USA Type Approval Test Report

For

Alcatel 7390 LMDS Broadband Wireless

BaseStation (7390 BS) 31.225GHz US band B

With Telaxis Communications Corp. (Millitech) Radios

Test Dated: March 26 - April 5, 2001

Test Performed:

FCC Part 101 and 2

NOTICE

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ABSTRACT

This document provides the test procedure and test report used to fulfill the requirements of the Approvals Group personnel and the Wireless product designers to evaluate the LMDS Broadband Wireless System - BaseStation (7390 BS) during radio type approval testing.

The test data contained in this report is evidence of compliance to specified radio standards for the units described herein.

GLOSSARY

ATM	*Asynchronous Transfer Mode*
BER	*Bit Error Rate*. The ratio of incorrect bits to total number of bits transmitted.
BS	*BaseStation, consists of DBS & RBS*
CISPR	*International Special Committee on Radio Interference*
CPE	*Customer Premises Equipment*
CW	*Continuous Wave*
DBS	*Digital BaseStation*
EMC	*Electro Magnetic Compatibility*
EUT	*Equipment Under Test*
FCC	*Federal Communications Commission*
ITE	*Information Technology Equipment*
IBS	*Intermediate Frequency BaseStation*
MIB	*Management Information Base*. A collection of objects that can be accessed via a network management protocol.
NT	*Network Termination*
NTU	*Network Termination Unit*
ORU	*Outdoor Receiver Unit – RBS RX*
OTRU	*Outdoor Transmitter Receiver Unit - RT*
OTU	*Outdoor Transmitter Unit – RBS TX*
RF	*Radio Frequency*
RBS	*Radio BaseStation, consists of RBS TX (OTU) & RBS RX (ORU)*
RT	*Radio Terminal - OTRU*
TBD	*To Be Determined*
TS	*Terminal Station, consists of NT & RT*

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1 INTRODUCTION

1.1 Purpose

This document provides a test plan and report for Radio Type Approval testing of the "Alcatel 7390 LMDS Broadband Wireless System - BaseStation (7390 BS)" according to applicable FCC standards. This test report is to show compliance according to the FCC Part 101 requirements and FCC Part 2 methods for the Alcatel 7390 LMDS Broadband Wireless – **BaseStation (7390BS) from 31.225GHz to 31.3GHz** using ***Telaxis*** *Communication Corp. (Millitech)* ***Radios*** to achieve certification in the United States.

1.2 Scope

This document shall be used to evaluate "Alcatel 7390 LMDS Broadband Wireless – BaseStation (7390 BS) 31.225GHz" conformance to the test requirements contained in applicable FCC standards. The test results are documented according to the test methods as mentioned in the FCC standards, and are to be submitted with the FCC Form 731 "Application for Equipment Authorization. This report is to show compliance for the 31.225GHz to 31.3GHz band only.

2 EQUIPMENT UNDER TEST (EUT)

2.1 Equipment Description

The Broadband Wireless System is a network of Network Terminal Units connected to Base Stations via wireless links and the Base Stations are, in turn, connected to the ATM Backbone Network via wired or point to point wireless links. A Network Manager augments the network. The system consists of a TDM QPSK downstream and two to four TDMA upstream Differential Coded QPSK burst mode per IBS card.

The Intermediate Frequency BaseStation Cards (IBS) connects to external transmitters and receivers via coax cable. Typically there is one BS per cell and is connected to the Backbone Network usually via ANT or CPL. The BS is the hub that delivers and collects all the wireless traffic from and to the subscribers in the BS coverage area. The BS is also the linking point between the subscribers and the Backbone Network.

The 7390 card cages/shelves are housed in Alcatel 19" equipment racks.

The external transmitters and receivers is typically mast mounted or mounted on a flat surface of the building.

Indoor BTS Equipment

Figure 1 shows the components that are required for the DBS. The number of IBS required depends on the number of users supported. Today's system configuration can handle up to 4 IBS cards, operating with one RBS TX. The Base Station consists of DBS and RBS. The RBS consists of a transmitter (RBS TX) and a receiver (RBS RX).

The minimum set of components required to support the first user is:

- 1 7390 Peripheral Shelf
- 1 or 2 ANT Cards (for redundancy)
- 1 TNT (T1 or E1) cards
- 5 IBS cards
- 5 AMD cards
- 2 DC-DC converter power supply units
- 1 Fan Unit
- 2-Combiner/splitter unit
- 1 Transmitter (RBS TX)
- 1 Receiver (RBS RX)
- External -48 v power supply for the transmitter, receiver and BS shelf
- 2 90° sectored antenna (one for transmit, one for receive)

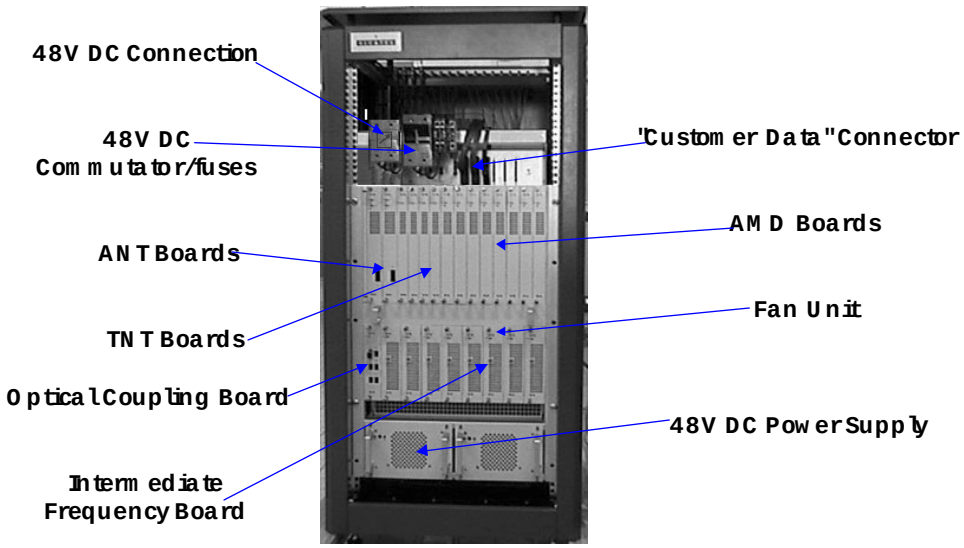


Figure 1: Digital Base Station

External RF Equipment

The IBS cards are connected to a Combiner/Splitter complex, which is used to interface to the mast-mounted transmitter(s) and receiver(s). This equipment is developed/provided by an OEM supplier. The OEM supplier for the RBS RX and RBS TX that has been tested and mentioned within this report is:

Telaxis Communications Corporation (name changed from Millitech)
20 Industrial Drive east
P.O Box 109
South Deerfield Massachusetts 01373-0109, USA

The base station radio equipment is located on pole mounts such that each sector has dedicated transmitters and receivers. The transmitters and receivers are mounted directly onto their respective sector antennas as shown in Figure 2 below.

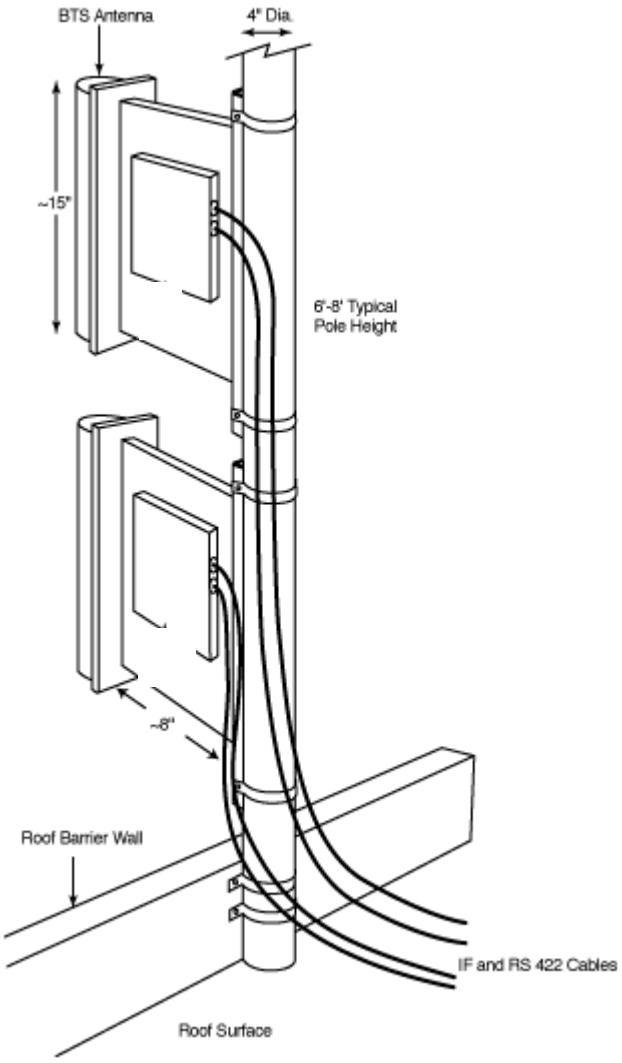


Figure 2 Typical Multi transmitter or receiver installation (vertical stacking)

2.2 EUT Configuration

Model Number	**Name and Description**	**S/N**
3CC 09743 ADAA	ANT	CU 004013096
3CC 09744 ACAA	TNT T1 – 100 Ohm	CU 002604242
3CC 09744 ABAA	TNT E1 – 120 Ohm	CU 004005318
3CC 11656 AAAA	AMD	CU 005203045
3CC 11656 AAAA	AMD	CU 005203041
3CC 11656 AAAA	AMD	CU 003700911
3CC 11656 AAAA	AMD	CU 010701498

3CC 11656 AAAA	AMD	CU 010701492
3CC 11656 AAAA	AMD	CU 010701563
3CC 09915 ABAA	CPL	CU 003905249
3CC 11815 AAAA	IBS	CU 003907780
3CC 11815 AAAA	IBS	CU 010304703
3CC 11815 AAAA	IBS	CU 010704576
3CC 11815 AAAA	IBS	CU 010704888
3CC 11815 AAAA	IBS	CU 010704563
3CC 11815 AAAA	IBS	CU 003907776
1AF 01899 AAAA	Power Supply Unit	00001558
1AF 01899 AAAA	Power Supply Unit	00001554
3CC 09908 AAAA	DBS	CU 002808702
PS6-A19 (9832)	Pulsar Microwave Combiner/Splitter	None
PS6-A19 (9832)	Pulsar Microwave Combiner/Splitter	None
90-4568-03	RBS TX (TX) BaseStation Telaxis (Millitech)	C 002028259
90-4567-03	RBS RX (RX) BaseStation Telaxis (Millitech)	993370412
---	Bias-Tee	none
3CC 09778 AAAA	Network Termination	CU 004880177
90-6626-03	RT Transceiver / Antenna Unit	993422090

2.3 EUT Cables

Part Number	**Cable Type**	**Length (m)**	**Shield**	**Connector Hoods**
90-2296-04	ISL Cable Optical	10.0	none	none
N/A	RJ45 shielded cable	5.0	Foil	metalized
N/A	coaxial cable	2.0	braid	SMA

2.4 System Test Configuration

2.4.1 Justification

The system was configured with 4 IBS cards with each carrier having a bandwidth (BW) of 14MHz, which is the maximum the RBS TX (TX) BaseStation radio can handle. The TX IF modulated carriers are combined together and fed to the RBS TX to achieve a maximum RF level of $\geq$ +17dBm per carrier for a total output power of +23dBm max. Only one carrier was used to operate with the OTRU (RT) and NT to achieve traffic. Operating with the maximum carriers and widest bandwidth will provide the worst condition based on intermodulation, spurious and spectral re-growth.

