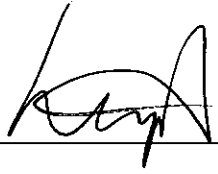
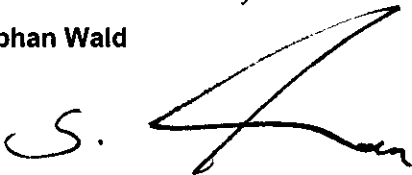


Prüfbericht - Nr.:		14004904 001		Seite 1 von 20 Page 1 of 20	
<i>Test Report No.</i>					
Auftraggeber: <i>Client:</i>		UNIFAT Technology Ltd. 7/F., Sui Hong Ind. Bldg., 547 – 549 Castle Peak Road, Kwai Chung, N.T. Hong Kong			
Gegenstand der Prüfung: <i>Test item:</i>		Bluetooth Hands-Free Car Kit			
Bezeichnung: <i>Identification:</i>		BTC-02 FCCID: RIIBTC-02		Serien-Nr.: <i>Serial No.</i>	
				Engineering sample	
Wareneingangs-Nr.: <i>Receipt No.:</i>		031117038		Eingangsdatum: <i>Date of receipt:</i>	
				21.11.2003	
Prüfort: <i>Testing location:</i>		Refer to section 4.1			
Prüfgrundlage: <i>Test specification:</i>		FCC Part 15, Subpart C ANSI C63.4-1992 CISPR 22:1997			
Prüfergebnis: <i>Test Result</i>		Der vorstehend beschriebene Prüfgegenstand wurde geprüft und entspricht oben genannter Prüfgrundlage. The a. m. test item passed.			
geprüft / tested by: Hugo Wan		kontrolliert / reviewed by Stephan Wald			
07.01.2004 Datum Date 		07.01.2004 Datum Date 		Unterschrift Signature	
Sonstiges / Other Aspects:					
Abkürzungen:		OK, Pass = entspricht Prüfgrundlage Fail = entspricht nicht Prüfgrundlage N/A = nicht anwendbar		Abbreviations:	
				OK, Pass = passed Fail = failed N/A = not applicable	
Dieser Prüfbericht bezieht sich nur auf den o.g. Prüfgegenstand und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report relates to the a. m. test item. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark on this or similar products. Authorized format 16.12.1996, R.M.					

1 Test Summary

7.1.1 ANTENNA CONNECTOR SUBCLAUSE 15.203

7.1.2 ANTENNA TYPE SUBCLAUSE 15.204

7.1.3 DISTURBANCE VOLTAGE ON AC MAINS SUBCLAUSE 15.207(A)

RESULT: Pass

Limit Subclause 15.207(a)

7.1.4 CARRIER FREQUENCY SEPERATION SUBCLAUSE 15.247(A)(1)

RESULT: Pass

Limit Subclause 15.247(a)(1)

7.1.5 DWELL TIME SUBCLAUSE 15.247(A)(1)(III)

RESULT: Pass

Limit Subclause 15.247(a)(1)(iii)

7.1.6 20dB BANDWIDTH SUBCLAUSE 15.247(A)(1)

7.1.7 HOPPING SEQUENCE SUBCLAUSE 15.247(A)(1)

7.1.8 RECEIVER INPUT BANDWIDTH SUBCLAUSE 15.247(A)(1)

7.1.9 PEAK OUTPUT POWER SUBCLAUSE 15.247(B)(1)

RESULT: Pass

Limit Subclause 15.247(b)(1)

7.1.10 BAND EDGE COMPLIANCE SUBCLAUSE 15.247(C)

RESULT: Pass

Limit Subclause 15.247(c)

7.1.11 SPURIOUS CONDUCTED EMISSIONS SUBCLAUSE 15.247(C)

RESULT: Pass

Limit Subclause 15.247(c)

7.1.12 SPURIOUS RADIATED EMISSIONS SUBCLAUSE 15.247(C)

RESULT: Pass

Limit Subclause 15.247(c)

2 Contents

1	TEST SUMMARY	2
2	CONTENTS	3
3	GENERAL REMARKS	4
3.1	COMPLEMENTARY MATERIALS.....	4
4	TEST SITES	4
4.1	TEST FACILITIES	4
4.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS	5
5	GENERAL PRODUCT INFORMATION	6
5.1	PRODUCT FUNCTION AND INTENDED USE	6
5.2	RATINGS AND SYSTEM DETAILS	6
5.3	INDEPENDENT OPERATION MODES	6
5.4	SUBMITTED DOCUMENTS	7
6	TEST SET-UP AND OPERATION MODE	7
6.1	PRINCIPLE OF CONFIGURATION SELECTION	7
6.2	TEST OPERATION AND TEST SOFTWARE.....	7
6.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	7
7	TEST RESULTS.....	8
7.1.1	<i>Antenna connector Subclause 15.203</i>	<i>8</i>
7.1.2	<i>Antenna type Subclause 15.204.....</i>	<i>8</i>
7.1.3	<i>Disturbance voltage on AC mains Subclause 15.207(a).....</i>	<i>9</i>
7.1.4	<i>Carrier frequency seperation Subclause 15.247(a)(1).....</i>	<i>10</i>
7.1.5	<i>Dwell time Subclause 15.247(a)(1)(iii).....</i>	<i>11</i>
7.1.6	<i>20dB bandwidth Subclause 15.247(a)(1)</i>	<i>12</i>
7.1.7	<i>Hopping sequence Subclause 15.247(a)(1).....</i>	<i>13</i>
7.1.8	<i>Receiver input bandwidth Subclause 15.247(a)(1)</i>	<i>14</i>
7.1.9	<i>Peak output power Subclause 15.247(b)(1)</i>	<i>15</i>
7.1.10	<i>Band edge compliance Subclause 15.247(c)</i>	<i>16</i>
7.1.11	<i>Spurious conducted emissions Subclause 15.247(c)</i>	<i>17</i>
7.1.12	<i>Spurious radiated emissions Subclause 15.247(c)</i>	<i>19</i>

3 General Remarks

3.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test Results

Appendix 2: Test Setup

Appendix 3: EUT Photos

Appendix 4: FCCID Label, Block Diagram, Schematics and User Manual

4 Test Sites

4.1 Test Facilities

Hong Kong Productivity Council
HKPC Building
78 Tat Chee Avenue
Kowloon
Hong Kong

4.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

	Kind of Equipment	Manufacturer	Type	S/N
☐	Test Receiver	Rohde & Schwarz	ESHS30	847115/005
☐	L/I/S/N	Rohde & Schwarz	ESH 3-Z5	849876/026
☐	Oscilloscope	HP	54713B	US34510455
☐	Test Receiver	Rohde & Schwarz	ESVP	882402/033
☐	Absorbing Clamp	Rohde & Schwarz	MDS-21	979 3/4
☒	Test Receiver	Rohde & Schwarz	ESVS30	842807/009
☒	Biconical Antenna	Rohde & Schwarz	HK116	841489/015
☒	Log.-Periodic Antenna	Rohde & Schwarz	HL223	841516/017
☐	Universal Power Analyzer	Voltech	PM3000A	9915
☐	Reference Impedance Network	Voltech	IEC 555 Standard	9946
☐	AC Power Source	California Instr.	4500L	HK51895
☐	Trip-Loop Antenna	Chase	LLA6142	1019
☒	Double Ridge Horn Antenna	EMCO	3115	9002-3351
☒	Double Ridge Horn Antenna	EMCO	3116	9002-3347
☐	RF Comms Test Set	HP	8920B	US36492628
☐	Spectrum Analyser + Tracking Gen.	HP	8596E	3639A00758
☐	Signal Generator	Rohde & Schwarz	SMY 01	844146/024
☐	Signal Generator	Rohde & Schwarz	SMY 01	844146/023
☐	BiLog Antenna	EMCO	3143	9607-1287
☐	Isotropic Field Probe	Holladay	HI-4422	90956
☐	Power Amplifier	Kalmus	757-LC	7620-1
☐	Power Amplifier	Kalmus	122-FC	7620-2
☐	Coupling Clamp	Schaffner	CDN 126	312
☐	Couple Device Network	Fischer	CDN-M2	9604
☒	Spectrum Analyzer	Rohde & Schwarz	FSP30	1093.4495K30
☐	Temperature Chamber	Binder	MK 240	9020-0028
☐	EFT,ESD,SURGE, DIPS tester	Schaffner	Best 96	IN3796-011

5 General Product Information

5.1 Product Function and Intended Use

The submitted sample is a Bluetooth Handsfree Car Kit based on the Bluetooth technology. Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1MHz apart are defined.

The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625µs, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s.

5.2 Ratings and System Details

	Receiver	Transmitter
Frequency range :	2402 - 2480MHz	2402 - 2480MHz
Number of channels :	79	79
Channel separation :	1MHz	1MHz
Type of antenna :	Inverted F type antenna	Inverted F type antenna
Power supply :	12V DC from car battery	12V DC from car battery

5.3 Independent Operation Modes

- a) Inquiry scan
- b) Page scan
- c) Connection state:
 - ACL link
 - SCO link

For further information, please refer to the user manual.

5.4 Submitted Documents

Schematics
Block Diagram
PCB Layout
User manual

6 Test Set-up and Operation Mode

6.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

6.2 Test Operation and Test Software

Refer to Test set-up in chapter 7.

6.3 Special Accessories and Auxiliary Equipment

The product did not test with any additional accessory.

7 Test Results

7.1.1 Antenna connector

Subclause 15.203

The antenna is permanently attached on the PCB.

7.1.2 Antenna type

Subclause 15.204

The EUT has an Inverted F type antenna soldered to the circuit board. The antenna gain is 0dBi.

7.1.3 Disturbance voltage on AC mains

Subclause 15.207(a)

RESULT:

N/A

The EUT does not have AC mains port for power supply connection. This test case is not applicable.

Limit

Subclause 15.207(a)

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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.1.4 Carrier frequency separation

Subclause 15.247(a)(1)

RESULT:

Pass

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (hopping on), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	100kHz/300kHz
Supply voltage	:	12VDC from AC/DC adapter
Temperature	:	23°C
Humidity	:	50%

The centre frequencies of the hopping channels are separated by more than the 20dB bandwidth.
For test results refer to Appendix 1, page 1

Limit

Subclause 15.247(a)(1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

7.1.5 Dwell time

Subclause 15.247(a)(1)(iii)

RESULT:

Pass

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (2441MHz), DH5 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	1MHz/3MHz
Supply voltage	:	12VDC from AC/DC adapter
Temperature	:	23°C
Humidity	:	50%

The screenshot in Appendix1 P.3 shows the occurrence of a channel in a 12.8s time period. In inquiry and page scan mode Bluetooth is using 32 hopping channels only. The frequency was used 25 times. The dwell time for the longest supported packet type is about 3ms. As a result the average time of occupancy will not be greater than 400ms.

i.e. Time period calculation:
 $0.4 \times 32 = 12.8s$

Limit calculation:
 $25 \times 2.936 \times 10^{-3} = 73.4 \times 10^{-3} s$
 $\leq 400 \times 10^{-3} s$

For test results please refer to Appendix 1, page 2-3.

Limit

Subclause 15.247(a)(1)(iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

7.1.6 20dB bandwidth

Subclause 15.247(a)(1)

Test specification : FCC § 15.31
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH5 packet
Port of testing : Temporary antenna port
Detector : PK
RBW/VBW : 30kHz/100kHz
Supply voltage : 12VDC from AC/DC adapter
Temperature : 23°C
Humidity : 50%

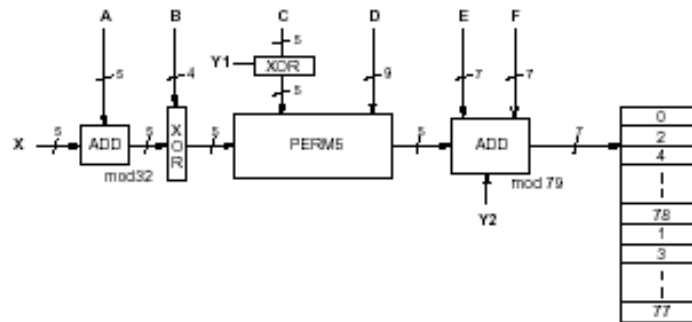
Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$ \Delta f_H + \Delta f_L $ (MHz)
2402	-0.464	0.468	0.932
2441	-0.460	0.408	0.868
2480	-0.464	0.476	0.940

For test results, please refer to Appendix 1, page 4-6.

7.1.7 Hopping sequence

Subclause 15.247(a)(1)

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



Example data:

Hop sequence {k} for CONNECTION STATE:
CLK start: 0x0000010
ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

0x0000010:	08 66	10 70	12 19	14 23	16 01	18 05	20 33	22 37
0x0000030:	24 03	26 07	28 35	30 39	32 72	34 76	36 25	38 29
0x0000050:	40 74	42 78	44 27	46 31	48 09	50 13	52 41	54 45
0x0000070:	56 11	58 15	60 43	62 47	64 25	66 19	68 49	70 51
0x0000090:	40 21	44 23	42 53	46 55	48 33	52 35	50 65	54 67
0x00000b0:	56 37	60 39	58 69	62 71	64 25	68 27	66 57	70 59
0x00000d0:	72 29	76 31	74 61	78 63	01 41	05 43	03 73	07 75
0x00000f0:	09 45	13 47	11 77	15 00	64 49	66 53	68 02	70 06
0x0000110:	01 51	03 55	05 04	07 08	72 57	74 61	76 10	78 14
0x0000130:	09 59	11 63	13 12	15 16	17 65	19 69	21 18	23 22
0x0000150:	33 67	35 71	37 20	39 24	25 73	27 77	29 26	31 30
0x0000170:	41 75	43 00	45 28	47 32	17 02	21 04	19 34	23 36
0x0000190:	33 06	37 08	35 38	39 40	25 10	29 12	27 42	31 44
0x00001b0:	41 14	45 16	43 46	47 48	49 18	53 20	51 50	55 52
0x00001d0:	65 22	69 24	67 54	71 56	57 26	61 28	59 58	63 60
0x00001f0:	73 30	77 32	75 62	00 64	49 34	51 42	57 66	59 74
0x0000210:	53 36	55 44	61 68	63 76	65 50	67 58	73 03	75 11
0x0000230:	69 52	71 60	77 05	00 13	02 38	04 46	10 70	12 78
0x0000250:	06 40	08 48	14 72	16 01	18 54	20 62	26 07	28 15
0x0000270:	22 56	24 64	30 09	32 17	02 66	06 74	10 19	14 27
0x0000290:	04 70	08 78	12 23	16 31	18 03	22 11	26 35	30 43
0x00002b0:	20 07	24 15	28 39	32 47	34 68	38 76	42 21	46 29
0x00002d0:	36 72	40 01	44 25	48 33	50 05	54 13	58 37	62 45
0x00002f0:	52 09	56 17	60 41	64 49	34 19	36 35	50 51	52 67
0x0000310:	38 21	40 37	54 53	56 69	42 27	44 43	58 59	60 75
0x0000330:	46 29	48 45	62 61	64 77	66 23	68 39	03 55	05 71
0x0000350:	70 25	72 41	07 57	09 73	74 31	76 47	11 63	13 00
0x0000370:	78 33	01 49	15 65	17 02	66 51	70 67	03 04	07 20
0x0000390:	68 55	72 71	05 08	09 24	74 59	78 75	11 12	15 28
0x00003b0:	76 63	01 00	13 16	17 32	19 53	23 69	35 06	39 22
0x00003d0:	21 57	25 73	37 10	41 26	27 61	31 77	43 14	47 30
0x00003f0:	29 65	33 02	45 18	49 34	19 04	21 08	23 20	25 24

7.1.8 Receiver input bandwidth

Subclause 15.247(a)(1)

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth is indirectly verified during Bluetooth RF conformance testing.

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 15 von 20
 Page 15 of 20

7.1.9 Peak output power

Subclause 15.247(b)(1)

RESULT:

Pass

Test specification : FCC § 15.31
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
 Port of testing : Temporary antenna port
 Detector : PK
 RBW/VBW : 1MHz/3MHz
 Supply voltage : 12VDC from AC/DC adapter
 Temperature : 23°C
 Humidity : 50%

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Actual value (dBm)
2402	-5.12	4.30	-0.82
2441	-5.84	4.15	-1.69
2480	-6.35	4.50	-1.85

All three transmit frequency modes comply with the maximum peak output power limit.
 For test results refer to Appendix 1, page 7-9

Limit

Subclause 15.247(b)(1)

Frequency range	RF output power
2.400-2.483,5MHz	0.125W (21.0dBm)

7.1.10 Band edge compliance

Subclause 15.247(c)

RESULT:

Pass

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	300kHz/1.0MHz
Supply voltage	:	12VDC from AC/DC adapter
Temperature	:	23°C
Humidity	:	50%

There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(c).

For test results refer to Appendix 1, page 10-12.

Limit

Subclause 15.247(c)

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

7.1.11 Spurious conducted emissions

Subclause 15.247(c)

RESULT:

Pass

Test specification : FCC § 15.31
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
 Port of testing : Temporary antenna port
 Detector : PK
 RBW/VBW : 100kHz/300kHz
 Supply voltage : 12VDC from AC/DC adapter
 Temperature : 23°C
 Humidity : 50%

Operating frequency : 2402MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
89.820	-52.35	-5.24	-47.11
1186.520	-53.10	-5.24	-47.86
4795.660	-52.06	-5.24	-46.82

Operating frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
269.280	-54.12	-5.95	-48.17
1206.460	-52.95	-5.95	-47.00
4885.300	-53.18	-5.95	-47.23

Operating frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
269.280	-55.64	-6.04	-49.60
1236.280	-52.96	-6.04	-46.92
7447.680	-48.77	-6.04	-42.73

All three transmit frequency modes comply with the 20dB limit stated in subclause 15.247(c).
 For test results refer to Appendix 1, page 13-22.

Prüfbericht - Nr.:

14004904 001

Test Report No.

Seite 18 von 20

Page 18 of 20

Limit

Subclause 15.247(c)

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.

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 19 von 20
Page 19 of 20

7.1.12 Spurious radiated emissions

Subclause 15.247(c)

RESULT:

Pass

Test specification : ANSI C63.4 - 1992
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
Port of testing : Enclosure
Measurement Location: 10m Semi Anechoic Chamber
Measurement Distance: 3m
Measurement BW : 1 MHz
Supply voltage : 12VDC from car battery

Tx frequency 2402MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
143.995	17.80	13.60	0.90	-	-	32.30	43.5 / QP
160.000	15.70	14.70	0.90	-	-	31.30	43.5 / QP

Tx frequency 2402MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
111.998	12.20	11.60	0.80	-	-	24.60	43.5 / QP
159.999	18.90	14.70	0.90	-	-	34.50	43.5 / QP

Tx frequency 2441MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
144.020	15.10	13.60	0.90	-	-	29.60	43.5 / QP
160.000	19.60	14.70	0.90	-	-	35.20	43.5 / QP
4882.060	46.48	33.40	3.53	32.87	0.33	50.87	54.0 / A

Tx frequency 2441MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
112.001	11.40	11.60	0.80	-	-	23.80	43.5 / QP
159.999	22.10	14.70	0.90	-	-	37.70	43.5 / QP

Tx frequency 2480MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
143.993	13.50	13.60	0.90	-	-	28.00	43.5 / QP
160.003	19.70	14.70	0.90	-	-	35.30	43.5 / QP
4960.068	40.28	33.40	3.53	32.87	0.33	44.67	54.0 / A

Tx frequency 2480MHz, Polarization Horizontal

Prüfbericht - Nr.:

14004904 001

Test Report No.

Seite 20 von 20

Page 20 of 20

Freq	Reading	AF	Cable att.	Pre -amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
157.719	16.70	14.70	0.90	-	-	32.30	43.5 / QP
159.999	16.30	14.70	0.90	-	-	31.90	43.5 / QP
4959.920	42.82	33.40	3.53	32.87	0.33	47.21	54.0 / A

All three transmit frequency modes comply with the field strength within the restricted bands.
For test results refer to Appendix 1, page 23-56.

Limit

Subclause 15.247(c)

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)).

Field strength limits within the restricted bands using average detector:

Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dBμV/m)	Measurement distance (meters)
30-88	100	$20 \cdot \log(100) = 40.0$	3
88-216	150	$20 \cdot \log(150) = 43.5$	3
216-960	200	$20 \cdot \log(200) = 46.0$	3
960-2500	500	$20 \cdot \log(500) = 54.0$	3

According to section 15.35(b), on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in this part, including emission measurements below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated.

Prüfbericht - Nr.:
 Test Report No.

