FCC RADIO TEST REPORT

FCC ID	:	**LHJ-FE5NA0010**
Equipment	:	**FE5NA0010, FE5NA0011**
Brand Name	:	**Continental**
Model Name	:	**FE5NA0010, FE5NA0011**
Applicant	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Manufacturer	:	**Continental Automotive Systems, Inc. 21440 W Lake Cook Rd., Deer Park, IL 60010, USA**
Standard	:	**FCC 47 CFR Part 2, 27**

The product was received on Apr. 11, 2024 and testing was performed from Apr. 23, 2024 to Apr. 24, 2024. We, Sporton International (USA) Inc., 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 from Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.
1175 Montague Expressway, Milpitas, CA 95035

Table of Contents

History of this test report

Report No.	Version	Description	Issue Date
FG240325001B	01	Initial issue of report	May 14, 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) §27.53 (h)	Radiated Spurious Emission (Band 13) (Band 66)	Pass	19.99 dB under the limit at 1560.00 MHz
	§2.1053 §27.53 (m)(4)	Radiated Spurious Emission (Band 7)		

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.

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	FE5NA0010, FE5NA0011
Brand Name	Continental
Model Name	FE5NA0010, FE5NA0011
FCC ID	LHJ-FE5NA0010
Installed into the Host	Equipment name: G12N510G1, G12N500G1 Brand name: Continental Model name: G12N510G1, G12N500G1
EUT supports Radios application	WCDMA/HSPA/LTE/5G NR/GNSS
EUT Stage	Identical Prototype

Sample Information			
Sample	**TA-code**	**L2/L5 GNSS**	**Band Difference**
1	FE5NA0010	Support	/
2	FE5NA0011	Not Support	BOM change: depopulated passive components from the GNSS RF front-end

Remark: The above EUT's information was declared by manufacturer.

Support Band and Evaluated Information	
Supported Band	B7, B13, B66
Evaluated and Tested band	B7, B13, B66

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx Frequency	LTE Band 7: 2502.5 MHz ~ 2567.5 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz LTE Band 66: 1710.7 MHz ~ 1754.3 MHz
Rx Frequency	LTE Band 7: 2622.5 MHz ~ 2687.5 MHz LTE Band 13: 748.5 MHz ~ 753.5 MHz LTE Band 66: 2110.7 MHz ~ 2154.3 MHz
Bandwidth	LTE Band 7: 5MHz / 10MHz / 15MHz / 20MHz LTE Band 13: 5MHz / 10MHz LTE Band 66: 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz
Antenna Type	**<Internal Antenna>:** TCP Antenna **<External Glass Antenna (Composed by component PN: 85038208, 85038209, 85038210, 85732934)>:** Glass Antenna
Antenna Gain	**<Internal Antenna>:** LTE Band 7 : 6.7 dBi LTE Band 13 : 2.2 dBi LTE Band 66 : 4.86 dBi **<External Glass Antenna (Composed by component PN: 85038208, 85038209, 85038210, 85732934)>:** LTE Band 7 : 4.03 dBi LTE Band 13 : 3.25 dBi LTE Band 66 : 5.07 dBi

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

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International (USA) Inc.	
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300	
Test Site No.	**Sporton Site No.**	
	03CH01-CA	
Test Engineer	Howard Huang	
Temperature (℃)	21.9~23.2	
Relative Humidity (%)	58.9~64.5	

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

FCC Designation No.: US1250

1.5 Applicable Standards

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

- ANSI C63.26-2015
- ANSI / TIA-603-E
- FCC 47 CFR Part 2, 27
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 414788 D01 Radiated Test Site v01r01.

