A RADIO TEST REPORT

FOR

MULTITONE ELECTRONICS PLC

ON

iPage

DOCUMENT NO. TRA-007413-W-UC-01

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TRaC Wireless Test Report	**:** TRA-007413-W-UC-1
Applicant	**:** Multitone Electronics plc
Apparatus	**:** iPage
Specification(s)	**:** CFR47 Part 90 & RSS119
Purpose of Test	**: Certification**
FCC ID	**:** E86IP133
IC ID	**:** 225A-IP133
Authorised by	**:**
	: K J Anderson, Authorised Signatory
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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 :

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1.3 Manufacturer

As Above

1.4 Apparatus Assessed

The following apparatus was assessed between 20th December 2011 – 17th January 2012

iPage IP133

The iPage is a UHF paging transmitter capable of operating with 10/12.5 kHz or 20/25 kHz channel spacing.

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	FCC Part	RSS Part	Appendix in Report	Pass/ Fail
RF Power Output	90.205	RSS-119 5.4	A1	Pass
Emission Mask	90.210	RSS-119 5.5	A2	Pass
Occupied Bandwidth	90.210	RSS-119 5.5	A3	Pass
Spurious Emissions at Antenna Terminals	90.210	RSS-119 5.8	A4	Pass
Field Strength of Spurious Emissions	90.210	RSS-119 5.8	A5	Pass
Frequency Stability	90.213	RSS-119 5.3	A6	Pass
Transient behaviour	90.214	RSS-119 5.9	A7	Pass
AC Powerline Conducted Emissions	15.107	RSS-GEN 5.5	A8	Pass
Field Strength of Un-Intentional Spurious Emissions	15.109	RSS-GEN 6.0	A9	Pass
Audio Frequency Response	2.1047	RSS-119 5.5	A10	N/A
Modulation Limiting	2.1047	RSS-119 5.5	A11	N/A

Abbreviations used in the above table:

FCC : Federal Communications Commission
CFR : Code of Federal Regulations
RSS : Radio Standards Specification

1.6 Standard References

47 CFR 2	Code of Federal Regulations, Title 47, Part 2, “Frequency allocations and Radio Telemetry Matters; General Rules and Regulations”
47 CFR 90	Code of Federal Regulations, Title 47, Part 90,”Land Mobile Radio Service”
47 CFR 15	Code of Federal Regulations, Title 47, Part 15,”Radio Frequency Devices” Subpart B, “Unintentional Radiators”
C63.4-2003	American National Standards Institute (ANSI), “Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range 9 kHz to 40 GHz”

1.6 Notes Relating To Assesment

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.

1.8 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 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, in addition to those listed in section 1.5

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 RF Output Power

Test Details:	
FCC Regulation	Title 47 of the CFR: Part 90.205, RSS-119 Section 5.4
Measurement standard	Title 47 of the CFR: Part 2.1046, RSS-GEN Section 4.8
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
Temperature	21
Humidity	50
EUT set up	Refer to Appendix C

Frequency (MHz)	Measured Level (dBm)	Attenuator and cable loss (dB)	Carrier power (dBm)	Carrier power (W)	Rated Output Power (W)
440	36.0	0.4	36.4	4.365	5
455	36.4	0.4	36.8	4.786	5
470	34.4	1.1	37.5	5.623	5

Limit 90.205(s)

The output power shall not exceed the manufacturers rated output power by more than 20%

Result

The iPage was found to comply with the limits

A2 Emissions Mask

Test Details:	
Regulation	Title 47 of the CFR: Part 90.210, RSS-119 Section 5.5
Measurement standard	Title 47 of the CFR: Part 2.1051
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Limit

Mask C – 25 kHz channels without audio filter

On any frequency removed from the assigned frequency by the following displacement frequency (f_d in kHz) or percentage of the authorised bandwidth

±5 kHz	-	10 kHz	83 Log (f_d / 5)	dB
±10 kHz	-	250 %	29 Log (f_d^2 / 11) or 50*	dB
> ±250%			43 + 10 log P	dB

Mask D – 12.5 kHz channels without audio filter

On any frequency removed from the centre of the authorised bandwidth (f_o) by the following frequency offsets

±0 kHz	-	5.625 kHz	0	dB
±5.625 kHz	-	12.5 kHz	7.27 (f_d -2.88 kHz)	dB
> ±12.5 kHz	-		50 + 10 Log P or 70*	dB
> ±50 kHz			43 + 10 Log P	dB#

Notes:
(10 log P_{watts}) – (43 + 10 Log (P_{watts} * 1000)) = LIMIT = -13 dBm
(10 log P_{watts}) – (50 + 10 Log (P_{watts} * 1000)) = LIMIT = -20 dBm
* whichever is the lesser attenuation

Not applicable for RSS-119

Results

The iPage was found to comply with the limits

See plots in Appendix B.

A3 Occupied Bandwidth

Test Details:	
Regulation	Title 47 of the CFR: Part 90.210, RSS-119 Section 5.5
Measurement standard	Title 47 of the CFR: Part 2.1049, RSS-GEN Section 4.6
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency Of Operation (MHz)	Channel Spacing	
	12.5 kHz	25 kHz
440	5.889 kHz	9.775 kHz
455	5.929 kHz	9.695 kHz
470	5.809 kHz	9.775 kHz

Limit

Channel Spacing	Bandwidth Limitation
12.5 kHz	11.25 kHz
25.0 kHz	20.00 kHz

Result

The iPage was found to comply with the limits

A4 Spurious Emissions at Antenna Terminals

Test Details:	
Regulation	Title 47 of the CFR: Part 90.210
Measurement standard	Title 47 of the CFR: Part 2.1051
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Bottom Channel

Frequency Range (MHz)	Freq. of Emission (MHz)	Measured Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit dBm
9 kHz - 5GHz	880.0	-70.74	40.64	-30.10	-13

Middle Channel

Frequency Range (MHz)	Freq. of Emission (MHz)	Measured Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit dBm
9 kHz - 5GHz	1365.0	-70.23	40.38	-29.85	-13

Top channel

Frequency Range (MHz)	Freq. of Emission (MHz)	Measured Level (dBm)	Attenuator & Cable Losses (dB)	Spurious Emission Level (dBm)	Limit dBm
9 kHz - 5GHz	No significant emissions with in 20 dB of limit				-13

Limit

Limit is determined by the outermost step of the emissions mask and is calculated as follows:

At least 43 + 10 log P dB

$(10\log P_{watts}) - (43+10\log (P_{watts} * 1000)) =$ LIMIT =-13 dBm

Limit reduces to $(10 \log P_{watts}) - (50 + 10 \text{ Log } (P_{watts} * 1000))$ = LIMIT = -20 dBm for RSS-119 Mask D

Result

The iPage was found to comply with the limits

A5 Radiated Electric Field Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric filed emission test applies to all spurious emissions.
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 90.210, RSS-119 Section 5.8
Measurement standard	Title 47 of the CFR: Part 2.1053, RSS-GEN Section 4.9
Frequency range	30 MHz – 5.2 GHz
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S08, S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1 & 2

Bottom Frequency

FREQUENCY RANGE	FREQ. (MHz)	ERP/EIRP (dBm)	LIMIT (dBm)
30 MHz – 5 GHz	1319.996	-31.8	-13
	2639.991	-31.9	-13
	3520.024	-30.9	-13
	4399.958	-31.4	-13
	4840.006	-23.4	-13

Middle Frequency

FREQUENCY RANGE	FREQ. (MHz)	ERP/EIRP (dBm)	LIMIT (dBm)
30 MHz – 5.1 GHz	1364.990	-32.7	-13
	3185.004	-28.3	-13
	4095.016	-32.1	-13
	4549.996	-20.2	-13
	5005.003	-20.6	-13

Top Frequency

FREQUENCY RANGE	FREQ. (MHz)	ERP/EIRP (dBm)	LIMIT (dBm)
30 MHz – 5.2 GHz	2820.006	-27.4	-13
	3290.007	-32.2	-13
	4230.002	-31.8	-13
	4700.004	-20.8	-13
	5170.000	-23.3	-13

Result

The iPage was found to comply with the limits

Notes:

1. Emissions Checked up to a minimum of 10 times Fc, this is extended is significant emissions are detected.

2. The unit was mounted on a turntable and rotated through 360^0 and in 3 orthogonal planes to find the worst case emission.

3. 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 Detector RBW = 1MHz; VBW = ≥RBW

4. Limit is determined as the outermost step of the emissions mask and is calculated as follows.

   At least 43 + 10 log P dB

   $(10\log P_{watts}) - (43+10\log (P_{watts} * 1000)) =$ LIMIT =-13 dBm

Limit reduces to $(10 \log P_{watts}) - (50 + 10 \text{ Log } (P_{watts} * 1000))$ = LIMIT = -20 dBm for RSS-119 Mask D

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 2.1057.

(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

A6 Frequency Stability

Test Details:	
Regulation	Title 47 of the CFR: Part 90.213, RSS-119 Section 5.3
Measurement standard	Title 47 of the CFR: Part 2.1055, RSS-GEN Section 4.7
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Voltage Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+25	12.0	440.00078	N/A	N/A	Reference*
+25	85%	440.00081	-30	-0.07	Pass
+25	115%	440.00082	-40	-0.09	Pass
Temperature Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+50	12.0	-60	-0.14	-60	Pass
+40	12.0	-40	-0.09	-40	Pass
+30	12.0	-30	-0.07	-30	Pass
+20	12.0	0	0.00	0	Pass
+10	12.0	110	0.25	110	Pass
0	12.0	230	0.52	230	Pass
-10	12.0	-30	-0.07	-30	Pass
-20	12.0	-100	-0.23	-100	Pass
-30	12.0	652	1.48	652	Pass

* Measured f_c at Tnom Vnom used as reference frequency drift calculations of measured f_c at extreme voltage / temperature.

Limit

±1.5 ppm (tightest applicable limit, See Appendix B for frequency stability plots verses limit)

Result

The iPage was found to comply with the limits

Test Details:	
Regulation	Title 47 of the CFR: Part 90.213, RSS-119 Section 5.3
Measurement standard	Title 47 of the CFR: Part 2.1055, RSS-GEN Section 4.7
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Voltage Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+25	12.0	455.00070	N/A	N/A	Reference*
+25	85%	455.000460	240	0.53	Pass
+25	115%	455.000460	240	0.53	Pass
Temperature Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+50	12.0	455.000500	200	0.44	Pass
+40	12.0	455.000450	250	0.55	Pass
+30	12.0	455.000440	260	0.57	Pass
+20	12.0	455.000450	250	0.55	Pass
+10	12.0	455.000370	330	0.73	Pass
0	12.0	455.000250	450	0.99	Pass
-10	12.0	455.000460	240	0.53	Pass
-20	12.0	455.000450	250	0.55	Pass
-30	12.0	455.000080	620	1.36	Pass

* Measured f_c at Tnom Vnom used as reference frequency drift calculations of measured f_c at extreme voltage / temperature.

Limit

±1.5 ppm (tightest applicable limit, See Appendix B for frequency stability plots verses limit)

Result

The iPage was found to comply with the limits

Test Details:	
Regulation	Title 47 of the CFR: Part 90.213, RSS-119 Section 5.3
Measurement standard	Title 47 of the CFR: Part 2.1055, RSS-GEN Section 4.7
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Voltage Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+20	12.0	470.000510	N/A	N/A	Reference*
+20	85%	470.000510	0	0.00	Pass
+20	115%	470.000530	-20	-0.04	Pass
Temperature Variation					
Temperature °C	Vnom (Vdc)	Measured Frequency (MHz)	Frequency Difference (Hz)	ppm	Pass/Fail
+50	12.0	470.000540	-30	-0.06	Pass
+40	12.0	470.000550	-40	-0.09	Pass
+30	12.0	470.000520	-10	-0.02	Pass
+20	12.0	470.000480	30	0.06	Pass
+10	12.0	470.000350	160	0.34	Pass
0	12.0	470.000170	340	0.72	Pass
-10	12.0	470.000440	70	0.15	Pass
-20	12.0	470.000410	100	0.21	Pass
-30	12.0	470.000870	-360	-0.77	Pass

* Measured f_c at Tnom Vnom used as reference frequency drift calculations of measured f_c at extreme voltage / temperature.

Limit

±1.5 ppm (tightest applicable limit, See Appendix B for frequency stability plots verses limit)

Result

The iPage was found to comply with the limits

A7 Transient Behaviour

Test Details:	
Regulation	Title 47 of the CFR: Part 90.214, RSS-119 Section 5.9
Measurement standard	Title 47 of the CFR: Part 2.1055,
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S04
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Channel	440 MHz	455MHz	470 MHz
Time, t1	Compliant	Compliant	Compliant
Time, t2	Compliant	Compliant	Compliant
Time, t3	Compliant	Compliant	Compliant

Limit

Time interval	Maximum Frequency Difference	All Equipment	
		150 – 174 MHz	421 – 512 MHz
25 kHz channels			
t1	±25 kHz	5.0 ms	10.0 ms
t2	±12.5 kHz	20.0 ms	25.0 ms
t3	±25 kHz	5.0 ms	10.0 ms
12.5 kHz channels			
t1	±12.5 kHz	5.0 ms	10.0 ms
t2	±6.25 kHz	20.0 ms	25.0 ms
t3	±12.5 kHz	5.0 ms	10.0 ms

Result

The iPage was found to comply with the limits

A8 Power Line Conducted Emissions

Preview power line conducted emission measurements were performed with a peak & average detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b).Where applicable formal measurements of the emissions were performed with an average and/or quasi peak detector.

Test Details:	
Regulation	Title 47 of the CFR: Part 15.107, RSS-GEN Section 5.5
Measurement standard	ANSI C63.10:2003
Frequency range	150kHz to 30MHz
EUT sample number	S03
Modification state	0
SE in test environment	S08, S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	3

The EUT was operated in both standby and transmit modes. The worst-case power line 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
No Significant Emissions within 20 dB of the limit						

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	0.18	Neutral	48.11	64.49	16.38	Pass
2	0.19	Neutral	45.72	64.04	18.32	Pass
3	0.18	Live	48.53	64.49	15.96	Pass
4	0.195	Live	44.92	63.82	18.90	Pass

Specification limits:

Conducted emission limits:

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dBμV	
	Quasi-peak	Average
0.15 to 0.5	66 to 56[2]	56 to 46[2]
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 (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓			
Effect of EUT internal configuration on emission levels	✓			

(i) Parameter defined by standard and / or single possible, refer to Appendix C
(ii) Parameter defined by client and / or single possible, refer to Appendix C
(iii) Parameter had a negligible effect on emission levels, refer to Appendix C
(iv) Worst case determined by initial measurement, refer to Appendix C

A9 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric filed 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 15.109, RSS-GEN 6.0
Measurement standard	ANSI C63.10:2003
Frequency range	30 MHz – 5 GHz
EUT sample number	S01, S02, S03
Modification state	0
SE in test environment	S08, S09
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1 & 2

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

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1.	30.7	12.4	0.4	18.3	-	31.0	-	35.5	30.7
2.	30.9	9.3	0.4	18.2	-	27.8	-	24.5	30.9
3.	31.1	4.1	0.4	18.1	-	22.6	-	13.5	31.1
4.	43.8	11.6	0.4	10.9	-	22.9	-	14.0	43.8
5.	64.8	23.0	0.6	4.9	-	28.5	-	26.6	64.8
6.	66.3	23.5	0.6	5.1	-	29.2	-	28.8	66.3
7.	68.3	17.0	0.6	5.3	-	22.9	-	14.0	68.3
8.	69.0	23.4	0.6	5.3	-	29.3	-	29.2	69.0
9.	69.7	21.0	0.6	5.4	-	27.0	-	22.4	69.7
10.	148.1	15.8	0.7	10.6	-	27.1	-	22.6	148.1
11.	275.0	16.5	1.0	12.8	-	30.3	-	32.7	275.0
12.	300.0	13.5	1.1	13.0	-	27.6	-	24.0	300.0
13.	350.0	10.6	1.2	14.5	-	26.3	-	20.7	350.0
14.	450.0	8.1	1.4	16.7	-	26.2	-	20.4	450.0

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: Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 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:

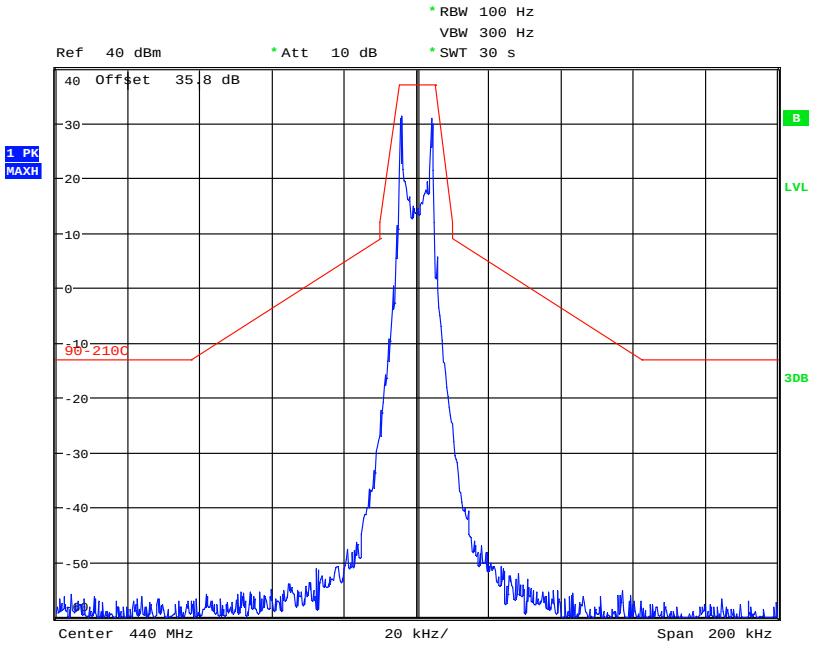
(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

(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.

