TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Product :	**VOICE COMMAND WATCH**
Brand:	**GUESS**
Model:	**C0001Gx / C0002Mx (x=A~Z,0~9 or blank)**
Model Difference:	**N/A**
FCC Rule Part:	**§15.247, Cat: DTS**
Applicant:	**Sequel AG**
Address:	**Genear-Guisan- Strasse 8, 5th Floor, Zug, Switzerland 6300**

Test Performed by:
International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
*Address:
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
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Report No.: **ISL-14LR285FCDTS-MA**
Issue Date : **2015/09/04**

Testing laboratory 0997

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.
This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

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VERIFICATION OF COMPLIANCE

Applicant:	Sequel AG
Product Description:	VOICE COMMAND WATCH
Brand Name:	GUESS
Model No.:	C0001Gx / C0002Mx (x=A~Z,0~9 or blank)
Model Difference:	N/A
Date of test:	2014/11/13 ~ 2015/05/04
Date of EUT Received:	2014/11/13

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dino Chen	***Date:***	2015/09/04
	Dino Chen / Engineer		
Prepared By:	Eva Kao	***Date:***	2015/09/04
	Eva Kao / Technical Supervisor		
Approved By:	Vincent Su	***Date:***	2015/09/04
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2015/09/04	Initial creation of document

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1 GENERAL INFORMATION

General:

Product Name	VOICE COMMAND WATCH
Brand Name	GUESS
Model Name	C0001Gx / C0002Mx (x=A~Z,0~9 or blank)
Model Difference	N/A
USB port	one provided for battery charge
Power Supply	3.7Vdc from battery
Product SW/HW version	1.5 / 1.0
Radio SW/HW version	1.5 / 1.0
Test SoftWare Version	BlueSuite 2.5
RF power setting in TEST SoftWare	100
FVIN (Firmware Version Identification Number)	2.28

Bluetooth:

Frequency Range:	2402 – 2480MHz	
Bluetooth Version:	V2.1 + EDR	V4.0
Channel number:	79 channels	40 channels, 2MHz step
Modulation type	GFSK +π / 4DQPSK + 8DPSK	Wide band Modulation (GFSK)
Tune-Up Power	1dBm +/-1.5 dBm	0dBm +/-1.5 dBm
Transmit Power:	2.19 dBm Peak	0.57 dBm Peak
Dwell Time:	<= 0.4s	N/A
Antenna Designation:	Chip Antenna , 2.2dBi	

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.1 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And to comply with Industry Canada RSS-210 issue 8: Dec. 2010 Annex 8.

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2014, ANSI C63.10: 2013 and RSS-Gen issue 4: 2014. Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: 558074 D01 DTS Meas Guidance v03r02

1.3 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2014. FCC Registration Number is: 872200; Designation Number is: TW1036, Canada Registration Number: 4067B-3.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 5 and 7 of ANSI C63.4: 2014 and RSS-Gen issue 4: 2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m/1.5m(Frequency above 1GHz) above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 6 and 11 of ANSI C63.10: 2013.

2.4 Configuration of Tested System

Fig. 1 AC Power line and Radiated/Conducted Emission Configuration

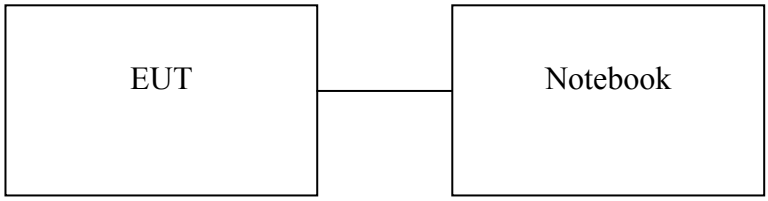


Table 1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Dell	D620	N/A	Shield	Non-shield

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3),(4) RSS-210 §A8.4(4)	Peak Output Power and EIRP	Compliant
§15.247(a)(2) RSS-210 §A8.2(a) RSS-Gen §6.6	6dB & 99% Power Bandwidth	Compliant
§15.247(d) RSS-210 §A8.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d) RSS-210 §A8.5	Spurious Emission	Compliant
§15.247(e) RSS-210 §A8.2(b) & §A8.3(2)	Peak Power Density	Compliant
§15.203 RSS-GEN 8.3, RSS-210 issue 8,§A8.4	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

The EUT has been tested under engineering operating condition.
Test program used to control the EUT for staying in continuous transmitting mode is programmed.

BT LE mode: Channel low (2402MHz), mid (2442MHz) and high (2480MHz) are chosen for full testing.

5 CONDUCTED EMISSION TEST

5.1 Standard Applicable:

According to §15.207 & RSS-Gen §8.8, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

1.The lower limit shall apply at the transition frequencies

2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	07/24/2014	07/23/2015
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/03/2014	09/02/2015
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2015	02/10/2016
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2015	03/11/2016

5.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10: 2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

5.4 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.5 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

AC POWER LINE CONDUCTED EMISSION TEST DATA

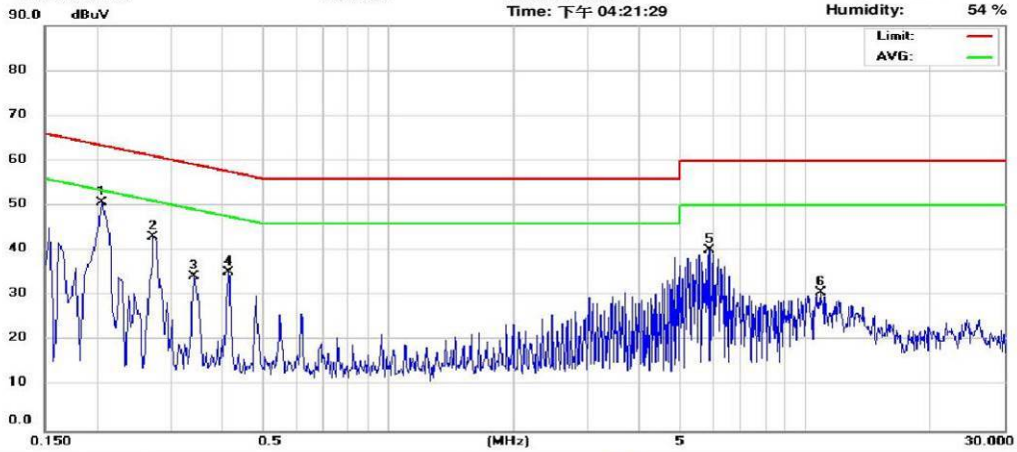
Operation Mode:	Operation Mode	Test Date:	2015/03/30
Test By:	Dino		

Address:No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel:03-4071718

Conducted Emission Measurement

File :14LR285 Data :#1 Date: 2015/3/30 Time: 下午 04:21:29

operator:
Temperature: 26 ℃
Humidity: 54 %



Site: Conduction 04
Limit: Conduction
Company:
EUT Model:
Execute Program:
Note:

Phase: L1
Power:
Witness:

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.206	9.58	50.19	63.37	-13.18	38.29	53.37	-15.08	
2	0.274	9.58	42.06	61.00	-18.94	30.68	51.00	-20.32	
3	0.342	9.58	33.42	59.15	-25.73	24.95	49.15	-24.20	
4	0.414	9.58	33.59	57.57	-23.98	23.57	47.57	-24.00	
5	5.914	9.67	33.02	60.00	-26.98	20.12	50.00	-29.88	
6	10.870	9.77	23.21	60.00	-36.79	16.63	50.00	-33.37	

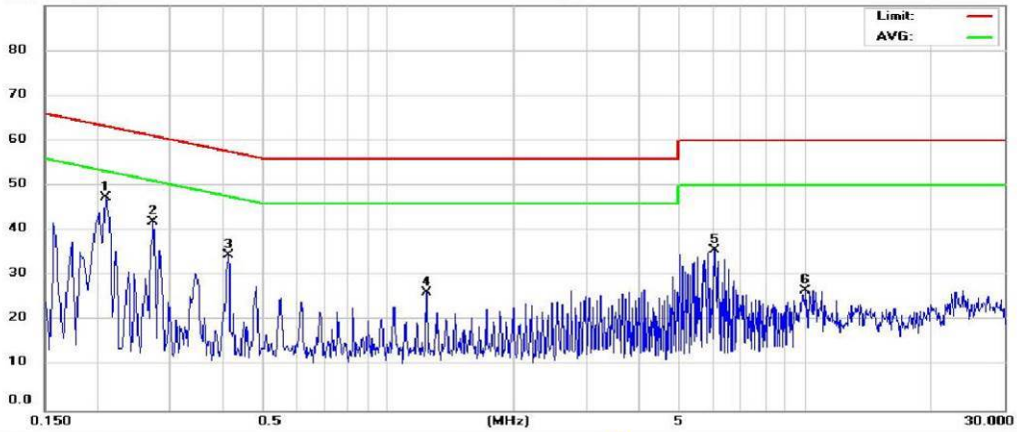
.

