

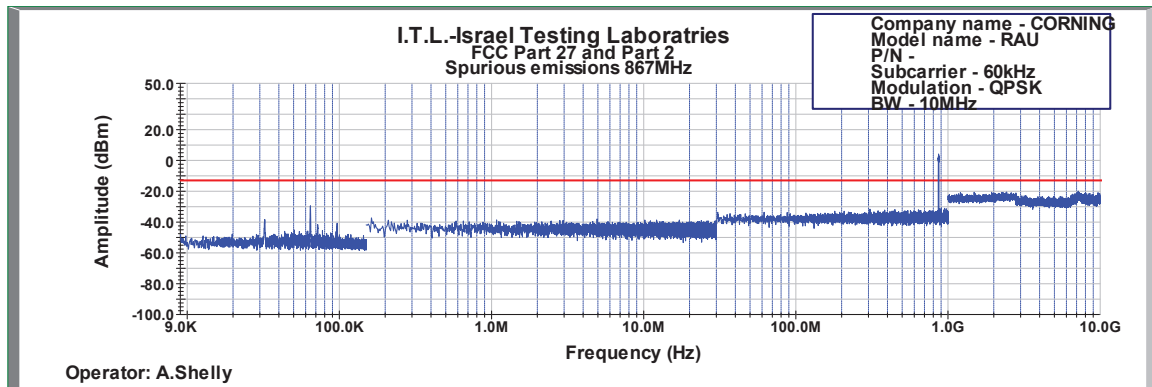


Figure 650: Spurious Emissions at Antenna Terminal QPSK 10MHz B.W.; 867.0MHz, 60kHz

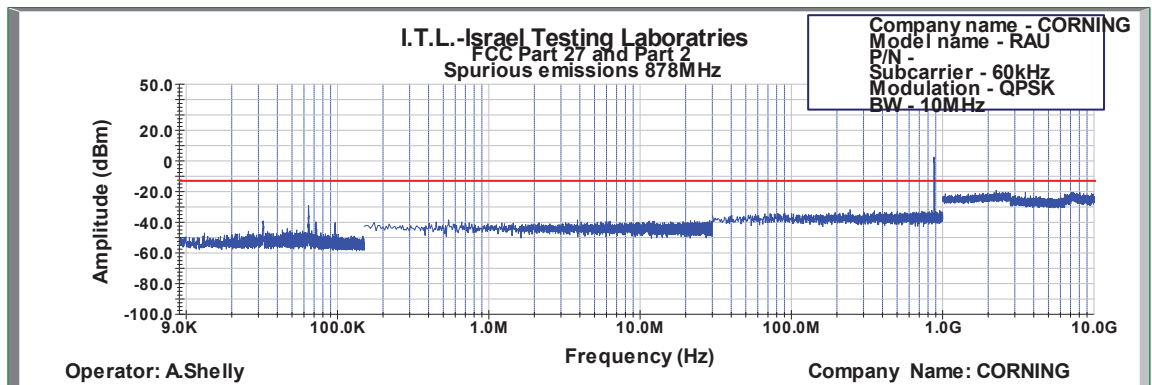


Figure 651: Spurious Emissions at Antenna Terminal QPSK 10MHz B.W.; 878.0MHz, 30kHz

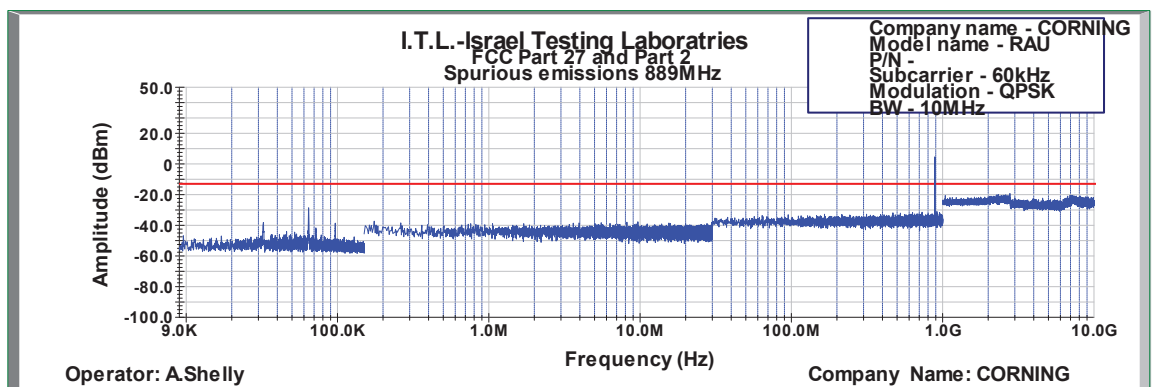


Figure 652: Spurious Emissions at Antenna Terminal QPSK 10MHz B.W.; 889.0MHz, 60kHz