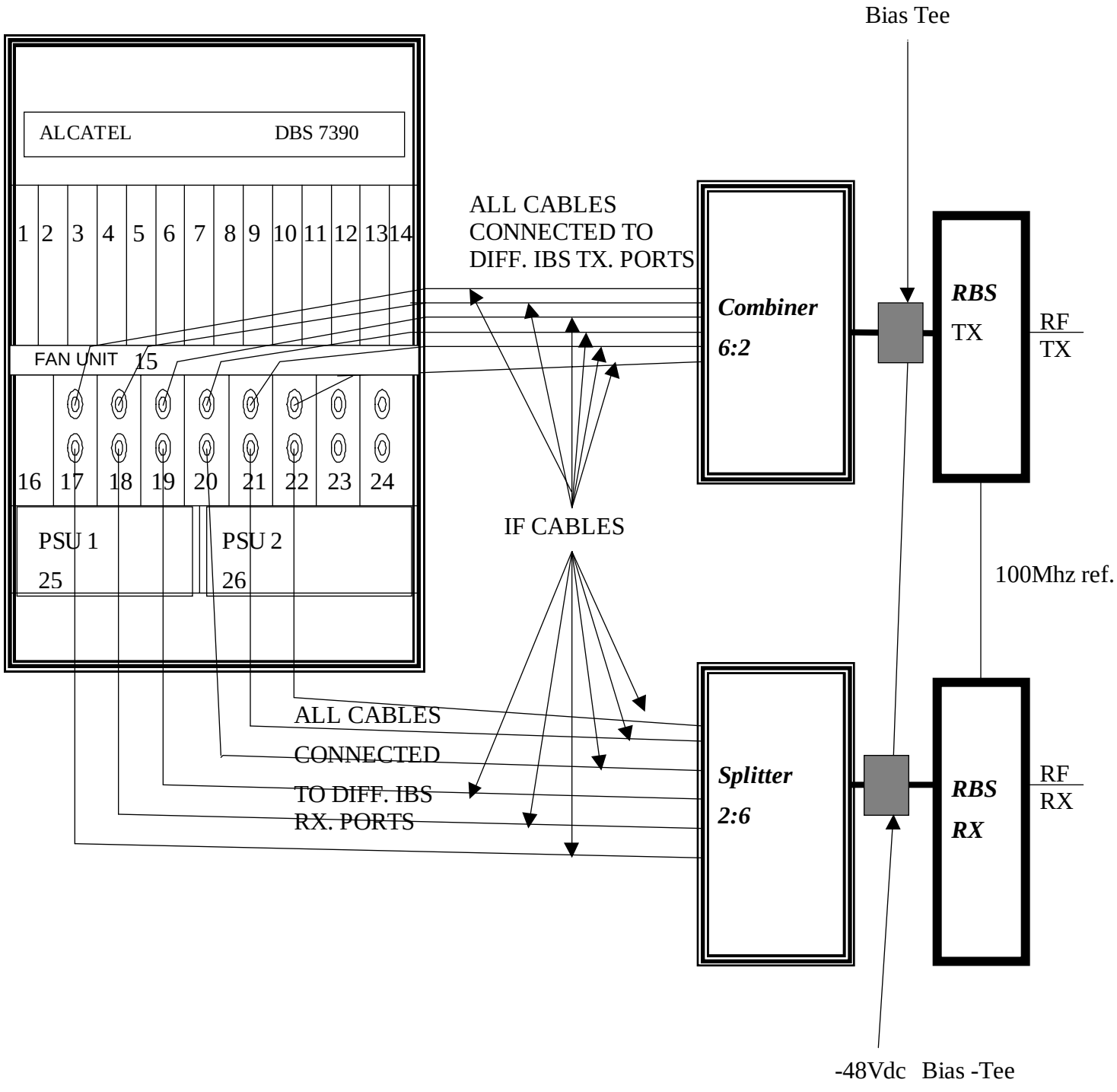
For the frequency stability measurements, an external source was used to provide an IF CW to the radio units. Only the RBS TX and RBS RX were placed in the temperature chamber during this specific test due to the 7390 shelf will usually be in a temperature-controlled environment, but meets all internal performance requirements between the temperatures of -5^{o}C to $+55^{o}$C.

For all tests, the EUT was configured to simulate a typical application. The testing was conducted using only cables recommended for use with the EUT by Alcatel. Attention was made to follow any recommended chassis grounding, cable routing, etc. in the Alcatel Technical Practices.

The EUT was placed according to the required set ups detailed in the test specifications and methods within this document for each type of radio type approval test (FCC Part 101 and 2).

The test result for conducted and radiated spurious were performed by an external lab (NEMKO Canada Inc., Ottawa) and complied together in this test report. The measurements were taken according to the instructions mentioned in the FCC Part 2 and Part 101.

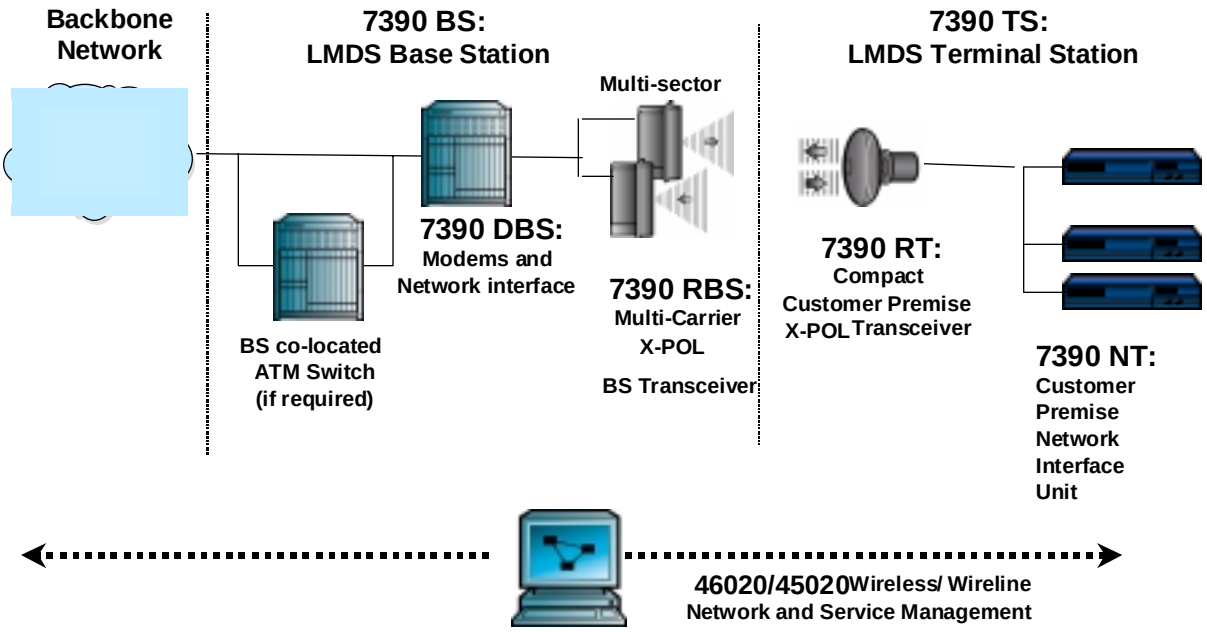
Figure 3 Diagram of System Configuration



2.4.2 Functional Interconnect

Figure 4 Block Diagram of Functional Interconnect

LMDS 7390 Broadband Wireless Components



Component

BS	**TS**
DBS consists of IBS, AMD, TNT,	NT **(**T1/E1 Services Card)
ANT & Power Supply Units.	Surge Arrestor
Combiner, Splitter, Bias Tee, Surge Arrestor	RT (OTRU)
RBS (RBS TX, RBS RX)	12” Antenna
90 Degree Sectored Antennae	

3 REGULATORY COMPLIANCE SUMMARY

This report has been read and approved by the appropriate departments responsible for its implementation. All changes found necessary for compliance will be incorporated into production. The EUT as configured in this report meets the requirements indicated below. The results of these tests apply only to items tested and provide an indication of hardware quality during operation and maintenance in their intended environment.

Declaration of Compliance

" This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. . Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by
Alcatel Canada Inc., 600 March Road, Kanata, Ontario, K2K2E6. and Nemko Canada Inc., 3325 River Road RR#5, Ottawa, Ontario, K1V 1H2 "

Standard	**Measurement Type**	**Method/ Limit**	**Pass/Fail Criteria**
FCC Part 101 & FCC Part 2 (10-1-00 edition)	Output Power	Section 2.1046 / Section 101.113	Pass
	Spectrum Mask (Occupied Bandwidth)	Section 2.1049 / Section 101.111(a)(2)(ii)	Pass
	Radiated Spurious	Section 2.1053 & 2.1057 / Section 101.111(a)(2)(ii)	Pass
	Conducted Spurious	Section 2.1051 & 2.1057 / Section 101.111(a)(2)(ii)	Pass
	Frequency Stability	Section 2.1055 / Section 101.107	Pass

Regulatory Compliance Requirements

Daxesh Thakker
Wireless Approvals Specialist

Date July, 12 2001

4 TEST RESULTS

4.1 RF Output Power

4.1.1 Test Specification

Standard	FCC Part 101 section 101.113 (edition 10-1-00)
Method	FCC Part2 section 2.1046 (edition 10-1-00)
Limits	Maximum EIRP of +30dBW

4.1.2 Test Location

Test Laboratory	Alcatel Canada Inc., Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Daxesh Thakker, Wireless Approvals Specialist

4.1.3 Tested by

Test Engineer	Daxesh Thakker, Wireless Approvals Specialist
Company	Alcatel Canada Inc.

4.1.4 Test Procedure

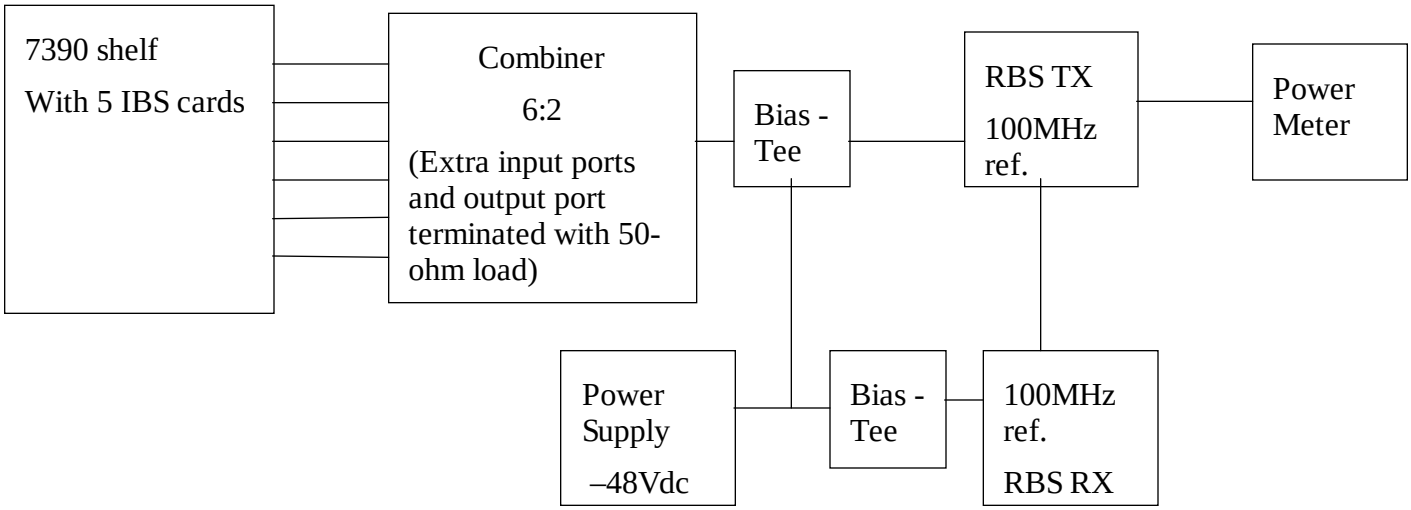
The output power was adjusted to have each carrier set at approximately $\geq$+14.5dBm, giving a total output power at the antenna port of +23dBm maximum. The transmitter can support following options

(a) 4 carriers, each with a BW of 14MHz & 16.9dBm power or

(b) 3 carriers, out of which 2 carriers with a BW of 28MHz & 17dBm power and 1 carrier with a BW of 14MHz & 17dBm power or

(c) 2 Carriers, each with a BW of 28MHz & 19dBm power.

Therefore, the worst condition was tested, using 4 carriers each set at a BW of 14MHz which is the maximum configuration this power amplifier will be operating. All power measurements were taken in normal operation (modulated).



RF Power Output Test Setup

(1) Calibrate power meter to the proper frequency of transmission.

(2) Enable RBS TX and add the appropriate attenuation at the antenna port to avoid damage to the power meter.

(3) Measure output power at the low and high end of the band of operation of the RBS TX. Measure the attenuator and compensate with an offset.

