

EMC TEST REPORT

Report No. : EME-050043

Model No. : DSST-24M

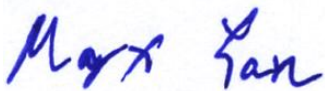
Issued Date : Mar. 25, 2005

Applicant : ICP Das Co., Ltd.
No. 111, Kuangfu N. Rd., Hukou Shiang,
Hsinchu, 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

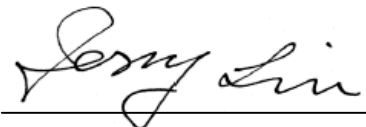
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Project Engineer



Marx Yan

Reviewed By



Jerry Liu

Table of Contents

Summary of Tests.....	4
1. General information	5
1.1 Identification of the EUT	5
1.2 Additional information about the EUT	5
1.3 Antenna description	6
1.4 Peripherals equipment.....	6
2. Test specifications	7
2.1 Test standard.....	7
2.2 Operation mode	7
2.3 Test equipment.....	8
3. Minimum 6dB Bandwidth test.....	9
3.1 Operating environment	9
3.2 Test setup & procedure	9
3.3 Measured data of Minimum 6dB Bandwidth test results	9
4. Maximum Output Power test.....	13
4.1 Operating environment	13
4.2 Test setup & procedure	13
4.3 Measured data of Maximum Output Power test results.....	13
5. Radiated Emission test.....	14
5.1 Operating environment	14
5.2 Test setup & procedure	14
5.3 Emission limits.....	15
5.4 Radiated spurious emission test data	16
5.4.1 Measurement results: frequencies equal to or less than 1 GHz.....	16
5.4.2 Measurement results: frequency above 1GHz	17
6. Power Spectrum Density test.....	20
6.1 Operating environment	20
6.2 Test setup & procedure	20
6.3 Measured data of Power Spectrum Density test results.....	20
7. Emission on the band edge §FCC 15.247(C).....	24
7.1 Band-edge (Radiated method).....	25

8. Power Line Conducted Emission test §FCC 15.207	29
8.1 Operating environment	29
8.2 Test setup & procedure	29
8.3 Emission limit	30
8.4 Uncertainty of Conducted Emission.....	30
8.5 Power Line Conducted Emission test data.....	31

Summary of Tests**Wireless Modem-Model: DSST-24M
FCC ID: Q6M3SDSST-24M**

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	: ICP Das Co., Ltd.
Product	: Wireless Modem
Model No.	: DSST-24M
FCC ID.	: Q6M3SDSST-24M
Frequency Range	: 2410.496MHz ~ 2471.936MHz
Channel Number	: 16 channels
Frequency of Each Channel	: $2410.496 + 4.096n$, $n=0\sim15$
Type of Modulation	: GFSK
Rated Power	: 5Vdc for RF module
Power Cord	: N/A
Sample Received	: Jan. 12, 2005
Test Date(s)	: Jan. 12, 2005 ~ Mar. 25, 2005

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The EUT is a Wireless Modem, 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 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

Antenna Type : Dipole antenna

Connector Type : SMA Reverse

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
DC power Supply 1	MRL	TH019N	N/A	FCC DoC Approved
DC power Supply 2	TESL	6210	N/A	FCC DoC Approved
Channel controller	N/A	N/A	N/A	FCC DoC Approved
Adapter	DVE	DV-1280-3	N/A	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 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 RF module connects with peripherals (5Vdc power supply and the channel controller connected with 24Vdc power supply). It worked in the status of continuously transmitting.

The EUT was transmitted continuously during the test.

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	04/13/2005
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	07/14/2005
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/13/2005
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/18/2005
Horn Antenna	EMCO	1GHz~18GHz	3115	EC338	08/16/2005
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2005
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC368	05/20/2005
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	4/13/2005
Pre-Amplifier	MITEQ	26GHz~40GHz	828825	EC374	1/28/2005
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/MA2491A	EC396	10/18/2005
Controller	HDGmbH	N/A	HD 100	EP317-1	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/13/2006

