

A.4 Conducted Spurious Emission

A.4.1 Reference

FCC CFR 47 Part 2, Clause 2.1051

FCC CFR 47 Part 90, Clause 90.543

A.4.2 Method of measurement

In accordance with FCC rules, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB or $76 + 10 \log(P)$ dB.

The spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using an attenuator and the frequency spectrum investigated from 3KHz to 8GHz. The resolution bandwidth of 100KHz was employed for frequency band 3KHz to 1GHz, resolution bandwidth of 6.25KHz was employed for frequency band 769MHz to 805MHz and resolution bandwidth of 1MHz was employed for frequency band 1GHz to 8GHz. The spectrum analyzer detector was set to RMS.

For MIMO mode configurations, the limit was adjusted with a correction of -3.01dB [10Log2] by using the Measure and Add 10Log(N) dB technique according to FCC KDB 662911 D01 Multiple Transmitter Output accounting for simultaneous transmission from antenna ports RF A and B.

A.4.3 Measurement limit

(e) For operations in the 758–768 MHz and the 788–798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

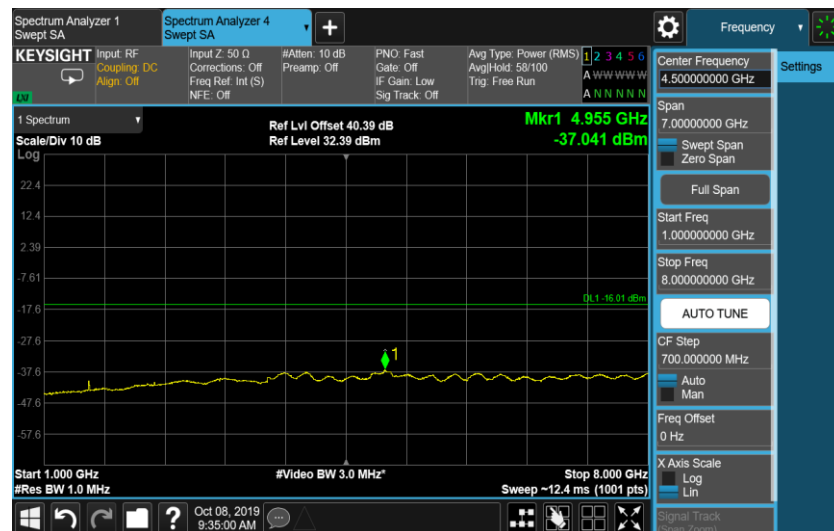
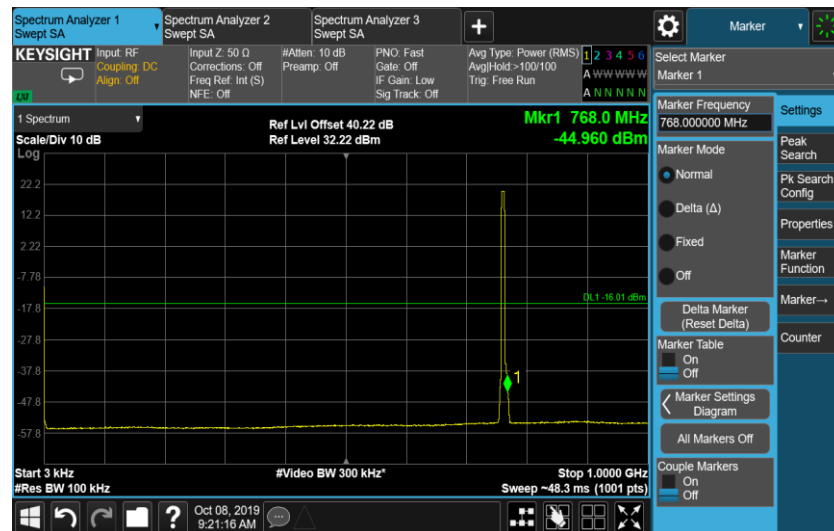
- (1) On all frequencies between 769–775MHz and 799–805 MHz, by a factor not less than $76 + 10 \log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations.
- (3) On any frequency between 775–788MHz, above 805 MHz, and below 758MHz, by at least $43 + 10 \log(P)$ dB.
- (4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.
- (5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

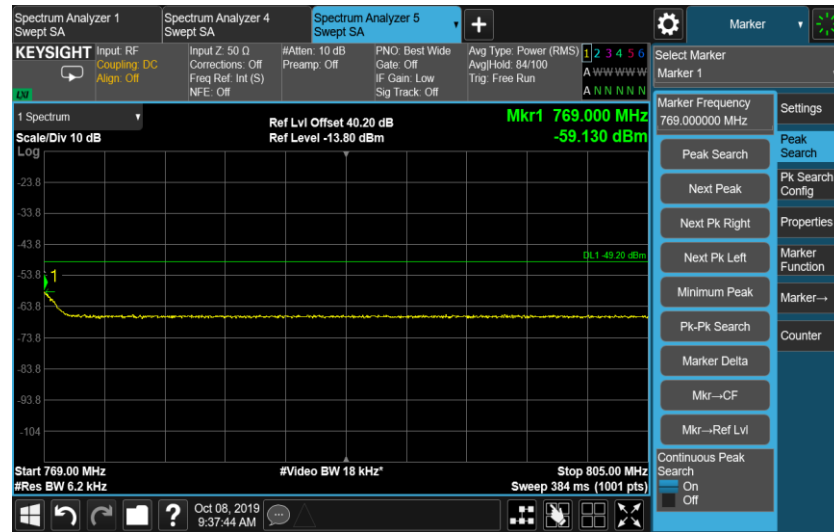
A.4.4 Measurement results

Configuration LTE-MIMO-1C QPSK

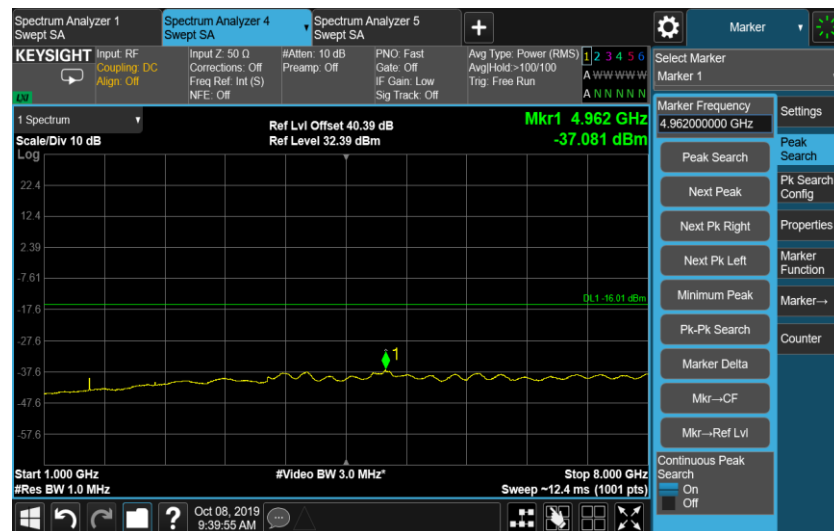
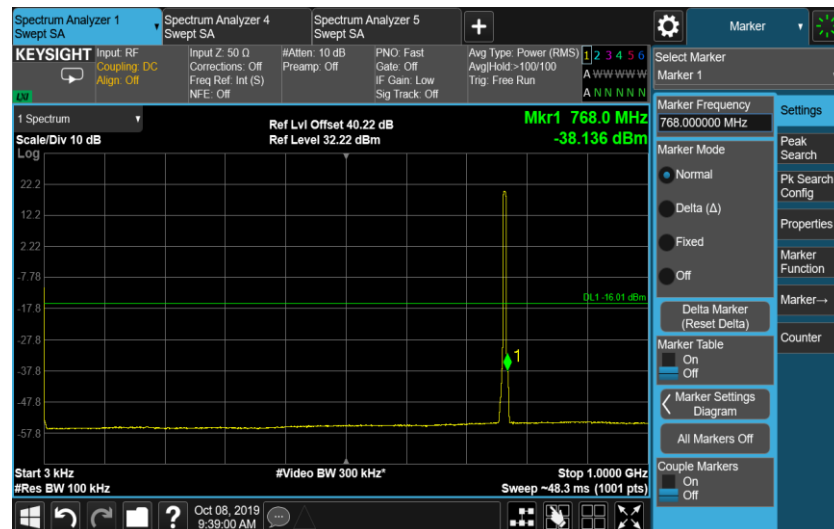
Channel Bandwidth	RBW (Hz)	Limit (dBm)
5.0 MHz	100k/6.2k	-16.01/-49.01
10.0 MHz	100k/6.2k	-16.01/-49.01

