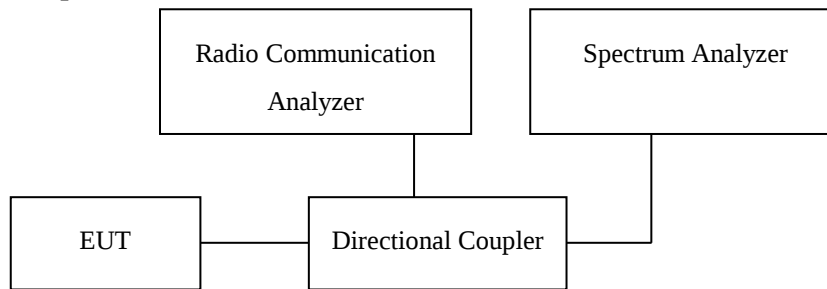


13. Conducted Spurious and Harmonic Emissions at Antenna Termianl

13.1 Operating environment

Temperature : 23 °C
Relative humidity : 47 % R.H.

13.2 Test set-up



(Configuration of conducted Emission measurement)

Conducted Spurious Emissions is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v04, April 9, 2018, Section 6.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The Conducted Spurious Emissions used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

Conduced spurious emissions

The EUT was setup to maximum output power. The 100 kHz RBW and 300 kHz VBW was used to scan from 30 MHz to 1 GHz. Also, the 1 MHz RBW and 3 MHz VBW was used to scan from 1 GHz to 26 GHz. The high, low and a middle channel were tested for out of band measurements.

13.3 Limits

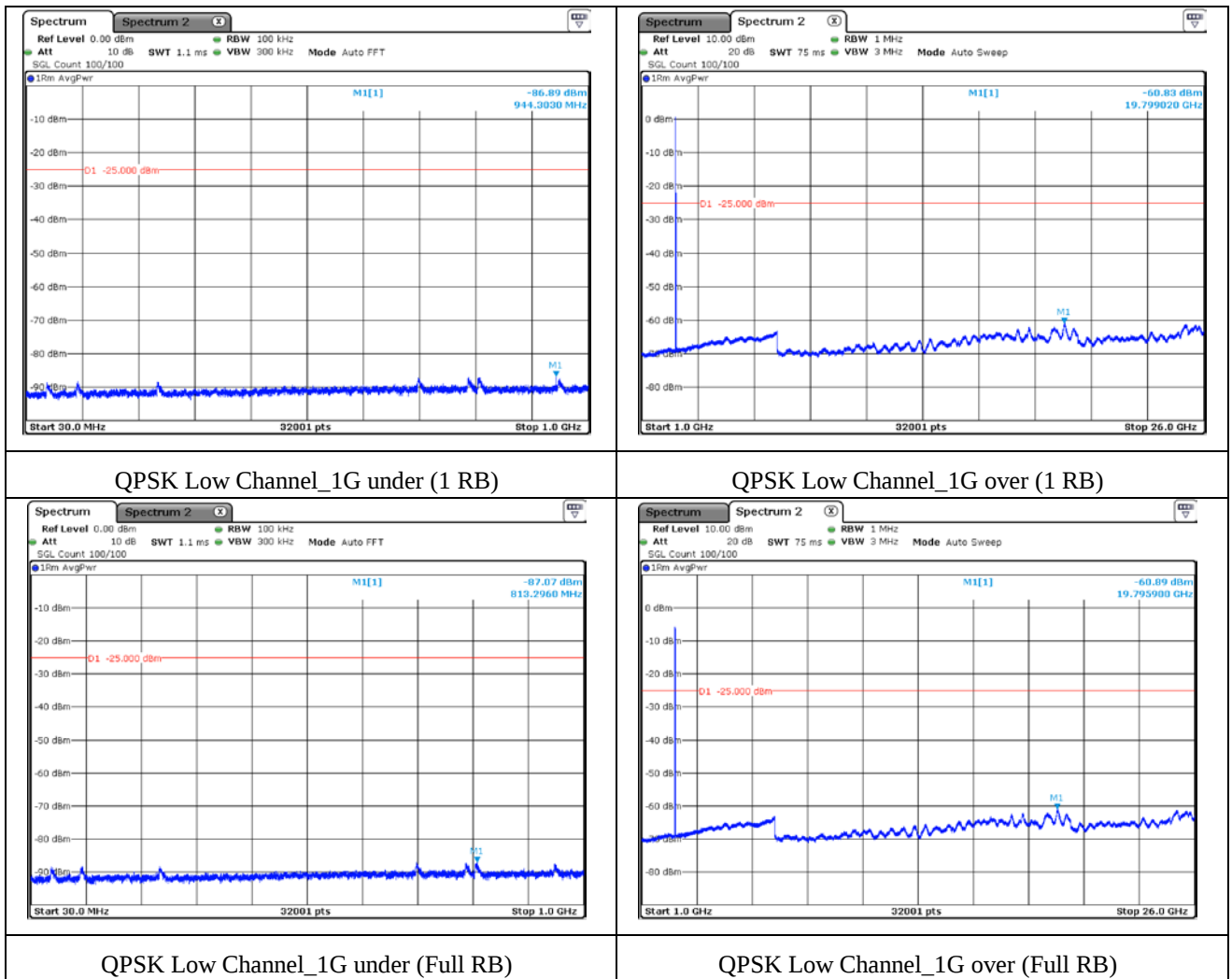
LTE -7 Rule Part 27.53(m)(4) For mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