Remark: All the test items were validated and recorded in accordance with the standards without any modification during the testing.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

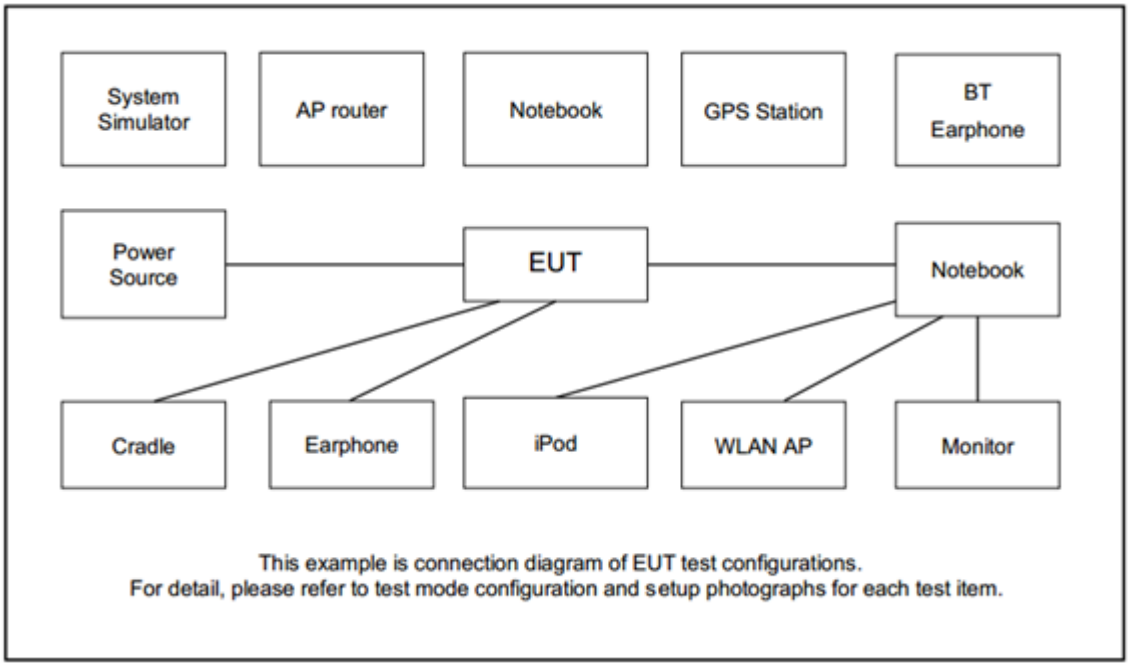
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Modulation Type	Modulation
A	QPSK
B	16QAM
C	64QAM
D	256QAM

Test Item	Modulation Type	Bandwidth	RB Size	Channel
RSE	A	Maximum	1RB	M

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 RB size/offset and modulations in exploratory test. Subsequently, only the worst-case emissions are reported.
3. All the radiated test cases were performed with Sample 1.

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	N/A
2.	System Simulator	Keysight	UXM	N/A	N/A	N/A

2.4 Frequency List of Low/Middle/High Channels

LTE Band 7 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	20850	21100	21350
	Frequency	2510	2535	2560

LTE Band 13 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
10	Channel	-	23230	-
	Frequency	-	782	-

LTE Band 66 Channel and Frequency List				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
20	Channel	132072	132322	132572
	Frequency	1720	1745	1770

