Prüfbericht - Nr.: Test Report No.	**14008745 001**		**Seite 1 von 14** Page 1 of 14
Auftraggeber: Applicant	**i.Tech Dynamic Ltd.** **Room 1112, Metroplaza, Tower 2** **223 Hing Fong Road** **Kwai Chung, N.T.** **Hong Kong**		
Gegenstand der Prüfung: Test item	**iM402 (Rx)**		
Bezeichnung: Identification	**iM402-A**	**Serien-Nr.:** Serial No.	**Engineering sample**
Wareneingangs-Nr.: Receipt No.	**050307022-** **050307028**	**Eingangsdatum:** Date of receipt	**07.03.2005**
Prüfort: 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 C63.4-2003** **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:		
11.04.2005	Hugo Wan		11.04.2005	Thomas Berns	
Datum Date	**Name** Name	**Unterschrift** Signature	**Datum** Date	**Name** Name	**Unterschrift** Signature

Sonstiges:
Other Aspects

FCCID: RKI-IM402-A

Abkürzungen:			Abbreviations:		
	OK, Pass, P	**= entspricht Prüfgrundlage**		**OK, Pass, P**	**= passed**
	Fail, F	**= entspricht nicht Prüfgrundlage**		**Fail, F**	**= failed**
	N/A	**= nicht anwendbar**		**N/A**	**= not applicable**
	NT	**= nicht getestet**		**NT**	**= not tested**

Table of Content

Appendix 4 – Product documentation ..... 29 pages

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	On-board Chip Antenna	On-board Chip Antenna
Antenna gain (dBi)	2	
Power level	fix	
Type of equipment	stand alone device	stand alone device
Connection to public utility power line	Yes	
Nominal voltage	V_{nor}: 3.9 V	V_{nor}: 3.9 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 stereo 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 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
Block Diagram
Bill of material
User manual

Special accessories and auxiliary equipment

The product has been tested together with the following additional accessory:

1. AC/DC Power Adaptor
   Model number: IT-PM5V/500mA
   Serial number: 0688A0019460
   Input: 100-240VAC, 100mA, 50-60Hz
   Output: 5VDC, 500mA

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: on board chip antenna soldered to the circuit board b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 2 dBi
Verdict:	Pass

Subclause 15.207 – Disturbance Voltage on AC Mains **Pass**

Test Port: AC mains input port of the charger
Applied voltage: 100VAC
Applicable only to equipment designed to be connected to the public utiliy power line.

Mode of operation: Charging only

Live measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.198	41.5	29.7	66 - 56	56 - 46	Pass
> 0,5 - 5	0.774	36.9	18.9	56	46	Pass
	1.400	38.3	19.1			Pass
> 5 - 30	-	-	-	60	50	Pass

Neutral measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.198	41.8	30.0	66 - 56	56 - 46	Pass
> 0,5 - 5	1.104	36.0	15.2	56	46	Pass
	1.458	37.3	16.2			Pass
> 5 - 30	-	-	-	60	50	Pass

Result: The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test results plots refer to Appendix 1, page 2-4.

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 : 3.9VDC from rechargeable battery
Temperature : 23ºC
Humidity : 50%

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 5.

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 : 3.9VDC from rechargeable battery
Temperature : 23ºC
Humidity : 50%

Result: The screenshot in Appendix 1 page 7 shows the occurrence of a channel in a 31.6 s time period. In normal hopping mode Bluetooth is using 79 hopping channels only. The frequency was used 64 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 x 79 = 31.6s

Limit calculation:
$64 \times 2.920 \times 10^{-3} = 186.9 \times 10^{-3}$
$<= 400.0 \times 10^{-3}$ s

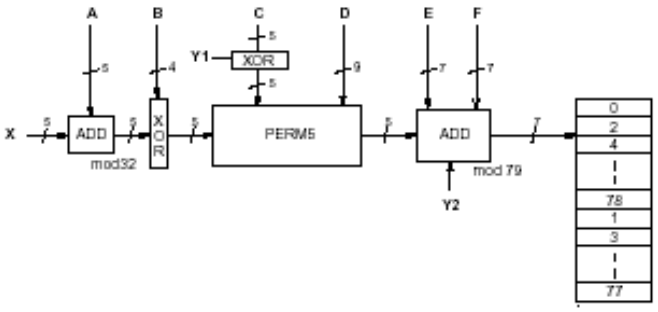
For test protocols please refer to Appendix 1, page 6-7.

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 : 3.9VDC from rechargeable battery Temperature : 23ºC Humidity : 50%
Results For test protocols refer to Appendix 1, page 8-9.

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.452	0.468	0.920
2441	0.452	0.472	0.924
2480	0.404	0.412	0.816

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 : 3.9VDC from rechargeable battery
Temperature : 23ºC
Humidity : 50%

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. For all other frequency hopping systems in the 2400 – 2483.5 MHz band: 0.125 Watts.

Result

All three transmit frequency modes comply with the maximum peak output power limit.

For test protocols please refer to Appendix 1, page 10-11.

Frequency (MHz)	**Maximum peak output power (dBm)**	**Cable attenuation (dB)**	**Output power (dBm)**	**Limit (W/dBm)**	**Verdict**
2402	1.57	3.52	5.09	1 / 30.0	Pass
2441	1.56	3.65	5.21	1 / 30.0	Pass
2480	1.30	3.60	4.90	1 / 30.0	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 : 3.9VDC from rechargeable battery
Temperature : 23ºC
Humidity : 50%

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 a peak found outside any 100 kHz bandwidth of the operating frequency band in the 2402MHz and 2480MHz transmit frequencies. The radio frequency power is as high as –40.84dB lower than the reference frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(c).

For test protocols refer to Appendix 1, page 12-13.

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 : 3.9VDC from rechargeable battery
Temperature : 23 ºC
Humidity : 50 %

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	4795.660	-39.80	2.03	-41.83	Pass
2441	807.660	-47.85	0.99	-48.84	Pass

	4875.420	-40.16	0.99	-41.15	Pass
2480	4955.180	-39.09	1.32	-40.41	Pass

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

Test Specification : ANSI C63.4 - 2003
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 : 3.9VDC from rechargeable battery
Temperature : 23ºC
Humidity : 50%

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 21-75.

Tx frequency 2402MHz Vertical Polarization

Freq MHz	Reading dBuV	AF dB(1/m)	Cable att. dB	Pre–amp dB	Filter att. dB	Level dBuV/m	Limit/ Detector dBuV/m
1602.000	50.56	25.40	1.89	36.17	0.60	42.28	74.0 / P
1602.020	48.76	25.40	1.89	36.17	0.60	40.48	54.0 / A
4803.920	46.10	33.40	3.53	32.87	0.33	50.49	74.0 / P
4804.020	44.47	33.40	3.53	32.87	0.33	48.86	54.0 / A

Tx frequency 2402MHz Horizontal Polarization

Freq MHz	Reading dBuV	AF dB(1/m)	Cable att. dB	Pre–amp dB	Filter att. dB	Level dBuV/m	Limit/ Detector dBuV/m
1602.000	54.56	25.40	1.89	36.17	0.60	46.28	74.0 / P
1601.980	53.75	25.40	1.89	36.17	0.60	45.47	54.0 / A
4803.960	47.65	33.40	3.53	32.87	0.33	52.04	74.0 / P
4803.940	46.25	33.40	3.53	32.87	0.33	50.64	54.0 / A

Tx frequency 2441MHz Vertical Polarization

Freq MHz	Reading dBuV	AF dB(1/m)	Cable att. dB	Pre–amp dB	Filter att. dB	Level dBuV/m	Limit/ Detector dBuV/m
1628.000	48.60	25.40	1.89	36.17	0.60	40.32	74.0 / P
1628.000	47.05	25.40	1.89	36.17	0.60	38.77	54.0 / A
4881.960	47.58	33.40	3.53	32.87	0.33	51.97	74.0 / P
4881.980	45.10	33.40	3.53	32.87	0.33	49.49	54.0 / A

Tx frequency 2441MHz			Horizontal Polarization				
Freq MHz	**Reading dbuV**	**AF dB(1/m)**	**Cable att. dB**	**Pre–amp dB**	**Filter att. dB**	**Level dBuV/m**	**Limit/ Detector dBuV/m**
1627.980	56.13	25.40	1.89	36.17	0.60	47.85	74.0 / P
1627.960	55.69	25.40	1.89	36.17	0.60	47.41	54.0 / A
4882.100	45.99	33.40	3.53	32.87	0.33	50.38	74.0 / P
4882.000	44.12	33.40	3.53	32.87	0.33	48.51	54.0 / A
Tx frequency 2480MHz			Vertical Polarization				
Freq MHz	**Reading dBuV**	**AF dB(1/m)**	**Cable att. dB**	**Pre–amp dB**	**Filter att. dB**	**Level dBuV/m**	**Limit/ Detector dBuV/m**
1653.960	50.72	25.40	1.89	36.17	0.60	42.44	74.0 / P
1654.020	49.21	25.40	1.89	36.17	0.60	40.93	54.0 / A
4959.880	45.42	33.40	3.53	32.87	0.33	49.81	74.0 / P
4960.000	43.38	33.40	3.53	32.87	0.33	47.77	54.0 / A
Tx frequency 2480MHz			Horizontal Polarization				
Freq MHz	**Reading dBuV**	**AF dB(1/m)**	**Cable att. dB**	**Pre–amp dB**	**Filter att. dB**	**Level dBuV/m**	**Limit/ Detector dBuV/m**
679.700	5.20	20.80	2.30	-	-	28.3	46.0 / QP
1654.080	56.49	25.40	1.89	36.17	0.60	48.21	74.0 / P
1654.020	55.82	25.40	1.89	36.17	0.60	47.54	54.0 / A
4959.760	45.57	33.40	3.53	32.87	0.33	49.96	74.0 / P
4960.000	43.52	33.40	3.53	32.87	0.33	47.91	54.0 / A

Appendix 1

Test results

Disturbance Voltage on AC Mains

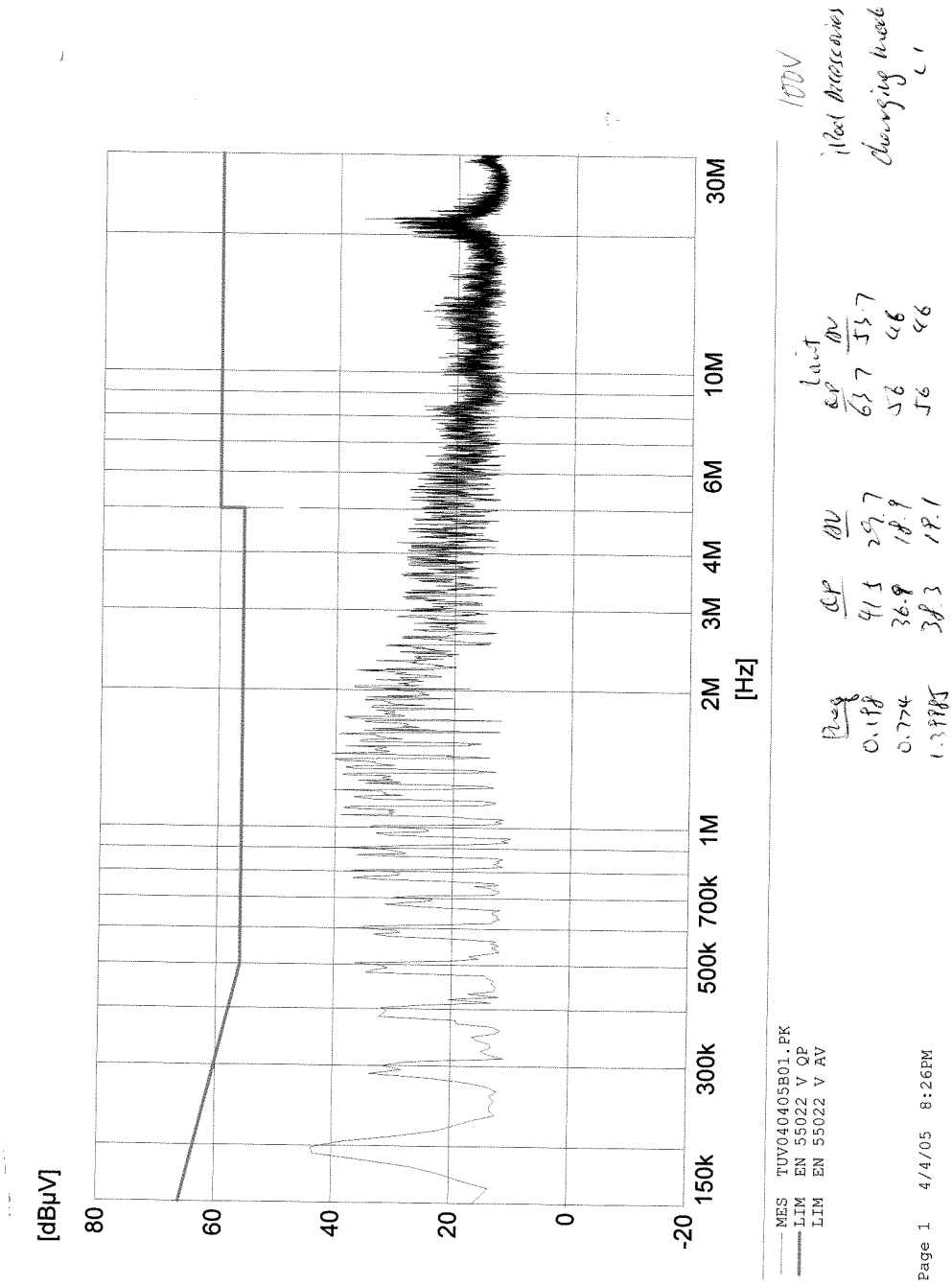
Date: 4 Apr 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 60%
Temperature: 23ºC
Voltage supply: 3.9V from rechargeable battery
Test by: Sharon Li
Op. mode: Charging

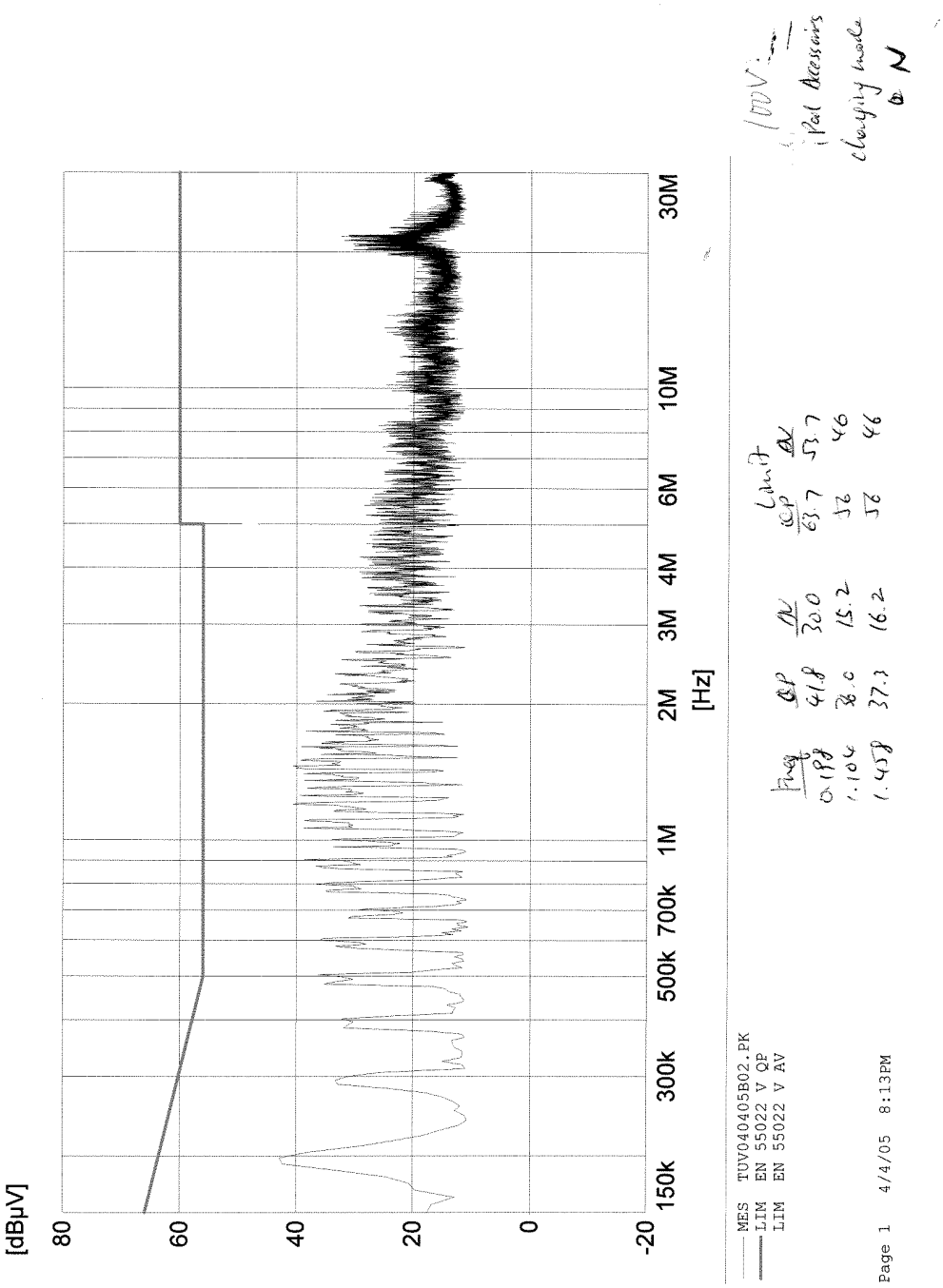
Live measurement

Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.198	41.5	29.7	Pass
0.774	36.9	18.9	Pass
1.400	38.3	19.1	Pass

Neutral measurement

Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.198	41.8	30.0	Pass
1.104	36.0	15.2	Pass
1.458	37.3	16.2	Pass

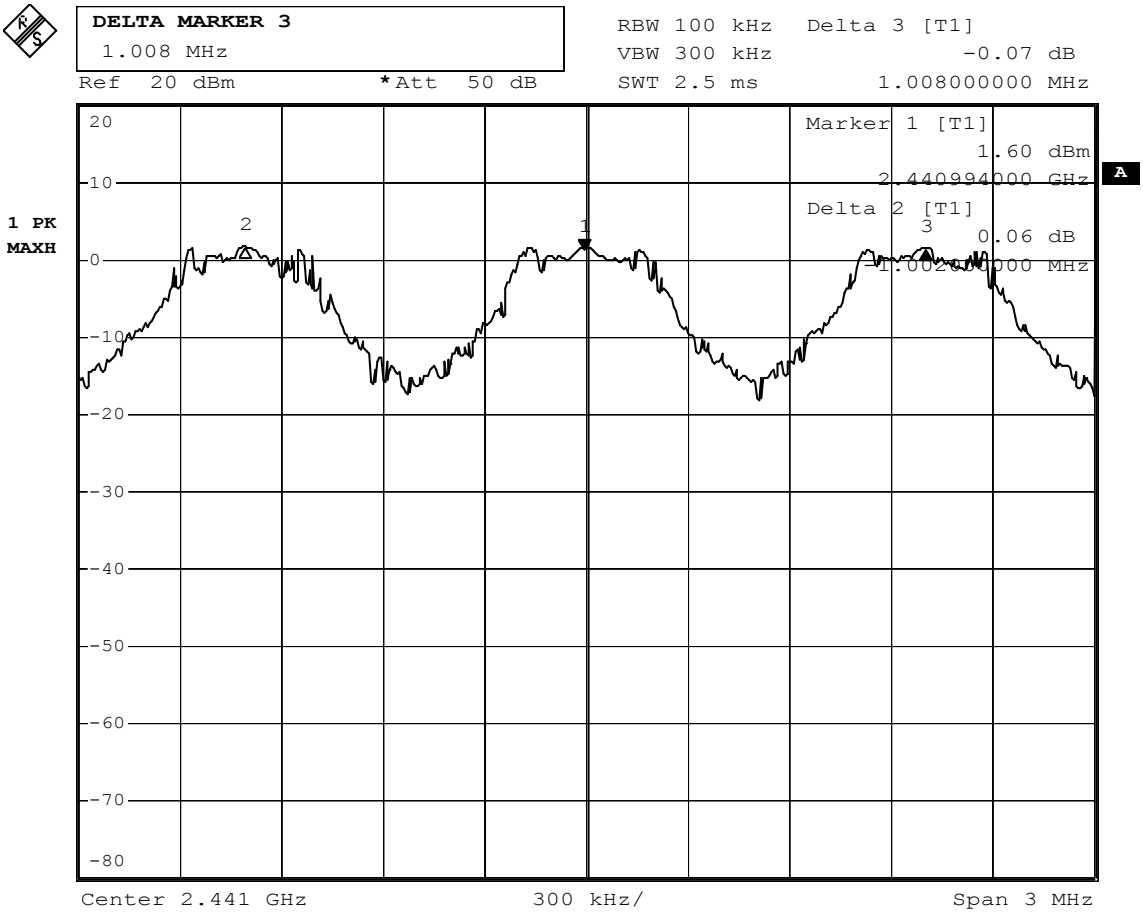

[dBµV]
80
60
40
20
0
-20
150k
300k
500k
700k
1M
2M
3M
4M
6M
10M
30M
[Hz]
MES TUV040405B01.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 4/4/05 8:26PM


[dBµV]
80
60
40
20
0
-20
150k
300k
500k
700k
1M
2M
3M
4M
6M
10M
30M
[Hz]
MES TUV040405B02.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 4/4/05 8:13PM

Carrier Frequency Separation

Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: Hopping on

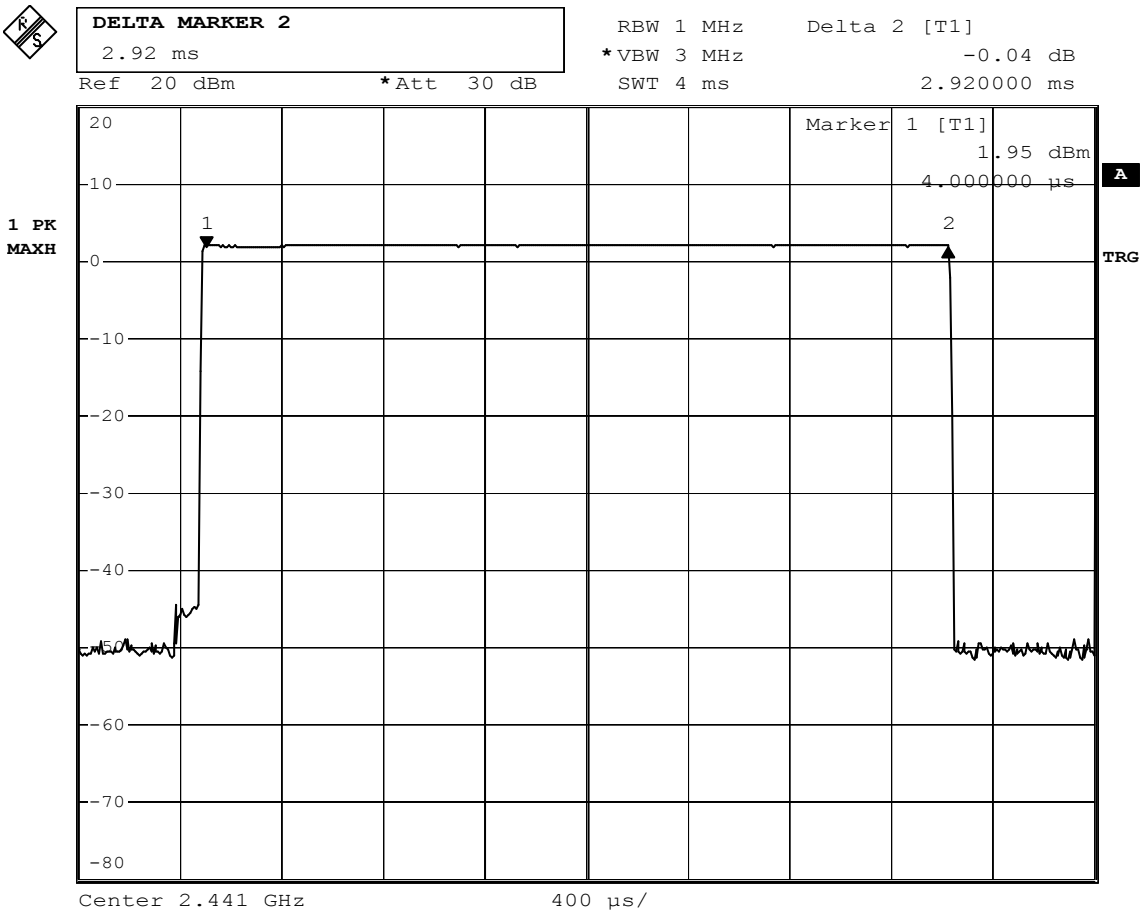
Reference frequency (MHz)	Channel Separation (MHz)
2441.000	1.002



