

EMC Test Report
FCCID: QRF-PVE35XBY
3.5 GHz WiMax CPE
Tranzeo Wireless Technologies Inc.

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Report No.: 270508.1

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



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Revision History

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1.0 General Information

1.1 EUT Description

Product Name	WiMax CPE
Company Name	Tranzeo Wireless Technologies Inc..
Model No.	TR-WMX-35-17; TR-WMX-35-20; TR-WMX-35-N.
Rated RF Output Power	Adjustable, 21.44 dBm MAX
Frequency Range	3650 -3675 MHz
Channel Separation	3.5/7.0 MHz in dependence on bandwidth used
Transmit Rate	25.9 Mbps maximum bit rate specification
Type of Modulation	OFDM
Antenna Type	Integral
Product Software	TR-WMX-0.4.2
Test Software	Mikrotik test software; RS EMC32 software
Operator Channel Selection	By Software
Power Adapter	Powertron PA1024-3DU Input: 100-240V 50-60Hz, 0.6A Output: 18V 1.1A 20W

Product sample tested:

Manufacturer	Model No.	Serial No.
Tranzeo Wireless	TR-WMX-35-17	TR-WMX-35-17-ENG 001
Tranzeo Wireless	TR-WMX-35-20	TR-WMX-35-20-ENG 001
Tranzeo Wireless	TR-WMX-35-N	TR-WMX-35-N-ENG 001

As an IEEE 802.16 compliant wireless system, this device includes a 3.5 GHz receive function as well as a 3.5 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 products, TR-WMX-35-17, TR-WMX-35-20, and TR-WMX-35-N are a product family. They use the same radio and are identical except for the following:

- The TR-WMX-35-N is fitted with a standard Type N antenna connector. This device operates at 3.5 GHz.
- The TR-WMX-35-17 and TR-WMX-58-20 are fitted with an integral 17 and 20 dBi patch antenna. This device operates at 3.5 GHz.

The tests were performed on a production sample model to demonstrate compliance with FCC Parts 2 and 90.

Frequencies tested in report:

Frequency (MHz)		Range (MHz)
Low	3650	3650-3675
Middle	3662	3650-3675
High	3675	3650-3675

1.2 Operational Description

The device is a WiMax CPE designed specifically for wireless networks. The device has an IEEE 802.16 radio and uses integral antennas with gains of 17 and 20 dBi as well as a standard type N antenna connector. The transceiver operates in the frequency band 3650-3675 MHz. The device transmits digital network data and is mounted in fixed point-to-multi point installations.

The type of RF modulation is OFDM used at 3.5 GHz band. The device can transmit data at a bit rate of up to 25.9 Mbps or a real-world data rate of approximately 11.5 and 5.4 Mbps for 7.0 and 3.5 MHz bandwidth, appropriately. The device's standard compliance ensures that it can communicate with a corresponding WiMax Base Station.

The product is used exclusively in a professionally installed, wireless network environment.

1.3 EUT Testing Configuration

Models TR-WMX-35-17, TR-WMX-35-20, and TR-WMX-35-N were tested.

The EUT was mounted to a custom non-metallic stand to best represent a typical user installation. The EUT was connected to a Base Station Emulator (BSE) to imitate a real world situation. The CPE does not transmit any signals unless it can identify a base station nearby. Both the BSE and the EUT were also connected to a host PC so that they 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 searches for a base station and transmits data back and forth to the base station.

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 base station and the data is transmitted at the highest possible rate.

This product has a channel spacing of 3.5 and 7 MHz. Data is presented for the worst case configuration across each frequency bandwidth.

1.4 Standards Applied

The following general standards were applied:

FCC CFR47 parts 2 and 90.

All tests have been performed in accordance with these test standards.

1.5 Overview of Test Results

Standard	Test Type	Criteria	Result
FCC 2.1046; FCC 90.1321	RF power output	A	PASS
FCC 2.1047 FCC 90.1323	Modulation characteristics	A	PASS
FCC 2.1049; FCC 90.1323	Occupied Bandwidth	A	PASS
FCC 2.1051; FCC 90.1321	Spurious emissions at antenna terminals	A	PASS
FCC 2.1053; FCC 90.1323	Field strength of spurious radiation	A	PASS
FCC 2.1055; FCC 90.1321	Frequency stability	A	PASS

Performance Criterion A: The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

Performance Criterion B: The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

Performance Criterion C: Temporary degradation or loss of function or performance is allowed during the test, provided the function is self-recoverable, or can be restored at the end of the test by the operation of the controls, as defined in the relevant equipment standard and in the technical specification published by the manufacturer.

1.6 Test Facilities

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 Number	Cal Due Date
Rohde & Schwarz	ESU 40	EMI Test Receiver	10011	29-Mar-08
Rohde & Schwarz	SMJ 100A	Vector Signal Generator	100645	12-Mar-08
ETS-Lindgren	2165	Turntable	00043883	N/R
ETS-Lindgren	2175	Mast Motor	00077487	N/R
Sunol Sciences	JB3	Antenna	A042004	05-May-08
Sunol Sciences	DRH-118	Antenna	A052804	02-Jun-08
Corn-Power	LI-115	LISN	241037	30-Jan-08
Boonton	4200	Power Meter	430519BG	12-Aug-08
Boonton	51033	Power Sensor	15779	12-Aug-08
Thermo Keytek	CE Master	Waveform Generator	9610265	25-Feb-08
Thermo Keytek	MZ-15/EC	ESD Applicator	0402265	25-Feb-08
Chase	EMCell	RF Immunity Cell	1016	N/R
Agilent	8648C	Signal Generator	3623A03622	14-Feb-08
Instruments for Industry	Power Amplifier	Power Amplifier	5580-20	N/R
ETS Lindgren	HI-6005	Isotropic Field Probe	00034277	N/R
ETS Lindgren	2090	Multi-Device Controller	00058942	07-Dec-08
FCC	F-120-9A	Bulk Current Injection Probe	399	N/R

1.8 Test System Details

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

Manufacturer	Model	Description	S/N
Compaq	Presario 2100	Laptop PC	F3261CYQ
Tranzeo	POE-1	DC injection unit	n/a

2.0 RF Output Power

2.1 Test Standard

Test Requirement: FCC CFR47 part 90 subpart Z Clause 90.205 (r), 90.1321

Test Method: FCC CFR47 part 2 subpart J Clause 2.1046

90.205 (r). The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output

90.1321 (a) ... fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one megahertz slice of spectrum.

Since the unit will only be used in a professional installation, the end-user of this product is to exercise proper engineering judgment in order to ensure that the EIRP limits are met.

The RF power of the EUT was measured at the antenna port with a modulated carrier.

2.2 Test Limits

The peak EIRP power density of the intentional radiator shall be less than 1 watt (30 dBm) in any 1 MHz slice of 25 MHz spectrum.

Frequency Range	Max Power/1 MHz
3650-3700 MHz	30 dBm

2.3 Method of measurement

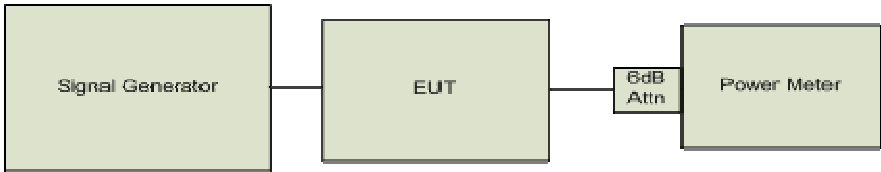
All test conditions and measurement procedures were performed in accordance with FCC CFR47 part 2 subpart J Clause 2.1046.

2.4 Test Setup

This test is performed on the sample unit equipped with a standard antenna connector. The power is measured using the power measurement feature of the spectrum analyzer. The base station emulator invokes the CPE to transmit. Communication with the base station emulator and the CPE is established by serial connection to the laptops. This procedure will be used for all transmitter conducted measurements.

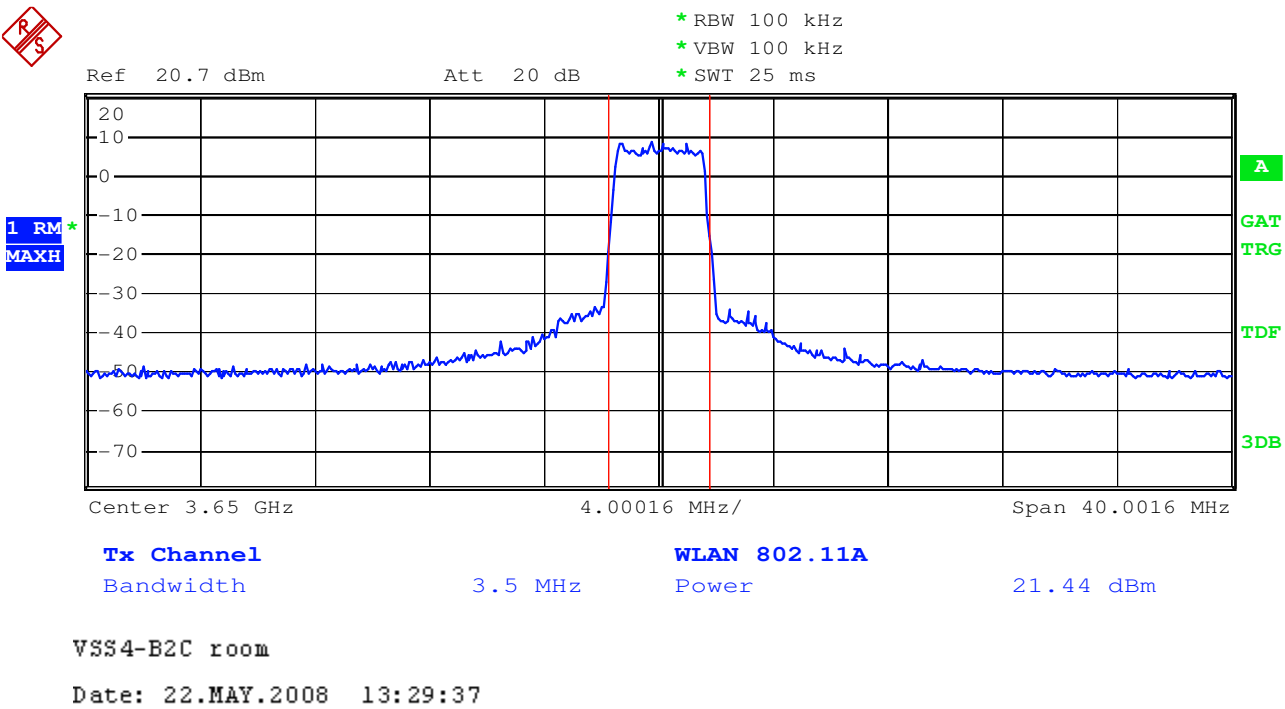
The test is performed at normal conditions according to FCC CER 47 2.1046.

Test Setup Block Diagram

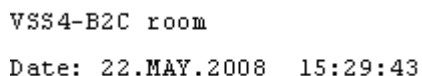


Data is presented for the worst case situation for 3.5 and 7 MHz bandwidths.