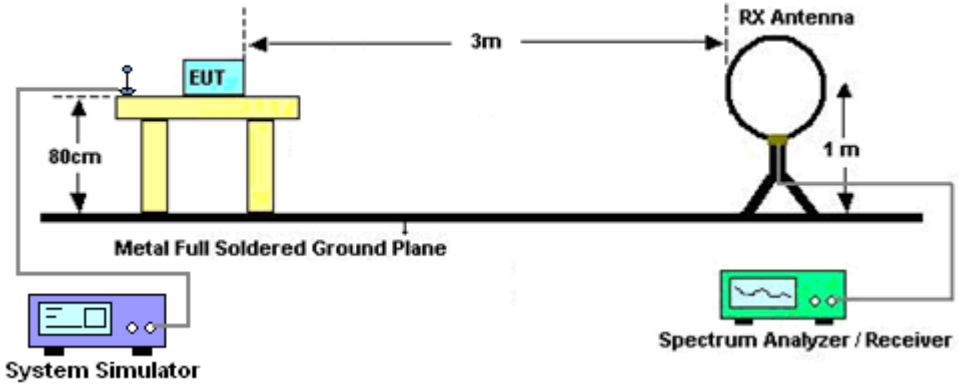
3 Radiated Test Items

3.1 Measuring Instruments

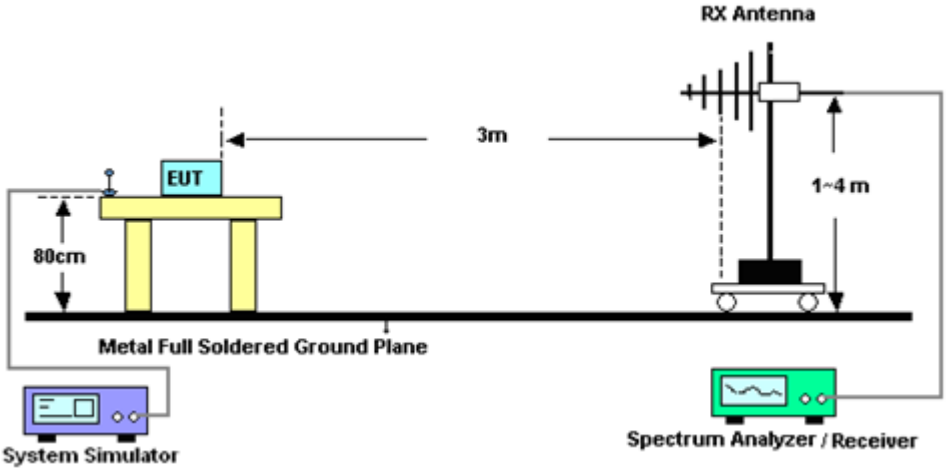
See list of measuring instruments of this test report.

