

# **FCC Test Report**

Report No.: RF150623E05-1

FCC ID: 2ABC8-5898

Test Model: 5898

Received Date: June 23, 2015

**Test Date:** Aug. 04 to 19, 2015

Issued Date: Oct. 02, 2015

Applicant: Honeywell Security Sensor CoE

Address: 38F, Block A of Galaxy Century Building, No.3069 Caitian Road, Fu Tian

District, Shenzhen, China

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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Taiwan R.O.C.





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# **Release Control Record**

Issue No.	Description	Date Issued
RF150623E05-1	Original release.	Oct. 02, 2015



# 1 Certificate of Conformity

Product: Wireless DUAL TEC Motion Sensor

Brand: Honeywell

Test Model: 5898

Sample Status: ENGINEERING SAMPLE

Applicant: Honeywell Security Sensor CoE

Test Date: Aug. 04 to 19, 2015

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.245)

ANSI C63.10: 2013

The above equipment 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: Men's Huang, Date: Oct. 02, 2015

Phoenix Huang / Specialist

Approved by: \_\_\_\_\_\_\_, Date: \_\_\_\_\_\_\_, Oct. 02, 2015



# 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.245)						
FCC Clause	Test Item	Result	Remarks			
15.207	AC Power Conducted Emission	NA	Power supply is 3Vdc from batteries			
15.245 / 15.215(c)	Radiated Emissions and and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 10500.00MHz.			
15.203	Antenna Requirement	PASS	No antenna connector is used.			

# 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:

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.37 dB
	1GHz ~ 6GHz	3.65 dB
Radiated Emissions above 1 GHz	6GHz ~ 18GHz	3.88 dB
	18GHz ~ 40GHz	4.11 dB

# 2.2 Modification Record

There were no modifications required for compliance.



# 3 General Information

# 3.1 General Description of EUT

Product	Wireless DUAL TEC Motion Sensor
Brand	Honeywell
Test Model	5898
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	3Vdc from batteries
Modulation Type	GFSK
Operating Frequency	10.527GHz
Number of Channel	1
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

# Note:

1. The antennas provided to the EUT, please refer to the following table:

Antenna Gain (dBi) <include cable="" loss=""></include>	Antenna Type	Connecter Type (External only)	Frequency range
7	patch array antenna	NA	10.522GHz~10.528GHz
0	Monopole antenna (individual antenna soldered on PCB board)	NA	345MHz

2. The above EUT information is 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 (GHz)
1	10.527



#### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE		APPLICA	ABLE TO	DESCRIPTION	
MODE	RE≥1G	RE<1G	PLC	BE	DESCRIPTION
-	<b>√</b>	V	-	√	-

Where

RE≥1G: Radiated Emission above 1GHz &

Bandedge Measurement

RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

BE: Band Edge Emission Measurement

Note: 1. No need to concern of Conducted Emission due to the EUT is powered by batteries.

2. "-"means no effect.

# **Radiated Emission Test (Above 1GHz):**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

AVAILABLE	TESTED	MODULATION
CHANNEL	CHANNEL	TYPE
1	1	GFSK

# Radiated Emission Test (Below 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

AVAILABLE	TESTED	MODULATION
CHANNEL	CHANNEL	TYPE
1	1	GFSK

## **Band Edge Emission Measurement:**

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

AVAILABLE	TESTED	MODULATION	
CHANNEL	CHANNEL	TYPE	
1	1	GFSK	



# **Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
DE: 40	25deg. C, 65%RH	3Vdc	Tim Ho
RE≥1G	23deg. C, 69%RH	3Vdc	Tim Ho
RE<1G	24deg. C, 68%RH	3Vdc	Tim Ho
BE	25deg. C, 60%RH	3Vdc	Anderson Chen



# 3.3 Description of Support Units

The EUT has been tested as an independent unit.

3.3.1 Configuration of System under Test

**EUT** 



# **General Description of Applied Standards** 3.4 The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards: FCC Part 15, Subpart C (15.245) ANSI C63.10-2013 All test items have been performed and recorded as per the above standards.

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## 4 Test Types and Results

## 4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

According to 15.245 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 (dBuV/m)			
(2)	Peak	Average		
	148	128		
10500 ~ 10550	Field Strength of Harmonics (dBuV/m)			
	108	88		

- (1) Field strength limits are specified at a distance of 3 meters.
- (2) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

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. 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.



