TRANZEO
EMC LABS INC

EMC Test Report

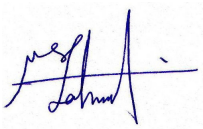
FCCID: QRF-SQQNT623

5.8 GHz Wireless Network Adapter
Tranzeo Wireless Technologies Inc.

Date: 9 April, 2007

Report No.: 090407.1

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



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Revision History

Table of Contents

1.0 General Information

1.1 EUT Description

Product Name	Wireless Network Device
Company Name	Tranzeo Wireless Technologies Inc.
FCC ID	QRF-SQQNT623
Model No.	TR-FDD-24
Frequency Range	5725-5850 MHz
Number of Channels	2 Simultaneous; 3 Channel Shield combinations
Transmit Rate	54 Mbps maximum bit rate specification
Type of Modulation	OFDM
Antenna Type	Integrated and external
Antenna Gain	5725-5850 32 dBi MAX
Product Software Revision	TR-3.4.4FDD.bin
Test Software	Bandwidth test software
Operator Channel Selection	By software
Power Adapter	Tranzeo Wireless Supplied SP48-181000
	Input: AC 120V 60Hz, 25.9 W
	Output: DC 18 V, 1000 mA
	Serial: 0504

Product samples tested:

Manufacturer	**Model No.**	**Serial No.**
Tranzeo Wireless	TR-FDD-24	FDD-ENGR1

Frequency of each Channel Shield:

TR-CS1					
20 MHz Bandwidth		**10 MHz Bandwidth**		**5 MHz Bandwidth**	
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
Channel 149	5745	Channel 148	5740	Channel 148	5740
Channel 165	5825	Channel 150	5750	Channel 149	5745
		Channel 164	5820	Channel 150	5750
		Channel 166	5830	Channel 164	5820
				Channel 165	5825
				Channel 166	5830

TR-CS2					
20 MHz Bandwidth		**10 MHz Bandwidth**		**5 MHz Bandwidth**	
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
Channel 149	5745	Channel 148	5740	Channel 148	5740
Channel 157	5785	Channel 150	5750	Channel 149	5745
		Channel 156	5780	Channel 150	5750
		Channel 158	5790	Channel 156	5780
				Channel 157	5785
				Channel 158	5790

TR-CS3					
20 MHz Bandwidth		**10 MHz Bandwidth**		**5 MHz Bandwidth**	
Channel	**Frequency**	**Channel**	**Frequency**	**Channel**	**Frequency**
Channel 153	5765	Channel 152	5760	Channel 152	5760
Channel 161	5805	Channel 154	5770	Channel 153	5765
		Channel 160	5800	Channel 154	5770
		Channel 162	5810	Channel 160	5800
				Channel 161	5805
				Channel 162	5810

The product, TR-FDD-24, uses an integrated 5.8 GHz 24 dBi antenna. However, a standard Type N antenna connector is also provided for using the unit with external antennas. To connect any external antenna, the internal antenna connector is removed and replaced by the provided Type N connector.

As a wireless bridge, this device includes a 5 GHz receive function as well as a 5 GHz digital modulation transmit function. The unit is fitted with an integrated antenna. 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 models to demonstrate compliance with FCC Part 15, Subpart B, and Subpart C, as well as Industry Canada RSS-210 Issue 6 for digitally modulated devices.

1.2 Operational Description

The device is a wireless network bridge designed specifically for outdoor applications. The device provides a bridge between IEEE802.3 wired Ethernet LANs and wireless networks. It uses either an internal or an external antenna coupled with a transceiver to connect to remote wireless clients. The transceiver operates in the frequency band 5725-5850 MHz in full duplex mode using channel specific duplexers (Channel Shields). The device transmits digital network data. The unit is mounted externally in fixed point-to-point installations. It is mounted on the exterior of a building typically for broadband internet access.

The type of RF modulation is OFDM which is used at 5.8 GHz with 20, 10 and 5 MHz bandwidths. The device can transmit data at a bit rate of 54 Mbps or a real-world data rate of approximately 27 Mbps. A 128 bits Wired Equivalent Protection (WEP) algorithm is used for secure communications.

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

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

1.3 EUT Testing Configuration

The product, TR-FDD-24, fitted with an integrated antenna was tested. A standard Type N connector was used to test the TR-FDD-24 unit with the highest gain external antenna of each type.

The EUT was mounted to a custom non-metallic stand to ease polarization changes and 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. For testing with external antennas, connection between each antenna and the Type N connector was made via 1 m of coaxial shielded cable.

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 Antennas

The TR-FDD-24 EUT was tested with the following external antennas:

5 GHz Antennas	
TR-5.8-32DB-ANT	32 dBi Dish Antenna
TR-GD58-26	26 dBi Grid antenna

1.5 EUT Modifications

No modifications were necessary for this unit to comply with FCC Part 15 and Industry Canada RSS-210 Issue 6.

1.6 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

1.7 Test Equipment

Manufacturer	Model	Description	Serial No.	Cal Due Date
Sunol Sciences	SM46C	Turntable	051204-2	N/R
Sunol Sciences	Custom	Mast Motor	TREML0001	N/R
Sunol Sciences	JB3	Antenna	A042004	02-Jun-2007
Sunol Sciences	DRH-118	Antenna	A052804	02-Jun-2007
Com-Power	LI-115	LISN	241037	30-Jan-2008
Rohde & Schwarz	FSP40	Spectrum Analyzer	100184	24-Aug-2007
Rohde & Schwarz	NRP	Power Meter	100055	02-Aug-2007
Rohde & Schwarz	ESCI	EMI Receiver	100123	02-Jun-2007

1.8 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 Block to Ethernet switch	2 m
Cat 5 LAN	Populate 2nd Ethernet port	1 m

1.9 Test Results

The EUT complies with FCC Part 15, Subparts B and C, as well as Industry Canada RSS-210 Issue 6.

2.0 Conducted Emissions

2.1 Test Standard

FCC Part 15, Subpart C, Section 15.207a.

| *a) Except as shown in Paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.* |

2.2 Test Limits

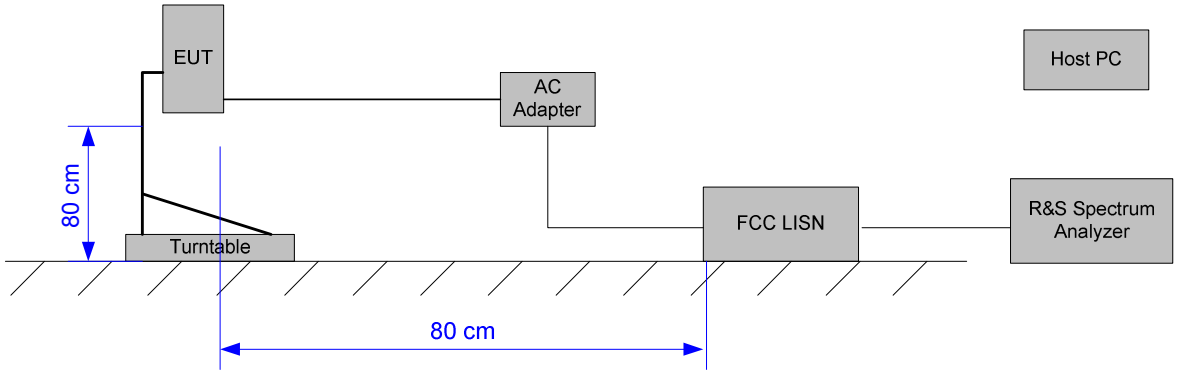
Frequency (MHz)	Maximum Level (dBuV) Quasi-Peak	Maximum Level (dBuV) Average
0.15-0.50	66-56 (Log Delta)	56-46 (Log Delta)
0.50-5.00	56	46
5.00-30.0	60	50

2.3 Test Setup

The EUT was exercised using bandwidth test software at the highest possible data rate. Testing was performed on the product's fixed channels and emission bandwidth. The data below is for the worst case configuration.

