

Prüfbericht - Nr.: 15042220 001 <i>Test Report No.:</i>		Seite 1 von 23 <i>Page 1 of 23</i>	
Auftraggeber: <i>Client:</i>		Checkpoint Systems Inc 101 Wolf Drive, P.O. Box 188, Thorofare, NJ 08086, United States	
Gegenstand der Prüfung: <i>Test item:</i>		Electronic Article Surveillance Detection System	
Bezeichnung: <i>Identification:</i>	Boulevard Mono	Serien-Nr.: <i>Serial No.:</i>	N/A
Wareneingangs-Nr.: <i>Receipt No.:</i>	153148742	Eingangsdatum: <i>Date of receipt:</i>	12.07.2010
Prüfört: <i>Testing location:</i>	Refer to section 1.1		
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15:2009 RSS-210 (Issue 8):2010 RSS-Gen (Issue 3):2010		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.		
geprüft/ tested by:		kontrolliert/ reviewed by:	
09.03.2011	Gu Weikang/PE	09.03.2011	Lu Xinhua/TC
<i>Datum</i>	<i>Name/Stellung</i>	<i>Unterschrift</i>	<i>Unterschrift</i>
<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>	<i>Signature</i>
Sonstiges/ Other Aspects:			
FCC ID: DO4AMBER IC: 3356B-AMBER			
Abkürzungen:		Abbreviations:	
P(ass)	= entspricht Prüfgrundlage	P(ass)	= passed
F(ail)	= entspricht nicht Prüfgrundlage	F(ail)	= failed
N/A	= nicht anwendbar	N/A	= not applicable
N/T	= nicht getestet	N/T	= not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p> <p><i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

TEST SUMMARY

4.1.1 CONDUCTED EMISSION

Result:

Passed

4.1.2 RADIATED EMISSION UP TO 30MHZ

Result:

Passed

4.2.1 RADIATED EMISSION ABOVE 30MHZ

Result:

Passed

4.3 EMISSION BANDWIDTH

Result:

N/A

4.4 DUTY CYCLE

Result:

N/A

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1 Test Sites

1.1 Test Facilities

Laboratory 1: TÜV Rheinland (Shanghai) Co., Ltd.

Address: 10-15/F, Huatsing Building, No. 88, Lane 777, West Guangzhong Road, Zhabei District, Shanghai 200072, P.R. China

(FCC registration No.: 657274; IC site No.: 2932F-1)

Laboratory 2: Shanghai Institute of Measurement and Testing Technology

Address: No. 716, Yi Shan Road, Shanghai 200233, P. R. China

(FCC registration No.: 142171; IC site No.: 6625A)

The used test equipments are in accordance with CISPR 16-1 series standards for measurement of radio interference. Part of the tests was conducted by “Shanghai Institute of Measurement and Testing Technology” under supervision of TÜV Rheinland’s engineer.

1.2 List of Test and Measurement Instruments

Table 1: List of test and measurement equipment

No.	Equipment	Model	Serial no.	Cal. due date
Lab 1:				
1.	3m modified semi-anechoic chamber	SAC	N/A	25.04.2011
2.	EMI test receiver	ESCI	100280	22.11.2011
3.	Broadband antenna	BTA-H	040005H	10.03.2012
4.	Spectrum analyzer	FSP30	100192	10.06.2011
5.	EMI test receiver	ESIB26	100227	10.06.2011
6.	Artificial mains network	NNB 42	04/10048	24.02.2011
Lab 2:				
7.	10m semi-anechoic chamber	SAC 10m	Rong-001-41	11.09.2011
8.	EMI test receiver	ESI 26	Rong-001-01	23.12.2010
9.	Loop Field Strength Measuring System	FMZB 1516	Rong-001-07	29.11.2011

2 General Product Information

2.1 Product Function and Intended Use

The Boulevard Mono system is an Electronic Article Surveillance System (EAS). The system detects target tags attached to merchandise. The targets resonate in the region of 8.2 MHz. When an article of merchandise is purchased, the target is deactivated which causes it to no longer resonate. The Boulevard Mono system monitors an area of 2.46-feet on either side of the antenna in the 7.9 to 8.5 MHz range, and triggers an alarm when a non-deactivated target is detected.

2.2 Ratings and System Details

System input	:	AC 120V, 60Hz
Protection class	:	I
Type of antenna	:	Loop antenna
Antenna info	:	W: 400 mm H: 1540 mm
Adaptor info	:	Model name: MW48T-1500800A Input: AC 120V, 60Hz Output: AC 15V, 0.8A

2.3 Operation in Restricted Bands

The EUT is a digital swept frequency hopping transmitter. The EUT hops on discrete frequencies. The discrete frequencies that can be transmitted by the EUT are as follows:

7.975, 8.05, 8.125, 8.2, 8.275, 8.35, 8.425, 8.5MHz.

The restricted frequency bands (per FCC Part 15 Clause 15.205) in the operating frequency band of the EUT are as follows:

8.291 – 8.294MHz
8.362 – 8.366MHz
8.37625 – 8.38675MHz
8.41425 – 8.41475MHz

Note: The used hopping frequency 8.35MHz is near to the restricted band, but according to FCC Part 15.205(1) are following devices are exempt from the requirements of this section: Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed above, the sweep never stopped with the fundamental emission within this bands and the fundamental emission is outside of the bands more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

The transmitter fulfils these requirements and so this unit is exempt of this section.

