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FCC TEST REPORT

REPORT NO.: RF980424H01

MODEL NO.: OERSX1

RECEIVED: April 24, 2009

TESTED: May 04 to 11, 2009

ISSUED: May 19, 2009

APPLICANT: ORO-TEK CO., LTD

ADDRESS: 1F., NO.21, LN. 510, JHONGJHENG RD.,
FONGYUAN CITY, TAICHUNG COUNTY 42059,
TAIWAN

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
Ltd., Taoyuan Branch Hsin Chu Laboratory

ADDRESS: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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1. CERTIFICATION

PRODUCT : TPMS
MODEL NO.: OERSX1
BRAND : ORO
APPLICANT : ORO-TEK CO., LTD
TESTED : May 04 to 11, 2009
TEST SAMPLE : R&D SAMPLE
STANDARDS : FCC Part 15, Subpart C (Section 15.231)
ANSI C63.4-2003

The above equipment (Model: OERSX1) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Carol Liao, **DATE:** May 19, 2009
(Carol Liao, Specialist)

TECHNICAL ACCEPTANCE : Hank Chung, **DATE:** May 19, 2009
Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY : May Chen, **DATE:** May 19, 2009
(May Chen, Deputy Manager)

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C; RSS-210 Issue 6			
Standard Section	Test Type and Limit	Result	REMARK
15.207	AC Power Conducted Emission	NA	NA
15.209 15.231(e)	Radiated Emission Test	PASS	Meet the requirement of limit. Minimum passing margin is -0.92dB at 315.00MHz
15.231(c)	Emission Bandwidth Measurement	PASS	Meet the requirement of limit
15.231(a)	De-activation	PASS	Meet the requirement of limit

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated emissions (30MHz-1GHz)	3.83 dB
Radiated emissions (1GHz -18GHz)	2.44 dB
Radiated emissions (18GHz -40GHz)	2.67 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	TPMS
MODEL NO.	OERSX1
FCC ID	XB4OERSX1CEB
POWER SUPPLY	DC 3.6V from battery
MODULATION TYPE	FSK
CARRIER FREQUENCY	315MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Monopole Antenna
DATA CABLE	NA
I/O PORT	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT was pre-tested in chamber under the following modes:

Test Mode	Description
Mode A	X-Y plane
Mode B	Y-Z plane
Mode C	Z-X plane

From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the modes were recorded in this report.

2. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 DESCRIPTION OF TEST MODES

One channel was provided to this EUT.

CHANNEL	FREQUENCY
1	315MHz

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	RE ≥ 1G	RE < 1G	PLC	EB	DT	
-	√	√	-	√	√	-

Where **RE ≥ 1G**: Radiated Emission above 1GHz **RE < 1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **EB**: 20dB Bandwidth measurement
DT: Deactivation Time measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (ABOVE 1 GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	FSK

RADIATED EMISSION TEST (BELOW 1 GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	FSK

EMISSION BANDWIDTH MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	FSK

DEACTIVATION TIME MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations.

☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE
1	1	FSK

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is an RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.231)

