

5.7 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Requirement: LTE Band 2 & LTE Band 25: FCC 47 CFR Part 24.238(a)
 LTE Band 4 & LTE Band 66: FCC 47 CFR Part 27.53(h)
 LTE Band 5 & LTE Band 26: FCC 47 CFR Part 22.917(a)
 LTE Band 12: FCC 47 CFR Part 27.53(g)
 LTE Band 13: FCC 47 CFR Part 27.53
 LTE Band 26: FCC 47 CFR Part 90.691
 LTE Band 2 & LTE Band 25: RSS-133 Issue 6, Section 6.5
 LTE Band 4 & LTE Band 66: RSS-139 Issue 3, Section 6.6
 LTE Band 5: RSS-132 Issue 3, Section 5.5
 LTE Band 12 & LTE Band 13 : RSS-130 Issue 2, Section 4.7

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limit:

FCC 47 CFR Part 24.238(a), 27.53(h)(1), 22.917(a), 27.53(g), 27.53(c)(2), 90.691:

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. The emission limit equal to -13 dBm.

RSS-132 Issue 3, Section 5.5, RSS-133 Issue 6, Section 6.6, RSS-139 Issue 3, Section 6.5, RSS-130 Issue 2, Section 4.7:

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. The emission limit equal to -13 dBm.

Test Procedure:

The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. b. Measuring frequency range is from 30 MHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

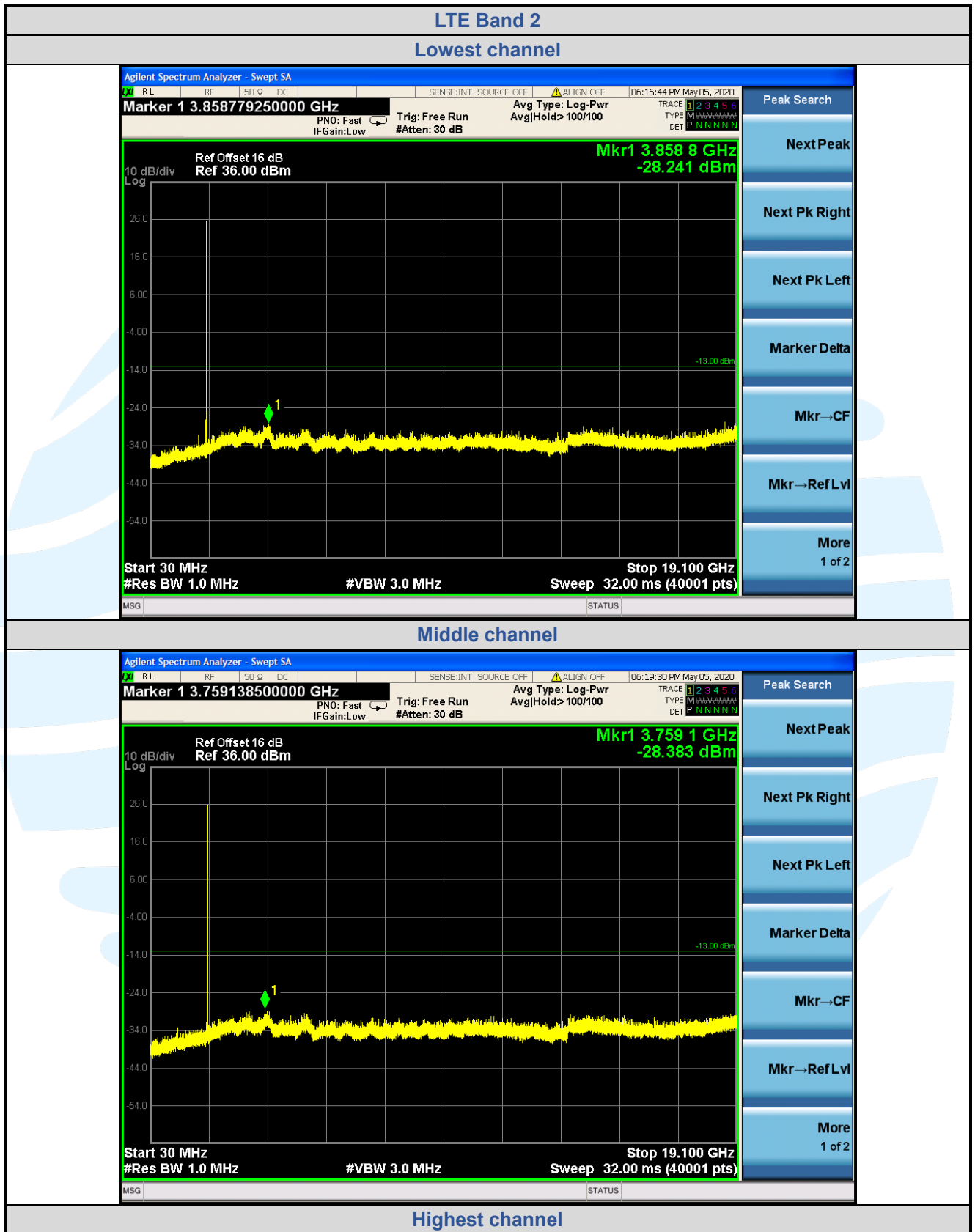
Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

5.7.1 LTE Band 2



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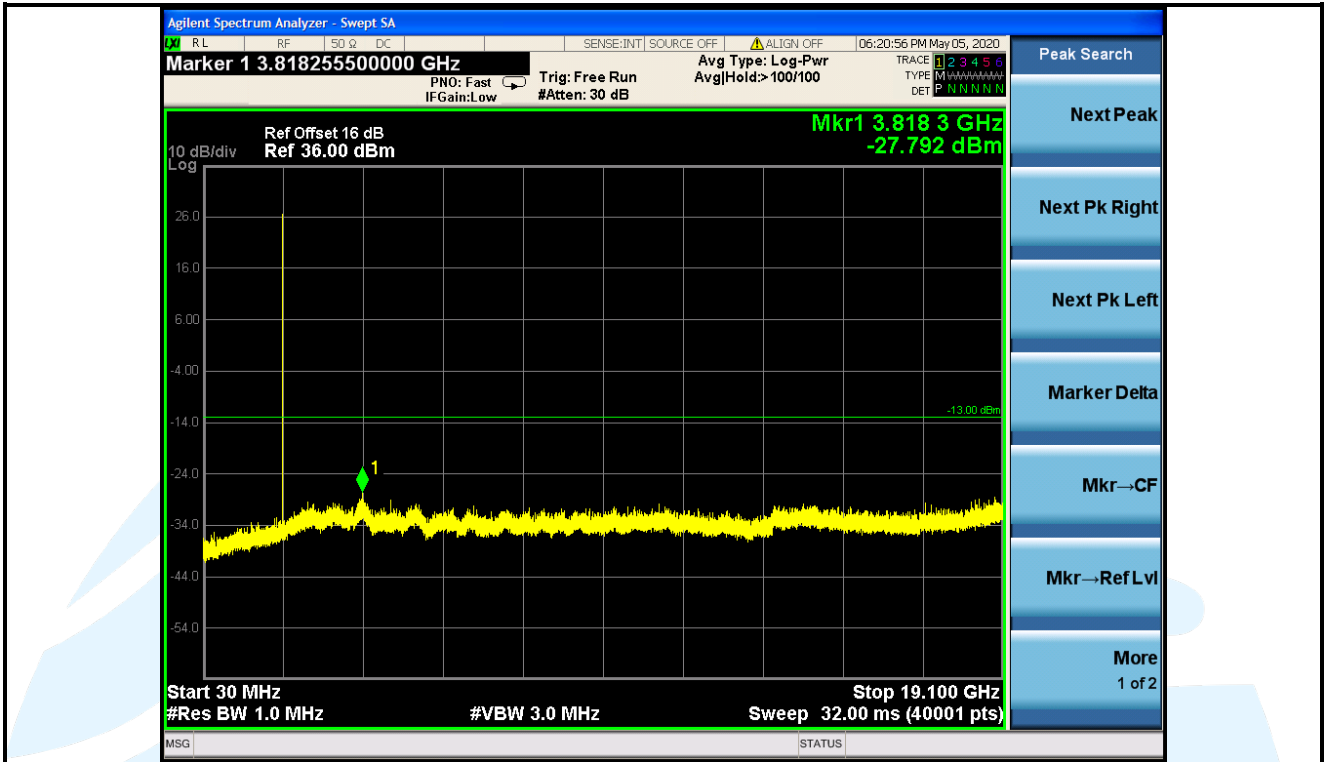
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

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Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

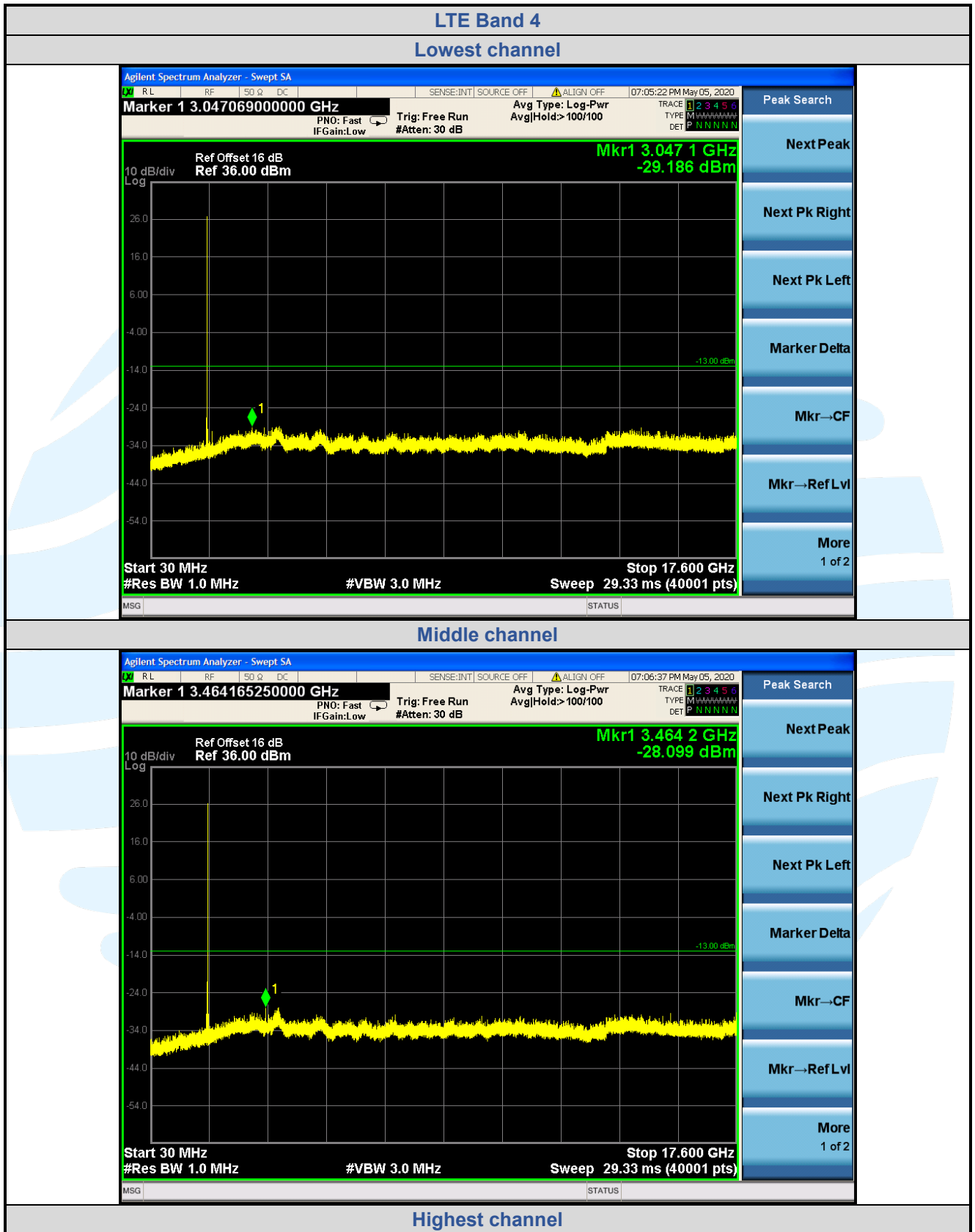
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5.7.2 LTE Band 4



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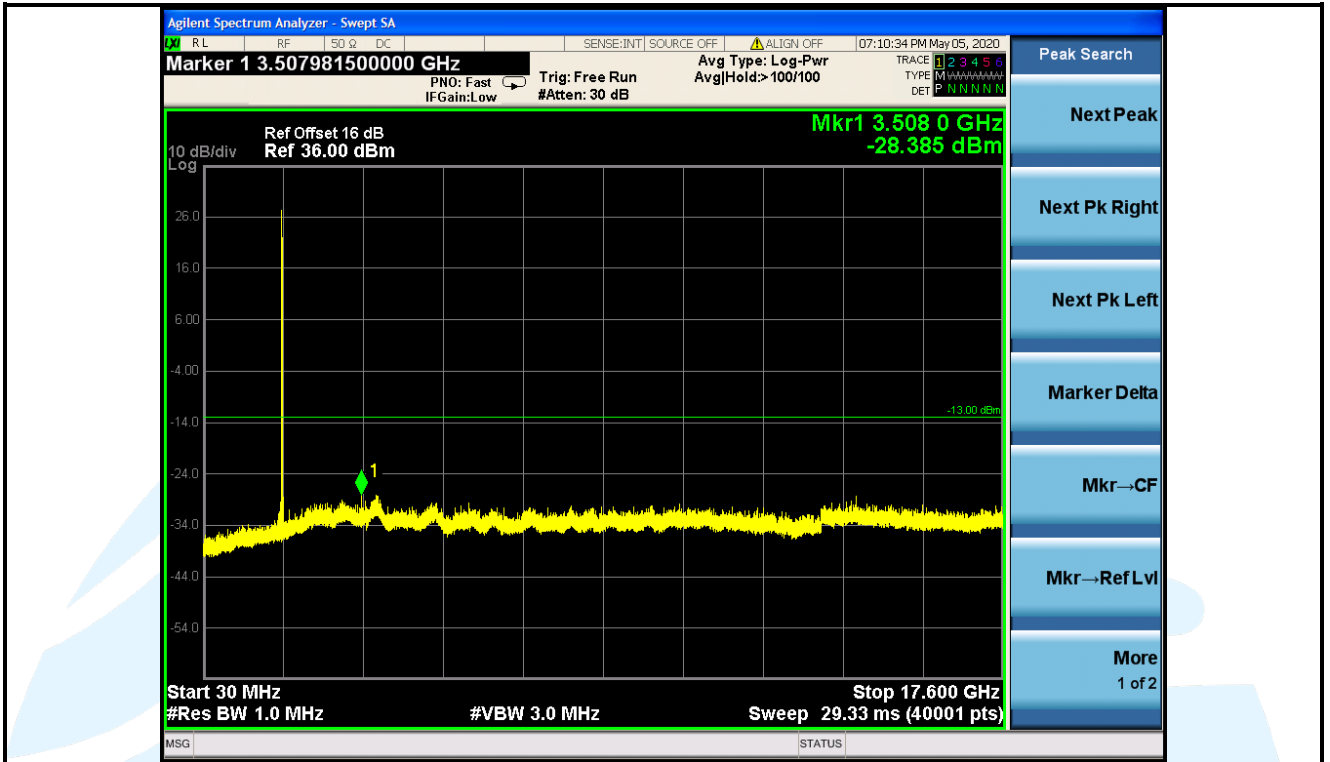
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Fax: +86-755-28230886

E-mail: info@uttlab.com

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Tel: +86-755-28230888

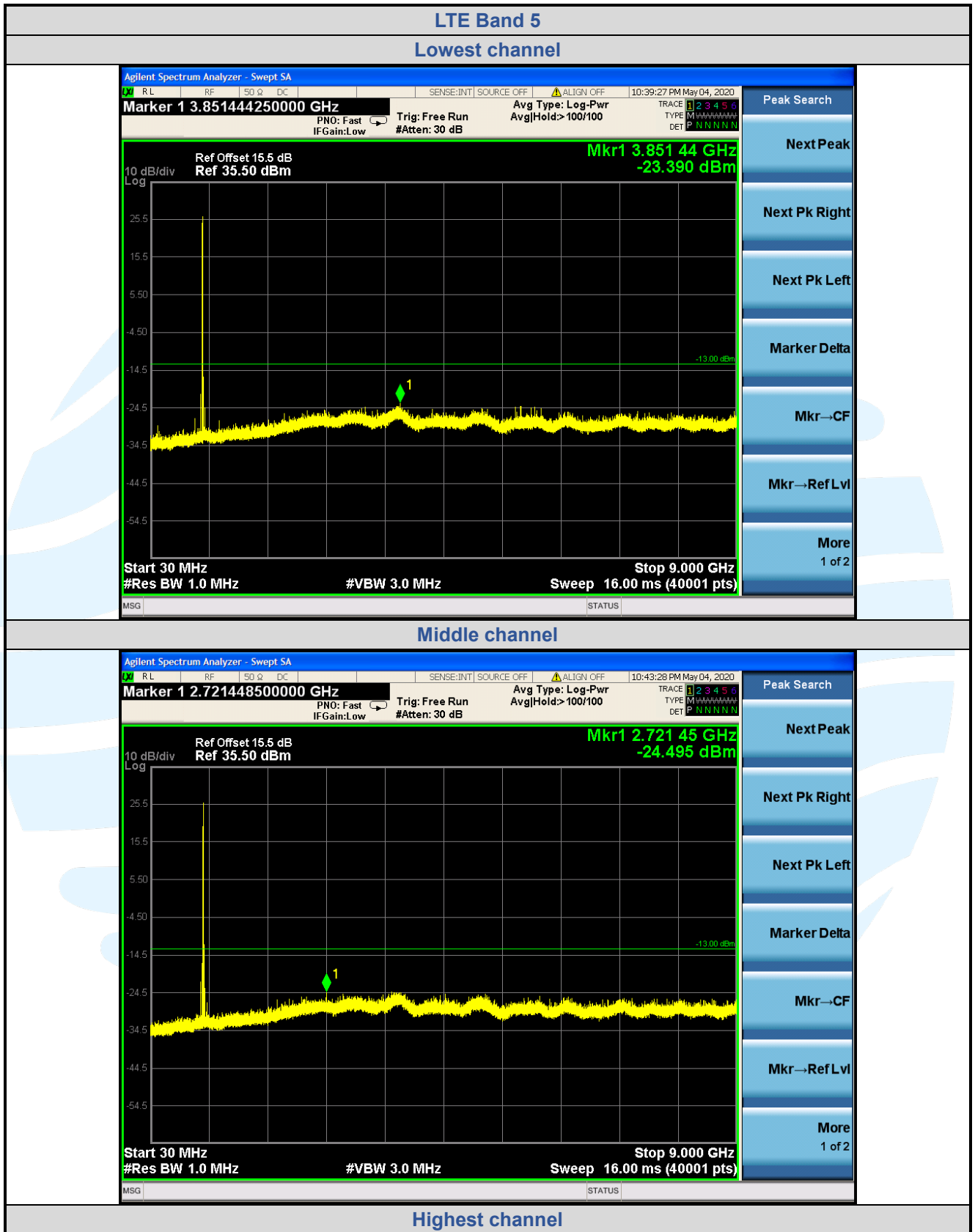
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5.7.3 LTE Band 5





Shenzhen UnionTrust Quality and Technology Co., Ltd.

