

TRaC RADIO TEST REPORT
FOR
Pace PLC
ON
DC60Xu US Cable Box
DOCUMENT NO. TRA-006542WUS1

TRaC Wireless Test Report : TRA-006542WUS1

Applicant : Pace PLC

Apparatus : DC60Xu

Specification(s) : CFR47 Part 15 C 15.247:July 2008

FCCID : NQ8DC60XU

Purpose of Test : Certification

Authorised by :



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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

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1.4 Apparatus Assessed

The following apparatus was assessed between 22/07/11 and 08/08/11:

DC60Xu US Cable Box

The above equipment contains a DSSS Zigbee RF4Ce transceiver operating in the 2400 MHz to 2483.5MHz band.

This assessment was performed against the radio device contained inside the DC60Xu when operating in transmit and receiver modes.

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
Radiated spurious emissions (Restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10	Pass
Conducted spurious emissions (Non-restricted bands)	Title 47 of the CFR: Part 15 Subpart C; 15.247	ANSI C63.10	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart C; 15.207	ANSI C63.10	Pass
AC Power conducted emissions	Title 47 of the CFR: Part 15 Subpart B; 15.107	ANSI C63.4	Pass
Occupied Bandwidth	Title 47 of the CFR : Part 15 Subpart C; 15.247(a)(2)	ANSI C63.10	Pass
Conducted Carrier Power	Title 47 of the CFR : Part 15 Subpart C; 15.247(b)	ANSI C63.10	Pass
Power Spectral Density	Title 47 of the CFR : Part 15 Subpart C; 15.247(d)	ANSI C63.10	Pass
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.4	Pass
Digital Modulation	Title 47 of the CFR: Part 15 Subpart C; 15.403	-	Pass
RF Safety	Title 47 of the CFR : Part 15 Subpart C; 15.247(i)	-	Pass

1.6 Notes Relating To The Assessment

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

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

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

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

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

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

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

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

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

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

1.7 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:**Measurement Uncertainty****2.1 Measurement Uncertainty Values**

For test data recorded, the following measurement uncertainty was calculated:

Radiated Electric Field Emissions

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

Power Line Conducted Emissions

Quantity Range	Quantity	Expanded Uncertainty
9kHz to 150kHz	Amplitude dB(μ V)	± 4.2 dB
150kHz to 30MHz	Amplitude dB(μ V)	± 3.1 dB

Section 3:

Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A:**Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
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 6 dB Bandwidth

Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2) requires the measurement of the bandwidth of the transmission between the -6 dB points on the transmitted spectrum.

Test Details	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) 15.247(a)(2)
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Measured 6dB Bandwidth (MHz)	Limit (kHz)	Result
2425	1.596	>500	Pass
2450	1.633	>500	Pass
2475	1.621	>500	Pass

Plots of the 6 dB bandwidth are contained in Appendix B of this test report.

A2 Transmitter Peak Output Power

Conducted carrier power was verified using a peak power meter, the EUT transmitting on its lowest, centre and highest carrier frequency in turn.

Test Details	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(b)(3)
Measurement standard	ANSI C63.10
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	Conducted Peak Carrier Power (W)	Antenna Gain dBi	Radiated Power (W) (EIRP)	Limit (W)	Result
2425	0.001348963	7.19	0.006950243	0.778036	Pass
2450	0.001333521	7.19	0.006823387	0.778036	Pass
2475	0.001321296	7.19	0.00676083	0.778036	Pass

Notes:

Note, if the Antenna gain has been calculated to be greater than 6dBi Then under section 15.247 (b)(4) the conducted power limit shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi:

$$\text{Gain} = 7.19 - 6 = 1.09$$

$$\text{Limit } 1\text{W or } (30\text{dBm} - 1.09\text{dB}) = 28.91\text{dBm}$$

$$28.1\text{dBm} = 778.036\text{mW}$$

Conducted Measurement

Measured Peak Carrier power includes highest gain of any antenna to be used. Highest Gain of any antenna was determined by measuring the peak radiated EIRP power at 3m subtracted from the peak conducted power using a power

Conducted measurements were performed with a temporary antenna connector provided by the client.

A3 Antenna Gain

The conducted output power limit specified in paragraph (b) is based on the use of antennas with directional gains that do not exceed 6dBi

Calculated Antenna Gain

Measured Maximum Antenna Gain dBi	Limit dBi
7.09	6

In general:

The conducted output power limit specified in paragraph 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

A4 Transmitter Power Spectral Density

Transmitter Power Spectral Density was verified with the EUT transmitting on its lowest, centre and highest carrier frequency in turn.

Test Details	
Regulation	Title 47 of the CFR: Part15 Subpart (c) 15.247(e)
Measurement standard	ANSI C63.10
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Channel Frequency (MHz)	Antenna port Peak Power Spectral Density (dBm/3kHz)	Antenna Gain dBi	Peak Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2425	-13.8	7.09	-6.71	8.0	Pass
2450	-13.93	7.09	-6.84	8.0	Pass
2475	-13.95	7.09	-6.86	8.0	Pass

Notes:

Conducted Measurement

Measured Power Spectral Density includes highest gain of any antenna to be used.

Highest Gain of any antenna to be used = 7.09 dBi

Conducted measurements were performed with a temporary antenna connector provided by the client.

The resolution bandwidth on the analyser was set to 3kHz and trace set to max hold.

The span is set to 2MHz

The sweep time is 680 seconds (Span/3kHz).

A5 RF Antenna Conducted Spurious Emissions

Measurement of conducted spurious emissions at the antenna port was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 10th harmonic with the EUT transmitting on its lowest, centre and highest carrier frequency in turn.

Test Details TX CH15: 2425 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10
Frequency range	9 kHz to 25 GHz
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case conducted upper band edge emission measurements at the antenna port are listed below with the transmitter at 2425MHz (CH15) :

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	9kHz to 25GHz	Pk	N	No Significant Emissions Within 20dB of the limit	83.83	Pass
2	2400.000	Pk	N	47.74	83.83	Pass
3	2390.000	Pk	Y	48.76	87.83	Pass
4	N/A	(In-band Pk)-(ΔPk Outside the band or band edge)		N/A	54.0	N/A

No further emissions were detected within 20 dB of the test limit.

RF Antenna Conducted Spurious Emissions continued:

Test Details TX CH20: 2450 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10
Frequency range	9 kHz to 25 GHz
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case conducted upper band edge emission measurements at the antenna port are listed below with the transmitter at 2450MHz (CH20) :

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	9kHz to 25GHz	Pk	N	No Significant Emissions Within 20dB of the limit	82.6	Pass

No further emissions were detected within 20 dB of the test limit.

RF Antenna Conducted Spurious Emissions continued:

Test Details TX CH25: 2475 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.247(d) and Clause 15.205
Measurement standard	ANSI C63.10
Frequency range	9 kHz to 25 GHz
EUT sample number	S02 and S03
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case conducted upper band edge emission measurements at the antenna port are listed below with the transmitter at 2475MHz (CH25) :

Ref No.	Measured Freq (MHz)	Det.	Is measured Frequency within the Restricted bands (Y/N)	Measured Peak Conducted power (RBW =100kHz) (dBuV)	15.247(d) Limit (dBuV)	Summary
1	9kHz to 25GHz	Pk	N	No Significant Emissions Within 20dB of the limit	82.2	Pass
2	2483.500	Pk	Y	49.13	82.2	Pass
3	2484.137	Pk	Y	54.87	82.2	Pass
4	N/A	(In-band Pk)-(ΔPk Outside the band or band edge)		N/A	54.0	Pass

No further emissions were detected within 20 dB of the test limit.

Notes:

1. The conducted emission limit for emissions outside the restricted bands, defined in 47CFR15.205(a) are based on a transmitted carrier level of 15.247(b). With the EUT transmitting on its lowest, centre and highest carrier frequencies in turn, emissions from the EUT are required to be 20 dB below the level of the highest fundamental as measured within a 100 kHz RBW in accordance with 15.247(d) using a peak detector.
2. The RBW = 100 kHz, Video bandwidth (VBW) > RBW and the radio spectrum was investigated up to the 10th harmonic in accordance 15.33 (a)(1).
3. The measurements at 2400 MHz and 2483.5 MHz were made to ensure band edge compliance.
4. The carrier level was measured whilst varying the supply voltage between 85% and 105% of the nominal supply voltage as required by 15.31(e). No variation in carrier level was observed. All other emissions were at least 20dB below the test limit

The limit outside the restricted band in 100 kHz RBW is defined using the following formula in accordance with 15.247(d):

$$\text{The limit in 100 kHz RBW} = (\text{Maximum Peak Conducted Carrier measured in 100kHz RBW}) - 20\text{dB}$$

Where:

The maximum peak conducted power was measured using a spectrum analyser using a 100 kHz resolution bandwidth.

Channel No.	Channel Frequency (MHz)	Measured Peak Carrier (dB μ V)	Measured Peak Carrier -20dB (dB μ V)	Emission Limit In a 100 kHz RBW (dB μ V)
15	2425	103.3	103.3-20	83.83
20	2450	102.1	102.1-20	82.1
25	2475	102.2	102.2-20	82.2

A6 Transmit Radiated Electric Field Emissions 15.209 and within the Restricted Bands of 15.205

Preliminary scans were performed using a peak detector with the RBW = 100kHz below 1GHz and a RBW = 1MHz >1GHz. The radiated electric field emission test applies to spurious emissions and harmonics that fall within the restricted bands listed in Section 15.205. The maximum permitted field strength is listed in Section 15.209. The EUT was set to transmit on its lowest, centre and highest carrier frequency.

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: TX CH15: 2425 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart C; 15.247 Clause 15.205 and 15.209
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25GHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case radiated emission measurements for spurious emissions:

TX CH15: 2425 MHz											
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT. FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	34.000	Pk	41.1	0.6	16.3	28.5	29.5	0	N/A	29.5	82.7
2	34.000	Qp	35.6	0.6	16.3	28.5	24.0	0	N/A	24.0	62.7
3	100.429	Pk	52.1	1	9.7	28.5	34.3	0	N/A	34.3	82.7
4	100.429	Qp	48.7	1	9.7	28.5	30.9	0	N/A	30.9	62.7
5	144.407	Pk	46.6	1.3	11.3	28.4	30.8	0	N/A	30.8	82.7
6	144.407	Qp	42	1.3	11.3	28.4	26.2	0	N/A	26.2	62.7
7	228.000	Pk	53.4	1.6	9.5	28.0	36.5	0	N/A	36.5	82.7
8	228.000	Qp	50.4	1.6	9.5	28.0	33.5	0	N/A	33.5	62.7
9	396.008	Pk	58.6	1.9	15.8	28.7	47.6	0	N/A	47.6	82.7
10	396.008	Qp	54.4	1.9	15.8	28.7	43.4	0	N/A	43.4	62.7

TX CH15: 2425 MHz (Continued)

Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
11	432.007	Pk	51.6	2.1	16.5	29.0	41.2	0	N/A	41.2	82.7
12	432.007	Qp	49.7	2.1	16.5	29.0	39.3	0	N/A	39.3	62.7
13	540.010	Pk	52.6	2.4	19.0	29.4	44.6	0	N/A	44.6	82.7
14	540.010	Qp	49.2	2.4	19.0	29.4	41.2	0	N/A	41.2	62.7
15	593.878	Pk	61.5	2.4	19.6	29.5	54.0	0	N/A	54.0	82.7
16	593.878	Qp	56.0	2.4	19.6	29.5	48.5	0	N/A	48.5	62.7
17	792.016	Pk	39.9	3.0	22.4	29.3	36.0	0	N/A	36.0	82.7
18	792.016	Qp	38.0	3.0	22.4	29.3	34.1	0	N/A	34.1	62.7
19	980.000	Pk	45.9	3.2	24.8	28.4	45.5	0	N/A	45.5	74.0
20	980.000	Qp	44.4	3.2	24.8	28.4	44.0	0	N/A	44.0	54.0
11	432.007	Pk	51.6	2.1	16.5	29.0	41.2	0	N/A	41.2	82.7
12	432.007	Qp	49.7	2.1	16.5	29.0	39.3	0	N/A	39.3	62.7
13	540.010	Pk	52.6	2.4	19.0	29.4	44.6	0	N/A	44.6	82.7
14	540.010	Qp	49.2	2.4	19.0	29.4	41.2	0	N/A	41.2	62.7
15	593.878	Pk	61.5	2.4	19.6	29.5	54.0	0	N/A	54.0	82.7
16	593.878	Qp	56.0	2.4	19.6	29.5	48.5	0	N/A	48.5	62.7
17	792.016	Pk	39.9	3.0	22.4	29.3	36.0	0	N/A	36.0	82.7
18	792.016	Qp	38.0	3.0	22.4	29.3	34.1	0	N/A	34.1	62.7
19	980.000	Pk	45.9	3.2	24.8	28.4	45.5	0	N/A	45.5	74.0
20	980.000	Qp	44.4	3.2	24.8	28.4	44.0	0	N/A	44.0	54.0
21	989.881	Pk	47.1	3.3	24.6	28.3	46.7	0	N/A	46.7	74.0
22	989.881	Qp	41.2	3.3	24.6	28.3	40.8	0	N/A	40.8	54.0
23	1188.024	Pk	53.2	2.2	25.4	34.3	46.5	0	N/A	46.5	74.0
24	1188.024	Av	39.3	2.2	25.4	34.3	32.7	0	0	32.7	54.0
25	1386.111	Pk	63.3	1.9	25.8	33.9	57.0	0	N/A	57.0	74.0
26	1386.111	Av	47.4	1.9	25.8	33.9	41.1	0	0	41.1	54.0
28	2772.054	Pk	54.9	3.4	29.5	33.9	53.9	0	N/A	53.9	74.0
29	2772.054	Av	42.9	3.4	29.5	33.9	41.9	0	0	41.9	54.0
30	2376.075	Pk	51.2	5.2	29.4	35.3	50.5	0	N/A	50.5	74.0
31	2376.075	Av	41.5	5.2	29.4	35.3	40.8	0	0	40.8	54.0

The worst case radiated emission measurements for spurious emissions:

TX CH15: 2425 MHz (continued)											
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBμV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBμV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBμV/m)	LIMIT (dBμV/m)
32	4849.166	Pk	49.2	5.6	33.3	34.1	54.1	0	N/A	54.1	74.0
33	4849.166	Av	39.3	5.6	33.3	34.1	44.2	0	0	44.2	54.0
34	5544.111	Pk	53.4	5.9	34.4	34.0	59.7	-9.5	N/A	50.2	74.0
35	5544.111	Av	40.9	5.9	34.4	34.0	47.2	-9.5	0	37.7	54.0

Test Details: TX CH20: 2450 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.209
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25 GHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case radiated emission measurements for spurious emissions:

TX CH20: 2450 MHz											
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	34.000	Pk	41.1	0.6	16.3	28.5	29.5	0	N/A	29.5	83.2
2	34.000	Qp	35.6	0.6	16.3	28.5	24.0	0	N/A	24.0	63.2
3	100.429	Pk	52.1	1.0	9.7	28.5	34.3	0	N/A	34.3	83.2
4	100.429	Qp	48.7	1.0	9.7	28.5	30.9	0	N/A	30.9	63.2
5	144.407	Pk	46.6	1.3	11.3	28.4	30.8	0	N/A	30.8	83.2
6	144.407	Qp	42.0	1.3	11.3	28.4	26.2	0	N/A	26.2	63.2
7	228.000	Pk	53.4	1.6	9.5	28.0	36.5	0	N/A	36.5	83.2
8	228.000	Qp	50.4	1.6	9.5	28.0	33.5	0	N/A	33.5	63.2
9	396.008	Pk	60.5	1.9	15.8	28.7	49.5	0	N/A	49.5	83.2
10	396.008	Qp	55.8	1.9	15.8	28.7	44.8	0	N/A	44.8	63.2
11	432.007	Pk	45.1	2.1	16.5	29.0	34.7	0	N/A	34.7	83.2
12	432.007	Qp	42.4	2.1	16.5	29.0	32.0	0	N/A	32.0	63.2
13	540.012	Pk	54.0	2.4	19.0	29.4	46.0	0	N/A	46.0	83.2
14	540.012	Qp	49.8	2.4	19.0	29.4	41.8	0	N/A	41.8	63.2
15	593.875	Pk	60.3	2.4	19.6	29.5	52.8	0	N/A	52.8	83.2
16	593.875	Qp	55.3	2.4	19.6	29.5	47.8	0	N/A	47.8	63.2
17	792.016	Pk	42.8	3.0	22.4	29.3	38.9	0	N/A	38.9	83.2
18	792.016	Qp	41.3	3.0	22.4	29.3	37.4	0	N/A	37.4	63.2
19	980.000	Pk	47.2	3.2	24.8	28.4	46.8	0	N/A	46.8	74.0
20	980.000	Qp	45.9	3.2	24.8	28.4	45.5	0	N/A	45.5	54.0

TX CH20: 2450 MHz (Continued)

Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
21	990.020	Pk	47.4	3.3	24.6	28.3	47.0	0	N/A	47.0	74.0
22	990.020	Qp	46.0	3.3	24.6	28.3	45.6	0	N/A	45.6	54.0
23	1386.000	Pk	62.9	1.9	25.8	33.9	56.6	0	N/A	56.6	74.0
24	1386.000	Av	47.3	1.9	25.8	33.9	41.1	0	0	41.1	54.0
25	2376.044	Pk	49.7	3.1	28.4	33.8	47.5	0	N/A	47.5	74.0
26	2376.044	Av	40.7	3.1	28.4	33.8	38.5	0	N/A	38.5	54.0
27	2772.056	Pk	57.8	3.4	29.5	33.9	56.8	0	N/A	56.8	74.0
28	2772.056	Av	46.2	3.4	29.5	33.9	45.2	0	N/A	45.2	54.0
29	3960.078	Pk	50.1	5.1	32.4	33.7	54.0	0	N/A	54.0	74.0
30	3960.078	Av	36.9	5.1	32.4	33.7	40.8	0	N/A	40.8	54.0
31	4899.034	Pk	53.3	5.6	33.4	34.1	58.2	0	N/A	58.2	74.0
32	4899.034	Av	44.8	5.6	33.4	34.1	49.7	0	N/A	49.7	54.0
33	5544.111	Pk	51.6	5.9	34.4	34.0	57.9	-9.5	N/A	48.4	74.0
34	5544.111	Av	38.2	5.9	34.4	34.0	44.5	-9.5	0	35.0	54.0

Test Details: TX CH25: 2475 MHz	
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.209
Measurement standard	ANSI C63.10
Frequency range	30MHz to 25 GHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case radiated emission measurements for spurious emissions:

TX CH25: 2475 MHz											
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	34.000	Pk	41.1	0.6	16.3	28.5	29.5	0	N/A	29.5	83.5
2	34.000	Qp	35.6	0.6	16.3	28.5	24.0	0	N/A	24.0	63.5
3	100.429	Pk	52.1	1.0	9.7	28.5	34.3	0	N/A	34.3	83.5
4	100.429	Qp	48.7	1.0	9.7	28.5	30.9	0	N/A	30.9	63.5
5	144.407	Pk	46.6	1.3	11.3	28.4	30.8	0	N/A	30.8	83.5
6	144.407	Qp	42.0	1.3	11.3	28.4	26.2	0	N/A	26.2	63.5
7	228.000	Pk	53.4	1.6	9.5	28.0	36.5	0	N/A	36.5	83.5
8	228.000	Qp	50.4	1.6	9.5	28.0	33.5	0	N/A	33.5	63.5
9	396.008	Pk	61.4	1.9	15.8	28.7	50.4	0	N/A	50.4	83.5
10	396.008	Qp	57.9	1.9	15.8	28.7	46.9	0	N/A	46.9	63.5
11	432.011	Pk	51.4	2.1	16.5	29.0	41.0	0	N/A	41.0	83.5
12	432.011	Qp	48.3	2.1	16.5	29.0	37.9	0	N/A	37.9	63.5
13	593.880	Pk	63.0	2.4	19.6	29.5	55.5	0	N/A	55.5	83.5
14	593.880	Qp	58.3	2.4	19.6	29.5	50.8	0	N/A	50.8	63.5
15	792.016	Pk	39.4	3.0	22.4	29.3	35.5	0	N/A	35.5	83.5
16	792.016	Qp	37.3	3.0	22.4	29.3	33.4	0	N/A	33.4	63.5
17	980.000	Pk	47.4	3.2	24.8	28.4	47.0	0	N/A	47.0	74.0
18	980.000	Qp	46.2	3.2	24.8	28.4	45.8	0	N/A	45.8	54.0
19	989.881	Pk	47.3	3.3	24.6	28.3	46.9	0	N/A	46.9	74.0
20	989.881	Qp	41.8	3.3	24.6	28.3	41.4	0	N/A	41.4	54.0

TX CH25: 2475 MHz (Continued)

Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	Duty cycle correction (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
21	1188.075	Pk	57.8	3.7	23.5	35.9	49.1	0	N/A	49.1	74.0
22	1188.075	Av	45.5	3.7	23.5	35.9	36.8	0	0	36.8	54.0
23	1386.101	Pk	62.1	4.1	24.9	35.6	55.5	0	N/A	55.5	74.0
24	1386.101	Av	47.0	4.1	24.9	35.6	40.4	0	0	40.4	54.0
25	2772.000	Pk	55.0	5.8	30.9	35.5	56.2	0	N/A	56.2	74.0
26	2772.000	Av	45.5	5.8	30.9	35.5	46.7	0	0	46.7	54.0
27	2483.500	Pk	55.8	5.4	29.8	35.3	55.7	0	N/A	55.7	74.0
28	2483.500	Av	44.5	5.4	29.8	35.3	44.4	0	0	44.4	54.0
29	4951.025	Pk	53.6	7.8	36.2	35.4	62.2	0	N/A	62.2	74.0
30	4951.025	Av	44.0	7.8	36.2	35.4	52.6	0	0	52.6	54.0
31	5544.111	Pk	51.2	5.9	34.4	34.0	57.5	-9.5	N/A	48.0	74.0
32	5544.111	Av	38.1	5.9	34.4	34.0	44.4	-9.5	0	34.9	54.0

Test Details: Radiated Carrier (dBuV/m)	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.209
Measurement standard	ANSI C63.10
Frequency range	CH15: 2425MHz, CH20: 2450MHz and CH25: 2475MHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Antenna 0										
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	2424.849	Pk	68.2	4.9	29.6	0	102.7	0	102.7	137.0
2	2450.500	Pk	68.7	4.8	29.7	0	103.2	0	103.2	137.0
3	2475.675	Pk	68.9	4.8	29.8	0	103.5	0	103.5	137.0

Antenna 1										
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	2424.500	Pk	65.5	5.1	29.6	0	100.2	0	100.2	137.0
2	2449.500	Pk	64.4	4.9	29.7	0	99.0	0	99.0	137.0
3	2474.475	Pk	63.8	4.8	29.8	0	98.4	0	98.4	137.0

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
- 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= 100 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= 1 MHz, VBW = 10 Hz or using an average detector.

