

TEST REPORT

of

FCC Part 15 Subpart C AND CANADA RSS-247

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

Product : Navigation Device

Brand: Magellan, Mio, Navman, Mitac

Model: N477

Model Difference: N/A

FCC ID: P4Q-N477

IC: 2420C-N477

FCC Rule Part: §15.247, Cat: DSS

IC Rule Part: RSS-247 issue 1: 2015

Applicant: Mitac International Corporation

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Nan Gan, Taipei, Taiwan

Test Performed by:
International Standards Laboratory

<Lung-Tan LAB>

*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;

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Report No.: **ISL-14LR095FC-R1**

Issue Date : **2015/11/02**

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: Mitac International Corporation
Product Description: Navigation Device
Brand Name: Magellan, Mio, Navman, Mitac
Model No.: N477
Model Difference: N/A
FCC ID: P4Q-N477
IC: 2420C-N477
Date of test: 2015/10/24~ 2015/10/30
Date of EUT Received: 2015/10/24

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:	 _____ <i>Dion Chang / Engineer</i>	Date:	2015/11/02 _____
Prepared By:	 _____ <i>Gigi Yeh / Specialist</i>	Date:	2015/11/02 _____
Approved By:	 _____ <i>Vincent Su / Technical Manager</i>	Date:	2015/11/02 _____

Version

Version No.	Date	Description
00	2014/04/24	Initial creation of document
01	2015/11/02	Modify the layout of mainboard and update to test standard to RSS 247 from RSS 210

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name	Navigation Device	
Brand Name	Magellan, Mio, Navman, Mitac	
Model Name	N477	
Model Difference	N/A	
USB port	One provided for Data link and battery charger	
Power Supply	5Vdc from AC/DC adapter, Car charger or 3.7Vdc Li-ion Battery	
	Adapter:	Model: QII050200B; Supplier: TPT
	Car charger:	Model: CA-052-00U-19; Supplier: Mitac

IC RSS-Gen:

PMN (Product Marketing Name)	Magellan RoadMate9465T-LMB Magellan RoadMate9412T-LM Magellan RoadMate9400-LM Magellan RoadMate9212T-LM Magellan RoadMate9412T-LM Magellan RoadMate9416T-LM
HVIN (Hardware Version Identification Number)	N477
FVIN (Firmware Version Identification Number)	R44
Test SoftWare Version	tata4A6BT_RF_FixCh_Test.exe
RF power setting in TEST SoftWare	tata4A6BT_RF_FixCh_Test.exe

Bluetooth:

Bluetooth Version	V2.0 + EDR (GFSK + $\pi/4$ DQPSK + 8DPSK)
Frequency Range	2402 – 2480MHz
Channel number	79 channels
Modulation type	Frequency Hopping Spread Spectrum
Max Measured Transmit Power	-0.05dBm (Peak)
Dwell Time	$\leq 0.4s$
Antenna Designation	Chip Antenna 1.34dBi

The EUT is compliance with Bluetooth EDR V2.0 Standard.

This is CIIPC report for BT 2.0 EDR mode

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

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: P4Q-N477** filing to comply with Section 15.247 of the FCC Part 15C, Subpart C Rules. And **IC: 2420C-N477** filing to comply with Industry Canada RSS-247 issue 1: 2015.

1.3. 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: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: 558074 D01 DTS Meas Guidance v03r02

1.4. 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.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. 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 tested with a test program to fix the TX/RX frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

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 ANSI C63.10: 2013 and RSS-Gen issue 4: 2014. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 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 and 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. according to the requirements in Section 6 and 11 of ANSI C63.10: 2013 and DA 00-705.