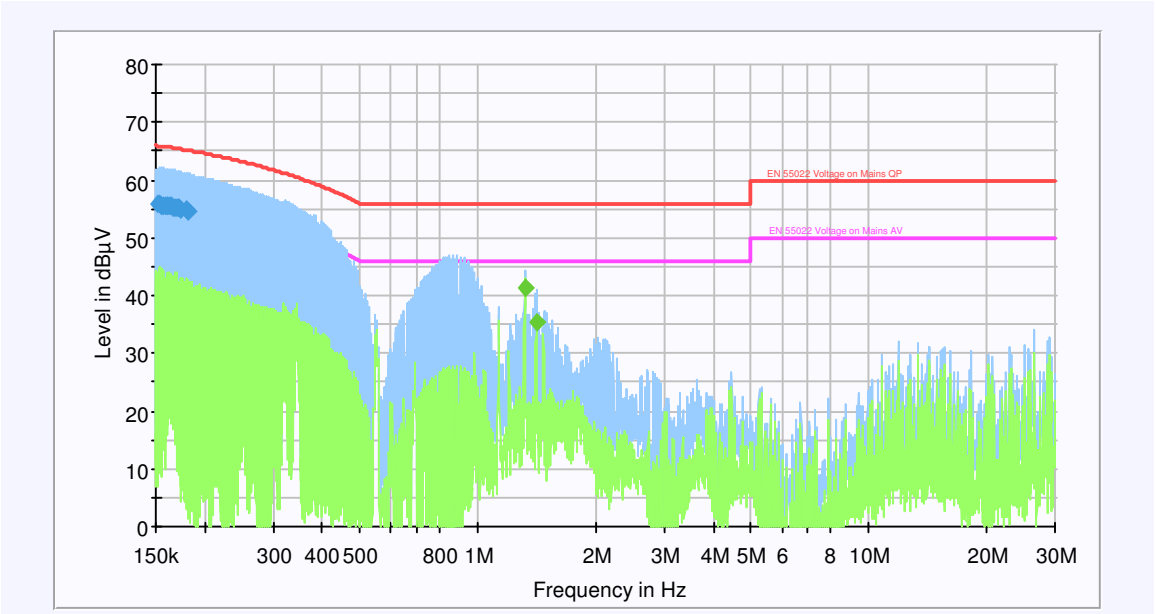
Note: For testing purposes only, to ensure worst case performance in all testing configurations, the radio is configured to transmit at the maximum possible RF power.

2.3.1 Test Setup Block Diagram



Note: The unused LISN terminal is terminated with a 50 ohms terminator.

2.4 Test Results



2.4.1 Test Data Peak Detector

Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.152418	55.8	9.000	On	N	-0.1	10.1	65.9
0.153182	55.8	9.000	On	N	-0.1	10.1	65.9
0.154566	55.7	9.000	On	N	-0.1	10.2	65.9
0.155963	55.7	9.000	On	N	-0.1	10.1	65.8
0.157372	55.6	9.000	On	N	-0.1	10.2	65.8
0.158160	55.6	9.000	On	N	-0.1	10.2	65.8
0.159589	55.6	9.000	On	N	-0.1	10.1	65.7
0.161031	55.6	9.000	On	N	-0.1	10.1	65.7
0.162487	55.4	9.000	On	N	-0.1	10.2	65.6
0.163955	55.4	9.000	On	N	-0.1	10.2	65.6
0.164776	55.4	9.000	On	N	-0.1	10.2	65.6
0.166265	55.3	9.000	On	N	-0.1	10.2	65.5
0.167768	55.2	9.000	On	N	-0.1	10.3	65.5
0.169284	55.1	9.000	On	N	-0.1	10.3	65.4
0.170813	55.0	9.000	On	N	-0.1	10.4	65.4
0.171669	55.1	9.000	On	N	-0.1	10.3	65.4
0.173220	54.9	9.000	On	N	-0.1	10.4	65.3
0.178850	54.8	9.000	On	N	-0.1	10.4	65.2
0.180466	54.8	9.000	On	N	-0.1	10.3	65.1
0.182097	54.7	9.000	On	N	-0.1	10.4	65.1

2.4.2 Test Data Average Detector

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.321533	41.4	9.000	On	L1	-0.1	4.6	46.0
1.411650	35.5	9.000	On	L1	-0.1	10.5	46.0

Note: All data points are corrected for insertion loss.

3.0 Peak Power Output

3.1 Test Standard

FCC CFR47, Part 15, Subpart B 15.247b.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the 1 watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power *is the highest total transmit power occurring in any mode.*

(4) The conducted output power limit specified in Paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in Paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in Paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(iii) Fixed, point-to-point operation, as used in Paragraphs (c)(4)(i) and (c)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility. |

3.2 Test Limits

The maximum conducted output power shall not exceed 30 dBm.

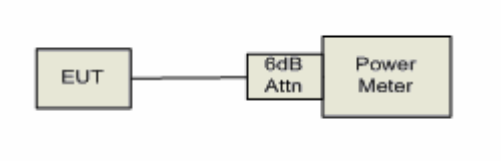
3.3 Test Setup

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

The test is performed at the product's fixed channels.

Power is measured using the R&S power meter.

3.3.1 Test Setup Block Diagram



3.4 Test Results

Channel Shield 1			
Mode OFDM/ Channel BW = 20MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
Output port, 5745	15.02	30	PASS
Output port, 5825	15.71	30	PASS
Output port, 2 channels combined	18.36	30	PASS

Channel Shield 2			
Mode OFDM/ Channel BW = 20MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
Output port, 5745	15.19	30	PASS
Output port, 5785	15.01	30	PASS
Output port, 2 channels combined	18.06	30	PASS

Channel Shield 3			
Mode OFDM/ Channel BW = 20MHz			
Frequency(MHz)	**Measurement(dBm)**	**Limit**	**Result**
Output port, 5765	15.06	30	PASS
Output port, 5805	15.20	30	PASS
Output port, 2 channels combined	18.13	30	PASS

4.0 Radiated Emissions, General Requirements

4.1 Test Standard

FCC Part 15, Subpart C, Section 15.209, Radiated Emission Limits, General Requirements.

| *(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:*

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

*** Except as provided in Paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., Sections 15.231 and 15.241.*

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. |

4.2 Test Limits

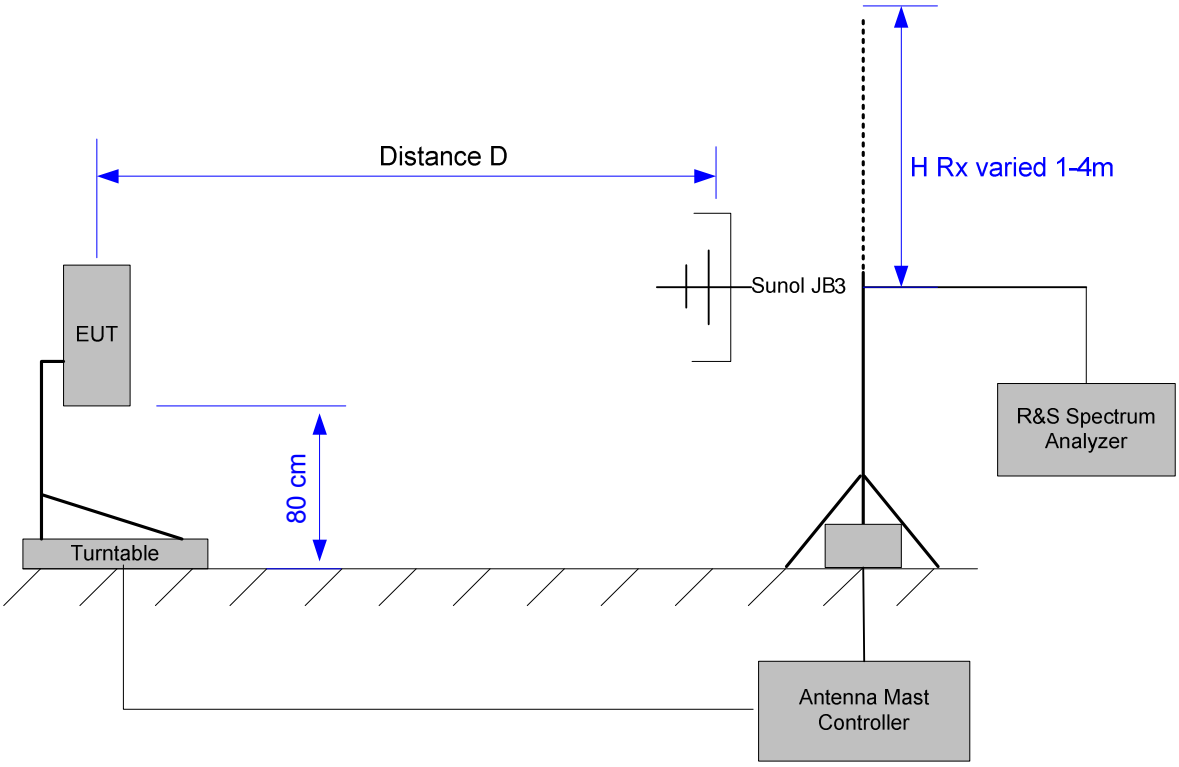
Frequency (MHz)	Maximum Field Strength (uV/m @ 3M)	Maximum Field Strength (dBuV/m @ 3m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-1000	500	54.0

