

TEST REPORT NO: RU1283/7318

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**REPORT ON THE CERTIFICATION TESTING OF A
INTEGRATION
ZIGBEE USB DONGLE
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.247 February 2006
INTENTIONAL RADIATOR SPECIFICATION**

TEST DATE: 1st – 8th November 2006

TESTED BY: **S HODGKINSON**
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0728

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Notes:		
1. Component failure during test	YES NO	[] [X]
2. If Yes, details of failure:		
3. The facilities used for the testing of the product contain in this report are FCC Listed.		
4. The contents of the attached applicants declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations' and is provided in good faith.		

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: UR2001

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, Part 15.247 February 2006

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: Zigbee USB Dongle

EQUIPMENT SERIAL No: Conducted : 1
Radiated : 8

EQUIPMENT TYPE: USB Radio Dongle

CARRIER EMISSION: 0.00152 Watts

ANTENNA TYPE: Integral Antenna

GAIN ANTENNA: 0Bi Maximum Gain Antenna

FREQUENCY OF OPERATION: 2400 MHz – 2483.5 MHz

CHANNEL SPACING: 5MHz

NUMBER OF CHANNELS: 15

FREQUENCY GENERATION: SAW Resonator ☐ Crystal ☐ Synthesiser ☒

MODULATION METHOD: Amplitude ☐ Digital ☒ Angle ☐

POWER SOURCE(s): +4.5Vdc

TEST DATE(s): 1st – 18th November 2006

ORDER No(s): 51611

APPLICANT: Integration

ADDRESS: Integration
16-18 West Street,
Reigate,
Surrey,
RH2 9BS
United Kingdom

TESTED BY:

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Date: 2006.11.30 09:27:56 ZJ Charters
Radio Section
Leader

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Zigbee USB Dongle
EQUIPMENT TYPE:	USB Radio Dongle
SERIAL NUMBER OF EUT:	Conducted : 1 Radiated : 8
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.247 February 2006
TEST RESULT:	COMPLIANT Yes [X] No []
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [] DISTRIBUTOR [] TEST HOUSE [] AGENT []
APPLICANT'S ORDER No(s):	51611
APPLICANT'S CONTACT PERSON(s):	Mr A Leitch
E-mail address:	aleitch@integration.com
APPLICANT:	Integration.
ADDRESS:	Integration 16-18 West Street, Reigate, Surrey, RH2 9BS United Kingdom
TEL:	+44 (0) 1737 227722
FAX:	+44 (0) 1737 227744
MANUFACTURER:	Integration.
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL Compliance Ltd
UKAS ACCREDITATION No:	0728
TEST DATE(s):	1 st – 8 th November 2006
TEST REPORT No:	RU1283/7318

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
	Intentional Emission Frequency:	15.247(b)	Peak	Yes
	Intentional Emission Field Strength:	-	-	No
	Intentional Emission Band Occupancy 6dB:	15.247 (a)	Peak	Yes
	Intentional Emission ERP (mW):	15.247 (b)	Peak	Yes
	Spurious Emissions – Conducted:	15.247 (c)	Peak	Yes
	Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak	Yes
	Spurious Emissions – Radiated >1000MHz:	15.209	Average	Yes
	Spectral Power Density:	15.247 (e)	Peak	Yes
	Spurious Emissions – Power Line TX:	15.207	Quasi Peak Average	Yes
	Spurious Emissions – Power Line RX:	15.107	Quasi Peak Average	Yes
	Maximum Frequency of Search:	15.33	-	Yes
	Antenna Arrangements Integral:	15.203	-	Yes
	Antenna Arrangements External Connector:	15.204	-	Yes
	Restricted Bands:	15.205	-	Yes
	Extrapolation Factor:	15.31(f)	-	Yes

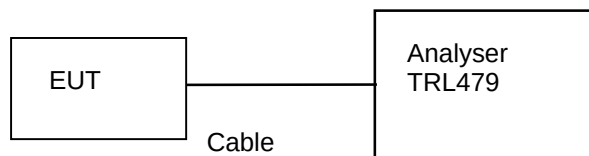
- | | | | |
|----|--|----------------|---------|
| 2. | Emission Designator: | F1D | |
| 3. | Duty Cycle: | | <100% |
| 4. | Transmitter bit or pulse rate and level: | | 250kBps |
| 5. | Temperatures: | Ambient (Tnom) | 20°C |
| 6. | Supply Voltages: | Vnom | +4.5Vdc |
- Note: Vnom voltages are as stated above unless otherwise shown on the test report page
- | | | | |
|----|---------------------|----------------|-------------------------------------|
| 7. | Equipment Category: | Single channel | ☐ |
| | | Two channel | ☐ |
| | | Multi-channel | ☒ |
| 8. | Channel Allocation: | Narrowband | ☐ |
| | | Wideband | ☒ |

TRANSMITTER TESTS

TRANSMITTER 6dB BANDWIDTH – CONDUCTED - PART 15.247(A)(2)

Ambient temperature = 19°C(<1GHz)
Relative humidity = 50% (<1GHz)
Conditions = Radio Lab
Supply voltage = +4.5Vdc

Diagram



Frequency	Channel	Measured Bandwidth	Limit
2405 MHz	11	1.28 MHz	>500kHz
2440 MHz	18	1.27 MHz	>500kHz
2480 MHz	26	1.33 MHz	>500kHz

Notes:

- 1 For analyser plot of middle channel see annex C.
- 2 In the 2.4 – 2.4835GHz band Zigbee channels are 11 - 26

Test Method:

- 1 A temporary antenna connector was supplied on the EUT to allow conducted measurements
- 2 The 6dB bandwidth was recorded with the EUT transmitting at maximum data rate.

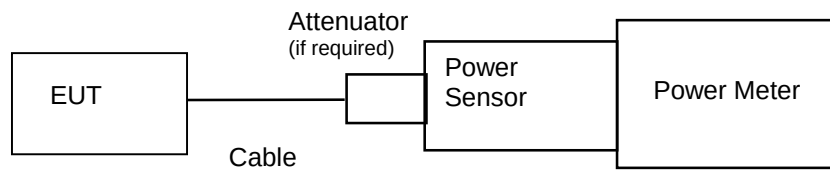
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS

TRANSMITTER - MAXIMUM PEAK POWER - CONDUCTED - PART 15.247(B)(3)

Ambient temperature = 24°C(<1GHz)
Relative humidity = 48% (<1GHz)
Conditions = Radio Lab
Supply voltage = +4.5Vdc

Diagram



Frequency MHz	Channel	Peak Power on Meter dBm	Attenuator & Cable loss dB	Peak Power Watts	EUT Antenna Gain dBi	Average Power Watts	Limit Watts
2405 MHz	11	-28.86	30.24	0.00137	0	0.00137	1 Watt
2440 MHz	18	-28.34	30.24	0.00152	0	0.00152	1 Watt
2480 MHz	26	-30.78	30.24	0.00085	0	0.00085	1 Watt

Notes:

- 1 Gain of antenna 0dBi, maximum gain antenna supplied by manufacturer.
- 2 In the 2.4 – 2.4835GHz band Zigbee channels are 11 - 26

Test Method:

- 1 The EUT was connected to the power sensor via a temporary antenna connector a cable and attenuator - if applicable.
- 2 The EUT was operated in transmit mode with modulation on top middle and bottom operating channels
- 3 The level on the power meter was recorded.

Test equipment used for Peak Power measurement:

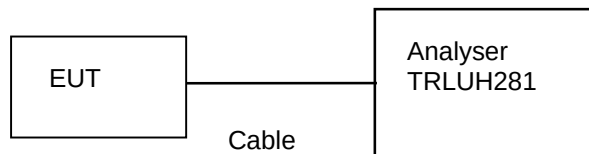
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
POWER METER	MARCONI	6960B	237034/019	UH132	X
POWER SENSOR	MARCONI	6920	1564	UH228	X
ATTENUATOR	JFW	50PF-030	N/A	N/A	X

TRANSMITTER TESTS

TRANSMITTER BAND EDGE EMISSIONS – CONDUCTED – Part 15.247(D)

Ambient temperature = 19°C
Relative humidity = 50%
Conditions = Conducted – Radio Lab
Supply voltage = +4.5Vdc

Diagram



Test Result

Measured as compliant, see analyser plots

Notes:

- 1 The EUT was set into a transmit mode with modulation on top and bottom operating frequencies.
- 2 The EUT was connected to the analyser via the temporary antenna connector.
- 3 See Annex D for analysers plots.
In the 2.4 – 2.4835GHz band Zigbee channels are 11 - 26

Test Method:

- 1 A plot covering transmission and lower band edge was taken. A marker was set on the peak emission of the lowest channel. The delta marker function was then used to measure the highest out of band emissions. (If no peaks exist outside the band the level is taken at the band edge).
- 2 A plot covering transmission and upper band edge was taken. A marker was set on the peak emission of the highest channel. The delta marker function was then used to measure the highest out of band emissions. (If no peaks exist outside the band the level is taken at the band edge).

The test equipment used for the tests is shown below:

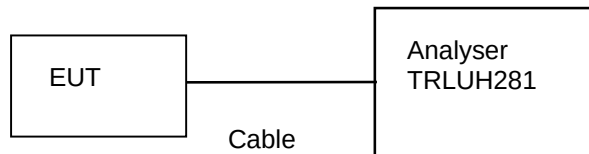
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS

TRANSMITTER POWER SPECTRAL DENSITY – CONDUCTED - PART 15.247(E)

Ambient temperature = 19°C(<1GHz)
Relative humidity = 50% (<1GHz)
Conditions = Radio Lab
Supply voltage = +4.5Vdc

Diagram



Frequency (MHz)	Channel	Measured Power Spectral Density (dBm)	EUT Antenna Gain (dBi)	Power Spectral Density (dBm)	Limit (dBm)
2405 MHz	11	-12.17	0	-13.57	+8
2440 MHz	18	-13.57	0	-13.44	+8
2480 MHz	26	-14.08	0	-14.08	+8

Notes:

- 1 For analyser plots see annex E.
- 2 In the 2.4 – 2.4835GHz band Zigbee channels are 11 - 26

Test Method:

- 1 The EUT was connected to the analyser via the temporary antenna connector and cable with a sweep time of 1000 seconds
- 2 The resolution bandwidth on the analyser was set to 3kHz and trace set to max hold.