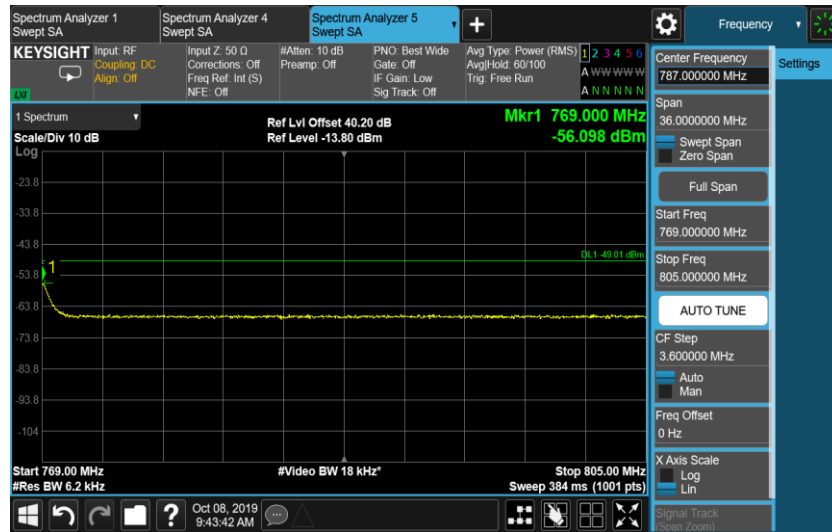
Port A, Channel Position B 5.0 MHz



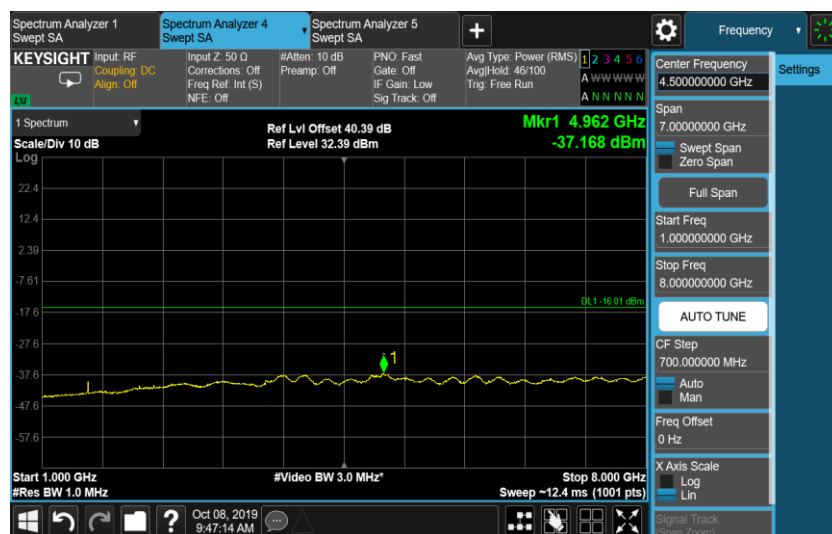
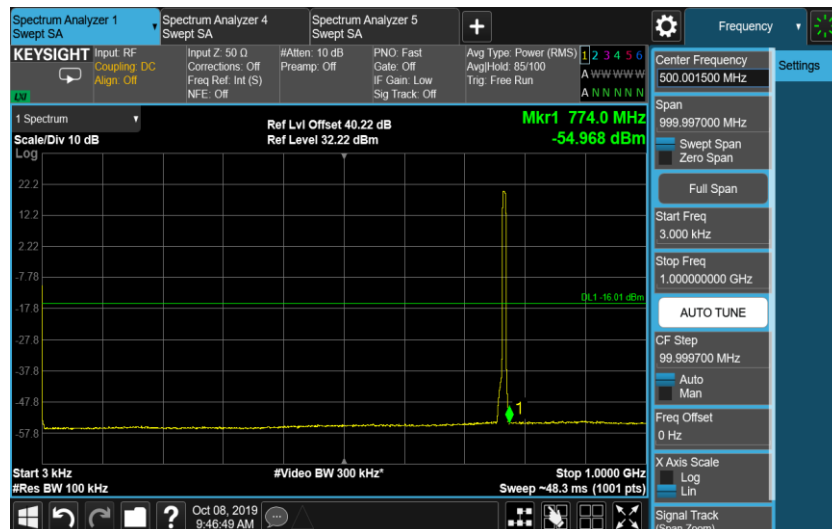


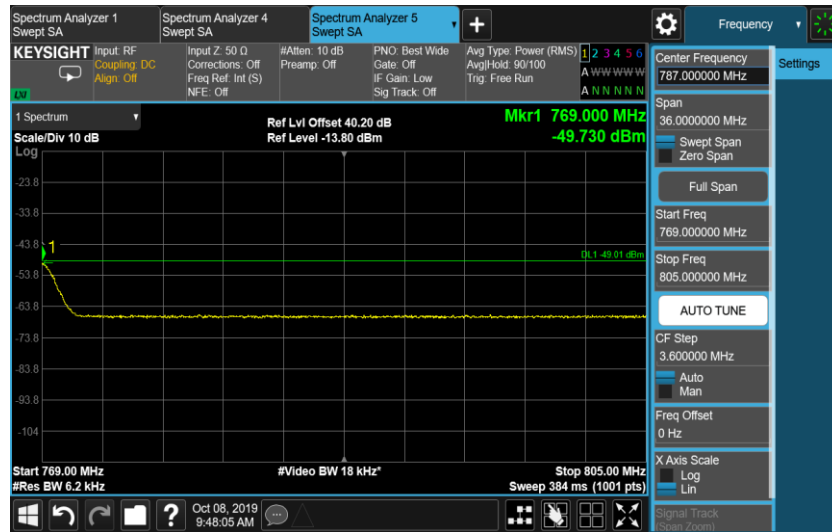
Port A, Channel Position M 5.0 MHz



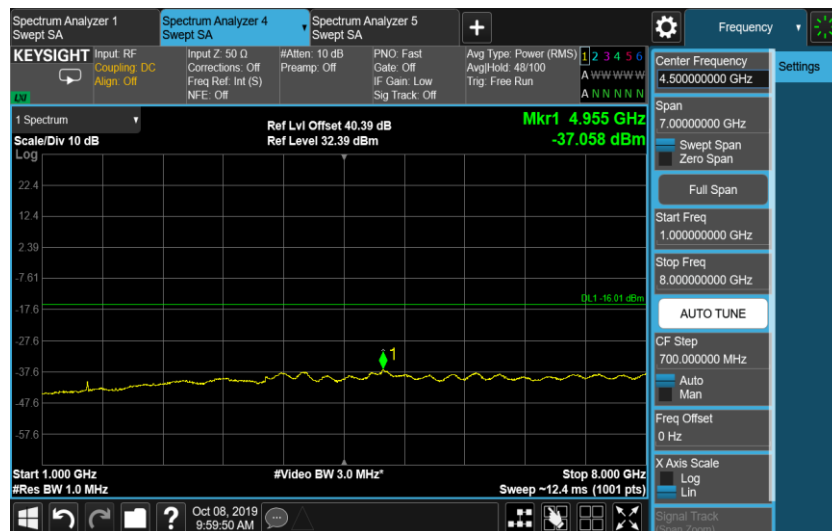
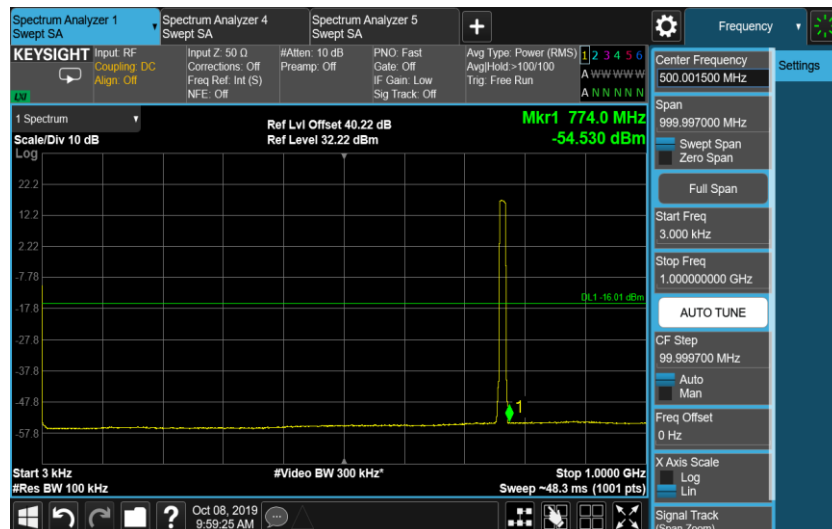