3.1.1 Test Setup

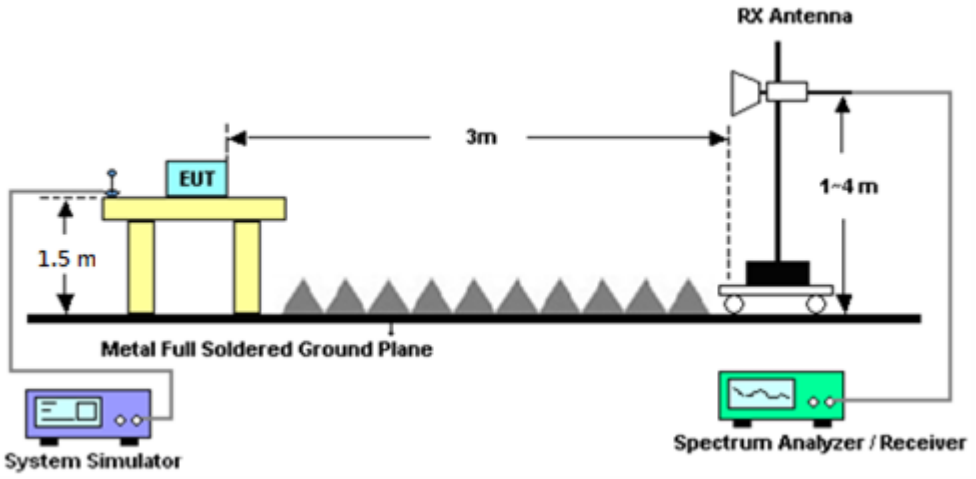
For radiated test below 30MHz



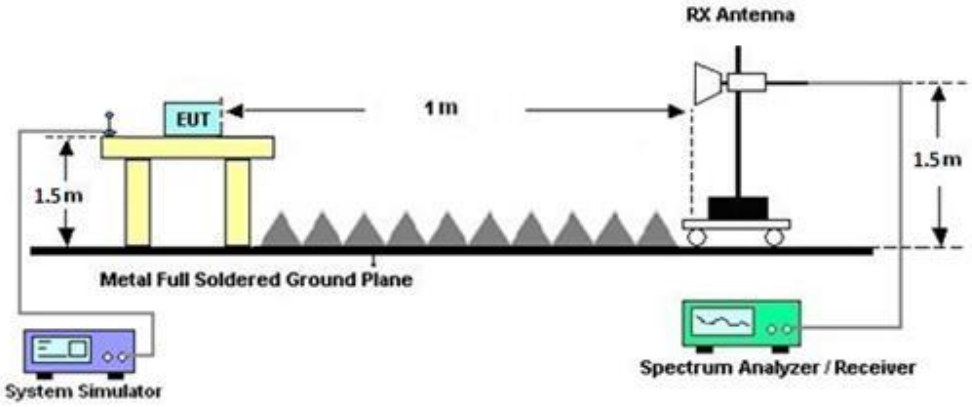
For radiated test from 30MHz to 1GHz



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 / TIA-603-E. 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 7

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 55 + 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	6111D	54683	30MHz~1GHz	Nov. 13, 2023	Apr. 23, 2024~ Apr. 24, 2024	Nov. 12, 2024	Radiation (03CH01-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02115	1GHz~18GHz	Aug. 09, 2023	Apr. 23, 2024~ Apr. 24, 2024	Aug. 08, 2024	Radiation (03CH01-CA)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00842	18GHz~40GHz	Jul. 17, 2023	Apr. 23, 2024~ Apr. 24, 2024	Jul. 16, 2024	Radiation (03CH01-CA)
Amplifier	SONOMA	310N	372241	N/A	May 03, 2023	Apr. 23, 2024~ Apr. 24, 2024	May 02, 2024	Radiation (03CH01-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	C1900251	1GHz~18GHz	Jun. 27, 2023	Apr. 23, 2024~ Apr. 24, 2024	Jun. 26, 2024	Radiation (03CH01-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz-40GHz	May 04, 2023	Apr. 23, 2024~ Apr. 24, 2024	May 03, 2024	Radiation (03CH01-CA)
EMI Test Receiver	R&S	ESU26	100049	20Hz~26.5GHz	May 02, 2023	Apr. 23, 2024~ Apr. 24, 2024	May 01, 2024	Radiation (03CH01-CA)
Spectrum Analyzer	R&S	FSW43	104042	2Hz~43GHz	Dec. 22, 2023	Apr. 23, 2024~ Apr. 24, 2024	Dec. 21, 2024	Radiation (03CH01-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8015932/2, 8015762/2, 804938/2	N/A	Mar. 05, 2024	Apr. 23, 2024~ Apr. 24, 2024	Mar. 04, 2025	Radiation (03CH01-CA)
Hygrometer	TESEO	608-H1	45142559	N/A	Aug. 30, 2023	Apr. 23, 2024~ Apr. 24, 2024	Aug. 29, 2024	Radiation (03CH01-CA)
Controller	Chaintek	EM-1000	060881	Control Turn Table & Antenna Mast	N/A	Apr. 23, 2024~ Apr. 24, 2024	N/A	Radiation (03CH01-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Apr. 23, 2024~ Apr. 24, 2024	N/A	Radiation (03CH01-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Apr. 23, 2024~ Apr. 24, 2024	N/A	Radiation (03CH01-CA)
Test Software	Audix E3	E6.2009-8-24d	PK-002093	N/A	N/A	Apr. 23, 2024~ Apr. 24, 2024	N/A	Radiation (03CH01-CA)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.40 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.60 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.30 dB**