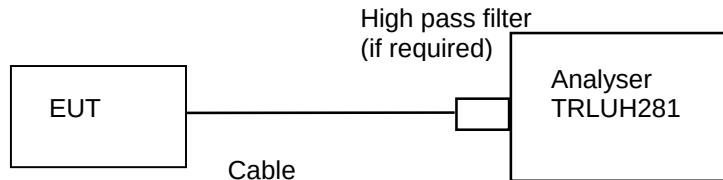
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – CONDUCTED – Part 15.247(D)

Ambient temperature = 22°C
 Relative humidity = 34%
 Conditions = Conducted –Radio Lab
 Supply voltage = +4.5Vdc

Diagram



Bottom Channel

Range Frequency (MHz)	Emission Frequency (GHz)	Emission Level (dBm)	Cable loss (dB)	Level (dBm)	Limit (dBm)
30 – 26000	No Significant Emissions within 20 dBs of the Limit				-22.05 dBm

Middle Channel

Range Frequency (MHz)	Emission Frequency (GHz)	Emission Level (dBm)	Cable loss (dB)	Level (dBm)	Limit (dBm)
30 – 26000	No Significant Emissions within 20 dBs of the Limit				-21.38 dBm

Top Channel

Range Frequency (MHz)	Emission Frequency (GHz)	Emission Level (dBm)	Cable loss (dB)	Level (dBm)	Limit (dBm)
30 – 26000	No Significant Emissions within 20 dBs of the Limit				-21.85 dBm

Notes:

- 1 Section 15.247(c) states that all spurious emissions measured within a 100kHz bandwidth shall be attenuated by at least 20dB below the level of the highest fundamental level measured within a 100kHz bandwidth.
- 2 Emissions with levels 20dB less than the limit are not necessarily recorded.
- 3 See Annex F for Plots of top and Bottom operating frequencies.

Test Method:

- 1 The EUT was connected to the analyzer using a cable and high pass filter (if required).
- 2 Frequency sweeps were performed to check for spurious emissions.
- 3 Any emissions discovered were checked for compliance against the limit.

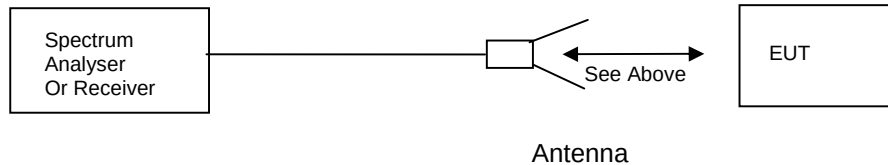
The test equipment used for the tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – Part 15.247(c) and 15.209

Ambient temperature	=	15°C(>1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	44% (>1GHz)	0.3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 0.3m	[X]
Supply voltage	=	+4.5Vdc		



Bottom Channel 2405 MHz	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Field Strength (dBμV/m)	Extrap. Factor (dB)	Result (μV/m)	Limit (μV/m)
30MHz – 88MHz Restricted bands	Note 7							100
88MHz – 216MHz Restricted bands	Note 7							150
216MHz – 960MHz Restricted bands	Note 7							200
960MHz – 1GHz Restricted bands	Note 7							500
1GHz – 26GHz Restricted bands	4809.860	35.11	1.16	33.0	69.44	-20	296.48	500
30MHz -26GHz	Note 7							-20dBc
See annex G for initial pre scan results.								

Middle Channel 2440 MHz	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Field Strength (dBμV/m)	Extrap. Factor (dB)	Result (μV/m)	Limit (μV/m)
30MHz – 88MHz Restricted bands	Note 7							100
88MHz – 216MHz Restricted bands	Note 7							150
216MHz – 960MHz Restricted bands	Note 7							200
960MHz – 1GHz Restricted bands	Note 7							500
1GHz – 26GHz Restricted bands	4879.890	35.40	1.16	33.0	69.56	-20	300.61	500
30MHz -26GHz	Note 7							-20dBc
See annex G for initial pre scan results.								

Top Channel 2480 MHz	Emission Frequency (MHz)	Meas. Rx. (dBuV)	Cable loss (dB)	Ant. Factor (dB/m)	Field Strength (dBµV/m)	Extrap. Factor (dB)	Result (µV/m)	Limit (µV/m)
30MHz – 88MHz Restricted bands	Note 7							100
88MHz – 216MHz Restricted bands	Note 7							150
216MHz – 960MHz Restricted bands	Note 7							200
960MHz – 1GHz Restricted bands	Note 7							500
1GHz – 26GHz Restricted bands	4959.920	32.55	1.16	33.0	66.71	-20	216.51	500
30MHz -26GHz	Note 7							-20dBc
See annex G for initial pre scan results.								

Notes:

- 1 Initial pre scans were performed see Annex G for plots <1GHz.
- 2 See Annex H for radiated bandedge compliance plots.
- 3 Emissions above 1GHz were measured with both a peak and average detectors.
- 4 Measurements <1GHz were performed at 3 meters.
- 5 Measurements >1GHz were initial performed at 0.3 metres. This distance was increased if sensitivity of analyser allowed.
- 6 0.3m to 3m extrapolated as per part 15.31
- 7 Only emissions with in 20dB of limit are recorded.
- 8 Emissions not directly related to the transmitter are reported under receiver tests.

Test Method:

- 1 As per section 15.247.
- 2 Measuring distances as notes 5 to 6 above.
- 3 EUT 0.8 metre above ground plane.
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m >30MHz.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes. Maximum results recorded.

The test equipment used for the tests is shown overleaf:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	X
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X

TRANSMITTER and RECEIVER TESTS

TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Parts 15.207 & 15.107

Ambient temperature = 20°C(<1GHz)
Relative humidity = 47%(<1GHz)
Conditions = Power Line Laboratory
Supply voltage = +110V AC
Supply Frequency = 60Hz

SIGNIFICANT EMISSIONS

Transmitting On Bottom Channel Part 15.207

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.180	47.71	Average	Neutral	54.49
0.200	42.34	Average	Neutral	53.61
0.430	33.70	Average	Neutral	47.25
0.490	36.59	Average	Neutral	46.17
0.675	31.22	Average	Live	46.00
0.970	33.47	Average	Live	46.00
1.105	34.07	Average	Live	46.00
1.420	31.77	Average	Live	46.00
1.600	31.71	Average	Live	46.00
1.780	32.60	Average	Live	46.00

SIGNIFICANT EMISSIONS

Transmitting On Top Channel Part 15.207

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.180	46.84	Average	Live	54.49
0.200	42.27	Average	Neutral	53.61
0.430	33.66	Average	Neutral	47.25
0.490	36.59	Average	Neutral	46.17
0.675	31.22	Average	Live	46.00
0.970	33.56	Average	Live	46.00
1.105	34.03	Average	Live	46.00
1.420	31.65	Average	Live	46.00
1.780	32.71	Average	Live	46.00

The test equipment used for the Transmitter Conducted Emissions – AC Power Line are shown on page 15:

SIGNIFICANT EMISSIONS

Receiving On Bottom Channel Part 15.107

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.180	47.56	Average	Neutral	54.49
0.200	42.20	Average	Neutral	53.61
0.430	33.61	Average	Neutral	47.25
0.490	36.46	Average	Neutral	46.17
0.675	31.09	Average	Live	46.00
0.970	33.47	Average	Live	46.00
1.105	34.03	Average	Live	46.00
1.420	31.65	Average	Live	46.00
1.780	32.66	Average	Live	46.00

SIGNIFICANT EMISSIONS

Receiving On Top Channel Part 15.107

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.180	47.87	Average	Neutral	54.49
0.200	42.78	Average	Neutral	53.61
0.430	33.89	Average	Neutral	47.25
0.490	36.73	Average	Neutral	46.17
0.675	31.10	Average	Live	46.00
0.970	33.29	Average	Live	46.00
1.105	33.39	Average	Live	46.00
1.305	31.87	Average	Live	46.00
1.785	31.81	Average	Neutral	46.00
1.845	32.86	Average	Live	46.00

The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test are shown on page 15:

- Notes:**
- 1 See attached plots annex I (Worst Case Scan for TX and RX).
 - 2 Only emissions within 15 dB of the limit are recorded.
 - 3 +110Vac to PC Supplying Zigbee Dongle with +4.5Vdc Via USB

Test Method: 1 As per Radio – Noise Emissions, ANSI C63.4: 2003.

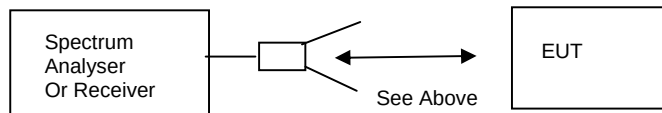
The test equipment used for the Transmitter Conducted Emissions – AC Power Line Part 15.207 test was:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	X
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	X

RECEIVER TESTS

RECEIVER SPURIOUS EMISSIONS – RADIATED – PART 15.109

Ambient temperature	=	15°C(<1GHz)	10m measurements <1GHz	[X]
Relative humidity	=	44% (<1GHz)	0.3m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 0.3m	[X]
Supply voltage	=	+4.5Vdc		



Antenna

	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)	LIMIT (µV/m)
	30MHz – 88MHz	Note 6						
	88MHz – 216MHz	Note 6						
	216MHz – 960MHz	Note 6						
	960MHz – 1.0GHz	Note 6						
	1GHz – 5.0GHz	Note 6						
Limits	30MHz to 88MHz		90µV/m @ 10m					
	88MHz to 216MHz		150µV/m @ 10m					
	216MHz to 960MHz		210µV/m @ 10m					
	960MHz to 1GHz		300µV/m @ 10m					
	1GHz to 5GHz		300µV/m @ 10m					

Notes:

- 1 R indicates frequency with a restricted band.
- 2 Initial pre scans were performed see Annex J for plots <1GHz.
- 3 Emissions above 1GHz were measured with both a peak and average detectors.
- 4 Measurements <1GHz were performed at 3 meters.
- 5 Measurements >1GHz were initial performed at 0.3metres. This distance was increased if sensitivity of analyser allowed.
- 6 Only emissions with in 20dB of limit are recorded.

Test Method:

- 1 As per Radio – Noise Emissions, ANSI C63.4: 2003.
- 2 Measuring distances as Notes 1 to 4 above.
- 3 EUT 0.8 metre above ground plane.
- 4 Emissions maximised by rotation of EUT, on an automatic turntable.
Raising and lowering the receiver antenna between 1m & 4m.
Horizontal and vertical polarisations, of the receive antenna.
EUT orientation in three orthogonal planes.
Maximum results recorded.

