

Out of band emission, Band Edge

Mode	Lowest	Highest
R99		
HSUPA		
HSDPA		

4.6 Antenna Port Test Data and Results for LTE Band 2

Serial Number:	CR220943987-RF-S1	Test Date:	2022-09-28~2022-10-11
Test Site:	RF	Test Mode:	Transmitting
Tester:	George Chen	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	26.1~28.3	Relative Humidity: (%)	42~56	ATM Pressure: (kPa)	100.2~100.9
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2022-07-15	2023-07-14
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
YINSAIGE	Coaxial Cable	SS402	SJ0100005	Each time	N/A
Weinschel	Power Splitter	1515	RA914	Each time	N/A
R&S	Wideband Radio Communication Tester	CMW500	149218	2022-07-15	2023-07-14
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30174	2022-04-06	2023-04-05
UNI-T	Multimeter	UT39A+	C210582554	2022-09-30	2023-09-29
ZHAOXIN	DC Power Supply	RXN-6010D	21R6010D0912386	N/A	N/A

* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

EUT Information@ LTE Band 2▲:

Antenna Gain G_T (dBi):	-1.5	Path Loss L_C (dB):	0.3
Operation Voltage(V_{DC}):			
Lowest:	3.6	Normal:	3.85
		Highest:	4.4

Test Frequency For Each Mode:

Operation Bandwidth	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
1.4MHz	1850.7	1880	1909.3
3MHz	1851.5	1880	1908.5
5MHz	1852.5	1880	1907.5
10MHz	1855	1880	1905
15MHz	1857.5	1880	1902.5
20MHz	1860	1880	1900

Test Data:

FCC §2.1046; § 24.232						
RF Output Power:						
Test Bandwidth & Modulation	Resource Block & RB offset	Conducted Average Output Power(dBm)			Maximum EIRP (dBm)	EIRP Limit (dBm)
		Lowest Channel	Middle Channel	Highest Channel		
1.4MHz QPSK	RB1#0	21.66	21.54	21.71	20.12	33
	RB1#3	21.69	21.54	21.75		
	RB1#5	21.8	21.59	21.79		
	RB3#0	21.88	21.71	21.88		
	RB3#3	21.84	21.7	21.92		
	RB6#0	20.81	20.62	20.75		
1.4MHz 16QAM	RB1#0	20.53	21.14	20.64	19.34	33
	RB1#3	20.63	21.12	20.67		
	RB1#5	20.6	21.08	20.65		
	RB3#0	20.95	20.61	20.96		
	RB3#3	20.84	20.61	20.94		
	RB6#0	19.96	19.73	20.08		
3MHz QPSK	RB1#0	21.83	21.55	21.81	20.08	33
	RB1#8	21.88	21.63	21.85		
	RB1#14	21.74	21.67	21.83		
	RB6#0	20.85	20.83	20.82		
	RB6#9	20.72	20.68	20.84		
	RB15#0	20.85	20.7	20.94		
3MHz 16QAM	RB1#0	21.5	20.52	21.29	19.75	33
	RB1#8	21.55	20.45	21.32		
	RB1#14	21.33	20.49	21.22		
	RB6#0	19.87	19.64	19.82		
	RB6#9	19.87	19.72	19.82		
	RB15#0	19.81	19.72	20		
5MHz QPSK	RB1#0	21.8	21.6	21.9	20.1	33
	RB1#13	21.77	21.67	21.8		
	RB1#24	21.74	21.75	21.76		
	RB15#0	20.72	20.76	20.92		
	RB15#10	20.7	20.73	20.91		
	RB25#0	20.73	20.68	20.94		
5MHz 16QAM	RB1#0	20.85	20.29	19.97	19.05	33
	RB1#13	20.73	20.32	20.01		
	RB1#24	20.8	20.45	20		
	RB15#0	19.66	19.71	19.92		
	RB15#10	19.69	19.68	19.94		
	RB25#0	19.8	19.64	20.04		
10MHz QPSK	RB1#0	21.86	21.67	21.75	20.06	33
	RB1#25	21.76	21.67	21.81		
	RB1#49	21.8	21.69	21.86		
	RB25#0	20.75	20.69	20.84		

	RB25#25	20.67	20.81	20.96		
	RB50#0	20.71	20.73	20.88		
10MHz 16QAM	RB1#0	20.86	20.12	21.08	19.32	33
	RB1#25	20.76	20.13	21.12		
	RB1#49	20.87	20.15	21.05		
	RB25#0	19.88	19.84	20.23		
	RB25#25	20.22	20.18	19.89		
	RB50#0	19.8	19.76	19.89		
15MHz QPSK	RB1#0	21.85	21.52	21.66	20.05	33
	RB1#38	21.73	21.62	21.68		
	RB1#74	21.78	21.72	21.85		
	RB36#0	20.66	20.71	20.79		
	RB36#39	20.82	20.76	20.93		
	RB75#0	20.82	20.67	20.91		
15MHz 16QAM	RB1#0	20.91	20.92	20.91	19.29	33
	RB1#38	20.84	20.94	20.98		
	RB1#74	20.87	21	21.09		
	RB36#0	19.82	19.65	20.02		
	RB36#39	19.77	20.1	19.99		
	RB75#0	20.13	19.69	20.31		
20MHz QPSK	RB1#0	21.86	21.63	21.83	20.16	33
	RB1#50	21.79	21.7	21.94		
	RB1#99	21.81	21.77	21.96		
	RB50#0	20.71	20.72	20.79		
	RB50#50	20.71	20.76	20.97		
	RB100#0	20.71	20.78	20.81		
20MHz 16QAM	RB1#0	20.78	21.4	20.76	19.74	33
	RB1#50	20.79	21.36	20.92		
	RB1#99	20.76	21.54	20.97		
	RB50#0	19.73	20.12	20.31		
	RB50#50	19.84	19.75	20.06		
	RB100#0	19.65	19.73	19.99		

Note: EIRP= Conducted Power(dBm) - L_C(dB) + G_T(dBi)

Result:

Pass

Peak-to-average Ratio(PAR)

Test Bandwidth & Modulation	Resource Block & RB offset	Peak-to-average Ratio(dB)			Limit (dB)
		Lowest Channel	Middle Channel	Highest Channel	
20MHz QPSK	RB1#0	4.17	5.1	4.72	13
	RB100#0	4.93	5.07	5.01	13
20MHz 16QAM	RB1#0	5.39	6.55	5.86	13
	RB100#0	5.83	6	6.03	13
Result:					Pass

FCC §2.1049, §24.238:Occupied Bandwidth						
Operation Mode	99% Occupied Bandwidth (MHz)			26 dB Occupied Bandwidth (MHz)		
	Low Channel	Middle channel	High Channel	Low Channel	Middle Channel	High Channel
1.4MHz QPSK	1.102	1.102	1.102	1.254	1.260	1.266
1.4MHz 16QAM	1.108	1.096	1.102	1.266	1.254	1.260
3MHz QPSK	2.695	2.695	2.695	3.012	3.012	3.000
3MHz 16QAM	2.683	2.683	2.695	3.000	3.024	3.012
5MHz QPSK	4.511	4.491	4.511	5.020	5.000	4.980
5MHz 16QAM	4.531	4.551	4.511	5.020	5.040	5.020
10MHz QPSK	8.942	8.982	8.942	9.760	9.840	9.760
10MHz 16QAM	8.942	8.982	8.942	9.760	9.840	9.760
15MHz QPSK	13.413	13.473	13.533	14.340	15.060	15.060
15MHz 16QAM	13.533	13.473	13.533	15.060	15.060	15.060
20MHz QPSK	17.964	17.964	17.964	19.760	19.600	19.600
20MHz 16QAM	17.964	18.044	18.044	19.680	19.680	19.760

Note: The test plots please refer to the Plots of Occupied Bandwidth

FCC §2.1051, §24.238 (a):Spurious Emissions at Antenna Terminal	
Result:	Pass, Please refer to the test plots of Spurious Emissions at Antenna Terminal.