3.5 MHz



1 RM
MAXH



3.5 MHz bandwidth

Freq (MHz)	Output Power, dBm	Bandwidth ,MHz	Meas Rdg (dBm/MHz)	Limit (dBm/M Hz)	Margin (dB)	Result
3650	21.44	3.5	3.94	30	-23.77	PASS
3675	21.11	3.5	3.88	30	-23.97	PASS
3700	18.94	3.5	3.48	30	-24.59	PASS

7.0 MHz bandwidth

Freq (MHz)	Output Power, dBm	Bandwidth ,MHz	Meas Rdg (dBm)	Limit (dBm)	Margin (dB)	Result
3650	19.60	7.0	2.32	30	-27.20	PASS
3675	19.67	7.0	2.36	30	-27.19	PASS
3700	19.60	7.0	2.32	30	-27.20	PASS

3.0 Modulation Characteristics / Occupied Bandwidth

3.1 Test Standard

Test Requirement: FCC CFR47 part 90 subpart Z Clause 90.1323

Test Method: FCC CFR47 part 2 subpart J Clause 2.1047, 2.1049

2.1047 (d) A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

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...

90.1323 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

§ 90.210 Emission masks.

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section.

(c) Emission Mask C. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

3.2 Method of Measurement

All test conditions and measurement procedures were performed in accordance with CFR47 part 2 subpart J Clause 2.1047, 2.1049.

3.3 Test Setup

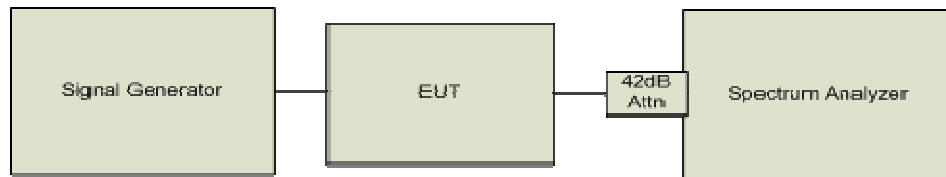
This test is performed conducted on the TR-WMX-35-N equipped with a standard N-connector. The occupied bandwidth is measured at the antenna port using the spectrum analyzer. A solid Received Signal Level (RSL) is established by using the right value for the attenuator. This procedure will be used for all transmitter conducted measurements.

Data is presented for low, middle and high channels in the worst case configuration.

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

Test Setup Block Diagram

Conducted Setup



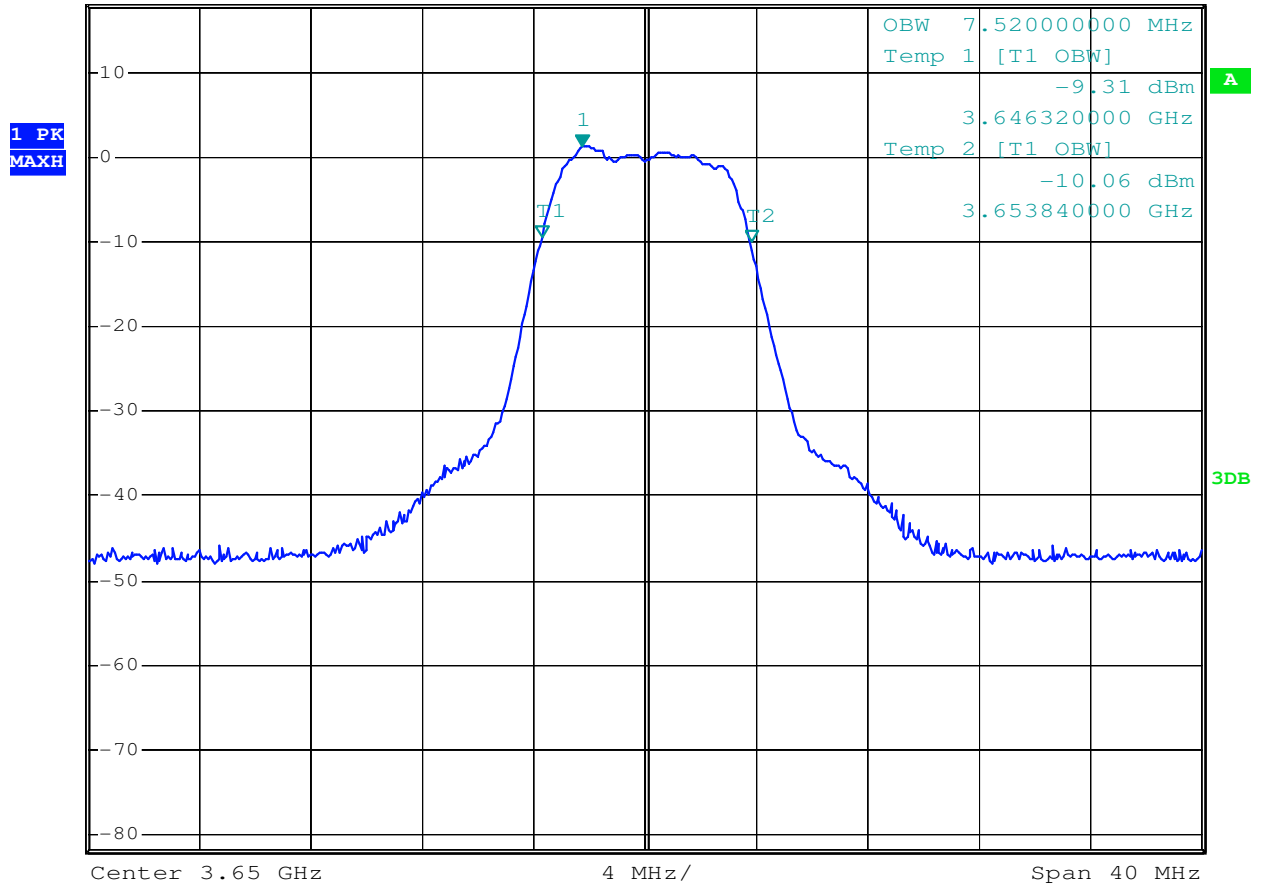
3.4 Test Setup

Bandwidth 7.0 MHz

Modulation 16QAM
Frequency 3650



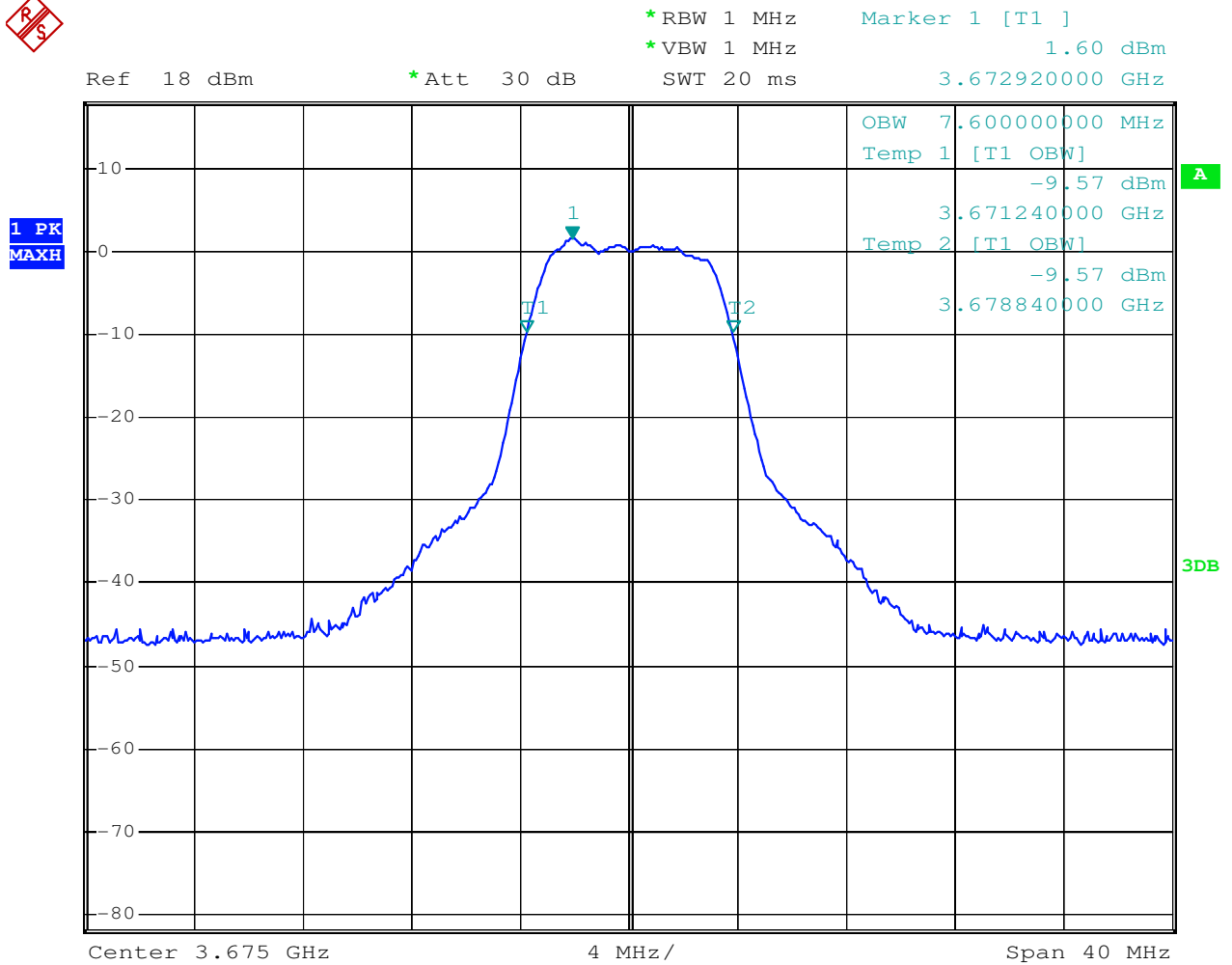
Ref 18 dBm * Att 30 dB * RBW 1 MHz Marker 1 [T1]
 * VBW 1 MHz 1.24 dBm
 SWT 20 ms 3.647760000 GHz



