

# **EMC Test Report**

**FCCID: QRF-G54DNT523**  
**IC: 5181A-G54DNT523**  
**4.9 GHz Wireless Network Adapter**  
**Tranzeo Wireless Technologies Inc.**

Testing body: Tranzeo EMC Labs Inc.  
19473 Fraser Way,  
Pitt Meadows,  
BC, Canada  
V3Y 2V4

Client: Tranzeo Wireless Technologies Inc.  
19473 Fraser Way,  
Pitt Meadows,  
BC, Canada  
V3Y 2V4

The test results indicated in this report refer exclusively to the equipment under test specified below. It is not permitted to transfer the results to other systems or configurations.

Order number: 104

Type of test: Testing of electromagnetic disturbances characteristics

Date the EUT was received: December 2<sup>nd</sup>, 2011


Date of test: December 5<sup>th</sup>, 2011 to December 30<sup>th</sup>, 2011

Report No.: 011611.1

Pitt Meadows, 16 January, 2012



EMC Manager: Andrew Marles



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## **Revision History**

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## 1.0 General Information

### 1.1 EUT Description

Product Name	4.9 GHz Wireless Network Adapter
Company Name	Tranzeo Wireless Technologies Inc
FCC ID	QRF-G54DNT523
Model No.	TR-49plus-24n
Radio	IEEE 802.11a
Frequency Range	4940-4990 MHz
Number of Channels	11 at 4.9GHz
Channel Bandwidth	5, 10, and 20 MHz
Transmit Rate	54 Mbps maximum bit rate specification
Type of Modulation	4.9GHz-OFDM
Antenna Type	External
Antenna Gain	4940-4990 MHz -30 dBi max
Product Software Revision	TR49-5.0.2Rt
Test Software	Mikrotik; RS EMC32
Power Adapter	AC adapter, model PA1020-180i
	Input: 100-240V 50-60Hz, 0.4 A
	Output: DC 24 V, 1.1 A 20W max

Product samples tested:

Manufacturer	Model No.	Serial No.
Tranzeo Wireless	TR-49plus-24n	TR-49plus-24n -Eng1

4.9 GHz Frequency Band					
Channel	Frequency,MHz	Channel	Frequency,MHz	Channel	Frequency,MHz
Channel 189	4945	Channel 193	4965	Channel 197	4985
Channel 190	4950	Channel 194	4970		
Channel 191	4955	Channel 195	4975		
Channel 192	4960	Channel 196	4980		

As an IEEE 802.11a wireless network adapter, this device includes a 4.9 GHz receive function as well as a 4.9 GHz digital modulation transmit function. There are no user serviceable parts inside the unit. It is factory sealed in a one-time use manner and inaccessible to the end user.

The tests were performed on production sample model to demonstrate compliance with the ANSI/TIA 603-C-2004, FCC Part 2 and Part 90, Subpart Y, as well as Industry Canada RSS-111 Issue 3 for digitally modulated devices.

## 1.2 Operational Description

The device is a wireless network designed specifically for wireless networks. The device has an 802.11a radio, as well as a standard type N antenna connector. The transceivers operate in the frequency band 4940-4990 MHz. The device transmits digital network data. The unit is mounted in fixed point-to-multi point installations.

The type of RF modulation is OFDM. The device can transmit data at a bit rate of 54 Mbps in OFDM mode or a real-world data rate of approximately 28.0 Mbps. A radio for secure communications uses WEP/WPA/WPA2 (PSK w/TKIP, EAP-TLS, EAP-PEAP TLS, EAP-PEAP MSChap/v2, EAP-TTLS) algorithms.

The firmware used with the device prevents the use of channels outside the specified frequency bands.

**The product is used in a professionally installed, fixed point-to-point environment.**

## 1.3 EUT Testing Configuration

The TR-49PLUS-24 model fitted with an external antenna was tested.

The device was tested with the highest gain antenna. Data is presented for the worst case configuration.

The EUT was mounted to a custom metallic stand to best represent a typical user installation. The EUT was connected to the host PC so that it could be cycled through the various test modes and channels.

The EUT was tested in the following modes:

- **Standby/Receive mode:** In this mode the EUT beacons at the lowest possible rate while searching for a client with which to establish communication.
- **Data transfer mode:** In this mode the EUT is exercised with commercially available bandwidth test software. A link is established between two PCs through the unit and an access point and data is transmitted at the highest possible rate.
- **Beaconing Mode:** In this mode the EUT is set to transmit network configuration beacons at the highest possible rate.

## 1.4 EUT Modifications

No modifications were necessary for this unit to comply with the ANSI/TIA 603-C-2004, FCC CFR 47 Part 2 and 90, as well as with Industry Canada RSS-Gen, Issue 2 and RSS-111, Issue 3.

## 1.5 Test Facilities

Tranzeo EMC Labs  
19473 Fraser Way  
Pitt Meadows, BC V3Y 2V4  
Canada

Phone: (604) 460-6002  
Fax: (604) 460-6005

FCC registration number: 960532  
Industry Canada Number: 5238A

## 1.6 Test Equipment

Manufacturer	Model	Description	Serial No.	Cal Due Date
ETS-Lindgren	2165	Turntable	00043883	N/R
ETS-Lindgren	2175	Mast Motor	00077487	N/R
ETS-Lindgren	1030	Chamber	S2014X7LH	N/A
Sunol Sciences	JB3	Antenna	A042004	02-Nov-2012
Sunol Sciences	DRH-118	Antenna	A052804	02-Dec-2012
Com-Power	LI-115	LISN	241037	30-Oct-2012
Rohde & Schwarz	FSP40	Spectrum Analyzer	100184	24-Aug-2012
Rohde & Schwarz	NRP	Power Meter	100055	02-Aug-2012
Rohde & Schwarz	ESU40	EMI Receiver	100011	29-Mar-2013
Rohde & Schwarz	ESCI	EMI Receiver	100123	02-Nov-2012
TestEQUITY	140	Temperature chamber	140191	N/R

## 1.7 Test System Details

The following auxiliary equipment and cables were used for performing the tests:

Manufacturer	Model	Description	Serial No.
Soyo	PW-930S	Laptop PC	6188
Pheenet	SW-05P	5 port switch	C0104260954
Tranzeo	POE-1	DC injection unit	n/a

Signal Cable Type	Signal Cable Description	Length
Cat 5 LAN	EUT to DC injection unit	50 m
Cat 5 LAN	DC injection unit to Ethernet switch	2 m
Cat 5 LAN	Populate 2 <sup>nd</sup> Ethernet port	1 m

## 1.8 Test Results

The EUT complies with the ANSI/TIA 603-C-2004, FCC CFR 47 Part 2 and 90 Subpart Y, as well as with Industry Canada RSS-Gen, Issue 2 and RSS-111, Issue 3.



## 2.0 Peak Power Output

### 2.1 Test Standard

FCC CFR47, Part 90, Subpart Y 90.1215

*90.1215. The transmitting power of stations operating in the 4940–4990 MHz band must not exceed the maximum limits in this section.*

*(a)(1) The maximum conducted output power should not exceed:*

<b><i>Channel bandwidth, MHz</i></b>	<b><i>High power maximum conducted output power, dBm</i></b>
5	27
10	30
20	33

*(2) If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.*

*(c) The maximum conducted output power is measured as a conducted emission over any interval of continuous transmission using instrumentation calibrated in terms of an RMS-equivalent voltage.*

### 2.2 Test Limits

Maximum conducted output power limits for 4.9 GHz are shown in the table below:

<b>Channel bandwidth, MHz</b>	<b>4.9 GHz band, dBm</b>
5	27
10	30
20	33

### 2.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the appropriate antenna port of the EUT.

The TR-49PLUS-24 model was tested. The test is performed at low, middle and high channels using in 5, 10, and 20 MHz bandwidths for 4.9 frequency band. To guarantee a maximum power measured, the worst case was defined to be the 6-24 Mbps data transmission rate. Power is measured using the channel power measurement feature of the spectrum analyzer.