2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed channel)

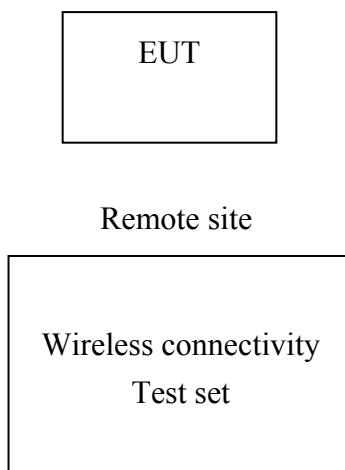


Table 1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Wireless connectivity Test set (BT Tester)	Agilent	N4010A	N/A	N/A	No- Shielding

3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)/ RSS-Gen §8.8	AC Power line Conducted Emission	N/A
§15.247(b)(1)/ RSS-247 issue 1, §5.4(2)	Peak Output Power/EIRP	Compliant
§15.247(d) RSS-247 issue 1, §5.5	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(c) RSS-Gen §8.9 RSS-247 issue 1, §5.5	TX Spurious Emission	Compliant
§15.247(a)(1)/ RSS-247 issue 1, §5.1(2)	Frequency Separation	N/A
§15.247(a)(1)(iii)/ RSS-247 issue 1, §5.1(4)	Number of hopping frequency	N/A
§15.247(a)(1)(ii)/ RSS-247 issue 1, §5.1(4)	Time of Occupancy	N/A
§15.247(a)(1) RSS-Gen §6.6 RSS-247 issue 1, §5.1(2)	20dB Bandwidth & 99% Power Bandwidth	N/A
§15.203, §15.247(c)/ RSS-GEN 8.3,	Antenna Requirement	Compliant

4. DESCRIPTION OF TEST MODES

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low (2402MHz), mid (2441MHz) and high (2480MHz) with each modulation were chosen for full testing.

The worst case BDR mode was reported for Radiated Emission.

5. PEAK OUTPUT POWER MEASUREMENT

5.1. Standard Applicable:

According to §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: 0.125 Watts.

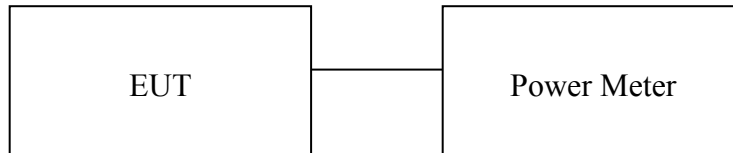
According to RSS-247 issue 1, §5.4

(2) For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels (see Section 5.4(5) for exceptions).

5.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter 05	Anritsu	ML2495A	1116010	07/29/2015	07/28/2016
Power Sensor 05	Anritsu	MA2411B	34NKF50	07/29/2015	07/28/2016
Power Sensor 06	DARE	RPR3006W	13I00030SNO3 3	10/31/2014	10/30/2015
Power Sensor 07	DARE	RPR3006W	13I00030SNO3 4	10/31/2014	10/30/2015
Temperature Chamber	KSON	THS-B4H100	2287	06/05/2015	06/04/2016
DC Power supply	ABM	8185D	N/A	07/16/2015	07/15/2016
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	05/02/2015	05/01/2016
Test Software	DARE	Radimation Ver:2013.1.23	NA	NA	NA

5.3. .Test Set-up:



5.4. 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 power meter or spectrum. (Channel power function, RBW, VBW = 1MHz)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

5.5. Measurement Result:

BDR Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-0.47	0.00	-0.47	0.00090	1
2441.00	-0.05	0.00	-0.05	0.00099	1
2480.00	-1.42	0.00	-1.42	0.00072	1

EDR 2M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-2.51	0.00	-2.51	0.00056	1
2441.00	-1.93	0.00	-1.93	0.00064	1
2480.00	-3.39	0.00	-3.39	0.00046	1

EDR 3M Mode

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	-2.14	0.00	-2.14	0.00061	1
2441.00	-1.55	0.00	-1.55	0.00070	1
2480.00	-2.88	0.00	-2.88	0.00052	1

Offset: 0.5dB

6. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

6.1. Standard Applicable:

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is 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 in §15.209(a).

