





TEST REPORT

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0232-A Page (1) of (67)</p>	 
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1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2023-08-24

2. Use of Report : Certification

3. Name of Product / Model : Tablet PC / SM-X306B

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam



5. FCC ID : A3LSMX306B

6. Date of Test : 2023-09-19 to 2023-10-27

7. Location of Test : Permanent Testing Lab On Site Testing
 (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

8. Test method used : FCC Part 2
 FCC Part 22 Subpart H
 FCC Part 27 Subpart C


9. Test Result : Refer to the test result in the test report

Affirmation	Tested by Name : Sunghyun Yoon  (Signature)	Technical Manager Name : Seungyong Kim  (Signature)
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2023-11-20

Eurofins KCTL Co.,Ltd.

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REPORT REVISION HISTORY

Date	Revision	Page No
2023-11-06	Originally issued	-
2023-11-20	Updated	48

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Note. The report No. KR23-SRF0232 is superseded by the report No. KR23-SRF0232-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

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1. General information

Client : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory : Samsung Electronics Vietnam Thai Nguyen Co., Ltd
Address : Yen Binh Industrial Park, Dong Tien Ward, Pho Yen Town, Thai Nguyen Province, Vietnam
Laboratory : Eurofins KCTL Co.,Ltd.
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
CAB Identifier: KR0040
ISED Number: 8035A
KOLAS No.: KT231

2. Device information

Equipment under test : Tablet PC
Model : SM-X306B
Modulation technique : DFT-s OFDM : PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM
CP-OFDM : QPSK, 16QAM, 64QAM, 256QAM
Power source : DC 3.85 V
Antenna specification : Main Antenna 1 : LDS Antenna (N5/66)
Antenna operation : Main Antenna 1 : SA/NSA (N5), SA/NSA (N66)
EN-DC for NSA : 2A-n5A, 66A-n5A, 2A-n66A, 5A-n66A, 12A-n66A, 13A-n66A
Frequency range : N5 : 826.5 MHz ~ 846.5 MHz
N66 : 1 712.5 MHz ~ 1 777.5 MHz
Bandwidth : N5 : 5 MHz, 10 MHz, 15 MHz, 20 MHz
N66 : 5 MHz, 10 MHz, 15 MHz, 20 MHz
SCS : 15 kHz
Software version : X306B.001
Hardware version : REV1.0
Test device serial No. : Conducted : R32W80012BT
Radiated : R32W80019FB
Operation temperature : 0 °C ~ 35 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

WLAN (11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE), NR n5/66, LTE B2/4/5/12/13/17/26/41/66,
 GSM 850/1900, WCDMA 850/1700/1900, NFC, Digitizer

NR Band N5

Ch.	Frequency (MHz)
165300	826.5
167300	836.5
169300	846.5

Table 2.1-1. 5M BW

Ch.	Frequency (MHz)
165800	829.0
167300	836.5
168800	844.0

Table 2.1-2. 10M BW

Ch.	Frequency (MHz)
166300	831.5
167300	836.5
168300	841.5

Table 2.1-3. 15M BW

Ch.	Frequency (MHz)
166800	834.0
167300	836.5
167800	839.0

Table 2.1-4. 20M BW

NR Band N66

Ch.	Frequency (MHz)
342500	1 712.5
349000	1 745.0
355500	1 777.5

Table 2.1-5. 5M BW

Ch.	Frequency (MHz)
343000	1 715.0
349000	1 745.0
355000	1 775.0

Table 2.1-6. 10M BW

Ch.	Frequency (MHz)
343500	1 717.5
349000	1 745.0
354500	1 772.5

Table 2.1-7. 15M BW

Ch.	Frequency (MHz)
344000	1 720.0
349000	1 745.0
354000	1 770.0

Table 2.1-8. 20M BW

3. Maximum ERP/EIRP power

NR Band n5

Mode	Tx frequency (MHz)	Bandwidth (MHz)	Emission designator	ERP	
				Max. power (dBm)	Max. power (W)
N5	826.5 ~ 846.5	5	4M55G7D	23.22	0.210
			4M55W7D	22.21	0.166
	829.0 ~ 844.0	10	9M02G7D	23.41	0.219
			9M02W7D	22.44	0.175
	831.5 ~ 841.5	15	13M5G7D	23.47	0.222
			13M5W7D	22.56	0.180
	834.0 ~ 839.0	20	18M0G7D	23.45	0.221
			18M0W7D	22.52	0.179

NR Band n66

Mode	Tx frequency (MHz)	Bandwidth (MHz)	Emission designator	EIRP	
				Max. power (dBm)	Max. power (W)
N66	1 712.5 ~ 1 777.5	5	4M56G7D	25.89	0.388
			4M55W7D	24.96	0.313
	1 715.0 ~ 1 775.0	10	9M02G7D	25.91	0.390
			8M99W7D	25.11	0.324
	1 717.5 ~ 1 772.5	15	13M5G7D	25.96	0.394
			13M5W7D	25.29	0.338
	1 720.0 ~ 1 770.0	20	18M0G7D	25.85	0.385
			18M0W7D	24.93	0.311

4. Summary of tests

FCC Part section(s)	Parameter	Test Limit	Test Condition	Test results
2.1046	Conducted Output Power	N/A	Conducted	Pass
2.1049	Occupied Bandwidth 26 dB Bandwidth	N/A		Pass
2.1051 22.917(a) 27.53(h)	Band Edge Emissions at Antenna Terminal	<43 + 10Log ₁₀ (P) dB for all out of band emissions		Pass
	Spurious Emissions at Antenna Terminal			Pass
27.50(d)(5)	Peak to Average Ratio	< 13 dB		Pass
2.1055 22.355	Frequency stability	< 2.5 ppm		Pass
27.54		Emission must remain in band		
22.913(a)(5)	Effective Radiated Power	< 7 Watts max. ERP	Radiated	Pass
27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts max. EIRP		Pass
				Pass
2.1053 22.917(a) 27.53(h)	Radiated Spurious Emissions	<43 + 10Log ₁₀ (P) dB for all out of band emissions		Pass

Notes:

- The test procedure(s) in this report were performed in accordance as following.
 - ◆ ANSI C63.26-2015
 - ◆ ANSI/TIA-603-E-2016
 - ◆ KDB 971168 D01 v03r01
 - ◆ KDB 971168 D02 v02r02

4.1. Worst case orientation

1. All modes of operation were investigated and the worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations in the test data.
2. Output power measurements were measured on PI/2 BPSK, QPSK, 16QAM, 64QAM and 256QAM modulation. All tests except output power was performed with QPSK and 16QAM modulation with highest power.
 - Waveform: DFT-s OFDM
 - Modes: NSA/SA [Worst Case: n5: SA, n66: SA]
3. In case of EN-DC mode, highest EIRP/ERP for stand-alone test case for LTE or 5GNR was configured then the spurious emissions were evaluated for simultaneous transmission.
 - EN-DC modes (Main Ant 1-Main Ant 1): 2A-n5A, 66A-n5A, 5A-n66A, 12A-n66A, 13A-n66A
 - EN-DC modes (Sub Ant 1-Main Ant 1): 2A-n66A,
 - Worst case:
(Main Ant 1-Main Ant 1): 66A-n5A, 13A-n66A
(Sub Ant 1-Main Ant 1): 2A-n66A
4. However, the PAPR was evaluated for all waveforms and modulations during pre-test, then all bandwidth was performed for the modulations with the highest result.
 - Worst Modulation:
n5: CP-OFDM (QPSK, 256QAM)
n66: CP-OFDM (QPSK, 64QAM)
5. EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
6. All configurations have been performed (Stand-alone, Stand-alone with TA, With accessories).
Worst case: Stand-alone

7. Test Condition

- The measurement was performed with various configurations then worst results are reported.

1) Radiated measurement

Test Description	Waveform	Modulation	RB size	Test Channel
Effective Radiated Power	DFT-s OFDM	QPSK, 16QAM	1	Low, Mid, High
Equivalent Isotropic Radiated Power		QPSK, 16QAM		
Radiated Spurious Emissions		QPSK		

Band	Bandwidth (MHz)	RB size	RB offset
N5	15	1	1, 40, 77
N66	15	1	1, 40, 77

2) Conducted measurement

Test Description	Waveform	Modulation	RB size	Test Channel
OBW & 26 dB BW	DFT-s OFDM	QPSK, 16QAM	Full	Low, Mid, High
Band Edge		QPSK	1	Low, High
Spurious Emissions			Full	
PAPR	CP OFDM	QPSK, 64QAM, 256QAM	Full	Mid

Band	Bandwidth	RB size	RB offset
N5	5, 10, 15, 20	1	0, 24, 51, 78, 105
		Full	0
N66	5, 10, 15, 20	1	0, 24, 51, 78, 105
		Full	0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (\pm)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	Below 1 000 MHz	2.4 dB
	1 000 MHz ~ 18 000 MHz	2.4 dB
	Above 1 8000 MHz	2.6 dB



6. Measurement results explanation example

Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	6.32	9 000	8.58
50	6.41	10 000	8.95
100	6.44	11 000	9.26
200	6.58	12 000	9.31
300	6.70	13 000	9.20
400	6.71	14 000	9.33
500	6.85	15 000	9.56
600	6.91	16 000	9.84
700	6.94	17 000	9.80
800	6.96	18 000	9.71
900	7.03	19 000	10.15
1 000	7.05	20 000	10.32
2 000	7.32	21 000	10.39
3 000	7.42	22 000	10.67
4 000	7.81	23 000	10.23
5 000	7.70	24 000	10.71
6 000	8.37	25 000	10.96
7 000	8.75	26 000	10.68
8 000	8.74	26 500	11.00

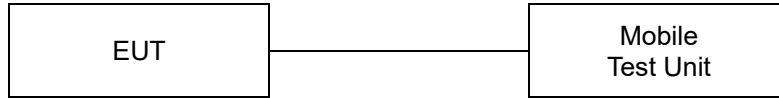
Note.

Offset(dB) = RF cable loss(dB) + Divider(dB)

7. Test results

7.1. Conducted output power

Test setup



Test procedure

971168 D01 v03r01 – Section 5.2
ANSI C63.26-2015 – Section 5.2.4.2
CFR 47 - Section §2.1046

Test settings

When an average power meter is used to perform RF output power measurements, the fundamental condition that measurement be performed only over durations of active transmissions at maximum output power level applies. Thus, an average power meter can always be used to perform the measurement when the EUT can be configured to transmit continuously.

If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98%), then the following options can be implemented to facilitate measurement of the average power with an average power meter:

- a) A gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only during active transmission bursts at maximum output power levels.
- b) A conventional average power meter with no signal gating capability can also be used if the measured burst duty cycle is constant (i.e., duty cycle variations are less than or equal to $\pm 2\%$) by performing the measurement over the on/off burst cycles and then correcting (increasing) the measured level by a factor equal to $[10\log (1/\text{duty cycle})]$. See 5.2.4.3.4 for guidance with respect to measuring the transmitter duty cycle.

See item r) of 4.1 for more information regarding power meter functional requirements and limitations, and consult the instrumentation-specific application literature for proper set-up and use.

