AN ENGINEERING DOCUMENT

FOR

TIMECODE SYSTEMS Ltd

ON

TIMECODE MASTER

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

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TRaC Wireless Test Report	**: TRA-008673-02-W-US-02**
Applicant	**: TIMECODE SYSTEMS Ltd**
Apparatus	**: TIMECODE MASTER**
Specification(s)	**: CFR47 Part 15.249 July 2010**
Purpose of Test	**: Certification**
FCCID	**: AYV-TCB01**
Authorised by	**:** 
	: Radio Product Manager
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Contents

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:

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1.3 Manufacturer

Timecode Systems Ltd
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1.4 Apparatus Assessed

The following apparatus was assessed between: 27th February – 28th March 2012

Timecode Master

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) Wi-Fi using a pre-approved WiFi module, FCC ID W707G2100-7G21.
3) BNC connections for timecode input/outputs and TV Sync output.

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
ANSI : American National Standards Institution
REFE : Radiated Electric Field Emissions
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
Mod	: Modification
EUT	: Equipment Under Test
SE	: Support Equipment
L	: Live Power Line
N	: Neutral Power Line
E	: Earth Power Line
Pk	: Peak Detector
QP	: Quasi-Peak Detector
Av	: Average Detector
CDN	: Coupling & decoupling network

ALSR	: Absorber Lined Screened Room
OATS	: Open Area Test Site
ATS	: Alternative Test Site
Ref	: Reference
Freq	: Frequency
MD	: Measurement Distance
SD	: Spec Distance
Pol	: Polarisation
H	: Horizontal Polarisation
V	: Vertical Polarisation

A1 Transmitter Intentional Emission Radiated

Test Details: Master Tx	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.249 (a)
Measurement standard	ANSI C63.10:2003
EUT sample number	S13
Modification state	0
SE in test environment	S08
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	**64.5**	**2.1**	**23.5**	**N/A**	**88.8**	**26.91**
Limit value @ fc			50mV/m = 94.0dBµV/m@3m			
Band occupancy @ -20 dBc = 36.69kHz			f lower		f higher	
			915.042147MHz		915.078846MHz	
			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	**65.5**	**2.1**	**23.5**	**N/A**	**89.8**	**30.90**
Limit value @ fc			50mV/m = 94.0dBµV/m@3m			
Band occupancy @ -20 dBc = 36.37kHz			f lower		f higher	
			918.642147MHz		918.678525MHz	
			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 orthagonal 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 : [X]

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	S13
Modification state	0
SE in test environment	S08
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 a Canon camera via BNC connections, the Master unit providing the timecode and Tv sync to the camera, to exercise to ports.

Bottom channel and top channel transmitter harmonics

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	HP Filter (dB)	Duty Cycle correction (dB)	Field ST'GH (dBµV/m)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1b.	1830.0	53.26	1.9	27.2	35.9	N/A	N/A	46.46pk	210.37pk	5011pk
1b.	1830.0	47.07	1.9	27.2	35.9	N/A	-21.93	18.34Av	8.26Av	500Av
2t.	1837.3	52.63	2.0	27.3	35.9	N/A	N/A	46.03pk	200.21pk	5011pk
2t.	1837.3	46.46	2.0	27.3	35.9	N/A	-21.93	17.93Av	7.88Av	500Av
3b.	2745.1	50.82	2.2	29.1	35.5	0.8	N/A	47.42pk	234.96pk	5011pk
3b.	2745.1	41.00	2.2	29.1	35.5	0.8	-21.93	15.67Av	6.07Av	500Av
4t.	2755.5	50.59	2.2	29.1	35.5	0.7	N/A	47.09pk	226.20pk	5011pk
4t.	2755.5	41.25	2.2	29.1	35.5	0.7	-21.93	15.82Av	6.18Av	500Av
5b.	3655.2	52.61	2.9	31.7	35.6	0.5	N/A	52.01pk	398.56pk	5011pk
5b.	3655.2	47.13	2.9	31.7	35.6	0.5	-21.93	24.60Av	16.98Av	500Av
6t.	3674.5	52.53	2.8	31.8	35.6	0.5	N/A	52.03pk	399.48pk	5011pk
6t.	3674.5	46.69	2.8	31.8	35.6	0.5	-21.93	24.26Av	16.33Av	500Av
7b.	4575.2	52.38	2.9	32.2	35.7	0.5	N/A	52.28pk	411.15pk	5011pk
7b.	4575.2	46.51	2.9	32.2	35.7	0.5	-21.93	24.48Av	16.74Av	500Av
8t.	4593.2	53.14	2.9	32.2	35.7	0.6	N/A	53.14pk	453.94pk	5011pk
8t.	4593.2	46.88	2.9	32.2	35.7	0.6	-21.93	24.78Av	17.33Av	500Av
9b.	5490.2	50.82	3.7	33.8	35.8	0.6	N/A	53.12pk	452.89pk	5011pk
9b.	5490.2	42.96	3.7	33.8	35.8	0.6	-21.93	23.33Av	14.67Av	500Av
10t.	5511.8	51.11	3.8	33.8	35.8	0.6	N/A	53.51pk	473.69pk	5011pk
10t.	5511.8	43.91	3.8	33.8	35.8	0.6	-21.93	24.38Av	16.55Av	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:

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

(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 a Canon camera via BNC connections, the Master unit providing the timecode and Tv Sync to the camera, to exercise to ports.

