USA Type Approval Test Report

For

Alcatel 7390 LMDS Broadband Wireless Terminal Station (7390TS) 31GHz-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 Alcatel 7390 LMDS Broadband Wireless System – Terminal Station (7390TS) 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 Terminal*
NTU	*Network Terminal 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*
TBD	*To Be Determined*
TS	*Terminal Station, consists of NT & RT (OTRU)*

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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" 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 System – **Terminal Station (7390TS) from 31.0GHz to 31.075GHz** using ***Telaxis Communications Corp. (Millitech) Radios*** with different NT interface modules to achieve certification in the United States.

1.2 Scope

This document shall be used to evaluate "Alcatel 7390 LMDS Broadband Wireless – Terminal Station (7390 TS) 31.0GHz" 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 31.0GHz to 31.075GHz band only.

2 EQUIPMENT UNDER TEST (EUT)

2.1 Equipment Description

The Broadband Wireless System is a network of Network Terminals 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 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 external transmitters and receivers is typically mast mounted or mounted on a flat surface of the building.

Terminal Station

The wireless Terminal Station consists of two major components; an outdoor radio terminal/antenna unit (RT) and an indoor Network Terminal (NT).

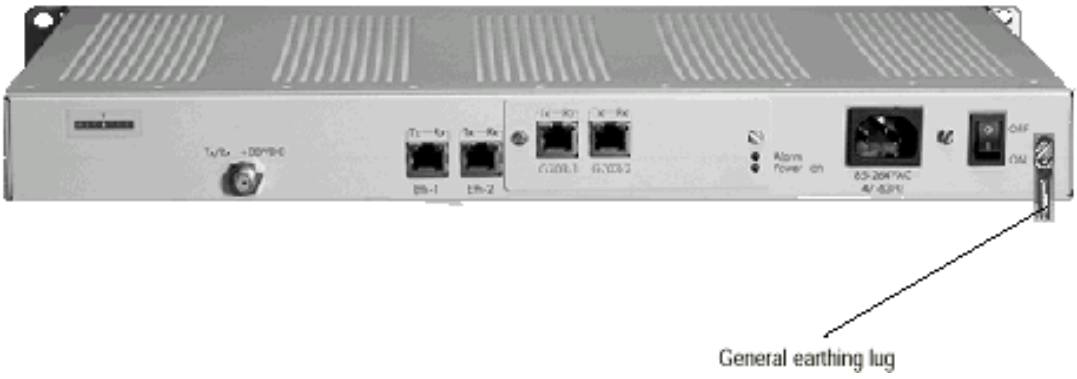
A maximum of 2 NTs can be supported from a single RT, using a combiner splitter arrangement similar to that used at the base station. In this configuration, both NTs must share the same uplink operating frequency, however uplink time slots can be assigned to the two NTs as required by the service being supported.

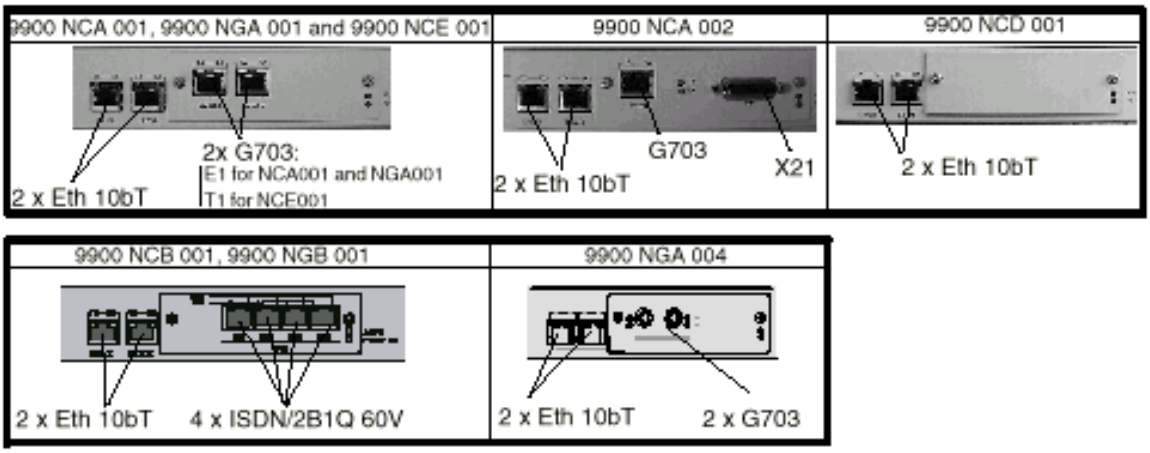
No support for multicarrier operation from a single RT is provided.

Indoor Equipment

The NT resides on the customer premises and, on the network side, is connected to an external transceiver (RT). The customer side connects to various types of customer premises equipment depending on the type of NTs. All NTs operate with the Upstream 3.5 or 7MHz depending upon downstream 14 or 28MHz bandwidth.

- T1 CE NT 9900, which has two T1, interfaces supporting either full or fractional T1 services and two 10Base-T Ethernet ports**.**
- E1 CE NT 9900 which has two E1 interface supporting either full or fractional E1 services and two 10Base-T Ethernet Ports.



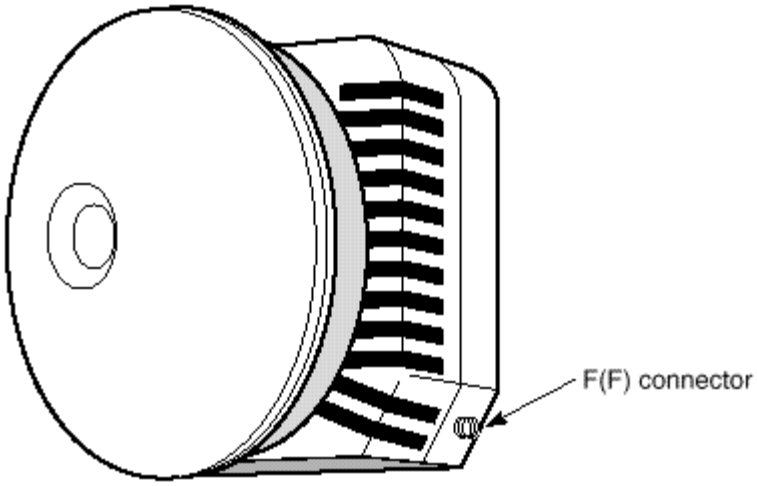


External Equipment

In addition to the NT, an external transceiver is required. The external transceiver is typically mounted near the roof of a building and is mounted in a fixed position. Figure 1 shows a typical application for the T1/E1 CE /Ethernet NT.

Only the external equipment is developed/provided by an OEM supplier. The OEM supplier for the RT, which 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



RT (Telaxis Communications)

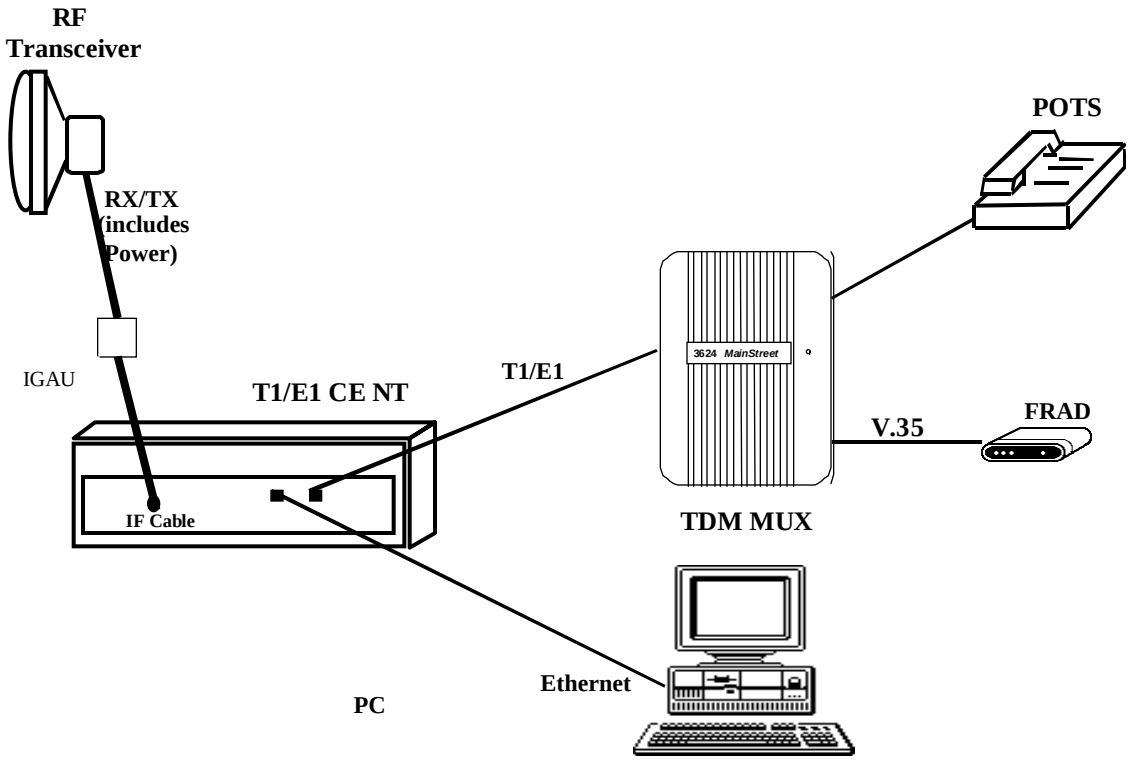


Figure1: T1/E1 Circuit Emulation / Ethernet NT

2.2 EUT Configuration

Model Number	Name and Description	S/N
3CC09778ADAA (mother board) 3CC09739AAAA (daughter board)	9900 E1 CE NT 120V	CU004880177
90-6626-03	Telaxis (Millitech) RT 31.0GHz with integrated one foot antenna	993422090
3CC12568AAAA	IGAU Amplifier	BS0044U0ZMV

2.3 EUT Cables

Part Number	Cable Type	Length (m)	Shield	Connector Hoods
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 one NT (E1 +Ethernet port) having bandwidths (BW) of 3.5 and 7.0MHz, which is then provided to the RT. The TX IF modulated carrier is adjusted by providing attenuation to the BS receiver, which in return will provide a command to increase or decrease the NT transmit power level. This function is called ATPC (Automatic Transmit Power Control) and it is used to achieve a maximum RF level of approximately +17dBm. At a time only one NT was used to operate with the RBS Rx and RBS Tx to achieve traffic. Operating with the maximum output level will provide the worst condition based on intermodulation, spurious and spectral re-growth.

