FCC Radio Test Report

FCC ID: YR8ES820

This report concerns: Class II Permissive Change

Project No.	:	2108H047
Equipment	:	4G waterproof GPS Tracker
Brand Name	:	esky
Test Model	:	ES820
Series Model	:	N/A
Applicant	:	eSky wireless Inc.
Address	:	A311#,258,Road Ren'ai suzhou china
Manufacturer	:	eSky wireless Inc.
Address	:	A311#,258,Road Ren'ai suzhou china
Date of Receipt	:	Aug. 26, 2021
Date of Test	:	Aug. 26, 2021 ~ Nov. 08, 2021
Issued Date	:	Nov. 09, 2021
Report Version	:	R00
Test Sample	:	Engineering Sample No.: SH2021082428
Standard(s)	:	47 CFR FCC Part 22 Subpart H 47 CFR FCC Part 2 ANSI/TIA/EIA-603-E-2016 FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Maker Qi

Prepared by : Maker Qi

Ryan. Wang

Approved by : Ryan Wang

TESTING CERT #5123.03

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	The RF module of this 4G waterproof GPS Tracker has been tested and certified. Only the Radiated Spurious Emissions has been evaluated and tested, and the worst case was recorded in this report. For the test results of all other test items please refer to above module test reports. (Report NO.: R1907A0408-R1V1, R1907A0408-R2V1, R1907A0408-R3V1, R1907A0408-R4V1, R1907A0408-M1V1)	Nov. 09, 2021

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H & Part 2			
Standard(s) Section	Test Item	Judgment	Remark
2.1053 22.917(a)	Radiated Spurious Emissions	PASS	------

Note:

1. For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”.
2. The output power and antenna gain of the EUT are lower than RF modules, so only the Radiated Spurious Emissions have been evaluated and tested, and the worst case was recorded in this report.The test results of output power, Please refer to the SAR test Report (Report No.: BTL-FCC SAR-1-2108H047_Appendix E) .

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210, China.
BTL's Test Firm Registration Number for FCC: 476765
BTL's Designation Number for FCC: CN1241

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2).
The BTL measurement uncertainty as below table:

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
SH-CB02	CISPR	9 KHz~30 MHz	-	2.16
		30 MHz~200 MHz	V	4.04
		30 MHz~200 MHz	H	2.90
		200 MHz~1,000 MHz	V	3.76
		200 MHz~1,000 MHz	H	3.82
		1GHz ~ 6GHz	-	4.56
		6GHz ~ 18GHz	-	4.14

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Radiated Spurious Emissions	26°C	61%	AC120V/60Hz	Forest Li

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	4G waterproof GPS Tracker		
Brand Name	esky		
Test Model	ES820		
Series Model	N/A		
Model Difference(s)	N/A		
Power Source	DC Voltage supplied from AC/DC adapter(support unit)		
Power Rating	Supply voltage:3.3-4.3V, Typical supply voltage:3.8V		
Antenna Type	internal		
Antenna Gain	WCDMA V		-4.4489
	LTE Band 5		
Modulation Type	WCDMA		UL: QPSK DL: QPSK
	WCDMA(HSDPA/HSUPA/DC-HSDPA)		16QAM
	LTE		UL: QPSK,16QAM DL: QPSK,16QAM, 64QAM
Operation Frequency	Band	TX(MHz)	RX(MHz)
	WCDMA V	824 ~ 849	869 ~ 894
	LTE Band 5	824 ~ 849	869 ~ 894

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

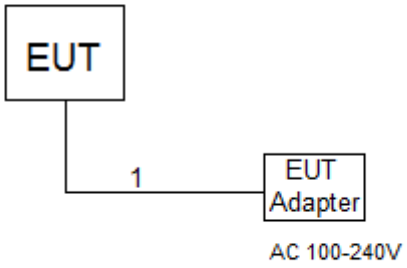
2. LTE Band 5 CH20525_5M mode was found to be the worst case and recorded.