The test equipment used for the Transmitter Spurious Emissions – Radiated – Part 15.209 tests is shown below:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
HORN ANTENNA	EMCO	3115	9010-3580	138	
HORN ANTENNA	EMCO	3115	9010-3581	139	X
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	
RECEIVER	ROHDE & SCHWARZ	ESVS 10	841431/014	UH186	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	X
SPECTRUM ANALYSER	ROHDE & SCHWARZ	FSU	200034	UH281	X

ANNEX A
PHOTOGRAPHS

PHOTOGRAPH No. 1

TEST SETUP



PHOTOGRAPH No. 2

TRANSMITTER TOP VIEW



PHOTOGRAPH No. 3

TRANSMITTER BOTTOM VIEW



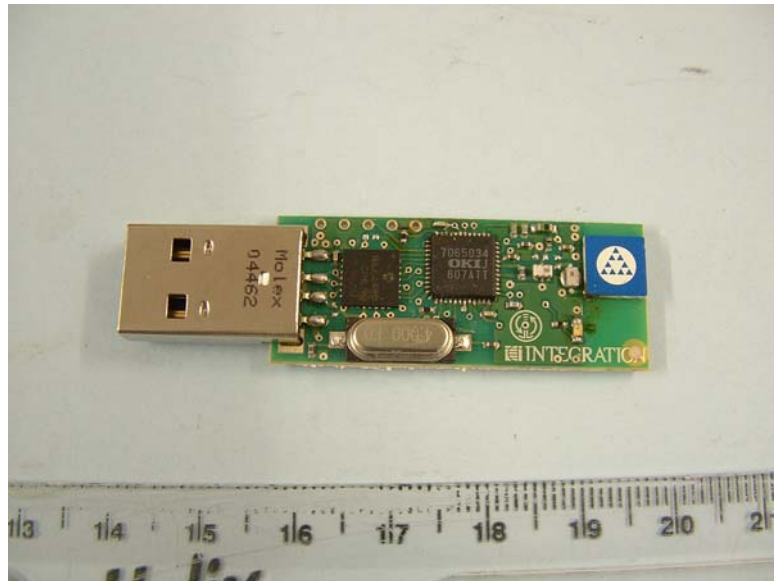
PHOTOGRAPH No. 4

OVERVIEW CAP REMOVED



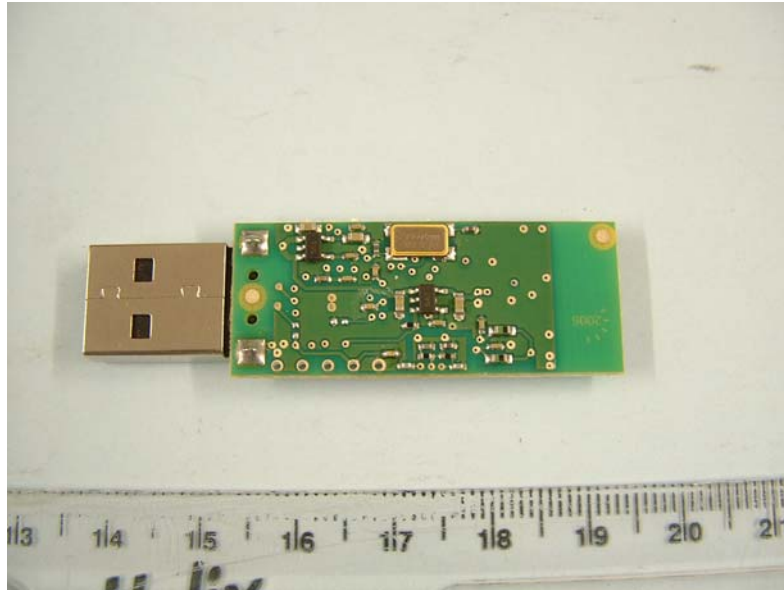
PHOTOGRAPH No. 5

PCB TOP SIDE



PHOTOGRAPH No. 6

PCB BOTTOM SIDE



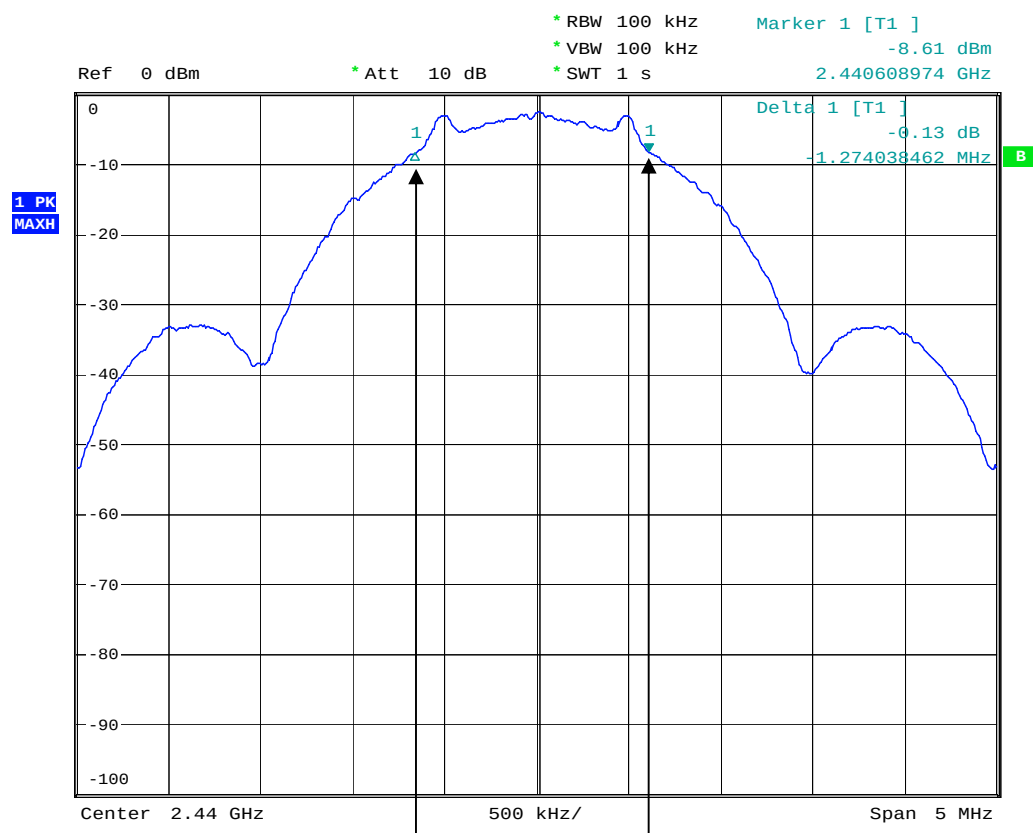
ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[X]
		-	DRAWINGS	[X]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[X]
		-	PSU	[]
		-	AUX	[]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C
6 dB BANDWIDTH

6dB Bandwidth Middle Channel



Date: 7.NOV.2006 09:55:51

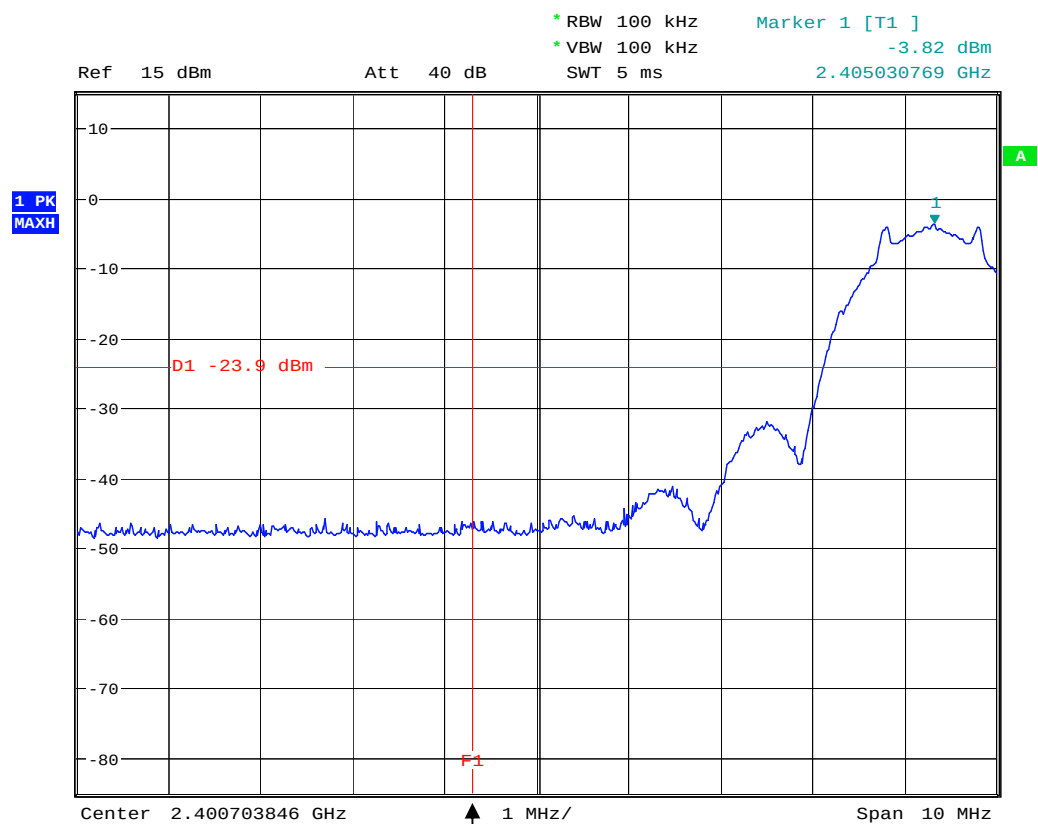
f lower

f higher

Occupied bandwidth = 1.274 MHz

ANNEX D
BAND EDGE COMPLIANCE (Conducted)

