

**AN ENGINEERING DOCUMENT**

**FOR**

**TIMECODE SYSTEMS Ltd**

**ON**

**TIMECODE BUDDY**

**DOCUMENT NO. TRA-008673-02-W-US-01**

**HULL**

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**TRaC Wireless Test Report** : TRA-008673-02-W-US-01

**Applicant** : TIMECODE SYSTEMS Ltd

**Apparatus** : TIMECODE BUDDY

**Specification(s)** : CFR47 Part 15.249 July 2010

**Purpose of Test** : Certification

**FCCID** : AYV-TCB02

**Authorised by** :



: Radio Product Manager

**Issue Date** : 18<sup>th</sup> April 2012

**Authorised Copy Number** : PDF

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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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Tests performed by: S Hodgkinson

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## 1.2 Tests Requested By

This testing in this report was requested by:

Timecode Systems Ltd  
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97 High Street  
Stourbridge  
West Midlands  
DY8 1FA

## 1.3 Manufacturer

Timecode Systems Ltd  
Seba House  
97 High Street  
Stourbridge  
West Midlands  
DY8 1FA

## 1.4 Apparatus Assessed

The following apparatus was assessed between: 27<sup>th</sup> February – 28<sup>th</sup> March 2012

Timecode Buddy

The Timecode buddy: system is used to sync SMPTE timecode data in Audio and Video recording, on a professional TV/Film set.

It comprises of two products: Timecode Buddy: master and Timecode Buddy: tx.

Various syncing options can be selected via the internal menu system.

- 1) A radio link using the band 915.05MHz – 918.65MHz which makes use of 14 radio channels spaced at 100kHz using GFSK modulation, 10kHz deviation.
- 2) BNC connections for Timecode input/outputs

## 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) 15.249	ANSI C63.10	Pass
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) 15.249	ANSI C63.10	Pass
Intentional Emission Field Strength	Title 47 of the CFR: Part 15 Subpart (c) 15.249	ANSI C63.10	Pass
Intentional Emission Band Occupancy	Title 47 of the CFR: Part 15 Subpart (c) 15.249	ANSI C63.10	Pass
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	-	N/A
Restricted Bands	Title 47 of the CFR: Part 15 Subpart (c) 15.205	-	N/A
Maximum Frequency of Search	Title 47 of the CFR: Part 15 Subpart (c) 15.33	-	Pass
Extrapolation Factor	Title 47 of the CFR: Part 15 Subpart (c) 15.31(f)	-	N/A

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	: 20 to 22 °C
Humidity	: 45 to 75 %

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 Measurement Uncertainty Values**

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

**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 (Power Meter) = **1.08dB**  
Uncertainty in test result (Spectrum Analyser) = **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 (Power Meter) = **0.113ppm**  
Uncertainty in test result (Spectrum Analyser) = **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 – Up to 8.1GHz = **3.31dB**  
Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**  
Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**  
Uncertainty in test result – 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%**

**[12] Power Line Conduction**

Uncertainty in test result = **3.4dB**

**[13] Spectrum Mask Measurements**

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

**[14] Adjacent Sub Band Selectivity**

Uncertainty in test result = **1.24dB**

**[15] Receiver Blocking – Listen Mode, Radiated**

Uncertainty in test result = **3.42dB**

**[16] Receiver Blocking – Talk Mode, Radiated**

Uncertainty in test result = **3.36dB**

**[17] Receiver Blocking – Talk Mode, Conducted**

Uncertainty in test result = **1.24dB**

**[18] Receiver Threshold**

Uncertainty in test result = **3.23dB**

**[19] Transmission Time Measurement**

Uncertainty in test result = **7.98%**

**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
EUT	: Equipment Under Test	ATS	: Alternative Test Site
SE	: Support Equipment	Ref	: Reference
L	: Live Power Line	Freq	: Frequency
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
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**

Test Details	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.249 (a)
Measurement standard	ANSI C63.10:2003
EUT sample number	S15
Modification state	0
SE in test environment	S08 S13
SE isolated from EUT	N
EUT set up	Refer to Appendix C
Temperature	22
Photographs (Appendix F)	

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	PRE AMP (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (mV/m)
915.05	67.5	2.1	23.5	N/A	93.0	44.66
Limit value @ fc			50mV/m = 94.0dBµV/m@3m			
Band occupancy @ -20 dBc = 25kHz			f lower		f higher	
			915.039423MHz		915.064423MHz	
			902MHz – 928MHz			

FREQ. (MHz)	MEASUREMENT Rx. READING (dBµV)	CABLE LOSS (dB)	ANT FACTOR (dB/m)	PRE AMP (dB)	FIELD STRENGTH (dBµV/m)	FIELD STRENGTH (mV/m)
918.65	66.1	2.1	23.5	N/A	91.7	38.01
Limit value @ fc			50mV/m = 94.0dBµV/m@3m			
Band occupancy @ -20 dBc =25kHz			f lower		f higher	
			918.639262MHz		918.664262MHz	
			902MHz – 928MHz			

- Notes:**
- 1 Results quoted are extrapolated as indicated
  - 2 Receiver detector @ fc = Quasi Peak / 120kHz bandwidth
  - 3 When battery powered the EUT was powered with new batteries

- 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 = 100 kHz. The radiated electric field emission test applies to all spurious emissions and harmonics emissions. The maximum permitted field strength is listed in Section 15.249. 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 (a)
Measurement standard	ANSI C63.10:2003
Frequency range	30MHz-10GHz
EUT sample number	S15
Modification state	0
SE in test environment	S08 S13
SE isolated from EUT	No
EUT set up	Refer to Appendix C
Temperature	22°C
Photographs (Appendix F)	

The worst case radiated harmonics are listed below:

The Master unit was connected to the Tx buddy via a BNC connection, the Master unit providing the timecode.

