

EMC TEST REPORT

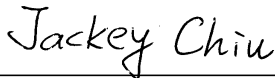
Report No. : EME-040014**Model No. : XG-650****Issued Date : Feb. 26, 2004**

Applicant : Z-COM, Inc.
7F-2, No. 9, Prosperity 1st RD., Science-Based Industrial
Park, Hsinchu, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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Project Engineer



Jackey Chiu

Reviewed By



Elton Chen

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Summary of Tests**54Mbps 802.11g Wireless Mini-PCI Adapter-Model: XG-650
FCC ID: M4Y-0XG650**

Test	Reference	Results
Radiated Spurious Emission test	15.205, 15.209	Complies

1. General information

1.1 Identification of the EUT

Applicant	: Z-COM, Inc.
Product	: 54Mbps 802.11g Wireless Mini-PCI Adapter
Model No.	: XG-650
FCC ID.	: M4Y-0XG650
Frequency Range	: 2412~2462 MHz
Channel Number	: 11 Channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: DSSS, OFDM
Rated Power	: 3.3Vdc
Power Cord	: N/A
Sample Received	: Nov. 27, 2003
Test Date(s)	: Nov. 27, 2003 ~ Dec. 19, 2003

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The 802.11g Wireless LAN Mini-PCI Adapter is an enhanced high-performance, that supports high-speed wireless networking at home, at office or in public places. 802.11g Wireless LAN Mini-PCI Adapter is able to communicate with any 802.11b and 802.11g compliant products.

The EUT meets special requirements for full modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

Owing to the change the antenna, and after verifying the change of EUT, we conducted the Radiated Spurious Emission Test only.

Regarding to the relevant data of the test result, please refer to the FCC ID: M4Y-0XG650. Granted on Feb. 25, 2004 issued for model No. XG-650.

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

1.3 Antenna description

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : 2dBi

Antenna Type : Dipole antenna

Connector Type : UFL

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Notebook	DELL	PP01L	CN-06P83-48643-33V-0112	5ZXMUL-36273-FB-E
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved
Access Point	SMC	WG 4005-172 (A3)	C-G 3030232-1-1-3*1000	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section § 15.205 、 §15.207 、 §15.209 、 §15.247 and ANSI C63.4/2001.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT was transmitted continuously during the radiated emission test.

After verifying the maximum output power, we found the maximum output power of 802.11b was occurred at 11Mbps data rate and 802.11g was occurred at 54Mbps data rate. The final test was executed under this condition and recorded in this report individually.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Last Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	6/16/2003
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	6/24/2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	7/19/2003
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	10/20/2003
Horn Antenna	EMCO	1GHz~18GHz	3115	EC332	10/15/2003
Horn Antenna	SCHWARZBECK	15GHz~40GHz	BBHA 9170	EC351	6/21/2003
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	EC350	6/21/2003
Turn Table	HDGmbH	N/A	DS 420S	EP317-3	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP317-2	N/A
Pre-Amplifier	MITER	100MHz~26.5GHz	919981	EC373	5/13/2003
Pre-Amplifier	MITER	26GHz~40GHz	828825	EC374	5/13/2003
Crystal Detector	Agilent	10MHz~18GHz	8472B	MY42240243	N/A
Signal Generator	Rohde & Schwarz	20MHz~27GHz	SMR27	EC354	8/16/2003
Two Channel Digital Storage Oscilloscope	Tektronix	N/A	TDS1012	C031679	8/16/2003
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	1/20/2003

Note: The above equipments are within the valid calibration period.