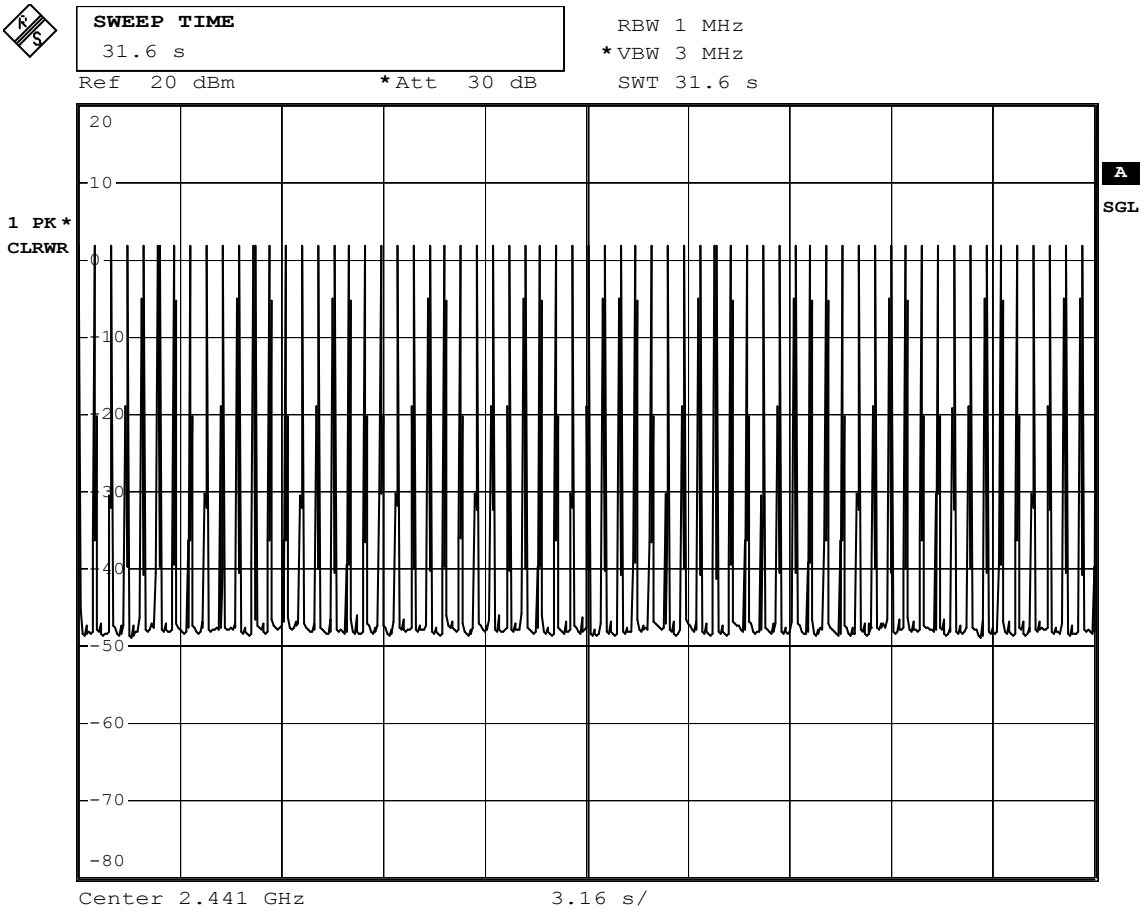
Dwell Time

Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: Hopping on

Burst Duration (ms)	Number of hopping	Time of occupancy (s)	Results
2.920	64	0.002920 x 64 = 0.1869	Pass



Date: 16.MAR.2005 12:03:59

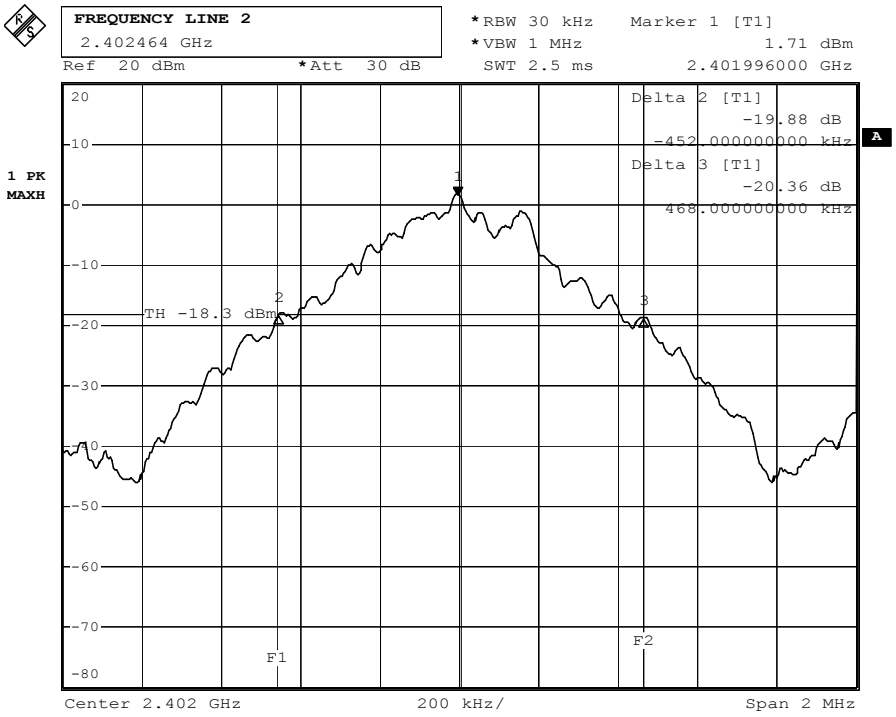


Date: 16.MAR.2005 12:01:04

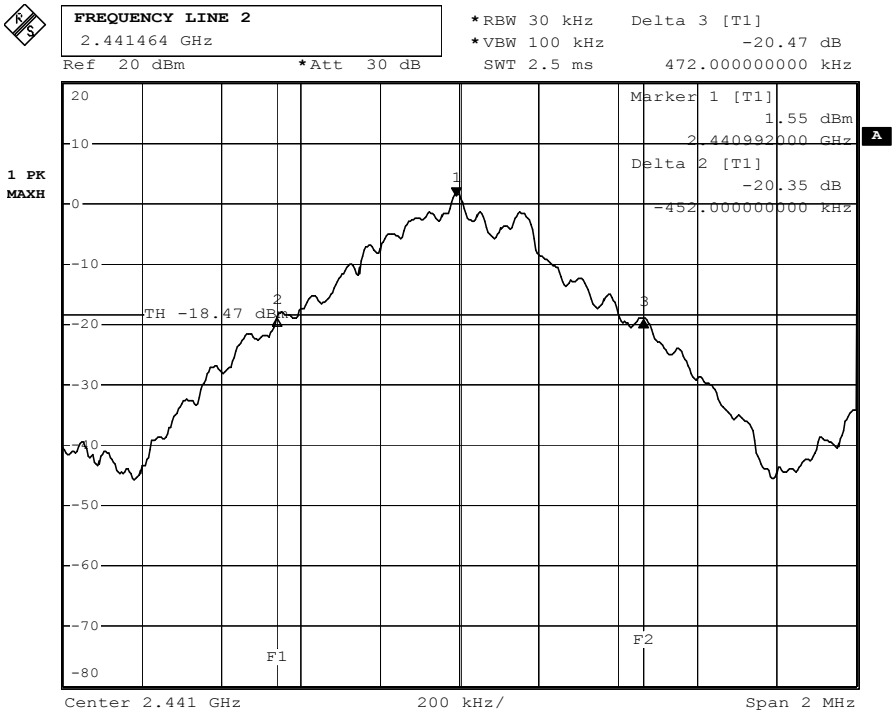
20dB Bandwidth

Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
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	0.452	0.468	0.920	Pass
2441	0.452	0.472	0.924	Pass
2480	0.404	0.412	0.816	Pass

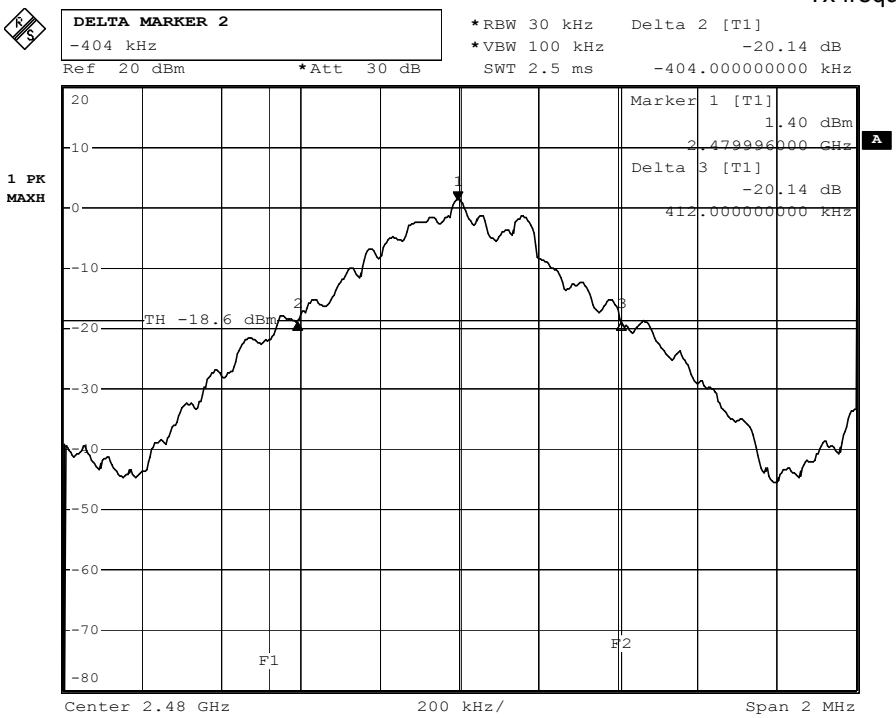


Tx frequency: 2402MHz



Date: 16.MAR.2005 17:39:43

Tx frequency: 2441MHz



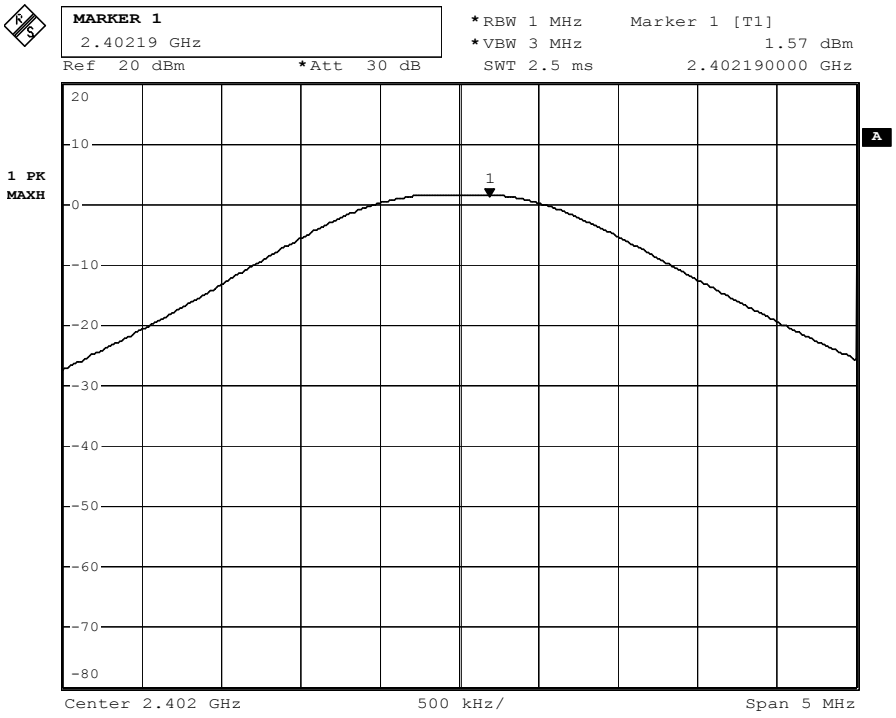
Date: 16.MAR.2005 14:22:12

Tx frequency: 2480MHz

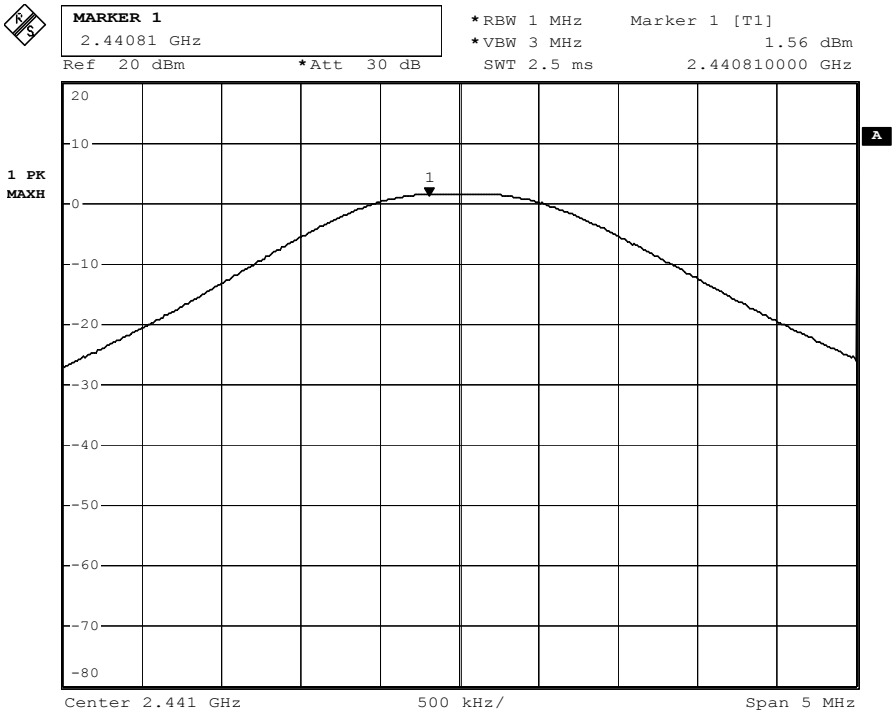
Peak Output Power

Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Power P_{PK} (dBm)	Cable Attenuation (dB)	Actual Peak Power (dBm)	Results
2402	1.57	3.52	5.09	Pass
2441	1.56	3.65	5.21	Pass
2480	1.30	3.60	4.90	Pass

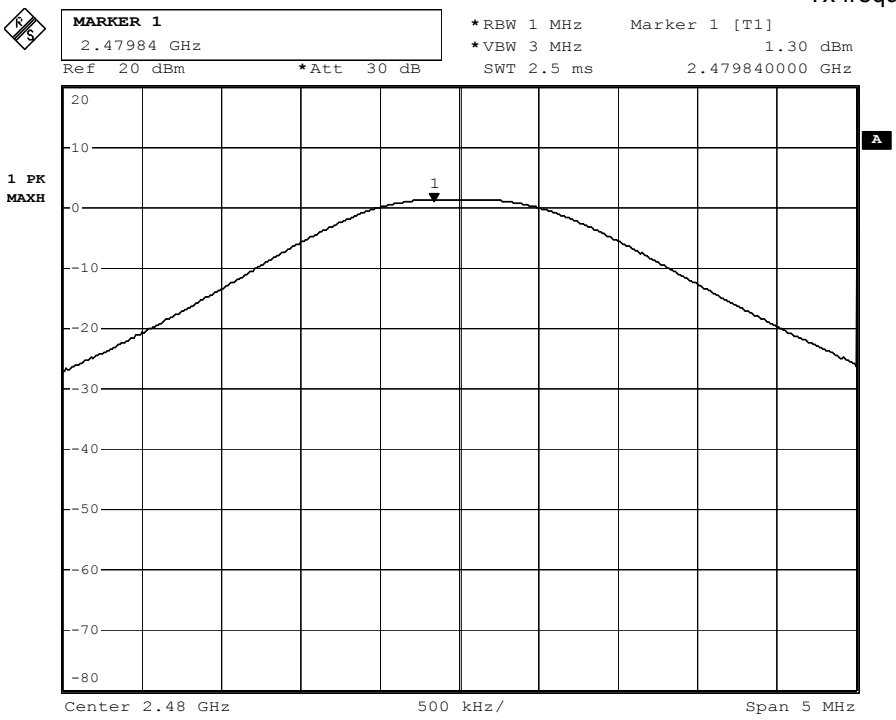


Tx frequency: 2402MHz



Date: 16.MAR.2005 14:26:51

Tx frequency: 2441MHz



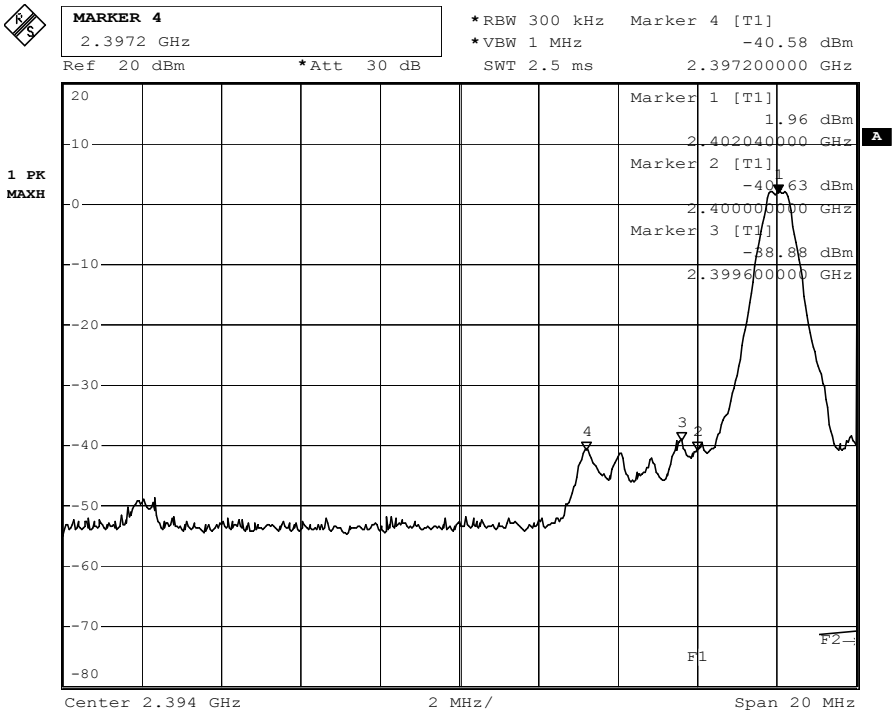
Date: 16.MAR.2005 14:27:51

Tx frequency: 2480MHz

Band Edge Compliance

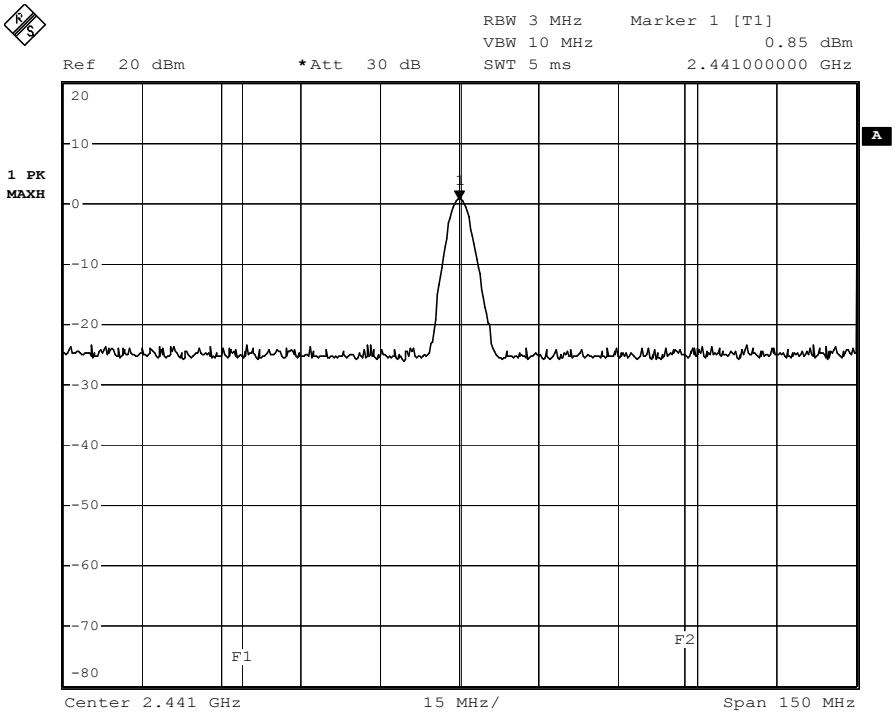
Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	1.96	2399.600	-40.84	Pass
2480	1.75	2483.920	-43.36	Pass



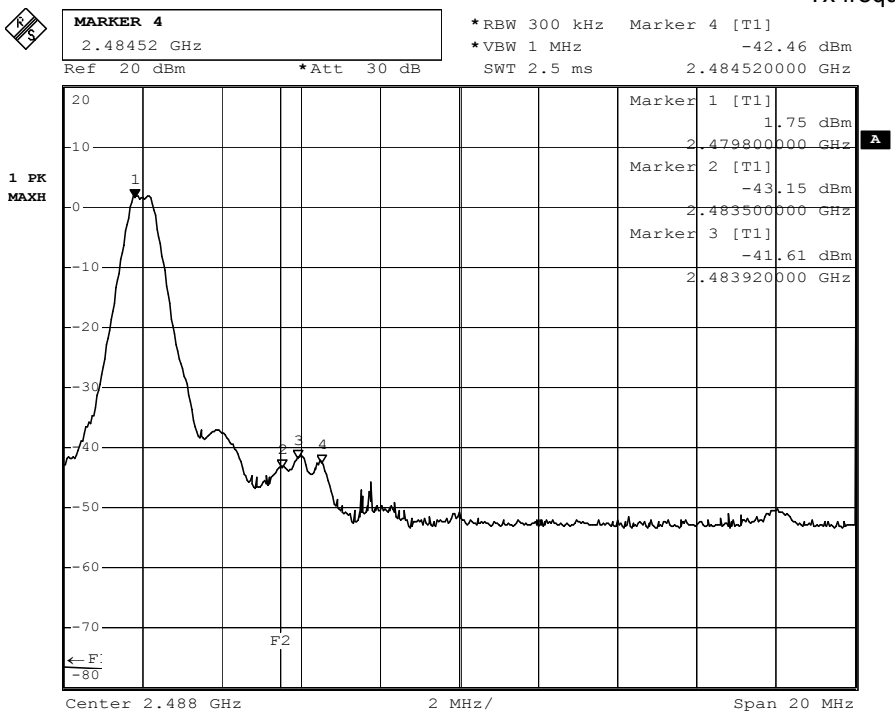
Date: 16.MAR.2005 14:35:19

Tx frequency: 2402MHz



Date: 16.MAR.2005 15:25:14

Tx frequency: 2441MHz



Date: 1.APR.2005 18:53:25

Tx frequency: 2480MHz

Spurious Emissions - Conducted

Date: 16 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Humidity: 50%
Temperature: 23ºC
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: TX mode, DH1 with PRBS9 payload

