

## COOLER MASTER TECHNOLOGY INC.

# TEST REPORT

**Model:**

IXC-ST1

**REPORT NUMBER**

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# Radio Spectrum TEST REPORT

<b>Applicant:</b>	<b>COOLER MASTER TECHNOLOGY INC. 7F., No. 398, Xinhua 1st Rd., Neihu Dist. Taipei City 114065, Taiwan</b>
<b>Product:</b>	<b>Synk X Transmitter</b>
<b>Model No.:</b>	<b>IXC-ST1</b>
<b>FCC ID:</b>	<b>2AR8X-IXC-ST1</b>
<b>Test Method/ Standard:</b>	<b>47 CFR FCC Part 15.249 &amp; ANSI C63.10 2013</b>
<b>Test By:</b>	<b>Intertek Testing Services Taiwan Ltd., Hsinchu Laboratory No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan</b>



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### Revision History

Report No.	Issue Date	Revision Summary
221000216THC-001	Dec. 07, 2022	Original report

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**Summary of Tests**

<b>Test</b>	<b>Reference</b>	<b>Results</b>
Radiated Emission test	15.249(c), 15.209	Pass
Emission on the Band Edge	15.249(d)	Pass
Conducted Emission of AC Power	15.207	Pass
Antenna Requirement	15.203	Pass

Note: Please note that the test results with statement of conformity, the decision rules which are based on: Safety Testing: the specification, standard or IEC Guide 115.

Other Testing: the specification, standard and not taking into account the measurement uncertainty.

## 1. General Information

### 1.1 Identification of the EUT

<b>Product:</b>	Synk X Transmitter
<b>Model No.:</b>	IXC-ST1
<b>Operating Frequency:</b>	5740 - 5840MHz
<b>Channel Number:</b>	51 channels
<b>Frequency of Each Channel:</b>	5740+2 k, k=0 ~ 50
<b>Rated Power:</b>	DC 5 V from adapter
<b>Power Cord:</b>	N/A
<b>Sample receiving date:</b>	2022/10/17
<b>Sample condition:</b>	Workable
<b>Test Date(s):</b>	2022/10/21 ~ 2022/10/28

### 1.2 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Model no.	Specification
Adapter	MKC-0502000DEXD	I/P: 100-240Vac, 50/60Hz, 0.4A O/P: 5.0Vdc, 2.0A, 10.0W

### 1.3 Antenna description

Antenna Type: PCB Antenna  
 Connector Type: Fixed  
 Antenna Gain: 1.46 dBi

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**2. Test specifications**

**2.1 Test standard**

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

**2.2 Operation mode**

EUT connected to Notebook PC USB port, executing.

“EMI\_TOOI\_V23\_EverestekInc2021\_1116” and select different frequency and modulation.

Mode	Frequency (MHz)	Signal on time(ms)	Signal on & off time(ms)	Duty cycle	Duty Cycle factor (dB)
TX	5740	5.767	5.767	1.000	0.000

**2.3 Peripherals equipment**

Peripherals	Brand	Model No.	Serial No.	Description of Data Cable
Notebook PC	HP	HP Probook 440 G3	5CD8021S9H	USB shielded cable 3.8m
Fixture	N/A	N/A	N/A	USB shielded cable 3.8m
earphone	Ergocity	ET- E220	N/A	N/A
Smart phone	SAMSUNG	GT-I9100	00009d5c92ef46f	Audio cable 0.8m
5.8G receive system	COOLER MASTER	N/A	N/A	N/A

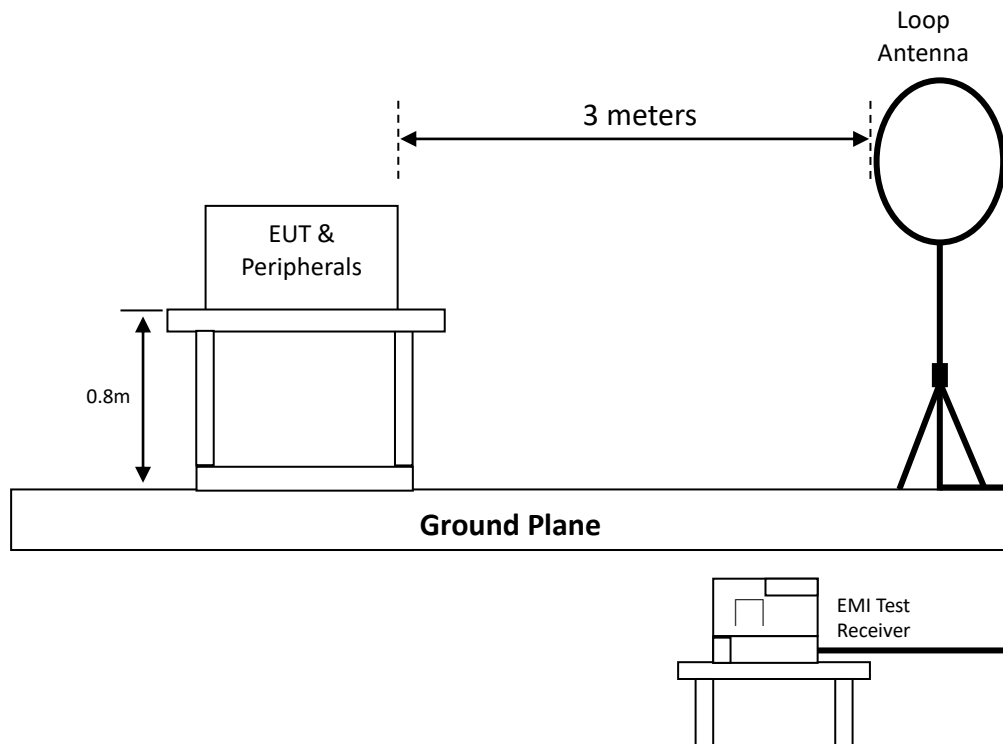
### 3. Radiated emission test FCC 15.249 (C)