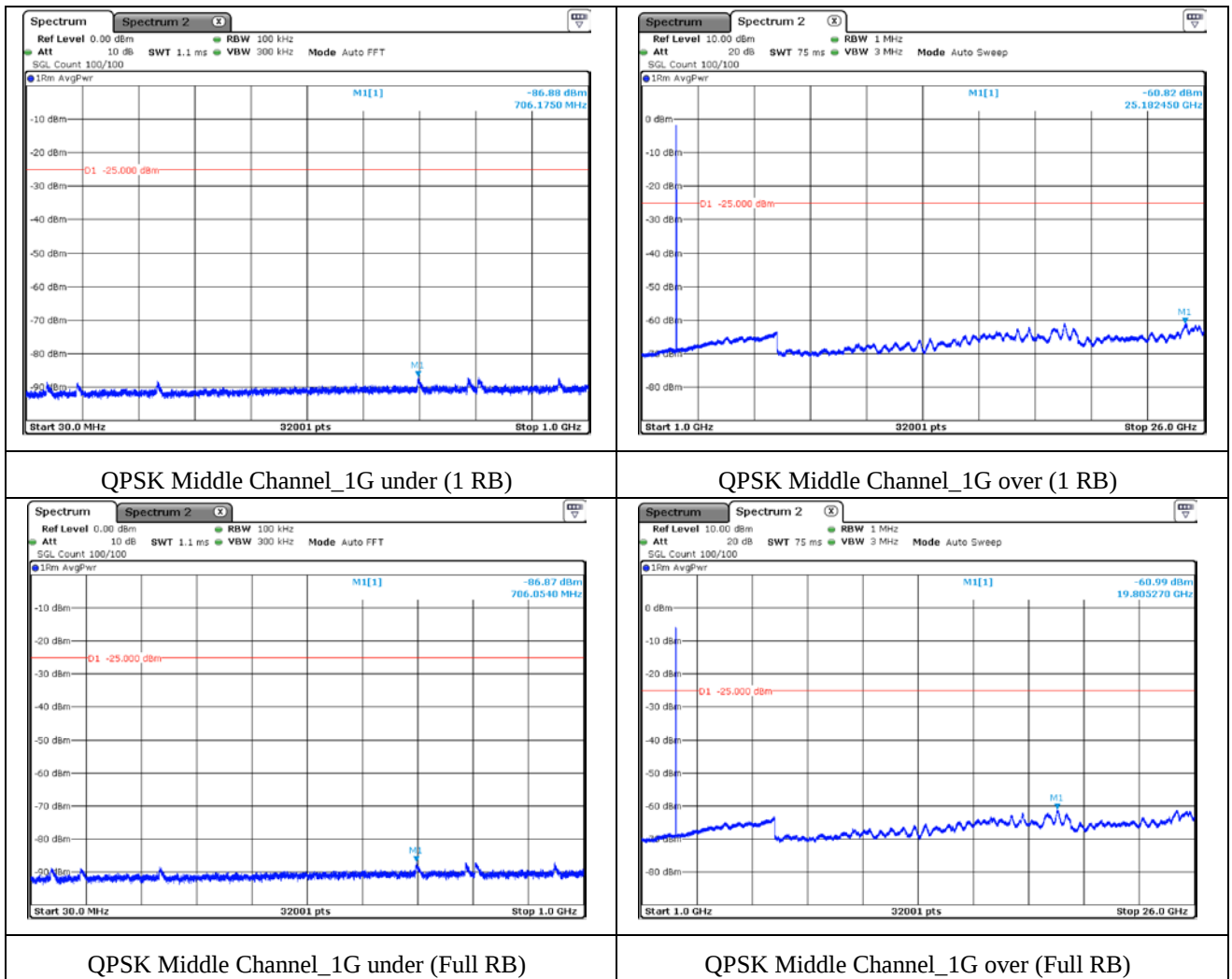
13.4 Test Date

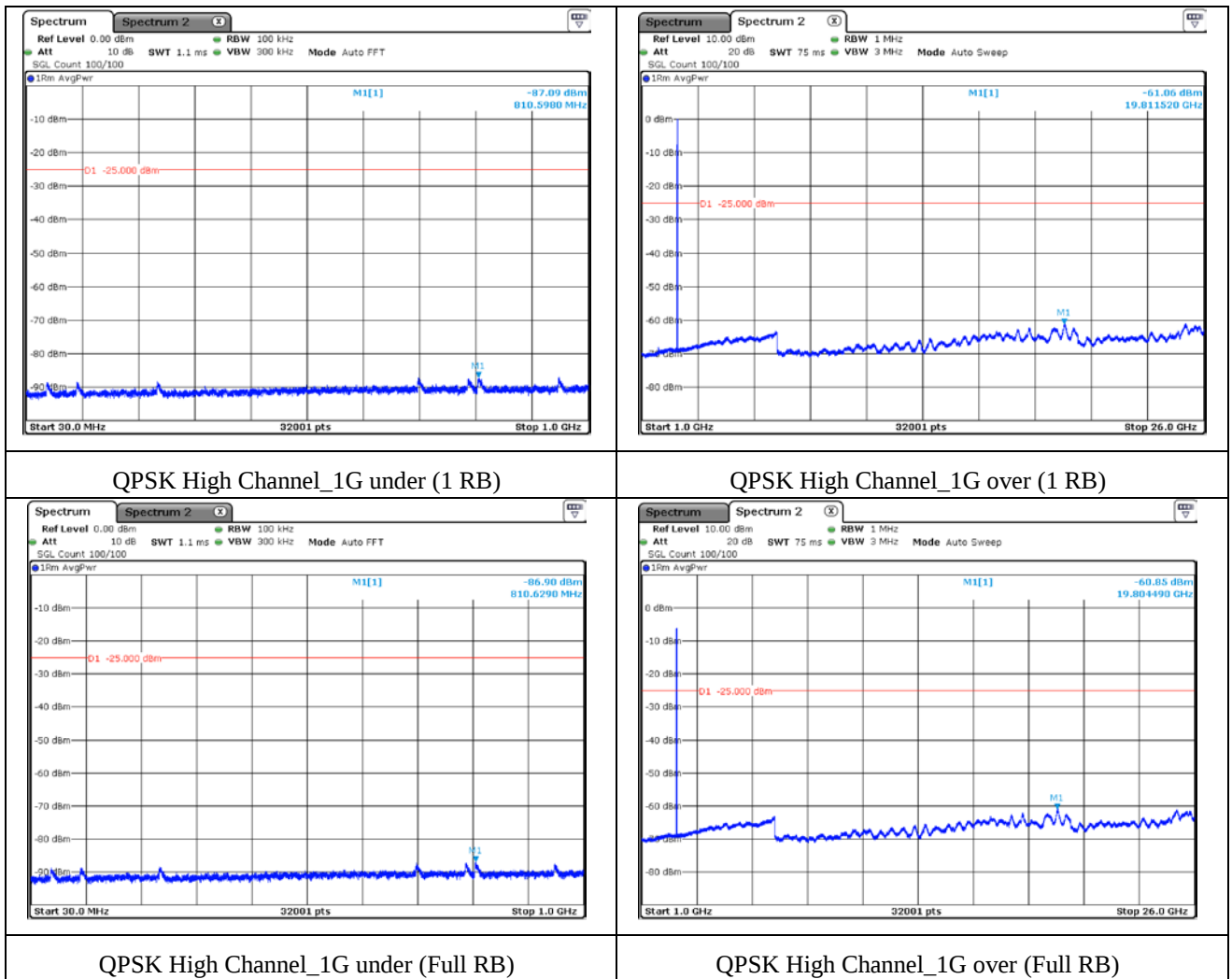
May 17, 2021 ~ May 28, 2021

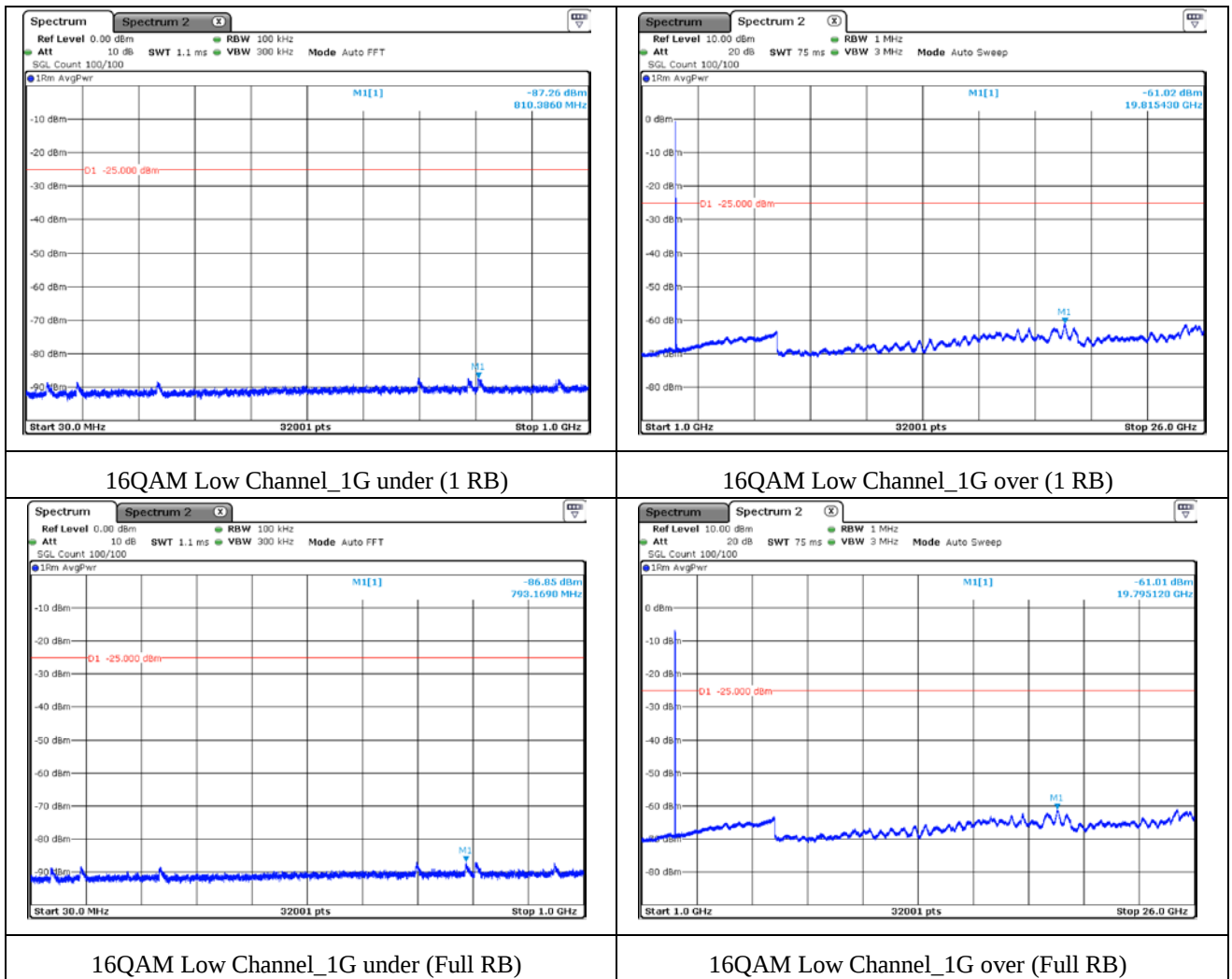
13.5 Test data for Band 7_Bandwidth 5 MHz

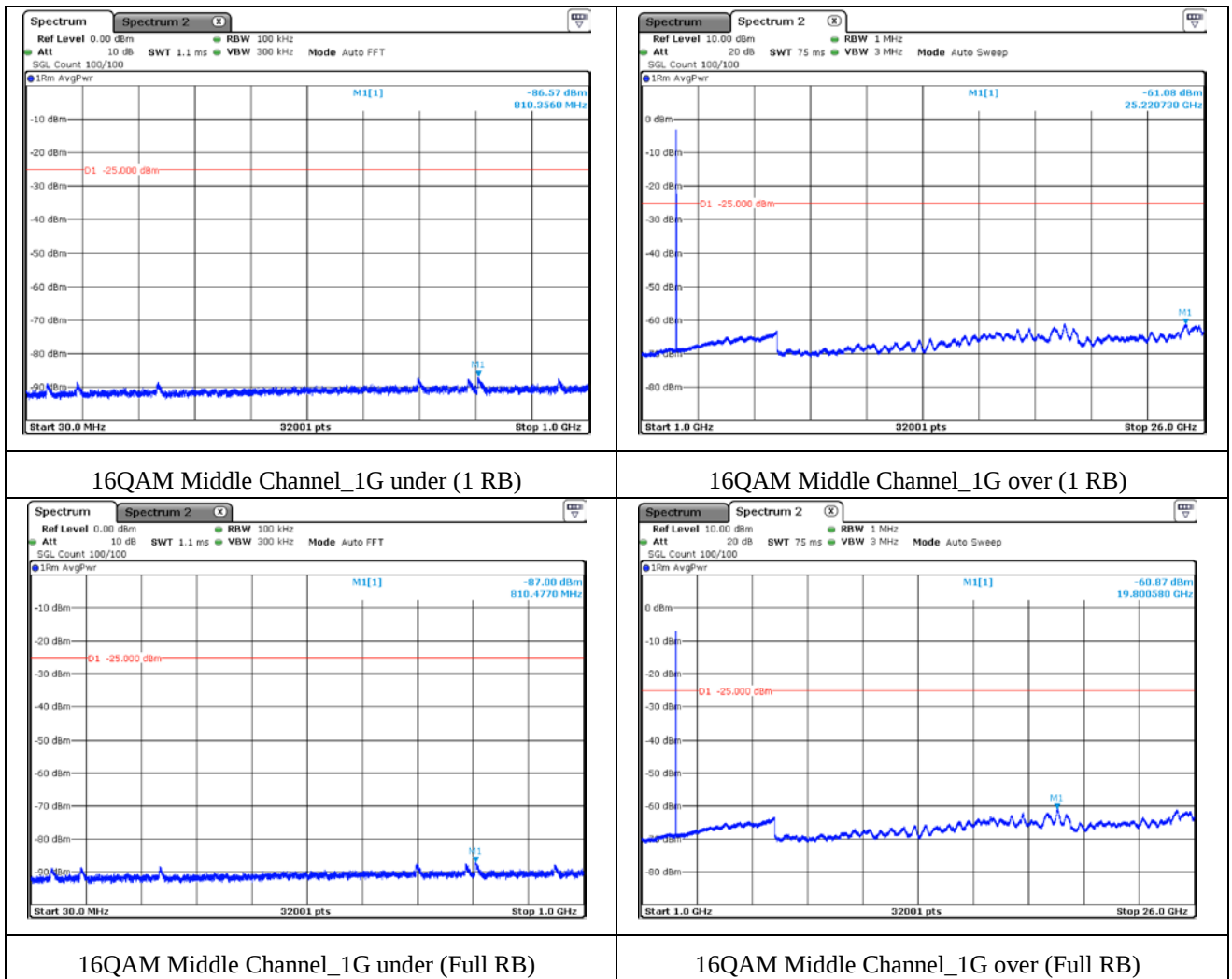
Test Mode	Channel	Frequency Range	Measured Value (dBm)	Cable Loss (dB)	Total Value (dBm)	Limit (dBm)	Result
LTE Band 7 QPSK							
1 RB	Low	30 MHz ~ 1 GHz	-86.89	20.87	-66.02	-25.00	PASS
		1 GHz ~ 26 GHz	-60.83	22.60	-38.23		PASS
	Middle	30 MHz ~ 1 GHz	-86.88	20.77	-66.11		PASS
		1 GHz ~ 26 GHz	-60.82	22.55	-38.27		PASS
	High	30 MHz ~ 1 GHz	-87.09	20.77	-66.32		PASS
		1 GHz ~ 26 GHz	-61.06	22.59	-38.47		PASS
Full RB	Low	30 MHz ~ 1 GHz	-87.07	20.68	-66.39	-25.00	PASS
		1 GHz ~ 26 GHz	-60.89	22.62	-38.27		PASS
	Middle	30 MHz ~ 1 GHz	-86.87	20.68	-66.19		PASS
		1 GHz ~ 26 GHz	-60.99	22.61	-38.38		PASS
	High	30 MHz ~ 1 GHz	-86.90	20.77	-66.13		PASS
		1 GHz ~ 26 GHz	-60.85	22.57	-38.28		PASS
LTE Band 7 16QAM							
1 RB	Low	30 MHz ~ 1 GHz	-87.26	20.88	-66.38	-25.00	PASS
		1 GHz ~ 26 GHz	-61.02	22.59	-38.43		PASS
	Middle	30 MHz ~ 1 GHz	-86.57	20.67	-65.90		PASS
		1 GHz ~ 26 GHz	-61.08	22.58	-38.50		PASS
	High	30 MHz ~ 1 GHz	-86.97	20.68	-66.29		PASS
		1 GHz ~ 26 GHz	-60.89	22.56	-38.33		PASS
Full RB	Low	30 MHz ~ 1 GHz	-86.85	20.68	-66.17	-25.00	PASS
		1 GHz ~ 26 GHz	-61.01	22.60	-38.41		PASS
	Middle	30 MHz ~ 1 GHz	-87.00	20.68	-66.32		PASS
		1 GHz ~ 26 GHz	-60.87	22.59	-38.28		PASS
	High	30 MHz ~ 1 GHz	-87.14	20.88	-66.26		PASS
		1 GHz ~ 26 GHz	-60.95	22.57	-38.38		PASS