### 2.3.1 Test Setup Block Diagram



## 2.4 Test Results

### AG-623

Ch	B/w, MHz	Value,dBm
193	20	19.27
196	20	19.19
190	20	19.96
193	10	19.55
196	10	19.99
190	10	20.01
193	5	18.50
196	5	19.89
190	5	19.67

### 3.0 Spurious Emissions at Antenna Terminals

#### 3.1 Test Standard

FCC Part 2, Subpart J, Section 2.1053, Field strength of spurious radiation..  
ANSI/TIA 603-C-2004

*2.1053(a) 2. 1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna..*

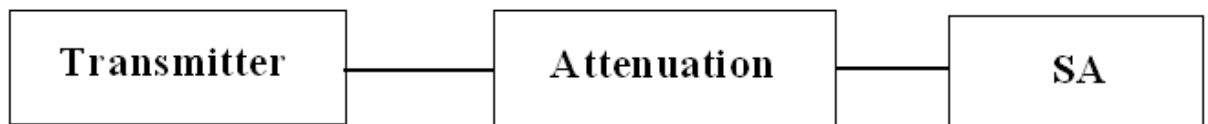
*ANSI/TIA 603-C-2004 2.2.13.1 Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired.*

#### 3.2 Test Setup

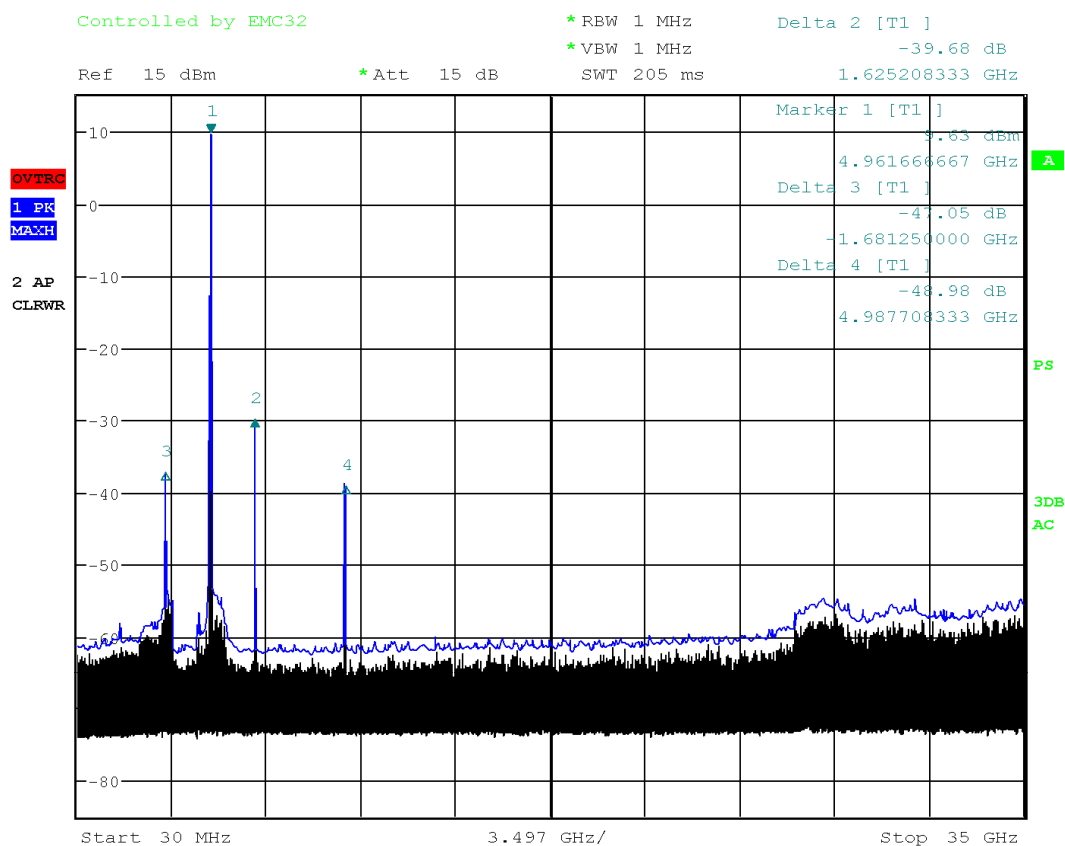
The TR-49PLUS-24 model was tested The EUT was tested when the radio was exercised in 4.9 GHz bands using data transfer mode at the highest possible transmit rate. The test is performed at low, middle and high channels in 5, 10, and 20 MHz. Only worst case data is shown below.

**Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.**

##### 3.2.1 Test Setup Block Diagram



## Results of spurious emissions at antenna terminal



Date: 15.DEC.2011 21:25:55

Data was taken applicable parts of ANSI/TIA 603-C-2004 and Part 90. These specifications are met. There are no deviations to the specifications.

Level of higher frequency emissions dropped to the noise floor.

The above plots show the worst case conducted output of the transmitter. It should be noted that the EUT is not transmitting on two or more channels simultaneously. However, the unit is cycled through low, mid and high channels, 5,10, and 20 MHz bandwidths. All conducted harmonics are at least 20 dBc.

## 4.0 Field Strength of Spurious Radiation

### 4.1 Test Standard

FCC Part 2, Subpart J, Section 2.1053, Field strength of spurious radiation..  
ANSI/TIA 603-C-2004.

*2.1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.*

*ANSI/TIA 603-C-2004 2.2.13.1 Radiated spurious emissions are emissions from the equipment when transmitting into a nonradiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired..*

### 4.2 Test Setup – Spurious Emissions

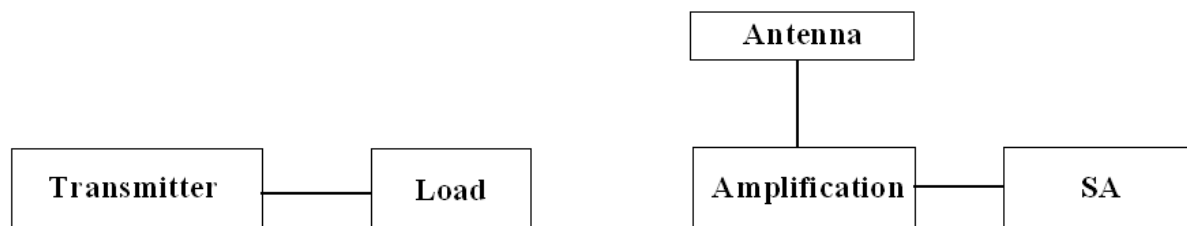
The TR-49PLUS-24 model was tested The EUT was tested when the radio was exercised in 4.9 GHz bands using data transfer mode at the highest possible transmit rate. The test is performed at low, middle and high channels in 5, 10, and 20 MHz. Only worst case data is shown below.

The antenna substitution method was used.

**Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.**

#### 4.2.1 Test Setup Block Diagram – Radiated Measurements (Spurious)

##### 4.2.2



### 4.3 Test Results

5 MHz channel spacing (Data taken at low, middle and high channels of operation)

Frequency of emission, MHz	Amplitude of EUT spurious emission , dBμV		Signal level to substitution antenna to reproduce, dBm		Emission level below carrier, dBc		Limit per 90.210, dBc
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
9890.0	14.4	14.9	-73.5	-73.0	90.5	90.0	50
14835.0	8.6	8.5	-78.8	-78.9	95.8	95.9	50
9890.0	16.1	16.1	-80.8	-80.8	97.8	97.8	50
148343	9.1	9.5	-78.2	--77.8	96.2	94.8	50
9900.6	15.9	16.3	-80.9	--79.9	97.9	96.9	50
14850.0	8.7	8.8	-78.4	-78.3	95.4	95.3	50

10 MHz channel spacing (Data taken at low, middle and high channels of operation)

Frequency of emission, MHz	Amplitude of EUT spurious emission , dBμV		Signal level to substitution antenna to reproduce, dBm		Emission level below carrier, dBc		Limit per 90.210, dBc
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
9890.0	14.3	14.8	-73.6	-73.1	90.6	90.1	50
14835.0	8.5	8.4	-78.9	-79.0	95.9	96.0	50
9890.0	16.0	16.1	-80.9	-80.9	96.0	97.9	50
148343	9.0	9.4	-78.3	--78.0	96.3	94.8	50
9900.6	15.8	16.2	-81.0	--80.1	98.0	96.9	50
14850.0	8.6	8.7	-78.5	-78.4	95.5	95.4	50

20 MHz channel spacing (Data taken at low, middle and high channels of operation)

Frequency of emission, MHz	Amplitude of EUT spurious emission , dBμV		Signal level to substitution antenna to reproduce, dBm		Emission level below carrier, dBc		Limit per 90.210, dBc
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
9890.0	14.2	14.7	-73.7	-73.2	90.7	90.2	50
14835.0	8.4	8.3	-79.0	-79.1	96.0	96.1	50
9890.0	15.9	15.9	-81.0	-81.0	98.0	98.0	50
148343	8.9	8.9	-78.4	--78.0	96.4	95.0	50
9900.6	15.7	16.3	-80.9	--80.3	97.9	97.3	50
14850.0	8.5	8.6	-78.6	-78.5	95.6	95.5	50

Other emissions present had amplitudes at least 20 dB below the limit.

Data was taken per ANSI/TIA 603-C-2004, FCC 2.1053 and applicable parts of Part 90.

Specifications of these sections are met. There are no deviations to the specifications.

## 5.0 Band Edge

### 5.1 Test Standard

FCC CFR 47, Part 2, Subpart J, 2.1051.

*2.1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.*

### 5.2 Test Limits

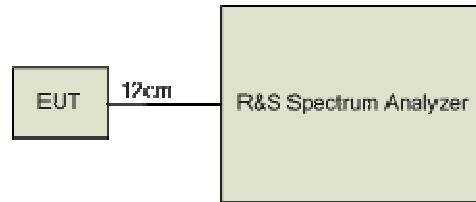
2.1051 The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

### 5.3 Test Setup

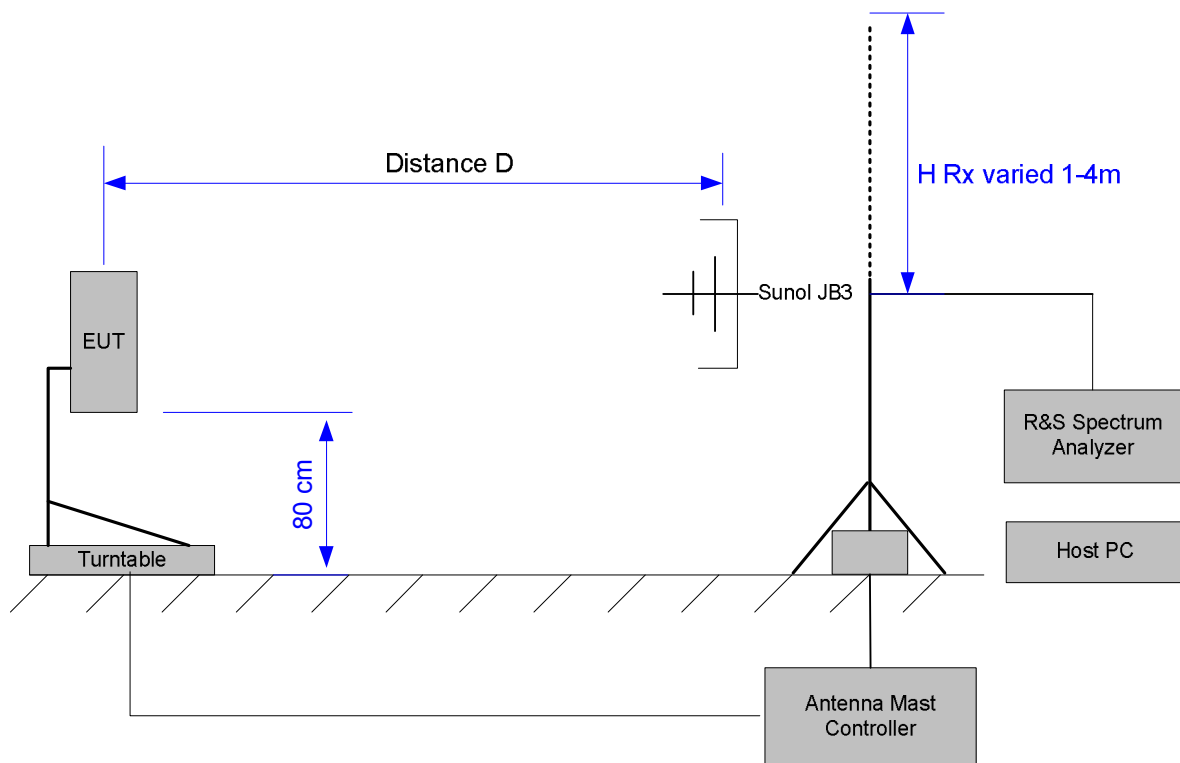
Both radiated and conducted measurements are made on the EUT to ensure compliance with the required emission levels.

The TR-49plus-24n model was tested. The test is performed at low and high channels. Compliance in the 4940-4990 MHz band is established through conducted measurements. Data is presented for the worst case configuration.