Address:No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist.,
Tao Yuan City 325, Taiwan.
Tel:03-4071718

Conducted Emission Measurement

File :14LR285 Data :#2 Date: 2015/3/30 Time: 下午 04:23:22

operator:
Temperature: 26 ℃
Humidity: 54 %



Site: Conduction 04
Limit: Conduction
Company:
EUT Model:
Execute Program:
Note:

Phase: N
Power:
Witness:

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.210	9.60	46.15	63.21	-17.06	34.36	53.21	-18.85	
2	0.274	9.60	41.60	61.00	-19.40	30.15	51.00	-20.85	
3	0.414	9.59	33.27	57.57	-24.30	23.26	47.57	-24.31	
4	1.238	9.61	22.11	56.00	-33.89	15.34	46.00	-30.66	
5	6.058	9.69	33.04	60.00	-26.96	20.97	50.00	-29.03	
6	10.050	9.76	22.93	60.00	-37.07	16.05	50.00	-33.95	

6 PEAK /AVERAGE OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

According to §15.247(b)(3),(4)(b)
(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

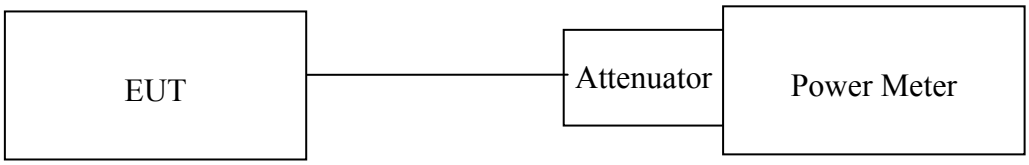
(c) Operation with directional antenna gains greater than 6 dBi.
(1) Fixed point-to-point operation:
(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

According to RSS-210 issue 8,§A8.4(4), For systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4(5), the e.i.r.p. shall not exceed 4 W.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter 05	Anritsu	ML2495A	1116010	05/08/2014	05/07/2015
Power Sensor 05	Anritsu	MA2411B	34NKF50	05/08/2014	05/07/2015
Power Sensor 06	DARE	RPR3006W	13I00030SNO33	10/31/2014	10/30/2015
Power Sensor 07	DARE	RPR3006W	13I00030SNO34	10/31/2014	10/30/2015
Temperature Chamber	KSON	THS-B4H100	2287	03/17/2015	03/16/2016
DC Power supply	ABM	8185D	N/A	07/16/2014	07/15/2015
AC Power supply	EXTECH	CFC105W	NA	12/27/2014	12/26/2015
Attenuator	Woken	Watt-65m3502	11051601	NA	NA
Splitter	MCLI	PS4-199	12465	12/27/2013	12/26/2015
Spectrum analyzer	Agilent	N9030A	MY51360021	05/02/2014	05/01/2015

6.3 Test Set-up:



6.4 Measurement Procedure:

Refer to section 9.1.3 and 9.2.3 Peak and Average Conducted Output Power Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r02

6.5 Measurement Result:

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	0.57	0.00	0.57	0.00114	1
Mid	0.04	0.00	0.04	0.00101	1
High	0.19	0.00	0.19	0.00104	1

Offset: 0.5dB

7 6dB Bandwidth & 99% Bandwidth

7.1 Standard Applicable:

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz,2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

According to RSS 210 issue 8, §8.2(a) Systems employing digital modulation techniques (which includes direct sequence) can now be certified under RSS-210 provided they comply with the following requirements: The minimum -6 dB bandwidth shall be at least 500 kHz.

7.2 Measurement Equipment Used:

Refer to section 6.2 for details.

7.3 Test Set-up:

Refer to section 6.3 for details.

7.4 Measurement Procedure:

Refer to section 8.1 DTS bandwidth Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r02

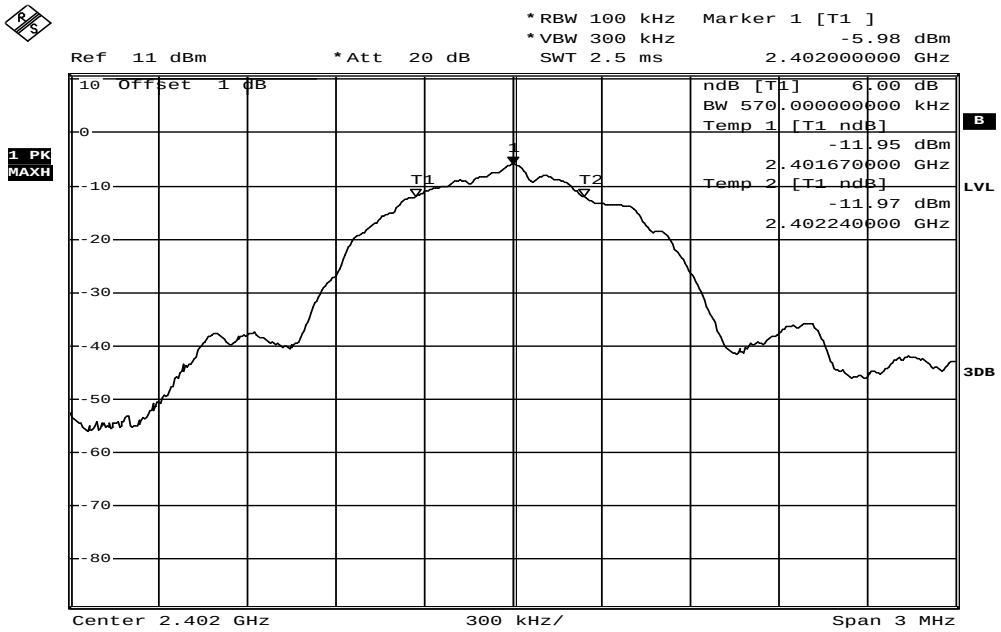
1. Set resolution bandwidth (RBW) = 100KHz.
2. Set the video bandwidth (VBW) =300KHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement.

7.5 Measurement Result:

CH	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (KHZ)
Lower	0.57	1.08	>500
Mid	0.594	1.086	>500
Higher	0.588	1.08	>500

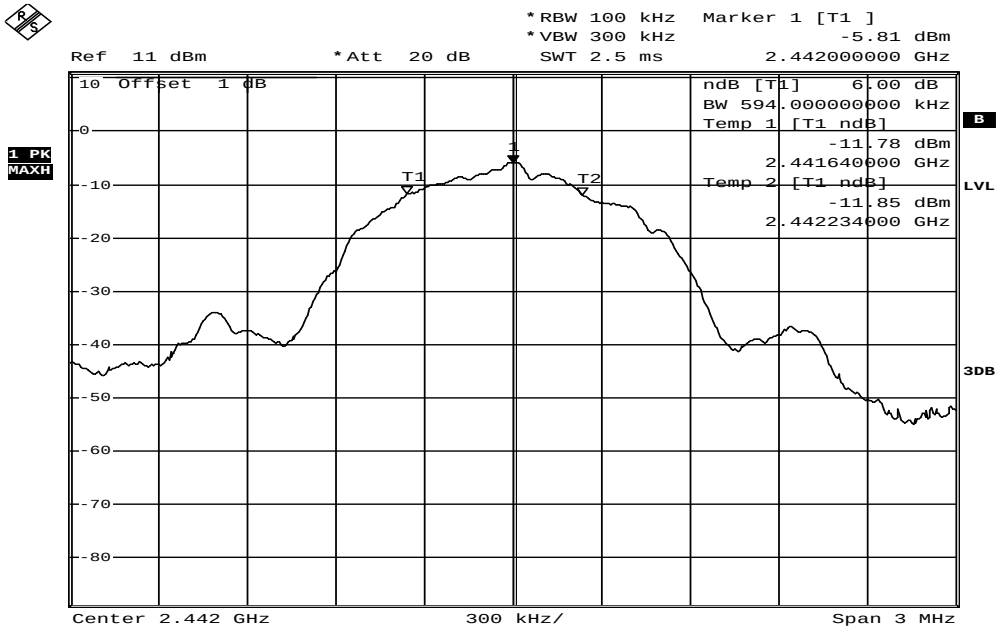
Note: Refer to next page for plots.