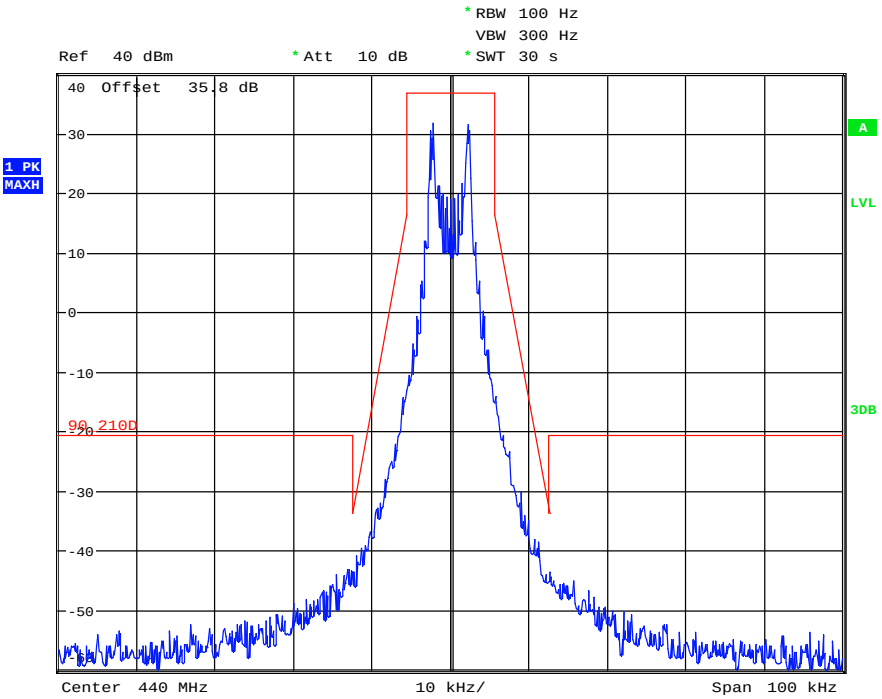
(d) Appendix C details the numbering system used to identify the sample and its modification state.

(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.



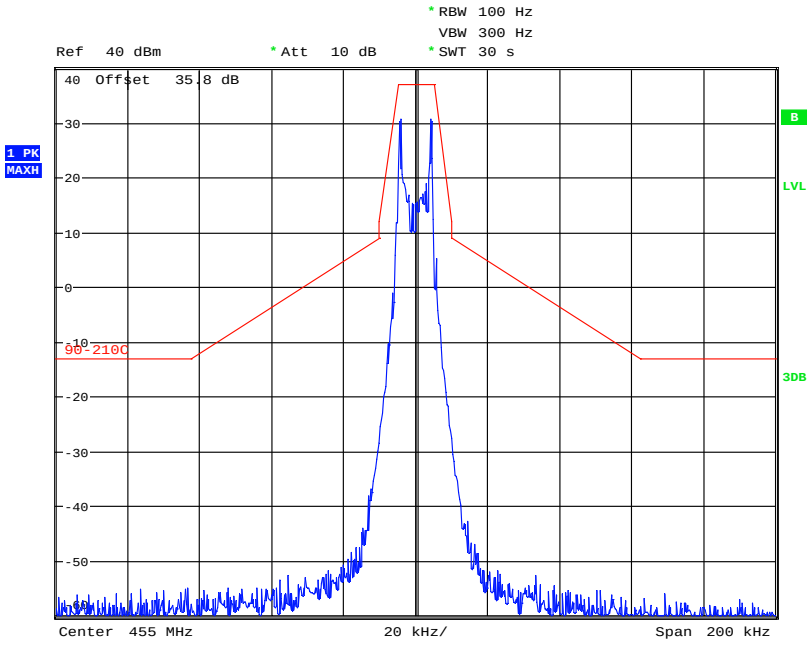
Date: 23.JAN.2012 14:56:19

440 MHz Mask C – 25 kHz



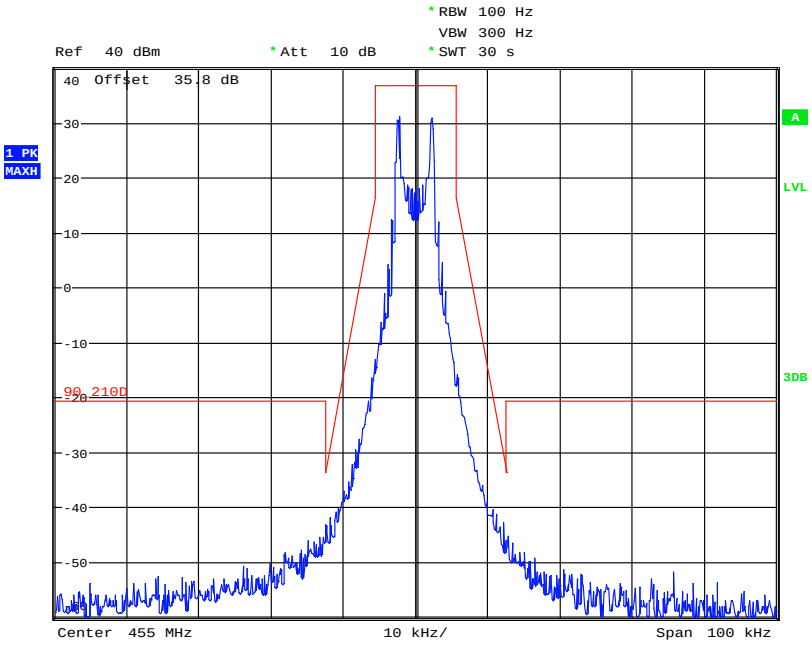
Date: 11.JAN.2012 14:15:41

440 MHz Mask D – 12.5 kHz



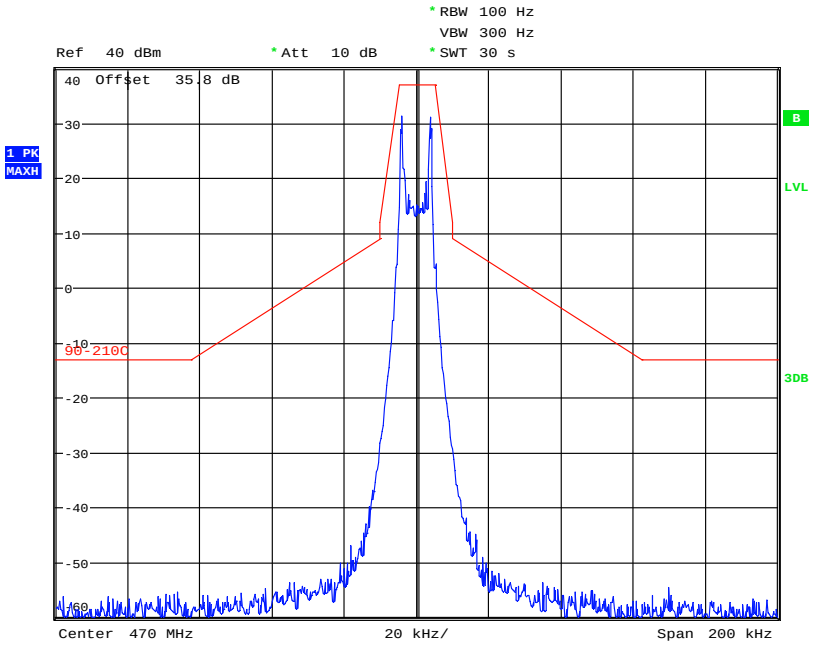
Date: 23.JAN.2012 14:51:30

455 MHz Mask C – 25 kHz



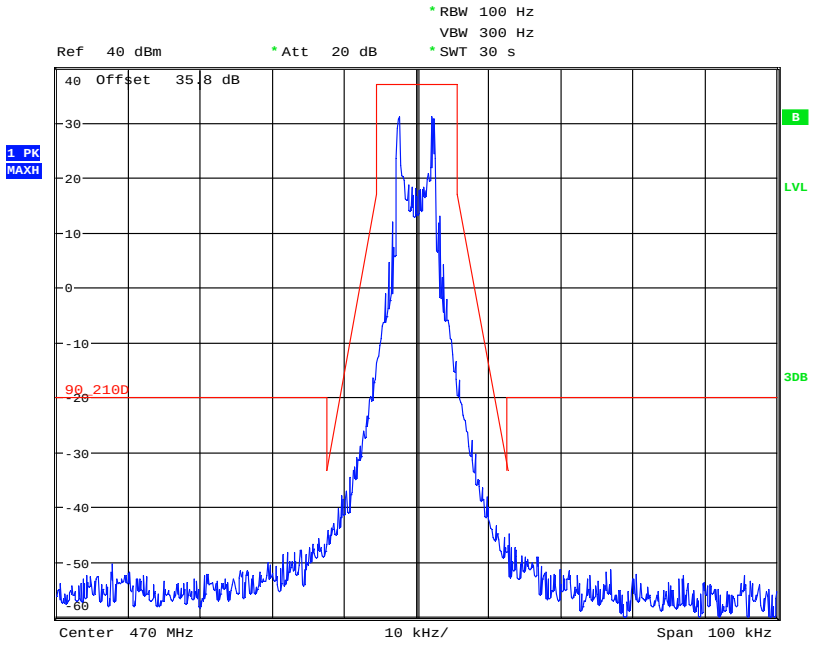
Date: 11.JAN.2012 14:08:27

455 MHz Mask D – 12.5 kHz



Date: 23.JAN.2012 14:42:34

470 MHz Mask C – 25 kHz



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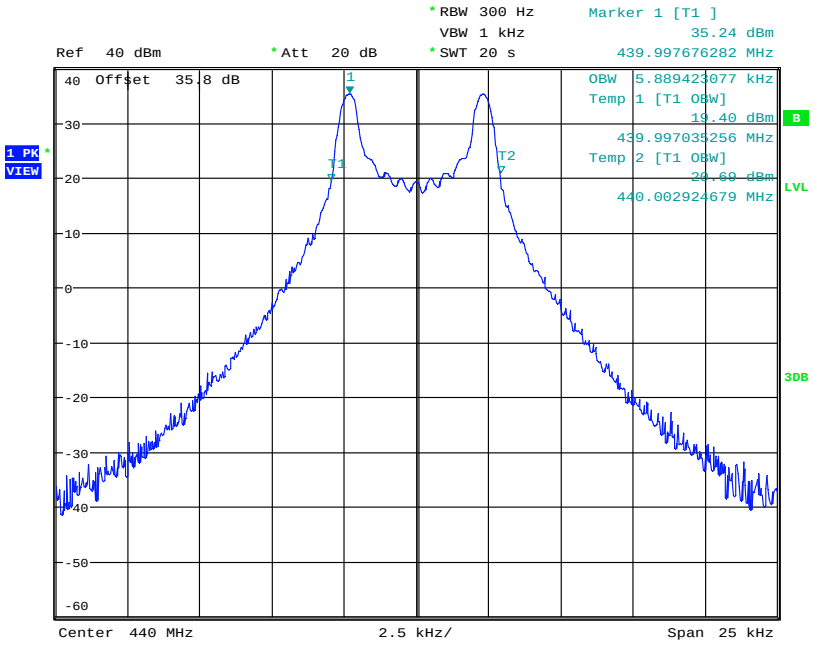
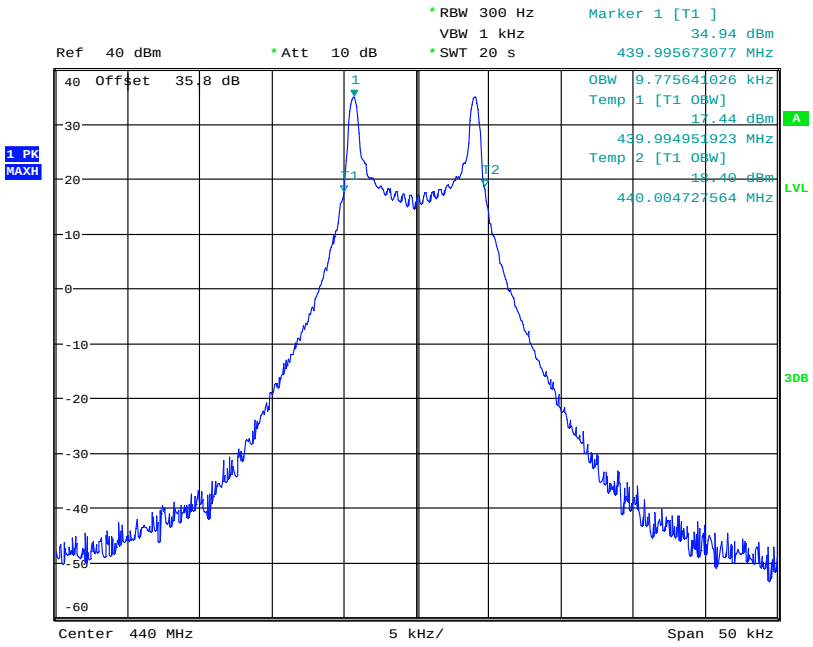
470 MHz Mask D – 12.5 kHz