Only one NT was used in the setup, due to there is no additional intermodulation when operating with 2 NTs with one RT. The NT RT operates with a TDMA access scheme on the upstream, therefore only one carrier will transit at one time. The RT will not support multicarriers.

Also, the E1 & T1 CE NTs 9900 were tested with the RT. The overall line rate is limited by the air interface, which provides a fixed ATM rate. The upstream and downstream bandwidths will not change due to the different interfaces, therefore the transmit carrier bandwidth is always 3.5 or 7.0 MHz.

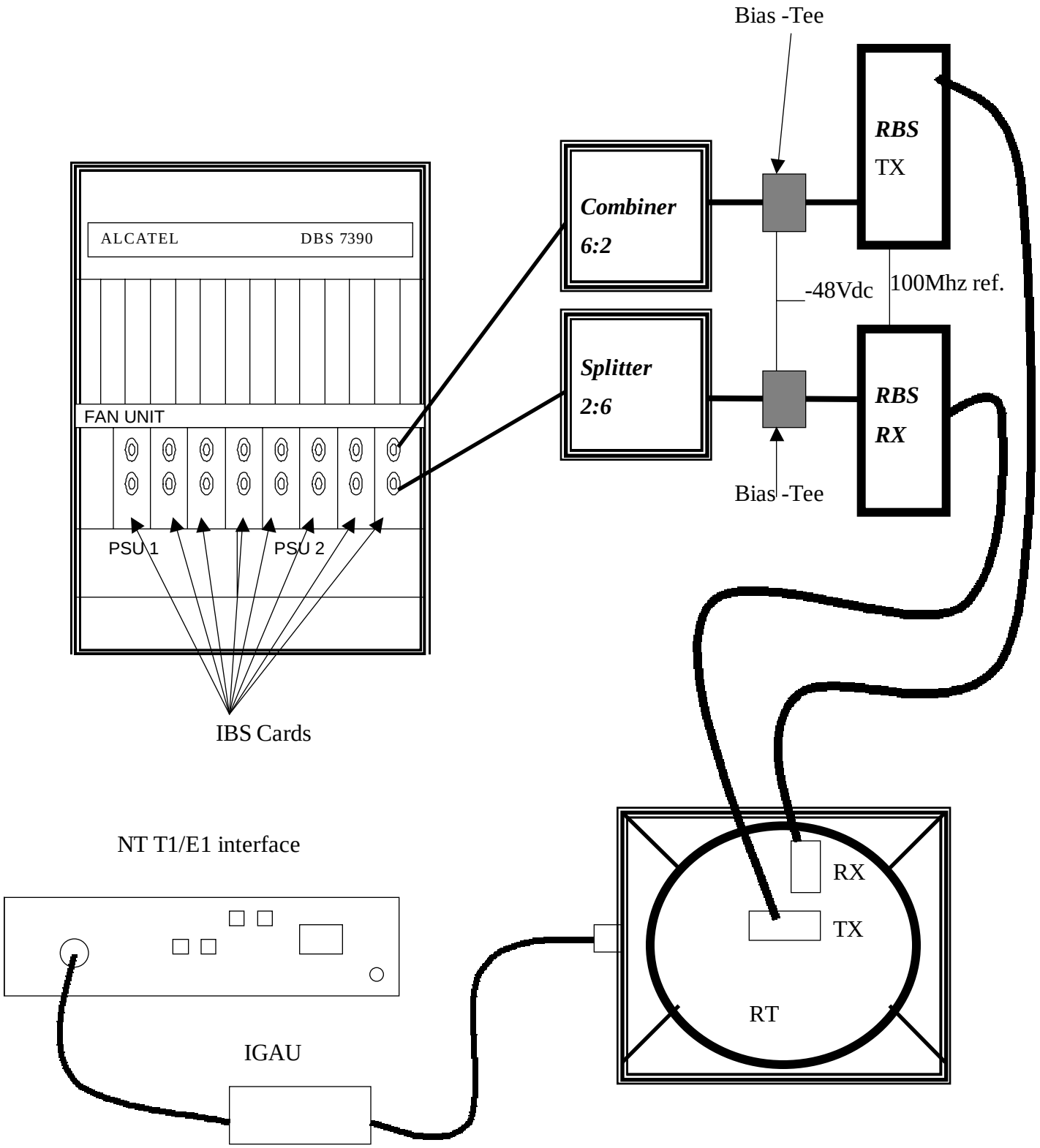
For the frequency stability measurements, an external source was used to provide an IF CW to the radio unit. Only the RT was placed in the temperature chamber during this specific test due to the NT unit will usually be in a temperature-controlled environment, but meets all internal performance requirements 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).

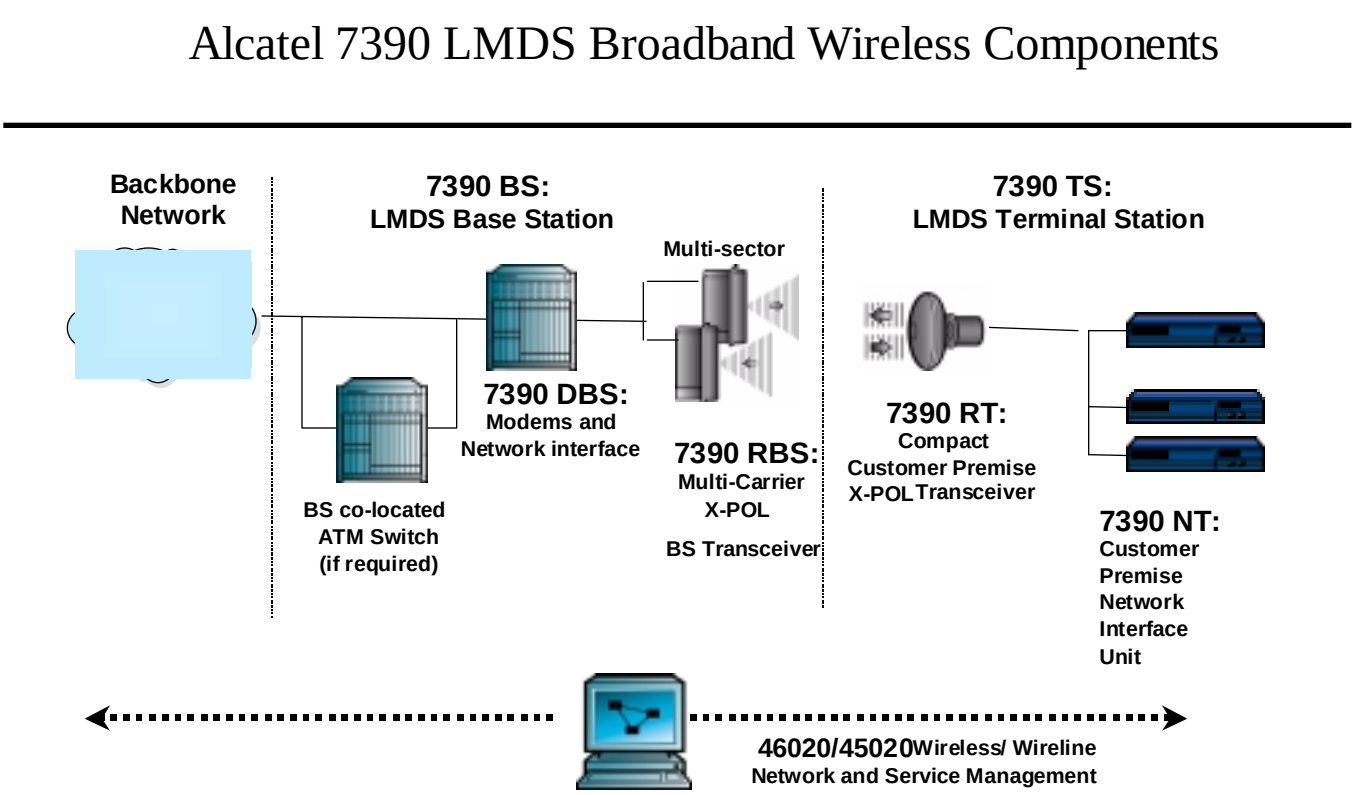
The test result for conducted and radiated spurious were performed by an external lab (Nemko Canada Inc, Ottawa) and complied together in this test report. The measurements were taken according to the instructions mentioned in the FCC Part 2 and Part 101.