4.1.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Power Meter	Hewlett Packard/ Model EPM-441A Tool # 8067	N/A	Last: 00/12/03 Due: 01/12/03
Power Sensor	Hewlett Packard/ Model 8487A Tool # 10419	-30dBm to +20dBm	Last: 00/08/23 Due: 01/08/23

4.1.6 Results - Test Data

Unit under Test	Frequency Band (MHz)	Maximum EIRP Level
RBS TX Telaxis (Millitech) BaseStation Transmitter	31,225 to 31,300	+14dBW maximum (4 carriers) +8dBW maximum per carrier

Antenna Gain of 90 degree sector antenna: 21dBi

Each carrier set at +17dBm (-13dBW), with a total of +23dBm (-7dBW) at the antenna port

Conversion from dBm to dBW: +17dBm - 30dB= -13dBW

4.2 Spectrum Mask

4.2.1 Test Specification

Standard	FCC Part 101 section 101.111(a)(2)(ii) (edition 10-1-00)
Method	FCC Part 2 section 2.1049 (edition 10-1-00)
Limits	A= 11+0.4(P-50) +10logB (B= 75MHz)

4.2.2 Test Location

Test Laboratory	Alcatel Canada Inc., Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Daxesh Thakker, Wireless Approvals Specialist

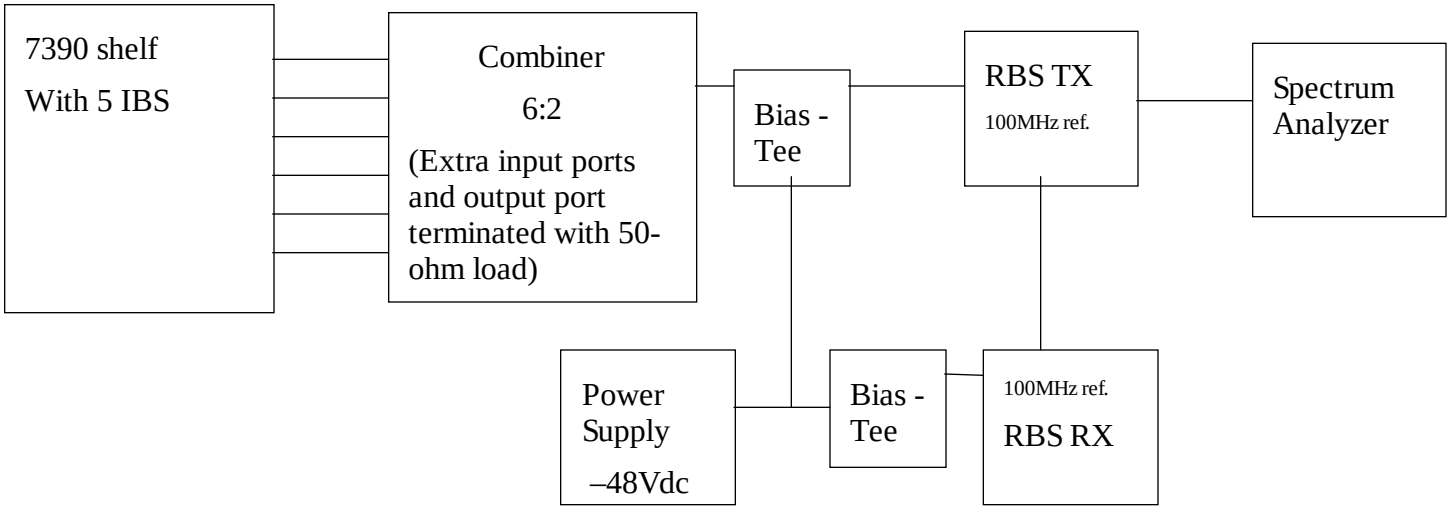
4.2.3 Tested by

Test Engineer	Daxesh Thakker, Wireless Approvals Specialist
Company	Alcatel Canada Inc.

4.2.4 Test Procedure

The measurements were done with 4 IBS cards inserted in the 7390 shelf and the 6:2 Combiner. Each carrier was adjusted at the RF output as per the following table and gave a measured total power at the antenna port as mentioned in the same table.

Sr.No.	No. of Carriers	B/W of each carrier (MHz)	Each Carrier power (dBm)	Total power at the antenna port (dBm)
01	4	14	16.9	22.9
02	3	1 carrier is 14 & 2 carriers are 28	17	21.8
03	2	28	19	22



Spectrum Mask measurement setup

(1) Set the settings of a spectrum analyzer as follows:

Center frequency	(i) 4 x 14MHz First carrier set at 31,232MHz, Second at 31,246MHz, Third at 31,260MHz and Fourth at 31,274MHz- total 4 carriers & considering from the lower end of the band. First carrier set at 31,251MHz, Second at 31,265MHz, Third at 31,279MHz and Fourth at 31,293MHz- total 4 carriers & considering from the higher end of the band. (ii) 1x 14MHz & 2 x 28MHz First carrier set at 31,239MHz (28MHz B/W) , Second carrier set at 31,267MHz (28MHz B/W) and Last carrier set at 31,288MHz (14MHz B/W)- total 3 carriers & considering from the lower end of the band First carrier set at 31,237MHz (14MHz B/W) , Second carrier set at 31,258MHz (28MHz B/W) and Last carrier set at 31,286MHz (28MHz B/W)- total 3 carriers & considering from the higher end of the band (iii) 2 x 28MHz First carrier set at 31,239MHz and Second at 31,267MHz – total 2 carriers & considering from the lower end of the band. First carrier set at 31,258MHz and Second at 31,286MHz - total 2 carriers & considering from the higher end of the band.
Sweeping time	Automatic

Resolution bandwidth	1 MHz
Video bandwidth	≥ 300 kHz (video averaging of display is allowed)
Y scale	10 dB/Div

(2)Connect spectrum analyzer at the antenna port and record the spectrum shape. Perform measurements at the edge of the frequency block with all carriers grouped side by side near the higher end of the assigned band. Repeat measurements at the lower end of the assigned band or to the lowest frequency the transmitter can operate at.

(3) Overlay the FCC mask and verify that it does not exceed the limits.

4.2.5 Test Equipment and Support Equipment

Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	Hewlett Packard/ Model 8563/ S/N #3804 A 00869	9kHz to 40GHz	Last: 00/12/21 Due: 01/12/21

4.2.6 Results - Test Data

Downlink frequency range: 31,225 to 31,300MHz

The highest frequency the last carrier will operate is at 31,286MHz with 28MHz carriers.

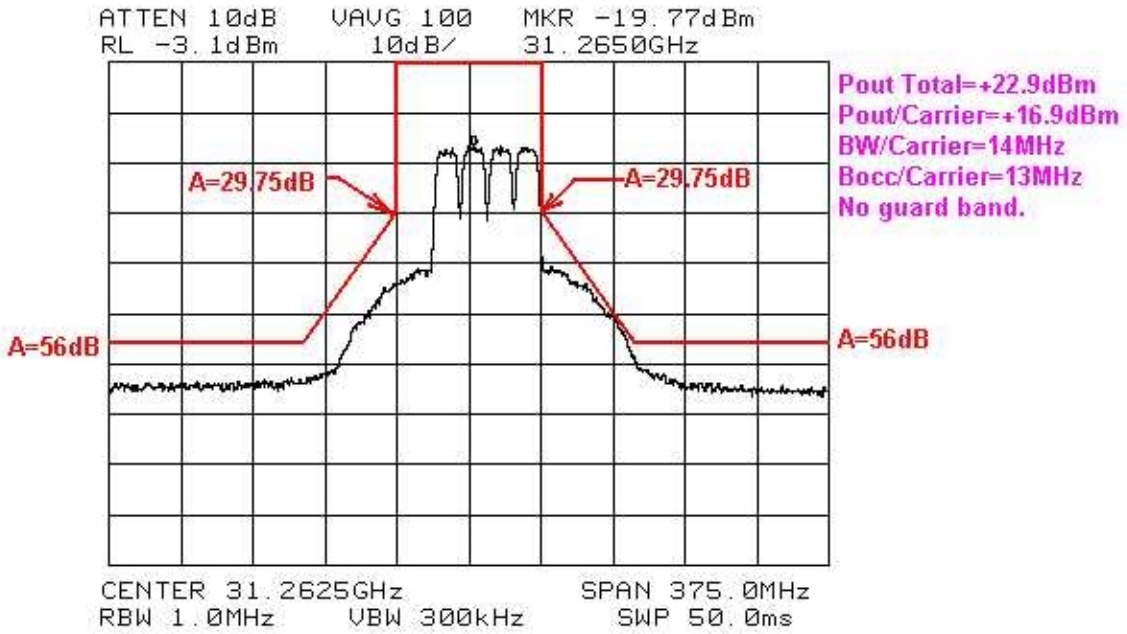
The lowest frequency the first carrier will operate at is 31,239MHz with 28MHz carriers

The highest frequency the last carrier will operate is at 31,293MHz with 14MHz carriers.

The lowest frequency the first carrier will operate at is 31,232MHz with 14MHz carriers

Total loss of a metallic armour cable and 2 attanuators connected at output Tx. Port of RBS TX
= 26dB