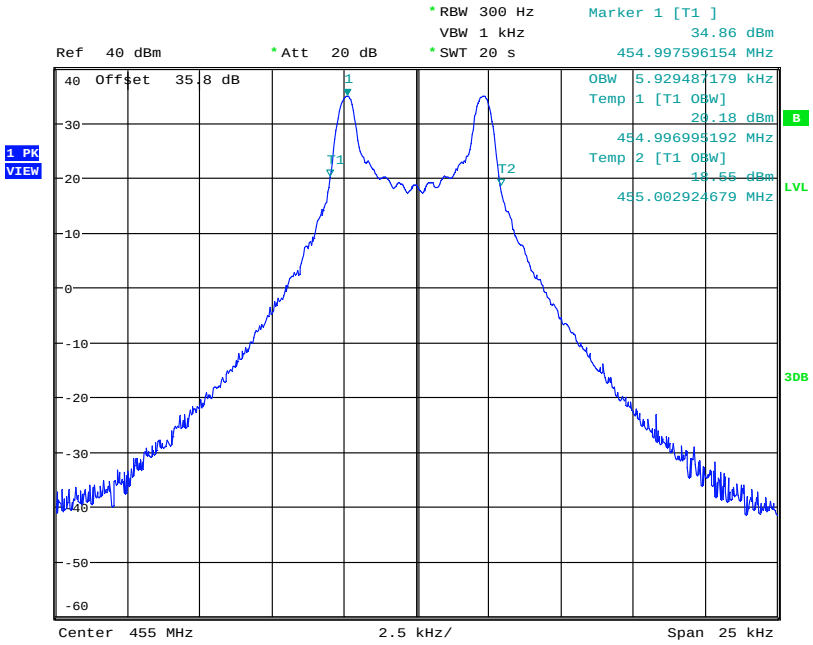
Date: 11.JAN.2012 14:14:40

440 MHz 99% Bandwidth – 12.5 kHz



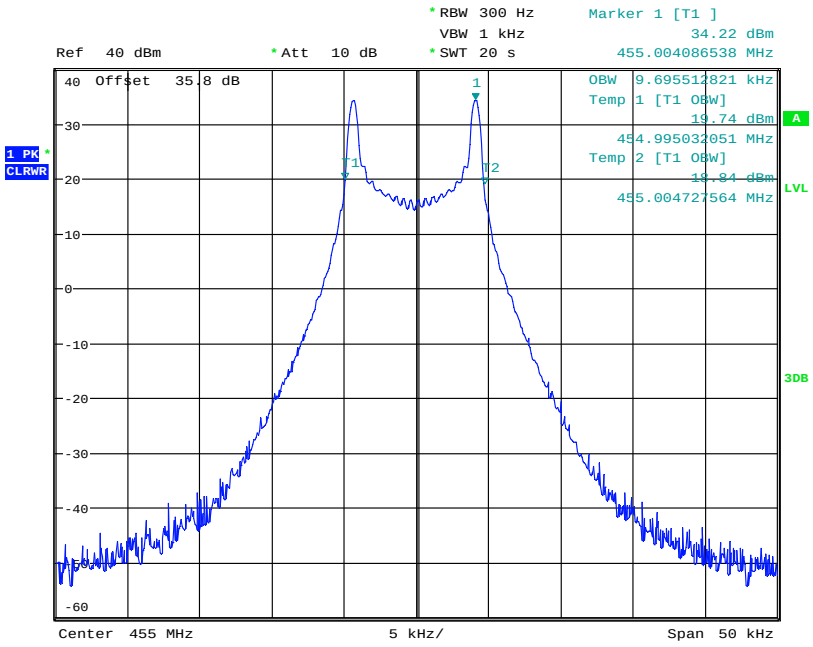
Date: 11.JAN.2012 11:20:26

440 MHz 99% Bandwidth – 25 kHz



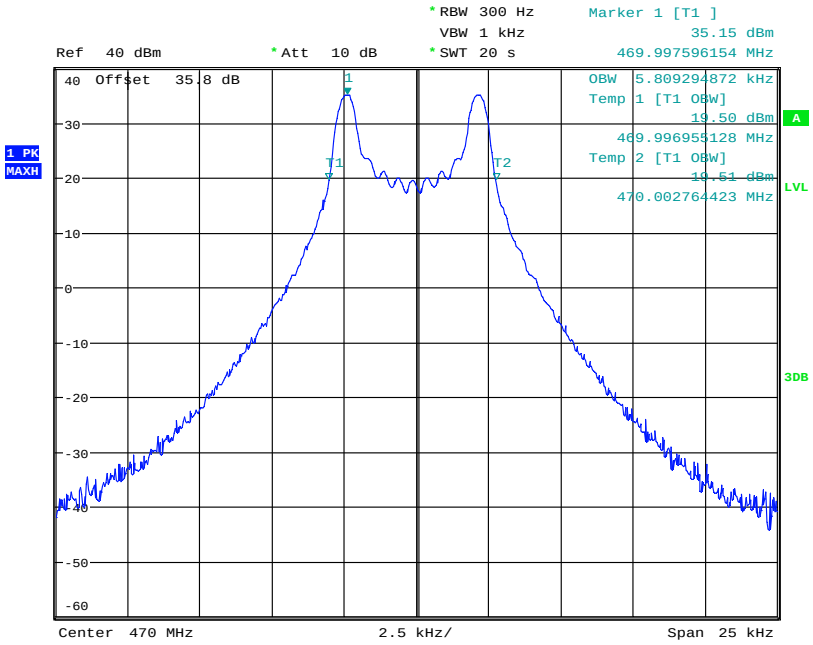
Date: 11.JAN.2012 14:06:03

455 MHz 99% Bandwidth – 12.5 kHz



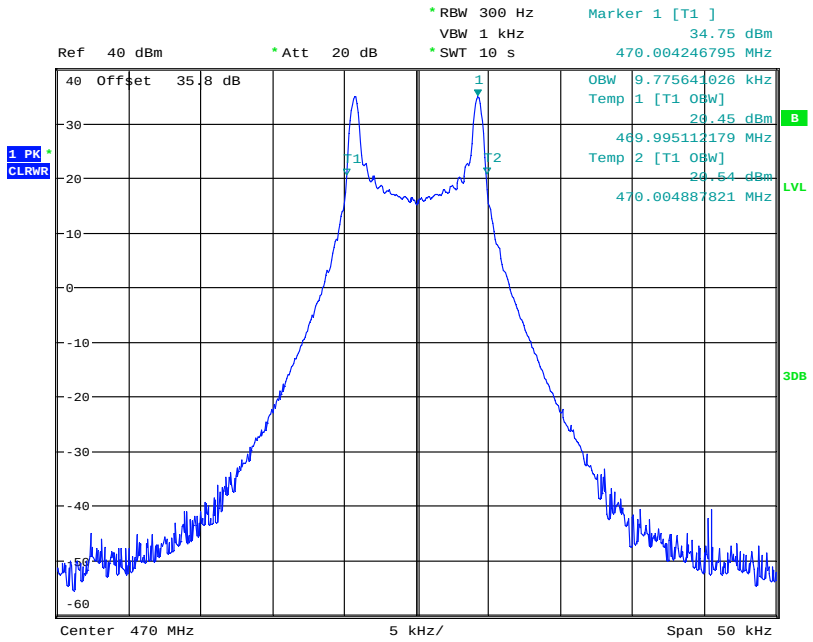
Date: 11.JAN.2012 11:18:18

455 MHz 99% Bandwidth – 25 kHz



Date: 11.JAN.2012 11:22:05

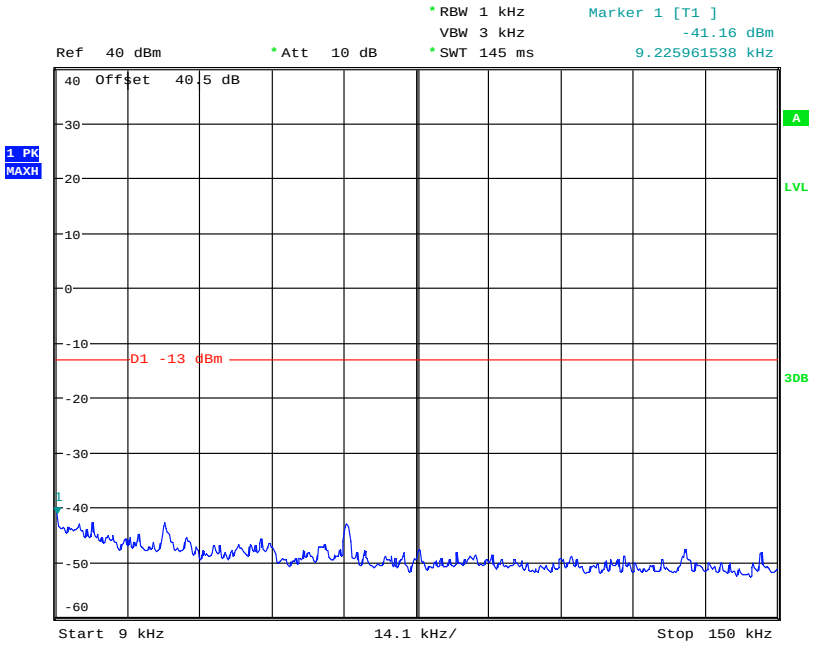
470 MHz 99% Bandwidth – 12.5 kHz



Date: 11.JAN.2012 13:59:39

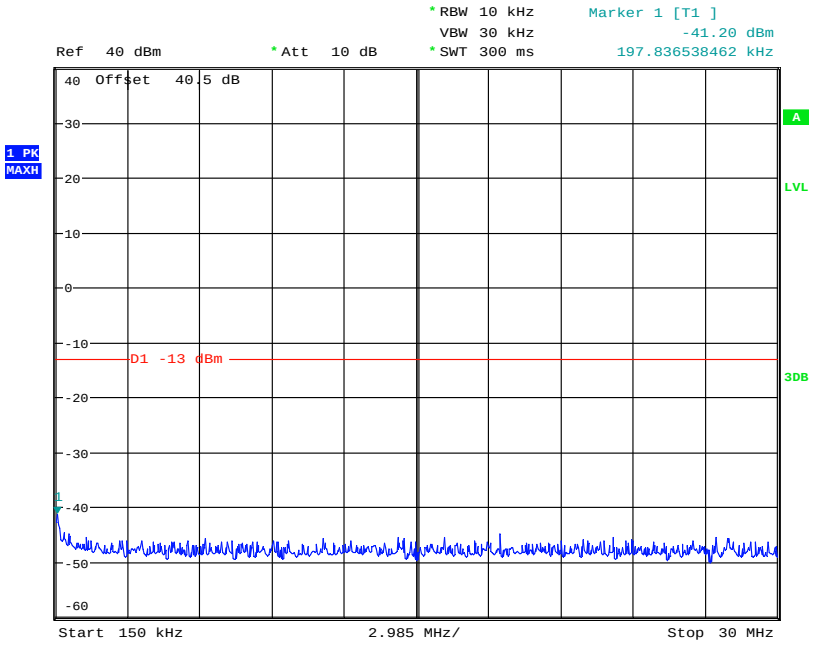
470 MHz 99% Bandwidth – 25 kHz

Spurious Emissions at antenna Terminals 440 MHz



Date: 20.DEC.2011 11:42:29

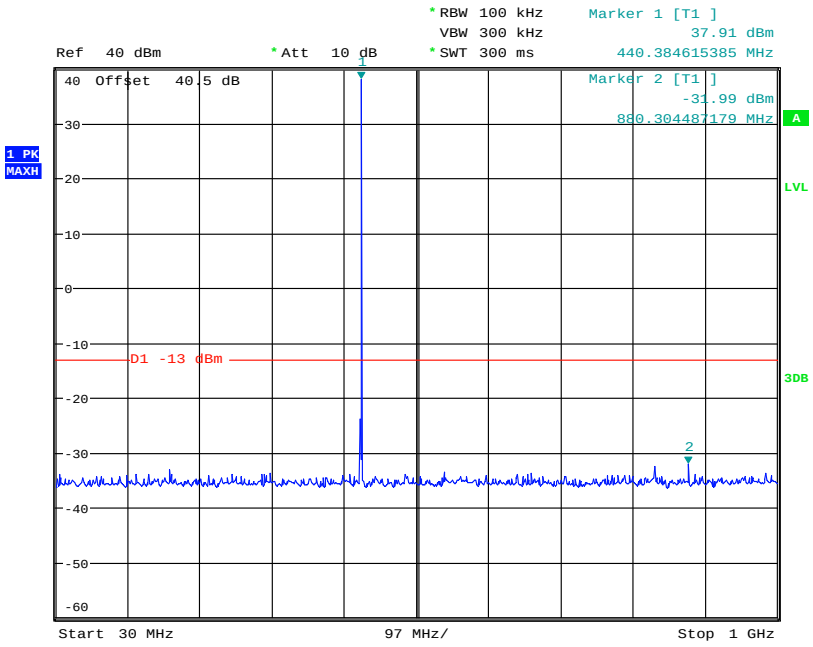
9 kHz – 150 kHz



Date: 20.DEC.2011 11:43:10

150 kHz – 30 MHz

Spurious Emissions at antenna Terminals 440 MHz



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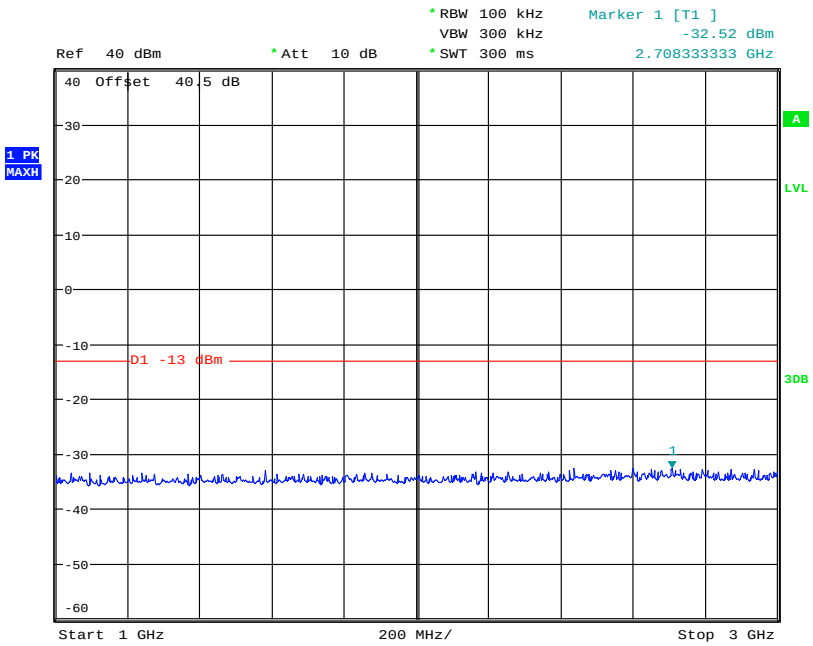
30MHz – 1GHz



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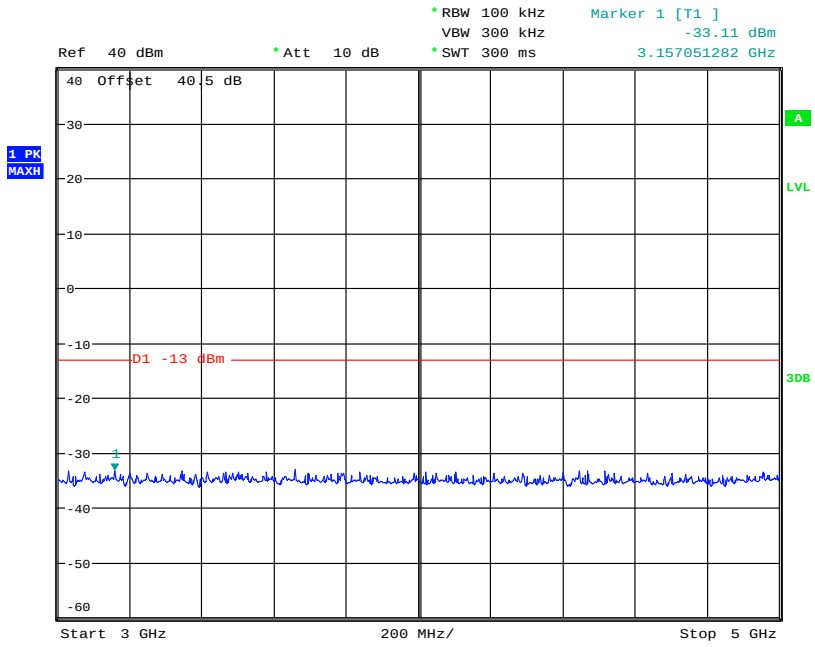
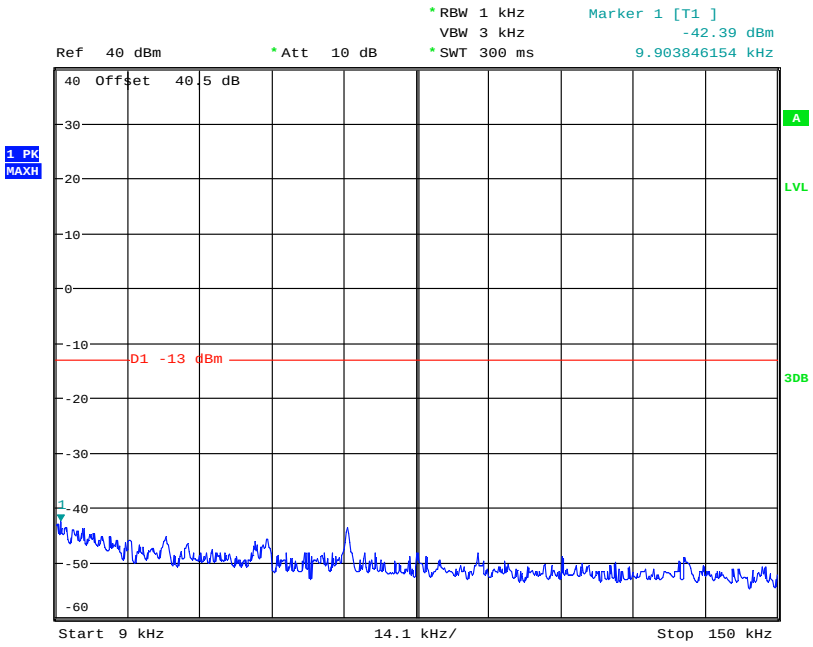
1GHz – 3GHz