4.3 Test Setup

The TR-FDD-24 was tested with all antennas. The unit was connected to the external antenna via 1m of coaxial shielded cable. The EUT was exercised using beaconing mode at the highest possible transmit rate. Testing was performed on the product's fixed channels in 20, 10 and 5MHz bandwidths using all channel shield combinations. 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.

4.3.1 Test Setup Block Diagram



Note: Measurements below 1 GHz were performed with the Sunol JB3 antenna with a measurement distance of 3 m. Compliance above 1 GHz is covered in Section 5.0.

4.4 Test Results

4.4.1 Channel Shield 1, Dish Antenna

Frequency (MHz)	QuasiPeak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
750.000000	41.5	156.0	V	0.0	23.6	4.50	46.00
194.200000	38.5	263.0	H	96.0	13.8	5.00	43.50
55.800000	34.8	264.0	H	181.0	8.6	5.20	40.00
530.600000	40.3	193.0	H	97.0	20.7	5.70	46.00
84.120000	32.5	214.0	H	285.0	8.6	7.60	40.00
207.160000	35.4	285.0	H	104.0	13.3	8.10	43.50
625.000000	37.9	99.0	V	5.0	22.1	8.10	46.00
180.640000	34.7	165.0	H	0.0	12.8	8.80	43.50
208.080000	32.5	193.0	H	254.0	13.1	11.00	43.50
85.360000	27.0	265.0	H	0.0	8.5	13.00	40.00
82.560000	27.0	285.0	H	285.0	8.7	13.00	40.00
91.920000	25.0	285.0	H	8.0	9.1	18.50	43.50
155.640000	18.8	99.0	V	163.0	14.1	24.70	43.50
140.720000	14.9	114.0	V	172.0	14.9	28.60	43.50
153.960000	12.4	156.0	H	183.0	13.9	31.10	43.50
162.800000	11.7	264.0	V	253.0	13.8	31.80	43.50
173.000000	9.5	194.0	V	172.0	13.3	34.00	43.50

Note: All data points are corrected for insertion loss.

4.4.2 Channel Shield 2, Dish Antenna

Frequency (MHz)	QuasiPeak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
883.480000	45.0	262.0	V	10.0	25.0	1.00	46.00
147.520000	42.5	164.0	V	261.0	14.5	1.00	43.50
196.840000	41.2	284.0	H	5.0	14.3	2.30	43.50
55.680000	37.2	263.0	H	253.0	8.6	2.80	40.00
750.000000	40.1	164.0	V	0.0	23.6	5.90	46.00
625.000000	39.4	100.0	V	5.0	22.1	6.60	46.00
204.640000	36.8	192.0	H	89.0	13.8	6.70	43.50
82.640000	32.6	265.0	H	276.0	8.7	7.40	40.00
86.080000	29.7	283.0	H	5.0	8.5	10.30	40.00
533.240000	35.1	163.0	V	104.0	20.2	10.90	46.00
208.160000	32.3	283.0	H	275.0	13.1	11.20	43.50
84.320000	27.7	256.0	H	5.0	8.5	12.30	40.00
182.640000	31.1	283.0	H	-10.0	12.8	12.40	43.50
719.200000	32.8	264.0	V	183.0	23.2	13.20	46.00
827.880000	22.3	114.0	H	188.0	25.2	23.70	46.00
154.720000	17.5	208.0	V	88.0	14.1	26.00	43.50
168.880000	13.1	142.0	V	104.0	13.5	30.40	43.50
134.960000	12.9	284.0	V	9.0	15.2	30.60	43.50

Note: All data points are corrected for insertion loss.

4.4.3 Channel Shield 3, Dish Antenna

Frequency (MHz)	QuasiPeak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
194.360000	40.7	284.0	H	88.0	13.8	2.80	43.50
101.440000	40.6	113.0	V	-5.0	12.3	2.90	43.50
55.880000	36.5	265.0	H	74.0	8.7	3.50	40.00
54.720000	35.7	264.0	H	181.0	8.6	4.30	40.00
208.560000	39.0	244.0	H	75.0	13.0	4.50	43.50
83.560000	35.1	264.0	H	266.0	8.6	4.90	40.00
750.000000	39.9	163.0	V	0.0	23.6	6.10	46.00
181.800000	37.0	264.0	H	105.0	12.8	6.50	43.50
530.720000	38.9	217.0	H	77.0	20.7	7.10	46.00
204.640000	36.3	164.0	H	85.0	13.8	7.20	43.50
625.000000	38.5	113.0	V	0.0	22.1	7.50	46.00
85.560000	27.8	262.0	H	0.0	8.5	12.20	40.00
141.400000	12.5	193.0	V	95.0	14.9	31.00	43.50
162.720000	11.2	243.0	V	5.0	13.8	32.30	43.50
133.120000	10.9	244.0	H	168.0	15.0	32.60	43.50

Note: All data points are corrected for insertion loss.

5.0 Harmonic and Spurious Emissions

5.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247d.

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

5.2 Test Limits

5725-5850 MHz limits:

- Fundamental Limit = 30 dBm
- Harmonics and Spurious Emissions = 30 dBc
- Restricted Band Emissions = AVG 54 dBuV, PK 74dBuV

5.3 Test Setup – Spurious Emissions

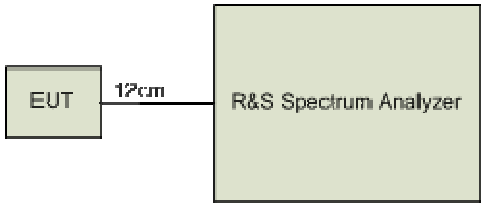
Both radiated and conducted measurements are made on the EUT to ensure compliance with the required emission levels. Conducted scans are used to determine compliance with the 30 dBc limit for emissions outside of the operational frequency band.

In addition to conducted measurements, extensive radiated testing above 1 GHz is performed. The measurement antenna is scanned around all sides of the EUT to identify signals of interest. Additional measurements at an appropriate measurement distance are performed to ensure that emissions were at maximum.

