TEST REPORT NO: RU1085/5229

COPY NO: 2

ISSUE NO: 1

FCC ID: OE5PenDTUUSB

REPORT ON THE CERTIFICATION TESTING OF A
Group 4 Technology Limited
ProxiPen DTU USB
WITH RESPECT TO
THE FCC RULES CFR 47, PART 15.209
INTENTIONAL RADIATOR SPECIFICATION

TEST DATE: 25th November – 2nd December 2003

TESTED BY: John Charters — J CHARTERS

APPROVED BY: Peter Green — P GREEN, PRODUCT MANAGER

DATE: 6th February 2004

Distribution:

Copy Nos:
1. Group 4 Technology Limited
2. FCC EVALUATION LABORATORIES
3. TRL EMC

THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE

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FS 21805

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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:	OE5PenDTUUSB
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 15.209
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	ProxiPen DTU USB
EQUIPMENT SERIAL No:	Engineering sample
ITU: EMISSION CODE:	19k2A1D
PRODUCT USE:	Tag reader
CARRIER EMISSION:	0.0017µV/m @ 300m
ANTENNA TYPE:	Integral
ALTERNATIVE ANTENNA:	Not applicable
BAND OF OPERATION:	0.009kHz – 0.490kHz
CHANNEL SPACING:	N/A wideband
NUMBER OF CHANNELS:	1
FREQUENCY GENERATION:	SAW Resonator [X] Crystal [ ] Synthesiser [ ]
MODULATION METHOD:	Amplitude [ ] Digital [X] Angle [ ]
POWER SOURCE(s):	5Vdc via USD port 9Vdc via external PSU
TEST DATE(s):	25th November – 2nd December 2003
ORDER No(s):	PRP10119
APPLICANT:	Group 4 Technology Limited
ADDRESS:	Challenge House Northway Lane Tewkesbury Gloucester GL19 4QH

TESTED BY: John Charters — J CHARTERS

APPROVED BY: Peter Green — P GREEN, PRODUCT MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	ProxiPen DTU USB
SERIAL NUMBER OF EUT:	Engineering sample
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 15.209
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	PRP10119
APPLICANT'S CONTACT PERSON(s):	Mr Eric Porter
E-mail address:	Eric.porter@g4tech.co.uk
APPLICANT:	Group 4 Technology Limited
ADDRESS:	Challenge House Northway Lane Tewkesbury Gloucester GL19 4QH
TEL:	+44 (0)1684 850977
FAX:	+44 (0)1684 294845
MANUFACTURER:	Group 4 Technology Limited
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	25th November – 2nd December 2003
TEST REPORT No:	RU1085/5229

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	DETECTOR	APPLICABILITY
Intentional Emission Frequency:	15.209(a)	Average	Yes
Intentional Emission Field Strength:	15.209(a)	Average	Yes
Intentional Emission Band Occupancy:	15.215(c)	Peak	Yes
Intentional Emission ERP (mW):	-	-	No
Spurious Emissions – Conducted:	15.207	Quasi Peak Average	Yes
Spurious Emissions – Radiated <1000MHz:	15.209	Quasi Peak Average	Yes
Spurious Emissions – Radiated >1000MHz:	-	-	No
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: 19k2A1D

3. Duty Cycle: 100%

4. Transmitter bit or pulse rate and level: 19200Bd

5. Temperatures: Ambient (Tnom) 12°C

6. Supply Voltages: Vnom 5Vdc

Note: Vnom voltages are as stated above unless otherwise shown on the test report page

7. Equipment Category:
   - Single channel [X]
   - Two channel [ ]
   - Multi-channel [ ]

8. Channel spacing:
   - Narrowband [ ]
   - Wideband [X]

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – RADIATED – PART 15.209

Ambient temperature	=	12°C(<1GHz)	3m measurements <30MHz	[X]
Relative humidity	=	64% (<1GHz),	3m measurements <1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	300m extrapolated from 3m	[X]
Supply voltage	=	5Vdc	30m extrapolated from 3m	[X]
Channel number	=	1		

