

**TRaC Wireless Test Report : TTR-000499WUS1**

**Applicant** : Widex A/S

**Apparatus** : USB Link

**Specification(s)** : CFR47 Part 15 October 2009

**Purpose of Test** : Certification

**FCCID** : TTY- USBL

**IC ID** : 5676B- USBL

**Authorised by** :



: Radio Product Manager

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**Section 1:**

**Introduction**

**1.1 General**

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

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## **1.2 Tests Requested By**

This testing in this report was requested by :

Widex A/S  
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## **1.3 Manufacturer**

Widex A/S  
Nymoellevej 6  
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## **1.4 Apparatus Assessed**

The following apparatus was assessed between 24/06/10 and 29/06/10.

USB Link

The above equipment was a programming unit for the C4 series hearing aids.

## 1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

Test Type	Regulation	Measurement standard	Result
Spurious Emissions Radiated <1000MHz	Title 47 of the CFR: Part 15 Subpart (c) 15.209	ANSI C63.10	Pass
Spurious Emissions Radiated >1000MHz	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10	N/A
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart (c) 15.207	ANSI C63.10	N/A
Intentional Emission Frequency	Title 47 of the CFR: Part 15 Subpart (c) 15.209	ANSI C63.10	Pass
Intentional Emission Field Strength:	Title 47 of the CFR: Part 15 Subpart (c) 15.209	ANSI C63.10	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.215	ANSI C63.10	Pass
Intentional Emission ERP (mW)	Title 47 of the CFR: Part 15 Subpart (c)	ANSI C63.10	N/A
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart (b) 15.109	ANSI C63.10	Pass
Antenna Arrangements Integral:	Title 47 of the CFR: Part 15 Subpart (c) 15.203	-	Pass
Antenna Arrangements External Connector	Title 47 of the CFR: Part 15 Subpart (c) 15.204	-	-
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	-
Maximum Frequency Of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	-
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	-

Abbreviations used in the above table:

CFR : Code of Federal Regulations  
REFE : Radiated Electric Field Emissions

ANSI : American National Standards Institution  
PLCE : Power Line Conducted Emissions

## **1.6 Notes Relating To The Assessment**

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, "Pass" indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %
Barometric Pressure	: 86 to 106 kPa

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

## **1.7 Deviations from Test Standards**

There were no deviations from the standards tested to.

## Section 2:

## Measurement Uncertainty

### 2.1 Application of Measurement Uncertainty

The following table contains the measurement uncertainties for measurements

The following procedure is used when determining the result of a measurement :

- (i) If specification limits are not exceeded by the measured result, extended by the positive component of the expanded uncertainty interval at a confidence level of 95%, then a pass result is recorded.
- (ii) Where a specification limit is exceeded by the result even when the result is decreased by the negative component of the expanded uncertainty interval, a fail result is recorded.
- (iii) Where measured result is below a limit, but by a margin less than the positive measurement uncertainty component, it is not possible to record a pass based on a 95% confidence level. However, the result indicates that a pass result is more probable than a fail result.
- (iv) Where a measured result is above a limit, but by a margin less than the negative measurement uncertainty component, it is not possible to record a fail based on a 95% confidence level. However the result indicates that a fail is more probable than a pass.

## 2.2 Measurement Uncertainty Values

For the test data recorded in accordance with note (iii) of Section 2.1 the following measurement uncertainty was calculated:

### Radiated Electric Field Emissions

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150 kHz	Amplitude dB( $\mu$ V/m)	$\pm 1.6$ dB
150 kHz to 30 MHz	Amplitude dB( $\mu$ V/m)	$\pm 2.1$ dB
30MHz to 300MHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 5.1$ dB
30MHz to 300MHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 5.2$ dB
300MHz to 1GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 5.4$ dB
300MHz to 1GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 5.2$ dB
1GHz to 18GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.4$ dB
1GHz to 18GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.4$ dB
18GHz to 26.5GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.2$ dB
18GHz to 26.5GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.2$ dB
26.5GHz to 40GHz Horizontal	Amplitude dB( $\mu$ V/m)	$\pm 4.3$ dB
26.5GHz to 40GHz Vertical	Amplitude dB( $\mu$ V/m)	$\pm 4.3$ dB



**Section 3:**

**Modifications**

**3.1 Modifications Performed During Assessment**

No modifications were performed during the assessment

**Appendix A:****Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test	Ref	: Reference
SE	: Support Equipment	Freq	: Frequency
L	: Live Power Line	MD	: Measurement Distance
N	: Neutral Power Line	SD	: Spec Distance
E	: Earth Power Line		
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

**A1 Transmitter Intentional Emission Radiated**

<b>Carrier power was verified with the EUT transmitting Test Details:</b>	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.209(b)(1)
Measurement standard	ANSI C63.10:2009
EUT sample number	S02
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1

FREQ. (MHz)	MEASUREMENT DISTANCE Meters	MEASUREMENT Rx. READING (dBμV/m)	EXTRAP. FACTOR (dB)	FIELD STRENGTH (μV/m)
10.390	1	59.1	60.4	0.87
10.390	3	39.4	40.0	0.93
Limit value @ fc		30 μV/m		
Band occupancy @ -20 dBc		f lower		f higher
		10.273MHz		11.136 MHz
		863 kHz		

- Notes:**
- 1 Results quoted are extrapolated as indicated
  - 2 Receiver detector @ fc = Quasi Peak 10 kHz
  - 3 When battery powered the EUT was powered with new batteries
  - 4 Extrapolation 3 - 30 Meters 40 dB as per 15.31(f)
  - 5 Extrapolation 1 – 3 Meters 20.4 dB as measured
  - 6 Extrapolation 1- 30 Meters 60.4 dB (40 + 20.4)

- Test Method:**
- 1 As per Radio – Noise Emissions, ANSI C63.10
  - 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.  
Horizontal and vertical polarisations, of the receive antenna.  
EUT orientation in three orthogonal planes.  
Maximum results recorded

**A2 Radiated Electric Field Emissions**

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit as required.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : ☐

3m alternative test site : ☒

The effect of the EUT set-up on the measurements is summarised in note (c) below.