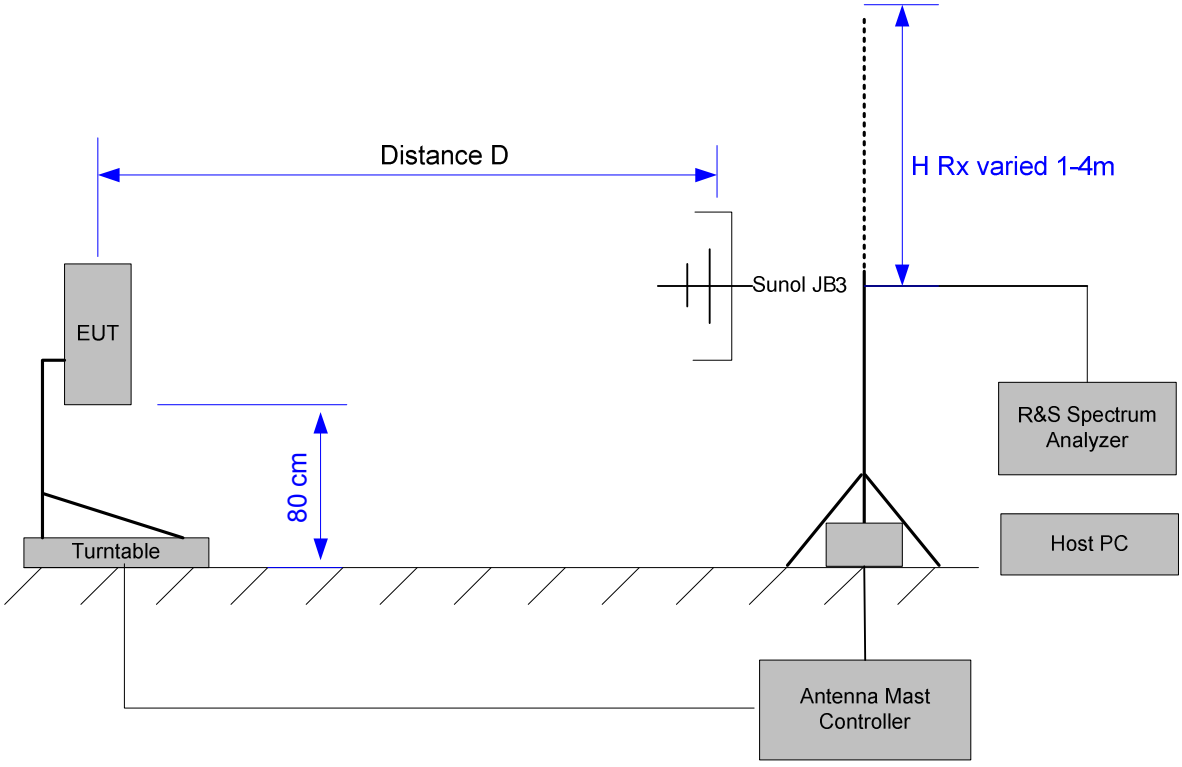
The TR-FDD-24 was tested with all antennas while transmitting at two channels simultaneously. Each external antenna is connected to the EUT using a Type N connecter via 1 m of coaxial shielded cable. The EUT was exercised using beaconing mode at the highest possible transmit rate. Testing was performed on product's fixed channels for all the bandwidth configurations. The data below is for the worst case configuration.

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

5.3.1 Test Setup Block Diagram – Conducted Measurements (Harmonics)

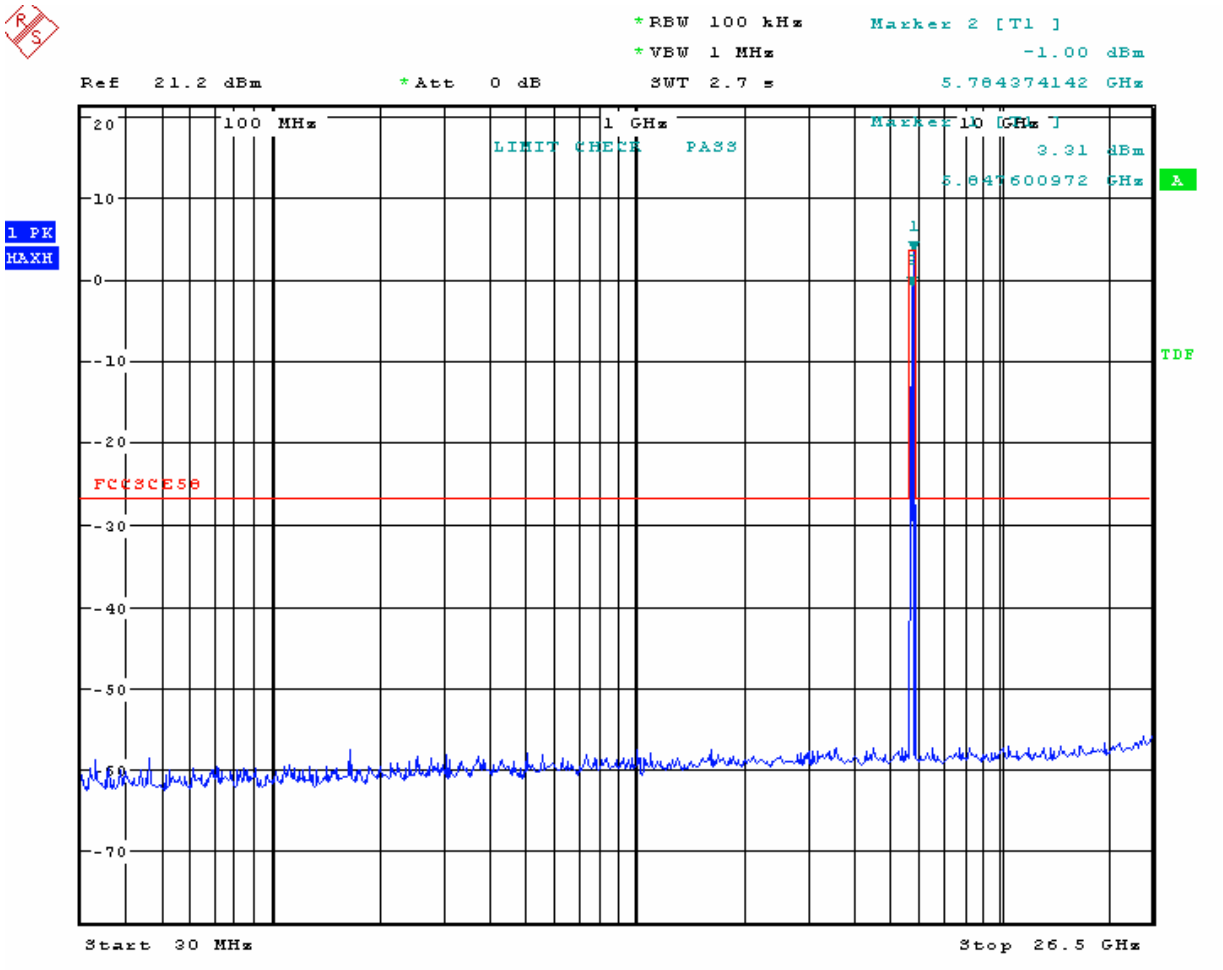


5.3.2 Test Setup Block Diagram – Radiated Measurements (Spurious)



5.4 Test Results

5.4.1 Test Results 15.247–Harmonics -30 dBc



The above plot shows the conducted output of the transmitter. There are no conducted harmonics within the 30 dBc limit.

5.4.2 Test Results 15.247– Restricted Bands (Spurious Emissions)

The following data is taken from frequencies identified during radiated pre-testing at 1m. Data presented below was taken at a measurement distance of 3 m. Data is presented for the worst case configuration of each channel shield.

Channel Shield 1					
Frequency (GHz)	**Reading Type**	**Reading (dBuV/m@3m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Result**
2.248	Peak	67.02	74	6.98	Pass
2.248	Average	19.87	54	34.13	Pass

Channel Shield 2					
Frequency (GHz)	**Reading Type**	**Reading (dBuV/m@3m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Result**
1.11	Peak	72.83	74	1.17	Pass
1.11	Average	25.68	54	28.32	Pass
2.231	Peak	67.81	74	6.19	Pass
2.231	Average	20.66	54	33.34	Pass

Channel Shield 3					
Frequency (GHz)	**Reading Type**	**Reading (dBuV/m@3m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Result**
1.108	Peak	69.11	74	4.89	Pass
1.108	Average	21.96	54	32.04	Pass
2.410	Peak	66.48	74	7.52	Pass
2.410	Average	19.33	54	34.67	Pass

No other emissions were detected within 20 dB of the limit.