	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACT.	FIELD STRENGTH (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)	LIMIT (µV/m)
0.009MHz - 0.490MHz								
0.490MHz - 1.705MHz								
1.705MHz - 30.0MHz								
30MHz - 88MHz	33.2	6.0	0.5	16.5	23.0	-	14.1	100
	63.7	14.95	0.6	5.05	20.6	-	10.7	100
88MHz - 216MHz								
216MHz - 960MHz	324.9	18.85	1.9	13.65	34.4	-	52.48	200
	389.9	19.1	2.0	15.2	36.3	-	65.31	200
	431.9	18.5	2.2	16.4	37.1	-	71.6	200
	498.4	17.3	2.6	17.2	37.1	-	71.6	200
	584.85	18.55	2.8	18.65	40.0	-	100.0	200
	649.8	23.7	3.0	19.1	45.8	-	194.9	200
	664.1	8.2	3.1	19.0	30.3	-	32.73	200
	813.75	16.3	3.6	20.1	40.0	-	100.00	200
	895.1	11.1	3.9	20.2	35.2	-	57.54	200
960MHz - 1GHz								
1GHz - 5GHz								

Limits	0.009MHz to 0.490MHz	2400/F(kHz)µV/m @ 300m
	0.490MHz to 1.705MHz	24000/F(kHz)µV/m @ 30m
	1.705MHz to 30MHz	30µV/m @ 30m
	30MHz to 88MHz	100µV/m @ 3m
	88MHz to 216MHz	150µV/m @ 3m
	216MHz to 960MHz	200µV/m @ 3m
	960MHz to 1GHz	500µV/m @ 3m
	1GHz to 5GHz	500µV/m @ 3m

Notes:

1. Results quoted are extrapolated as indicated
2. Emissions were searched to: (**x**) 1000MHz inclusive, as per Part 15.33a
3. Extrapolation factor 9.5dB from 1m to 3m, as per Part 15.31f
4. Extrapolation factor 80dB from 3m to 300m as per Part 15.31f
5. Extrapolation factor 40dB from 3m to 30m as per Part 15.31f
6. Measurements >1GHz @ 1m as per Part 15.31f(1)
7. Receiver detector 9kHz – 30MHz CISPR, Quasi-Peak, 10kHz bandwidth.
   Apart from the bands 9kHz-90kHz and 110kHz-490kHz where an Average detector is used.
8. Receiver detector 30MHz<1GHz = CISPR, Quasi-Peak, 120kHz bandwidth
9. Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth
10. New batteries used for battery powered products.
11. Emissions 20dB's below the limit are not necessarily recorded.
12. For emissions below 30MHz, the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
13. For emissions below 30MHz the cable losses are assumed to be negligible.

Test Method:

1. As per Radio – Noise Emissions, ANSI C63.4: 2001
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.(above 30MHz only)
   Horizontal and vertical polarisations, of the receive antenna.
   EUT orientation in three orthagonal planes.
   Maximum results recorded.

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

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	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	X
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	X
RANGE 1	TRL	3 METRE	N/A	UH06	X
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	X
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	X
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	X

TRANSMITTER TESTS

TRANSMITTER INTENTIONAL EMISSION – RADIATED – Part 15.209

Ambient temperature	=	10°C(<1GHz),	3m measurements @ fc	[X]
Relative humidity	=	70RH%(<1GHz),	10m measurements @ fc	[ ]
Conditions	=	Open Area Test Site (OATS)	30m measurements @ fc	[ ]
Supply voltage	=	+5Vdc	300m extrapolated from 3m	[X]
Channel number	=	1	30m extrapolated from 10m	[ ]

FREQ. (MHz)	MEASUREMENT DISTANCE (METERS)	MEASUREMENT Rx. READING (dBµV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (µV/m)
125.33	3	24.8	80.0	0.0017

Limit value @ fc	**19.2µV/m @ 300m**	
Band occupancy @ -20dBc	**f lower**	**f higher**
	110.00kHz	142.20kHz