These settings as per ANSI C63.10

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

Limits

Radiated emission limits (47 CFR 15: Clause 15.209) for emissions falling within the restricted bands defined in 15.205(a):

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
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:

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

The results displayed take into account applicable antenna factors and cable losses.

- (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				

A7 ac Power Line Conducted Emissions (15.207)

Preview ac power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector. The EUT was set to transmit on its lowest, centre and highest carrier frequency in turn. The formal measurements are detailed below:

Test Details:	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10
Frequency range	150kHz to 30MHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

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

Results measured using the average detector compared to the average limit

Ref No.	Conductor	Freq (MHz)	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	L	0.172	39.0	54.9	-15.9	Pass
2	L	0.342	37.7	49.2	-11.5	Pass
3	L	0.514	35.8	46.0	-10.2	Pass
4	L	0.554	39.0	46.0	-7.0	Pass
5	L	0.598	39.0	46.0	-7.1	Pass
6	L	0.639	33.8	46.0	-12.2	Pass
7	L	1.621	31.1	46.0	-14.9	Pass
8	L	3.115	30.1	46.0	-15.9	Pass
9	L	19.074	22.9	50.0	-27.1	Pass
10	L	20.747	28.1	50.0	-21.9	Pass
11	N	0.172	35.2	54.9	-19.7	Pass
12	N	0.342	30.9	49.2	-18.3	Pass
13	N	0.511	27.4	46.0	-18.6	Pass
14	N	0.544	15.5	46.0	-30.5	Pass
15	N	0.599	29.0	46.0	-17.0	Pass
16	N	0.642	24.6	46.0	-21.4	Pass
17	N	1.623	22.3	46.0	-23.7	Pass
18	N	3.117	22.7	46.0	-23.3	Pass
19	N	19.050	23.8	50.0	-26.2	Pass
20	N	20.758	26.3	50.0	-23.7	Pass

ac Power Line Conducted Emissions (15.207) continued:**Results measured using the quasi-peak detector compared to the quasi-peak limit**

Ref No.	Conductor	Freq (MHz)	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	L	0.172	51.1	64.9	-13.8	Pass
2	L	0.342	45.6	59.2	-13.6	Pass
3	L	0.514	41.7	56.0	-14.3	Pass
4	L	0.554	43.9	56.0	-12.1	Pass
5	L	0.598	43.6	56.0	-12.4	Pass
6	L	0.639	38.7	56.0	-17.3	Pass
7	L	1.621	34.8	56.0	-21.2	Pass
8	L	3.115	33.9	56.0	-22.1	Pass
9	L	19.074	32.4	60.0	-27.6	Pass
10	L	20.747	33.7	60.0	-26.3	Pass
11	N	0.172	45.4	64.9	-19.5	Pass
12	N	0.342	41.5	59.2	-17.7	Pass
13	N	0.511	38.2	56.0	-17.8	Pass
14	N	0.544	26.1	56.0	-29.9	Pass
15	N	0.599	39.0	56.0	-17.0	Pass
16	N	0.642	34.9	56.0	-21.1	Pass
17	N	1.623	30.2	56.0	-25.8	Pass
18	N	3.117	34.4	56.0	-21.6	Pass
19	N	19.050	33.4	60.0	-26.7	Pass
20	N	20.758	33.0	60.0	-27.0	Pass

Specification limits :

Conducted emission limits (47 CFR 15: Clause 15.207):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	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

A8 Unintentional Radiated Electric Field Emissions - 15.109 (Receiver/Digital circuitry)

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The maximum permitted field strength is listed in Section 15.109. The EUT was set to receive mode only on its lowest, centre and highest carrier frequency in turn.

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 :

Test Details: CH15: Receive Mode		
Regulation	Title 47 of the CFR: Part 15 Subpart (b) Clause 15.109	
Measurement standard	ANSI C63.4	
Class	B – refer to specification limit table below.	
Frequency range	30MHz to 1GHz	1GHz to 25GHz
EUT sample number	S02 and S11	S01 and S02
Modification state	0	
SE in test environment	None	
SE isolated from EUT	None	
EUT set up	Refer to Appendix C	

Receive mode 2425MHz										
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	33.918	QP	36.2	0.6	17.2	28.5	25.5	0	25.5	40.0
2.	123.011	QP	37.5	0.6	16.3	28.5	25.9	0	25.9	40.0
3	132.947	QP	41.9	1.1	11.2	28.5	25.7	0	25.7	40.0
4	396.003	QP	41.3	1.1	11.3	28.4	25.3	0	25.3	46.0
5	594.148	QP	38.1	1.9	15.8	28.7	27.1	0	27.1	46.0
6	792.012	QP	35.8	2.4	19.6	29.5	28.3	0	28.3	46.0
7	980.020	QP	36.5	3.0	22.4	29.3	32.6	0	32.6	54.0
8	990.149	QP	44.9	3.2	24.8	28.4	44.5	0	44.5	54.0
9	1188.020	Pk	50.3	2.2	25.4	34.3	43.7	0	43.7	74.0
10	1188.020	Av	36.2	2.2	25.4	34.3	29.5	0	29.5	54.0
11	1385.911	Pk	63.8	1.9	25.8	33.9	57.6	0	57.6	74.0
12	1385.911	Av	48.9	1.9	25.8	33.9	42.7	0	42.7	54.0
13	1782.032	Pk	53.5	2.1	27.2	33.7	49.1	0	49.1	74.0
14	1782.032	Av	38.1	2.1	27.2	33.7	33.7	0	33.7	54.0
15	2772.055	Pk	57.5	3.4	29.5	33.9	56.5	0	56.5	74.0
16	2772.055	Av	46.6	3.4	29.5	33.9	45.6	0	45.6	54.0
17	3366.377	Pk	49.4	4.3	31.0	34.1	50.6	0	50.6	74.0
18	3366.377	Av	35.3	4.3	31.0	34.1	36.4	0	36.4	54.0
19	3960.076	Pk	48.5	5.1	32.4	33.7	52.3	0	52.3	74.0
20	3960.076	Av	36.4	5.1	32.4	33.7	40.3	0	40.3	54.0
21	4927.633	Pk	42.1	5.5	33.5	34.1	47.0	0	47.0	74.0
22	4927.633	Av	28.9	5.5	33.5	34.1	33.8	0	33.8	54.0
23	5544.111	Pk	49.8	5.9	34.4	34.0	56.1	-9.5	46.6	74.0
24	5544.111	Av	36.7	5.9	34.4	34.0	43.0	-9.5	33.5	54.0

No further spurious emissions within 20 dB of the test limit were detected.

Unintentional Radiated Electric Field Emissions - 15.109 (Receiver/Digital circuitry)
continued:

Receive mode CH20: 2450MHz										
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	33.599	QP	37.6	0.6	16.5	28.5	26.2	0	26.2	40.0
2	33.962	QP	38.2	0.6	16.3	28.5	26.6	0	26.6	40.0
3	124.169	QP	40.9	1.1	11.2	28.5	24.7	0	24.7	40.0
4	130.819	QP	42.5	1.1	11.2	28.4	26.4	0	26.4	40.0
5	396.003	QP	41.4	1.9	15.8	28.7	30.4	0	30.4	46.0
6	594.000	QP	40.4	2.4	19.6	29.5	32.9	0	32.9	46.0
7	792.012	QP	38.22	3	22.4	29.3	34.3	0	34.3	46.0
8	980.014	QP	45.4	3.2	24.8	28.4	45.0	0	45.0	54.0
9	990.149	QP	39.9	3.3	24.6	28.3	39.5	0	39.5	54.0
10	1188.020	Pk	57.0	2.2	25.4	34.3	50.4	0	50.4	74.0
11	1188.020	Av	43.9	2.2	25.4	34.3	37.2	0	37.2	54.0
12	1385.911	Pk	64.5	1.9	25.8	33.9	58.3	0	58.3	74.0
13	1385.911	Av	48.7	1.9	25.8	33.9	42.5	0	42.5	54.0
14	1782.032	Pk	56.7	2.1	27.2	33.7	52.4	0	52.4	74.0
15	1782.032	Av	40.8	2.1	27.2	33.7	36.4	0	36.4	54.0
16	2178.288	Pk	51.7	3	28.2	33.7	49.2	0	49.2	74.0
17	2178.288	Av	36.4	3.0	28.2	33.7	33.9	0	33.9	54.0
18	2772.055	Pk	54.5	3.4	29.5	33.9	53.5	0	53.5	74.0
19	2772.055	Av	44.0	3.4	29.5	33.9	43.0	0	43.0	54.0
20	2970.233	Pk	52.5	3.7	30.2	34.0	52.4	0	52.4	74.0
21	2970.233	Av	36.6	3.7	30.2	34.0	36.5	0	36.5	54.0
22	3366.287	Pk	50.6	4.3	31	34.1	51.8	0	51.8	74.0
23	3366.287	Av	35.8	4.3	31	34.1	37.0	0	37.0	54.0
24	3564.069	Pk	52.0	4.6	31.4	34.1	53.9	0	53.9	74.0
25	3564.069	Av	46.5	4.6	31.4	34.1	48.4	0	48.4	54.0
26	3960.769	Pk	49.9	5.1	32.4	33.7	53.7	0	53.7	74.0
27	3960.769	Av	38.4	5.1	32.4	33.7	42.3	0	42.3	54.0
28	5544.111	Pk	49.7	5.9	34.4	34.0	56.0	-9.5	46.5	74.0
29	5544.111	Av	36.9	5.9	34.4	34.0	43.2	-9.5	33.7	54.0

No further spurious emissions within 20 dB of the test limit were detected.

Unintentional Radiated Electric Field Emissions - 15.109 (Receiver/Digital circuitry)
continued:

Receive mode CH25: 2475MHz										
Ref No.	FREQ. (MHz)	DET	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (dBµV/m)	LIMIT (dBµV/m)
1	32.517	QP	36.8	0.6	17	28.5	25.9	0	25.9	40.0
2	33.788	QP	37.7	0.6	16.4	28.5	26.2	0	26.2	40.0
3	123.590	QP	42.6	1.1	11.2	28.5	26.4	0	26.4	40.0
4	130.739	QP	42.6	1.1	11.2	28.4	26.5	0	26.5	40.0
5	396.008	QP	42.4	1.9	15.8	28.7	31.4	0	31.4	46.0
6	594.012	QP	39.3	2.4	19.6	29.5	31.8	0	31.8	46.0
7	792.012	QP	41.1	3	22.4	29.3	37.2	0	37.2	46.0
8	980.092	QP	45.1	3.2	24.8	28.4	44.7	0	44.7	54.0
9	989.879	QP	39.2	3.3	24.6	28.3	38.8	0	38.8	54.0
10	1188.020	Pk	56.3	2.2	25.4	34.3	49.6	0	49.6	74.0
11	1188.020	Av	41.7	2.2	25.4	34.3	35.0	0	35.0	54.0
12	1386.155	Pk	62.2	1.9	25.8	33.9	56.0	0	56.0	74.0
13	1386.155	Av	46.5	1.9	25.8	33.9	40.3	0	40.3	54.0
14	1782.033	Pk	56.6	2.1	27.2	33.7	52.2	0	52.2	74.0
15	1782.033	Av	40.8	2.1	27.2	33.7	36.4	0	36.4	54.0
16	2178.288	Pk	51.2	3.0	28.2	33.7	48.7	0	48.7	74.0
17	2178.288	Av	36.2	3.0	28.2	33.7	33.7	0	33.7	54.0
18	2574.500	Pk	51.9	3.3	28.8	33.8	50.2	0	50.2	74.0
19	2574.500	Av	34.7	3.3	28.8	33.8	33.0	0	33.0	54.0
20	2772.055	Pk	52.3	3.4	29.5	33.9	51.3	0	51.3	74.0
21	2772.055	Av	41.0	3.4	29.5	33.9	40.0	0	40.0	54.0
22	3366.100	Pk	50.2	4.3	31.0	34.1	51.4	0	51.4	74.0
23	3366.100	Av	35.4	4.3	31.0	34.1	36.5	0	36.5	54.0
24	3564.069	Pk	51.7	4.6	31.4	34.1	53.6	0	53.6	74.0
25	3564.069	Av	43.7	4.6	31.4	34.1	45.6	0	45.6	54.0
26	3960.076	Pk	49.6	5.1	32.4	33.7	53.4	0	53.4	74.0
27	3960.076	Av	35.3	5.1	32.4	33.7	39.1	0	39.1	54.0
28	5544.111	Pk	50.2	5.9	34.4	34.0	56.5	-9.5	47.0	74.0
29	5544.111	Av	37.0	5.9	34.4	34.0	43.3	-9.5	33.8	54.0

No further spurious emissions within 20 dB of the test limit were detected.

Specification limits :

The upper frequency of the measurement range was decided according to 47 CFR 15:2008 Clause 15.33.

Radiated emission limits (47 CFR 15:2008 Clause 15.109):

Except for a Class A digital device, the field strength of radiated emissions from unintentional radiators at a distance of 3m shall not exceed the following values:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Field strength $\text{dB}\mu\text{V/m}$
30-88	100	40.0 (quasi-peak)
88-216	150	43.5 (quasi-peak)
216-960	200	46.0 (quasi-peak)
960-1000	500	54.0 (quasi-peak)
Above 1000	500	54.0 (average)
Above 1000	-	74.0 (peak)

Notes:

- (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:

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

The results displayed take into account applicable antenna factors and cable losses.

- (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 1)	See 2)	See 3)	See 4)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		
Effect of Position of EUT cables & samples on emission levels		✓		
1) Parameter defined by standard and / or single possible. 2) Parameter defined by client and / or single possible. 3) Parameter had a negligible effect on emission levels. 4) Worst case determined by initial measurement.				

A9 ac Power Line Conducted Emissions 15.107 (Receiver/Digital circuitry)

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

Test Details: Receive Mode	
Regulation	Title 47 of the CFR: Part 15 Subpart (c) Clause 15.207
Measurement standard	ANSI C63.10
Class	B – refer to specification limit table below.
Frequency range	150kHz to 30MHz
EUT sample number	S01 and S02
Modification state	0
SE in test environment	8C1497S01 and Load boxes
SE isolated from EUT	None
EUT set up	Refer to Appendix C

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

Results measured using the average detector compared to the average limit

Ref No.	Conductor	Freq (MHz)	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	L	0.172	39.0	54.9	-15.9	Pass
2	L	0.343	37.7	49.1	-11.4	Pass
3	L	0.386	35.5	48.2	-12.6	Pass
4	L	0.472	33.6	46.5	-12.9	Pass
5	L	0.514	38.1	46.0	-7.9	Pass
6	L	0.558	38.4	46.0	-7.6	Pass
7	L	0.600	33.5	46.0	-12.5	Pass
8	L	3.126	29.7	46.0	-16.3	Pass
9	L	19.103	22.6	50.0	-27.4	Pass
10	L	20.609	23.8	50.0	-26.3	Pass
11	N	0.171	50.4	54.9	-4.5	Pass
12	N	0.343	36.8	49.1	-12.3	Pass
13	N	0.386	33.1	48.1	-15.0	Pass
14	N	0.472	33.1	46.5	-13.4	Pass
15	N	0.514	28.4	46.0	-17.6	Pass
16	N	0.557	27.7	46.0	-18.3	Pass
17	N	0.601	29.0	46.0	-17.0	Pass
18	N	3.086	23.1	46.0	-22.9	Pass
19	N	18.973	23.4	50.0	-26.6	Pass
20	N	20.609	26.4	50.0	-23.6	Pass

ac Power Line Conducted Emissions (15.107) continued:**Results measured using the quasi-peak detector compared to the quasi-peak limit**

Ref No.	Conductor	Freq (MHz)	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	L	0.172	51.7	64.9	-13.2	Pass
2	L	0.343	45.2	59.1	-13.9	Pass
3	L	0.386	43.9	58.2	-14.3	Pass
4	L	0.472	42.4	56.5	-14.0	Pass
5	L	0.514	43.9	56.0	-12.1	Pass
6	L	0.558	44.3	56.0	-11.7	Pass
7	L	0.600	43.5	56.0	-12.5	Pass
8	L	3.126	34.2	56.0	-21.9	Pass
9	L	19.103	32.3	60.0	-27.7	Pass
10	L	20.609	30.9	60.0	-29.1	Pass
11	N	0.171	51.0	64.9	-13.9	Pass
12	N	0.343	44.0	59.1	-15.1	Pass
13	N	0.386	41.7	58.1	-16.4	Pass
14	N	0.472	40.4	56.5	-16.1	Pass
15	N	0.514	39.0	56.0	-17.1	Pass
16	N	0.557	38.7	56.0	-17.3	Pass
17	N	0.601	39.0	56.0	-17.1	Pass
18	N	3.086	35.2	56.0	-20.8	Pass
19	N	18.973	32.5	60.0	-27.5	Pass
20	N	20.609	33.2	60.0	-26.8	Pass

Specification limits :

Conducted emission limits (47 CFR 15: Clause 15.107):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	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:
 3. The lower limit shall apply at the transition frequency.
 4. 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		✓		

(v) Parameter defined by standard and / or single possible, refer to Appendix C
 (vi) Parameter defined by client and / or single possible, refer to Appendix C
 (vii) Parameter had a negligible effect on emission levels, refer to Appendix C
 (viii) Worst case determined by initial measurement, refer to Appendix C

Appendix B:

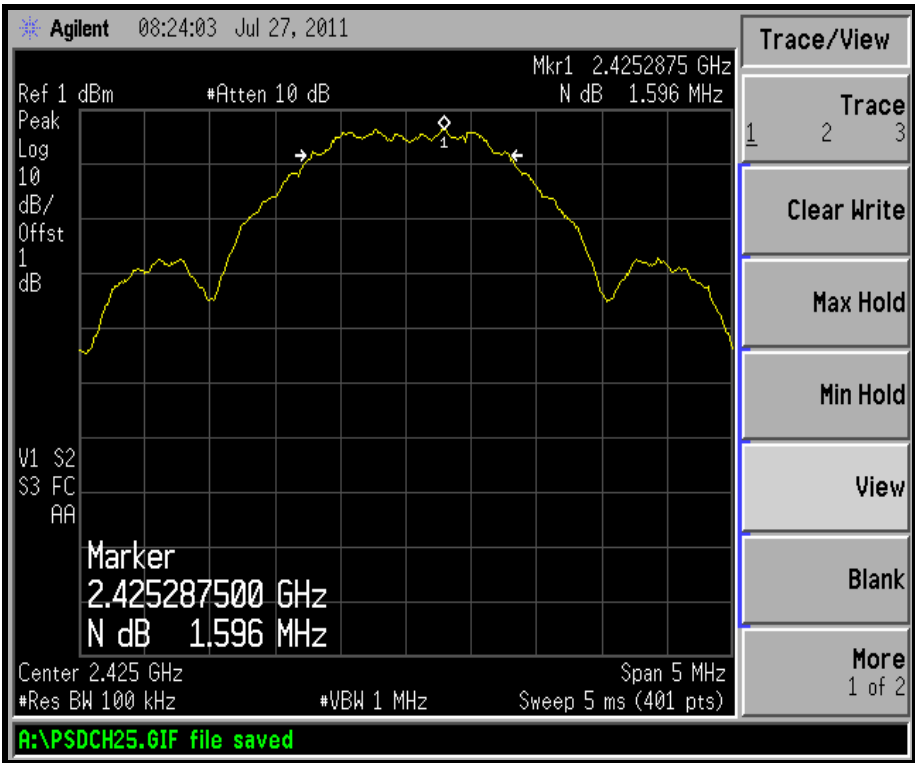
Supporting Graphical Data

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.

