

Figure 489: Spurious Emissions at Antenna Terminal 64QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 30kHz

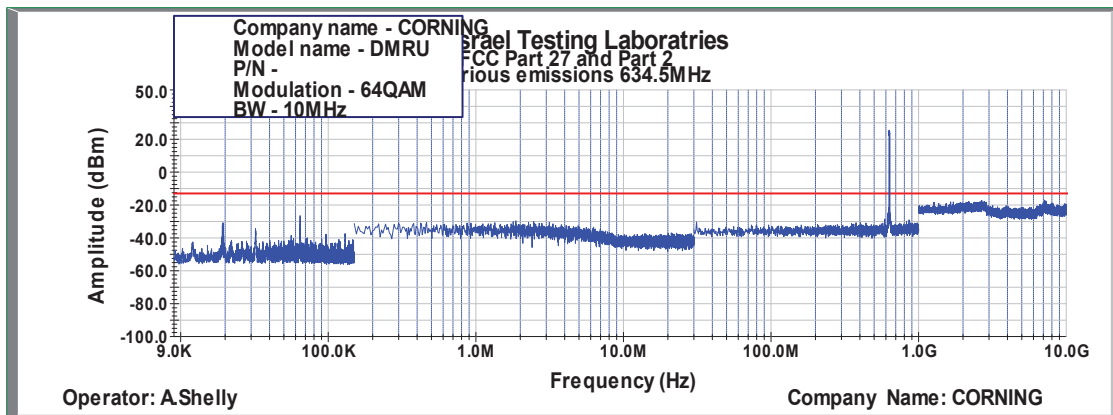


Figure 490: Spurious Emissions at Antenna Terminal 64QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 30kHz

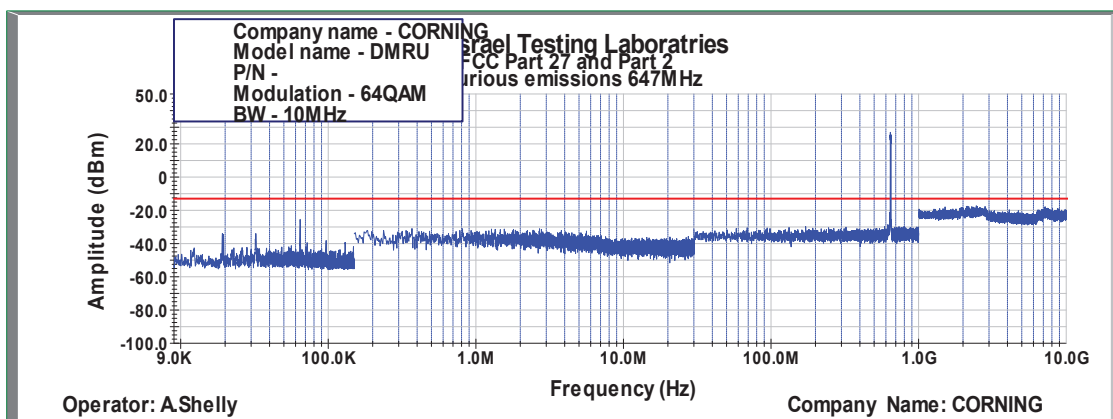


Figure 491: Spurious Emissions at Antenna Terminal 64QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 30kHz

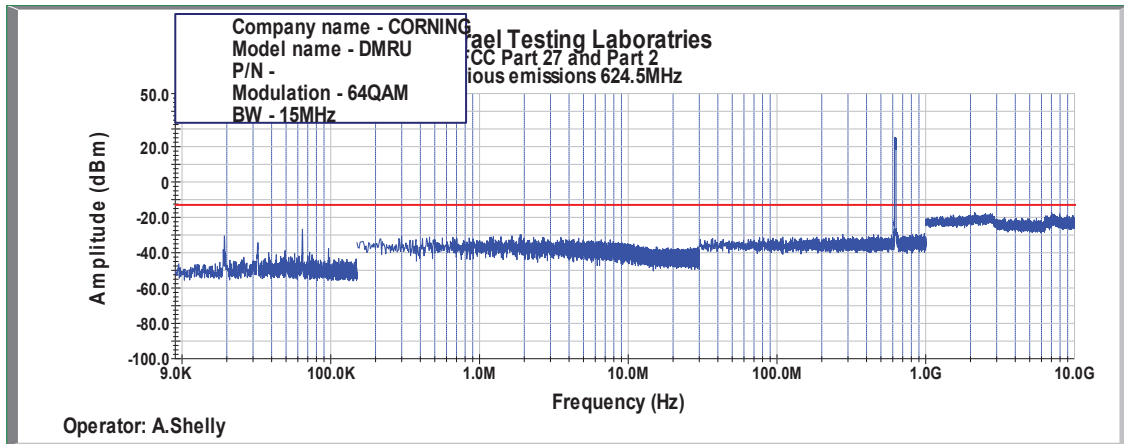


Figure 492: Spurious Emissions at Antenna Terminal 64QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 15kHz

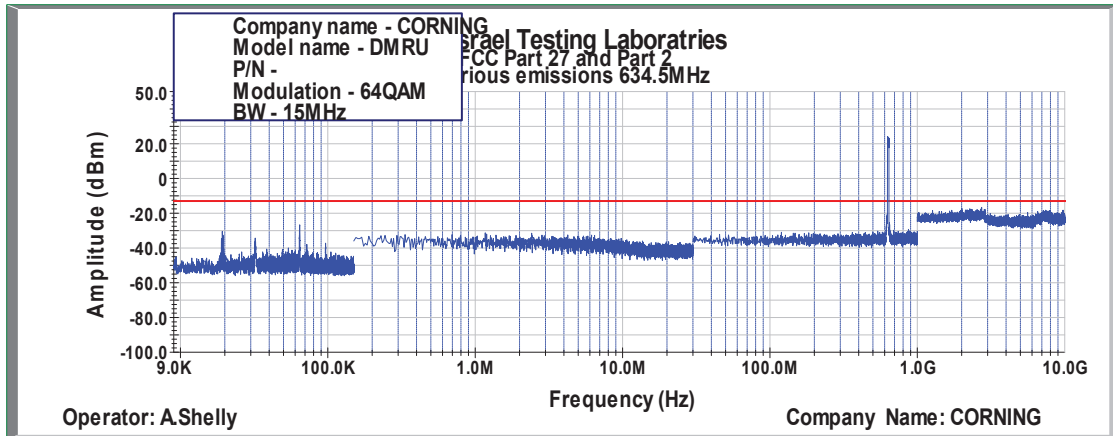


Figure 493: Spurious Emissions at Antenna Terminal 64QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 15kHz

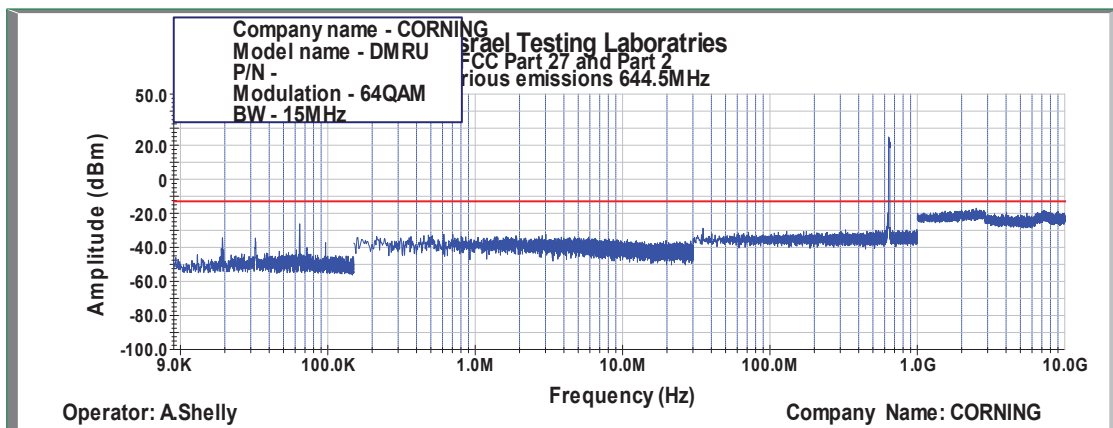


Figure 494: Spurious Emissions at Antenna Terminal 64QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 15kHz

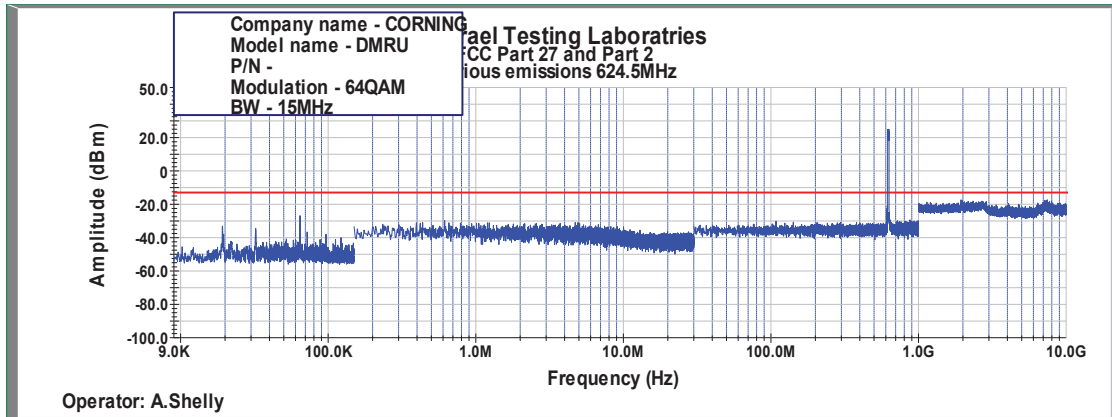


Figure 495: Spurious Emissions at Antenna Terminal 64QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 30kHz

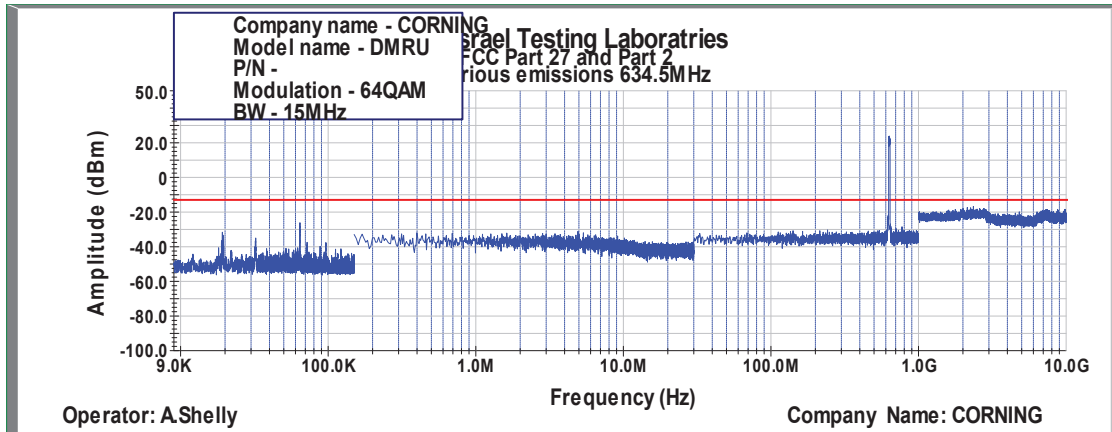


Figure 496: Spurious Emissions at Antenna Terminal 64QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 30kHz

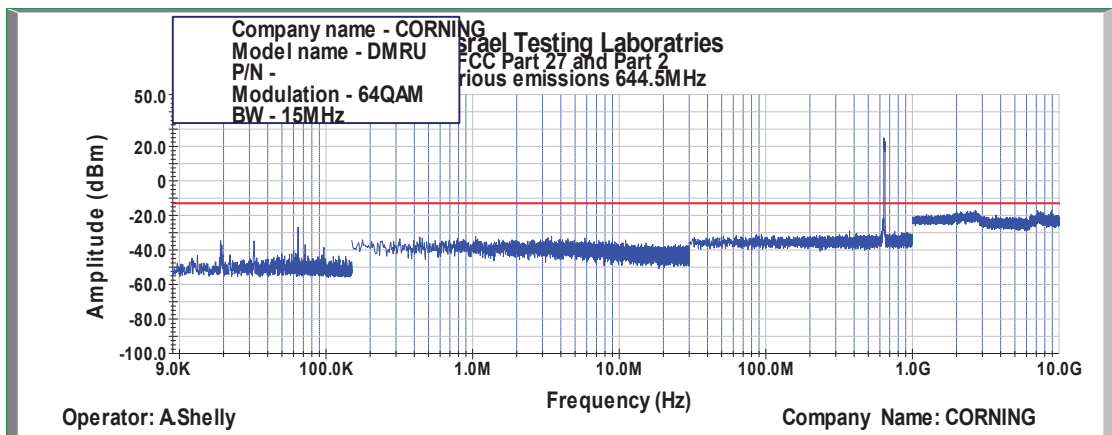


Figure 497: Spurious Emissions at Antenna Terminal 64QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 30kHz