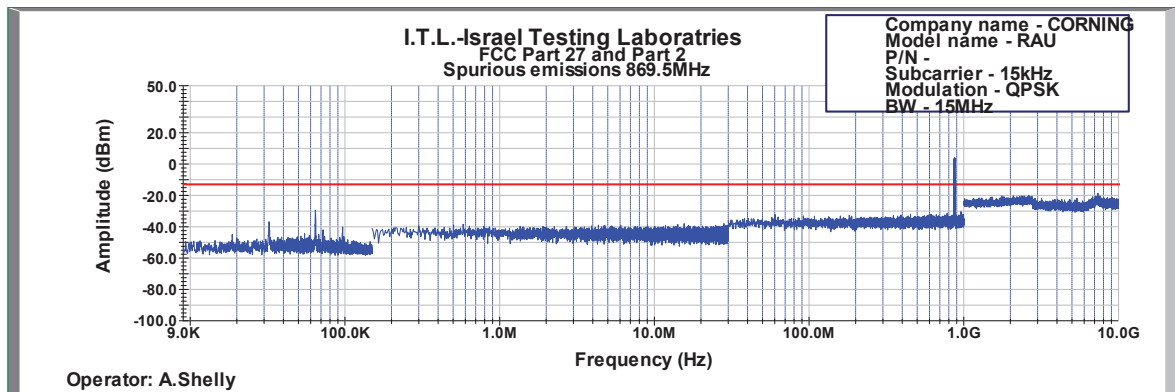


Figure 653: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 869.5MHz, 15kHz

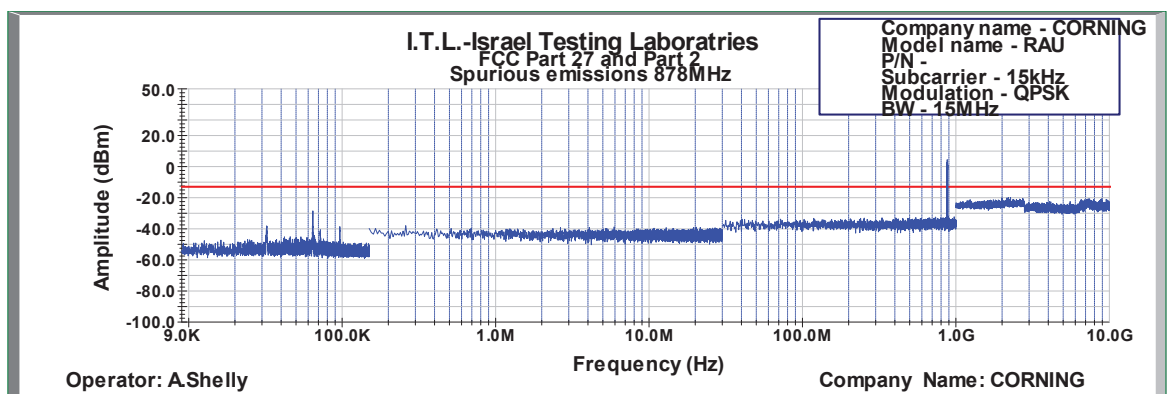


Figure 654: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 878.0MHz, 15kHz

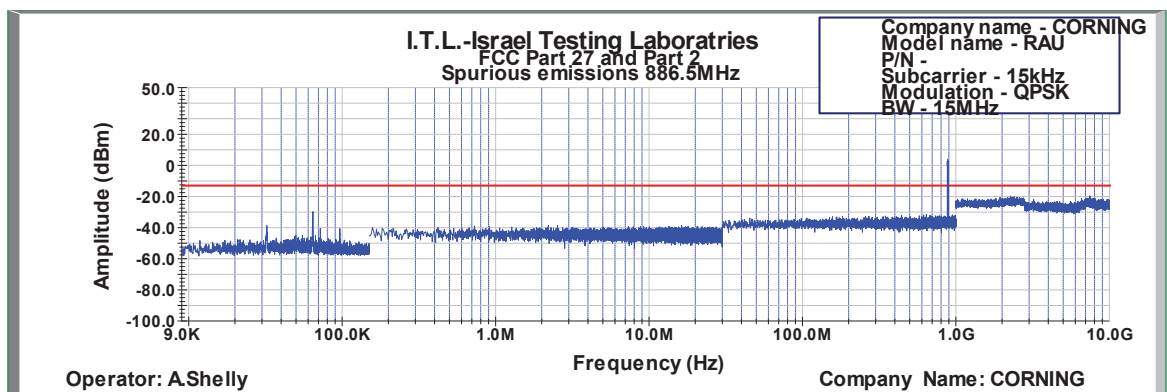


Figure 655: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 886.5MHz, 15kHz

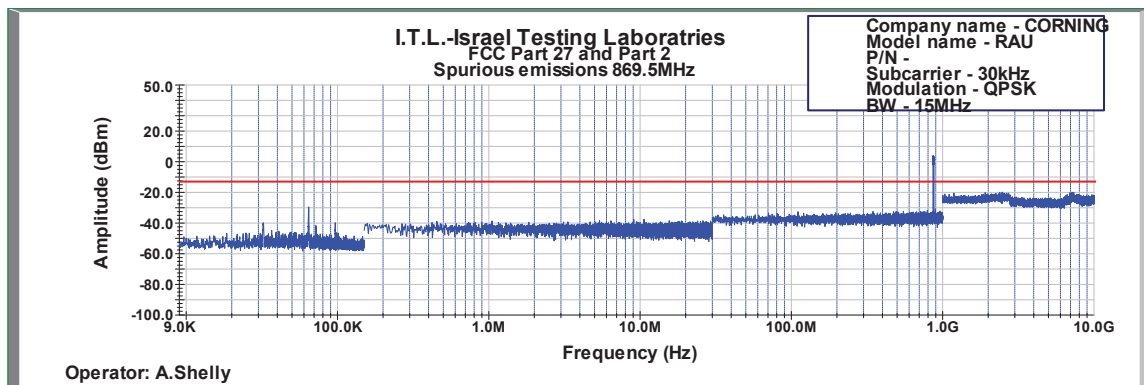


Figure 656: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 878.0MHz, 30kHz

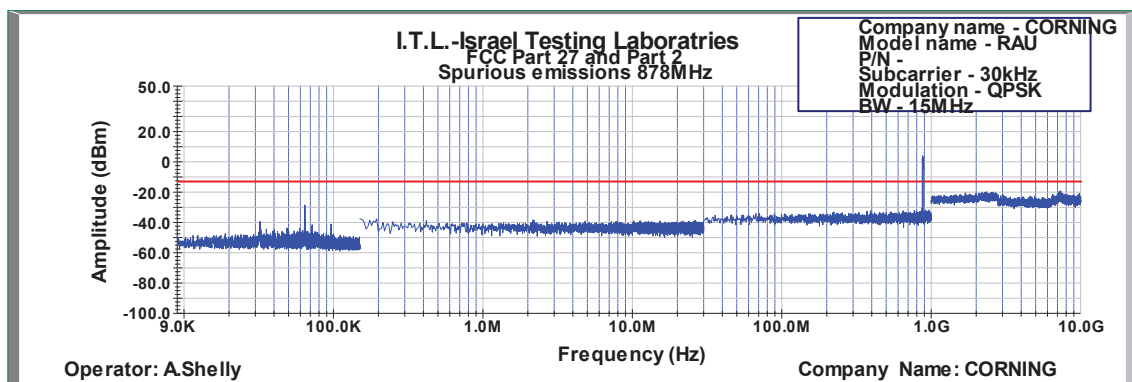