See spectrum analyser plot – Annex C

Notes:

1. Results quoted are extrapolated as indicated
2. Receiver detector @ fc = Average 10kHz bandwidth, measurement time = 100ms
3. When battery powered the EUT was powered with new batteries
4. For emissions below 30MHz the measuring receiver automatically compensates for the loss due to the antenna factor of the loop antenna. This loss is 20dB's across the measurement range 9kHz to 30MHz.
5. For emissions below 30MHz the cable losses are assumed to be negligible.
6. Peak emissions were found to be less than or equal to the average emission therefore deemed to comply with 15.35(b). See scan data Annex E
7. The test results quoted are the maximum seen after the supply voltage was varied between 85% and 115% of Vnom.
8. The emissions recorded above are the worst case after the unit was tested with the following supply options
   5Vdc power via PC USB port
   9Vdc external 110Vac power brick

Test Method:

1. As per Radio – Noise Emissions, ANSI C63.4: 2001
2. Measuring distances 3m
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.(above 30MHz only)
   Horizontal and vertical polarisations, of the receive antenna.
   EUT orientation in three orthagonal planes.
   Maximum results recorded

The test equipment used for the Transmitter Intentional Emission – Radiated – Part 15.209 tests is shown overleaf:

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	
SPECTRUM ANALYSER	TEKTRONIX	2756P	B010109	164	
BICONE ANTENNA	CHASE	BBA9106	N/A	193	
ANTENNA, LOG PERIODIC 300MHz – 1GHz	CHASE	UPA6108	1061	203	
RECEIVER	ROHDE & SCHWARZ	ESHS20	837960/003	237	
ANTENNA, BICONE 20MHz - 300MHz	CHASE	VBA6106A	1193	251	
BILOG ANTENNA	CHASE	CBL6112	2098	274	
RECEIVER	ROHDE & SCHWARZ	ESVS10	837948/003	317	
RECEIVER	ROHDE & SCHWARZ	ESVS10	844594/003	352	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
V / UHF RECEIVER 20MHz - 1GHz	ROHDE & SCHWARZ	ESVS 20	838804 / 005	415	
BILOG ANTENNA	SCHAFFNER	CBL6112B	2761	431	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	**X**
RECEIVER	ROHDE & SCHWARZ	ESVS 10	825892/003	UH04	
RANGE 1	TRL	3 METRE	N/A	UH06	**X**
AE, LOOP, Z2, 9kHz - 30MHz	ROHDE & SCHWARZ	HFH2	881058 - 53	07	**X**
BILOG ANTENNA	CHASE	CBL6112	2129	UH93	
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

TRANSMITTER TESTS

TRANSMITTER CONDUCTED EMISSIONS – AC POWER LINE Part 15.207

Ambient temperature	=	20°C(<1GHz),
Relative humidity	=	64%(<1GHz),
Conditions	=	Power Line Laboratory
Supply voltage	=	110V AC
Supply Frequency	=	60Hz

FREQUENCY (MHz)	MEASUREMENT RECEIVER READING (dBµV)	DETECTOR	CONDUCTOR (L or N)	LIMIT (dBµV)
0.15	60.80	Quasi Peak	L	66.0
0.27	45.25	Quasi Peak	L	61.12
0.285	43.68	Quasi Peak	L	60.67
0.405	40.02	Quasi Peak	L	57.75
25.495	8.66	Quasi Peak	L	60.00
0.15	9.4	Average	L	56.00
0.275	21.04	Average	L	50.97
0.285	15.92	Average	L	50.67
0.41	27.55	Average	L	47.65

