TEST REPORT

Application No.:	SZEM2005003551CR
Applicant:	DT Research. Inc.
Address of Applicant:	3RD FL NO 36 WUQUAN 7TH RD WUGU DISTRICT, NEW TAIPEI, Taiwan.
Manufacturer:	DT Research. Inc.
Address of Manufacturer:	2000 Concourse Drive. San Jose. CA 95131. U.S.A
Factory:	DT Research. Inc. Taiwan Branch
Address of Factory:	6F., No.36 Wuquan 7th Rd., Wugu Dist. New Taipei City 248 Taiwan
Equipment Under Test (EUT):	
EUT Name:	Rugged Tablet
Model No.:	DT300QXX(X=0-9, A-Z or Blank) ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
FCC ID:	YE3600-SC600TA
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2020-05-09
Date of Test:	2020-05-14 to 2020-06-04
Date of Issue:	2020-06-08
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020-06-08		Original

Authorized for issue by:				
				
		Edison Li /Project Engineer		
				
		Eric Fu /Reviewer		

2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

Remark:

Model No.: DT300QXX(X=0-9, A-Z or blank)

Only the model DT300Q was tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on model No..

This report is prepared for FCC class II permissive change.

The modular approval by TCB, FCC ID: YE3600-SC600TA, Granted on 05/18/2020.

The module installed into host platform mentioned above is electronically and mechanically identical to the original certified module. The Original FCC testing on module under FCC ID: YE3600-SC600TA was performed with an antenna of higher gain, and the antenna was connected to the module in an open environment. The current host platform under application uses a new antenna of the different type, Lower gain and is installed inside the host platform enclosure.

Therefore in this report Conducted Emissions at AC Power Line (150kHz-30MHz), Radiated Emissions which fall in the restricted bands and Radiated Spurious Emissions were fully retested on Model DT300Q and shown the data in this report.

According to the requirements of Question 12 of KDB 996369 D02, the Bluetooth and LTE band 2/4/5/12/13 do not occupying the same or overlapping frequency range, So it is not necessary to file the additional simultaneous transmission test data.

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4 General Information

4.1 Details of E.U.T.

Power Supply:	Switching Power Adapter Model: FSP060-DHAN3 AC Input: AC 100-240V, 50/60Hz, 1.5A DC Output: DC 12V, 5.0A(60W Max) Base Support1: ACC-008-99 Base Support2: ACC-008-38 Batteries: Model: ACC-006-317K Rated Capacity: 8800mAh Voltage: 3.7VDC Watt-Hour: 32.56Wh Max Charge Voltage: 4.2VDC
Test Voltage:	DC 3.7V
Cable:	DC cable:116cm with a ferrite core
Internal Source:	More than 108MHz
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	Bluetooth V4.2
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, π/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Antenna Type:	Integral
Antenna Gain:	2.8dBi

4.2 Description of Support Units

The EUT has been tested as an independent unit.

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4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10^{-8}
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	Conduction emission	± 3.0dB (150kHz to 30MHz)
5	RF conducted power	± 0.75dB
6	RF power density	± 2.84dB
7	Conducted Spurious emissions	± 0.75dB
8	RF Radiated power	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
9	Radiated Spurious emission test	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
10	Temperature test	± 1°C
11	Humidity test	± 3%
12	Supply voltages	± 1.5%
13	Time	± 3%

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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2019-07-11	2020-07-10
LISN	Rohde & Schwarz	ENV216	SEM007-01	2019-09-24	2020-09-23
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23

Radiated Emissions which fall in the restricted bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019-07-11	2020-07-10
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2020-09-23
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2020-04-01	2021-03-31
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2020-09-23
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

RE in Chamber					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date**	**Cal. Due date**
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-15	2019-12-16	2020-12-15
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2020-04-01	2021-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

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Coaxial Cable	SGS	N/A	SEM025-01	2019-07-11	2020-07-10

Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019-07-11	2020-07-10
EXA Spectrum Analyzer	AgilentTechnologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2020-09-23
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2020-04-01	2021-03-31
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2020-09-23
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2019-09-26	2020-09-25
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2019-09-26	2020-09-25
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2019-09-26	2020-09-25
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.8dBi.

Antenna location: Refer to internal photo.

6.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

6.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

6.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1): According to Technical Specification, the pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

> Number of shift register stages: 9

> Length of pseudo-random sequence: 29 -1 = 511 bits

> Longest sequence of zeros: 8 (non-inverted signal)

Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

Each frequency used equally on the average by each transmitter.

According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g): According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h): According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		

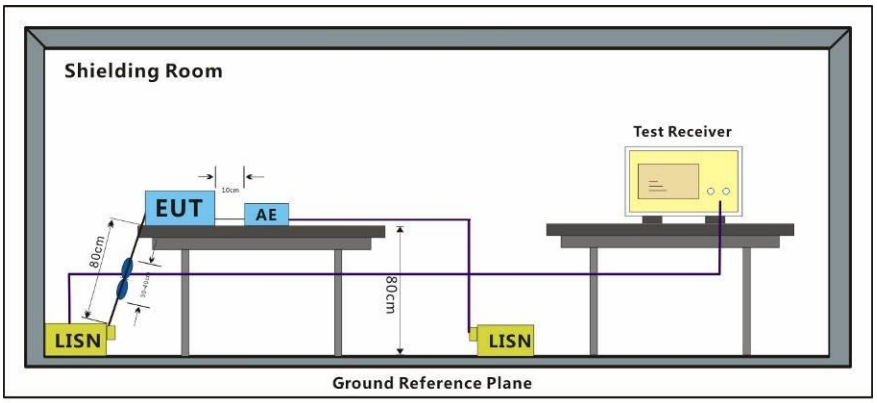
7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 55.9 % RH Atmospheric Pressure: 1010 mbar