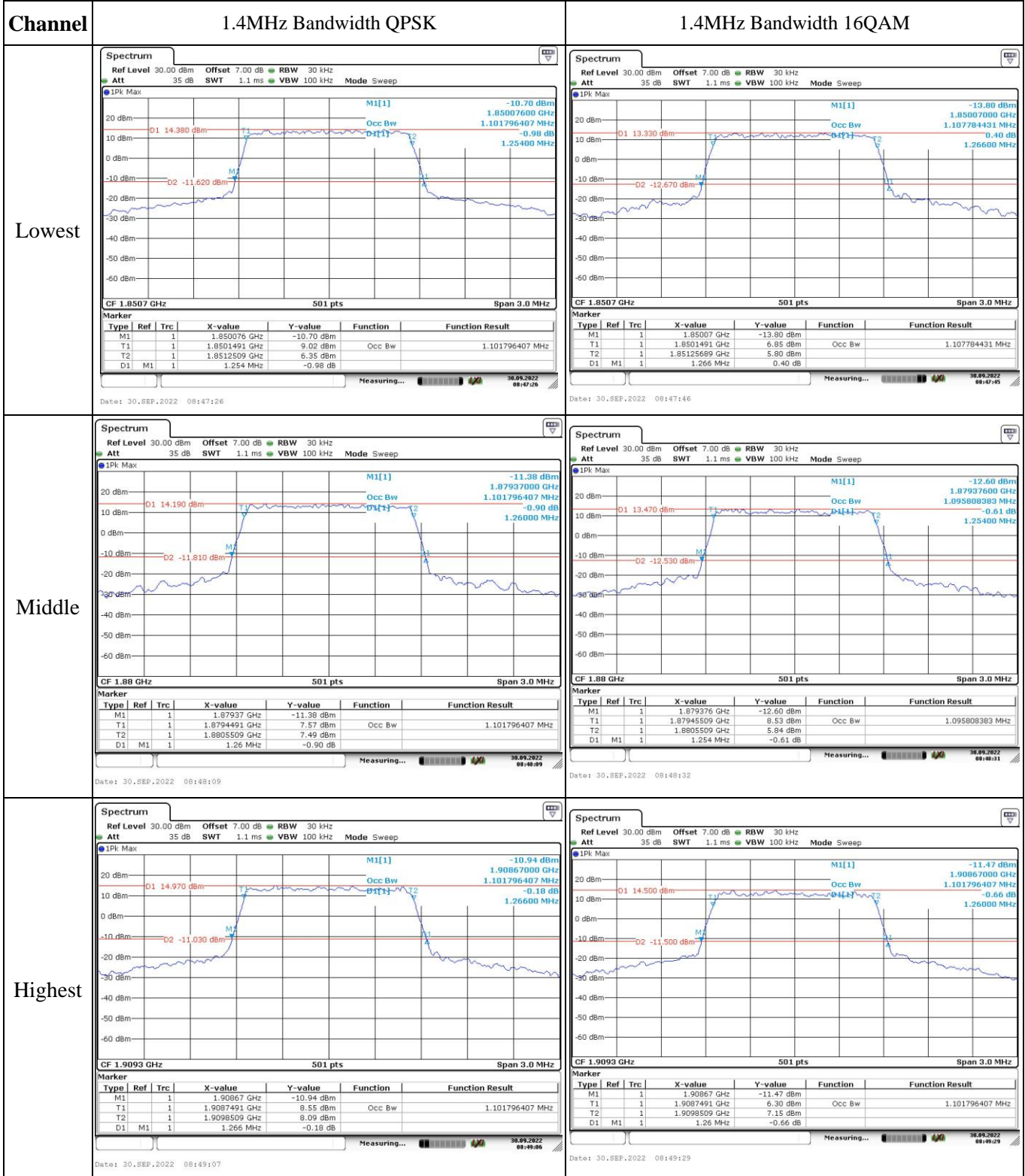
FCC §2.1051, §24.238 (a):Out of band emission, Band Edge	
Result:	Pass, Please refer to the test plots of Out of band emission, Band Edge.

FCC §2.1055, §24.235: Frequency Stability					
Test Mode:	20 MHz QPSK		Test Channel:	1880	MHz
Test Item	Temperature (°C)	Voltage (V _{DC})	Frequency Error		Result
			(Hz)	(ppm)	
Frequency Stability vs. Temperature	-30	3.85	-8.1	-0.004	Pass
	-20	3.85	-9.97	-0.005	Pass
	-10	3.85	-6.13	-0.003	Pass
	0	3.85	6.17	0.003	Pass
	10	3.85	7.92	0.004	Pass
	20	3.85	6.46	0.003	Pass
	30	3.85	-6.52	-0.003	Pass
	40	3.85	7.18	0.004	Pass
	50	3.85	-9.7	-0.005	Pass
Frequency Stability vs. Voltage	20	3.6	-8.17	-0.004	Pass
	20	4.4	-7.05	-0.004	Pass
Result:					Pass

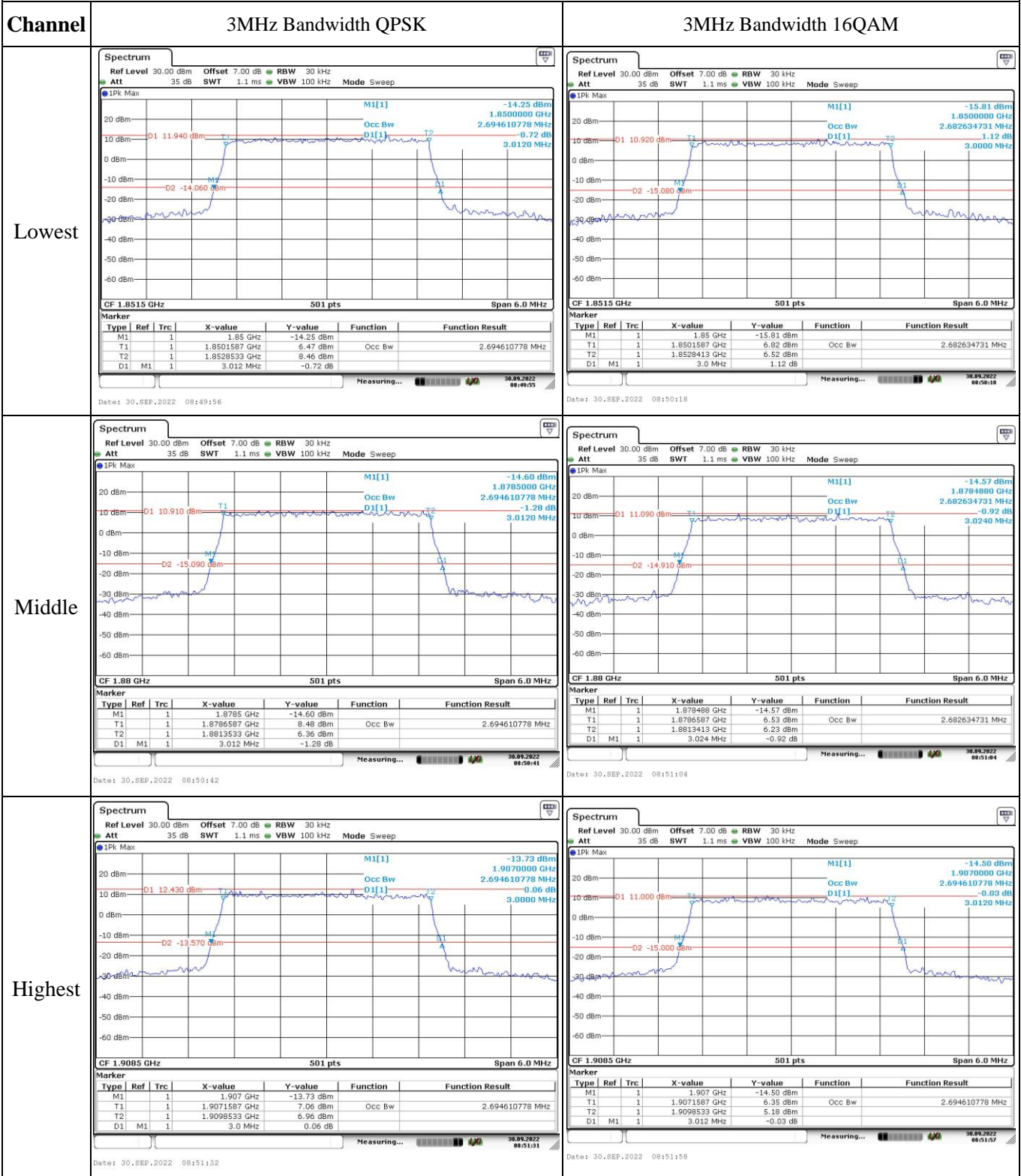
Test Mode:	20 MHz 16QAM		Test Channel:	1880	MHz
Test Item	Temperature (°C)	Voltage (V _{DC})	Frequency Error		Result
			(Hz)	(ppm)	
Frequency Stability vs. Temperature	-30	3.85	4.12	0.002	Pass
	-20	3.85	-6.68	-0.004	Pass
	-10	3.85	9.77	0.005	Pass
	0	3.85	-7.62	-0.004	Pass
	10	3.85	-9.91	-0.005	Pass
	20	3.85	-9.82	-0.005	Pass
	30	3.85	-6.68	-0.004	Pass
	40	3.85	-8.86	-0.005	Pass
	50	3.85	5.67	0.003	Pass
Frequency Stability vs. Voltage	20	3.6	6.05	0.003	Pass
	20	4.4	7.52	0.004	Pass
Result:				Pass	

Test Plots(Note: The 7.0dB is the Insertion loss of the RF cable, Coaxial tee connector and DC Block, which was offset into the Spectrum Analyzer):

Occupied Bandwidth



Occupied Bandwidth



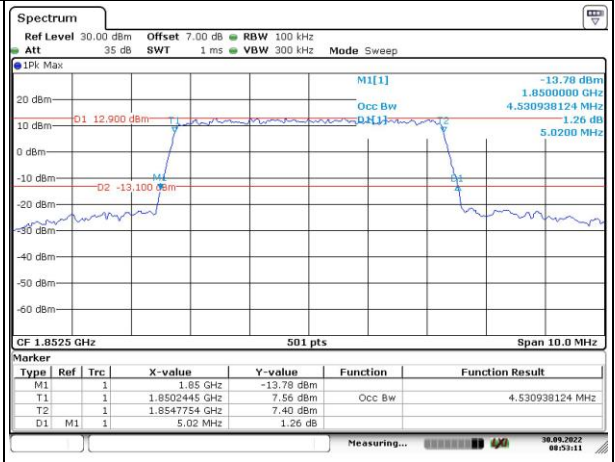
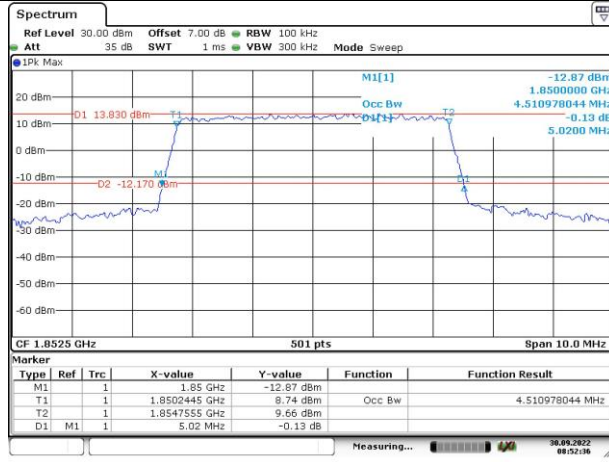
Occupied Bandwidth