Test Details:	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10:2009
Frequency range	9kHz – 1000MHz
EUT sample number	S02
Modification state	0
SE in test environment	Laptop
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photographs 1 and 2

The worst case radiated emission measurements for spurious emissions and harmonics are listed below:

Ref No	Freq (MHz)	Det	Ang Deg	Hgt (cm)	Pol	MD (m)	Res at MD (dBuV/m)	SD (m)	Res at SD (dBuV/m)	Spec Limit (dBuV/m)	Margin (dB)	Res Sum
1	75.770	QP	5	100	V	3	26.5	3	26.5	40	-13.5	Pass
2	116.910	QP	186	100	V	3	31.5	3	31.5	43.5	-12	Pass
3	148.235	QP	192	100	V	3	33.8	3	33.8	43.5	-9.7	Pass
4	264.100	QP	156	100	V	3	32.5	3	22	46	-24	Pass

No other emissions within 20 dB of the test limit were detected

**Notes:**

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1. For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 For Frequencies below 1 GHz, RBW= 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak                RBW=VBW= 1MHz  
 Average        RBW=VBW= 1MHz

The upper and lower frequency of the measurement range was decided according to CFR 47 Part 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits CFR 47 Part 15:2008 Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength mV/m	Measurement Distance m	Field strength dBmV/m
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left( \frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.

- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels:

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels	✓			
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

**A3 Unintentional Radiated Emissions**

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit standby / receive mode.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site :

☐

3m alternative test site :

☒

The effect of the EUT set-up on the measurements is summarised in note (c) below.

Test Details:	
Regulation	Title 47 of the CFR, Part 15 Subpart (c) Clause 15.109
Measurement standard	ANSI C63.10:2009
Frequency range	9kHz – 1000MHz
EUT sample number	S01
Modification state	0
SE in test environment	Laptop
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	Photograph 1

The worst case radiated emission measurements for spurious emissions are listed below:

Ref No	Freq (MHz)	Det	Ang Deg	Hgt (cm)	Pol	MD (m)	Res at MD (dBuV/m)	SD (m)	Res at SD (dBuV/m)	Spec Limit (dBuV/m)	Margin (dB)	Res Sum
1	75.770	QP	12	100	V	3	26.7	3	26.7	40	-13.3	Pass
2	116.910	QP	190	100	V	3	31.1	3	31.1	43.5	-12.4	Pass
3	148.235	QP	196	100	V	3	33.5	3	33.5	43.5	-10	Pass
4	264.100	QP	149	100	V	3	33.3	3	33.3	46	-12.7	Pass

No other emissions within 20 dB of the test limit were detected

**Notes:**

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1. For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak                RBW=VBW= 1MHz  
Average          RBW=VBW= 1MHz

The upper and lower frequency of the measurement range was decided according to CFR 47 Part 15:2008 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits CFR 47 Part 15:2008 Clause 15.109 for all emissions:

Frequency of emission (MHz)	Field strength mV/m	Measurement Distance m	Field strength dBmV/m
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left( \frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.



- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels:

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels	✓			
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

## A5 ac Power Line Conducted Emissions

Preview ac power line port conducted emission measurements were performed with a peak detector in a screened room.

The effect of the EUT set-up on the measurements is summarised in note (b) below.

Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The formal measurements are detailed below:

Test Details: TX Mode	
Regulation	Title 47 of the CFR:2008, Part 15 Subpart (c) (Clause 15.207)
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S02
Modification state	0
SE in test environment	8F1955S20
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs	Photograph 3

The worst-case ac power line port conducted emission measurements are listed below:

### Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.150	Live	28.4	56.0	-27.6	Pass
2	0.200	Live	32.2	53.6	-21.4	Pass
3	0.280	Live	33.5	50.8	-17.3	Pass
4	0.475	Live	24.5	48.3	-23.8	Pass
5	0.43	Live	26.7	47.3	-20.6	Pass
6	0.485	Live	21.2	46.3	-25.1	Pass
7	0.530	Live	22.8	46.0	-23.2	Pass
8	10.390	Live	43.6	50.0	-6.4	Pass
9	10.814	Live	42.6	50.0	-7.4	Pass
10	0.150	Neutral	31.0	56.0	-25.0	Pass
11	0.200	Neutral	33.5	53.6	-20.1	Pass
12	0.280	Neutral	32.3	50.8	-18.5	Pass
13	0.475	Neutral	23.6	48.3	-24.7	Pass
14	0.43	Neutral	23.9	47.3	-23.4	Pass
15	0.485	Neutral	20.1	46.3	-26.2	Pass
16	0.530	Neutral	22.5	46.0	-23.5	Pass
17	10.390	Neutral	43.7	50.0	-6.3	Pass
18	10.814	Neutral	42.8	50.0	-7.2	Pass

**Results measured using the quasi-peak detector compared to the quasi-peak limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.150	Live	44.5	66.0	-21.5	Pass
2	0.200	Live	45.8	63.6	-17.8	Pass
3	0.280	Live	42.7	60.8	-18.1	Pass
4	0.375	Live	41.1	58.3	-17.2	Pass
5	0.43	Live	41.2	57.3	-16.1	Pass
6	0.485	Live	38.5	56.3	-17.8	Pass
7	0.530	Live	38.2	56.0	-17.8	Pass
8	10.390	Live	45.5	60.0	-14.5	Pass
9	10.814	Live	44.5	60.0	-15.5	Pass
10	0.150	Neutral	54.1	66.0	-11.9	Pass
11	0.200	Neutral	49.1	63.6	-14.5	Pass
12	0.280	Neutral	41.7	60.8	-19.1	Pass
13	0.375	Neutral	38.6	58.3	-19.7	Pass
14	0.43	Neutral	38.5	57.3	-18.8	Pass
15	0.485	Neutral	36.0	56.3	-20.3	Pass
16	0.530	Neutral	29.8	56.0	-26.2	Pass
17	10.390	Neutral	45.6	60.0	-14.4	Pass
18	10.814	Neutral	44.7	60.0	-15.3	Pass

