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

TÜV

Prüfbericht - Nr.: *Test Report No.*	**14003059 001**	Seite 1 von 20 *Page 1 of 20*

Auftraggeber: *Client:*
Gigawavetech Pte Ltd.
1 Jalan Kilang Timor
#07-02 Pacific Tech Centre
Singapore

Gegenstand der Prüfung: *Test item:* **Class 1 Bluetooth Adapter**

Bezeichnung: *Identification:* **CFPA-001**
Serien-Nr.: *Serial No.* **Engineering sample**

Wareneingangs-Nr.: *Receipt No.:* 030311026
Eingangsdatum: *Date of receipt:* **11.3.2003**

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

Prüfgrundlage: *Test specification:*
FCC Part 15, Subpart C
ANSI C63.4-1992
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		**Stephan Wald**	
09.06.2003		09.06.2003	
Datum *Date*	**Unterschrift** *Signature*	**Datum** *Date*	**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

Dieser Prüfbericht bezieht sich nur auf den o.g. Prüfgegenstand und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report relates to the a. m. test item. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark on this or similar products.

Authorized format 16.12.1996, R.M.

1 Test Summary

7.1.1 ANTENNA CONNECTOR SUBCLAUSE 15.203

7.1.2 ANTENNA TYPE SUBCLAUSE 15.204

7.1.3 DISTURBANCE VOLTAGE ON AC MAINS SUBCLAUSE 15.207(A)
RESULT: N/A
Limit Subclause 15.207(a)

7.1.4 CARRIER FREQUENCY SEPERATION SUBCLAUSE 15.247(A)(1)
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)
RESULT: Pass
Limit Subclause 15.247(a)(1)(ii)

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)

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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 and Schematics

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	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	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 CompactFlash adapter which adds Bluetooth functionality to the handheld or laptop PC with CompactFlash adapter or PCMCIA slot.
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 devided 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	:	Surface mount chip antenna	Surface mount chip antenna
Power supply	:	Host supply	Host 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

A PCMCIA card with a CF card slot is accompanying with the sample equipment.
During the test, a laptop computer is used with the PCMCIA card and the EUT.

Laptop Computer: Toshiba Portege 4010
Model number: PP401T-0TEL9
Serial number: 92015403J
Voltage supply: DC 15V

7 Test Results

7.1.1 Antenna connector — Subclause 15.203

The EUT has no antenna connector.

7.1.2 Antenna type — Subclause 15.204

The EUT has a surface mount chip antenna soldered to the circuit board. The antenna gain is 1.65 dBi.

7.1.3 Disturbance voltage on AC mains Subclause 15.207(a)

RESULT: **N/A**

Test Specification : CISPR 22: 1997
Mode of operation : Normal operating mode (hopping on)
Port of testing : AC power port of charger of the notebook computer
Supply voltage : AC 110V
Temperature : 21°C
Humidity : 51%

For Live measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dBµV	dBµV	dBµV	dBµV
0.192	50.3	66 – 56*	38.2	56 – 46*

For Neutral measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dBµV	dBµV	dBµV	dBµV
0.258	48.4	66 – 56*	39.0	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 please refer to Appendix 1 page 40-44

Limit **ubclause 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 seperation Subclause 15.247(a)(1)

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (hopping on), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	100kHz/300kHz
Supply voltage	:	DC 3,3V
Temperature	:	22°C
Humidity	:	62%

The centre frequencies of the hopping channels are separated by 1MHz.
For test results refer to Appendix 1, page 2

Limit **Subclause 15.247(a)(1)**

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

7.1.5 Dwell time Subclause 15.247(a)(1)(iii)

RESULT: **Pass**

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (2441MHz), DH5 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	1MHz/3MHz
Supply voltage	:	DC 3,3V
Temperature	:	22°C
Humidity	:	62%

The screenshot in Appendix1 P.5 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 51 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:

$$51 \times 2.904 \times 10^{-3} = 148.104 \times 10^{-3}\text{s}$$
$$\leq 400 \times 10^{-3}\text{s}$$

For test results please refer to Appendix 1, page 3 – 5.

Limit **Subclause15.247(a)(1)(iii)**

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlopping 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 chasnnels employed.

7.1.6 20dB bandwidth Subclause 15.247(a)(1)

RESULT: **Pass**

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (2402MHz, 2441MHz, 2480MHz), DH5 packet
Port of testing	:	Temporary antenna port
Detector	:	Peak
RBW/VBW	:	30kHz/100kHz
Supply voltage	:	DC 3,3V
Temperature	:	22°C
Humidity	:	62%

20dB bandwidth (MHz)		
2402	2441	2480
(0.564)-(-0.292) = 0.856	(0.564)-(-0.288) = 0.852	(0.568)-(-0.292) = 0.860

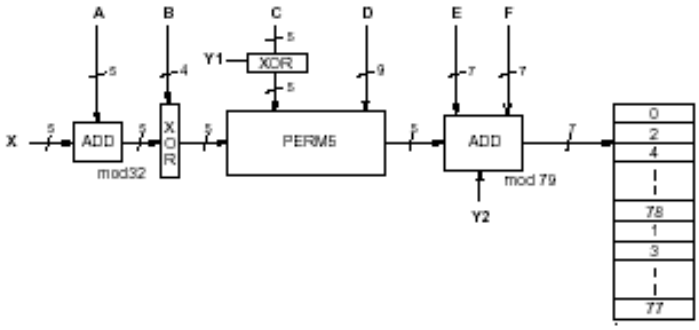
For test results refer to Appendix 1, page 6 – 9.

Limit **Subclause15.247(a)(1)(ii)**

The maximum 20dB bandwidth of the hopping channel is 1MHz.

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), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	1MHz/3MHz
Supply voltage	:	DC 3,3V
Temperature	:	22°C
Humidity	:	62%

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Corrected value (dBm)
2402	14.60	1.30	15.90
2441	14.70	1.30	16.00
2480	14.32	1.30	15.62

All three transmit frequency modes comply with the maximum peak output power limit.
For test results refer to Appendix 1, page 10 - 13

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), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	300kHz/1.0MHz
Supply voltage	:	DC 3,3V
Temperature	:	22°C
Humidity	:	62%

There is no peak found outside the 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 14 - 17

Limit **Subclause 15.247(c)**

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

7.1.11 Spurious conducted emissions Subclause 15.247(c)

RESULT: **Pass**

Test specification : FCC § 15.31
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
Port of testing : Temporary antenna port
Detector : PK
RBW/VBW : 100kHz/300kHz
Supply voltage : DC 3,3V
Temperature : 22°C
Humidity : 62%

Operating frequency : 2402MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
663.62	-42.55	14.92	-57.47
3202.48	-41.44	14.92	-56.36
7205.54	-45.22	14.92	-60.14
12009.18	-49.01	14.92	-63.93

Operating frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
702.66	-53.00	14.17	-67.17
3254.46	-45.64	14.17	-59.81
7322.54	-36.35	14.17	-50.52
12205.04	-56.84	14.17	-71.01

Operating frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
741.64	-40.52	14.32	-54.84
3306.48	-45.86	14.32	-60.18
7439.54	-40.02	14.32	-54.34

All three transmit frequency modes comply with the 20dB limit stated in subclause 15.247(c).
For test results refer to Appendix 1, page 18 - 39

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 - 1992
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet
Port of testing : Enclosure
Measurement Location: 10m Semi Anechoic Chamber
Measurement Distance: 3m
Measurement BW : 1 MHz
Supply voltage : DC 3,3V
Temperature : 23°C
Humidity : 65%

Tx frequency 2402MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
4803.66	61.84	32.40	3.34	33.18	0.36	64.76	54/A
4804.30	62.78	32.40	3.34	33.18	0.36	65.70	74/P

Tx frequency 2402MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
-	-	-	-	-	-	-	-

Tx frequency 2441MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
1200.60	60.20	24.40	1.52	37.10	1.87	50.89	54/A
4881.76	58.54	32.40	3.34	33.18	0.36	61.46	54/A
4882.26	63.79	32.40	3.34	33.18	0.36	66.71	74/P

Tx frequency 2441MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
-	-	-	-	-	-	-	-

Tx frequency 2480MHz, Polarization Vertical

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
4959.62	53.86	32.40	3.34	33.18	0.36	56.78	54/A
4960.34	55.25	32.40	3.34	33.18	0.36	58.17	74/P

Tx frequency 2480MHz, Polarization Horizontal

Freq	Reading	AF	Cable att.	Pre –amp	Filter att.	Level	Limit/ Detector
GHz	dBuV	dB(1/m)	dB	dB	dB	dBuV/m	dBuV/m
-	-	-	-	-	-	-	-

All three transmit frequency modes comply with the field strength within the restricted bands.

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:

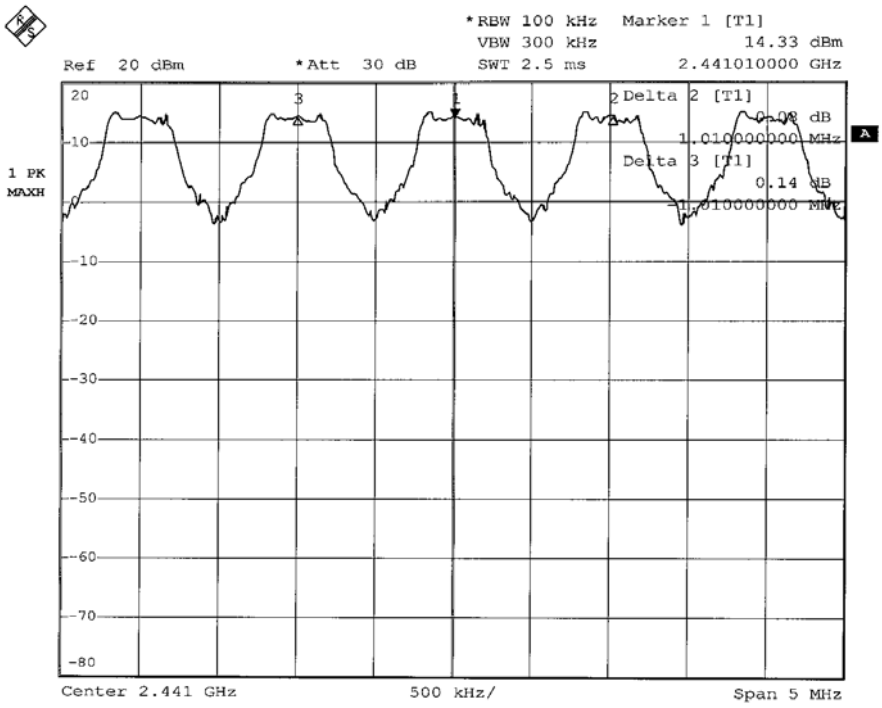
Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	20*log(100) = 40.0	3
88-216	150	20*log(150) = 43.5	3
216-960	200	20*log(200) = 46.0	3
960-2500	500	20*log(500) = 54.0	3

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.