# 4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210105	July 24, 2015	July 23, 2016
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 12, 2014	Nov. 11, 2015
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Feb. 06, 2015	Feb. 05, 2016
RF Cable	8D-FB	CHGCAB-001 -1 CHGCAB-001 -2	Oct. 04, 2014	Oct. 03, 2015
	RF-141	CHGCAB-004	Oct. 04, 2014	Oct. 03, 2015
Horn_Antenna AISI	AIH.8018	00003200911 10	Feb. 09, 2015	Feb. 08, 2016
Pre-Amplifier Agilent	8449B	3008A02578	June 23, 2015	June 22, 2016
RF Cable	NA	131205 131216 131217 SNMY23684/ 4	Jan. 16, 2015	Jan. 15, 2016
Spectrum Analyzer R&S	FSV40	100964	June 26, 2015	June 25, 2016
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Dec. 12, 2014	Dec. 11, 2015
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Feb. 05, 2015	Feb. 04, 2016
RF Cable	NA	329751/4 RF104-204	Dec. 11, 2014	Dec. 10, 2015
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table CT	NA	NA	NA	NA
SPECTRUM ANALYZER R&S	FSP 40	100060	May 08, 2015	May 07, 2016

#### 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 test was performed in 966 Chamber No. G.
- 3. The FCC Site Registration No. is 966073.
- 4. The VCCI Site Registration No. is G-137.
- 5. The CANADA Site Registration No. is IC 7450H-2.
- 6. Tested Date: Aug. 04 to 19, 2015



#### 4.1.3 Test Procedures

#### **Procedure for Below 18 GHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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 height of antenna 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 when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

#### Note:

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



#### **Procedure for Above 18 GHz**

External harmonic mixers are utilized.

- a. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The distance at which limits are typically specified is 3 meter; however, closer measurement distances may be utilized.
- c. Begin handheld measurements with the test antenna (horn) at a distance of 1 meter from the EUT, in a horizontally polarized position. Slowly adjust its position, entirely covering the plane 1 meter from the FUT
- d. Repeat (b) with the horn in a vertically polarized position.
- e. If the emission cannot be detected at 1 meter, reduce the RBW in order to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.
- f. Note the maximum level indicated on the Spectrum Analyzer.
- g. Based on the distance at which the measurement was made and the calculated distance to the edge of the far field, determine the appropriate distance attenuation factor. Apply this factor to the calculated field strength in order to determine the equivalent field strength at the distance at which the regulatory limit is specified. Compare to the appropriate limits
- h. Repeat (a) (f) for every emission that must be measured, up through the required frequency range of investigation

#### NOTE:

- The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 50MHz for Peak and Average detection at frequency above 40GHz.
- 2. Shorter measurement distances may be used to improve the measurement system's noise floor. As 15.245 description is based on the measurement in distance of 3 meters, the data obtained at 1-meter distance was compared to the calculate limit for 1-m distance:

Limit at 1-meter distance (dBuV)

- = Limit at 3 meter distance (dBuV) 20log(1/3)(dB)
- = Limit at 3 meter distance (dBuV) + 9.5(dB).

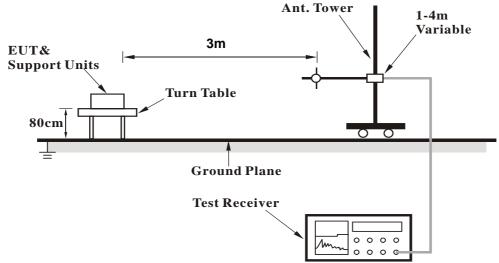
4.1.4 Deviation	from <sup>-</sup>	Test	Stand	larc
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No deviation.

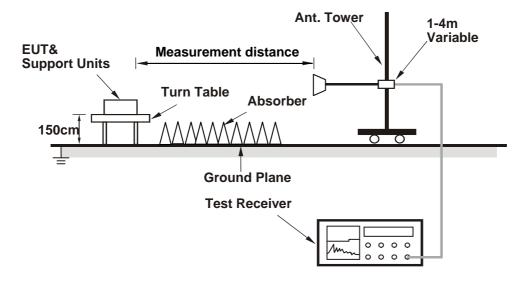


# 4.1.5 Test Setup

# <Frequency Range below 1GHz>



# <Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

# 4.1.6 EUT Operating Conditions

- a. Placed the EUT on the testing table.
- b. Set the EUT under transmission condition continuously at specific channel frequency.



