

FCC CO-LOCATION RADIO TEST REPORT

FCC ID : U8G-P1941

Equipment : PEPWAVE / peplink Wireless Product

Brand Name : PEPWAVE / peplink

Model Name : UBR LTE
MAX UBR LTE
MAX UBR
MAX UBR LTEA
UBR
MAX BR2 Pro
BR2 Pro
MAX BR2 Pro LTE
MAX BR2 Pro LTEA
MAX-CX2-Mini
MAX CX2 Mini
CX2 Mini
MAX-BR2-PRO-LTEA-W-T
MAX-BR2-PRO-LTE-US-T
Pismo941
UBR-LTE
UBR-LTE-US-T
UBR-LTE-US-T-PRM
UBR-LTEA-W-T
UBR-LTEA-W-T-PRM
MAX BR1 Pro
MAX BR1 Pro LTE
MAX BR1 Pro LTEA
MAX-BR1-PRO-LTEA-W-T
MAX-BR1-PRO-LTE-US-T

Applicant : PISMO LABS TECHNOLOGY LIMITED
A8, 5/F, HK Spinners Industrial Building, Phase 6,
481 Castle Peak Road, Cheung Sha Wan, Hong Kong

Manufacturer : PISMO LABS TECHNOLOGY LIMITED
A8, 5/F, HK Spinners Industrial Building, Phase 6,
481 Castle Peak Road, Cheung Sha Wan, Hong Kong

Standard : FCC Part 15 Subpart E §15.407



The detailed of model name can be referred PISMO_FCC_model_confirmation_to_Sporton_UBR LTE List

The product was received on Nov. 01, 2019 and testing was started from Jan. 19, 2020 and completed on Mar. 12, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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History of this test report

Report No.	Version	Description	Issued Date
FR9N0104D	01	Initial issue of report	Mar. 18, 2020
FR9N0104D	02	Revise antenna type, model name, and table of contents	Mar. 26, 2020
FR9N0104D	03	Revise Brand Name and Model Name	Mar. 30, 2020
FR9N0104D	04	Revise list of measuring equipment	Apr. 09, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(b)	Unwanted Emissions	Pass	Under limit 1.22 dB at 7143.000 MHz
3.2	15.203 15.407(a)	Antenna Requirement	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Dara Chiu



1 General Description

1.1 Product Feature of Equipment Under Test

WCDMA/LTE, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n, and GNSS

Product Specification subjective to this standard	
Integrated WWAN Module 1	Brand Name: Sierra Model Name: MC7455 FCC ID: N7NMC7455
Integrated WWAN Module 2	Brand Name: Telit Model Name: LE910C4-NF FCC ID: RI7LE910CXNF
Antenna Type	WWAN: Omni-directional Antenna WLAN: Omni-directional Antenna GPS: Directional Antenna
Serial Number	2937-8EEB-A663

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sporton Site No. 03CH16-HY

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

FCC designation No.: TW1190 and TW0007

1.4 Applicable Standards

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

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in two types of antenna angle, horizontal and vertical. The worst cases (vertical) were recorded in this report.

2.1 Carrier Frequency and Channel

2400-2483.5 MHz 802.11b		5150-5250 MHz 802.11an HT40	
Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2412	46	5230

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

<Co-Location>

Modulation	Data Rate
802.11b	1 Mbps
802.11n HT40	MCS0

Remark:

1. During the Radiated Spurious Emission test, the EUT turn on the WWAN functions simultaneously.
2. The test configuration was designated by manufacturer.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility “Artgui Tool” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Unwanted Emissions Measurement

3.1.1 Limit of Unwanted Emissions

Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

Note: The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \quad \mu\text{V/m, where P is the eirp (Watts)}$$

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

KDB789033 D02 v02r01 G)2)c)

- (i) Sections 15.407(b)(1-3) specifies the unwanted emissions limit for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.
- (ii) Section 15.407(b)(4) specifies the unwanted emissions limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are based on the use of a peak detector.

3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

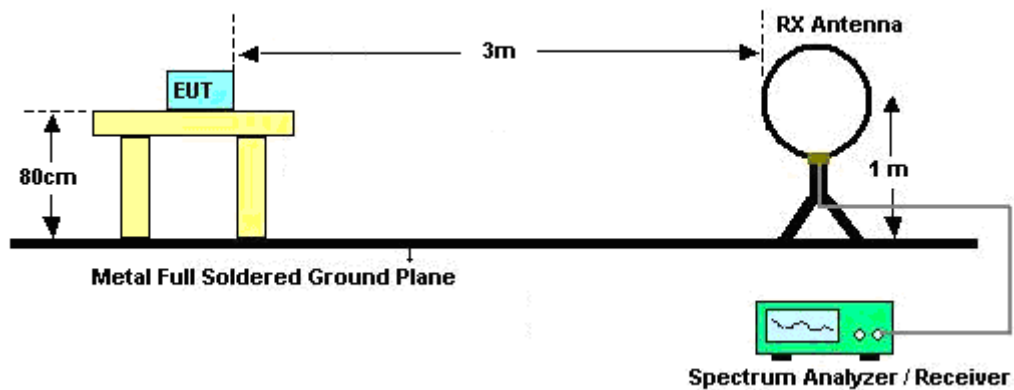
3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
 - RBW = 1 MHz
 - VBW $\geq$ 3 MHz
 - Detector = Peak
 - Sweep time = auto
 - Trace mode = max hold
 - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
 - RBW = 1 MHz
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. 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.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.