2.4 Independent Operation Modes

The Boulevard Mono system was operated in two conditions, with and without a security tag in the field of the antenna. It was determined that higher signal levels were exhibited without the security tag in the field. All emissions were recorded in this condition.

2.5 Submitted Documents

N/A.

2.6 Related Submittal(s) Grants

This is a single application for certification of transmitter.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

3.2 Test Operation and Test Software

The system software was set as follows,

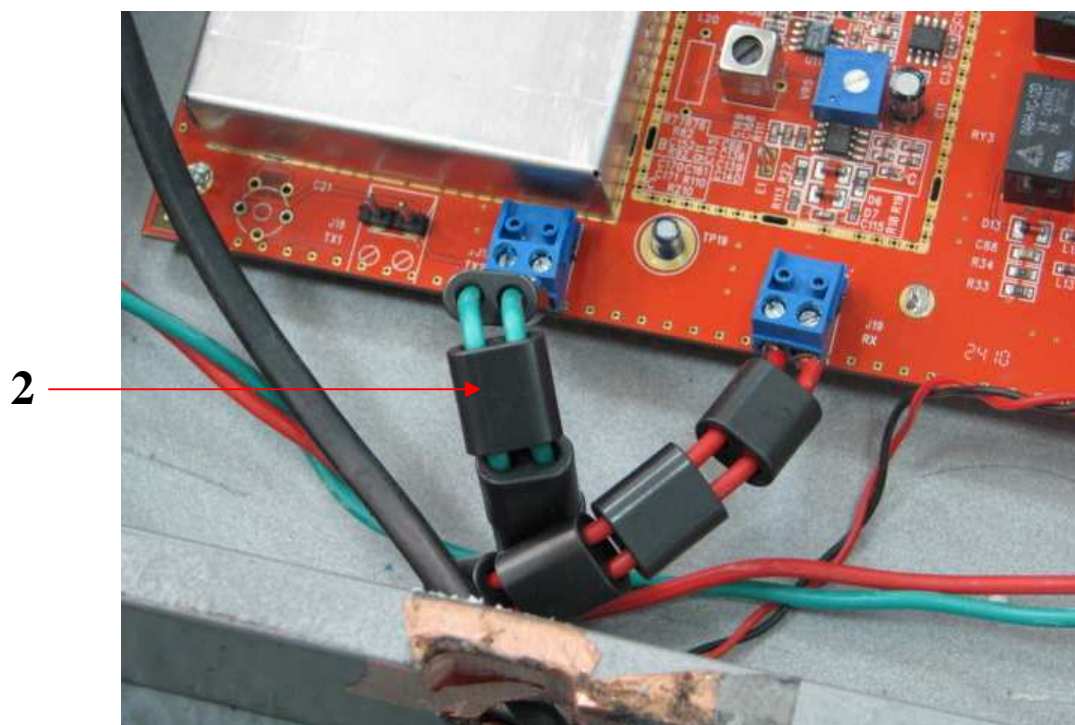
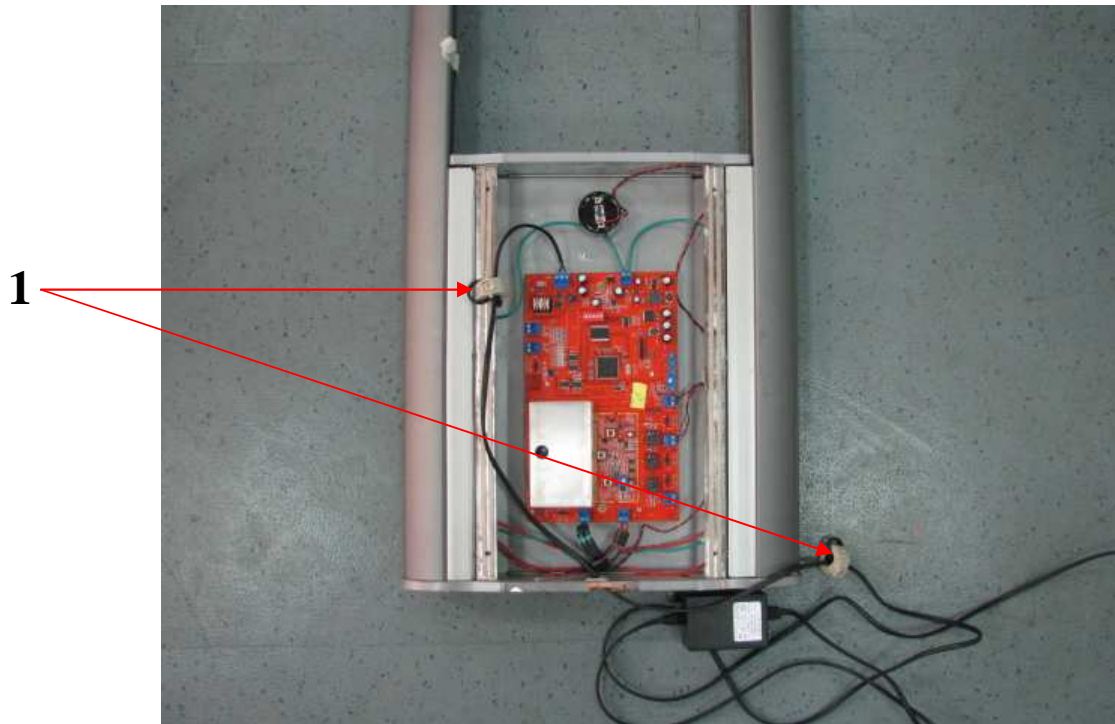
Antenna type	Frequency of Tx band	Tx power level
Boulevard Mono	8.2MHz	max power (approx. 5W)

3.3 Special Accessories and Auxiliary Equipment

None.