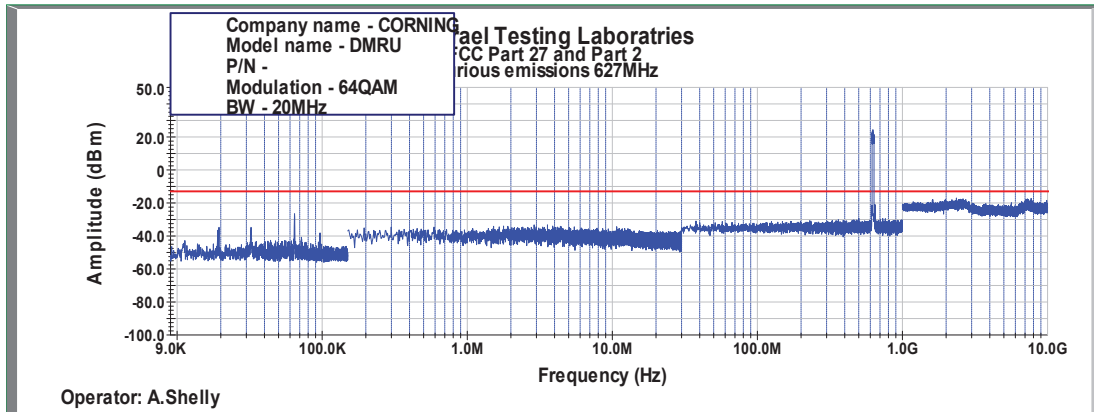


Figure 498: Spurious Emissions at Antenna Terminal 64QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 15kHz

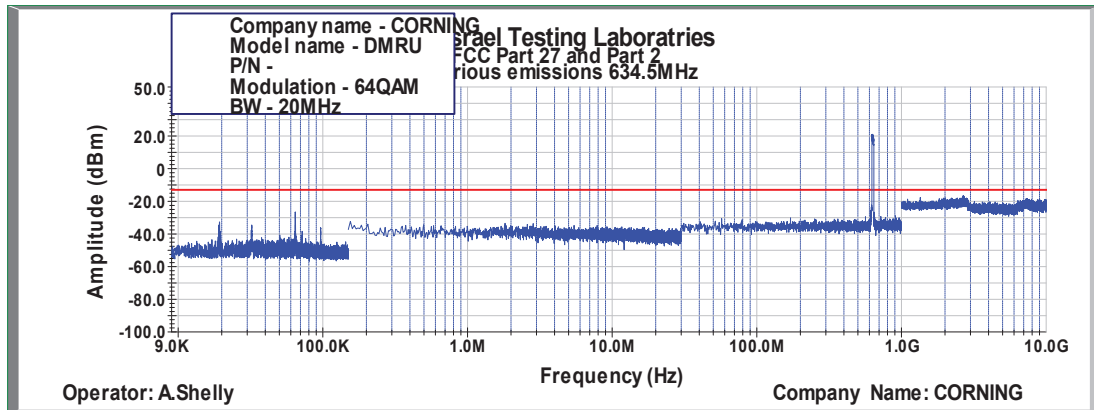


Figure 499: Spurious Emissions at Antenna Terminal 64QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 15kHz

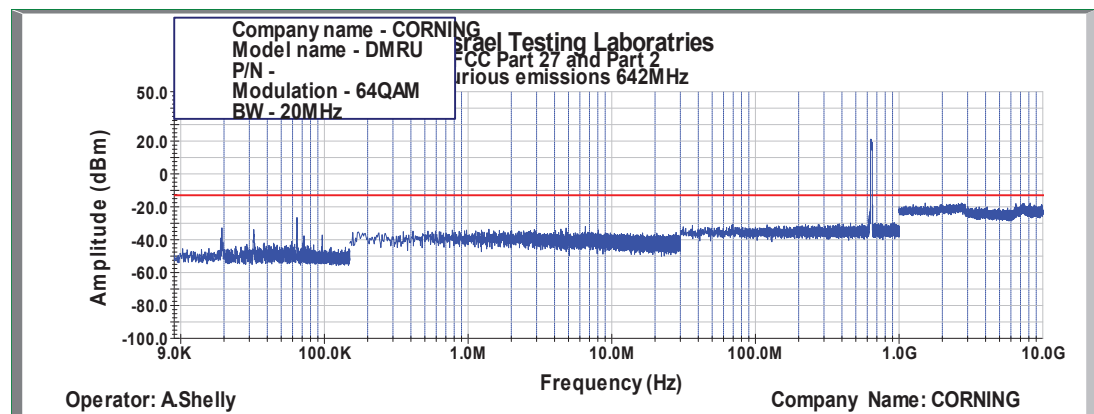


Figure 500: Spurious Emissions at Antenna Terminal 64QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 15kHz

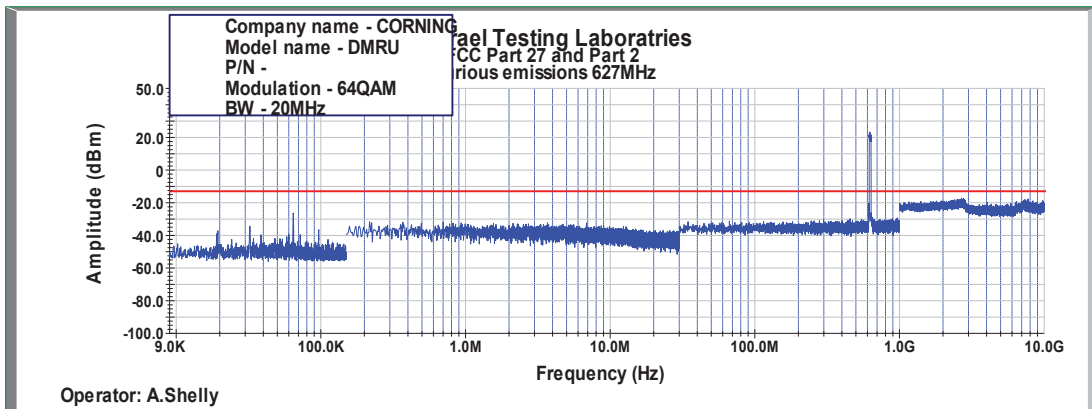


Figure 501: Spurious Emissions at Antenna Terminal 64QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 30kHz

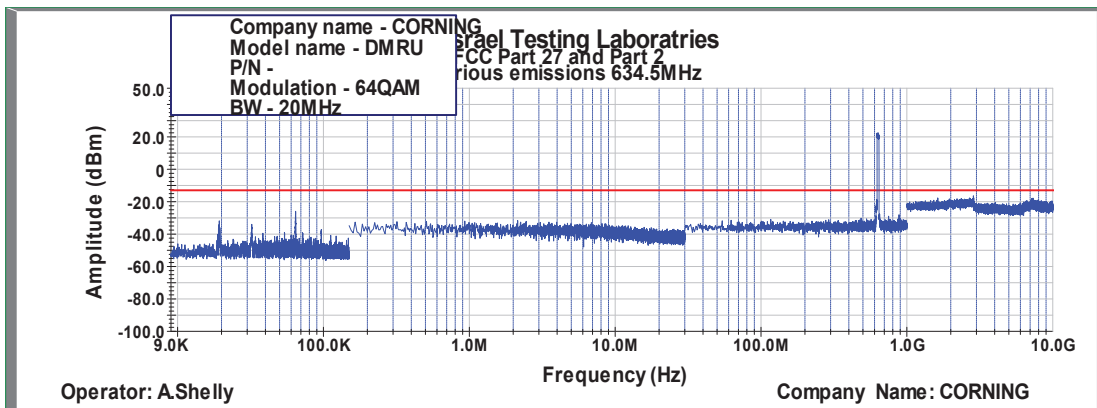


Figure 502: Spurious Emissions at Antenna Terminal 64QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 30kHz

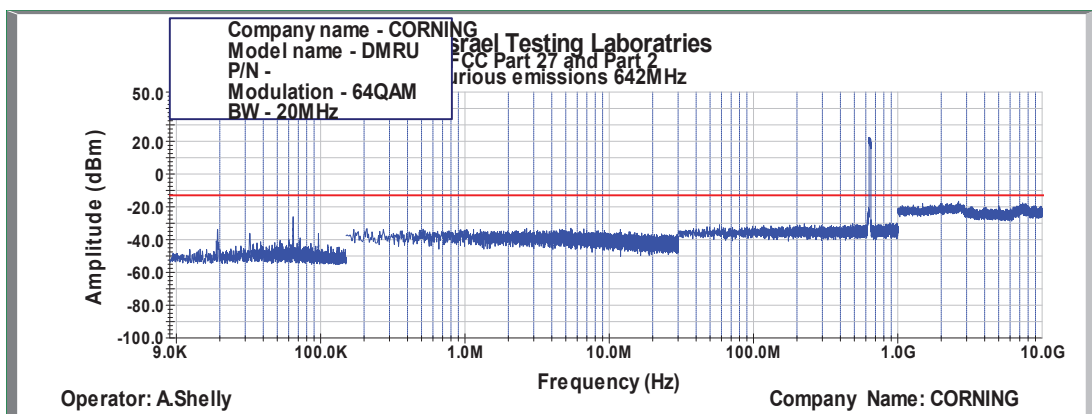


Figure 503: Spurious Emissions at Antenna Terminal 64QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 30kHz

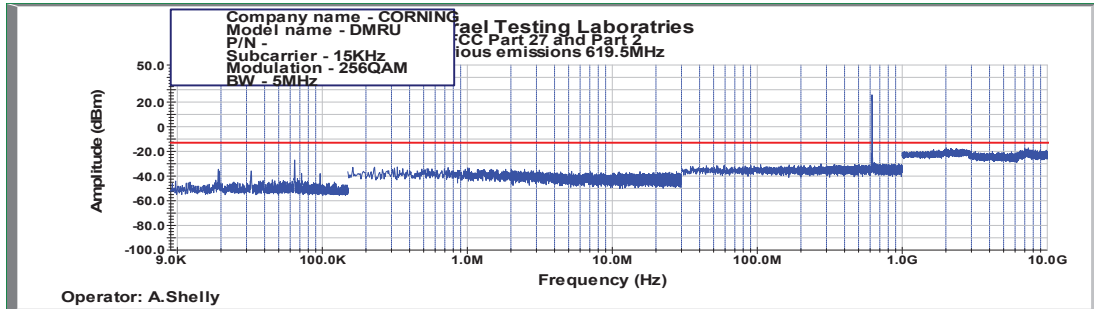


Figure 504: Spurious Emissions at Antenna Terminal 256QAM, 619.5MHz, B.W. 5MHz, Sub Carrier 15kHz

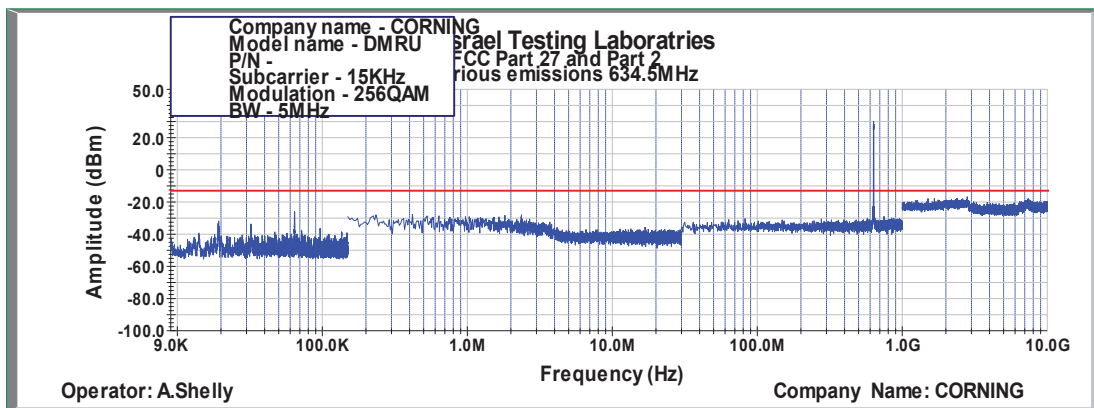


Figure 505: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 5MHz, Sub Carrier 15kHz

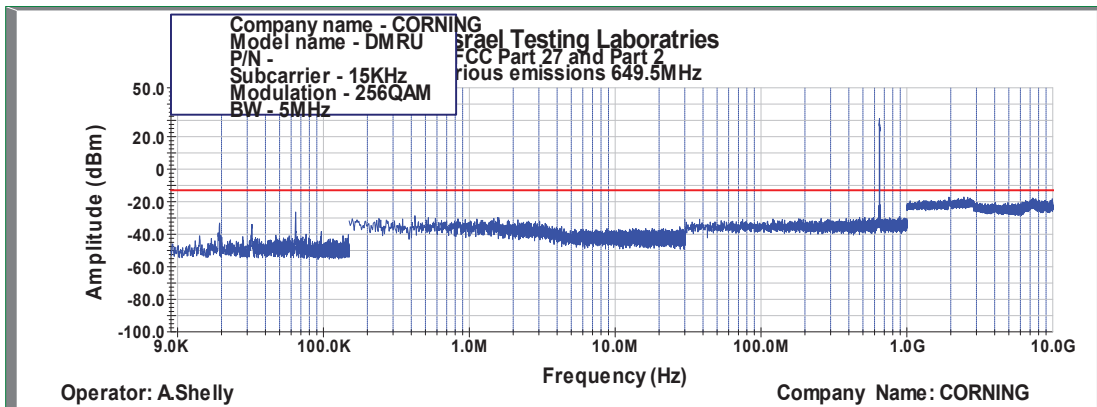


Figure 506: Spurious Emissions at Antenna Terminal 256QAM, 649.5MHz, B.W. 5MHz, Sub Carrier 15kHz

