

November 20, 2000

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road Columbia, MD 21046

Attention: Applications Examiner

Applicant: Allgon Telecom, Ltd.
7317 Jack Newell Blvd. North Fort Worth, Texas 76118

Equipment: COMPACT repeater with adjustable bandwidth, Model ALR4200
FCC ID: L6GALR4200

Specification: 47 CFR 22 Licensed Certification

Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of Allgon Telecom Ltd.. for the Licensed Certification of their Model: ALR4200, Repeater.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR, Part 22, for a Repeater.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,



Chris Harvey
Director, EMC Laboratory

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313

ENGINEERING TEST REPORT

in support of the
Application for Grant of Equipment Authorization

EQUIPMENT: COMPACT Repeater, Model ALR4200

FCC ID:: L6GALR4200

Specification: 47 CFR 22

On Behalf of the Applicant: Allgon Telecom Ltd.
7317 Jack Newell Blvd. North
FortWorth, TX 76118


Manufacturer: Allgon Telecom Ltd.
7317 Jack Newell Blvd. North
FortWorth, TX 76118

Manufacturer's Representative Mr. Tim Purvis

Test Date(s): August 8 thru September 22, 2000

ENGINEERING STATEMENT

I ATTEST: the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 22 of the FCC Rules under normal use and maintenance.



Liming Xu
Project Engineer, MET Laboratories

1.0 INTRODUCTION

The following data is presented on behalf of the Applicant, Allgon Telecom Ltd. as verification of the compliance of the Allgon COMPACT Repeater, Model ALR4200 to the requirements of 47CFR 22.

2.0 TEST SITE

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed on a three-meter open area test site (OATS). A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

3.0 TEST EQUIPMENT USED

| Manufacturer | Equipment | Calibration Due | Cal. Interval |
|-----------------|---------------------------|-----------------|---------------|
| Hewlett Packard | 8563A Spectrum Analyzer | 5/26/01 | annual |
| EMCO | Biconical Antenna 3104 | 04/10/01 | annual |
| EMCO | EMCO Log Periodic Antenna | 04/10/01 | annual |
| EMCO | Double Ridge Guided Horn | 2/27/01 | annual |
| Hewlett Packard | 8594EM Analyzer | 11/20/00 | annual |
| Rhode & Swartz | SMIQ03 SG | 08/16/01 | annual |
| Hewlett Packard | E4431B SG | 8/29/01 | annual |

4.0 EQUIPMENT UNDER TEST CONFIGURATION

The Cellular Repeater was configured with AC power supply modules and a digital signal generator was used to simulate various RF (i.e. FM, CDMA or iDEN type) input signals to the EUT. The EUT with host external computer was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, (with the exception of intermodulation tests), the EUT was configured for Single Channel operation which results in maximum possible output gain.

5.0 TEST TYPE(S)

- 5.1 Radiated Emissions: 47CFR2.1053, 22.901(d)(2), 22.917(e)
- 5.2 Occupied Bandwidth: 47CFR2.1049, Input vs. Output
- 5.3 RF Power Output: 47CFR 2.1046, 22.913(a)
- 5.4 Spurious Emission at Antenna Terminals:(uplink & downlink) 47CFR 2.1051, 22.917(e)
- 5.5 Intermodulation Distortion 47 CFR 2.1051, 22.917(e)

6.0 TEST RESULTS

6.1 TEST TYPE: Radiated Emissions

6.1.1 TECHNICAL SPECIFICATION: 2.1053; 22.901(d)(2), 22.917(e)

6.1.2 TEST DATE(S): August 11, 2000

6.1.3 MEASUREMENT PROCEDURES:

As required by 47 CFR 2.1053, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with all digital signal generators on and terminated. The frequency list from the preliminary measurements was used as a guide for making final measurements on a 10 meter open area test site. The unit was scanned over the frequency range of 9 kHz to 9 GHz.