3.4 Countermeasures to achieve EMC Compliance

The tested sample contains the ferrite cores shown as following figures:



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Page 9 of 23**Ferrite info & location**

1. Checkpoint P/N 284760 – Add a ferrite on the DC output end of power cable & power in connector with three turns.
2. Checkpoint P/N 221412 – Add 4 ferrites on the end of the TX2 and Rx connector with one turn.

4 Test Result

4.1 Emission in the Frequency Range up to 30 MHz

4.1.1 Conducted Emission

Result:	Passed
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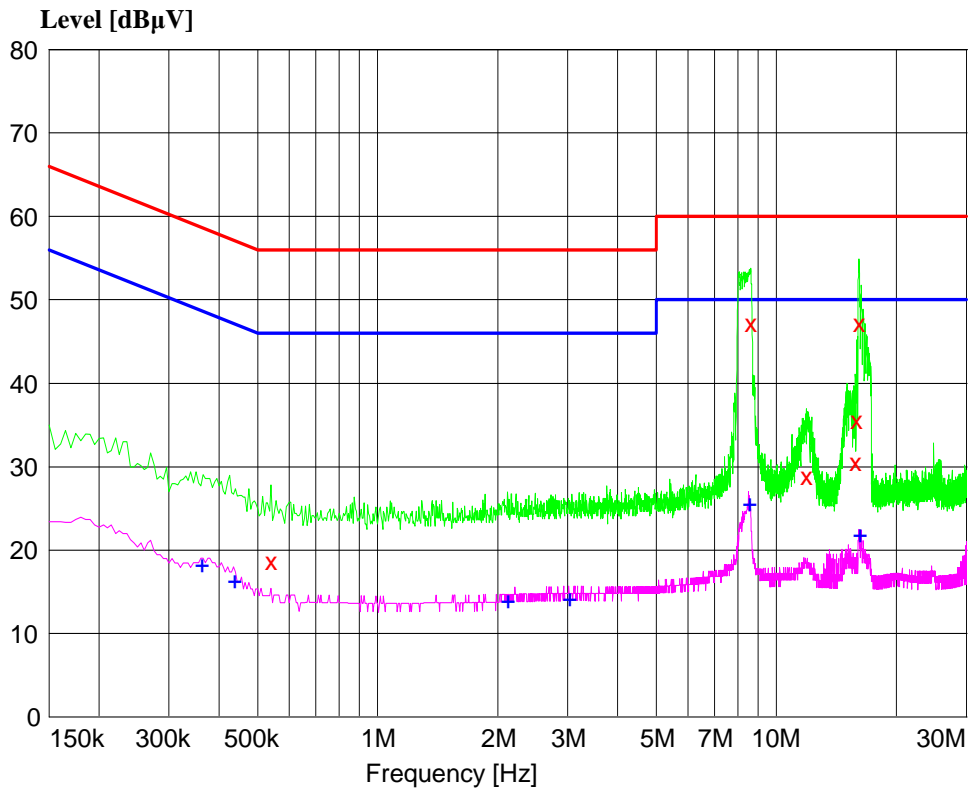
Date of testing	: 30.12.2010
Test specification	: FCC Part 15 Section 15.207 & RSS-GEN 7.2.4
Test method	: ANSI C63.10-2009
Measurement location	: Shielded room
Detector	: Quasi-peak, Average
Measurement BW	: 9 kHz
Supply voltage	: AC 120V, 60Hz
Measuring frequency range	: 0.15-30MHz
Ambient condition	: Temperature: 24°C; Relative humidity: 50%
Operational mode	: Continuous sweep

