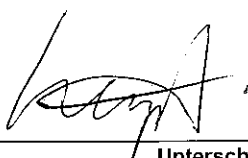
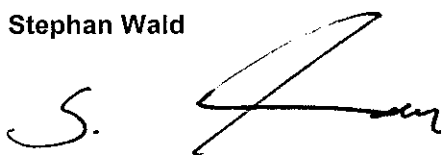


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<i>Test Report No.</i>					
Auftraggeber: <i>Client:</i>		Gigawavetech Pte Ltd. 1 Jalan Kilang Timor #07-02 Pacific Tech Centre Singapore			
Gegenstand der Prüfung: <i>Test item:</i>		Bluetooth Serial Port Dongle			
Bezeichnung: GWT-SPP1 <i>Identification:</i>		Serien-Nr.: <i>Serial No.</i>		Engineering sample	
Wareneingangs-Nr.: 030721050 <i>Receipt No.:</i>		Eingangsdatum: 21.07.2003 <i>Date of receipt:</i>			
Prüfart: <i>Testing location:</i>		Refer to section 4.1			
Prüfgrundlage: <i>Test specification:</i>		FCC Part 15, Subpart C ANSI C63.4-1992 CISPR 22:1997			
Prüfergebnis: <i>Test Result</i>		Der vorstehend beschriebene Prüfgegenstand wurde geprüft und entspricht oben genannter Prüfgrundlage. The a. m. test item passed.			
geprüft / tested by: Hugo Wan		kontrolliert / reviewed by Stephan Wald			
 05.09.2003 Datum Date		 05.09.2003 Datum Date			
Unterschrift Signature		Unterschrift Signature			
Sonstiges / Other Aspects:					
Abkürzungen: OK, Pass = entspricht Prüfgrundlage Fail = entspricht nicht Prüfgrundlage N/A = nicht anwendbar Abbreviations: OK, Pass = passed Fail = failed N/A = not applicable					
Dieser Prüfbericht bezieht sich nur auf den o.g. Prüfgegenstand und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report relates to the a. m. test item. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark on this or similar products. Authorized format 16.12.1996, R.M.					

1 Test Summary

7.1.1 ANTENNA CONNECTOR SUBCLAUSE 15.203

7.1.2 ANTENNA TYPE SUBCLAUSE 15.204

7.1.3 DISTURBANCE VOLTAGE ON AC MAINS SUBCLAUSE 15.207(A)

RESULT: Pass

Limit Subclause 15.207(a)

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

RESULT: Pass

Limit Subclause 15.247(a)(1)

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

RESULT: Pass

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

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

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 Serial Port Dongle which adds Bluetooth wireless connectivity to the serial port of the equipment.

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	: Surface mounted dielectric antenna	Surface mounted dielectric antenna
Power supply	: 4.5V AC/DC adapter	4.5V AC/DC adapter

5.3 Independent Operation Modes

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

During the test, a laptop computer is used to provide a serial port to control the EUT.

Laptop Computer: Sharp ACTIUS Notebook Computer
Model number: PC-A280
Serial number: 90016549
Voltage supply: DC 22V

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 mounted dielectric antenna soldered to the circuit board. The antenna gain is -0.20 dBi.

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7.1.3 Disturbance voltage on AC mains

Subclause 15.207(a)

RESULT:

Pass

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 : 28°C
 Humidity : 55%

For Live measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.195	43.90	66 – 56*	40.40	56 – 46*
0.260	35.90	66 – 56*	31.80	56 – 46*

For Neutral measurement

Frequency	QP reading	QP limit	Av reading	Av limit
MHz	dB μ V	dB μ V	dB μ V	dB μ V
0.195	36.50	66 – 56*	33.20	56 – 46*
0.260	32.90	66 – 56*	28.30	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 μ H/50 ohms line impedance stabilization network (LISN).

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

* Decreases with the logarithm of the frequency.

7.1.4 Carrier frequency separation

Subclause 15.247(a)(1)

RESULT:

Pass

Test specification	:	FCC § 15.31
Mode of operation	:	Tx mode (hopping on), DH1 packet
Port of testing	:	Temporary antenna port
Detector	:	PK
RBW/VBW	:	100kHz/300kHz
Supply voltage	:	4.5V DC
Temperature	:	23°C
Humidity	:	50%

The centre frequencies of the hopping channels are separated by more than 20dB bandwidth.
For test results refer to Appendix 1, page 4-5

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	:	4.5V DC
Temperature	:	23°C
Humidity	:	50%

The screenshot in Appendix1 P.8 shows the occurrence of a channel in a 12.8s time period. In inquiry and page scan mode Bluetooth is using 32 hopping channels only. The frequency was used 31 times. The dwell time for the longest supported packet type is about 3ms. As a result the average time of occupancy will not be greater than 400ms.

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

Limit calculation:
 $31 \times 2.936 \times 10^{-3} = 91.0 \times 10^{-3} s$
 $\leq 400 \times 10^{-3} s$

For test results please refer to Appendix 1, page 6-8.

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 chasnnels employed.

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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 : 4.5V DC
 Temperature : 23°C
 Humidity : 50%

20dB bandwidth (MHz)		
2402	2441	2480
(0.408)-(-0.452)	(0.408)-(-0.456)	(0.460)-(-0.456)
= 0.860	= 0.864	= 0.916

For test results refer to Appendix 1, page 9-12.

Limit

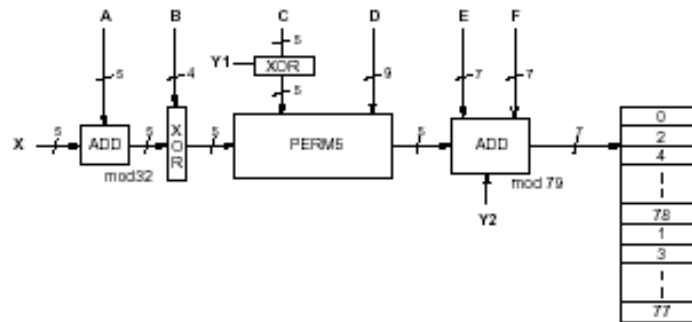
Subclause 15.247(a)(1)(ii)

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	64 25	66 27	68 57	70 59
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.

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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 : 4.5V DC
 Temperature : 23°C
 Humidity : 50%

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Actual value (dBm)
2402	-1.29	4.30	3.01
2441	-1.91	4.15	2.24
2480	-2.87	4.50	1.63

All three transmit frequency modes comply with the maximum peak output power limit.
 For test results refer to Appendix 1, page 13-16

Limit

Subclause 15.247(b)(1)

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

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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	:	4.5V DC
Temperature	:	23°C
Humidity	:	50%

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 17 - 20

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.

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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 : 4.5V DC
 Temperature : 23°C
 Humidity : 50%

Operating frequency : 2402MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
-	-	-	-

Operating frequency : 2441MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
-	-	-	-

Operating frequency : 2480MHz

Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)
-	-	-	-

All three transmit frequency modes comply with the 20dB limit stated in subclause 15.247(c).
 For test results refer to Appendix 1, page 21 - 30

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.