Figure 2 Diagram of System Configuration



2.4.2 Functional Interconnect

Figure 3 Block Diagram of Functional Interconnect



Component

BS	TS
DBS consists of IBS, AMD, TNT,	NT **(**T1/E1 Services Card), IGAU
ANT & Power Supply Units.	Surge Arrestor
Combiner, Splitter, Bias Tee, Surge Arrestor	RT (OTRU)
RBS (OTU, ORU)	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 June 27, 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 +55dBW

4.1.2 Test Location

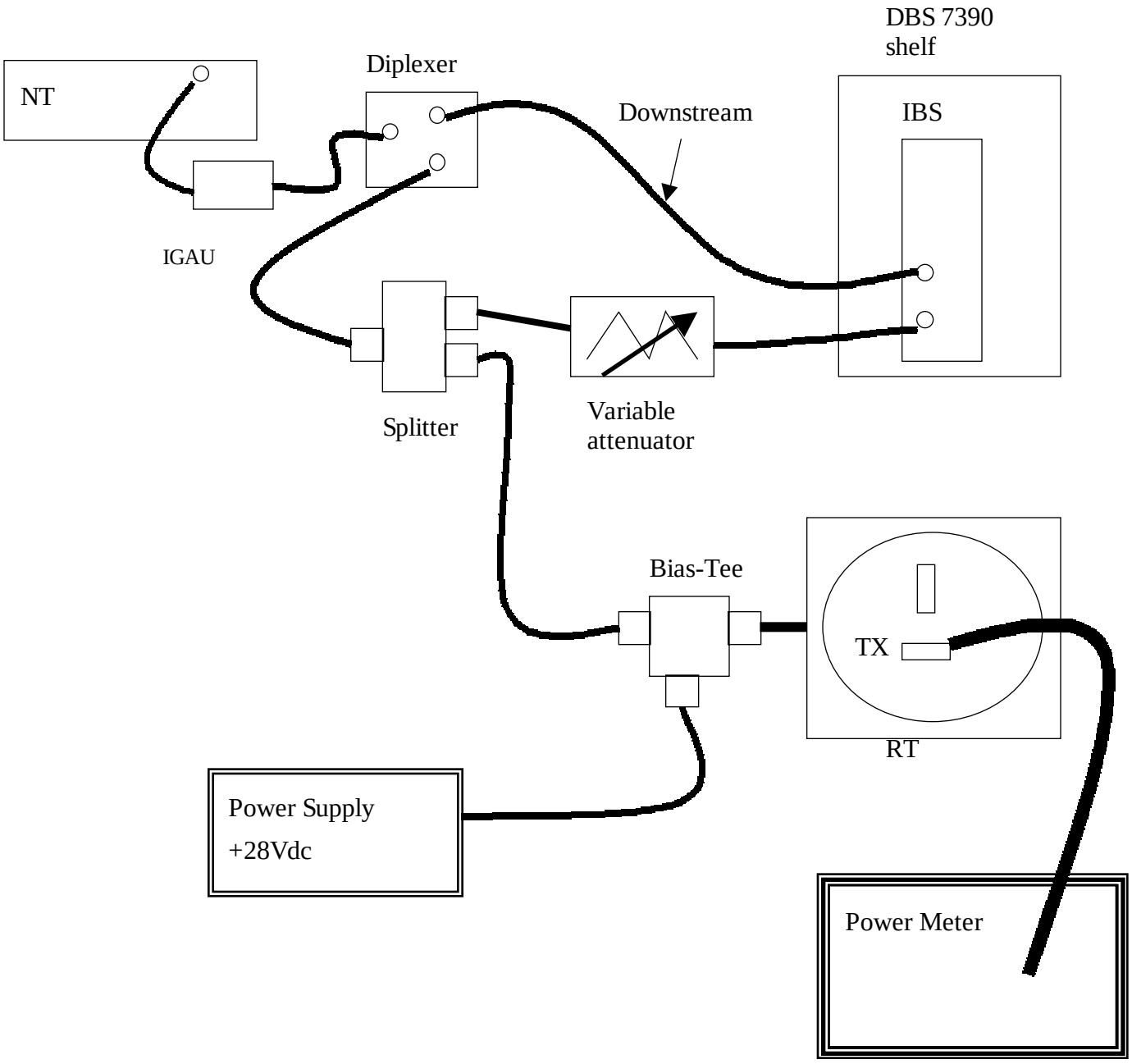
Test Laboratory	Alcatel Canada Inc., Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Daxesh Thakker, Wireless Approvals Specialist

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 the carrier set at approximately $\geq$+17dBm at the antenna port. All power measurements were taken in normal operation (modulated).



RF Power Output Test Setup

Note: The diplexer is used to separate the Upstream and Downstream IF signals from the +28Vdc. The splitter is used to separate the Upstream path to maintain a closed loop system with the BS at the IF level. Without a closed loop, the Upstream is not able to transmit. The Bias-Tee is used to combine the external +28Vdc and the modulated IF upstream signal to the radio (RT). By increasing the variable attenuator, the BS will detect a weaker signal, which will return a message to the NT via the downstream to increase the power level of the upstream.

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

(2) Turn on the RT and adjust the variable attenuator on the upstream IF path to achieve a ≥ +17dBm at the antenna port. Add the appropriate fixed attenuators to avoid damage to the power meter.

(3) Measure output power at the low and high end of the band of operation of the RT. 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

Equipment under Test	Frequency Band (MHz)	Maximum EIRP Level
RT Telaxis (Millitech) Terminal Station Transmitter	31.000 to 31.075	+23dBW maximum (1 foot antenna) +29dBW maximum (2 foot antenna)

Antenna Gain of a 1-foot antenna: 36dBi

Antenna Gain of a 2-foot antenna: 42dBi

Each carrier set at +17dBm (-13dBW), 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

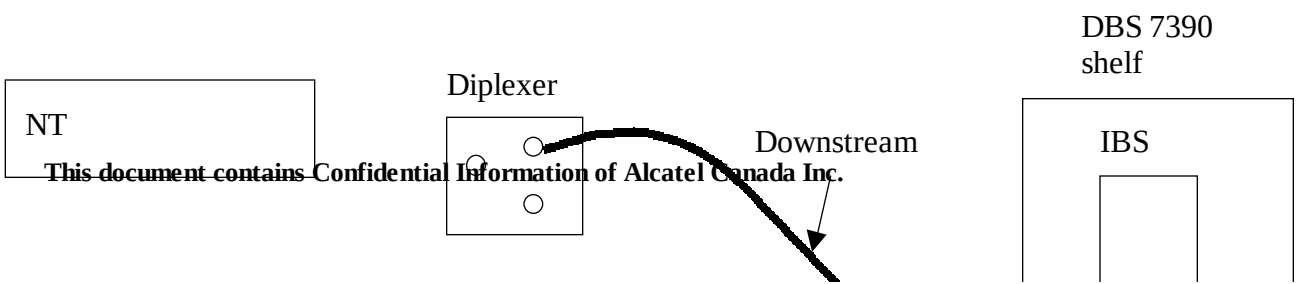
Test Laboratory	Alcatel Canada Inc., Design Integrity Laboratory
Address	600 March Road Kanata, Ontario K2K 2E6
Prime Contact	Daxesh Thakker, Wireless Approvals Specialist

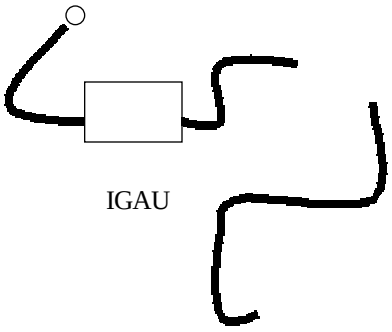
4.2.3 Tested by

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

4.2.4 Test Procedure

The measurements were done with one NT and one RT communicating with the Basestation to control the output power level. The upstream was attenuated at the IF level, where the Basestation then provided a command to the NT via the downstream to increase or decrease the output power level for the upstream. The carrier was adjusted at the RF output to approximately +17dBm.





RT

Spectrum Mask measurement setup

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

Center frequency	(i) Lower Carrier frequency set at **31,001.75MHz** (Carrier bandwidth is 3.5 MHz) (ii) Higher Carrier frequency set at **31,073.25MHz** (Carrier bandwidth is 3.5 MHz) (iii)Lower Carrier frequency set at **31,003.50MHz** (Carrier bandwidth is 7.0 MHz) (iv) Higher Carrier frequency set at **31,071.50MHz** (Carrier bandwidth is 7.0 MHz)
Sweeping time	Automatic
Resolution bandwidth	100KHz
Video bandwidth	$\geq$ 300 kHz (video averaging of display is allowed)
Y scale	10 dB/Div

(2) Connect spectrum analyzer at the antenna port of the transmitter and record the spectrum shape. Perform measurements at the edge of the frequency block near the lower end of the assigned band. Repeat measurements at the higher end of the assigned band or to the highest 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

Upstream frequency range: 31,000 to 31,075MHz

The highest frequency the last carrier will operate is at 31071.50MHz with 7.0MHz carrier.

The lowest frequency the first carrier will operate at is 31003.50MHz with 7.0MHz carrier.

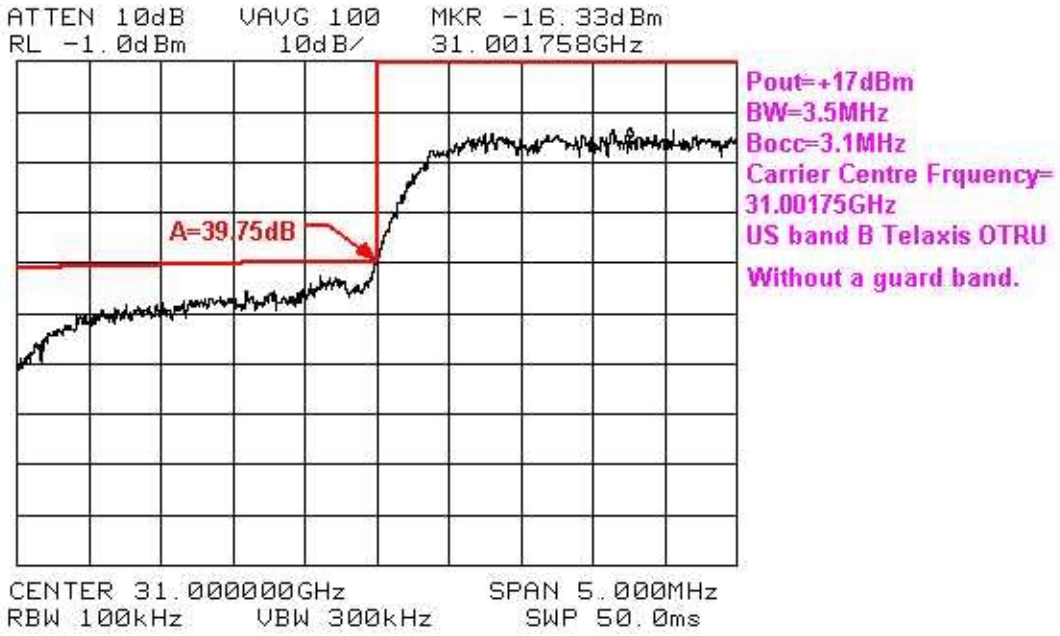
The highest frequency the last carrier will operate is at 31073.25MHz with 3.5MHz carrier.

