

Figure 689: Spurious Emissions at Antenna Terminal 256QAM, 619.5MHz, B.W. 5MHz, Sub Carrier 15kHz

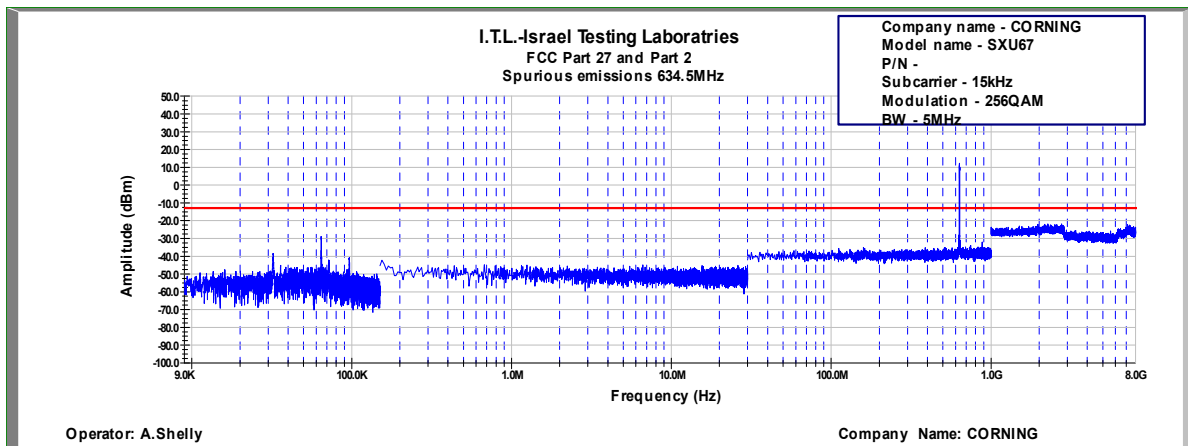


Figure 690: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 5MHz, Sub Carrier 15kHz

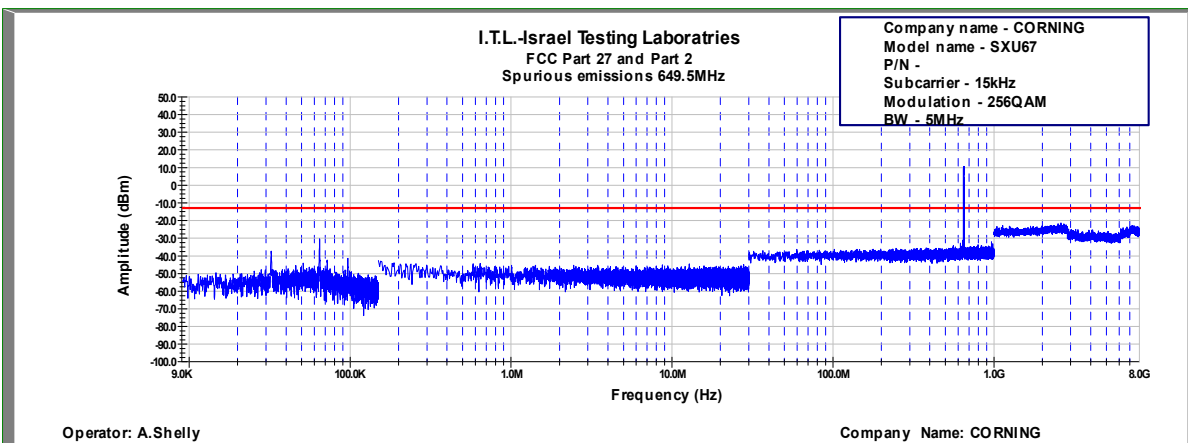


Figure 691: Spurious Emissions at Antenna Terminal 256QAM, 649.5MHz, B.W. 5MHz, Sub Carrier 15kHz

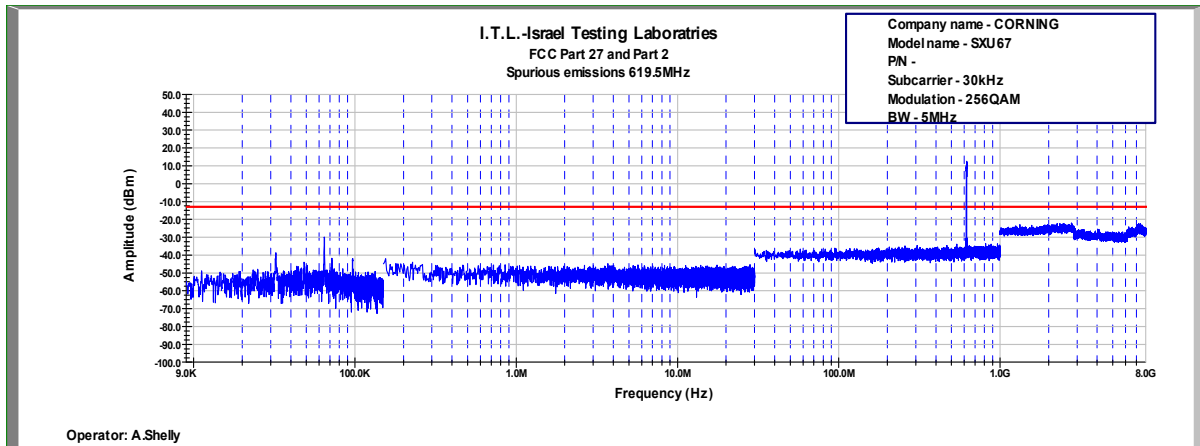


Figure 692: Spurious Emissions at Antenna Terminal 256QAM, 619.5MHz, B.W. 5MHz, Sub Carrier 30kHz

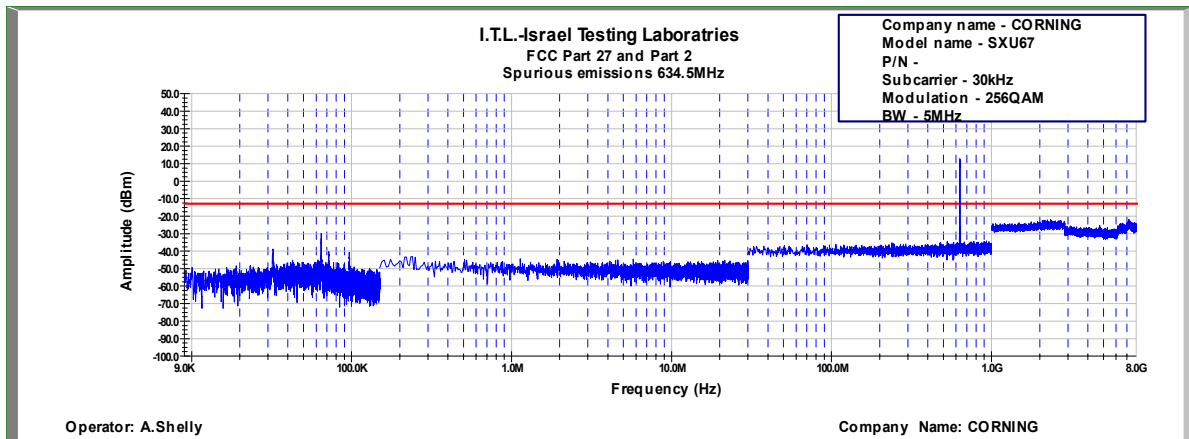


Figure 693: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 5MHz, Sub Carrier 30kHz

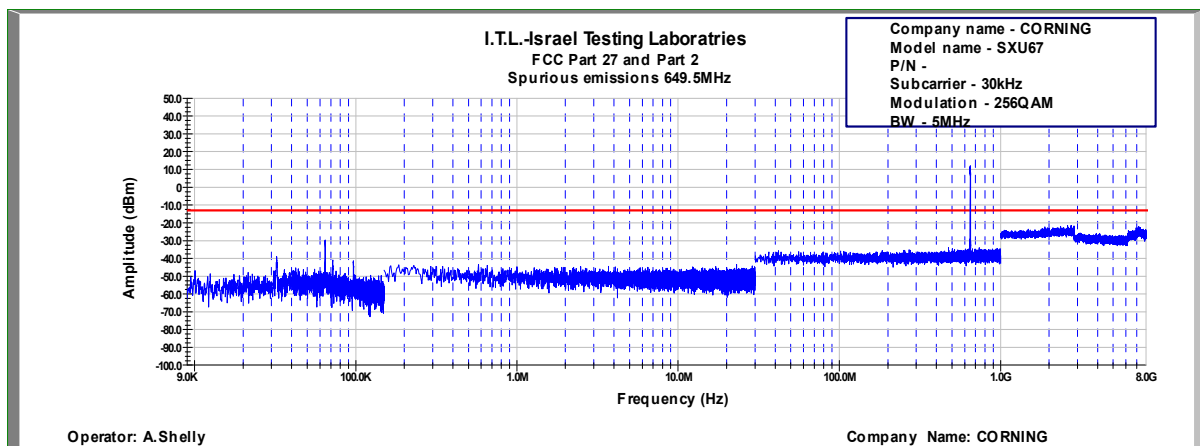


Figure 694: Spurious Emissions at Antenna Terminal 256QAM, 649.5MHz, B.W. 5MHz, Sub Carrier 30kHz

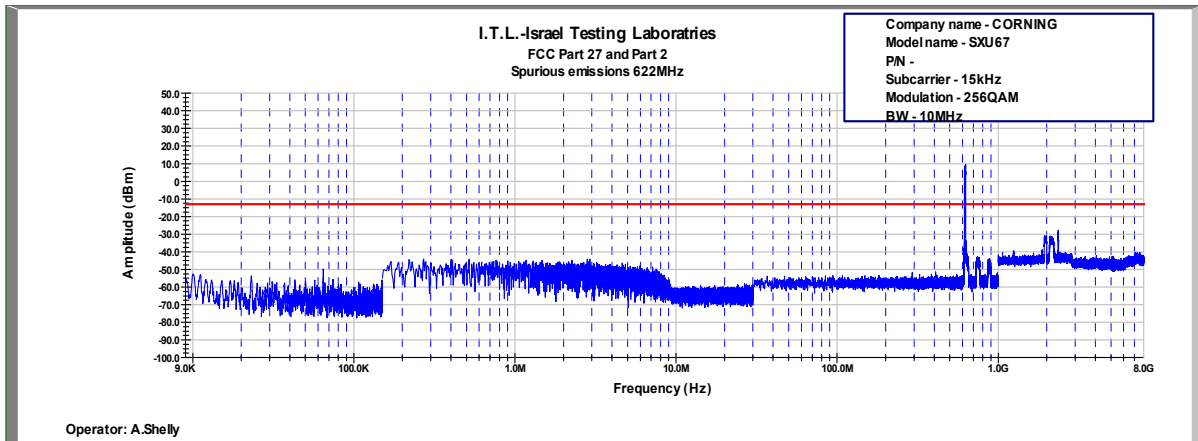


Figure 695: Spurious Emissions at Antenna Terminal 256QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 15kHz

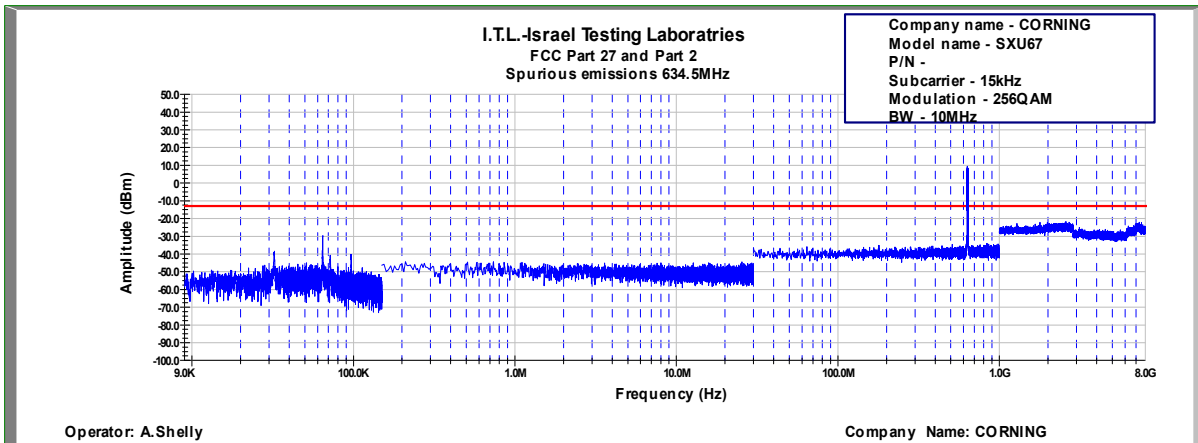


Figure 696: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 15kHz

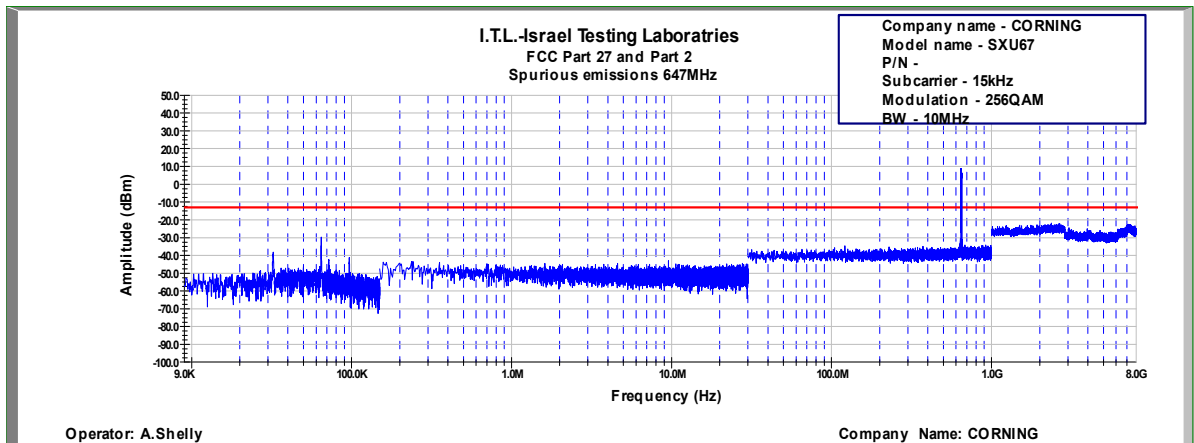


Figure 697: Spurious Emissions at Antenna Terminal 256QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 15kHz

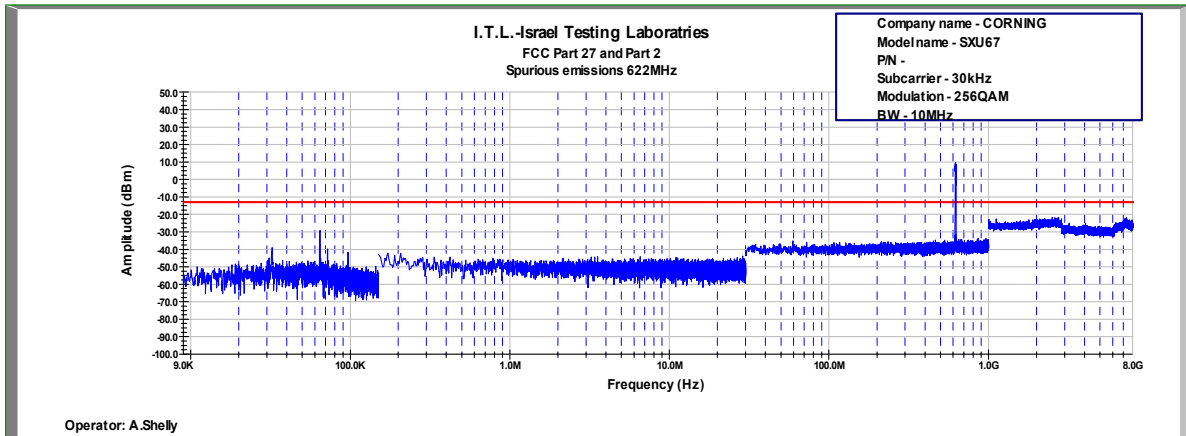


Figure 698: Spurious Emissions at Antenna Terminal 256QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 30kHz