6.0 Band Edge

6.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247d.

| *(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).* |

6.2 Test Limits

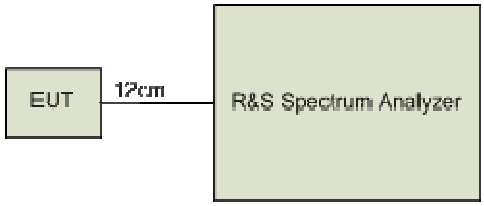
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). (See Section 15.205(c).)

6.3 Test Setup

Conducted measurements are made on the EUT to ensure compliance with the required emission levels.

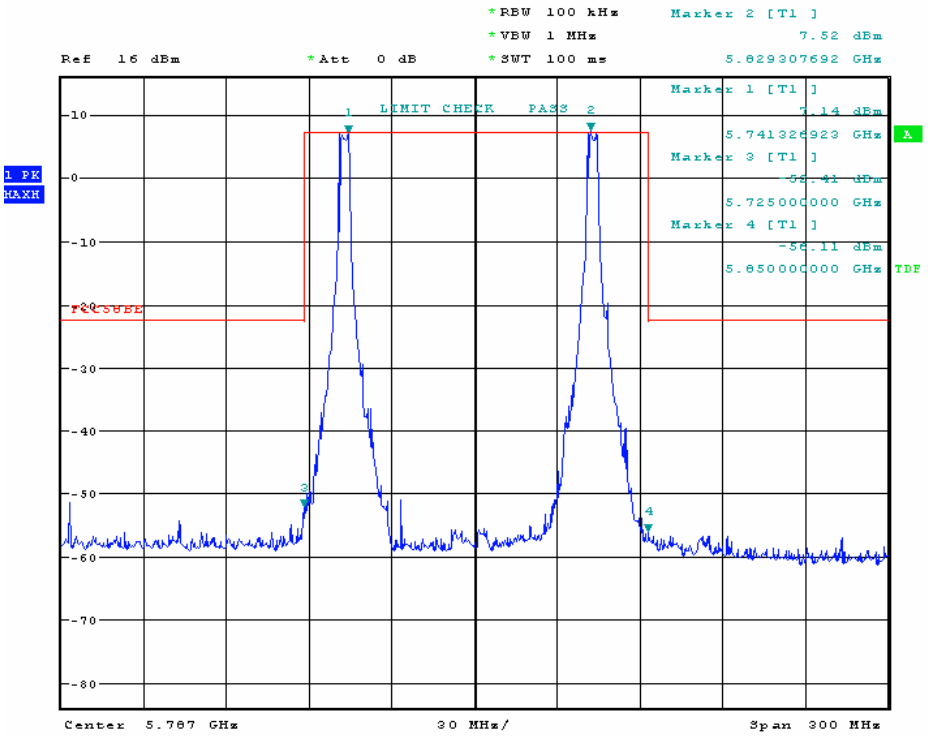
The test is performed at the product's fixed channels. Compliance in the 5725-5850 MHz band is established through conducted measurements.

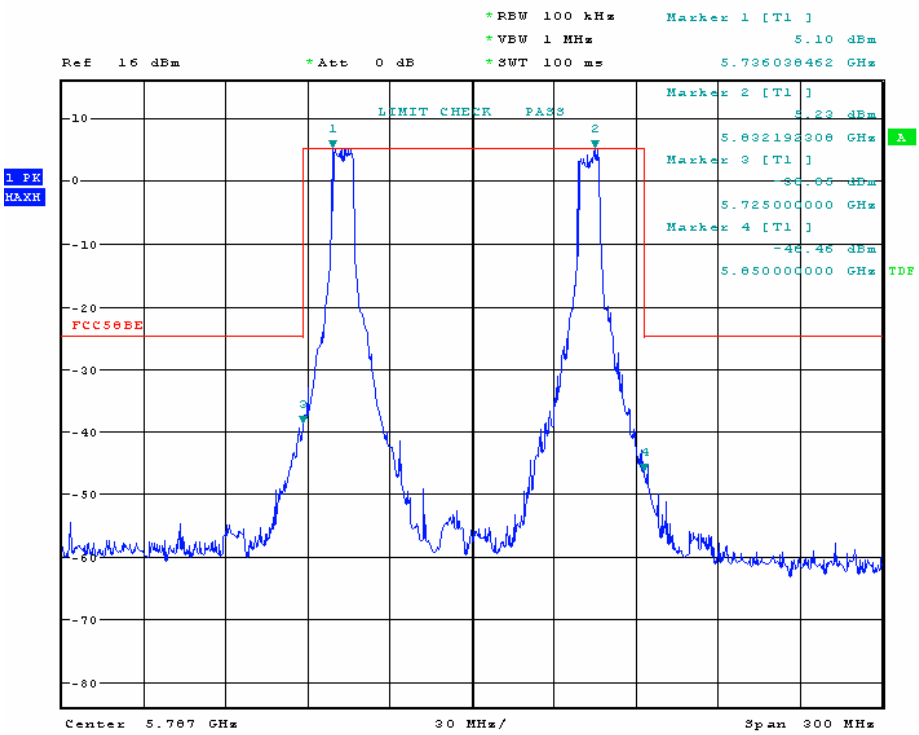
6.3.1 Test Setup Block Diagram – Conducted Measurements)

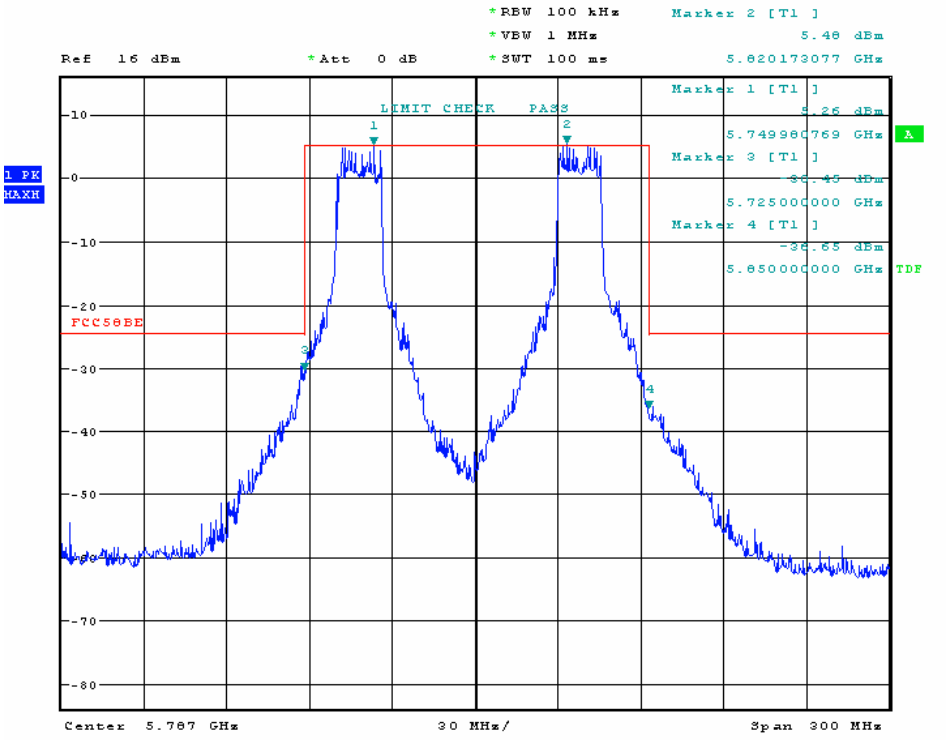


6.4 Test Results

6.4.1 5725-5850 MHz, Conducted Measurements







All emissions outside of the 5725-5850 MHz frequency band are attenuated by at least 30 dB. Please note that in the above plots the radio is transmitting at two frequencies simultaneously.

