# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | **:** | **LHJ-FE5NA0010** |
| **Equipment** | **:** | **FE5NA0010, FE5NA0011** |
| **Brand Name** | **:** | **Continental** |
| **Model Name** | **:** | **FE5NA0010, FE5NA0011** |
| **Applicant** | **:** | **Continental Automotive Systems, Inc.<br>21440 W Lake Cook Rd., Deer Park, IL 60010, USA** |
| **Manufacturer** | **:** | **Continental Automotive Systems, Inc.<br>21440 W Lake Cook Rd., Deer Park, IL 60010, USA** |
| **Standard** | **:** | **FCC 47 CFR Part 2, 22(H), 27(L)** |

**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*

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# History of this test report

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| FG240325001A | 01 | Initial issue of report | May 14, 2024 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.4 | §2.1053<br>§22.917(a)<br>§27.53(h) | Field Strength of Spurious Radiation | Pass | 46.01 dB under the limit at 6930.00 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.<br>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<br>Brand name: Continental<br>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.

## 1.2 Product Specification of Equipment Under Test

| Product Specification is subject to this standard | |
|---|---|
| **Tx Frequency** | **WCDMA:**<br>Band V: 826.4 MHz ~ 846.6 MHz<br>Band IV: 1712.4 MHz ~ 1752.6 MHz |
| **Rx Frequency** | **WCDMA:**<br>Band V: 871.4 MHz ~ 891.6 MHz<br>Band IV: 2112.4 MHz ~ 2152.6 MHz |
| **Antenna Type** | **<Internal Antenna>:**<br>TCP antenna<br>**<External Glass Antenna (Composed by component PN: 85038208, 85038209, 85038210, 85732934)>:**<br>Glass Antenna |
| **Antenna Gain** | **<Internal Antenna>:**<br>Cellular Band: 4.69 dBi<br>AWS Band: 4.86 dBi<br>**<External Glass Antenna (Composed by component PN: 85038208, 85038209, 85038210, 85732934)>:**<br>Cellular Band: 2.72 dBi<br>AWS Band: 5.07 dBi |
| **Type of Modulation** | WCDMA: QPSK (Uplink)<br>HSDPA: 64QAM (Downlink)<br>HSUPA: QPSK (Uplink) |

**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<br>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 declared by 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,
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- 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 were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated emissions were investigated as following frequency range:

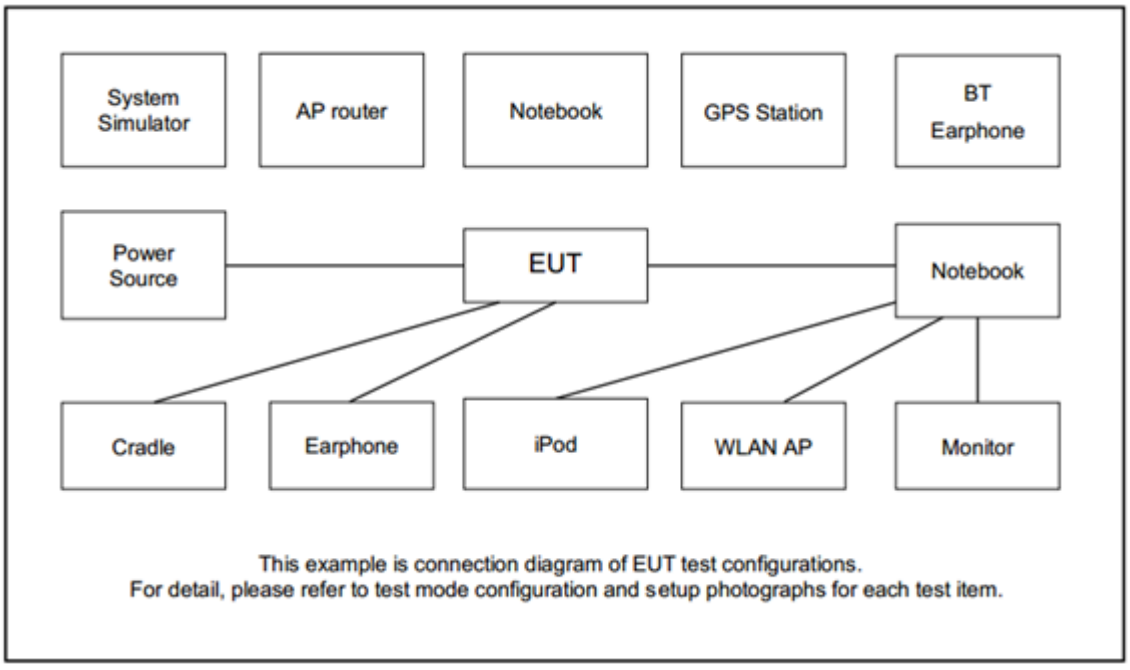
All modes, data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

| Test Modes | |
|---|---|
| **Band** | **Radiated TCs** |
| **WCDMA Band V** | RMC 12.2Kbps Link |
| **WCDMA Band IV** | RMC 12.2Kbps Link |

