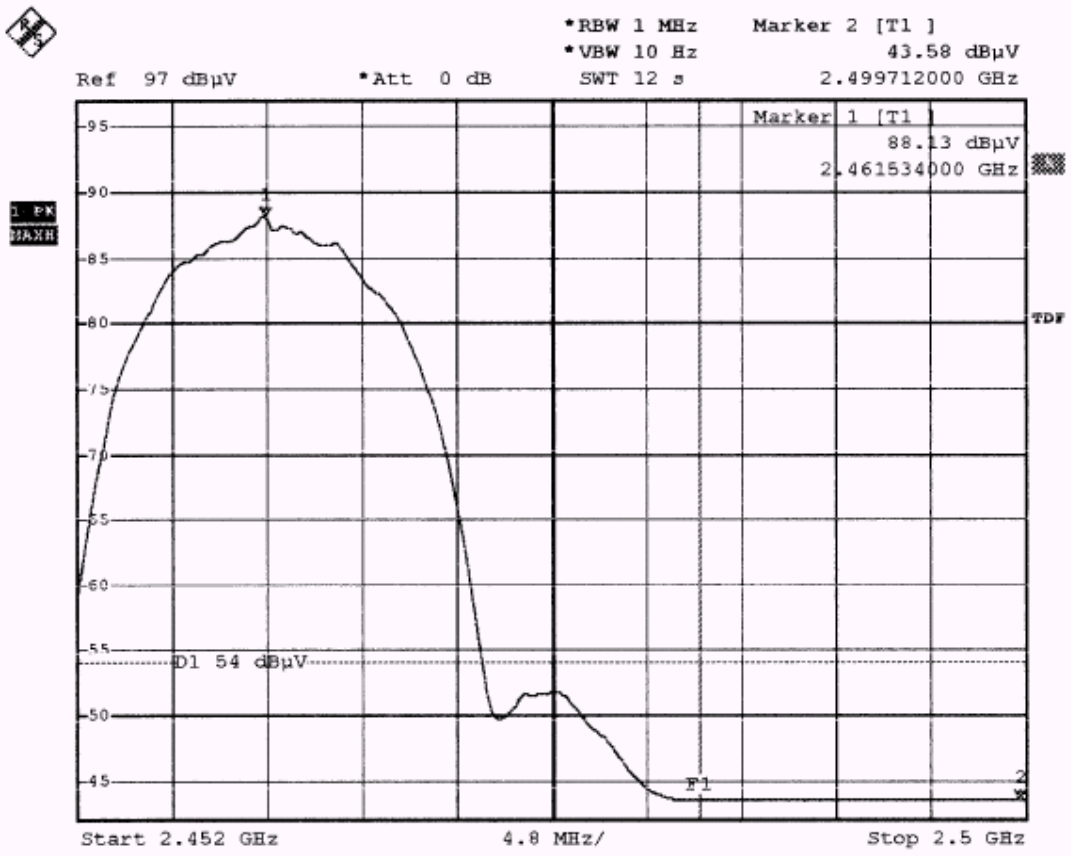
Comment A: Band-edge test at low channel (dipole Ant.)
Peak detector F2=2390MHz (Equip. used: EC338/353)