7.0 Occupied Bandwidth

7.1 Test Standard

FCC CFR47, Part 15, Subpart B 15.247a.

| *(a) Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:*

(2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz. |

7.2 Test Limits

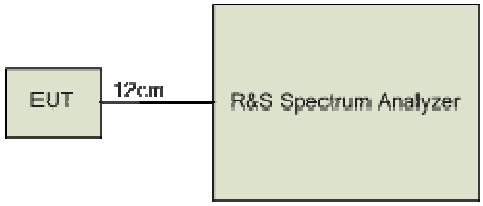
The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3 Test Setup

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

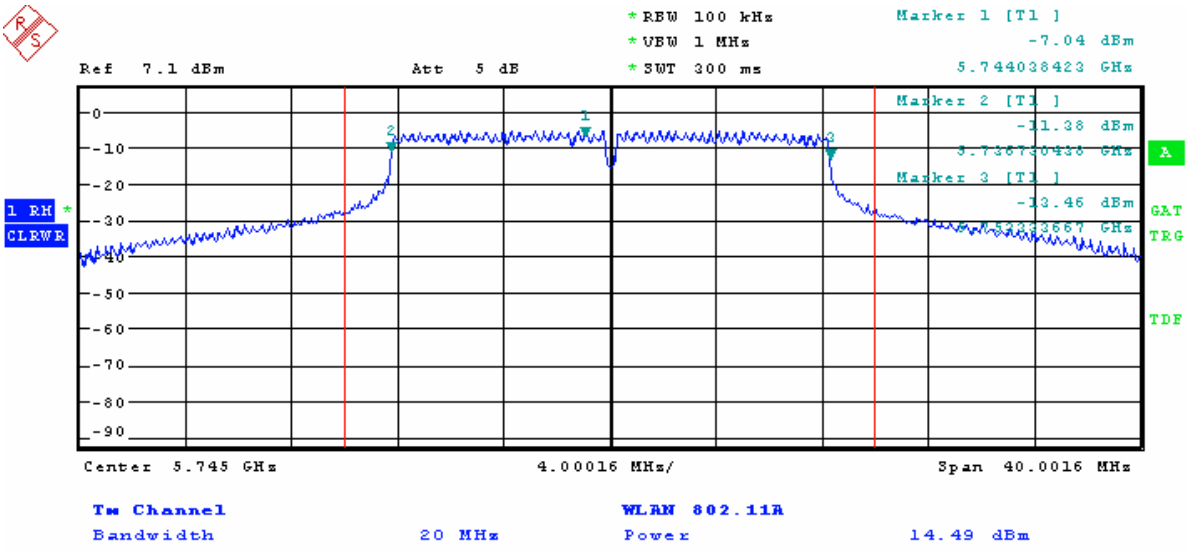
The test is performed at product's fixed channels using OFDM modulation in 20, 10 and 5 MHz bandwidths. Only worst case data is shown below.

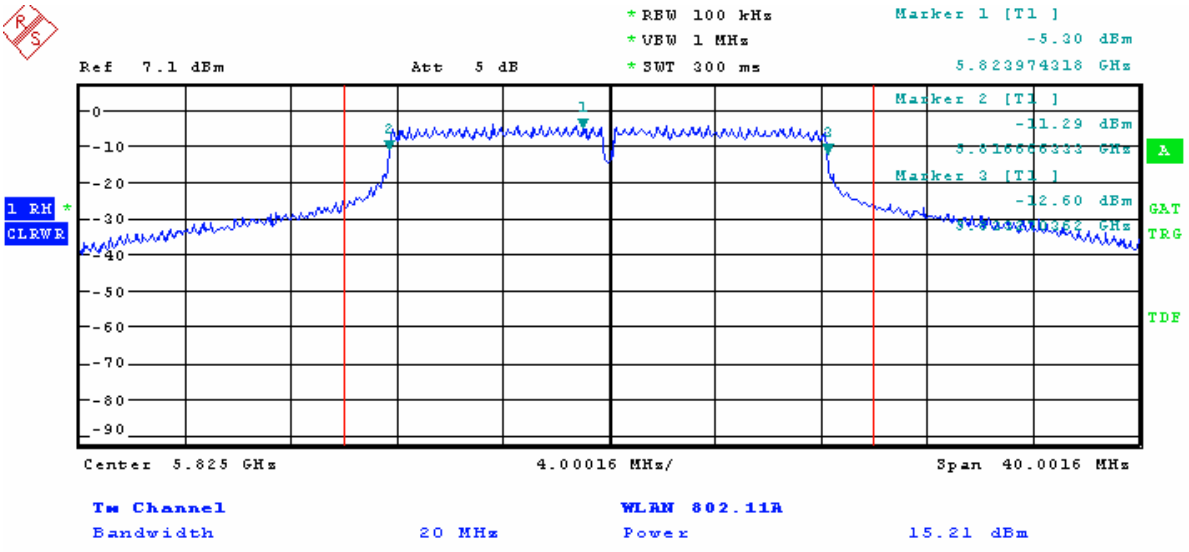
7.3.1 Test Setup Block Diagram



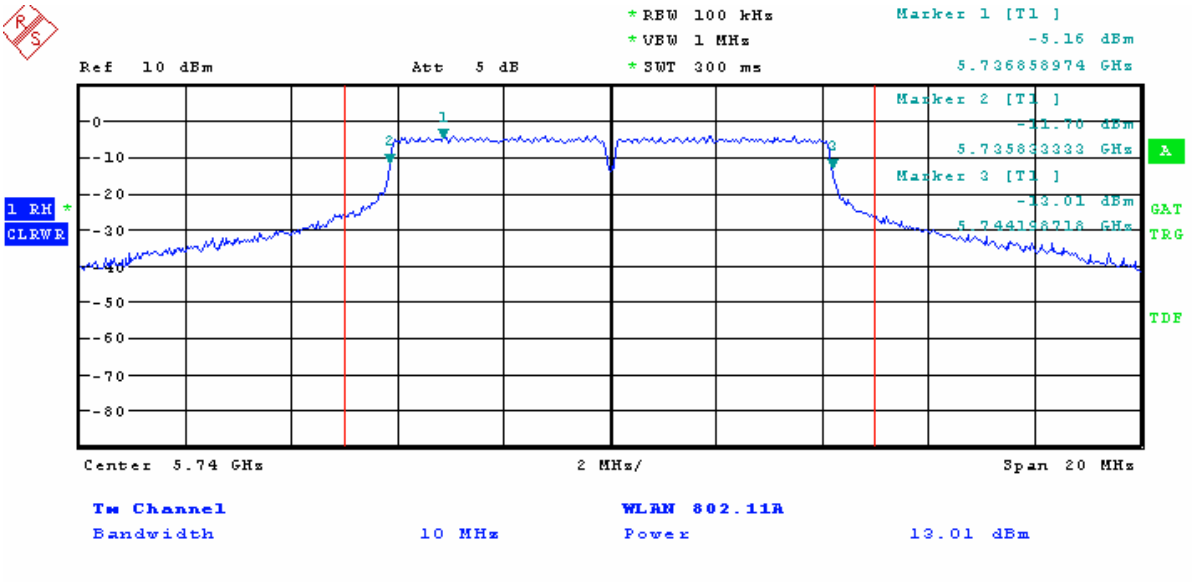
7.4 Test Results, 6 dB Occupied Bandwidth