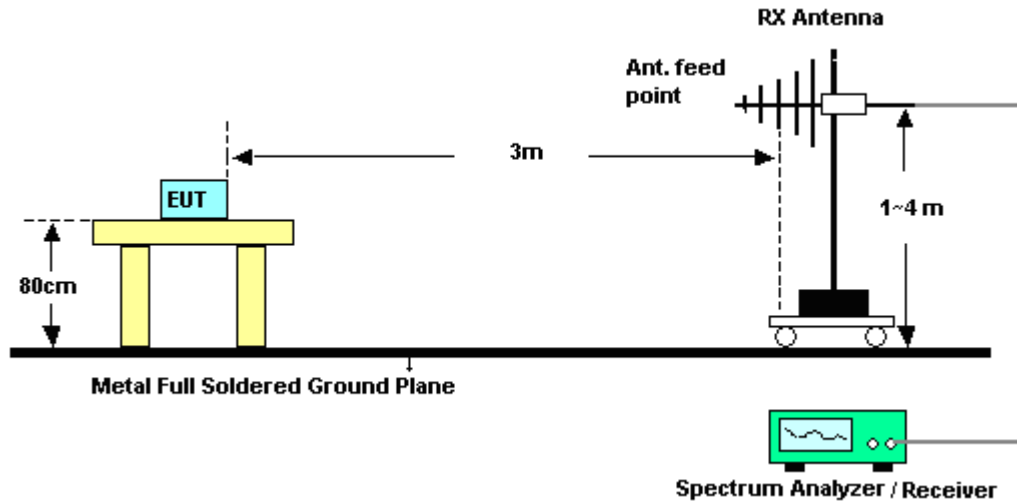
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.1.4 Test Setup

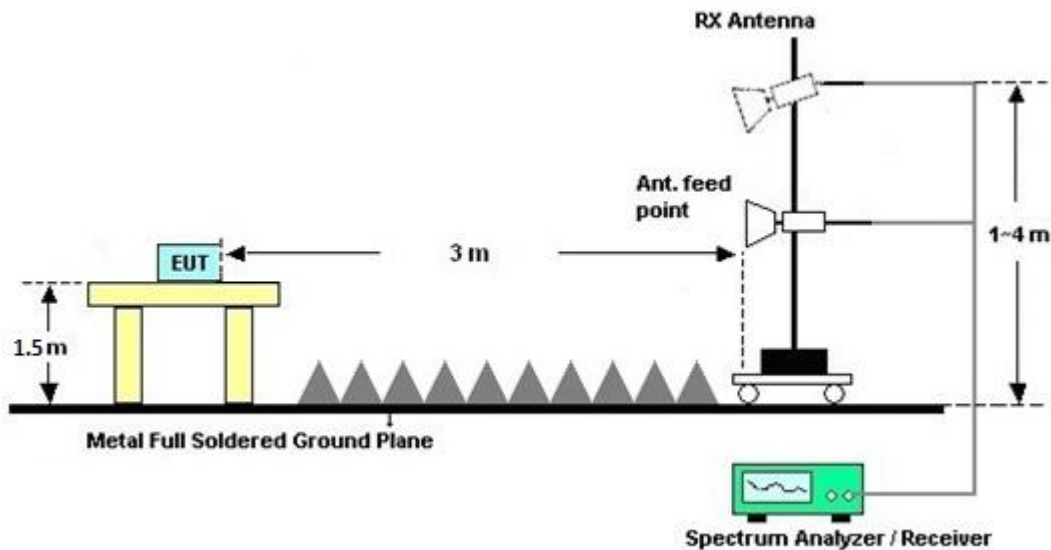
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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 a comparison data 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.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.1.7 Duty Cycle

Please refer to Appendix C.

3.1.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.



3.2 Antenna Requirements

3.2.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Dec. 26, 2019	Jan. 19, 2020~ Mar. 12, 2020	Dec. 25, 2020	Radiation (03CH16-HY)
Bilog Antenna	TESEQ	CBL6111D&00 802N1D01N-0 6	47020&06	30MHz to 1GHz	Oct. 13, 2019	Jan. 19, 2020~ Mar. 12, 2020	Oct. 12, 2020	Radiation (03CH16-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-1522	1G~18GHz	Sep. 19, 2019	Jan. 19, 2020~ Mar. 12, 2020	Sep. 18, 2020	Radiation (03CH16-HY)
Amplifier	SONOMA	310N	371607	9kHz~1000MHz	Oct. 01, 2019	Jan. 19, 2020~ Mar. 12, 2020	Sep. 30, 2020	Radiation (03CH16-HY)
Preamplifier	Jet-Power	JPA0118-55-30 3	17100018000 54001	1GHz~18GHz	May 19, 2019	Jan. 19, 2020~ Mar. 12, 2020	May 18, 2020	Radiation (03CH16-HY)
Preamplifier	EMEC	EMC184045B	980192	18GHz ~40GHz	Jul. 10, 2019	Jan. 19, 2020~ Mar. 12, 2020	Jul. 09, 2020	Radiation (03CH16-HY)
Preamplifier	Keysight	83017A	MY53270264	1GHz~26.5GHz	Dec. 11, 2019	Jan. 19, 2020~ Mar. 12, 2020	Dec. 10, 2020	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY55420170	20MHz~8.4GHz	Mar. 08, 2019	Jan. 19, 2020~ Mar. 06, 2020	Mar. 07, 2020	Radiation (03CH16-HY)
EMI Test Receiver	Keysight	N9038A (MXE)	MY54130085	20MHz~8.4GHz	Nov. 01, 2019	Mar. 06, 2020~ Mar. 12, 2020	Oct. 31, 2020	Radiation (03CH16-HY)
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	Apr. 29, 2019	Jan. 19, 2020~ Mar. 12, 2020	Apr. 28, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11680/4P E	NA	Aug. 30, 2019	Jan. 19, 2020~ Mar. 12, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY11688/4P E	NA	Aug. 30, 2019	Jan. 19, 2020~ Mar. 12, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	EC-A5-300-5 757	NA	Aug. 30, 2019	Jan. 19, 2020~ Mar. 12, 2020	Aug. 29, 2020	Radiation (03CH16-HY)
Software	Audix	E3 6.2009-8-24	RK-001136	N/A	N/A	Jan. 19, 2020~ Mar. 12, 2020	N/A	Radiation (03CH16-HY)
Base Station	Anritsu	MT8820C	6201341951	NA	Jul. 15, 2019	Jan. 19, 2020~ Mar. 12, 2020	Jul. 14, 2021	Radiation (03CH16-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA917057 6	18GHz- 40GHz	May 14, 2019	Jan. 19, 2020~ Mar. 12, 2020	May 13, 2020	Radiation (03CH16-HY)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.9
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	6.7
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.9
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Appendix A. Radiated Spurious Emission