6dB Band Width Test Data CH-Low



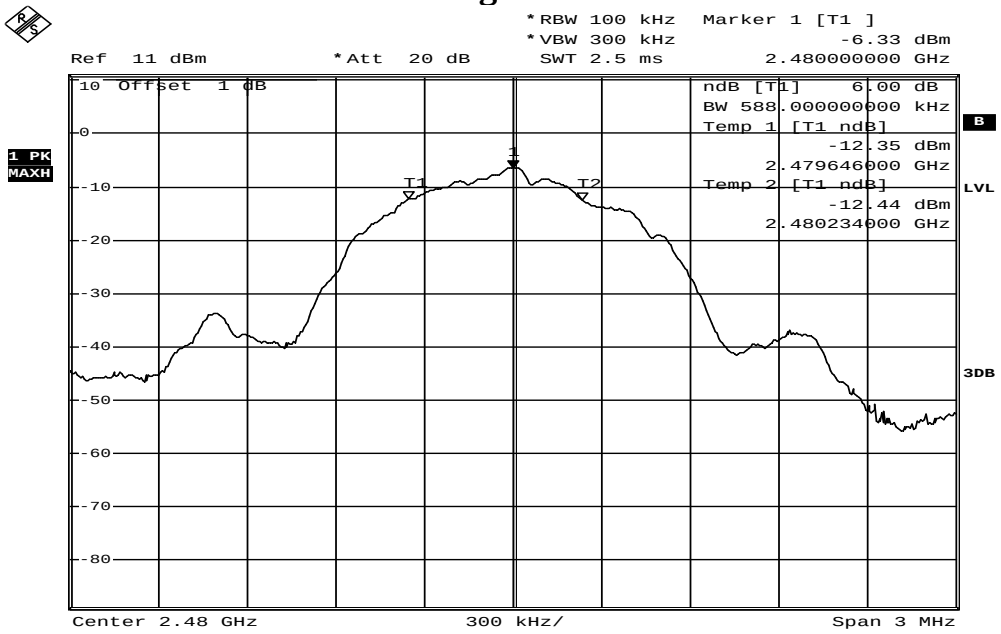
Date: 19.MAR.2015 14:31:27

6dB Band Width Test Data CH-Mid



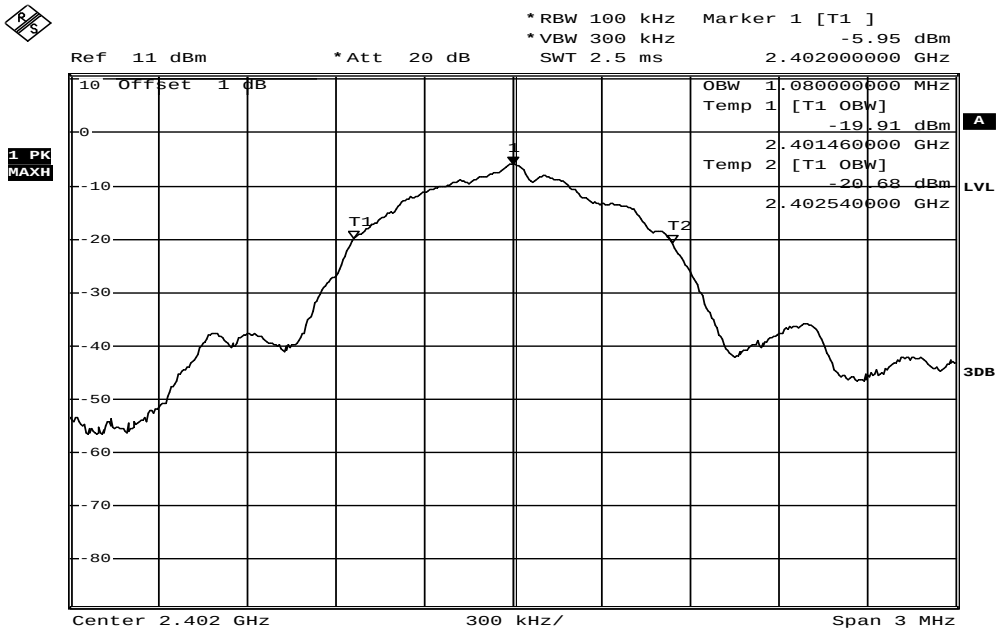
Date: 19.MAR.2015 14:33:45

6dB Band Width Test Data CH-High



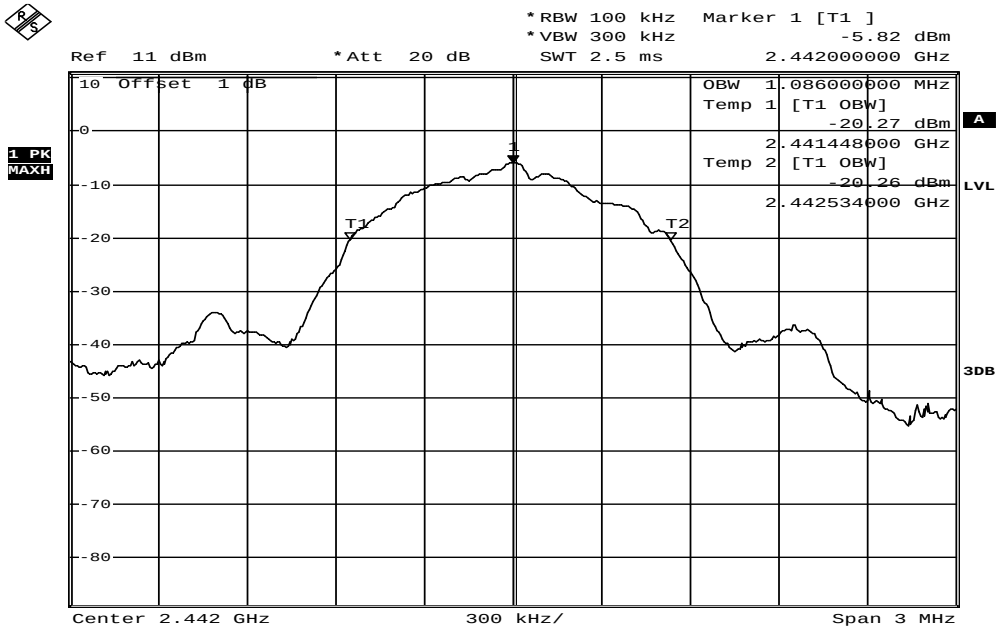
Date: 19.MAR.2015 14:34:40

99% Band Width Test Data CH-Low



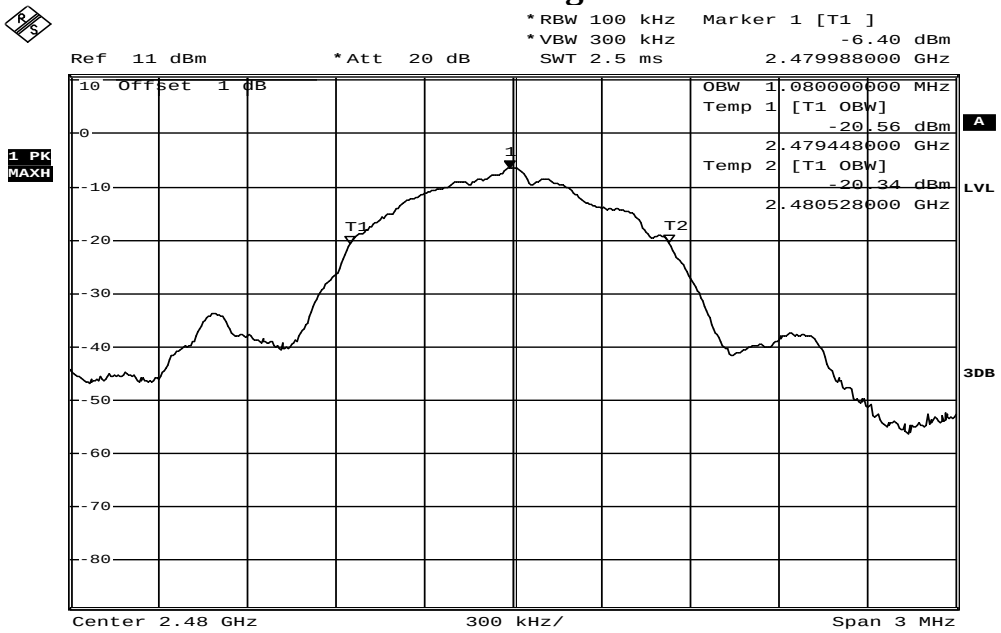
Date: 19.MAR.2015 14:33:17

99% Band Width Test Data CH-Mid



Date: 19.MAR.2015 14:34:05

99% Band Width Test Data CH-High



Date: 19.MAR.2015 14:34:57

8 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, 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 in15.209(a).