Limit Section 15.207 & RSS-GEN 7.2.4,

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

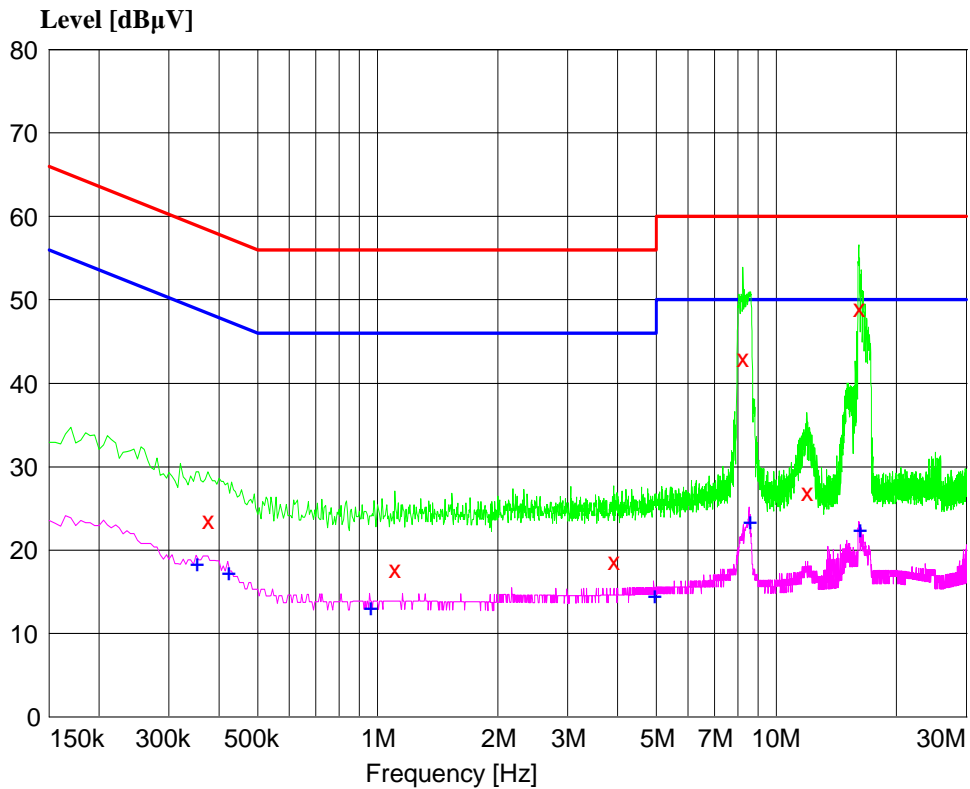
The following figures and tables were those measured by an automatic measuring system. Both quasi-peak and average values were measured. Quasi-peak and average values were measured and listed respectively where they had a maximum in previous scanning survey. In the following figures, “×” means quasi-peak result and “+” means average result which was measured in final measurement.

Figure 1: Spectral diagram, conducted emission, 150kHz - 30MHz, L

Final quasi-peak measurement results:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line
0.540000	18.70	20.2	56.0	37.3	L1
8.620000	47.30	21.0	60.0	12.7	L1
11.880000	29.00	21.1	60.0	31.0	L1
15.750000	30.50	21.1	60.0	29.5	L1
15.915000	35.70	21.2	60.0	24.3	L1
16.110000	47.20	21.2	60.0	12.8	L1

Final average measurement results:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line
0.360000	18.40	20.0	48.7	30.4	L1
0.435000	16.50	20.0	47.2	30.7	L1
2.115000	14.00	20.3	46.0	32.0	L1
3.015000	14.30	20.4	46.0	31.7	L1
8.515000	25.60	21.0	50.0	24.4	L1
16.105000	21.90	21.2	50.0	28.1	L1

Figure 2: Spectral diagram, conducted emission, 150kHz - 30MHz, N

Final quasi-peak measurement results:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line
0.375000	23.60	20.3	58.4	34.7	N
1.105000	17.70	20.4	56.0	38.3	N
3.905000	18.70	20.2	56.0	37.3	N
8.235000	43.00	20.3	60.0	17.0	N
11.920000	27.00	20.7	60.0	33.0	N
16.115000	49.00	21.4	60.0	11.0	N

Final average measurement results:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line
0.350000	18.50	20.3	49.0	30.5	N
0.420000	17.40	20.2	47.4	30.0	N
0.955000	13.20	20.4	46.0	32.8	N
4.920000	14.70	20.2	46.0	31.3	N
8.555000	23.50	20.3	50.0	26.5	N
16.145000	22.60	21.4	50.0	27.4	N

4.1.2 Radiated Emission up to 30MHz

Result:
Passed

Date of testing	:	10.12.2010
Test specification	:	FCC Part 15 Section 15.223 & RSS-210 A2.3
Test method	:	ANSI C63.10-2009
Measurement location	:	Semi anechoic chamber
Measurement distance	:	10m
Detector	:	Peak
Measurement BW	:	200Hz (9-150kHz) 9kHz (150kHz-30MHz)
Supply voltage	:	AC 120V, 60Hz
Measuring frequency range	:	9kHz - 30MHz
Ambient condition	:	Temperature: 21°C; Relative humidity: 36%

Limit Section 15.223 & RSS-210 A2.3,

(a) The field strength of any emission within the band 1.705-10.0MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level.

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBμV/m)	Measurement distance (meters)
1.705-10	88.54	38.94	30

Remark: The field strength was derived from clause 4.3 of this report using following equation:

Field strength = 726 (6dB bandwidth in kHz) / 8.2 (center frequency in MHz) = 88.54 microvolts/meter.

(b) The field strength of emissions outside of the band 1.705-10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBμV/m)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)		300
0.490-1.705	24000/F(kHz)		30
1.705-30	30	29.5	30

The radiated emission measurement was made at 10m. The EUT was placed on a nonconductive support 0.1m above the ground plane. The antenna height was set at 1 m. The spectrum was examined from 9kHz - 30MHz. At each frequency, the EUT was rotated 360° in order to determine the emission's maximum level. Measurements were taken using 3 antenna polarizations.

The field strength level was established by adding the meter reading of the EMI test receiver to the factors associated with antenna correction factor & cable loss. In addition, pulse correction factor (duty cycle) $K_E = -43.69\text{dB}$ derived from clause 4.4 of this report was used to calculate the average level.