Test Engineer :	Jacky Hung, Andy Yang, and CR Liro	Temperature :	20~25°C
		Relative Humidity :	50~60%

11b_Tx_CH01 + LTE Band 25 CH26615 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
11b_Tx_CH 01 + LTE Band 25 CH26615		2339.295	57.32	-16.68	74	40.98	27.84	18.26	29.76	147	332	P	H
		2310.105	44.8	-9.2	54	28.38	27.96	18.21	29.75	147	332	A	H
	*	2412	97.48	-	-	81.28	27.6	18.39	29.79	147	332	P	H
	*	2412	93.5	-	-	77.3	27.6	18.39	29.79	147	332	A	H
													H
													H
		2333.415	60.16	-13.84	74	43.8	27.87	18.25	29.76	107	61	P	V
		2386.335	51.78	-2.22	54	35.56	27.65	18.35	29.78	107	61	A	V
	*	2412	108.06	-	-	91.86	27.6	18.39	29.79	107	61	P	V
	*	2412	105.01	-	-	88.81	27.6	18.39	29.79	107	61	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

**11b_Tx_CH01 + LTE Band 25 CH26615 (Harmonic @ 3m)**

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
11b_Tx_CH 01 + LTE Band 25 CH26615		3795	41.99	-32.01	74	59.47	29.2	11.22	57.9	100	0	P	H
		4824	39.41	-34.59	74	53.94	31.15	12.43	58.11	100	0	P	H
												P	H
												P	H
		3795	44.17	-29.83	74	61.65	29.2	11.22	57.9	100	0	P	V
		4824	46.06	-27.94	74	60.59	31.15	12.43	58.11	100	0	P	V
												P	V
												P	V

Emission below 1GHz

11b_Tx_CH01 + LTE Band 25 CH26615 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11b_Tx_CH01 + LTE Band 25 CH26615		177.44	33.38	-10.12	43.5	48.32	15.03	2.33	32.3	-	-	P	H
		250.19	36.87	-9.13	46	47.86	18.58	3.4	32.34	-	-	P	H
		375.32	38.5	-7.5	46	46.49	20.94	3.31	32.24	-	-	P	H
		500.45	38.62	-7.38	46	43.04	23.92	3.75	32.09	-	-	P	H
		624.61	37.56	-8.44	46	39.3	25.96	4.28	31.98	-	-	P	H
		900	43.49	-2.51	46	41.27	28.99	5.15	31.92	100	338	QP	H
													H
													H
													H
													H
													H
													H
													H
		63.95	35.07	-4.93	40	54.42	11.69	1.34	32.38	127	28	QP	V
		234.67	30.8	-15.2	46	43.71	16.75	2.67	32.33	-	-	P	V
		375.32	35.37	-10.63	46	43.36	20.94	3.31	32.24	-	-	P	V
		500.45	41.08	-4.92	46	45.5	23.92	3.75	32.09	100	284	QP	V
		624.61	37.82	-8.18	46	39.56	25.96	4.28	31.98	-	-	P	V
		899.99	42.18	-3.82	46	39.96	28.99	5.15	31.92	106	309	QP	V
													V
												V	
												V	
												V	
												V	
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



11b_Tx_CH01 + WCDMA Band 5 CH4233 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11b_Tx_CH01 + WCDMA Band 5 CH4233		2330.58	56.91	-17.09	74	40.79	27.88	18	29.76	100	131	P	H
		2386.125	45.12	-8.88	54	29.15	27.66	18.09	29.78	100	131	A	H
	*	2412	95.38	-	-	79.44	27.6	18.13	29.79	100	131	P	H
	*	2412	92.19	-	-	76.25	27.6	18.13	29.79	100	131	A	H
													H
													H
		2331.525	60.91	-13.09	74	44.8	27.87	18	29.76	299	37	P	V
		2386.23	51.3	-2.7	54	35.33	27.66	18.09	29.78	299	37	A	V
	*	2412	107.62	-	-	91.68	27.6	18.13	29.79	299	37	P	V
	*	2412	104.29	-	-	88.35	27.6	18.13	29.79	299	37	A	V
													V
													V

11b_Tx_CH01 + WCDMA Band 5 CH4233 (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11b_Tx_CH01 + WCDMA Band 5 CH4233		4824	39.92	-34.08	74	54.45	31.15	12.43	58.11	100	0	P	H
												A	H
												P	H
												P	H
												P	H
		4824	45.56	-28.44	74	60.09	31.15	12.43	58.11	100	0	P	V
												A	V
												P	V
												P	V
												P	V
												P	V
												P	V

Emission below 1GHz

11b_Tx_CH01 + WCDMA Band 5 CH4233 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11b_Tx_CH01 + WCDMA Band 5 CH4233		73.65	29.59	-10.41	40	48.06	12.45	1.42	32.34	-	-	P	H
		182.29	33.8	-9.7	43.5	49.05	14.8	2.26	32.31	-	-	P	H
		259.89	36.12	-9.88	46	45.63	20.08	2.75	32.34	-	-	P	H
		375.32	39.49	-6.51	46	47.53	20.94	3.26	32.24	-	-	P	H
		500.45	37.61	-8.39	46	42.08	23.92	3.7	32.09	-	-	P	H
		900.09	42.07	-3.93	46	40.01	28.99	4.99	31.92	100	337	QP	H
													H
													H
													H
													H
													H
													H
		63.95	36.36	-3.64	40	55.72	11.69	1.33	32.38	100	21	QP	V
		375.32	35.84	-10.16	46	43.88	20.94	3.26	32.24	-	-	P	V
		450.01	36.14	-9.86	46	41.6	23.11	3.57	32.14	-	-	P	V
		500.45	41.14	-4.86	46	45.61	23.92	3.7	32.09	100	292	QP	V
		624.61	35.24	-10.76	46	37.07	25.96	4.19	31.98	-	-	P	V
		900.09	39.27	-6.73	46	37.21	28.99	4.99	31.92	-	-	P	V
													V
													V
												V	
												V	
												V	
												V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