Tx frequency : 2402MHz

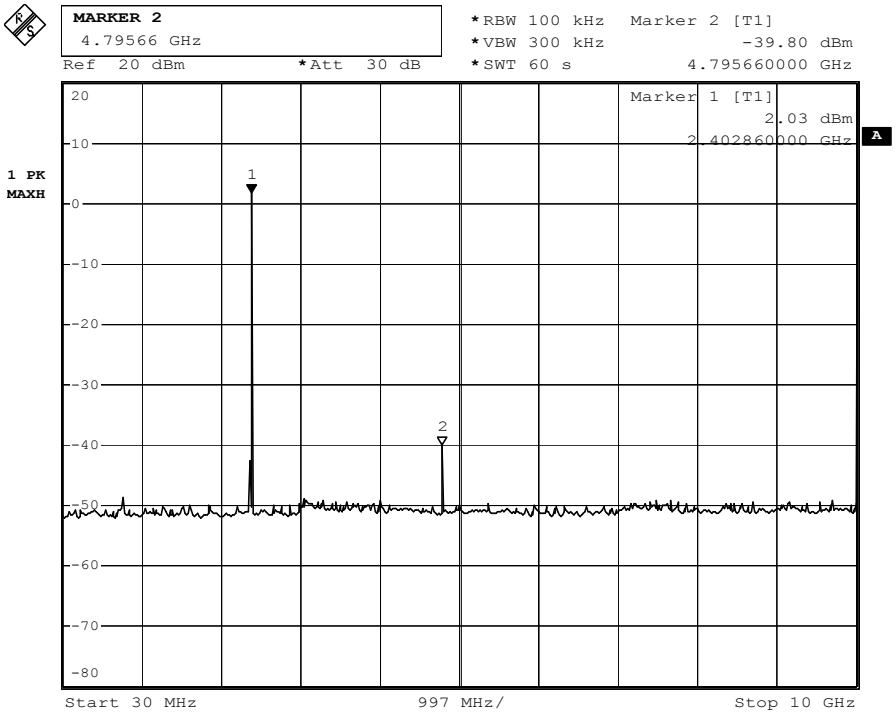
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
4795.660	-39.80	2.03	-41.83	Pass

Tx frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
807.660	-47.85	0.99	-48.84	Pass
4875.420	-40.16	0.99	-41.15	Pass

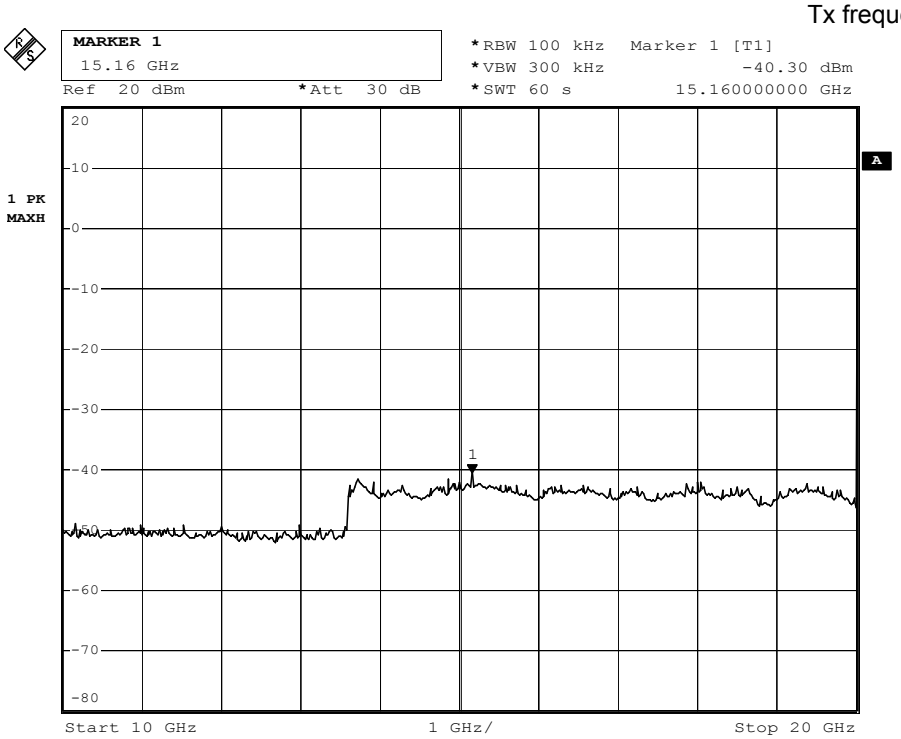
Tx frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
4955.180	-39.09	1.32	-40.41	Pass



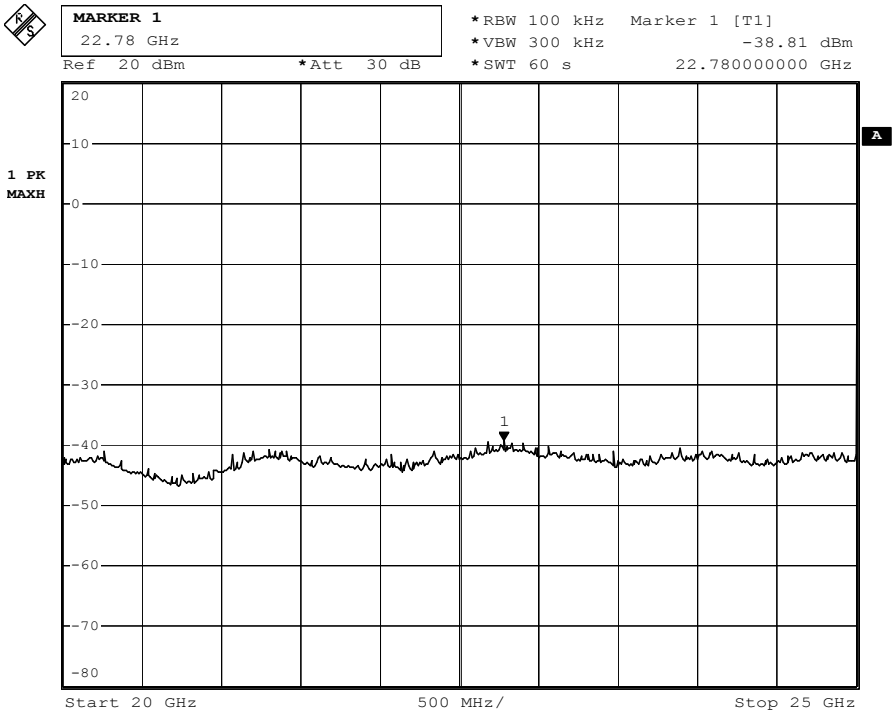
Date: 16.MAR.2005 14:47:35

Tx frequency: 2402MHz



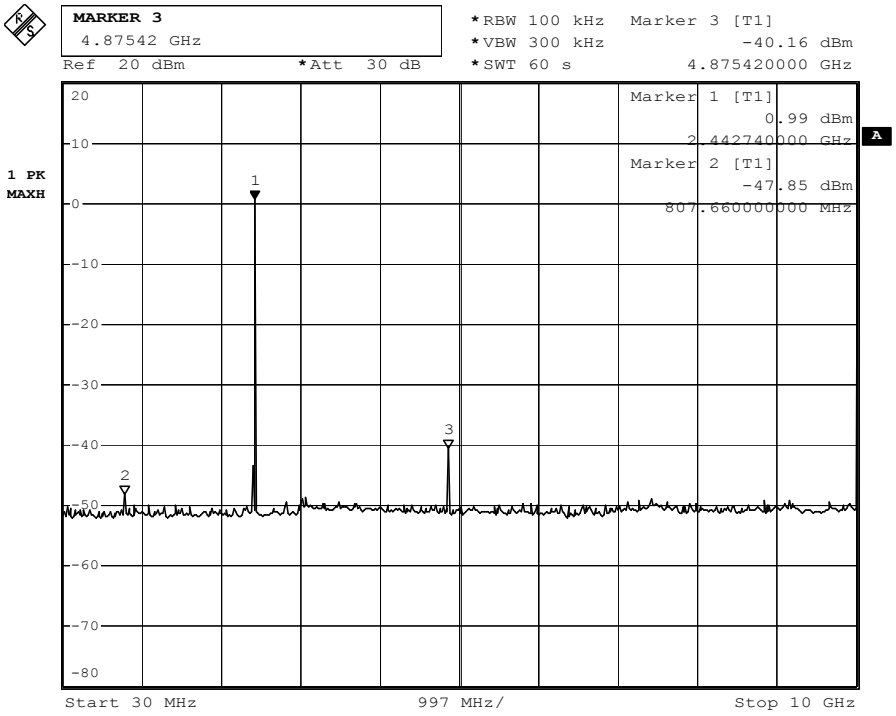
Date: 16.MAR.2005 14:49:19

Tx frequency: 2402MHz



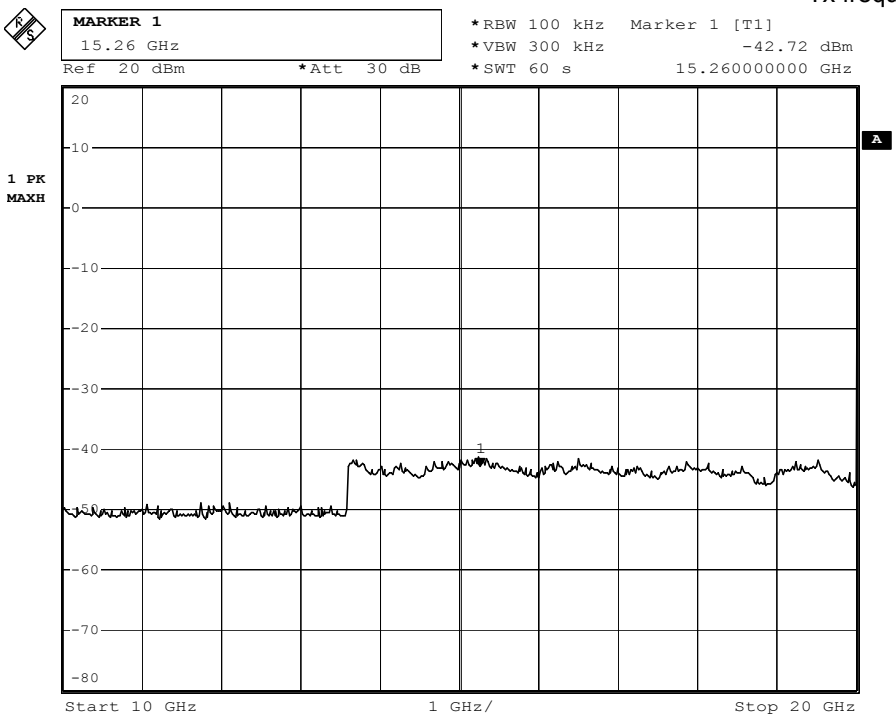
Date: 16.MAR.2005 14:51:17

Tx frequency: 2402MHz



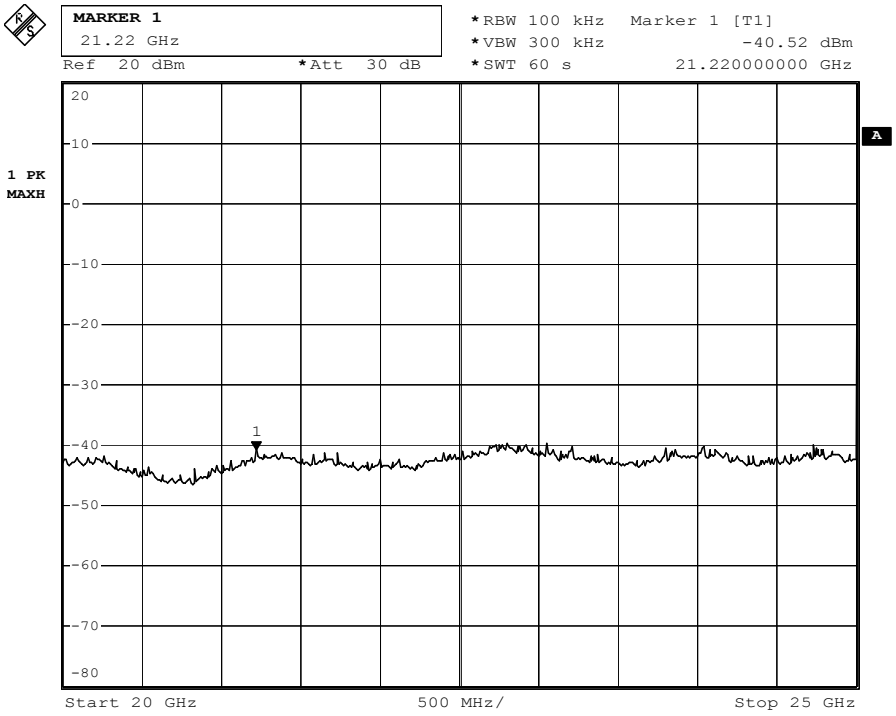
Date: 16.MAR.2005 14:40:06

Tx frequency: 2441MHz



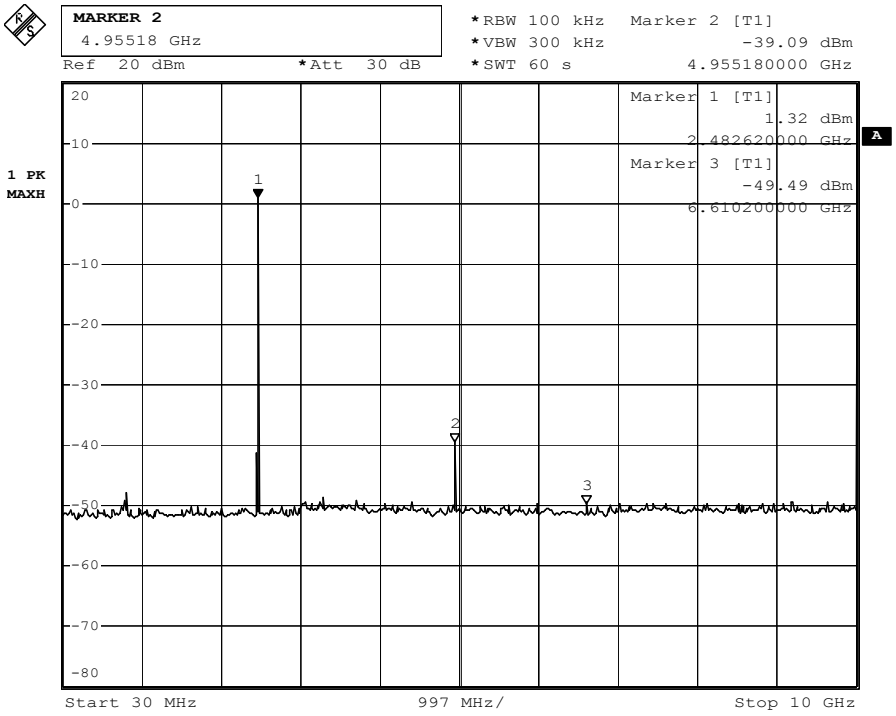
Date: 16.MAR.2005 14:43:01

Tx frequency: 2441MHz



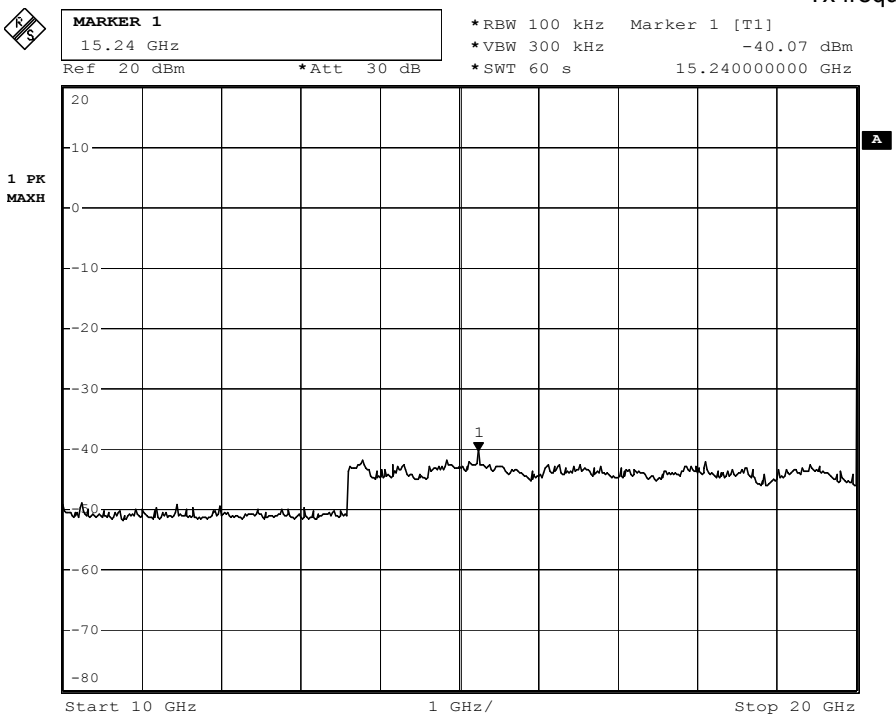
Date: 16.MAR.2005 14:44:50

Tx frequency: 2441MHz



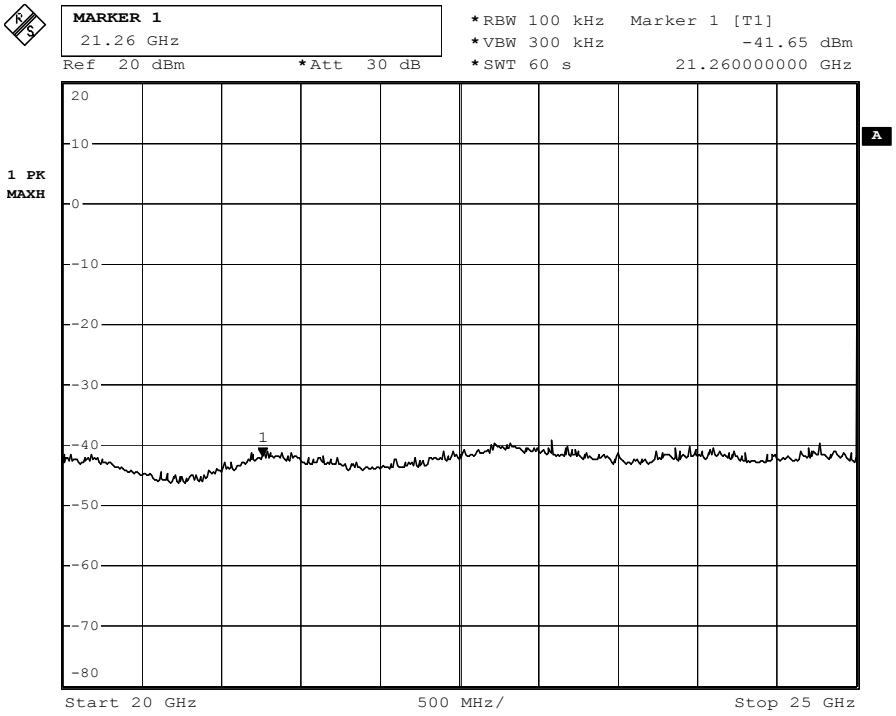
Date: 16.MAR.2005 14:55:19

Tx frequency: 2480MHz



Date: 16.MAR.2005 15:00:45

Tx frequency: 2480MHz



Date: 16.MAR.2005 15:03:30

Tx frequency: 2480MHz

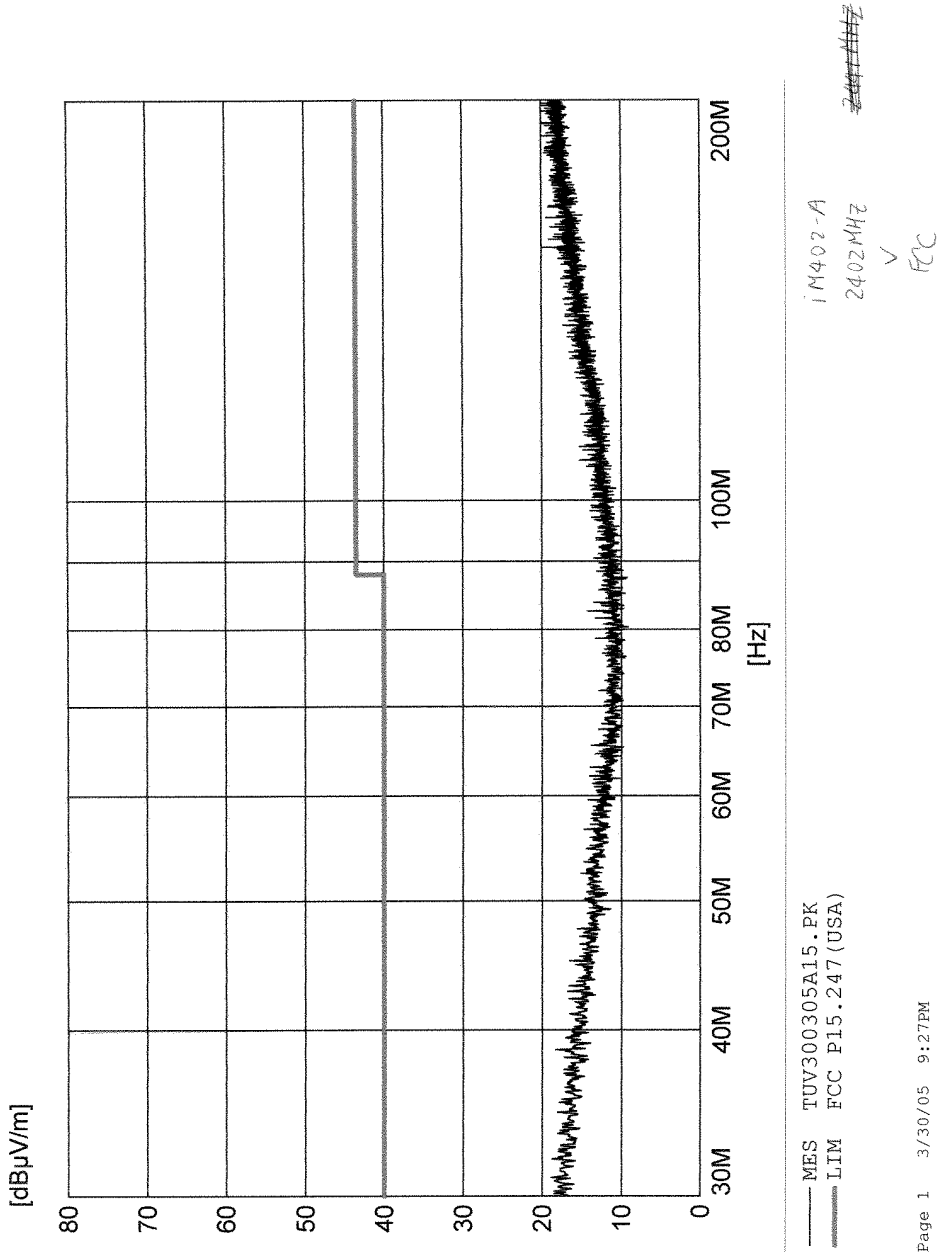
Spurious Emissions - Radiated

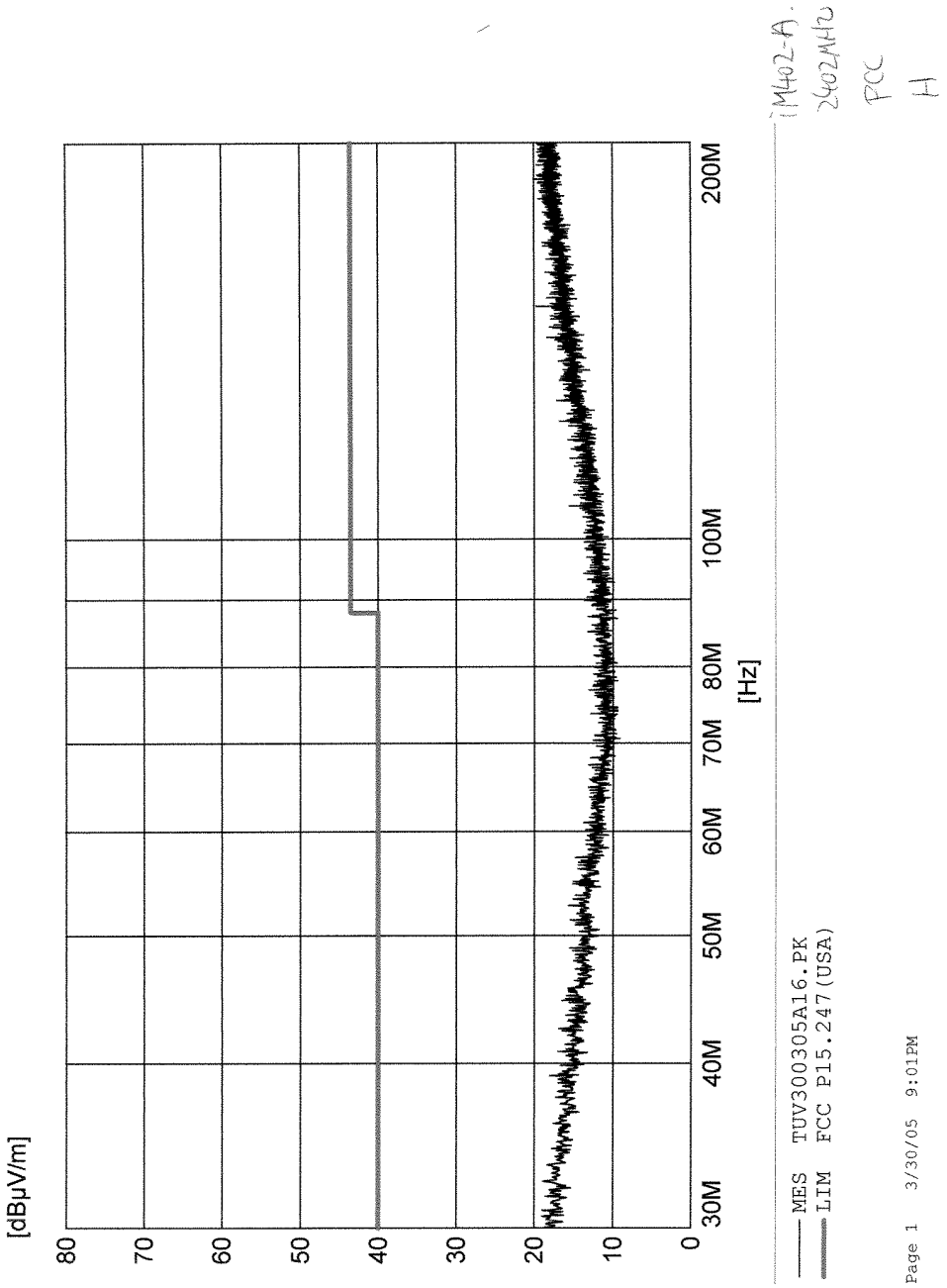
Date: 1 Mar 2005
EUT: iM402-A
Company: i.Tech Dynamic Ltd.
Voltage supply: 3.9VDC from rechargeable battery
Test by: Sharon Li
Op. mode: TX mode, DH1 with PRBS9 payload