Figure 657: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 878.0MHz, 30kHz

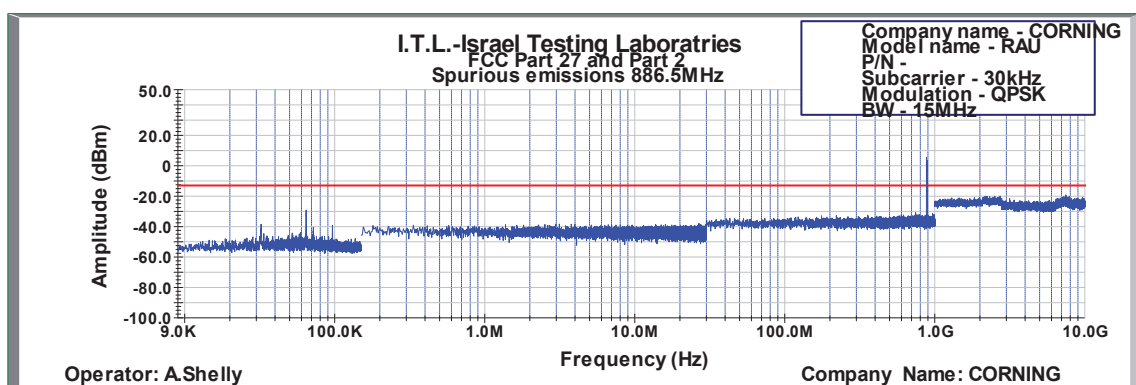


Figure 658: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 886.5MHz, 30kHz

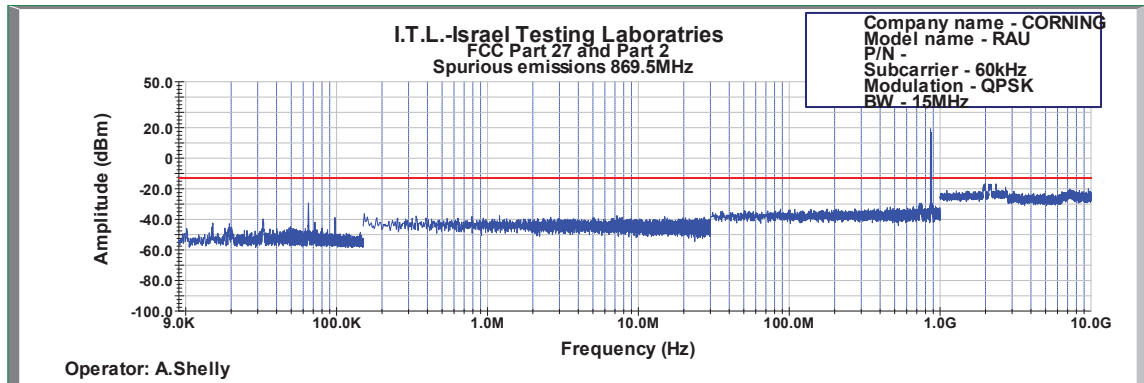


Figure 659: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 886.5MHz, 60kHz

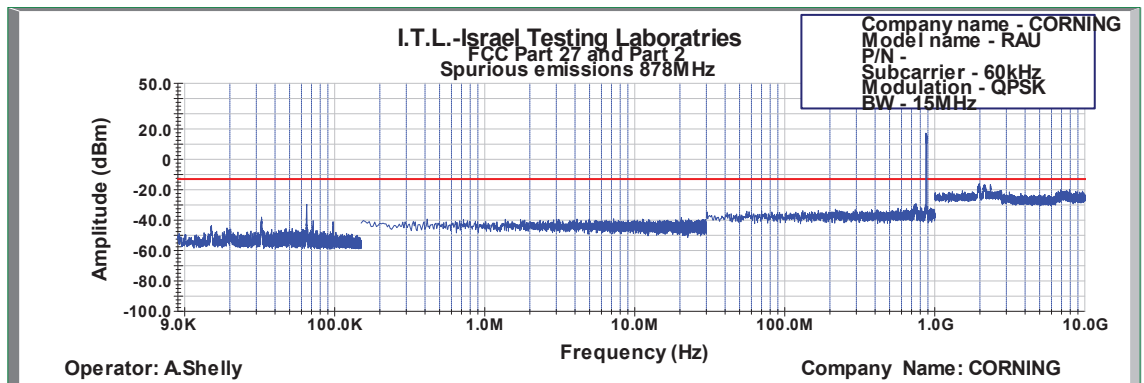


Figure 660: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 878.0MHz, 60kHz

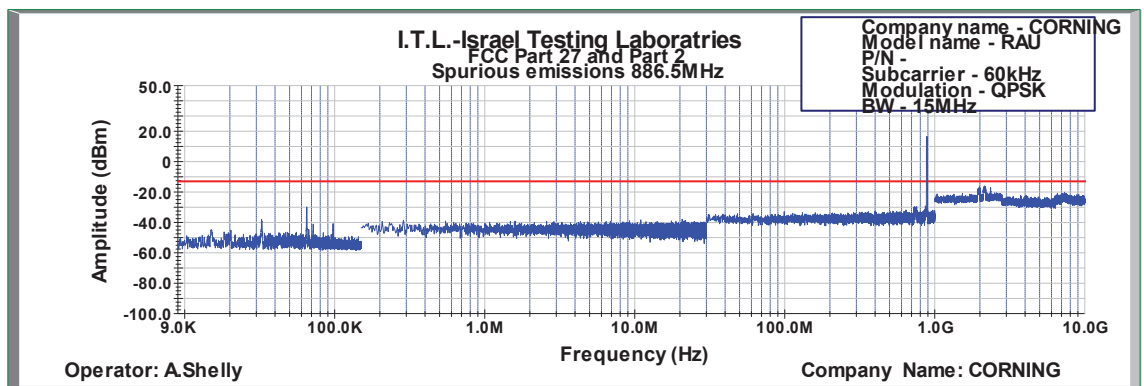


Figure 661: Spurious Emissions at Antenna Terminal QPSK 15MHz B.W.; 886.5MHz, 60kHz