Carrier Frequency Seperation

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22°C
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: Hopping on

Reference frequency (MHz)	Channel Separation (MHz)	Results
2441.000	1.010	Passed



Date: 14.MAR.2003 14:44:44

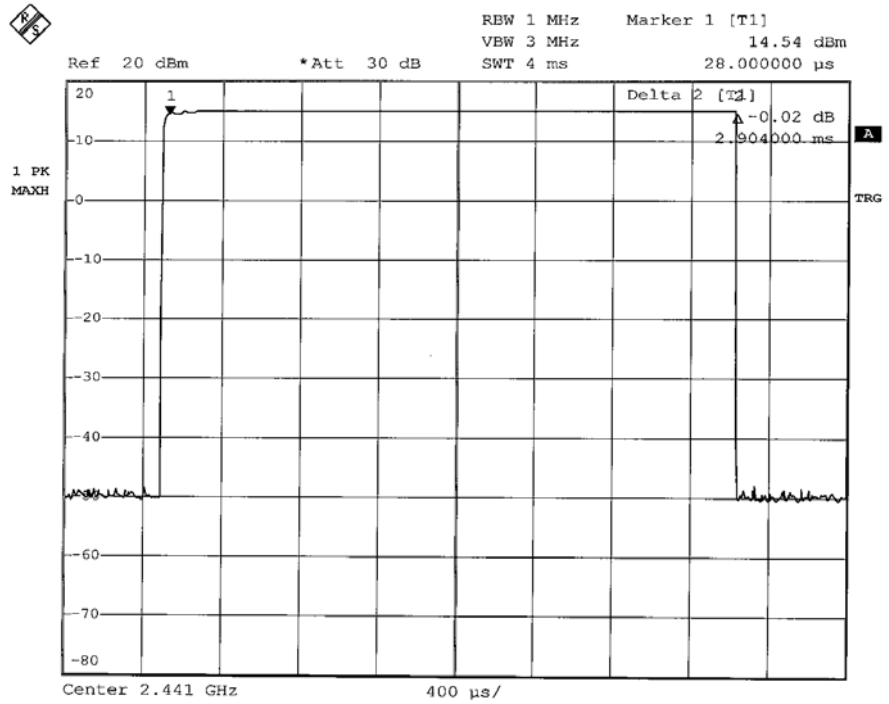
CF Class I
Hopping on

Fcc

Dwell Time

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22ºC
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: Hopping on

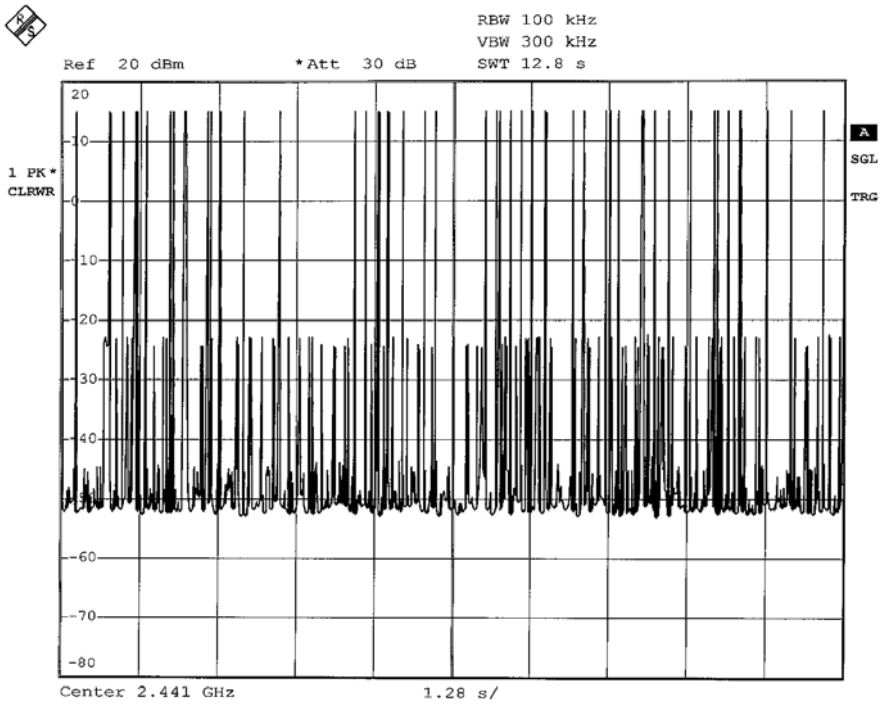
Burst Duration (ms)	Number of hopping	Time of occupancy (s)	Results
2.904	51	0.002904 x 51 = 0.1481	Passed



Date: 14.MAR.2003 15:13:38

CF. Class I
Hopping on

FCC



Date: 14.MAR.2003 15:26:10

CF Class I
Hopping on

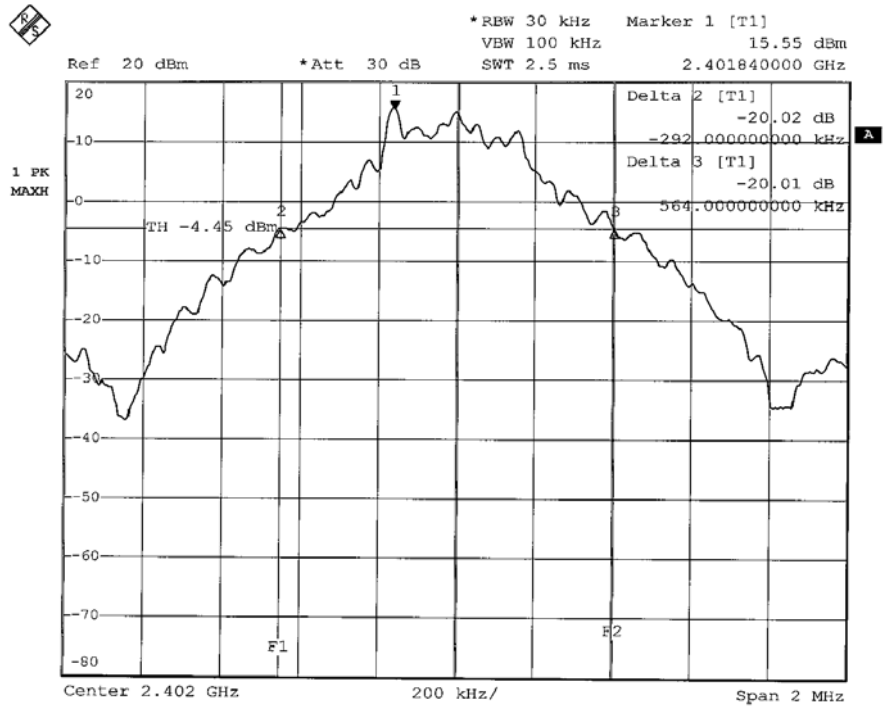
51 burst

FCC

20dB Bandwidth

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22°C
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: TX mode, DH5 with PRBS9 payload

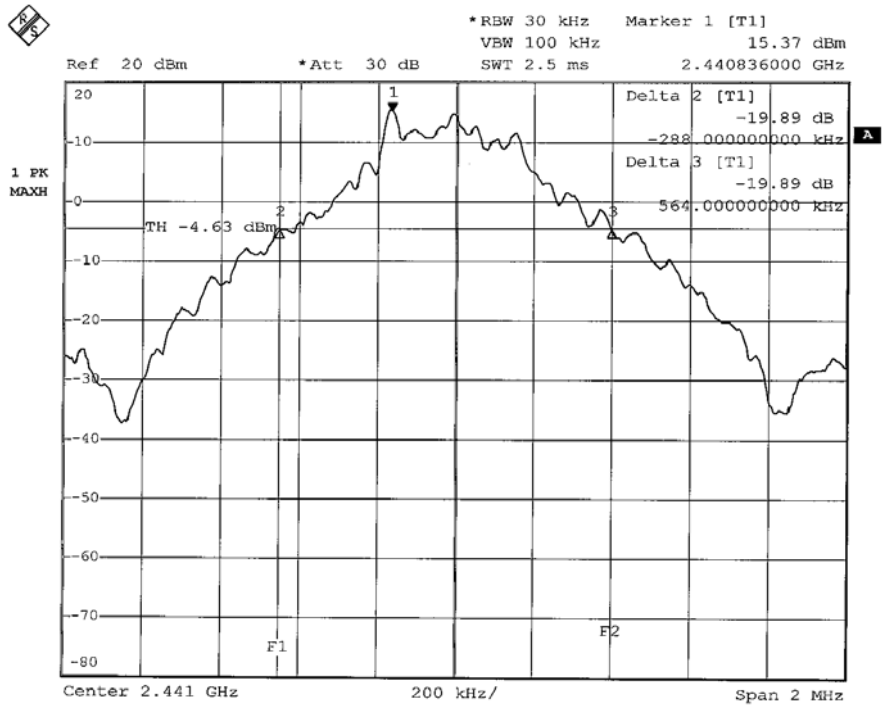
Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$\lvert\Delta f_H\rvert+\lvert\Delta f_L\rvert$ (MHz)	Results
2402	-0.292	0.564	0.856	Passed
2441	-0.288	0.564	0.852	Passed
2480	-0.292	0.568	0.860	Passed



Date: 14.MAR.2003 15:29:59

CF Class I
2402 MHz

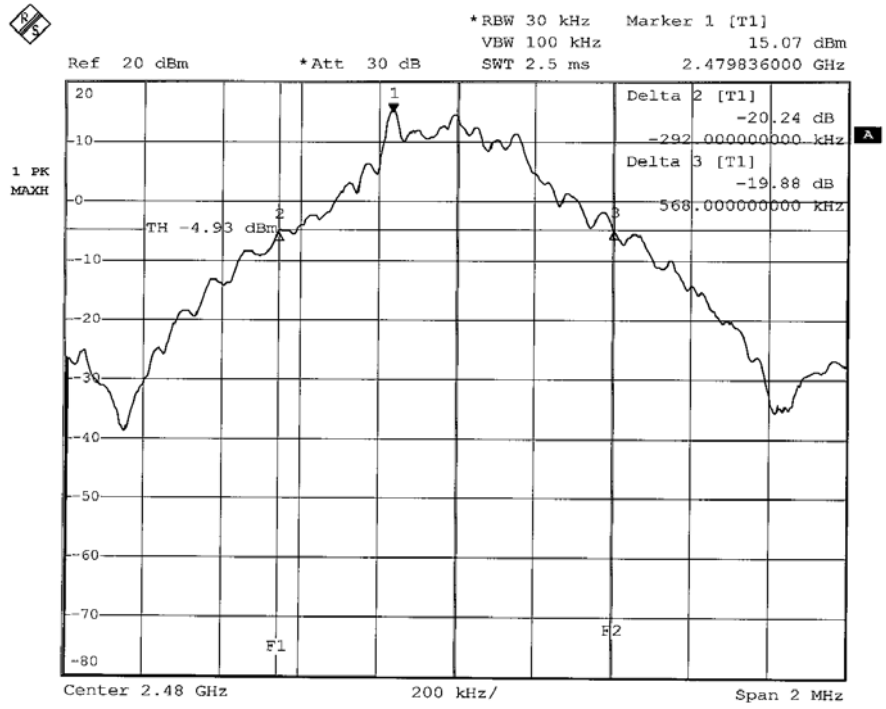
FCC



Date: 14.MAR.2003 15:31:55

CF Class 1
2441 MHz

FCC



Date: 14.MAR.2003 15:34:34

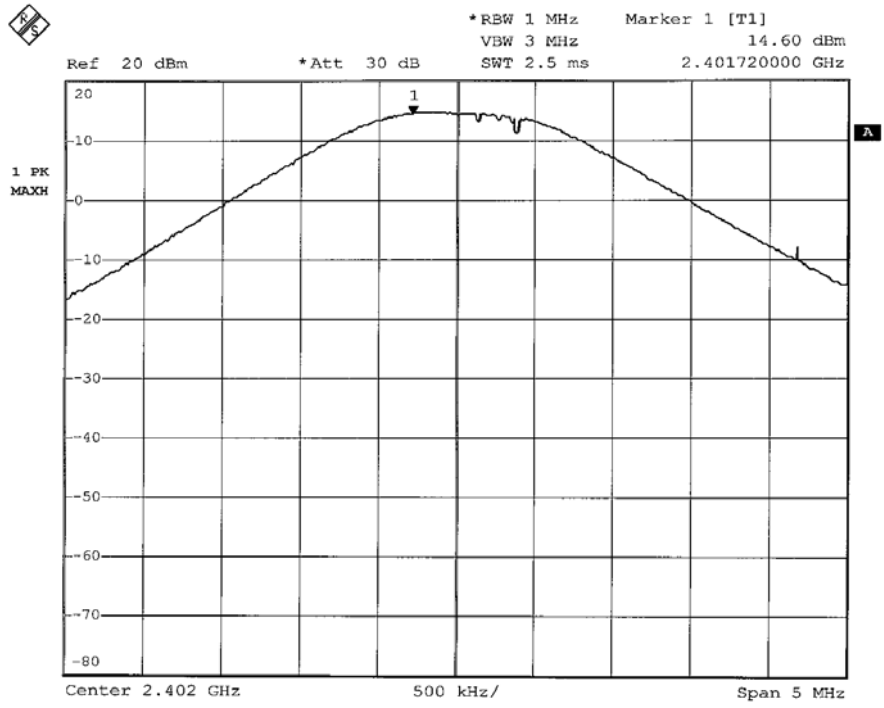
CF Class 1
2480 MHz

FCC

Peak Output Power

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22°C
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