Test results

SA Mode

Test Band	Bandwidth (MHz)	Waveform	SCS (kHz)	Modulation	RB size	RB offset	MPR	Maximum power			
								Frequency (MHz)			
								Low	Middle	High	
NR n5	5	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.30	24.32	24.25	
					1	13	0	24.17	24.21	24.15	
					1	23	0	24.28	24.24	24.17	
					12	0	0.5	23.84	23.82	23.81	
					12	7	0	24.34	24.21	24.22	
					12	13	0.5	23.83	23.74	23.77	
					25	0	0.5	23.78	23.81	23.73	
				QPSK	1	1	0	24.30	24.34	24.28	
					1	13	0	24.24	24.24	24.17	
					1	23	0	24.33	24.25	24.25	
					12	0	1	23.28	23.21	23.22	
					12	7	0	24.27	24.35	24.23	
					12	13	1	23.32	23.28	23.28	
				16QAM	1	1	1	23.23	23.45	23.12	
					64QAM	1	1	2.5	21.82	21.78	22.09
	256QAM	1	1		4.5	19.98	20.02	20.06			
	10	DFT-s OFDM	15	CP-OFDM	QPSK	1	1	1.5	22.86	22.93	22.78
					PI/2 BPSK	1	1	0	24.34	24.30	24.20
						1	26	0	24.40	24.41	24.25
						1	50	0	24.36	24.28	24.04
						25	0	0.5	23.74	23.84	23.68
						25	14	0	24.35	24.31	24.08
						25	27	0.5	23.78	23.81	23.60
						50	0	0.5	23.81	23.80	23.66
					QPSK	1	1	0	24.29	24.32	24.19
						1	26	0	24.38	24.42	24.16
						1	50	0	24.31	24.29	24.15
						25	0	1	23.33	23.36	23.15
						25	14	0	24.37	24.32	24.16
						25	27	1	23.37	23.28	23.15
16QAM					1	1	1	23.26	23.41	23.11	
	64QAM	1	1	2.5	21.95	21.92	22.01				
	256QAM	1	1	4.5	19.75	19.80	19.75				
10	DFT-s OFDM	15	CP-OFDM	QPSK	1	1	1.5	22.84	22.78	22.67	

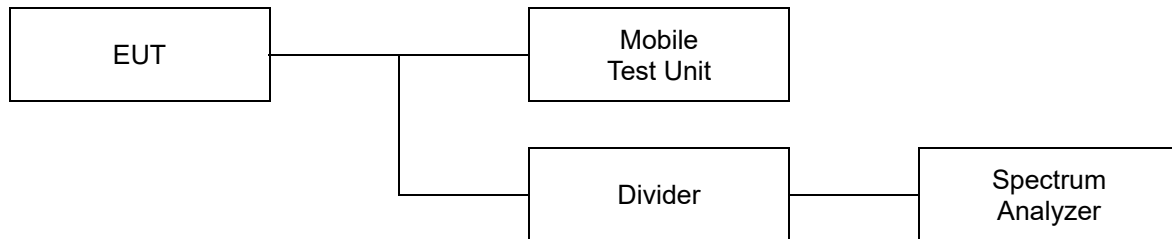
Test Band	Bandwidth (MHz)	Waveform	SCS (kHz)	Modulation	RB size	RB offset	MPR	Maximum power			
								Frequency (MHz)			
								Low	Middle	High	
NR n5	15	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.24	24.34	24.19	
					1	40	0	24.12	24.16	24.10	
					1	77	0	24.19	24.17	24.11	
					36	0	0.5	23.70	23.88	23.72	
					36	22	0	24.30	24.34	24.17	
					36	43	0.5	23.85	23.83	23.68	
					75	0	0.5	23.84	23.83	23.71	
				QPSK	1	1	0	24.23	24.35	24.25	
					1	40	0	24.22	24.20	24.17	
					1	77	0	24.24	24.19	24.16	
					36	0	1	23.28	23.31	23.27	
					36	22	0	24.33	24.35	24.18	
					36	43	1	23.23	23.28	23.25	
					75	0	1	23.33	23.33	23.21	
				16QAM	1	1	1	23.28	23.21	23.25	
				64QAM	1	1	2.5	21.81	22.14	21.77	
	256QAM	1	1	4.5	19.72	19.93	19.67				
	CP-OFDM	20	DFT-s OFDM	15	QPSK	1	1	1.5	22.76	22.91	22.78
	PI/2 BPSK					1	1	0	24.17	24.23	24.28
						1	53	0	24.32	24.42	24.32
						1	104	0	24.09	24.13	24.14
						50	0	0.5	23.75	23.84	23.78
						50	28	0	24.15	24.26	24.35
						50	56	0.5	23.65	23.76	23.78
					100	0	0.5	23.73	23.85	23.79	
	QPSK				1	1	0	24.11	24.28	24.22	
					1	53	0	24.26	24.46	24.29	
					1	104	0	24.06	24.14	24.20	
					50	0	1	23.18	23.37	23.35	
					50	28	0	24.29	24.36	24.19	
					50	56	1	23.19	23.27	23.24	
					100	0	1	23.22	23.30	23.28	
16QAM	1				1	1	23.38	23.28	23.40		
64QAM	1	1	2.5	21.93	21.82	22.13					
256QAM	1	1	4.5	19.61	19.56	19.75					
CP-OFDM				QPSK	1	1	1.5	22.64	22.75	22.78	

Test Band	Bandwidth (MHz)	Waveform	SCS (kHz)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (MHz)		
								Low	Middle	High
NR n66	5	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.70	24.80	24.60
					1	13	0	24.59	24.68	24.51
					1	23	0	24.63	24.82	24.57
					12	0	0.5	24.09	24.35	24.03
					12	7	0	24.62	24.84	24.51
					12	13	0.5	24.08	24.39	24.01
					25	0	0.5	24.14	24.34	24.03
				QPSK	1	1	0	24.70	24.86	24.56
					1	13	0	24.62	24.72	24.47
					1	23	0	24.59	24.86	24.67
					12	0	1	23.64	23.84	23.48
					12	7	0	24.58	24.88	24.57
					12	13	1	23.64	23.75	23.61
					25	0	1	23.64	23.79	23.56
					16QAM	1	1	1	23.57	23.63
	64QAM	1	1	2.5	22.19	22.31	22.37			
	256QAM	1	1	4.5	19.96	20.12	19.95			
	CP-OFDM	QPSK	1	1	1.5	22.98	23.12	23.02		
	10	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.52	24.93	24.58
					1	26	0	24.57	24.75	24.65
					1	50	0	24.48	24.65	24.60
					25	0	0.5	24.01	24.34	24.01
					25	14	0	24.49	24.82	24.56
					25	27	0.5	24.03	24.28	24.02
					50	0	0.5	24.05	24.32	24.04
				QPSK	1	1	0	24.63	24.98	24.60
					1	26	0	24.51	24.84	24.54
					1	50	0	24.50	24.76	24.56
					25	0	1	23.64	23.89	23.57
					25	14	0	24.62	24.85	24.57
25					27	1	23.55	23.68	23.56	
50					0	1	23.56	23.74	23.57	
16QAM					1	1	1	23.92	23.80	23.75
64QAM	1	1	2.5	22.46	22.41	22.12				
256QAM	1	1	4.5	19.98	20.12	19.95				
CP-OFDM	QPSK	1	1	1.5	23.28	23.18	22.98			

Test Band	Bandwidth (MHz)	Waveform	SCS (kHz)	Modulation	RB size	RB offset	MPR	Maximum power		
								Frequency (MHz)		
								Low	Middle	High
NR n66	15	DFT-s OFDM	15	PI/2 BPSK	1	1	0	24.37	24.78	24.50
					1	40	0	24.58	24.64	24.38
					1	77	0	24.64	24.60	24.50
					36	0	0.5	24.18	24.44	24.05
					36	22	0	24.70	24.76	24.50
					36	43	0.5	24.11	24.27	23.92
					75	0	0.5	24.16	24.28	23.93
				QPSK	1	1	0	24.38	24.79	24.66
					1	40	0	24.53	24.76	24.42
					1	77	0	24.61	24.68	24.58
					36	0	1	23.61	23.95	23.56
					36	22	0	24.62	24.93	24.48
					36	43	1	23.55	23.82	23.47
					75	0	1	23.59	23.85	23.49
					16QAM	1	1	1	23.86	23.76
	64QAM	1	1	2.5	22.17	22.44	22.23			
	256QAM	1	1	4.5	19.79	20.11	19.88			
	CP-OFDM	DFT-s OFDM	15	QPSK	1	1	1.5	23.18	23.49	23.01
	PI/2 BPSK				1	1	0	24.45	24.67	24.41
					1	53	0	24.45	24.66	24.58
					1	104	0	24.47	24.39	24.37
					50	0	0.5	23.98	24.27	24.02
					50	28	0	24.38	24.72	24.52
					50	56	0.5	23.91	24.06	23.93
				100	0	0.5	23.94	24.19	24.05	
	QPSK			1	1	0	24.54	24.85	24.42	
				1	53	0	24.56	24.69	24.45	
				1	104	0	24.61	24.48	24.50	
				50	0	1	23.52	23.80	23.56	
				50	28	0	24.52	24.74	24.46	
50				56	1	23.49	23.55	23.41		
100				0	1	23.47	23.69	23.39		
16QAM	1	1	1	23.40	23.63	23.40				
64QAM	1	1	2.5	21.95	22.29	21.85				
256QAM	1	1	4.5	19.79	20.10	19.82				
CP-OFDM	DFT-s OFDM	20	QPSK	1	1	1.5	22.97	23.14	22.98	

7.2. 99% Occupied Bandwidth & 26 dB Bandwidth

Test setup



Limit

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Test procedure

971168 D01 v03r01 – Section 4.2 and 4.3
ANSI C63.26-2015 – Section 5.4.3 and 5.4.4

Test settings

◆ 26dB Bandwidth

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
- b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times$ RBW.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target “-X dB” requirement, i.e., if the requirement calls for measuring the -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
- e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
- f) Determine the reference value by either of the following:
 - 1) Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
 - 2) Set the EUT to transmit an unmodulated carrier. Set the spectrum analyzer marker to the level of the carrier.
- g) Determine the “-X dB amplitude” as equal to (Reference Value - X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
- h) If the reference value was determined using an unmodulated carrier, turn the EUT modulation on, then either clear the existing trace or start a new trace on the spectrum

analyzer and allow the new trace to stabilize. Otherwise the trace from step f) shall be used for step i).

- i) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the “-X dB amplitude” determined in step f). If a marker is below this “-X dB amplitude” value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
- j) The spectral envelope can cross the “-X dB amplitude” at multiple points. The lowest or highest frequency shall be selected as the frequencies that are the farthest away from the center frequency at which the spectral envelope crosses the “-X dB amplitude.”
- k) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

◆ 99% Occupied Bandwidth

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (typically a span of $1.5 \times \text{OBW}$ is sufficient).
- b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set $\geq 3 \times \text{RBW}$.
- c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
- d) Set the detection mode to peak, and the trace mode to max-hold.
- e) If the instrument does not have a 99% OBW function, recover the trace data points and sum directly in linear power terms. Place the recovered amplitude data points, beginning at the lowest frequency, in a running sum until 0.5% of the total is reached. Record that frequency as the lower OBW frequency. Repeat the process until 99.5% of the total is reached and record that frequency as the upper OBW frequency. The 99% power OBW can be determined by computing the difference these two frequencies.
- f) The OBW shall be reported and plot(s) of the measuring instrument display shall be provided with the test report. The frequency and amplitude axis and scale shall be clearly labeled. Tabular data can be reported in addition to the plot(s).