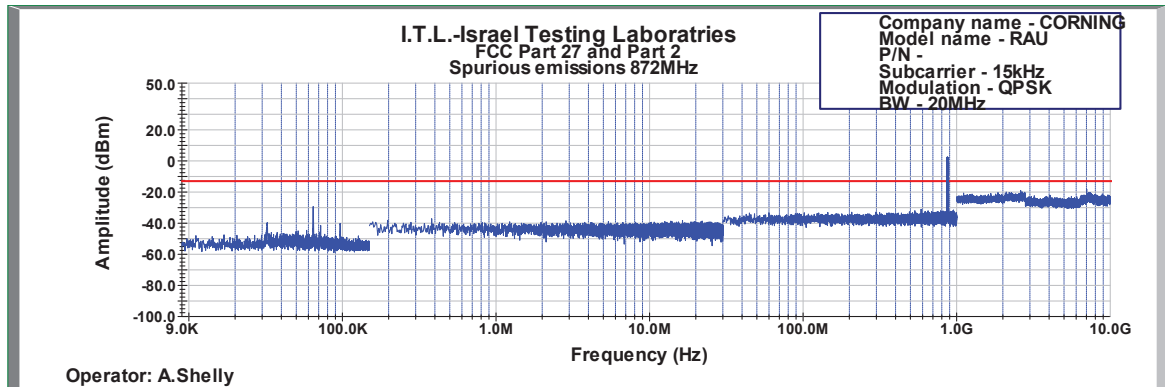


Figure 662: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 872.0MHz, 15kHz

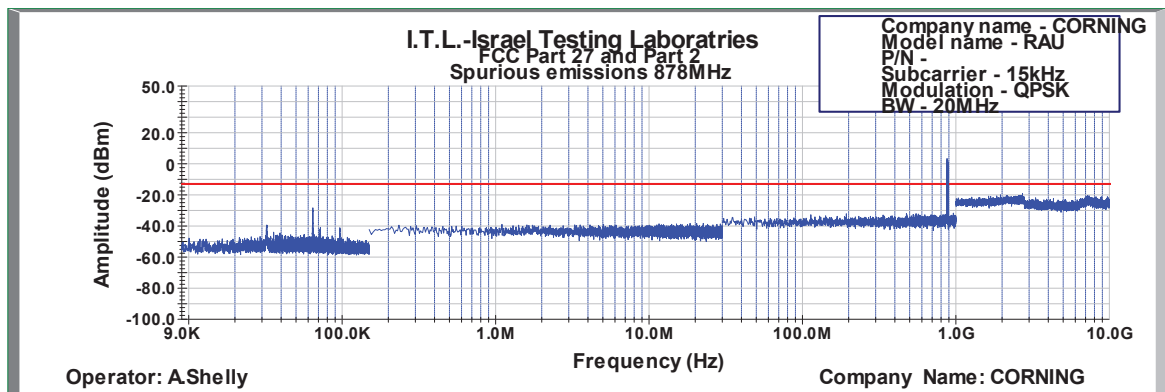


Figure 663: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 878.0MHz, 15kHz

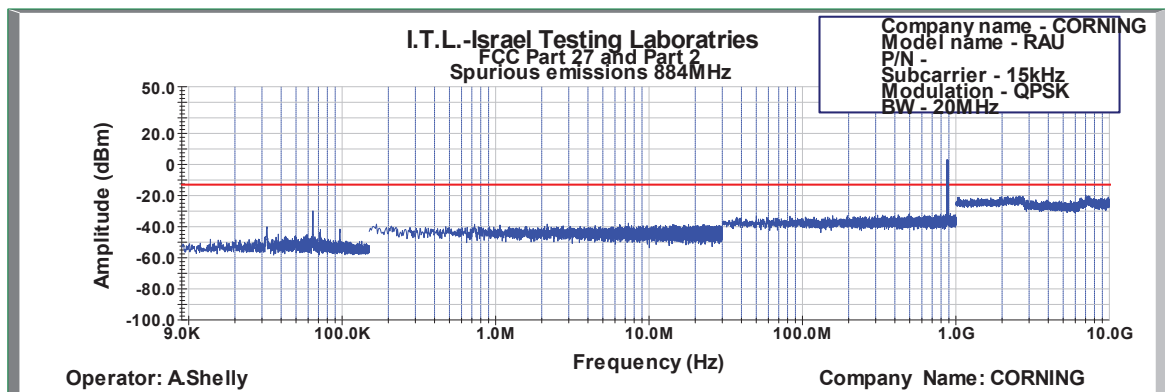


Figure 664: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 884.0MHz, 15kHz

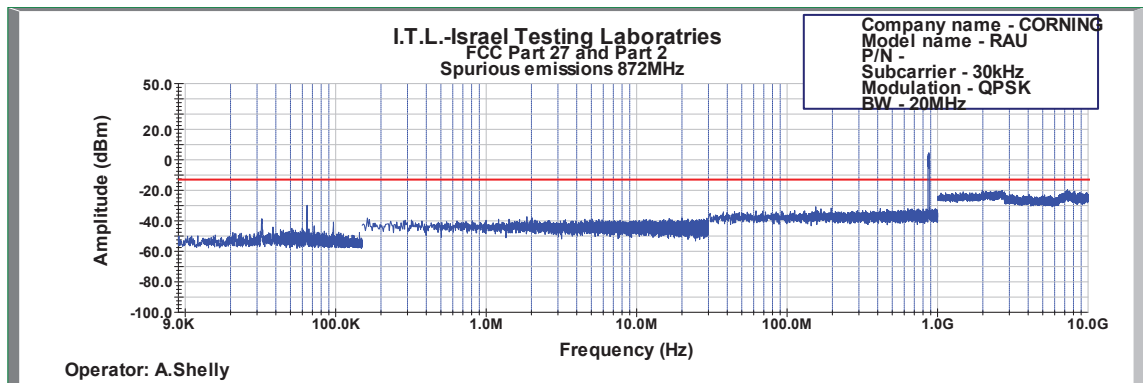


Figure 665: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 872.0MHz, 30kHz

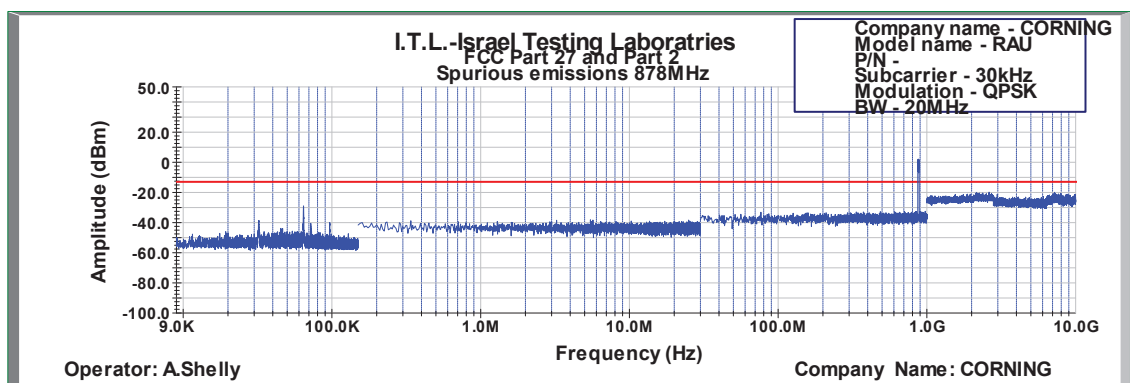


