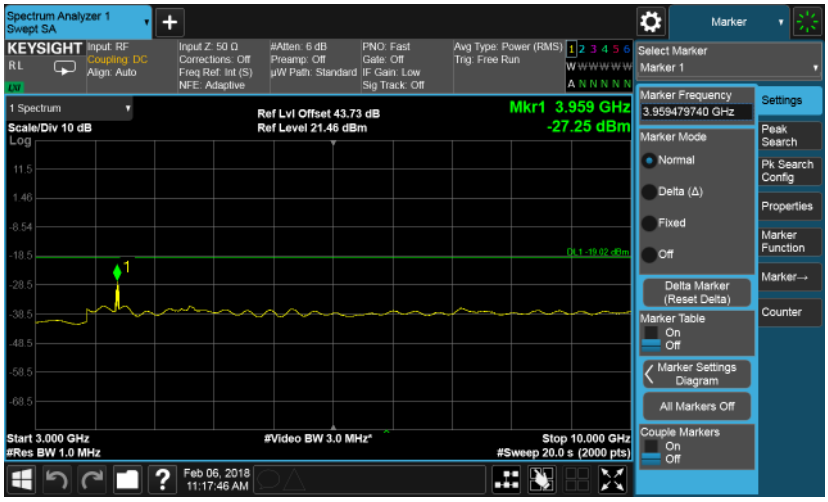

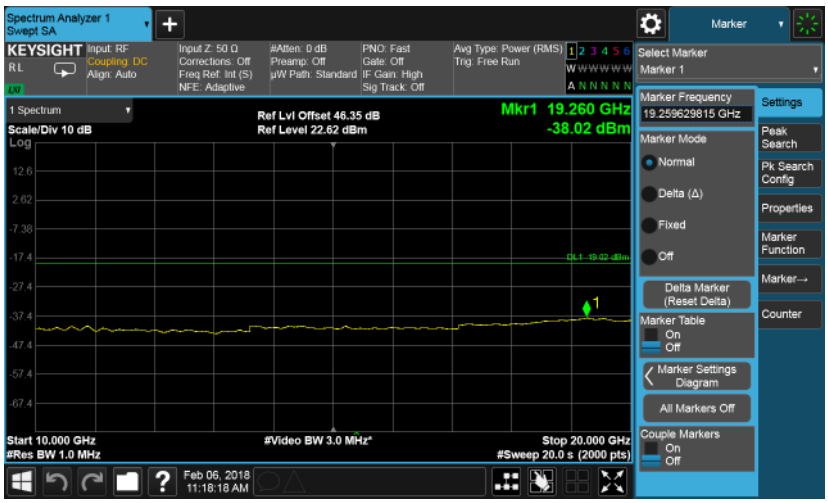

Configuration NB-IOT+GSM+LTE-MC-3 (1NB QPSK +2GSM GMSK +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
NB: 250 KHz G: 250 KHz L:5.0 MHz	1.0	-19.02

