TEST REPORT

of

FCC Part 15 Subpart C

Full Modular Approval

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

Product :	**Bluetooth Low Energy module**
Brand:	**N/A**
Model:	**ISBLE1810-X52**
Model Difference:	**N/A**
FCC ID:	**2AI2V-ISBLE1810X52**
FCC Rule Part:	**§15.247, Cat: DTS**
Applicant:	**iSenseTek Technology Inc.**
Address:	**4F-1, No.15, Ln. 360, Sec. 1,Neihu Rd., Neihu Dist., Taipei , Taiwan**

Test Performed by:
International Standards Laboratory Corp.
<LT Lab.>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW0997; TAF: 0997

*Address:
No. 120, Lane 180, Hsin Ho Rd.
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Report No.: **ISL-16LR355FC-R1**
Issue Date : **2019/07/15**

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:	iSenseTek Technology Inc.
Product Description:	Bluetooth Low Energy module
Brand Name:	N/A
Model No.:	ISBLE1810-X52
Model Difference:	N/A
Module:	2AI2V-ISBLE1810X52
Date of test:	2019/06/17
Date of EUT Received:	2019/06/15

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 Corp.

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:	Barry Lee	***Date:***	2019/07/15
	Barry Lee / Senior Engineer		
Prepared By:	Gigi Yeh	***Date:***	2019/07/15
	Gigi Yeh / Senior Engineer		
Approved By:	Jerry Liu	***Date:***	2019/07/15
	Jerry Liu / Technical Manager		

Version

Version No.	Date	Description
00	2019/07/15	Initial creation of document

Uncertainty of Measurement

Description Of Test	Uncertainty
Conducted Emission (AC power line)	2.586 dB
Field Strength of Spurious Radiation	≤30MHz: 2.96dB 30-1GHz: 4.22 dB 1-40 GHz: 4.08 dB
Conducted Power	2.412 GHz: 1.30 dB 5.805 GHz: 1.55 dB
Power Density	2.412 GHz:1.30 dB 5.805 GHz: 1.67 dB
Frequency	0.0032%
Time	0.01%
DC Voltage	1%

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1 General Information

General:

Product Name	Bluetooth Low Energy module
Brand Name	N/A
Model Name	ISBLE1810-x52
Model Difference	N/A
Power Supply	3.0Vdc

RF spec.:

Frequency Range:	2402 – 2480MHz
Channel number:	40 channels, 2MHz step
Modulation type	Digital Modulation
Modulation type:	GFSK
Tune-up power	2.69 dBm
Power Tolerance:	+/- 1.0 dBm
Dwell Time:	N/A
Antenna Designation:	Fixed PCB Ant , 0.5dBi Ipex type detachable PIFA Antenna , 2.0 +/- 0.5 dBi Ipex type detachable PCB Antenna , 2.0 +/- 0.5 dBi Ipex type detachable Dipole Antenna , 4.5 +/- 0.5 dBi The antennas above comply with FCC 15.203 requirements.

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 for **FCC ID: 2AI2V-ISBLE1810X52** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: 558074 D01 15.247 Meas Guidance v05r02

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 Corp.**<LT 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 C63.10: 2013. FCC Registration Number is: 487532; Designation Number is: TW0997, Canada Registration Number: 4067B-4.

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 6 and RSS-Gen issue 5: 2018. Con-ducted 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 0.8/1.5 m 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 8 and 13 and Subclause 8.3.1.2 of ANSI C63.10: 2013.

2.4 Configuration of Tested System

Fig. 2-1 Configuration

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	KIT	NA	ISBLE1810-EV	NA	Non-shielded	Non-shielded
2	Adaptor	SONY	UCH-12	4017W28502646	shielding	shielding

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

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) (3),(4) RSS-247 issue 2,§5.4(4)	Peak Output Power/ EIRP	Compliant
§15.247(a)(2) RSS-247 issue 2, §5.2(1) RSS-Gen §6.6	6dB & 99% Power Bandwidth	N/A
§15.247(d) RSS-247 issue 2, §5.5	100 kHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d) RSS-247 issue 2, §5.5	Spurious Emission	Compliant
§15.247(e) RSS-247 issue 2, §5.2(2)	Peak Power Density	N/A
§15.203 RSS-GEN 8.3	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.

This is Class II PC case BT BLE mode: Channel low (2402MHz), mid (2442MHz) and high (2480MHz) are chosen for below testing.

1. RF Output power
2. Radiated transmitter spurious emissions for three type of new antenna.
3. Radiated spurious emissions of 100 kHz Bandwidth Of Frequency Band Edges for three type of new antenna.

5 Peak Output Power Measurement

5.1 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-247 issue 2,§5.4

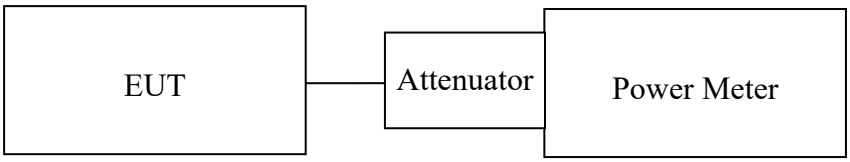
(4) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

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	10/28/2018	10/27/2019
Power Sensor 05	Anritsu	MA2411B	34NKF50	10/28/2018	10/27/2019
Power Sensor 06	DARE	RPR3006W	13I00030SNO33	01/11/2019	01/10/2020
Power Sensor 07	DARE	RPR3006W	13I00030SNO34	01/11/2019	01/10/2020
Temperature Chamber	KSON	THS-B4H100	2287	02/19/2019	02/18/2020
DC Power supply	ABM	8185D	N/A	01/10/2019	01/09/2020
AC Power supply	EXTECH	CFC105W	NA	12/25/2018	12/24/2019
Attenuator	Woken	Watt-65m3502	11051601	NA	NA
Splitter	MCLI	PS4-199	12465	12/26/2017	12/25/2019
Spectrum analyzer	keysight	N9010A	MY56070257	10/15/2018	10/14/2019
Spectrum analyzer	R&S	FSP40	100116	01/10/2019	01/09/2020
Test Sofware	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
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

5.5 Measurement Result:

Original Data

1Mbps

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.67	0.00	2.67	0.00185	1
Mid	2.71	0.00	2.71	0.00187	1
High	2.65	0.00	2.65	0.00184	1

2 Mbps

Frequency (MHz)	Peak Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
Low	2.33	0.00	2.33	0.00171	1
Mid	2.39	0.00	2.39	0.00173	1
High	2.29	0.00	2.29	0.00169	1

Offset: 0.5dB

New Data

Operation Mode:	**Normal Operation**	Test Date:	2019/06/17

Frequency (MHz)	Peak Reading Power (dBm)	Output Power (W)	Limit (W)
Low	2.66	0.00185	1
Mid	2.69	0.00186	1
High	2.64	0.00184	1

2 Mbps

Frequency (MHz)	Peak Reading Power (dBm)	Output Power (W)	Limit (W)
Low	2.32	0.00171	1
Mid	2.38	0.00173	1
High	2.29	0.00169	1

offset:0.5

6 Spurious Emission Test

6.1 Standard Applicable

According to §15.247(c), 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-247 issue 2, §5.5

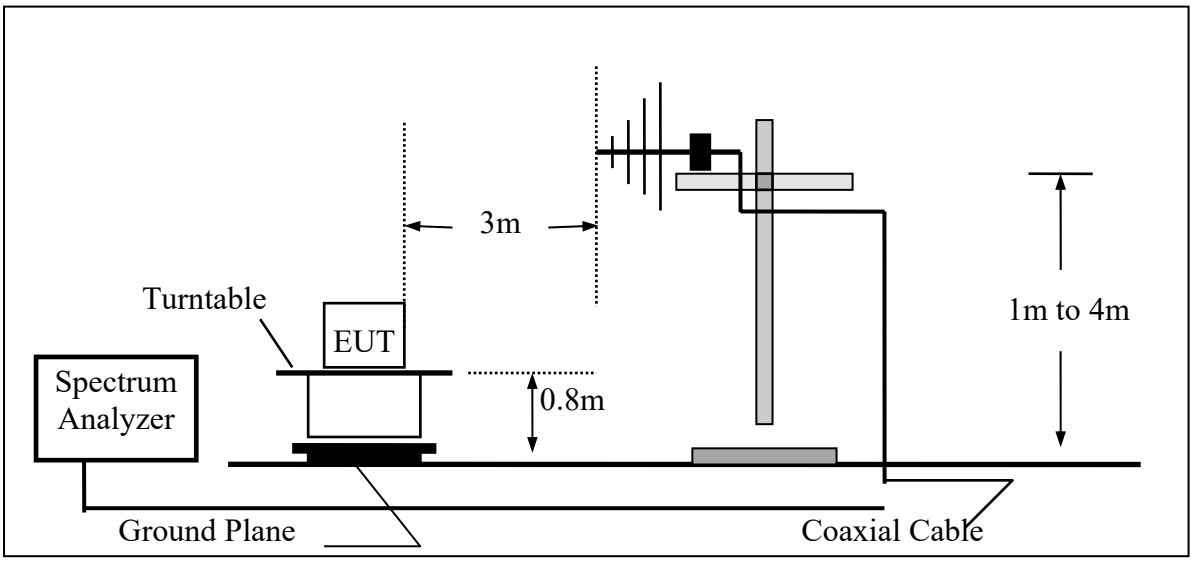
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB be-low that in the 100 kHz bandwidth within the band that contains the highest level of the de-sired power, based on either 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:

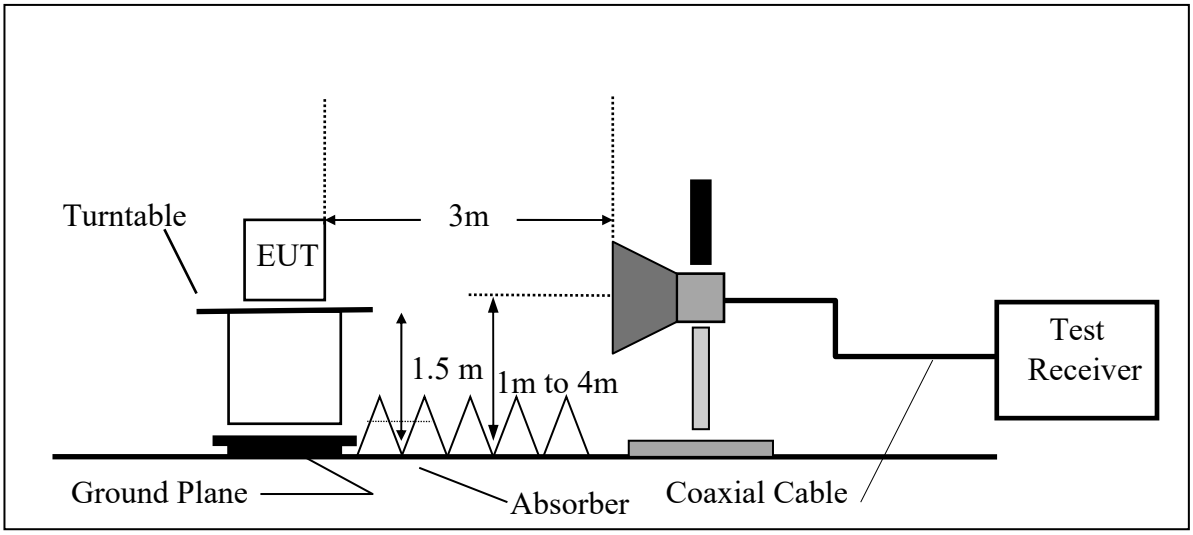
Chamber 19(966)					
Equipment Type	**MFR**	**Model Number**	**Serial Number**	**Last Cal.**	**Cal Due.**
Spectrum analyzer	R&S	FSP40	100116	01/10/2019	01/09/2020
EMI Receiver	R&S	ESR3	102461	08/08/2018	08/07/2019
Loop Antenna(9K-30M)	EM	EM-6879	271	06/06/2018	06/05/2020
Bilog Antenna (30M-1G)	SCHWARZBECK	VULB9168 w 5dB Att	736	01/29/2019	01/28/2020
Horn antenna (1G-18G)	SCHWARZBECK	9120D	9120D-1627	11/27/2017	11/26/2019
Horn antenna (18G-26G)	Com-power	AH-826	081001	11/21/2017	11/20/2019
Horn antenna (26G-40G)	Com-power	AH-640	100A	03/29/2019	03/28/2021
Preamplifier (9k-1000M)	HP	8447F	3113A06362	01/14/2019	01/13/2020
Preamplifier(1G-26G)	Agilent	8449B	3008A02471	10/29/2018	10/28/2019
Preamplifier (26G-40G)	MITEQ	JS4-26004000-27-5A	818471	05/06/2019	05/05/2020
RF Cable (9k-18G)	HUBER SUHNER	SUCOFLEX 104A	MY1397/4A	01/17/2019	01/16/2020
RF cable (18G~40G)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/12/2018	11/11/2019
Turn Table	MF	Turn Table-19	Turn Table-19	N/A	N/A
Mast Tower	MF	JSDES-15A	1308283	N/A	N/A
Controller	MF	MF-7802BS	MF780208460	N/A	N/A
AC power source	T-Power	TFC-1005	40006471	N/A	N/A
Signal Generator	Anritsu	MG3692A	20311	01/09/2019	01/08/2020
2.4G Filter	Micro-Tronics	Brm50702	76	12/25/2018	12/24/2019
Test Software	Audix	E3 Ver:6.12023	N/A	N/A	N/A

6.3 Test SET-UP:

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



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



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6.4 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.

Test receiver setting	:	Blew 1GHz
Detector	:	Average(9kHz – 90kHz, 110kHz – 90kHz), Quasi-Peak
Bandwidth	:	200Hz, 120kHz
Test spectrum setting	:	Above 1GHz
Peak	:	RBW=1MHz, VBW=3MHz,Sweep=auto
Average (for BLE)	:	RBW=1MHz, VBW=3kHz, Sweep=auto

Average Measurement Setting (VBW)

Mode	Duty Cycle (%)	T_{on} (us)	T_{off} (us)	$1/T_{on}$ (kHz)	Determined VBW Setting
Bluetooth LE	63.2	395	230	2.53	3kHz

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.