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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 : 4.5V DC

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
4804.200	51.95	33.40	3.53	32.87	0.33	47.56	54/A
4804.200	57.41	33.40	3.53	32.87	0.33	53.02	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
-	-	-	-	-	-	-	-

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
-	-	-	-	-	-	-	-

Tx frequency 2480MHz, Polarization Horizontal

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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 (dB μ V/m)	Measurement distance (meters)
30-88	100	$20 \cdot \log(100) = 40.0$	3
88-216	150	$20 \cdot \log(150) = 43.5$	3
216-960	200	$20 \cdot \log(200) = 46.0$	3
960-2500	500	$20 \cdot \log(500) = 54.0$	3

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



Disturbance Voltage on AC Mains

Date: 4 Sep 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 55%
Temperature: 28°C
Voltage supply: 110V
Test by: Hugo Wan
Initial conditions: Normal operation using file transfer application

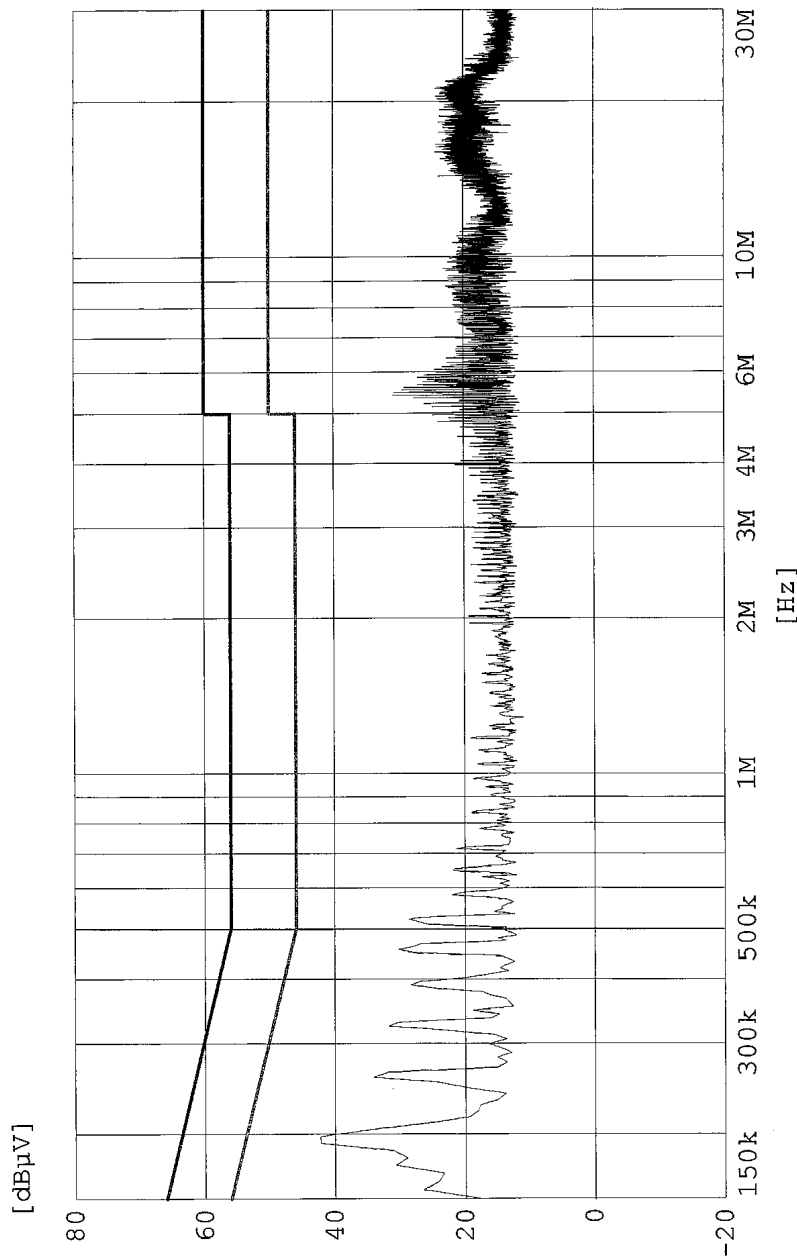
Live measurement		QP reading (dBµV)	Av reading (dBµV)	Results
Frequency (MHz)				
0.195		43.90	40.40	Pass
0.260		35.90	31.80	Pass

Neutral measurement		QP reading (dBµV)	Av reading (dBµV)	Results
Frequency (MHz)				
0.195		36.50	33.20	Pass
0.260		32.90	28.30	Pass

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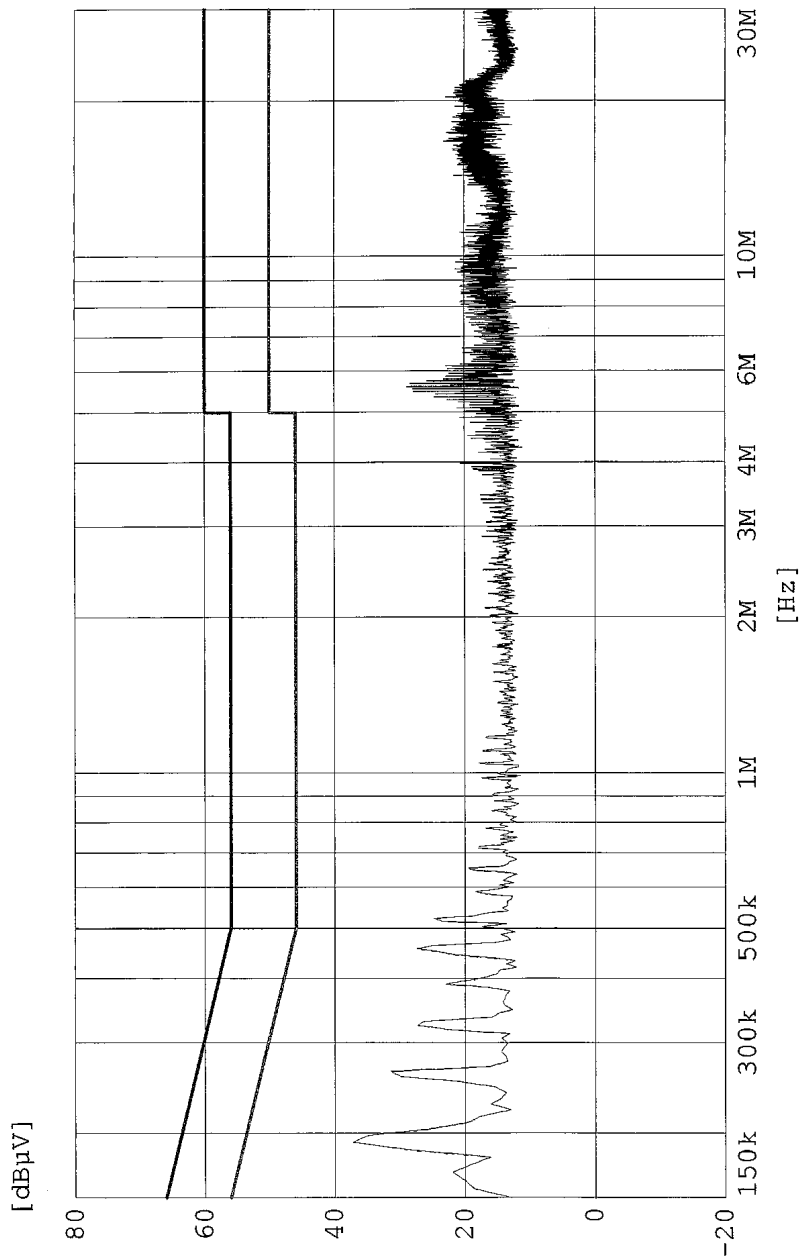


MES 06347B04.PK
 LIM CISPR 22 V QP
 LIM CISPR 22 V AV
 Gigawatttech GWT-SPP1
 Sharp Laptop
 0.195
 0.260
 QP 43.9
 AV 40.4
 35.9
 31.8
 L
 FCC

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MES 06347B03.PK
 LIM CISPR 22 V QP
 LIM CISPR 22 V AV