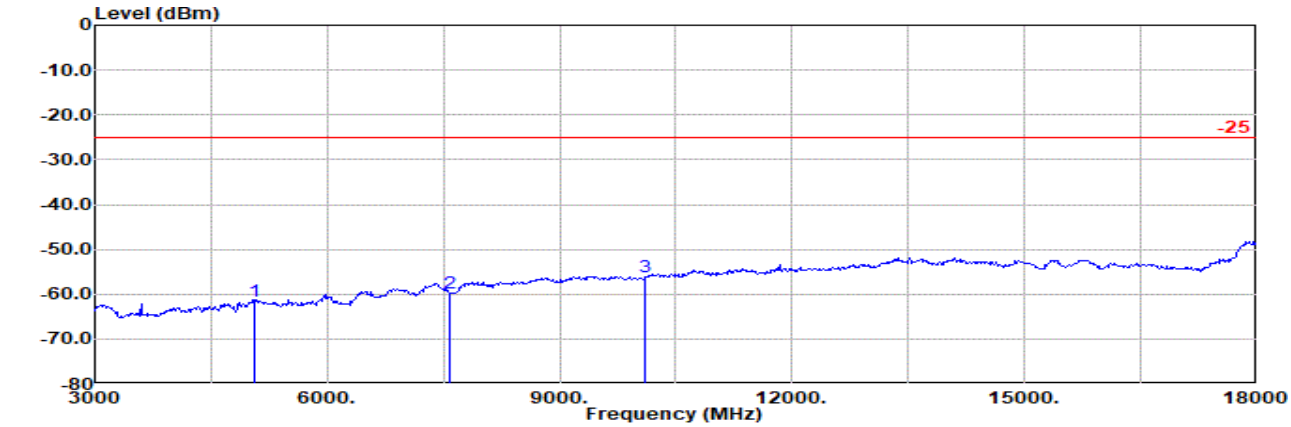
Appendix A. Test Results of Radiated Test

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
1	Part 27M	LTE B7	M	10110	-56.23	RMS	38.72	-52.11	0.35	-95.23	52.04	-25.00	-31.23	H	Antenna-L246 Primary
2	Part 27F	LTE B13	M	1560	-62.14	RMS	25.52	-60.15	0.51	-95.23	67.21	-42.15	-19.99	V	Antenna-L246 Primary
2	Part 27L	LTE B66	M	6945	-58.64	RMS	35.96	-52.59	0.34	-95.23	52.88	-13.00	-45.64	V	Antenna-L246 Primary