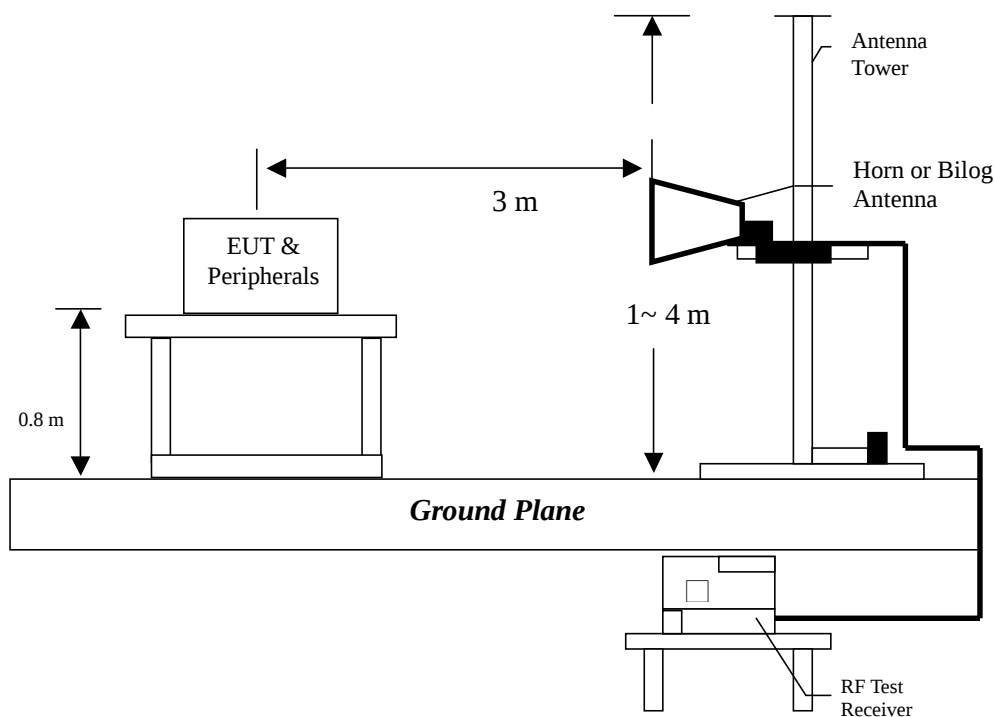
3. Radiated Emission test

3.1 Operating environment

Temperature:	23	°C	(10-40°C)
Relative Humidity:	54	%	(10-90%)
Atmospheric Pressure	1023	hPa	(860-1060hPa)

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

5.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.

Expanded uncertainty (k=2) of radiated emission measurement is ± 4.98 dB.

Expanded uncertainty (k=2) of conducted emission measurement is ± 2.02 dB.

5.4 Radiated spurious emission test data

5.4.1 Measurement results: frequencies equal to or less than 1 GHz

EUT : XG-650

Worst Case Condition : 802.11b Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
79.990	QP	V	10.57	22.94	33.51	40.00	-6.49	171	242
99.523	QP	V	10.44	13.64	24.08	43.50	-19.42	190	177
132.680	QP	V	13.34	17.98	31.32	43.50	-12.18	173	208
166.110	QP	V	14.92	19.60	34.52	43.50	-8.98	177	168
198.990	QP	V	12.03	14.45	26.48	43.50	-17.02	174	167
239.980	QP	V	11.82	24.36	36.18	46.00	-9.82	100	171
80.000	QP	H	9.50	14.33	23.83	40.00	-16.17	100	93
99.510	QP	H	10.44	23.07	33.51	43.50	-9.99	231	256
132.680	QP	H	13.34	23.08	36.42	43.50	-7.08	184	232
165.840	QP	H	14.92	24.21	39.13	43.50	-4.37	110	278
198.980	QP	H	12.03	20.76	32.79	43.50	-10.71	169	294
559.970	QP	H	19.60	8.75	28.35	46.00	-17.65	183	262

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

EUT : XG-650

Worst Case Condition : 802.11g Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
80.000	QP	V	9.50	24.06	33.56	40.00	-6.44	244	174
99.520	QP	V	10.44	27.94	38.38	43.50	-5.12	184	177
132.690	QP	V	13.34	13.69	27.03	43.50	-16.47	202	177
165.840	QP	V	14.92	16.88	31.80	43.50	-11.70	168	175
199.012	QP	V	12.03	26.24	38.27	43.50	-5.23	164	171
239.980	QP	V	11.82	26.47	38.29	46.00	-7.71	127	168
80.000	QP	H	9.50	17.33	26.83	40.00	-13.17	323	240
99.520	QP	H	10.44	20.22	30.66	43.50	-12.84	213	259
132.670	QP	H	13.34	21.14	34.48	43.50	-9.02	186	283
165.830	QP	H	14.92	22.81	37.73	43.50	-5.77	128	326
198.970	QP	H	12.03	10.45	22.48	43.50	-21.02	177	323
399.230	QP	H	16.40	10.45	26.85	46.00	-19.15	132	255

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

5.4.2 Measurement results: frequency above 1GHz

EUT : XG-650

Test Condition : 802.11b Tx at low, middle, high channel

Test Result:

No spurious emission was found above the spectrum analyzer's noise floor.

The noise floor are listed as below:

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

EUT : XG-650

Test Condition : 802.11g Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Antenna Polariz. (H/V)	Preamp (dB)	Correction Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV)	Limit @ 3 m (dBuV)	Margin (dB)	Antenna high (cm)	Turn Table angle (degree)
4176	PK	V	31.88	35.742	46.438	50.3	74	-23.7	151	69
4176	AV	H	31.88	35.742	39.948	43.81	54	-10.19	151	69

Remark:

1. Corrected Level = Reading Level + Correction Factor – Preamp
2. Correction Factor = Antenna Factor + Cable Loss
3. The frequency measured ranges from 1GHz to 25GHz. The data value listed above which is higher than the noise floor, the others please refer to noise floor level.
4. The low and middle channel no spurious emission were found above the spectrum analyzer's noise floor.