**Bottom channel and top channel transmitter harmonics**

Ref No.	FREQ. (MHz)	MEAS Rx (dB $\mu$ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	HP Filter (dB)	Duty Cycle correction (dB)	Field ST'GH (dB $\mu$ V/m)	FIELD ST'GH ( $\mu$ V/m)	LIMIT ( $\mu$ V/m)
1b.	1830.0	55.6	1.9	27.2	35.9	N/A	N/A	48.80pk	275.42	5011pk
1b.	1830.0	51.44	1.9	27.2	35.9	N/A	-21.93	22.71Av	13.66	500Av
2t.	1837.3	54.06	2.0	27.3	35.9	N/A	N/A	47.46pk	236.04	5011pk
2t.	1837.3	49.97	2.0	27.3	35.9	N/A	-21.93	21.44Av	11.80	500Av
3b.	2745.1	51.25	2.2	29.1	35.5	0.8	N/A	47.85pk	246.88	5011pk
3b.	2745.1	42.94	2.2	29.1	35.5	0.8	-21.93	17.61Av	7.59	500Av
4t.	2755.5	51.78	2.2	29.1	35.5	0.7	N/A	48.28pk	259.41	5011pk
4t.	2755.5	43.59	2.2	29.1	35.5	0.7	-21.93	18.16Av	8.09	500Av
5b.	3660.2	62.04	2.9	31.7	35.6	0.5	N/A	61.29pk	1160.11	5011pk
5b.	3660.2	60.57	2.9	31.7	35.6	0.5	-21.93	38.14Av	80.72	500Av
6t.	3674.5	62.29	2.8	31.8	35.6	0.5	N/A	61.79pk	1228.85	5011pk
6t.	3674.5	60.95	2.8	31.8	35.6	0.5	-21.93	38.52Av	84.33	500Av
7b.	4575.2	49.83	2.9	32.2	35.7	0.5	N/A	49.73pk	306.54	5011pk
7b.	4575.2	40.01	2.9	32.2	35.7	0.5	-21.93	17.98Av	7.92	500Av
8t.	4593.2	49.70	2.9	32.2	35.7	0.6	N/A	49.70pk	305.49	5011pk
8t.	4593.2	40.53	2.9	32.2	35.7	0.6	-21.93	18.60Av	8.511	500Av
9b.	5490.2	49.91	3.7	33.8	35.8	0.6	N/A	52.21pk	407.85	5011pk
9b.	5490.2	42.03	3.7	33.8	35.8	0.6	-21.93	22.40Av	13.18	500Av
10t.	5511.8	50.41	3.8	33.8	35.8	0.6	N/A	52.81pk	437.01	5011pk
10t.	5511.8	42.24	3.8	33.8	35.8	0.6	-21.93	22.71Av	13.66	500Av

**Note: (b) = bottom channel  
(t) = top channel**

**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 47 CFR Part 15:2010 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR part 15- Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength (dBµV/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 = 100 kHz. 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 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 C63.10:2003
Frequency range	30MHz – 10GHz
EUT sample number	S15
Modification state	0
SE in test environment	S08 S13
SE isolated from EUT	No
EUT set up	Refer to Appendix C
Temperature	22°C
Photographs (Appendix F)	

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

The Master unit was connected to the Tx buddy via a BNC connection, the Master unit providing the timecode.

Ref No.	FREQ. (MHz)	MEAS Rx (dB $\mu$ V)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	HP Filter (dB)	Duty Cycle correction (dB)	Field ST'GH (dB $\mu$ V/m)	FIELD ST'GH ( $\mu$ V/m)	LIMIT ( $\mu$ V/m)
1.	1524.0	53.14	1.8	25.8	36.6	N/A	N/A	44.14pk	161.06pk	5011pk
1.	1524.0	44.51	1.8	25.8	36.6	N/A	N/A	35.51Av	59.63Av	500Av
2.	1630.3	52.35	1.8	26.1	36.3	N/A	N/A	43.95pk	157.58pk	5011pk
2.	1630.3	44.44	1.8	26.1	36.3	N/A	N/A	36.04Av	66.38Av	500Av
3.	1665.8	51.82	1.8	26.1	36.3	N/A	N/A	43.82pk	155.23pk	5011pk
3.	1665.8	42.23	1.9	26.4	36.3	N/A	N/A	34.23Av	51.46Av	500Av
4.	1737.1	54.16	2.0	26.8	36.1	N/A	N/A	46.86pk	220.29pk	5011pk
4.	1737.1	46.20	2.0	26.8	36.1	N/A	N/A	38.90Av	88.10Av	500Av
5.	1772.4	53.36	2.0	26.9	36.1	N/A	N/A	46.16pk	203.23pk	5011pk
5.	1772.4	45.10	2.0	26.9	36.1	N/A	N/A	37.90Av	78.54Av	500Av
6.	1807.6	51.80	2.1	27.1	36.0	N/A	N/A	45.18pk	181.55pk	5011pk
6.	1807.6	42.00	2.1	27.1	36.0	N/A	N/A	35.0pk	56.23Av	500Av

**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 47 CFR Part 15:2010 Clause 15.33(a) and 15.33(a)(1).

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

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength (dBµV/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				

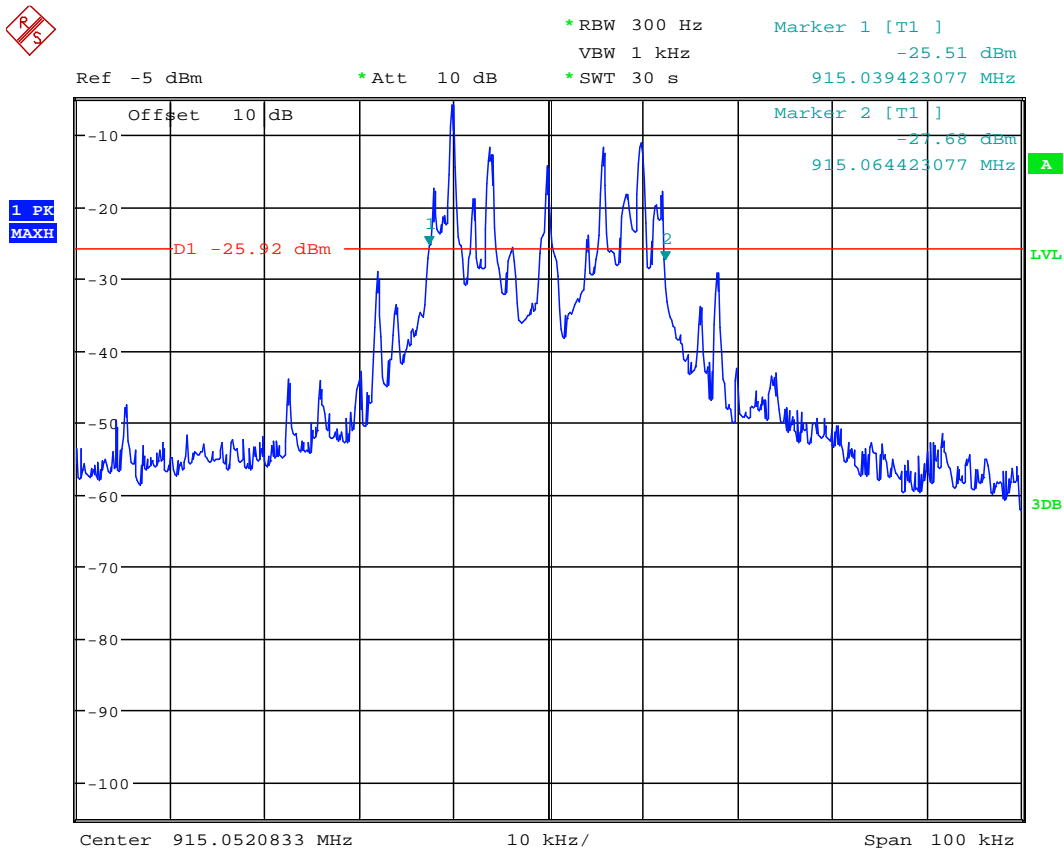
**Appendix B:****Supporting Graphical Data**