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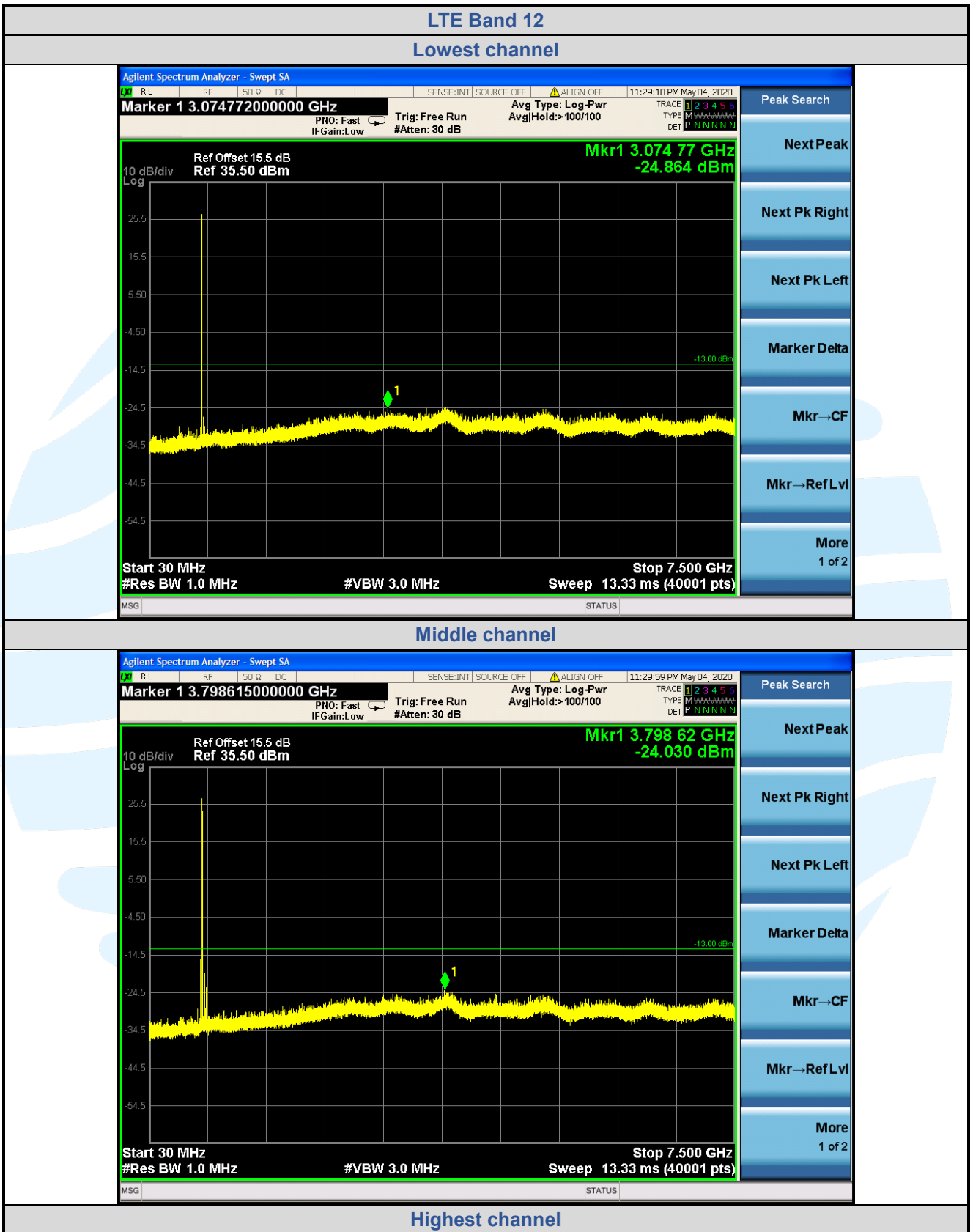
Fax: +86-755-28230886

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[Http://www.uttlab.com](http://www.uttlab.com)

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5.7.4 LTE Band 12



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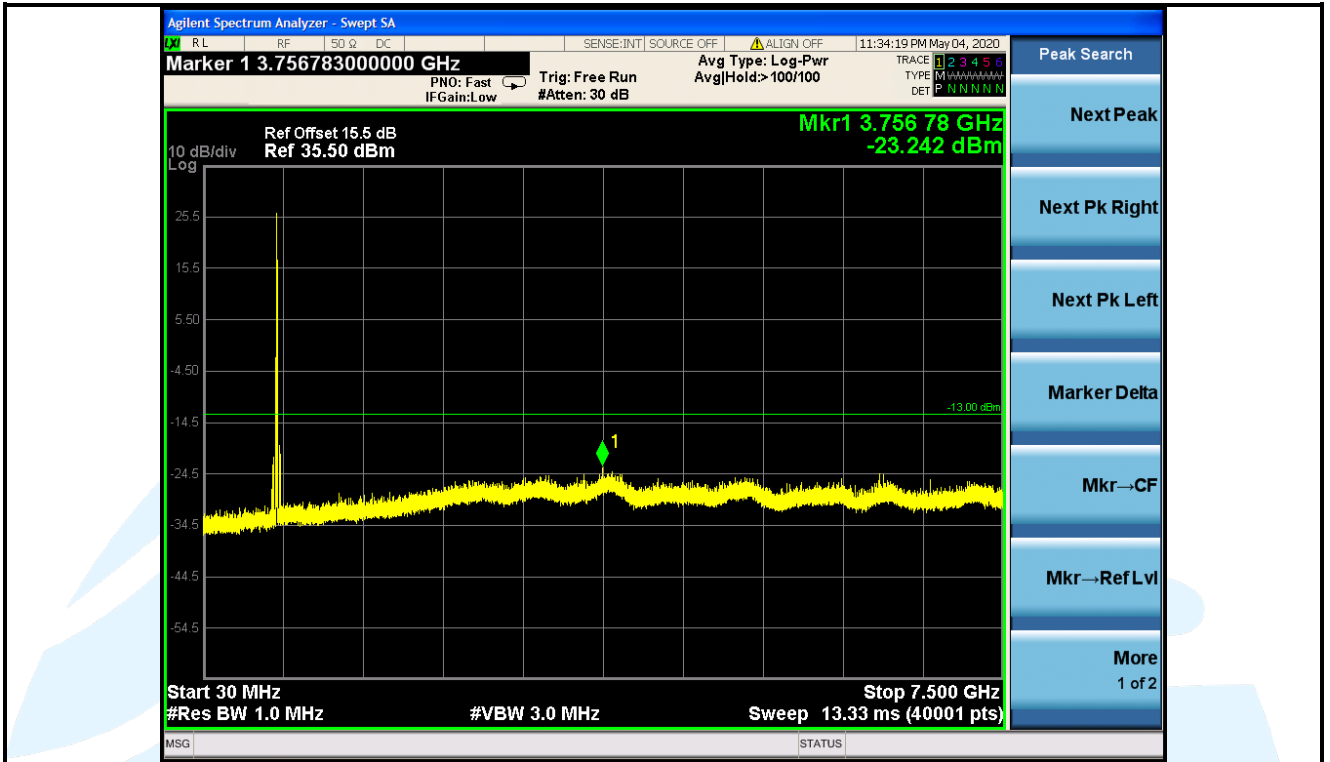
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

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Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

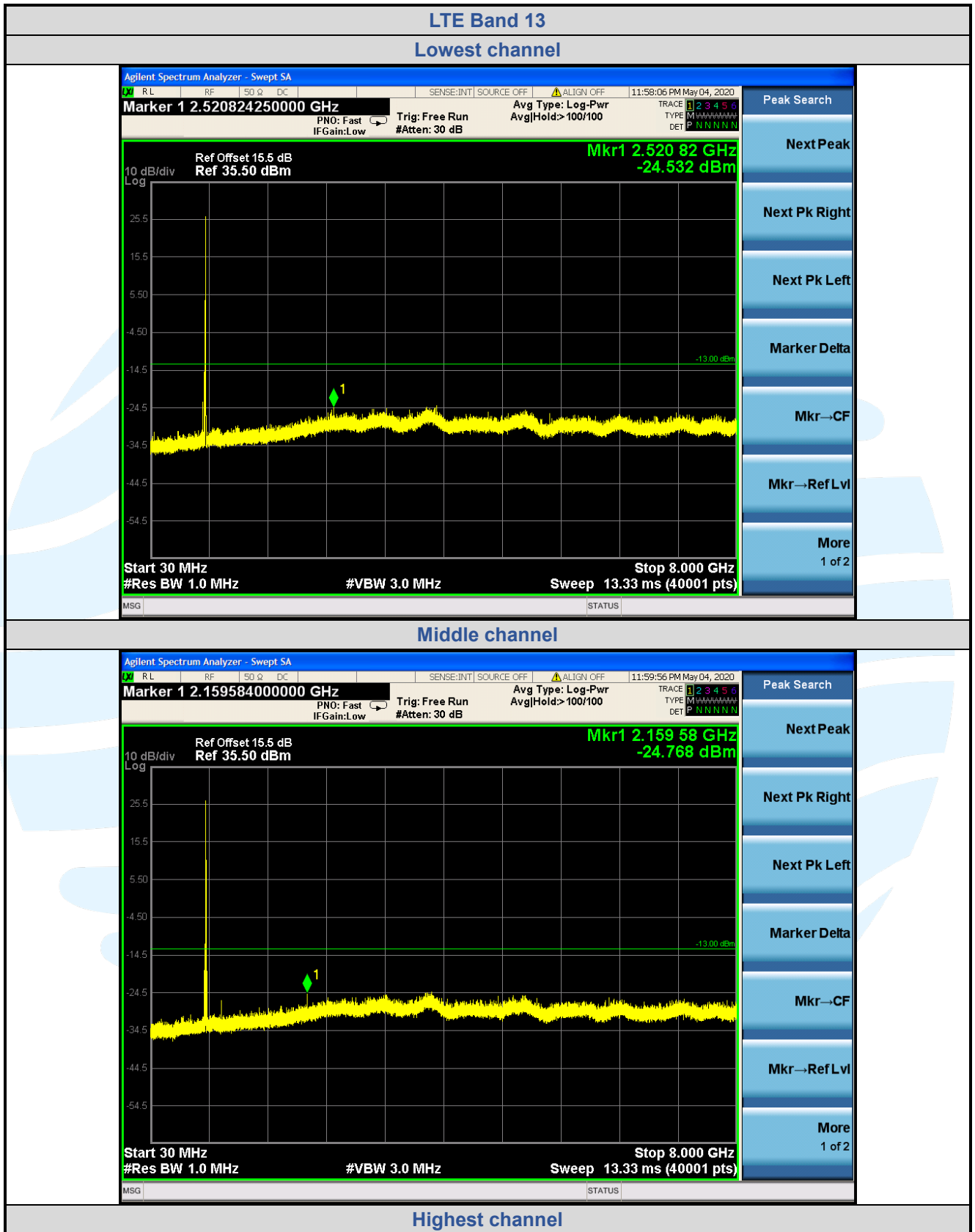
Fax: +86-755-28230886

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5.7.5 LTE Band 13



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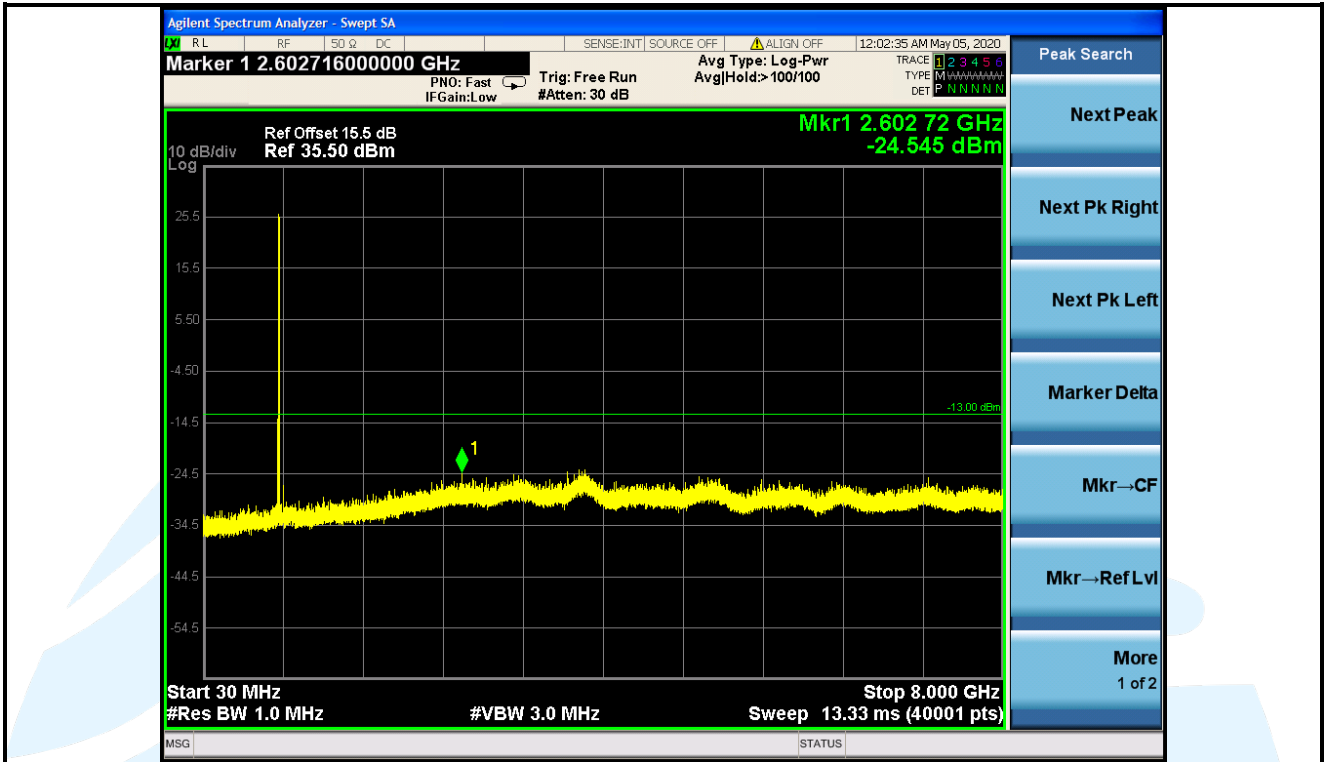
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

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Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