#### 4.1.7 Test Results

CHANNEL	TX Channel 1	DETECTOR	Dook (DK)
FREQUENCY RANGE	1GHz ~ 18GHz	FUNCTION	Peak (PK)

	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	10500.00	73.9 PK	74.0	-0.1	1.88 H	206	61.61	12.29	
2	10500.00	48.1 AV	54.0	-5.9	1.88 H	206	35.81	12.29	
3	*10527.00	108.9 PK	148.0	-39.1	1.88 H	206	96.46	12.44	
4	*10527.00	83.1 AV	128.0	-44.9	1.88 H	206	70.66	12.44	
5	10550.00	62.3 PK	74.0	-11.7	1.88 H	206	49.72	12.58	
6	10550.00	36.5 AV	54.0	-17.5	1.88 H	206	23.92	12.58	
		ANTENNA	A POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 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	10500.00	65.9 PK	74.0	-8.1	1.00 V	129	53.61	12.29	
2	10500.00	40.1 AV	54.0	-13.9	1.00 V	129	27.81	12.29	
3	*10527.00	99.4 PK	148.0	-48.6	1.00 V	129	86.96	12.44	
4	*10527.00	73.6 AV	128.0	-54.4	1.00 V	129	61.16	12.44	
5	10550.00	63.1 PK	74.0	-10.9	1.00 V	129	50.52	12.58	
6	10550.00	37.3 AV	54.0	-16.7	1.00 V	129	24.72	12.58	

## **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) Pre-Amplifier 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 + 20 log(Duty cycle) Where the duty factor is calculated from following formula:

 $20 \log (Duty \text{ cycle}) = 20 \log (0.017 \text{ ms} / 0.33 \text{ ms}) = -25.8 \text{ dB}$ 

Please see page 19 for plotted duty.



CHANNEL	TX Channel 1	DETECTOR	Dook (DK)
FREQUENCY RANGE	18GHz ~ 53GHz	FUNCTION	Peak (PK)

		ANITENINIA	DOL A DITY	TEOT DIO	TANOE HO	DIZONITAL	AT 4 NA		
	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 1 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	21054.00	64.2 PK	83.5	-19.3	1.00 H	360	71.40	-7.18	
2	21054.00	38.4 AV	63.5	-25.1	1.00 H	360	45.60	-7.18	
3	31581.00	65.3 PK	83.5	-18.2	1.00 H	258	65.70	-0.40	
4	31581.00	39.5 AV	63.5	-24.0	1.00 H	258	39.90	-0.40	
		ANTENNA	POLARITY	/ & TEST DI	STANCE: V	ERTICAL A	T 1 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	21054.00	70.7 PK	83.5	-12.8	1.00 V	347	77.88	-7.18	
2	21054.00	44.9 AV	63.5	-18.6	1.00 V	347	52.08	-7.18	

# **REMARKS:**

31581.00

31581.00

4

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)

-22.4

-24.0

- 2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.

83.5

63.5

- 4. Margin value = Emission Level Limit value
- 5. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:

1.00 V

1.00 V

198

198

61.50

39.90

-0.40

-0.40

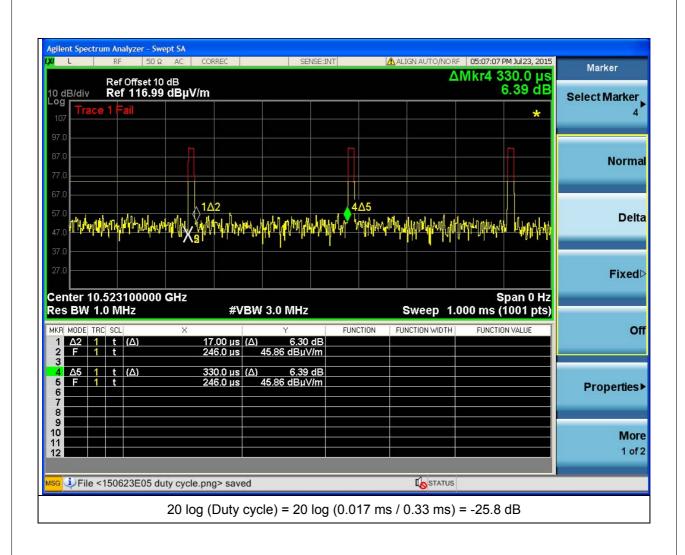
 $20 \log (Duty \text{ cycle}) = 20 \log (0.017 \text{ ms} / 0.33 \text{ ms}) = -25.8 \text{ dB}$ 

Please see page 19 for plotted duty.

