FCC RADIO TEST REPORT

FCC ID	:	**XV2SC415C61**
Equipment	:	**SC415 Universal Tank Monitor**
Brand Name	:	**Anova**
Model Name	:	**SC415C6-E2**
Applicant	:	**Silicon Controls Pty Ltd** **Suite 1, 33 Waterloo Road; Macquarie Park NSW 2113 AUSTRALIA**
Manufacturer	:	**Silicon Controls Pty Ltd** **Suite 1, 33 Waterloo Road; Macquarie Park NSW 2113 AUSTRALIA**
Standard	:	**FCC 47 CFR Part 2, and 90(S)**

The product was received on Jan. 21, 2021 and testing was started from Feb. 01, 2021 and completed on Feb. 18, 2021.We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FG111807E	01	Initial issue of report	Jun. 04, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	§2.1046	Conducted Output Power and Effective Radiated Power	Reporting only	-
-	-	Peak-to-Average Ratio	-	See Note
-	§2.1049 §90.209	Occupied Bandwidth and 26dB Bandwidth	-	See Note
-	§2.1051 §90.691	Emission masks – In-band emissions	-	See Note
-	§2.1051 §90.691	Emission masks – Out of band emissions	-	See Note
-	§2.1055 §90.213	Frequency Stability for Temperature & Voltage	-	See Note
3.3	§2.1053 §90.691	Field Strength of Spurious Radiation	Pass	Under limit 42.24 dB at 1640.000 MHz
Remark: The module (Model: ME910G1-WW) makes no difference after verifying output power, this report reuses test data from the module report.				

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Keven Cheng
Report Producer: Dara Chiu

1 General Description

1.1 Feature of Equipment Under Test

GSM/LTE

Product Specification subjective to this standard	
Antenna Type	WWAN: PCB Antenna
Antenna Gain	Band 26: 0.50dBi

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Site

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory	
Test Site Location	No.52 , Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH02-HY	03CH07-HY
Test Engineer	Benjamin Lin	Jesse Wang, Stan Hsieh and Ken Wu
Temperature	20~21℃	19~25℃
Relative Humidity	50~52%	46~60%

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW1190

1.4 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR Part 2, 90
- ANSI / TIA-603-E
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 414788 D01 Radiated Test Site v01r01
- Interim Guidance for Equipment Authorization of Devices with Channel Bandwidths Combined Across Two Contiguous Service Rule Allocations OET/Lab/EACB, June 6, 2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

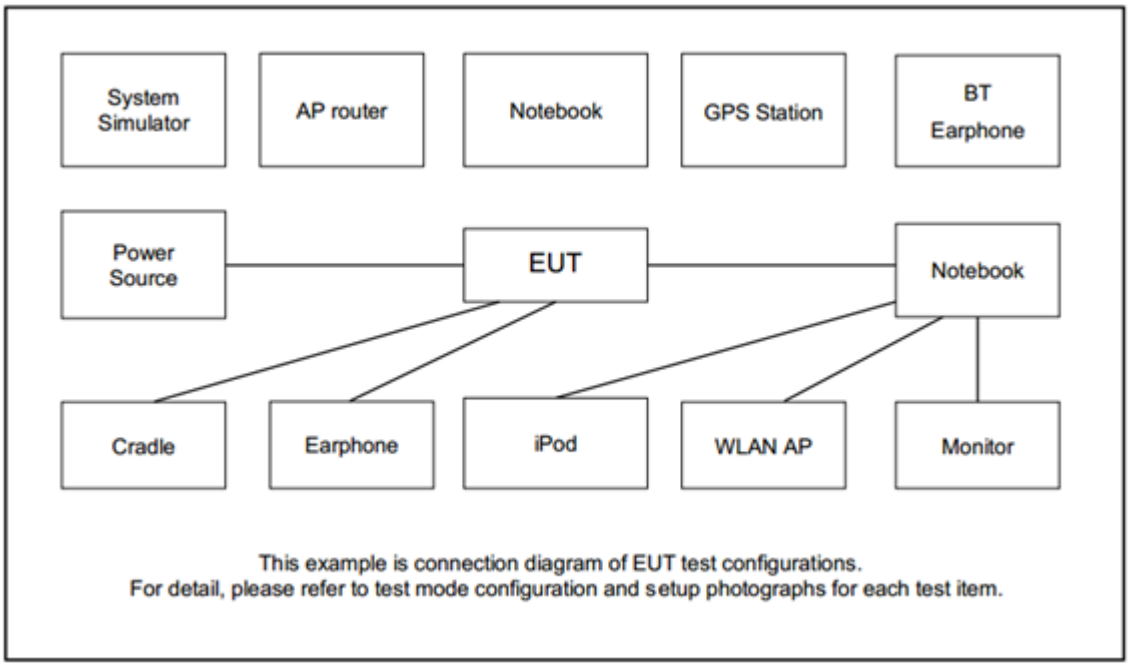
During all testing, EUT is in link mode with base station emulator at maximum power level.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