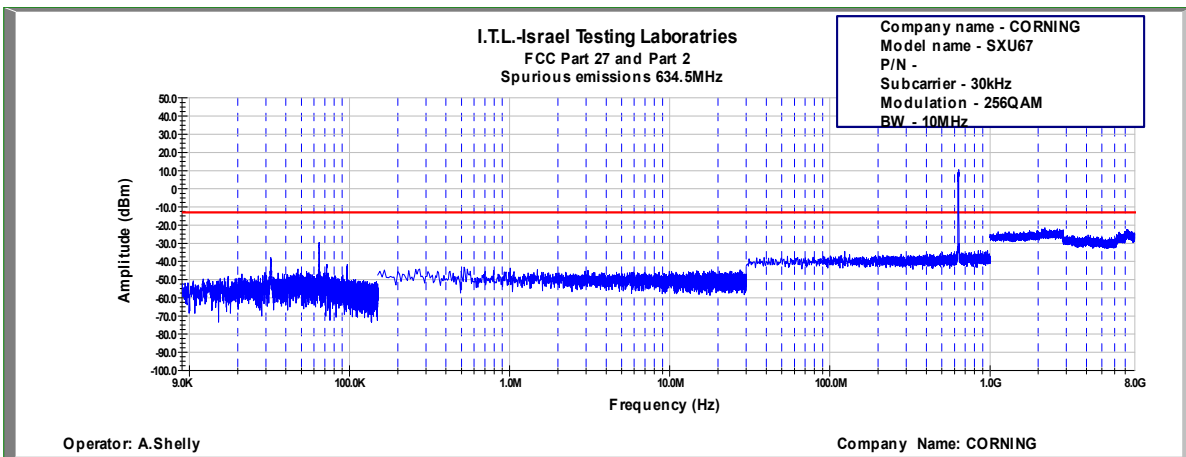


Figure 699: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 30kHz

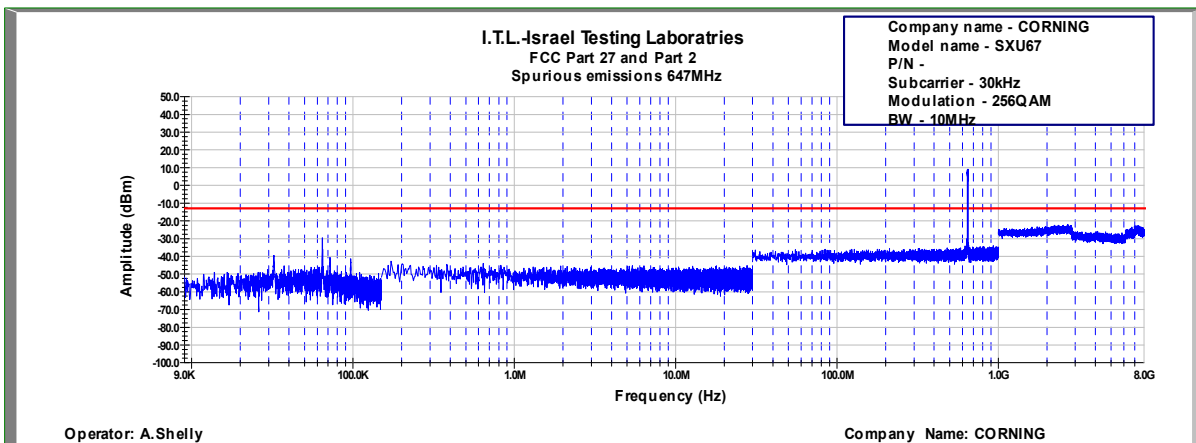


Figure 700: Spurious Emissions at Antenna Terminal 256QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 30kHz

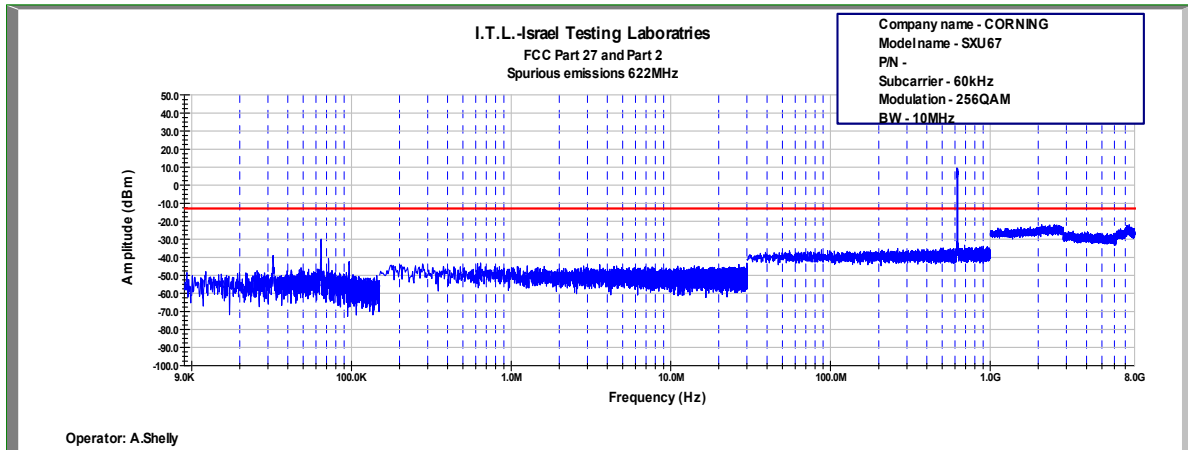


Figure 701: Spurious Emissions at Antenna Terminal 256QAM, 622.0MHz, B.W. 10MHz, Sub Carrier 60kHz

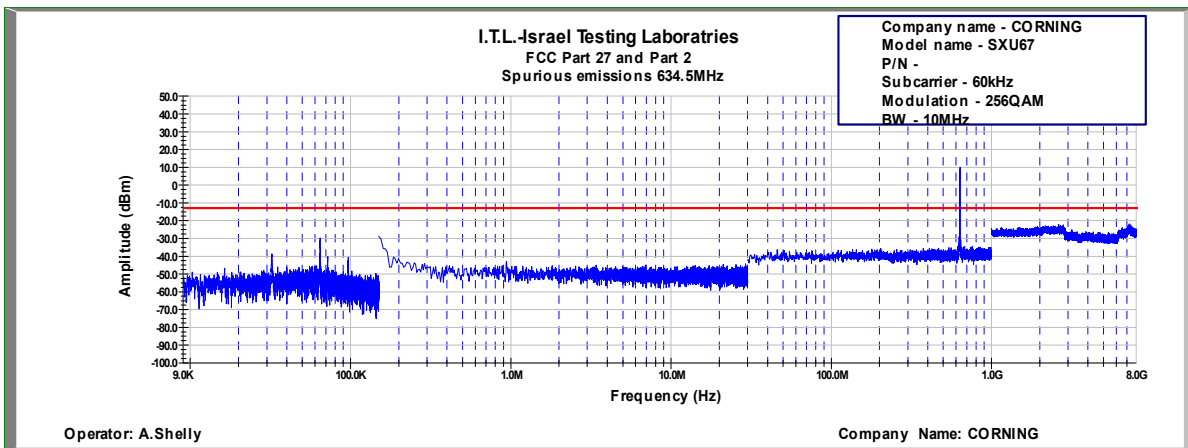


Figure 702: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 10MHz, Sub Carrier 60kHz

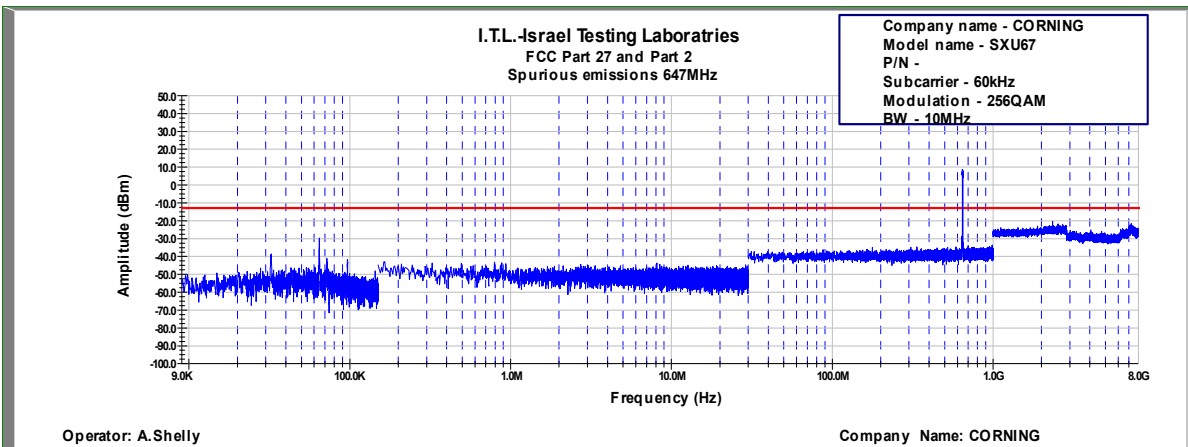


Figure 703: Spurious Emissions at Antenna Terminal 256QAM, 647.0MHz, B.W. 10MHz, Sub Carrier 60kHz

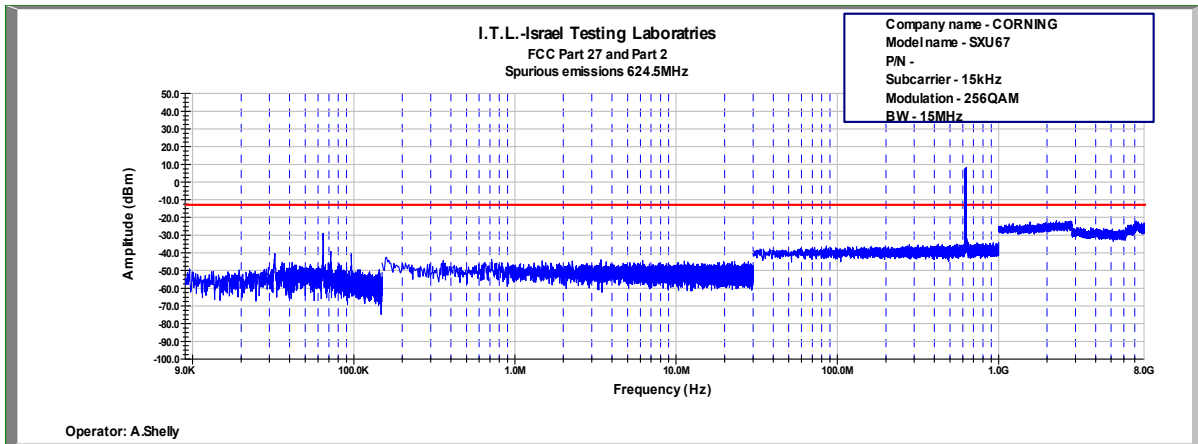


Figure 704: Spurious Emissions at Antenna Terminal 256QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 15kHz

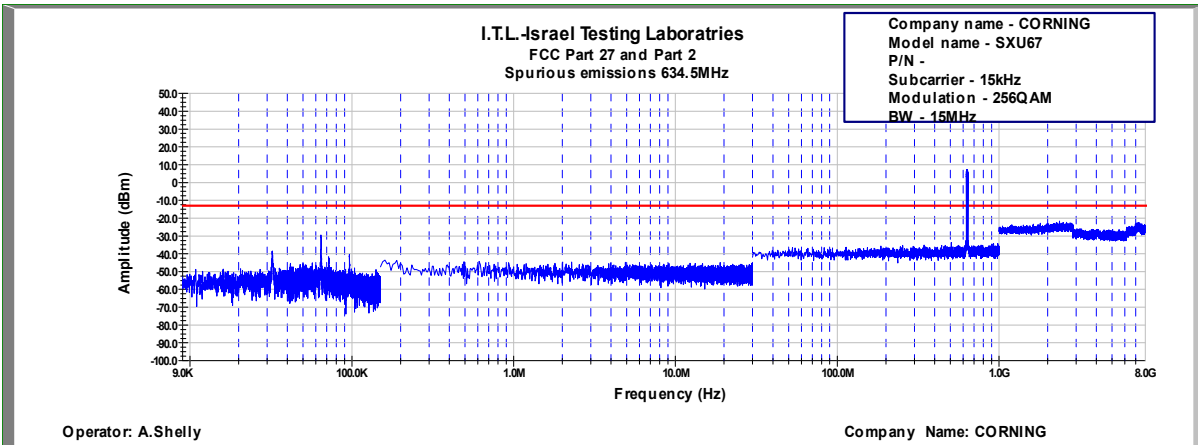


Figure 705: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 15kHz

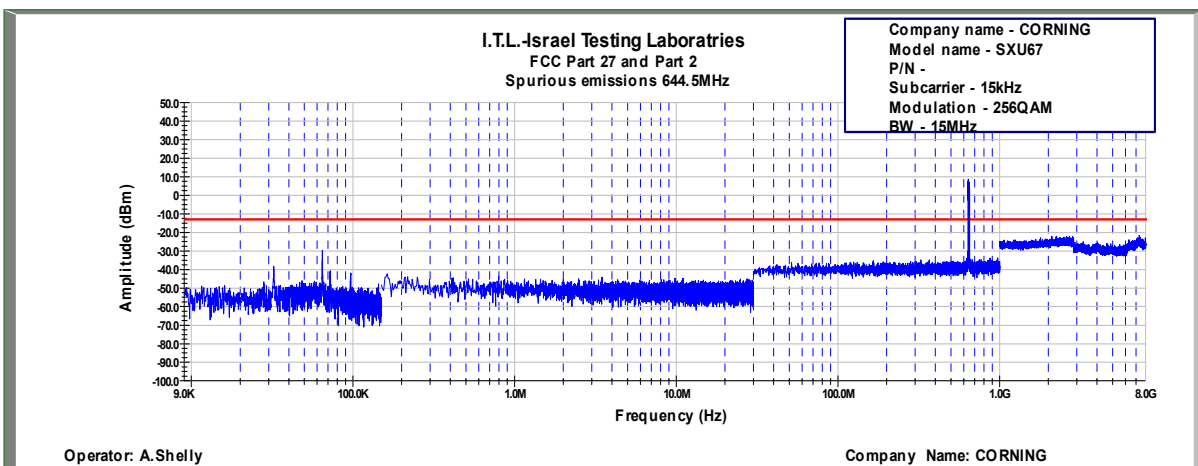


Figure 706: Spurious Emissions at Antenna Terminal 256QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 15kHz

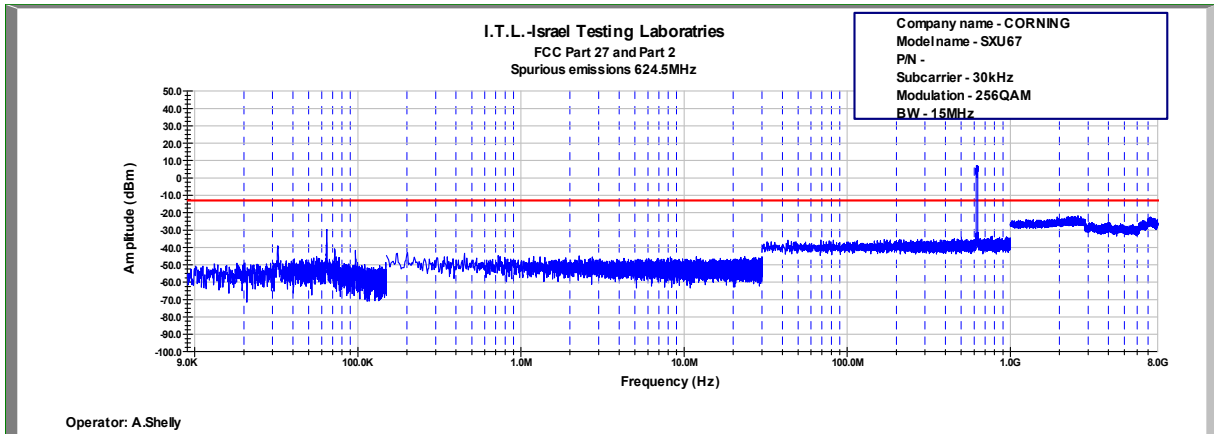


Figure 707: Spurious Emissions at Antenna Terminal 256QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 30kHz