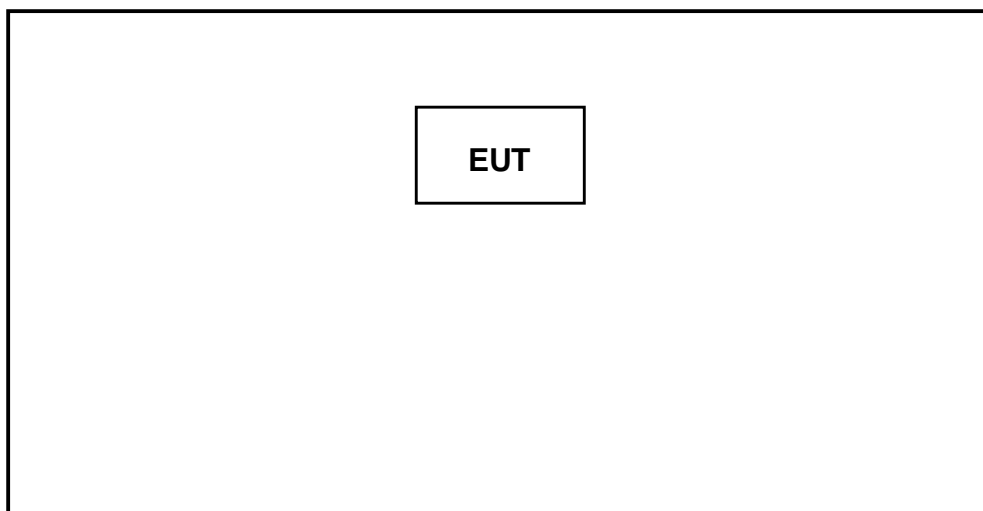
ANSI C63.4-2003

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3.5 CONFIGURATION OF SYSTEM UNDER TEST



4. TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

NA

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.231(e) the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	uV/meter	dBuV/meter	uV/meter	dBuV/meter
40.66 ~ 40.70	1000	60	100	46.02
70 ~ 130	500	53.97	50	33.97
130 ~ 174	500 ~ 1500	53.97 ~ 63.52	50 ~ 150	33.97 ~ 43.52
174 ~ 260	1500	63.52	150	43.52
260 ~ 470	1500 ~ 5000	63.52 ~ 73.97	150 ~ 500	43.52 ~ 53.97
Above 470	5000	73.97	500	53.97

NOTE:

1. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $22.72727(F) - 2454.545$; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $16.6667(F) - 2833.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
2. The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

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4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ADVANTEST Spectrum Analyzer	U3751	17010023	July. 31, 2008	July. 30, 2009
ADVANTEST Spectrum Analyzer	U3772	160100280	July 26, 2008	July 25, 2009
HP Pre_Amplifier	8449B	3008A01922	Sep. 25, 2008	Sep. 24, 2009
ROHDE & SCHWARZ Test Receiver	ESVS 30	841977/002	Nov. 03, 2008	Nov. 02, 2009
SCHAFFNER(CHASE) Broadband Antenna	CBL6112B	2798	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120-D1	D123	Sep. 30, 2008	Sep. 29, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 23, 2009	Jan. 22, 2010
RF Switches	MP59B	6100175593	Sep. 02, 2008	Sep. 01, 2009
RF Cable	8DFB	STBCAB-30M-1GHz	Sep. 02, 2008	Sep. 01, 2009
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA
CORCOM AC Filter	MRI2030	024/019	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: U3772) are used only for the measurement of emission frequency above 1GHz if tested.

3. The test was performed in Open Site No. B.

4. The VCCI Site Registration No. is R-847.

5. The FCC Site Registration No. is 92753.

6. The CANADA Site Registration No. is IC 7450G-2.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10-meter open field site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using the quasi-peak method or average method as specified and then reported in Data sheet peak mode and QP mode.