(Dipole antenna)

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	66.86	16.72	19.39	36.11	40.00	-3.89	Peak	VERTICAL
2	89.17	14.28	14.98	29.26	43.50	-14.24	Peak	VERTICAL
3	200.72	12.02	18.55	30.57	43.50	-12.93	Peak	VERTICAL
4	289.96	6.71	21.61	28.32	46.00	-17.68	Peak	VERTICAL
5	357.86	7.53	23.37	30.90	46.00	-15.10	Peak	VERTICAL
6	737.13	2.70	30.75	33.45	46.00	-12.55	Peak	VERTICAL
1	154.16	8.58	20.97	29.55	43.50	-13.95	Peak	HORIZONTAL
2	197.81	14.48	18.62	33.10	43.50	-10.40	Peak	HORIZONTAL
3	287.05	10.81	21.58	32.39	46.00	-13.61	Peak	HORIZONTAL
4	309.36	9.88	22.16	32.04	46.00	-13.96	Peak	HORIZONTAL
5	352.04	10.30	23.24	33.54	46.00	-12.46	Peak	HORIZONTAL
6	838.01	4.81	32.00	36.81	46.00	-9.19	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	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	32.91	8.99	20.04	29.03	40.00	-10.97	Peak	VERTICAL
2	41.64	7.24	21.03	28.27	40.00	-11.73	Peak	VERTICAL
3	86.26	11.61	15.17	26.78	40.00	-13.22	Peak	VERTICAL
4	193.93	11.69	18.76	30.45	43.50	-13.05	Peak	VERTICAL
5	874.87	3.79	32.33	36.12	46.00	-9.88	Peak	VERTICAL
6	962.17	3.62	33.53	37.15	54.00	-16.85	Peak	VERTICAL
1	148.34	7.61	20.79	28.40	43.50	-15.10	Peak	HORIZONTAL
2	191.02	13.51	18.87	32.38	43.50	-11.12	Peak	HORIZONTAL
3	234.67	8.52	19.69	28.21	46.00	-17.79	Peak	HORIZONTAL
4	255.04	10.15	20.47	30.62	46.00	-15.38	Peak	HORIZONTAL
5	298.69	10.91	21.90	32.81	46.00	-13.19	Peak	HORIZONTAL
6	339.43	9.73	23.05	32.78	46.00	-13.22	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	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	32.91	8.84	20.04	28.88	40.00	-11.12	Peak	VERTICAL
2	83.35	16.16	15.61	31.77	40.00	-8.23	Peak	VERTICAL
3	188.11	10.10	19.09	29.19	43.50	-14.31	Peak	VERTICAL
1	144.46	9.17	20.63	29.80	43.50	-13.70	Peak	HORIZONTAL
2	185.20	12.72	19.37	32.09	43.50	-11.41	Peak	HORIZONTAL
3	206.54	10.89	18.63	29.52	43.50	-13.98	Peak	HORIZONTAL
4	247.28	10.48	20.25	30.73	46.00	-15.27	Peak	HORIZONTAL
5	289.96	12.41	21.61	34.02	46.00	-11.98	Peak	HORIZONTAL
6	329.73	9.72	22.82	32.54	46.00	-13.46	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.

(PCB antenna)

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	80.44	17.14	16.25	33.39	40.00	-6.61	Peak	VERTICAL
2	183.26	9.17	19.56	28.73	43.50	-14.77	Peak	VERTICAL
3	203.63	10.11	18.59	28.70	43.50	-14.80	Peak	VERTICAL
4	243.40	6.85	20.16	27.01	46.00	-18.99	Peak	VERTICAL
5	486.87	4.09	26.26	30.35	46.00	-15.65	Peak	VERTICAL
6	869.05	4.09	32.26	36.35	46.00	-9.65	Peak	VERTICAL
1	159.98	6.96	21.11	28.07	43.50	-15.43	Peak	HORIZONTAL
2	200.72	13.75	18.55	32.30	43.50	-11.20	Peak	HORIZONTAL
3	240.49	12.00	20.09	32.09	46.00	-13.91	Peak	HORIZONTAL
4	281.23	11.11	21.50	32.61	46.00	-13.39	Peak	HORIZONTAL
5	301.60	10.95	21.98	32.93	46.00	-13.07	Peak	HORIZONTAL
6	321.97	12.50	22.57	35.07	46.00	-10.93	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	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	39.70	8.48	20.85	29.33	40.00	-10.67	Peak	VERTICAL
2	78.50	18.03	16.78	34.81	40.00	-5.19	Peak	VERTICAL
3	98.87	9.90	16.00	25.90	43.50	-17.60	Peak	VERTICAL
4	178.41	7.64	20.03	27.67	43.50	-15.83	Peak	VERTICAL
5	197.81	10.89	18.62	29.51	43.50	-13.99	Peak	VERTICAL
6	504.33	4.55	26.59	31.14	46.00	-14.86	Peak	VERTICAL
1	194.90	13.80	18.72	32.52	43.50	-10.98	Peak	HORIZONTAL
2	234.67	9.85	19.69	29.54	46.00	-16.46	Peak	HORIZONTAL
3	273.47	8.04	21.14	29.18	46.00	-16.82	Peak	HORIZONTAL
4	293.84	10.47	21.74	32.21	46.00	-13.79	Peak	HORIZONTAL
5	313.24	13.19	22.28	35.47	46.00	-10.53	Peak	HORIZONTAL
6	562.53	4.74	27.73	32.47	46.00	-13.53	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	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	31.94	8.45	20.03	28.48	40.00	-11.52	Peak	VERTICAL
2	78.50	13.61	16.78	30.39	40.00	-9.61	Peak	VERTICAL
3	94.02	11.55	15.20	26.75	43.50	-16.75	Peak	VERTICAL
4	188.11	8.43	19.09	27.52	43.50	-15.98	Peak	VERTICAL
5	595.51	4.29	28.65	32.94	46.00	-13.06	Peak	VERTICAL
6	724.52	4.05	30.41	34.46	46.00	-11.54	Peak	VERTICAL
1	155.13	6.46	20.99	27.45	43.50	-16.05	Peak	HORIZONTAL
2	186.17	11.01	19.28	30.29	43.50	-13.21	Peak	HORIZONTAL
3	201.69	10.16	18.57	28.73	43.50	-14.77	Peak	HORIZONTAL
4	295.78	8.53	21.80	30.33	46.00	-15.67	Peak	HORIZONTAL
5	311.30	11.35	22.22	33.57	46.00	-12.43	Peak	HORIZONTAL
6	373.38	8.95	23.92	32.87	46.00	-13.13	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.

(PIFA antenna)

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	33.88	9.39	20.14	29.53	40.00	-10.47	Peak	VERTICAL
2	76.56	14.00	17.30	31.30	40.00	-8.70	Peak	VERTICAL
3	197.81	9.91	18.62	28.53	43.50	-14.97	Peak	VERTICAL
4	365.62	6.84	23.65	30.49	46.00	-15.51	Peak	VERTICAL
5	543.13	4.30	27.57	31.87	46.00	-14.13	Peak	VERTICAL
6	887.48	4.36	32.47	36.83	46.00	-9.17	Peak	VERTICAL
1	150.28	6.28	20.88	27.16	43.50	-16.34	Peak	HORIZONTAL
2	195.87	10.93	18.70	29.63	43.50	-13.87	Peak	HORIZONTAL
3	241.46	8.57	20.11	28.68	46.00	-17.32	Peak	HORIZONTAL
4	302.57	11.55	22.00	33.55	46.00	-12.45	Peak	HORIZONTAL
5	362.71	9.03	23.53	32.56	46.00	-13.44	Peak	HORIZONTAL
6	855.47	4.18	32.10	36.28	46.00	-9.72	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	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	33.88	9.10	20.14	29.24	40.00	-10.76	Peak	VERTICAL
2	74.62	13.44	17.65	31.09	40.00	-8.91	Peak	VERTICAL
3	89.17	10.54	14.98	25.52	43.50	-17.98	Peak	VERTICAL
4	193.93	8.45	18.76	27.21	43.50	-16.29	Peak	VERTICAL
5	425.76	2.94	25.15	28.09	46.00	-17.91	Peak	VERTICAL
6	831.22	4.12	31.92	36.04	46.00	-9.96	Peak	VERTICAL
1	191.99	11.02	18.84	29.86	43.50	-13.64	Peak	HORIZONTAL
2	206.54	8.35	18.63	26.98	43.50	-16.52	Peak	HORIZONTAL
3	236.61	7.93	19.82	27.75	46.00	-18.25	Peak	HORIZONTAL
4	265.71	7.79	20.82	28.61	46.00	-17.39	Peak	HORIZONTAL
5	296.75	11.55	21.83	33.38	46.00	-12.62	Peak	HORIZONTAL
6	737.13	4.41	30.75	35.16	46.00	-10.84	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	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	32.91	8.84	20.04	28.88	40.00	-11.12	Peak	VERTICAL
2	83.35	16.16	15.61	31.77	40.00	-8.23	Peak	VERTICAL
3	188.11	10.10	19.09	29.19	43.50	-14.31	Peak	VERTICAL
1	144.46	9.17	20.63	29.80	43.50	-13.70	Peak	HORIZONTAL
2	185.20	12.72	19.37	32.09	43.50	-11.41	Peak	HORIZONTAL
3	206.54	10.89	18.63	29.52	43.50	-13.98	Peak	HORIZONTAL
4	247.28	10.48	20.25	30.73	46.00	-15.27	Peak	HORIZONTAL
5	289.96	12.41	21.61	34.02	46.00	-11.98	Peak	HORIZONTAL
6	329.73	9.72	22.82	32.54	46.00	-13.46	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.

(Dipole antenna)

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4804.00	47.42	-9.41	38.01	74.00	-35.99	Peak	VERTICAL
2	7206.00	51.85	-1.83	50.02	74.00	-23.98	Peak	VERTICAL
1	4804.00	45.46	-9.41	36.05	74.00	-37.95	Peak	HORIZONTAL
2	7206.00	52.95	-1.83	51.12	74.00	-22.88	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4882.00	47.75	-9.21	38.54	74.00	-35.46	Peak	VERTICAL
2	7323.00	56.68	-1.75	54.93	74.00	-19.07	Peak	VERTICAL
1	4882.00	46.87	-9.21	37.66	74.00	-36.34	Peak	HORIZONTAL
2	7323.00	55.17	-1.75	53.42	74.00	-20.58	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4960.00	49.77	-9.01	40.76	74.00	-33.24	Peak	VERTICAL
2	7440.00	53.59	-1.75	51.84	74.00	-22.16	Peak	VERTICAL
1	4960.00	46.78	-9.01	37.77	74.00	-36.23	Peak	HORIZONTAL
2	7440.00	53.12	-1.75	51.37	74.00	-22.63	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= 3kHz, Sweep time= 200 ms.

(PCB antenna)

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4804.00	48.33	-9.41	38.92	74.00	-35.08	Peak	VERTICAL
2	7206.00	58.83	-1.83	57.00	74.00	-17.00	Peak	VERTICAL
1	4804.00	48.02	-9.41	38.61	74.00	-35.39	Peak	HORIZONTAL
2	7206.00	53.13	-1.83	51.30	54.00	-2.70	Average	HORIZONTAL
3	7206.00	58.13	-1.83	56.30	74.00	-17.70	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4882.00	47.81	-9.21	38.60	74.00	-35.40	Peak	VERTICAL
2	7328.00	53.19	-1.75	51.44	54.00	-2.56	Average	VERTICAL
3	7328.00	59.08	-1.75	57.33	74.00	-16.67	Peak	VERTICAL
1	4882.00	46.48	-9.21	37.27	74.00	-36.73	Peak	HORIZONTAL
2	7323.00	53.15	-1.75	51.40	54.00	-2.60	Average	HORIZONTAL
3	7323.00	60.09	-1.75	58.34	74.00	-15.66	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4960.00	46.09	-9.01	37.08	74.00	-36.92	Peak	VERTICAL
2	7440.00	45.99	-1.75	44.24	74.00	-29.76	Peak	VERTICAL
1	4960.00	44.85	-9.01	35.84	74.00	-38.16	Peak	HORIZONTAL
2	7440.00	46.81	-1.75	45.06	74.00	-28.94	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= 3kHz, Sweep time= 200 ms.

(PIFA antenna)

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4804.00	48.21	-9.41	38.80	74.00	-35.20	Peak	VERTICAL
2	7206.00	48.27	-1.83	46.44	54.00	-7.56	Average	VERTICAL
3	7206.00	56.35	-1.83	54.52	74.00	-19.48	Peak	VERTICAL
1	4804.00	49.07	-9.41	39.66	74.00	-34.34	Peak	HORIZONTAL
2	7206.00	50.42	-1.83	48.59	54.00	-5.41	Average	HORIZONTAL
3	7206.00	58.21	-1.83	56.38	74.00	-17.62	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH Mid	Test Date	2019/06/17
Fundamental Frequency	2442MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4882.00	47.39	-9.21	38.18	74.00	-35.82	Peak	VERTICAL
2	7323.00	53.50	-1.75	51.75	54.00	-2.25	Average	VERTICAL
3	7323.00	58.23	-1.75	56.48	74.00	-17.52	Peak	VERTICAL
1	4882.00	46.96	-9.21	37.75	74.00	-36.25	Peak	HORIZONTAL
2	7323.00	54.16	-1.75	52.41	54.00	-1.59	Average	HORIZONTAL
3	7323.00	57.79	-1.75	56.04	74.00	-17.96	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= 3kHz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	TX CH High	Test Date	2019/06/17
Fundamental Frequency	2480MHz	Test By	Barry
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	4960.00	45.82	-9.01	36.81	74.00	-37.19	Peak	VERTICAL
2	7440.00	52.46	-1.75	50.71	54.00	-3.29	Average	VERTICAL
3	7440.00	56.86	-1.75	55.11	74.00	-18.89	Peak	VERTICAL
1	4960.00	47.10	-9.01	38.09	74.00	-35.91	Peak	HORIZONTAL
2	7440.00	53.16	-1.75	51.41	54.00	-2.59	Average	HORIZONTAL
3	7440.00	57.31	-1.75	55.56	74.00	-18.44	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= 3kHz, Sweep time= 200 ms.

7 100kHz Bandwidth of Band Edges Measurement

7.1 Standard Applicable:

According to §15.247(c), 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-247 issue 2, §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.