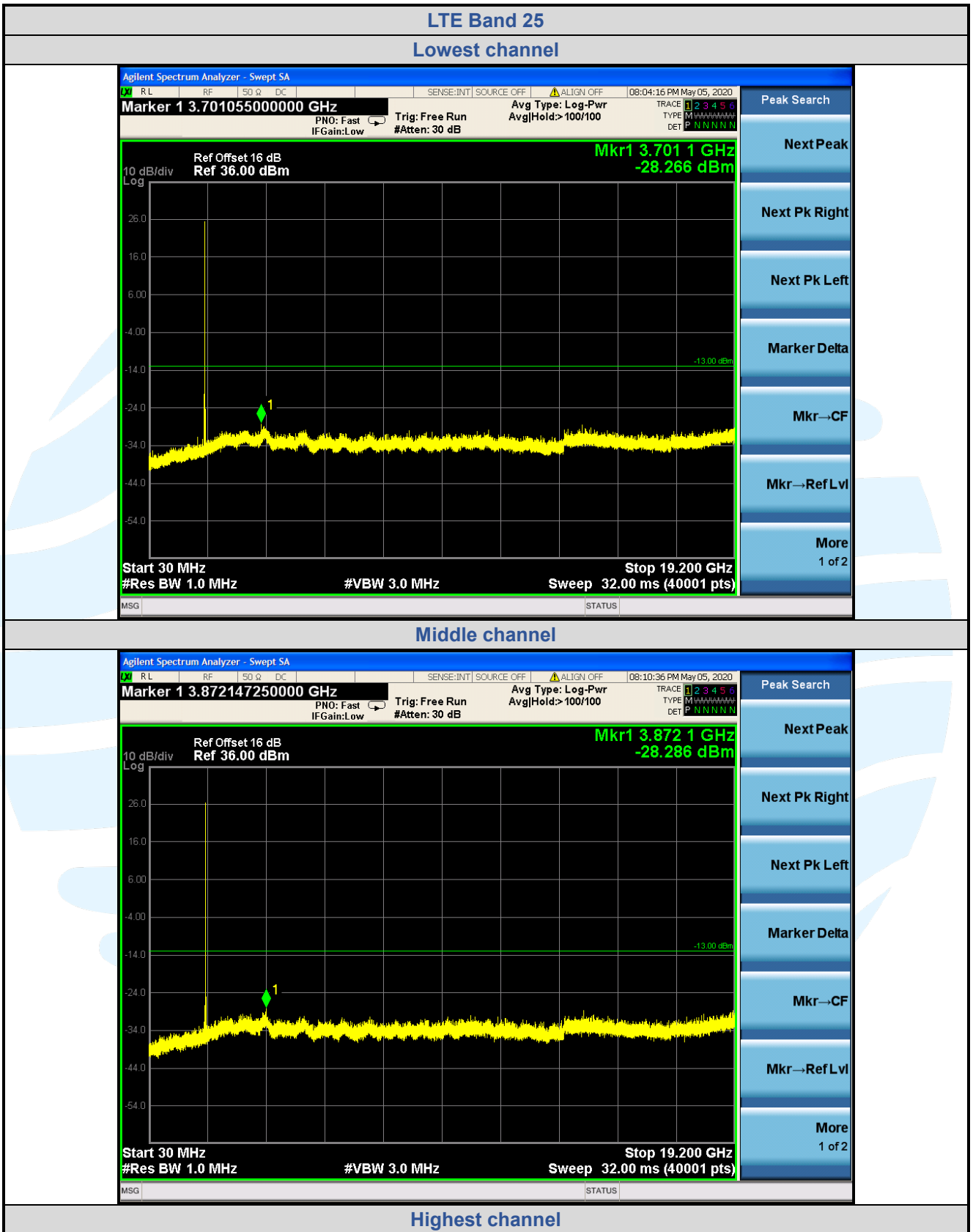
Fax: +86-755-28230886

E-mail: info@uttlab.com

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5.7.6 LTE Band 25



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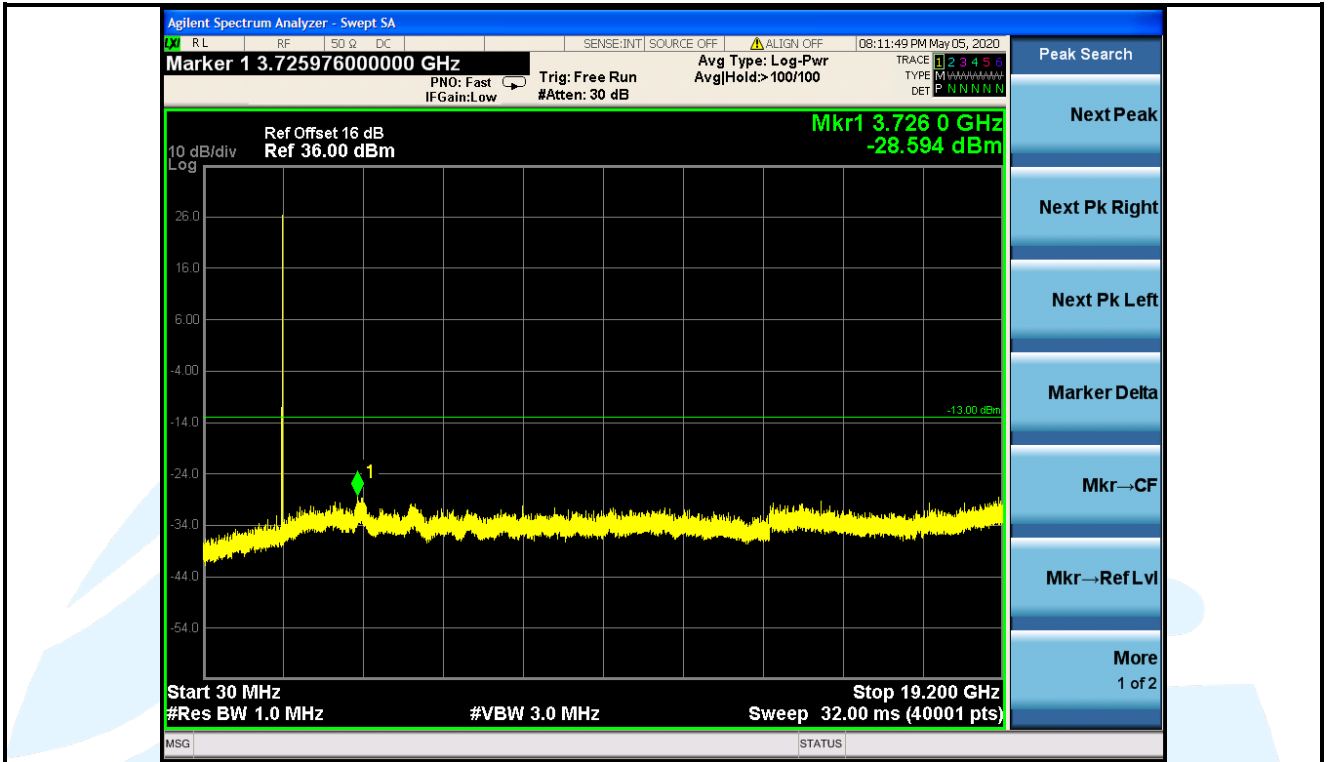
Tel: +86-755-28230888

Fax: +86-755-28230886

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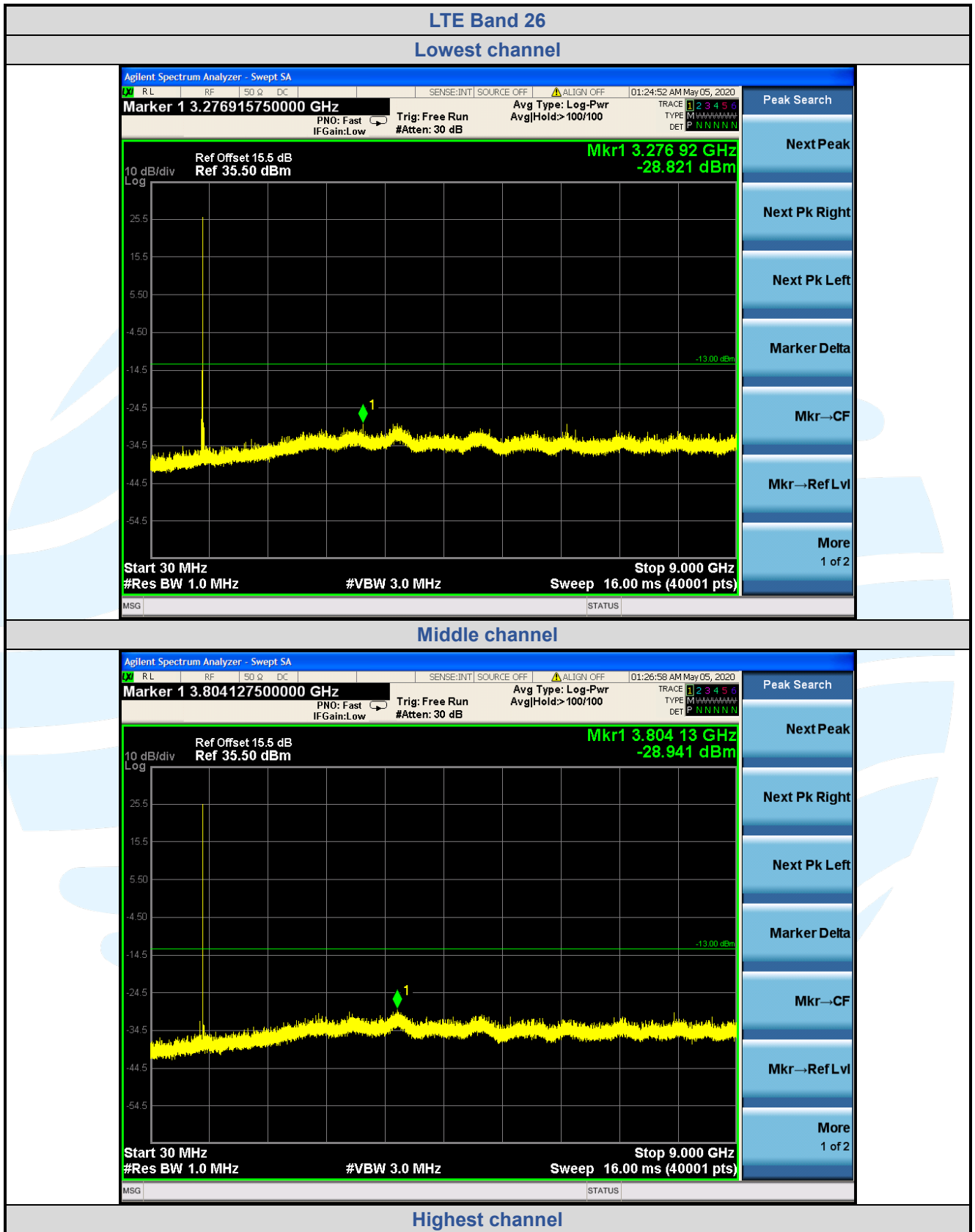
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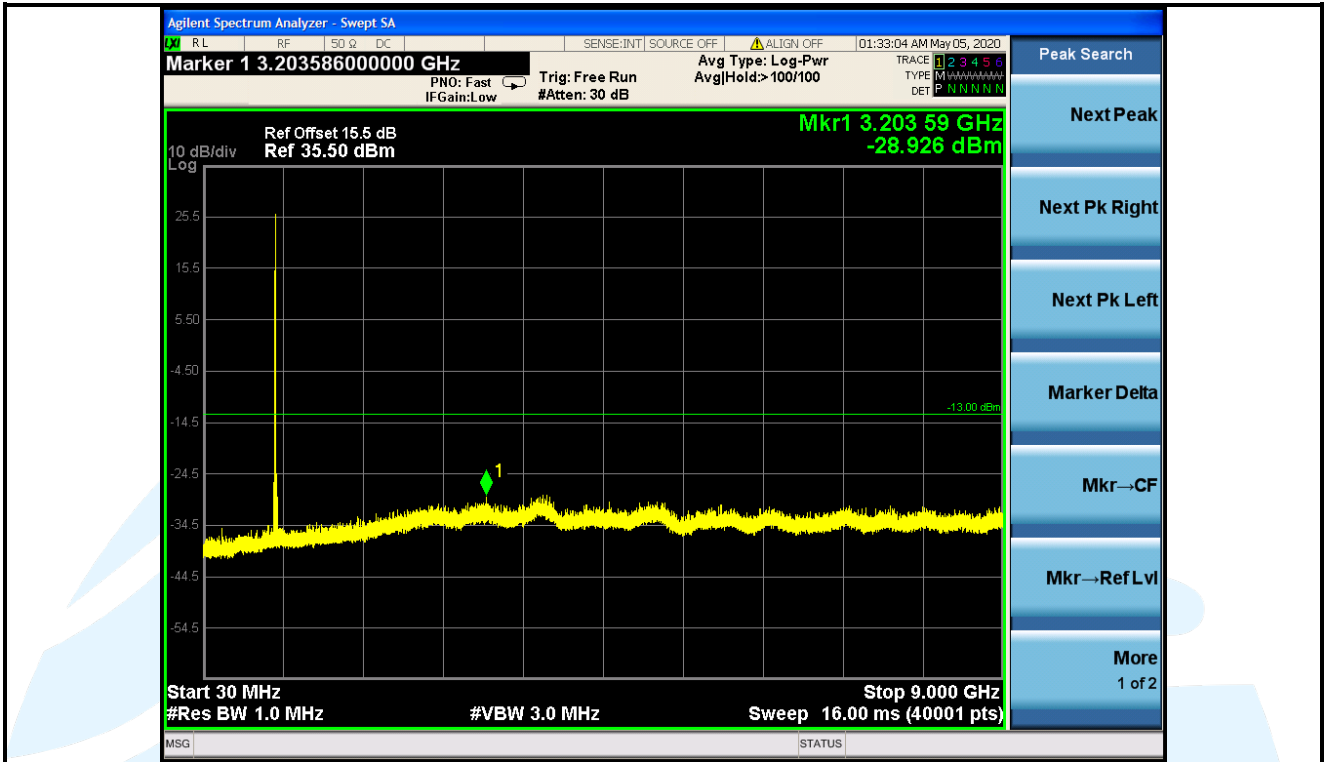
E-mail: info@uttlab.com

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5.7.7 LTE Band 26





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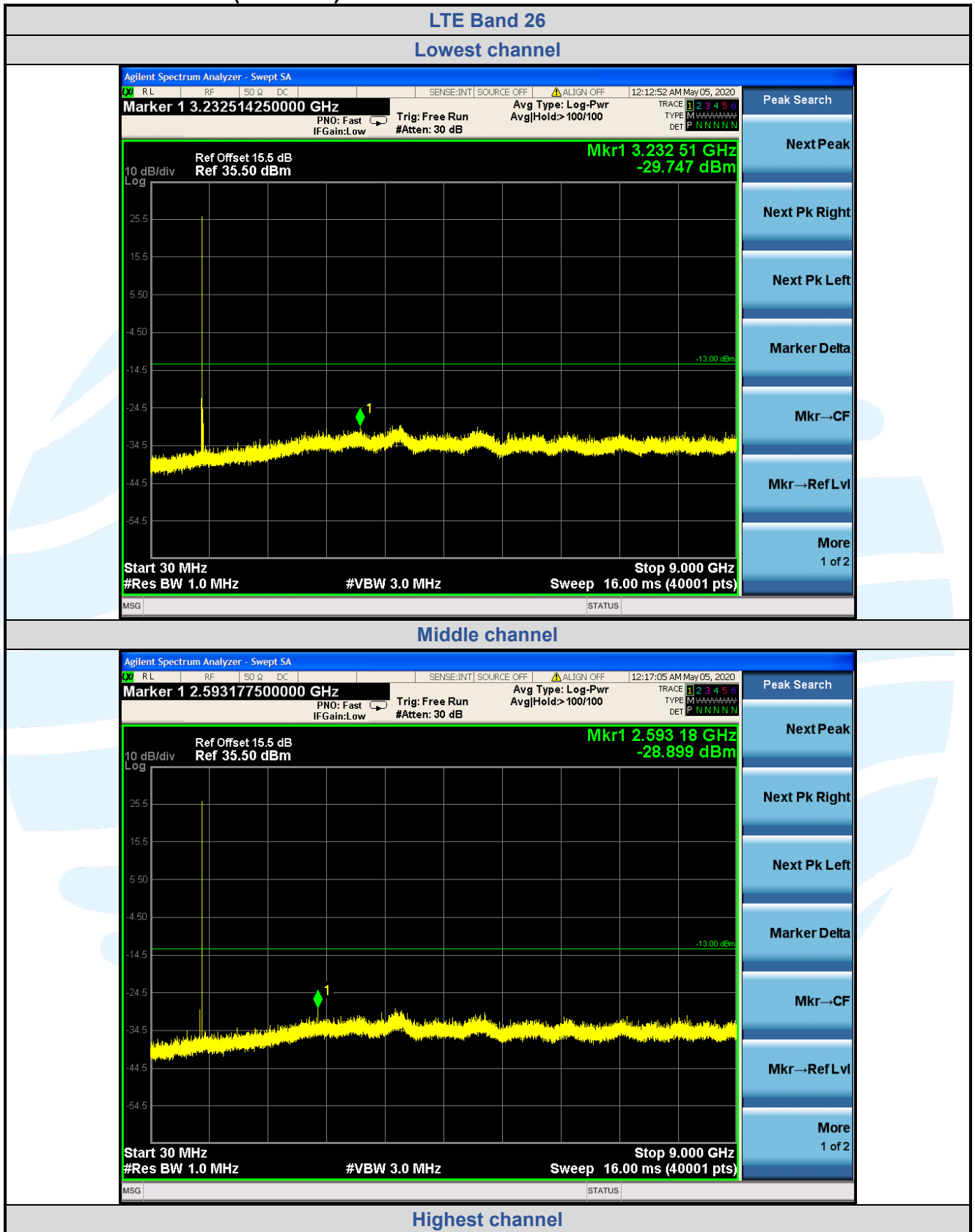
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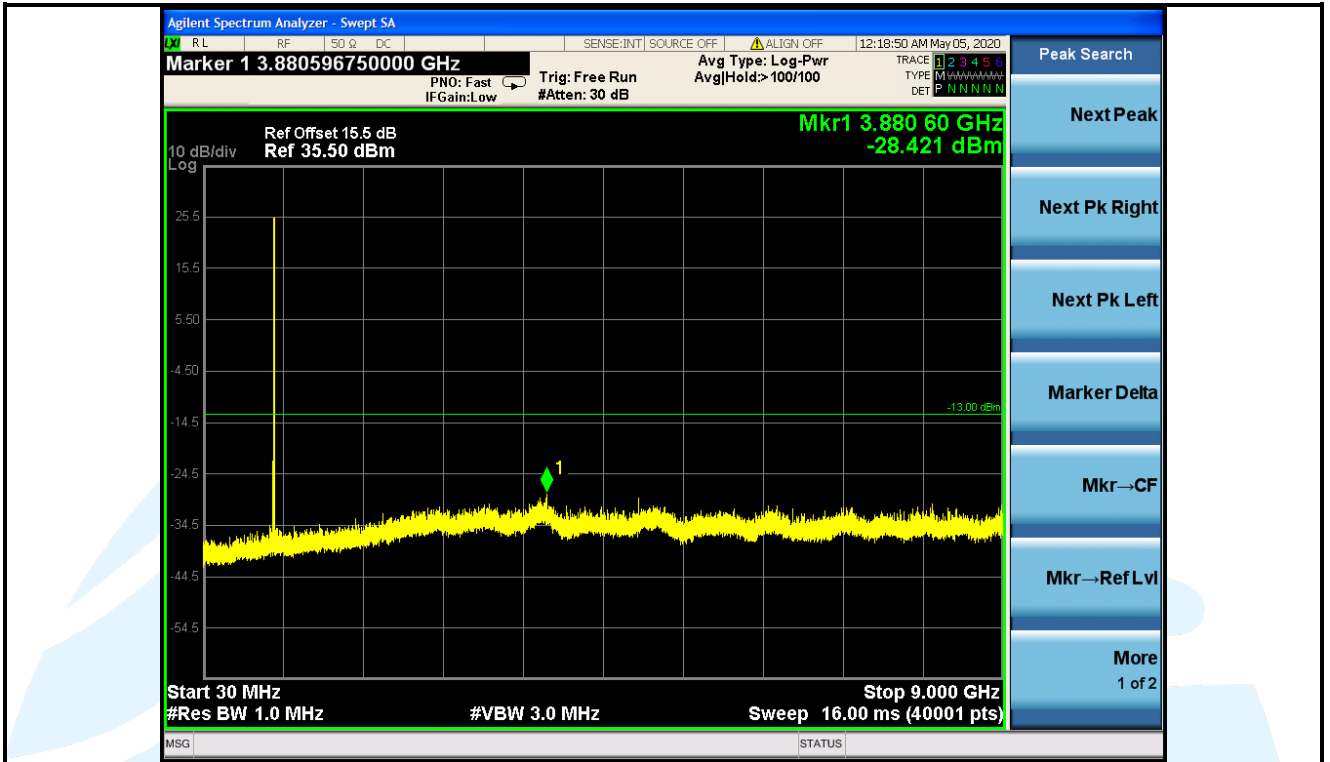
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5.7.8 LTE Band 26 (Part 90S)