Test Details: RX Mode	
Regulation	Title 47 of the CFR:2008, Part 15 Subpart (b)(Clause 15.107)
Measurement standard	ANSI C63.10:2009
Frequency range	150kHz to 30MHz
EUT sample number	S01
Modification state	0
SE in test environment	8F1955S20
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs	Photograph 3

The worst case ac power line port conducted emission measurements are listed below:

**Results measured using the average detector compared to the average limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.150	Live	27.1	56.0	-28.9	Pass
2	0.200	Live	32.7	53.6	-20.9	Pass
3	0.270	Live	38.4	51.1	-12.7	Pass
4	0.290	Live	24.9	50.5	-25.6	Pass
5	0.3	Live	41.1	50.2	-9.1	Pass
6	0.485	Live	24.3	46.3	-22.0	Pass
7	0.495	Live	22.4	56.1	-33.7	Pass
8	0.530	Live	23.9	46.0	-22.1	Pass
9	0.670	Live	22.4	46.0	-23.6	Pass
10	0.150	Neutral	31.3	56.0	-24.7	Pass
11	0.200	Neutral	33.4	53.6	-20.2	Pass
12	0.270	Neutral	30.7	51.1	-20.4	Pass
13	0.290	Neutral	24.9	50.5	-25.6	Pass
14	0.3	Neutral	41.7	50.2	-8.5	Pass
15	0.485	Neutral	20.9	46.3	-25.4	Pass
16	0.495	Neutral	20.9	46.1	-25.2	Pass
17	0.530	Neutral	23.5	46.0	-22.5	Pass
18	0.670	Neutral	20.1	46.0	-25.9	Pass

**Results measured using the quasi-peak detector compared to the quasi-peak limit**

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.150	Live	42.1	66.0	-23.9	Pass
2	0.200	Live	46.1	63.6	-17.5	Pass
3	0.270	Live	43.3	61.1	-17.8	Pass
4	0.290	Live	32.2	60.5	-28.3	Pass
5	0.3	Live	44.5	60.2	-15.7	Pass
6	0.485	Live	40.9	56.3	-15.4	Pass
7	0.495	Live	39.7	56.1	-16.4	Pass
8	0.530	Live	37.7	56.0	-18.3	Pass
9	0.670	Live	37.2	56.0	-18.8	Pass
10	0.150	Neutral	54.6	66.0	-11.4	Pass
11	0.200	Neutral	49.0	63.6	-14.6	Pass
12	0.270	Neutral	42.7	61.1	-18.4	Pass
13	0.290	Neutral	32.1	60.5	-28.4	Pass
14	0.3	Neutral	43.6	60.2	-16.6	Pass
15	0.485	Neutral	37.4	56.3	-18.9	Pass
16	0.495	Neutral	37.2	56.1	-18.9	Pass
17	0.530	Neutral	34.6	56.0	-21.4	Pass
18	0.670	Neutral	34.3	56.0	-21.7	Pass

**Specification limits :**

ac power port conducted emission limits (CFR 47 Part 15:2008 Clause 15.107 and 15.207):

Frequency range MHz	Limits dB $\mu$ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

Notes:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

Notes:

- (a) The levels may have been rounded for display purposes.
- (b) The following table summarises the effect of the EUT operating mode and internal configuration on the measured emission levels :

	See 1)	See 2)	See 3)	See 4)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels	✓			

1) Parameter defined by standard and / or single possible.  
 2) Parameter defined by client and / or single possible.  
 3) Parameter had a negligible effect on emission levels.  
 4) Worst case determined by initial measurement.