Output power level after 2 attanuators & a cable = -3.1dBm… in case of 4 x 14MHz carriers
= -4.2dBm… in case of 2 x 28MHz &
1 x 14MHz carriers
= -4.0dBm… in case of 2 x 28MHz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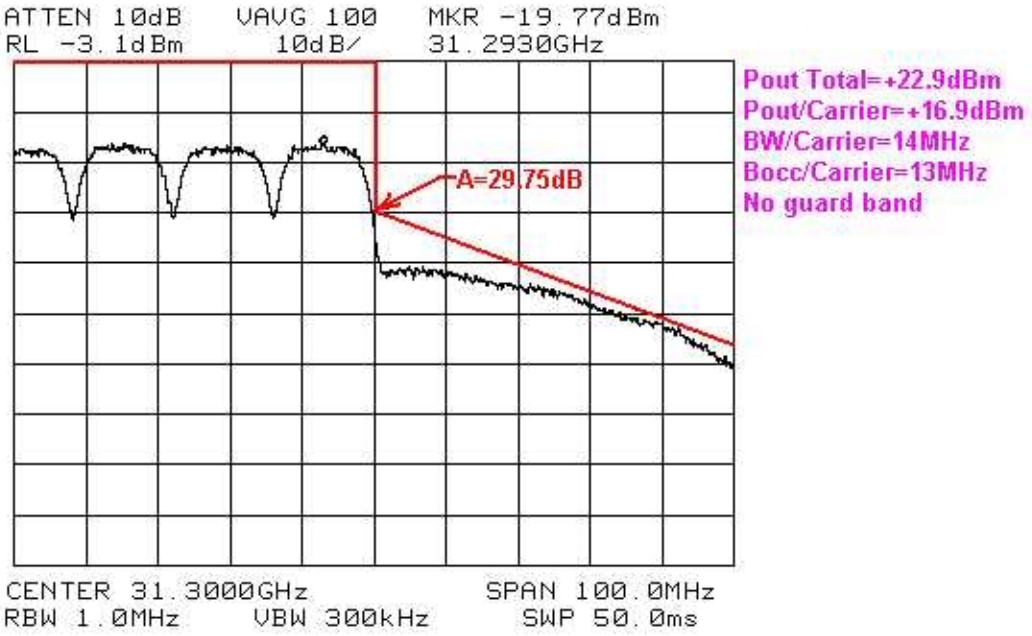
RL -3.1dBm
VAVG 100
10dB/
MKR -19.77dBm
31.2650GHz
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
Bocc/Carrier=13MHz
No guard band.
A=29.75dB
A=29.75dB
A=56dB
A=56dB
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms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RL -3.1dBm
VAVG 100
10dB/
MKR -19.77dBm
31.2930GHz
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
Bocc/Carrier=13MHz
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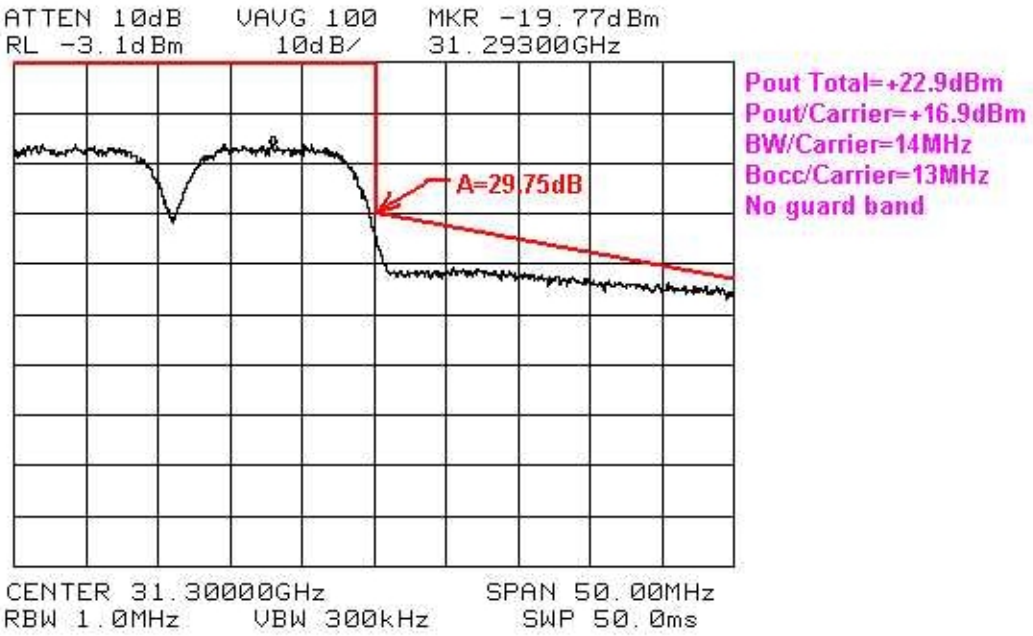
A=29.75dB
CENTER 31.3000GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms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VAVG 100
10dB/
MKR -19.77dBm
31.29300GHz
A=29.75dB
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
Bocc/Carrier=13MHz
No guard band
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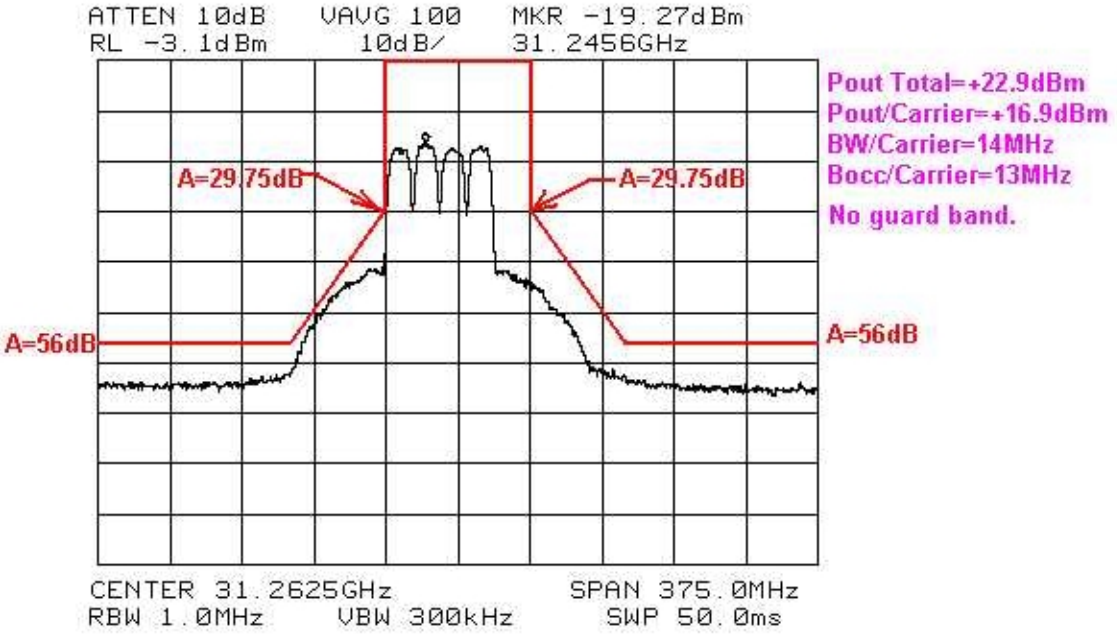
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms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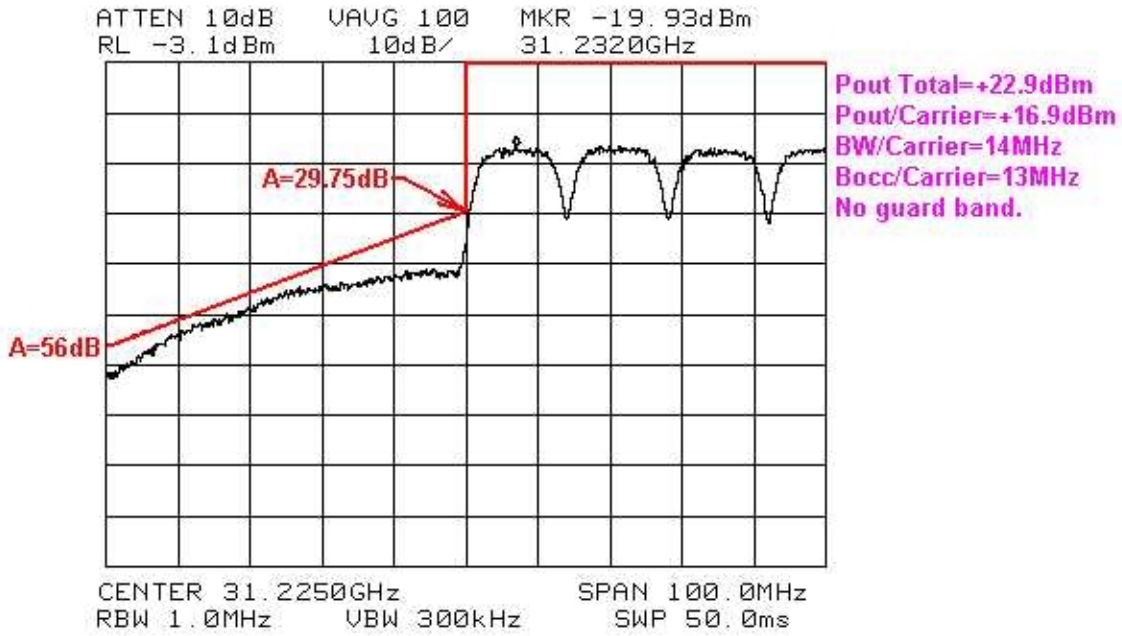
RL -3.1dBm
VAVG 100
10dB/
MKR -19.27dBm
31.2456GHz
A=29.75dB
A=29.75dB
A=56dB
A=56dB
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
Bocc/Carrier=13MHz
No guard band.
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms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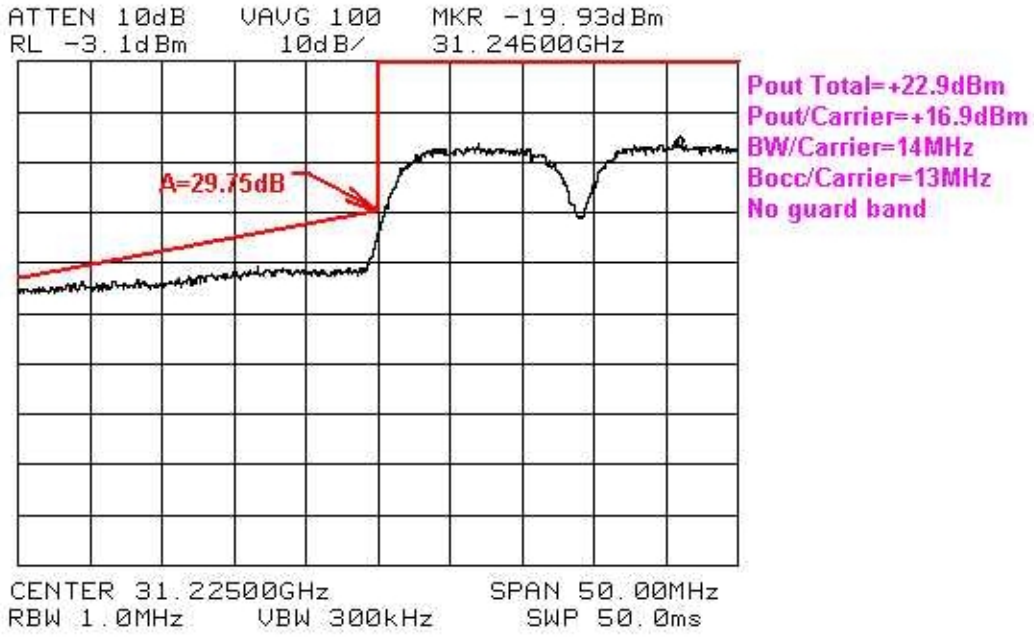
RL -3.1dBm
VAVG 100
10dB/
MKR -19.93dBm
31.2320GHz
A=29.75dB
A=56dB
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
Bocc/Carrier=13MHz
No guard band.
CENTER 31.2250GHz
RBW 1.0MHz
VBW 300kHz
SPAN 100.0MHz
SWP 50.0ms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RL -3.1dBm
VAVG 100
10dB/
MKR -19.93dBm
31.24600GHz
A=29.75dB
Pout Total=+22.9dBm
Pout/Carrier=+16.9dBm
BW/Carrier=14MHz
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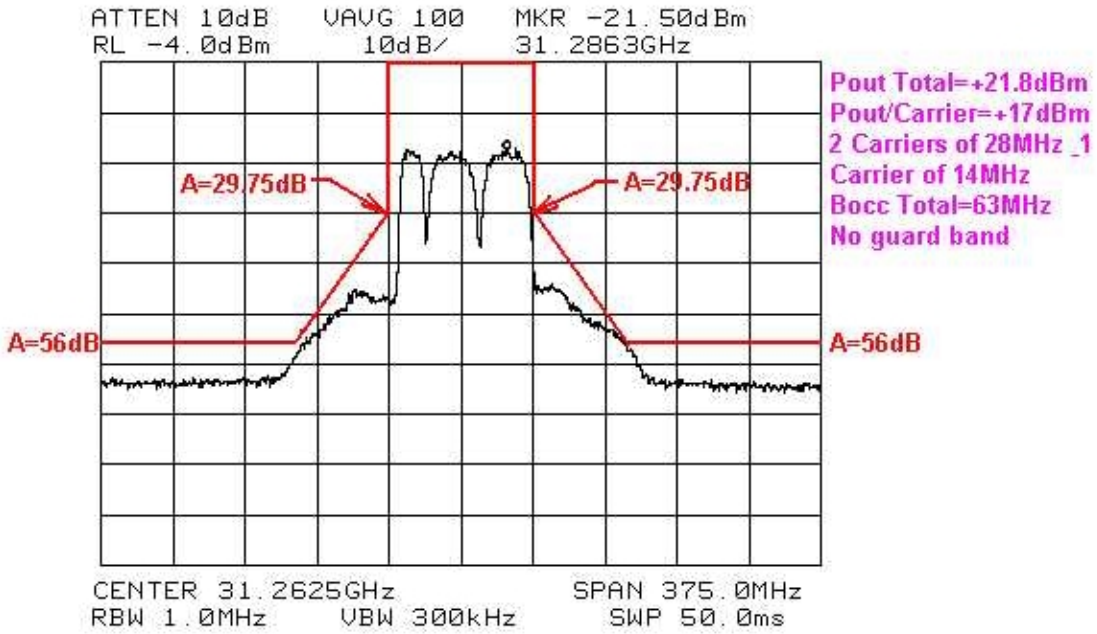
No guard band
CENTER 31.22500GHz
RBW 1.0MHz
VBW 300kHz
SPAN 50.00MHz
SWP 50.0ms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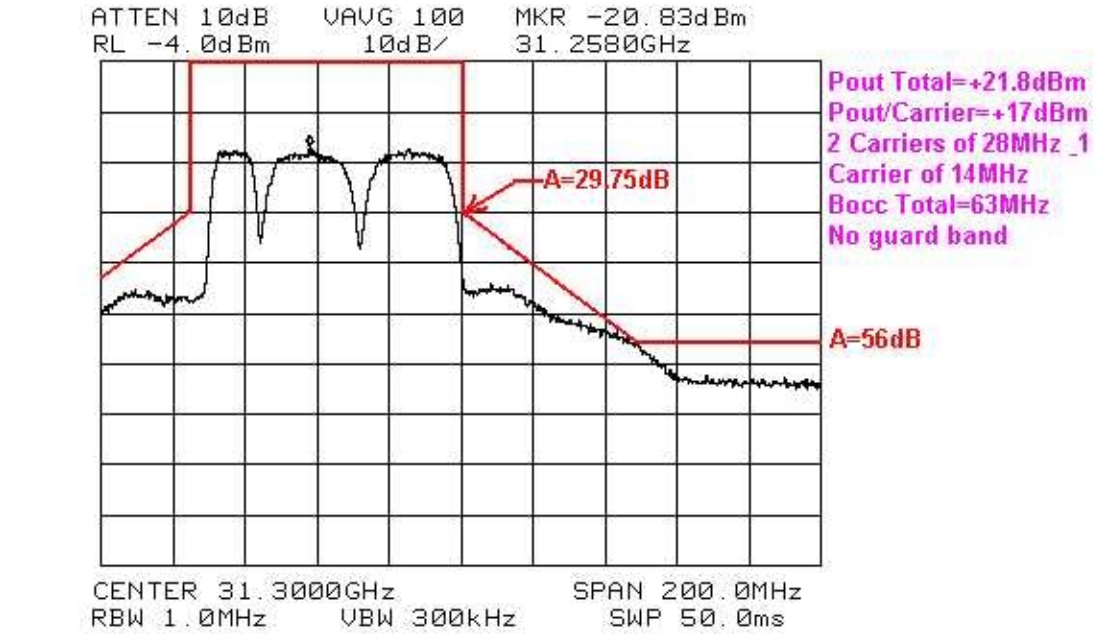
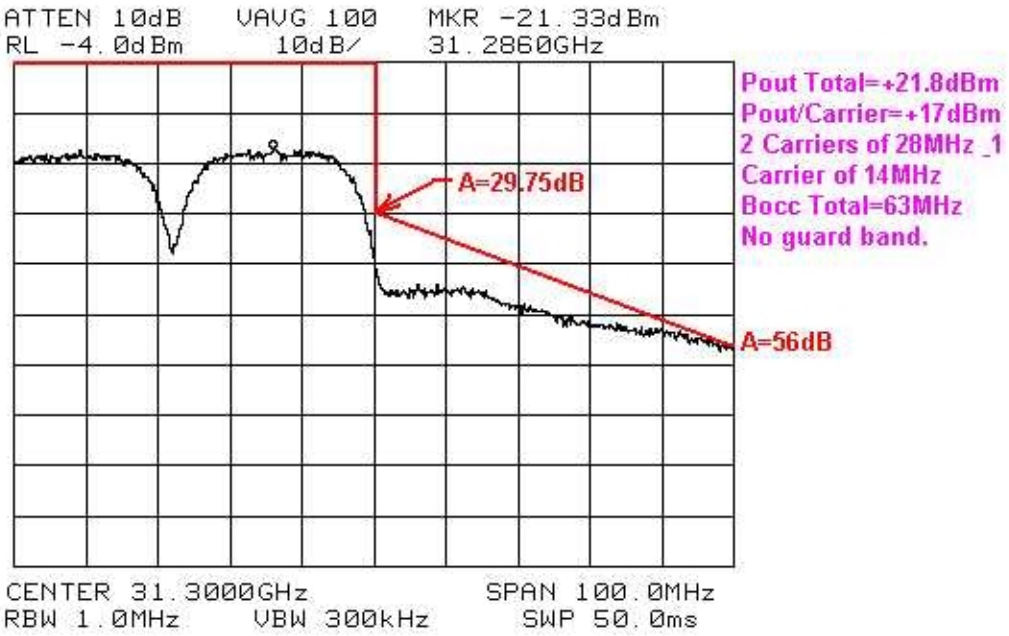
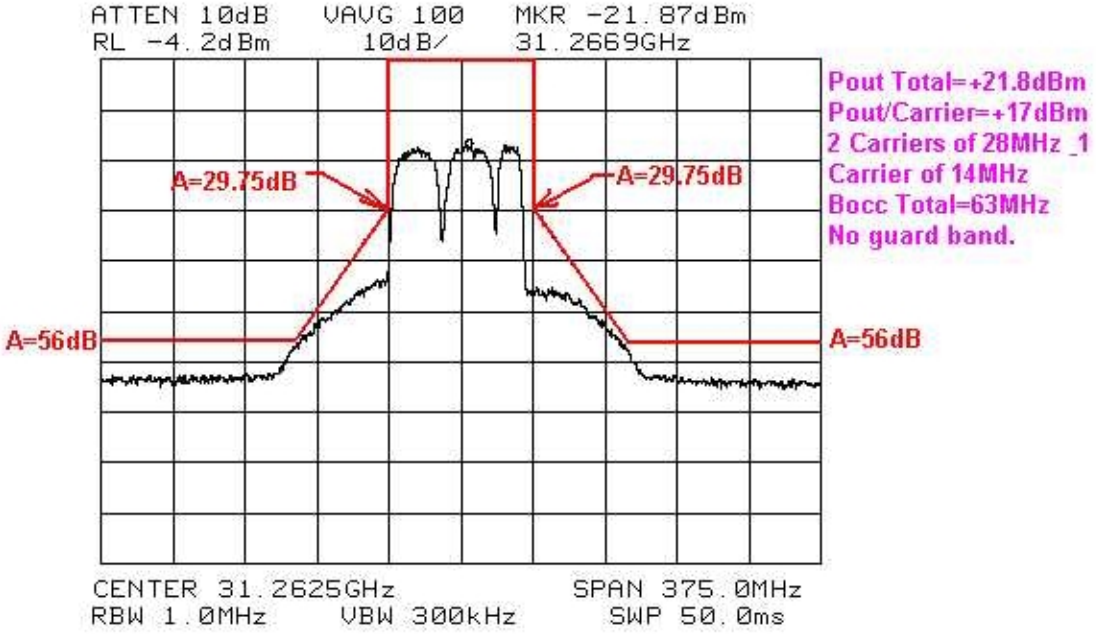
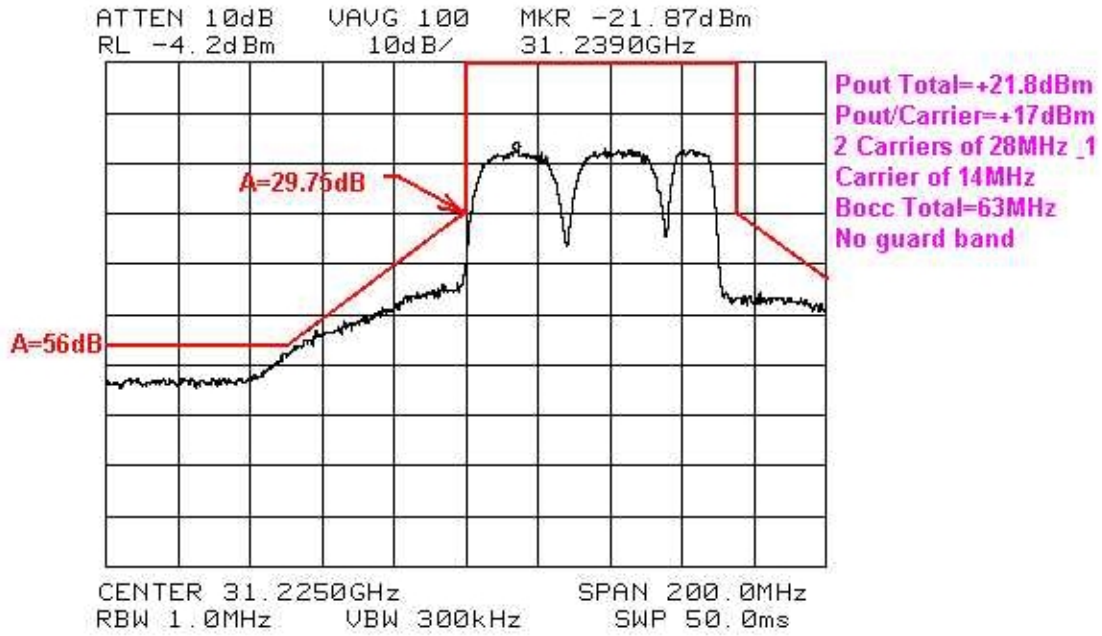
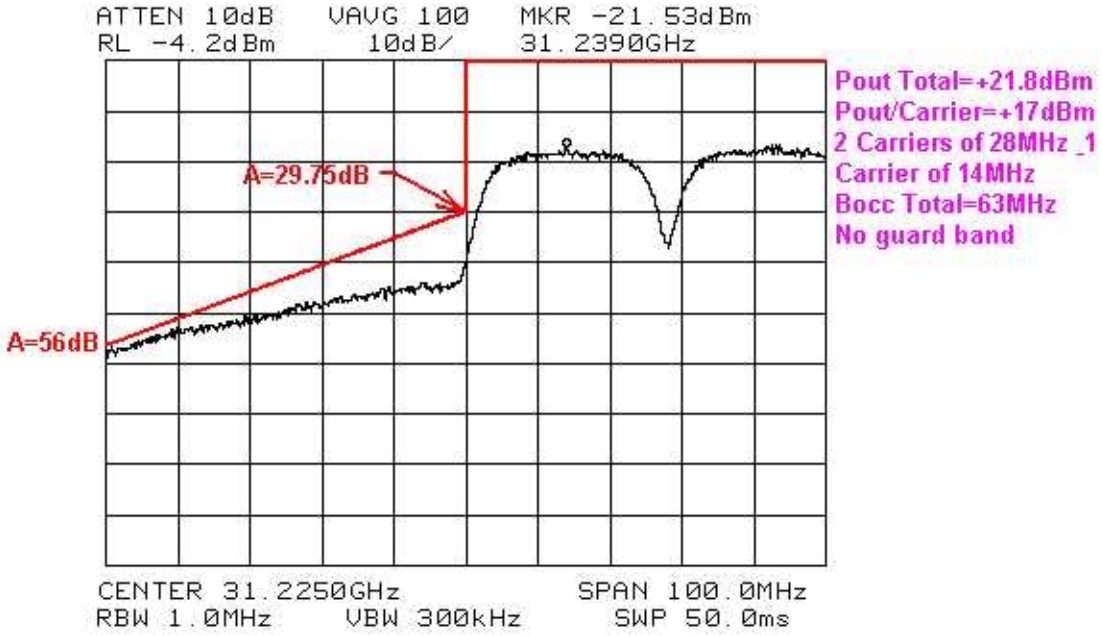
RL -4.0dBm
VAVG 100
10dB/
MKR -21.50dBm
31.2863GHz
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band
A=29.75dB
A=29.75dB
A=56dB
A=56dB
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms

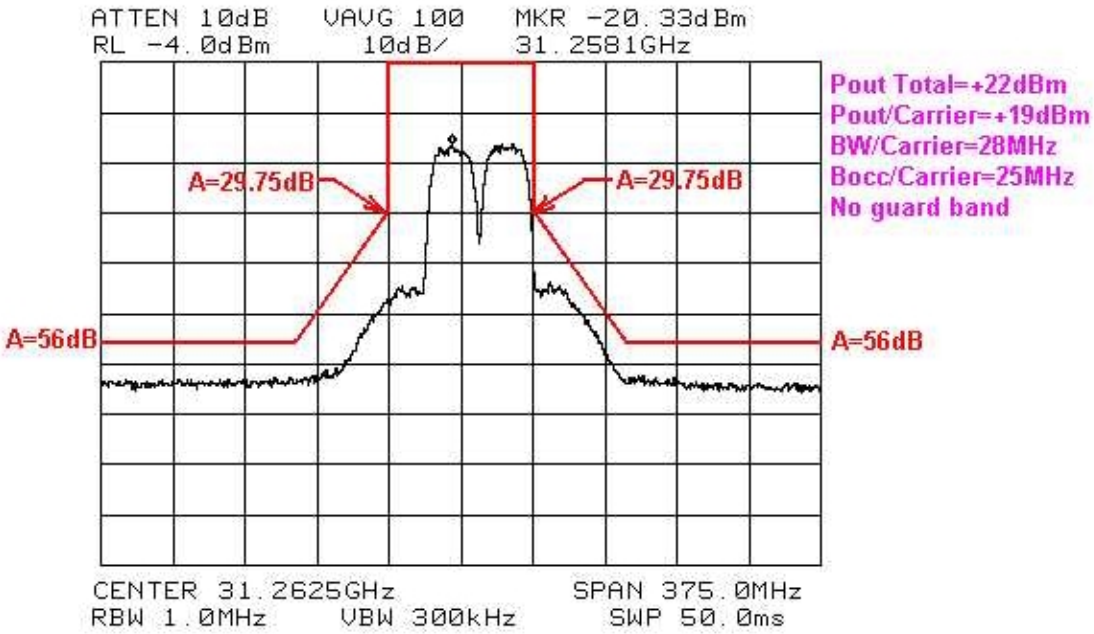

ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -20.83dBm
31.2580GHz
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band
A=29.75dB
A=56dB
CENTER 31.3000GHz
SPAN 200.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms

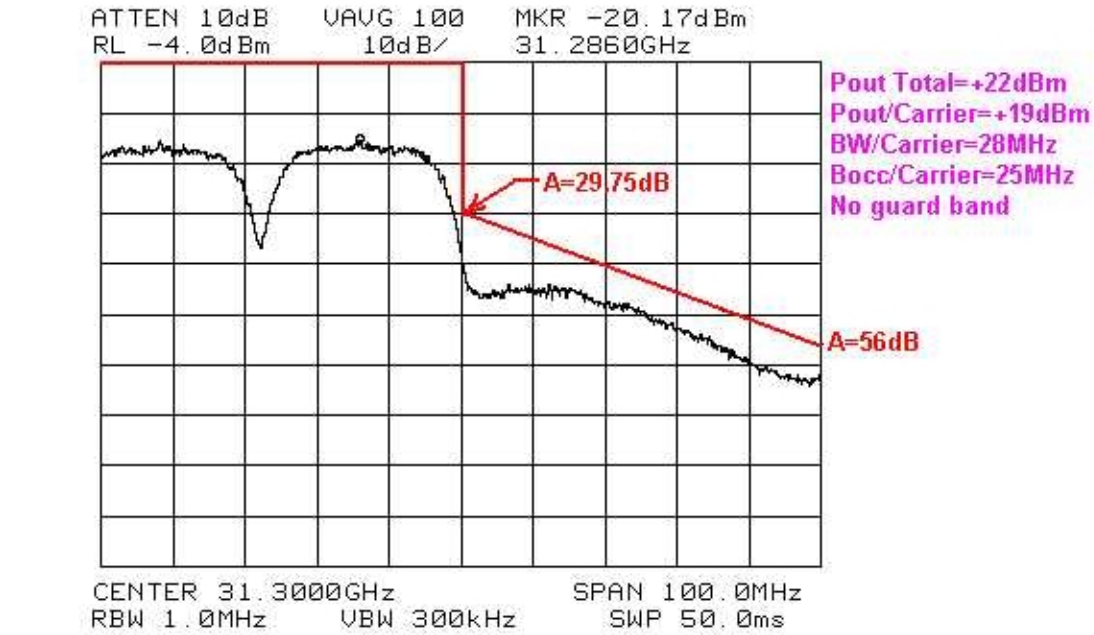

ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -21.33dBm
31.2860GHz
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band.
A=29.75dB
A=56dB
CENTER 31.3000GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms

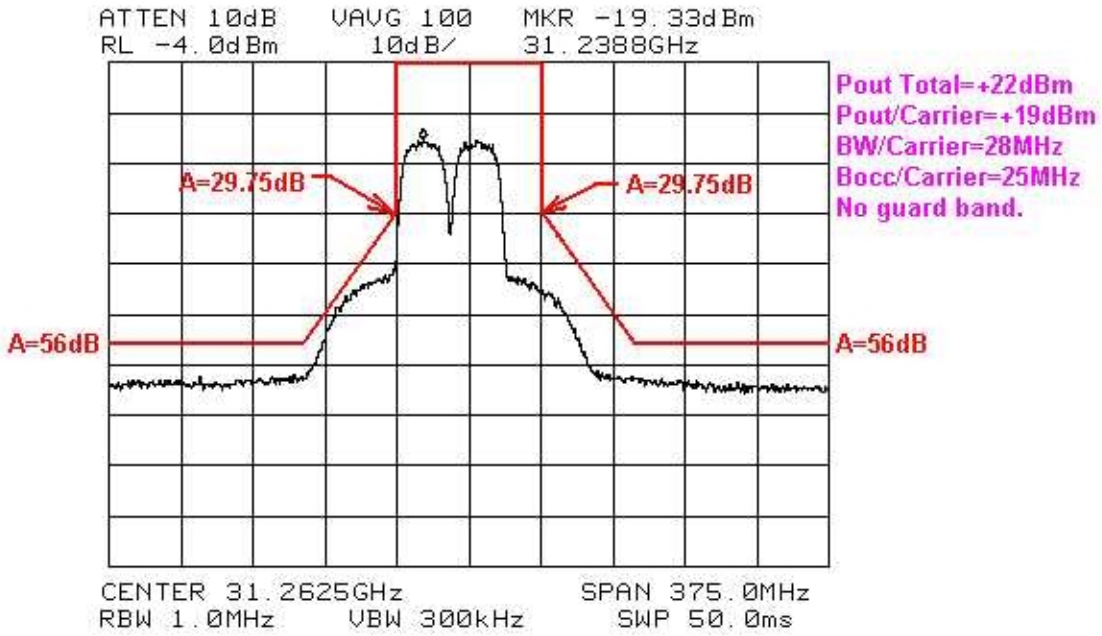

ATTEN 10dB
RL -4.2dBm
VAVG 100
10dB/
MKR -21.87dBm
31.2669GHz
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band.
A=29.75dB
A=29.75dB
A=56dB
A=56dB
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms

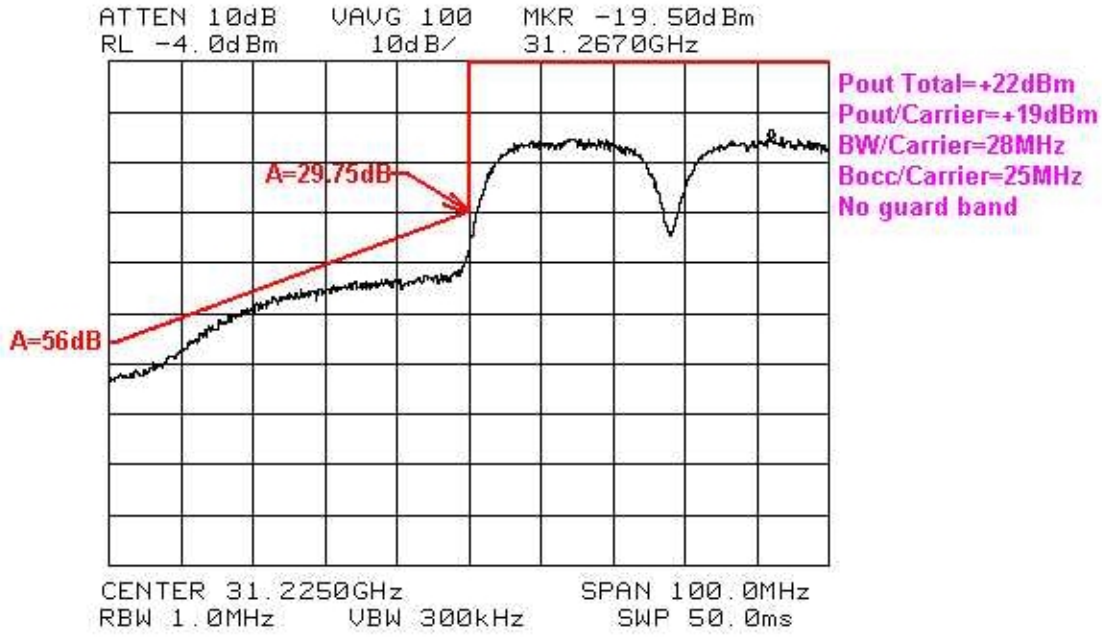

ATTEN 10dB
RL -4.2dBm
VAVG 100
10dB/
MKR -21.87dBm
31.2390GHz
A=29.75dB
A=56dB
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band
CENTER 31.2250GHz
SPAN 200.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -4.2dBm
VAVG 100
10dB/
MKR -21.53dBm
31.2390GHz
A=29.75dB
A=56dB
Pout Total=+21.8dBm
Pout/Carrier=+17dBm
2 Carriers of 28MHz _1
Carrier of 14MHz
Bocc Total=63MHz
No guard band
CENTER 31.2250GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -20.33dBm
31.2581GHz
Pout Total=+22dBm
Pout/Carrier=+19dBm
BW/Carrier=28MHz
Bocc/Carrier=25MHz
No guard band
A=29.75dB
A=29.75dB
A=56dB
A=56dB
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -20.17dBm
31.2860GHz
Pout Total=+22dBm
Pout/Carrier=+19dBm
BW/Carrier=28MHz
Bocc/Carrier=25MHz
No guard band
A=29.75dB
A=56dB
CENTER 31.3000GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -19.33dBm
31.2388GHz
Pout Total=+22dBm
Pout/Carrier=+19dBm
BW/Carrier=28MHz
Bocc/Carrier=25MHz
No guard band.
A=29.75dB
A=29.75dB
A=56dB
A=56dB
CENTER 31.2625GHz
SPAN 375.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -4.0dBm
VAVG 100
10dB/
MKR -19.50dBm
31.2670GHz
Pout Total=+22dBm
Pout/Carrier=+19dBm
BW/Carrier=28MHz
Bocc/Carrier=25MHz
No guard band
A=29.75dB
A=56dB
CENTER 31.2250GHz
SPAN 100.0MHz
RBW 1.0MHz
VBW 300kHz
SWP 50.0ms

4.3 Radiated Spurious

4.3.1 Test Specification

Standard	FCC Part 101 section 101.111(a)(2)(iii) (edition 10-1-00)
Limit	43 +10log Pmean

4.3.2 Test Location

Test Laboratory	Nemko Canada Inc.
Address	3325 River Road R.R.5 Ottawa, Ontario K1V 1H2
Prime Contact	Russell Grant, Manager Wireless Group

4.3.3 Tested by

Test Engineer	Glen Westwell
Company	Nemko Canada Inc.

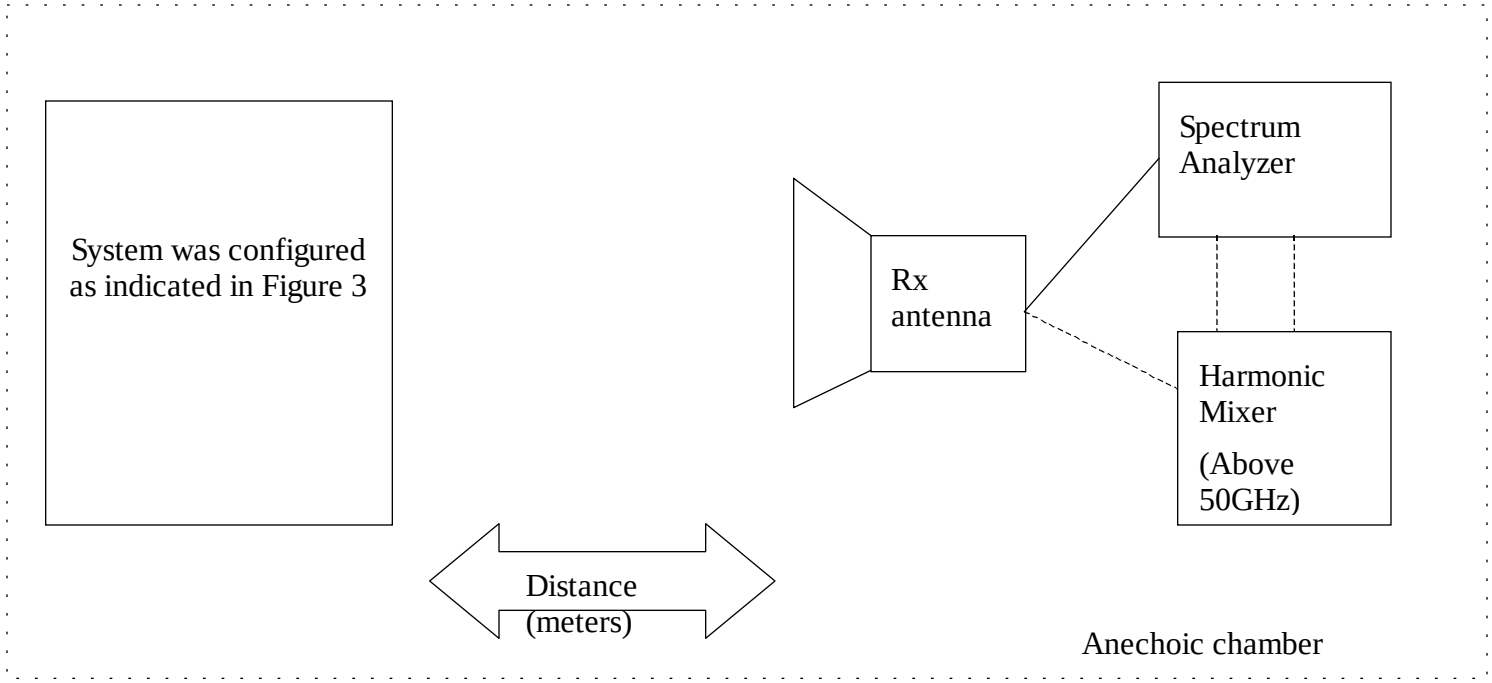
4.3.4 Test Procedure

The measurements were done with 4 IBS cards inserted in the 7390 shelf and the 6:2 Combiner. Each carrier was adjusted at the RF output to approximately $\geq$+17dBm, which gave a measured total power at the antenna port of +23dBm maximum.

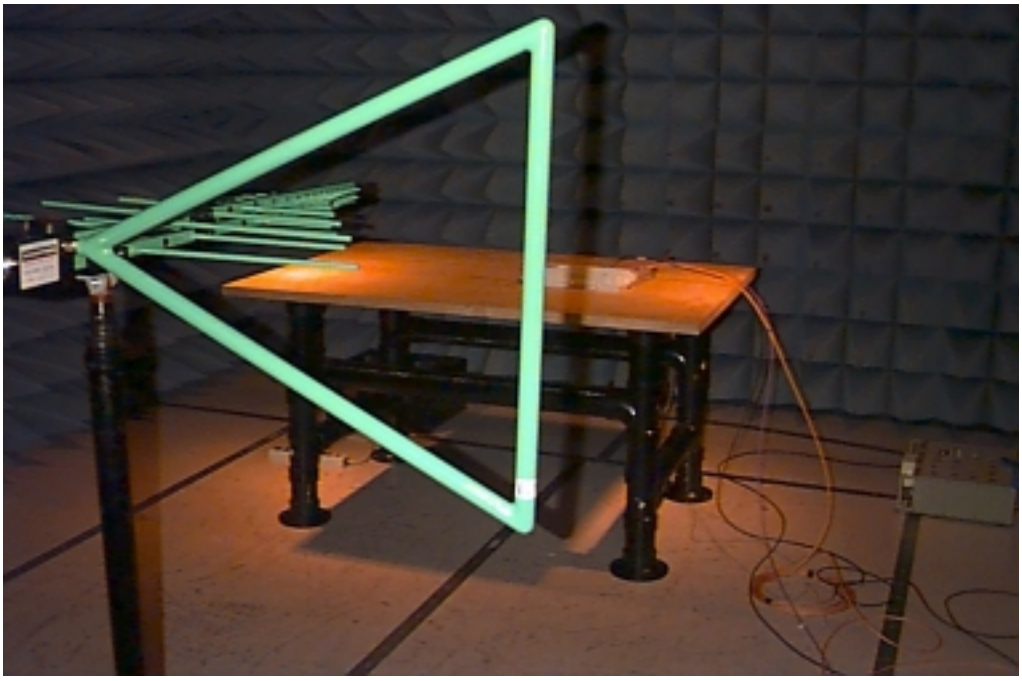
The reference level was measured with the vertical polarized 90-degree sector antenna that had a gain of 21dBi. Once the reference level was defined, the final measurements were taken with the RBS TX port terminated with a 50Ω load.

