

EMC TEST REPORT

Report No. : EME-031079
Model No. : 11-133
Issued Date : Dec. 8, 2003

Applicant : **Teletronics International Inc.**
1803 Research Blvd., Suite 404, Rockville,
MD 20850-3155, U.S.A.

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



Jerry Liu

Reviewed By



Elton Chen

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Summary of Tests

**11Mbps Wireless LAN Card-Model: 11-133
FCC ID: MFM-11-133**

Test	Reference	Results
Radiated Spurious Emission test	15.205, 15.209	Complies

1. General information

1.1 Identification of the EUT

Applicant	: Teletronics International Inc.
Product	: 11Mbps Wireless LAN Card
Model No.	: 11-133
FCC ID.	: MFM-11-133
Frequency Range	: 2412MHz to 2462MHz
Channel Number	: 11 channels
Frequency of Each Channel	: 2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Type of Modulation	: CCK (11Mps, 5.5Mbps), DQPSK (2Mbps), DBPSK (1Mbps)
Rated Power	: 3.3/5Vdc
Power Cord	: N/A
Sample Received	: Sep. 22, 2003
Test Date(s)	: Sep. 26, 2003 to Oct. 3, 2003

A FCC DoC report has been generated for the client.

1.2 Additional information about the EUT

The EUT is an IEEE802.11/802.11b-compliant PCMCIA Type II DSSS wireless LAN PC card. It fully supports wireless networking under Windows 95/98, and NT 4.0, it can be operated in Ad-Hoc and Infrastructure network configurations.

For more detail features, please refer to User's manual.

Owing to adding the series of antenna, and after verifying the change of EUT, we conducted the Radiated Spurious Emission Test and Band-Edge Test.

Regarding to the relevant data of the test result, please refer to the FCC ID: MFM-11-133 Granted on Oct. 17, 2003 issued for model No. 11-133.

1.3 Antenna description

The EUT requires professional installation.

The EUT can be equipped with 4 types of antenna. Please see below table for details:

Antenna 1:

Antenna Gain : 2.5dBi
Antenna Type : Rubber Ducky
Connector Type : N type (male)

Antenna 2:

Antenna Gain : 24dBi
Antenna Type : Grid
Connector Type : N type (female)

Antenna 3:

Antenna Gain : 5dBi
Antenna Type : omni (for indoor use)
Connector Type : N type (male)

Antenna 4:

Antenna Gain : 5dBi
Antenna Type : omni (for outdoor use)
Connector Type : N type (female)

The EUT has four types of antennas. We choose antenna 1, 2 and 3 to conduct the tests because the antenna 3 and antenna 4 are identical and defined as family antenna.

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Notebook	Twinhead	P79T	H0905483	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	FCC DoC Approved
Modem	Dynalink	V1456VQE	00V230A00051494	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 test.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Series No.	Last Cal.Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	825788/014	Feb. 18, 2003
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	825428/005	June 10, 2003
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	100137	July 10, 2003
Horn Antenna	EMCO	1GHz~18GHz	3115	9906-5890	Sep. 19, 2003
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	159	June 21, 2003
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160	3133	Feb. 21, 2003
Turn Table	HDGmbH	N/A	DS 420S	420/669/01	N/A
Antenna Tower	HDGmbH	N/A	MA 240	240/573	N/A
Microwave Amplifier	Agilent	2GHz~26.5GHz	8348A	3111A00567	Dec. 20, 2002
Crystal Detector	Agilent	10MHz~18GHz	8472B	MY42240243	N/A
Signal Generator	Rohde & Schwarz	20MHz~27GHz	SMR27	100036	Aug. 15, 2003
Two Channel Digital Storage Oscilloscope	Tektronix	N/A	TDS1012	C031679	Aug. 16, 2003

Note:

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

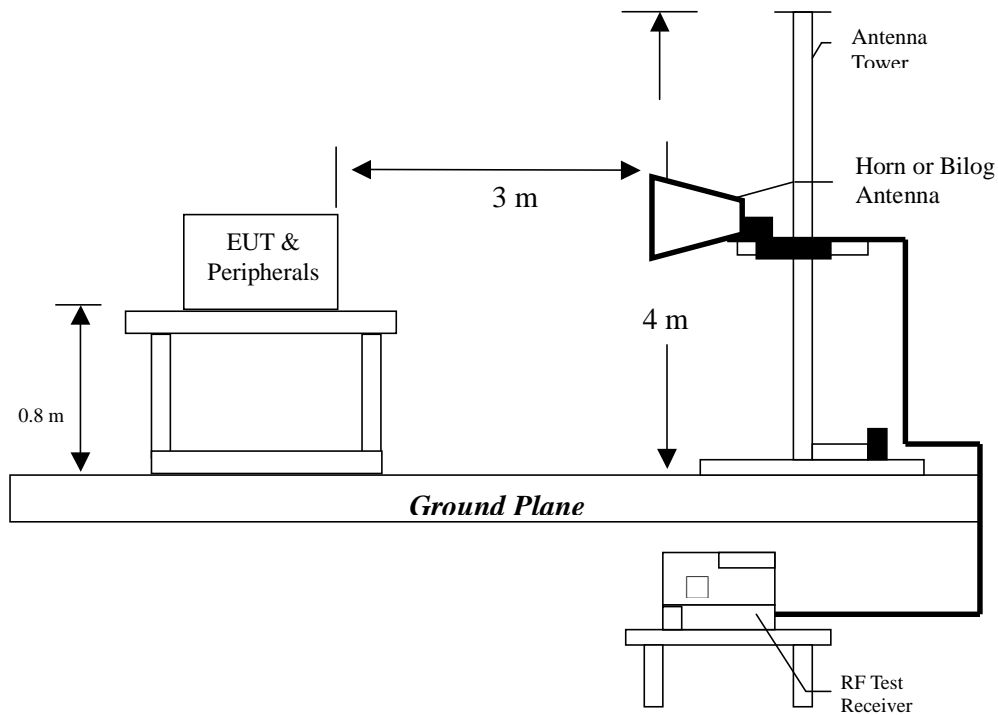
3. Radiated Emission test

3.1 Operating environment

Temperature:	25	°C	(10-40°C)
Relative Humidity:	55	%	(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”.

