TEST REPORT
FOR FCC TYPE ACCEPTANCE
MODEL R307B
BIDIRECTIONAL SMR REPEATER
FCC ID: P6T803

TEST REPORT

P. G. Electronics, Ltd. is pleased to submit this technical report on tests performed on the Model R307B bidirectional repeater (FCC ID: P6T803) to demonstrate compliance with the requirements for Type Acceptance by the FCC.

The undersigned personnel verify that the tests were performed as described herein and the results given were measured on the production unit.

Model Number R307B Serial Number 100014

_____ Date _____
Paul Liber – Test Engineer

_____ Date _____
Gerry Graham – P. Eng. President

1.0 NAMES AND ADDRESSES

1.1 Manufacturer

The Model R307B bidirectional repeater (FCC ID: P6T803) is manufactured by:

P. G. Electronics, Ltd.
800 Arrow Rd., Unit 8,
Weston, Ontario
M9M 2Z8

1.2 Applicant

The applicant for the acceptance of the repeater is:

P. G. Electronics, Ltd.
800 Arrow Rd., Unit 8,
Weston, Ontario
M9M 2Z8

2.0 COMPLIANCE

The equipment has been tested in accordance with the following performance tests and the results provided below demonstrate compliance with FCC regulations. Please refer to section 3.0 for the list of test equipment used.

2.1 Gain

The gain was measured using the test arrangement as shown in Figure 2.1-1 below. Measurements were made at three frequencies in the band.

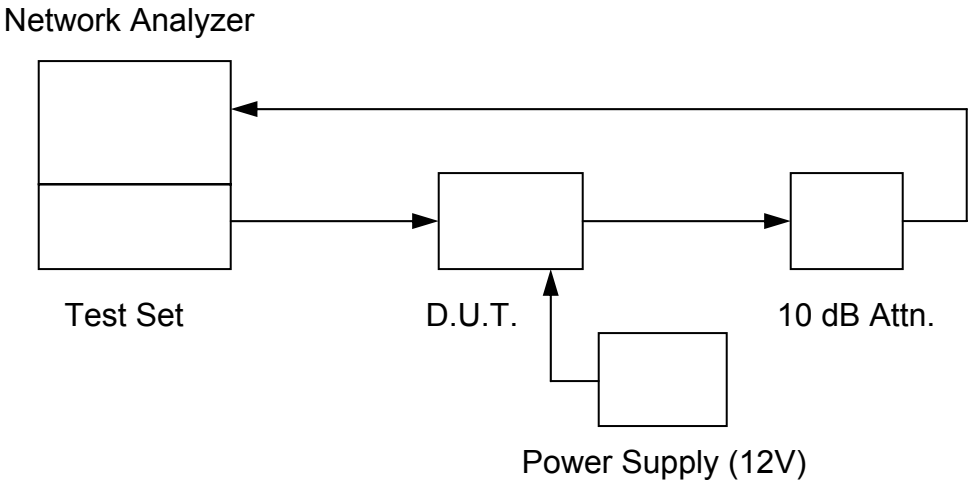
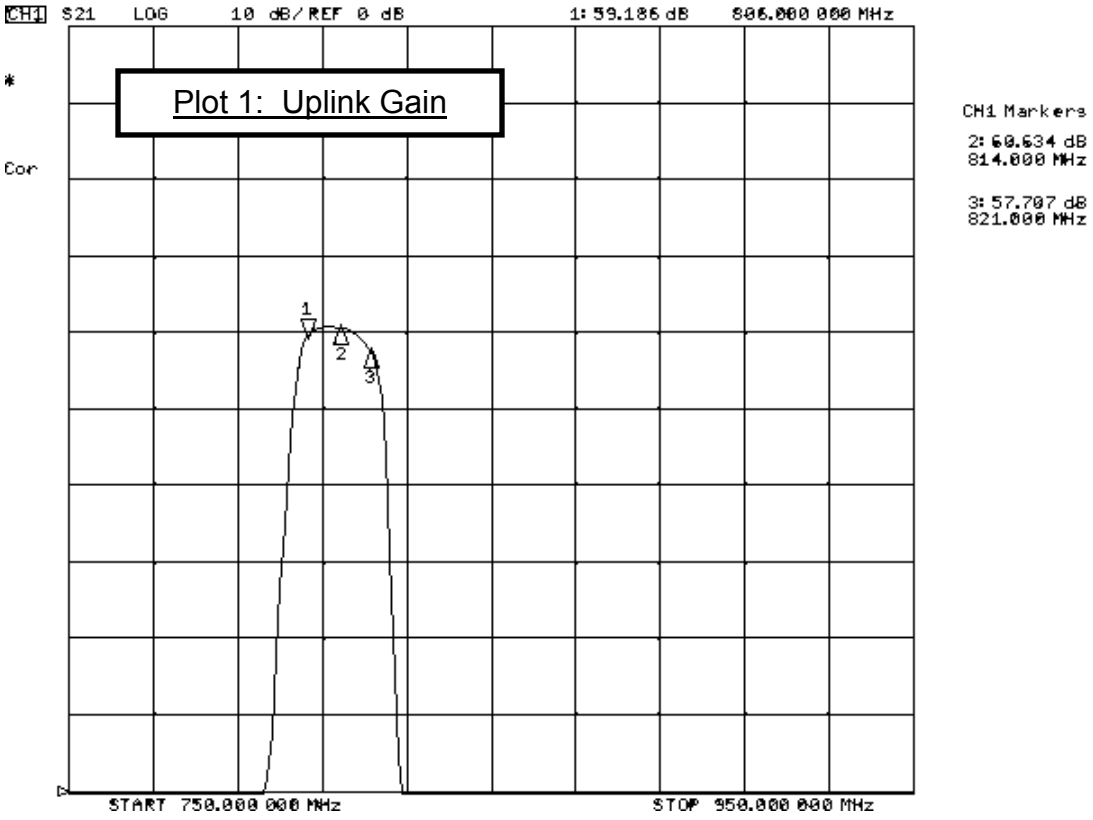
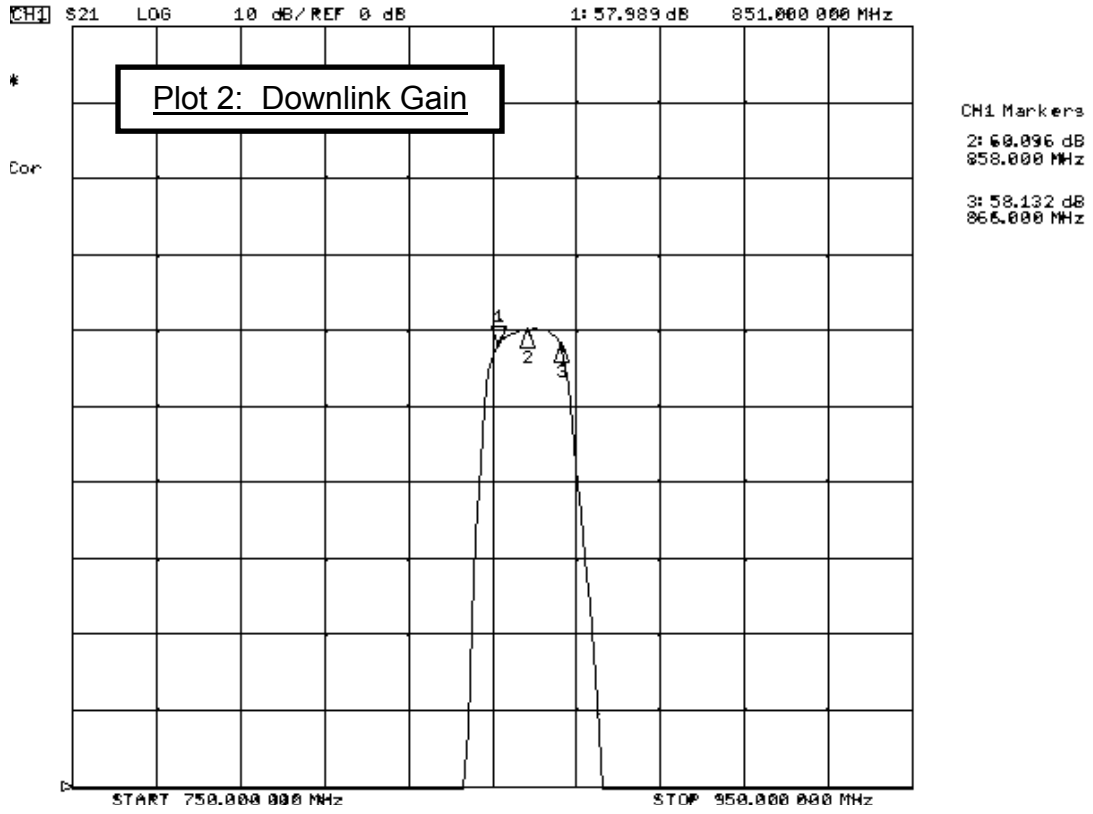


