TÜV Rheinland
Product Safety GmbH
Am Grauen Stein D - 51105 Köln

TÜV

Prüfbericht - Nr.: *Test Report No.*	**14005769 001**	Seite 1 von 19 *Page 1 of 19*

Auftraggeber: *Client:*
i.Tech Dynamic Limited
Room 1112, Metroplaza
Tower 2, 223 Hing Fong Road
Kwai Chung
N.T., Hong Kong

Gegenstand der Prüfung: *Test item:* **Bluetooth Buzzer Clip Headset**

Bezeichnung: *Identification:* **C51-A03101-XX**
FCCID: RKIC51-A03101-XX
Serien-Nr.: *Serial No.* **Engineering sample**

Wareneingangs-Nr.: *Receipt No.:* **040323001**
Eingangsdatum: *Date of receipt:* **23.03.2004**

Prüfort: *Testing location:* **Refer to section 4.1**

Prüfgrundlage: *Test specification:*
FCC Part 15, Subpart C
ANSI C63.4-2001
CISPR 22:1997

Prüfergebnis: *Test Result*
Der vorstehend beschriebene Prüfgegenstand wurde geprüft und entspricht oben genannter Prüfgrundlage.
The a. m. test item passed.

geprüft / *tested by:*	**kontrolliert** / *reviewed by*
Hugo Wan	**Thomas Berns**
13.04.2004	13.04.2004
Datum *Date*	**Datum** *Date*
Unterschrift *Signature*	**Unterschrift** *Signature*

Sonstiges / *Other Aspects:*

Abkürzungen:			Abbreviations:		
	OK, Pass	= entspricht Prüfgrundlage		OK, Pass	= passed
	Fail	= entspricht nicht Prüfgrundlage		Fail	= failed
	N/A	= nicht anwendbar		N/A	= not applicable

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

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 Headset 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	:	Cernamic type antenna	Cernamic type antenna
Power supply	:	3.9V Lithium Battery supply	3.9V Lithium Battery supply

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 EUT was not tested together with any additional accessories.

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 a cernamic type antenna soldered to the circuit board. The antenna gain is 1.9dBi.

7.1.3 Disturbance voltage on AC mains Subclause 15.207(a)

RESULT: **Pass**

Test Specification : CISPR 22: 1997
Mode of operation : Charging mode
Port of testing : AC power port of the charger of the EUT
Supply voltage : AC 110V
Temperature : 27°C
Humidity : 54%

For Live measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dBµV	dBµV	dBµV	dBµV
0.150	51.00	66 – 56*	36.90	56 – 46*

For Neutral measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dBµV	dBµV	dBµV	dBµV
0.150	36.10	66 – 56*	6.70	56 – 46*

* Decreases with the logarithm of the frequency.

The radio frequency voltage conducted back onto the Live and the Neutral power lines complies with the limits.

For test results refer to Appendix 1, page 1-3

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 µH/50 ohms line impedance stabilization network (LISN).

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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)
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	100kHz/300kHz
Supply voltage	:	3.9V DC supply
Temperature	:	22°C
Humidity	:	55%

The centre frequencies of the hopping channels are separated by more than the 20dB bandwidth.
For test results refer to Appendix 1, page 4

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 (Hopping on)
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	1MHz/3MHz
Supply voltage	:	3.9V DC supply
Temperature	:	22°C
Humidity	:	55%

The screenshot in Appendix1 P.6 shows the occurance 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 27 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:

$$0.4 \times 32 = 12.8\text{s}$$

Limit calculation:

$$27 \times 2.944 \times 10^{-3} = 79.490 \times 10^{-3}\text{s}$$

$$\leq 400 \times 10^{-3}\text{s}$$

For test results please refer to Appendix 1, page 5-6.

Limit **Subclause15.247(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)**

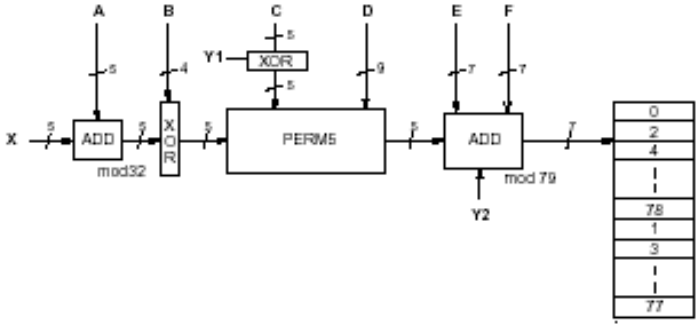
Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (2402MHz, 2441MHz, 2480MHz)
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	30kHz/100kHz
Supply voltage	:	3.9V DC supply
Temperature	:	22°C
Humidity	:	55%

Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$\lvert\Delta f_H\rvert+\lvert\Delta f_L\rvert$ (MHz)
2402	-0.432	0.468	0.900
2441	-0.448	0.464	0.912
2480	-0.452	0.456	0.908

For test results, please refer to Appendix 1, page 7-9.