### 5.3.1 Test Setup Block Diagram – Conducted Measurements



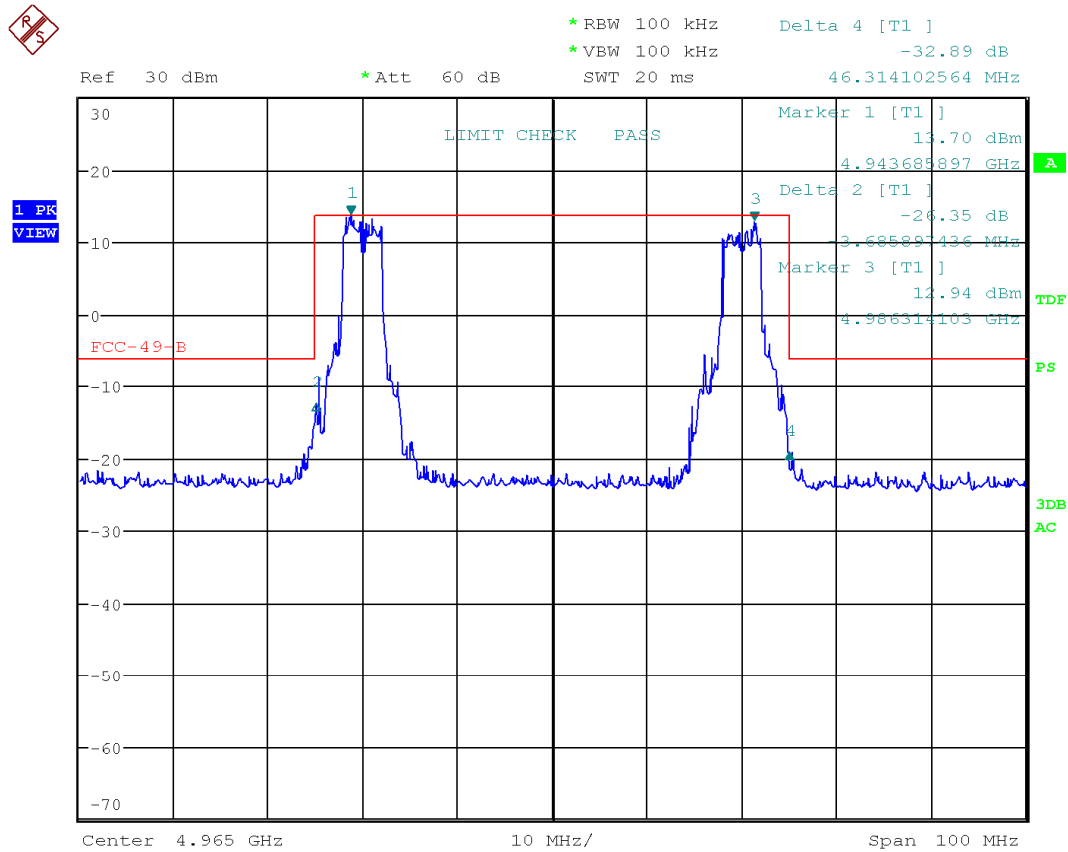
### 5.3.2 Test Setup Block Diagram – Radiated Measurements



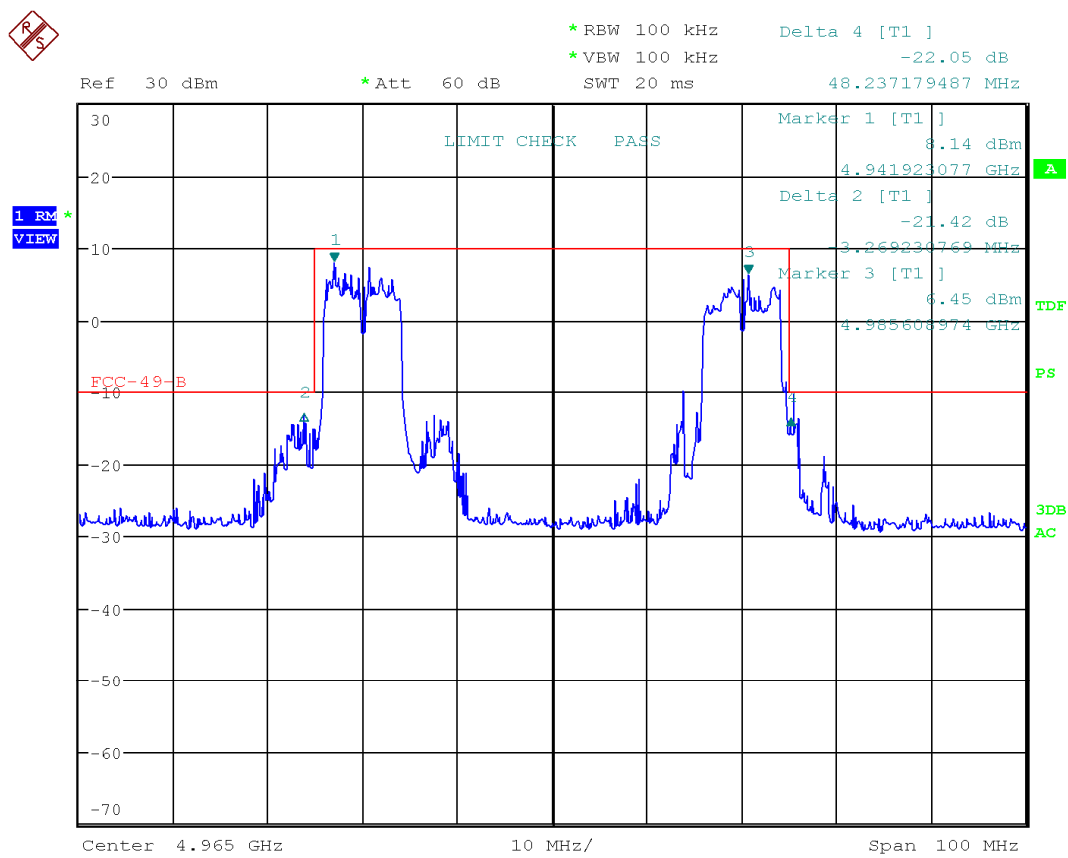


## 5.4 Test Results

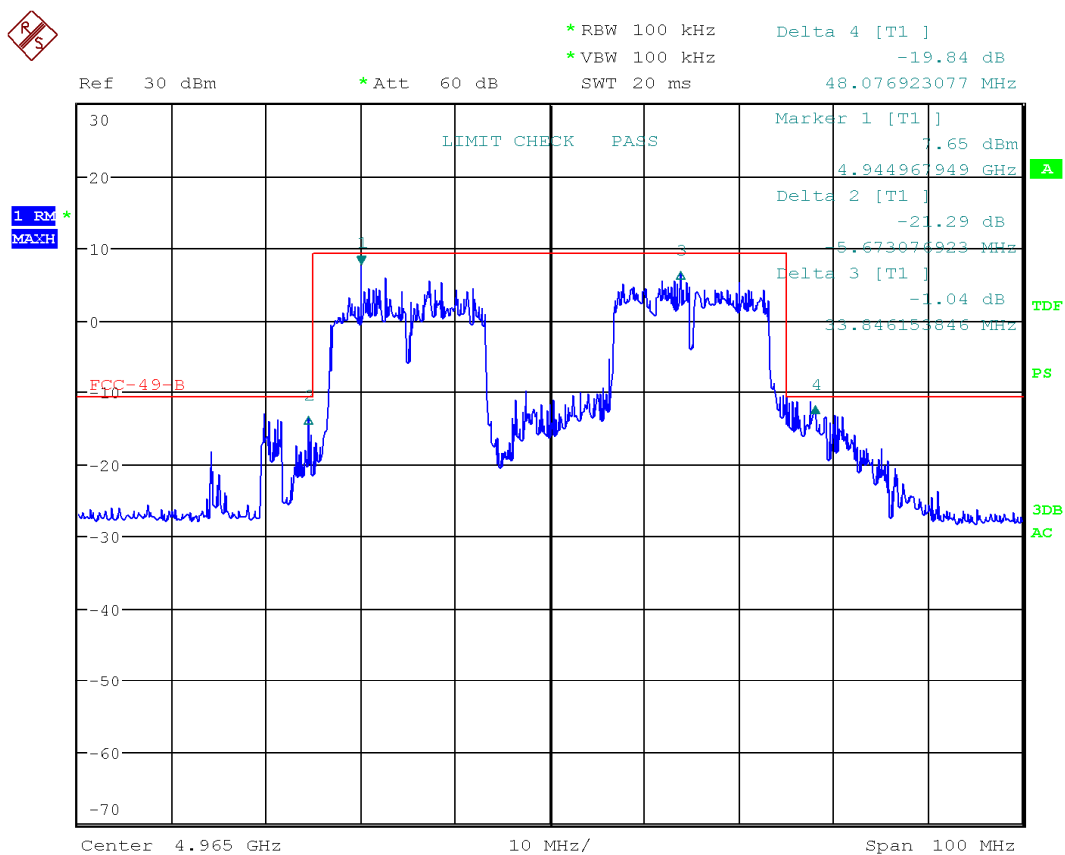
### 5.4.1 Conducted Measurements



Date: 27.DEC.2011 19:55:54



Date: 27.DEC.2011 20:16:40



Date: 27.DEC.2011 20:12:22

All emissions outside of the 4940-4990 MHz frequency band are attenuated by at least 20 dB.