Test mode: c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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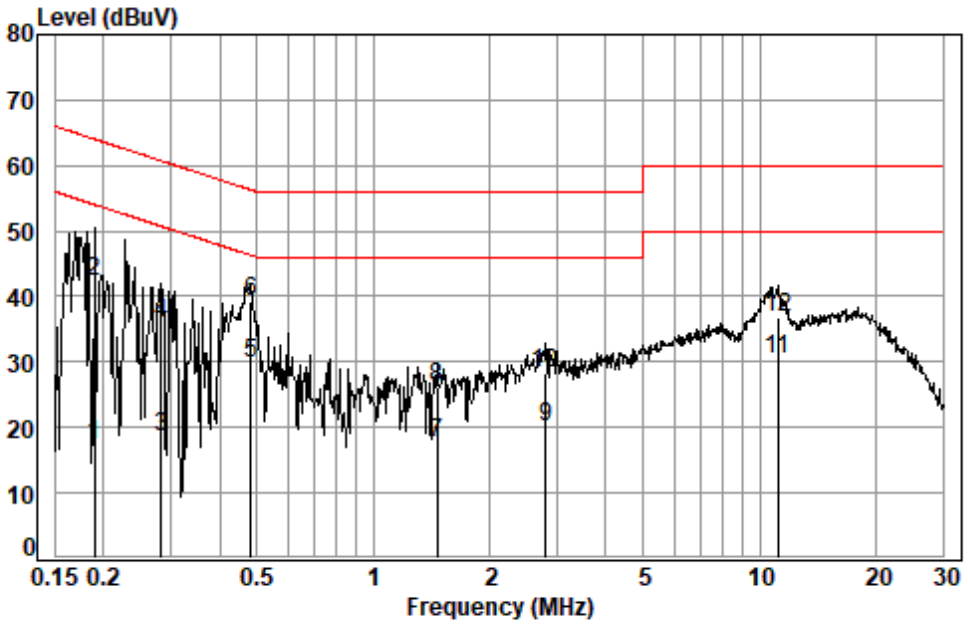
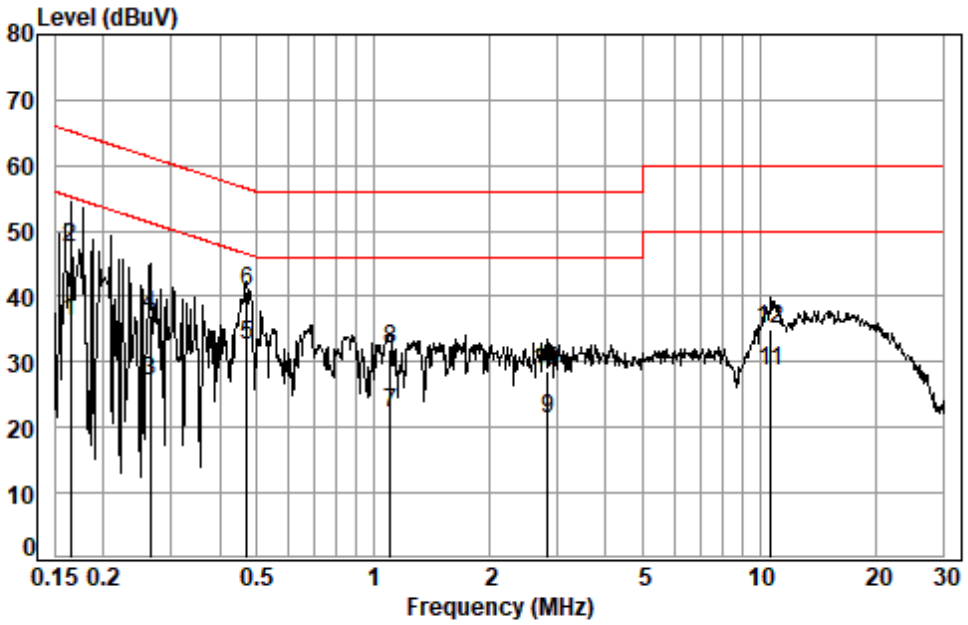
Mode:c; Condition: Line



Site : Shielding Room
Condition: Line
Job No. : 03551CR
Test mode: c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1904	0.02	9.59	7.77	17.38	54.02	-36.64	Average
2	0.1904	0.02	9.59	32.67	42.28	64.02	-21.74	QP
3	0.2833	0.04	9.59	8.83	18.46	50.72	-32.26	Average
4	0.2833	0.04	9.59	26.11	35.74	60.72	-24.98	QP
5	0.4812	0.06	9.59	20.16	29.81	46.32	-16.51	Average
6	0.4812	0.06	9.59	29.48	39.13	56.32	-17.19	QP
7	1.4640	0.13	9.61	7.94	17.68	46.00	-28.32	Average
8	1.4640	0.13	9.61	16.28	26.02	56.00	-29.98	QP
9	2.7942	0.16	9.66	10.15	19.97	46.00	-26.03	Average
10	2.7942	0.16	9.66	18.51	28.33	56.00	-27.67	QP
11	11.1386	0.18	9.89	20.32	30.39	50.00	-19.61	Average
12	11.1386	0.18	9.89	26.64	36.71	60.00	-23.29	QP

Mode:c; Condition: Neutral



Site : Shielding Room
Condition: Neutral
Job No. : 03551CR
Test mode: c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1650	0.01	9.55	26.50	36.06	55.21	-19.15	Average
2	0.1650	0.01	9.55	37.75	47.31	65.21	-17.90	QP
3	0.2644	0.03	9.54	17.51	27.08	51.29	-24.21	Average
4	0.2644	0.03	9.54	27.42	36.99	61.29	-24.30	QP
5	0.4711	0.06	9.54	22.95	32.55	46.49	-13.94	Average
6	0.4711	0.06	9.54	31.28	40.88	56.49	-15.61	QP
7	1.1056	0.10	9.55	12.55	22.20	46.00	-23.80	Average
8	1.1056	0.10	9.55	22.24	31.89	56.00	-24.11	QP
9	2.8240	0.16	9.58	11.54	21.28	46.00	-24.72	Average
10	2.8240	0.16	9.58	18.81	28.55	56.00	-27.45	QP
11	10.6763	0.18	9.90	18.41	28.49	50.00	-21.51	Average
12	10.6763	0.18	9.90	24.86	34.94	60.00	-25.06	QP