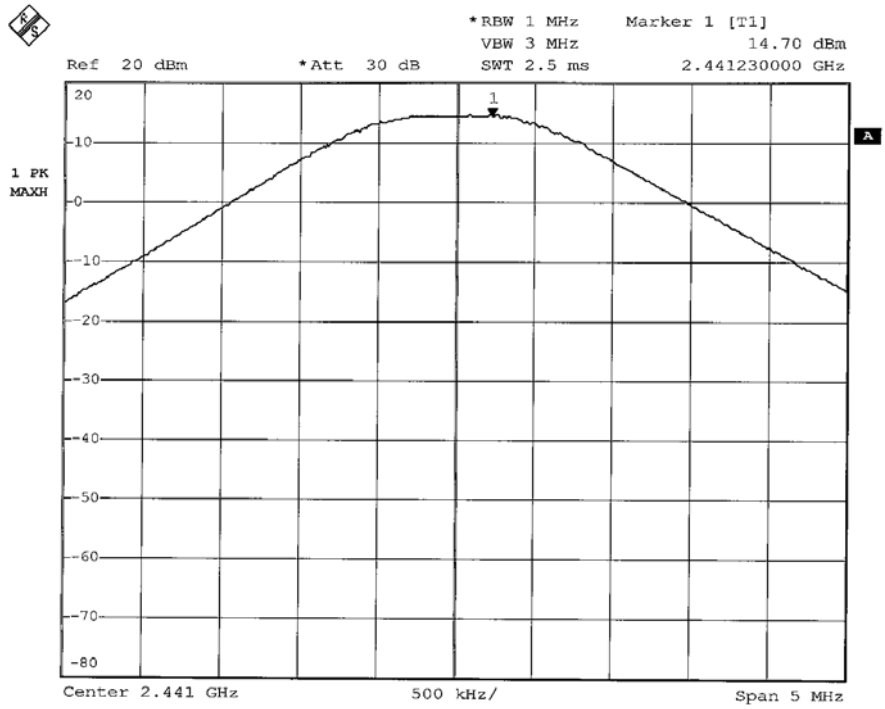
Tx Frequency (MHz)	Cable Attenuation (dB)	Power P_{PK} (dBm)	Actual Peak Power (dBm)	Results
2402	1.30	14.60	15.90	Passed
2441	1.30	14.70	16.00	Passed
2480	1.30	14.32	15.62	Passed



Date: 14.MAR.2003 15:40:39

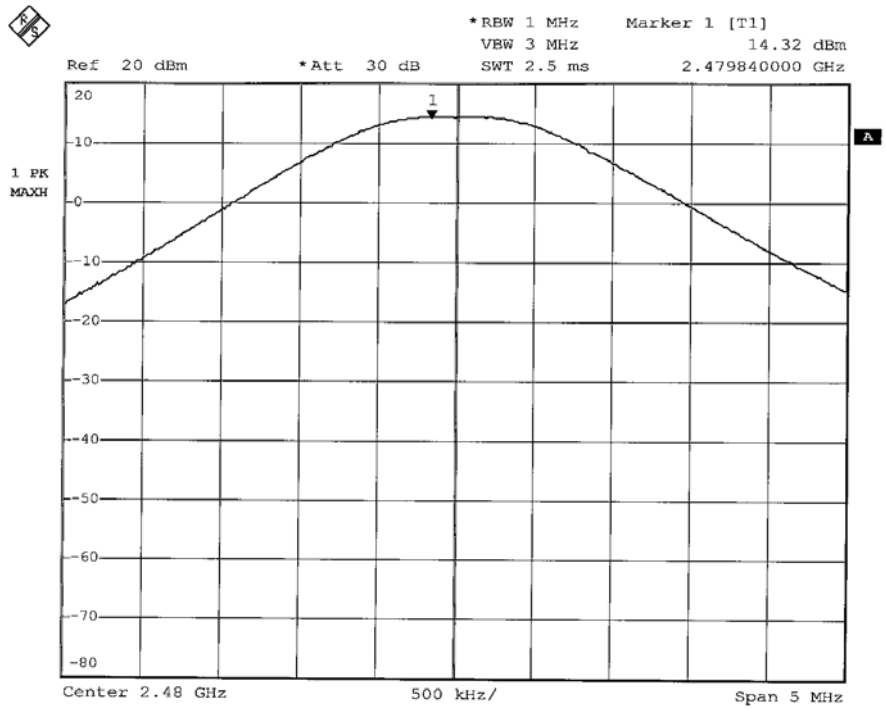
CF Class I
2402 MHz

FCC



CF Class 1
2441 MHz

FCC



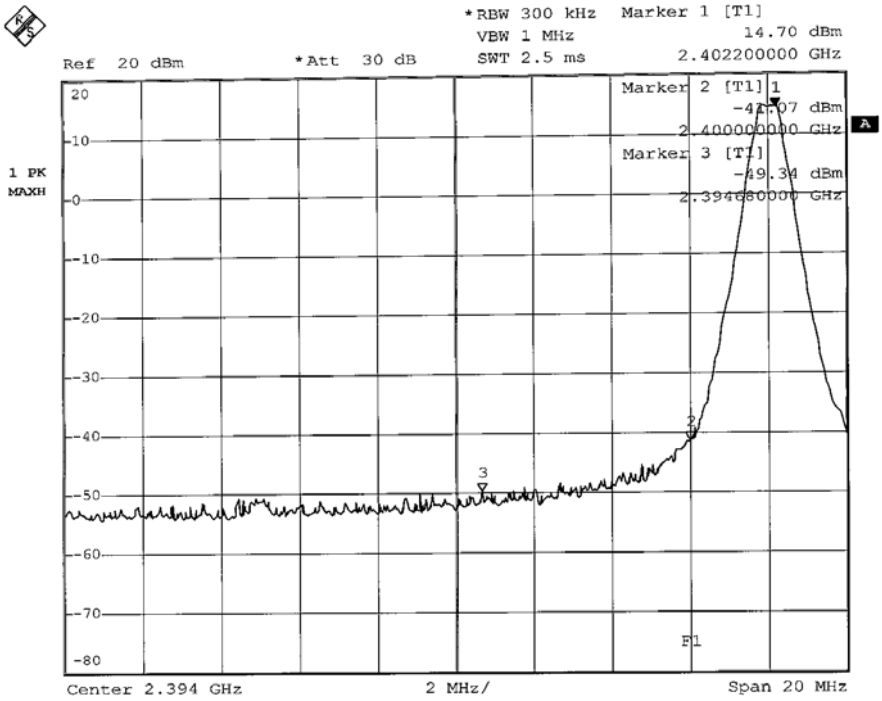
CF Class 1
2480 MHz

FCC

Band Edge Compliance

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22°C
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

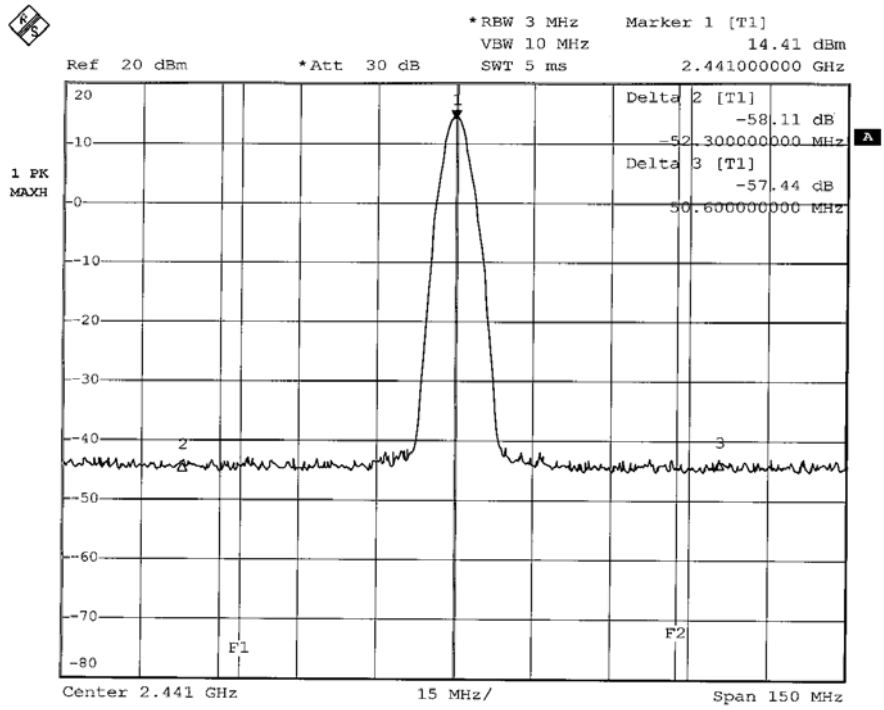
Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	14.70	No Peak	-	Passed
2480	14.29	No Peak	-	Passed



Date: 14.MAR.2003 15:54:47

CF Class 1
2402 MHz

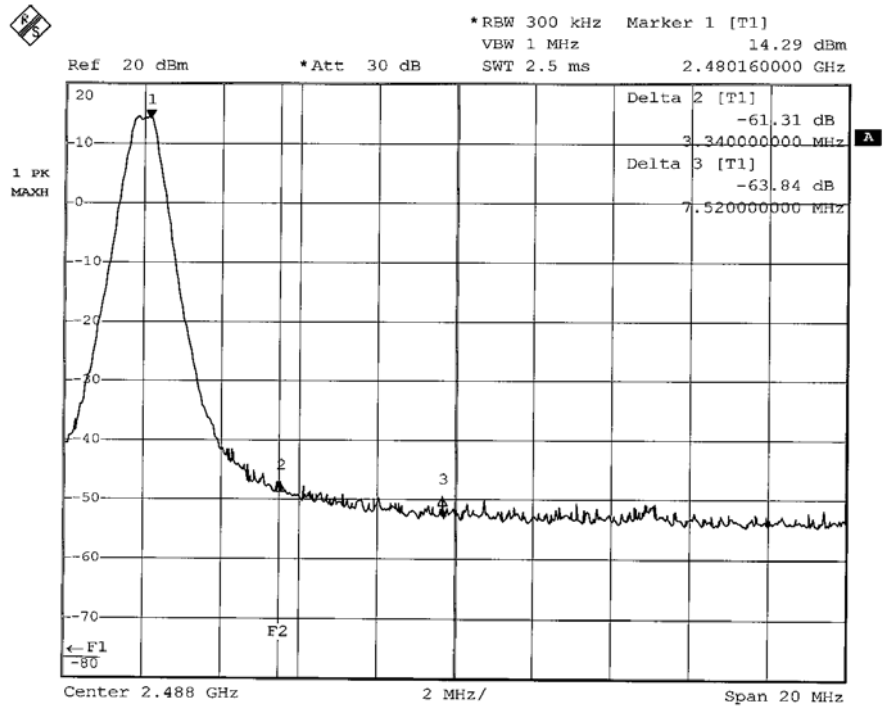
Fcc



Date: 14.MAR.2003 15:56:33

CF Class I
2441MHz

FCC



Date: 14.MAR.2003 15:58:29

CF Class I
2480 MHz

FCC

Spurious Emissions - Conducted

Date: 14 Mar 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 62%
Temperature: 22°C
Voltage supply: 3.3V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