3.3 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.

3.4 Radiated spurious emission test data

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

EUT : 11-133

Worst Case Condition : Tx at low channel with antenna 1

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)
66.64500	QP	V	12.94	23.55	36.49	40.00	-3.51	100	29
131.98000	QP	V	13.34	23.48	36.82	43.50	-6.68	100	43
219.98000	QP	V	11.52	11.85	23.37	46.00	-22.63	100	39
307.98000	QP	V	14.45	14.28	28.73	46.00	-17.27	241	33
395.98000	QP	V	16.40	10.50	26.90	46.00	-19.10	168	203
432.06000	QP	V	17.37	17.43	34.80	46.00	-11.20	119	170
131.98000	QP	H	13.34	29.51	42.85	43.50	-0.65	147	173
175.98000	QP	H	14.29	12.58	26.87	43.50	-16.63	147	181
199.97000	QP	H	12.03	26.52	38.55	43.50	-4.95	147	135
219.98000	QP	H	11.52	20.28	31.80	46.00	-14.20	134	196
307.98000	QP	H	14.45	29.50	43.95	46.00	-2.05	100	360
395.98000	QP	H	16.40	21.72	38.12	46.00	-7.88	100	360

Remark:

1. Corrected Level = Reading Level + Correction Factor

2. Correction Factor = Antenna Factor + Cable Loss

EUT : 11-133

Worst Case Condition : Tx at low channel with antenna 2

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)
66.64800	QP	V	12.94	20.96	33.90	40.00	-6.10	100	0
130.90000	QP	V	13.34	25.54	38.88	43.50	-4.62	121	360
299.95200	QP	V	14.07	20.45	34.52	46.00	-11.48	150	233
533.26000	QP	V	19.15	19.64	38.79	46.00	-7.21	106	165
666.61600	QP	V	21.72	11.62	33.34	46.00	-12.66	141	180
733.24000	QP	V	22.60	20.94	43.54	46.00	-2.46	100	162
131.98000	QP	H	13.34	28.39	41.73	43.50	-1.77	219	110
307.98500	QP	H	14.45	24.22	38.67	46.00	-7.33	344	52
333.28000	QP	H	14.99	21.37	36.36	46.00	-9.64	124	61
533.27000	QP	H	19.15	18.12	37.27	46.00	-8.73	137	112
720.11800	QP	H	22.22	19.54	41.76	46.00	-4.24	106	64
733.27000	QP	H	22.60	17.82	40.42	46.00	-5.58	100	65

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

EUT : 11-133

Worst Case Condition : Tx at low channel with antenna 3

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)
66.63000	QP	V	12.94	23.40	36.34	40.00	-3.66	100	169
131.98000	QP	V	13.34	28.30	41.64	43.50	-1.86	105	123
175.98000	QP	V	14.29	10.99	25.28	43.50	-18.22	107	211
199.96000	QP	V	12.03	25.13	37.16	43.50	-6.34	104	259
219.98000	QP	V	11.52	27.85	39.37	46.00	-6.63	100	256
307.98000	QP	V	14.45	22.13	36.58	46.00	-9.42	100	309
131.98000	QP	H	13.34	29.10	42.44	43.50	-1.06	230	166
199.97000	QP	H	12.03	25.85	37.88	43.50	-5.62	100	125
219.98000	QP	H	11.52	27.47	38.99	46.00	-7.01	141	62
307.97000	QP	H	14.45	28.48	42.93	46.00	-3.07	100	50
333.29000	QP	H	14.99	27.85	42.84	46.00	-3.16	100	156
399.93000	QP	H	16.40	15.48	31.88	46.00	-14.12	213	204

Remark:

1. Corrected Level = Reading Level + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

3.4.2 Measurement results: frequency above 1GHz

The radiated spurious emissions at

Frequency(MHz)	Margin
4075	-1.28

are less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

EUT : 11-133

Test Condition : Tx at low channel with antenna 1

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)
4075	PK	V	31.88	35.742	51.838	55.7	74	-18.3	100	135
4075	AV	V	31.88	35.742	48.858	52.72	54	-1.28	100	135

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.

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 : 11-133

Test Condition : Tx at middle and high channel with antenna 1

There were no spurious emissions observed above the measurement analyzer noise floor, when the EUT was operated at middle and highest channel.

EUT : 11-133

Test Condition : Tx at low, middle and high channel with antenna 2

There were no spurious emissions observed above the measurement analyzer noise floor, when the EUT was operated at middle and highest channel.

EUT : 11-133

Test Condition : Tx at low channel with antenna 3

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)
4075.52	PK	V	31.88	35.742	48.128	51.99	74	-22.01	106	85
4075.52	AV	V	31.88	35.742	44.888	48.75	54	-5.25	106	85

EUT : 11-133

Test Condition : Tx at middle channel with antenna 3

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)
4125.51	PK	V	31.88	35.742	47.598	51.46	74	-22.54	110	92
4125.51	AV	V	31.88	35.742	42.378	46.24	54	-7.76	110	92

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.

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 : 11-133

Test Condition : Tx at high channel with antenna 3

There were no spurious emissions observed above the measurement analyzer noise floor, when the EUT was operated at highest channel.