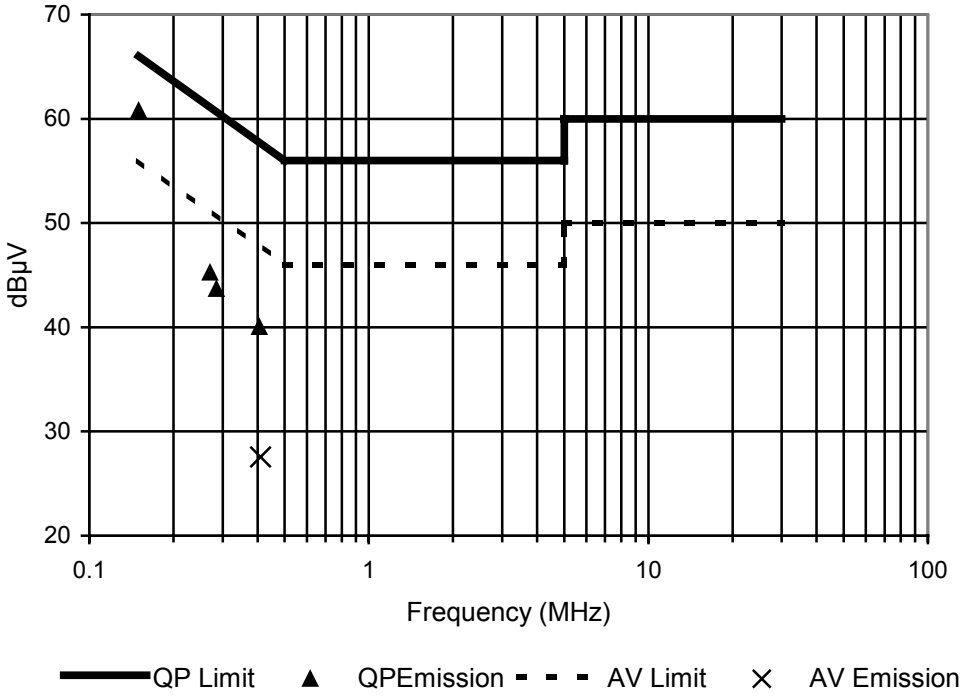
Notes:
1 See attached plot
2 Measurements were taken both live & neutral lines, worst case levels are recorded in the table.

Test Method:
1 As per Radio – Noise Emissions, ANSI C63.4: 2001

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	ESHS20	837960/003	237	
LISN / AMN	ROHDE & SCHWARZ	ESH3-Z5	83746/010	289	
RECEIVER	ROHDE & SCHWARZ	ESHS10	844077/019	353	
RECEIVER	ROHDE & SCHWARZ	ESHS 10	830051/001	UH03	**X**
LISN/AMN	ROHDE & SCHWARZ	ESH3-Z5	863906/018	UH05	**X**
SPECTRUM ANALYSER	MARCONI	2386/2380	152076/004	UH120	

POWER LINE CONDUCTION EMISSIONS



ANNEX A

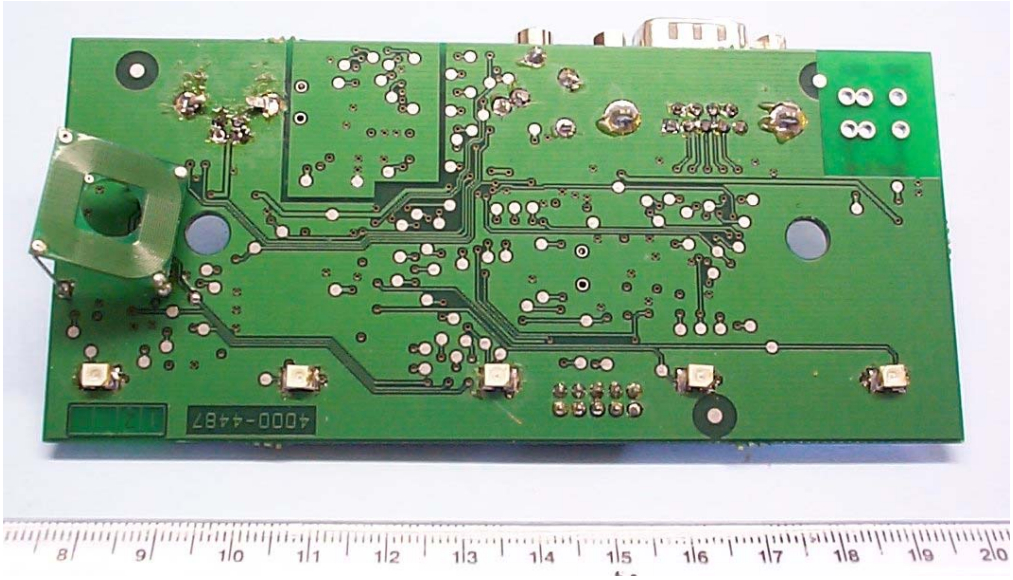
PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