#### 3.1 Operating environment

Temperature (°C) :	22
Relative Humidity (%) :	60
Test date:	2022/10/28

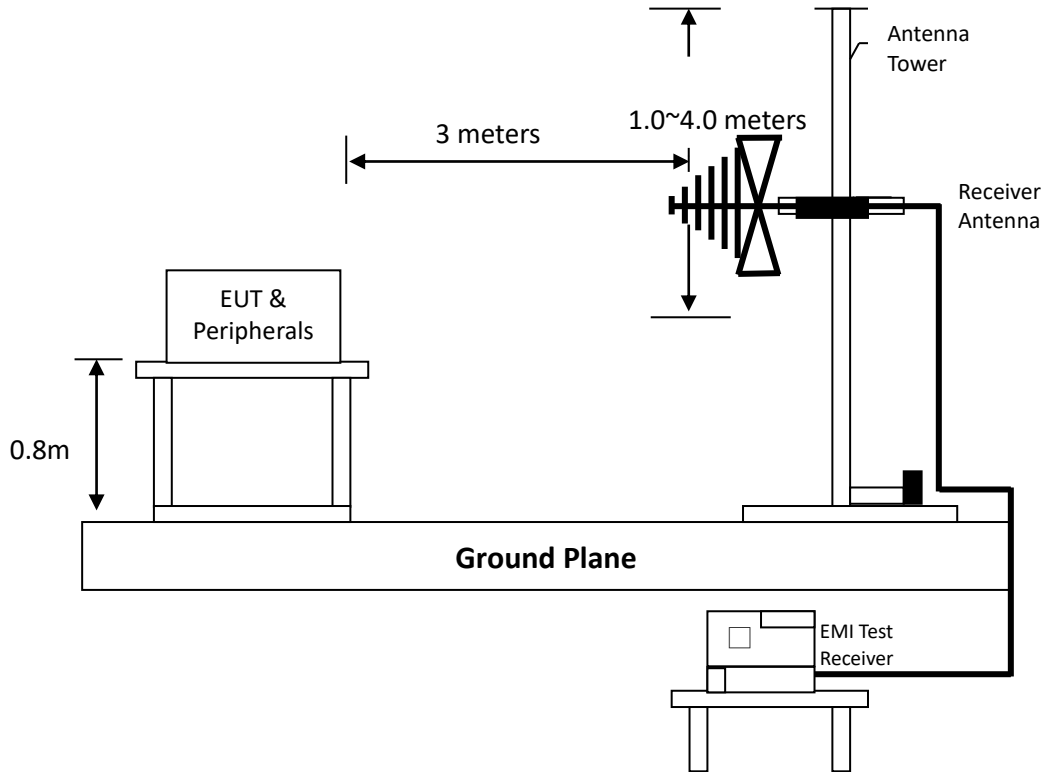
#### 3.2 Test setup & procedure

Radiated emission from 9kHz to 30MHz uses Loop Antenna:

