FCC CO-LOCATION RADIO TEST REPORT

FCC ID	:	**2AW3A-2NAC24ACUCM**
Equipment	:	**EV Charger**
Brand Name	:	**RIVIAN**
Model Name	:	**2NAC24ACUCM**
Marketing Name	:	**RIVIAN WAYPOINTS CHARGER**
Applicant	:	**Rivian Automotive LLC.** **14600 Myford Road, Irvine Irvine CA, 92606**
Manufacturer	:	**Lite-On Technology Corporation** **29F , No.555, Siyuan Rd., Xinzhuang Dist., New Taipei City, Taiwan (R.O.C.)**
Standard	:	**FCC 47 CFR Part 2, 27**

The product was received on Mar. 27, 2024 and testing was performed from Jun. 03, 2024 to Jul. 02, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory
No. 58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)
TEL : 886-3-327-0868
FAX : 886-3-327-0855

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History of this test report

Report No.	Version	Description	Issue Date
FG432616E	01	Initial issue of report	Jul. 30, 2024
FG432616E	02	Revise Test Mode This report is an updated version, replacing the report issued on Jul. 30, 2024.	Aug. 02, 2024
FG432616E	03	Revise Product Feature This report is an updated version, replacing the report issued on Aug. 02, 2024.	Aug. 21, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1053 §27.53 (c)(2) §27.53 (f)	Radiated Spurious Emission (Band 13)	Pass	2.12 dB under the limit at 1573.00 MHz

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Danny Lee

Report Producer: Clio Lo

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
General Specs GSM/LTE, Bluetooth - LE, Wi-Fi 2.4GHz 802.11b/g/n, and NFC. **Antenna Type** WWAN: FPC Antenna WLAN: FPC Antenna Bluetooth - LE: Internal Antenna NFC: Loop Antenna	
Antenna Gain	LTE Band 13 : 2.8

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

Support band and evaluated information	
Supported band	B13
Evaluated and Tested band	B13

band Power Class		
	PC3	-
B13	V	-

1.2 Modification of EUT

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

1.3 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY
Test Engineer	Yuan Lee, Fu Chen and Troye Hsieh
Temperature (℃)	20.2~20.9
Relative Humidity (%)	52.3~65.4

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

FCC Designation No.: TW3786

1.4 Applicable Standards

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

- ANSI C63.26-2015
- FCC 47 CFR Part 2, 27
- FCC Part 15 Subpart C §15.247
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Modulation Type	Modulation
A	QPSK

Test Item	Modulation Type	Subcarrier	Tone	Channel
RSE	A	15 kHz	1T0	L, M, H

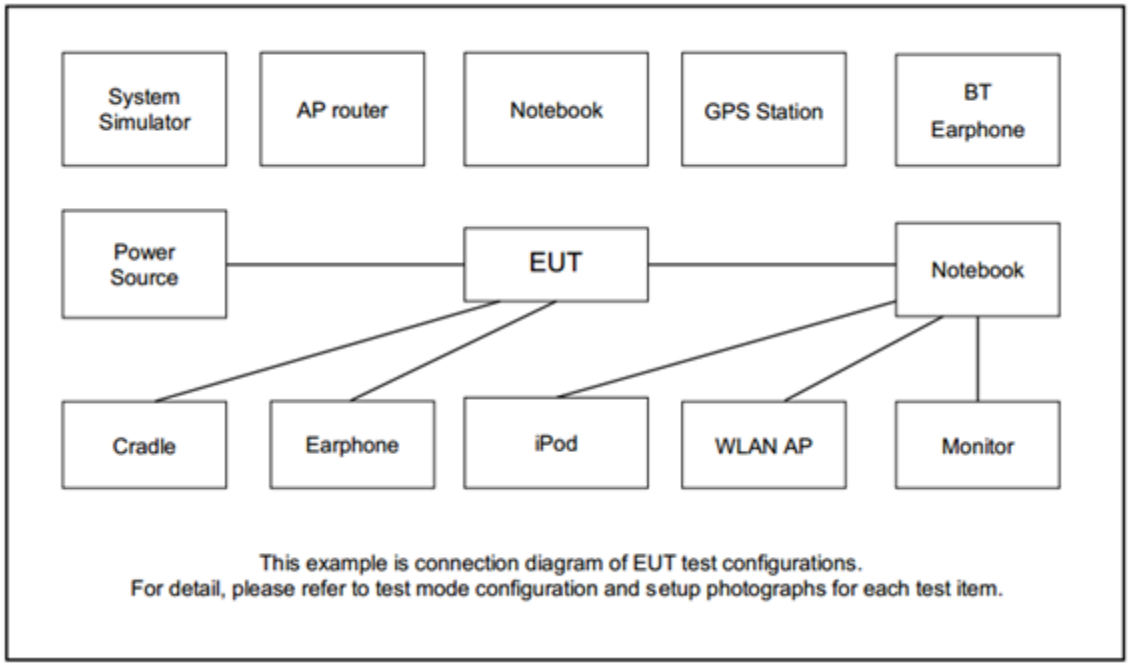
Remark:
1. Evaluated all the transmitter signal and reporting worst-case configuration among all modulation types.
2. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different Tone size/offset and modulations in exploratory test. Subsequently, only the worst-case emissions are reported.
3. During the Radiated Spurious Emission test, the EUT turn on the Bluetooth_LE and WLAN functions simultaneously.