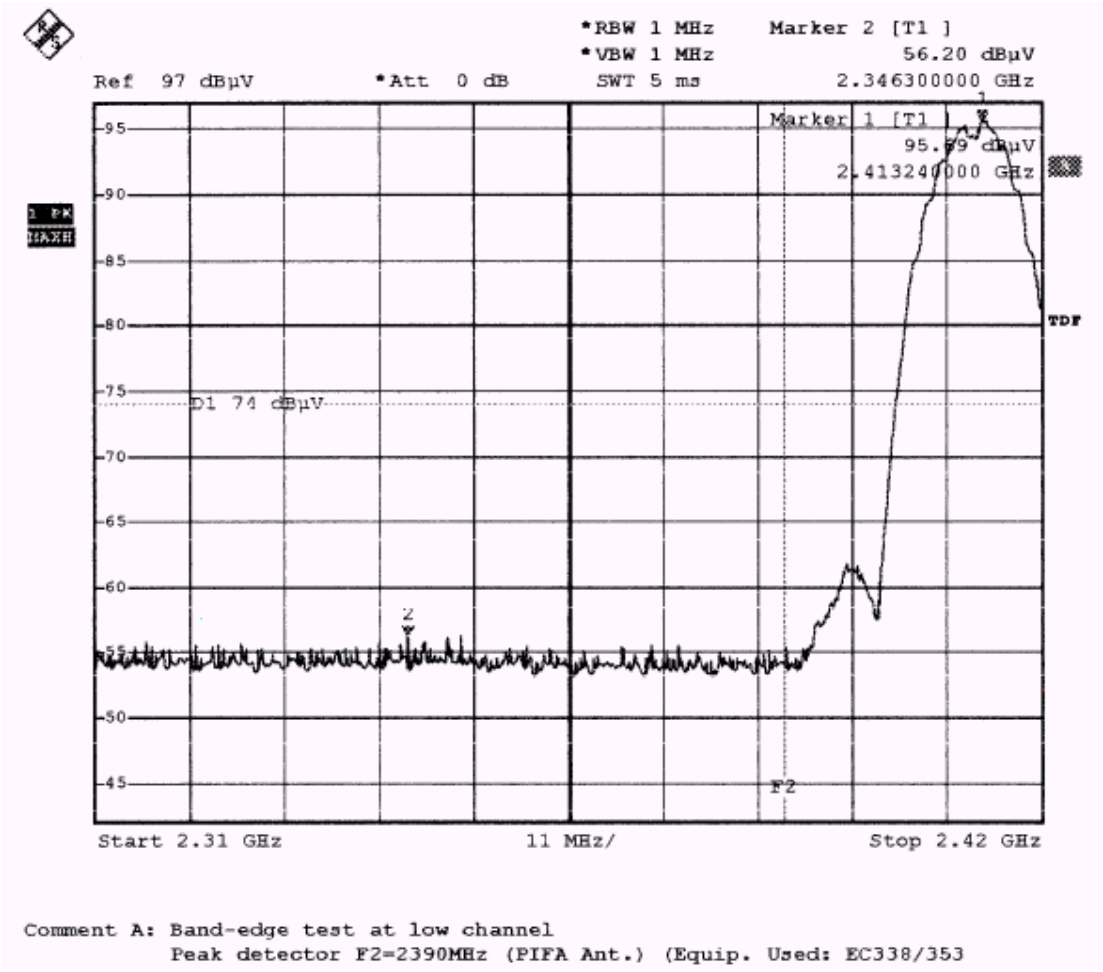
Comment A: Band-edge test at low channel (dipole Ant.)
Average detector F2=2390MHz (Equip. used: EC338/353)