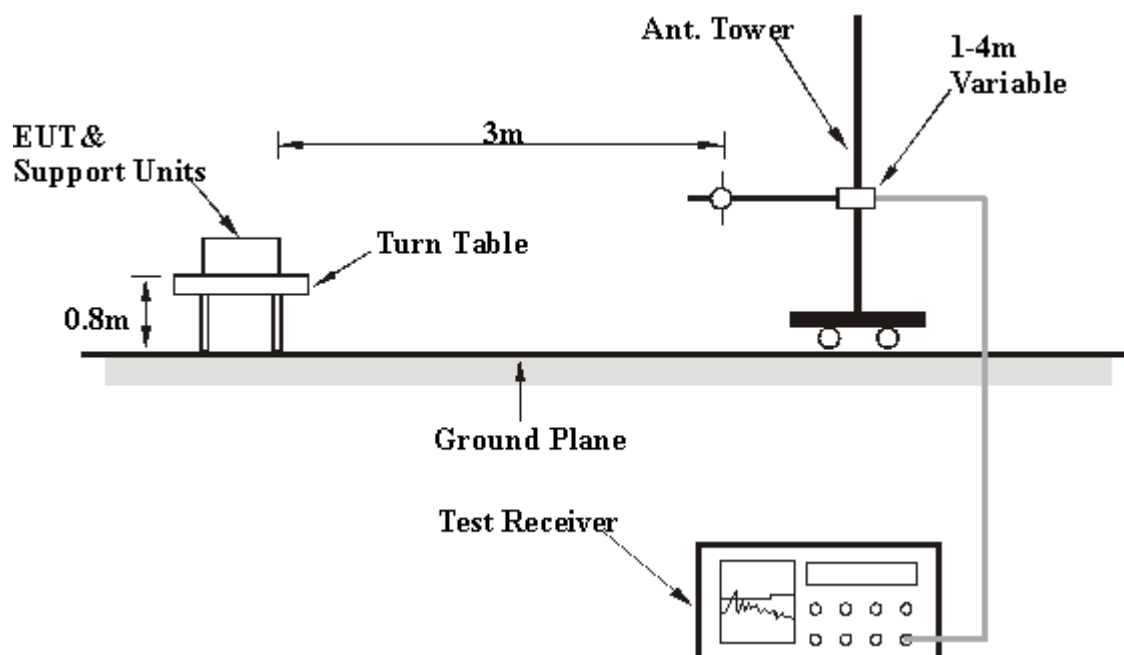
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.



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4.2.7 TEST RESULTS

Below 1GHz Worst-Case Data

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	DC 3.6V from battery	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	25deg. C, 68%RH 965hPa	TESTED BY	Eric Lee

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	164.26	29.20 QP	43.50	-14.30	1.58 H	85	17.80	11.40
2	240.00	32.60 QP	46.00	-13.40	1.24 H	5	19.13	13.47
3	*315.00	86.74 PK	87.66	-0.92	1.06 H	277	71.90	14.84
4	*315.00	58.04 AV	67.66	-9.62	1.06 H	277	43.20	14.84
5	400.00	32.10 QP	46.00	-13.90	2.00 H	245	14.81	17.29
6	630.00	57.16 PK	67.66	-10.50	1.49 H	301	34.20	22.96
7	630.00	31.06 AV	47.66	-16.60	1.49 H	301	8.10	22.96
8	945.10	61.06 PK	67.66	-6.60	1.00 H	238	32.20	28.86
9	945.10	37.26 AV	47.66	-10.40	1.00 H	238	8.40	28.86
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	130.21	27.14 QP	43.50	-16.36	1.32 V	56	13.74	13.40
2	149.88	27.24 QP	43.50	-16.26	1.11 V	2	16.28	10.96
3	*315.00	71.54 PK	87.66	-16.12	1.16 V	0	56.70	14.84
4	*315.00	42.74 AV	67.66	-24.92	1.16 V	0	27.90	14.84
5	610.00	31.00 QP	46.00	-15.00	1.58 V	112	8.16	22.84
6	630.00	49.86 PK	67.66	-17.80	1.04 V	197	26.90	22.96
7	630.00	27.56 AV	47.66	-20.10	1.04 V	197	4.60	22.96
8	945.10	53.56 PK	67.66	-14.10	1.45 V	114	24.70	28.86
9	945.10	34.16 AV	47.66	-13.50	1.45 V	114	5.30	28.86

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. "*" = Fundamental frequency
 6. The average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle) Where the duty factor is calculated from following formula:

$$20\log (\text{Duty cycle}) = 20\log \frac{1 \times 9.4\text{ms}}{100\text{ms}} = 20.53\text{dB}$$

Please see page 17 for plotted duty.

