

FM Transmission System Requirements

Proof of Performance

W242CR & W237BN Combined Antenna System

February 13, 2017

Albert Broadcast Services, Inc.

Florence, SC 29502

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The measurements contained herein were performed on February 13, 2017 by Albert Broadcast Services, Inc. to certify that the combined operation of W242CR and W237BN into a single antenna meets or exceeds the requirements for RF Emissions outlined in FCC Rules & Regulations 73.317(b) through (d).

The measurements were performed by Albert Broadcast Services, Inc., utilizing an RF Spectrum Analyzer, Anritsu model MS2721B, serial number 720137. The analyzer was warmed for a period of 15 minutes to its normalized temperature before measurements began. The two transmitters under measurement were connected to the transmitter input ports of each station's Microwave Filter Co. harmonic filter/combiner system. The spectrum analyzer instrument was connected to a directional coupler RF sample port in a line section connected between the combined output of the Microwave Filter Co. combiner system and the transmission line leading to the (combined) antenna.

The summary results are that the requirements for FM transmission system occupied bandwidth limitations and RF Emission Standards outlined in FCC 73.317(b), (c) and (d) were met with the system operating as described above. Tabular results at harmonic frequencies of interest and at the expected intermodulation frequencies are presented herein, along with selected spectrum analyzer screen shot documentation for clarification.

FCC 73.317(b) requirements were met by measurement of the occupied bandwidth measurement function built in to the Anritsu MS2721B spectrum analyzer. Each station was found to be well under the 240 kHz limit, with both stations operating at normal power and modulation levels.

FCC 73.317(c) and (d) were measured in the following manner. Each station's modulation was removed and the transmitter RF output power set for normal station operation. The carrier levels for the two stations were observed on the spectrum analyzer and positioned near the top of the spectrum display. The carrier amplitude reference levels for each transmitter were then carefully measured and noted. Then modulation was applied and the emissions were measured relative to 73.317 (c) and (d) and compared to the level of the unmodulated carrier for the respective station under test. The tabulated results are as follows:

Albert Broadcast Services, Inc.
for
Glory Communications
W242CR & W237BN Combined Antenna System Emission Measurements
February 13, 2017

Station: W242CR

* Denotes the observed level of emission less the unmodulated carrier level for the respective fundamental frequency (station) with BOTH stations operating at normal modulation levels at the time of measurement.

<u>Frequency</u>	<u>Emission *</u>	<u>Notes</u>	<u>Occupied Emission Measurement</u>
96.3 MHz	0.0 dBm	Reference unmodulated carrier level	150.635 kHz
192.6 MHz	-81.10 dB	1st Harmonic	
288.9 MHz	-94.62 dB	2nd Harmonic	
385.2 MHz	-95.08 dB	3rd Harmonic	
481.5 MHz	-94.54 dB	4th Harmonic	

Station: W237BN

100.7 MHz	0.0 dBm	Reference unmodulated carrier level	132.486 kHz
201.4 MHz	-74.96 dB	1st Harmonic	
302.1 MHz	-84.36 dB	2nd Harmonic	
402.8 MHz	-94.31 dB	3rd Harmonic	
503.5 MHz	-95.42 dB	4th Harmonic	

Combined Intermodulation Product Measurements:

87.5 MHz	-84.40 dB	96.3 MHz x3 minus 100.7 MHz x2
91.9 MHz	-85.19 dB	96.3 MHz x2 minus 100.7 MHz
105.1 MHz	-82.71 dB	100.7 MHz x2 minus 96.3 MHz
109.5 MHz	-95.39 dB	100.7 MHz x3 minus 96.3 MHz x2
188.2 MHz	-95.52 dB	96.3 MHz x3 minus 100.7 MHz
192.6 MHz	-81.10 dB	96.3 MHz x2
197.0 MHz	-74.31 dB	96.3 MHz plus 100.7 MHz
201.4 MHz	-74.96 dB	100.7 MHz x2
205.8 MHz	-87.40 dB	100.7 MHz x3 minus 96.3 MHz

Combined Intermodulation Product Measurements: (continued)

288.9 MHz	-94.62 dB	96.3 MHz x3
293.3 MHz	-88.86 dB	96.3 MHz x2 plus 100.7 MHz
297.7 MHz	-86.60 dB	100.7 MHz x2 plus 96.3 MHz
302.1 MHz	-84.36 dB	100.7 MHz x3
389.6 MHz	-95.46 dB	100.7 MHz plus 96.3 MHz x3
394.0 MHz	-95.53 dB	100.7 MHz x2 plus 96.3 MHz x2
398.4 MHz	-95.52 dB	100.7 MHz x3 plus 96.3 MHz
490.3 MHz	-94.20 dB	96.3 MHz x3 plus 100.7 MHz x2
494.7 MHz	-93.83 dB	100.7 MHz x3 plus 96.3 MHz x2
591.0 MHz	-94.01 dB	96.3 MHz x3 plus 100.7 MHz x3

Albert Broadcast Services, Inc.