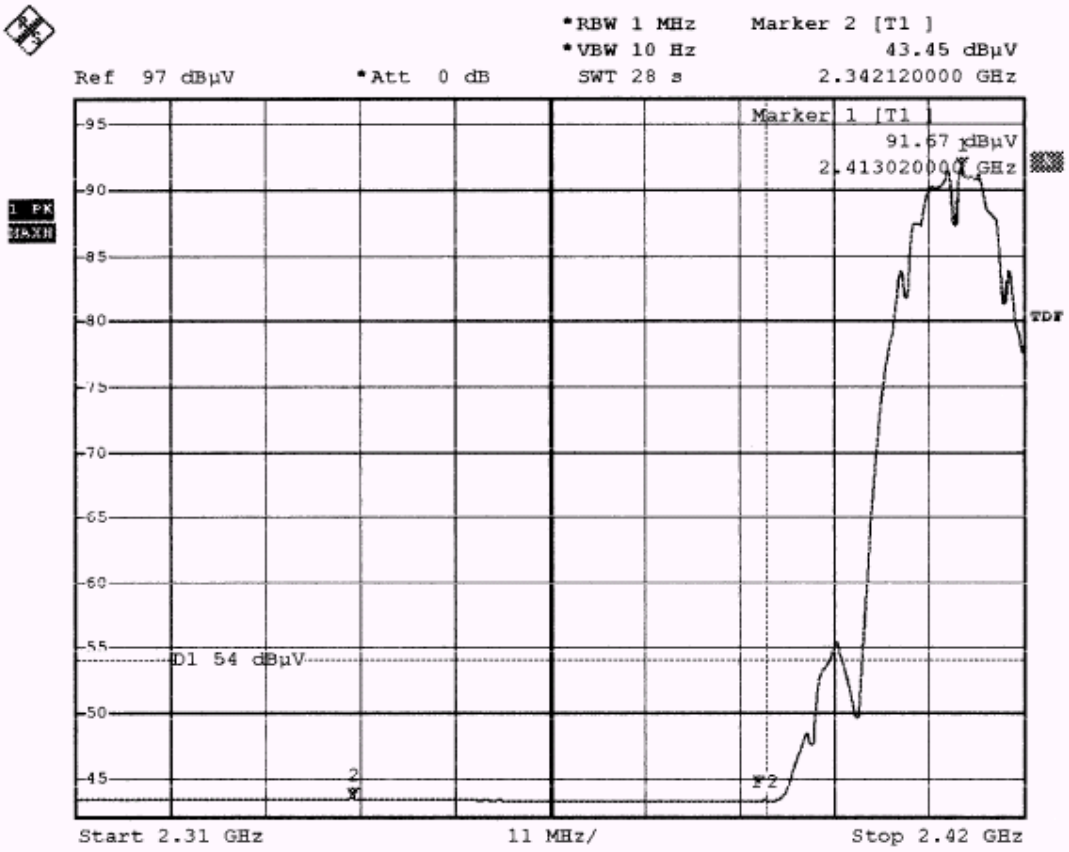
Comment A: Band-edge test at high channel (dipole Ant.)
Peak detector F1=2483.5MHz (Equip. Used: EC338/353)