7.2 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

7.2.1 E.U.T. Operation

Operating Environment:

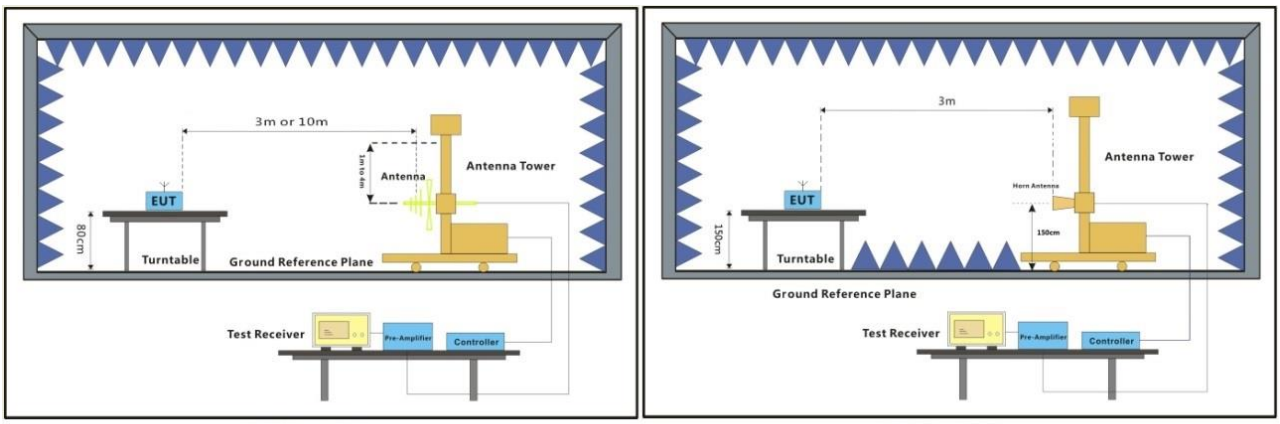
Temperature: 23.1 °C Humidity: 47.4 % RH Atmospheric Pressure: 1010 mbar

Pretest these modes to find the worst case: b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

The worst case for final test: c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

7.2.2 Test Setup Diagram



30MHz-1GHz　　Above 1GHz

7.2.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

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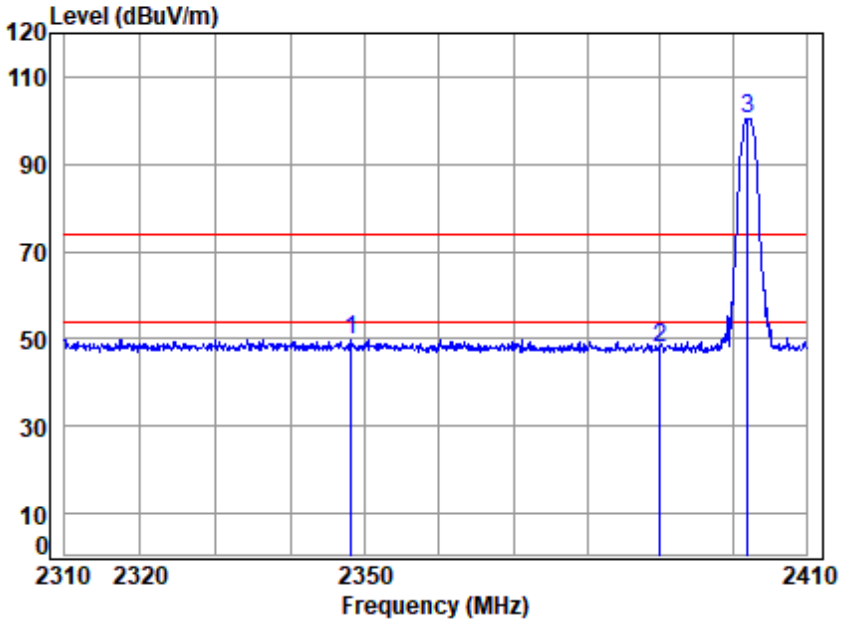
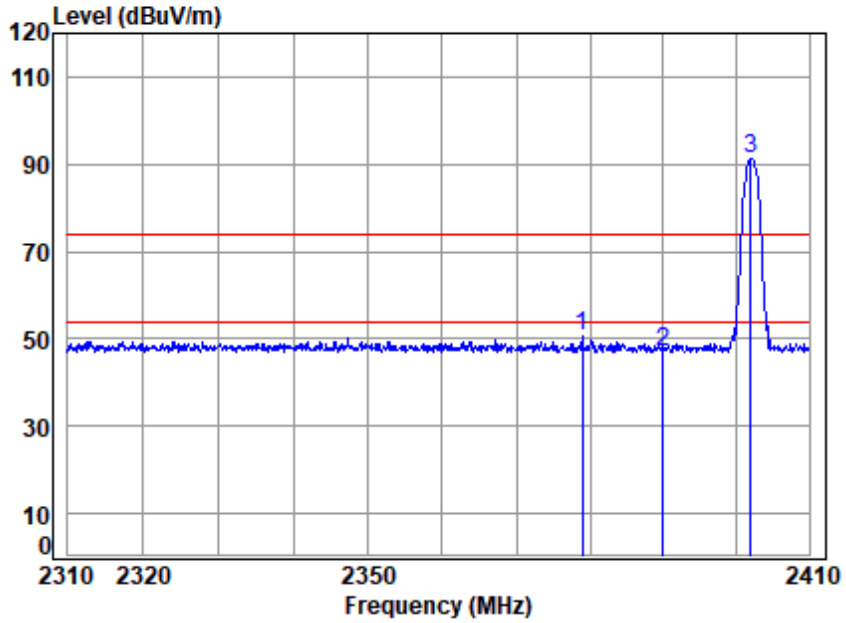
Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03551CR
Mode : 2402 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2348.198	3.96	28.45	40.95	58.42	49.88	74.00	-24.12	peak
2	2390.000	3.69	28.52	40.97	56.69	47.93	74.00	-26.07	peak
3 *	2402.000	3.63	28.54	40.98	109.38	100.57	74.00	26.57	peak