GigawaveTech GWT-SPI
 Sharp Laptop

0.195
 0.260

N

QP AV
 36.5 33.2
 32.9 28.3

FCC



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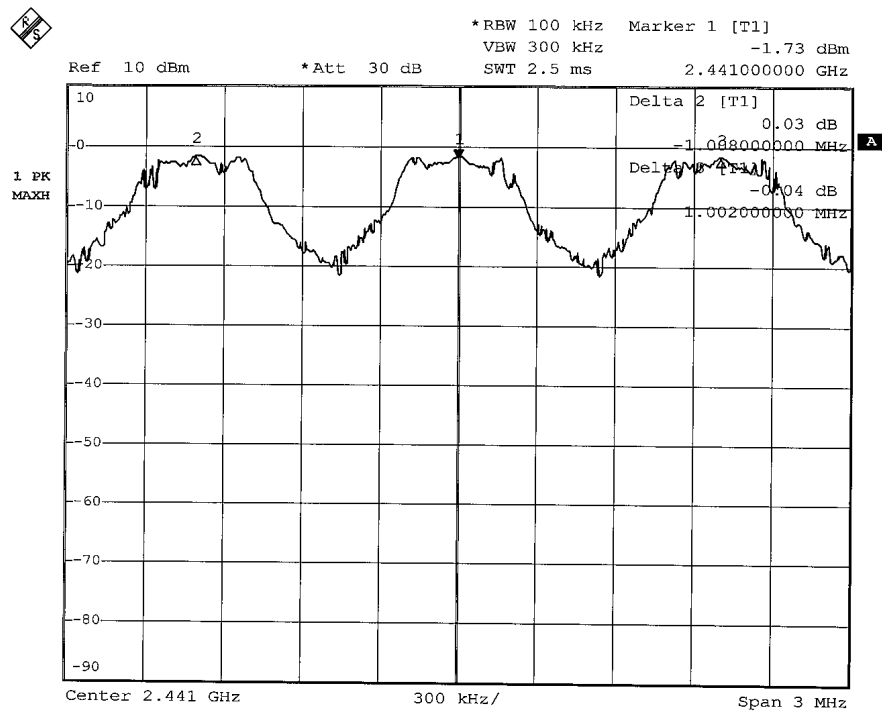
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Carrier Frequency Separation

Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: Hopping on

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



Date: 25.AUG.2003 15:06:37

GWTSP1
Hopping on



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Dwell Time

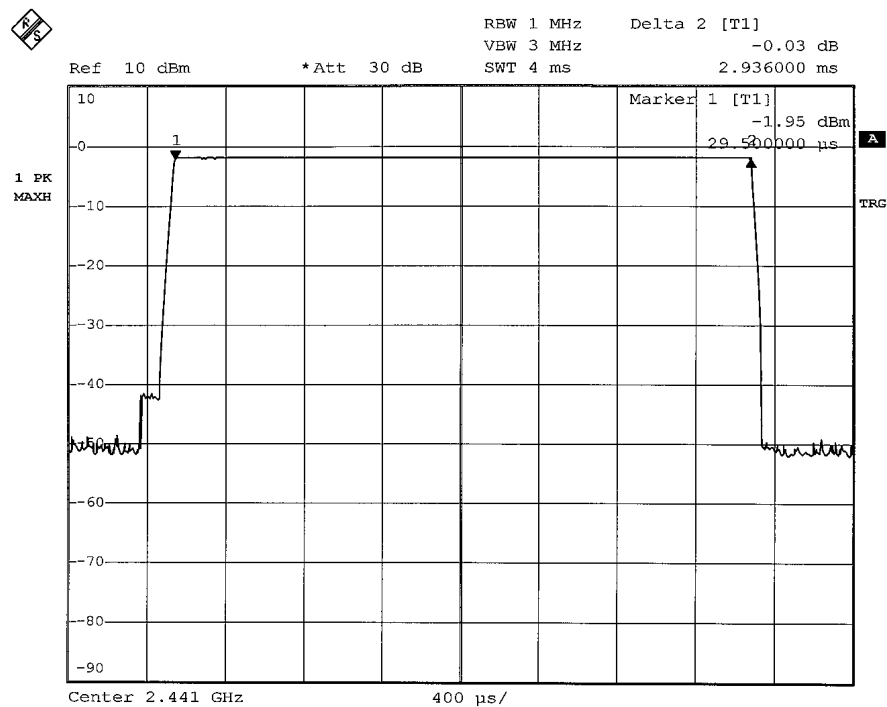
Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: Hopping on

Burst Duration (ms)	Number of hopping	Time of occupancy (s)	Results
2.936	31	$0.002936 \times 31 = 0.0910$	Pass

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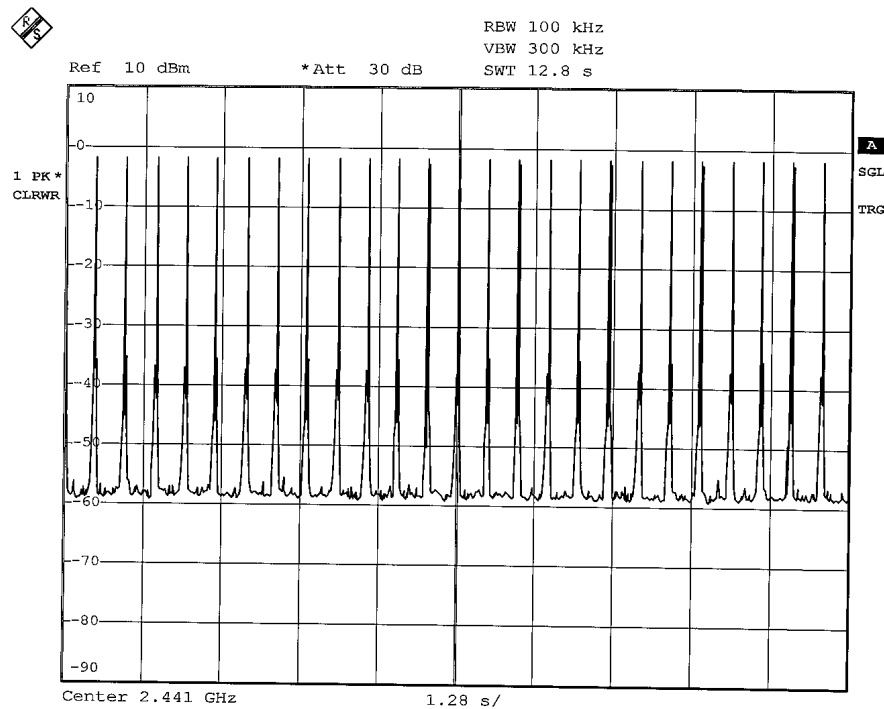
Date: 25.AUG.2003 15:02:42

GWTSP1
 Hopping on

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Date: 25.AUG.2003 14:55:57

GWTSP1
Hopping on

31 hoppings



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20dB Bandwidth

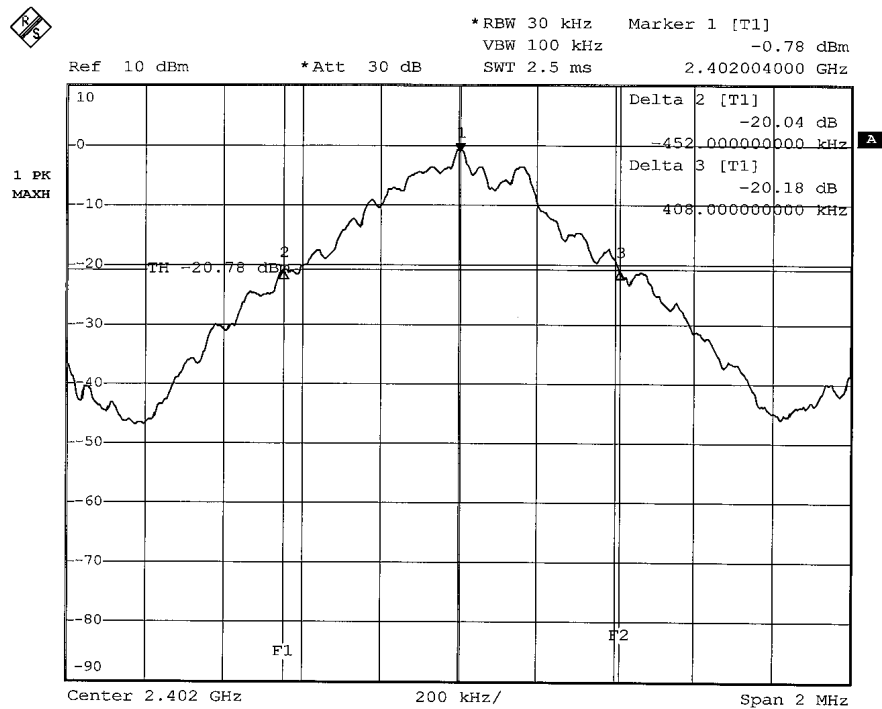
Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: TX mode, DH5 with PRBS9 payload