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	Field ST'GH (dBµV/m)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	118.55	17.00	0.7	11.5	29.2	28.84	150
2.	218.20	17.30	1.0	8.4	26.7	21.62	200
3.	218.90	20.50	1.0	8.5	30.0	31.62	200
4.	230.40	16.20	1.0	9.8	27.0	22.38	200
5.	371.25	14.60	1.3	14.8	30.7	34.27	200
6.	405.20	14.60	1.3	16.2	32.1	40.27	200
7.	432.00	18.10	1.4	16.3	35.8	61.66	200
8.	445.50	12.70	1.4	16.4	30.5	33.49	200
9.	499.20	11.60	1.5	17.2	30.3	32.73	200
10.	504.00	10.60	1.5	17.3	29.4	29.51	200
11.	519.75	16.40	1.5	17.5	35.4	58.88	200
12.	540.00	14.70	1.5	18.4	34.6	53.70	200
13.	556.90	11.30	1.5	18.6	31.4	37.15	200
14.	576.00	16.20	1.6	18.7	36.5	66.83	200
15.	668.25	16.10	1.7	19.0	36.8	69.18	200
16.	720.00	16.50	1.8	19.5	37.8	77.62	200
17.	742.50	16.70	1.8	19.9	38.4	83.17	200
18.	816.75	19.70	1.9	20.6	42.2	128.82	200
19.	864.00	15.80	2.0	20.5	38.3	82.22	200
20.	936.00	16.50	2.1	20.8	39.4	93.32	200
21.	965.25	17.40	2.1	21.2	40.7	108.39	500

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	HP Filter (dB)	Duty Cycle correction (dB)	Field ST'GH (dBµV/m)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	1009.6	55.88	1.4	24.5	37.6	N/A	N/A	44.18pk	161.80pk	5011pk
1.	1009.6	48.19	1.4	24.5	37.6	N/A	N/A	36.49Av	66.75Av	500Av
2.	1080.3	59.05	1.6	24.9	37.4	N/A	N/A	48.15pk	255.56pk	5011pk
2.	1080.3	46.77	1.6	24.9	37.4	N/A	N/A	35.87Av	62.15Av	500Av
3.	1151.8	59.15	1.5	25	37.3	N/A	N/A	48.35pk	261.51pk	5011pk
3.	1151.8	47.60	1.5	25	37.3	N/A	N/A	36.80Av	69.18Av	500Av
4.	1262.2	56.47	1.6	25.2	37.1	N/A	N/A	46.17pk	203.47pk	5011pk
4.	1262.2	50.31	1.6	25.2	37.1	N/A	N/A	40.01Av	100.11Av	500Av
5.	1700.8	53.62	2	26.6	36.2	N/A	N/A	46.02pk	199.98pk	5011pk
5.	1700.8	42.36	2	26.6	36.2	N/A	N/A	34.76Av	54.70Av	500Av
6.	1736.6	53.16	2	26.8	36.1	N/A	N/A	45.86pk	196.33pk	5011pk
6.	1736.6	43.97	2	26.8	36.1	N/A	N/A	36.67Av	68.15Av	500Av
7.	1772.1	51.45	2	26.9	36.1	N/A	N/A	44.25pk	163.11pk	5011pk
7.	1772.1	42.66	2	26.9	36.1	N/A	N/A	35.46Av	59.29Av	500Av
8.	2301.7	52.86	1.9	28.2	35.6	N/A	N/A	47.36pk	233.34pk	5011pk
8.	2301.7	45.32	1.9	28.2	35.6	N/A	N/A	39.82Av	97.94Av	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:

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

(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.

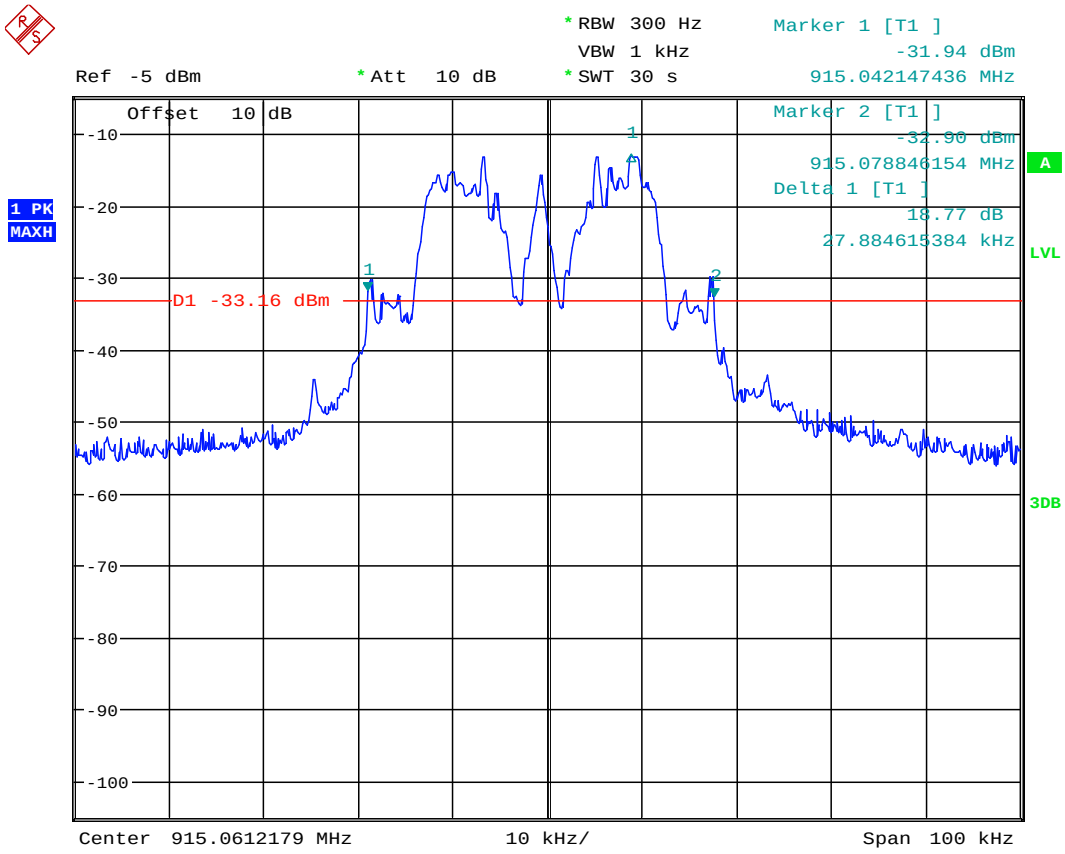
(b) The time and date on the plots do not necessarily equate to the time of the test.