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

3. Minimum 6dB Bandwidth test

3.1 Operating environment

Temperature: 23 °C
Relative Humidity: 55 %
Atmospheric Pressure: 1023 hPa

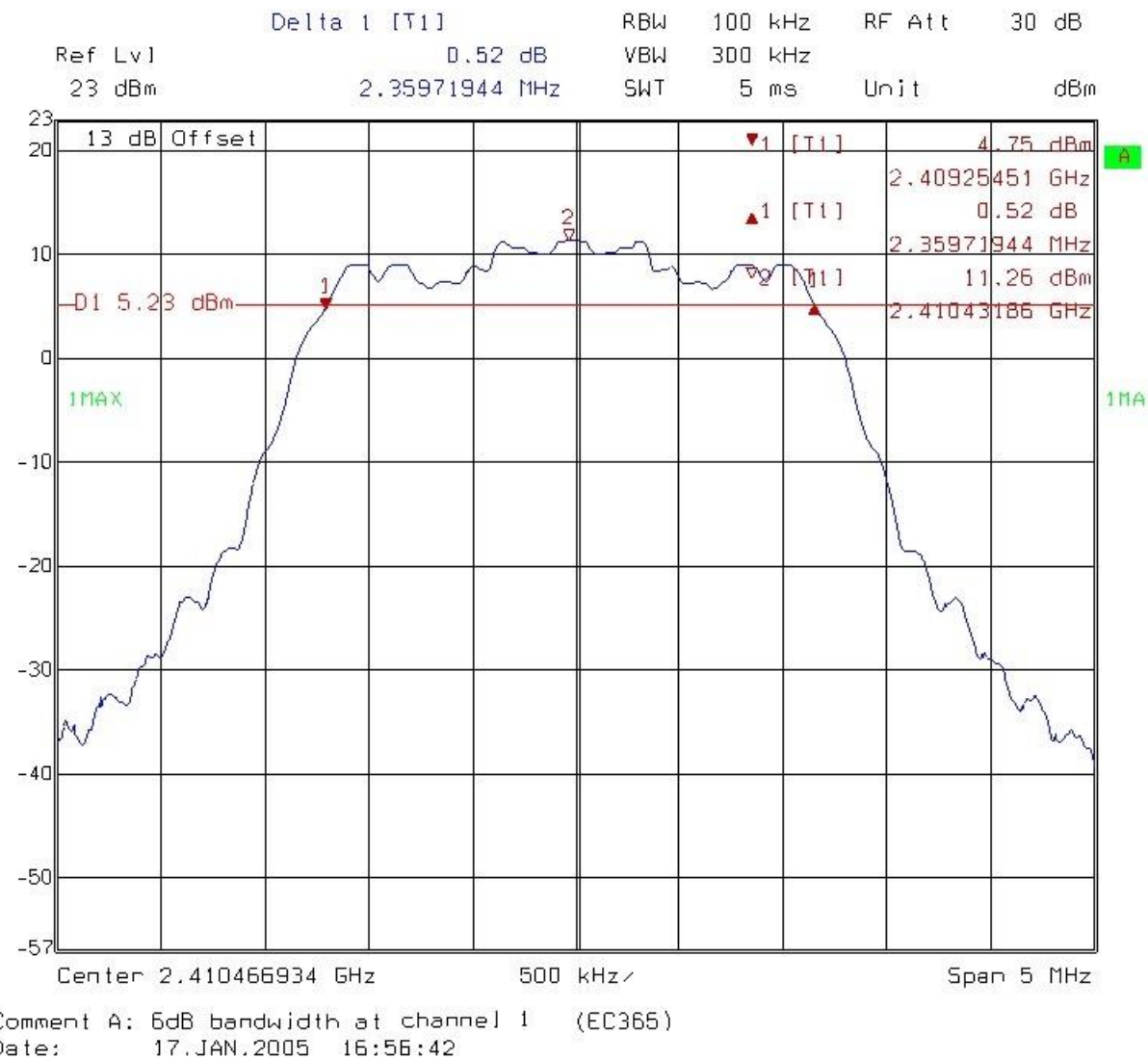
3.2 Test setup & procedure

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 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

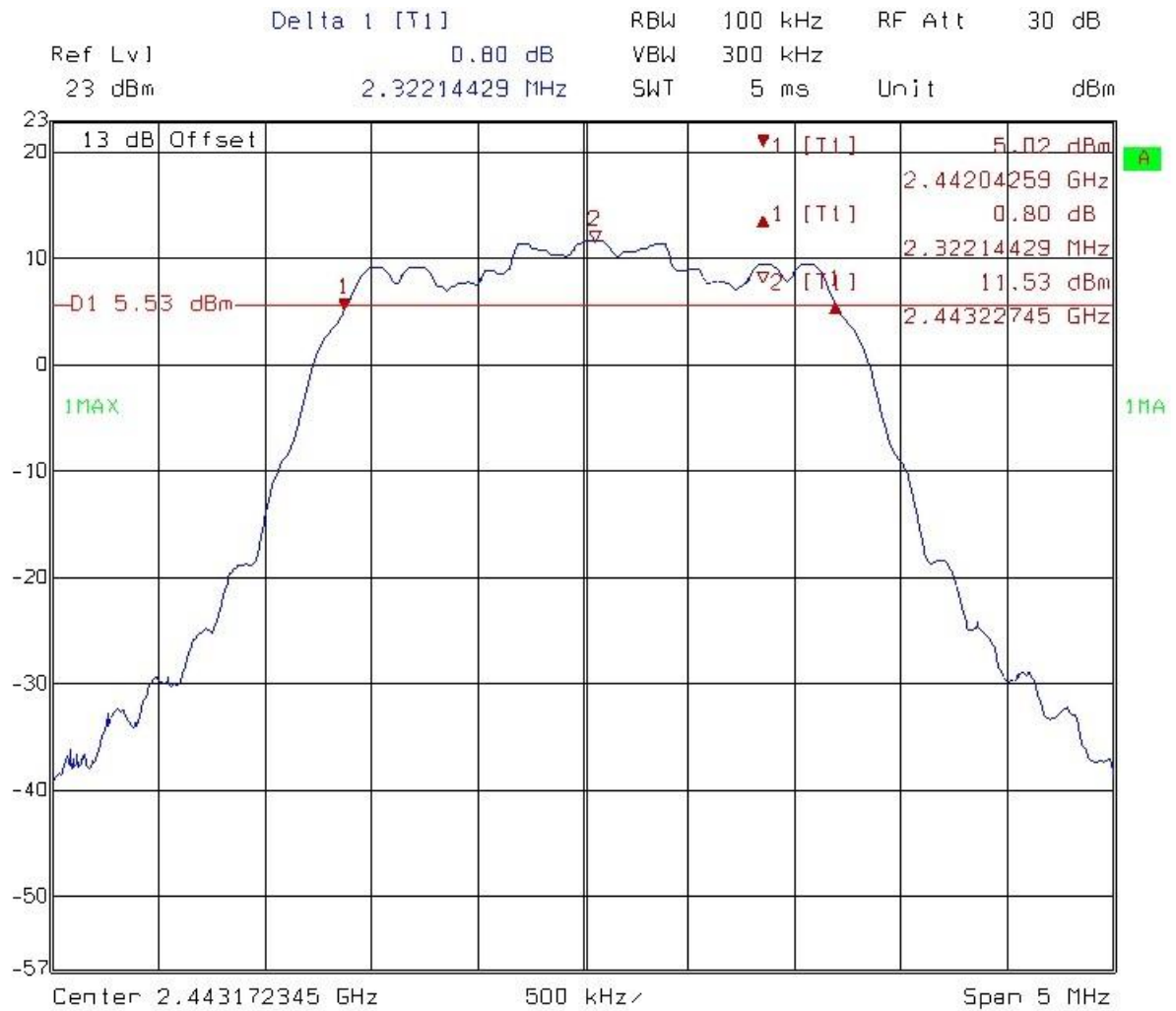
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1	2410.496	2.36	> 500kHz
8	2439.168	2.32	> 500kHz
16	2471.936	2.24	> 500kHz

Please see the plot below.