14004904 001

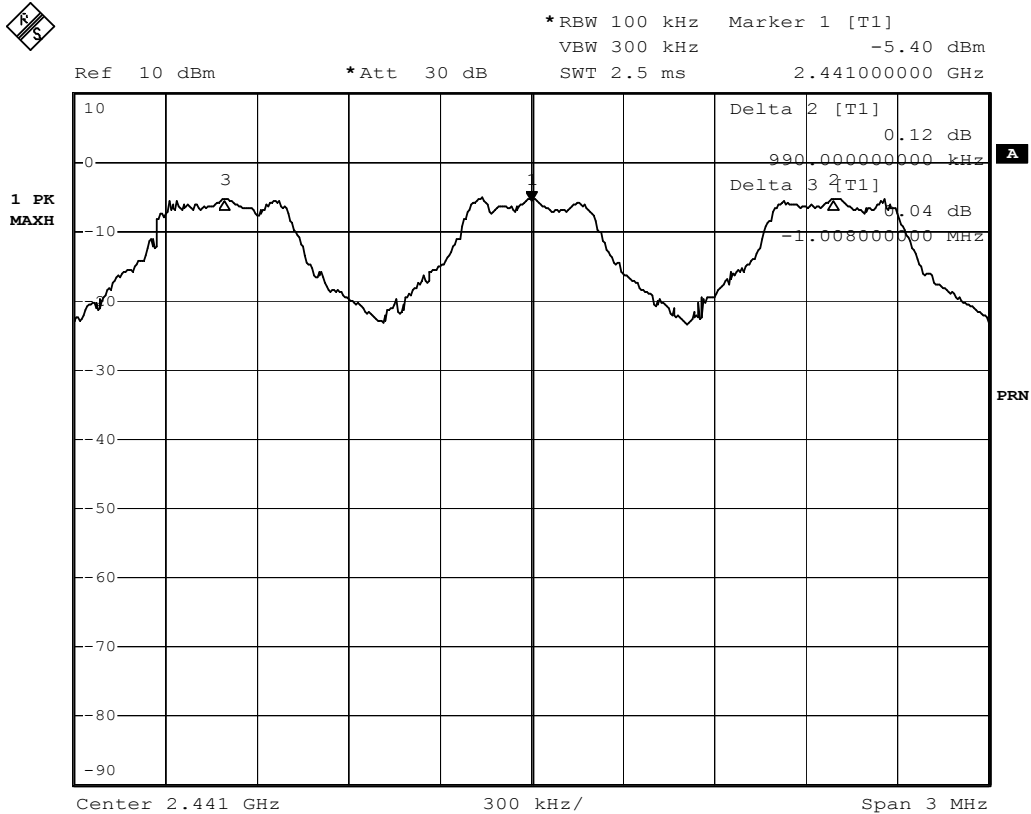
Seite 1 von 56
 Page 1 of 56

Carrier Frequency Separation

Date: 3 Dec 2003
 EUT: BTC-02
 Company: Unifat Technology Ltd.
 Humidity: 50%
 Temperature: 23°C
 Voltage supply: 12VDC from AC/DC adapter
 Test by: Hugo Wan
 Op. mode: Hopping on

Reference frequency (MHz)
 2441.000

Channel Separation (MHz)
 0.990



Date: 3.DEC.2003 09:53:16

Prüfbericht - Nr.:
Test Report No.

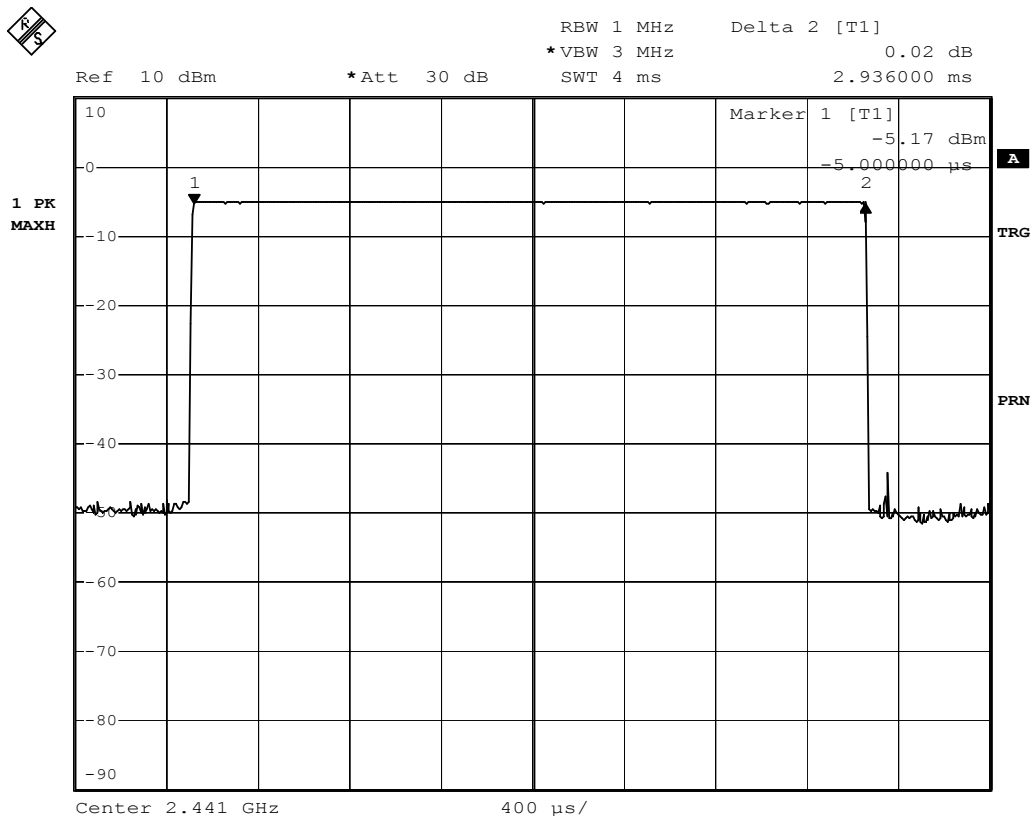
14004904 001

Seite 2 von 56
 Page 2 of 56

Dwell Time

Date: 3 Dec 2003
 EUT: BTC-02
 Company: Unifat Technology Ltd.
 Humidity: 50%
 Temperature: 23°C
 Voltage supply: 12VDC from AC/DC adapter
 Test by: Hugo Wan
 Op. mode: Hopping on

Burst Duration (ms)	Number of hopping	Time of occupancy (s)	Results
2.936	25	$0.002936 \times 25 =$ 0.0734	Pass

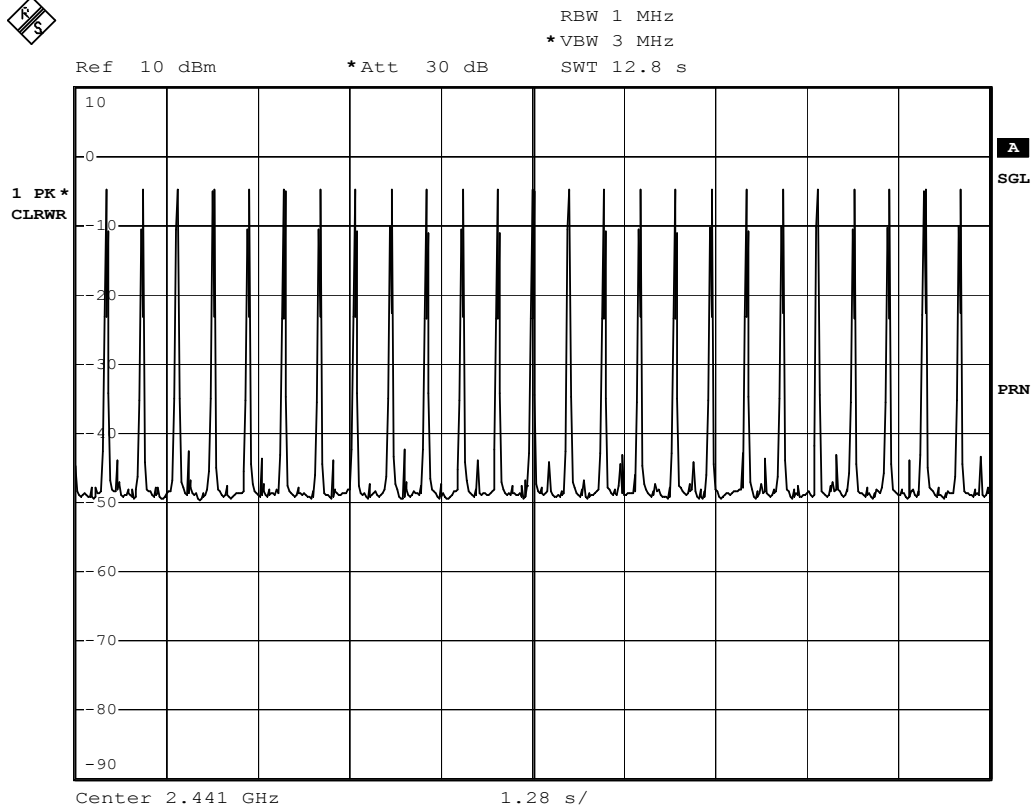


Date: 3.DEC.2003 09:55:47

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 3 von 56
 Page 3 of 56



Date: 3.DEC.2003 09:57:20

Prüfbericht - Nr.:
 Test Report No.

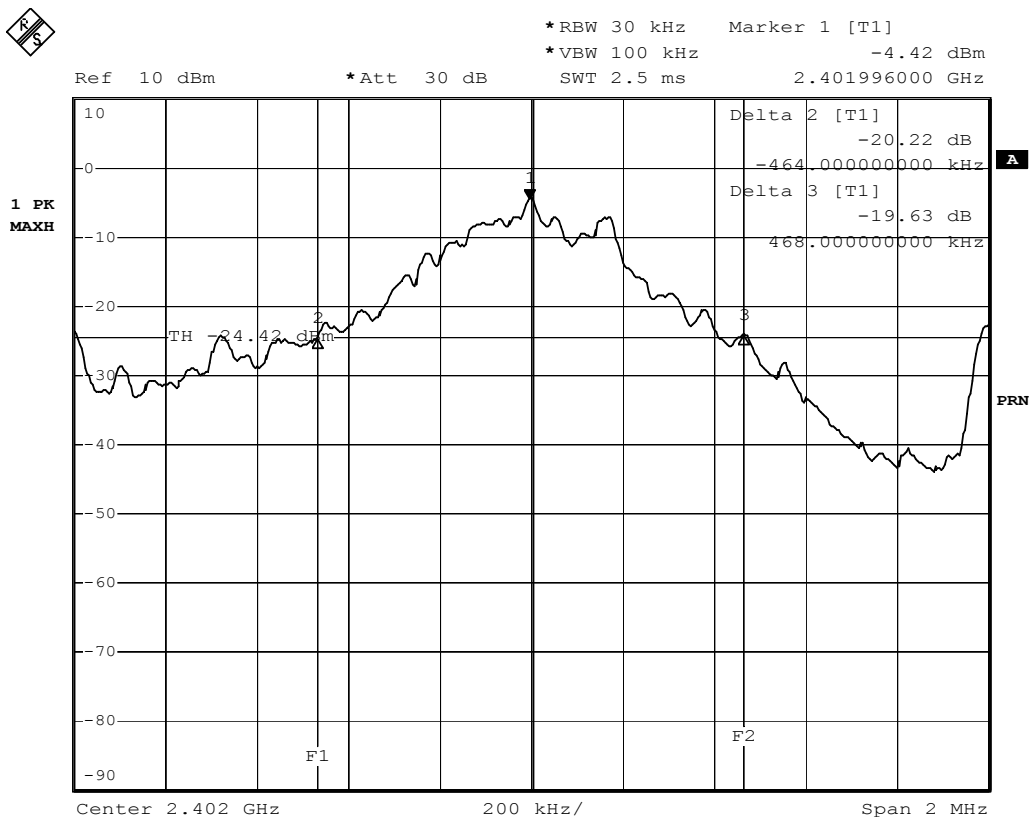
14004904 001

Seite 4 von 56
 Page 4 of 56

20dB Bandwidth

Date: 3 Dec 2003
 EUT: BTC-02
 Company: Unifat Technology Ltd.
 Humidity: 50%
 Temperature: 23°C
 Voltage supply: 12VDC from AC/DC adapter
 Test by: Hugo Wan
 Op. mode: TX mode, DH5 with PRBS9 payload

Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$ \Delta f_H + \Delta f_L $ (MHz)	Results
2402	-0.464	0.468	0.932	Pass
2441	-0.460	0.408	0.868	Pass
2480	-0.464	0.476	0.940	Pass



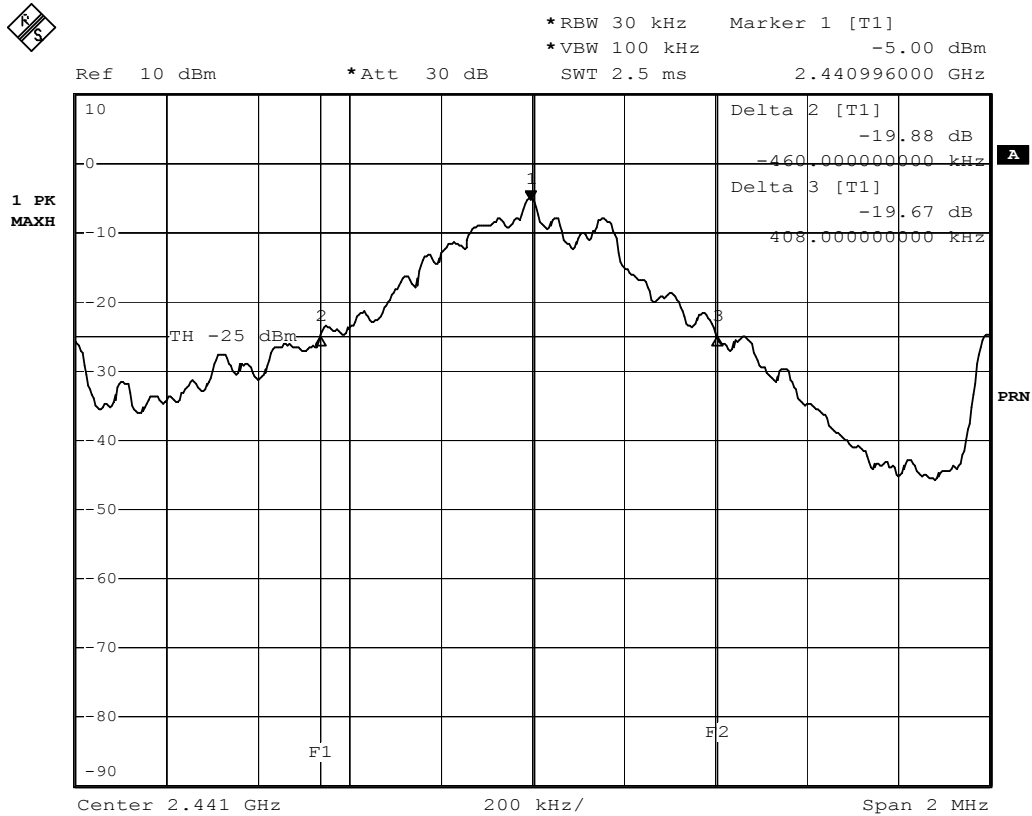
Date: 3.DEC.2003 10:10:47

Tx frequency: 2402MHz

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 5 von 56
 Page 5 of 56



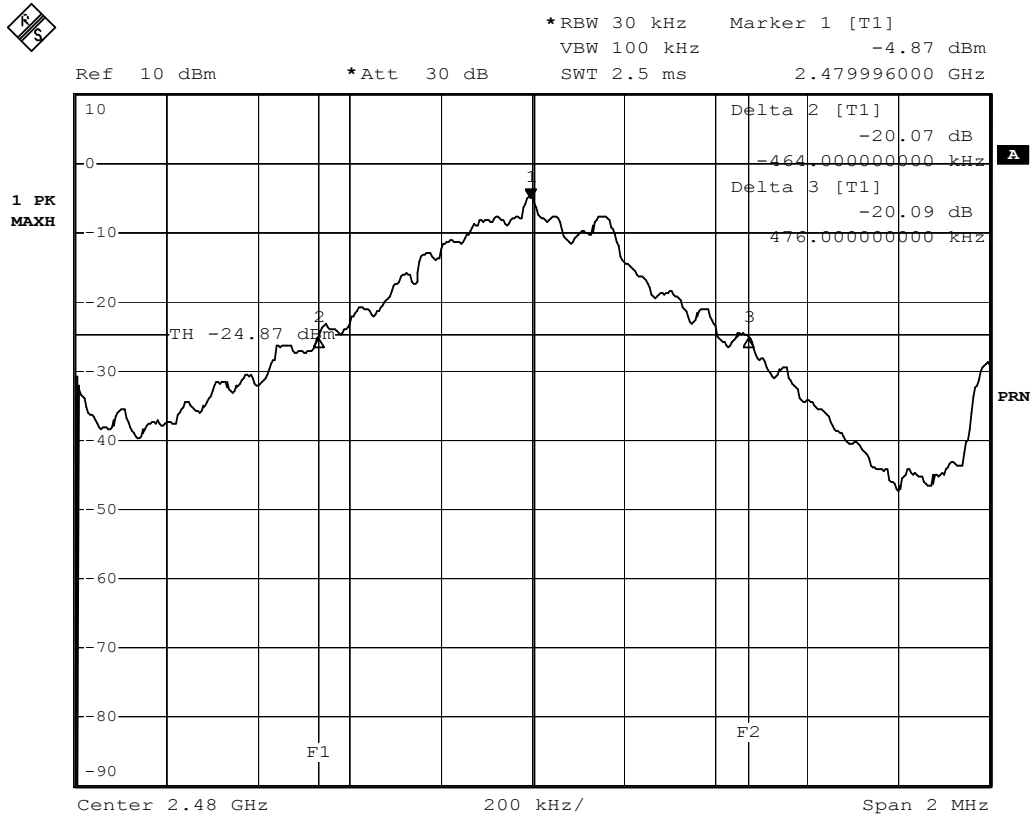
Date: 3.DEC.2003 10:07:25

Tx frequency: 2441MHz

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 6 von 56
 Page 6 of 56



Date: 25.NOV.2003 11:38:41

Tx frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 7 von 56
 Page 7 of 56

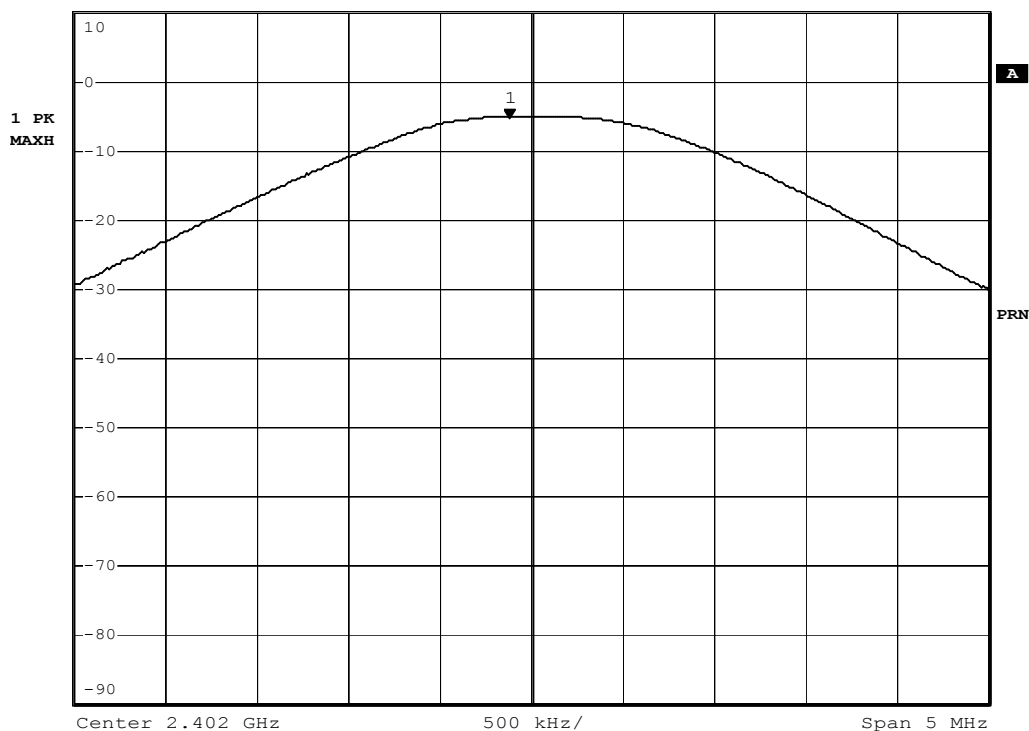
Peak Output Power

Date: 3 Dec 2003
 EUT: BTC-02
 Company: Unifat Technology Ltd.
 Humidity: 50%
 Temperature: 23°C
 Voltage supply: 12VDC from AC/DC adapter
 Test by: Hugo Wan
 Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Cable Attenuation (dB)	Power P _{PK} (dBm)	Actual Peak Power (dBm)	Results
2402	4.30	-5.12	-0.82	Pass
2441	4.15	-5.84	-1.69	Pass
2480	4.50	-6.35	-1.85	Pass



*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz -5.12 dBm
 Ref 10 dBm *Att 30 dB SWT 2.5 ms 2.401880000 GHz