11a(n40)_Tx_CH46 + LTE Band 25 CH26615 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
11a(n40)_Tx_CH46 + LTE Band 25 CH26615		5097.24	54.24	-19.76	74	38.53	31.79	12.73	28.81	303	330	P	H
		5148.46	42.42	-11.58	54	26.77	31.7	12.8	28.85	303	330	A	H
	*	5230	99	-	-	83.63	31.38	12.89	28.9	303	330	P	H
	*	5230	90.42	-	-	75.05	31.38	12.89	28.9	303	330	A	H
		5429.76	52.93	-21.07	74	37.36	31.52	13.08	29.03	303	330	P	H
		5453	41.93	-12.07	54	26.26	31.61	13.11	29.05	303	330	A	H
		5144.56	61.63	-12.37	74	45.97	31.71	12.8	28.85	209	42	P	V
		5148.72	49.61	-4.39	54	33.96	31.7	12.8	28.85	209	42	A	V
	*	5230	114.81	-	-	99.44	31.38	12.89	28.9	209	42	P	V
	*	5230	105.29	-	-	89.92	31.38	12.89	28.9	209	42	A	V
		5384.12	57.8	-16.2	74	42.46	31.34	13	29	209	42	P	V
		5400.08	47.77	-6.23	54	32.36	31.4	13.02	29.01	209	42	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

11a(n40)_Tx_CH46 + LTE Band 25 CH26615 (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
11a(n40)_Tx_CH46 + LTE Band 25 CH26615		10460	51.85	-16.35	68.2	51.95	39.92	19.32	59.34	100	0	P	H
		15690	47.04	-26.96	74	45.19	37.34	24.37	59.86	100	0	P	H
												P	H
												P	H
		7143	66.98	-1.22	68.2	72.55	35.99	16.17	57.73	100	0	P	V
		10460	59.77	-8.43	68.2	59.87	39.92	19.32	59.34	100	0	P	V
		15690	49.84	-24.16	74	47.99	37.34	24.37	59.86	100	0	P	V
												P	V
												P	V

Emission below 1GHz

11a(n40)_Tx_CH46 + LTE Band 25 CH26615 (LF)

[illegible]



11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233		5014.82	55.27	-18.73	74	39.85	31.56	12.62	28.76	181	352	P	H
		5146.9	42.87	-11.13	54	27.21	31.71	12.8	28.85	181	352	A	H
	*	5230	97.86	-	-	82.49	31.38	12.89	28.9	181	352	P	H
	*	5230	89.18	-	-	73.81	31.38	12.89	28.9	181	352	A	H
		5412.68	53.17	-20.83	74	37.7	31.45	13.04	29.02	181	352	P	H
		5438.16	42.24	-11.76	54	26.64	31.55	13.09	29.04	181	352	A	H
		5135.98	61.31	-12.69	74	45.64	31.73	12.78	28.84	210	41	P	V
		5148.72	50.19	-3.81	54	34.54	31.7	12.8	28.85	210	41	A	V
	*	5230	114.04	-	-	98.67	31.38	12.89	28.9	210	41	P	V
	*	5230	105.78	-	-	90.41	31.38	12.89	28.9	210	41	A	V
		5439	57.76	-16.24	74	42.15	31.56	13.09	29.04	210	41	P	V
		5400.08	47.38	-6.62	54	31.97	31.4	13.02	29.01	210	41	A	V

11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233		10460	53.2	-15	68.2	53.3	39.92	19.32	59.34	100	0	P	H
		15690	46.32	-27.68	74	44.47	37.34	24.37	59.86	100	0	A	H
												P	H
												P	H
												P	H
		10460	58.51	-9.69	68.2	58.61	39.92	19.32	59.34	100	0	P	V
		15690	49.75	-24.25	74	47.9	37.34	24.37	59.86	100	0	A	V
												P	V
												P	V
												P	V
												P	V
												P	V

Emission below 1GHz

11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (LF)

[illegible]



Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is over limit line.
P/A	Peak or Average
H/V	Horizontal or Vertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)
= 43.54 (dBμV/m)
2. Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 43.54(dBμV/m) – 54(dBμV/m)
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix B. Radiated Spurious Emission Plots

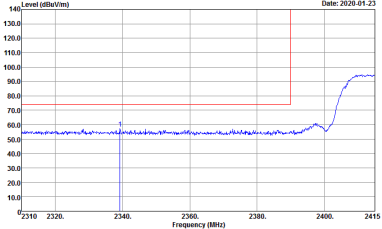
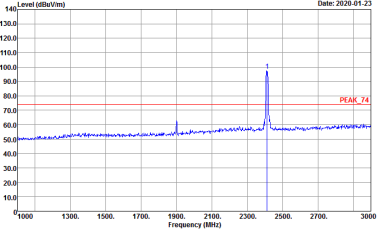
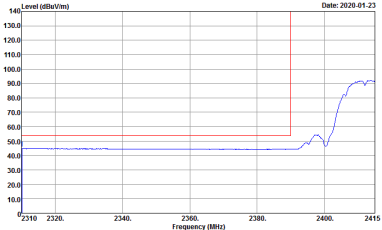
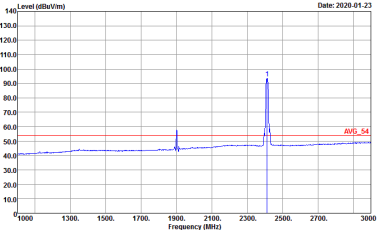
Test Engineer :	Jacky Hung, Andy Yang, and CR Liro	Temperature :	20~25°C
		Relative Humidity :	50~60%