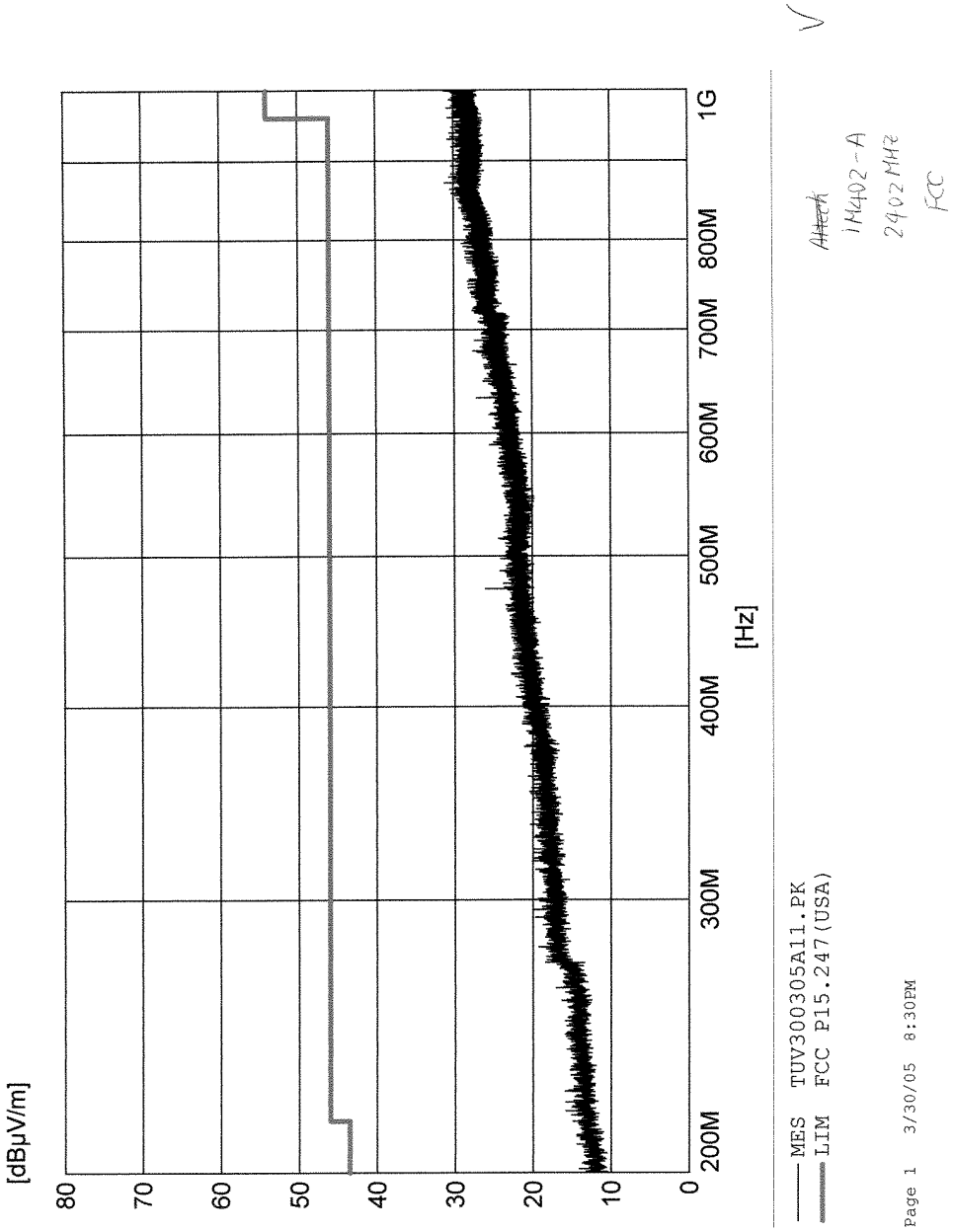
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2402	V	1602.000	42.28	P
2402	V	1602.020	40.48	A
2402	V	4803.920	50.49	P
2402	V	4804.020	48.86	A
2402	H	1602.000	46.28	P
2402	H	1601.980	45.47	A
2402	H	4803.960	52.04	P
2402	H	4803.940	50.64	A

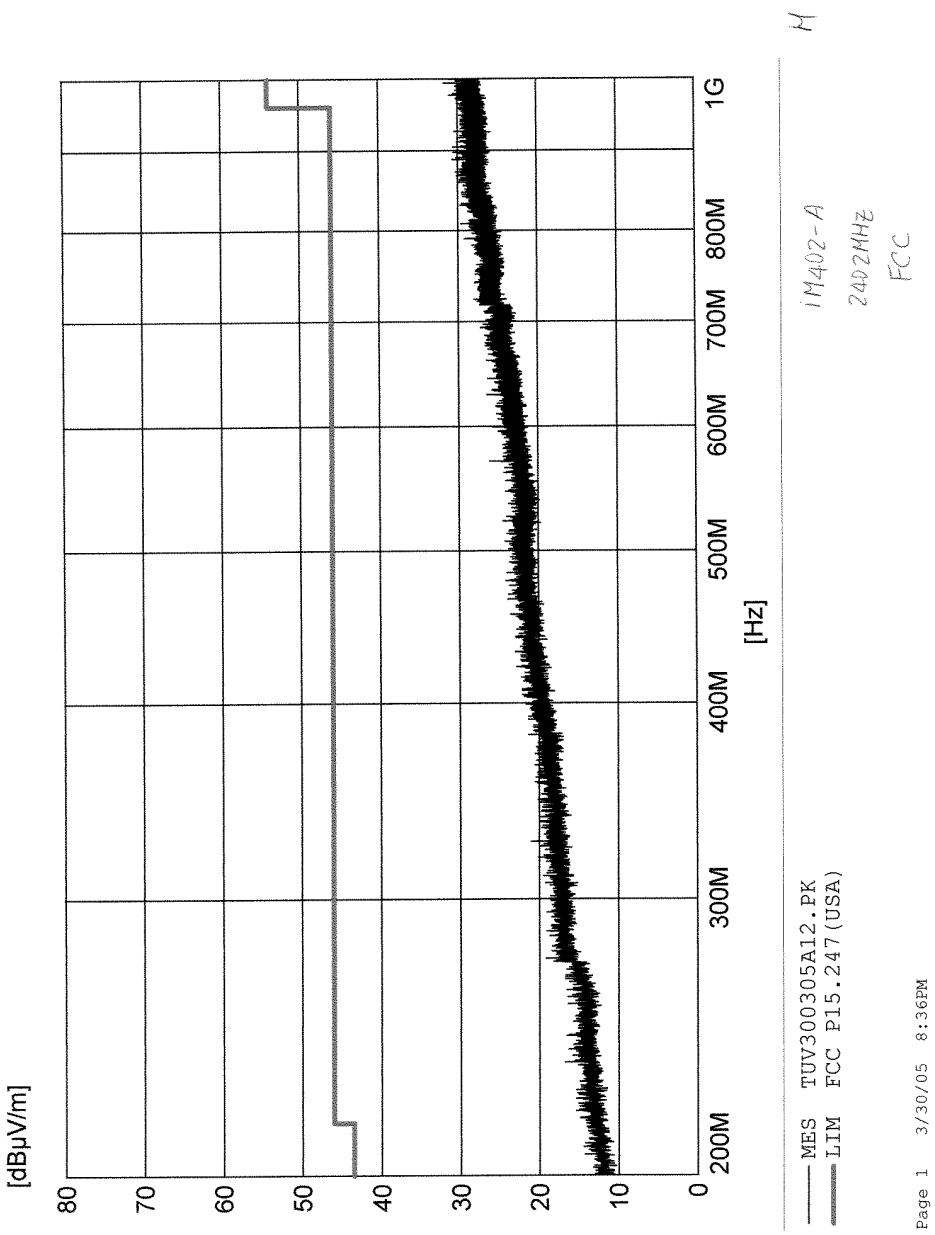
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2441	V	1628.000	40.32	P
2441	V	1628.000	38.77	A
2441	V	4881.960	51.97	P
2441	V	4881.980	49.49	A
2441	H	1627.980	47.85	P
2441	H	1627.960	47.41	A
2441	H	4882.100	50.38	P
2441	H	4882.000	48.51	A

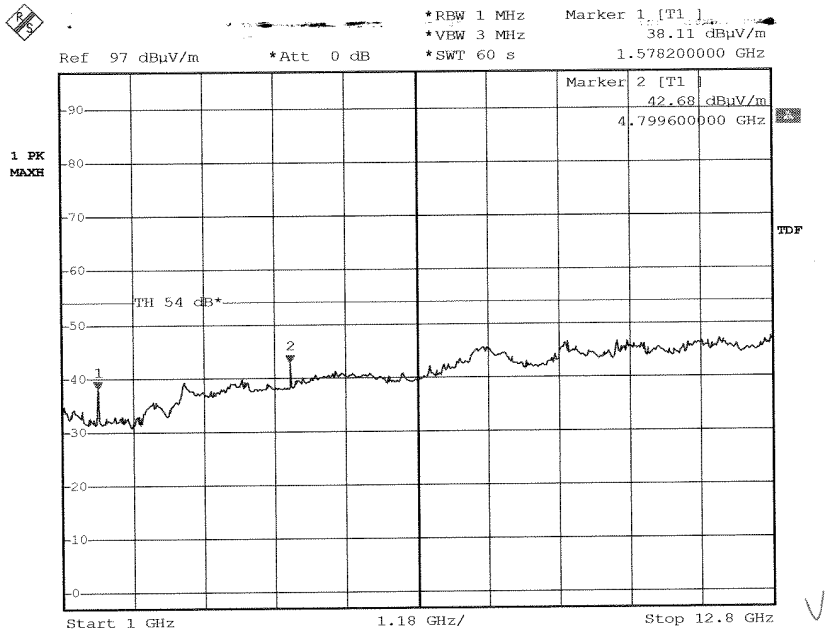
Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2480	V	1653.960	42.44	P
2480	V	1654.020	40.93	A
2480	V	4959.880	49.81	P
2480	V	4960.000	47.77	A
2480	H	679.700	28.3	QP
2480	H	1654.080	48.21	P
2480	H	1654.020	47.54	A
2480	H	4959.760	49.96	P
2480	H	4960.000	47.91	A


[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A15.PK
LIM FCC P15.247(USA)
iM402-A
2402MHz
V
FCC
Page 1 3/30/05 9:27PM


iM402-A.
2402MHz
PCC
H
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A16.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 9:01PM


[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV300305A11.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 8:30PM
Attech
1M402-A
2402MHz
FCC
V


H
1M402-A
2402MHz
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV300305A12.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 8:36PM



Date: 17.MAR.2005 10:20:00

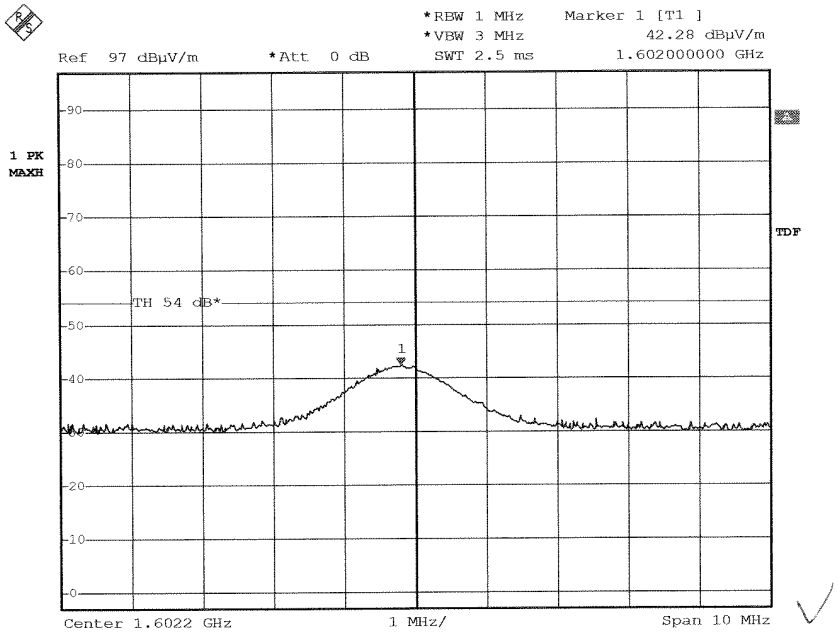
iTech

iM402-A

2402

Fcc

2.4 G Filter



Date: 17.MAR.2005 10:25:46

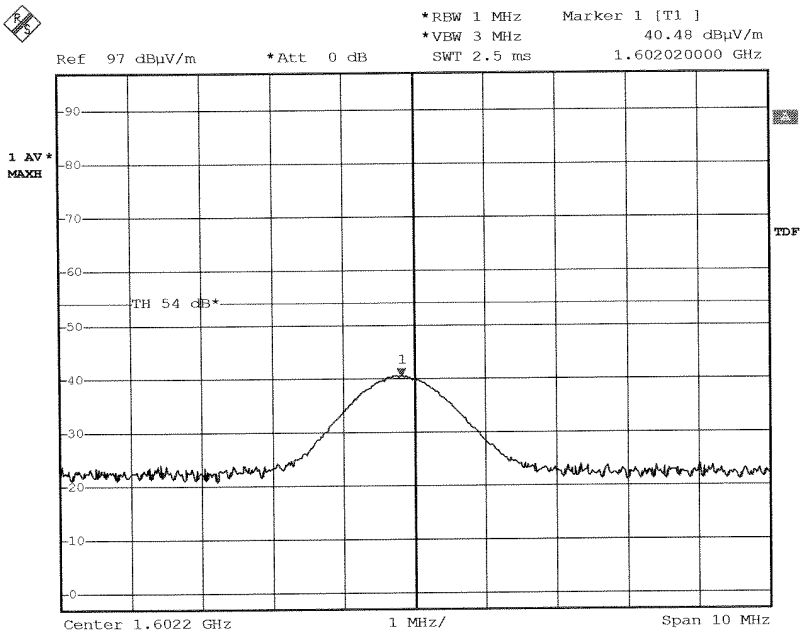
i.Tech

iM402-A

2402

Fcc

2.4G Filter.