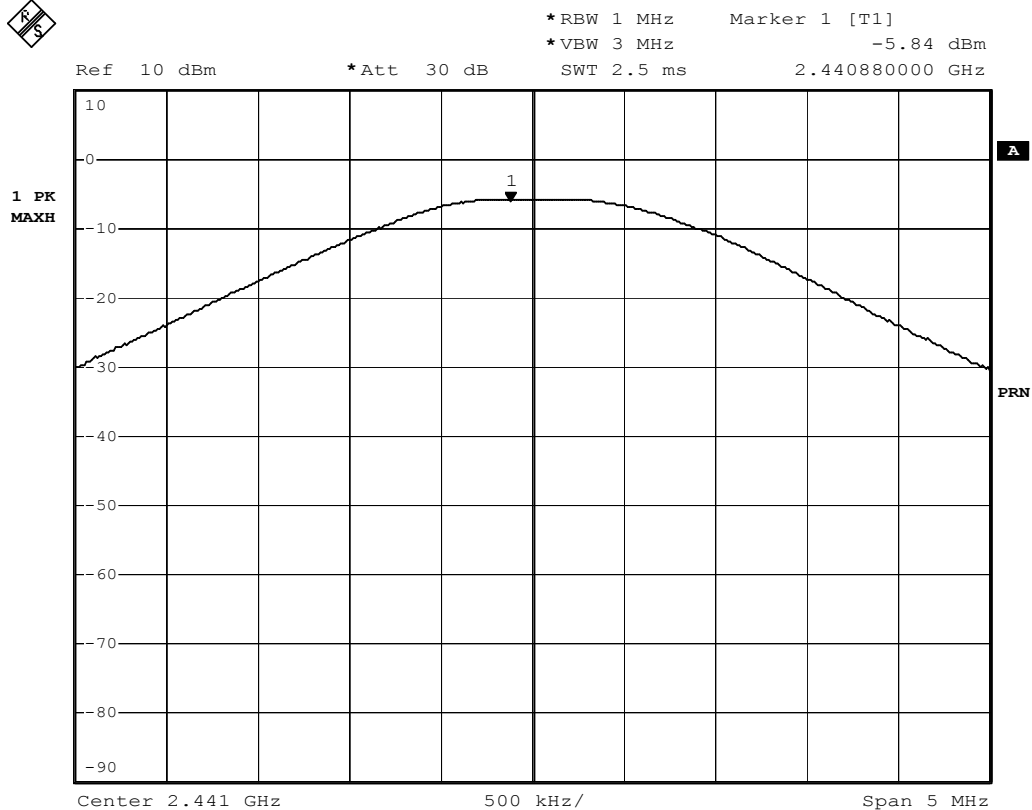
Date: 3.DEC.2003 10:18:26

Tx frequency: 2402MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 8 von 56
 Page 8 of 56



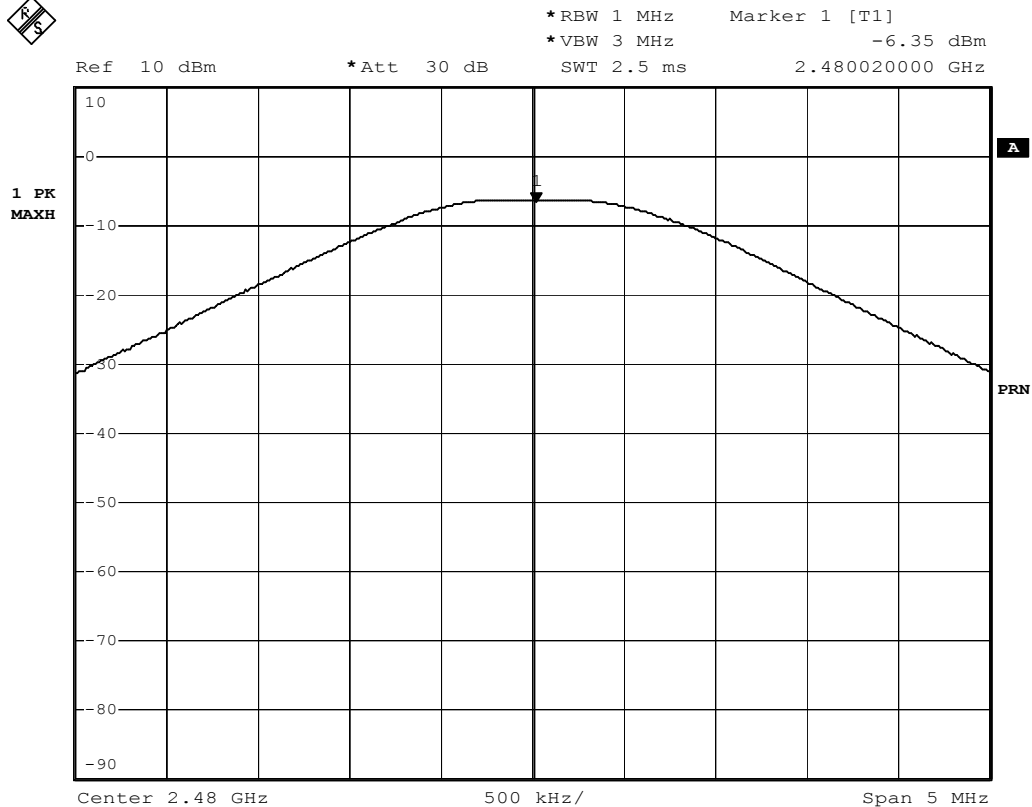
Date: 3.DEC.2003 10:22:02

Tx frequency: 2441MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 9 von 56
 Page 9 of 56



Date: 3.DEC.2003 10:24:07

Tx frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.

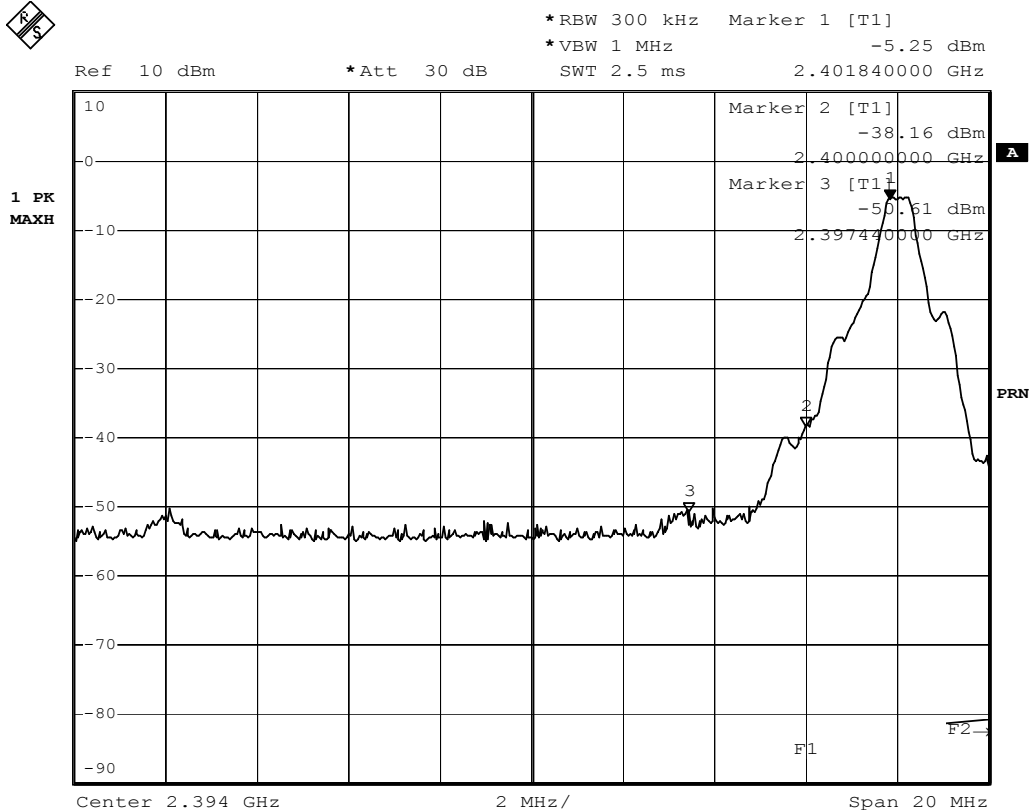
14004904 001

Seite 10 von 56
 Page 10 of 56

Band Edge Compliance

Date: 3 Dec 2003
 EUT: BTC-02
 Company: Unifat Technology Ltd.
 Humidity: 50%
 Temperature: 23°C
 Voltage supply: 12VDC from AC/DC adapter
 Test by: Hugo Wan
 Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	-5.25	No Peak	-	Pass
2480	-6.20	No Peak	-	Pass



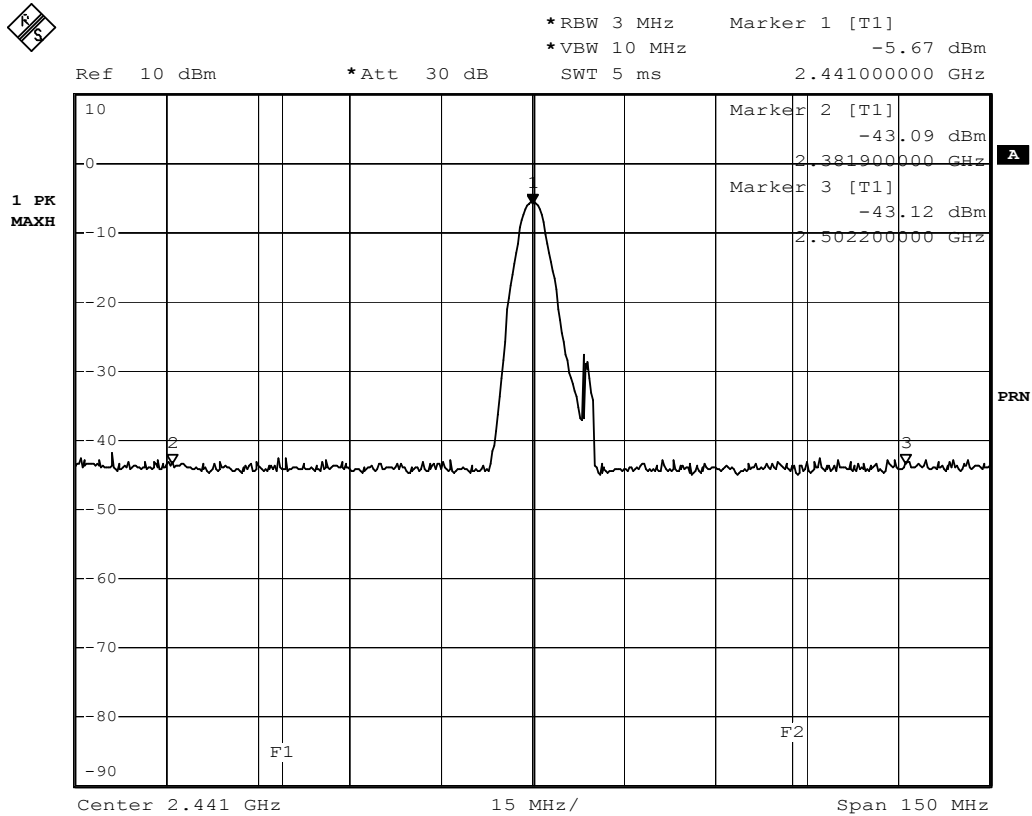
Date: 3.DEC.2003 10:32:23

Tx frequency: 2402MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 11 von 56
 Page 11 of 56



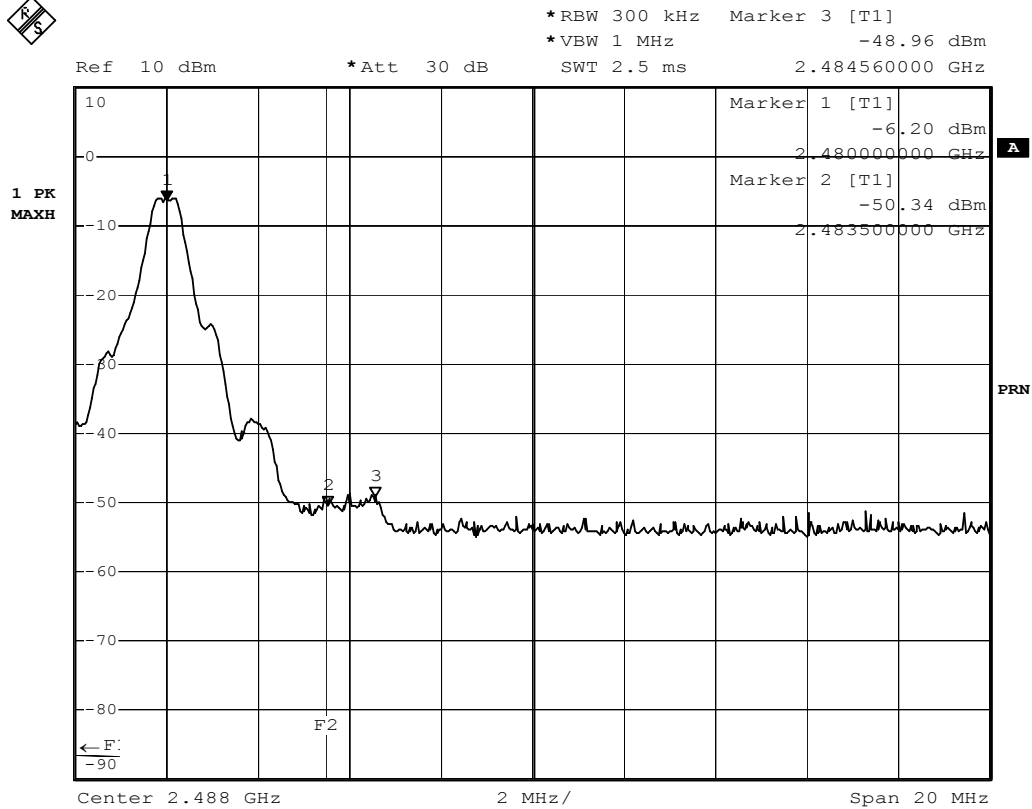
Date: 3.DEC.2003 10:30:18

Tx frequency: 2441MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 12 von 56
 Page 12 of 56



Date: 3.DEC.2003 10:26:34

Tx frequency: 2480MHz

Prüfbericht - Nr.:

14004904 001

Seite 13 von 56
 Page 13 of 56

Test Report No.

Spurious Emissions - Conducted

Date: 3 Dec 2003

EUT: BTC-02

Company: Unifat Technology Ltd.

Humidity: 50%

Temperature: 23°C

Voltage supply: 12VDC from AC/DC adapter

Test by: Hugo Wan

Op. mode: TX mode, DH1 with PRBS9 payload

Tx frequency : 2402MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
89.820	-52.35	-5.24	-47.11	Pass
1186.520	-53.10	-5.24	-47.86	Pass
4795.660	-52.06	-5.24	-46.82	Pass

Tx frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
269.280	-54.12	-5.95	-48.17	Pass
1206.460	-52.95	-5.95	-47.00	Pass
4885.300	-53.18	-5.95	-47.23	Pass

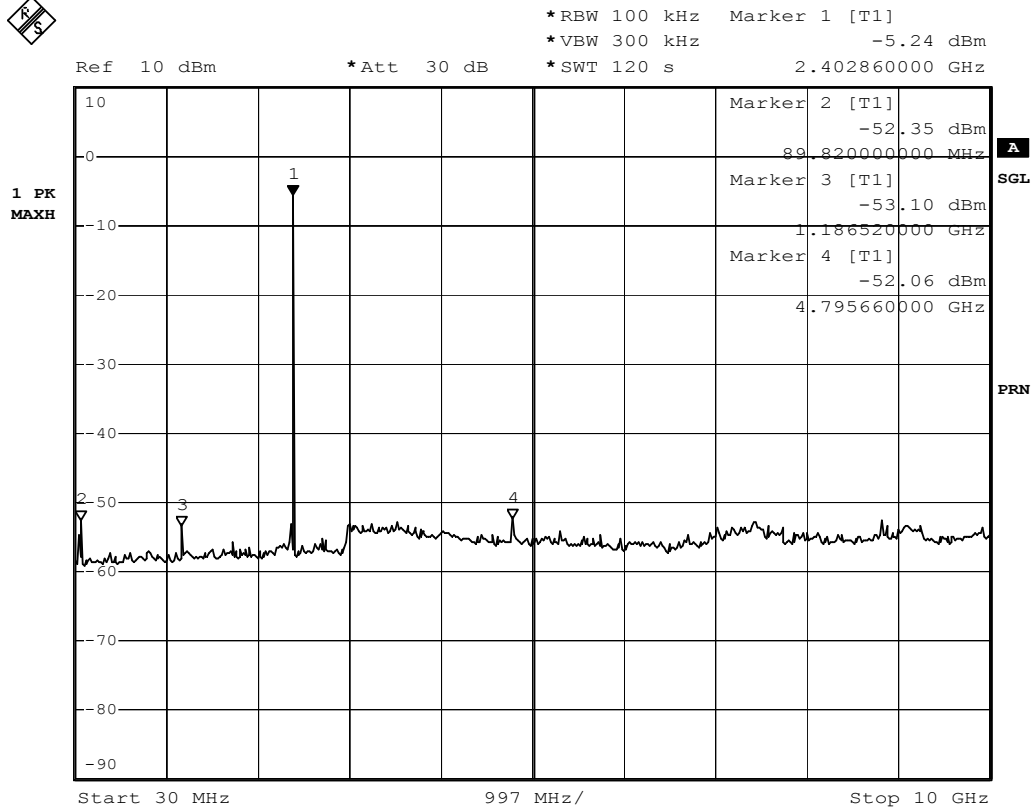
Tx frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
269.280	-55.64	-6.04	-49.60	Pass
1236.280	-52.96	-6.04	-46.92	Pass
7447.680	-48.77	-6.04	-42.73	Pass

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 14 von 56
 Page 14 of 56



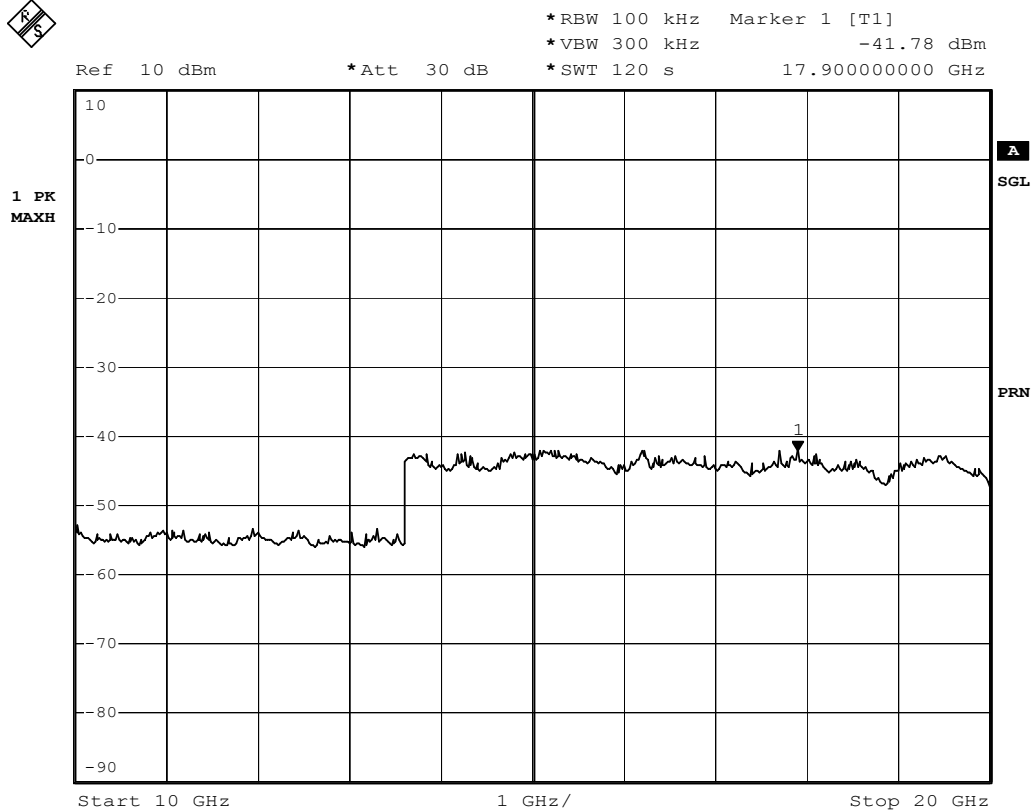
Date: 3.DEC.2003 10:36:05

Tx frequency: 2402MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 15 von 56
 Page 15 of 56



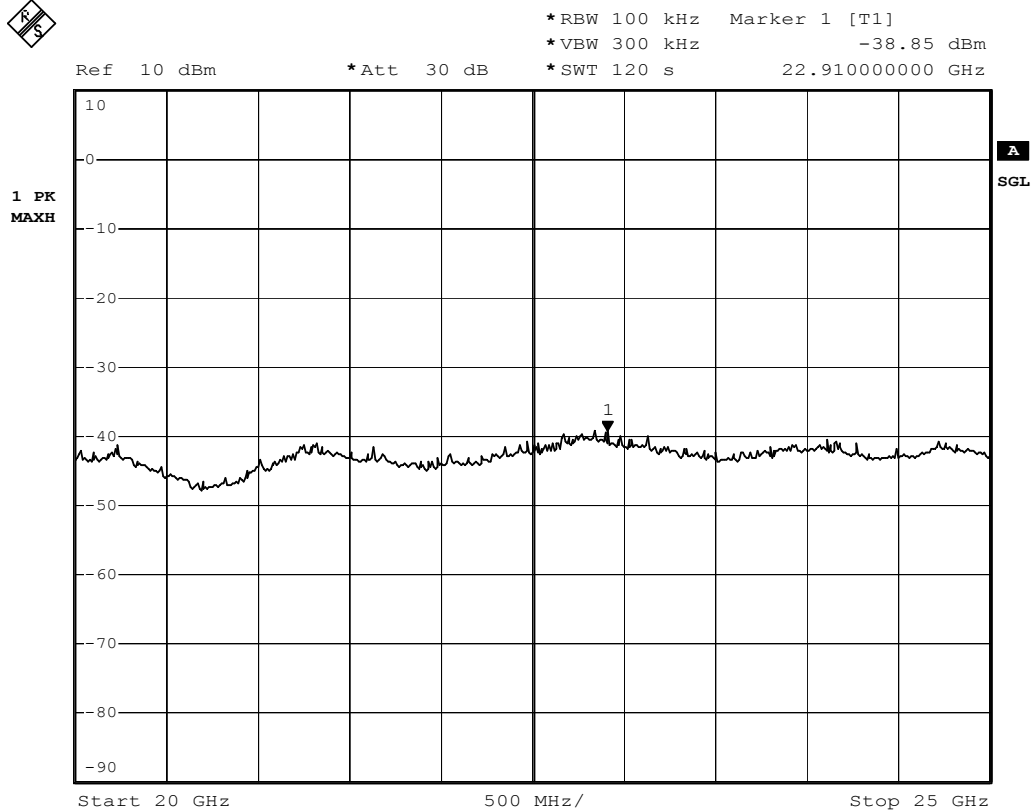
Date: 3.DEC.2003 10:40:16

Tx frequency: 2402MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 16 von 56
 Page 16 of 56