**Remark:** For Radiated Test Cases, the tests were performed with Sample 1.

## 2.2 Connection Diagram of Test System




## 2.3 Support Unit used in test configuration

| Item | Equipment | Brand Name | Model No. | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | System Simulator | Anritsu | MT8821C | N/A | N/A | N/A |

## 2.4 Frequency List of Low/Middle/High Channels

| Frequency List | | | | |
|---|---|---|---|---|
| **Band** | **Channel/Frequency(MHz)** | **Lowest** | **Middle** | **Highest** |
| WCDMA Band V | Channel | 4132 | 4182 | 4233 |
| | Frequency | 826.4 | 836.4 | 846.6 |
| WCDMA Band IV | Channel | 1312 | 1413 | 1513 |
| | Frequency | 1712.4 | 1732.6 | 1752.6 |

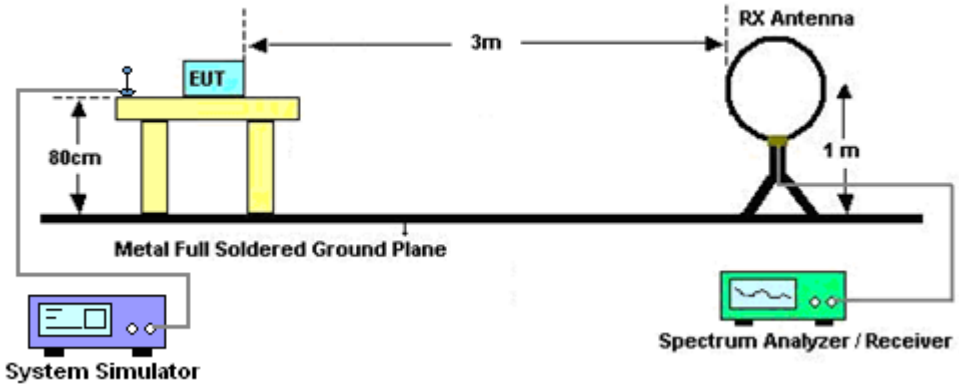
# 3 Radiated Test Items

## 3.1 Measuring Instruments

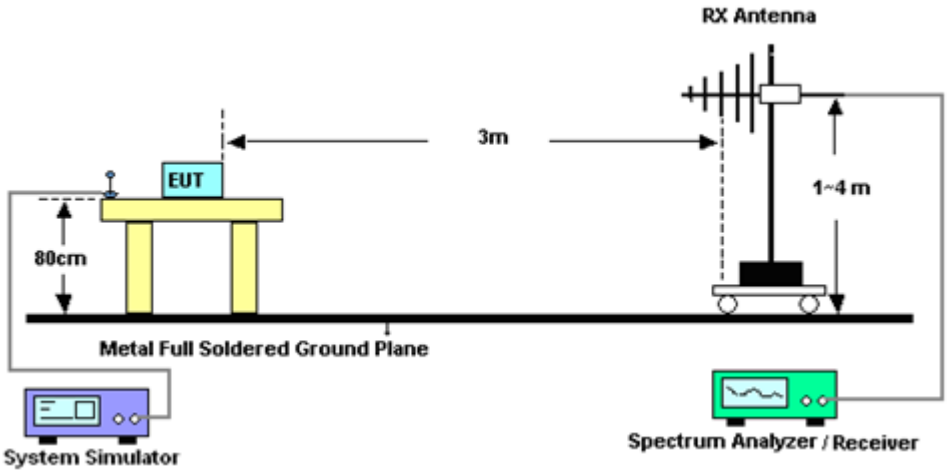
Please refer to the measuring equipment list in this test report.

