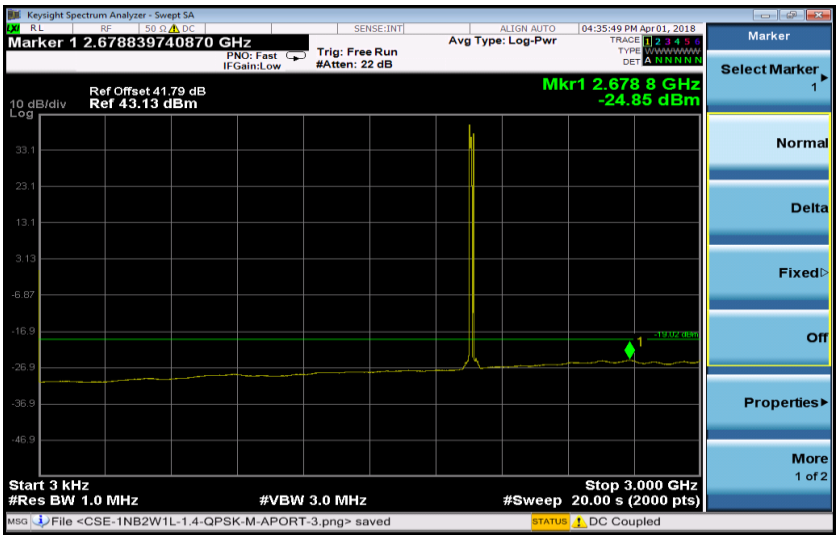
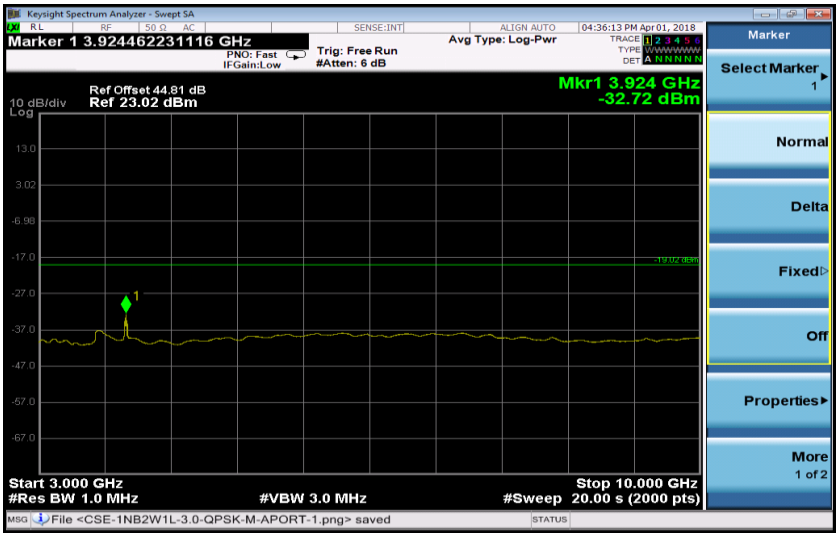
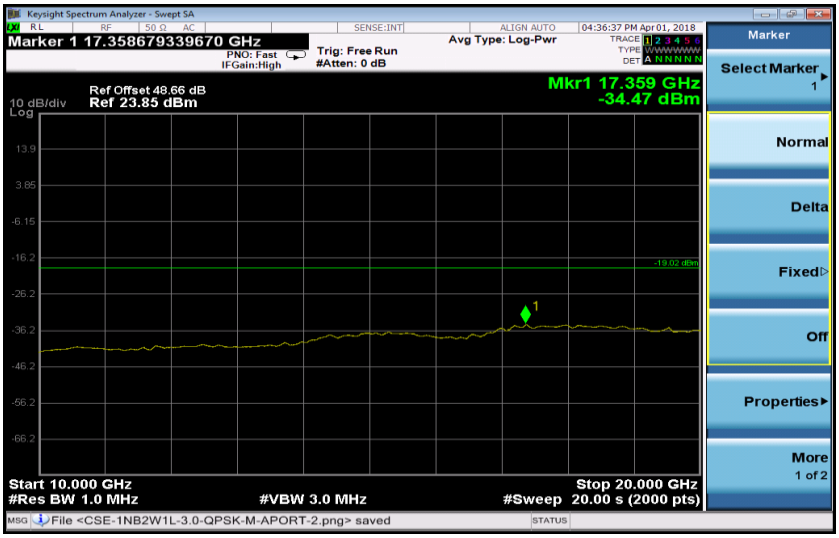
Port B, Channel Position M, LTE 3.0 MHz