According to RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2 Radiated emission:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/29/2014	07/28/2015
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/26/2014	05/25/2015
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/07/2014	05/06/2015
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	03/07/2015	03/06/2017
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	12/30/2014	12/29/2015
Horn antenna1-18G	ETS	3117	00066665	11/27/2014	11/26/2015
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/21/2015	01/20/2017
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2013	05/14/2015
Preamplifier9-1000M	HP	8447D	NA	03/12/2015	03/11/2016
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/30/2014	07/29/2015
Preamplifier1-26G	EM	EM01M26G	NA	03/11/2015	03/10/2016
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	05/08/2013	05/07/2015
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	12/02/2014	12/01/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/17/2014	10/16/2015
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	10/03/2013	10/02/2015
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2014	12/26/2015

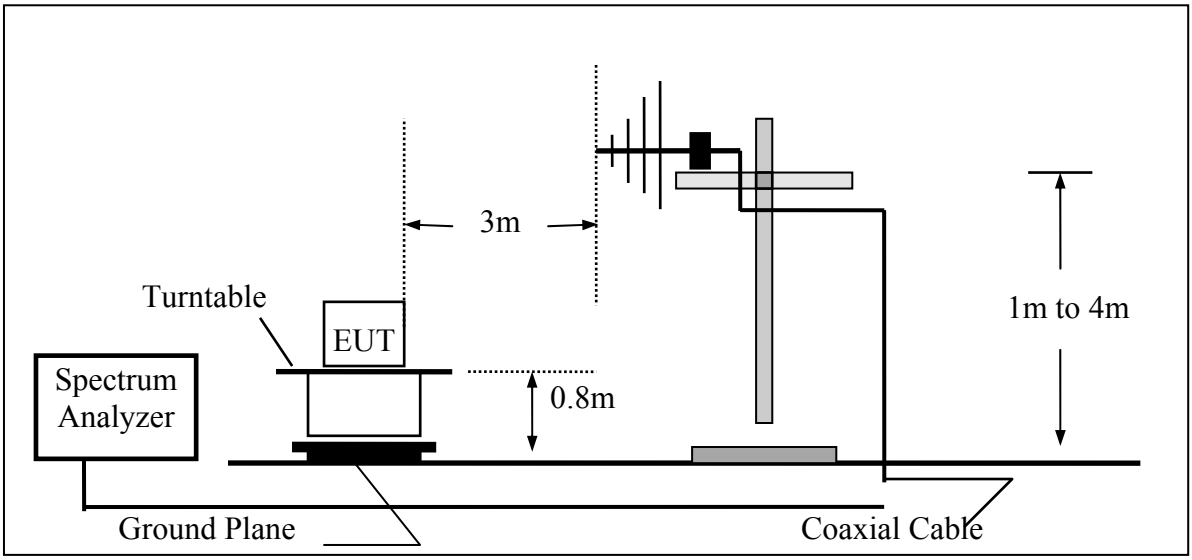
8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

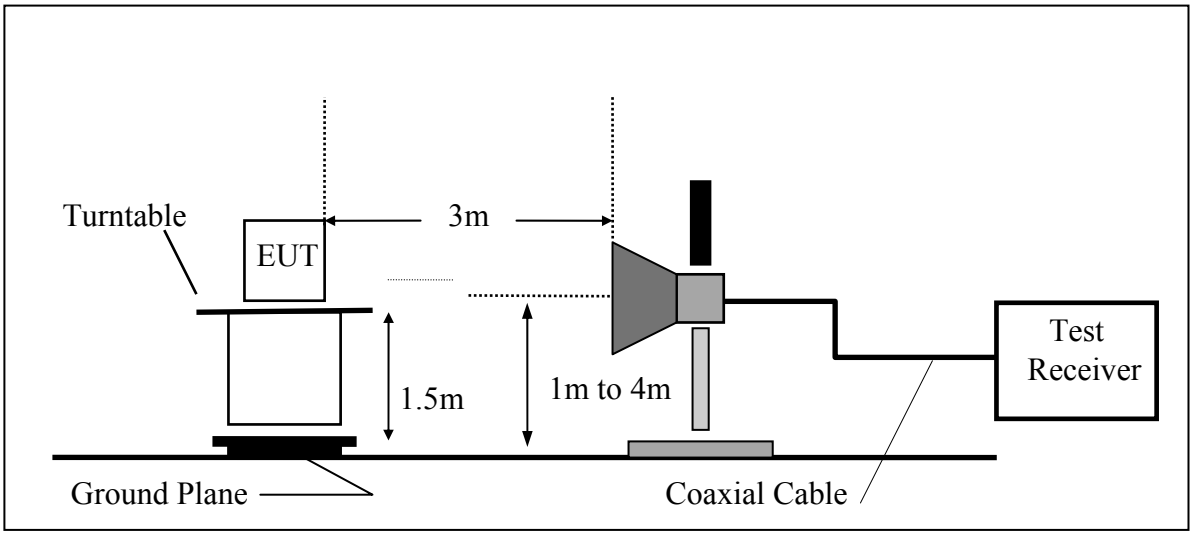
Refer to section 6.3 for details.

8.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW=100kHz, VBW=3* RBW, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r02

The measurement of unwanted emissions at the edge of the authorized frequency bands can be complicated by the leakage of RF energy from the fundamental emission into the RBW pass band. Thus, for measurements at the band edges, a narrower resolution bandwidth (no less than 10 kHz) can be used within the first 1 MHz beyond the fundamental emission, provided that that measured energy is subsequently integrated over the appropriate reference bandwidth (i.e., 100 kHz or 1 MHz). This integration can be performed using the band power function of the spectrum analyzer or by summing the spectral levels (in linear power units) over the appropriate reference bandwidth.

8.5 Field Strength Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

8.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Radiated Emission:

Operation Mode	TX CH Low	Test Date	2015/03/18
Fundamental Frequency	2402 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2379.19	50.68	-10.72	39.96	74.00	-34.04	Peak	VERTICAL
2	2390.00	48.75	-10.68	38.07	74.00	-35.93	Peak	VERTICAL
3	2400.00	60.66	-10.66	50.00	74.00	-24.00	Peak	VERTICAL
4	2402.26	96.32	-10.64	85.68	--	F	Peak	VERTICAL
1	2313.07	51.01	-10.96	40.05	74.00	-33.95	Peak	HORIZONTAL
2	2390.00	47.40	-10.68	36.72	74.00	-37.28	Peak	HORIZONTAL
3	2400.00	61.65	-10.66	50.99	74.00	-23.01	Peak	HORIZONTAL
4	2402.26	98.18	-10.64	87.54	--	F	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2015/03/18
Fundamental Frequency	2480 MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	51.56	-10.34	41.22	74.00	-32.78	Peak	VERTICAL
1	2483.50	53.24	-10.34	42.90	74.00	-31.10	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

9 SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

According to §15.247(d), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-210 issue 8, §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2 Radiated emission:

Refer to section 7.2 for details.

9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2 Radiated emission:

Refer to section 7.3 for details.

9.4 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m/1.5m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r02

9.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

9.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	2015/03/18
Fundamental Frequency	2402MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	257.95	42.81	-12.68	30.13	46.00	-15.87	Peak	VERTICAL
2	299.66	43.57	-11.11	32.46	46.00	-13.54	Peak	VERTICAL
3	388.90	40.96	-9.38	31.58	46.00	-14.42	Peak	VERTICAL
4	451.95	37.05	-7.76	29.29	46.00	-16.71	Peak	VERTICAL
5	532.46	31.06	-6.91	24.15	46.00	-21.85	Peak	VERTICAL
6	799.21	26.92	-2.21	24.71	46.00	-21.29	Peak	VERTICAL
1	258.92	40.13	-12.66	27.47	46.00	-18.53	Peak	HORIZONTAL
2	299.66	35.67	-11.11	24.56	46.00	-21.44	Peak	HORIZONTAL
3	388.90	37.99	-9.38	28.61	46.00	-17.39	Peak	HORIZONTAL
4	453.89	35.77	-7.75	28.02	46.00	-17.98	Peak	HORIZONTAL
5	695.42	26.12	-4.08	22.04	46.00	-23.96	Peak	HORIZONTAL
6	965.08	27.98	0.55	28.53	54.00	-25.47	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Mid	Test Date	2015/03/18
Fundamental Frequency	2442MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	48.43	45.19	-12.04	33.15	40.00	-6.85	Peak	VERTICAL
2	257.95	41.88	-12.68	29.20	46.00	-16.80	Peak	VERTICAL
3	299.66	43.99	-11.11	32.88	46.00	-13.12	Peak	VERTICAL
4	388.90	41.46	-9.38	32.08	46.00	-13.92	Peak	VERTICAL
5	453.89	37.19	-7.75	29.44	46.00	-16.56	Peak	VERTICAL
6	799.21	27.10	-2.21	24.89	46.00	-21.11	Peak	VERTICAL
1	35.82	46.56	-13.00	33.56	40.00	-6.44	Peak	HORIZONTAL
2	258.92	40.32	-12.66	27.66	46.00	-18.34	Peak	HORIZONTAL
3	299.66	35.48	-11.11	24.37	46.00	-21.63	Peak	HORIZONTAL
4	388.90	36.54	-9.38	27.16	46.00	-18.84	Peak	HORIZONTAL
5	453.89	36.77	-7.75	29.02	46.00	-16.98	Peak	HORIZONTAL
6	966.05	28.04	0.56	28.60	54.00	-25.40	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH High	Test Date	2015/03/18
Fundamental Frequency	2480MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	35.82	47.05	-13.00	34.05	40.00	-5.95	Peak	VERTICAL
2	258.92	42.91	-12.66	30.25	46.00	-15.75	Peak	VERTICAL
3	299.66	43.47	-11.11	32.36	46.00	-13.64	Peak	VERTICAL
4	386.96	41.53	-9.42	32.11	46.00	-13.89	Peak	VERTICAL
5	453.89	35.79	-7.75	28.04	46.00	-17.96	Peak	VERTICAL
6	797.27	27.39	-2.24	25.15	46.00	-20.85	Peak	VERTICAL
1	35.82	45.00	-13.00	32.00	40.00	-8.00	Peak	HORIZONTAL
2	71.71	43.33	-15.03	28.30	40.00	-11.70	Peak	HORIZONTAL
3	257.95	40.62	-12.68	27.94	46.00	-18.06	Peak	HORIZONTAL
4	386.96	37.54	-9.42	28.12	46.00	-17.88	Peak	HORIZONTAL
5	453.89	36.03	-7.75	28.28	46.00	-17.72	Peak	HORIZONTAL
6	967.02	27.63	0.58	28.21	54.00	-25.79	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2015/03/18
Fundamental Frequency	2402MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4804.00	47.89	-3.19	44.70	74.00	-29.30	Peak	VERTICAL
2	7206.00	38.06	4.17	42.23	74.00	-31.77	Peak	VERTICAL
1	4804.00	49.47	-3.19	46.28	74.00	-27.72	Peak	HORIZONTAL
2	7206.00	35.28	4.17	39.45	74.00	-34.55	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	2015/03/18
Fundamental Frequency	2442MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4884.00	48.58	-3.01	45.57	74.00	-28.43	Peak	VERTICAL
2	7326.00	35.05	4.51	39.56	74.00	-34.44	Peak	VERTICAL
1	4884.00	50.94	-3.01	47.93	74.00	-26.07	Peak	HORIZONTAL
2	7326.00	36.29	4.51	40.80	74.00	-33.20	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	2015/03/18
Fundamental Frequency	2480MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB/m	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4960.00	48.24	-2.84	45.40	74.00	-28.60	Peak	VERTICAL
2	7440.00	35.50	4.80	40.30	74.00	-33.70	Peak	VERTICAL
1	4960.00	50.29	-2.84	47.45	74.00	-26.55	Peak	HORIZONTAL
2	7440.00	34.86	4.80	39.66	74.00	-34.34	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