The Radiated Spurious Emissions *Limit* is obtained by the following:
Based on an output power (as measured at the output of the RF Amplifier) of 1 watts:

$$P_o = 1 \text{ W}$$

As per 2.1053, it is assumed this power is to be fed to a half-wave tuned dipole. Using a conversion formula for distance, the field strength at one meter can be derived:

$$E(V/m)_{1m} = \frac{\sqrt{49.2 \times 1}}{1}$$

$$E(V/m)_{1m} = 7 \text{ V/m or } 137 \text{ dB}\mu\text{V}$$

As per 90.210(h), 90.691(a), the spurious emissions must be attenuated by $43 + 10\log(P)$ which is:

$$43 + 10\text{Log}(1) = 43 \text{ dB}$$

Therefore, the limit for spurious emissions is:

$$137 \text{ dB}\mu\text{V} - 43 \text{ dB} = 94 \text{ dB}\mu\text{V} @ 1m$$

At 3 meters measurement distance, the limit is;

$$E(V/m)_{3m} = \frac{\sqrt{49.2 \times 1}}{3}$$

$$E(V/m)_{3m} = 2.333 \text{ V/m or } 127 \text{ dB}\mu\text{V}$$

According to 24.238(a), all signals must be attenuated by 46.08 dB. Therefore, the limit for spurious emissions for a test distance of 3 meters is:

$$127 - 43 = 84 \text{ dB}\mu\text{V} @ 3m$$

6.1.4 RESULTS:

| Frequency (MHz) | Azimuth (Degrees) | Polarity | Height (Meters) | Raw Amplitude (dBuV) | A.C.F. (dB) | Cable loss (dB) | Corrected Amplitude (dBuV/m) | Limit dBm |
|-----------------|-------------------|----------|-----------------|----------------------|-------------|-----------------|------------------------------|-----------|
| 52.925 | 0 | H | 2.2 | 16.86 | 11.2 | 1.31 | 29.37 | -23 |
| 52.925 | 355 | V | 1 | 20.99 | 11.74 | 1.31 | 34.04 | -23 |
| 123.951 | 135 | H | 1.6 | 21.99 | 12.92 | 2.17 | 37.08 | -23 |
| 123.951 | 340 | V | 1 | 21.79 | 12.53 | 2.17 | 36.49 | -23 |
| 224.922 | 360 | H | 4 | 13.83 | 15.91 | 2.86 | 32.60 | -23 |
| 224.922 | 0 | V | 4 | 13.86 | 16.30 | 2.86 | 33.02 | -23 |
| 377.25 | 150 | H | 1.4 | 14.5 | 16.05 | 3.79 | 34.33 | -23 |
| 377.25 | 210 | V | 1 | 14.39 | 15.89 | 3.79 | 34.07 | -23 |
| 458.2 | 145 | H | 2.1 | 13.92 | 17.52 | 4.17 | 35.61 | -23 |
| 458.2 | 215 | V | 1.5 | 13.99 | 17.12 | 4.17 | 35.28 | -23 |
| 800.0 | 245 | H | 3.3 | 14.46 | 22.4 | 5.94 | 42.80 | -23 |
| 800.0 | 0 | V | 1 | 14.45 | 22.1 | 5.94 | 42.49 | -23 |

No Radiated Emissions was observed between 800 MhZ and 9GhZ.

The device complies with 47 CFR 2.1053; 22.901(d)(2), 22.917(e).

Spur Limit = P - (43+ 10 log P) = 30 dBm - 43 dBm = - 13 dBm @ 1 meter

Added distance correction factor - 23 dBm @ 3 meter



6.2 TEST TYPE: Occupied Bandwidth

6.2.1 TECHNICAL SPECIFICATION: 47 CFR 2.1046

6.2.2 TEST DATE(S): August 8, 2000

6.2.3 MEASUREMENT PROCEDURES:

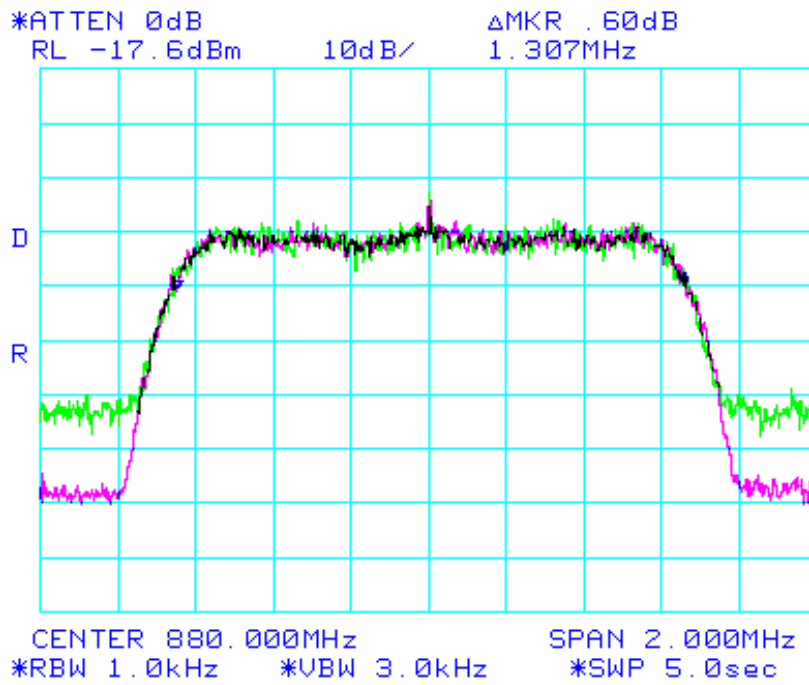
As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made on the Repeater pre- and post- repeater. A digital signal generator was configured to transmit a modulated carrier signal. Using an IF bandwidth from 300Hz to 1KHz, we determined the occupied bandwidth of the emission at the Input vs Output.