PO Box 4170

Florence, SC 29502

RF Emission Measurements for W242CR and W237BN, Glory Communications, Columbia, SC

2/13/2017

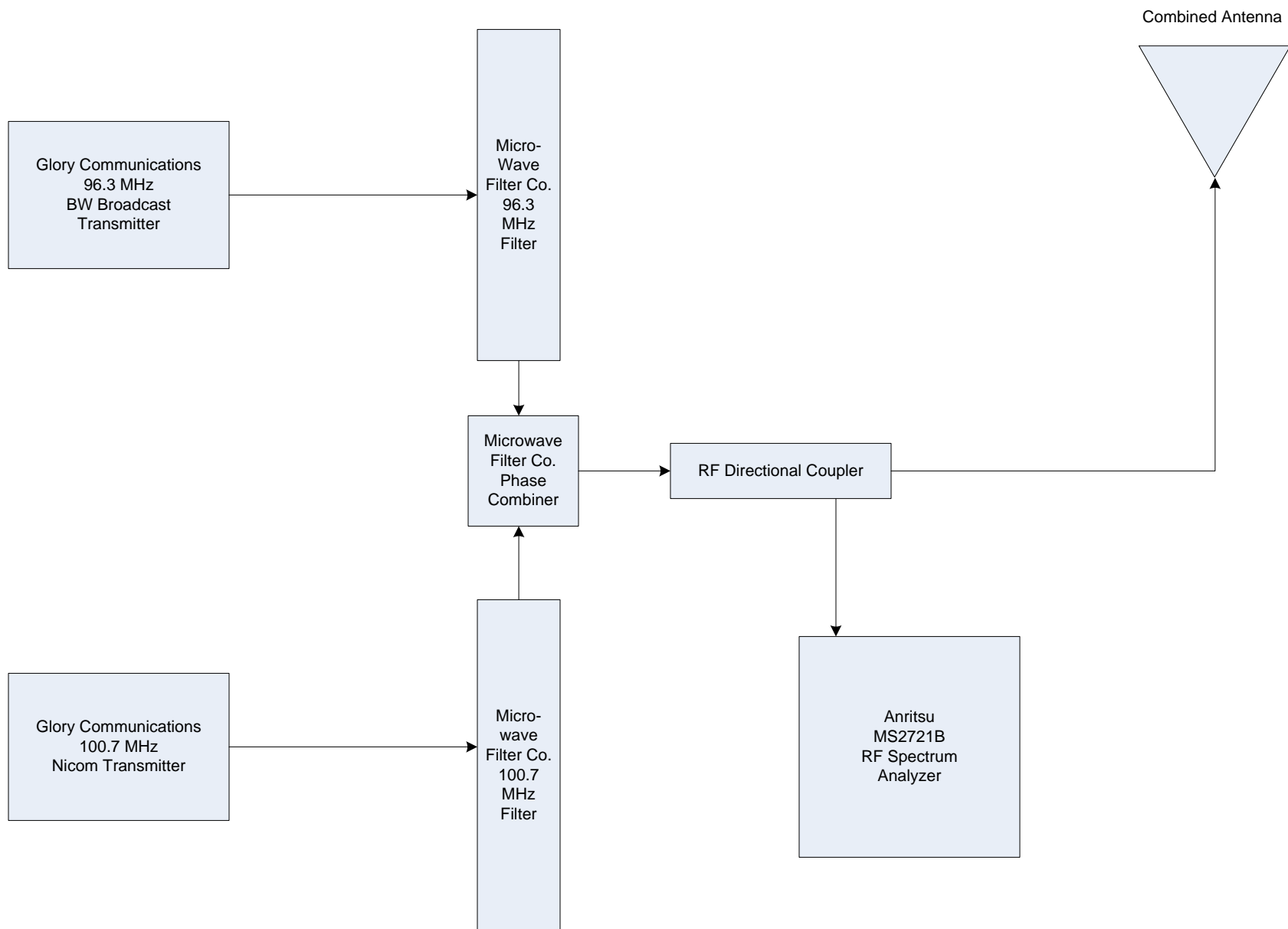
The measurements performed herein were taken by Steward R. Albert, President of Albert Broadcast Services, Inc., Florence, SC. Mr. Albert certifies that he is familiar with the requirements for performing such measurements and has been employed as an engineer for AM, FM, Television and Post Production facilities since 1974. He holds an FCC Lifetime General Class Radiotelephone license (grand-fathered First Class FCC License) with Radar Endorsement. Mr. Albert also holds a Society of Broadcast Engineers certification as a Frequency Coordinator for the Charlotte, NC operational area.

All measurements were performed with an Anritsu MS2721B RF Spectrum Analyzer as follows:

Measurements that follow were taken with each transmitter, W242CR (96.3 MHz) and W237BN (100.7 MHz) modulated at normal level, with both stations operating into their respective Microwave Filter Co., Inc. Combiner input ports with the output of the combiner/harmonic filter system connected to the combined antenna proposed in the station construction permit. Measurement point for all measurements shown was the RF pickup point at the output of the Microwave Filter Co. combiner system.

What follows are:

- Connection Diagram for transmitters, combiner, monitor point and antenna
- Spectrum Analyzer measurement graphs for pertinent portions of FCC 73.317(b)-(d)
- FM Combiner/filter system measurement graphs provided by the manufacturer