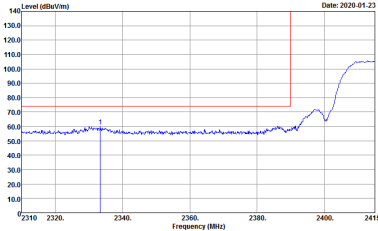
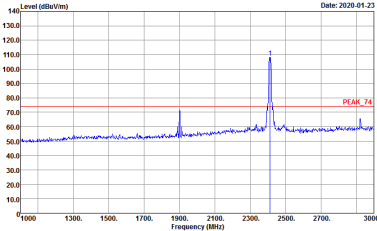
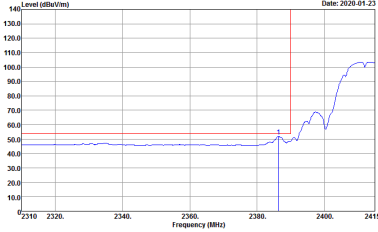
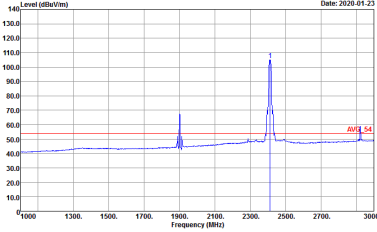
Note symbol

-L	Low channel location
-R	High channel location



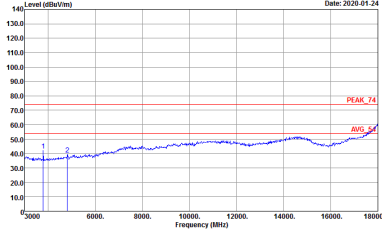
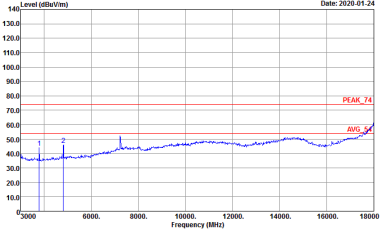
11b_Tx_CH01 + LTE Band 25 CH26615 (Band Edge @ 3m)

ANT. 1	11b_Tx_CH01 + LTE Band 25 CH26615 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 19	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 19
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 19	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 19

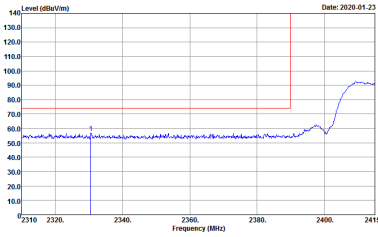
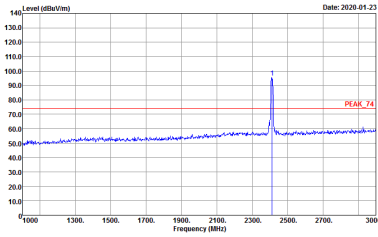
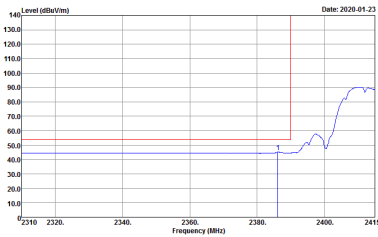
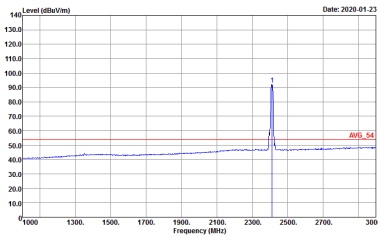
ANT. 1	11b_Tx_CH01 + LTE Band 25 CH26615 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 VERTICAL Detector : Peak Project : SN0104 Setting : 19	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 VERTICAL Detector : Peak Project : SN0104 Setting : 19
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 VERTICAL Detector : Peak Project : SN0104 Setting : 19	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522 VERTICAL Detector : Peak Project : SN0104 Setting : 19

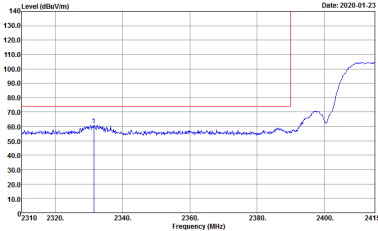
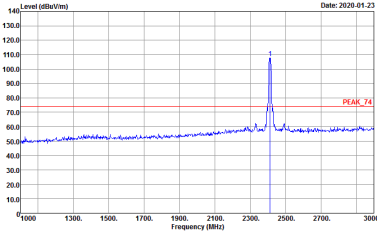
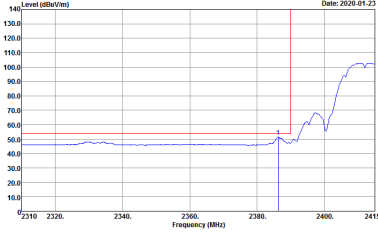
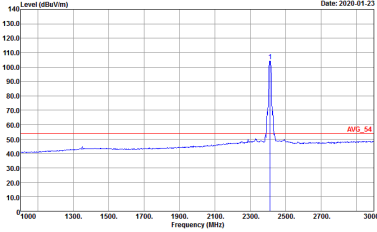


11b_Tx_CH01 + LTE Band 25 CH26615 (@ 3m) Harmonic

ANT. 1	11b_Tx_CH01 + LTE Band 25 CH26615_Tx_CH01	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 19	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 19

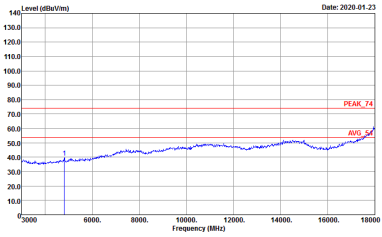
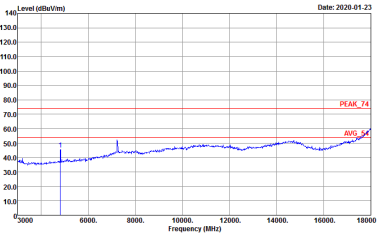
11b_Tx_CH01 + WCDMA Band 5 CH4233 (Band Edge @ 3m)