According to RSS-247 issue 1, §5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

6.2. Measurement Equipment Used:

6.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

6.2.2. Radiated emission:

Chamber 14(966)					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/30/2015	07/29/2016
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/21/2015	05/20/2016
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/23/2015	05/22/2016
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	12/03/2013	12/02/2015
Dipole antenna	SCHWARZBECK	UHAP,300-1000	1195	12/03/2013	12/02/2015
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	05/11/2015	05/10/2017
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	07/24/2015	07/23/2017
Preamplifier9-1000M	HP	8447D	NA	03/12/2015	03/11/2016
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/28/2015	07/27/2016
Preamplifier1-26G	EM	EM01M26G	NA	03/11/2015	03/10/2016
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	07/23/2015	07/22/2017
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	12/02/2014	12/01/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/17/2015	10/16/2016
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	10/03/2015	10/02/2017
Signal Generator	R&S	SMU200A	102330	03/11/2015	02/10/2016
Signal Generator	Anritsu	MG3692A	20311	10/29/2015	10/28/2016
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2014	12/26/2015

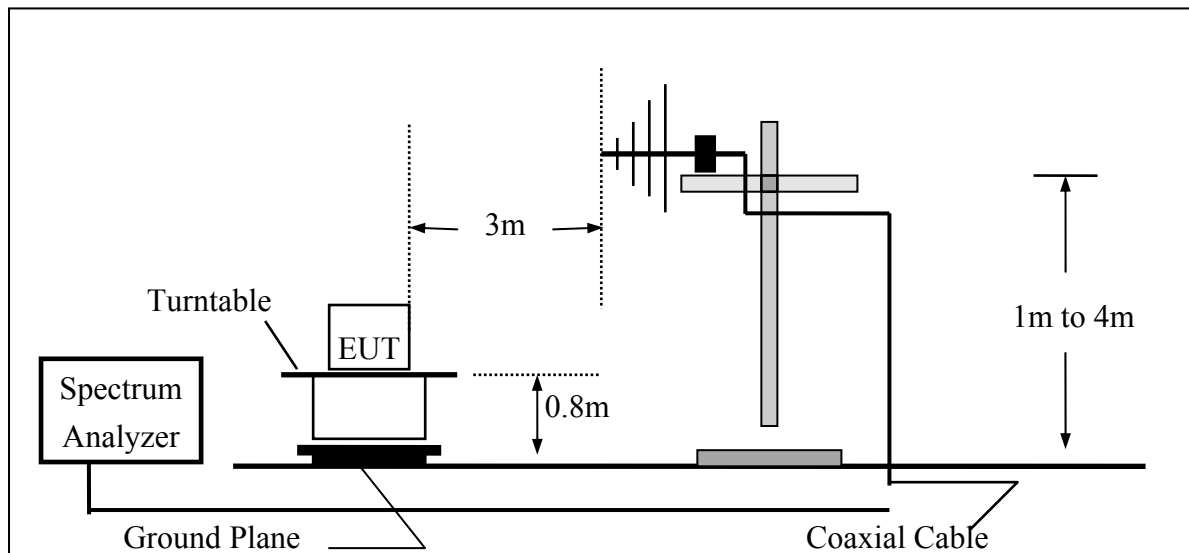
6.3. Test SET-UP:

6.3.1. Conducted Emission at antenna port:

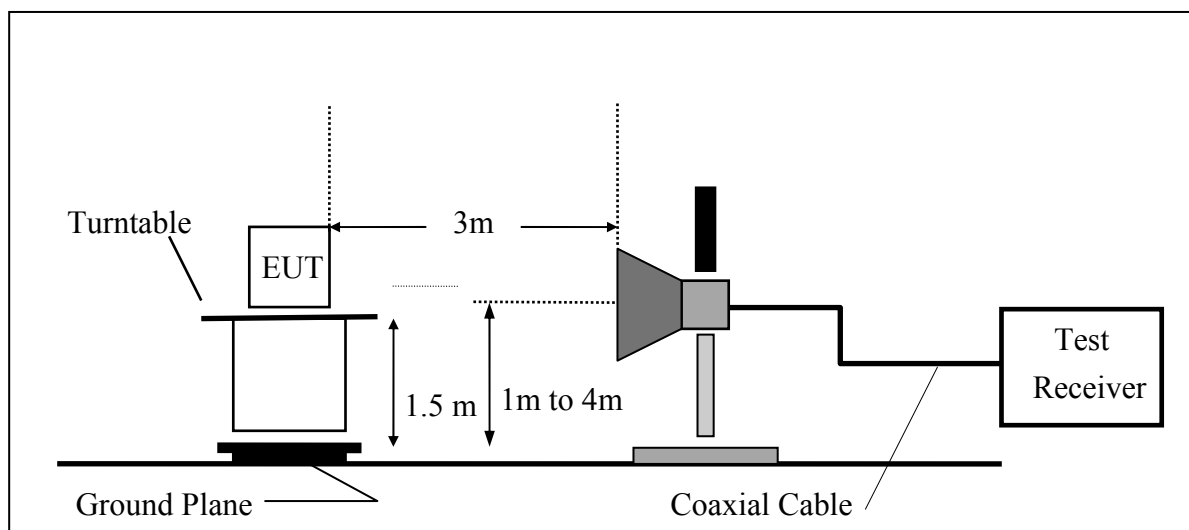
Refer to section 6.3 for details.