Channel

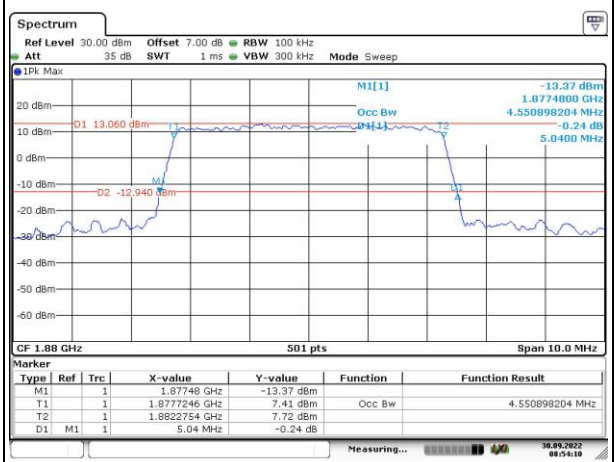
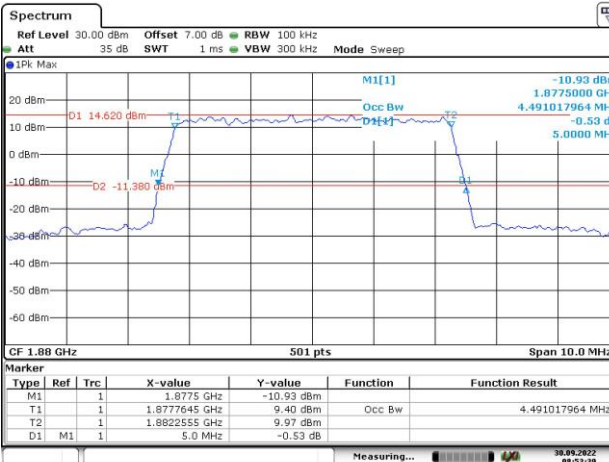
5MHz Bandwidth QPSK

5MHz Bandwidth 16QAM

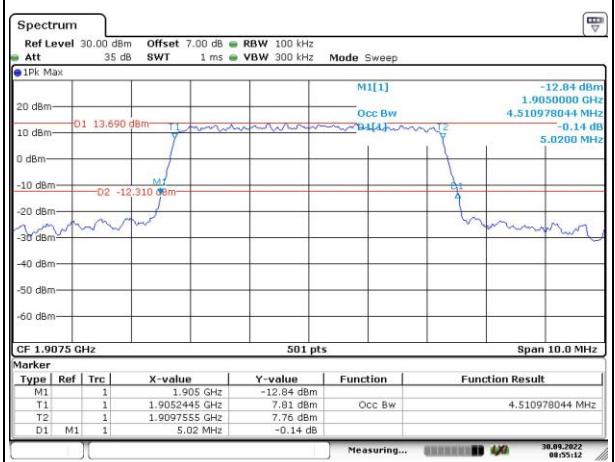
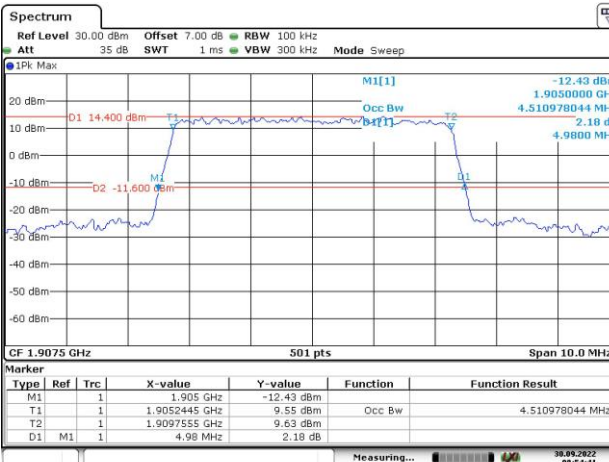
Lowest



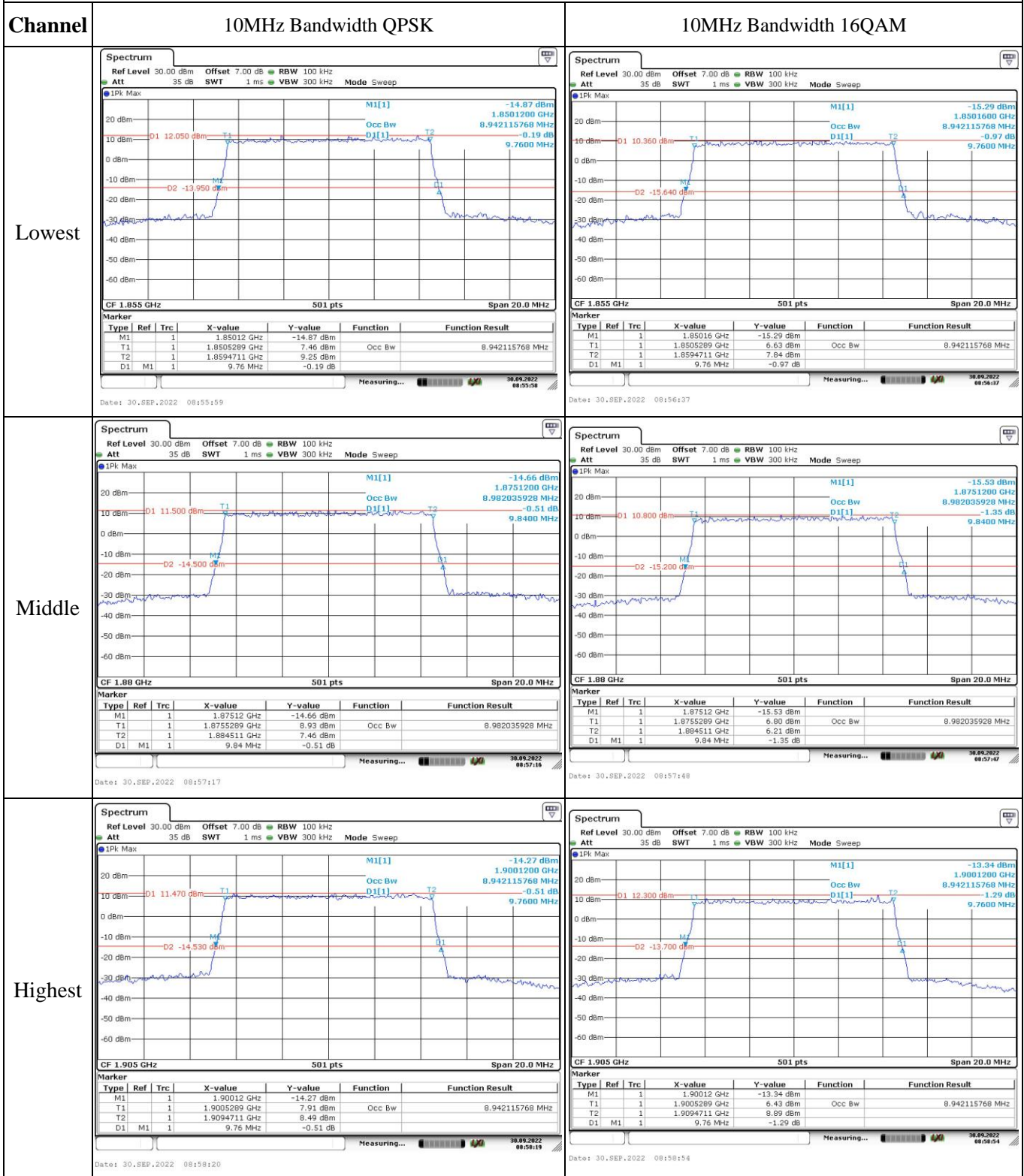
Middle



Highest



Occupied Bandwidth



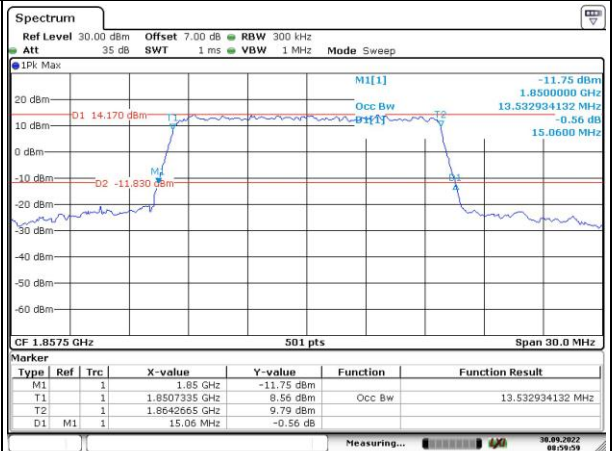
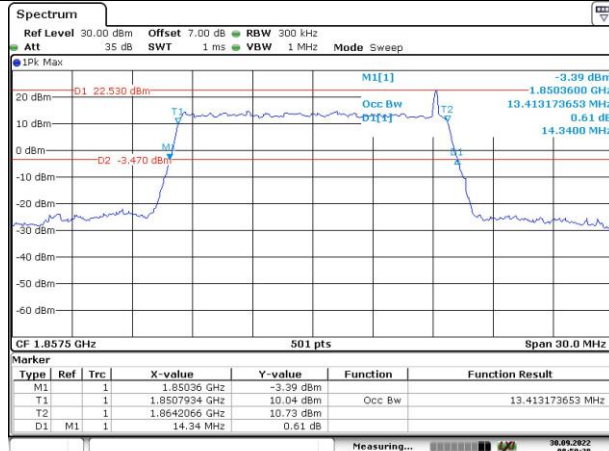
Occupied Bandwidth