Figure 2.1-1

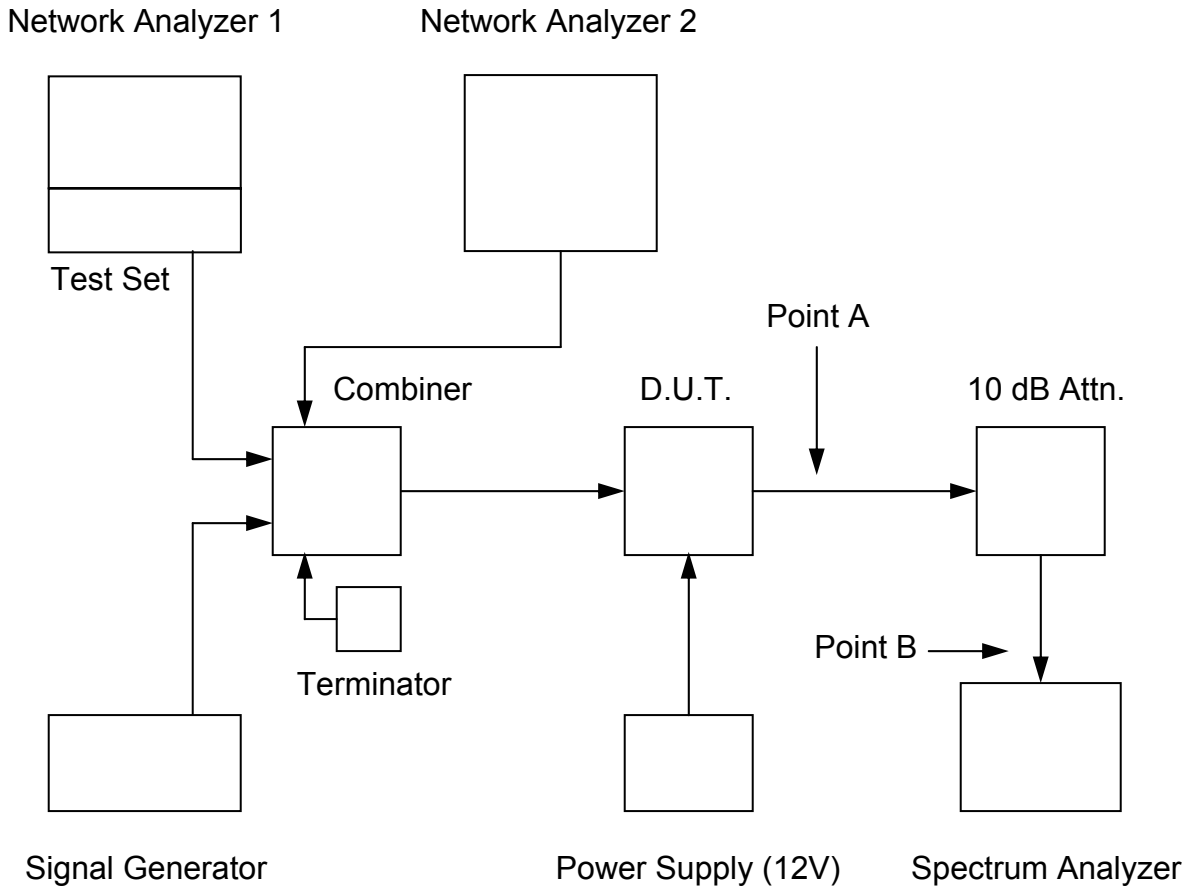
The unit gain was measured for both directions (uplink and downlink). These results are shown in Plot 1 and Plot 2 that follow.


CH1 S21 LOG 10 dB/ REF 0 dB 1: 59.186 dB 806.000 000 MHz
Plot 1: Uplink Gain
Cor
CH1 Markers
2: 60.634 dB
814.000 MHz
3: 57.707 dB
821.000 MHz
START 750.000 000 MHz
STOP 950.000 000 MHz


CH1 S21 LOG 10 dB/ REF 0 dB 1: 57.989 dB 851.000 000 MHz
Plot 2: Downlink Gain
Cor
CH1 Markers
2: 60.096 dB
858.000 MHz
3: 58.132 dB
866.000 MHz
START 750.000 000 MHz
STOP 950.000 000 MHz

2.2 Intermodulation and Spurious

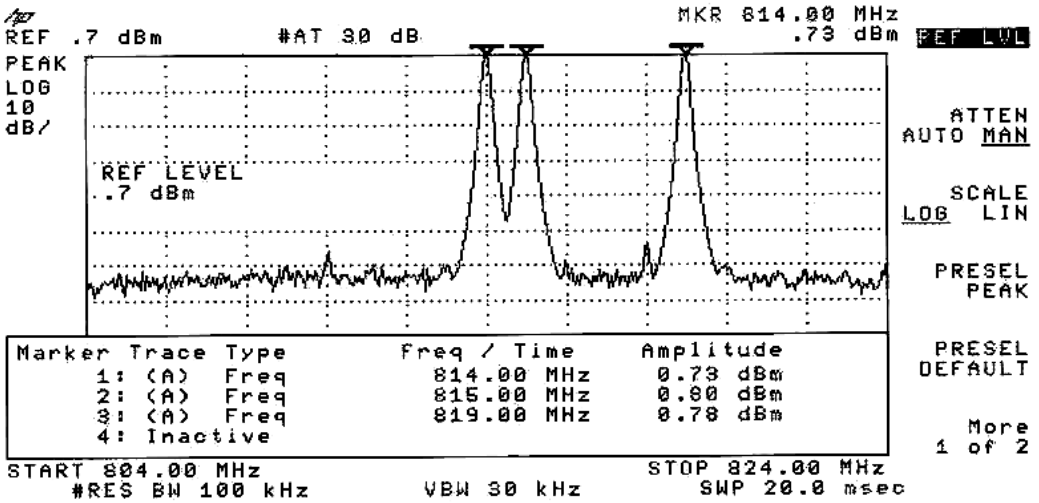
Intermodulation and spurious products were measured with the repeater operating at the maximum total rated inband power level specified in the Operator's Manual (Refer to TM0051 exhibit provided.). A three tone test was conducted using the equipment test arrangement in Figure 2.2-1 below with the input power levels adjusted to give the rated output power of +11.2 dBm for each tone (+16 dBm total inband power). The Network Analyzers were used as signal sources. The 10.5 dB loss to the spectrum analyzer results in tone levels of +0.7 dBm into the instrument.



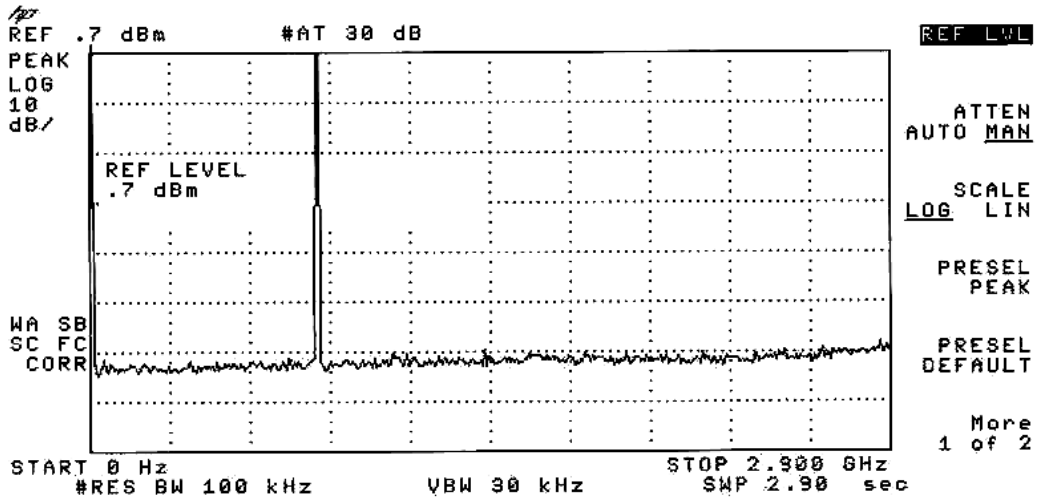
***Note**: Loss from Point A (D.U.T. output) to Point B (Spectrum Analyzer input) was 10.5 dB. This includes the loss of the 10 dB attenuator and cables.