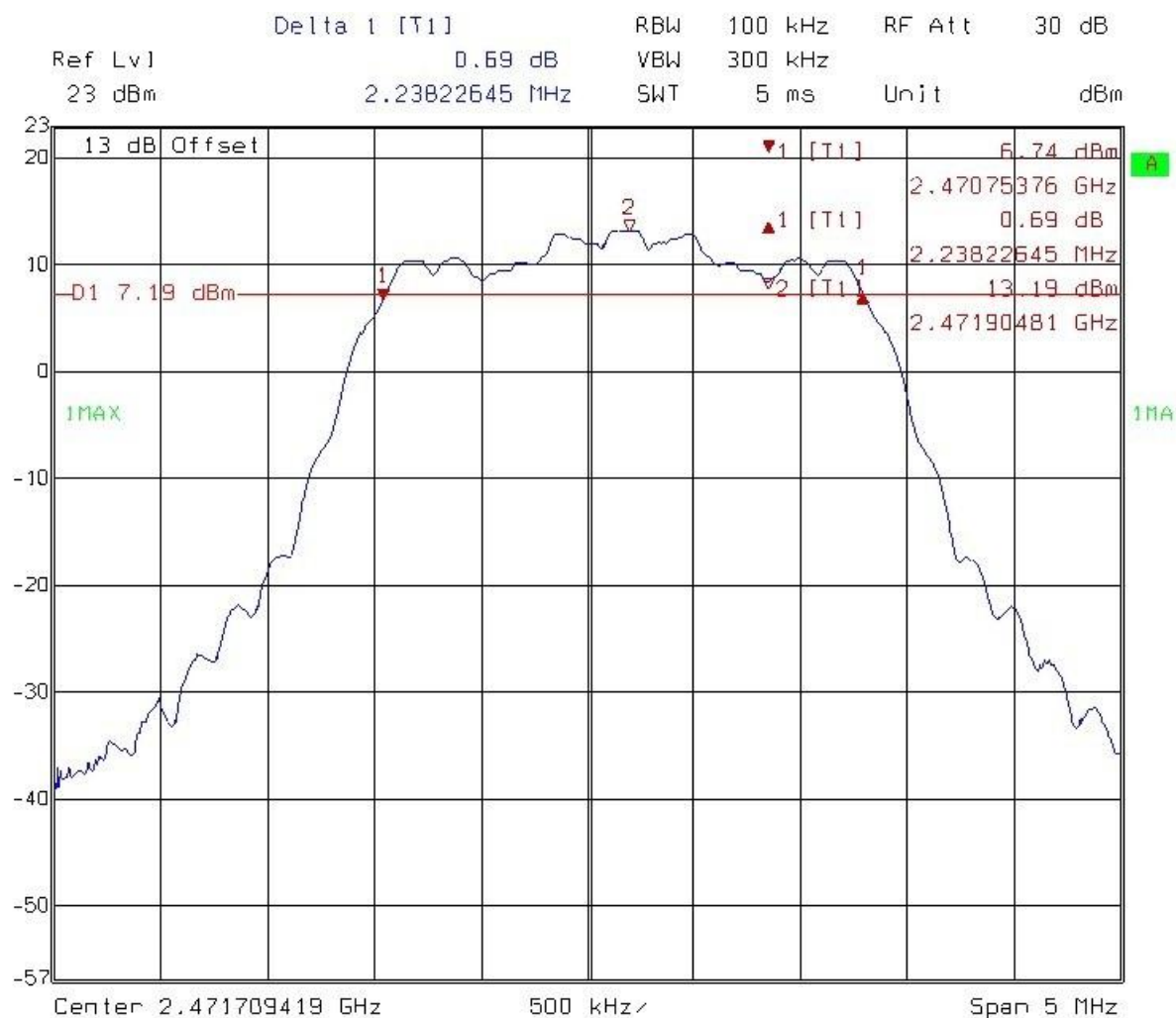
A

1MAX



Comment A: 5dB bandwidth at channel 8 (EC365)

Date: 17.JAN.2005 17:01:38



Comment A: 5dB bandwidth at channel 16 (EC365)

Date: 17.JAN.2005 17:05:27

4. Maximum Output Power test

4.1 Operating environment

Temperature: 23 °C
 Relative Humidity: 52 %
 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 (2.99 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

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1	2410.496	2.99	13.27	16.26	42.27	1
8	2439.168	2.99	13.59	16.58	45.50	1
16	2471.936	2.99	14.91	17.90	61.66	1

Remark:

Conducted Peak Output Power = Reading + C.L

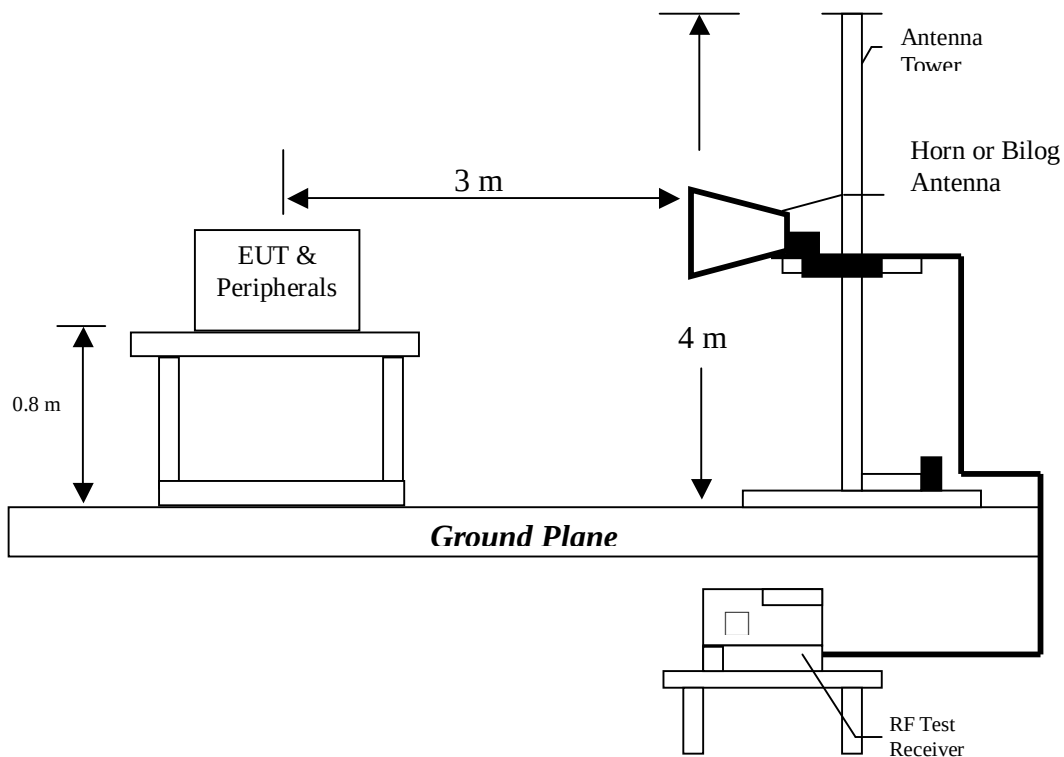
5. Radiated Emission test

5.1 Operating environment

Temperature: 25 °C
Relative Humidity: 54 %
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 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.

5.4 Radiated spurious emission test data

The radiated spurious emissions at

Frequency(MHz)	Margin
171.600	-3.81

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

The test was performed on EUT under continuously transmitting mode. Channel 1, 8, 16 were verified. The worst case occurred at Tx channel 1.