Spurious Emissions at antenna Terminals 440 MHz



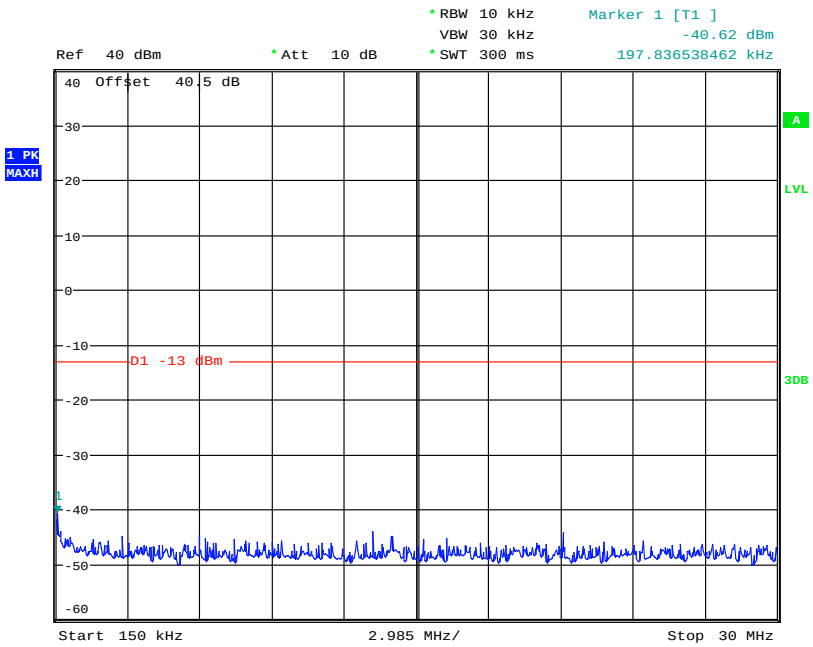
3GHz – 5GHz

Spurious Emissions at antenna Terminals 455 MHz



Date: 20.DEC.2011 11:51:43

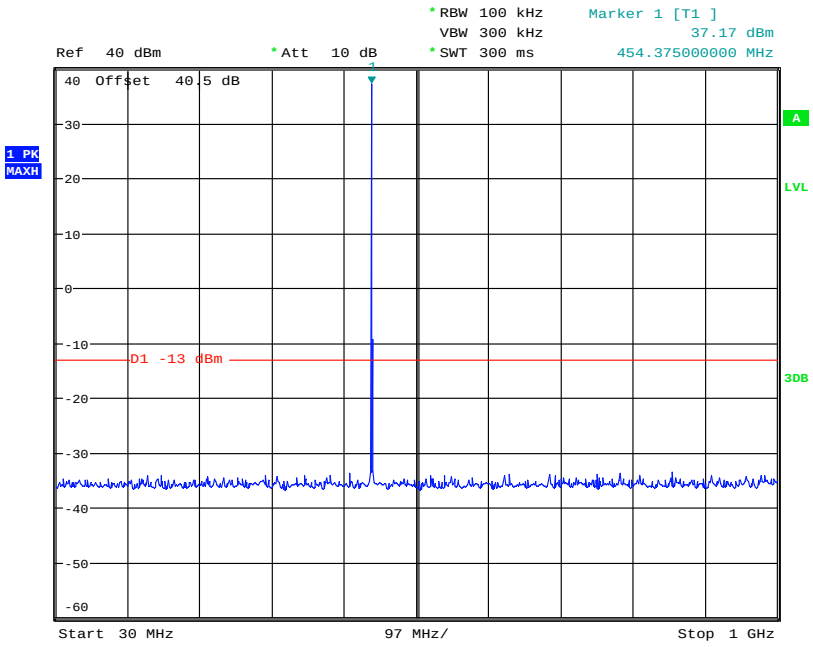
9 kHz – 150 kHz



Date: 20.DEC.2011 11:52:13

150 kHz – 30 MHz

Spurious Emissions at antenna Terminals 455 MHz



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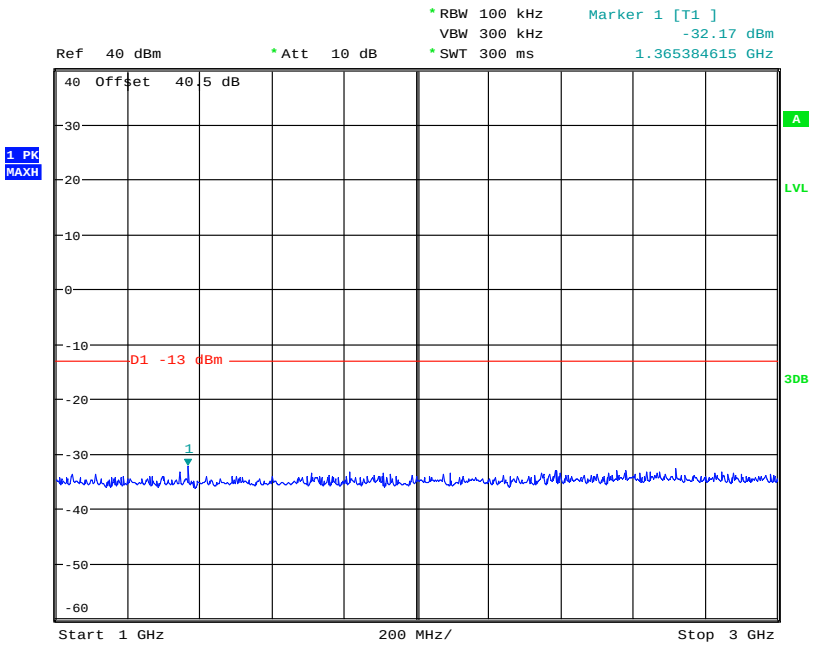
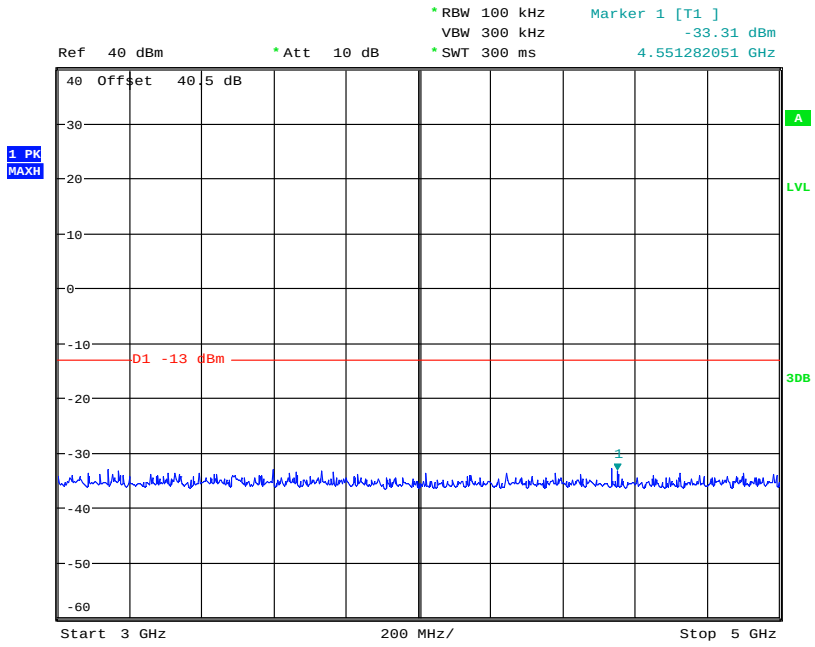
30MHz – 1GHz