4.2.8 TEST RESULTS

Above 1GHz Worst-Case Data

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 20GHz
INPUT POWER	DC 3.6V from battery	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 66%RH 965hPa	TESTED BY	Eric Lee

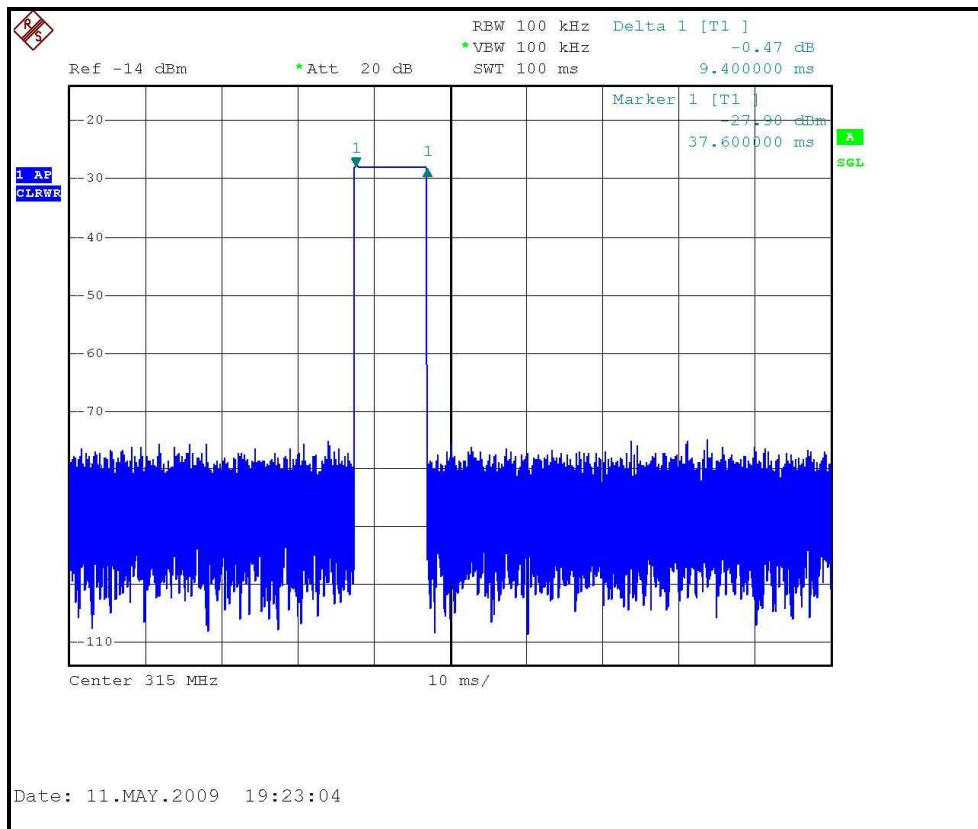
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1260.14	68.99 PK	74.00	-5.01	1.30 H	4	41.71	27.28
2	1260.14	48.46 AV	54.00	-5.54	1.30 H	4	21.18	27.28
3	1575.18	59.75 PK	74.00	-14.25	1.09 H	126	31.73	28.02
4	1575.18	39.22 AV	54.00	-14.78	1.09 H	126	11.20	28.02
5	2835.32	61.80 PK	74.00	-12.20	1.16 H	19	30.23	31.57
6	2835.32	41.27 AV	54.00	-12.73	1.16 H	19	9.70	31.57
7	3780.42	59.86 PK	74.00	-14.14	1.10 H	54	26.76	33.10
8	3780.42	39.33 AV	54.00	-14.67	1.10 H	54	6.23	33.10

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2205.25	47.74 PK	74.00	-26.26	1.24 V	76	18.42	29.32
2	2205.25	27.21 AV	54.00	-26.79	1.24 V	76	-2.11	29.32
3	2835.00	71.50 PK	74.00	-2.50	1.10 V	324	39.93	31.57
4	2835.00	50.97 AV	54.00	-3.03	1.10 V	324	19.40	31.57
5	3150.36	71.59 PK	74.00	-2.41	1.01 V	281	39.39	32.20
6	3150.36	51.06 AV	54.00	-2.94	1.01 V	281	18.86	32.20
7	3780.43	69.99 PK	74.00	-4.01	1.09 V	180	36.89	33.10
8	3780.43	49.46 AV	54.00	-4.54	1.09 V	180	16.36	33.10