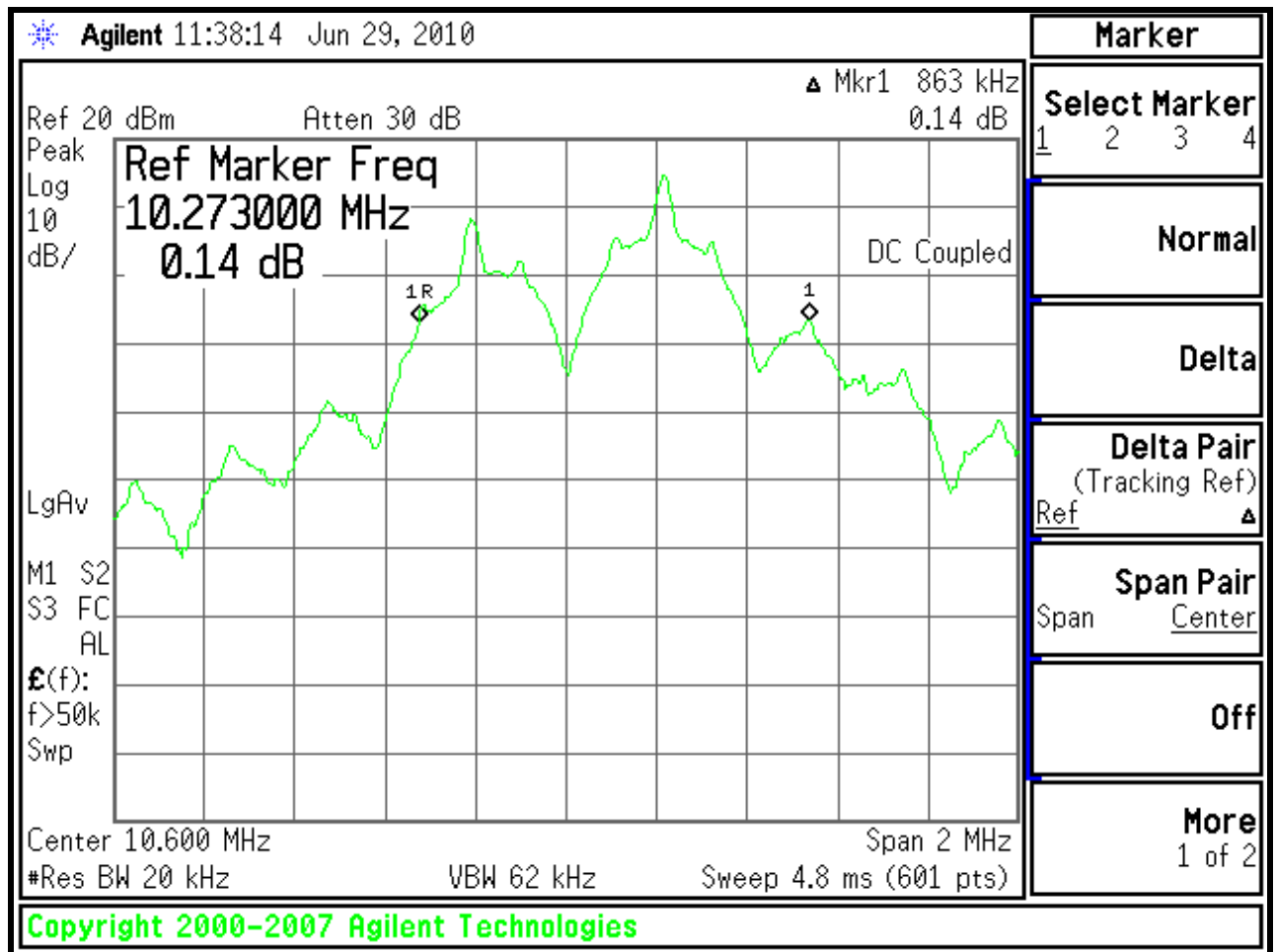
**Appendix B:**

**Supporting Graphical Data**

This appendix contains graphical data obtained during testing.

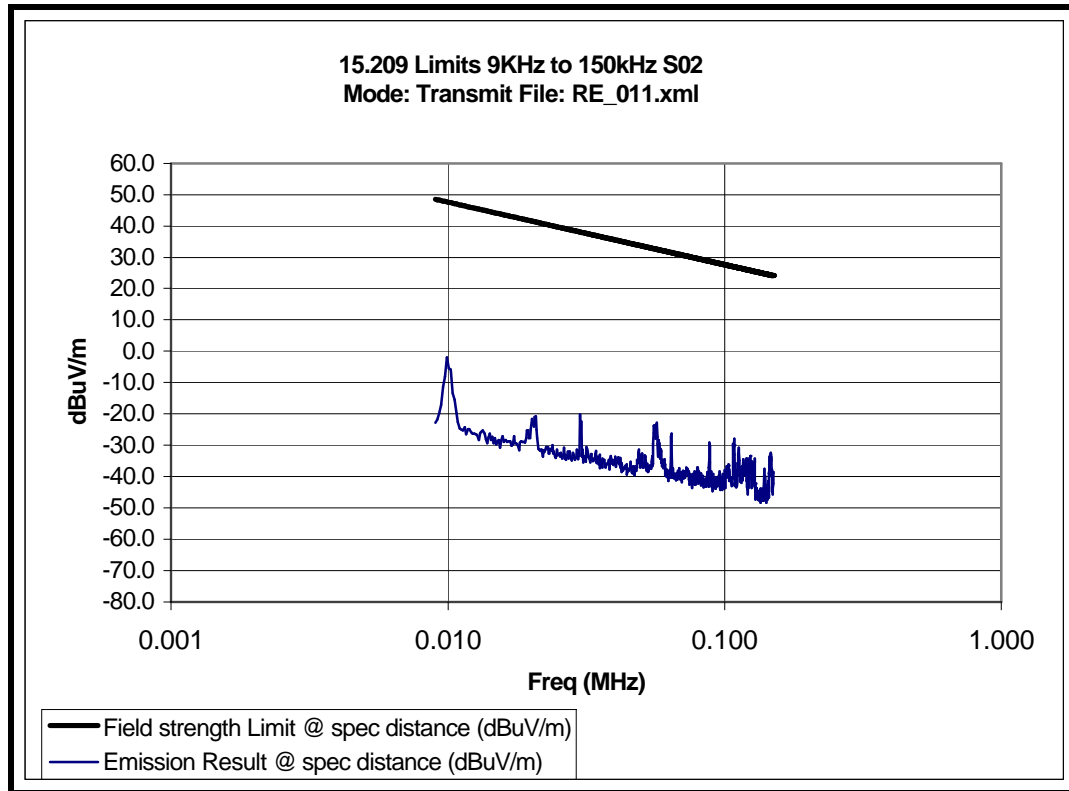
Notes:

- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.
- (d) Appendix C details the numbering system used to identify the sample and its modification state.
- (e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