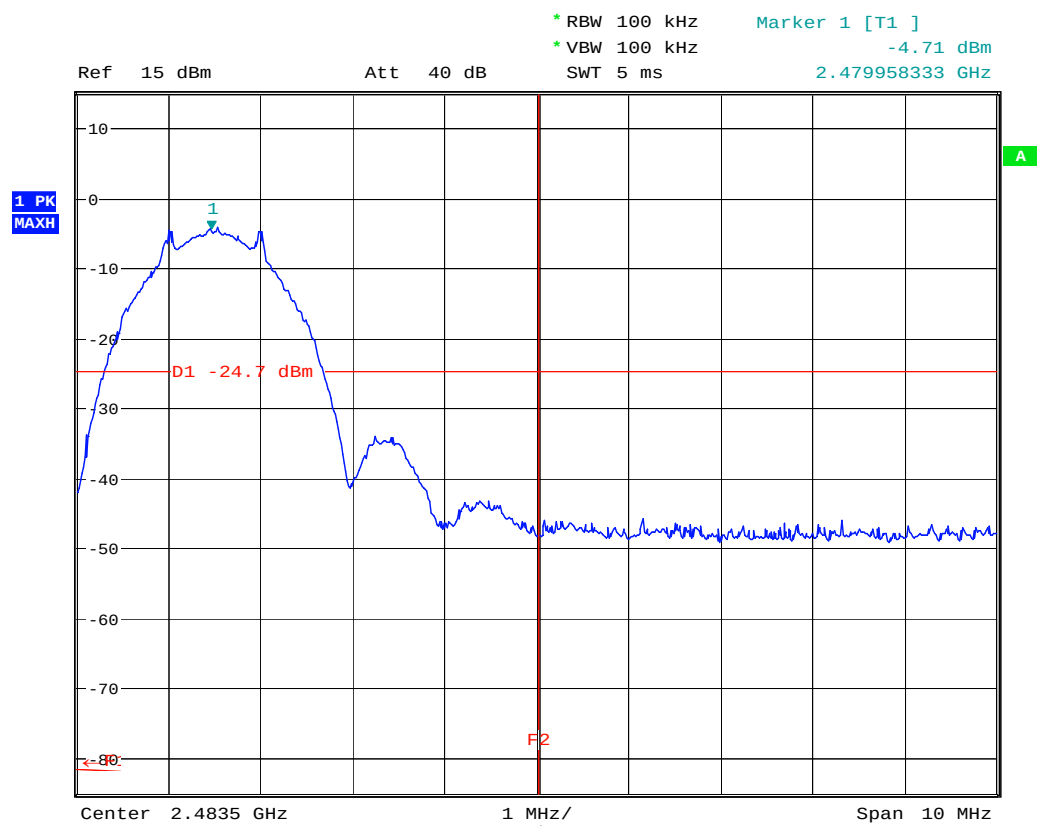
Lower Band Edge



Date: 7.NOV.2006 17:58:19

Bangedge

Upper Band Edge

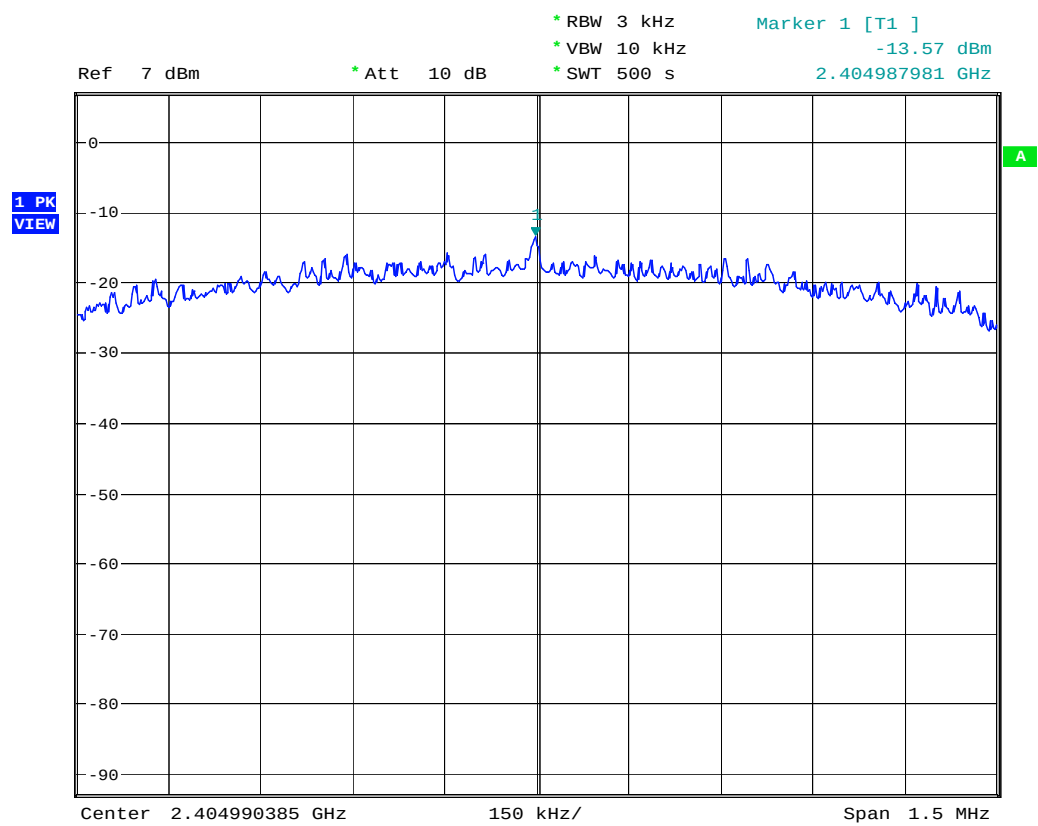


Date: 7.NOV.2006 17:59:41

Bandedge

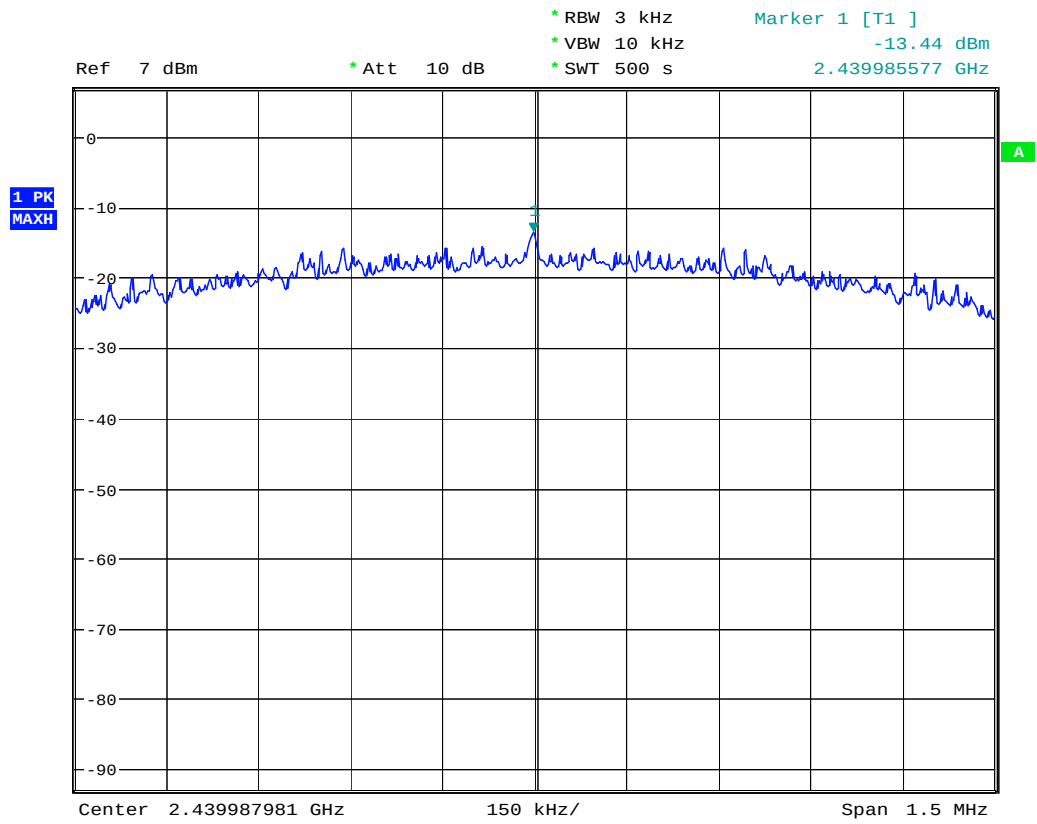
ANNEX E
POWER SPECTRAL DENSITY

Power Spectral Density Bottom Channel



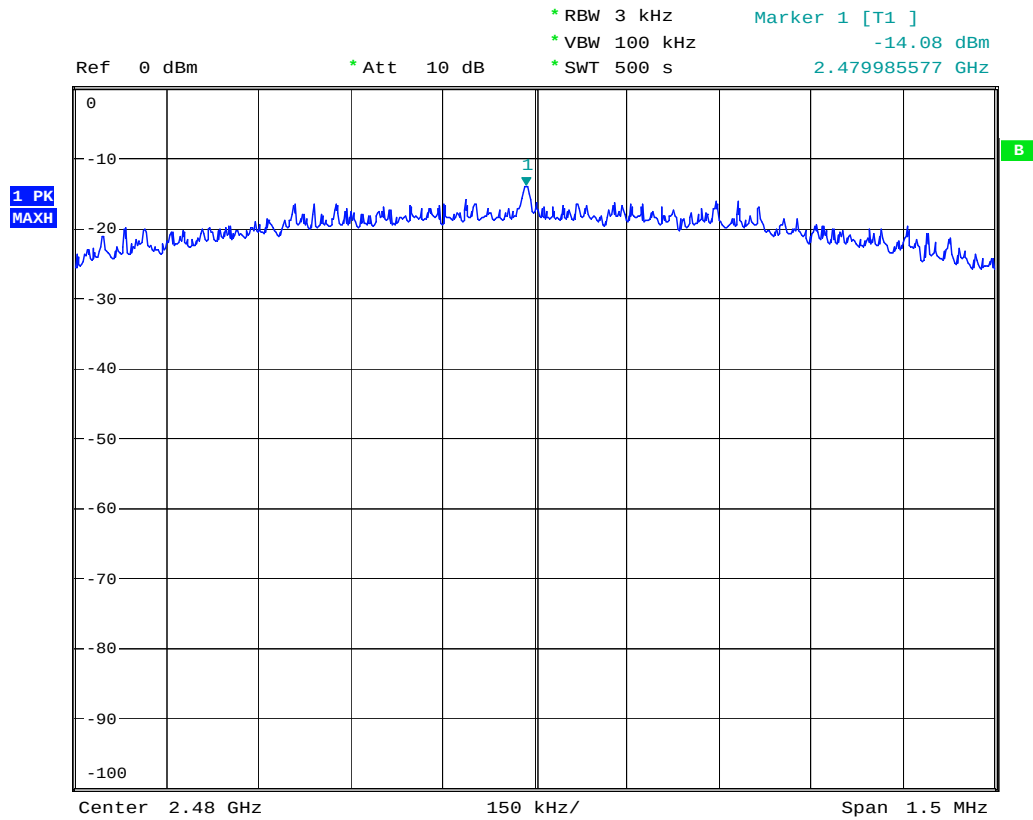
Date: 23.NOV.2006 10:15:40

Power Spectral Density Middle Channel



Date: 23.NOV.2006 10:39:52

Power Spectral Density Top Channel

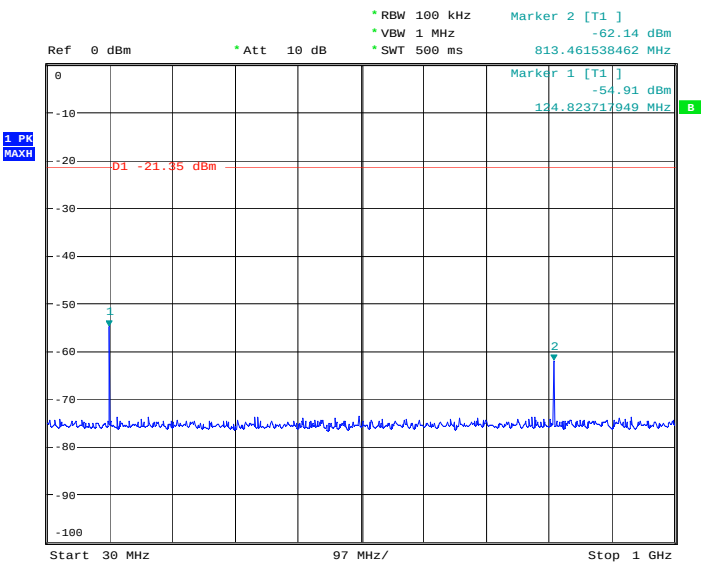


Date: 7.NOV.2006 10:12:55

ANNEX F
TRANSMITTER SPURIOUS EMISSIONS CONDUCTED

Bottom Channel

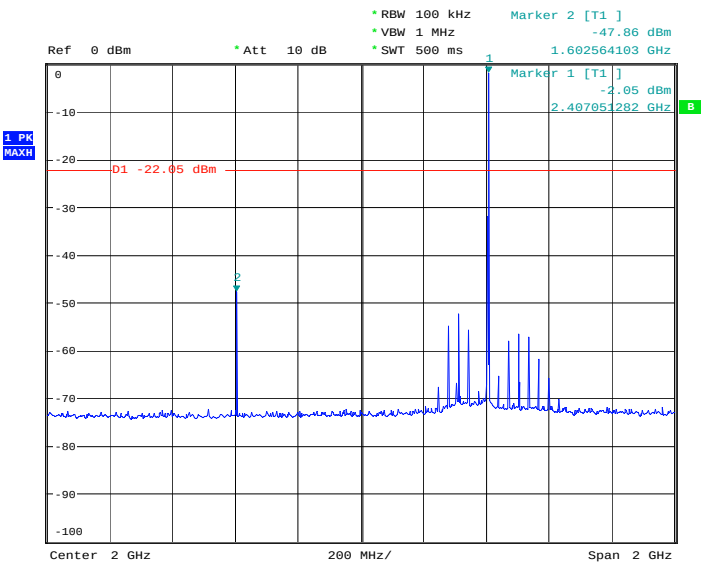
30 MHz – 1 GHz



Date: 6.NOV.2006 13:58:35

Bottom Channel

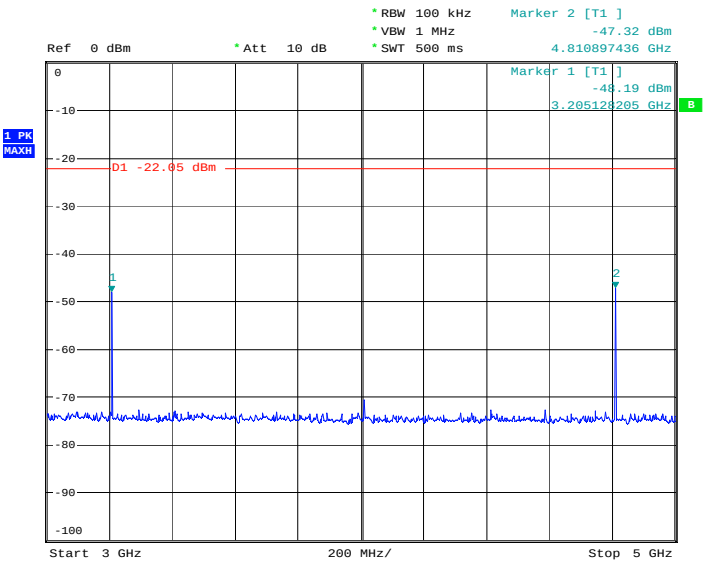
1 GHz – 3 GHz



Date: 6.NOV.2006 13:23:52

Bottom Channel

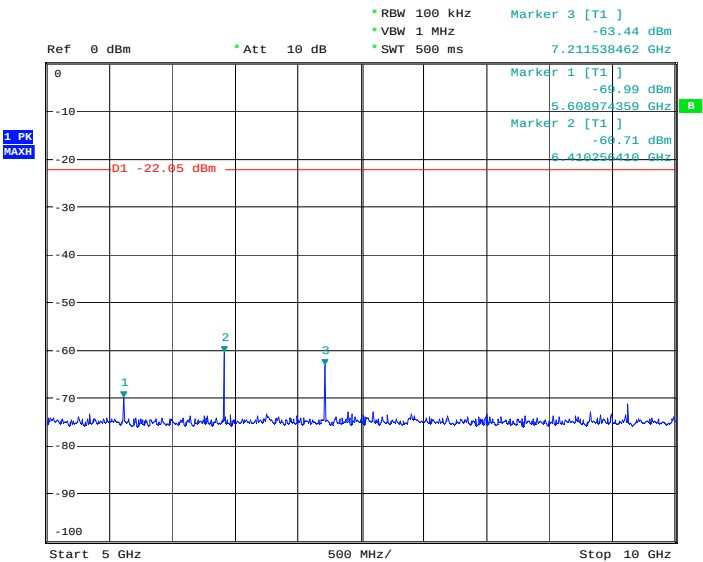
3GHz – 5 GHz



Date: 6.NOV.2006 13:25:47