Frequency range investigated for radiated emission is 30 MHz to 9000 MHz.

Test Items	LTE -NB1 Band	Subcarrier (kHz)		Modulation		Tone@		Test Channel		
		3.75	15	BPSK	QPSK	1	Full	L	M	H
Max. Output Power	26	v	v	v	v	v	v	v	v	v
E.R.P.	26	v	v	v	v	Max. Power				
Radiated Spurious Emission	26	Worst Case						v	v	v
Remark	1. The mark "**v**" means that this configuration is chosen for testing. 2. The mark "-" means that this bandwidth is not supported.									

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m

2.4 Frequency List of Low/Middle/High Channels

LTE-NB1 Band 26 Channel and Frequency List			
Channel/Frequency(MHz)	**Lowest**	**Middle**	**Highest**
Channel	26691	26740	26789
Frequency	814.1	819.0	823.9

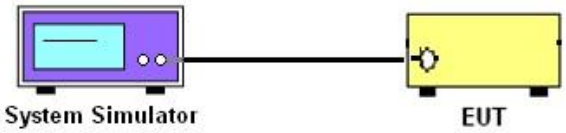
3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



3.1.3 Test Result of Conducted Test

Please refer to Appendix A.

3.2 Conducted Output Power Measurement and ERP Measurement

3.2.1 Description of the Conducted Output Power Measurement and ERP Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 100 Watts for LTE Band 26.

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.3 Field Strength of Spurious Radiation Measurement

3.3.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E. The power of any emission FCC Part 90.691 on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

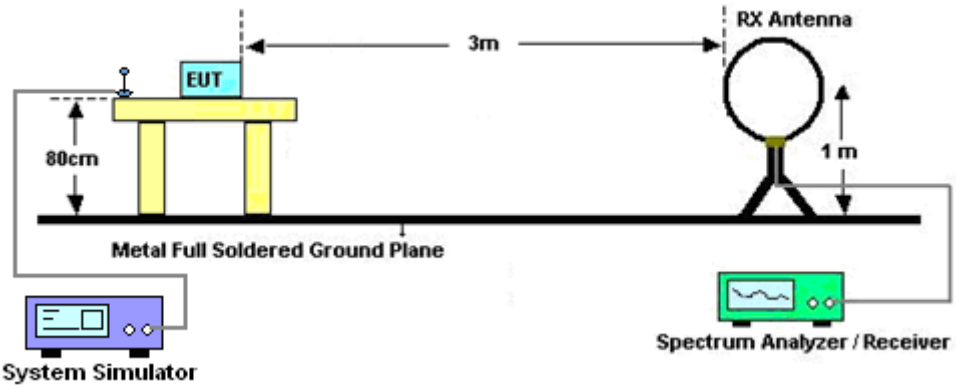
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43+10\log_{10}(P[\text{Watts}])$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.3.2 Test Procedures