The noise floor are listed as below:

For PK:

1GHz-3GHz: 20dBuV

3GHz-14GHz: 27dBuV

14GHz-26.5GHz: 39dBuV

For AV:

1GHz-3GHz: 10dBuV

3GHz-14GHz: 16dBuV

14GHz-26.5GHz: 28dBuV

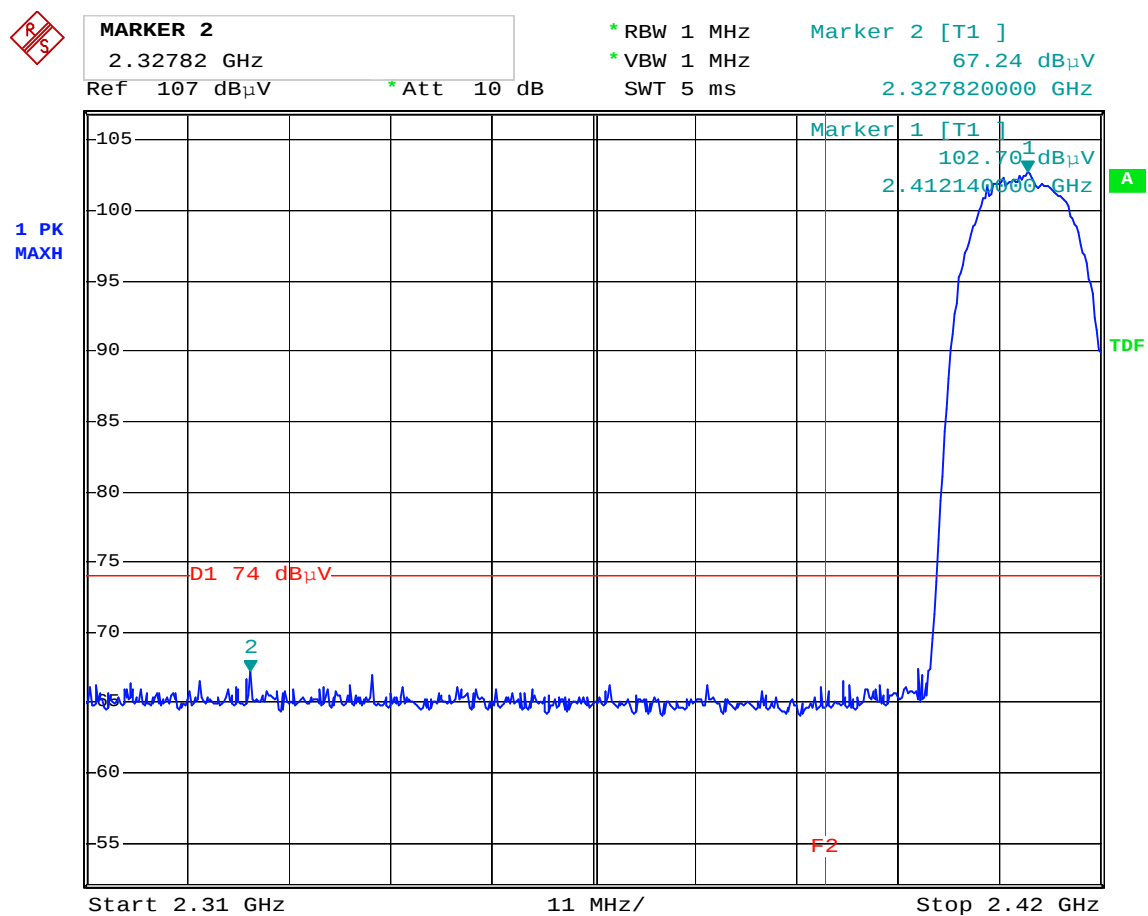
7. Emission on the band edge §FCC 15.247(C)

In any 100kHz 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 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.

Please see the plot below.