## 6.0 Occupied Bandwidth

### 6.1 Test Standard

FCC CFR 47, Part 2, Subpart J, 2.1049

*2.1049 The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission ...*

### 6.2 Test Limits

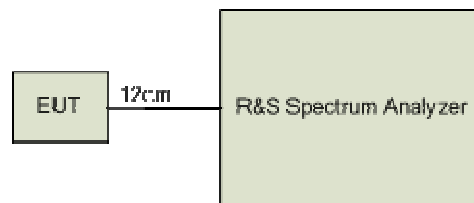
The occupied bandwidth for 4.9 GHz to be determined.

### 6.3 Test Setup

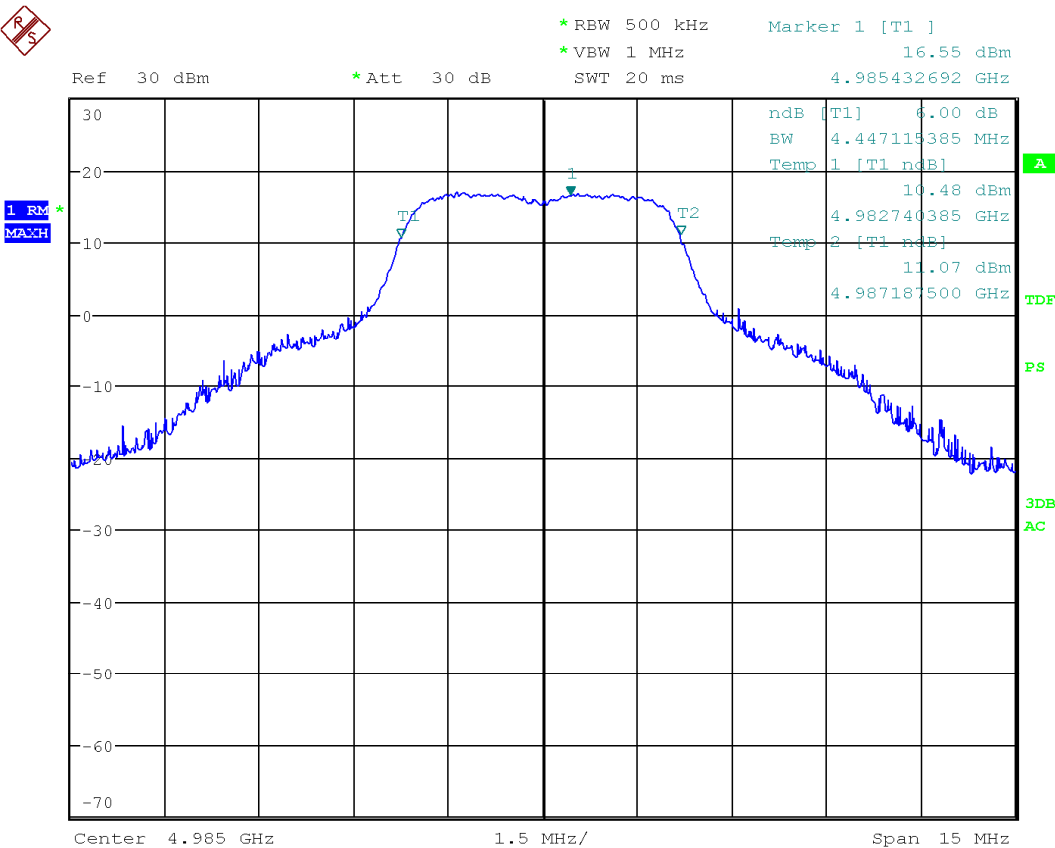
This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The TR-49plus-24N model was tested The test is performed at low, middle and high channels in 5, 10, and 20 MHz bandwidths for 4.9 GHz frequency band. Only the worst case is shown.