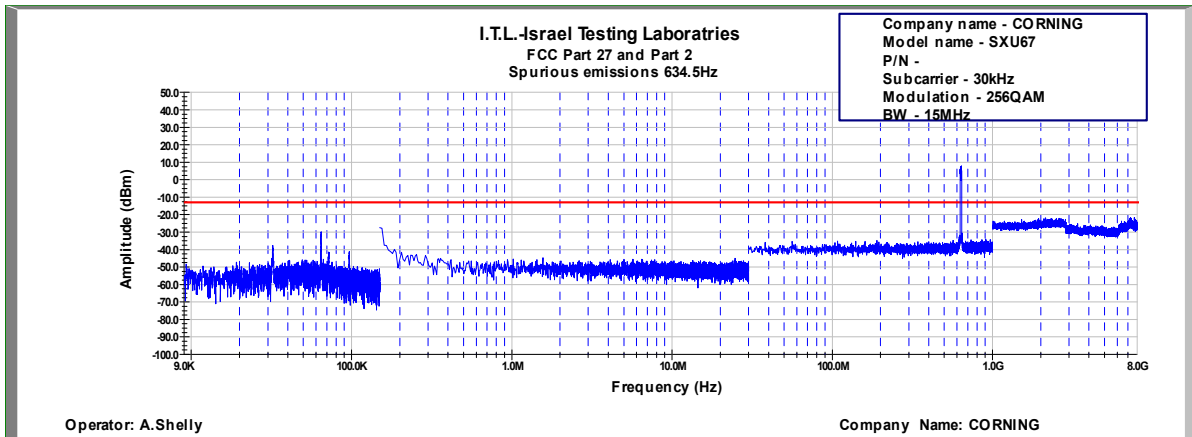


Figure 708: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 30kHz

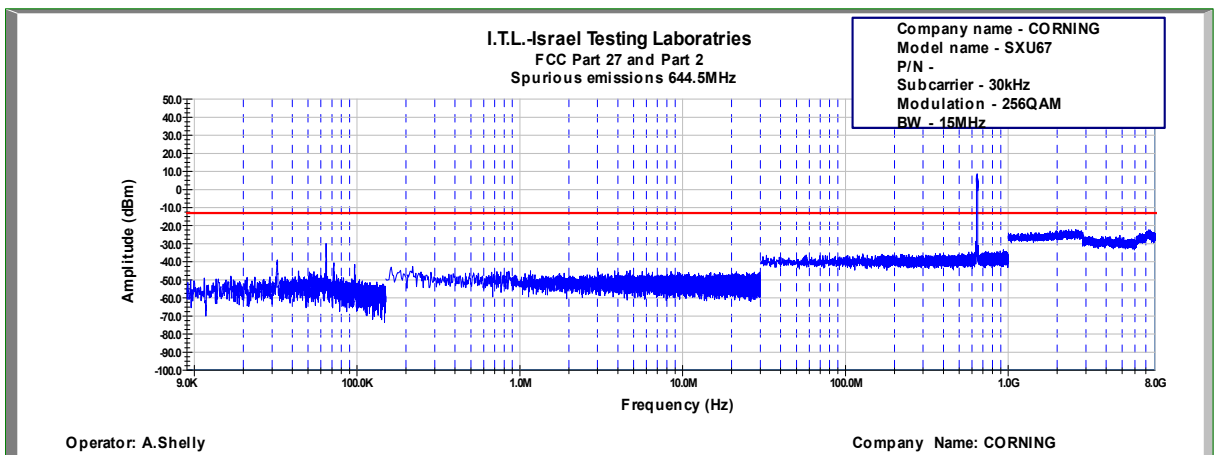


Figure 709: Spurious Emissions at Antenna Terminal 256QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 30kHz

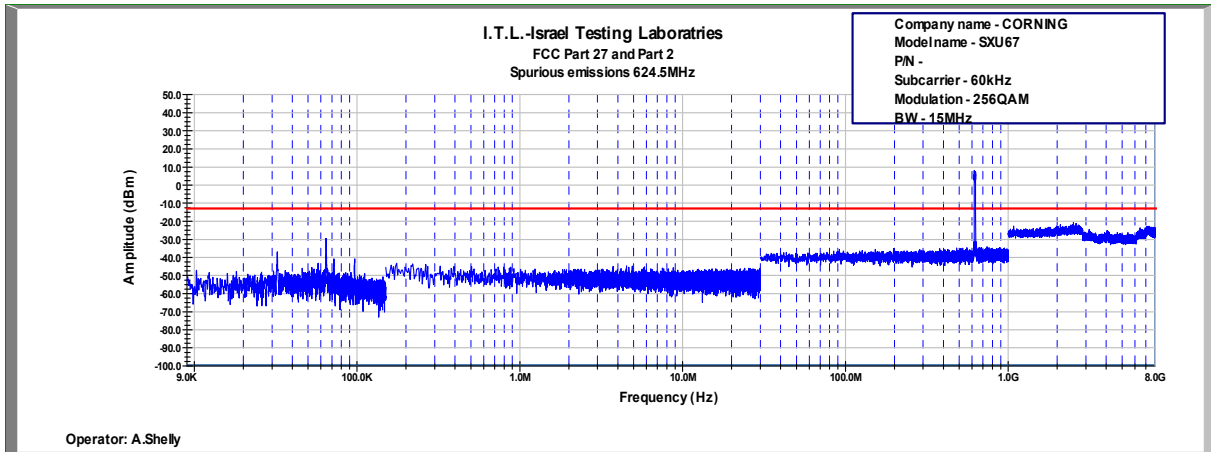


Figure 710: Spurious Emissions at Antenna Terminal 256QAM, 624.5MHz, B.W. 15MHz, Sub Carrier 60kHz

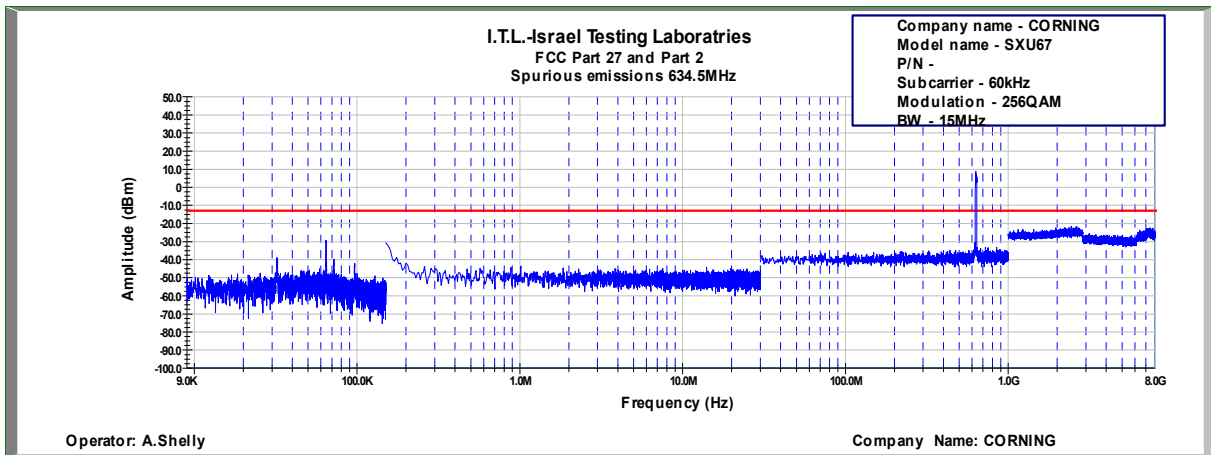


Figure 711: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 15MHz, Sub Carrier 60kHz

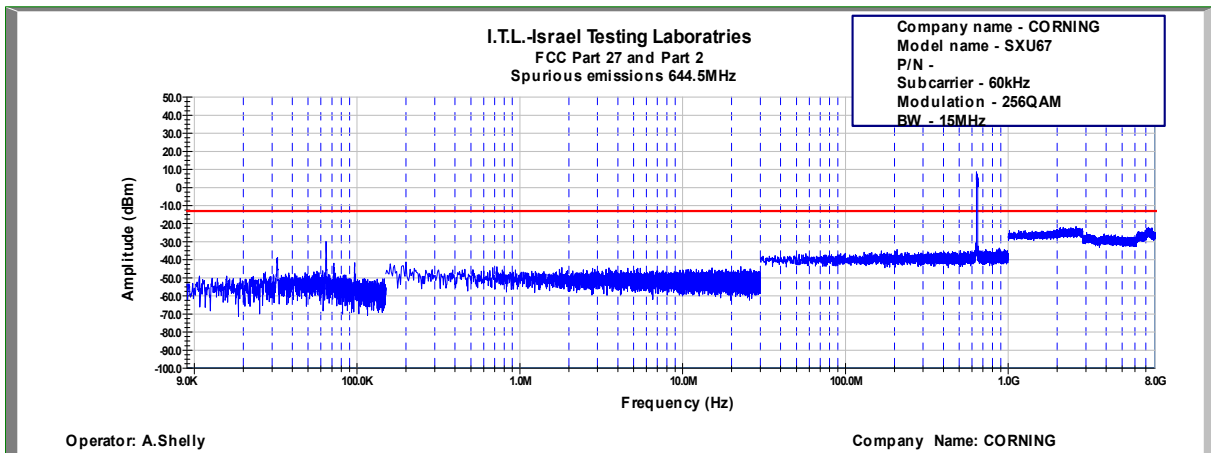


Figure 712: Spurious Emissions at Antenna Terminal 256QAM, 644.5MHz, B.W. 15MHz, Sub Carrier 60kHz

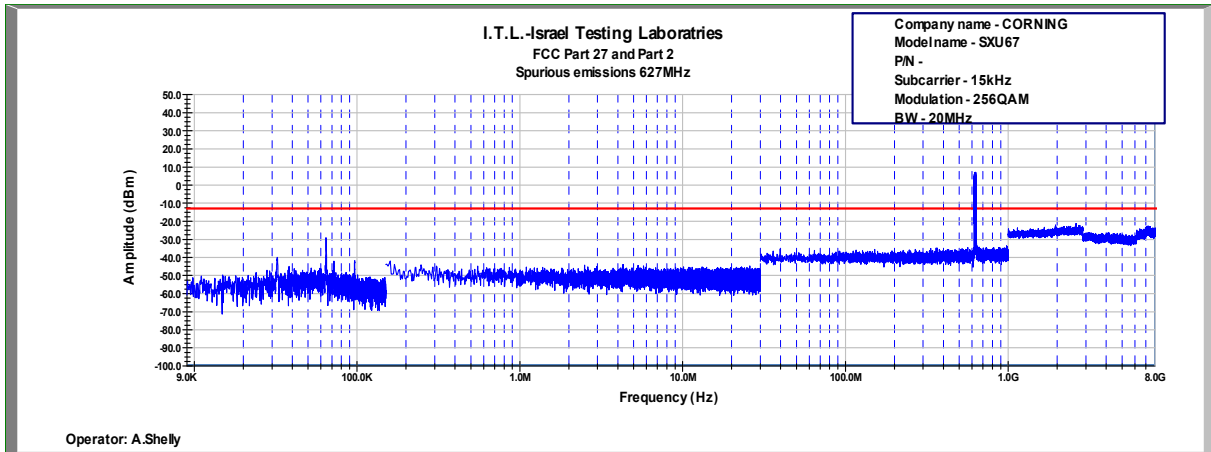


Figure 713: Spurious Emissions at Antenna Terminal 256QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 15kHz

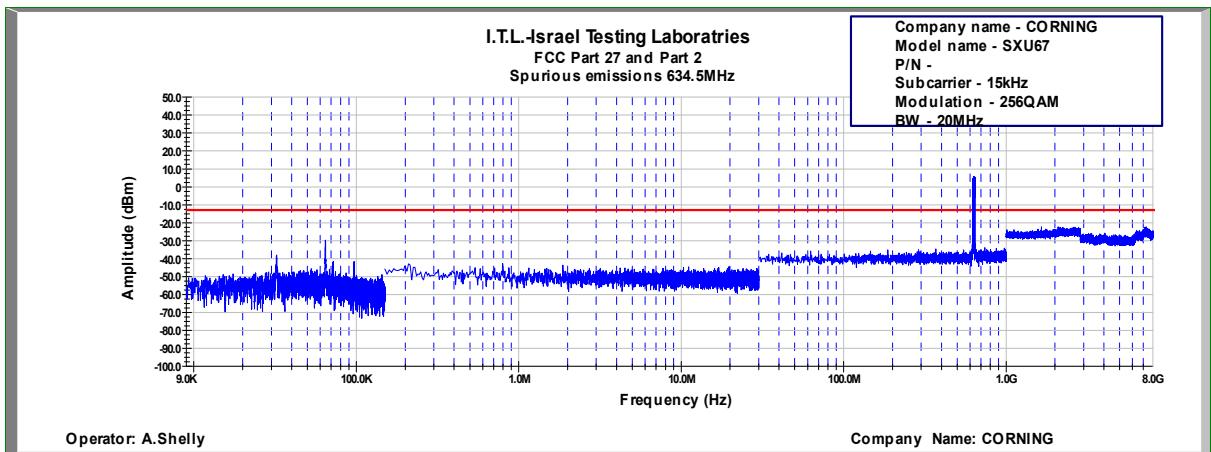


Figure 714: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 15kHz

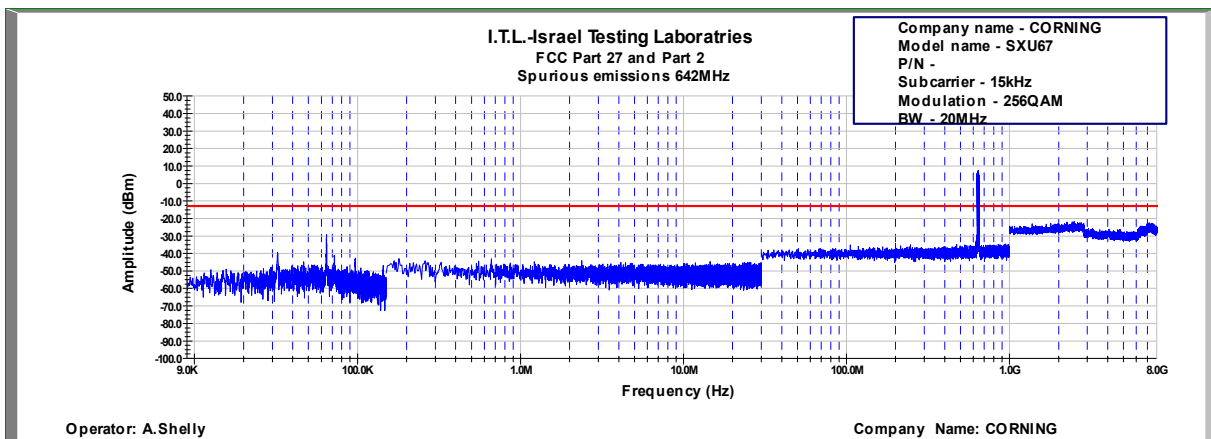


Figure 715: Spurious Emissions at Antenna Terminal 256QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 15kHz