Channel

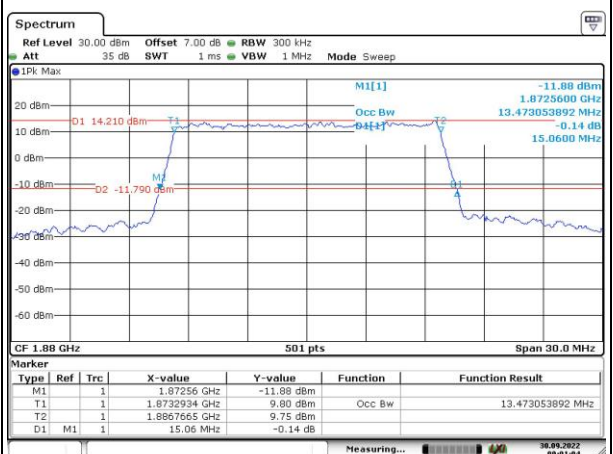
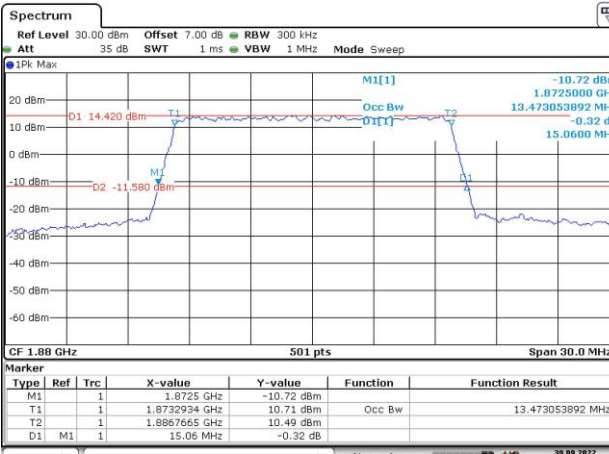
15MHz Bandwidth QPSK

15MHz Bandwidth 16QAM

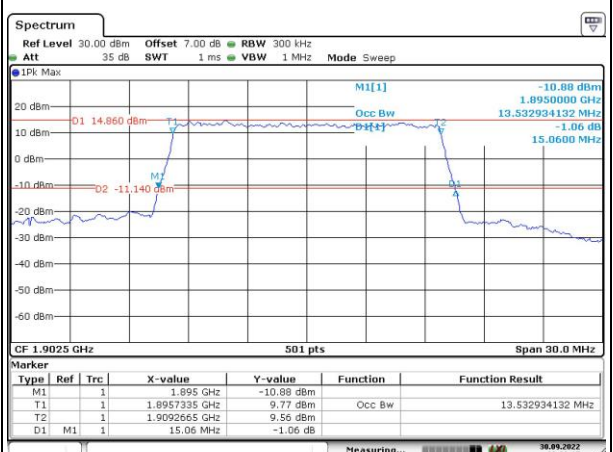
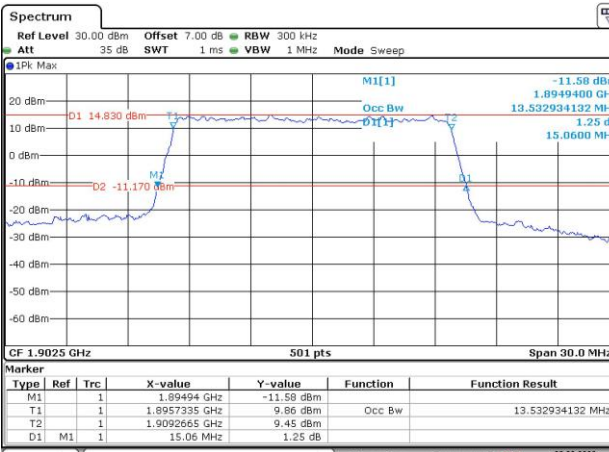
Lowest



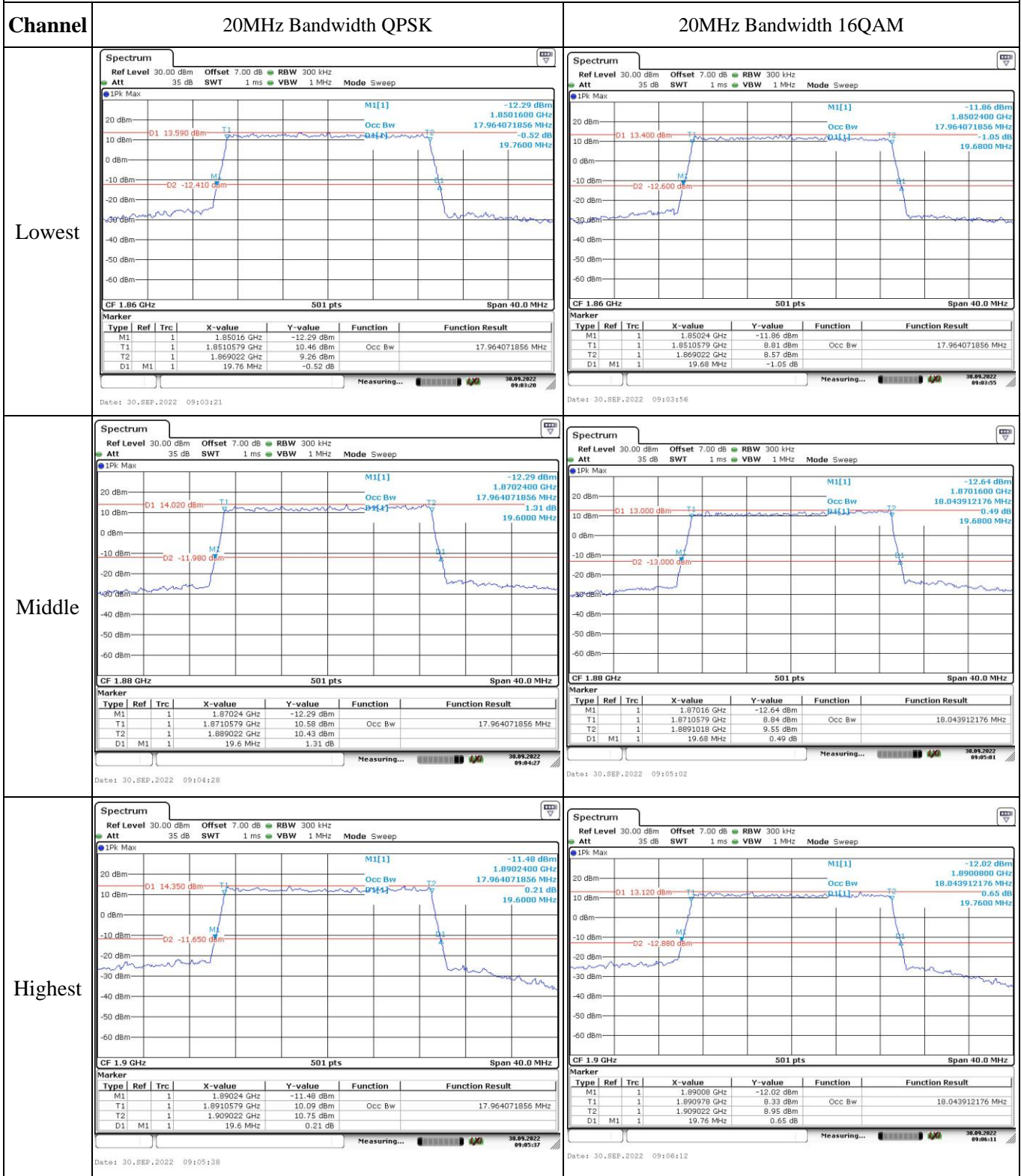
Middle



Highest



Occupied Bandwidth

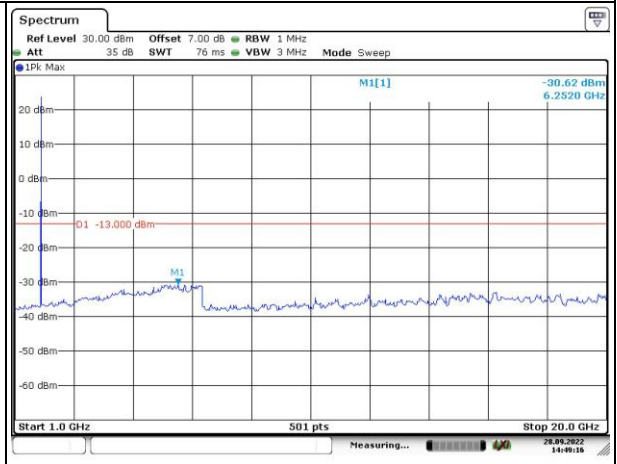
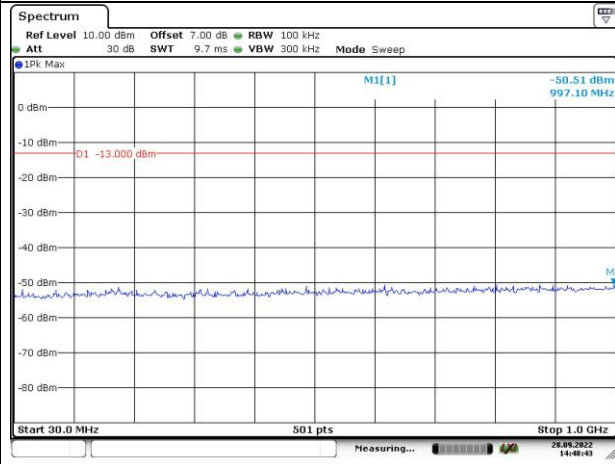