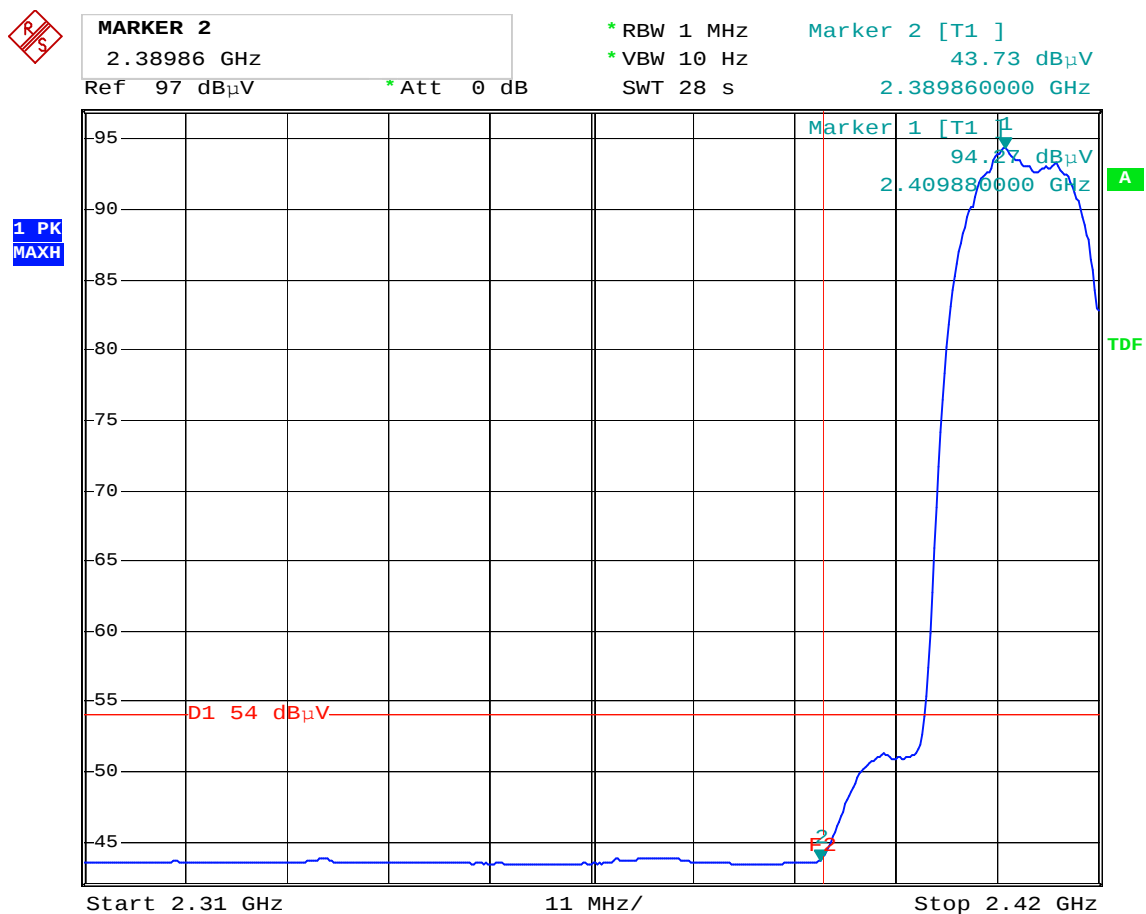
7.1 Band-edge

Test Condition: 802.11b function (DSSS Modulation)



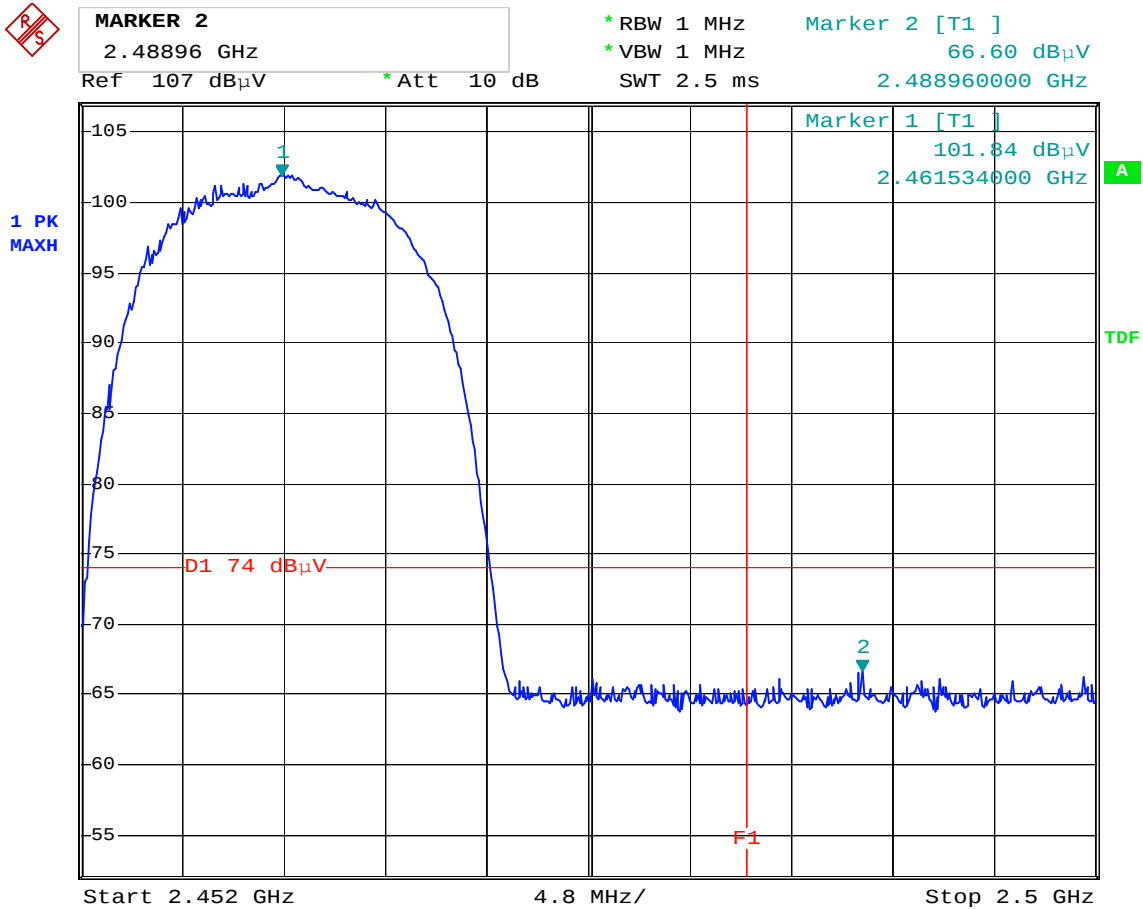
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Peak detector F2=2390MHz 802.11b