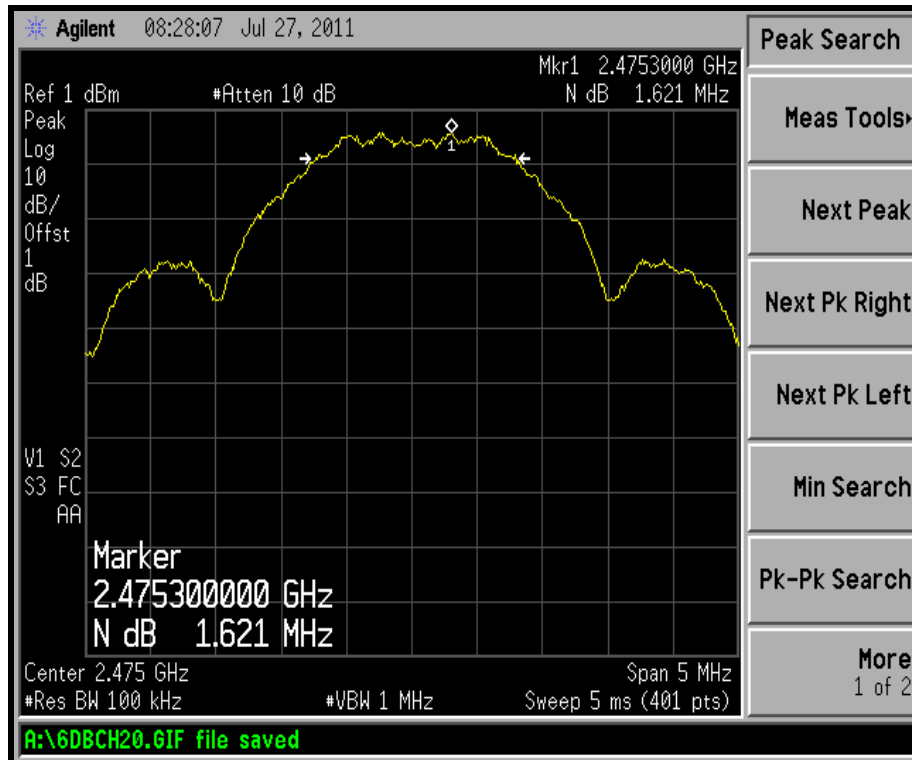
B1 Conducted Graphical Data



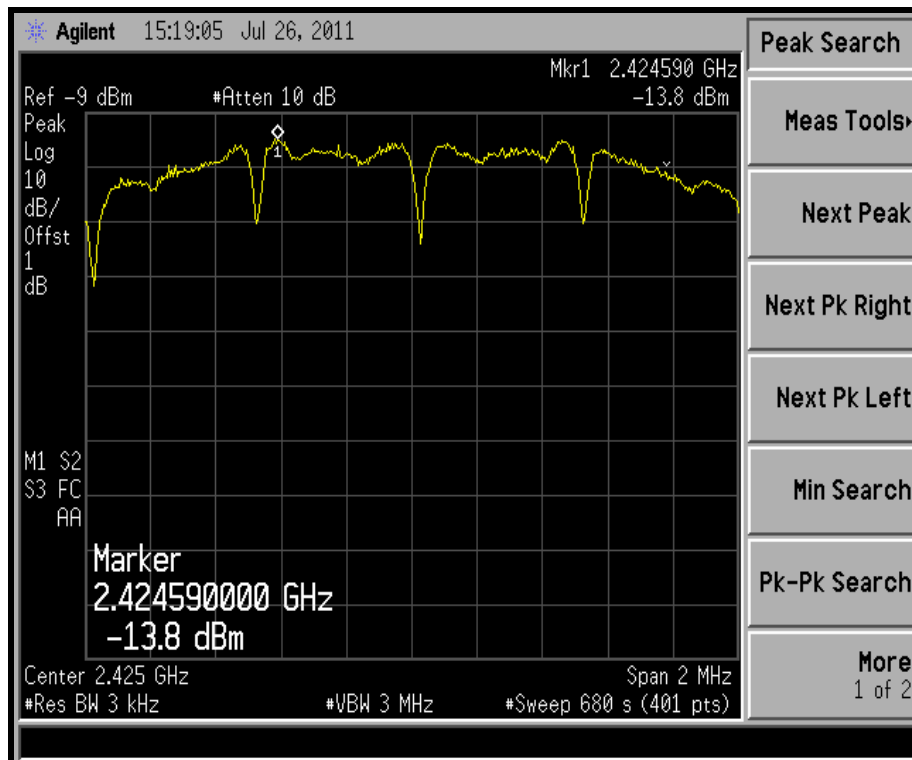
6dB Bandwidth: Channel 15 2425MHz



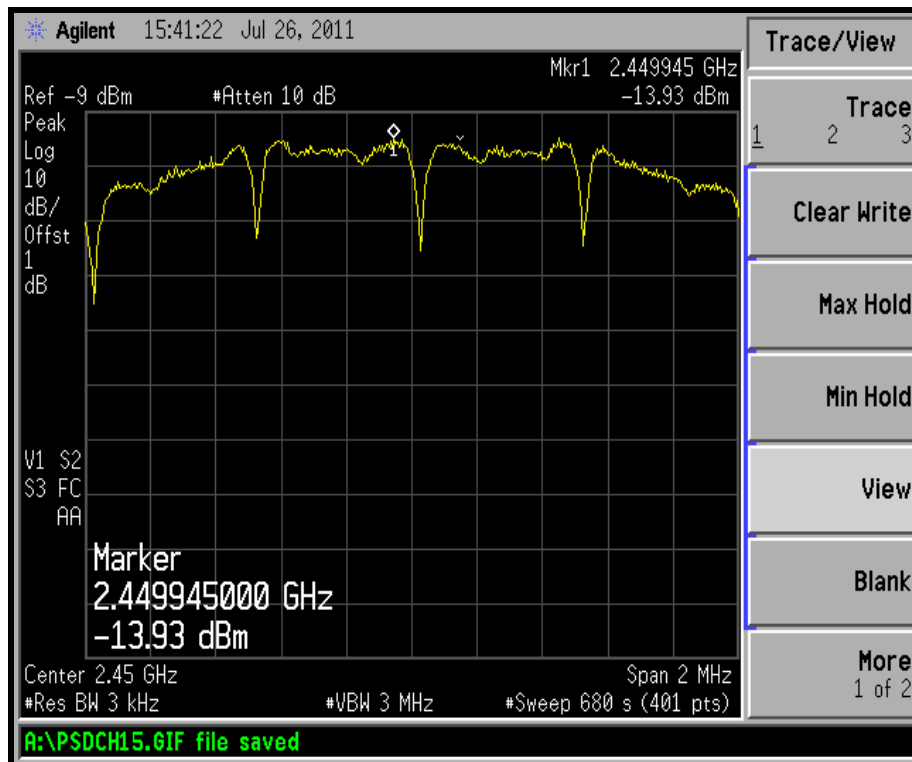
6dB Bandwidth: Channel 20 2450MHz



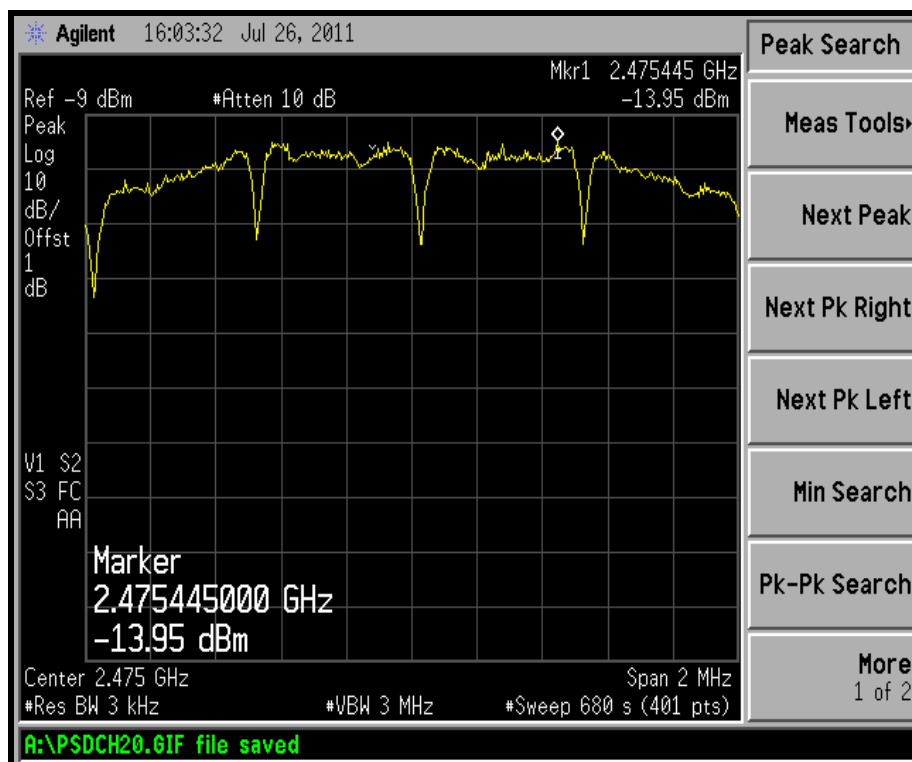
6dB Bandwidth: Channel 25 2475MHz



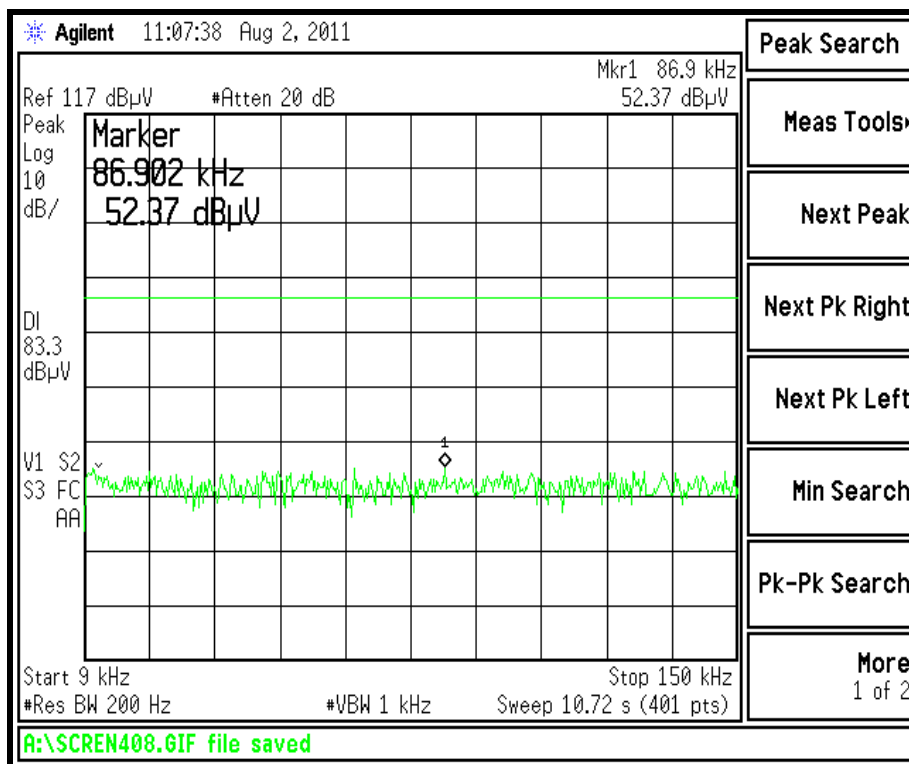
Power Spectral Density: Channel 15 2425MHz



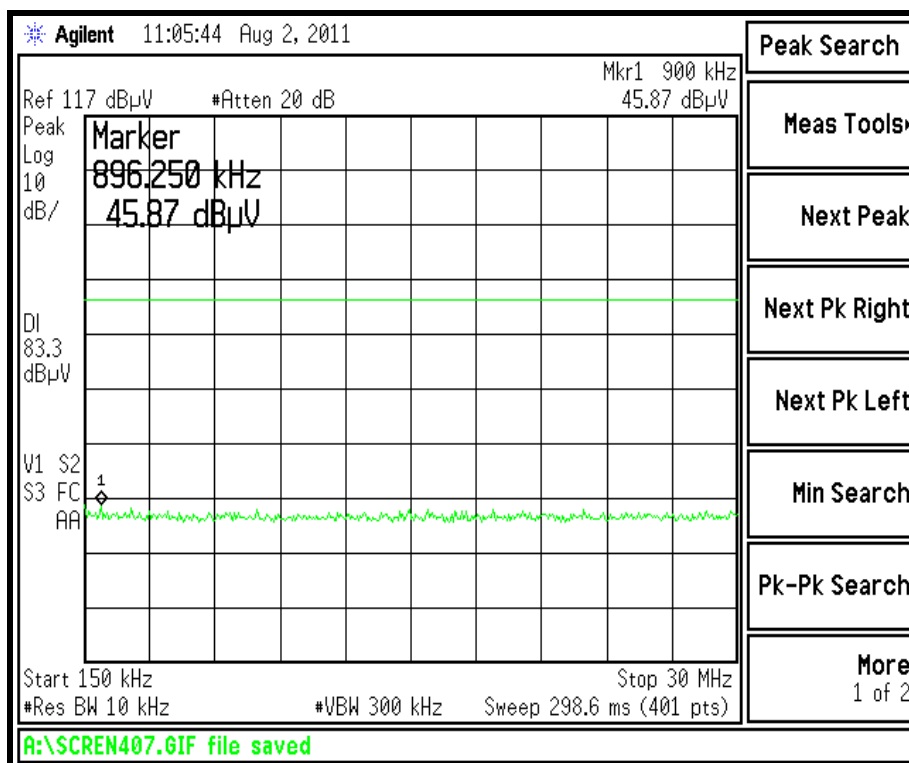
Power Spectral Density: Channel 20 2450MHz



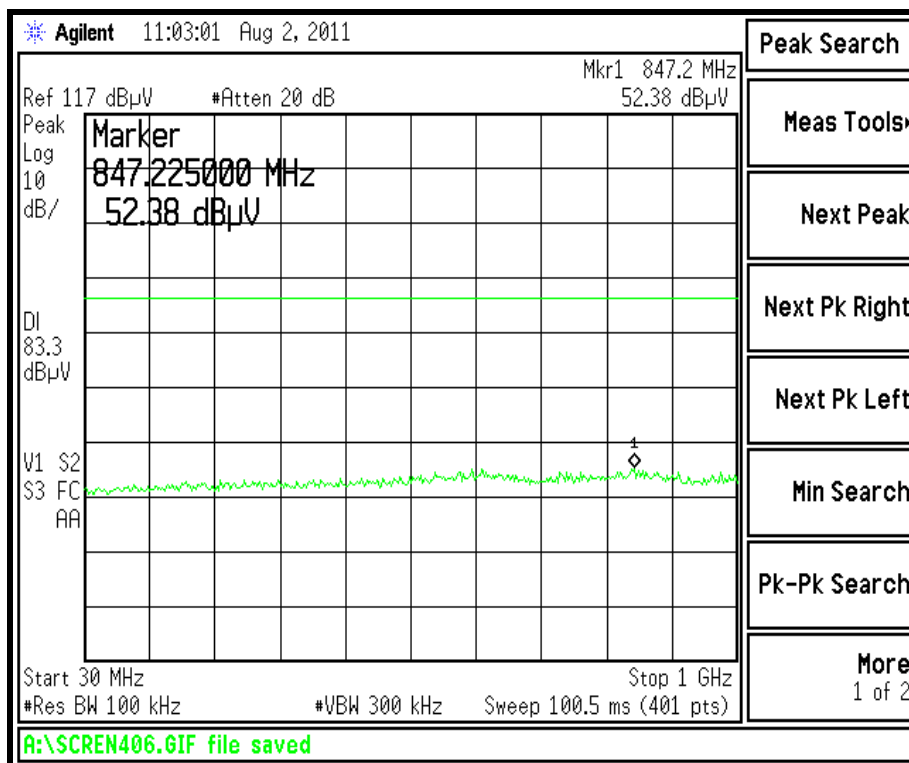
Power Spectral Density: Channel 25 2475MHz