Spurious Emissions at Antenna Terminal

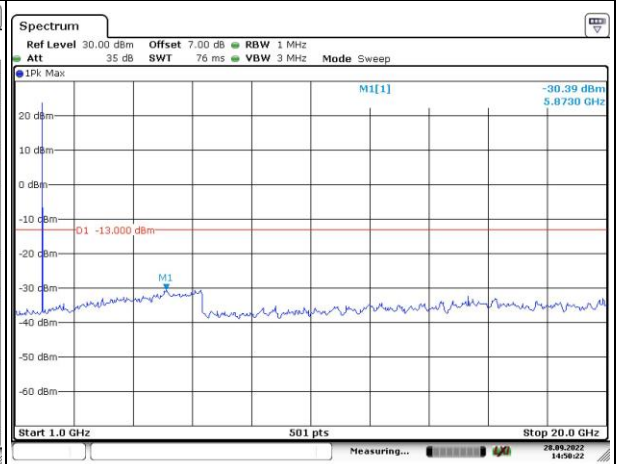
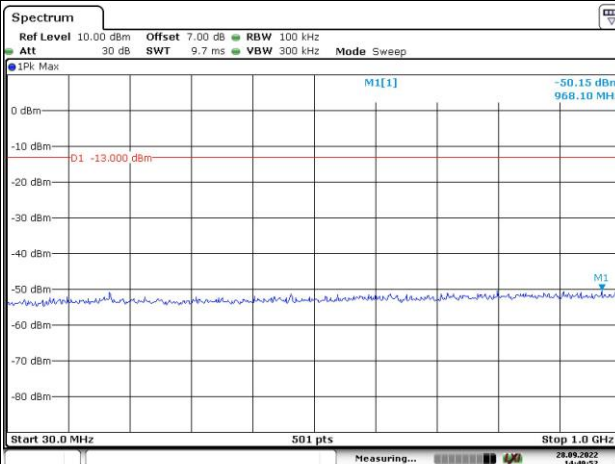
Channel

1.4MHz Bandwidth QPSK

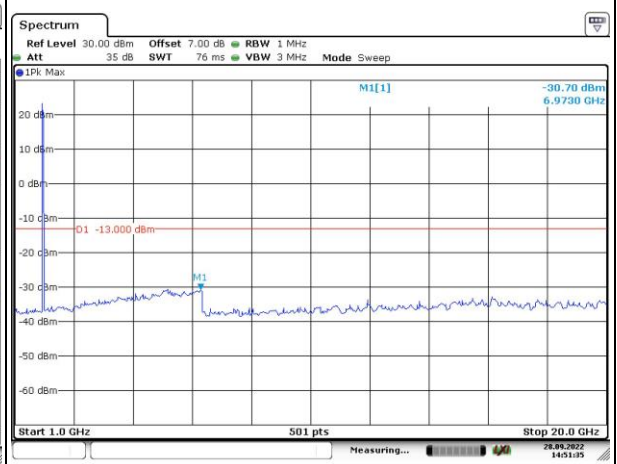
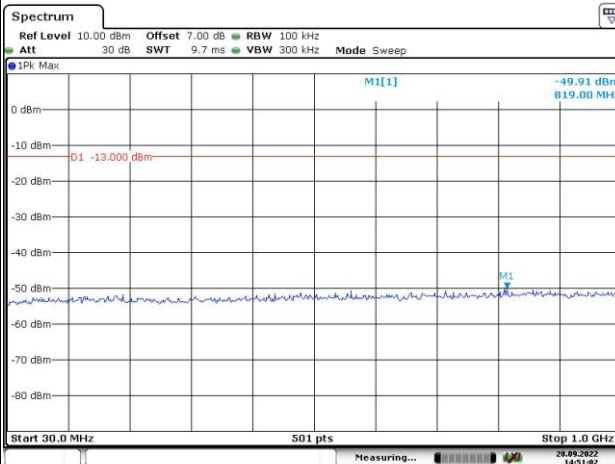
Lowest



Middle



Highest

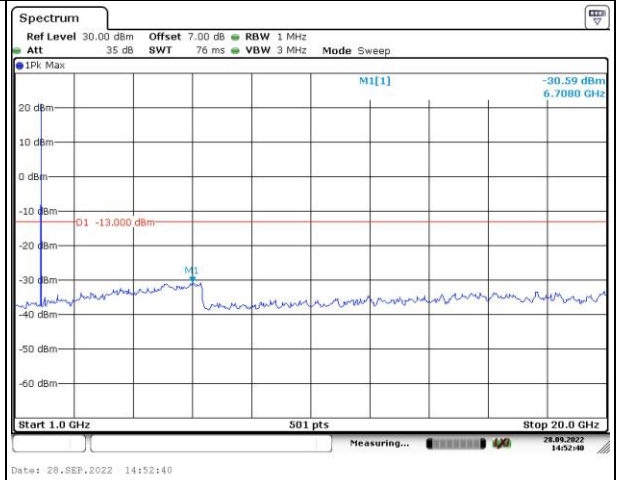
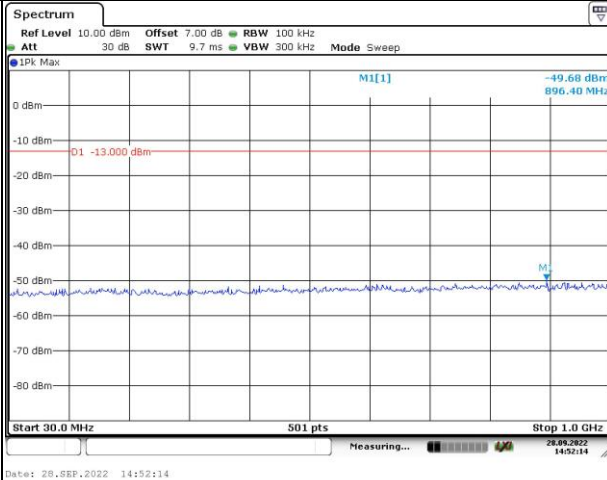


Spurious Emissions at Antenna Terminal

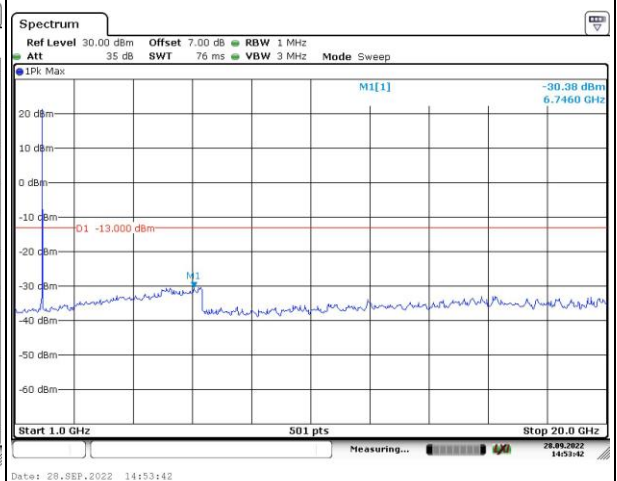
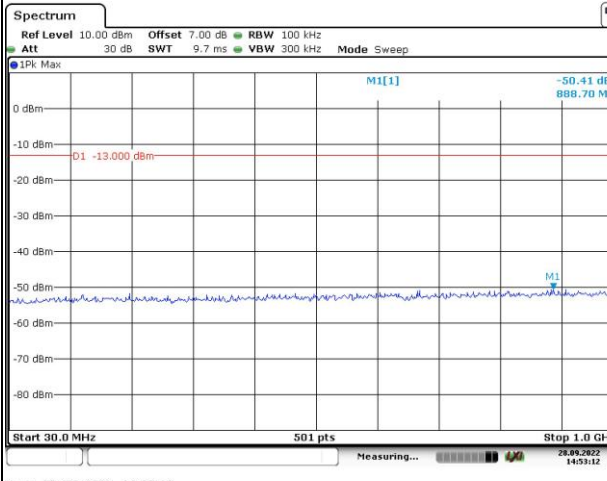
Channel

3MHz Bandwidth QPSK

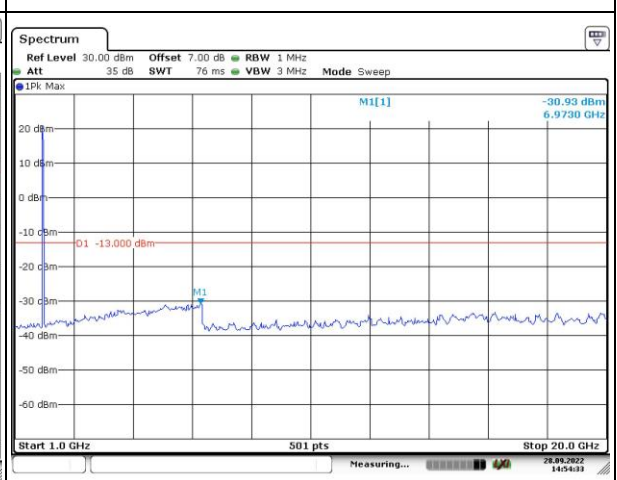
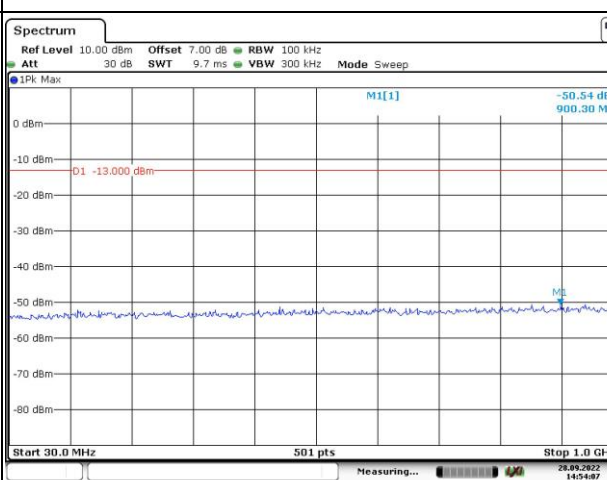
Lowest