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 Bottom channel

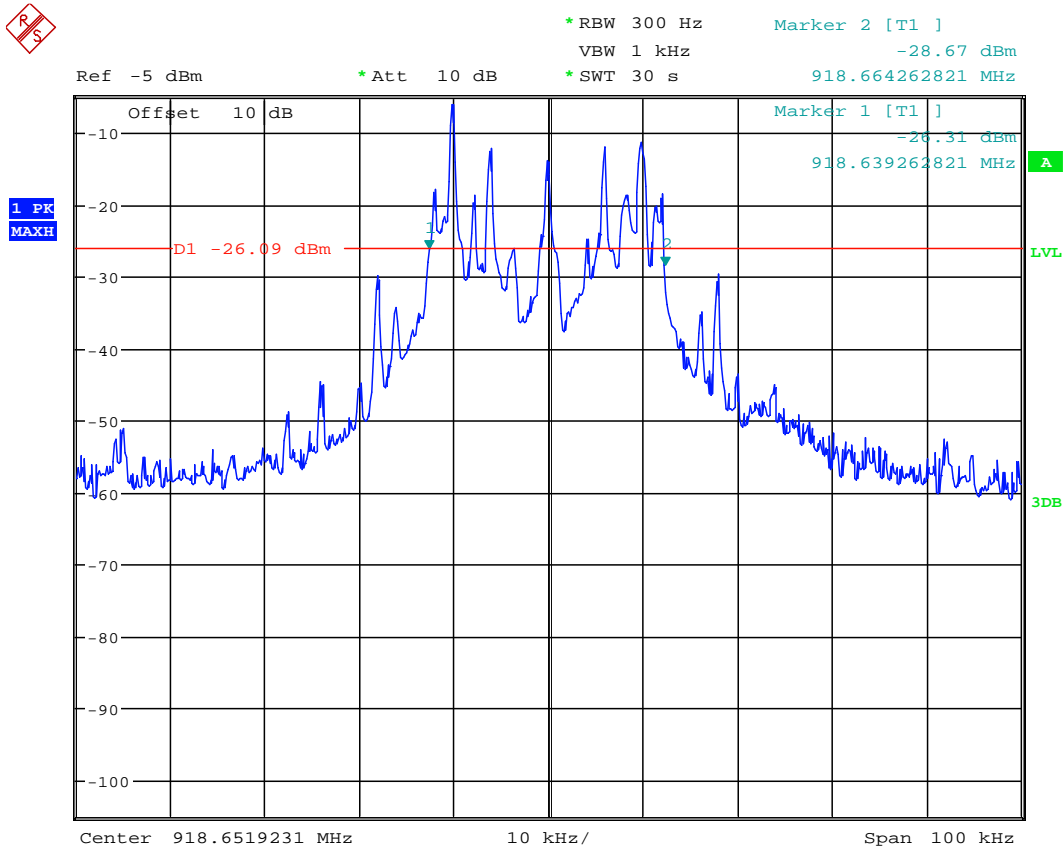


Date: 16.MAR.2012 12:39:55

FI = 915.039423MHz  
 FH = 915.064423MHz

20dB bandwidth = 25kHz

20dB Bandwidth top channel

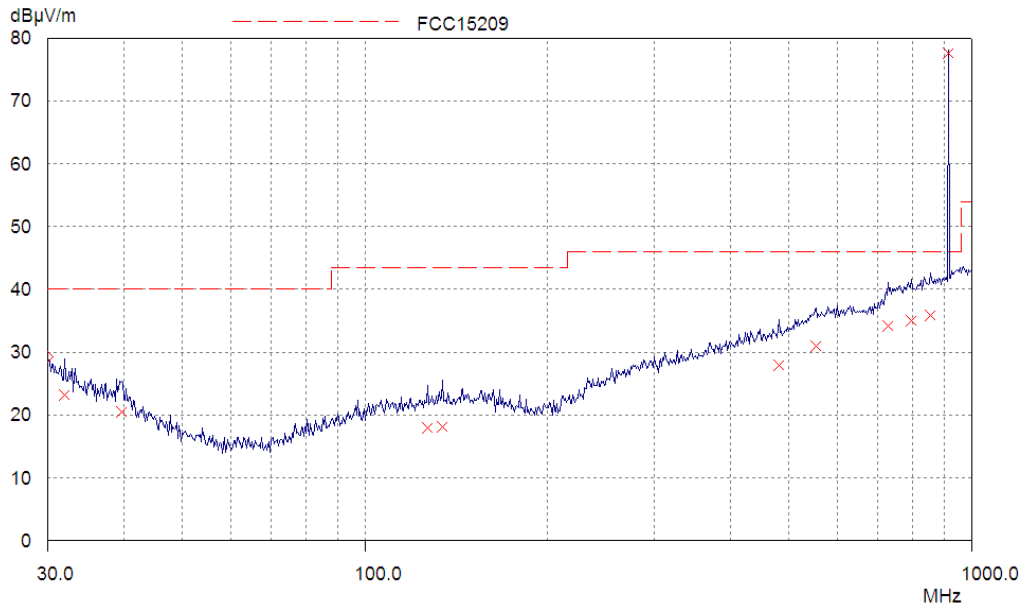


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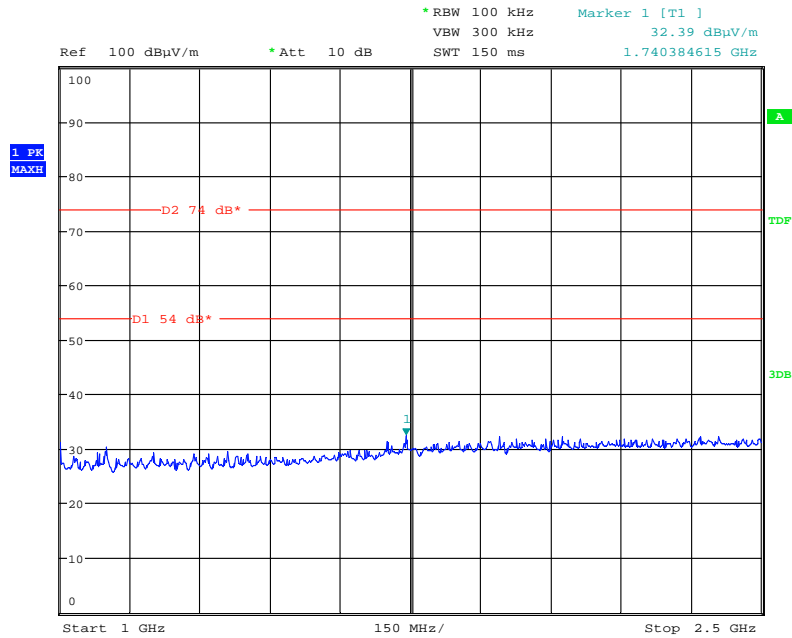
FI = 918.639262MHz  
 FH = 918.664262MHz