VSS4-B2C room

Date: 22.MAY.2008 16:56:26

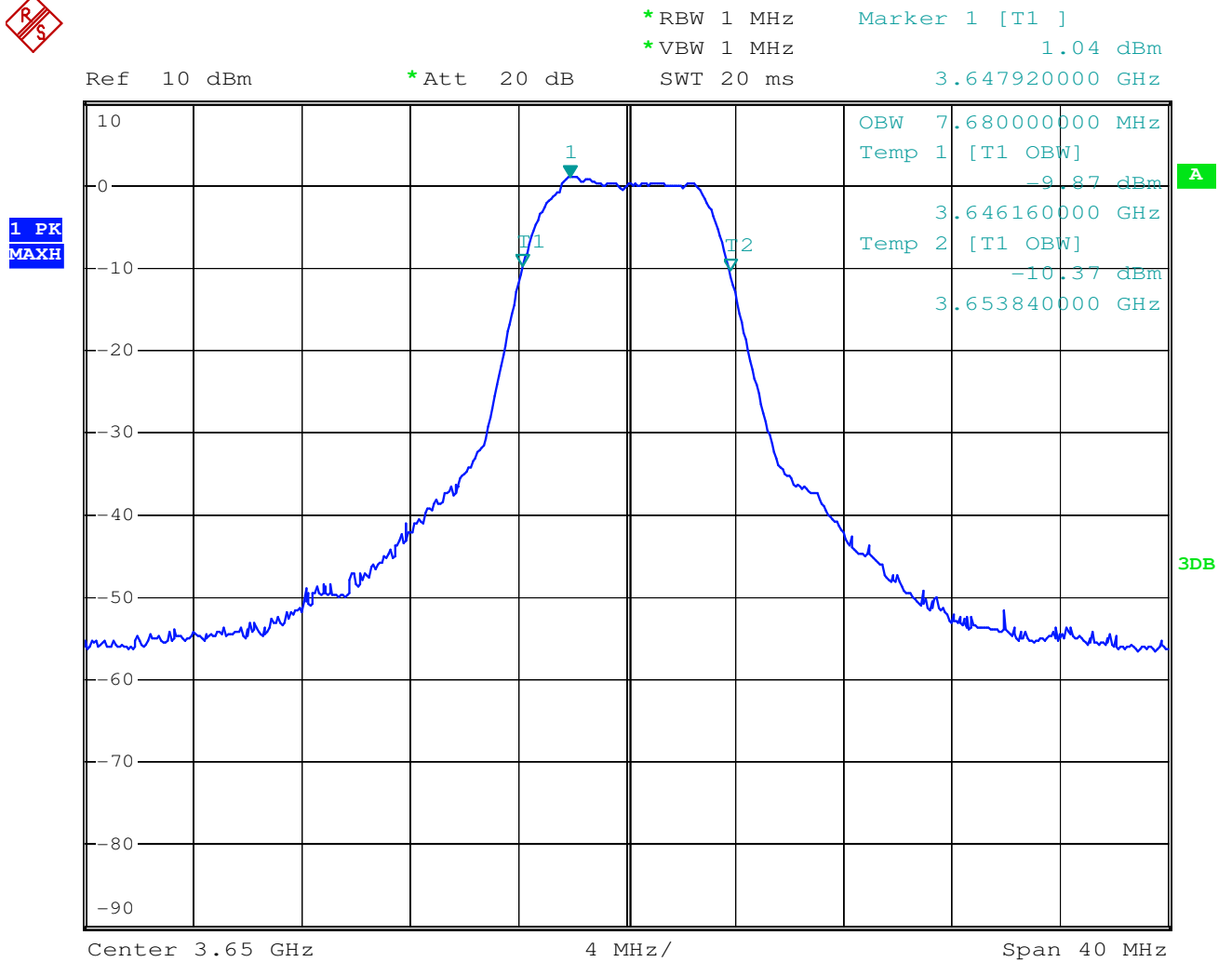
Modulation 16QAM
Frequency 3675



VSS4-B2C room

Date: 22.MAY.2008 16:54:19

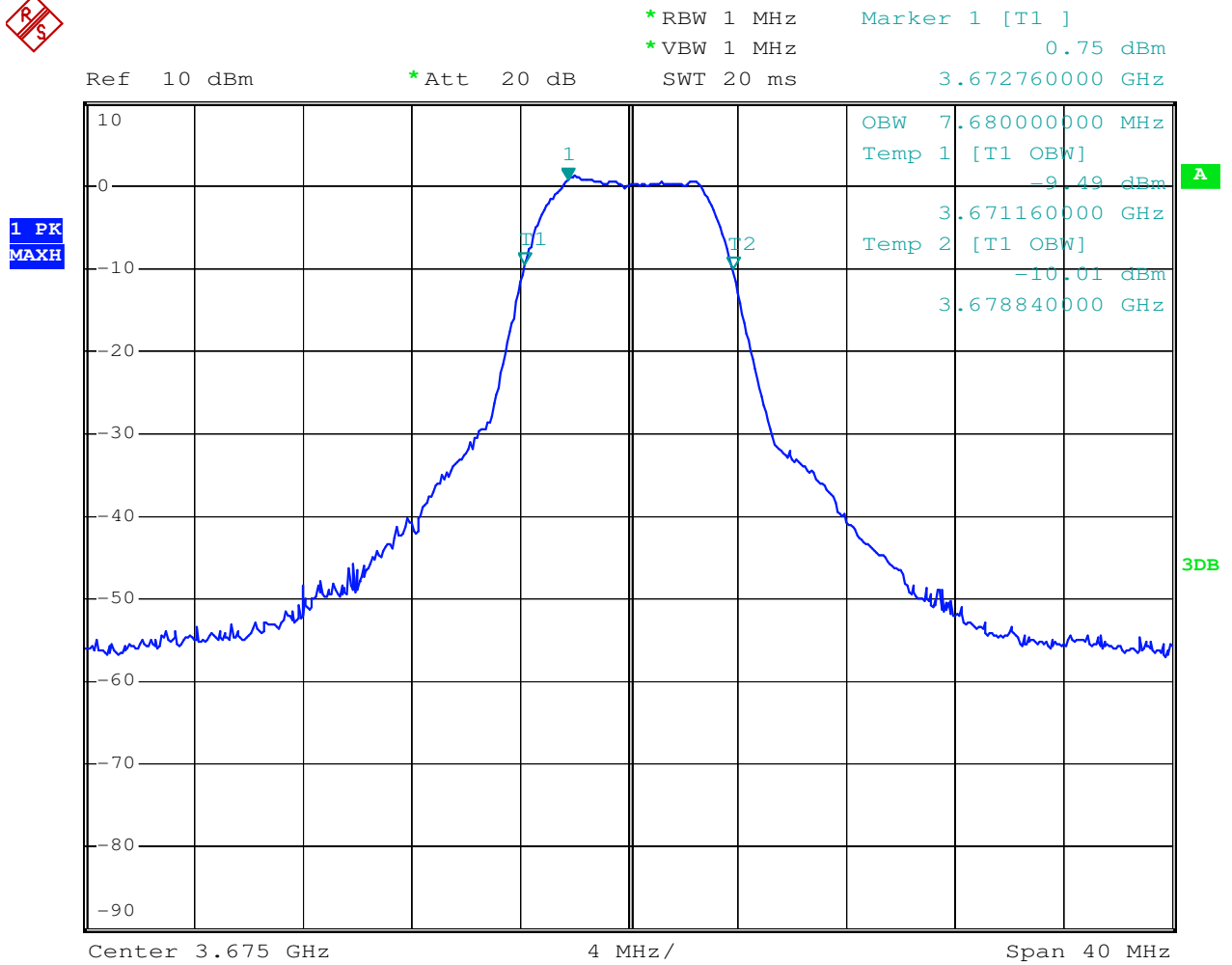
Modulation 64QAM
Frequency 3650



VSS4-B2C room

Date: 22.MAY.2008 17:07:41

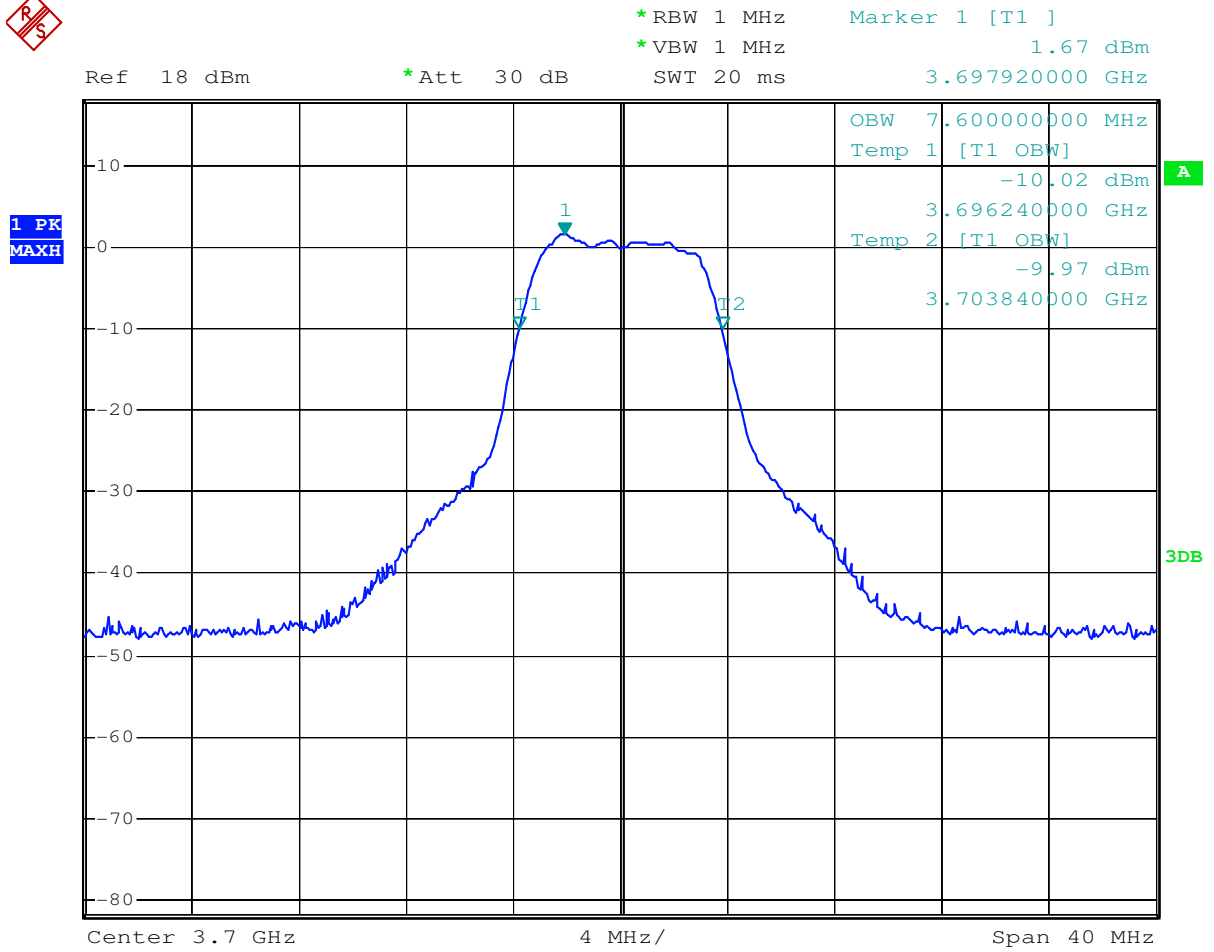
Modulation 64QAM
Frequency 3675



VSS4-B2C room

Date: 22.MAY.2008 17:05:45

Modulation 16QAM
Frequency 3700

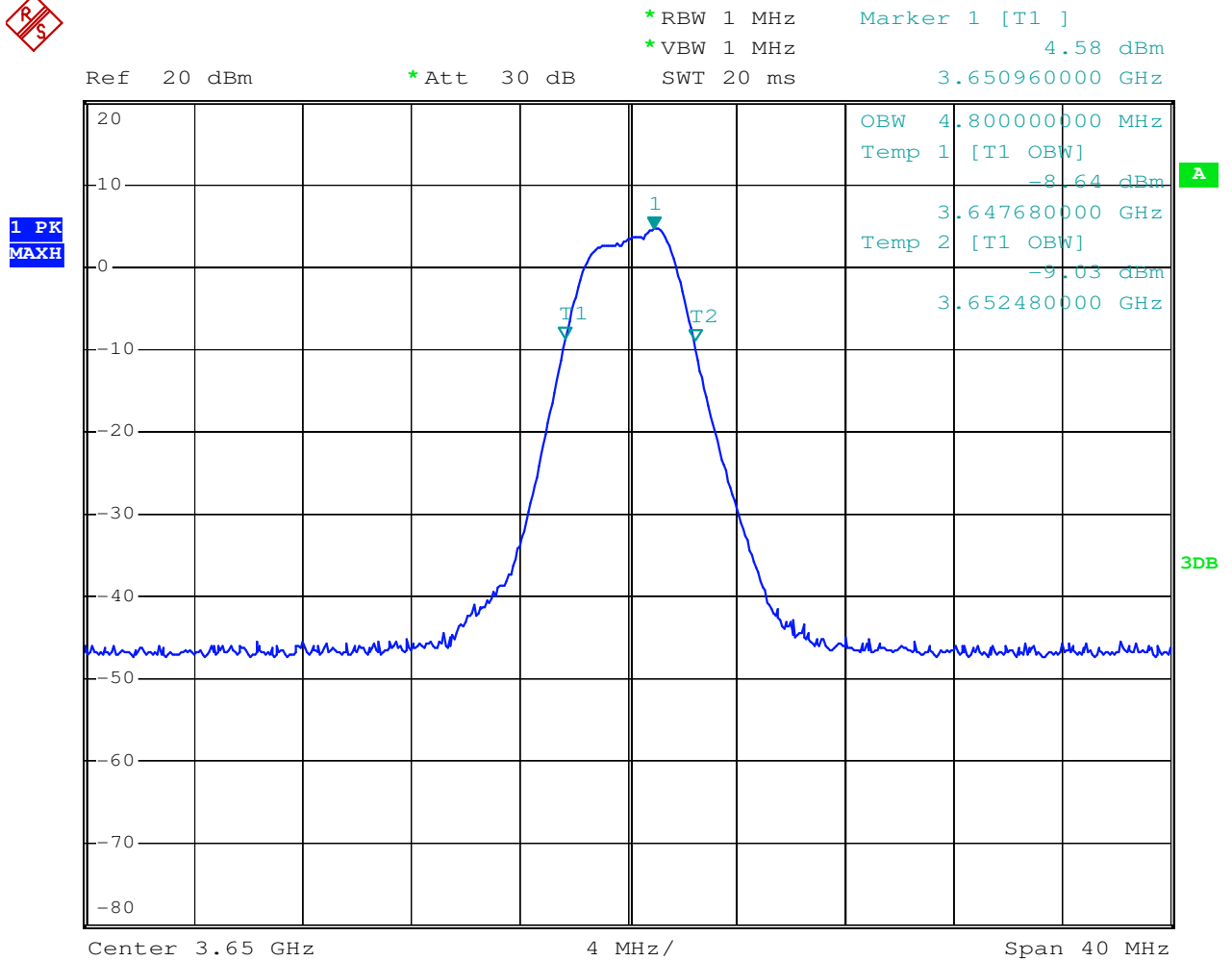


VSS4-B2C room

Date: 22.MAY.2008 16:58:04

Bandwidth 3.5 MHz

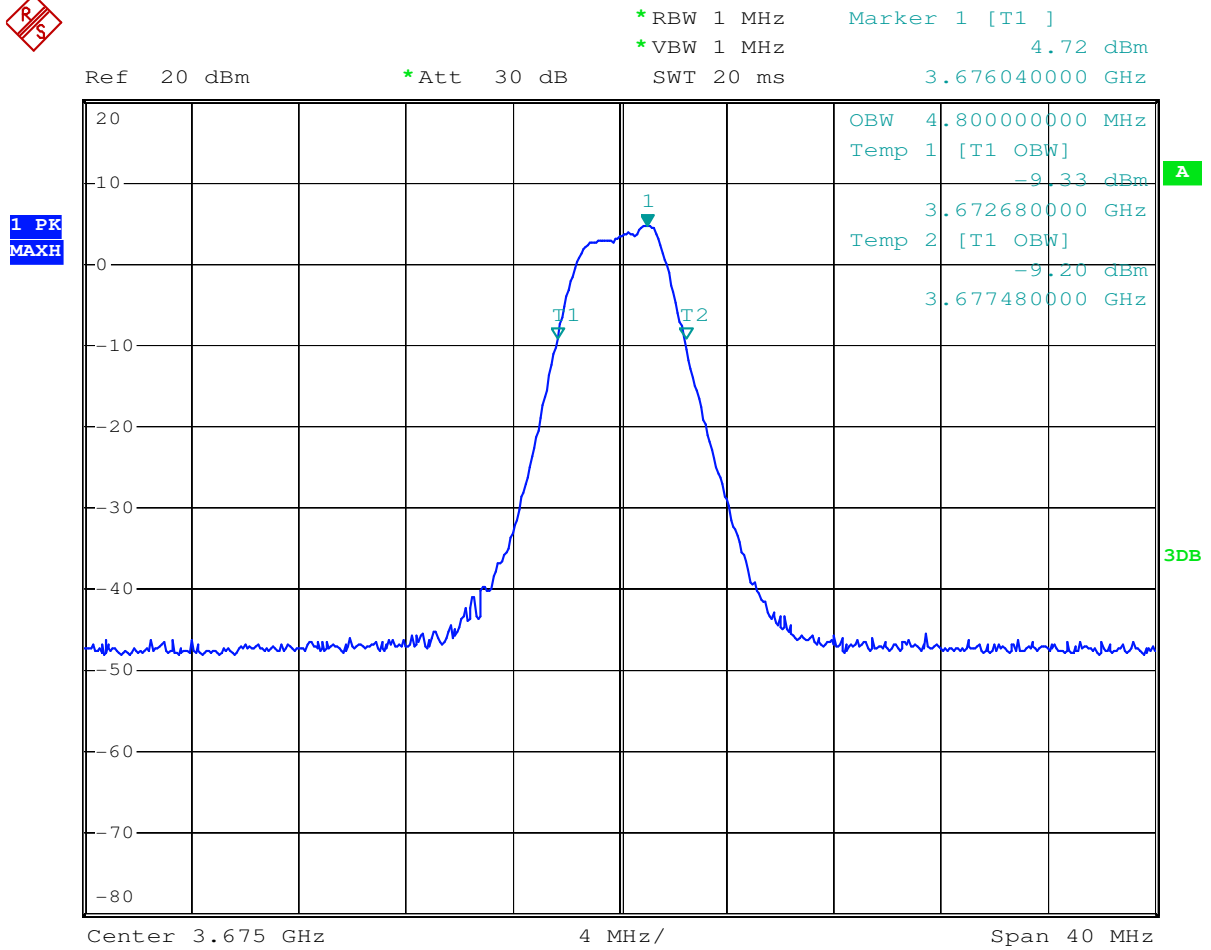
Modulation 16QAM
Frequency 3650



VSS4-B2C room

Date: 23.MAY.2008 09:48:39

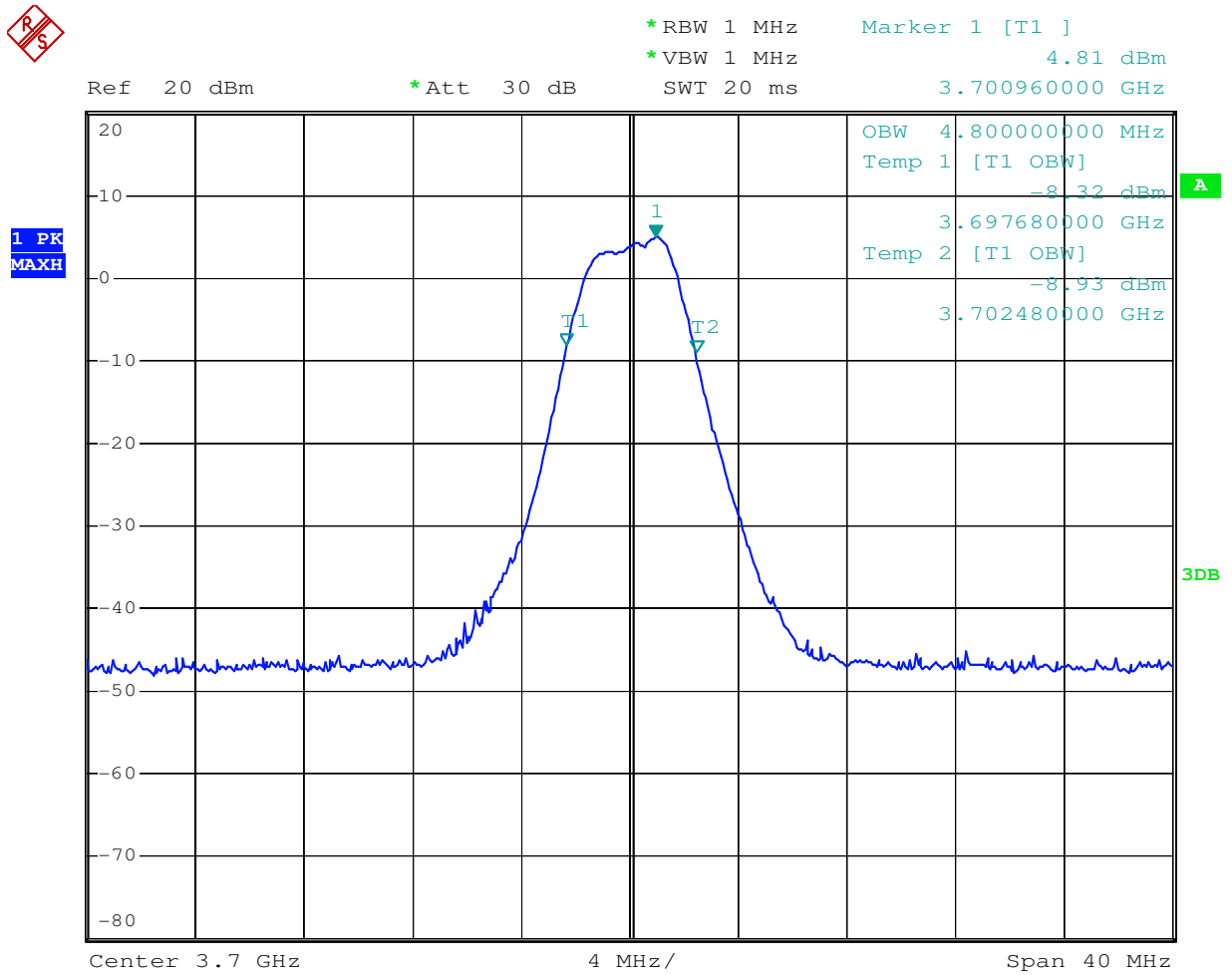
Modulation 16QAM
Frequency 3675