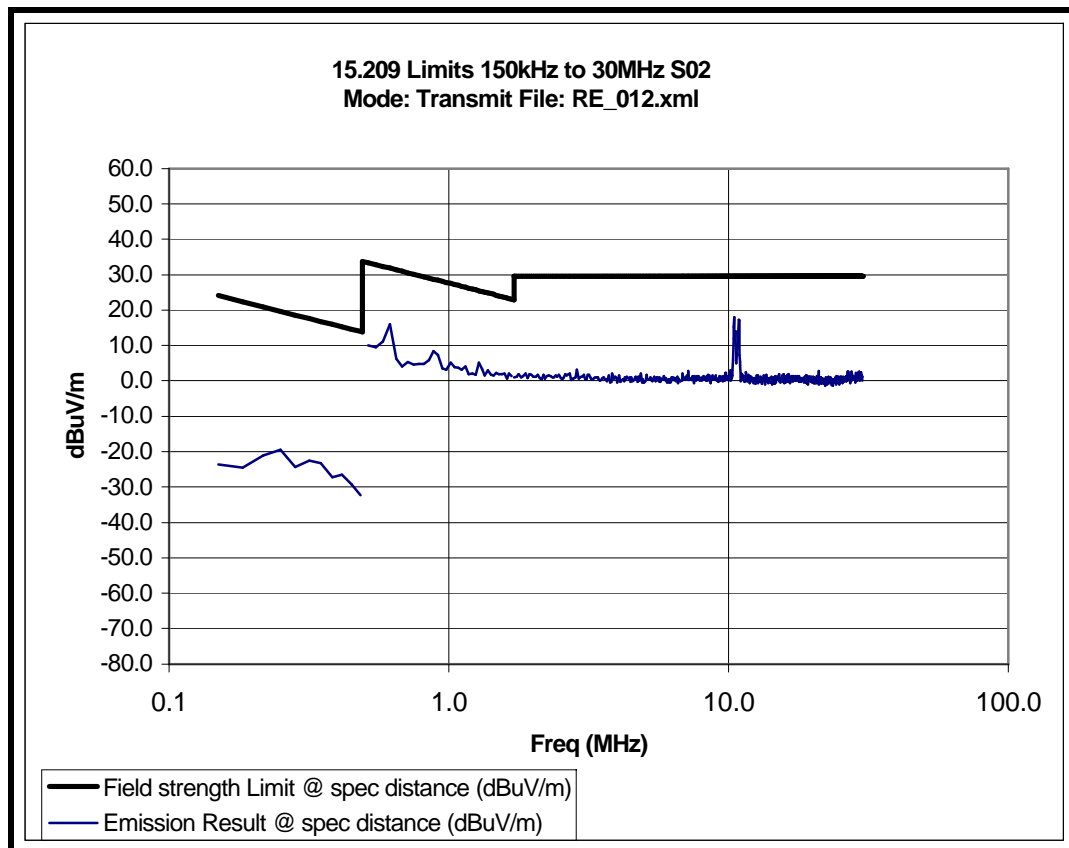


20dB Bandwidth

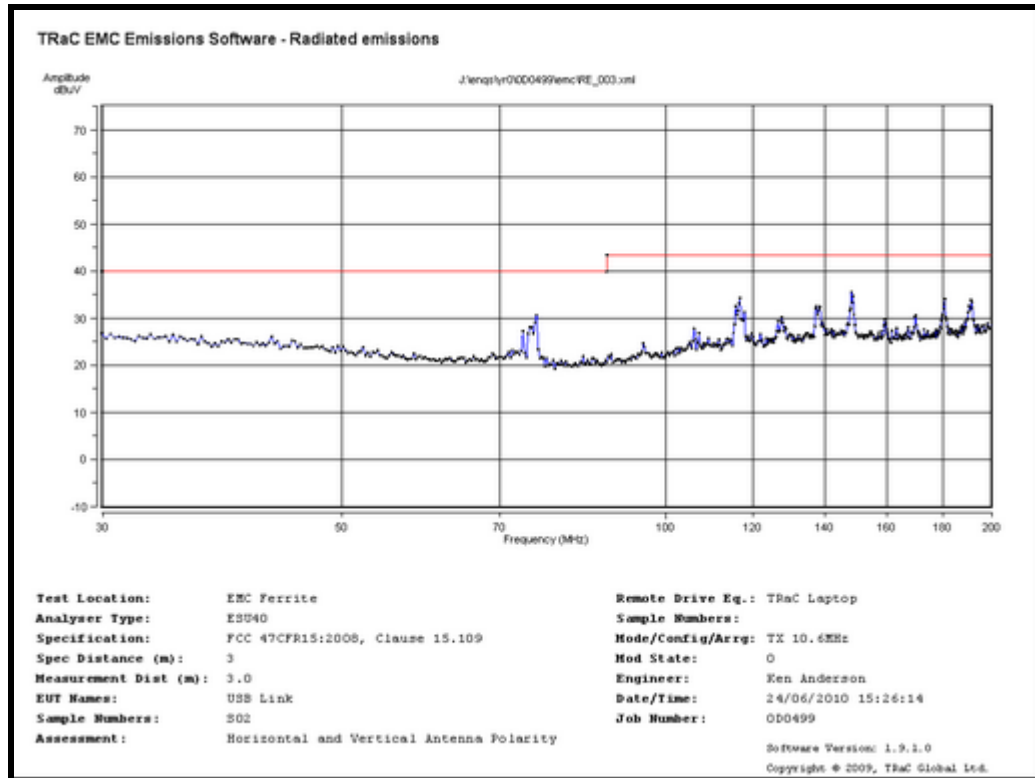




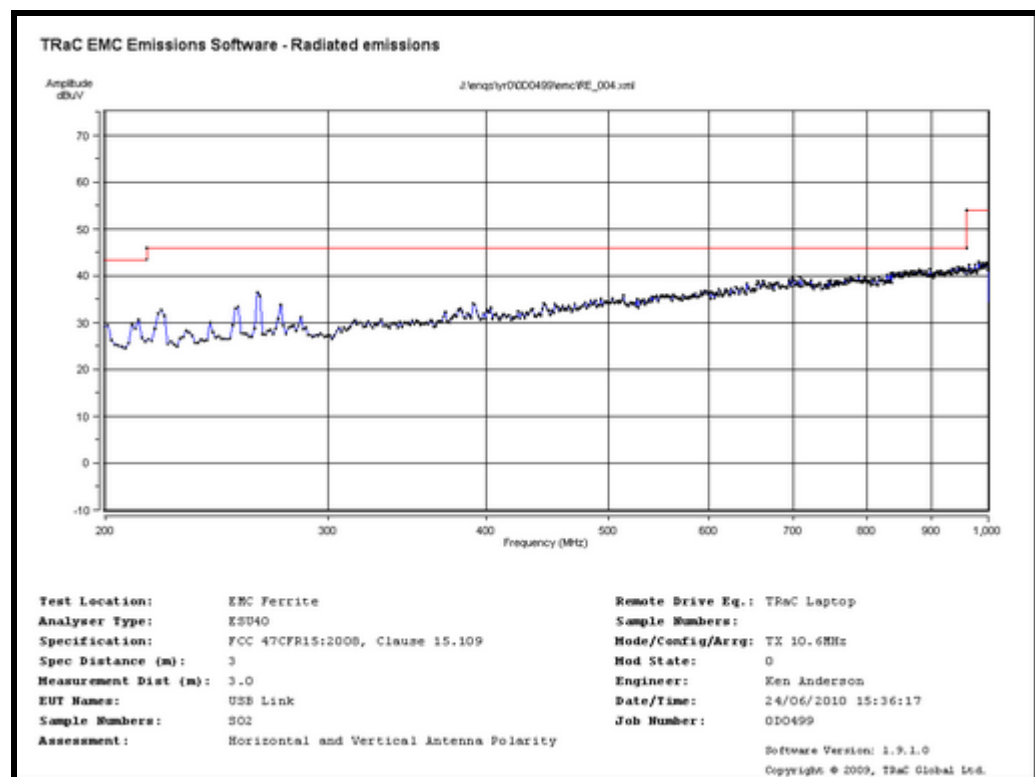
Radiated spurious emissions 9kHz to 150kHz