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 03551CR
Mode : 2402 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2378.949	3.76	28.50	40.97	59.21	50.50	74.00	-23.50	peak
2	2390.000	3.69	28.52	40.97	55.74	46.98	74.00	-27.02	peak
3 *	2402.000	3.63	28.54	40.98	99.93	91.12	74.00	17.12	peak

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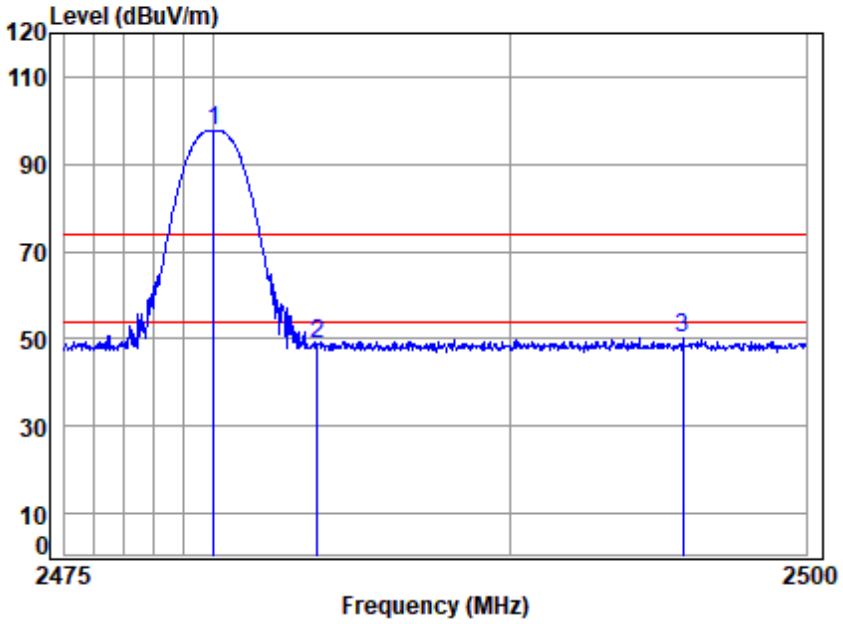
Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03551CR
Mode : 2480 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	3.99	28.67	41.01	106.12	97.77	74.00	23.77	peak
2	2483.500	4.01	28.67	41.01	57.10	48.77	74.00	-25.23	peak
3	2495.833	4.06	28.69	41.02	58.53	50.26	74.00	-23.74	peak

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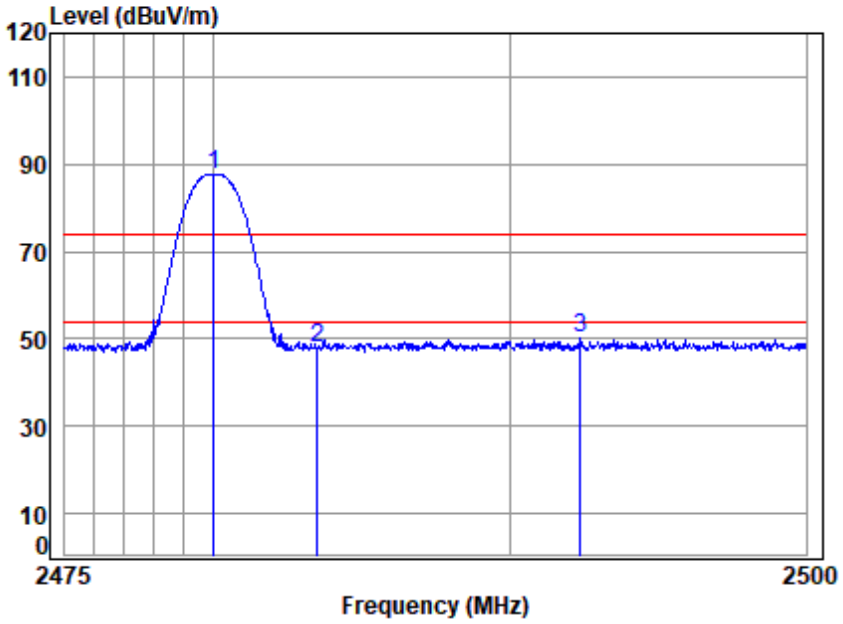
Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 03551CR
Mode : 2480 Band edge
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	3.99	28.67	41.01	96.03	87.68	74.00	13.68	peak
2	2483.500	4.01	28.67	41.01	56.25	47.92	74.00	-26.08	peak
3	2492.373	4.05	28.69	41.01	58.26	49.99	74.00	-24.01	peak

7.3 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance: 3m
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.		