(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

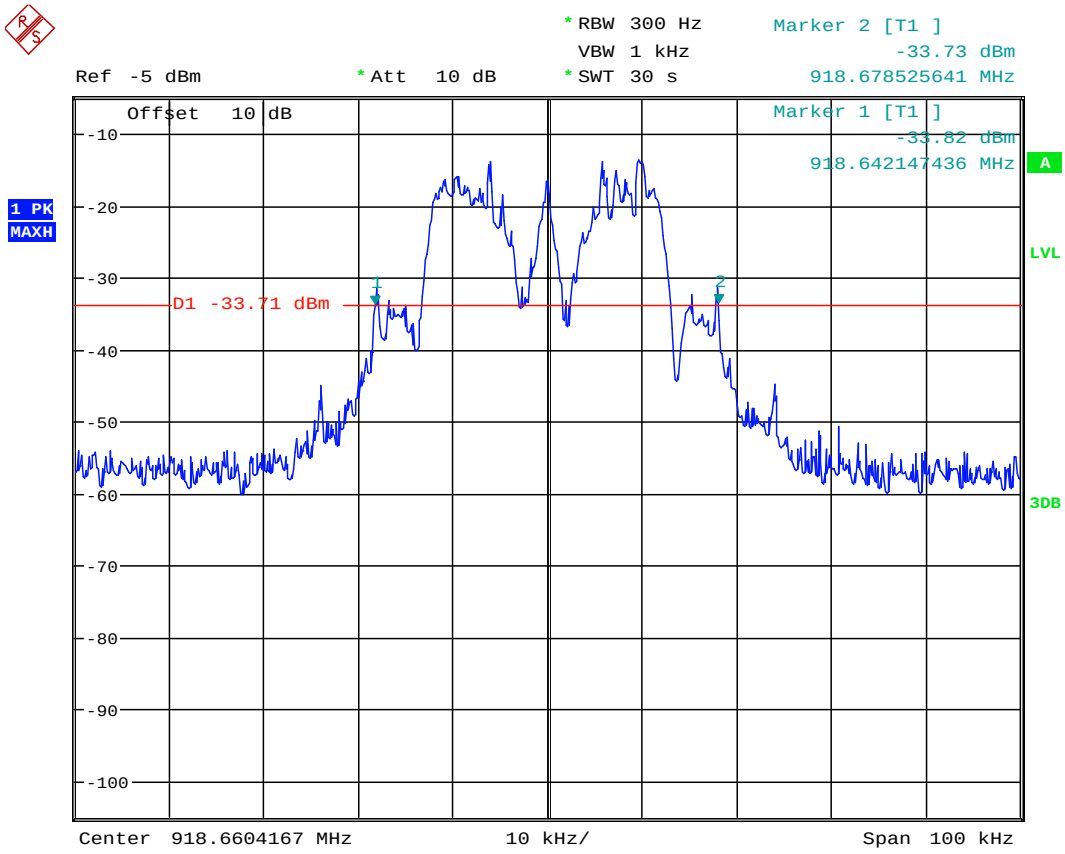


Date: 16.MAR.2012 12:23:22

FI = 915.042147MHz
FH = 915.078846MHz

20dB bandwidth = 36.69kHz

20dB Bandwidth top channel

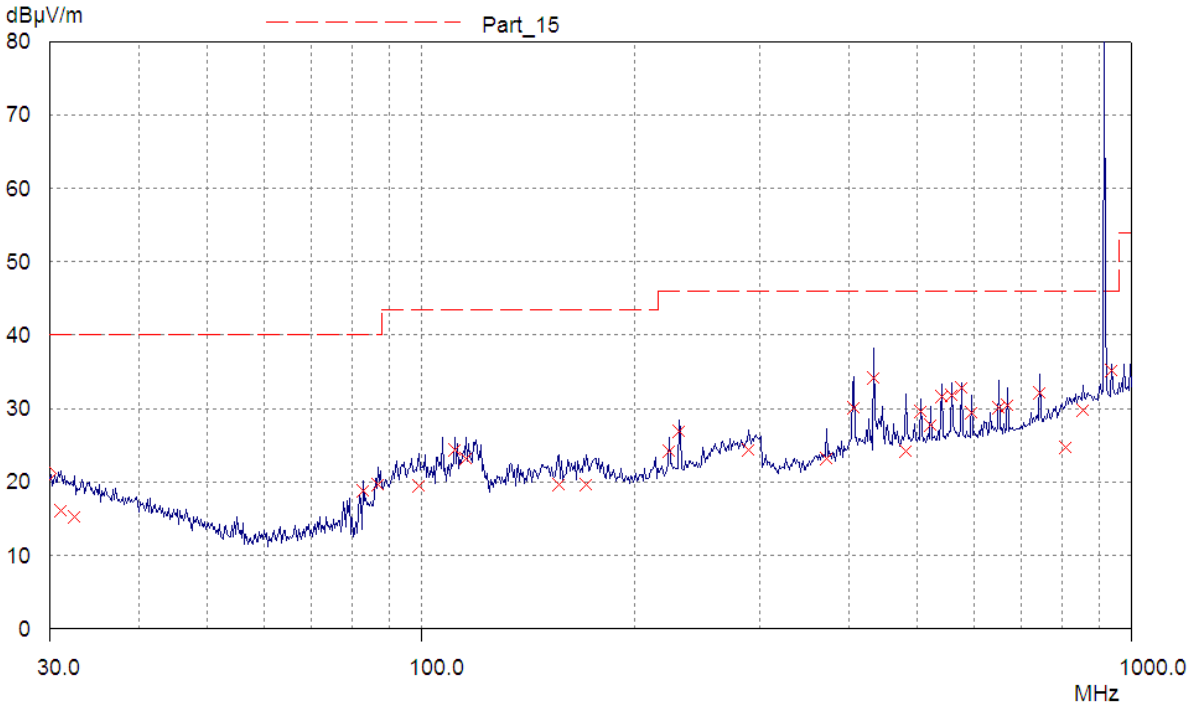


Date: 16.MAR.2012 12:32:49

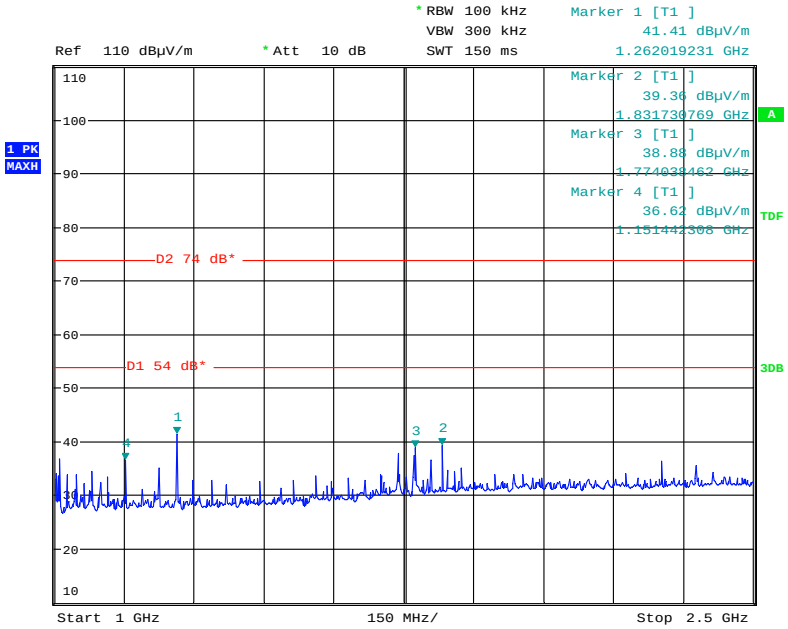
Fl = 918.642147MHz
FH = 918.678525MHz

20dB bandwidth = 36.37kHz

Bottom channel Radiated spurious emissions 30MHz to 1GHz

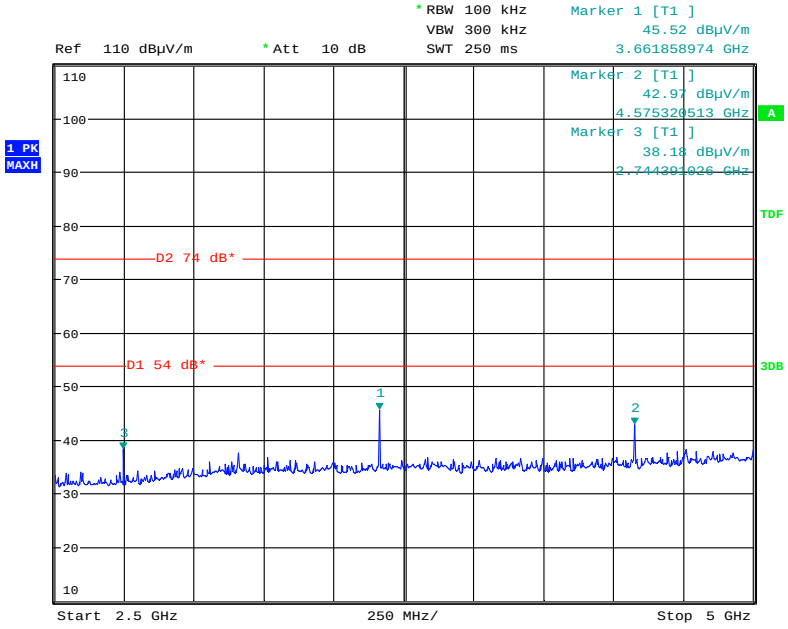


1GHz to 2.5GHz