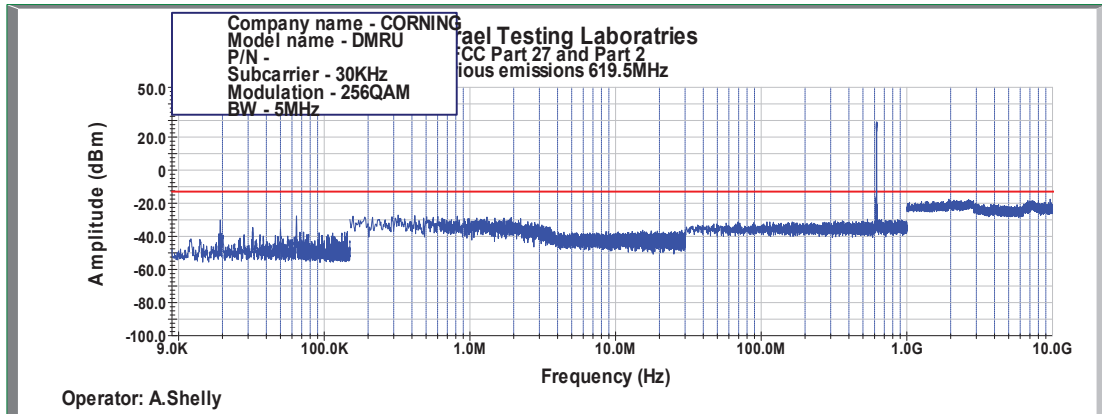


Figure 507: Spurious Emissions at Antenna Terminal 256QAM, 619.5MHz, B.W. 5MHz, Sub Carrier 30kHz

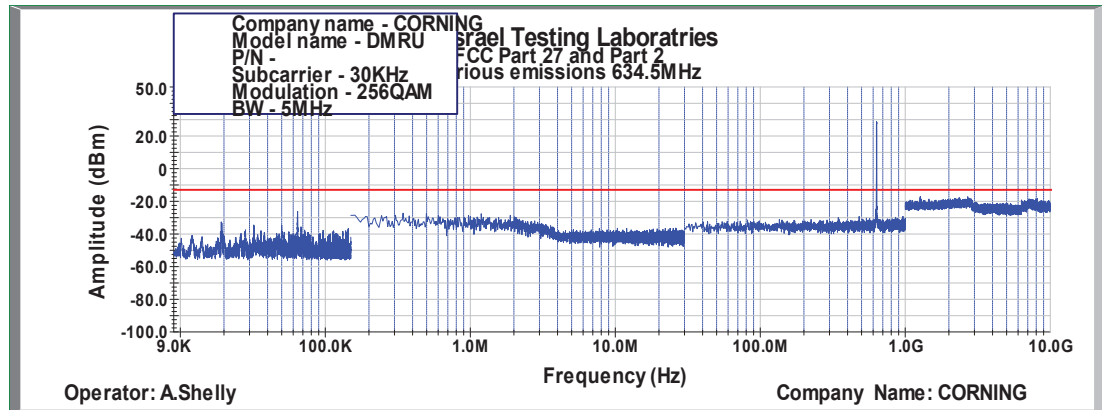


Figure 508: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 5MHz, Sub Carrier 30kHz

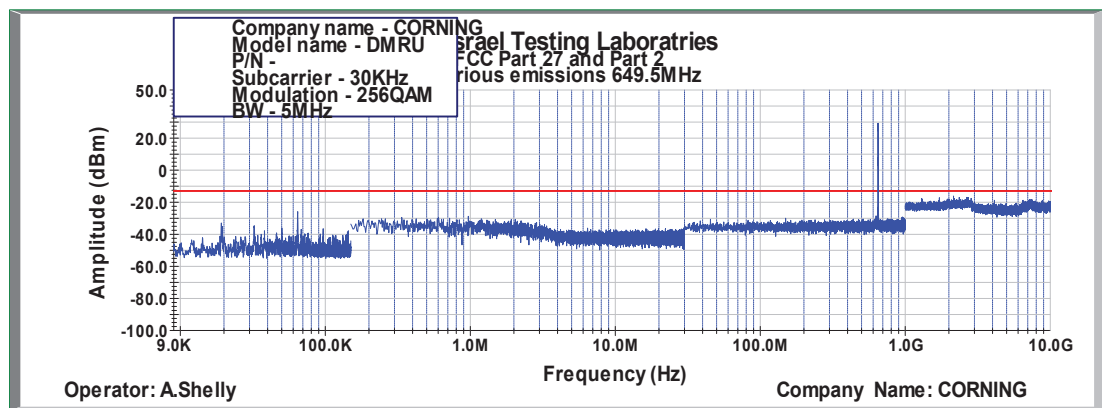


Figure 509: Spurious Emissions at Antenna Terminal 256QAM, 649.5MHz, B.W. 5MHz, Sub Carrier 30kHz

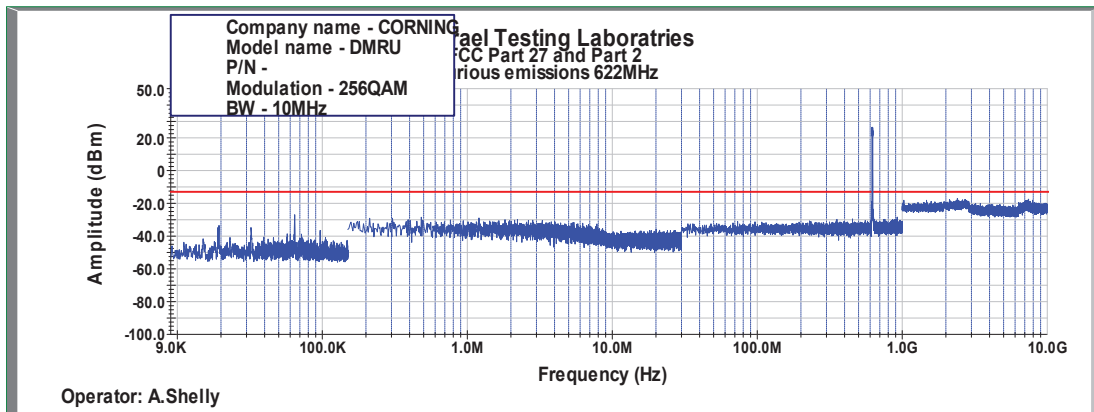


Figure 510: Spurious Emissions at Antenna Terminal 256QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 15kHz

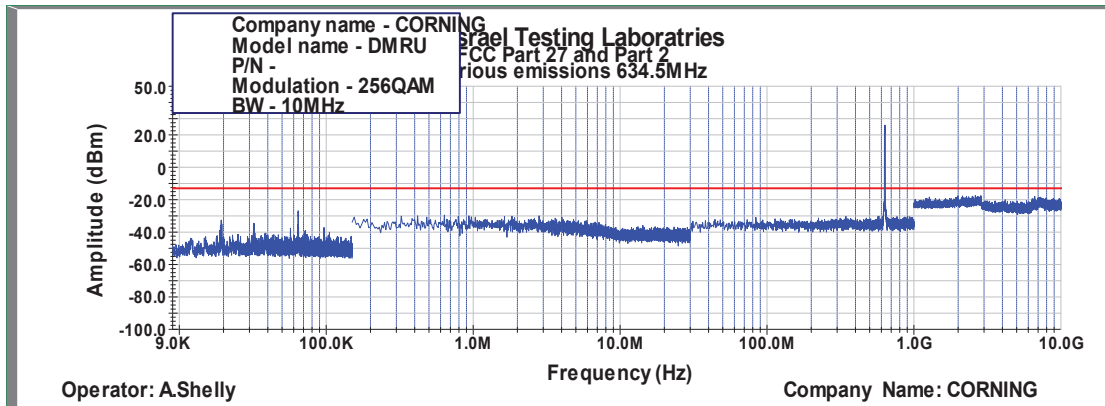


Figure 511: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 15kHz

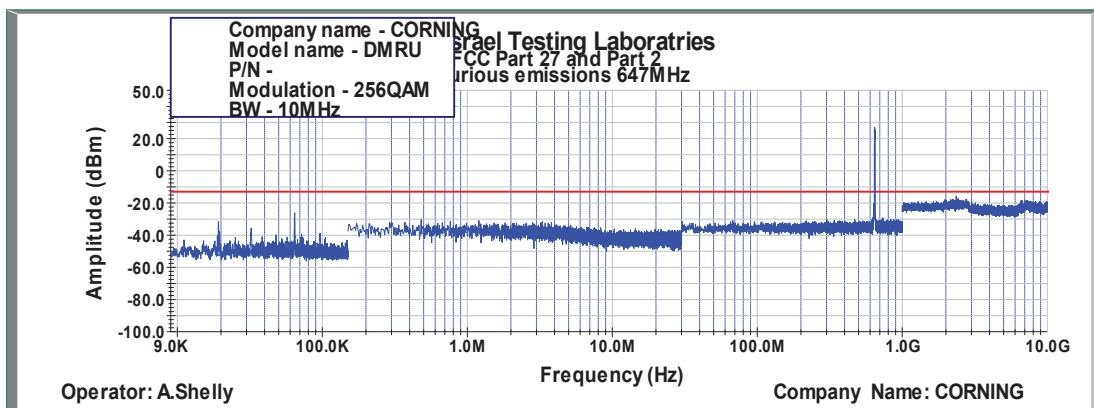


Figure 512: Spurious Emissions at Antenna Terminal 256QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 15kHz

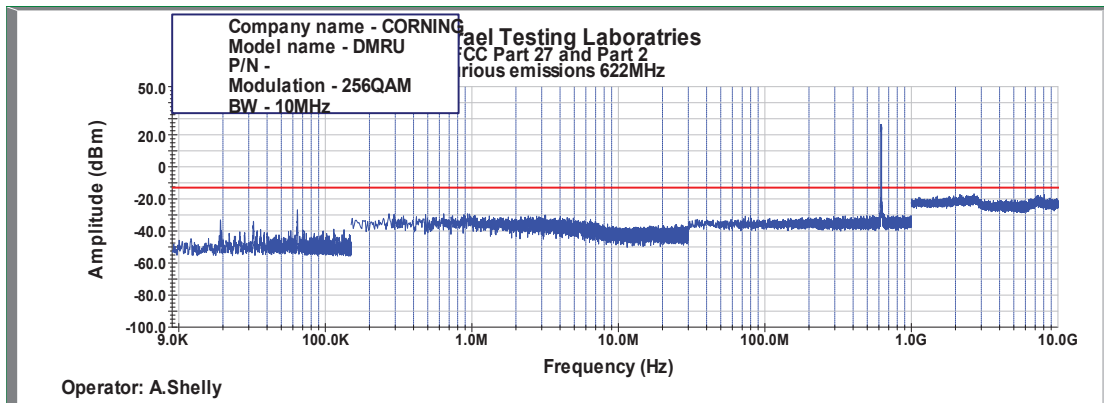


Figure 513: Spurious Emissions at Antenna Terminal 256QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 30kHz

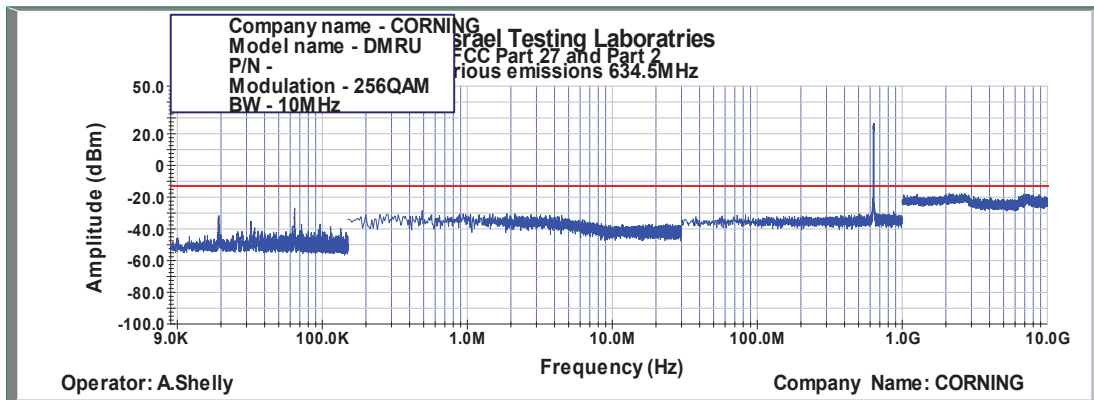


Figure 514: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 30kHz

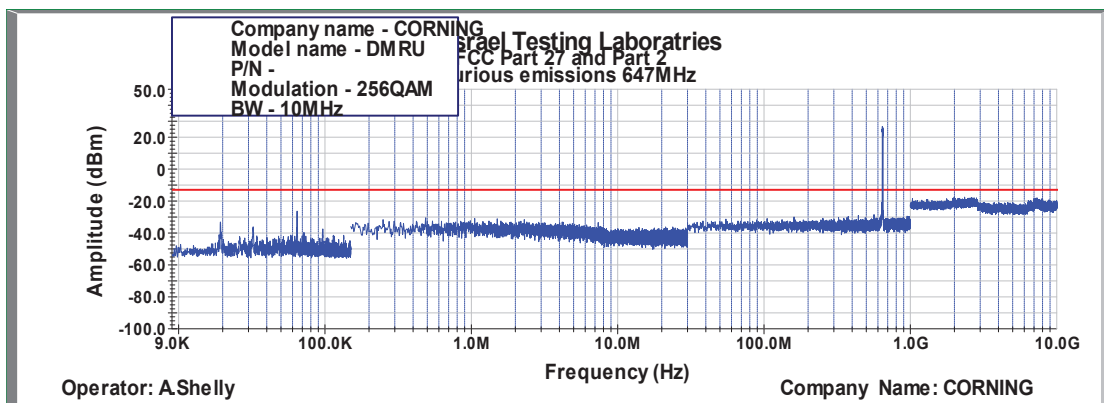


Figure 515: Spurious Emissions at Antenna Terminal 256QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 30kHz