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 | 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
```

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.

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)
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	1MHz/3MHz
Supply voltage	:	3.9V DC supply
Temperature	:	22°C
Humidity	:	55%

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Actual value (dBm)
2402	0.43	4.30	4.73
2441	0.35	4.15	4.50
2480	-0.11	4.50	4.39

All three transmit frequency modes comply with the maximum peak output power limit.
For test results refer to Appendix 1, page 10-12

Limit **Subclause15.247(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)
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	300kHz/1.0MHz
Supply voltage	:	3.9V DC supply
Temperature	:	22°C
Humidity	:	55%

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 13-15.

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)
Port of testing : Temporary antenna port
Detector : PK
RBW/VBW : 100kHz/300kHz
Supply voltage : 3.9V DC supply
Temperature : 22°C
Humidity : 55%

Operating frequency : 2402MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
No Peak Found	-	-	-

Operating frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
No Peak Found	-	-	-

Operating frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
No Peak Found	-	-	-

All three transmit frequency modes comply with the 20dB limit stated in subclause 15.247(c).
For test results refer to Appendix 1, page 16-25.

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.

7.1.12 Spurious radiated emissions Subclause 15.247(c)

RESULT: **Pass**

Test specification : ANSI C63.4 - 2001
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz)
Port of testing : Enclosure
Measurement Location: 10m Semi Anechoic Chamber
Measurement Distance: 3m
Measurement BW : 1 MHz
Supply voltage : 3.9V Lithium Battery

Tx frequency 2402MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

Tx frequency 2402MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

Tx frequency 2441MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

Tx frequency 2441MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

Tx frequency 2480MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

Tx frequency 2480MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
MHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
no peak found	-	-	-	-	-	-	-

All three transmit frequency modes comply with the field strength within the restricted bands.
For test results refer to Appendix 1, page 26-56.

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*log(100) = 40.0	3
88-216	150	20*log(150) = 43.5	3
216-960	200	20*log(200) = 46.0	3
960-2500	500	20*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.

Disturbance Voltage on AC Mains

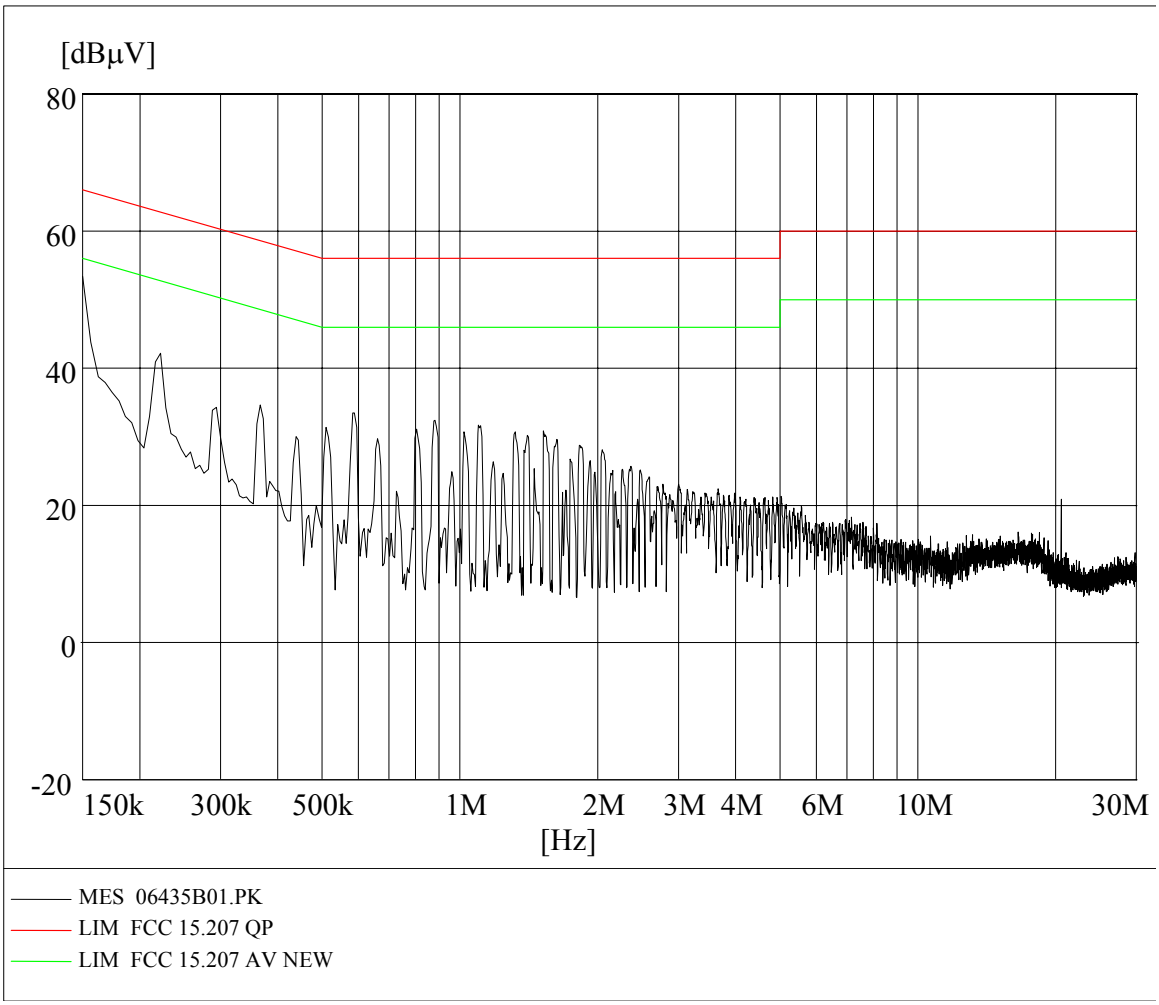
Date: 9 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 54%
Temperature: 27ºC
Voltage supply: 110V
Test by: Hugo Wan
Op. mode: Charging mode

Live measurement

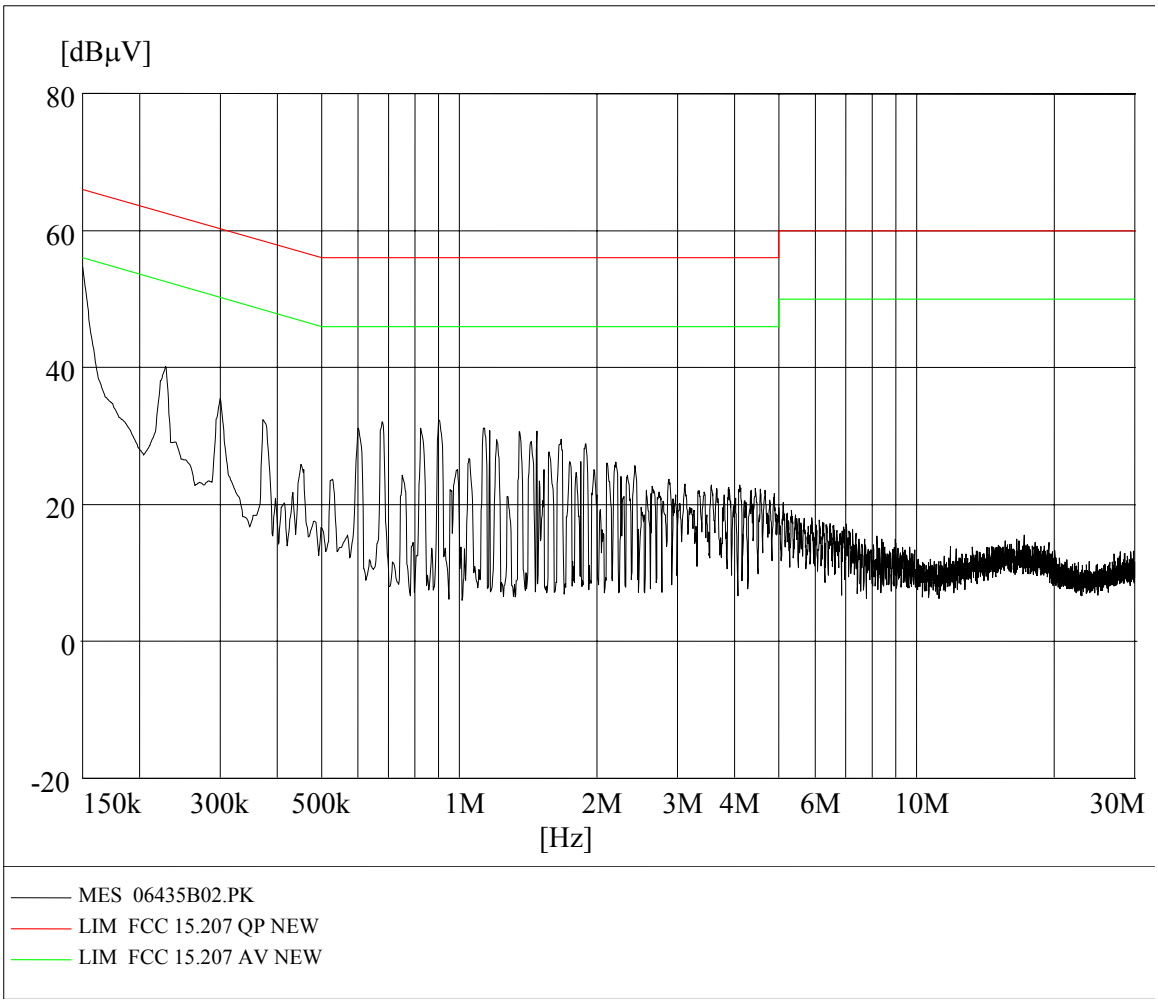
Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.150	51.00	36.90	Pass

Neutral measurement

Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.150	36.10	6.70	Pass