Figure 2.2-1

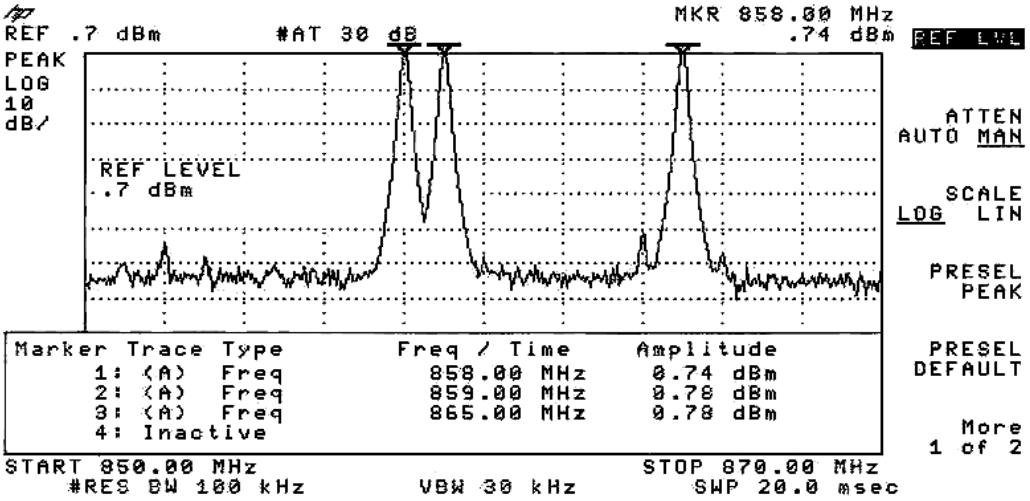
The results of these tests are shown in Plots 3 and 4 that follow for two spectrum analyzer sweep settings with the reference level set at +0.7 dBm. For the uplink direction, in Plot 3, the narrower band setting shows in-band intermodulation products, while in Plot 4 the spectrum outside the SMR band is displayed to show harmonics and spurious. Plots 5 and 6 show the equivalent results for the downlink direction.



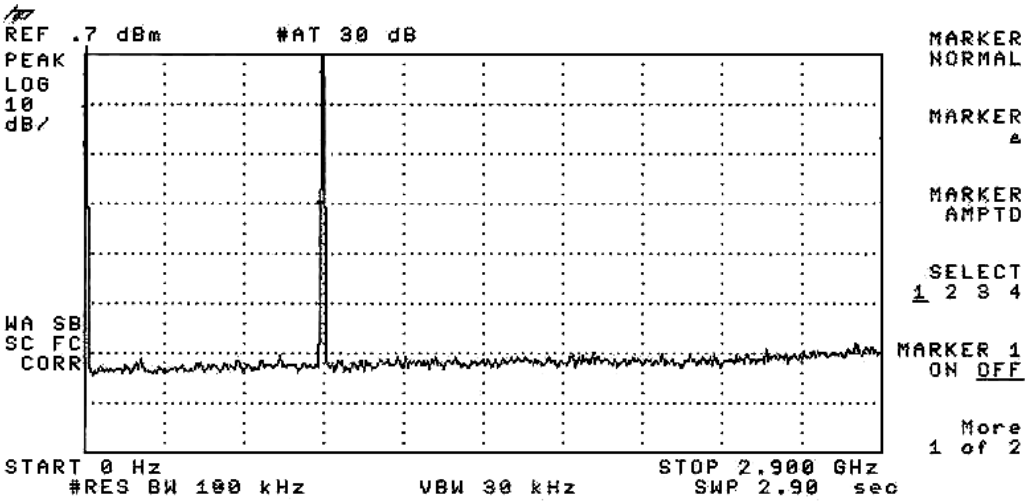
Plot 3: Uplink 3-tone Intermodulation (Narrow Sweep)



Plot 4: Uplink 3-tone Intermodulation (Broad Sweep)



Plot 5: Downlink 3-tone Intermodulation (Narrow Sweep)



Plot 6: Downlink 3-tone Intermodulation (Broad Sweep)

Examination of the above results shows that all products are at least 50 dB below the fundamentals.

2.3 Modulated Channel Tests

These tests show a comparison of the input and output signals for operation with a single modulated signal at the maximum rated RF input drive level of the repeater.

Figure 2.3-1 below shows the test arrangement used for the tests. All the test results display the input level and the output level with sufficient attenuation to display it as an overlay on the same screen.

The input signal is displayed on the spectrum analyzer using the reference bypass. The output signal is displayed on the spectrum analyzer with the equipment connected as shown. Tests are performed for both the uplink and downlink directions for FM and two types of digital modulations.

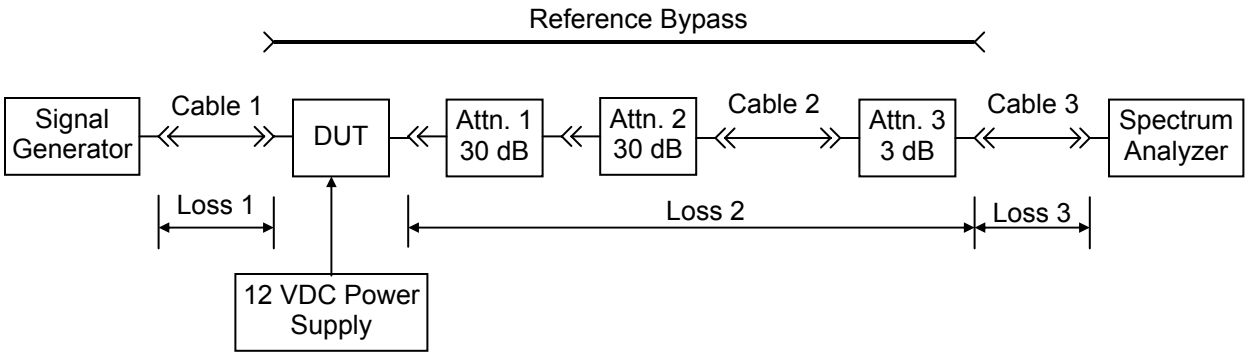


Figure 2.3-1

The following notes apply:

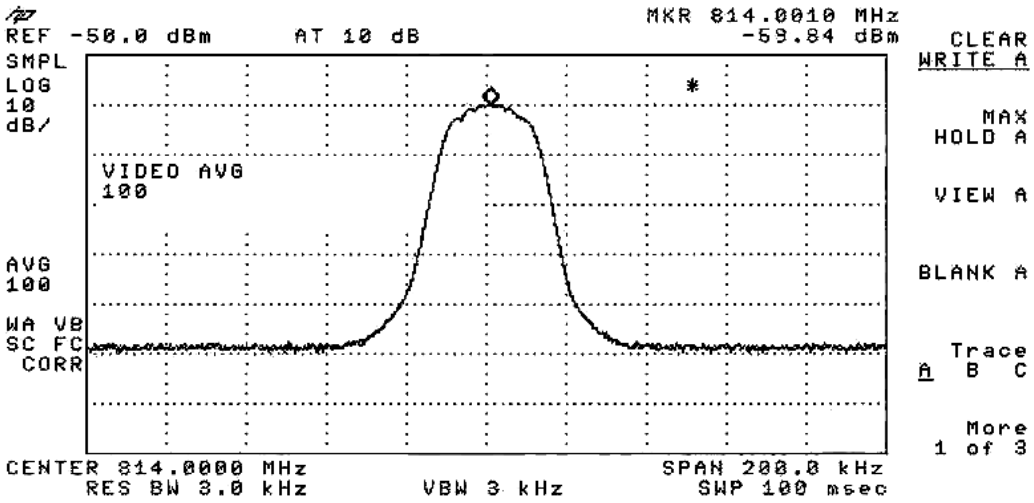
a. Loss 1, loss 2 and loss 3 are measured at the test frequency.