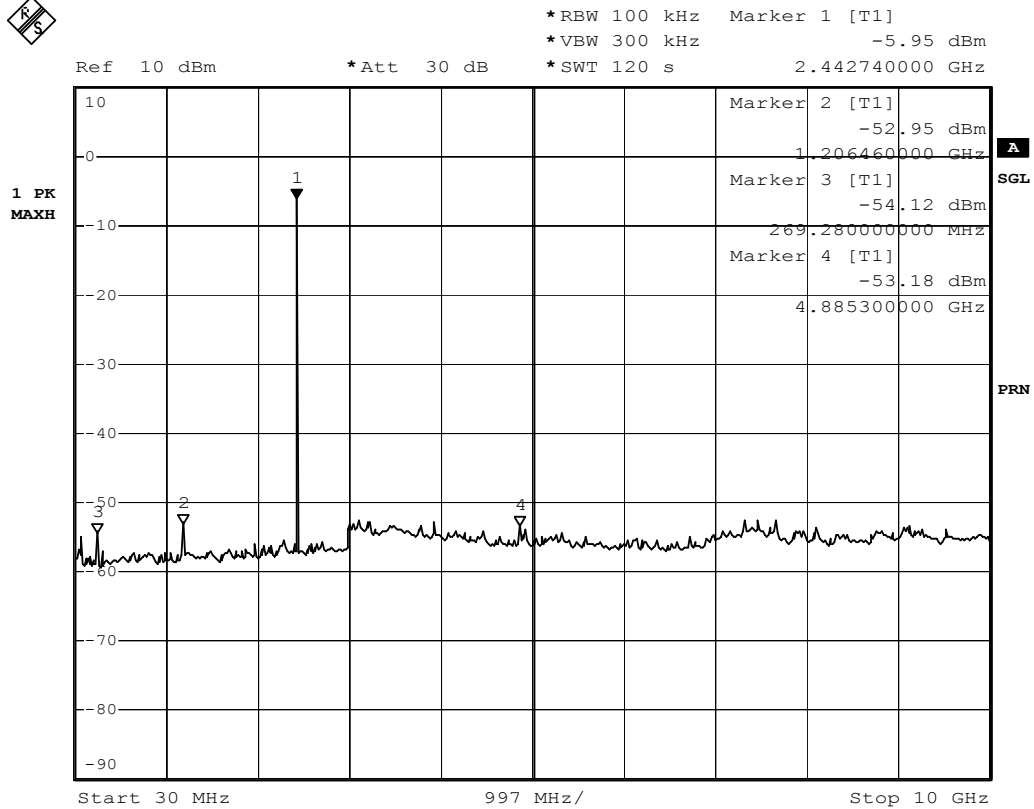
Date: 3.DEC.2003 10:46:48

Tx frequency: 2402MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 17 von 56
 Page 17 of 56



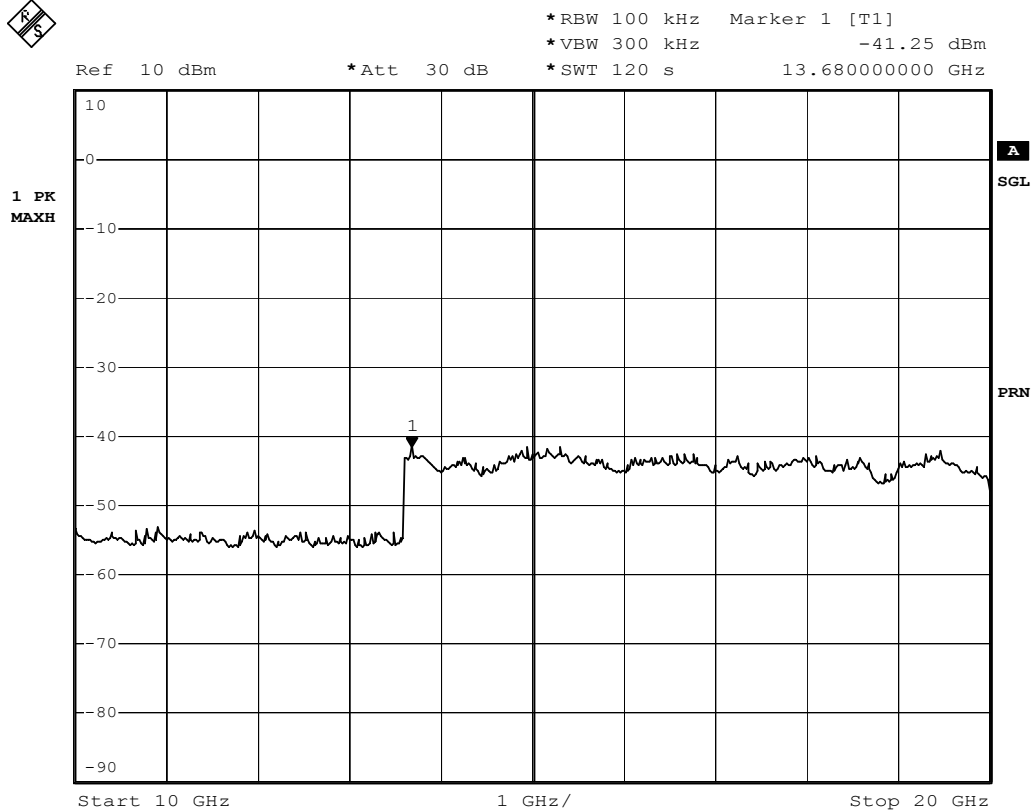
Date: 3.DEC.2003 11:01:11

Tx frequency: 2441MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 18 von 56
 Page 18 of 56



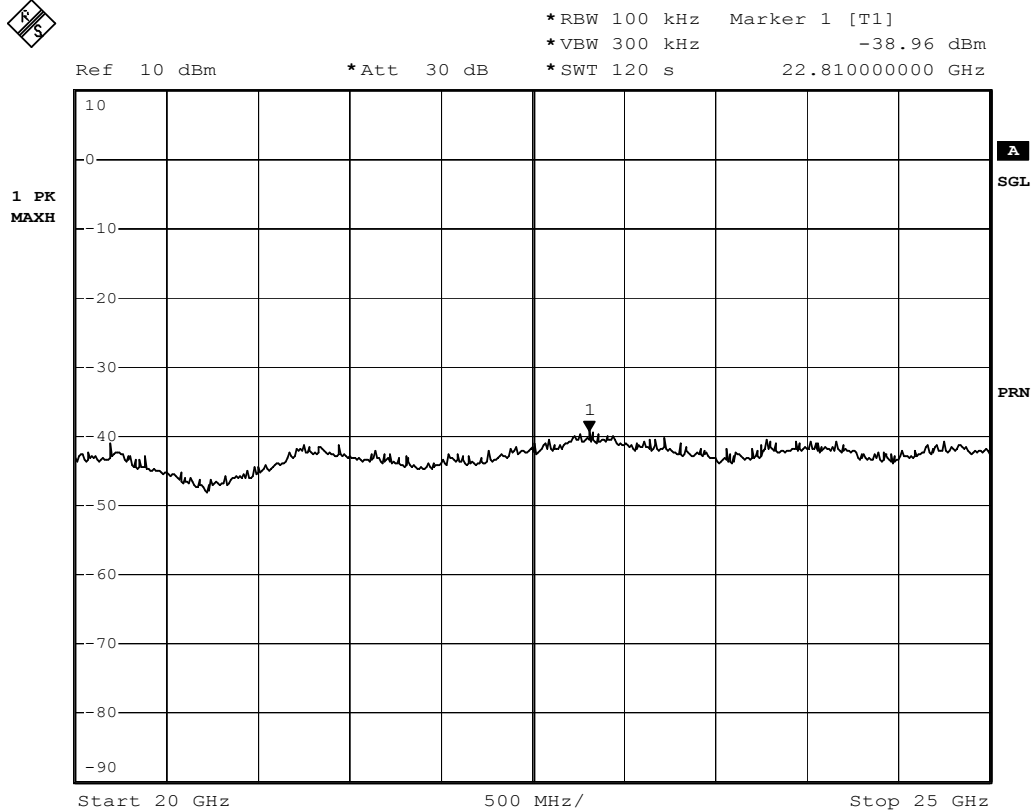
Date: 3.DEC.2003 11:04:58

Tx frequency: 2441MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 19 von 56
 Page 19 of 56



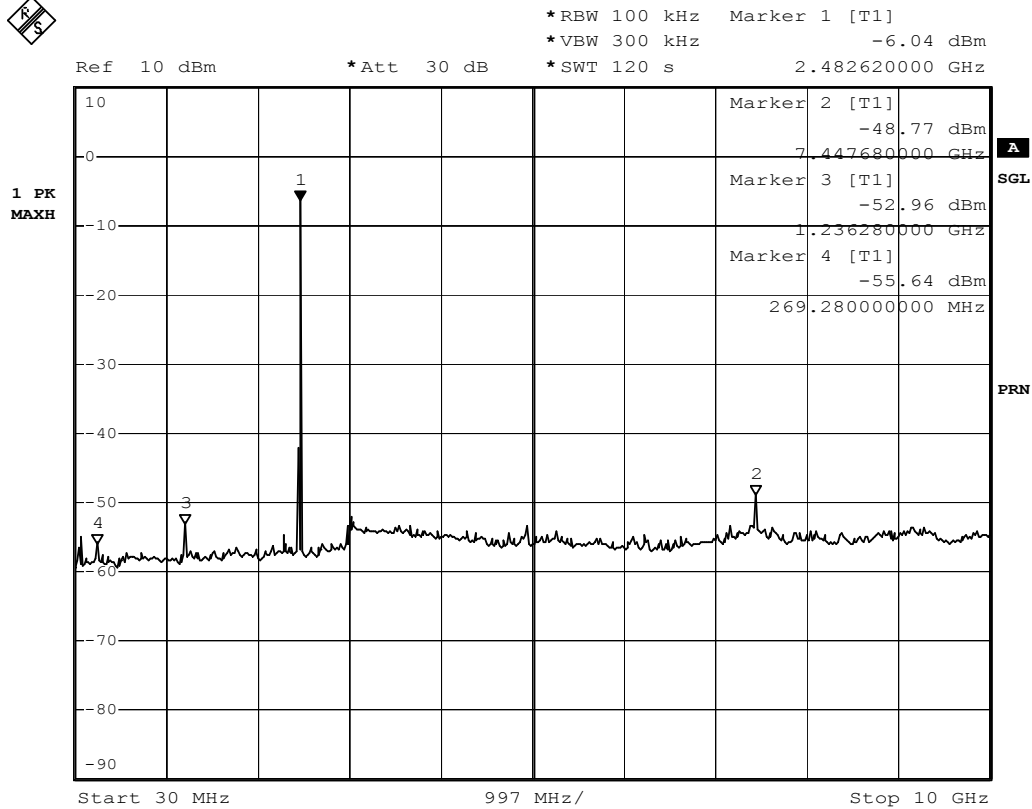
Date: 3.DEC.2003 10:49:35

Tx frequency: 2441MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 20 von 56
 Page 20 of 56



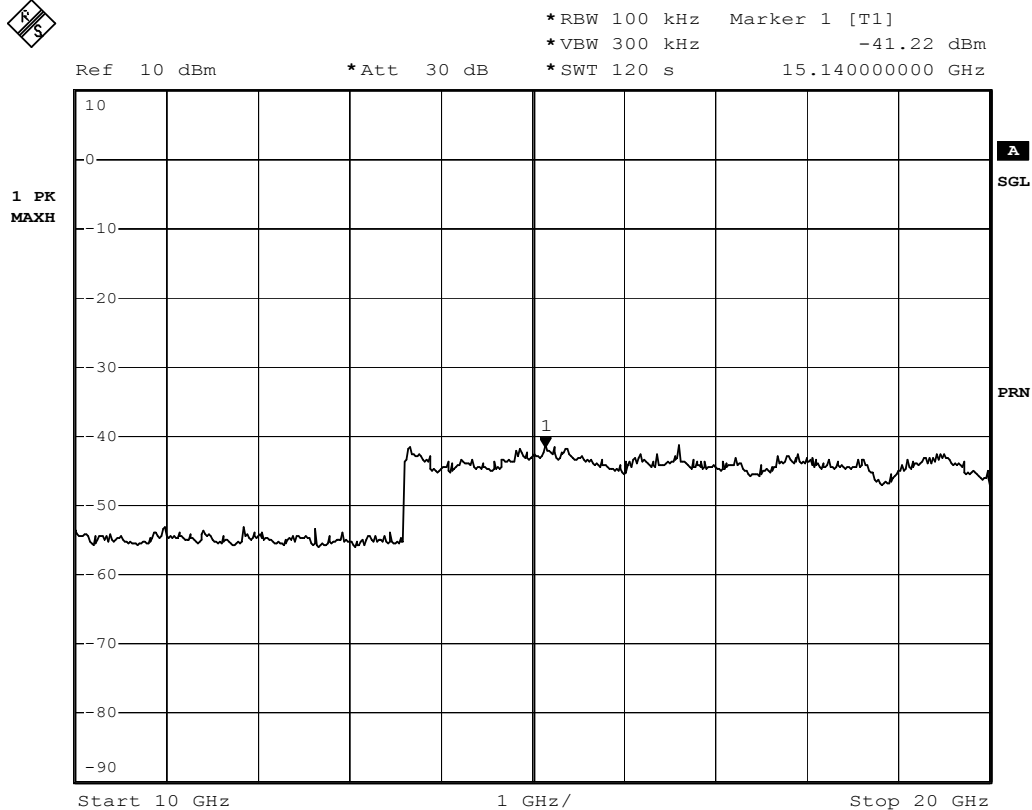
Date: 3.DEC.2003 10:57:22

Tx frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 21 von 56
 Page 21 of 56



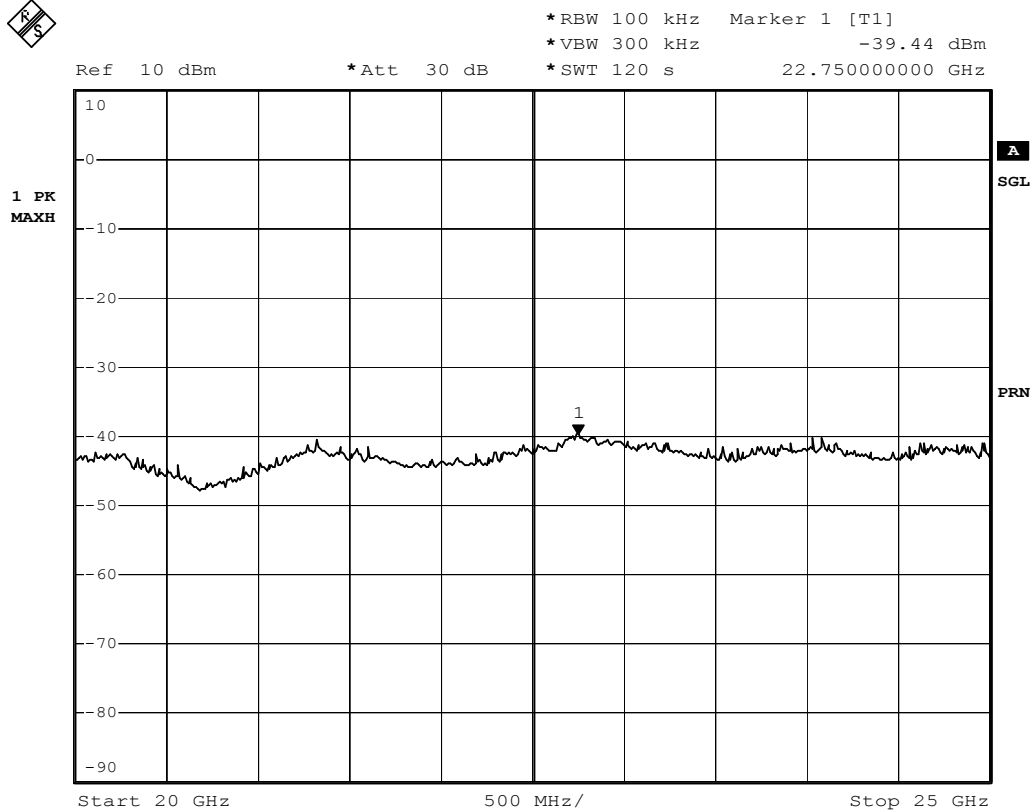
Date: 3.DEC.2003 10:54:07

Tx frequency: 2480MHz

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 22 von 56
 Page 22 of 56



Date: 3.DEC.2003 10:51:47

Tx frequency: 2480MHz

Prüfbericht - Nr.:

14004904 001

Seite 23 von 56
 Page 23 of 56

Test Report No.

Spurious Emissions - Radiated

Date: 11 Dec 2003

EUT: BTU-02

Company: Unifat Technology Ltd.

Voltage supply: 12VDC from car battery

Test by: Hugo Wan

Op. mode: TX mode, DH1 with PRBS9 payload

Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2402	V	143.995	32.30	QP
2402	V	160.000	31.30	QP
2402	H	111.998	24.60	QP
2402	H	159.999	34.50	QP

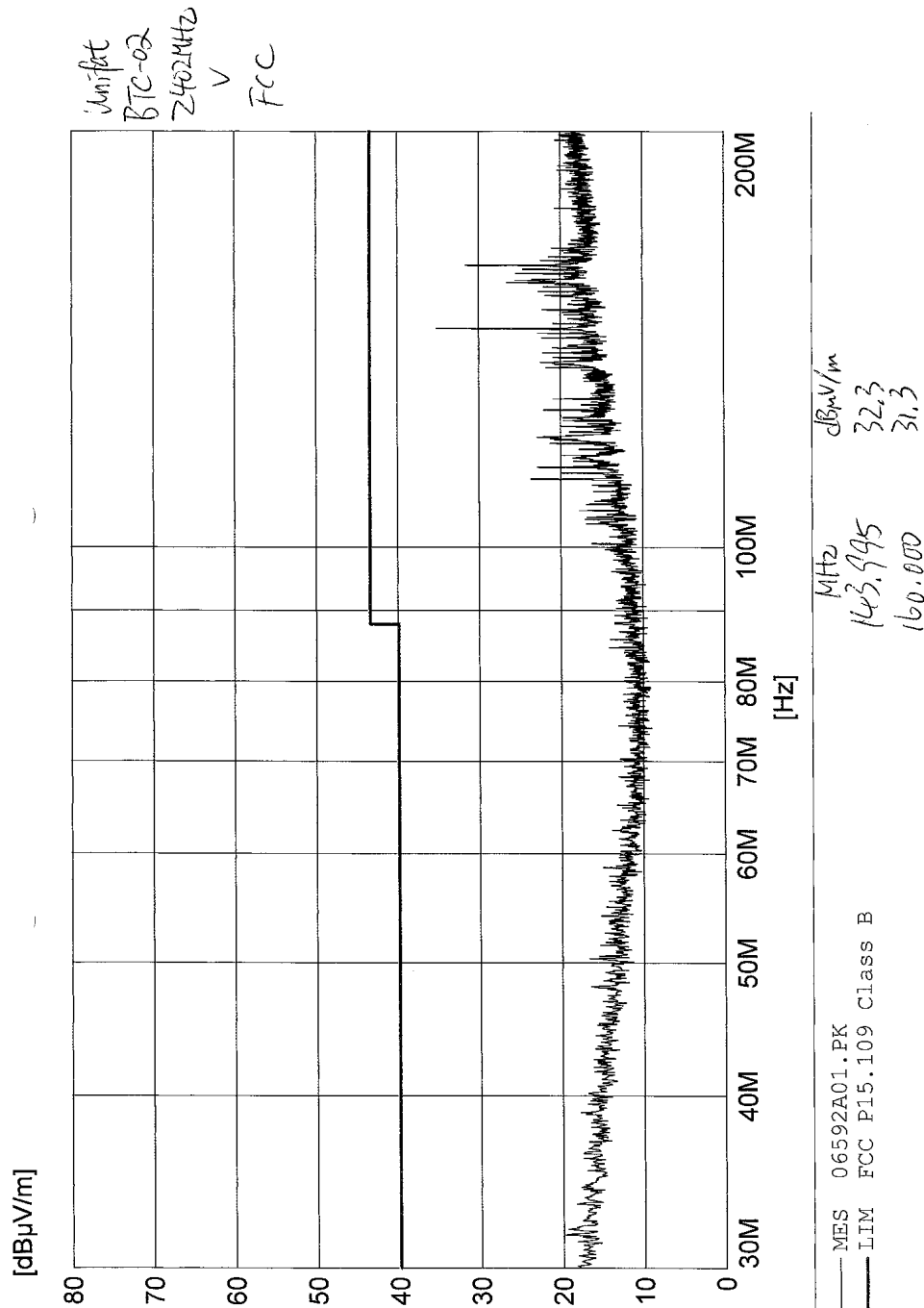
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2441	V	144.020	29.60	QP
2441	V	160.000	35.20	QP
2441	H	112.001	23.80	QP
2441	H	159.999	37.70	QP
2441	V	4882.060	50.87	A

Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2480	V	143.993	28.00	QP
2480	V	160.003	35.30	QP
2480	H	157.719	32.30	QP
2480	H	159.999	31.90	QP
2480	V	4960.068	44.67	A
2480	H	4959.920	47.21	A

Prüfbericht - Nr.:
 Test Report No.