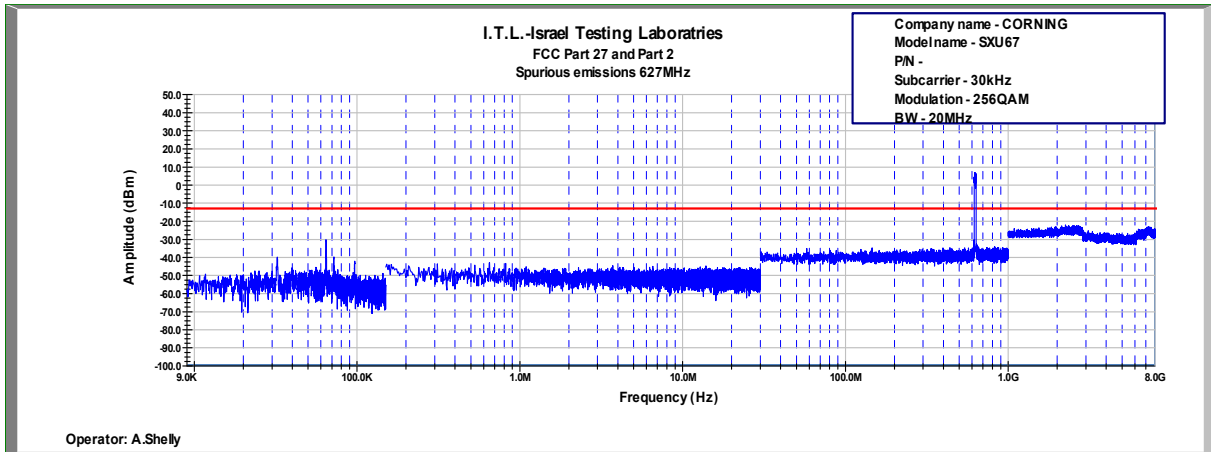


Figure 716: Spurious Emissions at Antenna Terminal 256QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 30kHz

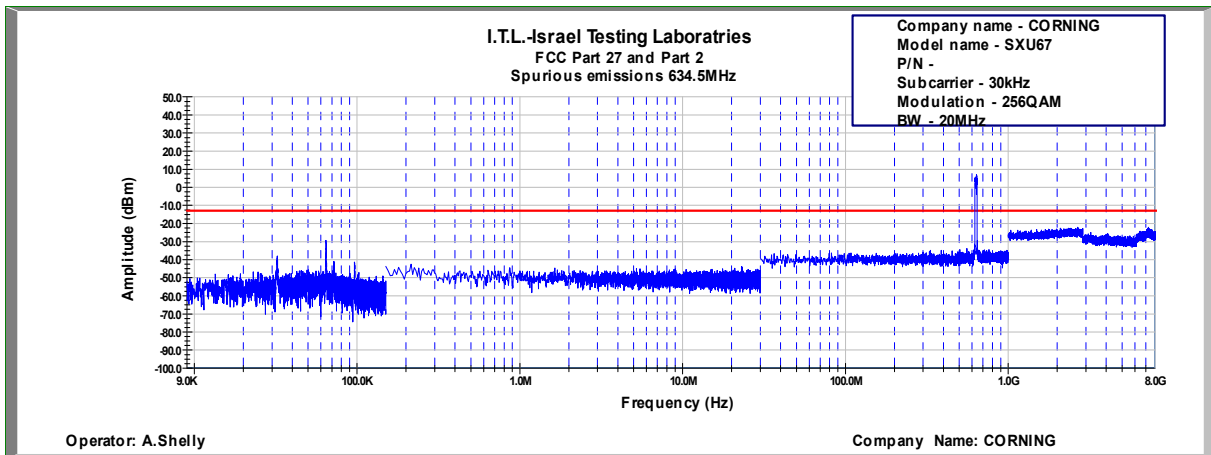


Figure 717: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 30kHz

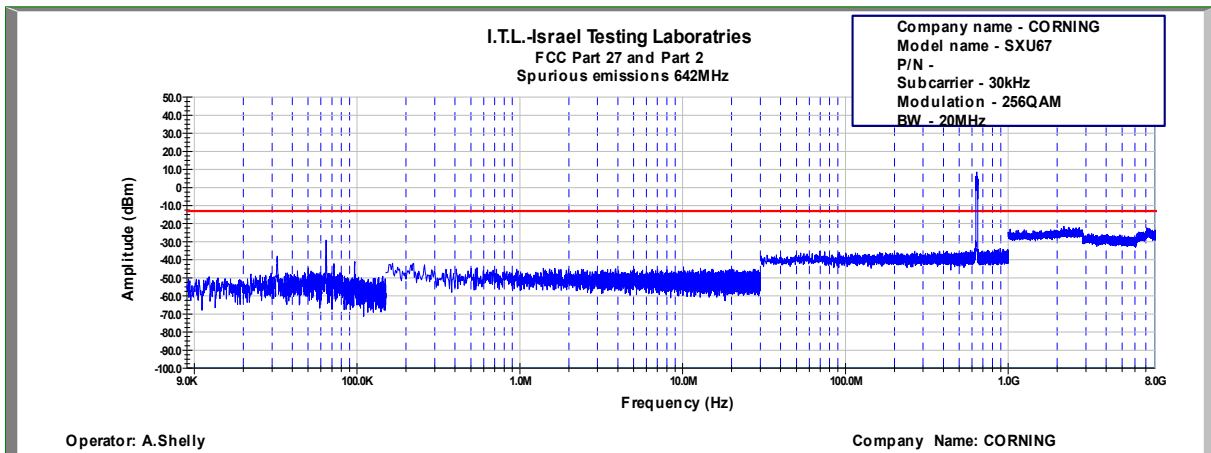


Figure 718: Spurious Emissions at Antenna Terminal 256QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 30kHz

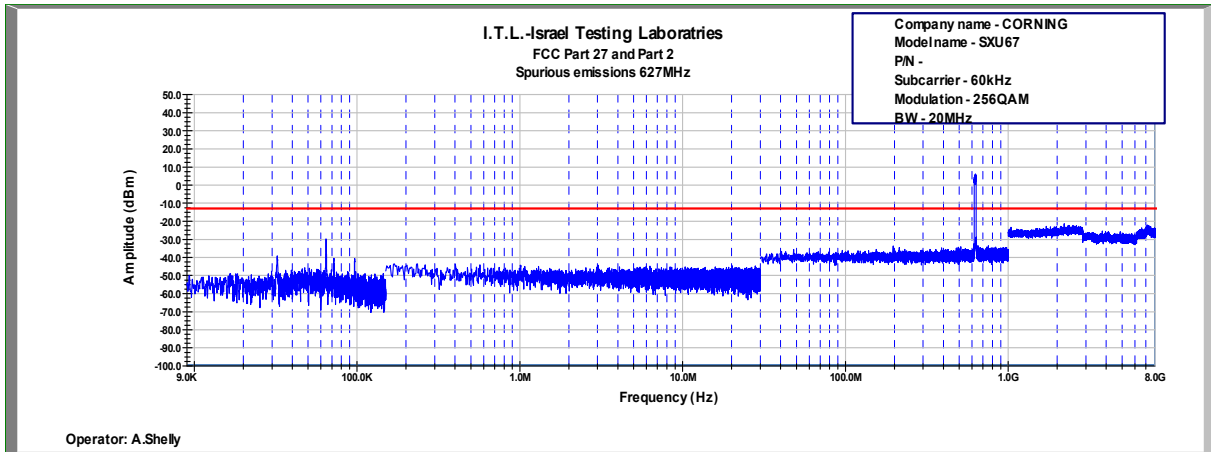


Figure 719: Spurious Emissions at Antenna Terminal 256QAM, 627.0MHz, B.W. 20MHz, Sub Carrier 60kHz

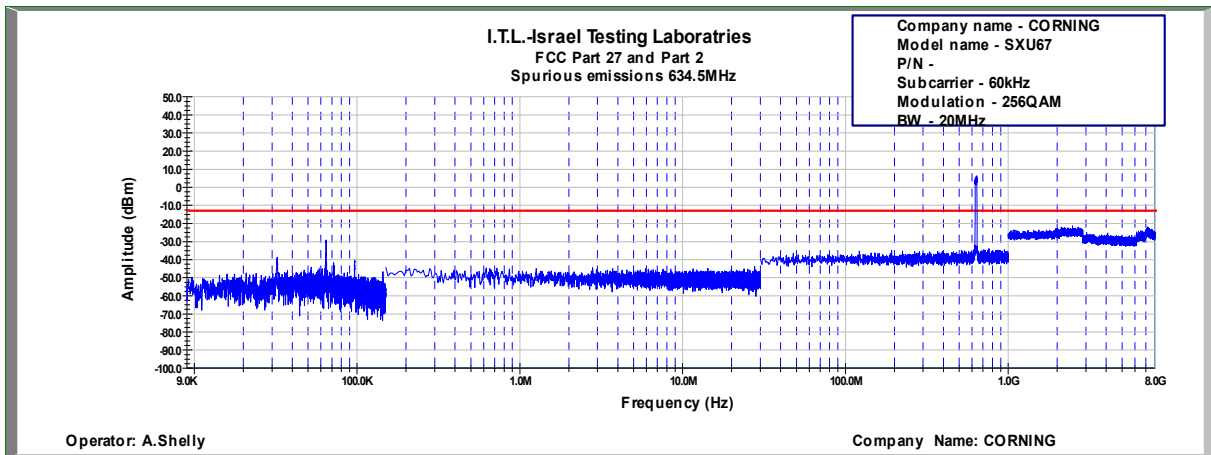


Figure 720: Spurious Emissions at Antenna Terminal 256QAM, 634.5MHz, B.W. 20MHz, Sub Carrier 60kHz

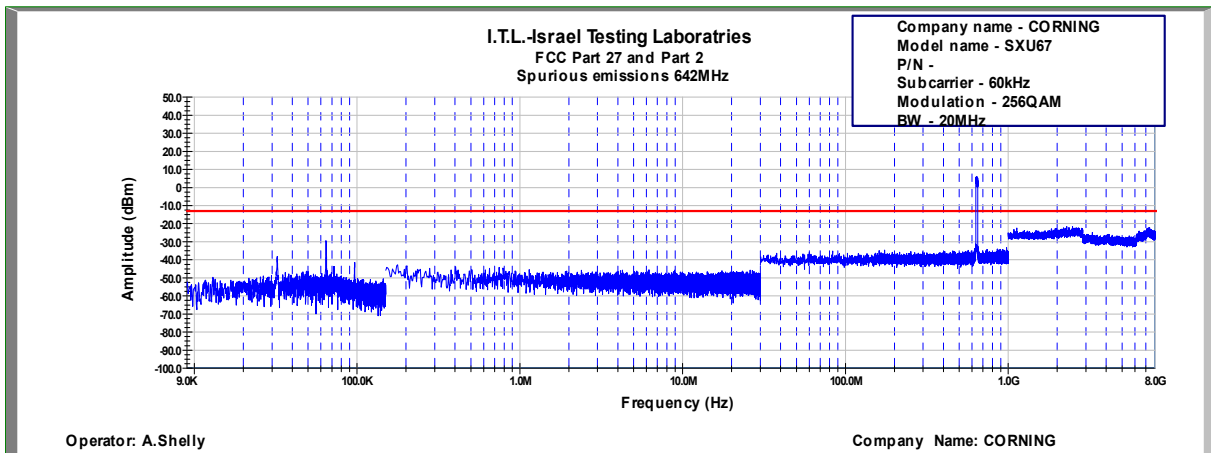


Figure 721: Spurious Emissions at Antenna Terminal 256QAM, 642.0MHz, B.W. 20MHz, Sub Carrier 60kHz

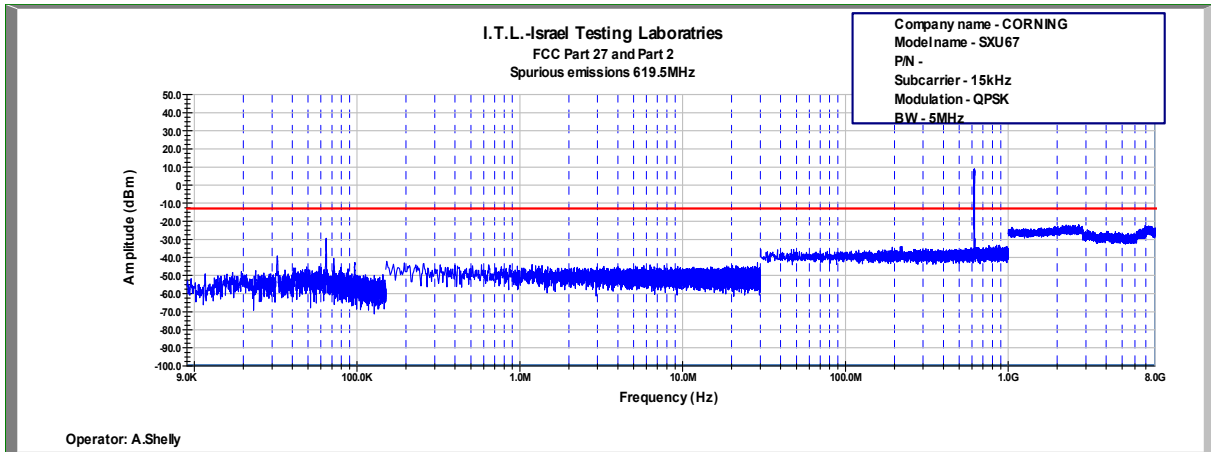


Figure 722: Spurious Emissions at Antenna Terminal QPSK, 619.5MHz, B.W. 5MHz, Sub Carrier 15kHz

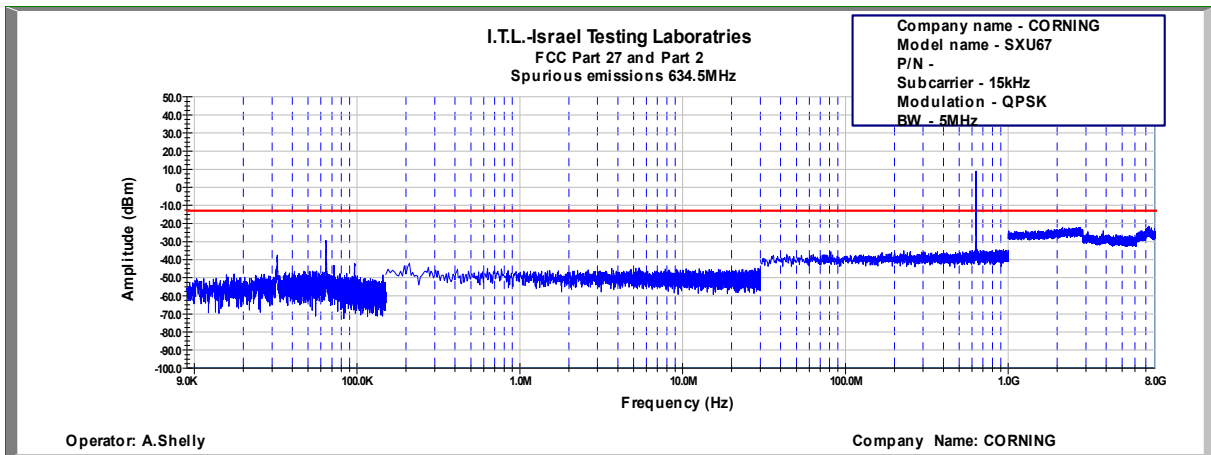


Figure 723: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 5MHz, Sub Carrier 15kHz

