

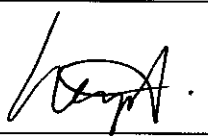
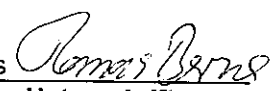
Prüfbericht - Nr.:		14004905 002		Seite 1 von 13	
Test Report No.		Page 1 of 13			
Auftraggeber: Applicant		UNIFAT Technology Ltd. 7/F., Sui Hong Ind. Bldg. 547 – 549 Castle Peak Road Kwai Chung, N.T. Hong Kong			
Gegenstand der Prüfung: Test item		Bluetooth Hands-Free Car Kit			
Bezeichnung: Identification		BTU-02	Serien-Nr.: Serial No.		Engineering sample
Wareneingangs-Nr.: Receipt No.		040520006	Eingangsdatum: Date of receipt		20.05.2004
Prüfart: Testing location		TÜV Rheinland Hong Kong Ltd. Room 8, 25th Floor, Skyline Tower, 39 Wang Kwong Road, Kowloon Bay Kowloon, Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong			
Prüfgrundlage: Test specification		FCC Part 15 Subpart C ANSI C63.4-2001 CISPR 22:1997			
Prüfergebnis: Test Result		Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed.			
geprüft / tested by:			kontrolliert / reviewed by:		
08.06.2004	Hugo Wan		08.06.2004	Thomas Berns	
Datum Date	Name Name	Unterschrift Signature	Datum Date	Name Name	Unterschrift Signature
Sonstiges: Other Aspects		FCCID: RIIBTU-02			
Abkürzungen:		OK, Pass, P Fail, F N/A NT	= entspricht Prüfgrundlage = entspricht nicht Prüfgrundlage = nicht anwendbar = nicht getestet	Abbreviations: OK, Pass, P Fail, F N/A NT = passed = failed = not applicable = not tested	
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster 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 sample. Without permission of the test center this test report is not permitted to be duplicate in extracts. This test report does not entitle to carry any safety mark on this or similar products.					

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Product information

Manufacturers declarations

	Transmitter	Receiver
Operating frequency range	2402 - 2480 MHz	2402 - 2480 MHz
Type of modulation	FHSS modulation	FHSS modulation
Number of channels	79	79
Channel separation	1 MHz	1 MHz
Type of antenna	Integral Antenna	Integral Antenna
Antenna gain (dBi)	0	
Power level	fix	
Type of equipment	stand alone, plug-in radio device	stand alone, plug-in radio device
Connection to public utility power line	No	
Nominal voltage	V _{nom} : 12 V	V _{nom} : 12 V
Independent Operation Modes	Page scan Inquiry scan Connection state - ACL Link Connection state - SCO Link	

Product function and intended use

The test item is a 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 1 MHz 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 625 µs, 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.

Submitted documents

Circuit Diagram
PCB Layout
Block Diagram
Bill of material
User manual

Special accessories and auxiliary equipment

None

List of Test and Measurement Instruments

	Kind of Equipment	Manufacturer	Type	S/N
☐	Test Receiver	Rohde & Schwarz	ESH-3	890173/033
☐	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	3115	9002-3347
☐	RF Comms Test Set	HP	8920B	US36492628
☐	Spectrum Analyser + Tracking G.	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
☐	Surge Generator	Schaffner	NSG650	280

Result FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information		Pass
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Result:	Permanent attached antenna	
Verdict:	Pass	

Subclause 15.204 – Antenna Information		Pass
Requirement:	Provide information for every antenna proposed for the use with the EUT	
Result:	a) Antenna type: Inverted F type antenna soldered to the circuit board b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 0 dBi	
Verdict:	Pass	

Subclause 15.207 – Conducted Emission		N.A.
Applicable only to equipment designed to be connected to the public utility power line.		

Subclause 15.247 (a) – Carrier Frequency Separation		Pass
Requirement:	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.	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), DH1 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 12VDC from AC/DC adapter Temperature : 23°C Humidity : 54%		
Result: The centre frequencies of the hopping channels are separated by more than the 20dB bandwidth. For test results plots refer to Appendix 1, page 2.		
Verdict: Pass		

Subclause 15.247 (a) – Time of Occupancy (Dwell Time)	Pass
Requirement: 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.	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), DH5 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 12VDC from AC/DC adapter Temperature : 23°C Humidity : 54%	
Result: The screenshot in Appendix 1 page 4 shows the occurrence of a channel in a 12.8 s time period. In inquiry and page scan mode Bluetooth is using 32 hopping channels only. The frequency was used 26 times. The dwell time for the longest supported packet type is about 3 ms. As a result the average time of occupancy will not be greater than 400 ms. i.e. Time period calculation: $0.4 \times 32 = 12.8\text{s}$ Limit calculation: $26 \times 2.936 \times 10^{-3} = 76.34 \times 10^{-3}\text{s}$ $\leq 400 \times 10^{-3}\text{s}$ For test protocols please refer to Appendix 1, page 3-4. Verdict: Pass	

Subclause 15.247 (a) – 20 dB Bandwidth

Requirement: 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.

Test Specification : FCC Part 15 Subpart A – Subclause 15.31
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH5 packet
 Port of testing : Temporary antenna port
 Detector : Peak
 RBW/VBW : 30 kHz / 100 kHz
 Supply voltage : 12VDC from AC/DC adapter
 Temperature : 23°C
 Humidity : 54%

Results

Frequency (MHz)	20 dB right (MHz)	20 dB left (MHz)	20dB bandwidth (MHz)
2402	0.404	0.436	0.840
2441	0.400	0.440	0.840
2480	0.400	0.440	0.840

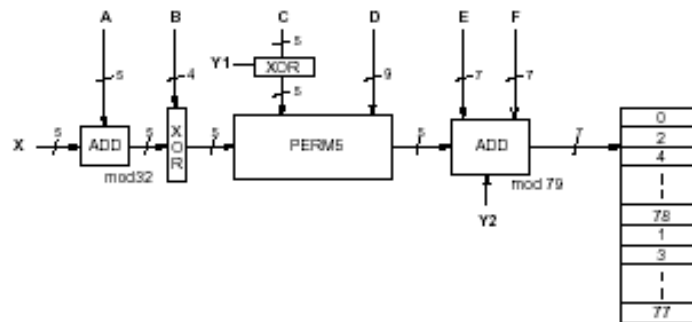
For test protocols refer to Appendix 1, page 5-7.

Subclause 15.247 (a) – Hopping Sequence**Pass**

Requirement: The hopping sequence is generated and provided with an example.