Notes:

1. The EUT was setup to maximum output power with all bandwidth and modulation.

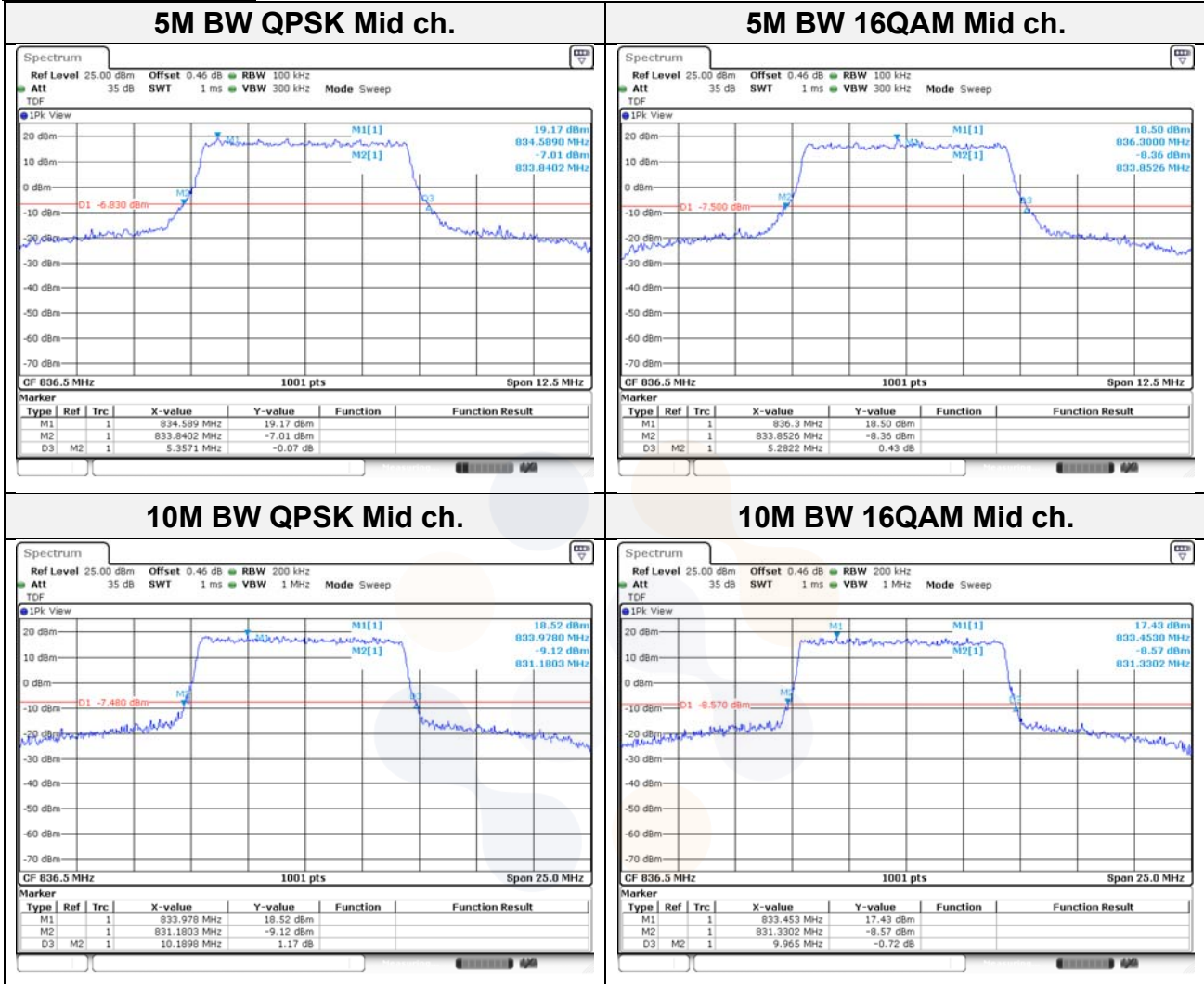
Test results

Test Band	Bandwidth (MHz)	Frequency (MHz)	Waveform	SCS (kHz)	Modulation	26dB bandwidth (MHz)	99 % bandwidth (MHz)
NR N5	5	826.5	DFT-s OFDM	15	QPSK	5.34	4.55
					16QAM	5.46	4.55
		836.5			QPSK	5.36	4.55
					16QAM	5.28	4.51
		846.5			QPSK	5.51	4.53
					16QAM	5.33	4.53
	10	829.0	DFT-s OFDM		QPSK	9.99	8.97
					16QAM	10.09	9.02
		836.5			QPSK	10.19	9.02
					16QAM	9.97	9.02
		844.0			QPSK	10.06	9.02
					16QAM	10.01	8.97
	15	831.5	DFT-s OFDM		QPSK	14.87	13.49
					16QAM	14.80	13.52
		836.5			QPSK	14.80	13.49
					16QAM	14.84	13.49
		841.5			QPSK	14.76	13.45
					16QAM	14.76	13.49
	20	834.0	DFT-s OFDM		QPSK	19.58	18.03
					16QAM	19.73	18.03
		836.5			QPSK	19.68	17.98
					16QAM	19.58	17.98
		839.0			QPSK	19.48	17.98
					16QAM	19.63	17.98

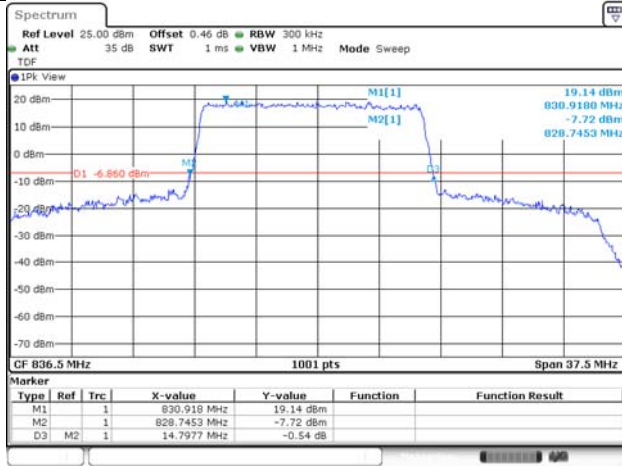
Test Band	Bandwidth (MHz)	Frequency (MHz)	Waveform	SCS (kHz)	Modulation	26dB bandwidth (MHz)	99 % bandwidth (MHz)		
NR N66	5	1 712.5	DFT-s OFDM	15	QPSK	5.43	4.53		
		1 745.0			16QAM	5.41	4.53		
		1 777.5			QPSK	5.41	4.56		
					16QAM	5.41	4.55		
		10			1 715.0	DFT-s OFDM	QPSK	5.44	4.53
					1 745.0		16QAM	5.37	4.53
	1 775.0		QPSK		10.06		9.02		
			16QAM		9.94		8.99		
	1 717.5		QPSK		10.09		8.99		
			16QAM		9.97		8.99		
	15	1 745.0	DFT-s OFDM		QPSK	10.09	8.99		
		1 772.5			16QAM	9.97	8.99		
		1 717.5			QPSK	14.72	13.49		
					16QAM	14.72	13.52		
		1 745.0			QPSK	14.84	13.45		
					16QAM	14.69	13.49		
	20	1 720.0	DFT-s OFDM		QPSK	14.72	13.49		
		1 745.0			16QAM	14.76	13.49		
		1 770.0			QPSK	19.63	17.98		
					16QAM	19.68	18.03		
		1 745.0			QPSK	19.78	17.98		
					16QAM	19.63	18.03		
	1 770.0	QPSK	19.73		17.98				
		16QAM	19.68		17.98				

26 dB Bandwidth

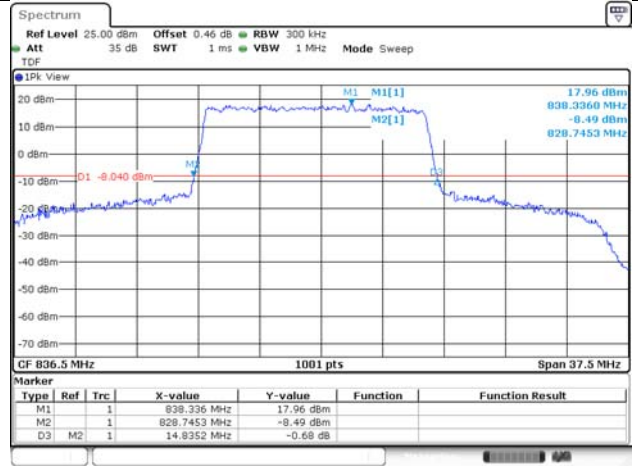
Test mode: NR N5



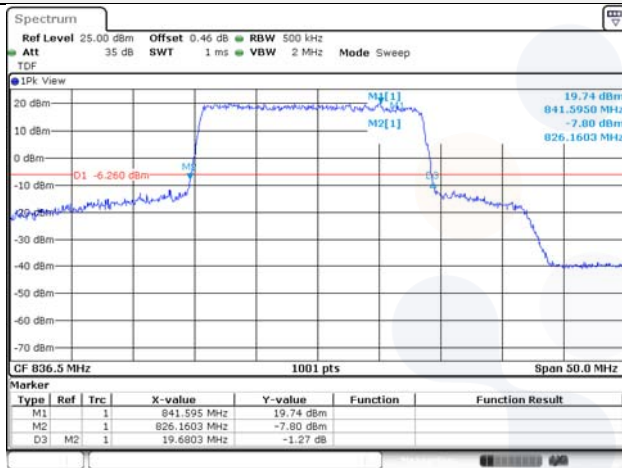
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15M BW 16QAM Mid ch.



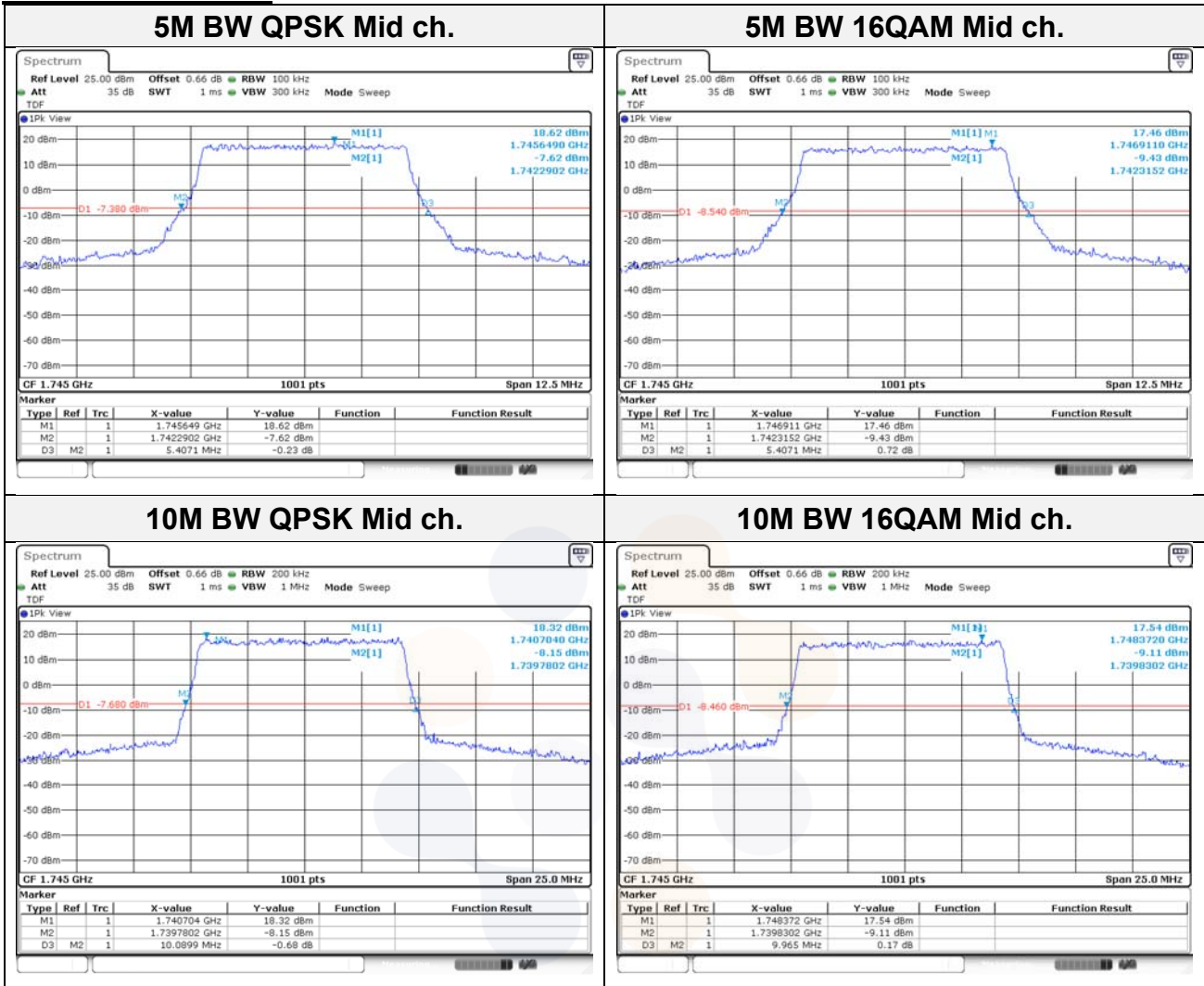
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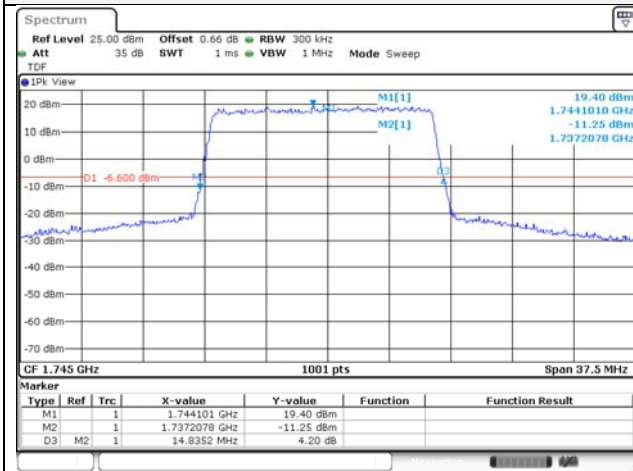
20M BW 16QAM Mid ch.