Tx frequency (MHz)	Δf_L (MHz)	Δf_H (MHz)	$ \Delta f_L + \Delta f_H $ (MHz)	Results
2402	-0.452	0.408	0.860	Pass
2441	-0.456	0.408	0.864	Pass
2480	-0.456	0.460	0.916	Pass

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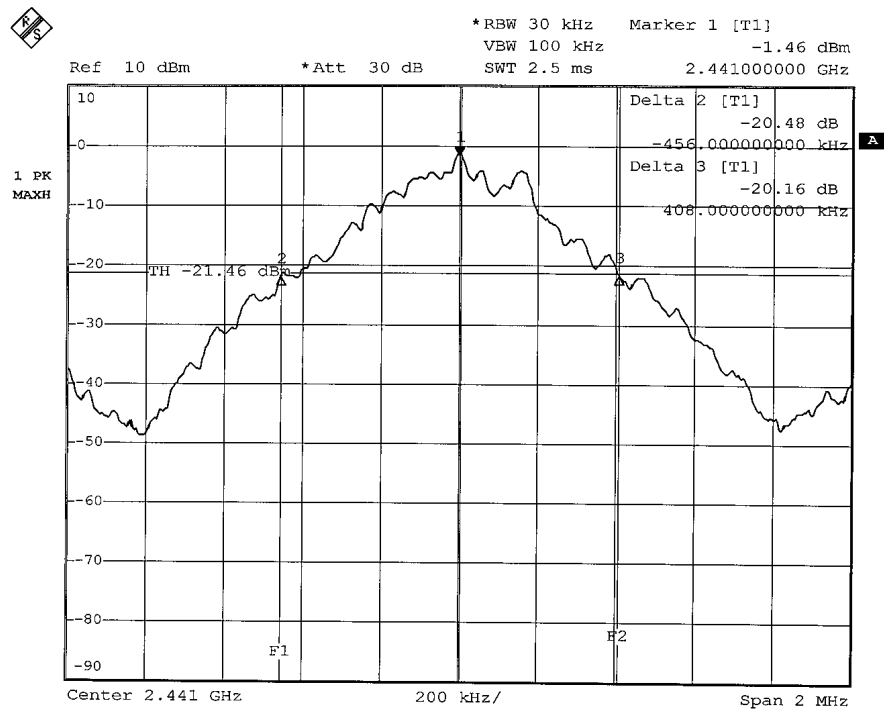
Date: 25.AUG.2003 14:46:47

GWTSP1
 2402MHz Tx

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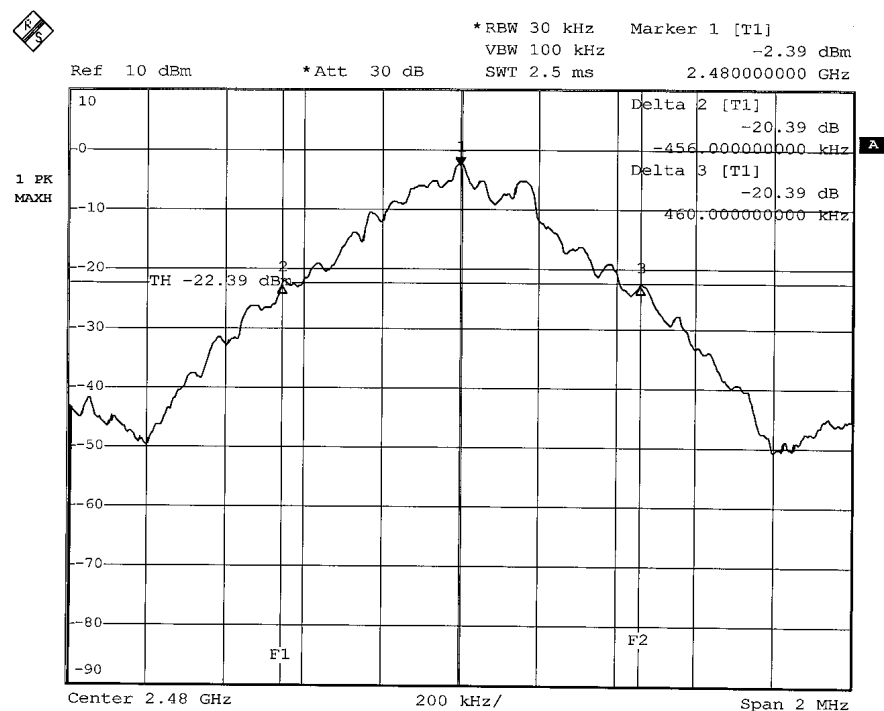
Date: 25.AUG.2003 14:49:16

GWTSP1
 2441MHz Tx

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Date: 25.AUG.2003 14:52:45

GWTSP1
 2480MHz Tx



Peak Output Power

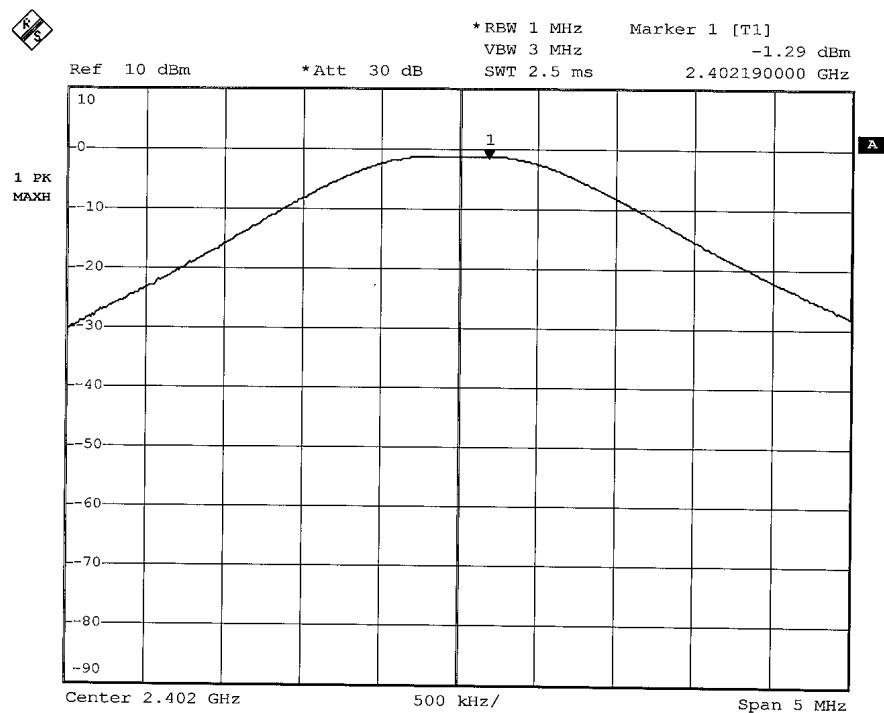
Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Cable Attenuation (dB)	Power P _{PK} (dBm)	Actual Peak Power (dBm)	Results
2402	4.30	-1.29	3.01	Pass
2441	4.15	-1.91	2.24	Pass
2480	4.50	-2.87	1.63	Pass