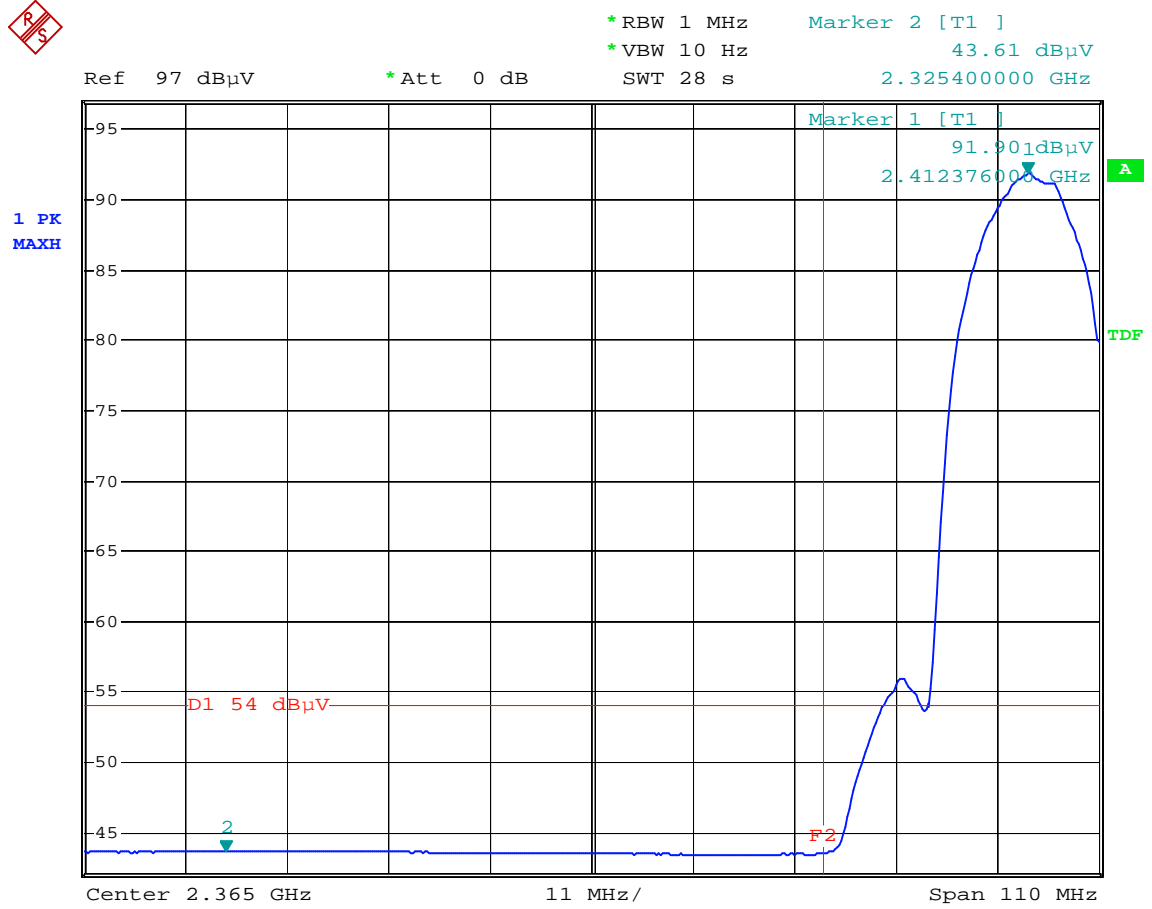
4. Emission on the band edge §FCC 15.247(C)

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.

4.1 Band-edge (Radiated method)

Antenna 1:



Comment A: Band-edge test at low channel ¹FN R
 Average detector F2=2390MHz .