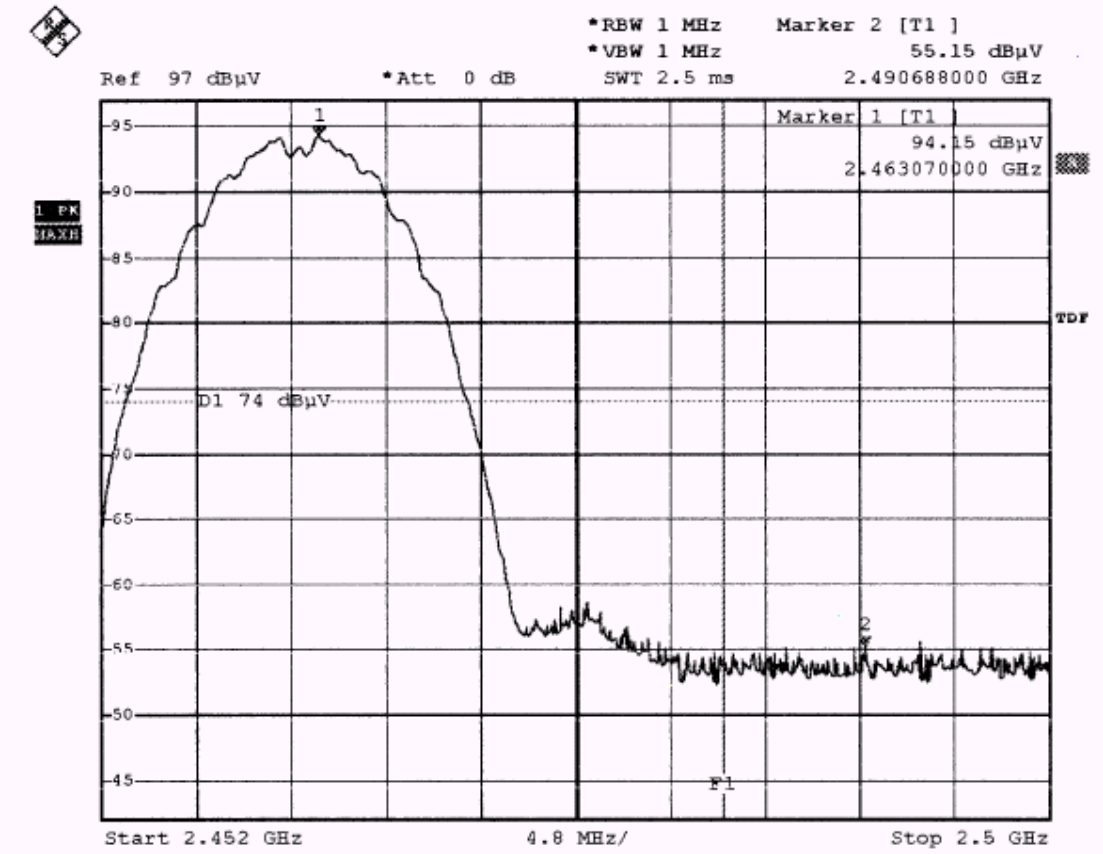
Comment A: Band-edge test at high channel (dipole Ant.)
Average detector F1=2483.5MHz (Equip. Used: EC338/353)



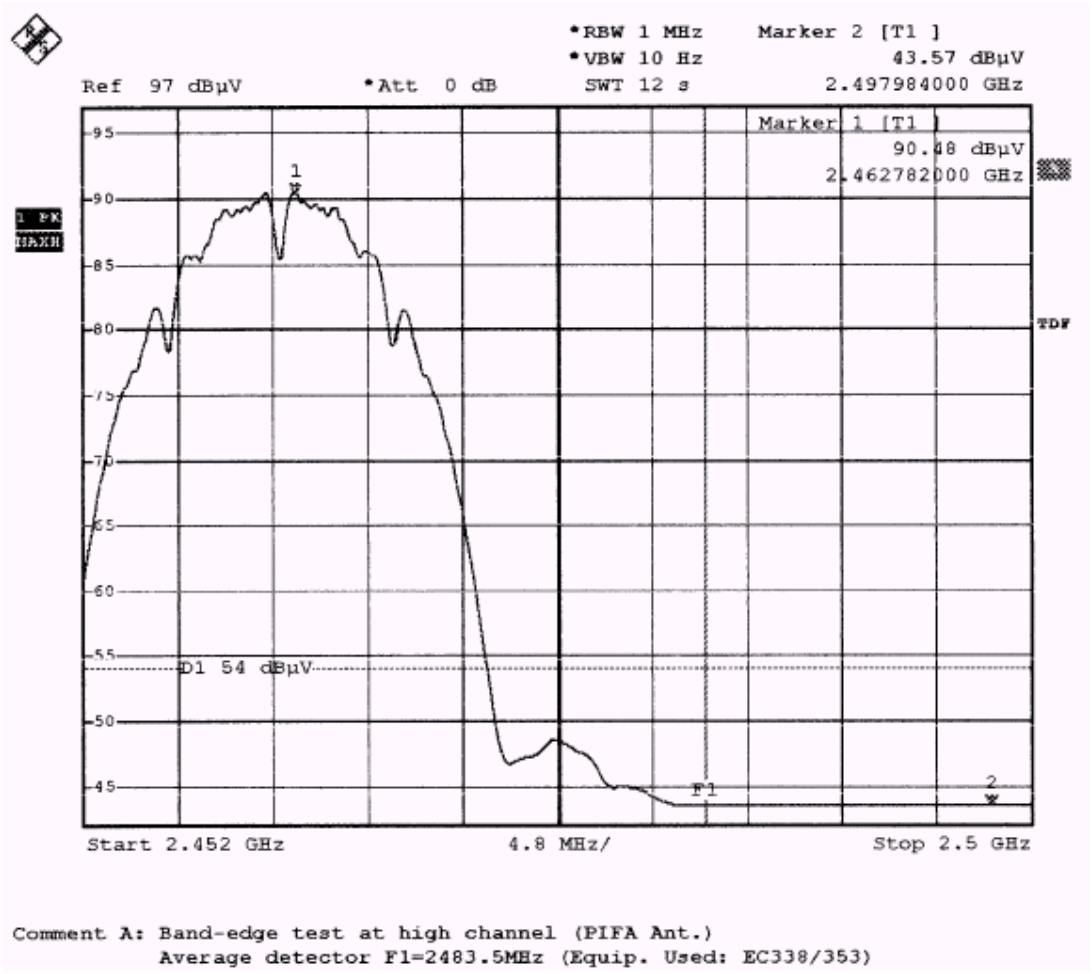
Comment A: Band-edge test at low channel
Peak detector F2=2390MHz (PIFA Ant.) (Equip. Used: EC338/353