2.2 DESCRIPTION OF TEST MODES AND TEST CONDITION

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
The worst case was found when positioned on X-plane for EIRP and X-axis for radiated emission.
Following channel(s) was (were) selected for the final test as listed below:

LTE BAND 5					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Radiated Emission	20425 to 20625	20525	5MHz	QPSK	1 RB

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATIONOFSYSTEMTESTED



2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m

3. TEST RESULT

3.1 RADIATED EMISSIONS MEASUREMENT

3.1.1 LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13dBm.

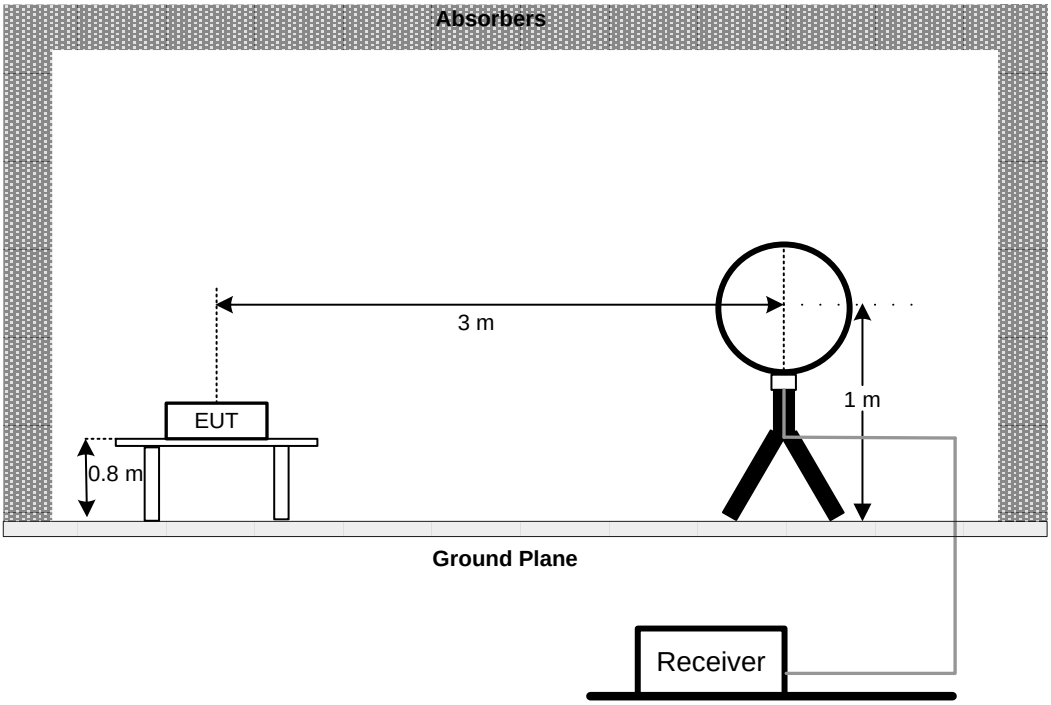
3.1.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.2.

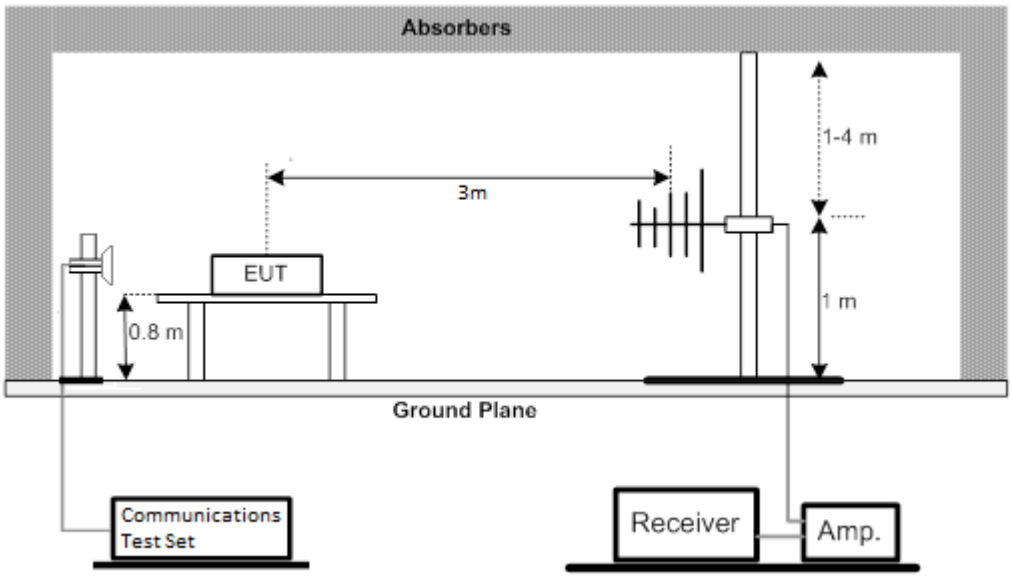
1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G
3. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.
5. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