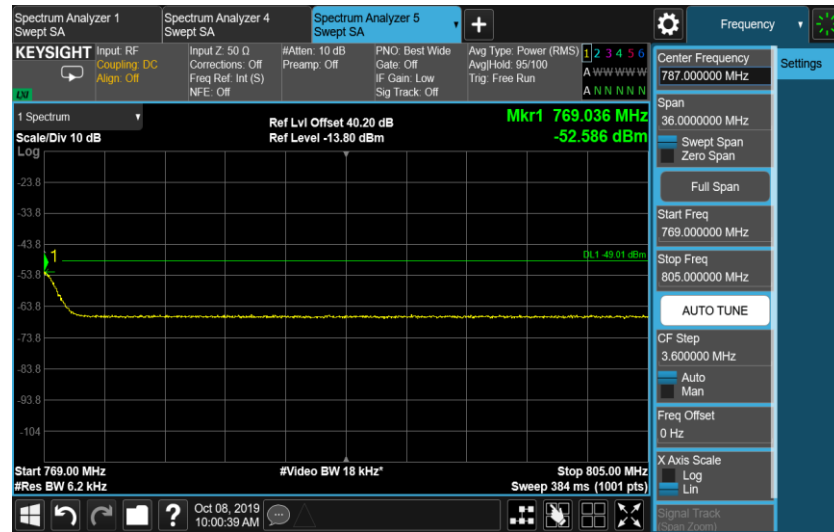
Port A, Channel Position T 5.0 MHz





Port A, Channel Position M 10.0 MHz

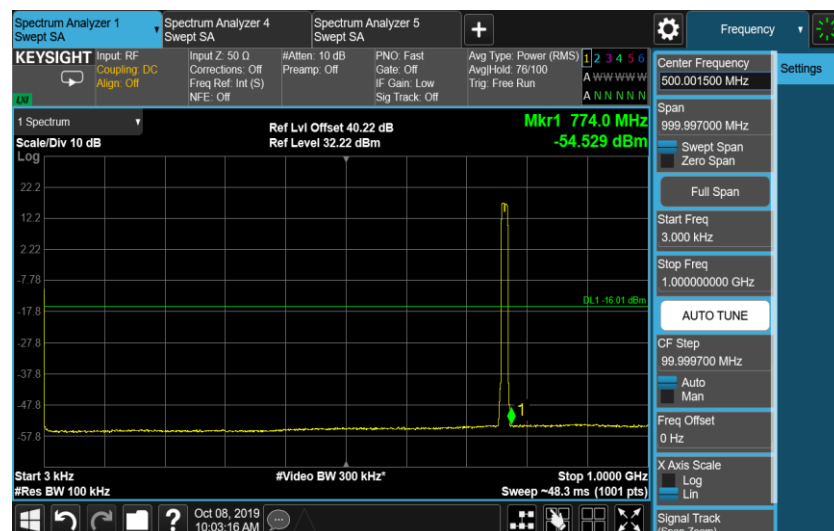


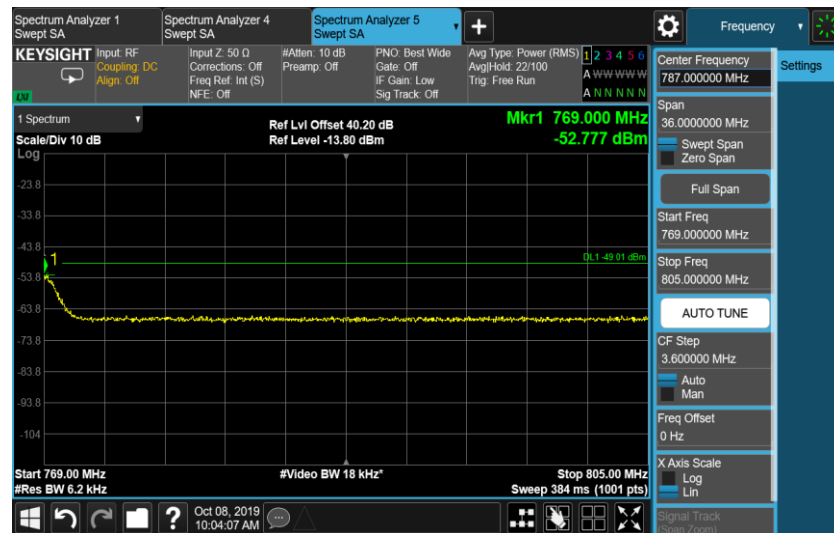
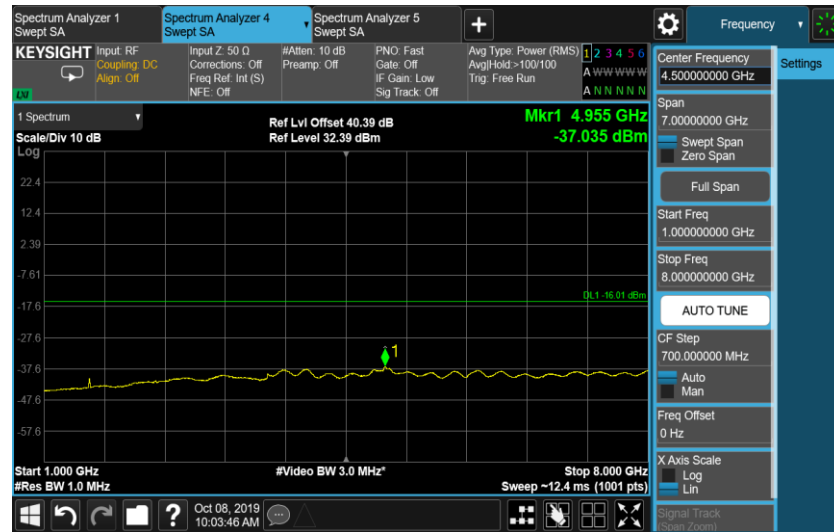