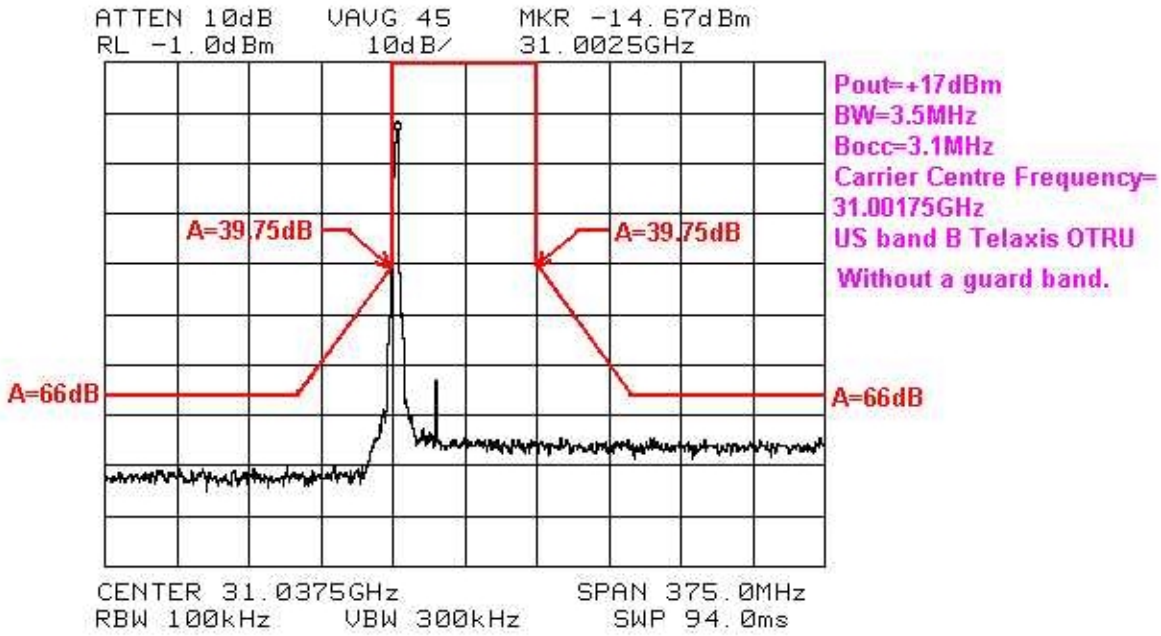
The lowest frequency the first carrier will operate at is 31001.75MHz with 3.5MHz carrier.

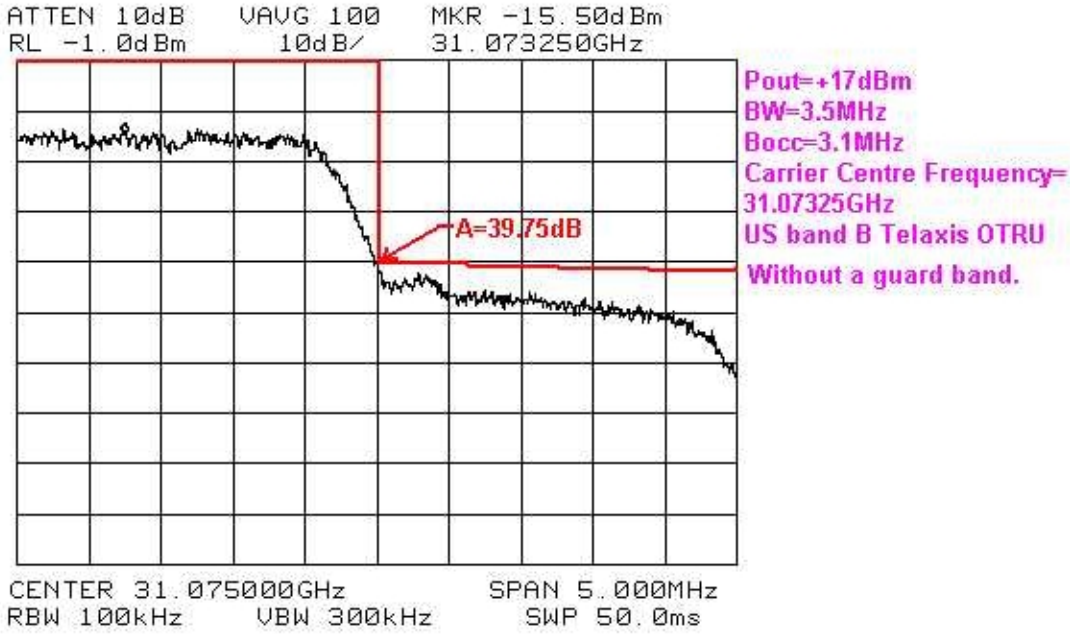
Output Reference Level after cable loss, directional coupler loss & 10dB attn. = -0.6dBm

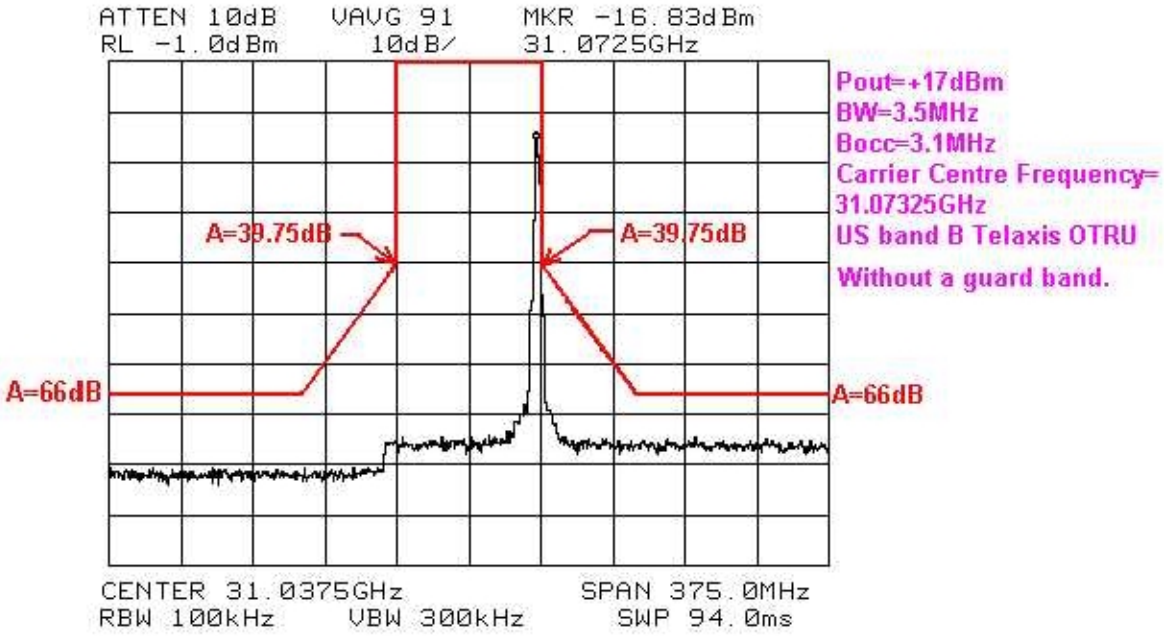
Each carrier BW= 3.5MHz or 7.0MHz.

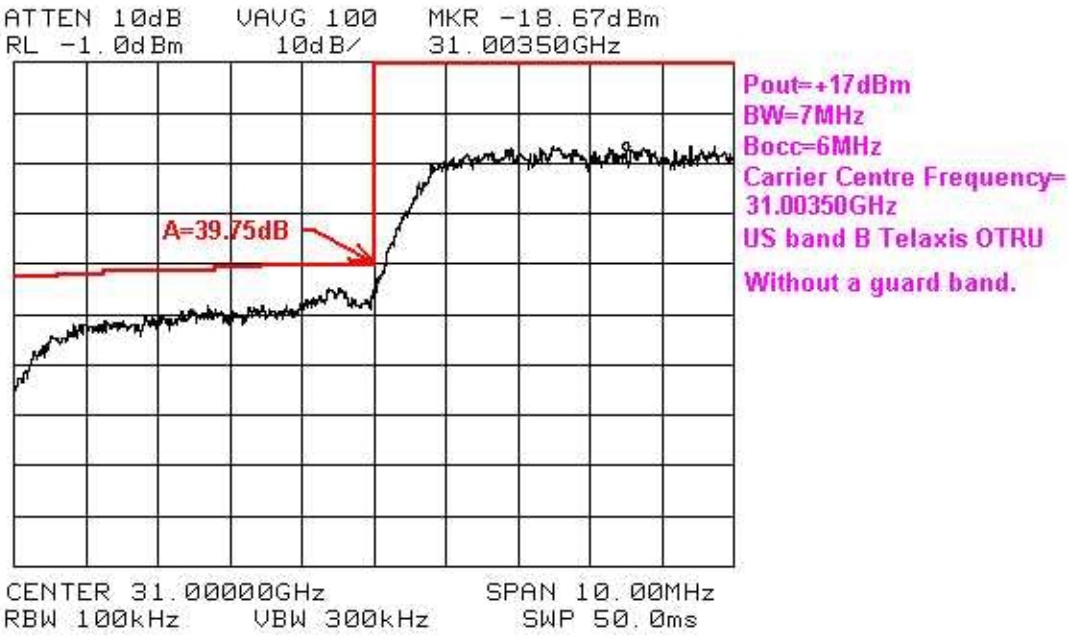
No spurious were measurable above 32GHz. See Spectrum Plots