Tx frequency : 2402MHz

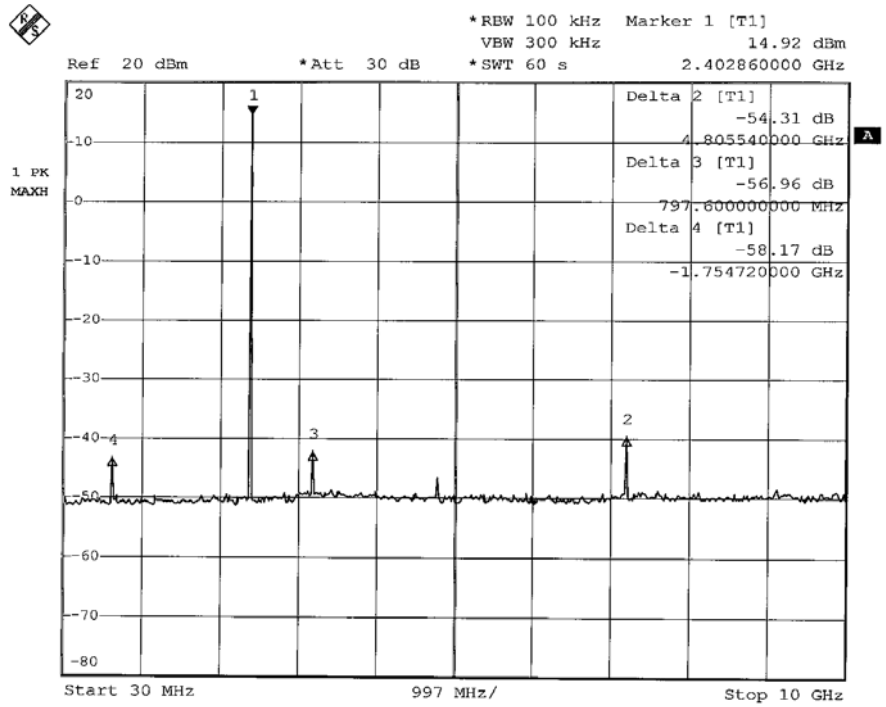
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
663.62	-42.55	14.92	-57.47	Passed
3202.48	-41.44	14.92	-56.36	Passed
7205.54	-45.22	14.92	-60.14	Passed
12009.18	-49.01	14.92	-63.93	Passed

Tx frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
702.64	-26.16	14.17	-40.33	Passed
3254.46	-45.64	14.17	-59.81	Passed
7322.54	-36.35	14.17	-50.52	Passed
12205.04	-56.84	14.17	-71.01	Passed

Tx frequency : 2480MHz

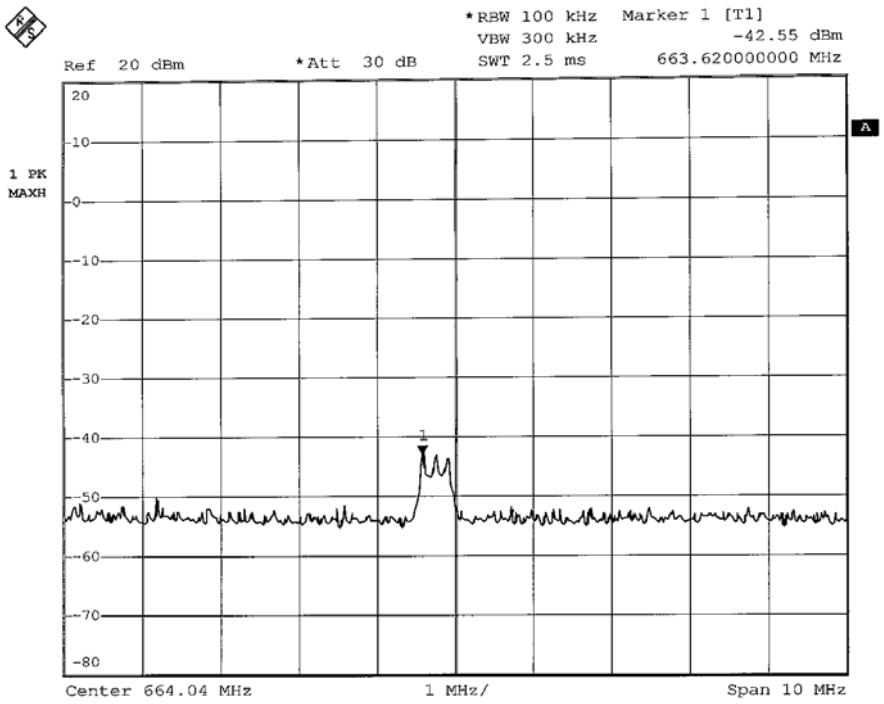
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
741.64	-40.52	14.32	-54.84	Passed
3306.48	-45.86	14.32	-60.18	Passed
7439.54	-40.02	14.32	-54.34	Passed