3.1.3 TEST SETUP LAYOUT

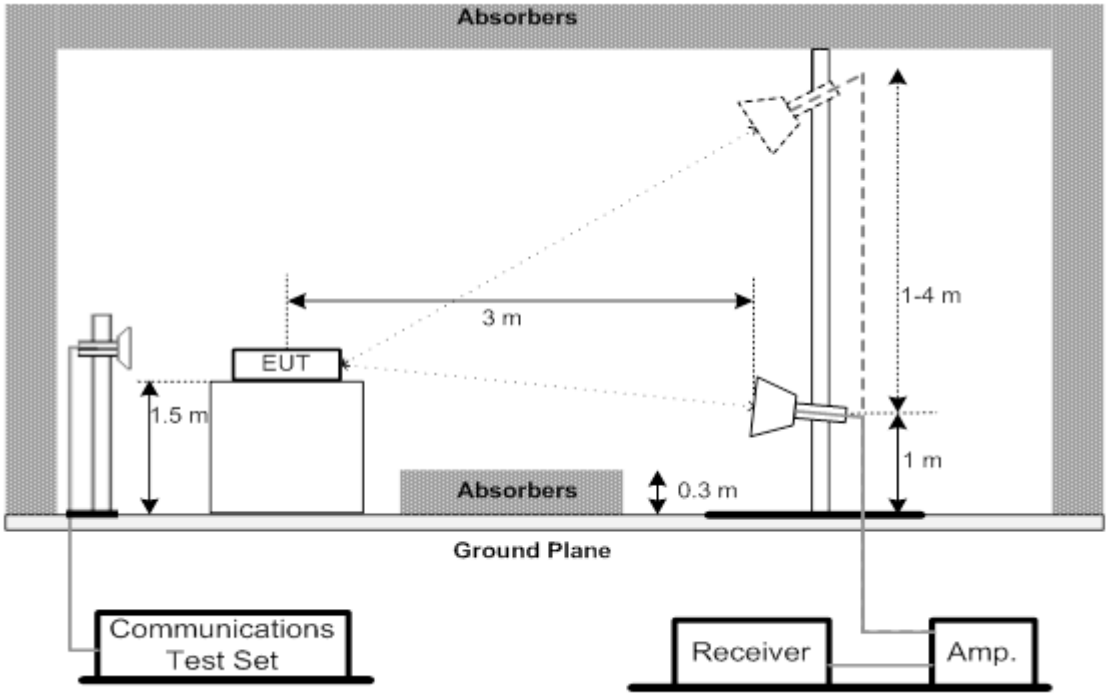
Below 30MHz



30MHz to 1GHz



Above 1GHz



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the module report.

3.1.6 TEST RESULTS (30MHZ TO 1000MHZ)

Please refer to the Appendix A.

3.1.7 TEST RESULTS (ABOVE 1000MHZ)

Please refer to the Appendix B.

4. LIST OF MEASUREMENT EQUIPMENTS

Radiated Emission Measurement(30M-1G)					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB 9160	9160-3233	Mar. 26, 2022
2	Pre-Amplifier	emci	EMC9135	980401	Mar. 20, 2022
3	MXE EMI Receiver	Keysight	N9038A	MY56400088	Mar. 21, 2022
4	Test Cable	emci	EMC104-SM-SM-7000	181020	Apr. 11, 2022
5	Test Cable	emci	EMC104-SM-SM-2500	170618	Apr. 11, 2022
6	Test Cable	emci	EMC104-SM-NM-800	170647	Apr. 11, 2022
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	Wideband Radio Communication Test	R&S	CMW500	129246	Aug. 23, 2022