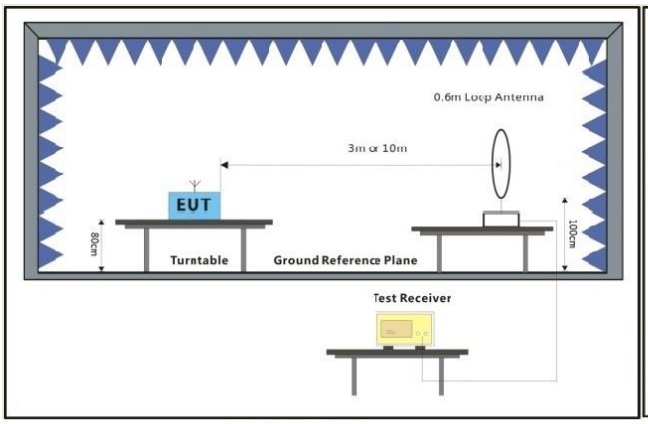
7.3.1 E.U.T. Operation

Operating Environment:

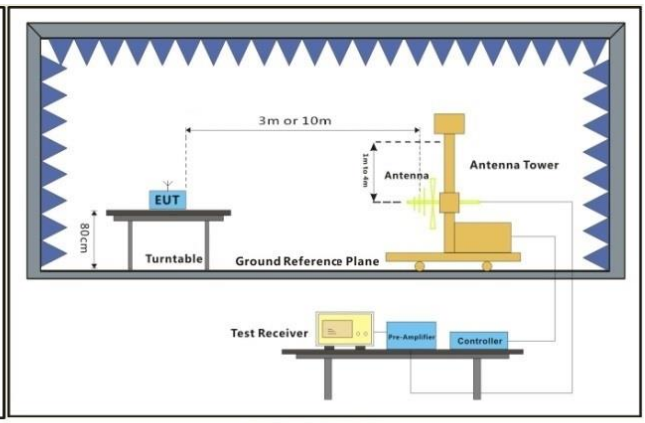
Temperature: 24.6 °C Humidity: 62.6 % RH Atmospheric Pressure: 1010 mbar

Pretest these modes to find the worst case:	b: TX_non-Hop mode_Keep the EUT in continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
	c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.
The worst case for final test:	c: Charge + TX_non-Hop mode_Keep the EUT in charging and continuously transmitting mode with GFSK modulation, π/4DQPSK modulation, 8DPSK modulation. All modes have been tested and only the data of worst case is recorded in the report.

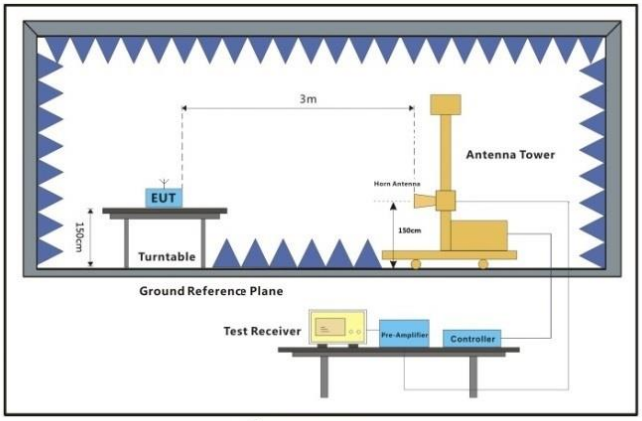
7.3.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

7.3.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

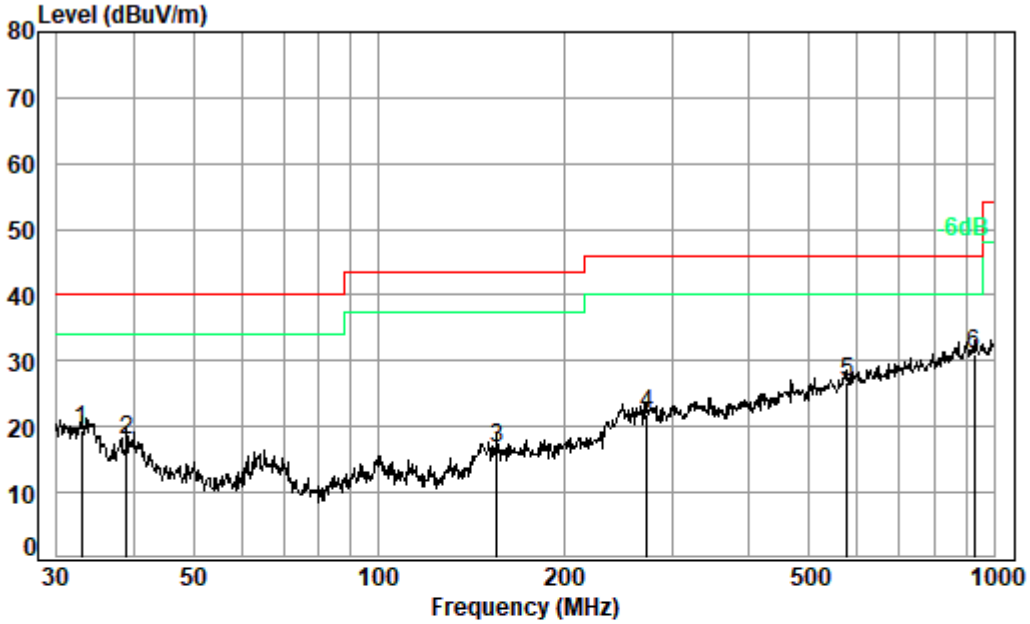
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