   Loss 1 = 0.6 dB (Cable 1)
   Loss 2 = 60.5 dB (Attn. 1 + Attn. 2 + Cable 2 + Attn. 3)
   Loss 3 = 0.6 dB (Cable 3)

b. Signal generator set to test frequency and desired modulation. Amplitude set to DUT maximum rated output level minus 60 dB (DUT gain) plus Loss 1. Therefore, to obtain +16 dBm at the output of the DUT requires a Generator level of: +16 dBm (test level) – 60 dB (DUT gain) + 0.6 dB (Loss 1) = -43.4 dBm.

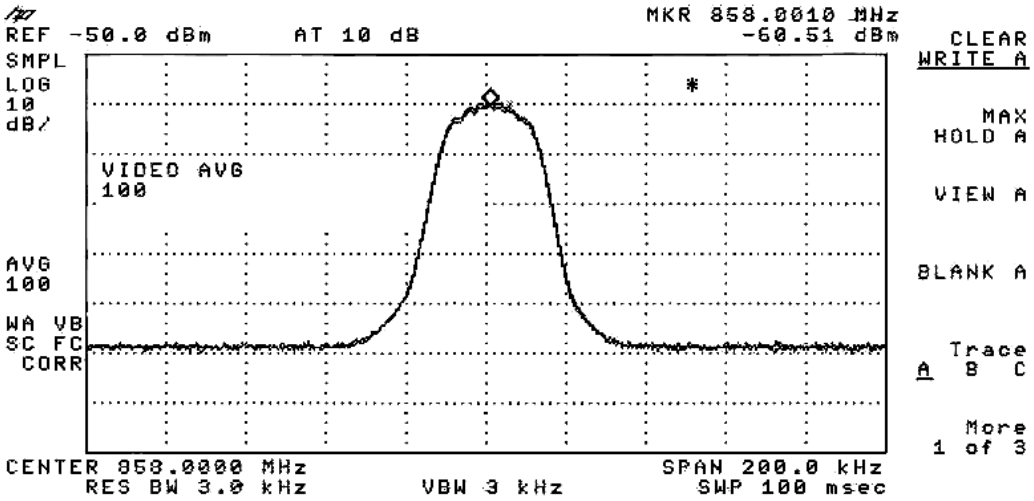
c. The DUT output level is equal to the spectrum analyzer level + Loss 2 + Loss 3; which is the spectrum analyzer level + 61.1 dB.

The results of these tests are shown in Plots 7 through 12 that follow. Plots 7 and 8 show results for FM modulation (AMPS), Plots 9 and 10 show results for for Digital Modulation 1 (NADC), and Plots 11 and 12 show results for Digital Modulation 2 (GSM).



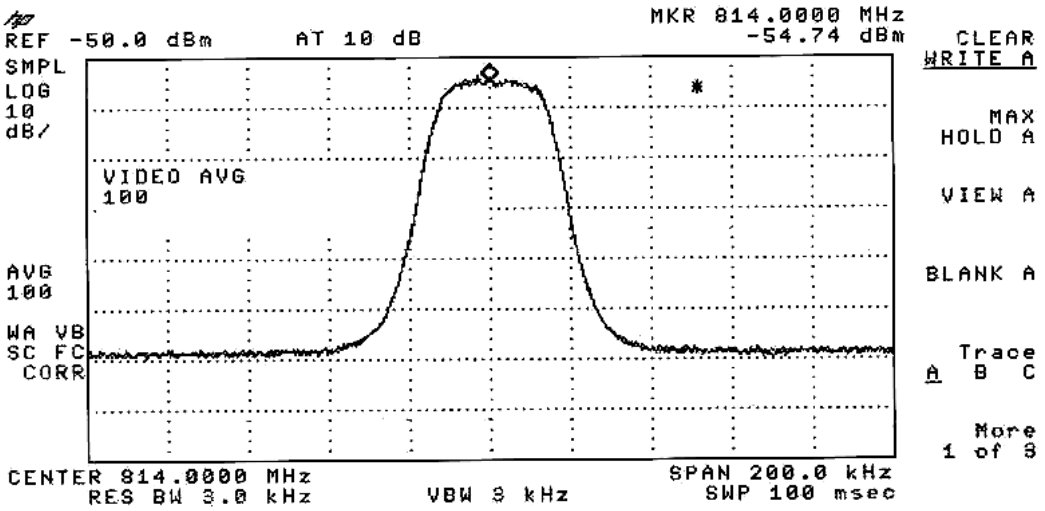
Plot 7: Uplink FM Modulated Channel Test

Input Level = -43.4 dBm
Deviation = 12KHz
Video Averaging = ON
Modulation = 1KHz
Span = 200 KHz



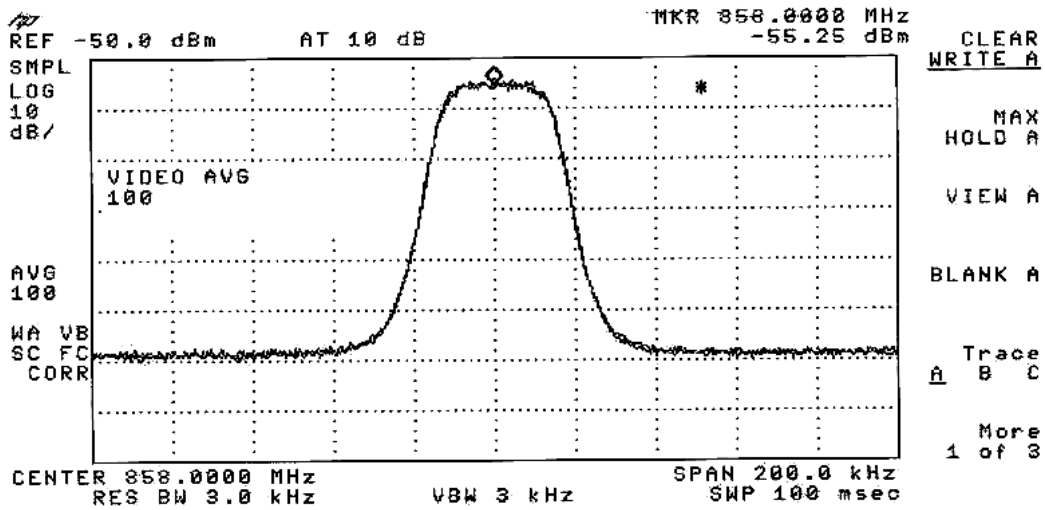
Plot 8: Downlink FM Modulated Channel Test

Input Level = -43.4 dBm
Deviation = 12KHz
Video Averaging = ON
Modulation = 1KHz
Span = 200 KHz



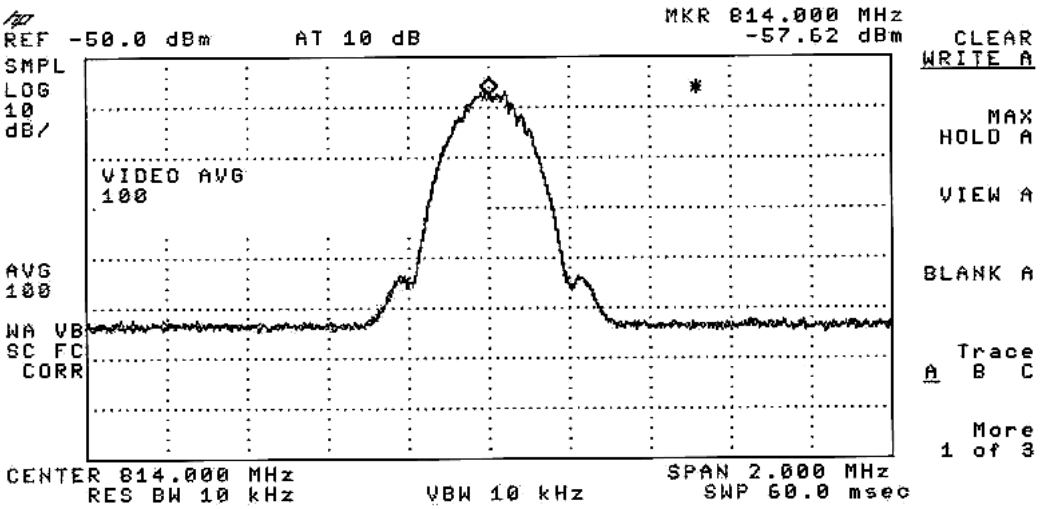
Plot 9: Uplink NADC Modulated Channel Test