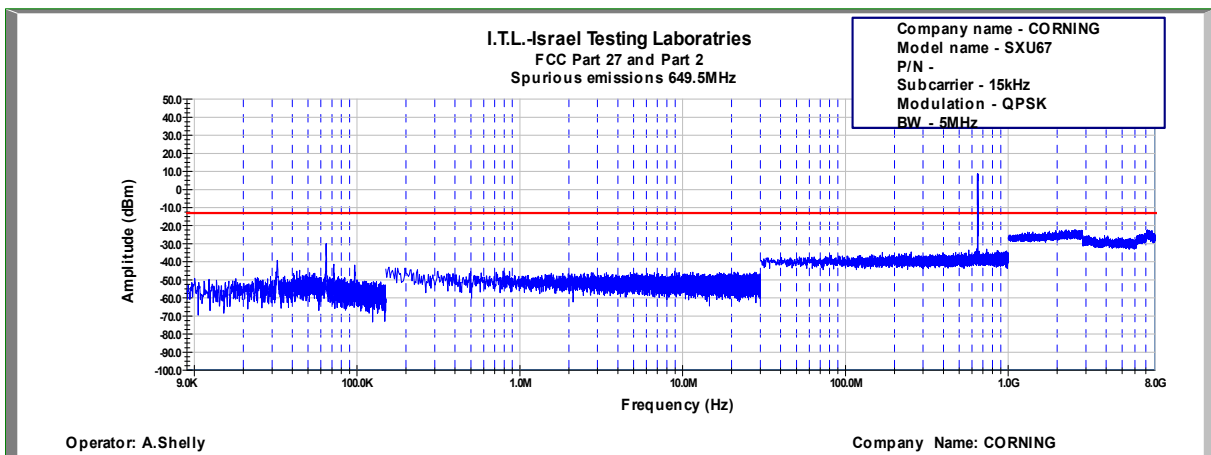


Figure 724: Spurious Emissions at Antenna Terminal QPSK, 649.5MHz, B.W. 5MHz, Sub Carrier 15kHz

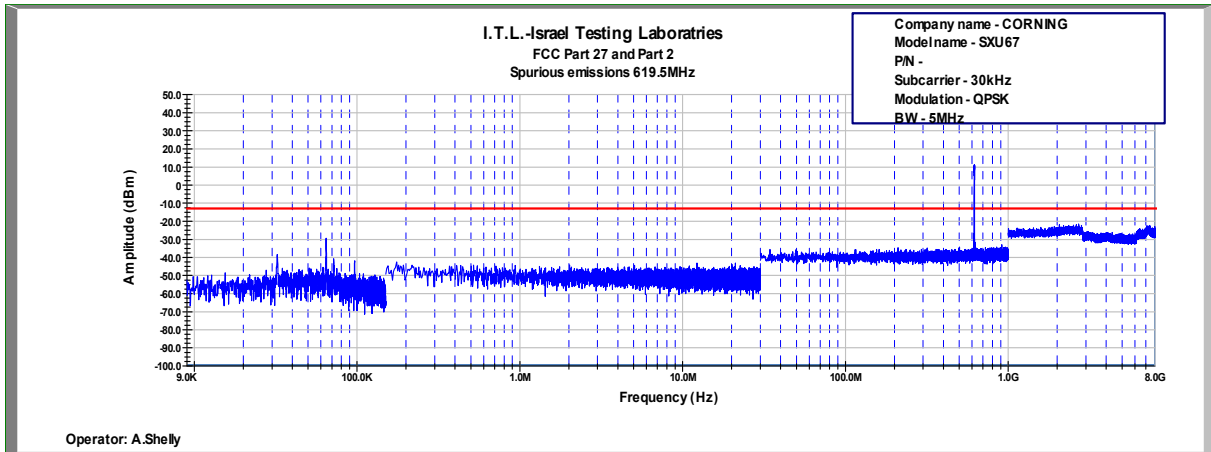


Figure 725: Spurious Emissions at Antenna Terminal QPSK, 619.5MHz, B.W. 5MHz, Sub Carrier 30kHz

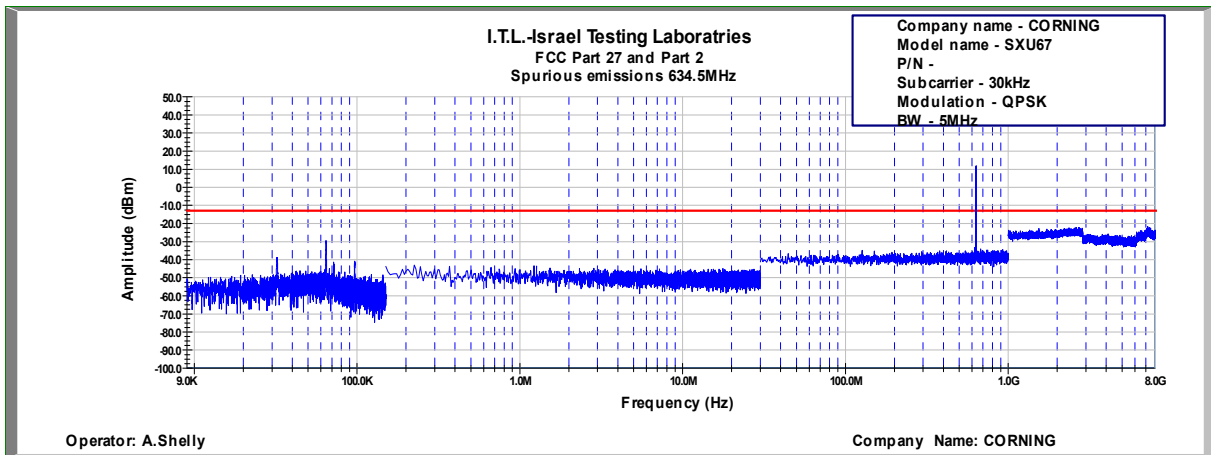


Figure 726: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 5MHz, Sub Carrier 30kHz

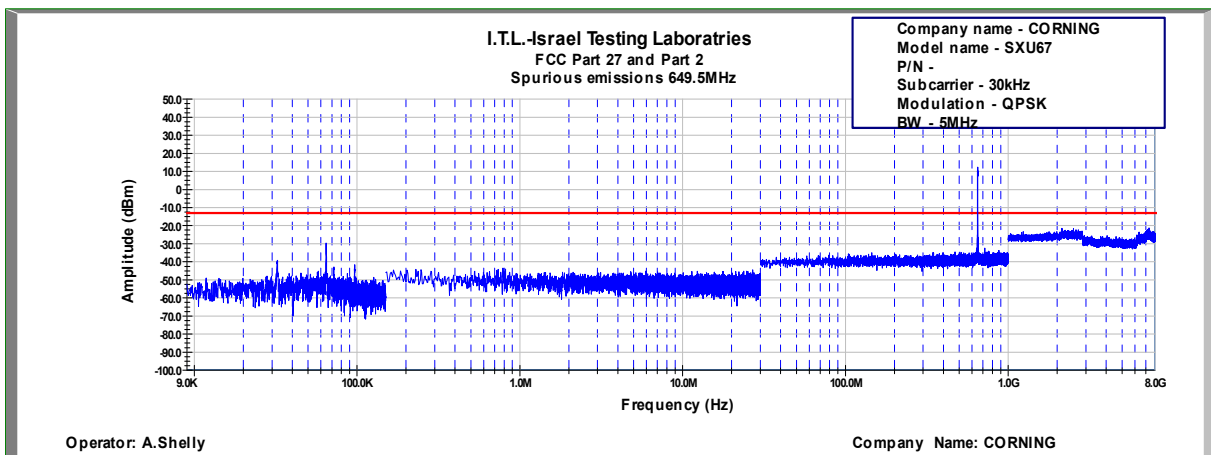


Figure 727: Spurious Emissions at Antenna Terminal QPSK, 649.5MHz, B.W. 5MHz, Sub Carrier 30kHz

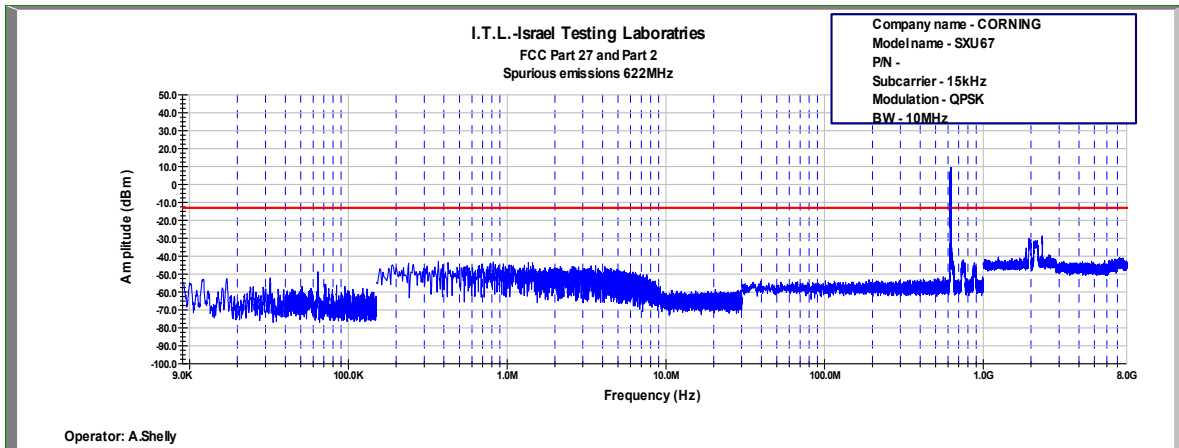


Figure 728: Spurious Emissions at Antenna Terminal QPSK, 622.0MHz, B.W. 10MHz, Sub Carrier 15kHz

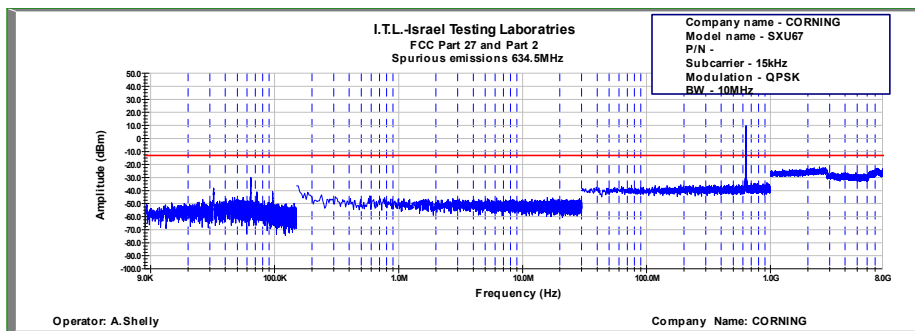


Figure 729: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 10MHz, Sub Carrier 15kHz

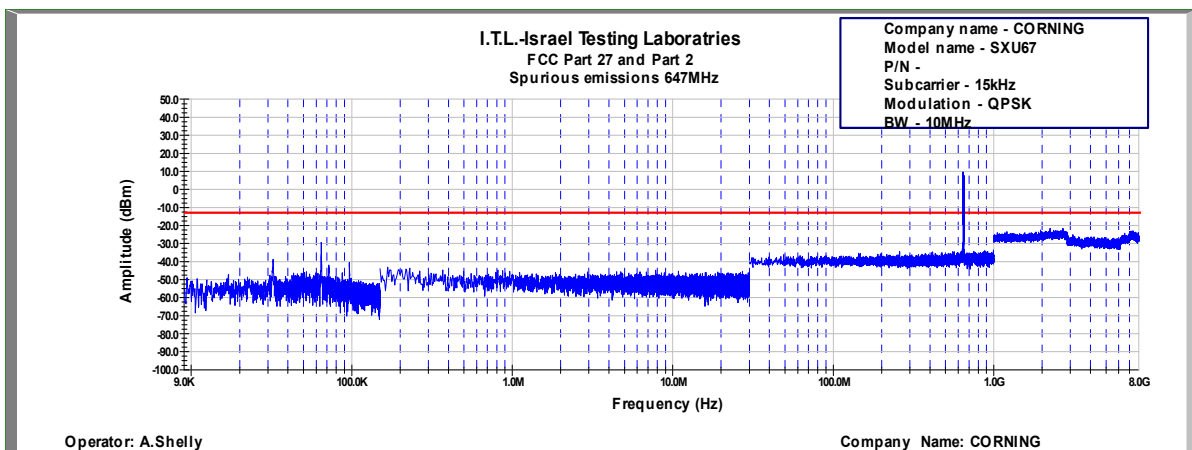


Figure 730: Spurious Emissions at Antenna Terminal QPSK, 647.0MHz, B.W. 10MHz, Sub Carrier 15kHz

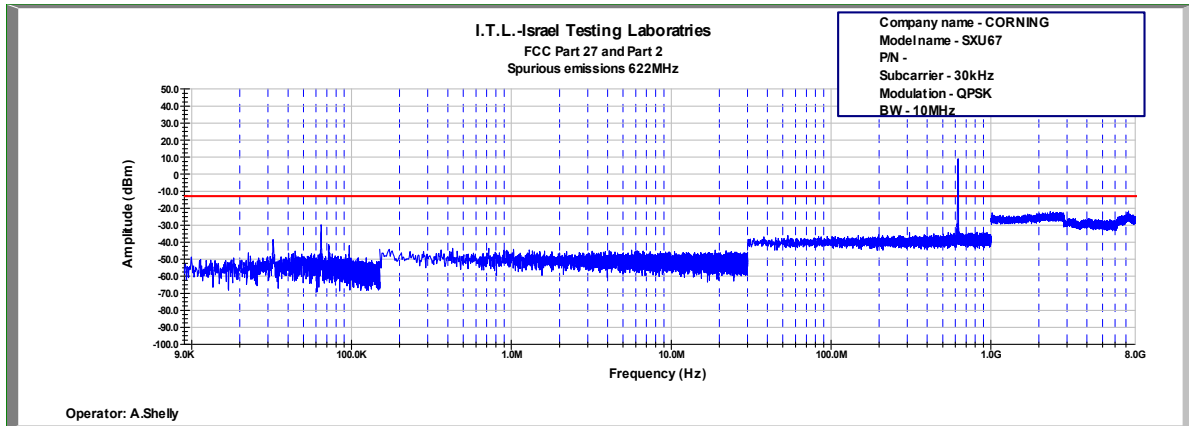


Figure 731: Spurious Emissions at Antenna Terminal QPSK, 622.0MHz,
B.W. 10MHz, Sub Carrier 30kHz

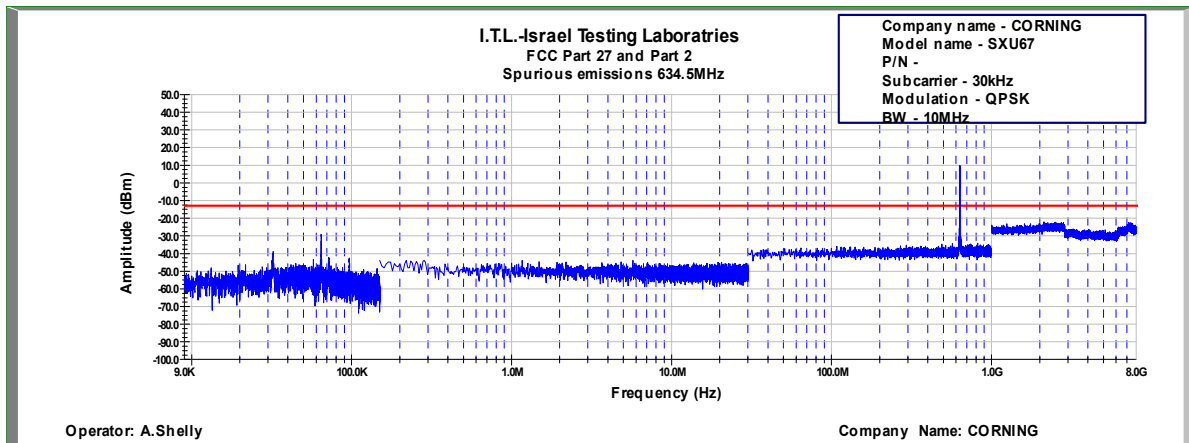


Figure 732: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 10MHz, Sub Carrier 30kHz