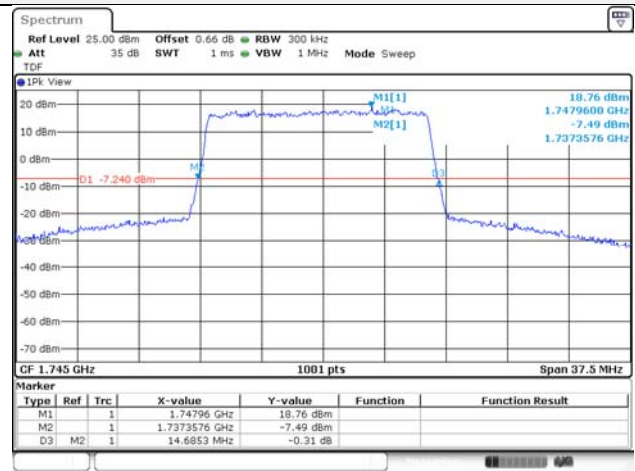
Test mode: NR N66



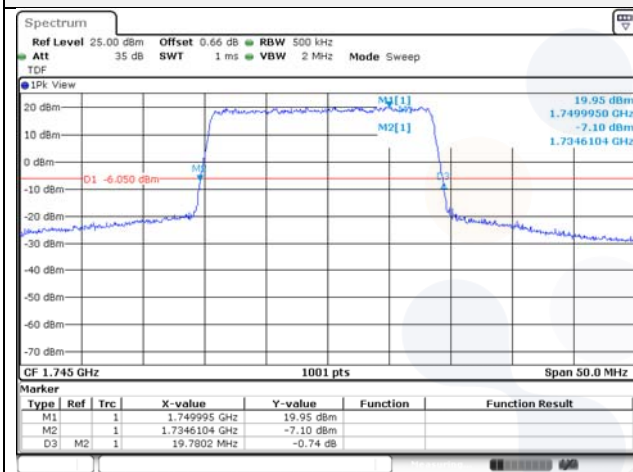
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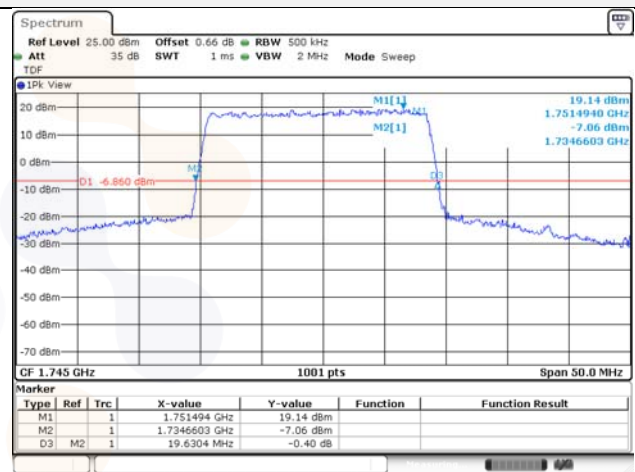
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20M BW QPSK Mid ch.

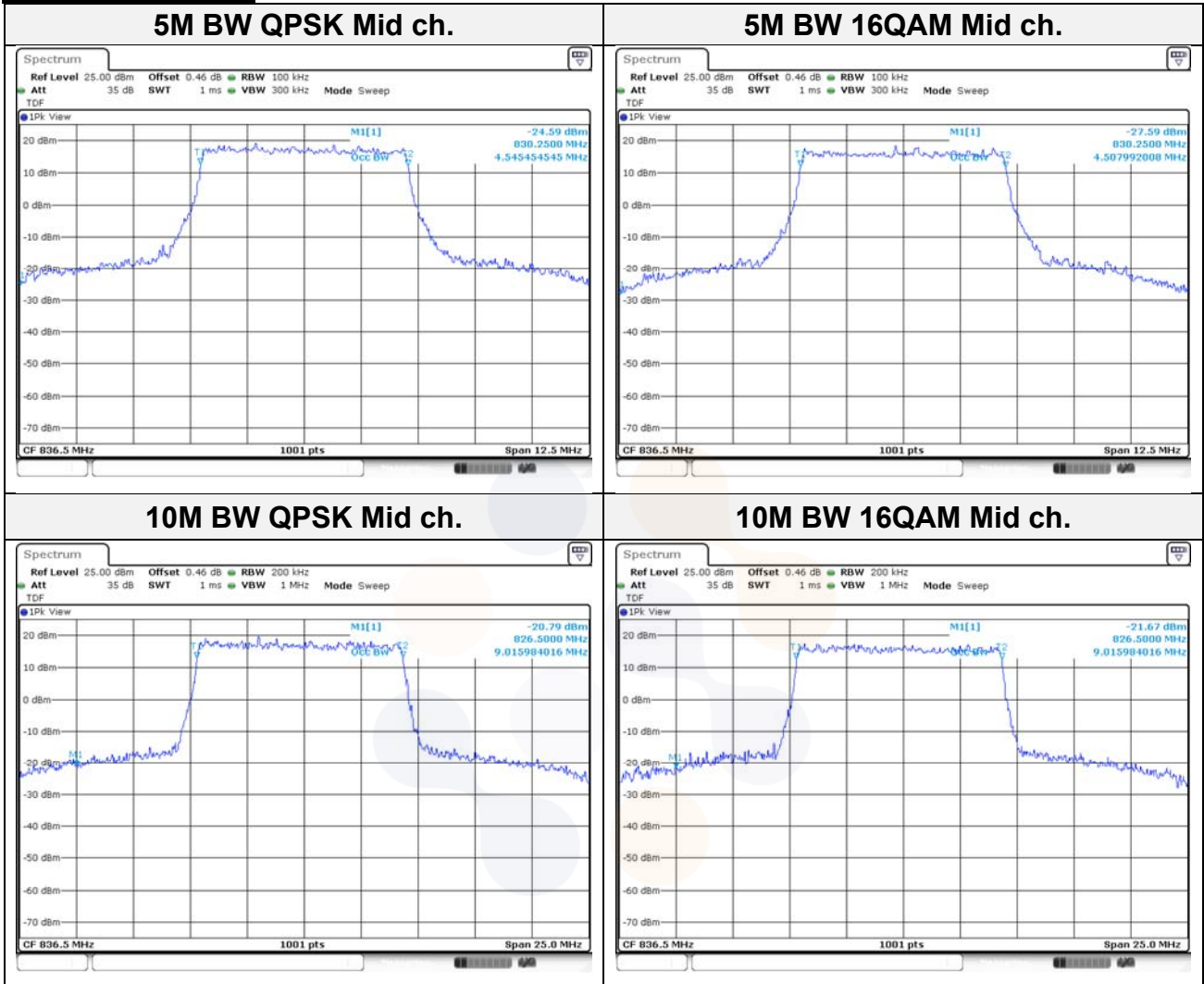


20M BW 16QAM Mid ch.

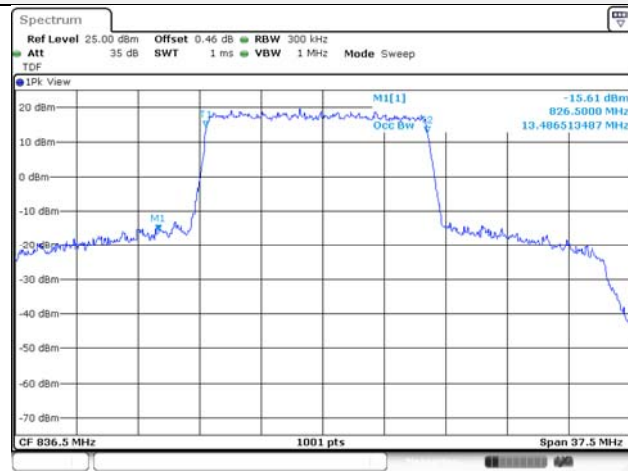


99% Bandwidth

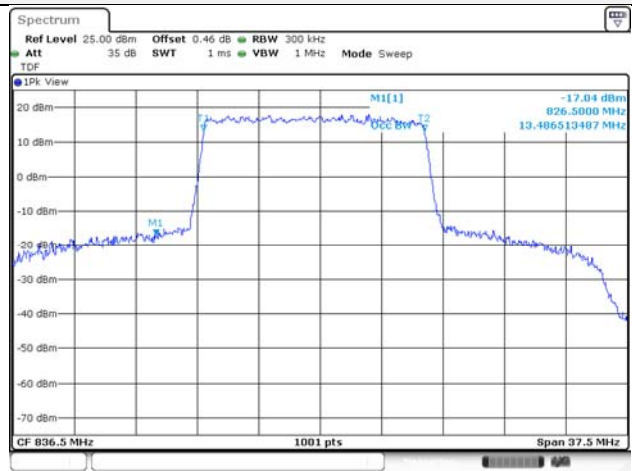
Test mode: NR N5



15M BW QPSK Mid ch.