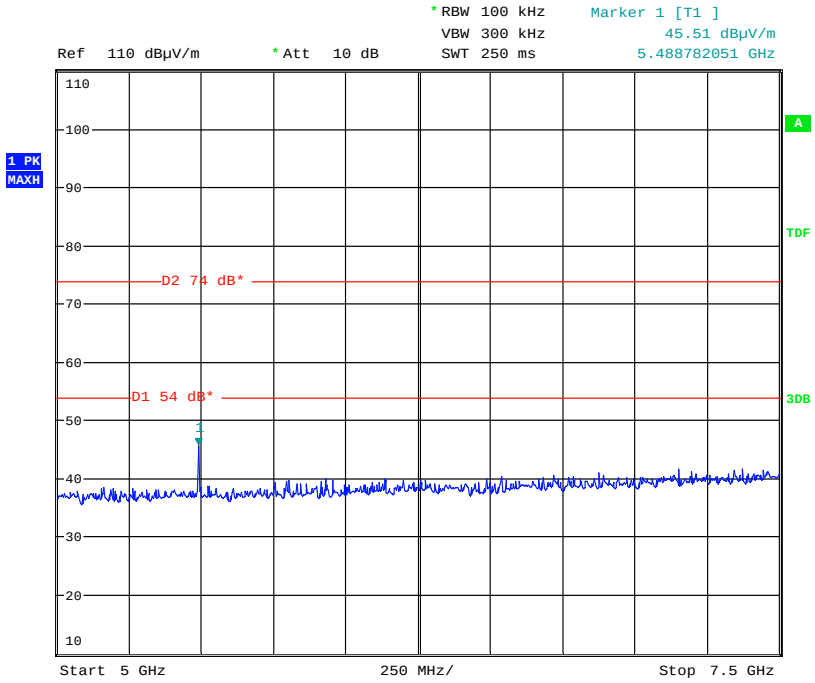
Date: 20.MAR.2012 09:20:18

2.5GHz to 5GHz



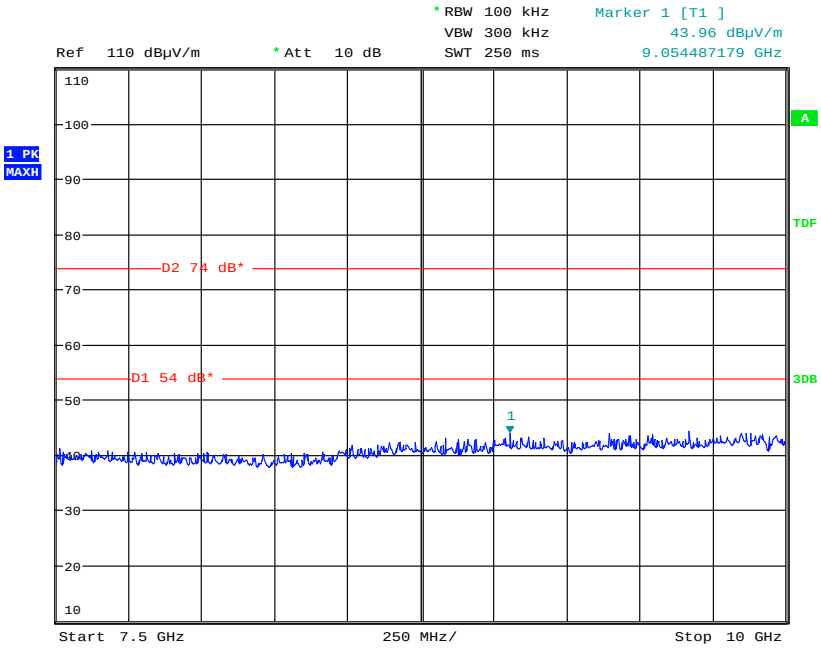
Date: 20.MAR.2012 09:21:24

5GHz to 7.5GHz



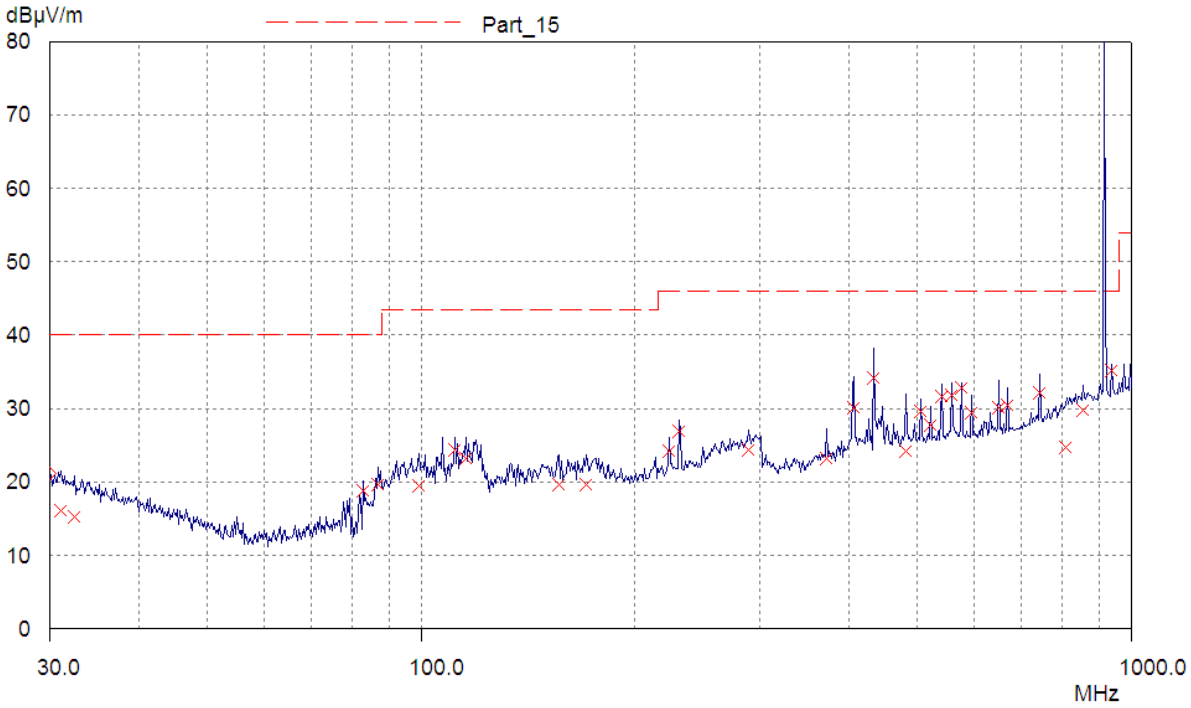
Date: 20.MAR.2012 09:22:00

7.5GHz to 10GHz

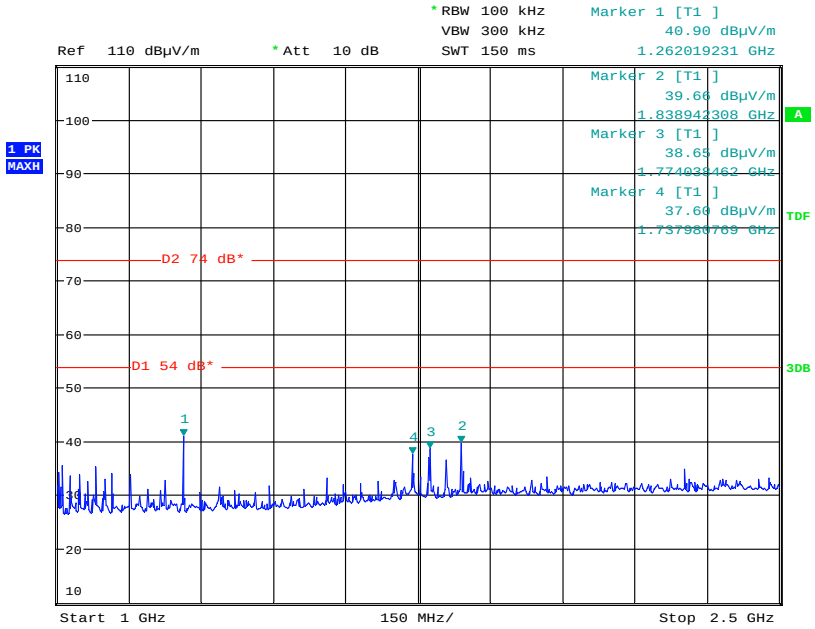


Date: 20.MAR.2012 09:22:24

Top channel Radiated spurious emissions 30MHz to 1GHz

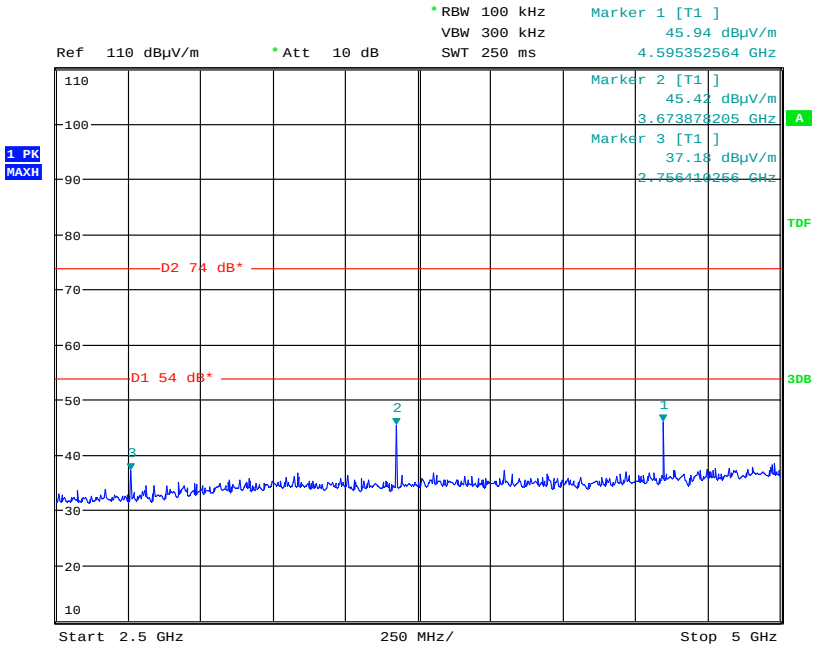


1 GHz to 2.5GHz



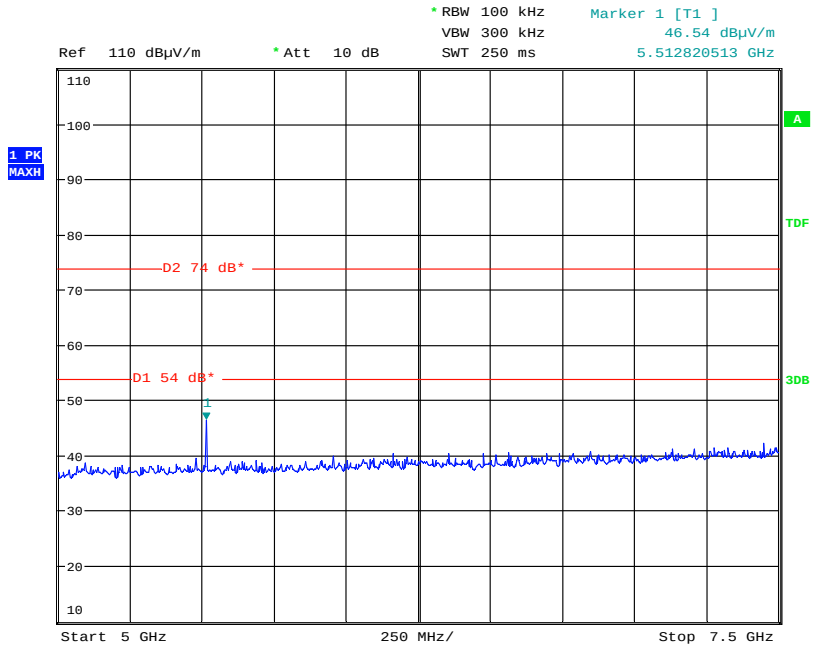
Date: 20.MAR.2012 09:32:29

2.5GHz to 5GHz



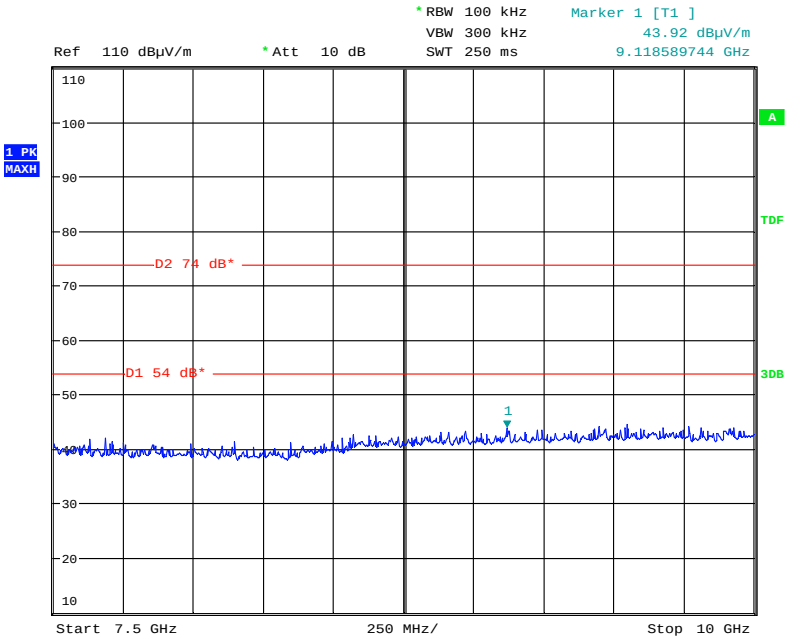