20dB bandwidth = 25kHz

Bottom channel Radiated spurious emissions 30MHz to 1GHz

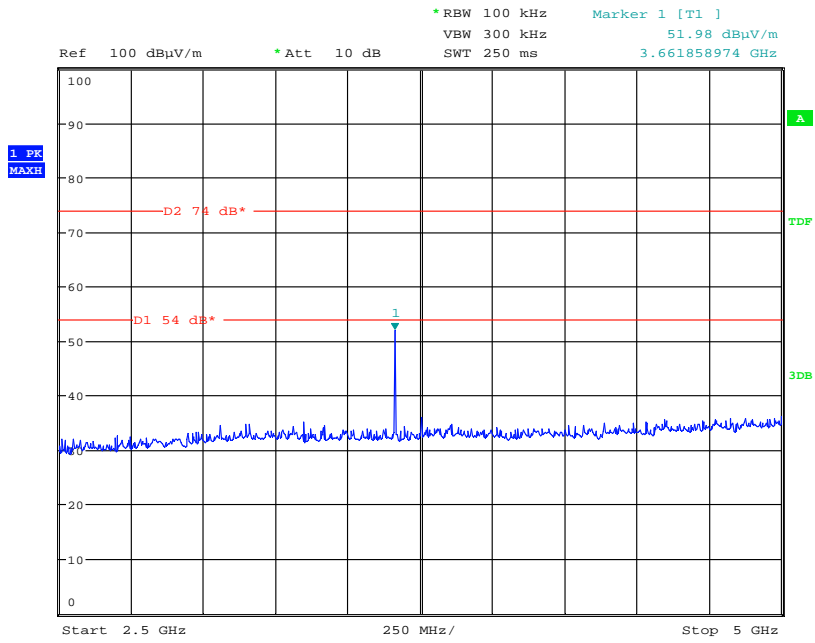


1GHz to 2.5GHz



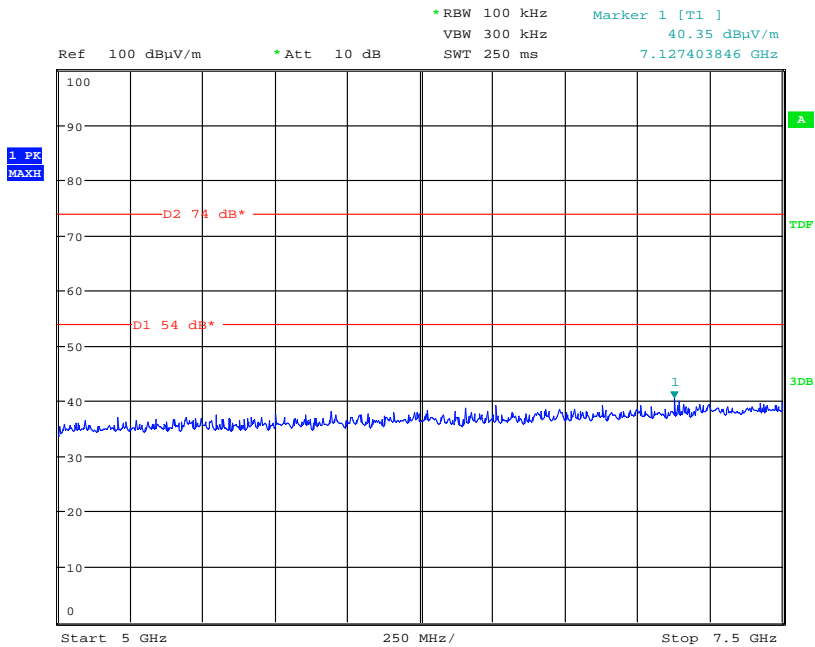
Date: 19.MAR.2012 09:53:39

2.5GHz to 5GHz



Date: 19.MAR.2012 09:54:15

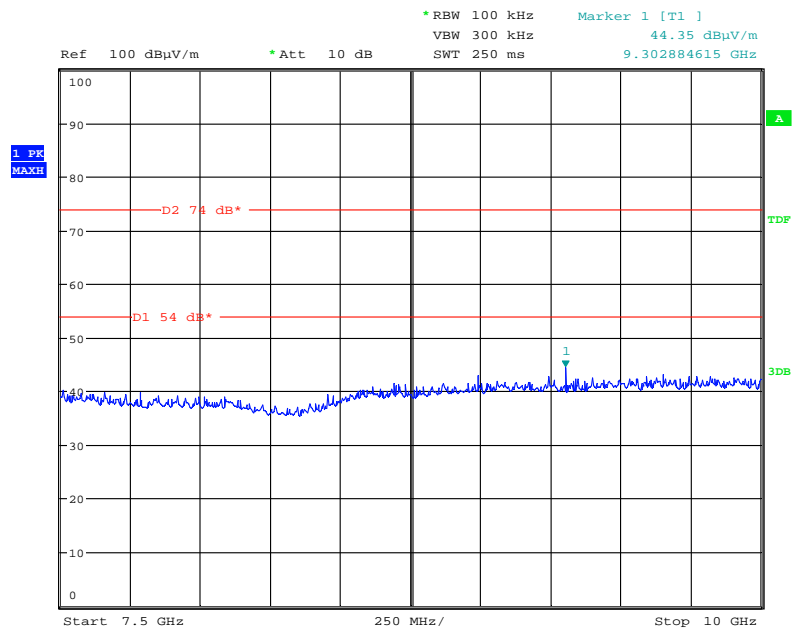
5GHz to 7.5GHz



Date: 19.MAR.2012 09:54:52

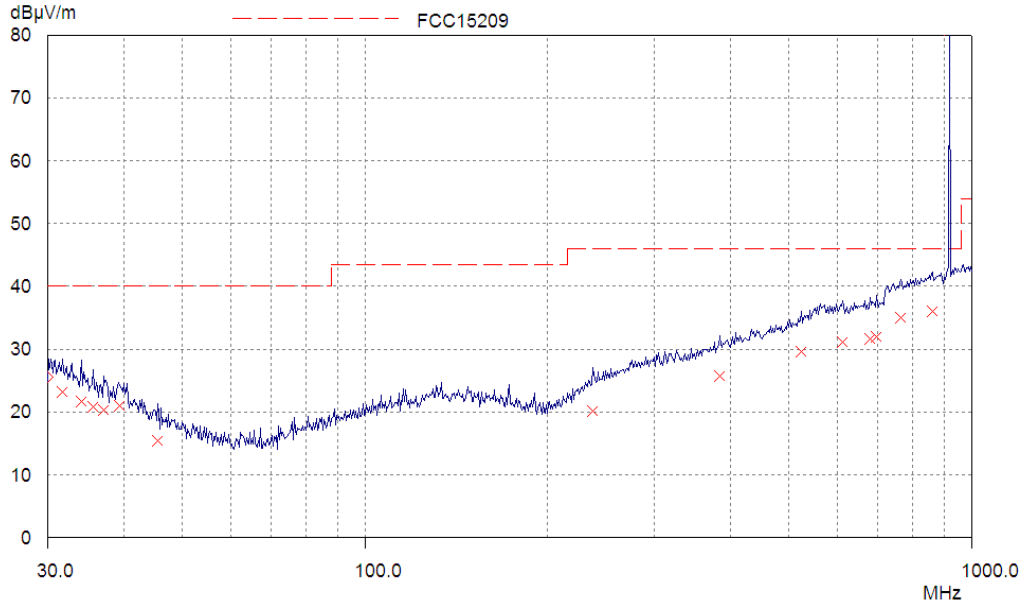


7.5GHz to 10GHz

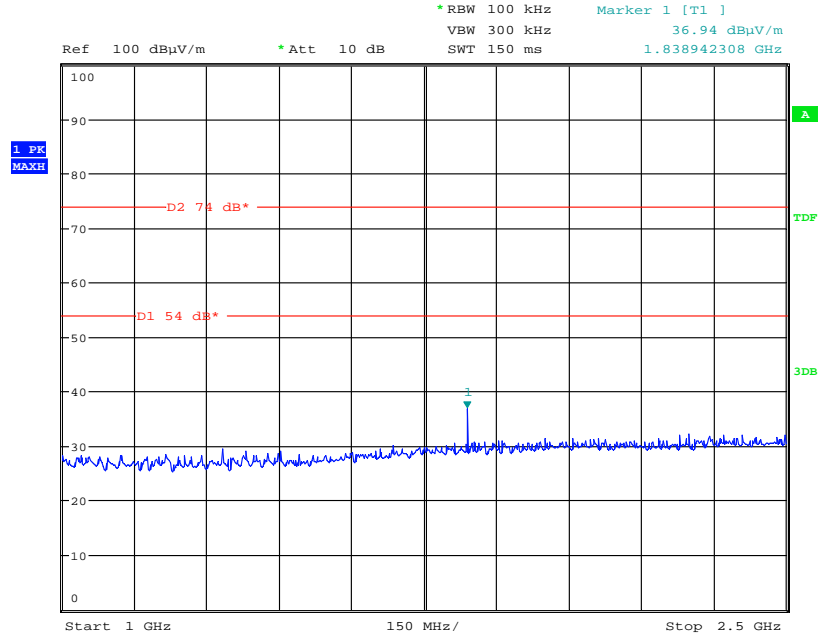


Date: 19.MAR.2012 09:55:36

Top channel Radiated spurious emissions 30MHz to 1GHz

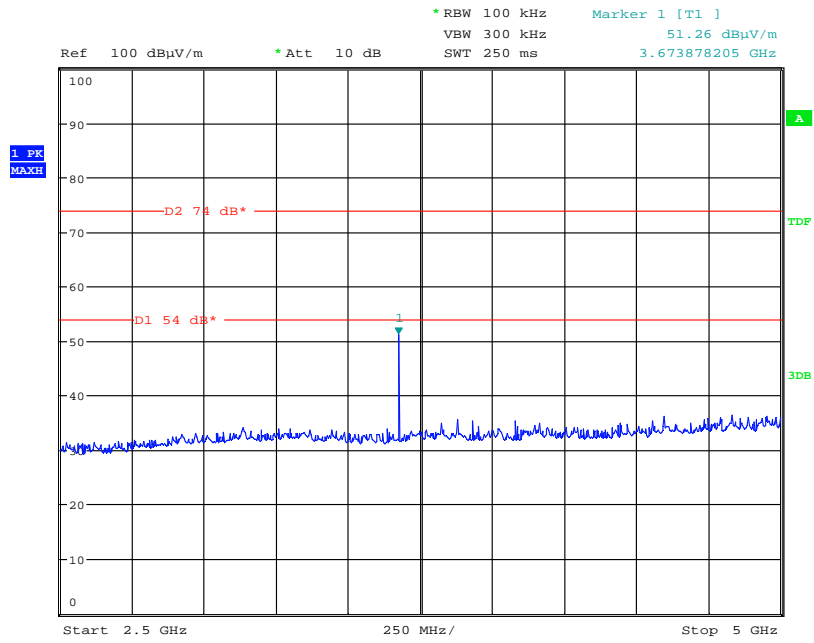


1 GHz to 2.5GHz



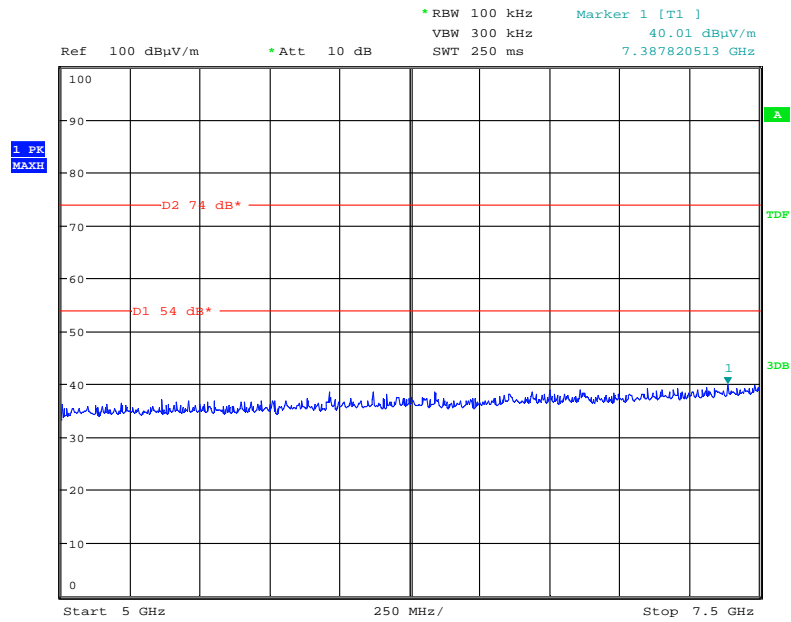
Date: 19.MAR.2012 10:06:29

2.5GHz to 5GHz



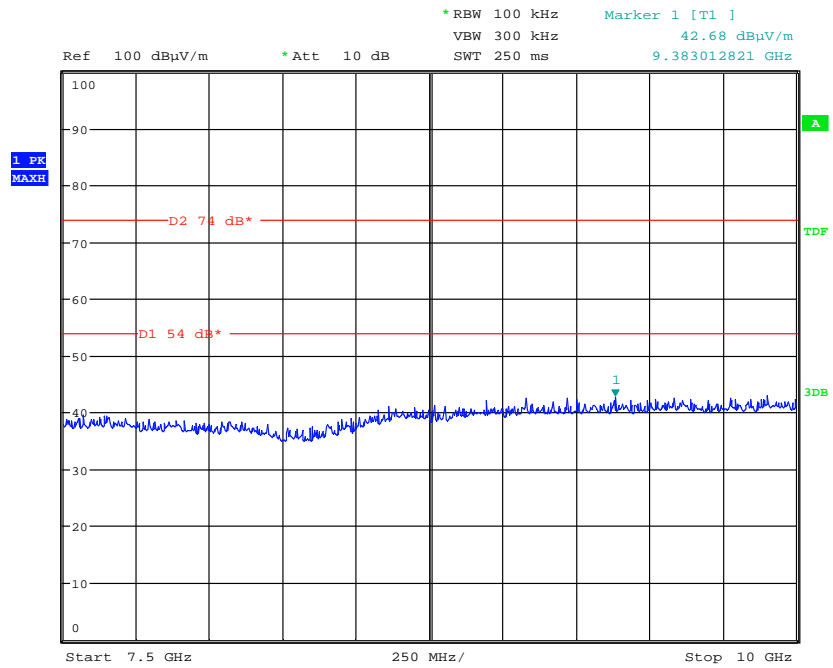
Date: 19.MAR.2012 10:04:03

5GHz to 7.5GHz



Date: 19.MAR.2012 10:04:34

7.5GHz to 10GHz