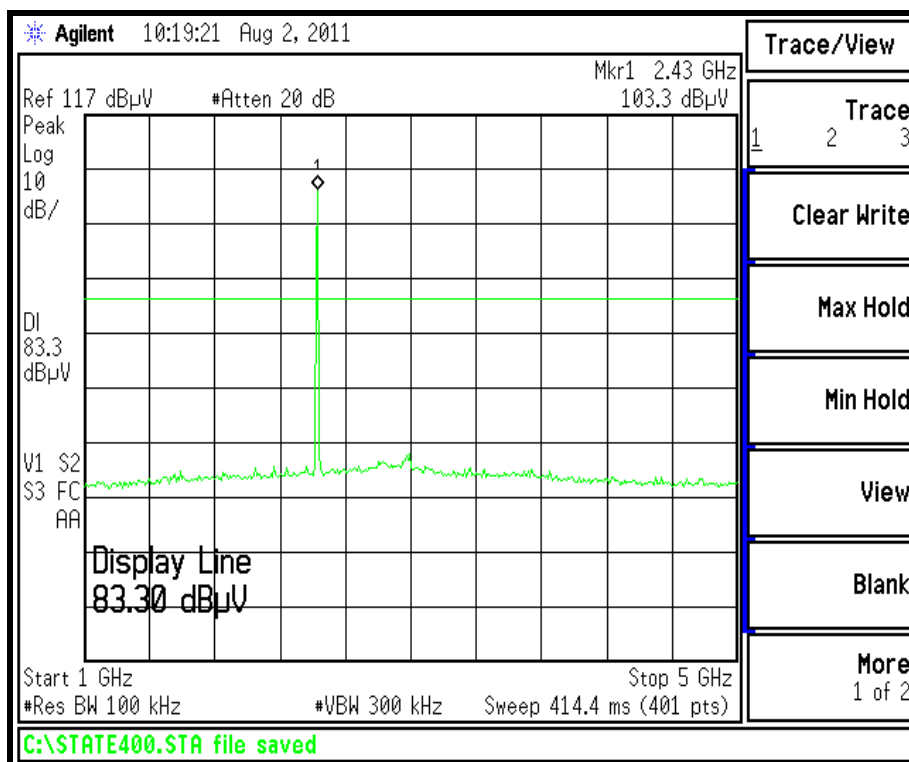
Conducted Emissions Channel 15 2425MHz



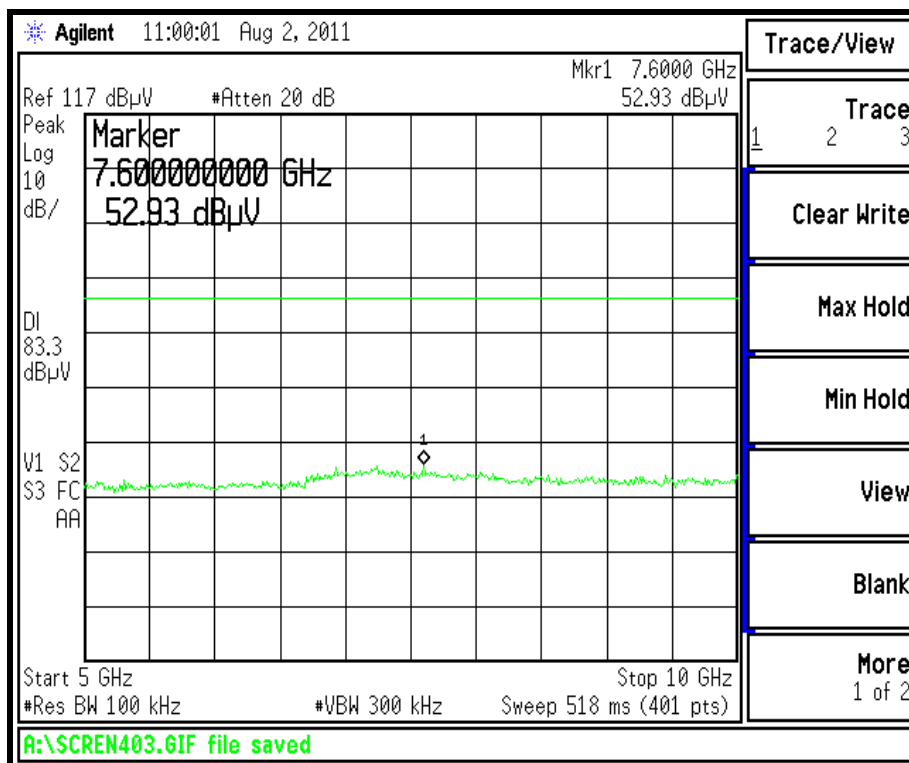
Conducted Emissions Channel 15 2425MHz



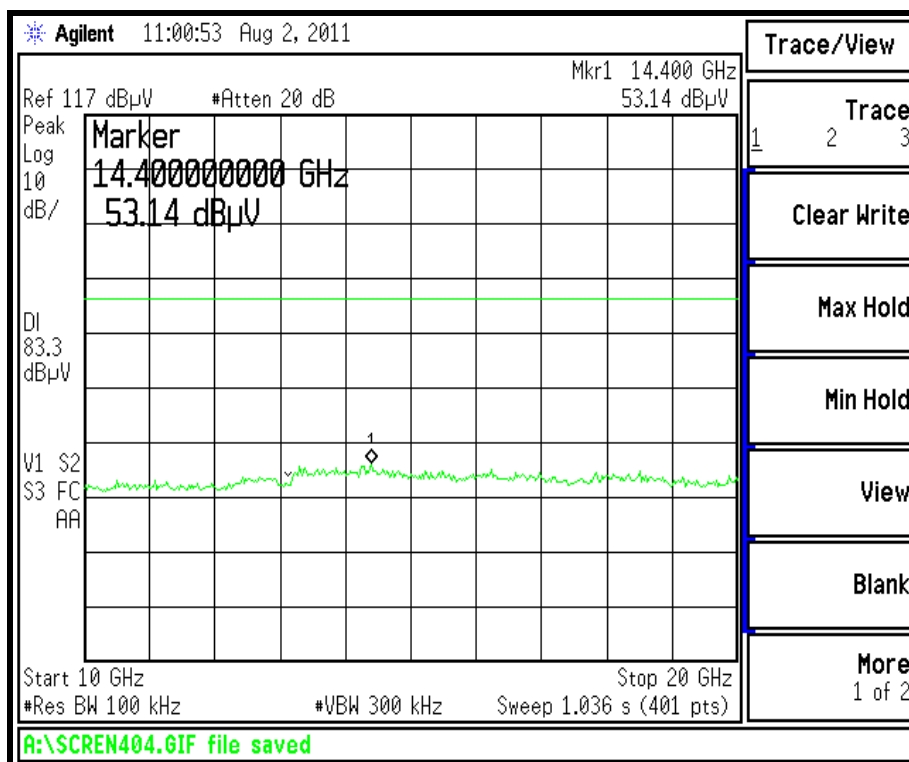
Conducted Emissions Channel 15 2425MHz



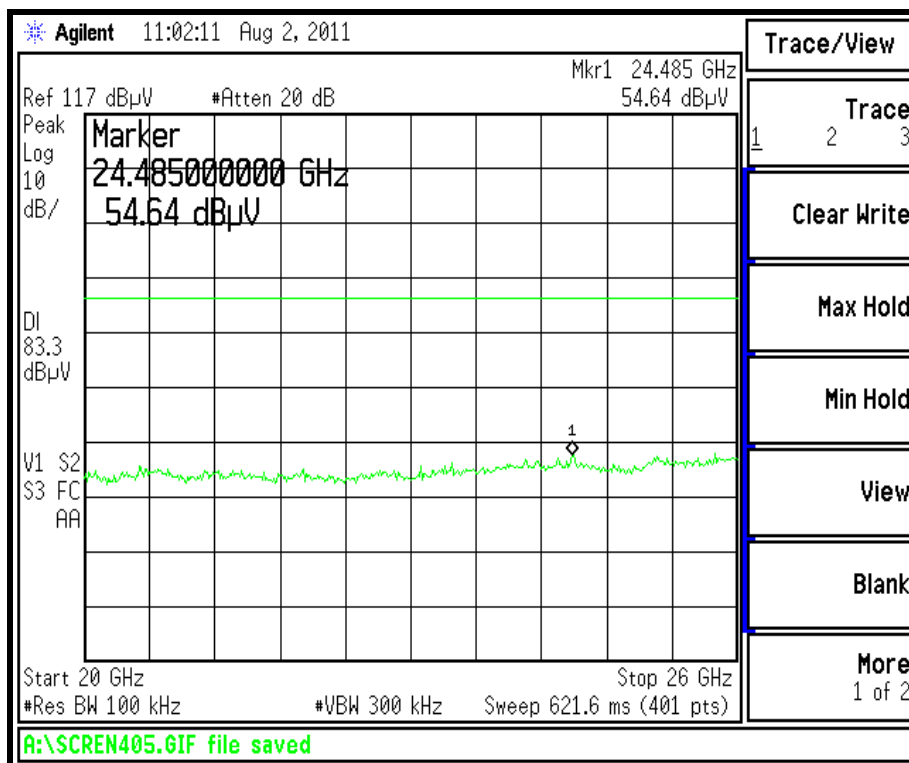
Conducted Emissions Channel 15 2425MHz



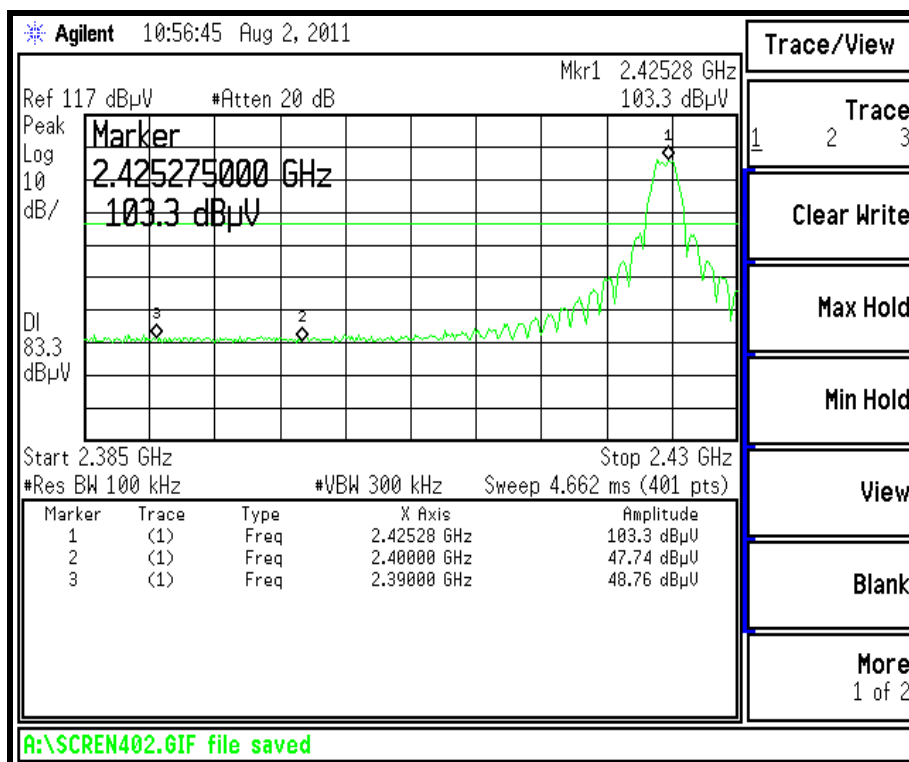
Conducted Emissions Channel 15 2425MHz



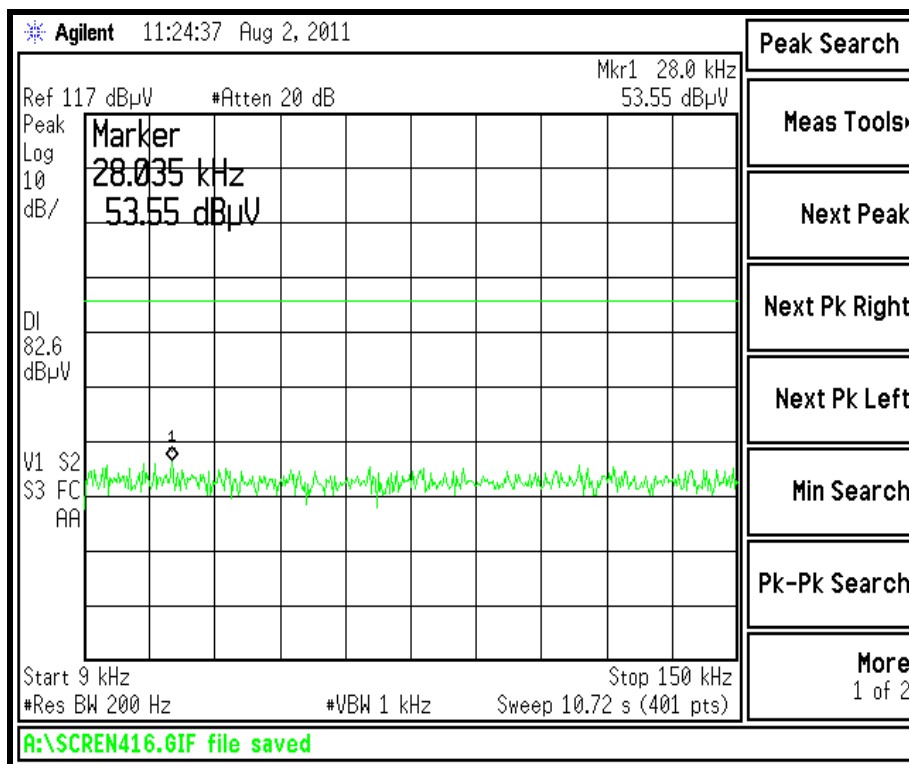
Conducted Emissions Channel 15 2425MHz



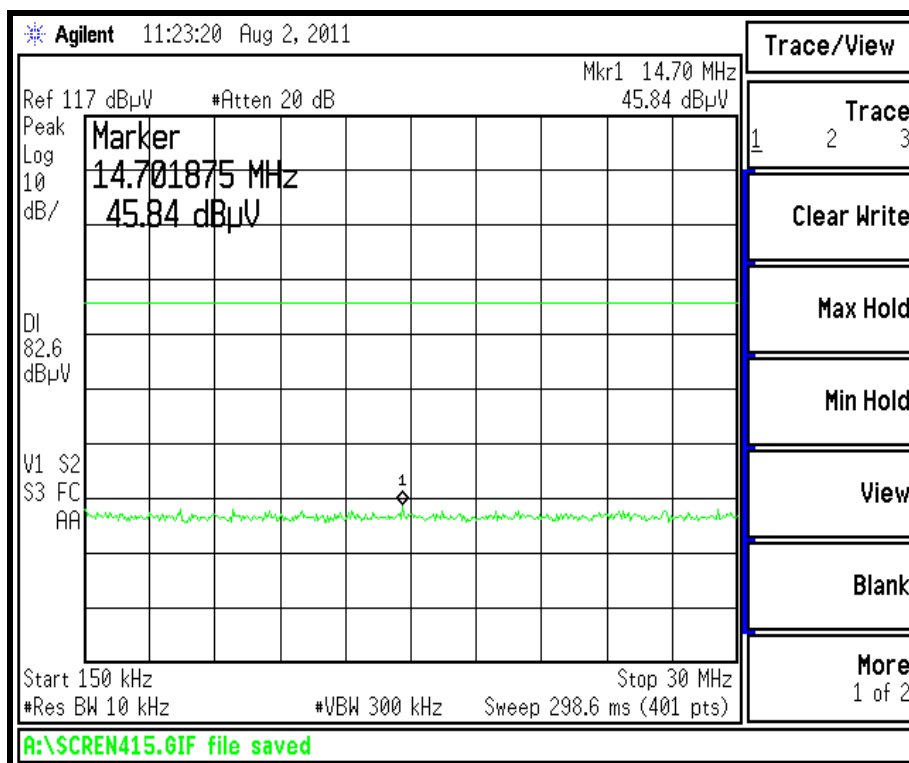
Conducted Emissions Channel 15 2425MHz



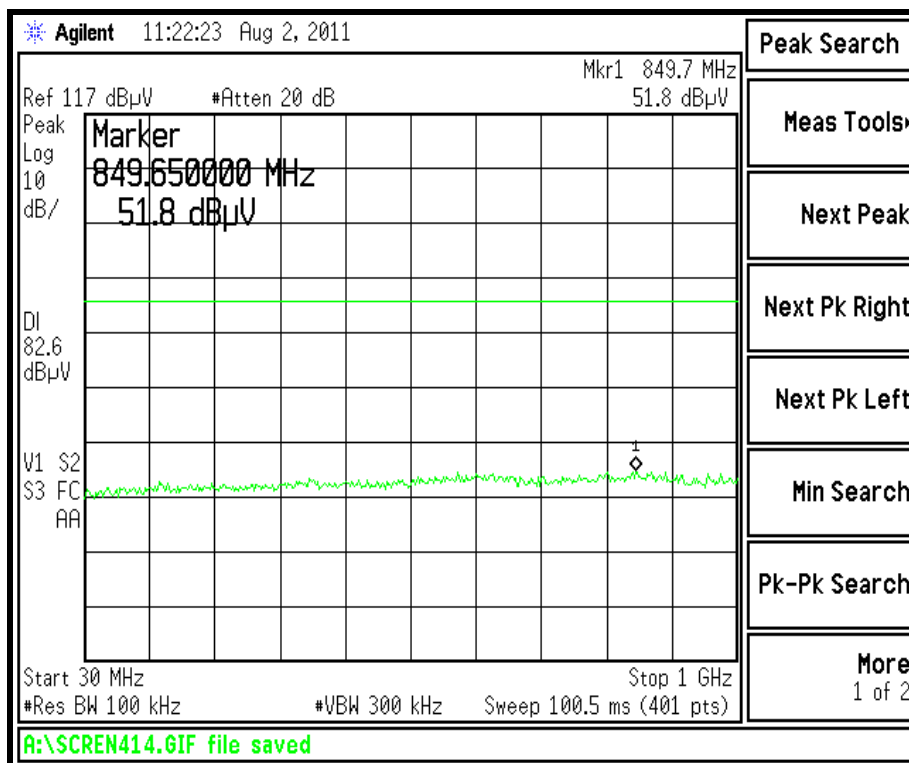
Conducted Emissions Channel 15 2425MHz: Lower-Band edge