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “*” = Fundamental frequency
 6. The average value of fundamental frequency is: Average = Peak value + 20log (Duty cycle) Where the duty factor is calculated from following formula:

$$20\log (\text{Duty cycle}) = 20\log \frac{1 \times 9.4\text{ms}}{100\text{ms}} = 20.53\text{dB}$$

Please see page 17 for plotted duty.



$$20\log (\text{Duty cycle}) = 20\log \frac{1 \times 9.4\text{ms}}{100\text{ms}} = 20.53\text{dB}$$

4.3 20dB OCCUPIED BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF EMISSION BANDWIDTH MEASUREMENT

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and below 900 MHz.

Fundamental Frequency (MHz)	Limit of Emission Bandwidth(kHz)
315	787.5

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

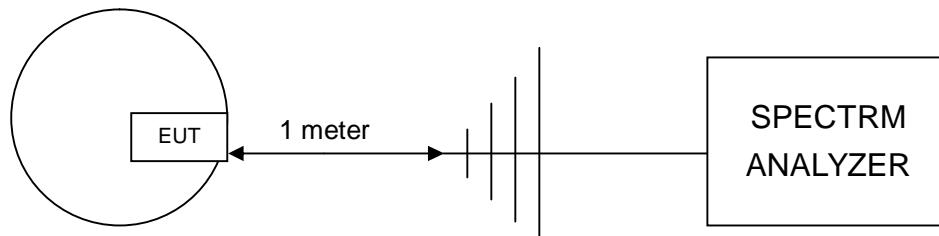
4.3.3 TEST PROCEDURE

- a. The EUT was placed on the turn table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 10 kHz and video bandwidth to 30 kHz then select Peak function to scan the channel frequency.
- d. The emission bandwidth was measured and recorded.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