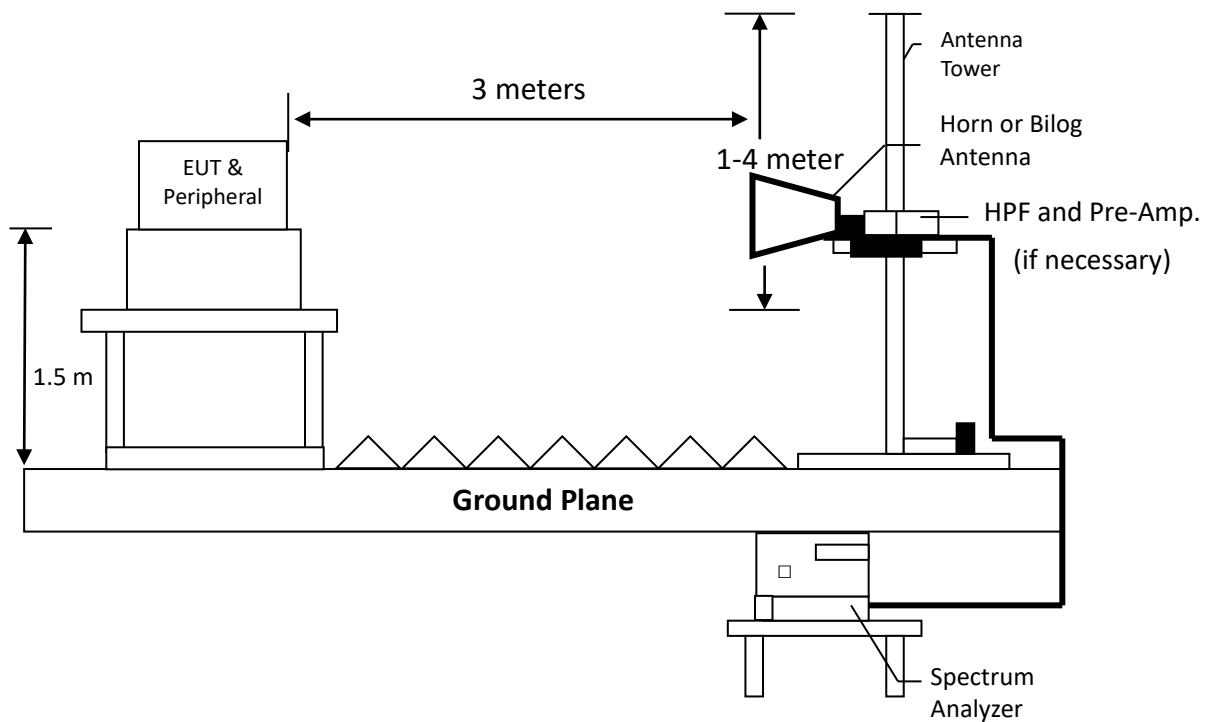




## Radiated emission below 1GHz using Bilog Antenna



## Radiated emission above 1GHz using Horn Antenna



**TEST REPORT**

Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/ 3 MHz VBW) recorded also on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

**3.3 Emission limit**

**3.3.1 Fundamental and harmonics emission limits**

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
5725-5875	50	94	500	54

**TEST REPORT****3.3.2 General radiated emission limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

<b>Frequency MHz</b>	<b>15.209 Limits (dB<math>\mu</math>V/m@3m)</b>
30-88	40
88-216	43.5
216-960	46
Above 960	54

## Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

**TEST REPORT**

**3.4 Radiated spurious emission test data**

**3.4.1 Measurement results: frequency range from 9 kHz to 30 MHz**

Temperature (°C) :	22
Relative Humidity (%) :	60
Test date :	2022/10/28

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 5740MHz.

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
Perpendicular	0.009	AV	18.11	55.85	73.96	128.52	-54.56
Perpendicular	0.579	QP	18.85	40.76	59.61	72.38	-12.77
Perpendicular	1.209	QP	19.10	33.48	52.58	65.96	-13.38
Perpendicular	1.748	QP	19.10	29.21	48.31	69.54	-21.23
Perpendicular	2.348	QP	19.09	24.98	44.07	69.54	-25.47
Perpendicular	2.918	QP	19.09	22.92	42.01	69.54	-27.53

Remark: Corr. Factor = Antenna Factor + Cable Loss

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBµV)	Corrected Reading (dBµV/m)	Limit @ 3 m (dBµV/m)	Margin (dB)
Parallel	0.009	AV	18.11	53.56	71.67	128.52	-56.85
Parallel	0.429	AV	18.74	30.13	48.87	94.97	-46.10
Parallel	0.579	QP	18.85	36.69	55.54	72.38	-16.84
Parallel	1.179	QP	19.10	29.16	48.26	66.19	-17.93
Parallel	1.778	QP	19.10	24.13	43.23	69.54	-26.31
Parallel	2.348	QP	19.09	21.97	41.06	69.54	-28.48

Remark: Corr. Factor = Antenna Factor + Cable Loss

**TEST REPORT**

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dB $\mu$ V)	Corrected Reading (dB $\mu$ V/m)	Limit @ 3 m (dB $\mu$ V/m)	Margin (dB)
Ground-parallel	0.009	AV	18.11	53.10	71.21	128.52	-57.31
Ground-parallel	0.579	QP	18.85	34.33	53.18	72.38	-19.20
Ground-parallel	0.699	QP	18.92	27.51	46.43	70.81	-24.38
Ground-parallel	1.029	QP	19.10	23.67	42.77	67.37	-24.60
Ground-parallel	1.149	QP	19.10	27.29	46.39	66.43	-20.04
Ground-parallel	1.748	QP	19.10	22.82	41.92	69.54	-27.62

Remark: Corr. Factor = Antenna Factor + Cable Loss

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**3.4.2 Measurement results: frequencies equal to or less than 1 GHz**

Temperature (°C) :	22
Relative Humidity (%):	60
Test date:	2022/10/28

The test was performed on EUT under continuously transmitting mode. The worst case occurred at 5740MHz.