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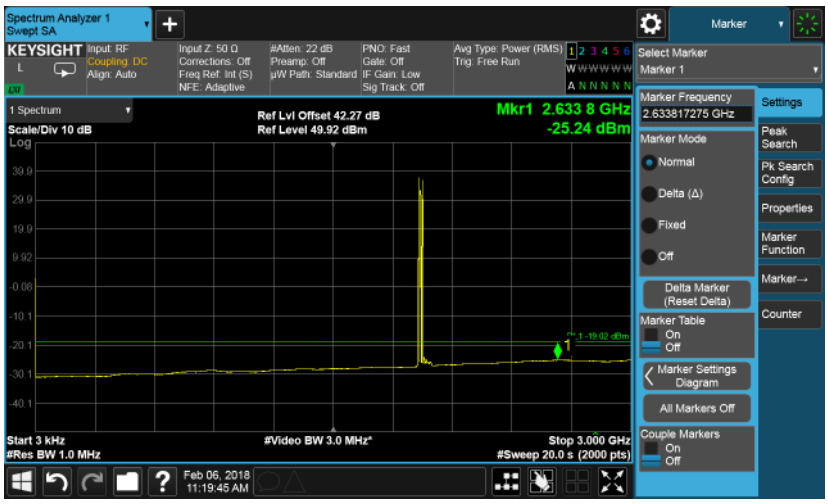
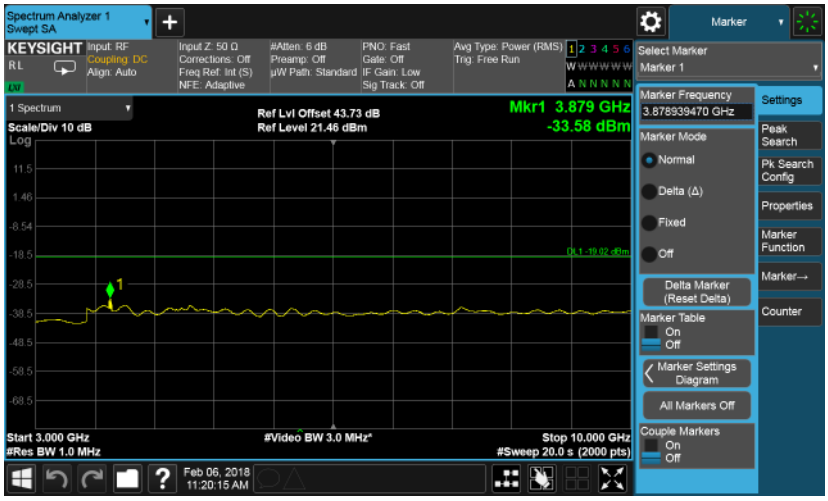
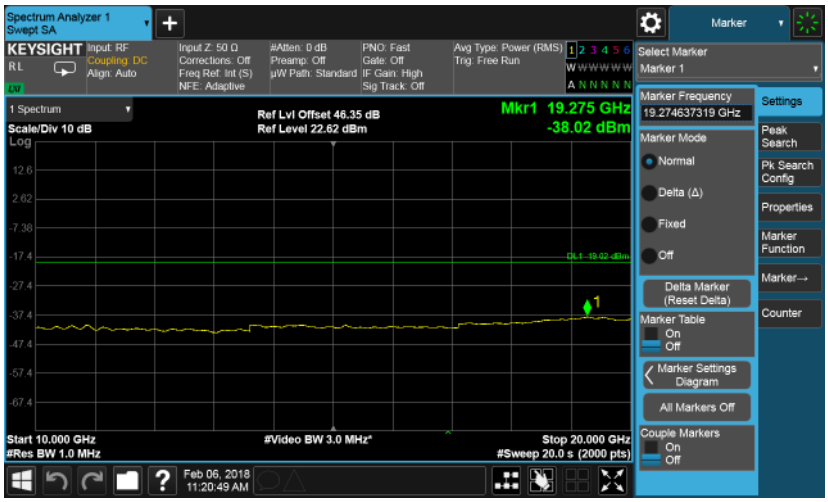
Port B, Channel Position B