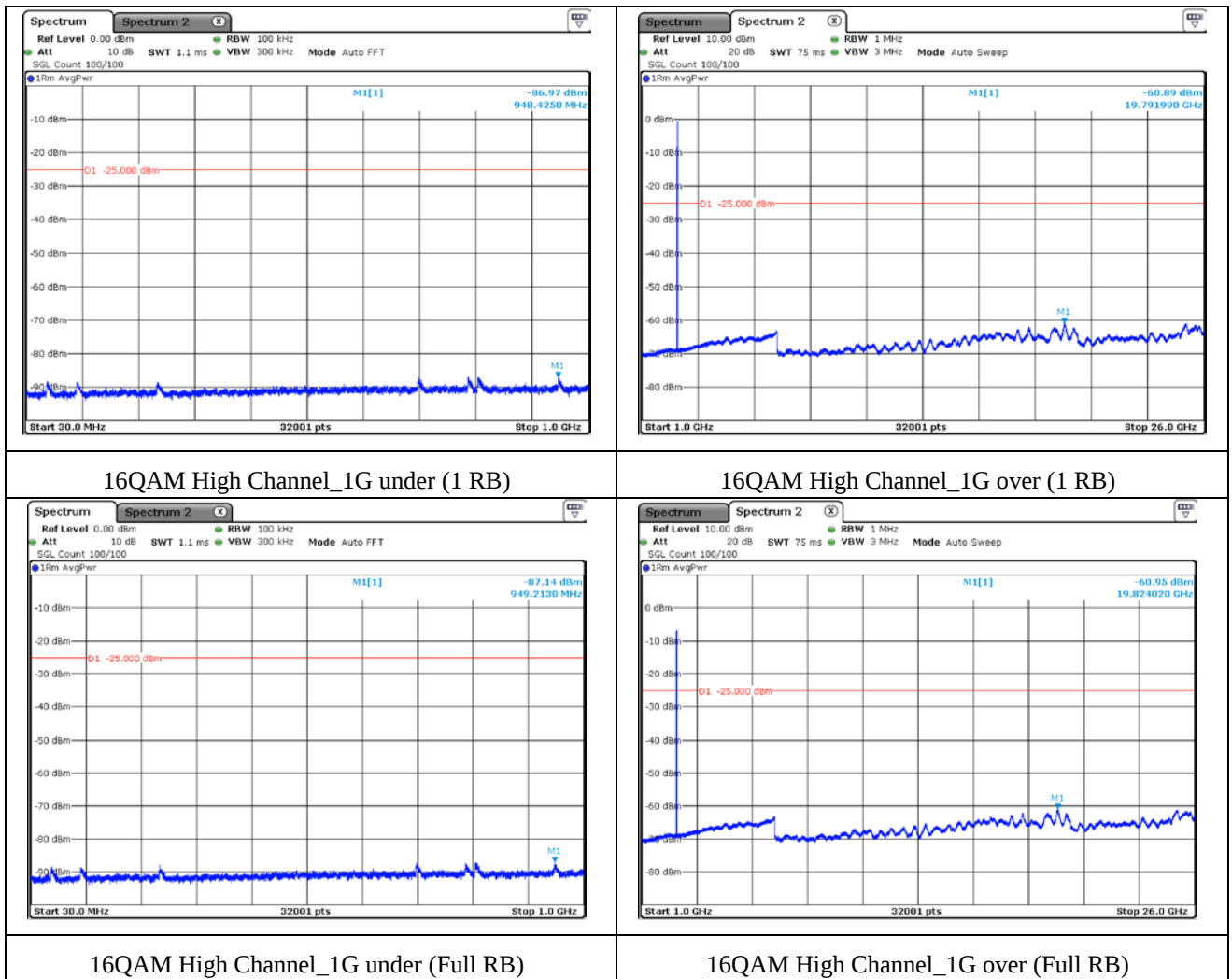






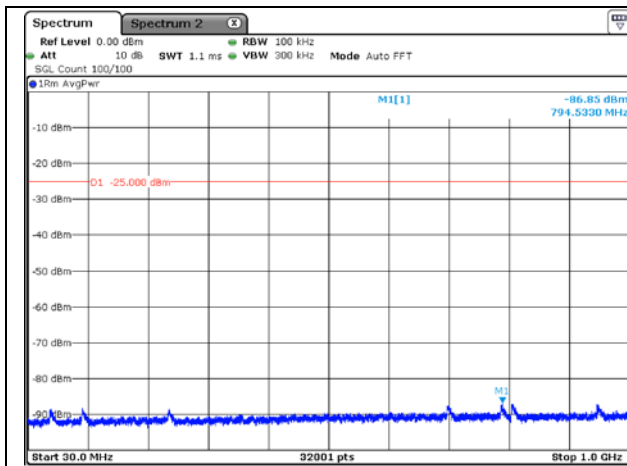




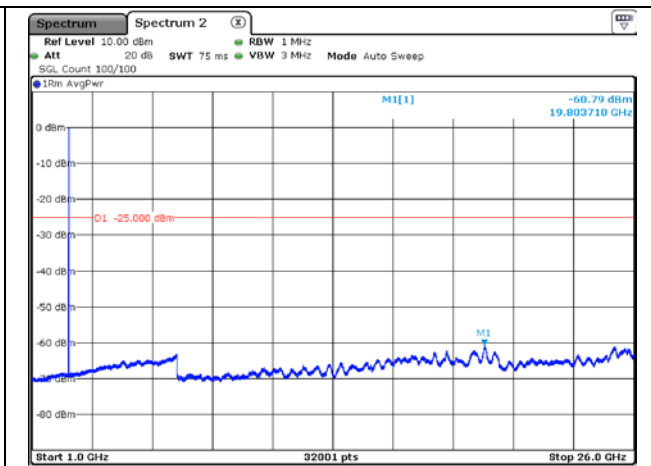


13.6 Test data for Band 7_Bandwidth 10 MHz

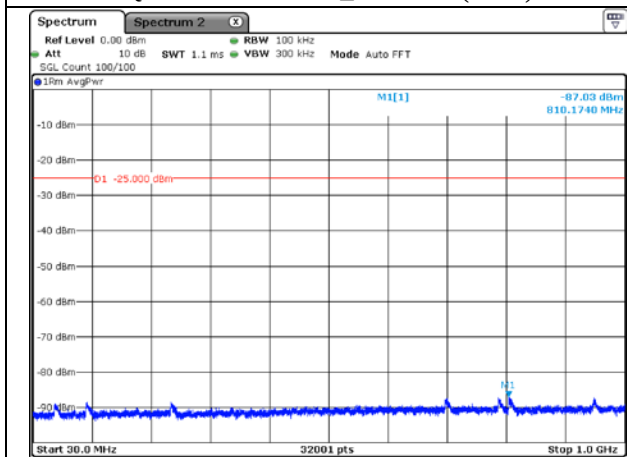
Test Mode	Channel	Frequency Range	Measured Value (dBm)	Cable Loss (dB)	Total Value (dBm)	Limit (dBm)	Result
LTE Band 7 QPSK							
1 RB	Low	30 MHz ~ 1 GHz	-86.85	20.88	-65.97	-25.00	PASS
		1 GHz ~ 26 GHz	-60.79	22.58	-38.21		PASS
	Middle	30 MHz ~ 1 GHz	-86.96	20.68	-66.28		PASS
		1 GHz ~ 26 GHz	-60.91	22.53	-38.38		PASS
	High	30 MHz ~ 1 GHz	-87.06	20.77	-66.29		PASS
		1 GHz ~ 26 GHz	-60.93	22.57	-38.36		PASS
Full RB	Low	30 MHz ~ 1 GHz	-87.03	20.68	-66.35	-25.00	PASS
		1 GHz ~ 26 GHz	-61.01	22.54	-38.47		PASS
	Middle	30 MHz ~ 1 GHz	-86.96	20.68	-66.28		PASS
		1 GHz ~ 26 GHz	-60.87	22.56	-38.31		PASS
	High	30 MHz ~ 1 GHz	-87.00	20.68	-66.32		PASS
		1 GHz ~ 26 GHz	-60.85	22.57	-38.28		PASS
LTE Band 7 16QAM							
1 RB	Low	30 MHz ~ 1 GHz	-86.66	20.68	-65.98	-25.00	PASS
		1 GHz ~ 26 GHz	-60.91	22.53	-38.38		PASS
	Middle	30 MHz ~ 1 GHz	-87.09	20.68	-66.41		PASS
		1 GHz ~ 26 GHz	-60.84	22.59	-38.25		PASS
	High	30 MHz ~ 1 GHz	-87.24	20.68	-66.56		PASS
		1 GHz ~ 26 GHz	-61.01	22.54	-38.47		PASS
Full RB	Low	30 MHz ~ 1 GHz	-87.10	20.88	-66.22	-25.00	PASS
		1 GHz ~ 26 GHz	-60.95	22.59	-38.36		PASS
	Middle	30 MHz ~ 1 GHz	-87.18	20.68	-66.50		PASS
		1 GHz ~ 26 GHz	-60.95	22.53	-38.42		PASS
	High	30 MHz ~ 1 GHz	-87.05	20.88	-66.17		PASS
		1 GHz ~ 26 GHz	-60.99	22.58	-38.41		PASS



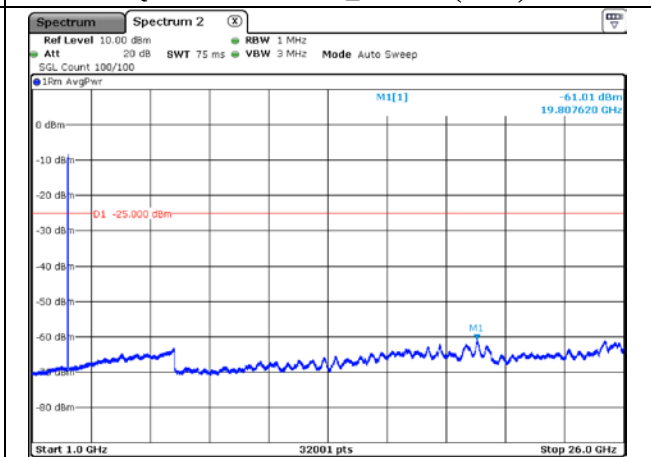
QPSK Low Channel_1G under (1 RB)



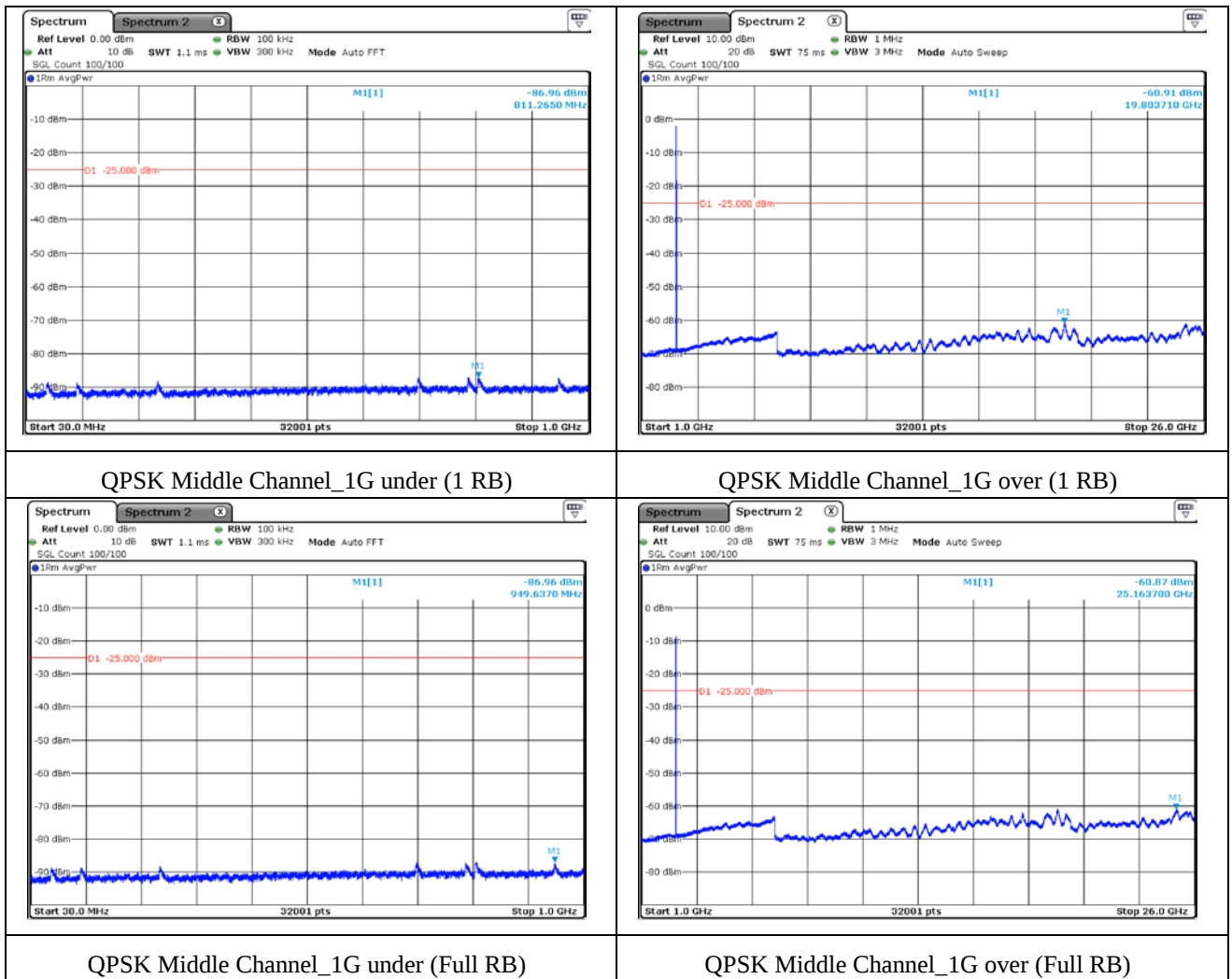
QPSK Low Channel_1G over (1 RB)

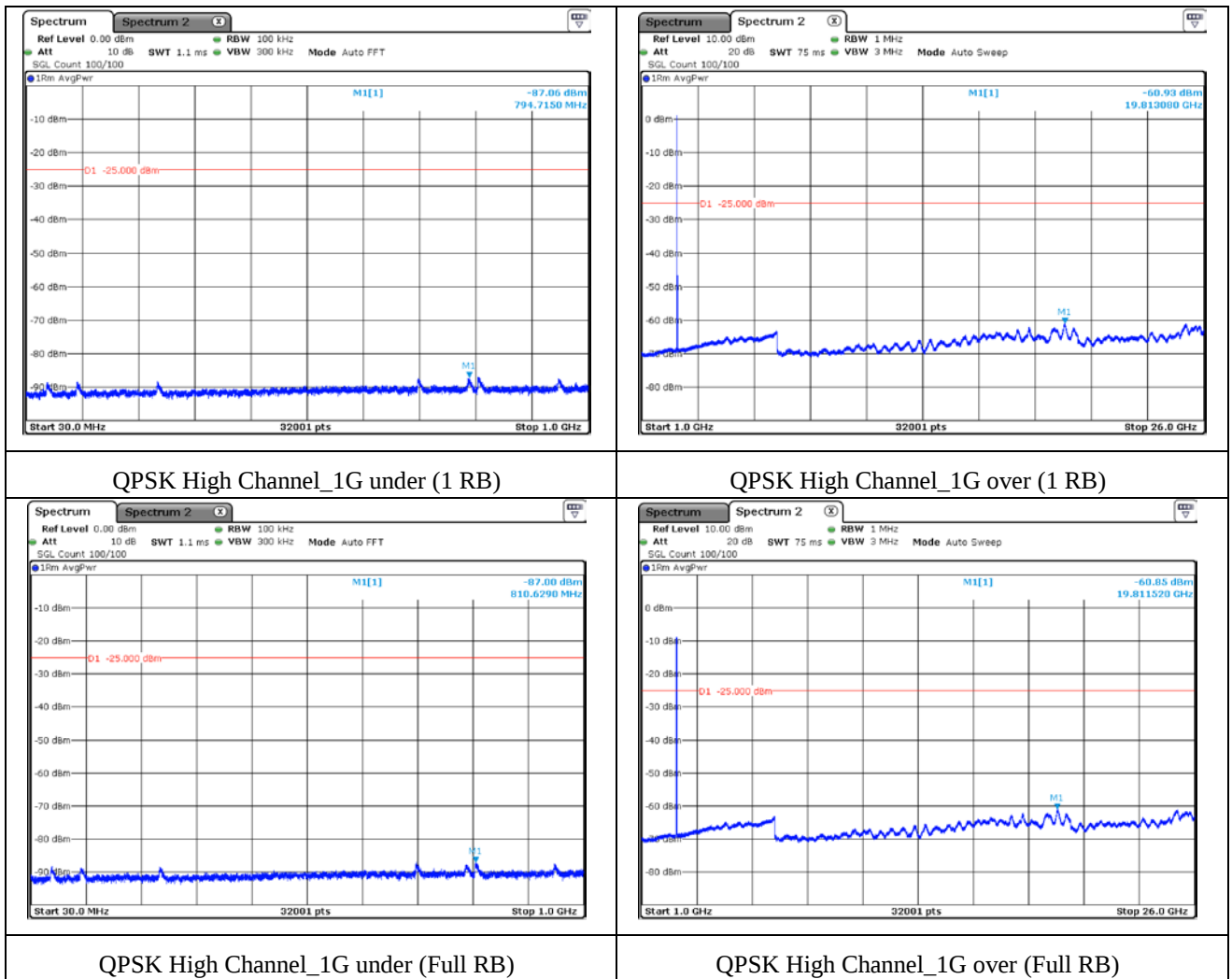


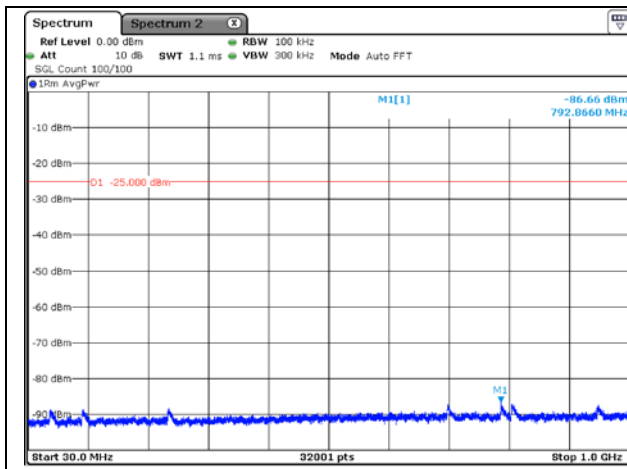
QPSK Low Channel_1G under (Full RB)