6.2.4 RESULTS:

Equipment complies with Section 2.1049. Plots of the occupied bandwidth, as measured at the Repeater RF input port and at the antenna RF output port (post amplification) follow:

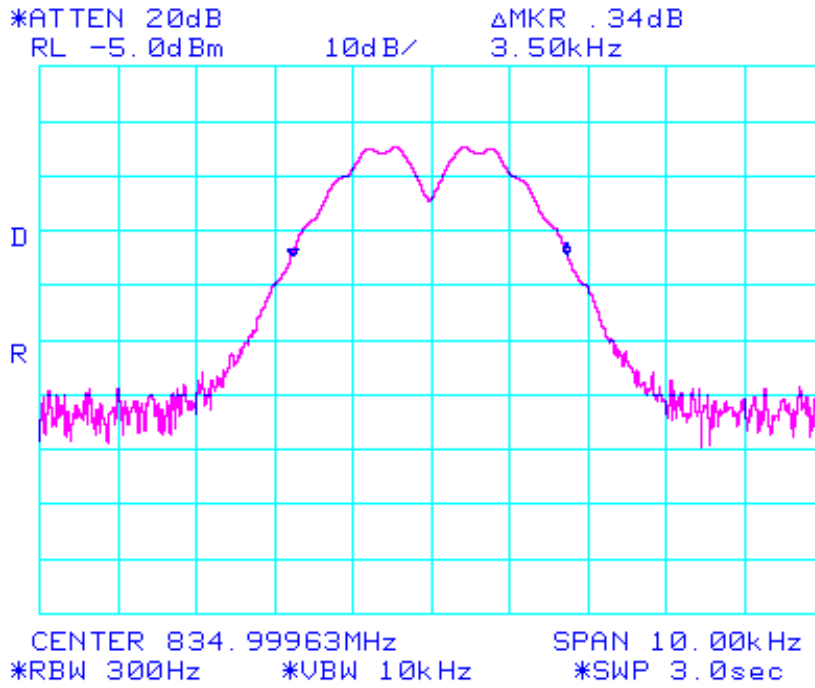
Occupied B/W (CDMA) Input vs Output Downlink