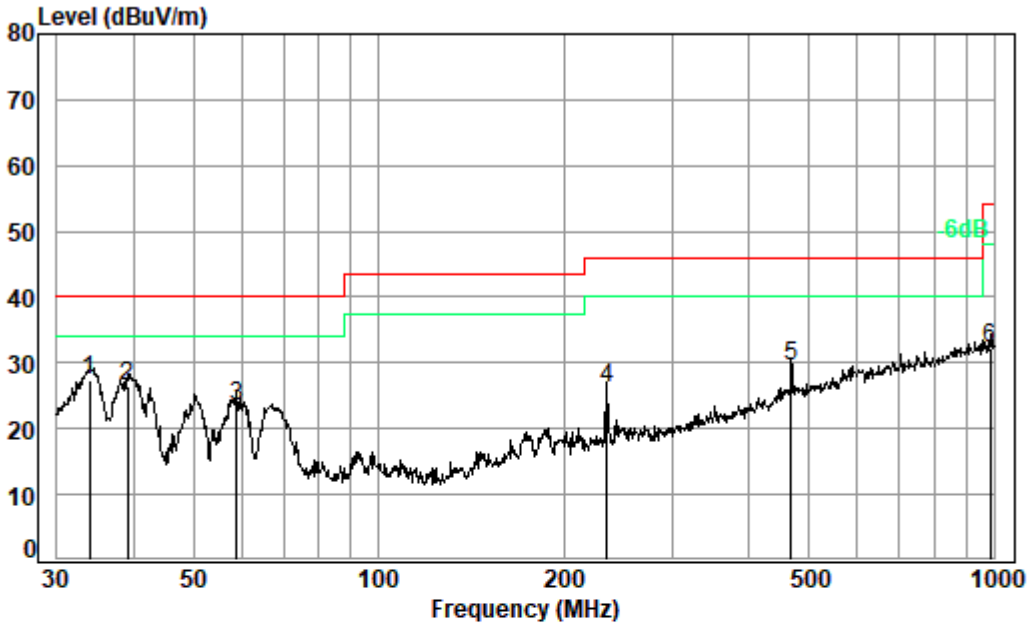
Radiated emission below 1GHz
Mode:c; Polarization:Horizontal



Condition: 3m HORIZONTAL
Job No. : 03551CR
Test Mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	32.86	0.60	20.92	27.73	25.80	19.59	40.00	-20.41	QP
2	39.02	0.60	17.93	27.71	27.08	17.90	40.00	-22.10	QP
3	155.91	1.33	15.15	27.31	27.57	16.74	43.50	-26.76	QP
4	273.23	1.78	18.90	26.93	28.06	21.81	46.00	-24.19	QP
5	576.64	2.68	26.16	28.06	25.90	26.68	46.00	-19.32	QP
6 pp	929.01	3.63	29.95	27.01	24.55	31.12	46.00	-14.88	QP

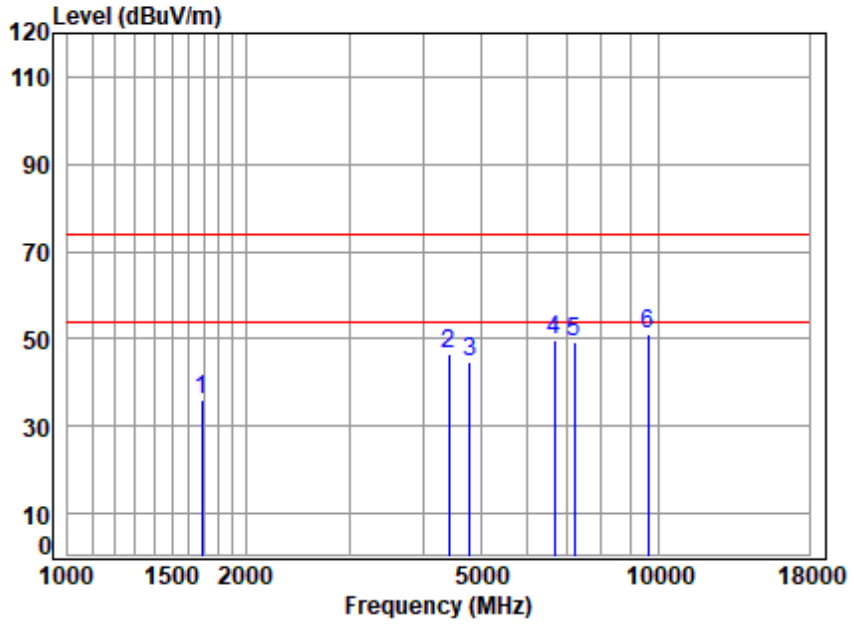
Mode:c; Polarization:Vertical



Condition: 3m VERTICAL
Job No. : 03551CR
Test Mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	33.92	0.60	20.37	27.72	34.13	27.38	40.00	-12.62	QP
2	39.16	0.60	17.87	27.71	35.56	26.32	40.00	-13.68	QP
3	58.82	0.80	13.31	27.67	36.99	23.43	40.00	-16.57	QP
4	234.99	1.60	18.41	27.03	33.22	26.20	46.00	-19.80	QP
5	468.88	2.49	23.97	27.68	30.61	29.39	46.00	-16.61	QP
6	986.07	3.69	30.23	26.73	25.09	32.28	54.00	-21.72	QP

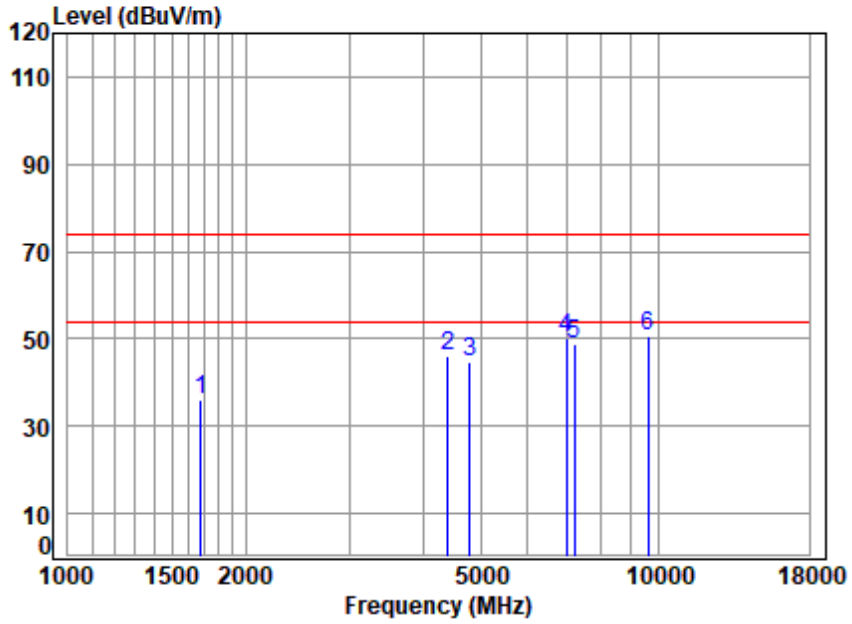
Transmitter emission above 1GHz
Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03551CR
Mode : 2402 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1687.347	3.27	26.62	40.62	46.91	36.18	74.00	-37.82	peak
2	4417.841	6.63	33.46	42.49	48.87	46.47	74.00	-27.53	peak
3	4804.000	6.80	33.97	42.77	46.78	44.78	74.00	-29.22	peak
4	6659.763	8.21	35.70	41.86	47.80	49.85	74.00	-24.15	peak
5	7206.000	8.44	36.07	41.58	46.13	49.06	74.00	-24.94	peak
6	9608.000	9.17	37.67	38.57	42.67	50.94	74.00	-23.06	peak