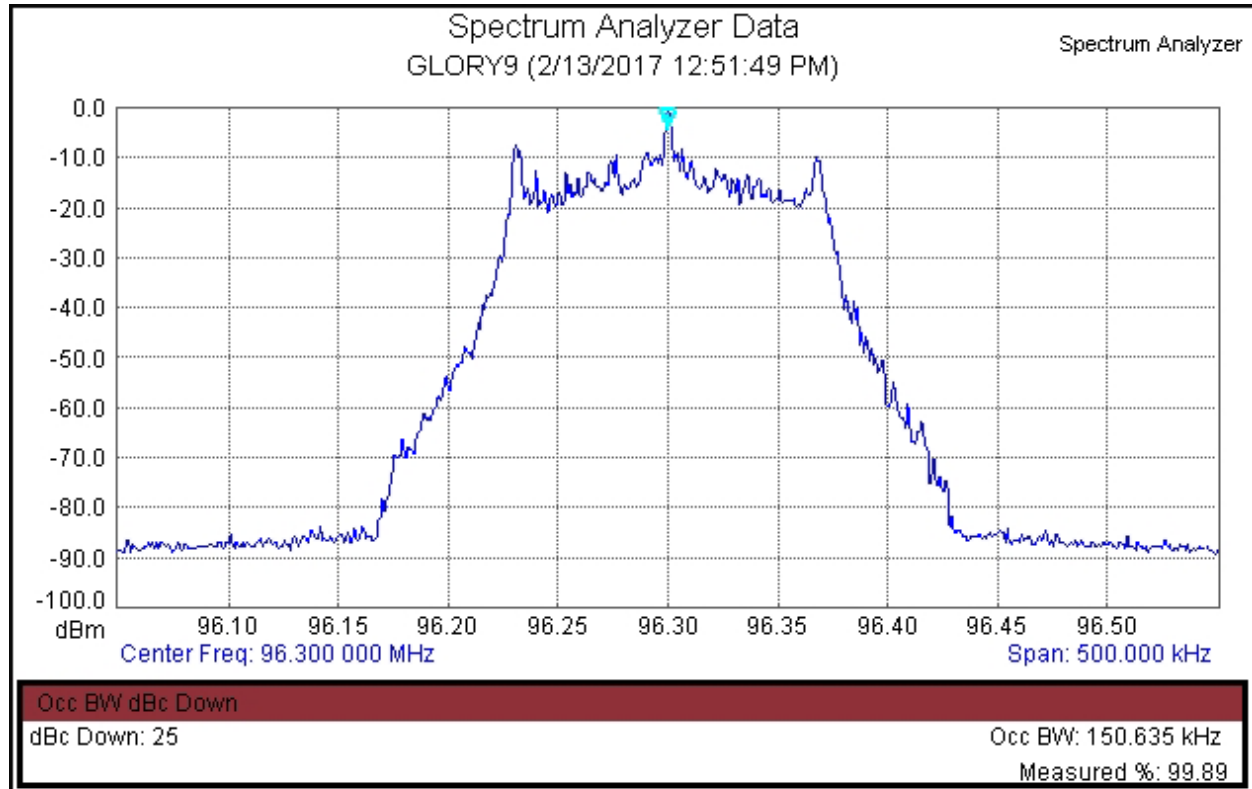


Connection Diagram

Glory Communications

2/13/2017

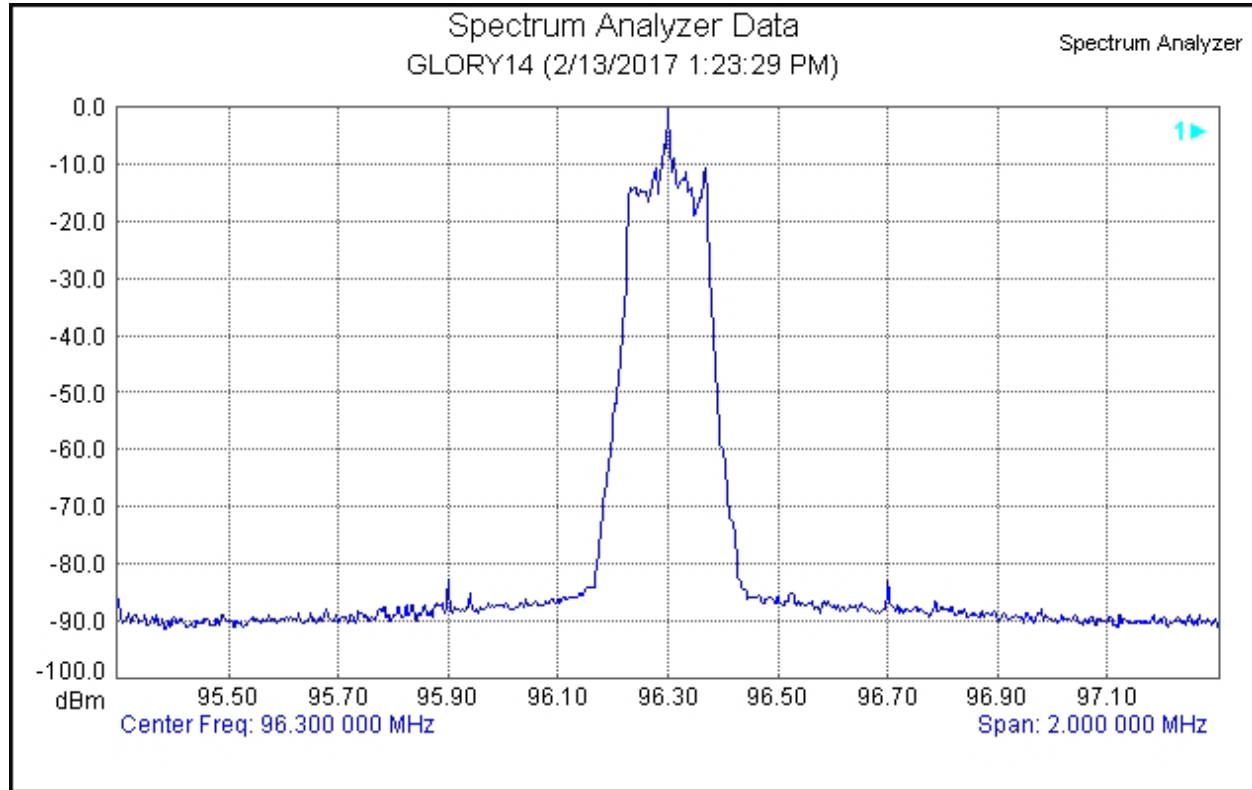
RF Spectrum Occupancy Measurement to satisfy FCC 73.317(b) for W242CR 96.3 MHz as measured at the output of the station Microwave Filter Co., Inc. combiner system:



Measurement Parameters

		Stop Frequency	96.550 000 MHz
Trace Mode	Max Hold	Frequency Span	500.000 000 kHz
Preamp	OFF	Reference Level	0.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	720137
Input Attenuation	20.0 dB	Base Ver.	V4.32
RBW	300.0 Hz	App Ver.	V5.73
VBW	3.0 MHz	Model	MS2721B
Detection	Peak	Options	9, 20, 25, 27, 31
Center Frequency	96.300 000 MHz	Date	2/13/2017 12:51:49 PM
Start Frequency	96.050 000 MHz	Device Name	AlbertBroadcastServicesInc

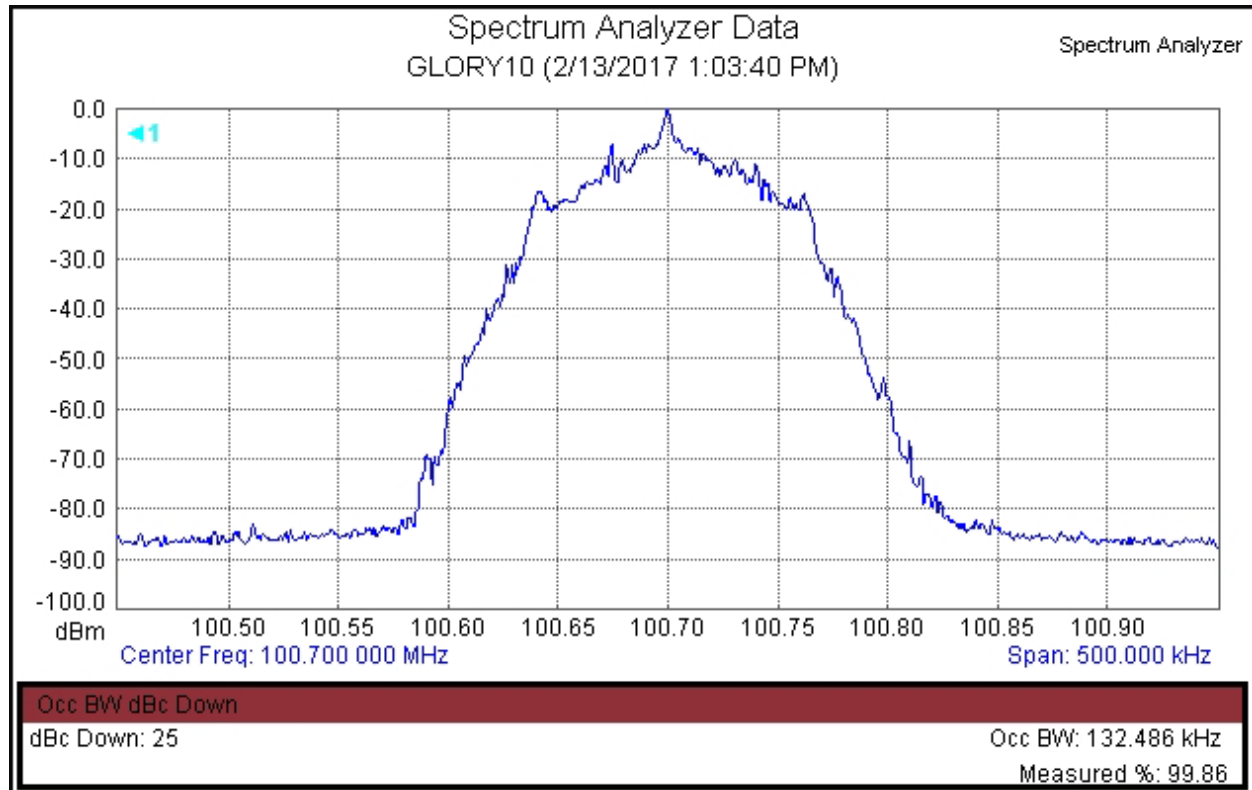
RF Spectrum Occupancy Measurement to satisfy FCC 73.317(c) for W242CR 96.3 MHz as measured at the output of the station Microwave Filter Co., Inc. combiner system.



Measurement Parameters

		Stop Frequency	97.300 000 MHz
Trace Mode	Max Hold	Frequency Span	2.000 000 MHz
Preamp	OFF	Reference Level	0.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	720137
Input Attenuation	20.0 dB	Base Ver.	V4.32
RBW	300.0 Hz	App Ver.	V5.73
VBW	3.0 MHz	Model	MS2721B
Detection	Peak	Options	9, 20, 25, 27, 31
Center Frequency	96.300 000 MHz	Date	2/13/2017 1:23:29 PM
Start Frequency	95.300 000 MHz	Device Name	AlbertBroadcastServicesInc