61.1 PK

39.5 AV







# **Below 1GHz Data**

CHANNEL	TX Channel 1	DETECTOR	Overi Beek (OB)
FREQUENCY RANGE	Below 1GHz	FUNCTION	Quasi-Peak (QP)

	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	42.03	18.5 QP	40.0	-21.5	1.00 H	360	32.13	-13.64	
2	160.03	16.2 QP	43.5	-27.3	1.00 H	200	28.84	-12.68	
3	188.50	12.7 QP	43.5	-30.8	1.00 H	177	28.63	-15.93	
4	438.27	17.5 QP	46.0	-28.5	1.00 H	78	26.14	-8.68	
5	585.71	20.0 QP	46.0	-26.0	1.00 H	144	25.85	-5.82	
6	919.39	25.1 QP	46.0	-20.9	1.00 H	261	25.43	-0.29	
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
	FREQ.	EMISSION	LIMIT	MARGIN	ANTENNA	TABLE	RAW	CORRECTION	

	7.11.12.11.11.11.11.11.11.11.11.11.11.11.								
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	35.19	22.2 QP	40.0	-17.8	1.00 V	360	36.66	-14.48	
2	42.32	26.3 QP	40.0	-13.8	1.00 V	76	39.85	-13.60	
3	67.59	15.6 QP	40.0	-24.4	1.00 V	254	30.47	-14.87	
4	250.04	16.3 QP	46.0	-29.7	1.00 V	360	30.65	-14.32	
5	374.98	18.2 QP	46.0	-27.8	1.00 V	349	28.65	-10.49	
6	742.22	22.9 QP	46.0	-23.1	1.00 V	257	25.53	-2.60	

# **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) Pre-Amplifier Factor(dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission Level Limit value

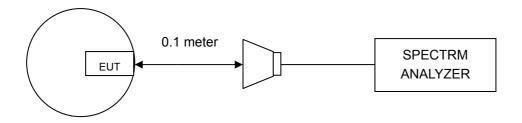


# 4.2 Band Edge Measurement

# 4.2.1 Limits of Band Edge Measurement

According to 15.215(c), the requirement is to ensure the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified, is contained within the frequency band designated in the rule section under which the equipment is operated.

#### 4.2.2 Test Setup



#### 4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

## 4.2.4 Test Procedures

- 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 1 MHz and video bandwidth to 3 MHz then select Peak function to scan the channel frequency.
- d. The emission bandwidth was measured and recorded.

#### 4.2.5 Deviation from Test Standard

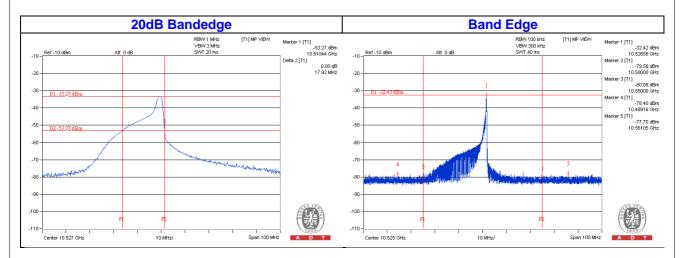
No deviation.

# 4.2.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at below channel frequencies individually.



# 4.2.7 Test Results





5 Pictures of Test Arrangements						
Please refer to the attached file (Test Setup Photo).						

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# Appendix - 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 according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab Hsin Chu EMC/RF/Telecom Lab

Tel: 886-2-26052180 Tel: 886-3-5935343 Fax: 886-2-26051924 Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232 Fax: 886-3-3270892

Email: <a href="mailto:service.adt@tw.bureauveritas.com">service.adt@tw.bureauveritas.com</a>
Web Site: <a href="mailto:www.bureauveritas-adt.com">www.bureauveritas-adt.com</a>

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

--- END ---