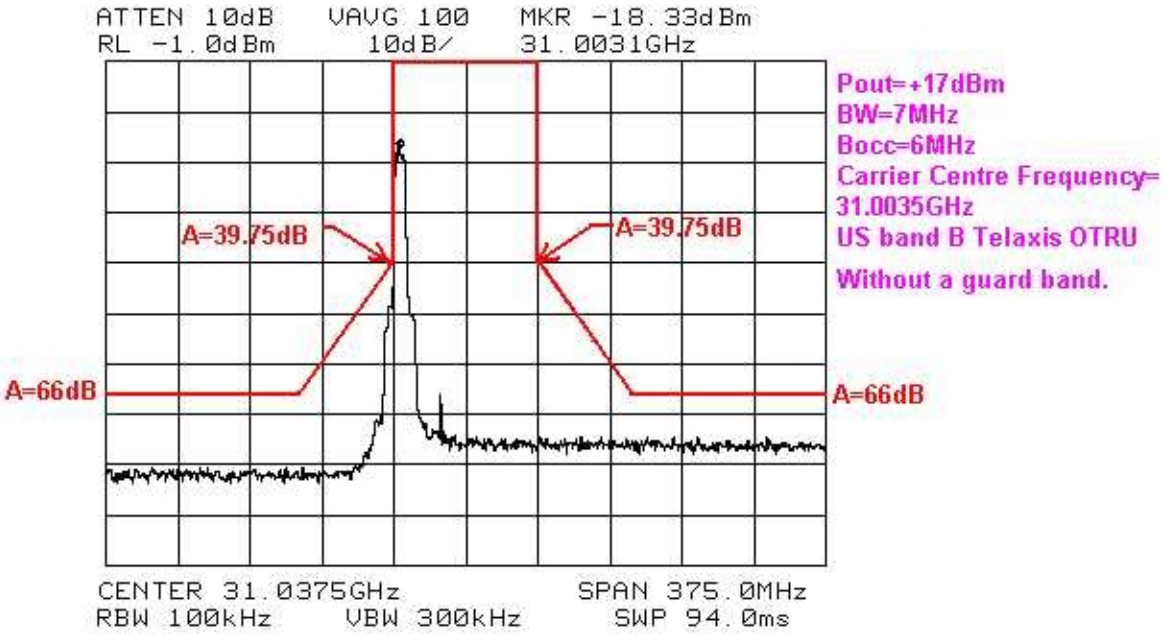


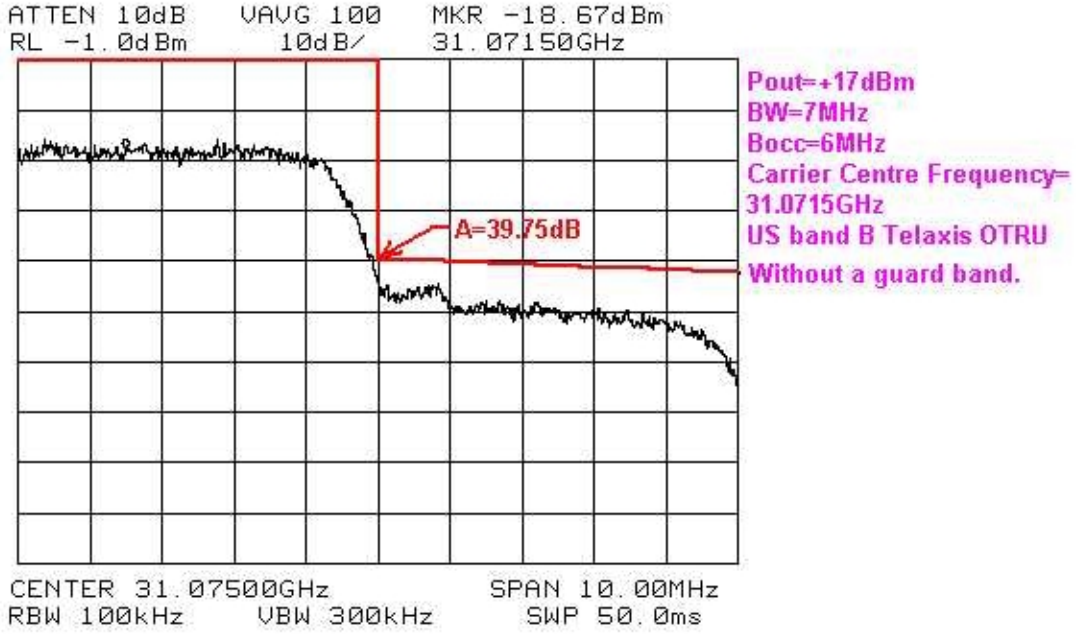

ATTEN 10dB
RL -1.0dBm
VAVG 45
10dB/
MKR -14.67dBm
31.0025GHz
Pout=+17dBm
BW=3.5MHz
Bocc=3.1MHz
Carrier Centre Frequency=
31.00175GHz
US band B Telaxis OTRU
Without a guard band.
A=39.75dB
A=39.75dB
A=66dB
A=66dB
CENTER 31.0375GHz
SPAN 375.0MHz
RBW 100kHz
VBW 300kHz
SWP 94.0ms

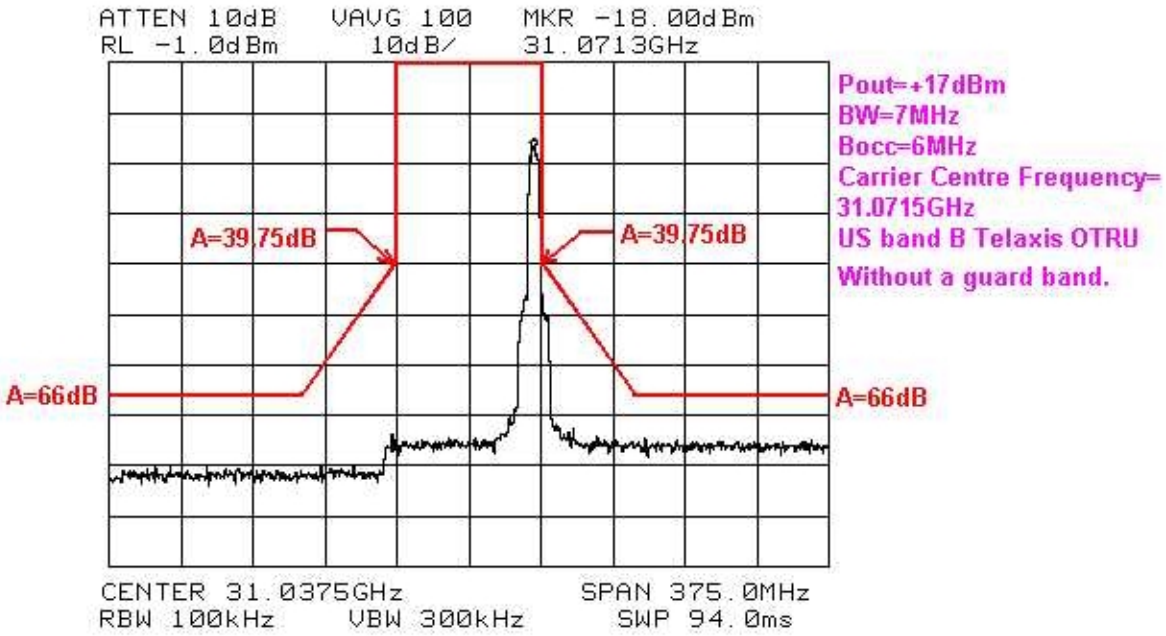

ATTEN 10dB
RL -1.0dBm
VAVG 100
10dB/
MKR -15.50dBm
31.073250GHz
Pout=+17dBm
BW=3.5MHz
Bocc=3.1MHz
Carrier Centre Frequency=
31.07325GHz
US band B Telaxis OTRU
Without a guard band.
A=39.75dB
CENTER 31.075000GHz
SPAN 5.000MHz
RBW 100kHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -1.0dBm
VAVG 91
10dB/
MKR -16.83dBm
31.0725GHz
Pout=+17dBm
BW=3.5MHz
Bocc=3.1MHz
Carrier Centre Frequency=
31.07325GHz
US band B Telaxis OTRU
Without a guard band.
A=39.75dB
A=39.75dB
A=66dB
A=66dB
CENTER 31.0375GHz
SPAN 375.0MHz
RBW 100kHz
VBW 300kHz
SWP 94.0ms


ATTEN 10dB
RL -1.0dBm
VAVG 100
10dB/
MKR -18.67dBm
31.00350GHz
Pout=+17dBm
BW=7MHz
Bocc=6MHz
Carrier Centre Frequency=
31.00350GHz
US band B Telaxis OTRU
Without a guard band.
A=39.75dB
CENTER 31.00000GHz
SPAN 10.00MHz
RBW 100kHz
VBW 300kHz
SWP 50.0ms


ATTEN 10dB
RL -1.0dBm
VAVG 100
10dB/
MKR -18.33dBm
31.0031GHz
A=39.75dB
A=39.75dB
A=66dB
A=66dB
Pout=+17dBm
BW=7MHz
Bocc=6MHz
Carrier Centre Frequency=
31.0035GHz
US band B Telaxis OTRU
Without a guard band.
CENTER 31.0375GHz
SPAN 375.0MHz
RBW 100kHz
VBW 300kHz
SWP 94.0ms


ATTEN 10dB
RL -1.0dBm
VAVG 100
10dB/
MKR -18.67dBm
31.07150GHz
A=39.75dB
Pout=+17dBm
BW=7MHz
Bocc=6MHz
Carrier Centre Frequency=
31.0715GHz
US band B Telaxis OTRU
Without a guard band.
CENTER 31.07500GHz
SPAN 10.00MHz
RBW 100kHz
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., Ottawa.
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. Ottawa.