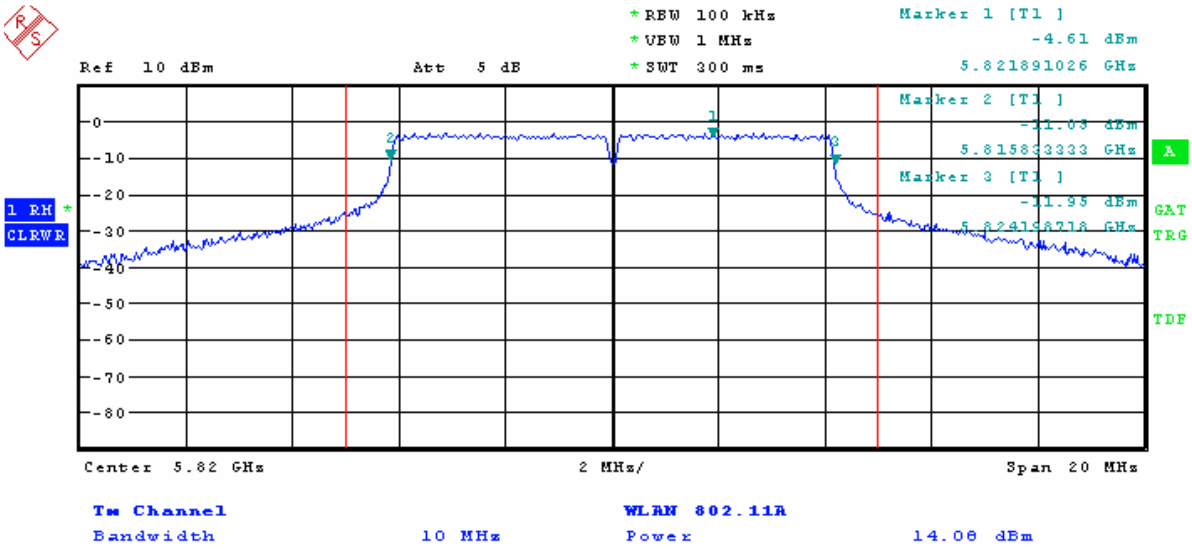
7.4.1 20MHz Bandwidth



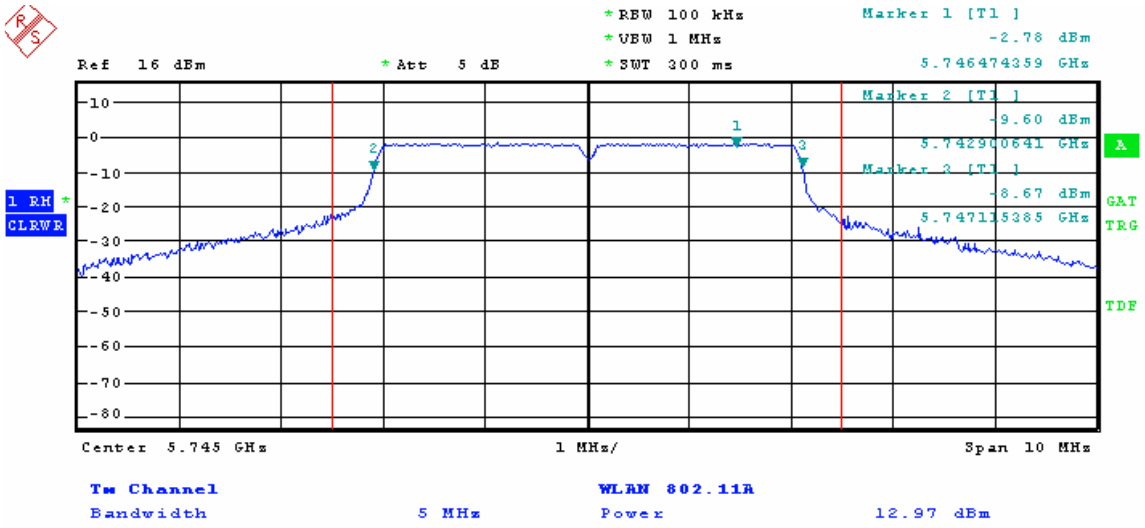


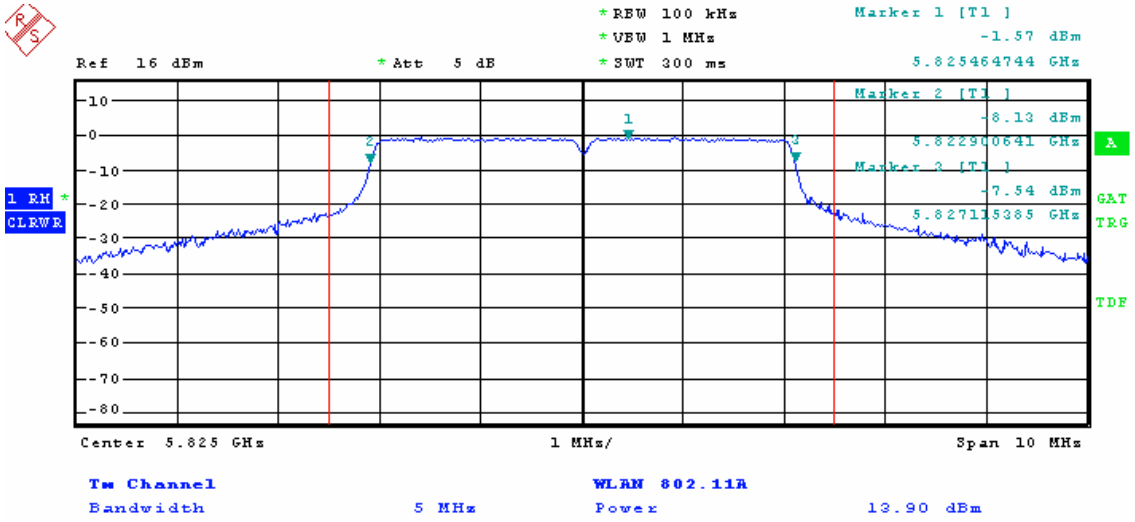
7.4.2 10MHz Bandwidth





7.4.3 5MHz Bandwidth





7.4.4 *Data Table – Occupied Bandwidth*

Mode OFDM/ Channel BW = 5MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 149	5745	4.2	0.5	PASS
Ch 165	5825	4.2	0.5	PASS
Mode OFDM/ Channel BW = 10MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 148	5740	8.4	0.5	PASS
Ch 164	5820	8.3	0.5	PASS
Mode OFDM/ Channel BW = 20MHz				
Channel	**Frequency(MHz)**	**Occupied Bandwidth(MHz)**	**Limit**	**Result**
Ch 149	5745	16.6	0.5	PASS
Ch 165	5825	16.6	0.5	PASS

8.0 Power Spectral Density

8.1 Test Standard

FCC CFR 47, Part 15, Subpart B 15.247e.

| *(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.* |

8.2 Test Limits

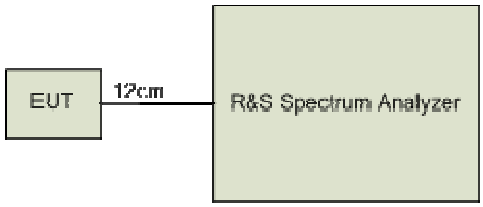
The transmitted power density shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

8.3 Test Setup

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

The test is performed at product's fixed channels using OFDM modulation in 20, 10 and 5 MHz bandwidths.

8.3.1 Test Setup Block Diagram



8.4 Test Results 15.247

The calculations are based on the graphs shown in section 7 for occupied bandwidth. A factor of 15.23 dB = 10*log (100kHz/3kHz) is subtracted from the reading of marker 1 for correction to 3 kHz.

8.4.1 Data Table – Power Spectral Density

Mode OFDM/ Channel BW = 5MHz					
Channel	**Frequency (MHz)**	**Measurement(dBm)**	**PSD in 3 kHz(dBm)**	**Limit (dBm)**	**Result**
149	5746.5	-2.78	-18.01	8	PASS
165	5825.5	-1.57	-16.8	8	PASS

Mode OFDM/ Channel BW = 10MHz					
Channel	**Frequency (MHz)**	**Measurement(dBm)**	**PSD in 3 kHz(dBm)**	**Limit (dBm)**	**Result**
148	5736.9	-5.16	-20.39	8	PASS
164	5821.9	-4.61	-19.84	8	PASS

Mode OFDM/ Channel BW = 20MHz					
Channel	**Frequency (MHz)**	**Measurement(dBm)**	**PSD in 3 kHz(dBm)**	**Limit (dBm)**	**Result**
149	5744.0	-7.04	-22.27	8	PASS
165	5824.0	-5.30	-20.53	8	PASS

9.0 RF Exposure Evaluation

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".