The equation is expressed as follows:

$$FS = R + AF + CF + (K_E)$$

Where FS = Field strength level in $\text{dB}\mu\text{V}/\text{m}$;

R = Reading of EMI test receiver in $\text{dB}\mu\text{V}$;

AF = Antenna factor in dB/m ;

CF = Cable attenuation factor in dB ;

K_E = Pulse correction factor (for calculating average levels only).

In the following table for measurement results, Correction factor (Corr.) = AF + CF.

Table 2: Radiated emission results, 9kHz - 30MHz, Peak & Average

Freq. (MHz)	Peak reading	Corr. (dB)	Peak level (dB$\mu\text{V}/\text{m}$)	Limit (dB$\mu\text{V}/\text{m}$)	Margin (dB)	AV level (dB$\mu\text{V}/\text{m}$)	Limit (dB$\mu\text{V}/\text{m}$)	Margin (dB)	Pol.
8.59	40.49	20.17	60.66	78.02	17.36	16.97	58.02	41.05	X
8.40	46.45	20.17	66.62	78.02	11.40	22.93	58.02	35.09	Y
8.16	33.56	20.17	53.73	78.02	24.29	10.04	58.02	47.98	Z

Remark: Polarization of antenna to ground plane: X - along measurement axis, Y - vertical axis, Z - horizontal axis.

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated Emission above 30MHz

Result:
Passed

Date of testing	:	21.12.2010
Test specification	:	FCC Part 15 Section 15.223(b) & RSS-210 A2.3
Test method	:	ANSI C63.10-2009
Measurement location	:	Semi anechoic chamber
Measurement distance	:	3m
Detector	:	Quasi-peak
Measurement BW	:	120 kHz
Supply voltage	:	AC 120V, 60Hz
Measuring frequency range	:	30 - 1000MHz
Ambient condition	:	Temperature: 24°C; Relative humidity: 50%

Limit Section 15.223(b) & RSS-210 A2.3,

(b) The field strength of emissions outside of the band 1.705-10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dB μ V/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

The radiated emission measurement was made at 3m. The EUT was placed on a nonconductive support 0.1m above the ground plane. The spectrum was examined from 30 - 1000MHz. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The field strength level was established by adding the meter reading of the EMI test receiver to the factors associated with antenna correction factor & cable loss.

The equation is expressed as follows:

$$FS = R + AF + CF$$

Where FS = Field strength level in dB μ V/m;

R = Reading of EMI test receiver in dB μ V;

AF = Antenna factor in dB/m;

CF = Cable attenuation factor in dB.

In the following table for measurement results, Correction factor (Corr.) = AF + CF.

Table 3: Radiated emission results, 30MHz - 1GHz, Quasi-peak

Freq. (MHz)	QP reading	Corr. (dB)	QP level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Antenna height (cm)	Angle (deg)	Pol.
119.35	26.6	10.1	36.7	43.5	6.8	100.0	10.0	H
360.22	22.2	17.1	39.3	46.0	6.8	100.0	0.0	H
507.77	25.0	19.3	44.3	46.0	1.8	100.0	170.0	H
33.97	-1.2	28.0	26.8	40.0	13.2	100.0	180.0	V
51.67	0.4	19.0	26.3	40.0	13.7	100.0	0.0	V
326.73	23.3	16.2	39.5	46.0	6.5	100.0	180.0	V