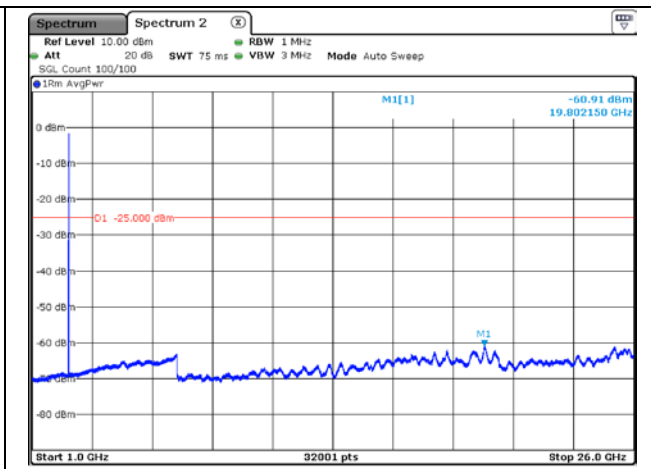
QPSK Low Channel_1G over (Full RB)



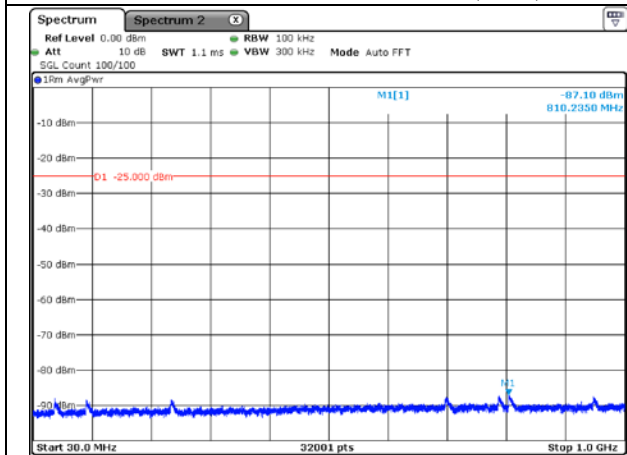




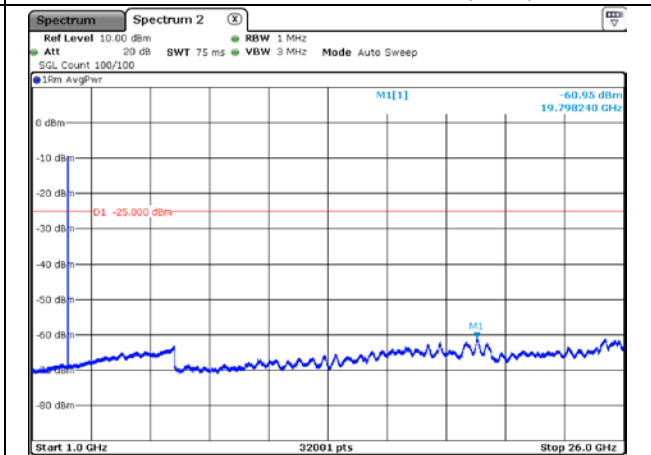
16QAM Low Channel_1G under (1 RB)



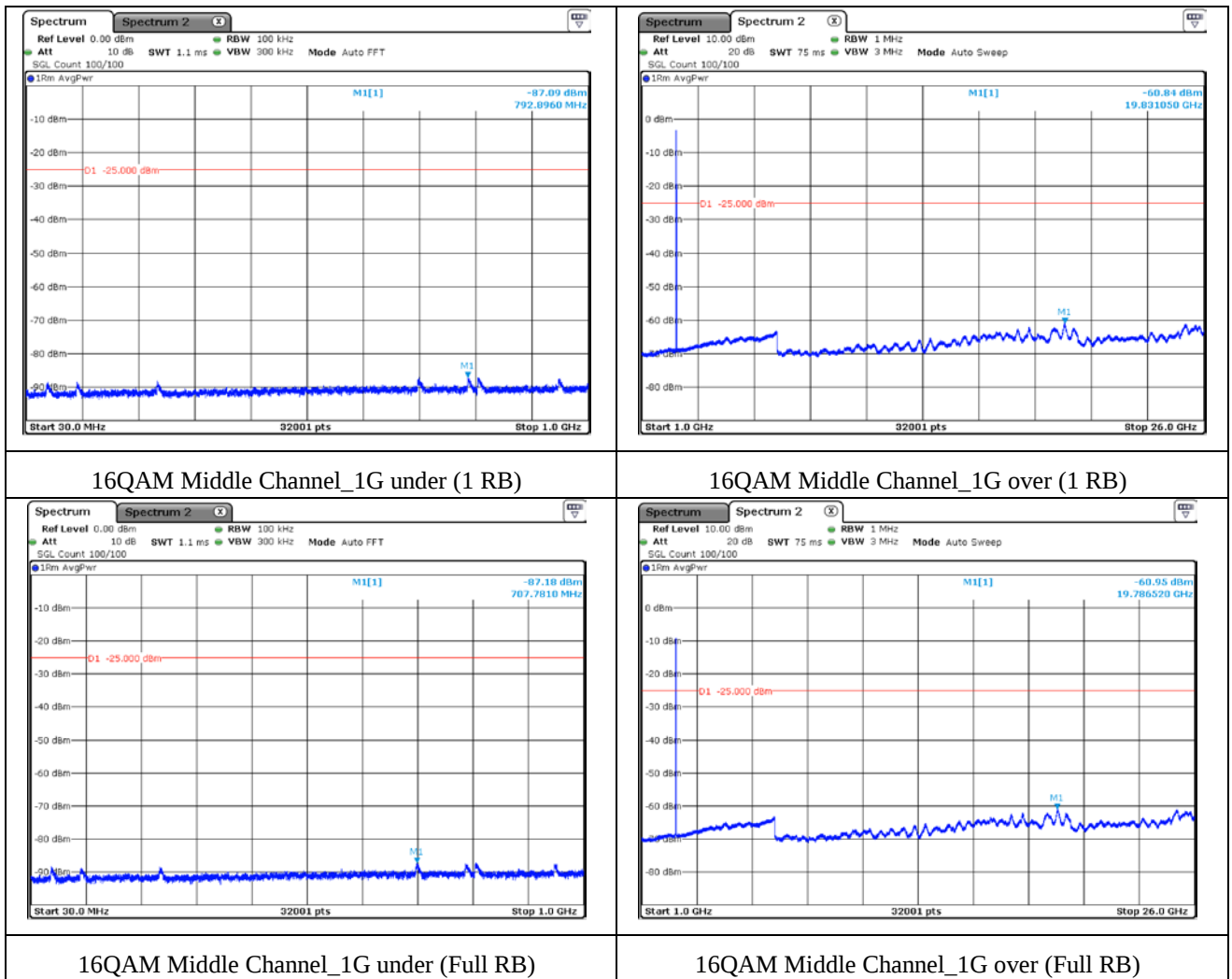
16QAM Low Channel_1G over (1 RB)

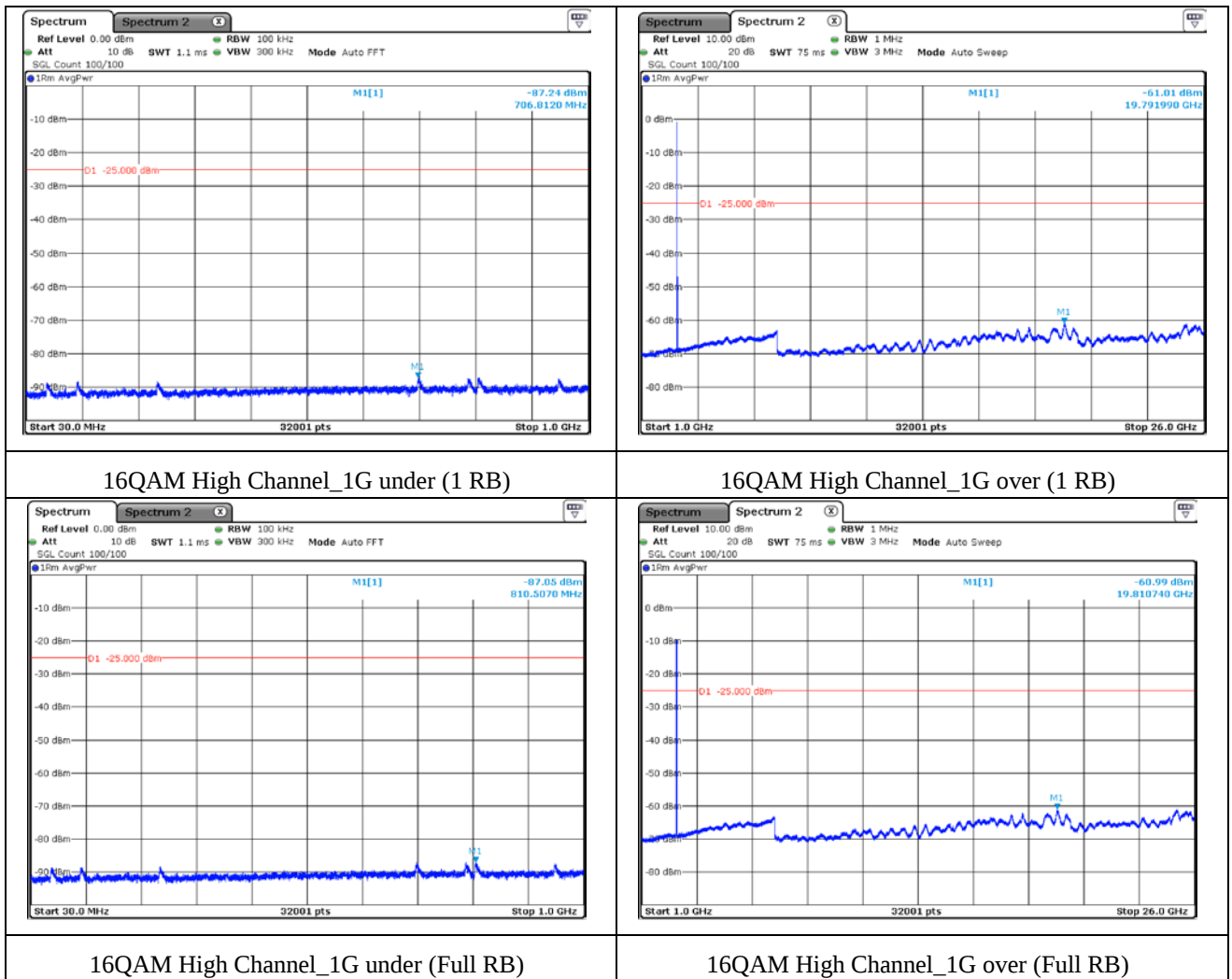


16QAM Low Channel_1G under (Full RB)