Live terminal

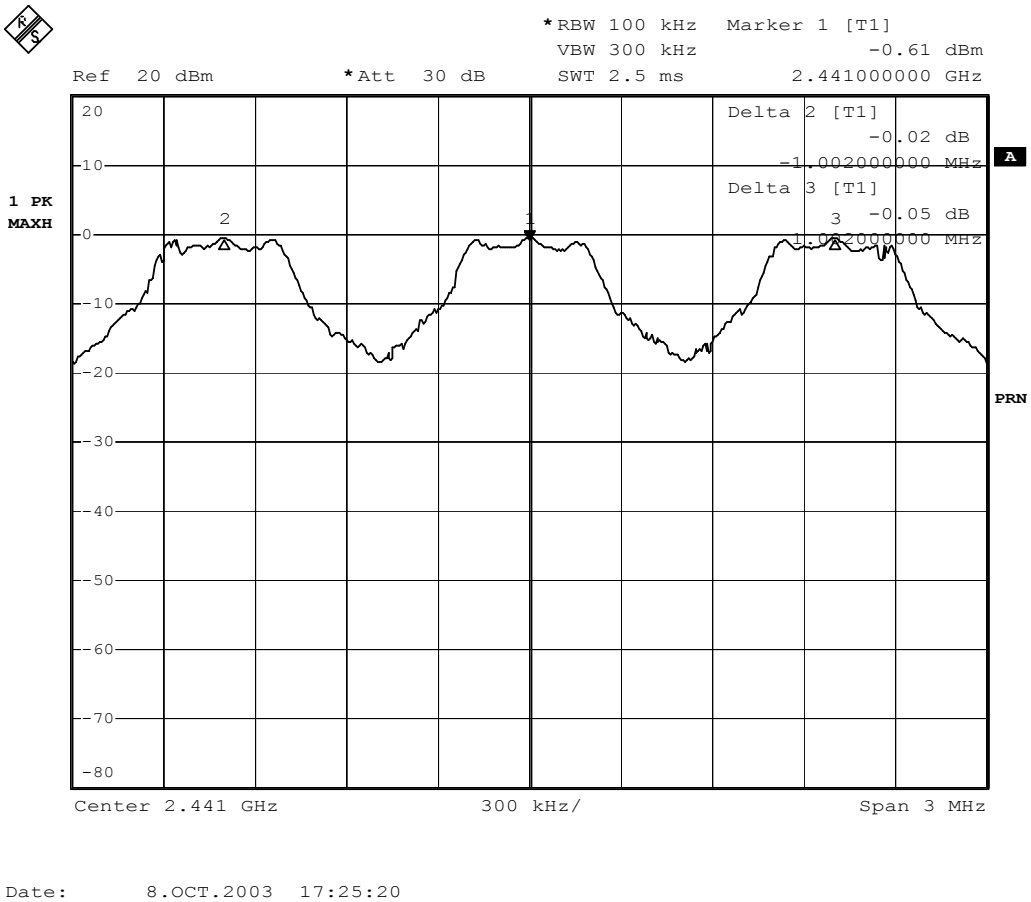


Neutral terminal

Carrier Frequency Seperation

Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: Hopping on

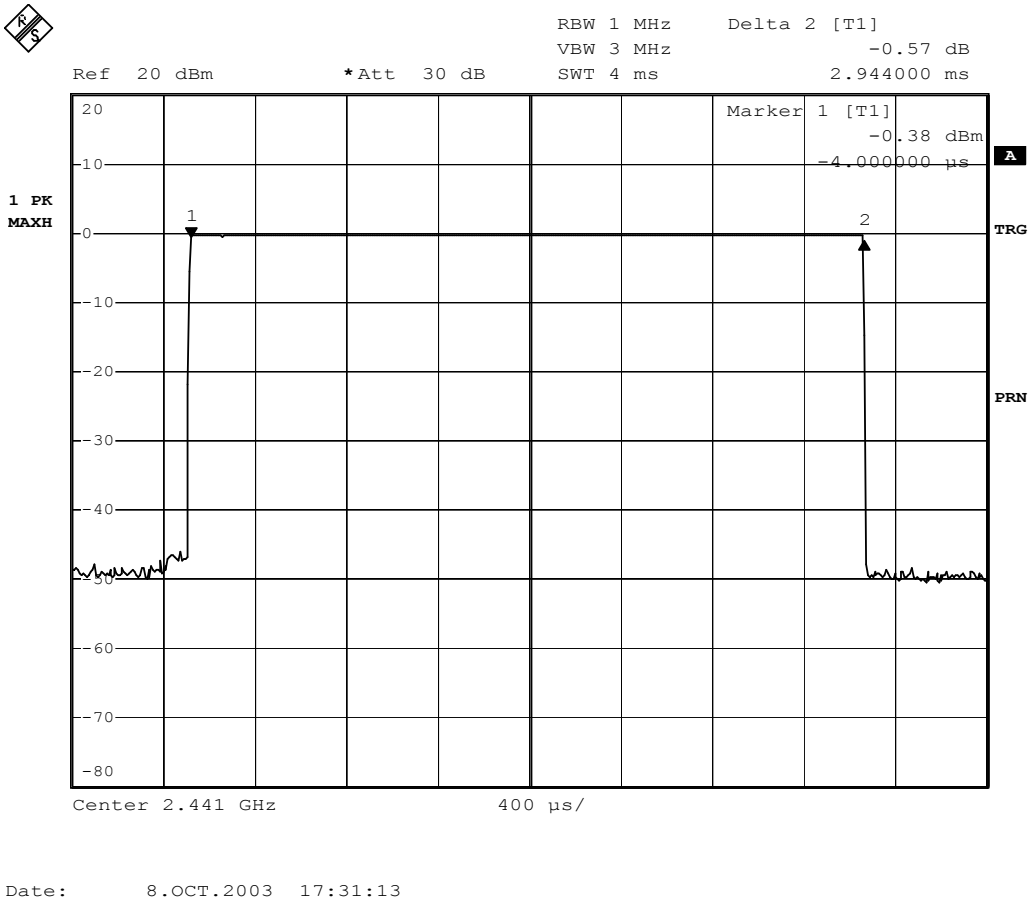
Reference frequency (MHz)	Channel Separation (MHz)	Results
2441.000	1.002	Pass

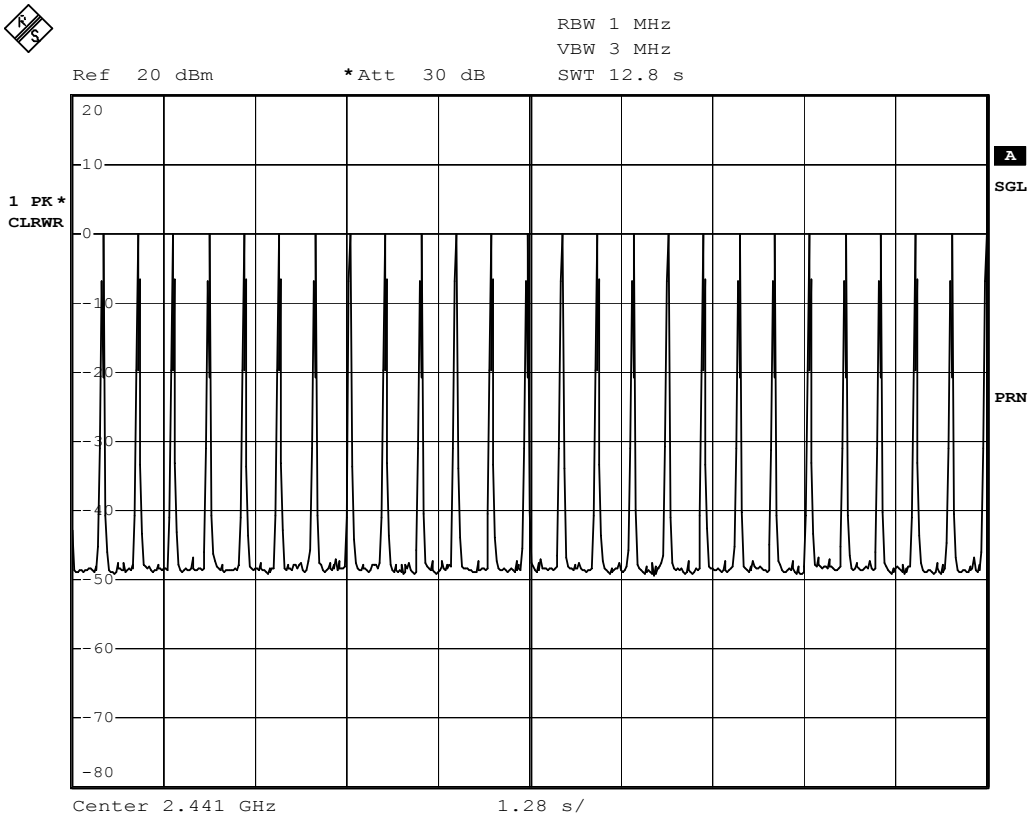


Dwell Time

Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: Hopping on

Burst Duration (ms)	Number of hopping	Time of occupancy (s)	Results
2.944	27	0.002944 x 27 = 0.07949	Pass



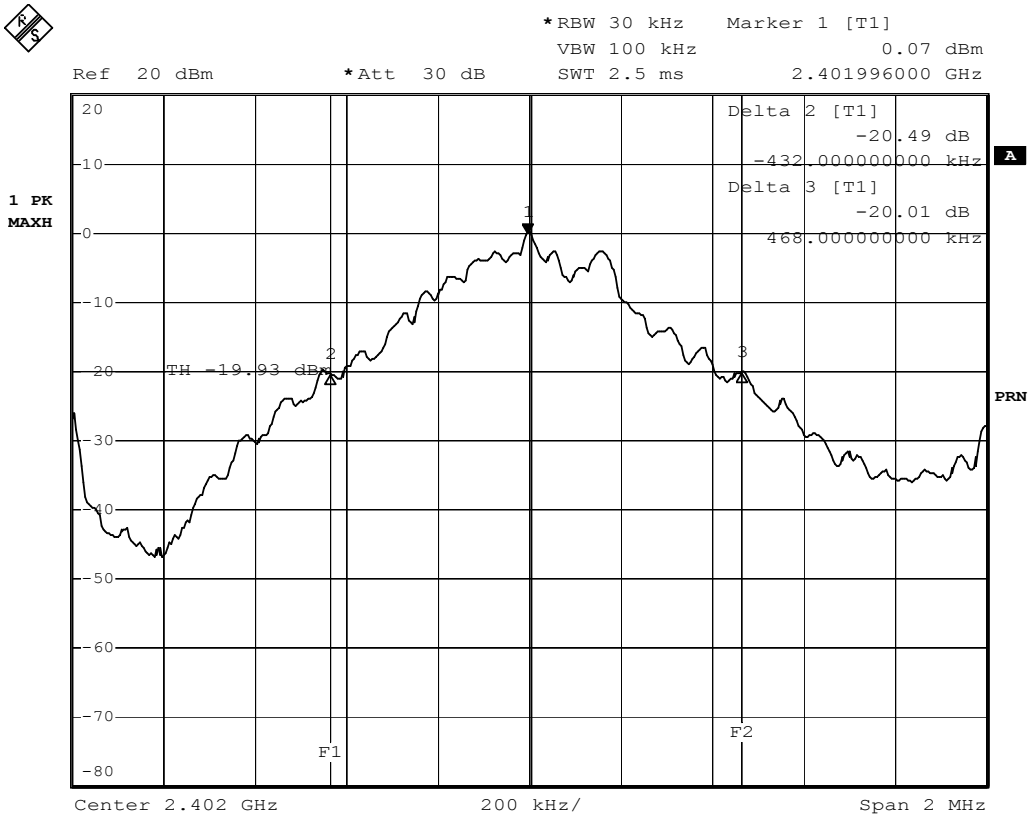


Date: 8.OCT.2003 17:32:49

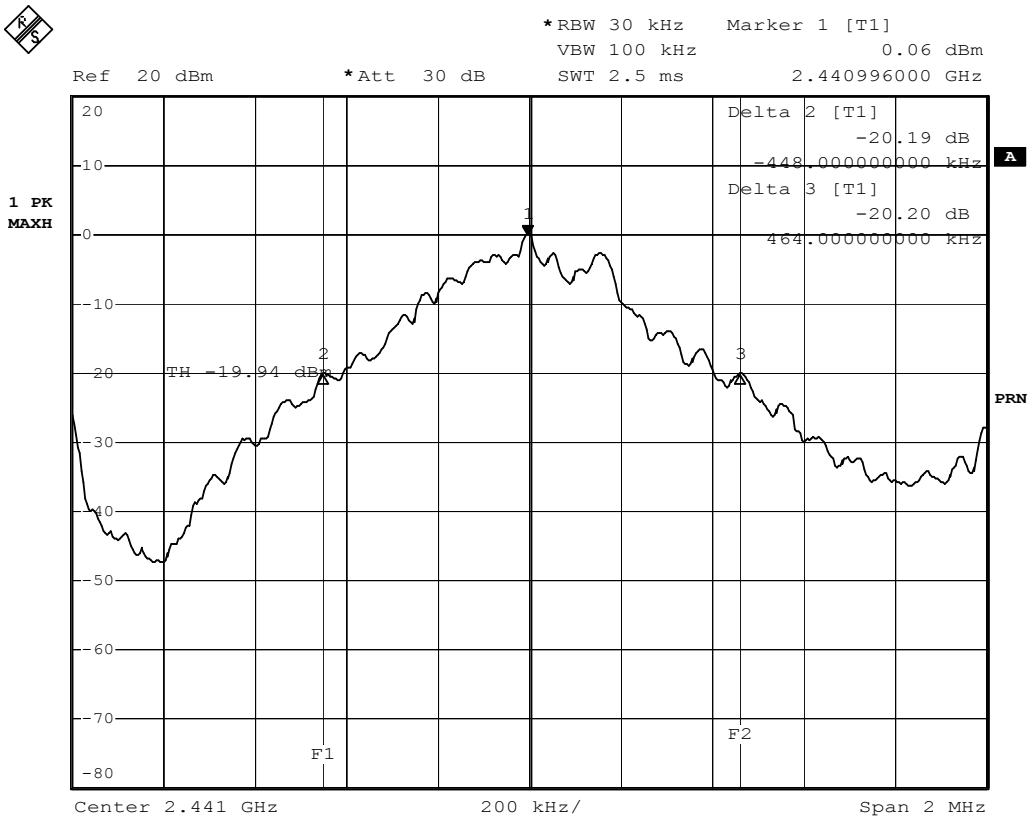
20dB Bandwidth

Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: TX mode, DH5 with PRBS9 payload

Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$\lvert\Delta f_H\rvert+\lvert\Delta f_L\rvert$ (MHz)	Results
2402	-0.432	0.468	0.900	Pass
2441	-0.448	0.464	0.912	Pass
2480	-0.452	0.456	0.908	Pass

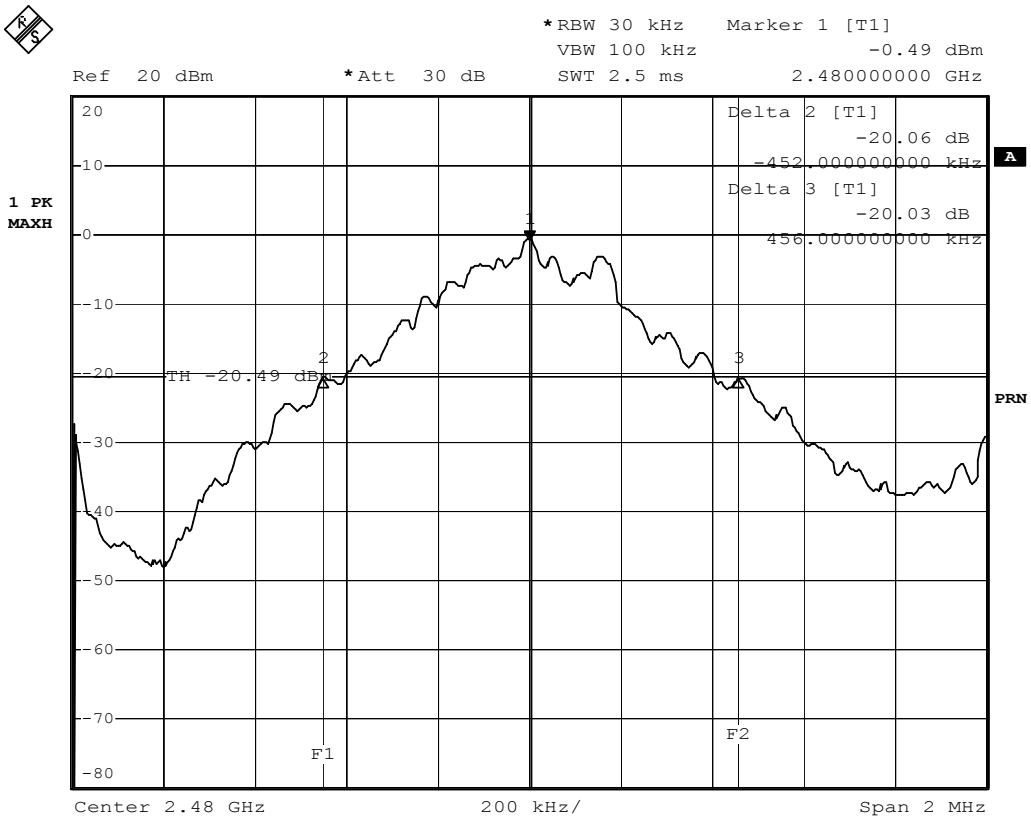


Tx frequency: 2402MHz



Date: 8.OCT.2003 17:40:28

Tx frequency: 2441MHz



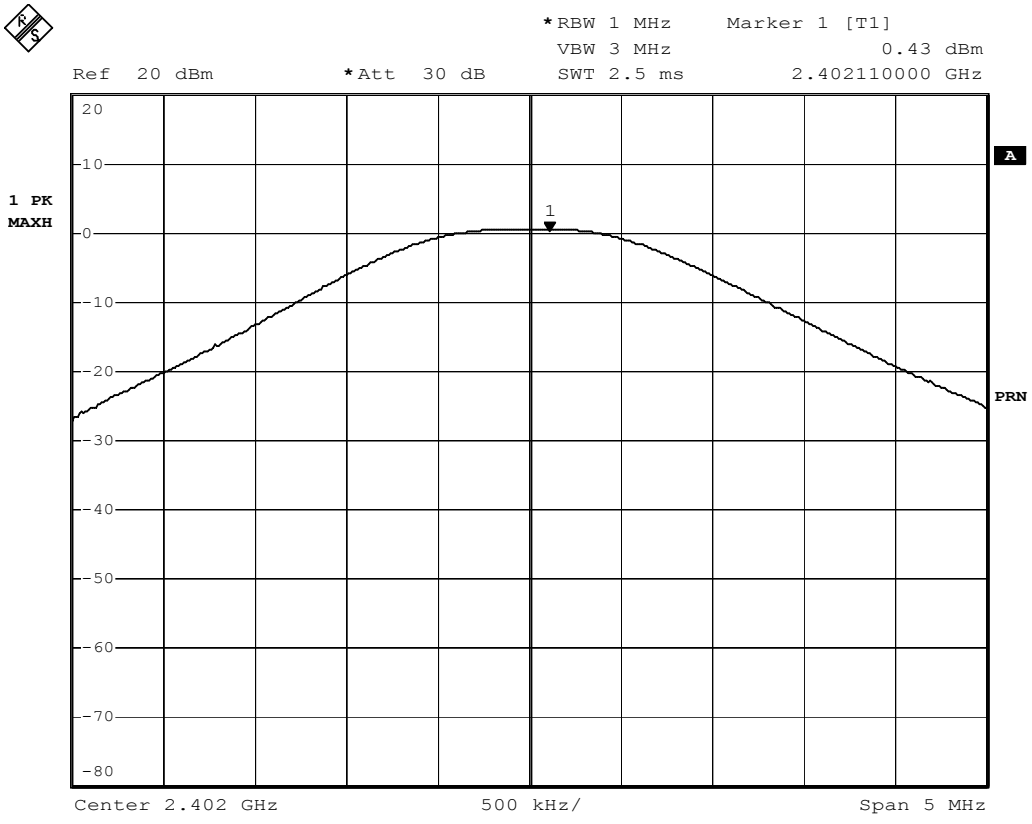
Date: 8.OCT.2003 17:42:12

Tx frequency: 2480MHz

Peak Output Power

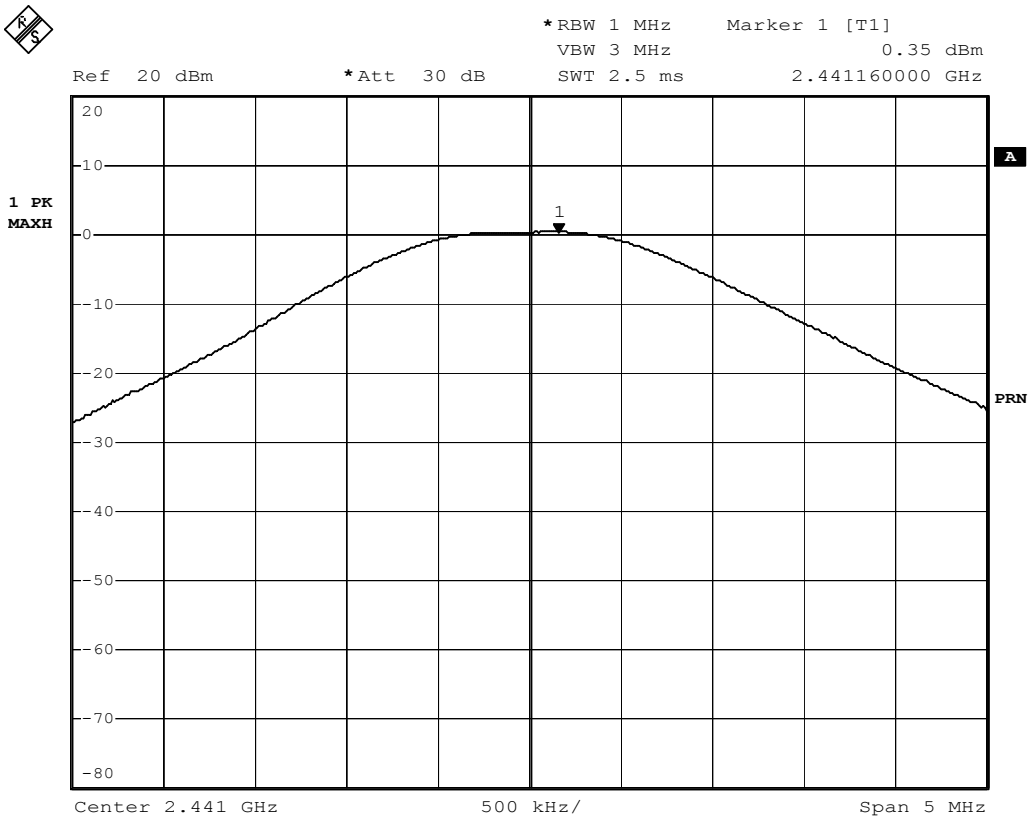
Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Cable Attenuation (dB)	Power P_{PK} (dBm)	Actual Peak Power (dBm)	Results
2402	4.30	0.43	4.73	Pass
2441	4.15	0.35	4.50	Pass
2480	4.50	-0.11	4.39	Pass



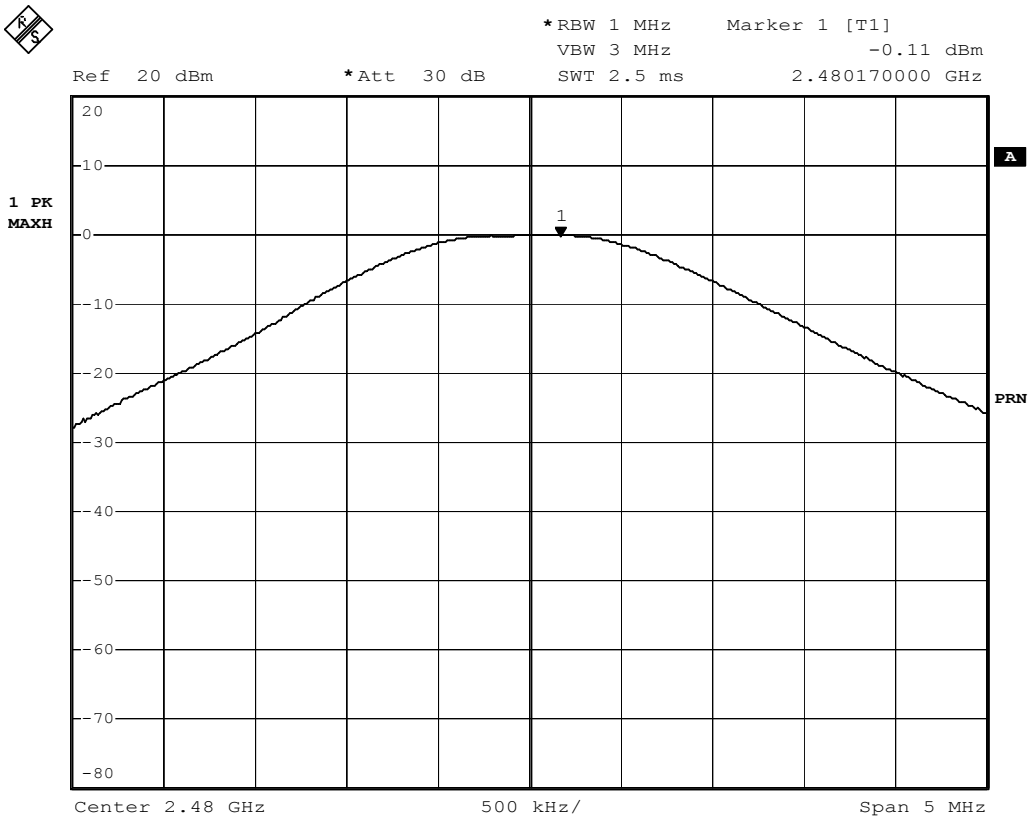
Date: 8.OCT.2003 14:55:57

Tx frequency: 2402MHz



Date: 8.OCT.2003 14:58:00

Tx frequency: 2441MHz