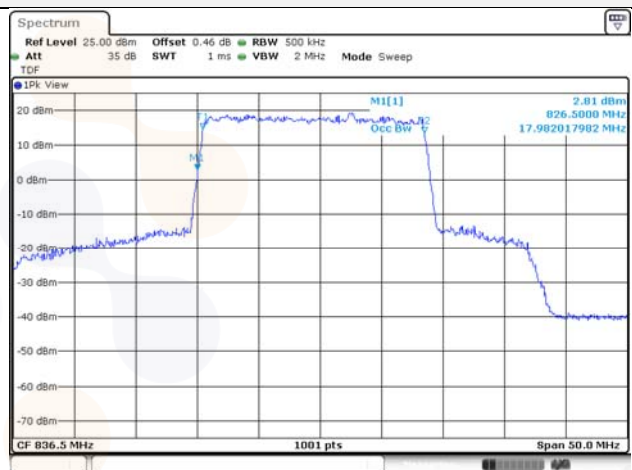
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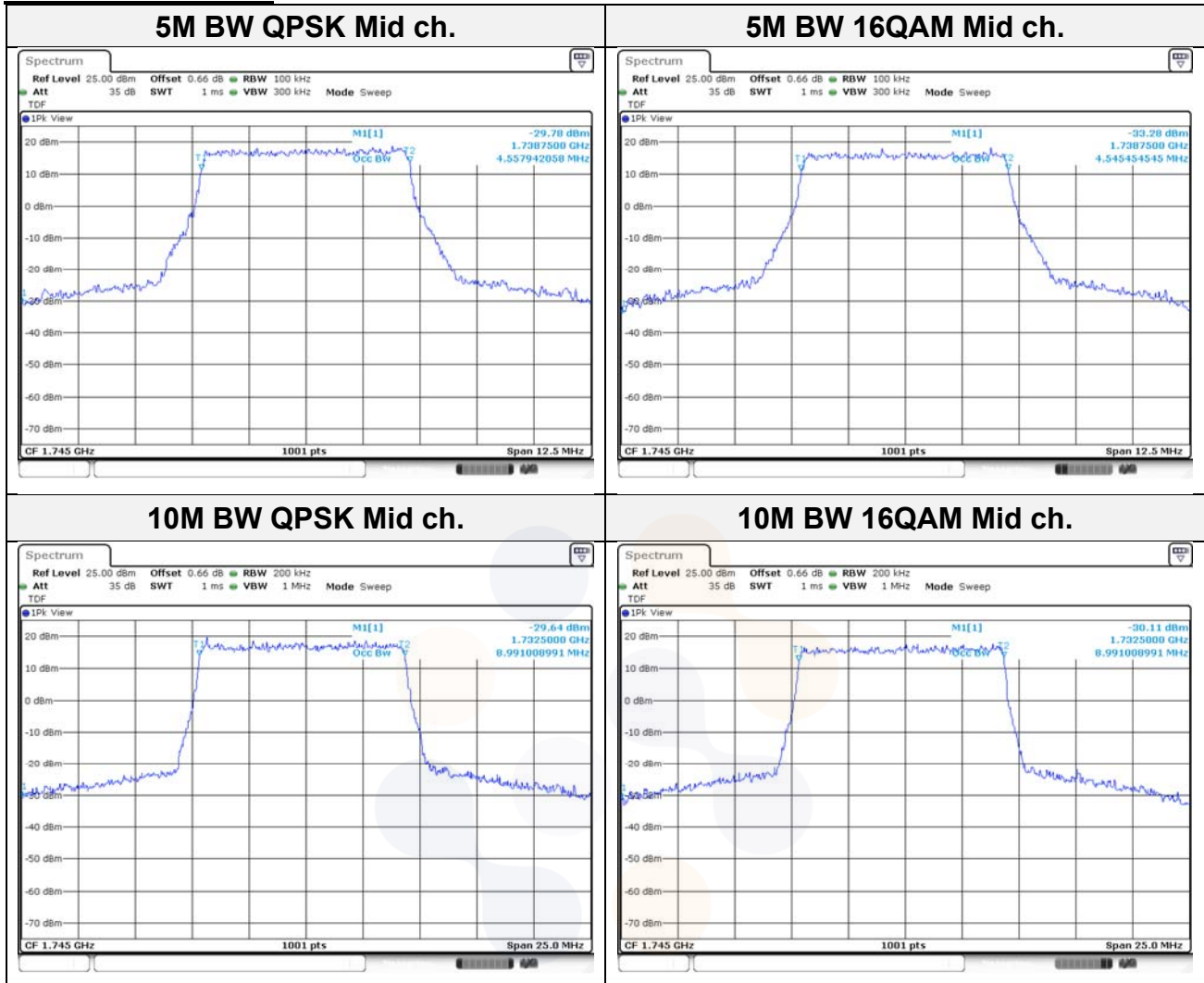
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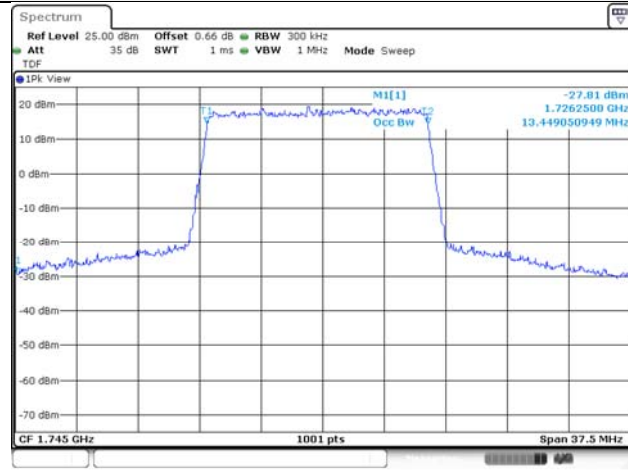
20M BW 16QAM Mid ch.



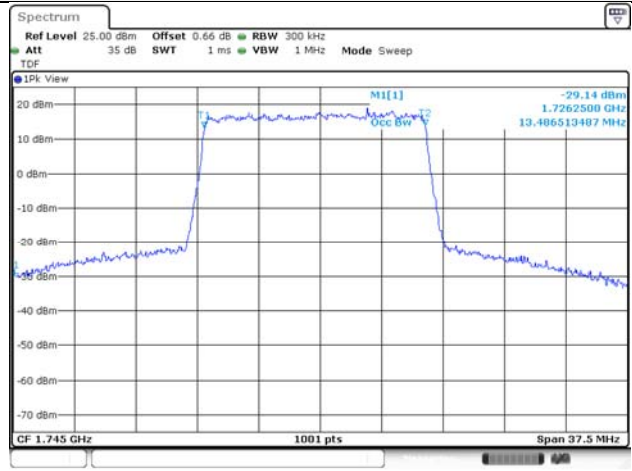
Test mode: NR N66



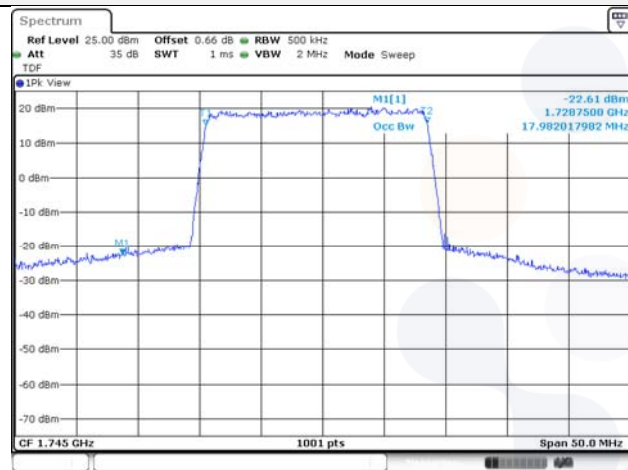
15M BW QPSK Mid ch.



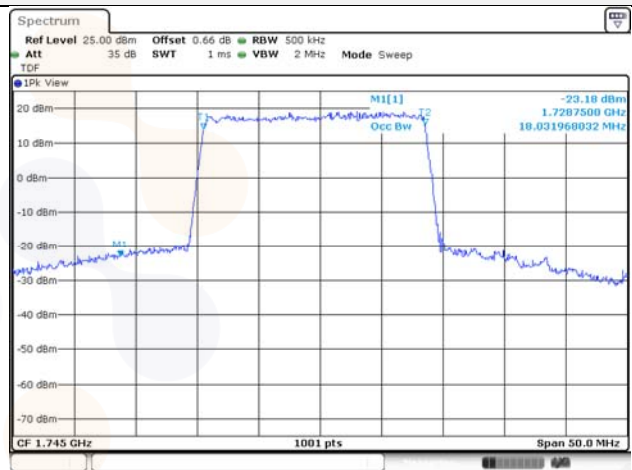
15M BW 16QAM Mid ch.



20M BW QPSK Mid ch.

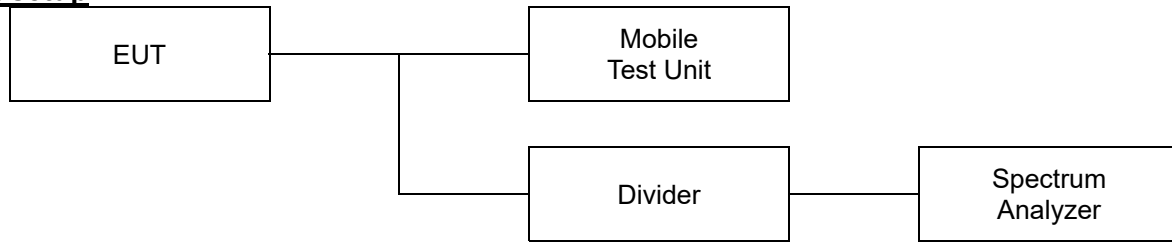


20M BW 16QAM Mid ch.



7.3. Band Edge Emissions at Antenna Terminal

Test setup



Limit

According to §22.917(a), 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 $43 + 10\log(P_{\text{Watts}})$ dB.

According to §27.53(h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log(P_{\text{Watts}})$ dB.

Test procedure

971168 D01 v03r01 - Section 6
ANSI C63.26-2015 – Section 5.7

Test settings

- 1) Start frequency was set to 30 MHz and stop frequency was set to at least 10th the fundamental frequency.
- 2) Span was set large enough so as to capture all out of band emissions near the band edge.
- 3) Set the RBW > 1% of the emission bandwidth.
- 4) Set the VBW $\geq 3 \times$ RBW.
- 5) Set the number of sweep points $\geq 2 \times$ Span/RBW
- 6) Detector = RMS
- 7) Trace mode = trace average
- 8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
 - a) If the device can be configured to transmit continuously (duty cycle $\geq 98\%$), set the (sweep time) > (number of points in sweep) \times (symbol period) (e.g., by a factor of 10 \times symbol period \times number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
 - b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) \times (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time
 - c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) \times (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by $[10 \log (1/\text{duty cycle})]$. This assumes that the transmission period and duty cycle

is relatively constant (duty cycle variation $\leq \pm 2\%$).

- d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations $> \pm 2\%$), set the sweep time so that the averaging is performed over the on-period by setting the sweep time $> (\text{symbol period}) \times (\text{number of points})$, while also maintaining the sweep time $< (\text{transmitter on-time})$. The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.

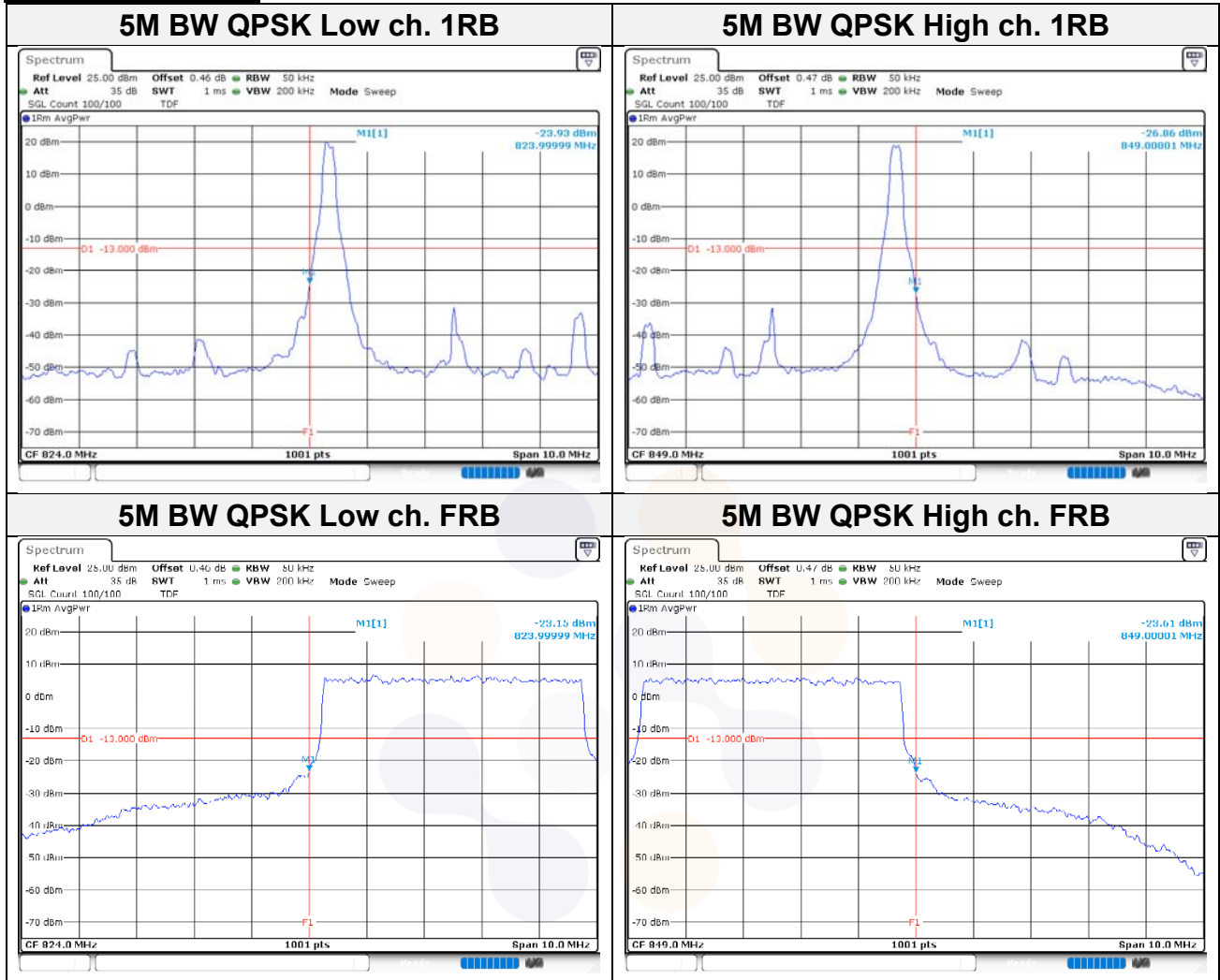
- 9) Allow trace to fully stabilize.