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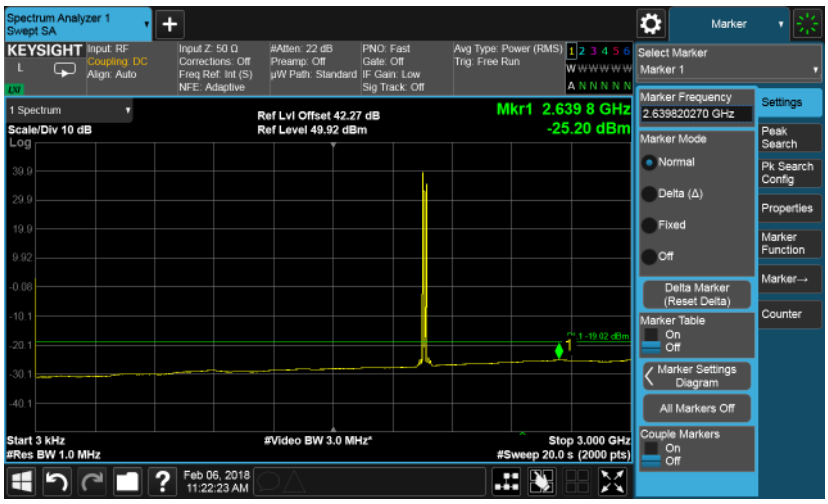
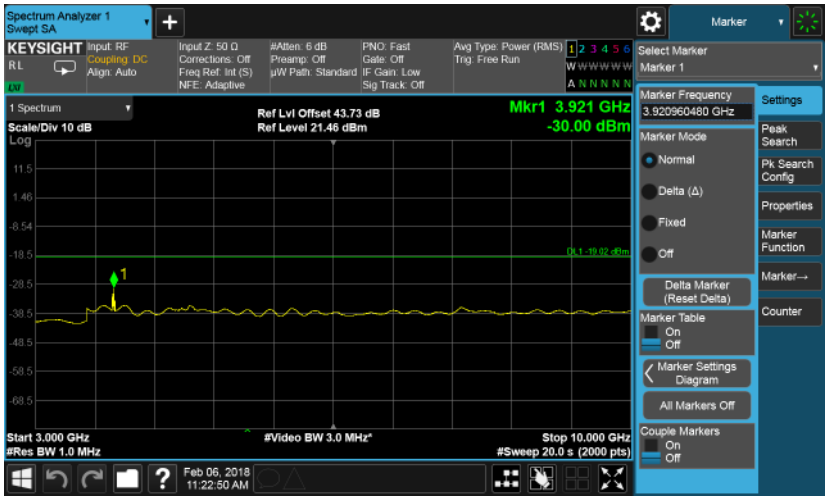
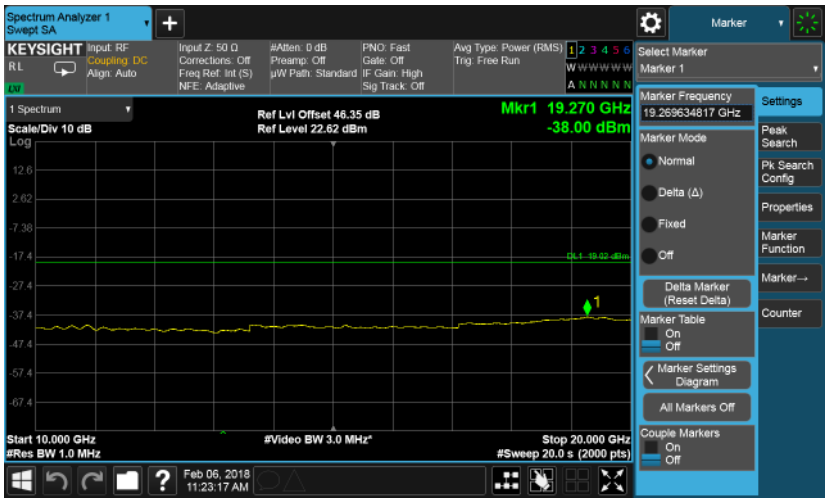
Port B, Channel Position M







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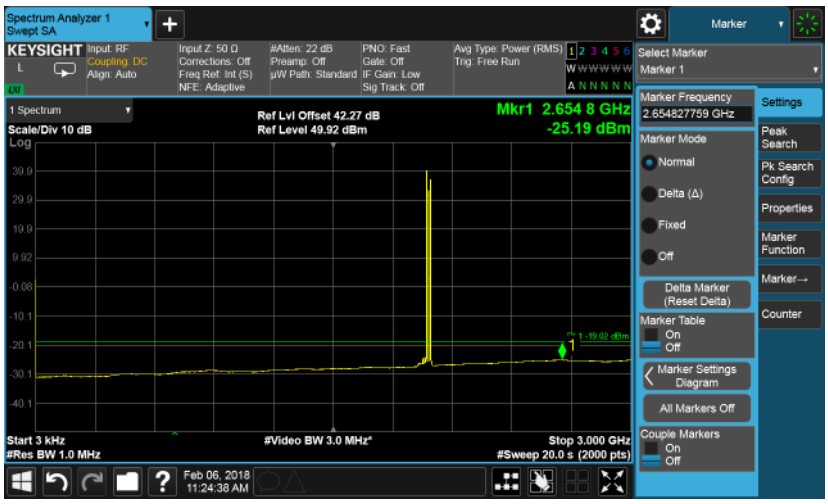
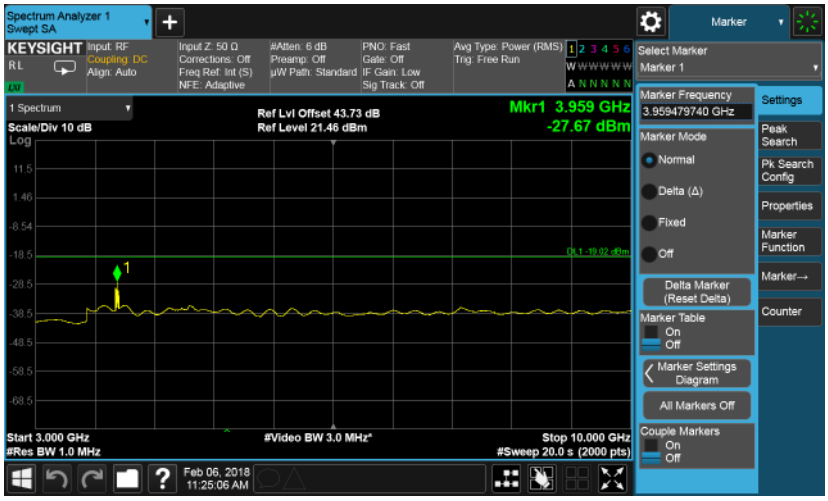
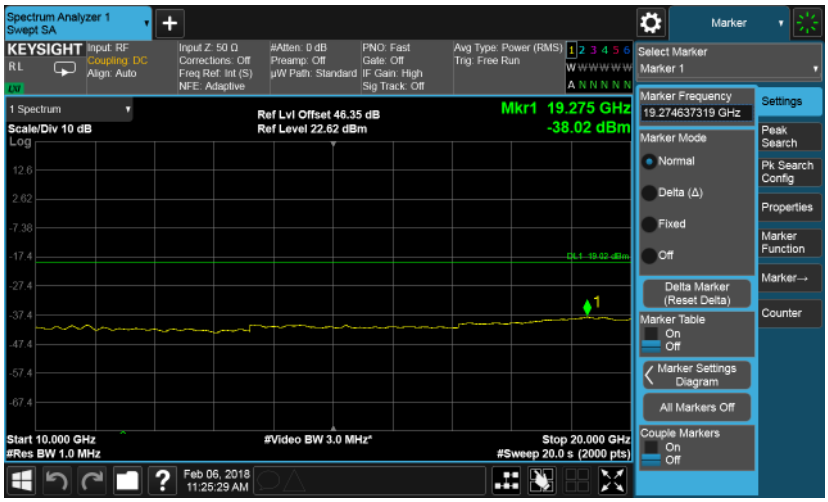
Port B, Channel Position T