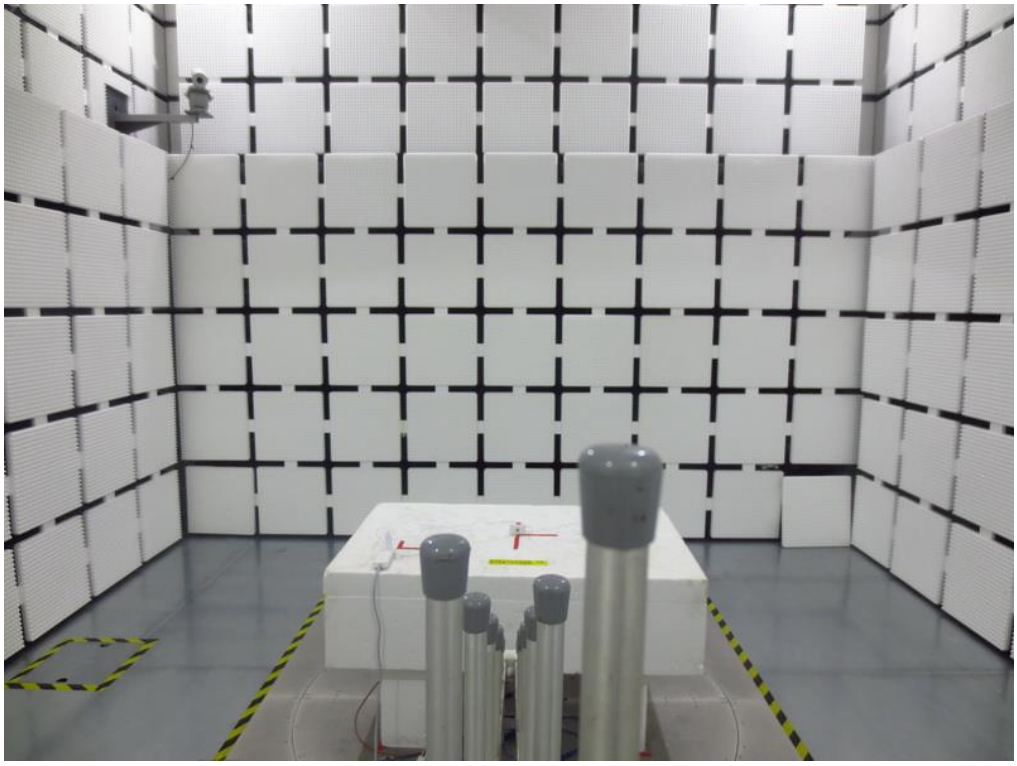
Radiated Emission Measurement(1G-18G)					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double-Ridged Waveguide Horn Antenna	ETS-Lindgren	BBHA 9120D	9120D-1817	Mar. 26, 2022
2	Pre-Amplifier	emci	EMC051845SE	980725	Aug. 23, 2022
3	EXA Spectrum Analyzer	Keysight	N9010A	MY56480579	Mar. 21, 2022
4	Test Cable	emci	EMC104-SM-SM-7000	181020	Apr. 11, 2022
5	Test Cable	emci	EMC104-SM-SM-2500	170618	Apr. 11, 2022
6	Test Cable	emci	EMC104-SM-NM-800	170647	Apr. 11, 2022
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	Wideband Radio Communication Test	R&S	CMW500	129246	Aug. 23, 2022

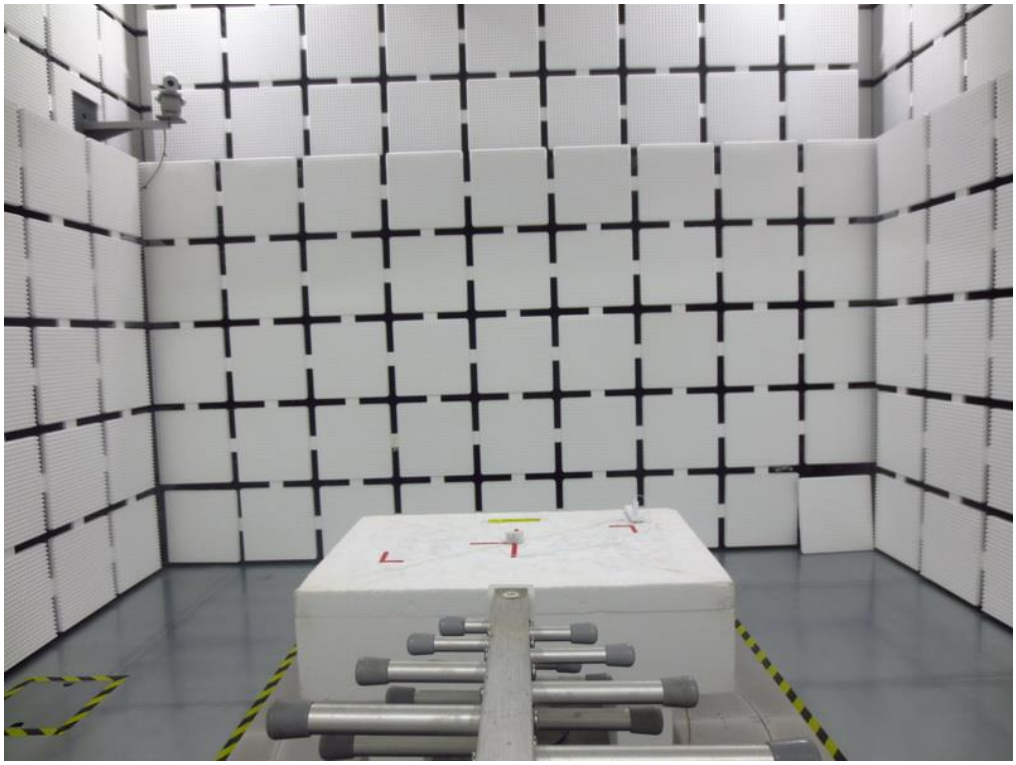
Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