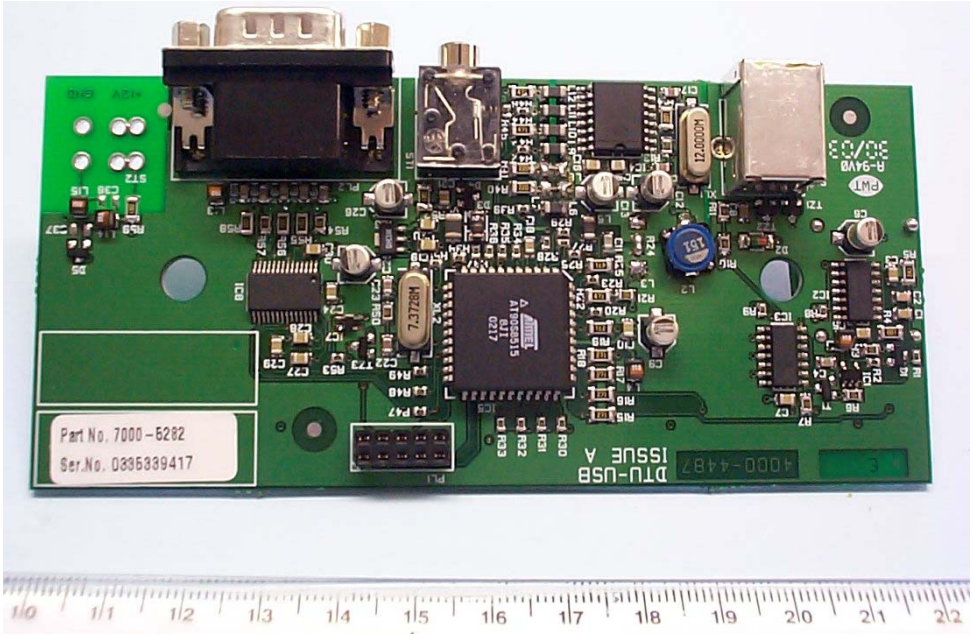
PHOTOGRAPH No. 2 **TRANSMITTER FRONT VIEW**