Date: 17.MAR.2005 10:26:22

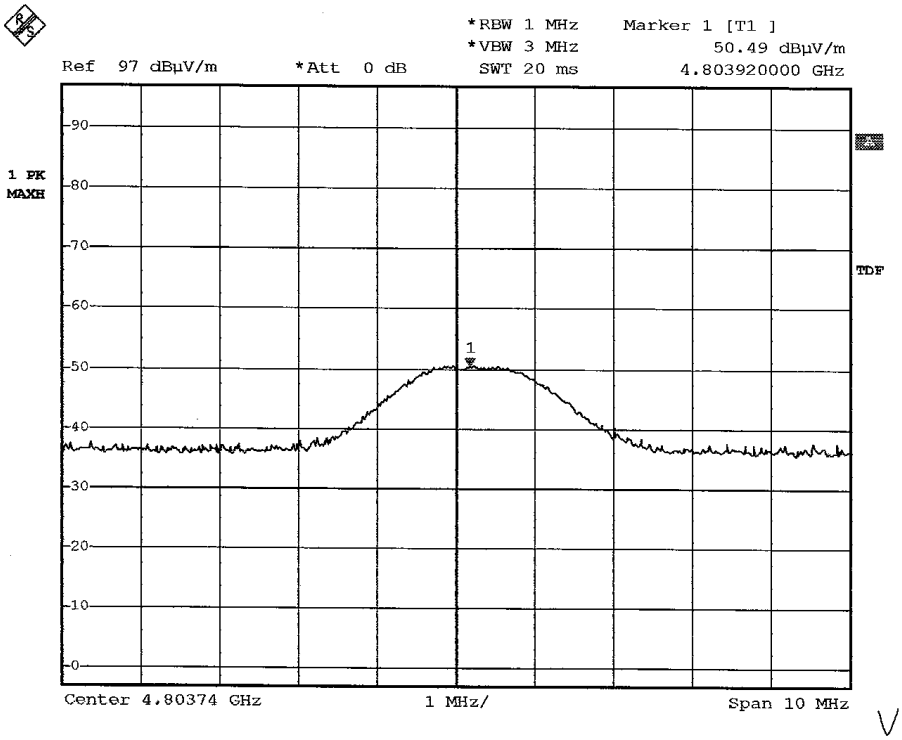
iTech

iM402-A

2402

FCC

2.4G Filter

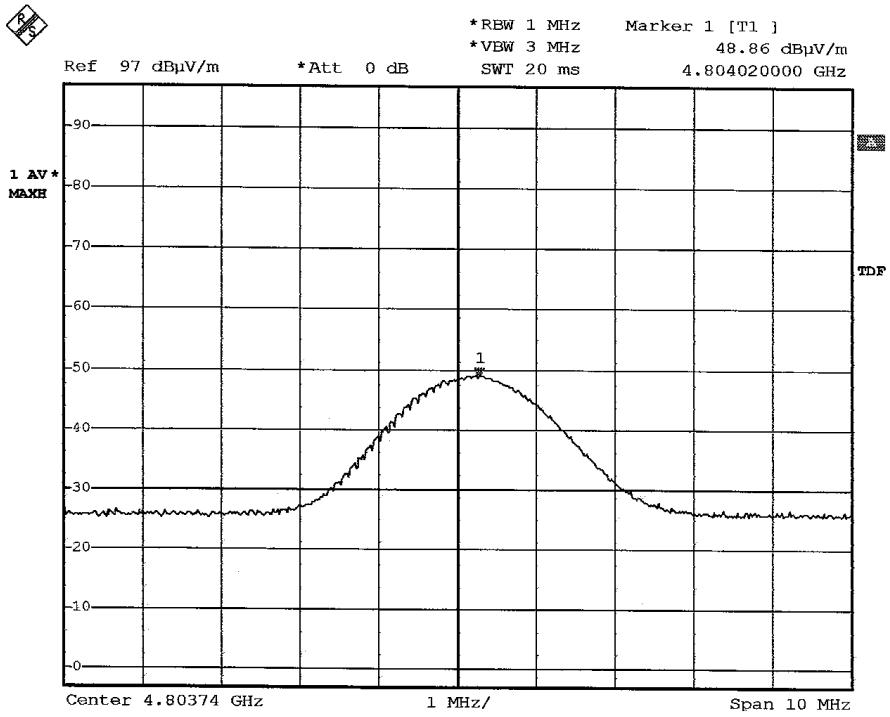


V

Date: 6.APR.2005 22:57:58

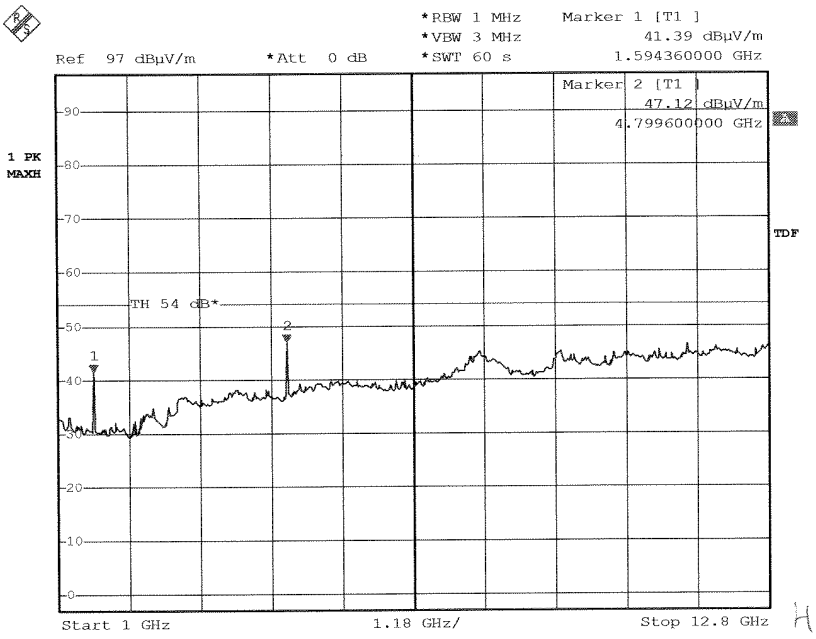
i.Tech
iM402-A

2402MHz



I.Tech
IM402-A

AV
2402MHz



Date: 17.MAR.2005 10:36:54

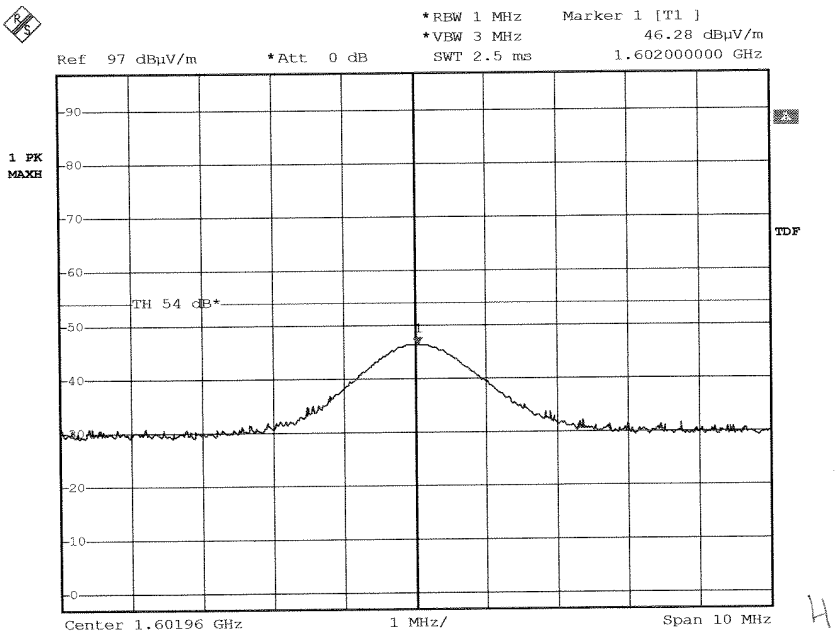
iTech

iM402-A

2402

Fcc

2.4G Filter



Date: 17.MAR.2005 10:42:08

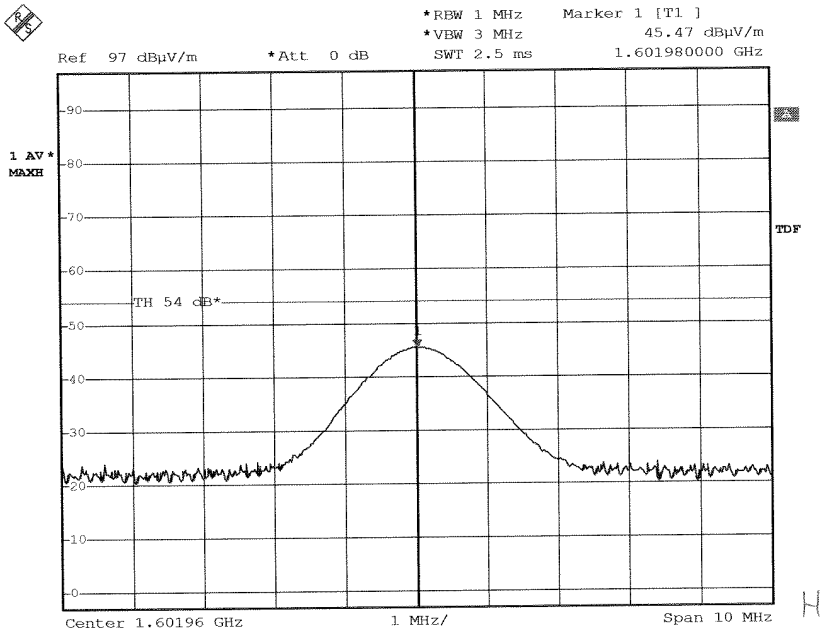
iTech

IM402-A

2402

Fcc

2.4G Filter



Date: 17.MAR.2005 10:44:13

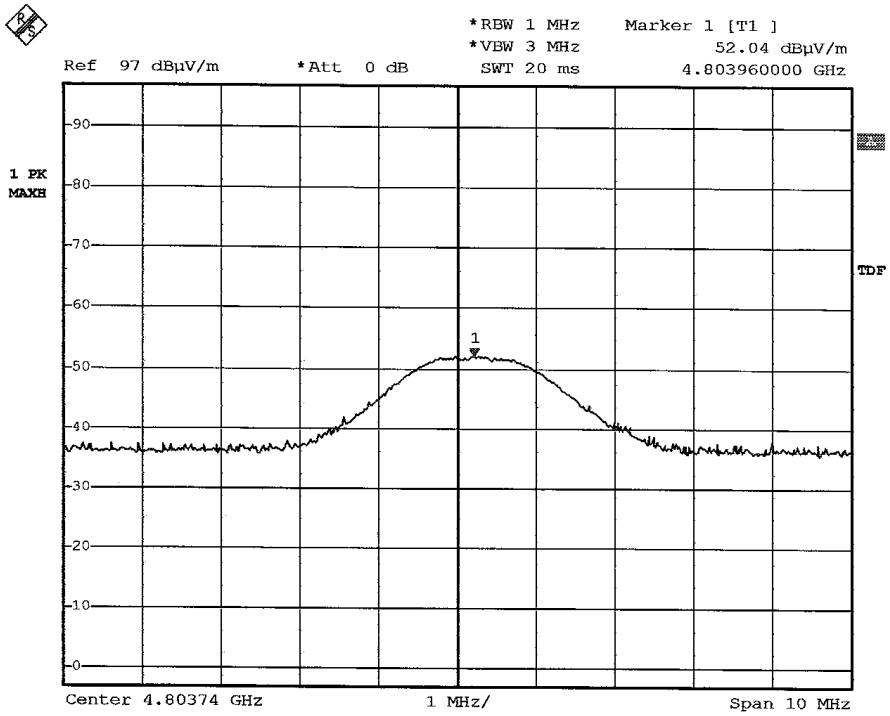
iTech

iM402-A

2402

FCC

24G Filter

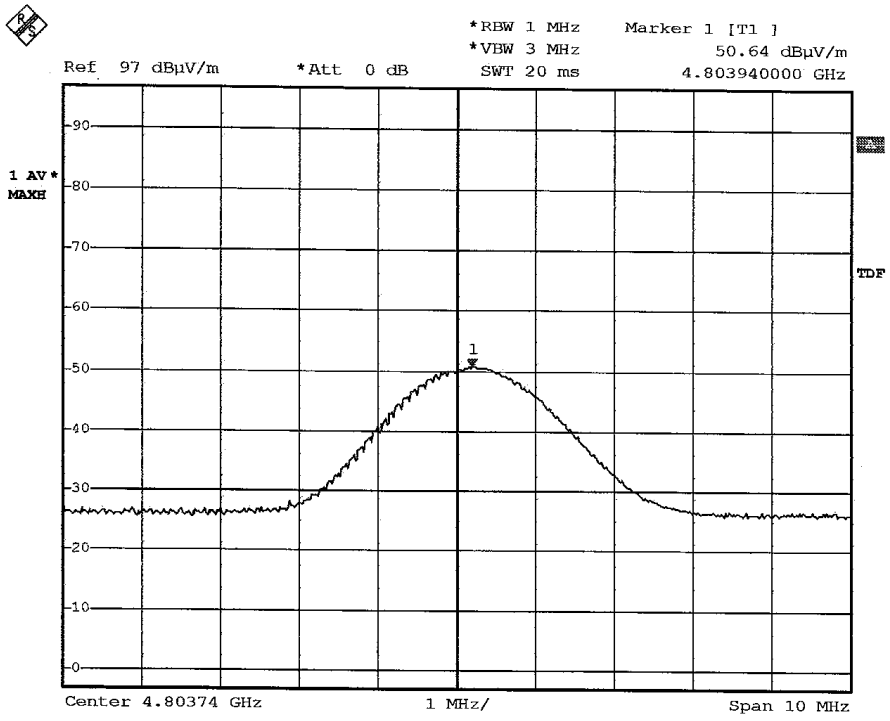


H

Date: 6.APR.2005 23:04:56

T.Tech
TM402-A

2402MHz

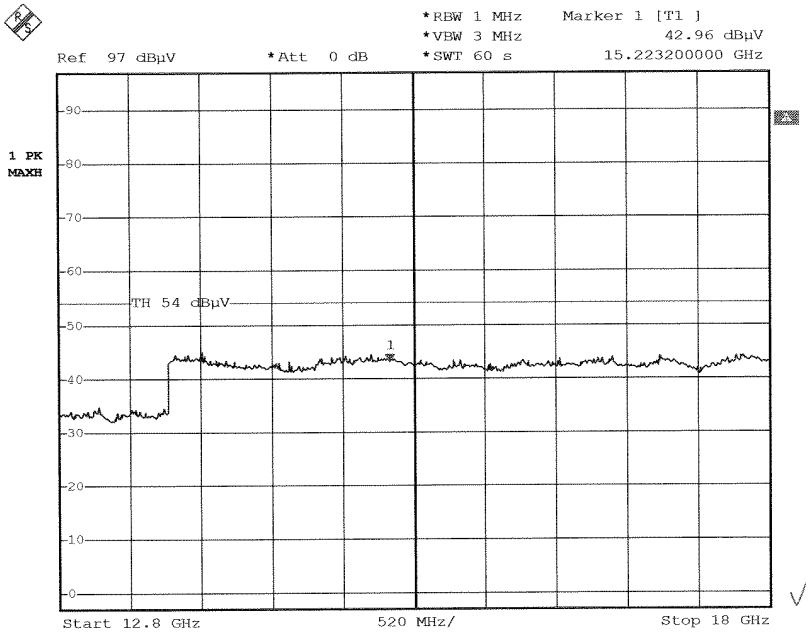


Date: 6.APR.2005 23:05:22

i.Tech
iM402-A

H

2402MHz

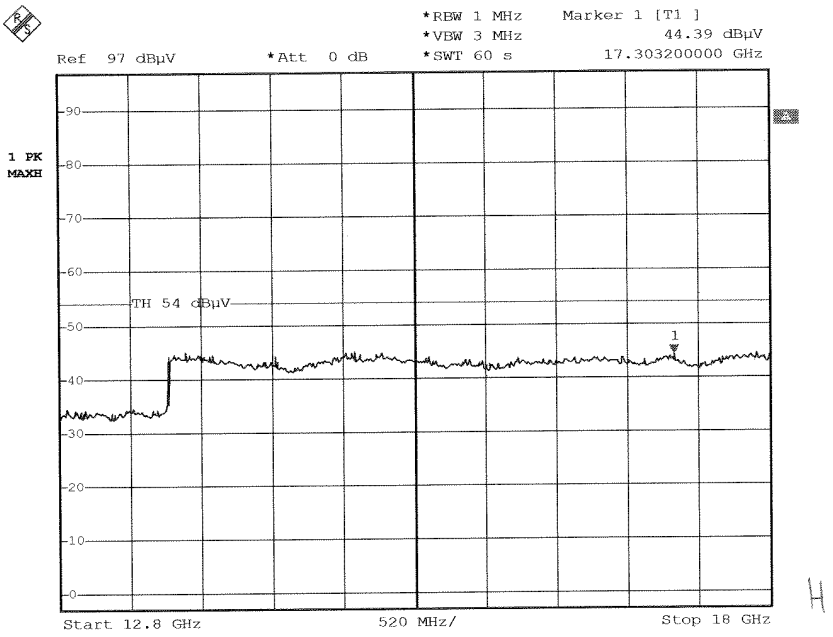


Date: 17.MAR.2005 10:57:50

iTech
iM402-A

2402

Fcc



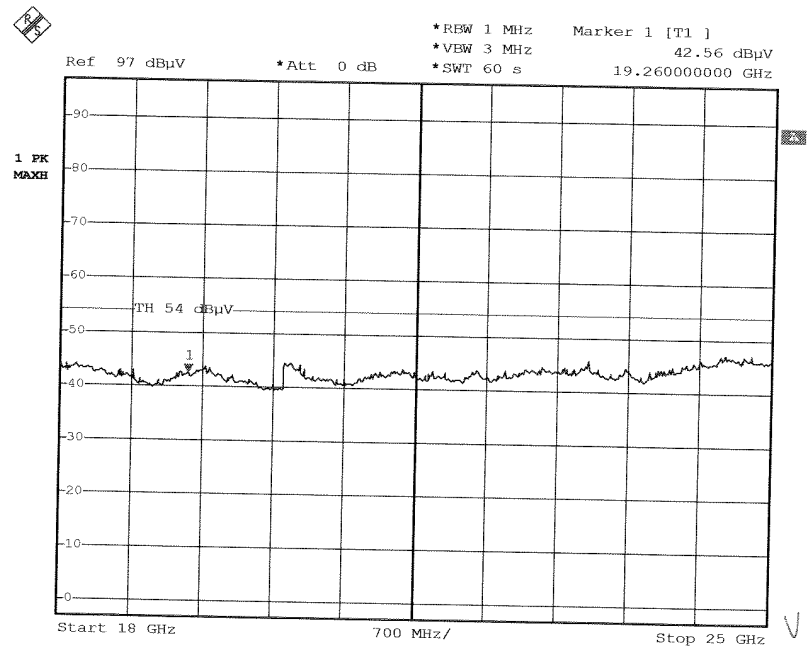
Date: 17.MAR.2005 10:54:52

iTech

IM402-A

2402

Fcc



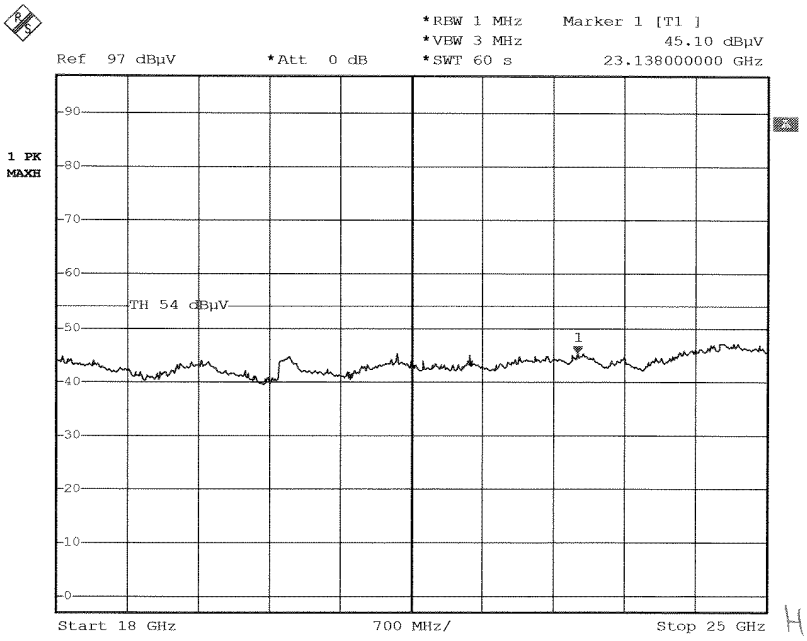
Date: 17.MAR.2005 11:12:00

iTech

iM402-A

2402

FCC



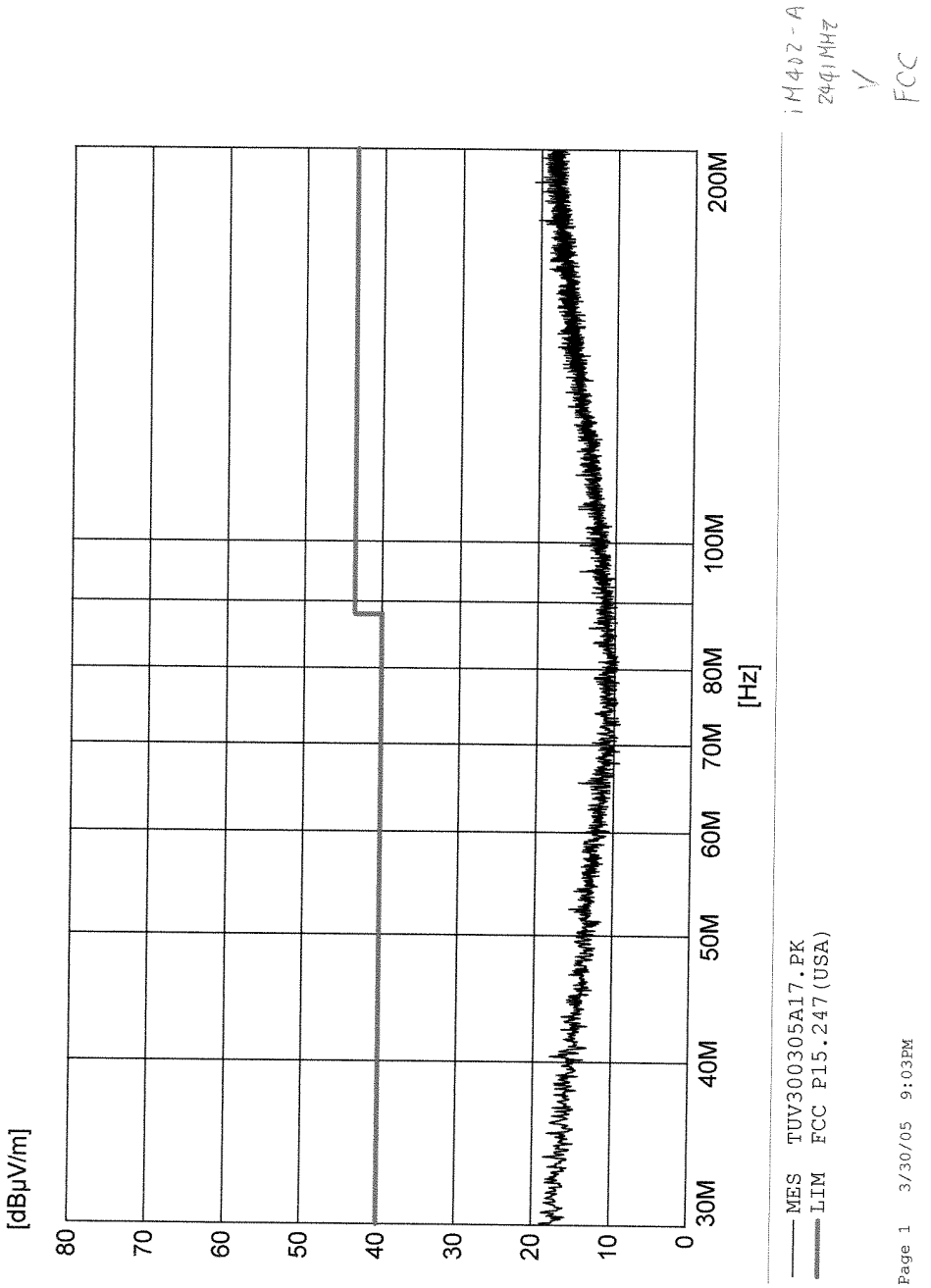
Date: 17.MAR.2005 11:09:26

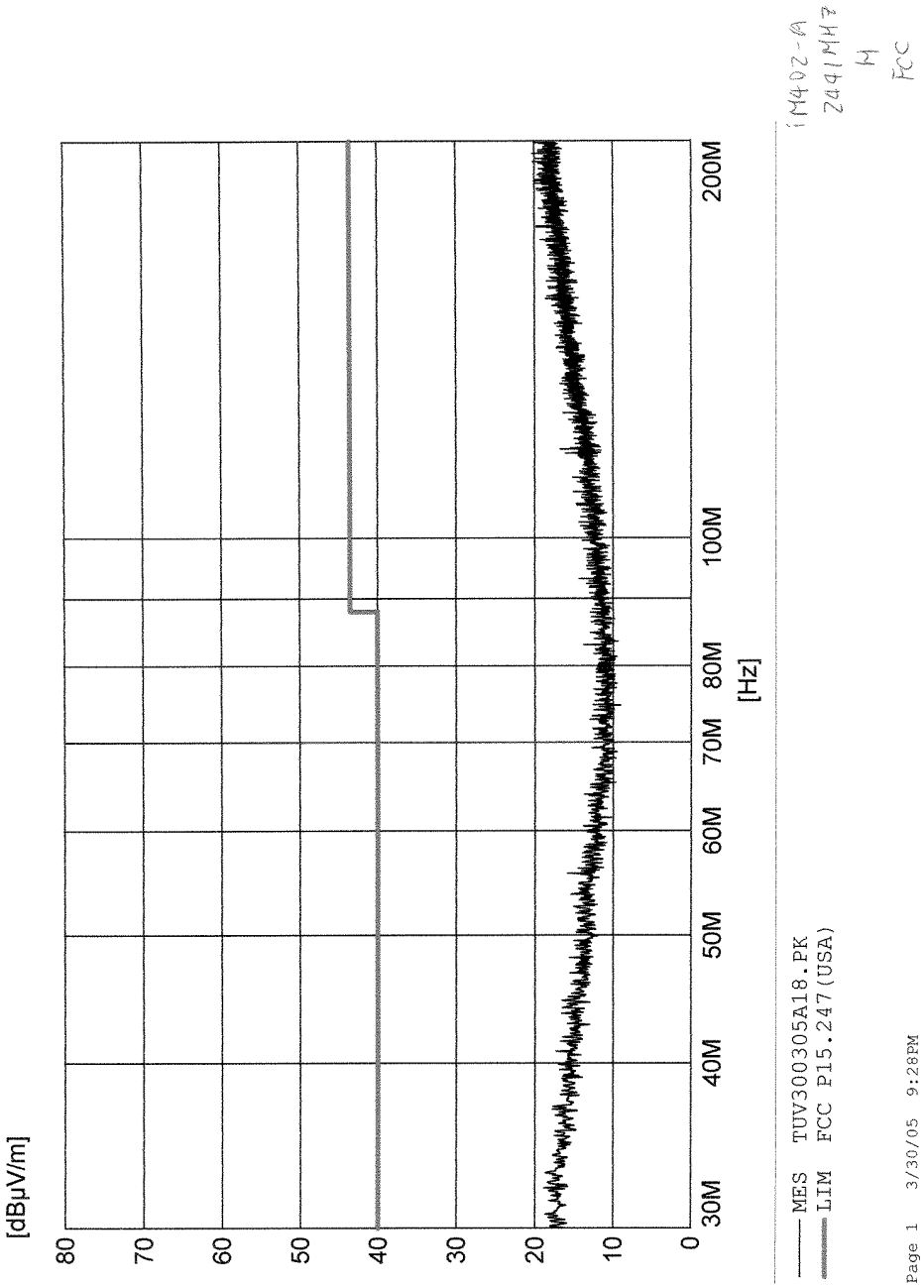
iTech

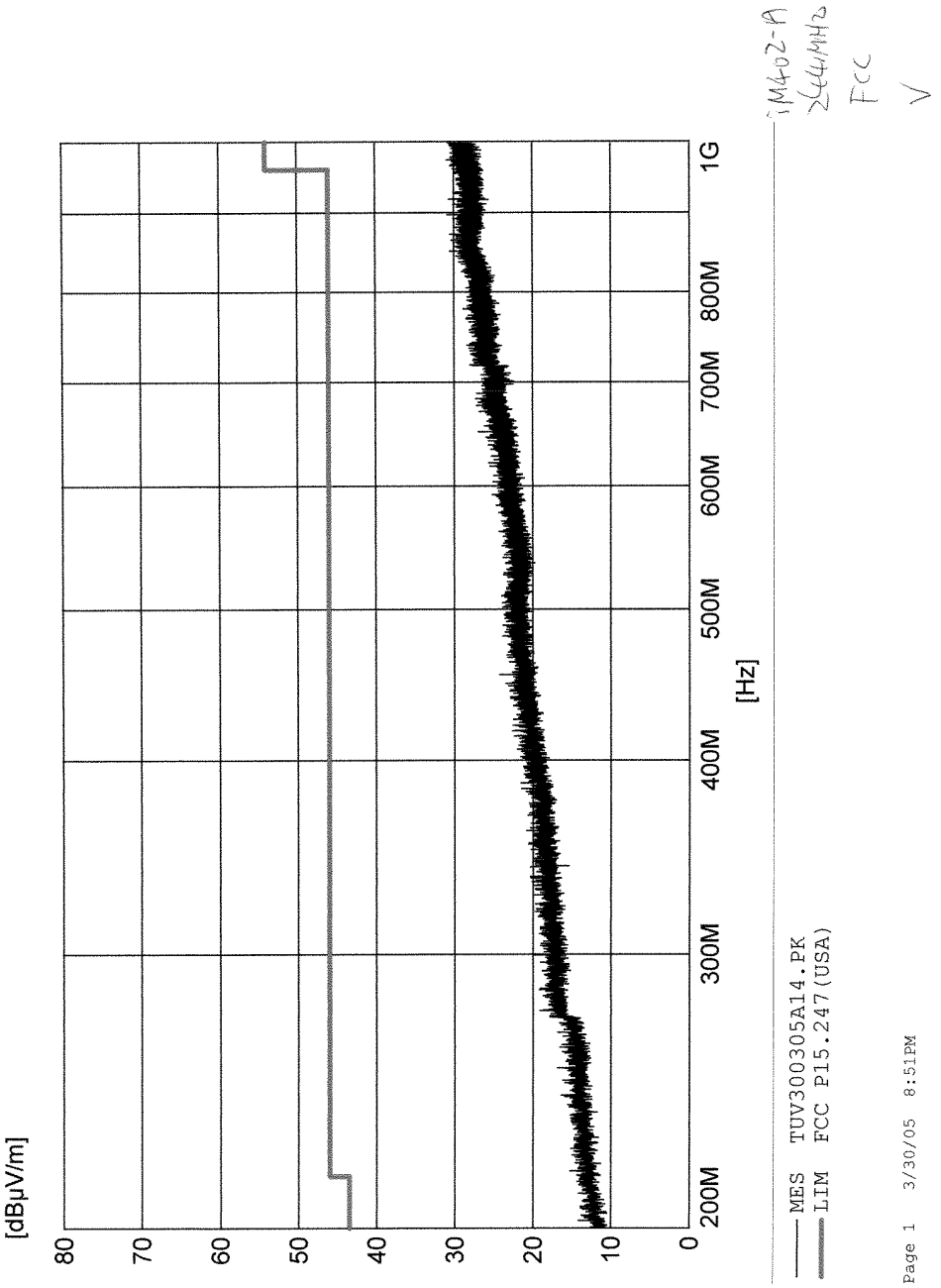
iM402-A

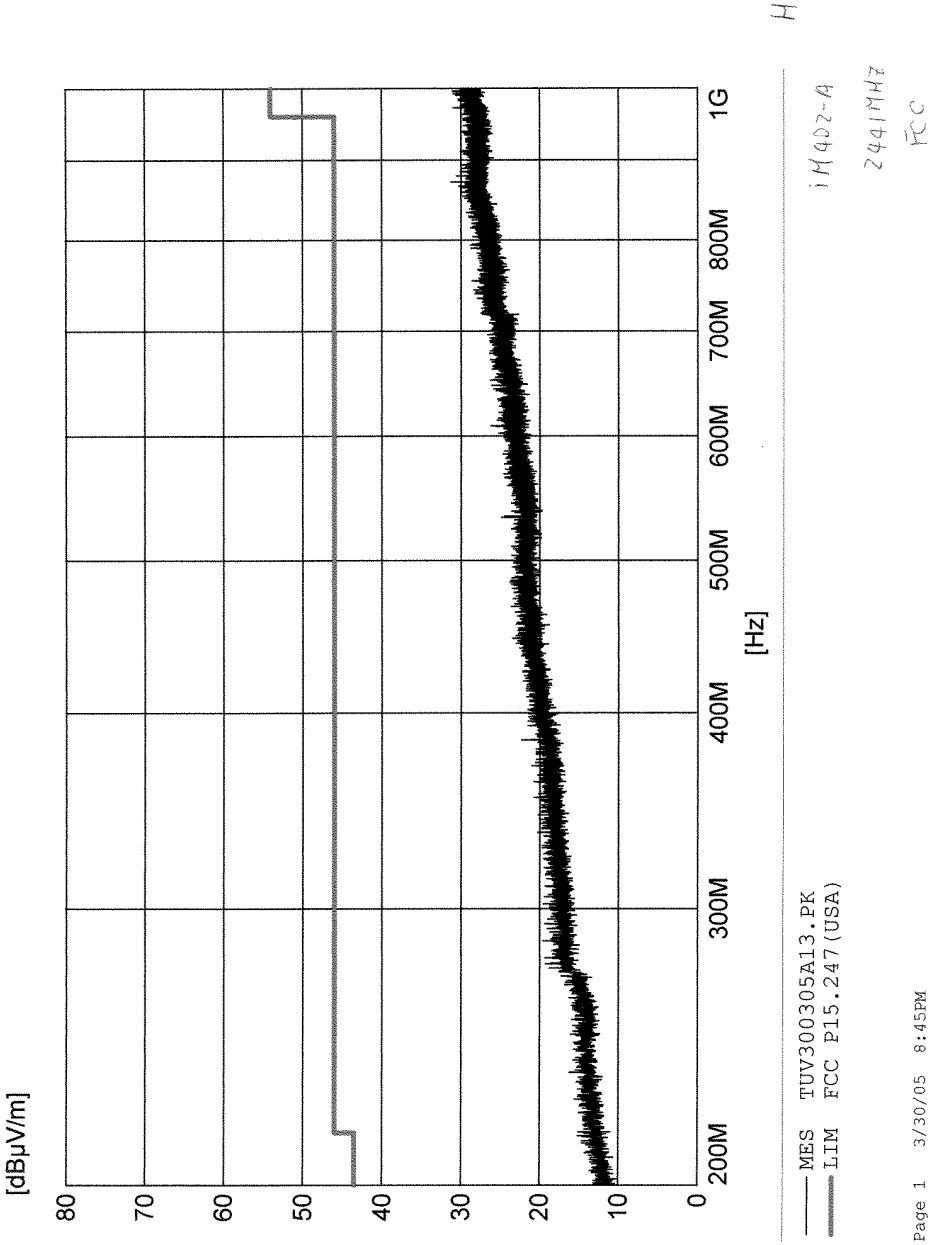
2402

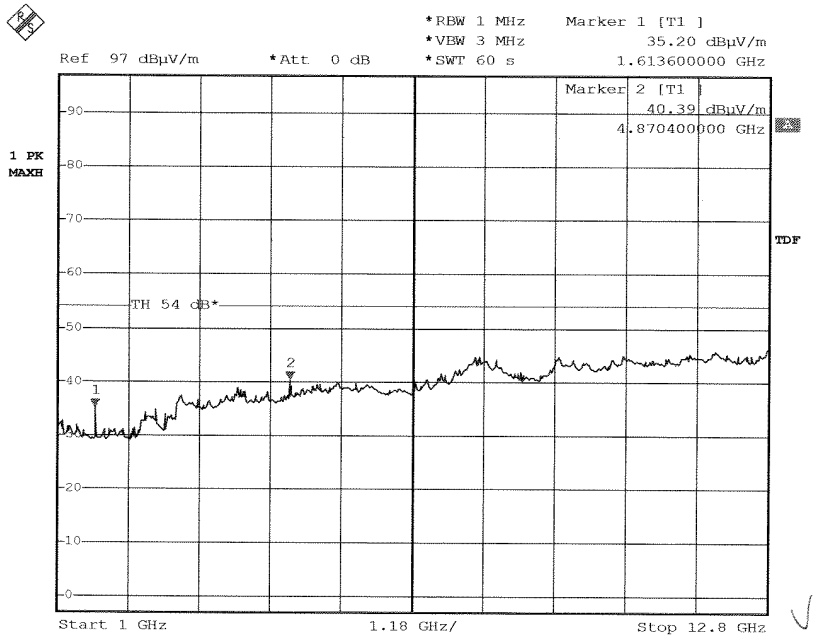
FCC


iM402-A
2441MHz
V
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A17.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 9:03PM


[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A18.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 9:28PM


[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV300305A14.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 8:51PM


H
1M402-A
2441MHz
FCC
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES TUV300305A13.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 8:45PM