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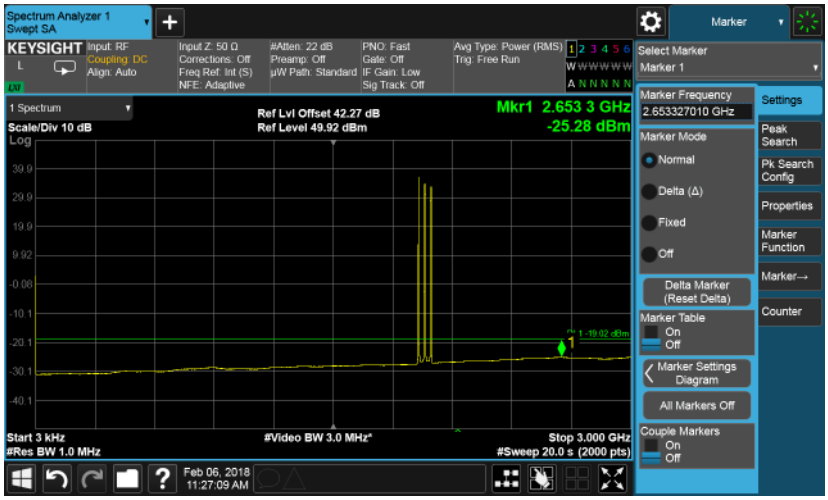
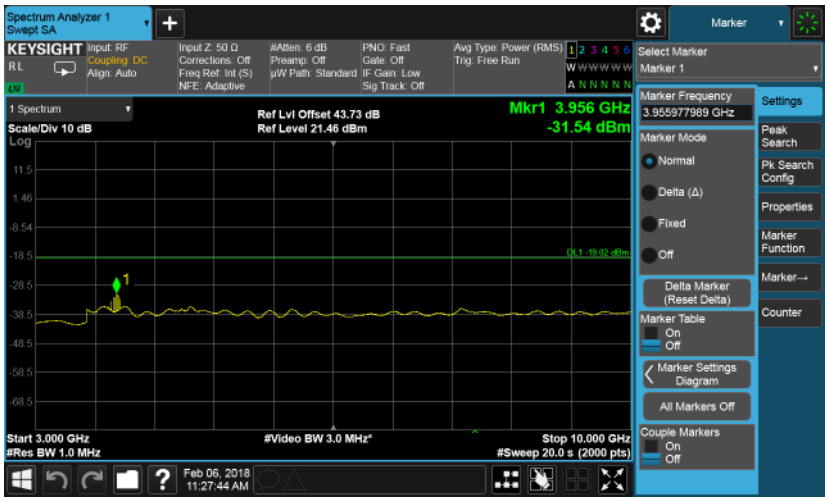
Configuration NB-IOT+WCDMA+LTE-MIMO-MC-1 (1NB QPSK +1WCDMA 16QAM +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
NB: 250 KHz W: 5.0 MHz L:5.0 MHz	1.0	-19.02