Notes:

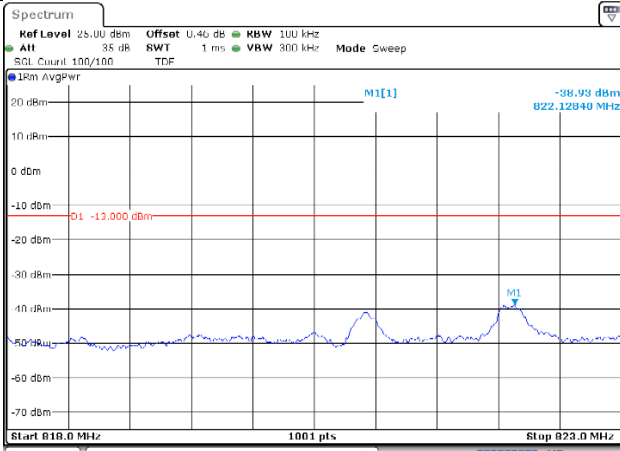
1. Per 22.917(b), 27.53(h)(3), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
2. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.

Test results

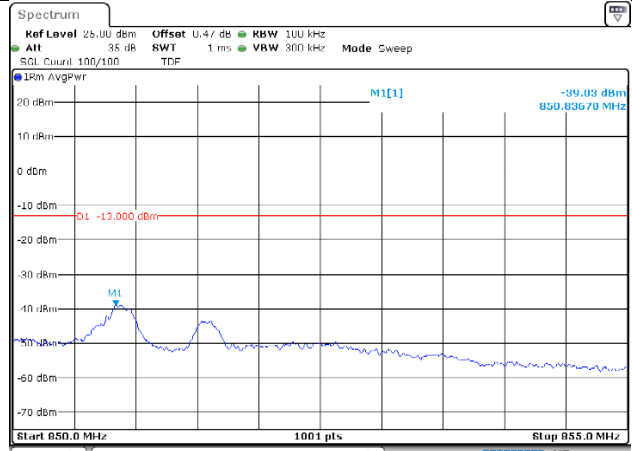
Test mode: NR N5



5M BW QPSK Lower extended 1RB



5M BW QPSK Upper extended 1RB



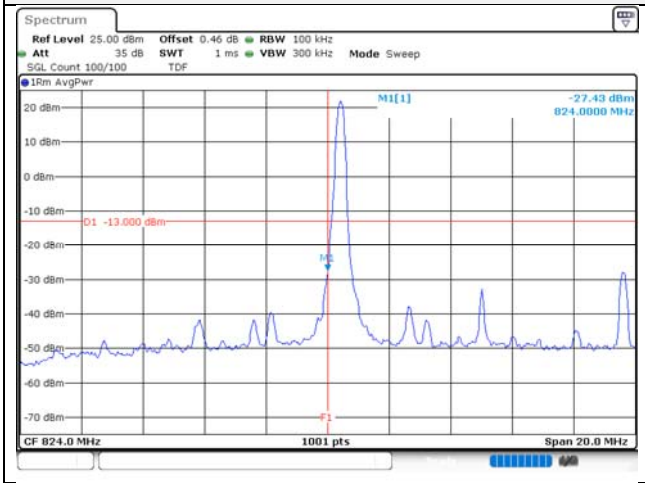
5M BW QPSK Lower extended FRB



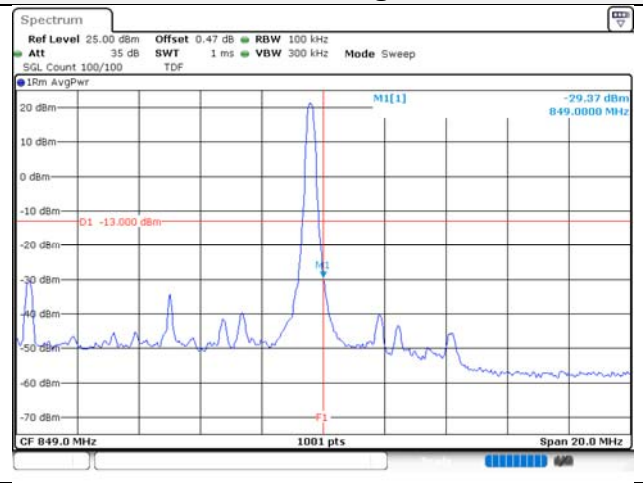
5M BW QPSK Upper extended FRB



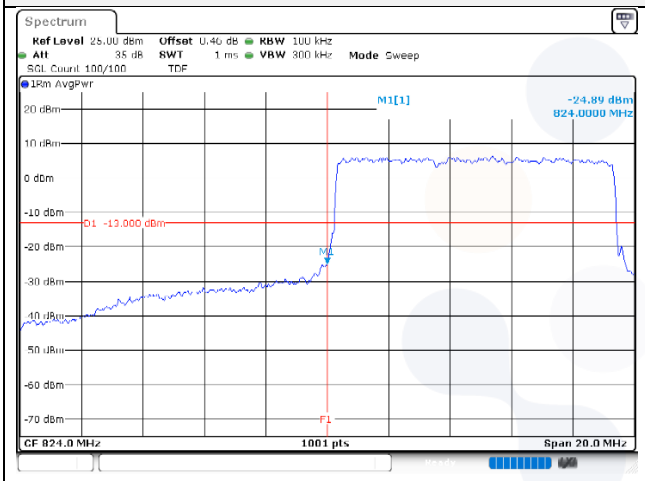
10M BW QPSK Low ch. 1RB



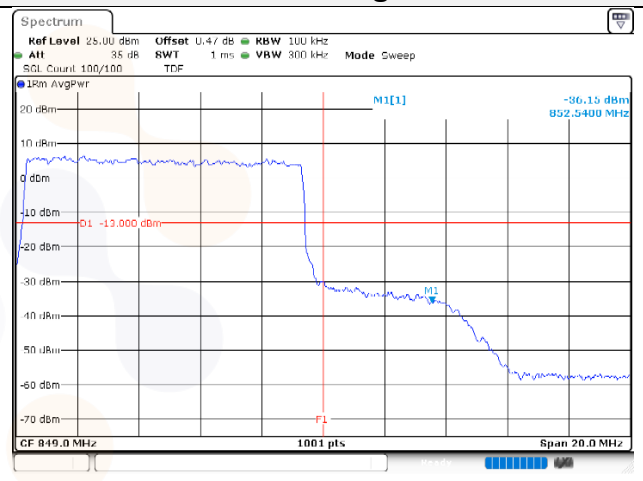
10M BW QPSK High ch. 1RB



10M BW QPSK Low ch. FRB



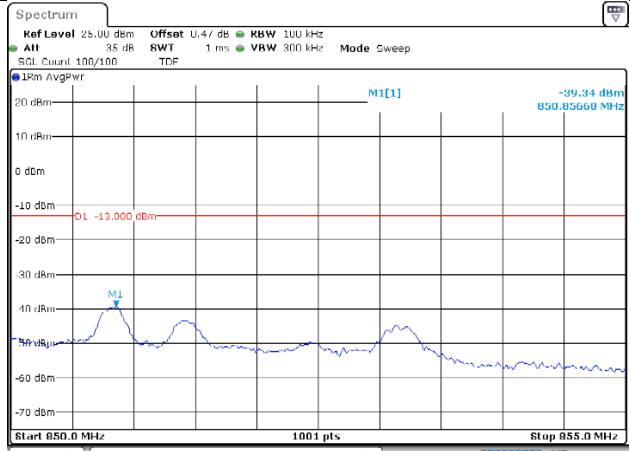
10M BW QPSK High ch. FRB



10M BW QPSK Lower extended 1RB



10M BW QPSK Upper extended 1RB



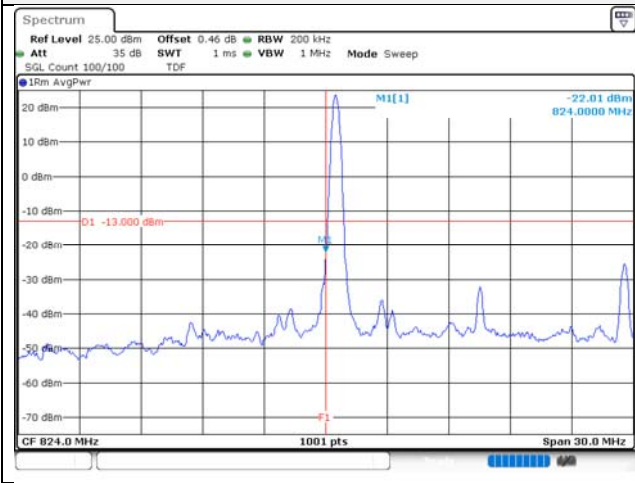
10M BW QPSK Lower extended FRB



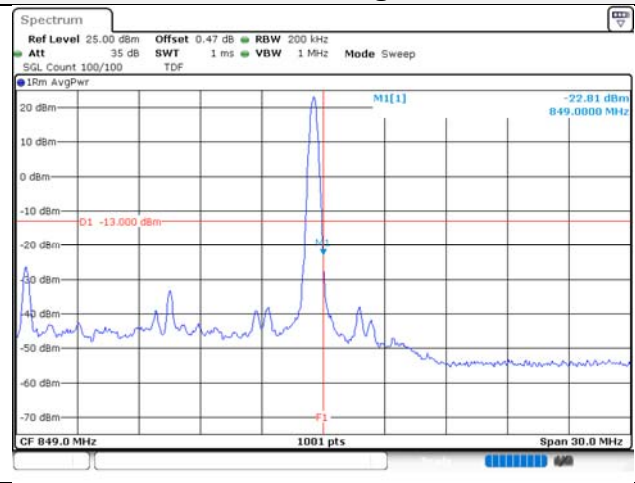
10M BW QPSK Upper extended FRB