Date: 19.MAR.2012 10:05:10

**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 Global upon request.

**C1 Test samples**

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

Sample No.	Description	Identification
S15	Buddy Tx	Tx005

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

Sample No.	Description	Identification
S13	Master Tx	N/A

**C2 EUT operating mode during testing**

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

Test	Description of Operating Mode
All tests detailed in this report	Transmitting on bottom and bottom channels with and without modulation enabled.

Test	Description of Operating Mode:
Receiver conducted and radiated (ERP) spurious emissions	N/A

### **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 :  
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
BNC	50 $\Omega$ Coax cable	30cms	Master Tx

**C5 Details of Equipment Used**

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRLUH281	FSU46	Spectrum Analyser	Rhode & Schwarz	09/02/2012
TRL138	3115	1-18GHz Horn Antenna	EMCO	08/11/2011
TRL139	3115	1-18GHz Horn Antenna	EMCO	14/09/2011
TRL572	8499B	1 – 26.5 GHz Pre Amplifier	Agilent	24/11/2010
TRLUH004	ESVS10	Receiver	Rhode & Schwarz	12/01/2012
TRLUH191	CBL611/A	BiLog Periodic Antenna	York	08/11/2010

Appendix D:

Additional Information

# Timecode Systems Ltd.

Seba House, 97 High St, Stourbridge, West Midlands, DY8 1FA

## Declaration Statement – FCC Transmitter Duty Cycle


Timecode Buddy: master (FCC ID: AYV-TCB/01)

Timecode Buddy: tx (FCC ID: AYV-TCB/02)

I can confirm that when either units are in normal transmit mode, the TX ON time in any 100ms period is a maximum of 8ms.