Same as Item 4.2.6

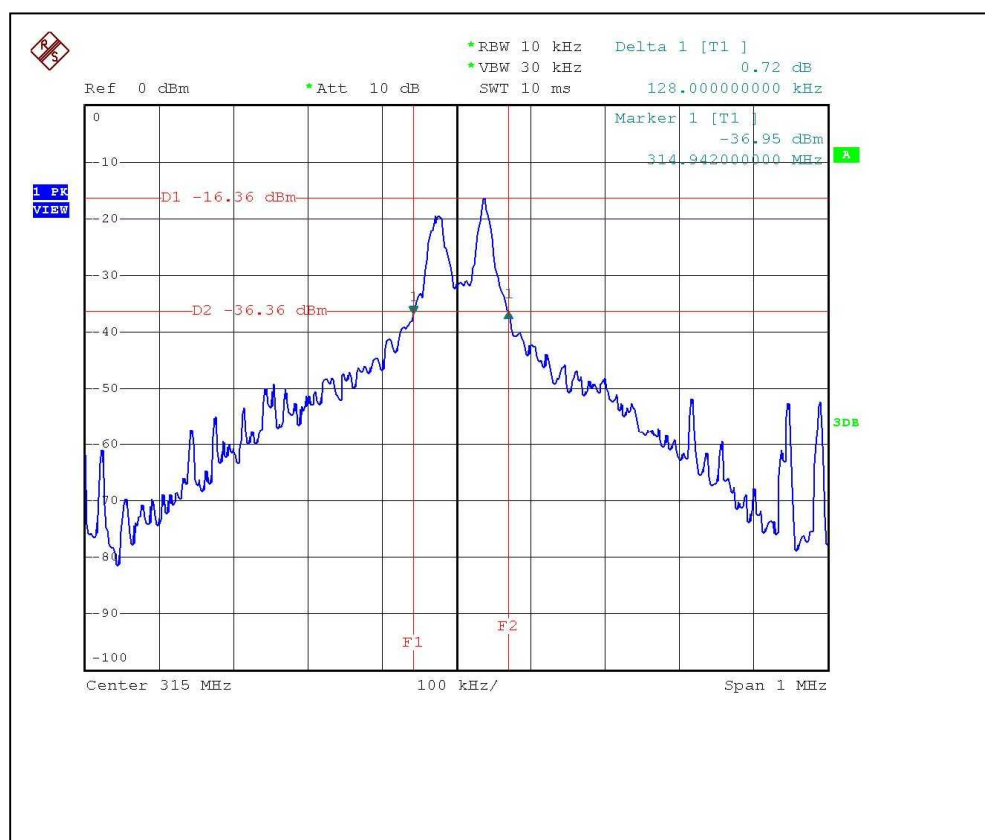
4.3.7 TEST RESULTS

802.11b DSSS MODULATION:

MODULATION TYPE	FSK	TRANSFER RATE	9600bps
INPUT POWER	DC 3.6V from battery	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Eric Lee		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (KHz)	MAXIMUM LIMIT (KHz)	PASS / FAIL
1	315	128.00	787.5	PASS

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4.4 DEACTIVATION TIME

4.4.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

Device operated automatically shall be limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

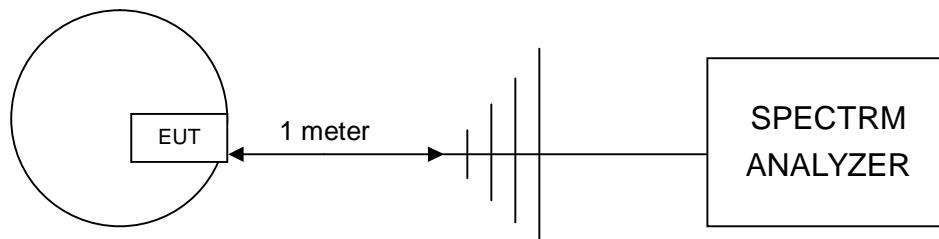
4.4.3 TEST PROCEDURE

- a. The EUT was placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 100kHz and video bandwidth to 100kHz. The spectrum analyser was turned to the centre frequency of the transmitter's and the analyser's marker function was used to determine the duration of transmission.
- d. The transmission duration was measured and recorded.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITION

Same as Item 4.2.6



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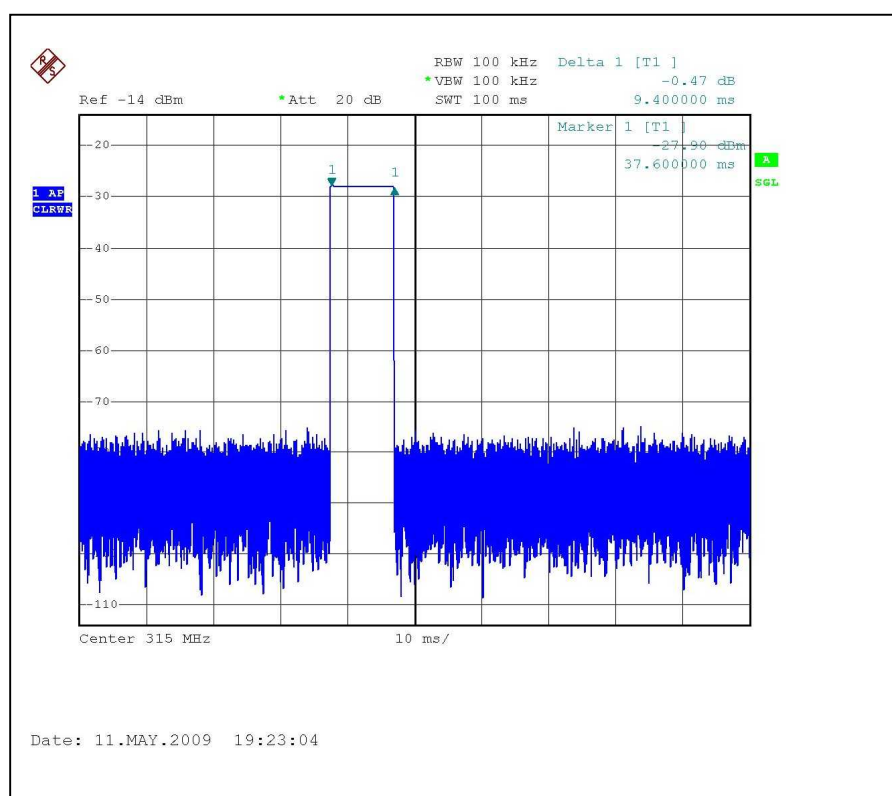
4.4.7 TEST RESULTS