Hopping sequence

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 | 32 17 | 36 19 | 34 49 | 38 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 |

```

Subclause 15.247 (a) – Equal Hopping Frequency Use

Pass

Requirement: Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (a) – Receiver Input Bandwidth		Pass
Requirement:	The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.	
Receiver input bandwidth		
The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.		

Subclause 15.247 (a) – Receiver Hopping Capability		Pass
Requirement:	The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.	
Receiver hopping Capability		
The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.		

Subclause 15.247 (b) – Peak Output Power				Pass	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 12VDC from AC/DC adapter Temperature : 23°C Humidity : 54%					
Requirement:		For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt.			
Result All three transmit frequency modes comply with the maximum peak output power limit.. For test protocols please refer to Appendix 1, page 8-10.					
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	-10.23	4.30	-5.93	0.125 / 21.0	Pass
2441	-11.56	4.15	-7.41	0.125 / 21.0	Pass
2480	-12.32	4.50	-7.82	0.125 / 21.0	Pass

Subclause 15.247 (b) – Band edge compliance		Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 300 kHz / 1 MHz Supply voltage : 12VDC from AC/DC adapter Temperature : 23°C Humidity : 54%		
Requirement:	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.	
Result There is no peak found outside any 100 kHz 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 protocols refer to Appendix 1, page 11-13.		

Subclause 15.247 (c) – Spurious Conducted Emissions				Pass	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 12VDC from AC/DC adapter Temperature : 23°C Humidity : 54%					
Requirement:		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.			
Result 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 protocols refer to Appendix 1, page 14-20.					