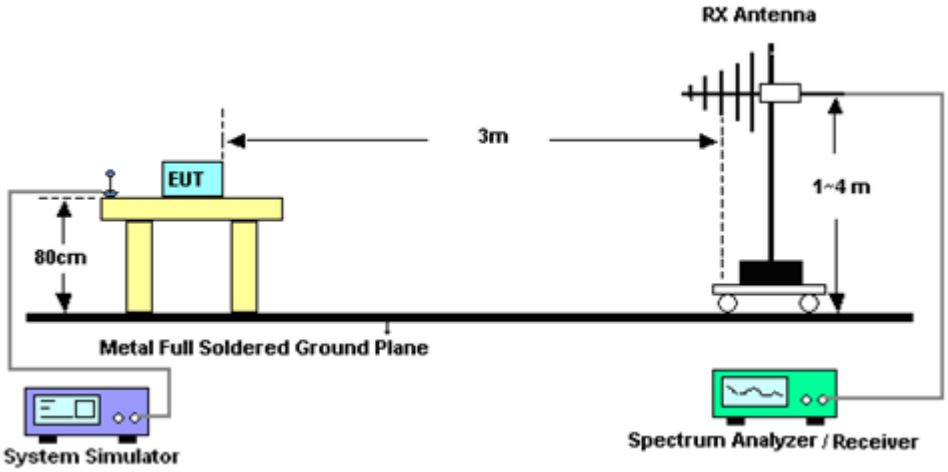
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = EIRP - 2.15
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

3.3.3 Test Setup

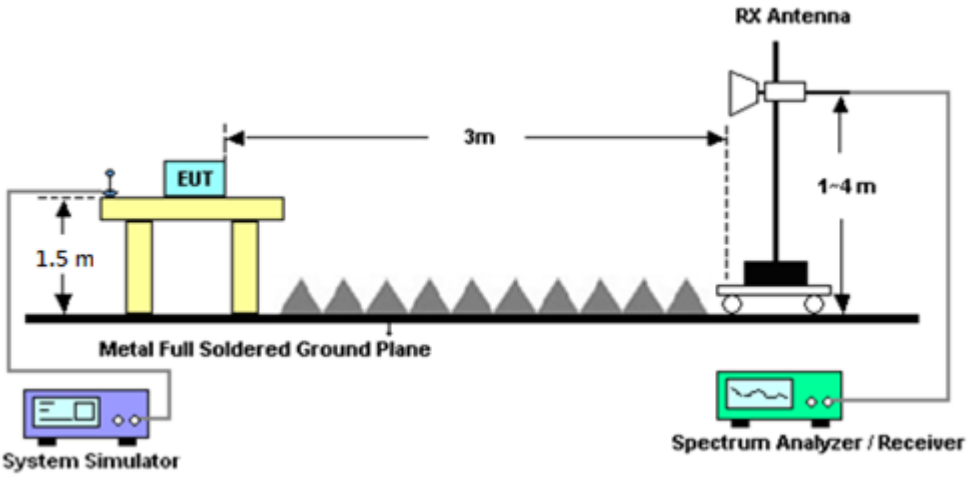
For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.3.4 Test Result of Field Strength of Spurious Radiated

Please refer to Appendix B.

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N -06	35419 & 03	30MHz~1GHz	Apr. 29, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Apr. 28, 2021	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 01, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Nov. 30, 2021	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 04, 2021	Feb. 05, 2021 ~ Feb. 18, 2021	Jan. 03, 2022	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Oct. 31, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Oct. 30, 2021	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jun. 09, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Jun. 08, 2021	Radiation (03CH07-HY)
Filter	Microwave	H1G013G1	SN477215	1GHz High Pass Filter	Oct. 31, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Oct. 30, 2021	Radiation (03CH07-HY)
Filter	Microwave	H3G018G1	SN477219	3GHz High Pass Filter	Oct. 31, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Oct. 30, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4, MY28655/4	9kHz~30MHz	Feb. 25, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	30MHz~1GHz	Feb. 25, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Feb. 24, 2021	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	1GHz~18GHz	Feb. 25, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Feb. 24, 2021	Radiation (03CH07-HY)
Controller	ChainTek	Chaintek 3000	N/A	Control Turn table	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
Controller	Max-Full	MF7802	MF780208368	Control Ant Mast	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
Double Ridge Horn Antenna	EMCO	3117	00227880	1 -18 GHz	N/A	Feb. 05, 2021 ~ Feb. 18, 2021	N/A	Radiation (03CH07-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	Dec. 04, 2020	Feb. 05, 2021 ~ Feb. 18, 2021	Dec. 03, 2021	Radiation (03CH07-HY)
Base Station (Measure)	Anritsu	MT8821C	6201664755	2/3/4G/LTE FDD/TDD with44)/LTE-3CC DLCA/2CC ULCA, CatM1/NB1/NB2	Jul. 12, 2020	Feb. 01, 2021~ Feb. 08, 2021	Jul. 11, 2021	Conducted (TH02-HY)
Coupler	Warison	20dB 25W SMA Directional Coupler	#A	1-18GHz	Jan. 12, 2021	Feb. 01, 2021~ Feb. 08, 2021	Jan. 11, 2022	Conducted (TH02-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.35**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.81**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