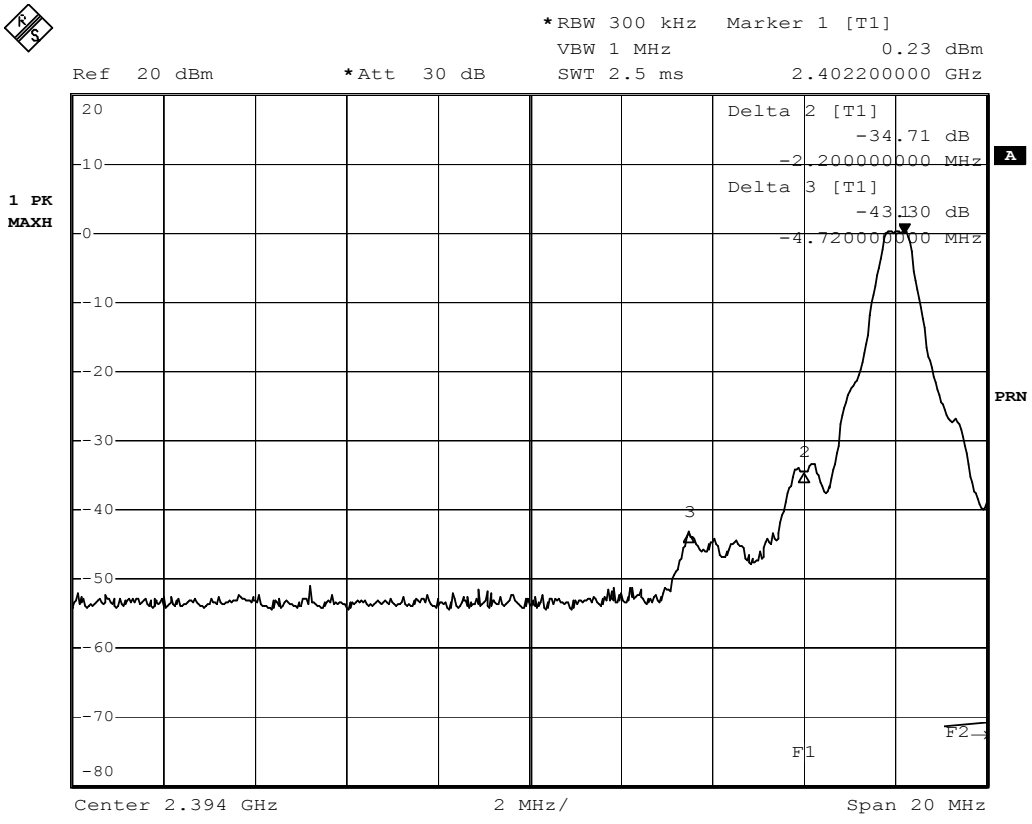
Date: 8.OCT.2003 14:58:42

Tx frequency: 2480MHz

Band Edge Compliance

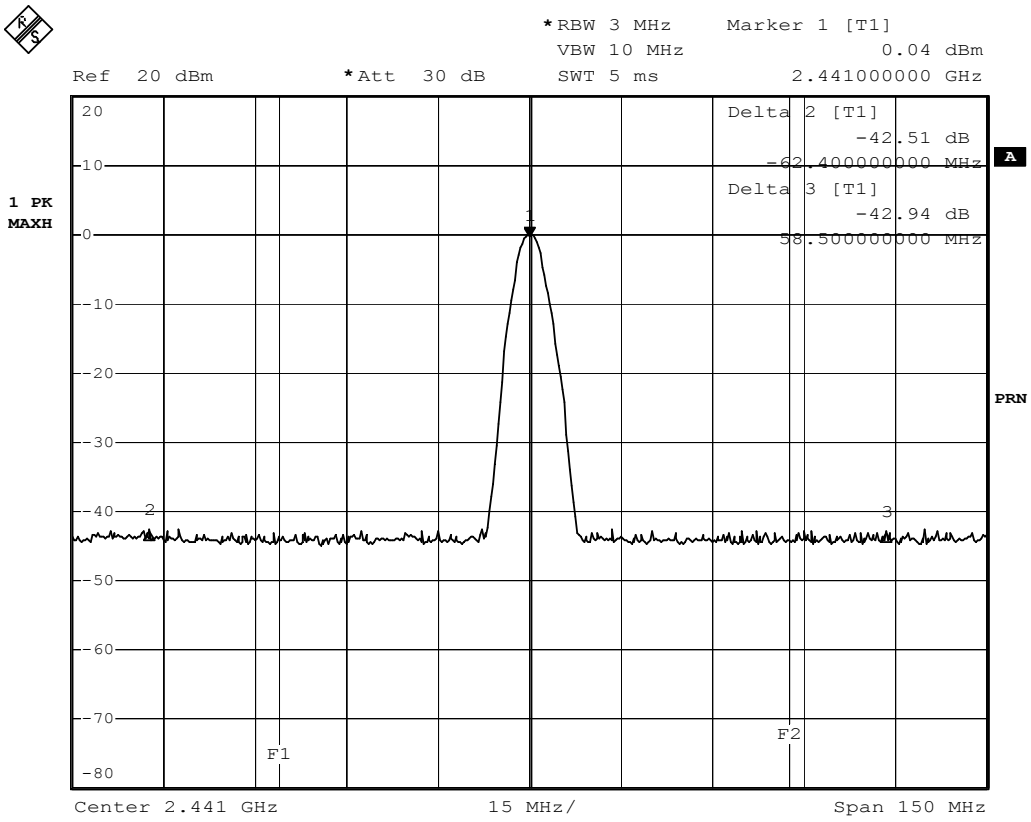
Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	0.23	No Peak	-	Pass
2480	-0.42	No Peak	-	Pass



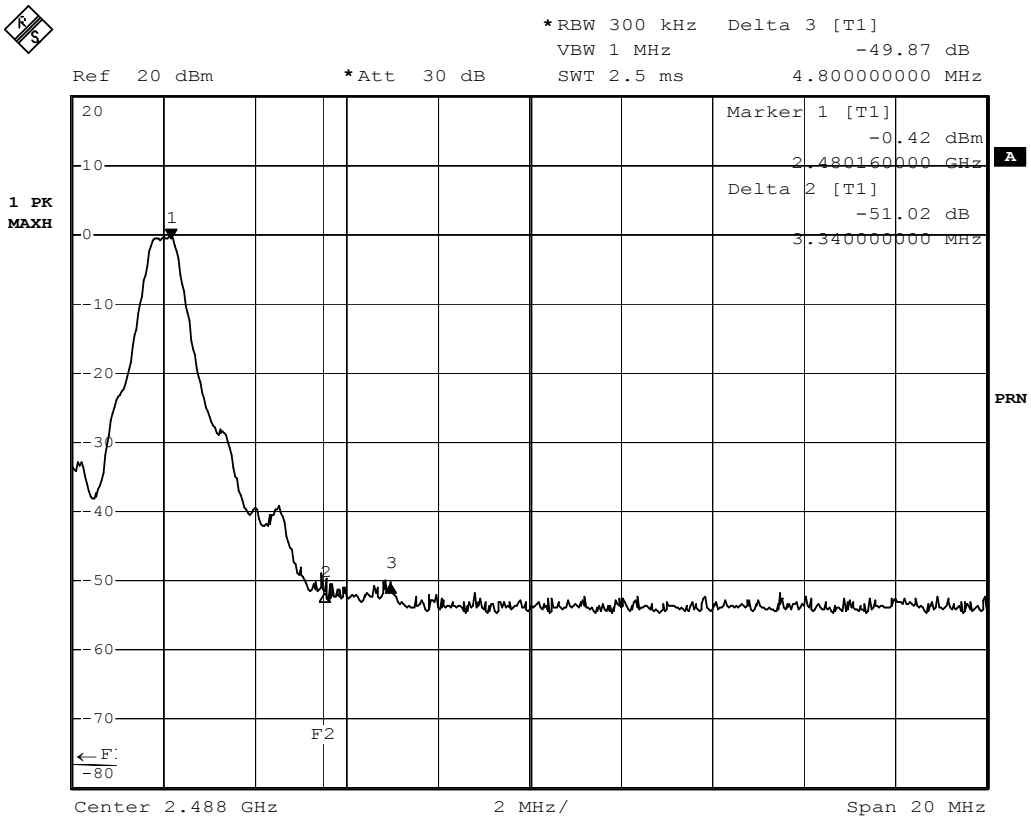
Date: 8.OCT.2003 15:04:48

Tx frequency: 2402MHz



Date: 8.OCT.2003 15:06:05

Tx frequency: 2441MHz



Date: 8.OCT.2003 15:08:00

Tx frequency: 2480MHz

Spurious Emissions - Conducted

Date: 8 Oct 2003
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Humidity: 55%
Temperature: 22ºC
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: TX mode, DH1 with PRBS9 payload

Tx frequency : 2402MHz

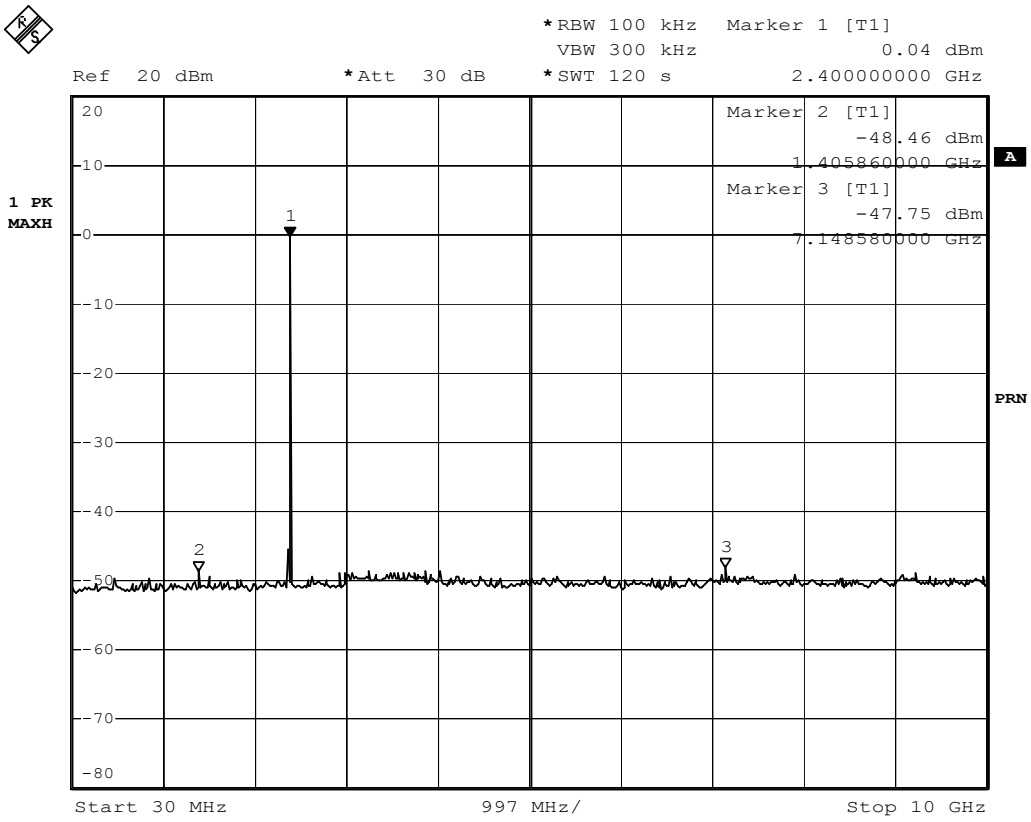
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
No peak found	-	-	-	Pass

Tx frequency : 2441MHz

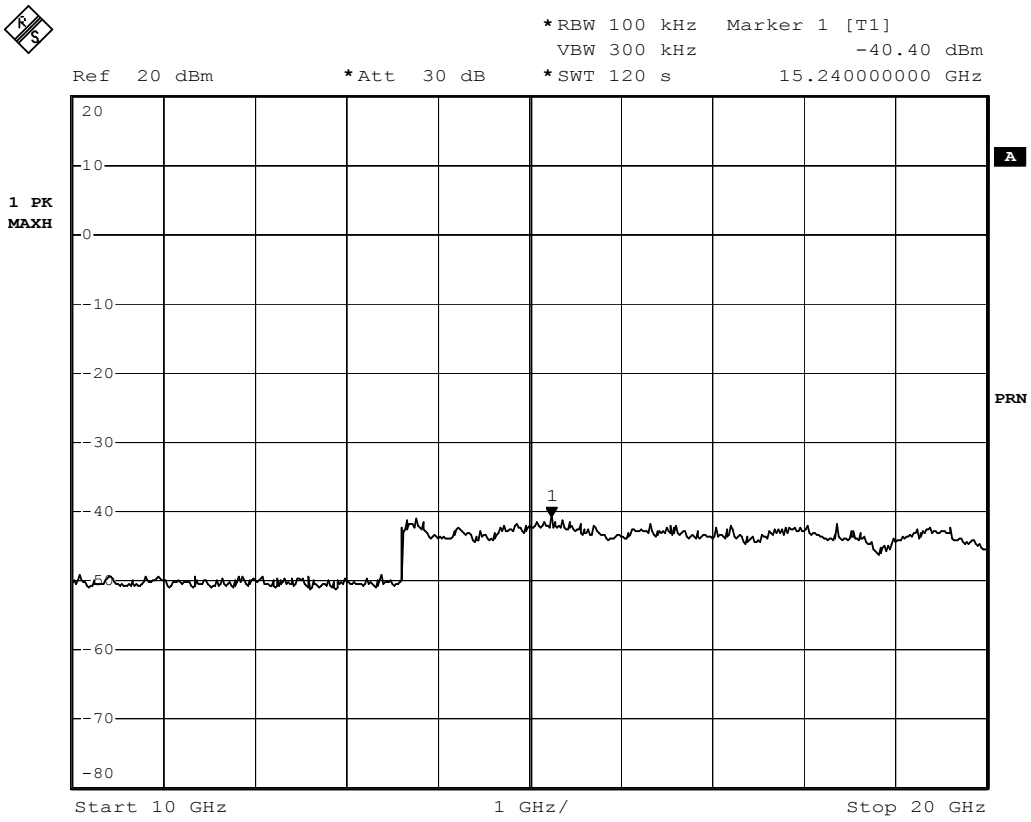
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
No peak found	-	-	-	Pass

Tx frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
No peak found	-	-	-	Pass

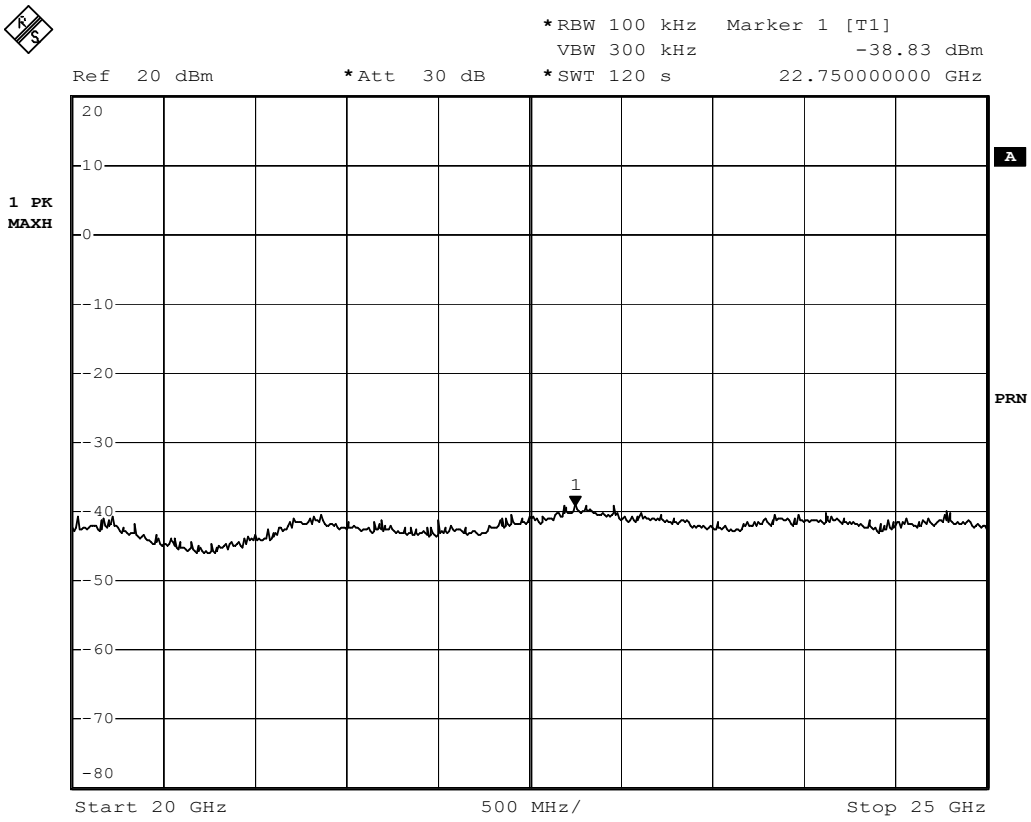


Tx frequency: 2402MHz



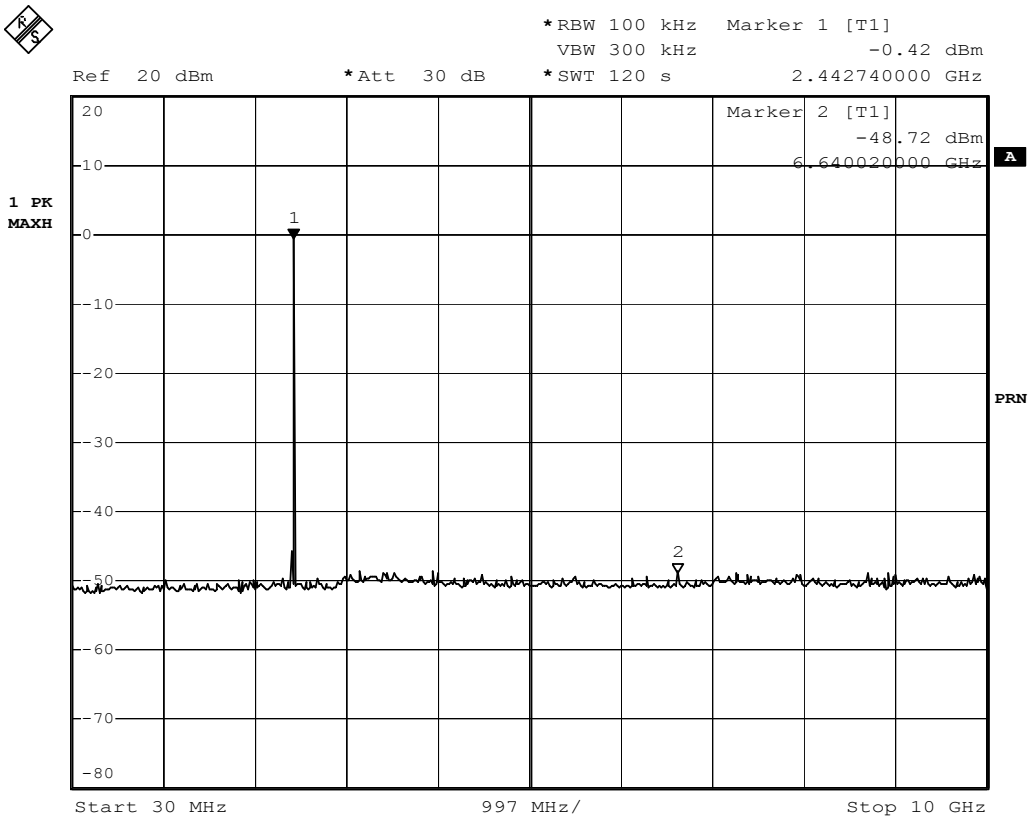
Date: 8.OCT.2003 15:28:06

Tx frequency: 2402MHz



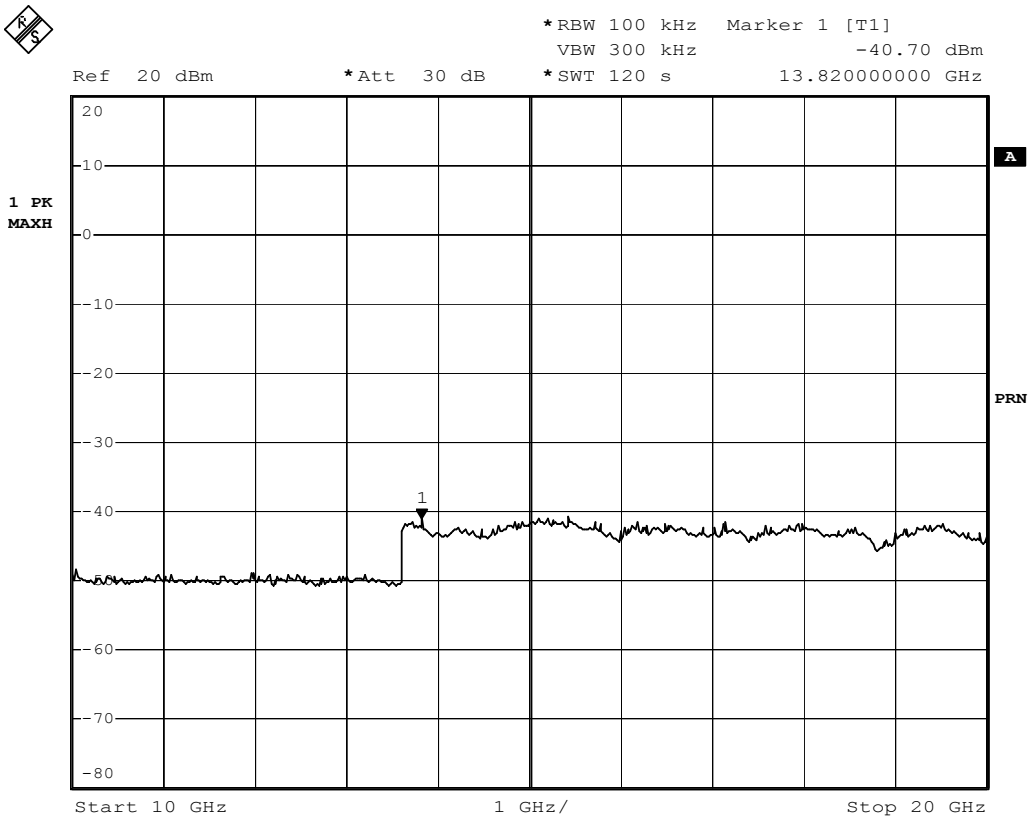
Date: 8.OCT.2003 15:32:13

Tx frequency: 2402MHz



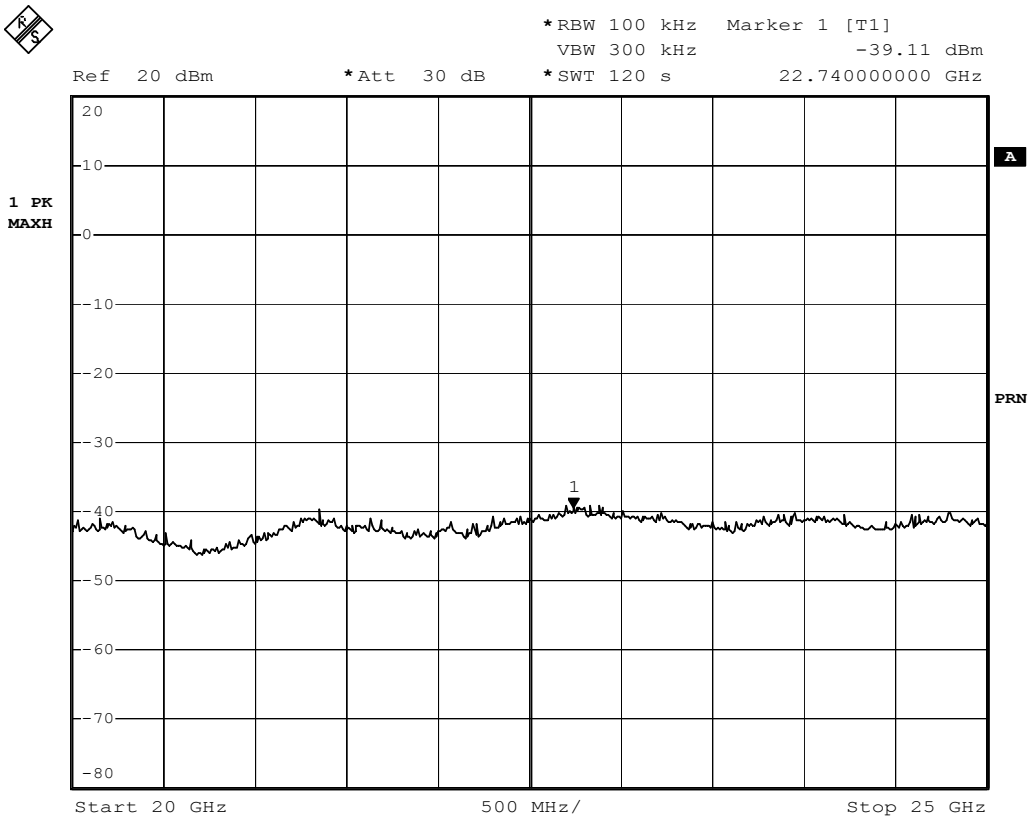
Date: 8.OCT.2003 16:47:30

Tx frequency: 2441MHz



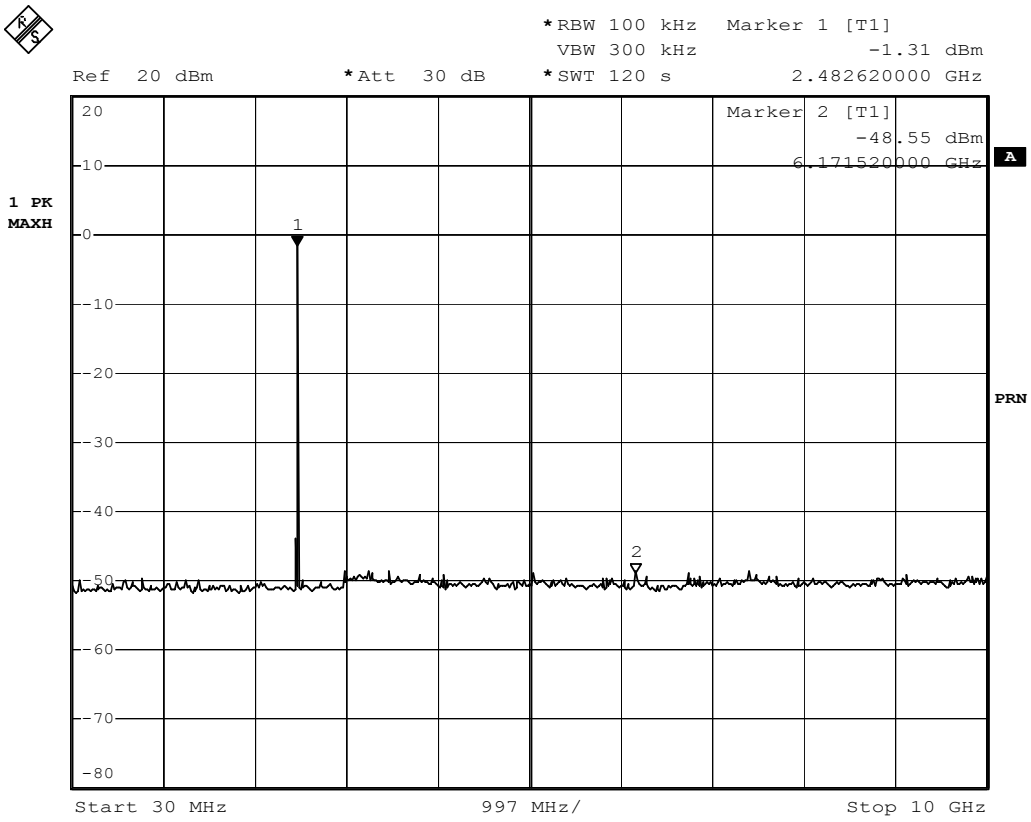
Date: 8.OCT.2003 16:58:05

Tx frequency: 2441MHz



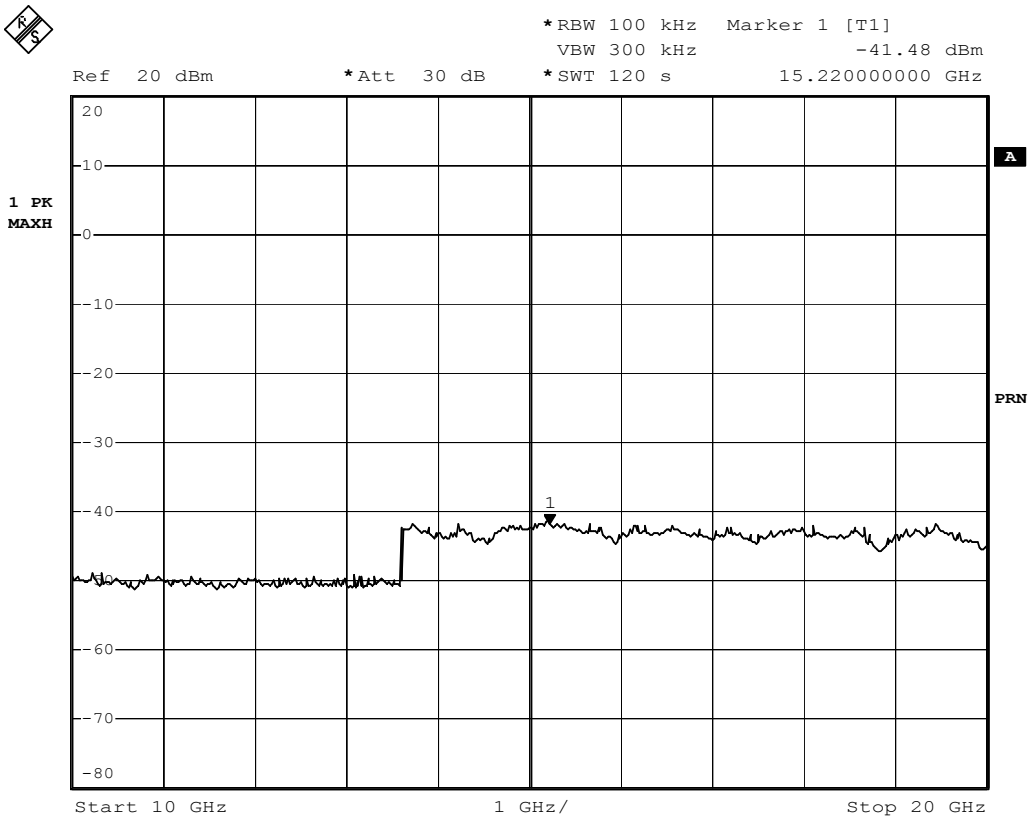
Date: 8.OCT.2003 17:02:23

Tx frequency: 2441MHz

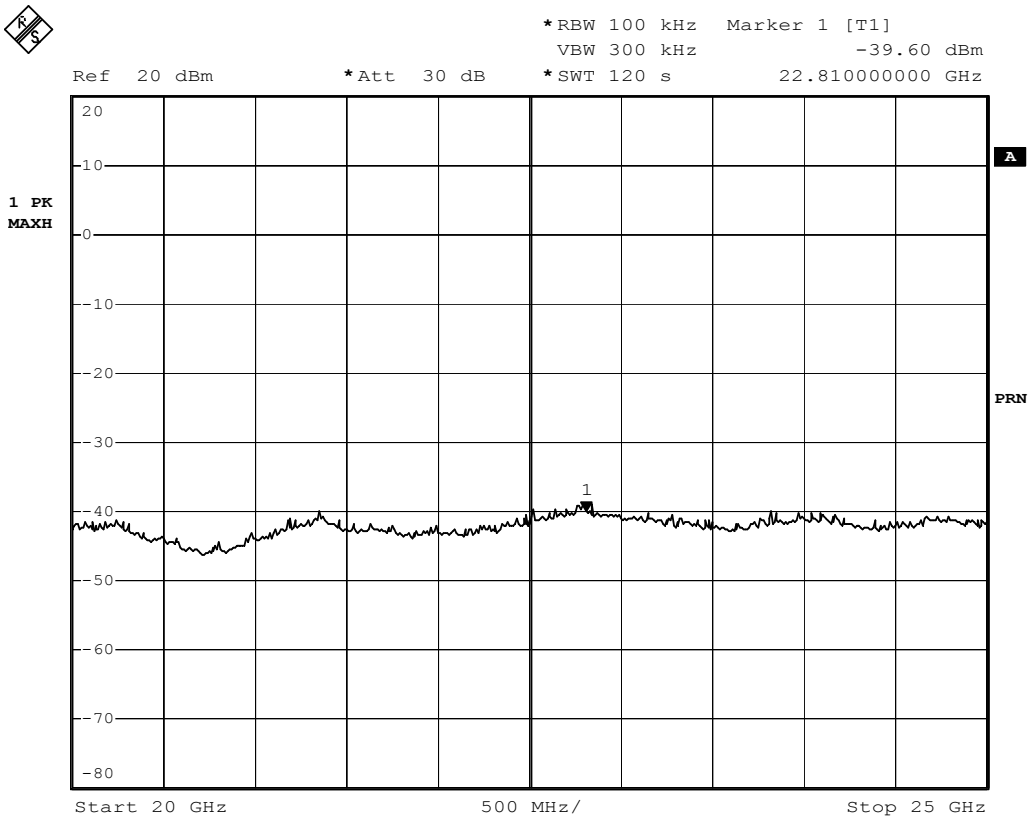