Operating frequency MHz	Spurious frequency MHz	Spurious Level dBm	Reference value dBm	Delta dB	Verdict
2402	1186.520	-52.49	-11.09	-41.4	Pass
	4795.660	-53.08	-11.09	-41.99	Pass

2441	1206.460	-51.20	-11.82	-39.38	Pass
	4875.420	-52.47	-11.82	-40.65	Pass
2480	1226.400	-51.65	-12.42	-39.23	Pass
	4955.180	-51.17	-12.42	-38.75	Pass

Subclause 15.247 (c) – Spurious Radiated Emissions**Pass**

Test Specification : ANSI C63.4 - 1992
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
 Port of testing : Enclosure
 Detector : Peak
 RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz
 1 MHz / 3 MHz for $f > 1$ GHz
 Supply voltage : 12VDC from car battery
 Temperature : 23°C
 Humidity : 54%

Requirement: 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.

Result

All three transmit frequency modes comply with the field strength within the restricted bands.
 For test protocols refer to Appendix 1, page 21-68.

Tx frequency 2402MHz

Vertical Polarization

Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
112.000	17.80	11.60	0.80	-	-	30.20	43.5 / QP
176.000	12.80	15.60	1.00	-	-	29.40	43.5 / QP
4804.000	46.86	33.40	3.53	32.87	0.33	51.25	54.0 / P
4803.980	38.12	33.40	3.53	32.87	0.33	42.51	54.0 / A

Tx frequency 2402MHz

Horizontal Polarization

Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
128.000	21.80	13.00	0.90	-	-	35.70	43.5 / QP
160.000	18.70	14.70	0.90	-	-	34.30	43.5 / QP
208.000	10.40	16.70	1.10	-	-	28.20	43.5 / QP
4804.060	42.14	33.40	3.53	32.87	0.33	46.53	54.0 / P
4803.980	32.69	33.40	3.53	32.87	0.33	37.08	54.0 / A

Tx frequency 2441MHz Vertical Polarization							
Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
112.000	16.80	11.60	0.80	-	-	29.20	43.5 / QP
176.000	11.20	15.60	1.00	-	-	27.80	43.5 / QP
4882.020	48.00	33.40	3.53	32.87	0.33	52.39	54.0 / P
4882.020	41.95	33.40	3.53	32.87	0.33	46.34	54.0 / A
Tx frequency 2441MHz Horizontal Polarization							
Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
128.000	20.10	13.00	0.90	-	-	34.00	43.5 / QP