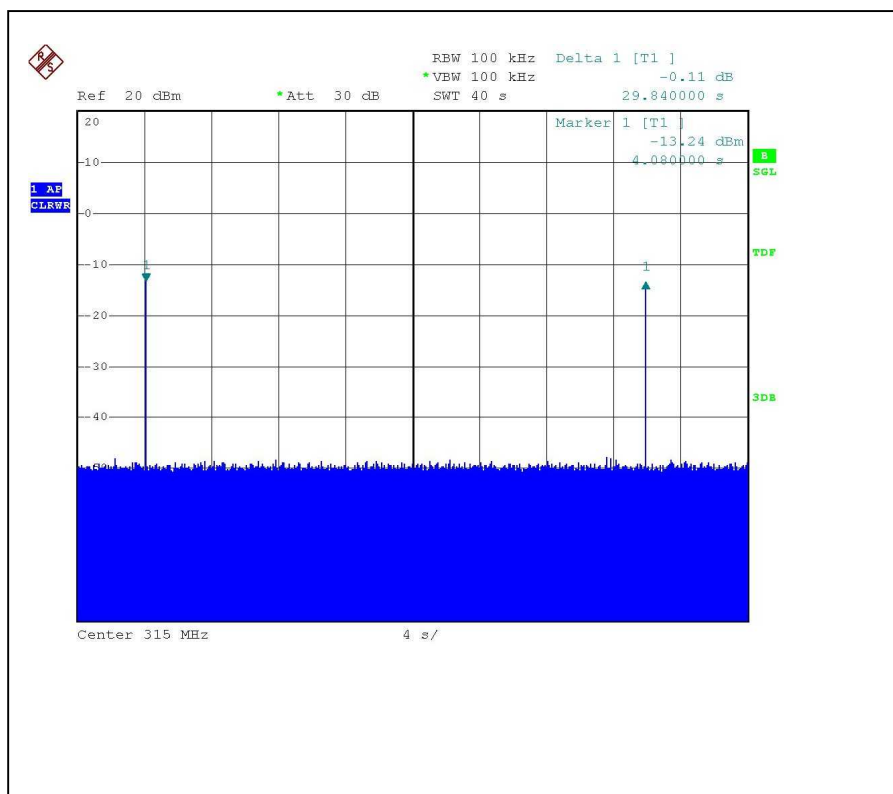
802.11b DSSS MODULATION:

MODULATION TYPE	FSK	TRANSFER RATE	9600bps
INPUT POWER	DC 3.6V from battery	ENVIRONMENTAL CONDITIONS	25deg.C, 60%RH, 965hPa
TESTED BY	Eric Lee		

CHANNEL FREQUENCY (MHZ)	EACH TRANSMISSION TIME (SECOND)	SILENT PERIOD BETWEEN TRANSMISSIONS (SECOND)	PASS/FAIL
315	<1s	>10s and >30*(duration of the transmission)	PASS

The plots of test results are attached as below.







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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

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6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA, CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Telecom Lab:

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Fax: 886-3-3185050

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

7. APPENDIX - A MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

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