Port B, Channel Position M





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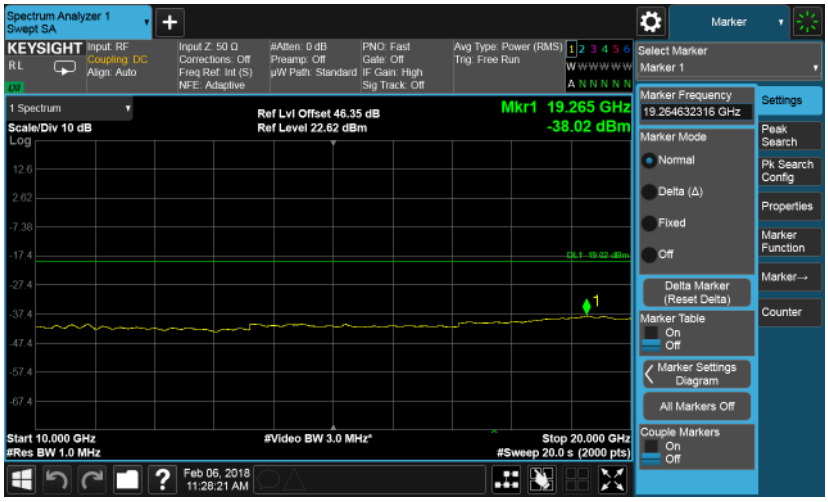
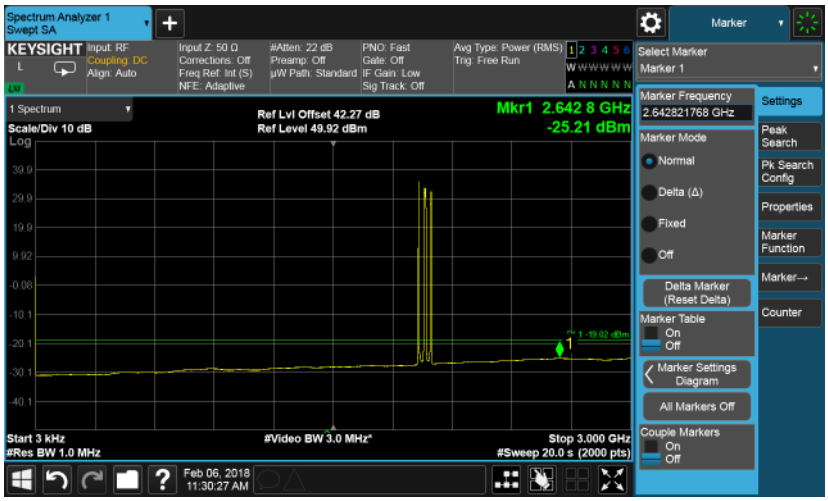


Configuration NB-IOT+WCDMA+LTE-MC-3 (1NB QPSK +2WCDMA 16QAM +1LTE QPSK)

Channel Bandwidth	RBW (MHz)	Limit (dBm)
NB: 250 KHz W: 5.0 MHz L:5.0 MHz	1.0	-19.02

Port B, Channel Position M



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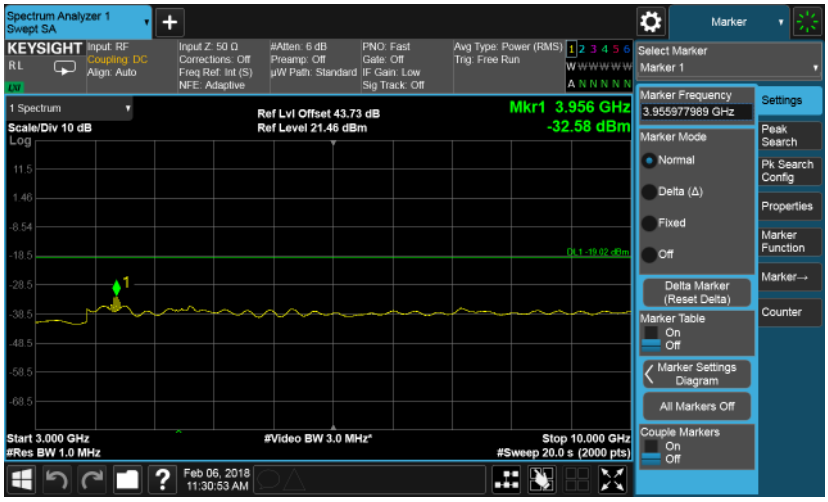