Date: 14.MAR.2003 16:32:47

CF Class I
2402 MHz

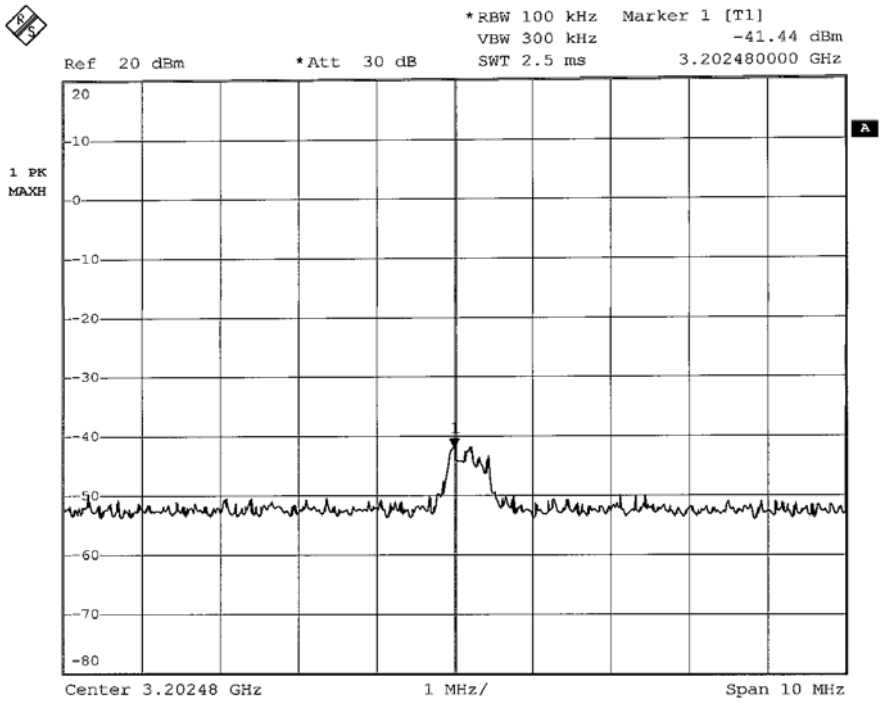
FCC



Date: 14.MAR.2003 16:43:56

CF Class I
2402 MHz

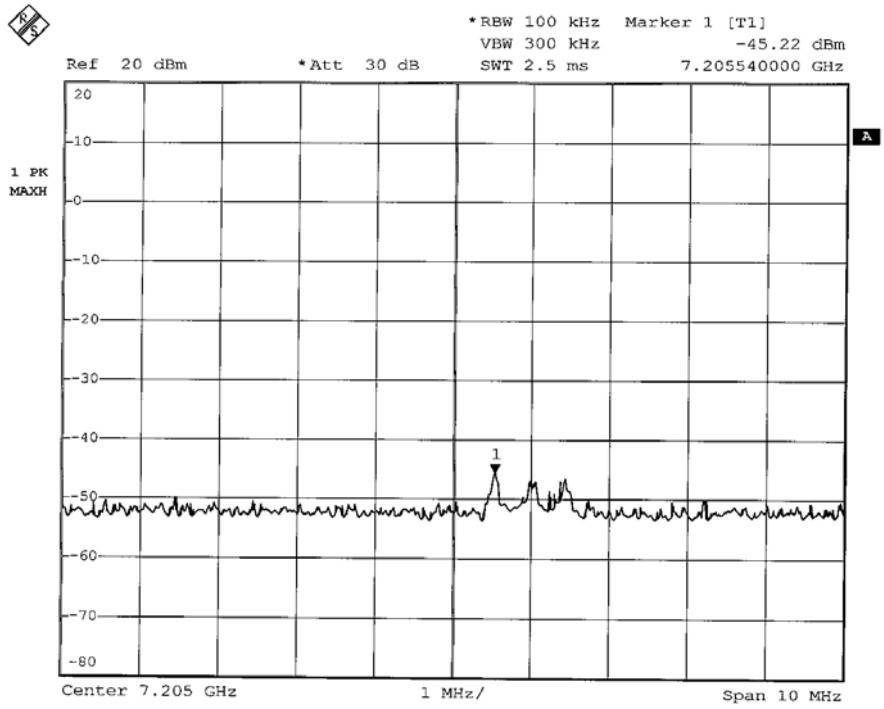
FCC



Date: 14.MAR.2003 16:48:39

CF Class I
2402MHz

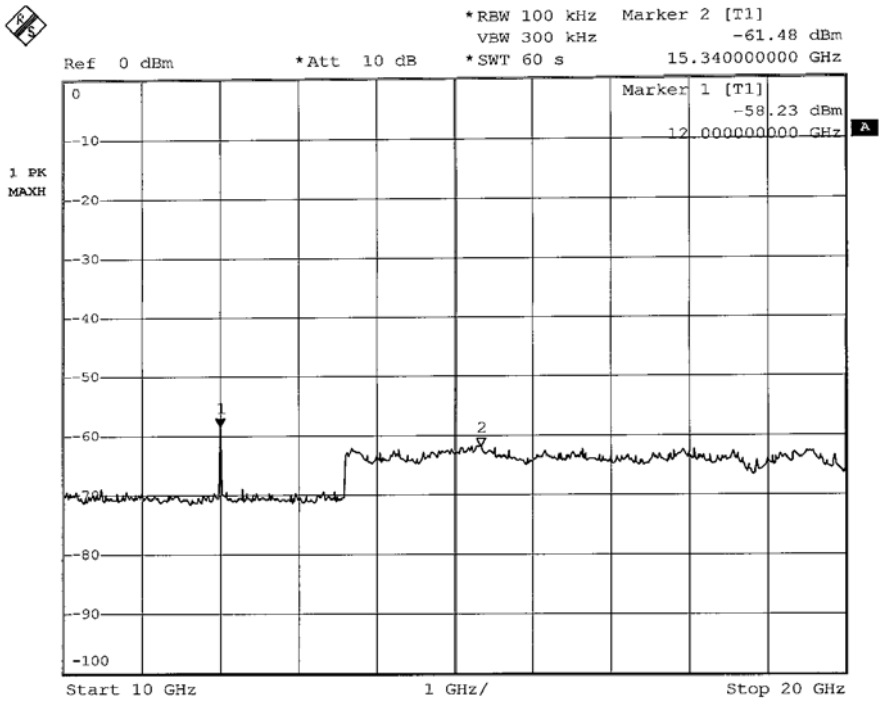
FCC



Date: 14.MAR.2003 16:47:59

CF Class I
2402MHz

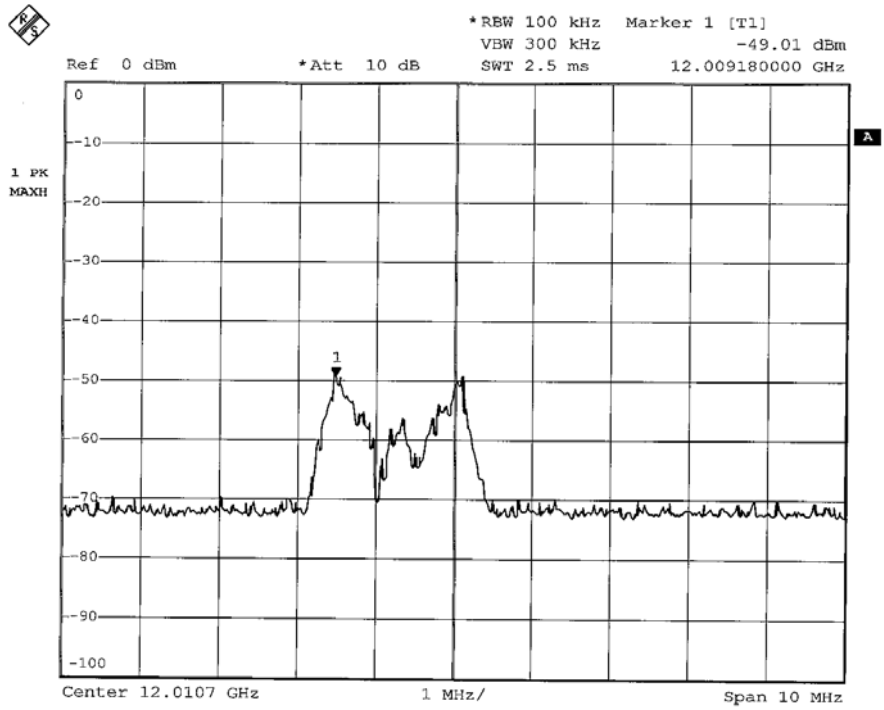
FCC



Date: 14.MAR.2003 16:37:53

CF Class 1
2402MHz

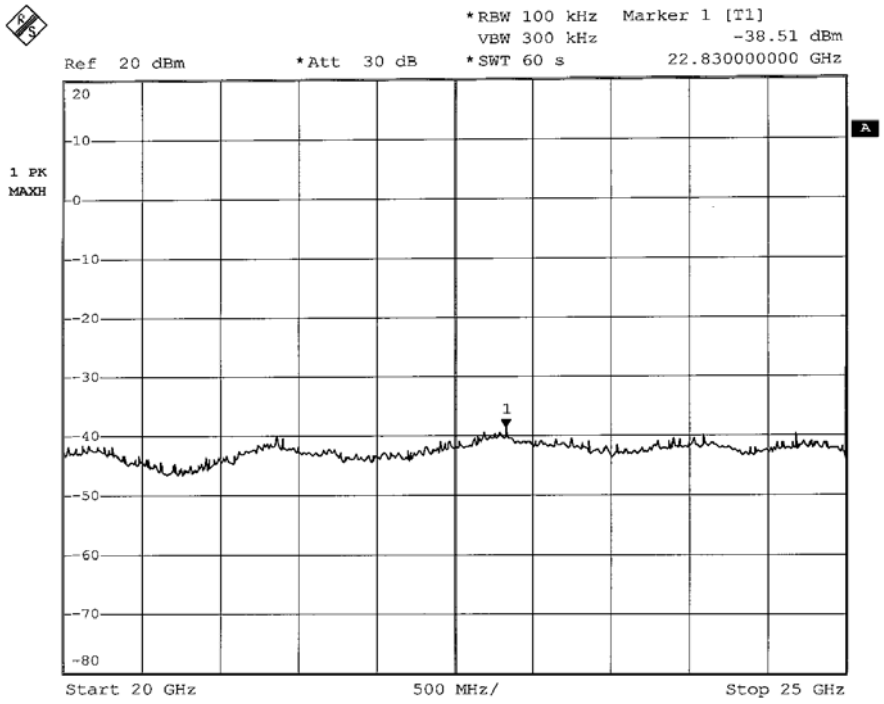
FCC



Date: 14.MAR.2003 16:39:38

CF Class I
2402MHz

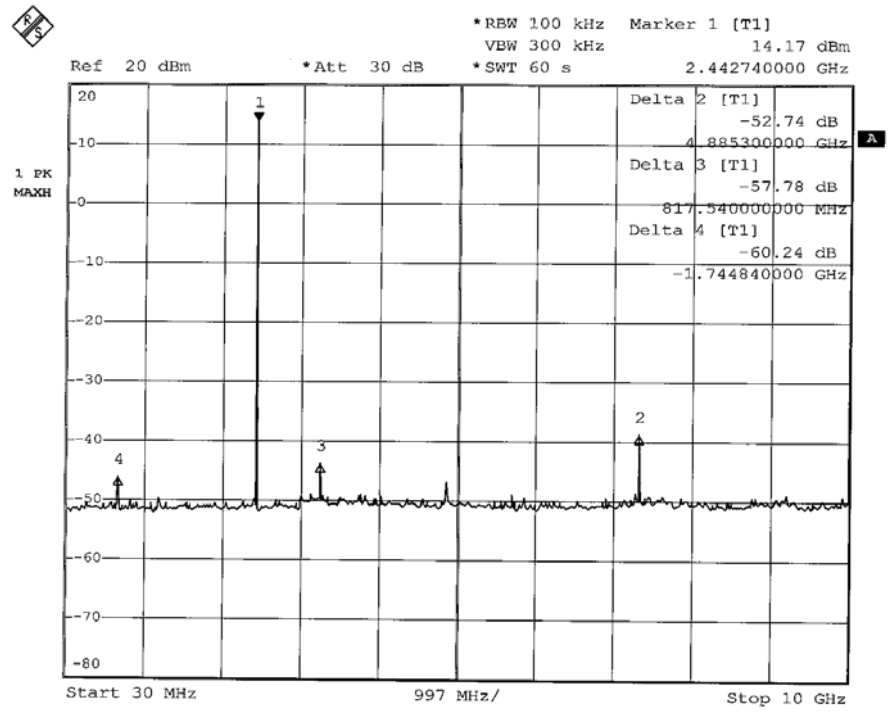
FCC



Date: 14.MAR.2003 16:51:20

CF Class I
2402 MHz

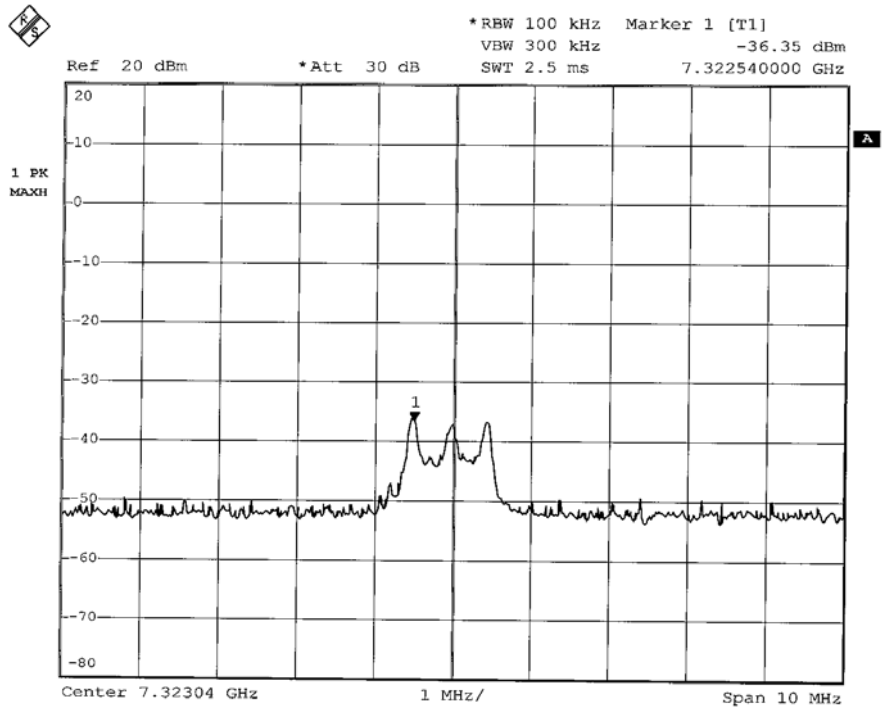
FCC



Date: 14.MAR.2003 16:56:39