160.000	14.90	14.70	0.90	-	-	30.50	43.5 / QP
208.002	13.50	16.70	1.10	-	-	31.30	43.5 / QP
4882.000	43.09	33.40	3.53	32.87	0.33	47.48	54.0 / P
4881.980	36.96	33.40	3.53	32.87	0.33	41.35	54.0 / A
7323.180	37.44	37.10	4.56	34.15	0.18	45.13	54.0 / P
7322.960	30.54	37.10	4.56	34.15	0.18	38.23	54.0 / A
Tx frequency 2480MHz Vertical Polarization							
Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
112.000	17.30	11.60	0.80	-	-	29.70	43.5 / QP
176.000	11.30	15.60	1.00	-	-	27.90	43.5 / QP
208.000	7.70	16.70	1.10	-	-	25.50	43.5 / QP
224.000	6.30	17.00	1.10	-	-	24.40	43.5 / QP
4959.660	48.02	33.40	3.53	32.87	0.33	52.41	54.0 / P
4959.920	46.80	33.40	3.53	32.87	0.33	51.19	54.0 / A
Tx frequency 2480MHz Horizontal Polarization							
Freq	Reading	AF	Cable att.	Pre-amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
128.000	20.20	13.00	0.90	-	-	34.10	43.5 / QP
160.000	17.10	14.70	0.90	-	-	32.70	43.5 / QP
224.000	11.60	17.00	1.10	-	-	29.70	43.5 / QP
268.844	6.20	18.90	1.30	-	-	26.40	43.5 / QP
4959.960	44.86	33.40	3.53	32.87	0.33	49.25	54.0 / P
4960.000	39.58	33.40	3.53	32.87	0.33	43.97	54.0 / A
7439.400	39.37	37.10	4.56	34.15	0.18	47.06	54.0 / P
7439.980	34.24	37.10	4.56	34.15	0.18	41.93	54.0 / A

Appendix 1

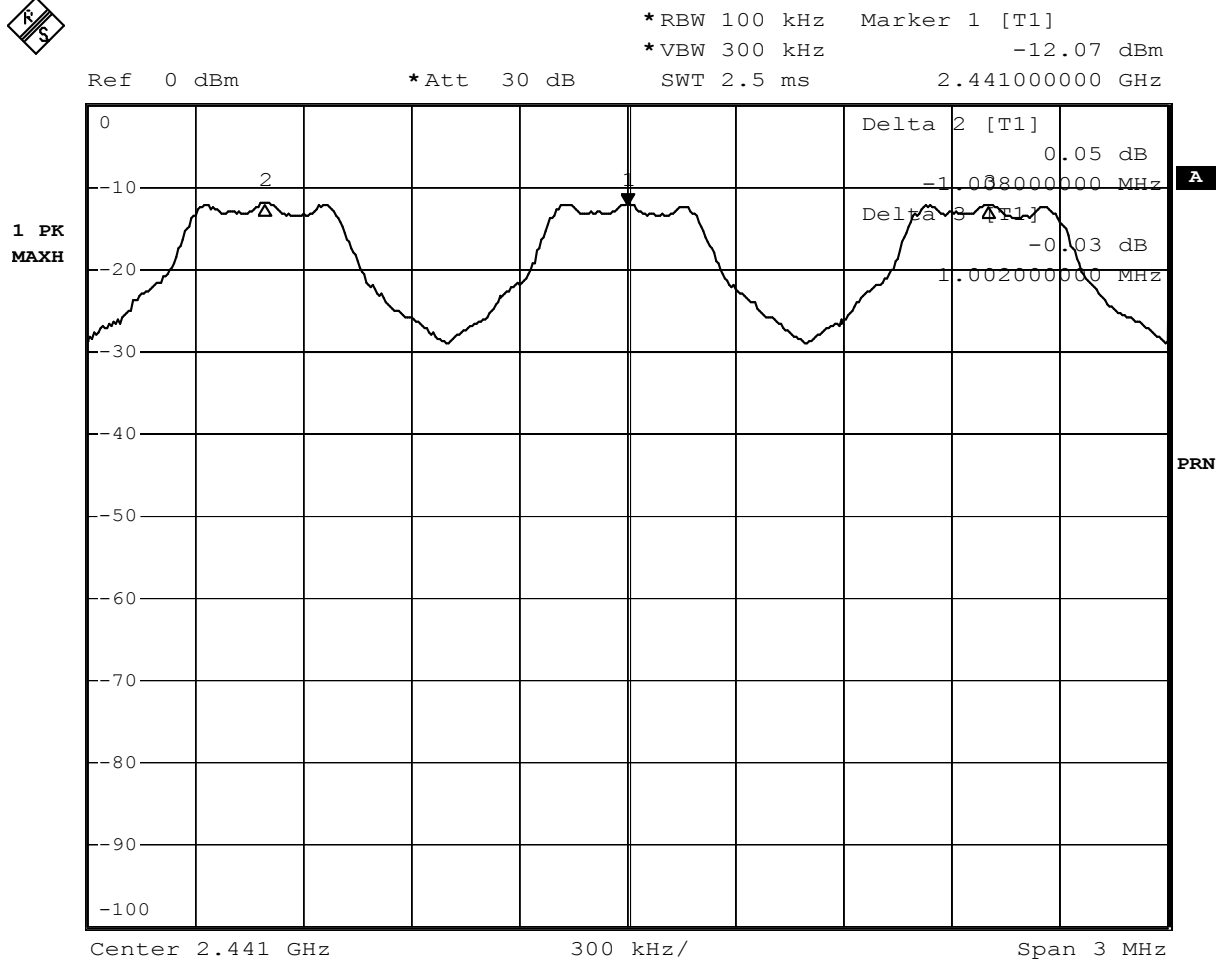
Test results

Carrier Frequency Separation

Date: 1 Jun 2004
 EUT: BTU-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)
 1.002

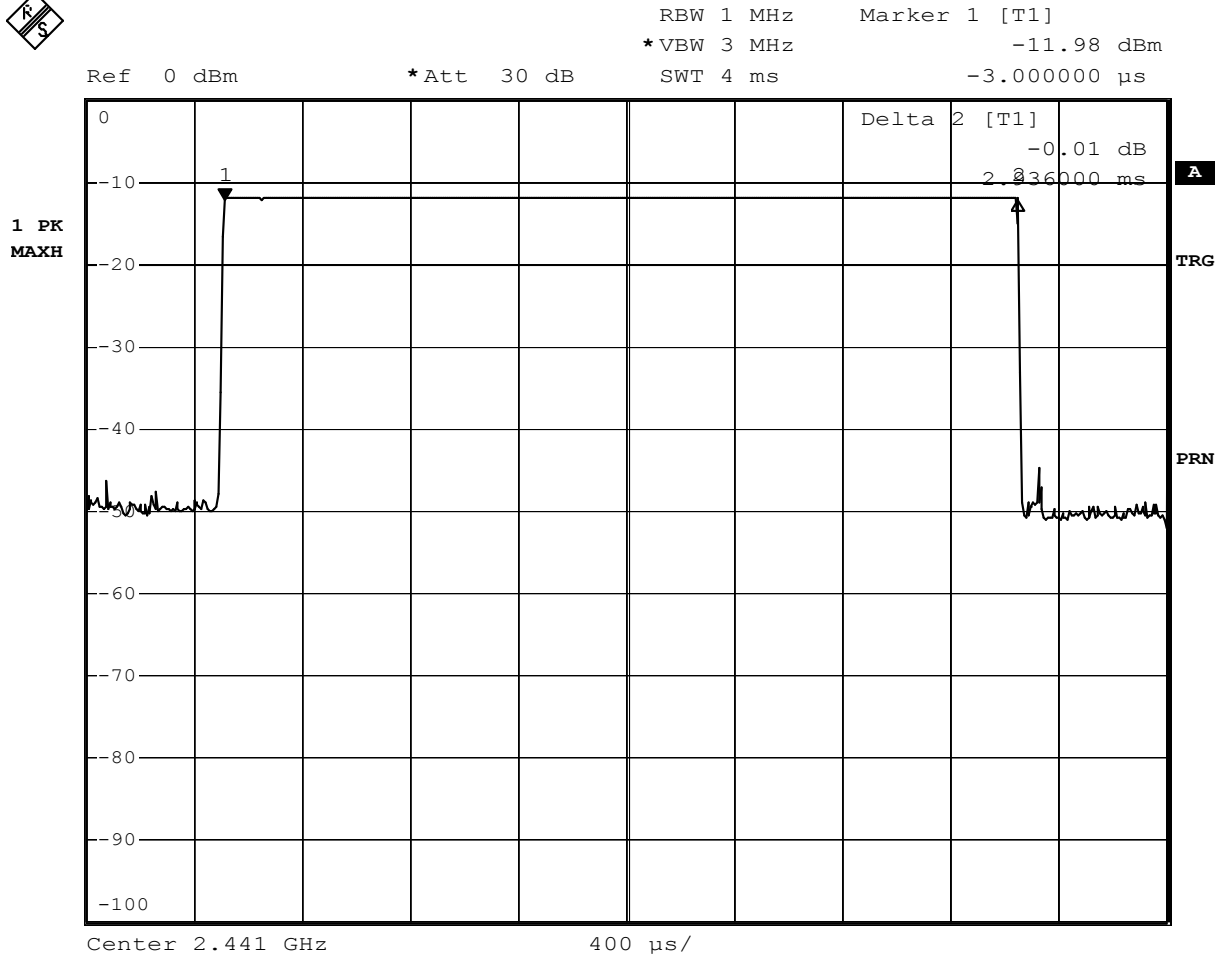


Date: 1.JUN.2004 16:39:42

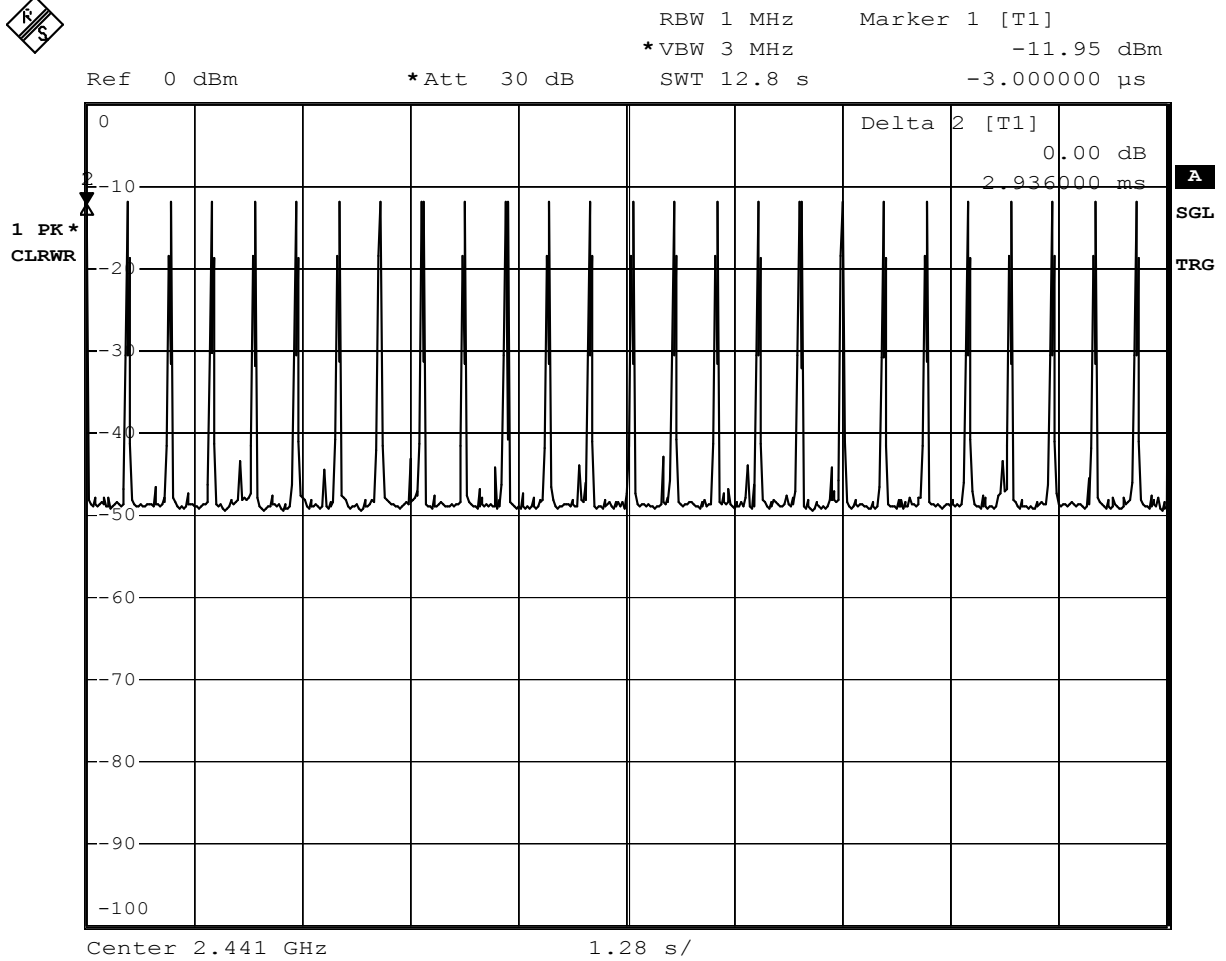
Dwell Time

Date: 1 Jun 2004
 EUT: BTU-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	26	$0.002936 \times 26 = 0.07634$	Pass



Date: 1.JUN.2004 16:43:31



Date: 1.JUN.2004 16:46:29

20dB Bandwidth

Date: 1 Jun 2004

EUT: BTU-02

Company: Unifat Technology Ltd.

Humidity: 50%

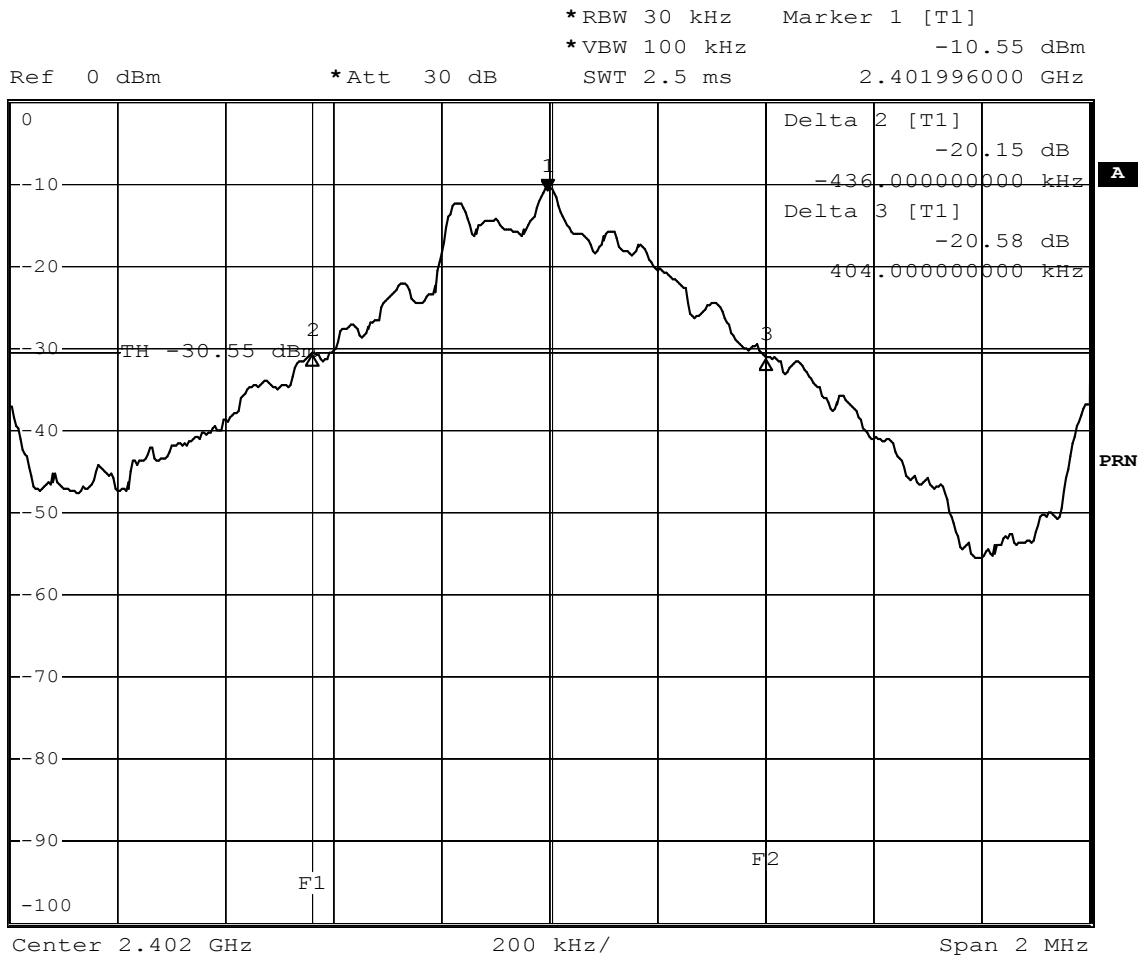
Temperature: 23°C

Voltage supply: 12VDC from AC/DC adapter

Test by: Hugo Wan

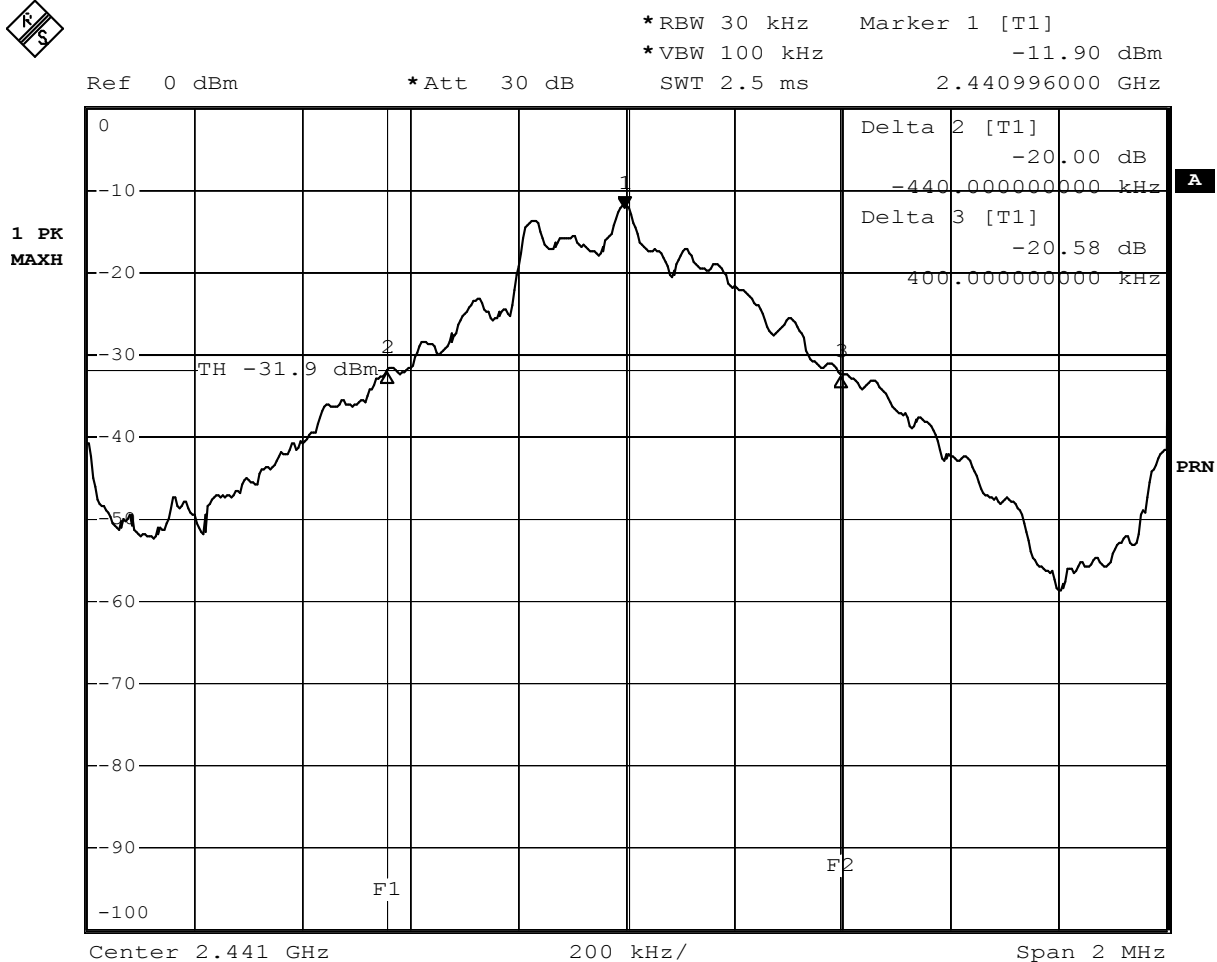
Op. mode: TX mode, DH5 with PRBS9 payload

Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$ \Delta f_H + \Delta f_L $ (MHz)	Results
2402	-0.436	0.404	0.840	Pass
2441	-0.440	0.400	0.840	Pass
2480	-0.440	0.400	0.840	Pass



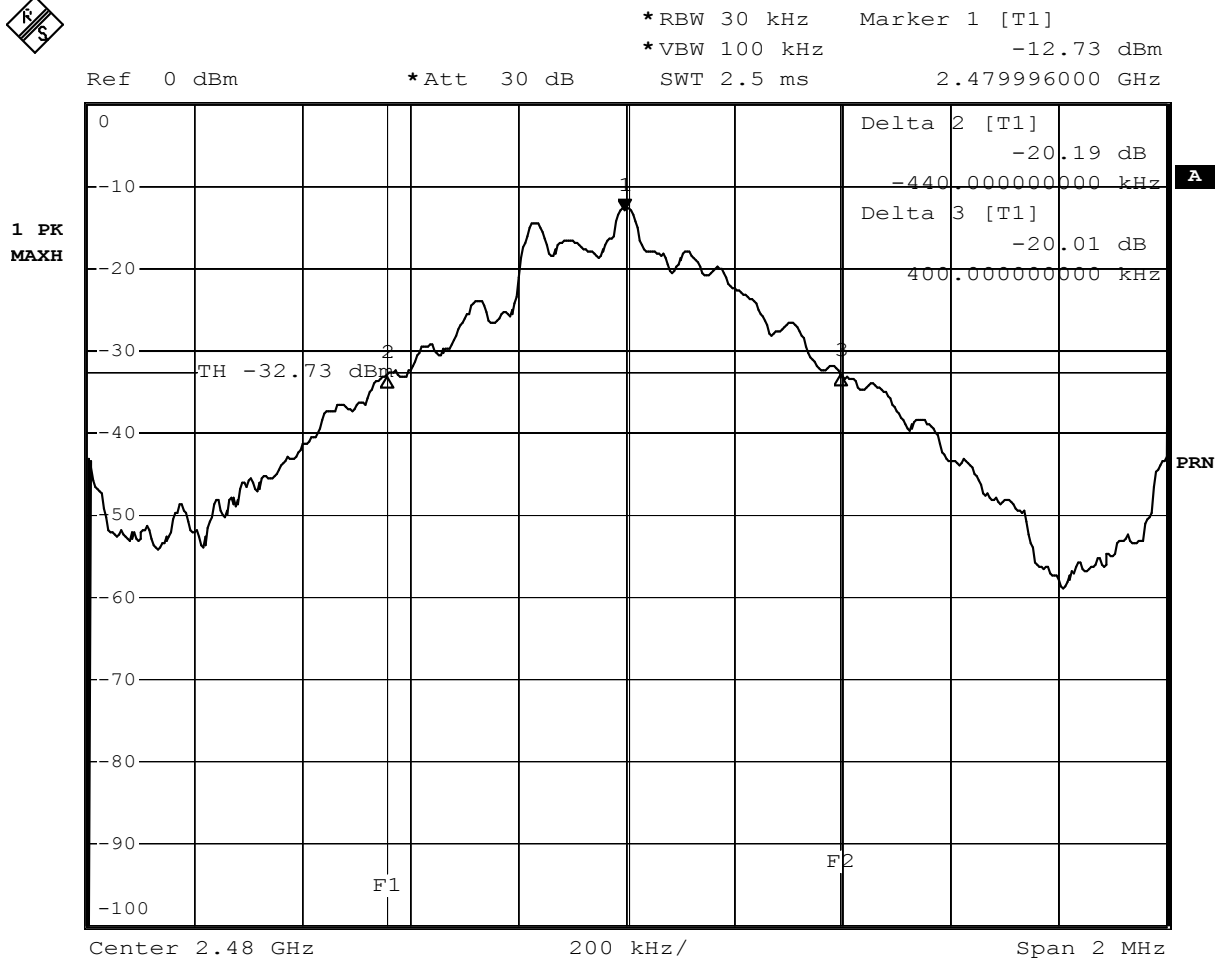
Date: 1.JUN.2004 16:49:54

Tx frequency: 2402MHz



Date: 1.JUN.2004 16:51:37

Tx frequency: 2441MHz



Date: 1.JUN.2004 16:54:42

Tx frequency: 2480MHz

Peak Output Power

Date: 1 Jun 2004

EUT: BTU-02

Company: Unifat Technology Ltd.

Humidity: 50%

Temperature: 23°C

Voltage supply: 12VDC from AC/DC adapter

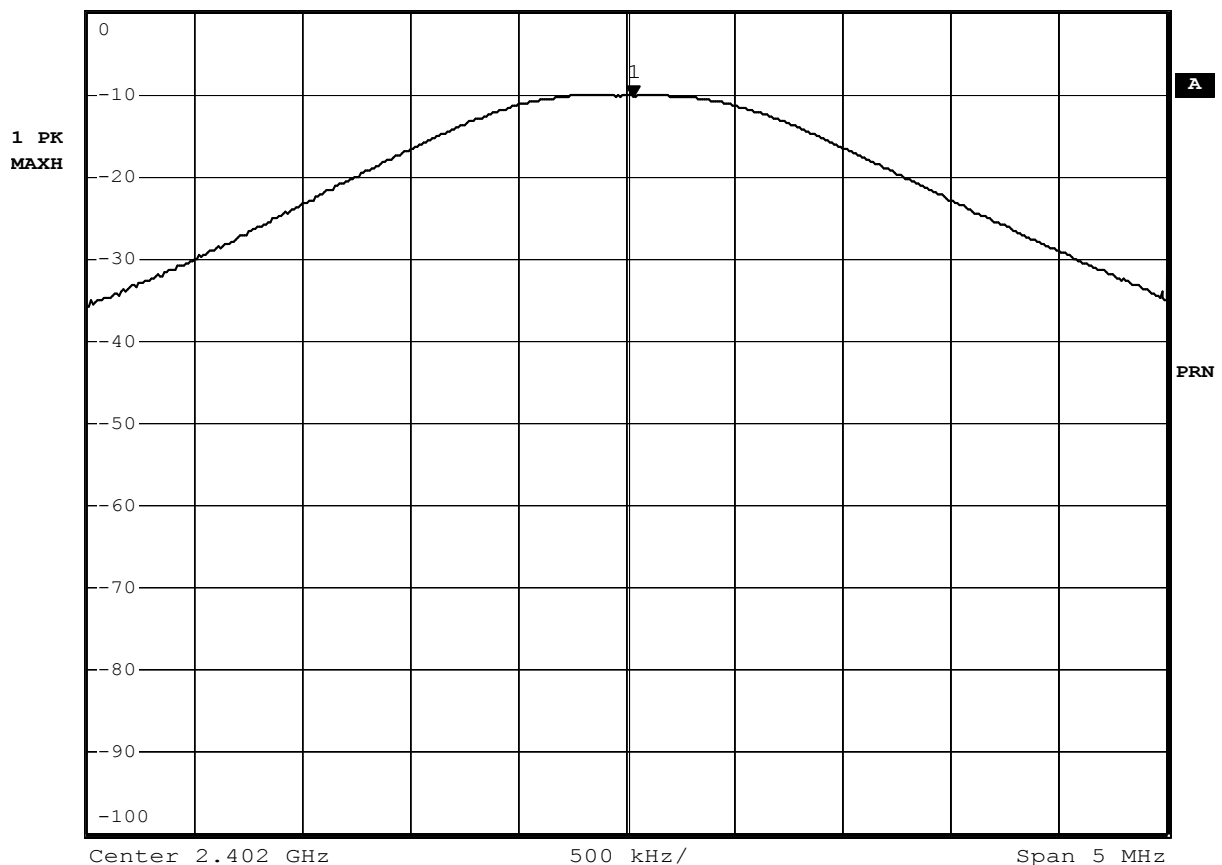
Test by: Hugo Wan

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	-10.23	-5.93	Pass
2441	4.15	-11.56	-7.41	Pass
2480	4.50	-12.32	-7.82	Pass

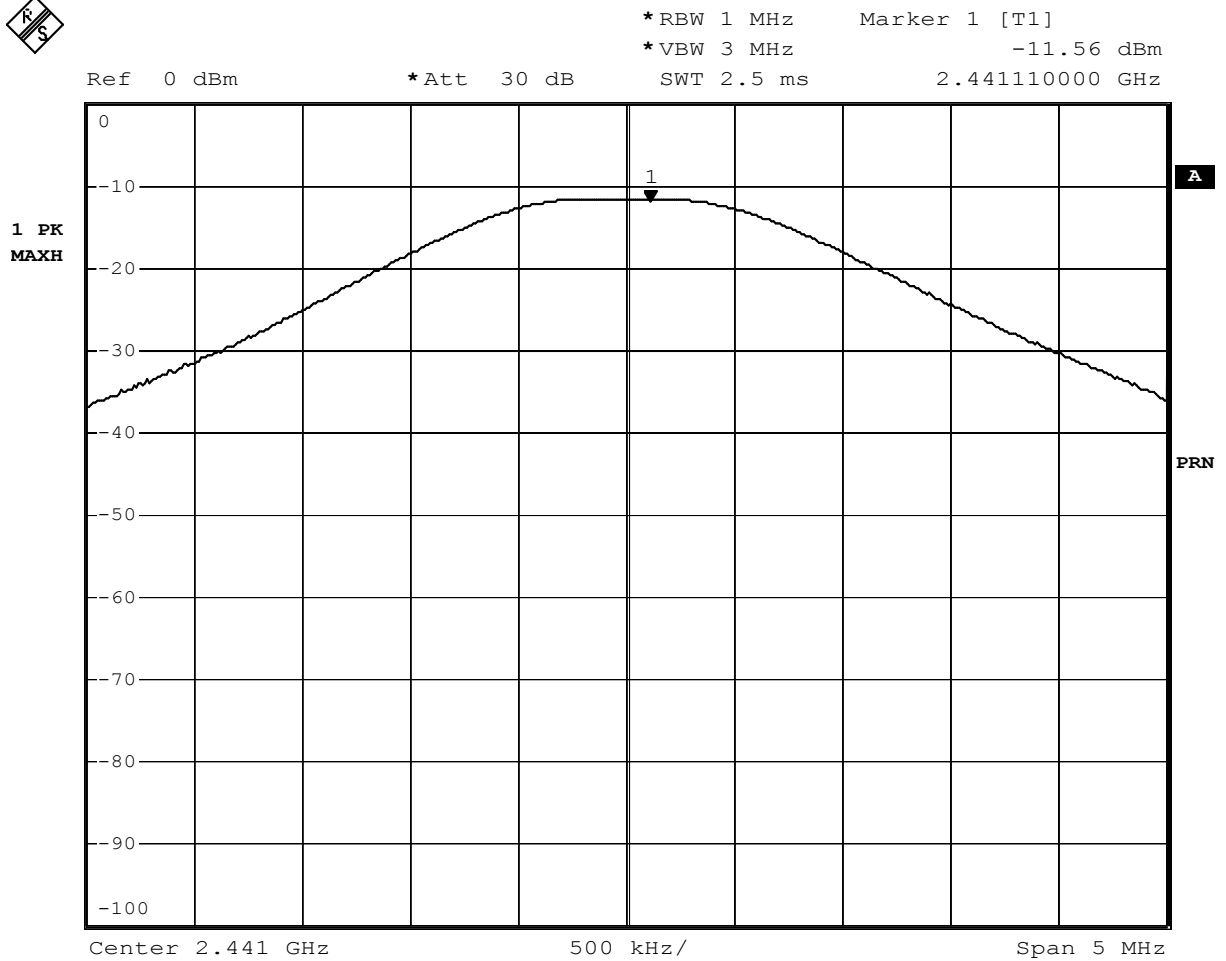


*RBW 1 MHz Marker 1 [T1]
 *VBW 3 MHz -10.23 dBm
 Ref 0 dBm *Att 30 dB SWT 2.5 ms 2.402030000 GHz



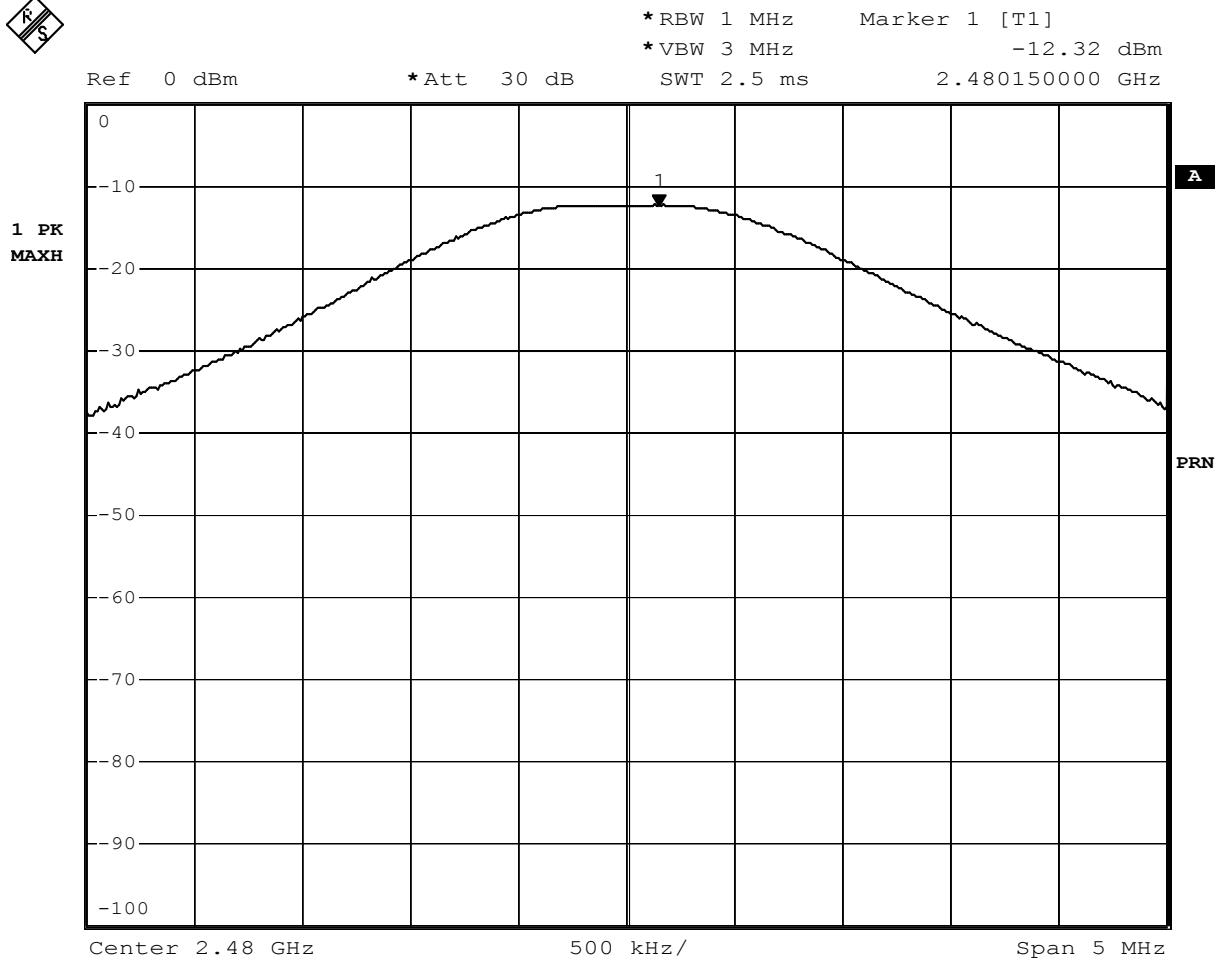
Date: 1.JUN.2004 15:10:30

Tx frequency: 2402MHz



Date: 1.JUN.2004 15:11:36

Tx frequency: 2441MHz



Date: 1.JUN.2004 15:12:19

Tx frequency: 2480MHz

Band Edge Compliance

Date: 1 Jun 2004

EUT: BTU-02

Company: Unifat Technology Ltd.

Humidity: 50%

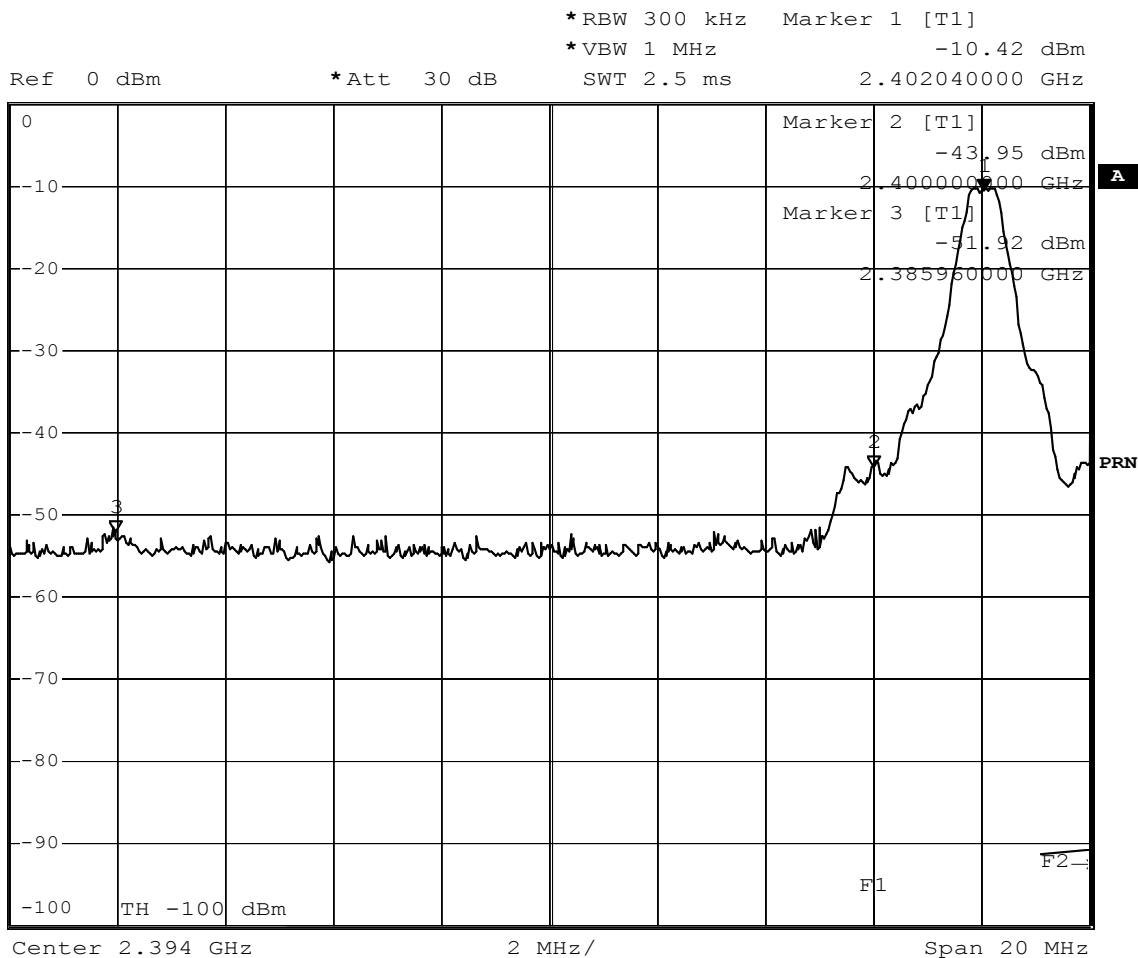
Temperature: 23°C

Voltage supply: 12VDC from AC/DC adapter

Test by: Hugo Wan

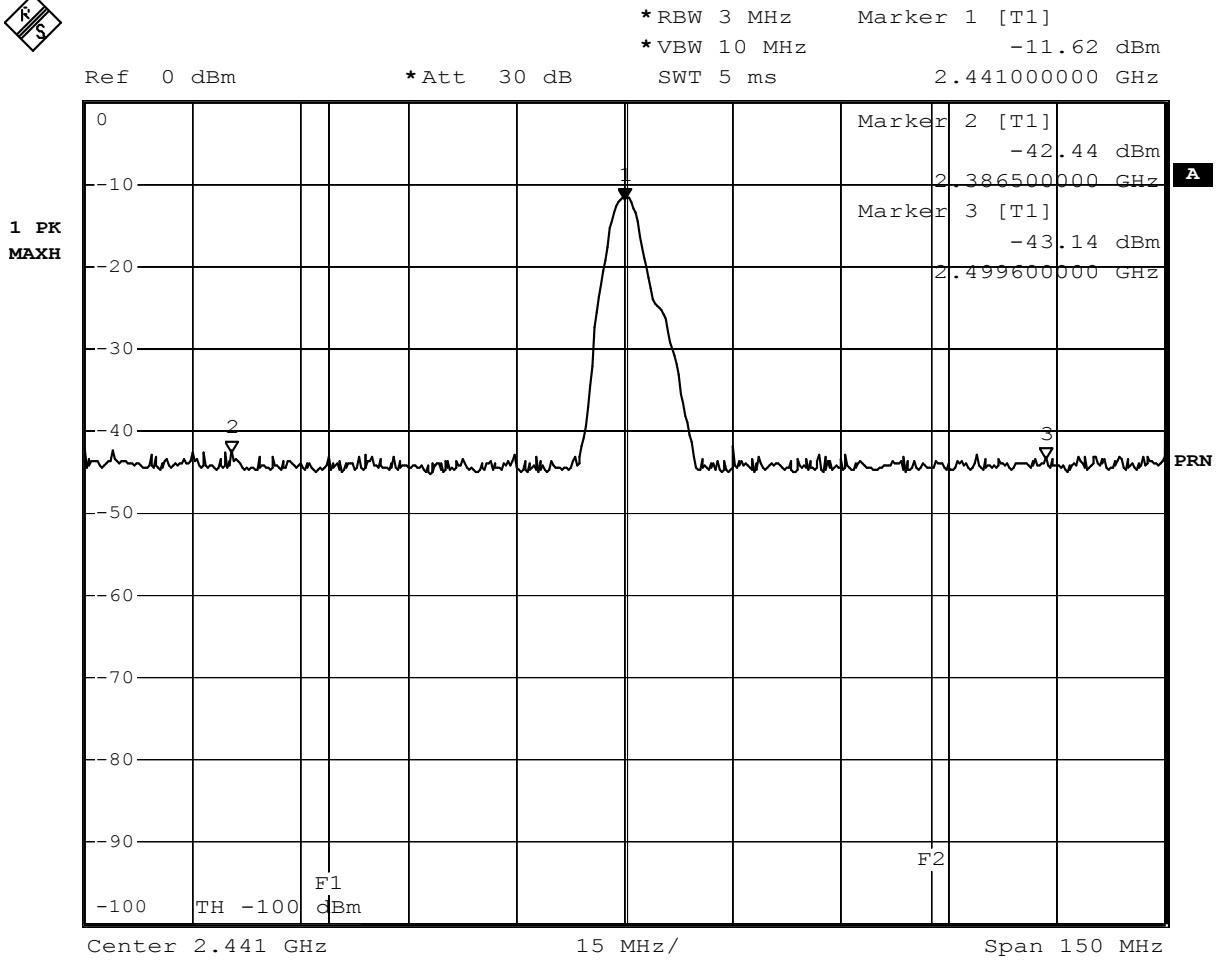
Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	-10.42	No Peak	-	Pass
2480	-12.70	No Peak	-	Pass



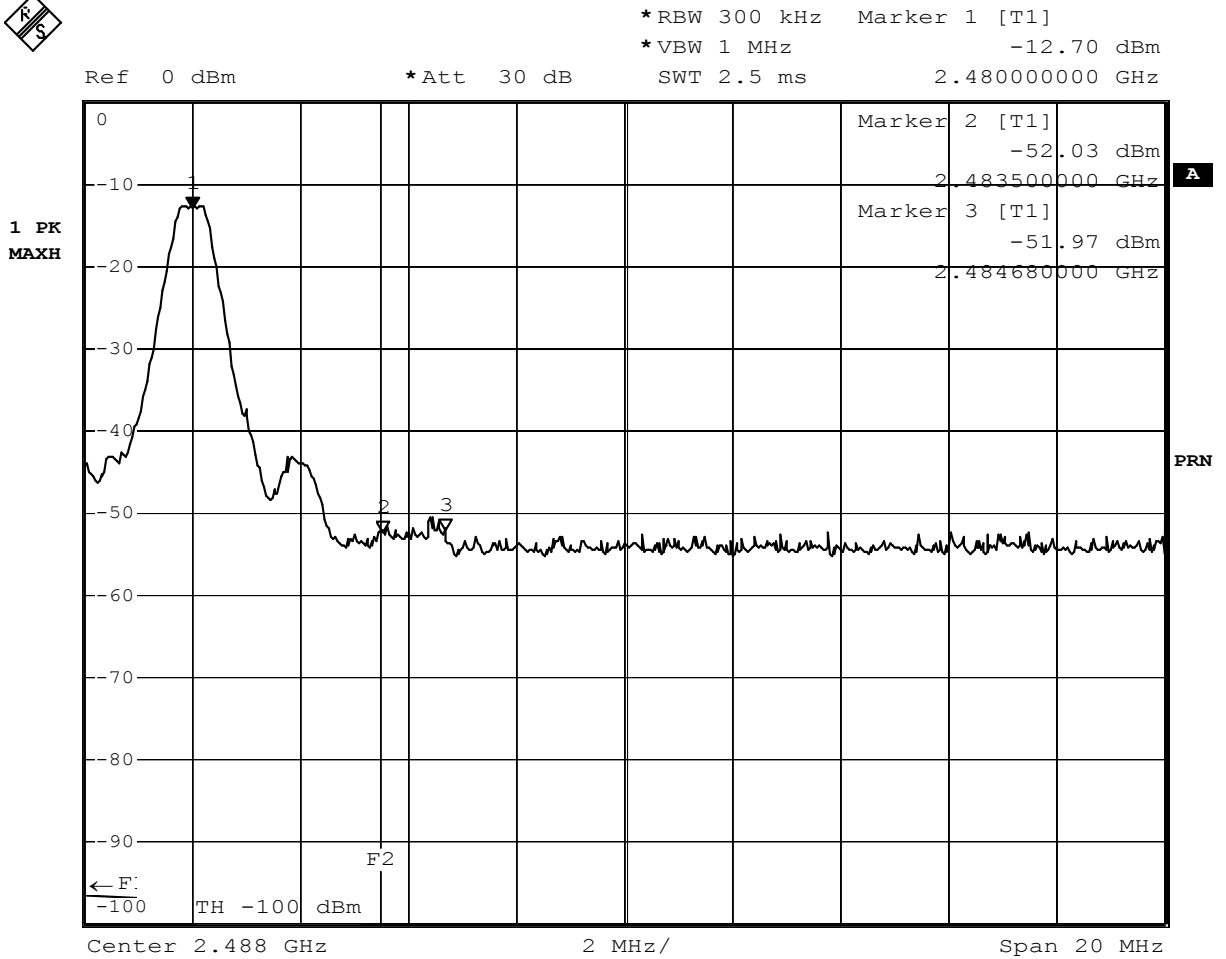
Date: 1.JUN.2004 16:58:56

Tx frequency: 2402MHz



Date: 1.JUN.2004 16:57:51

Tx frequency: 2441MHz



Date: 1.JUN.2004 16:56:58

Tx frequency: 2480MHz

Spurious Emissions - Conducted

Date: 1 Jun 2004

EUT: BTU-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

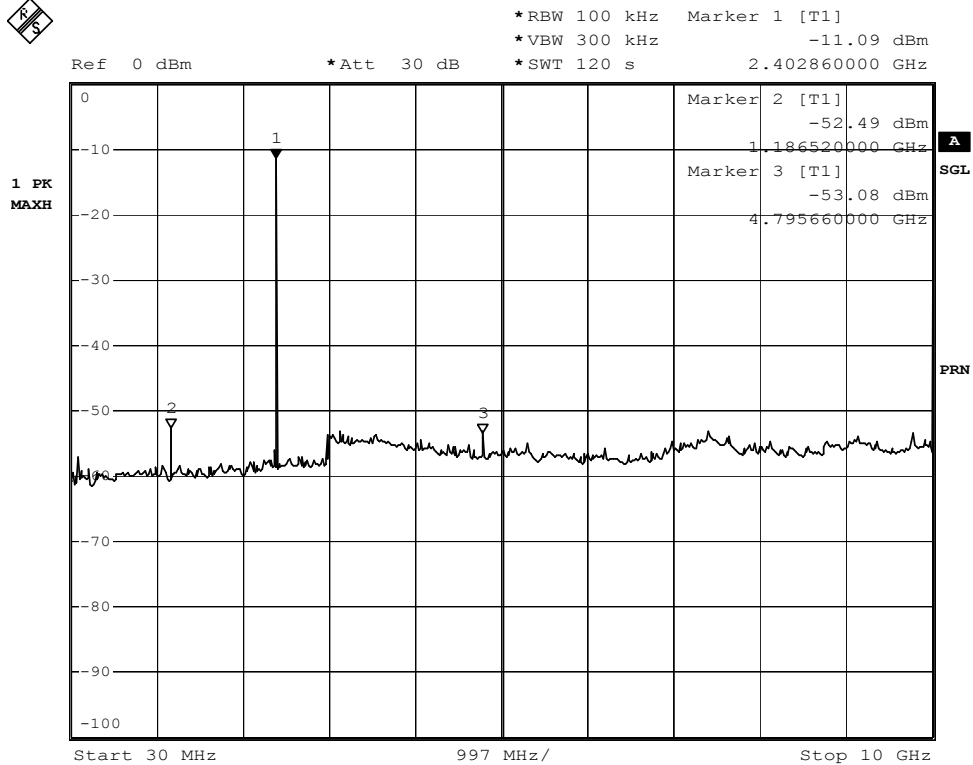
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
1186.520	-52.49	-11.09	-41.4	Pass
4795.660	-53.08	-11.09	-41.99	Pass

Tx frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
1206.460	-51.20	-11.82	-39.38	Pass
4875.420	-52.47	-11.82	-40.65	Pass