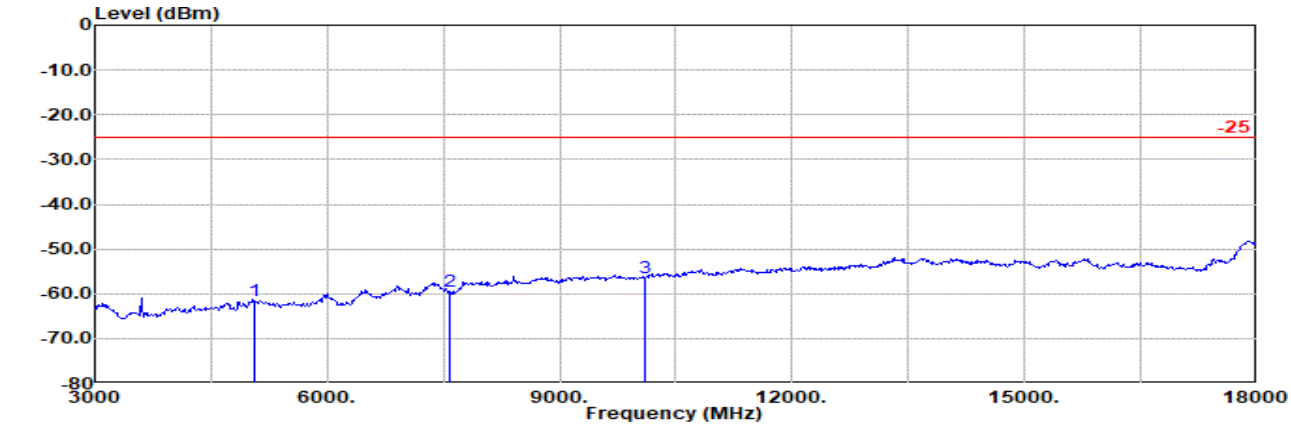
Antenna-L246 Primary

Part 27M Mode 1
LTE B7 20M Ch21100 1RB0 QPSK
M



Site : 03CH01-CA
Condition: -25 3m HORN_02115_230809 Horizontal
: LTE Band 7 20M Ch21100 1RB0 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	5055.00	-61.43	RMS	33.21	-55.95	0.54	-95.23	56.00	-25.00	-36.43	Horizontal
2	7575.00	-59.69	RMS	36.30	-52.48	0.37	-95.23	51.35	-25.00	-34.69	Horizontal
3	10110.00	-56.23	RMS	38.72	-52.11	0.35	-95.23	52.04	-25.00	-31.23	Horizontal



Site : 03CH01-CA
Condition: -25 3m HORN_02115_230809 Vertical
: LTE Band 7 20M Ch21100 1RB0 QPSK

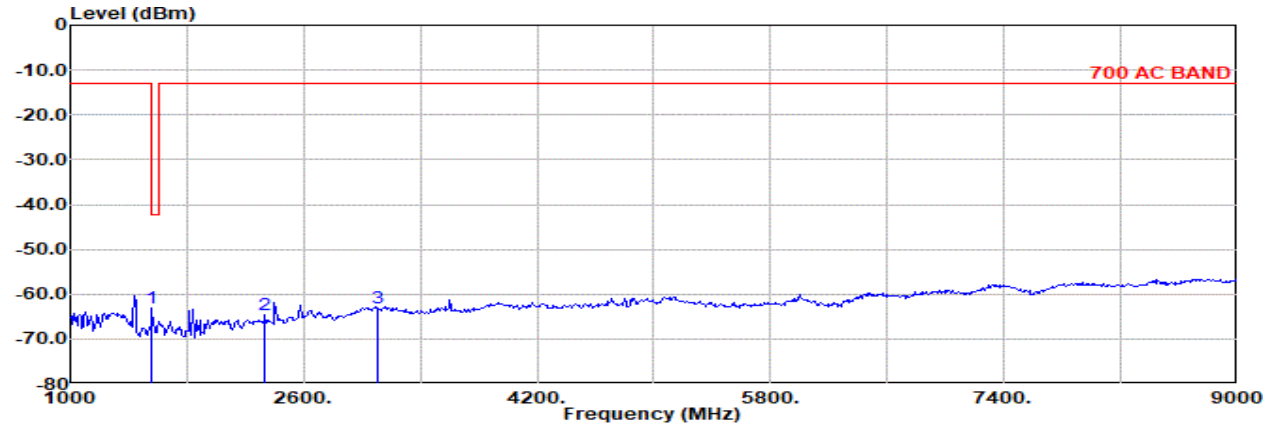
	Freq	Level	Detector	Ant Factor	Amp\Cb l	Filter	EIRPCF	Readin g	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	5055.00	-61.73	RMS	33.15	-55.95	0.54	-95.23	55.75	-25.00	-36.73	Vertical
2	7575.00	-59.61	RMS	36.28	-52.48	0.37	-95.23	51.45	-25.00	-34.61	Vertical
3	10110.00	-56.36	RMS	38.74	-52.11	0.35	-95.23	51.89	-25.00	-31.36	Vertical