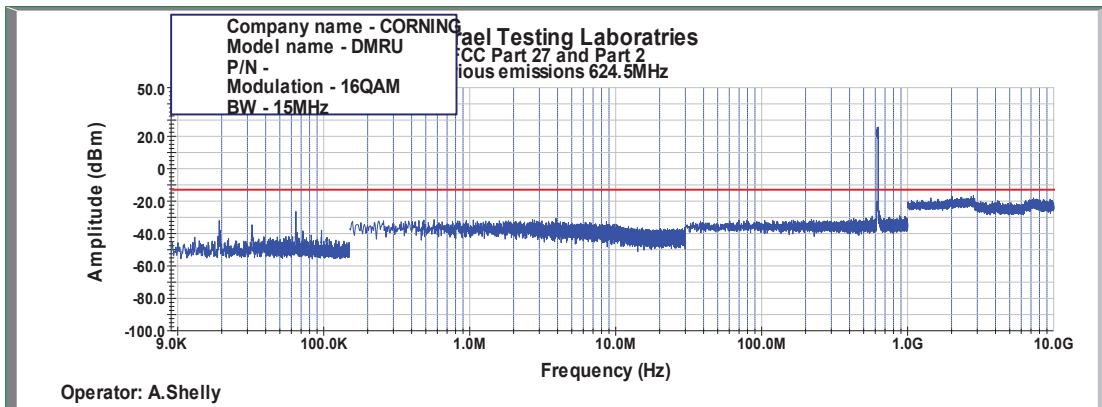


Figure 516: Spurious Emissions at Antenna Terminal 256QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 15kHz

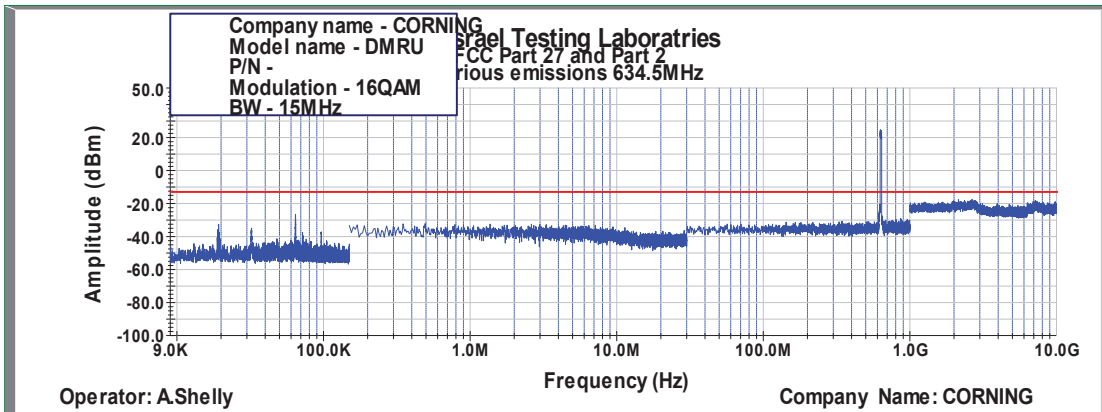


Figure 517: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 15kHz

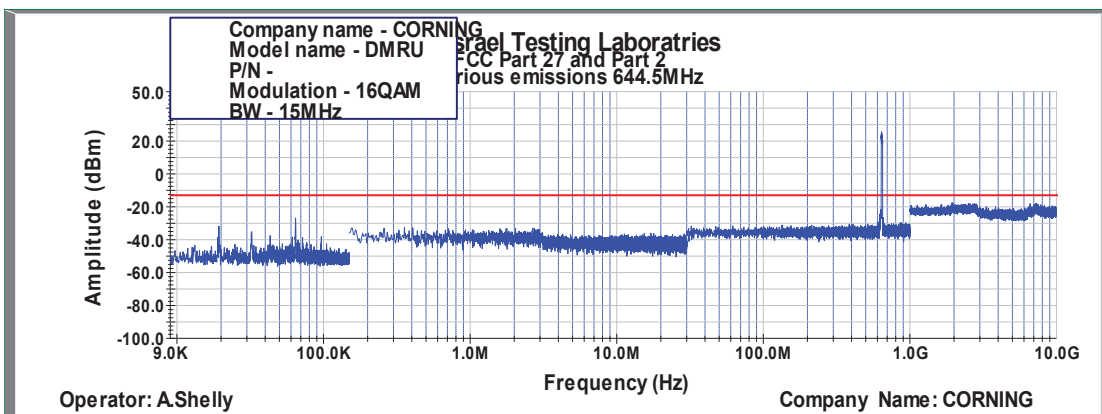


Figure 518: Spurious Emissions at Antenna Terminal 256QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 15kHz

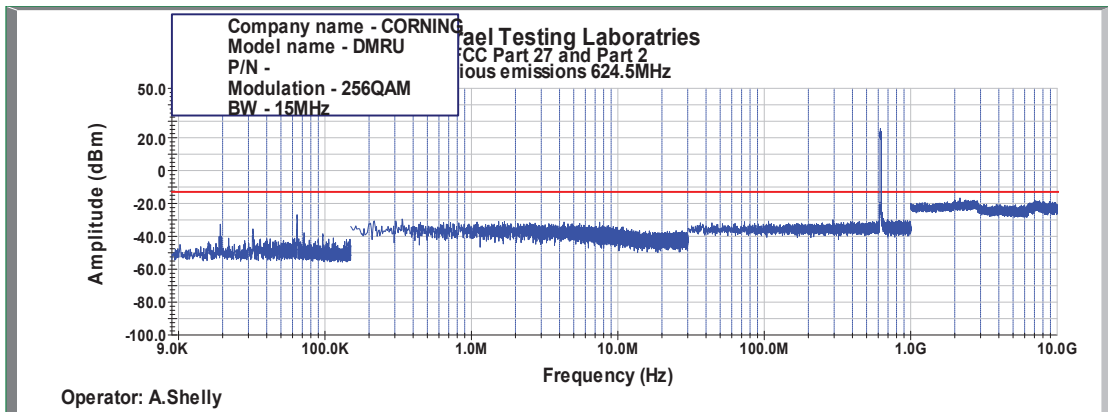


Figure 519: Spurious Emissions at Antenna Terminal 256QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 30kHz

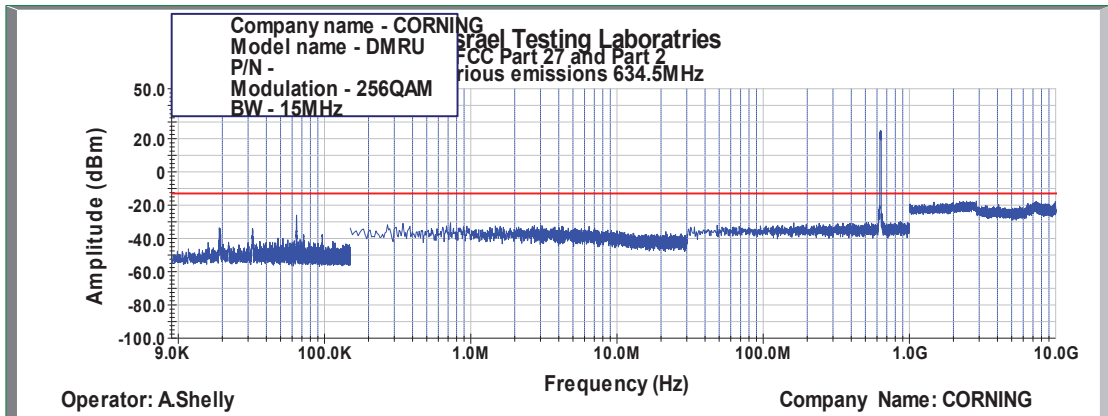


Figure 520: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 30kHz

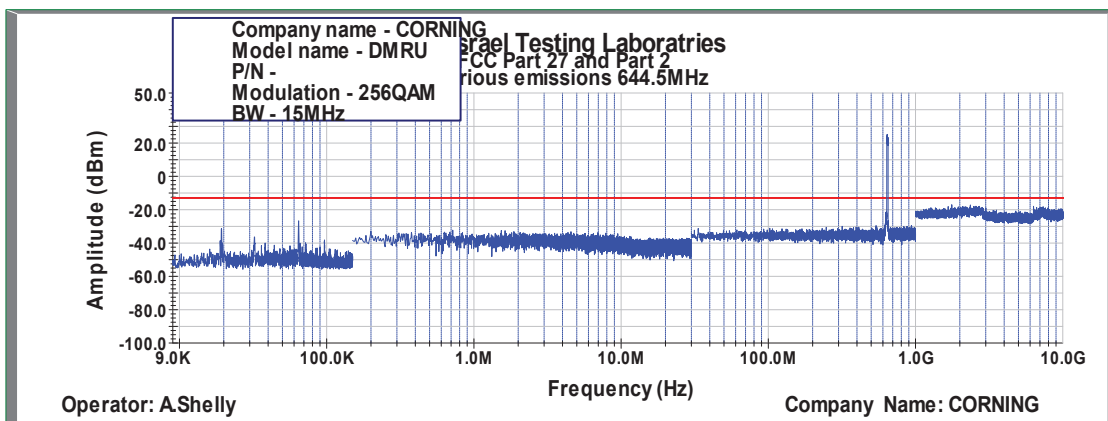


Figure 521: Spurious Emissions at Antenna Terminal 256QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 30kHz

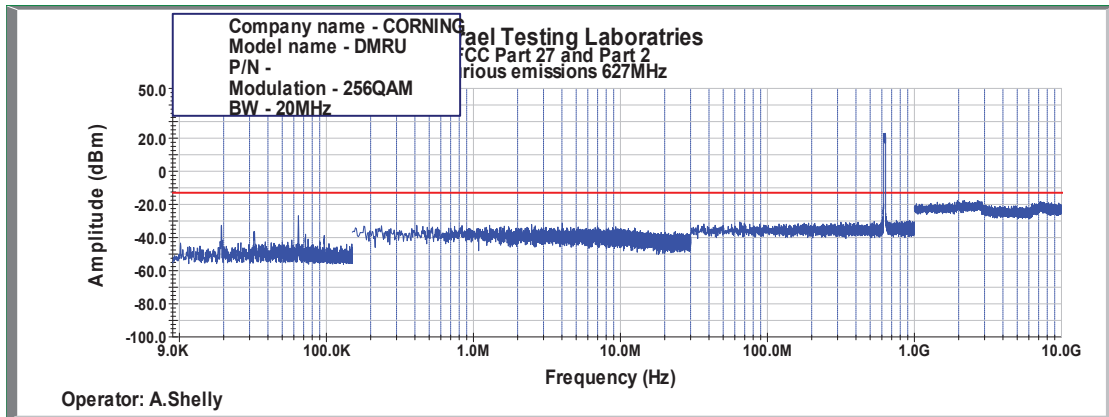


Figure 522: Spurious Emissions at Antenna Terminal 256QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 15kHz