Bottom Channel

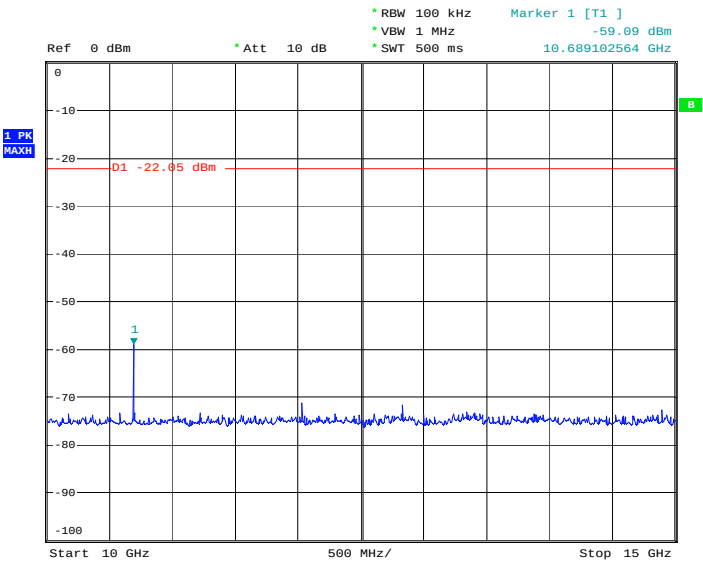
5 GHz – 10 GHz



Date: 6.NOV.2006 13:27:45

Bottom Channel

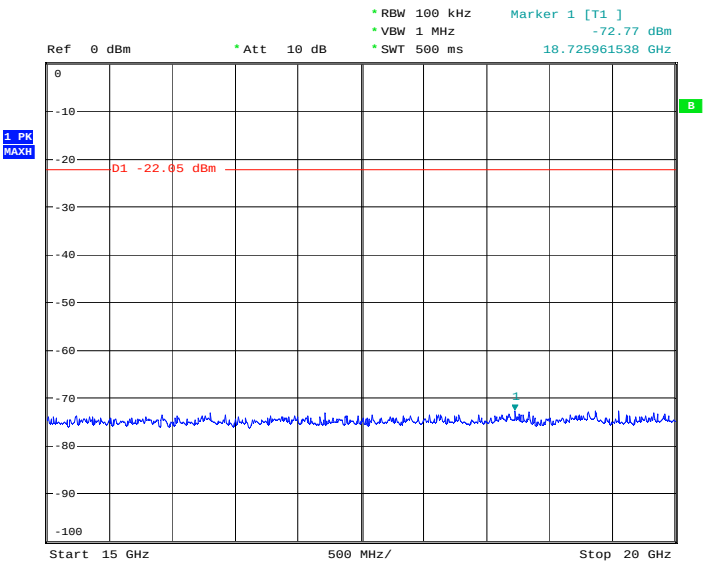
10 GHz- 15 GHz



Date: 6.NOV.2006 13:28:36

Bottom Channel

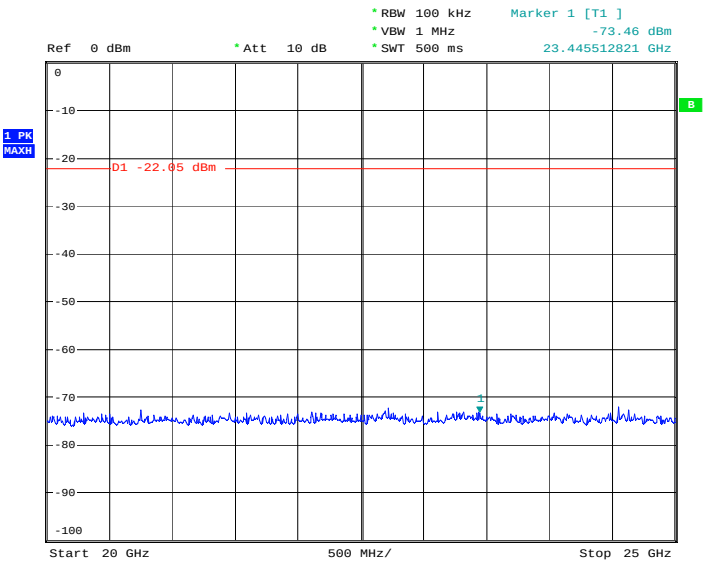
15 GHz – 20 GHz



Date: 6.NOV.2006 13:29:20

Bottom Channel

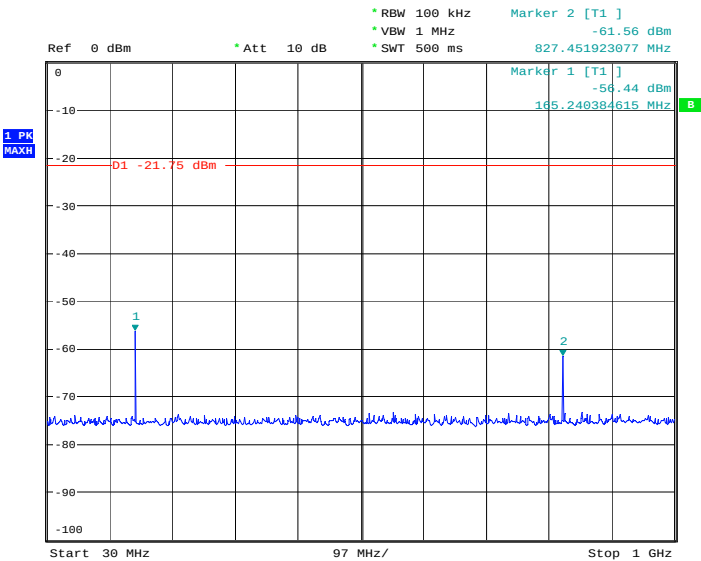
20 GHz – 25 GHz



Date: 6.NOV.2006 13:29:55

Top Channel

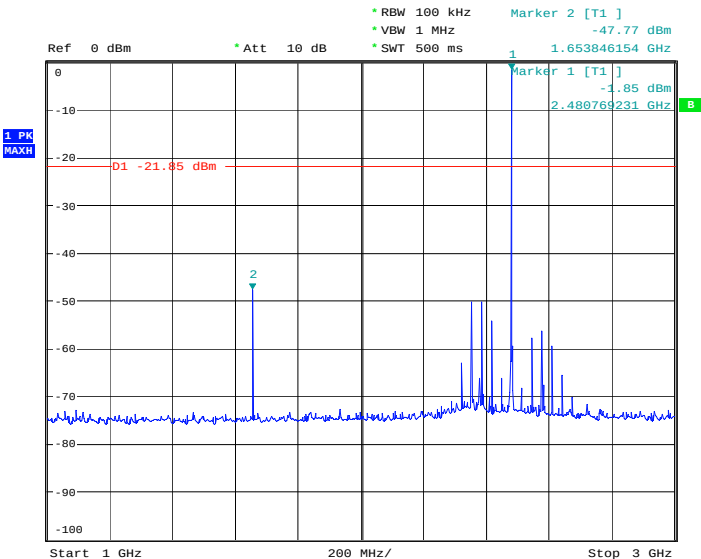
30 MHz – 1 GHz



Date: 6.NOV.2006 13:59:54

Top Channel

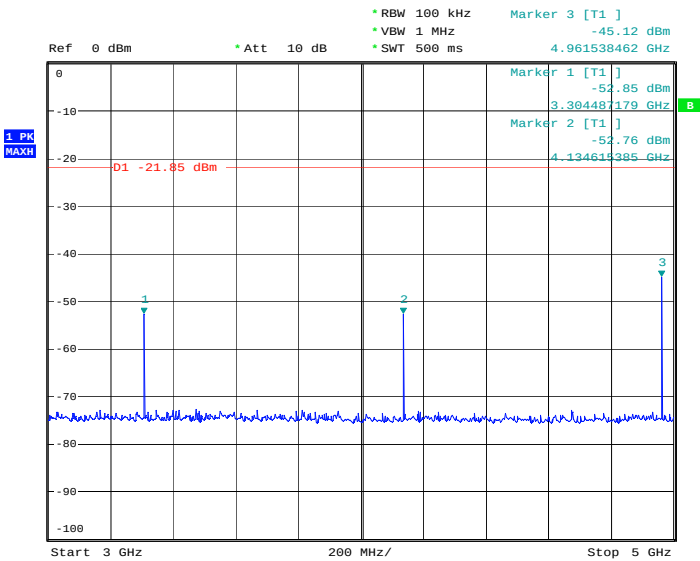
1 GHz – 3 GHz



Date: 6.NOV.2006 13:45:57

Top Channel

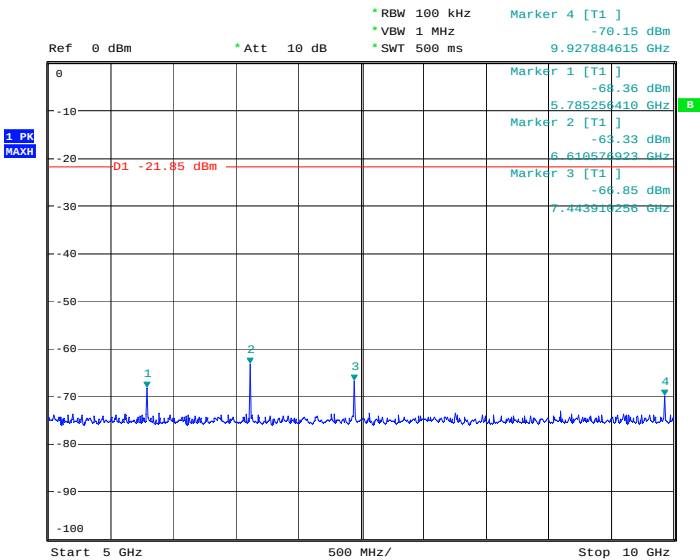
3GHz – 5 GHz



Date: 6.NOV.2006 13:47:13

Top Channel

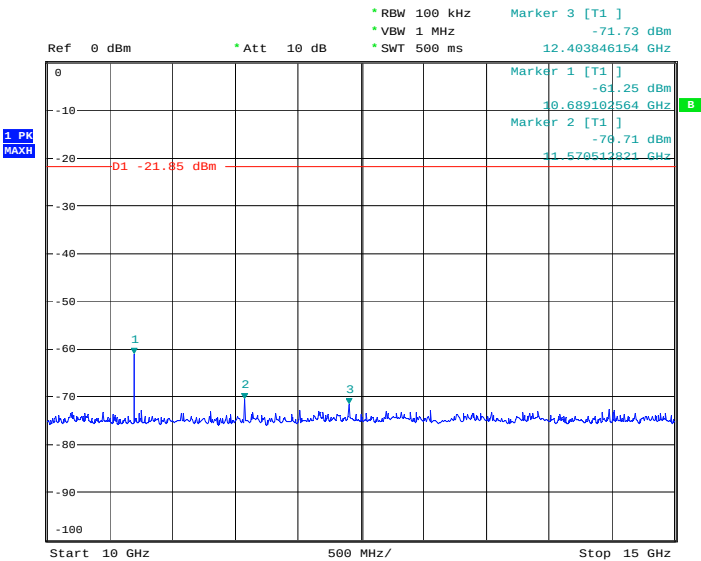
5 GHz – 10 GHz



Date: 6.NOV.2006 13:48:14

Top Channel

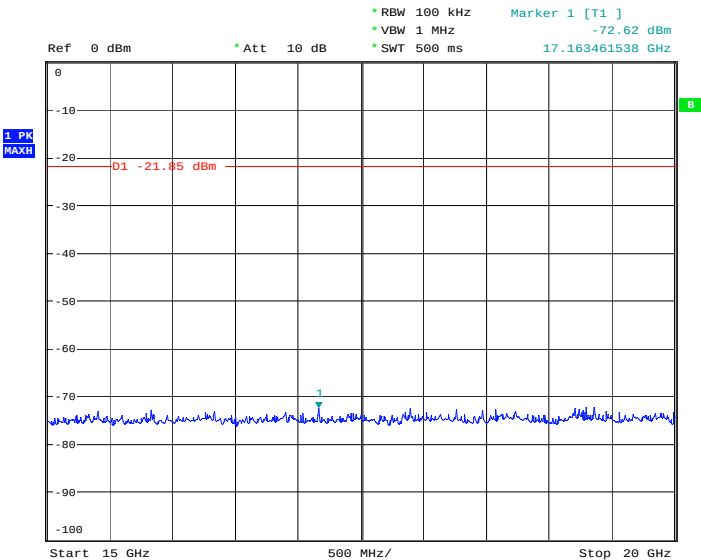
10 GHz- 15 GHz



Date: 6.NOV.2006 13:49:28

Top Channel