7.2 Measurement Equipment Used:

Chamber 19(966)					
Equipment Type	**MFR**	**Model Number**	**Serial Number**	**Last Cal.**	**Cal Due.**
Spectrum analyzer	R&S	FSP40	100116	01/10/2019	01/09/2020
EMI Receiver	R&S	ESR3	102461	08/08/2018	08/07/2019
Loop Antenna(9K-30M)	EM	EM-6879	271	06/06/2018	06/05/2020
Bilog Antenna (30M-1G)	SCHWARZBECK	VULB9168 w 5dB Att	736	01/29/2019	01/28/2020
Horn antenna (1G-18G)	SCHWARZBECK	9120D	9120D-1627	11/27/2017	11/26/2019
Horn antenna (18G-26G)	Com-power	AH-826	081001	11/21/2017	11/20/2019
Horn antenna (26G-40G)	Com-power	AH-640	100A	03/29/2019	03/28/2021
Preamplifier (9k-1000M)	HP	8447F	3113A06362	01/14/2019	01/13/2020
Preamplifier(1G-26G)	Agilent	8449B	3008A02471	10/29/2018	10/28/2019
Preamplifier (26G-40G)	MITEQ	JS4-26004000-27-5A	818471	05/06/2019	05/05/2020
RF Cable (9k-18G)	HUBER SUHNER	SUCOFLEX 104A	MY1397/4A	01/17/2019	01/16/2020
RF cable (18G~40G)	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	11/12/2018	11/11/2019
Turn Table	MF	Turn Table-19	Turn Table-19	N/A	N/A
Mast Tower	MF	JSDES-15A	1308283	N/A	N/A
Controller	MF	MF-7802BS	MF780208460	N/A	N/A
AC power source	T-Power	TFC-1005	40006471	N/A	N/A
Signal Generator	Anritsu	MG3692A	20311	01/09/2019	01/08/2020
2.4G Filter	Micro-Tronics	Brm50702	76	12/25/2018	12/24/2019
Test Software	Audix	E3 Ver:6.12023	N/A	N/A	N/A

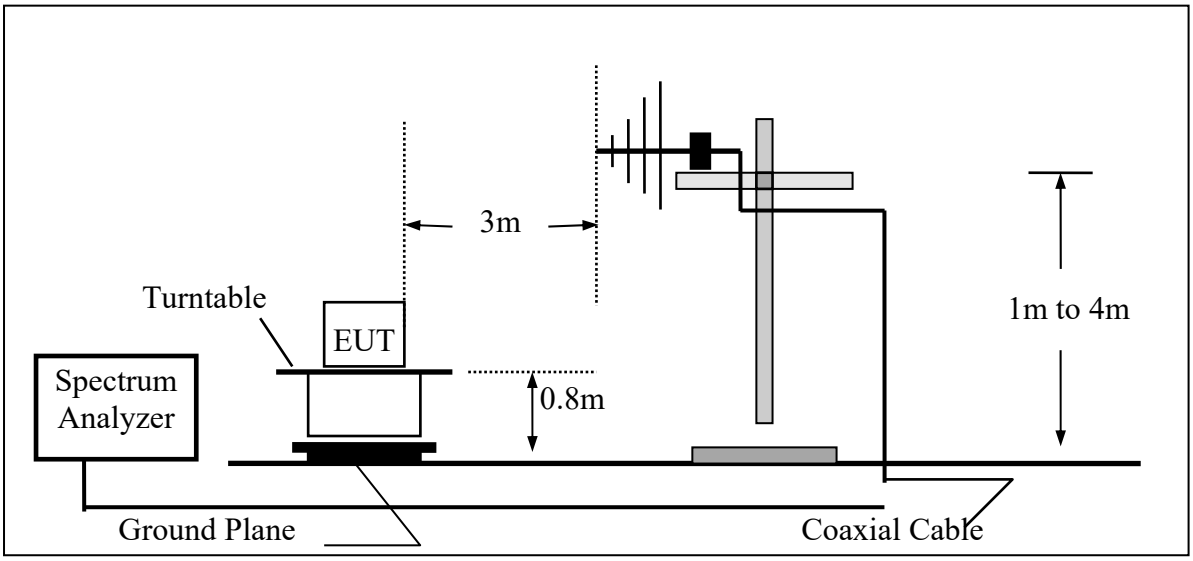
7.3 Test SET-UP:

7.3.1 Conducted Emission at antenna port:

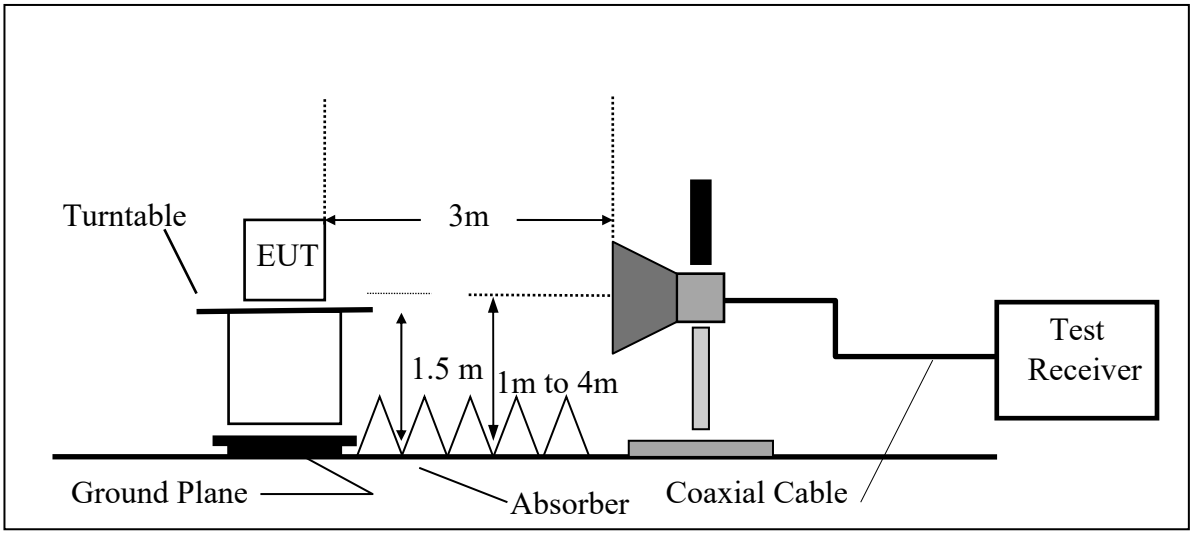
Refer to section 6.3 for details.

7.3.2 Radiated emission:

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



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



7.4 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.

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:

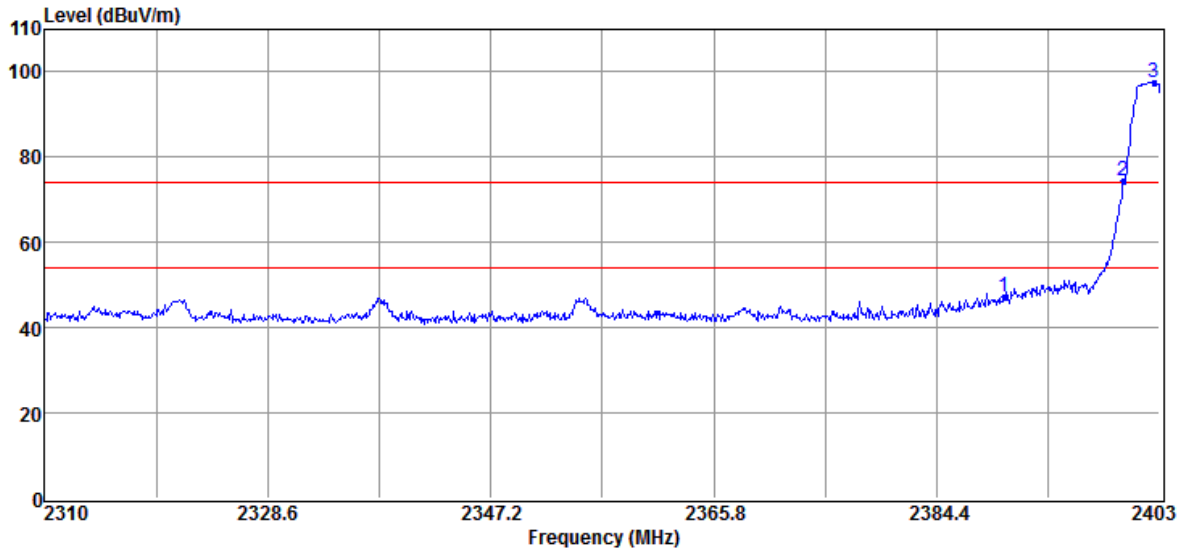
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

(Dipole Antenna)

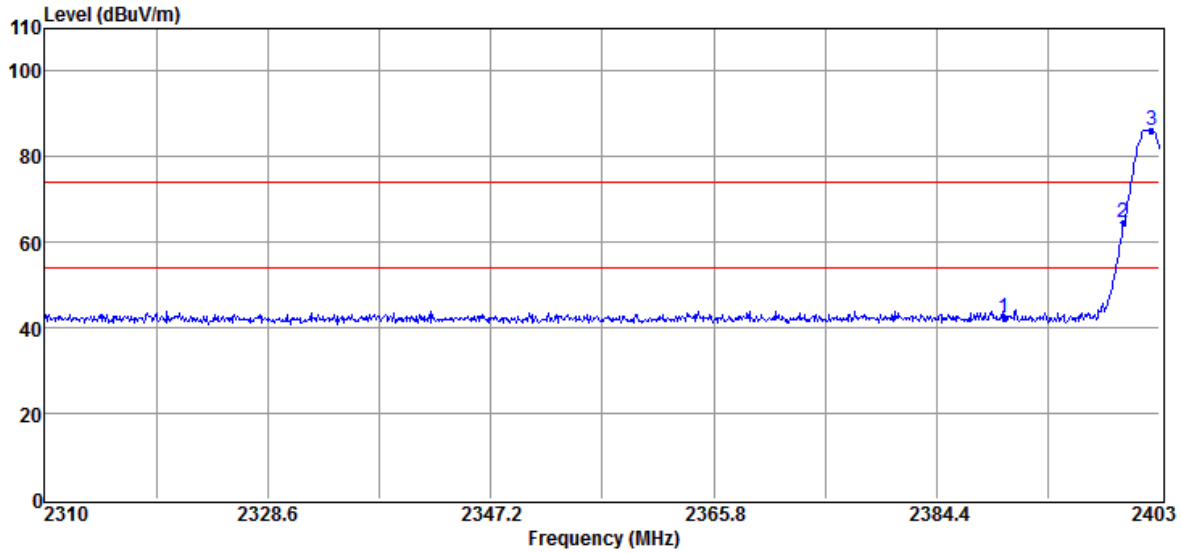
Radiated Emission:

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2390.00	62.97	-15.84	47.13	74.00	-26.87	Peak	VERTICAL
2	2400.00	90.18	-15.86	74.32	77.59	-3.27	Peak	VERTICAL
3	2402.54	113.45	-15.86	97.59	F	--	Peak	VERTICAL
1	2390.00	58.00	-15.84	42.16	74.00	-31.84	Peak	HORIZONTAL
2	2400.00	80.57	-15.86	64.71	66.3	-1.59	Peak	HORIZONTAL
3	2402.35	102.16	-15.86	86.30	F	--	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.

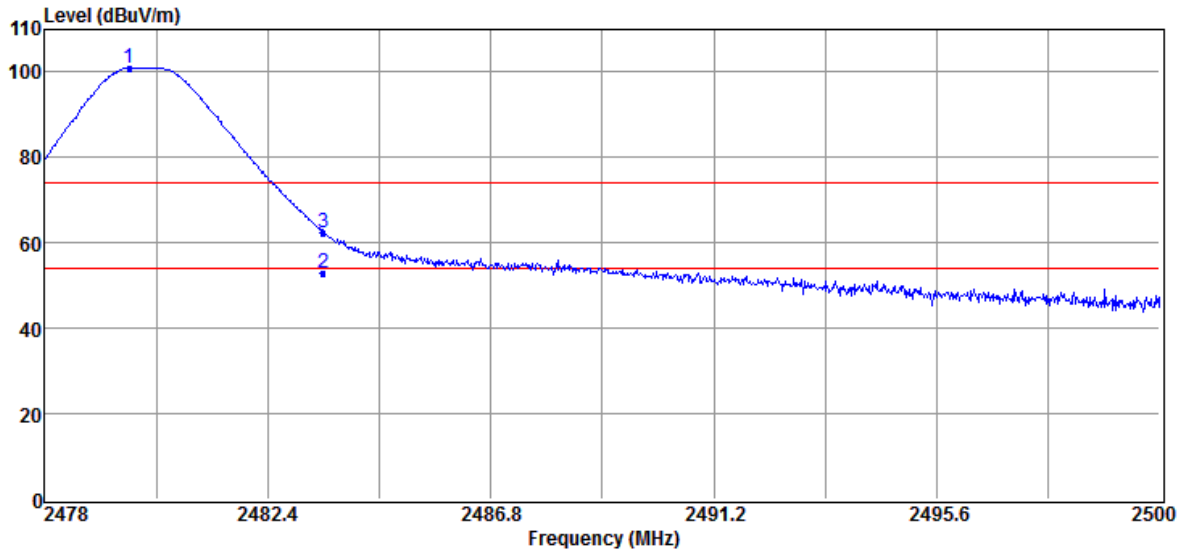
4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW=3kHz, Sweep time= 200 ms.

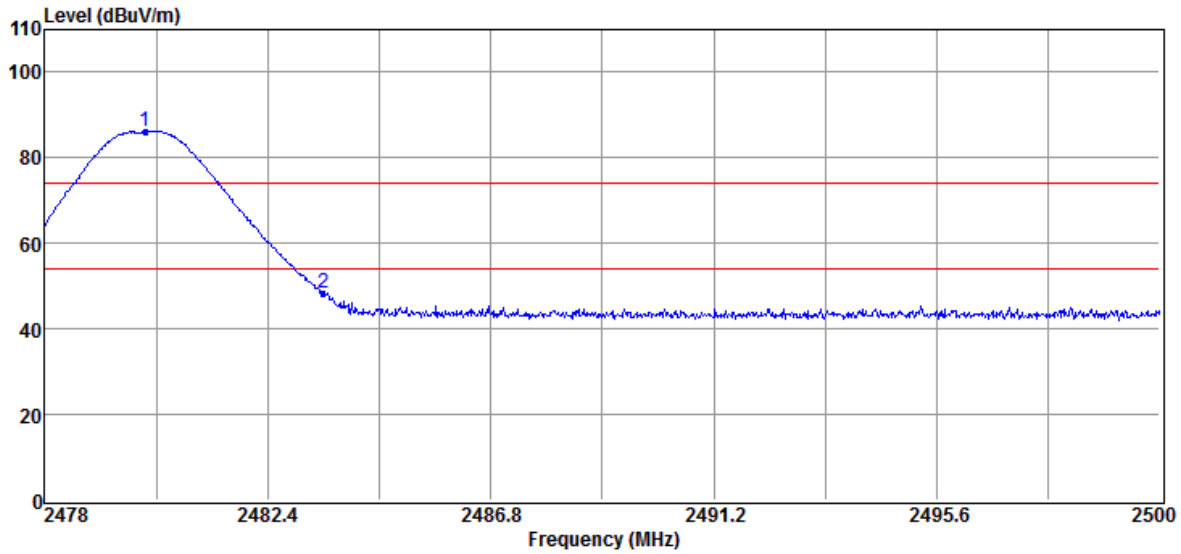
Note: "F" denotes fundamental frequency

Operation Mode	TX CH High	Test Date	2018/11/16
Fundamental Frequency	2480 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2479.67	116.89	-15.84	101.05	F	--	Peak	VERTICAL
2	2483.50	68.65	-15.84	52.81	54.00	-1.19	Average	VERTICAL
3	2483.50	78.36	-15.84	62.52	74.00	-11.48	Peak	VERTICAL
1	2479.98	102.00	-15.84	86.16	F	--	Peak	HORIZONTAL
2	2483.50	64.19	-15.84	48.35	74.00	-25.65	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= 3kHz, Sweep time= 200 ms.