PHOTOGRAPH No. 3 **TRANSMITTER REAR VIEW**

PHOTOGRAPH No. 4 **TRANSMITTER PCB TRACK SIDE**



PHOTOGRAPH No. 5 **TRANSMITTER PCB COMPONENT SIDE**



PHOTOGRAPH No. 6 **TEST SETUP**

ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

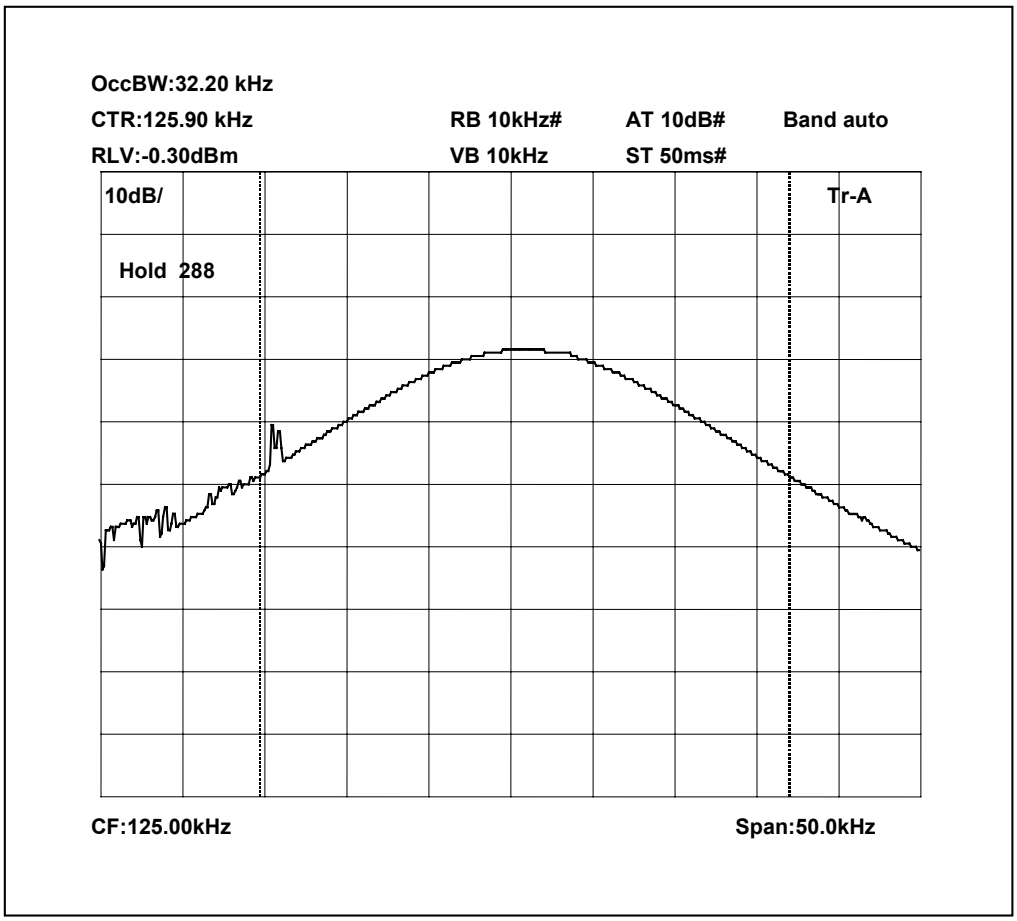
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

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	[ ]
		-	DECLARATION	[ ]
		-	DRAWINGS	[X]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C

BANDWIDTH PLOT

BANDWIDTH PLOT



Bandwidth @-20dBc = 32.2kHz
Fl = 110.00kHz
Fh = 142.20kHz

ANNEX D

SCAN DATA

TRL Compliance Services Ltd 25 Nov 2003 11:55

E-Field Radiation

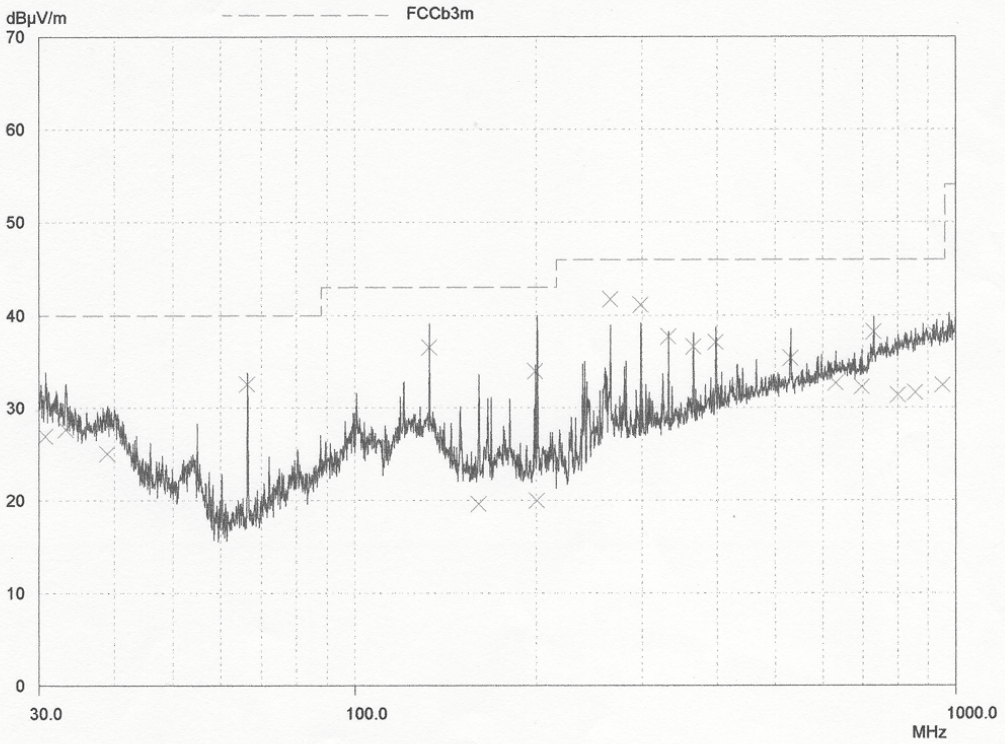
EUT:	USB DTU RU1085
Manuf:	Group 4
Op Cond:	3m Indoor Prescan
Operator:	J. Charters
Test Spec:	CFR47 FCC part 15.109 (Class B)
Comment:	DTU reading pen