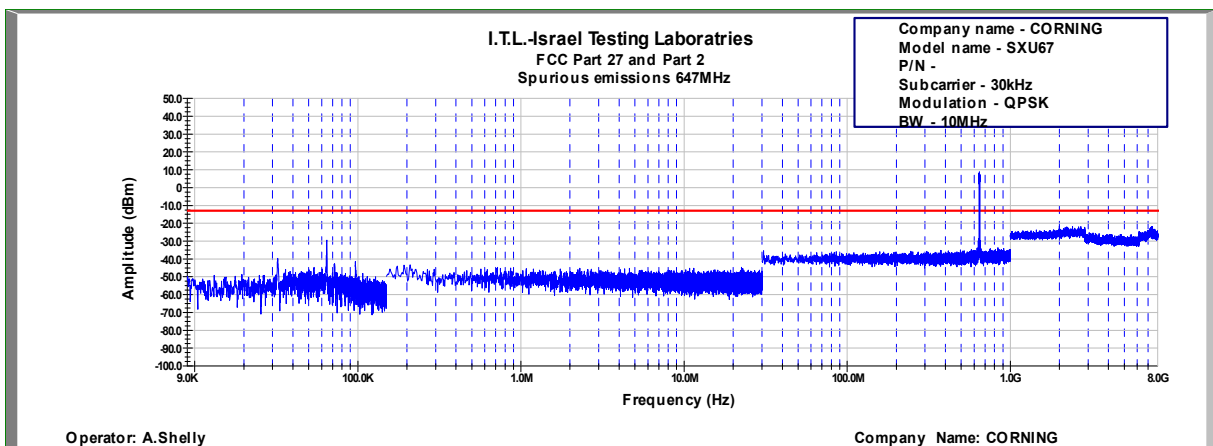


Figure 733: Spurious Emissions at Antenna Terminal QPSK, 647.0MHz,
B.W. 10MHz, Sub Carrier 30kHz

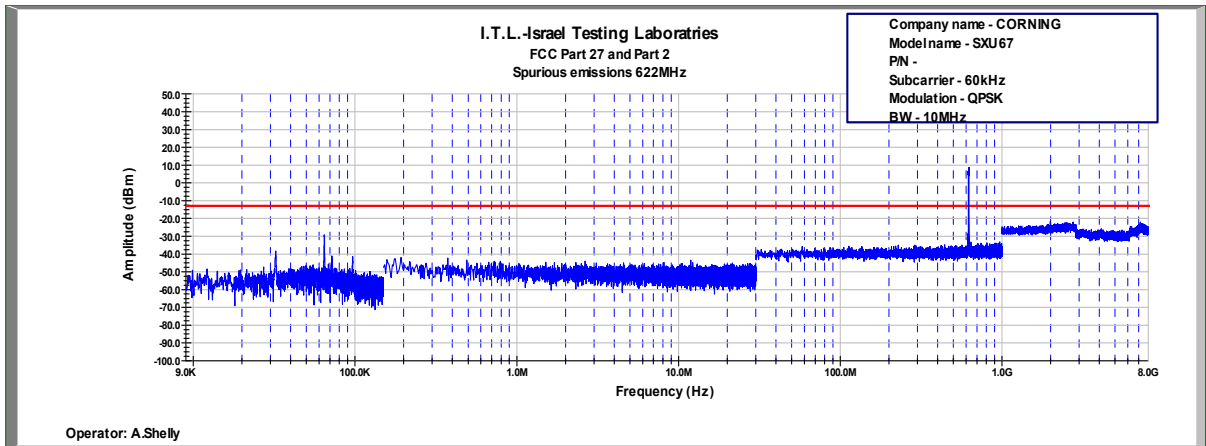


Figure 734: Spurious Emissions at Antenna Terminal QPSK, 622.0MHz, B.W. 10MHz, Sub Carrier 60kHz

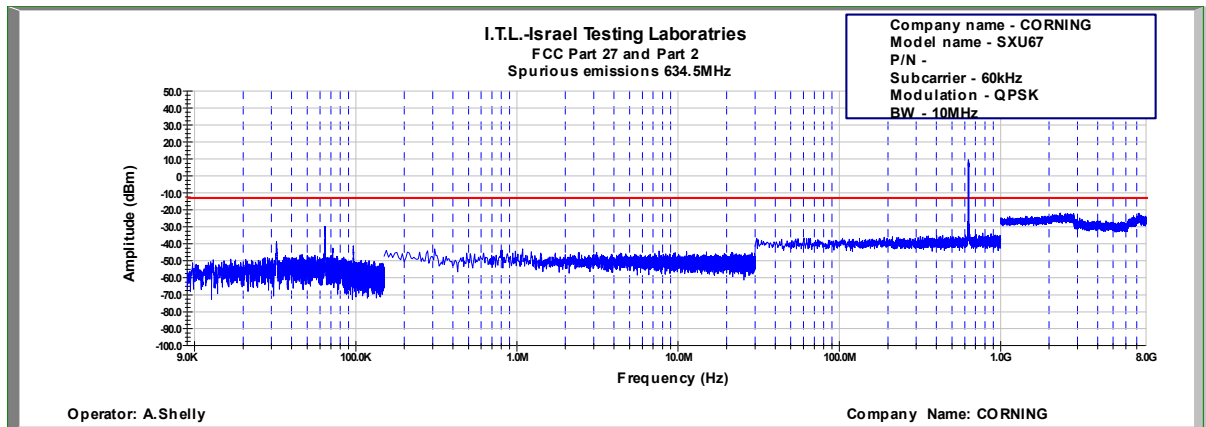


Figure 735: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 10MHz, Sub Carrier 60kHz

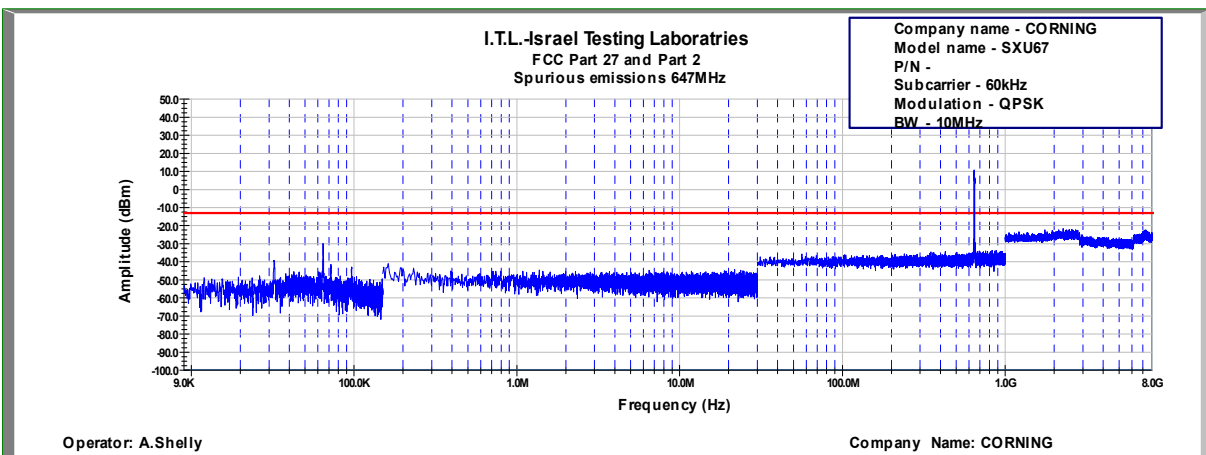


Figure 736: Spurious Emissions at Antenna Terminal QPSK, 647.0MHz, B.W. 10MHz, Sub Carrier 60kHz

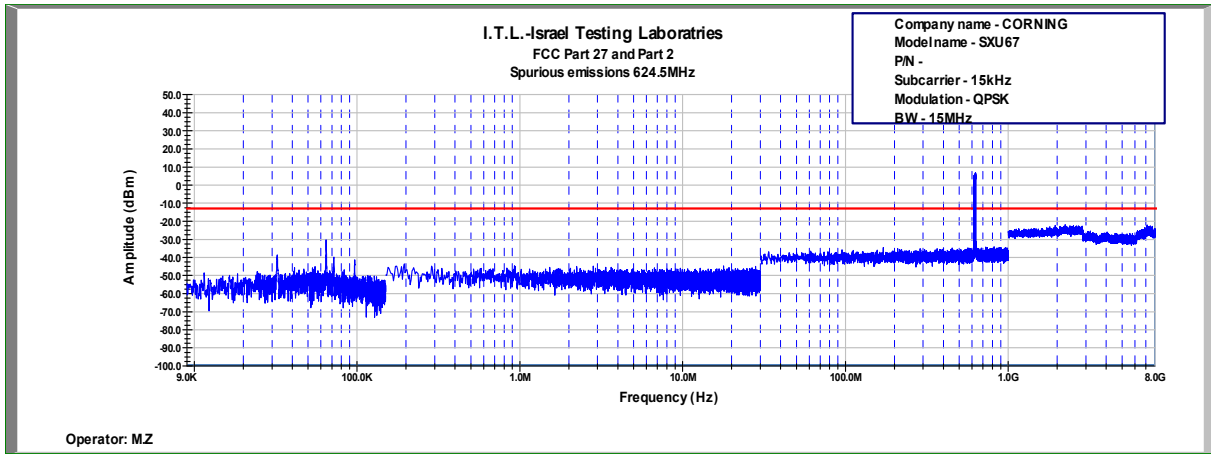


Figure 737: Spurious Emissions at Antenna Terminal QPSK, 624.5MHz, B.W. 15MHz, Sub Carrier 15kHz

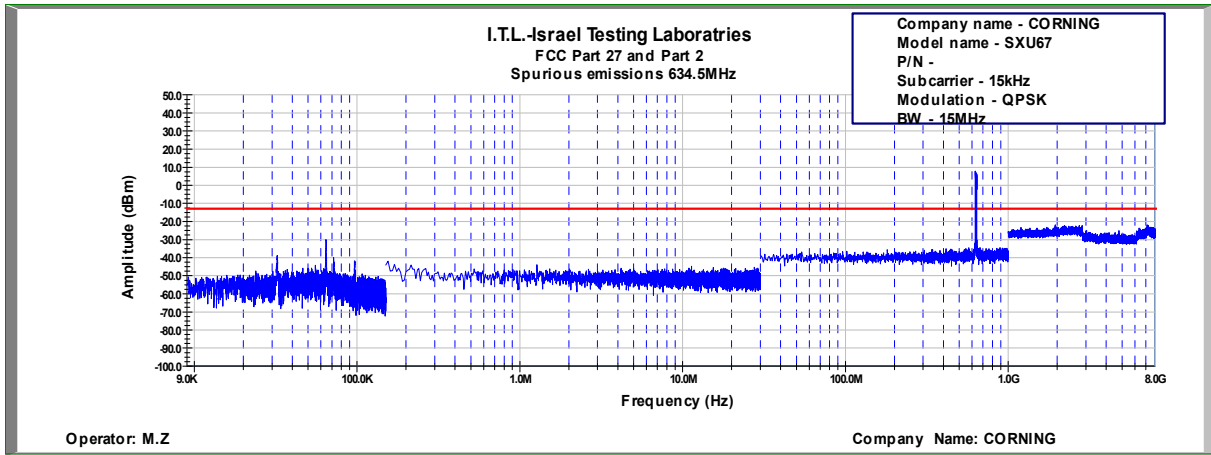


Figure 738: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 15MHz, Sub Carrier 15kHz

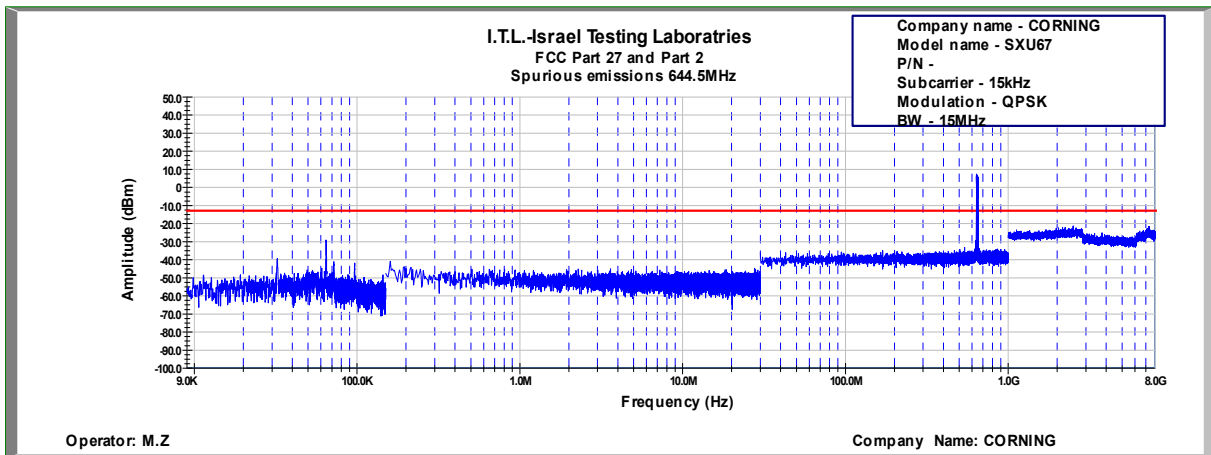


Figure 739: Spurious Emissions at Antenna Terminal QPSK, 644.5MHz, B.W. 15MHz, Sub Carrier 15kHz

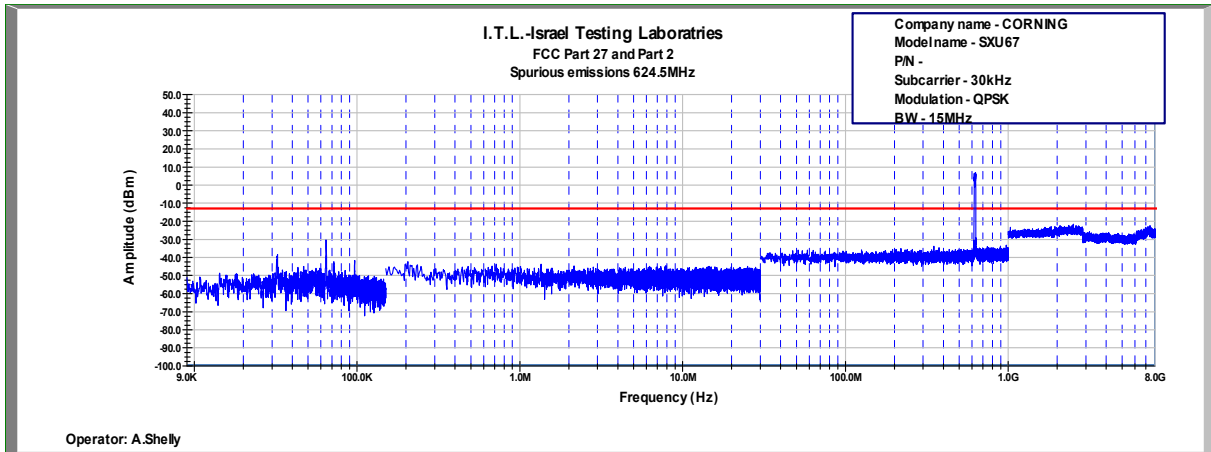


Figure 740: Spurious Emissions at Antenna Terminal QPSK, 624.5MHz, B.W. 15MHz, Sub Carrier 30kHz