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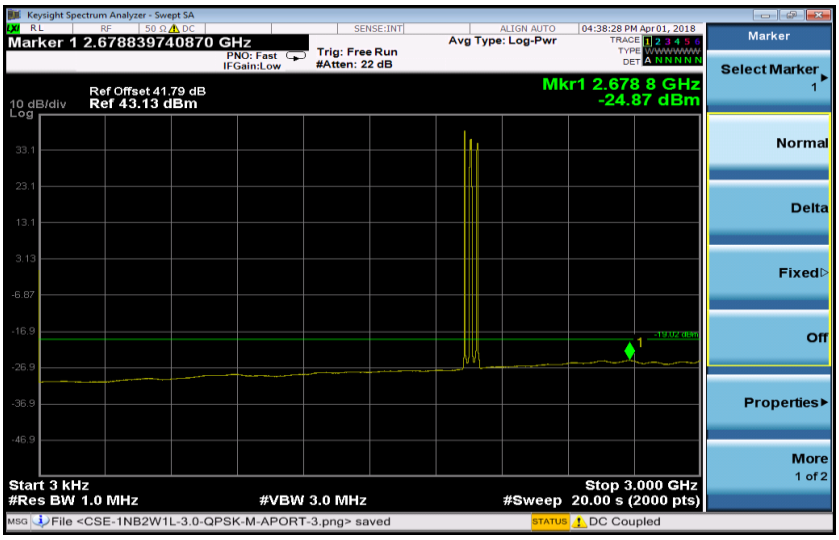
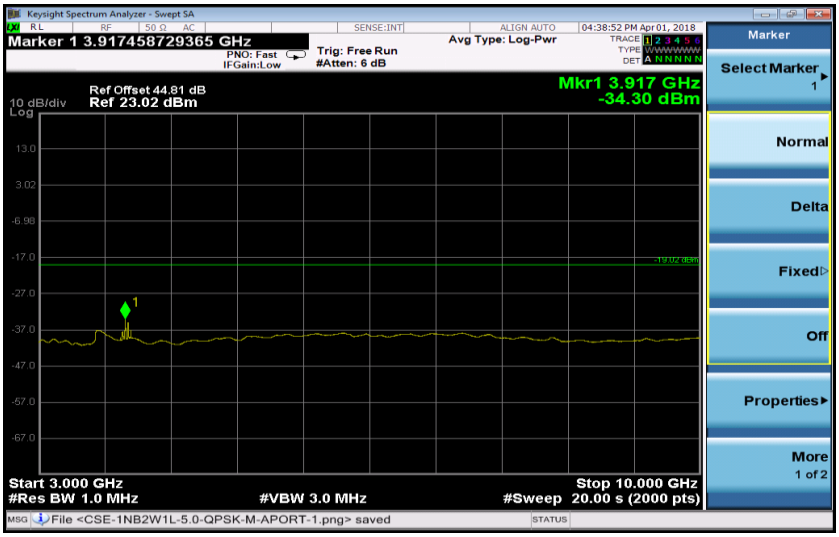
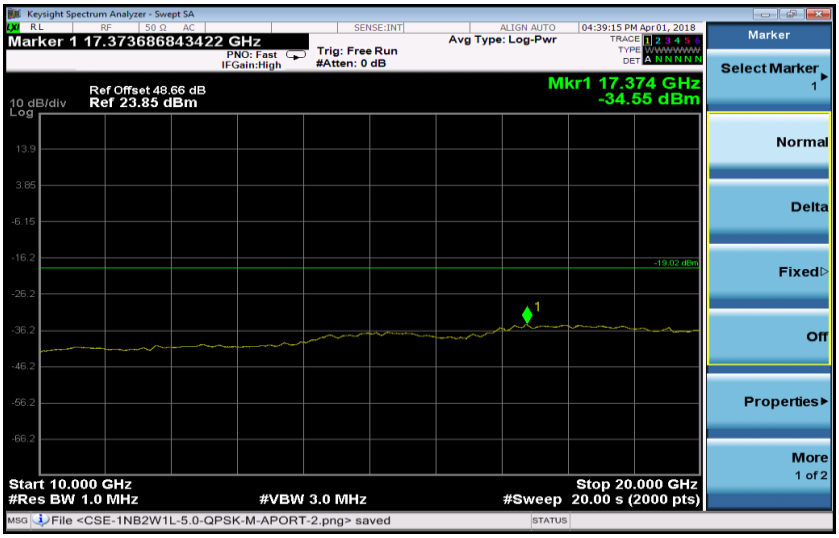
Port B, Channel Position M, LTE 5.0 MHz