Middle



Highest

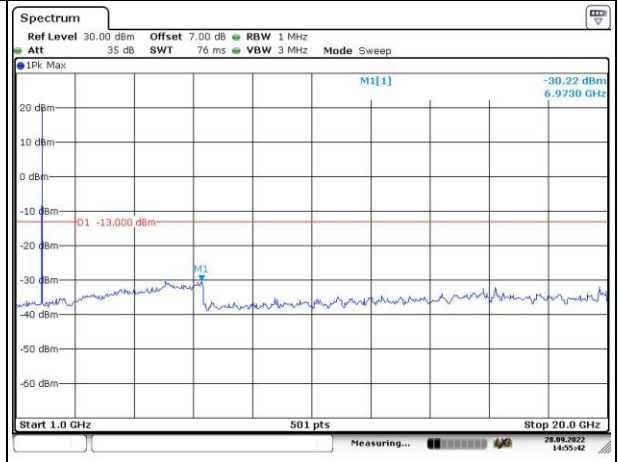
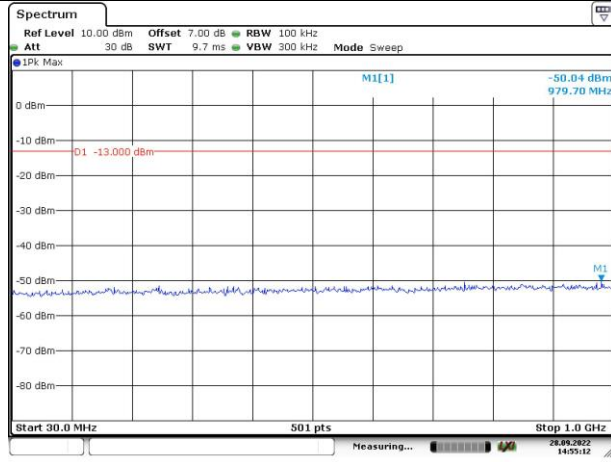


Spurious Emissions at Antenna Terminal

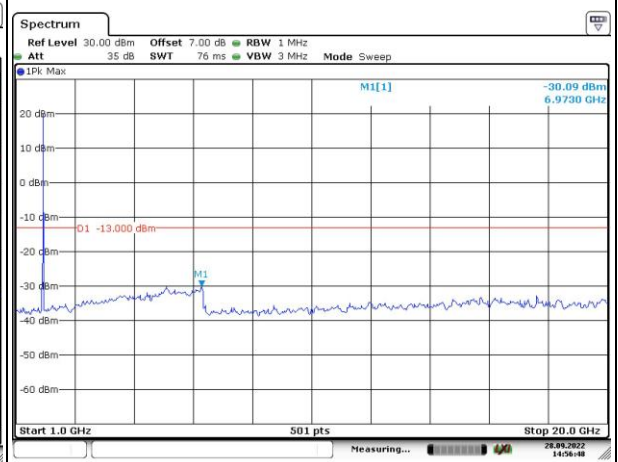
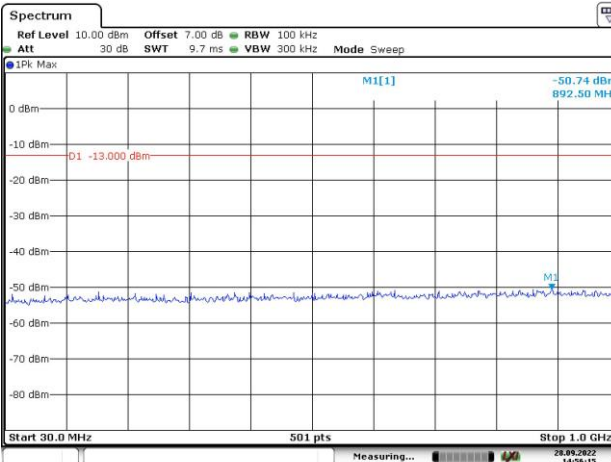
Channel

5MHz Bandwidth QPSK

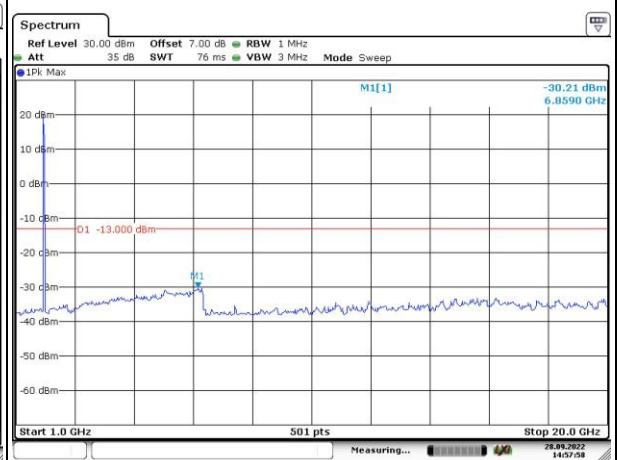
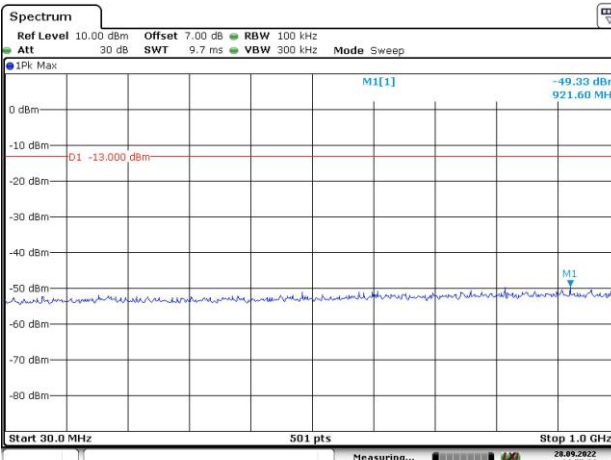
Lowest



Middle



Highest

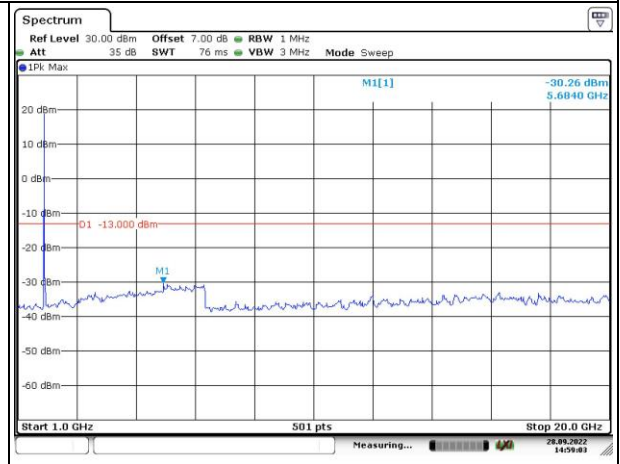
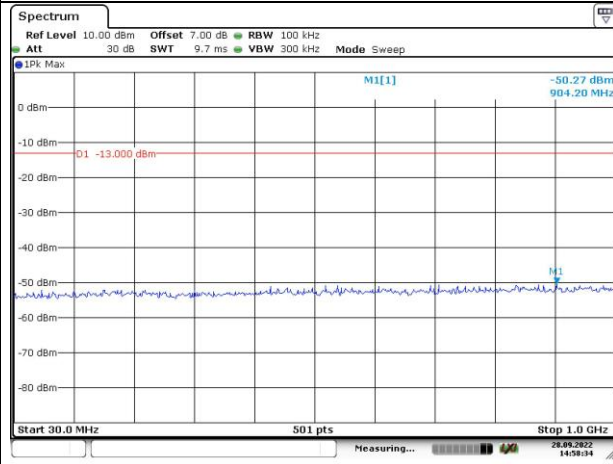