10030



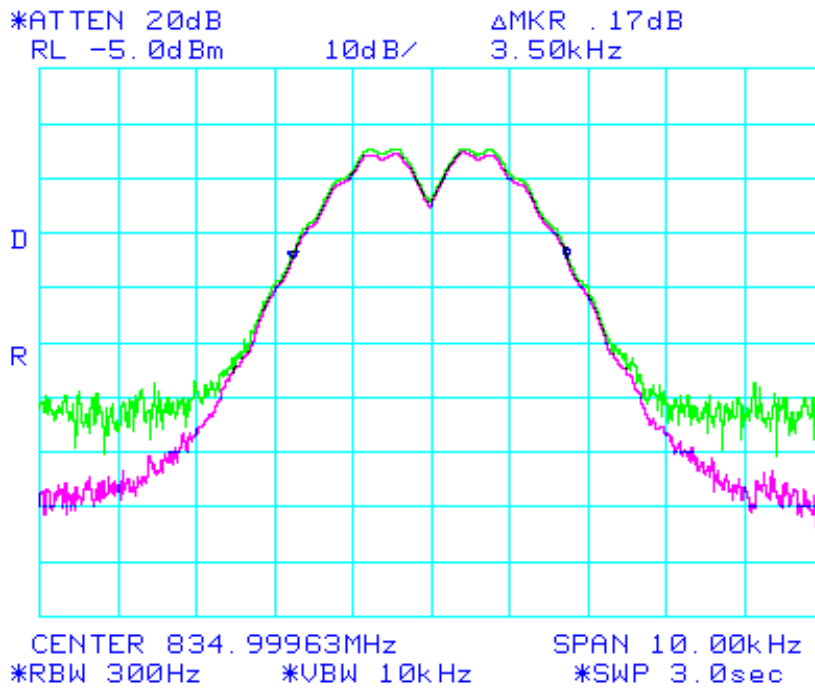
Occupied B/W (FM) at Input side Uplink

10030



Occupied B/W (FM) Input vs Output Uplink

10030



6.3 TEST TYPE: RF POWER OUTPUT

6.3.1 TECHNICAL SPECIFICATION: 47 CFR 2.1046 and 22.913(a)

6.3.2 TEST DATE(S): August 8, 2000

6.3.3 MEASUREMENT PROCEDURES:

As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a FM,CDMA and iDEN(TDMA) modulated signal.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output of the signal generator and at the RF output terminals of the EUT appear on the following pages:

6.3.4 RESULTS:

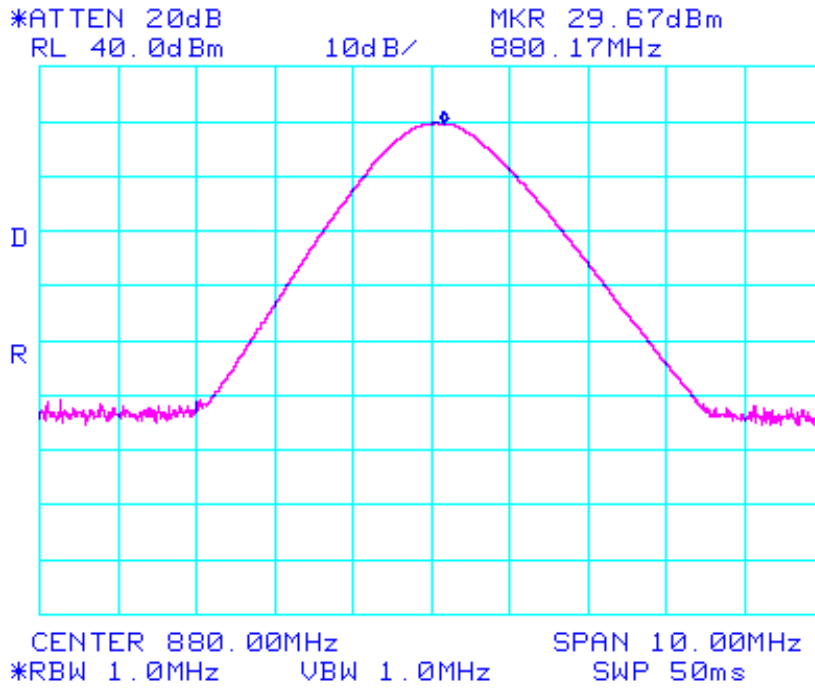
Equipment complies with 47CFR 2.1046 and 22.913(a). The repeater power does not exceed of 100 W, at the carrier frequency.

Photograph of Antenna Conducted Spurious Emissions and RF Power Output Test Configuration