Input Level = -43.4 dBm Modulation = NADC
Span = 200 KHz Video Averaging = ON



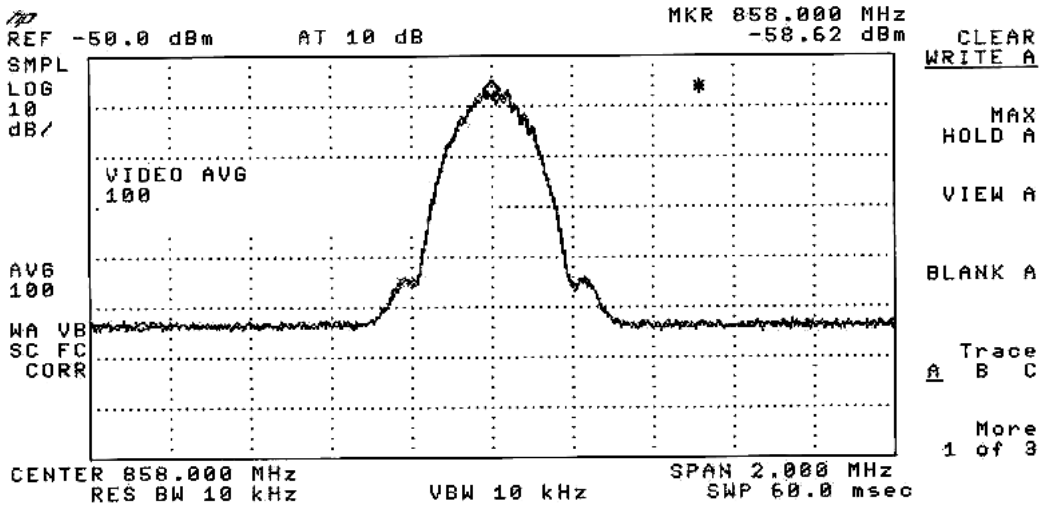
Plot 10: Downlink NADC Modulated Channel Test

Input Level = -43.4 dBm Modulation = NADC
Span = 200 KHz Video Averaging = ON



Plot 11: Uplink GSM Modulated Channel Test

Input Level = -43.4 dBm Modulation = GSM
Span = 2 MHz Video Averaging = ON



Plot 12: Downlink GSM Modulated Channel Test

Input Level = -43.4 dBm Modulation = GSM
Span = 2 MHz Video Averaging = ON

The results for FM modulation at the rated output level show no measurable distortion visible on the spectrum analyzer.

Similarly, the results for Digital Modulation 1 (NADC) show no measurable distortion visible on the spectrum analyzer.

Similarly, the results for Digital Modulation 2 (GSM) show no measurable distortion visible on the spectrum analyzer.

2.4 Radiated Spurious Emissions

These tests address the requirements for spurious emissions as specified in Sections 2.991 and 2.997 of the FCC R&Rs.

The testing was performed in three parts using the equipment arrangements shown in Figure 2.4-1 parts A, B, and C as shown below.

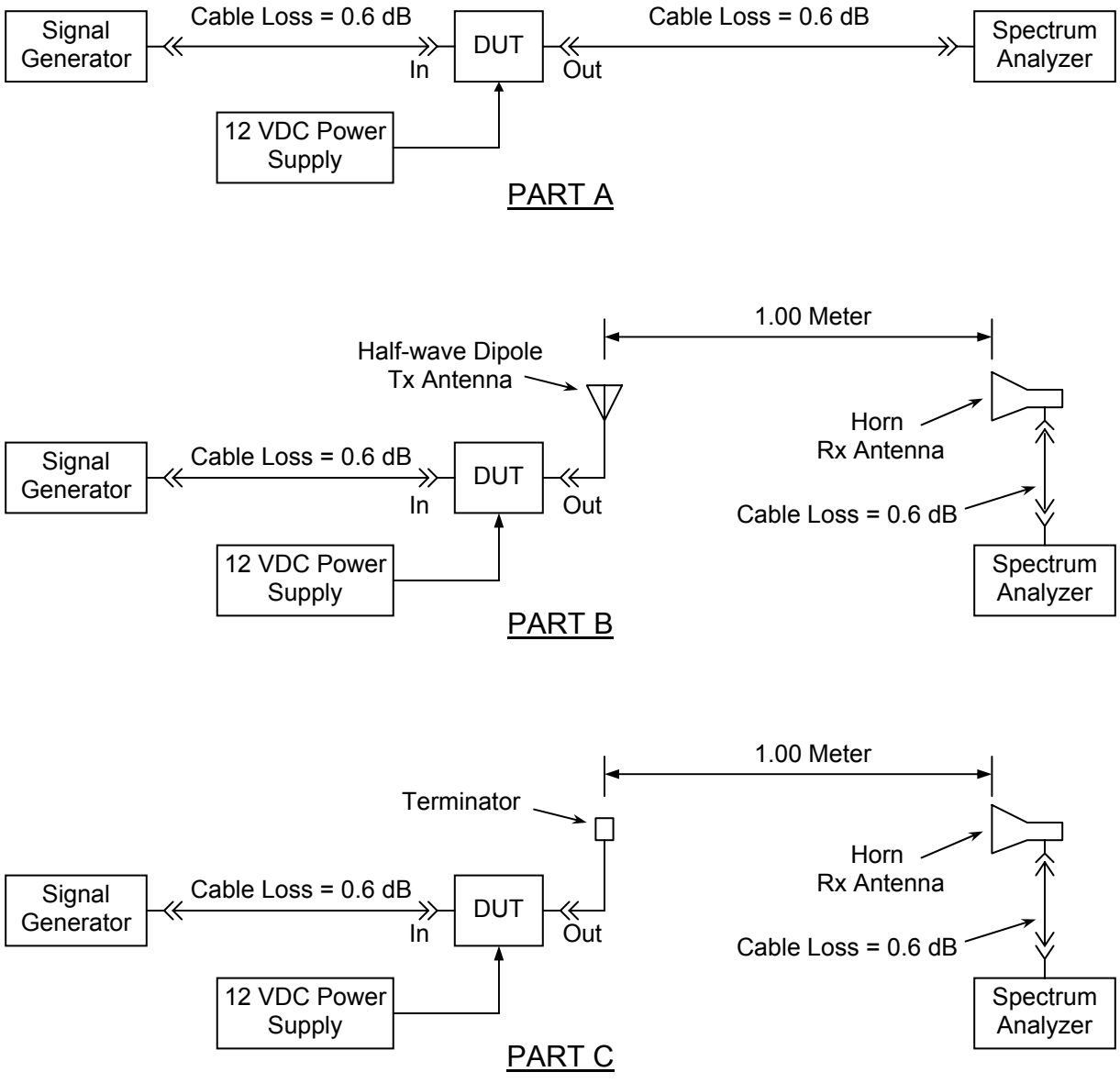


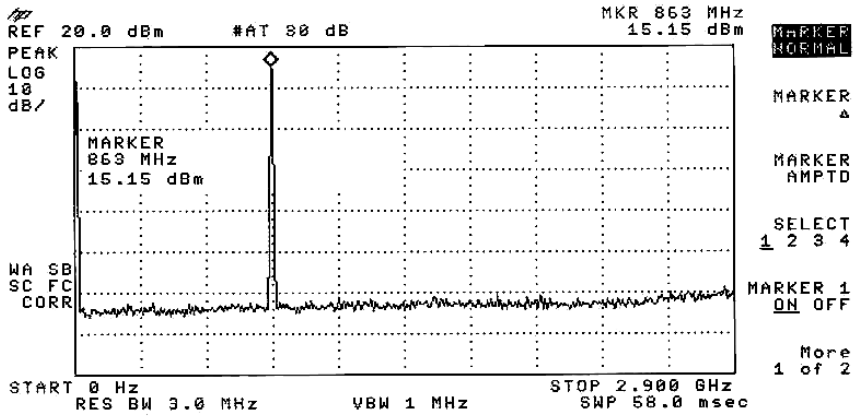
Figure 2.4-1

Part A: Antenna Terminal Emissions

In these tests, the generator fed the maximum rated input signal into the DUT and the spectrum analyzer was directly connected to the output of the DUT as per Figure 2.4.-1 Part A.