Scan Settings (1 Range)

Frequencies			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	15	30MHz	1000MHz	TRLUH72
	21	30MHz	1000MHz	CBL6112B

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



PAGE 1

Powerline Conduction

02 Dec 2003 11:52

150kHz - 30MHz

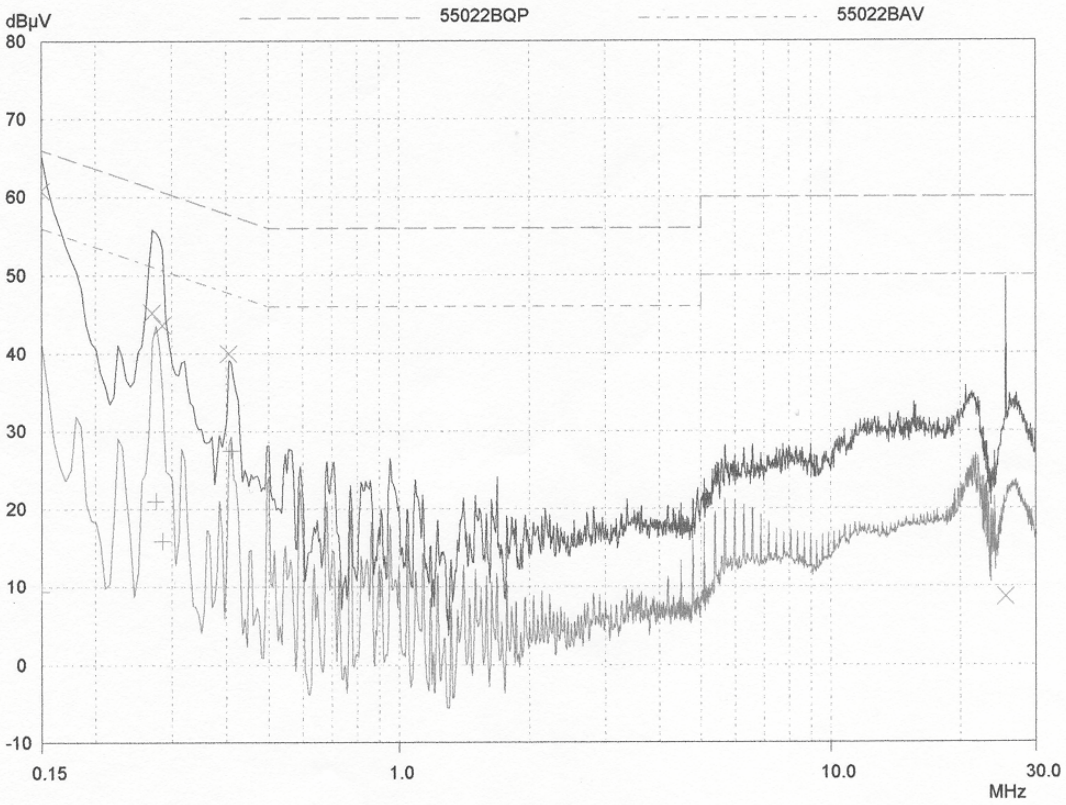
EUT:	DTU
Manuf:	Group 4
Op Cond:	LISN UH5, UH21
Operator:	J Charters
Test Spec:	EN55022 Class B (or Variant)
Comment:	Live
	110Vdc