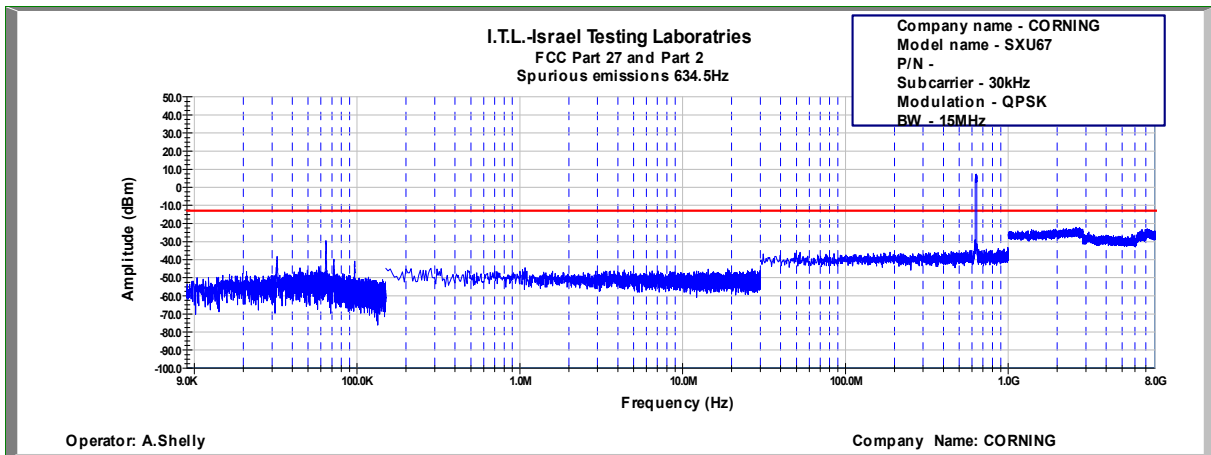


Figure 741: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 15MHz, Sub Carrier 30kHz

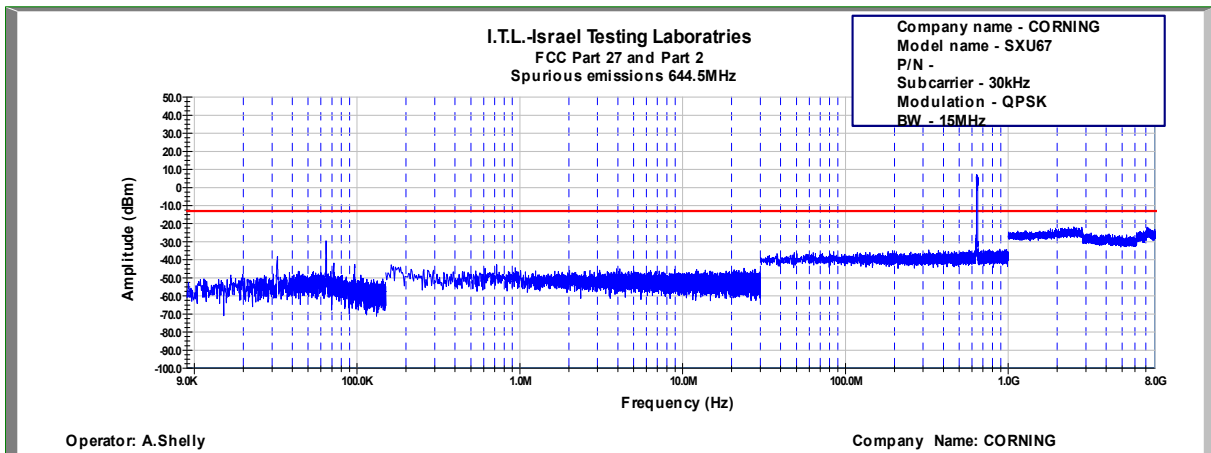


Figure 742: Spurious Emissions at Antenna Terminal QPSK, 644.5MHz, B.W. 15MHz, Sub Carrier 30kHz

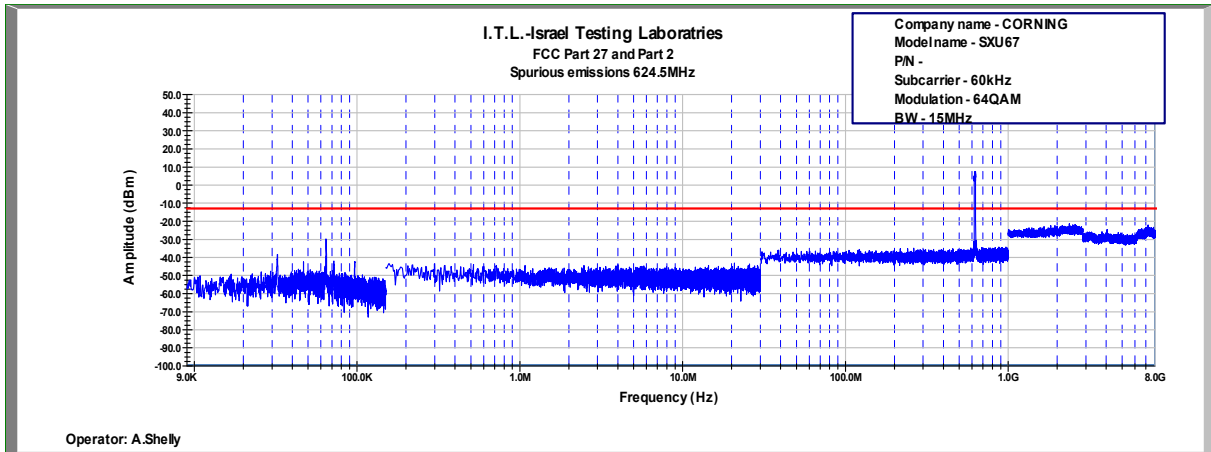


Figure 743: Spurious Emissions at Antenna Terminal QPSK, 624.5MHz, B.W. 15MHz, Sub Carrier 60kHz

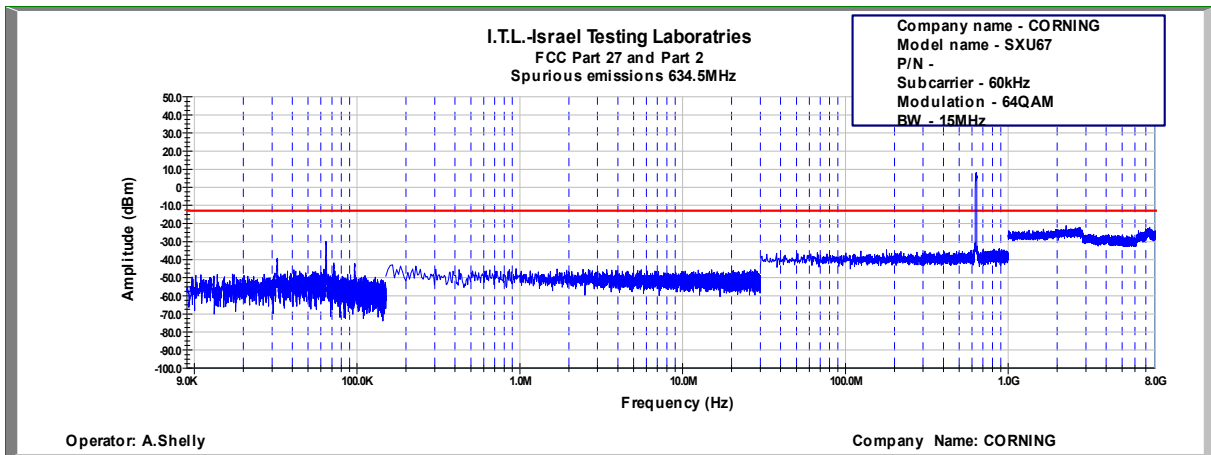


Figure 744: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 15MHz, Sub Carrier 60kHz

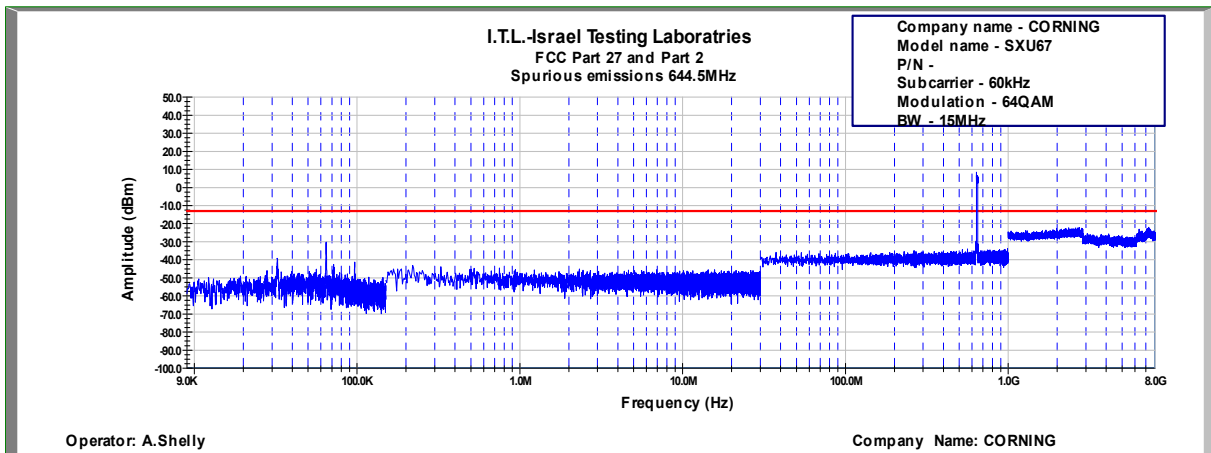


Figure 745: Spurious Emissions at Antenna Terminal QPSK, 644.5MHz, B.W. 15MHz, Sub Carrier 60kHz

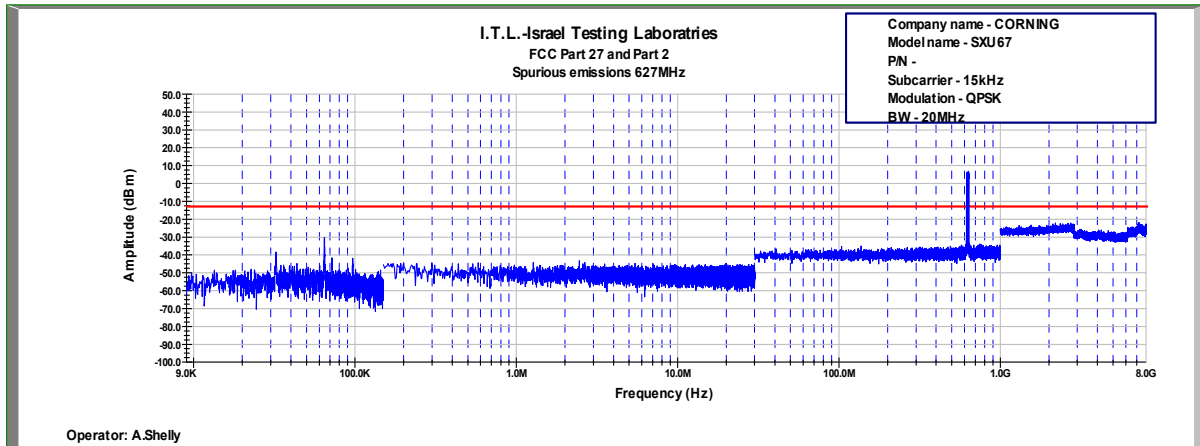


Figure 746: Spurious Emissions at Antenna Terminal QPSK, 627.0MHz, B.W. 20MHz, Sub Carrier 15kHz

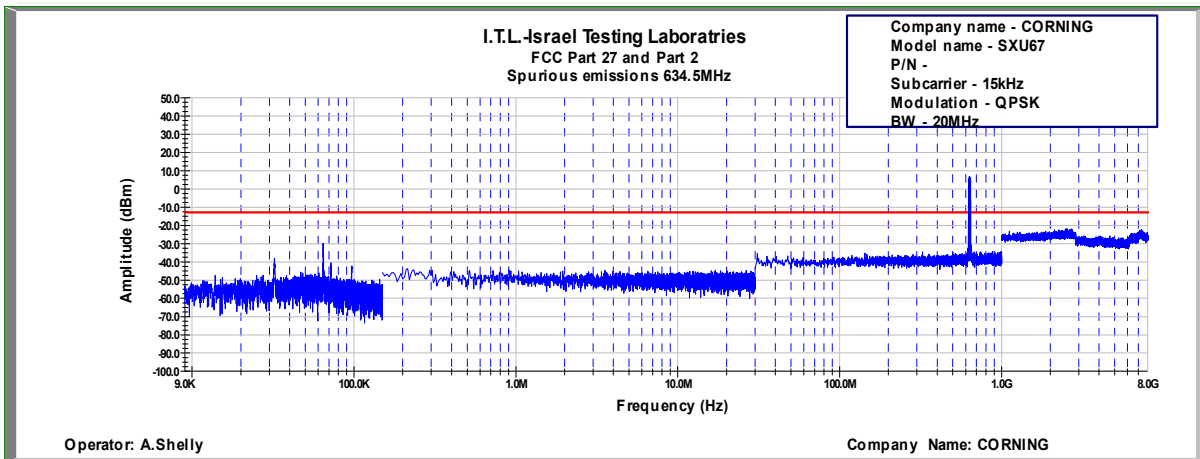


Figure 747: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 20MHz, Sub Carrier 15kHz

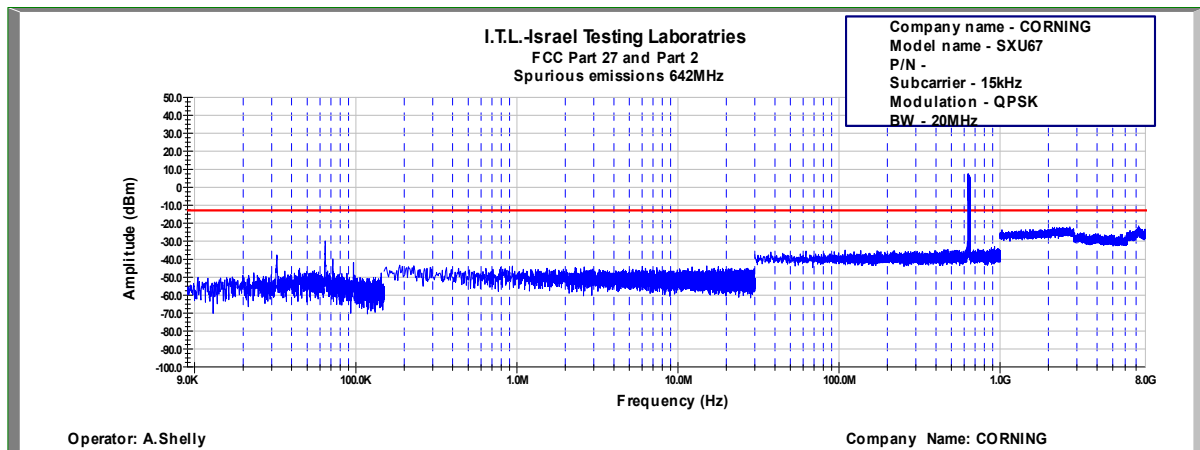


Figure 748: Spurious Emissions at Antenna Terminal QPSK, 642.0MHz, B.W. 20MHz, Sub Carrier 15kHz