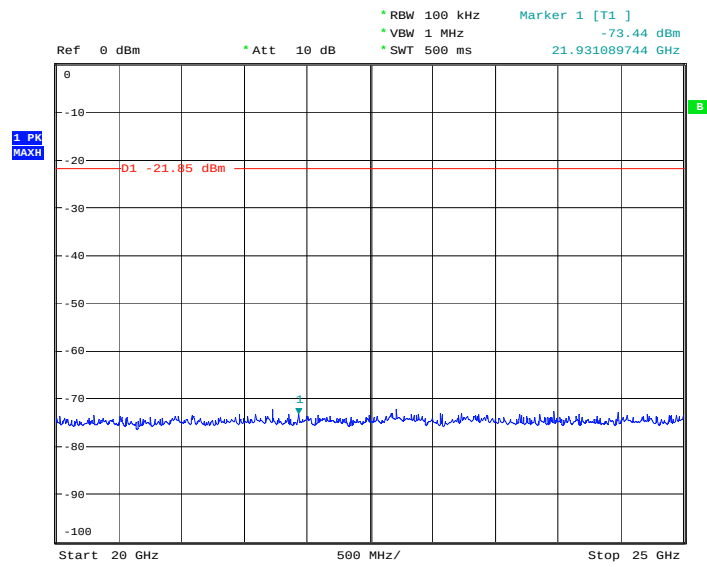
15 GHz – 20 GHz



Date: 6.NOV.2006 13:50:15

Top Channel

20 GHz – 25 GHz



Date: 6.NOV.2006 13:50:50

ANNEX G
TRANSMITTER SPURIOUS EMISSIONS RADIATED

Bottom Channel

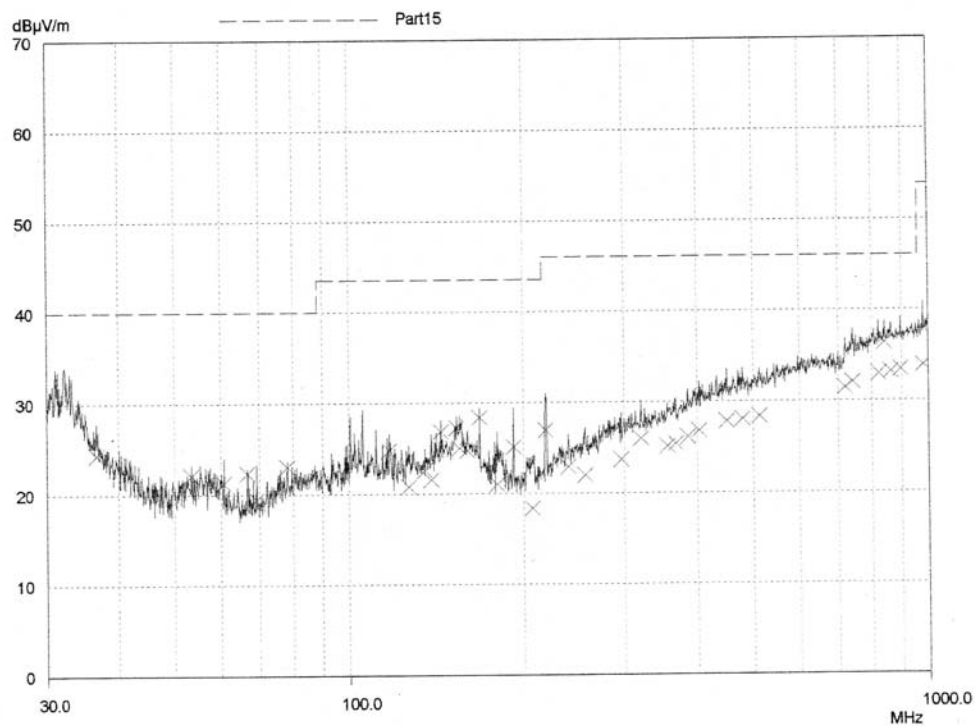
30 MHz – 1 GHz

TRL Compliance Services Ltd E-Field Radiation (30MHz-1GHz)

01 Nov 2006 11:16

EUT: 2.4GHz zigbee USB Dongle
 Manuf: Integration
 Op Cond: Prescan 30MHz - 1000MHz
 Operator: S Hodgkinson
 Test Spec: Part15
 Comment: Unit in Tx bottom channel .Unit in front USB slot on Pc ,facing Rx antenna
 Rx antenna Vertical

Scan Settings		(1 Range)			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30MHz	1000MHz	50kHz	120kHz	PK	1msec	Auto	ON	60dB
Transducer	No.	Start	Stop	Name				
1	21	30MHz	1000MHz	UH72				
	22	30MHz	1000MHz	UH93				
Final Measurement:		Detector:	X QP					
		Meas Time:	2sec					
		Subranges:	50					
		Acc Margin:	10 dB					