CF Class 1
2441 MHz

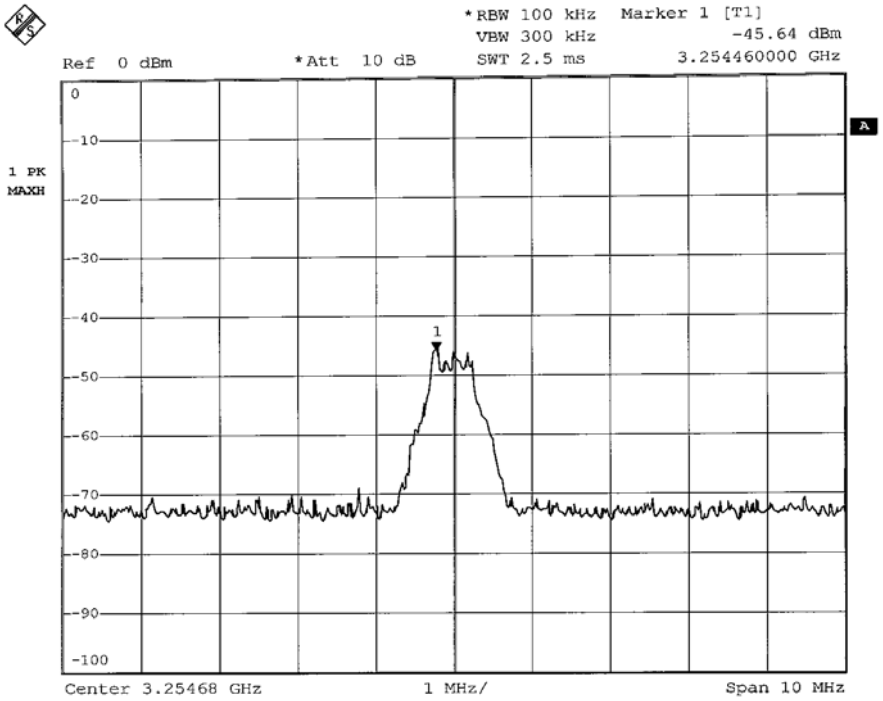
FCC



Date: 14.MAR.2003 16:58:10

CF Class I
2441MHz

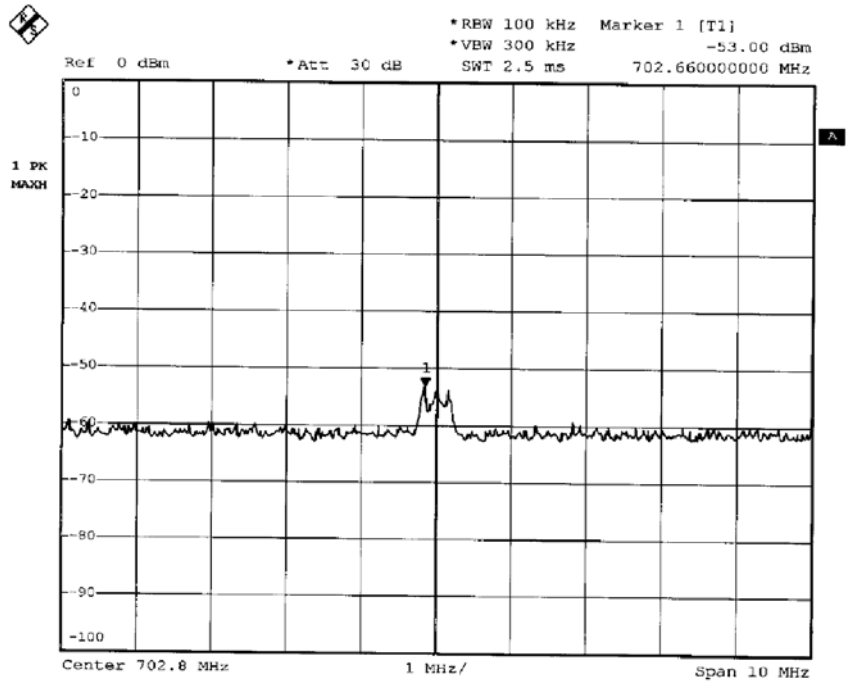
FCC



Date: 14.MAR.2003 16:59:01

CF Class 1
2441 MHz

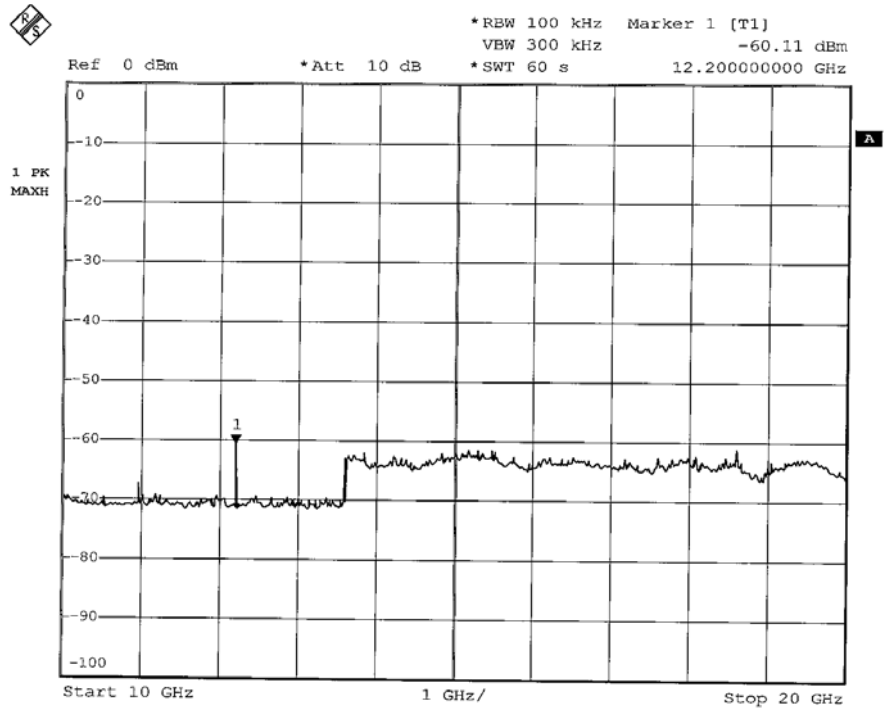
FCC



Date: 9.APR.2003 17:33:19

CF Class I
2441 MHz

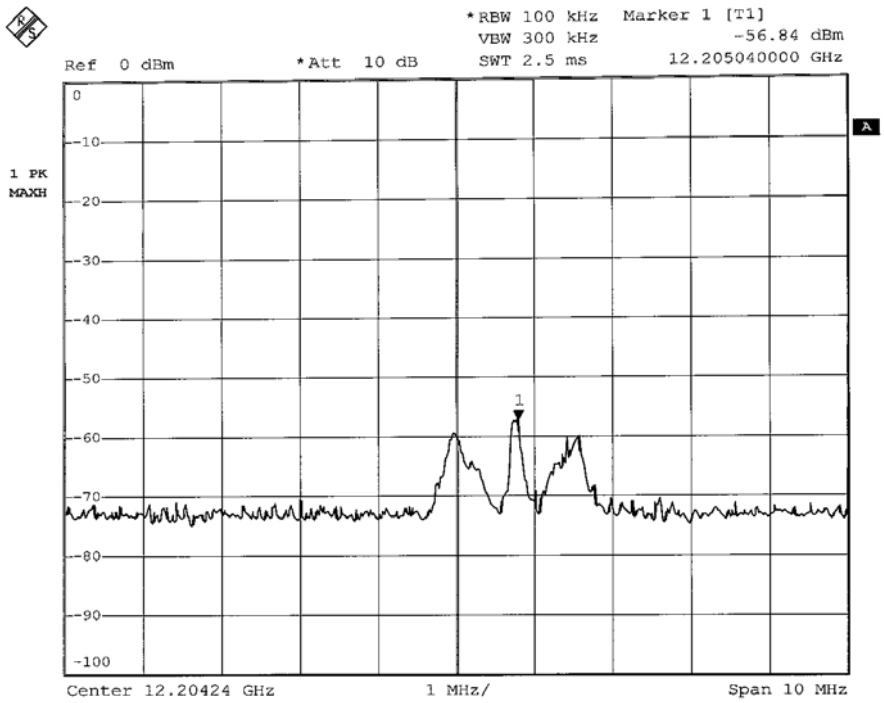
FCC



Date: 14.MAR.2003 17:07:52

CF Class I
2441 MHz

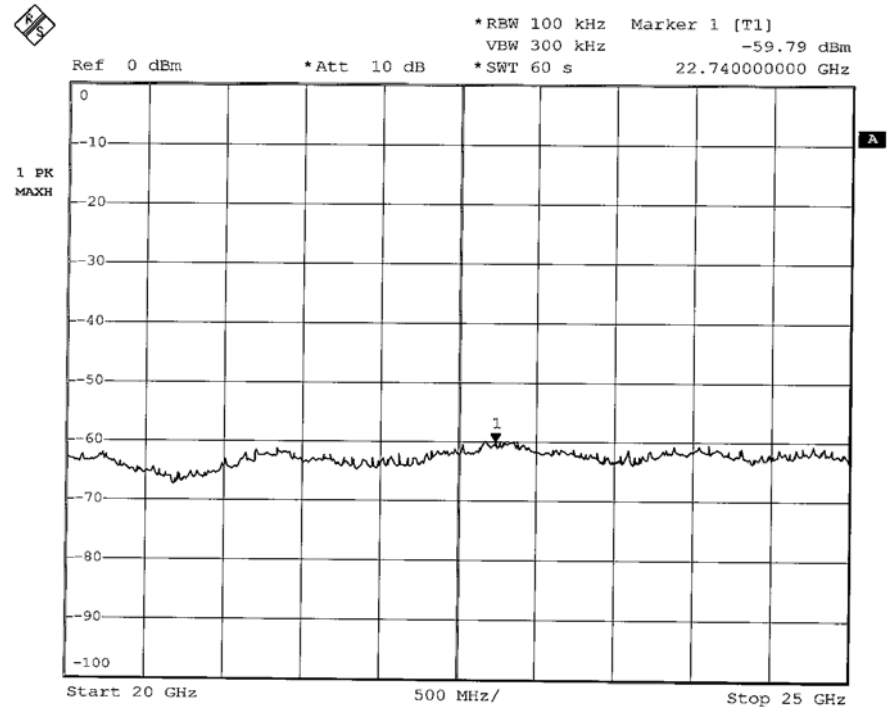
FCC



Date: 14.MAR.2003 17:08:25

CR Class 1
2441 MHz

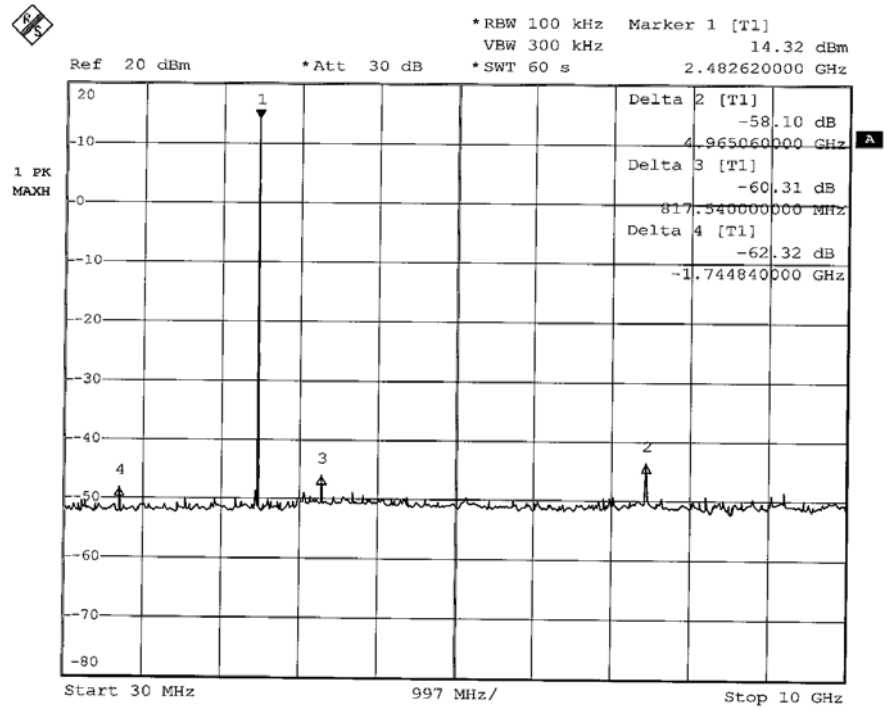
FCC



Date: 14.MAR.2003 17:10:40

CF Class I
2441 MHz

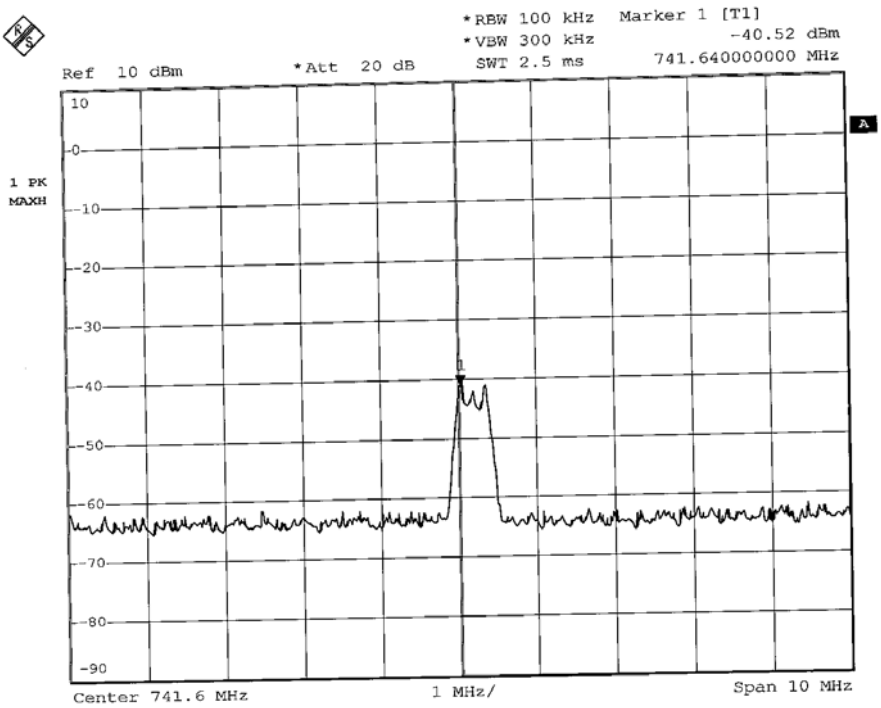
FCC



Date: 17.MAR.2003 15:32:49

CF Class I
2480MHz