6. EUT TEST PHOTO

Radiated Emissions Test Photos

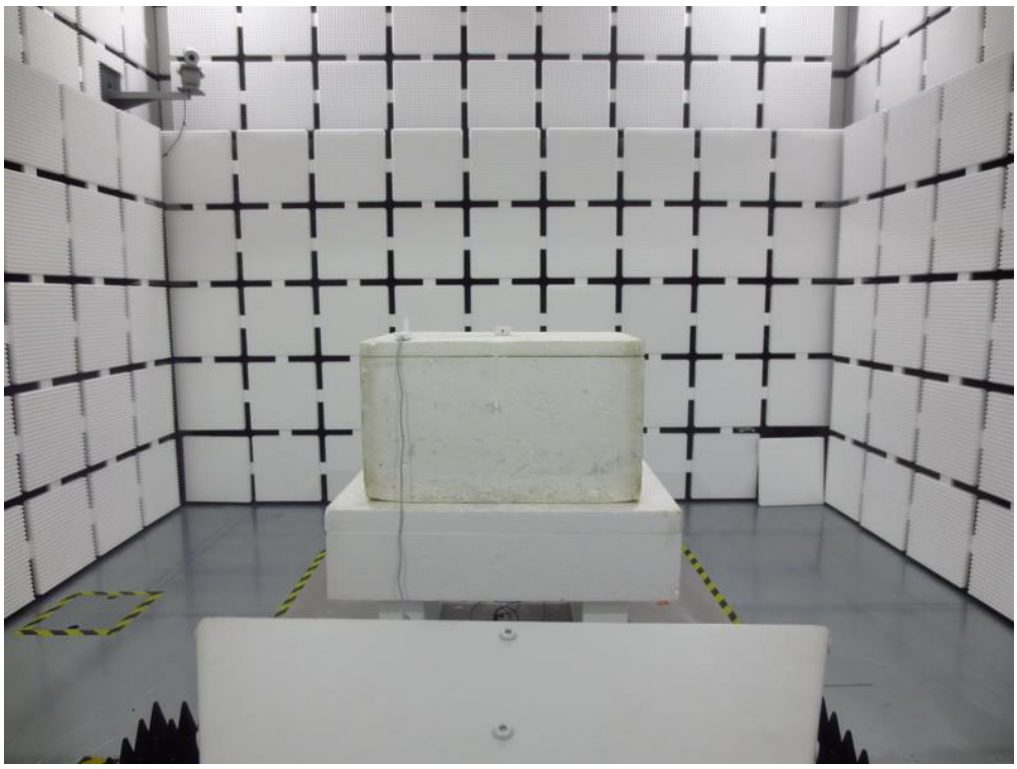
30 MHz to 1000 MHz

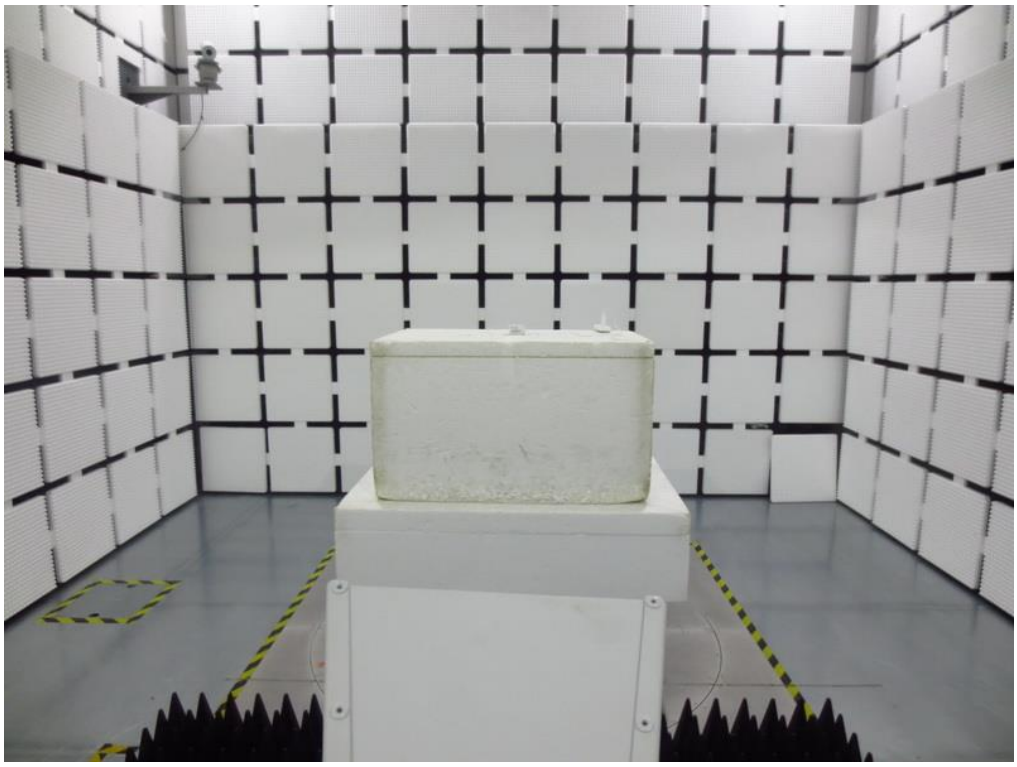