## 3.2 Test Setup

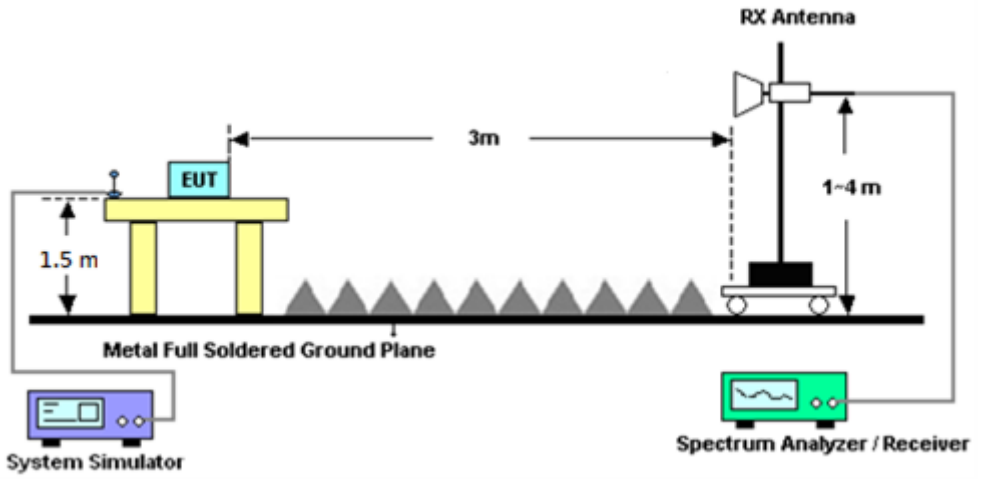
**For radiated test below 30MHz**




**For radiated test from 30MHz to 1GHz**



**For radiated test above 1GHz**




## 3.3 Test Result of Radiated Test

Please refer to Appendix A.

**Note:**

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is 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.

# 3.4 Field Strength of Spurious Radiation Measurement

## 3.4.1 Description of Field Strength of Spurious Radiated Measurement

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

## 3.4.2 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 is placed on a rotatable wooden table 0.8 meters for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz above the ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the antenna tower.
3. The table is 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 for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1 MHz, VBW = 3 MHz, taking 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 shall be excluded against the limit line in the operating frequency band.
10. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

# 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

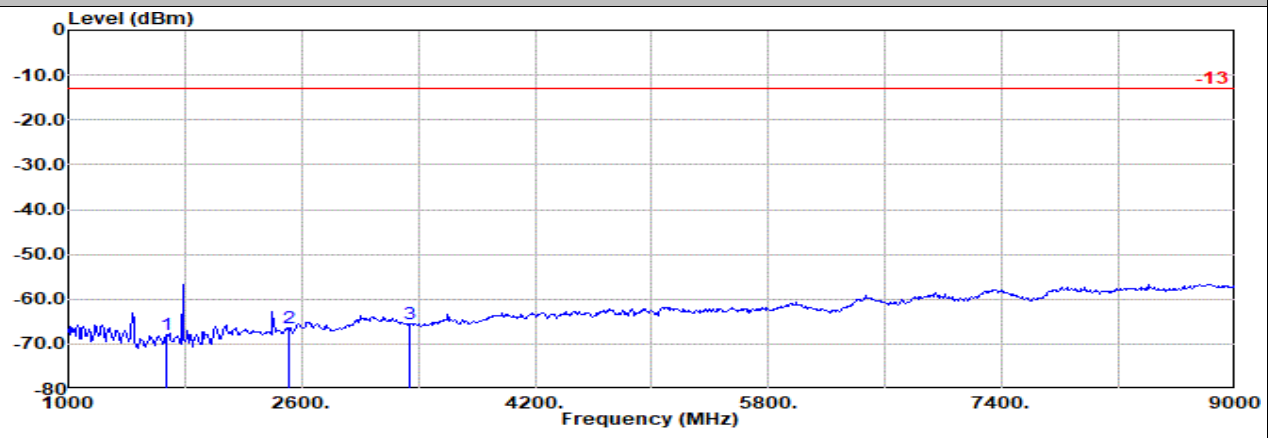
| Mode | Part | Band | Ch | Freq (MHz) | Level (dBm) | Det | Ant Factor (dB) | Amp\Cbl (dB) | Filter (dB) | EIRPCF (dB) | Reading (dBuV) | Limit (dBm) | Margin (dB) | Pol | Ant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Part 22H | WCDMA B5 | M | 3344 | -65.54 | RMS | 29.50 | -57.88 | 0.26 | -95.23 | 57.81 | -13.00 | -52.54 | V | Antenna-L246 Primary |
| 1 | Part 27L | WCDMA B4 | M | 6930 | -59.01 | RMS | 35.89 | -52.59 | 0.34 | -95.23 | 52.58 | -13.00 | -46.01 | H | Antenna-L246 Primary |