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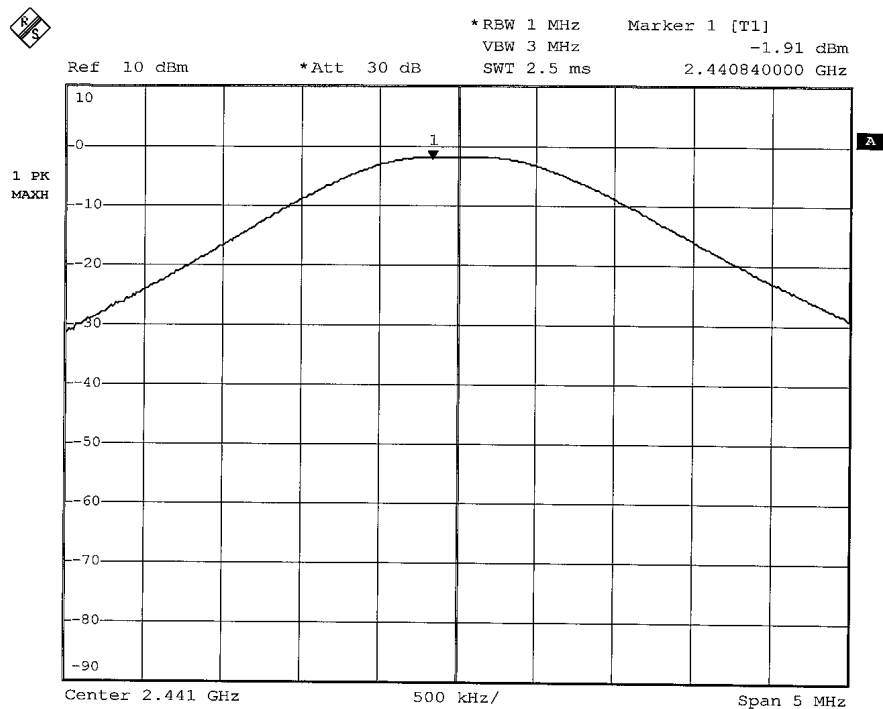
Date: 25.AUG.2003 15:11:02

GWTSP1
 2402MHz Tx

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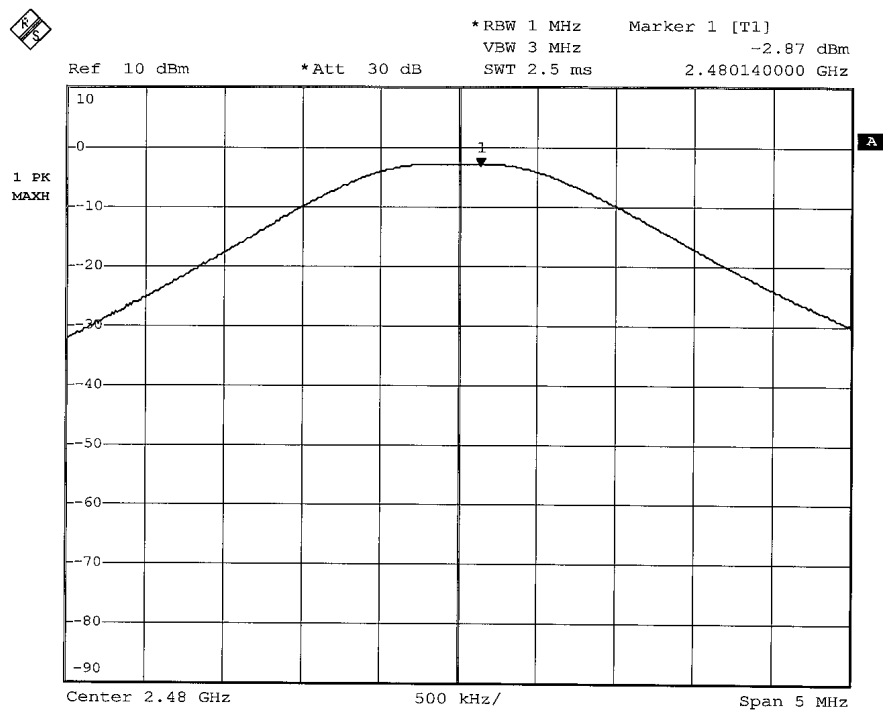
Date: 25.AUG.2003 15:11:42

GWTSP1
2441MHz Tx

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Date: 25.AUG.2003 15:13:23

GWTSP1
 2480MHz Tx



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Band Edge Compliance

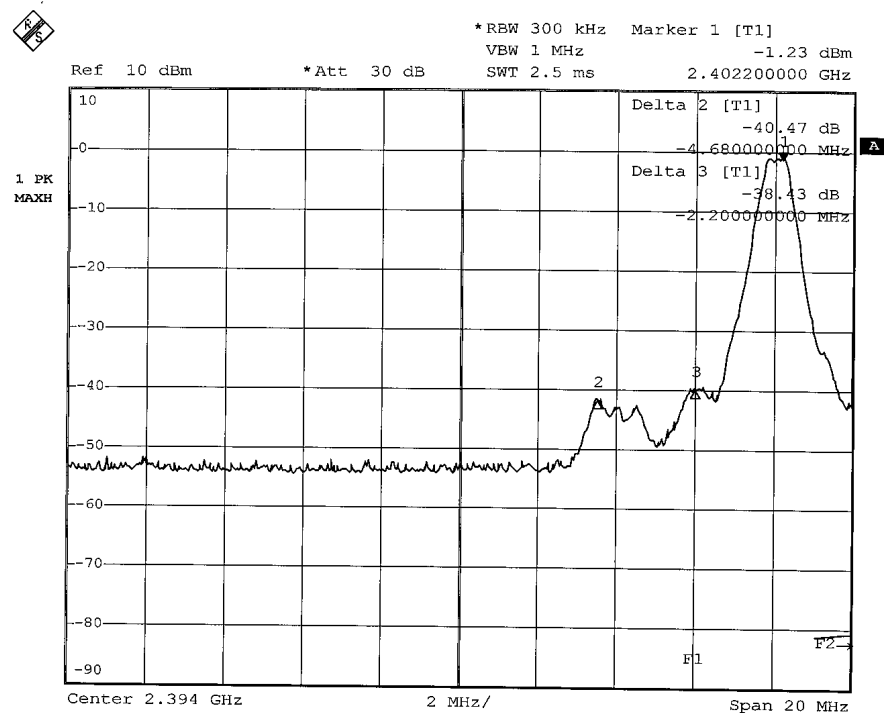
Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

Tx Frequency (MHz)	Peak in band Power level (dBm)	RF power outside 100kHz BW (MHz)	RF power difference outside 100kHz BW (dB)	Results
2402	-1.23	No Peak	-	Pass
2480	-2.75	No Peak	-	Pass

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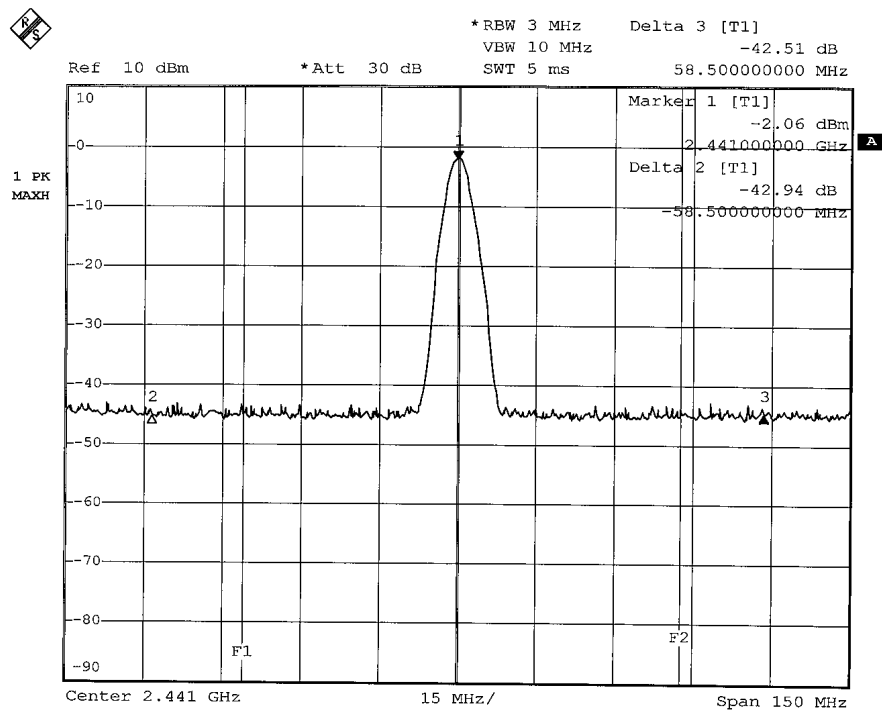
Date: 25.AUG.2003 15:24:47