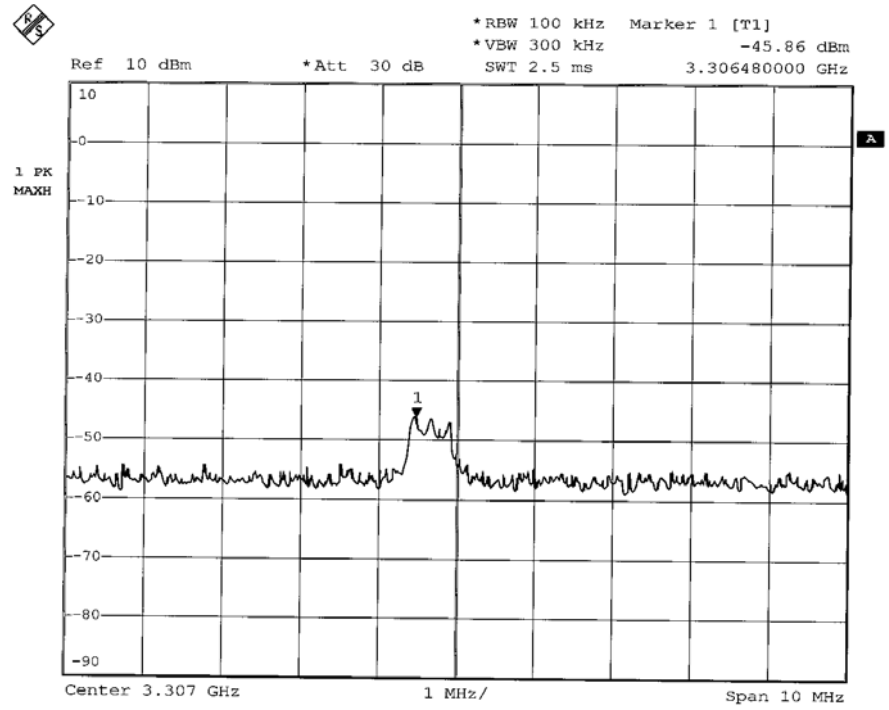
FCC



Date: 17.MAR.2003 15:35:57

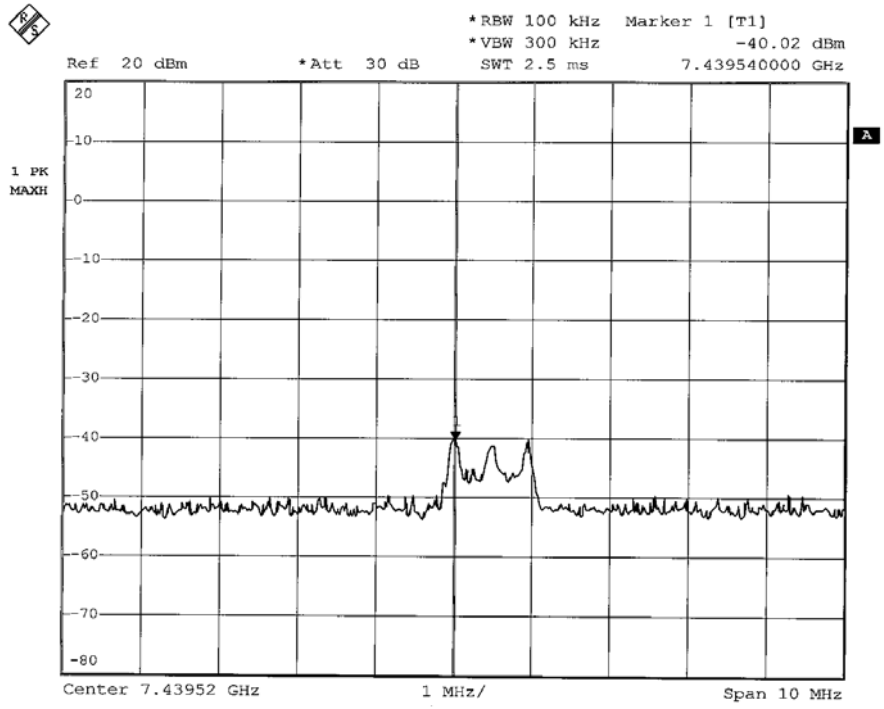
CF Class I
2480 MHz

FCC



CF Class 1
24f0MHz

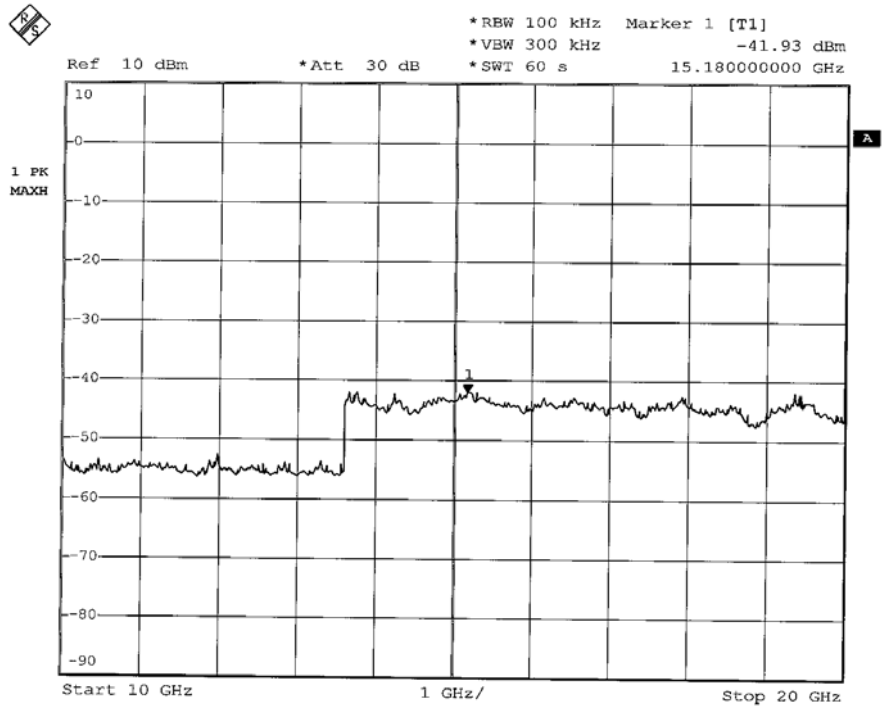
FCC



Date: 17.MAR.2003 15:34:57

CF Class 1
2480 MHz

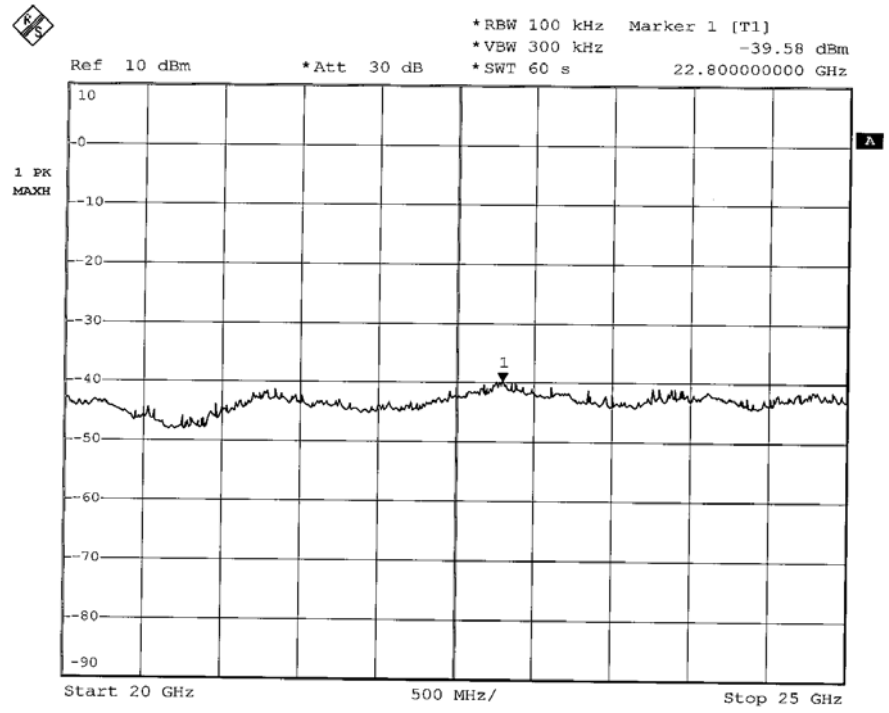
FCC



Date: 17.MAR.2003 15:39:06

CF Class I
2480 MHz

FCC



Date: 17.MAR.2003 15:40:17

CF Class I
2480 MHz

FCC

Disturbance Voltage on AC Mains

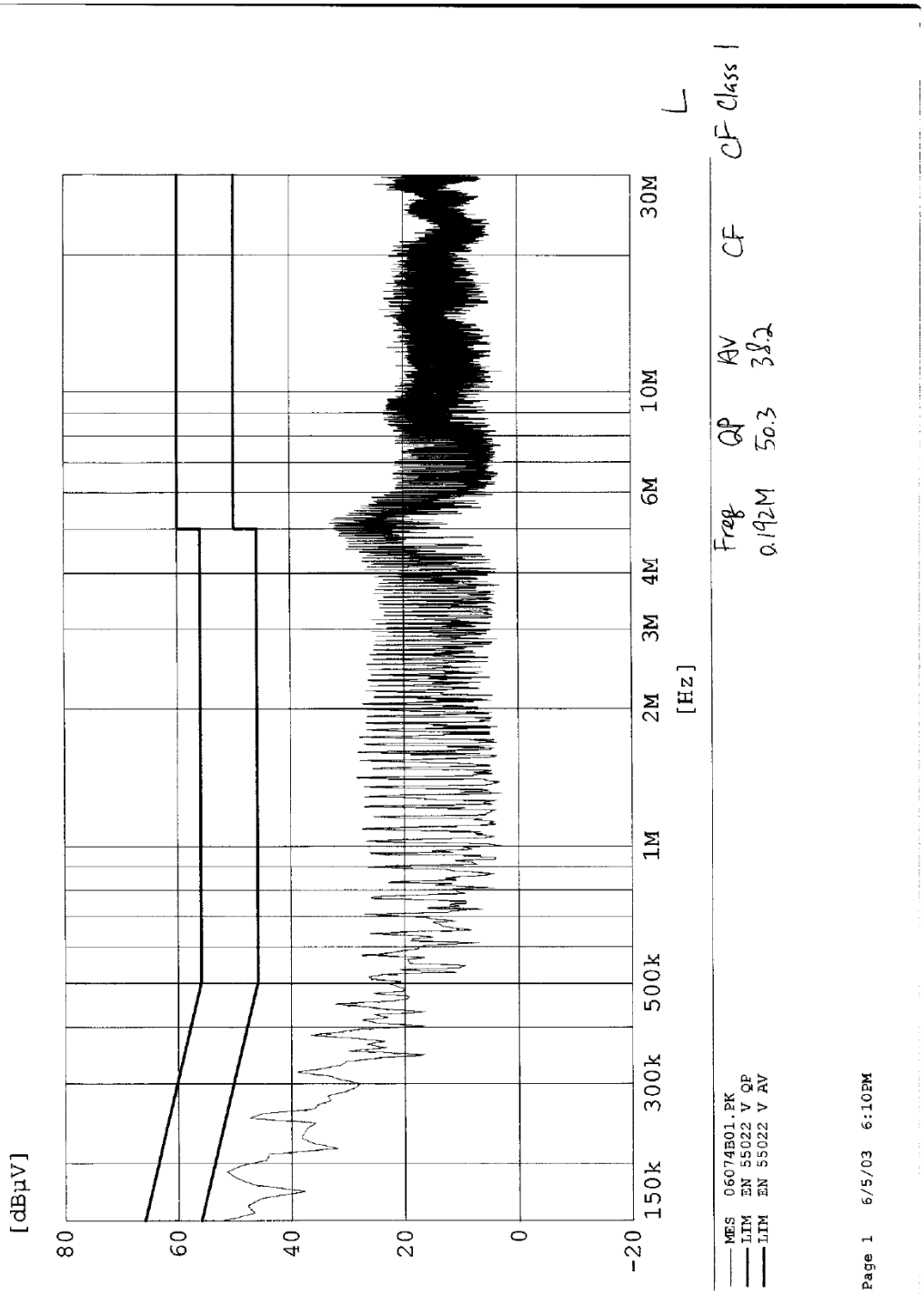
Date: 5 Jun 03
EUT: Bluetooth CF card (Class 1)
Company: Gigawavetech Pte Ltd.
Humidity: 51%
Temperature: 21°C
Voltage supply: 110V
Test by: Hugo Wan
Initial conditions: Normal operation using file transfer application