Date: 20.DEC.2011 11:55:46

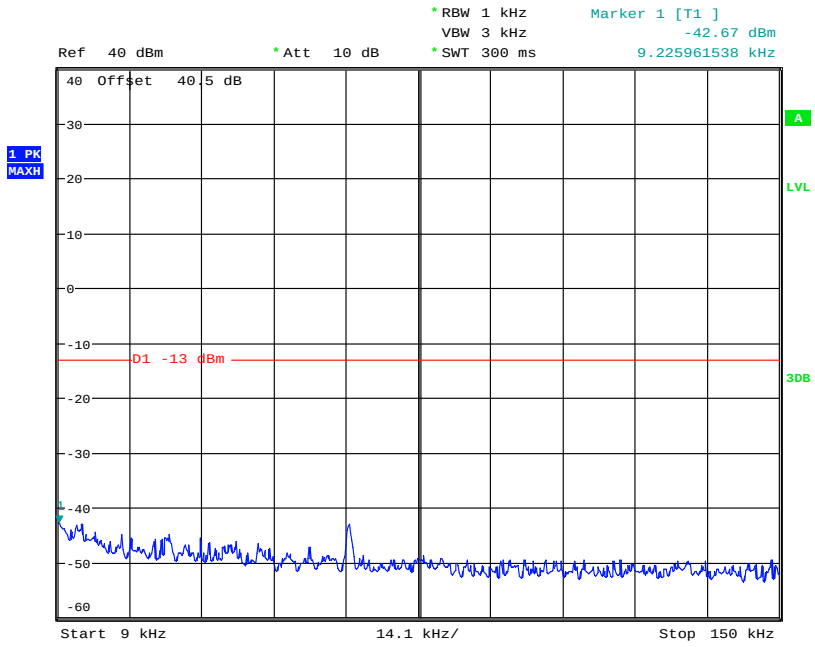
1GHz – 3GHz

Spurious Emissions at antenna Terminals 455 MHz



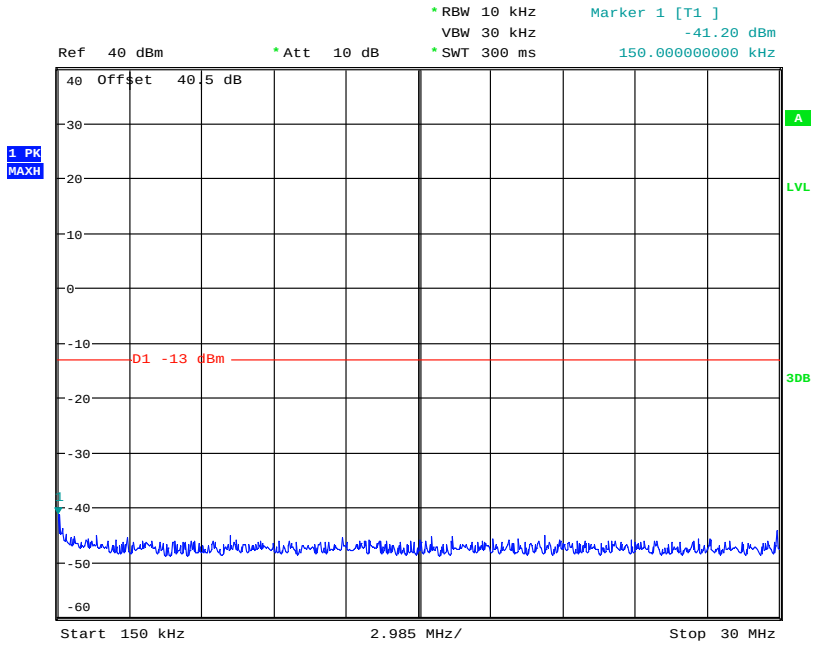
3GHz – 5GHz

Spurious Emissions at antenna Terminals 470 MHz



Date: 20.DEC.2011 11:58:41

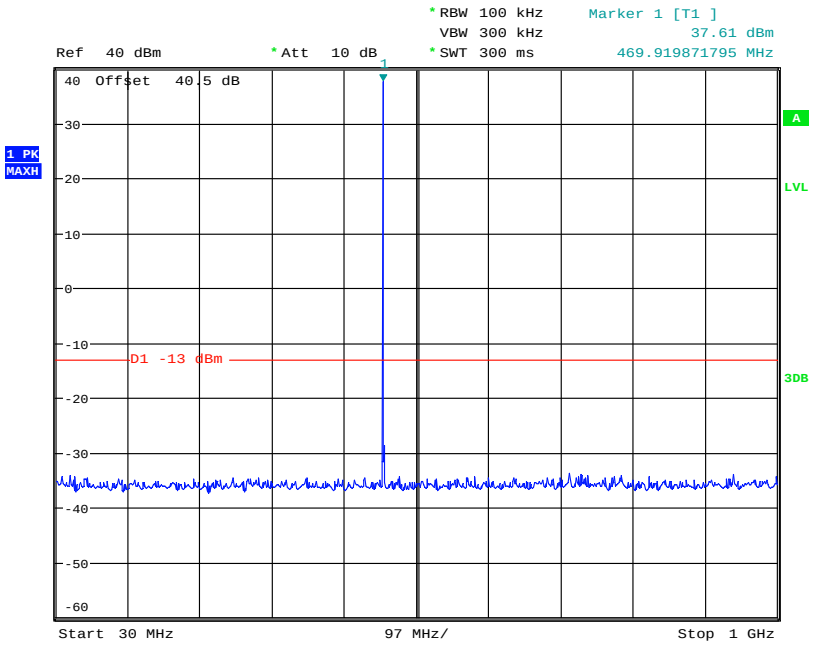
9 kHz – 150 kHz



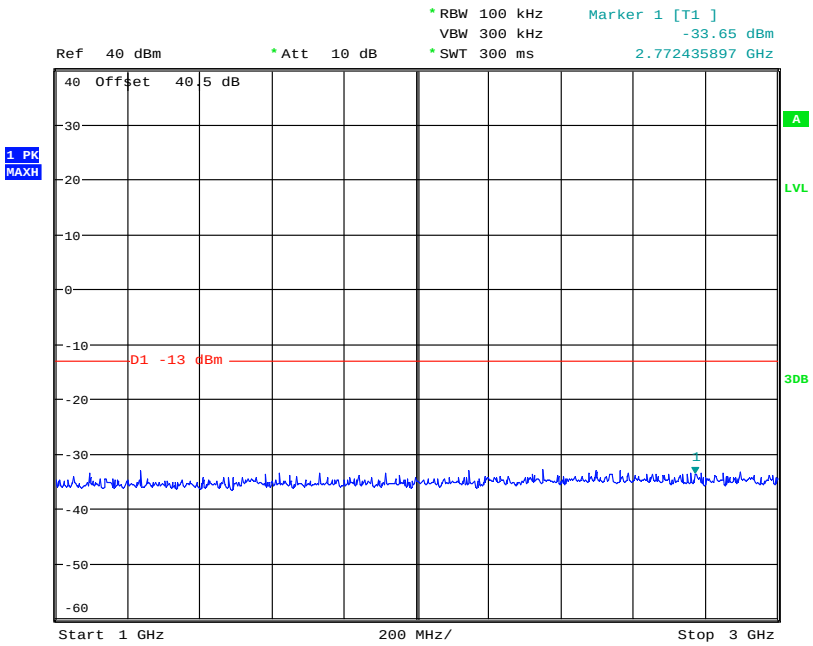
Date: 20.DEC.2011 11:59:29

150 kHz – 30 MHz

Spurious Emissions at antenna Terminals 470 MHz

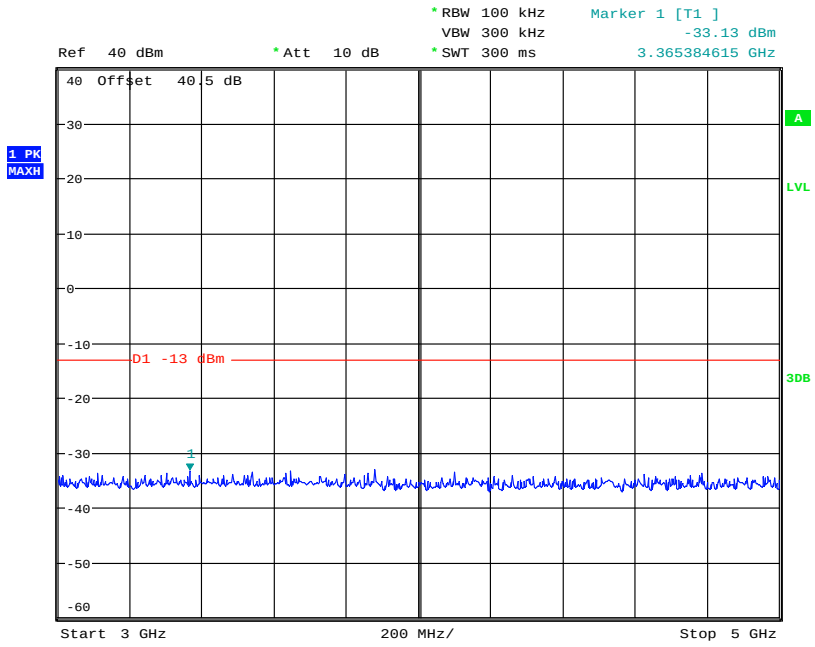


30MHz – 1GHz



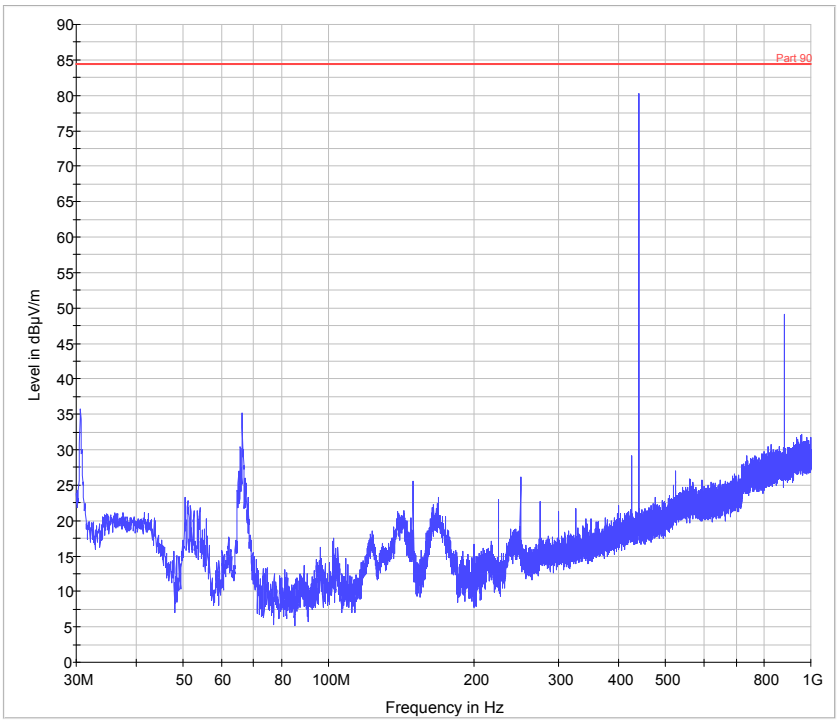
1GHz – 3GHz

Spurious Emissions at antenna Terminals 470 MHz

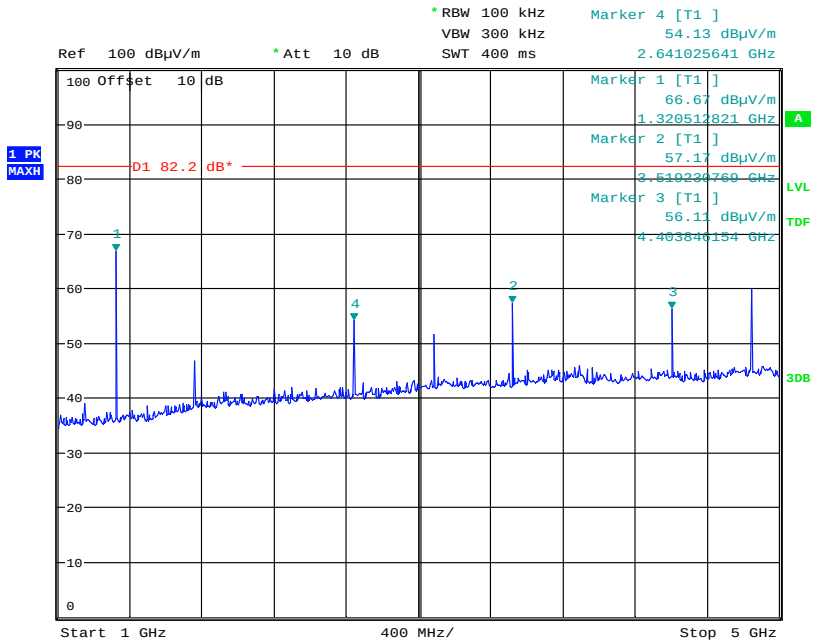


3GHz – 5GHz

Field Strength of Spurious Emissions 440 MHz



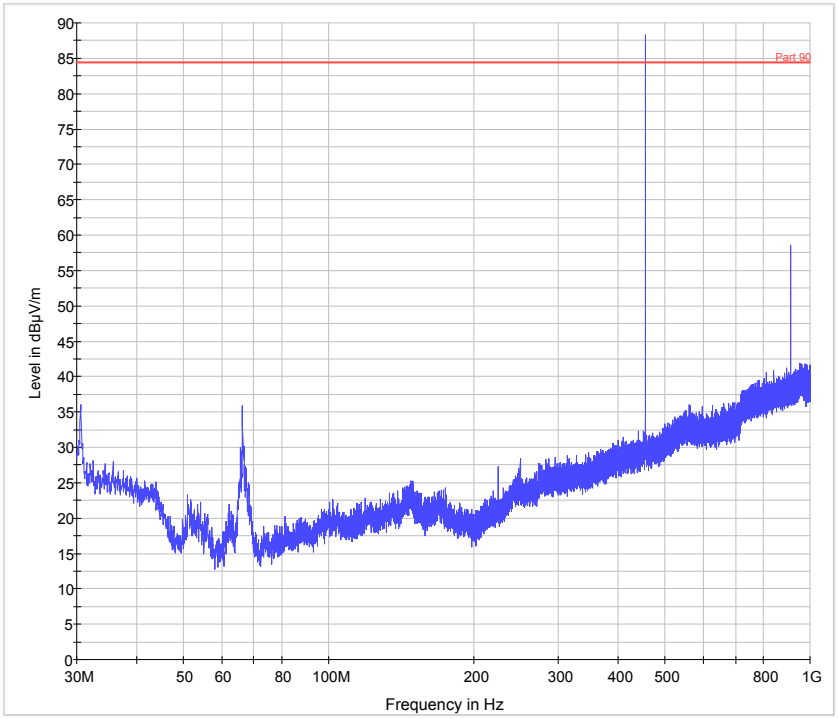
30M Hz – 1 GHz



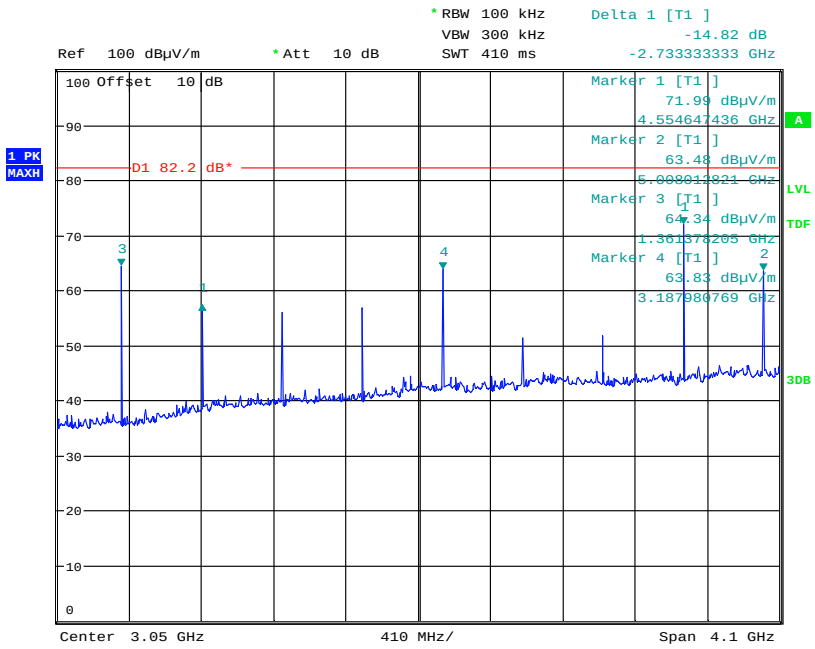
Date: 12.JAN.2012 12:37:10

1 GHz – 5 GHz

Field Strength of Spurious Emissions 455 MHz



30M Hz – 1 GHz



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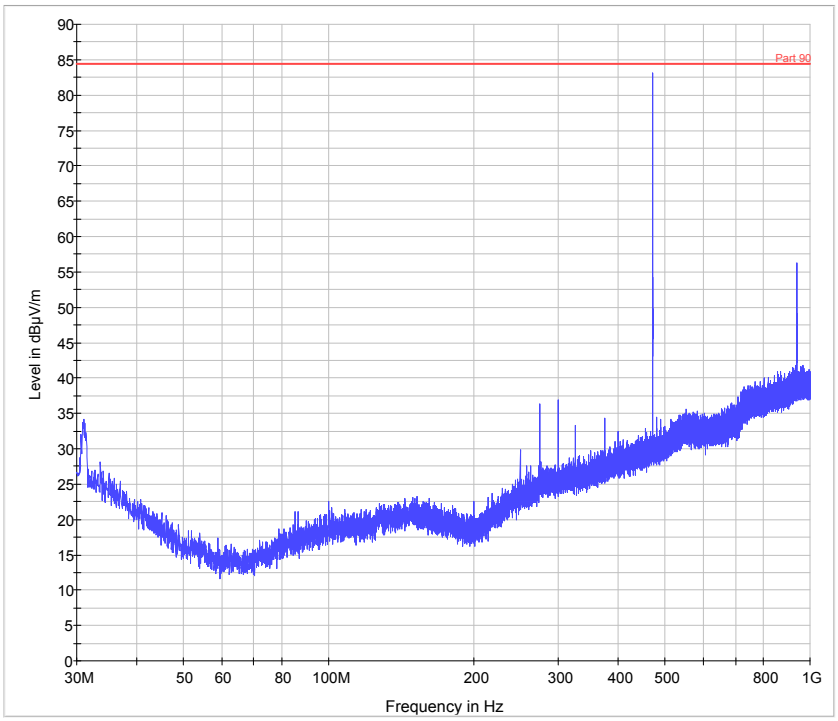
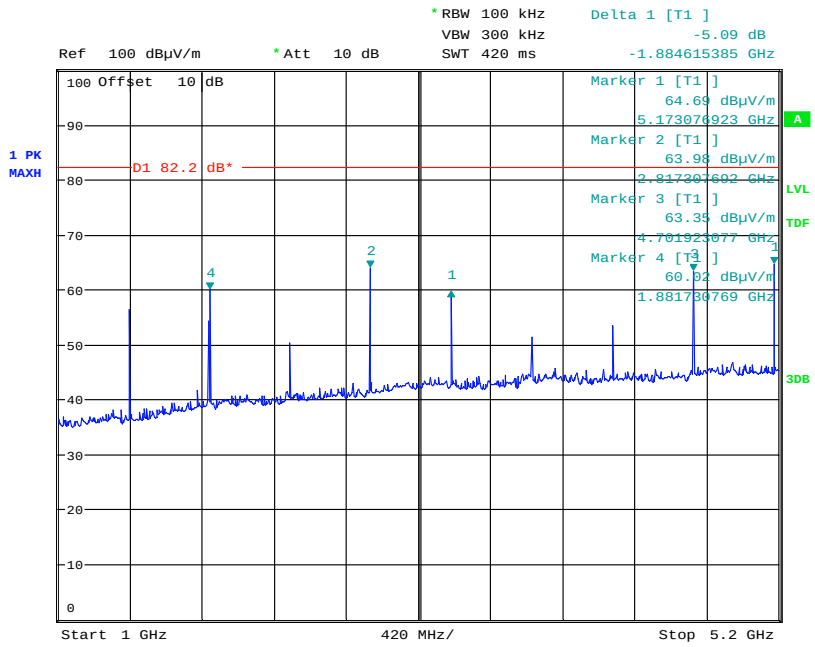
1 GHz – 5 GHz