VSS4-B2C room

Date: 23.MAY.2008 09:56:39

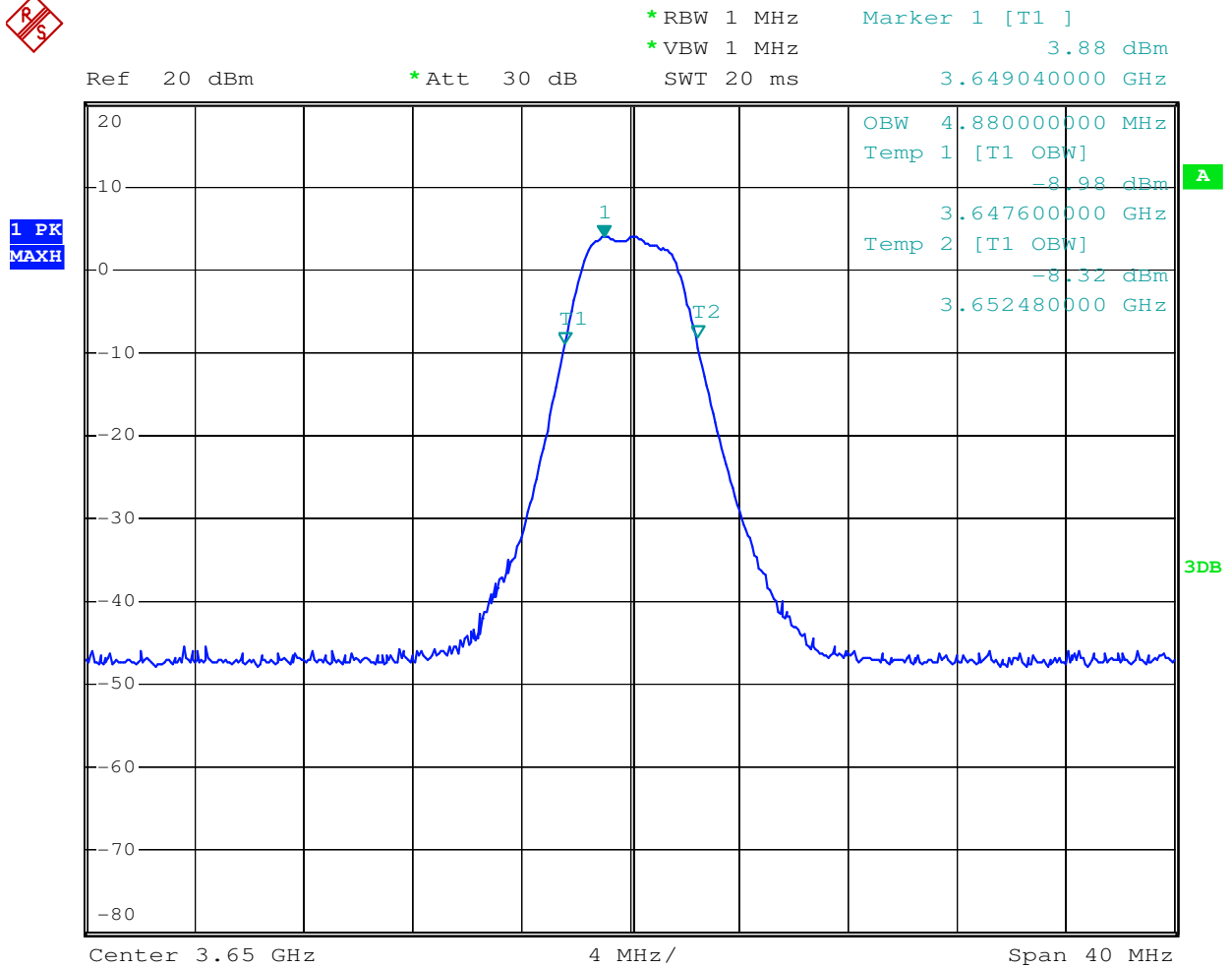
Modulation 16QAM Frequency 3700



VSS4-B2C room

Date: 23.MAY.2008 09:58:41

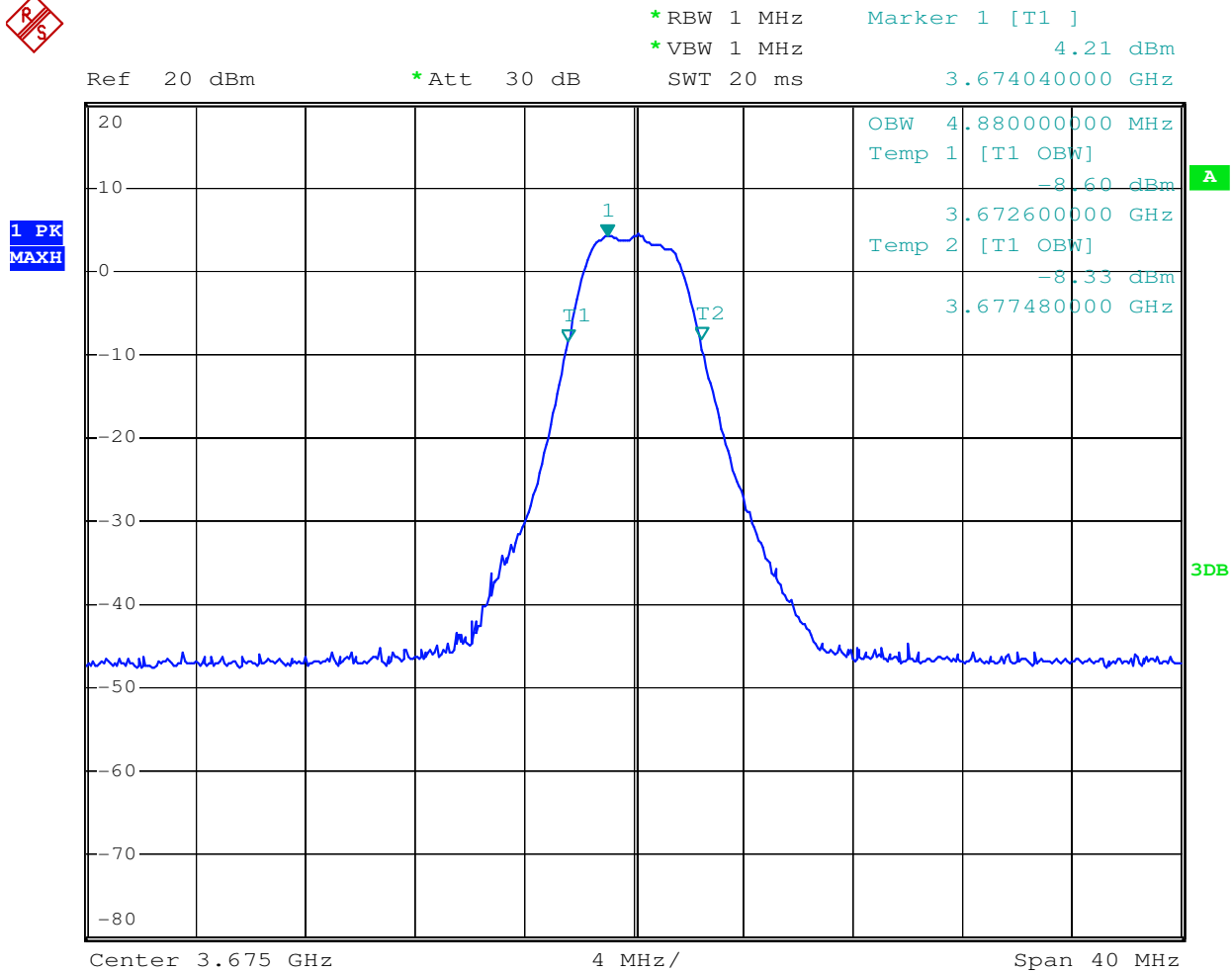
Modulation 64QAM
Frequency 3650



VSS4-B2C room

Date: 23.MAY.2008 10:05:43

Modulation 64QAM
Frequency 3675



VSS4-B2C room

Date: 23.MAY.2008 10:03:43

4.0 Spurious Emissions at Antenna Terminal

4.1 Test Standard

Test Requirement: FCC CFR47 part 90 subpart Z Clause 90.1321;

Test Method: FCC CFR47 part 2 subpart J Clause 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.

4.2 Test Limits

Required attenuation = $43 + 10 \log P$ dB

Conducted limit = -13 dBm

4.3 Method of measurement