10 Peak Power Spectral Density

10.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-210 issue 8, §A8.2(b) and §A8.3(2), The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

10.2 Measurement Equipment Used:

Refer to section 6.2 for details.

10.3 Test Set-up:

Refer to section 6.3 for details.

10.4 Measurement Procedure:

Refer to section 10.2 Peak Power Density(PKPPSD) Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r02

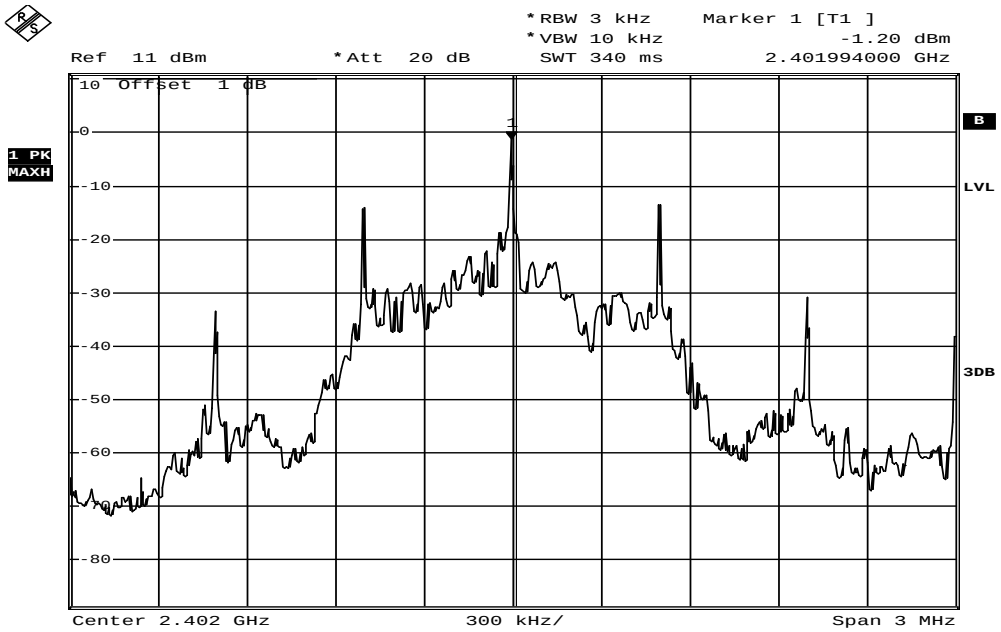
1. Set analyzer center frequency to DTS channel frequency
2. Set the span to 1.5 times the DTS bandwidth.
3. Set resolution bandwidth 3KHz ≤RBW ≤100KHz.
4. Set the video bandwidth VBW≥3×RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.5 Measurement Result:

LE mode

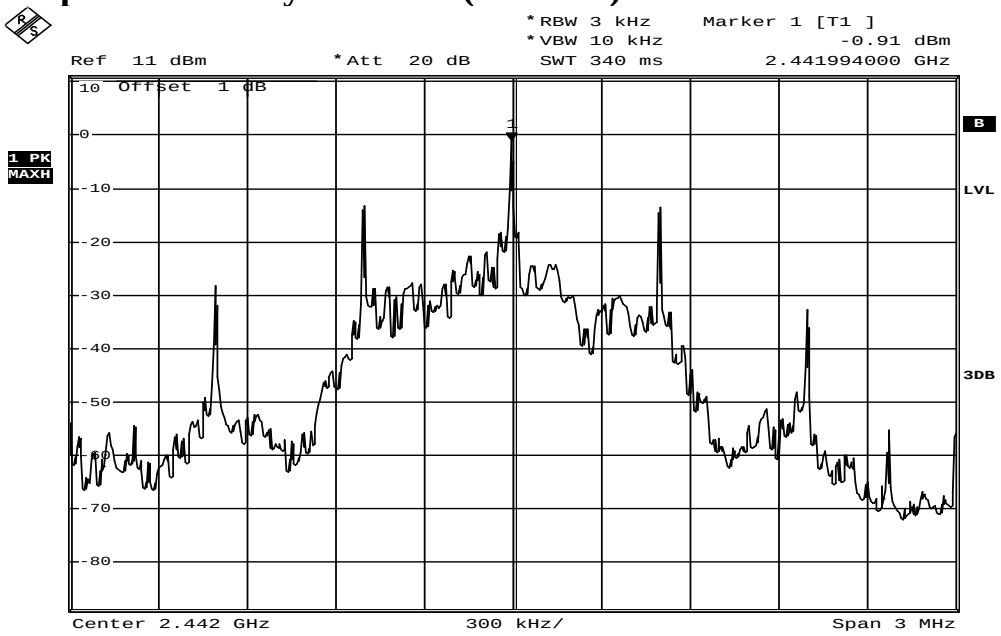
Frequency MHz	Power Density Level (dBm)/3KHz	Maximum Limit (dBm)
Low	-1.2	8
Mid	-0.91	8
High	-0.83	8

Power Spectral Density Test Plot (CH-Low)



Date: 27.MAR.2015 09:16:00

Power Spectral Density Test Plot (CH-Mid)



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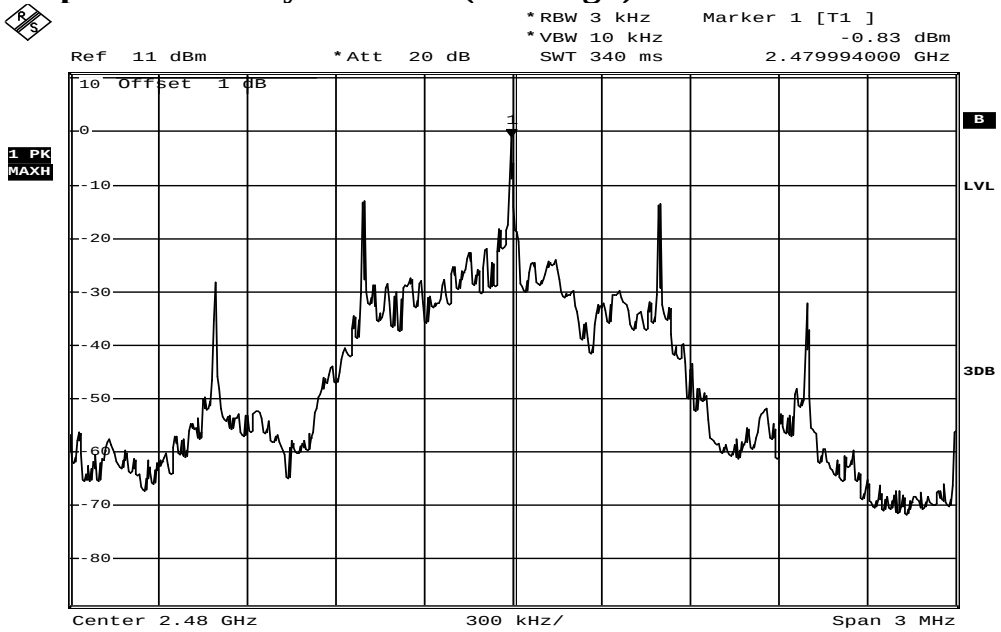
Power Spectral Density Test Plot (CH-High)