Radiated Emissions Test Photos

Above 1 GHz

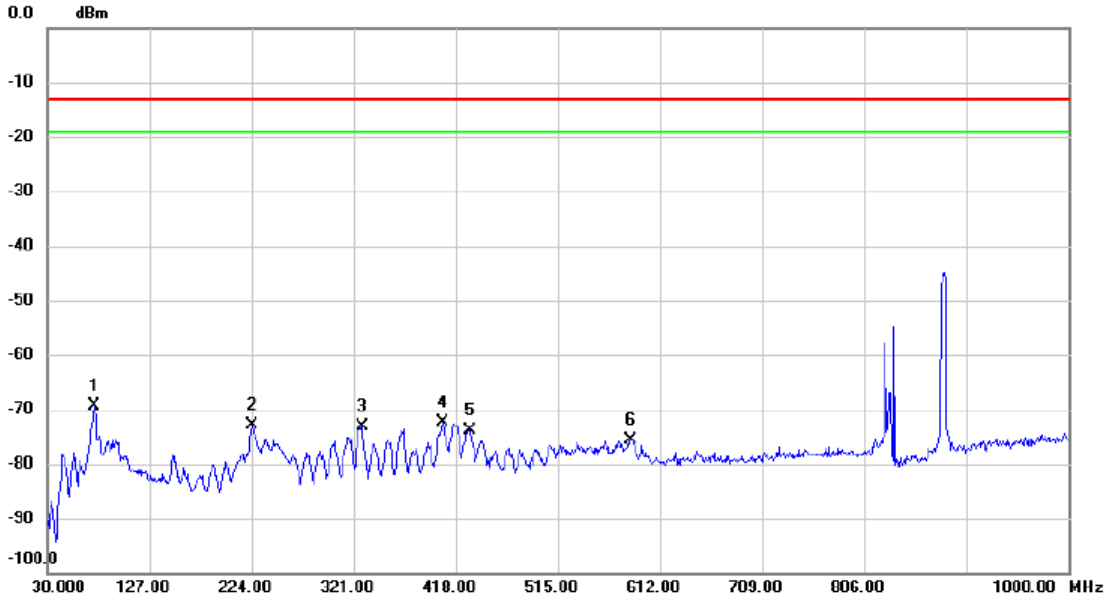




APPENDIX A - RADIATED EMISSION (30MHZ TO 1GHZ)