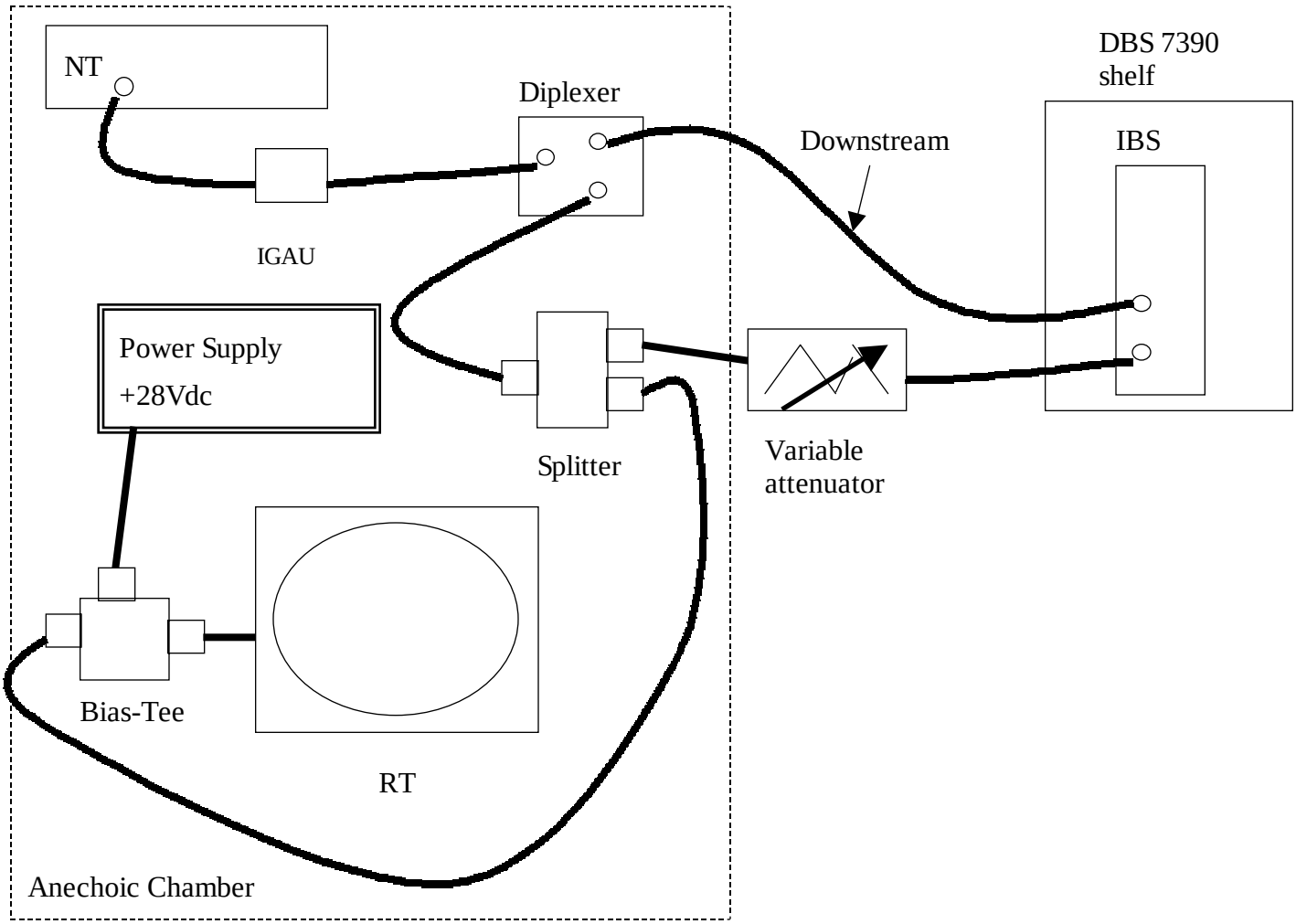
4.3.4 Test Procedure

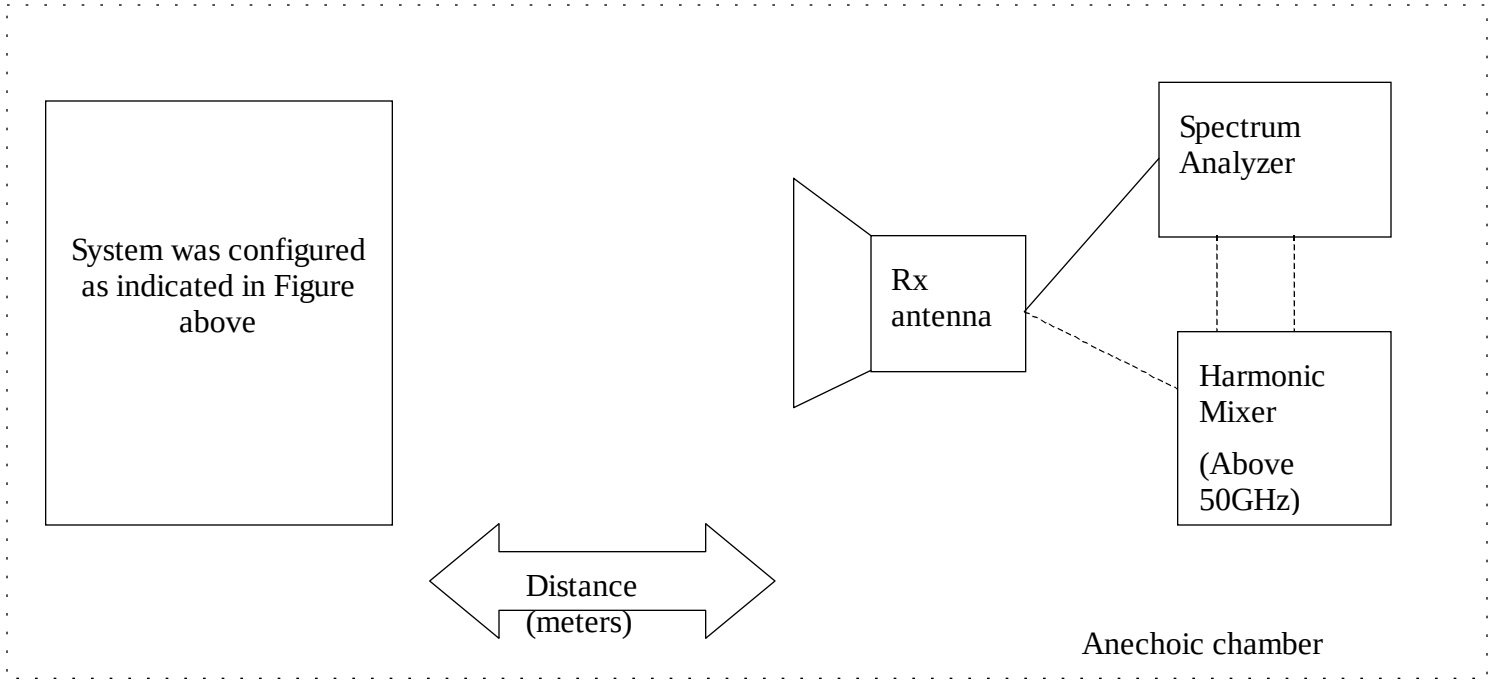
The measurements were done with one NT and the RT was adjusted at the RF output to approximately ≥+17dBm at the antenna port.

The reference level was measured with the vertical polarized antenna that had a gain of 36dBi. Once the reference level was defined, the final measurements were taken with the RT port terminated with a 50Ω load.

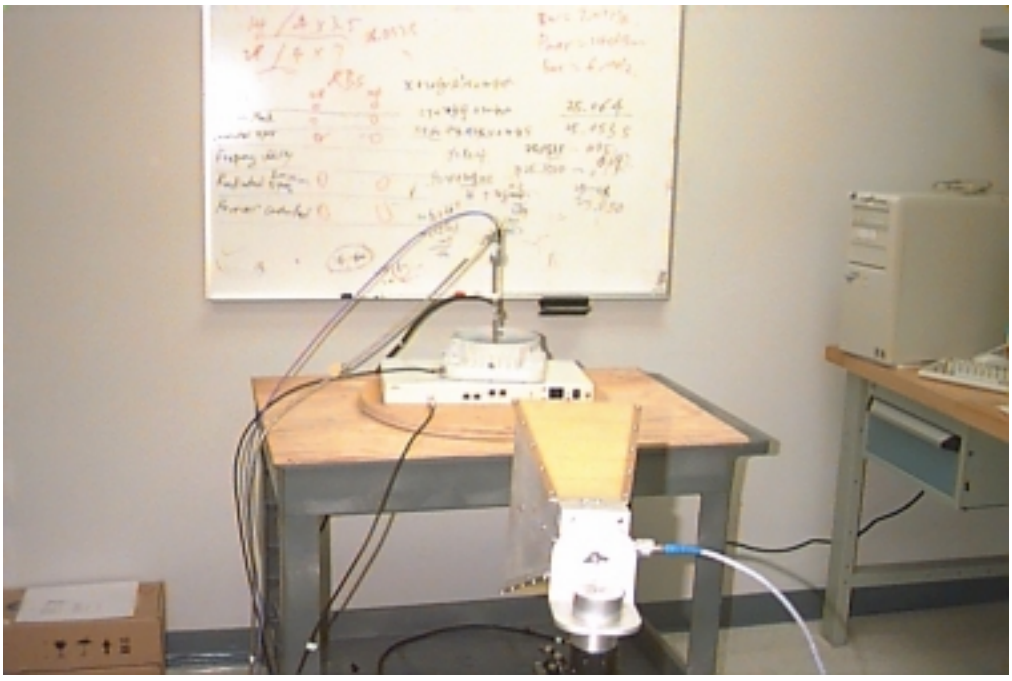
All radiated spurious measurements were taken in semi-anechoic room at a distance of 3, 1 or 0.3 meters in the vertical and horizontal polarization.