All test conditions and measurement procedures were performed in accordance with FCC CFR47 part 2 subpart J Clause 2.1051.

4.4 Test Setup

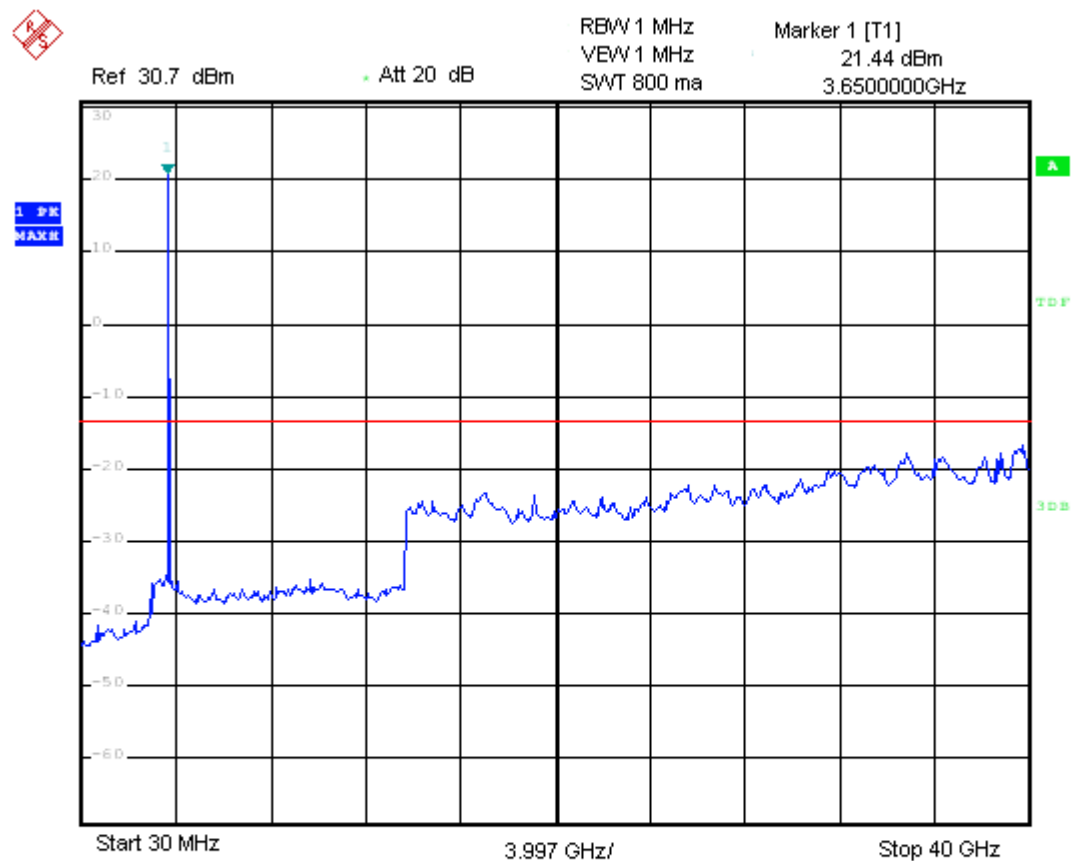
The EUT was exercised with OFDM modulation. Measurements above 1 GHz were taken with RBW, VBW = 1 MHz. The EUT was exercised using bandwidth test software at the highest possible data rate. Testing was performed on low, middle and high channels in the 3.5 GHz frequency band. All emission bandwidths were tested.

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.

Test Setup Block Diagram



4.5 Test Results



VSS4-B2C room

Date: 23.MAY.2008 13:00:18

Data for low, middle and high channel are presented.
There were not detected any other emissions with level exceeding 34.5dBc limit.