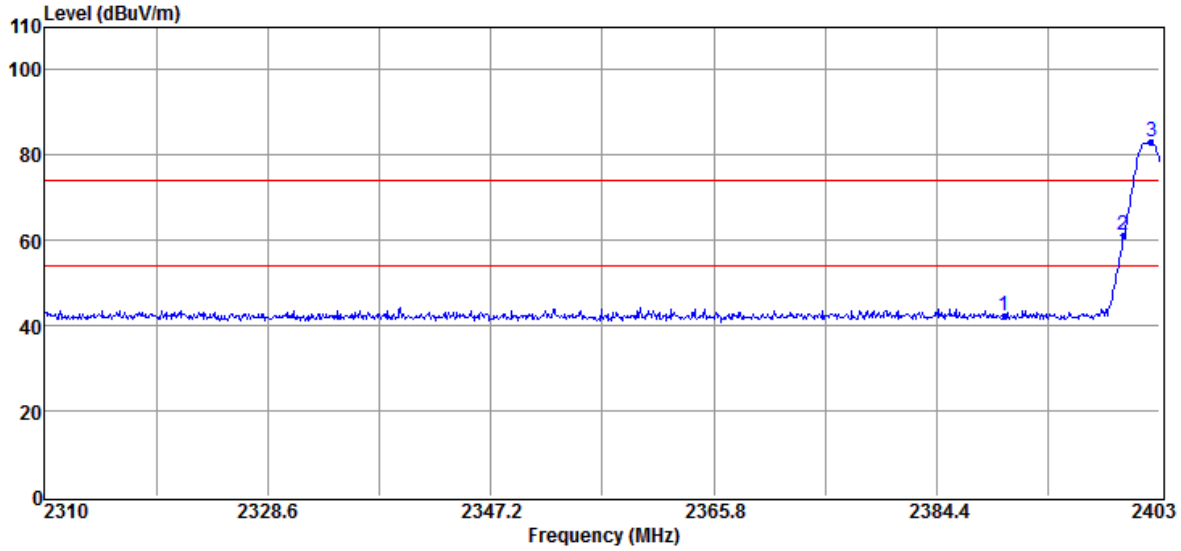
Note: "F" denotes fundamental frequency

(PCB Antenna)

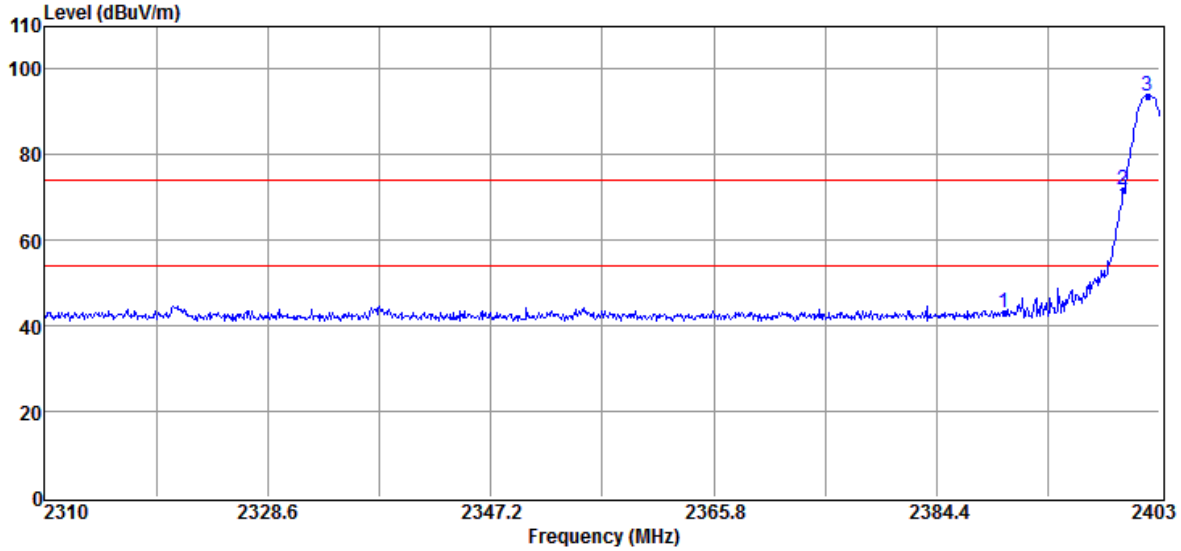
Radiated Emission:

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2390.00	58.19	-15.84	42.35	74.00	-31.65	Peak	VERTICAL
2	2400.00	77.28	-15.86	61.42	63.12	-1.7	Peak	VERTICAL
3	2402.35	98.98	-15.86	83.12	F	--	Peak	VERTICAL
1	2390.00	58.84	-15.84	43.00	74.00	-31.00	Peak	HORIZONTAL
2	2400.00	87.70	-15.86	71.84	73.86	-2.02	Peak	HORIZONTAL
3	2401.98	109.72	-15.86	93.86	F	--	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.

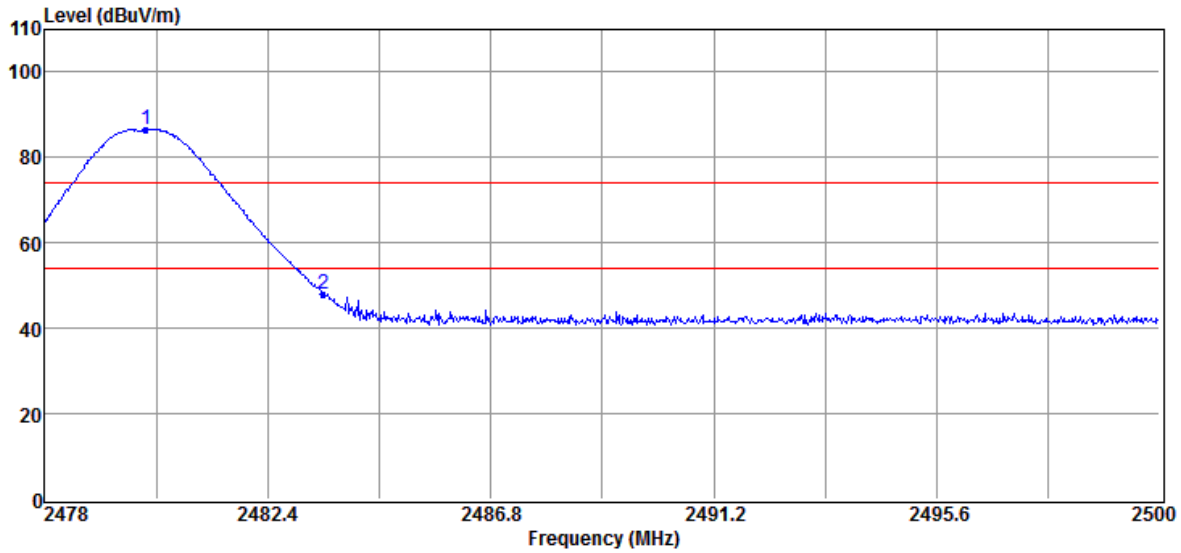
4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3kHz, Sweep time= 200 ms.

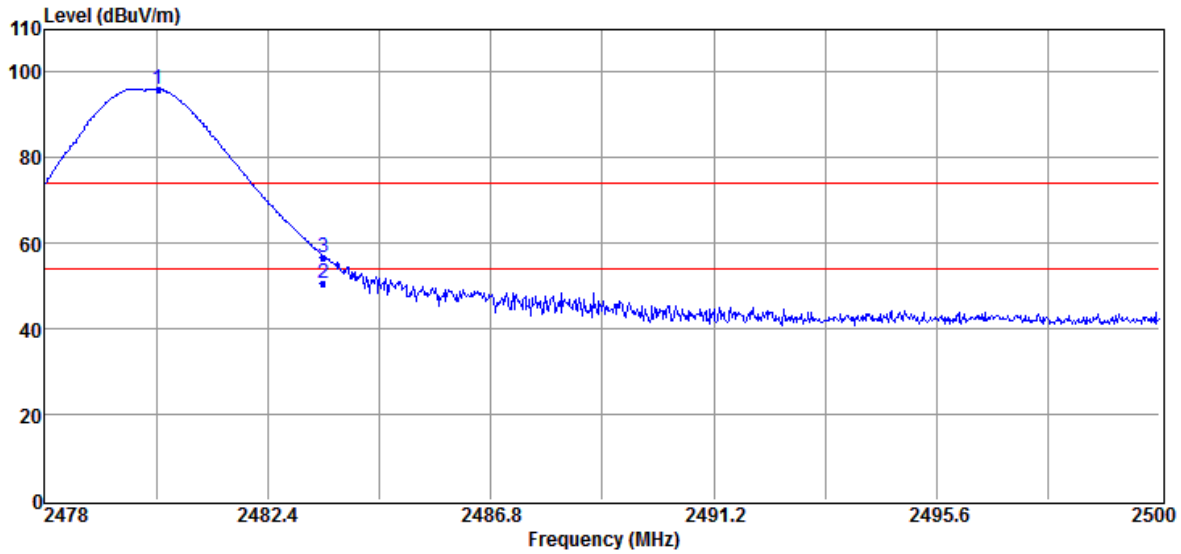
Note: "F" denotes fundamental frequency

Operation Mode	TX CH High	Test Date	2018/11/16
Fundamental Frequency	2480 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2480.00	102.34	-15.84	86.50	F	--	Peak	VERTICAL
2	2483.50	63.95	-15.84	48.11	74.00	-25.89	Peak	VERTICAL
1	2480.24	111.88	-15.84	96.04	F	--	Peak	HORIZONTAL
2	2483.50	66.51	-15.84	50.67	54.00	-3.33	Average	HORIZONTAL
3	2483.50	72.73	-15.84	56.89	74.00	-17.11	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= 3kHz, Sweep time= 200 ms.

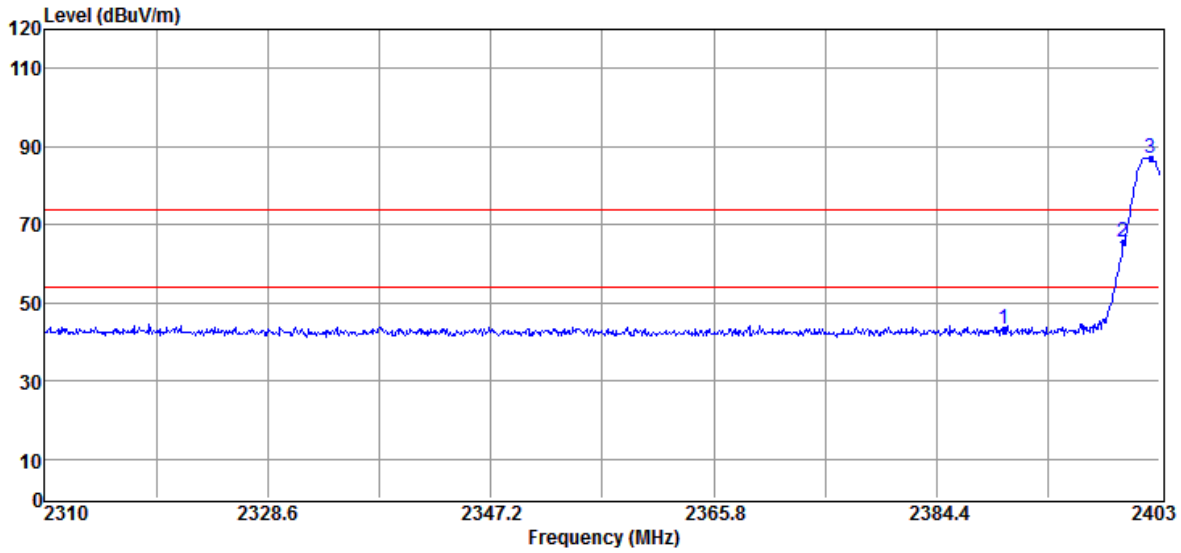
Note: "F" denotes fundamental frequency

(PIFA Antenna)

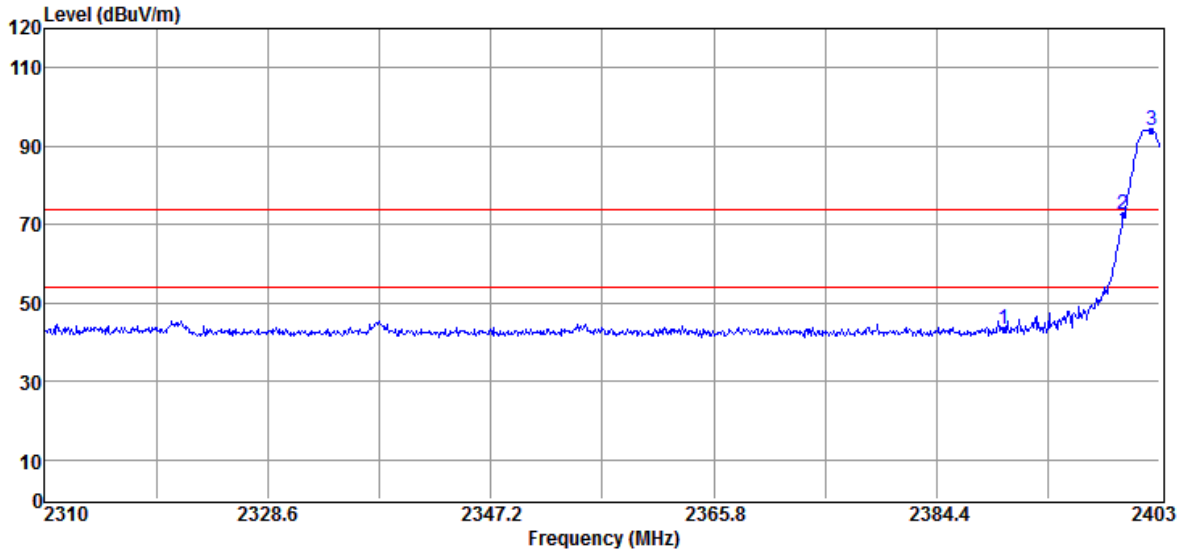
Radiated Emission:

Operation Mode	TX CH Low	Test Date	2019/06/17
Fundamental Frequency	2402 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2390.00	59.07	-15.84	43.23	74.00	-30.77	Peak	VERTICAL
2	2400.00	81.62	-15.86	65.76	67.17	-1.41	Peak	VERTICAL
3	2402.26	103.03	-15.86	87.17	F	--	Peak	VERTICAL
1	2390.00	59.20	-15.84	43.36	74.00	-30.64	Peak	HORIZONTAL
2	2400.00	88.39	-15.86	72.53	74.18	-1.65	Peak	HORIZONTAL
3	2402.35	110.04	-15.86	94.18	F	--	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.

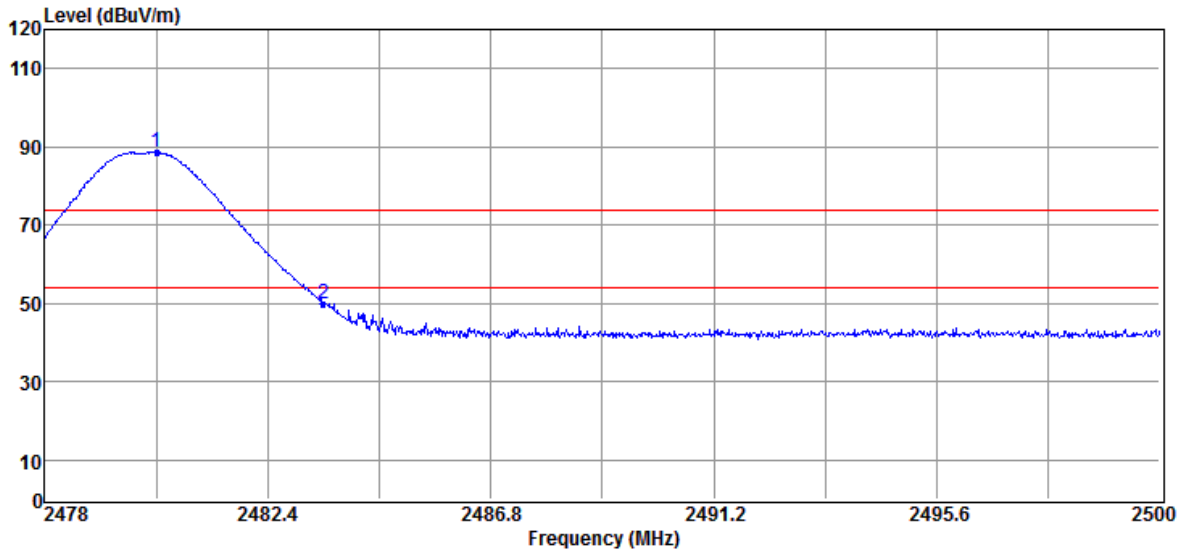
4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3kHz, Sweep time= 200 ms.