EUT : DSST-24M

Worst Case : Tx at channel 1

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)
43.600	QP	V	10.03	20.40	31.83	43.50	-11.67	116.36	345.41
94.000	QP	V	13.34	18.70	34.74	43.50	-8.76	127.10	233.16
171.600	QP	V	14.29	17.30	39.69	43.50	-3.81	110.28	17.17
220.100	QP	V	15.60	13.70	33.90	46.00	-12.10	102.34	243.39
274.400	QP	V	16.70	9.70	31.90	46.00	-14.10	141.41	232.23
485.900	QP	V	17.86	6.70	34.06	46.00	-11.94	136.79	94.74
96.000	QP	H	12.96	21.80	33.36	40.00	-6.64	143.17	242.48
136.700	QP	H	10.03	21.40	28.73	43.50	-14.77	133.21	160.09
175.500	QP	H	14.29	25.40	31.59	43.50	-11.91	110.34	355.24
354.000	QP	H	11.82	18.30	25.52	46.00	-20.48	130.42	274.25
396.700	QP	H	13.66	15.20	23.36	46.00	-22.64	136.67	288.03
441.300	QP	H	18.61	16.20	25.31	46.00	-20.69	105.00	33.78

Remark:

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

5.4.2 Measurement results: frequency above 1GHz

EUT : DSST-24M

Test Condition : Tx at channel 1

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamplifier (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4820.920	PK	V	39.60	35.25	57.20	52.85	74.00	-21.15	126.38	332.00
4820.920	AV	V	39.60	35.25	48.28	43.93	54.00	-10.07	157.62	145.00
4820.920	PK	H	39.60	35.25	48.04	43.69	74.00	-30.31	114.61	217.00
4820.920	AV	H	39.60	35.25	38.25	33.90	54.00	-20.10	183.71	113.00
7231.480	PK	V	39.25	39.05	62.45	62.25	74.00	-11.75	113.47	326.00
7231.480	AV	V	39.25	39.05	49.21	49.01	54.00	-4.99	160.70	254.00
7231.480	PK	H	39.25	39.05	53.14	52.94	74.00	-21.06	100.10	162.00
7231.480	AV	H	39.25	39.05	40.92	40.72	54.00	-13.28	185.39	113.00
9641.840	PK	V	37.89	41.58	57.99	61.68	74.00	-12.32	104.65	19.00
9641.840	AV	V	37.89	41.58	43.05	46.74	54.00	-7.26	172.07	342.00
9641.840	PK	H	37.89	41.58	48.08	51.77	74.00	-22.23	195.57	304.00
9641.840	AV	H	37.89	41.58	34.60	38.29	54.00	-15.71	104.29	356.00

Remark:

1. Corrected Level = Reading + 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.

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 : DSST-24M

Test Condition : Tx at channel 8

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)
4886.500	PK	V	39.60	35.25	55.06	50.71	74.00	-23.29	173.03	307.00
4886.500	AV	V	39.60	35.25	46.16	41.81	54.00	-12.19	161.89	288.00
4886.500	PK	H	39.60	35.25	52.25	47.90	74.00	-26.10	116.13	181.00
4886.500	AV	H	39.60	35.25	42.98	38.63	54.00	-15.37	199.92	204.00
7329.800	PK	V	39.25	39.05	56.48	56.28	74.00	-17.72	124.96	43.00
7329.800	AV	V	39.25	39.05	44.06	43.86	54.00	-10.14	163.06	316.00
7329.800	PK	H	39.25	39.05	47.72	47.52	74.00	-26.48	155.92	122.00
7329.800	AV	H	39.25	39.05	35.43	35.23	54.00	-18.77	124.20	237.00
9772.640	PK	V	37.89	41.58	50.84	54.53	74.00	-19.47	179.65	123.00
9772.640	AV	V	37.89	41.58	37.19	40.88	54.00	-13.12	184.10	95.00
9772.640	PK	H	37.89	41.58	46.71	50.40	74.00	-23.60	126.11	249.00
9772.640	AV	H	37.89	41.58	33.29	36.98	54.00	-17.02	136.50	247.00

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.

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 : DSST-24M

Test Condition : Tx at channel 16

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)
4943.960	PK	V	39.60	35.25	54.61	50.26	74.00	-23.74	151.99	118.00
4943.960	AV	V	39.60	35.25	45.88	41.53	54.00	-12.47	102.30	44.00
4943.960	PK	H	39.60	35.25	52.38	48.03	74.00	-25.97	141.89	15.00
4943.960	AV	H	39.60	35.25	43.28	38.93	54.00	-15.07	124.11	215.00
7415.860	PK	V	39.25	39.05	61.46	61.26	74.00	-12.74	157.15	25.00
7415.860	AV	V	39.25	39.05	49.03	48.83	54.00	-5.17	119.15	108.00
7415.860	PK	H	39.25	39.05	54.49	54.29	74.00	-19.71	112.20	245.00
7415.860	AV	H	39.25	39.05	42.38	42.18	54.00	-11.82	170.94	340.00
9887.640	PK	V	37.89	41.58	48.15	51.84	74.00	-22.16	191.63	305.00
9887.640	AV	V	37.89	41.58	34.96	38.65	54.00	-15.35	154.59	272.00
9887.640	PK	H	37.89	41.58	44.34	48.03	74.00	-25.97	112.67	286.00
9887.640	AV	H	37.89	41.58	31.63	35.32	54.00	-18.68	108.80	214.00

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.

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: 22 °C
Relative Humidity: 54 %
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 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

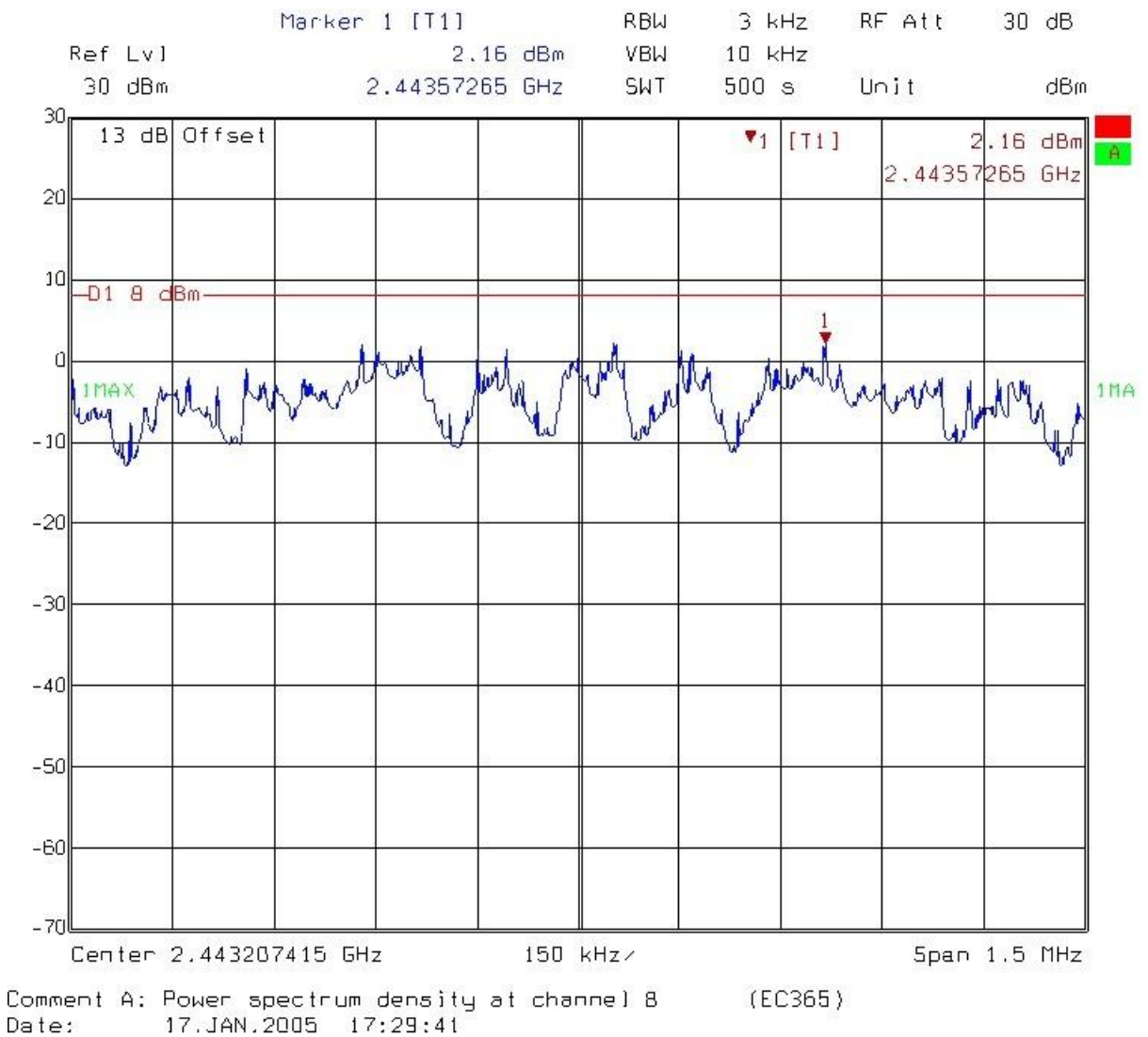
Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
1	2410.496	2.67	8
8	2439.168	2.16	8
16	2471.936	4.34	8