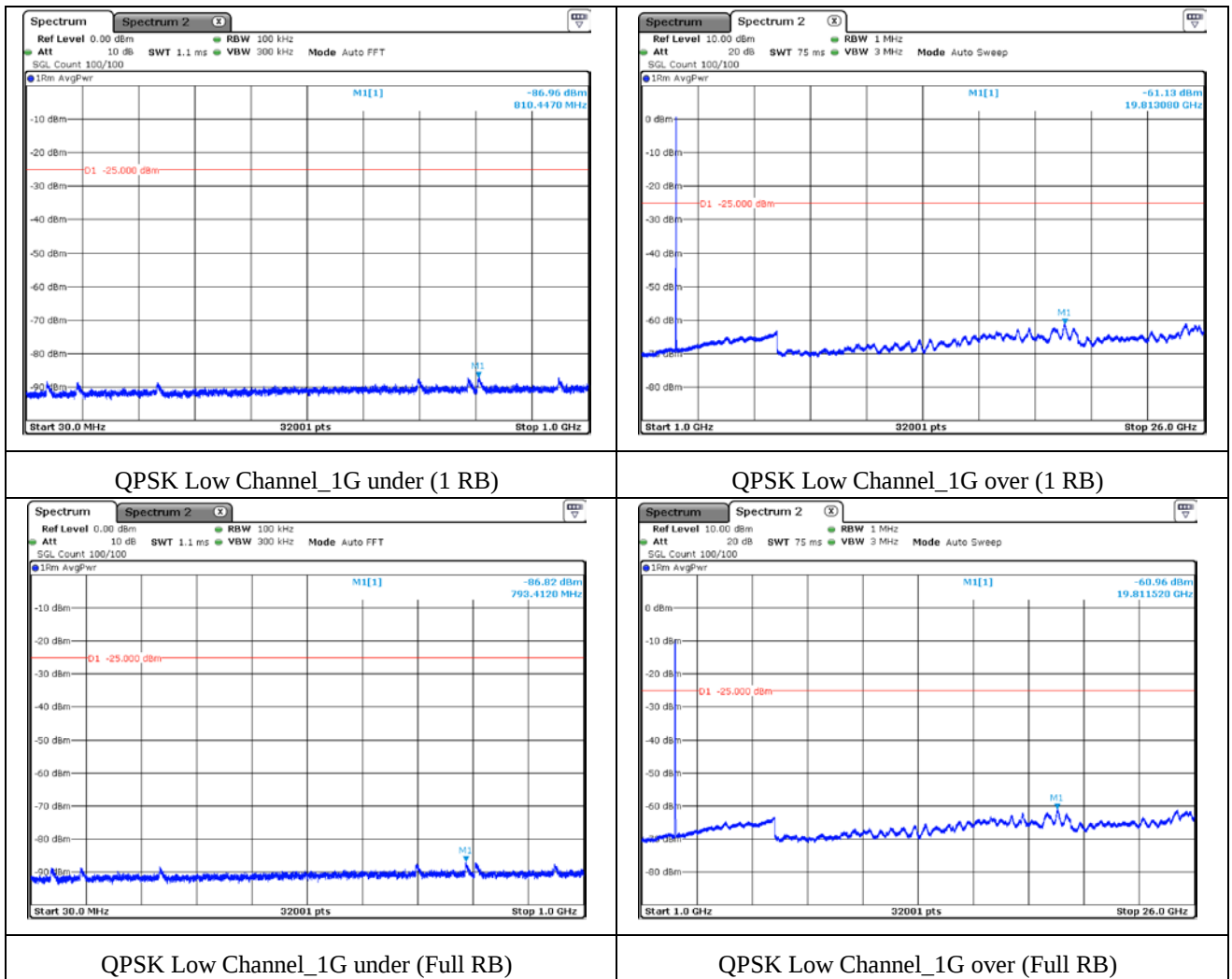
16QAM Low Channel_1G over (Full RB)

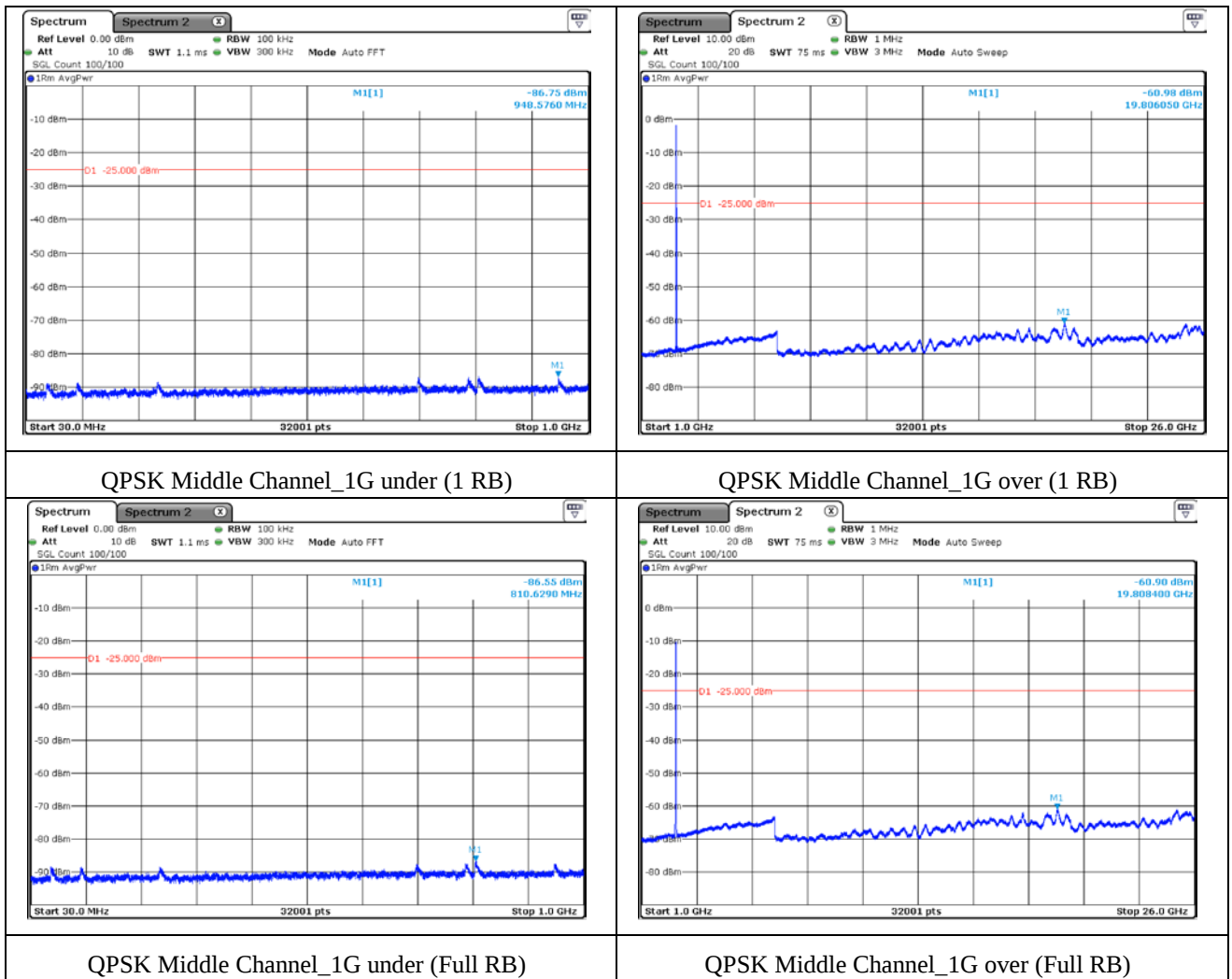


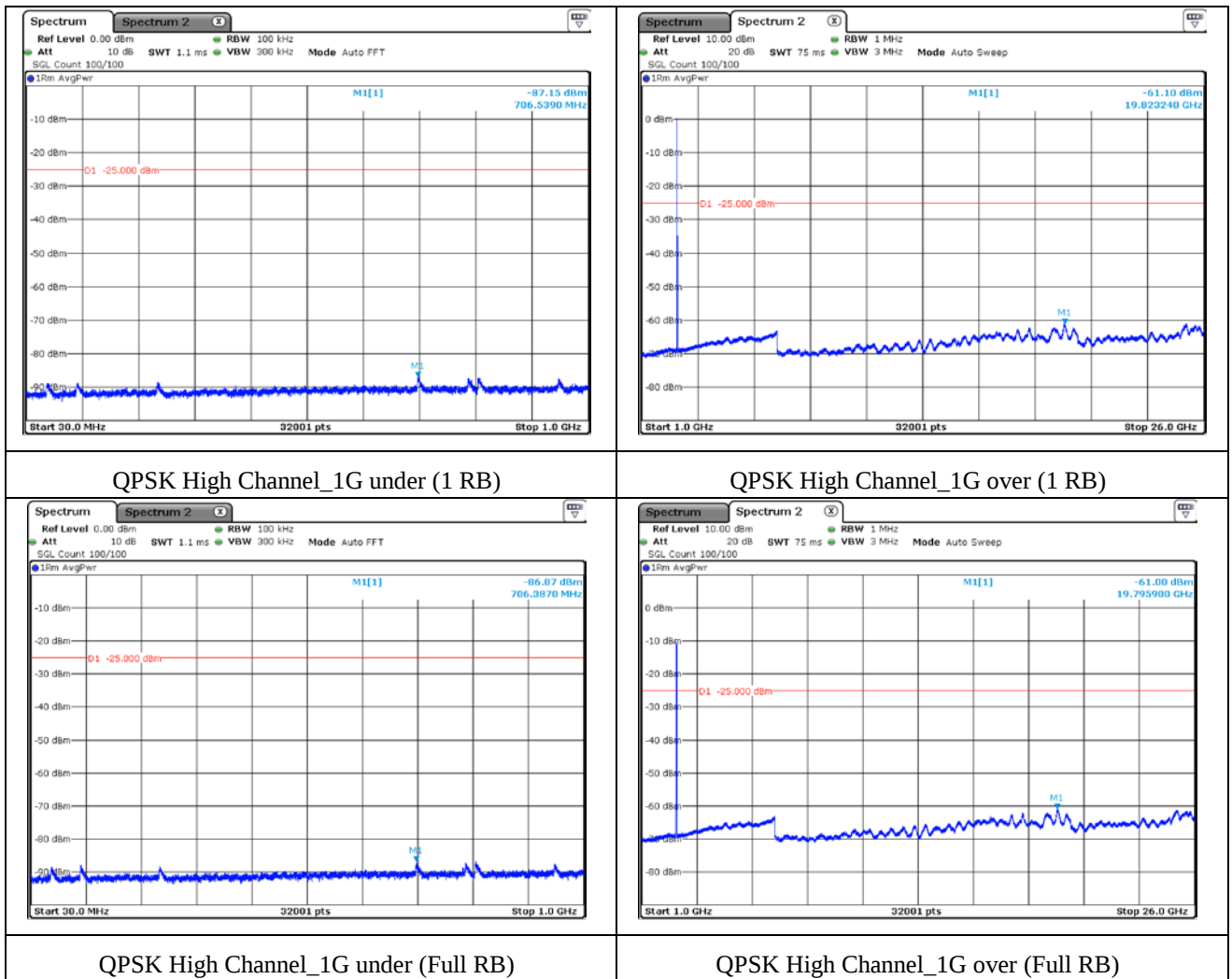


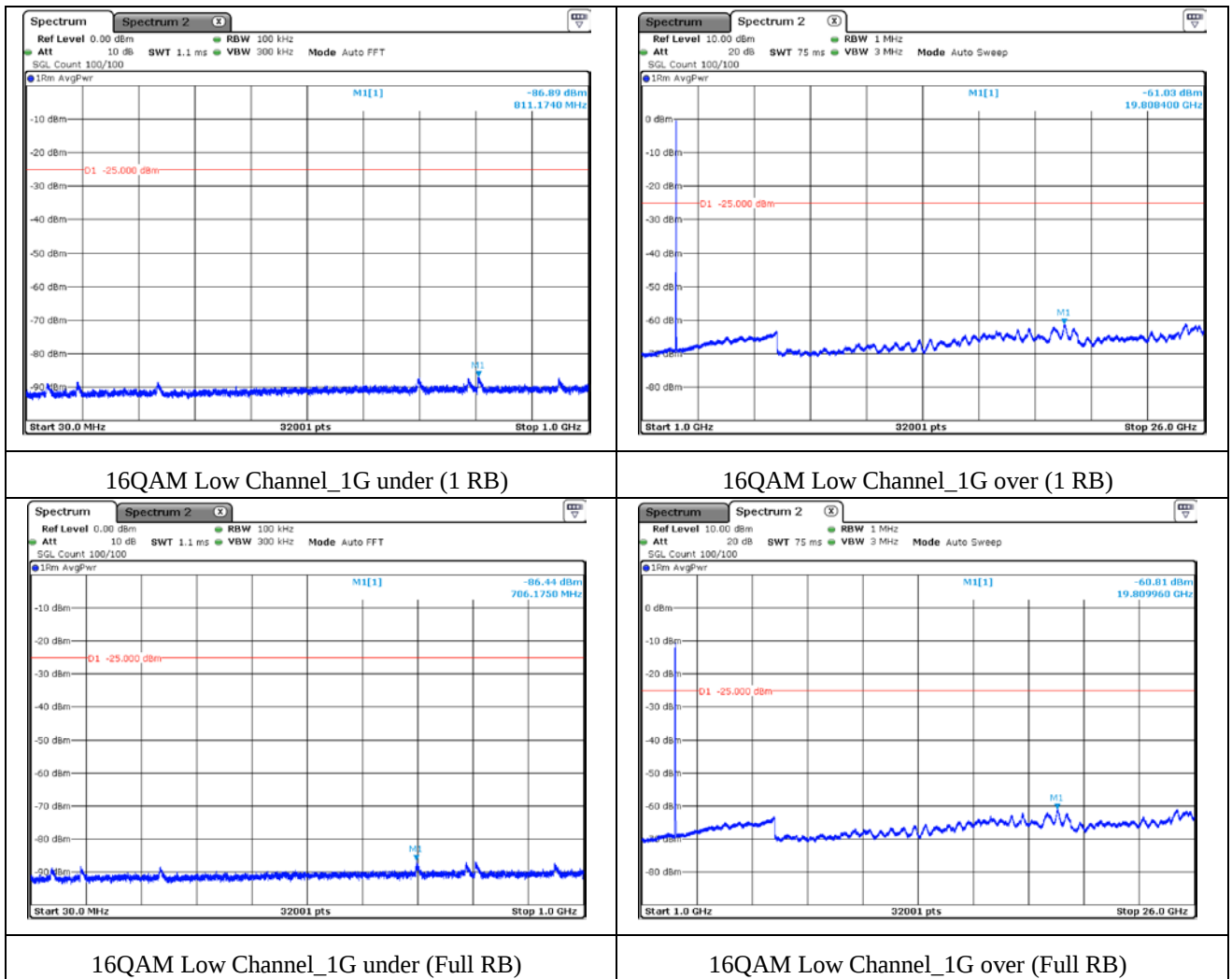
13.7 Test data for Band 7_Bandwidth 15 MHz