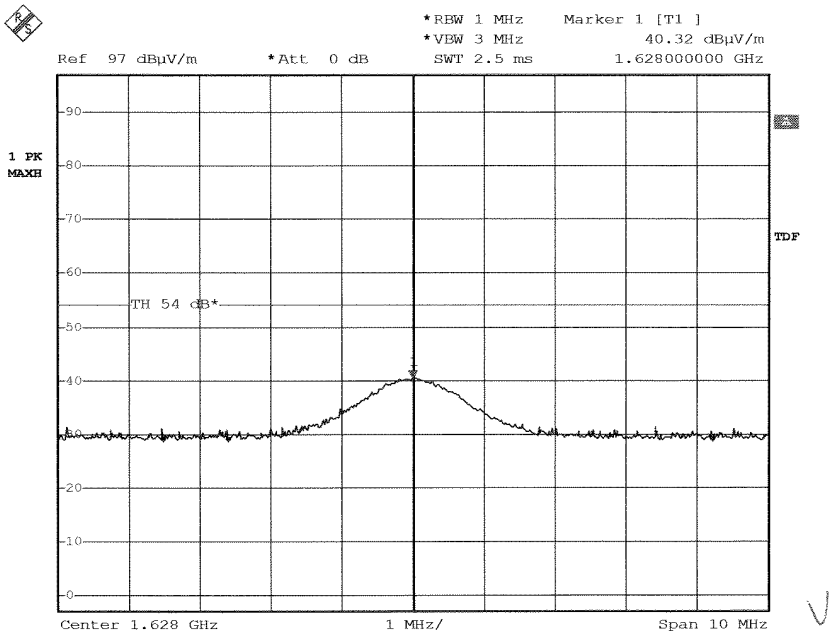


Date: 17.MAR.2005 11:16:24

i.Tech
iM402-A
2441

FCC

246 Filter



V

Date: 17.MAR.2005 11:21:07

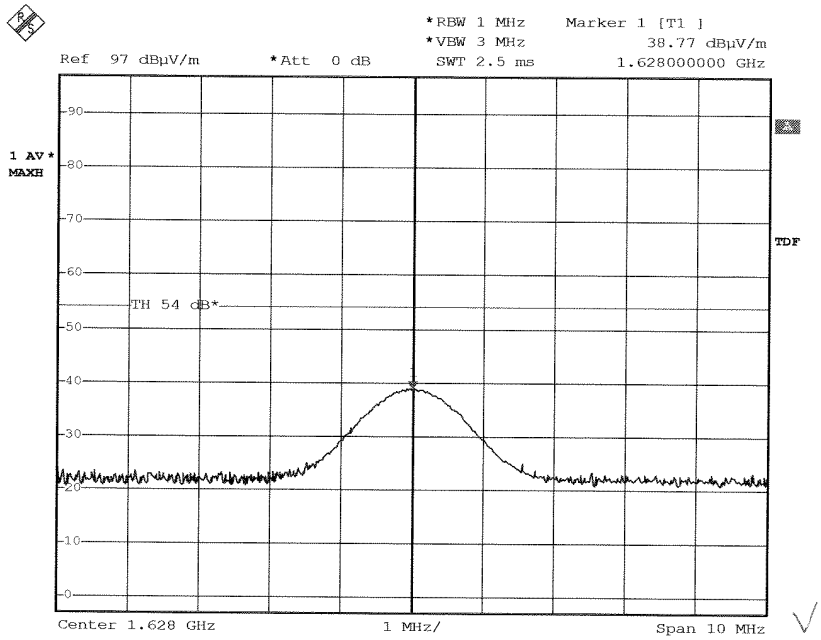
iTech

iM402-A

2441

Fcc

2.4G Filter



Date: 17.MAR.2005 11:21:41

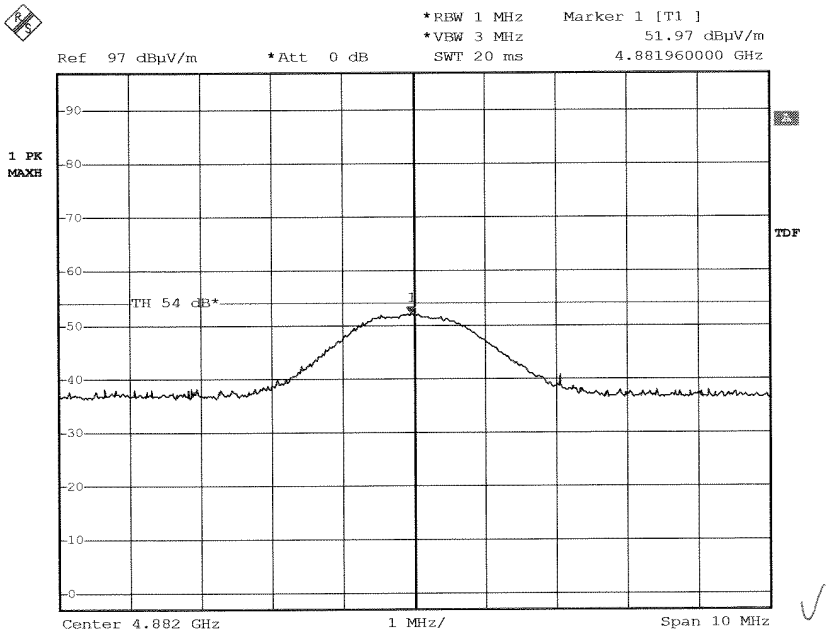
iTech

IM402-A

2441

FCC

2.4G Filter



Date: 17.MAR.2005 11:27:04

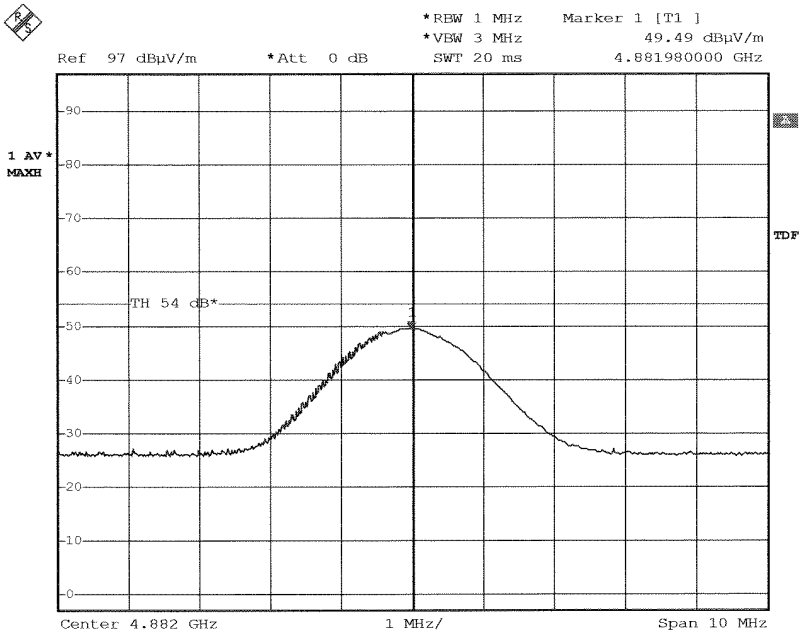
iTech

iM402-N

2441

Fcc

2.4G Filter

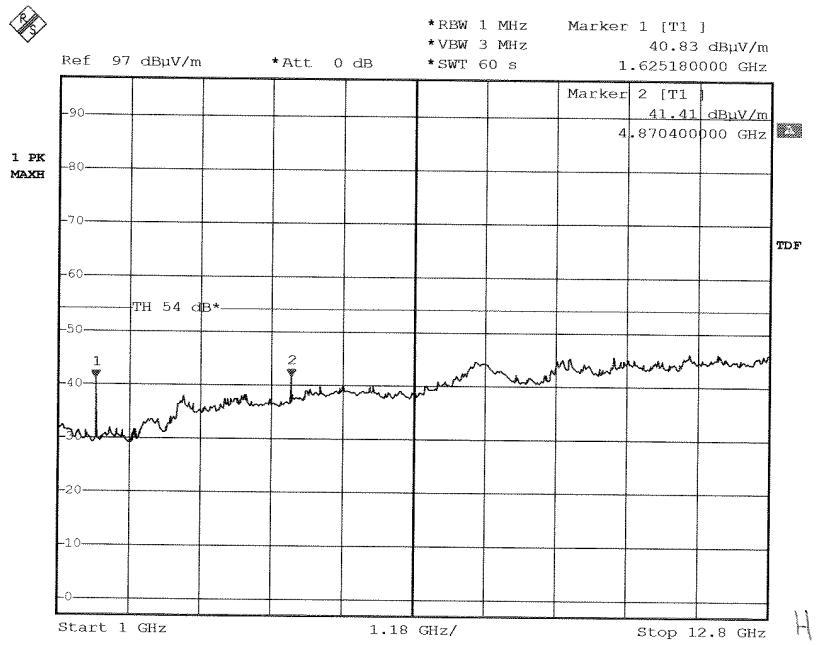


Date: 17.MAR.2005 11:27:30

i.Tech
:M402-A
2441

FCC

2.4G Filter



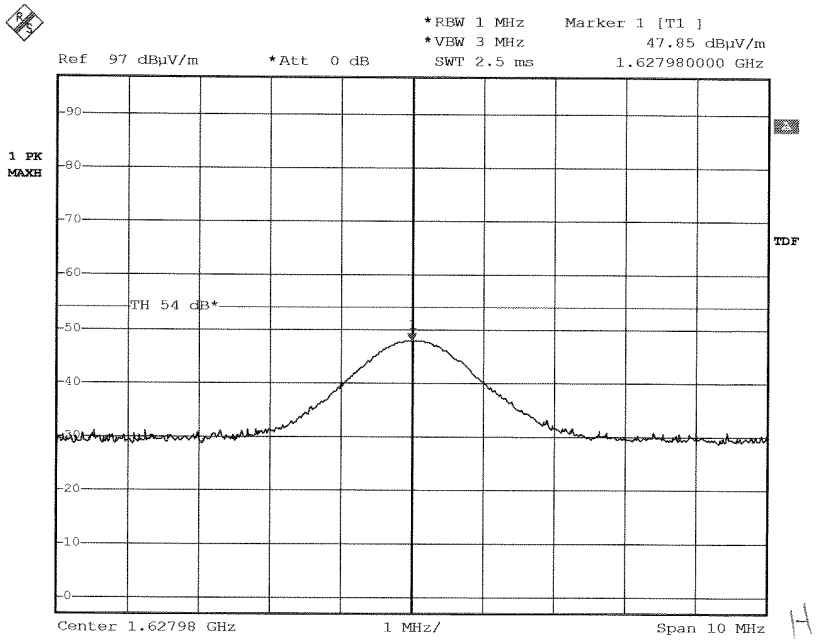
iTech

iM402-A

2441

FCC

2.4G filter

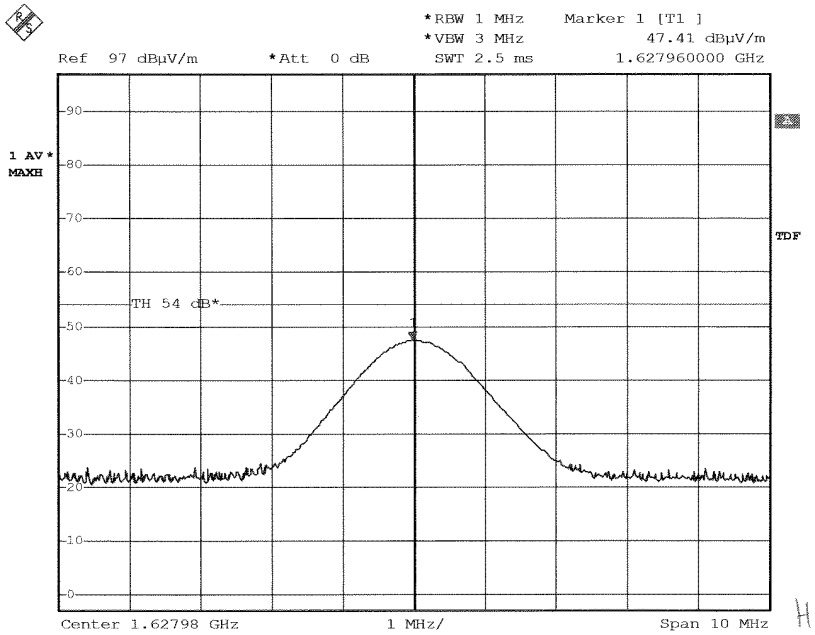


i.Tech

iM402-A

2441

FCC



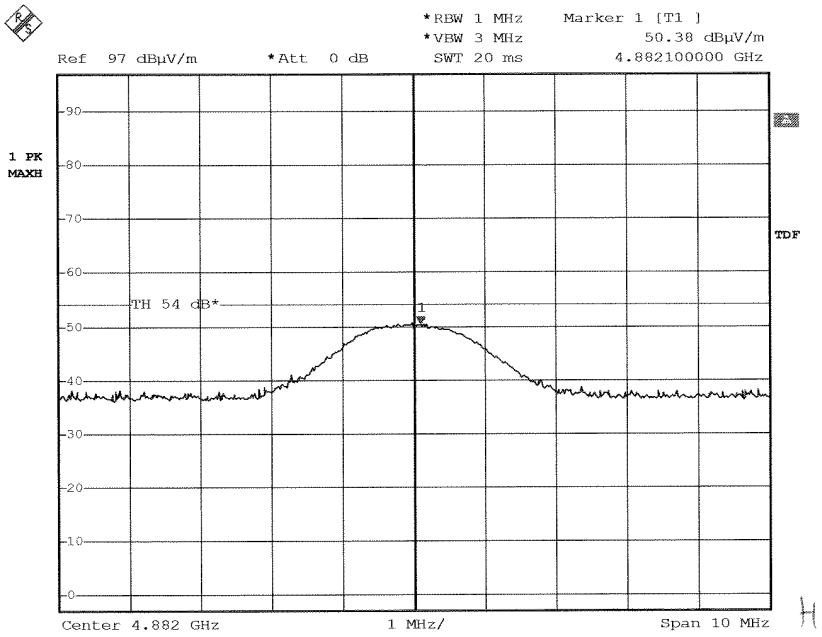
Date: 17.MAR.2005 11:39:33

iTech

TM452-A

2444

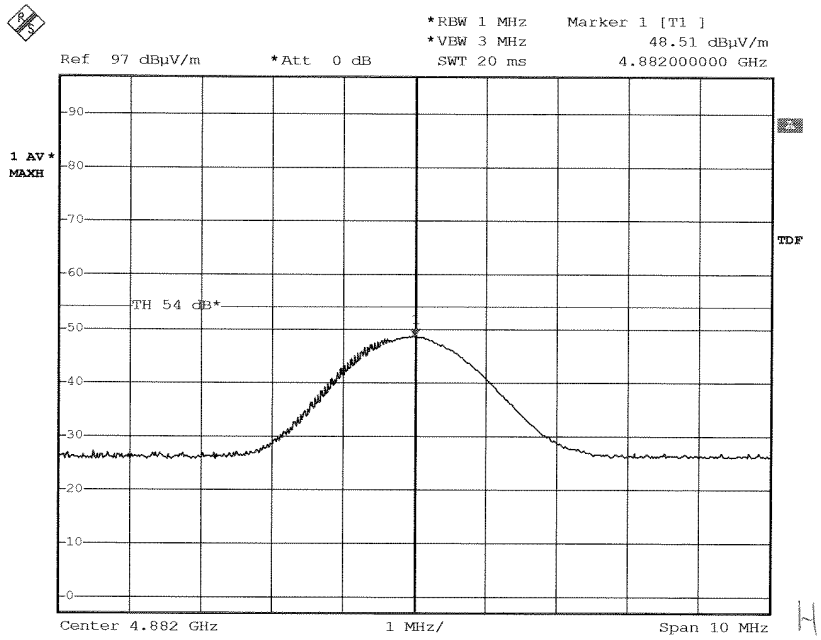
Fcc



iTech
IM402-A
2441

FCC

2.4G Filter



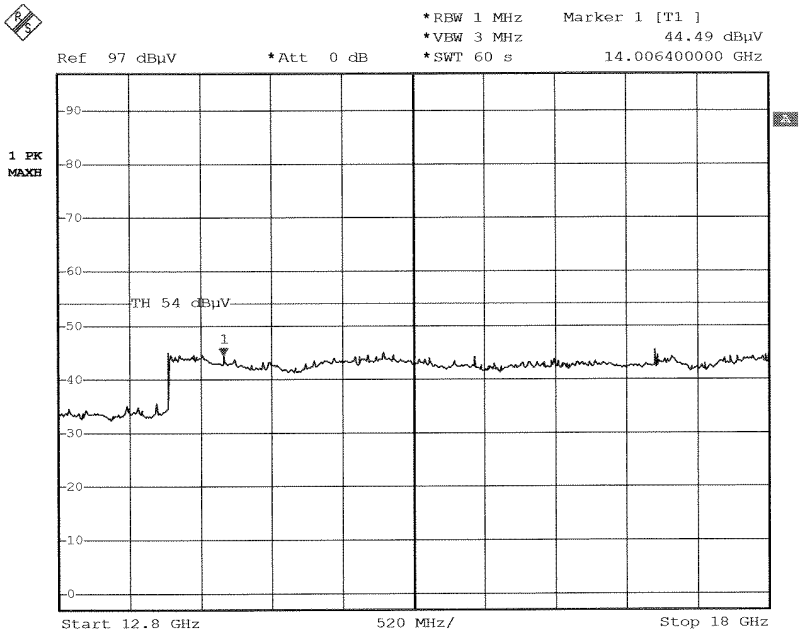
iTech

iM402-A

2441

Fcc

24G Filter



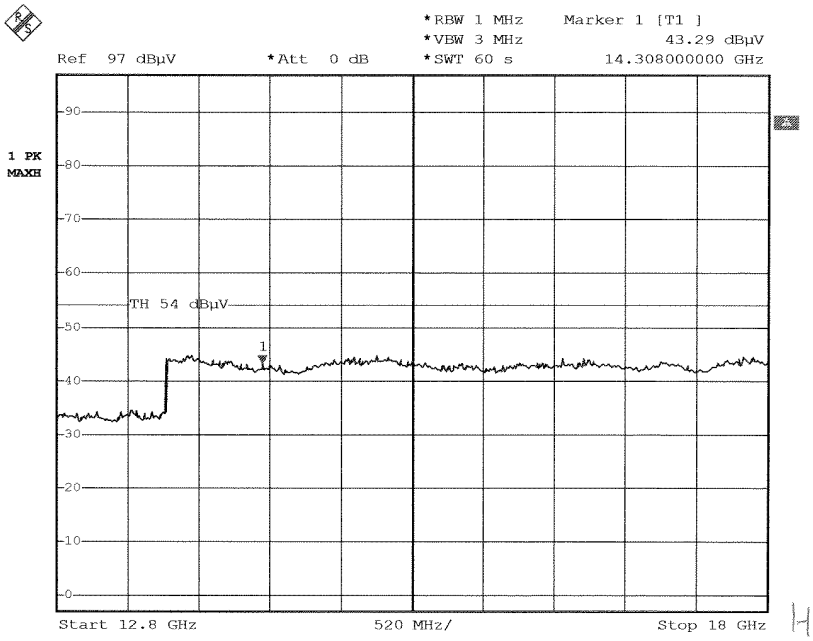
V

iTech

iM402-A

2MA1

Fcc



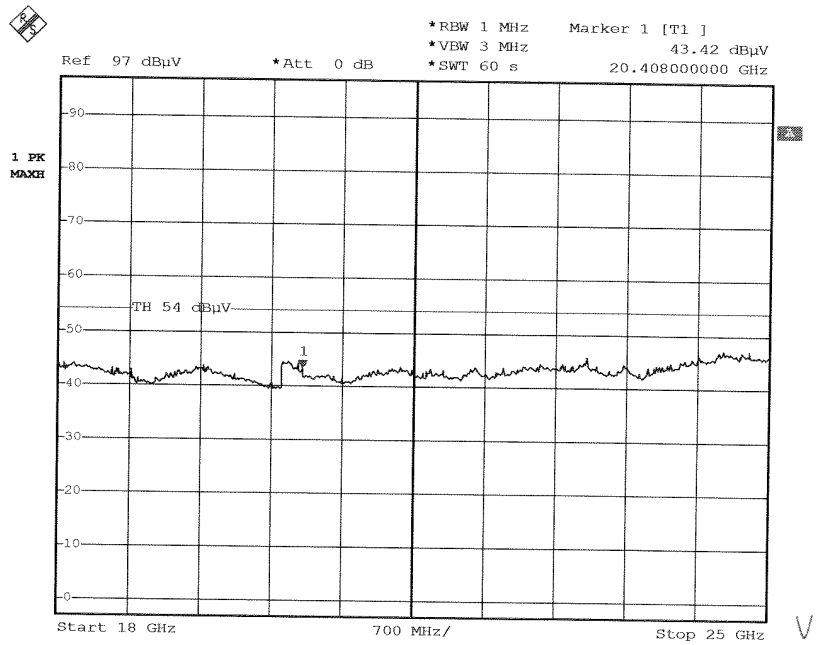