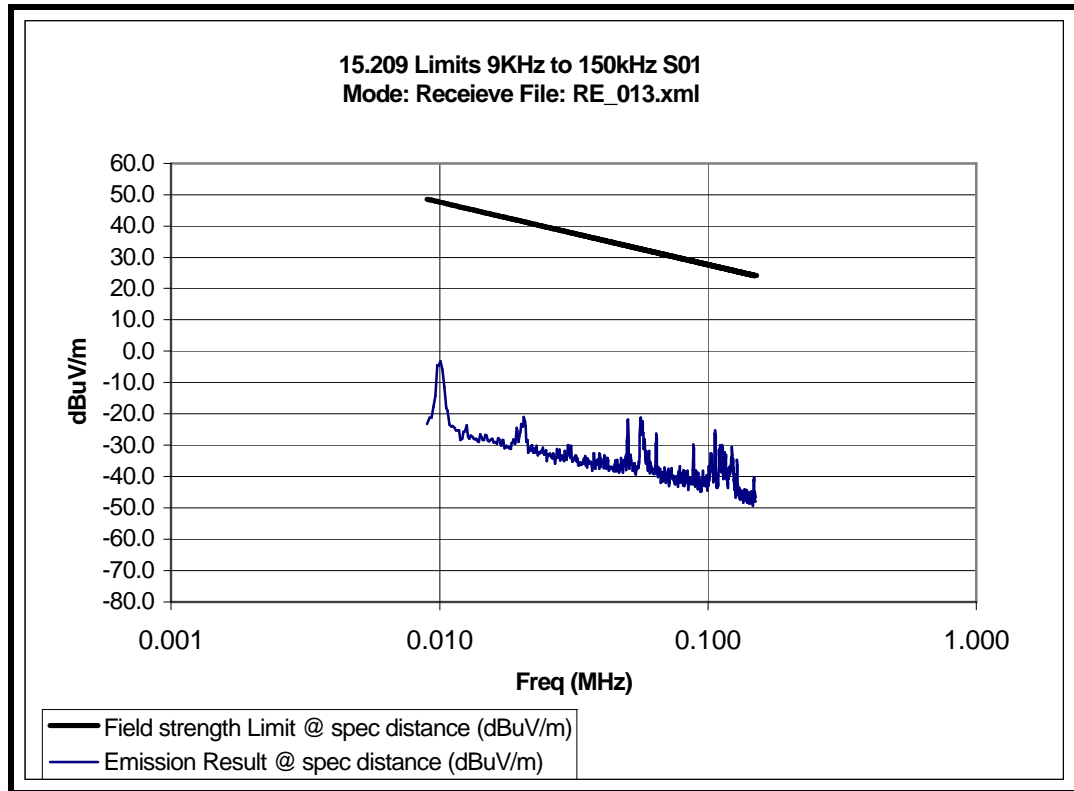
Radiated spurious emissions 150kHz to 30MHz



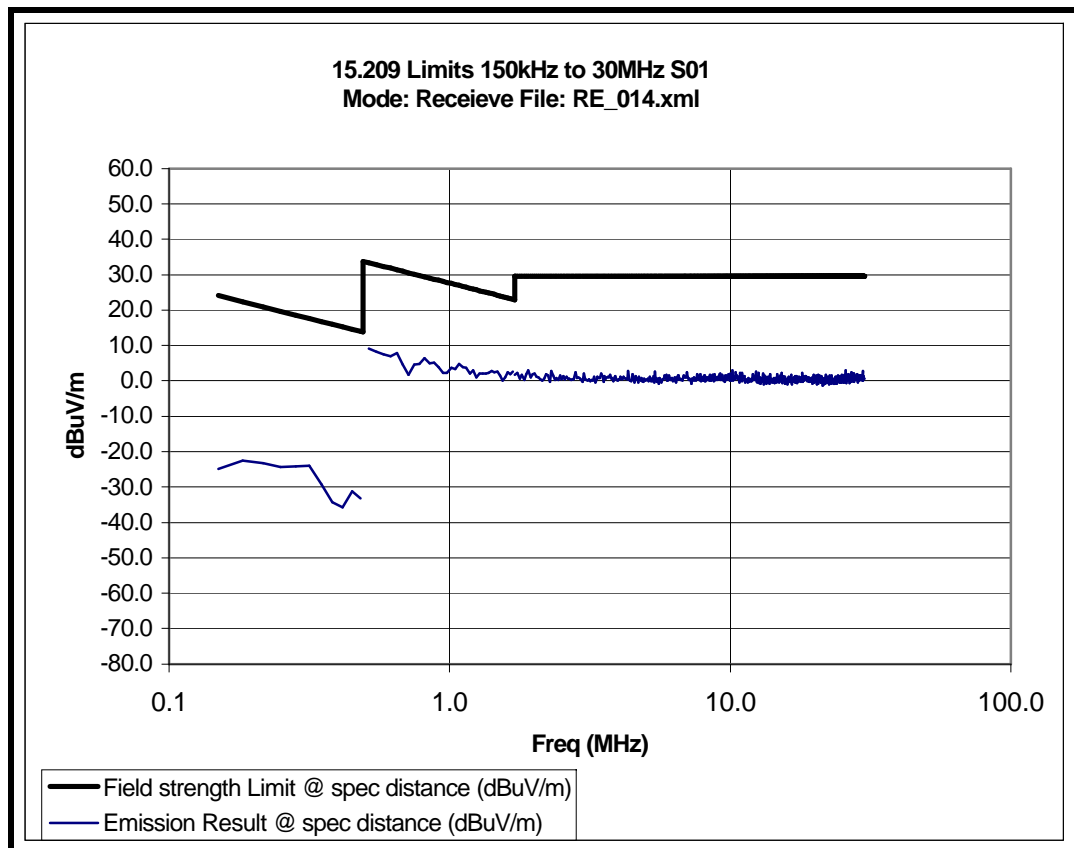
Radiated spurious emissions 30MHz to 200MHz