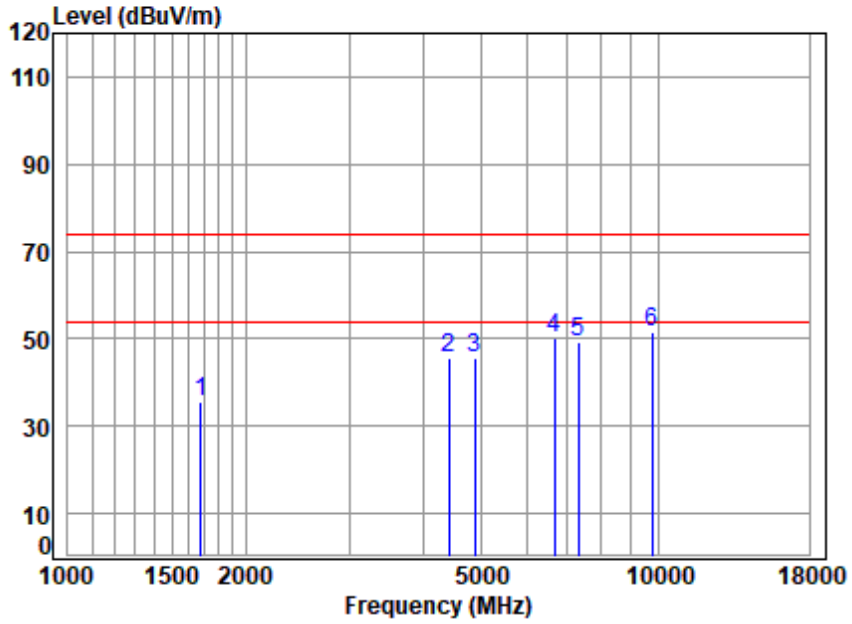
Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:Low



Site : chamber
Condition: 3m VERTICAL
Job No : 03551CR
Mode : 2402 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.621	3.23	26.58	40.62	47.05	36.24	74.00	-37.76	peak
2	4405.090	6.67	33.44	42.48	48.47	46.10	74.00	-27.90	peak
3	4804.000	6.80	33.97	42.77	46.75	44.75	74.00	-29.25	peak
4	6974.982	7.81	35.89	41.70	48.08	50.08	74.00	-23.92	peak
5	7206.000	8.44	36.07	41.58	45.97	48.90	74.00	-25.10	peak
6	9608.000	9.17	37.67	38.57	42.16	50.43	74.00	-23.57	peak

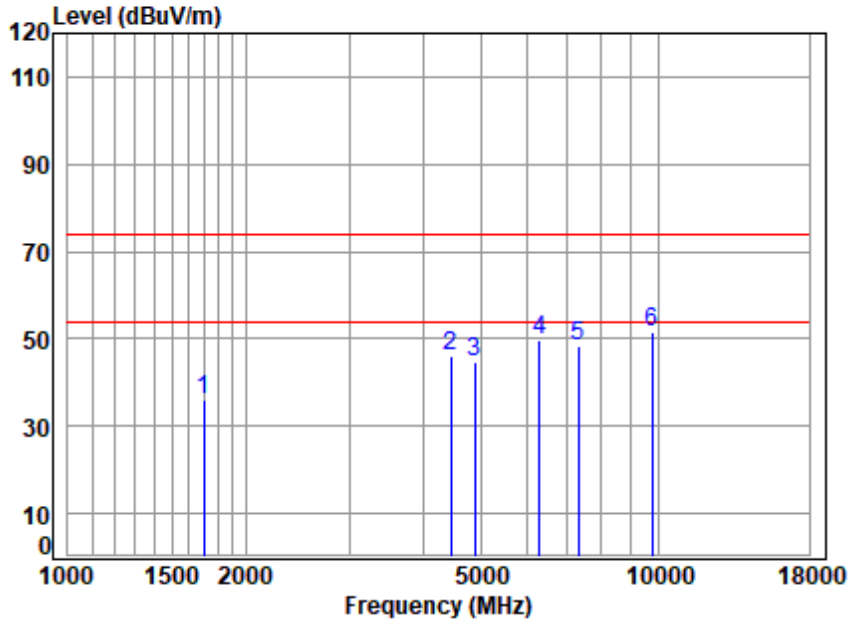
Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03551CR
Mode : 2441 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.621	3.23	26.58	40.62	46.50	35.69	74.00	-38.31	peak
2	4417.841	6.63	33.46	42.49	47.95	45.55	74.00	-28.45	peak
3	4882.000	7.03	34.06	42.82	47.41	45.68	74.00	-28.32	peak
4	6679.040	8.27	35.71	41.85	48.12	50.25	74.00	-23.75	peak
5	7323.000	8.36	36.16	41.52	46.26	49.26	74.00	-24.74	peak
6	9764.000	9.30	37.76	38.34	42.65	51.37	74.00	-22.63	peak