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
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



PAGE 1

Powerline Conduction

150kHz - 30MHz

02 Dec 2003 12:07

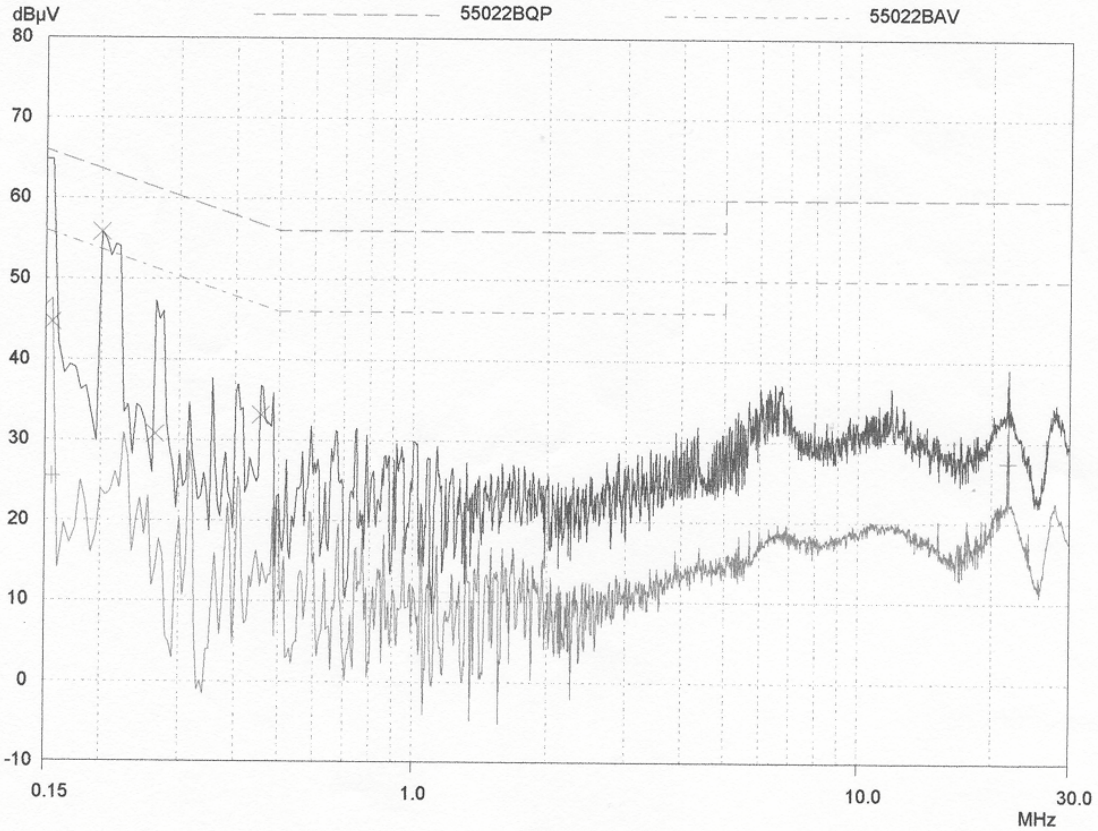
EUT:	DTU
Manuf:	Group 4
Op Cond:	LISN UH5, UH21
Operator:	J Charters
Test Spec:	EN55022 Class B (or Variant)
Comment:	neutral 110Vdc

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
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



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