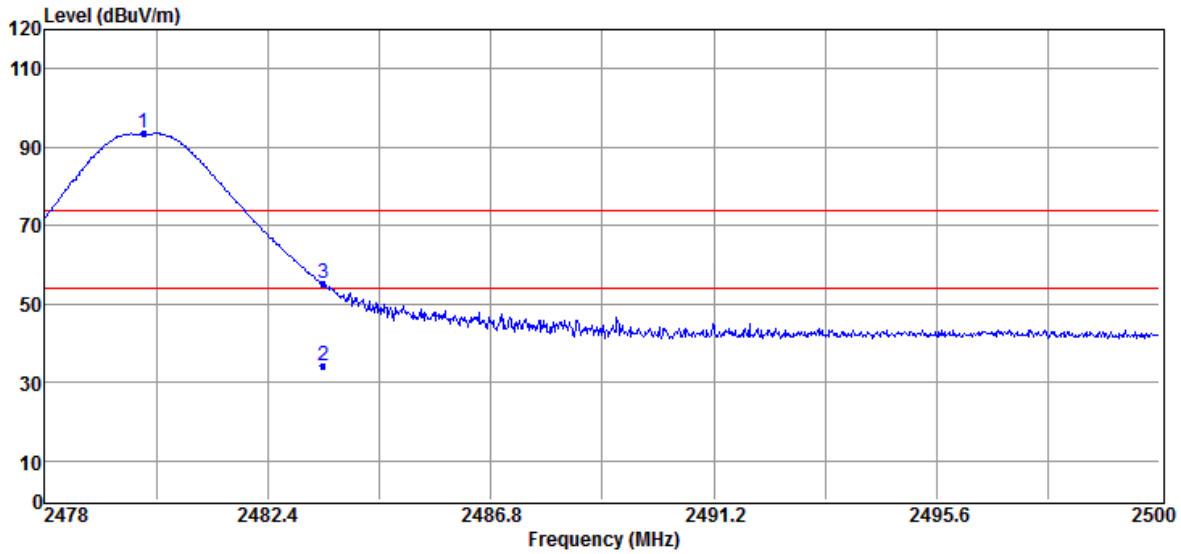
Note: "F" denotes fundamental frequency

Operation Mode	TX CH High	Test Date	2018/11/16
Fundamental Frequency	2480 MHz	Test By	Barry
Temperature	25 ℃	Humidity	60 %

VERTICAL:



HORIZONTAL:



No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol V/H
1	2480.20	104.38	-15.84	88.54	F	--	Peak	VERTICAL
2	2483.50	65.89	-15.84	50.05	74.00	-23.95	Peak	VERTICAL
1	2479.96	109.31	-15.84	93.47	F	--	Peak	HORIZONTAL
2	2483.50	50.15	-15.84	34.31	54.00	-19.69	Average	HORIZONTAL
3	2483.50	70.91	-15.84	55.07	74.00	-18.93	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.

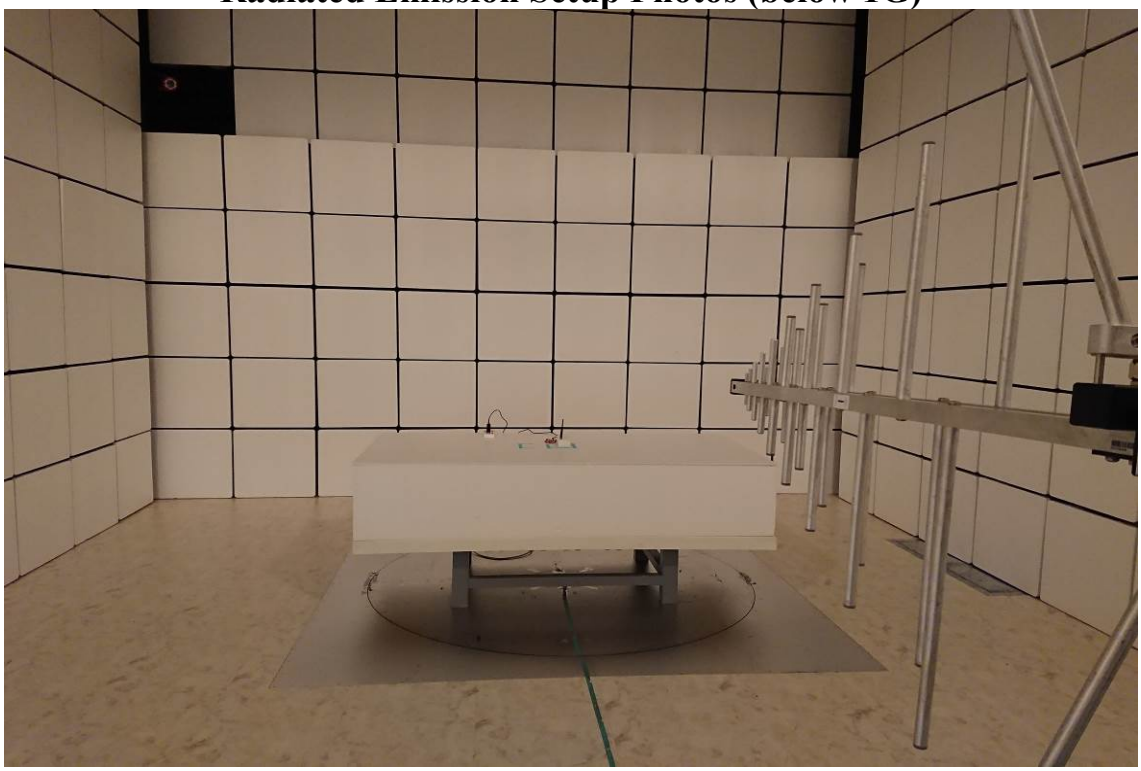
4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

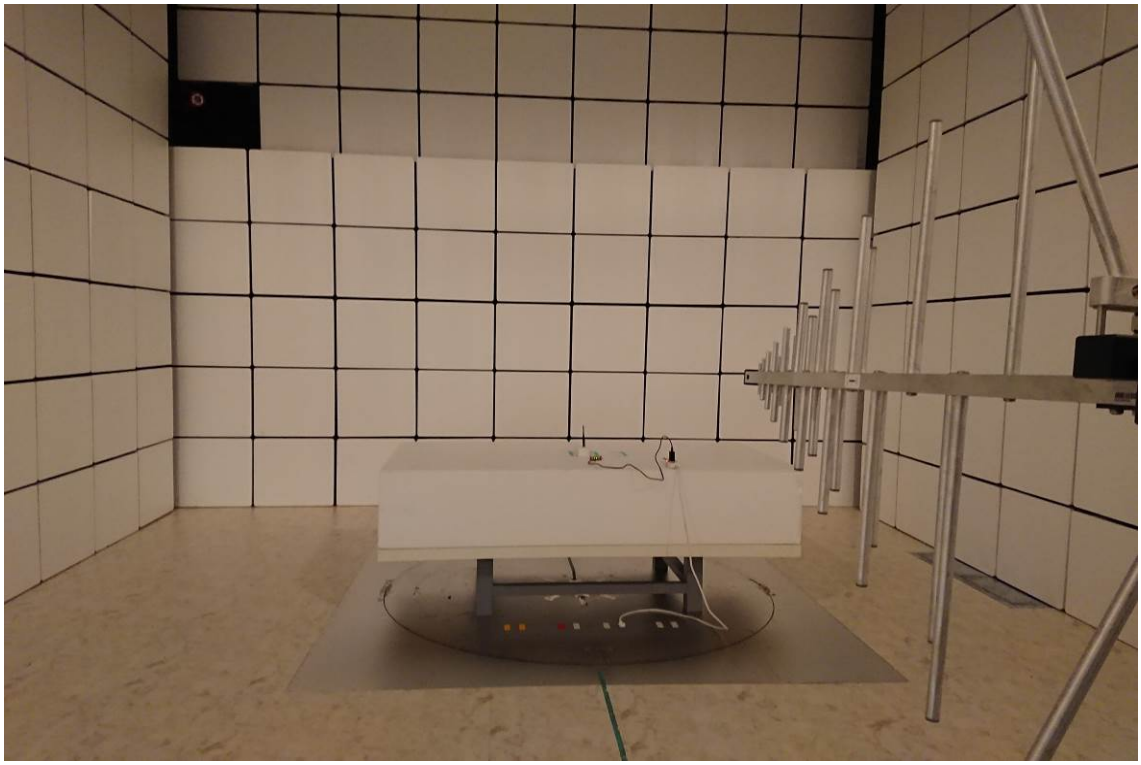
5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3kHz, Sweep time= 200 ms.

Note: "F" denotes fundamental frequency

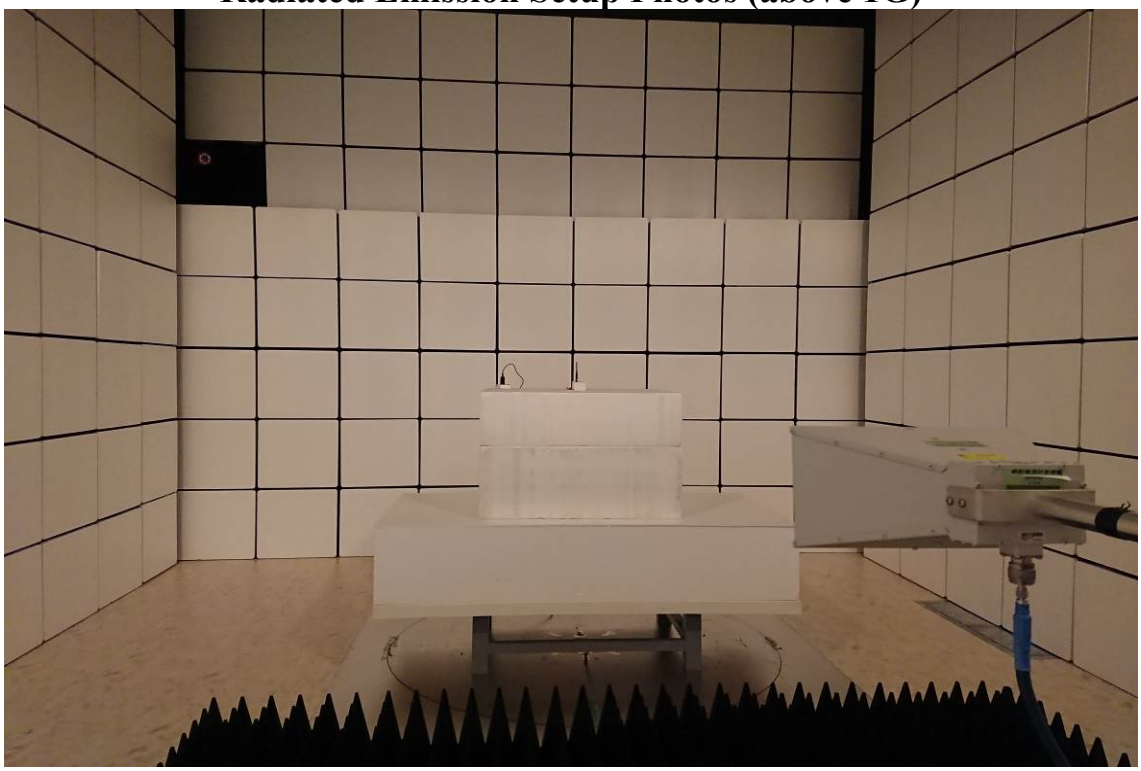
Photographs of Set Up

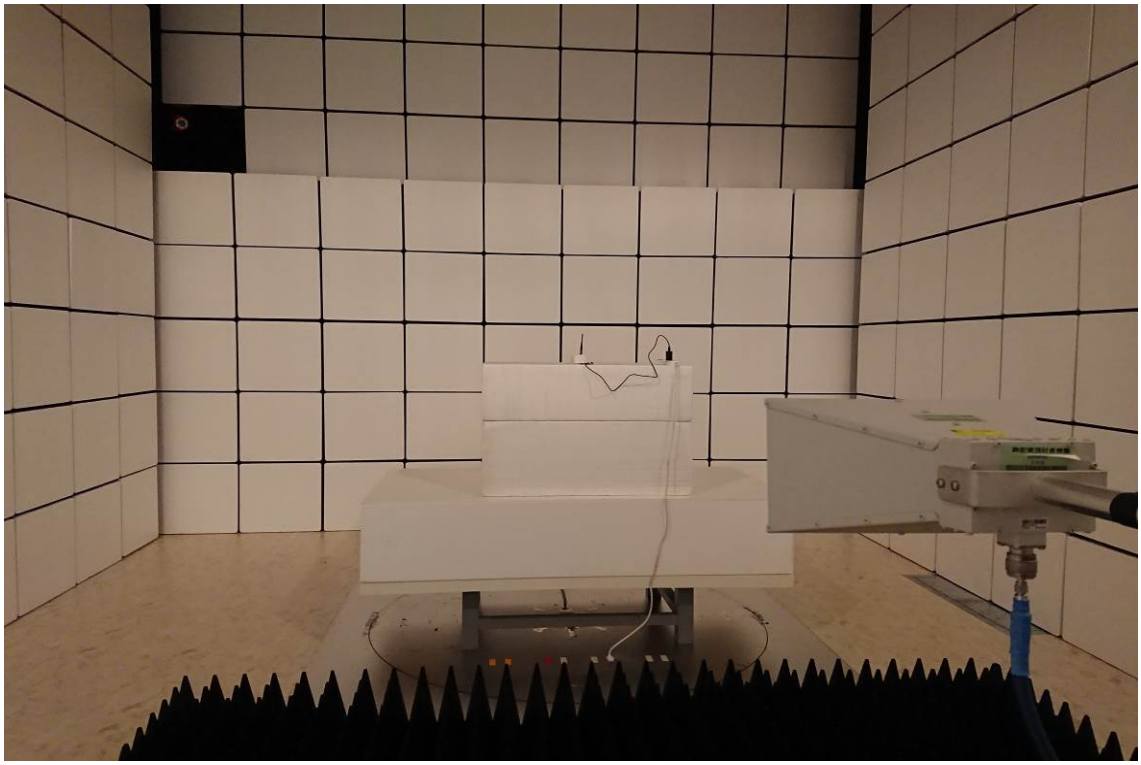
Dipole Antenna
Radiated Emission Setup Photos (below 1G)