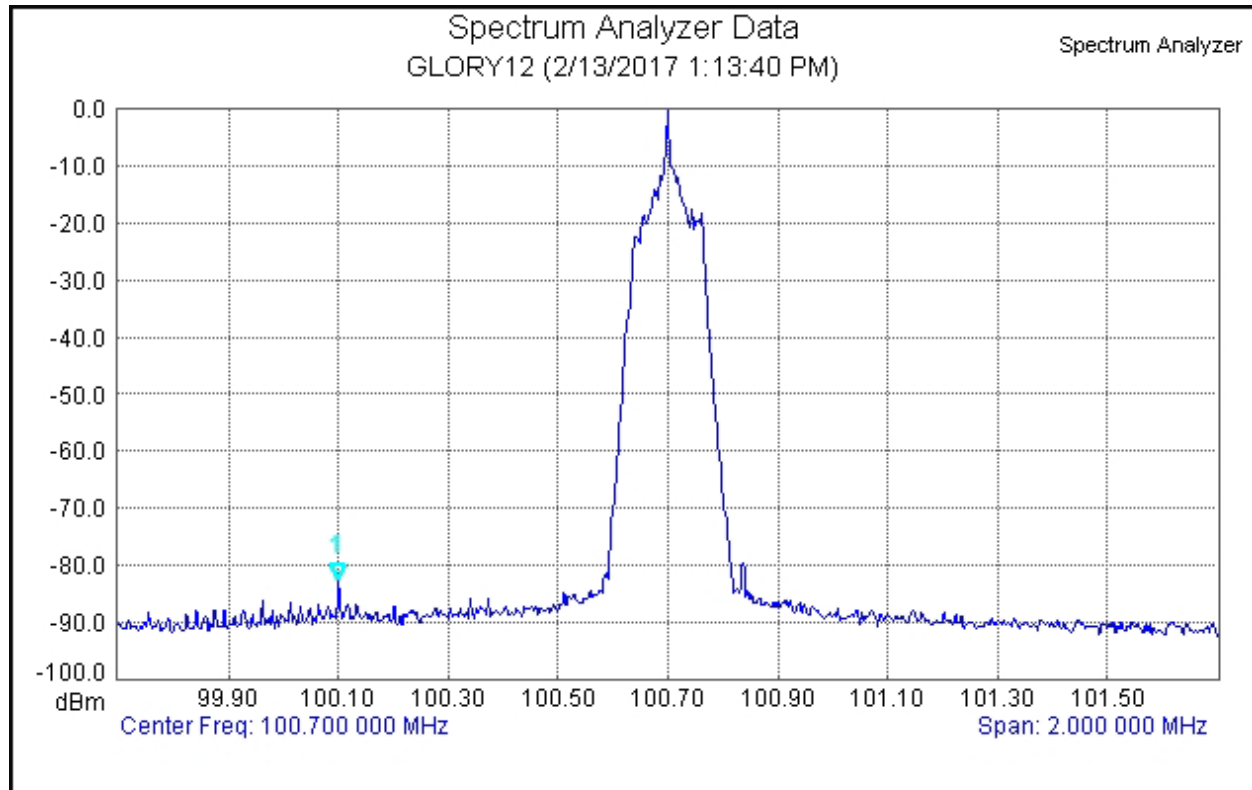
RF Spectrum Occupancy Measurement to satisfy FCC 73.317(b) for W237BN 100.7 MHz as measured at the output of the station Microwave Filter Co., Inc. combiner system.



Measurement Parameters

		Stop Frequency	100.950 000 MHz
Trace Mode	Max Hold	Frequency Span	500.000 000 kHz
Preamp	OFF	Reference Level	0.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	720137
Input Attenuation	20.0 dB	Base Ver.	V4.32
RBW	300.0 Hz	App Ver.	V5.73
VBW	3.0 MHz	Model	MS2721B
Detection	Peak	Options	9, 20, 25, 27, 31
Center Frequency	100.700 000 MHz	Date	2/13/2017 1:03:40 PM
Start Frequency	100.450 000 MHz	Device Name	AlbertBroadcastServicesInc

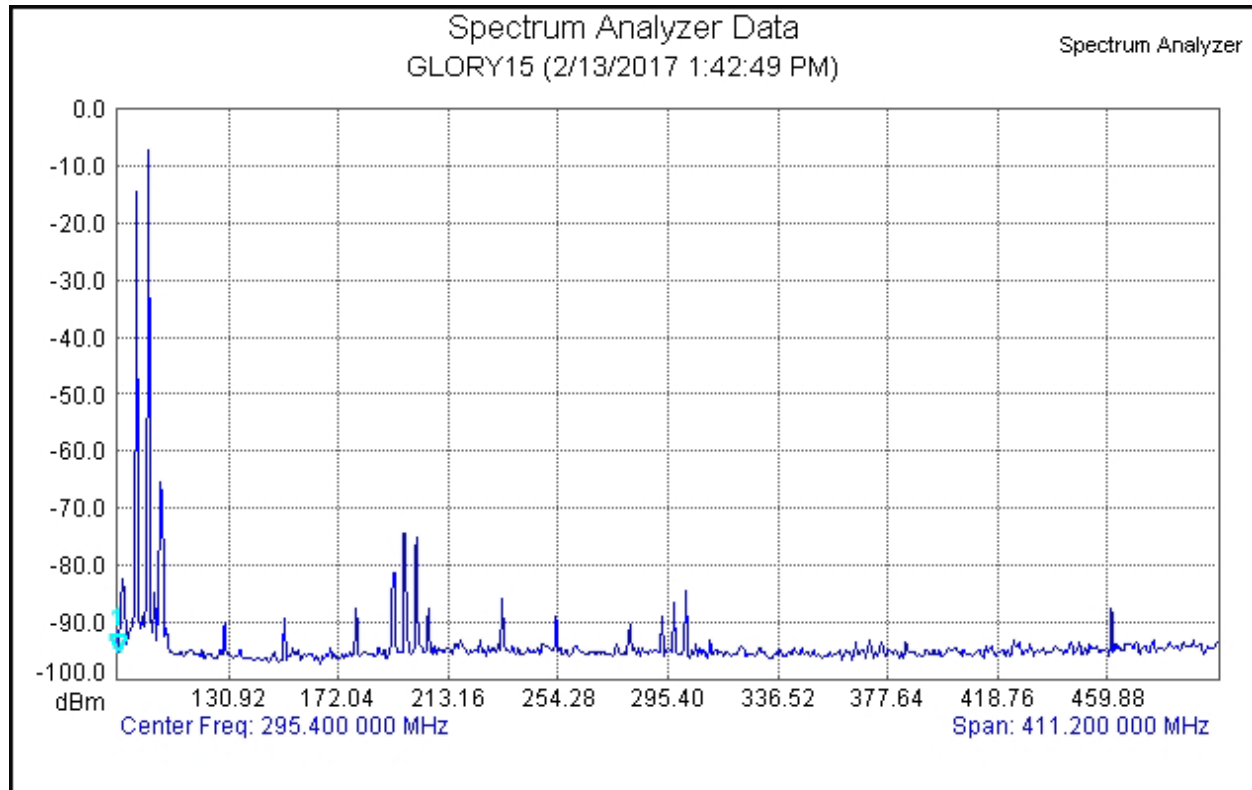
RF Spectrum Occupancy Measurement to satisfy FCC 73.317(c) for W237BN 100.7 MHz as measured at the output of the station Microwave Filter Co., Inc. combiner system.