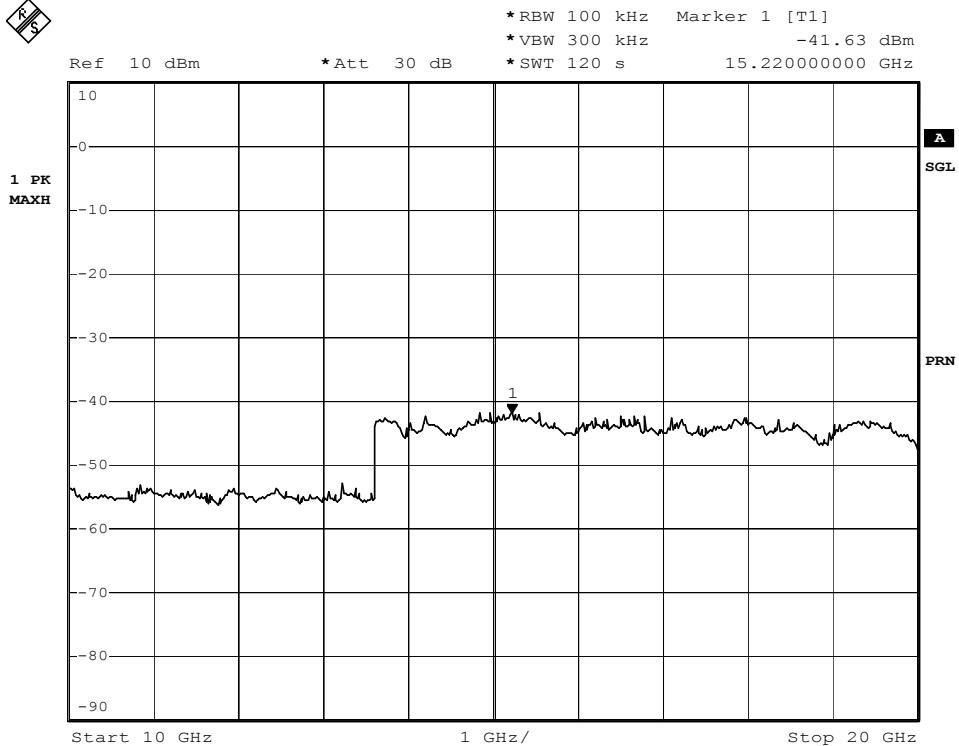
Tx frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
1226.400	-51.65	-12.42	-39.23	Pass
4955.180	-51.17	-12.42	-38.75	Pass



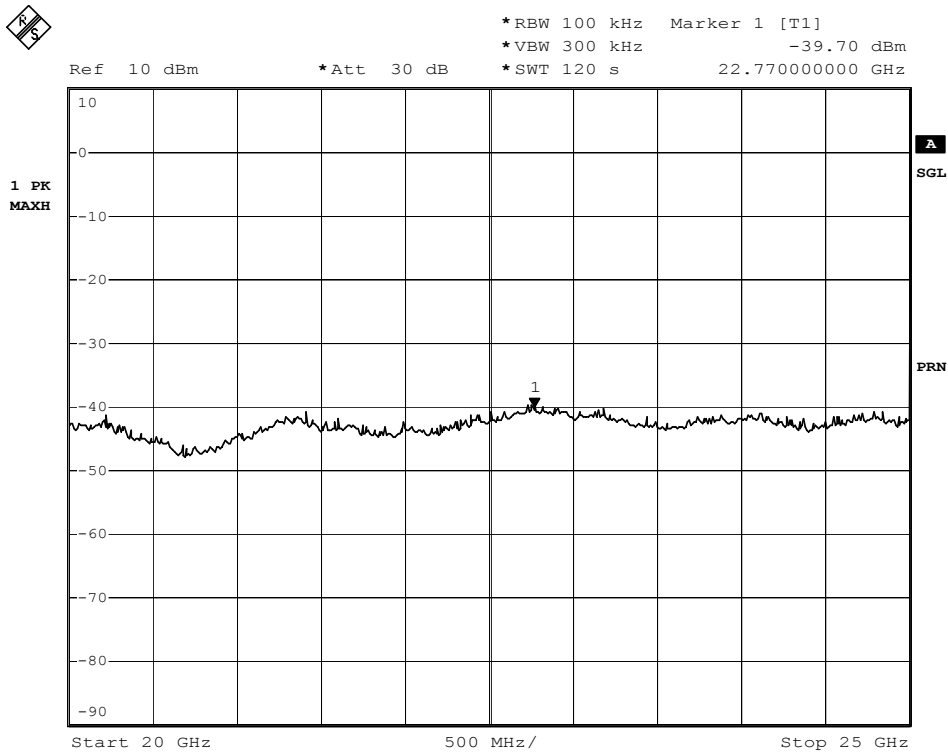
Date: 1.JUN.2004 15:34:26

Tx frequency: 2402MHz



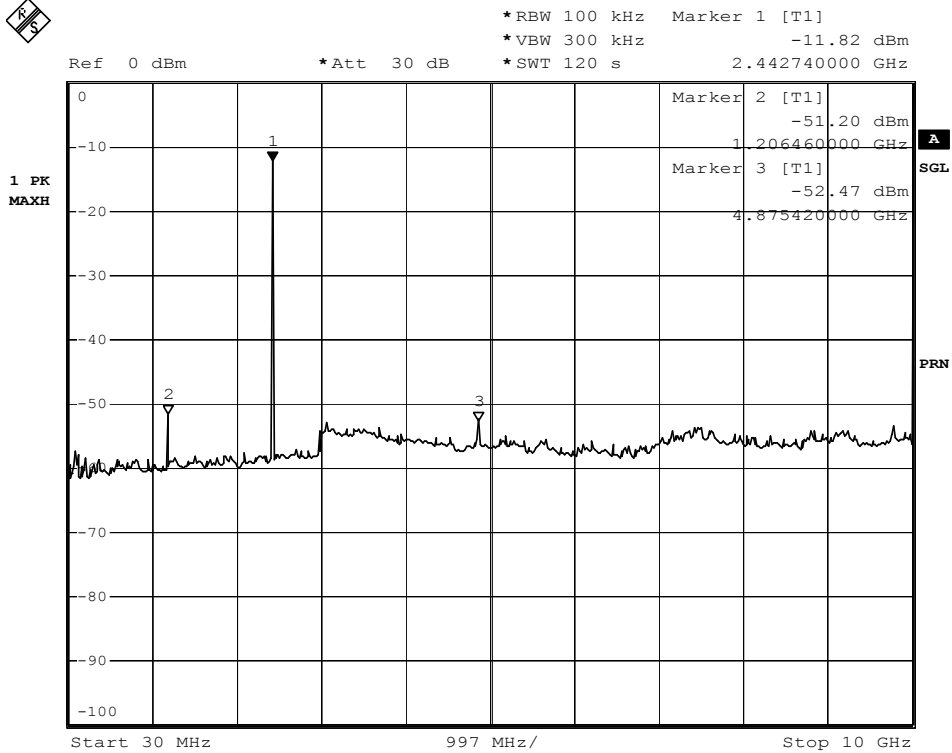
Date: 1.DEC.2003 18:33:18

Tx frequency: 2402MHz



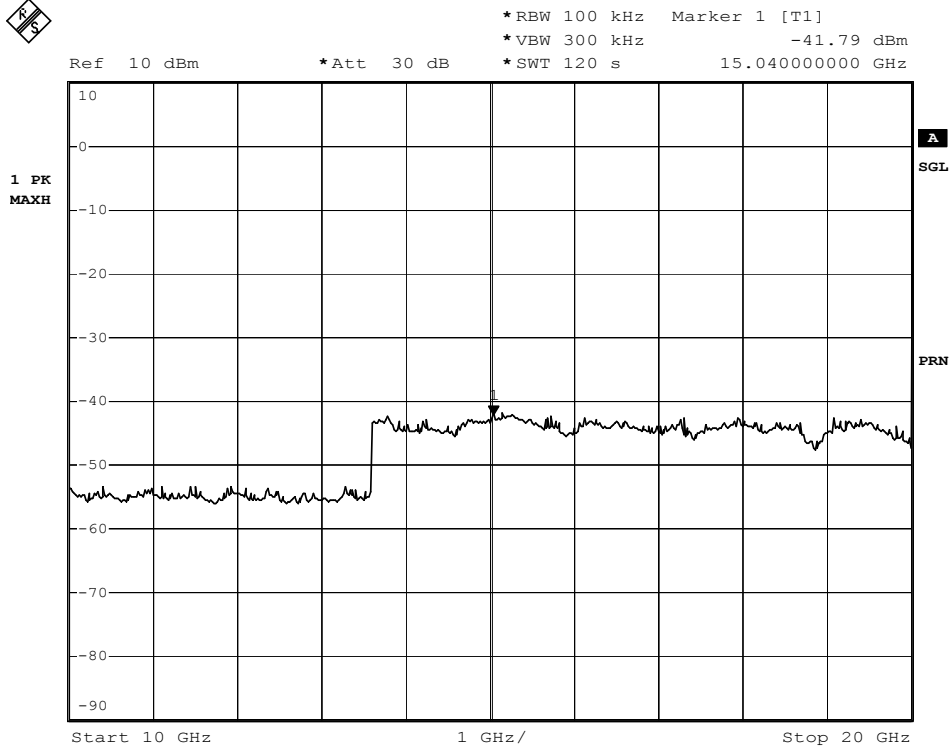
Date: 1.DEC.2003 18:35:42

Tx frequency: 2402MHz



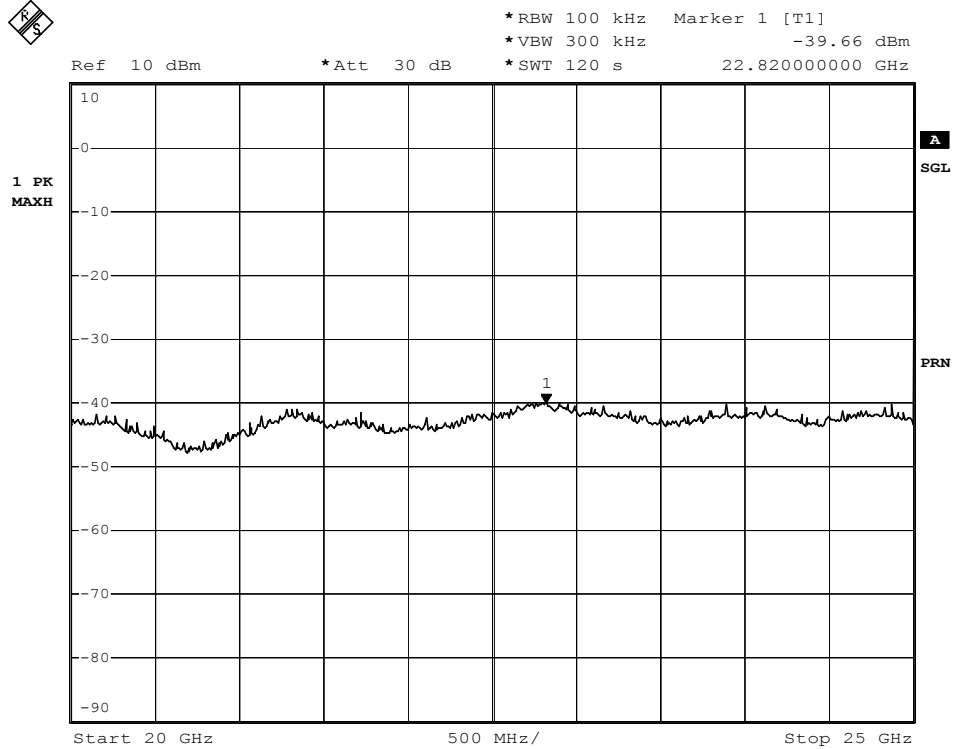
Date: 1.JUN.2004 15:32:13

Tx frequency: 2441MHz



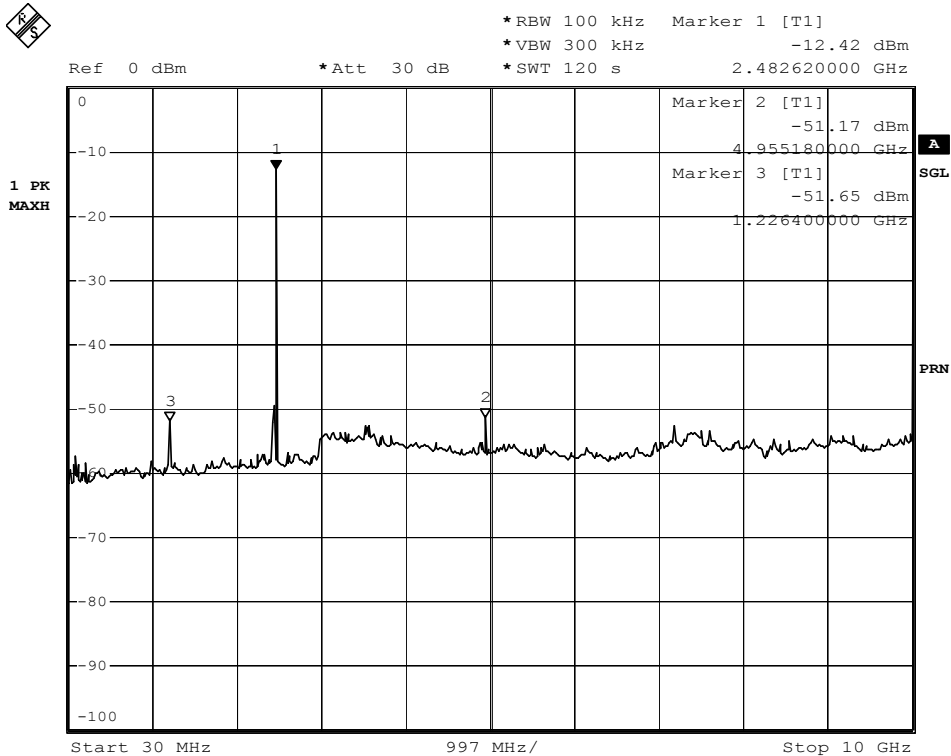
Date: 1.DEC.2003 18:43:57

Tx frequency: 2441MHz



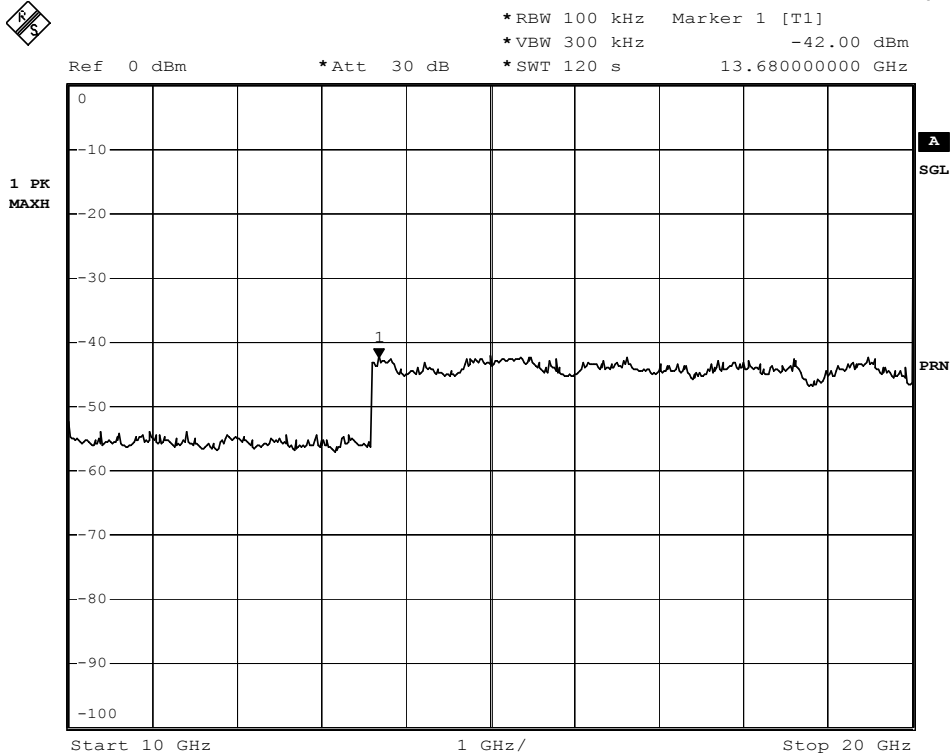
Date: 1.DEC.2003 18:47:52

Tx frequency: 2441MHz



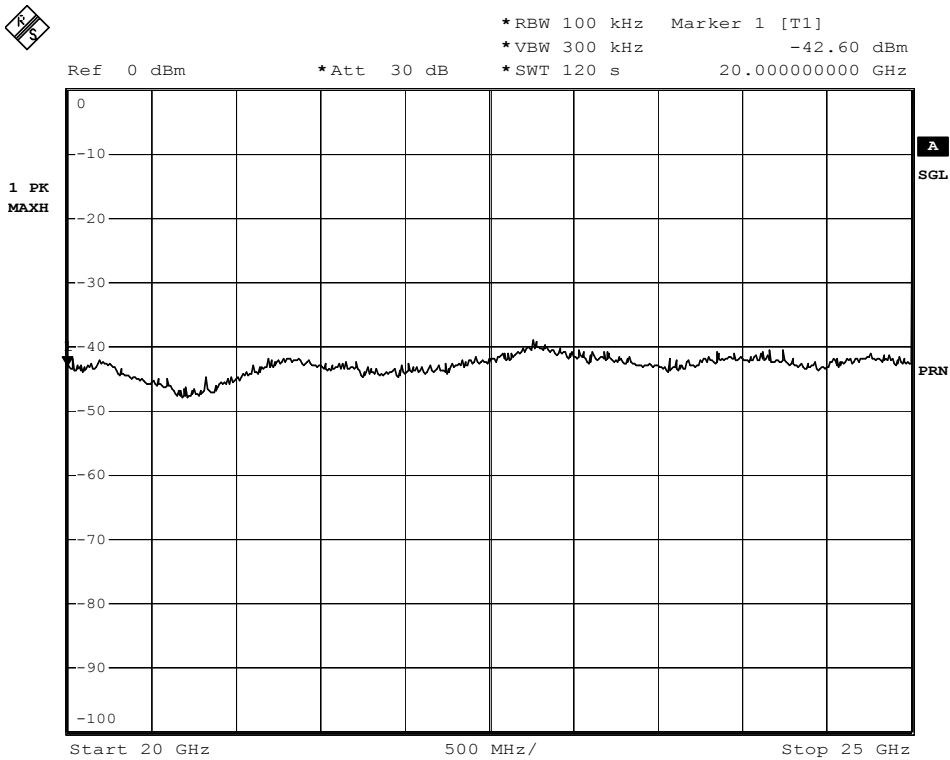
Date: 1.JUN.2004 15:18:25

Tx frequency: 2480MHz



Date: 1.JUN.2004 15:21:14

Tx frequency: 2480MHz



Date: 1.JUN.2004 15:28:41

Tx frequency: 2480MHz

Spurious Emissions - Radiated

Date: 27 May 2004

EUT: BTU-02

Company: Unifat Technology Ltd.

Voltage supply: 12VDC from car battery

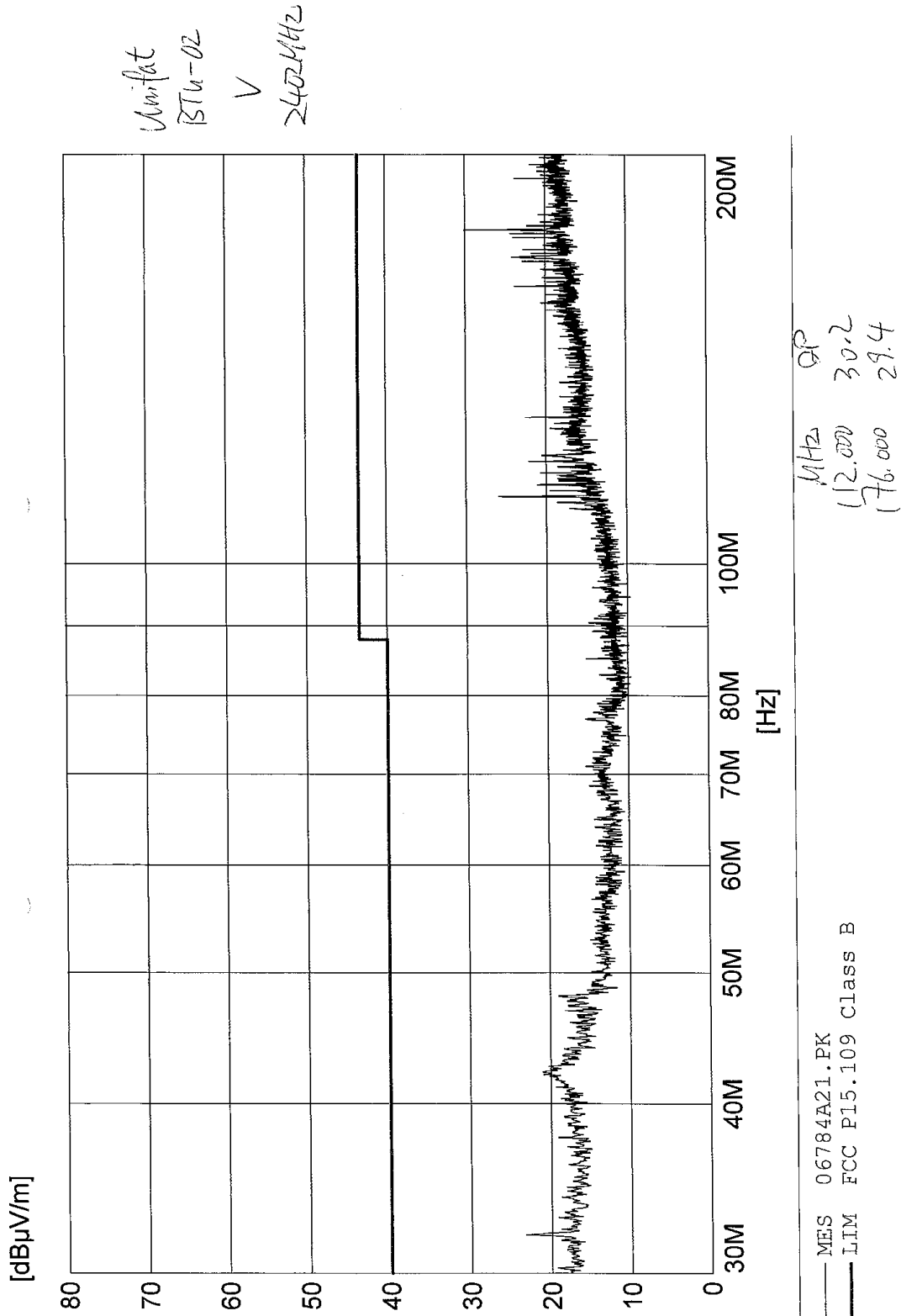
Test by: Hugo Wan

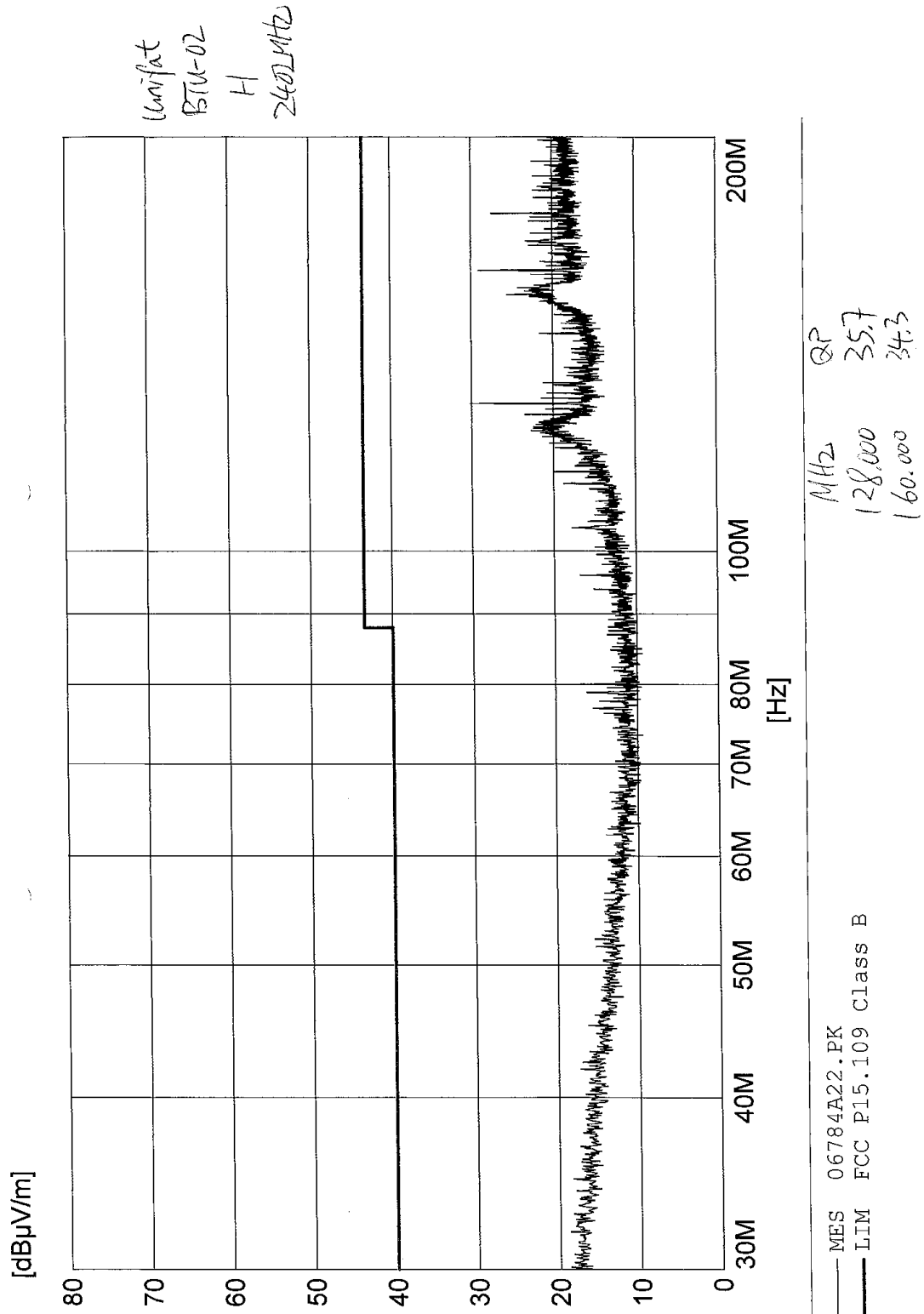
Op. mode: TX mode, DH1 with PRBS9 payload

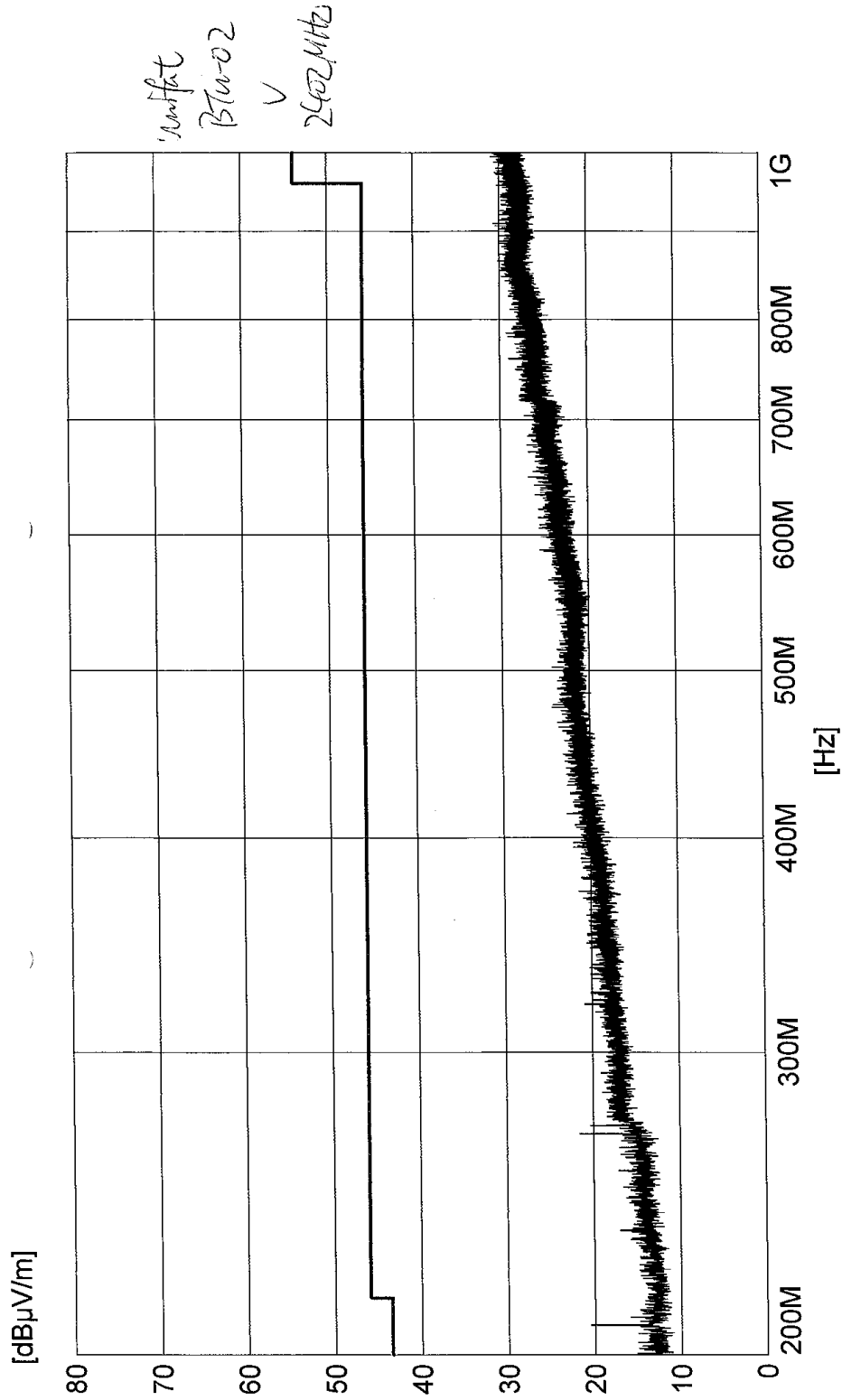
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2402	V	112.000	30.2	QP
2402	V	176.000	29.4	QP
2402	V	4804.000	51.25	P
2402	V	4803.980	42.51	A
2402	H	128.000	35.7	QP
2402	H	160.000	34.3	QP
2402	H	208.000	28.2	QP
2402	H	4804.060	46.53	P
2402	H	4803.980	37.08	A

Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2441	V	112.000	29.2	QP
2441	V	176.000	27.8	QP
2441	V	4882.020	52.39	P
2441	V	4882.020	46.34	A
2441	H	128.000	34.0	QP
2441	H	160.000	30.5	QP
2441	H	208.002	31.3	QP
2441	H	4882.000	47.48	P
2441	H	4881.980	41.35	A
2441	H	7323.180	45.13	P
2441	H	7322.960	38.23	A

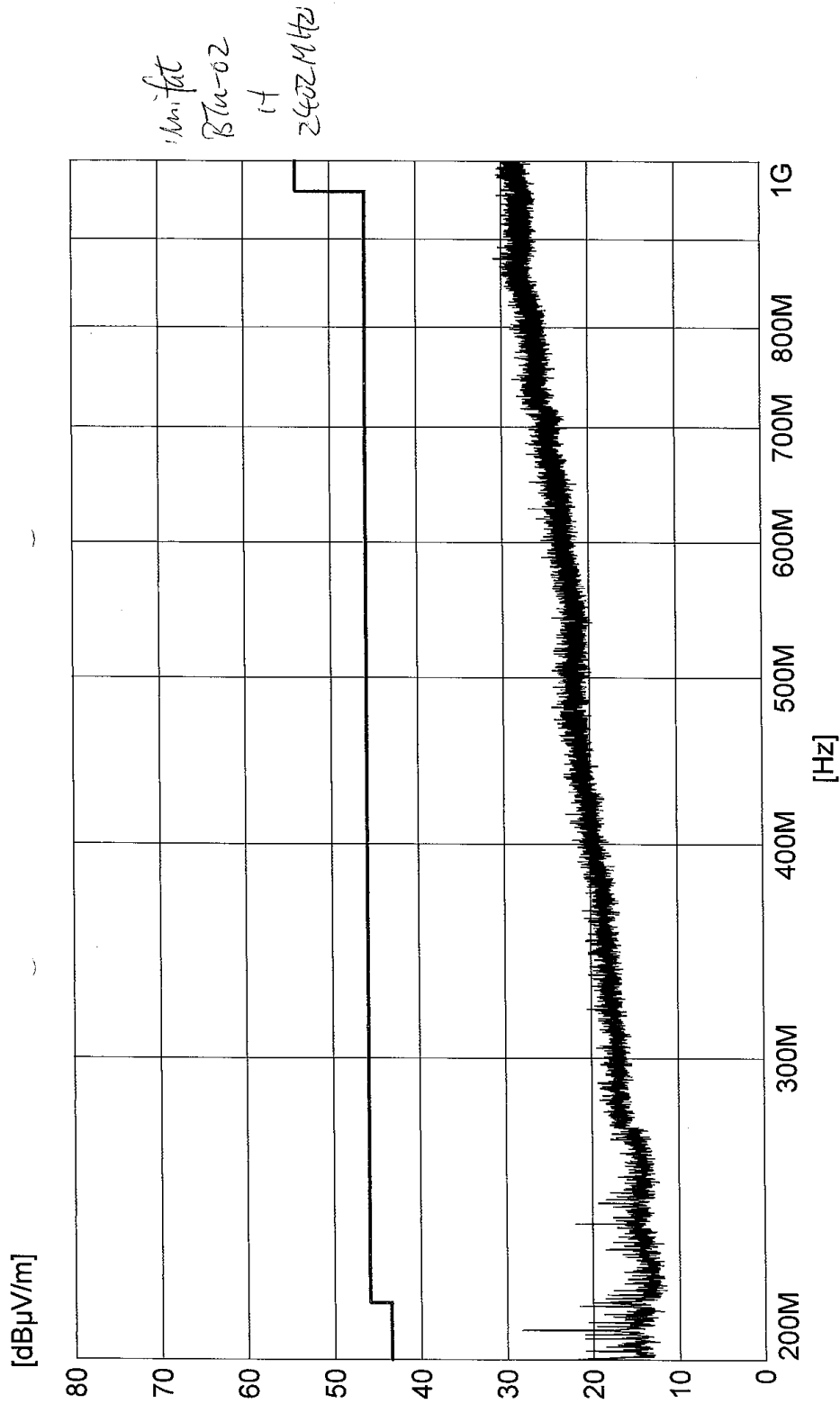
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2480	V	112.000	29.7	QP
2480	V	176.000	27.9	QP
2480	V	208.000	25.5	QP
2480	V	224.000	24.0	QP
2480	V	4959.660	52.41	P