The final test modes consider the modulation and the worst data rates as shown in the table below.

<Co-Location>

Modulation	Data Rate
Bluetooth-LE CH39 + 802.11b CH01 + LTE NB-IoT Band 13	2Mbps + MCS0 + QPSK

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.	Notebook	Dell	Latitude 3400	N/A	N/A	AC I/P: Unshielded, 1.2m DC O/P: Shielded, 1.8m

2.4 Frequency List of Low/Middle/High Channels

LTE-NB1 Band 13 Channel and Frequency List			
Channel/Frequency(MHz)	**Lowest**	**Middle**	**Highest**
Channel	23181	23230	23279
Frequency	777.1	782.0	786.9

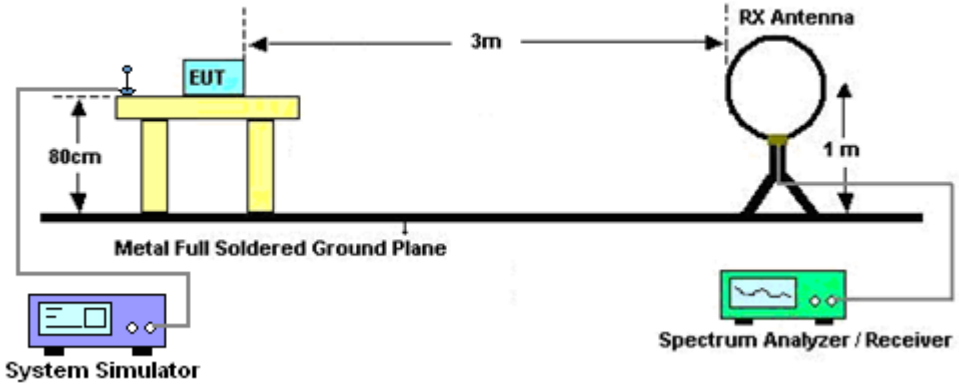
3 Radiated Test Items

3.1 Measuring Instruments

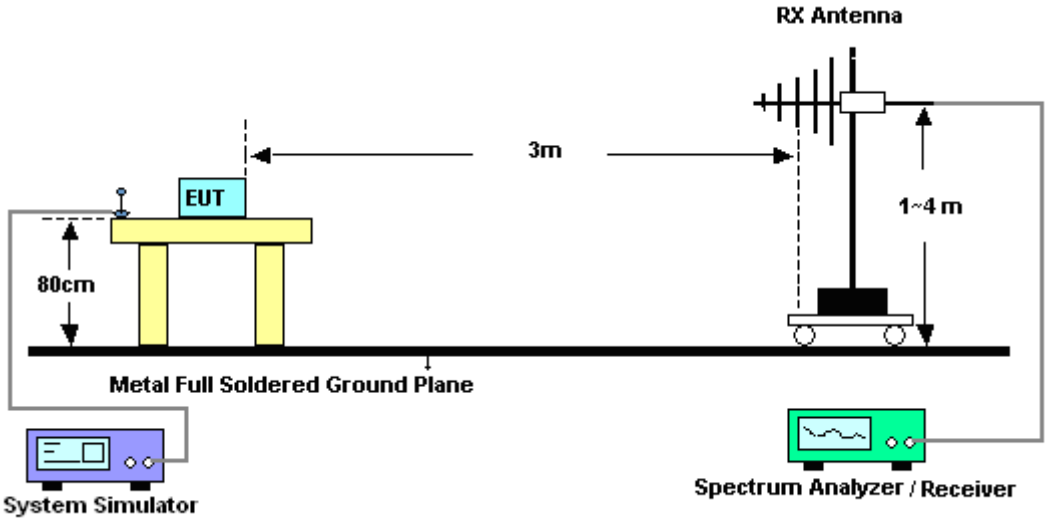
See list of measuring instruments of this test report.