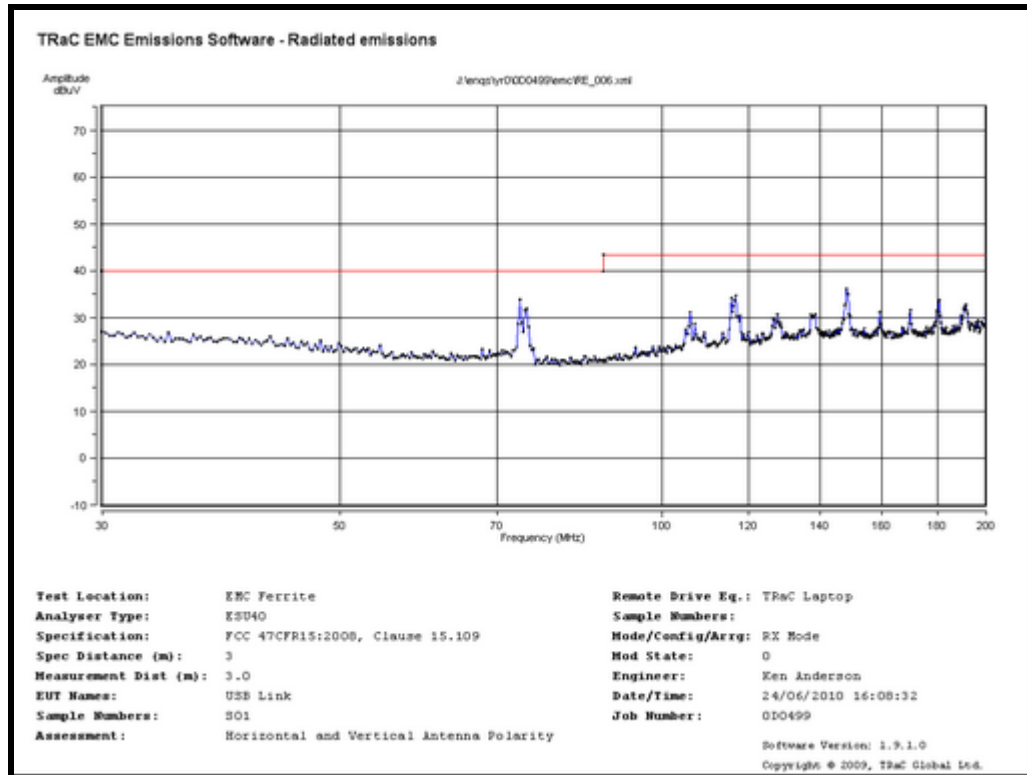
Radiated spurious emissions 200MHz to 1GHz



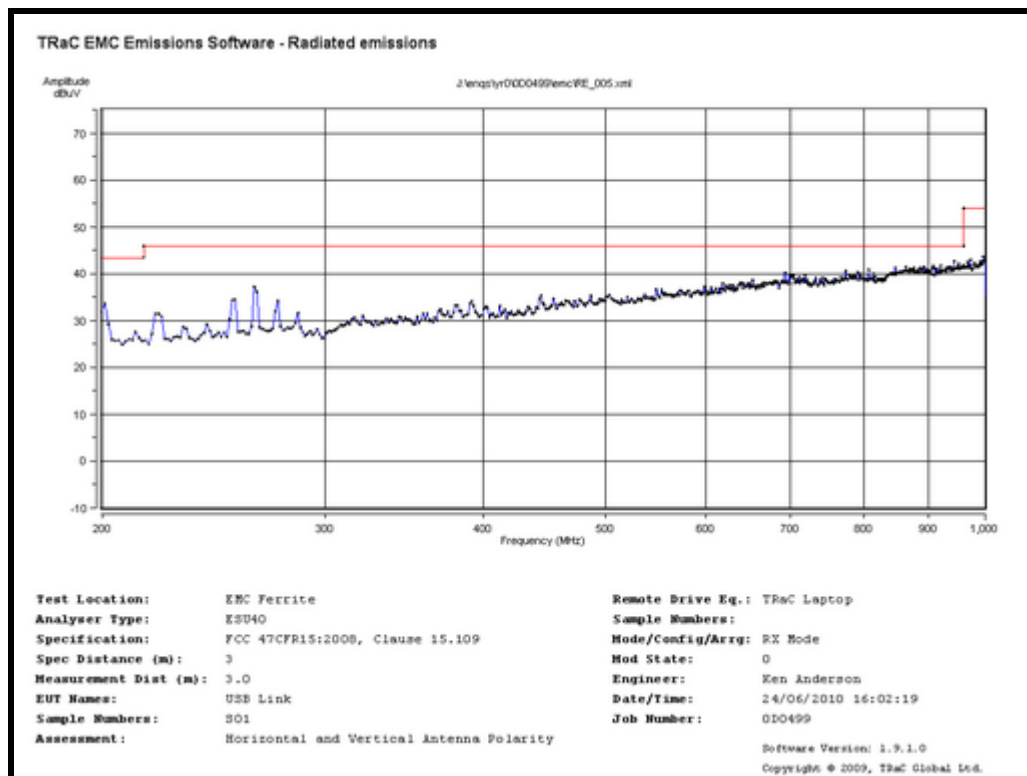
Unintentional Radiated spurious emissions 9kHz to 150kHz



Unintentional Radiated spurious emissions 150kHz to 30MHz



Unintentional Radiated spurious emissions 30MHz to 200MHz



Unintentional Radiated spurious emissions 200MHz to 1GHz

## Appendix C: Additional Test and Sample Details

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

**Sample No:** Sxx Mod w

where:

xx	= sample number	eg. S01
w	= modification number	eg. Mod 2

The following terminology is used throughout the test report:

**Support Equipment (SE)** is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

**EUT configuration** refers to the internal set-up of the EUT. It may include for example:

- Positioning of cards in a chassis.
- Setting of any internal switches.
- Circuit board jumper settings.
- Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as "single possible configuration".