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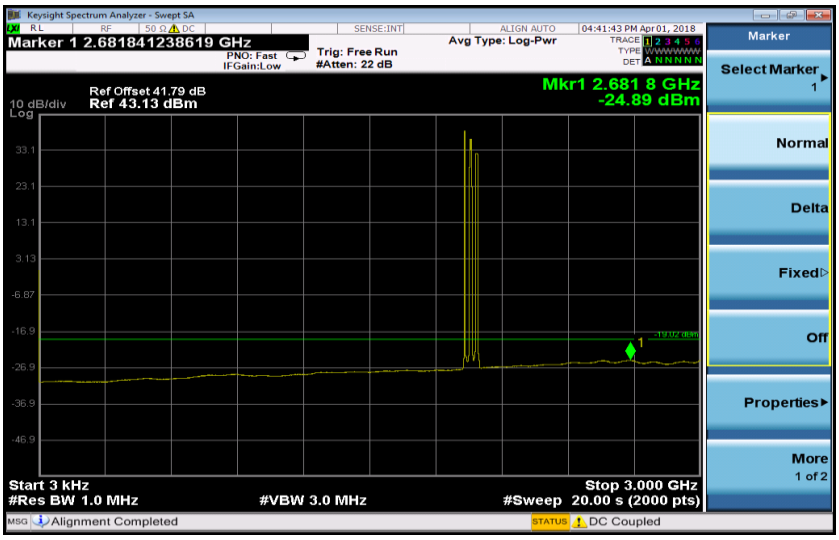
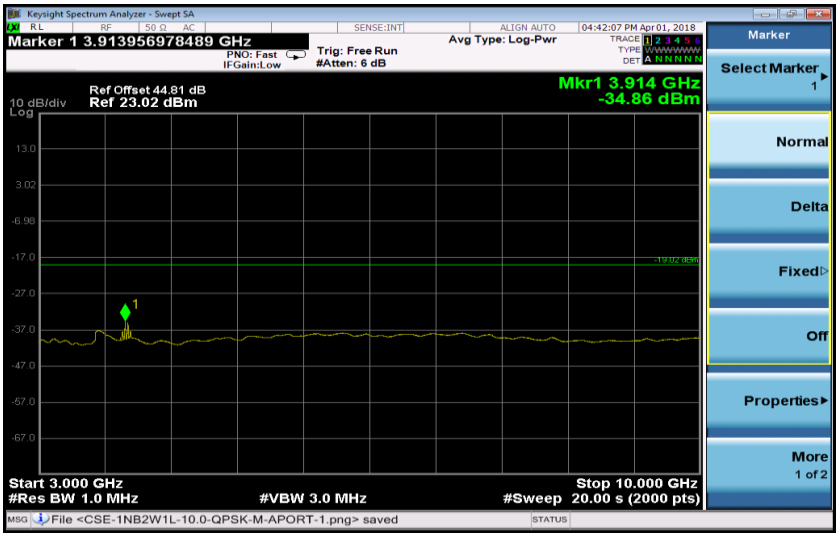
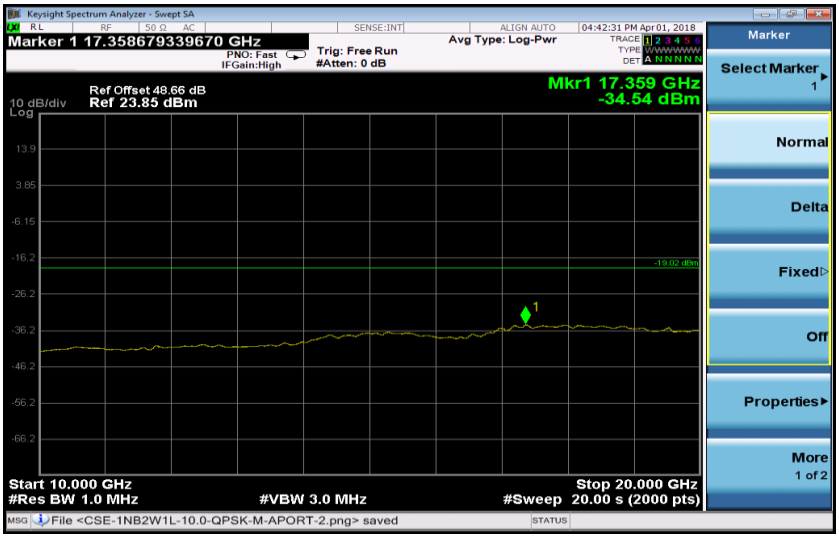
Port B, Channel Position M, LTE 10.0 MHz