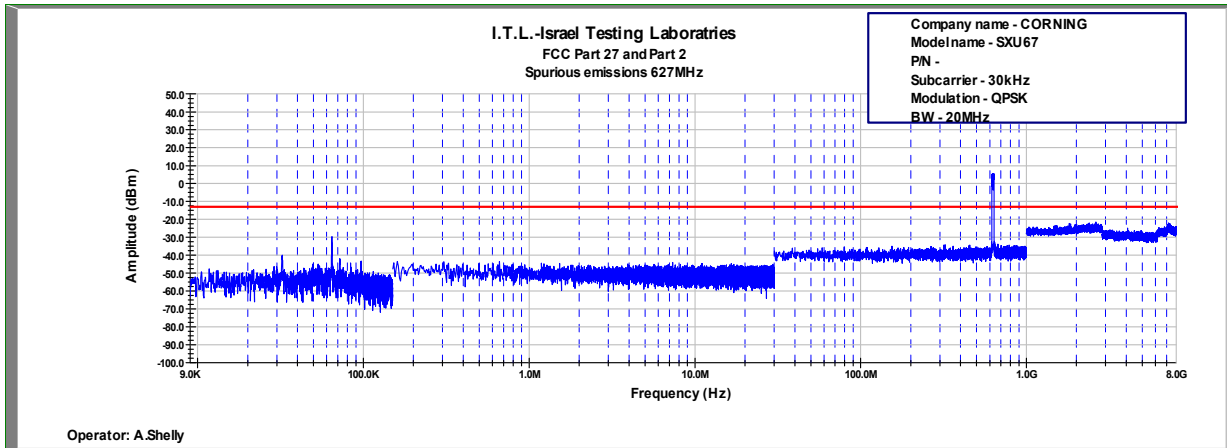


Figure 749: Spurious Emissions at Antenna Terminal QPSK, 627.0MHz, B.W. 20MHz, Sub Carrier 30kHz

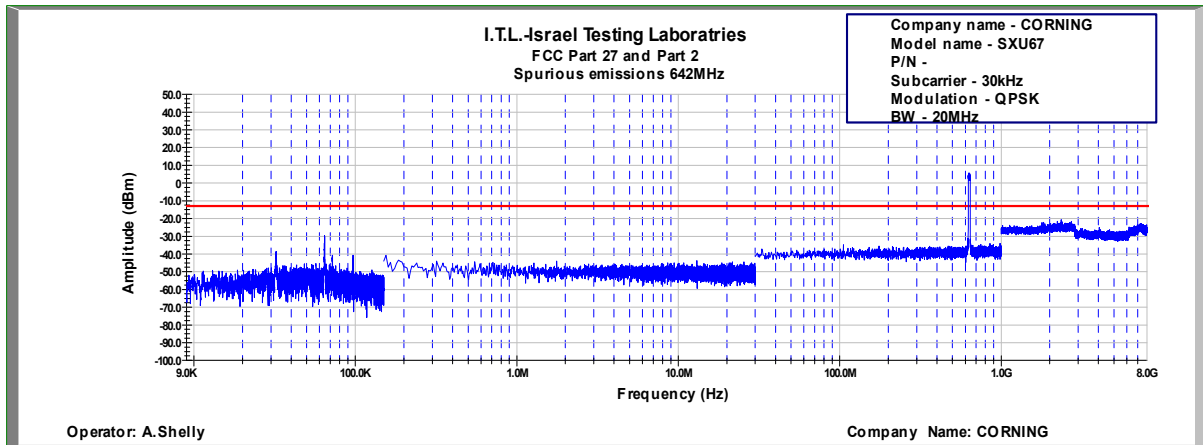


Figure 750: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz, B.W. 20MHz, Sub Carrier 30kHz

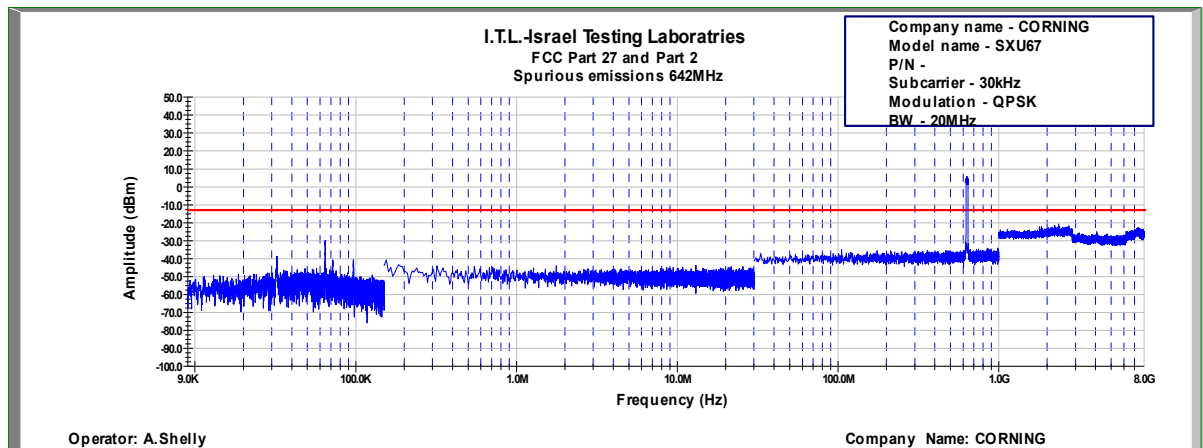


Figure 751: Spurious Emissions at Antenna Terminal QPSK, 642.0MHz, B.W. 20MHz, Sub Carrier 30kHz

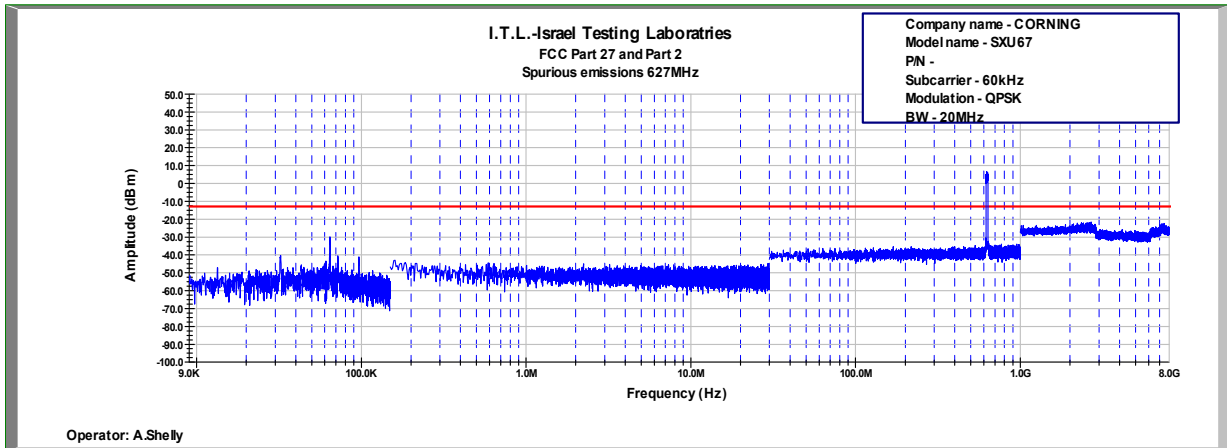


Figure 752: Spurious Emissions at Antenna Terminal QPSK, 627.0MHz,
B.W. 20MHz, Sub Carrier 60kHz

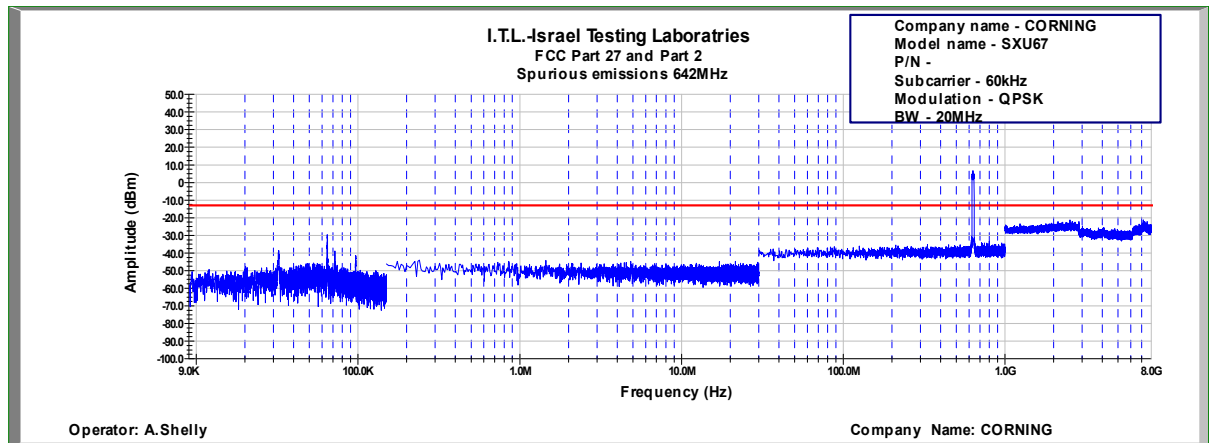


Figure 753: Spurious Emissions at Antenna Terminal QPSK, 634.5MHz,
B.W. 20MHz, Sub Carrier 60kHz

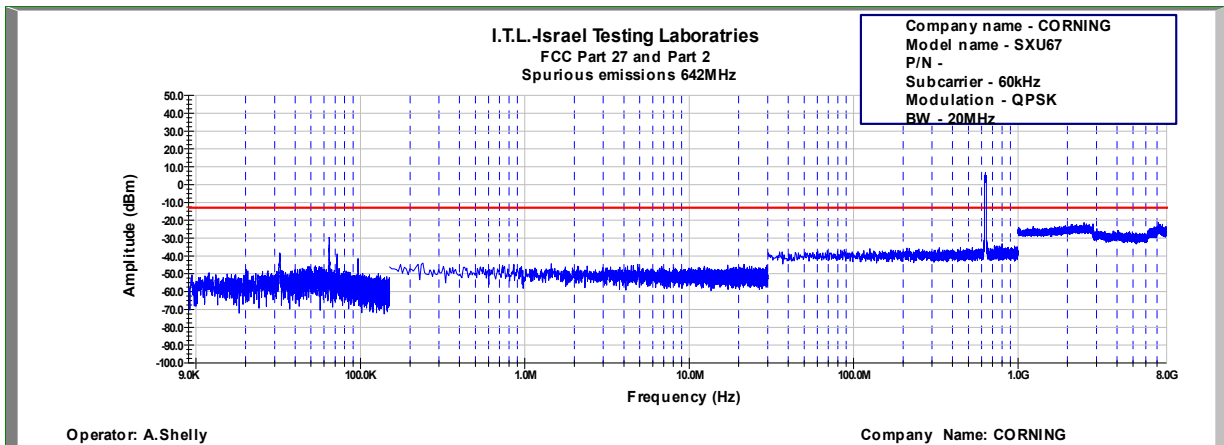


Figure 754: Spurious Emissions at Antenna Terminal QPSK, 642.0MHz,
B.W. 20MHz, Sub Carrier 60kHz



8.4 Test Equipment Used; Spurious Emissions at Antenna Terminals

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Agilent Technologies	N9010A	MY52220686	28 November 2018	28 November 2020
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY51350437	03 December 2018	03 December 2020
20 dB Attenuator	Bird	8304-N20DB	-	24 December 2019	24 December 2020

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 (MHz) 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

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

Judgement: Passed



9.5 Test Instrumentation Used; Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	8542E	3906A00276	February 28, 2019	February 28, 2020
RF Filter Section	HP	85420E	3705A00248	February 28, 2019	February 28, 2020
EMI Receiver	R&S	ESCI7	100724	February 27, 2019	February 28, 2020
Spectrum Analyzer	HP	8593EM	3536A00120ADI	February 26, 2019	February 28, 2020
Active Loop Antenna	EMCO	6502	9506-2950	February 5, 2019	February 28, 2021
Antenna Biconical	EMCO	3110B	9912-3337	May 21, 2019	May 31, 2020
Antenna Log Periodic	EMCO	3146	9505-4081	May 31, 2018	May 31, 2020
Horn Antenna 1G-18G	ETS	3115	29845	May 31, 2018	May 31, 2021
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	December 24, 2019	December 31, 2020
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	December 24, 2019	December 31, 2020
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

1.1 Test Specification

KDB 935210 D05 v01r01, Section 3.3

1.2 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= 20.8 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 $\geq 3 * RBW$.

1.3 Test Limit

N/A

1.4 Test Results

JUDGEMENT: Passed

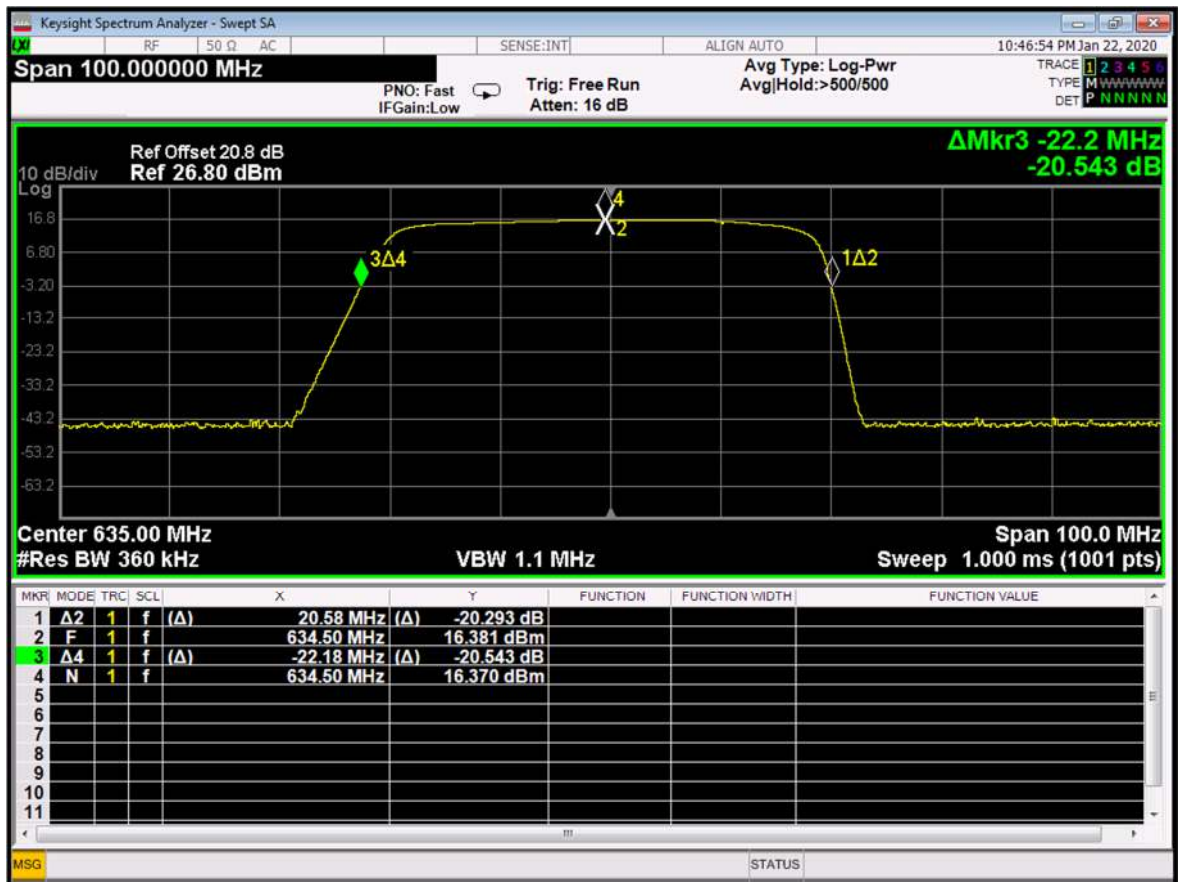


Figure 755. — Out-of-Band Rejection Plot



1.5 Test Equipment Used; Out-of-Band Rejection

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EXA signal Analyzer	Agilent Technologies	N9010A	MY52220686	28 November 2018	28 November 2020
EXG Vector Signal Generator	Agilent Technologies	N5172B	MY51350437	03 December 2018	03 December 2020
20 dB Attenuator	Bird	8304-N20DB	-	24 December 2019	24 December 2020

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