Spurious Emissions at Antenna Terminal

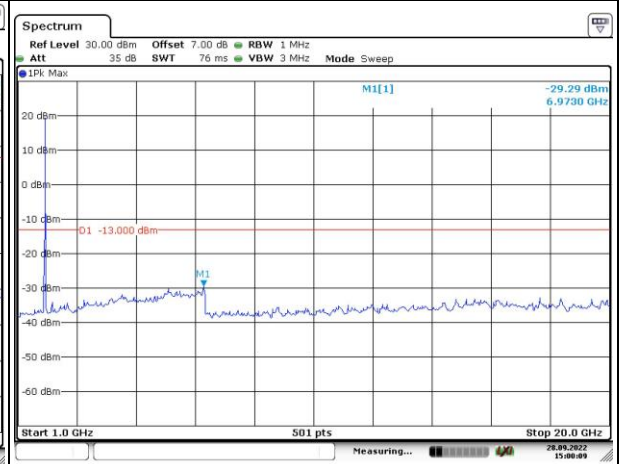
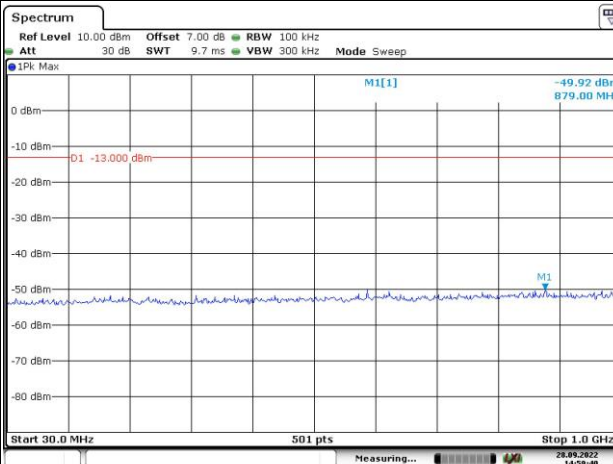
Channel

10MHz Bandwidth QPSK

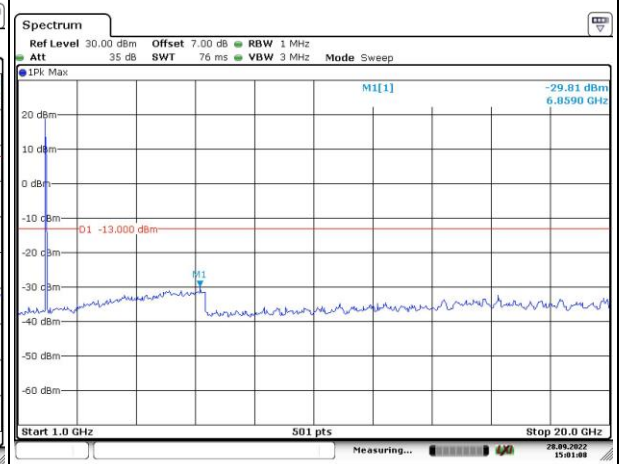
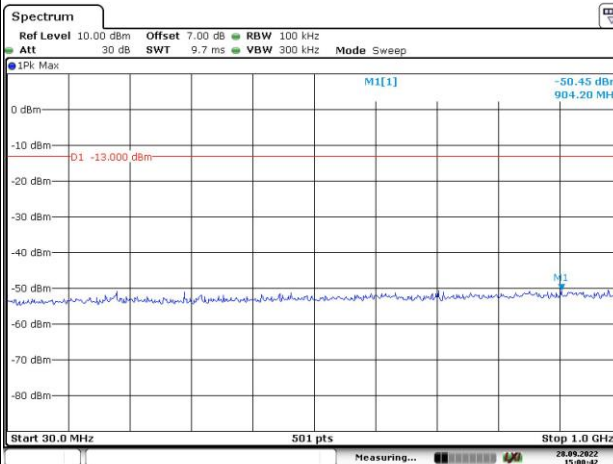
Lowest



Middle



Highest

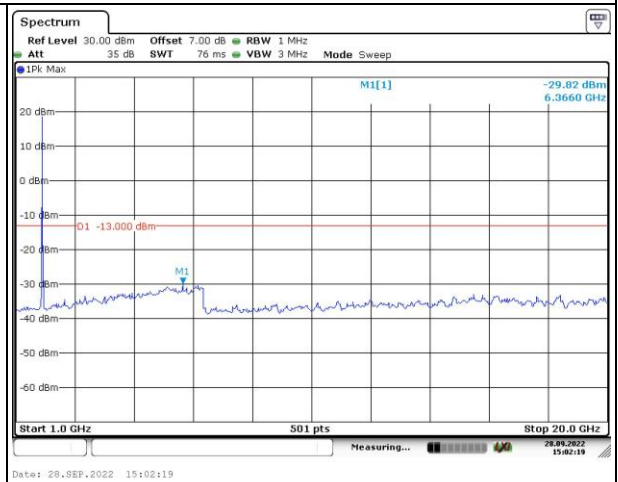
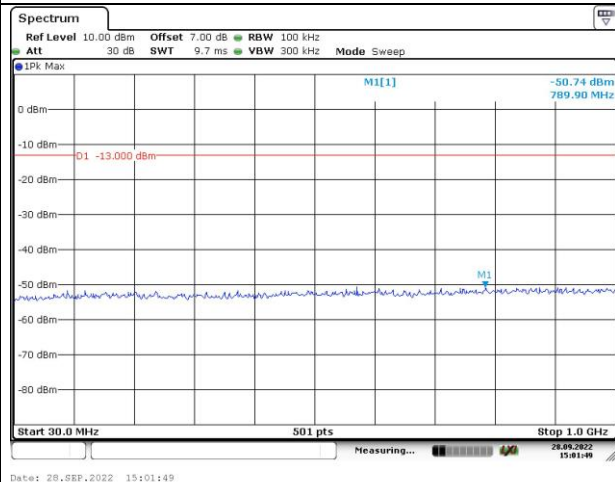


Spurious Emissions at Antenna Terminal

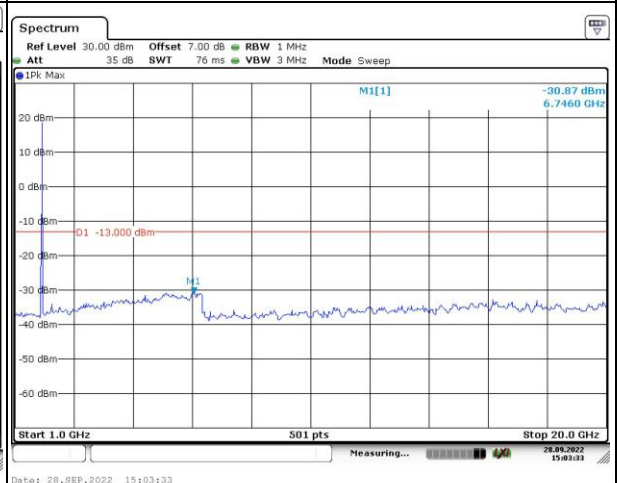
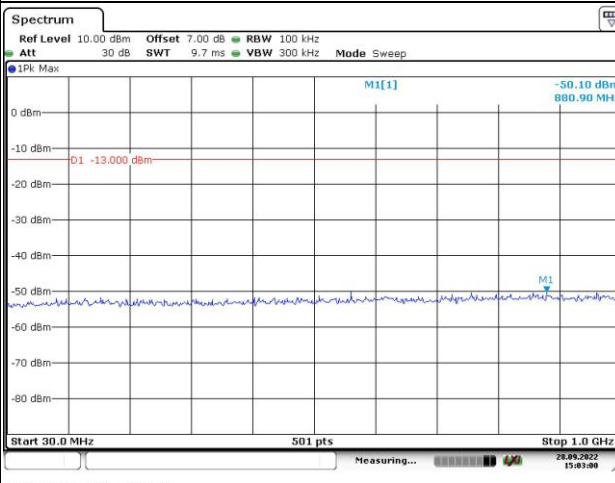
Channel

15MHz Bandwidth QPSK

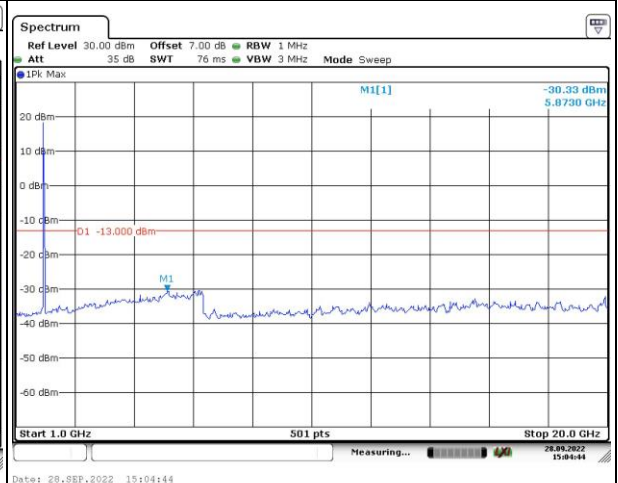
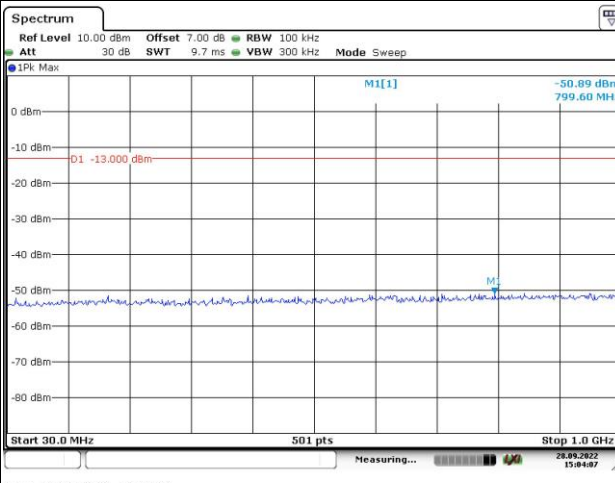
Lowest