ANT. 1	11b_Tx_CH01 + WCDMA Band 5 CH4233 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 20	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 20
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 20	 Site : 03CH16-HY Condition : AVG_54 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 20

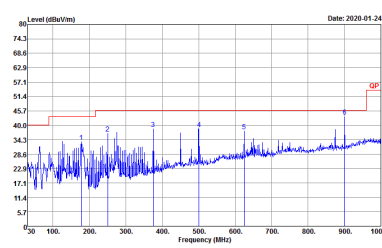
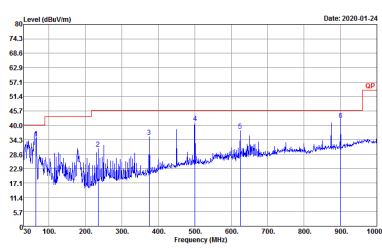
ANT. 1	11b_Tx_CH01 + WCDMA Band 5 CH4233 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 VERTICAL Detector : Peak Project : SNJ0104 Setting : 20	 Site : 03CH16-HY Condition : PEAK_74 3m 9120D_1522 VERTICAL Detector : Peak Project : SNJ0104 Setting : 20
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 VERTICAL Detector : Peak Project : SNJ0104 Setting : 20	 Site : 03CH16-HY Condition : AVG_54 3m 9120D_1522 VERTICAL Detector : Peak Project : SNJ0104 Setting : 20



11b_Tx_CH01 + WCDMA Band 5 CH4233 (Harmonic @ 3m)

ANT	11b_Tx_CH01 + WCDMA Band 5 CH4233	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 20	 Site : 03CH16-HY Condition : PEAK_74 3m 91200_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 20

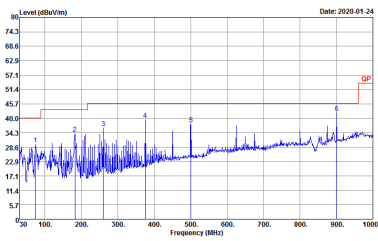
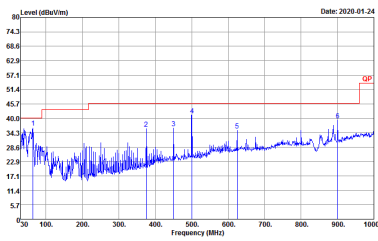
Emission below 1GHz
11b_Tx_CH01 + LTE Band 25 CH26615 (LF)

ANT. 1	11b_Tx_CH01 + LTE Band 25 CH26615	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m B1L06_47020406 HORIZONTAL Detector : Peak Project : 9N0104	 Site : 03CH16-HY Condition : QP 3m B1L06_47020406 VERTICAL Detector : Peak Project : 9N0104

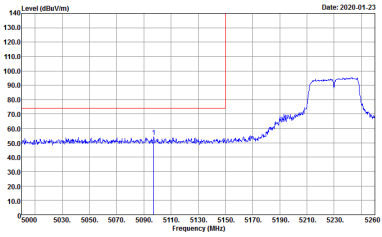
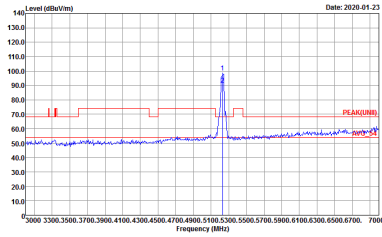
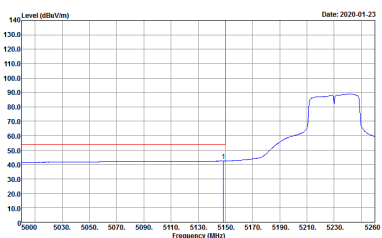


Emission below 1GHz

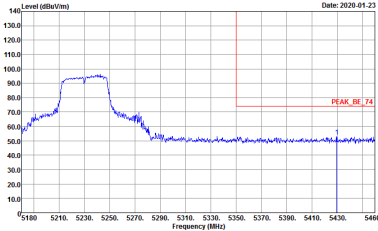
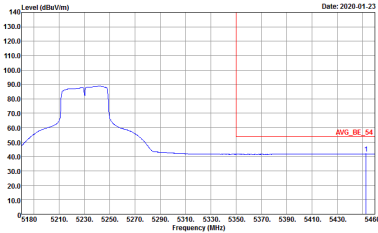
11b_Tx_CH01 + WCDMA Band 5 CH4233 (LF)

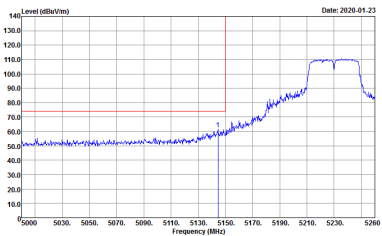
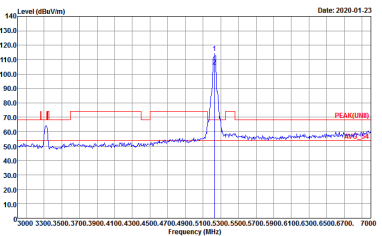
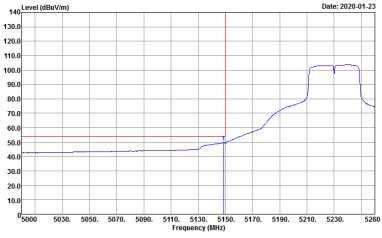
ANT. 1	11b_Tx_CH01 + WCDMA Band 5 CH4233	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m B1L06_47020406 HORIZONTAL Detector : Peak Project : 9N0104	 Site : 03CH16-HY Condition : QP 3m B1L06_47020406 VERTICAL Detector : Peak Project : 9N0104

11a(n40)_Tx_CH46 + LTE Band 25 CH26615 (Band Edge @ 3m)