6.3.2. Radiated emission:

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



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



6.4. 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, VBW=100KHz, 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.

6.5. 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	

6.6. Measurement Result:

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

Radiated Emission: (BDR Hopping mode)

Operation Mode TX CH Low
Fundamental Frequency 2402 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2369.60	46.96	-10.82	36.14	74.00	-37.86	Peak	VERTICAL
2	2390.00	43.93	-10.74	33.19	74.00	-40.81	Peak	VERTICAL
3	2400.00	46.32	-10.71	35.61	60.63	-25.02	Peak	VERTICAL
4	2402.03	91.33	-10.70	80.63	--	F	Peak	VERTICAL
1	2331.53	46.32	-10.96	35.36	74.00	-38.64	Peak	HORIZONTAL
2	2390.00	42.77	-10.74	32.03	74.00	-41.97	Peak	HORIZONTAL
3	2400.00	49.37	-10.71	38.66	67.99	-29.33	Peak	HORIZONTAL
4	2402.03	98.69	-10.70	87.99	--	F	Peak	HORIZONTAL

Operation Mode TX CH High
Fundamental Frequency 2480 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
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	43.15	-10.40	32.75	74.00	-41.25	Peak	VERTICAL
2	2495.93	45.25	-10.36	34.89	74.00	-39.11	Peak	VERTICAL
1	2483.50	43.92	-10.40	33.52	74.00	-40.48	Peak	HORIZONTAL
2	2492.40	45.21	-10.39	34.82	74.00	-39.18	Peak	HORIZONTAL

Remark:

- Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 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.
- "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 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.
- Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission (EDR 2M Hopping mode):

Operation Mode TX CH Low
Fundamental Frequency 2402 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2385.58	46.00	-10.77	35.23	74.00	-38.77	Peak	VERTICAL
2	2390.00	44.54	-10.74	33.80	74.00	-40.20	Peak	VERTICAL
3	2400.00	45.38	-10.71	34.67	56.81	-22.14	Peak	VERTICAL
4	2402.03	87.51	-10.70	76.81	--	F	Peak	VERTICAL
1	2374.86	45.96	-10.81	35.15	74.00	-38.85	Peak	HORIZONTAL
2	2390.00	44.63	-10.74	33.89	74.00	-40.11	Peak	HORIZONTAL
3	2400.00	48.64	-10.71	37.93	67.65	-29.72	Peak	HORIZONTAL
4	2401.93	98.35	-10.70	87.65	--	F	Peak	HORIZONTAL

Operation Mode TX CH High
Fundamental Frequency 2480 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
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	43.58	-10.40	33.18	74.00	-40.82	Peak	VERTICAL
2	2496.96	45.73	-10.36	35.37	74.00	-38.63	Peak	VERTICAL
1	2483.50	43.88	-10.40	33.48	74.00	-40.52	Peak	HORIZONTAL
2	2486.58	45.34	-10.40	34.94	74.00	-39.06	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 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 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.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission (EDR 3M Hopping mode):

Operation Mode TX CH Low
Fundamental Frequency 2402 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2385.86	47.08	-10.77	36.31	74.00	-37.69	Peak	VERTICAL
2	2390.00	45.24	-10.74	34.50	74.00	-39.50	Peak	VERTICAL
3	2400.00	46.90	-10.71	36.19	58.98	-22.79	Peak	VERTICAL
4	2401.84	89.68	-10.70	78.98	--	F	Peak	VERTICAL
1	2383.04	45.63	-10.77	34.86	74.00	-39.14	Peak	HORIZONTAL
2	2390.00	44.59	-10.74	33.85	74.00	-40.15	Peak	HORIZONTAL
3	2400.00	52.98	-10.71	42.27	65.61	-23.34	Peak	HORIZONTAL
4	2402.03	96.31	-10.70	85.61	--	F	Peak	HORIZONTAL