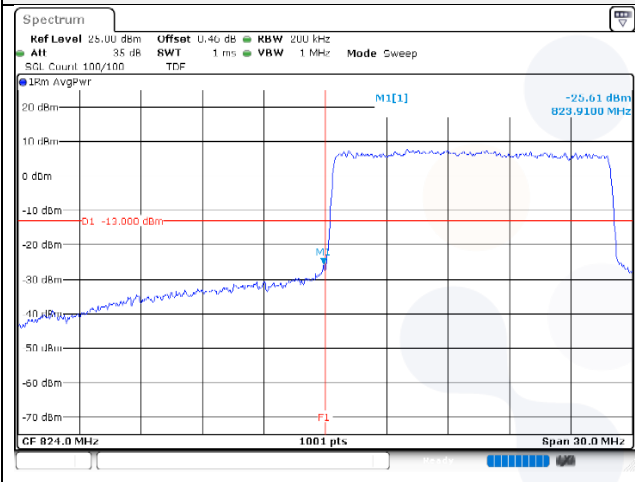
15M BW QPSK Low ch. 1RB



15M BW QPSK High ch. 1RB



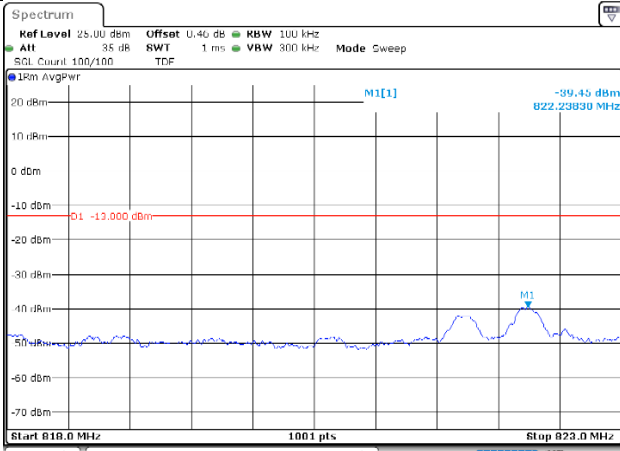
15M BW QPSK Low ch. FRB



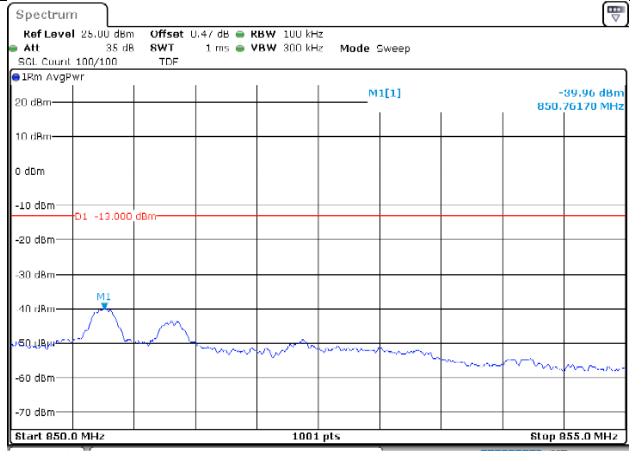
15M BW QPSK High ch. FRB



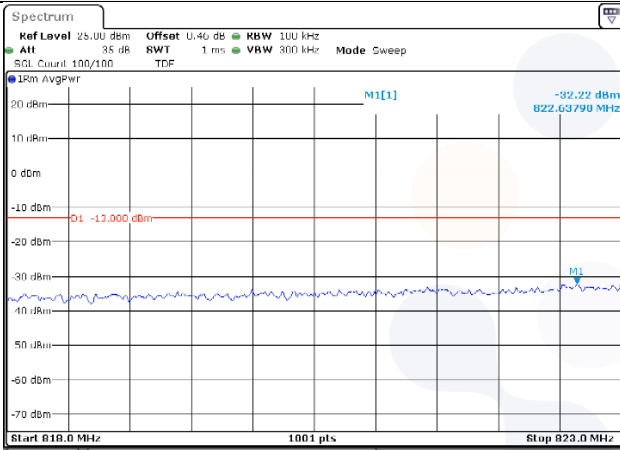
15M BW QPSK Lower extended 1RB



15M BW QPSK Upper extended 1RB



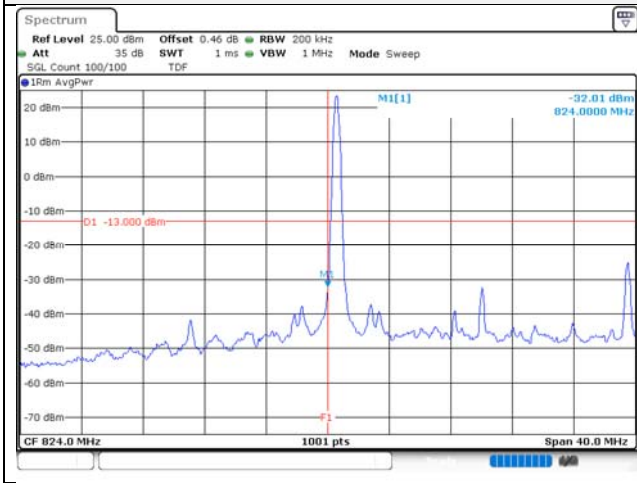
15M BW QPSK Lower extended FRB



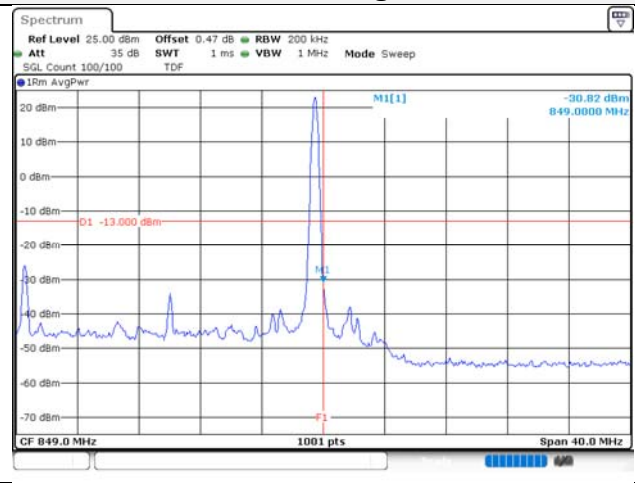
15M BW QPSK Upper extended FRB



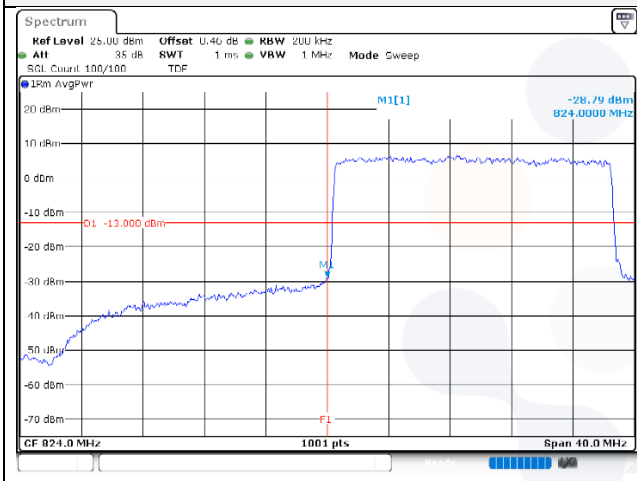
20M BW QPSK Low ch. 1RB



20M BW QPSK High ch. 1RB



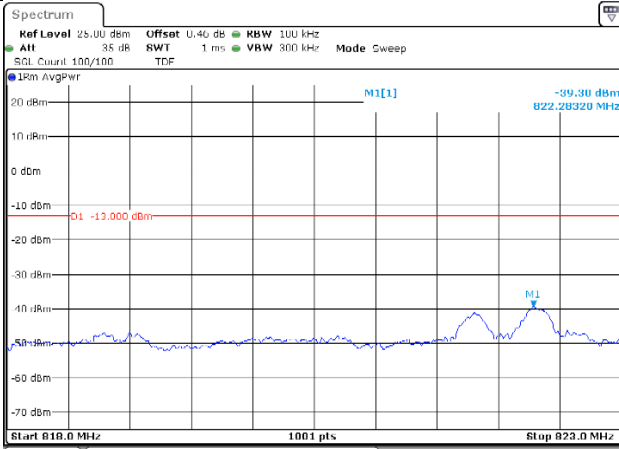
20M BW QPSK Low ch. FRB



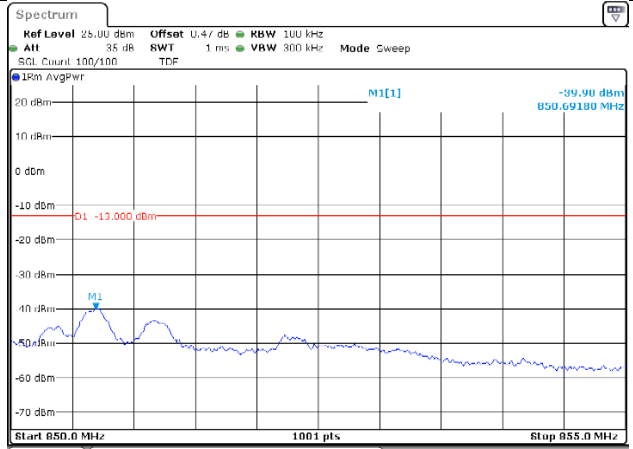
20M BW QPSK High ch. FRB



20M BW QPSK Lower extended 1RB



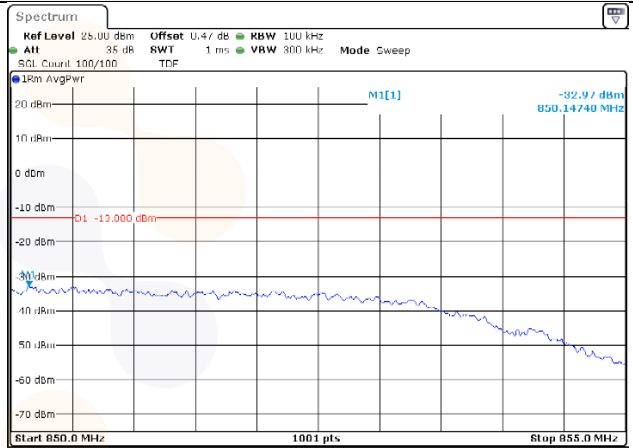
20M BW QPSK Upper extended 1RB



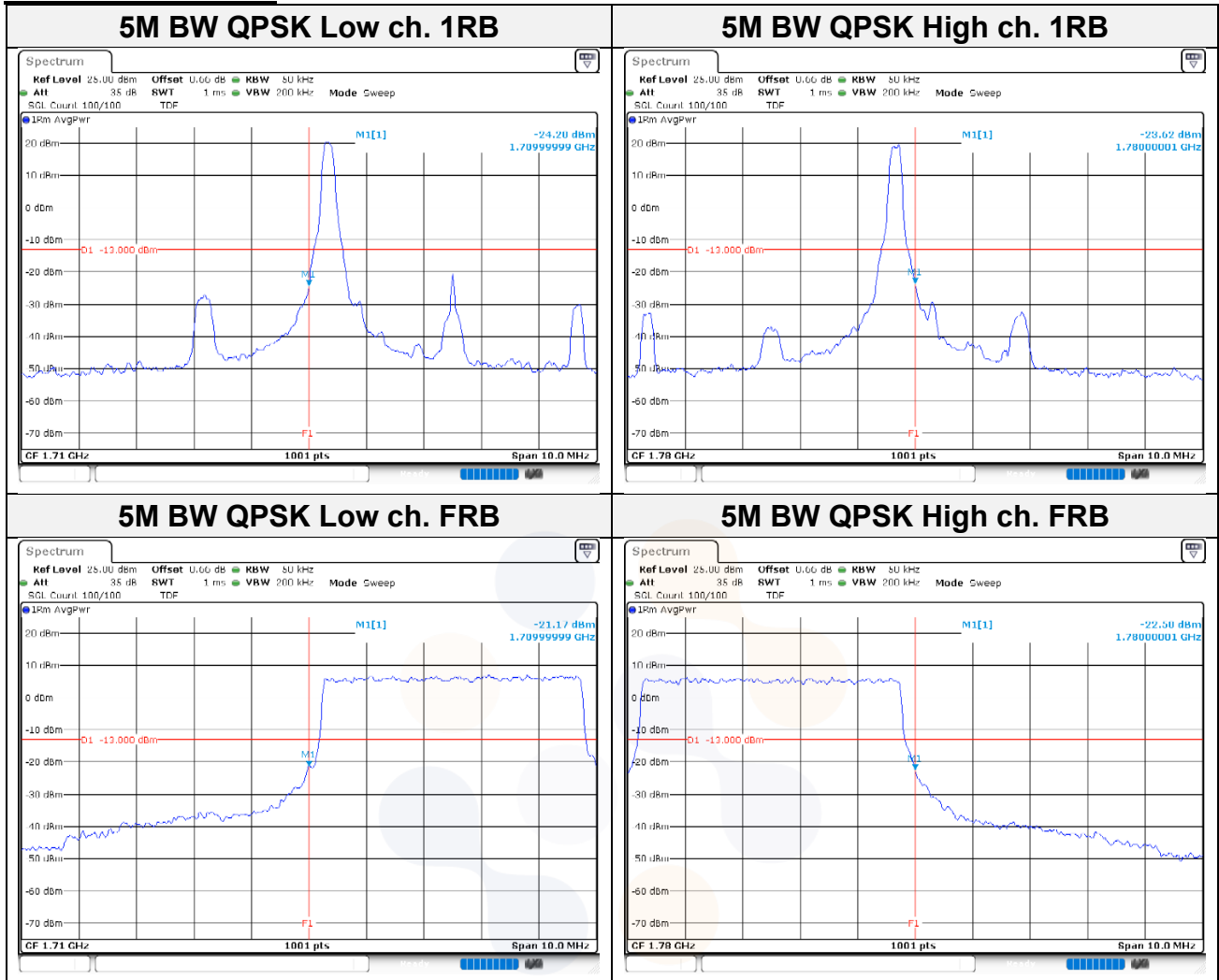
20M BW QPSK Lower extended FRB