Test Mode:	LTE Band 5_TX CH20525_5M

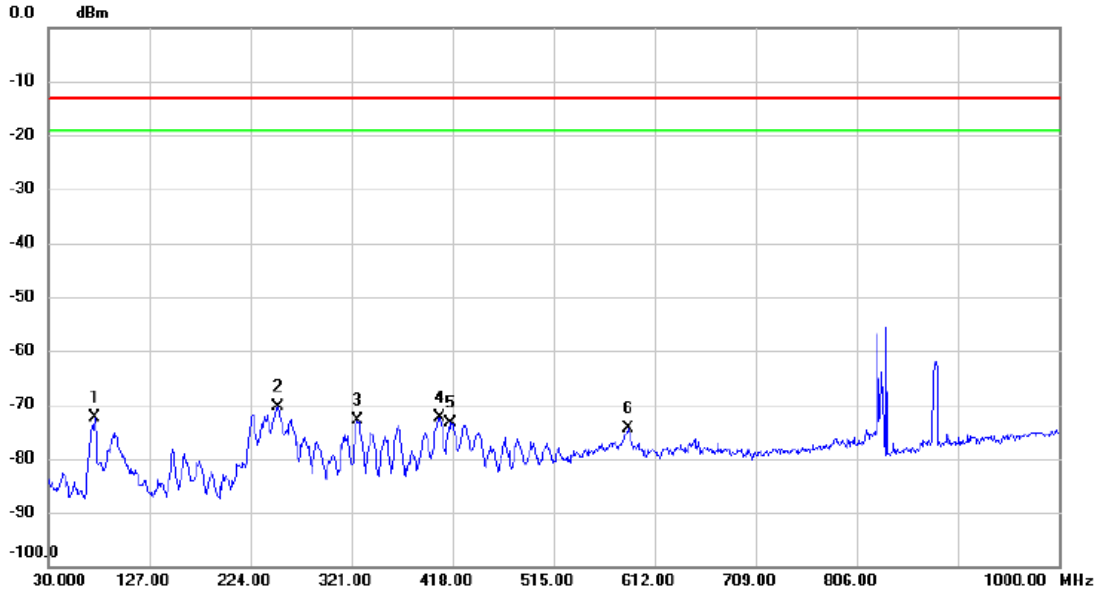
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	75.1050	-61.00	-8.31	-69.31	-13.00	-56.31	RMS	
2		224.4850	-69.47	-3.44	-72.91	-13.00	-59.91	RMS	
3		328.7600	-72.21	-0.80	-73.01	-13.00	-60.01	RMS	
4		405.8750	-73.11	0.65	-72.46	-13.00	-59.46	RMS	
5		431.5800	-74.62	0.82	-73.80	-13.00	-60.80	RMS	
6		583.8700	-79.28	3.78	-75.50	-13.00	-62.50	RMS	