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11 ANTENNA REQUIREMENT

11.1 Standard Applicable

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

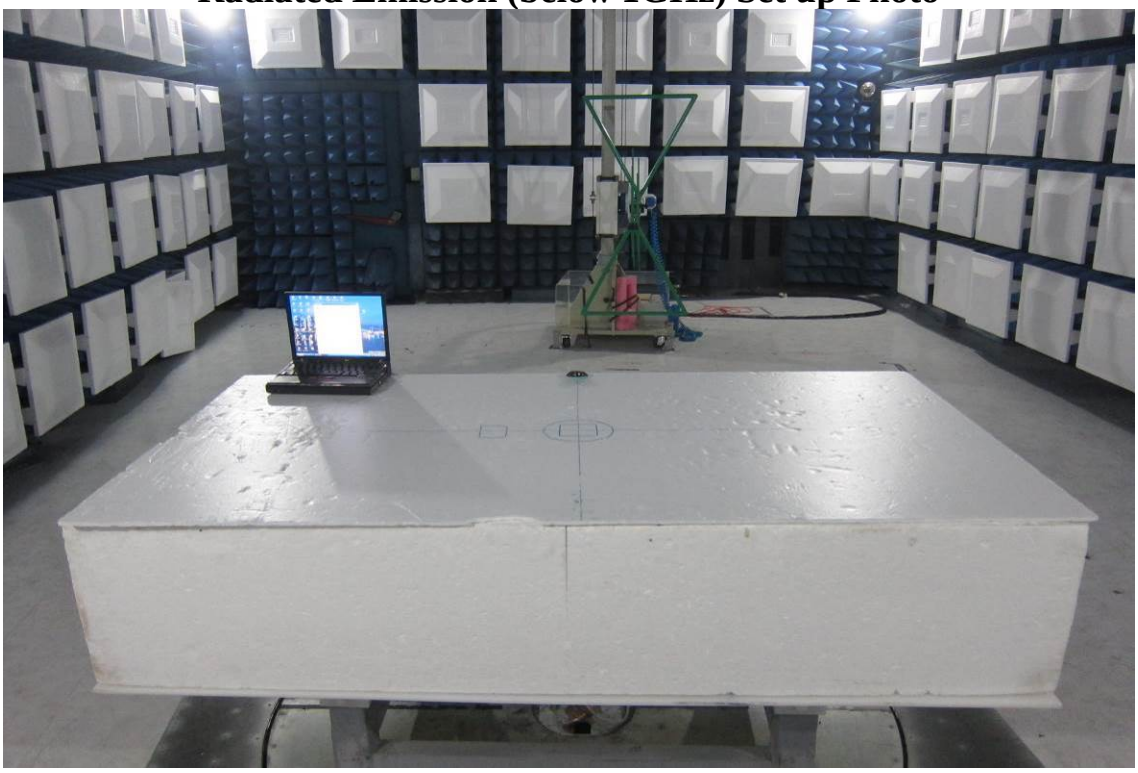
According to RSS-GEN 8.3, the applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.
Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.
User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:
This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

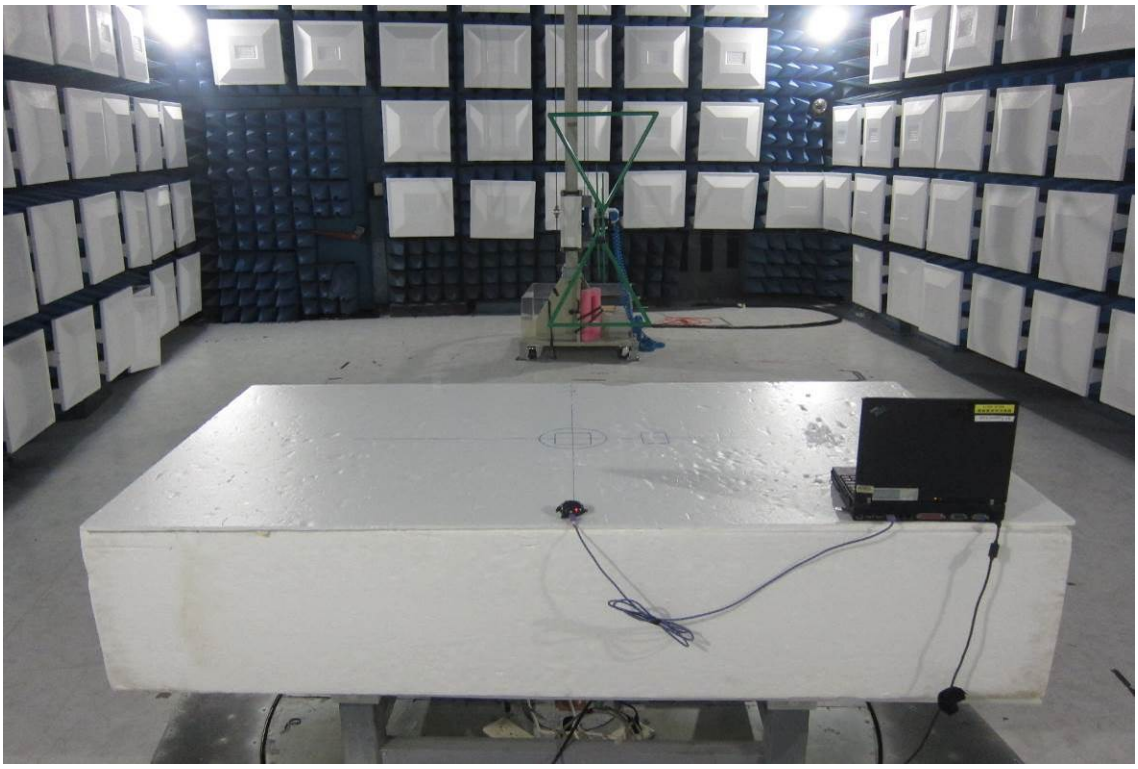
11.2 Antenna Connected Construction

The directional gains of antenna used for transmitting is Chip Antenna 2.2dBi, and the antenna connector is designed with unique detachable and no consideration of replacement by user. Please see EUT photo for details and antenna spec. for details.