14004904 001

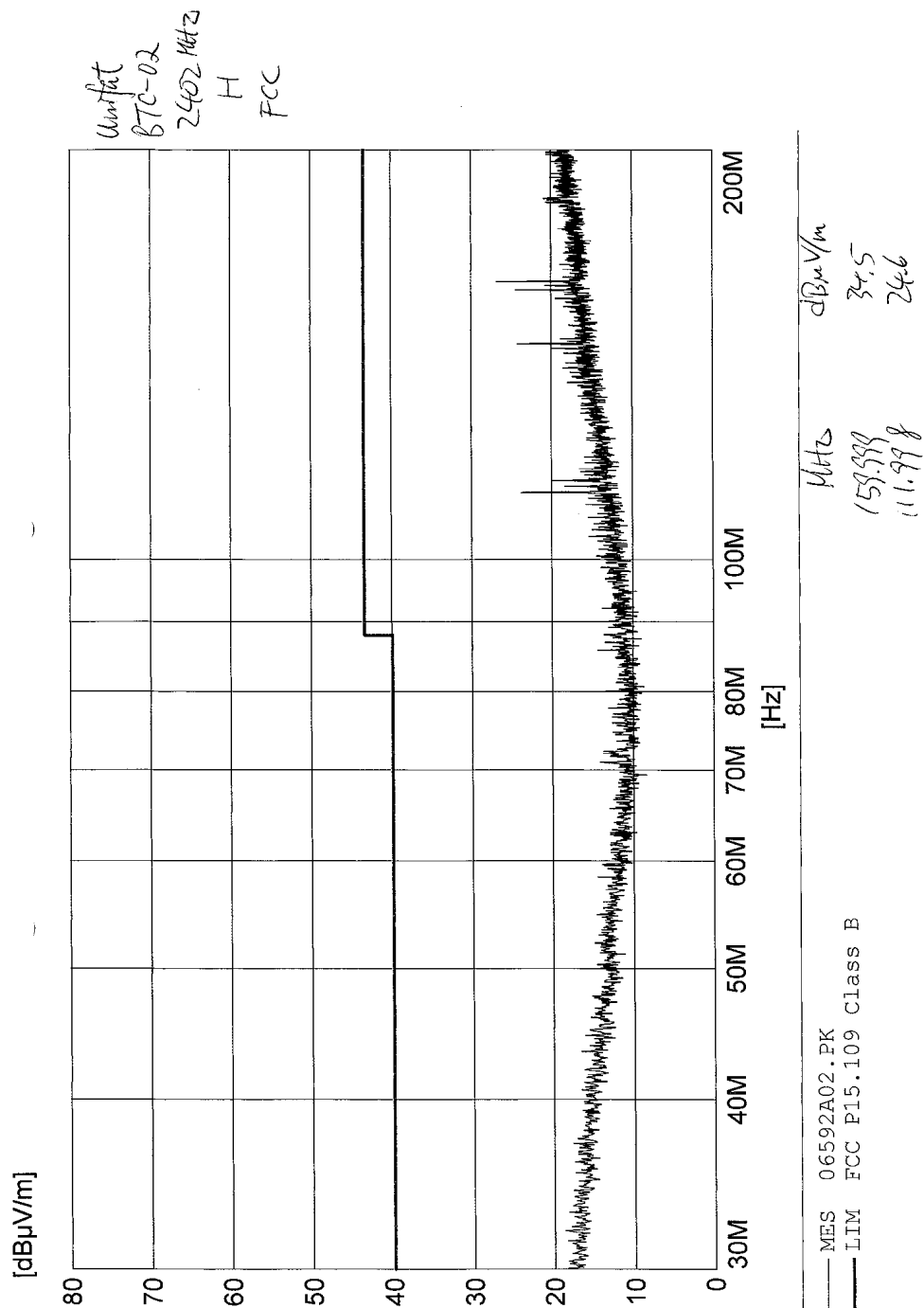
Seite 24 von 56
 Page 24 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

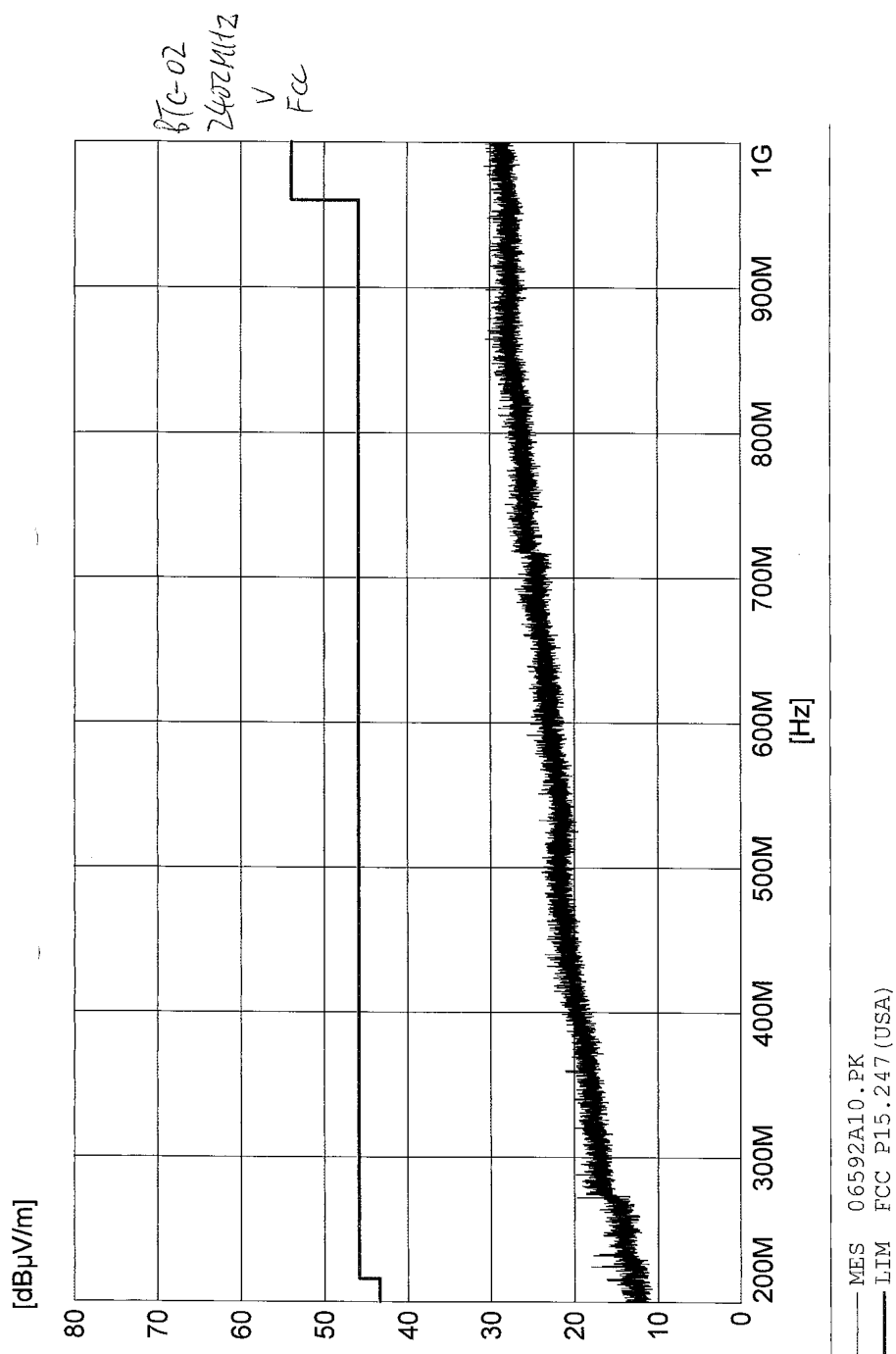
Seite 25 von 56
 Page 25 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

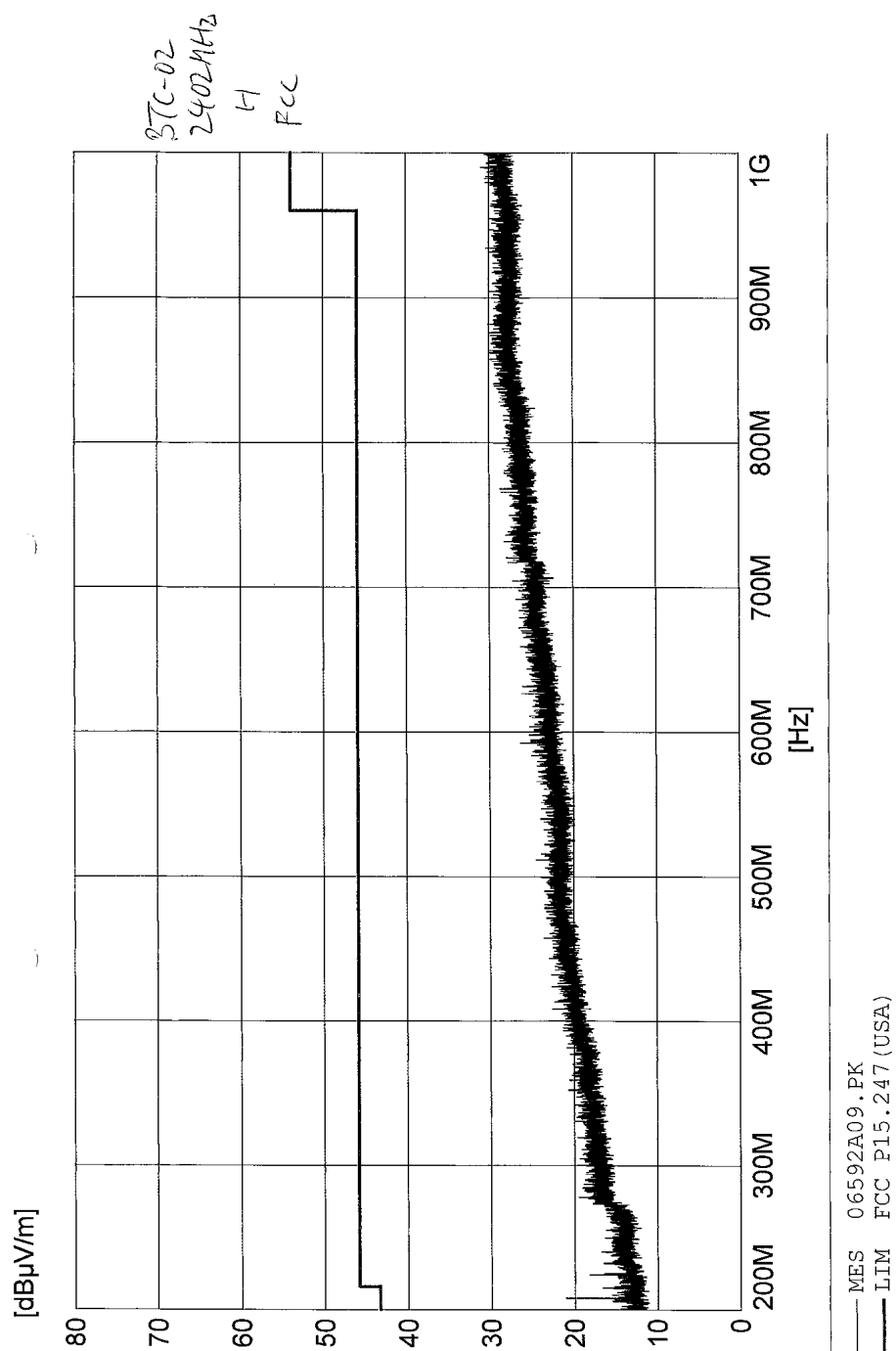
Seite 26 von 56
 Page 26 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

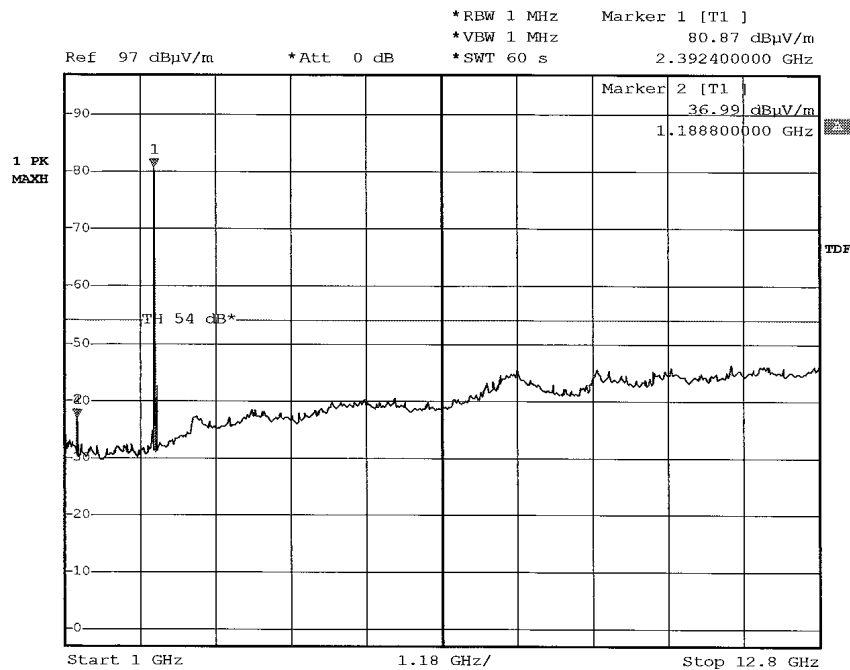
Seite 27 von 56
 Page 27 of 56



Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 28 von 56
Page 28 of 56



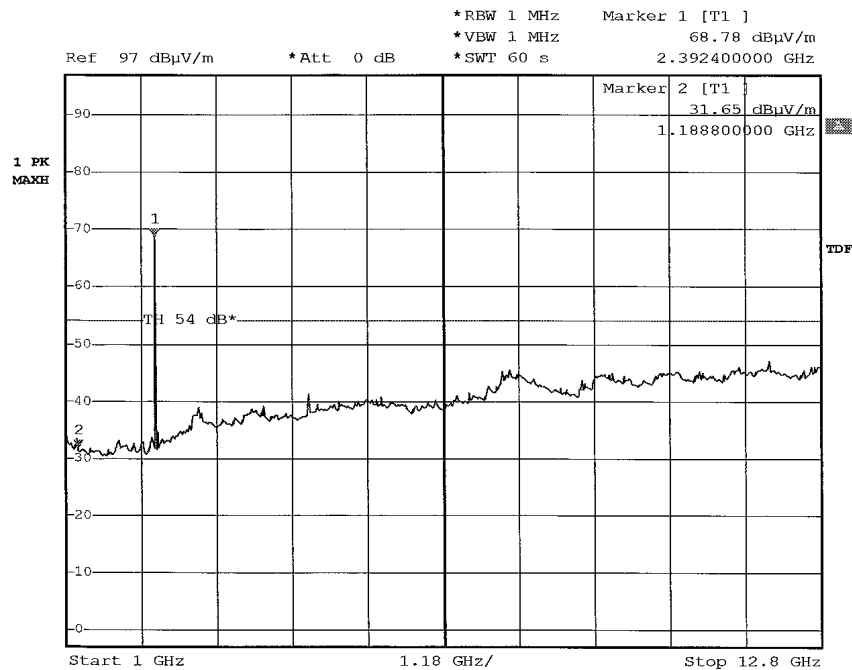
Date: 11.DEC.2003 09:01:52

BTC-02
2402MHz
✓
FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 29 von 56
 Page 29 of 56



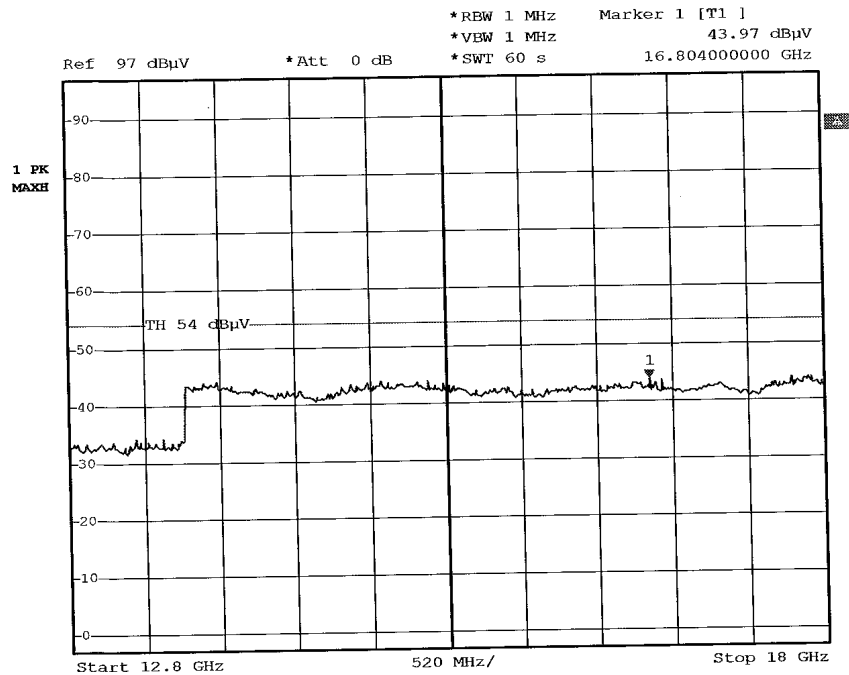
Date: 11.DEC.2003 09:05:01

BTC-02
 2402MHz
 H
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 30 von 56
Page 30 of 56



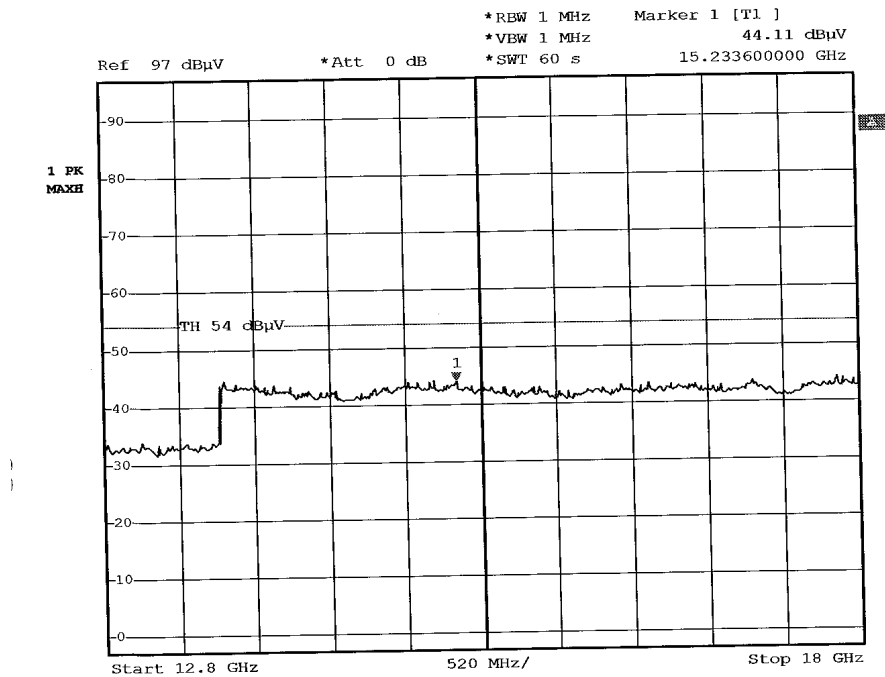
Date: 27.NOV.2003 12:51:34

Unitat
BTC-02
2402MHz
V
FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 31 von 56
Page 31 of 56