Configuration LTE-MIMO-2C QPSK

Channel Bandwidth	RBW (Hz)	Limit (dBm)
5.0 MHz	100k/6.2k	-16.01/-49.01

Port A, Channel Position M 5.0 MHz

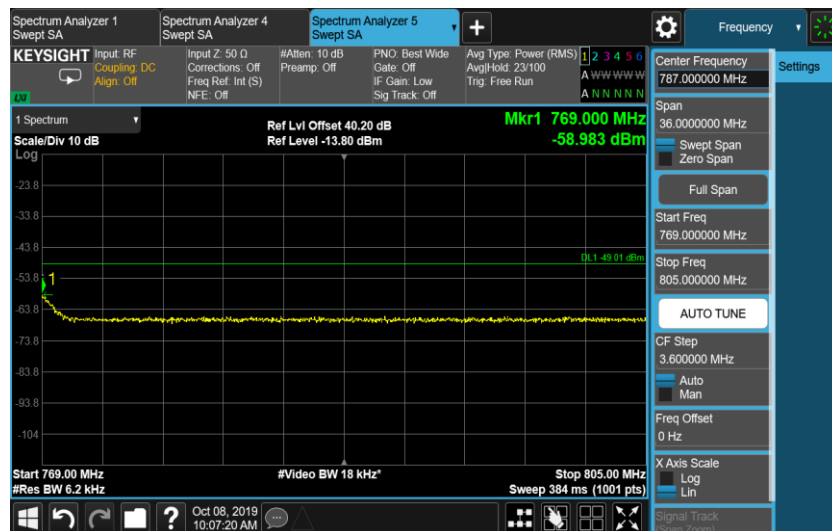
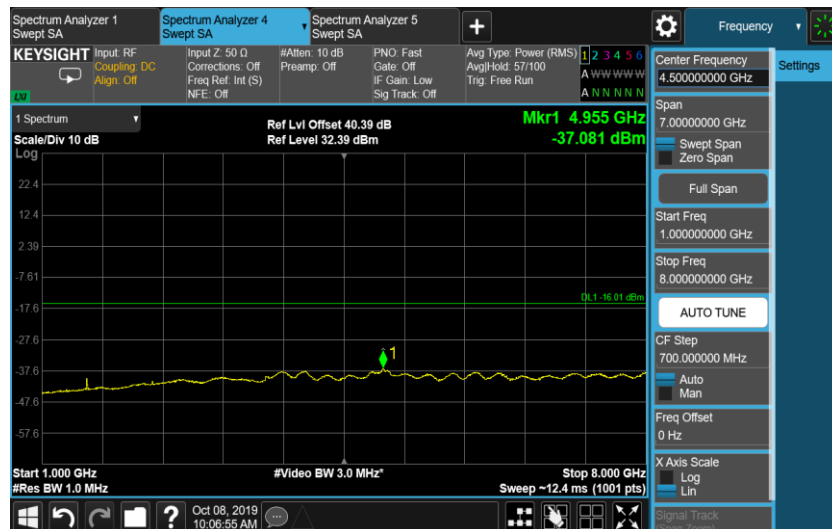
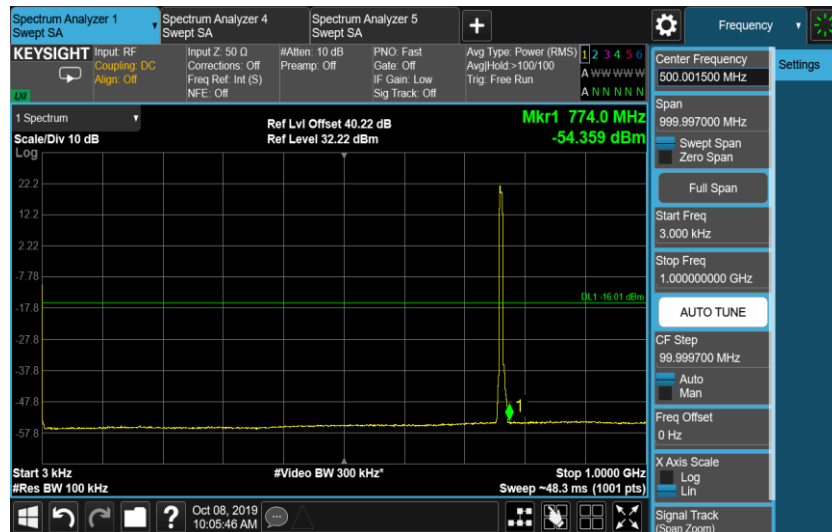




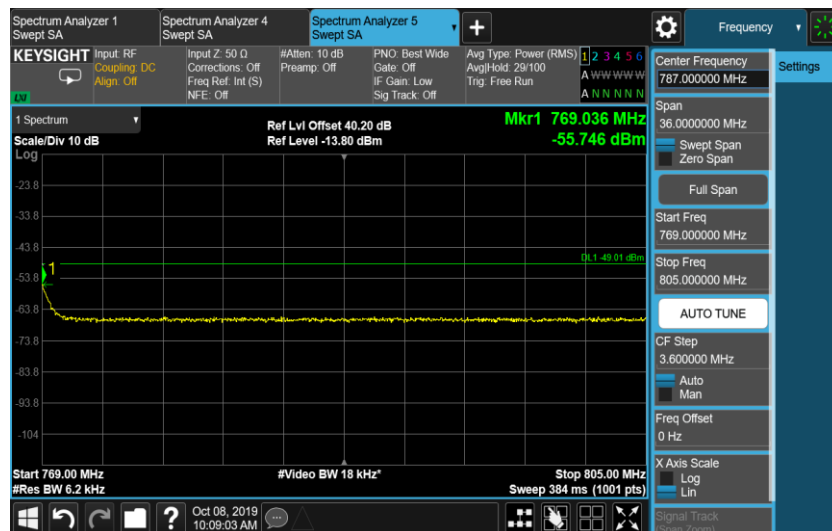
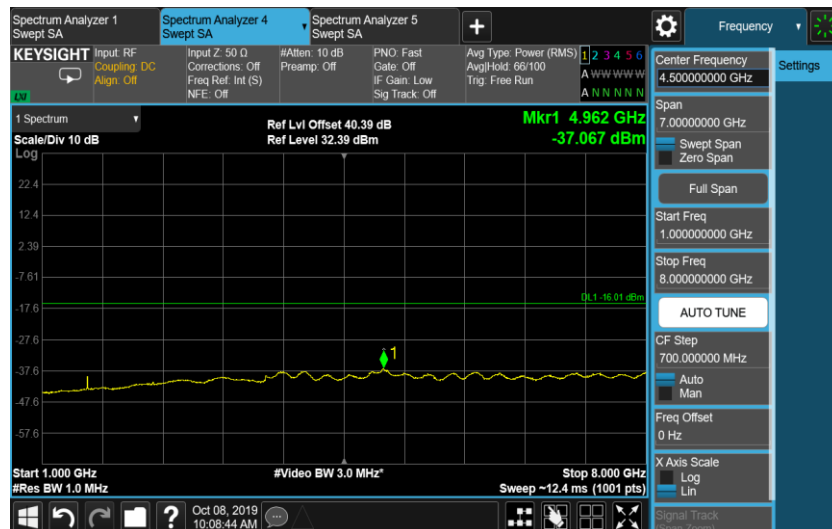
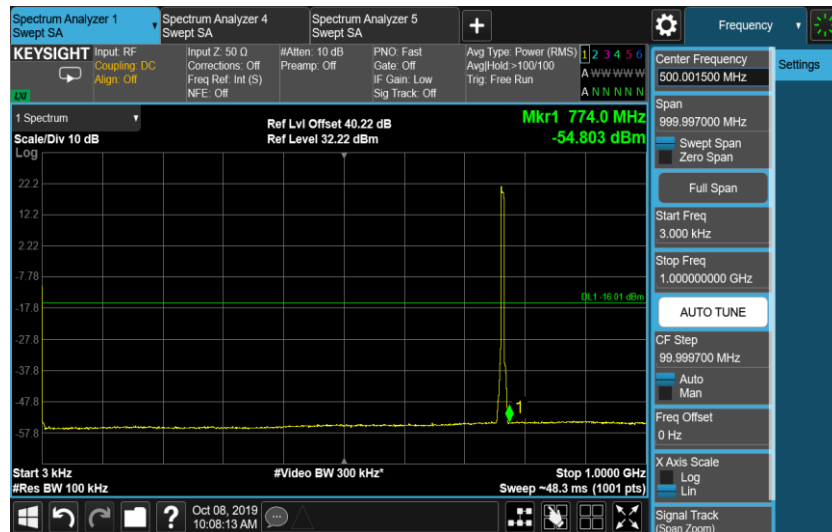
Configuration NB-IoT-InBand-1C, QPSK

Channel Bandwidth	RBW (Hz)	Limit (dBm)
5.0 MHz	100k/6.2k	-16.01/-49.01
10.0 MHz	100k/6.2k	-16.01/-49.01