*Paul Scurr* 29/03/2012

Paul Scurr  
Company Director  
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[paulscurr@timecodebuddy.com](mailto:paulscurr@timecodebuddy.com)

Timecode Buddy system 

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

Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 1MHz and a video Bandwidth of 1MHz the sweep time was set accordingly to capture the pulse train. The transmit pulsewidths and period was measured. A plots of the pulse train is contained in Appendix B of this test report.

If the pulse train was less than 100 ms, including blanking intervals, the duty cycle was calculated by averaging the sum of the pulsewidths over one complete pulse train. However if the pulse train exceeds 100ms then the duty cycle was calculated by averaging the sum of the pulsewidths over the 100ms width with the highest average value. (The duty cycle is the value of the sum of the pulse widths in one period (or 100ms), divided by the length of the period (or 100ms). The duty cycle correction factor was then expressed in dB and the peak emissions adjusted accordingly to give an average value of the emission.

Correction factor dB =  $20 \times (\text{Log}_{10} \text{ Calculated Duty Cycle})$

Therefore the calculated duty cycle was determined:

The pulse train period was greater than >100ms and in as shown from the plots in contained in appendix B of this test report.

Duty cycle =  $\frac{\text{the sum of the highest average value pulsewidths over 100ms}}{100\text{ms}}$

e.g

$$= \frac{7.459\text{ms}}{100\text{ms}} = 0.07459$$

0.07459 or 7.459%

Correction factor (dB) =  $20 \times (\text{Log}_{10} 0.07459) = -22.54\text{dB}$

Timecode: Duty cycle correction factor to be used for the radiated spurious emissions.

Txon period 8mS in 1000mS  
Worse case 8mS in 100mS

Therefore  $20\log(8 \div 100) = -21.93\text{dB}$ .

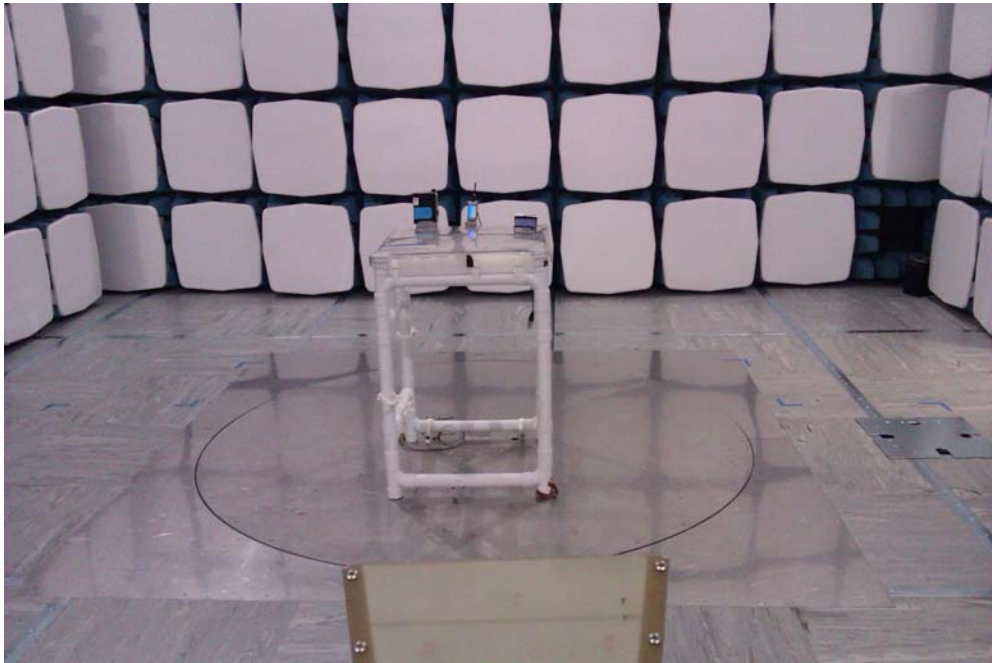
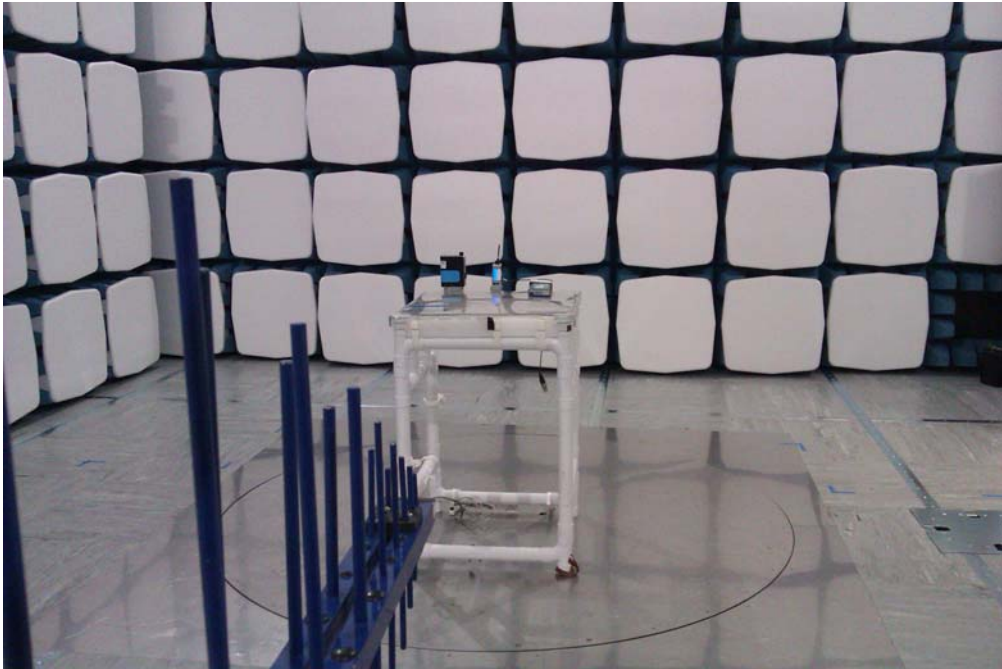
**Appendix F:**