Field Strength of Spurious Emissions 470 MHz

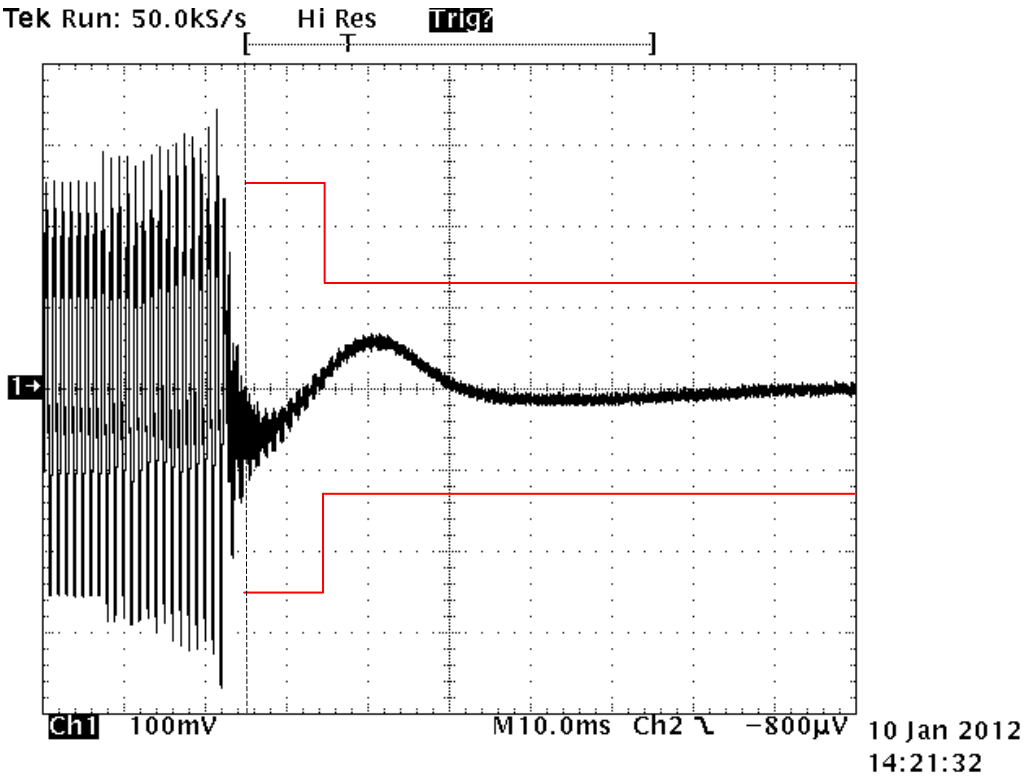


30M Hz – 1 GHz

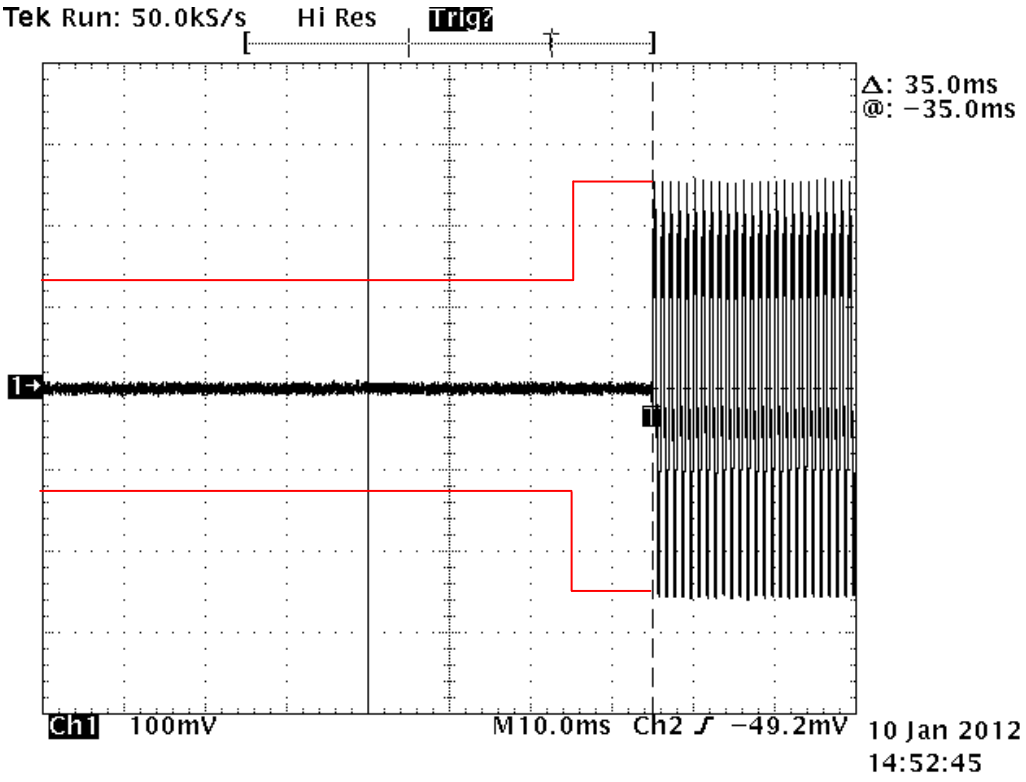


Date: 12.JAN.2012 14:28:24

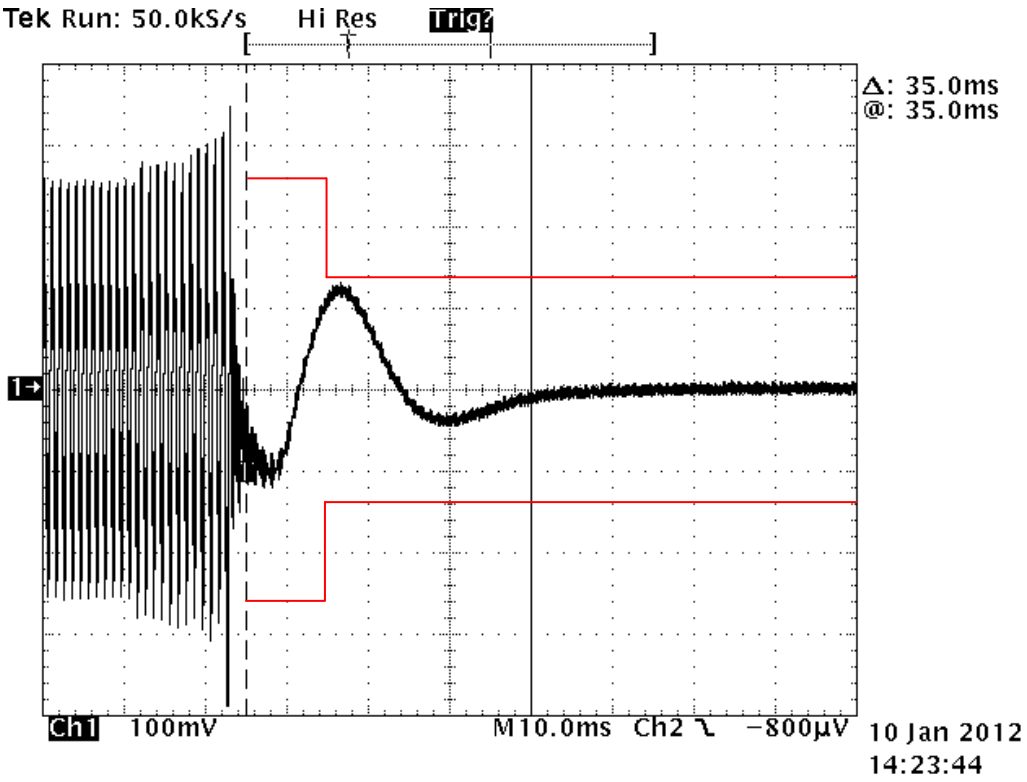
1 GHz – 5 GHz



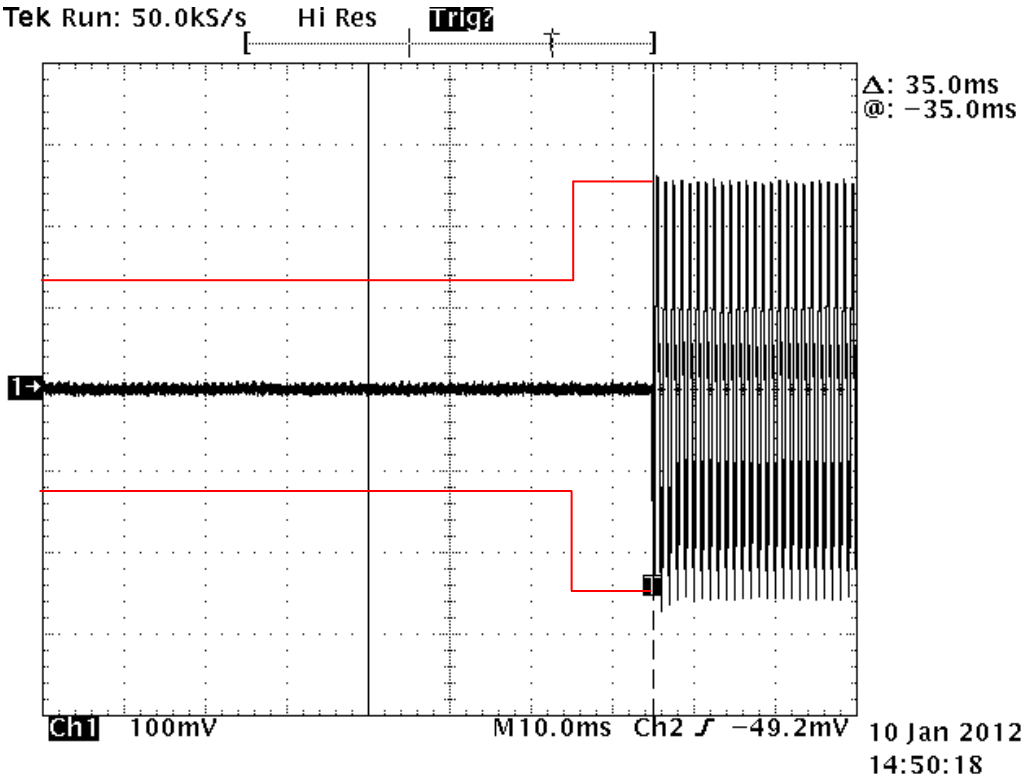
440 MHz On Transient – 12.5 kHz



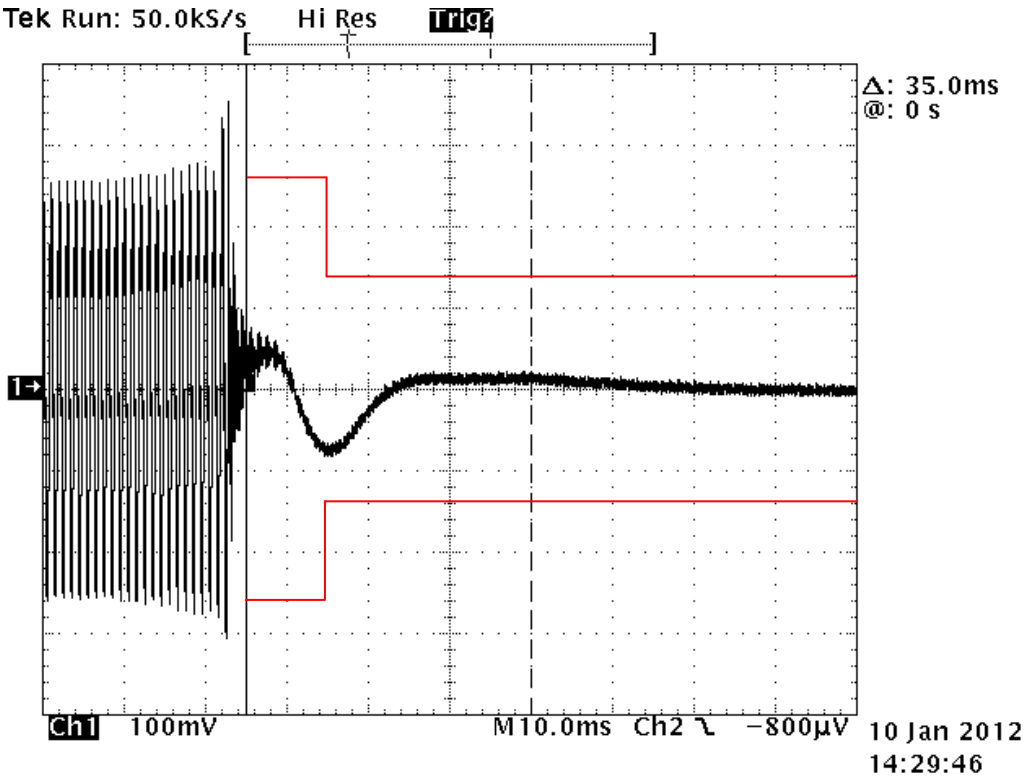
440 MHz Off Transient – 12.5 kHz



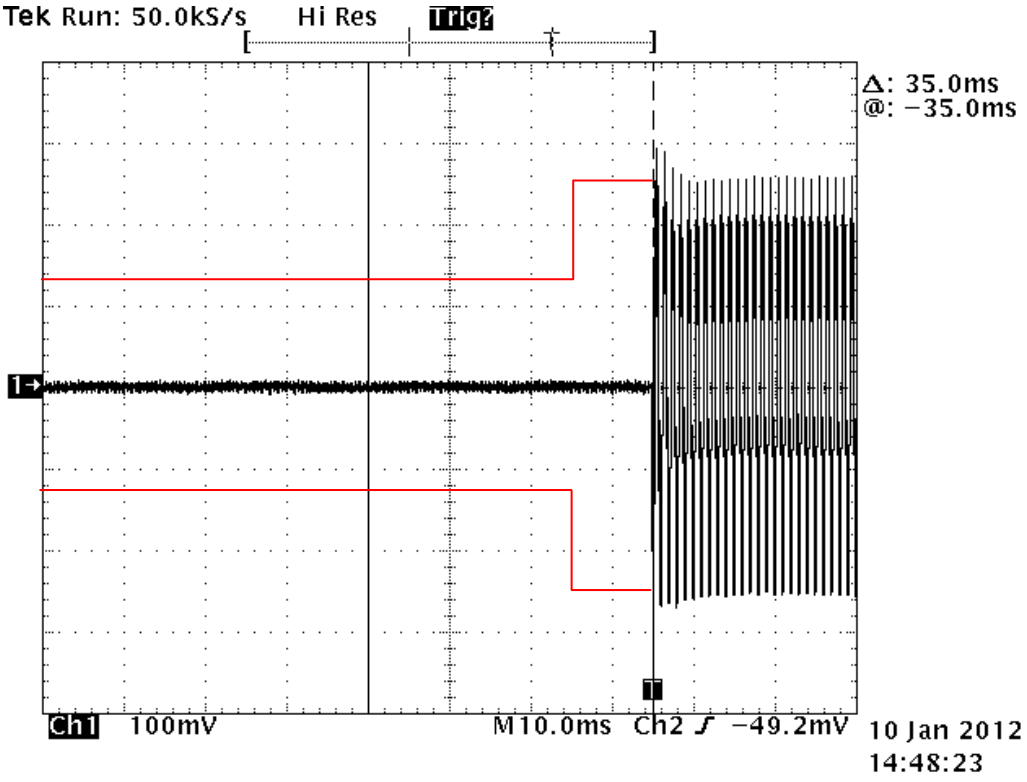
455 MHz On Transient – 12.5 kHz



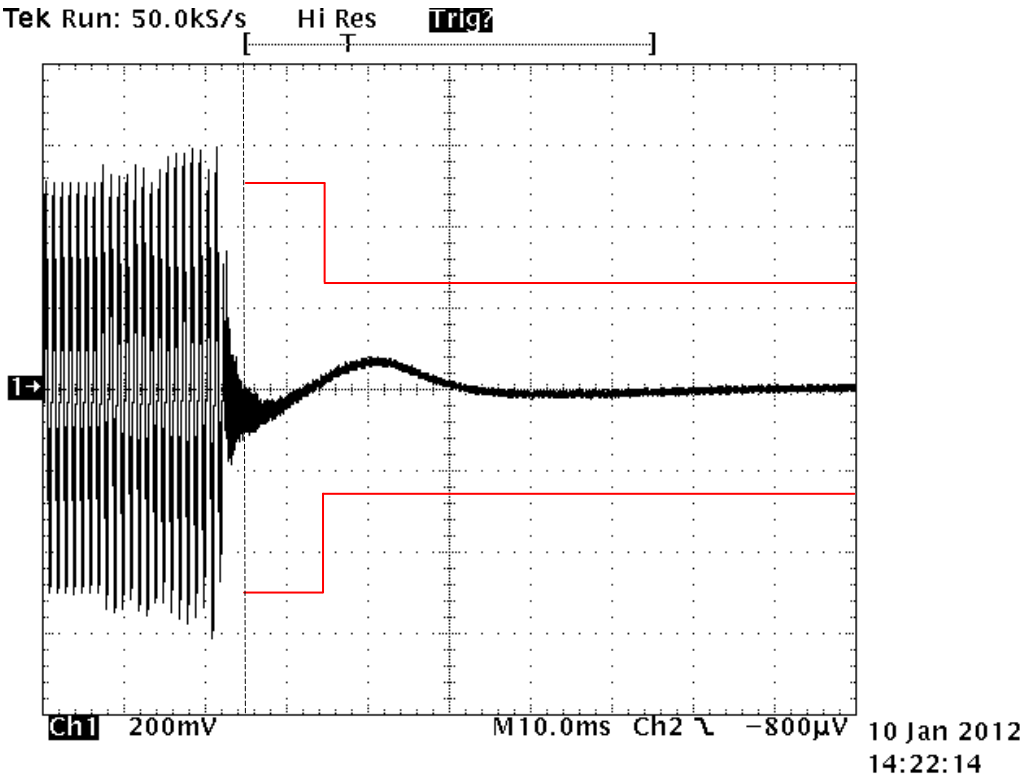
455 MHz Off Transient – 12.5 kHz



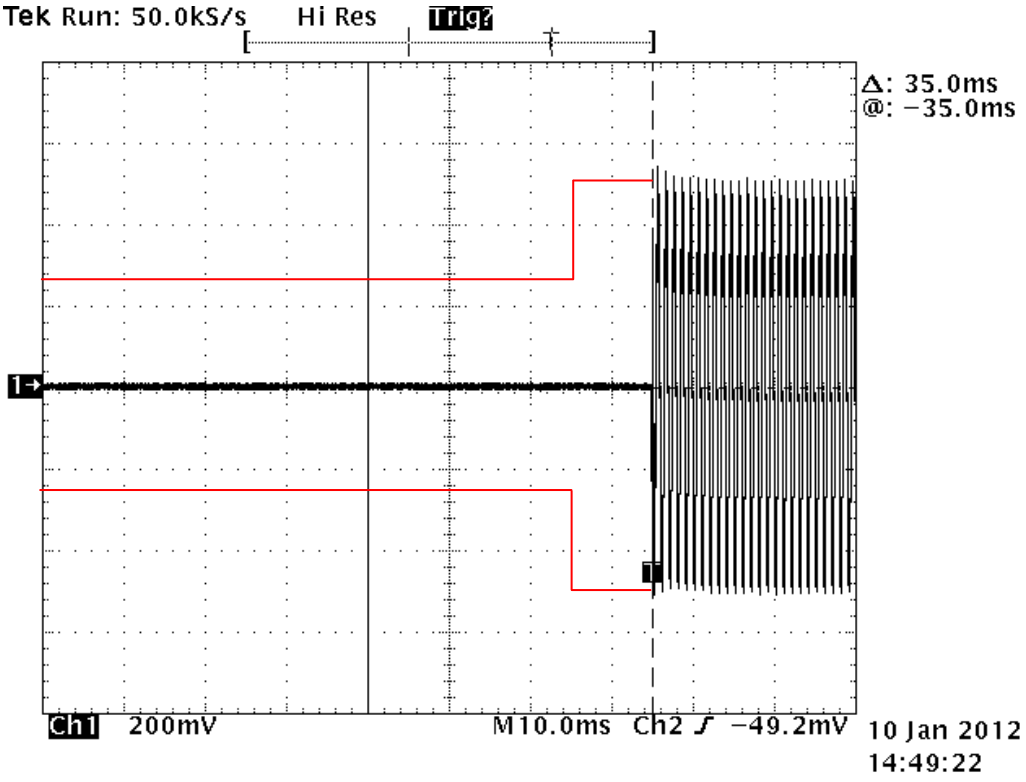
455 MHz On Transient – 12.5 kHz



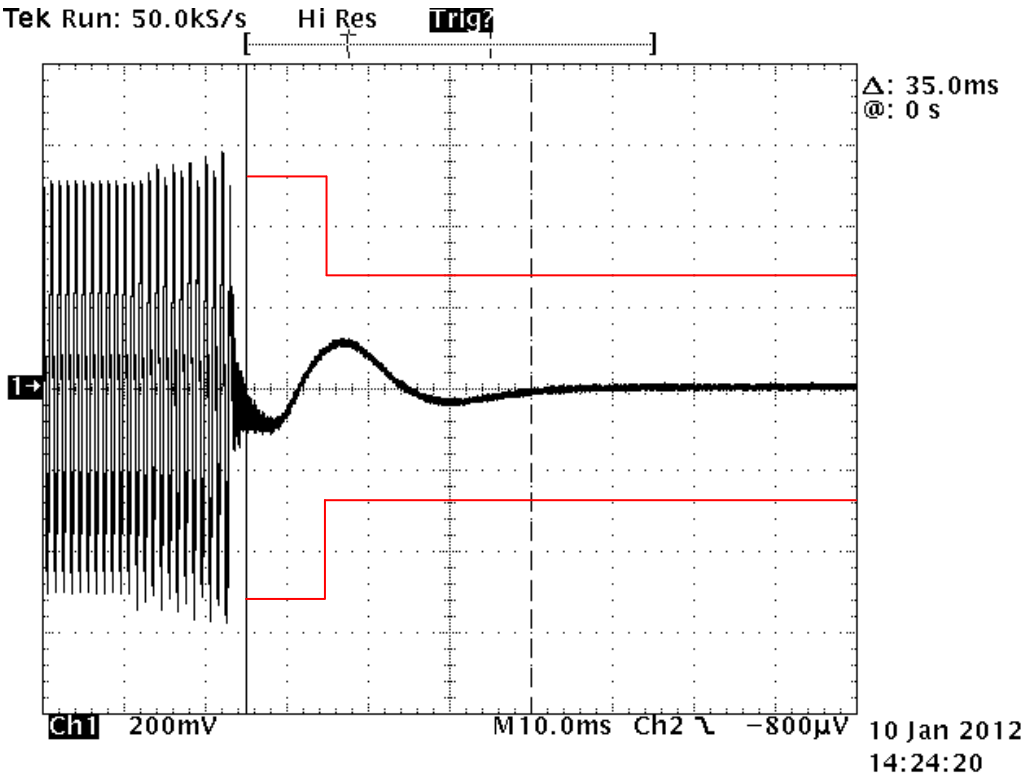
455 MHz Off Transient – 12.5 kHz



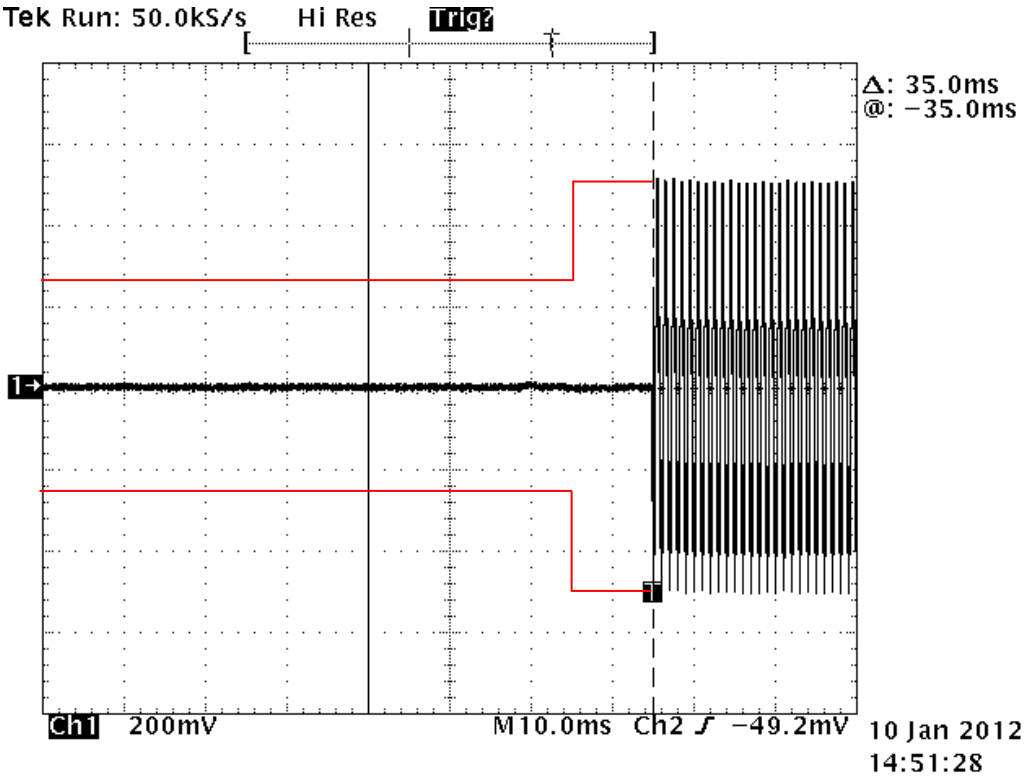
440 MHz On Transient – 25 kHz



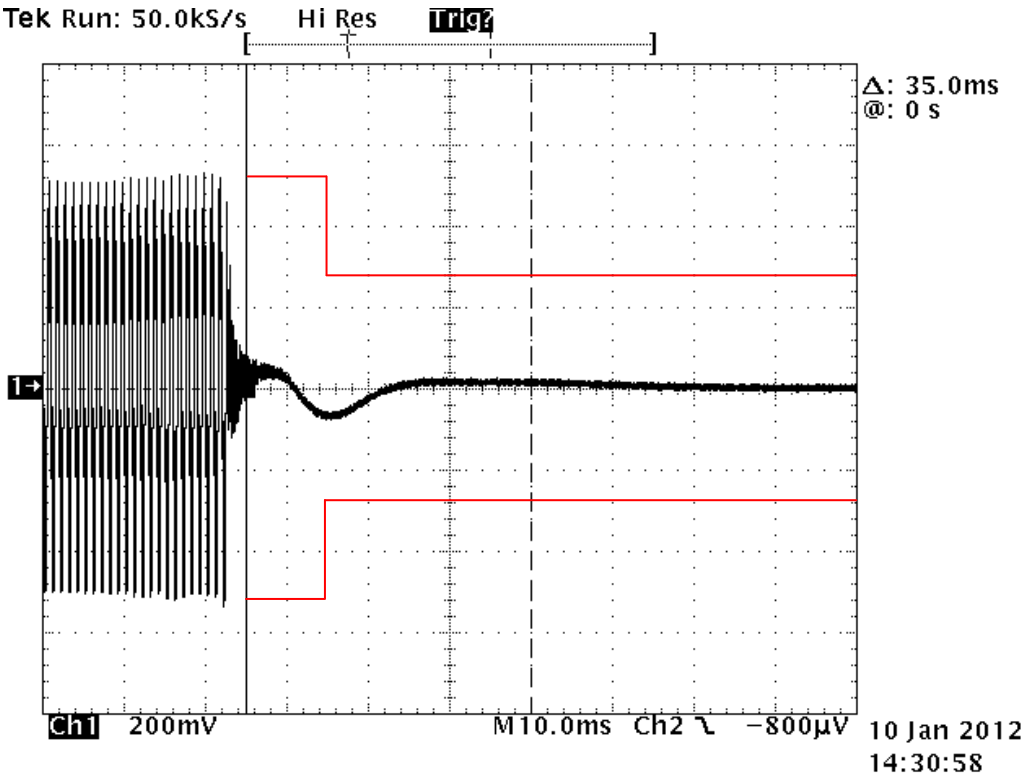
440 MHz Off Transient – 25 kHz



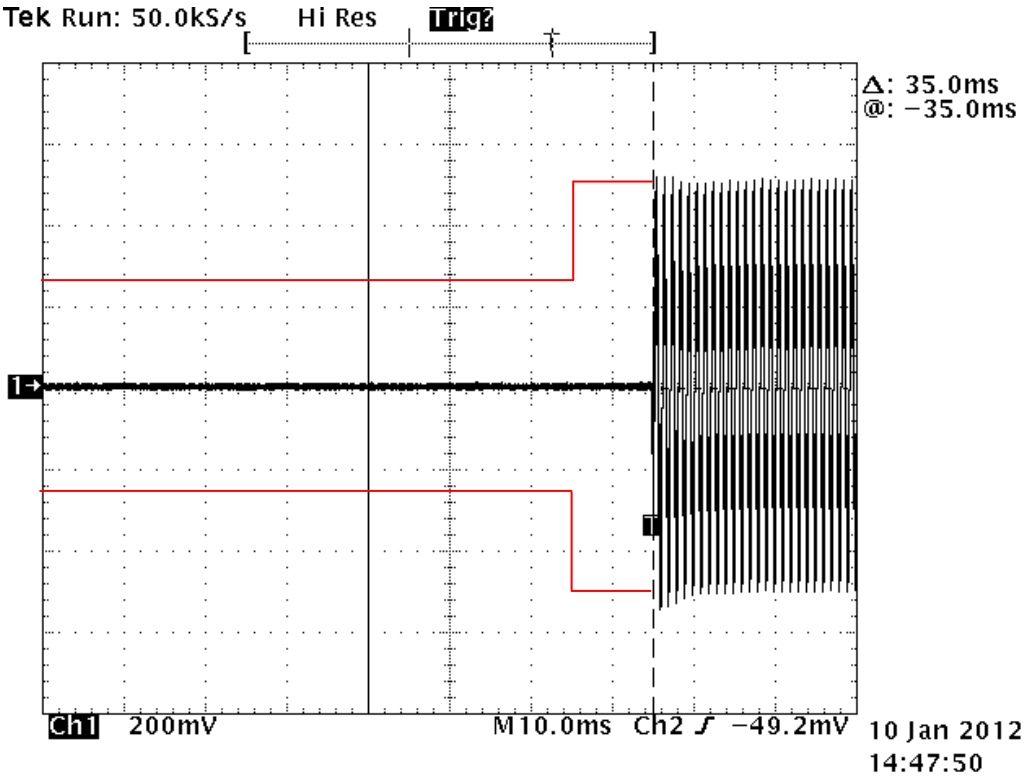
455 MHz On Transient – 25 kHz



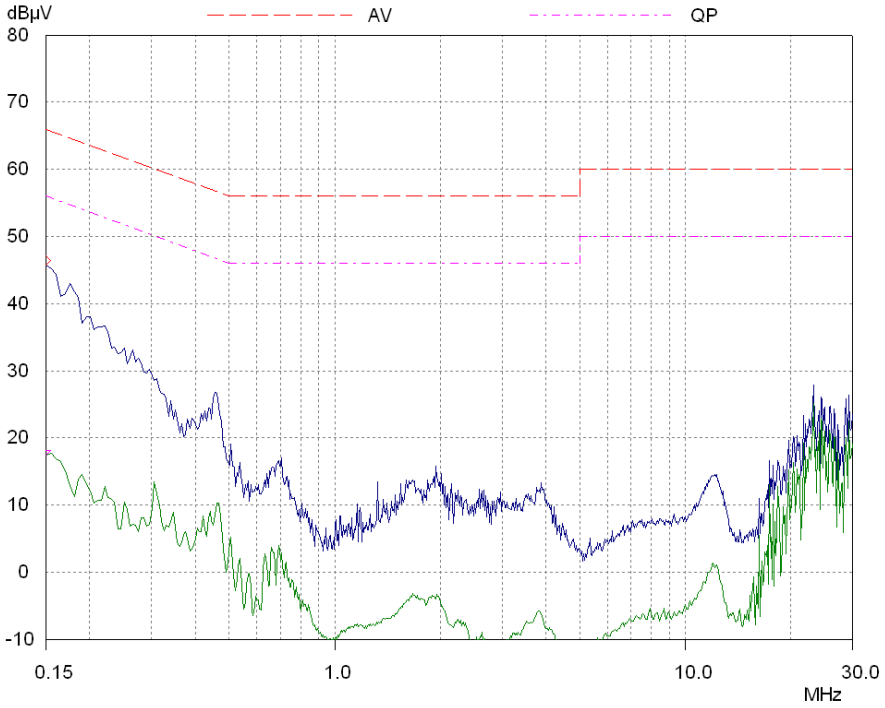
455 MHz Off Transient – 25 kHz



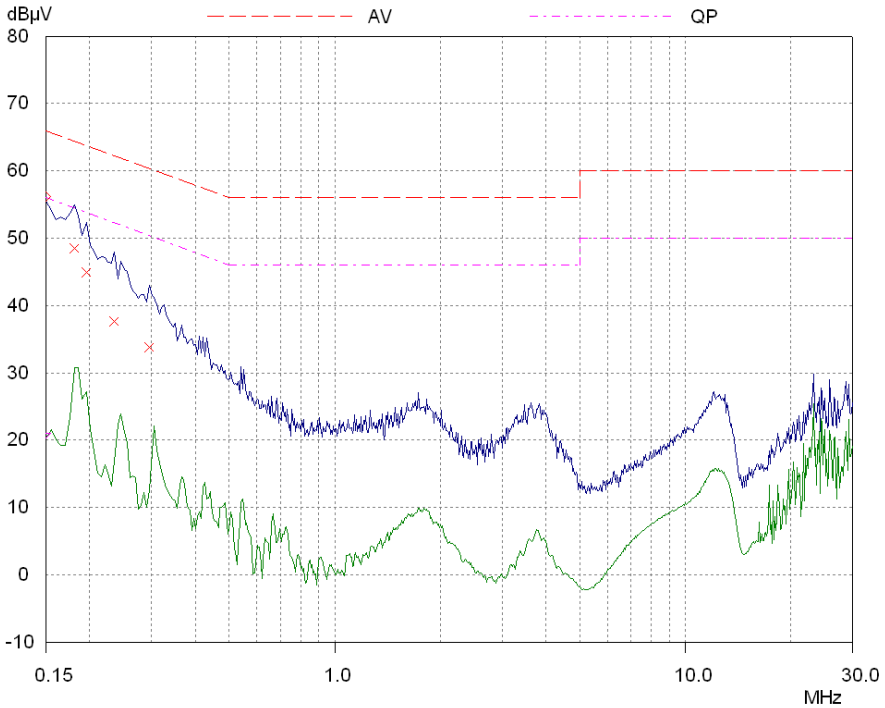
470 MHz On Transient – 25 kHz



470 MHz Off Transient – 25 kHz

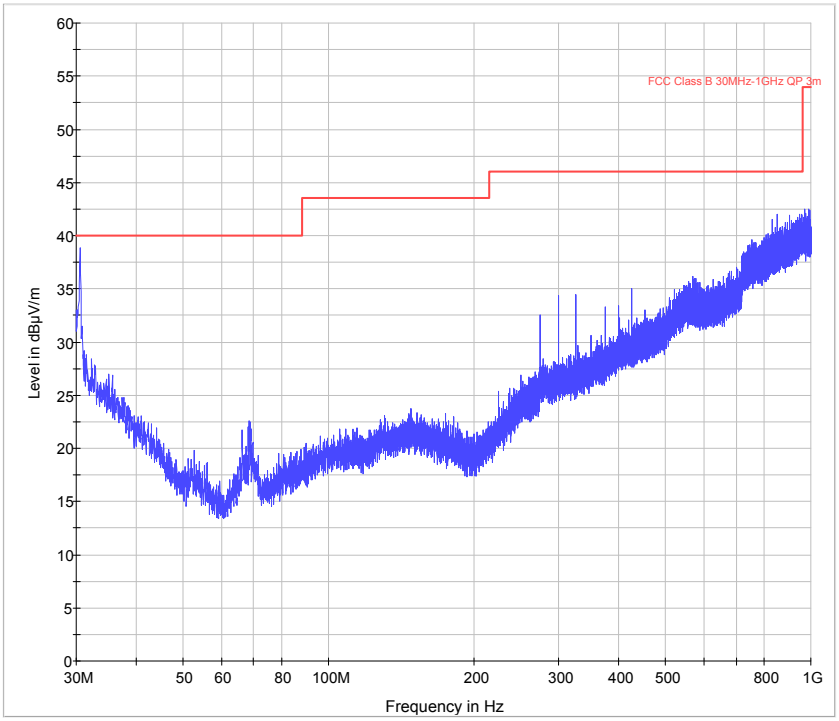


AC powerline Conducted Emissions EUT in RX mode

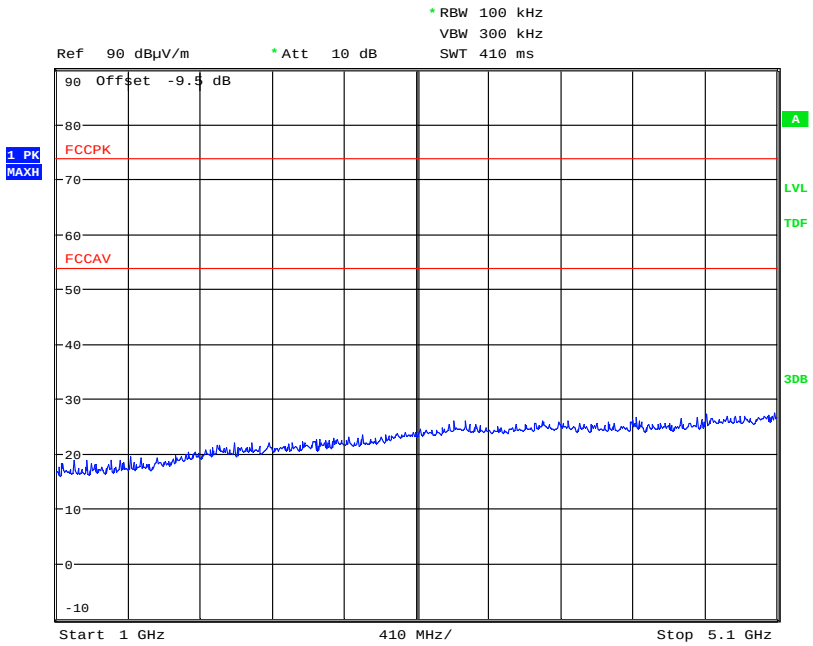


AC powerline Conducted Emissions EUT transmitting

Field Strength of Un-intentional Spurious Emissions 440 MHz

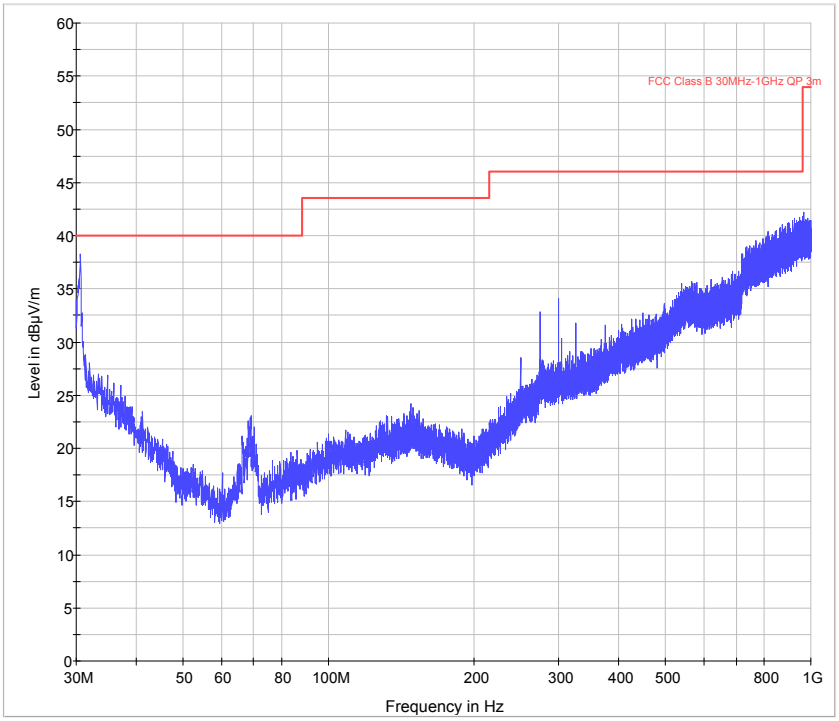


30M Hz – 1 GHz

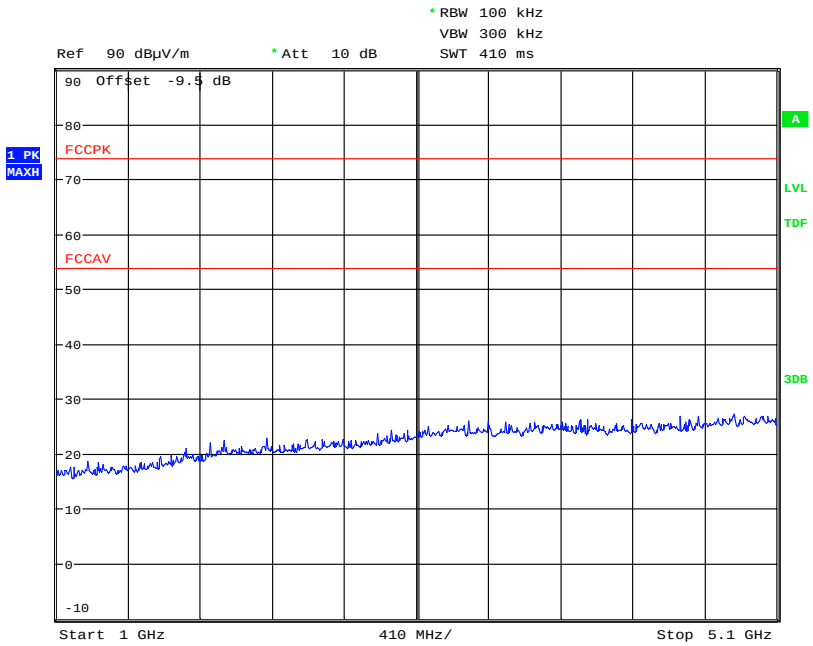


1 GHz – 5 GHz

Field Strength of Un-intentional Spurious Emissions 455 MHz

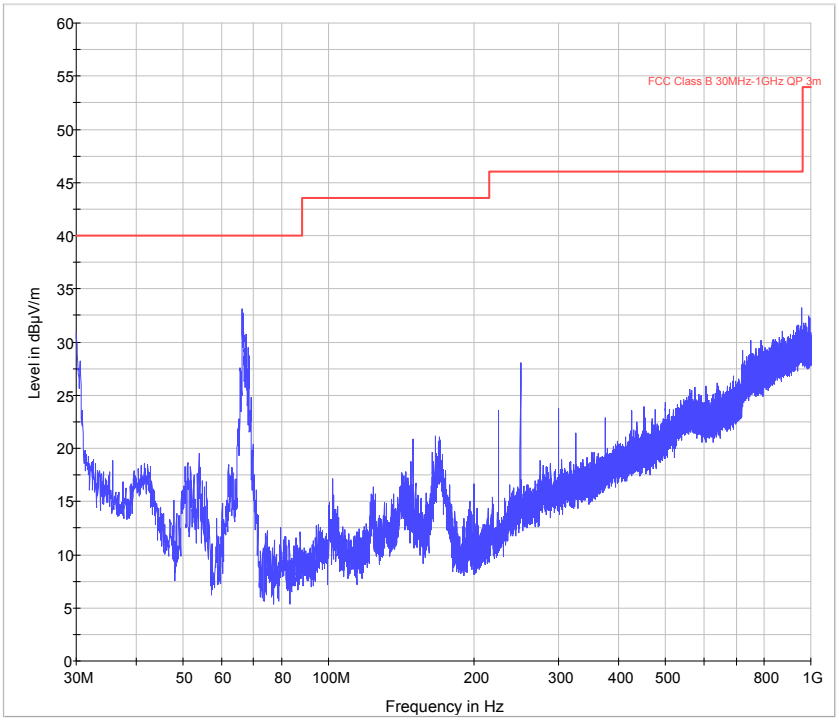


30M Hz – 1 GHz

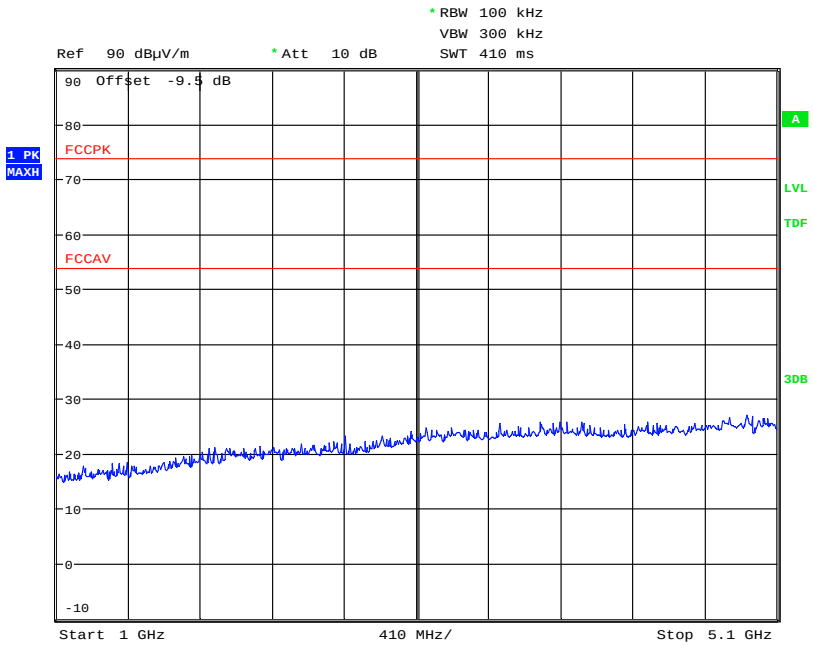


1 GHz – 5 GHz

Field Strength of Un-intentional Spurious Emissions 470 MHz