3.1.1 Test Setup

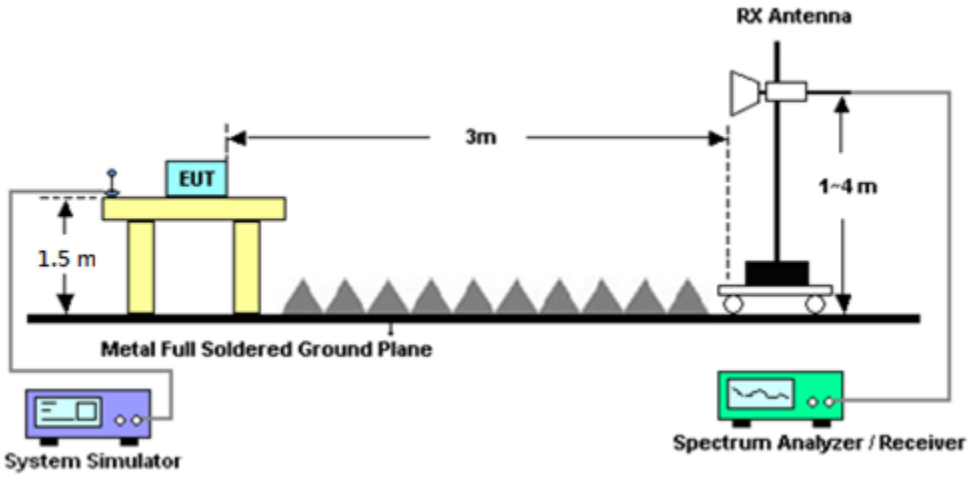
For radiated test below 30MHz



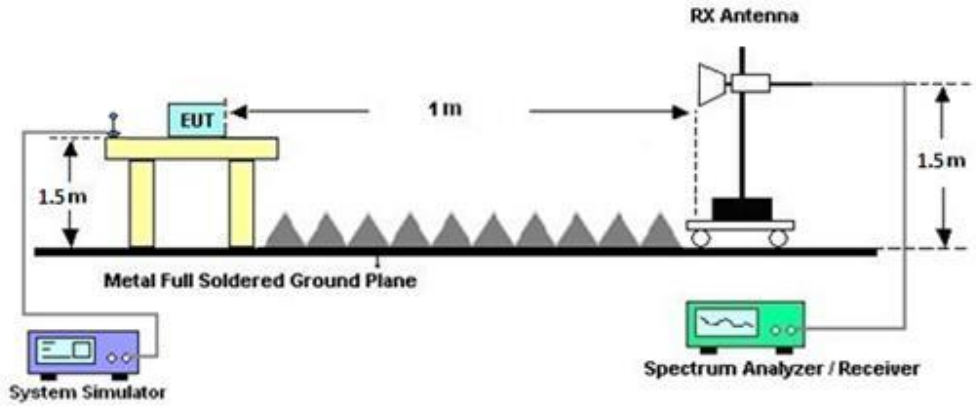
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.1.2 Test Result of Radiated Test

Please refer to Appendix A.

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 adequate comparison measurement 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.

3.2 Radiated Spurious Emission Measurement

3.2.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI C63.26-2015. 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 (P) dB.

For LTE Band 13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.2.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI C63.26-2015 section 5.5.4 Radiated measurement using the field strength method.

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, taking the record of maximum spurious emission.
6. To convert spectrum reading E(dBuV/m) to EIRP(dBm)