Date: 8.OCT.2003 17:16:03

Tx frequency: 2480MHz



Tx frequency: 2480MHz



Date: 8.OCT.2003 17:06:58

Tx frequency: 2480MHz

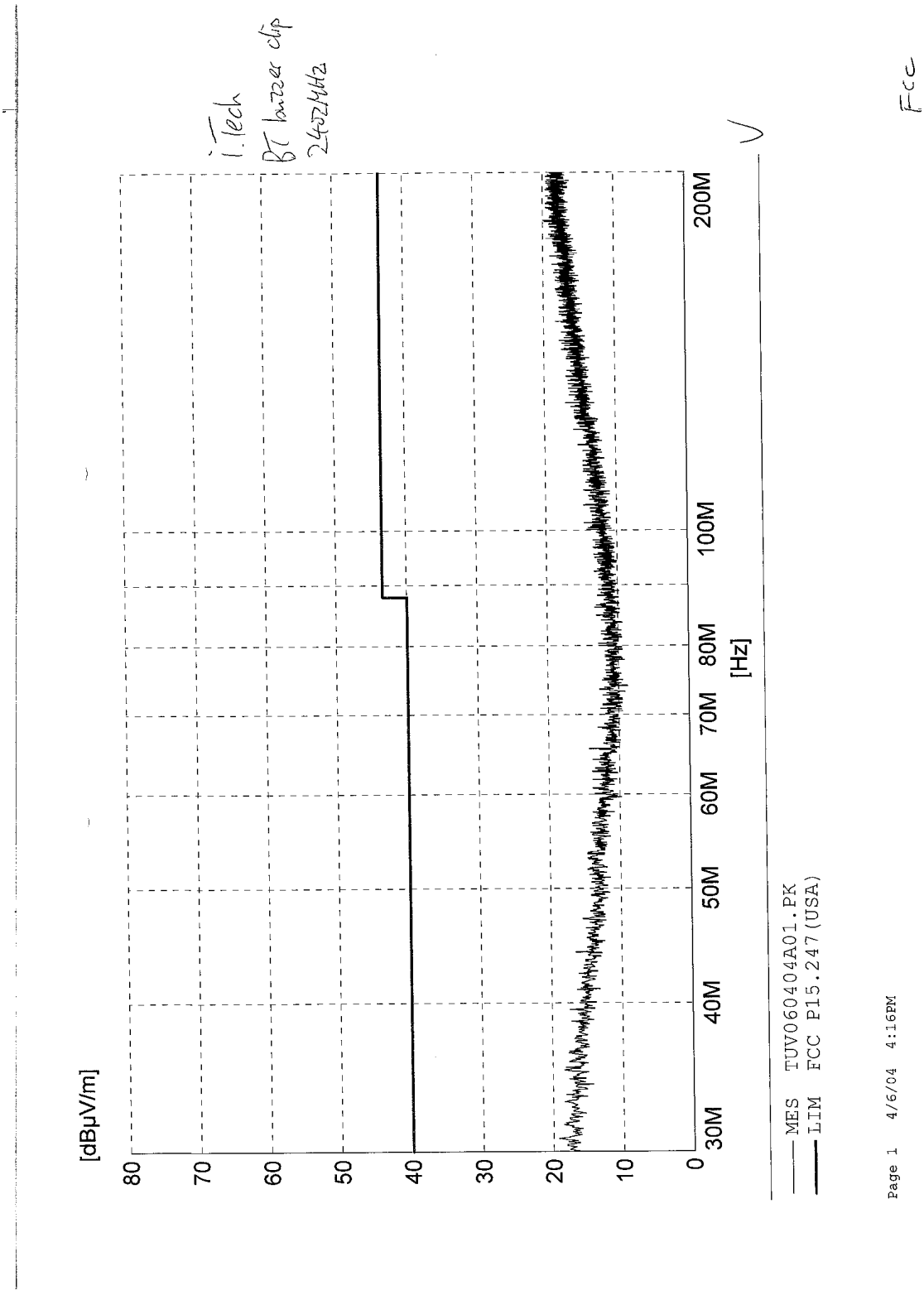
Spurious Emissions - Radiated

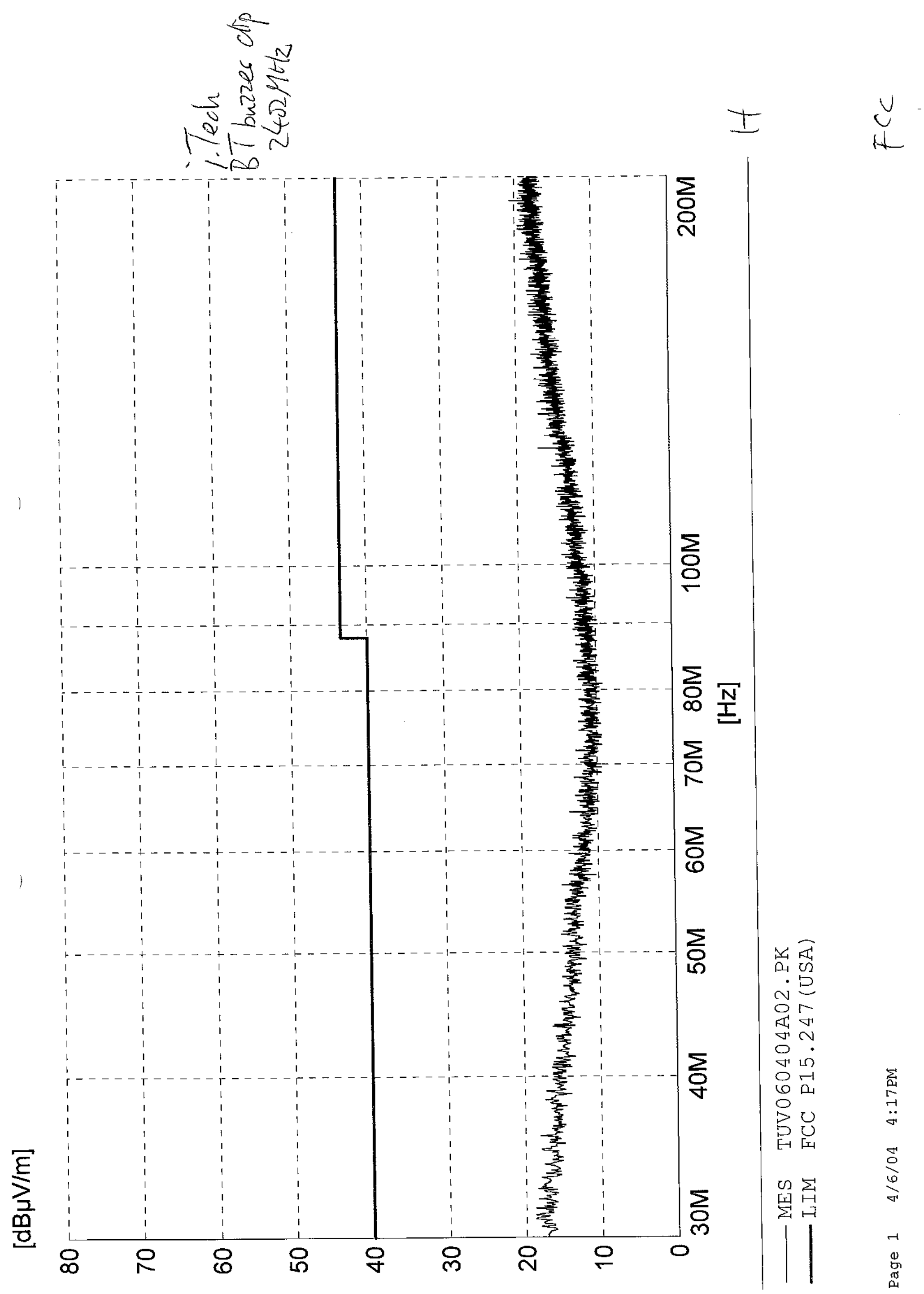
Date: 6 Apr 2004
EUT: Bluetooth Buzzer Clip Headset (C51-A03101-XX)
Company: i.Tech Dynamic Ltd.
Voltage supply: 3.9V
Test by: Hugo Wan
Op. mode: TX mode, DH1 with PRBS9 payload

Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2402	-	No Peak	-	-

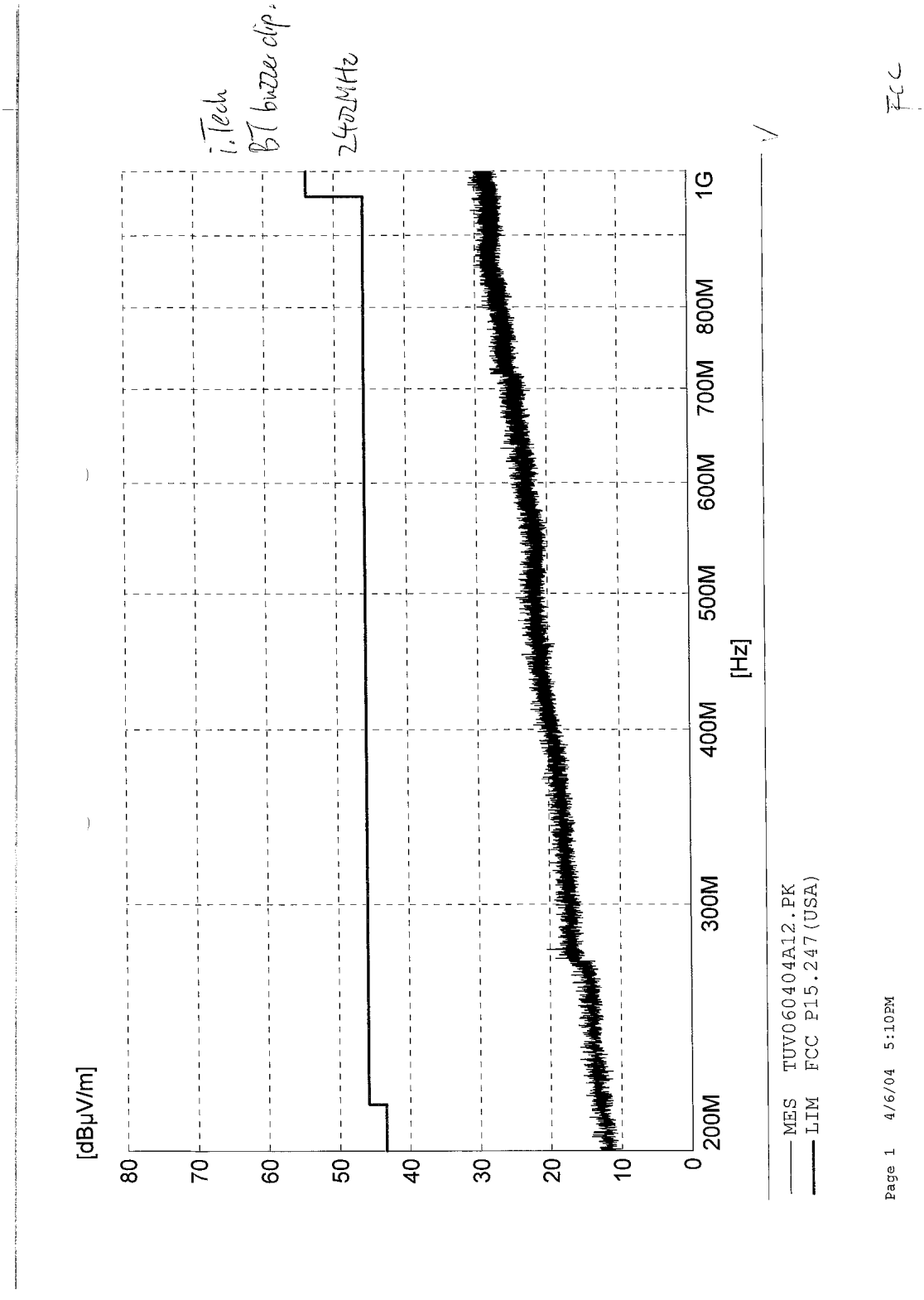
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2441	-	No Peak	-	-

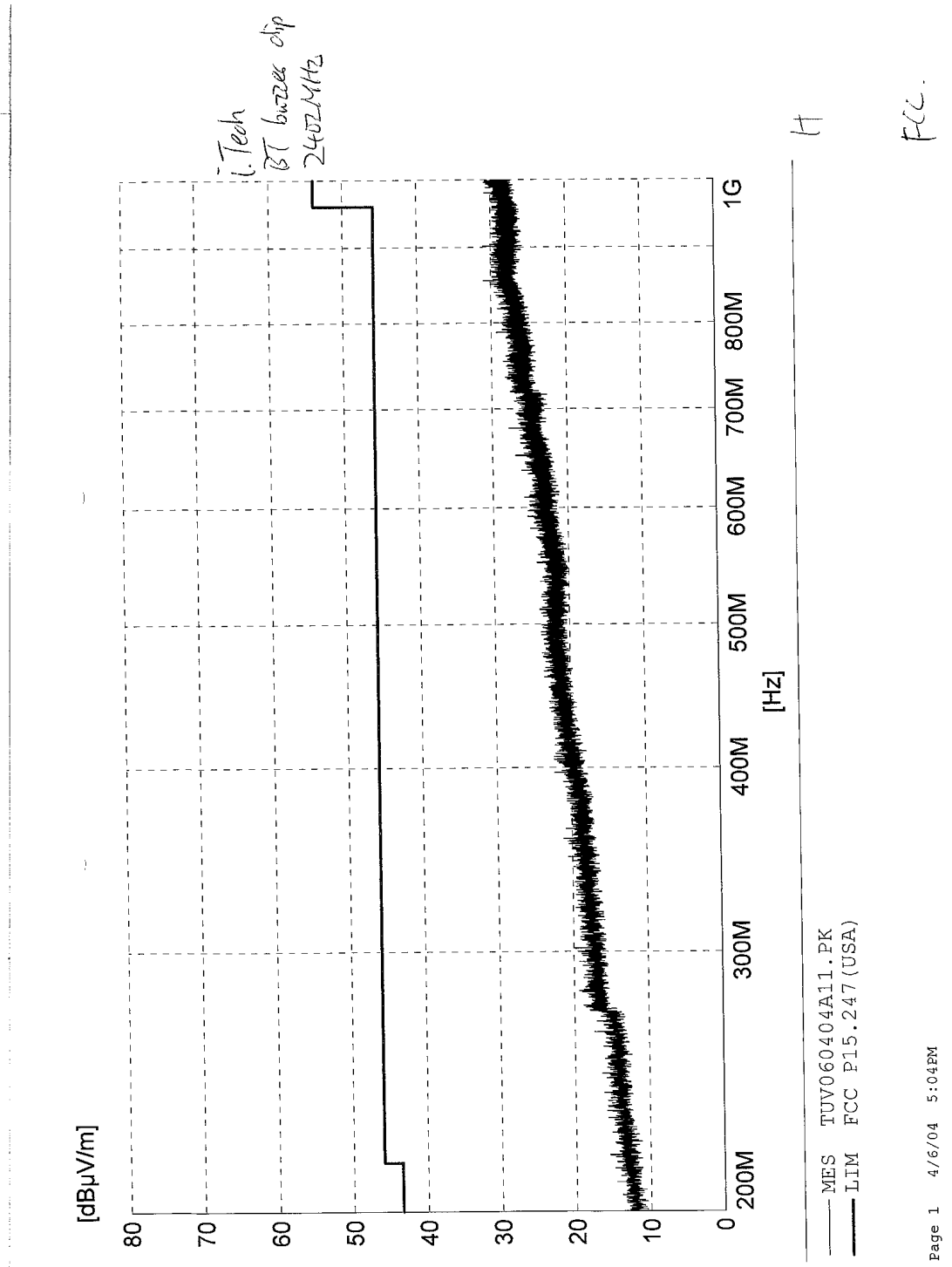
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2480	-	No Peak	-	-

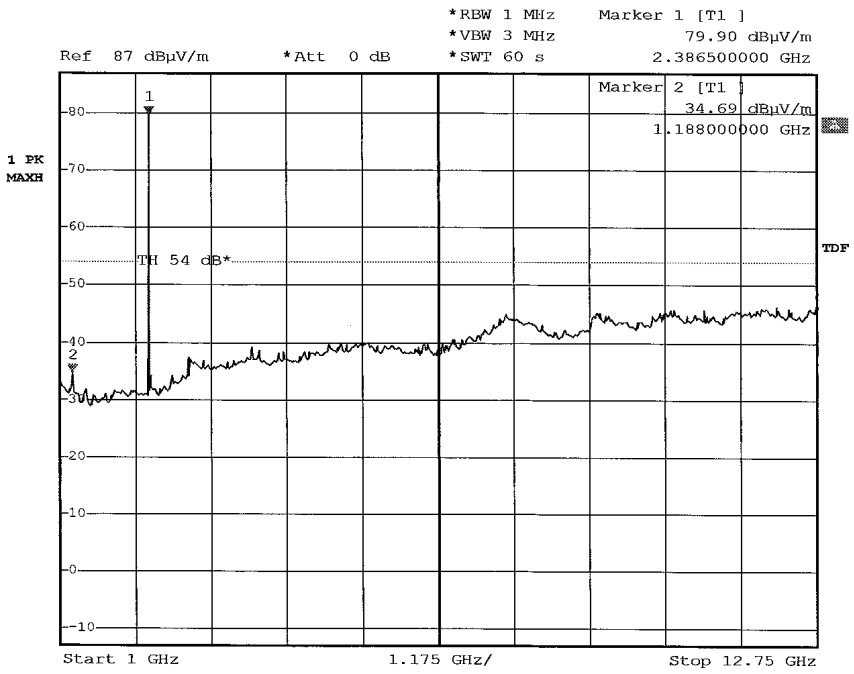

i.Tech
BT buzzer clip
2402MHz
Fcc
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
V
MES TUV060404A01.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:16PM



[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV060404A02.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:17PM


i.Tech
BT buzzer clip.
2402MHz
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A12.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 5:10PM

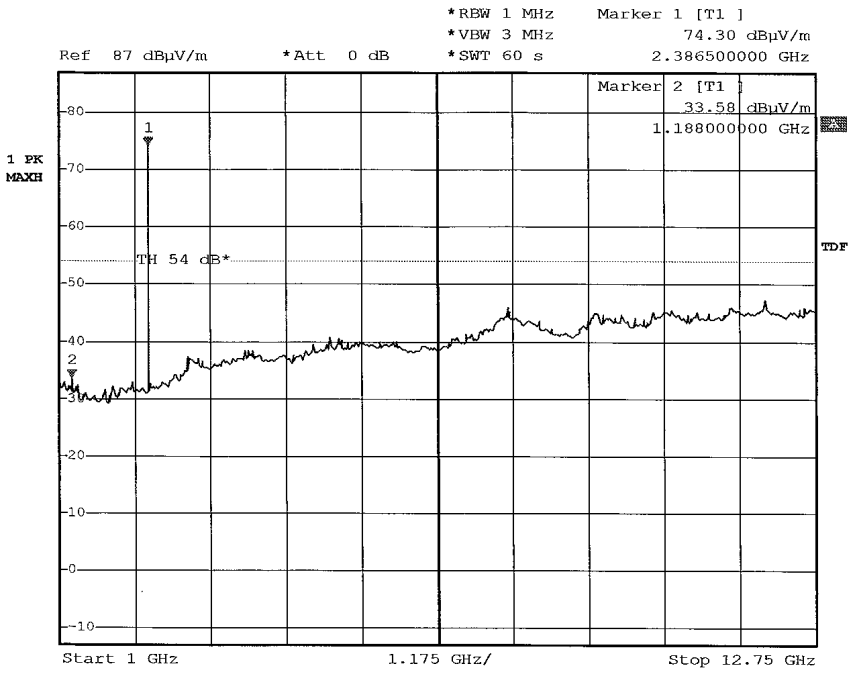

i Tech
BT buzzer chip
2402MHz
H
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A11.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 5:04PM



Date: 6.APR.2004 17:27:22

1. Tech
BT buzzer chip.
2402 MHz

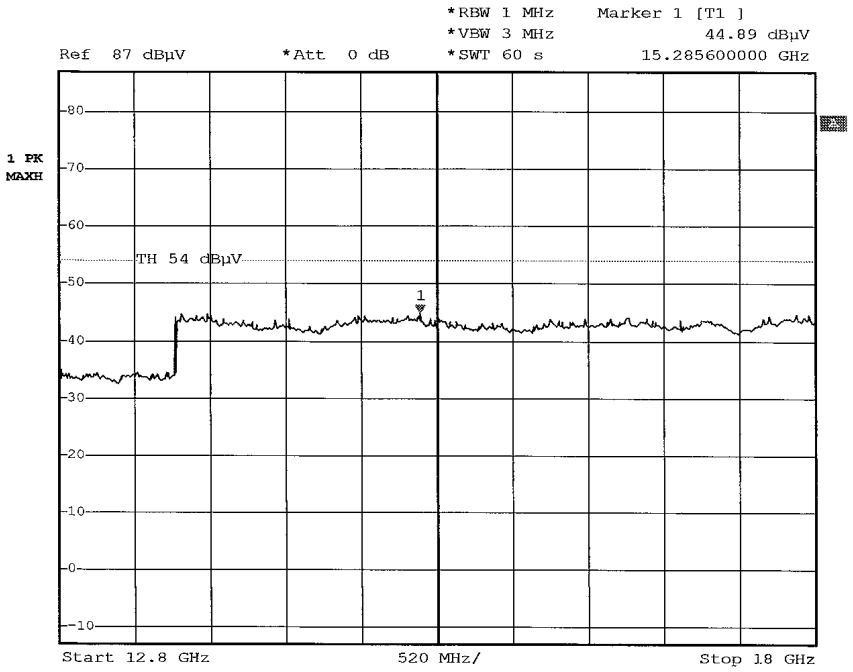
V
FCC.



Date: 6.APR.2004 17:30:08

i.Tech
BT buzzer dip
2402 MHz