The system was setup in maximum configuration as indicated below.





Radiated Spurious measurement setup



Radiated Spurious Setup front view at NEMKO CANADA INC. Ottawa 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

The spurious were verified from 30MHz to 160GHz and were 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., Ottawa.
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. Lab, Ottawa.

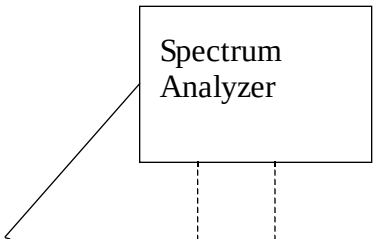
4.4.4 Test Procedure

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

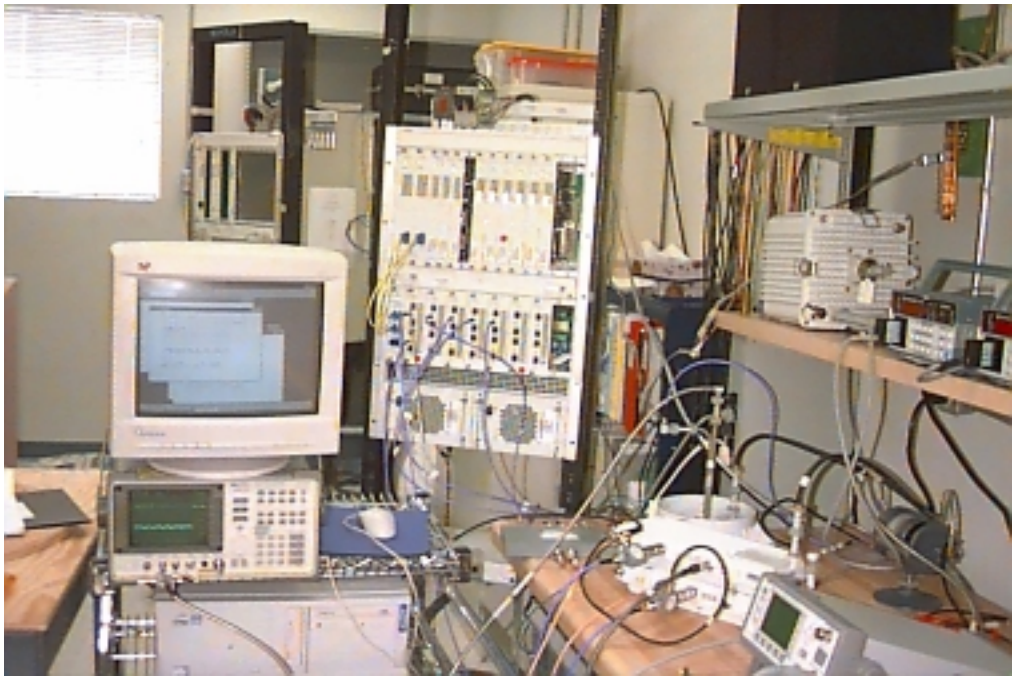
The measurements were done with one NT interconnected to a diplexer and the basestation to achieve traffic at the IF level. The IF upstream was split to feed a modulated IF output to the RT. The upstream was attenuated (variable) at the IF level, where the Basestation then provided a command to the NT via the downstream to boost or reduce the output power level for the upstream. The attenuation was adjusted to maintain a RF output to approximately +17dBm.

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

System was configured as the Spectrum mask



Conducted Spurious measurement setup



Conducted Spurious Setup at NEMKO CANADA INC. Ottawa 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 spurious were verified from 30MHz to 160GHz and were 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

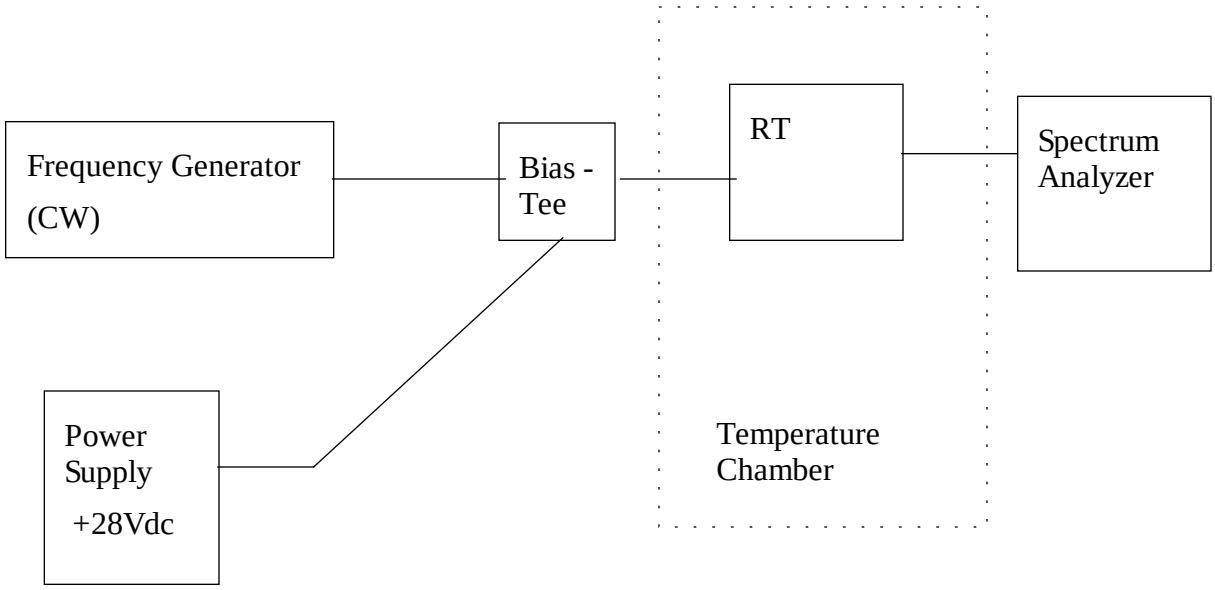
For the frequency stability measurements, an external source was used to provide an IF CW to the radio unit. Only the RT was placed in the temperature chamber during this specific test. The NT will usually be in a temperature-controlled environment, but can operate within a range of –10C to +55C.

The NT was not in the setup; due to the software will not support in sending a CW to the RT. Also the transmitter will not operate if the system, including the basestation, is not receiving traffic from the downstream forming a closed loop.

An algorithm has been designed that will correct the frequency when the system is operating in a closed loop; upstream and downstream fully functional (synchronized). This algorithm has been designed to achieve the ±10ppm limits**.** The tests were done without the closed loop, therefore the algorithm does not come into play and is considered the worst case for the RT.

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 +23.8Vdc to +32.2Vdc.

Note: The TS operates on AC, but an external supply was used to vary the DC source to the RT, due to the NT changes the secondary source (DC) very little when the primary (AC) is varied. Therefore the DC supply was varied to show that the frequency is not affected by voltage fluctuation. The AC source is capable of handling from 85 to 264Vac keeping the +32.2Vdc constant. i.e.: 85Vac= +32.2Vdc (worst case)



Frequency Stability measurement setup

4.5.5 Test Equipment and Support Equipment

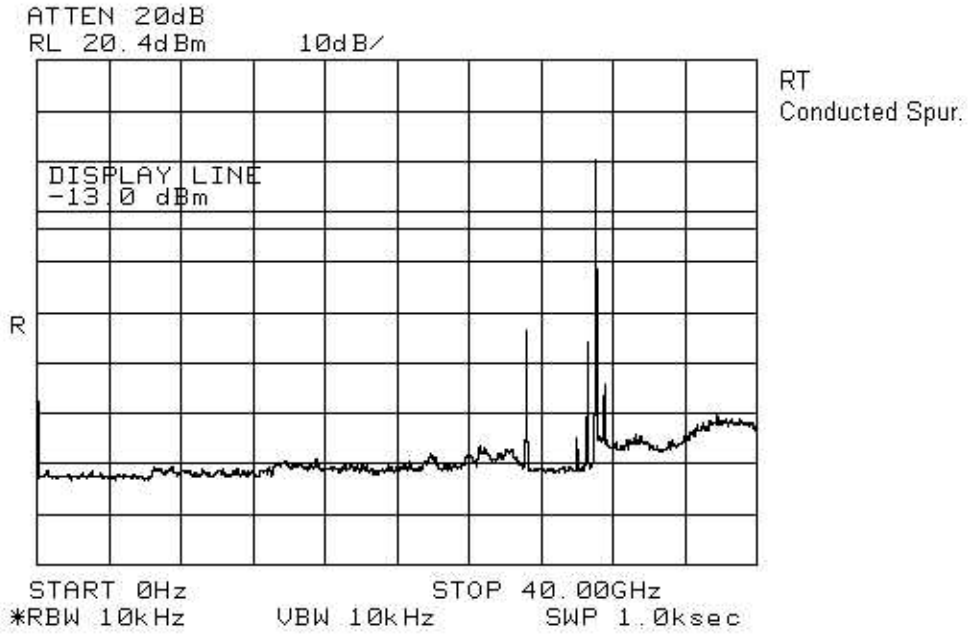
Instrument	Mfr./Model / S/N	Range	Calibration
Spectrum Analyzer	Hewlett Packard/ Model 8563E/ S/N # 3804 A 00869	9kHz to 40GHz	Last: 00/12/21 Due: 01/12/21
Frequency Generator	Hewlett Packard/ Model 83640B/ S/N # 3844A 00761	9kHz to 40GHz	Last: 01/01/19 Due: 02/01/19