Date: 13.JAN.2004 18:02:31

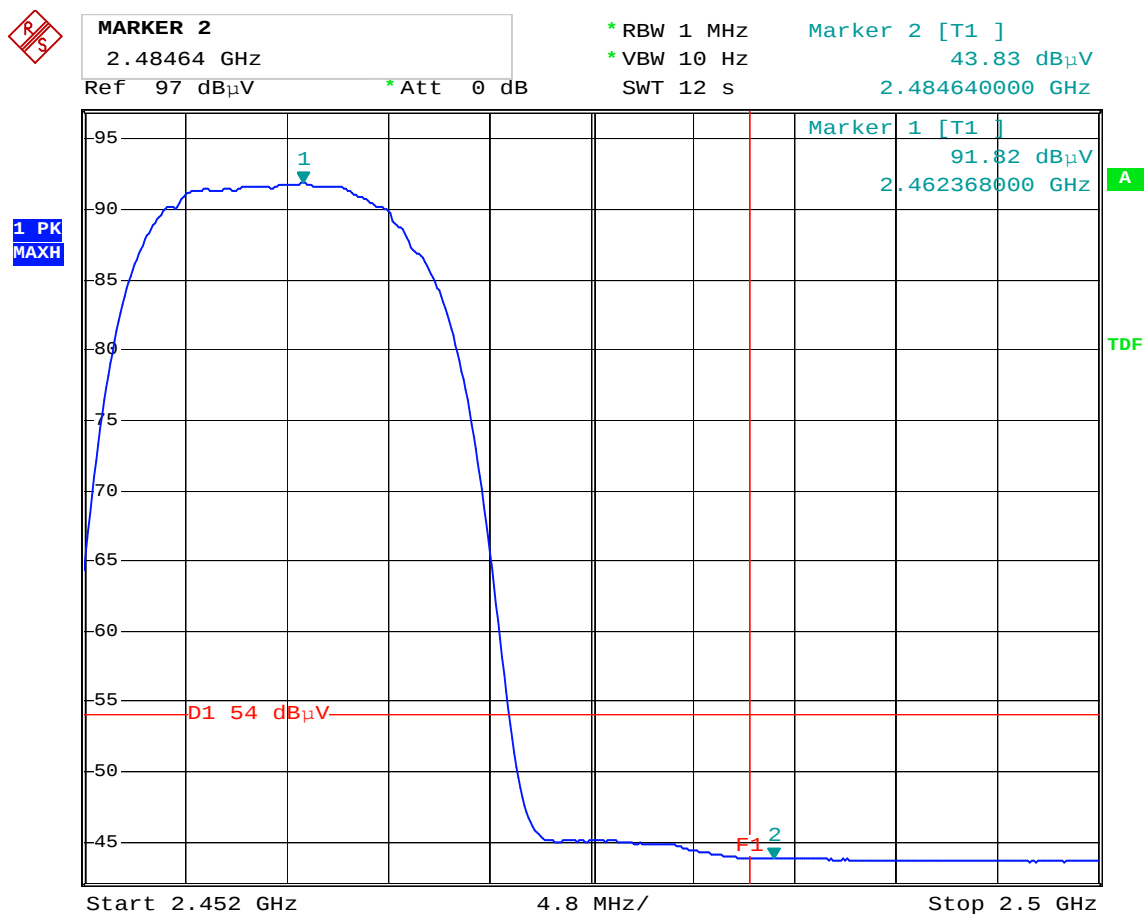


Comment A: Band-edge test at low channel EN B
Average detector F2=2390MHz 802.11b