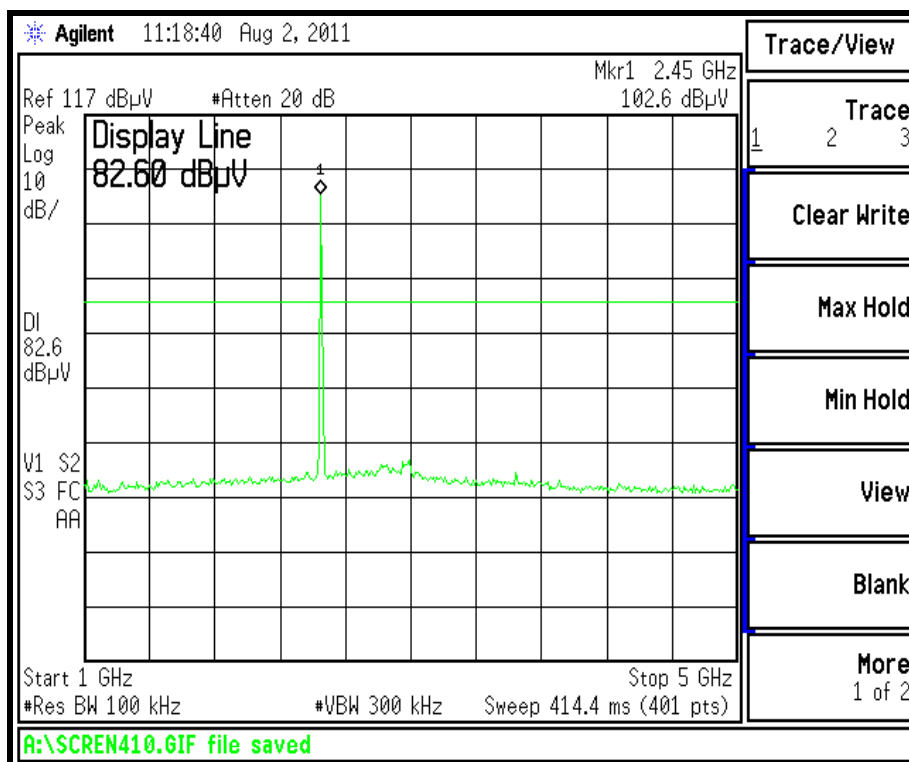
Conducted Emissions Channel 20 2450MHz



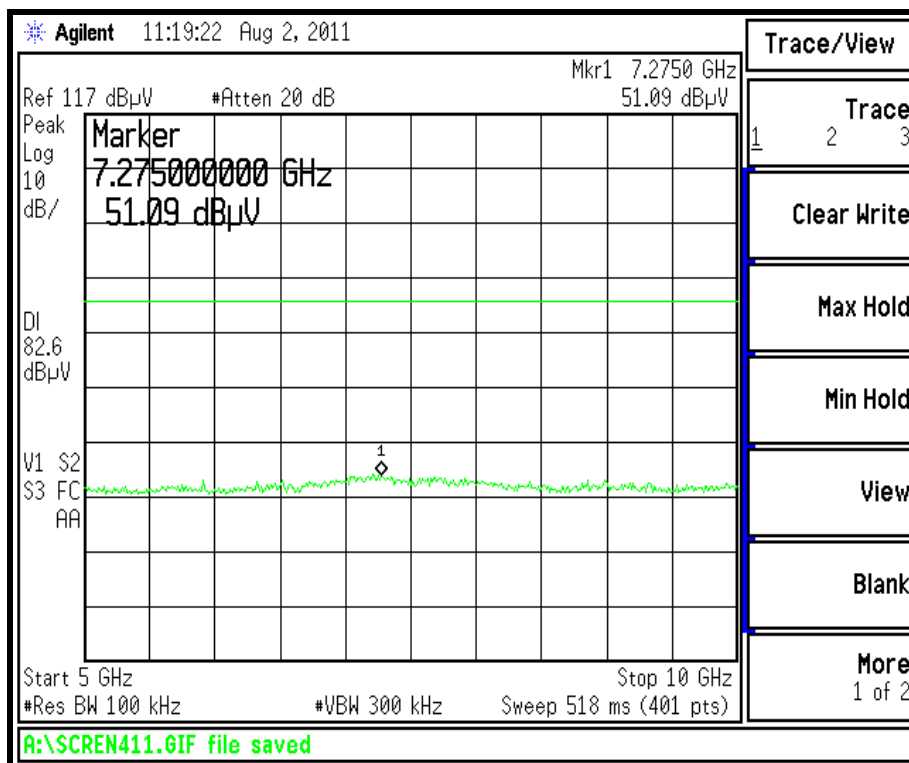
Conducted Emissions Channel 20 2450MHz



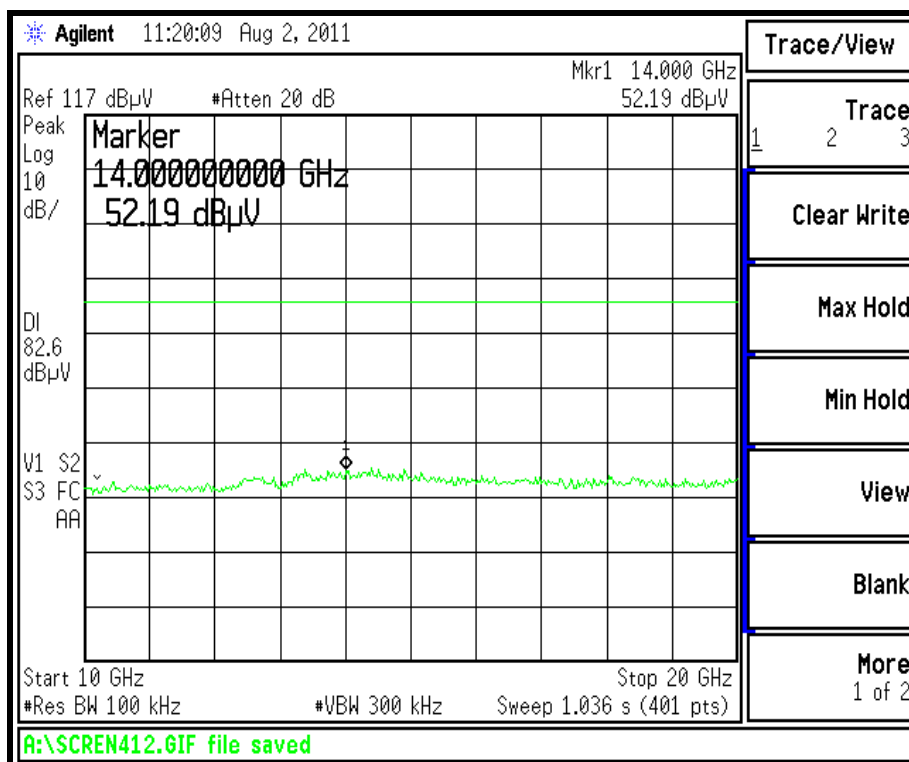
Conducted Emissions Channel 20 2450MHz



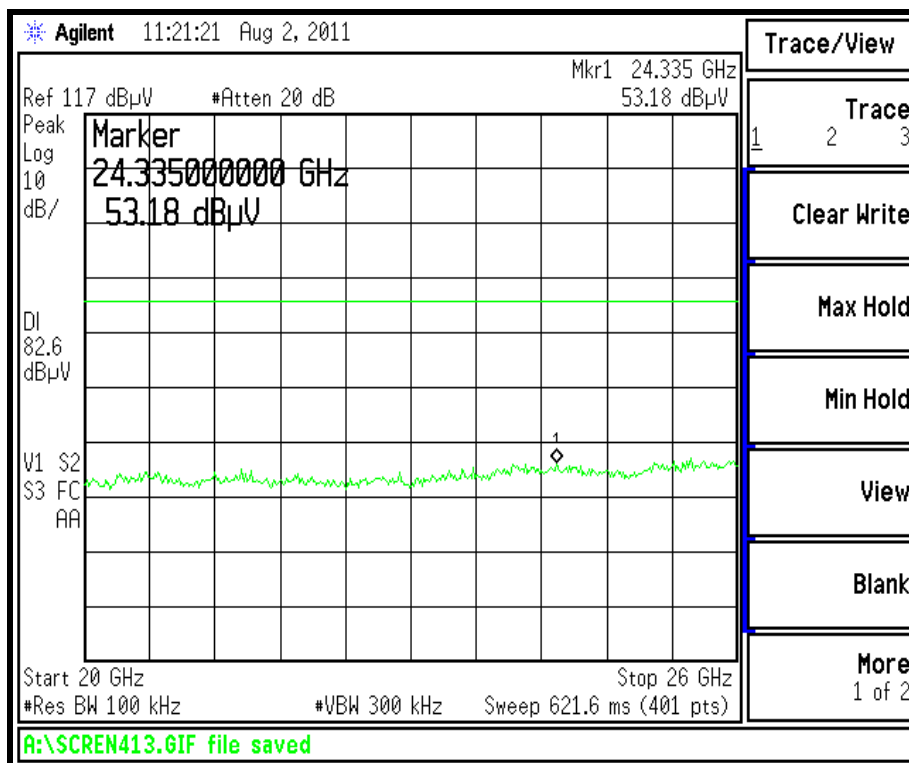
Conducted Emissions Channel 20 2450MHz



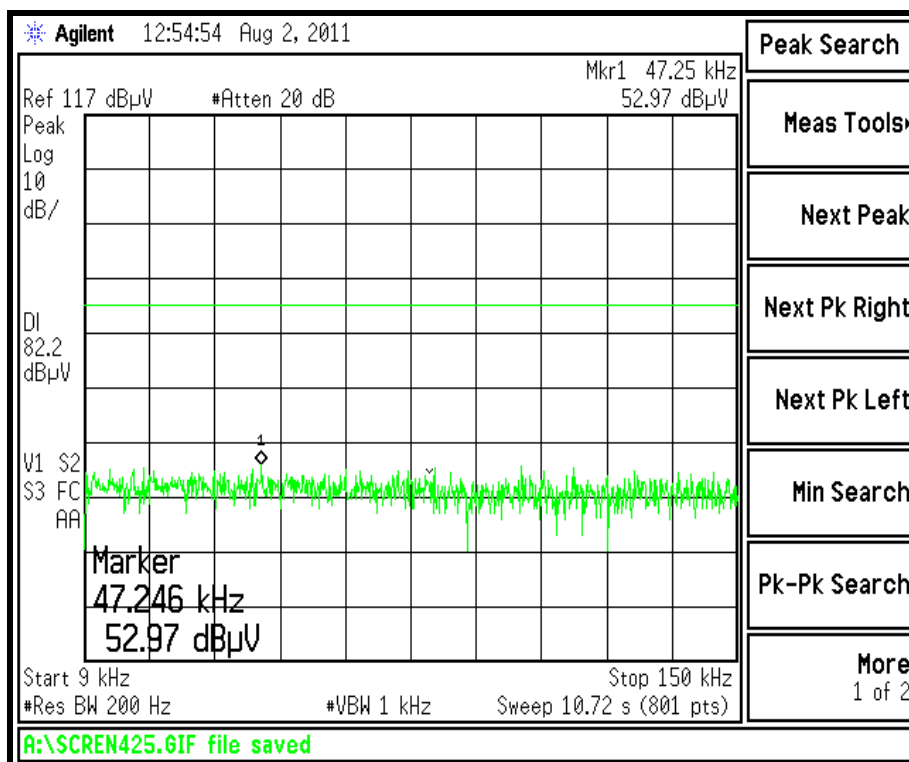
Conducted Emissions Channel 20 2450MHz



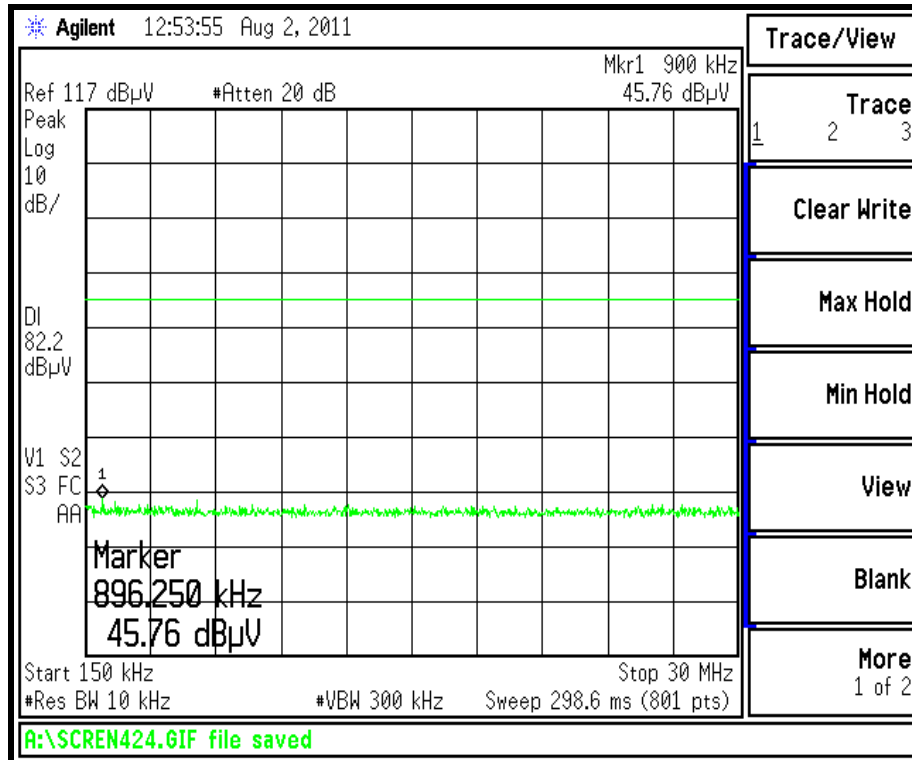
Conducted Emissions Channel 20 2450MHz



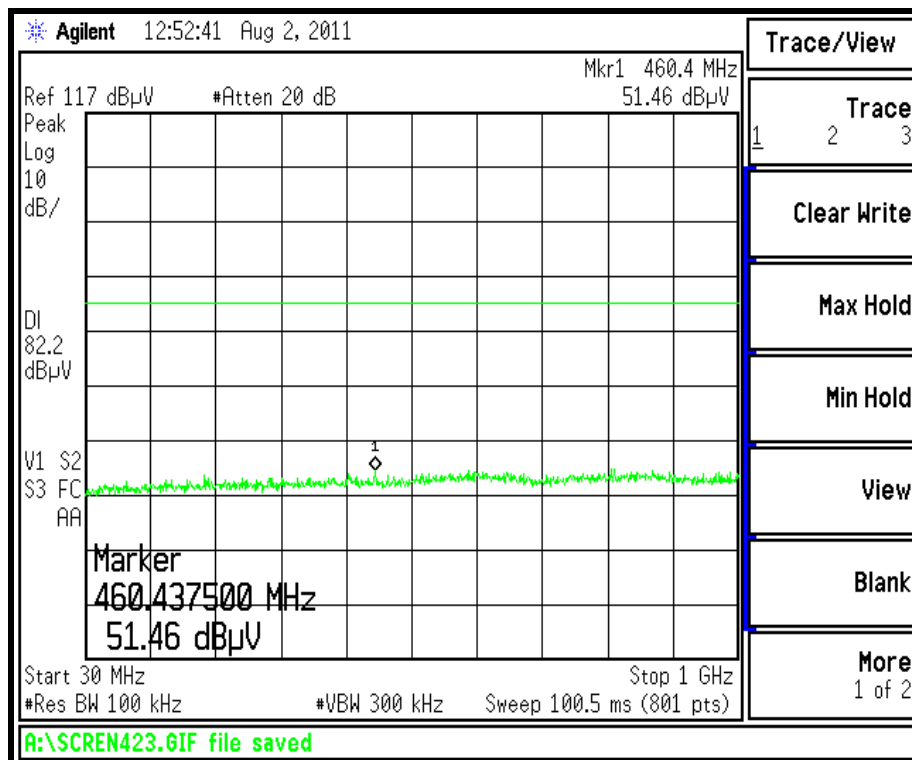
Conducted Emissions Channel 20 2450MHz



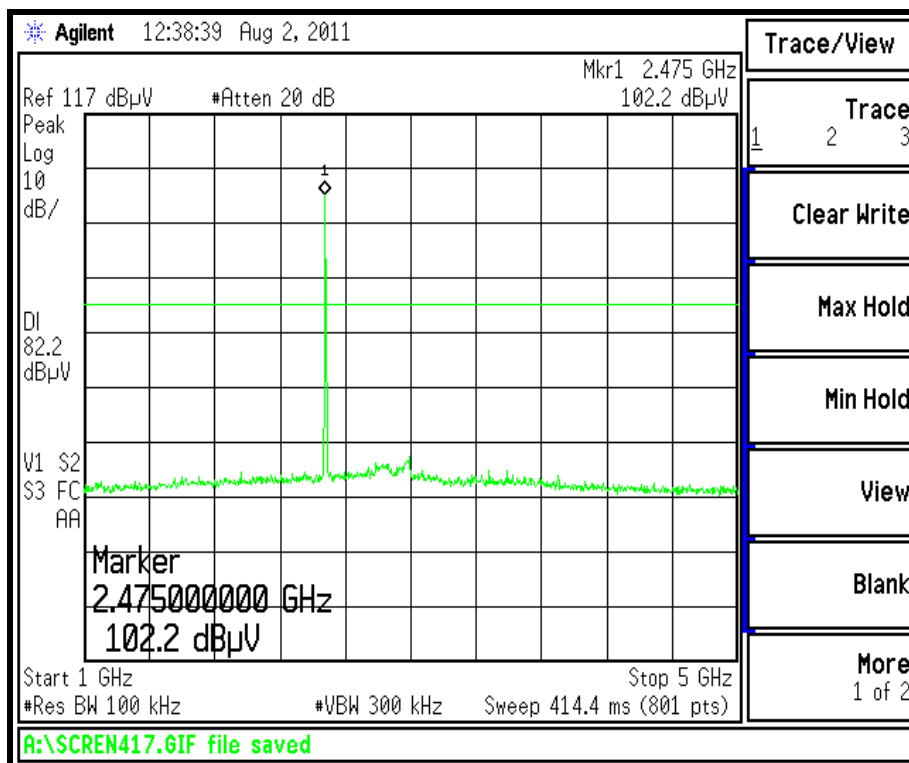
Conducted Emissions Channel 25 2475MHz



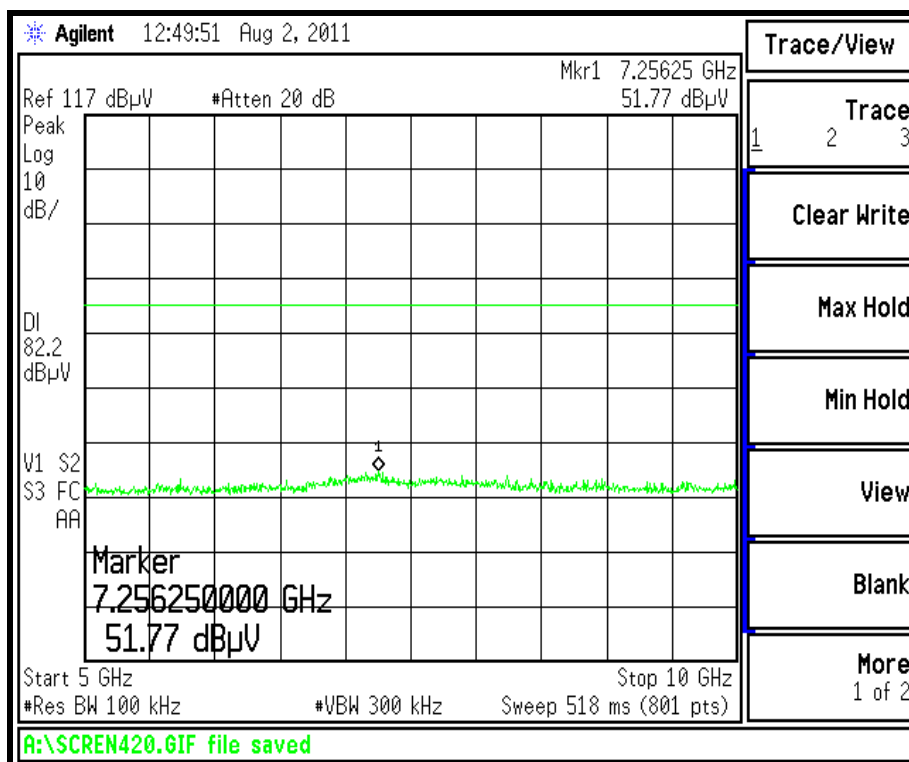
Conducted Emissions Channel 25 2475MHz



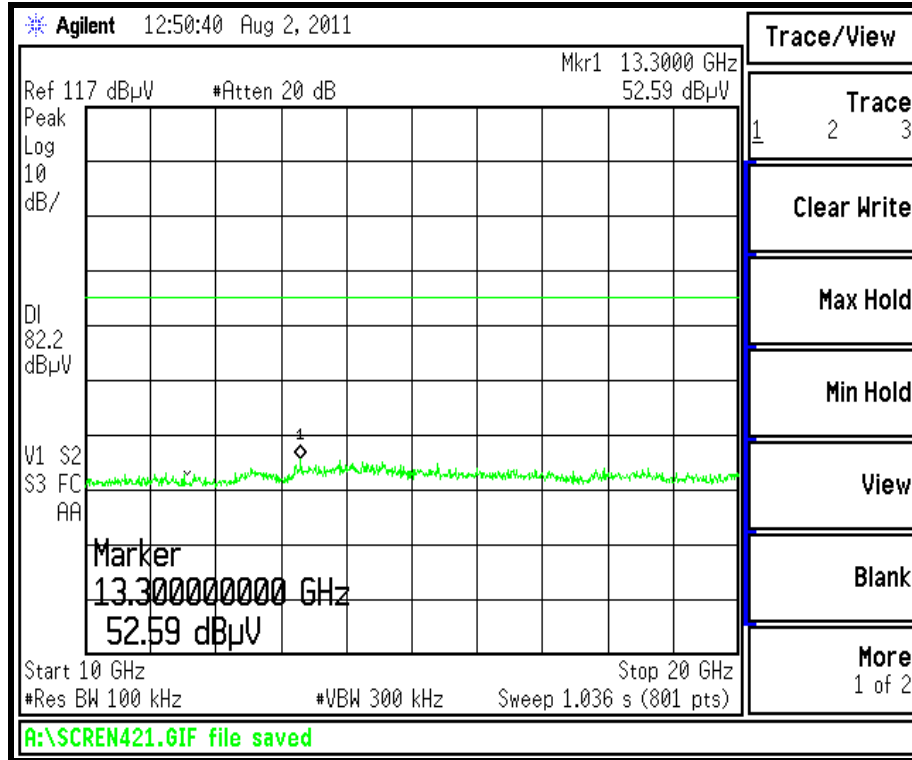
Conducted Emissions Channel 25 2475MHz



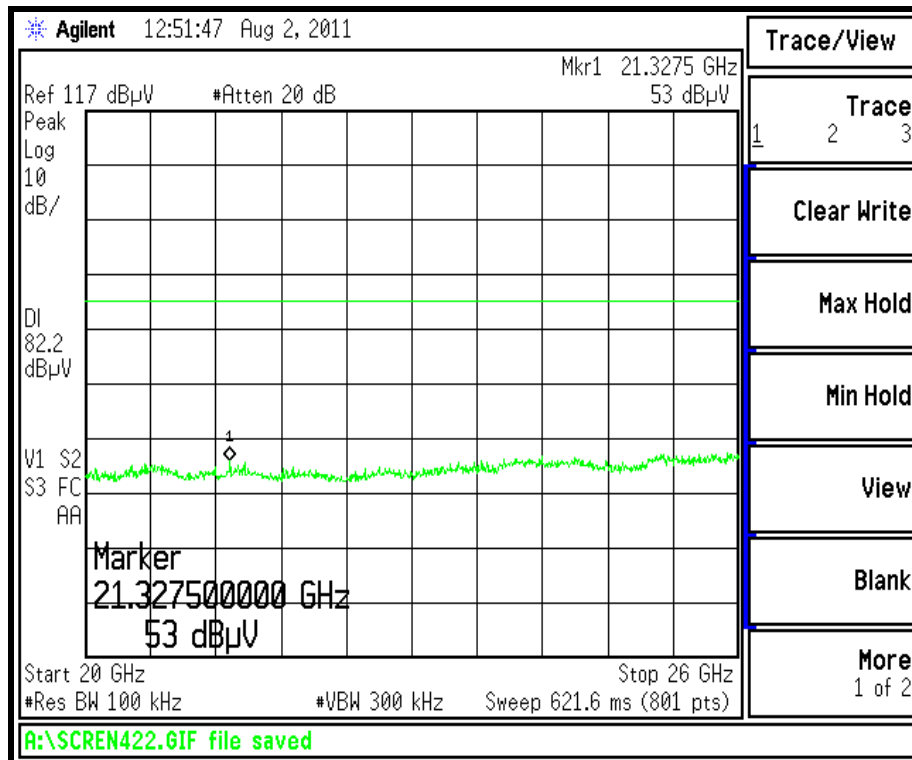