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Vertical	36.79	QP	19.04	15.65	34.69	40.00	-5.31
Vertical	45.52	QP	20.68	13.80	34.48	40.00	-5.52
Vertical	61.04	QP	19.97	19.34	39.31	40.00	-0.69
Vertical	85.29	QP	15.01	19.07	34.08	40.00	-5.92
Vertical	110.51	QP	17.03	16.86	33.89	43.50	-9.61
Vertical	147.37	QP	20.39	12.45	32.84	43.50	-10.66

Antenna Polarity	Frequency (MHz)	Spectrum Analyzer Detector	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Horizontal	36.79	QP	19.04	6.03	25.07	40.00	-14.93
Horizontal	61.04	QP	19.97	10.22	30.19	40.00	-9.81
Horizontal	110.51	QP	17.03	12.72	29.75	43.50	-13.75
Horizontal	134.76	QP	19.36	17.34	36.70	43.50	-6.80
Horizontal	147.37	QP	20.39	7.61	28.00	43.50	-15.50
Horizontal	159.01	QP	20.69	7.71	28.40	43.50	-15.10

Remark: Corr. Factor = Antenna Factor + Cable Loss

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**3.4.3 Measurement results: frequency above 1GHz**

Temperature (°C) :	22
Relative Humidity (%):	60
Test date:	2022/10/28

Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
Channel_Low	11480	PK	H	11.28	32.26	43.54	74.00	-30.46
	11480	PK	V	11.28	32.01	43.29	74.00	-30.71
Channel_Mid	11580	PK	H	11.24	28.47	39.71	74.00	-34.29
	11580	PK	V	11.24	31.80	43.04	74.00	-30.96
Channel_High	11680	PK	H	11.04	29.96	41.00	74.00	-33.00
	11680	PK	V	11.04	30.63	41.67	74.00	-32.33

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre\_Amplifier Gain

**TEST REPORT**

**3.4.4 Measurement results: Fundamental**

Temperature (°C) :	22
Relative Humidity (%) :	60
Test date:	2022/10/26

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)
5740	PK	H	-4.10	111.24	107.14	114.00	-6.86
	AV	H	-4.10	96.28	92.18	94.00	-1.82
	PK	V	-4.10	101.08	96.98	114.00	-17.02
	AV	V	-4.10	86.57	82.47	94.00	-11.53
5790	PK	H	-3.75	110.09	106.34	114.00	-7.66
	AV	H	-3.75	94.17	90.42	94.00	-3.58
	PK	V	-3.75	103.59	99.84	114.00	-14.16
	AV	V	-3.75	87.80	84.05	94.00	-9.95
5840	PK	H	-3.43	111.93	108.50	114.00	-5.50
	AV	H	-3.43	95.35	91.92	94.00	-2.08
	PK	V	-3.43	104.00	100.57	114.00	-13.43
	AV	V	-3.43	87.31	83.88	94.00	-10.12

Remark: Correction Factor = Antenna Factor + Cable Loss– Preamp. Gain



**TEST REPORT**

**4. Radiated emission on the band edge FCC 15.249(d)**

**4.1 Operating environment**

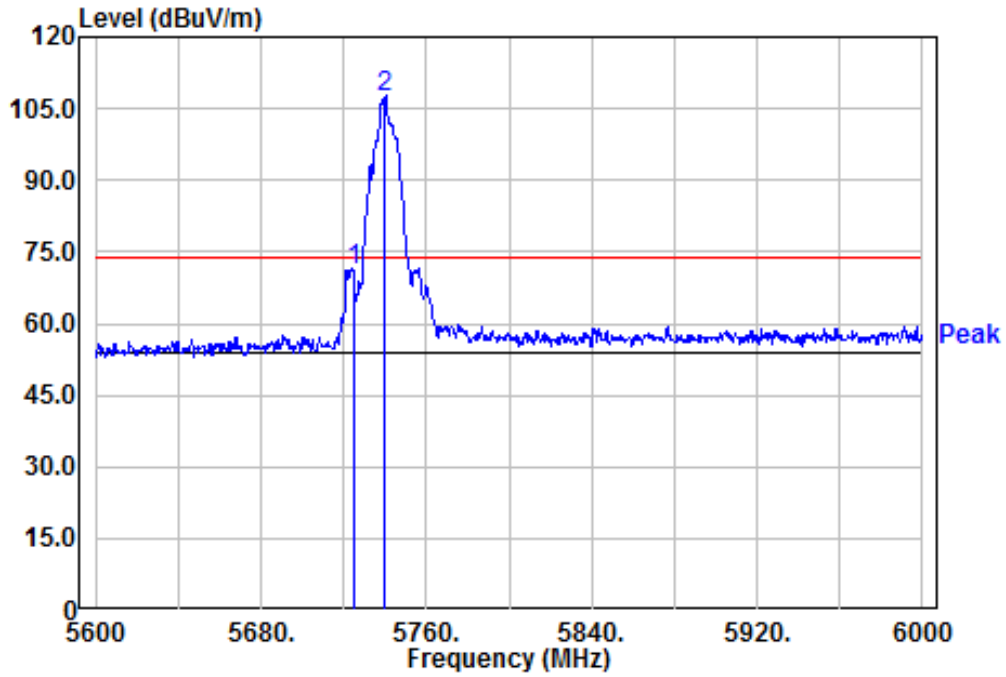
Temperature (°C) :	22
Relative Humidity (%) :	60
Test date:	2022/10/26