Date: 14.JAN.2004 16:07:27



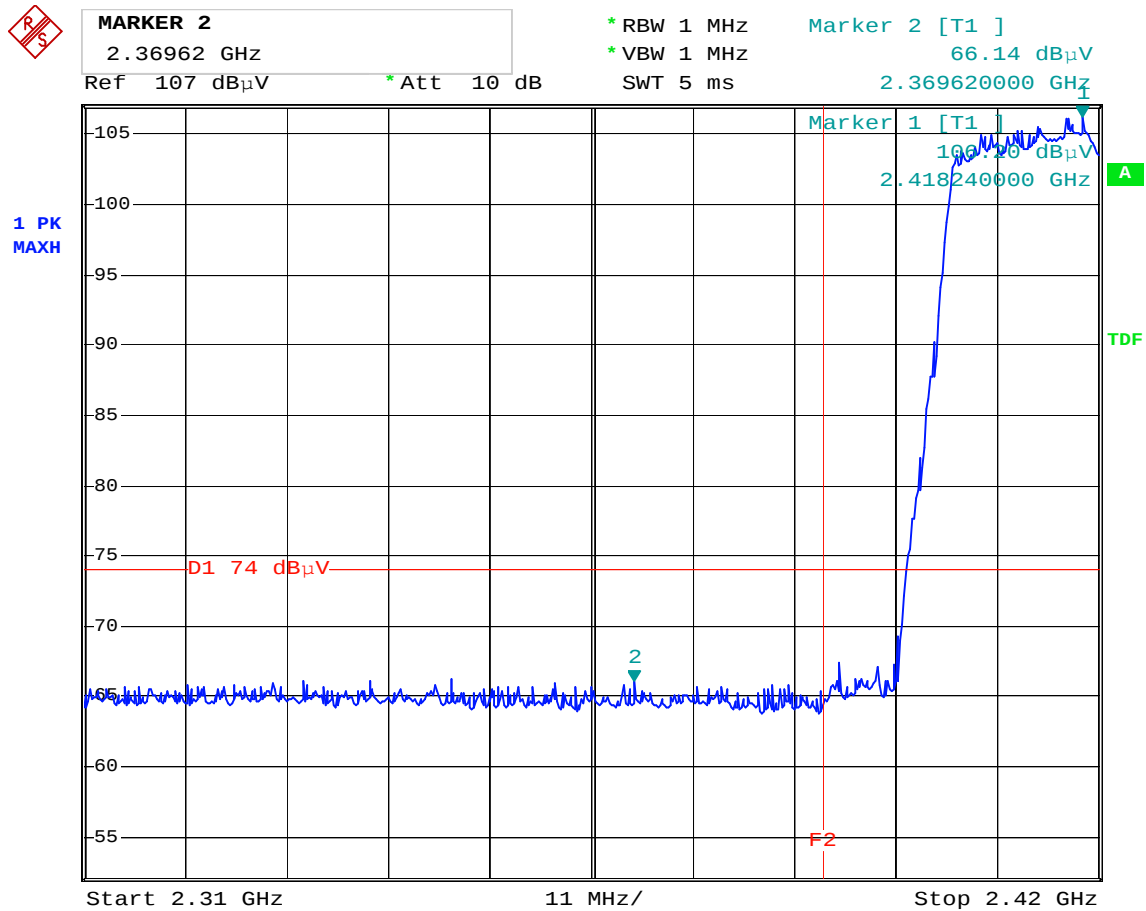
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 Peak detector F1=2483.5MHz 802.11b
 Date: 13.JAN.2004 17:56:20