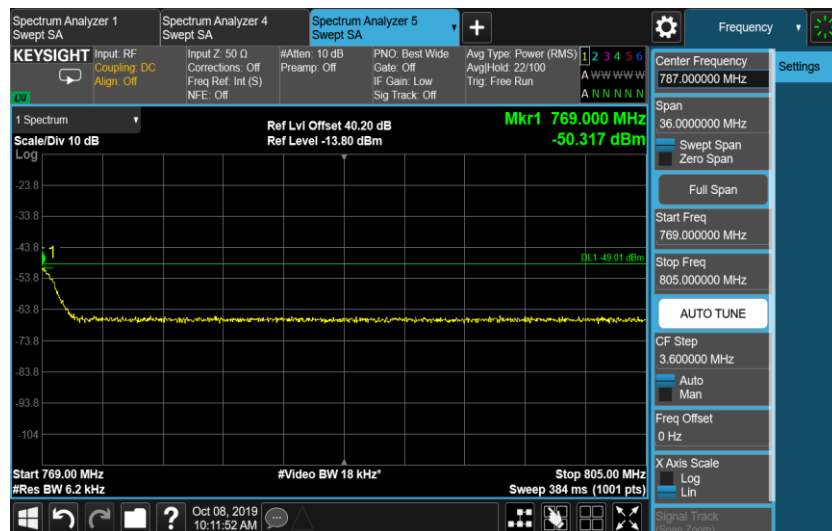
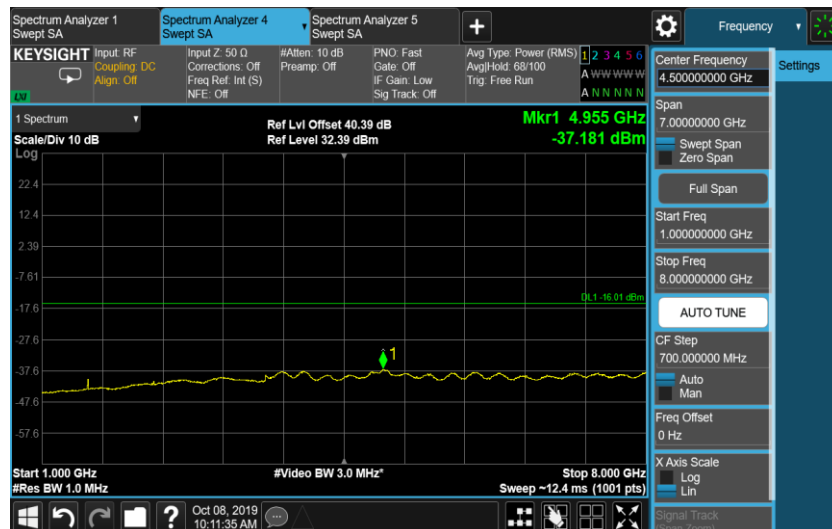
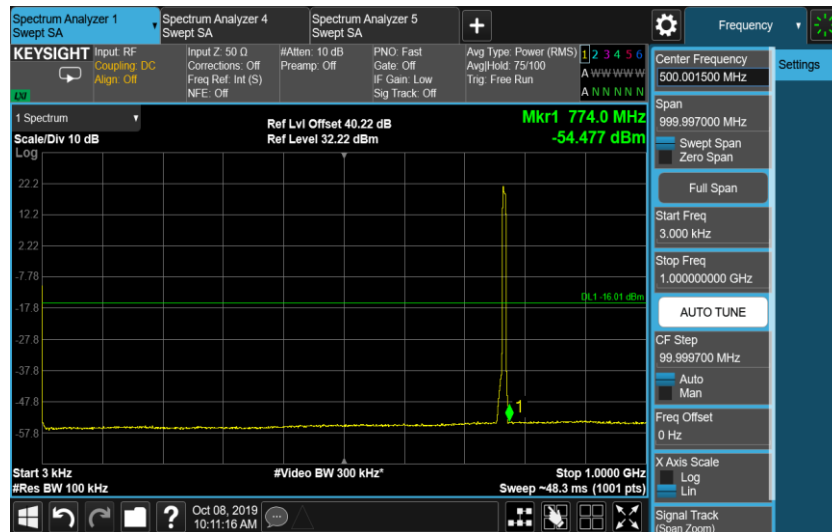
Port A, Channel Position B 5.0 MHz



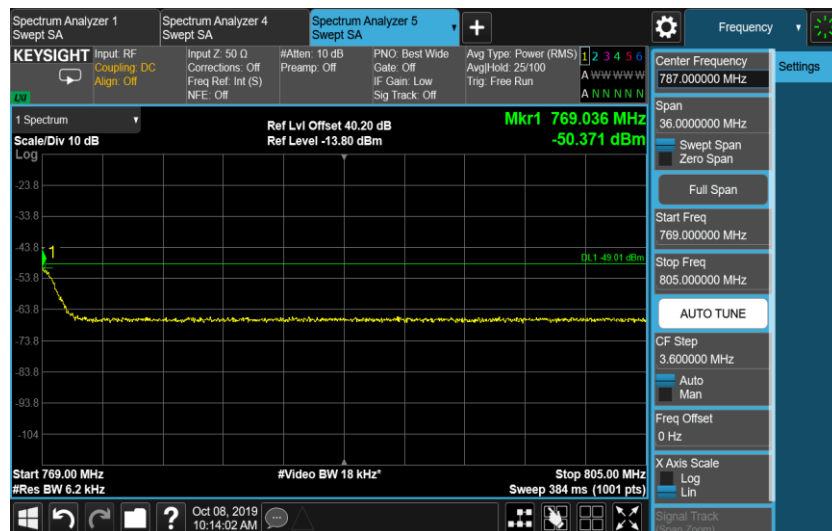
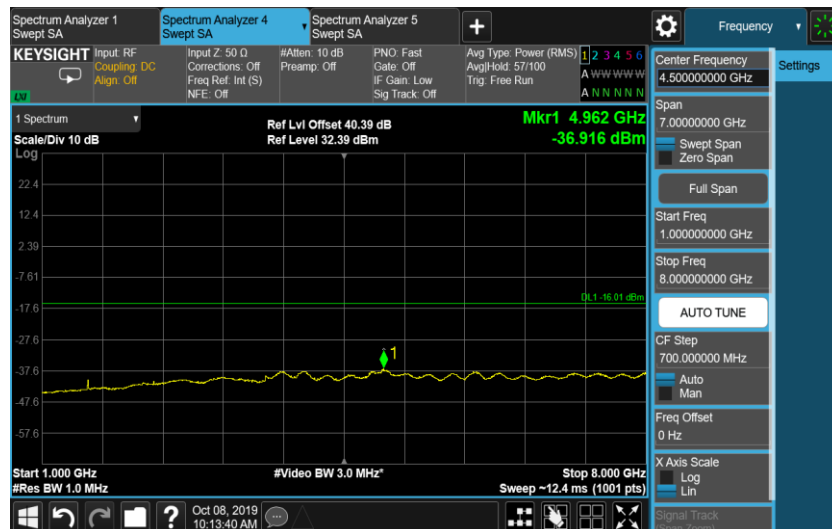
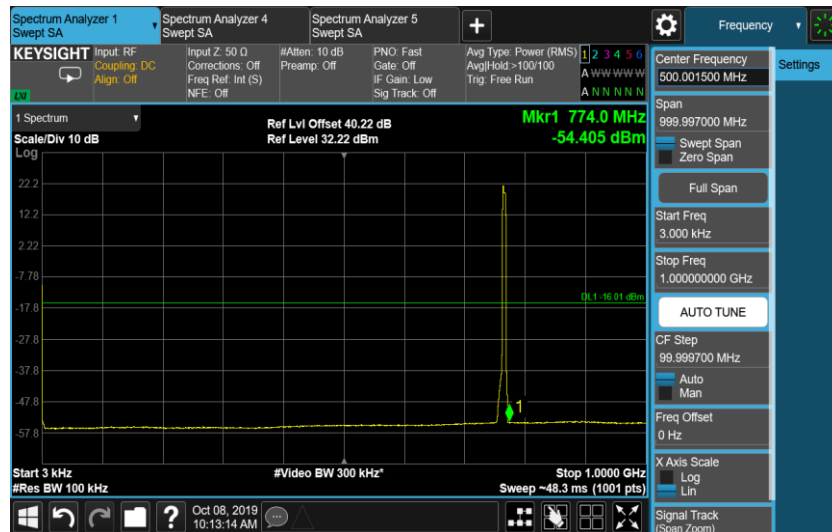
Port A, Channel Position M 5.0 MHz



Port A, Channel Position T 5.0 MHz



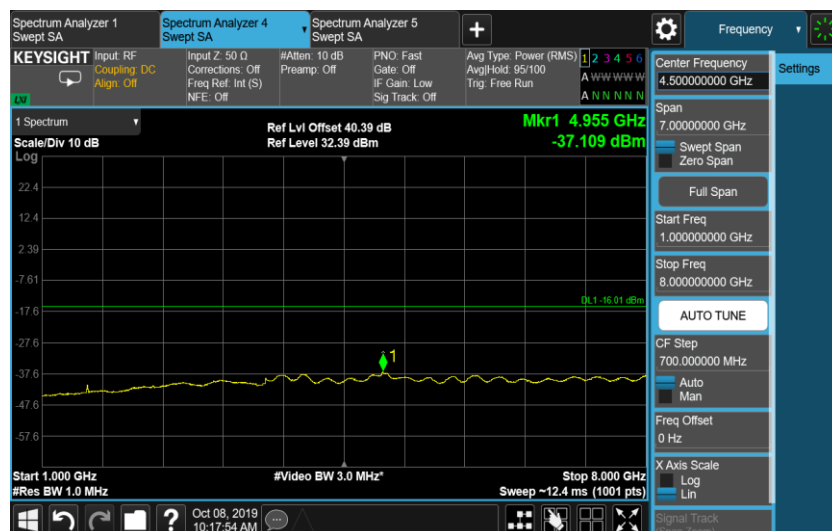
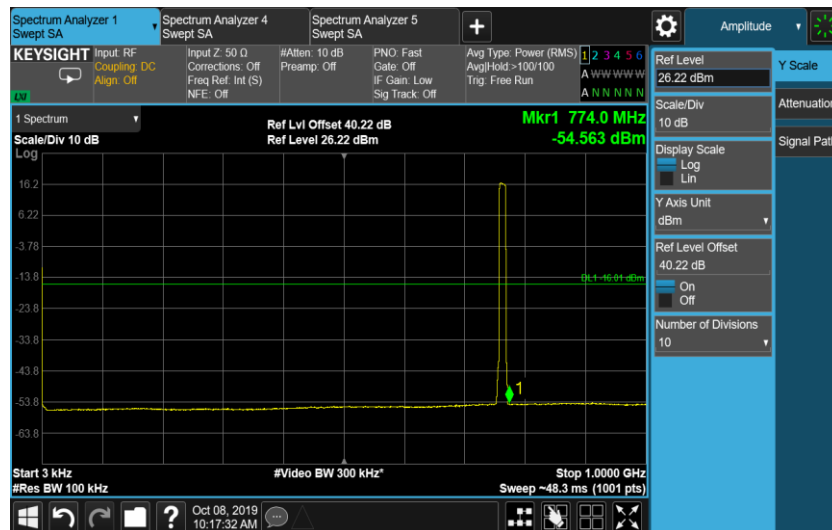
Port A, Channel Position M 10.0 MHz