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## A.5 Radiated Spurious Emission

### A.5.1 Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 24, Clause 24.232 (a) (d)
RSS-133, Clause 6.4

### A.5.2Method of measurement

The measurements procedures in TIA-603-E: 2016 are used. This measurement is carried out in semi-anechoic chamber.
A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the measurement antenna in both horizontal and vertical polarizations.
Emissions identified within the range 30MHz to 20GHz were then formally measured using a peak detector as the worst case.
The limits for outside a licensee's frequency band(s) of operation the power of the spurious emissions have been calculated, as shown below using the following formula:

Field Strength of Carrier - (43 + 10Log (P)) dB

Where:

Field Strength is measured in dBμV/m
P is measured Transmitter Power in Watts

The EUT was measured with the antenna height varied between 1 and 4 m with the turn table rotated between 0 and 360 degrees. The emission of any outside a licensee's frequencies within 20dB of the limit were measured with the substitution method used according to the standard.
The measurements were performed at a 3m distance unless otherwise stated.

### A.5.3 Measurement limit

The field strength of the carrier has been calculated assuming that the power is to be fed to a half-wave tuned dipoles as per 2.1053 (a).

$E_{(v/m)}=(30 \times G_i \times P_o)^{0.5} / d$

Where

$G_i$ is the antenna gain of ideal half-wave dipoles,
$P_o$ is the power out of the transceiver in W,
d is the measurement distance in meter.