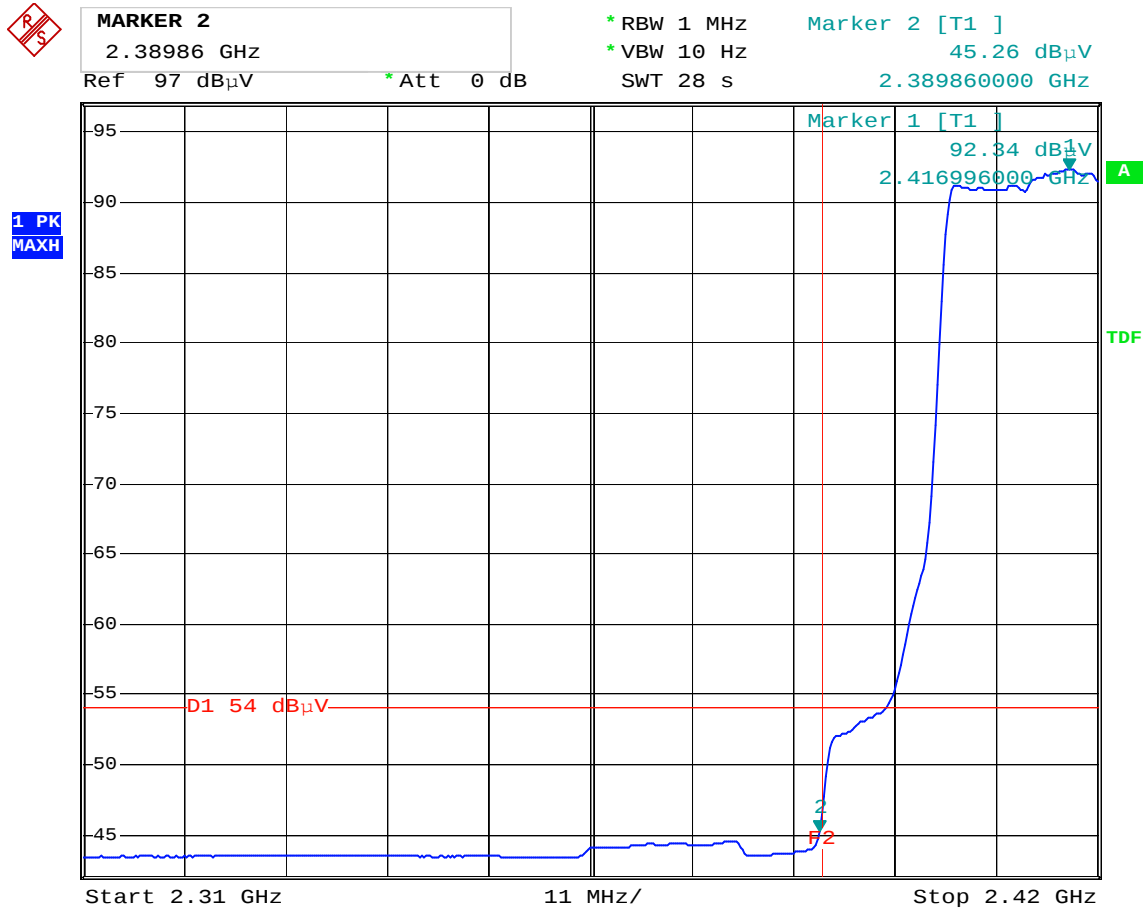
Comment A: Band-edge test at high channel N B
Average detector F1=2483.5MHz 802.11b

Date: 14.JAN.2004 16:08:55

Test Condition: 802.11g function (OFDM Modulation)



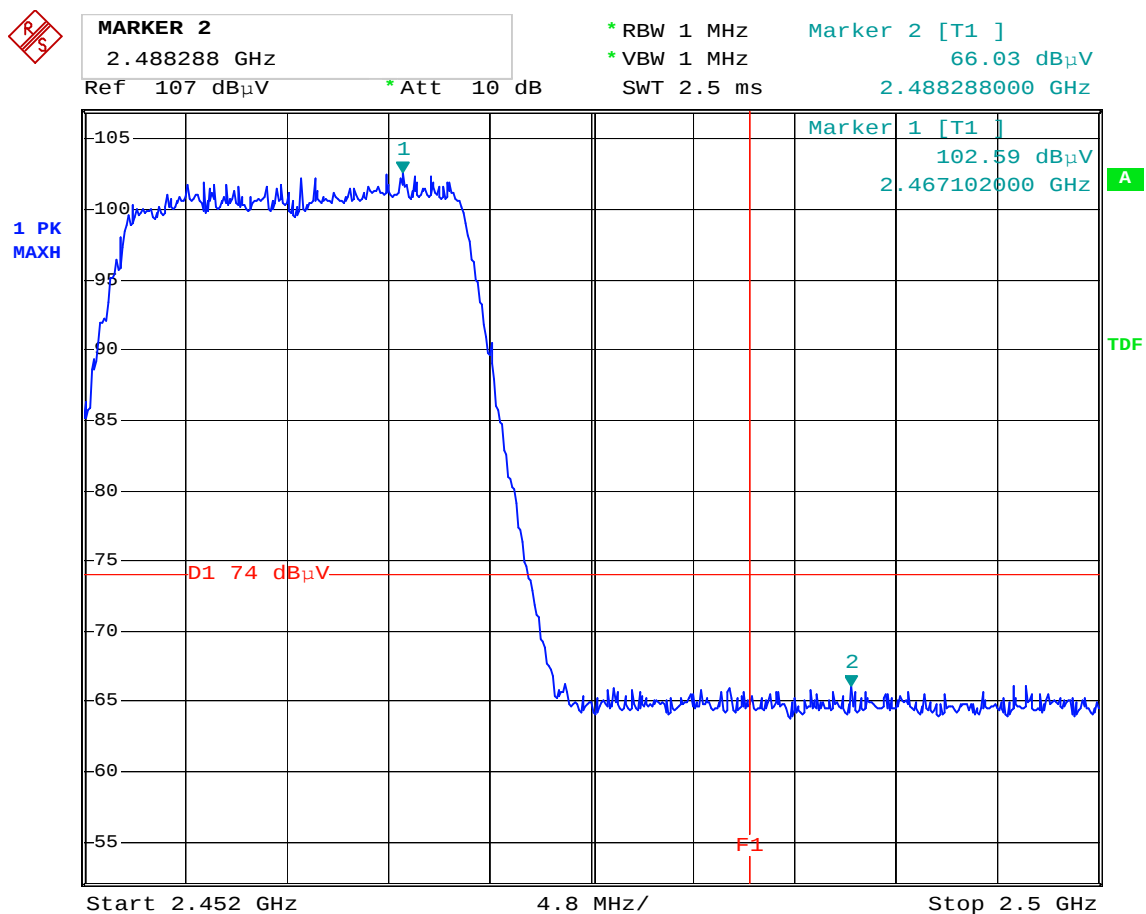
Comment A: Band-edge test at low channel11
 Peak detector F2=2390MHz 802.11g
 Date: 13.JAN.2004 17:42:21