**4.2 Radiated emission on the band edge test data**

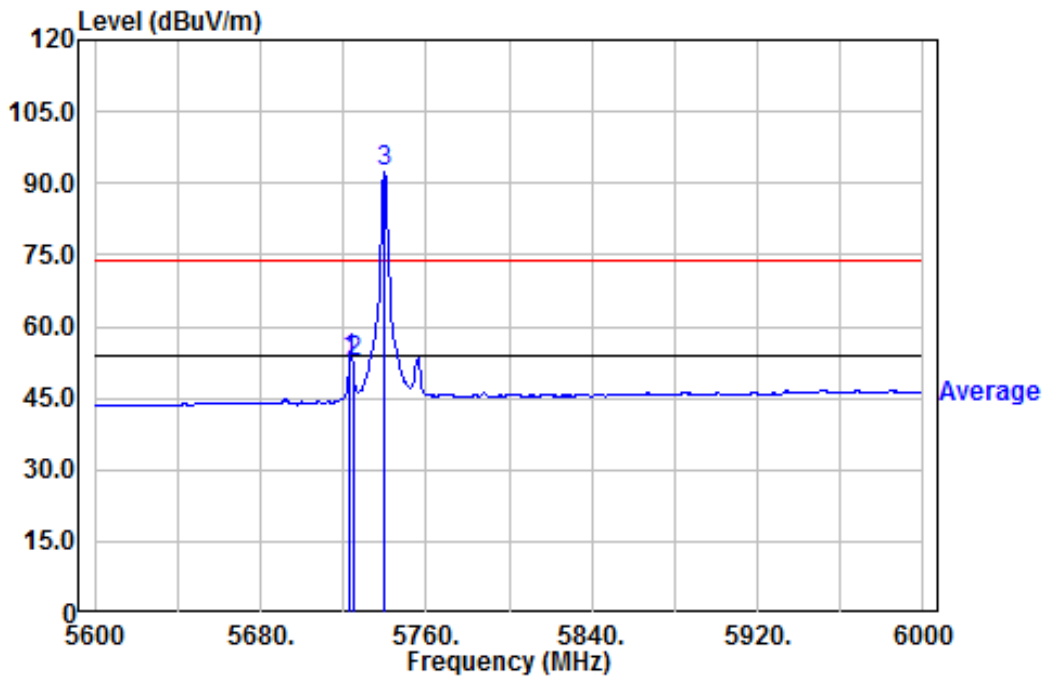
Mode	Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBμV)	Corrected Reading (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin (dB)	Restricted band (MHz)
Channel_Low	5724.80	PK	H	-4.22	75.38	71.16	74	-2.84	≤5725
	5723.20	AV	H	-4.23	57.20	52.97	54	-1.03	
Channel_High	5884.00	PK	H	-3.13	63.12	59.99	74	-14.01	≤5875
	5950.40	AV	H	-3.10	49.70	46.60	54	-7.40	