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Tel: +86-755-28230888

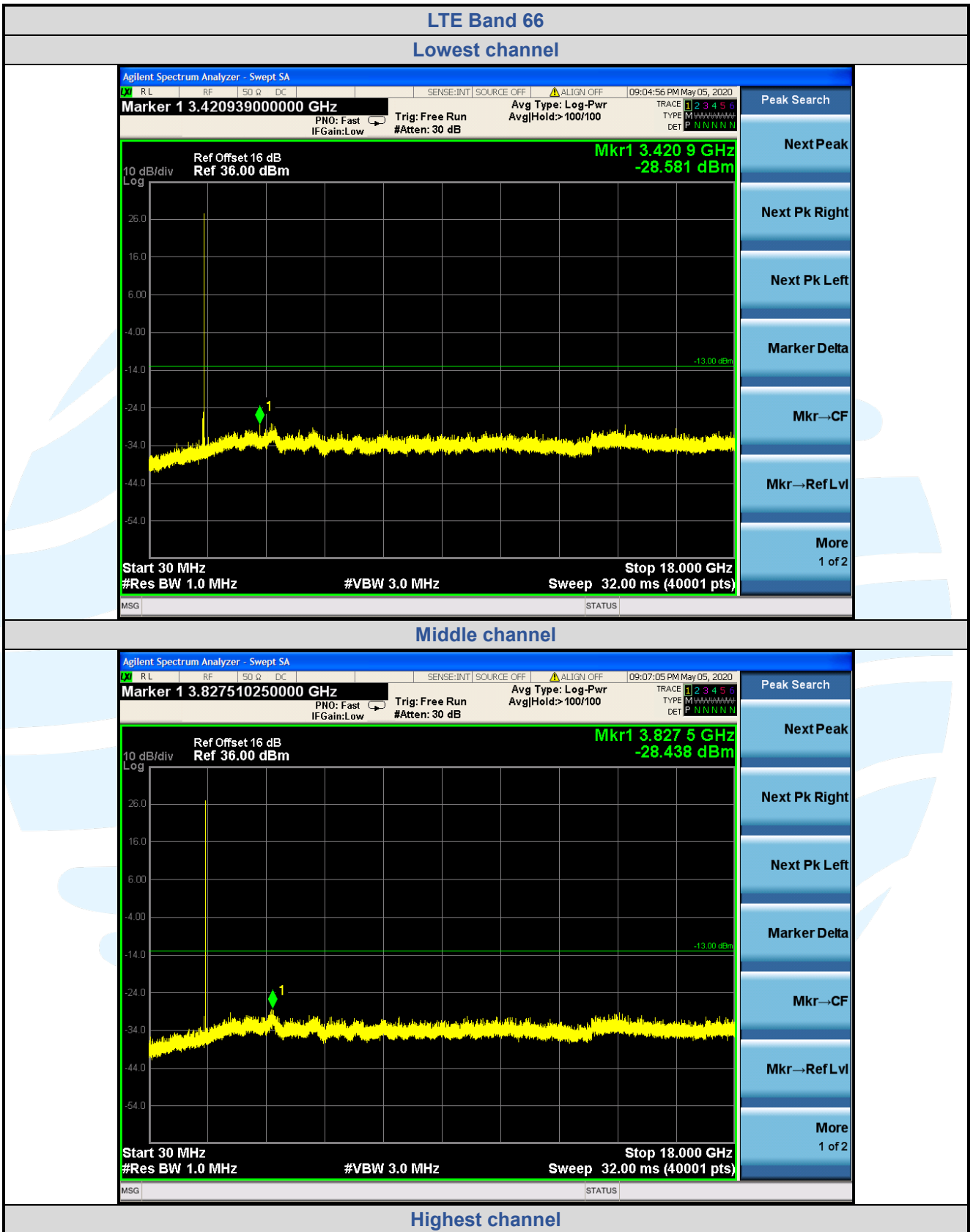
Fax: +86-755-28230886

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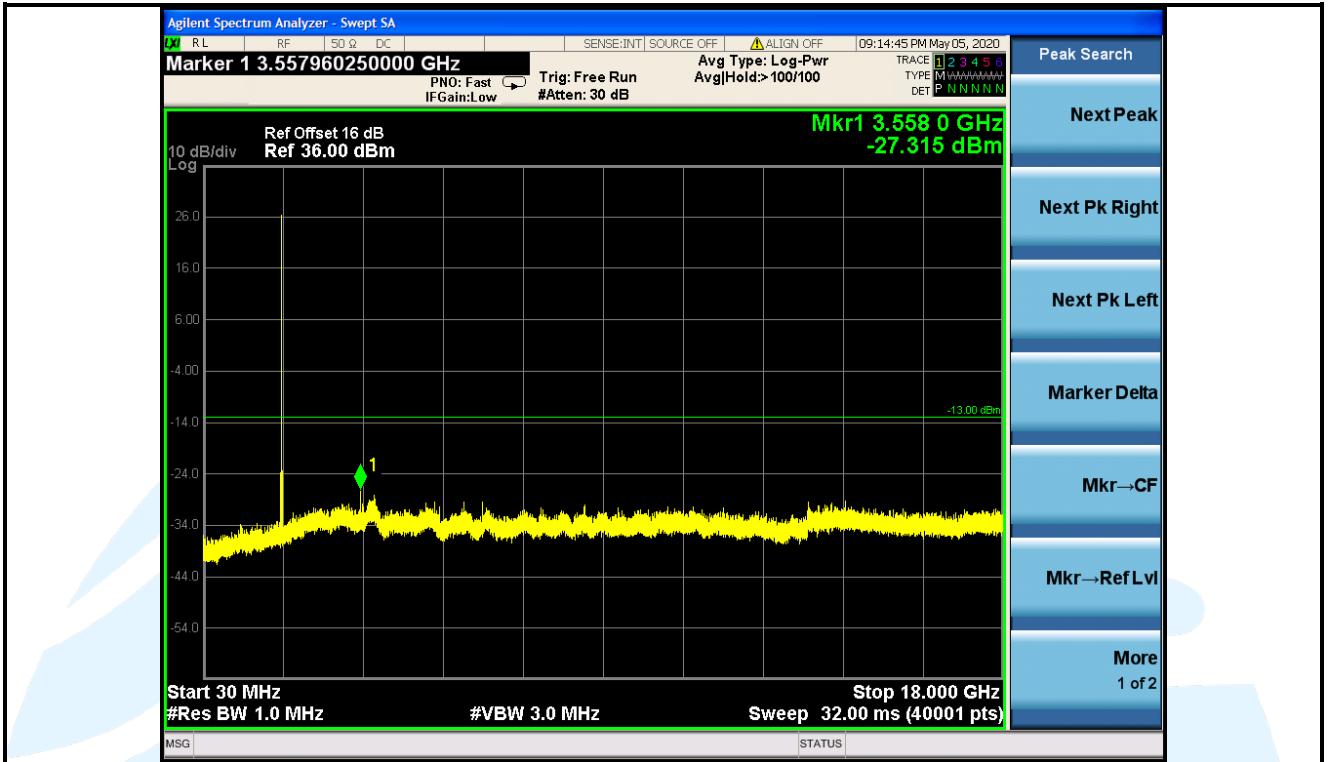
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5.7.9 LTE Band 66



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Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

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5.8 FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement: LTE Band 2 & LTE Band 25: FCC 47 CFR Part 24.238(a)
 LTE Band 4 & LTE Band 66: FCC 47 CFR Part 27.53(h)
 LTE Band 5 & LTE Band 26: FCC 47 CFR Part 22.917(a)
 LTE Band 12 : FCC 47 CFR Part 27.53(g)
 LTE Band 13: FCC 47 CFR Part 27.53
 LTE Band 26: FCC 47 CFR Part 90.691
 LTE Band 2 & LTE Band 25: RSS-133 Issue 6, Section 6.5
 LTE Band 4 & LTE Band 66: RSS-139 Issue 3, Section 6.6
 LTE Band 5: RSS-132 Issue 3, Section 5.5
 LTE Band 12 & LTE Band 13: RSS-130 Issue 2, Section 4.7

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-30 MHz	Peak	10 kHz	30 KHz	Peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak

Limits:

FCC 47 CFR Part 24.238(a), 27.53(h)(1), 22.917(a), 27.53(g), 27.53(c)(2), 90.691:

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. The emission limit equal to -13 dBm.

FCC 47 CFR Part 27.53:

(c) 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.

(f) Emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals. (-70 dBW/MHz = -40dBm/MHz).

RSS-132 Issue 3, Section 5.5, RSS-133 Issue 6, Section 6.6, RSS-139 Issue 3, Section 6.5, RSS-130 Issue 2, Section 4.7:

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. The emission limit equal to -13 dBm.

Test Setup: Refer to section 4.2.1 for details.

Test Procedures: KDB 971168 D01v03r01 Section 7

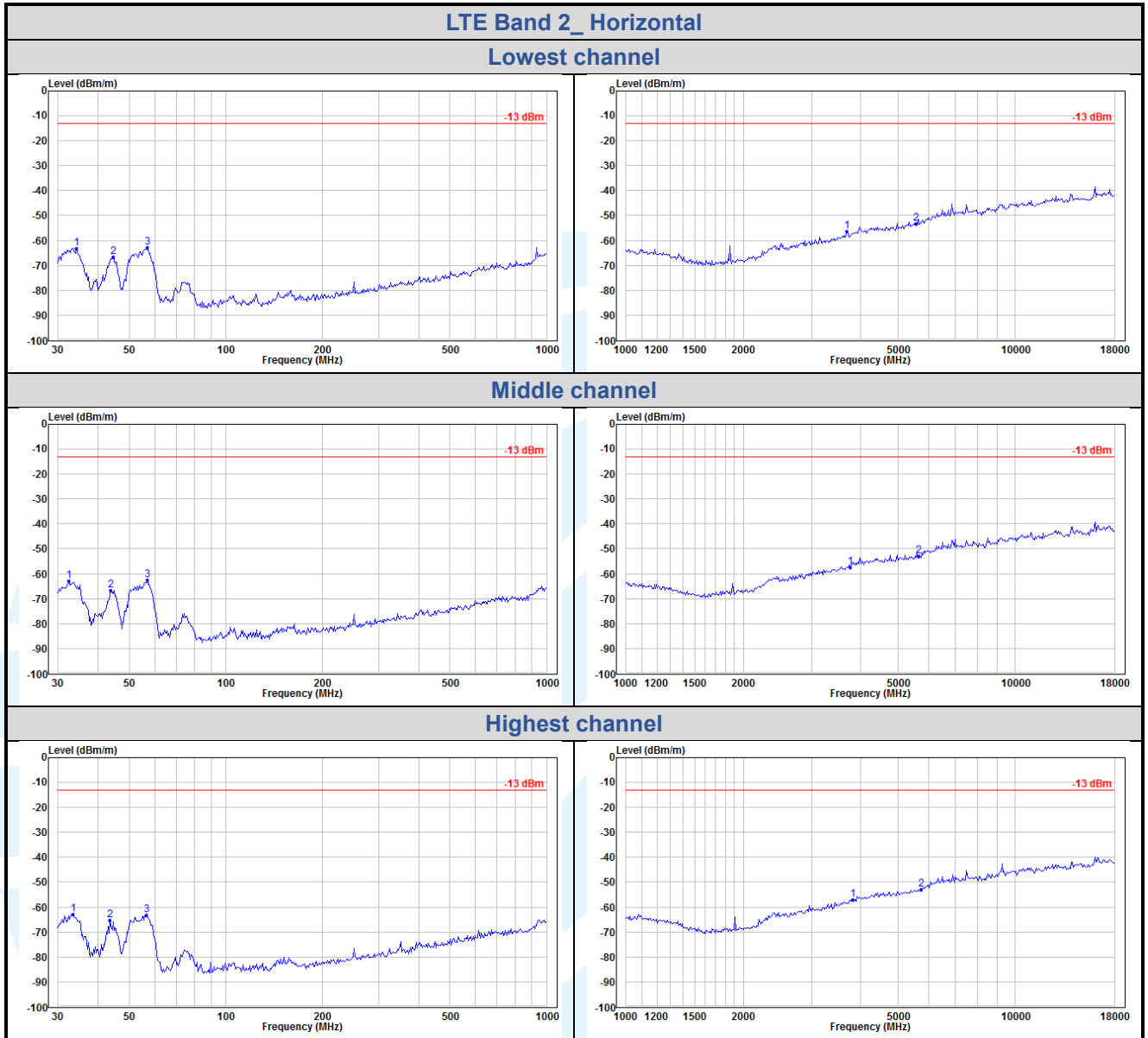
Equipment Used: Refer to section 3 for details.

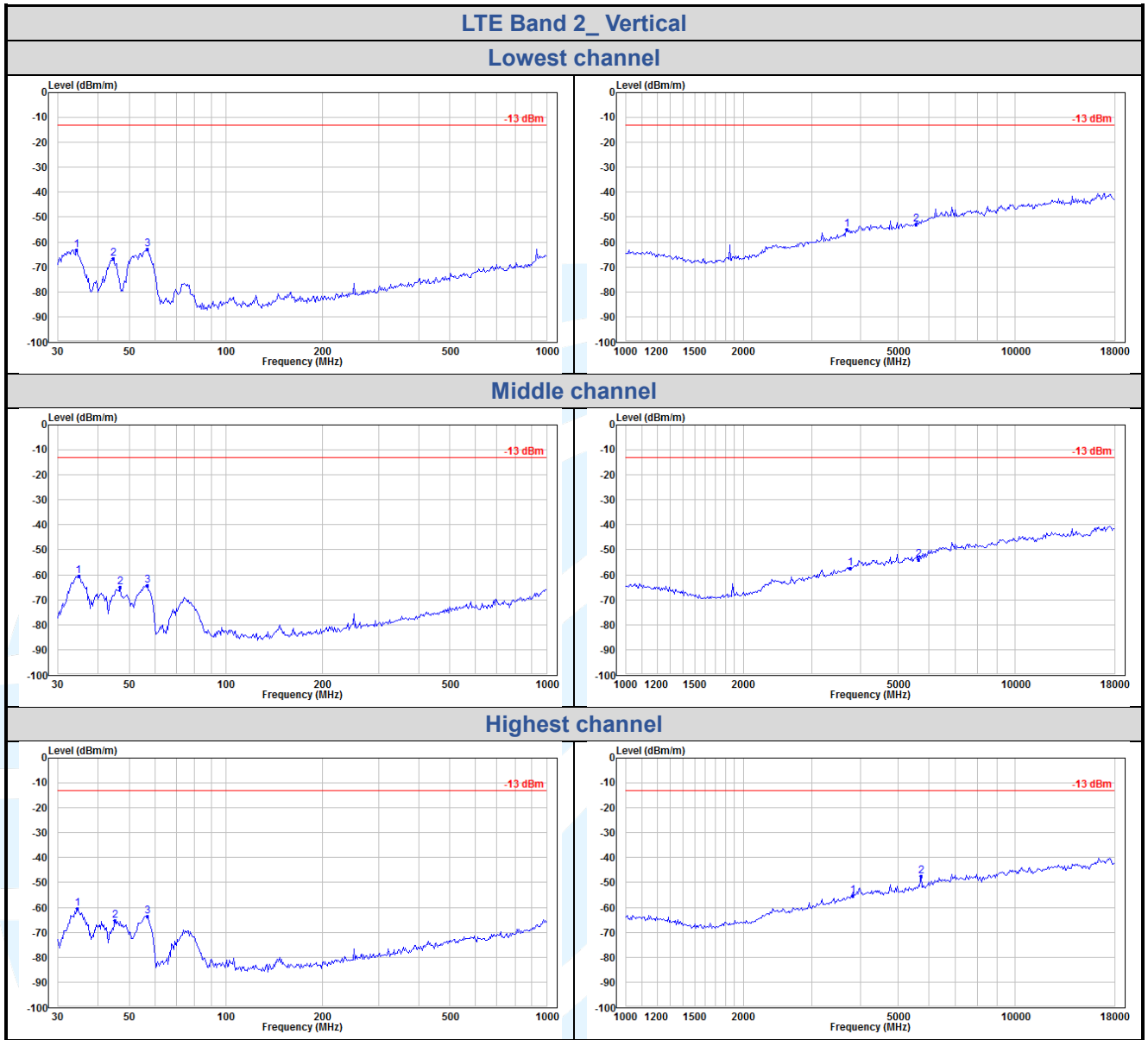
Test Result: Pass

The measurement data as follows:

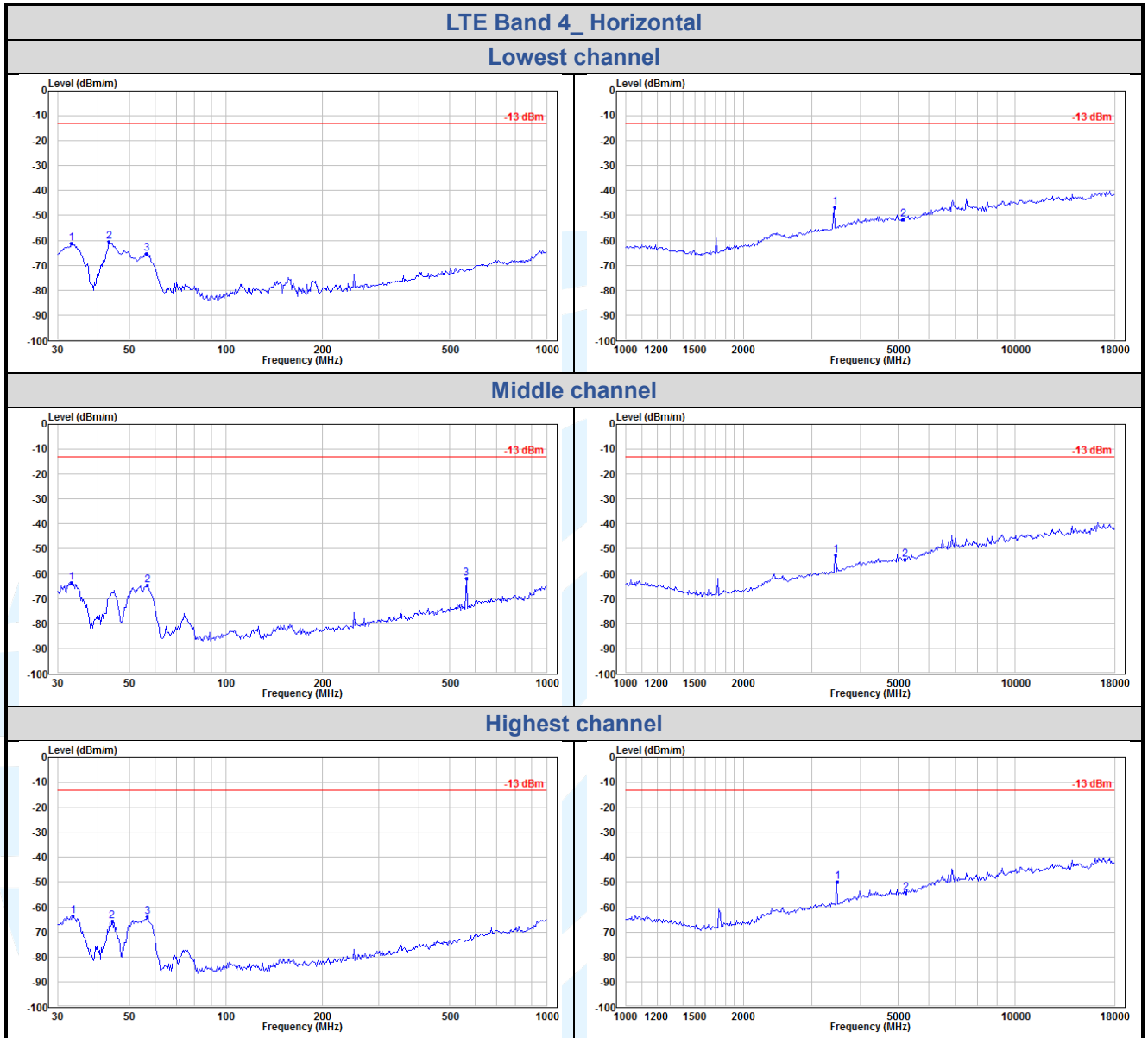
All bands emission had tested and emission margin more than 20dB