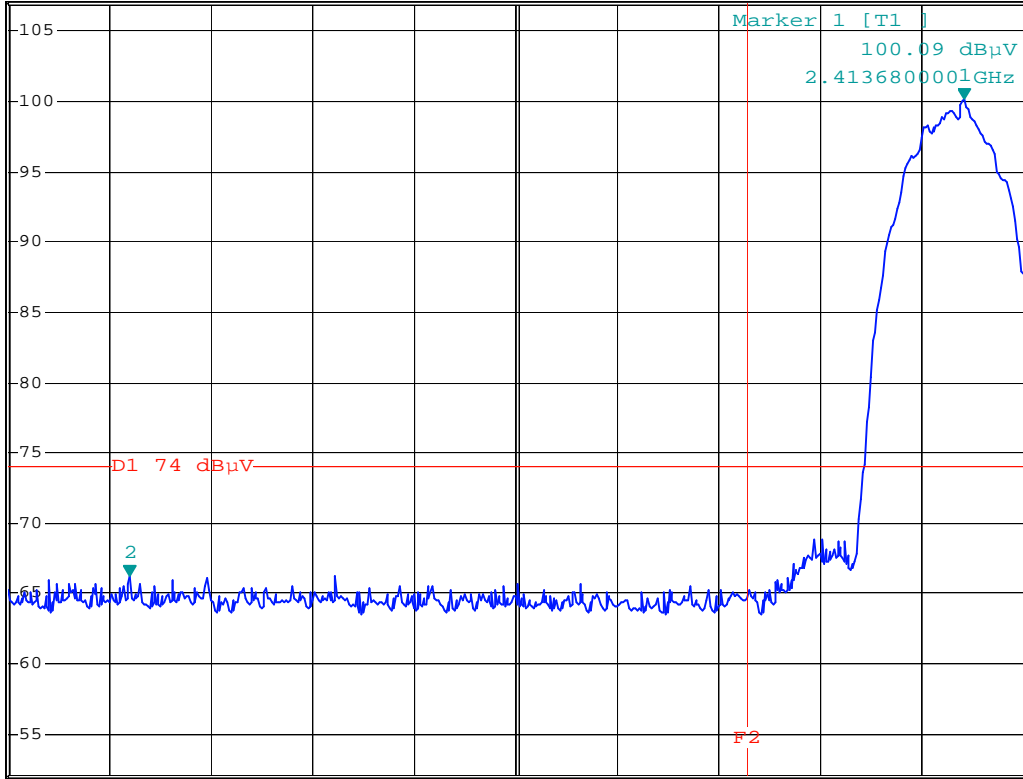
Date: 3.OCT.2003 15:50:43



MARKER 2
 2.3232 GHz
 Ref 107 dB μ V * Att 10 dB

*RBW 1 MHz Marker 2 [T1]
 *VBW 1 MHz 66.17 dB μ V
 SWT 5 ms 2.323200000 GHz

1 PK
 MAXH

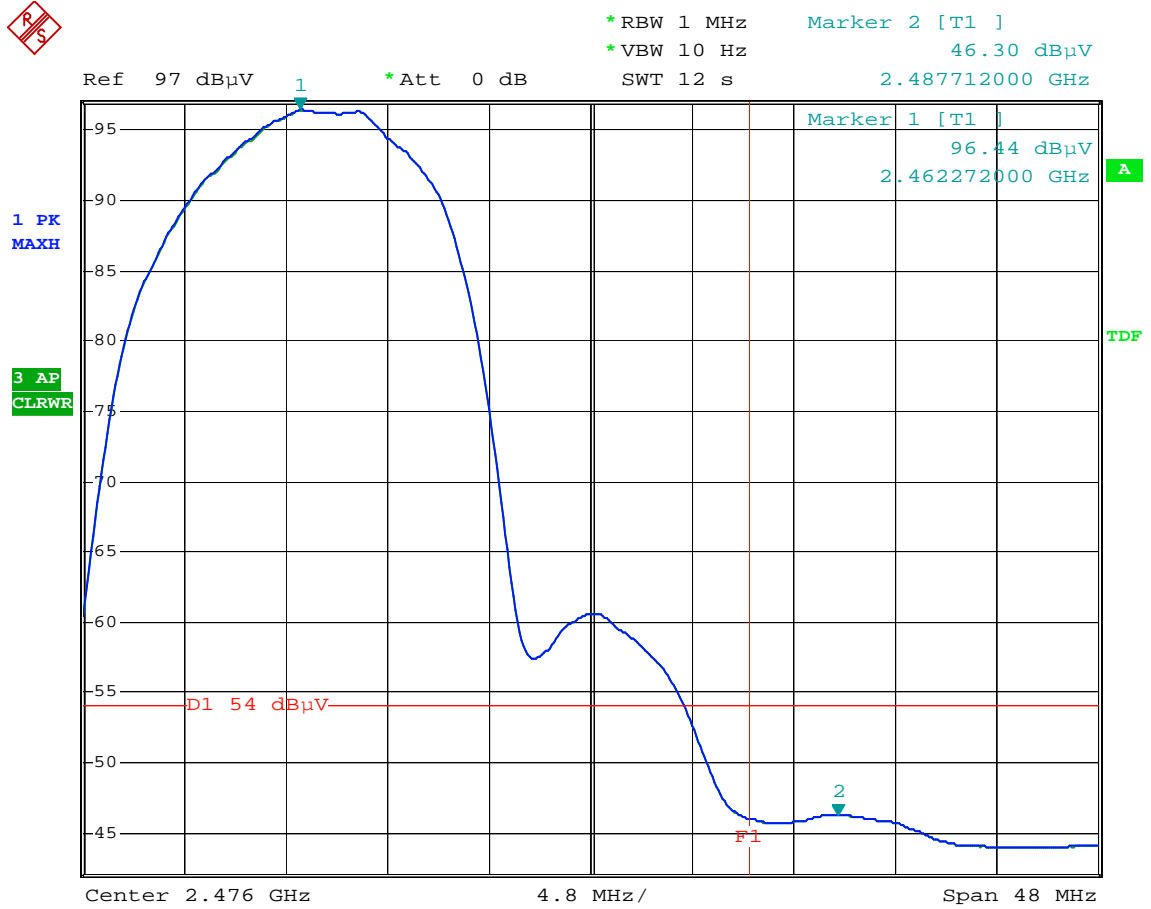


Center 2.365 GHz 11 MHz/ Span 110 MHz

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

Peak detector F2=2390MHz