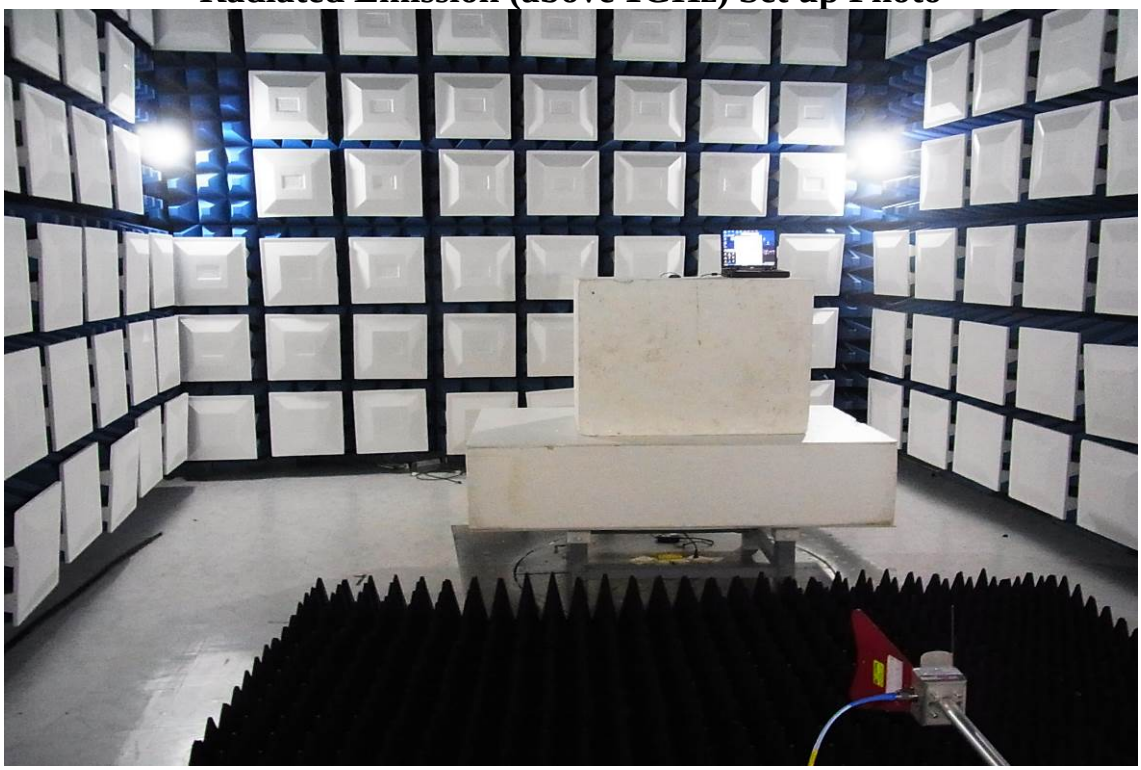
APPENDIX 1
PHOTOGRAPHS OF SET UP

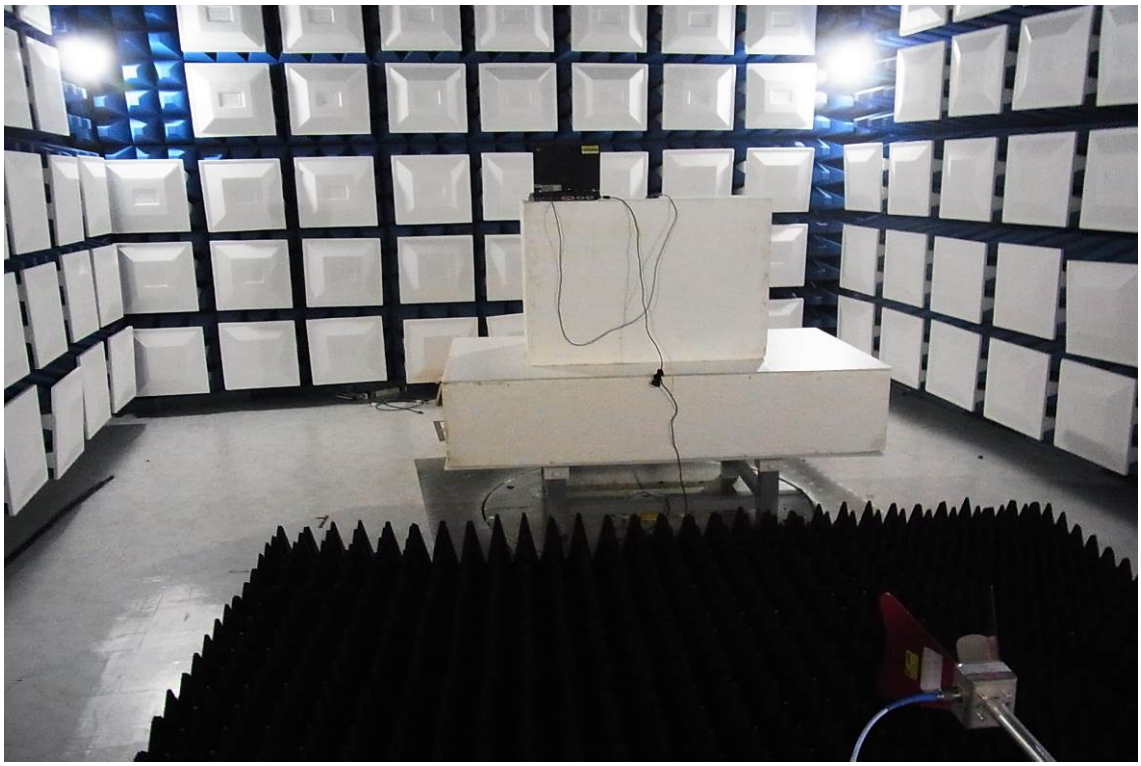
Radiated Emission (below 1GHz) Set up Photo