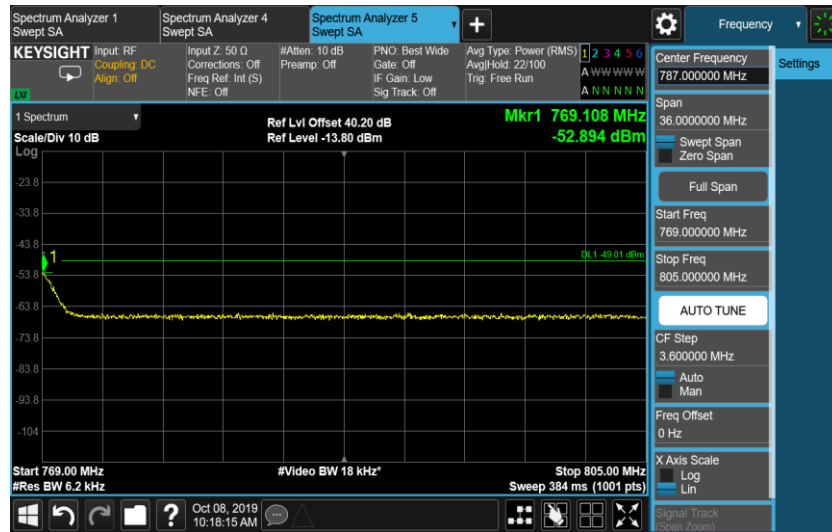


Configuration NB-IoT-GuardBand-1C, QPSK

Channel Bandwidth	RBW (Hz)	Limit (dBm)
10.0 MHz	100k/6.2k	-16.01/-49.01

Port A, Channel Position M 10.0 MHz





A.5 Radiated Spurious Emission

A.5.1 Reference

FCC CFR 47 Part 2, Clause 2.1053

FCC CFR 47 Part 90, Clause 90.543

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 polarizations.

The measurements in the frequency range 30 to 1000MHz was performed with a RBW of 100kHz except in the frequency bands 769 to 775MHz and 799 to 805 MHz where a RBW of 10kHz was used.

The measurements in the frequency range 1 to 8GHz was performed with a RBW of 1MHz except in the frequency band 1559 to 1610MHz where a RBW of 10kHz was used.

Emissions identified within the range 30MHz to 8GHz 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:

$$\text{Field Strength of Carrier} - (43 + 10\text{Log}(P)) \text{ dB}$$

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:

$$E_{(v/m)} = (30 \times 1.64 \times 16.56)^{0.5} / 3 = 9.51 \text{ V/m} = 139.57 \text{ dB}\mu\text{V/m}$$

As per 90.543 (e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $76 + 10 \log (P)$ dB in a 6.25 kHz band segment, for base and fixed stations.

this gives:

$$76 + 10\log(16.56) = 88.19 \text{ dB}$$

Therefore the limit at 3m measurement distance is:

$$139.57 - 88.19 = 51.4 \text{ dB}\mu\text{V/m}$$

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least $43 + 10 \log (P)$ dB.

this gives:

$$43 + 10\log(16.56) = 55.19 \text{ dB}$$

Therefore the limit at 3m measurement distance is:

$$139.57 - 55.19 = 84.4 \text{ dB}\mu\text{V/m}$$

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

(f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics 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. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

These limits have been used to determine Pass or Fail for the harmonics measured and detailed in the following results.

A.5.4 Measurement results

Configuration LTE-MIMO-1C 5.0MHz; QPSK;

Maximum Output Power 40.0 dBm

Channel Position	Channel Frequencies
Channel Position B	760.5MHz
Channel Position M	763.0MHz
Channel Position T	765.5MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 5.0MHz; 16QAM

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position B	760.5MHz
Channel Position M	763.0MHz
Channel Position T	765.5MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 5.0MHz; 64QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position B	760.5MHz
Channel Position M	763.0MHz
Channel Position T	765.5MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 5.0MHz; 256QAM

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position B	760.5MHz
Channel Position M	763.0MHz
Channel Position T	765.5MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 10.0MHz; QPSK;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 10.0MHz; 16QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 10.0MHz; 64QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-1C 10.0MHz; 256QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-2C 5.0MHz; QPSK;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	760.5 MHz+765.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-2C 5.0MHz; 16QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	760.5 MHz+765.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-2C 5.0MHz; 64QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	760.5 MHz+765.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration LTE-MIMO-2C 5.0MHz; 256QAM;

Maximum Output Power 40.0 dBm ;

Channel Position	Channel Frequencies
Channel Position M	760.5 MHz+765.5MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IOT-InBand-1C 5.0MHz;

Maximum Output Power 40 dBm

Channel Position	Channel Frequencies
Channel Position B	760.5MHz
Channel Position M	763.0MHz
Channel Position T	765.5MHz

Channel Position B

No emissions were detected within 20dB of the limit.

Channel Position M

No emissions were detected within 20dB of the limit.

Channel Position T

No emissions were detected within 20dB of the limit.

Configuration NB-IOT-InBand-1C 10.0MHz;

Maximum Output Power 40 dBm

Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

No emissions were detected within 20dB of the limit.

Configuration NB-IOT-GuardBand-1C 10.0MHz

Maximum Output Power 40 dBm

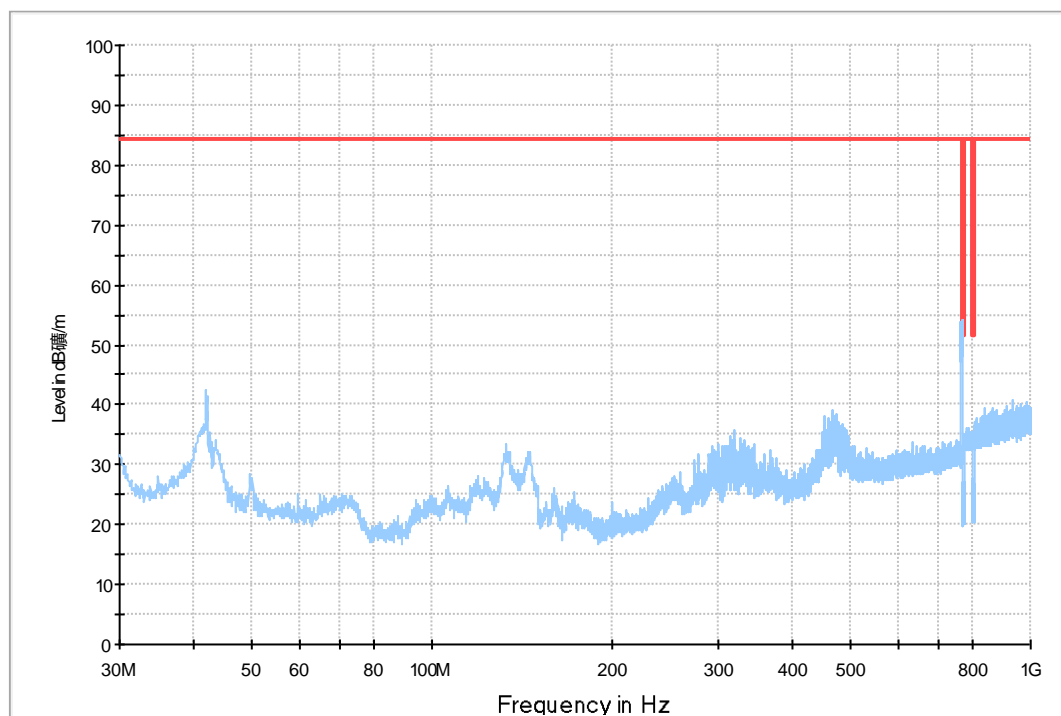
Channel Position	Channel Frequencies
Channel Position M	763.0 MHz