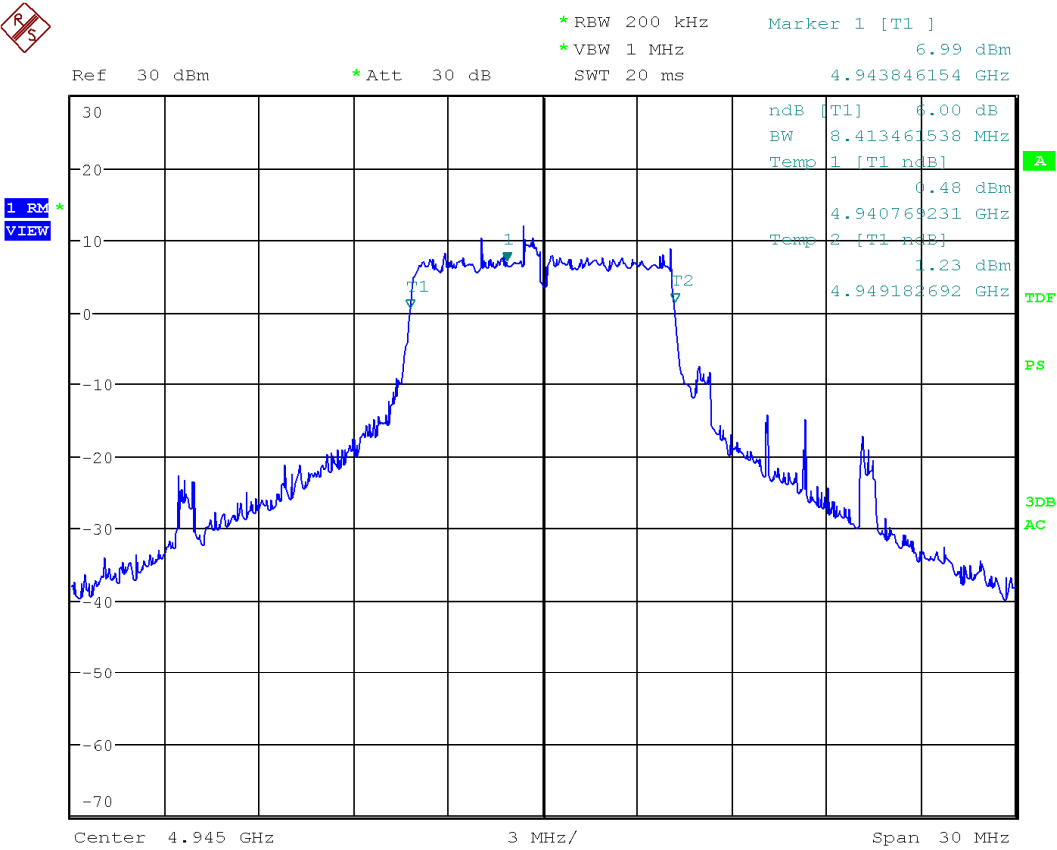
#### 6.3.1 Test Setup Block Diagram



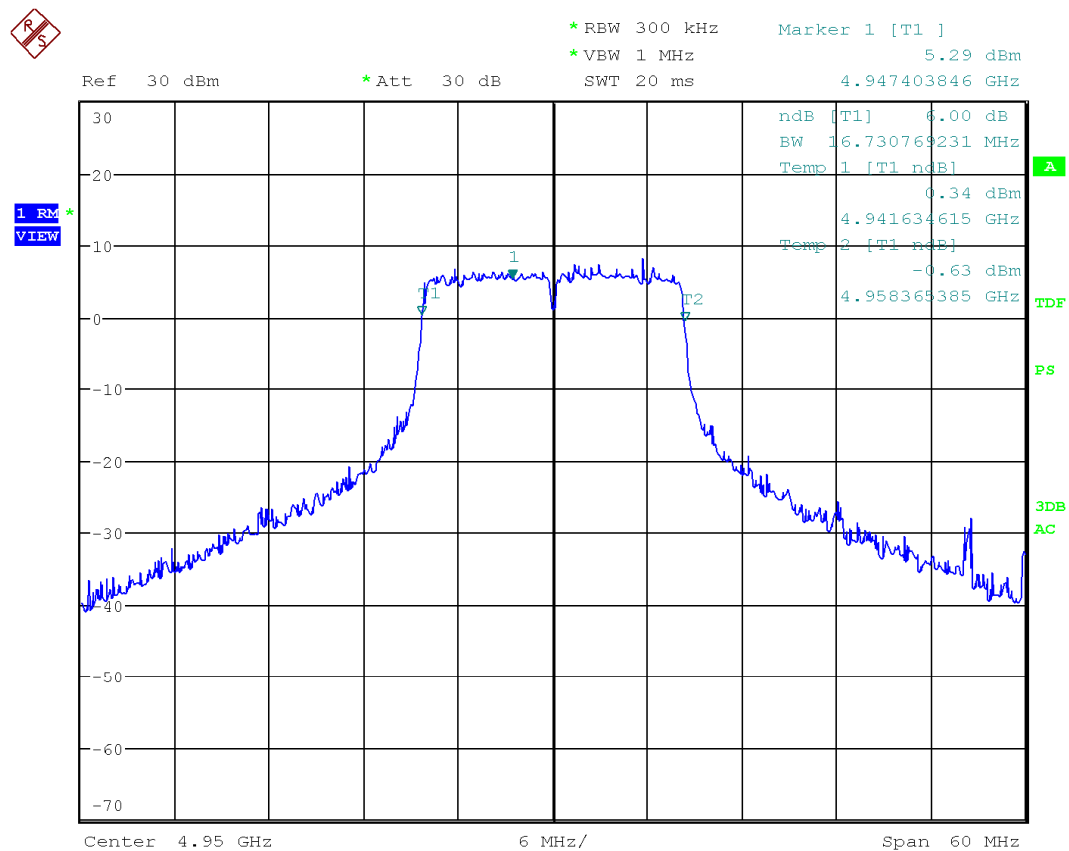
Test Results



Date: 23.DEC.2011 20:48:58



Date: 23.DEC.2011 20:55:25



Date: 23.DEC.2011 21:00:29

Ch	B/w	Value,MHz
193	10	8.27
	5	4.13
	20	16.15
190/189	10	8.27
	5	4.25
	20	16.54
196/197	10	8.32
	5	4.11
	20	16.54

## 7.0 Power Spectral Density

### 7.1 Test Standard

FCC CFR47, Part 90, Subpart Y 90.1215

*90.1215 (a)(2) High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. ... If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi.*

*(d) The peak power spectral density is measured as conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements are made over a bandwidth of one MHz or the 26 dB emission bandwidth of the device, whichever is less. A resolution bandwidth less than the measurement bandwidth can be used, provided that the measured power is integrated to show total power over the measurement bandwidth. If the resolution bandwidth is approximately equal to the measurement bandwidth, and much less than the emission bandwidth of the equipment under test, the measured results shall be corrected to account for any difference between the resolution bandwidth of the test instrument and its actual noise bandwidth.*

### 7.2 Test Limits

For 4.9 GHz the transmitted power density shall not be greater than 21 dBm in any 1 MHz band during any time interval of continuous transmission

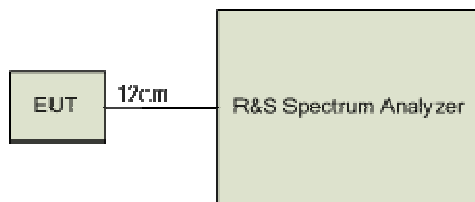
### 7.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to the antenna port of the EUT.

The TR-49plus-24N model was tested The test is performed at low, middle and high channels in 5, 10, and 20 MHz bandwidths for 4.9 GHz frequency band.

### 7.4 Test Setup Block Diagram





## 7.5 Test Results

Ch	B/w, MHz	Value,dBm	Per 1 MHz	Plus 6 32dbi	Limit
190	20	-58.8	1.2	7.2	21
193	20	-58.05	1.95	7.95	
196	20	-57.86	2.14	8.14	
189	10	-57.2	2.8	8.8	
193	10	-56.89	3.11	9.11	
197	10	-55.94	4.06	10.06	
189	5	-54.9	5.1	11.1	
193	5	-54.19	5.81	11.81	
197	5	-53.39	6.61	12.61	

## 8.0 Transmitter unwanted emission mask

### 8.1 Test Standard

IC RSS-111, Issue 3

*111.4.3 The 0 dB reference level in the unwanted emission mask (see Section 5.4) is the maximum inband power spectral density measured in terms of average power in the equipment's channel bandwidth, using a resolution bandwidth of at least 1% of the occupied bandwidth and a video bandwidth of 30 kHz. The unwanted power spectral density emissions are also measured using a measurement device employing a resolution bandwidth of at least 1% of the occupied bandwidth.*

*111.5.4 On any frequency  $f$ , offset from the channel centre frequency  $f_c$  by a separation  $f_d$  (expressed as a percentage of the channel bandwidth), the spectral power density of the unwanted emissions for low- and high-power transmitters shall comply with the limits specified in the table below.*

### 8.2 Test Limits

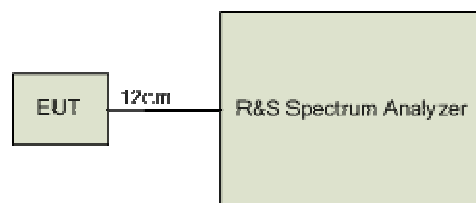
Offset Frequency $f_d$ (% of the Equipment's Channel Bandwidth)	Minimum Attenuation, dB
$0 < f_d < 45$	0
$45 < f_d < 50$	$568 \log (f_d/45)$
$50 < f_d < 55$	$26 + 145 \log (f_d/50)$
$55 < f_d < 100$	$32 + 31 \log (f_d/55)$
$100 < f_d \leq 150$	$40 + 57 \log (f_d/100)$
$f_d > 150$	whichever is less stringent 50 or $55 + 10 \log (P(\text{watts}))$

### 8.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to one (access point or backhaul radio) of the antenna port of the EUT.