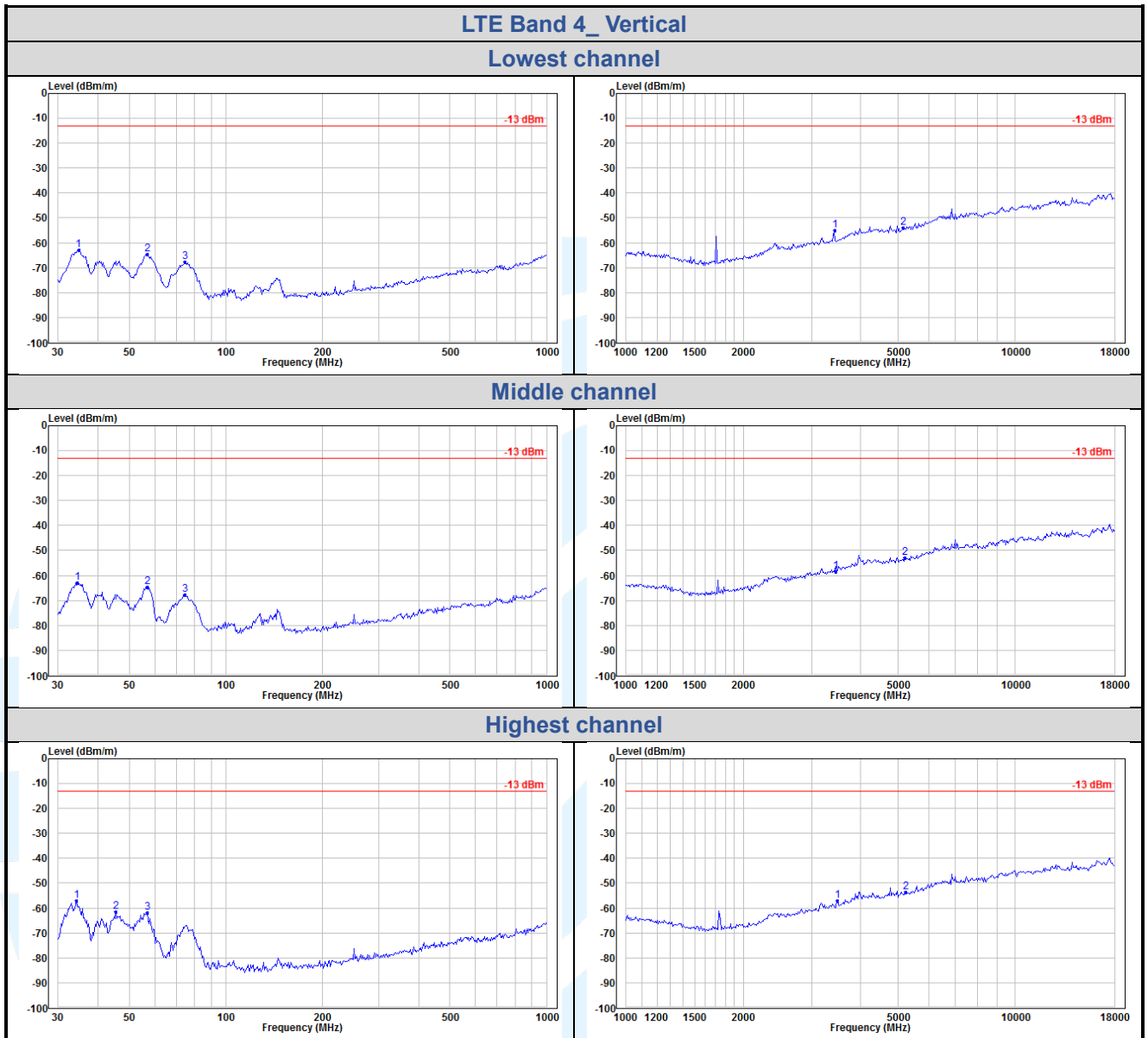
5.8.1 LTE Band 2



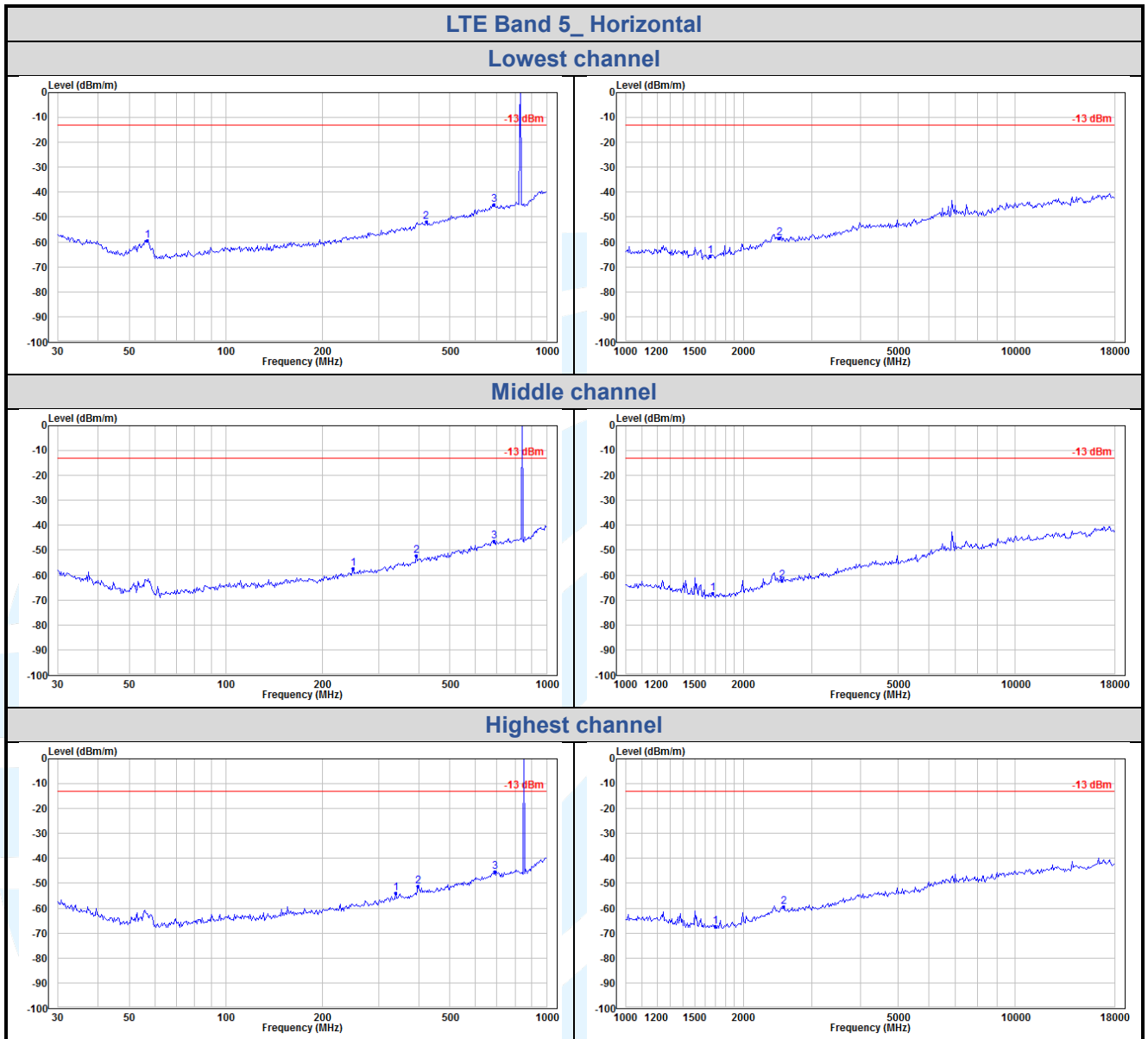


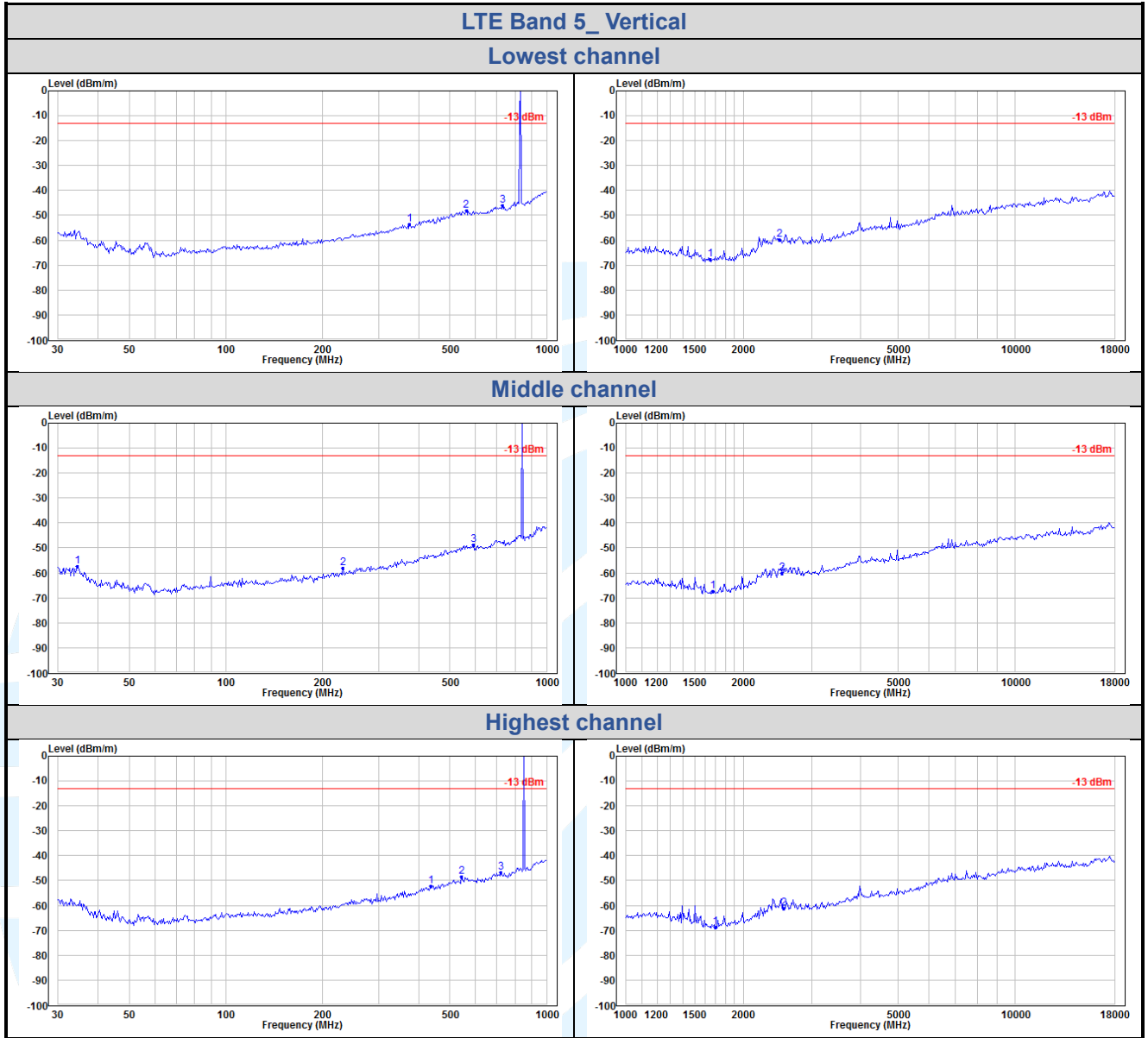
5.8.2 LTE Band 4





5.8.3 LTE Band 5





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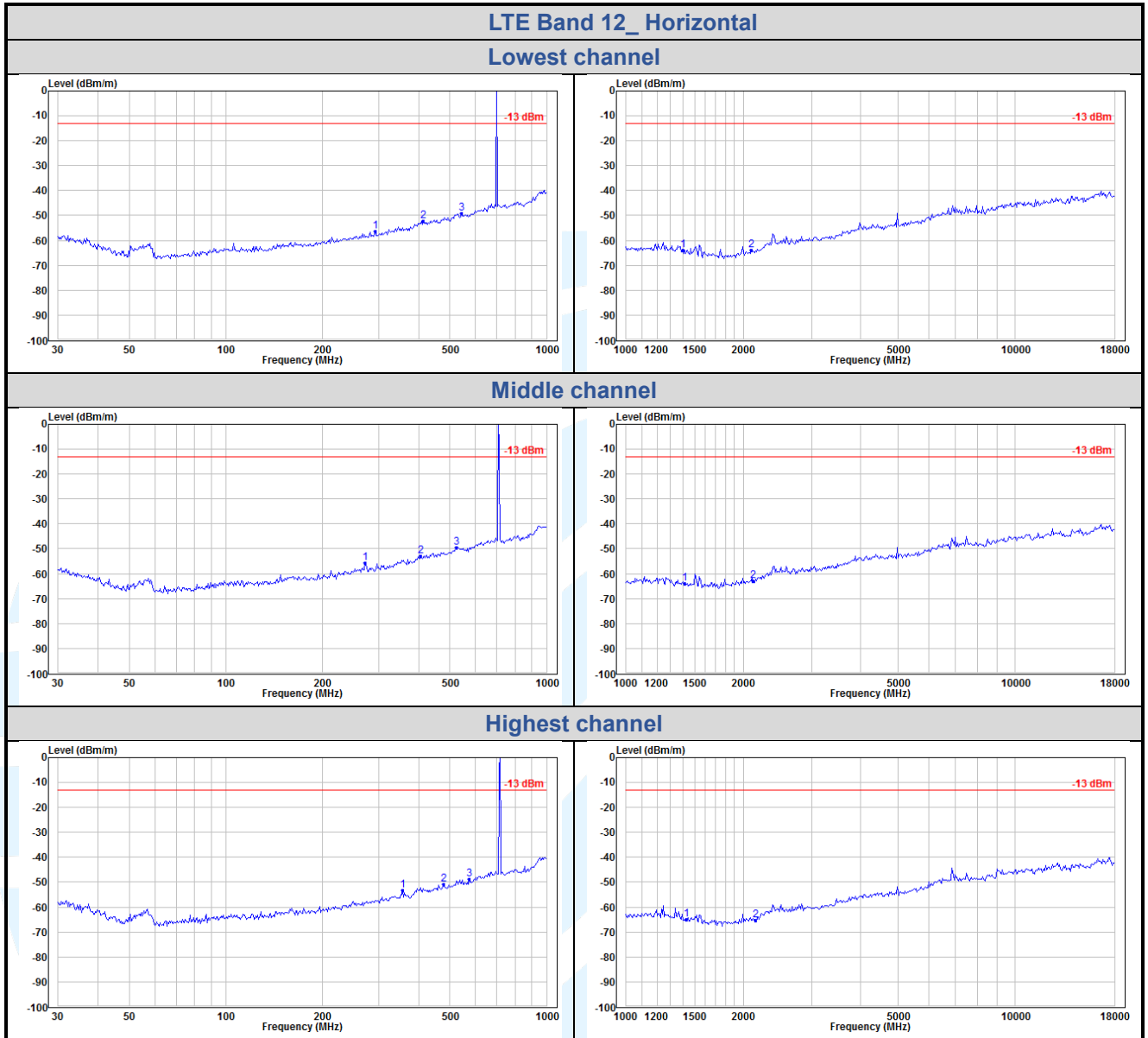
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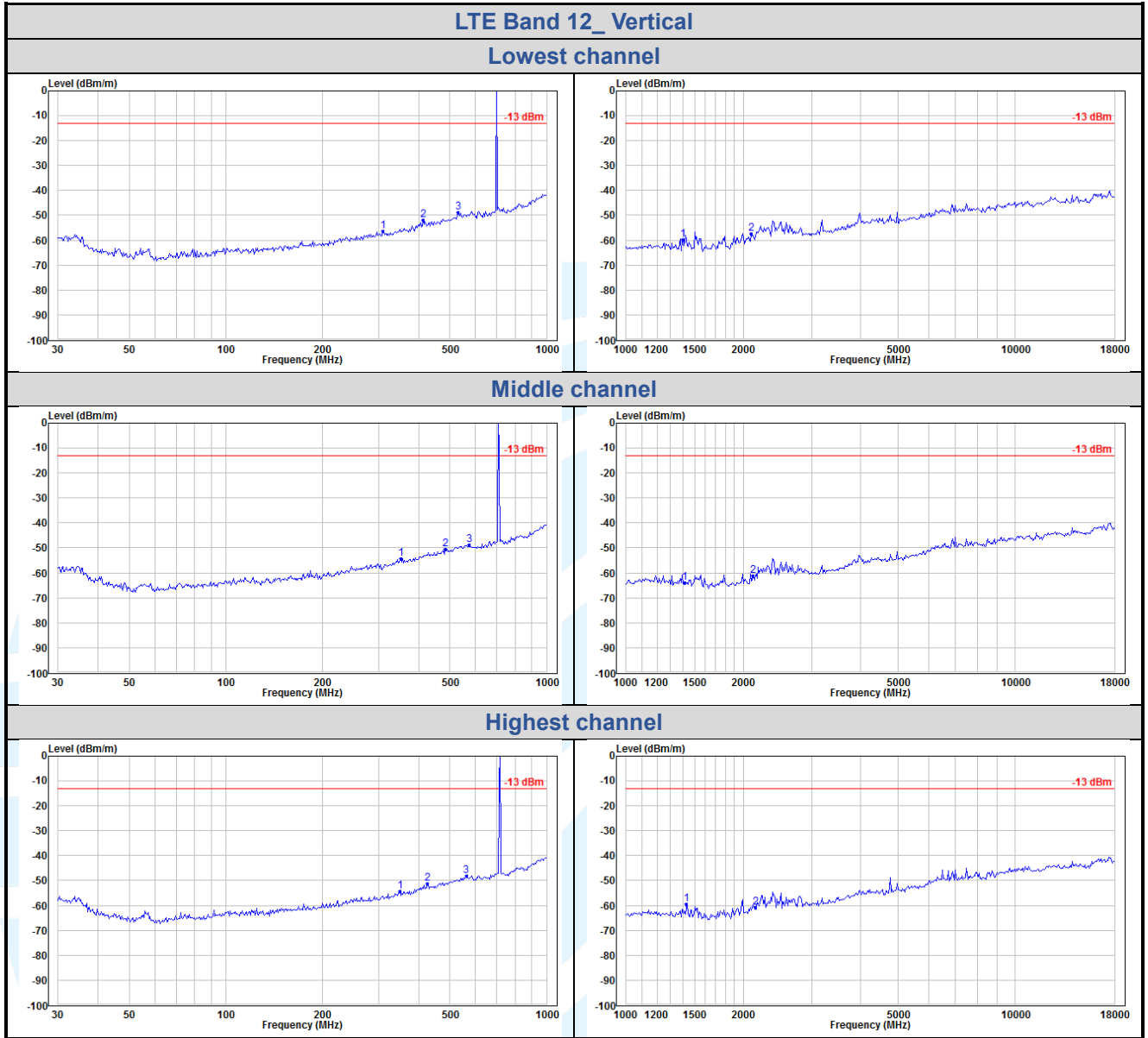
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5.8.4 LTE Band 12