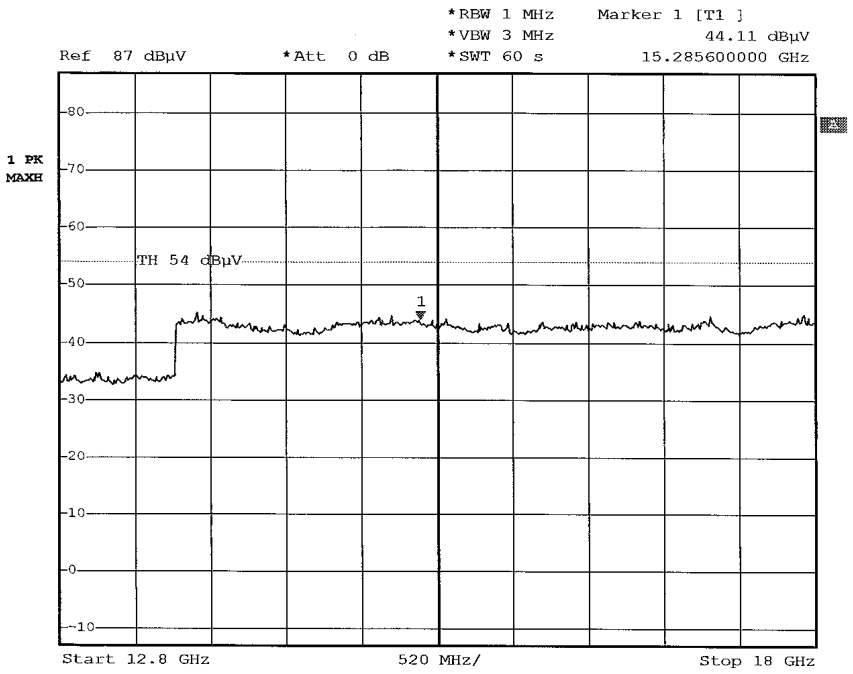
H
Fcc



Date: 6.APR.2004 17:53:15

Tech
BT buzzer dip
2402 MHz

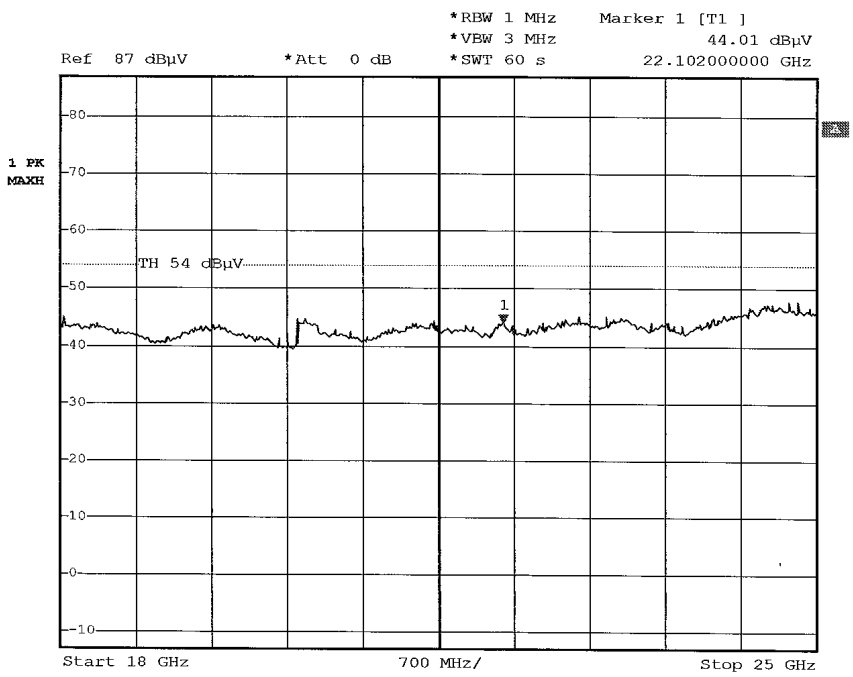
V
Fcc.



Date: 6.APR.2004 17:55:38

i. Tech
BT buzzer chip
2402MHz

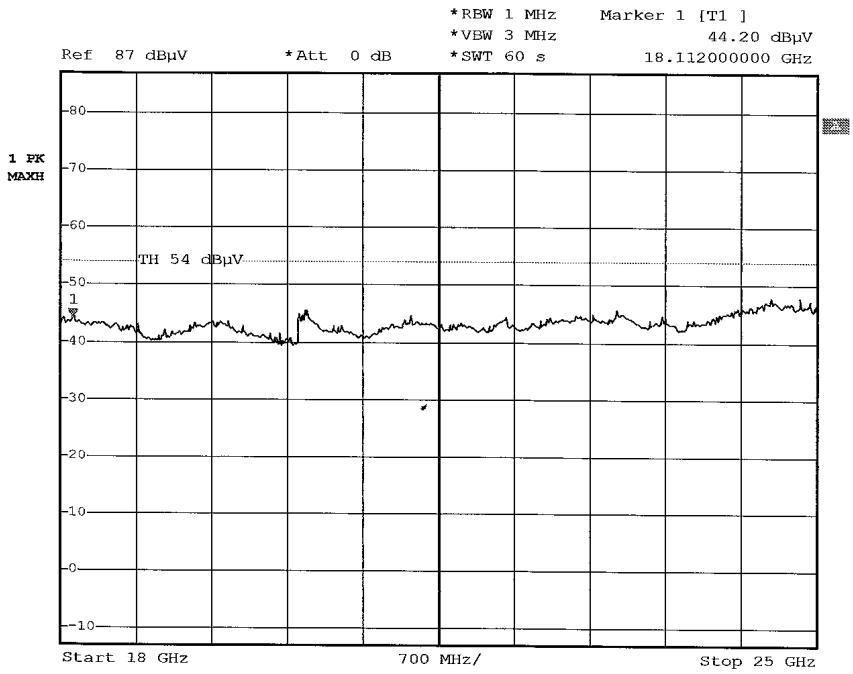
H
Pcc



Date: 6.APR.2004 18:02:44

BT buzzer chip
2402MHz

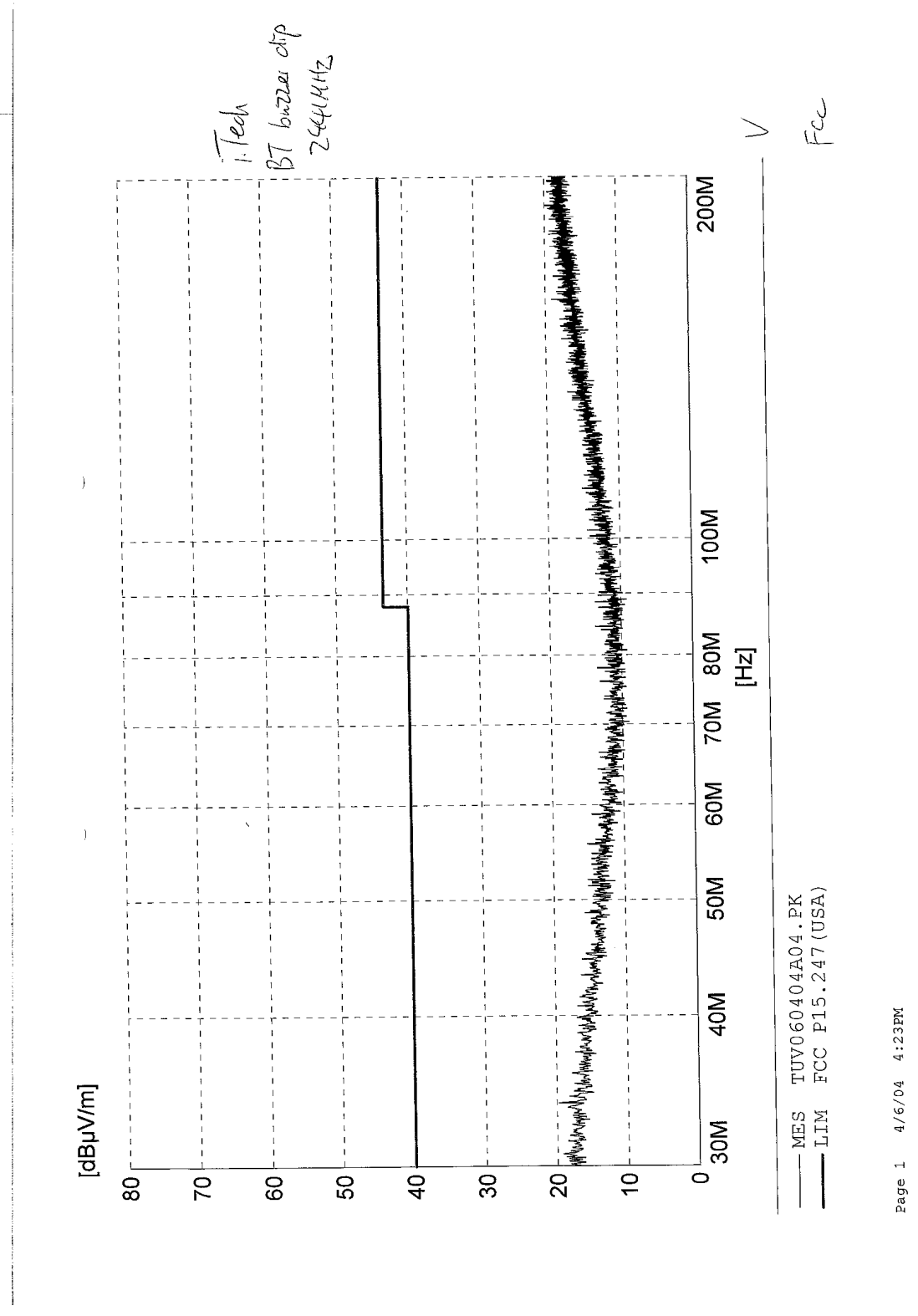
V
Fcc

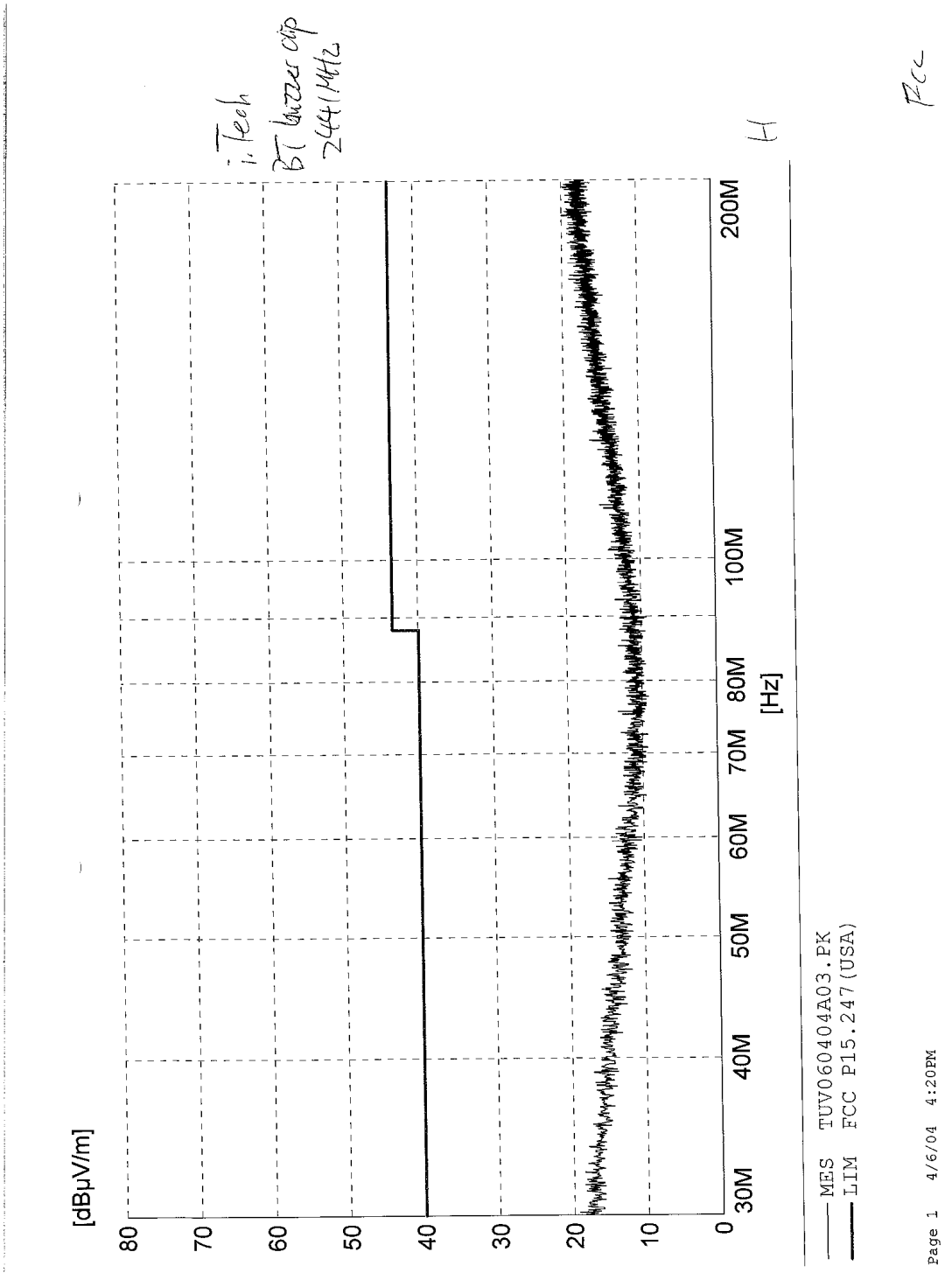


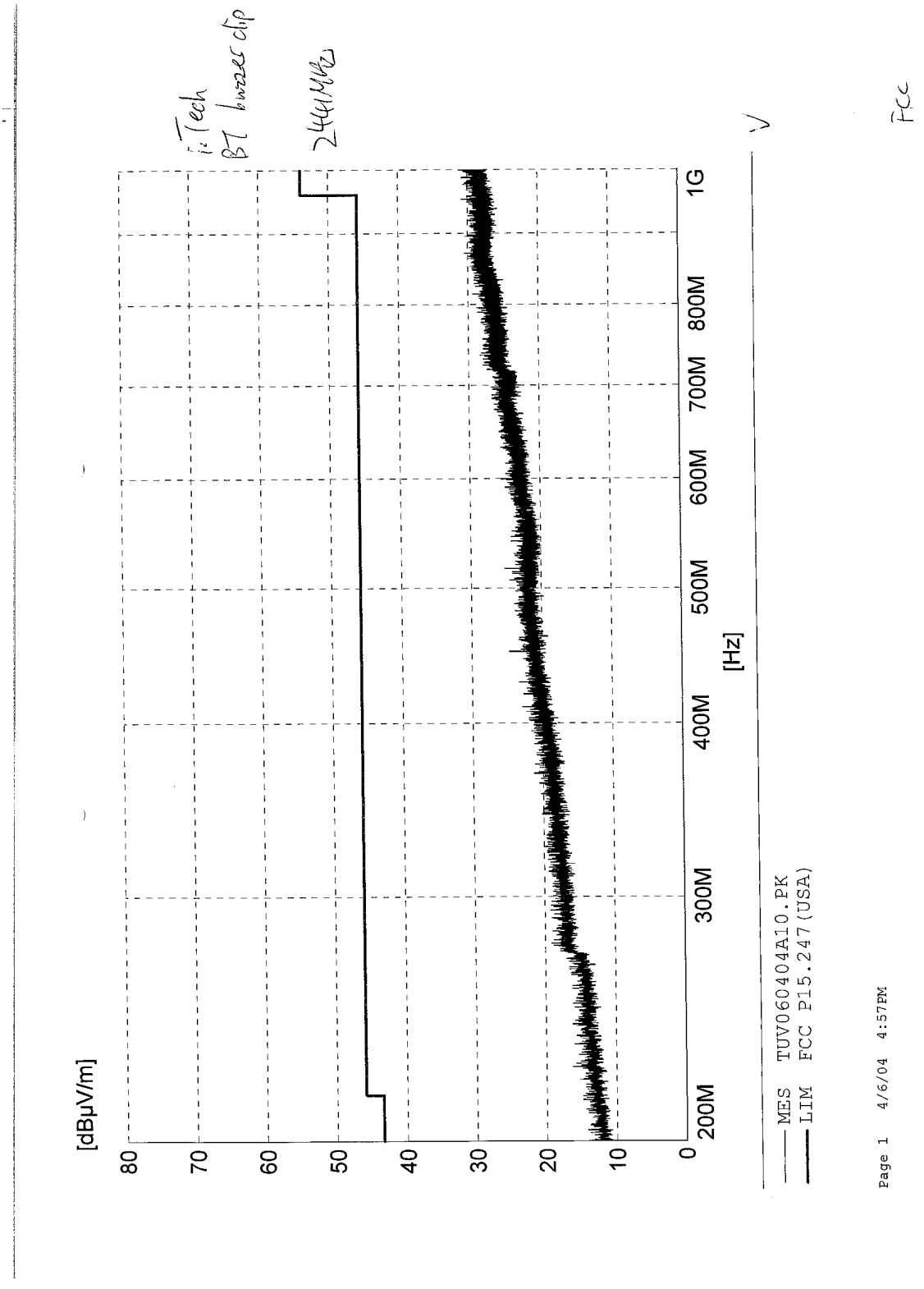
Date: 6.APR.2004 18:05:51

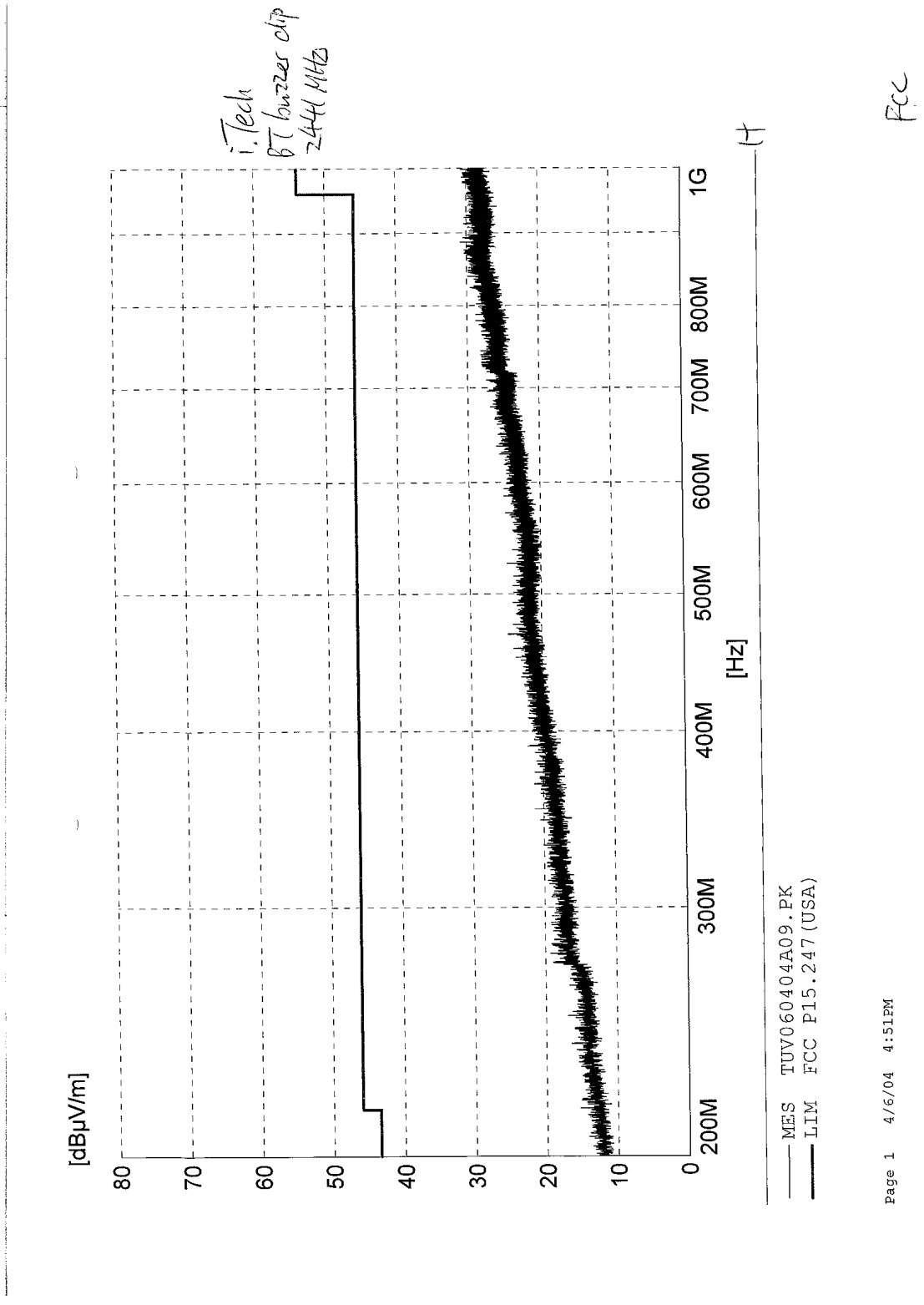
i. Tech
BT buzzer clip
2402MHz

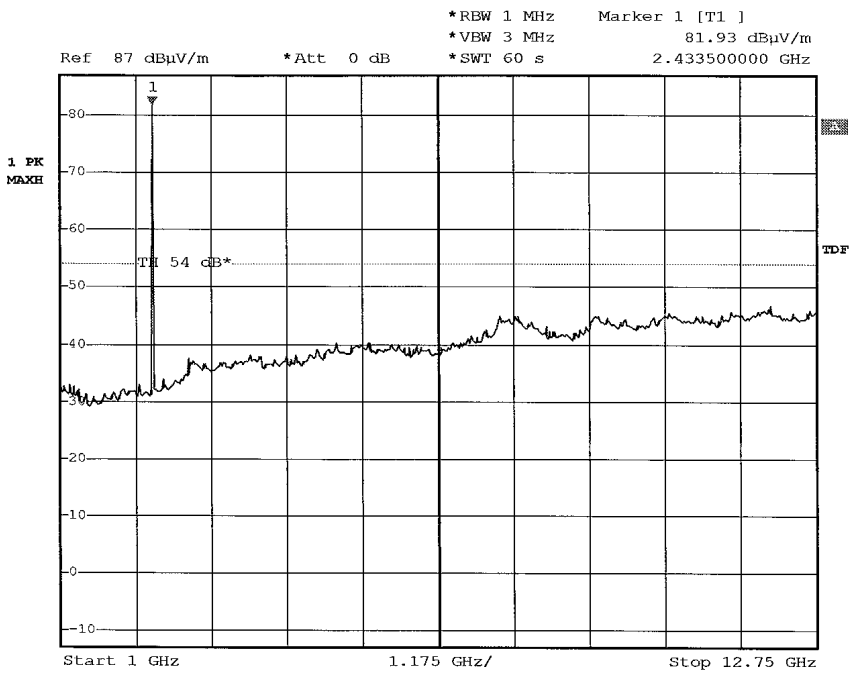
H
FCC


1. Test
BT buzzer dtp
2441MHz
V
Fcc
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV060404A04.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:23PM


i-Tech
BT Buzzer clip
2441MHz
H
Pcc
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV060404A03.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:20PM


i-Tech
BT buzzer clip
2441MHz
FCC
V
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A10.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:57PM

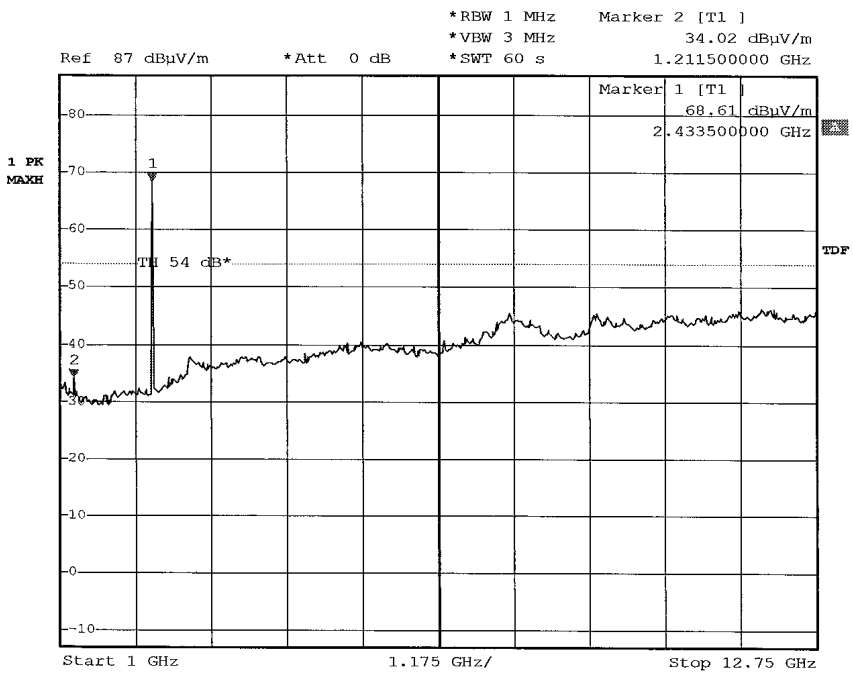

1. Tech
BT buzzer clip
2441 MHz
FCC
H
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A09.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:51PM



Date: 6.APR.2004 17:36:27

1. Tech
BT buzzer clip
2441 MHz

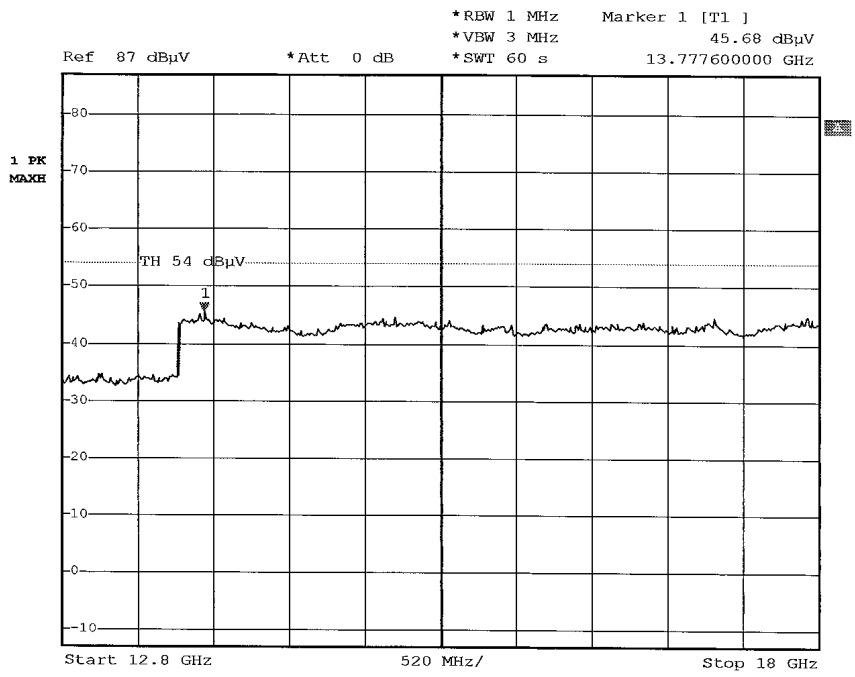
V
FCC



Date: 6.APR.2004 17:33:49

i.Tech
BT buzzer chip
2441MHz

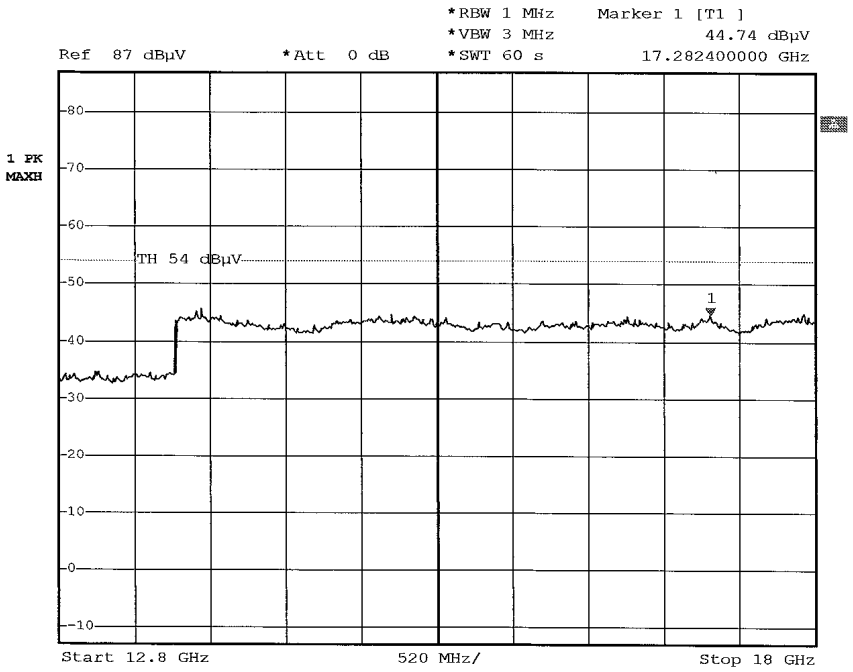
H
Fcc



Date: 6.APR.2004 17:55:50

i.Tech
BT buzzer clip
2441MHz

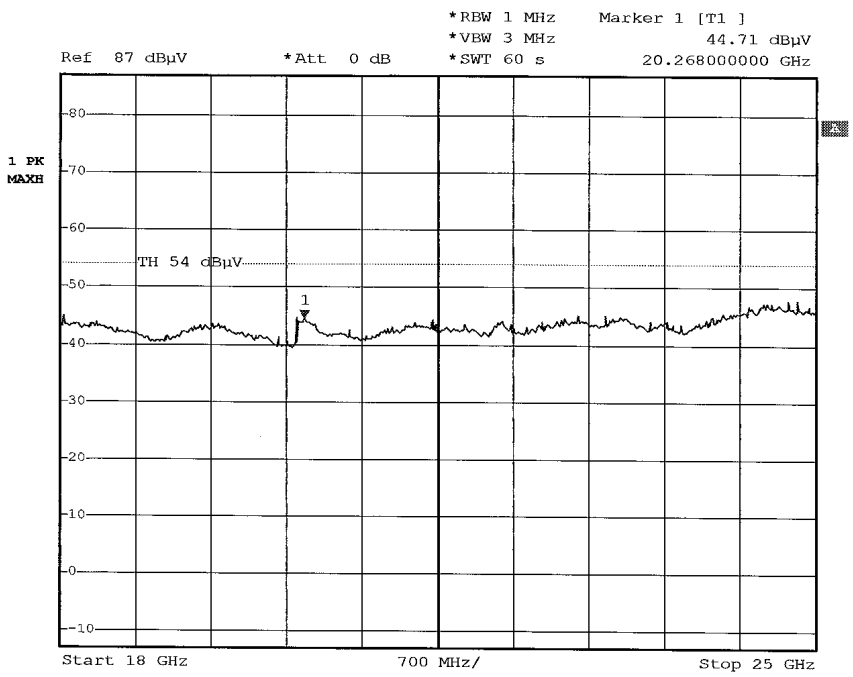
V
FCC



Date: 6.APR.2004 17:56:32