Date: 20.MAR.2012 09:33:27

5GHz to 7.5GHz



Date: 20.MAR.2012 09:34:21

7.5GHz to 10GHz



Date: 20.MAR.2012 09:34:53

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
S13	Master Tx	N/A

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

Sample No.	Description	Identification
S00	Canon Camera	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. The Master unit was connected to a Canon camera via BNC connections, the Master unit providing the timecode and Tv sync to the camera, to exercise to ports.

Test	Description of Operating Mode:
Receiver conducted and radiated (ERP) spurious emissions	Using the Master Tx menu, RF mode was selected so that the receiver channel could be selected. The receiver channels used were Bottom channel and Top channel

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 Timecode out	50Ω Coax cable	30cms	Cannon Camera
BNC Tv Sync	50Ω Coax cable	30cms	Cannon Camera

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.

29/03/2012

Paul Scurrell
Company Director
www.timecodebuddy.com
paulscurrell@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 x (Log_{10} 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 = $\frac{\text{the sum of the highest average value pulsewidths over 100ms}}{\text{100ms}}$

e.g

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

0.07459 or 7.459%

Correction factor (dB) = 20 x (Log_{10} 0.07459) = -22.54dB

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

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

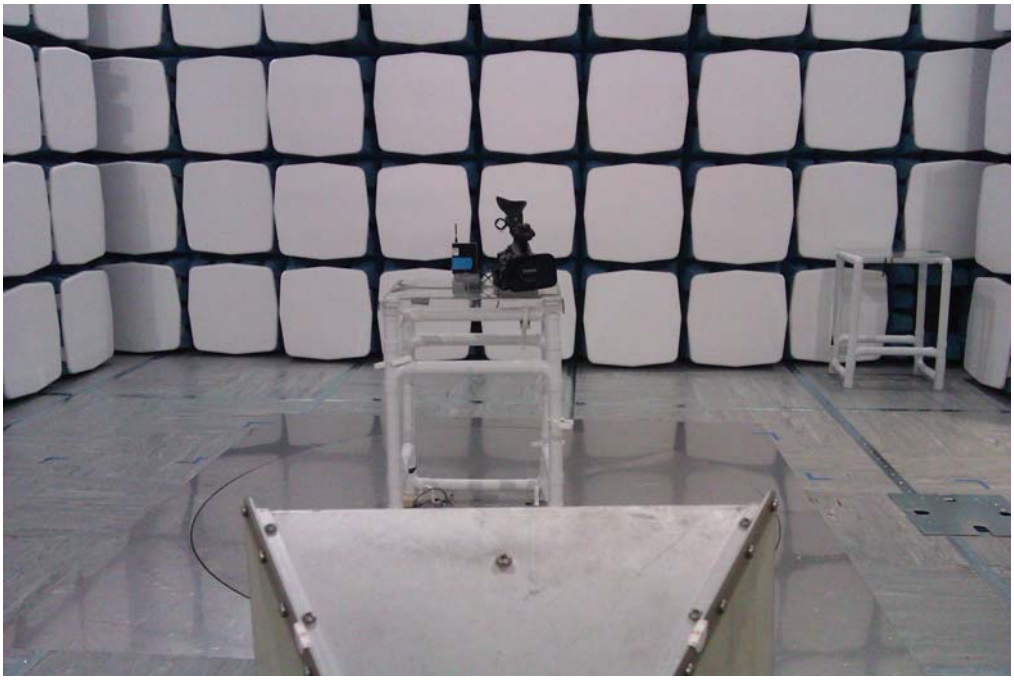
Therefore 20log (8÷100) = -21.93dB.

Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

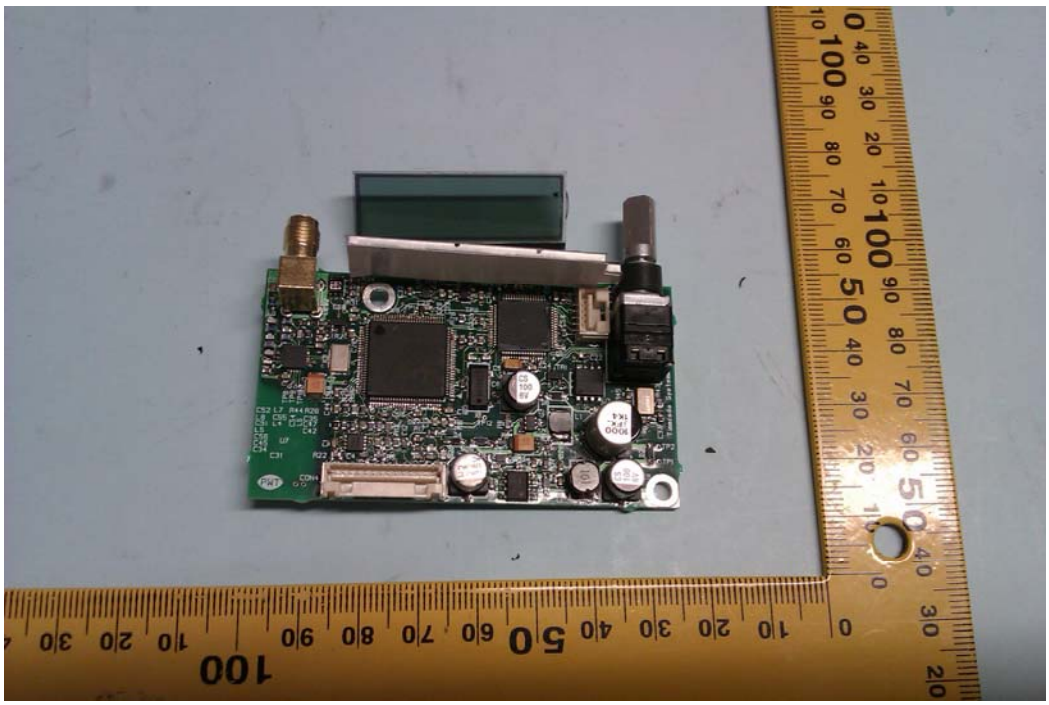
1. Test setup.
2. Overview/battery compartment removed
3. Top View case removed/PCB removed from chassis
4. Underside view removed from chassis

Photograph 1

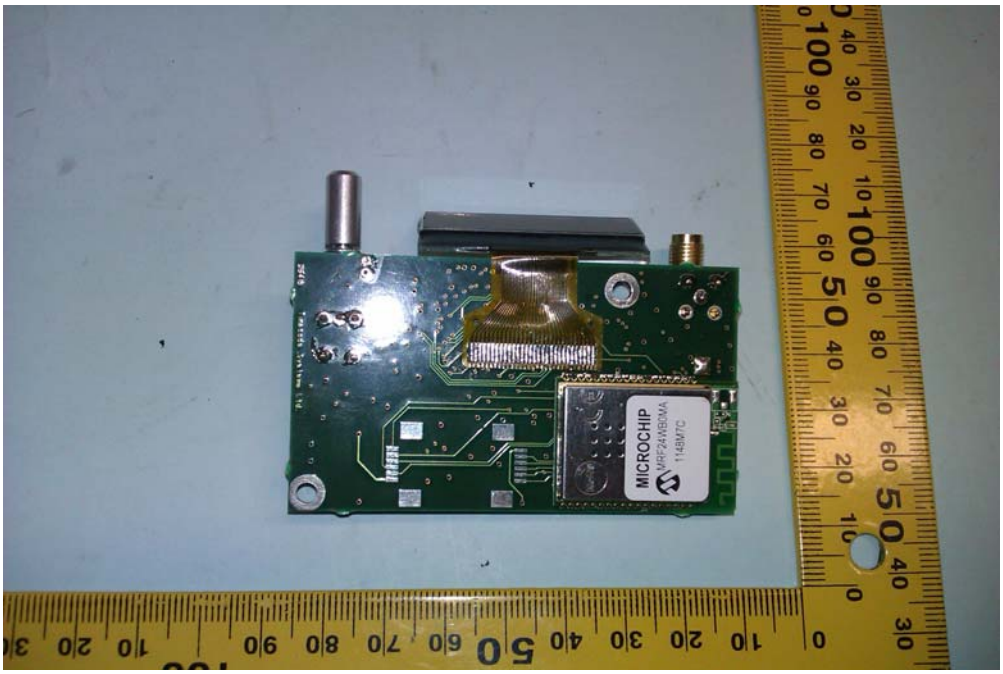


Photograph 2

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^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

Result

Prediction Frequency (MHz)	Maximum EIRP	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 0.612mW/cm^2
918.65	0.28mW	0.612	0.191

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