   EIRP(dBm) = Level (dBuV/m) + 20log(d) -104.77, where d is the distance at which filed strength limit is specified in the rules.
7. Field Strength Level (dBm) = Spectrum Reading (dBm) + Antenna Factor + Cable Loss + Read Level - Preamp Factor.
8. ERP (dBm) = EIRP (dBm) - 2.15
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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 & N-6-06	35414 & AT-N0602	30MHz~1GHz	Oct. 07, 2023	Jun. 03, 2024~ Jul. 02, 2024	Oct. 06, 2024	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 12, 2023	Jun. 03, 2024~ Jul. 02, 2024	Sep. 11, 2024	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-01620	1GHz~18GHz	Aug. 17, 2023	Jun. 03, 2024~ Jul. 02, 2024	Aug. 16, 2024	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	1224	18GHz~40GHz	Jul. 10, 2023	Jun. 03, 2024~ Jul. 02, 2024	Jul. 09, 2024	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 08, 2023	Jun. 03, 2024~ Jul. 02, 2024	Dec. 07, 2024	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Mar. 25, 2024	Jun. 03, 2024~ Jul. 02, 2024	Mar. 24, 2025	Radiation (03CH11-HY)
Preamplifier	EMEC	EM18G40G	060871	18GHz~40GHz	Aug. 30, 2023	Jun. 03, 2024~ Jul. 02, 2024	Aug. 29, 2024	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 05, 2023	Jun. 03, 2024~ Jul. 02, 2024	Oct. 04, 2024	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Aug. 02, 2023	Jun. 03, 2024~ Jul. 02, 2024	Aug. 01, 2024	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Jun. 03, 2024~ Jul. 02, 2024	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Jun. 03, 2024~ Jul. 02, 2024	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jun. 03, 2024~ Jul. 02, 2024	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Jun. 03, 2024~ Jul. 02, 2024	N/A	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTM-303B	TP140325	N/A	Dec. 08, 2023	Jun. 03, 2024~ Jul. 02, 2024	Dec. 07, 2024	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804013/2	30M~40G	May 23, 2024	Jun. 03, 2024~ Jul. 02, 2024	May 22, 2025	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz~40GHz	Mar. 06, 2024	Jun. 03, 2024~ Jul. 02, 2024	Mar. 05, 2025	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9K~30M	Mar. 06, 2024	Jun. 03, 2024~ Jul. 02, 2024	Mar. 05, 2025	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	30M~40G	Mar. 06, 2024	Jun. 03, 2024~ Jul. 02, 2024	Mar. 05, 2025	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-900-1000-15000-60SS	SN12	1GHz High Pass Filter	Sep. 11, 2023	Jun. 03, 2024~ Jul. 02, 2024	Sep. 10, 2024	Radiation (03CH11-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60SS	SN3	3GHz High Pass Filter	Sep. 11, 2023	Jun. 03, 2024~ Jul. 02, 2024	Sep. 10, 2024	Radiation (03CH11-HY)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.290 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.530 dB**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.610 dB**

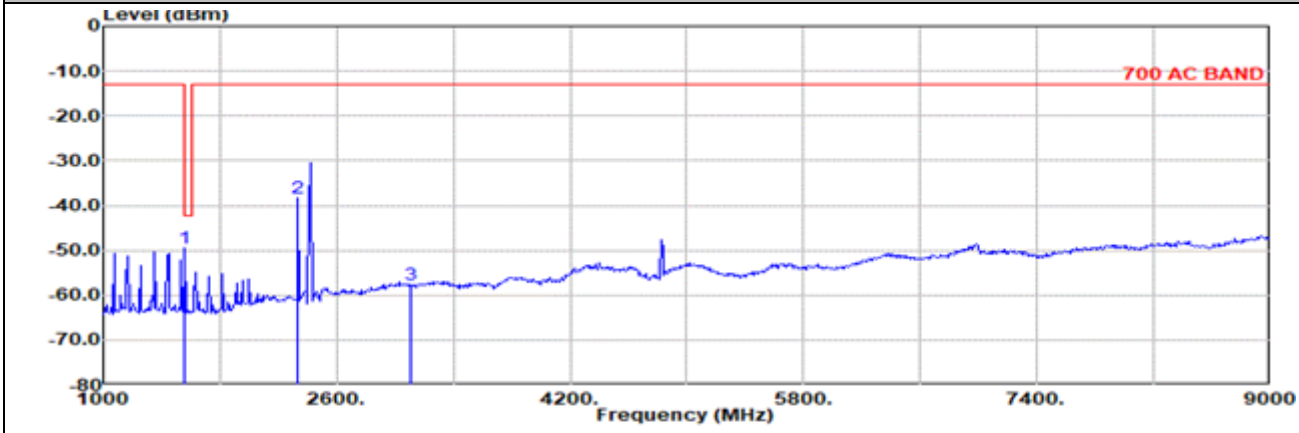
Appendix A. Test Results of Radiated Test