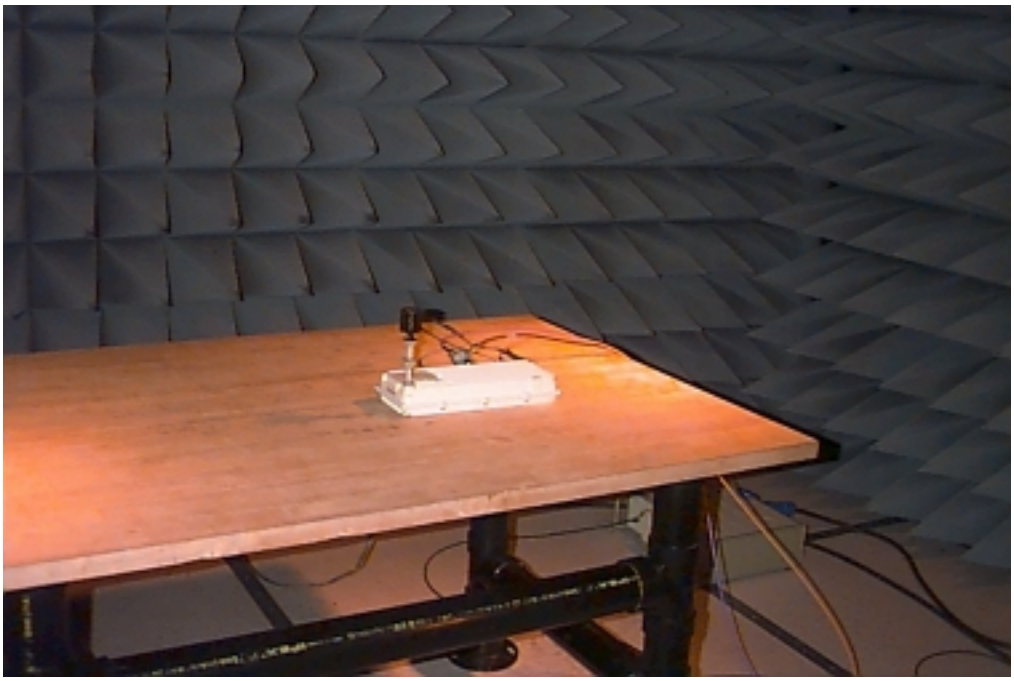
All radiated spurious measurements were taken in semi-anechoic room at a distance of 3, 1 or 0.3 meters in the vertical and horizontal polarization.

The system was setup in maximum configuration as indicated in figure 3 (section 2.4.1).



Radiated Spurious measurement setup





Radiated Spurious Setup in a Semi- Anechoic Chamber at Nemko Canada Inc. Laboratories

4.3.5 Test Equipment and Support Equipment

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	May 31/00	Nov. 30/01
1 Year	Horn Antenna	EMCO #1	3115	3132	Dec. 11/00	Dec. 11/01
1 Year	Log Periodic Antenna 1	EMCO	LPA-25	1141	Aug. 3/00	Aug. 3/01
3 Year	Diplexer	Olsen - OML	DPL.26 (H.P)		Mar. 15/00	Mar 15/03
3 Year	Mixer/Antenna 40-60Ghz	Olsen – OML	M19HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer /Antenna 60-90Ghz	Olsen – OML	M12HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer / Antenna 90-140Ghz	Olsen – OML	M08HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer / Antenna 140-220Ghz	Olsen – OML	M05HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Bilog Antenna	Shaftner	CBL6112 B	2651	Jan. 6/00	Jan. 6/03

NA: Not Applicable

NCR: No Cal Required

COU: CAL On Use

4.3.6 Results - Test Data

No emission Detected.

The spurious was verified from 30MHz to 160GHz and is below the limits.

4.4 Conducted Spurious

4.4.1 Test Specification

Standard	FCC Part 101 section 101.111(a)(2)(iii) (edition 10-1-00)
Limit	+10log Pmean

4.4.2 Test Location

Test Laboratory	Nemko Canada Inc.
Address	3325 River Road R.R.5 Ottawa, Ontario K1V 1H2
Prime Contact	Russell Grant, Manager Wireless Group

4.4.3 Tested by

Test Engineer	Glen Westwell
Company	Nemko Canada Inc., Ottawa.

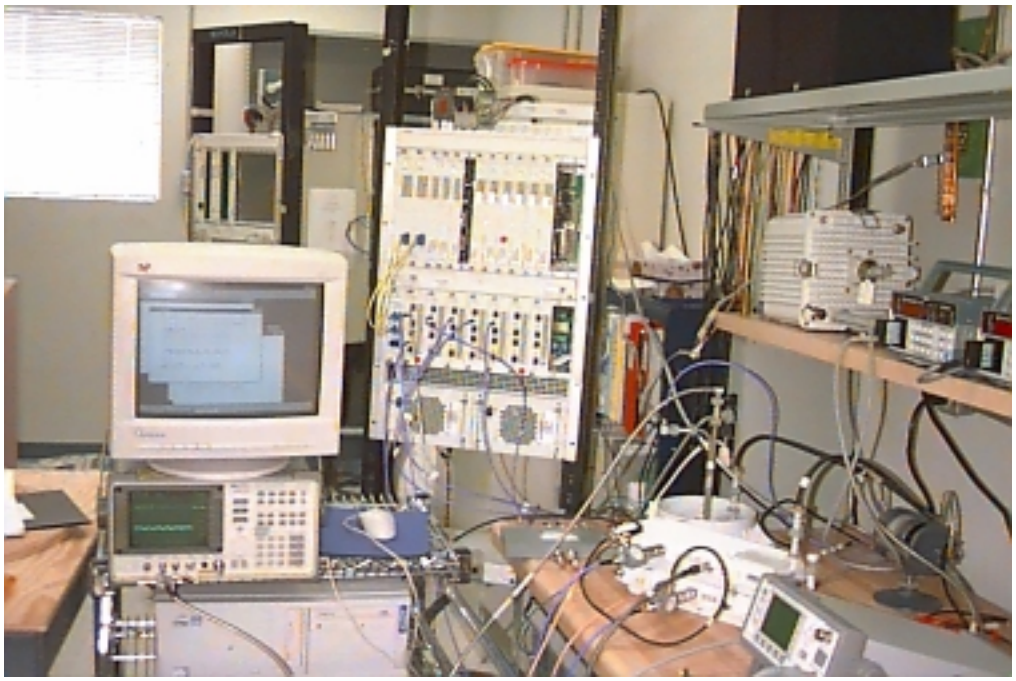
4.4.4 Test Procedure

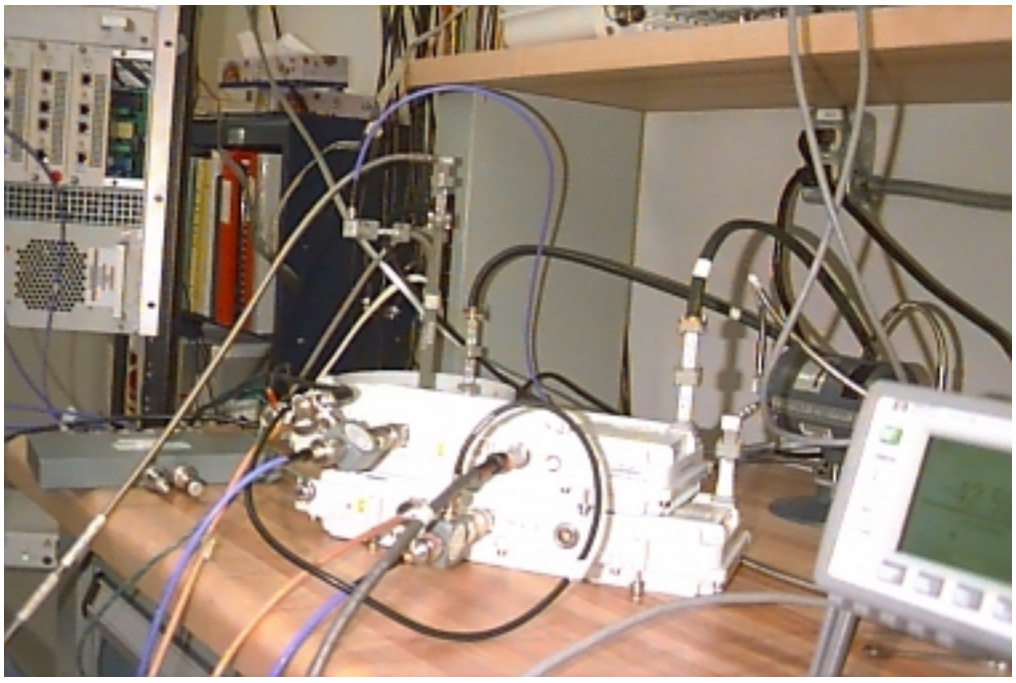
The conducted spurious are measured at the antenna port of the RBS TX in normal operation.

The measurements were done with 4 IBS cards inserted in the 7390 shelf and the 6:2 Combiner. Each carrier was adjusted at the RF output to approximately $\geq$ +17dBm, which gave a measured total power at the antenna port of +23dBm maximum.

Measured emissions at the frequencies, which are outside the occupied bandwidth up to 160GHz.

Conducted Spurious measurement setup





Conducted Spurious Setup at Nemko Canada Inc. Laboratories

4.4.5 Test Equipment and Support Equipment

Cal Cycle	Equipment	Manufacturer	Model	Serial No.	Last Cal.	Next Cal.
3 Year	Mixer/Antenna 40-60Ghz	Olsen – OML	M19HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer /Antenna 60-90Ghz	Olsen – OML	M12HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer / Antenna 90-140Ghz	Olsen – OML	M08HWA (H.P.)		Mar. 15/00	Mar. 15/03
3 Year	Mixer / Antenna 140-220Ghz	Olsen – OML	M05HWA (H.P.)		Mar. 15/00	Mar. 15/03
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	May 31/00	Nov. 30/01

4.4.6 Results - Test Data

The Conducted spurious was verified from 30MHz to 160GHz and is below the limits.

See Appendix A for plots.

4.5 Frequency Stability

4.5.1 Test Specification

Standard	FCC Part 101 section 101.107
Limit	+/- 10ppm

4.5.2 Test Location

Test Laboratory	Alcatel Canada Inc., Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Daxesh Thakker, Wireless Approvals Specialist

4.5.3 Tested by

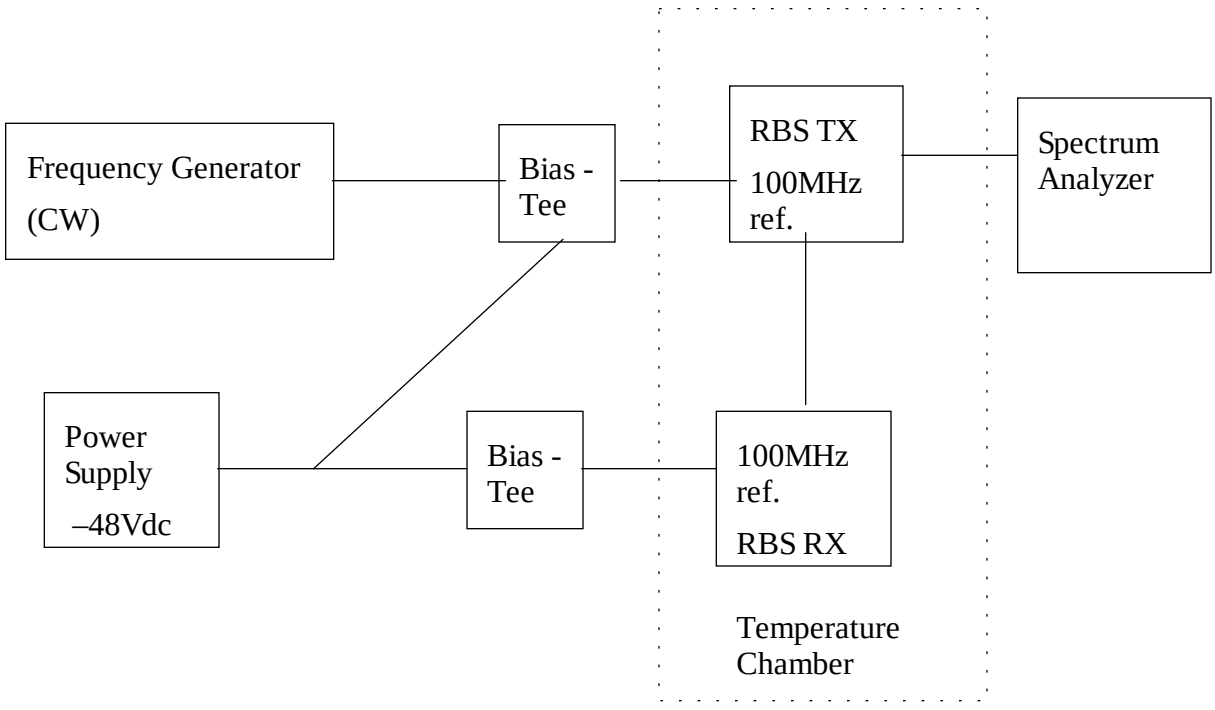
Test Engineer	Daxesh Thakker, Wireless Approvals Specialist
Company	Alcatel Canada Inc.

4.5.4 Test Procedure

For the frequency stability measurements, an external source was used to provide an IF CW to the radio units. Only the RBS TX and RBS RX were placed in the temperature chamber during this specific test due to the 7390 shelf will be in a temperature-controlled environment, and can operate within a range of –10C to +55C.

All measurements were taken according to the method mentioned in the FCC Part 2, where a reading was taken at every 10^{o} C intervals and the supply voltage was varied to the range of --38Vdc to –56Vdc.

<u>Note:</u> The BS operates only on DC, therefore the DC supply was varied to show that the frequency is not affected by voltage fluctuation.