Operation Mode TX CH High
Fundamental Frequency 2480 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
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	45.04	-10.40	34.64	74.00	-39.36	Peak	VERTICAL
2	2488.39	45.44	-10.39	35.05	74.00	-38.95	Peak	VERTICAL
1	2483.50	43.70	-10.40	33.30	74.00	-40.70	Peak	HORIZONTAL
2	2496.28	45.71	-10.36	35.35	74.00	-38.65	Peak	HORIZONTAL

Remark:

- Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 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.
- "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 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.
- Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission: BDR Non-Hopping mode (worst case)

Operation Mode TX CH Low
Fundamental Frequency 2402 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2384.35	43.53	-10.77	32.76	74.00	-41.24	Peak	VERTICAL
2	2390.00	40.54	-10.74	29.80	74.00	-44.20	Peak	VERTICAL
3	2400.00	45.17	-10.71	34.46	66.58	-32.12	Peak	VERTICAL
4	2402.03	97.28	-10.70	86.58	--	F	Peak	VERTICAL
1	2385.95	43.32	-10.77	32.55	74.00	-41.45	Peak	HORIZONTAL
2	2390.00	41.29	-10.74	30.55	74.00	-43.45	Peak	HORIZONTAL
3	2400.00	53.22	-10.71	42.51	70.52	-28.01	Peak	HORIZONTAL
4	2402.03	101.22	-10.70	90.52	--	F	Peak	HORIZONTAL

Operation Mode TX CH High
Fundamental Frequency 2480 MHz
Temperature 25

Test Date 2015/03/18
Test By Dino
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	40.35	-10.40	29.95	74.00	-44.05	Peak	VERTICAL
2	2494.20	42.79	-10.36	32.43	74.00	-41.57	Peak	VERTICAL
1	2483.50	41.64	-10.40	31.24	74.00	-42.76	Peak	HORIZONTAL
2	2490.84	42.54	-10.39	32.15	74.00	-41.85	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 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 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.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

7. SPURIOUS EMISSION TEST

7.1. 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-Gen §7.2.5 and RSS-247 issue 1, §5.5, 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 field strength limits specified in RSS-Gen is not required.

7.2. Measurement Equipment Used:

7.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

7.2.2. Radiated emission:

Refer to section 7.2 for details.

7.3. Test SET-UP:

7.3.1. Conducted Emission at antenna port:

Refer to section 6.3 for details.

7.3.2. Radiated emission:

Refer to section 7.3 for details.

7.4. Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m 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.

7.5. 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	

7.6. Measurement Result:

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

Radiated Spurious Emission Measurement Result: (below 1GHz) (Worst case: BDR Mode)