A1. Summary of each worse mode

Mode	Part	Band	Ch	Freq (MHz)	Level (dBm)	Det	Ant Factor (dB)	Amp\Cbl (dB)	Filter (dB)	EIRPCF (dB)	Reading (dBuV)	Limit (dBm)	Margin (dB)	Pol	Ant
4	Part 27F	LTE B13	H	1573	-44.27	RMS	25.34	-28.66	0.78	-95.23	53.50	-42.15	-2.12	V	1

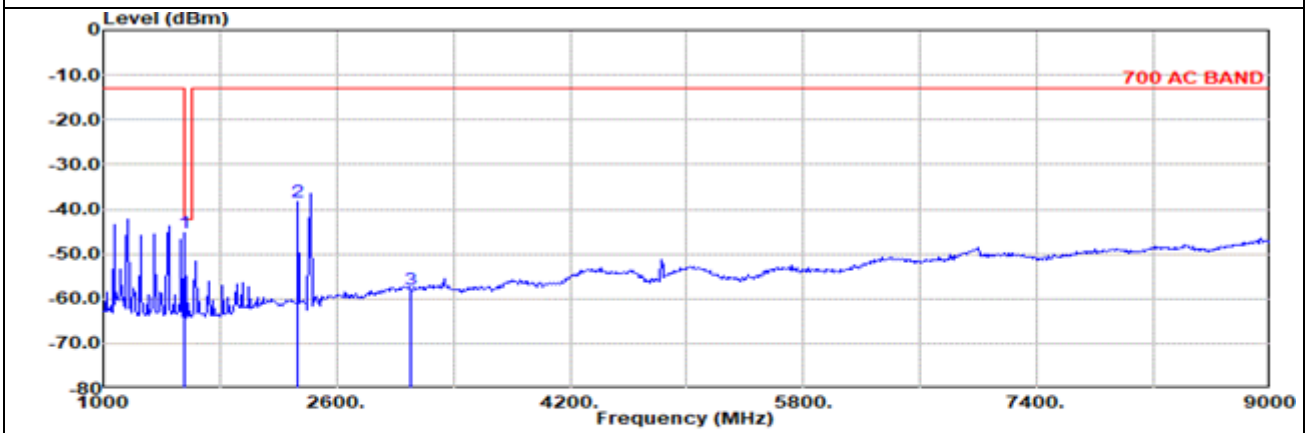
Ant. 1

Part 27F Mode 4
LTE B13 15k Ch23181
L



Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Horizontal
: NB IoT Band 13 15k Ch23181 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1554.20	-49.40	RMS	25.16	-28.74	0.81	-95.23	48.60	-13.00	-36.40	Horizontal
2	2331.30	-38.38	RMS	27.21	-26.64	0.66	-95.23	55.62	-13.00	-25.38	Horizontal
3	3108.40	-57.71	RMS	29.57	-25.43	0.79	-95.23	32.59	-13.00	-44.71	Horizontal