Measurement Parameters

		Stop Frequency	101.700 000 MHz
Trace Mode	Max Hold	Frequency Span	2.000 000 MHz
Preamp	OFF	Reference Level	0.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	720137
Input Attenuation	20.0 dB	Base Ver.	V4.32
RBW	300.0 Hz	App Ver.	V5.73
VBW	3.0 MHz	Model	MS2721B
Detection	Peak	Options	9, 20, 25, 27, 31
Center Frequency	100.700 000 MHz	Date	2/13/2017 1:13:40 PM
Start Frequency	99.700 000 MHz	Device Name	AlbertBroadcastServicesInc

RF Spectrum Occupancy Measurement to satisfy FCC 73.317(d) for W242CR 96.3MHz and W237BN 100.7 MHz as measured at the output of the station Microwave Filter Co., Inc. combiner system.



Measurement Parameters

		Stop Frequency	501.000 000 MHz
Trace Mode	Max Hold	Frequency Span	411.200 000 MHz
Preamp	OFF	Reference Level	0.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	720137
Input Attenuation	20.0 dB	Base Ver.	V4.32
RBW	300.0 Hz	App Ver.	V5.73
VBW	3.0 MHz	Model	MS2721B
Detection	Peak	Options	9, 20, 25, 27, 31
Center Frequency	295.400 000 MHz	Date	2/13/2017 1:42:49 PM
Start Frequency	89.800 000 MHz	Device Name	AlbertBroadcastServicesInc

Microwave Filter Co., Inc.

6743 Kinne Street
E. Syracuse, New York 13057

Record of Test

Customer:	Glory Communications	Date:	10/20/14
Model:	19048 (RA# 10122)	Cust. PO #:	Verbal
Description:	FM Diplexer	Serial #:	14100001 R1609
Tested By:	R.S.	MFC Job #:	72105.01
		Equipment:	

Passband Loss:

Frequencies	Specification	Measured	Remarks
96.2-96.4 MHz	0.5 dB (max.)	.39 dB	
100.6-100.8 MHz	0.5 dB (max.)	.41 dB	

Passband Return Loss:

Frequencies	Specification	Measured	Remarks
96.2-96.4 MHz	1.25:1 (max.)	1.16:1	
100.6-100.8 MHz	1.25:1 (max.)	1.16:1	

Mutual Isolation:

Frequencies	Specification	Measured	Remarks
Mutual Isolation	30 dB (approx.)	39.0 dB	

General:

Impedance: 50 Ω

Connectors: 7/8 EIA Output

N type (female) Input

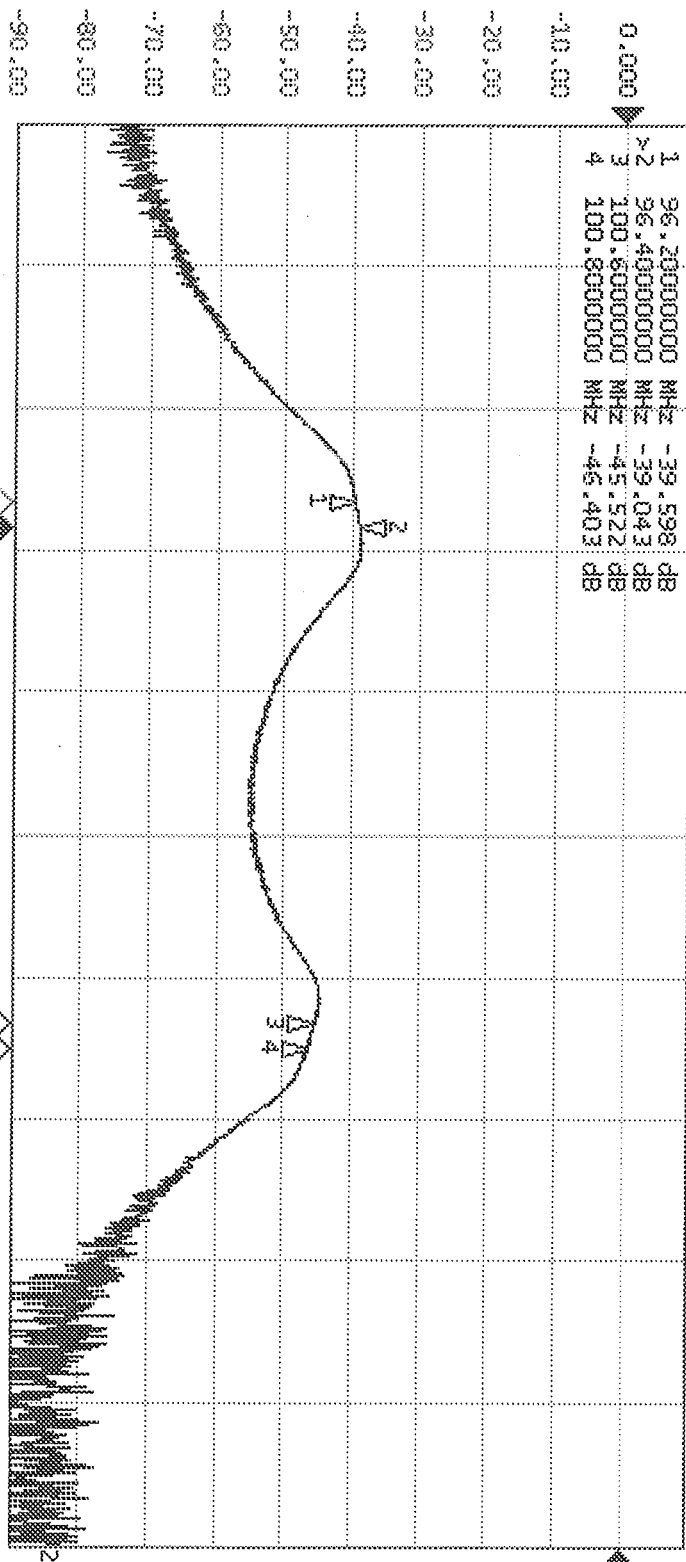
Power: 900 Watts Channel

Indoor use

1 Active Ch1 Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Inst State

MEAS S21 Log Mag 10.00dB/ Ref 0.000dB [F2]

1	96.200000000	MHz	-39.598	dB
>2	96.400000000	MHz	-39.043	dB
3	100.600000000	MHz	-45.522	dB
4	100.800000000	MHz	-45.403	dB



1 Center 99 MHz

IF BW 30 kHz

Span 12 MHz

07

Ch1 Tr2 S21	1	96.200000000	MHz	-39.598	dB
Ch1 Tr2 S21	>2	96.400000000	MHz	-39.043	dB
Ch1 Tr2 S21	3	100.600000000	MHz	-45.522	dB
Ch1 Tr2 S21	4	100.800000000	MHz	-45.403	dB

IN PROCESS TEST / FINAL TEST

PN 19048

DATE 9/27/16

TESTED BY: Pal Burton

PASS / FAIL

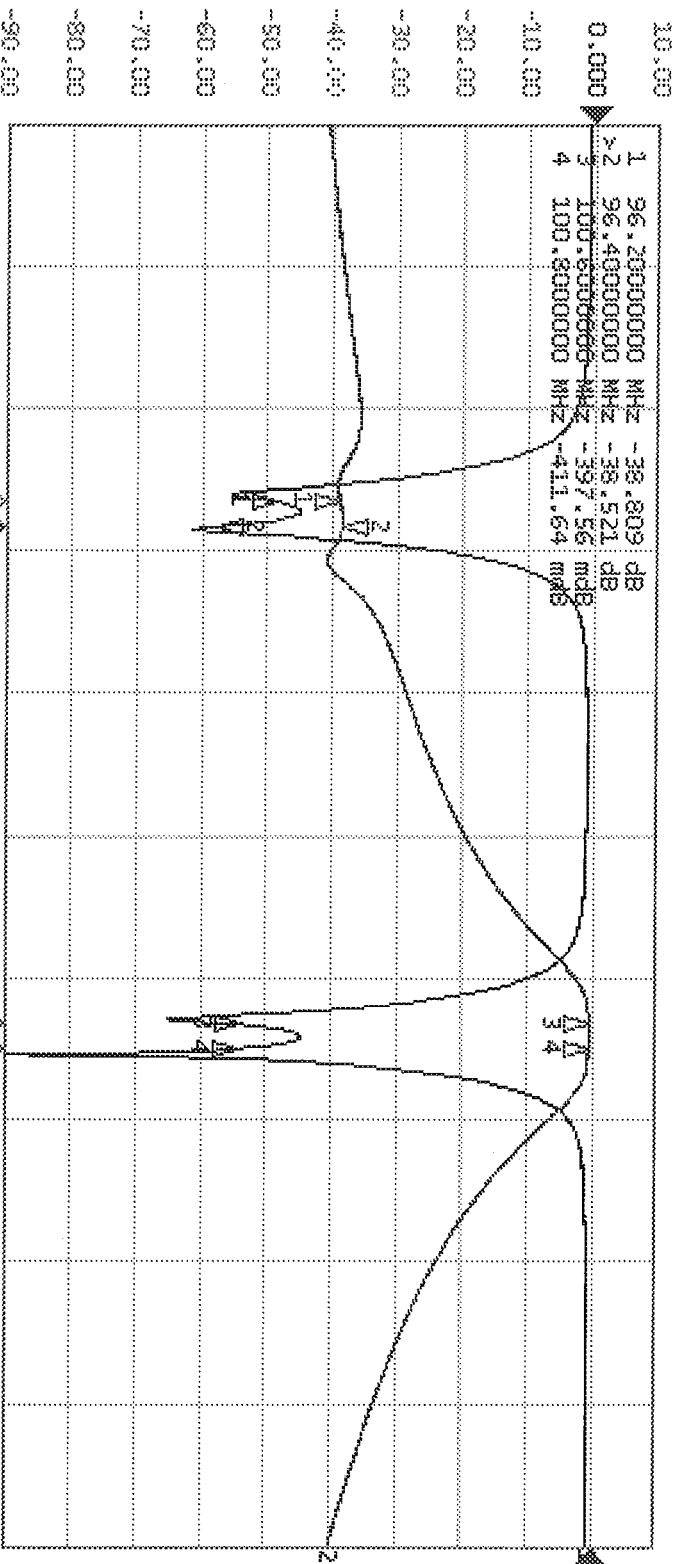


Meas

2016-09-27 05:09

1 Active Ch1 Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Inst State

Tr1 S11 Log Mag 5.000dB / Ref 0.000dB [F2]
 S21 Log Mag 10.000dB / Ref 0.000dB [F2]