2480	V	4959.920	51.19	A
2480	H	128.000	34.1	QP
2480	H	160.000	32.7	QP
2480	H	224.000	29.7	QP
2480	H	268.844	26.4	QP
2480	H	4959.960	49.25	P
2480	H	4960.000	43.97	A
2480	H	7439.400	47.06	P
2480	H	7439.980	41.93	A





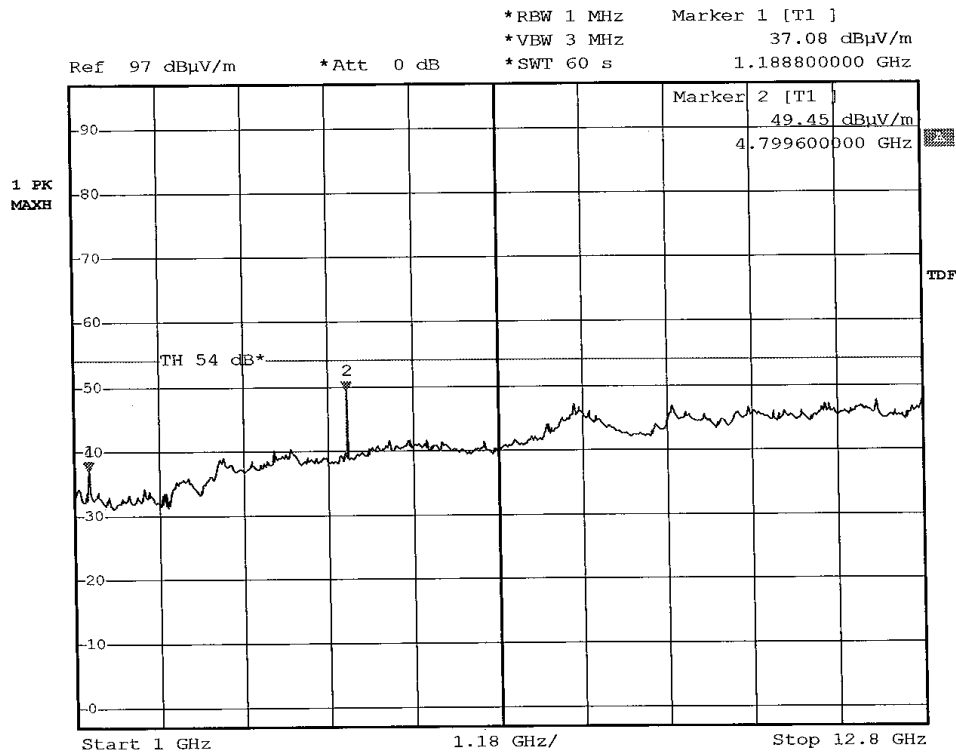


— MES TUV010404A03.PK
 — LIM FCC P15.247 (USA)



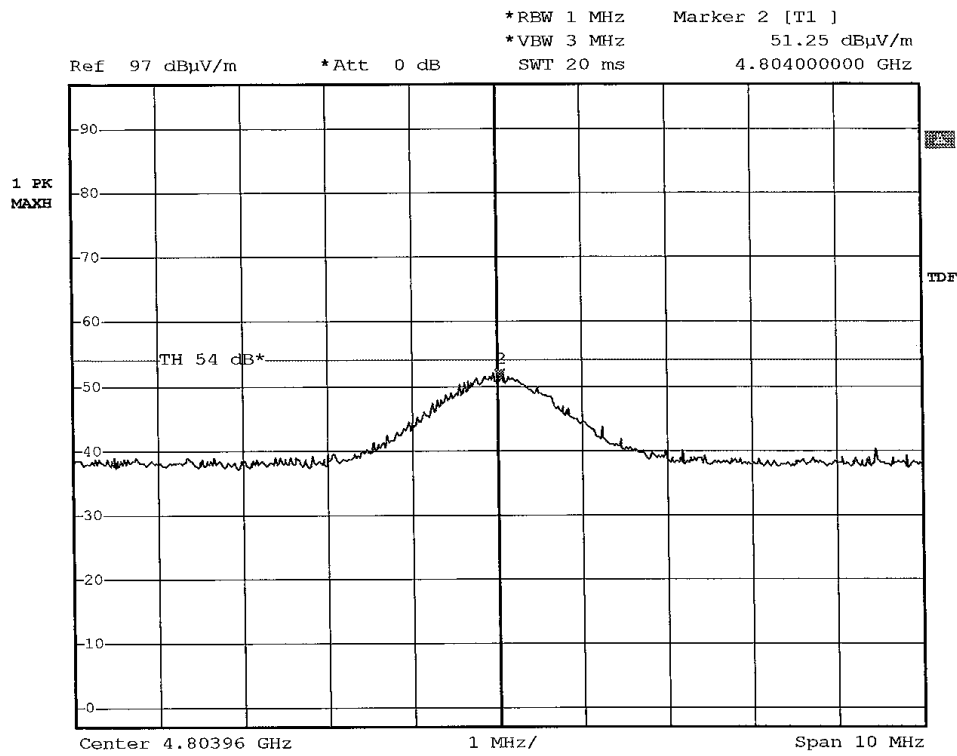
MHz QP
208.000 282

— MES TUV010404A04.PK
— LIM FCC P15.247 (USA)



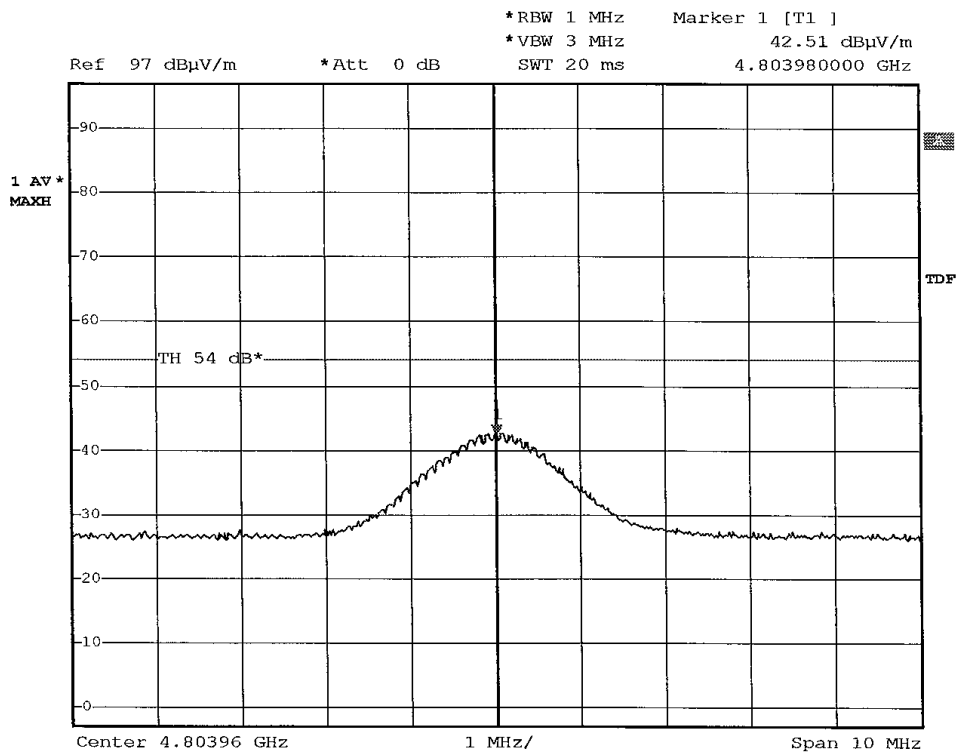
Date: 27.MAY.2004 09:55:05

BTU-02
 2402 MHz
 ✓



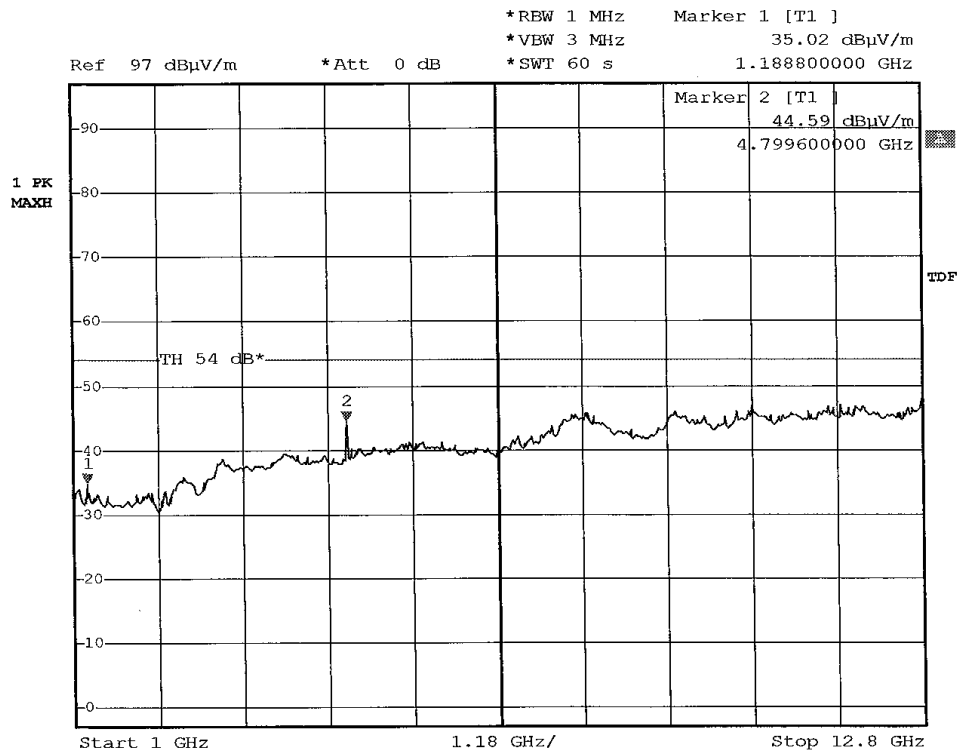
Date: 27.MAY.2004 10:01:33

BTU-02
2402MHz
✓



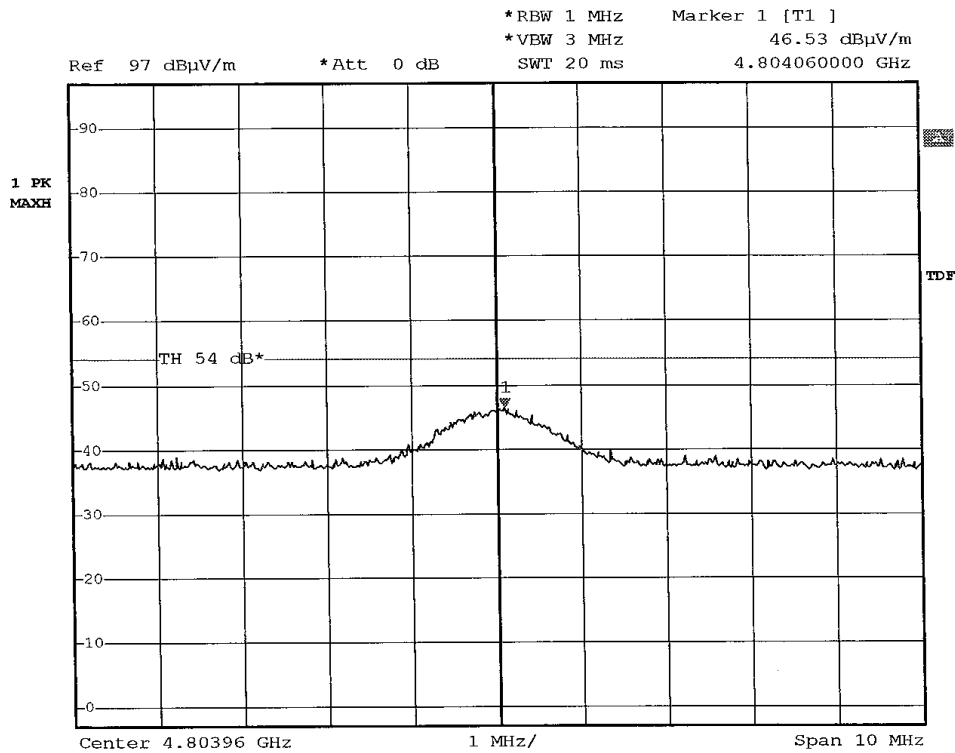
Date: 27.MAY.2004 10:29:21

BTU-02
 2402 MHz
 V



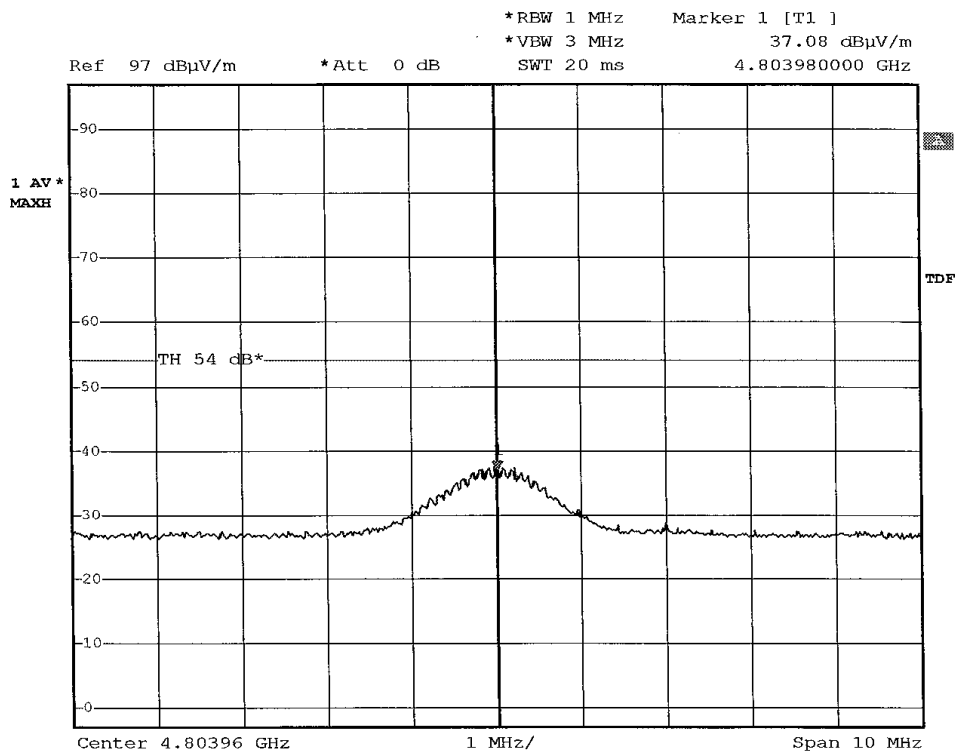
Date: 27.MAY.2004 09:57:49

BTu-02
 2402MHz
 H



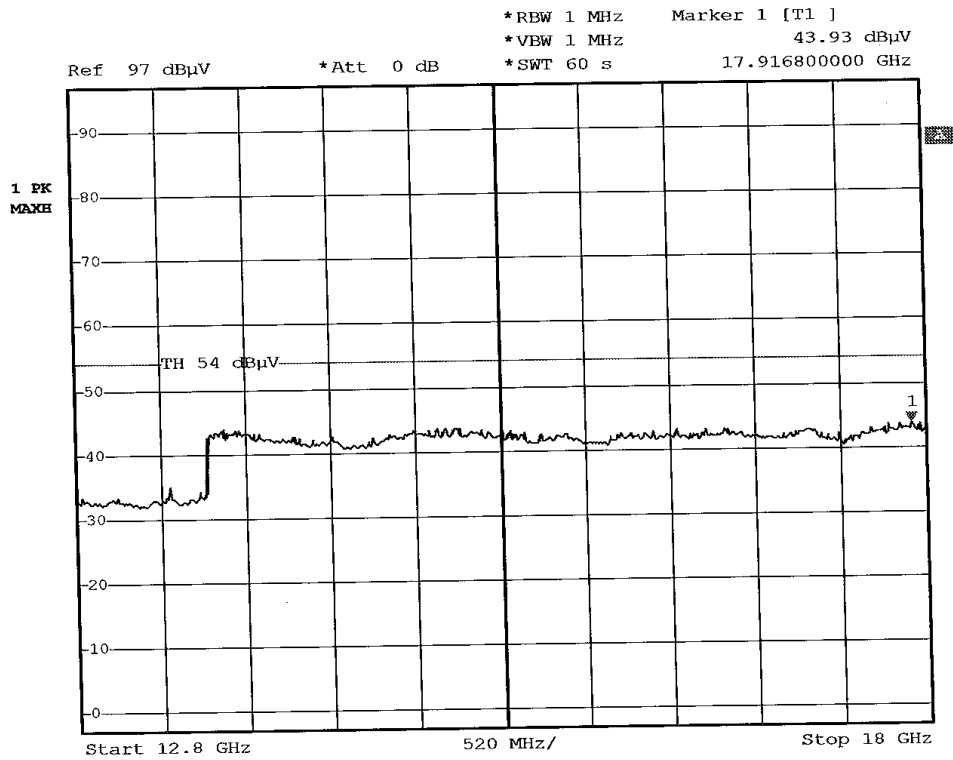
Date: 27.MAY.2004 10:34:23

BTM-02
2402MHz
1-1



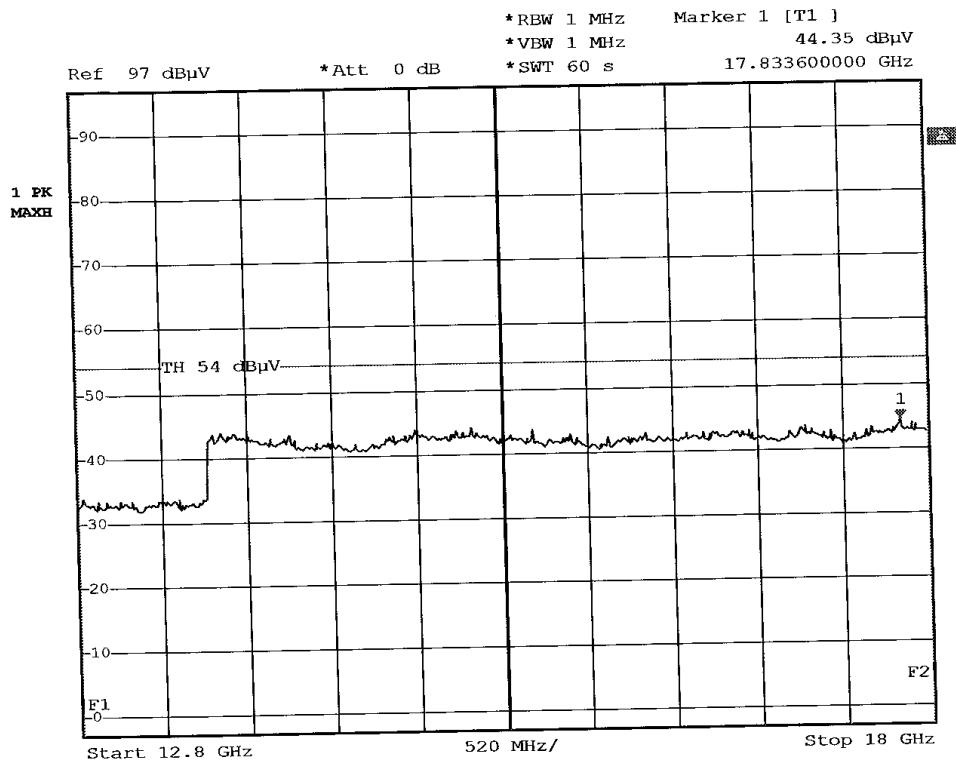
Date: 27.MAY.2004 10:35:19

BTM-02
 2402MHz
 H



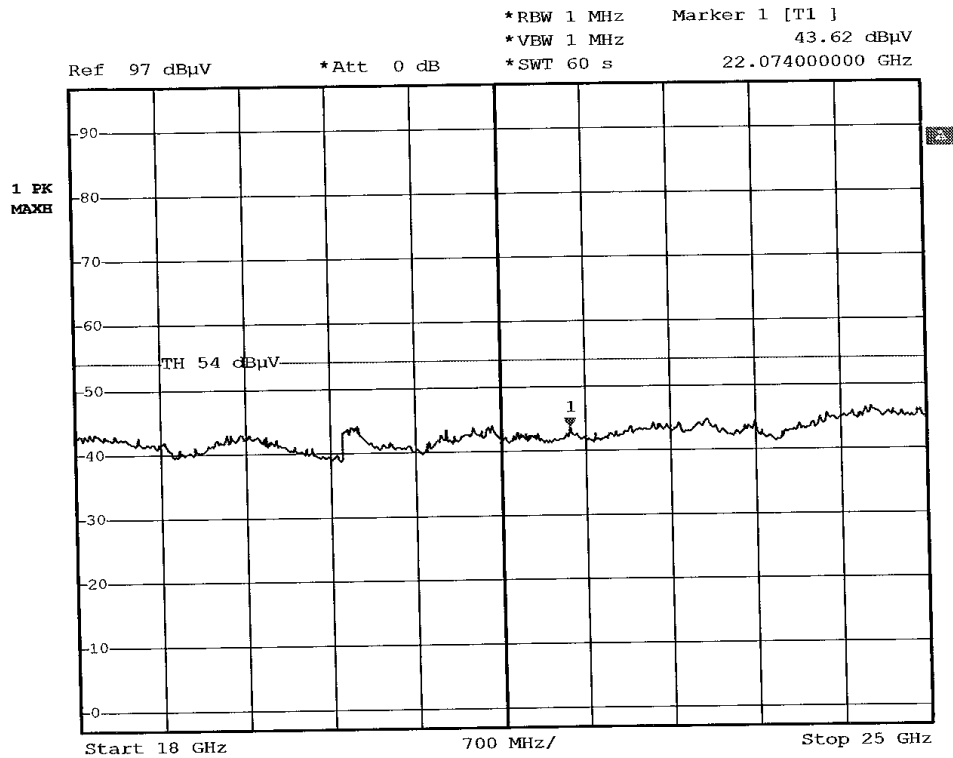
Date: 27.NOV.2003 12:46:44

unfat
 BTU-02
 2402 MHz
 V
 FCC



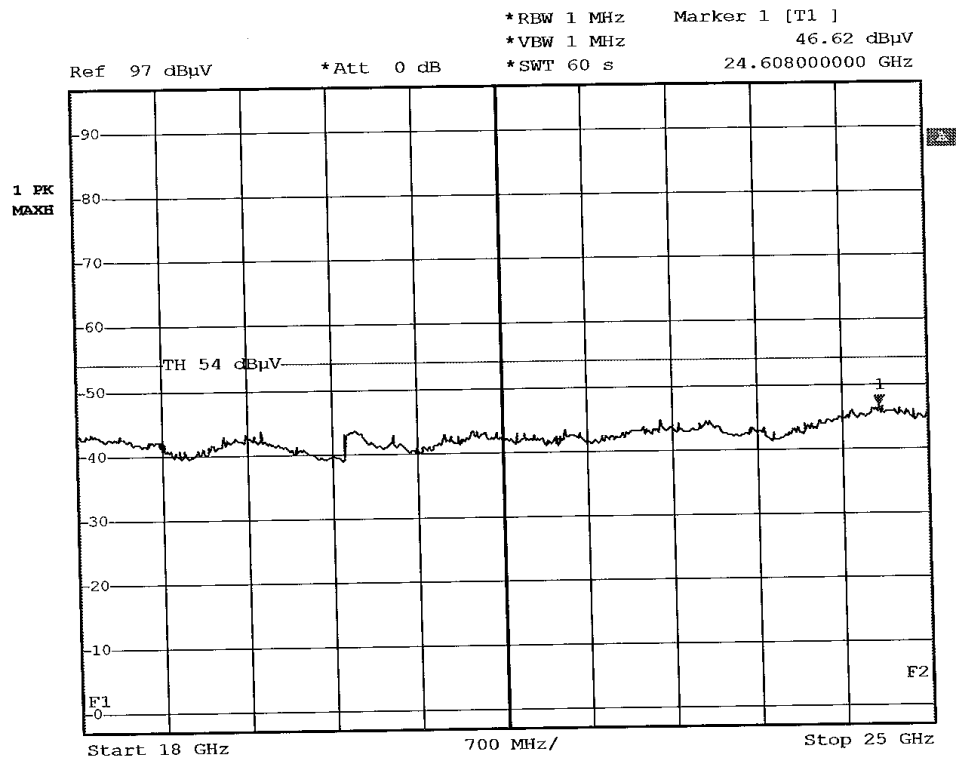
Date: 27.NOV.2003 12:42:34

Unifut
 BTH-02
 2402MHz
 H
 FCC



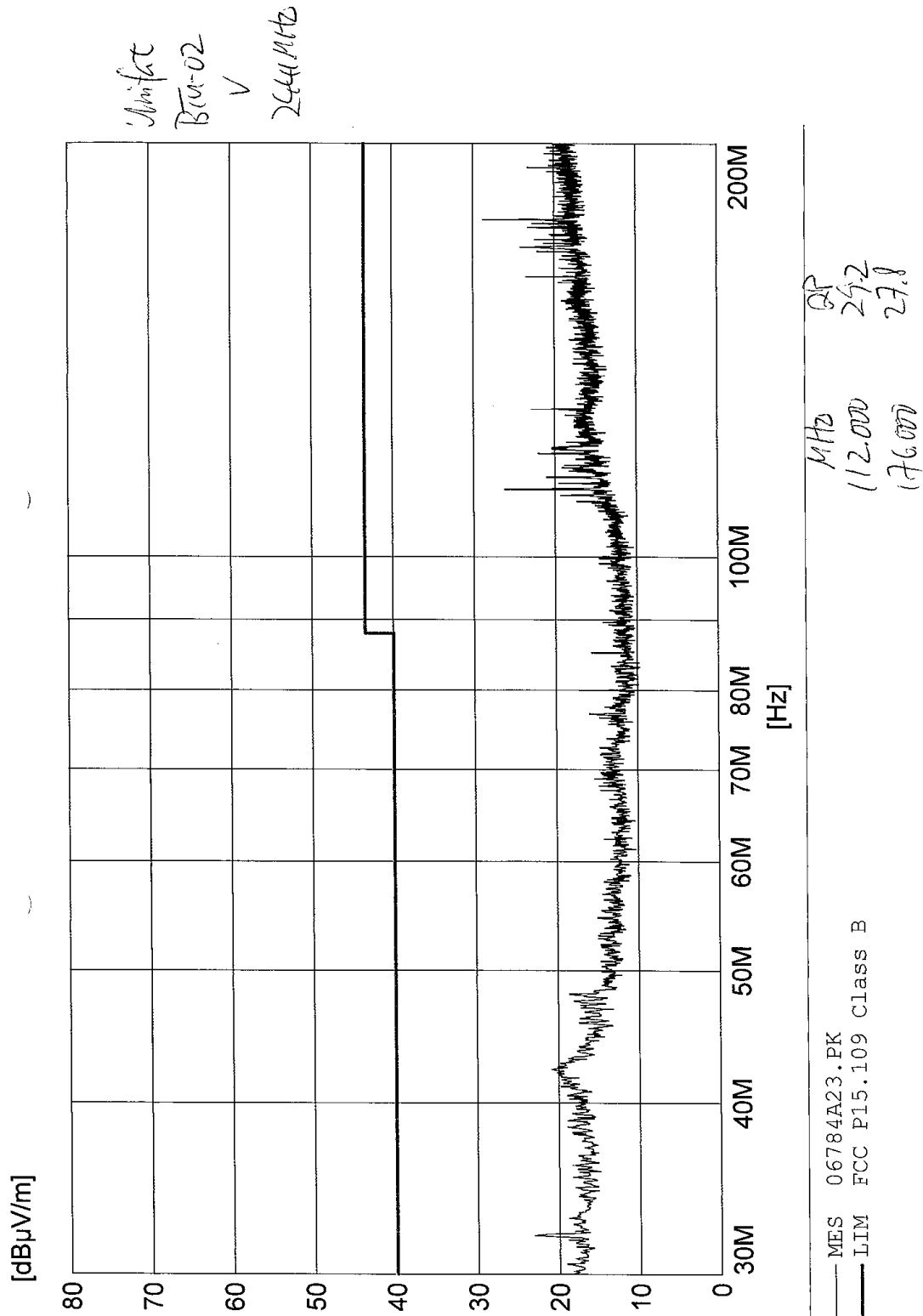
Date: 27.NOV.2003 13:11:55

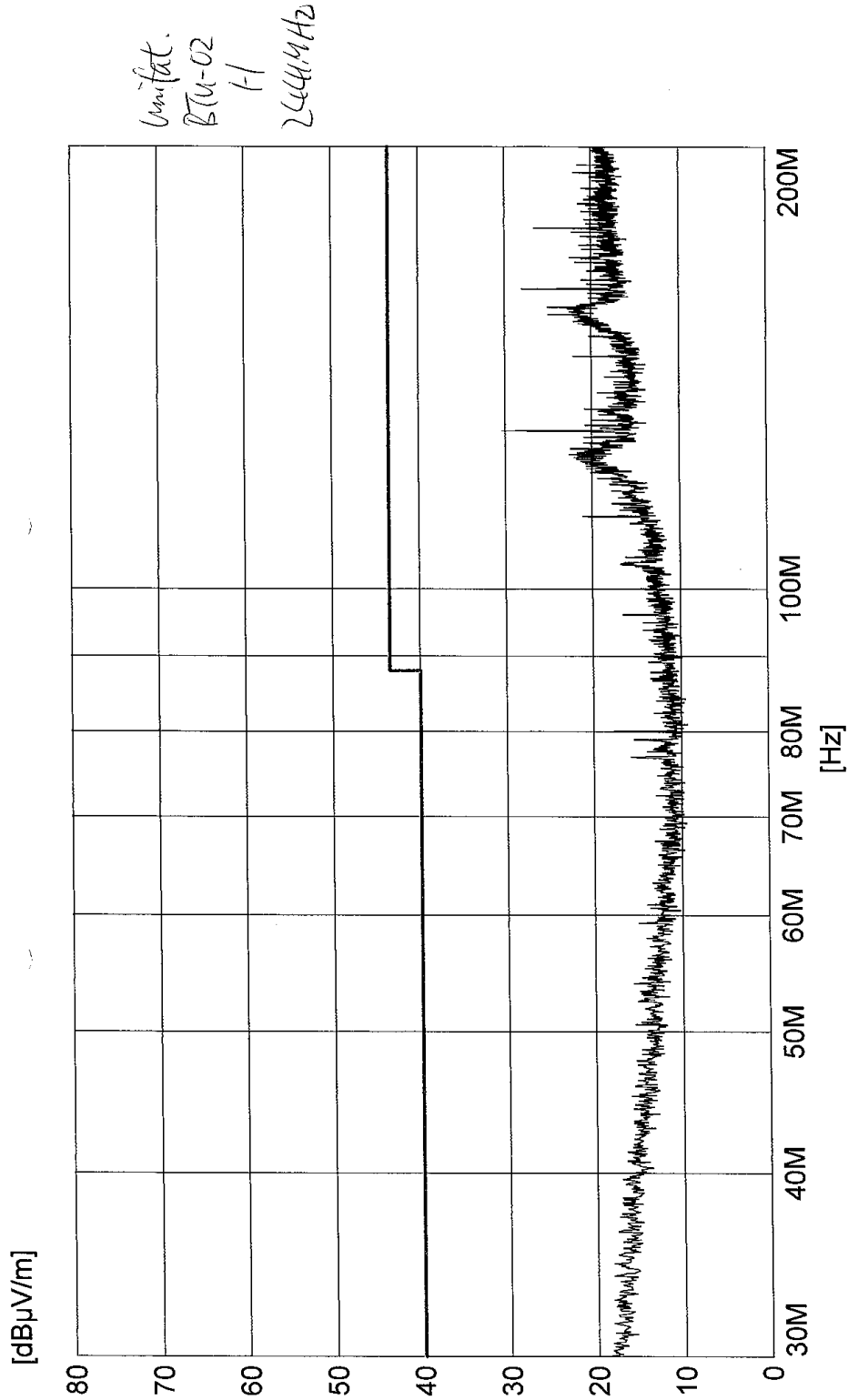
BTU-02
 2400 MHz
 ✓
 FCC



Date: 27.NOV.2003 13:05:57

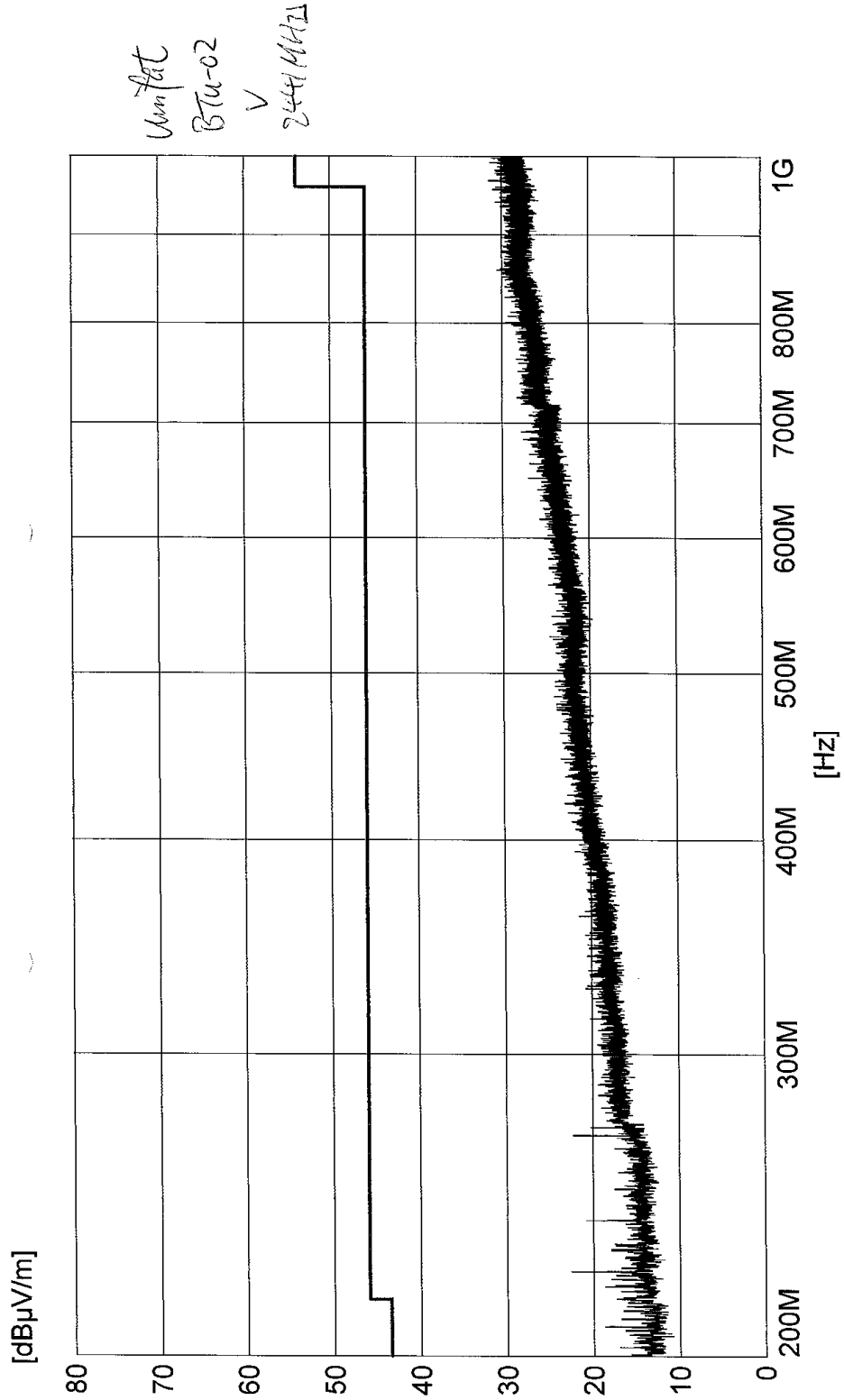
Unifast
BTU-02
2402MHz
H
FCC



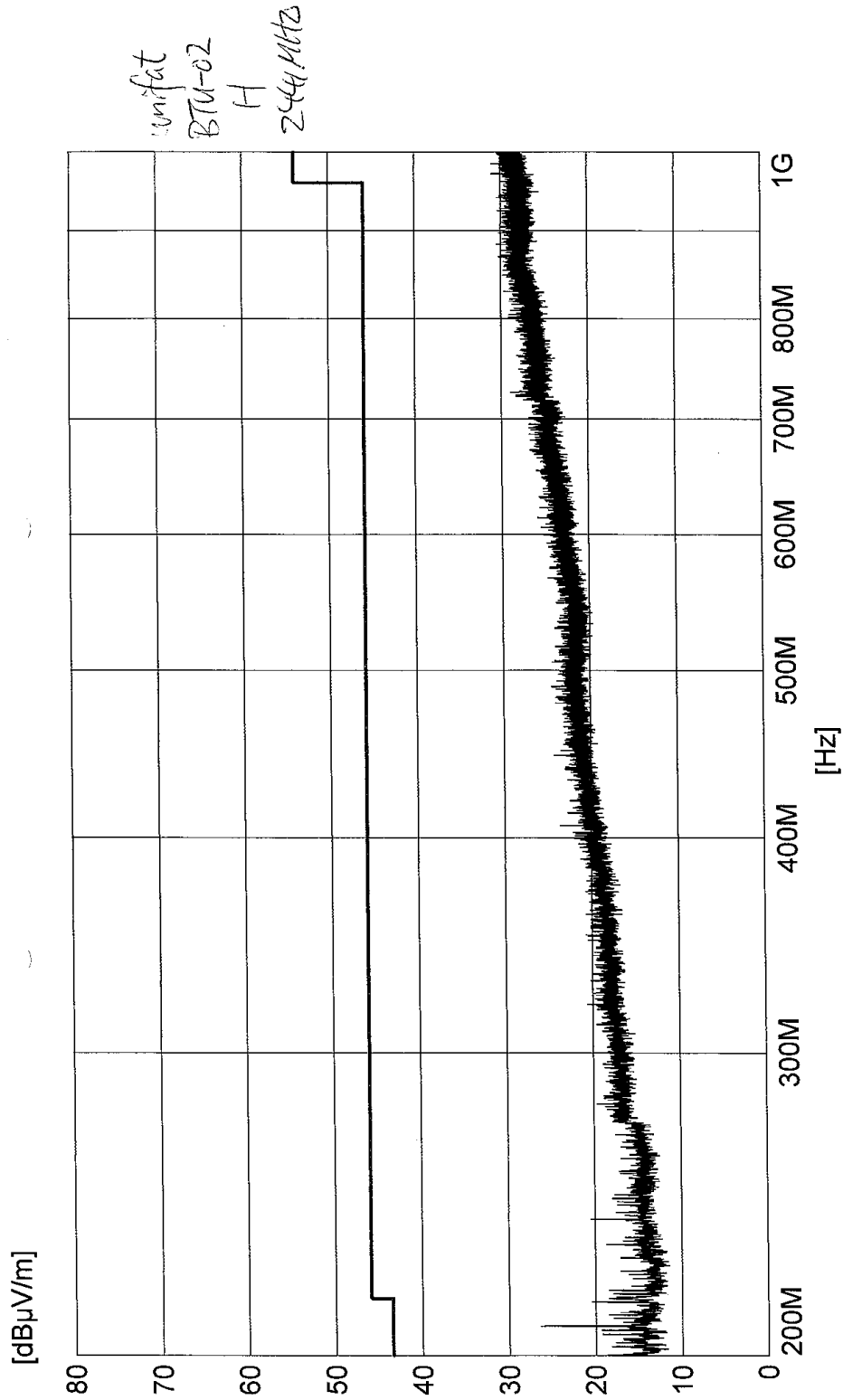


MHz
128.000
160.000
34.0
30.5

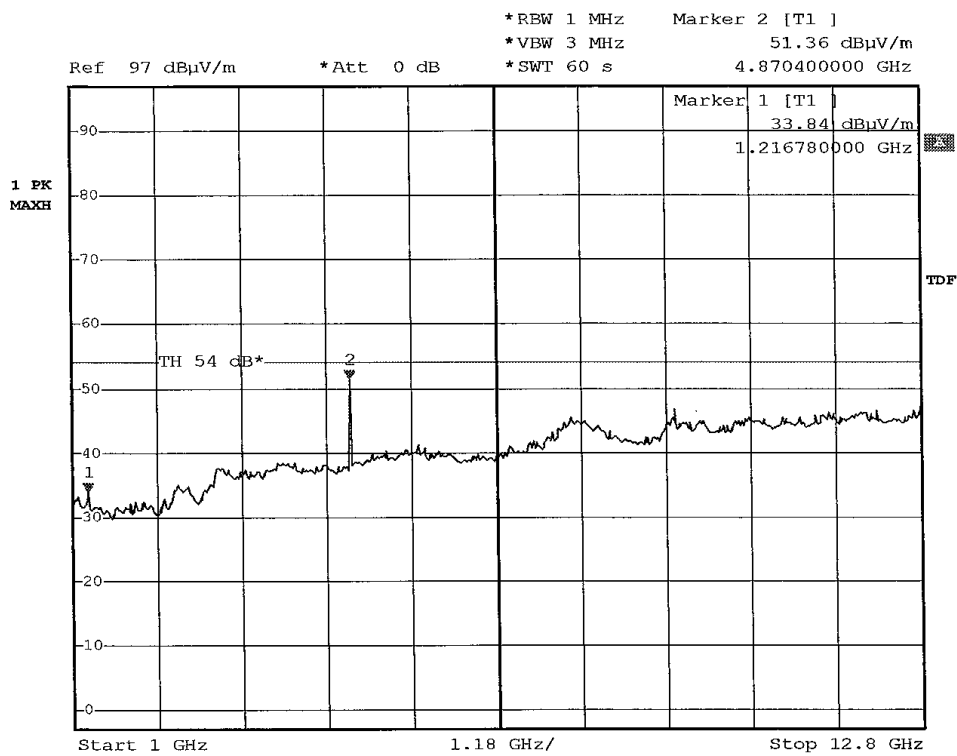
— MES 06784A24.PK
— LIM FCC P15.109 Class B



— MES 06784A28.PK
 — LIM FCC P15.247 (USA)

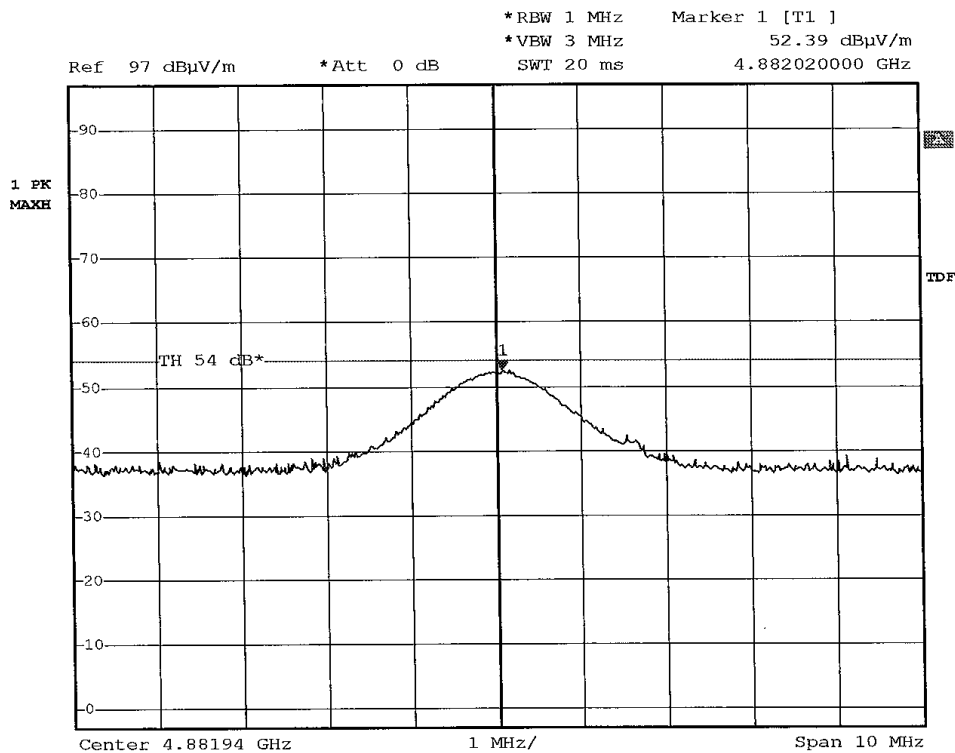


208.002 MHz RP
363



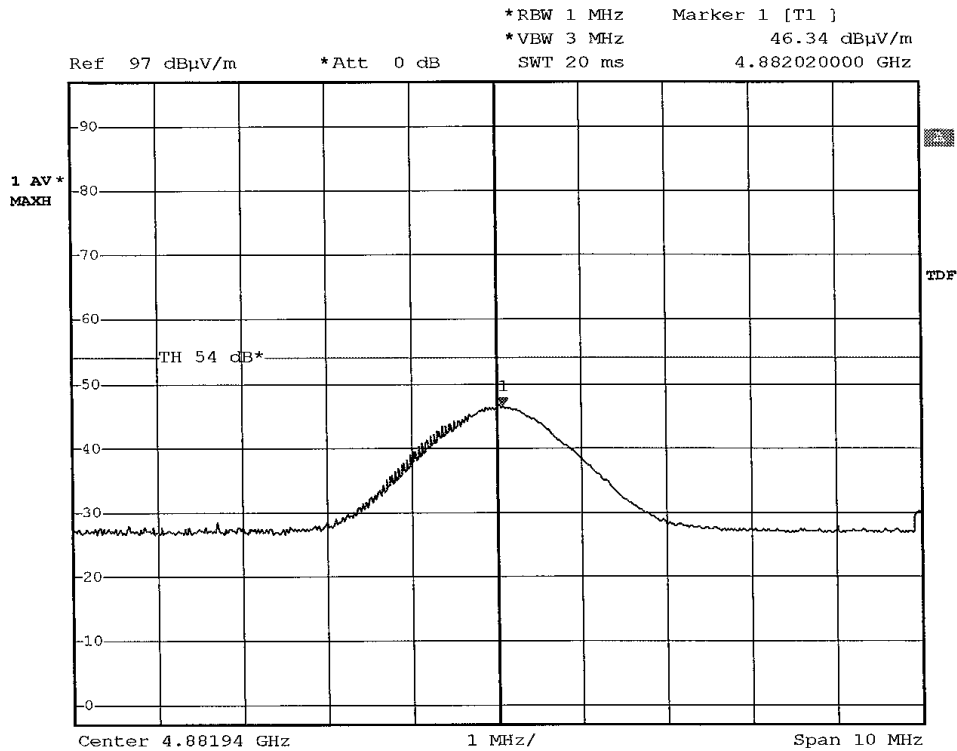
Date: 27.MAY.2004 10:40:19

BTM-02
244 MHz
✓



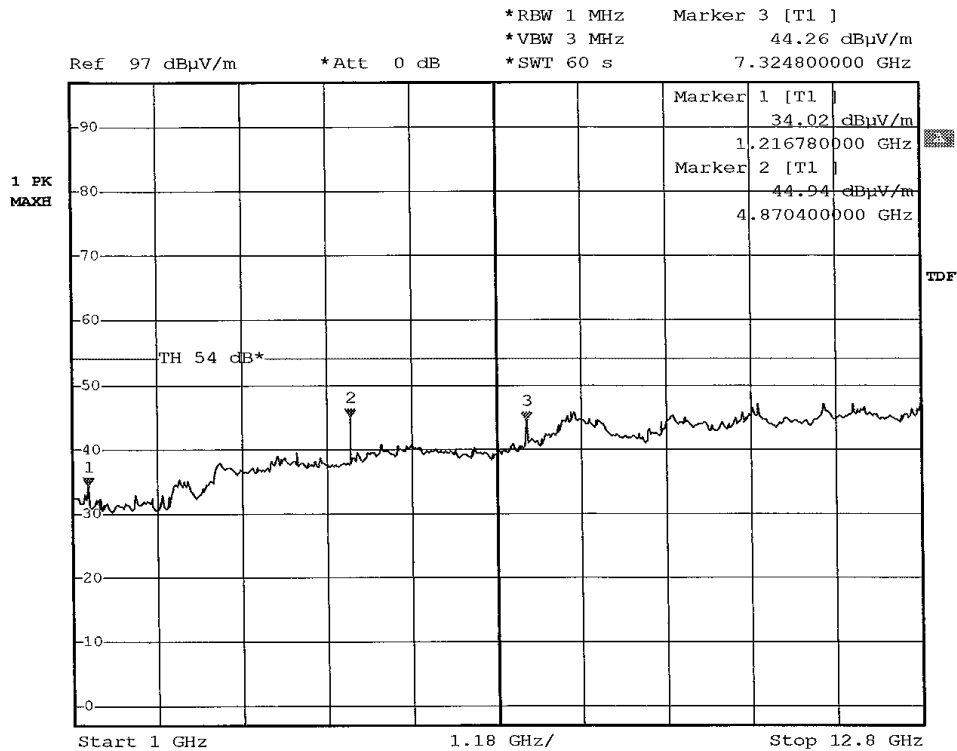
Date: 27.MAY.2004 10:50:39

BTU-02
 2441 MHz
 V



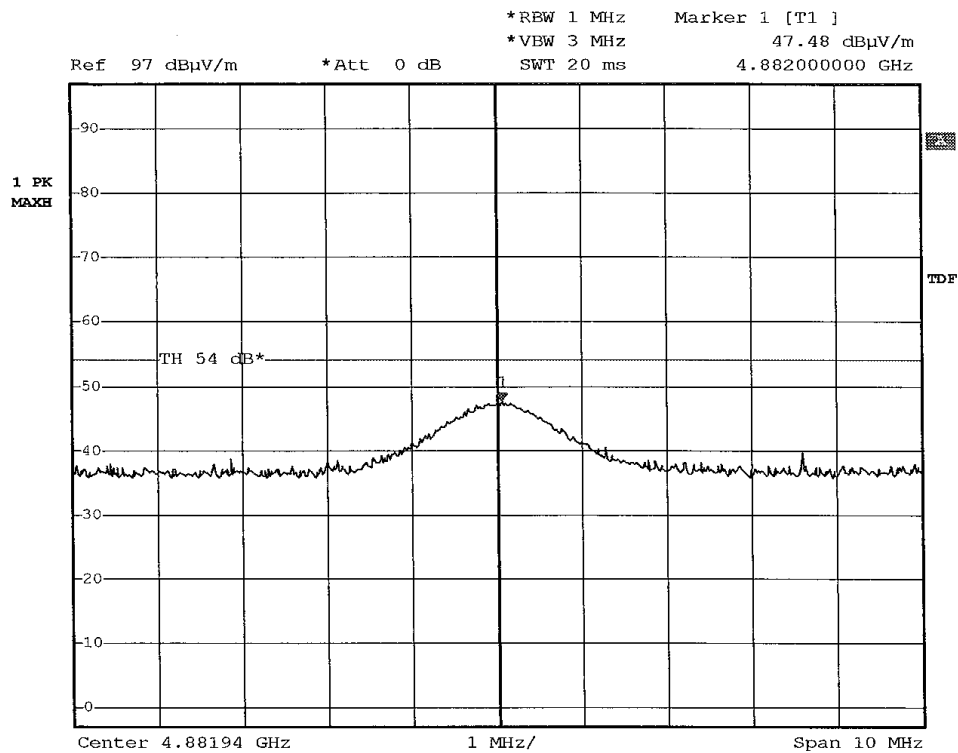
Date: 27.MAY.2004 10:51:37

BTU-02
2641 MHz
V



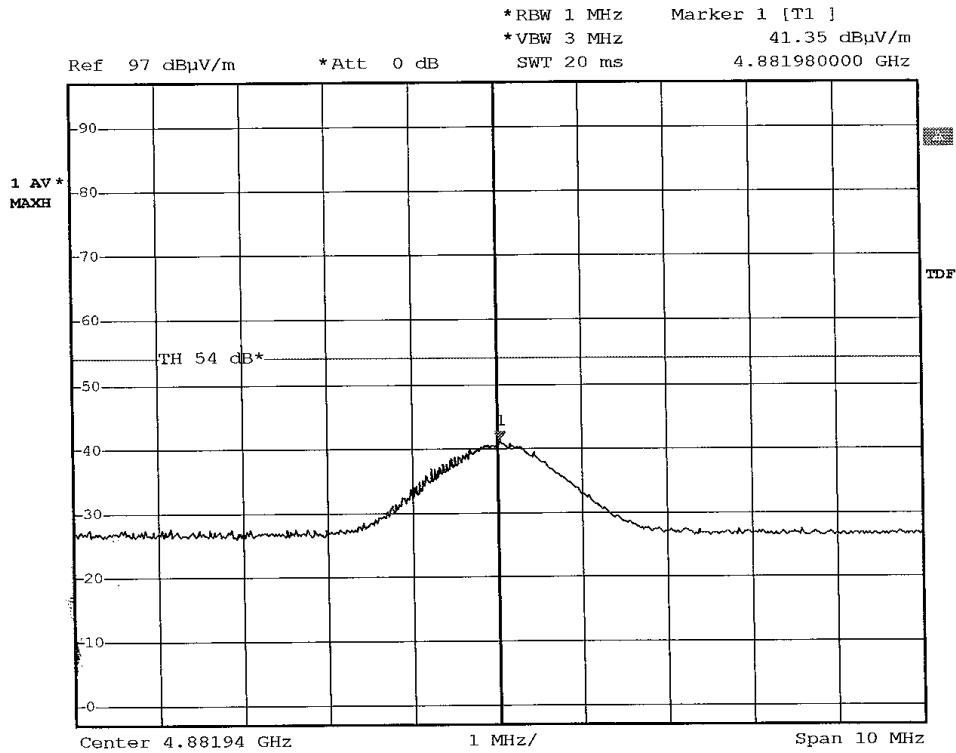
Date: 27.MAY.2004 10:43:57

BTU-02