Middle



Highest

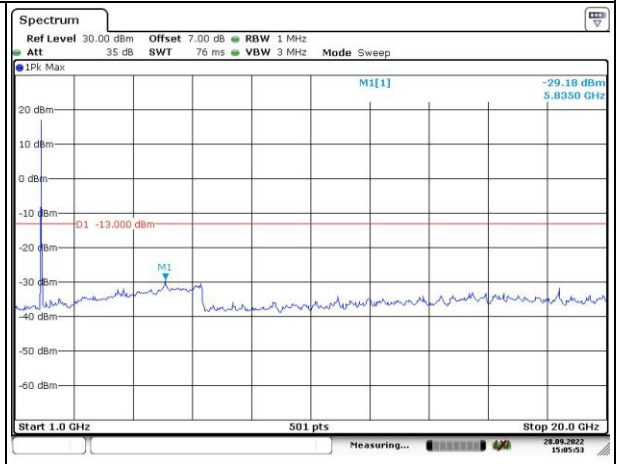
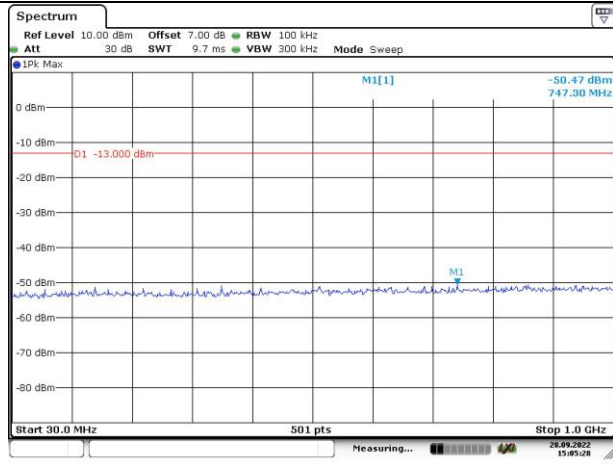


Spurious Emissions at Antenna Terminal

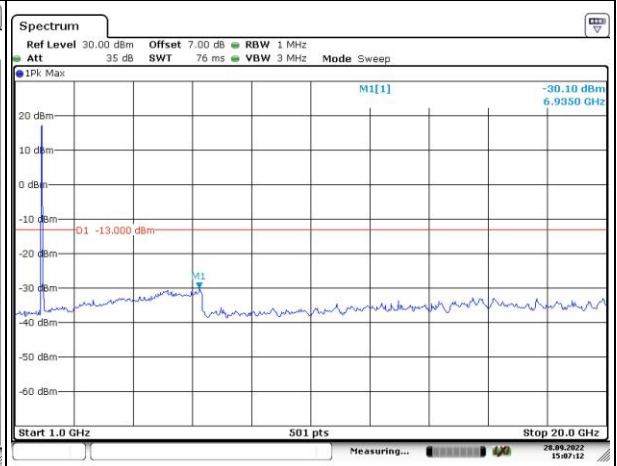
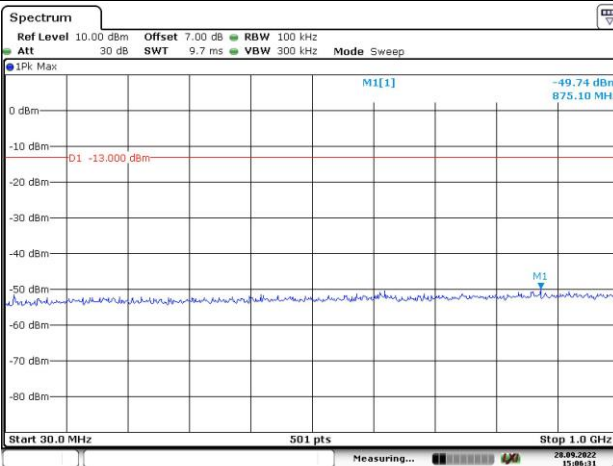
Channel

20MHz Bandwidth QPSK

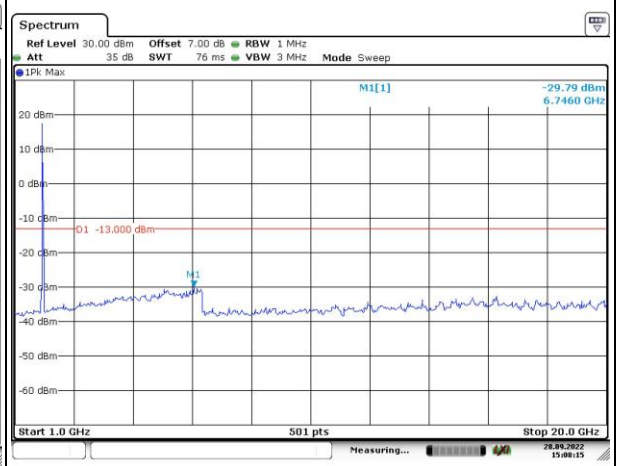
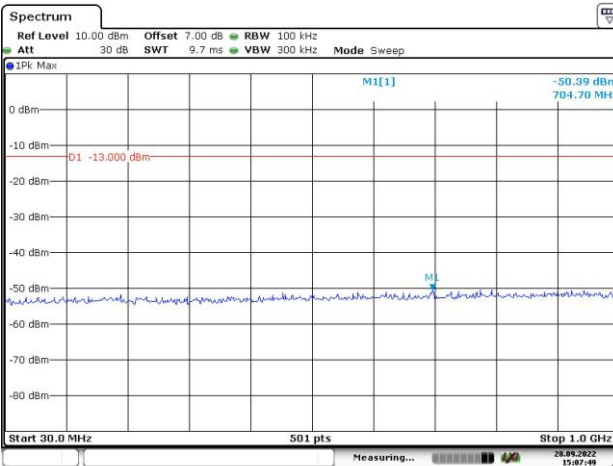
Lowest



Middle



Highest



Out of band emission, Band Edge

Mode	Lowest	Highest
QPSK 1.4MHz		
QPSK 3MHz		
QPSK 5MHz		

Out of band emission, Band Edge

Mode	Lowest	Highest
QPSK 10MHz		
QPSK 15MHz		
QPSK 20MHz		

Out of band emission, Band Edge

Mode	Lowest	Highest
16QAM 1.4MHz	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 30 kHz Att 35 dB SWT 35 ms VBW 100 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -31.47 dBm 1.8500000 GHz -13.000 dBm CF 1.85 GHz 501 pts Span 3.0 MHz Ready 28.09.2022 14:33:38 Date: 28. SEP. 2022 14:33:39</p>	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 30 kHz Att 35 dB SWT 35 ms VBW 100 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -31.13 dBm 1.9100000 GHz -13.000 dBm CF 1.91 GHz 501 pts Span 3.0 MHz Ready 28.09.2022 14:33:53 Date: 28. SEP. 2022 14:33:53</p>
16QAM 3MHz	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 30 kHz Att 35 dB SWT 35 ms VBW 100 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -29.30 dBm 1.8500000 GHz -13.000 dBm CF 1.85 GHz 501 pts Span 6.0 MHz Ready 28.09.2022 14:34:09 Date: 28. SEP. 2022 14:34:09</p>	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 30 kHz Att 35 dB SWT 35 ms VBW 100 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -29.33 dBm 1.9100000 GHz -13.000 dBm CF 1.91 GHz 501 pts Span 6.0 MHz Ready 28.09.2022 14:34:22 Date: 28. SEP. 2022 14:34:22</p>
16QAM 5MHz	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 100 kHz Att 35 dB SWT 35 ms VBW 300 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -30.18 dBm 1.8500000 GHz -13.000 dBm CF 1.85 GHz 501 pts Span 10.0 MHz Ready 28.09.2022 14:34:38 Date: 28. SEP. 2022 14:34:38</p>	<p>Spectrum Ref Level 30.00 dBm Offset 7.00 dB RBW 100 kHz Att 35 dB SWT 35 ms VBW 300 kHz Mode Sweep SGL Count 50/50 IRm AvgPwr M1[1] -30.52 dBm 1.9100000 GHz -13.000 dBm CF 1.91 GHz 501 pts Span 10.0 MHz Ready 28.09.2022 14:34:51 Date: 28. SEP. 2022 14:34:51</p>

Out of band emission, Band Edge

Mode	Lowest	Highest
16QAM 10MHz		
16QAM 15MHz		
16QAM 20MHz		

4.7 Antenna Port Test Data and Results for LTE Band 4

Serial Number:	CR220943987-RF-S1	Test Date:	2022-09-28~2022-10-11
Test Site:	RF	Test Mode:	Transmitting
Tester:	George Chen	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	26.1~28.3	Relative Humidity: (%)	42~56	ATM Pressure: (kPa)	100.2~100.9
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSV40	101474	2022-07-15	2023-07-14
zhuoxiang	Coaxial Cable	SMA-178	211001	Each time	N/A
YINSAIGE	Coaxial Cable	SS402	SJ0100005	Each time	N/A
Weinschel	Power Splitter	1515	RA914	Each time	N/A
R&S	Wideband Radio Communication Tester	CMW500	149218	2022-07-15	2023-07-14
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30174	2022-04-06	2023-04-05
UNI-T	Multimeter	UT39A+	C210582554	2022-09-30	2023-09-29
ZHAOXIN	DC Power Supply	RXN-6010D	21R6010D0912386	N/A	N/A

* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

EUT Information@ LTE Band 4▲:

Antenna Gain G_T (dBi):	-1.3	Path Loss L_C (dB):	0.3
Operation Voltage(V_{DC}):			
Lowest:	3.6	Normal:	3.85
		Highest:	4.4

Test Frequency For Each Mode:

Operation Bandwidth	Lowest Frequency (MHz)	Middle Frequency (MHz)	Highest Frequency (MHz)
1.4MHz	1710.7	1732.5	1754.3
3MHz	1711.5	1732.5	1753.5
5MHz	1712.5	1732.5	1752.5
10MHz	1715	1732.5	1750
15MHz	1717.5	1732.5	1747.5
20MHz	1720	1732.5	1745