Remark: Correction Factor = Antenna Factor + Cable Loss

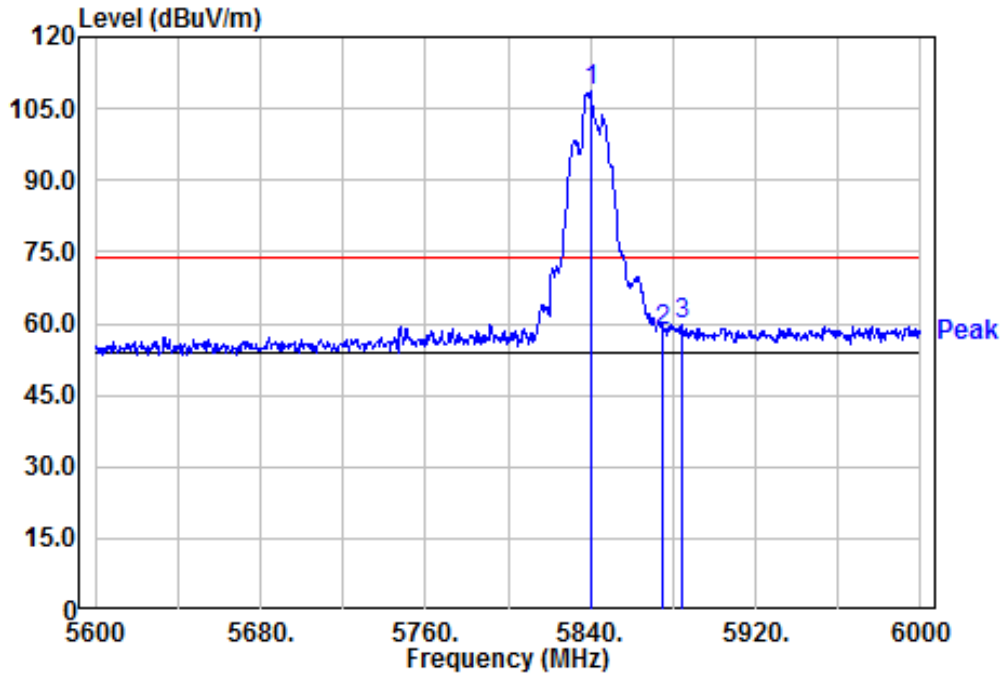
### Restricted Band Bandedge @ Low Ch Mode TX PK



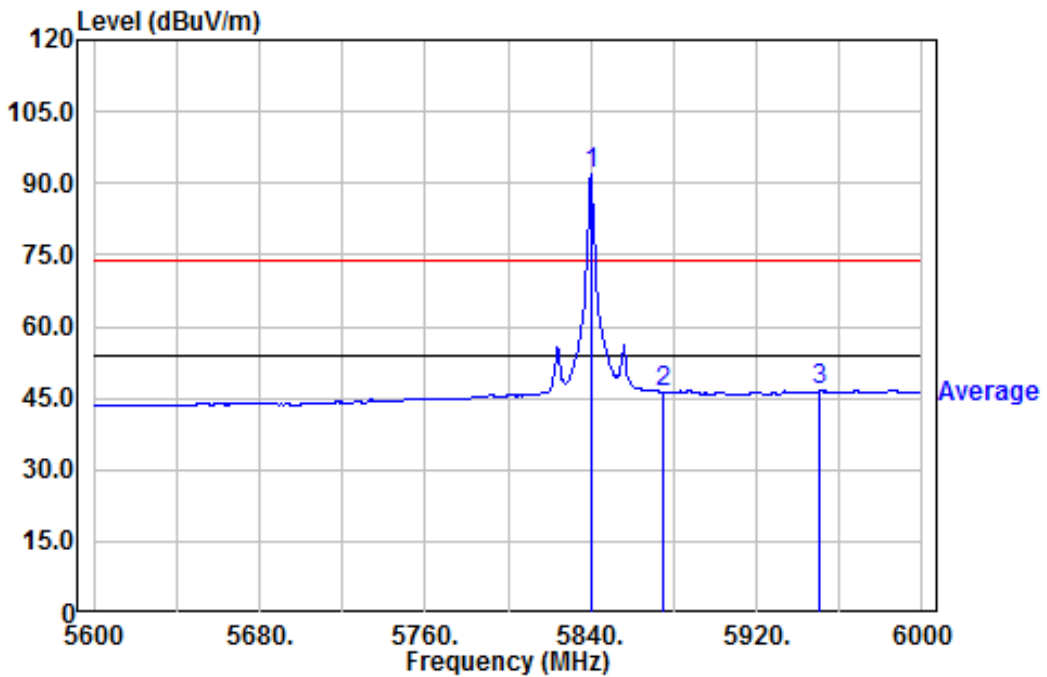
### Restricted Band Bandedge @ Low Ch Mode TX AV