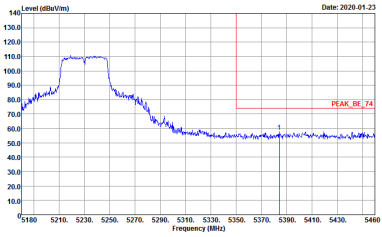
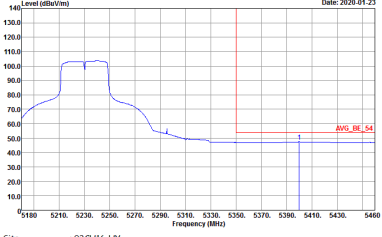
ANT.1	11a(n40)_Tx_CH46 + LTE Band 25 CH26615 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	 Site : 03CH16-HY Condition : PEAK(UNT) 3m 9120D_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	



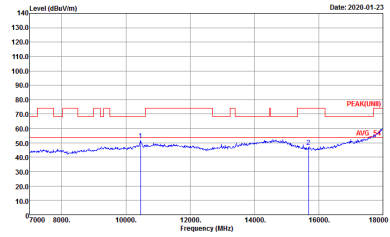
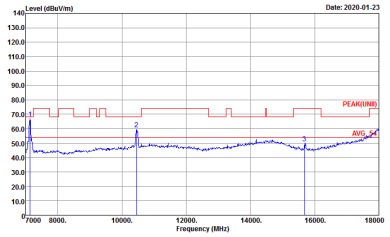
ANT.1	11a(n40)_Tx_CH46 + LTE Band 25 CH26615 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	

ANT.1	11a(n40)_Tx_CH46 + LTE Band 25 CH26615 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	

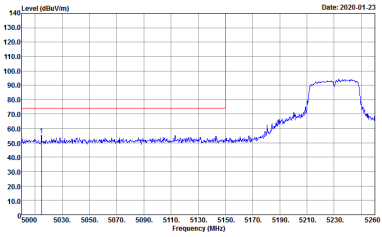
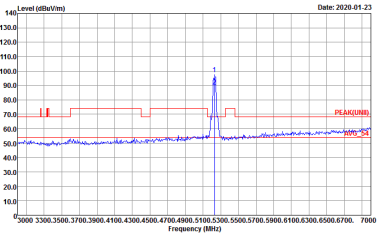
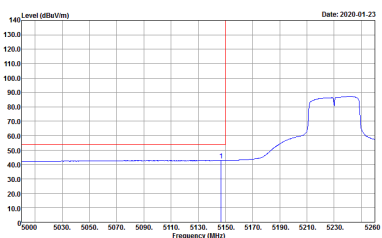


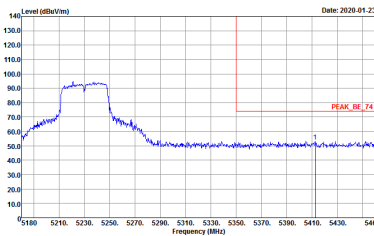
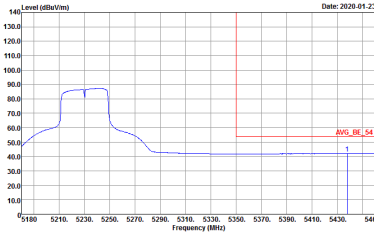
ANT.1	11a(n40)_Tx_CH46 + LTE Band 25 CH26615 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 21.5	
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 21.5	

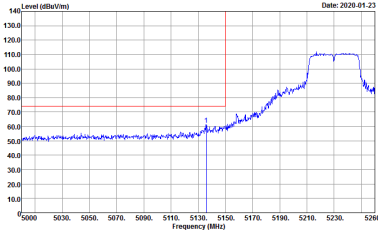
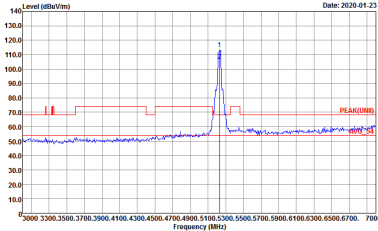
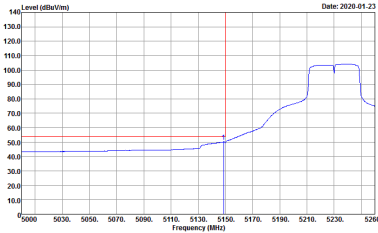
11a(n40)_Tx_CH46 + LTE Band 25 CH26615 Harmonic

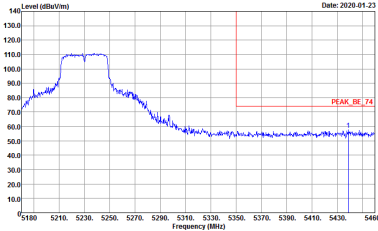
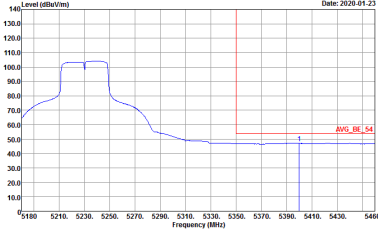
ANT.1	11a(n40)_Tx_CH46 + LTE Band 25 CH26615	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 9120D_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : Z15	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 9120D_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : Z15

11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (Band Edge @ 3m)

ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 9120D_1522 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 HORIZONTAL RBW:1000.000KHz VBW:0.010KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	

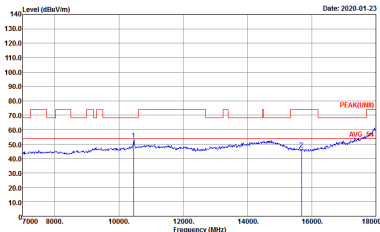
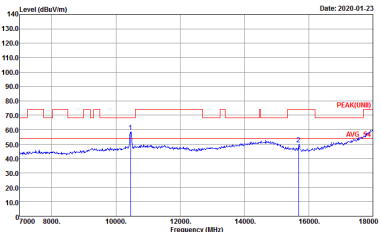
ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 - L	
Simultaneously	Horizontal	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : 21.5	

ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 91200_1522 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 9N0104 Setting : 21.5	

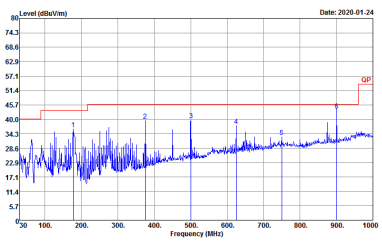
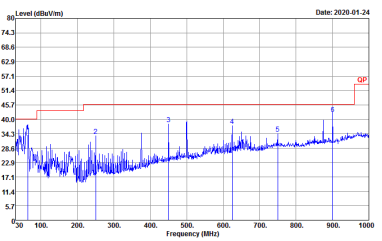
ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 - L	
Simultaneously	Vertical	Fundamental
Peak	 Site : 03CH16-HY Condition : PEAK_BE_74 3m 9120D_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 21.5	
Avg.	 Site : 03CH16-HY Condition : AVG_BE_54 3m 9120D_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : 21.5	



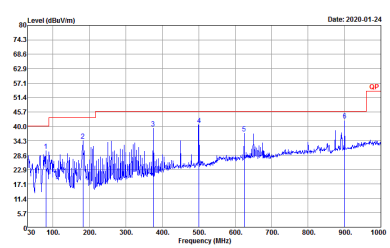
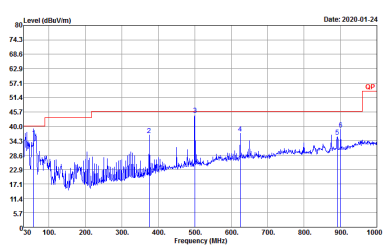
11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (Harmonic @ 3m)

ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233	
Simultaneously	Horizontal	Vertical
Peak Avg.	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522 HORIZONTAL Detector : Peak Project : 9N0104 Setting : Z1.5	 Site : 03CH16-HY Condition : PEAK(UNIT) 3m 91200_1522 VERTICAL Detector : Peak Project : 9N0104 Setting : Z1.5

Emission below 1GHz
11b_Tx_CH01 + LTE Band 25 CH26615 (LF)

ANT.1	11b_Tx_CH01 + LTE Band 25 CH26615	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m B1L06_47020M06 HORIZONTAL Detector : Peak Project : 9N0104	 Site : 03CH16-HY Condition : QP 3m B1L06_47020M06 VERTICAL Detector : Peak Project : 9N0104

Emission below 1GHz
11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233 (LF)

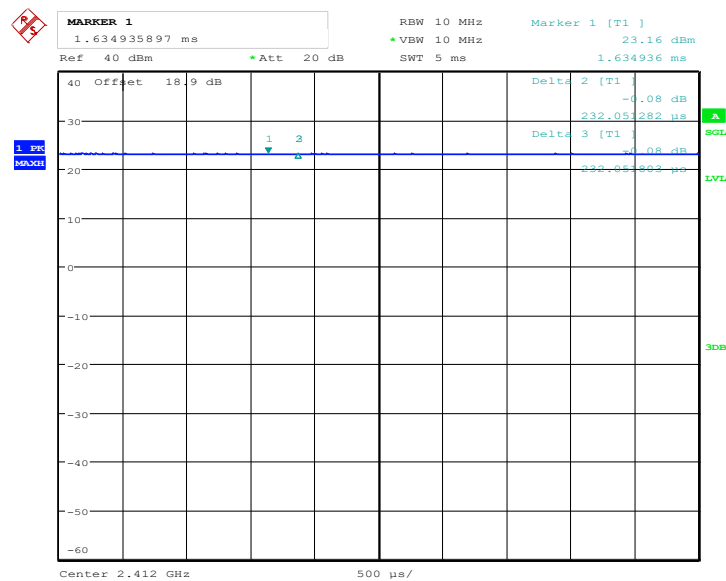
ANT.1	11a(n40)_Tx_CH46 + WCDMA Band 5 CH4233	
Simultaneously	Horizontal	Vertical
QP / Peak	 Site : 03CH16-HY Condition : QP 3m B1L06_47020M06 HORIZONTAL Detector : Peak Project : 9N0104	 Site : 03CH16-HY Condition : QP 3m B1L06_47020M06 VERTICAL Detector : Peak Project : 9N0104

Appendix C. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting	Duty Factor(dB)
1	802.11b	100.00	-	-	10Hz	0.00
1	5GHz 802.11n HT40	100.00	-	-	3kHz	0.00

<Ant. 1>

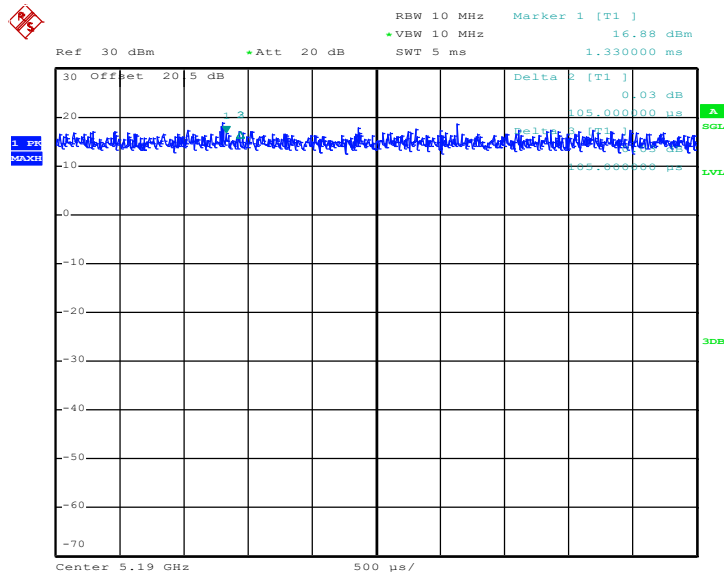
802.11b



Date: 11.FEB.2020 16:15:39



802.11n HT40



Date: 12.MAR.2020 14:18:39