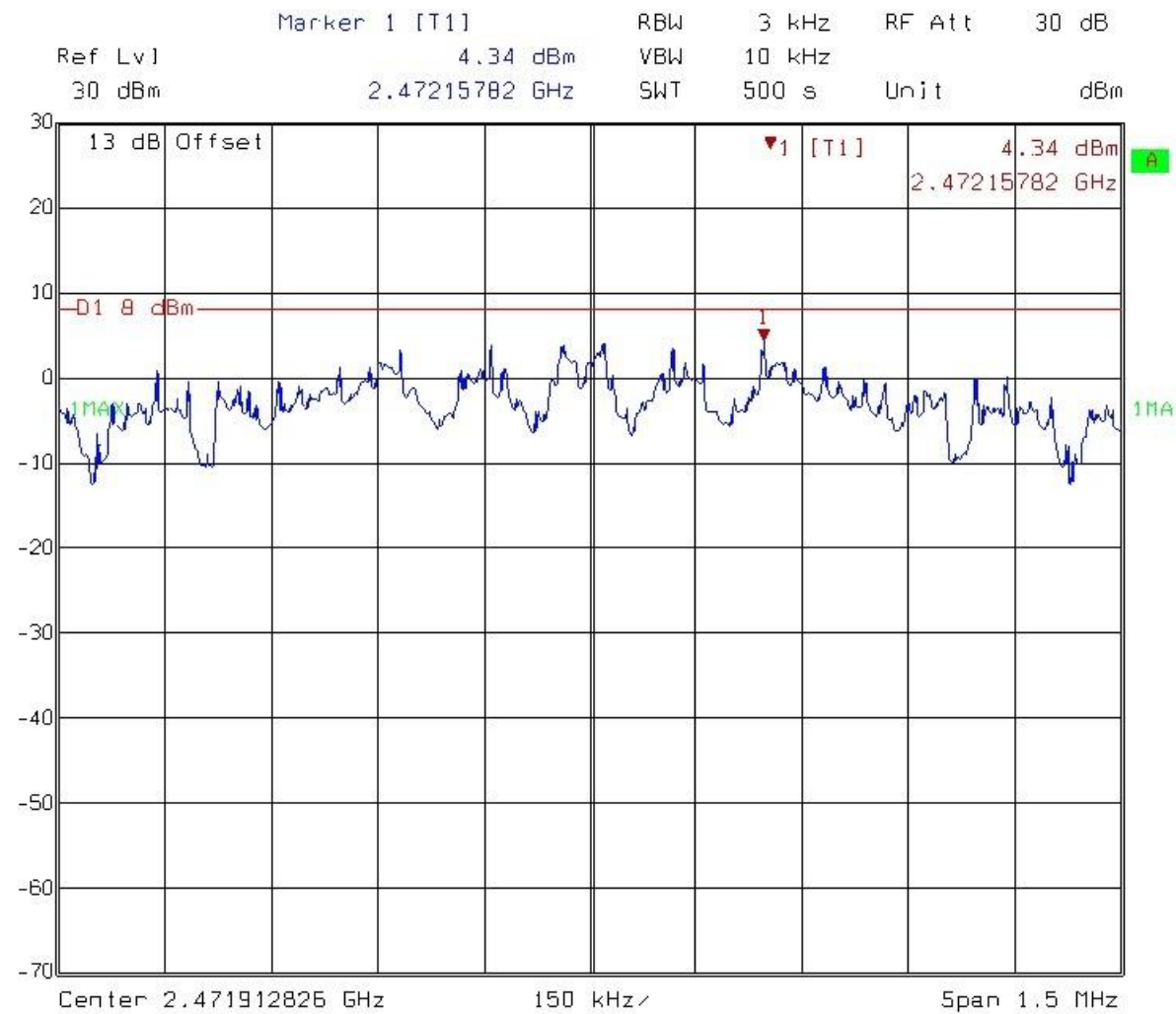
Please see the plot below.



Comment A: Power spectrum density at channel 1 (EC365)