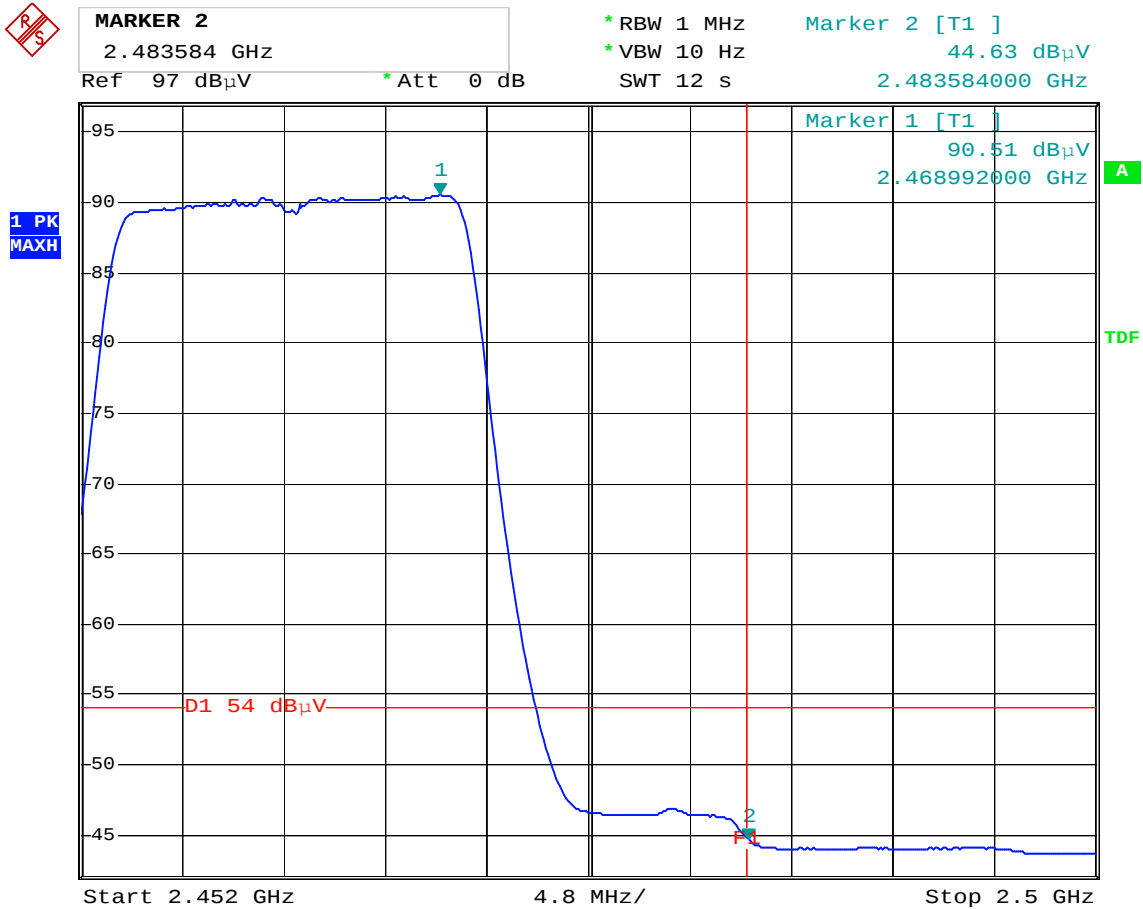
Comment A: Band-edge test at low channel EN B

Average detector F2=2390MHz

Date: 14.JAN.2004 16:14:12



Comment A: Band-edge test at high channel
 Peak detector F1=2483.5MHz 802.11g
 Date: 13.JAN.2004 17:50:35



Comment A: Band-edge test at high channel N B
 Average detector F1=2483.5MHz
 Date: 14.JAN.2004 16:11:34