5.0 Field Strength of Spurious Radiation

5.1 Test Standard

Test Requirement: FCC CFR47 part 90 subpart Z Clause 90.1321

Test Method: FCC CFR47 part 2 subpart J Clause 2.1053

1 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. 1

5.2 Test Limits

Required attenuation = $43 + 10 \log P$ dB

Radiated limit = 84.5 dBuV

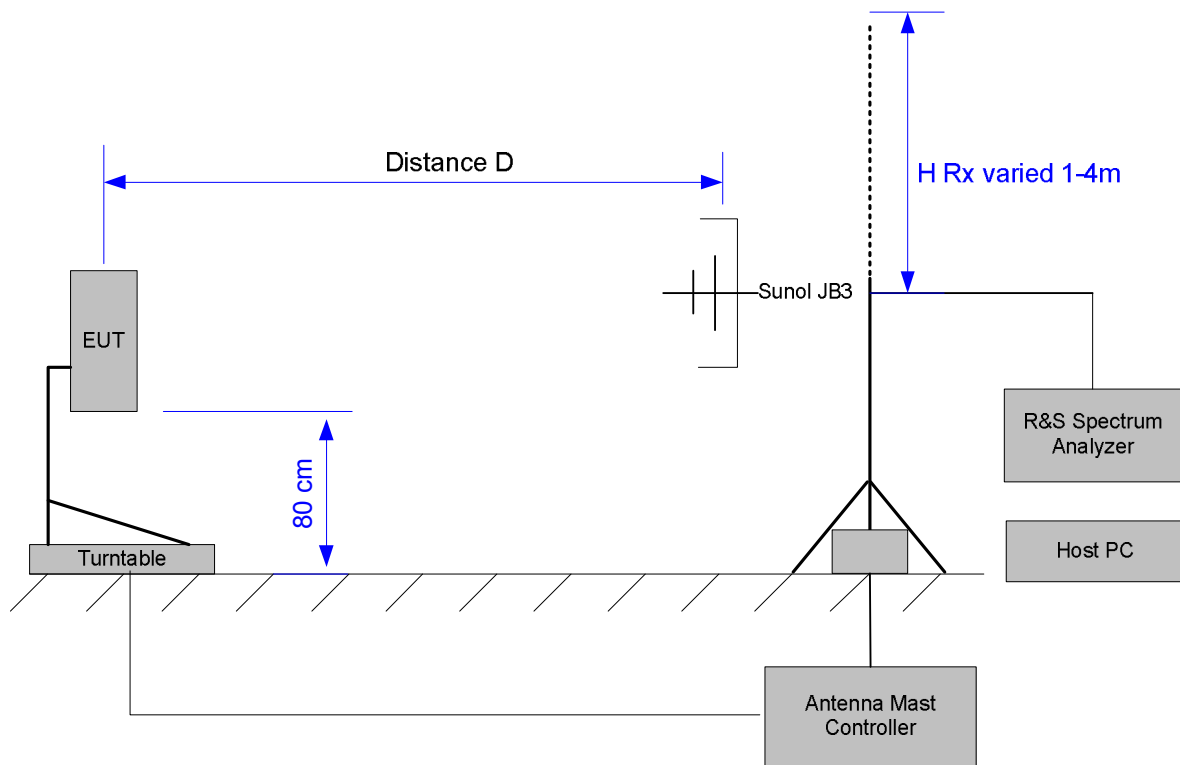
5.3 Method of Measurement

All test conditions and measurement procedures were performed in accordance with FCC CFR47 part 2 subpart J Clause 2.1053. Substitution method as prescribed under ANSI/TIA-603-C section 22.17 and 2.2.12 is required for all signals within 20 dB of limit.

5.4 Test Setup

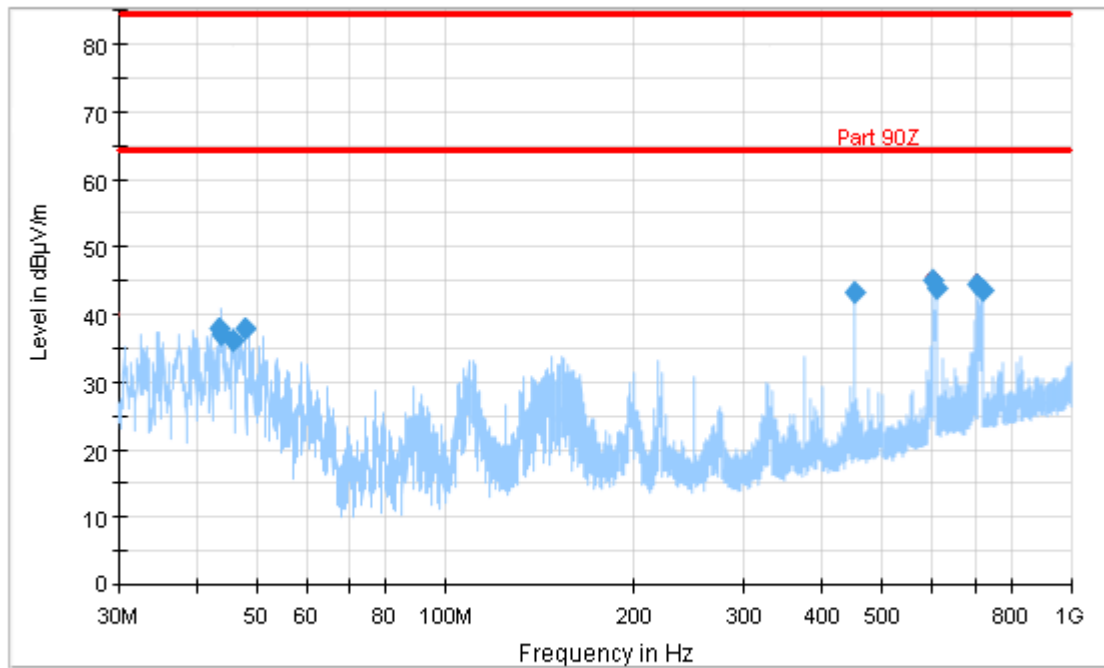
The output of the EUT is connected to the measurement equipment. Only worst case measurements are shown below.

Test Setup Block Diagram – Radiated Measurements (Spurious)



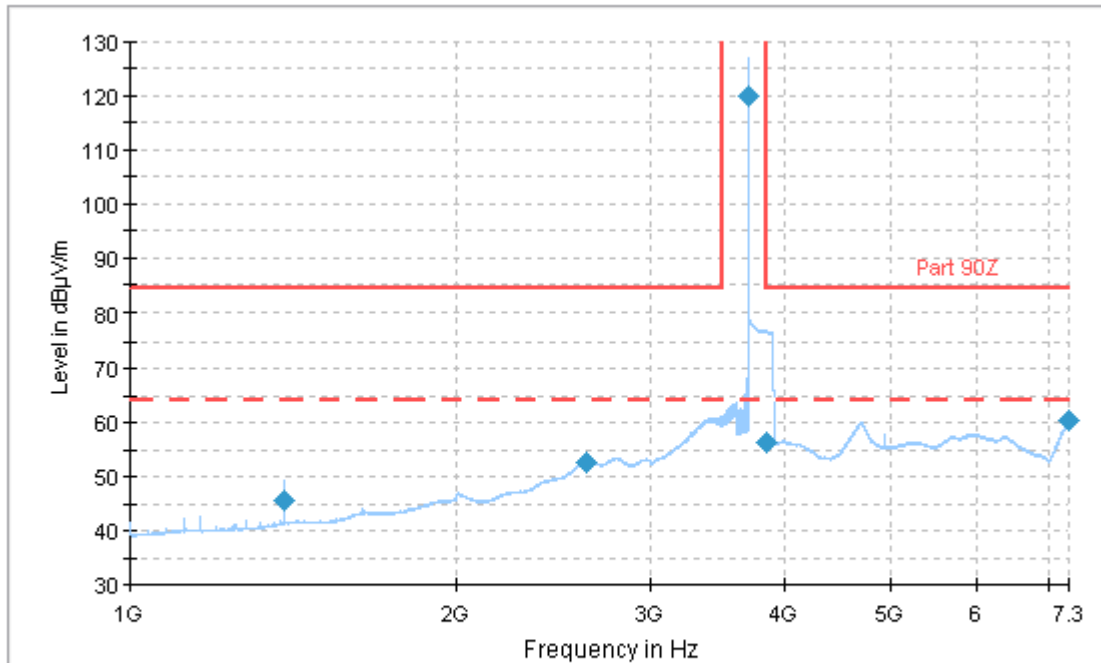
5.5 Test Results

30 MHz - 1 GHz



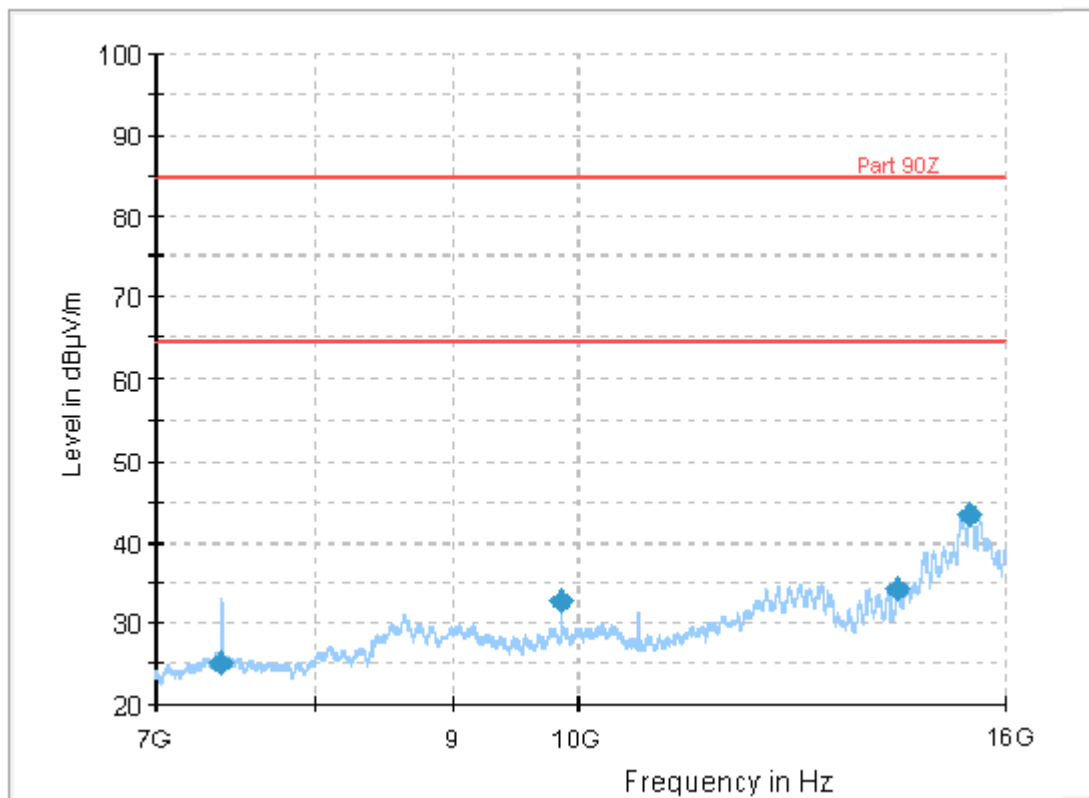
No emissions were found within 20 dB of limit.

1 GHz-7.3 GHz



No emissions were found within 20 dB of limit.

7GHz-18GHz



No emissions were found within 20 dB of limit.

6.0 Frequency Stability

6.1 Test Standard

Test Requirement: FCC CFR47 part 90 subpart Z Clause 90.1321

Test Method: FCC CFR47 part 2 subpart J Clause 2.1055

6.2 Test Limits

90.213 Frequency stability.

(a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following
...above 2450 MHz ... frequency stability is to be specified in the station authorization

The frequency stability shall be measured with variation of ambient temperature as follows from -30° to +50° centigrade for all equipment... Vary primary supply voltage from 85 to 115 percent of the nominal value...