LTE-NB1 Band 26 Maximum Average Power [dBm]					
Sub-carrier Spacing [kHz]	Mod	Number of Tones	Lowest	Middle	Highest
3.75	BPSK	1T0	5.88	23.79	5.88
3.75		1T47	5.83	23.69	5.81
3.75	QPSK	1T0	5.90	23.82	5.88
3.75		1T47	5.82	23.71	5.83
15	BPSK	1T0	5.82	23.95	5.79
15		1T11	5.75	23.87	5.71
15		12T0	4.01	21.95	3.98
15	QPSK	1T0	5.81	23.98	5.81
15		1T11	5.76	23.91	5.77
15		12T0	4.00	21.99	3.98

ERP

<Reporting Only>

LTE NB1 Band 26 / 3.75KHz (Average) (Average) (GT - LC = 0.5 dB)						
Channel	Mode	Tones	Conducted		ERP	
			Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	BPSK	1T/0	22.94	0.1968	21.29	0.1346
Middle			22.88	0.1941	21.23	0.1327
Highest			22.96	0.1977	21.31	0.1352
Lowest	QPSK	1T/0	22.95	0.1972	21.30	0.1349
Middle			22.92	0.1959	21.27	0.1340
Highest			22.98	0.1986	21.33	0.1358
Limit	ERP < 100W		Result		PASS	

LTE NB1 Band 26 / 15KHz (Average) (Average) (GT - LC = 0.5 dB)						
Channel	Mode	Tones	Conducted		ERP	
			Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	BPSK	1T/0	22.86	0.1932	21.21	0.1321
Middle			22.97	0.1982	21.32	0.1355
Highest			22.89	0.1945	21.24	0.1330
Lowest	QPSK	1T/0	22.87	0.1936	21.22	0.1324
Middle			22.99	0.1991	21.34	0.1361
Highest			22.9	0.1950	21.25	0.1334
Limit	ERP < 100W		Result		PASS	

Appendix B. Test Results of Radiated Test

LTE Band 26

LTE Band 26 /15KHz / QPSK									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	1628	-62.97	-13	-49.97	-74.71	-64.79	0.97	4.94	H
	2442	-58.82	-13	-45.82	-75.94	-60.62	1.27	5.23	H
	3256	-57.24	-13	-44.24	-76.4	-60.49	1.53	6.93	H
									H
									H
									H
	1628	-62.29	-13	-49.29	-74.51	-64.11	0.97	4.94	V
	2442	-58.37	-13	-45.37	-75.93	-60.17	1.27	5.23	V
	3256	-56.48	-13	-43.48	-76.04	-59.73	1.53	6.93	V
									V
									V
									V
Middle	1640	-59.29	-13	-46.29	-71.17	-61.07	0.97	4.91	H
	2457	-58.38	-13	-45.38	-75.56	-60.22	1.28	5.27	H
	3276	-57.36	-13	-44.36	-76.61	-60.69	1.53	7.01	H
									H
									H
									H
	1640	-55.24	-13	-42.24	-67.59	-57.02	0.97	4.91	V
	2457	-58.28	-13	-45.28	-75.9	-60.12	1.28	5.27	V
	3276	-56.99	-13	-43.99	-76.61	-60.32	1.53	7.01	V
									V
									V
									V

LTE Band 26 /15KHz / QPSK									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Highest	1648	-62.62	-13	-49.62	-74.5	-64.38	0.98	4.89	H
	2472	-58.55	-13	-45.55	-75.76	-60.43	1.28	5.32	H
	3296	-57.40	-13	-44.40	-76.74	-60.81	1.54	7.10	H
									H
									H
									H
	1648	-61.26	-13	-48.26	-73.61	-63.02	0.98	4.89	V
	2472	-57.99	-13	-44.99	-75.64	-59.87	1.28	5.32	V
	3296	-56.70	-13	-43.70	-76.37	-60.11	1.54	7.10	V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.