Antenna-L246 Primary

Part 27F Mode 2

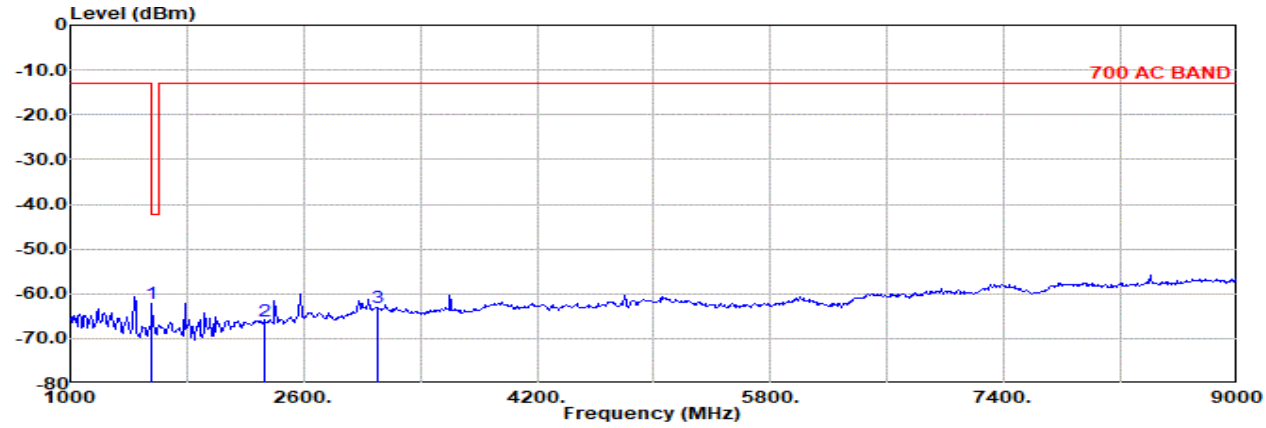
LTE B13 10M Ch23230 1RB0 QPSK

M



Site : 03CH01-CA
Condition: 700 AC BAND 3m HORN_02115_230809 Horizontal
: LTE Band 13 10M Ch23230 1RB0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cbl	Filter	EIRPCF	Reading	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1560.00	-62.94	RMS	25.54	-60.15	0.51	-95.23	66.39	-42.15	-20.79	Horizontal
2	2336.00	-64.74	RMS	27.10	-58.92	0.33	-95.23	61.98	-13.00	-51.74	Horizontal
3	3112.00	-63.24	RMS	29.79	-56.91	0.26	-95.23	58.85	-13.00	-50.24	Horizontal



Site : 03CH01-CA
Condition: 700 AC BAND 3m HORN_02115_230809 Vertical
: LTE Band 13 10M Ch23230 1RB0 QPSK

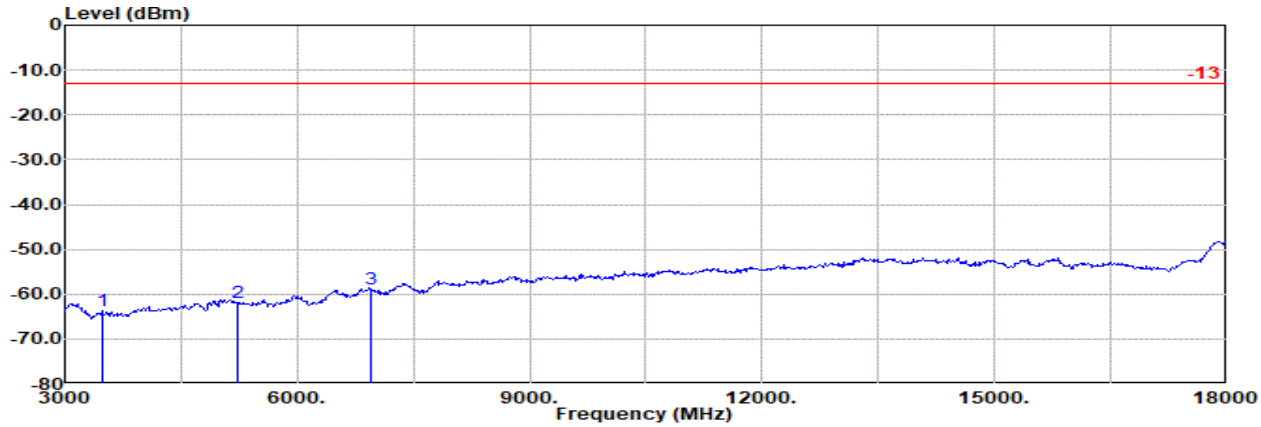
	Freq	Level	Detector	Ant Factor	Amp\Cbl	Filter	EIRPCF	Reading	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	1560.00	-62.14	RMS	25.52	-60.15	0.51	-95.23	67.21	-42.15	-19.99	Vertical
2	2336.00	-66.09	RMS	27.15	-58.92	0.33	-95.23	60.58	-13.00	-53.09	Vertical
3	3112.00	-63.08	RMS	29.79	-56.91	0.26	-95.23	59.01	-13.00	-50.08	Vertical