Operation Mode TX CH Low
Fundamental Frequency 2402MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	106.63	44.43	-15.99	28.44	43.50	-15.06	Peak	VERTICAL
2	579.99	25.27	-5.84	19.43	46.00	-26.57	Peak	VERTICAL
3	699.30	24.29	-4.05	20.24	46.00	-25.76	Peak	VERTICAL
4	821.52	24.32	-1.84	22.48	46.00	-23.52	Peak	VERTICAL
5	917.55	24.15	-0.16	23.99	46.00	-22.01	Peak	VERTICAL
6	986.42	24.13	0.79	24.92	54.00	-29.08	Peak	VERTICAL
1	106.63	43.14	-15.99	27.15	43.50	-16.35	Peak	HORIZONTAL
2	509.18	25.44	-7.22	18.22	46.00	-27.78	Peak	HORIZONTAL
3	592.60	25.67	-5.56	20.11	46.00	-25.89	Peak	HORIZONTAL
4	677.96	25.20	-4.37	20.83	46.00	-25.17	Peak	HORIZONTAL
5	829.28	23.69	-1.70	21.99	46.00	-24.01	Peak	HORIZONTAL
6	941.80	23.89	0.30	24.19	46.00	-21.81	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 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 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 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH Mid
Fundamental Frequency 2441MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	106.63	45.07	-15.99	29.08	43.50	-14.42	Peak	VERTICAL
2	411.21	24.47	-8.77	15.70	46.00	-30.30	Peak	VERTICAL
3	537.31	24.68	-6.74	17.94	46.00	-28.06	Peak	VERTICAL
4	758.47	24.24	-2.72	21.52	46.00	-24.48	Peak	VERTICAL
5	903.97	24.91	-0.42	24.49	46.00	-21.51	Peak	VERTICAL
6	970.90	24.28	0.65	24.93	54.00	-29.07	Peak	VERTICAL
1	106.63	43.89	-15.99	27.90	43.50	-15.60	Peak	HORIZONTAL
2	462.62	25.01	-7.77	17.24	46.00	-28.76	Peak	HORIZONTAL
3	628.49	24.57	-5.06	19.51	46.00	-26.49	Peak	HORIZONTAL
4	762.35	24.37	-2.67	21.70	46.00	-24.30	Peak	HORIZONTAL
5	917.55	23.79	-0.16	23.63	46.00	-22.37	Peak	HORIZONTAL
6	990.30	24.57	0.82	25.39	54.00	-28.61	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 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 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 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH High
Fundamental Frequency 2480MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	96.93	40.80	-17.59	23.21	43.50	-20.29	Peak	VERTICAL
2	106.63	45.83	-15.99	29.84	43.50	-13.66	Peak	VERTICAL
3	604.24	25.45	-5.34	20.11	46.00	-25.89	Peak	VERTICAL
4	733.25	24.88	-3.22	21.66	46.00	-24.34	Peak	VERTICAL
5	909.79	24.66	-0.31	24.35	46.00	-21.65	Peak	VERTICAL
6	983.51	23.89	0.76	24.65	54.00	-29.35	Peak	VERTICAL
1	106.63	43.51	-15.99	27.52	43.50	-15.98	Peak	HORIZONTAL
2	549.92	25.37	-6.53	18.84	46.00	-27.16	Peak	HORIZONTAL
3	703.18	25.07	-3.96	21.11	46.00	-24.89	Peak	HORIZONTAL
4	751.68	25.20	-2.80	22.40	46.00	-23.60	Peak	HORIZONTAL
5	878.75	24.04	-0.86	23.18	46.00	-22.82	Peak	HORIZONTAL
6	977.69	23.84	0.71	24.55	54.00	-29.45	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 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 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 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode TX CH Low
Fundamental Frequency 2402 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4804.00	39.96	-3.29	36.67	74.00	-37.33	Peak	VERTICAL
2	7206.00	37.97	4.00	41.97	74.00	-32.03	Peak	VERTICAL
1	4804.00	39.86	-3.29	36.57	74.00	-37.43	Peak	HORIZONTAL
2	7206.00	36.21	4.00	40.21	74.00	-33.79	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 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 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.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 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	2015/10/29
Fundamental Frequency	2441 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	4882.00	38.73	-3.11	35.62	74.00	-38.38	Peak	VERTICAL
2	7323.00	36.41	4.21	40.62	74.00	-33.38	Peak	VERTICAL
1	4882.00	39.07	-3.11	35.96	74.00	-38.04	Peak	HORIZONTAL
2	7323.00	36.58	4.21	40.79	74.00	-33.21	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 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 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.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 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
Fundamental Frequency 2480 MHz
Temperature 25

Test Date 2015/10/29
Test By Dino
Humidity 60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	4960.00	37.86	-2.94	34.92	74.00	-39.08	Peak	VERTICAL
2	7440.00	35.91	4.42	40.33	74.00	-33.67	Peak	VERTICAL
1	4960.00	37.61	-2.94	34.67	74.00	-39.33	Peak	HORIZONTAL
2	7440.00	36.27	4.42	40.69	74.00	-33.31	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 "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- 4 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.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

8. ANTENNA REQUIREMENT

8.1. Standard Applicable:

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

And according to §15.247(c), if transmitting antennas of directional gain greater than 6dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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).

8.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is 1.34dBi, and the antenna type is printed antenna which is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.