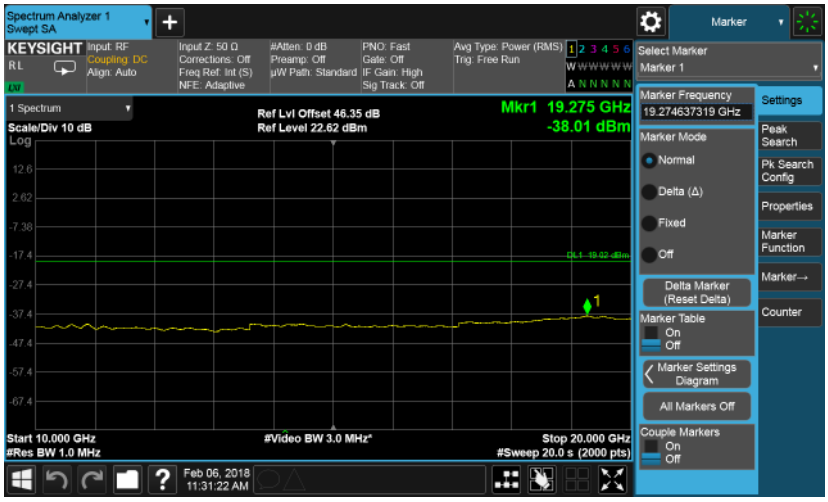

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A.5 Radiated Spurious Emission

A.5.1 Reference

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

A.5.2 Method 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 polarisations.
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 turntable 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:
$E_{(v/m)}=(30 \times 1.64 \times 16.56)^{0.5} / 3 = 9.51$V/m = 139.57 dBμV/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 GSM-1C

Maximum Output Power 52.0dBm in total, GSM Bandwidth 200kMHz

Channel Position	Channel Frequencies
Channel Position B	1930.4MHz
Channel Position M	1960.0MHz
Channel Position T	1989.6MHz

Channel Position B – GMSK

No emissions were detected within 20dB of the limit.

Channel Position M – GMSK

No emissions were detected within 20dB of the limit.

Channel Position T – GMSK

No emissions were detected within 20dB of the limit.

Configuration GSM-1C

Maximum Output Power 52.0dBm in total, GSM Bandwidth 200kMHz

Channel Position	Channel Frequencies
Channel Position B	1930.4MHz
Channel Position M	1960.0MHz
Channel Position T	1989.6MHz

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-1C :

Maximum Output Power 52.0dBm in total, 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 49.0dBm in total, WCDMA Bandwidth 5.0MHz

Channel Position	Channel Frequencies

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Channel Position M_{RFBW}	1932.4MHz+1992.6 MHz

Channel Position M_{RFBW} – QPSK

No emissions were detected within 20dB of the limit.

Configuration WCDMA-1C :

Maximum Output Power 52.0dBm in total, 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 – 16QAM

No emissions were detected within 20dB of the limit.

Channel Position M –16QAM

No emissions were detected within 20dB of the limit.

Channel Position T –16QAM

No emissions were detected within 20dB of the limit

Configuration LTE- MIMO-1C

Maximum Output Power 52.0dBm in total, 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/16QAM/64QAM/256QAM

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 49.0dBm in total, LTE Bandwidth5.0MHz

Channel Position	Channel Frequencies
Channel Position B	1932.5MHz+1992.5 MHz
Channel Position M	1962.5MHz+1932.5 MHz
Channel Position T	1992.5MHz+1932.5 MHz

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.

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Configuration LTE-MIMO-6C

Maximum Output Power 49.0dBm in total, LTE Bandwidth 5MHz

Channel Position	Channel Frequencies
Channel Position B	1932.5MHz+1937.5MHz+1942.5MHz+1992.5MHz+1987.5MHz+198.5MHz

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 GSM+WCDMA-MC-1

Maximum Output Power 52dBm in total, WCDMA Bandwidth 5MHz,GSM Bandwidth 200kHz,

Channel Position	Channel Frequencies
Channel Position B	1930.4 MHz+1987.6MHz

Channel Position B –16QAM

No emissions were detected within 20dB of the limit.