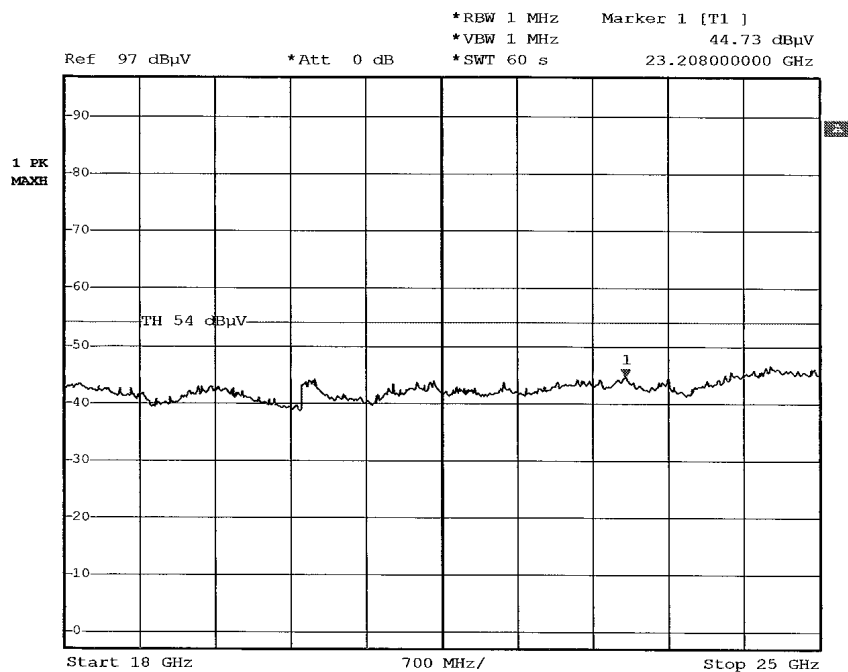
Date: 27.NOV.2003 12:55:03

Unitat
BTC-02
2402MHz
H
FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 32 von 56
 Page 32 of 56



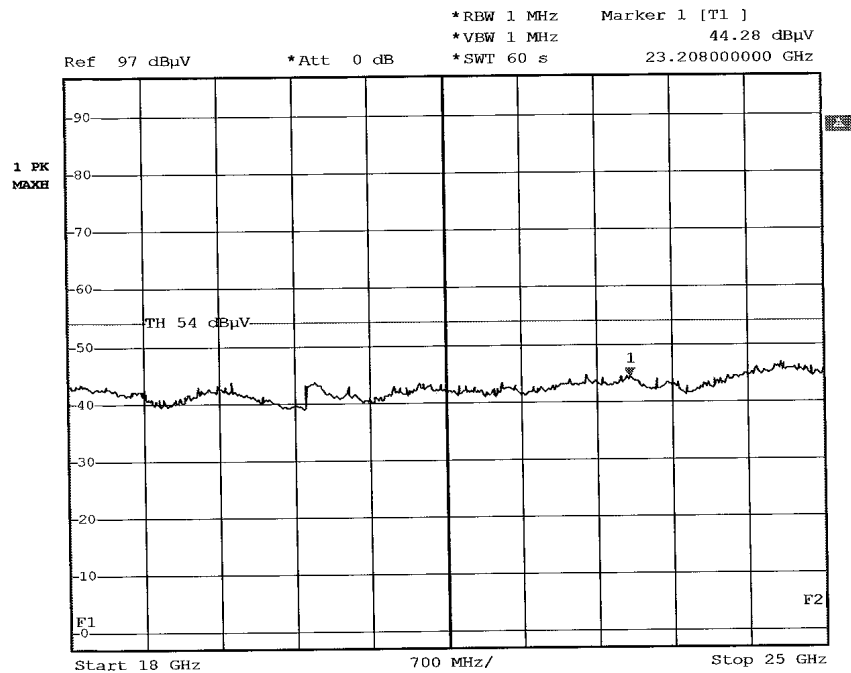
Date: 27.NOV.2003 13:12:06

BTC-02
 2402MHz
 V
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 33 von 56
Page 33 of 56



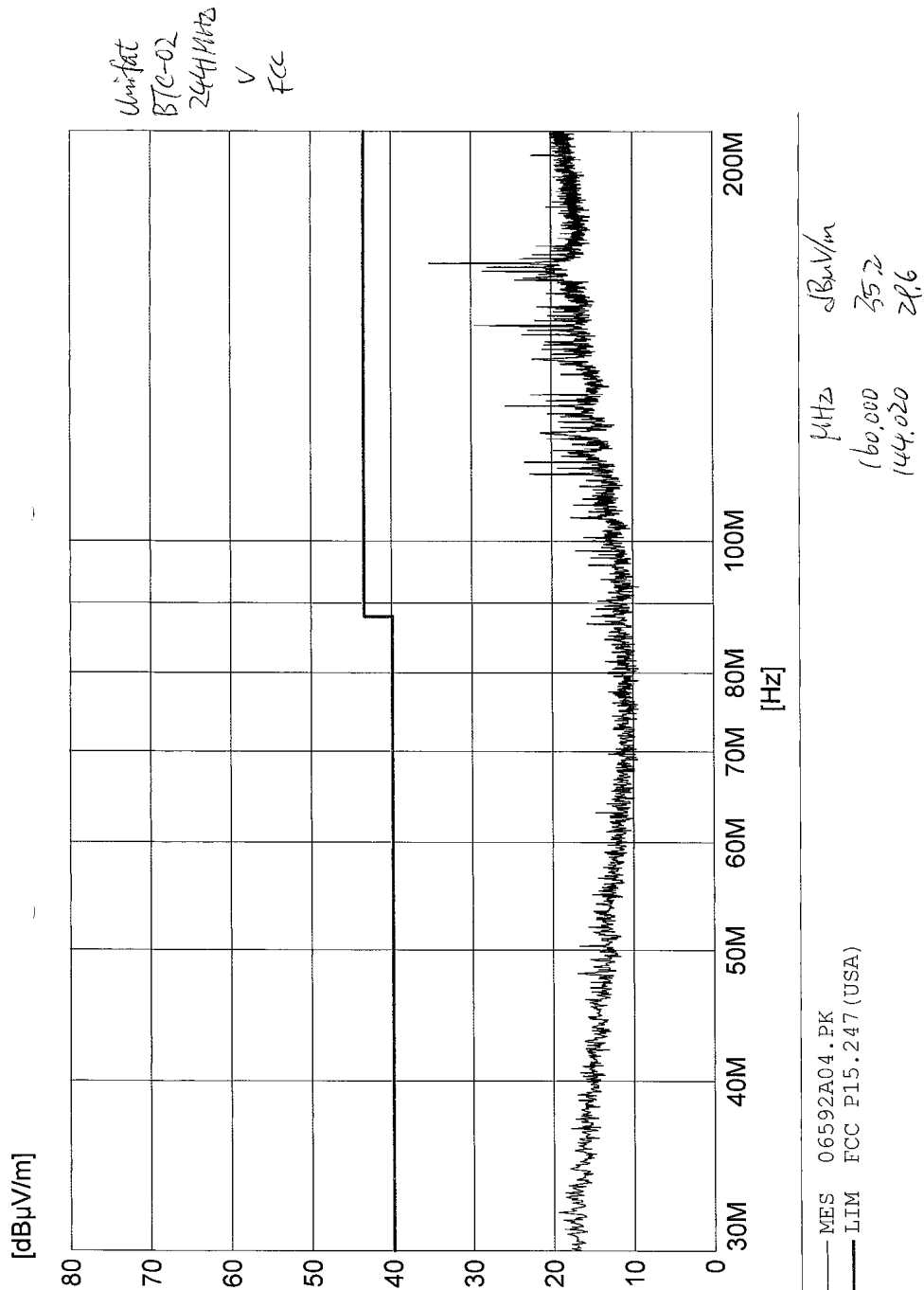
Date: 27.NOV.2003 13:06:11

Umfat
BTC-02
2402MHz
1-
FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

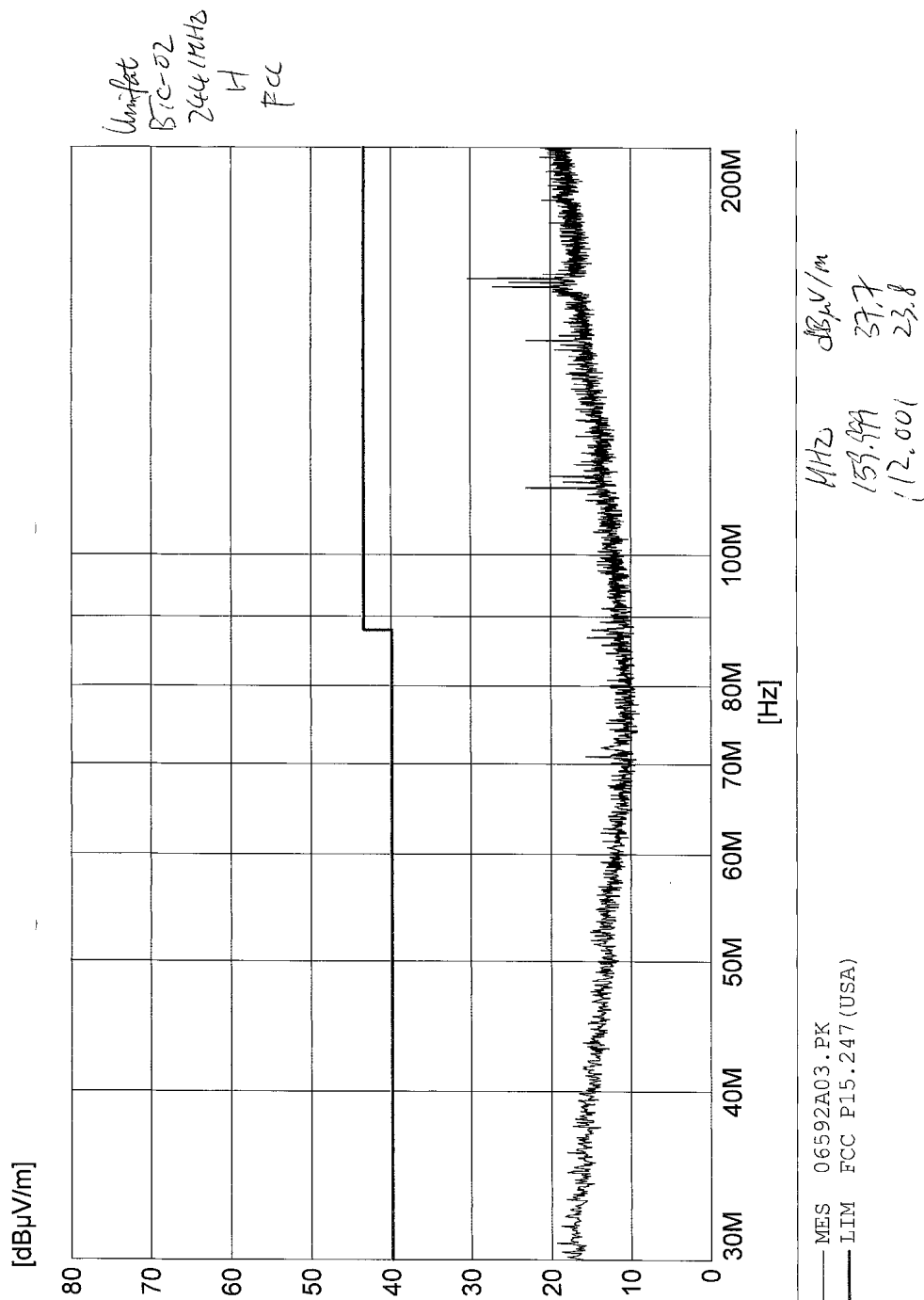
Seite 34 von 56
 Page 34 of 56



Prüfbericht - Nr.:
Test Report No.

14004904 001

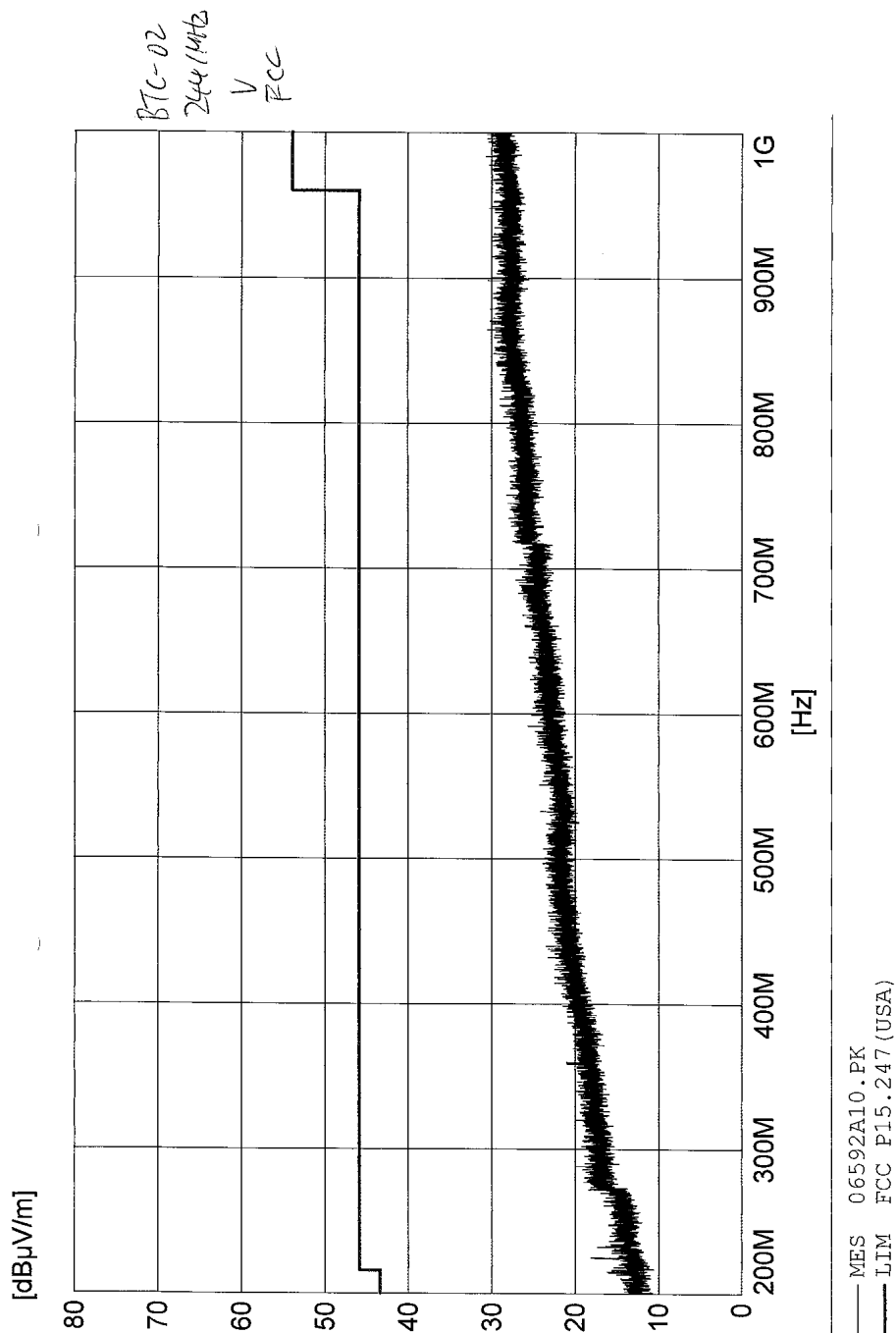
Seite 35 von 56
Page 35 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

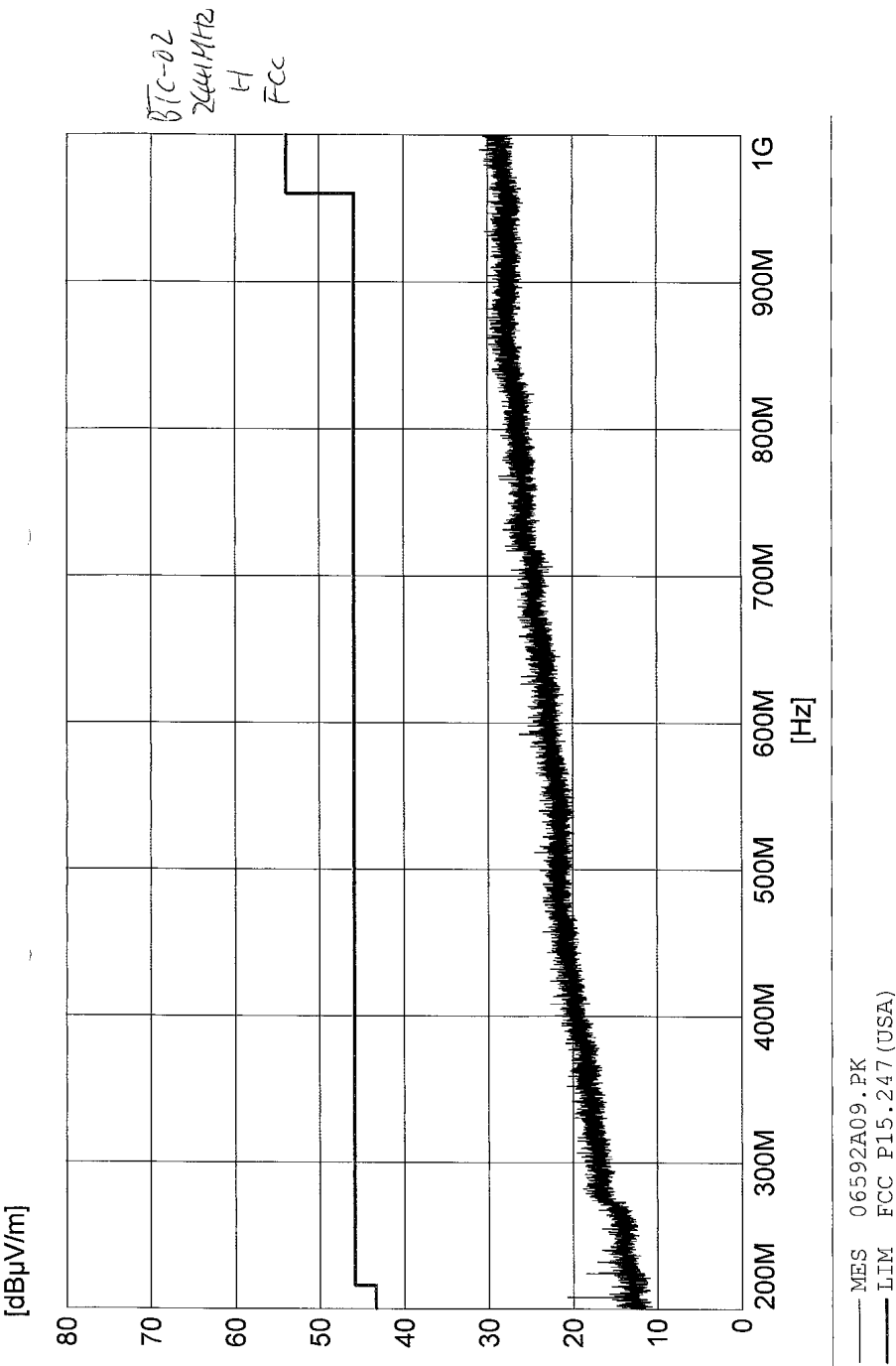
Seite 36 von 56
 Page 36 of 56



Prüfbericht - Nr.:
Test Report No.