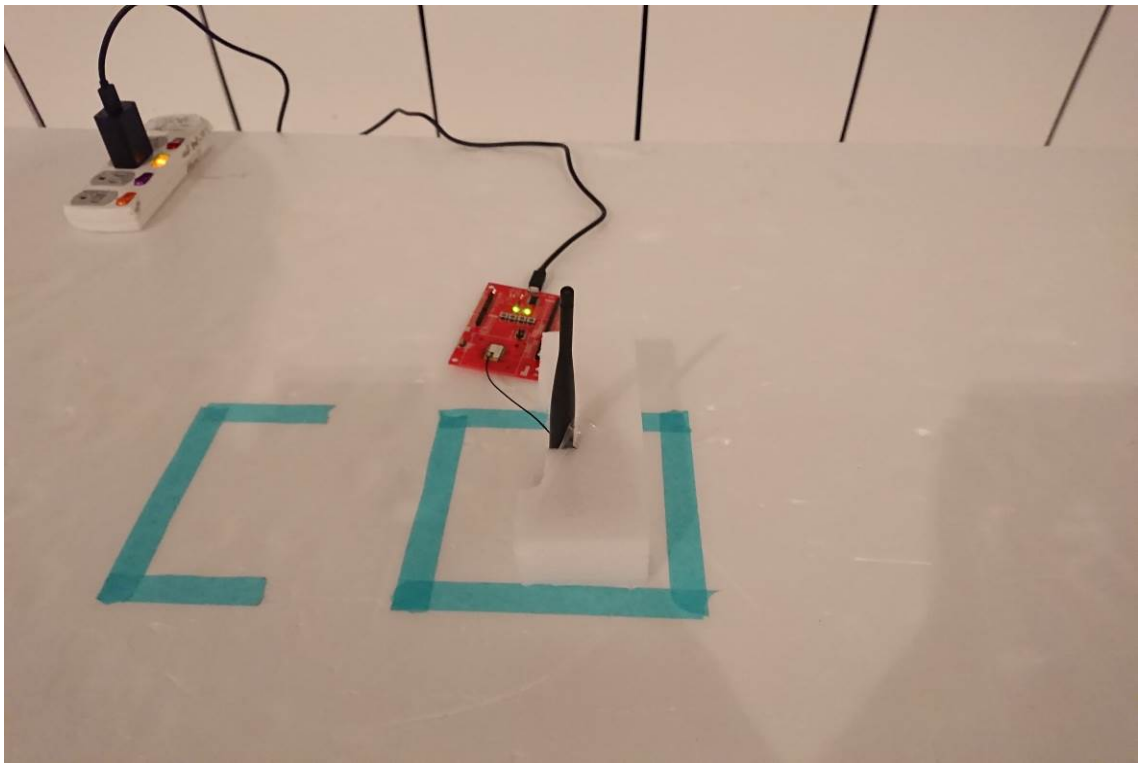




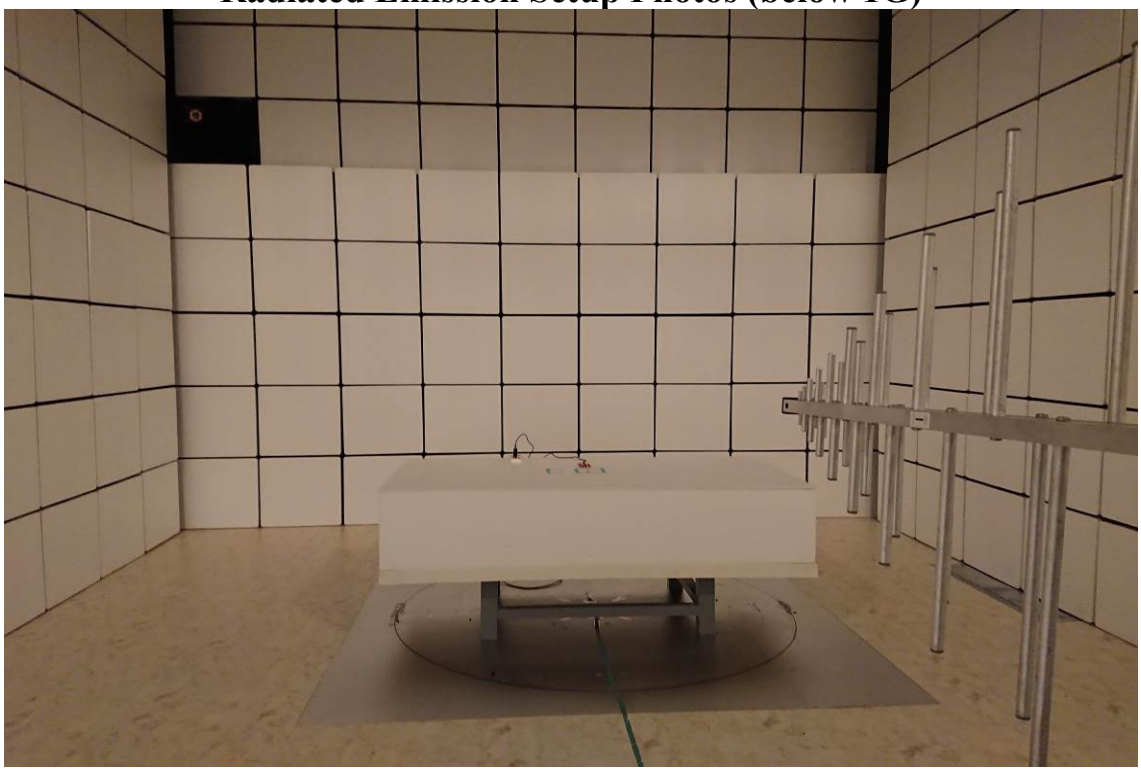
Radiated Emission Setup Photos (above 1G)

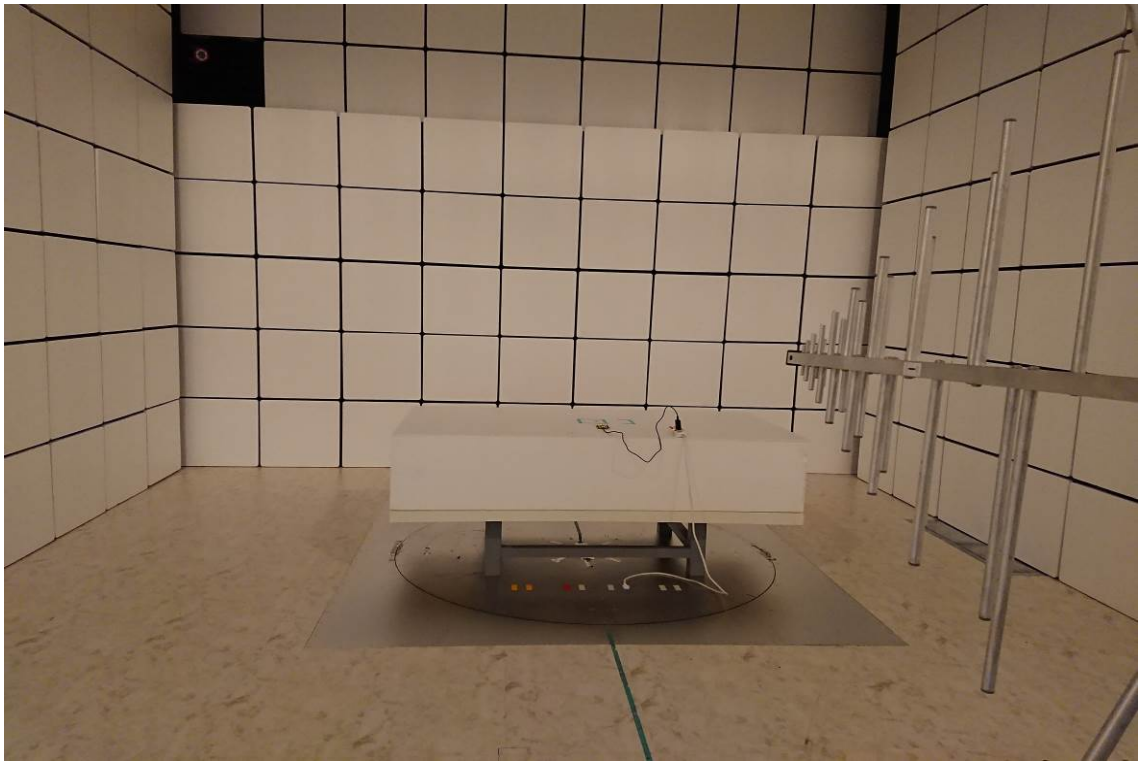




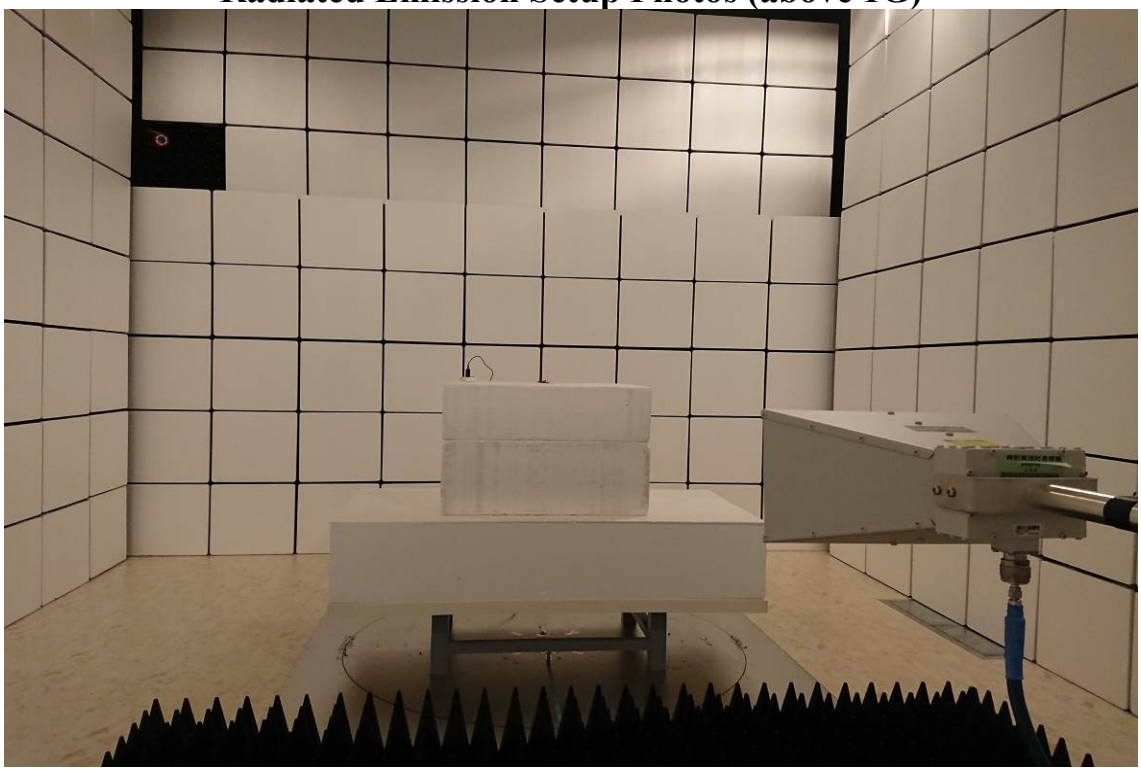


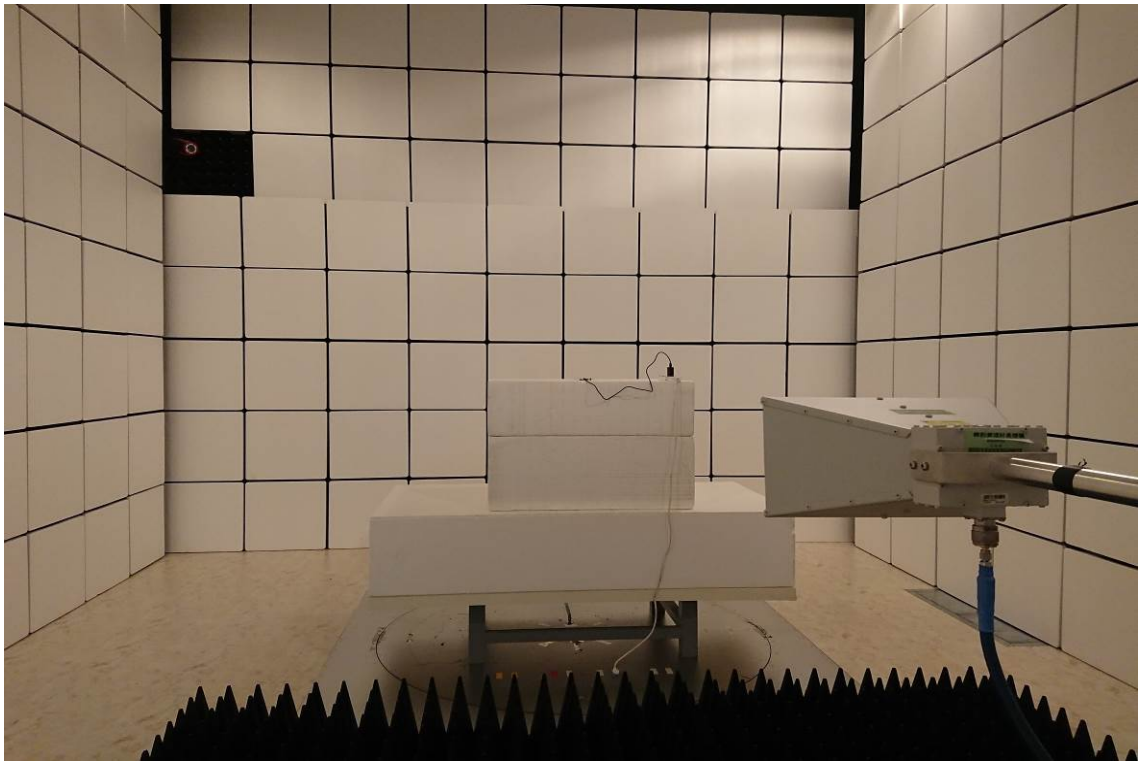
PCB Antenna
Radiated Emission Setup Photos (below 1G)