4.3 Emission Bandwidth

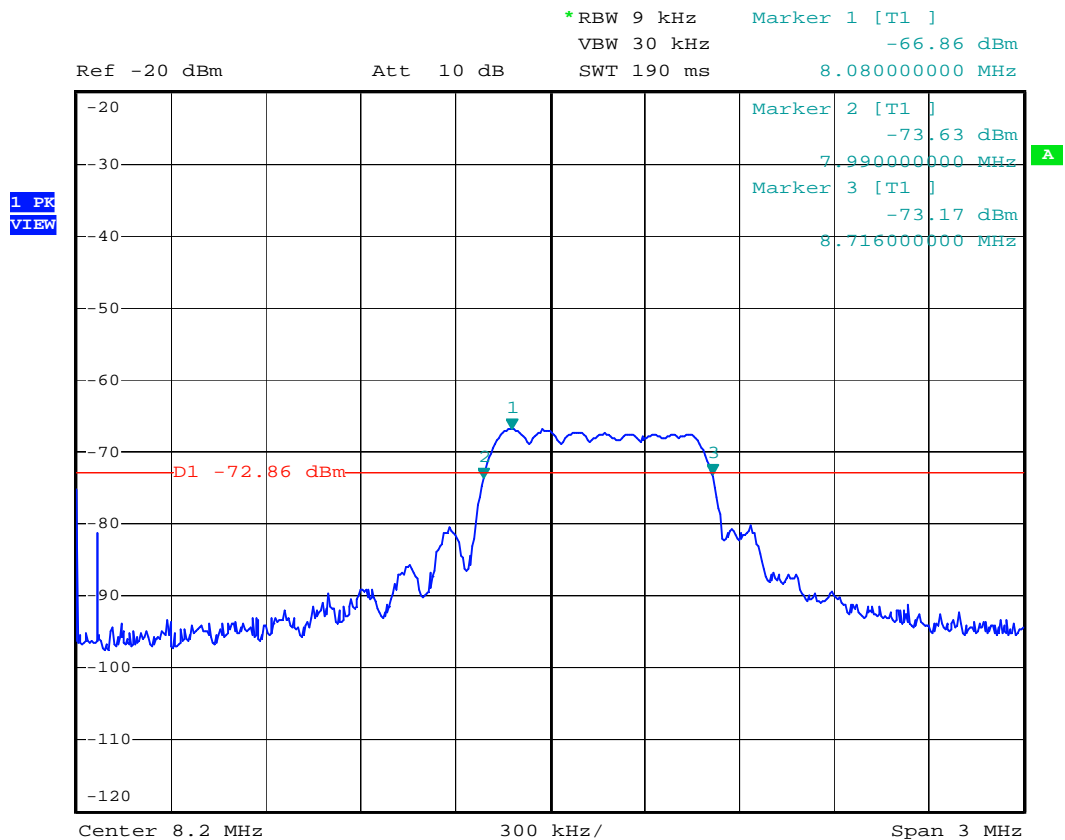
Result:
N/A

Date of testing : 04.01.2011
 Test specification : FCC Part 15 Section 15.223(a) & RSS-210 A2.3
 Ambient condition : Temperature: 24°C; Relative humidity: 42%

Table 4: Emission bandwidth measurement result

Max Peak (MHz)	6dB Bandwidth F1 (MHz)	6dB Bandwidth F2 (MHz)	Measured Bandwidth (MHz)
8.080	7.990	8.716	0.726

The following figure was that measured by spectrum analyzer.

Figure 3: Spectral diagram, emission bandwidth measurement


4.4 Duty Cycle

Result:
N/A

Date of testing : 04.01.2011
 Ambient condition : Temperature: 24°C; Relative humidity: 42%

The duty cycle factor, expressed in dB, is arrived by taking the following formula:

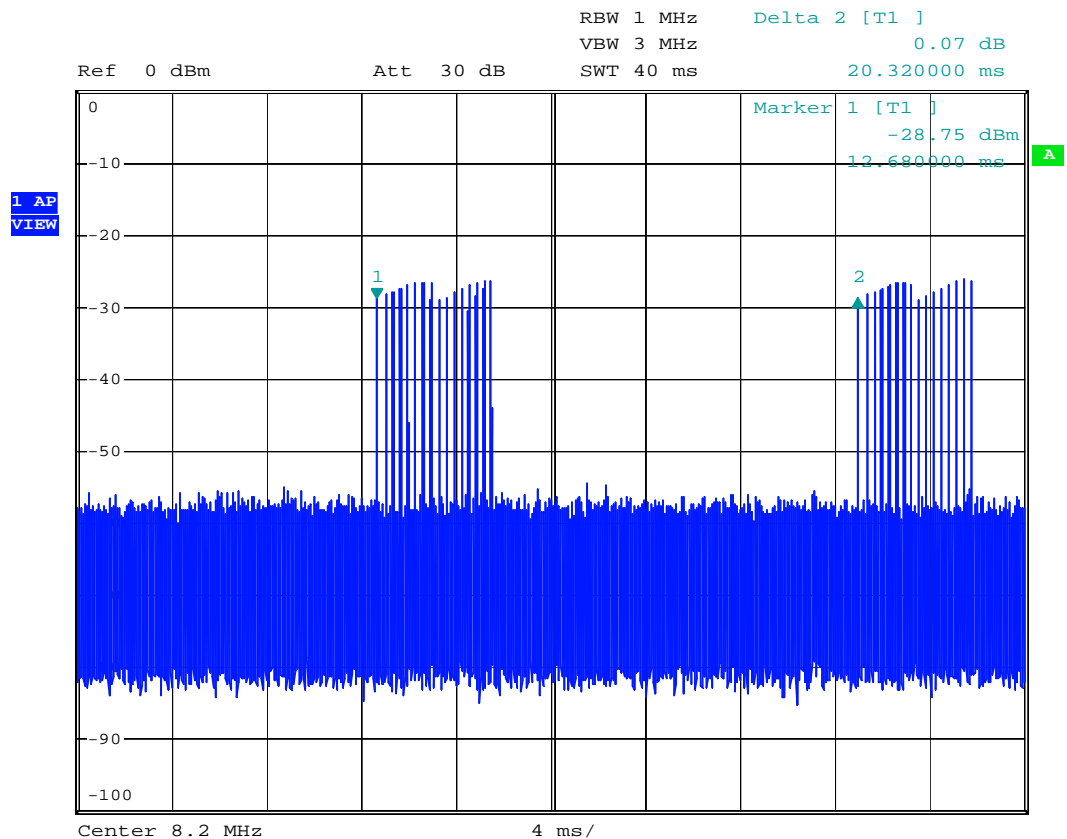
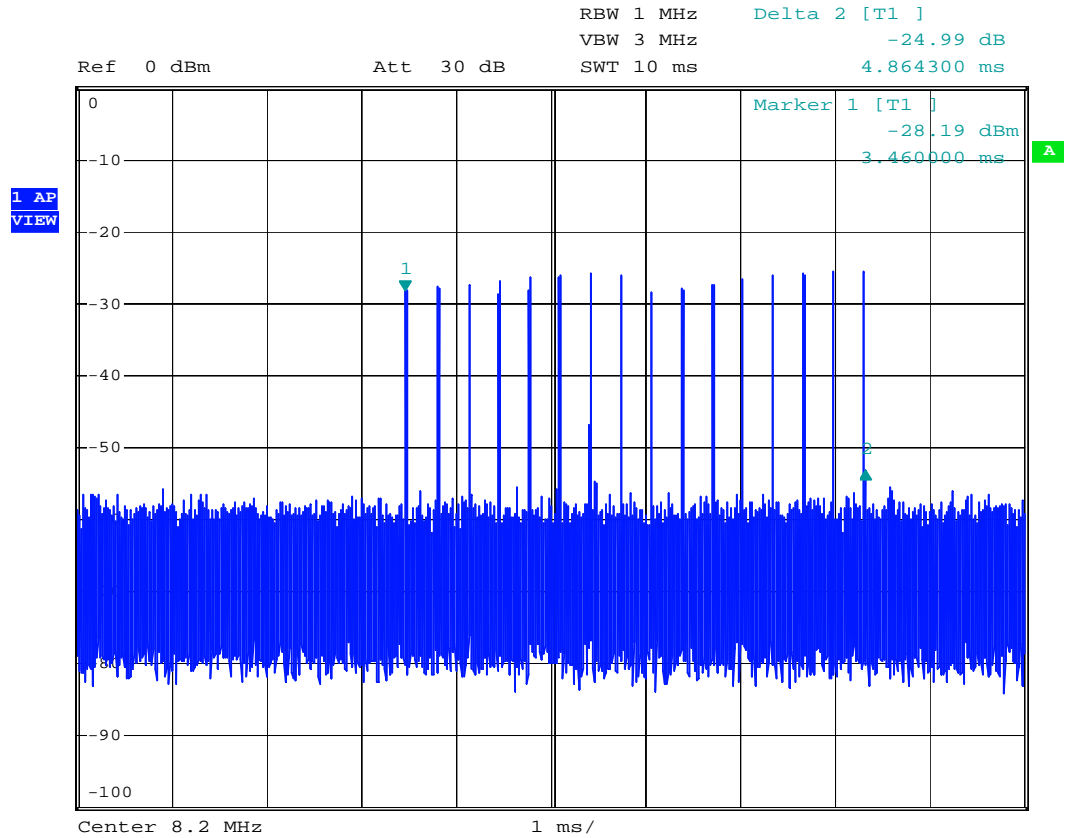
$$K_E = 20 \log [(t_{iB} * p) / T_w]$$