GWTSP1
 2402MHz Tx

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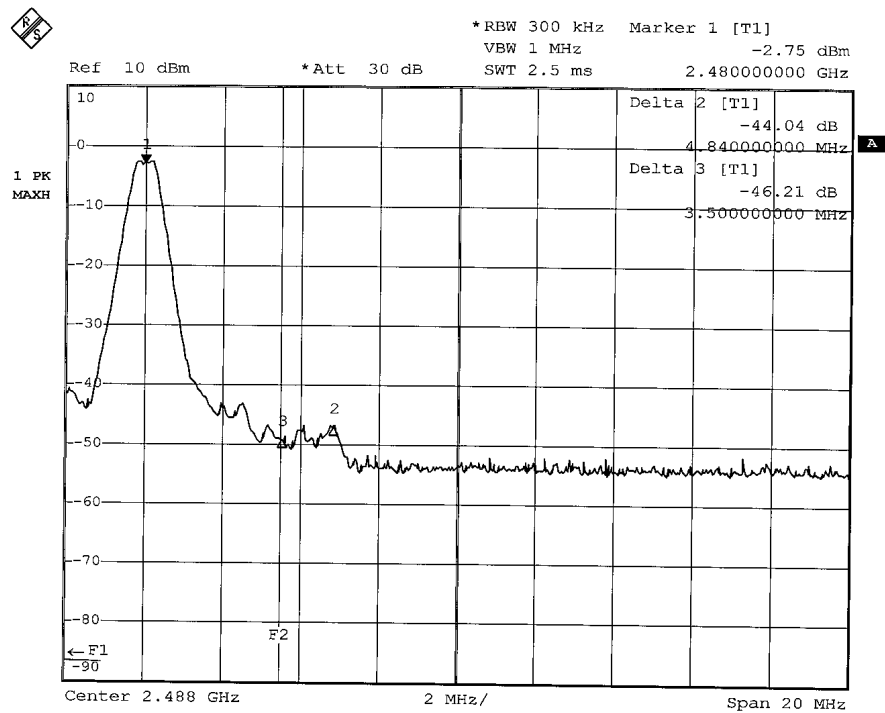
Date: 25.AUG.2003 15:26:02

GWTSP1
 2441MHz Tx

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Date: 25.AUG.2003 15:28:29

GWTSP1
 2480MHz Tx



Spurious Emissions - Conducted

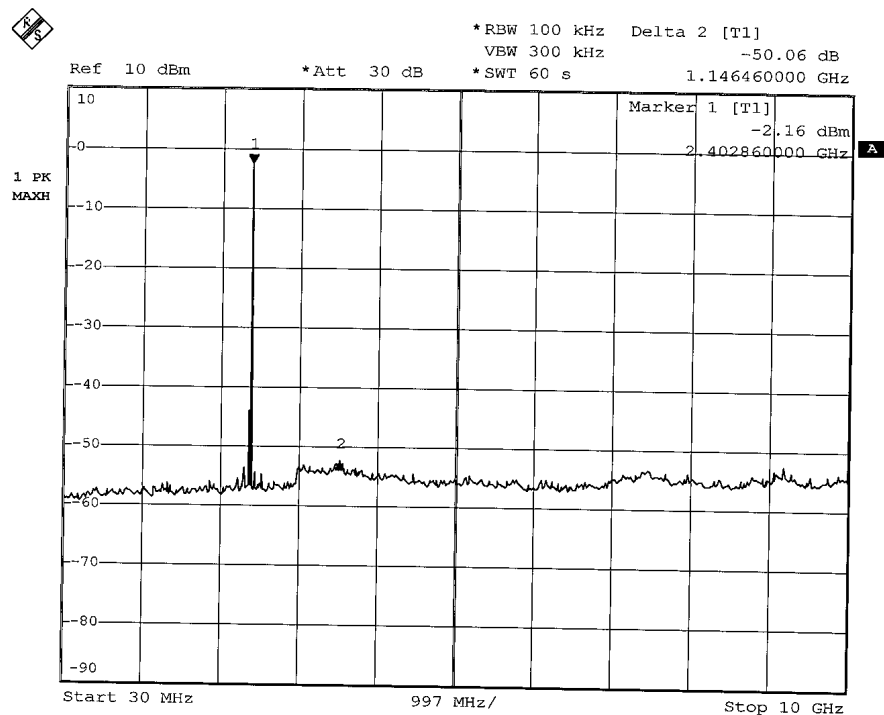
Date: 25 Aug 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Humidity: 50%
Temperature: 23°C
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

Tx frequency : 2402MHz				
Spurious Frequency (MHz)	Power level (dBm)	Reference value (dBm)	Delta to reference level (dB)	Results
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

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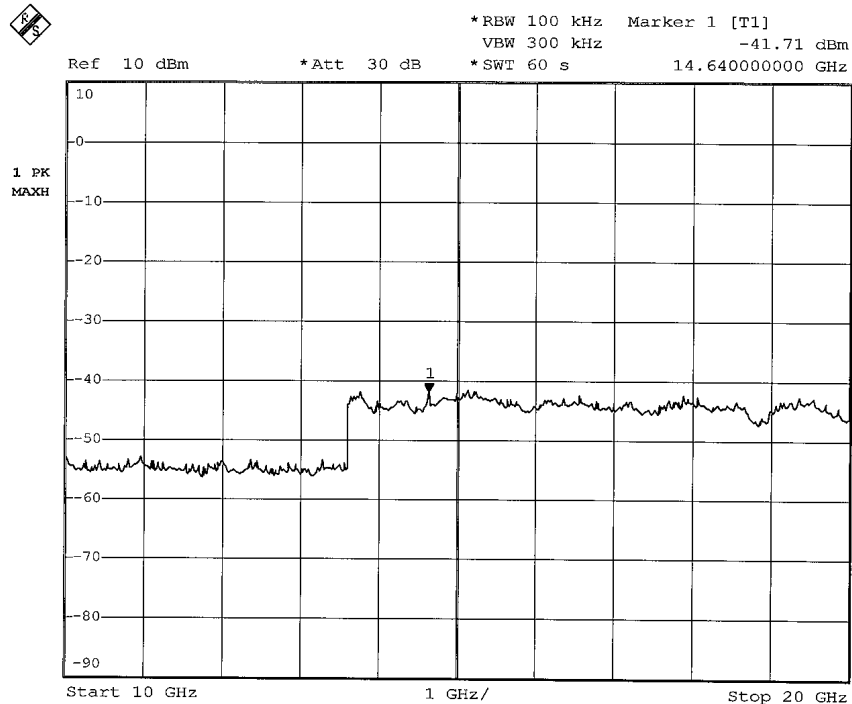
Date: 25.AUG.2003 15:43:06