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

9.1 EUT Operating Condition

The maximum antenna gain is 32 dBi at 5.8 GHz.

9.2 RF exposure evaluation distance calculation

EUT with 32 dBi antenna

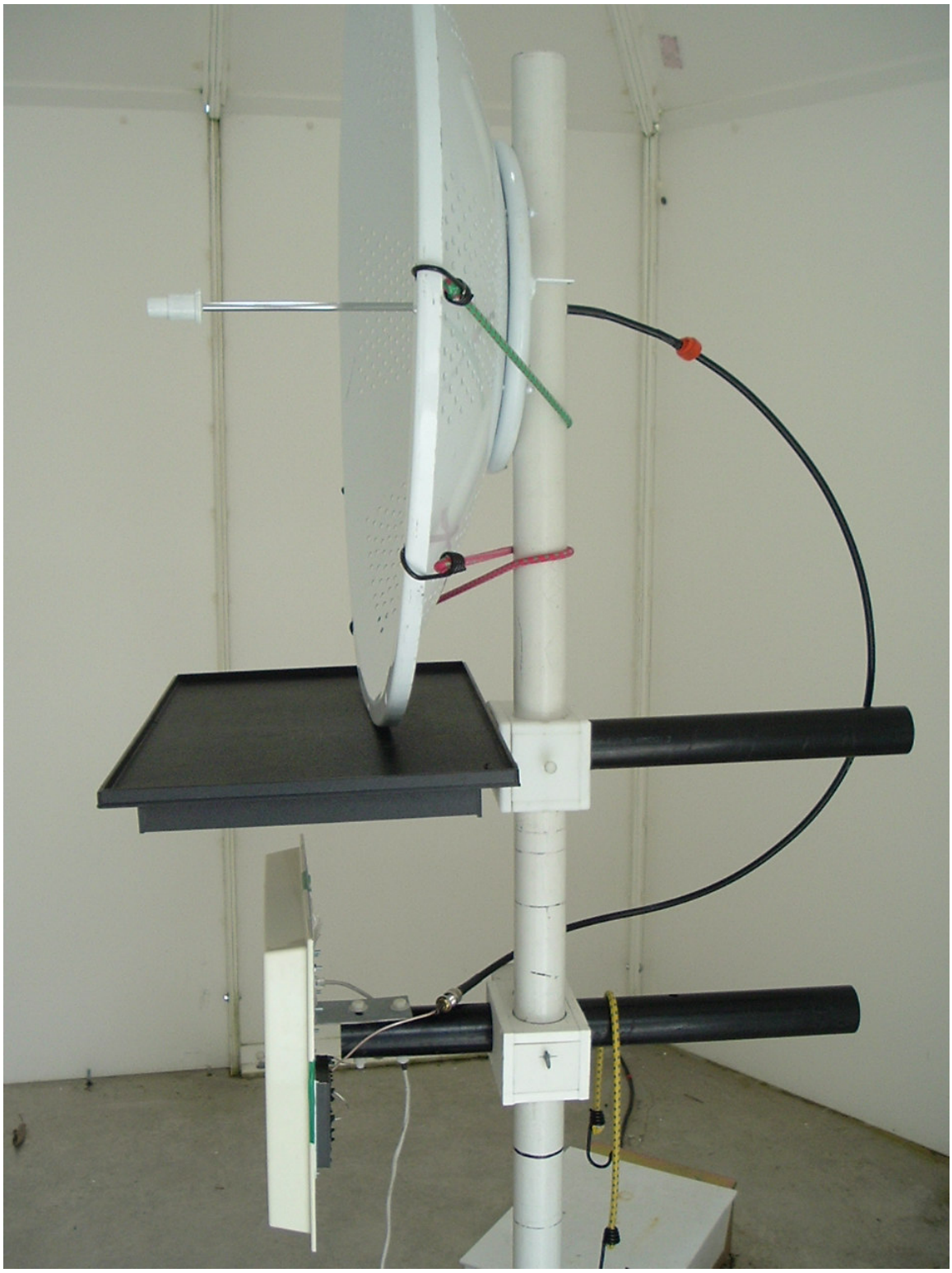
Freq (MHz)	Output Power to Antenna (dBm)	Antenna Gain (dBi)	r (cm)
5785	18.36	32	93.3

As shown above, the minimum distance where the MPE limit is reached is 93.3 cm from the EUT.

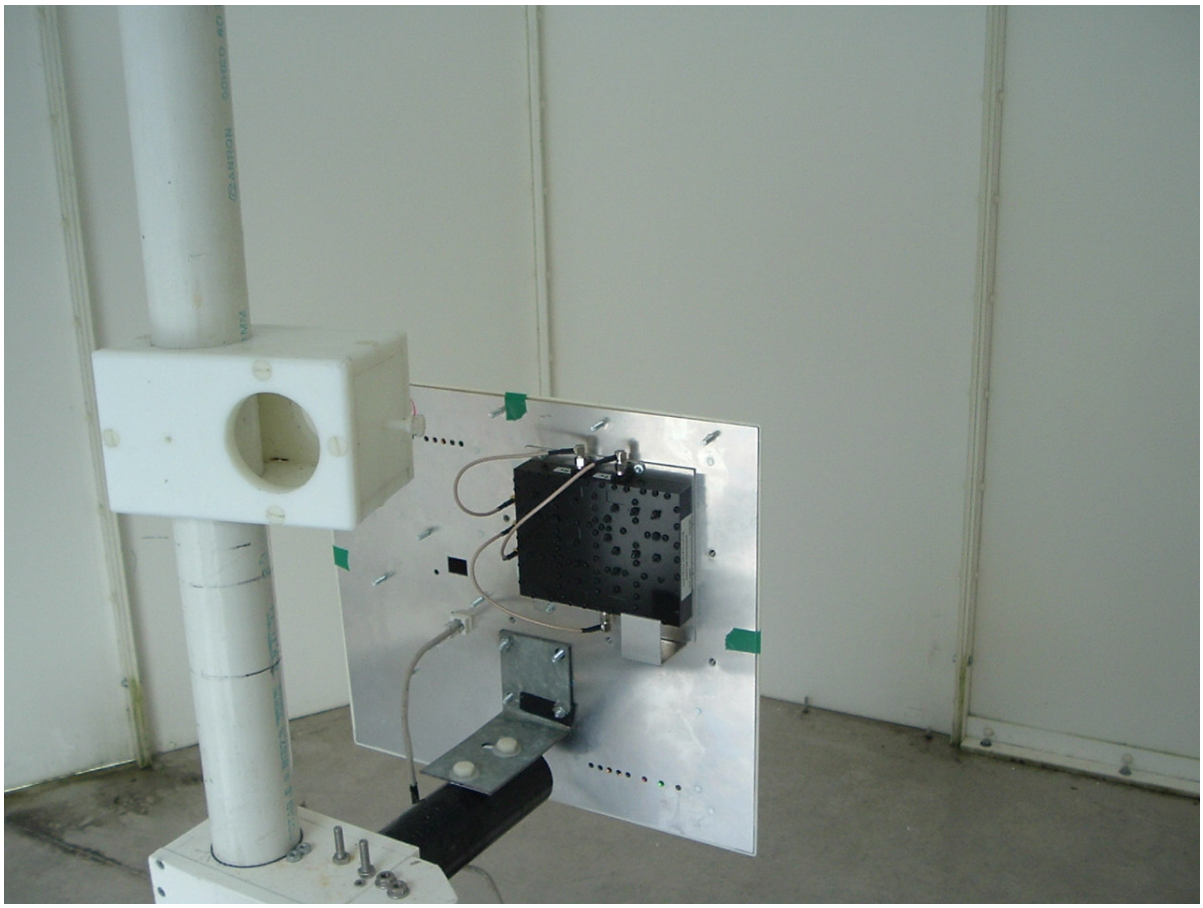
10.0 Test Photos

10.1 Grid Antenna

10.2 Dish Antenna



10.3 Integrated Antenna, Radiated Emissions Test Setup



10.4 Conducted Emissions Setup