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Tel: +86-755-28230888

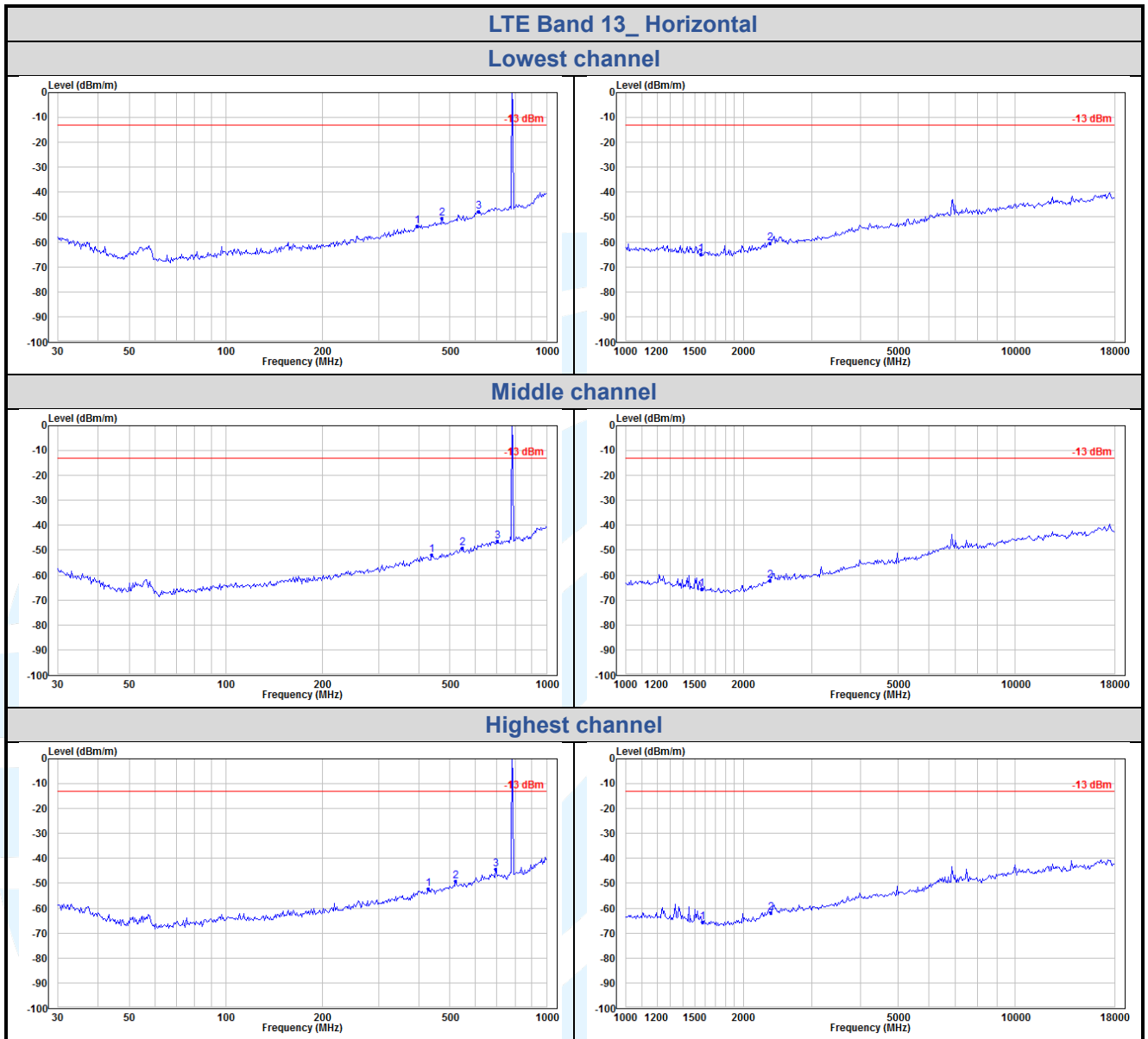
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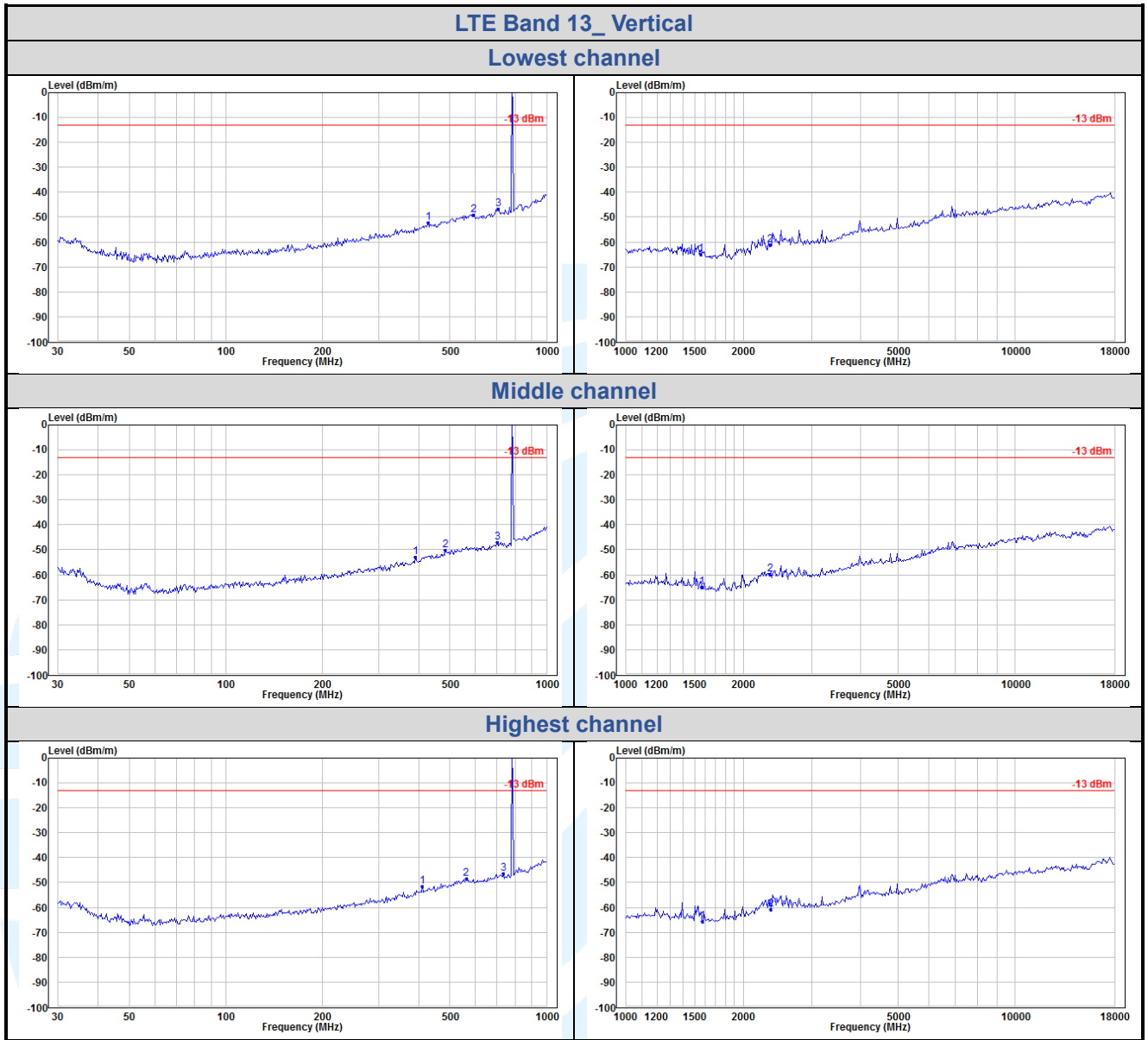
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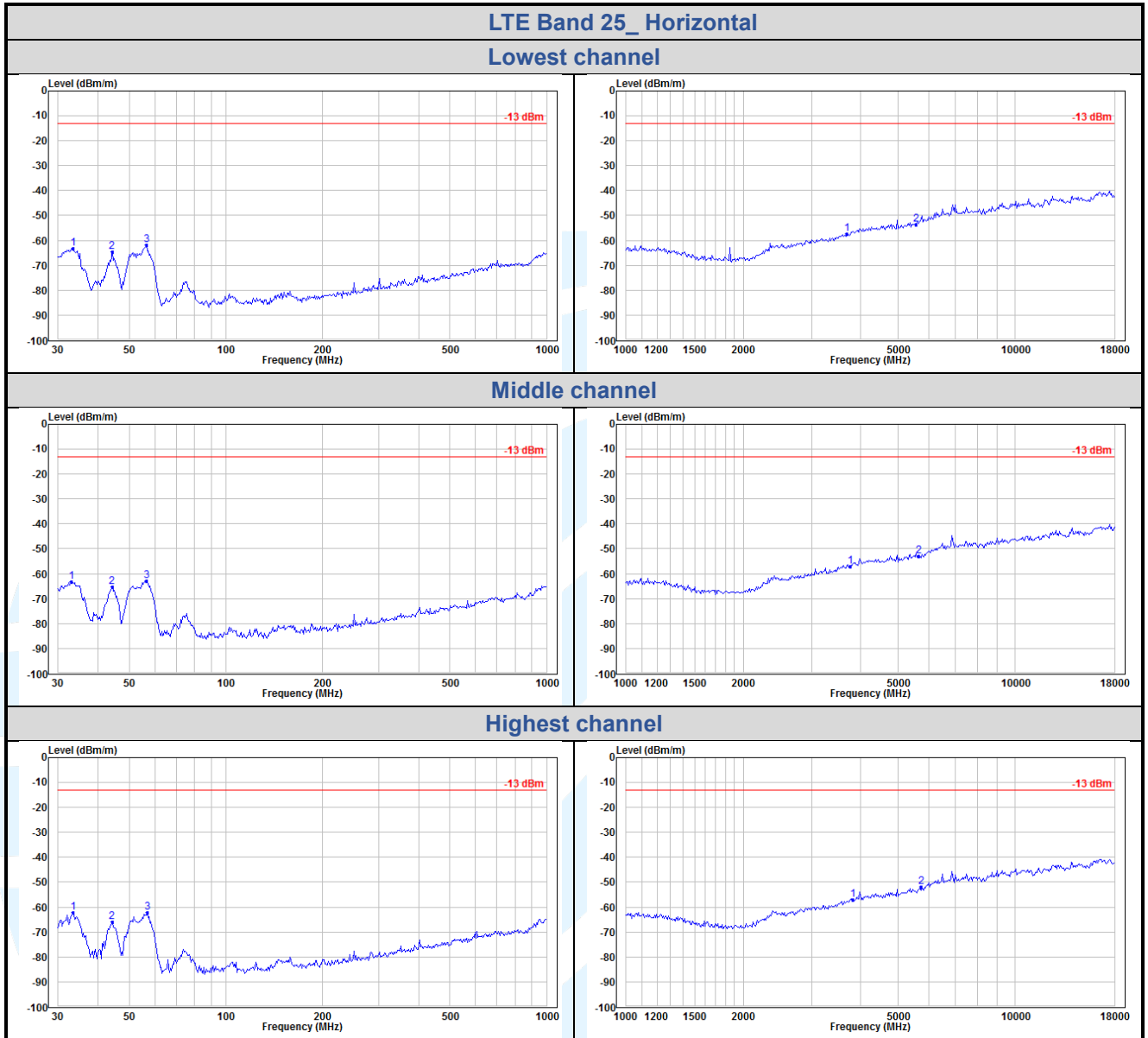
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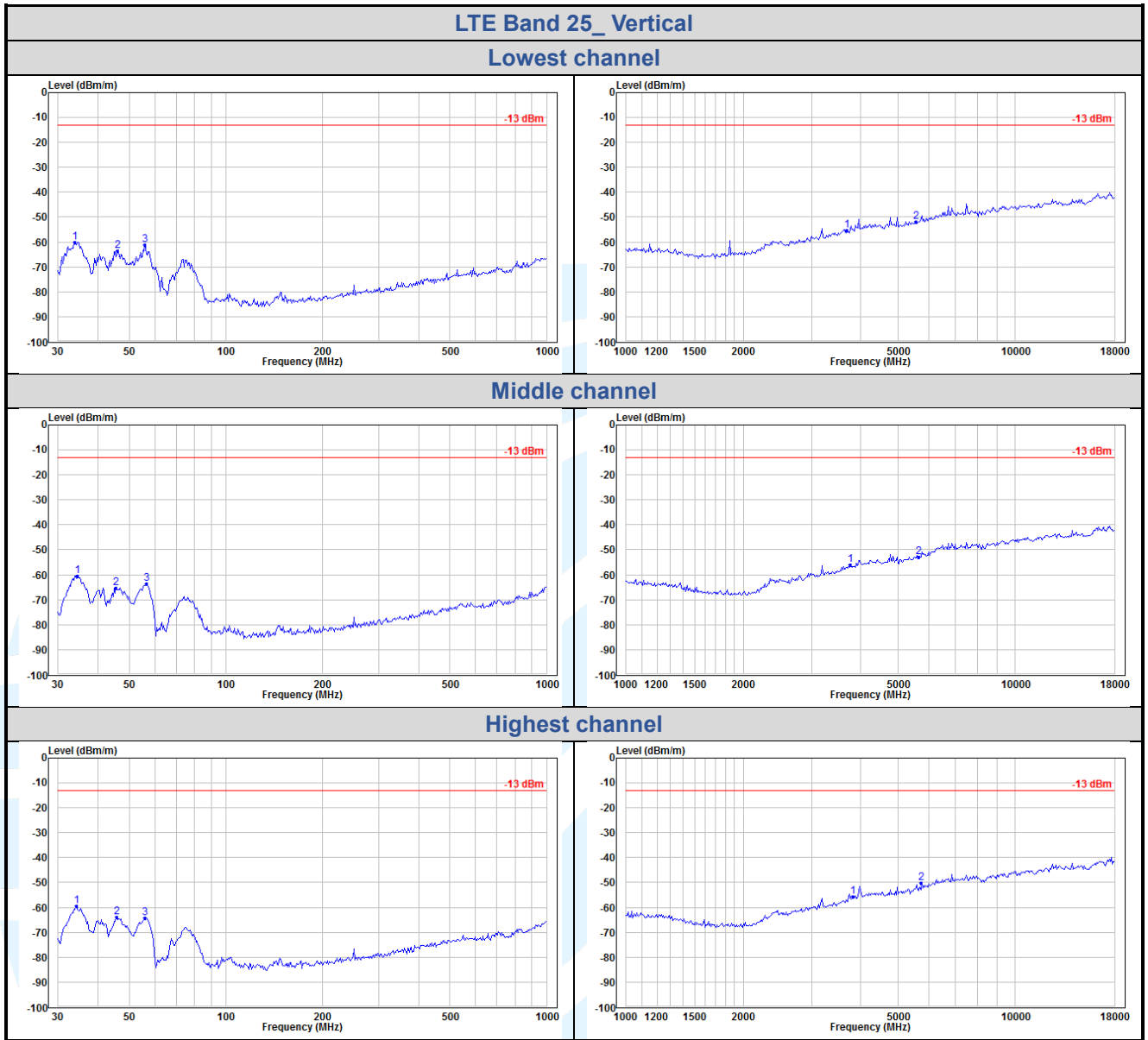
5.8.5 LTE Band 13