GWTSP1
 2402MHz Tx

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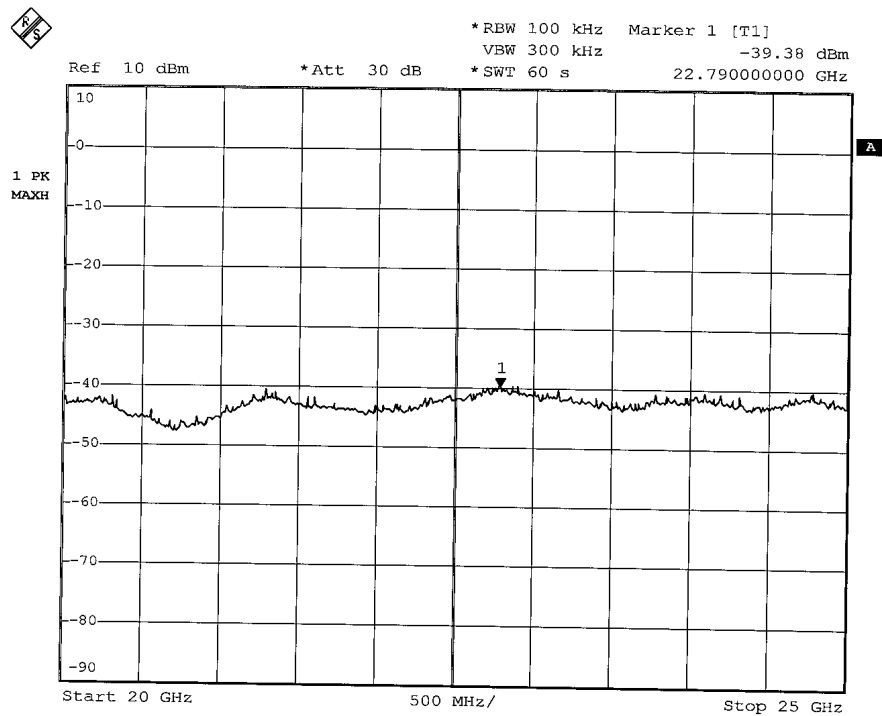
Date: 25.AUG.2003 15:46:06

GWTSP1
2402MHz Tx

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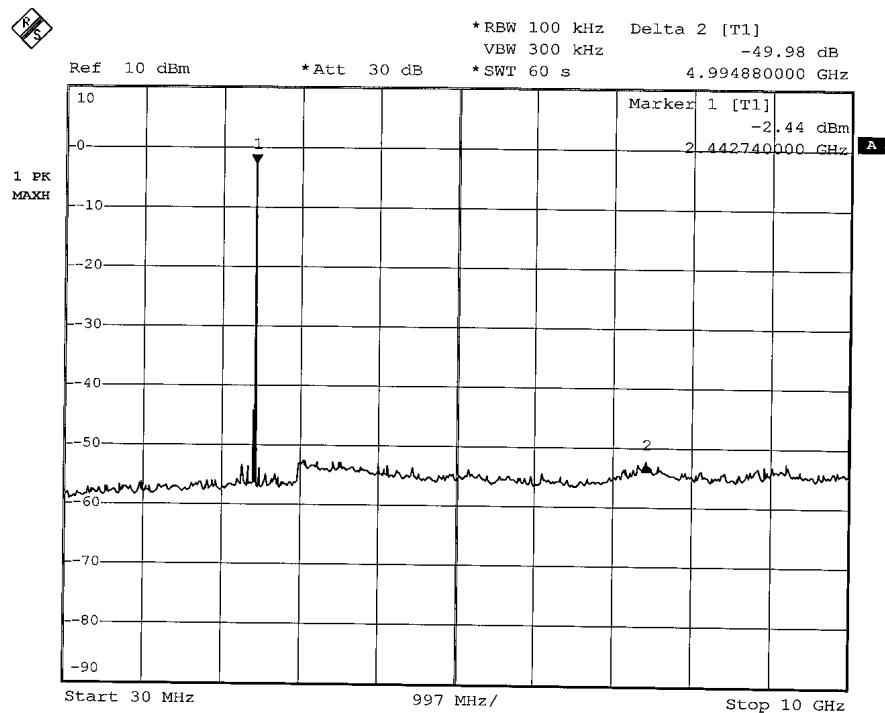
Date: 25.AUG.2003 15:50:16

GWTSP1
2402MHz Tx

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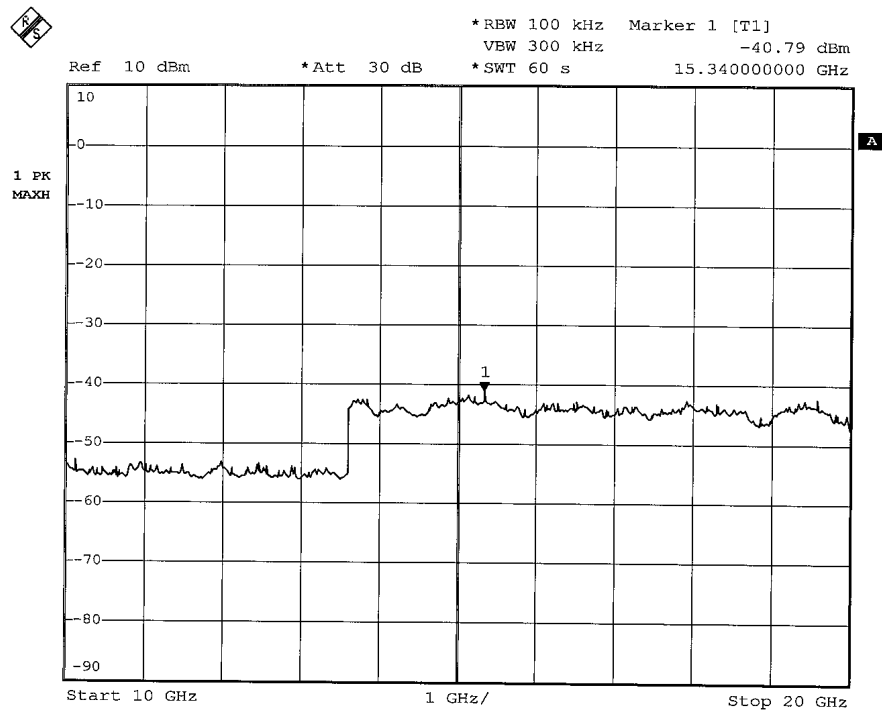
Date: 25.AUG.2003 15:58:33

GWTSP1
 2441MHz Tx

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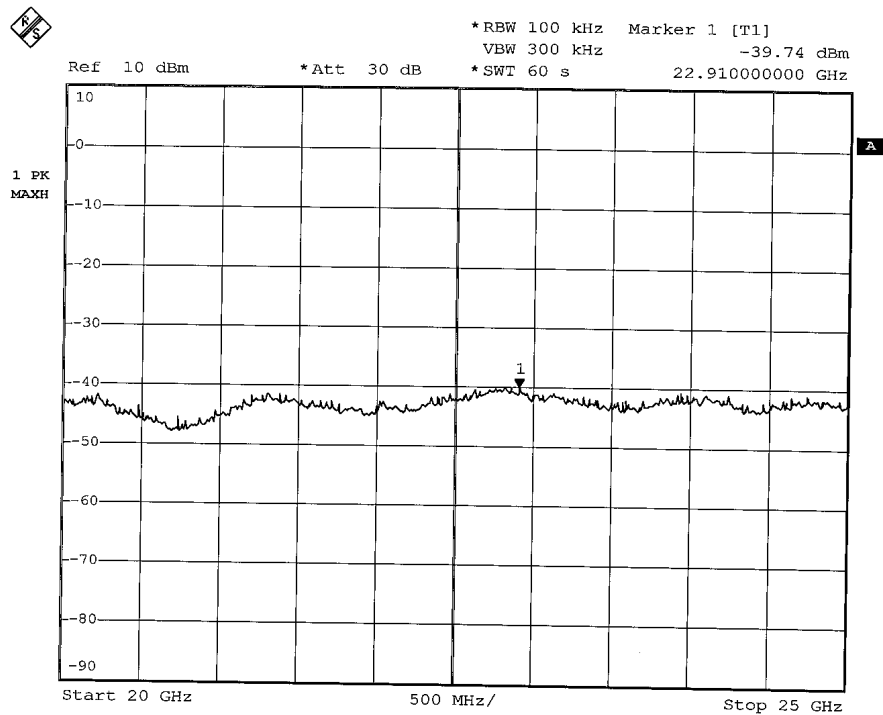
Date: 25.AUG.2003 16:22:24