30M Hz – 1 GHz



1 GHz – 5 GHz

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
S01	iPage IP33	0000068-02
S02	iPage IP33	0000065-02
S03	iPage IP33	0000078-02

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

Sample No.	Description	Identification
S04	Laptop & Power Supply	None
S08	Power Box	None
S09	ISDN Cable	None

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

Identification	Description
None	

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	EUT transmitting on the required frequency with / without modulation and set to 12.5 kHz or 25kHz as required

Test	Description of Operating Mode:
Receiver conducted and radiated (ERP) spurious emissions	EUT active but non-transmitting.

Test	Description of Operating Mode:
PLCE	EUT Active nut not transmitting & highest powered unit transmitting

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, S03
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
Antenna Port	Coaxial cable	1m	Measuring setup
Dc port	2 Wire cable	1.5m	PSU

Sample : S01, S02, S03
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Antenna Port	None	0	50Ω Load
Dc port	2 Wire cable	1.5m	PSU
Network	YFC-CAT.EE FTP Patch 3P (S08)	2m	Local Network (S04)
Alarm	26AWGx4P (UL) c(UL) CMH E164469-P3	10m	Load Box (S09)

* Only connected during setup.

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRL05	CMTA	RADIO COMMS ANALYSER	R&S	05/04/2011
TRL11	TCC 125-815P	TEMP CHAMBER	SHARTREE	Use TRL426
TRL103	8308-200	ATTENUATOR	BIRD	Cal In Use
TRL135	68030.17.A	ATTENUATOR	SHUNER	Cal In Use
TRL138	3115	HORN	EMCO	08/11/2011
TRL139	3115	HORN	EMCO	14/09/2011
TRL176	2042	SIGNAL GENERATOR	MARCONI	07/10/2011
TRL193	VHA 9103 balu	BICONE ANTENNA	CHASE	06/05/2008