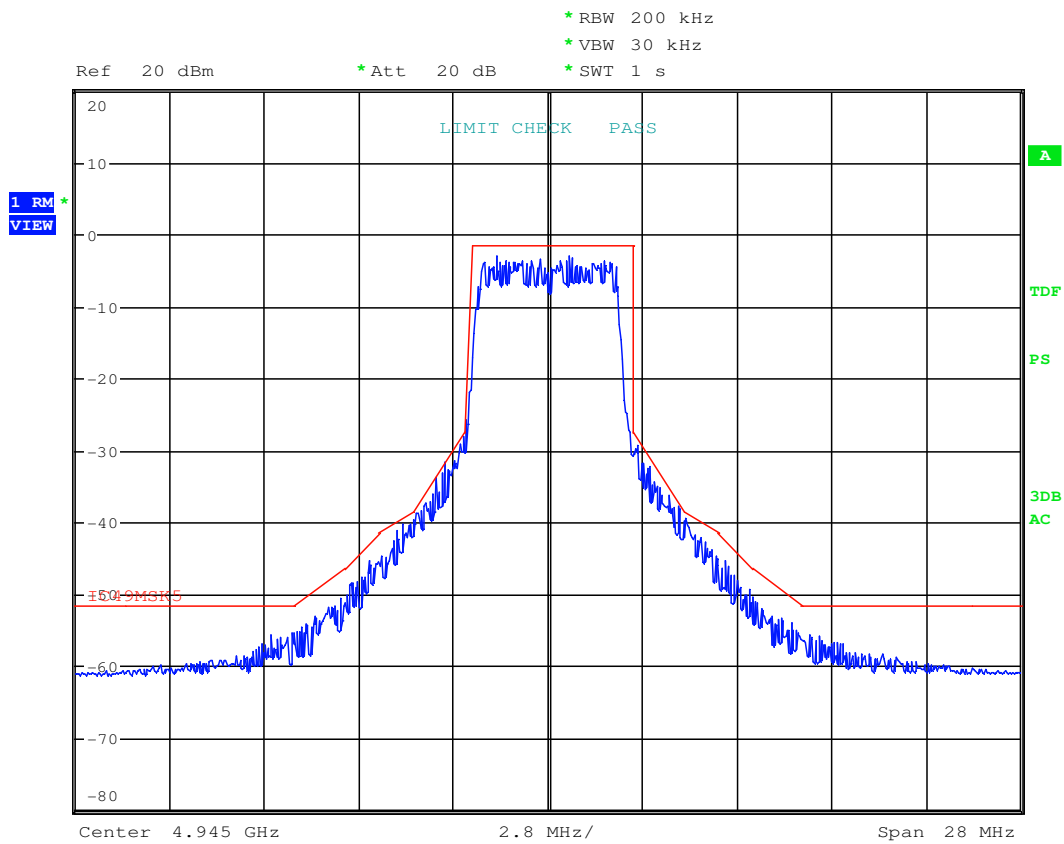
The TR-49plus-24n model was tested The test is performed at low, middle and high channels in 5, 10, and 20 MHz bandwidths for 4.9 GHz frequency band.

### 8.4 Test Setup Block Diagram

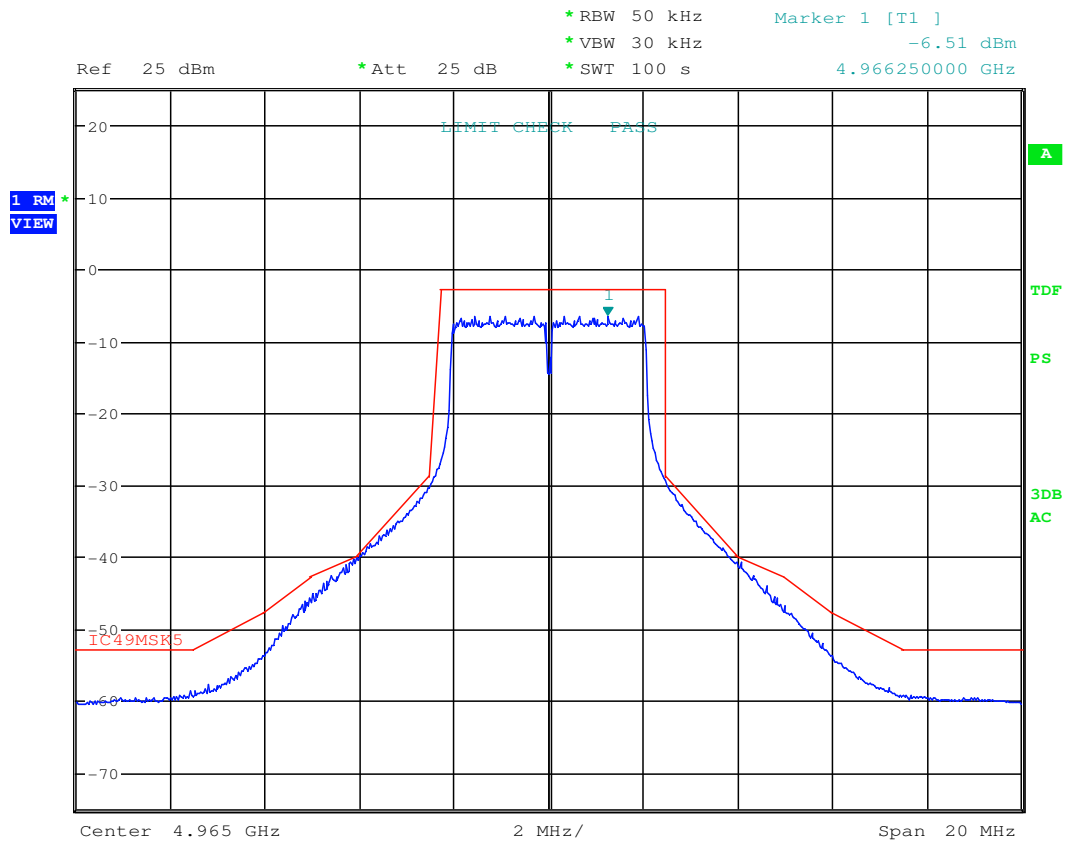


## 8.5 Test Results IC RSS-111

### AG-623



Date: 18.JAN.2010 19:32:23

**CM-9**

Date: 25.JAN.2010 14:42:27

## 9.0 Transmitter Frequency Stability

### 9.1 Test Standard

IC RSS-111, Issue 3

IC RSS-Gen., Issue 2

FCC Part 2, Subpart J, Section 2.1055

*RSS-111 5.2 The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation when tested at the temperature and supply voltage variations specified in RSS-Gen.*

*RSS-Gen 4.7 The following temperatures and supply voltage ranges apply, unless specified otherwise in the applicable RSS.*

*(a) at temperatures of -20°C, +20°C and +50°C, and at the manufacturer's rated supply voltage; and*

*(b) at temperature of +20°C and at  $\pm 15$  percent of the manufacturer's rated supply voltage.*

*2.1055 (a) The frequency stability shall be measured with variation of ambient temperature as follows: (1) From -30° to +50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.*

*(d) The frequency stability shall be measured with variation of primary supply voltage as follows: (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.*

### 9.2 Test Limits

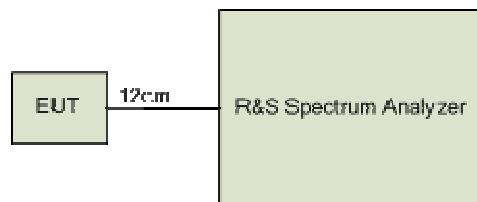
The actual carrier centre frequency for any given channel shall be maintained within the range of 20 ppm.

### 9.3 Test Setup

This test is performed conducted. The measurement equipment is connected directly to one (access point or backhaul radio) of the antenna port of the EUT.

The TR-49plus-24n model was tested The test is performed at low, middle and high channels in 5, 10, and 20 MHz bandwidths for 4.9 GHz frequency band. This test is performed at normal and extreme (temperature and voltage) test conditions.

### 9.3.1 Test Setup Block Diagram



## 9.4 Test Results

See Appendix in the end of this report.

## 10.0 RF Exposure Evaluation

### 10.1 Test Standard

FCC CFR47, Part 1, 1307 (b), 1310  
 FCC CFR47, Part 2, Subpart J 1091  
 FCC CFR47, Part 90, Subpart Y 90.1217

*FCC 1.1310 states the criteria listed in the table below shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Section 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Section 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation".*

<b>Frequency Range (MHz)</b>	<b>Electric Field Strength (V/m)</b>	<b>Magnetic Field Strength (A/M)</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Average Time</b>
<i>(A) Limits for Occupational/Control Exposures</i>				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
<i>(B) Limits for General Population/Uncontrolled Exposures</i>				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

### 10.2 EUT Operating Condition

The maximum antenna gain is 32 dBi at 4.9 GHz.