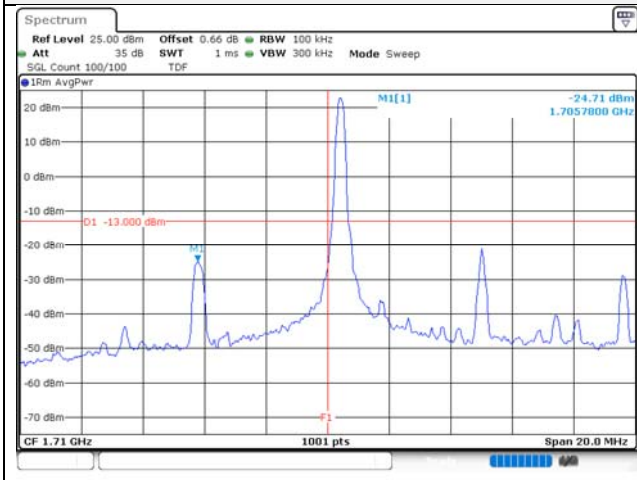
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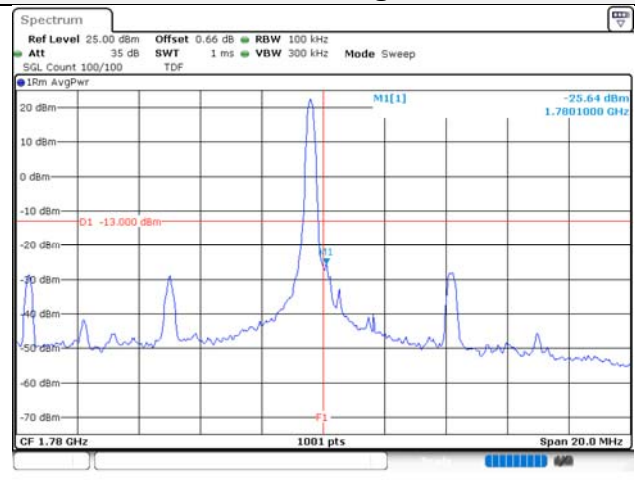
Test mode: NR N66



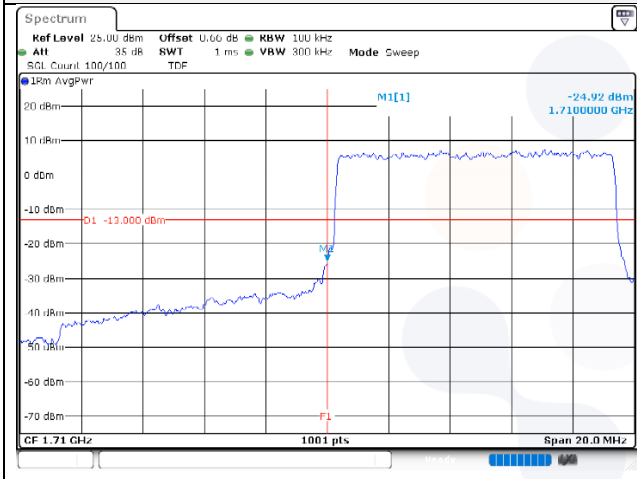
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10M BW QPSK High ch. 1RB



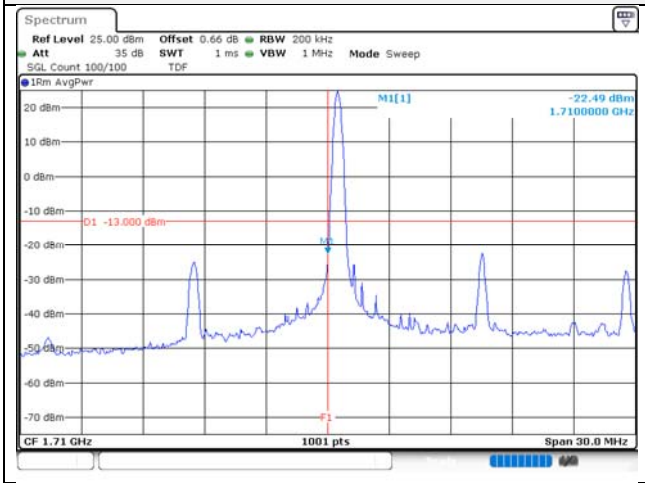
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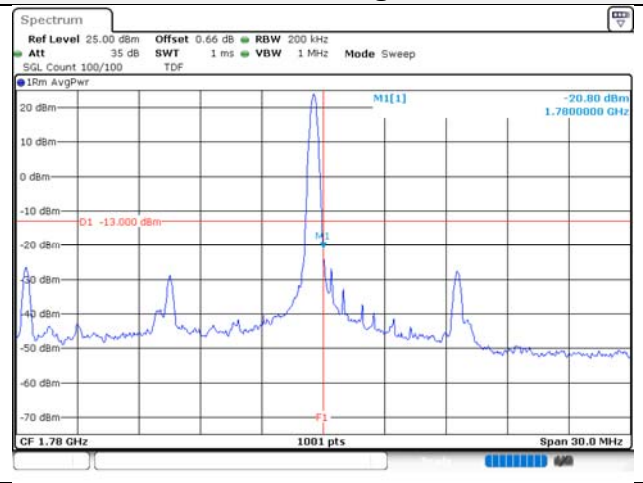
10M BW QPSK High ch. FRB



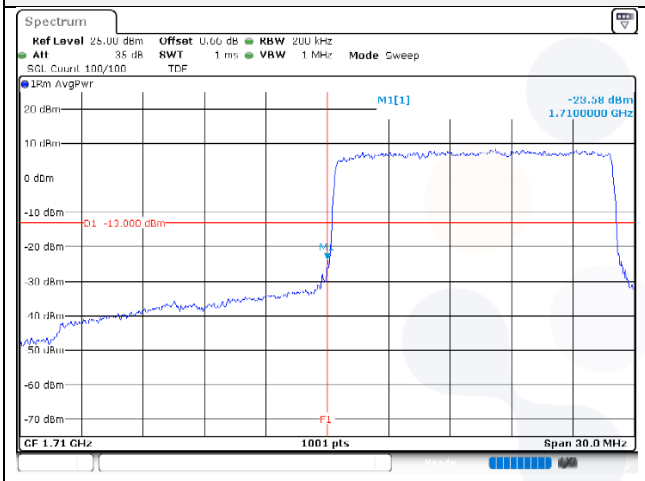
15M BW QPSK Low ch. 1RB



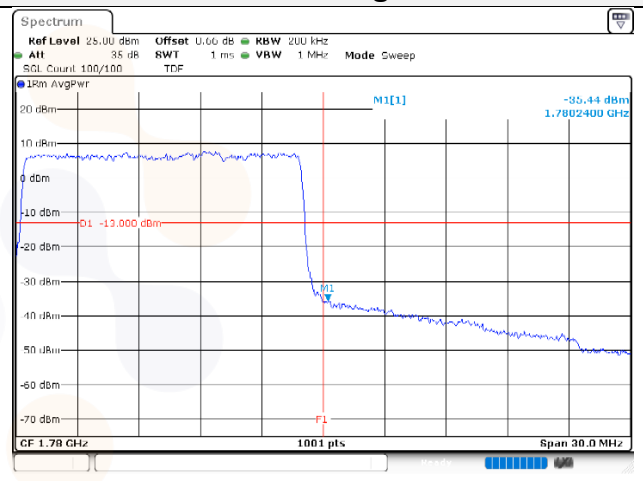
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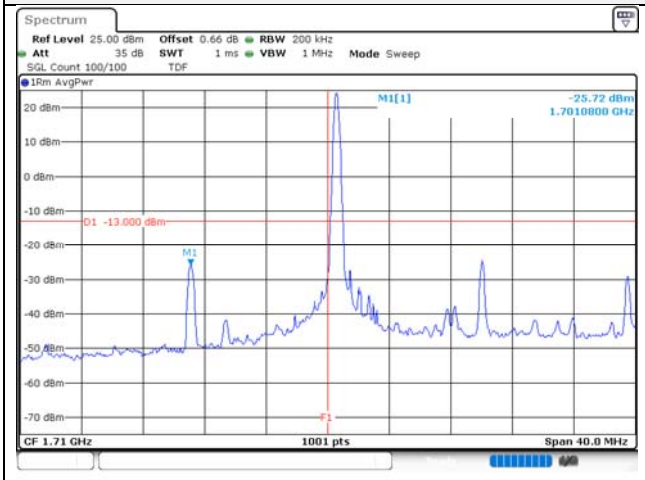
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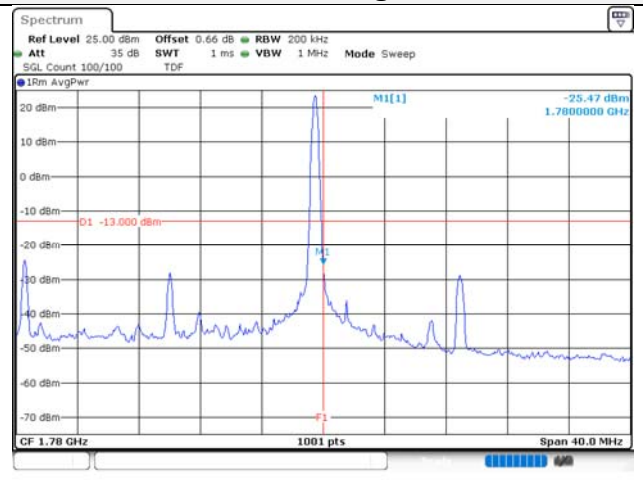
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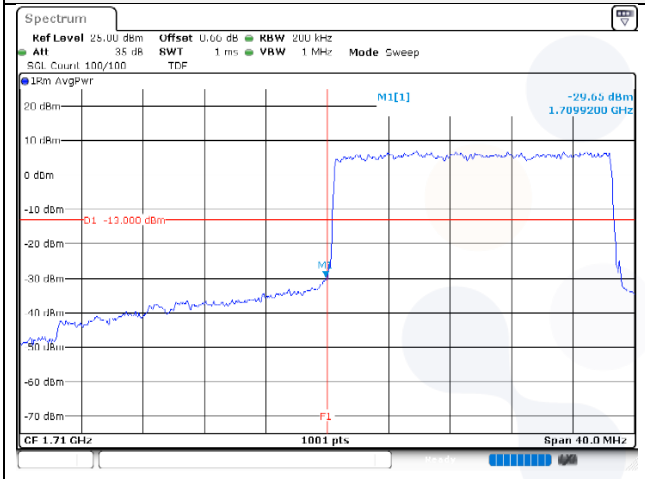
20M BW QPSK Low ch. 1RB



20M BW QPSK High ch. 1RB



20M BW QPSK Low ch. FRB



20M BW QPSK High ch. FRB