**Photographs and Figures**

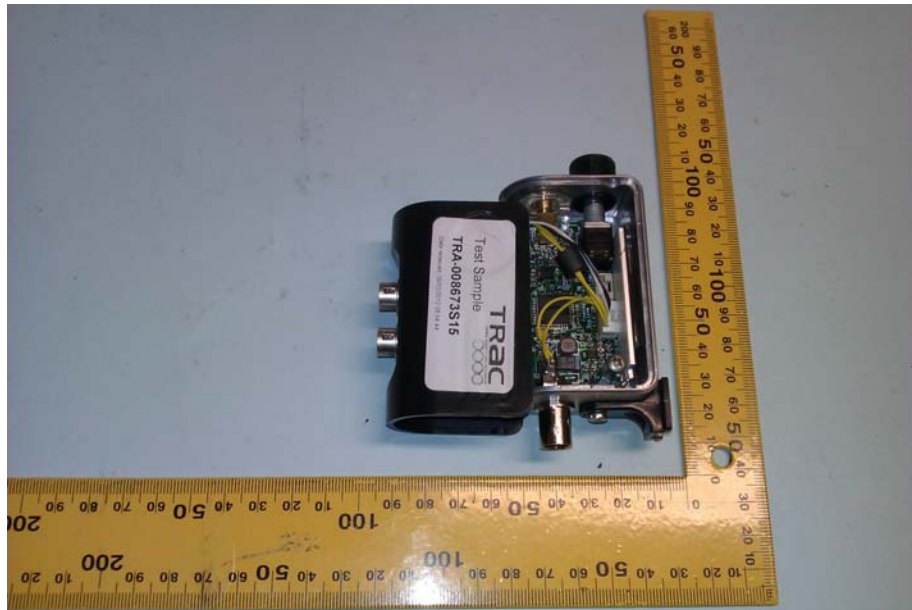
The following photographs were taken of the test samples:

1. Test setup.
2. Overview/case removed
3. Top View mounted and removed from chassis
4. Underside view removed from chassis

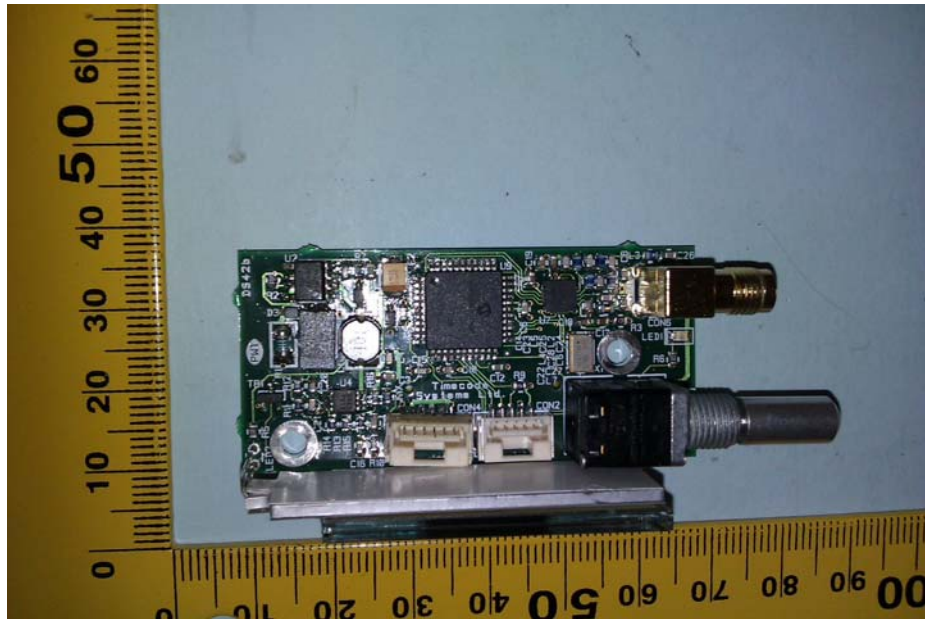
Photograph 1



Photograph 2

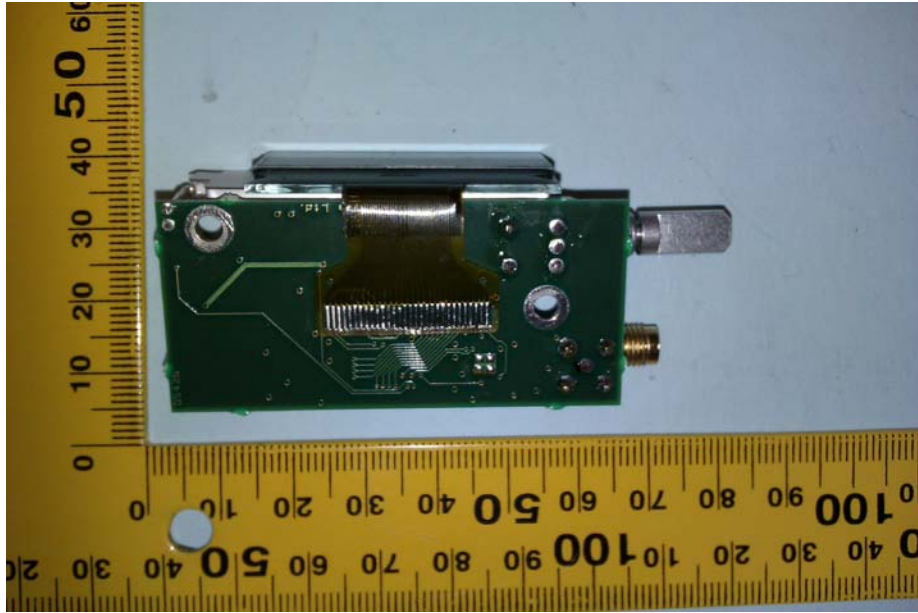


Photograph 3





Photograph 4



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

OET Bulletin No. 65, Supplement C 01-01

**47 CFR §§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 1mW/cm<sup>2</sup> 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

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

where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

**Result**

Prediction Frequency (MHz)	Maximum EIRP	Power density limit (S) (mW/cm <sup>2</sup> )	Distance (R) cm required to be less than 0.612mW/cm <sup>2</sup>
915.05	0.598mw	0.612	0.2789