Figure 666: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 878.0MHz, 30kHz

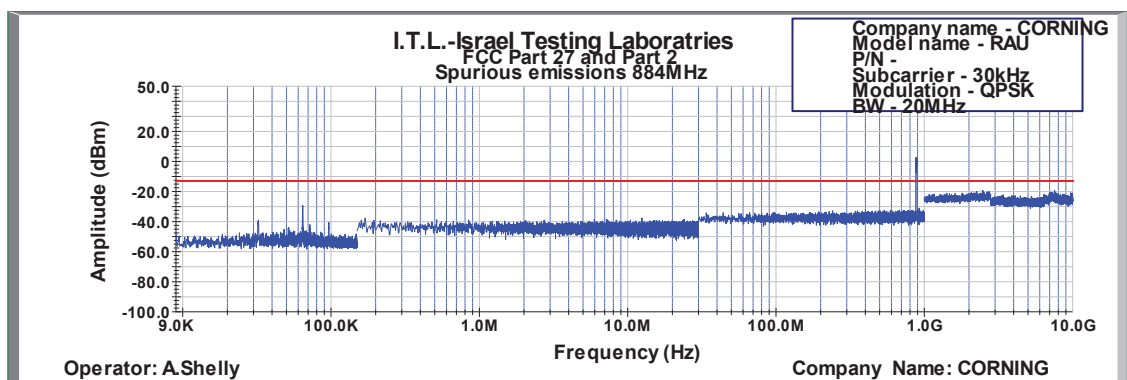


Figure 667: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 884.0MHz, 30kHz



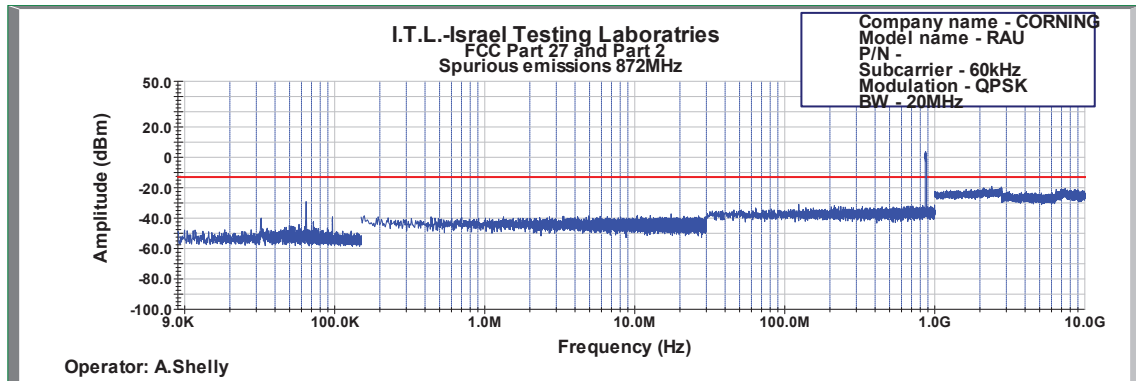


Figure 668: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 872.0MHz, 60kHz

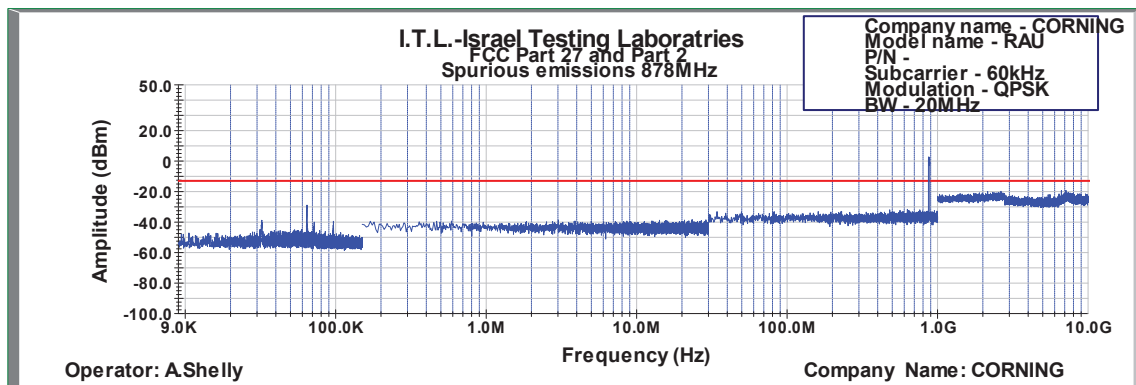


Figure 669: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 878.0MHz, 60kHz

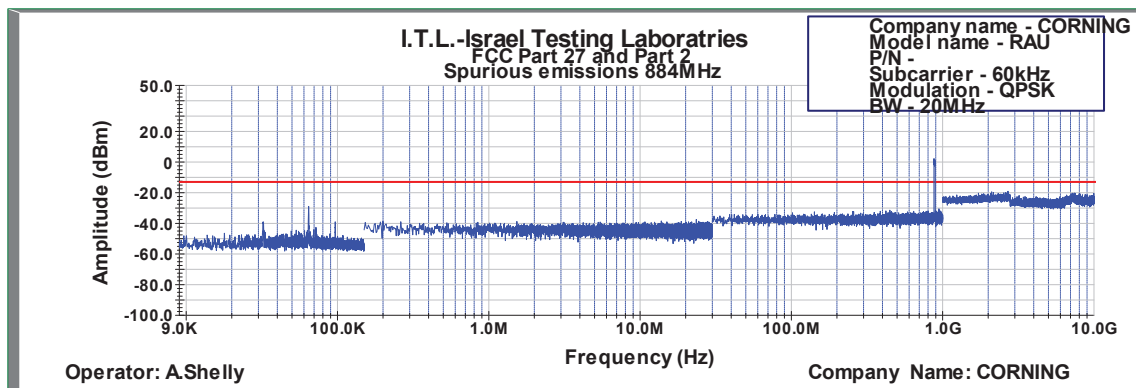


Figure 670: Spurious Emissions at Antenna Terminal QPSK 20MHz B.W.; 884.0MHz, 60kHz