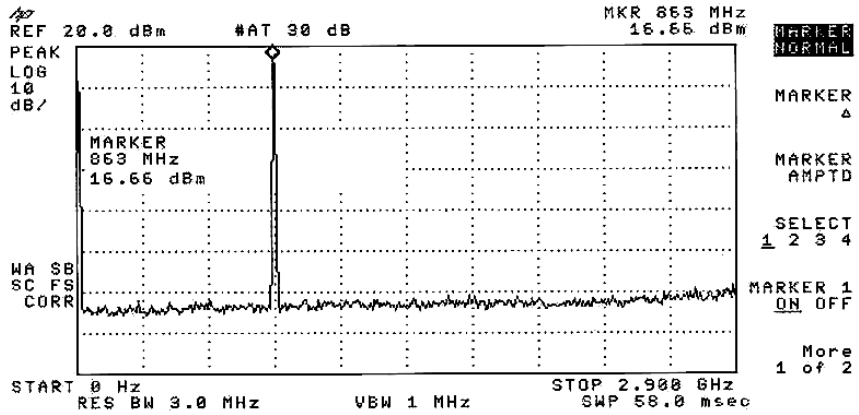
The output spectrum was recorded in the downlink direction for each of FM, Digital 1 (NADC) and Digital 2 (GSM) type modulations.

The results are plotted in the two overlapping bands 0 – 2.9 GHz and 2.8 – 10 GHz and are shown in Plots 13 through 18 on the following pages.



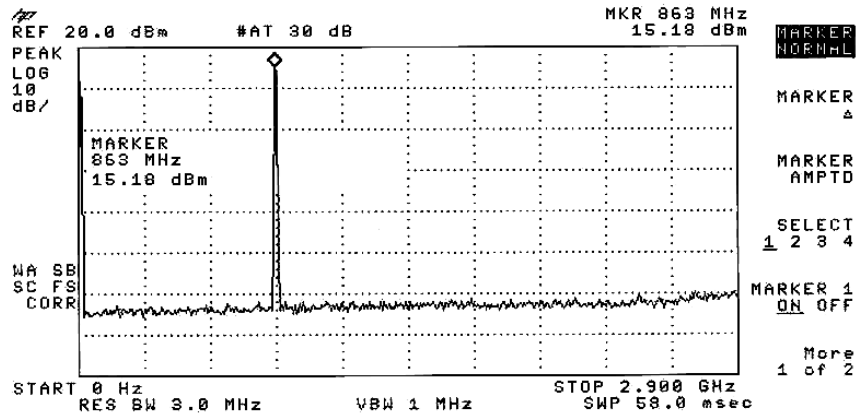
Plot 13: Antenna Terminal Emissions (FM Modulation)

Input Level = -43.4 dBm Modulation = FM
Span = 0 – 2.9 GHz



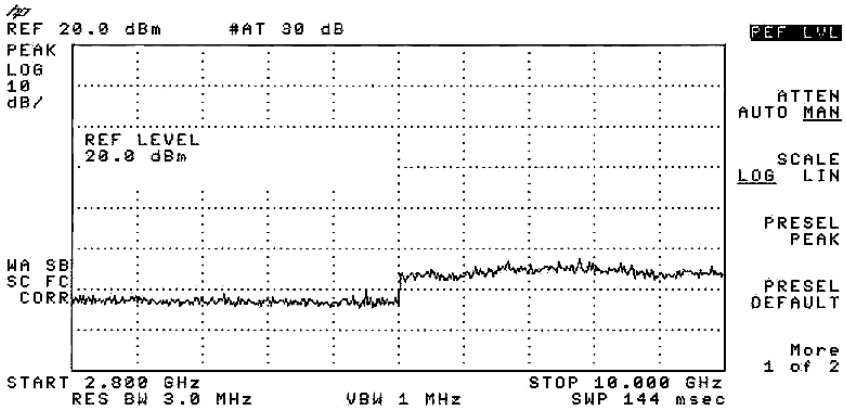
Plot 14: Antenna Terminal Emissions (NADC Modulation)

Input Level = -43.4 dBm Modulation = NADC
Span = 0 – 2.9 GHz



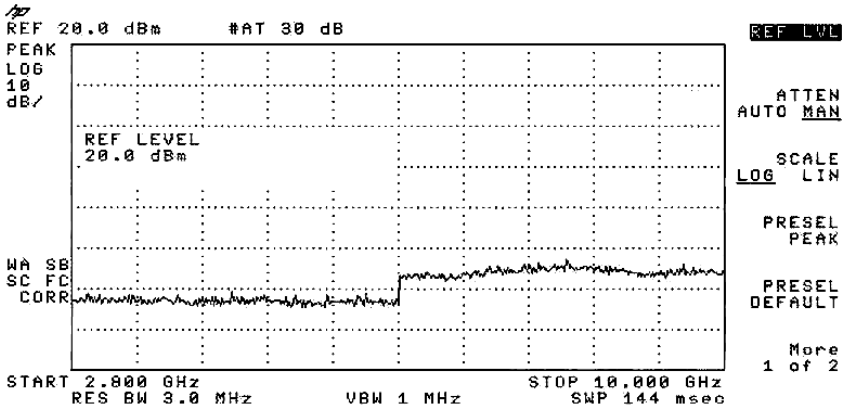
Plot 15 Antenna Terminal Emissions (GSM Modulation)

Input Level = -43.4 dBm Modulation = GSM
Span = 0 – 2.9 GHz



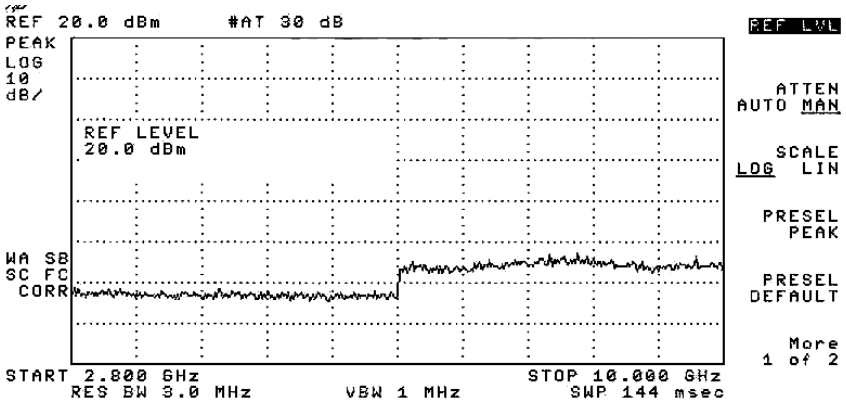
Plot 16: Antenna Terminal Emissions (FM Modulation)

Input Level = -43.4 dBm Modulation = FM
Span = 2.8 - 10 GHz



Plot 17: Antenna Terminal Emissions (NADC Modulation)

Input Level = -43.4 dBm Modulation = NADC
Span = 2.8 - 10 GHz



Plot 18 Antenna Terminal Emissions (GSM Modulation)

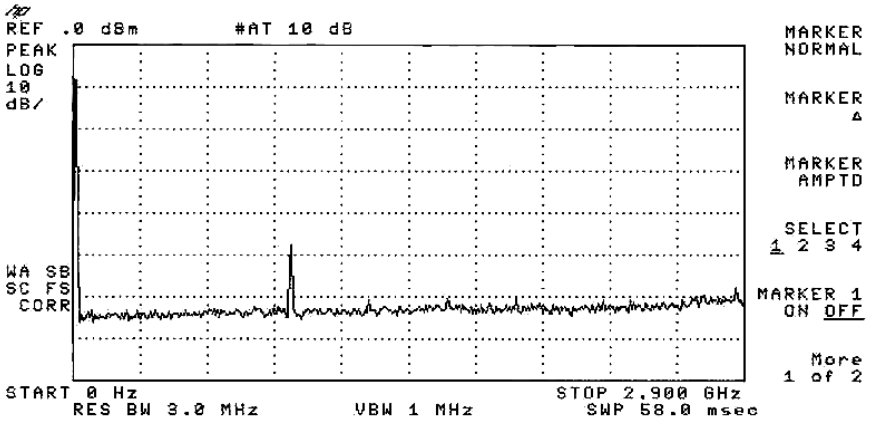
Input Level = -43.4 dBm Modulation = GSM
Span = 2.8 - 10 GHz

The specification limit for spurious signals is 43 dB + 10 log (P); where P is in watts. For an output signal of +16 dBm, the required spurious to carrier ratio is 29 dB. The results in Plots 13 through 18 show no measurable spurious above the analyzer noise floor which is at least 50 dB below the output signal. Thus the unit is compliant with the requirement.