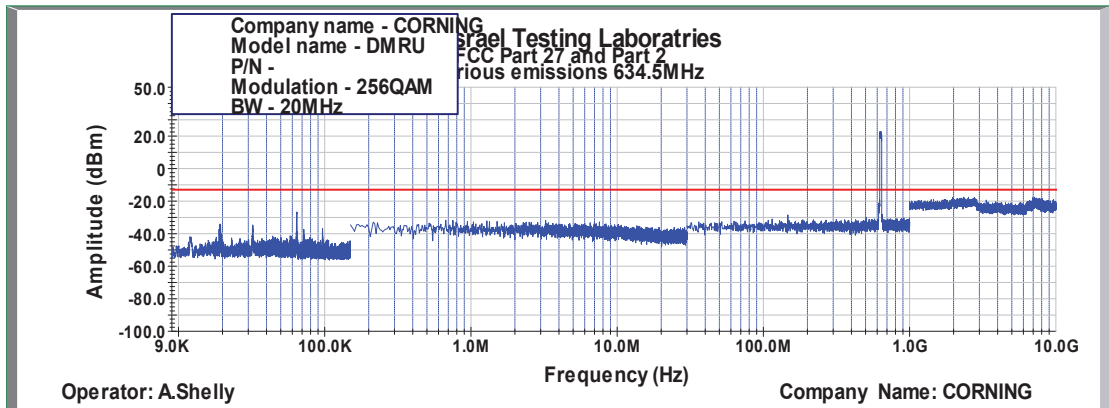


Figure 523: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 15kHz

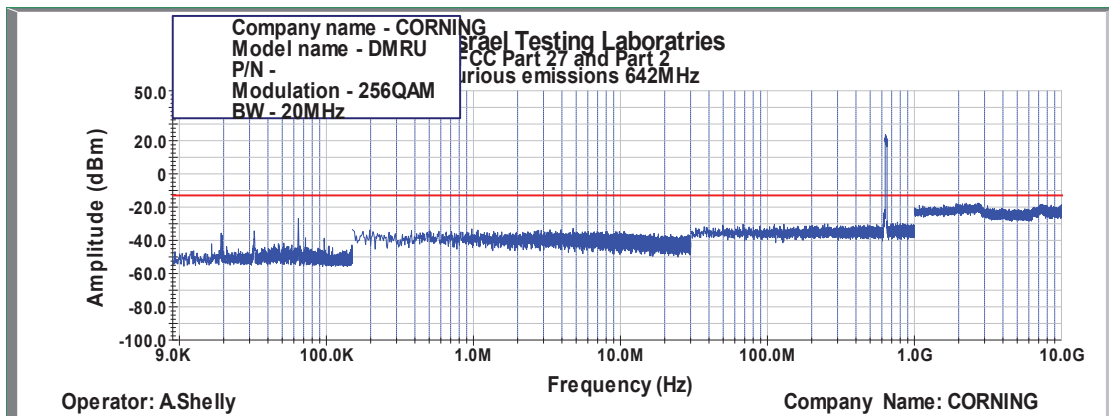


Figure 524: Spurious Emissions at Antenna Terminal 256QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 15kHz

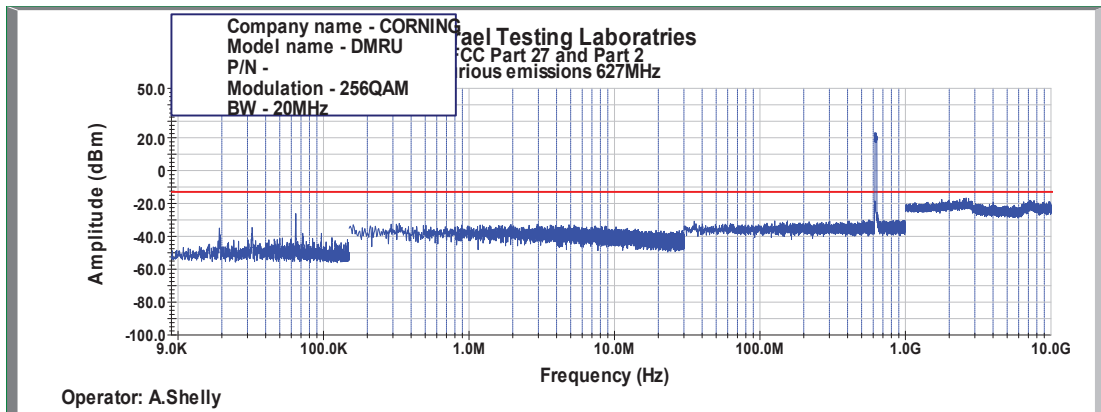


Figure 525: Spurious Emissions at Antenna Terminal 256QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 30kHz

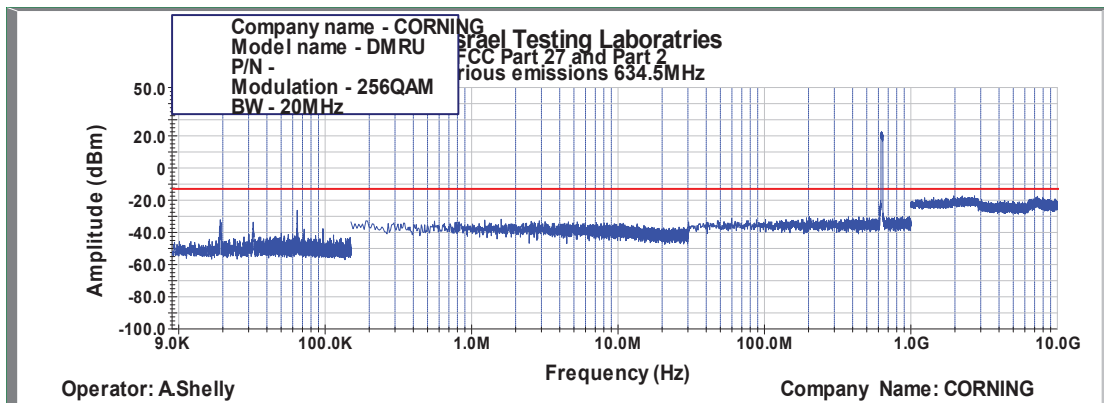


Figure 526: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 30kHz

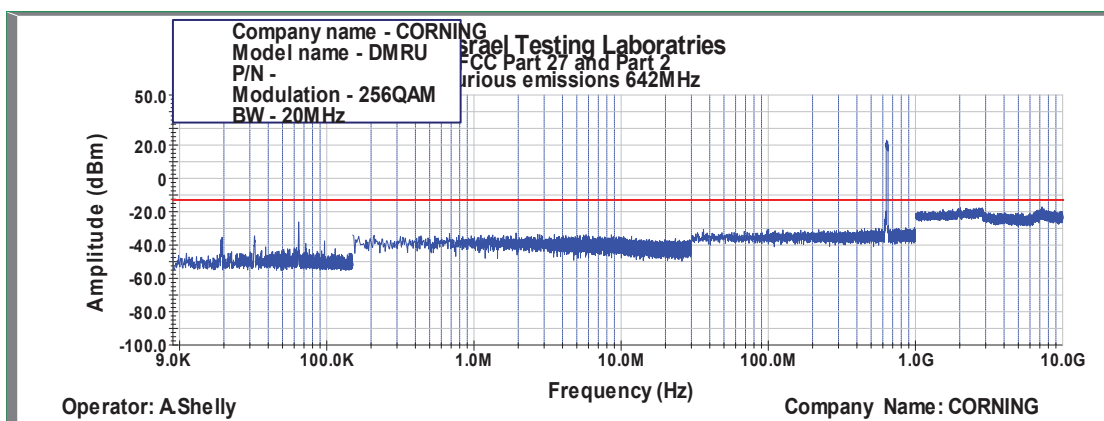


Figure 527: Spurious Emissions at Antenna Terminal 256QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 30kHz

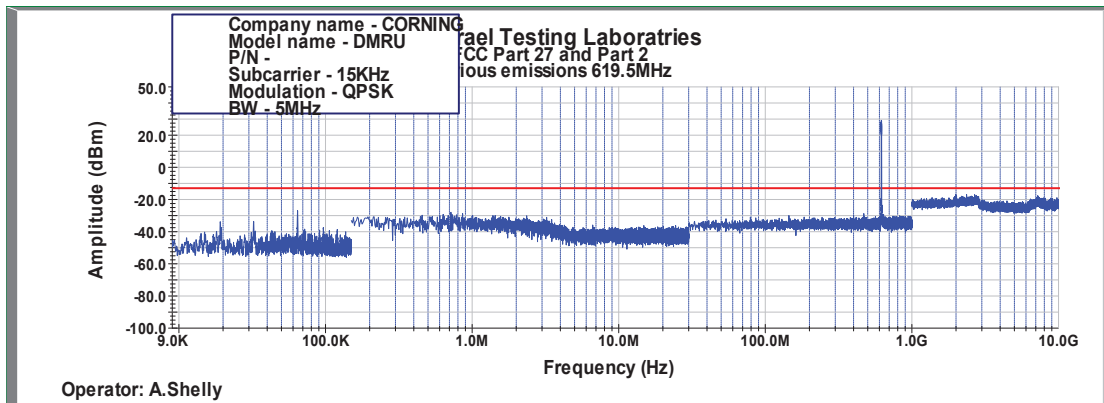


Figure 528: Spurious Emissions at Antenna Terminal QPSK, 619.5MHz,
B.W. 5MHz, Sub Carrier 15kHz

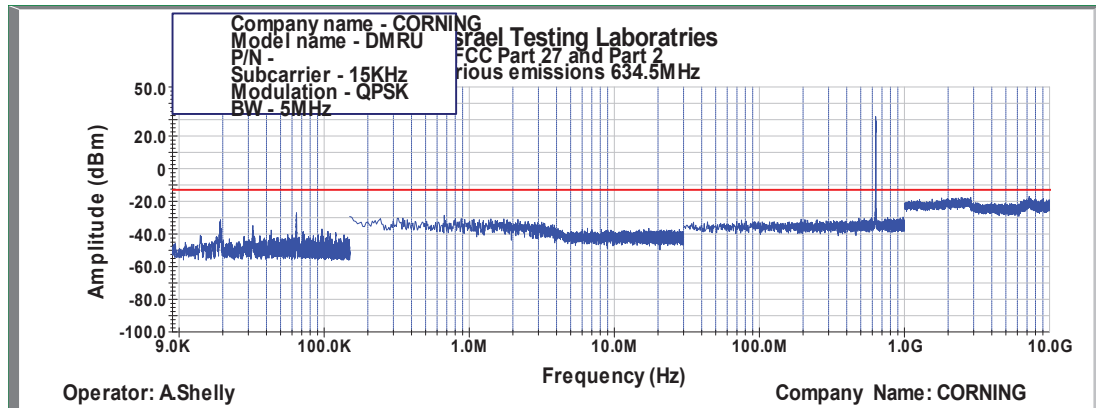


Figure 529: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 5MHz, Sub Carrier 15kHz

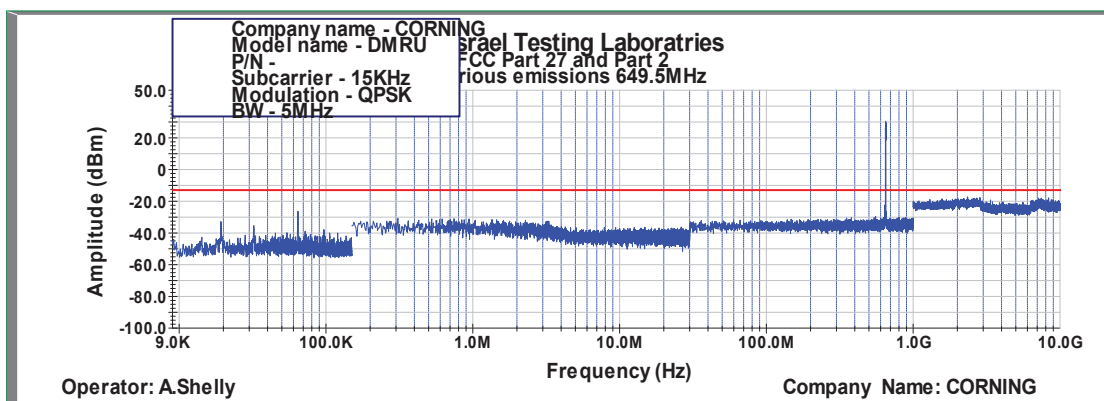


Figure 530: Spurious Emissions at Antenna Terminal QPSK, 649.5MHz,
B.W. 5MHz, Sub Carrier 15kHz

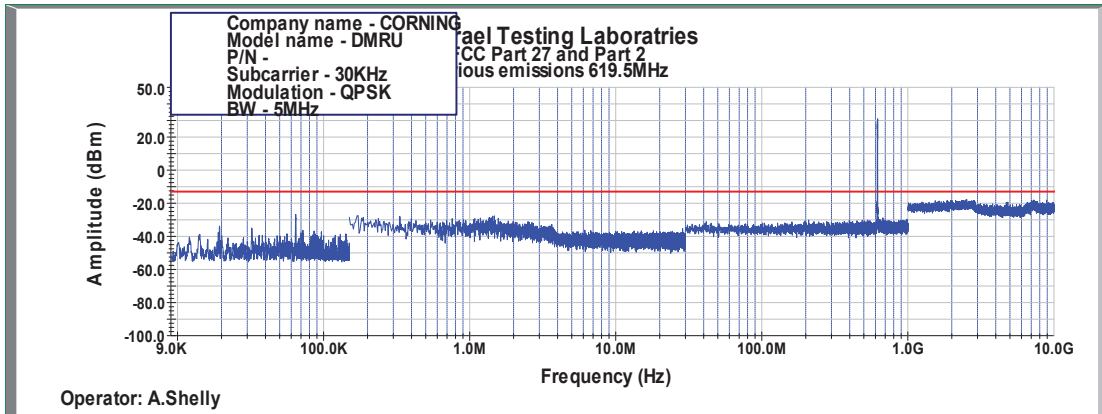


Figure 531: Spurious Emissions at Antenna Terminal QPSK, 619.5MHz,
B.W. 5MHz, Sub Carrier 30kHz