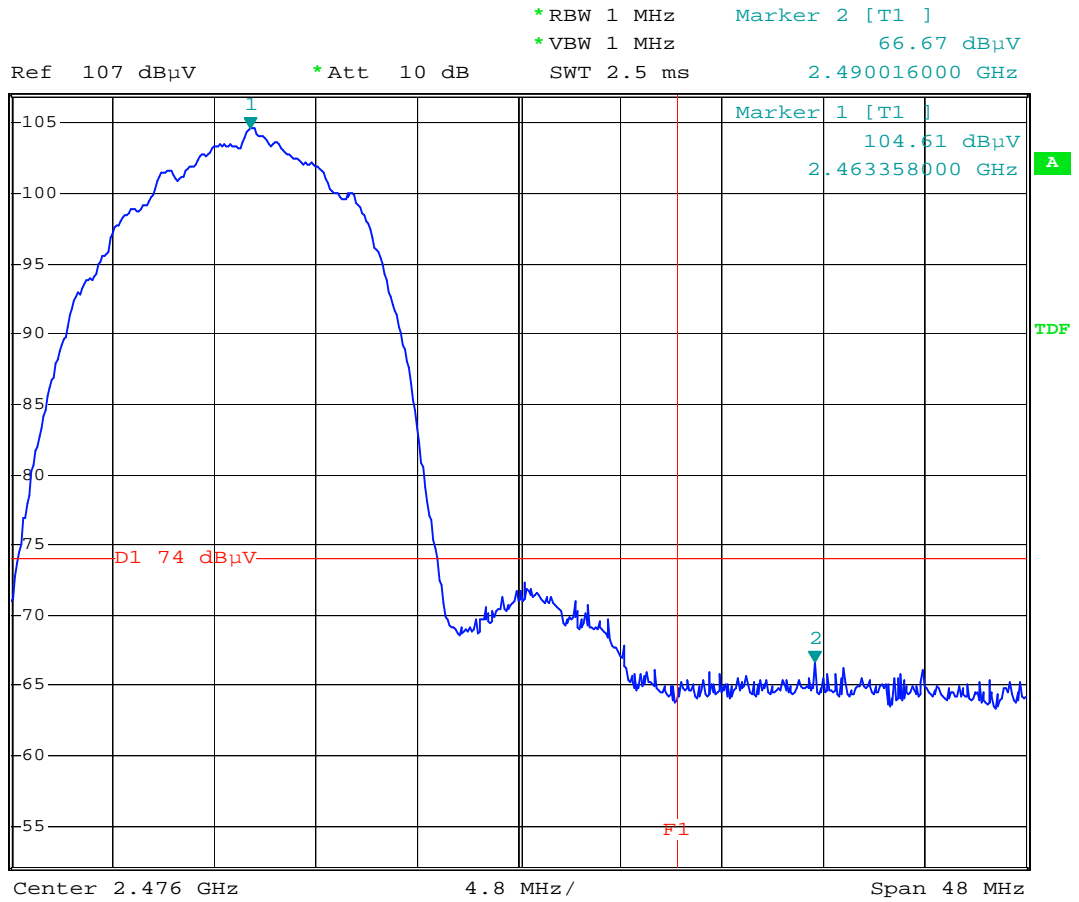
Date: 3.OCT.2003 15:53:27



Comment A: Band-edge test at high channel

Average detector F1=2483.5MHz

Date: 3.OCT.2003 15:58:45

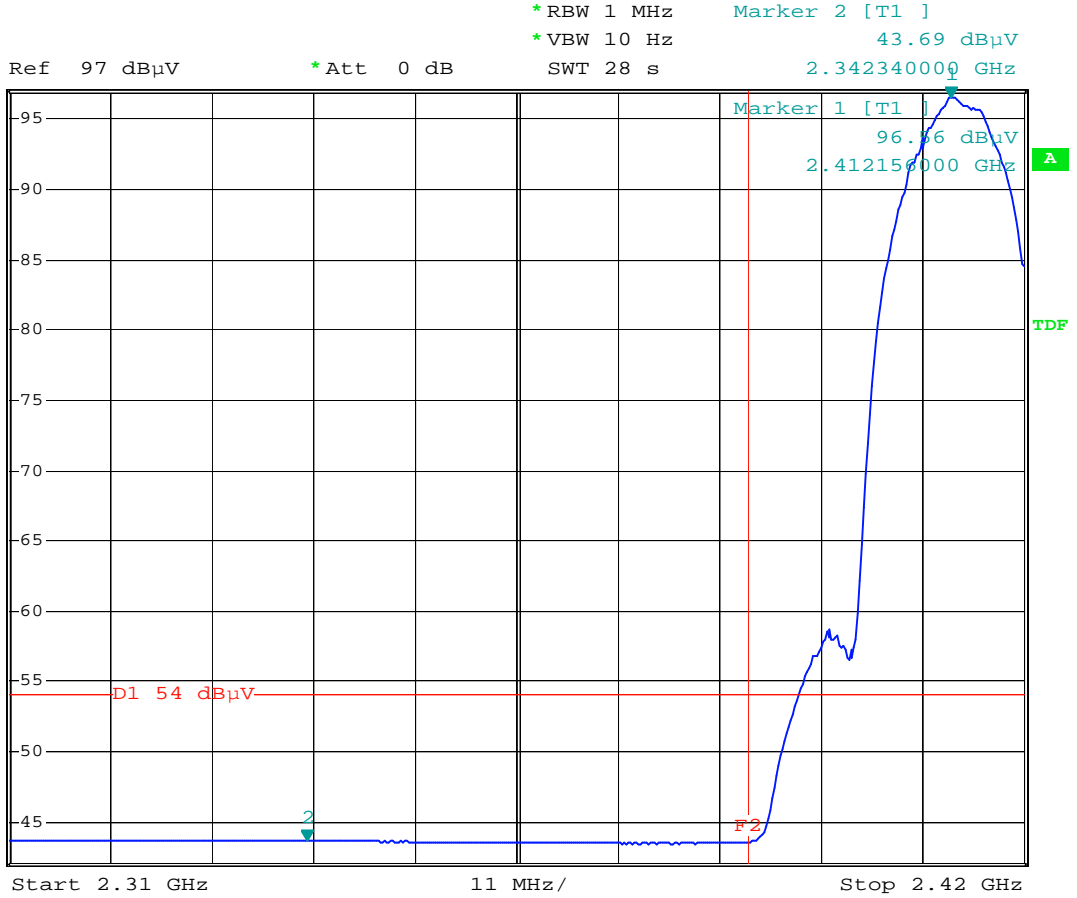


Comment A: Band-edge test at high channel N R

Peak detector F1=2483.5MHz

Date: 3.OCT.2003 15:57:04

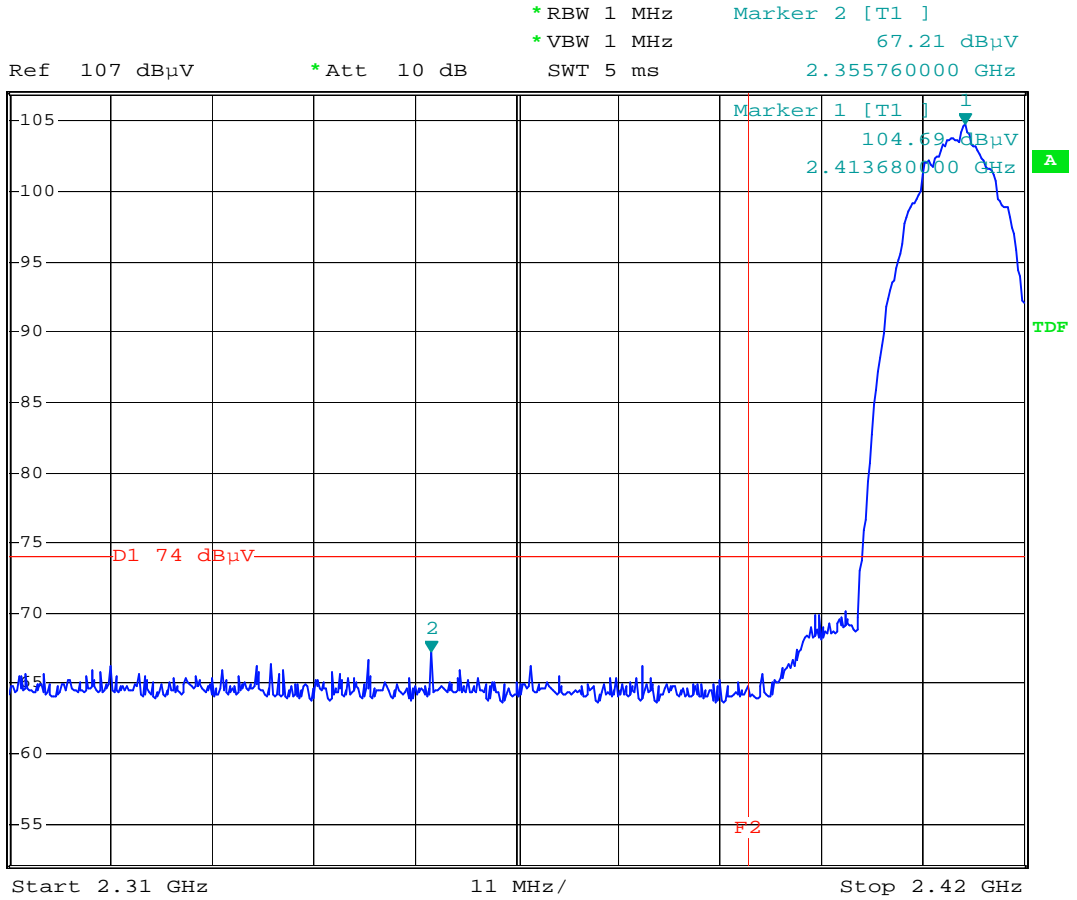