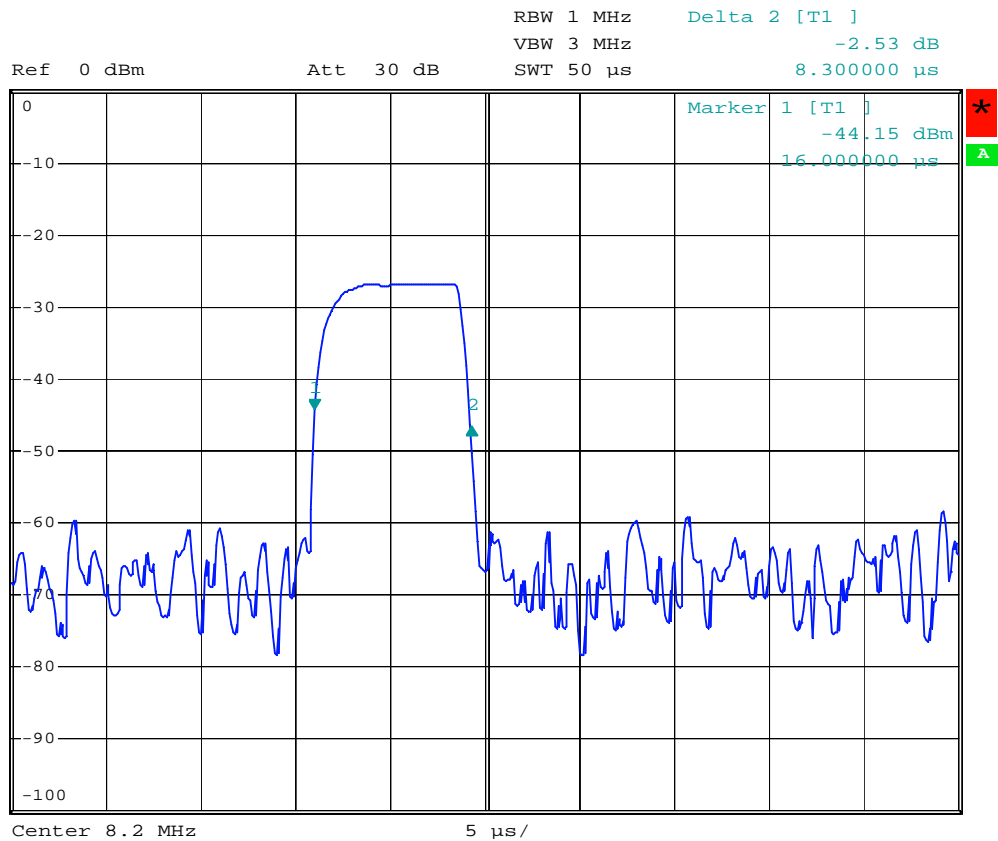
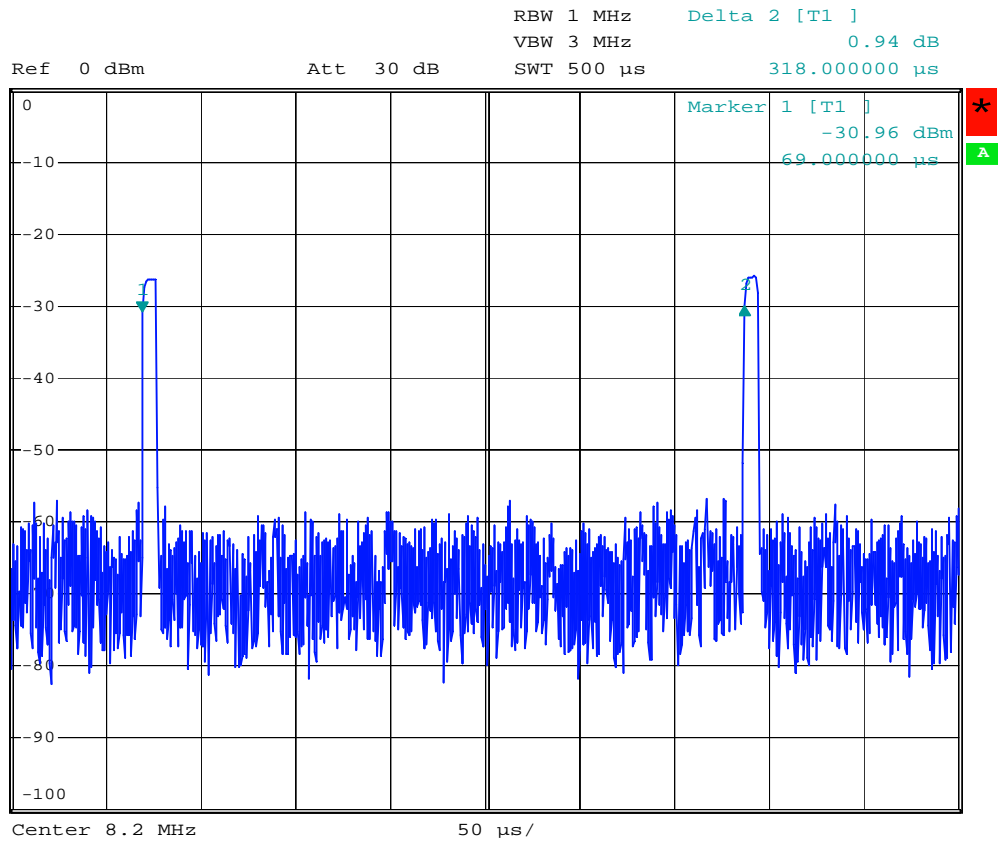
K_E : pulse operation correction factor (dB);
 t_{iw} : pulse duration for one complete pulse track (msec);
 t_{iB} : pulse duration for one pulse (µsec);
 T_w : a period of the pulse track (msec);
 p: number of pulses in one train.