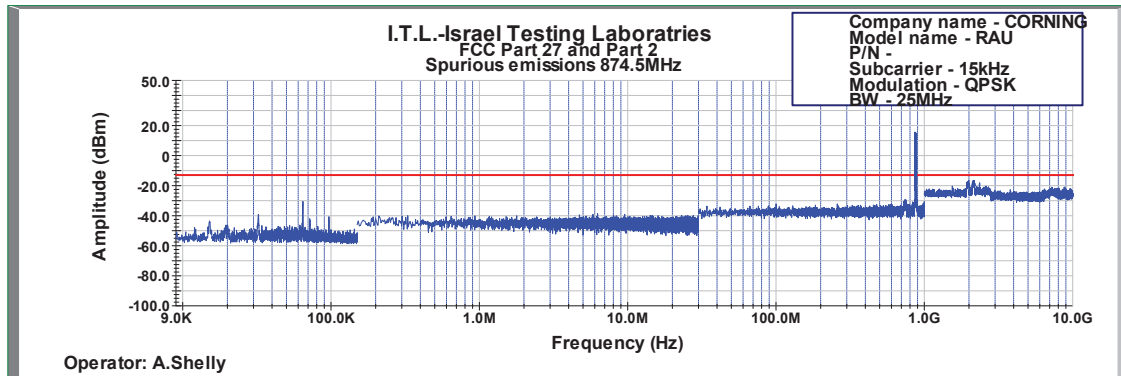


Figure 671: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 874.5MHz, 15kHz

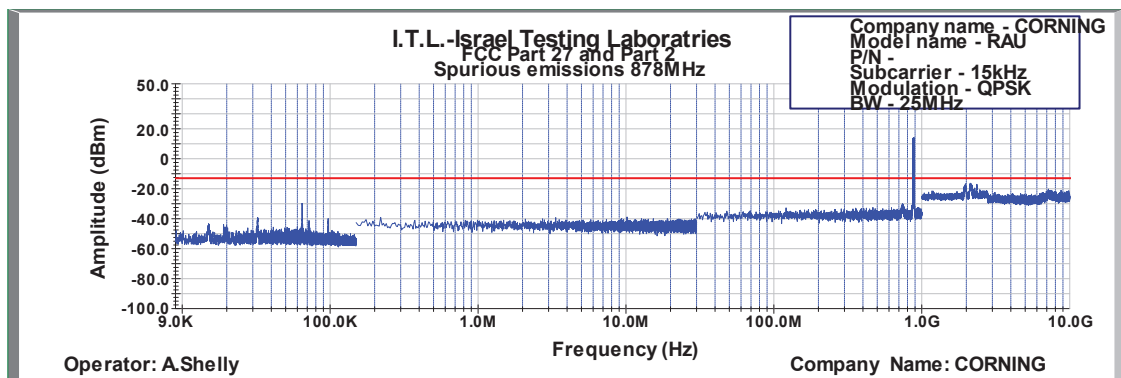


Figure 672: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 878.0MHz, 15kHz

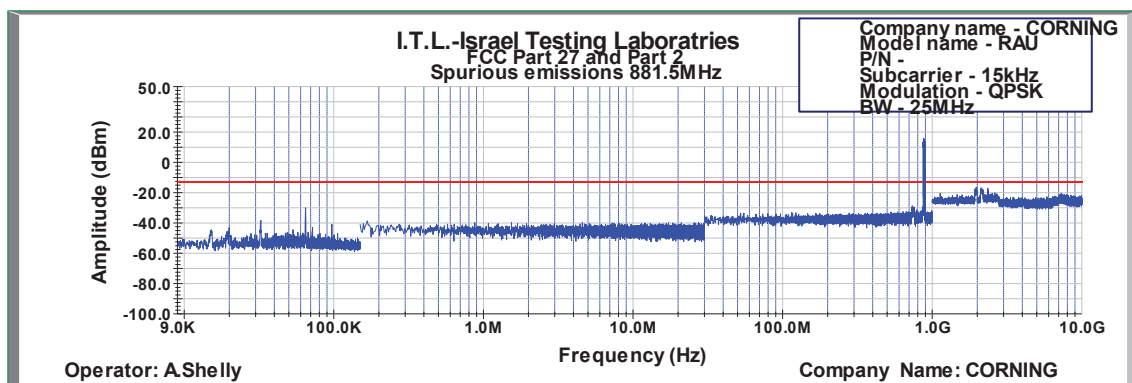


Figure 673: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 881.5MHz, 15kHz



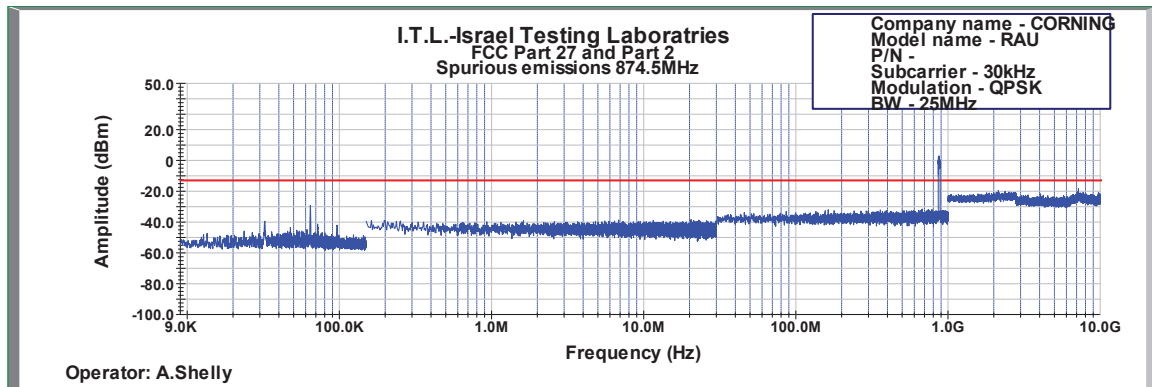


Figure 674: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 874.5MHz, 30kHz

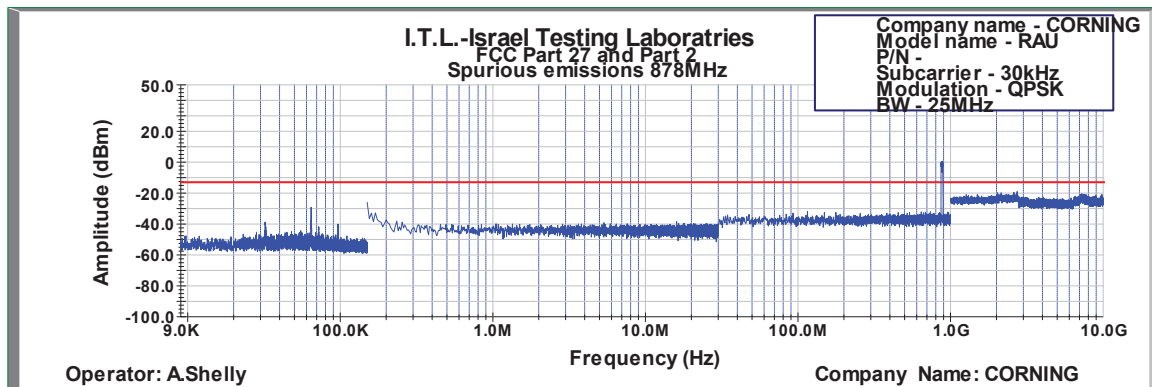


Figure 675: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 878.0MHz, 30kHz

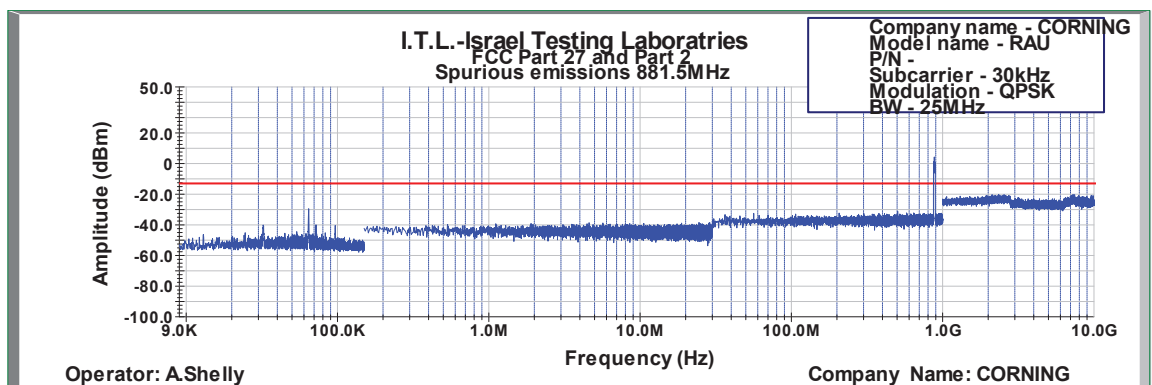


Figure 676: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 881.5MHz, 30kHz

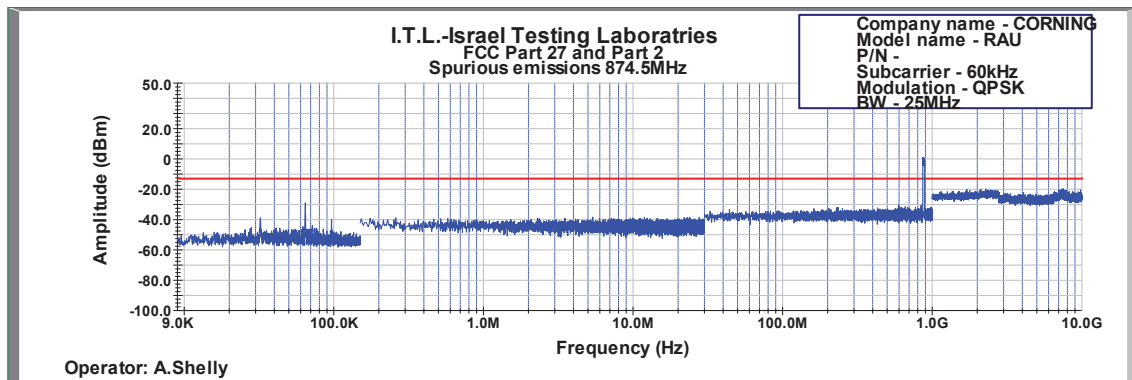


Figure 677: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 874.5MHz, 15kHz

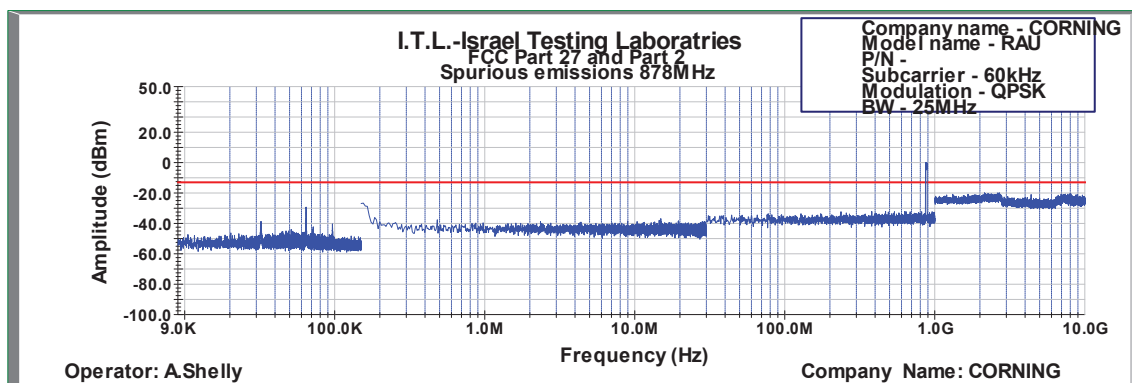


Figure 678: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 878.5MHz, 30kHz

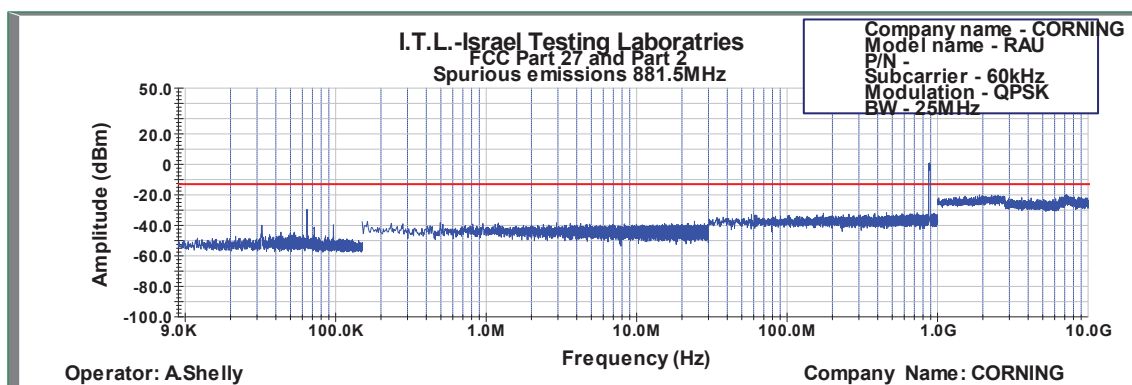


Figure 679: Spurious Emissions at Antenna Terminal QPSK 25MHz B.W.; 881.5MHz, 60kHz



### 6.5 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             | November 28, 2018     | May 30, 2021         |
| Vector Signal Generator | R&S                  | SMBV100B    | 1423.1003K02-101470-XE | October 2, 2019       | October 2, 2022      |
| 40 dB Attenuator        | Weinschel            | WA 39-40-33 | A1323                  | July 7, 2020          | July 31, 2021        |