i-Tech
BT buzzer clip
2441MHz

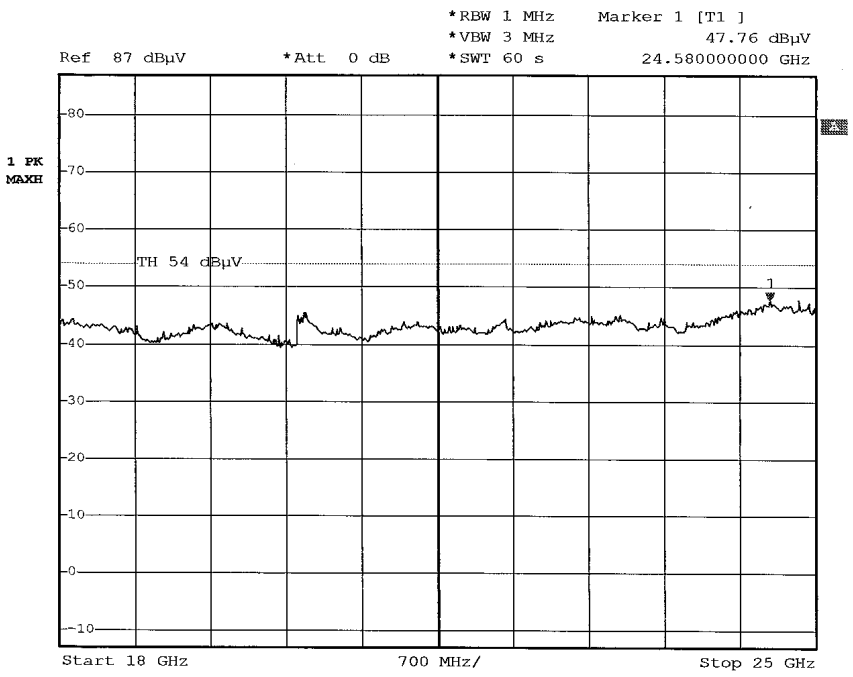
1+
FCC



Date: 6.APR.2004 18:02:30

BT buzzer clip
2441MHz

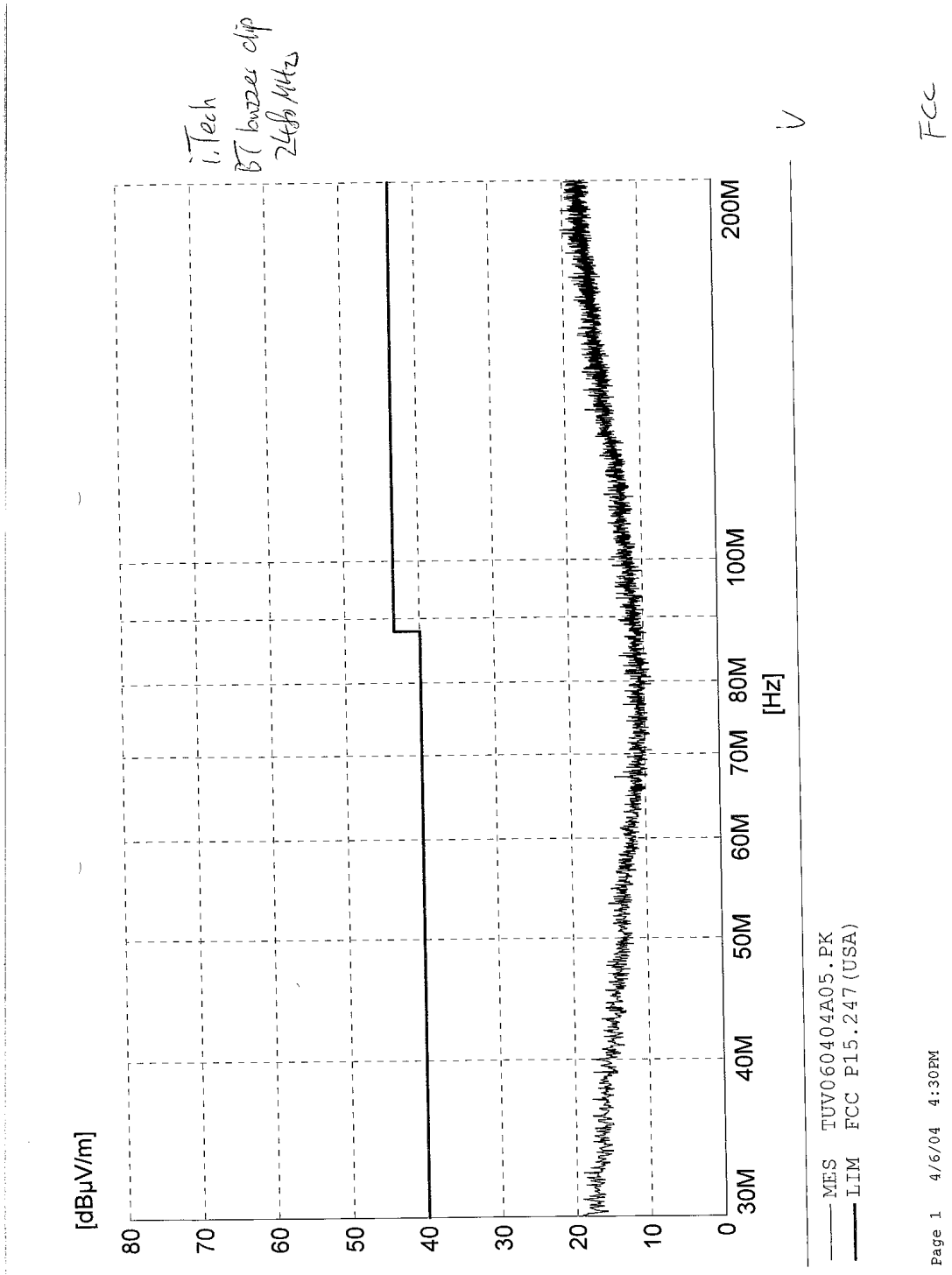
V
FCC

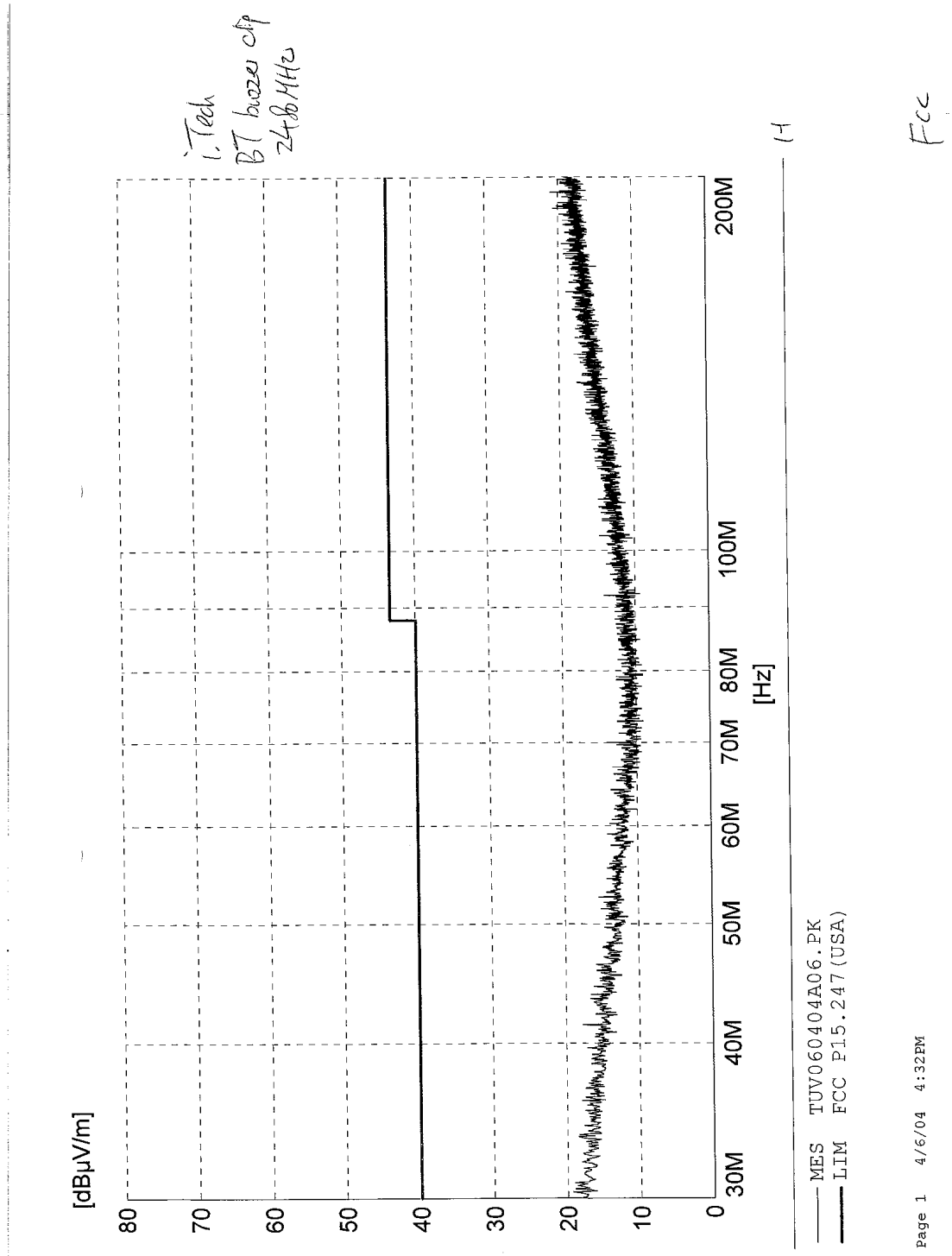


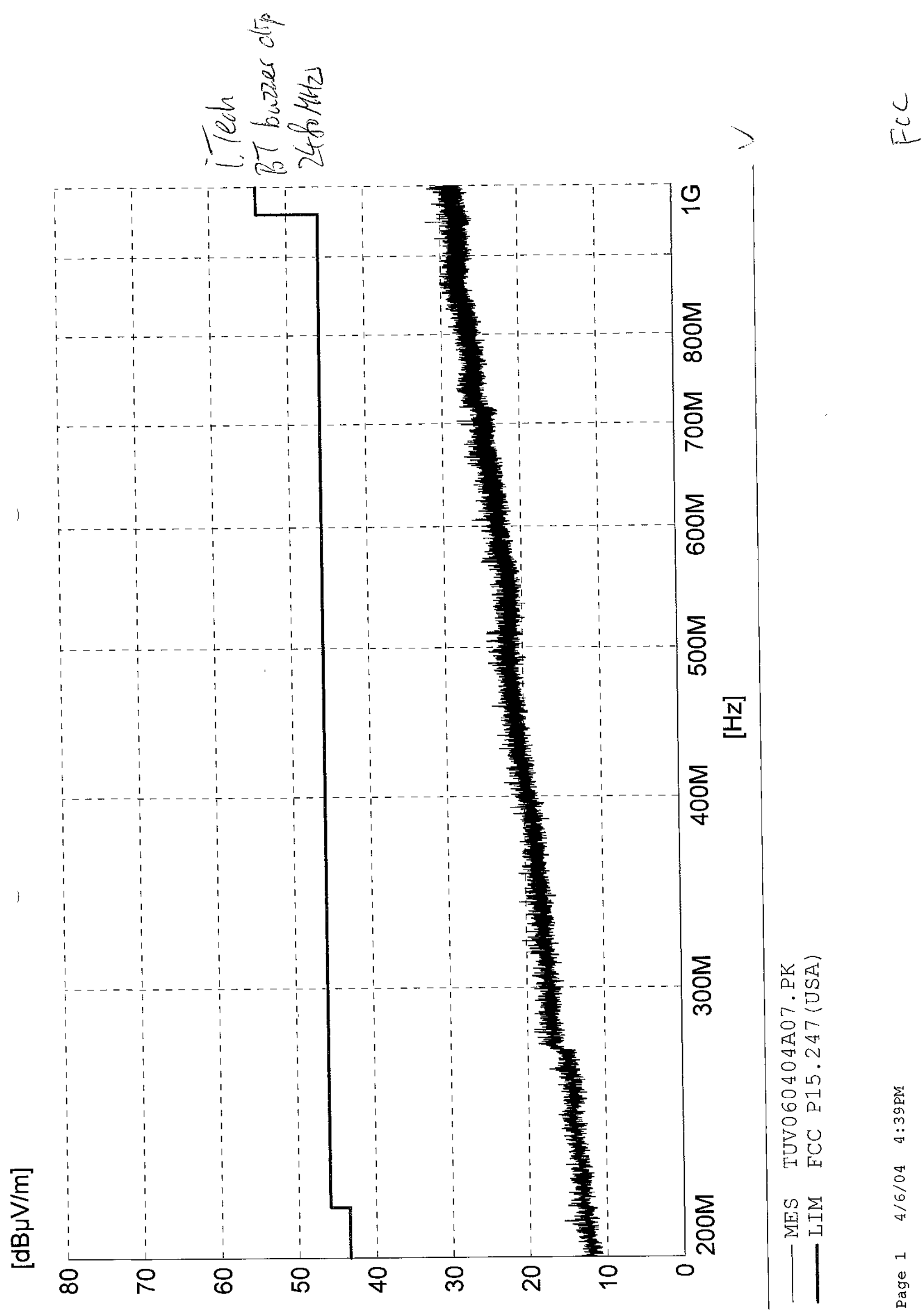
Date: 6.APR.2004 18:05:29

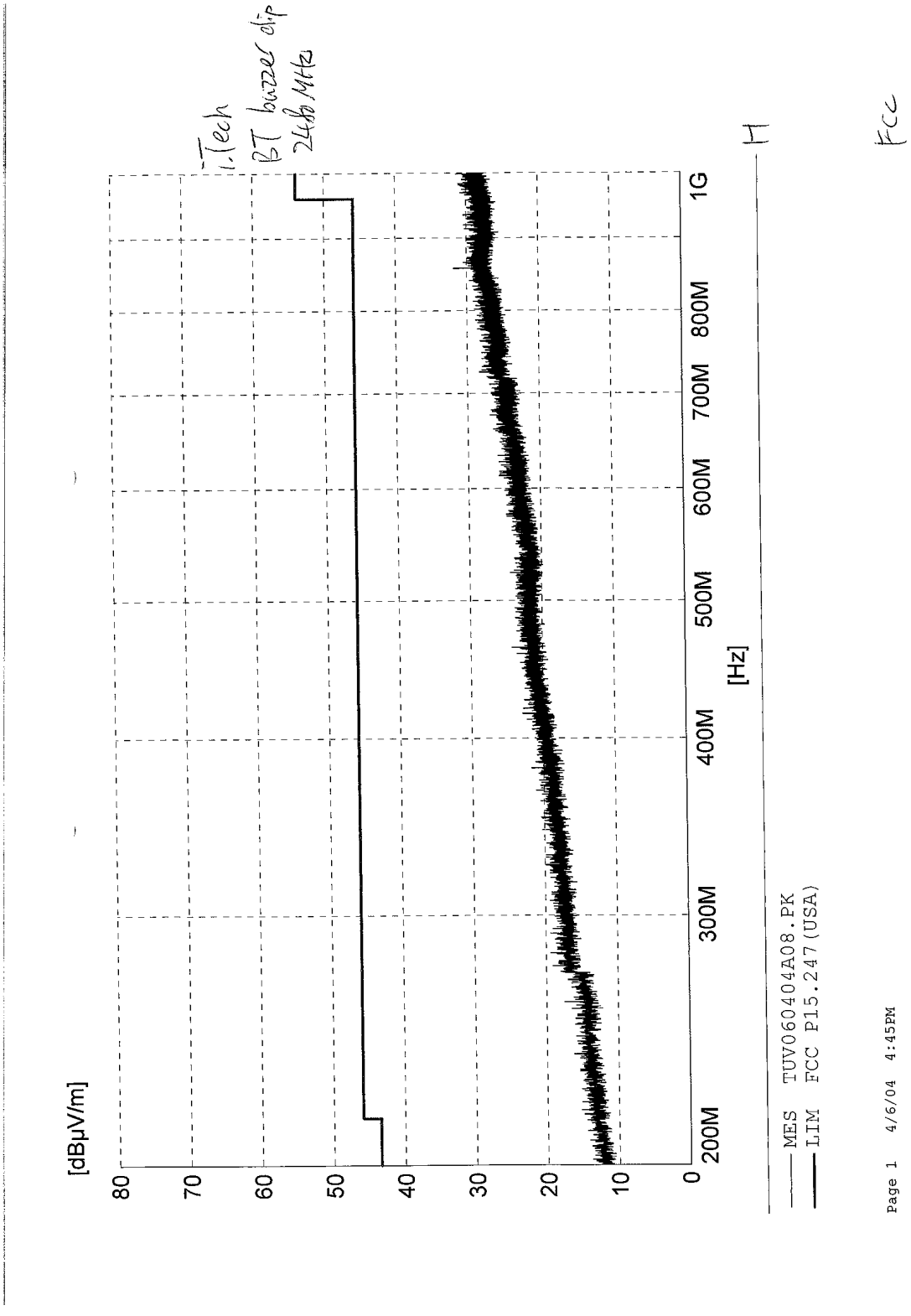
1. Tech
BT buzzer dip
2441 MHz

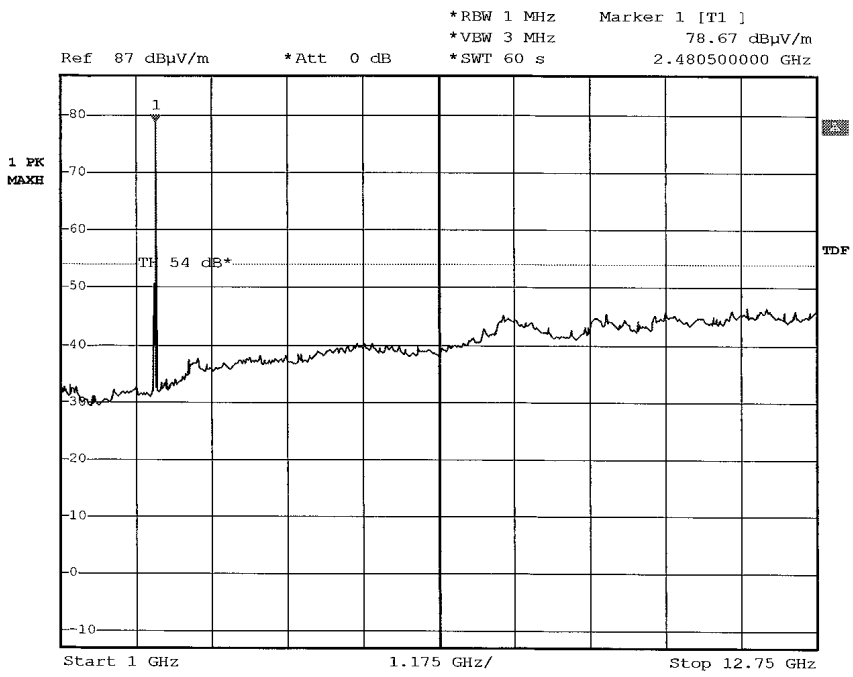
H
Pcc


i.Tech
BT buzzer clip
2466 MHz
V
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV060404A05.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:30PM


1. Test
BT hopping chp
2498 MHz
Fcc
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV060404A06.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:32PM


[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A07.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:39PM

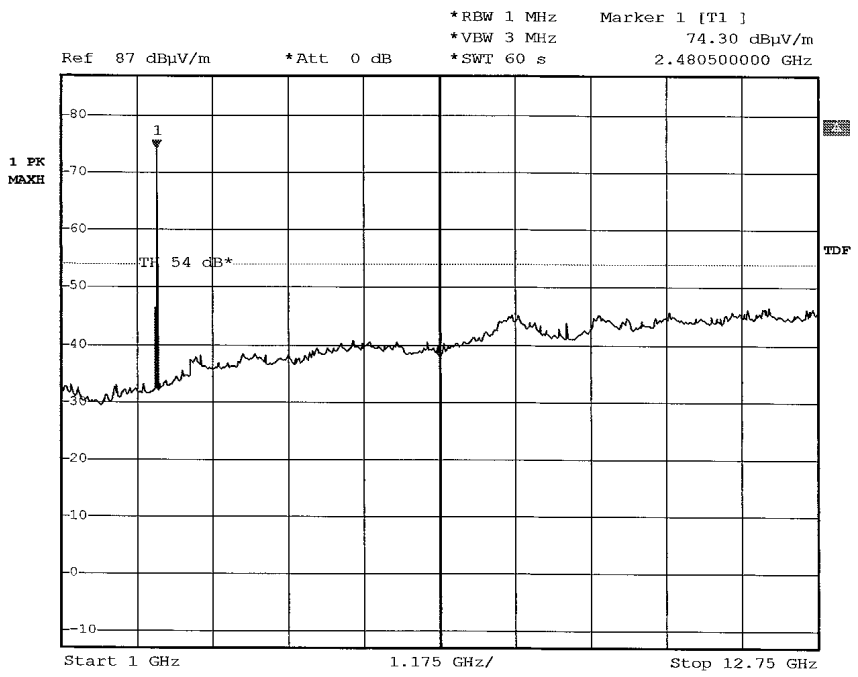

i.Tech
BT buzzer dip
2480 MHz
H
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV060404A08.PK
LIM FCC P15.247(USA)
Page 1 4/6/04 4:45PM



Date: 6.APR.2004 17:39:50

i.Tech
BT buzzer clip
2480MHz

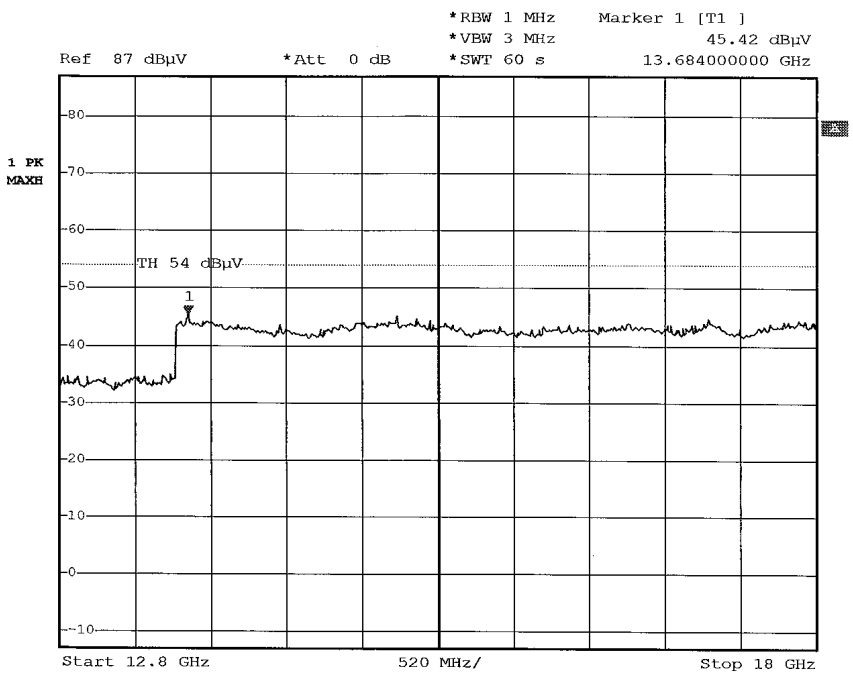
1/
Fcc



Date: 6.APR.2004 17:42:13

i, Tech
BT buzzer clip
2480 MHz

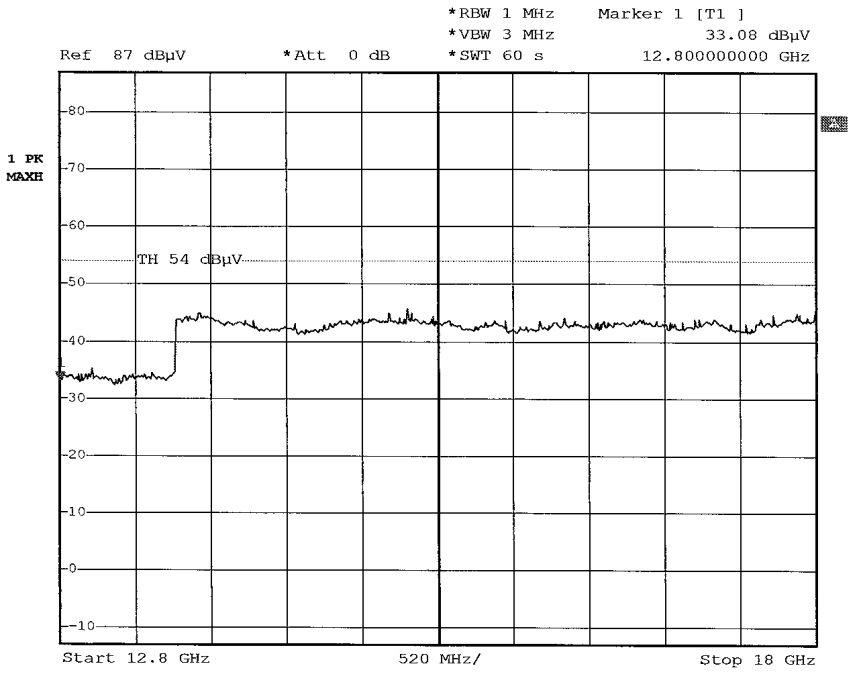
H
FCC.



Date: 6.APR.2004 17:49:59

I.Tech
BT buzzer clip
2480MHz

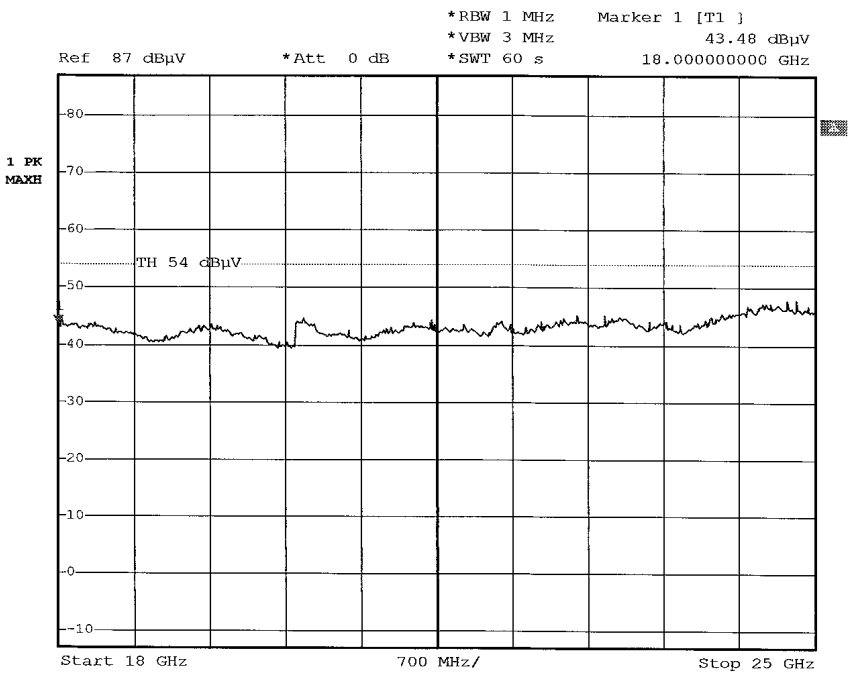
V
FCC



Date: 6.APR.2004 17:45:11

i.Tech
BT buzzer clip
24-hour MHz

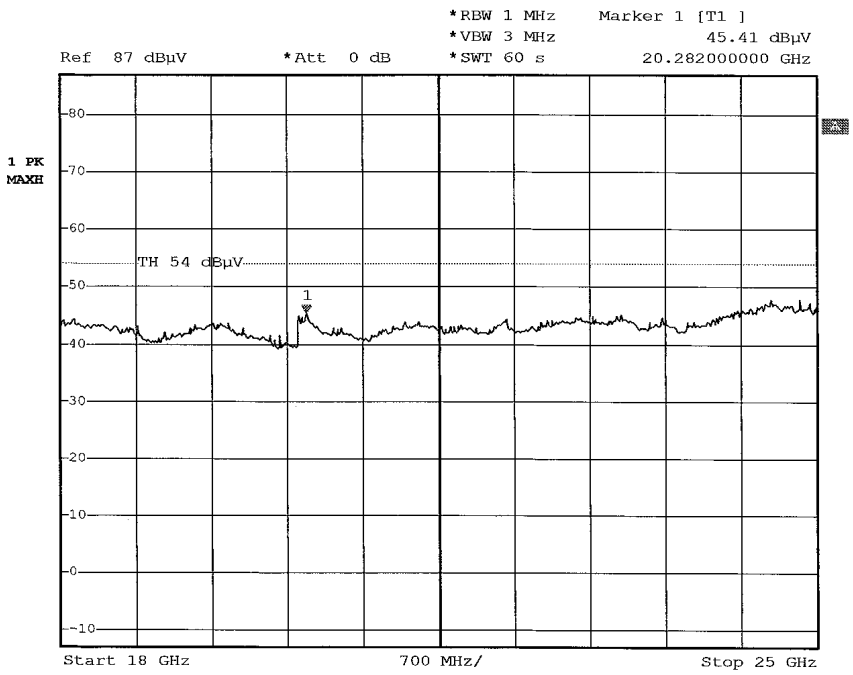
H
Pcc



Date: 6.APR.2004 18:02:20

BT buzzer clip
2480 MHz

V
FCC



Date: 6.APR.2004 18:05:22

i.Tech
BT buzzer clip
2480 MHz

H
Pcc