Date: 17.JAN.2005 17:33:50





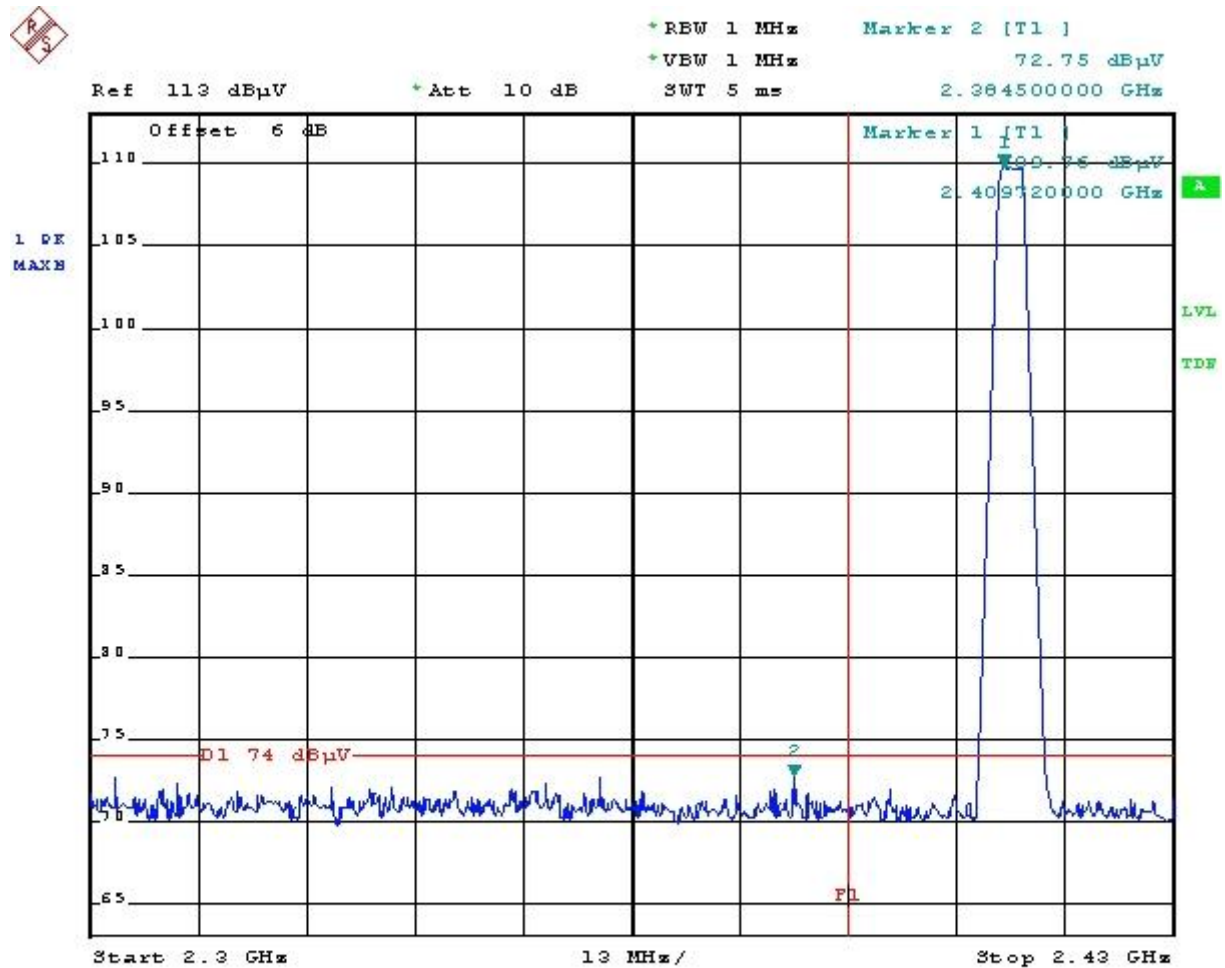
Comment A: Power spectrum density at channel 16 (EC365)
Date: 17.JAN.2005 17:17:21

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.

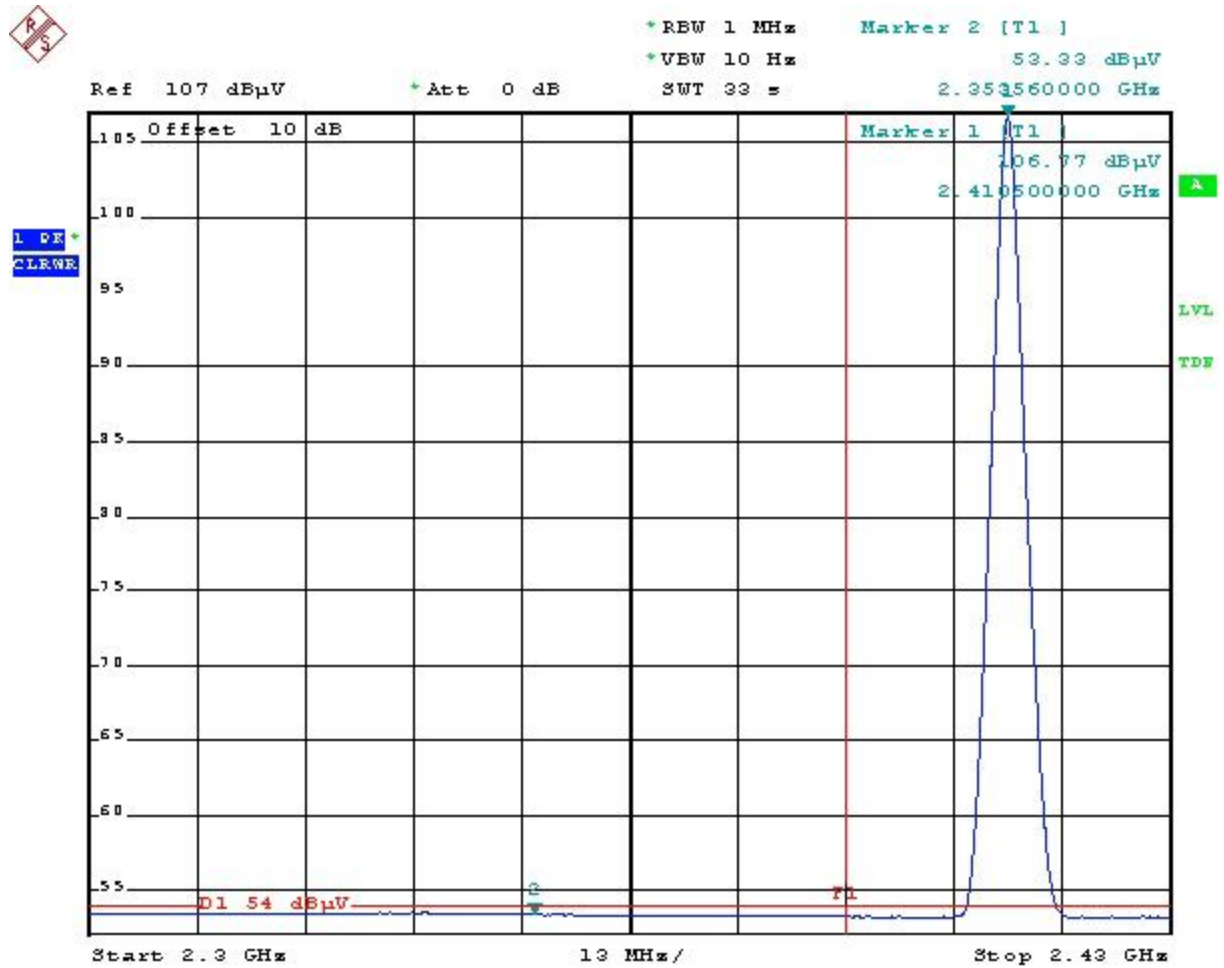
7.1 Band-edge (Radiated method)