| RF Cable                | Huber Suner          | Sucofelex   | 27504/4PEA             | August 23, 2020       | August 31, 2021      |

**Table 15 Test Equipment Used**



## 7 Spurious Radiated Emission

### 7.1 Test Specification

FCC Part 27, Subpart C, Sections 27.53(c)(1) (3) 27.53 (g)

### 7.2 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-10.0GHz:**

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 -10.0GHz 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  $\Omega$  termination.

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



### **7.3 Test Limit**

The power of any emission outside of the authorized operating frequency ranges (862 - 894 MHz) must be attenuated below the transmitting power (P) by a factor of at least  $43 + \log(P)$  dB, yielding  $-13\text{dBm}$ .

### **7.4 Test Results**

JUDGMENT:            Passed

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



## 7.5 Test Instrumentation Used; Radiated Measurements

| Instrument                  | Manufacturer    | Model            | Serial Number  | Calibration           |                      |
|-----------------------------|-----------------|------------------|----------------|-----------------------|----------------------|
|                             |                 |                  |                | Last Calibration Date | Next Calibration Due |
| EMI Receiver                | HP              | 8542E            | 3906A00276     | March 03, 2020        | March 03, 2021       |
| RF Filter Section           | HP              | 85420E           | 3705A00248     | March 03, 2020        | March 03, 2021       |
| Spectrum Analyzer           | HP              | 8593EM           | 3536A00120ADI  | March 10, 2020        | March 10, 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         |
| Horn Antenna 18G-26.5G      | ARA             | SWH-28           | 1007           | December 13, 2017     | December 31, 2020    |
| 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 16 Test Equipment Used**





## 8 APPENDIX A - CORRECTION FACTORS

### 8.1 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            |



**8.2 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           |



**8.3      Correction factors for      Horn Antenna**  
**Model: SWH-28**  
**at 1 meter range.**

| <b>FREQUENCY</b><br><b>(GHz)</b> | <b>AFE</b><br><b>(dB /m)</b> | <b>Gain</b><br><b>(dBi)</b> |
|----------------------------------|------------------------------|-----------------------------|
| 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                        |



#### 8.4 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     |



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

| Frequency [MHz] | AF<br>[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        |



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

| Frequency [MHz] | AF<br>[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        |

**8.7 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        |