**EUT arrangement** refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Telecoms & Radio upon request.

**C1) Test samples**

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description	Identification
S01	USB Link (Normal Sample)	None
S02	USB Link (Constant transmit sample)	None

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
8F1955S20	Dell Laptop	B5GXH3J

The following samples of apparatus were supplied by TRaC Telecoms & Radio as support or drive equipment (auxiliary equipment):

Identification	Description
Laptop	Compaq Laptop

**C2) EUT Operating Mode During Testing.**

During testing, the EUT was exercised as described in the following tables:

Test	Description of Operating Mode: Transmit
REFE: Radiated E-Field (Transmitter carrier output levels dBuV/m)	The EUT was transmitting continuously on maximum power using FSK (centre frequency 10.6MHz / Deviation $\pm 200$ kHz) modulation and powered via USB from a laptop.
REFE: Radiated Spurious emissions E-Field at frequencies below 30MHz (dBuV/m) (15.209)	
Radiated Spurious emissions (E-Field) at frequencies $\geq 30$ MHz (15.209)	
PLCE 15.207 Power Line Conducted Emissions	
20dB Bandwidth of Emissions	

Test	Description of Operating Mode: Receive mode
REFE: 15.109 Radiated Spurious emissions E-field below 30MHz (Receive)	The EUT was placed in receive mode (non-transmitting) Mode during the test. Powered via USB from a laptop.
REFE: 15.109 Radiated Spurious emissions (E-Field) frequencies $\geq 30$ MHz (Receive)	
PLCE 15.107 Power Line Conducted Emissions	

**C3) EUT Configuration Information.**

The EUT was submitted for testing in one single possible configuration.



**C4) List of EUT Ports**

The tables below describe the termination of EUT ports:

Sample : S01/S02  
Tests : All

Port	Description of Cable Attached	Cable length	Equipment Connected
USB port	4 Core Unscreened	3.0m	Laptop
Antenna port	None	N/A	Integral

**C5 Details of Equipment Used**

For Radiated Electric Field Emissions 9 kHz to 30 MHz

RFG No	Type	Description	Manufacturer	Date Calibrated.
274	ATS	Ferrite Lined Chamber	TRaC	10/06/10
023	HFH-Z2	Mag Loop Antenna 9kHz-30MHz	R & S	26/05/09
214	ESAI	Spec Analyser/Test Rxer (LF/HF)	R & S	22/03/10
246	N-type	RF coaxial cable (Lab 10)	TRaC	22/09/09
270	N-type	RF coaxial cable (Lab 10)	TRaC	22/09/09

For Radiated Electric Field Emissions 30MHz to 1GHz

RFG No	Type	Description	Manufacturer	Date Calibrated.
REF886	ATS	Ferrite Lined Chamber	TRaC	10/06/10
025	3146	Log Periodic Antenna (200-1000 MHz)	EMCO	18/04/10
095	3109	Biconical Antenna (25 – 300 MHz)	EMCO	18/04/10
REF847	ESU	EMI Test Receiver (Spectrum analyser)	R&S	11/06/10
REF 881	N-type	RF coaxial cable (Lab 16)	TRaC	10/06/10
REF885	N-type	RF coaxial cable (Lab 16)	TRaC	10/06/10

For 20dB Bandwidth measurement

RFG No	Type	Description	Manufacturer	Date Calibrated
REF837	PSA	Spectrum analyser	Agilent	18/01/10

For power line conducted emissions:

RFG No	Type	Description	Manufacturer	Date Calibrated
n/a	Lab 7	Small Screened Chamber	TRaC	-
189	ESH3-Z5	Single-phase LISN	R & S	17/06/10
232	ESH3-Z2	Pulse Limiter	R & S	16/02/10
125	ESHS 10	Test Receiver (LF)	R & S	25/11/09
404	E4407B	Spectrum Analyser	Agilent	10/07/09
092	BNC	RF coaxial cable (Lab 7)	TRaC	22/09/09
295	BNC	RF coaxial cable (Lab 7)	TRaC	22/09/09

**Appendix D:**

**Additional Information**

No additional information is included within this test report.

**Appendix E: Calculation of the duty cycle correction factor**

No average detector measurements were made during testing, therefore this calculation is not required

**Appendix F:**

**Photographs and Figures**

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: front view.
2. Radiated electric field emissions arrangement: close up.
3. Power Line Conducted Emissions



Photograph 1



Photograph 2





Photograph 3



**Appendix G:****MPE Calculation**

OET Bulletin No. 65, Supplement C 01-01

**CFR 47 Part 15:2008 §§1.1307 and 2.1091**

2.1091 Radio frequency radiation exposure evaluation: mobile devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than  $1\text{mW}/\text{cm}^2$  power density limit, as required under FCC rules.

**Prediction of MPE limit at a given distance**

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4 \pi R^2} \quad \text{re - arranged} \quad R = \sqrt{\frac{EIRP}{S 4 \pi}}$$

where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

Note:

The EIRP value was determined using the peak E Field measurement.

Result

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) ( $\text{mW}/\text{cm}^2$ )	Distance (R) cm required to be less than $1\text{mW}/\text{cm}^2$
10.8	$4.6 \times 10^{-6}$	1	$6.0 \times 10^{-4}$

**Appendix H:****Cross Reference FCC Part 15c to IC RSS 210**

The testing of the TM#2 was carried out to FCC 47CFR Part 15c and the results for this testing can be found in Appendix A of this report.

All measurements were carried out in accordance with ANSI C63.4, 'Methods of Measurements of RF Emissions from low voltage Electrical and Electronic Equipment in the Range 9kHz to 40GHz.

The table below shows the applicable RSS-210 and RSS-Gen parts and the corresponding FCC 47CFR Part 15 rules:

<b>RSS-210</b>	<b>FCC 47CFR Part 15</b>
2.6	Part 15.109
2.6	Part 15.209
<b>RSS-Gen</b>	<b>FCC 47CFR Part 15</b>
7.2.2	15.107 and 15.207

In addition below is a plot of the 99% emissions bandwidth, as stipulated in Section 4.4.1 of RSS-Gen.