Conducted Emissions Channel 25 2475MHz



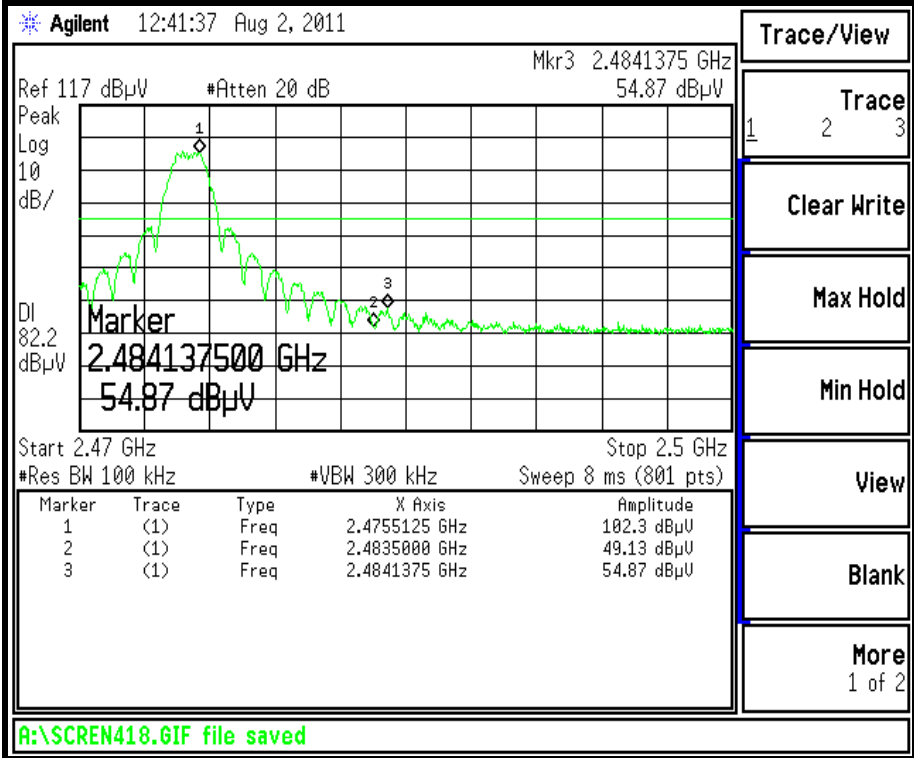
Conducted Emissions Channel 26 2480MHz



Conducted Emissions Channel 25 2475MHz

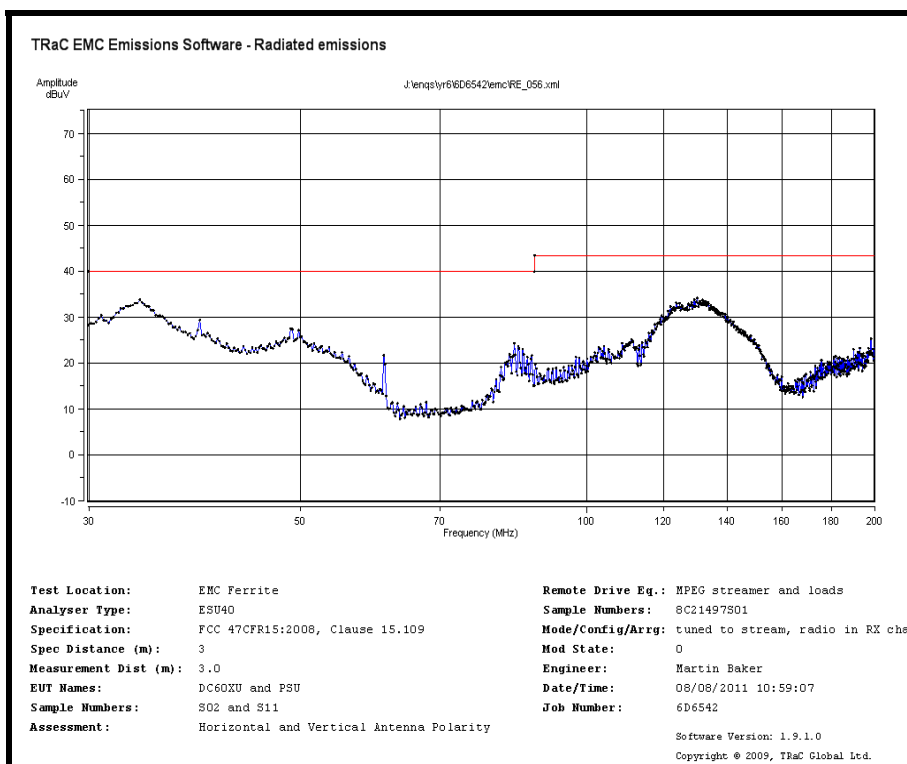


Conducted Emissions Channel 25 2475MHz

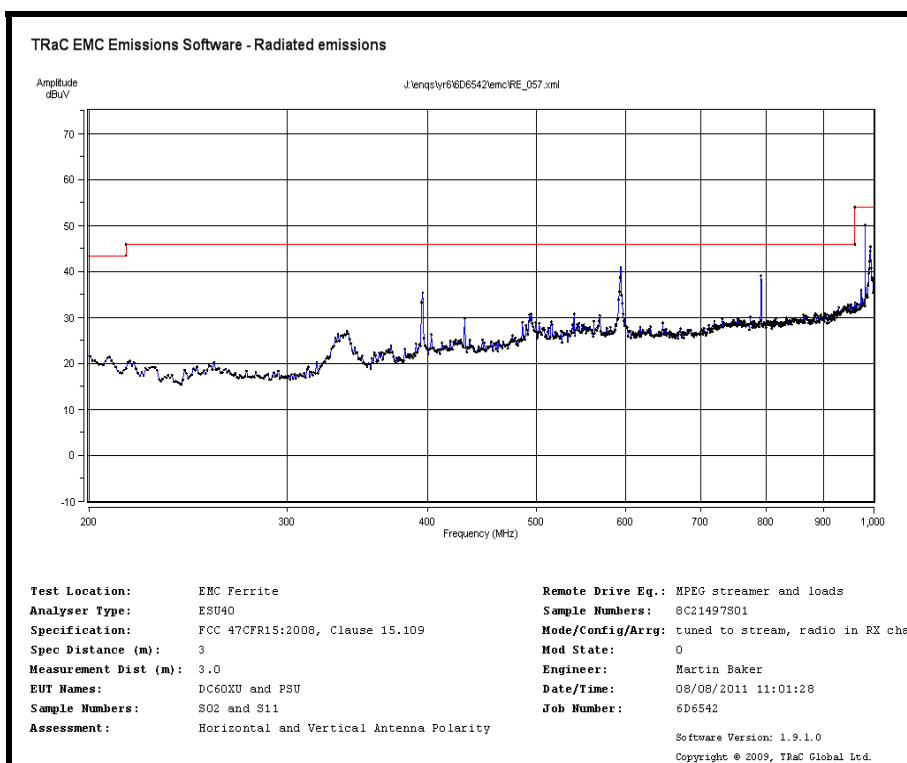


Conducted Emissions Channel 25 2475MHz: Upper-Band edge

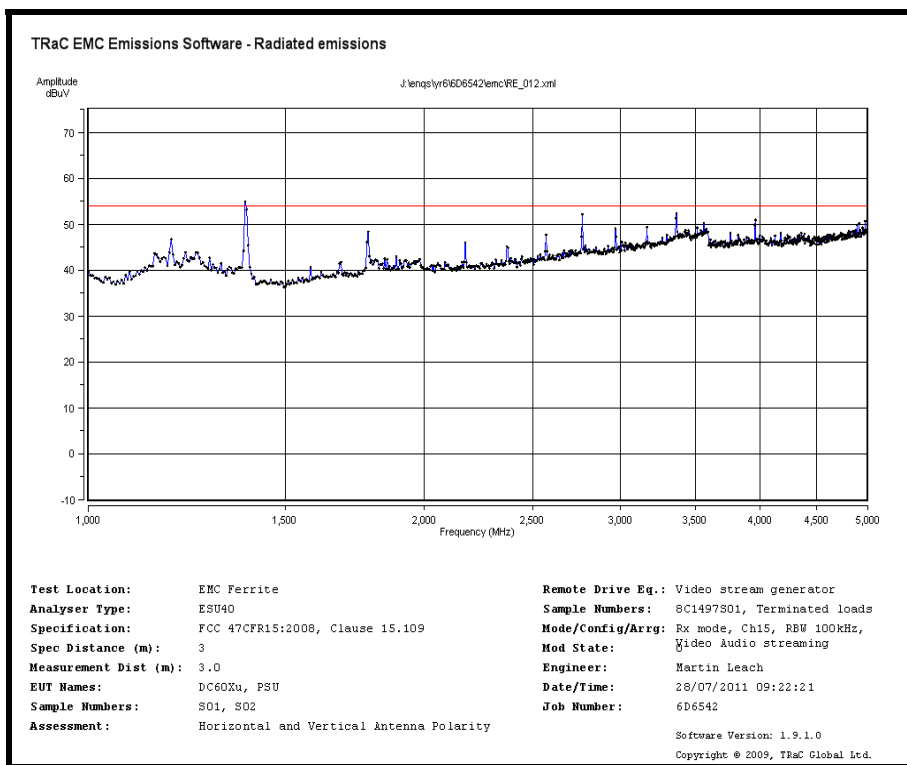
B2 Radiated Graphical Data



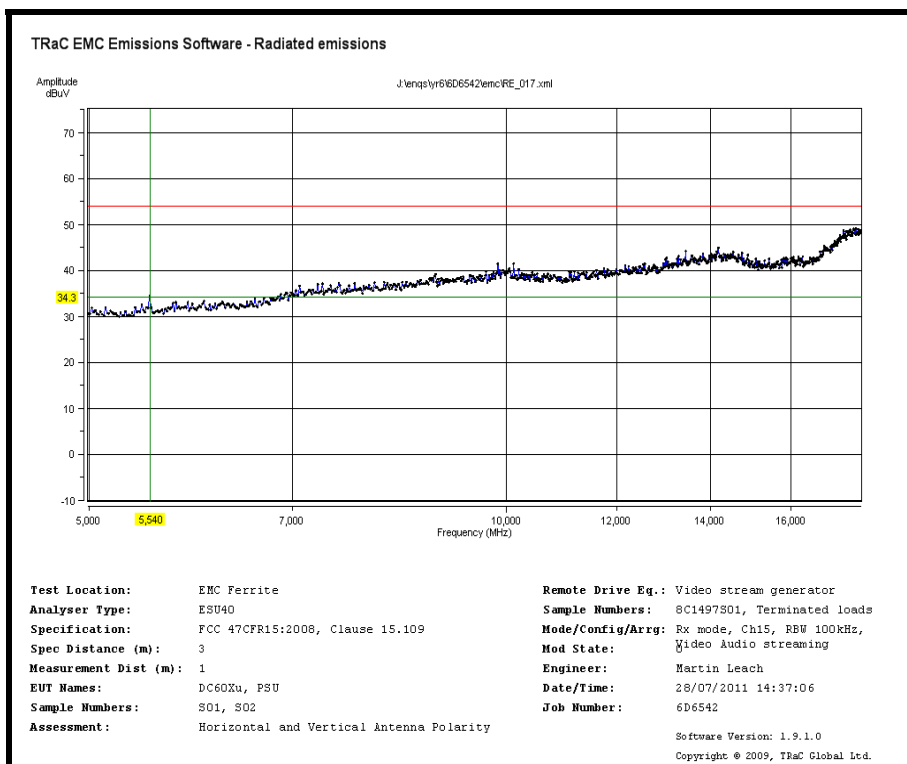
Radiated RX Mode Ch15 2425MHz Emissions (15.109)



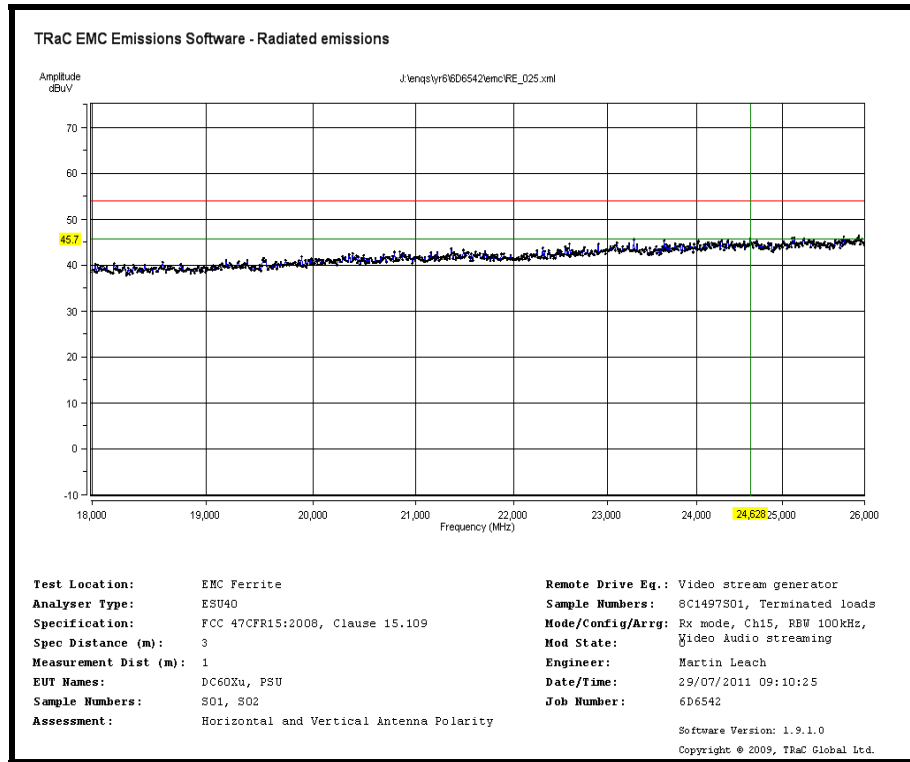
Radiated RX Mode Ch15 Emissions (15.109)



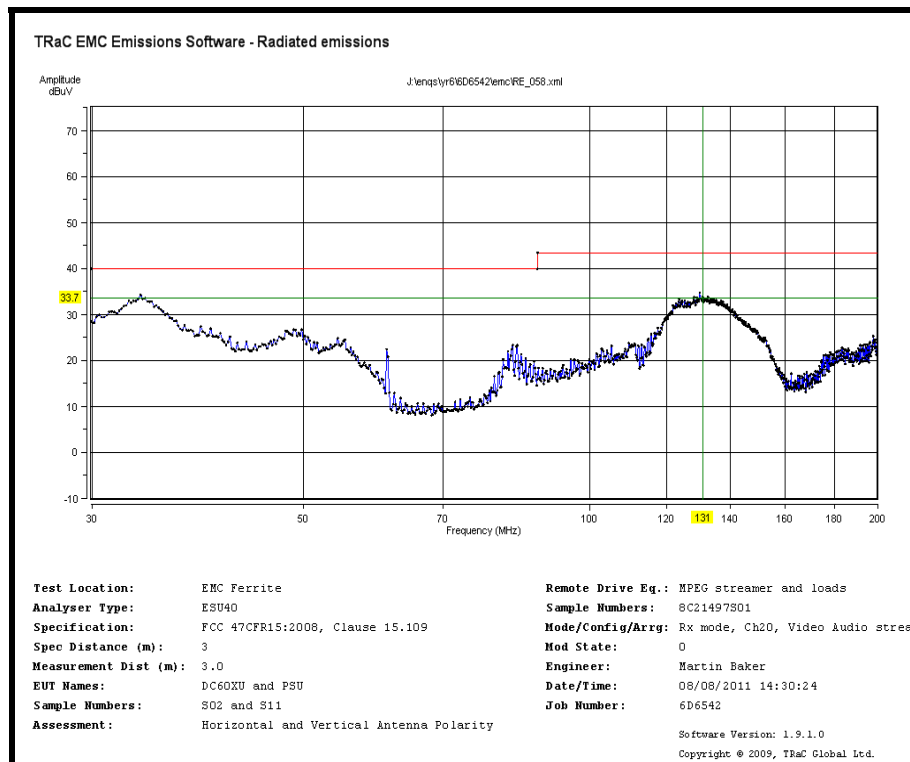
Radiated RX Mode Ch15 2425MHz Emissions (15.109)



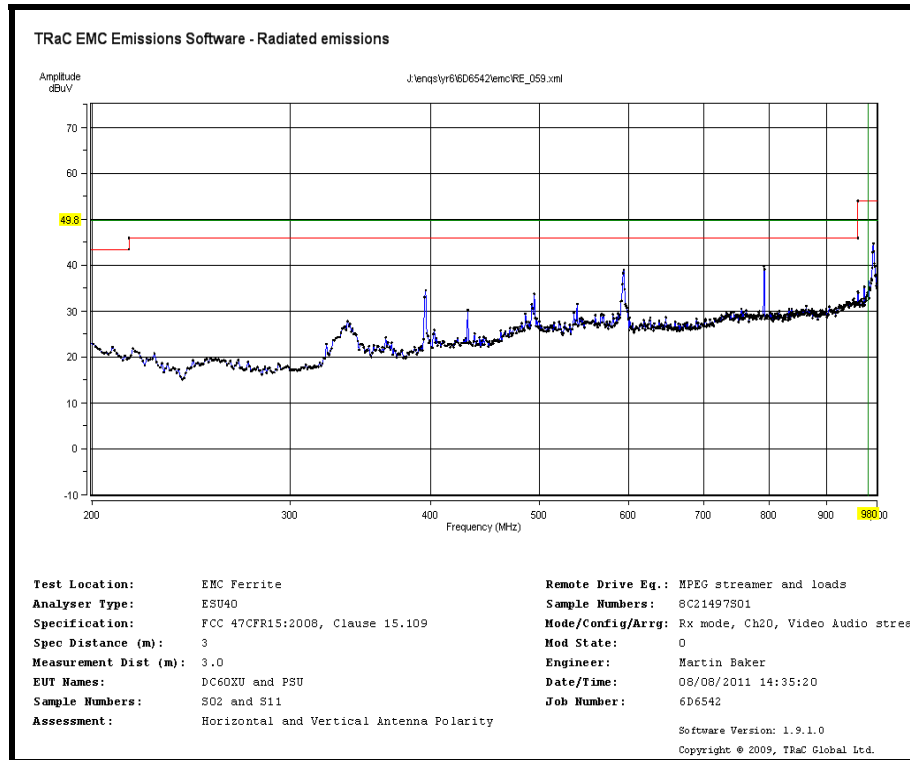
Radiated RX Mode Ch15 2425MHz Emissions (15.109)



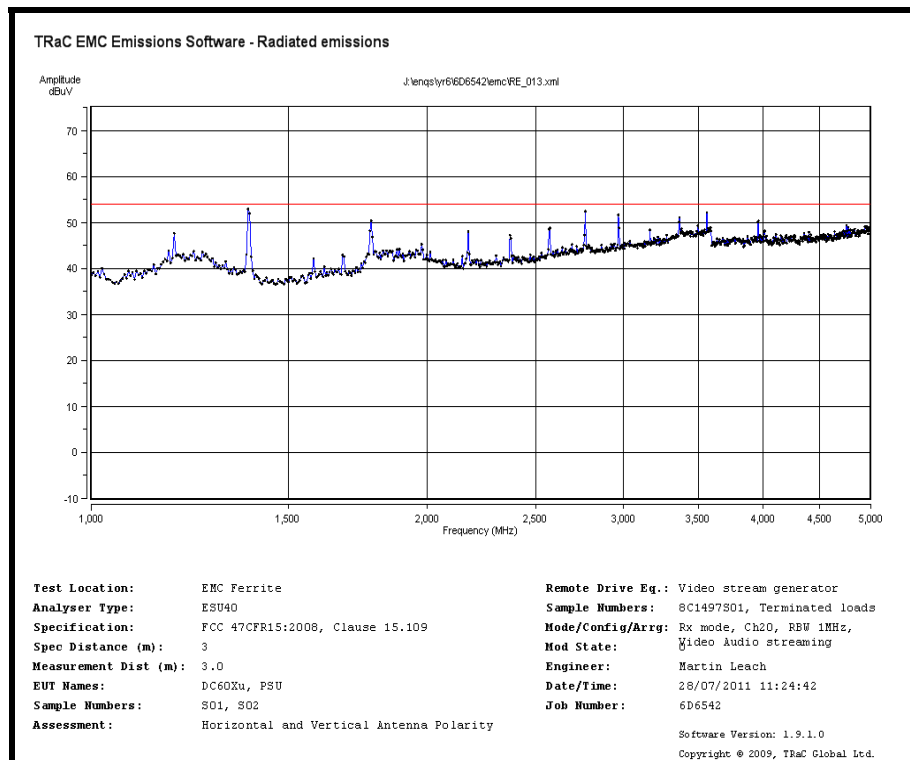
Radiated RX Mode Ch15 2425MHz Emissions (15.109)