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:middle



Site : chamber
Condition: 3m VERTICAL
Job No : 03551CR
Mode : 2441 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1702.042	3.30	26.68	40.63	46.79	36.14	74.00	-37.86	peak
2	4456.315	6.51	33.53	42.52	48.42	45.94	74.00	-28.06	peak
3	4882.000	7.03	34.06	42.82	46.62	44.89	74.00	-29.11	peak
4	6303.890	7.24	35.41	42.06	49.20	49.79	74.00	-24.21	peak
5	7323.000	8.36	36.16	41.52	45.56	48.56	74.00	-25.44	peak
6	9764.000	9.30	37.76	38.34	42.87	51.59	74.00	-22.41	peak

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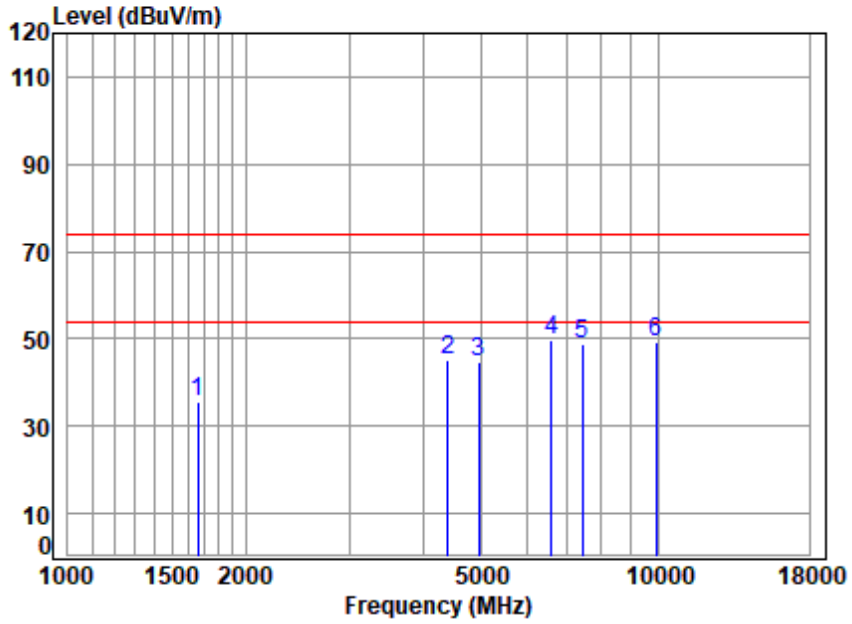
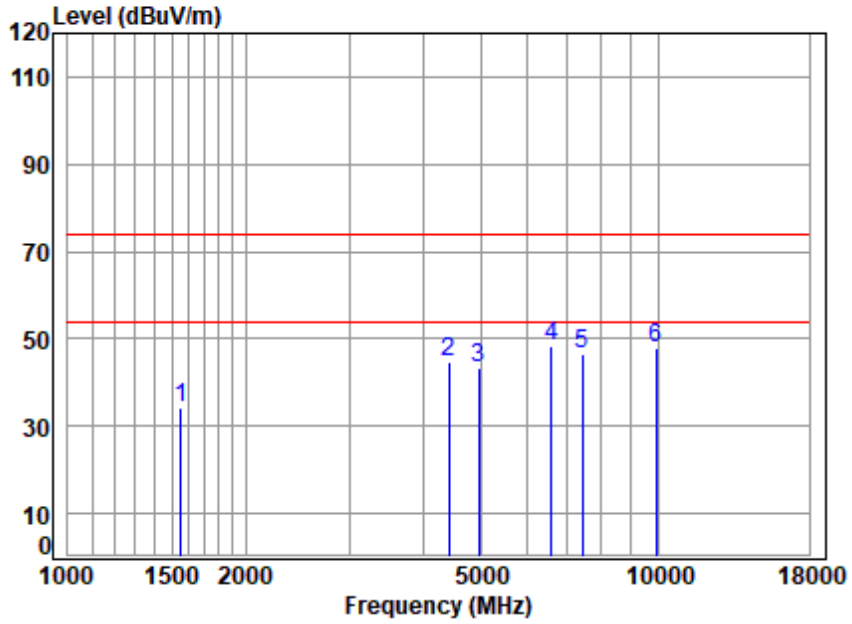
Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03551CR
Mode : 2480 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1663.137	3.18	26.52	40.61	46.65	35.74	74.00	-38.26	peak
2	4405.090	6.67	33.44	42.48	47.72	45.35	74.00	-28.65	peak
3	4960.000	7.02	34.15	42.87	46.41	44.71	74.00	-29.29	peak
4	6583.209	7.90	35.65	41.91	48.15	49.79	74.00	-24.21	peak
5	7440.000	8.10	36.25	41.46	45.83	48.72	74.00	-25.28	peak
6	9920.000	8.96	37.85	38.12	40.76	49.45	74.00	-24.55	peak

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 03551CR
Mode : 2480 TX SE
Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1556.169	2.97	26.06	40.54	45.61	34.10	74.00	-39.90	peak
2	4417.841	6.63	33.46	42.49	46.98	44.58	74.00	-29.42	peak
3	4960.000	7.02	34.15	42.87	45.25	43.55	74.00	-30.45	peak
4	6602.265	8.00	35.66	41.89	46.41	48.18	74.00	-25.82	peak
5	7440.000	8.10	36.25	41.46	43.54	46.43	74.00	-27.57	peak
6	9920.000	8.96	37.85	38.12	39.43	48.12	74.00	-25.88	peak

8 Photographs

8.1 Test Setup

Please refer to setup photos.

8.2 EUT Constructional Details (EUT Photos)

Please Refer to external and internal photos for details.

- End of the Report -

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