Date: 17.MAR.2005 11:04:31

iTech

iM402-A

2441

Fcc



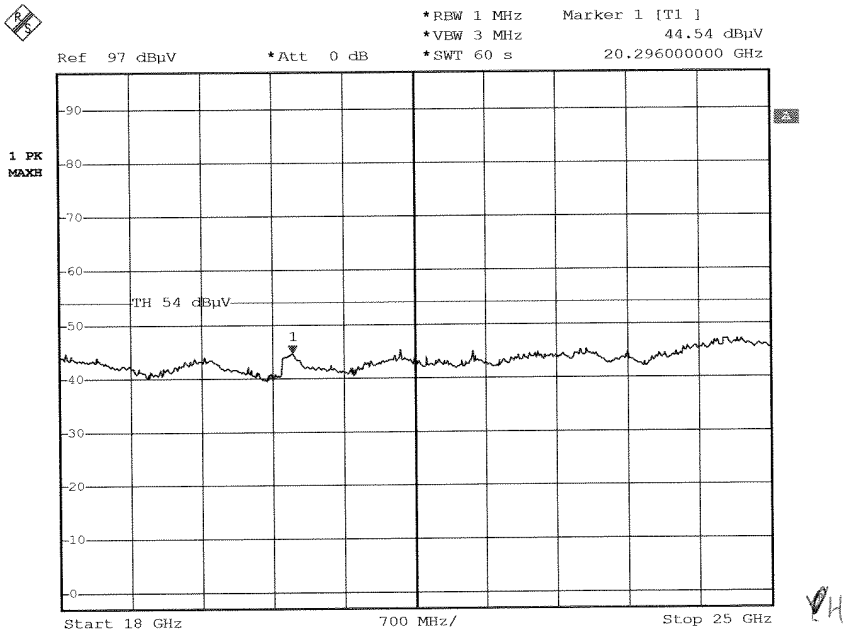
Date: 17.MAR.2005 11:12:20

iTech

iM402-A

2441

Fcc



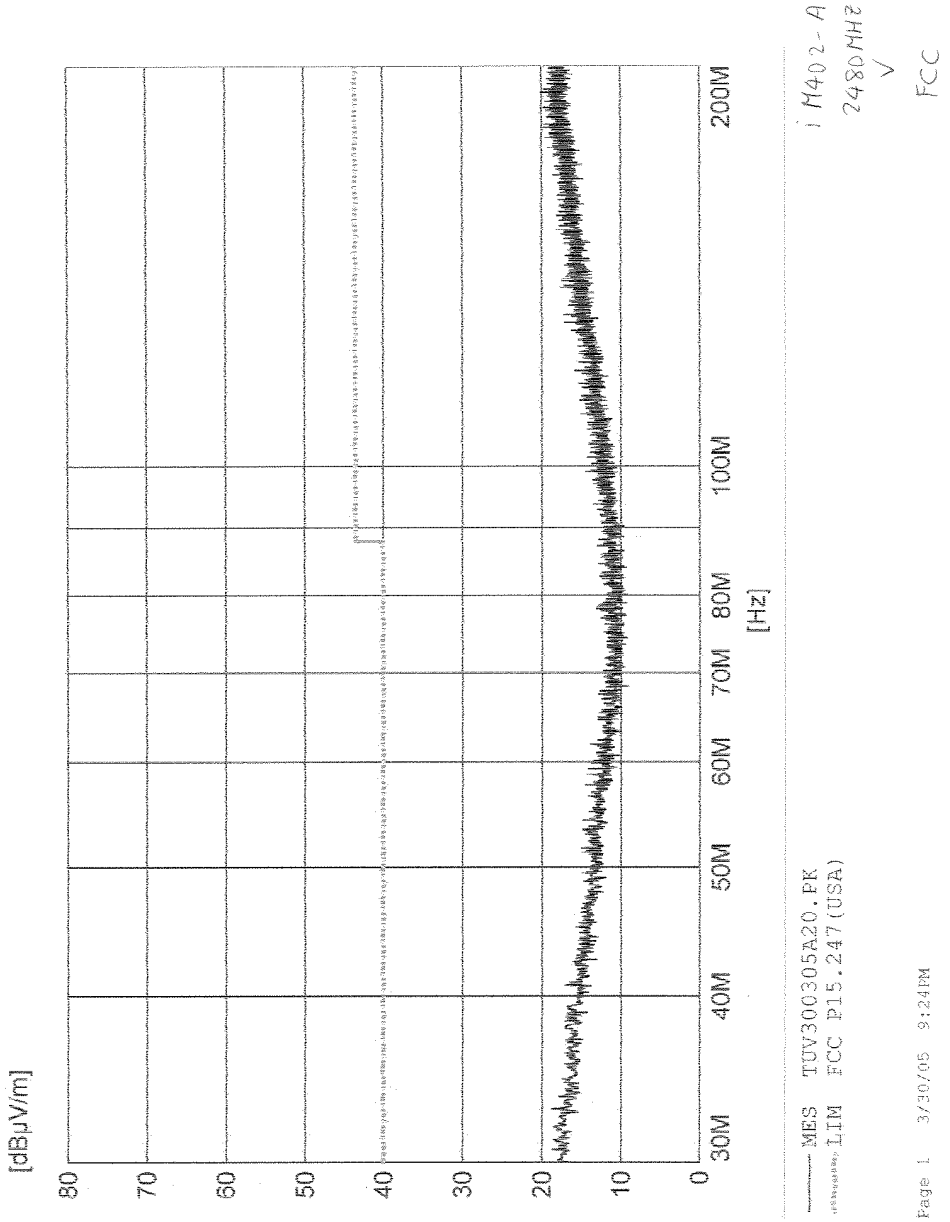
Date: 17.MAR.2005 11:08:42

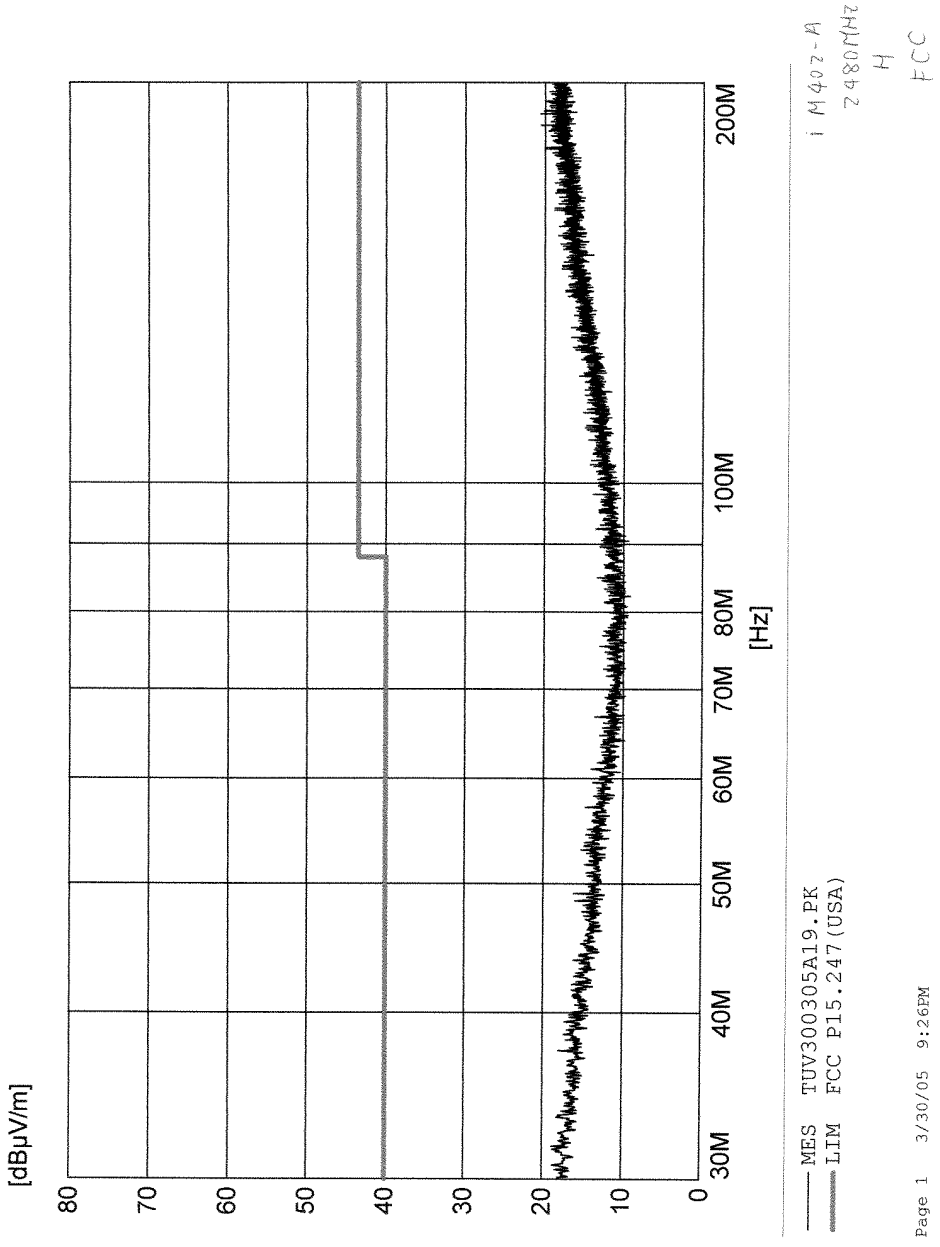
i.Tech

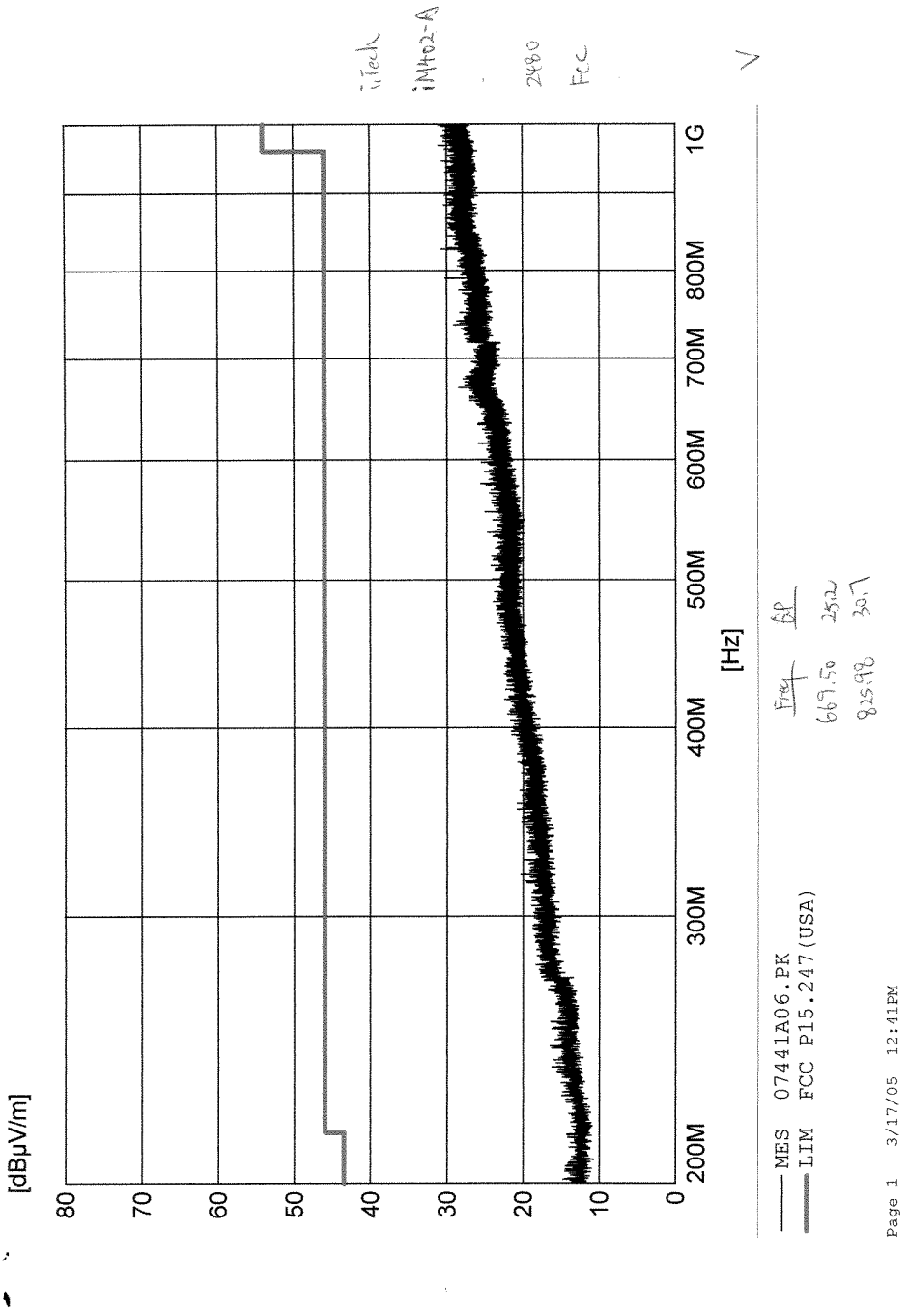
3M402-A

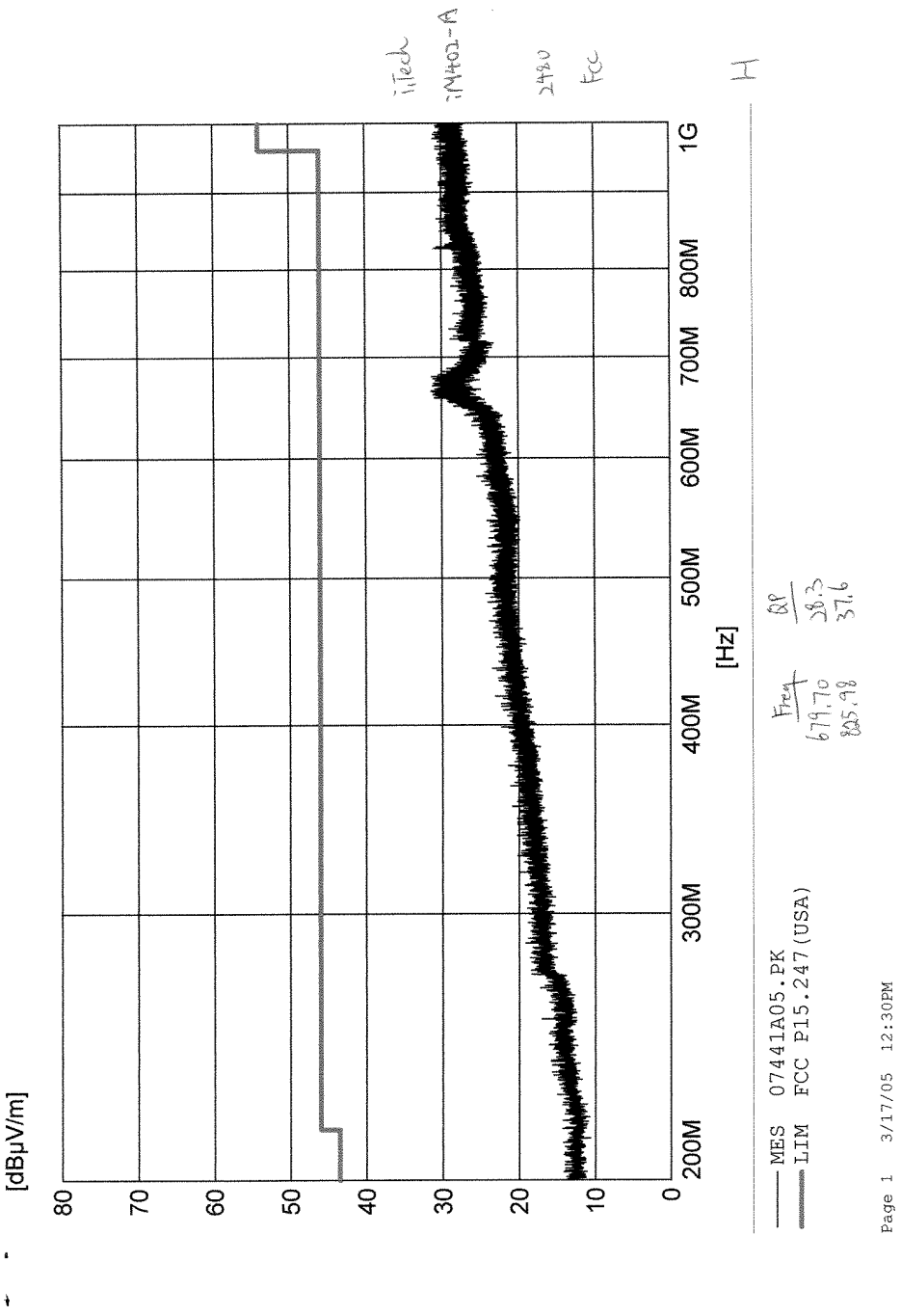
2441

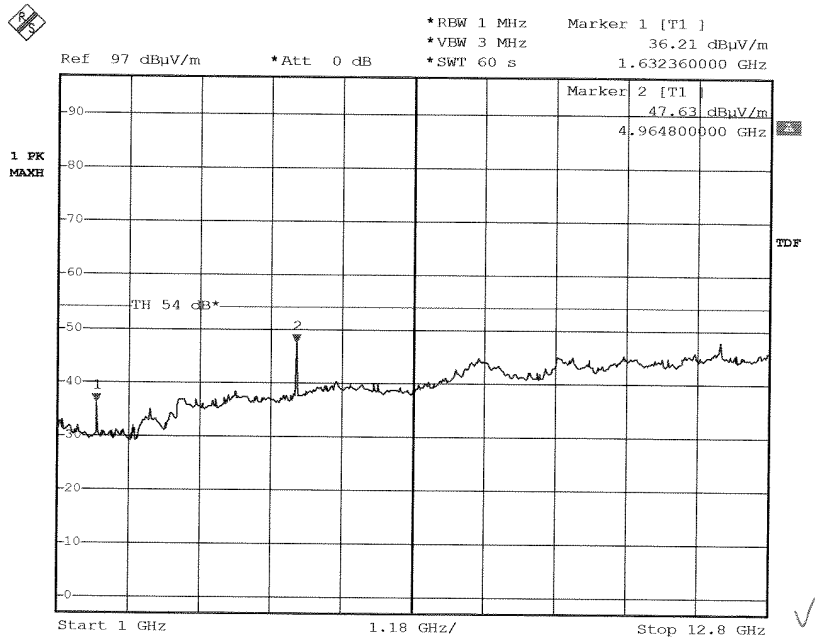
FCC


[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A20.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 9:24PM
1 M402-A
2480MHz
V
FCC


[dBµV/m]
80
70
60
50
40
30
20
10
0
30M
40M
50M
60M
70M
80M
100M
200M
[Hz]
MES TUV300305A19.PK
LIM FCC P15.247(USA)
Page 1 3/30/05 9:26PM
i M402-A
2480MHz
H
FCC


iTech
iMH02-A
2480
FCC
V
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES 07441A06.PK
LIM FCC P15.247(USA)
Page 1 3/17/05 12:41PM


iTech
IN4001-A
2480
FCC
H
[dBµV/m]
80
70
60
50
40
30
20
10
0
200M
300M
400M
500M
600M
700M
800M
1G
[Hz]
MES 07441A05.PK
LIM FCC P15.247(USA)
Freq
679.70
805.98
QP
38.3
37.6
Page 1 3/17/05 12:30PM