Therefore at 3m measurement distance the field strength using the lowest transceiver output power would be:
$E_{(v/m)}=(30 \times 1.64 \times 16.56)^{0.5} / 3 = 9.51V/m = 139.57 dB\mu V/m$
As per 24.238 (a) the spurious emission must be attenuated by 43 + 10log (Po) dB this gives:
43 + 10log(16.56) = 55.19 dB
Therefore the limit at 3m measurement distance is:
139.57 – 55.19 = 84.4 dBμV/m
These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

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**A.5.4 Measurement results**

**Configuration WCDMA-1C :**

Maximum Output Power 52.0dBm, WCDMA Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position B | 1932.4MHz |
| Channel Position M | 1962.6MHz |
| Channel Position T | 1992.6MHz |

Channel Position B – QPSK

No emissions were detected within 20dB of the limit.

Channel Position M – QPSK

No emissions were detected within 20dB of the limit.

Channel Position T – QPSK

No emissions were detected within 20dB of the limit.

**Configuration WCDMA-2C :**

Maximum Output Power 52.0dBm, WCDMA Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | 1932.4MHz+1992.6 MHz |

Channel Position M – QPSK

No emissions were detected within 20dB of the limit.

**Configuration WCDMA-1C :**

Maximum Output Power 52.0dBm, WCDMA Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | 1962.6MHz |

Channel Position M – 16QAM

No emissions were detected within 20dB of the limit.

**Configuration WCDMA-2C :**

Maximum Output Power 52.0dBm, WCDMA Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | 1932.4MHz+1992.6 MHz |

Channel Position M–16QAM

No emissions were detected within 20dB of the limit.

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**Configuration LTE-MIMO-1C :**

Maximum Output Power 52.0dBm, LTE Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position B | 1932.5MHz |
| Channel Position M | 1962.5MHz |
| Channel Position T | 1992.5MHz |

Channel Position B– QPSK

No emissions were detected within 20dB of the limit.

Channel Position M– QPSK

No emissions were detected within 20dB of the limit.

Channel Position T – QPSK

No emissions were detected within 20dB of the limit.

**Configuration LTE-MIMO-2C :**

Maximum Output Power 52.0dBm, LTE Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | 1932.5MHz+1992.5 MHz |

Channel Position M –QPSK

No emissions were detected within 20dB of the limit.

**Configuration WCDMA+LTE-MC-3 :**

Maximum Output Power 52dBm, WCDMA Bandwidth 5.0MHz, LTE Bandwidth 5.0MHz

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | WCDMA:（1932.4MHz+1937.4MHz+1942.4MHz）+ LTE（1982.5MHz+1987.5MHz+1992.5MHz） |

Channel Position M–WCDMA（16QAM）/LTE（16QAM）

No emissions were detected within 20dB of the limit.

**Configuration NB-IoT+WCDMA+LTE-MIMO-MC-1 :**

Maximum Output Power 52dBm, WCDMA Bandwidth 5MHz, WCDMA Bandwidth 5MHz, NB-IoT.

| Channel Position | Channel Frequencies |
|---|---|
| Channel Position M | WCDMA （1962.4 MHz）+LTE （1985MHz）+NB （1930.3MHz） |

Channel Position M –WCDMA（16QAM）/LTE（16QAM）/NB

No emissions were detected within 20dB of the limit.

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**Configuration LTE-MIMO-1C ：**

Maximum Output Power 55dBm, LTE Bandwidth 5.0MHz

| | |
|---|---|
| Channel Position | Channel Frequencies |
| Channel Position B | LTE（1932.5MHz） |
| Channel Position M | LTE（1962.5MHz） |
| Channel Position T | LTE（1992.5MHz） |

Channel Position B– QPSK

No emissions were detected within 20dB of the limit.