Frequency Stability measurement setup

4.5.5 Test Equipment and Support Equipment

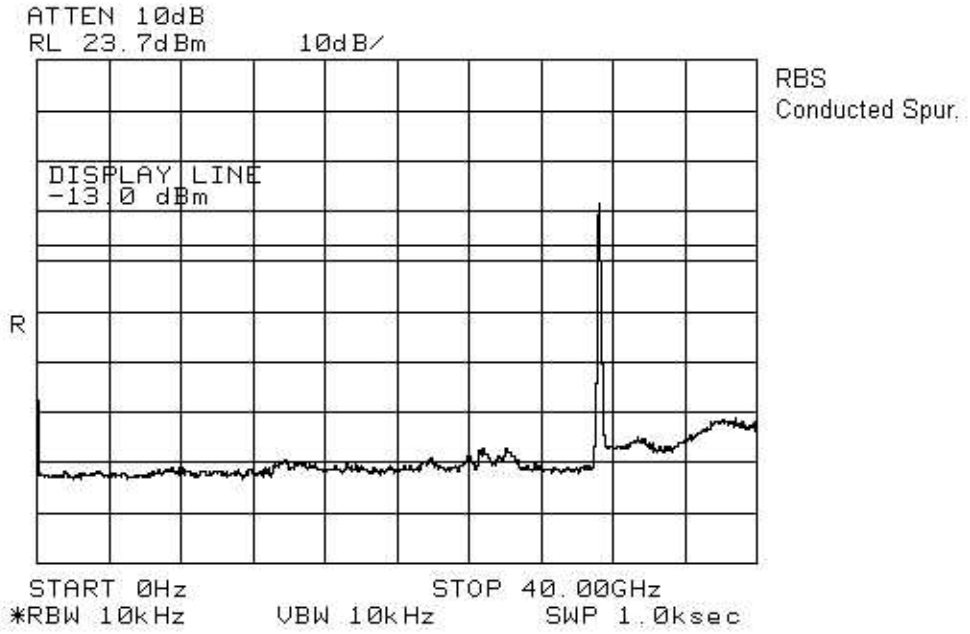
Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	Hewlett Packard/ Model 8563E/ S/N # 3804 A 00869	9kHz to 40GHz	Last: 00/12/21 Due: 01/12/21
Frequency Generator	Hewlett Packard/ Model 83640B/ S/N # 3844A 00761	9kHz to 40GHz	Last: 01/01/19 Due: 02/01/19

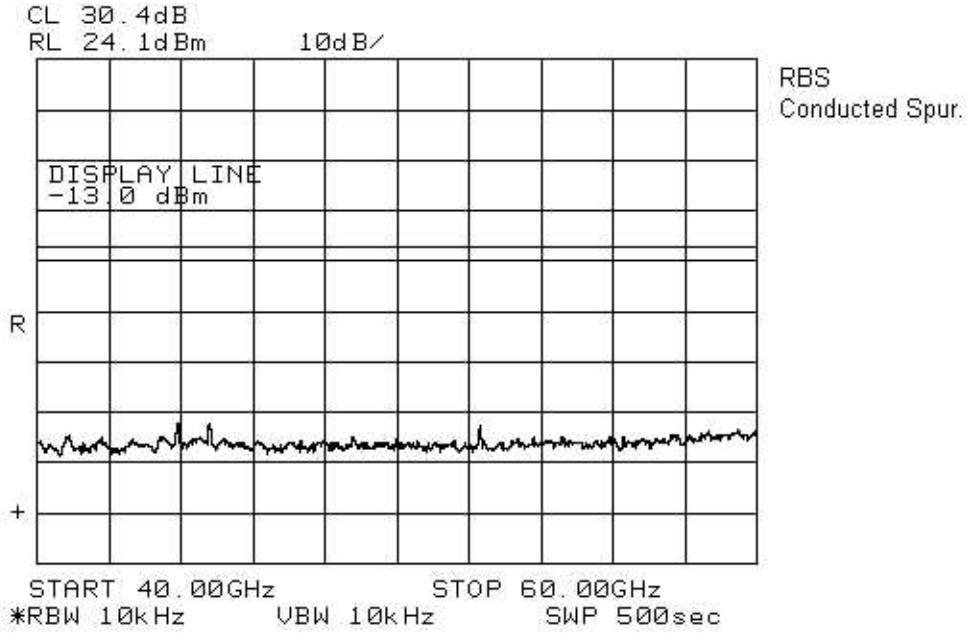
4.5.6 Results - Test Data

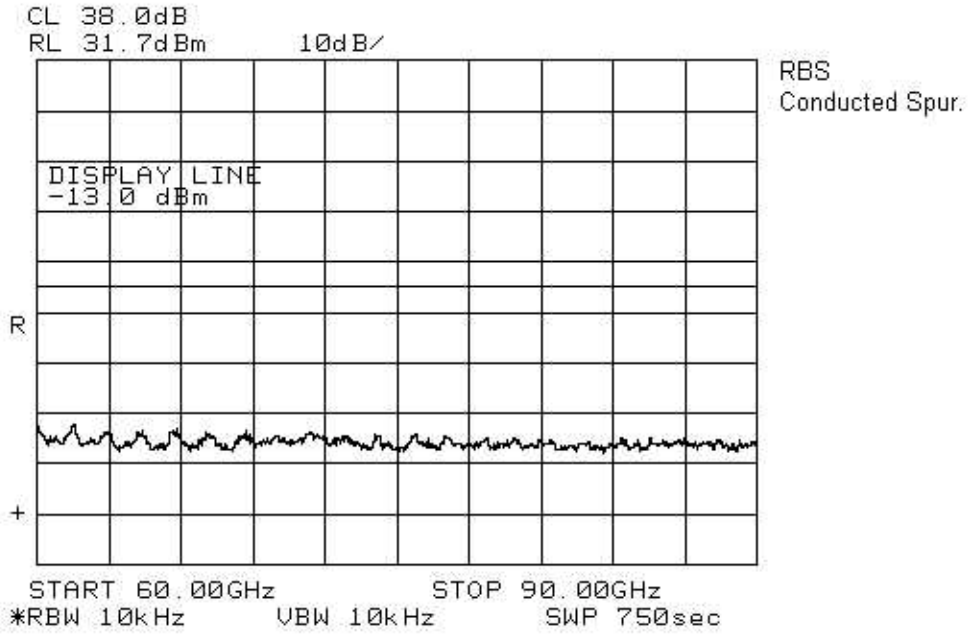
Nominal DC Supply Voltage to Radio is –48Vdc				
Note: An external supply was used to vary the DC source from –38V to –56V.				
Temperature(^{o}C)	Frequency (kHz)	Measured Frequency (kHz)		Tolerance
		Supply voltage		Limit (+/-10ppm)
		-38Vdc	-56Vdc	
-30	31,300 000	31,300 001.4	31,300 001.4	<1ppm
-20	31,300 000	31,300 001.2	31,300 001.2	<1ppm
-10	31,300 000	31,300 000.9	31,300 000.9	<1ppm
0	31,300 000	31,300 000.9	31,300 000.9	<1ppm
10	31,300 000	31,299 996.8	31,299 996.8	<1ppm
20	31,300 000	31,299 996.9	31,299 996.9	<1ppm
30	31,300 000	31,299 995.7	31,299 995.7	<1ppm
40	31,300 000	31,299 994.5	31,299 994.5	<1ppm
50	31,300 000	31,299 994.2	31,299 994.2	<1ppm

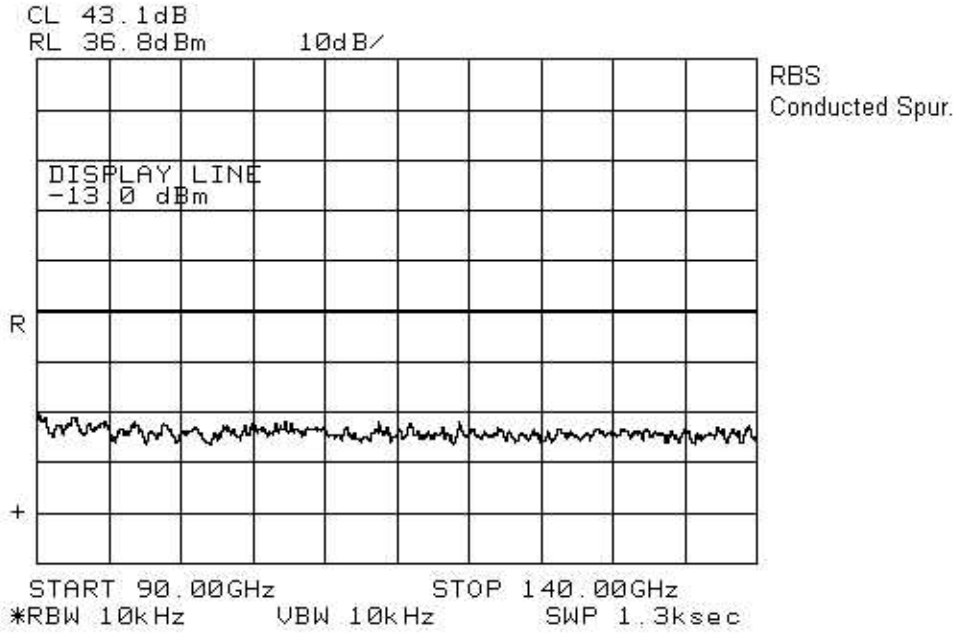
APPENDIX A: CONDUCTED SPURIOUS PLOTS

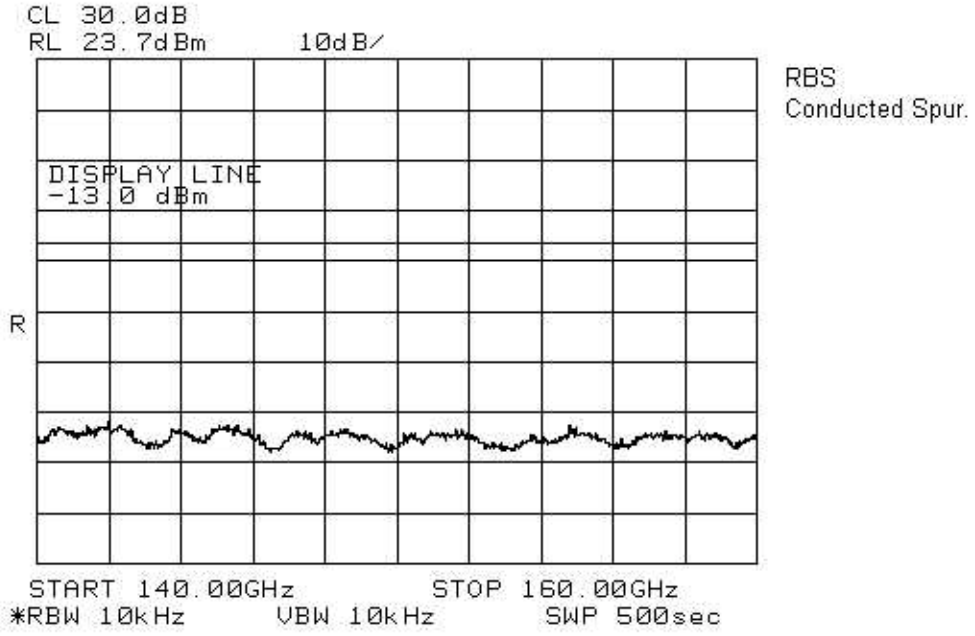
The Conducted spurious was verified from 30MHz to 160GHz and is below the specification limits.






CL 38.0dB
RL 31.7dBm
10dB/
RBS
Conducted Spur.
DISPLAY LINE
-13.0 dBm
R
+
START 60.00GHz
STOP 90.00GHz
*RBW 10kHz
VBW 10kHz
SWP 750sec


CL 43.1dB
RL 36.8dBm
10dB/
RBS
Conducted Spur.
DISPLAY LINE
-13.0 dBm
R
+
START 90.00GHz
STOP 140.00GHz
*RBW 10kHz
VBW 10kHz
SWP 1.3ksec


CL 30.0dB
RL 23.7dBm
10dB/
RBS
Conducted Spur.
DISPLAY LINE
-13.0 dBm
R
START 140.00GHz
STOP 160.00GHz
*RBW 10kHz
VBW 10kHz
SWP 500sec

REFERENCES

[1] FCC, 47 CFR Part101 Fixed Microwave Services, edition 10-1-00

[2] FCC, 47 CFR Part 2 Frequency Allocation and Radio Treaty Matters: General Rules and Regulations, edition 10-1-99

[3] ANSI, C63.4, Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz, 1992.

[4] Bellcore**,** GR-1089-CORE Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 1, November 1994.

[5] Bellcore**,** GR-1089-ILR Revised and Additional Criteria for GR-1089-CORE, Issue 1A, JULY 1996.

[6] Bellcore, TR-NWT-001089 Electromagnetic Compatibility and Electrical Safety Generic Criteria for Network Telecommunication Equipment, Issue 1, October, 1991.

[7] FCC, 47 CFR Part 15 Radio Frequency Devices, 1995

[8] Industry Canada, ICES-003 Interference-Causing Equipment Standard DIGITAL APPARATUS, Issue 2, Revision 1, 1995.

[9] ISO, GUIDE 25 General requirements for the competence of calibration and testing laboratories, Third Edition, 1990.

HISTORY

This document was created from the document template GQP0001, version 12.2.1

Version	Date	Person	Reason
1.0	01.04.18	D.Thakker	Issue
1.1	01.05.10	D.Thakker	Modified
1.2	01.06.27	D.Thakker	Modified to delete 36 & 21MHz results
1.3	01.07.12	D.Thakker	Modified to add 2 x 28MHz results