Configuration WCDMA+LTE-MC-1

Maximum Output Power 52dBm in total, WCDMA Bandwidth 5MHz,LTE Bandwidth 1.4MHz,

Channel Position	Channel Frequencies
Channel Position B	1932.4 MHz+1994.3MHz
Channel Position M	1955 MHz+1971.8MHz
Channel Position T	1977.4MHz+1994.3MHz

Channel Position B –16QAM/QPSK

No emissions were detected within 20dB of the limit.

Channel Position M –16QAM/QPSK

No emissions were detected within 20dB of the limit.

Channel Position T –16QAM/QPSK

No emissions were detected within 20dB of the limit.

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Configuration GSM+WCDMA-MC-2

Maximum Output Power 49.0dBm in total, WCDMA Bandwidth 5MHz

Channel Position	Channel Frequencies
Channel Position B	1930.4MHz+1932.2 MHz+1934.0 MHz+1935.8MHz+1982.6 MHz+1987.6 MHz

Channel Position B –GMSK+QPSK

No emissions were detected within 20dB of the limit.

Configuration NBIoT-InBand-1C

Maximum Output Power 49.0dBm in total, **NB-IoT**180kHz, LTE Bandwidth 20MHz,

Channel Position	Channel Frequencies
Channel Position M	1962.5MHz(LTE)+ PRB4

Channel Position M

No emissions were detected within 20dB of the limit.

Note: The test results stated were worst cases of different multi-carrier combinations.

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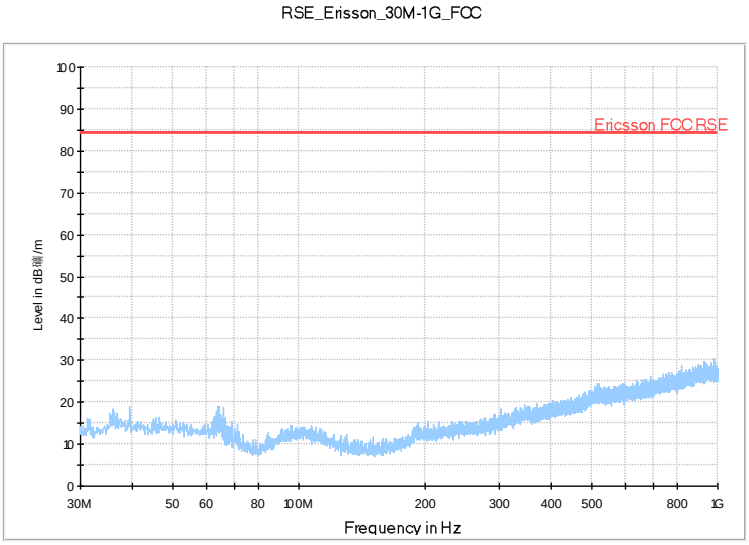
Configuration LTE-MIMO-1C ：

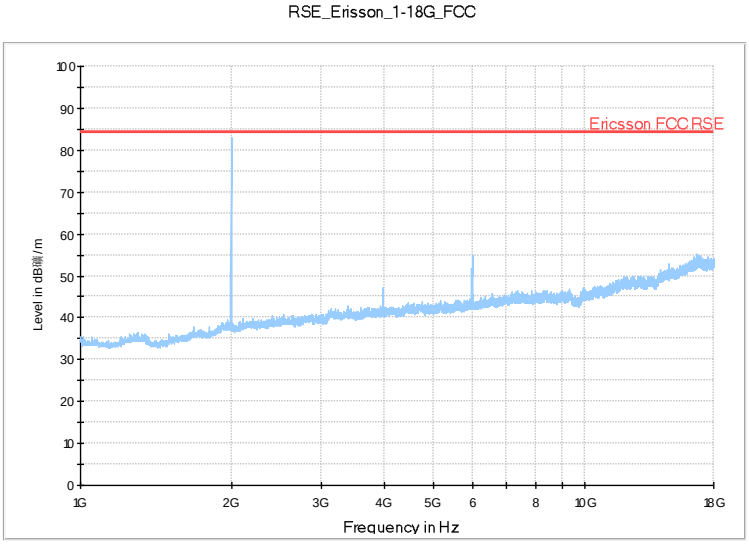
Maximum Output Power 52.0dBm in total, LTE Bandwidth 5MHz,