Channel Position M

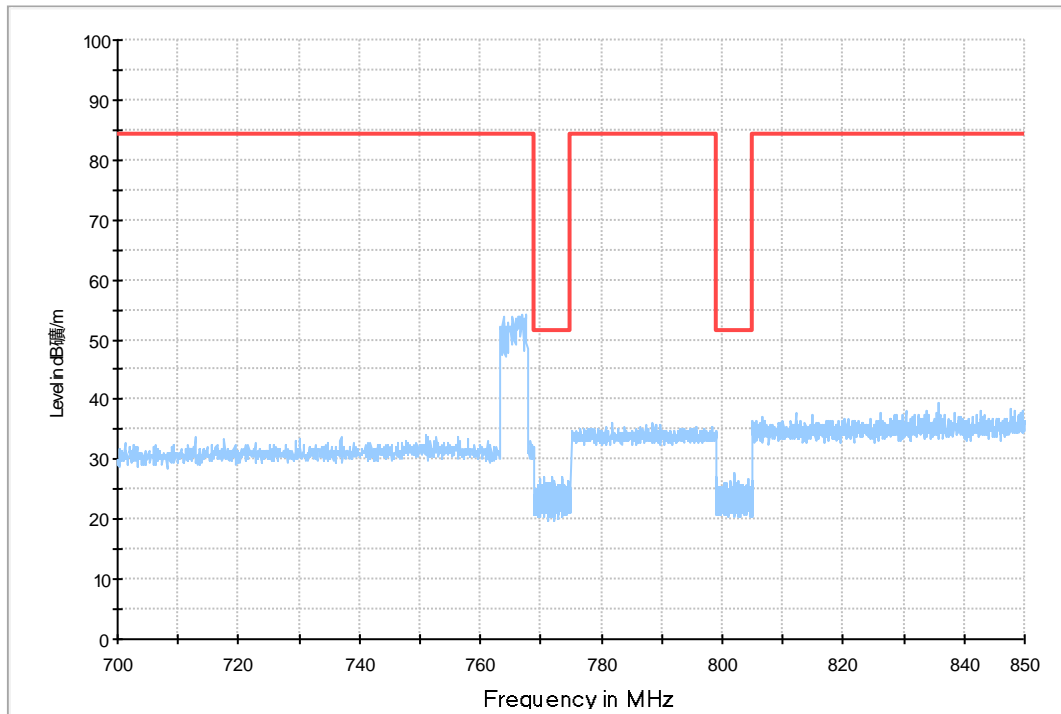
No emissions were detected within 20dB of the limit.

Final Results

RSE_Erison_30M-1G_FCC



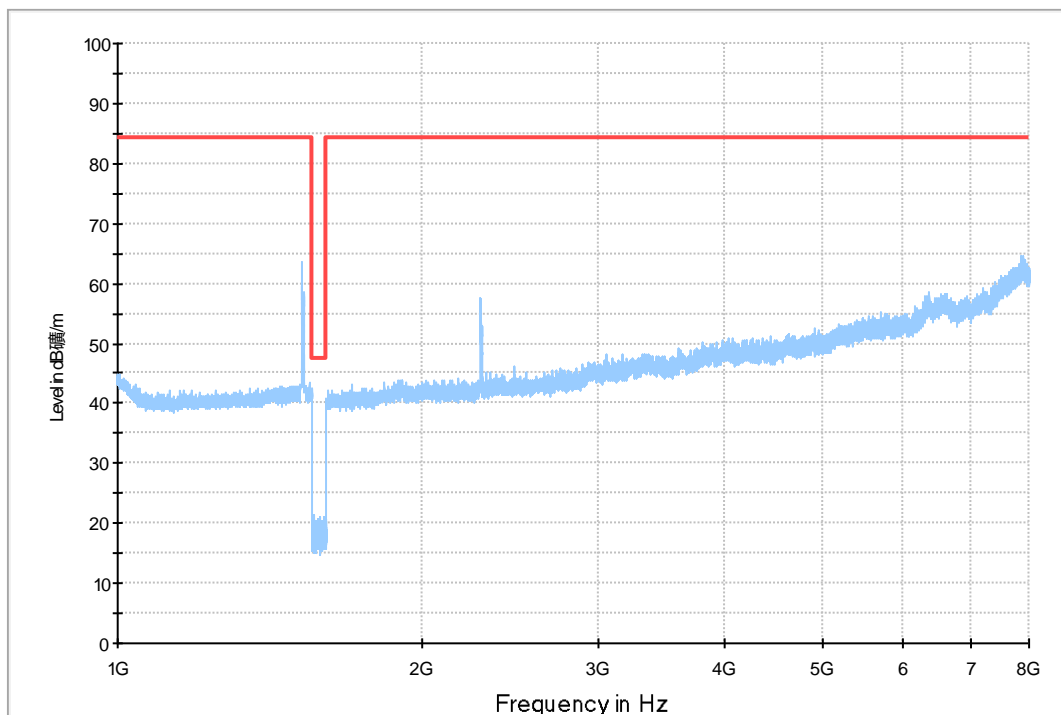
RSE_Erisson_30M-1G_FCC



External antenna

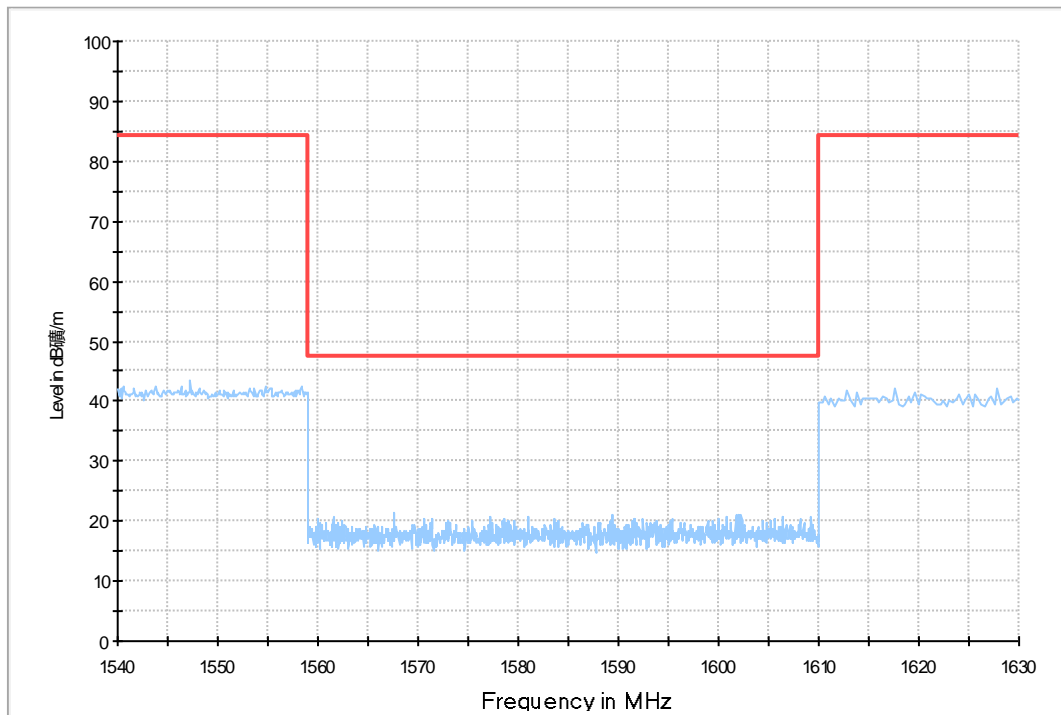
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RSE_Erisson_1-18G_FCC



Configuration LTE-MIMO-1C 5.0MHz; 16QAM; M;