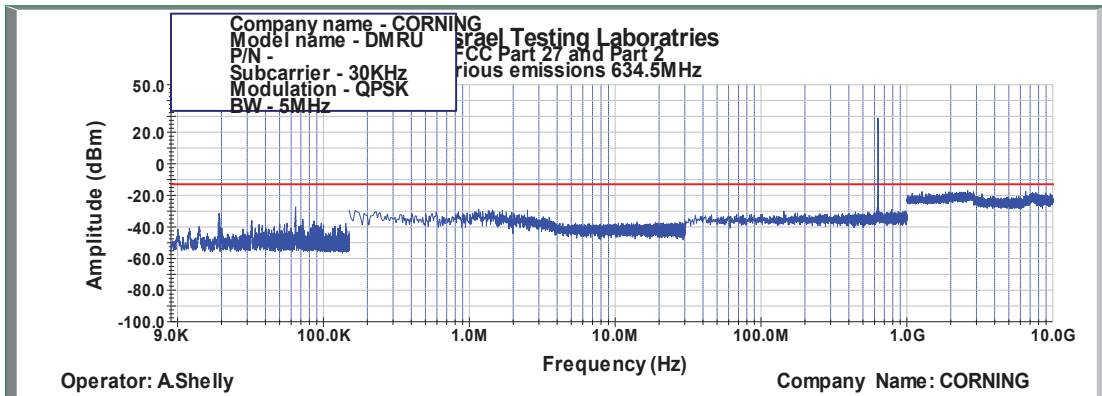


Figure 532: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 5MHz, Sub Carrier 30kHz

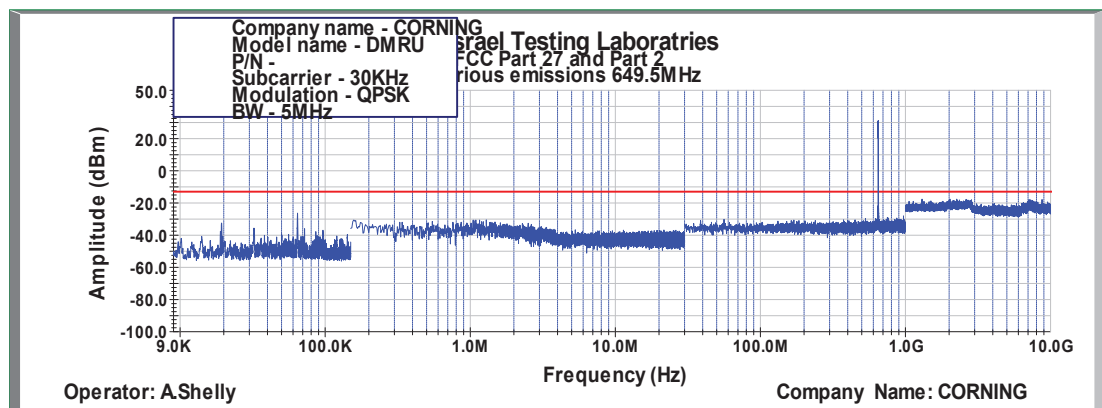


Figure 533: Spurious Emissions at Antenna Terminal QPSK, 649.5MHz,
B.W. 5MHz, Sub Carrier 30kHz

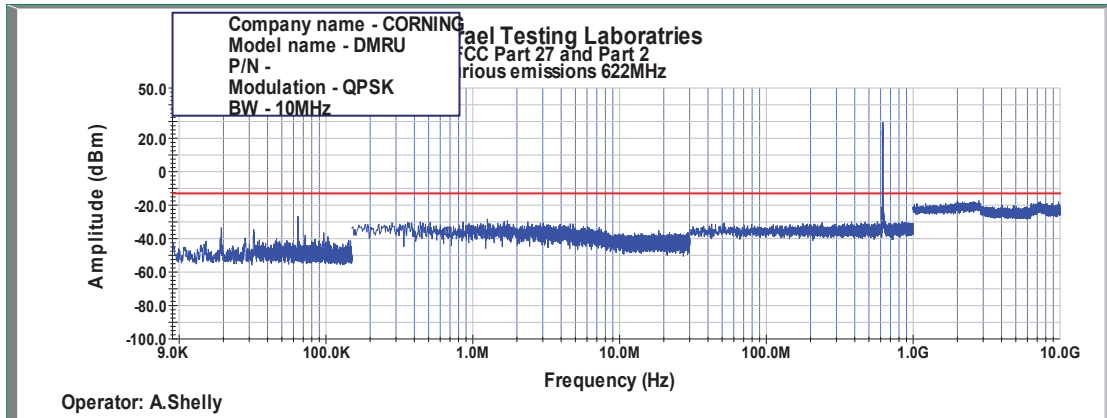


Figure 534: Spurious Emissions at Antenna Terminal QPSK, 622.0MHz,
B.W. 10MHz, Sub Carrier 15kHz

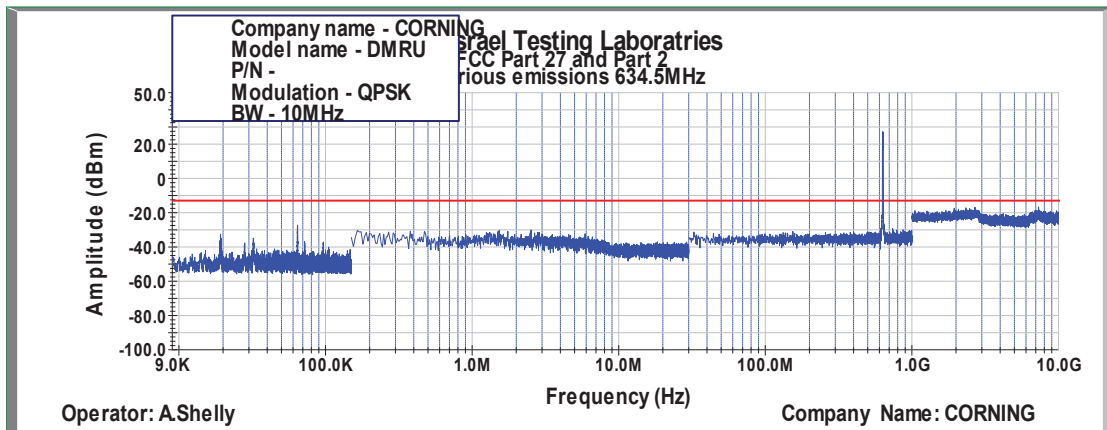


Figure 535: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 10MHz, Sub Carrier 15kHz

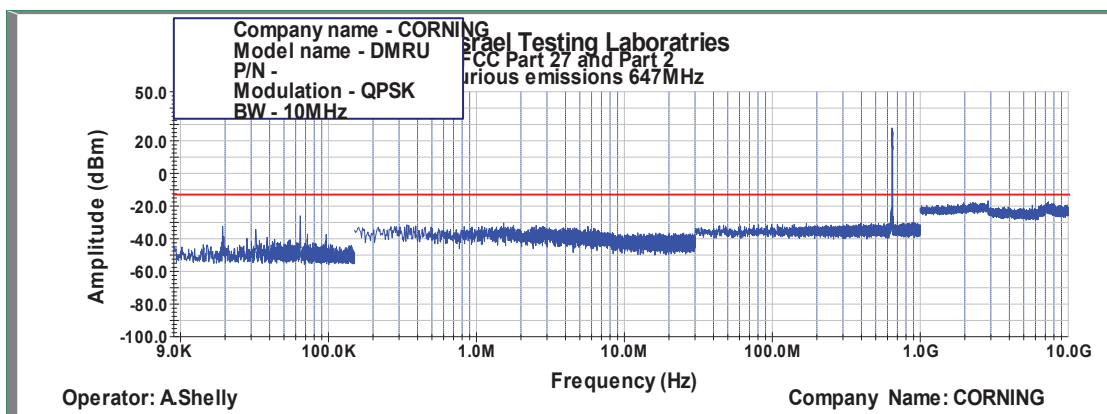


Figure 536: Spurious Emissions at Antenna Terminal QPSK, 647.0MHz,
B.W. 10MHz, Sub Carrier 15kHz

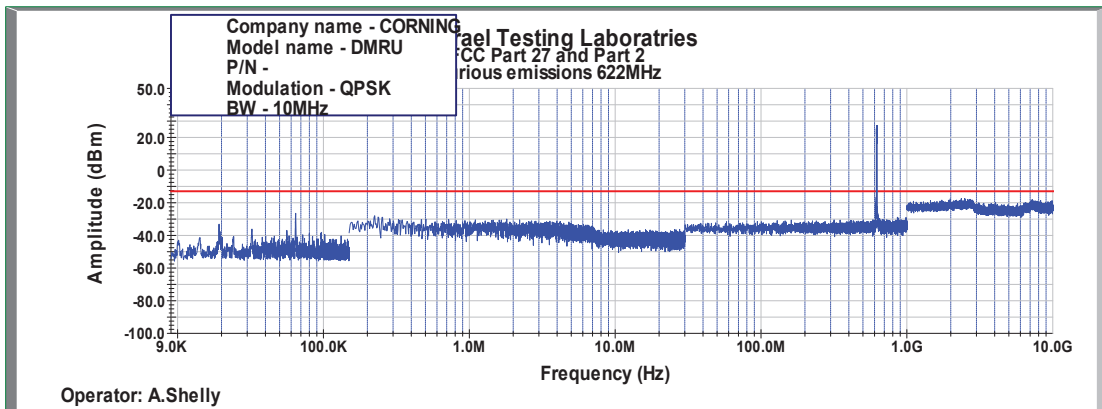


Figure 537: Spurious Emissions at Antenna Terminal QPSK, 622.0MHz,
B.W. 10MHz, Sub Carrier 30kHz

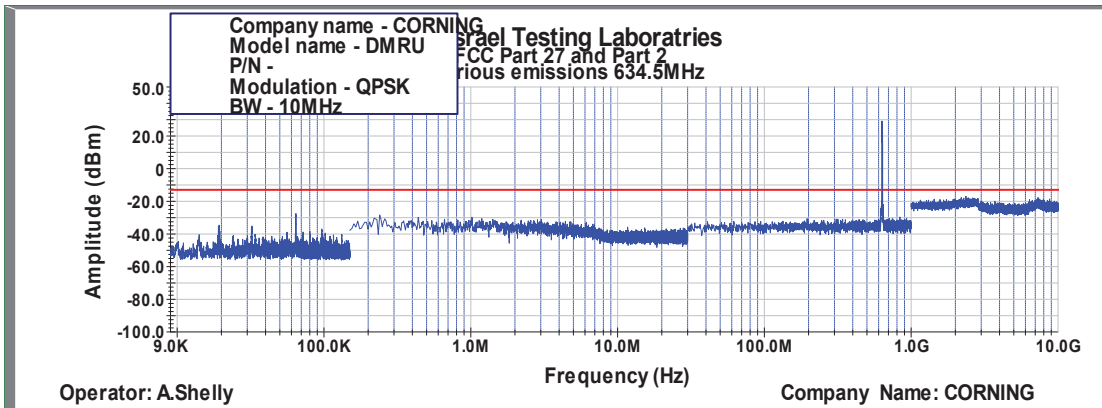


Figure 538: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 10MHz, Sub Carrier 30kHz

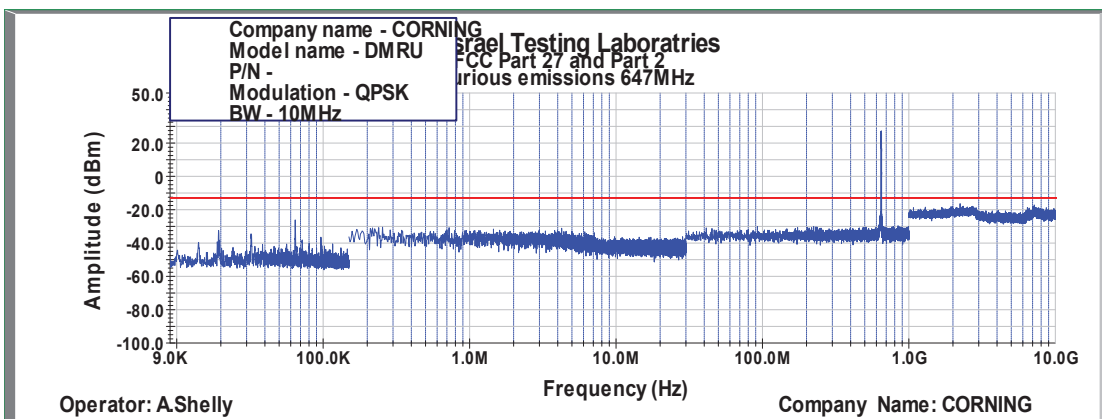


Figure 539: Spurious Emissions at Antenna Terminal QPSK, 647.0MHz,
B.W. 10MHz, Sub Carrier 30kHz