Antenna-L246 Primary

Part 27L Mode 2

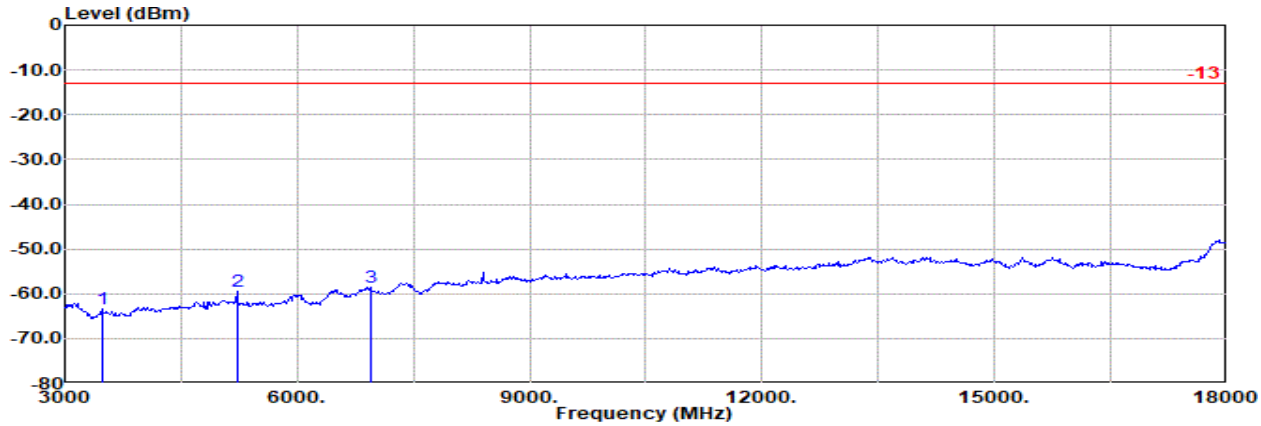
LTE B66 20M Ch132322 1RB0 QPSK

M



Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Horizontal
: LTE Band 66 20M Ch132322 1RB0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cbl	Filter	EIRPCF	Reading	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	3480.00	-63.60	RMS	29.47	-57.71	0.98	-95.23	-63.80	-13.00	-50.60	Horizontal
2	5220.00	-61.98	RMS	32.98	-55.56	0.47	-95.23	55.36	-13.00	-48.98	Horizontal
3	6945.00	-58.88	RMS	35.90	-52.59	0.34	-95.23	52.70	-13.00	-45.88	Horizontal



Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Vertical
: LTE Band 66 20M Ch132322 1RB0 QPSK

	Freq	Level	Detector	Ant Factor	Amp\Cbl	Filter	EIRPCF	Reading	Limit	Margin	Pol
	MHz	dBm		dB/m	dB	dB	dB	dBuV	dBm	dB	
1	3480.00	-63.47	RMS	29.55	-57.71	0.98	-95.23	58.94	-13.00	-50.47	Vertical
2	5220.00	-59.42	RMS	32.98	-55.56	0.47	-95.23	57.92	-13.00	-46.42	Vertical
3	6945.00	-58.64	RMS	35.96	-52.59	0.34	-95.23	52.88	-13.00	-45.64	Vertical