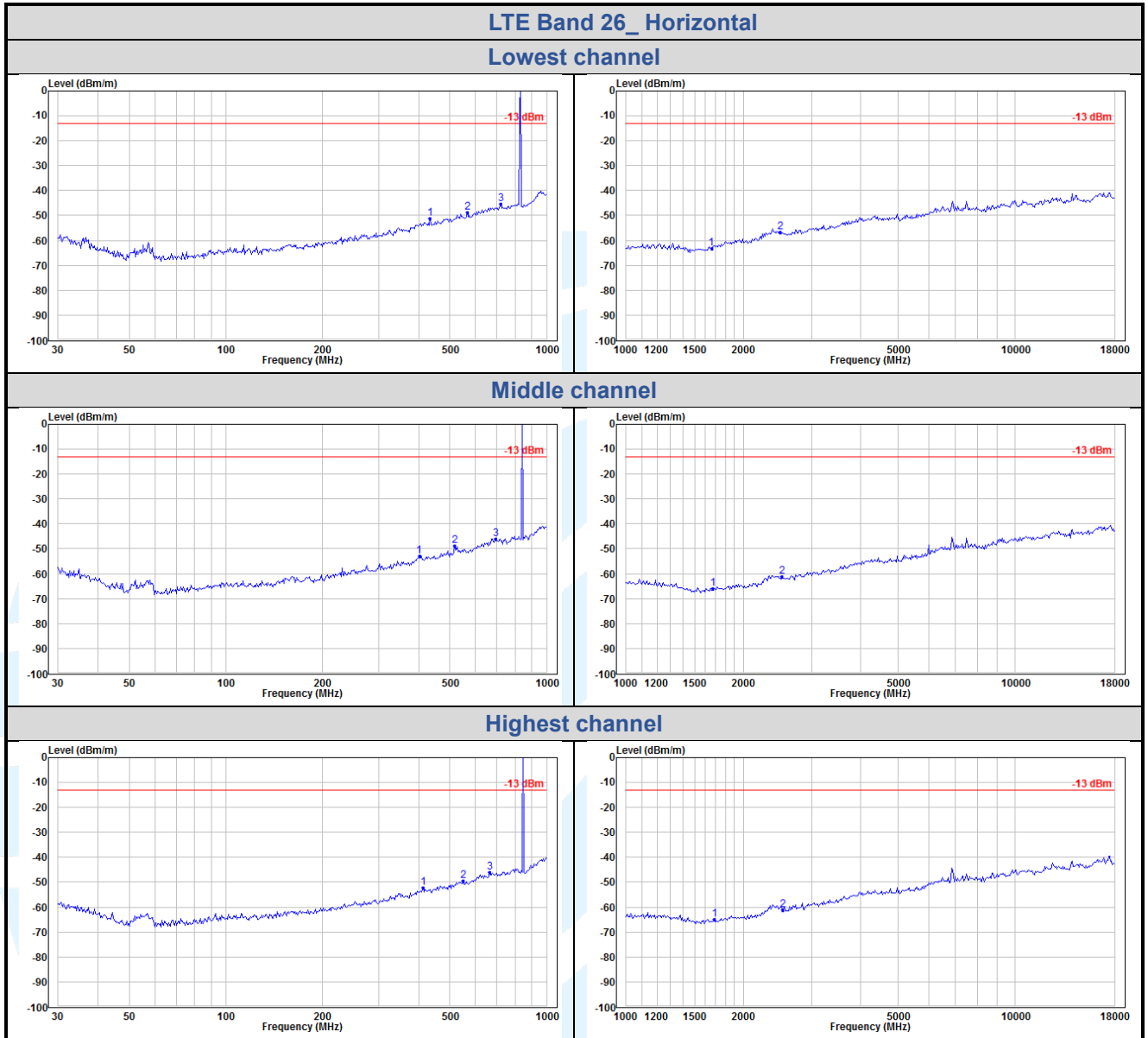


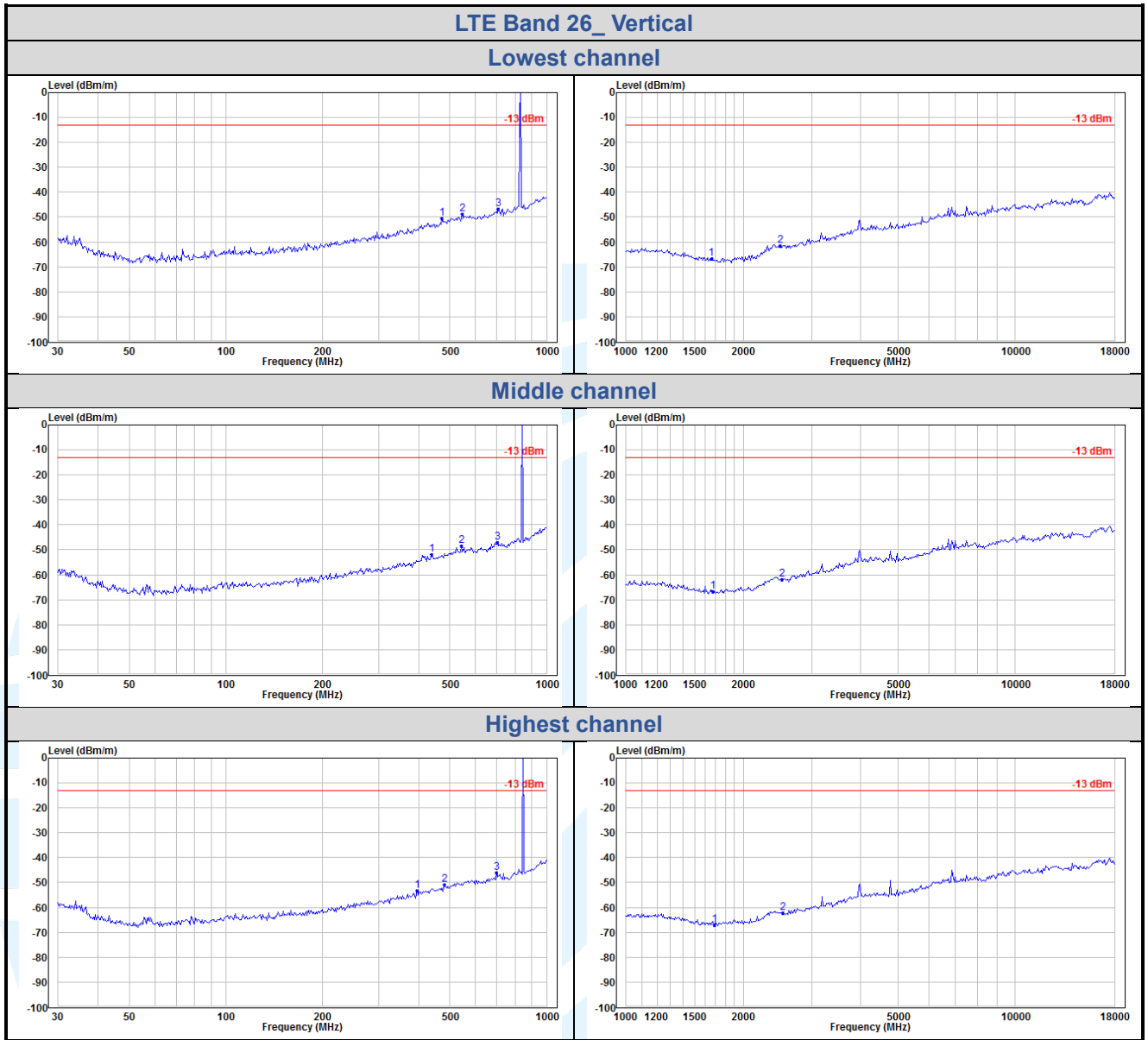
5.8.6 LTE Band 25



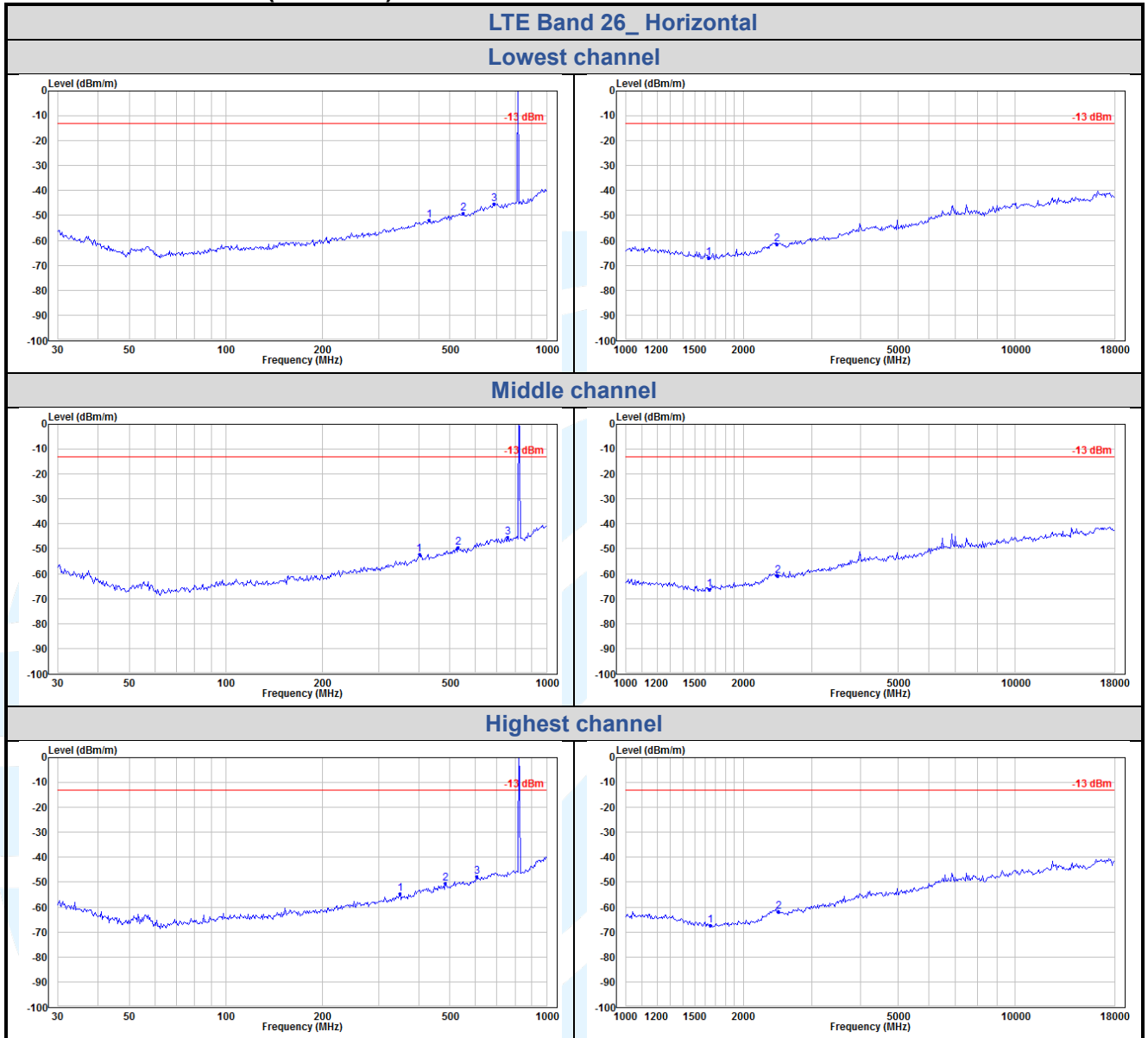


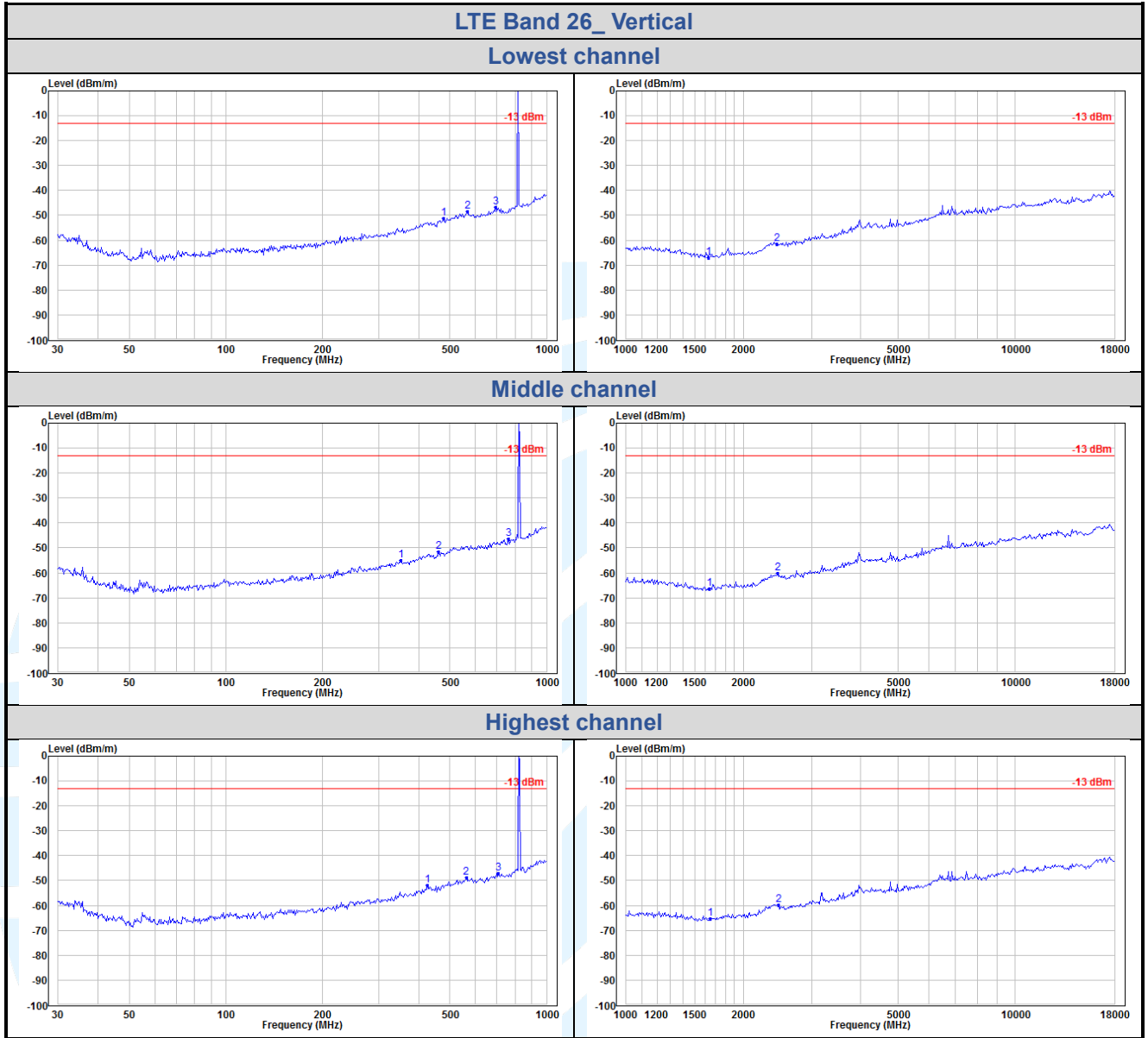
5.8.7 LTE Band 26



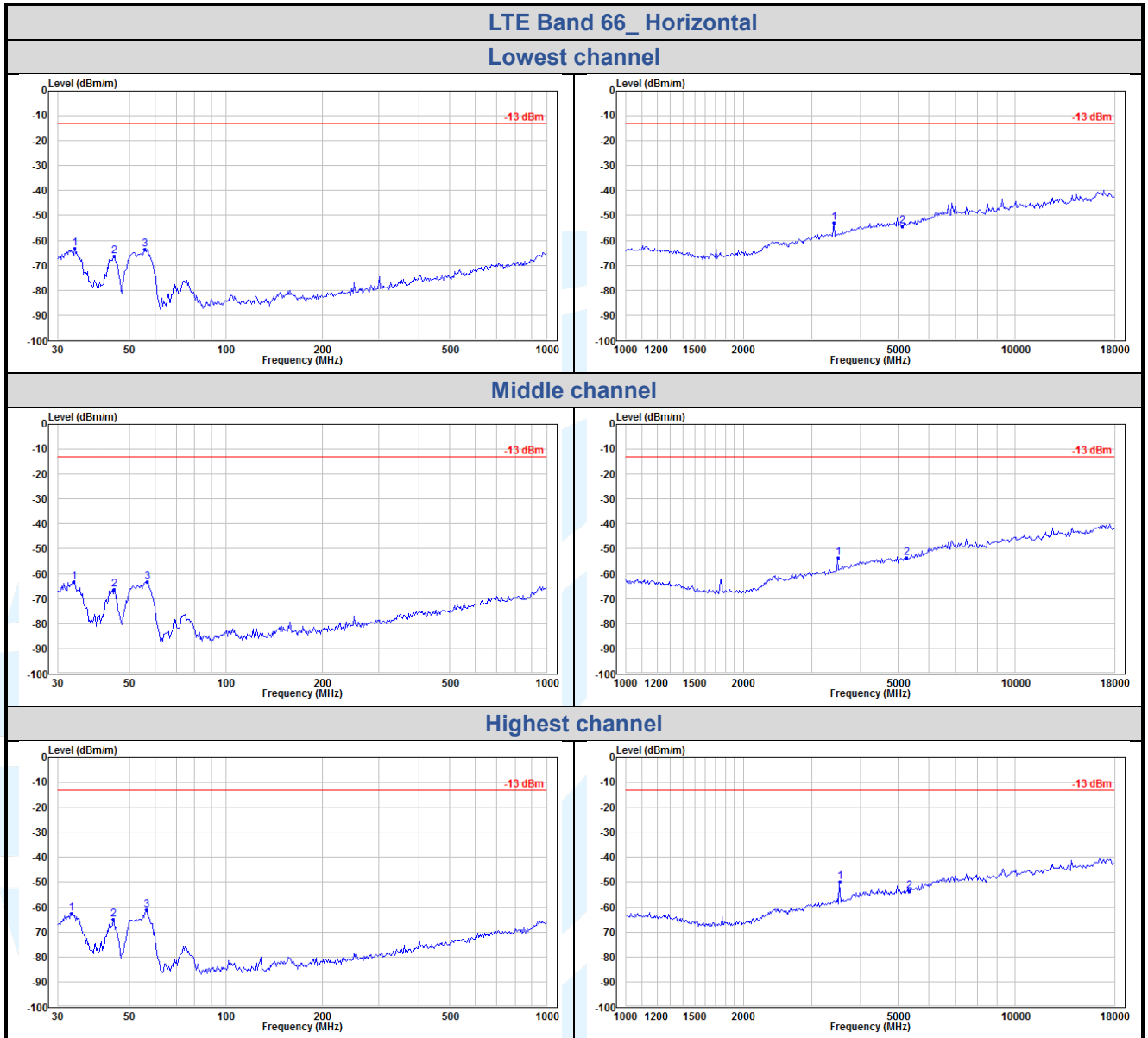


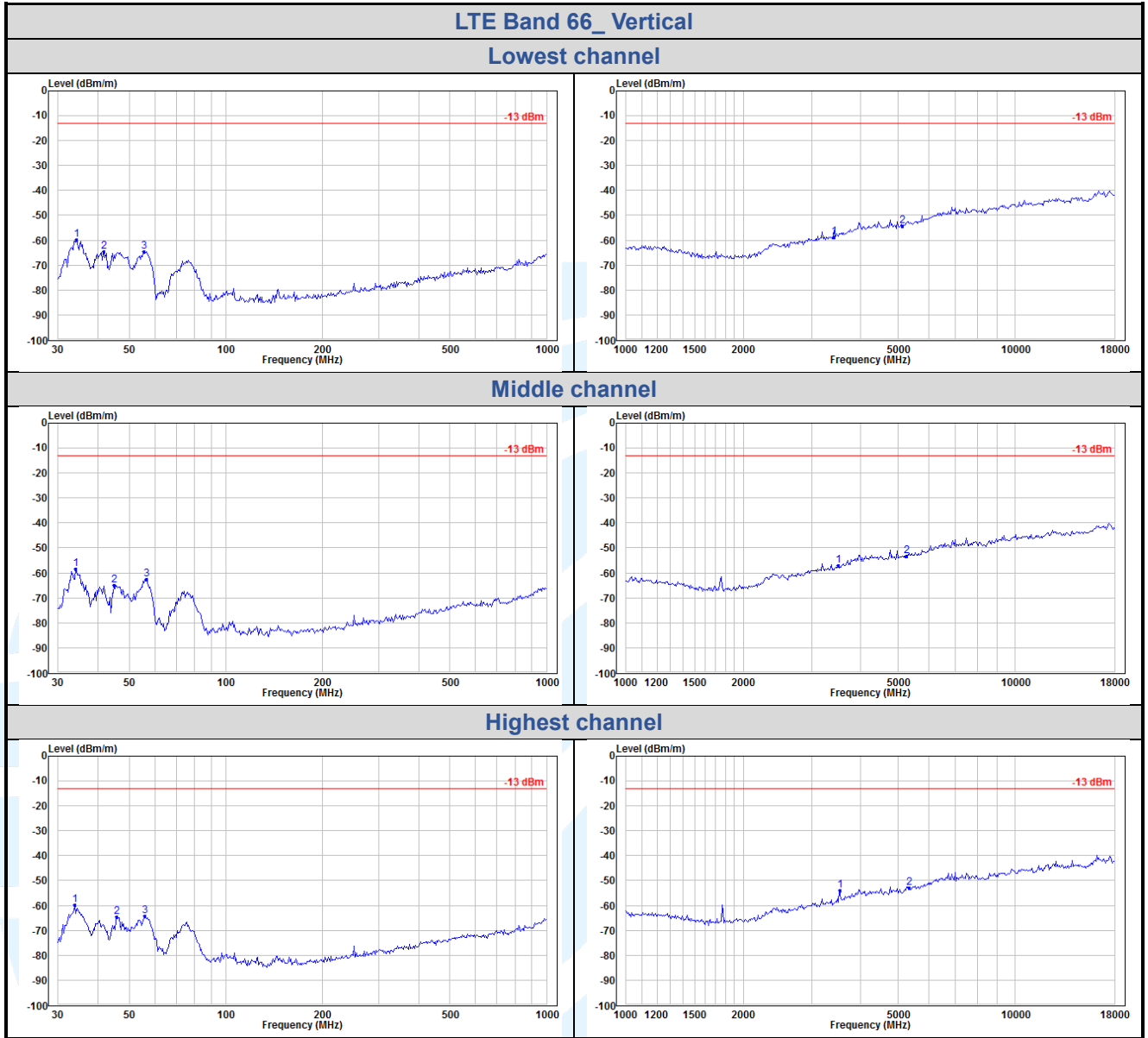
5.8.8 LTE Band 26(Part 90S)





5.8.9 LTE Band 66





5.9 FREQUENCY STABILITY

FCC 47 CFR Part 2.1055 &
 FCC 47 CFR Part 22.355 &
 FCC 47 CFR Part 24.235 &
 FCC 47 CFR Part 27.54,

Test Requirement:

LTE Band 2 & LTE Band 25: RSS-133 Issue 6, Section 6.3
LTE Band 4 & LTE Band 66: RSS-139 Issue 3, Section 6.4
LTE Band 5: RSS-132 Issue 3, Section 5.3
LTE Band 12 & LTE Band 13: RSS-130 Issue 2, Section 4.5

Test Method:

ANSI C63.26-2015 & KDB 971168 D01v03r01

Limits:

FCC 47 CFR Part 22.355, FCC 47 CFR Par 90.213

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

FCC 47 CFR Part 24.235, FCC 47 CFR Part 27.54

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

RSS-132 Issue 3, Section 5.3:

The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations and ± 1.5 ppm for base stations

RSS-133 Issue 6, Section 6.3:

The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations.

RSS-139 Issue 3, Section 6.4, RSS-130 Issue 2, Section 4.5:

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

Test Setup: Refer to section 4.2.2 for details.

Test Procedures:

- 1) Use CMW 500 or CMU 200 with Frequency Error measurement capability.
 - a) Temp. = -30° to $+50^{\circ}\text{C}$
 - b) Voltage = low voltage, 2.55 Vdc, Normal, 3.8 Vdc and High voltage, 4.6Vdc.

2) Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

3) Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

Equipment Used: Refer to section 3 for details.

Test Result: Pass

5.9.1 LTE Band 2

Modulation	Channel/ Frequency (MHz)	Voltage	Temperature	Deviation	Deviation	Limit	Pass/ Fail
		(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 2 / 20MHz / Full RB							
QPSK	18900 / 1880.0	VL	TN	4.21	0.0022	N/A	Pass
		VN		5.74	0.0031		Pass
		VH		4.33	0.0023		Pass
		VN	50	6.45	0.0034		Pass
			40	5.86	0.0031		Pass
			30	5.68	0.0030		Pass
			20	5.21	0.0028		Pass
			10	4.54	0.0024		Pass
			0	4.32	0.0023		Pass
			-10	-1.23	-0.0007		Pass
			-20	-2.34	-0.0012		Pass
			-30	-3.43	-0.0018		Pass

5.9.2 LTE Band 4

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Pass/ Fail
QPSK	20175 / 1732.5	VL	TN	-5.66	-0.0033	N/A	Pass
		VN		-4.53	-0.0026		Pass
		VH		-5.43	-0.0031		Pass
		VN	50	-10.22	-0.0059		Pass
			40	-8.43	-0.0049		Pass
			30	-5.21	-0.0030		Pass
			20	-6.35	-0.0037		Pass
			10	-6.76	-0.0039		Pass
			0	-7.43	-0.0043		Pass
			-10	-7.86	-0.0045		Pass
			-20	-8.90	-0.0051		Pass
			-30	-9.65	-0.0056		Pass

5.9.3 LTE Band 5

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
QPSK	20525 / 836.5	VL	TN	7.48	0.0089	± 2.5	Pass
		VN		5.85	0.0070	± 2.5	Pass
		VH		5.96	0.0071	± 2.5	Pass
		VN	50	7.43	0.0089	± 2.5	Pass
			40	6.52	0.0078	± 2.5	Pass
			30	5.79	0.0069	± 2.5	Pass
			20	4.32	0.0052	± 2.5	Pass
			10	3.98	0.0048	± 2.5	Pass
			0	-2.01	-0.0024	± 2.5	Pass
			-10	-2.58	-0.0031	± 2.5	Pass
			-20	-3.41	-0.0041	± 2.5	Pass
			-30	1.60	0.0019	± 2.5	Pass

5.9.4 LTE Band 12

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
LTE Band 12 / 10MHz / Full RB							
QPSK	23095 / 707.5	VL	TN	-4.64	-0.0066	N/A	Pass
		VN		-4.19	-0.0059		Pass
		VH		-3.98	-0.0056		Pass
		VN	50	-6.45	-0.0091		Pass
			40	-3.65	-0.0052		Pass
			30	-4.18	-0.0059		Pass
			20	-3.78	-0.0053		Pass
			10	-5.43	-0.0077		Pass
			0	-3.88	-0.0055		Pass
			-10	-5.45	-0.0077		Pass
			-20	-5.67	-0.0080		Pass
			-30	-1.83	-0.0026		Pass

5.9.5 LTE Band 13

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
LTE Band 13 / 10MHz / Full RB							
QPSK	23230 / 782	VL	TN	-3.22	-0.0041	N/A	Pass
		VN		-5.12	-0.0065		Pass
		VH		-5.43	-0.0069		Pass
		VN	50	-3.54	-0.0045		Pass
			40	-2.31	-0.0030		Pass
			30	-4.98	-0.0064		Pass
			20	-2.67	-0.0034		Pass
			10	-4.75	-0.0061		Pass
			0	-3.01	-0.0038		Pass
			-10	-3.18	-0.0041		Pass
			-20	-4.52	-0.0058		Pass
			-30	-5.02	-0.0064		Pass

5.9.6 LTE Band 25

Modulation	Channel/ Frequency (MHz)	Voltage	Temperature	Deviation	Deviation	Limit	Result
		(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 25 / 20MHz / Full RB							
QPSK	26340 / 1880.0	VL	TN	4.55	0.0024	N/A	Pass
		VN		5.76	0.0031		Pass
		VH		5.55	0.0030		Pass
		VN	50	6.43	0.0034		Pass
			40	6.01	0.0032		Pass
			30	5.67	0.0030		Pass
			20	5.56	0.0030		Pass
			10	4.09	0.0022		Pass
			0	3.12	0.0017		Pass
			-10	-1.32	-0.0007		Pass
			-20	-1.56	-0.0008		Pass
			-30	3.76	0.0020		Pass

5.9.7 LTE Band 26

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
LTE Band 26 / 15MHz / Full RB							
QPSK	26915 / 836.5	VL	TN	-8.67	-0.0104	± 2.5	Pass
		VN		-8.21	-0.0098	± 2.5	Pass
		VH		-8.08	-0.0097	± 2.5	Pass
		VN	50	-5.49	-0.0066	± 2.5	Pass
			40	-6.38	-0.0076	± 2.5	Pass
			30	-8.11	-0.0097	± 2.5	Pass
			20	-10.32	-0.0123	± 2.5	Pass
			10	-9.42	-0.0113	± 2.5	Pass
			0	-10.54	-0.0126	± 2.5	Pass
			-10	-10.76	-0.0129	± 2.5	Pass
			-20	-12.30	-0.0147	± 2.5	Pass
			-30	-2.23	-0.0027	± 2.5	Pass

5.9.8 LTE Band 26 (Part 90S)

Modulation	Channel/ Frequency (MHz)	Voltage (Vdc)	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Result
LTE Band 26 / 10MHz / Full RB							
QPSK	26740 / 819	VL	TN	-10.12	-0.0124	± 2.5	Pass
		VN		-8.67	-0.0106	± 2.5	Pass
		VH		-9.32	-0.0114	± 2.5	Pass
		VN	50	-5.43	-0.0066	± 2.5	Pass
			40	-7.39	-0.0090	± 2.5	Pass
			30	-8.43	-0.0103	± 2.5	Pass
			20	-9.01	-0.0110	± 2.5	Pass
			10	-9.43	-0.0115	± 2.5	Pass
			0	-10.21	-0.0125	± 2.5	Pass
			-10	-11.32	-0.0138	± 2.5	Pass
			-20	-12.39	-0.0151	± 2.5	Pass
			-30	-11.34	-0.0138	± 2.5	Pass

5.9.9 LTE Band 66

Modulation	Channel/ Frequency (MHz)	Voltage	Temperature	Deviation	Deviation	Limit	Result
		(Vdc)	(°C)	(Hz)	(ppm)	(ppm)	
LTE Band 66 / 20MHz / Full RB							
QPSK	132322 / 1745	VL	TN	13.21	0.0076	N/A	Pass
		VN		11.65	0.0067		Pass
		VH		12.43	0.0071		Pass
		VN	50	14.53	0.0083		Pass
			40	12.89	0.0074		Pass
			30	11.62	0.0067		Pass
			20	8.90	0.0051		Pass
			10	5.47	0.0031		Pass
			0	0.93	0.0005		Pass
			-10	-2.14	-0.0012		Pass
			-20	-3.55	-0.0020		Pass
			-30	-4.37	-0.0025		Pass

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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