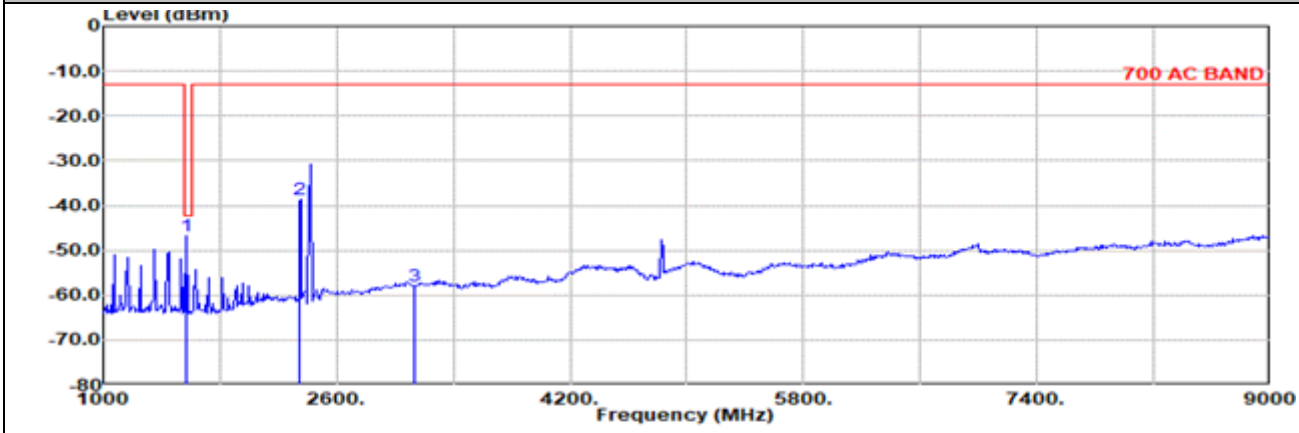


Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Vertical
: NB IoT Band 13 15k Ch23181 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1554.20	-45.42	RMS	25.16	-28.74	0.81	-95.23	52.58	-13.00	-32.42	Vertical
2	2331.30	-38.45	RMS	27.21	-26.64	0.66	-95.23	55.55	-13.00	-25.45	Vertical
3	3108.40	-57.92	RMS	29.57	-25.43	0.79	-95.23	32.38	-13.00	-44.92	Vertical

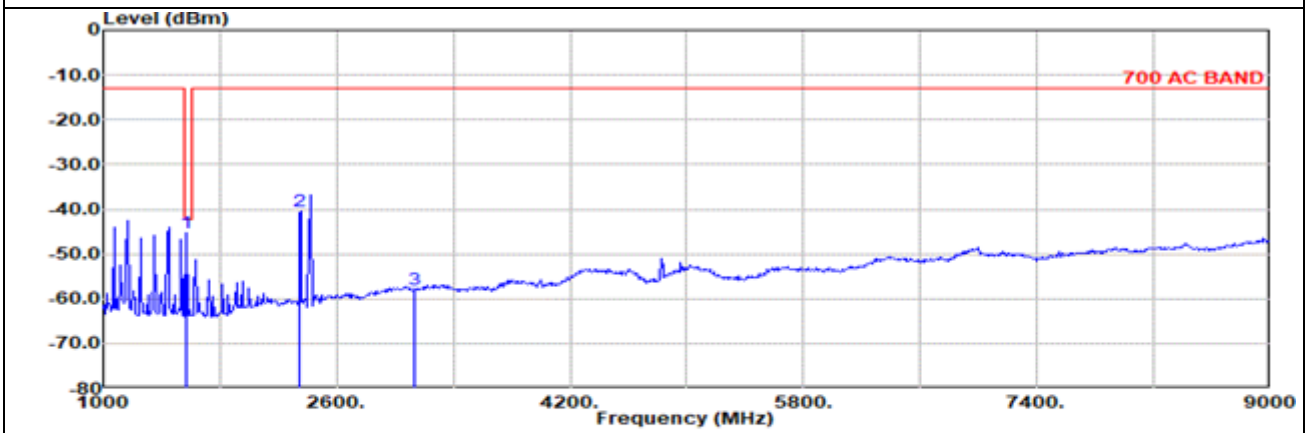
Ant. 1

Part 27F Mode 4
LTE B13 15k Ch23230
M



Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Horizontal
: NB IoT Band 13 15k Ch23230 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1564.00	-46.75	RMS	25.18	-28.70	0.79	-95.23	51.21	-42.15	-4.60	Horizontal
2	2346.00	-38.56	RMS	27.30	-26.62	0.66	-95.23	55.33	-13.00	-25.56	Horizontal
3	3128.00	-57.85	RMS	29.72	-25.39	0.82	-95.23	32.23	-13.00	-44.85	Horizontal