PAGE 1

Top Channel

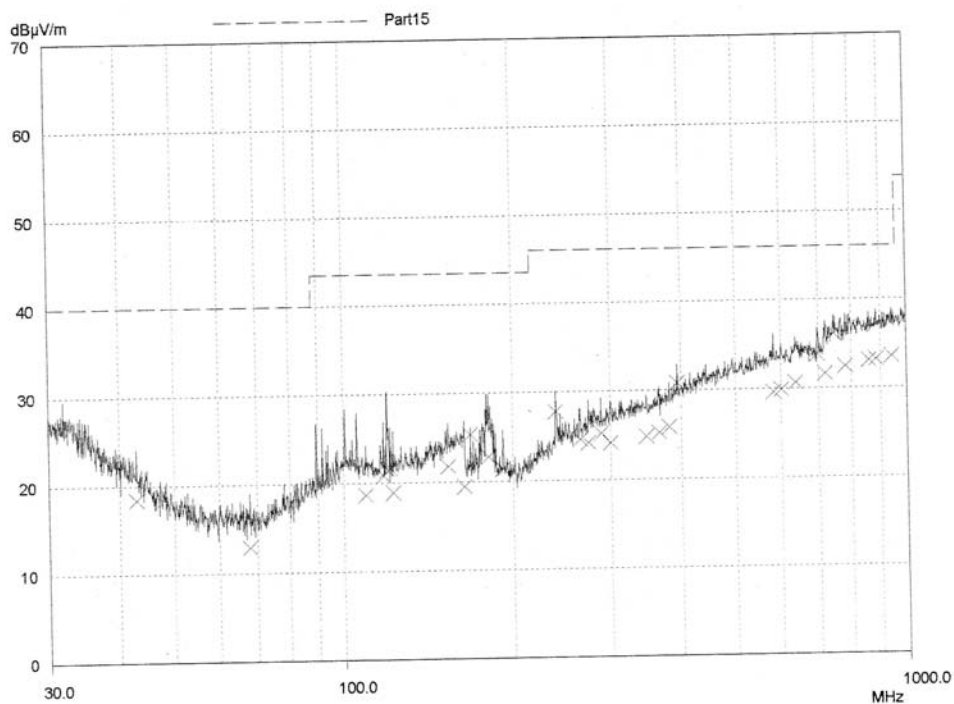
30 MHz – 1 GHz

TRL Compliance Services Ltd E-Field Radiation (30MHz-1GHz)

01 Nov 2006 11:55

EUT: 2.4GHz zigbee USB Dongle
Manuf: Integration
Op Cond: Prescan 30MHz - 1000MHz
Operator: S Hodgkinson
Test Spec: Part15
Comment: Unit in Tx top channel .Unit in front USB slot on Pc ,facing Rx antenna
Rx antenna Horizontal

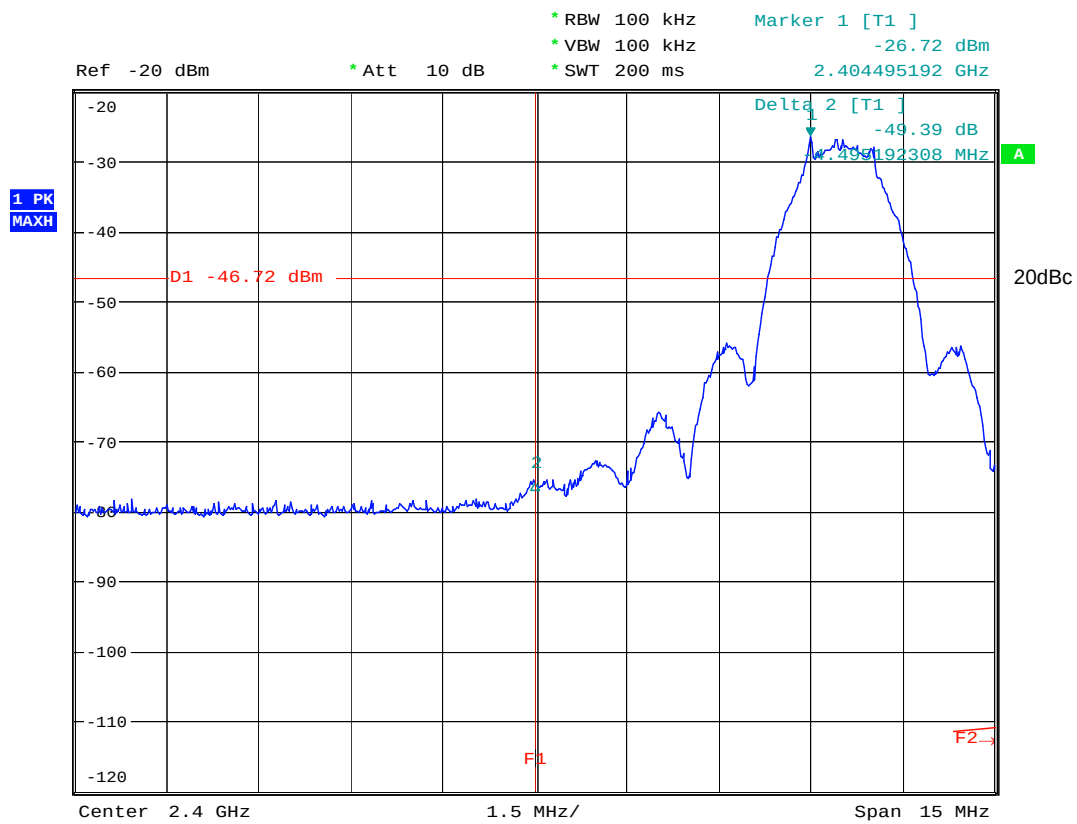
Scan Settings		(1 Range)			Receiver Settings					
Frequencies					IF BW	Detector	M-Time	Atten	Preamp	OpRge
Start	Stop	Step			120kHz	PK	1msec	Auto	ON	60dB
30MHz	1000MHz	50kHz								
Transducer	No.	Start	Stop		Name					
1	21	30MHz	1000MHz		UH72					
	22	30MHz	1000MHz		UH93					
Final Measurement:		Detector:	X QP							
		Meas Time:	2sec							
		Subranges:	50							
		Acc Margin:	10 dB							



PAGE 1

ANNEX H
BAND EDGE COMPLIANCE (Radiated)

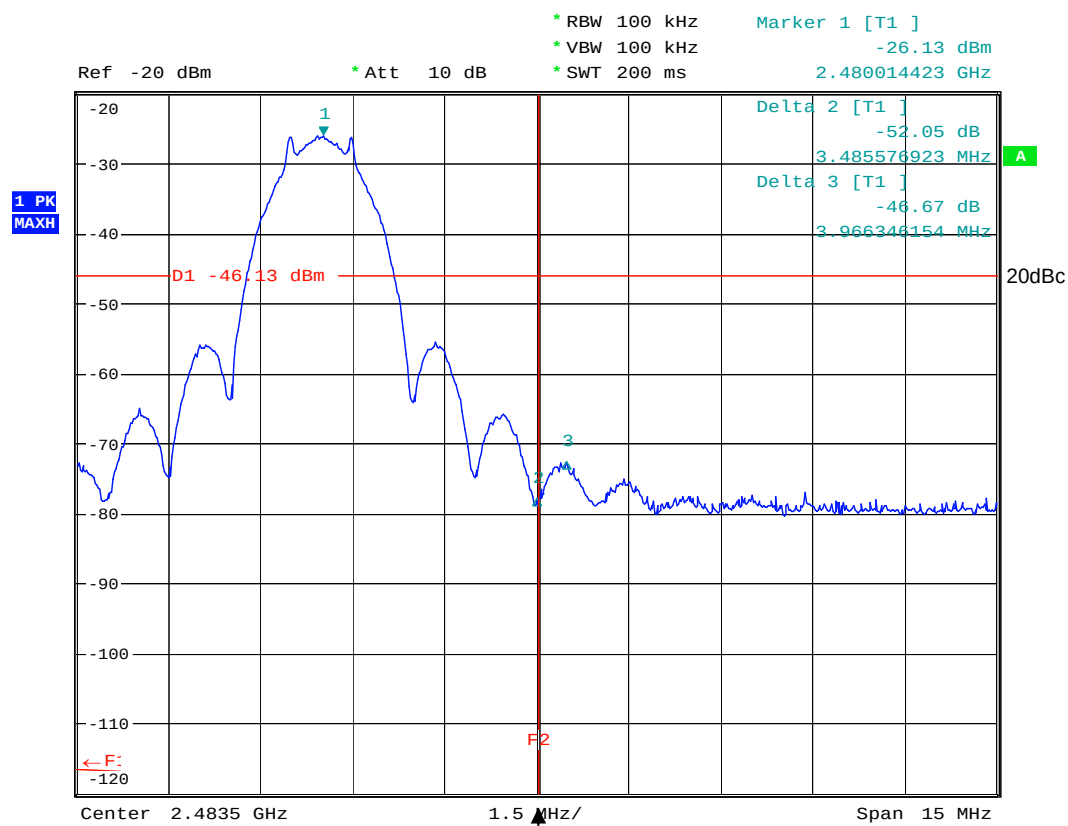
Lower Band Edge



Date: 21.NOV.2006 14:07:30

Bandedge

Upper Band Edge



Date: 8.NOV.2006 11:32:24

Bandedge

ANNEX I
AC POWER LINE CONDUCTION

TX Mode Bottom Channel

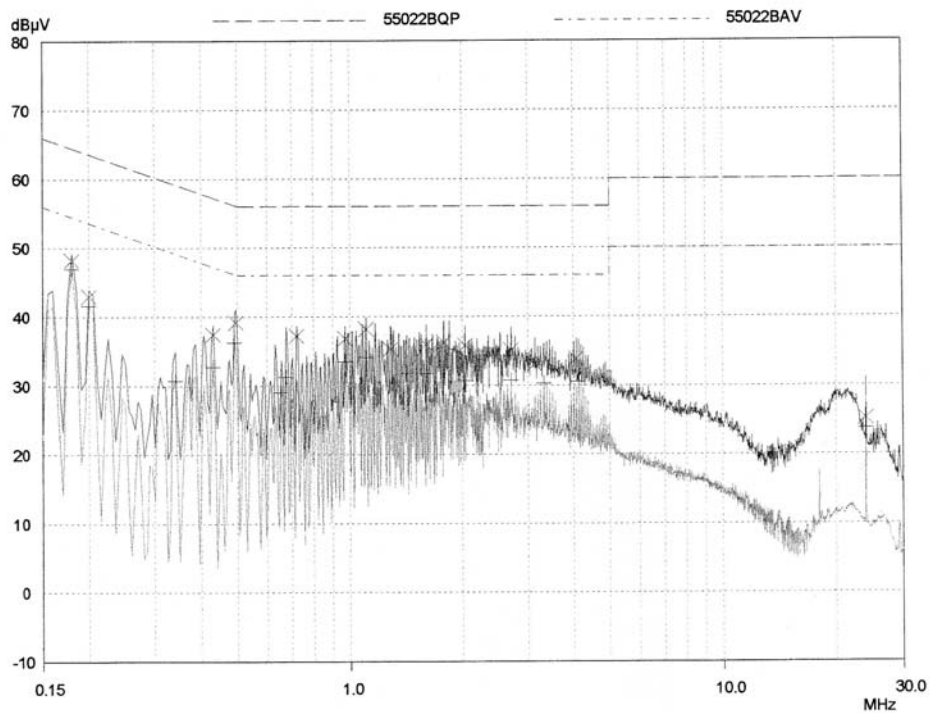
Powerline Conduction

01 Nov 2006 14:55

150kHz - 30MHz

EUT: 2.4GHz Zigbee USB Dongle
 Manuf: Integration
 Op Cond: LISN UH05, cable UH21 & Receiver UH187
 Operator: S Hodgkinson
 Test Spec: EN55022 Class B (or Variant)
 Comment: Live Line, 110Vac, 60Hz
 Dongle in Tx mode bottom channel.