Channel Position M– QPSK

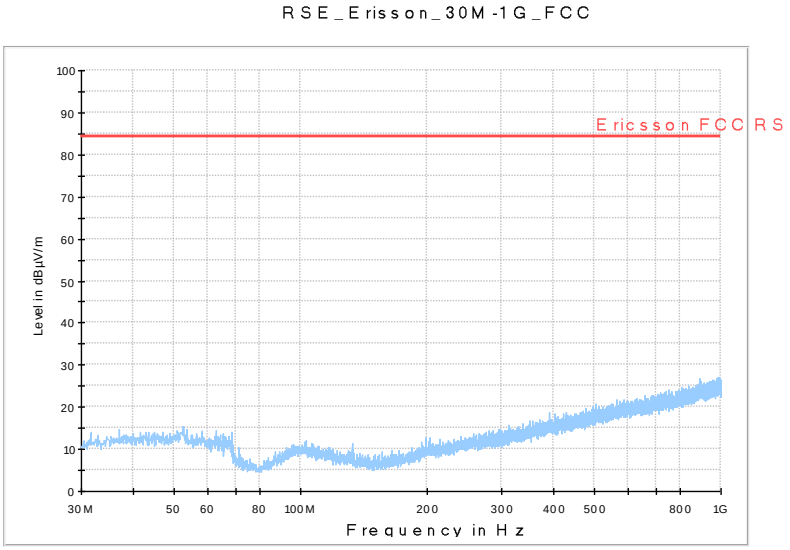
No emissions were detected within 20dB of the limit.

Channel Position T – QPSK

No emissions were detected within 20dB of the limit.

Note: The equipment support LTE 4x4 MIMO.

Channel Position B –QPSK-30MHz-1GHz

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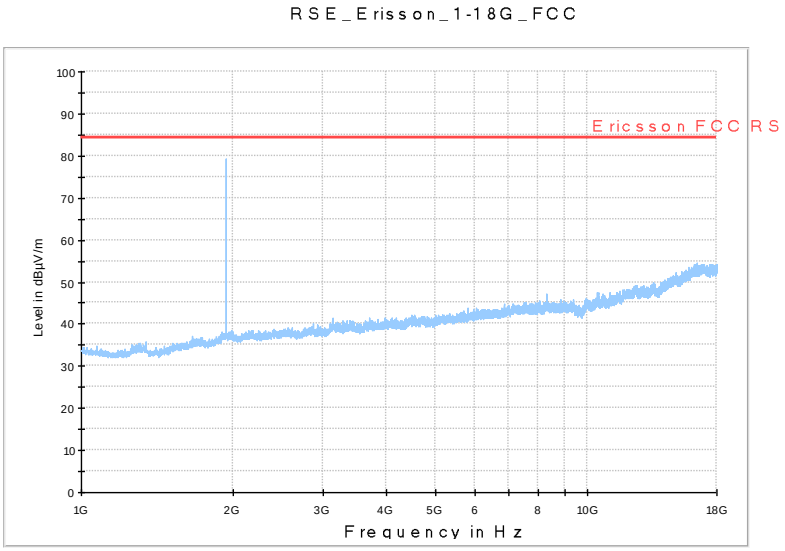
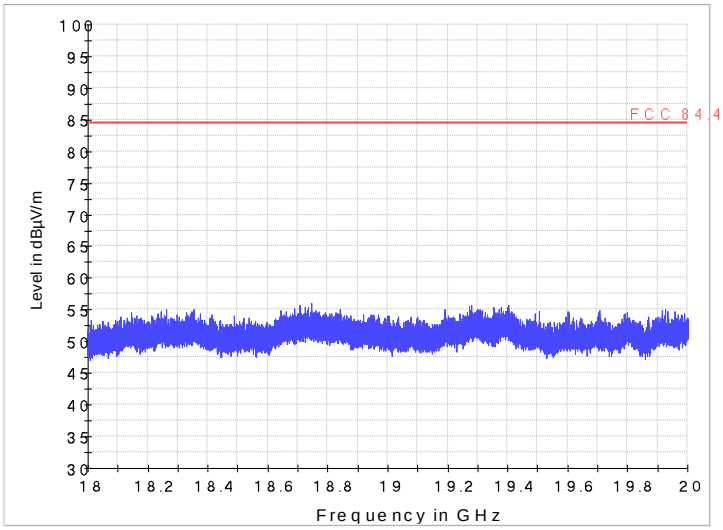
Channel Position B –QPSK-1GHz-18GHz




Channel Position B –QPSK-18GHz-20GHz




**Remarks**

The EUT does not exceed -13dBm / 84.4dBµV/m at the measured frequencies.