Part B: Radiated Spurious Emissions – DUT Connected to Radiating Antenna

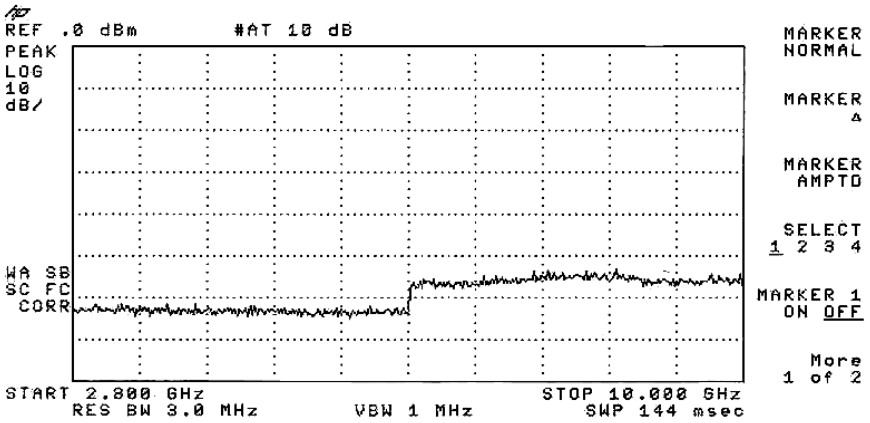
To check radiated spurious emissions, the (DUT) was located in an open test area and emissions were measured with a radiating antenna connected to the output connector. The receiving horn antenna was placed at a distance of 1 meter from the radiating antenna. Figure 2.4-1 part B shows the test arrangement.

Plots 19 through 26 that follow show the results of the above tests. Plots 19 and 20 show the site background noise. Plots 21 through 23 show the measured radiated signals with the DUT connected to a half wave dipole antenna over a 0 – 2.9 GHz sweep. Plots 24 through 26 show the measured radiated signals with the DUT connected to a half wave dipole antenna over a 2.8 - 10 GHz sweep.



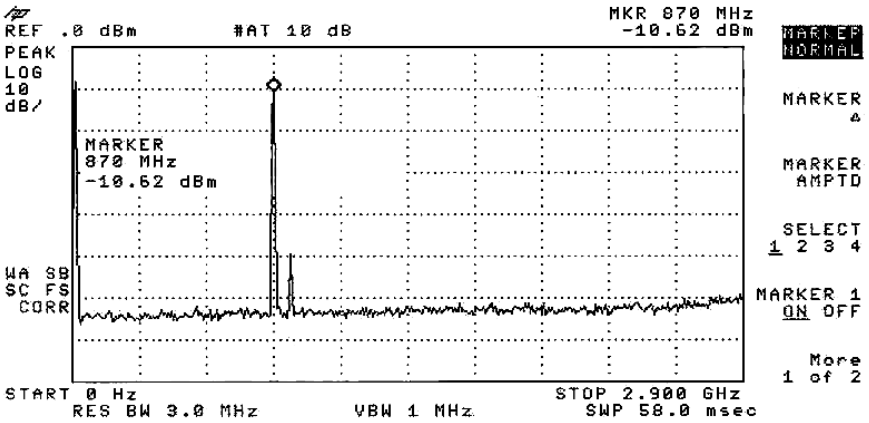
Plot 19 Radiated Spurious – Site Noise (DUT Unpowered)

Span = 0 – 2.9 GHz



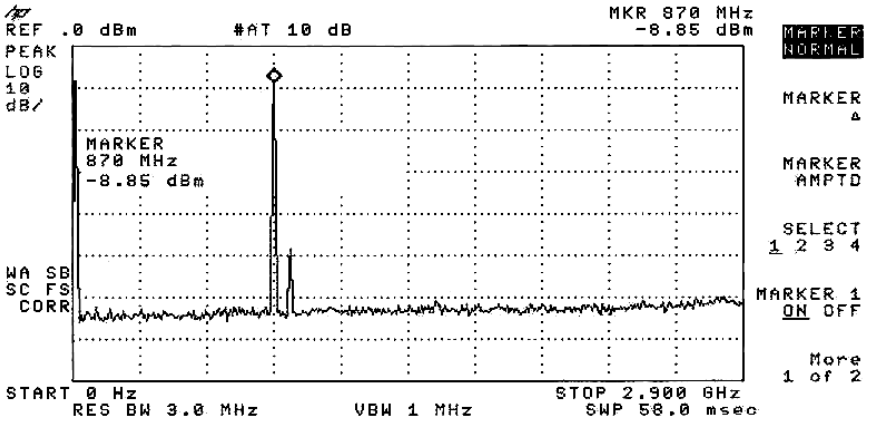
Plot 20 Radiated Spurious – Site Noise (DUT Unpowered)

Span = 2.8 – 10 GHz



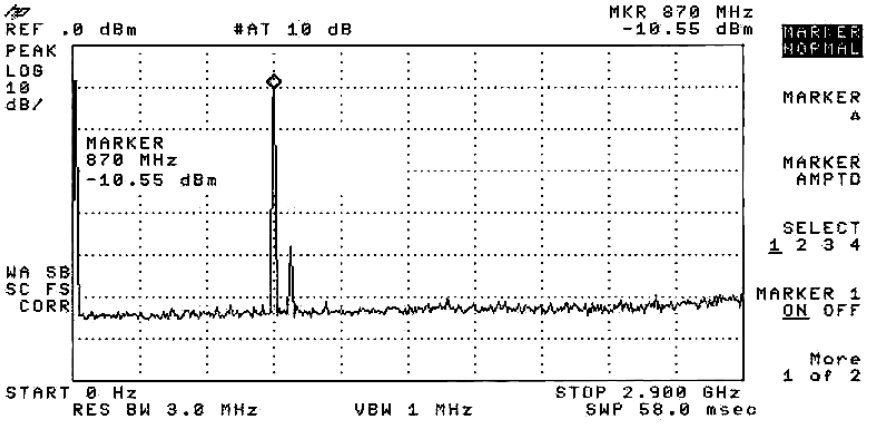
Plot 21 Radiated Spurious – FM Modulation

Input Level = -43.4 dBm Modulation = FM
Span = 0 – 2.9 GHz



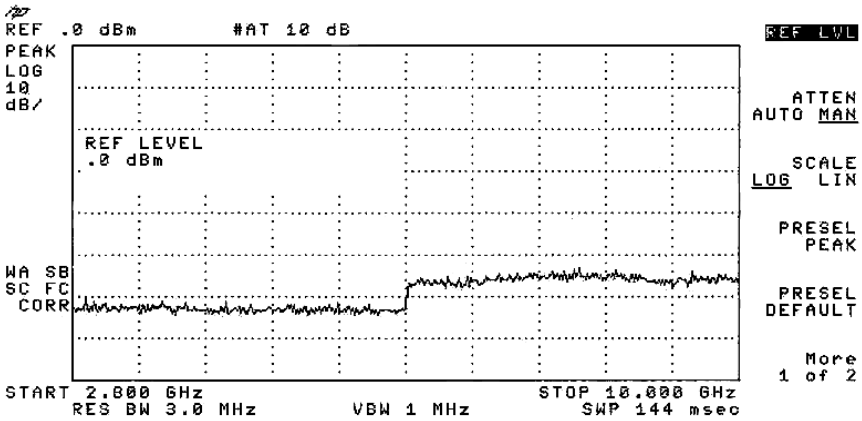
Plot 22 Radiated Spurious – NADC Modulation