Comment A: Band-edge test at low channel
Average detector F2=2390MHz (PIFA Ant.) (Equip. Used: EC338/



Comment A: Band-edge test at high channel (PIFA Ant.)
Peak detector F1=2483.5MHz (Equip. Used: EC338/353)



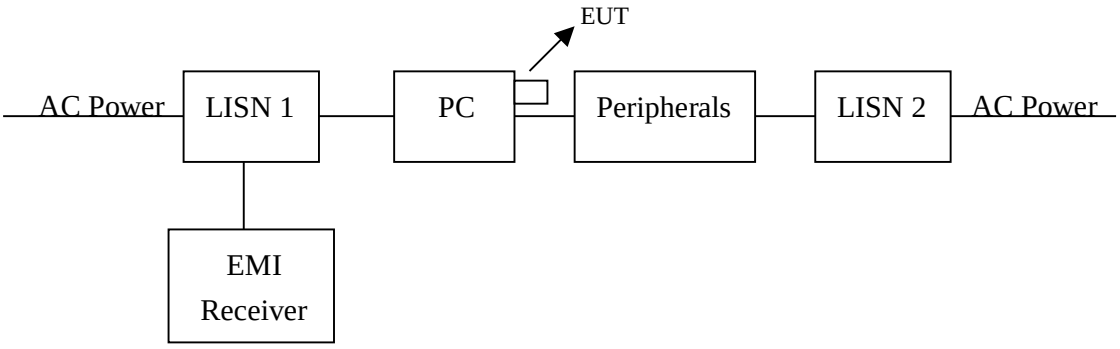
Comment A: Band-edge test at high channel (PIFA Ant.)
Average detector F1=2483.5MHz (Equip. Used: EC338/353)

8. Power Line Conducted Emission test §FCC 15.207

8.1 Operating environment

Temperature:	25	℃	(10-40℃)
Relative Humidity:	55	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1061hPa)

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 C63.4/1992 on conducted measurement. The AC power conducted emissions was invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

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

Please see the plot below.

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.