Antenna 2



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

Average detector F2=2390MHz

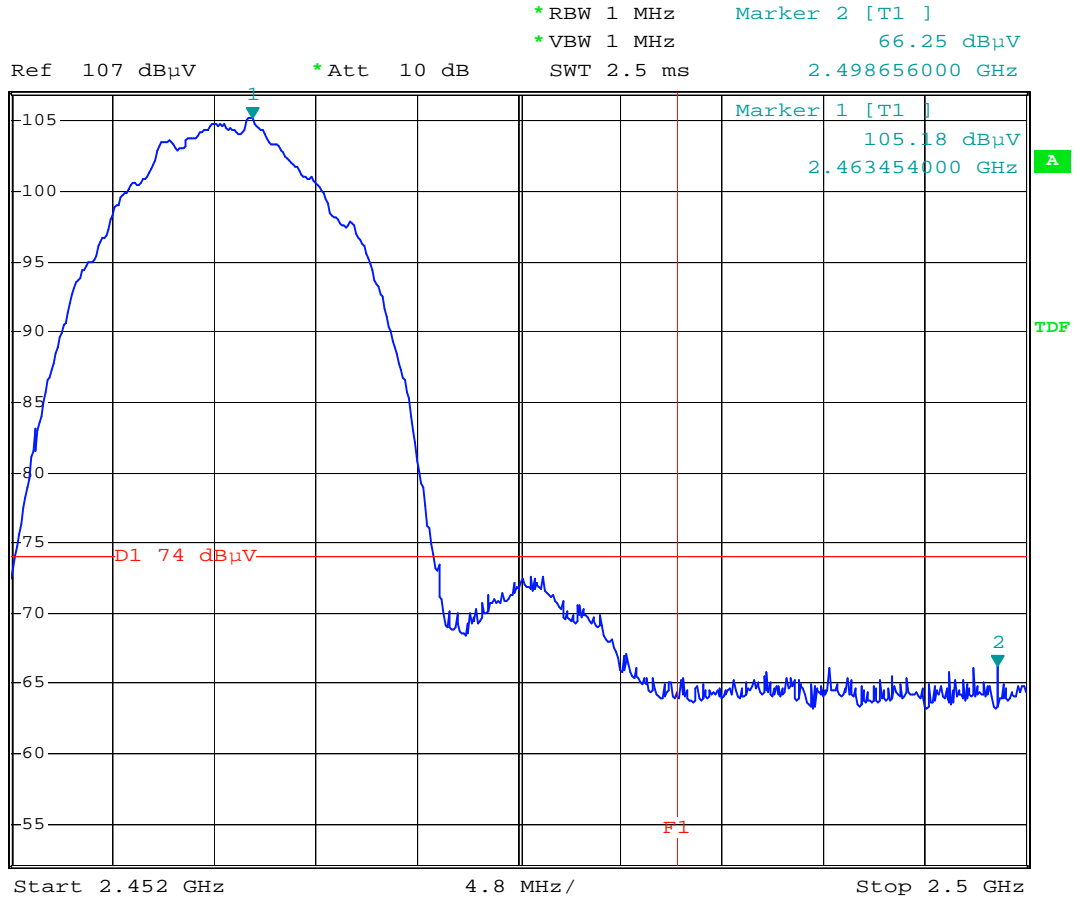
Date: 3.OCT.2003 11:57:01



Comment A: Band-edge test at low channel ENR

Peak detector F2=2390MHz

Date: 3.OCT.2003 11:52:50



Comment A: Band-edge test at high channel N R
 Peak detector F1=2483.5MHz
 Date: 3.OCT.2003 12:07:03