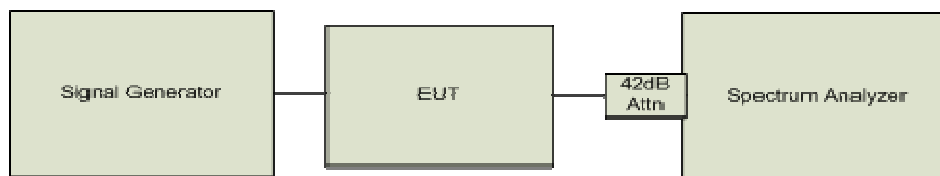
6.3 Method of Measurement

All test conditions and measurement procedures were performed in accordance with FCC CFR47 part 2 subpart J Clause 2.1055.

6.4 Test Setup

Test Setup Block Diagram

Conducted Setup



6.5 Test Results

Frequency	Bandwidth	Deviation (kHz)	Deviation (ppm)
3650	3.5	0	0.00
	7	21	5.75
3675	3.5	21	5.71
	7	21	5.71
3700	3.5	21	5.68
	7	21	5.68

Detailed test results of ambient temperatures to be found in appendix A.

7.0 RF Exposure Evaluation

7.1 Test Standard

Test Requirement: FCC 1.1310

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

7.2 Method of Measurement

All test conditions and measurement procedures were performed in accordance with FCC 1.1310.

7.3 EUT Operating Condition

The maximum antenna gain is 23.8 dBi at 3.65 GHz.

7.4 RF exposure evaluation distance calculation

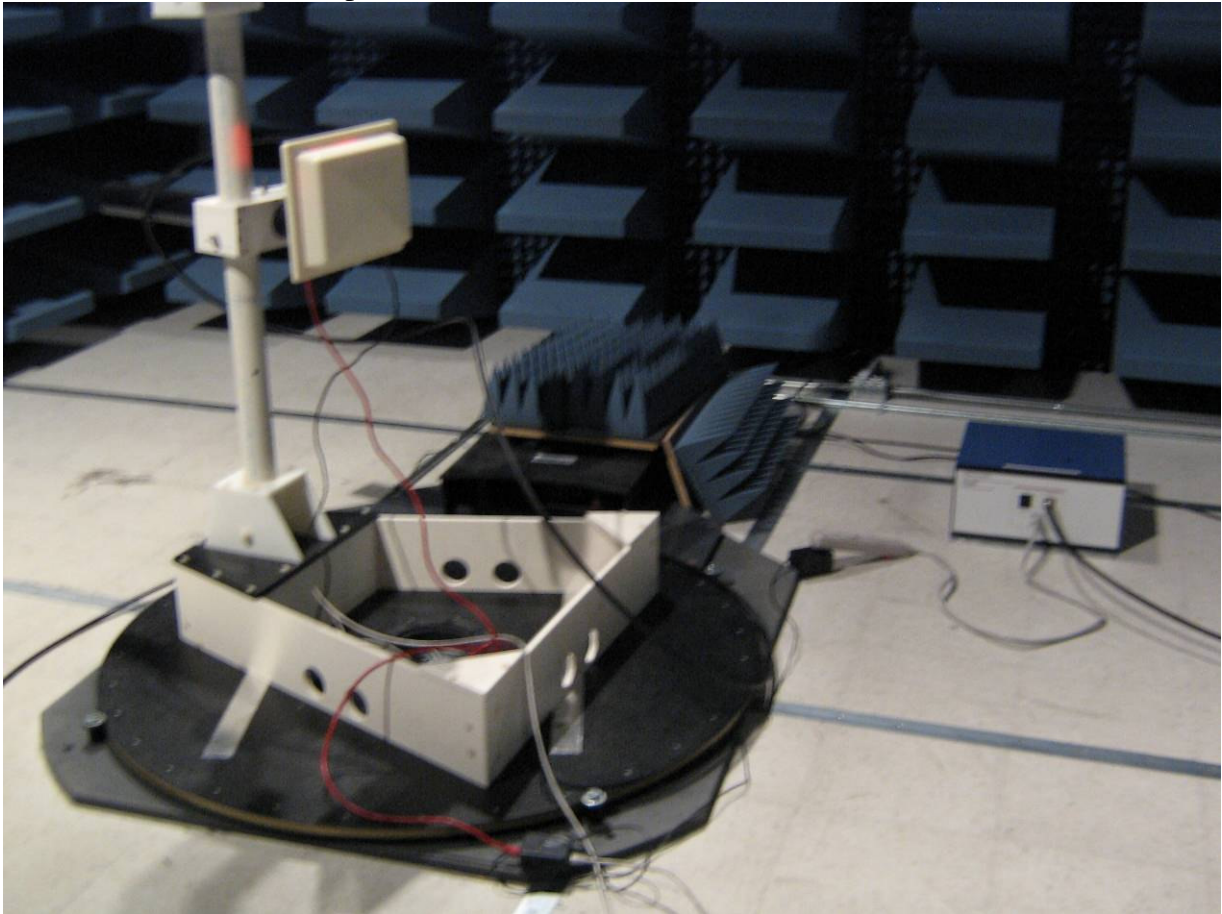
EUT with 23.8 dBi antenna

Mode OFDM/ Channel BW = 3.5 MHz			
Freq (MHz)	Output Power to Antenna (dBm)	Antenna Gain (dBi)	r (cm)
3650	21.44	23.8	51.5
3675	21.08	23.8	49.3
3700	18.92	23.8	38.4

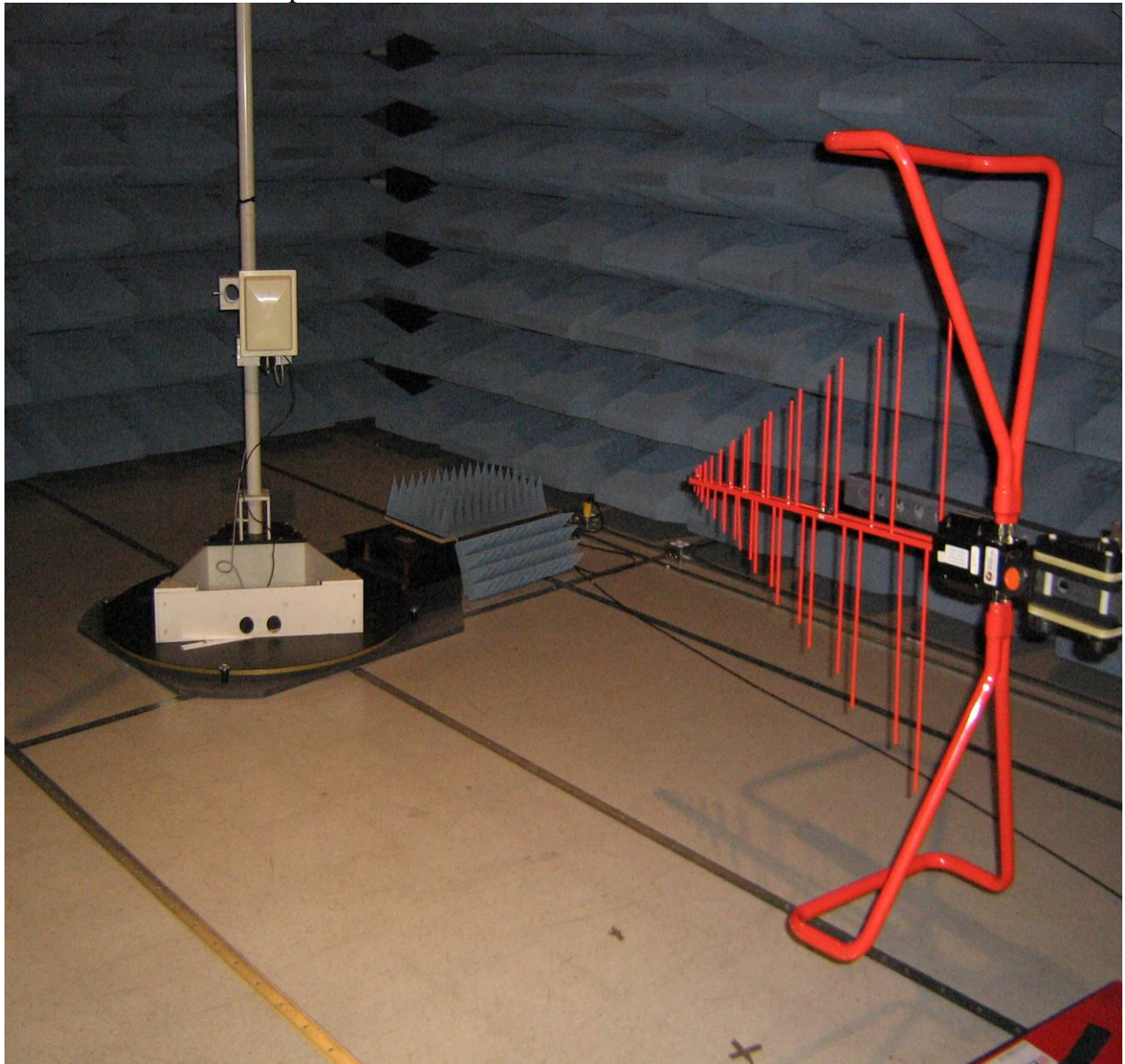
As shown above, the minimum distance where the MPE limit is reached is 51.5 cm for the EUT.

8.0 Test Photos

Conducted Emissions Setup



Radiated Emissions Setup



APPENDIX A

Table 1. Frequency 3650 Bandwidth 3.5 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30	15.3	3648.4040	3651.5960	3650.0000	0.0000
-30	18	3648.4040	3651.5960	3650.0000	0.0000
-30	20.7	3648.4040	3651.5960	3650.0000	0.0000
-20	15.3	3648.4040	3651.5960	3650.0000	0.0000
-20	18	3648.4040	3651.5960	3650.0000	0.0000
-20	20.7	3648.4040	3651.5960	3650.0000	0.0000
-10	15.3	3648.4040	3651.5960	3650.0000	0.0000
-10	18	3648.4040	3651.5960	3650.0000	0.0000
-10	20.7	3648.4040	3651.5960	3650.0000	0.0000
0	15.3	3648.4040	3651.5960	3650.0000	0.0000
0	18	3648.4040	3651.5960	3650.0000	0.0000
0	20.7	3648.4271	3651.5729	3650.0000	0.0000
10	15.3	3648.4271	3651.5729	3650.0000	0.0000
10	18	3648.4271	3651.5729	3650.0000	0.0000
10	20.7	3648.4271	3651.5729	3650.0000	0.0000
20	15.3	3648.4271	3651.5729	3650.0000	0.0000
20	18	3648.4271	3651.5729	3650.0000	0.0000
20	20.7	3648.4271	3651.5729	3650.0000	0.0000
30	15.3	3648.4271	3651.5729	3650.0000	0.0000
30	18	3648.4271	3651.5729	3650.0000	0.0000
30	20.7	3648.4271	3651.5729	3650.0000	0.0000
40	15.3	3648.4271	3651.5729	3650.0000	0.0000
40	18	3648.4271	3651.5729	3650.0000	0.0000
40	20.7	3648.4232	3651.5768	3650.0000	0.0000
50	15.3	3648.4232	3651.5768	3650.0000	0.0000
50	18	3648.4232	3651.5768	3650.0000	0.0000
50	20.7	3648.4232	3651.5768	3650.0000	0.0000