Radiated Emission (above 1GHz) Set up Photo





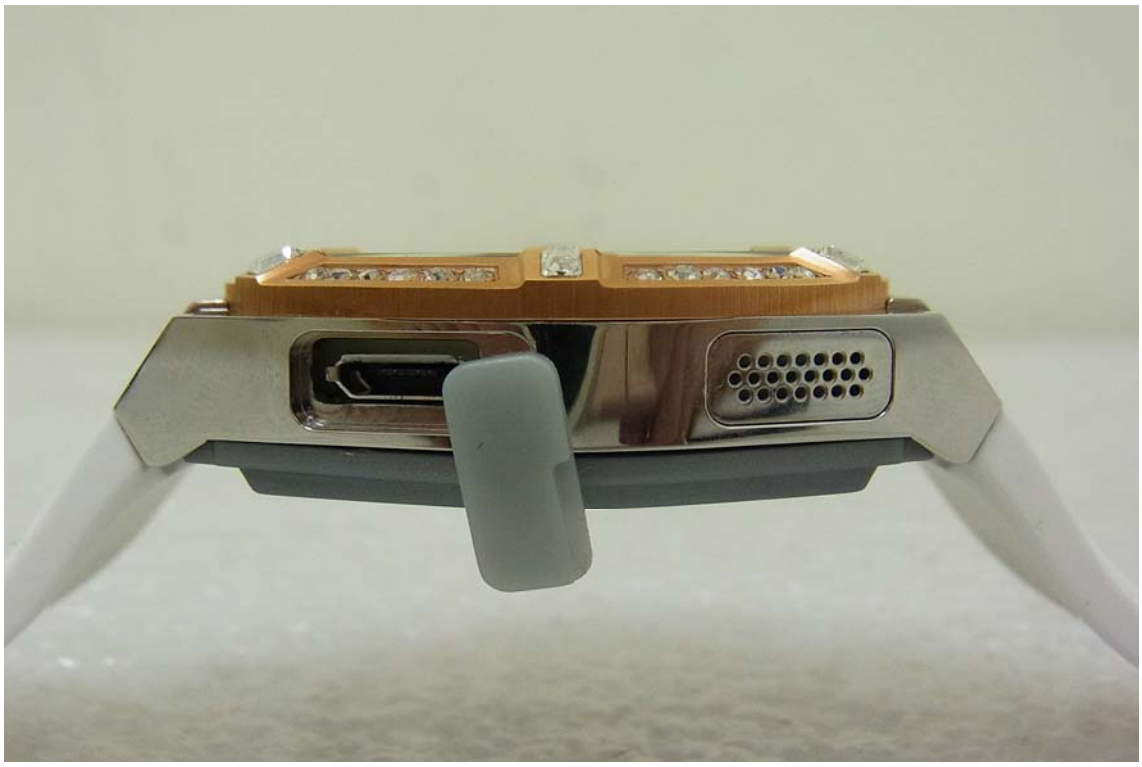
Conducted Emission Set up Photo

APPENDIX 2
PHOTOGRAPHS OF EUT

EUT 1

EUT 2

EUT 3



EUT 4

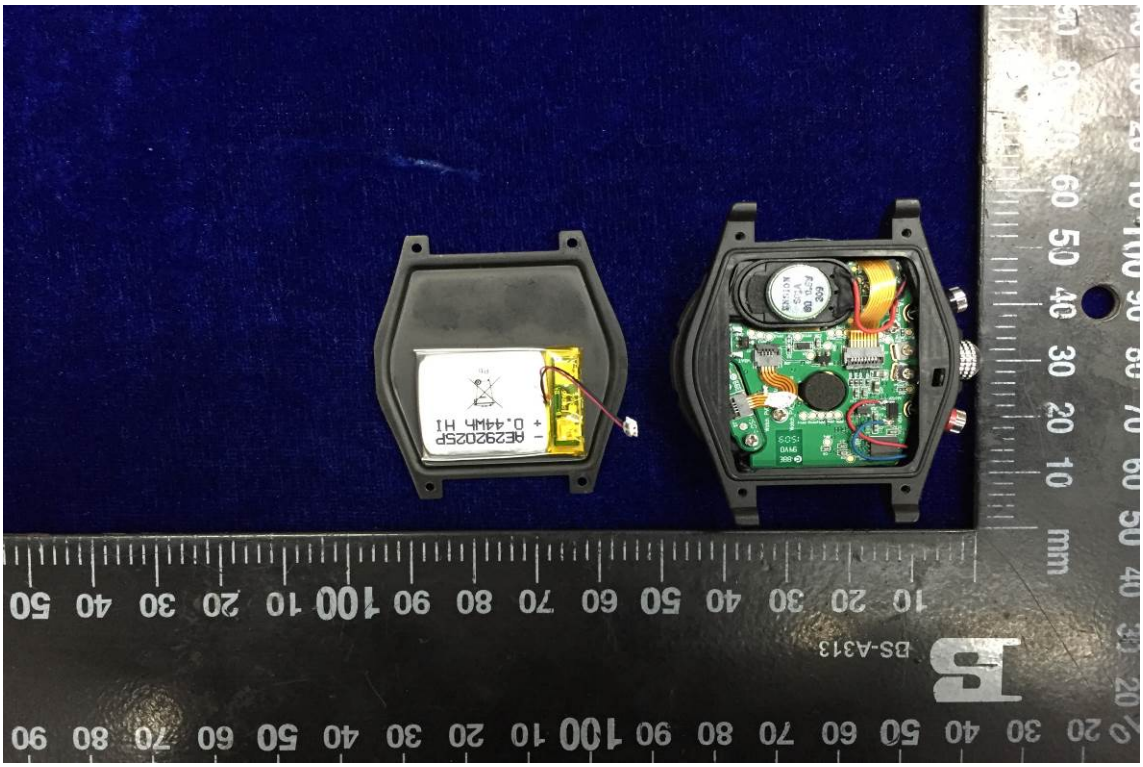
EUT 5

EUT 6

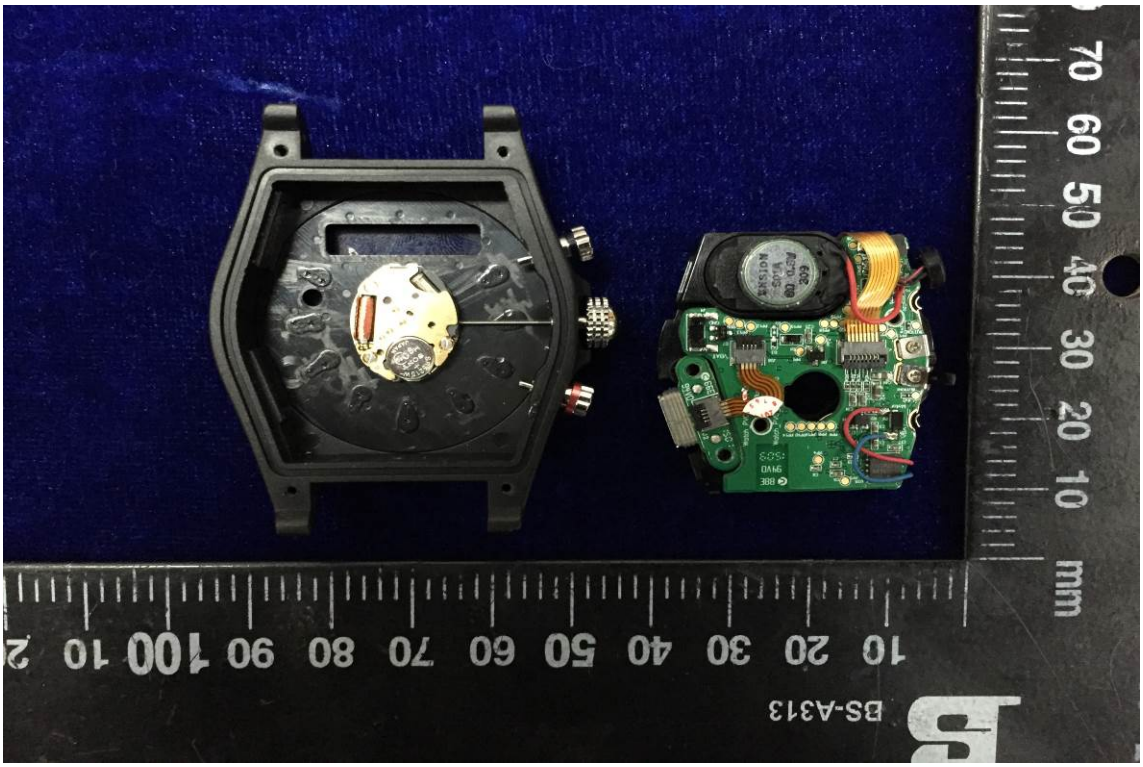
EUT 7

EUT 8

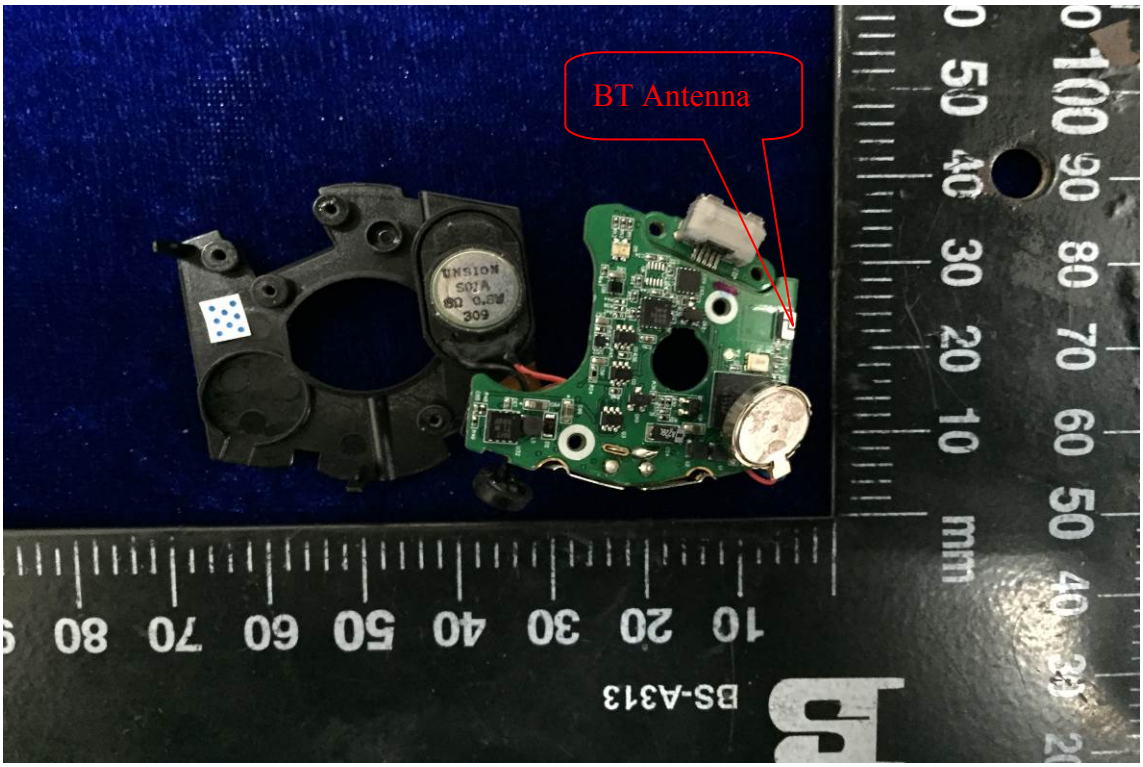
EUT 9



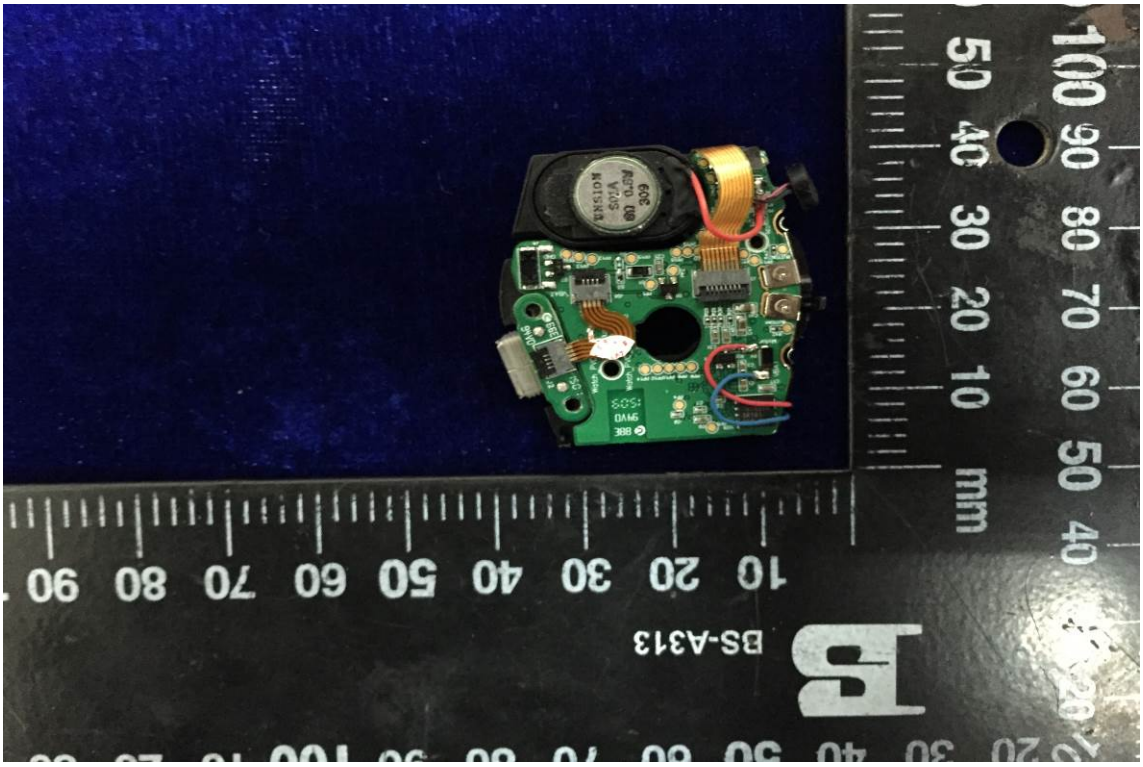
EUT 10



EUT 11



EUT 12



~ End of Report ~