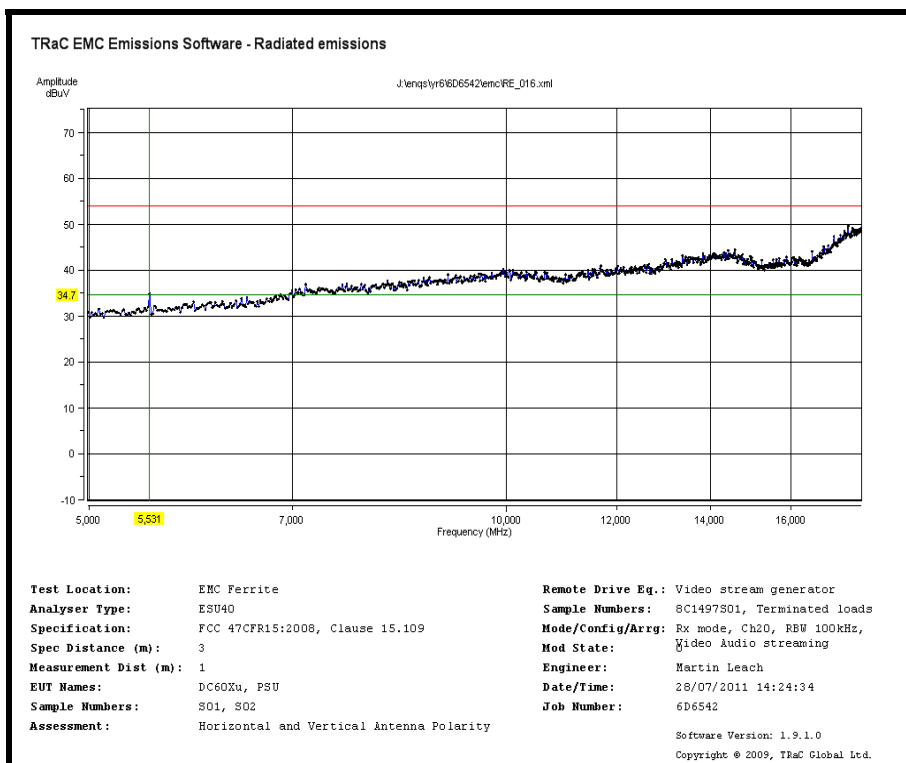
Radiated RX Mode Ch20 2450MHz Emissions (15.109)



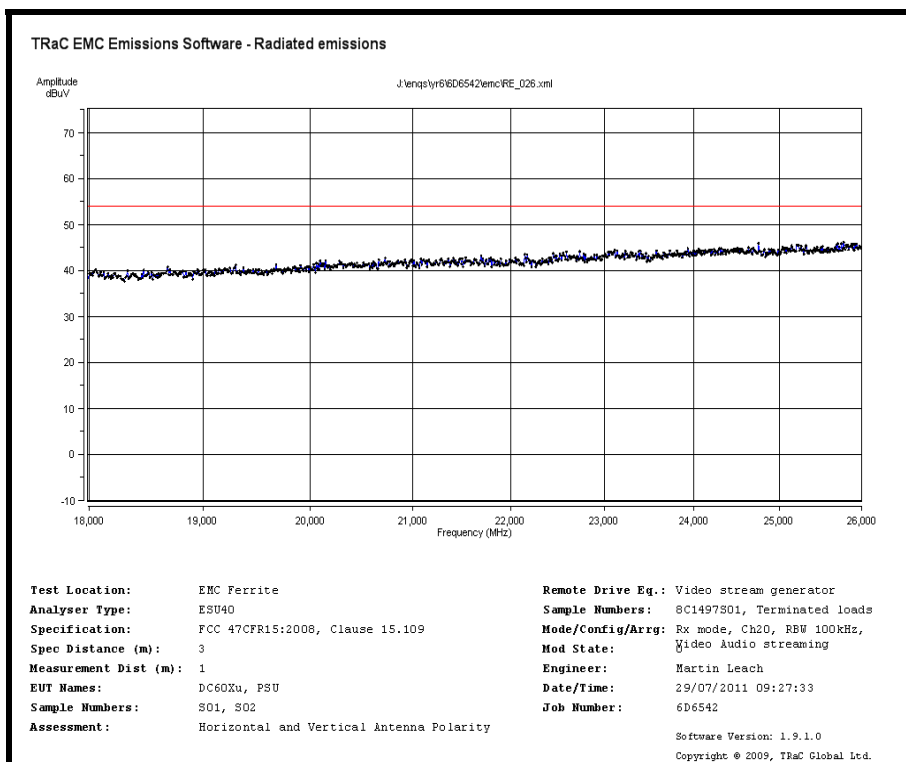
Radiated RX Mode Ch20 2450MHz Emissions (15.109)



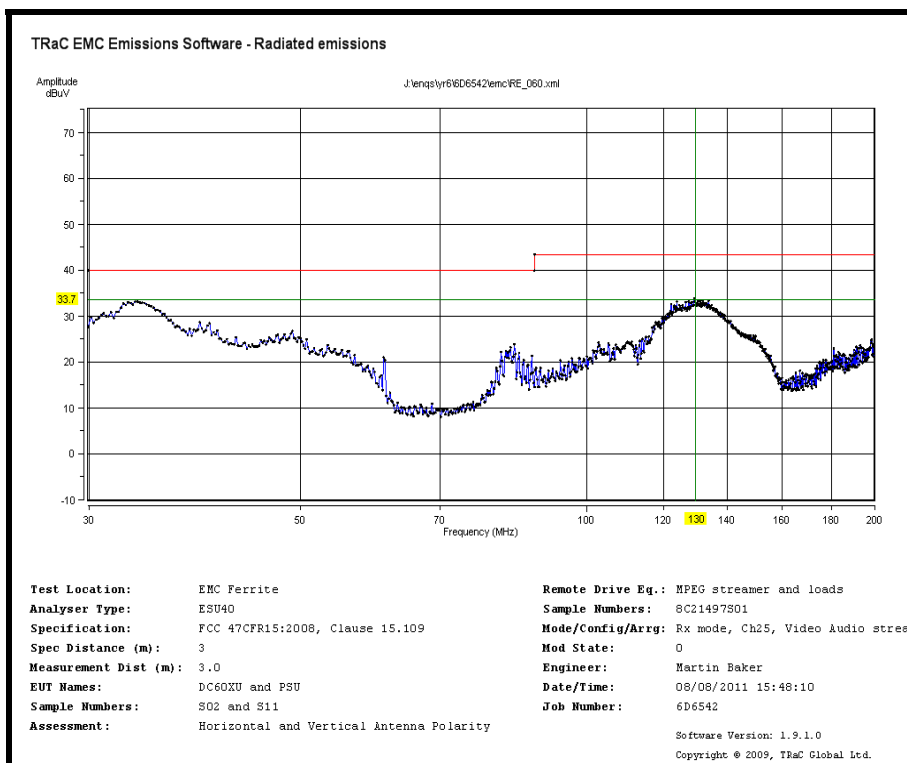
Radiated RX Mode Ch20 2450MHz Emissions (15.109)



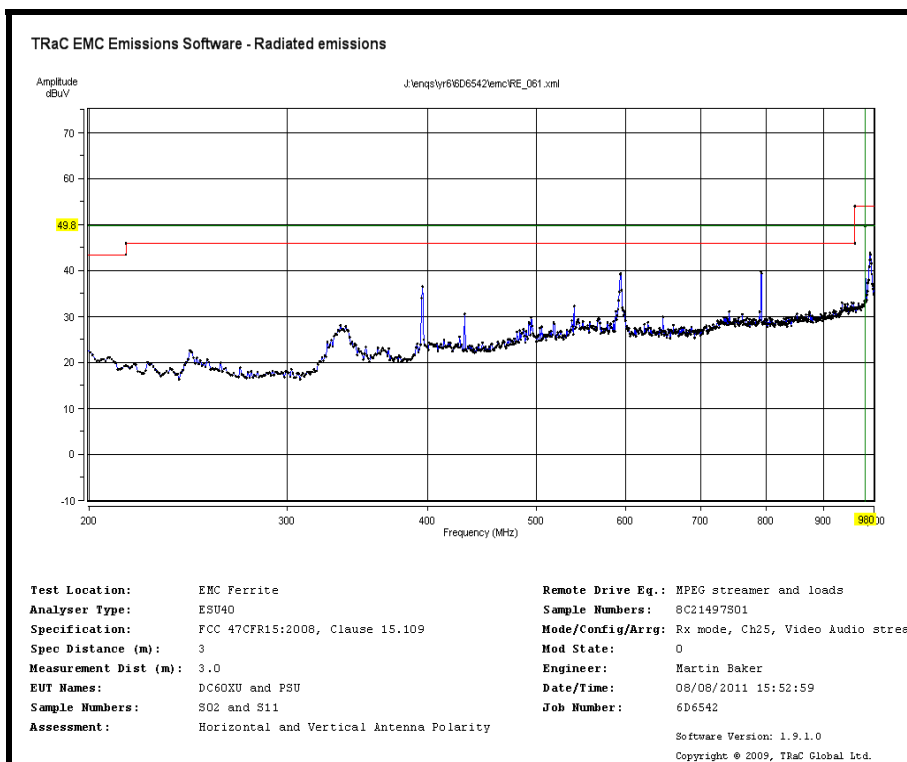
Radiated RX Mode Ch20 2450MHz Emissions (15.109)



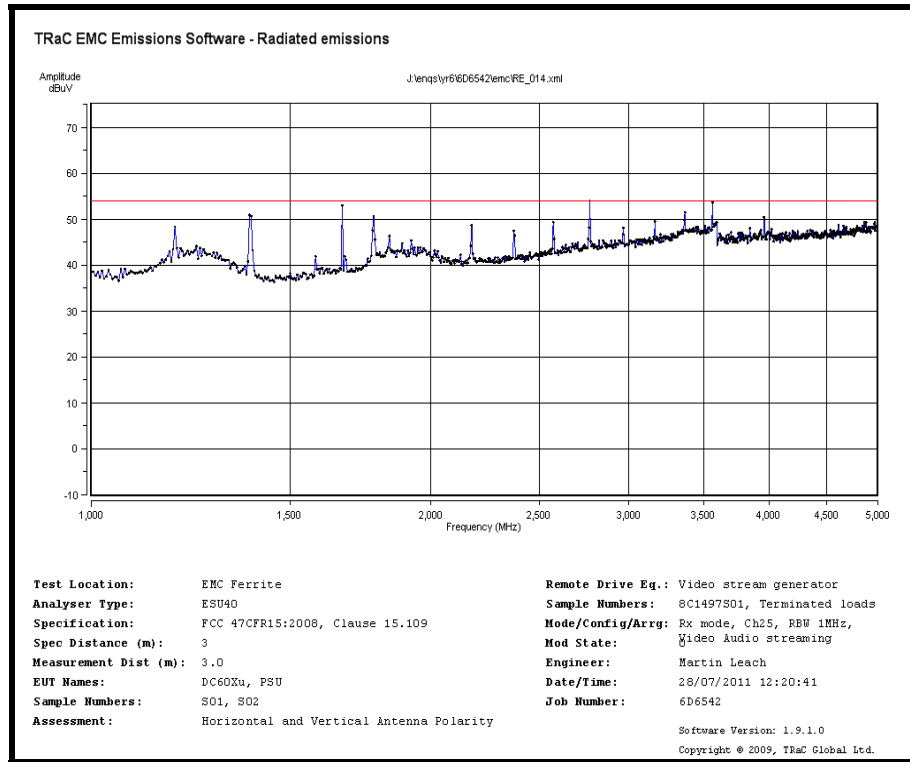
Radiated RX Mode Ch20 2450MHz Emissions (15.109)



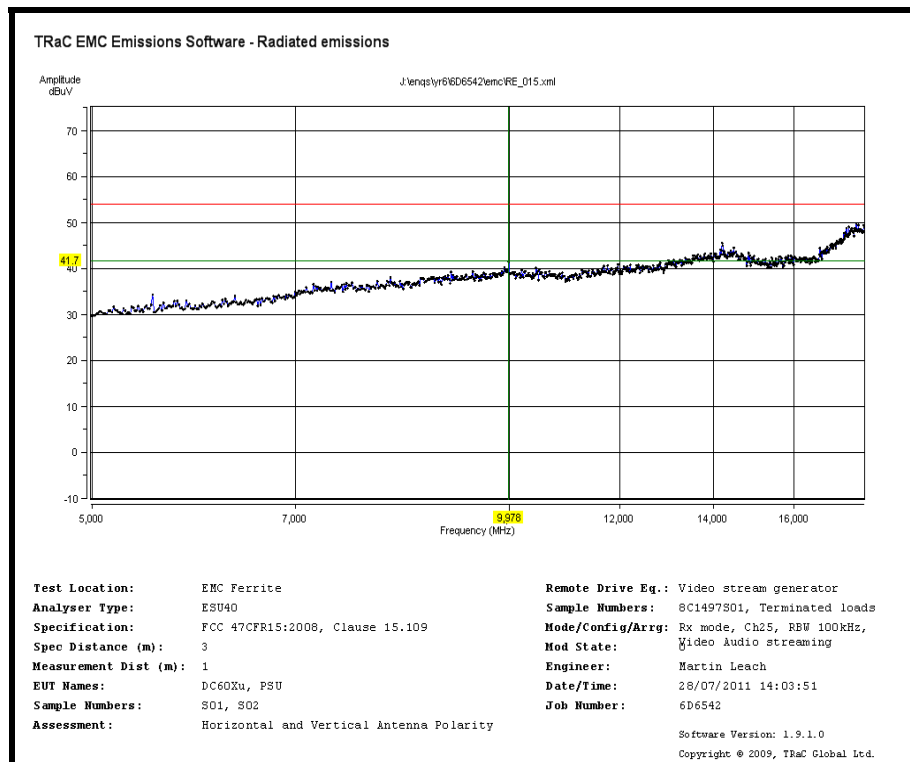
Radiated RX Mode Ch25 2475MHz Emissions (15.109)



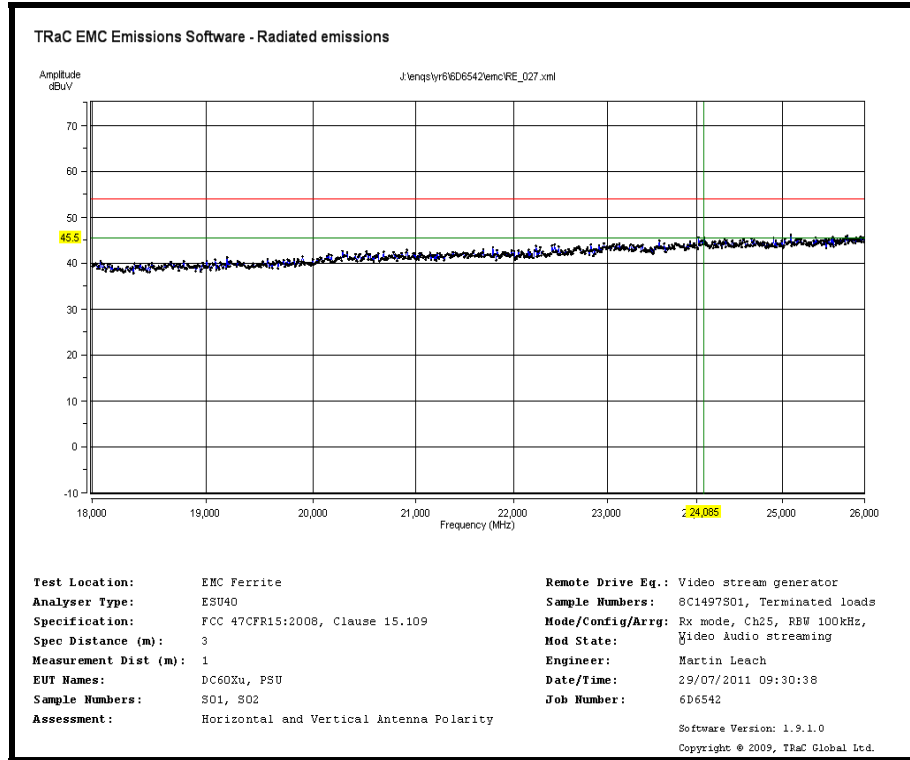
Radiated RX Mode Ch25 2475MHz Emissions (15.109)



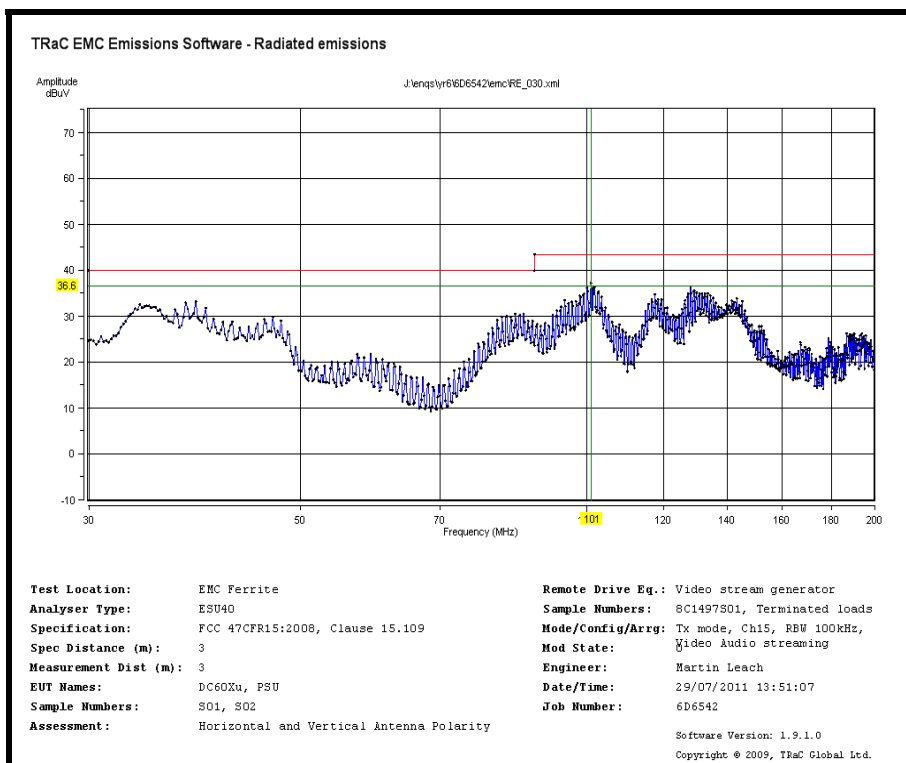
Radiated RX Mode Ch25 2475MHz Emissions (15.109)



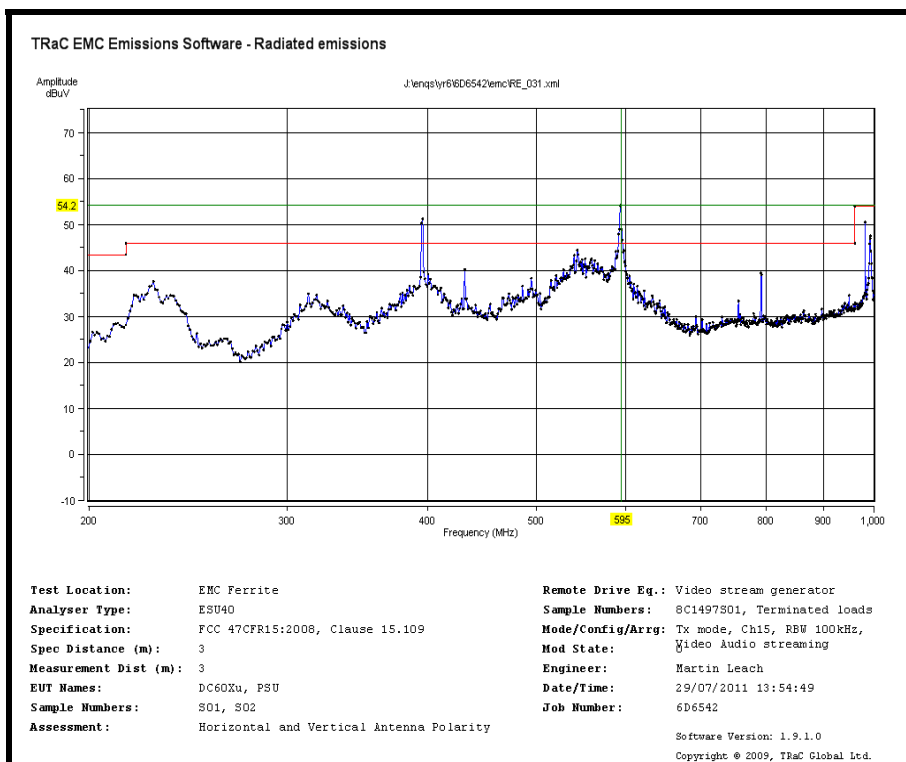
Radiated RX Mode Ch25 2475MHz Emissions (15.109)