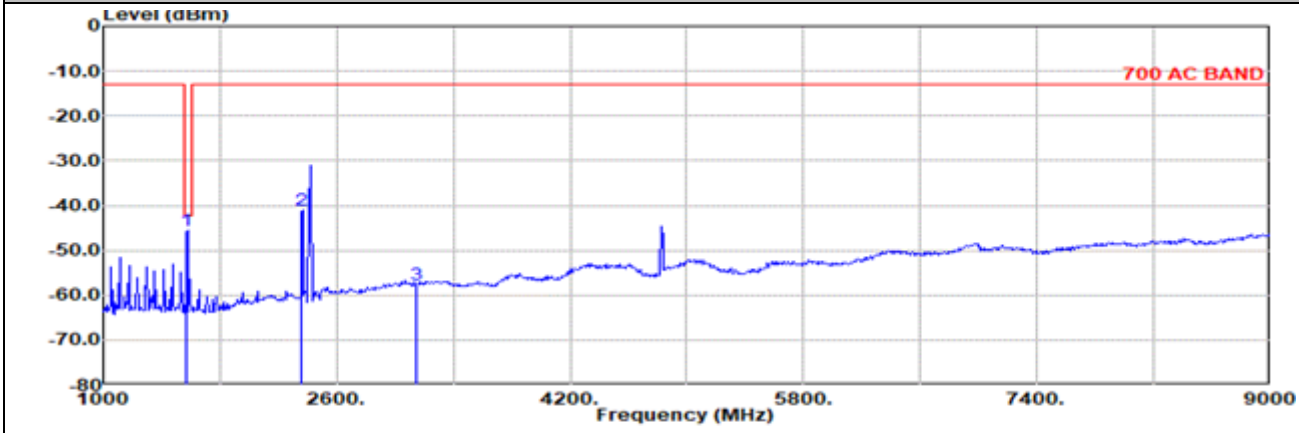


Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Vertical
: NB IoT Band 13 15k Ch23230 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1564.00	-45.40	RMS	25.18	-28.70	0.79	-95.23	52.56	-42.15	-3.25	Vertical
2	2346.00	-40.59	RMS	27.30	-26.62	0.66	-95.23	53.30	-13.00	-27.59	Vertical
3	3128.00	-57.93	RMS	29.72	-25.39	0.82	-95.23	32.15	-13.00	-44.93	Vertical

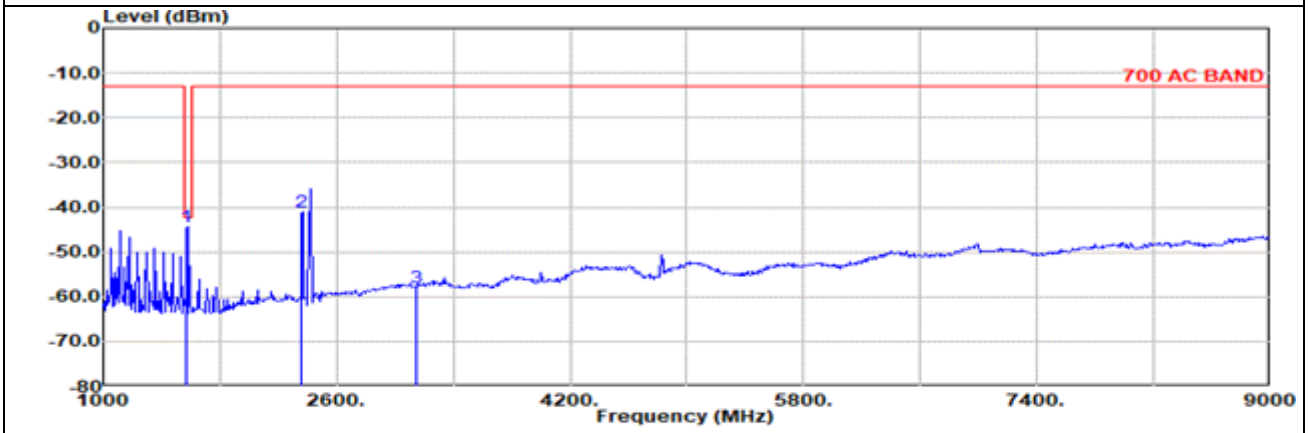
Ant. 1

Part 27F Mode 4
LTE B13 15k Ch23279
H



Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Horizontal
: NB IoT Band 13 15k Ch23279 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1573.80	-45.61	RMS	25.34	-28.66	0.78	-95.23	52.16	-42.15	-3.46	Horizontal
2	2360.70	-41.13	RMS	27.30	-26.60	0.67	-95.23	52.73	-13.00	-28.13	Horizontal
3	3147.60	-57.66	RMS	29.88	-25.36	0.86	-95.23	32.19	-13.00	-44.66	Horizontal