14004904 001

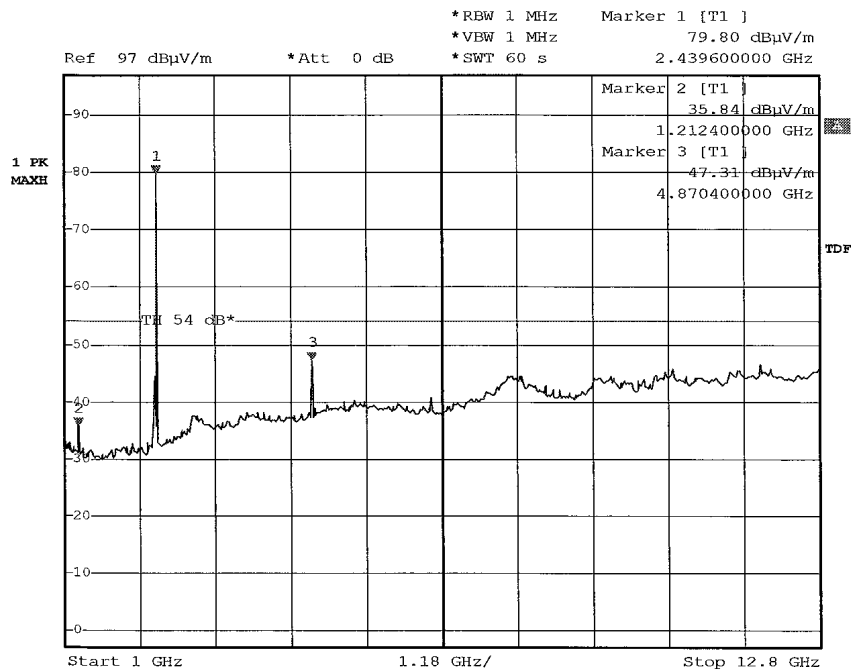
Seite 37 von 56
Page 37 of 56



Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 38 von 56
 Page 38 of 56



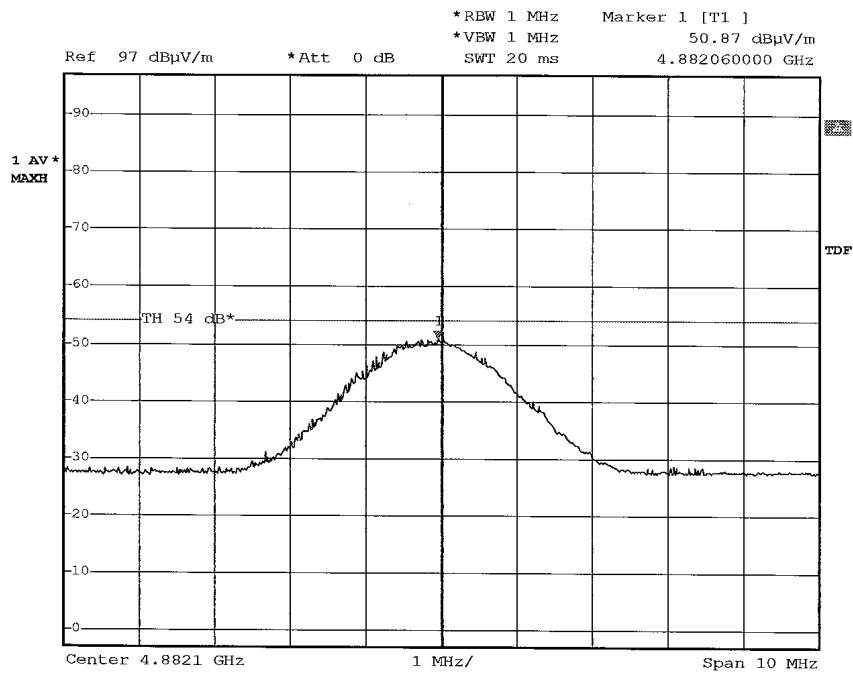
Date: 11.DEC.2003 09:08:44

BTC-02
 2641MHz
 V
 FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 39 von 56
 Page 39 of 56



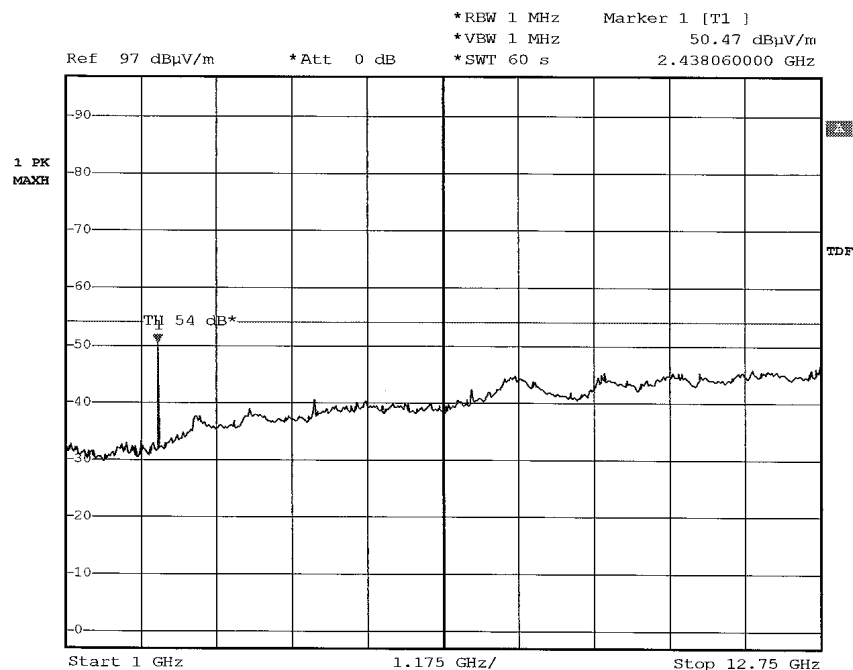
Date: 11.DEC.2003 09:12:00

BTC-02
 2544MHz
 V
 FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 40 von 56
 Page 40 of 56



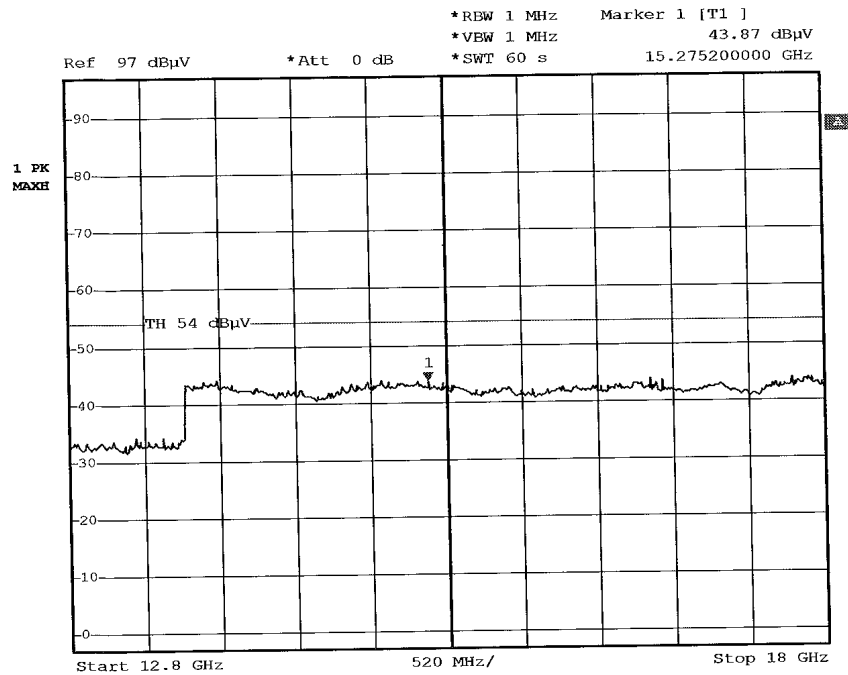
Date: 11.DEC.2003 09:14:57

BT0-02
 2441 MHz
 H
 FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 41 von 56
 Page 41 of 56



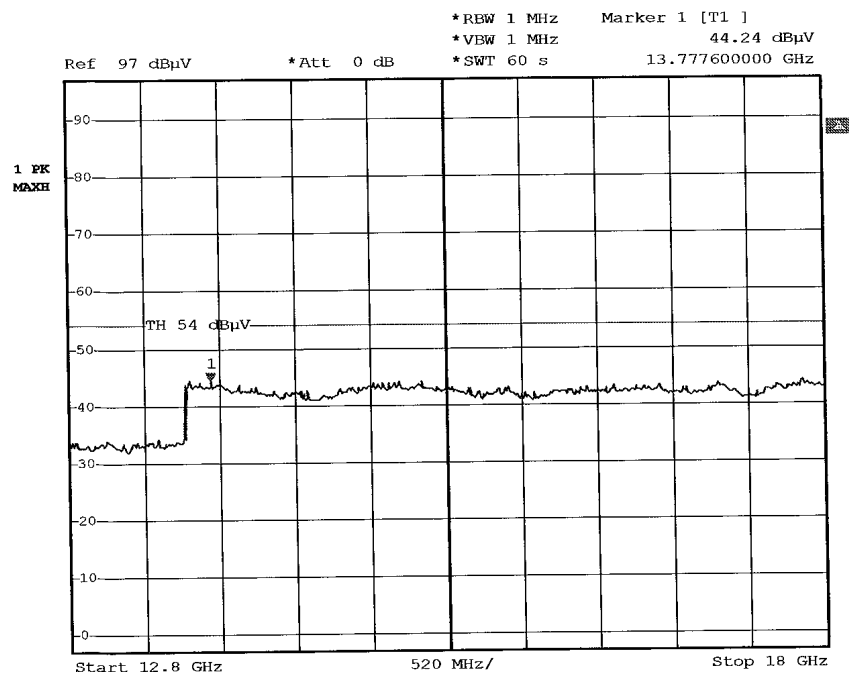
Date: 27.NOV.2003 12:51:46

Unifit
 BTC-02
 2441 MHz
 V
 FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 42 von 56
 Page 42 of 56



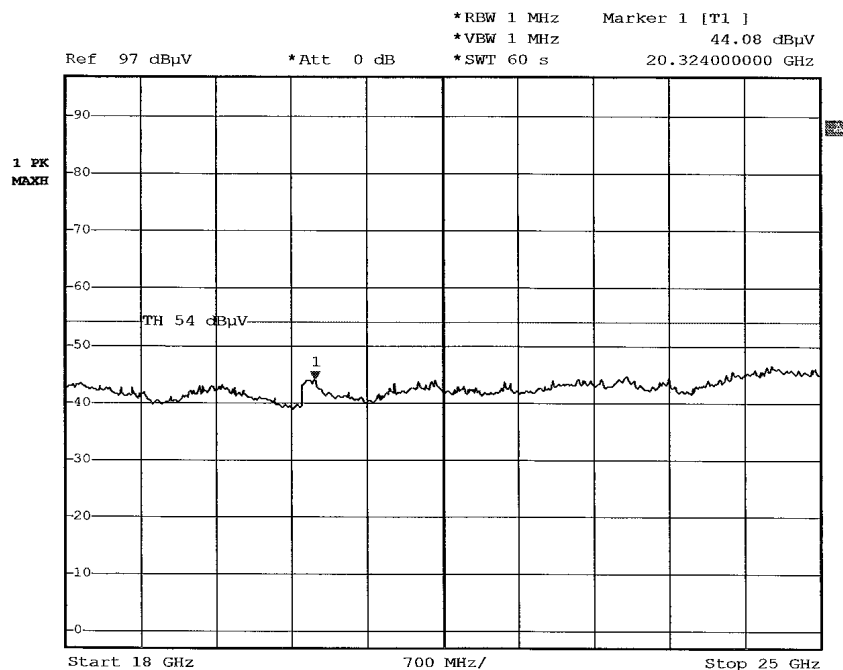
Date: 27.NOV.2003 12:57:36

Unfat
 BTC-02
 2441 MHz
 H
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 43 von 56
Page 43 of 56



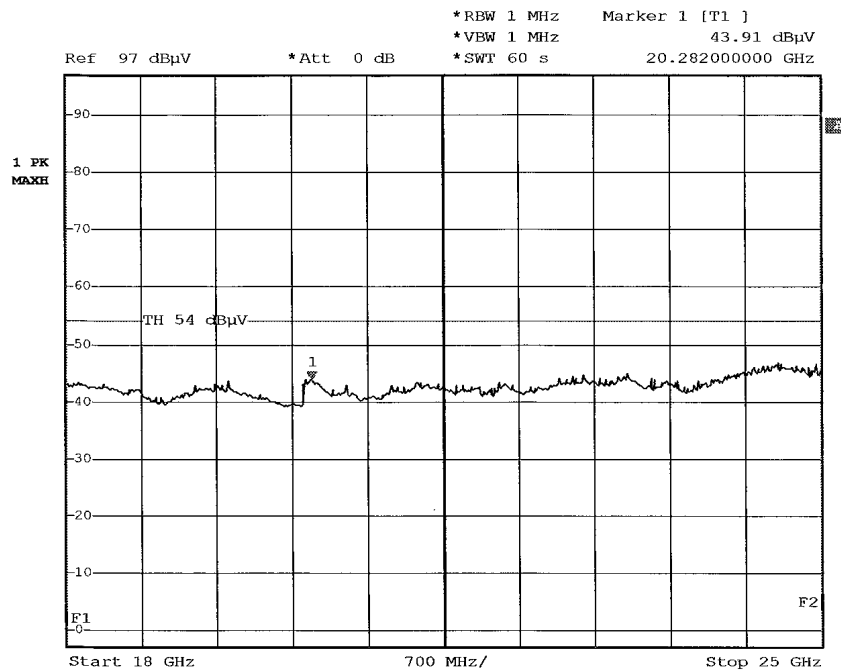
Date: 27.NOV.2003 13:12:51

BTC-02
2441MHz
V
FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 44 von 56
Page 44 of 56



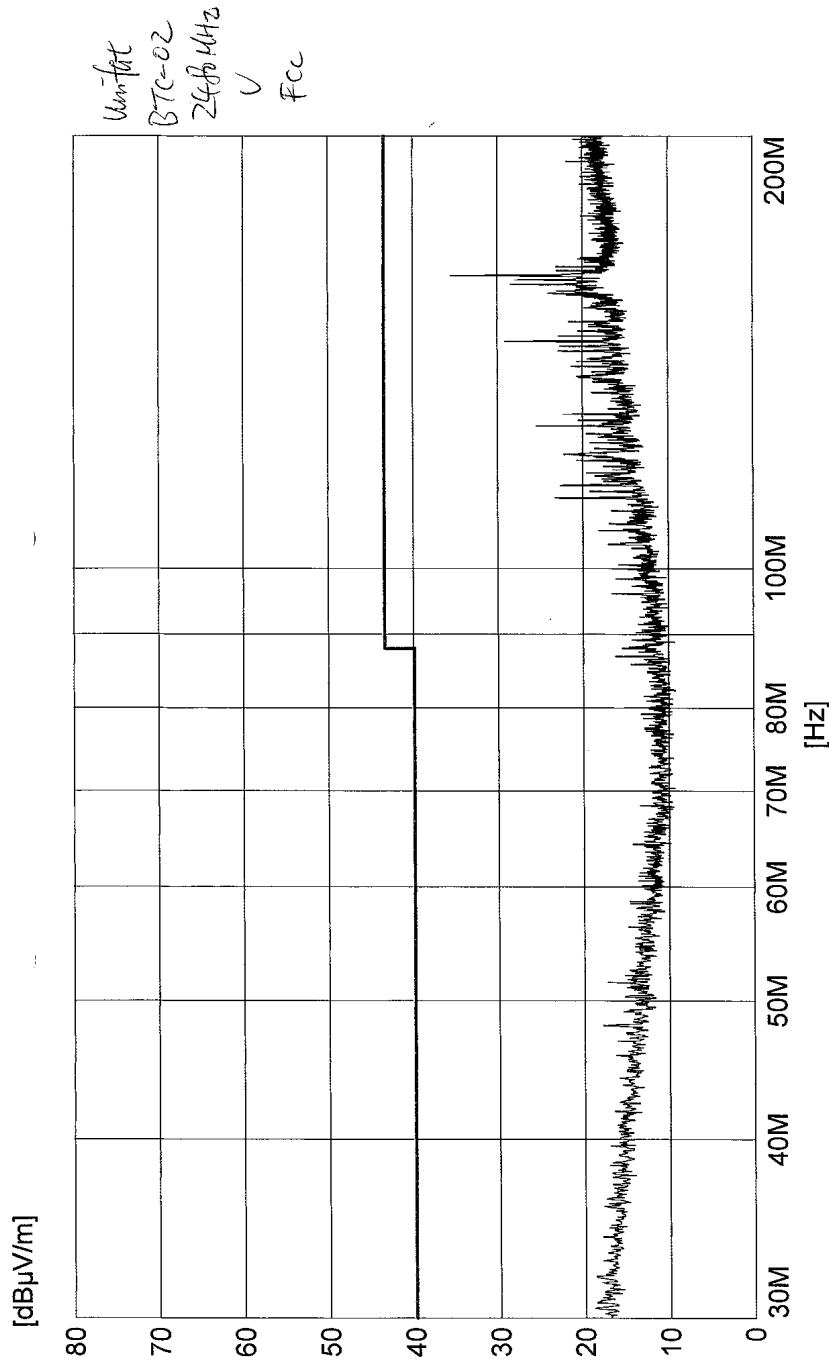
Date: 27.NOV.2003 13:07:19

Umfat
RTC-02
2441MHz
FCC
11

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 45 von 56
 Page 45 of 56



MHz
 160.003
 143.993

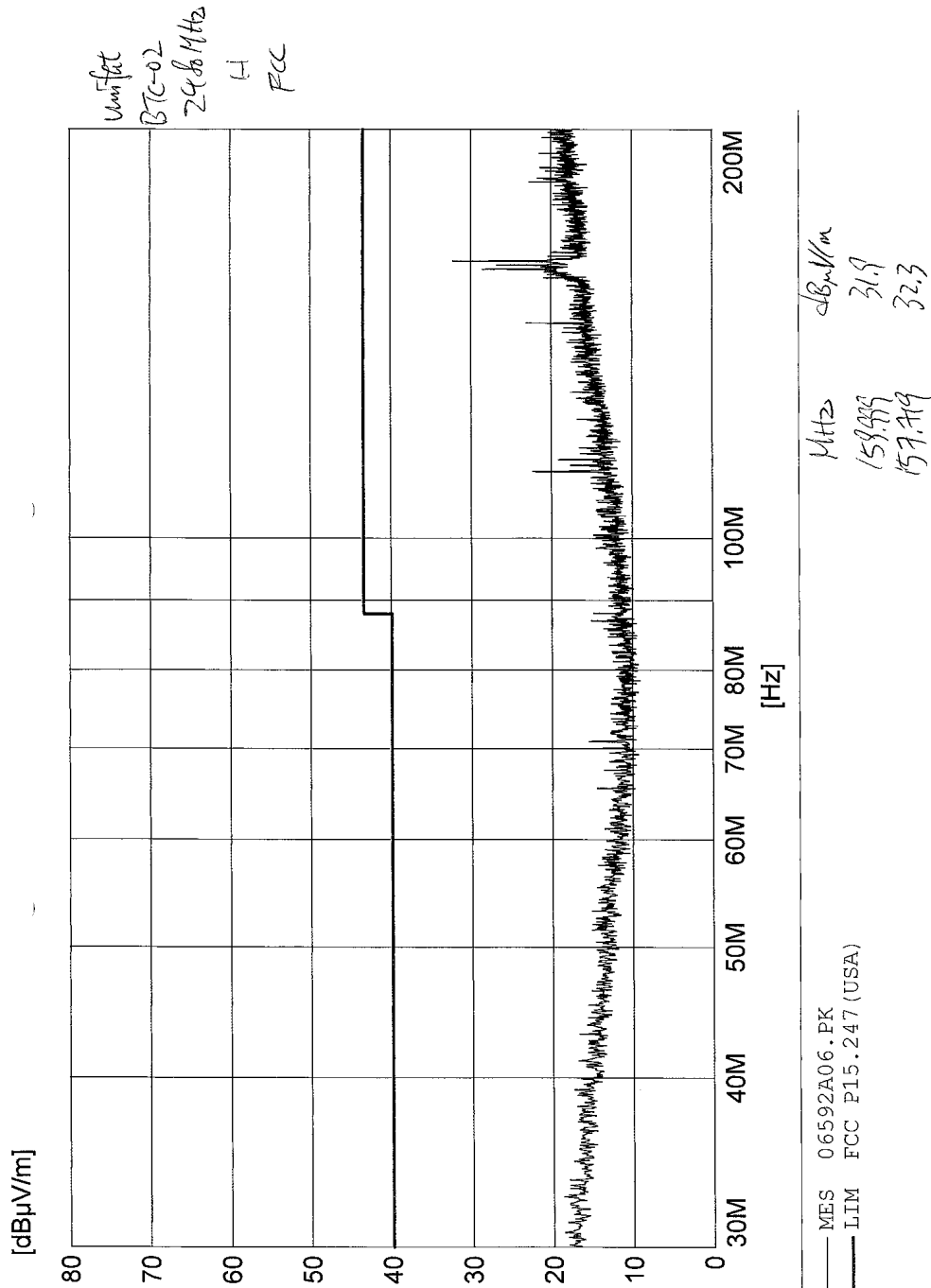
dBµV/m
 35.3
 28.0

— MES 06592A05.PK
 — LIM FCC P15.247 (USA)

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 46 von 56
 Page 46 of 56

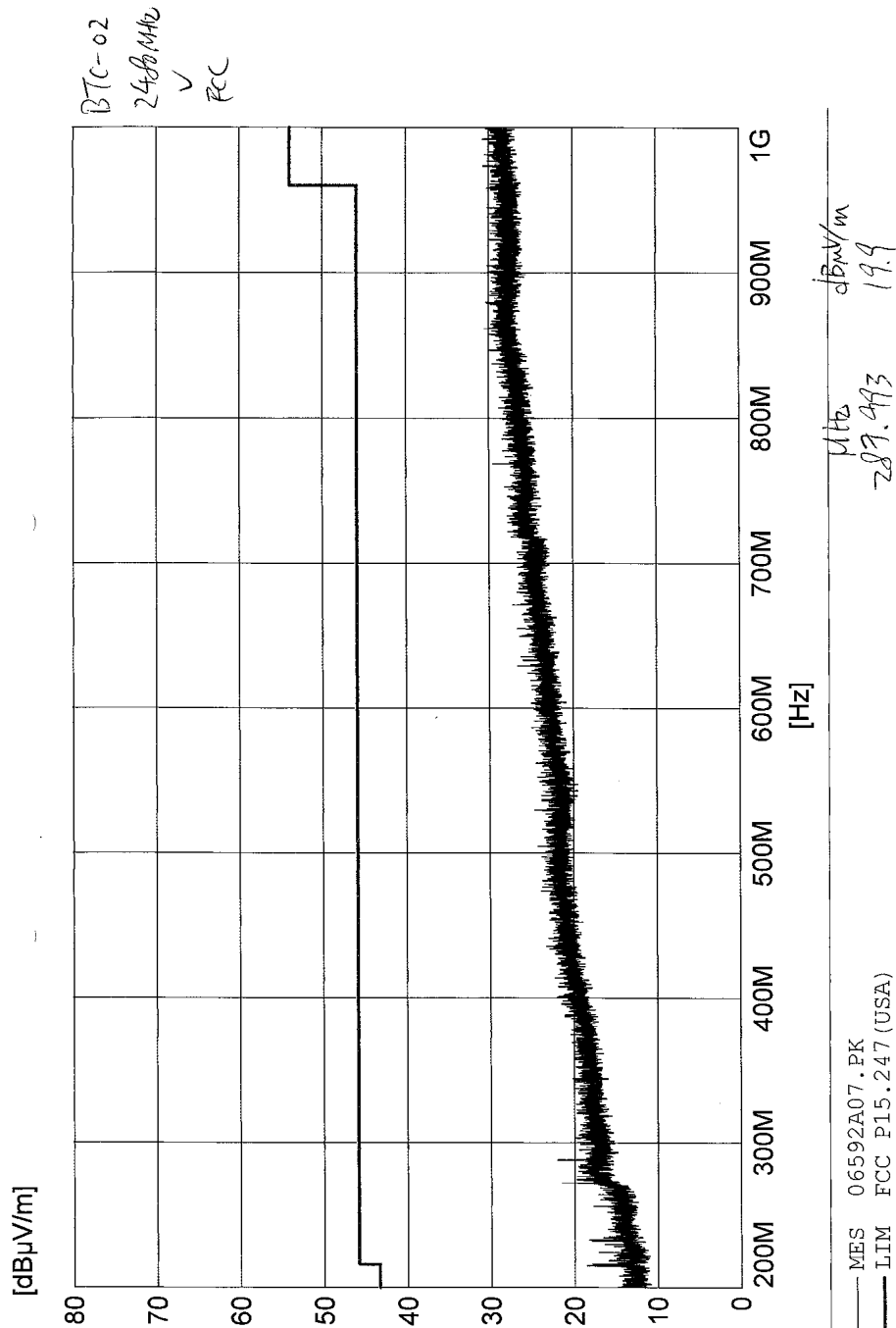


MES 06592A06.PK
 LIM FCC P15.247 (USA)

Prüfbericht - Nr.:
 Test Report No.