8.3 Power Line Conducted Emission test data

(1) Line

EUT : WLC-100M

Worst Case Condition : Tx at middle channel with antenna A

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.15800	47.50	65.57	43.30	55.57	-18.07	-12.27
0.19000	44.60	64.04	38.70	54.04	-19.44	-15.34
0.22200	40.40	62.74	36.90	52.74	-22.34	-15.84
0.70200	38.90	56.00	31.60	46.00	-17.10	-14.40
0.73400	39.80	56.00	30.30	46.00	-16.20	-15.70
0.76600	38.30	56.00	27.90	46.00	-17.70	-18.10

(2) Neutral

EUT : WLC-100M

Worst Case Condition : Tx at middle channel with antenna A

Freq. (MHz)	Reading (dB μ V) QP	Limit (dB μ V) QP	Reading (dB μ V) AV	Limit (dB μ V) AV	Margin (dB)	
					QP	AV
0.15800	47.40	65.57	43.30	55.57	-18.17	-12.27
0.19000	44.40	64.04	38.60	54.04	-19.64	-15.44
0.22200	38.70	62.74	35.70	52.74	-24.04	-17.04
0.70200	38.50	56.00	30.40	46.00	-17.50	-15.60
0.73400	38.50	56.00	31.60	46.00	-17.50	-14.40
0.76600	37.30	56.00	26.90	46.00	-18.70	-19.10

Remark:

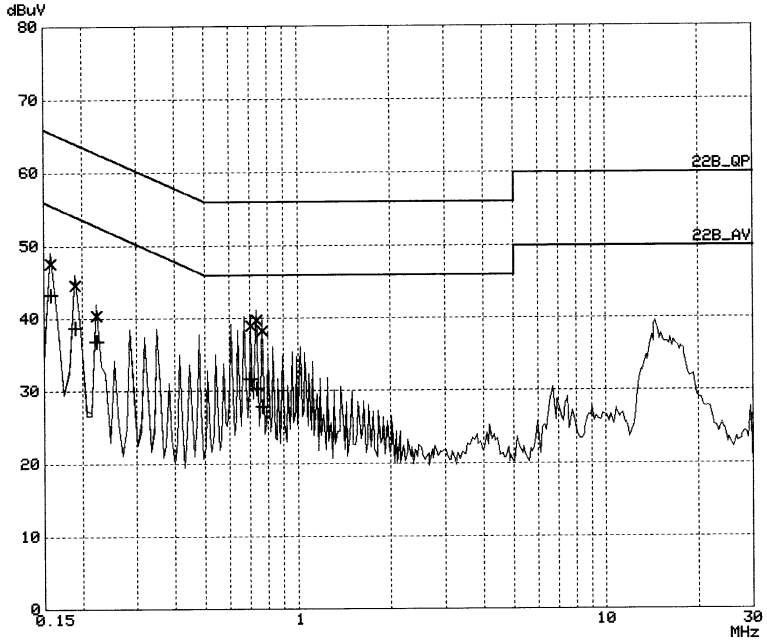
1. The reading value included cable loss and LISN factor.
2. Uncertainty was calculated in accordance with NAMAS NIS 81.
   Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

Please see the plot below

```
Intertek Testing Services
RF VOLTAGE
EUT:            WLC-100M
Manuf:          Cellvision
Op Cond:        LISN-L
Operator:       Jerry
Test Spec:      FCC P15 Class B
Comment:        EMI RCV:EC346       LISN:EC320
                120V 60Hz 24'c 66%RHMid Channel
Date:           15. Aug 03  10:37

Scan Settings (1 Range)
|--------- Frequencies -----------||--------- Receiver Settings ---------|
   Start       Stop        Step      IF BW  Detector  M-Time  Atten Preamp
 150k         30M          8k          9k       PK      20ms AUTO LN   OFF

Final Measurement: x QP / + AV
                   Meas Time:    1 s
```



Intertek Testing Services
RF VOLTAGE

EUT:	WLC-100M
Manuf:	Cellvision
Op Cond:	LISN-N
Operator:	Jerry
Test Spec:	FCC P15 Class B
Comment:	EMI RCV:EC346 LISN:EC320
	120V 60Hz 24'c 66%RHmid channel
Date:	15. Aug 03 10:59

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	8k	9k	PK	20ms	AUTO LN	OFF

Final Measurement: x QP / + AV
Meas Time: 1 s