RF Power output FM Downlink

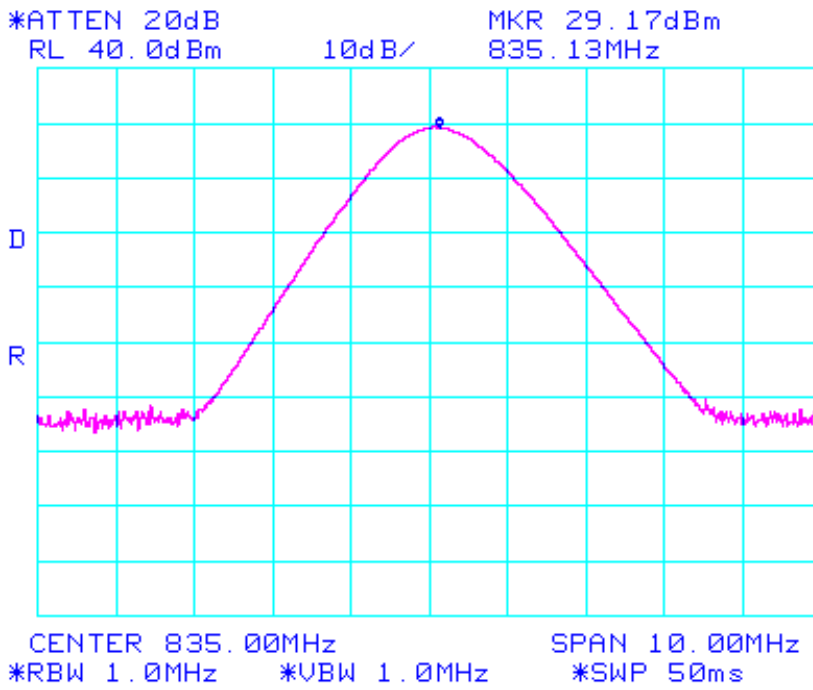
10030



RF Power output FM

Uplink

10030



6.4 TEST TYPE: Spurious Emissions at Antenna Terminals**6.4.1 TECHNICAL SPECIFICATION:** 2.1051; 22.917(e)**6.4.2 TEST DATE(S):** September 20, 2000**6.4.3 MEASUREMENT PROCEDURES:**

As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 Ω attenuator and spectrum analyzer set for a 30 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The Digital signal generator was adjusted for continuous transmit on frequencies in both the uplink and down-link frequency bands. The frequency spectrum was investigated from 9.0 KHz to 9.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

6.4.4 RESULTS:

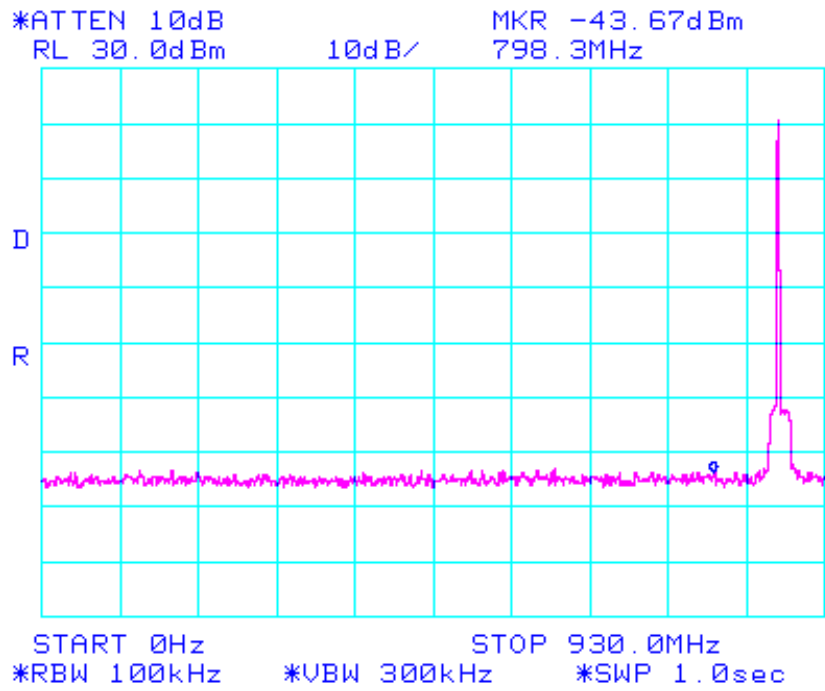
Spur limit = $P_o - (43 + 10\log P) = 143 \text{ dB}\mu\text{V} - (49 \text{ dB}) = 94 \text{ dB}\mu\text{V} = -13.1 \text{ dBm}$

Equipment complies with Section 2.1051 and 22.917(e)