Scan Settings		(1 Range)			Receiver Settings				
Frequencies		Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
Start	Stop								
150kHz	30MHz	5kHz	10kHz	PK+AV	50msec	Auto	OFF	60dB	
Transducer	No.	Start	Stop	Name					
	1	150kHz	30MHz	UH21					
Final Measurement:		Detectors:	X QP / + AV						
		Meas Time:	2sec						
		Subranges:	25						
		Acc Margin:	20 dB						



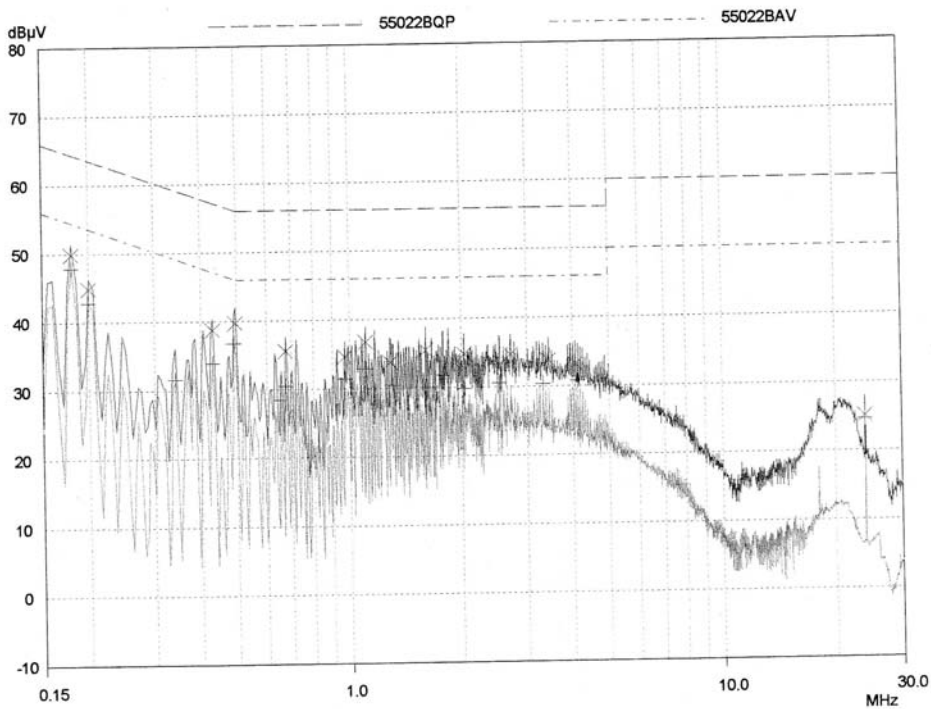
RX Mode Top Channel

02 Nov 2006 09:19

Powerline Conduction
150kHz - 30MHz

EUT: 2.4GHz Zigbee USB Dongle
Manuf: Integration
Op Cond: LISN UH05, cable UH21 & Receiver UH187
Operator: S Hodgkinson
Test Spec: EN55022 Class B (or Variant)
Comment: Neutral Line, 110Vac, 60Hz
Dongle in Rx mode top channel

Scan Settings			(1 Range)		Receiver Settings			
Frequencies			Start	Stop	IF BW	Detector	M-Time	Atten
			150kHz	30MHz	10kHz	PK+AV	50msec	Auto
			Step				Preamp	OpRge
			5kHz				OFF	60dB
Transducer	No.	Start	Stop	Name				
	1	150kHz	30MHz	UH21				
Final Measurement:			Detectors:	X QP / + AV				
			Meas Time:	2sec				
			Subranges:	25				
			Acc Margin:	20 dB				



ANNEX J
RECEIVER SPURIOUS EMISSIONS RADIATED

TRL Compliance Services Ltd

01 Nov 2006 14:00

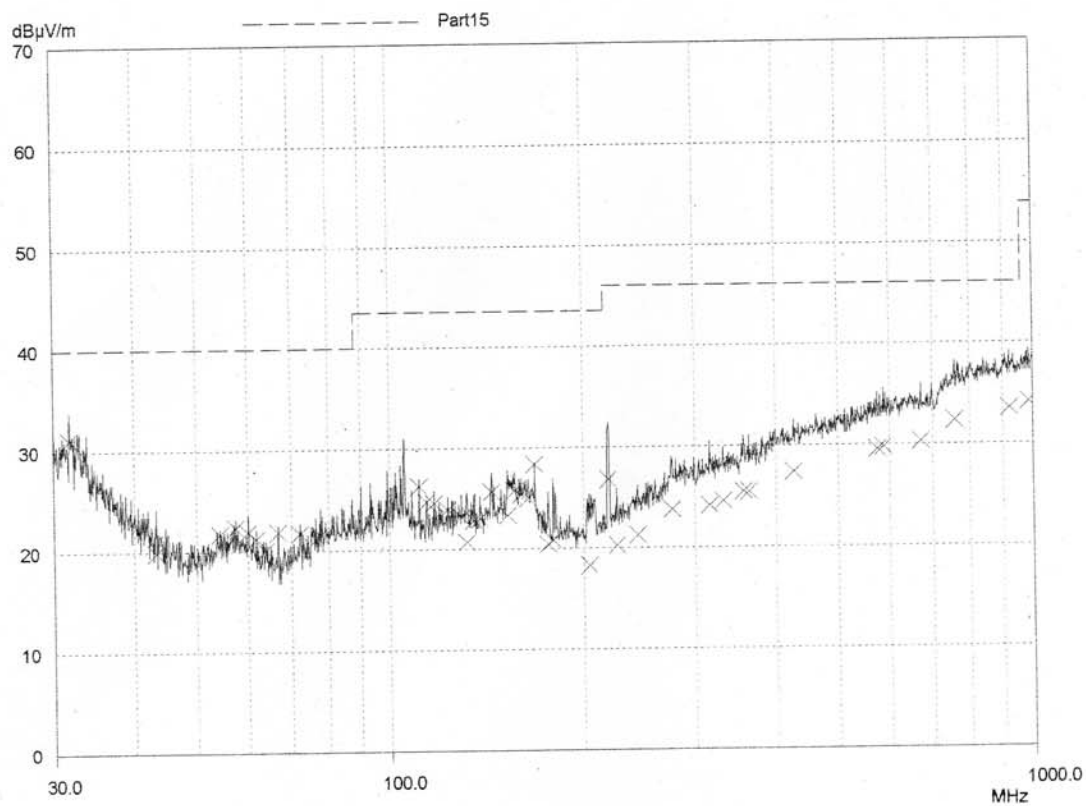
E-Field Radiation (30MHz-1GHz)

EUT: 2.4GHz zigbee USB Dongle
 Manuf: Integration
 Op Cond: Prescan 30MHz - 1000MHz
 Operator: S Hodgkinson
 Test Spec: Part15
 Comment: Unit in Rx top channel .Unit in front USB slot on Pc ,facing Rx antenna
 Rx antenna Vertical
 Result File: 1.dat : New Measurement

Scan Settings			(1 Range)			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
30MHz	1000MHz	50kHz	120kHz	PK	1msec	Auto	ON	60dB	

Transducer	No.	Start	Stop	Name
1	21	30MHz	1000MHz	UH72
	22	30MHz	1000MHz	UH93

Final Measurement: Detector: X QP
 Meas Time: 2sec
 Subranges: 50
 Acc Margin: 10 dB



ANNEX K
TEST EQUIPMENT CALIBRATION DETAILS

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH003	Receiver	R&S	24/07/2006	12	24/07/2007
UH005	LISN	R&S	11/04/2006	12	11/04/2007
UH006	3m Range ERP CAL	TRL	06/01/2006	12	06/01/2007
UH028	Log Periodic Ant	Schwarbeck	28/04/2005	24	28/04/2007
UH029	Bicone Antenna	Schwarbeck	27/04/2005	24	27/04/2007
UH041	Multimeter	AVOmeter	20/12/2005	12	20/12/2006
UH093	Bilog Antenna	Chase	19/08/2005	12	19/08/2006
UH120	Spectrum Analyser	Marconi	15/03/2005	12	15/03/2006
UH122	Oscilloscope	Tektronix	07/06/2005	24	07/06/2007
UH132	Power meter	Marconi	03/01/2006	12	03/01/2007
UH162	ERP Cable Cal	TRL	06/01/2006	12	06/01/2007
UH179	Power Sensor	Marconi	14/12/2004	12	14/12/2005
UH186	Receiver	R&S	01/02/2006	12	01/02/2007
UH228	Power Sensor	Marconi	03/01/2006	12	03/01/2007
UH253	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH254	1m Cable N type	TRL	05/01/2006	12	05/01/2007
UH265	Notch filer	Telonic	24/06/2005	12	24/06/2006
UH271	1m Cable N type	TRL	23/02/2006	12	23/02/2007
UH273	1m Cable N type	TRL	23/02/2006	12	23/02/2007
L005	CMTA	R&S	05/12/2005	12	05/12/2006
L007	Loop Antenna	R&S	29/03/2005	24	29/03/2007
L138	1-18GHz Horn	EMCO	15/04/2005	24	15/04/2007
L139	1-18GHz Horn	EMCO	03/05/2005	24	03/05/2007
L176	Signal Generator	Marconi	31/01/2005	12	31/01/2006
L193	Bicone Antenna	Chase	12/10/2003	24	12/10/2005
L203	Log Periodic Ant	Chase	21/10/2003	24	21/10/2005
L280	18GHz Cable	Rosenberger	05/01/2006	12	05/01/2007
L343	CCIR Noise Filter	TRL	07/06/2005	12	07/06/2006
L426	Temperature Indicator	Fluke	04/01/2006	12	04/01/2007
L479	Analyser	Anritsu	18/11/2005	12	18/11/2006
L552	Signal Generator	Agilent	25/04/2005	12	25/04/2006
N/A	High Pass Filter	AFL	23/02/2006	12	23/02/2007

ANNEX L
MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%**, Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**