Channel Position	Channel Frequencies
Channel Position T	1992.5MHz

Channel Position B –QPSK-30MHz-1GHz



Channel Position T –QPSK-1GHz-18GHz



Channel Position T –QPSK-18GHz-20GHz

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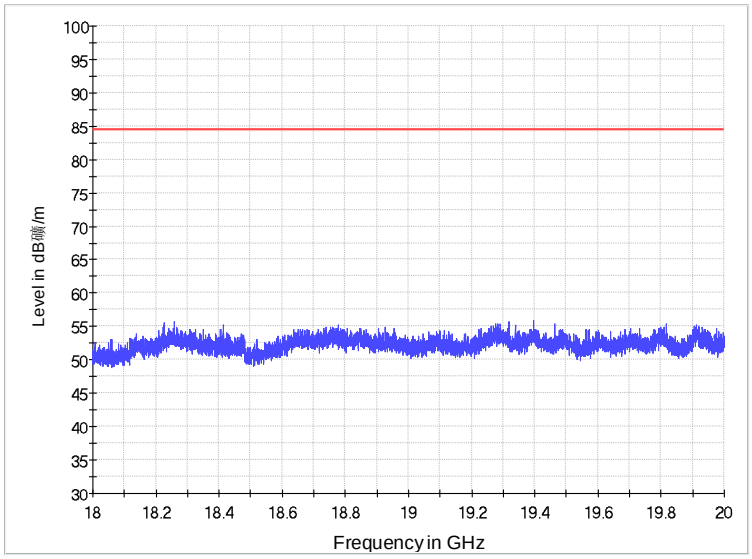

Remarks

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 of 200 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 fundamental emissions stay within the authorized frequency block.
IC: ±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

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	-4.06	2.08	-4.55
	-20	6.24	5.04	-2.83
	-10	-7.41	-4.05	2.22
	0	-7.10	3.36	-5.50
	10	-4.86	-5.23	-2.37
	20	-7.20	-7.80	-8.31
	30	2.56	-6.85	6.27
	40	4.35	-7.31	-4.29
	50	-6.30	-5.39	6.41

Configuration WCDMA-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	-1.28	1.88	-1.53
	-20	1.78	1.37	1.06
	-10	-2.31	1.19	-1.26
	0	1.49	1.36	1.92
	10	-1.17	1.46	0.99
	20	1.31	-1.03	1.28
	30	-1.15	-1.27	-1.31
	40	-0.95	1.16	-1.64
	50	1.42	1.39	-1.31

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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	1.36	-1.76	-1.66
	-20	-1.01	1.42	1.09
	-10	-1.28	1.16	-1.14
	0	0.89	1.07	1.13
	10	-1.02	1.24	1.23
	20	-1.07	1.11	-1.00
	30	-0.86	1.21	1.16
	40	-1.19	1.37	1.23
	50	-1.46	1.43	1.19

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	2.42	2.24	2.30
	-20	2.32	1.75	1.83
	-10	2.37	2.23	2.35
	0	1.69	1.74	2.25
	10	2.96	2.38	2.50
	20	2.51	1.77	1.97
	30	2.17	2.64	2.21
	40	2.65	2.64	2.73
	50	2.25	2.28	2.89

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Configuration NB-IOT-Standalone-1C
Maximum Output Power 43.0dBm per port

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
-48	-30	1.75	1.48	1.39
	-20	1.25	-2.63	-1.34
	-10	-2.09	2.32	-2.51
	0	1.94	1.50	-1.65
	10	-1.33	1.26	1.97
	20	1.68	1.23	1.21
	30	2.53	1.72	1.43
	40	2.22	1.87	1.91
	50	2.70	1.73	1.45

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	-2.73	-8.07	4.59
-48	20	5.72	2.69	4.24
-55.2	20	3.76	8.20	3.59

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	-1.36	-0.37	-1.28
-48	20	-0.19	0.30	0.45
-55.2	20	-0.60	-1.66	-0.43

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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	0.72	0.52	0.56
-48	20	1.18	0.89	-0.52
-55.2	20	0.84	-0.91	0.80

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	1.80	2.16	1.69
-48	20	1.65	2.08	2.06
-55.2	20	1.86	1.71	2.36

Configuration NB-IOT-Standalone-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	2.63	2.70	2.44
-48	20	3.15	2.70	2.48
-55.2	20	2.92	2.76	2.59

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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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