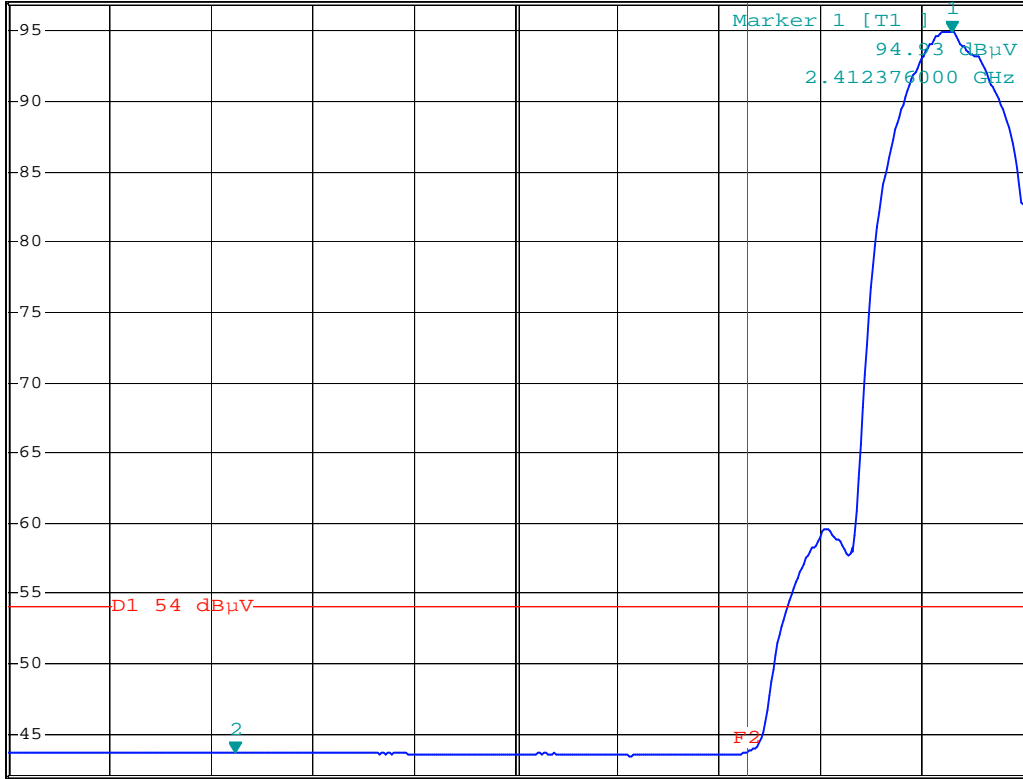
Antenna 3



START FREQUENCY
 2.31 GHz
 Ref 97 dBμV *Att 0 dB

*RBW 1 MHz Marker 2 [T1]
 *VBW 10 Hz 43.66 dBμV
 SWT 28 s 2.334640000 GHz

1 PK
 MAXH

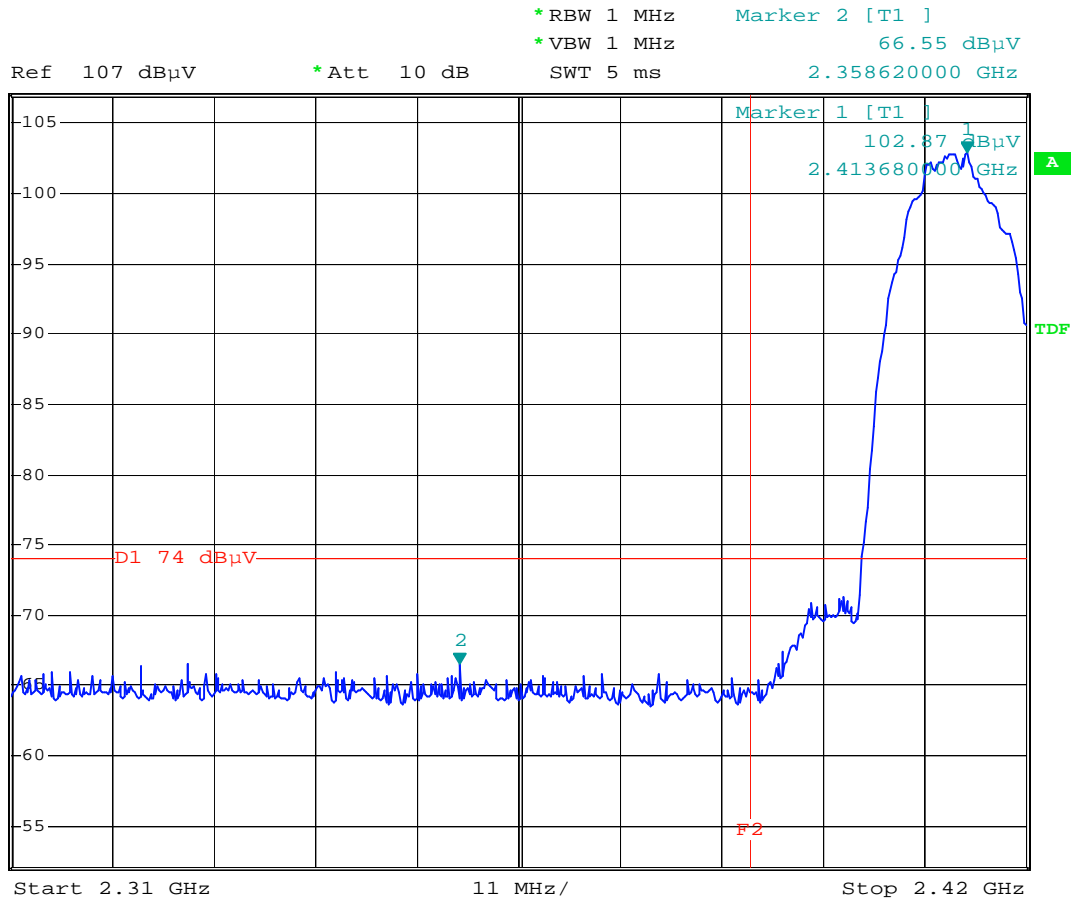


Start 2.31 GHz 11 MHz/ Stop 2.42 GHz

Comment A: Band-edge test at low channelEN B

Average detector F2=2390MHz

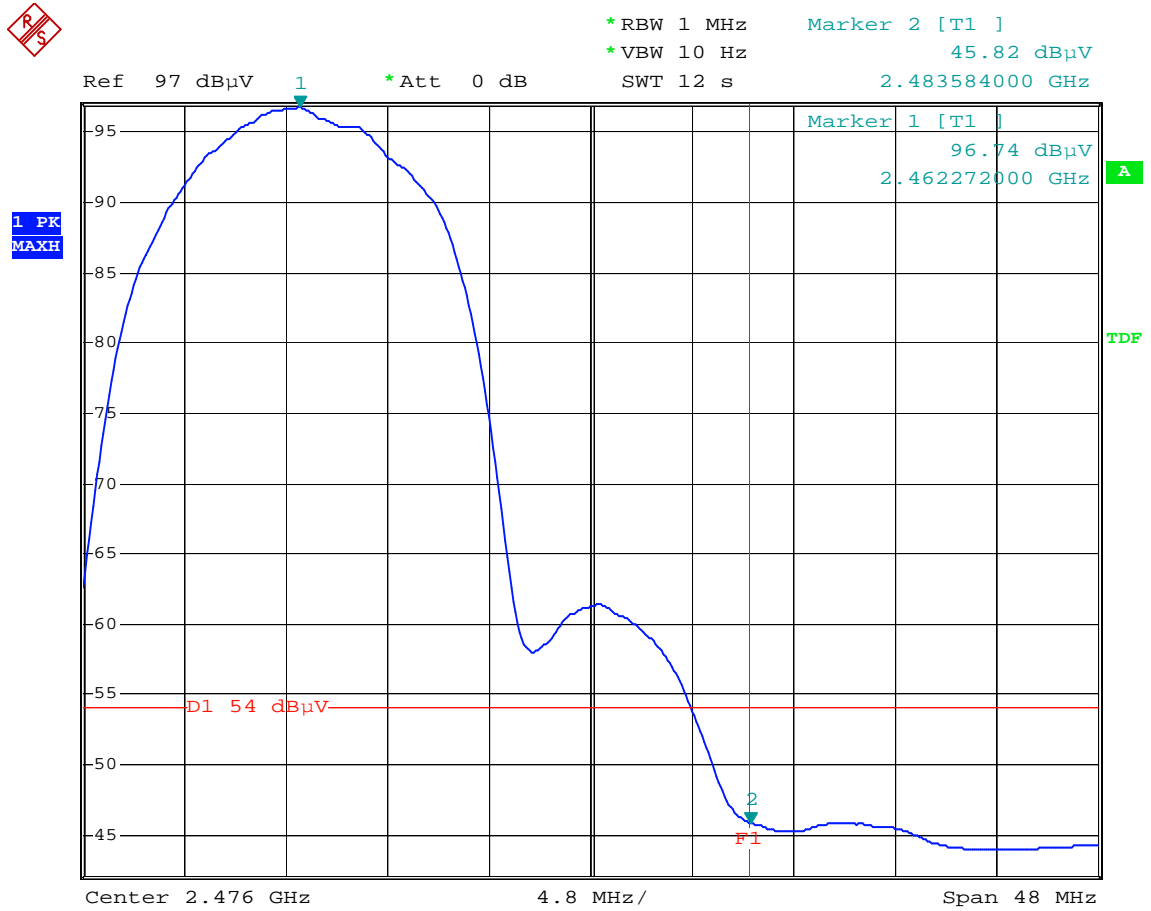