Comment: Band-edge Test at CH1

Comment: Peak Detector F1=2390MHz @External Att.=6dB

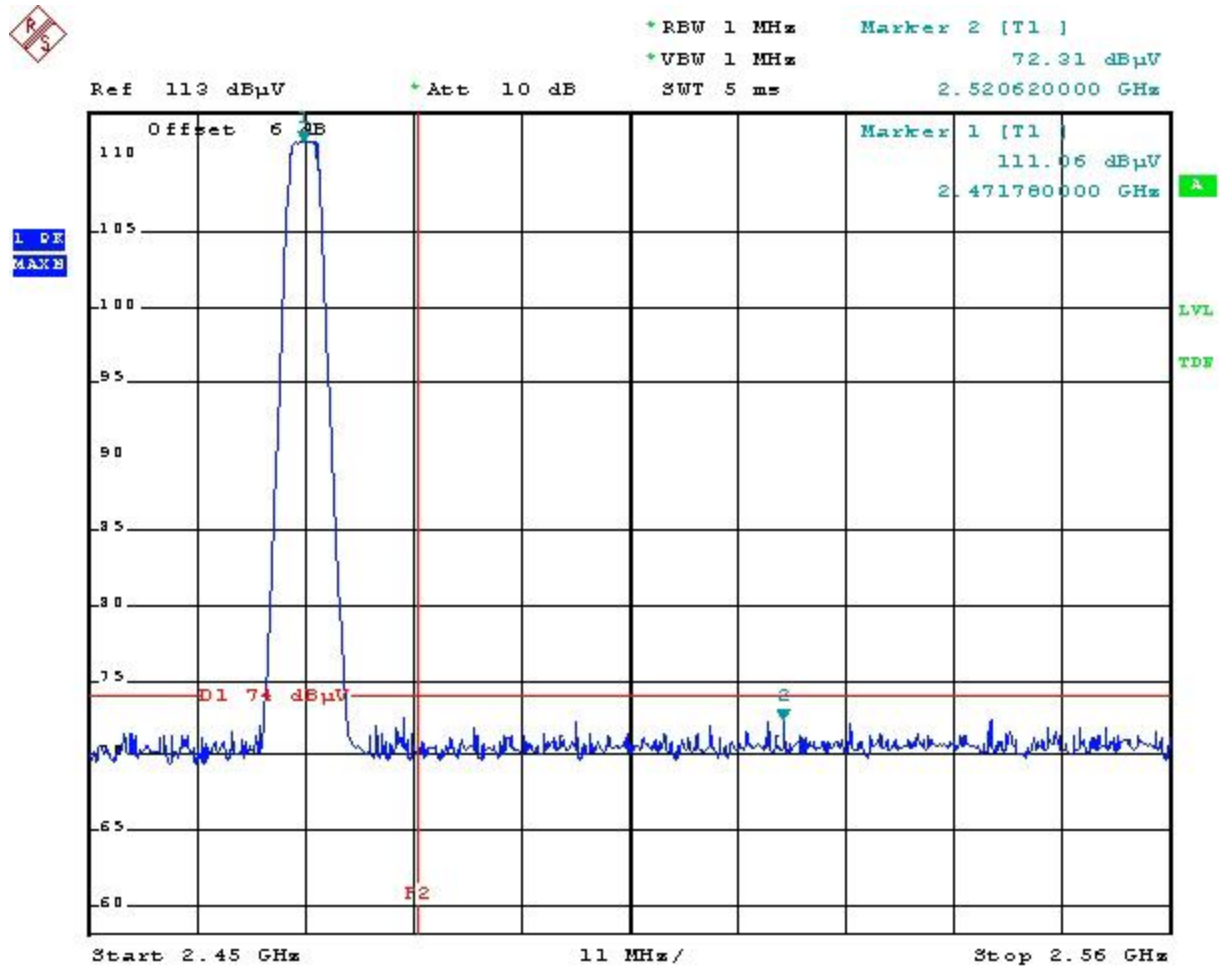
Date: 25.JAN.2005 22:11:23



Comment: Band-edge Test at CH1

Comment: Avg. Detector F1=2390MHz @External Att.=10dB

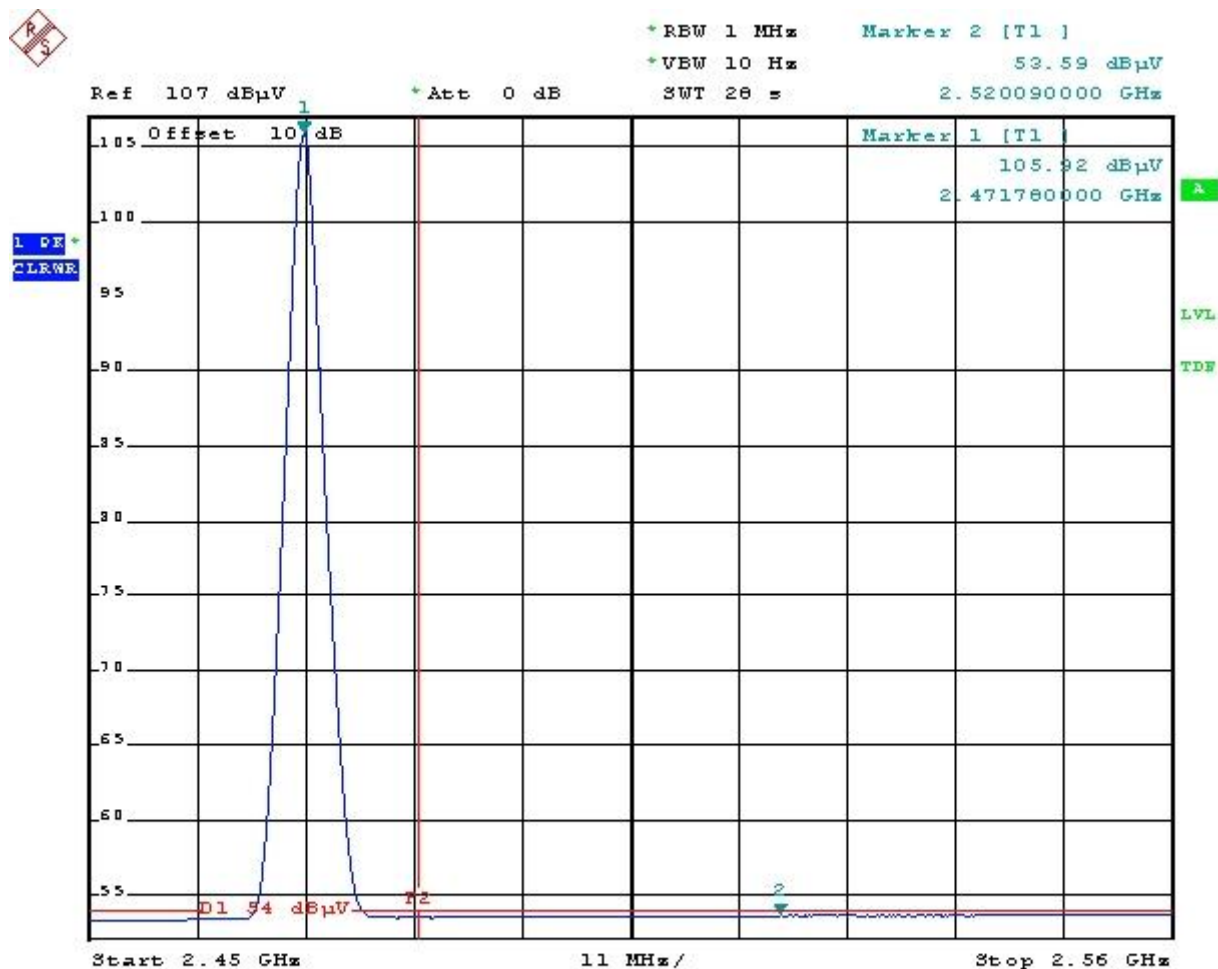
Date: 25.JAN.2005 21:50:58



Comment: Band-edge Test at CH16

Comment: Peak Detector F2=2483.5MHz @External Att.=6dB

Date: 25.JAN.2005 22:05:59



Comment: Band-edge Test at CH16

Comment: Avg. Detector F2=2483.5MHz @External Att.=10dB

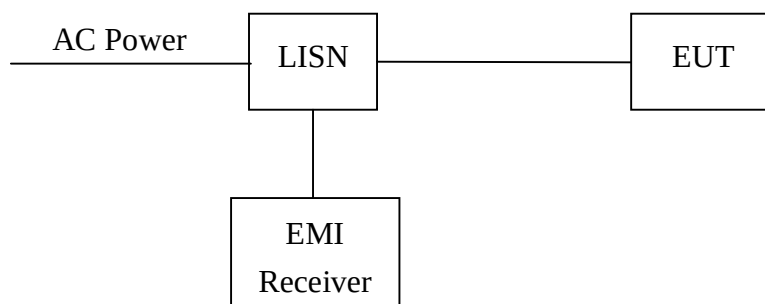
Date: 25.JAN.2005 22:01:06

8. Power Line Conducted Emission test §FCC 15.207

8.1 Operating environment

Temperature:	22	°C
Relative Humidity:	55	%
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 ± 2.6 dB.

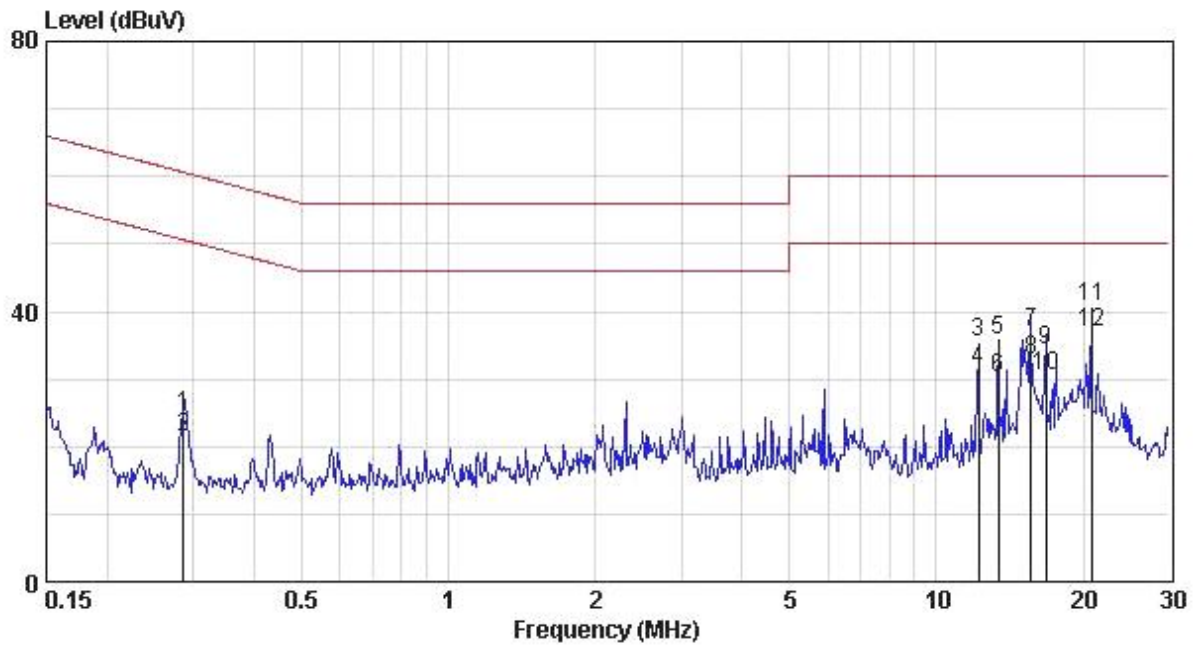
8.5 Power Line Conducted Emission test data

Phase: Line
Model No.: DSST-24M
Test Mode: Normal operation mode

Phase	Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB)	
							Qp	Av