PLOTS OF SPURIOUS EMISSIONS AT ANTENNA TERMINALS : on following pages

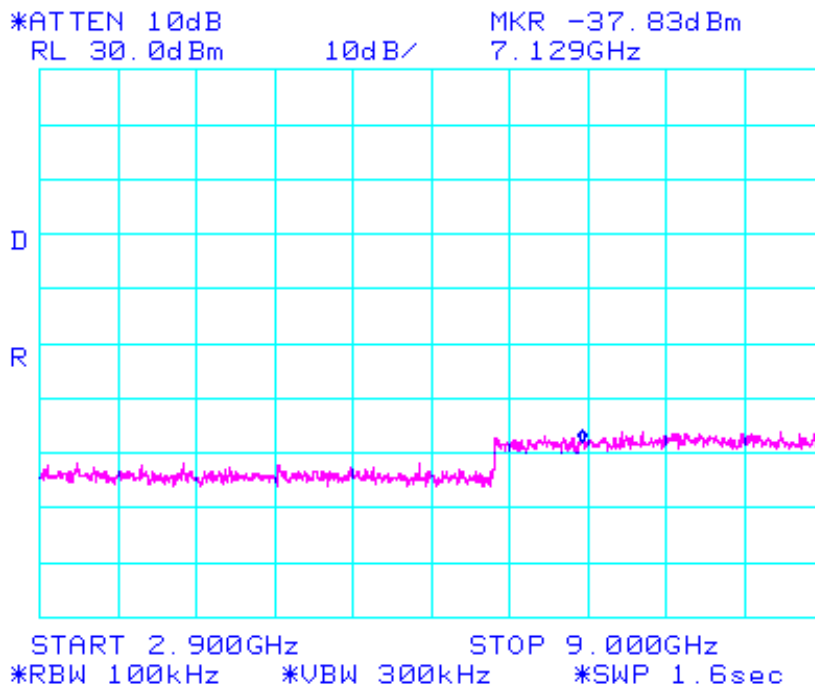
Spur emissions Downlink

10030



Spur emissions Downlink

10030



6.6 TEST TYPE: Intermodulation Spurious Emissions Antenna Terminals**6.6.1 TECHNICAL SPECIFICATION:** 47 CFR 2.1051.**6.6.2 TEST DATE(S):** September 20, 2000**6.6.3 MEASUREMENT PROCEDURES:** UPLINK and DOWNLINK

Spurious emissions were measured at the antenna terminal with the Digital signal generator tuned to transmit on a frequency in the uplink/downlink of its tuneable range.

6.6.4 RESULTS:

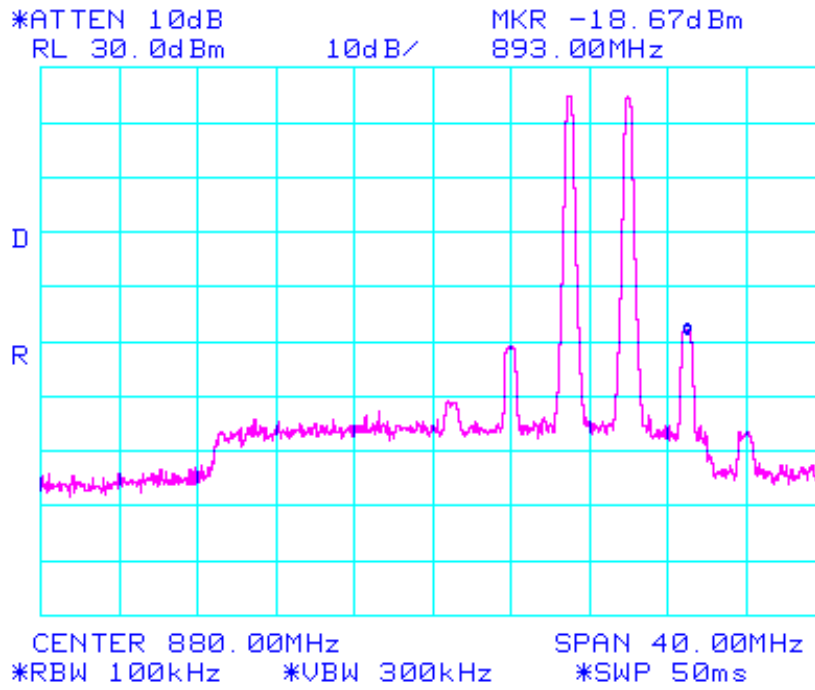
Equipment complies with 47CFR 2.1051. Plots of the spurious emissions as measured at the antenna ports are included in this application as file attachment:

Intermodulation Spurious Products from 2-tone Simultaneous RF Injection At low side and high side of Cellular band. **Uplink and Downlink**