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## A.6 Frequency Stability

### A.6.1 Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 24, Clause 24.235
RSS-133, Clause 6.3

### A.6.2 Method of measurement

Temperature Variation

The EUT was tested over the temperature range -30°C to +50°C in 10°C steps with -48 VDC Power Supply. At each temperature step, the Base Station was configured to transmit an[RAT]* at maximum power on the middle channel of the operating band. After achieving thermal balance, the averages of 200 transmission bursts were measured and the result recorded.

Voltage Variation

The EUT was tested at the supplied voltages varied from 85 to 115 percent of the nominal values of -48 VDC. At +20°C, the Base Station was configured to transmit an [RAT]* at maximum power on the bottom, middle and top channel of the operating band. The average of200 transmission bursts was measured and the result recorded.

[RAT]*:
GSM - GSM Single Carrier with all timeslots active with GMSK modulation
WCDMA - Test Model 1 Single Carrier with QPSK modulation
LTE (5.0 MHz OBW) - Test Model E-TM1.1 Single Carrier with QPSK modulation
NB-IoT - QPSK modulation

### A.6.3 Measurement limit

FCC: The frequency stability shall be sufficient to ensure that the fundamentalemissions stay within the authorized frequency block.
ISED: ±1.0 ppm

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**A.6.4 Measurement results**

Frequency Error – Temperature Variation

Configuration GSM-1C

Maximum Output Power 43.0dBm per port, Channel Bandwidth 250KHz

| Supply Voltage DC(V) | Temperature | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -48 | -30 | -3.01 | -3.98 | 3.38 |
| | -20 | 3.35 | 3.12 | 2.53 |
| | -10 | -4.27 | 3.87 | 4.97 |
| | 0 | 3.92 | 4.32 | 2.66 |
| | 10 | 4.04 | -4.54 | 5.34 |
| | 20 | -3.97 | 3.08 | -4.79 |
| | 30 | 2.16 | 2.15 | 3.35 |
| | 40 | 2.66 | -4.32 | 2.28 |
| | 50 | 2.75 | -2.77 | -2.18 |

Configuration WCDMA-1C

Maximum Output Power 46.0dBm per port, Channel Bandwidth 5MHz

| Supply Voltage DC(V) | Temperature | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -48 | -30 | -1.27 | -1.09 | 1.45 |
| | -20 | 1.35 | 1.82 | 1.26 |
| | -10 | -1.72 | 1.53 | 1.43 |
| | 0 | -1.35 | -1.36 | 1.34 |
| | 10 | 1.68 | 1.16 | 1.34 |
| | 20 | -1.24 | 1.25 | 1.05 |
| | 30 | 1.22 | 1.01 | -2.15 |
| | 40 | -1.27 | -1.09 | 1.13 |
| | 50 | -1.04 | -1.11 | -1.03 |

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Configuration LTE-MIMO-1C

Maximum Output Power 46.0dBm per port, Channel Bandwidth 5MHz

| Supply Voltage DC(V) | Temperature | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -48 | -30 | 1.59 | -649.36m | 737.07m |
| | -20 | 1.02 | 940.23m | 1.06 |
| | -10 | -733.93m | 705.56m | 1.45 |
| | 0 | 859.02m | 787.38m | 976.18m |
| | 10 | 908.37m | -905.24m | 770.13m |
| | 20 | -838.14m | 664.97m | 673.59m |
| | 30 | 788.77m | 674.45m | 746.23m |
| | 40 | 1.03 | 1.02 | 975.46m |
| | 50 | 980.89m | 721.79m | -788.56m |