14004904 001

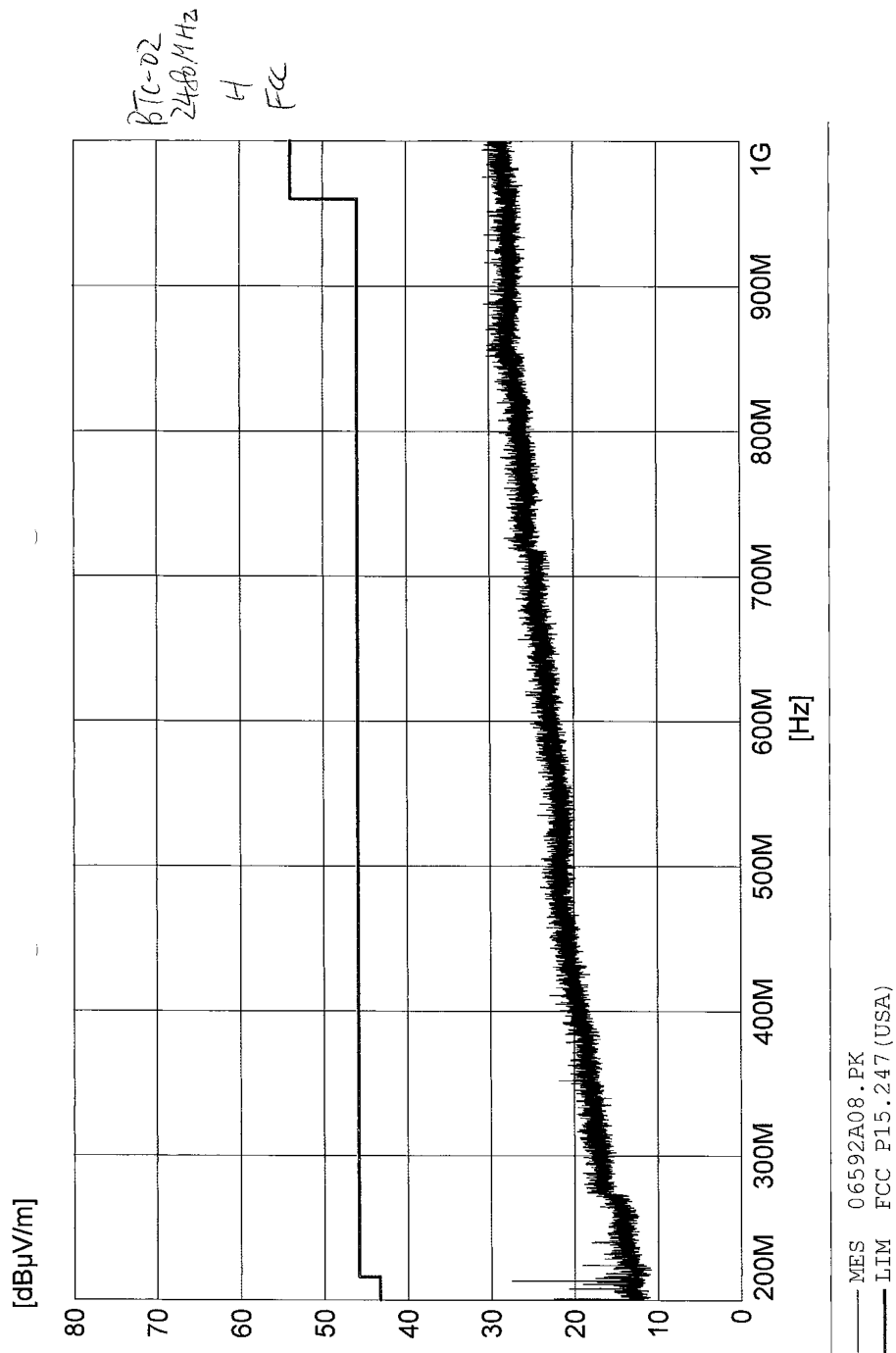
Seite 47 von 56
 Page 47 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

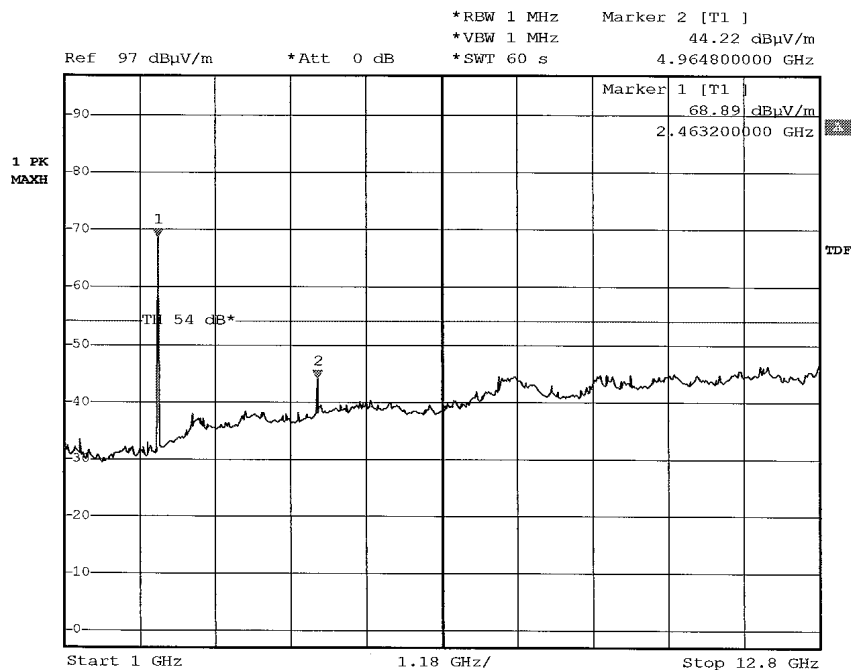
Seite 48 von 56
 Page 48 of 56



Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 49 von 56
 Page 49 of 56



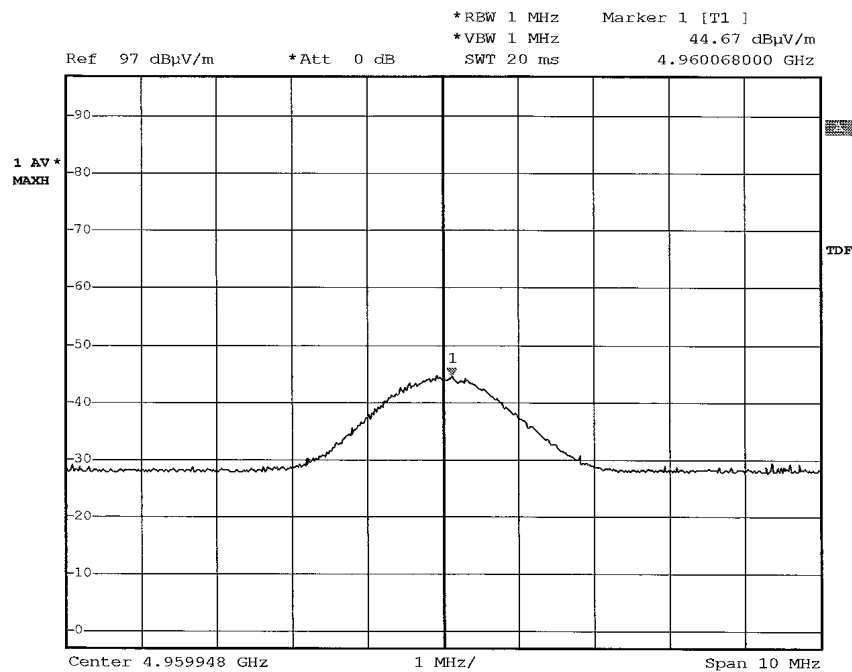
Date: 11.DEC.2003 09:22:14

BTG-02
 2480 MHz
 ✓
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 50 von 56
Page 50 of 56



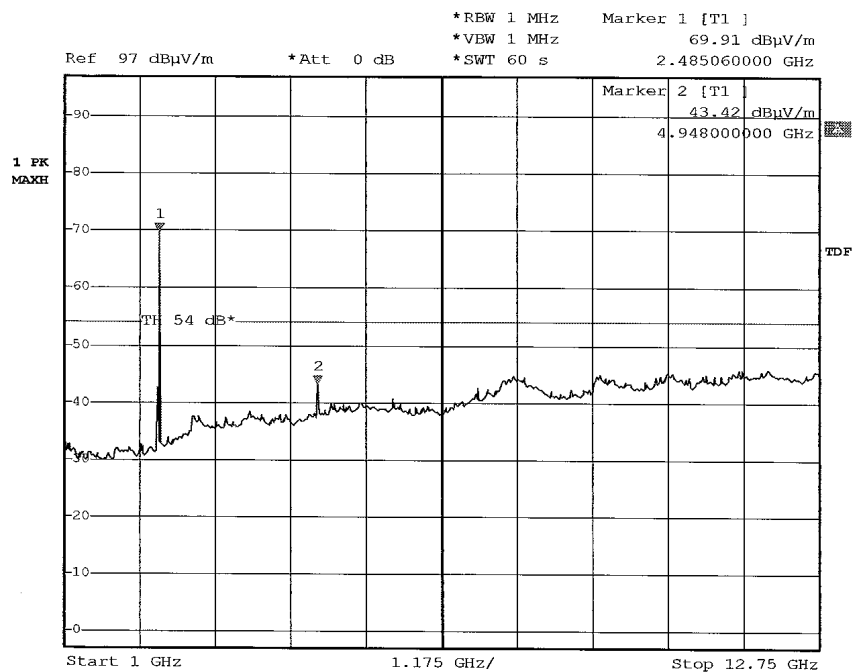
Date: 11.DEC.2003 09:23:45

BTC-02
2480MHz
V
FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 51 von 56
 Page 51 of 56



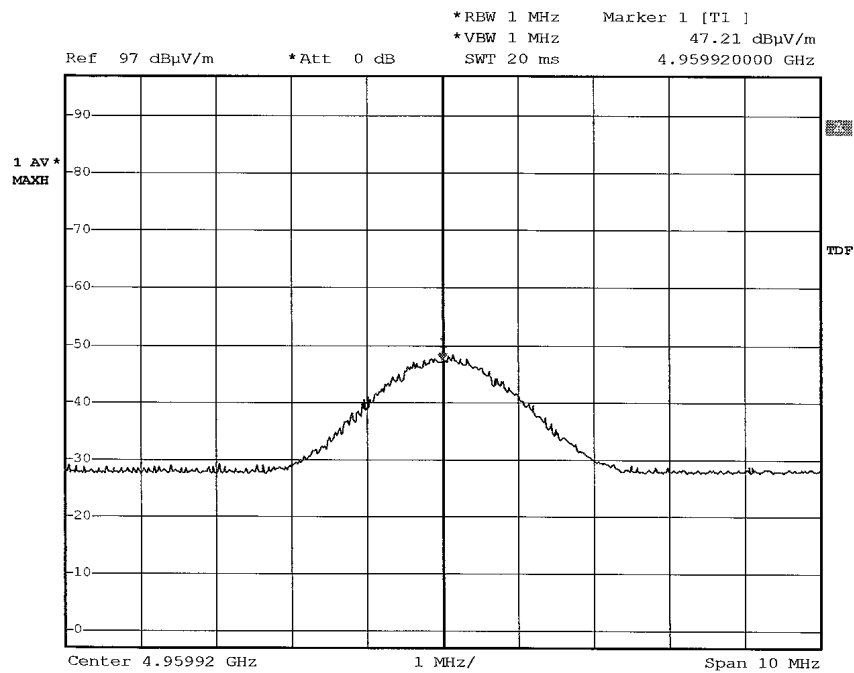
Date: 11.DEC.2003 09:18:18

BTC-02
 240 MHz
 H
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 52 von 56
Page 52 of 56



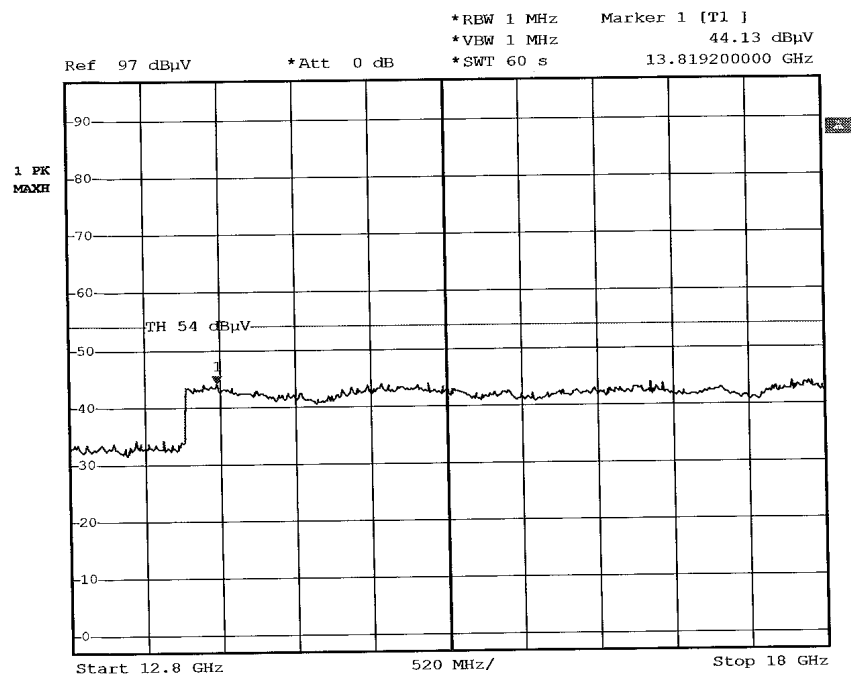
Date: 11.DEC.2003 09:19:57

BTC-02
2480 MHz
H
FCC

Prüfbericht - Nr.:
 Test Report No.

14004904 001

Seite 53 von 56
 Page 53 of 56



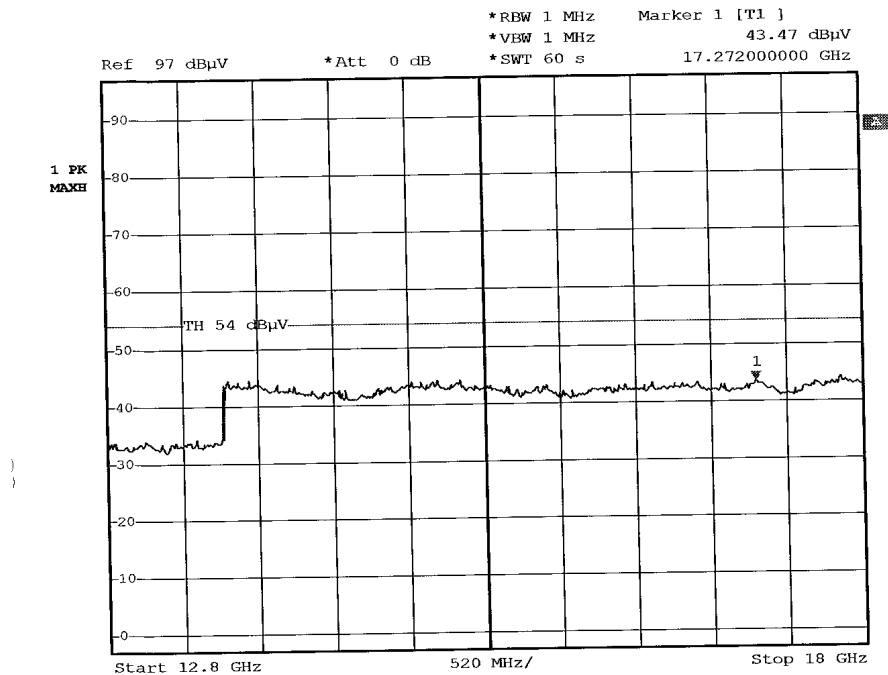
Date: 27.NOV.2003 12:51:57

Unifat
 BTC-02
 248 MHz
 V
 FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 54 von 56
Page 54 of 56



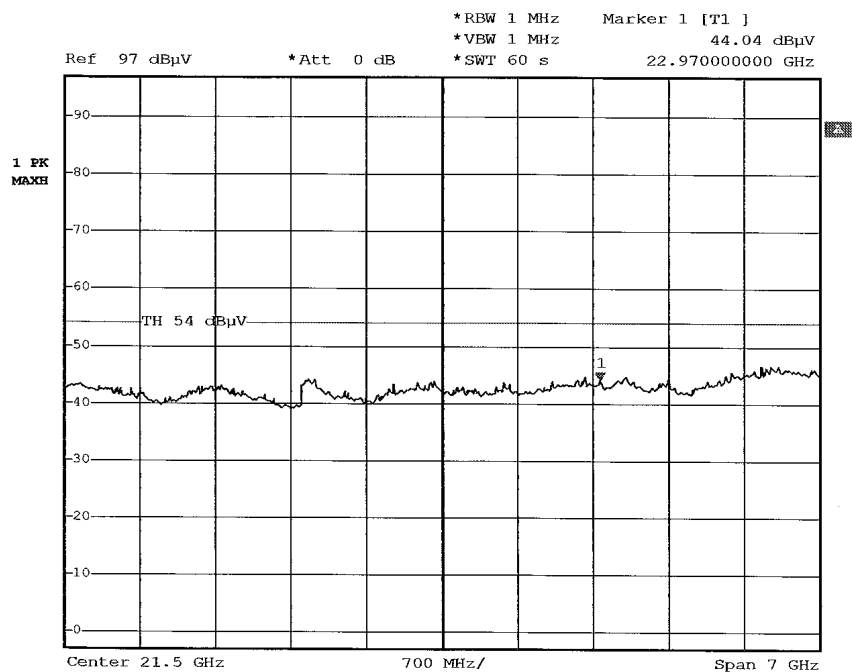
Date: 27.NOV.2003 12:57:25

unifat
BTC-02
2480 MHz
H
FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 55 von 56
Page 55 of 56



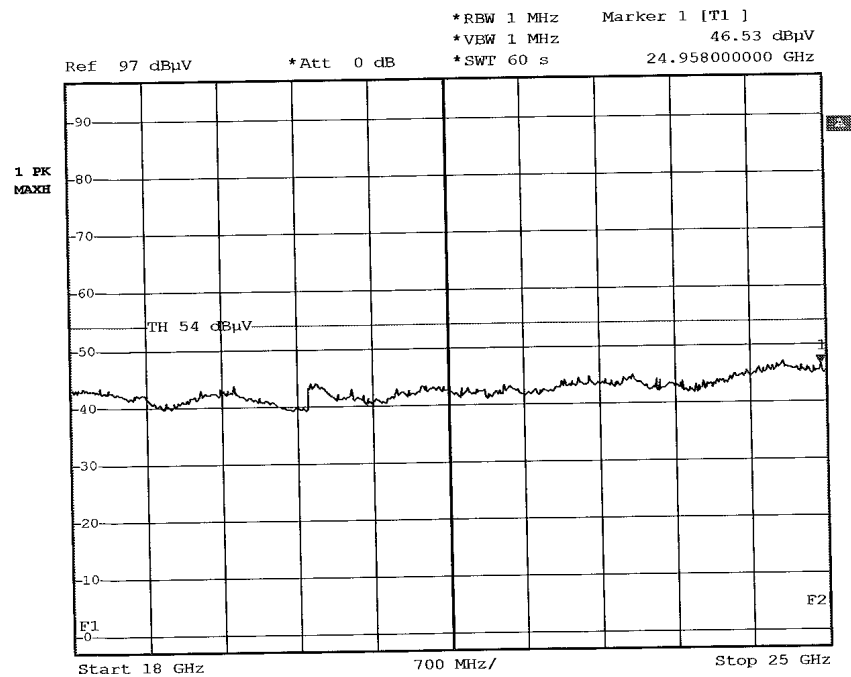
Date: 27.NOV.2003 13:13:47

BTC-02
2480 MHz
✓
FCC

Prüfbericht - Nr.:
Test Report No.

14004904 001

Seite 56 von 56
Page 56 of 56



Date: 27.NOV.2003 13:08:20

Unifat
BTC-02
24.958 MHz
H
FCC