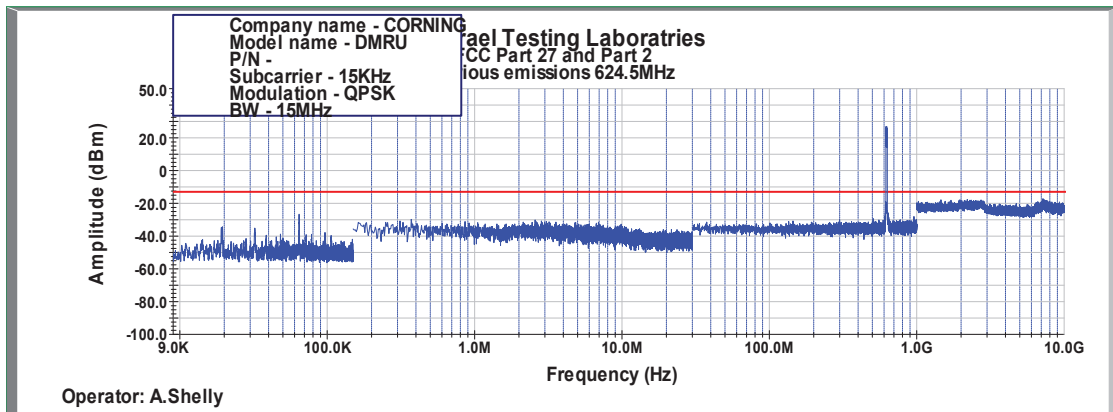


Figure 540: Spurious Emissions at Antenna Terminal QPSK, 624.5MHz, B.W. 15MHz, Sub Carrier 15kHz

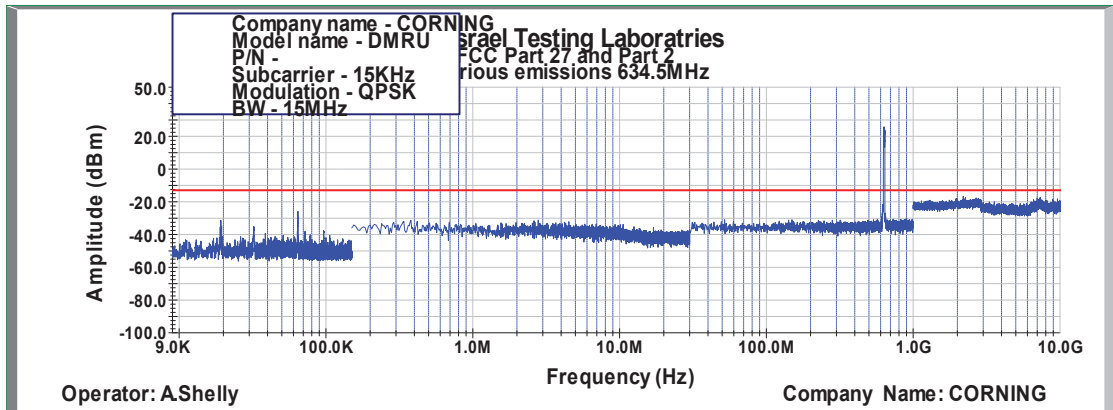


Figure 541: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 15MHz, Sub Carrier 15kHz

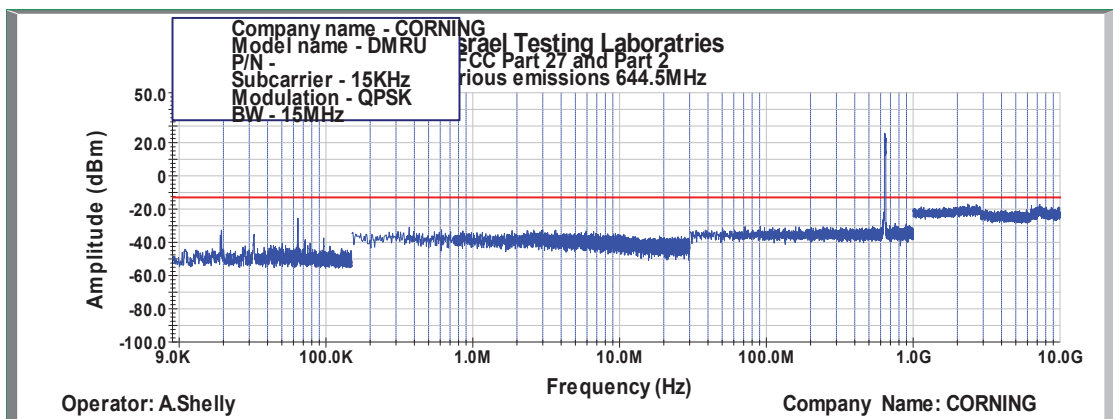


Figure 542: Spurious Emissions at Antenna Terminal QPSK, 644.5MHz, B.W. 15MHz, Sub Carrier 15kHz

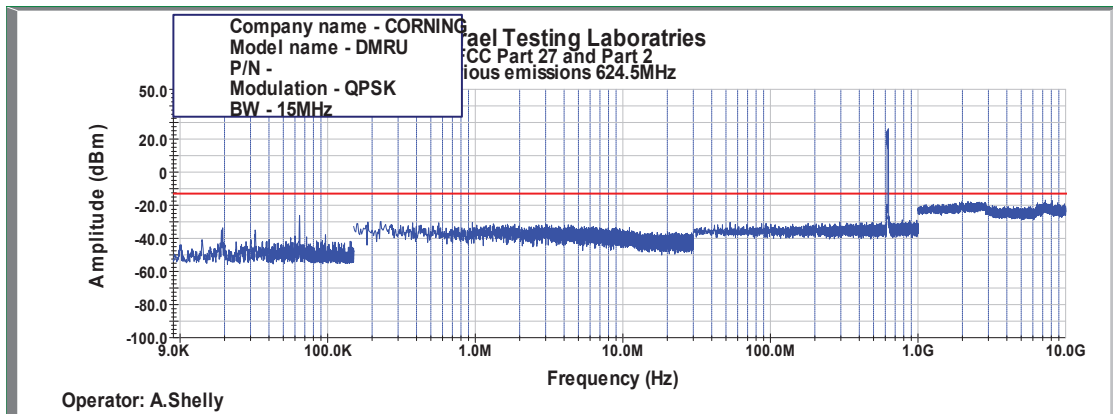


Figure 543: Spurious Emissions at Antenna Terminal QPSK, 624.5MHz,
B.W. 15MHz, Sub Carrier 30kHz

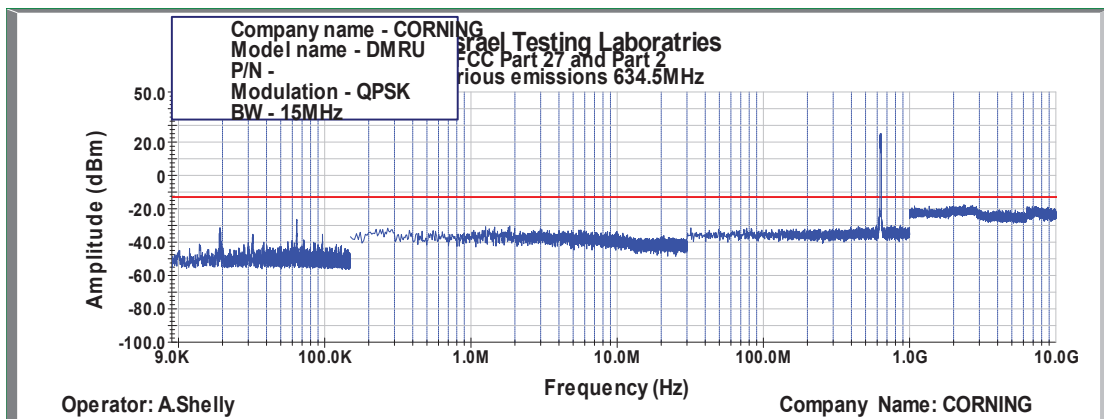


Figure 544: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 15MHz, Sub Carrier 30kHz

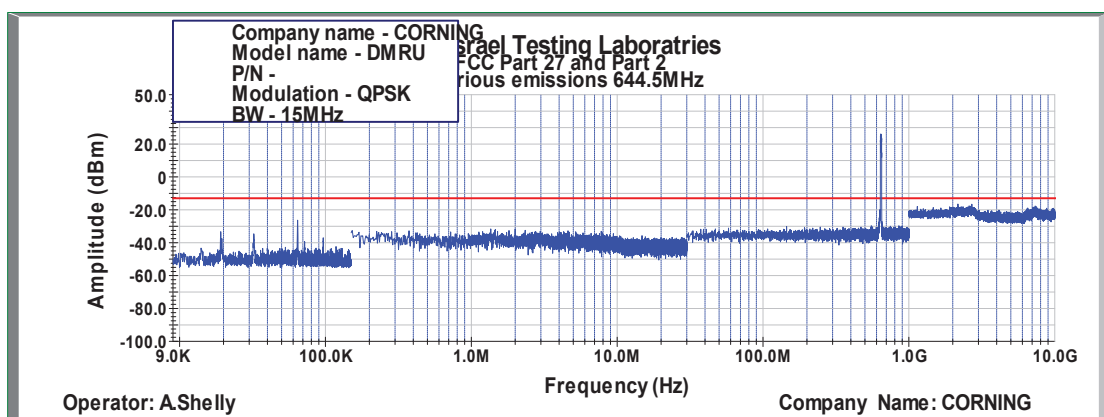


Figure 545: Spurious Emissions at Antenna Terminal QPSK, 644.5MHz,
B.W. 15MHz, Sub Carrier 30kHz

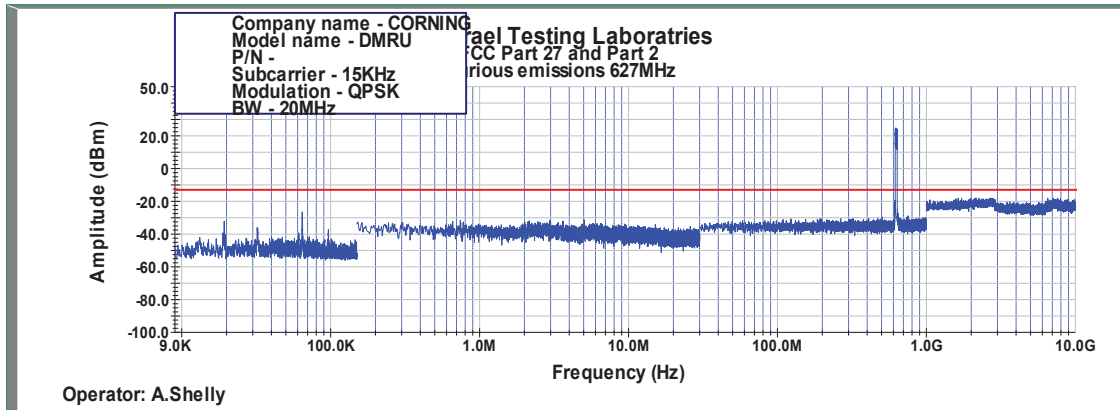


Figure 546: Spurious Emissions at Antenna Terminal QPSK, 627.0MHz,
B.W. 20MHz, Sub Carrier 15kHz

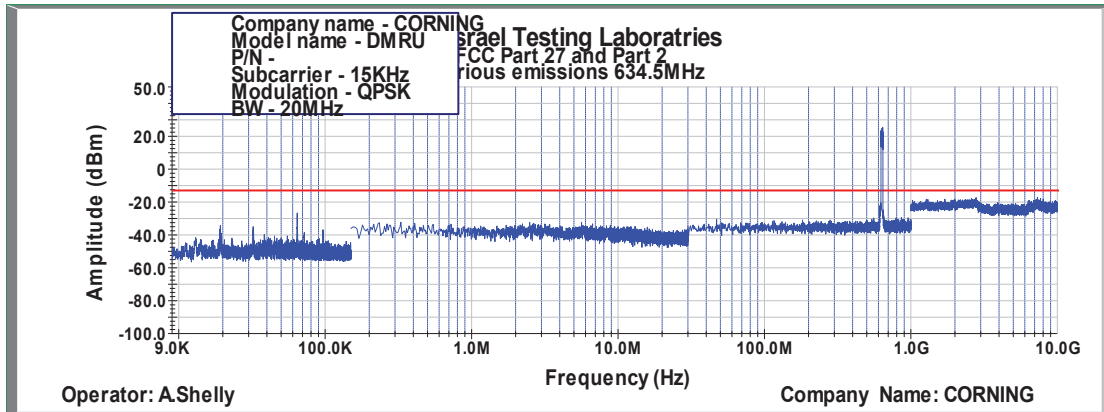


Figure 547: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 20MHz, Sub Carrier 15kHz