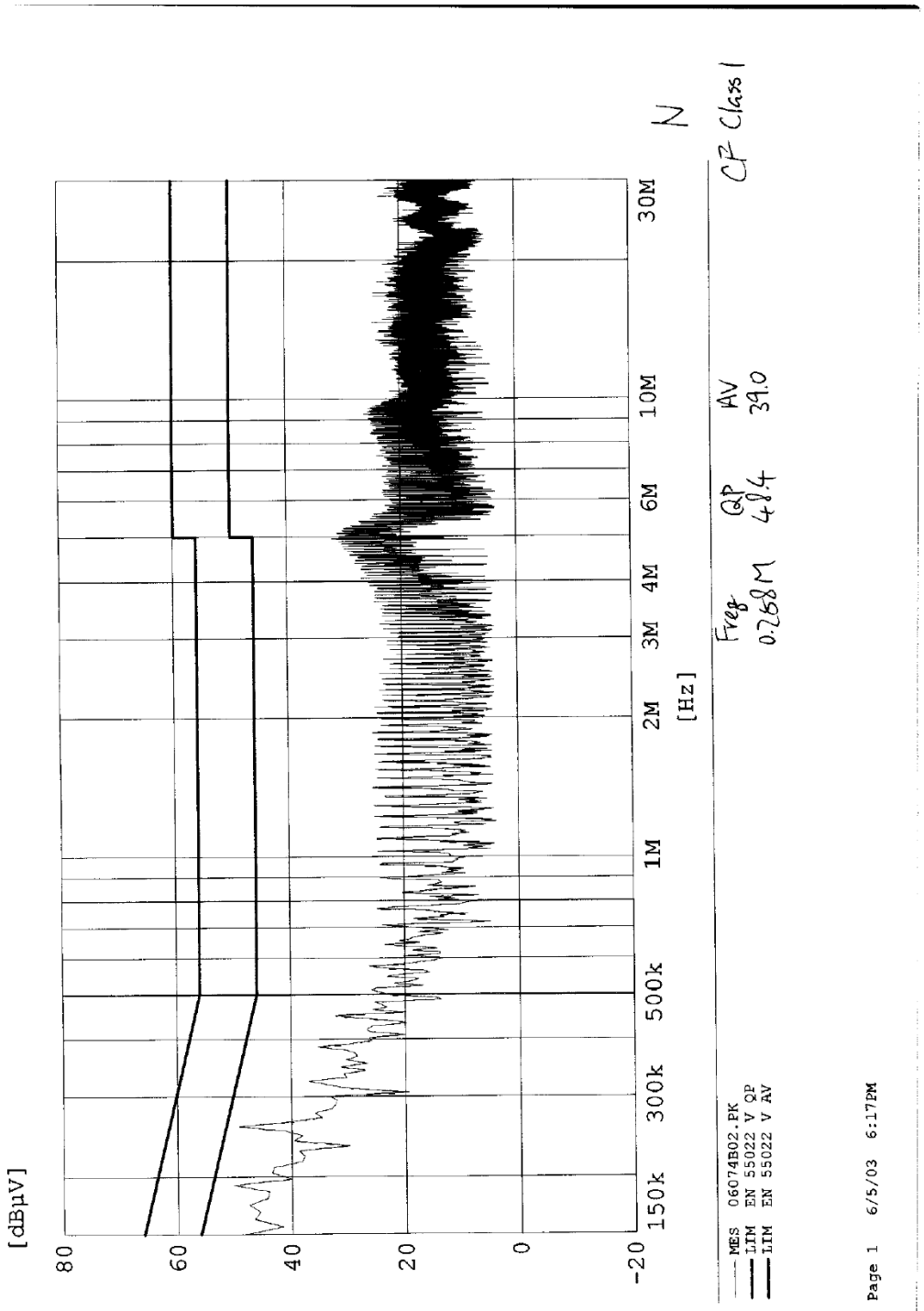
Live measurement

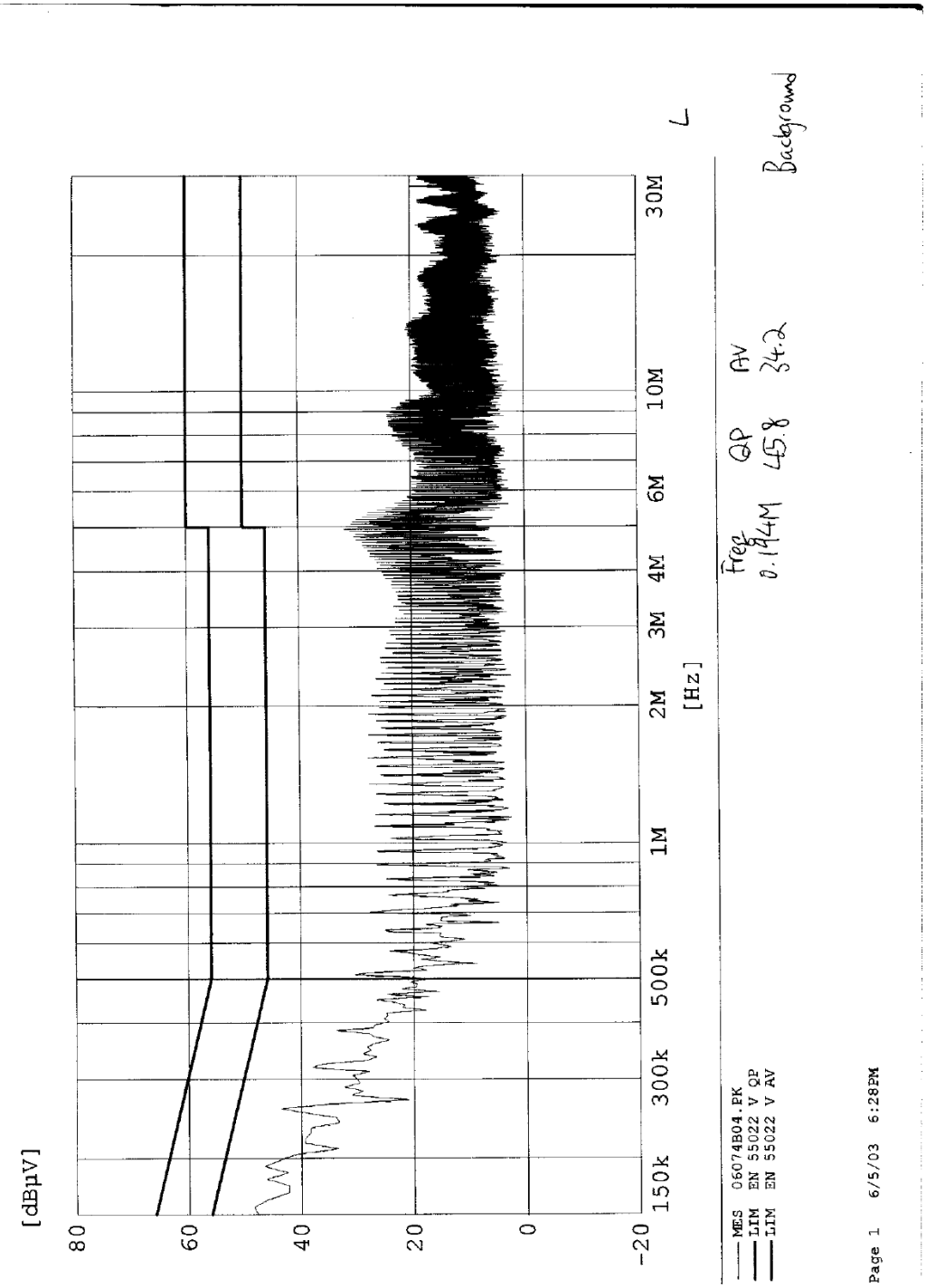
Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.192	50.3	38.2	Passed

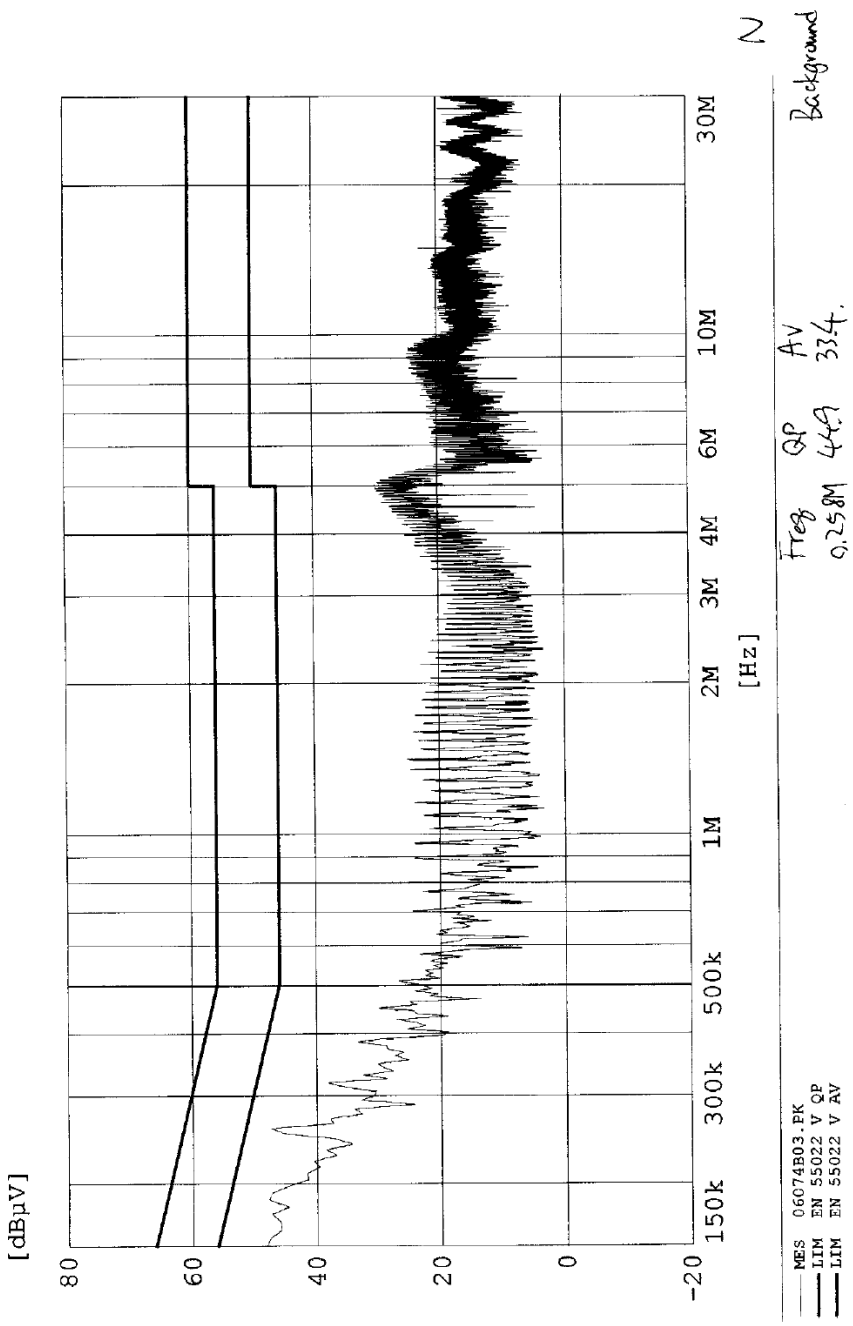
Neutral measurement

Frequency (MHz)	QP reading (dBµV)	Av reading (dBµV)	Results
0.258	48.4	39.0	Passed


[dBµV]
80
60
40
20
0
-20
150k
300k
500k
1M
2M
3M
4M
6M
10M
30M
[Hz]
MES 06074B01.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 6/5/03 6:10PM
Freq QP AV CF
0.192M 50.3 38.2
CF Class I
L


[dBµV]
80
60
40
20
0
-20
150k
300k
500k
1M
2M
3M
4M
6M
10M
30M
[Hz]
N
CP Class I
Freq
0.268M
QP
48.4
AV
39.0
MES 06074B02.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 6/5/03 6:17PM


[dBµV]
80
60
40
20
0
-20
150k
300k
500k
1M
2M
3M
4M
6M
10M
30M
[Hz]
L
Background
Freq QP AV
0.194M 45.8 34.2
MES 06074B04.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 6/5/03 6:28PM


[dBµV]
80
60
40
20
0
-20
150k
300k
500k
1M
2M
3M
4M
6M
10M
30M
[Hz]
N
Background
Freq QP AV
0.258M 44.9 33.4
MES 06074B03.PK
LIM EN 55022 V QP
LIM EN 55022 V AV
Page 1 6/5/03 6:23PM