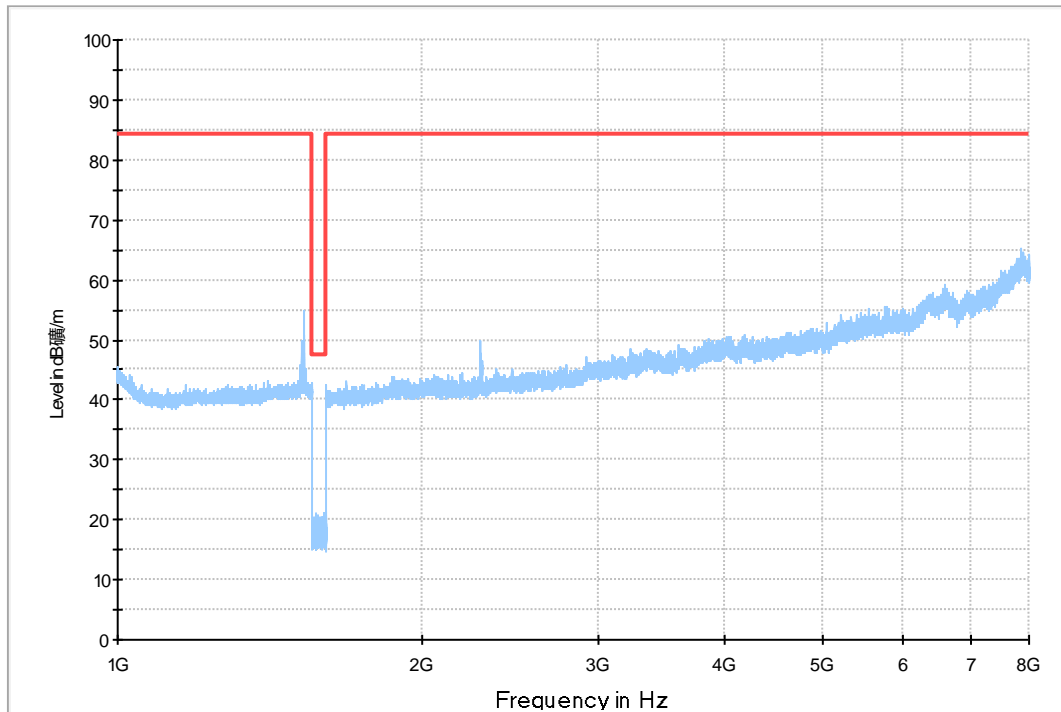
RSE_Erison_1-18G_FCC



Integrated antenna

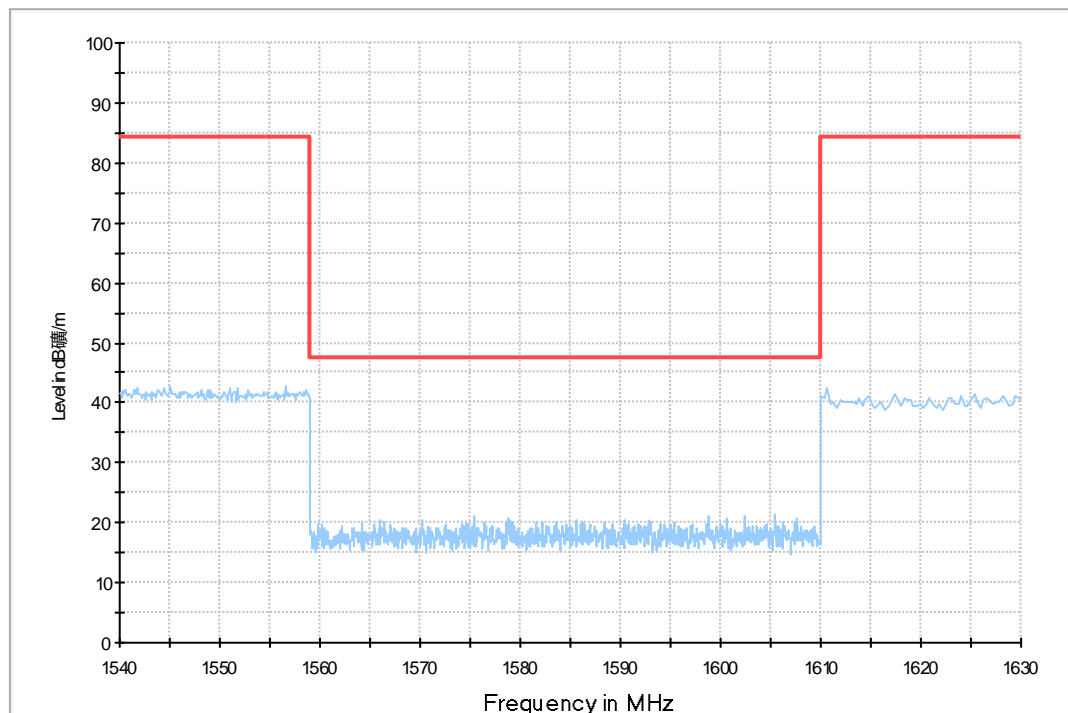
Configuration LTE-MIMO-1C 5.0MHz; 16QAM; M;

RSE_Erisson_1-18G_FCC



Configuration LTE-MIMO-1C 5.0MHz; 16QAM; M;

RSE_Erisson_1-18G_FCC



A.6 Frequency Stability

A.6.1 Reference

FCC CFR 47 Part 90, Clause 90.213, 90.539

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 -48V DC Power Supply. At each temperature step, the Base Station was configured to transmit an [RAT]* at maximum power on the bottom, middle and top 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 -48V DC. 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]*:

LTE (10.0 MHz) - Single Carrier with QPSK modulation

NB-IoT - QPSK modulation

A.6.4 Measurement results

Frequency Error – Temperature Variation

Configuration LTE-MIMO-1C, QPSK, Port A, Channel Bandwidth 10MHz

Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature	Frequency Stability (mHz)		
		Channel position B	Channel position M	Channel position T
48	-30	-	-802.61	-
	-20	-	-506.91	-
	-10	-	784.79	-
	0	-	595.76	-
	10	-	-762.72	-
	20	-	752.83	-
	30	-	390.64	-
	40	-	677.55	-
	50	-	-802.86	-

Configuration NB-IoT-InBand-1C, QPSK, Port A, Channel Bandwidth 10MHz

Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
48	-30	-	-2.90	-
	-20	-	-1.93	-
	-10	-	1.24	-
	0	-	-1.39	-
	10	-	-1.35	-
	20	-	-1.68	-
	30	-	-1.52	-
	40	-	-1.39	-
	50	-	-1.49	-

Configuration NB-IoT-GuardBand-1C, QPSK, Port A, Channel Bandwidth 10MHz
Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature	Frequency Stability (mHz)		
		Channel position B	Channel position M	Channel position T
48	-30	-	-602.29	-
	-20	-	-598.69	-
	-10	-	-392.04	-
	0	-	-373.00	-
	10	-	-552.00	-
	20	-	-461.06	-
	30	-	612.82	-
	40	-	701.68	-
	50	-	571.20	-

Frequency Error – Voltage Variation

Configuration LTE-MIMO-1C, QPSK, Port A, Channel Bandwidth 10MHz
Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (mHz)		
		Channel position B	Channel position M	Channel position T
40.8	20	-	-155.49	-
48	20	-	974.34	-
55.2	20	-	231.98	-

Configuration NB-IoT-InBand-1C, QPSK, Port A, Channel Bandwidth 10MHz
Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (Hz)		
		Channel position B	Channel position M	Channel position T
40.8	20	-	-1.77	-
48	20	-	-1.91	-
55.2	20	-	-2.73	-

Configuration NB-IoT-GuardBand-1C, QPSK, Port A, Channel Bandwidth 10MHz
Maximum Output Power 37.0dBm per port

Supply Voltage DC(V)	Temperature(°C)	Frequency Stability (mHz)		
		Channel position B	Channel position M	Channel position T
40.8	20	-	-291.68	-
48	20	-	-894.80	-
55.2	20	-	117.21	-

ANNEX B: Accreditation Certificate

<p>United States Department of Commerce National Institute of Standards and Technology</p> <p>NVLAP[®]</p> <hr/> <p>Certificate of Accreditation to ISO/IEC 17025:2005</p> <hr/> <p>NVLAP LAB CODE: 600118-0</p> <p>Telecommunication Technology Labs, CAICT Beijing China</p> <p><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p> <p>Electromagnetic Compatibility & Telecommunications</p> <p><i>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).</i></p> <table><tr><td><p>2019-09-26 through 2020-09-30 <i>Effective Dates</i></p></td><td></td><td><p> <i>For the National Voluntary Laboratory Accreditation Program</i></p></td></tr></table>		<p>2019-09-26 through 2020-09-30 <i>Effective Dates</i></p>		<p> <i>For the National Voluntary Laboratory Accreditation Program</i></p>
<p>2019-09-26 through 2020-09-30 <i>Effective Dates</i></p>		<p> <i>For the National Voluntary Laboratory Accreditation Program</i></p>		

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