**Antenna-L246 Primary**

**Part 22H Mode 1**

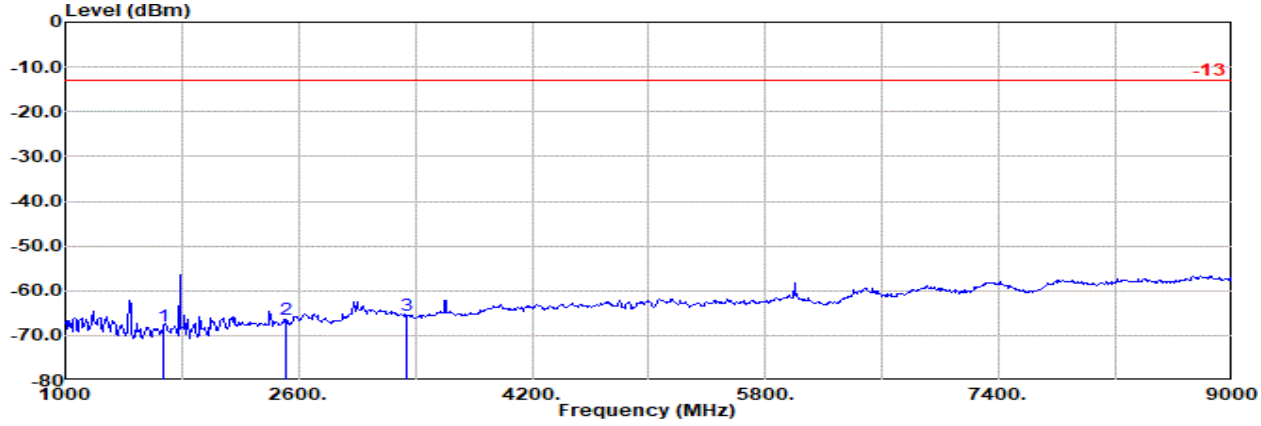
**WCDMA B5 Ch4183**

**M**




Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Horizontal
: WCDMA Band 5 Ch4183 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 | 1672.00 | -68.03 | RMS | 25.11 | -61.24 | 0.47 | -95.23 | 62.86 | -13.00 | -55.03 | Horizontal |
| 2 | 2512.00 | -66.28 | RMS | 28.03 | -59.73 | 0.31 | -95.23 | 60.34 | -13.00 | -53.28 | Horizontal |
| 3 | 3344.00 | -65.66 | RMS | 29.55 | -57.88 | 0.26 | -95.23 | 57.64 | -13.00 | -52.66 | Horizontal |




Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Vertical
: WCDMA Band 5 Ch4183 1RB0 QPSK

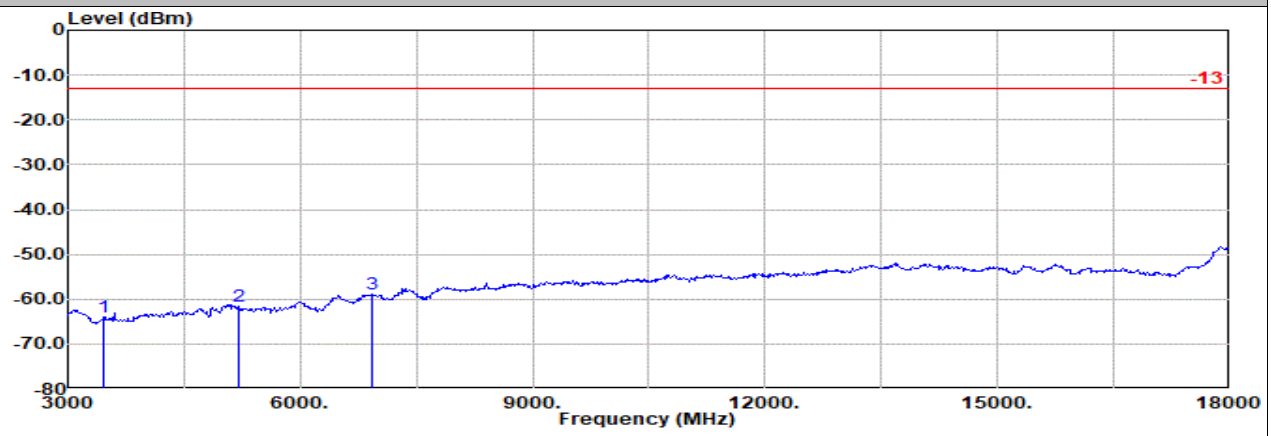
| | Freq | Level | Detector | Ant Factor | Amp\Cbl | Filter | EIRPCF | Reading | Limit | Margin | Pol |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBm | | dB/m | dB | dB | dB | dBuV | dBm | dB | |
| 1 | 1672.00 | -67.81 | RMS | 25.16 | -61.24 | 0.47 | -95.23 | 63.03 | -13.00 | -54.81 | Vertical |
| 2 | 2512.00 | -66.33 | RMS | 27.85 | -59.73 | 0.31 | -95.23 | 60.47 | -13.00 | -53.33 | Vertical |
| 3 | 3344.00 | -65.54 | RMS | 29.50 | -57.88 | 0.26 | -95.23 | 57.81 | -13.00 | -52.54 | Vertical |