### 10.3 RF exposure evaluation distance calculation

#### 4.9 GHz radio with 32 dBi antenna

<b>Freq (MHz)</b>	<b>Output Power to Antenna (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>r (cm)</b>
4950	20.01	32	131.1
4965	19.55	32	110.4
4980	10.99	32	122.6

As shown above, the minimum distance where the MPE limit is reached is 131.1 cm for the EUT.

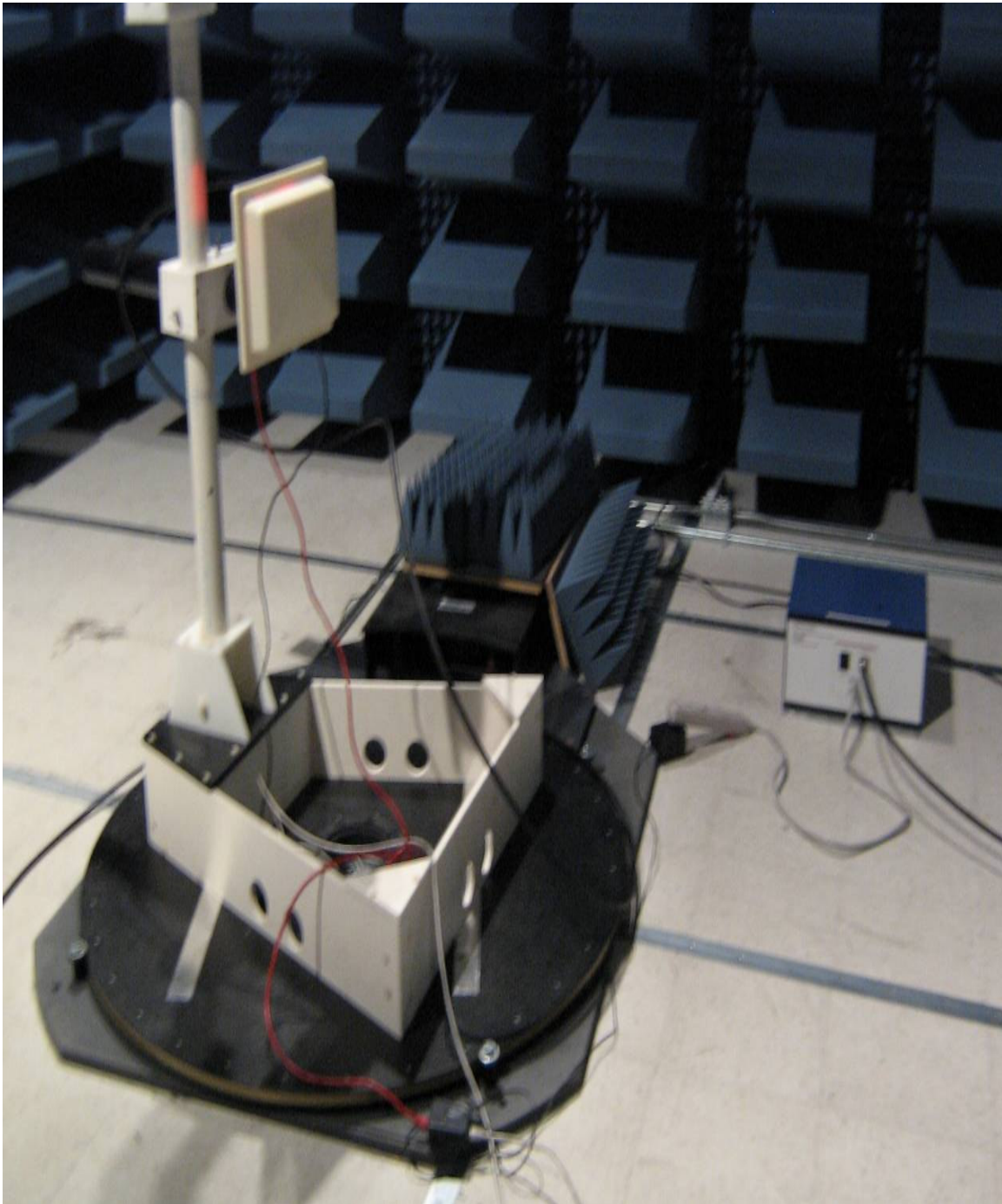
## **11.0 Test Photos**

### **11.1 Radiated emissions setup**





## 11.2 Conducted emissions setup



## Appendix

### AG-623

Temperature	F1	F2	FCntr	Fdev, kHz	PPM Limit	Voltage, V	Frequency, MHz	Bandwidth
20	4.941666700	4.9584135	4.950040100	40.1	99.00	15.3	4950	20
20	4.941506400	4.9584936	4.950000000	0.0	99.00	21.7	4950	20
50	4.941746800	4.9584135	4.950080150	80.1	99.00	15.3	4950	20
50	4.941746800	4.9584135	4.950080150	80.1	99.00	21.7	4950	20
50	4.941666670	4.9584135	4.950040085	40.1	99.00	18	4950	20
50	4.956666700	4.973493	4.965079850	79.9	99.30	18	4965	20
50	4.971666670	4.98849359	4.980080130	80.1	99.60	18	4980	20
50	4.980753200	4.98932692	4.985040060	40.1	99.70	18	4985	10
50	4.96064103	4.96942308	4.96503206	32.1	99.3	18	4965	10
50	4.940769230	4.94935897	4.945064100	64.1	98.90	18	4945	10
-55	4.940576923	4.949423077	4.945	0.0	98.90	18	4945	5
-55	4.982749385	4.987259615	4.985	4.5	99.70	18	4985	5
-55	4.962692308	4.967259615	4.965	-24.0	99.30	18	4965	5
-55	4.956634615	4.973413462	4.965	24.0	99.30	18	4965	20
-55	4.956634615	4.973413462	4.965	24.0	99.30	15.7	4965	20
-55	4.956682692	4.973509615	4.965	96.2	99.30	21.3	4965	20

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Temperature	F1	F2	FCntr	Fdev, kHz	PPM Limit	Voltage, V	Frequency, MHz	Bandwidth
50	4.956530449	4.973637821	4.965084135	84.1	99.30	15.3	4965	20
50	4.940633013	4.949487179	4.945060096	60.1	98.90	18	4945	10
50	4.980713141	4.989447115	4.985080128	80.1	99.70	18	4985	10
50	4.962788462	4.967307692	4.965048077	48.1	99.30	18	4965	5
20	4.971530449	4.988469551	4.980000000	0.0	99.60	15.3	4980	20
20	4.956634615	4.973557692	4.965096154	96.2	99.30	15.3	4965	10
20	4.956634615	4.973413462	4.965024039	24.0	99.30	18	4965	5
20	4.956442308	4.973605769	4.965024039	24.0	99.30	21.7	4965	20
-55	4.971530449	4.988357372	4.979943911	-56.1	99.60	15.3	4980	20
-55	4.971530449	4.988469551	4.980000000	0.0	99.60	18	4980	20
-55	4.971474359	4.988413462	4.979943911	-56.1	99.60	21.7	4980	20
-55	4.940625000	4.949431090	4.945028045	28.0	98.90	21.7	4945	10
-55	4.940763077	4.949375000	4.945069039	69.0	98.90	15.3	4945	10
-55	4.962668269	4.967283654	4.964975962	-24.0	99.30	18	4965	5