Configuration NB-IoT-InBand-1C

Maximum Output Power 46.0dBm per port, Channel Bandwidth 5MHz

| Supply Voltage DC(V) | Temperature | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -48 | -30 | -5.11 | -5.05 | -7.42 |
| | -20 | -5.02 | -4.75 | -5.54 |
| | -10 | -5.21 | -6.13 | -5.36 |
| | 0 | -5.15 | -5.25 | -6.27 |
| | 10 | -5.17 | -5.28 | -5.24 |
| | 20 | -5.28 | -5.28 | -5.66 |
| | 30 | -5.69 | -5.99 | -6.53 |
| | 40 | -6.40 | -5.08 | -6.07 |
| | 50 | -4.45 | -5.30 | -5.63 |

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Configuration NB-IoT-Standalone-1C
Maximum Output Power 46.0dBm per port

| Supply Voltage DC(V) | Temperature | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -48 | -30 | 1.27 | 1.87 | 1.07 |
| | -20 | 1.57 | 1.05 | -1.02 |
| | -10 | 1.47 | 1.35 | -1.24 |
| | 0 | 1.61 | -1.27 | -1.40 |
| | 10 | -1.03 | 1.40 | 959.41m |
| | 20 | 1.05 | 1.74 | 1.62 |
| | 30 | 1.40 | 1.17 | 1.24 |
| | 40 | 1.05 | 1.55 | 1.26 |
| | 50 | 1.81 | 1.65 | 1.15 |

Frequency Error – Voltage Variation

Configuration GSM-1C
Maximum Output Power 43.0dBm per port

| Supply Voltage DC(V) | Temperature(°C) | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -40.8 | 20 | 4.369 | 3.832 | -4.852 |
| -48 | 20 | 4.217 | 2.690 | -4.309 |
| -55.2 | 20 | 4.472 | -4.407 | 4.505 |

Configuration WCDMA-1C
Maximum Output Power 46.0dBm per port

| Supply Voltage DC(V) | Temperature(°C) | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -40.8 | 20 | -1.96 | -1.85 | 1.22 |
| -48 | 20 | -1.41 | -1.64 | 1.45 |
| -55.2 | 20 | -1.15 | 1.84 | 1.13 |

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Configuration LTE-MIMO-1C

Maximum Output Power 46.0dBm per port, Channel Bandwidth 5MHz

| Supply Voltage DC(V) | Temperature(°C) | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -40.8 | 20 | 376.08m | 719.88m | 684.76m |
| -48 | 20 | 591.10m | 410.34m | 291.57m |
| -55.2 | 20 | 569.58m | 303.94m | 554.22m |

Configuration NB-IoT-InBand-1C

Maximum Output Power 46.0dBm per port, Channel Bandwidth 5MHz

| Supply Voltage DC(V) | Temperature(°C) | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -40.8 | 20 | 4.451 | 4.611 | 4.260 |
| -48 | 20 | 5.189 | 4.985 | 4.596 |
| -55.2 | 20 | 4.612 | 5.117 | 5.201 |

Configuration NB-IoT-Standalone-1C

Maximum Output Power 46.0dBm per port

| Supply Voltage DC(V) | Temperature(°C) | Frequency Stability (Hz) | | |
|---|---|---|---|---|
| | | Channel position B | Channel position M | Channel position T |
| -40.8 | 20 | 520.21m | 361.67m | 455.36m |
| -48 | 20 | 598.68m | 272.73m | 235.18m |
| -55.2 | 20 | 304.77m | 295.34m | 303.98m |

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## ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:*

Electromagnetic Compatibility & Telecommunications

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).*

2017-08-22 through 2018-09-30
*Effective Dates*

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

*For the National Voluntary Laboratory Accreditation Program*

*****END OF REPORT*****

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