### Restricted Band Bandedge @ High Ch Mode TX PK



### Restricted Band Bandedge @ High Ch Mode TX AV



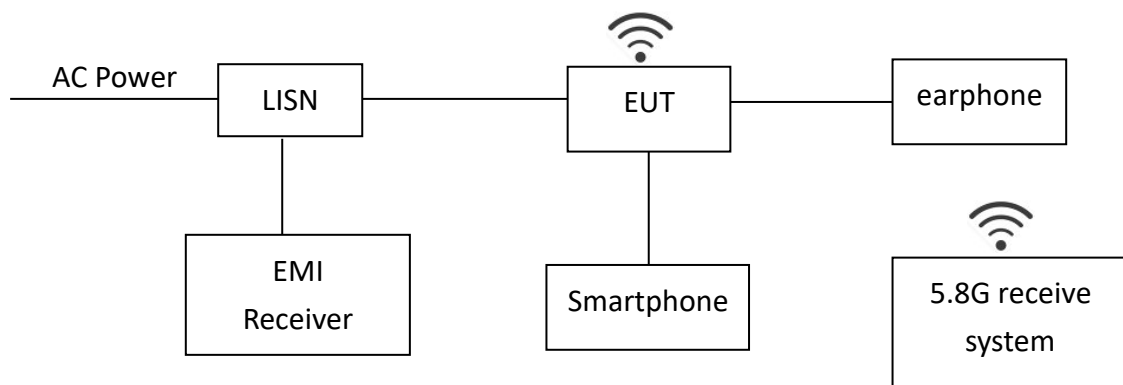
## TEST REPORT

### 5. Conducted emission test FCC 15.207

#### 6.1 Operating environment

Temperature (°C) :	24
Relative Humidity (%) :	51
Test date:	2022/10/21

#### 5.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCI 30) is set at 9kHz.

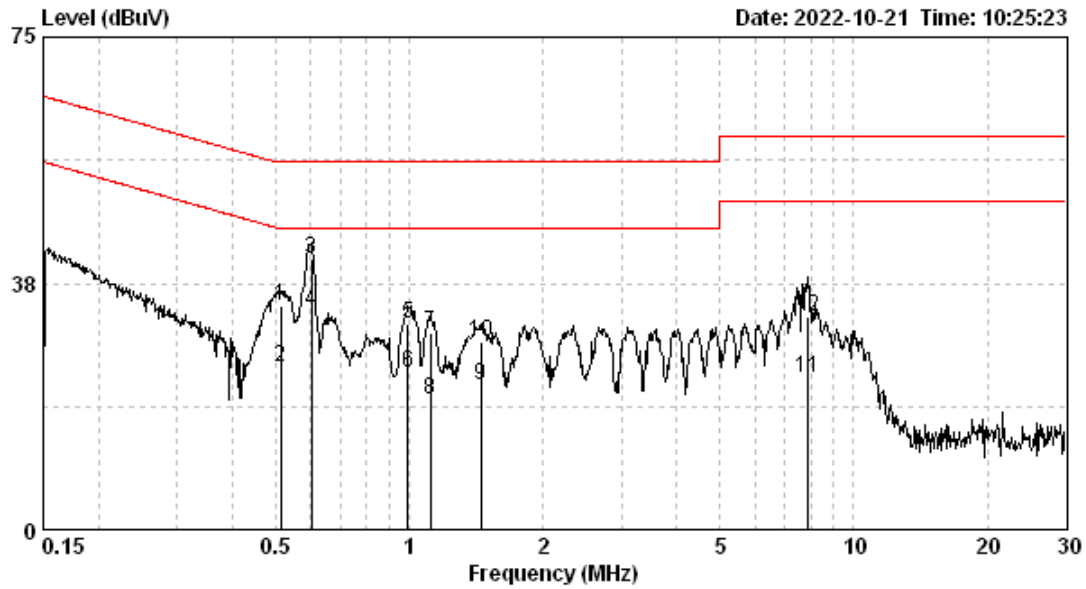
#### 5.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

\*Decreases with the logarithm of the frequency.

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### 5.4 Conducted emission data FCC 15.207