GWTSP1
2441MHz Tx

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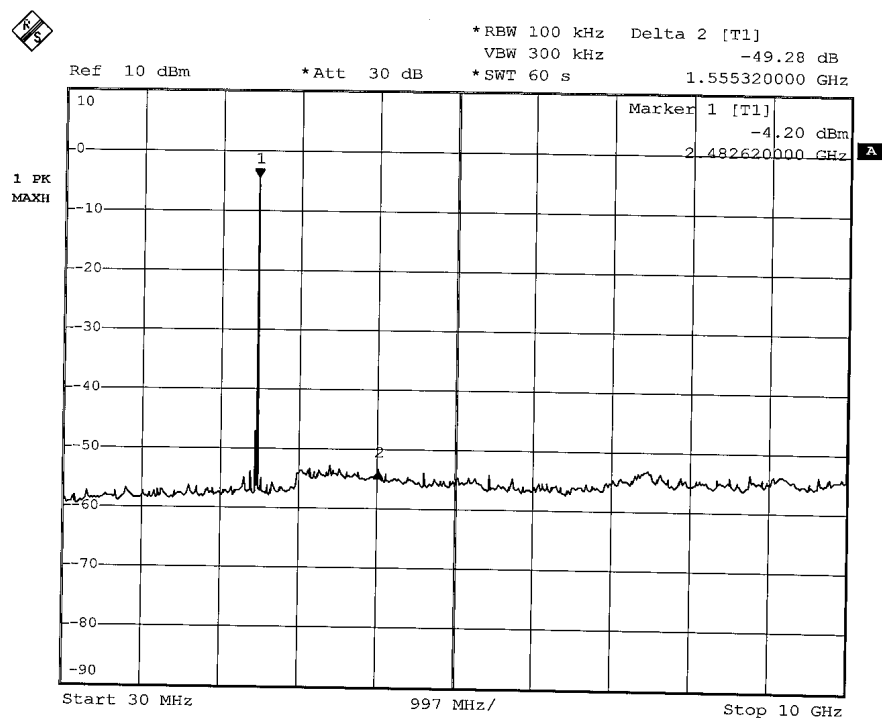
Date: 25.AUG.2003 16:24:37

GWTSP1
2441MHz Tx

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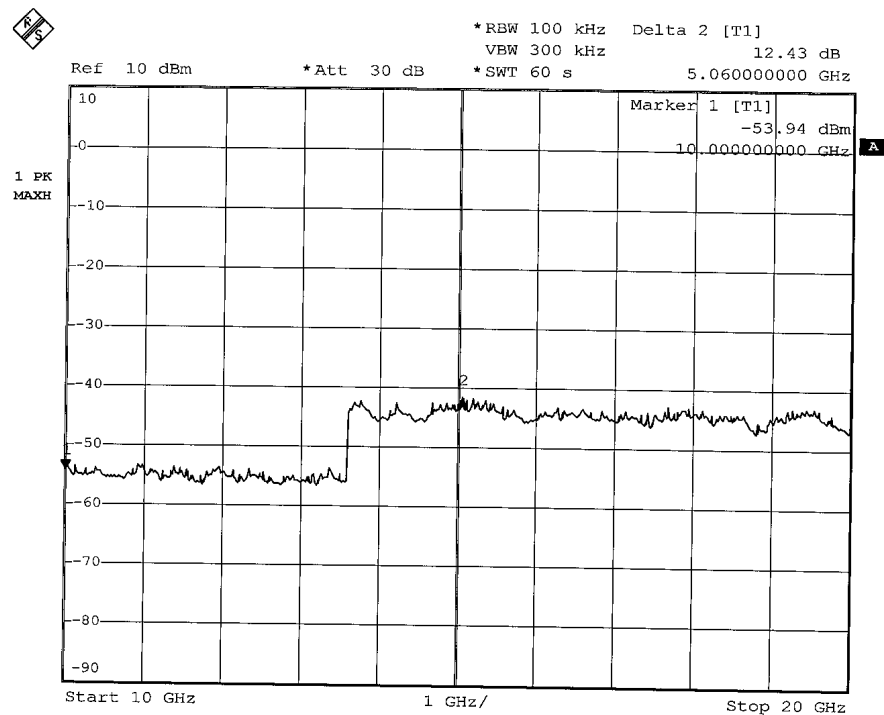
Date: 25.AUG.2003 16:27:33

GWTSP1
 2480MHz Tx

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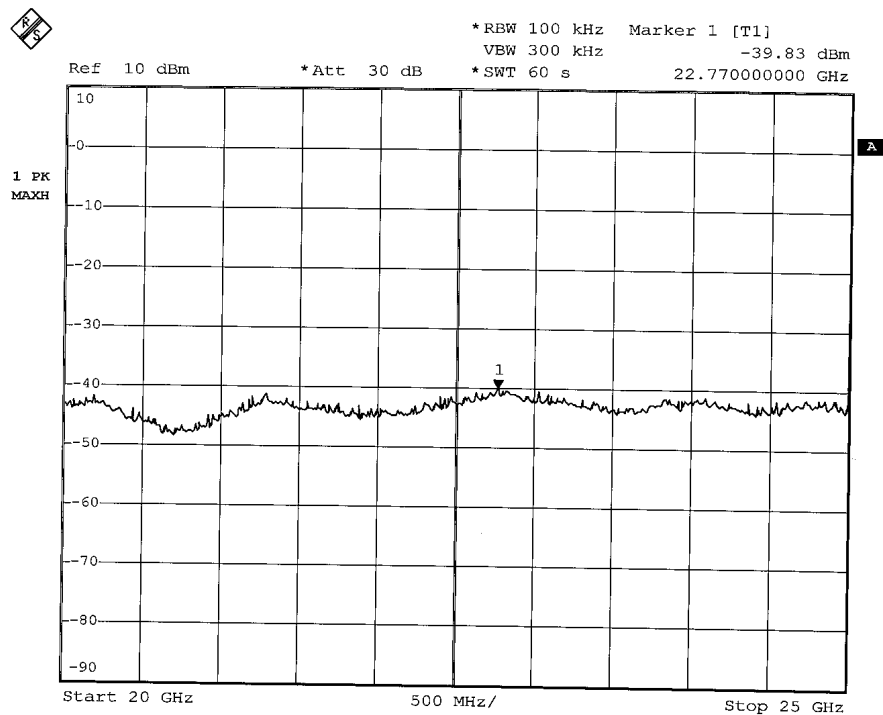
Date: 25.AUG.2003 16:28:54

GWTSP1
 2480MHz Tx

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Date: 25.AUG.2003 16:30:05

GWTSP1
2480MHz Tx



Spurious Emissions - Radiated

Date: 31 Jul 03
EUT: Bluetooth Serial Port Dongle (GWT-SPP1)
Company: Gigawavetech Pte Ltd.
Voltage supply: 4.5V
Test by: Hugo Wan
Initial conditions: TX mode, DH1 with PRBS9 payload

Tx frequency (MHz)	Polarization	Spurious Frequency (MHz)	Power Level (dBuV/m)	Detector (P/QP/A)
2402	Vertical	4804.200	47.56	A
2402	Vertical	4804.200	53.02	P
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	-	-