Ch1 Tr1 S11	1	96.20000000	MHz	-24.235	dB
Ch1 Tr1 S11	2	96.40000000	MHz	-28.798	dB
Ch1 Tr1 S11	3	100.60000000	MHz	-26.958	dB
Ch1 Tr1 S11	4	100.80000000	MHz	-27.047	dB
Ch1 Tr2 S21	1	96.20000000	MHz	-38.809	dB
Ch1 Tr2 S21	>2	96.40000000	MHz	-38.521	dB
Ch1 Tr2 S21	3	100.60000000	MHz	-39.756	mdB
Ch1 Tr2 S21	4	100.80000000	MHz	-41.164	mdB

IN PROCESS TEST / FINAL TEST

PN 19048

DATE 9/27/16

TESTED BY: Pat Burton

PASS / FAIL



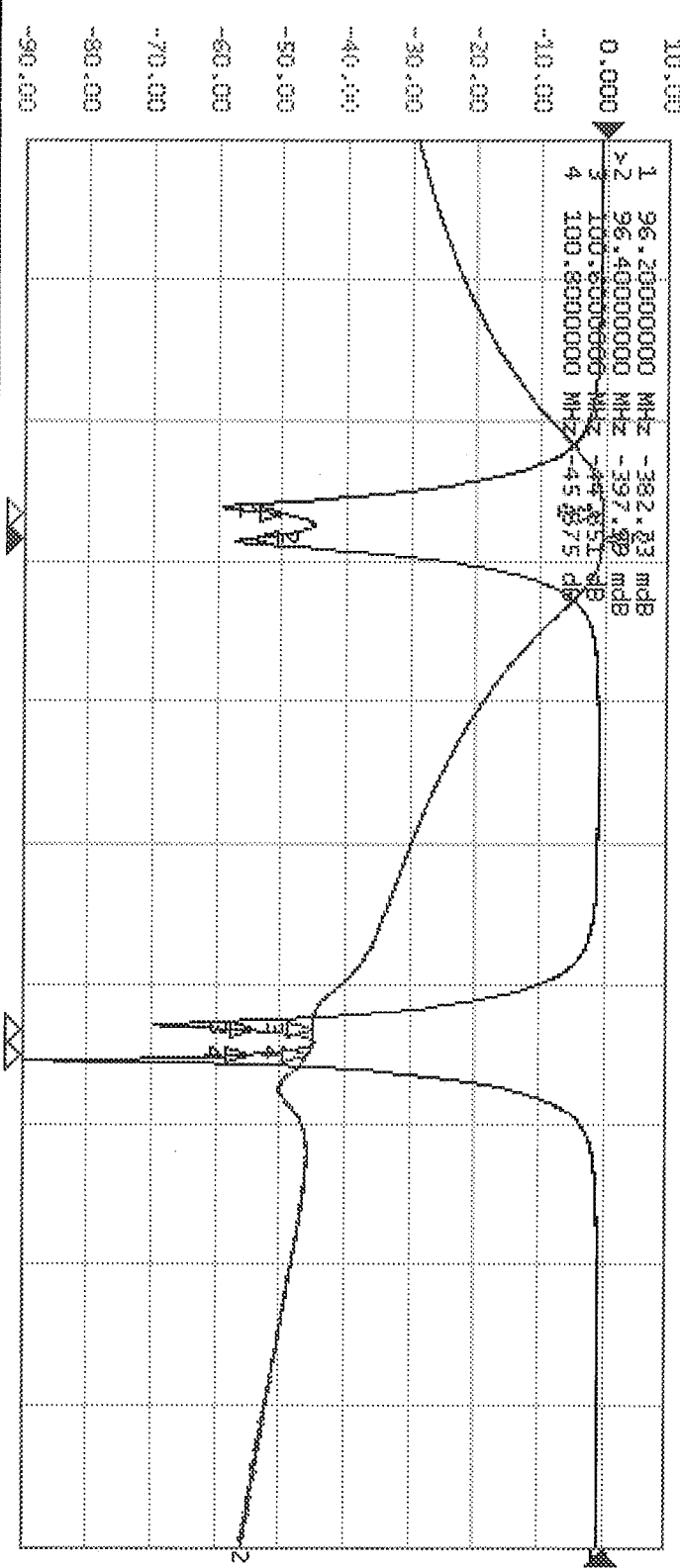
1-800-448-1666
 315-438-4700

Meas

2016-09-27 05:06

1 Active Ch1 Trace 2 Response 3 Stimulus 4 Mfr/Analysis 5 Instr State

Tr1 S11 Log Mag 5.000dB / Ref 0.000dB [F2]
 S21 Log Mag 10.000dB / Ref 0.000dB [F2]



Ch1 Tr1 S11	1	96.20000000	MHz	-24.917	dB
Ch1 Tr1 S11	2	96.40000000	MHz	-27.336	dB
Ch1 Tr1 S11	3	100.60000000	MHz	-27.017	dB
Ch1 Tr1 S11	4	100.80000000	MHz	-27.322	dB
Ch1 Tr2 S21	1	96.20000000	MHz	-382.73	dB
Ch1 Tr2 S21	>2	96.40000000	MHz	-397.99	dB
Ch1 Tr2 S21	3	100.60000000	MHz	-44.851	dB
Ch1 Tr2 S21	4	100.80000000	MHz	-45.875	dB



IN PROCESS TEST / FINAL TEST
 PN 19048
 DATE 9/27/16
 TESTED BY: Pat Burton
 PASS / FAIL