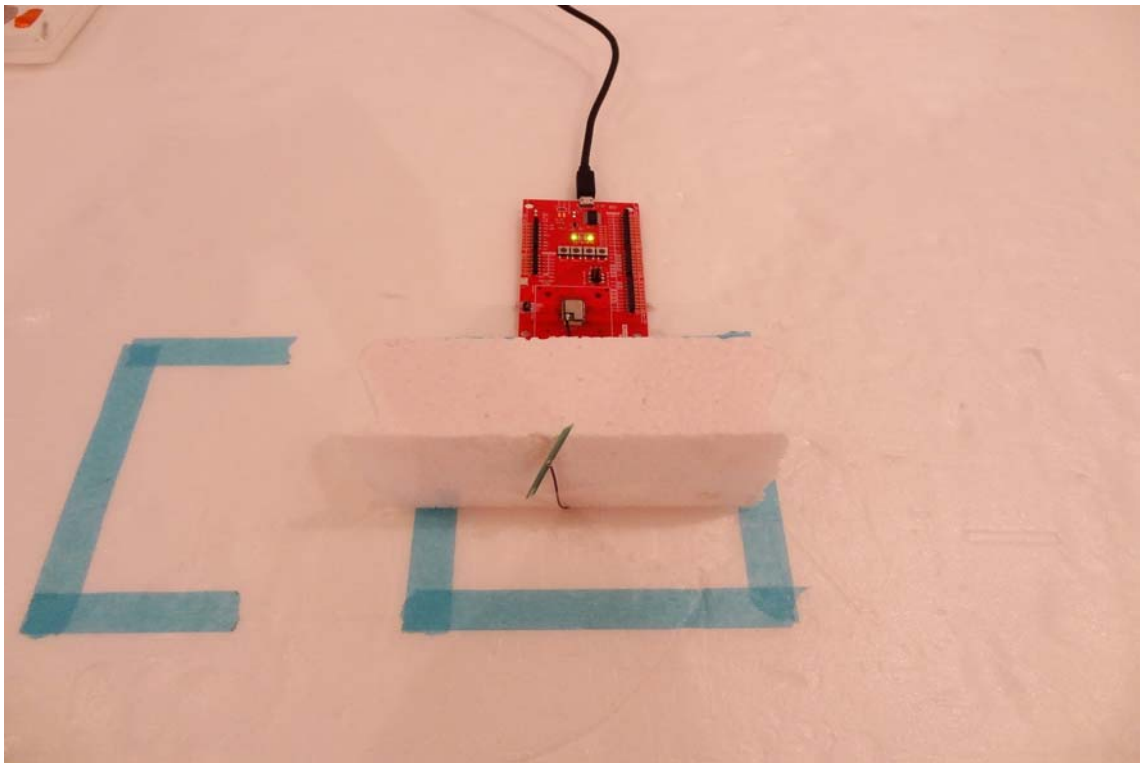




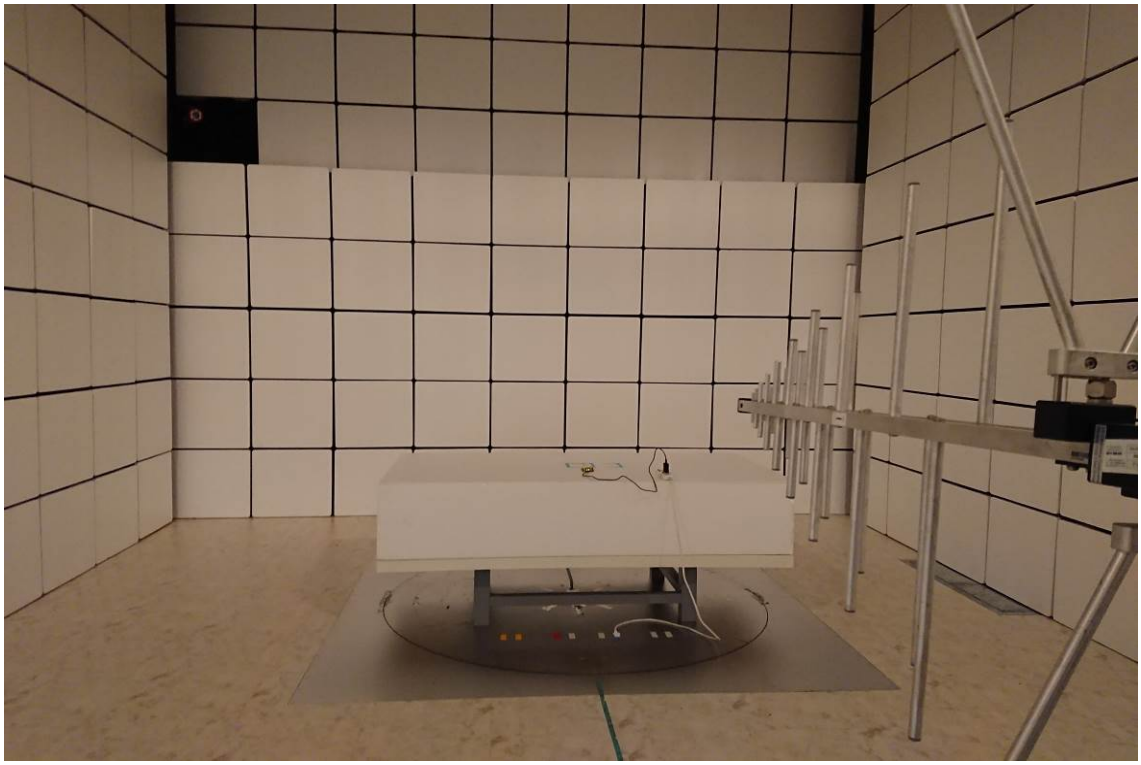
Radiated Emission Setup Photos (above 1G)



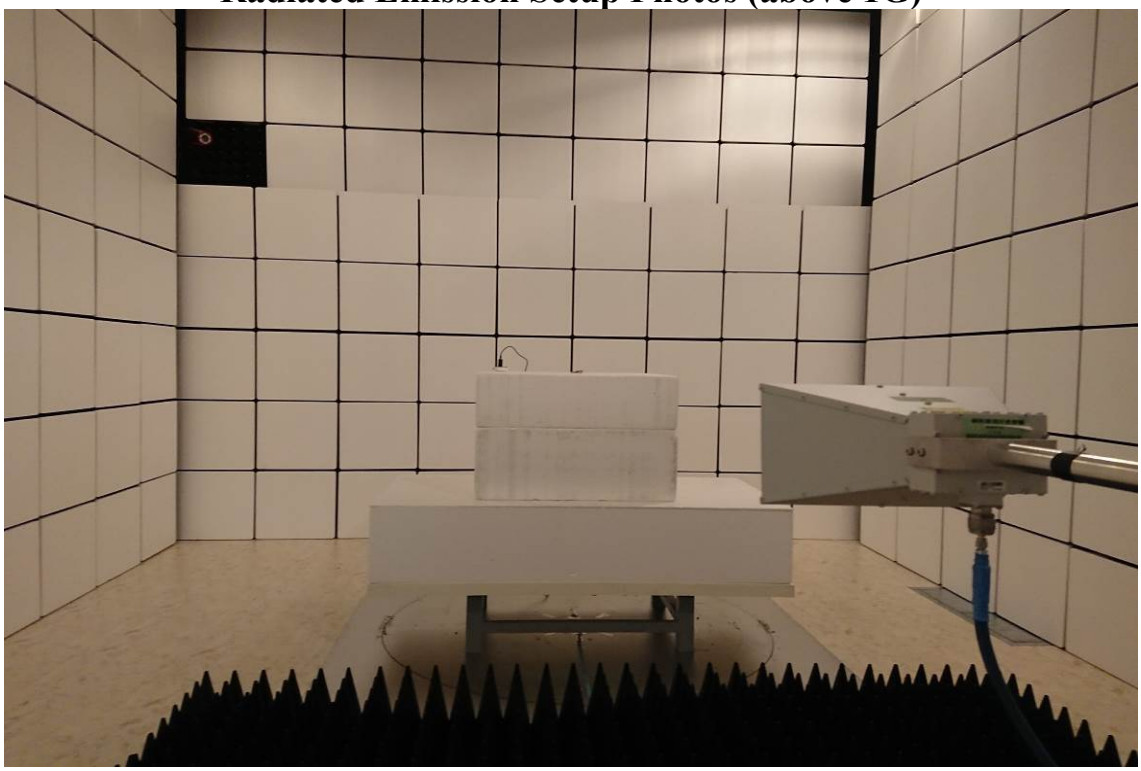


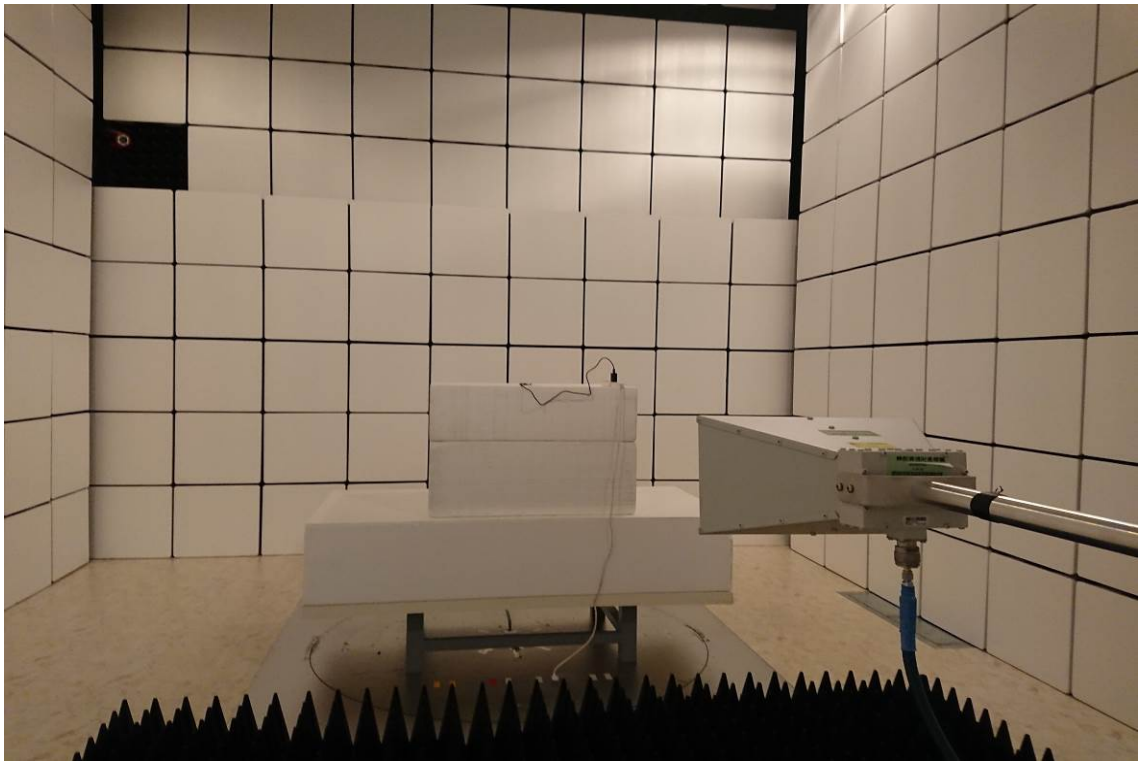


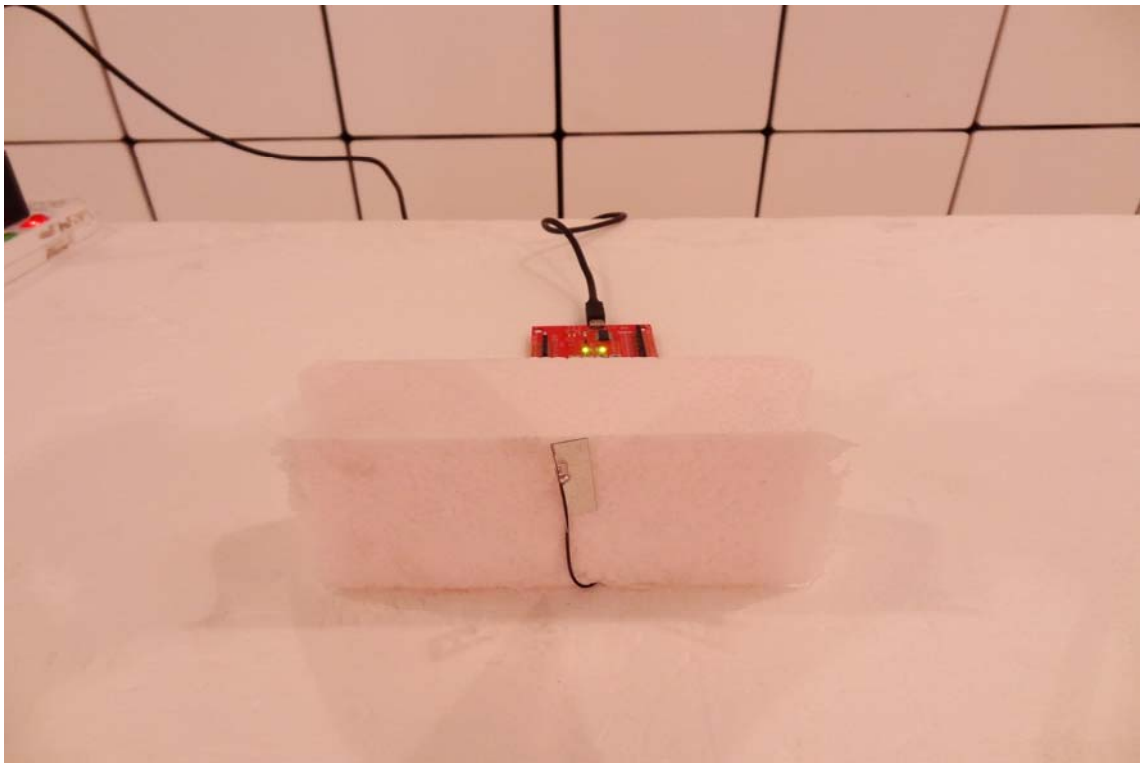
PIFA Antenna
Radiated Emission Setup Photos (below 1G)



Radiated Emission Setup Photos (above 1G)