TRL203	UPA6108	LOG PERIODIC	CHASE	06/05/2008
TRL222	8304-100-N	ATTENUATOR	BIRD	Cal In Use
TRL246	8304-0600N	ATTENUATOR	BIRD	Cal In Use
TRL426	52 SERIES II	TEMP INDICATOR	FLUKE	04/03/2011
TRL572	8449B	PRE AMPLIFIER	AGILENT	24/11/2010
TRLUH28	UHALP 9108	LOG PERIODIC	SCHWARZBECK	17/06/2011
TRLUH29	VHBA 9123	BICONE ANTENNA	SCHWARZBECK	17/06/2011
TRLUH41	M3004	MULTIMETER	AVOMeter	04/03/2011
TRLUH93	CBL6112	BILOG ANTENNA	Chase	20/06/2011
TRLUH96	6960B	POWER METER	MARCONI	15/11/2011
TRLUH122		OSCILLOSCOPE	TEKTRONICS	12/11/2010
TRLUH100	PL32QMD	PSU	THANDAR	Use TRLUH41
TRLUH187	ESHS10	RECEIVER	R&S	12/01/2012
TRLUH191	CBL611/A	BILOG ANTENNA	YORK	08/11/2010
TRLUH195	ESH3-Z5.831.5518.52	LISN	R&S	01/03/2011
TRLUH228	6920	POWER SENSOR	MARCONI	23/11/2011
TRLUH281	FSU 46	SPECTRUM ANALYSER	R&S	10/02/2011
TRLUH287	11708A	ATTENUATOR	HP	Cal In Use
TRLUH302	8472A	CRYSTAL DETECTOR	HP	Info Only
TRLUH314	117310	DIRECTIONAL COUPLER	SINGER	Cal In Use
TRLUH396	ENV216	LISN	R&S	14/01/2012
TRLUH403	ESCI	RECEIVER	R&S	06/04/2011
REF 901	2-18A-MFN-06	ATTENUATOR	BIRD	Cal In Use
REF902	2-18A-MFN-06	ATTENUATOR	BIRD	Cal In Use
REF910	FSU 46	SPECTRUM ANALYSER	R&S	02/12/2011
N/A	SH4141	HIGH PASS FILTER	BSC	Cal In Use

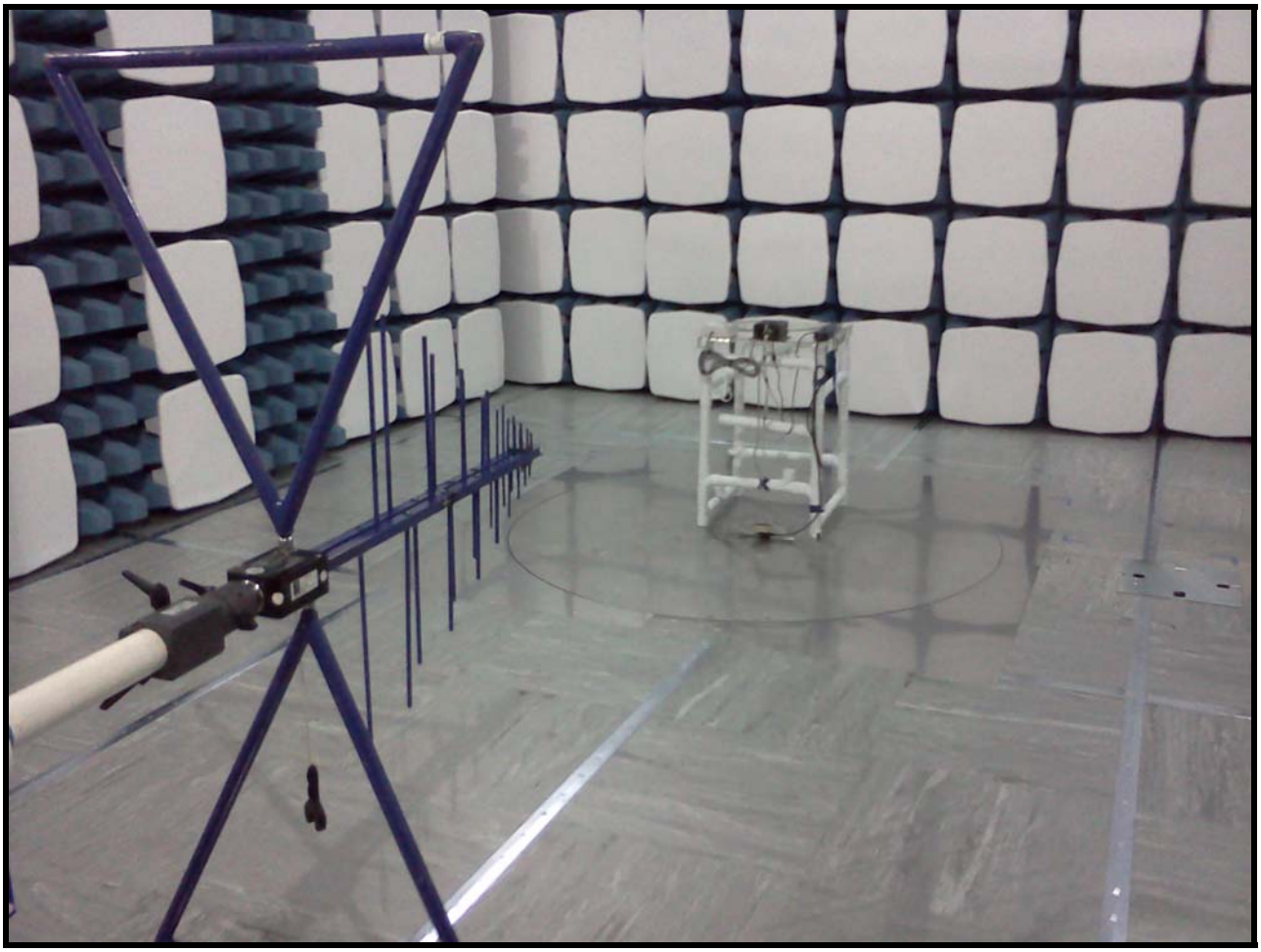
Appendix D: Additional Information

No additional information is included within this test report.

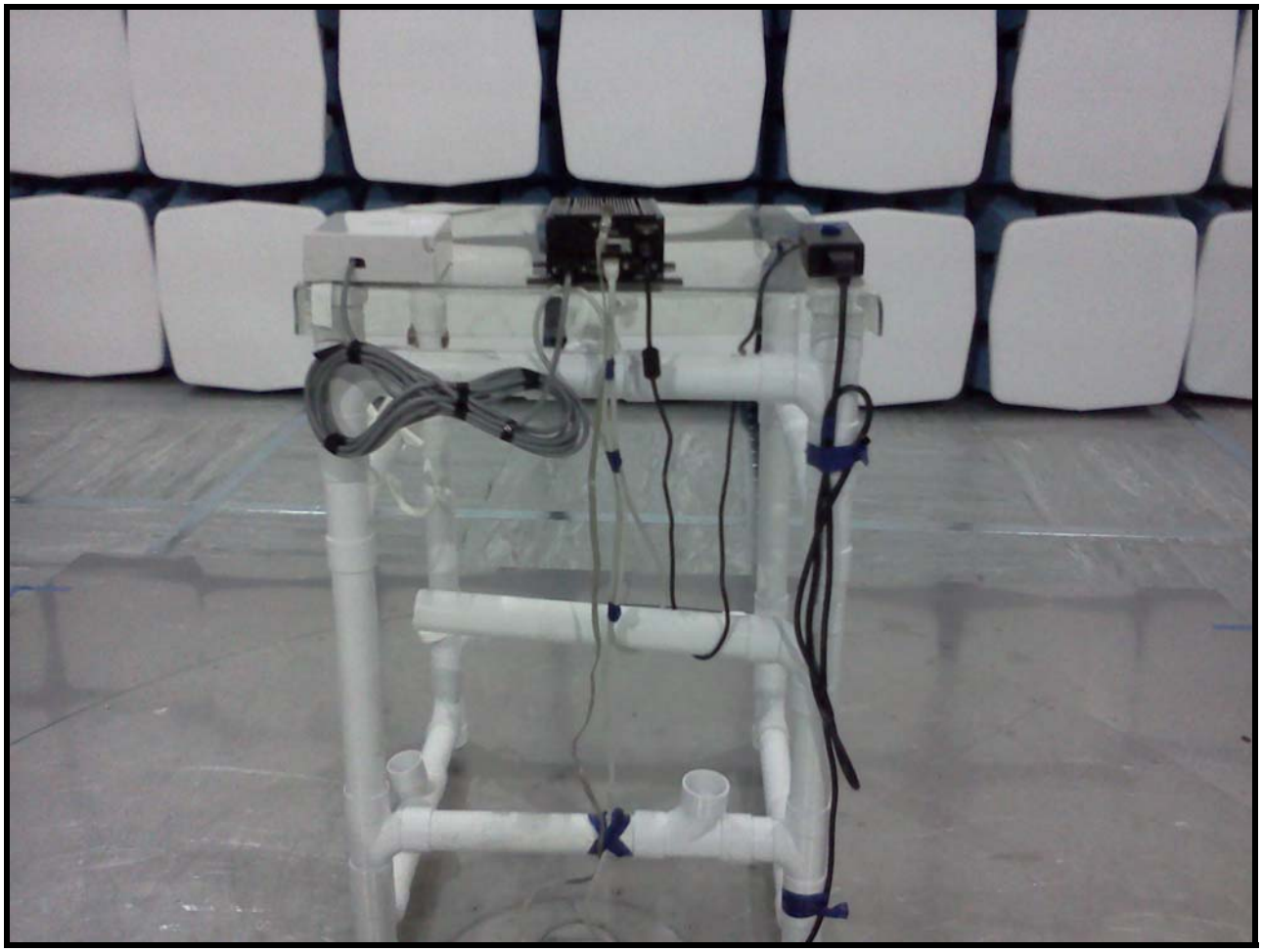
Appendix F: Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Overview.
2. Radiated electric field emissions arrangement: Close up.
3. AC Powerline Conducted emissions arrangement: Overview.



Photograph 1



Photograph 2

Photograph 3

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