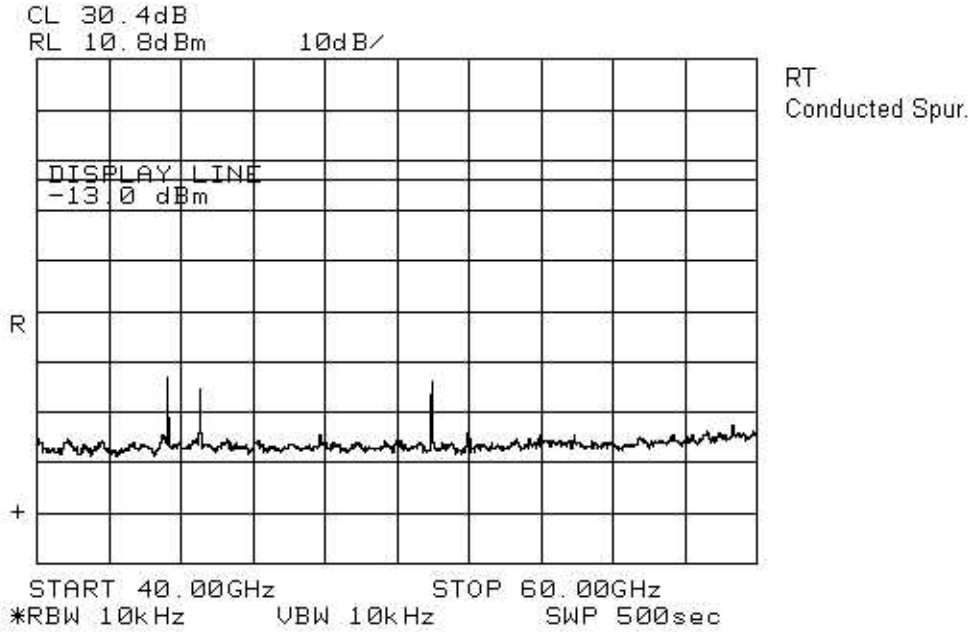
4.5.6 Results - Test Data

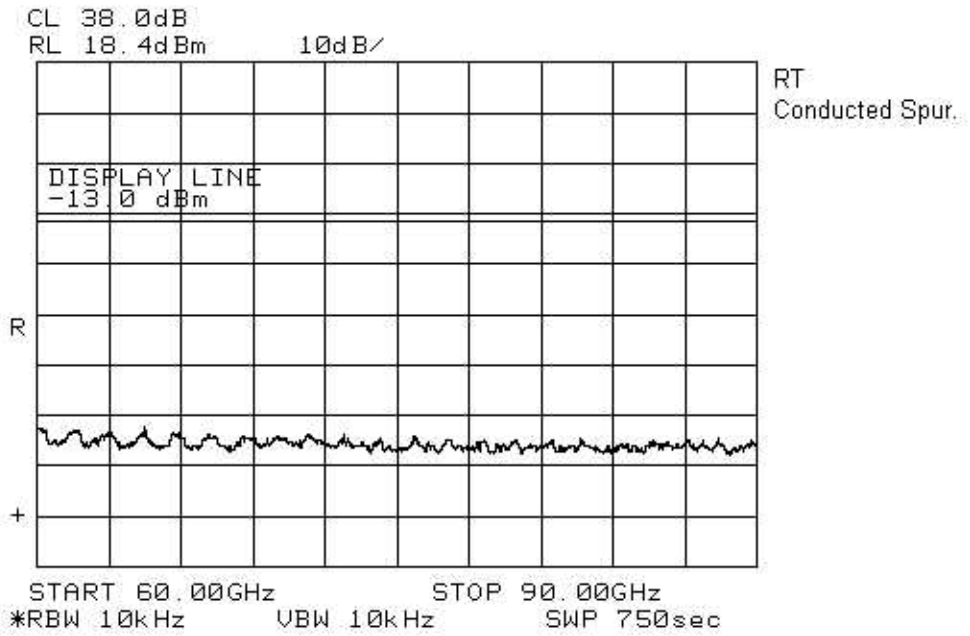
Nominal DC Supply Voltage to Radio is +28Vdc				
Note: An external supply was used to vary the DC source from +23.8V to +32.2V.				
Temperature(^{o}C)	Frequency (kHz)	Measured Frequency (kHz)		Tolerance
		Supply voltage Note: An external supply was used to vary the DC source, due to the NT changes the secondary source (DC) very little when the primary (AC) is varied. The AC source is capable of handling from 85 to 264Vac keeping the +32.2Vdc constant. i.e.: 85Vac= +32.2Vdc (worst case)		Limit (+/-10ppm) (+/-275kHz)
		+23.8Vdc	+32.2Vdc	
-30	31,075,000	31,075,030.8	31,075,031.2	<2ppm
-20	31,075,000	31,075,001.8	31,075,002.4	<1ppm
-10	31,075,000	31,075,000.8	31,075,001.3	<1ppm
0	31,075,000	31,075,000.7	31,075,001.2	<1ppm
10	31,075,000	31,075,002.3	31,075,002.9	<1ppm
20	31,075,000	31,075,000.7	31,075,000.9	<1ppm
30	31,075,000	31,074,988.5	31,074,989.2	<1ppm
40	31,075,000	31,074,975.8	31,074,976.2	<1ppm
50	31,075,000	31,074,974.2	31,074,974.9	<1ppm

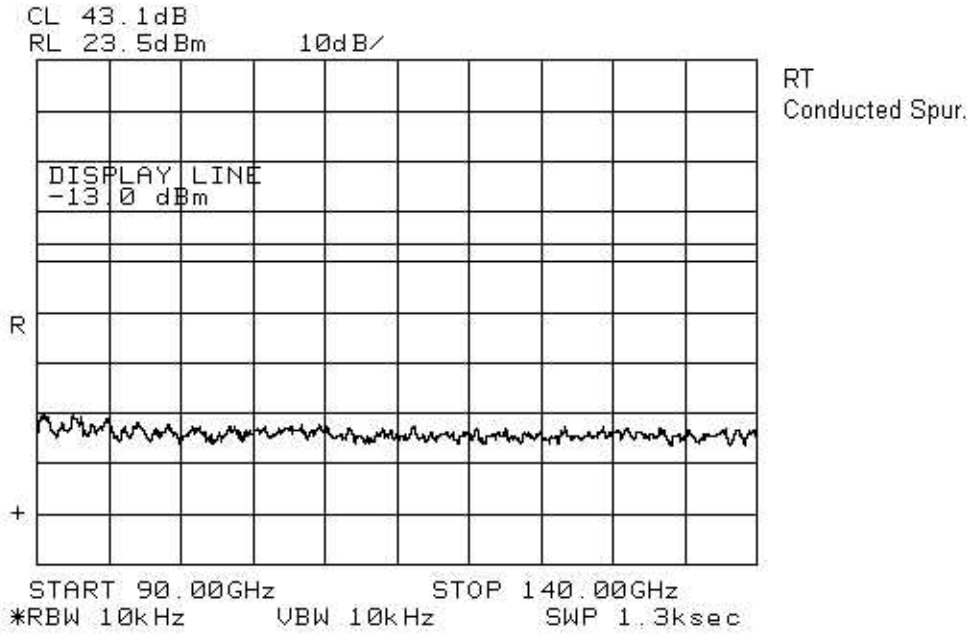
APPENDIX B: CONDUCTED SPURIOUS PLOTS

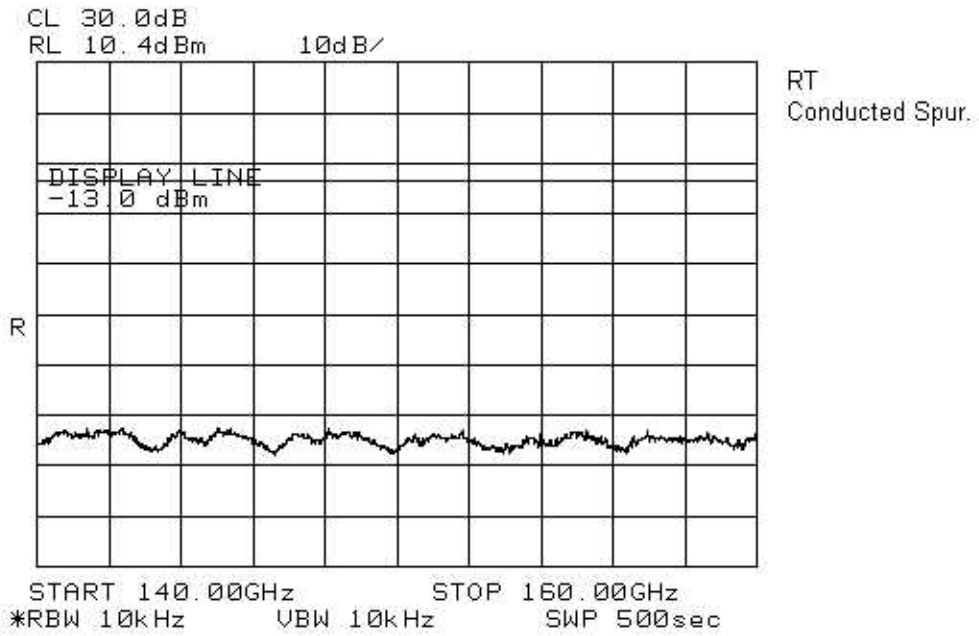
The spurious were verified from 30MHz to 160GHz and were below the limits.






CL 38.0dB
RL 18.4dBm
10dB/
RT
Conducted Spur.
DISPLAY LINE
-13.0 dBm
R
+
START 60.00GHz
STOP 90.00GHz
*RBW 10kHz
VBW 10kHz
SWP 750sec


CL 43.1dB
RL 23.5dBm
10dB/
RT
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 10.4dBm
10dB/
RT
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 10-1-00

[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	01.05.14	D.Thakker	Issue
1.1	01.06.27	D.Thakker	Modified