Test Mode:	LTE Band 5_TX CH20525_5M

Horizontal

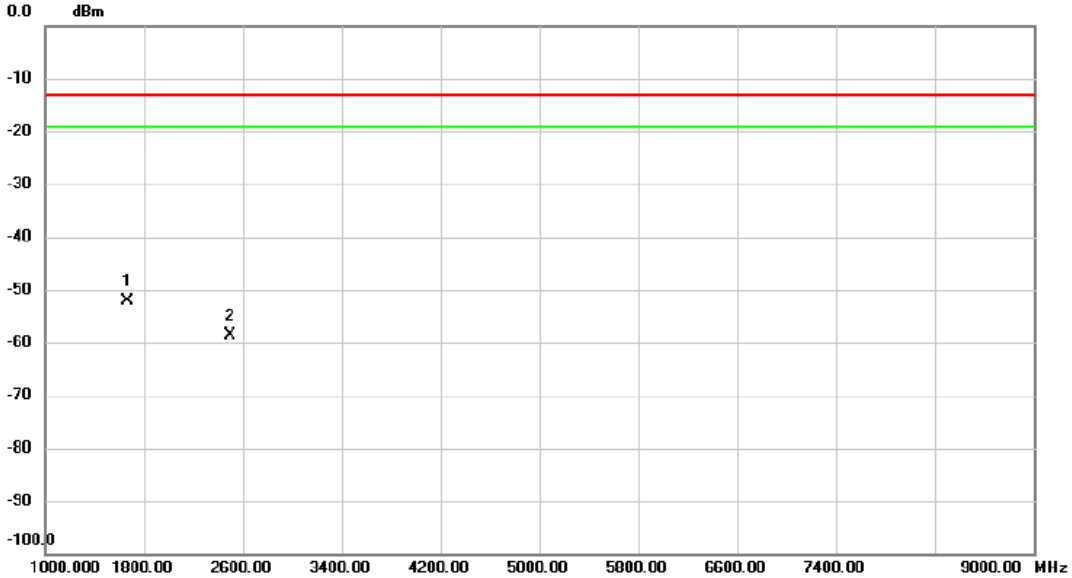


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1		75.1050	-63.97	-8.37	-72.34	-13.00	-59.34	RMS	
2	*	250.1900	-69.24	-1.25	-70.49	-13.00	-57.49	RMS	
3		326.8200	-72.20	-0.66	-72.86	-13.00	-59.86	RMS	
4		405.8750	-72.79	0.46	-72.33	-13.00	-59.33	RMS	
5		416.5450	-73.82	0.56	-73.26	-13.00	-60.26	RMS	
6		587.2650	-78.17	3.84	-74.33	-13.00	-61.33	RMS	

APPENDIX B - RADIATED EMISSION (ABOVE 1GHZ)

Test Mode:	LTE Band 5_TX CH20525_5M

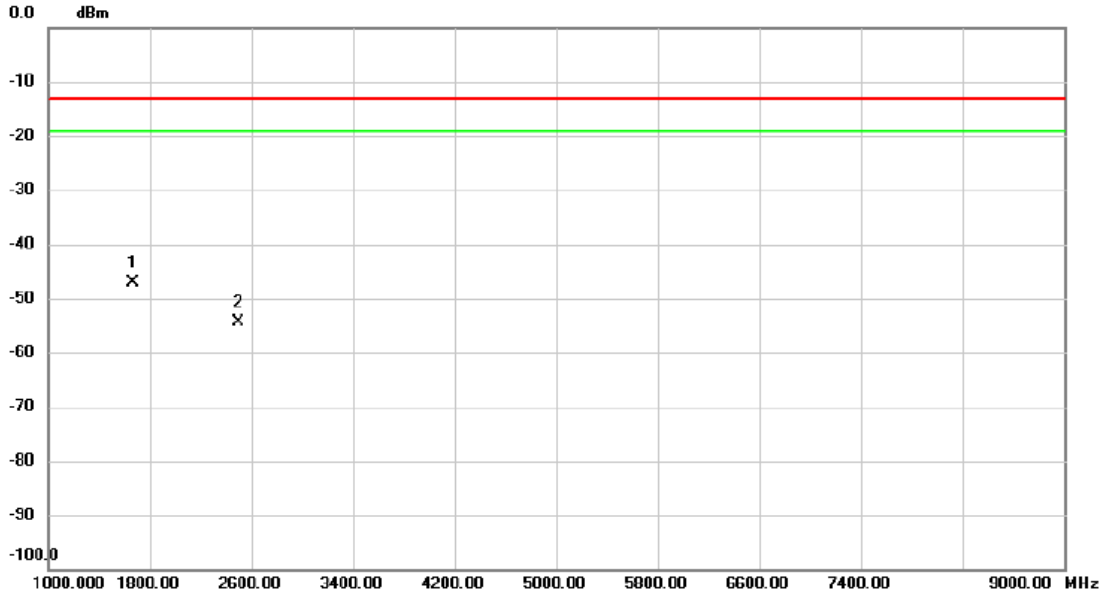
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1668.800	-41.06	-11.17	-52.23	-13.00	-39.23	RMS	
2		2502.750	-51.04	-7.55	-58.59	-13.00	-45.59	RMS	

Test Mode:	LTE Band 5_TX CH20525_5M

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBm	dB	dBm	dBm	dB	Detector	Comment
1	*	1668.800	-36.16	-11.01	-47.17	-13.00	-34.17	RMS	
2		2503.200	-46.48	-7.92	-54.40	-13.00	-41.40	RMS	

End of Test Report