Table 2. Frequency 3650 Bandwidth 7.0 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30.0000	15.3000	3646.8500	3653.1500	3650.0000	0.0000
-30.0000	18.0000	3646.8500	3653.1500	3650.0000	0.0000
-30.0000	20.7000	3646.8920	3653.1500	3650.0210	21.0000
-20.0000	15.3000	3646.8920	3653.1500	3650.0210	21.0000
-20.0000	18.0000	3646.8500	3653.1500	3650.0000	0.0000
-20.0000	20.7000	3646.8920	3653.1500	3650.0210	21.0000
-10.0000	15.3000	3653.1500	3646.8920	3650.0210	21.0000
-10.0000	18.0000	3646.8500	3653.1500	3650.0000	0.0000
-10.0000	20.7000	3646.8500	3653.1500	3650.0000	0.0000
0.0000	15.3000	3646.8920	3653.1500	3650.0210	21.0000
0.0000	18.0000	3646.8500	3653.1500	3650.0000	0.0000
0.0000	20.7000	3646.8500	3653.1500	3650.0000	0.0000
10.0000	15.3000	3646.8836	3653.1311	3650.0074	7.3500
10.0000	18.0000	3646.8836	3653.1311	3650.0074	7.3500
10.0000	20.7000	3646.8836	3653.1311	3650.0074	7.3500
20.0000	15.3000	3646.8836	3653.1311	3650.0074	7.3500
20.0000	18.0000	3646.8836	3653.1311	3650.0074	7.3500
20.0000	20.7000	3646.8836	3653.1311	3650.0074	7.3500
30.0000	15.3000	3646.8836	3653.1311	3650.0074	7.3500
30.0000	18.0000	3646.8836	3653.1311	3650.0074	7.3500
30.0000	20.7000	3646.8836	3653.1311	3650.0074	7.3500
40.0000	15.3000	3646.8836	3653.1311	3650.0074	7.3500
40.0000	18.0000	3646.8836	3653.1311	3650.0074	7.3500
40.0000	20.7000	3646.8836	3653.1311	3650.0074	7.3500
50.0000	15.3000	3646.8756	3653.1244	3650.0000	0.0000
50.0000	18.0000	3646.8756	3653.1244	3650.0000	0.0000
50.0000	20.7000	3646.8756	3653.1244	3650.0000	0.0000

Table 3. Frequency 3662 Bandwidth 3.5 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30.0000	15.3000	3673.4460	3676.5960	3675.0210	21.0000
-30.0000	18.0000	3673.4460	3676.5960	3675.0210	21.0000
-30.0000	20.7000	3673.4040	3676.5960	3675.0000	0.0000
-20.0000	15.3000	3673.4460	3676.5960	3675.0210	21.0000
-20.0000	18.0000	3673.4040	3676.5960	3675.0000	0.0000
-20.0000	20.7000	3673.4460	3676.5960	3675.0210	21.0000
-10.0000	15.3000	3673.4040	3676.5960	3675.0000	0.0000
-10.0000	18.0000	3673.4040	3676.5960	3675.0000	0.0000
-10.0000	20.7000	3673.4040	3676.5960	3675.0000	0.0000
0.0000	15.3000	3673.4271	3676.5729	3675.0000	0.0000
0.0000	18.0000	3673.4460	3676.5960	3675.0210	21.0000
0.0000	20.7000	3673.4271	3676.5729	3675.0000	0.0000
10.0000	15.3000	3673.4271	3676.5729	3675.0000	0.0000
10.0000	18.0000	3673.4271	3676.5729	3675.0000	0.0000
10.0000	20.7000	3673.4271	3676.5729	3675.0000	0.0000
20.0000	15.3000	3673.4271	3676.5729	3675.0000	0.0000
20.0000	18.0000	3673.4271	3676.5729	3675.0000	0.0000
20.0000	20.7000	3676.4271	3673.5729	3675.0000	0.0000
30.0000	15.3000	3673.4271	3676.5729	3675.0000	0.0000
30.0000	18.0000	3673.4271	3676.5729	3675.0000	0.0000
30.0000	20.7000	3673.4271	3676.5729	3675.0000	0.0000
40.0000	15.3000	3673.4271	3676.5729	3675.0000	0.0000
40.0000	18.0000	3673.4271	3676.5729	3675.0000	0.0000
40.0000	20.7000	3673.4232	3676.5768	3675.0000	0.0000
50.0000	15.3000	3673.4232	3676.5768	3675.0000	0.0000
50.0000	18.0000	3673.4232	3676.5768	3675.0000	0.0000
50.0000	20.7000	3673.4232	3676.5768	3675.0000	0.0000

Table 4. Frequency 3662 Bandwidth 7.0 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30.0000	15.3000	3671.8920	3678.1500	3675.0210	21.0000
-30.0000	18.0000	3671.8920	3678.1500	3675.0210	21.0000
-30.0000	20.7000	3671.8920	3678.1500	3675.0210	21.0000
-20.0000	15.3000	3671.8920	3678.1500	3675.0210	21.0000
-20.0000	18.0000	3671.8920	3678.1500	3675.0210	21.0000
-20.0000	20.7000	3671.8920	3678.1500	3675.0210	21.0000
-10.0000	15.3000	3671.8920	3678.1500	3675.0210	21.0000
-10.0000	18.0000	3671.8920	3678.1500	3675.0210	21.0000
-10.0000	20.7000	3671.8920	3678.1500	3675.0210	21.0000
0.0000	15.3000	3671.8920	3678.1500	3675.0210	21.0000
0.0000	18.0000	3671.8920	3678.1500	3675.0210	21.0000
0.0000	20.7000	3671.8920	3678.1500	3675.0210	21.0000
10.0000	15.3000	3671.8836	3678.1311	3675.0074	7.3500
10.0000	18.0000	3671.8836	3678.1311	3675.0074	7.3500
10.0000	20.7000	3671.8836	3678.1311	3675.0074	7.3500
20.0000	15.3000	3671.8836	3678.1311	3675.0074	7.3500
20.0000	18.0000	3671.8836	3678.1311	3675.0074	7.3500
20.0000	20.7000	3671.8836	3678.1164	3675.0000	0.0000
30.0000	15.3000	3671.8836	3678.1311	3675.0074	7.3500
30.0000	18.0000	3671.8836	3678.1311	3675.0074	7.3500
30.0000	20.7000	3671.8836	3678.1311	3675.0074	7.3500
40.0000	15.3000	3671.8836	3678.1311	3675.0074	7.3500
40.0000	18.0000	3671.8836	3678.1311	3675.0074	7.3500
40.0000	20.7000	3671.8836	3678.1311	3675.0074	7.3500
50.0000	15.3000	3671.8756	3678.1244	3675.0000	0.0000
50.0000	18.0000	3671.8756	3678.1244	3675.0000	0.0000
50.0000	20.7000	3671.8756	3678.1244	3675.0000	0.0000

Table 5. Frequency 3675 Bandwidth 3.5 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30.0000	15.3000	3698.4460	3701.5960	3700.0210	21.0000
-30.0000	18.0000	3698.4040	3701.5960	3700.0000	0.0000
-30.0000	20.7000	3698.4460	3701.5960	3700.0210	21.0000
-20.0000	15.3000	3698.4040	3701.5960	3700.0000	0.0000
-20.0000	18.0000	3698.4040	3701.5960	3700.0000	0.0000
-20.0000	20.7000	3698.4040	3701.5960	3700.0000	0.0000
-10.0000	15.3000	3698.4040	3701.5960	3700.0000	0.0000
-10.0000	18.0000	3698.4040	3701.5960	3700.0000	0.0000
-10.0000	20.7000	3698.4040	3701.5960	3700.0000	0.0000
0.0000	15.3000	3698.4271	3701.5729	3700.0000	0.0000
0.0000	18.0000	3698.4040	3701.5960	3700.0000	0.0000
0.0000	20.7000	3698.4271	3701.5729	3700.0000	0.0000
10.0000	15.3000	3698.4271	3701.5729	3700.0000	0.0000
10.0000	18.0000	3698.4271	3701.5729	3700.0000	0.0000
10.0000	20.7000	3698.4271	3701.5729	3700.0000	0.0000
20.0000	15.3000	3698.4271	3701.5729	3700.0000	0.0000
20.0000	18.0000	3698.4271	3701.5729	3700.0000	0.0000
20.0000	20.7000	3698.4271	3701.5729	3700.0000	0.0000
30.0000	15.3000	3698.4271	3701.5729	3700.0000	0.0000
30.0000	18.0000	3698.4271	3701.5729	3700.0000	0.0000
30.0000	20.7000	3698.4271	3701.5729	3700.0000	0.0000
40.0000	15.3000	3698.4271	3701.5729	3700.0000	0.0000
40.0000	18.0000	3698.4271	3701.5729	3700.0000	0.0000
40.0000	20.7000	3698.4271	3701.5729	3700.0000	0.0000
50.0000	15.3000	3698.4232	3701.5768	3700.0000	0.0000
50.0000	18.0000	3698.4232	3701.5622	3699.9927	7.3000
50.0000	20.7000	3698.4232	3701.5768	3700.0000	0.0000

Table 6. Frequency 3675 Bandwidth 7.0 MHz

Temperature	Voltage	F 1	F 2	(F1+F2)/2	Deviation
-30.0000	15.3000	3696.8920	3703.1500	3700.0210	21.0000
-30.0000	18.0000	3696.8500	3703.1500	3700.0000	0.0000
-30.0000	20.7000	3696.8500	3703.1500	3700.0000	0.0000
-20.0000	15.3000	3696.8500	3703.1500	3700.0000	0.0000
-20.0000	18.0000	3696.8500	3703.1500	3700.0000	0.0000
-20.0000	20.7000	3696.8500	3703.1500	3700.0000	0.0000
-10.0000	15.3000	3696.8920	3703.1500	3700.0210	21.0000
-10.0000	18.0000	3696.8500	3703.1500	3700.0000	0.0000
-10.0000	20.7000	3696.8920	3703.1500	3700.0210	21.0000
0.0000	15.3000	3696.8920	3703.1500	3700.0210	21.0000
0.0000	18.0000	3696.8500	3703.1500	3700.0000	0.0000
0.0000	20.7000	3696.8920	3703.1500	3700.0210	21.0000
10.0000	15.3000	3696.8836	3703.1311	3700.0074	7.3500
10.0000	18.0000	3696.8836	3703.1311	3700.0074	7.3500
10.0000	20.7000	3696.8836	3703.1311	3700.0074	7.3500
20.0000	15.3000	3696.8836	3703.1311	3700.0074	7.3500
20.0000	18.0000	3696.8836	3703.1311	3700.0074	7.3500
20.0000	20.7000	3696.8836	3703.1311	3700.0074	7.3500
30.0000	15.3000	3696.8836	3703.1311	3700.0074	7.3500
30.0000	18.0000	3696.8836	3703.1311	3700.0074	7.3500
30.0000	20.7000	3696.8836	3703.1311	3700.0074	7.3500
40.0000	15.3000	3696.8836	3703.1311	3700.0074	7.3500
40.0000	18.0000	3696.8836	3703.1311	3700.0074	7.3500
40.0000	20.7000	3696.8836	3703.1311	3700.0074	7.3500
50.0000	15.3000	3696.8756	3703.1244	3700.0000	0.0000
50.0000	18.0000	3696.8756	3703.1244	3700.0000	0.0000
50.0000	20.7000	3696.8756	3703.1244	3700.0000	0.0000