Input Level = -43.4 dBm Modulation = NADC
Span = 0 - 2.9 GHz



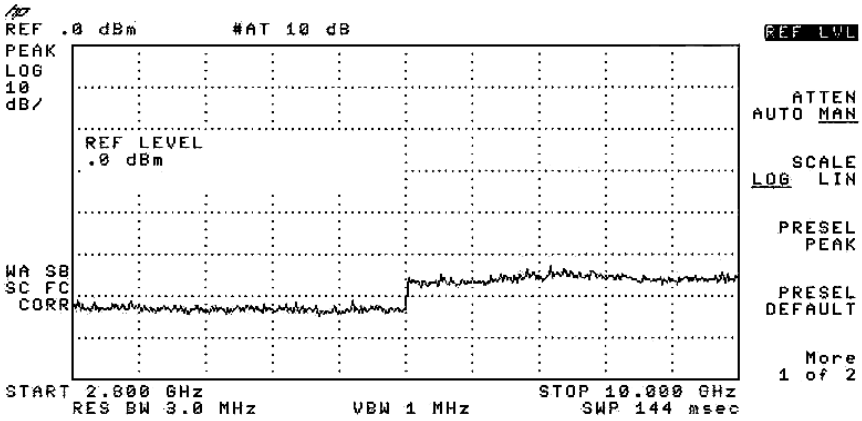
Plot 23 Radiated Spurious – GSM Modulation

Input Level = -43.4 dBm Modulation = GSM
Span = 0 - 2.9 GHz



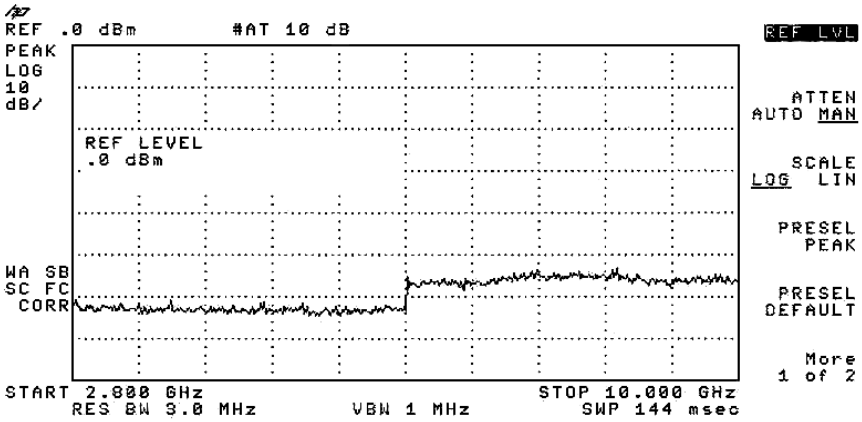
Plot 24 Radiated Spurious – FM Modulation

Input Level = -43.4 dBm Modulation = FM
Span = 2.8 – 10 GHz



Plot 25 Radiated Spurious – NADC Modulation

Input Level = -43.4 dBm Modulation = NADC
Span = 2.8 – 10 GHz



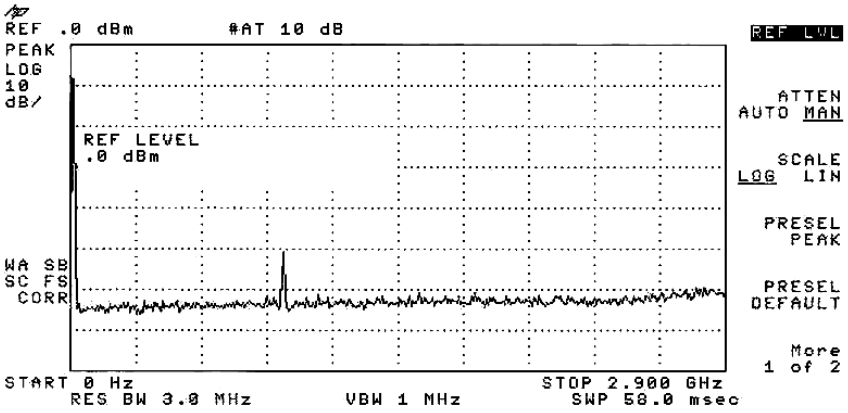
Plot 26 Radiated Spurious – GSM Modulation

Input Level = -43.4 dBm Modulation = GSM
Span = 2.8 – 10 GHz

The results in Plots 21 through 26 above show no measurable spurious above the background noise measured in Plots 19 and 20. The test demonstrates that radiated emissions are well below the required level.

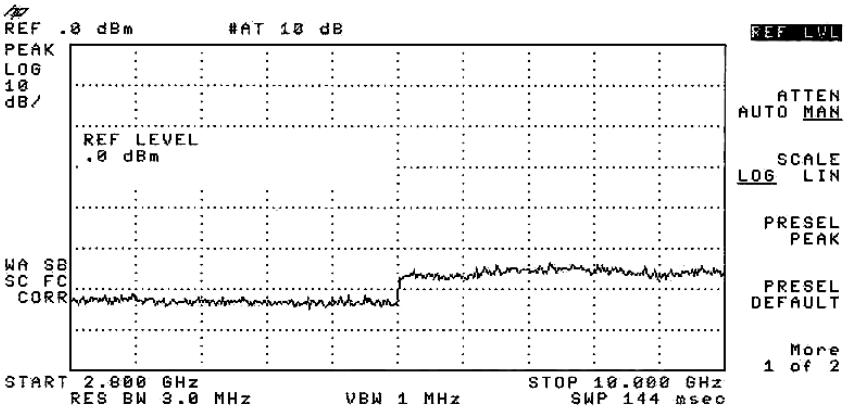
Part C: Radiated Spurious Emissions – DUT Terminated

The tests of Part B were repeated with the DUT connected to a 50 ohm termination instead of a radiating antenna. Figure 2.4-1 part C shows the test arrangement. Results are shown in plots 27 and 28 that follow.



Plot 27 Radiated Spurious – DUT Terminated

Input Level = -43.4 dBm Modulation = NADC
Span = 0 - 2.9 GHz



Plot 28 Radiated Spurious – DUT Terminated

Input Level = -43.4 dBm Modulation = NADC
Span = 2.8 - 10 GHz

The results in Plots 27 through 28 above show no measurable spurious above the background noise measured in Plots 19 and 20. The orientation of the DUT was varied in various planes and no spurious signals were found. The test demonstrates that there is no spurious signal leakage from the enclosure.

3.0 TEST EQUIPMENT LIST

The test equipment used in performing the tests is listed below:

REFERENCE	PART NUMBER	MANUFACTURER	SERIAL NUMBER	DESCRIPTION
DUT	001-0307-002	P. G. Electronics	100014	R307B Device Under Test
Network Analyzer 1	HP8753C	Hewlett-Packard	3029A01161	3 GHz Network Analyzer
Test Set	HP85044A	Hewlett-Packard	2542A02097	Test set used with HP8753C
Network Analyzer 2	HP8753ES	Hewlett-Packard	MY40002281	3 GHz Network Analyzer
Spectrum Analyzer	HP8592L	Hewlett-Packard	3801A01119	22 GHz Spectrum Analyzer
Signal Generator	HP ESG-D3000A	Hewlett-Packard	US36260112	3 GHz Signal Generator
Power Supply	PW118	Ault		Power Supply (12VDC, 1.5A)
Combiner	ZB4PD1-930W	Mini-Circuits	--------	Power Divider/Combiner
Terminator	ANNE-50	Mini-Circuits	--------	50 Ohm Terminator
10 dB Attn.	PE7005-10	Pasternack	--------	10dB SMA Attenuator
30 dB Attn.	660-30-1 (qty. 2)	MECA	--------	30dB SMA Attenuator
3 dB Attn.	5080	Wavetek	17101	Step Attenuator (Set to 3 dB)
Horn Antenna	SAS-299/571	AH Systems	289	Horn Antenna
½ Wave Dipole	SEXE	Sinclabs	--------	½ Wave Dipole Antenna

4.0 TEST FACILITY DESCRIPTION

The testing in this exhibit was performed at the factory of the manufacturer:

P. G. Electronics, Ltd.
800 Arrow Rd., Unit 8,
Weston, Ontario
M9M 2Z8

P. G. Electronics has previously been granted equipment authorization by the FCC for various units. The most recent unit was the Model A289 (FCC ID: P6T81902).

All tests described herein were performed in the same company laboratory using the similar test arrangements as shown. The test equipment used is listed in section 3.0.

4.0 CONCLUSIONS

Testing has demonstrated that the unit meets the requirements for FCC Type Acceptance.