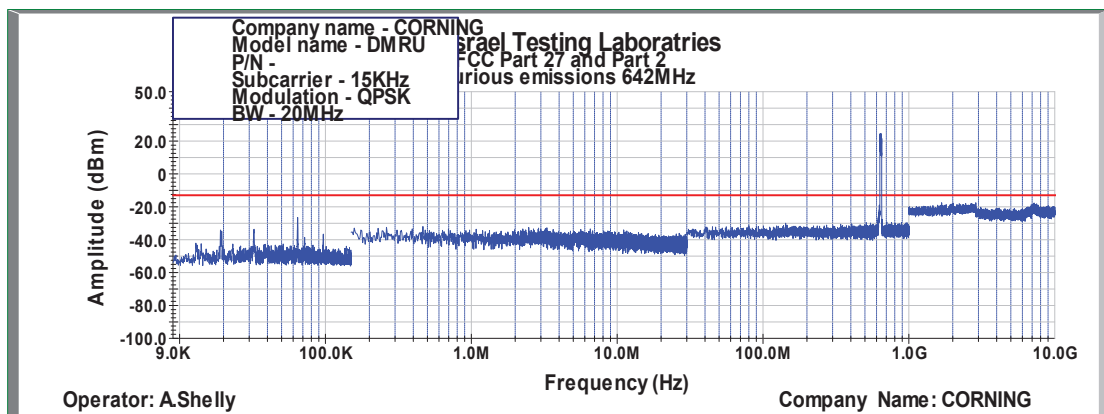


Figure 548: Spurious Emissions at Antenna Terminal QPSK, 642.0MHz,
B.W. 20MHz, Sub Carrier 15kHz

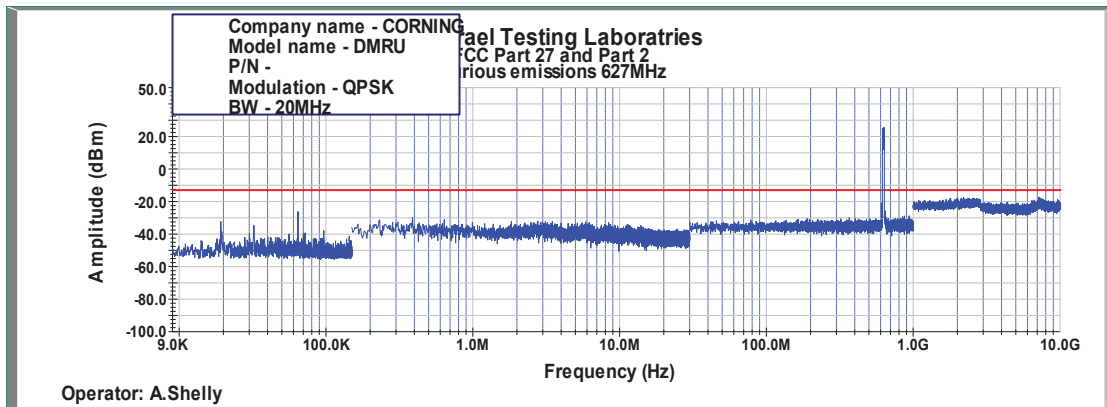


Figure 549: Spurious Emissions at Antenna Terminal QPSK, 627.0MHz,
B.W. 20MHz, Sub Carrier 30kHz

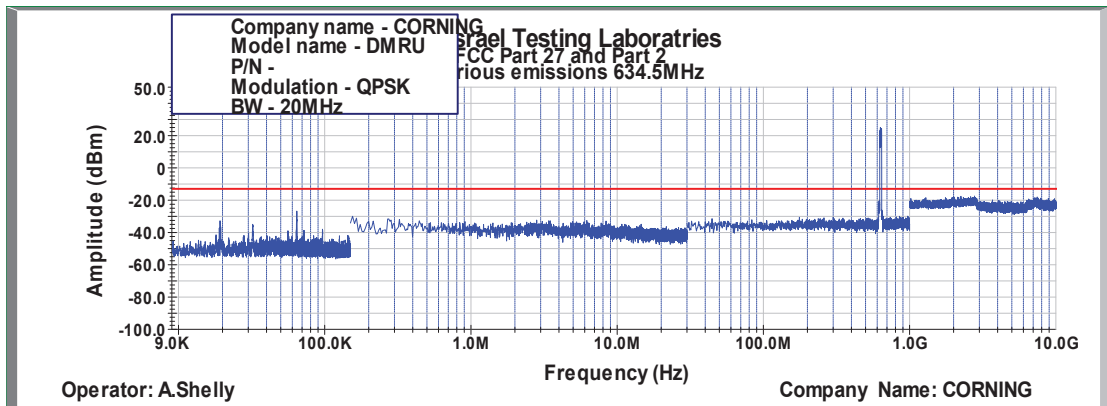


Figure 550: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 20MHz, Sub Carrier 30kHz

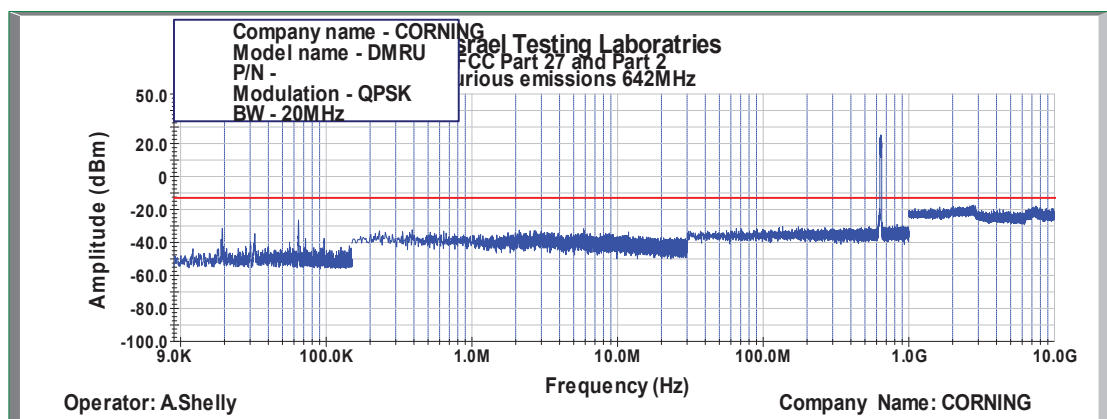


Figure 551: Spurious Emissions at Antenna Terminal QPSK, 642.0MHz,
B.W. 20MHz, Sub Carrier 30kHz



8.5 Test Equipment Used; Spurious Emissions at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 25 Test Equipment Used



9 Spurious Radiated Emission

9.1 Test Specification

FCC, Part 27, Subpart C, Section 27.53 (g)

9.2 Test Procedure

(Temperature (23°C)/ Humidity (47%RH))

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.

For measurements between 0.009MHz-30MHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 0.009MHz-30MHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization. The emissions were measured at a distance of 3 meters.

For measurements between 30.0MHz-1.0GHz:

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

For measurements between 1.0GHz-8.0GHz:

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -8.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator.

The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).

The signals observed in step (a) were converted to radiated power using:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{Cable Loss (dB)} + \text{Substitution Antenna Gain (dBd)}$$

P_d = Dipole equivalent power (result).

P_g = Signal generator output level.

A Peak detector was used for this test.

Testing was performed when the RF port was connected to 50 Ω termination.

Evaluation was performed for all possible modulations, bandwidths, and sub carriers.



9.3 **Test Limit**

The power of any emission outside of the authorized operating frequency ranges (617-652MHz) must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB, yielding -13dBm

9.4 **Test Results**

JUDGEMENT: Passed

No emissions were detected above the EMI receiver noise level which is at least 20 dB below the limit.



9.5 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	8542E	3906A00276	March 11, 2020	March 31, 2021
RF Filter Section	HP	85420E	3705A00248	March 11, 2020	March 31, 2021
EMI Receiver	R&S	ESCI7	100724	March 9, 2020	March 31, 2021
Spectrum Analyzer	HP	8593EM	3826A00265	March 9, 2020	March 31, 2021
Active Loop Antenna	EMCO	6502	9506-2950	February 5, 2019	February 28, 2021
Antenna Biconical	EMCO	3110B	9912-3337	May 21, 2019	May 31, 2021
Antenna Log Periodic	EMCO	3146	9505-4081	May 31, 2018	May 31, 2021
Horn Antenna 1G-18G	ETS	3115	29845	May 31, 2018	May 31, 2021
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	August 23, 2020	August 31, 2021
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 24, 2020	August 31, 2021
Vector Signal Generator	VIAVI	MTS 5800	WMNK0071690263	July 1, 2018	July 1, 2021
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	-	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

Table 26 Test Equipment Used



10 Out-of-Band Rejection

10.1 Test Specification

KDB 935210 D05 v01r04, Section 3.3

10.2 Test Procedure

(Temperature (21°C)/ Humidity (35%RH))

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator and an appropriate coaxial cable (max Loss= 40.9 dB).

The signal and spectrum analyzer frequency range was set to $\pm 250\%$ of the passband, Dwell time set to approximately 10msec.

RBW was set between 1% to 5% of the E.U.T passband and VBW set to $\geq 3 \cdot \text{RBW}$.

10.3 Test Limit

N/A

10.4 Test Results

JUDGEMENT: Passed

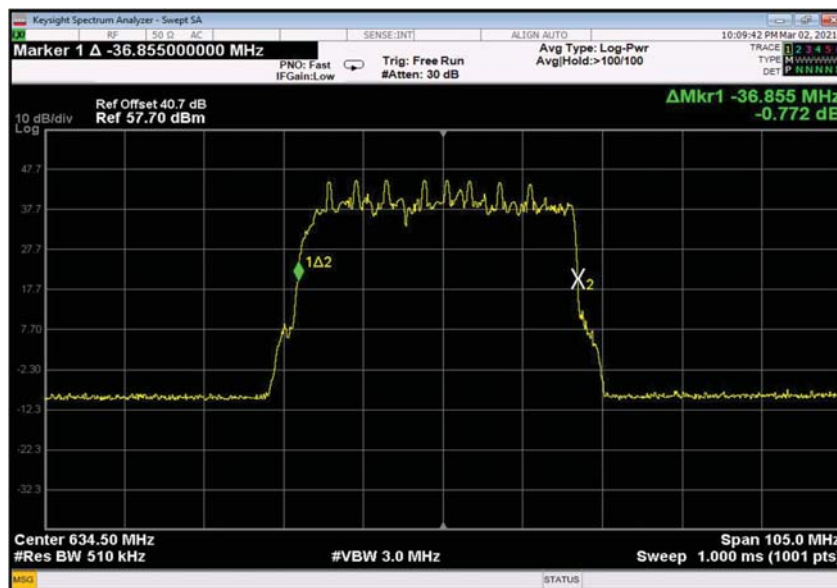


Figure 552. — Out-of-Band Rejection Plot



10.5 Test Equipment Used; Out-of-Band Rejection

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Keysight	UXA N9040B	MY56080119	January 31, 2020	January 31, 2022
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY53051952	January 17, 2019	January 17, 2022
40 dB Attenuator	Weinschel Associates	WA 39-40-33	-	November 1, 2020	November 1, 2021
RF Coaxial Cable	Huber-Suner	SLLS210B	-	November 1, 2020	November 1, 2021

Table 27 Test Equipment Used



11 APPENDIX A - CORRECTION FACTORS

11.1 Correction factors for RF OATS Cable 35m ITL #1784

Frequency (MHz)	Cable loss (dB)
10.0	0.3
20.0	0.2
50.0	-0.1
100.0	-0.6
200.0	-1.2
500.0	-2.3
1000.0	-3.6



11.2 Correction factors for RF OATS Cable 10m
ITL #1794

Frequency(MHz)	Cable loss(dB)
10.0	-0.3
20.0	-0.3
50.0	-0.5
100.0	-0.7
200.0	-1.1
500.0	-1.8
1000.0	-2.7



11.3 Correction factors for

Horn Antenna

**Model: SWH-28
at 1 meter range.**

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4



11.4 Correction factors for Horn Antenna

Model: 3115

Antenna serial number: 29845

3 meter range

f(GHz)	AF(dB/m)	GA(dB)
0.75	25	3
1G	23.5	7
1.5G	26	8
2G	29	7
2.5G	27.5	10
3G	30	10
3.5G	31.5	10
4G	32.5	9.5
4.5G	32.5	10.5
5G	33	10.5
5.5G	35	10.5
6G	36.5	9.5
6.5G	36.5	10
7G	37.5	10
7.5G	37.5	10
8G	37.5	11
8.5G	38	11
9G	37.5	11.5
9.5G	38	11.5
10G	38.5	11.5
10.5G	38.5	12
11G	38.5	12.5
11.5G	38.5	13
12G	38	13.5
12.5G	38.5	13
13G	40	12
13.5G	41	12
14G	40	13
14.5G	39	14
15G	38	15.5
15.5G	37.5	16
16G	37.5	16
16.5G	39	15
17G	40	15
17.5G	42	13.5
18G	42.5	13



11.5 Correction factors for Log Periodic Antenna
EMCO, Model 3146,
Serial #9505-4081

Frequency [MHz]	AF [dB/m]
200.0	11.47
250.0	12.06
300.0	14.77
400.0	15.77
500.0	18.01
600.0	18.84
700.0	20.93
800.0	21.27
900.0	22.44
1000.0	24.10



11.6 Correction factors for Biconical Antenna
EMCO, Model 3110B,
Serial #9912-3337

Frequency [MHz]	AF [dB/m]
30.0	14.18
35.0	13.95
40.0	12.84
45.0	11.23
50.0	11.10
60.0	10.39
70.0	9.34
80.0	9.02
90.0	9.31
100.0	8.95
120.0	11.53
140.0	12.20
160.0	12.56
180.0	13.49
200.0	15.27



11.7 Correction factors for ACTIVE LOOP ANTENNA
Model 6502
S/N 9506-2950

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8