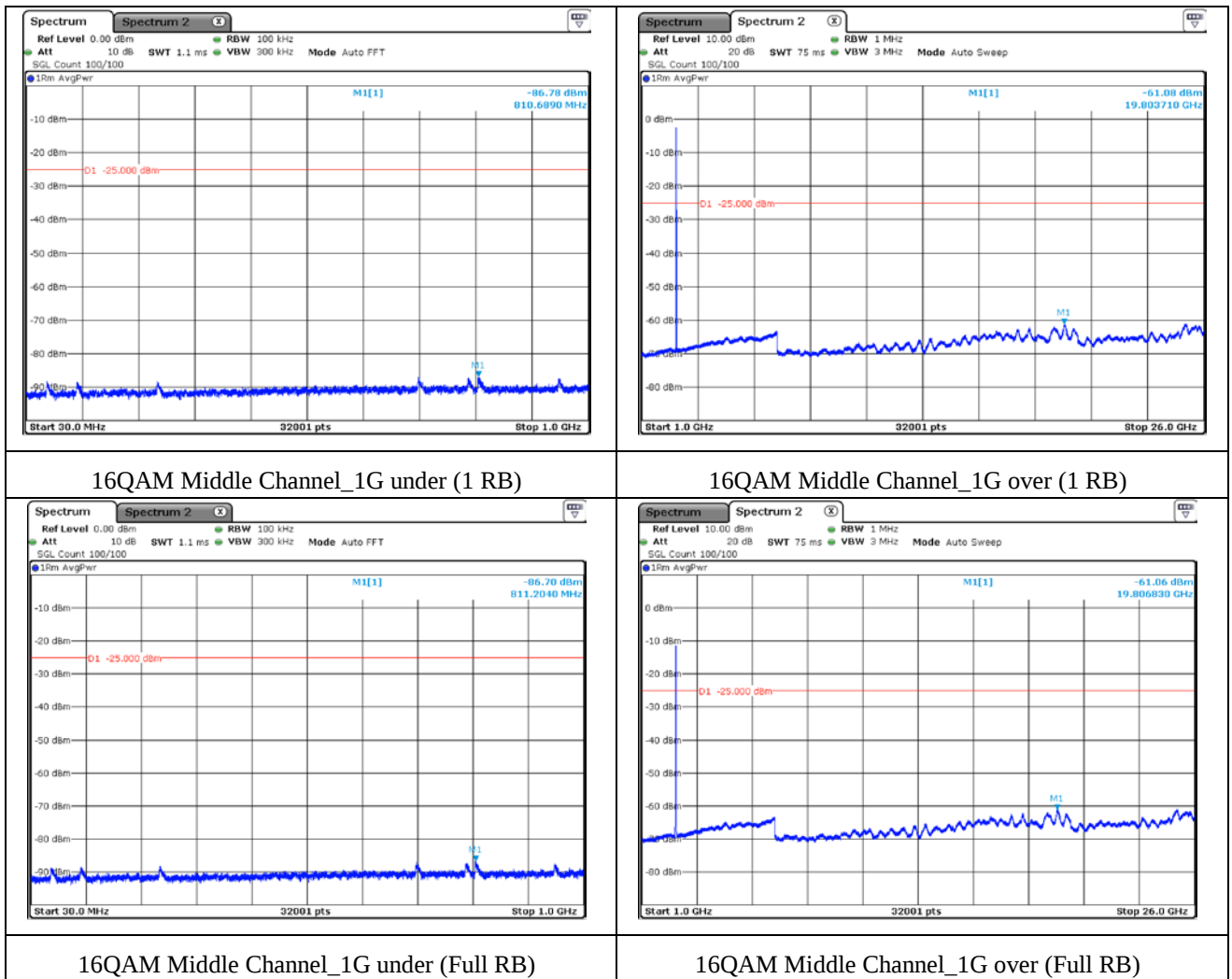
Test Mode	Channel	Frequency Range	Measured Value (dBm)	Cable Loss (dB)	Total Value (dBm)	Limit (dBm)	Result
LTE Band 7 QPSK							
1 RB	Low	30 MHz ~ 1 GHz	-86.96	20.88	-66.08	-25.00	PASS
		1 GHz ~ 26 GHz	-61.13	22.60	-38.53		PASS
	Middle	30 MHz ~ 1 GHz	-86.75	20.68	-66.07		PASS
		1 GHz ~ 26 GHz	-60.98	22.59	-38.39		PASS
	High	30 MHz ~ 1 GHz	-87.15	20.77	-66.38		PASS
		1 GHz ~ 26 GHz	-61.10	22.57	-38.53		PASS
Full RB	Low	30 MHz ~ 1 GHz	-86.82	20.67	-66.15	-25.00	PASS
		1 GHz ~ 26 GHz	-60.96	22.56	-38.40		PASS
	Middle	30 MHz ~ 1 GHz	-86.55	20.68	-65.87		PASS
		1 GHz ~ 26 GHz	-60.90	22.59	-38.31		PASS
	High	30 MHz ~ 1 GHz	-86.87	20.88	-65.99		PASS
		1 GHz ~ 26 GHz	-61.00	22.53	-38.47		PASS
LTE Band 7 16QAM							
1 RB	Low	30 MHz ~ 1 GHz	-86.89	20.77	-66.12	-25.00	PASS
		1 GHz ~ 26 GHz	-61.03	22.57	-38.46		PASS
	Middle	30 MHz ~ 1 GHz	-86.78	20.88	-65.90		PASS
		1 GHz ~ 26 GHz	-61.08	22.54	-38.54		PASS
	High	30 MHz ~ 1 GHz	-86.83	20.68	-66.15		PASS
		1 GHz ~ 26 GHz	-60.85	22.59	-38.26		PASS
Full RB	Low	30 MHz ~ 1 GHz	-86.44	20.68	-65.76	-25.00	PASS
		1 GHz ~ 26 GHz	-60.81	22.60	-38.21		PASS
	Middle	30 MHz ~ 1 GHz	-86.70	20.77	-65.93		PASS
		1 GHz ~ 26 GHz	-61.06	22.55	-38.51		PASS
	High	30 MHz ~ 1 GHz	-86.93	20.77	-66.16		PASS
		1 GHz ~ 26 GHz	-60.94	22.58	-38.36		PASS