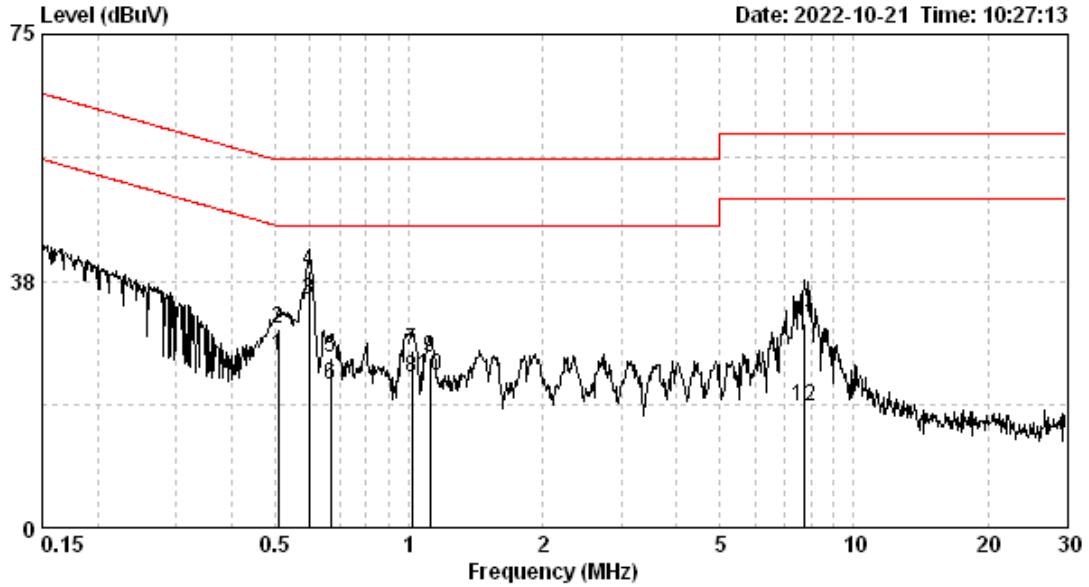


Test voltage :AC 120V/60Hz  
 Temp. / R.H. :25°C / 58%  
 Atmospheric pressure :1005 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBUV)	Level QP (dBUV)	Limit QP (dBUV)	Reading AV (dBUV)	Level AV (dBUV)	Limit AV (dBUV)	Margin (dB)	
									QP	AV
LINE	0.513	9.66	24.29	33.95	56.00	15.06	24.72	46.00	-22.05	-21.28
LINE	0.601	9.67	31.47	41.14	56.00	23.44	33.11	46.00	-14.86	-12.89
LINE	0.994	9.69	21.65	31.34	56.00	14.09	23.78	46.00	-24.66	-22.22
LINE	1.117	9.69	20.18	29.87	56.00	10.20	19.89	46.00	-26.13	-26.11
LINE	1.449	9.70	18.74	28.44	56.00	12.21	21.91	46.00	-27.56	-24.09
LINE	7.852	9.76	22.68	32.44	60.00	13.40	23.17	50.00	-27.56	-26.83

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBUV) = Corr. Factor (dB) + Reading (dBUV)
3. Margin (dB) = Level (dBUV) – Limit (dBUV)



Test voltage : AC 120V/60Hz  
 Temp. / R.H. : 25°C / 58%  
 Atmospheric pressure : 1005 hPa

Phase	Frequency (MHz)	Corr. Factor (dB)	Reading QP (dBUV)	Level QP (dBUV)	Limit QP (dBUV)	Reading AV (dBUV)	Level AV (dBUV)	Limit AV (dBUV)	Margin (dB)	
									QP	AV
NEUTRAL	0.510	9.67	20.60	30.27	56.00	16.39	26.06	46.00	-25.73	-19.94
NEUTRAL	0.598	9.68	29.30	38.98	56.00	24.98	34.67	46.00	-17.02	-11.33
NEUTRAL	0.668	9.69	16.08	25.76	56.00	12.14	21.83	46.00	-30.24	-24.17
NEUTRAL	1.016	9.71	17.12	26.83	56.00	12.96	22.67	46.00	-29.17	-23.33
NEUTRAL	1.117	9.71	16.19	25.90	56.00	13.41	23.12	46.00	-30.10	-22.88
NEUTRAL	7.769	9.79	21.22	31.00	60.00	8.68	18.46	50.00	-29.00	-31.54

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Level (dBUV) = Corr. Factor (dB) + Reading (dBUV)
3. Margin (dB) = Level (dBUV) – Limit (dBUV)

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**Appendix A: Test equipment list**

Test Equipment/ Test site	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR7	101822	2022/08/09	2023/08/08
Signal Analyzer	Agilent	N9030A	MY51380492	2022/08/09	2023/08/08
Active Loop Antenna	SCHWARZBECK MESS-ELEKTRONIC	FMZB1519	1519-067	2022/04/13	2023/04/12
Broadband Antenna	SHWARZBECK	VULB 9168	9168-172	2022/01/20	2023/01/19
Horn Antenna	EMCO	BBHA 9120 D	9120D-456	2022/01/21	2023/01/20
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170159	2021/04/08	2024/04/07
Broadband Amplifier	SGH	SGH118(45dB)	20220105-1	2022/01/07	2023/01/06
Pre-amplifier	SGH	SGH184	20201124-1	2021/12/06	2022/12/05
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2022/03/04	2023/03/03
966-2(B) Cable	SUHNER	SUCOFLEX 104P	CB0005	2022/03/04	2023/03/03
966-2 Cable	SUHNER	SUCOFLEX 104P	9403/4P	2021/11/30	2022/11/29
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2022/01/14	2023/01/13
Hight Pass Filter	Reactel	7HS-7G/18G-S11	N/A	2022/05/25	2023/05/24
Test software	Audix	e3	V9	NCR	NCR

Note: No Calibration Required (NCR).

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Test Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	R&S	ESCI	100018	2021/11/16	2022/11/15
LISN	R&S	ENV216	101160	2022/07/13	2023/07/12
CON-2 Cable	SUHNER	EMCCFD300-B M-NM-6000	170502	2022/04/29	2023/04/28
Test software	Audix	e3	V4.20040112L	NCR	NCR

Note: No Calibration Required (NCR).



## Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

Item	Uncertainty
Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.16 dB
Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m	5.02 dB
Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m	5.17 dB
Vertically polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Horizontally polarized Radiated disturbances from 18GHz~26.5GHz in a semi-anechoic chamber at a distance of 1m	2.39 dB
Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m	3.70 dB
Emission on the Band Edge Test	4.32 dB
AC Power Line Conducted Emission	3.08 dB