Date: 3.OCT.2003 11:44:04



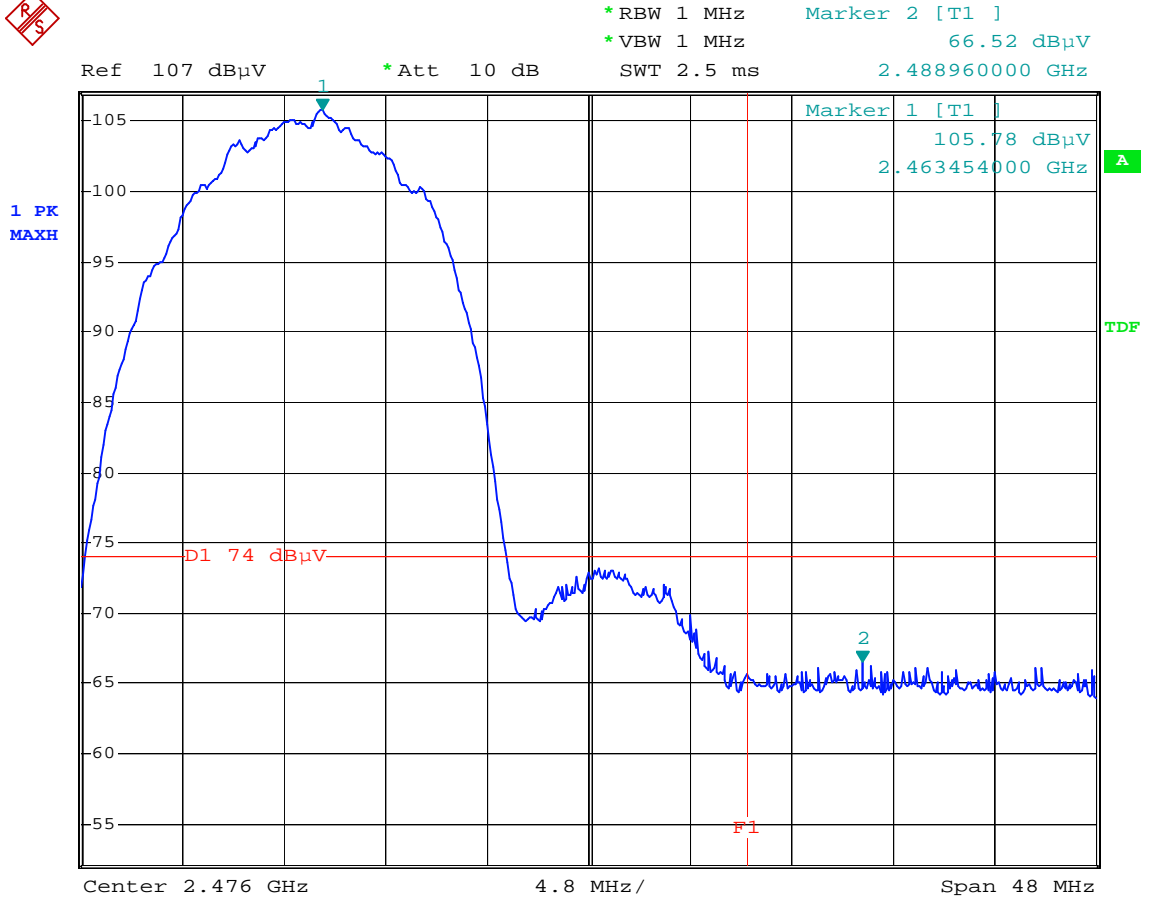
Comment A: Band-edge test at low channel ENR

Peak detector F2=2390MHz

Date: 3.OCT.2003 11:45:09



Comment A: Band-edge test at high channel NR
 Average detector F1=2483.5MHz
 Date: 3.OCT.2003 11:41:08



Comment A: Band-edge test at high channel N R

Peak detector F1=2483.5MHz

Date: 3.OCT.2003 11:35:52