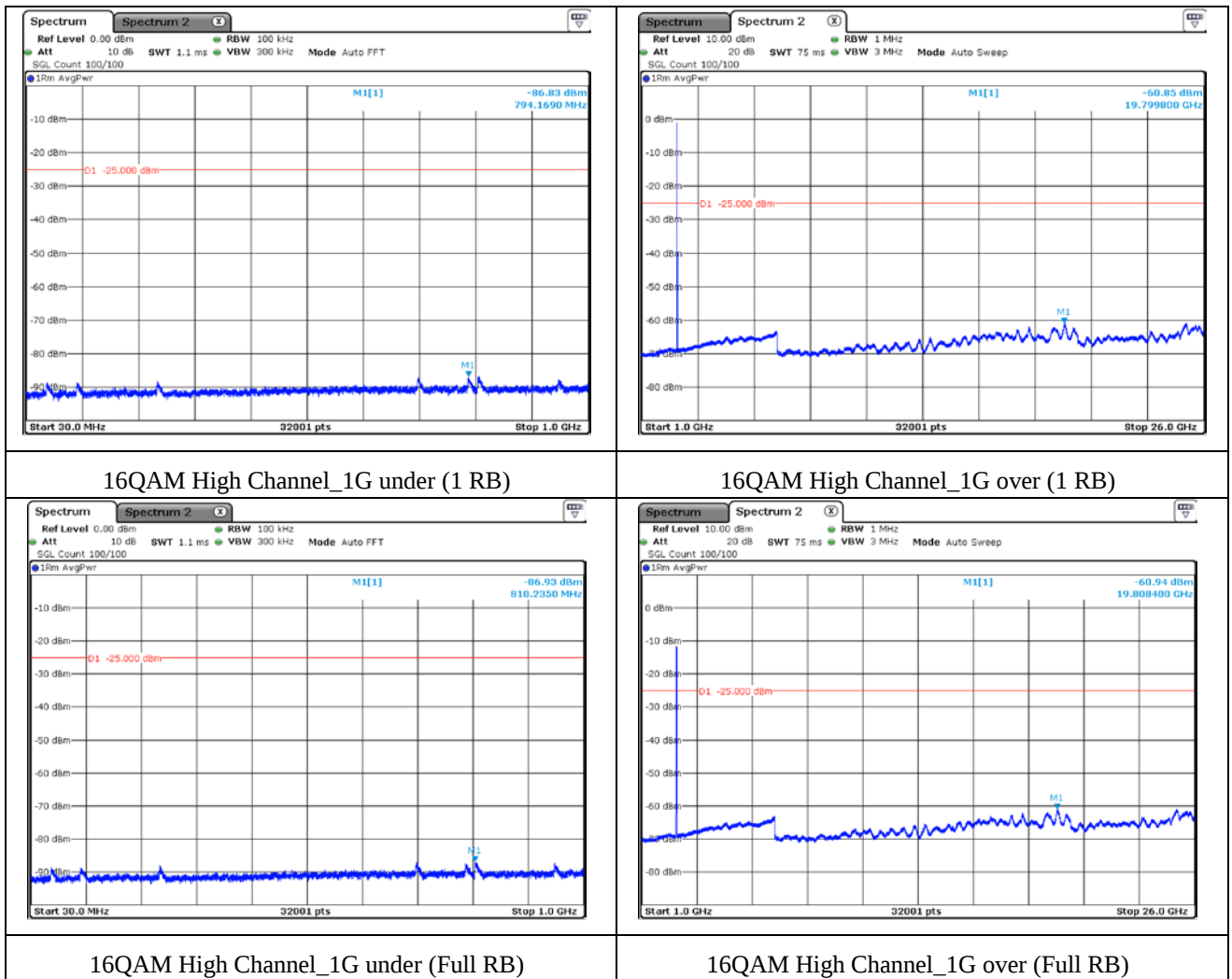






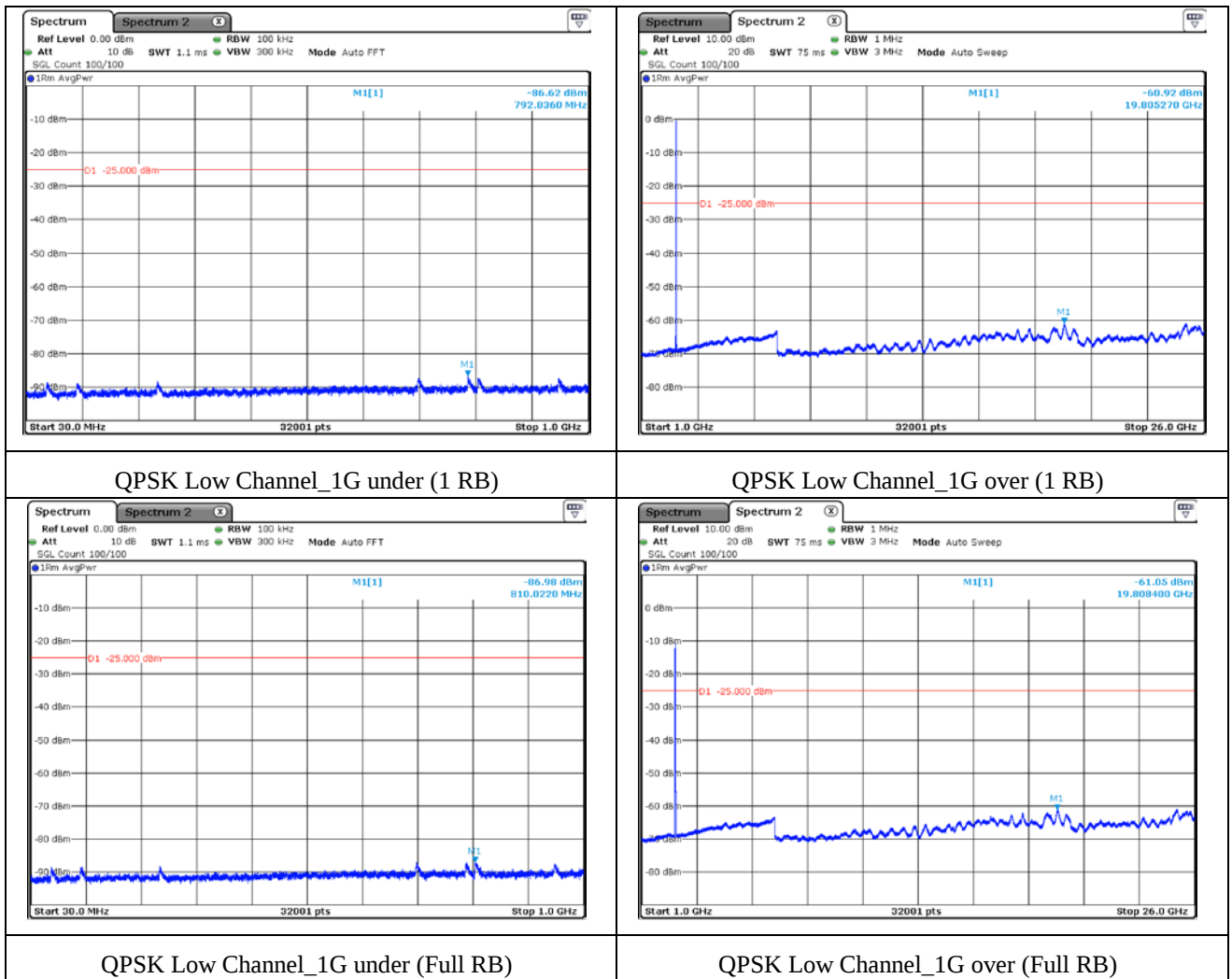


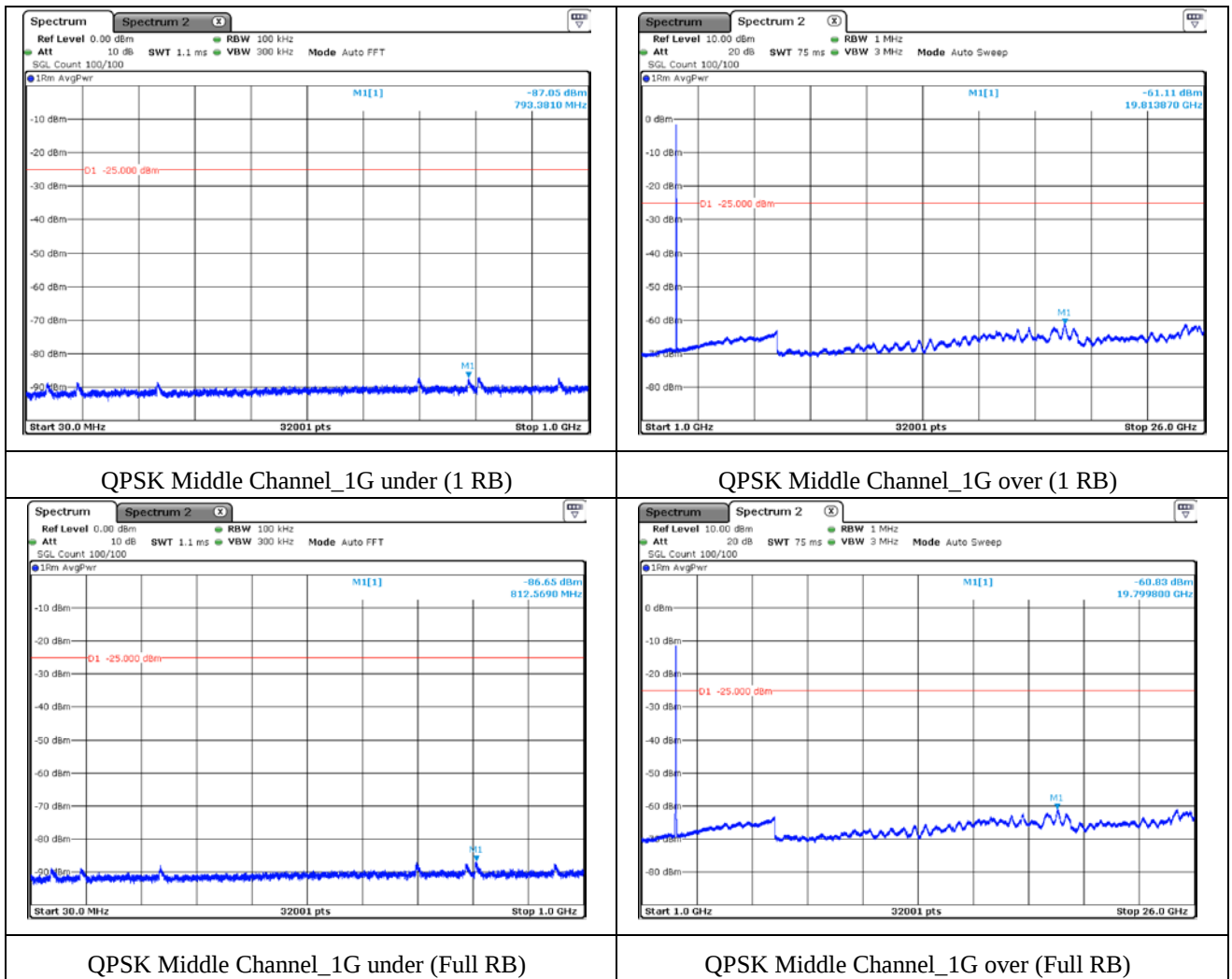


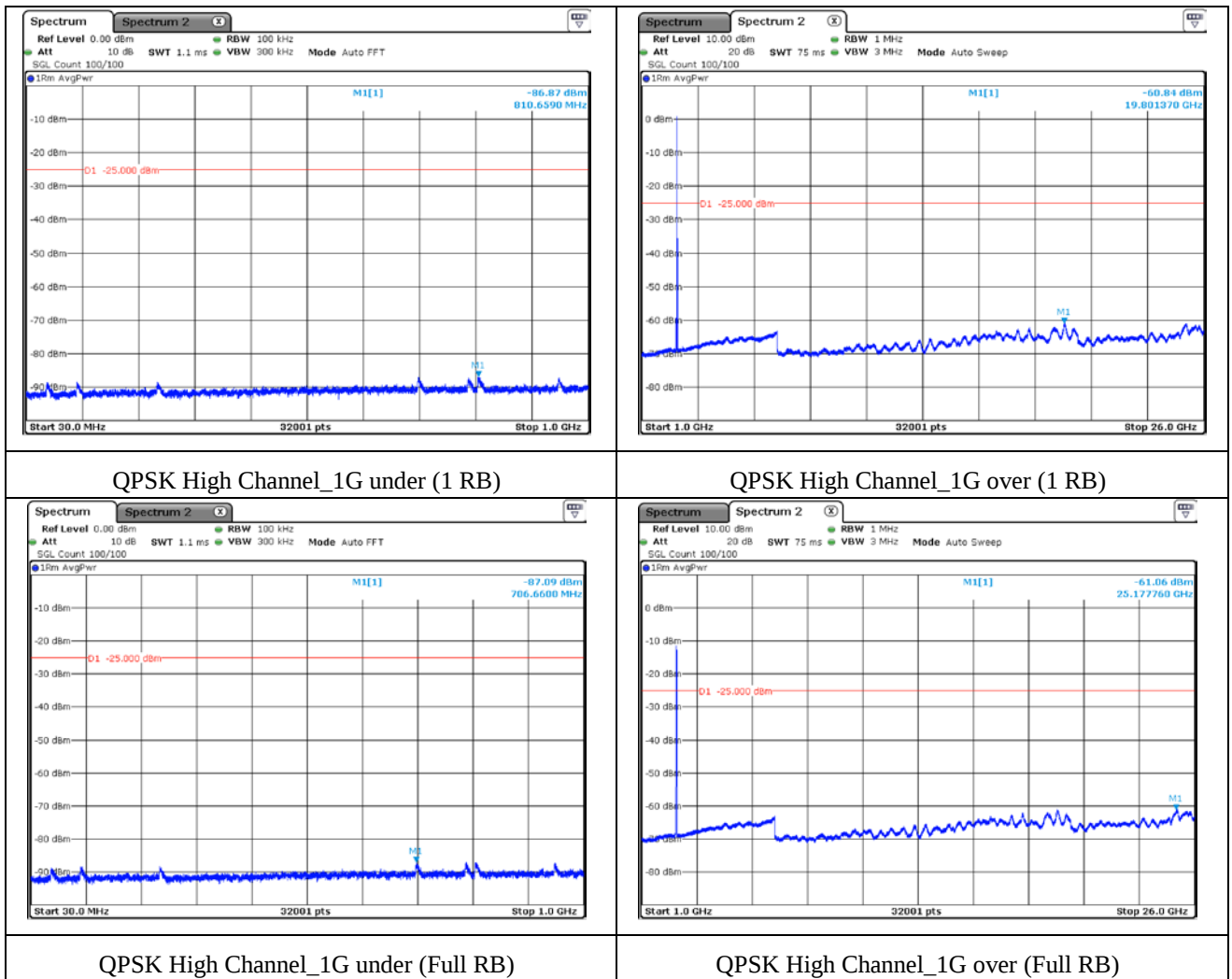


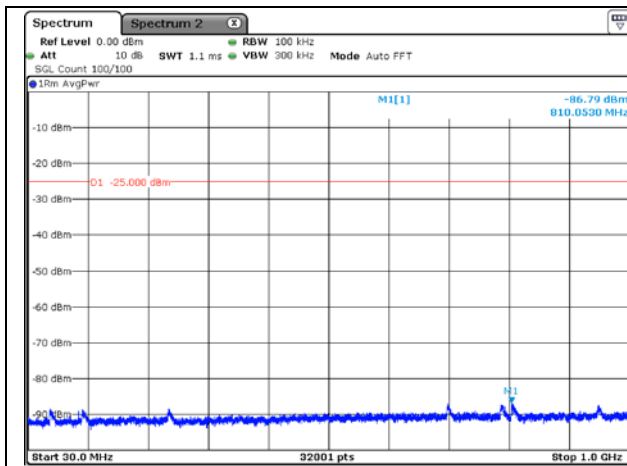
13.8 Test data for Band 7_Bandwidth 20 MHz

Test Mode	Channel	Frequency Range	Measured Value (dBm)	Cable Loss (dB)	Total Value (dBm)	Limit (dBm)	Result
LTE Band 7 QPSK							
1 RB	Low	30 MHz ~ 1 GHz	-86.79	20.88	-65.91	-25.00	PASS
		1 GHz ~ 26 GHz	-61.00	22.60	-38.40		PASS
	Middle	30 MHz ~ 1 GHz	-86.97	20.88	-66.09		PASS
		1 GHz ~ 26 GHz	-60.91	22.55	-38.36		PASS
	High	30 MHz ~ 1 GHz	-86.84	20.68	-66.16		PASS
		1 GHz ~ 26 GHz	-60.95	22.57	-38.38		PASS
Full RB	Low	30 MHz ~ 1 GHz	-86.72	20.67	-66.05	-25.00	PASS
		1 GHz ~ 26 GHz	-60.97	22.58	-38.39		PASS
	Middle	30 MHz ~ 1 GHz	-87.05	20.67	-66.38		PASS
		1 GHz ~ 26 GHz	-60.83	22.59	-38.24		PASS
	High	30 MHz ~ 1 GHz	-86.92	20.67	-66.25		PASS
		1 GHz ~ 26 GHz	-60.96	22.57	-38.39		PASS
LTE Band 7 16QAM							
1 RB	Low	30 MHz ~ 1 GHz	-86.79	20.68	-66.11	-25.00	PASS
		1 GHz ~ 26 GHz	-61.00	22.55	-38.45		PASS
	Middle	30 MHz ~ 1 GHz	-86.97	20.88	-66.09		PASS
		1 GHz ~ 26 GHz	-60.91	22.57	-38.34		PASS
	High	30 MHz ~ 1 GHz	-86.84	20.68	-66.16		PASS
		1 GHz ~ 26 GHz	-60.95	22.58	-38.37		PASS
Full RB	Low	30 MHz ~ 1 GHz	-87.05	20.68	-66.37	-25.00	PASS
		1 GHz ~ 26 GHz	-60.83	22.58	-38.25		PASS
	Middle	30 MHz ~ 1 GHz	-86.92	20.68	-66.24		PASS
		1 GHz ~ 26 GHz	-60.96	22.60	-38.36		PASS
	High	30 MHz ~ 1 GHz	-86.72	20.88	-65.84		PASS
		1 GHz ~ 26 GHz	-60.97	22.60	-38.37		PASS