LINE	0.286	0.10	24.59	60.64	21.43	50.64	-36.05	-29.21
LINE	12.198	0.64	35.52	60.00	31.49	50.00	-24.48	-18.51
LINE	13.422	0.72	35.65	60.00	30.27	50.00	-24.35	-19.73
LINE	15.616	0.84	36.99	60.00	32.92	50.00	-23.01	-17.08
LINE	16.777	0.87	34.28	60.00	30.52	50.00	-25.72	-19.48
LINE	20.805	0.97	40.72	60.00	36.95	50.00	-19.28	-13.05

Remark:

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



Phase: Neutral
Model No.: DSST-24M
Test Mode: Normal operation mode

Phase	Frequency (MHz)	Corr. Factor (dB)	Level	Limit	Level	Limit	Margin	
			Qp (dBuV)	Qp (dBuV)	AV (dBuV)	Av (dBuV)	Qp	Av
NEUTRAL	0.286	0.10	24.16	60.64	22.10	50.64	-36.48	-28.54
NEUTRAL	5.907	0.26	23.91	60.00	18.21	50.00	-36.09	-31.79
NEUTRAL	12.198	0.40	34.35	60.00	32.50	50.00	-25.65	-17.50
NEUTRAL	13.422	0.45	32.96	60.00	31.31	50.00	-27.04	-18.69
NEUTRAL	15.006	0.52	34.00	60.00	30.86	50.00	-26.00	-19.14
NEUTRAL	20.805	0.75	36.20	60.00	32.13	50.00	-23.80	-17.87

Remark:

1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)

2. Margin (dB) = Level (dBuV) – Limit (dBuV)