Table 5: Duty cycle measurement result

t_{iw} (msec)	T_w (msec)	t_{iB} (µsec)	p	K_E (dB / %)
4.864	20.32	8.3	16	-43.69 / 0.65

The following figures were those measured by spectrum analyzer.

Figure 4: Duty cycle measurement result




5 Photographs of the Test Set-Up

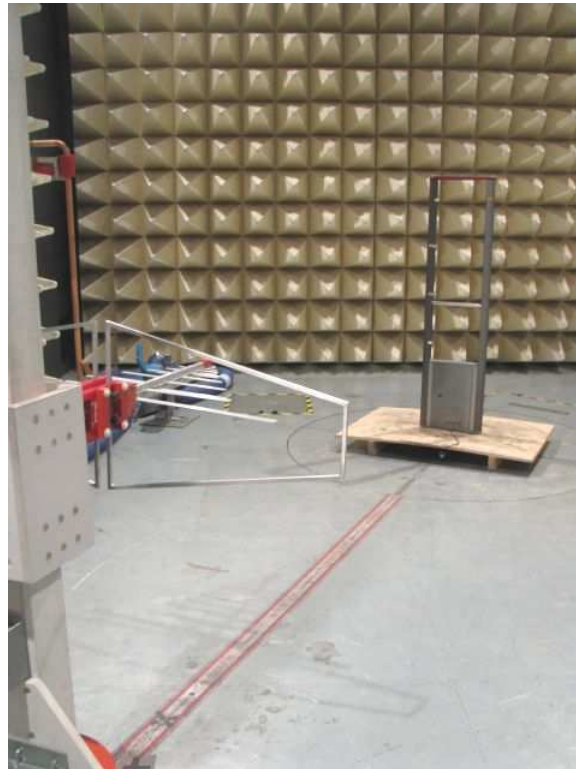
Photograph 1: Set-up for conducted emission



Photograph 2: Set-up for radiated emission (9kHz - 30MHz)



Photograph 3: Set-up for radiated emission (30 - 1000MHz)



Photograph 4: Set-up for emission bandwidth & duty cycle



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