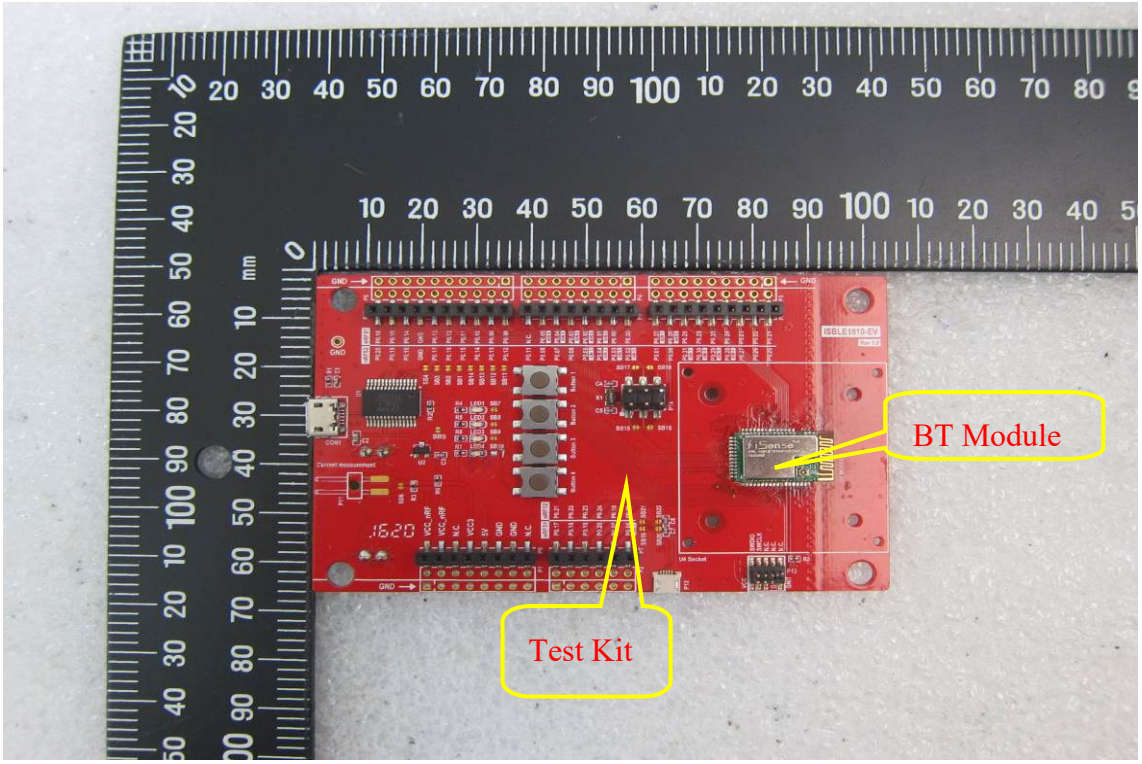




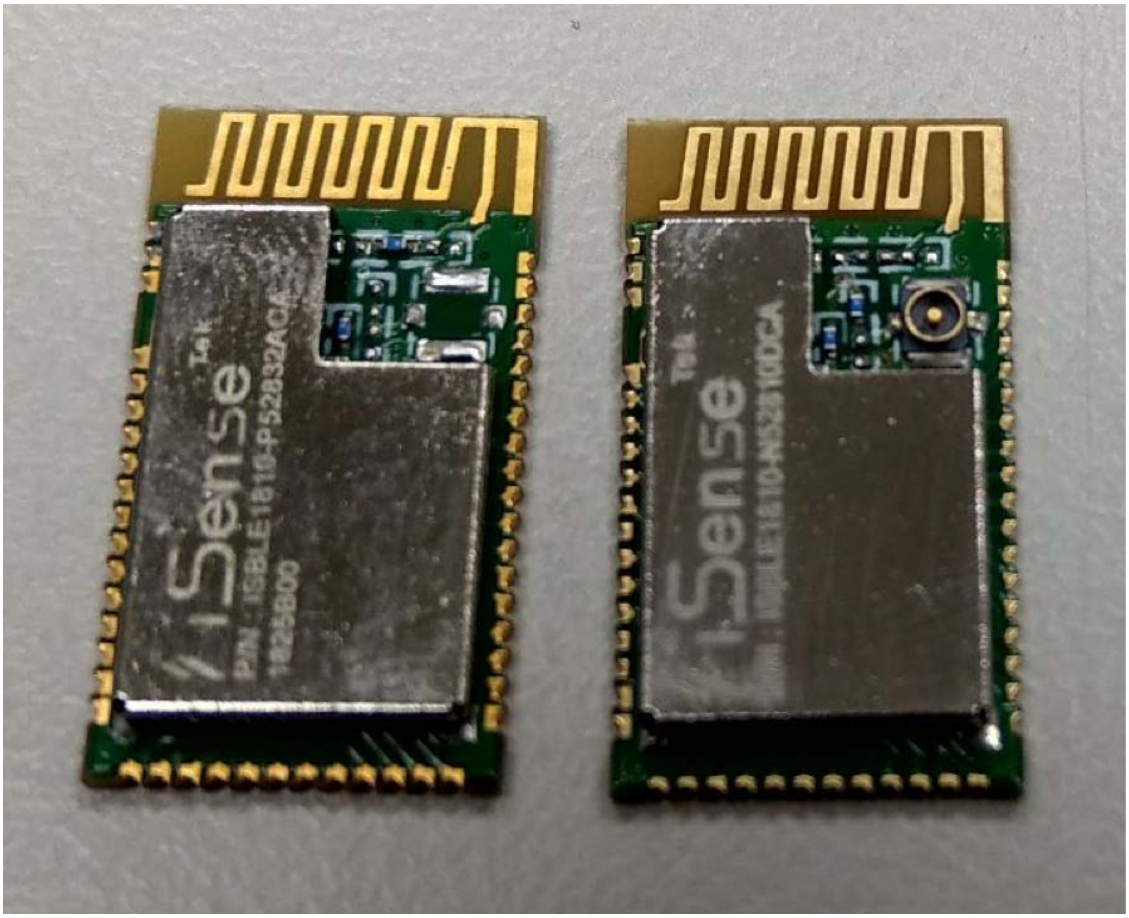


Photographs of EUT

EUT 1

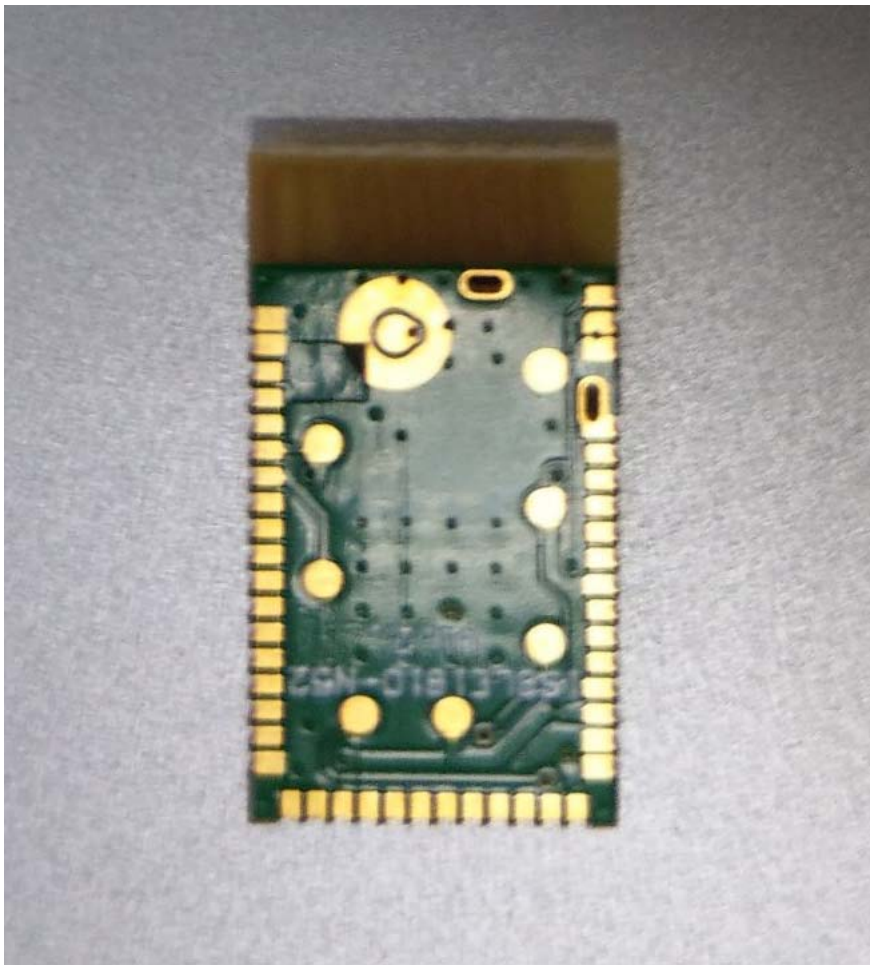


EUT 2

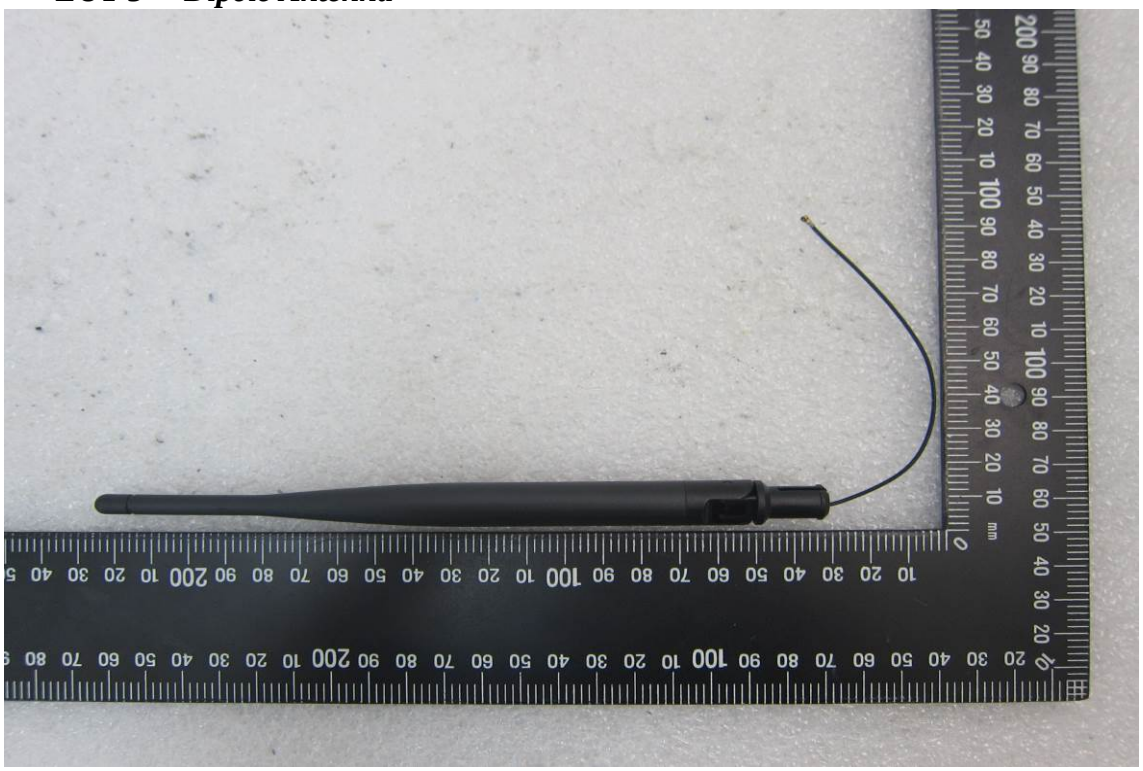


EUT 3

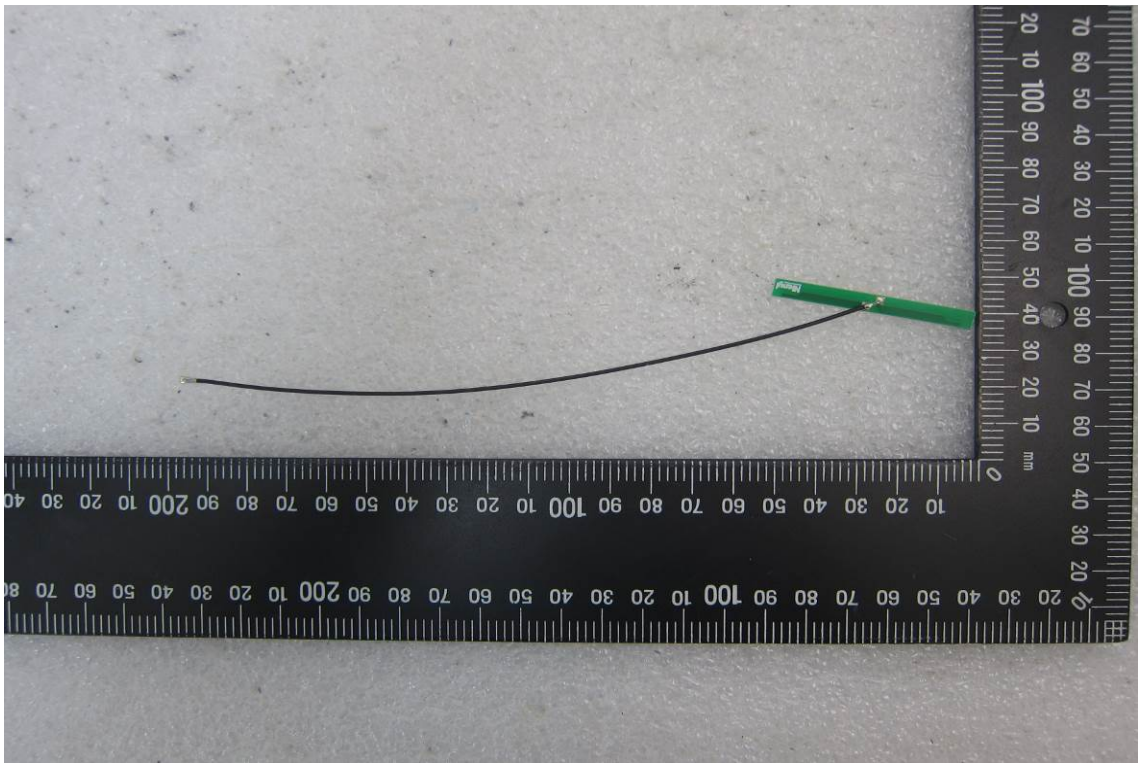
EUT 4



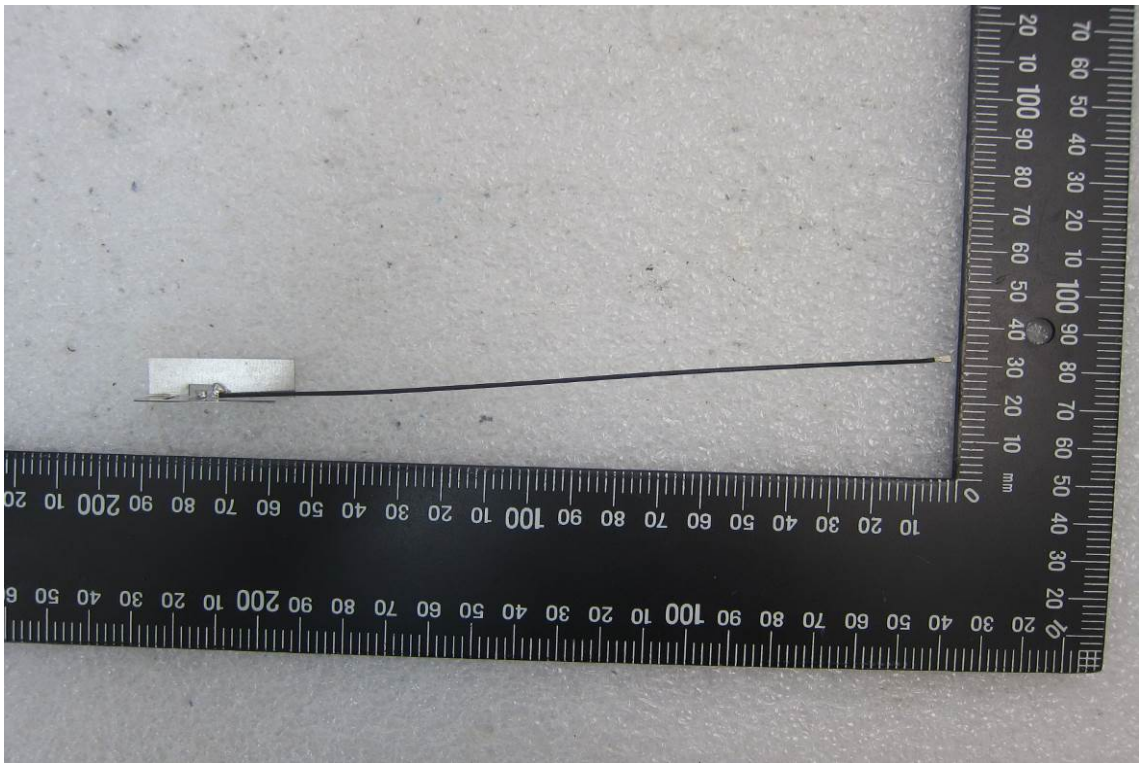
EUT 5 Dipole Antenna



EUT 6 PCB Antenna



EUT 7 PIFA Antenna



~ End of Report ~