Date: 17.MAR.2005 12:06:26

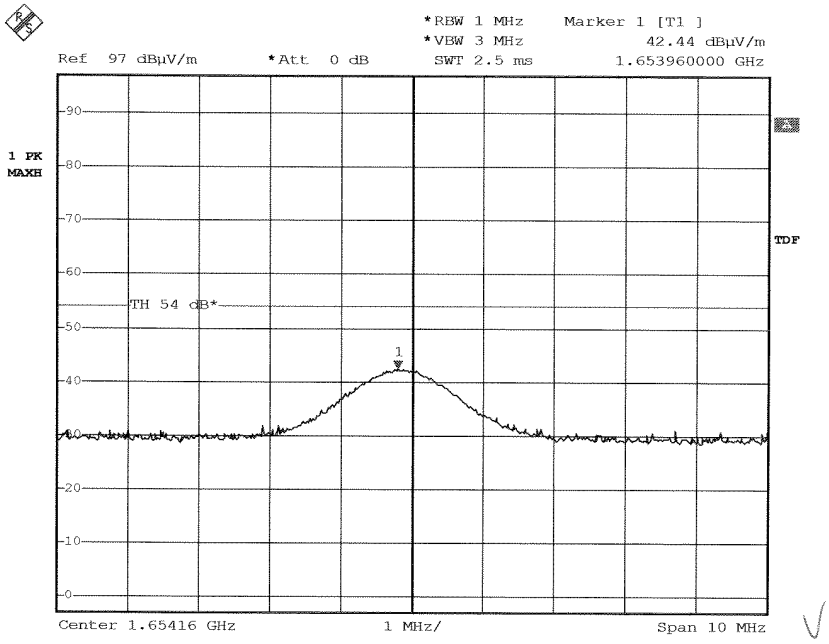
iTech

iM402-A

1680

FCC

2.4G Filter



Date: 17.MAR.2005 12:11:23

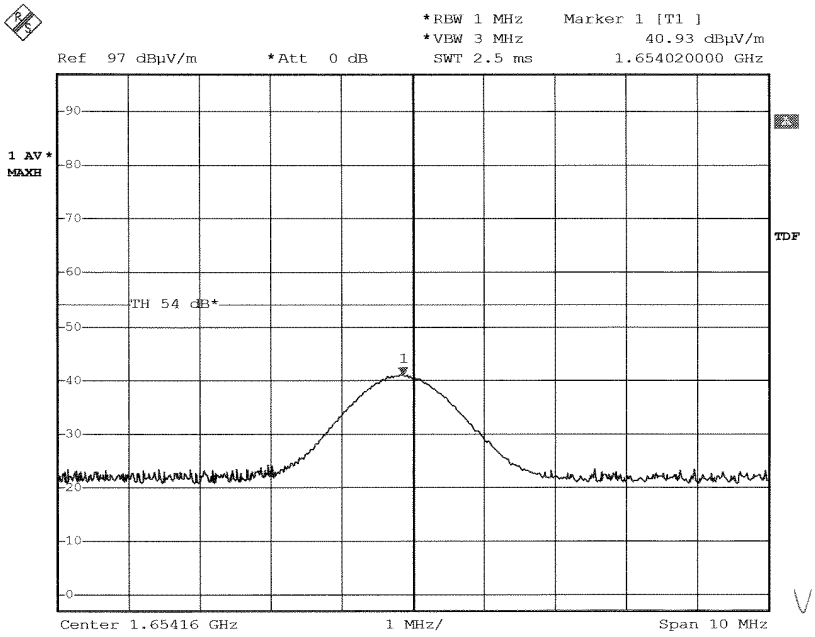
iTech

iM402-A

2680

Fcc

2.4G Filter



Date: 17.MAR.2005 12:12:30

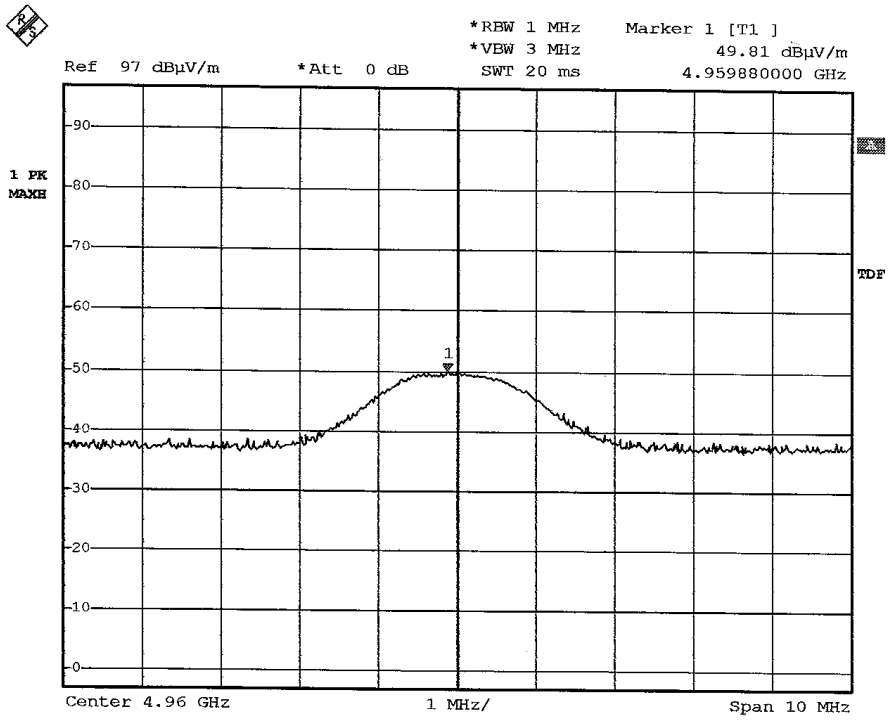
i.Tech

iM402-A

2480

Fcc

2.4G Filter

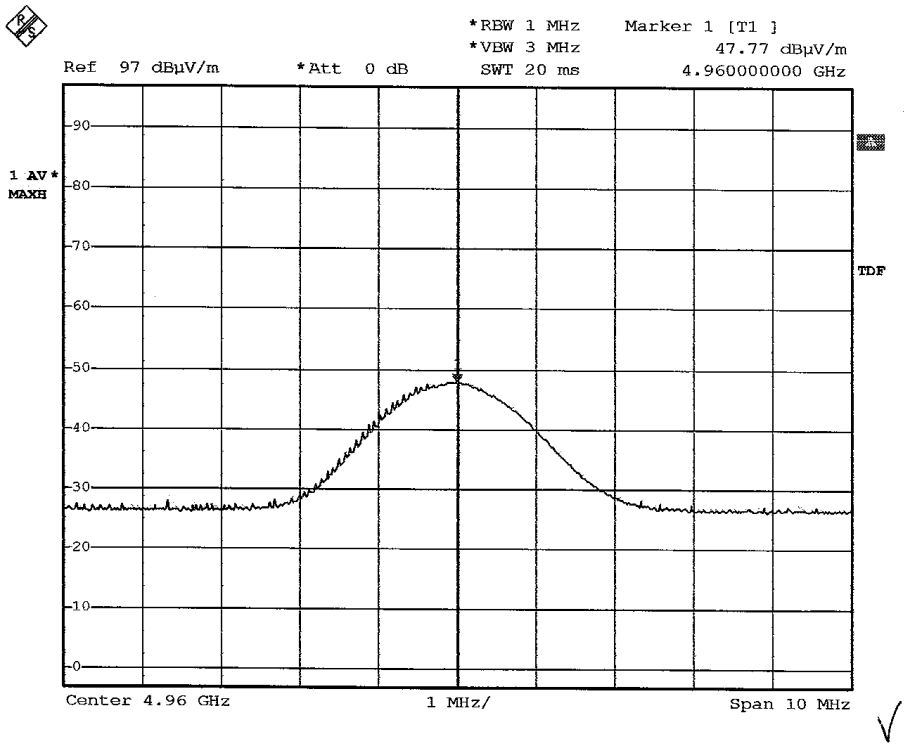


Date: 6.APR.2005 22:52:50

V

i.Tech
iM402-A

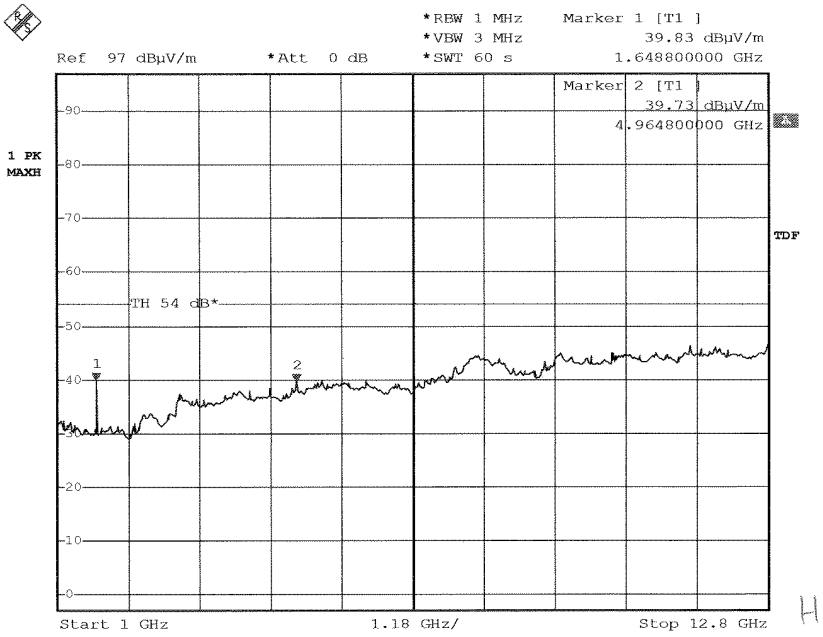
2480MHz



√

2480MHz

i.Tech
iM402-A



Date: 17.MAR.2005 11:52:49

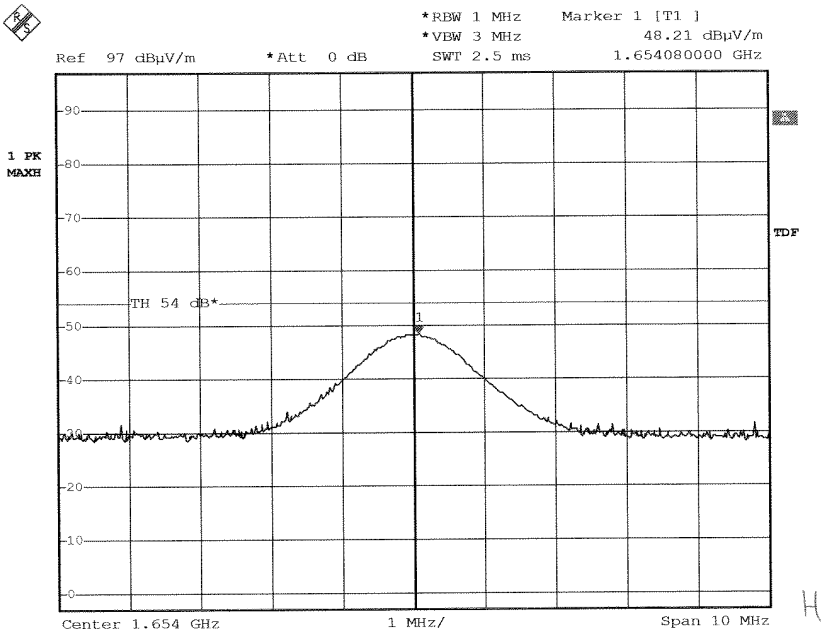
iTech

iM402-A

2480

Fcc

2.4G Filter



Date: 17.MAR.2005 11:55:42

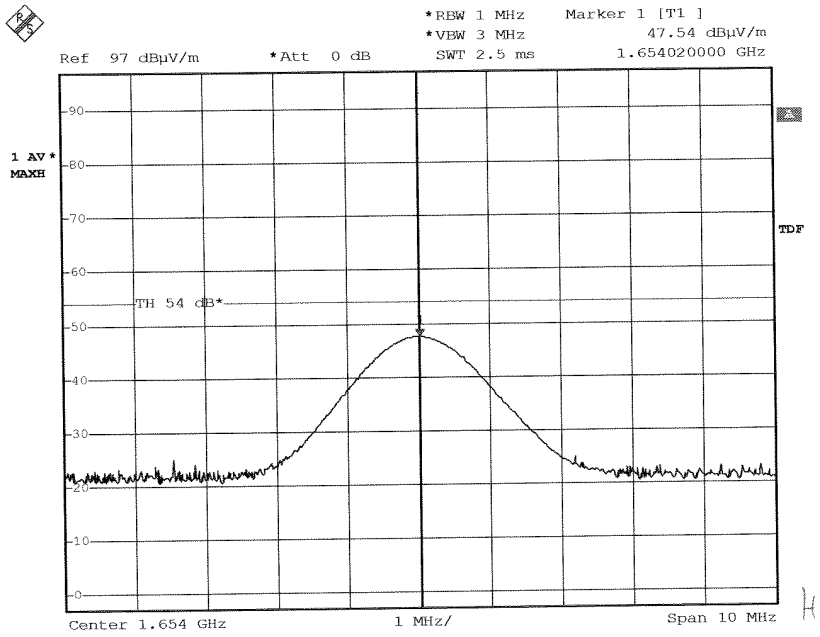
iTech

iM462-A

2480

Fcc

2.4G Filter



Date: 17.MAR.2005 11:57:02

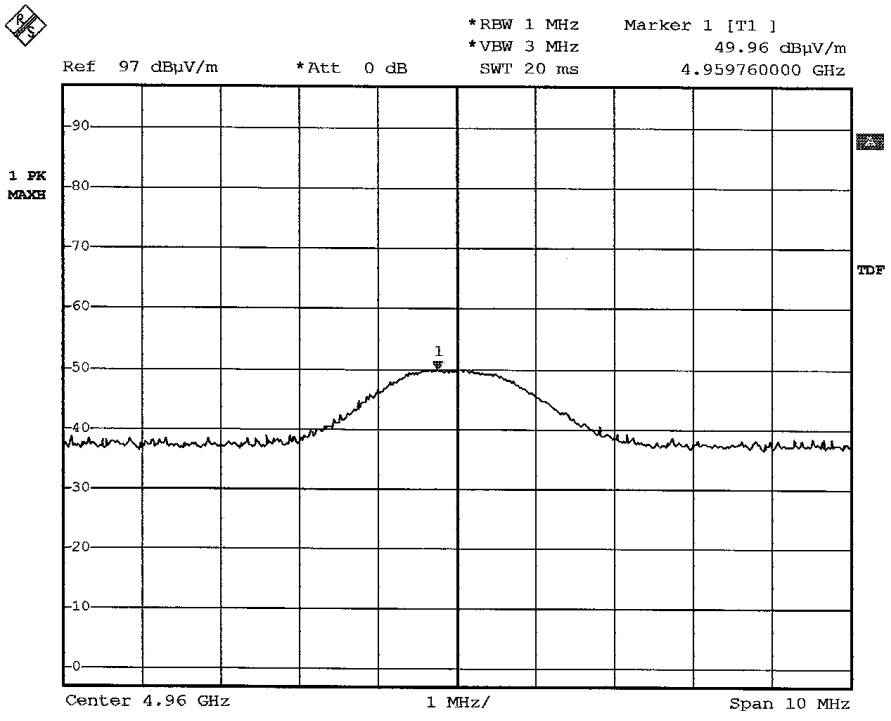
iTech

iM402-A

2480

Fcc

2.4G Ffher

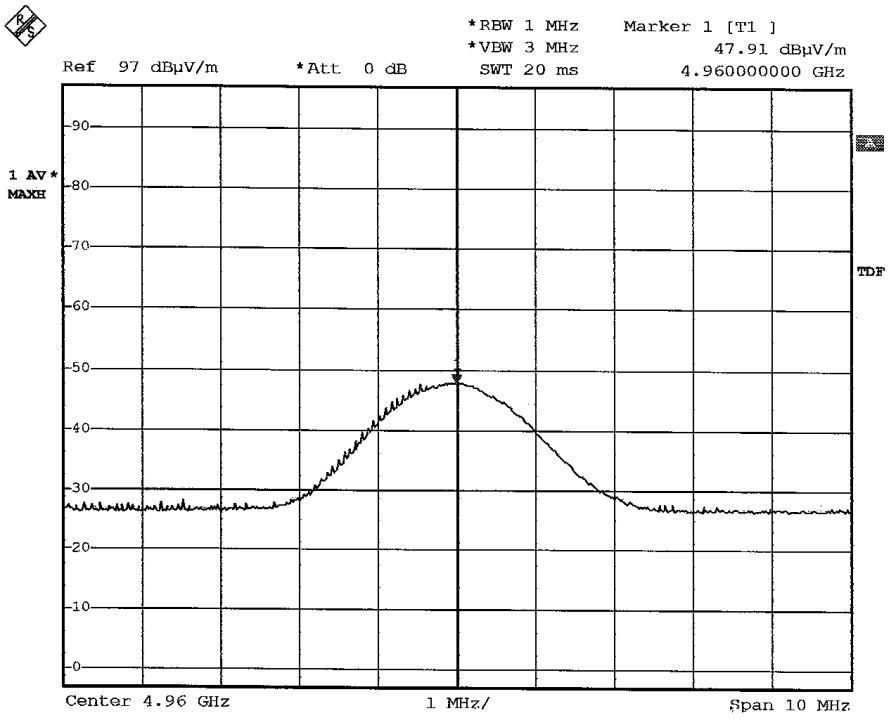


H

2480MHz

Date: 6.APR.2005 22:47:37

i.Tech
iM402-A

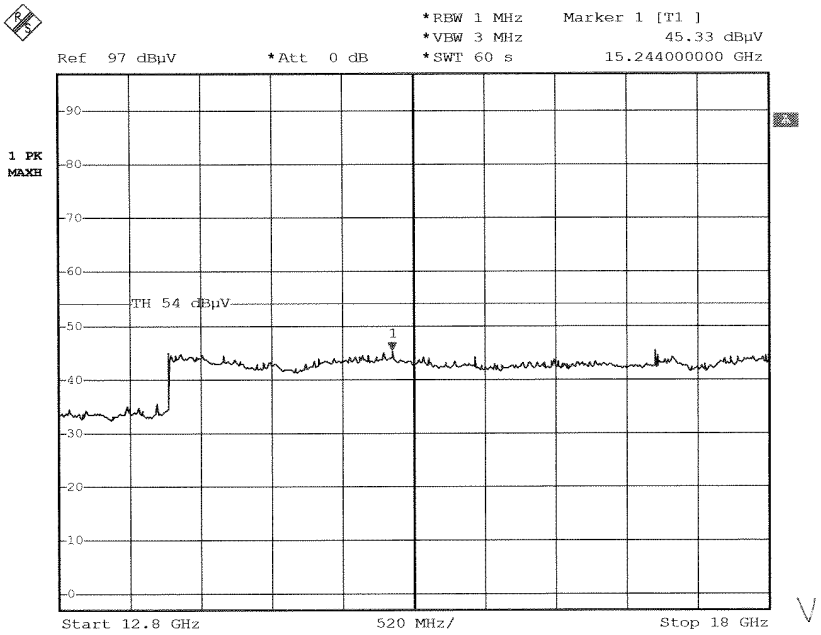


Date: 6.APR.2005 22:48:10

i.Tech
iM402-A

H

2480MHz



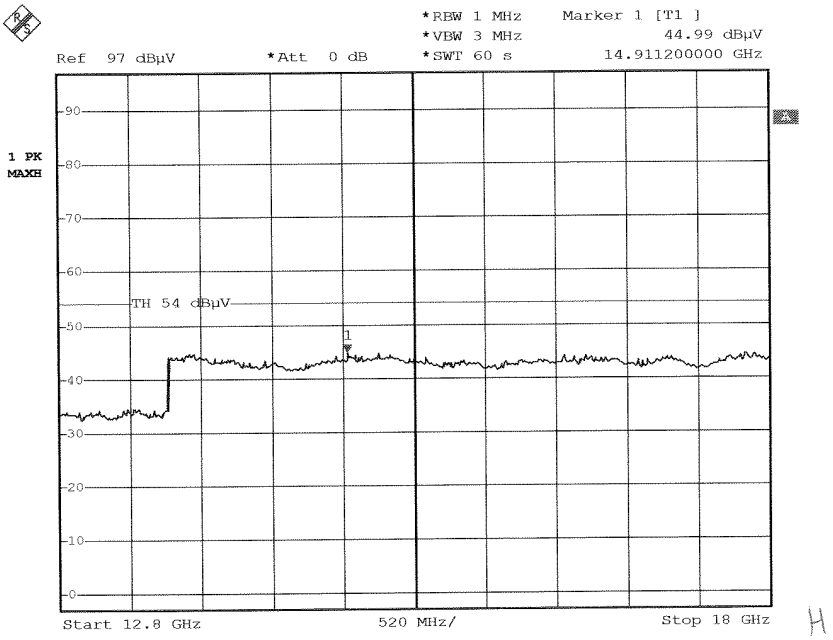
Date: 17.MAR.2005 11:02:06

i.Tech

iM402-A

2480

FCC



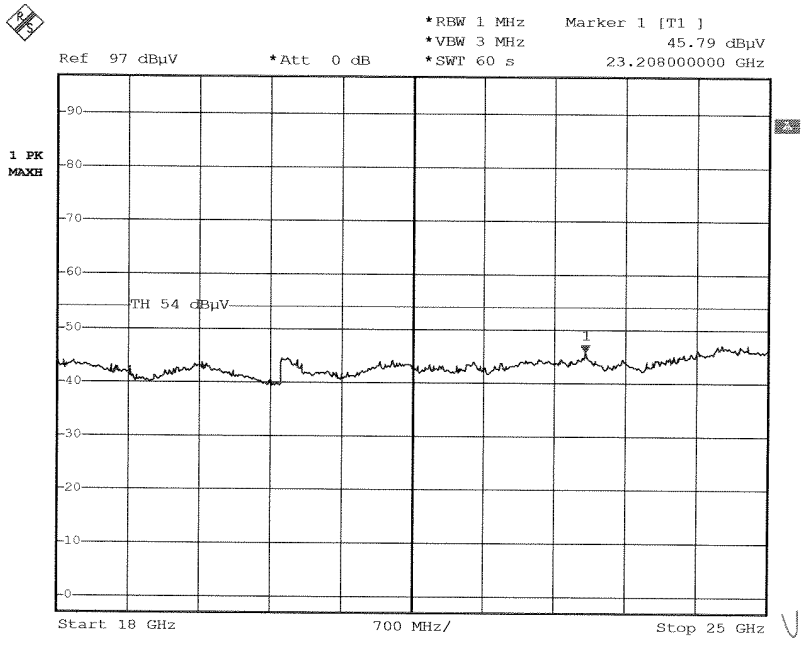
Date: 17.MAR.2005 11:05:32

iTech

iM1402-A

2480

FCC



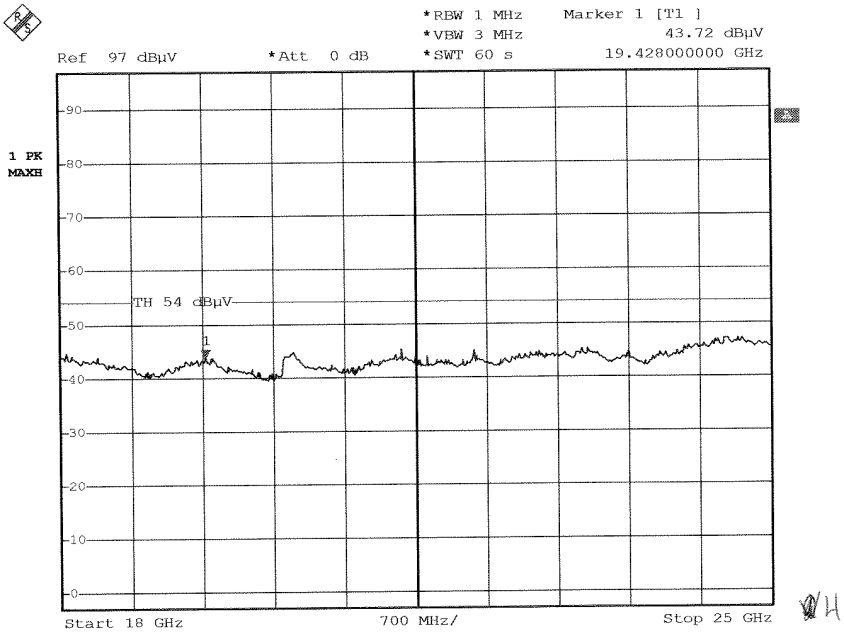
Date: 17.MAR.2005 11:12:50

i.Tech

3M402-A

2446

FCC



Date: 17.MAR.2005 11:08:11

iTech

iM402-A

2480

FCC