244.1 MHz
H



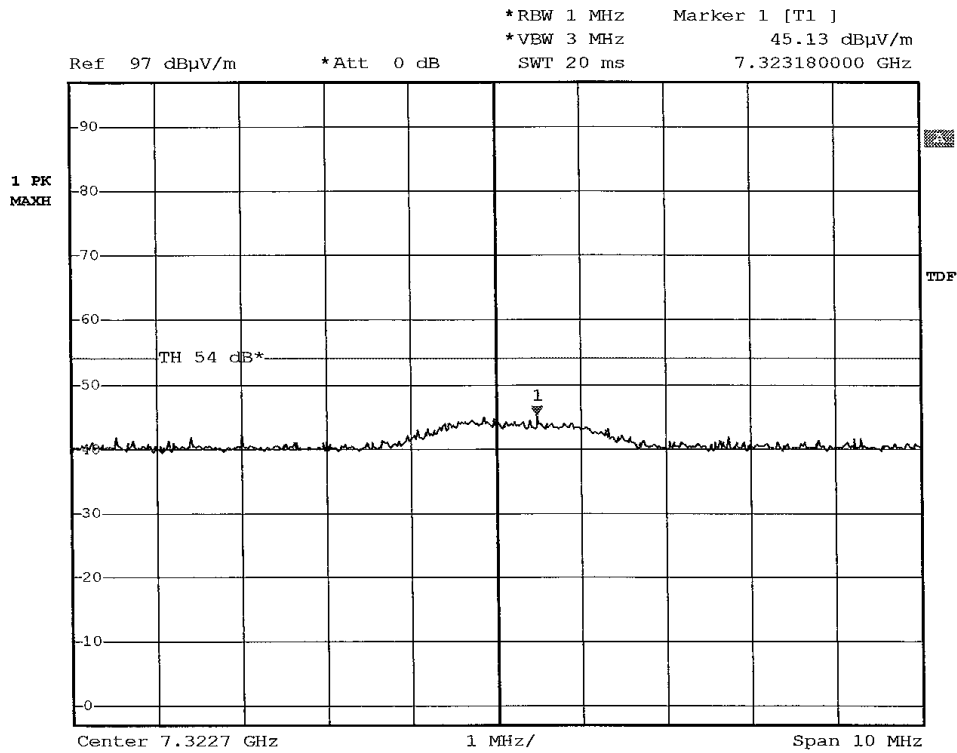
Date: 27.MAY.2004 10:57:27

BTM-02
2441MHz
11



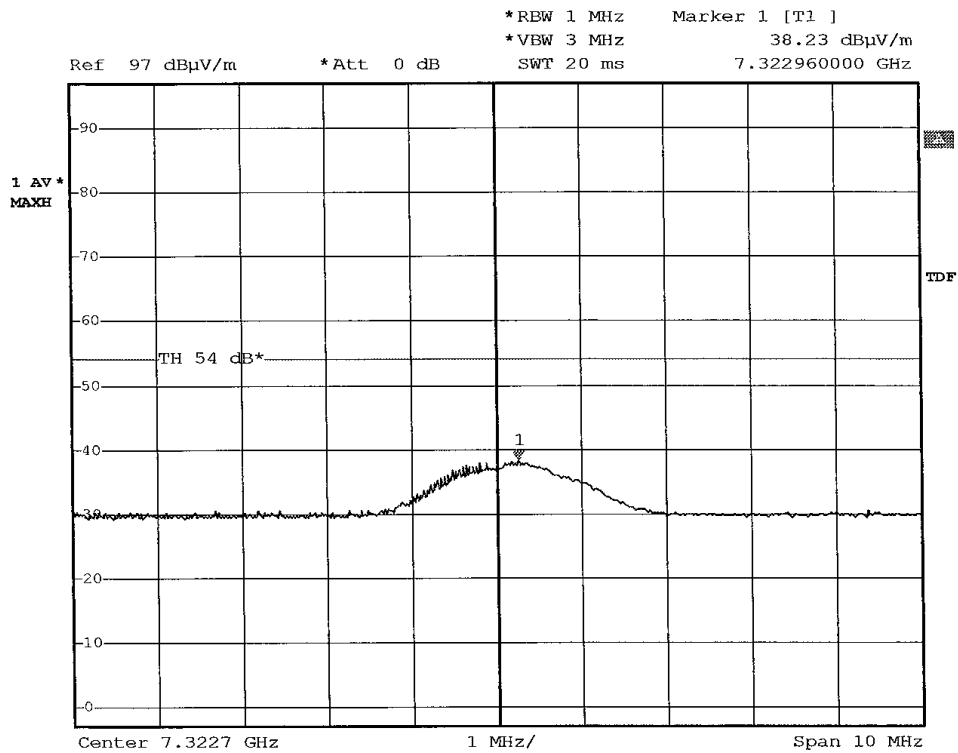
Date: 27.MAY.2004 10:56:58

BTM-02
 244 MHz
 H



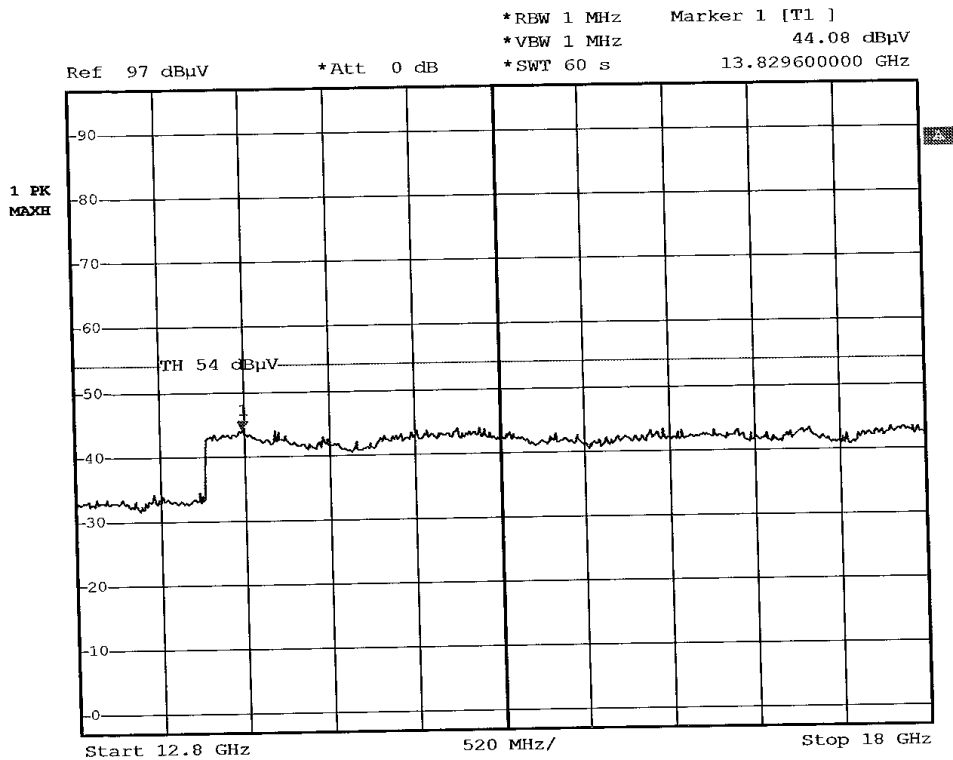
Date: 27.MAY.2004 11:00:34

BTU-02
244 MHz
H



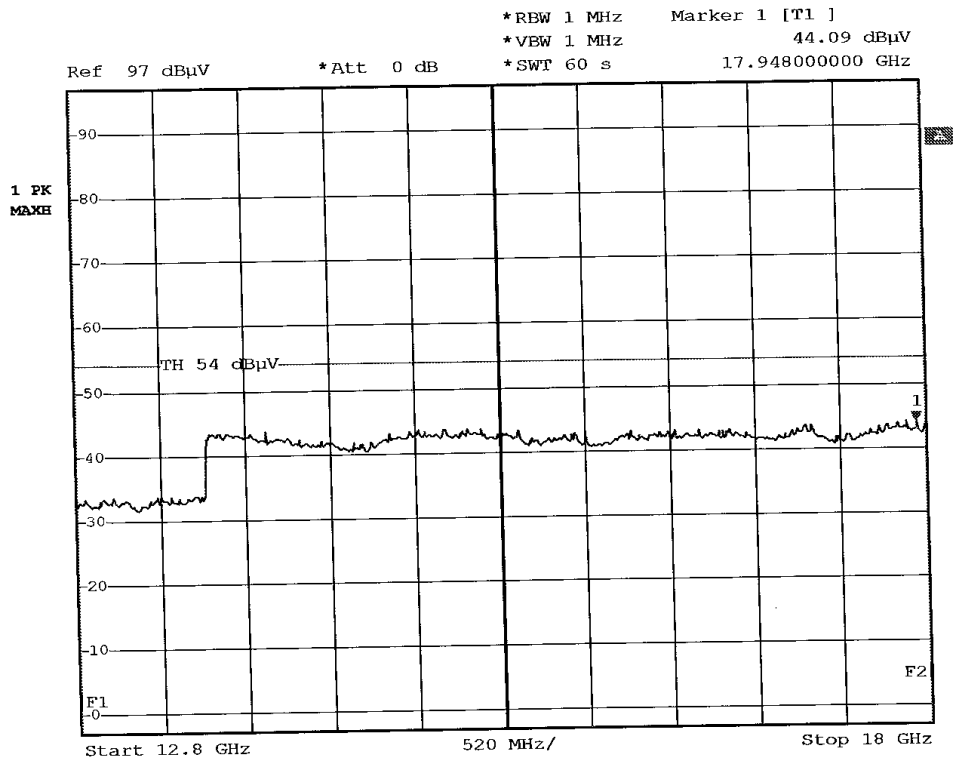
Date: 27.MAY.2004 11:00:59

BTU-02
 244 MHz
 14



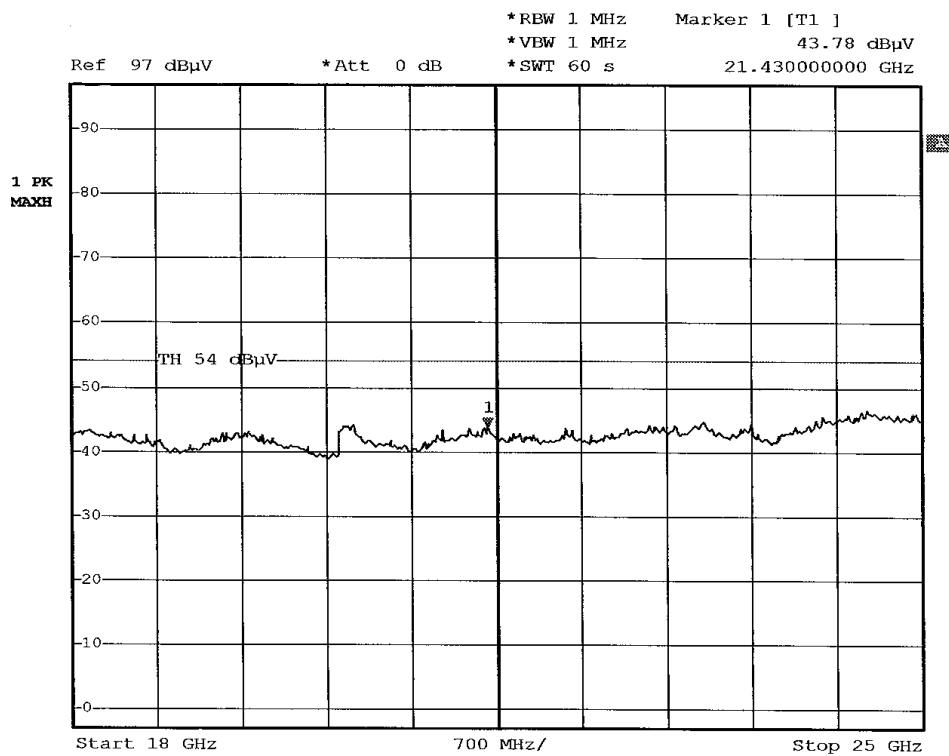
Date: 27.NOV.2003 12:32:46

Unifat
 BTU-02
 244MHz
 V
 FCC



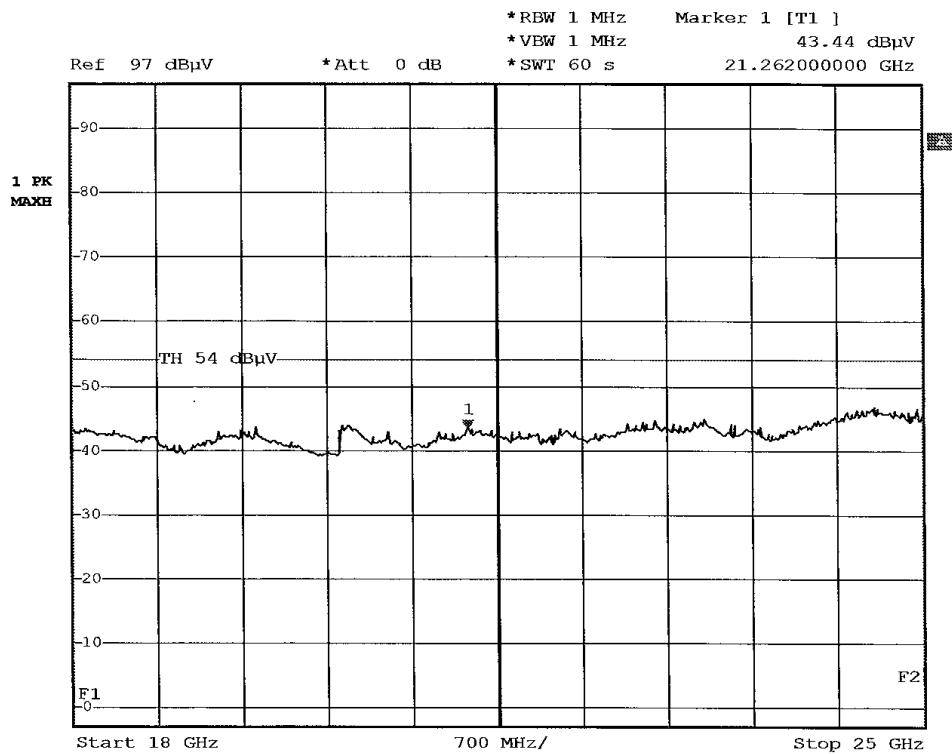
Date: 27.NOV.2003 12:36:36

Unifat
BTU-02
2641MHz
H
FCC



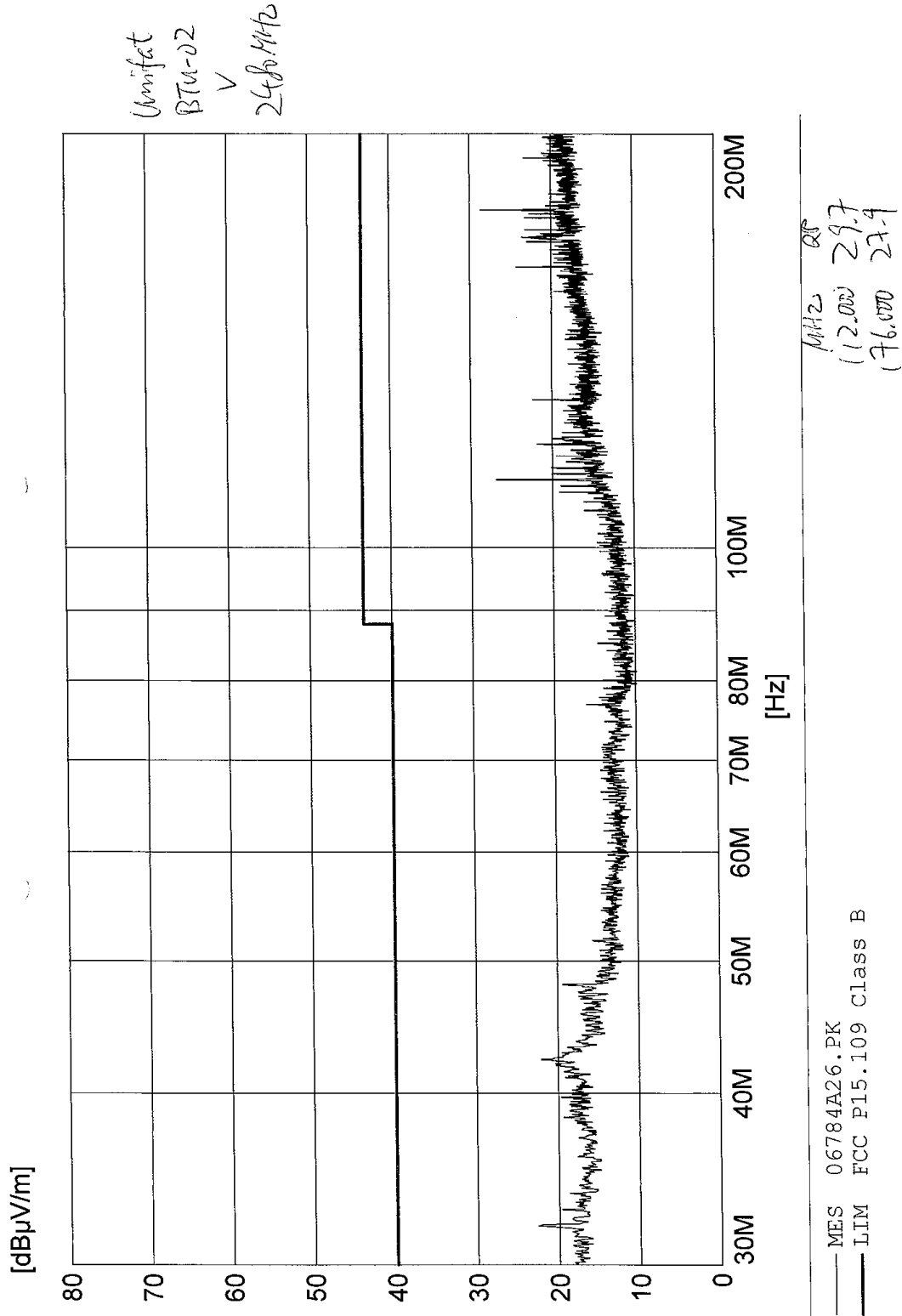
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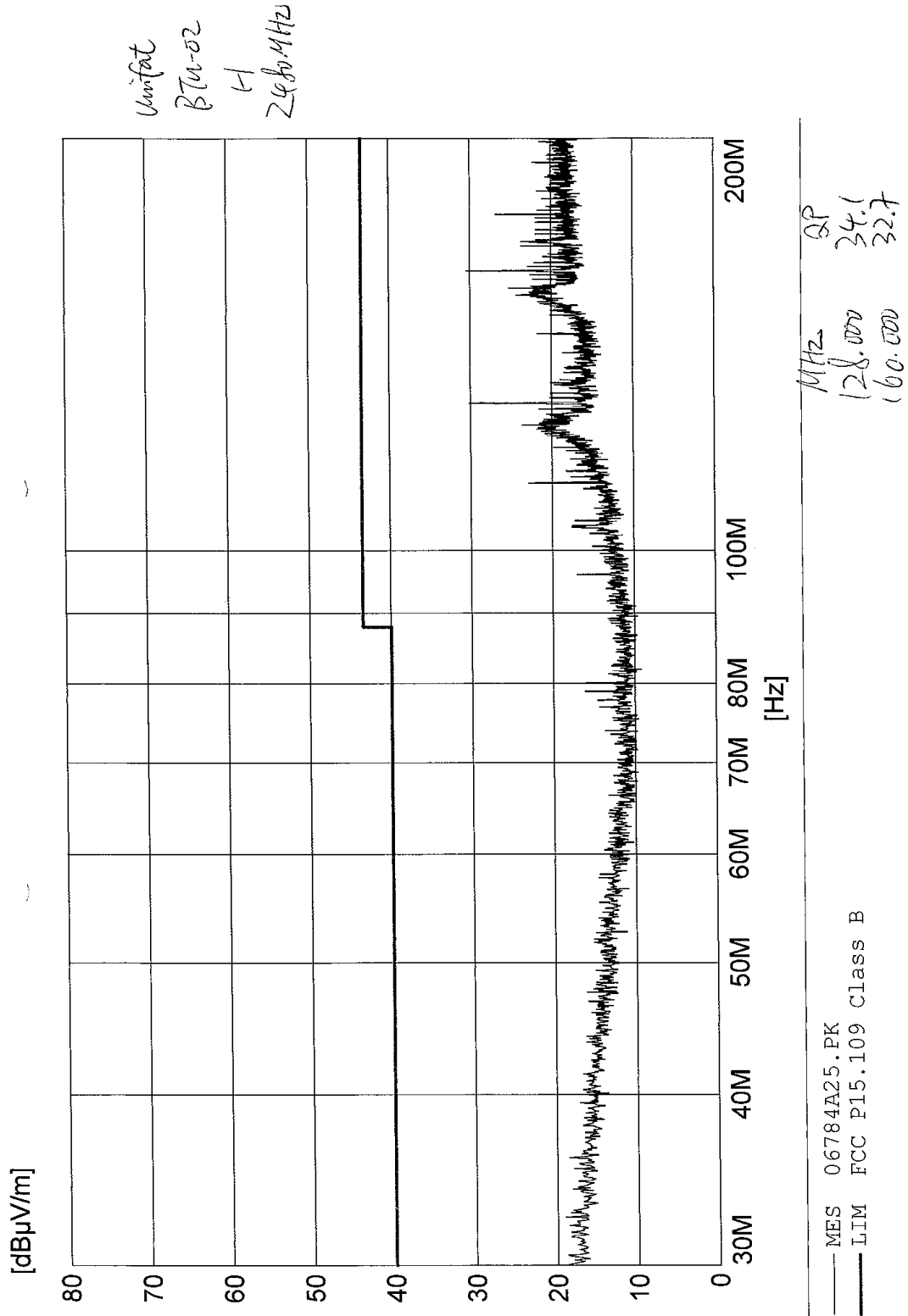
BTu-02
2441MHz
V
FCC

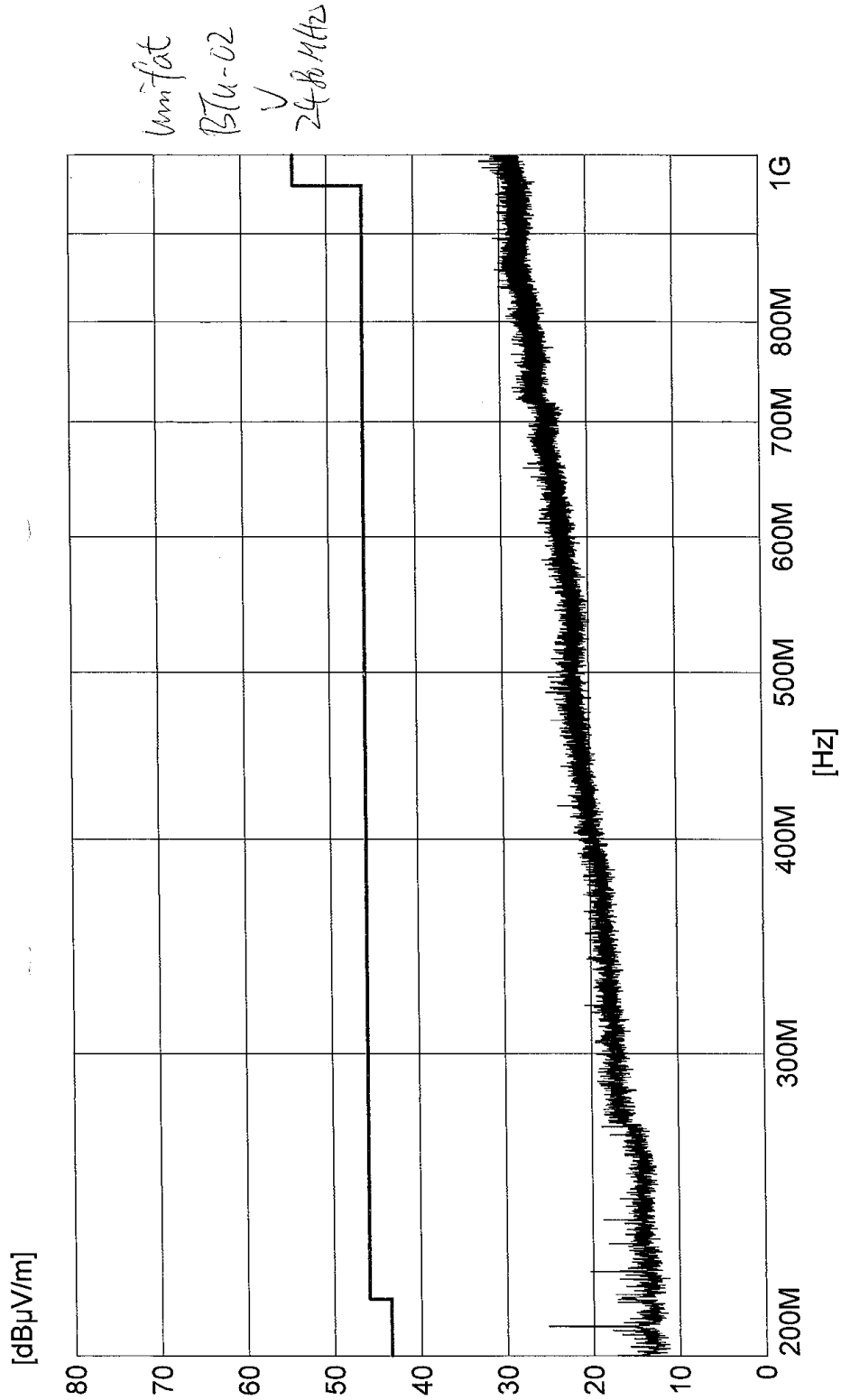


Date: 27.NOV.2003 13:07:10

unifat
BTU-02
2441MHz
14
Fcc

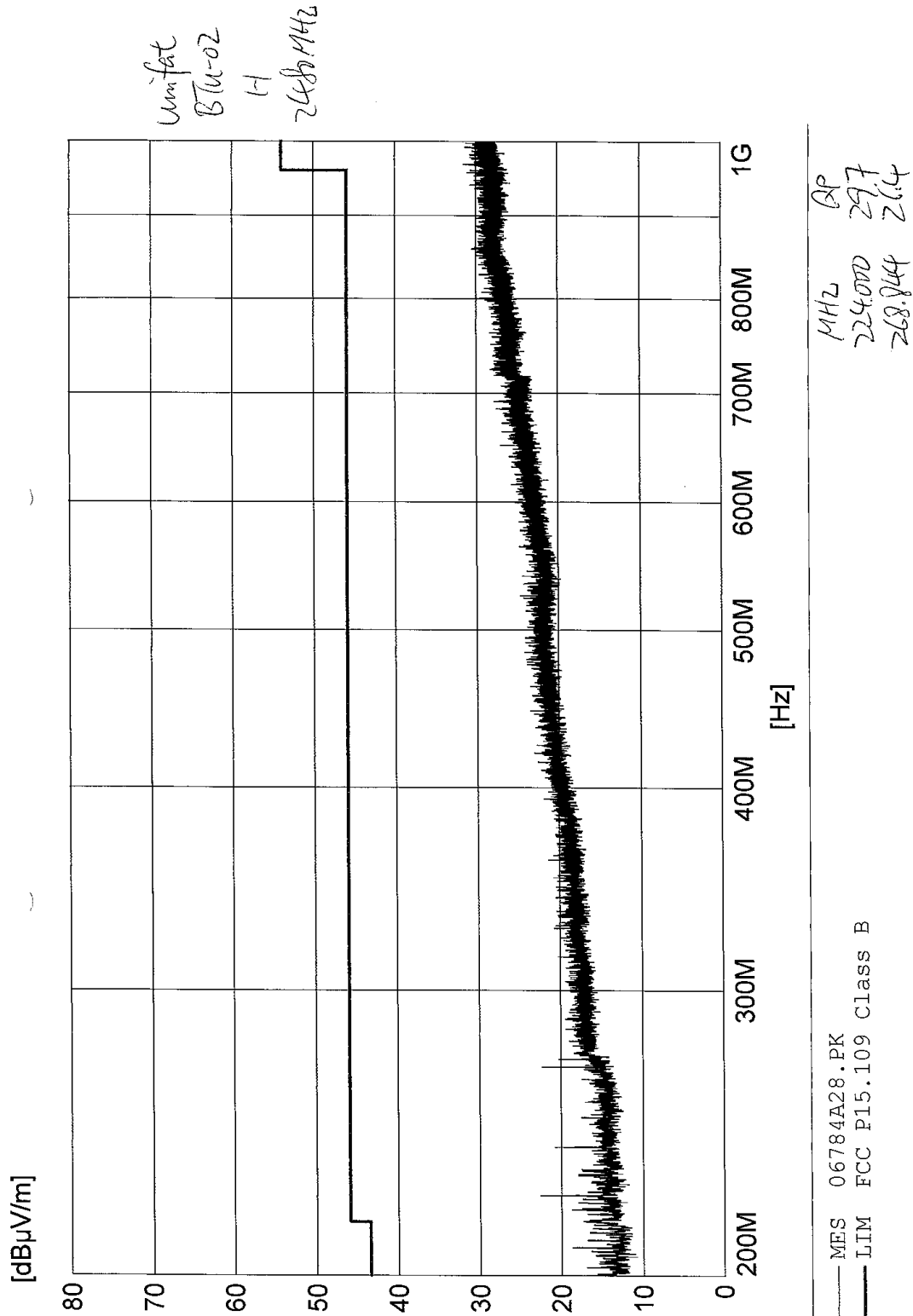


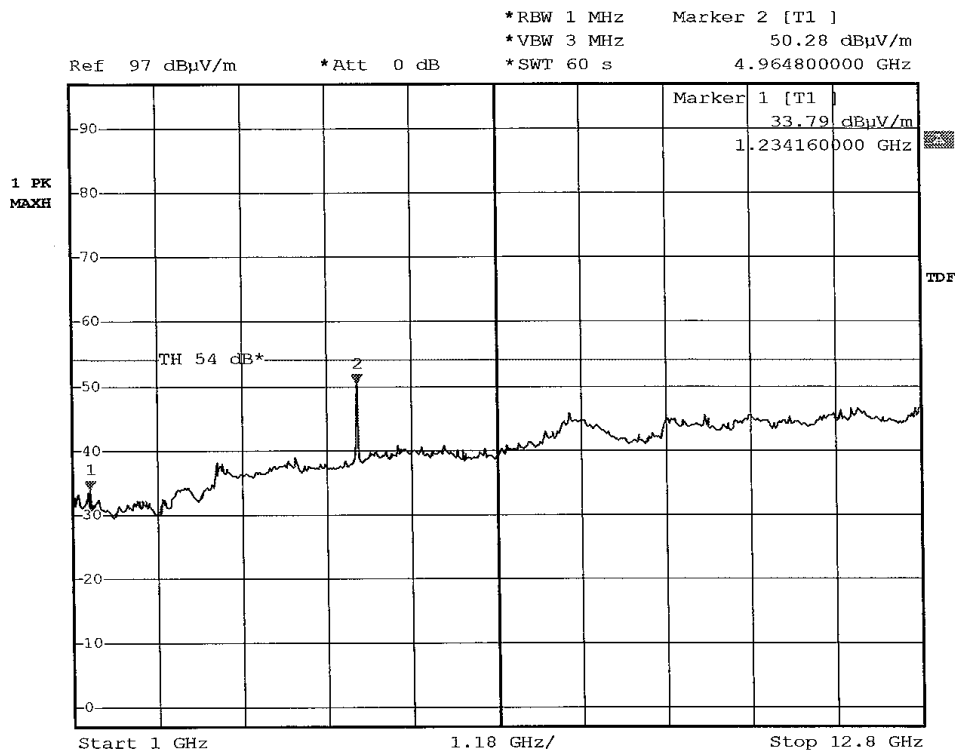




— MES 06784A27.PK
- - - LIM FCC P15.109 Class B

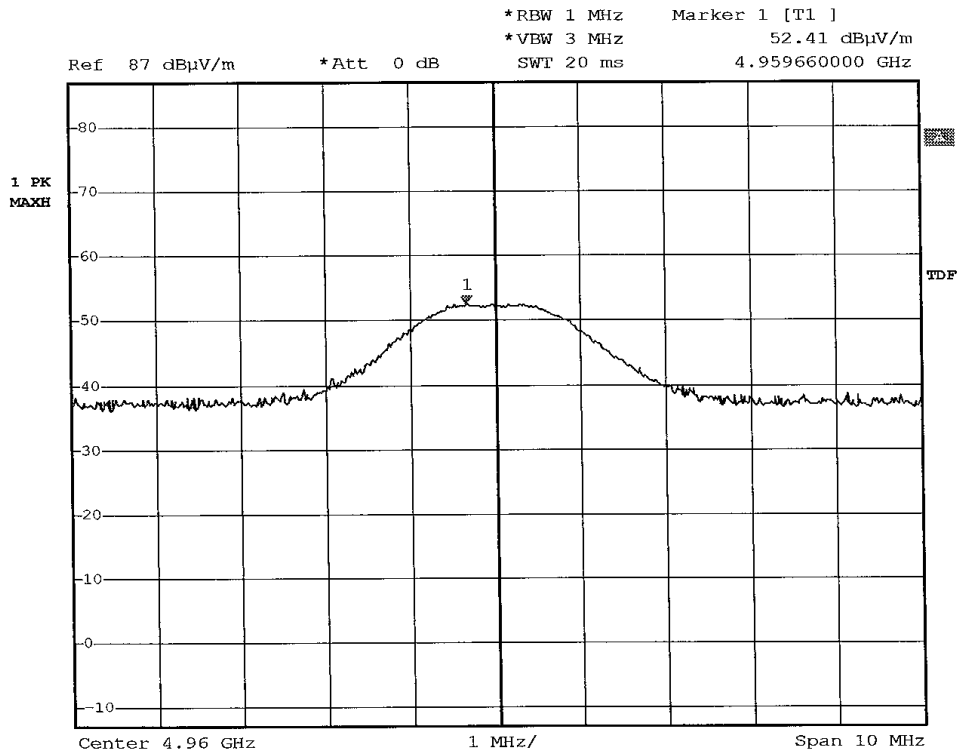
41Hz 2P
208.000 25.5
224.000 24.0





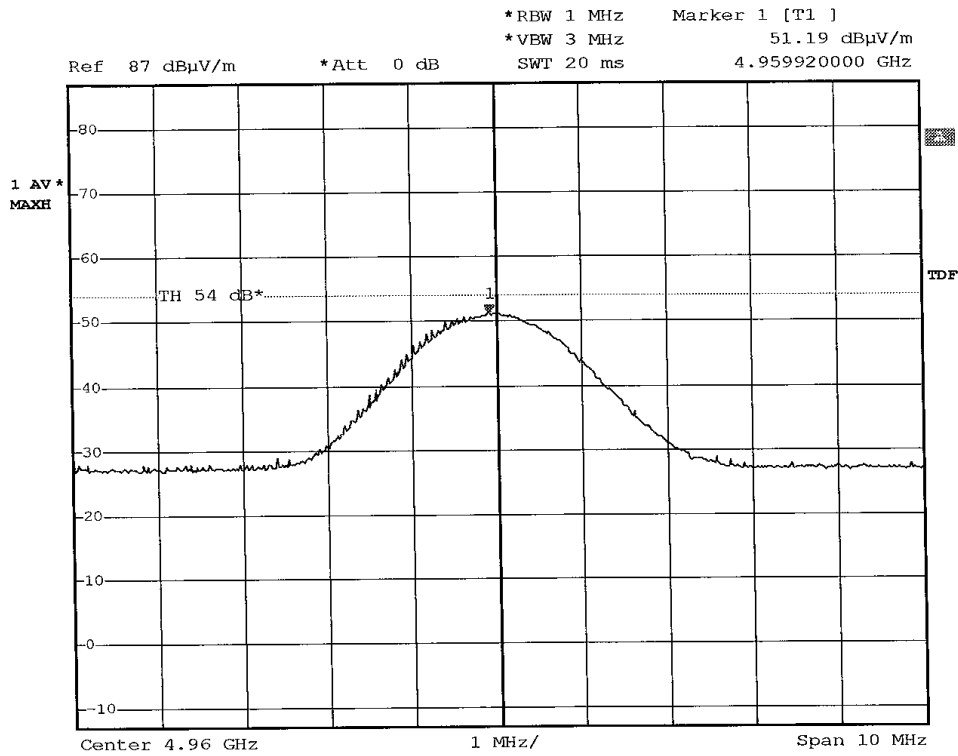
Date: 27.MAY.2004 11:07:48

3TU-02
2480 MHz
✓



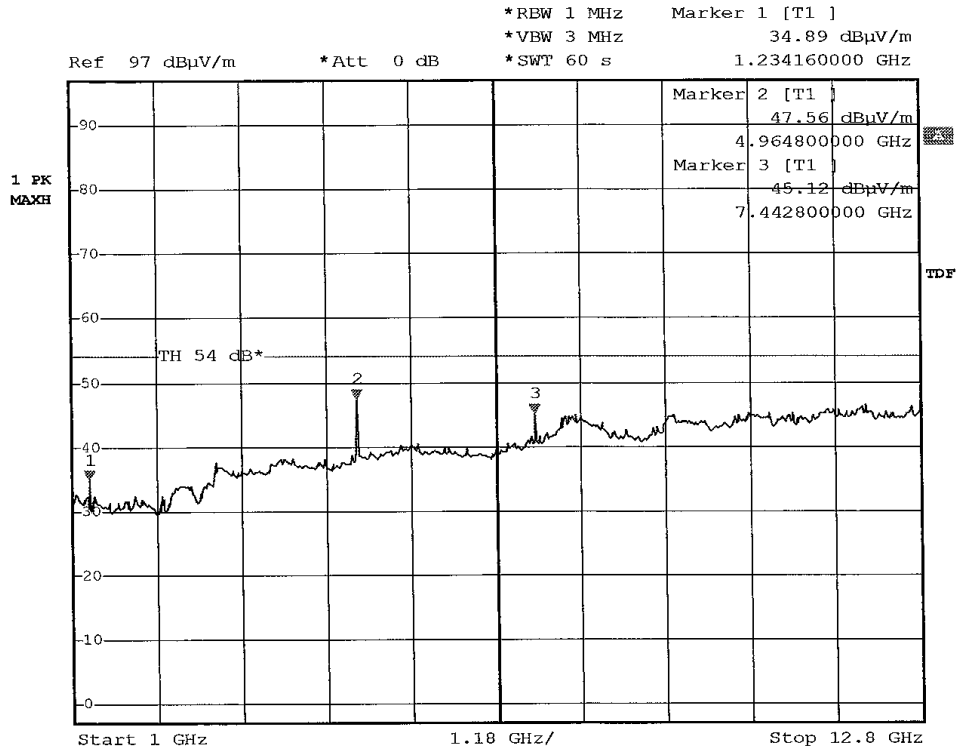
Date: 27.MAY.2004 18:09:07

BTU-02
2480 MHz
V



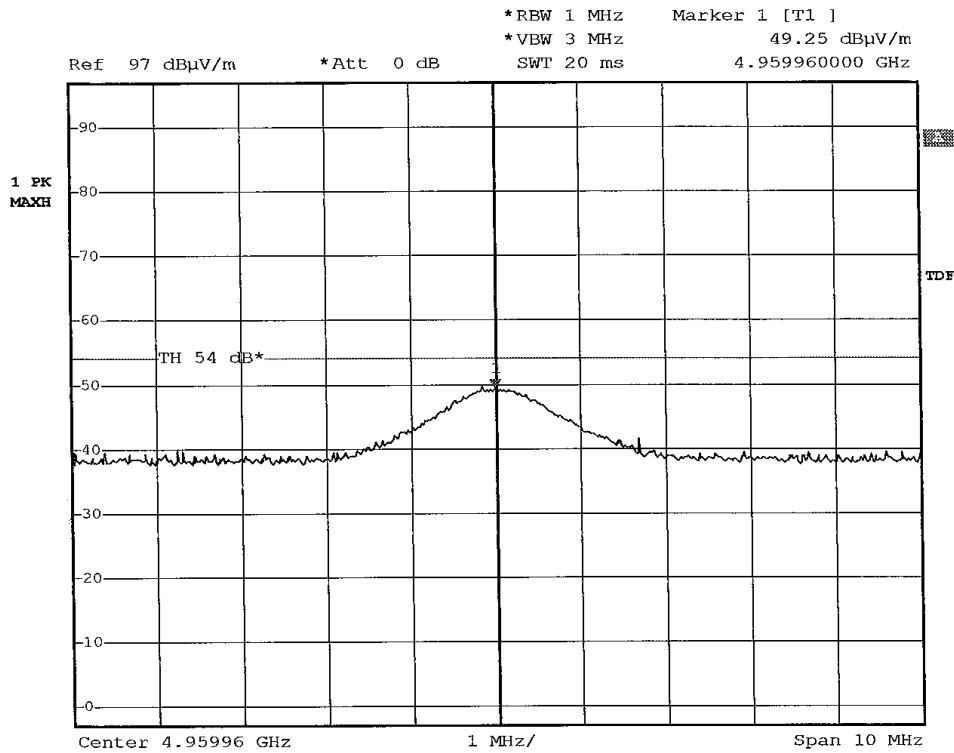
Date: 27.MAY.2004 18:10:28

BTu-02
24.80 MHz
✓



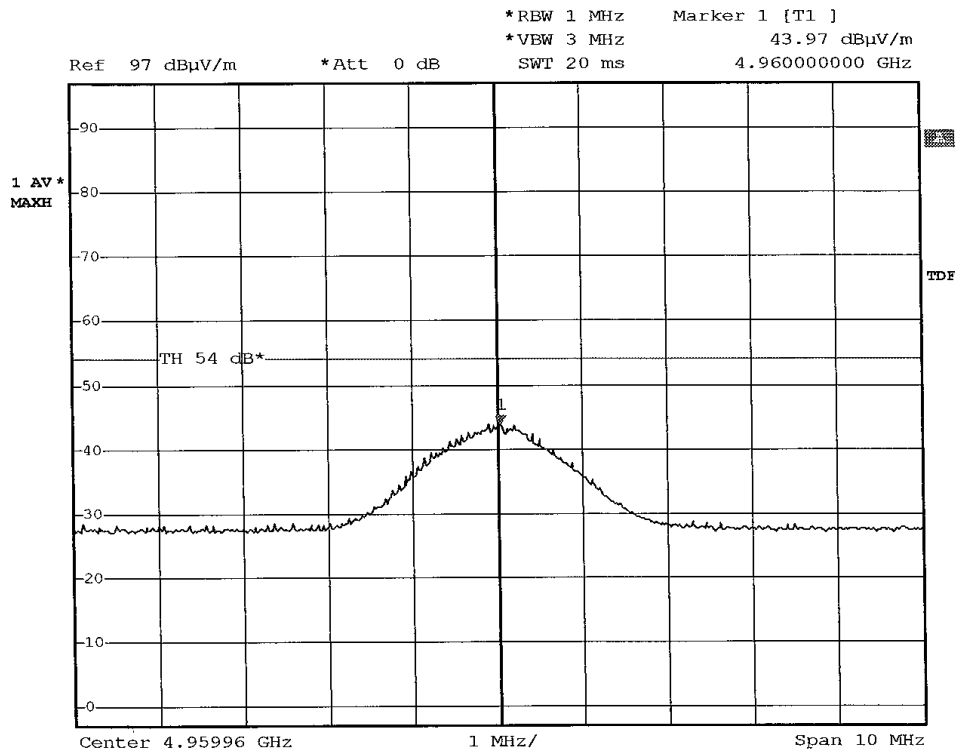
Date: 27.MAY.2004 11:10:05

BTU-02
 2480 MHz
 H



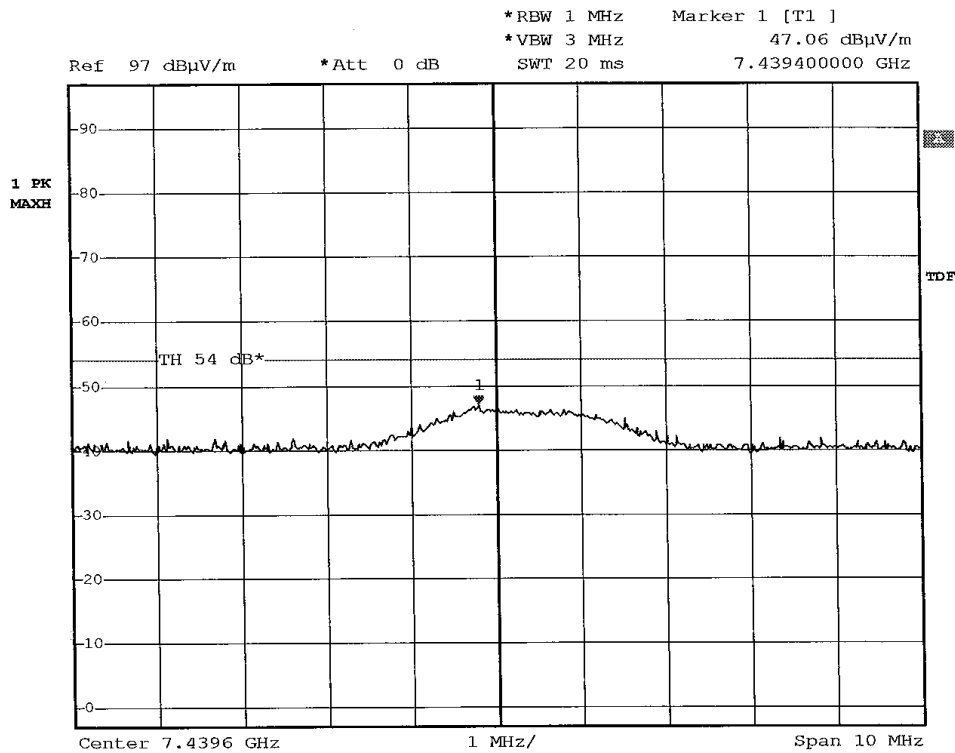
Date: 27.MAY.2004 11:19:56

BTU-02
 2480 MHz
 H



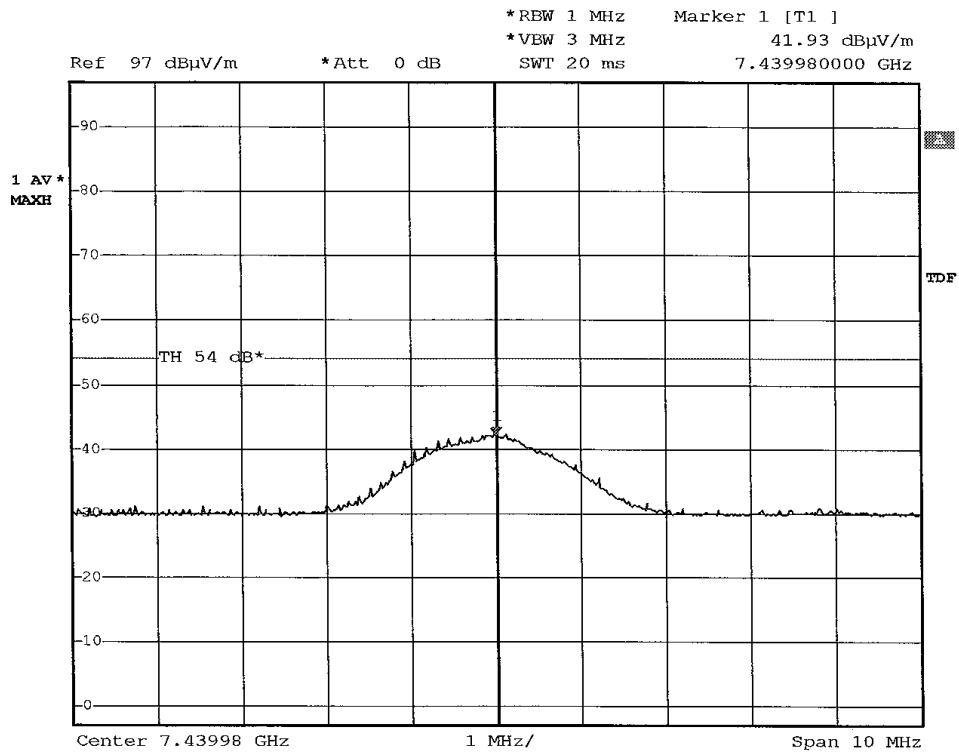
Date: 27.MAY.2004 11:20:21

BTU-02
 2480 MHz
 H



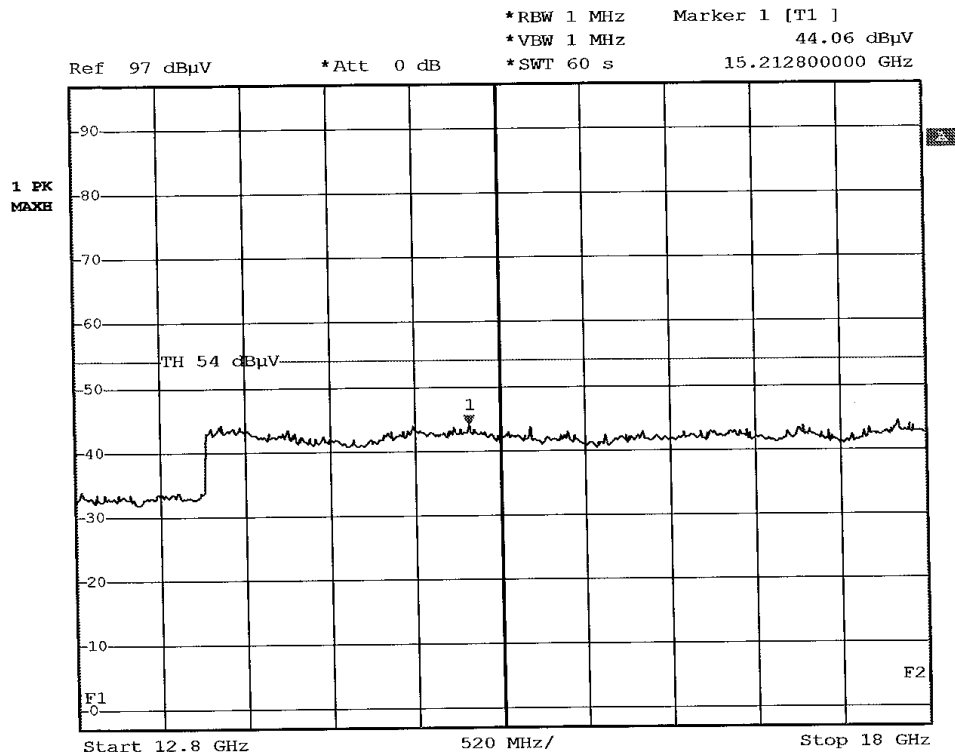
Date: 27.MAY.2004 11:22:21

BTU-02
 248 MHz
 14



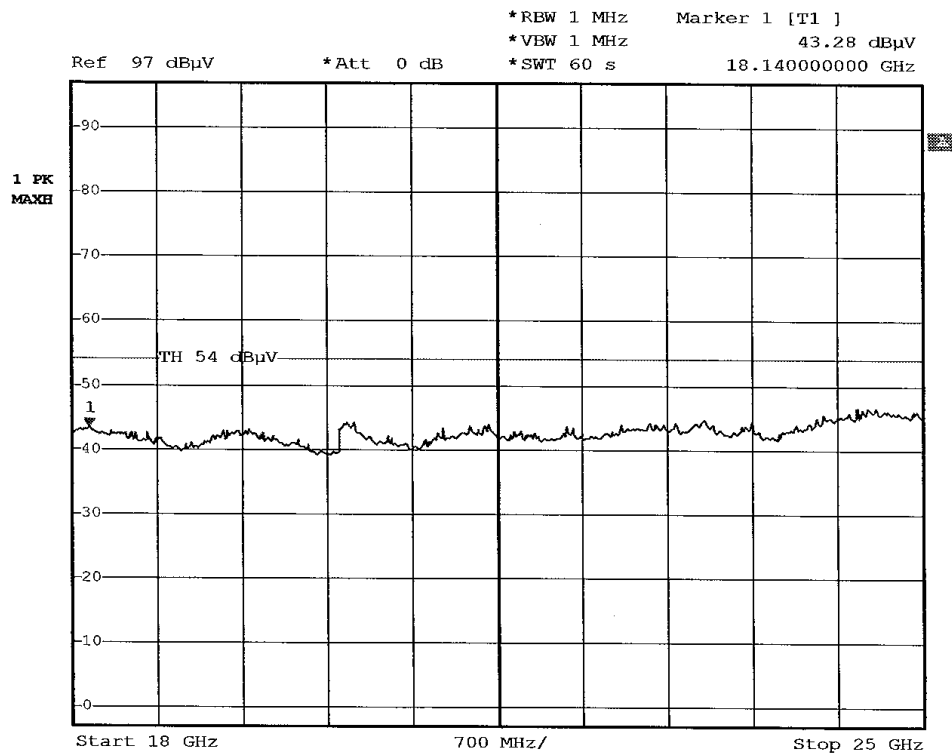
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BTU-02
 2480 MHz
 14



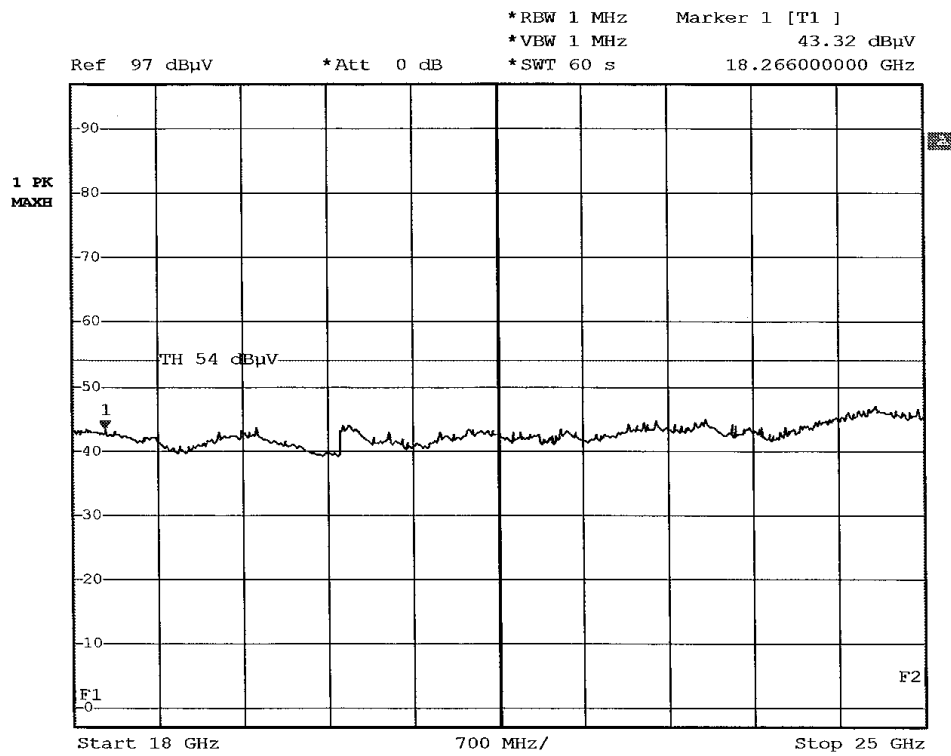
Date: 27.NOV.2003 12:42:45

Unifast
 BTU-02
 240 MHz
 H
 FCC



Date: 27.NOV.2003 13:13:25

BTu-02
2480 MHz
V
FCC



Date: 27.NOV.2003 13:07:54

unifast
 BTU-02
 2480 MHz
 H
 FCC