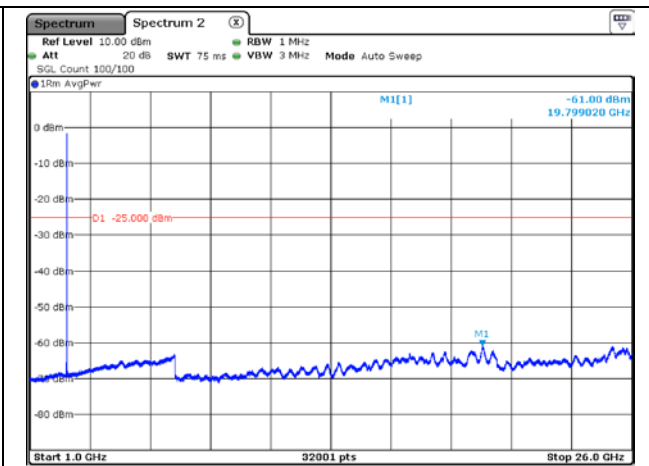




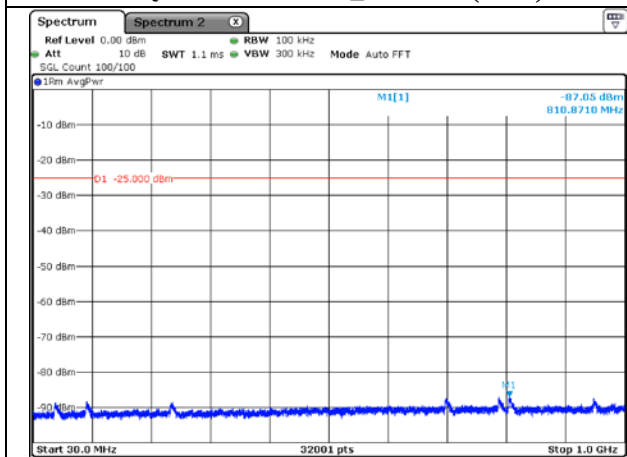




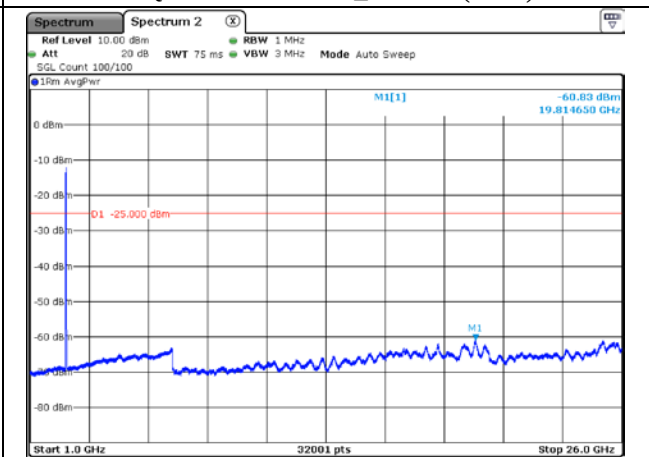
16QAM Low Channel_1G under (1 RB)



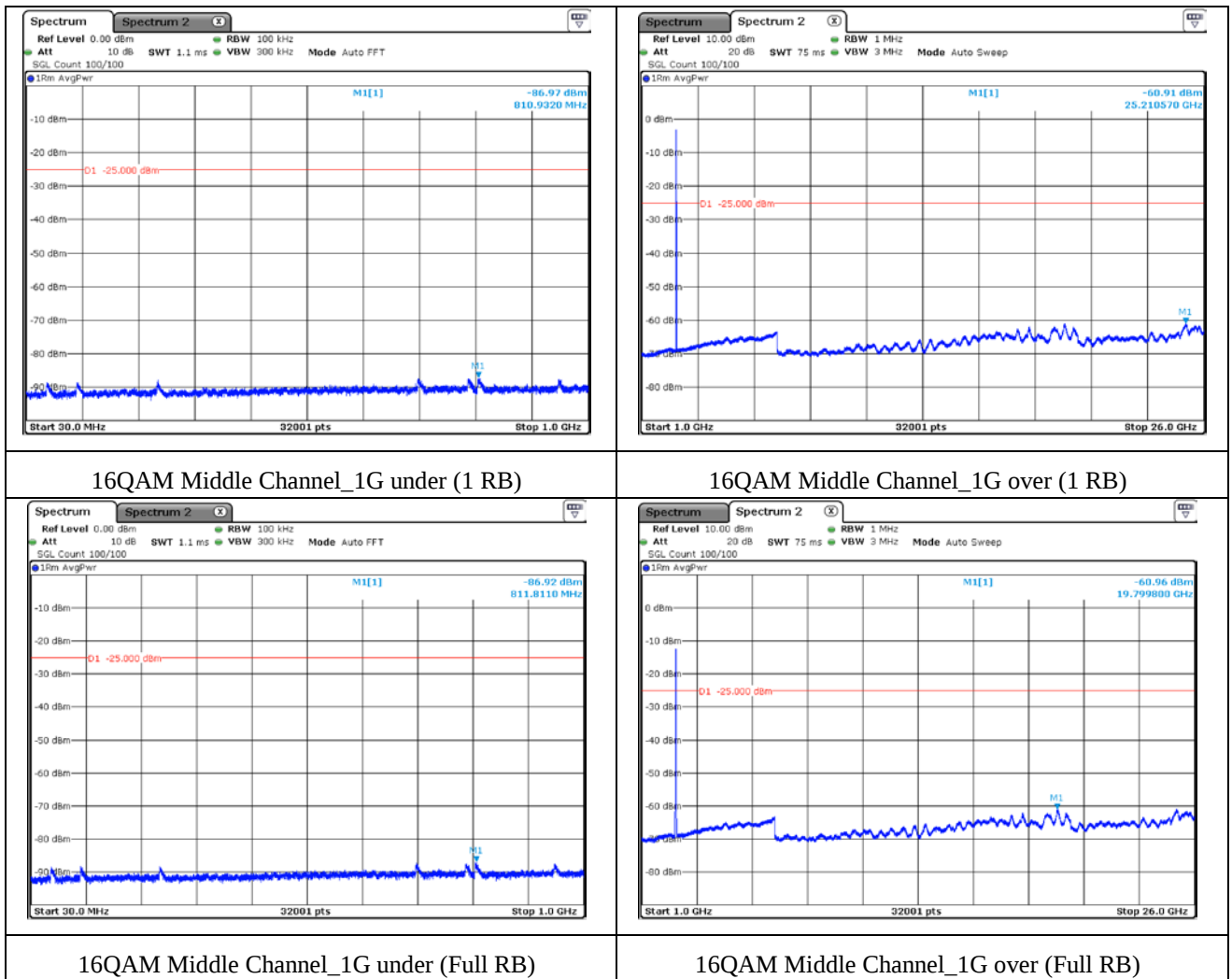
16QAM Low Channel_1G over (1 RB)

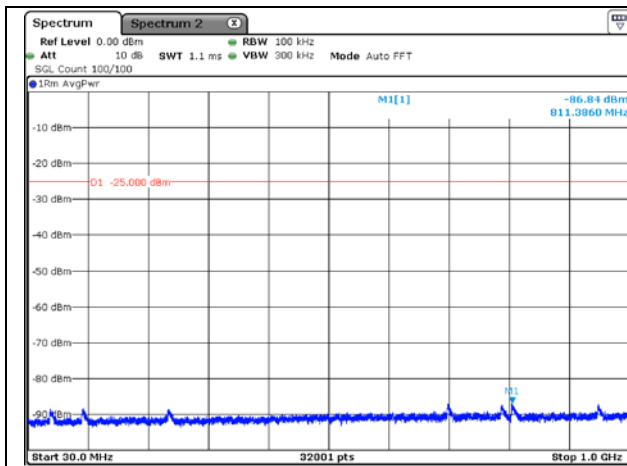


16QAM Low Channel_1G under (Full RB)

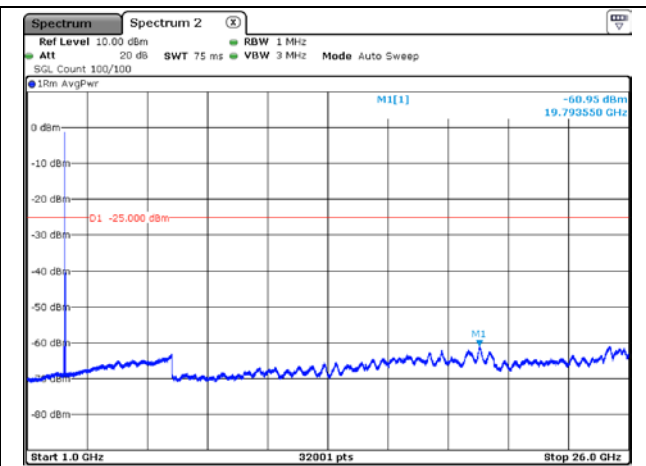


16QAM Low Channel_1G over (Full RB)

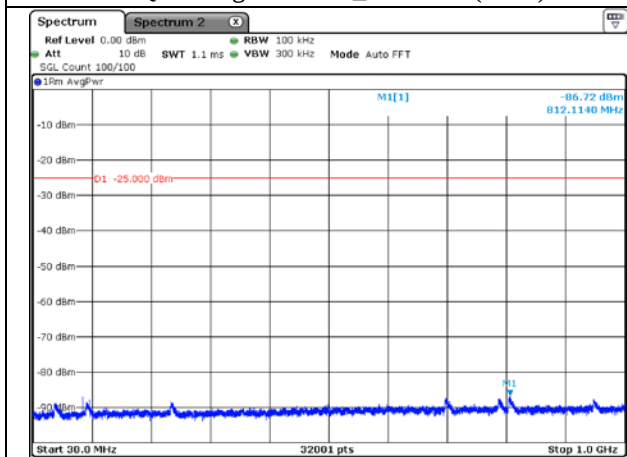




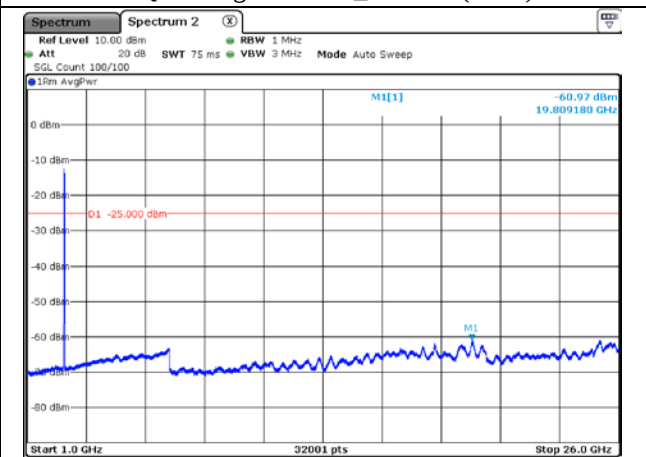
16QAM High Channel_1G under (1 RB)



16QAM High Channel_1G over (1 RB)



16QAM High Channel_1G under (Full RB)



16QAM High Channel_1G over (Full RB)

14. FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

14.1 Operating environment

Temperature : 23 °C
Relative humidity : 47 % R.H.

14.2 Test set-up

1. Frequency Stability (Voltage Variation)

+20 °C temperature and $\pm 15\%$ supply voltage variations. If a product is specified to operate over a range of input voltage then the -15% variation is applied to the lowermost voltage and the $+15\%$ is applied to the uppermost voltage.

- (1) Vary primary supply voltage from $\pm 15\%$ of the nominal value for other than hand carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

2. Frequency Stability (Temperature Variation)

Turn EUT off and set chamber temperature to $-30\text{ }^{\circ}\text{C}$ and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised $10\text{ }^{\circ}\text{C}$ step from $-30\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$. Repeat above method for frequency measurements every $10\text{ }^{\circ}\text{C}$ step and then record all measured frequencies on each temperature step.

14.3 Test Date

May 17, 2021 ~ May 28, 2021

14.4 Test data for Band 7

14.4.1 Test data for Voltage(V)

Temperature(° C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
23	4.0	2 535 000 000	2 534 999 993	-0.002 8
	3.9		2 534 999 994	-0.002 4
	4.1		2 534 999 994	-0.002 4

14.4.2 Test data for Temperature(° C)

Temperature(° C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
-30	4.0	2 535 000 000	2 534 999 989	-0.004 3
-20			2 534 999 990	-0.003 9
-10			2 534 999 992	-0.003 2
0			2 534 999 993	-0.002 8
10			2 534 999 994	-0.002 4
20			2 534 999 994	-0.002 4
30			2 534 999 995	-0.002 0
40			2 534 999 968	-0.012 6
50			2 534 999 975	-0.009 9

15. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 15, 2020 (1Y)
CS20-23-436/20	PULSAER MICROWAVE CORPORATION	Broadband Directional Coupler	1147	Jul. 15, 2020 (1Y)
MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 15, 2020 (1Y)
E5515C	Agilent	Wireless Connectivity Tester	MY48360785	Feb. 09, 2021 (1Y)
GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 06, 2021 (1Y)
PSL-2KP	ESPEC	Environmental Test Chamber	14009407	Feb. 16, 2021 (1Y)
ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 15, 2021 (1Y)
310N	Sonoma Instrument	AMPLIFIER	392756	Oct. 16, 2020 (1Y)
SCU18	Rohde & Schwarz	Signal Conditioning unit	102266	Jul. 15, 2020 (1Y)
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Feb. 08, 2021 (1Y)
HLA 6121	TESEQ	Loop Antenna	50841	Apl. 06, 2020 (2Y)
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)
HLP-2008	TDK RF Solutions	Hybrid Antenna	131316	Feb. 27, 2020 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Nov. 20, 2020 (1Y)
AH-118	Com-Power	Horn Antenna	10050061	Oct. 15, 2020 (1Y)
BBHA 9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 07, 2021 (1Y)
SAS-574	A.H. Systems	Horn Antenna	676	Oct. 15, 2020 (1Y)
WRCJV16-2480- 2500-2570- 2590-80ST	Wainwright Instruments GmbH	Band Reject Filter	1	Jul. 15, 2020 (1Y)
MA-4640-XPET	Innco Systems GmbH	Antenna Master	MA4640/652	N/A
DT2000-2t	Innco Systems GmbH	Turn Table	N/A	N/A