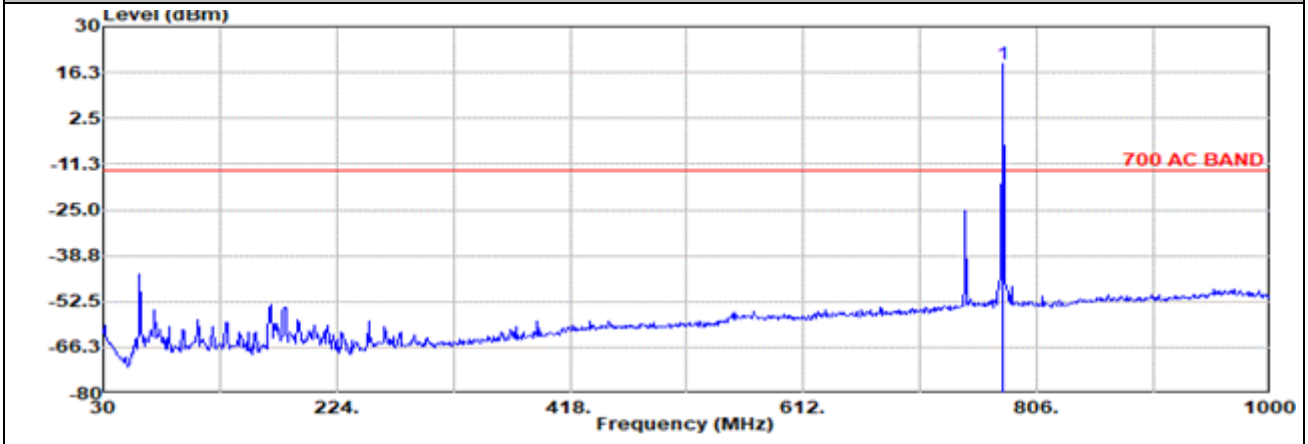


Site : 03CH11-HY
Condition: 700 AC BAND 3m 9120D_01620_230817 Vertical
: NB IoT Band 13 15k Ch23279 1T0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1573.80	-44.27	RMS	25.34	-28.66	0.78	-95.23	53.50	-42.15	-2.12	Vertical
2	2360.70	-41.12	RMS	27.30	-26.60	0.67	-95.23	52.74	-13.00	-28.12	Vertical
3	3147.60	-57.84	RMS	29.88	-25.36	0.86	-95.23	32.01	-13.00	-44.84	Vertical

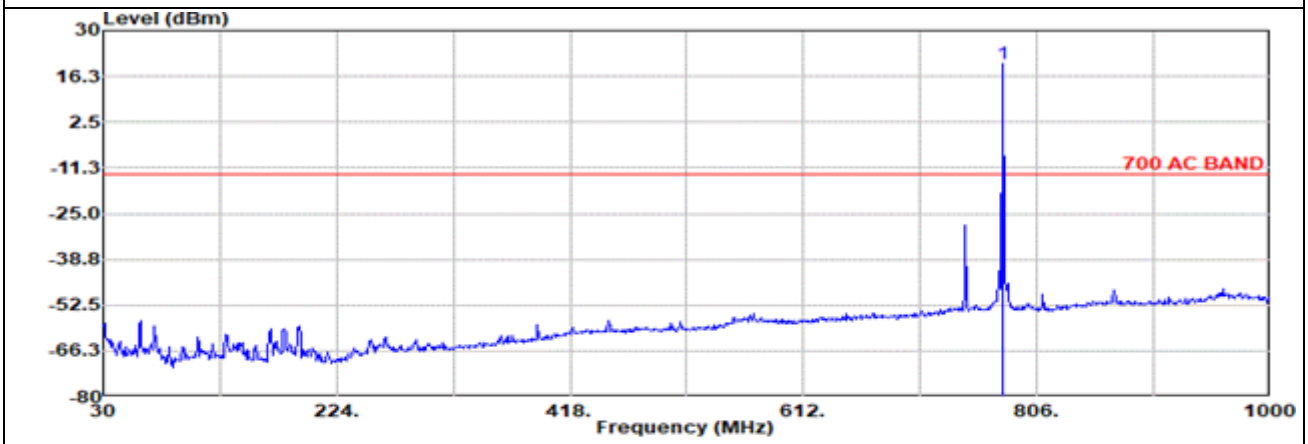
Ant. 1

Part 27F Mode 4
LTE B13 15k Ch23279 1RB0 QPSK
H



Site : 03CH11-HY
Condition: 700 AC BAND 3m Bilog_35414_231007 Horizontal
: NB IoT Band 13 15k Ch23279 1T0 QPSK
: #1 is fundamental signal which can be ignored.

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	777.10	18.82	RMS	28.10	4.21	0.00	-95.23	81.74	-13.00	31.82	Horizontal



Site : 03CH11-HY
Condition: 700 AC BAND 3m Bilog_35414_231007 Vertical
: NB IoT Band 13 15k Ch23279 1T0 QPSK
: #1 is fundamental signal which can be ignored.

	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	777.10	20.24	RMS	28.10	4.21	0.00	-95.23	83.16	-13.00	33.24	Vertical

Remark: #1 is fundamental signal which can be ignored.