**Antenna-L246 Primary**

**Part 27L Mode 1**

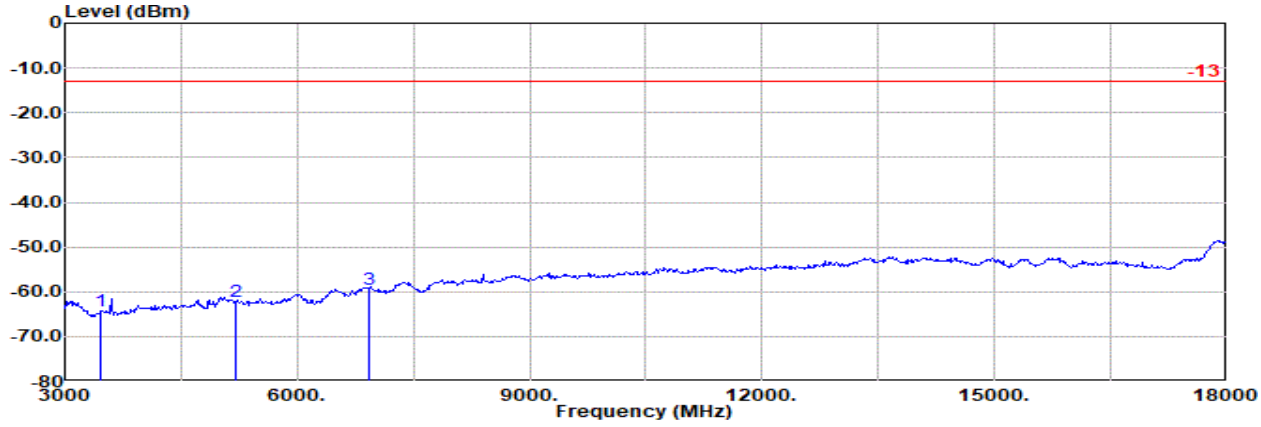
**WCDMA B4 Ch1413**

**M**




Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Horizontal
: WCDMA B4 Ch1413 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 | 3465.00 | -63.99 | RMS | 29.47 | -57.73 | 1.00 | -95.23 | 58.50 | -13.00 | -50.99 | Horizontal |
| 2 | 5205.00 | -61.72 | RMS | 32.99 | -55.60 | 0.48 | -95.23 | 55.64 | -13.00 | -48.72 | Horizontal |
| 3 | 6930.00 | -59.01 | RMS | 35.89 | -52.59 | 0.34 | -95.23 | 52.58 | -13.00 | -46.01 | Horizontal |




Site : 03CH01-CA
Condition: -13 3m HORN_02115_230809 Vertical
: WCDMA B4 Ch1413 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 | 3465.00 | -64.44 | RMS | 29.54 | -57.73 | 1.00 | -95.23 | 57.98 | -13.00 | -51.44 | Vertical |
| 2 | 5205.00 | -62.12 | RMS | 32.99 | -55.60 | 0.48 | -95.23 | 55.24 | -13.00 | -49.12 | Vertical |
| 3 | 6930.00 | -59.32 | RMS | 35.96 | -52.59 | 0.34 | -95.23 | 52.20 | -13.00 | -46.32 | Vertical |