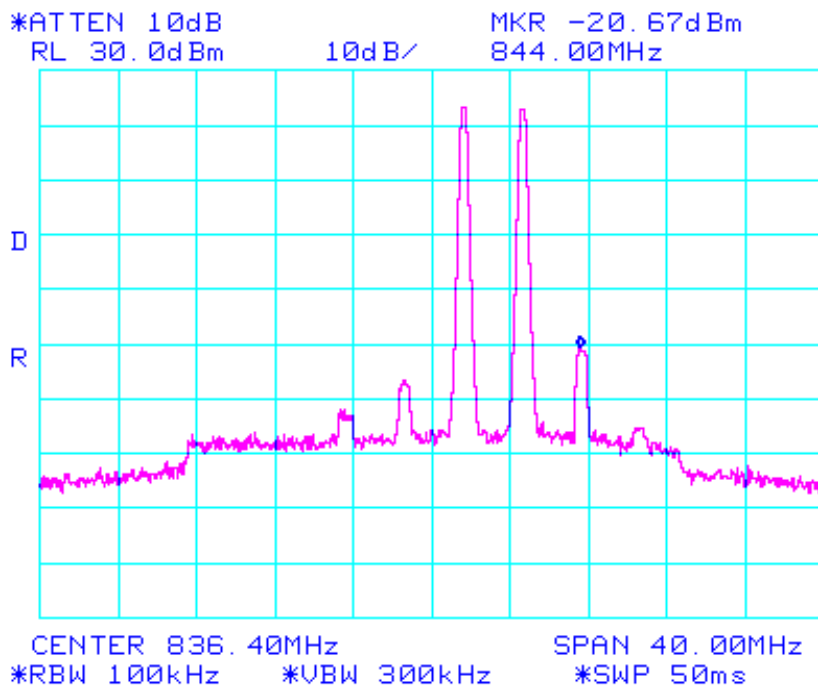
$$\text{Spur limit} = P_o - (43 + 10\log P) = 132.5 \text{ dB}\mu\text{V} - (38.44 \text{ dB}) = 94 \text{ dB}\mu\text{V} = -13. \text{ dBm}$$

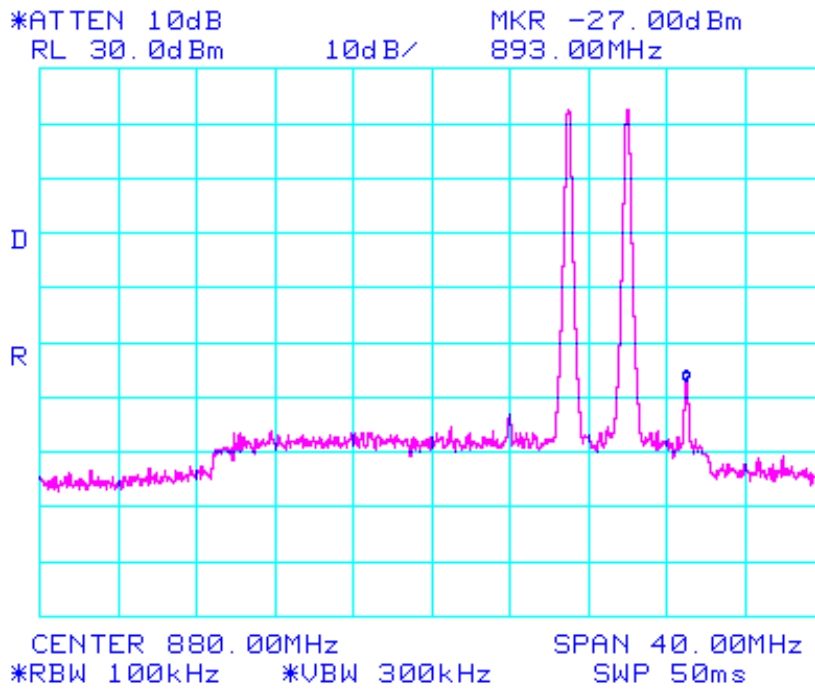
| modulation type | Intermodulation products (MHZ) | Emission Level (dBm) | Limit (dBm) |
|-----------------|--------------------------------|----------------------|-------------|
| TDMA(downlink) | 880.00 893.00 | -16.67 -18.67 | -13 |
| TDMA(Uplink) | 835.00 844.00 | -25.50 -20.67 | -13 |
| CDMA(downlink) | 879.20 892.73 | -15.00 -18.00 | -13 |
| CDMA(uplink) | 837.27 847.00 | -30.67 -33.00 | -13 |
| FM (downlink) | 878.93 893.00 | -24.50 -27.00 | -13 |
| FM (uplink) | 837.00 841.07 | -36.17 -34.67 | -13 |

IMD at high side of downlink band. Met 10030



IMD at high side of uplink band. Met 10030





IMD Spur emissions at high side of downlink band MET10030 FM