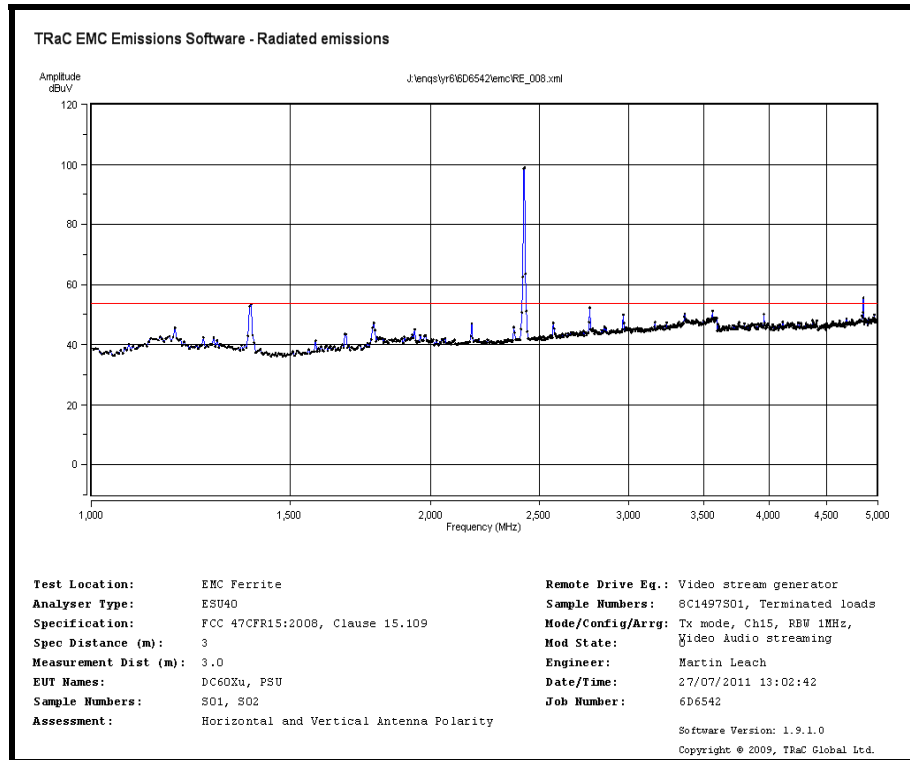
Radiated RX Mode Ch25 2475MHz Emissions (15.109)



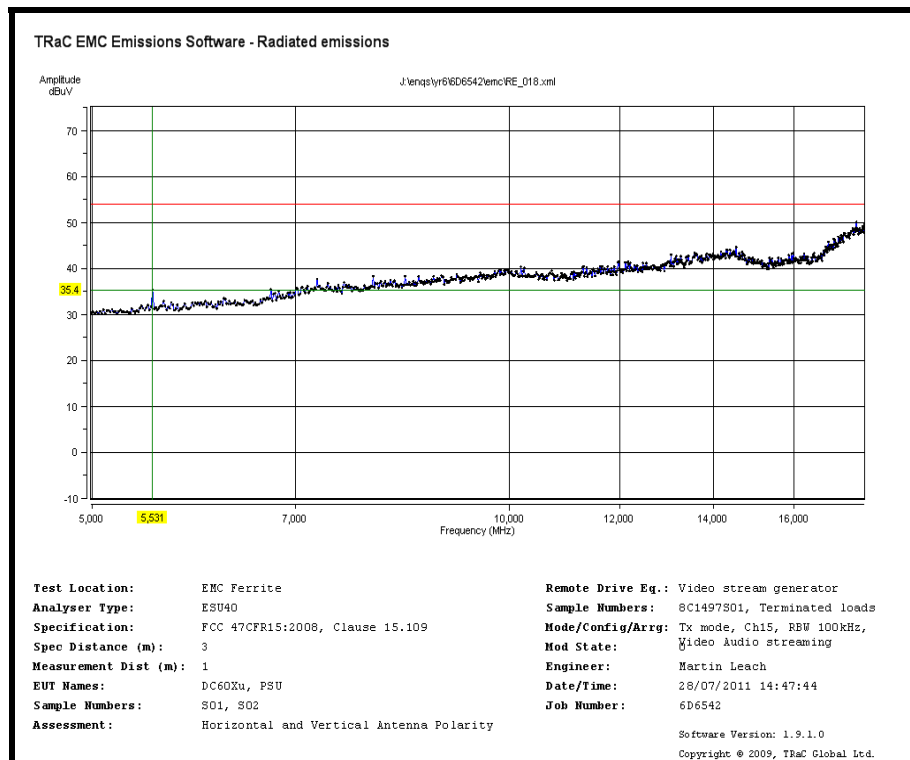
Radiated Transmitter Emissions Channel 15 2425MHz (15.209)



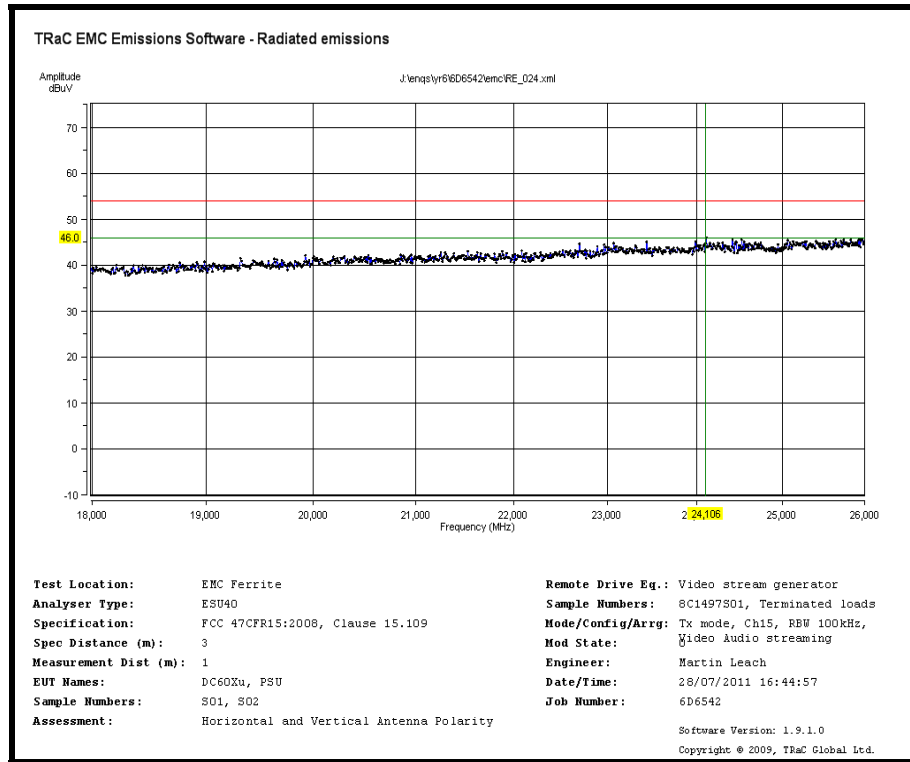
Radiated Transmitter Emissions Channel 15 2425MHz (15.209)



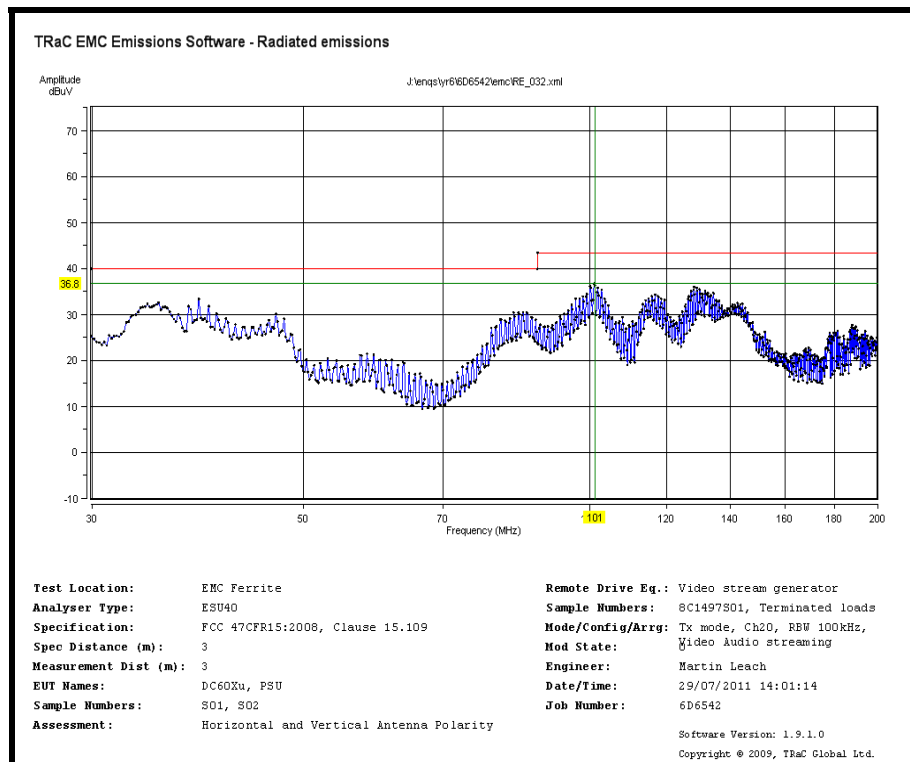
Radiated Transmitter Emissions Channel 15 2425MHz (15.209)



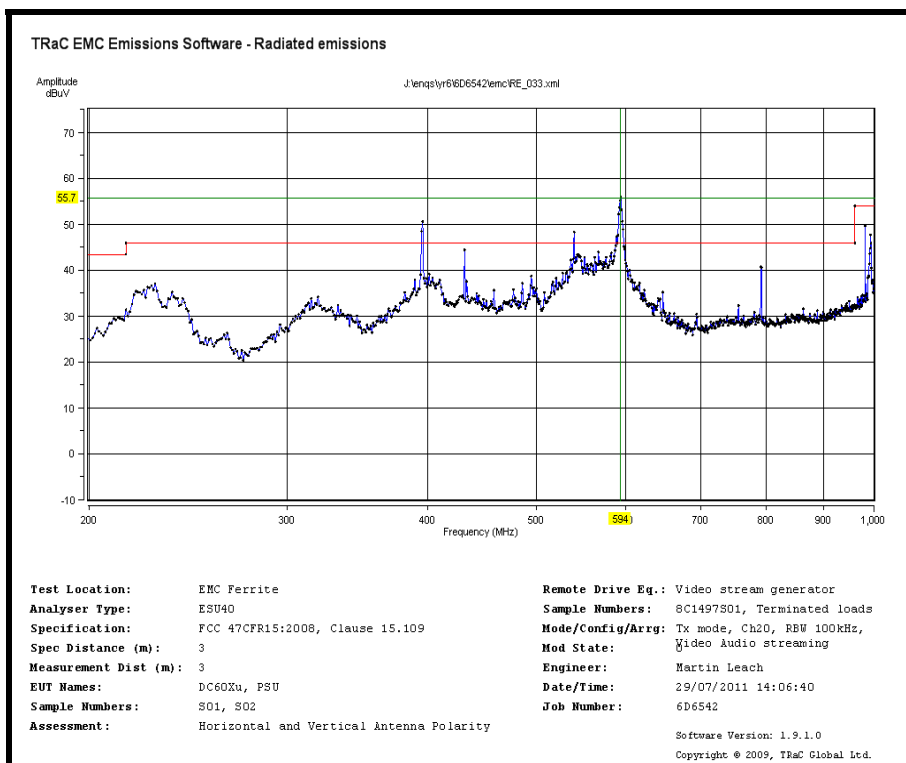
Radiated Transmitter Emissions Channel 15 2425MHz (15.209)



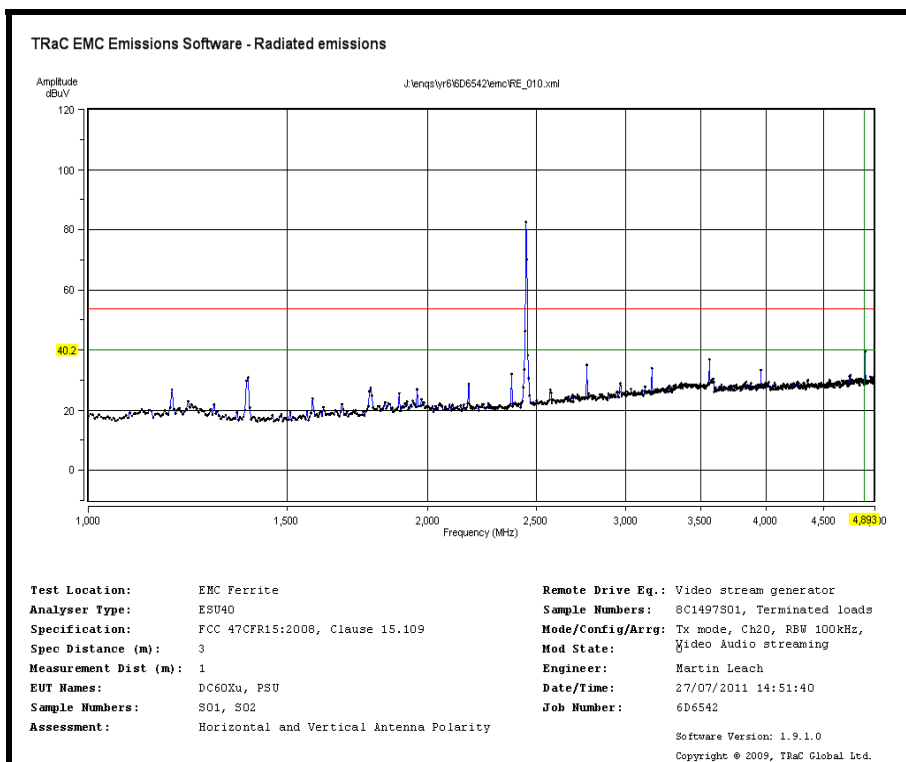
Radiated Transmitter Emissions Channel 15 2425MHz (15.209)



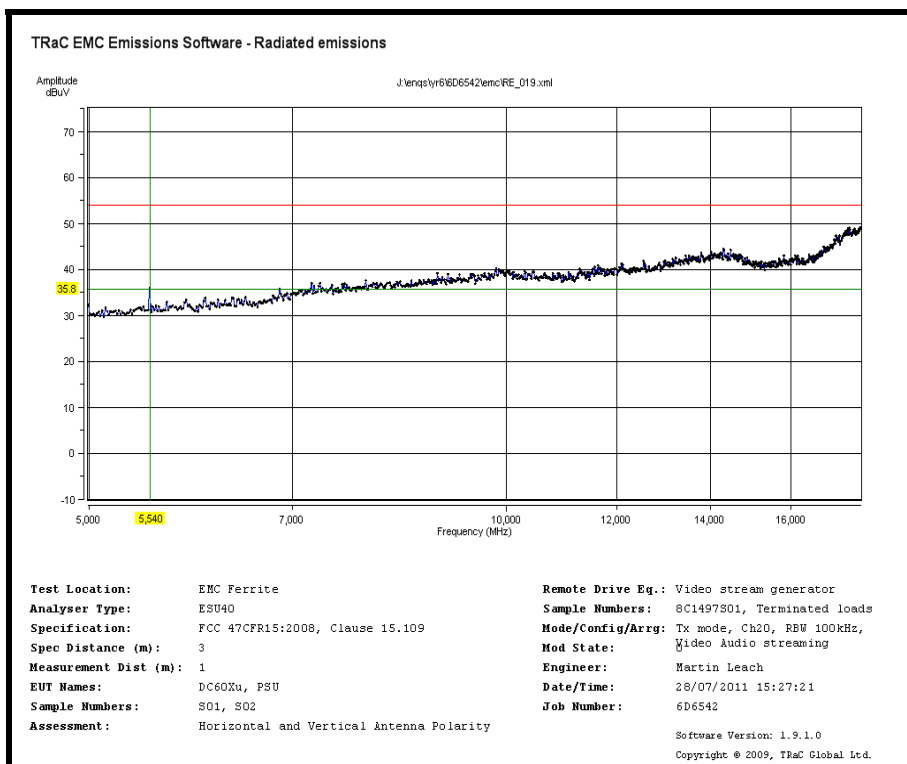
Radiated Transmitter Emissions Channel 20 2450MHz (15.209)



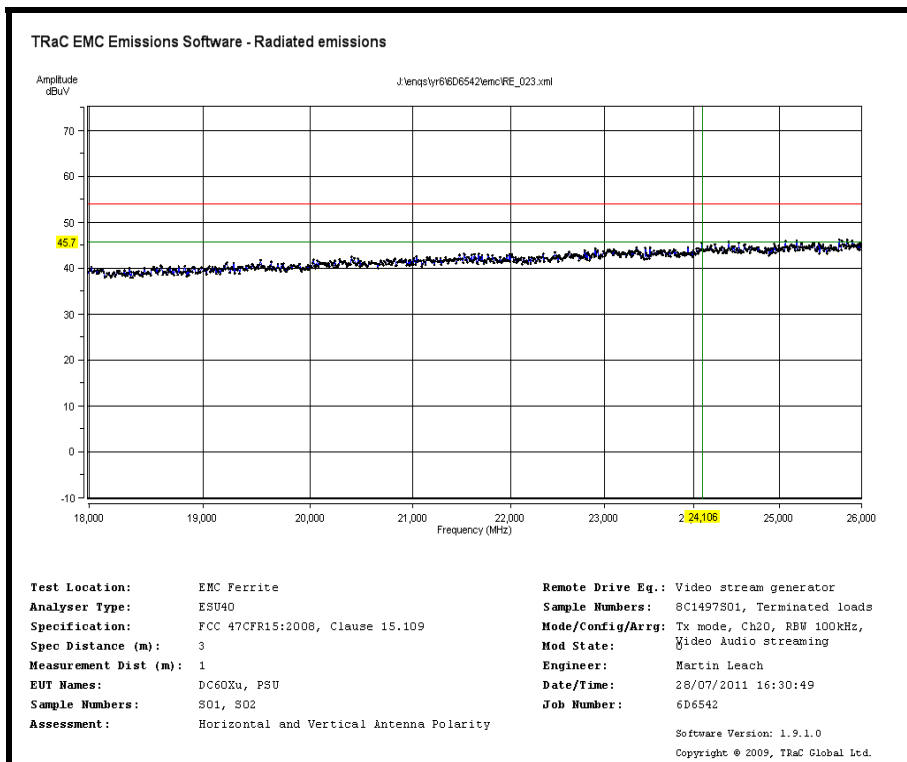
Radiated Transmitter Emissions Channel 20 2450MHz (15.209)



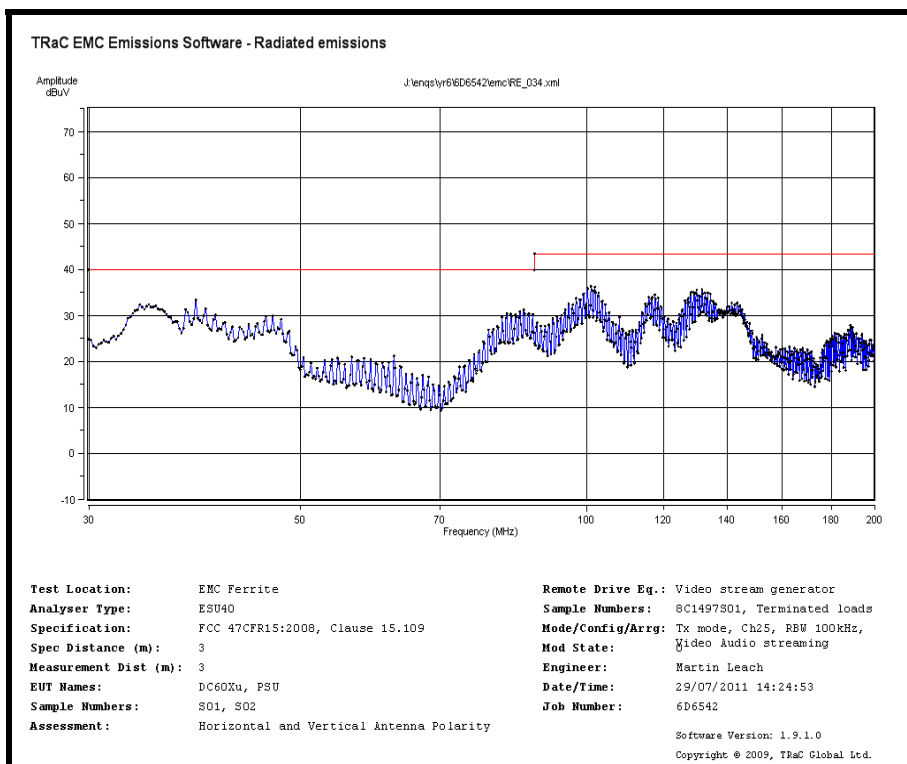
Radiated Transmitter Emissions Channel 20 2450MHz (15.209)



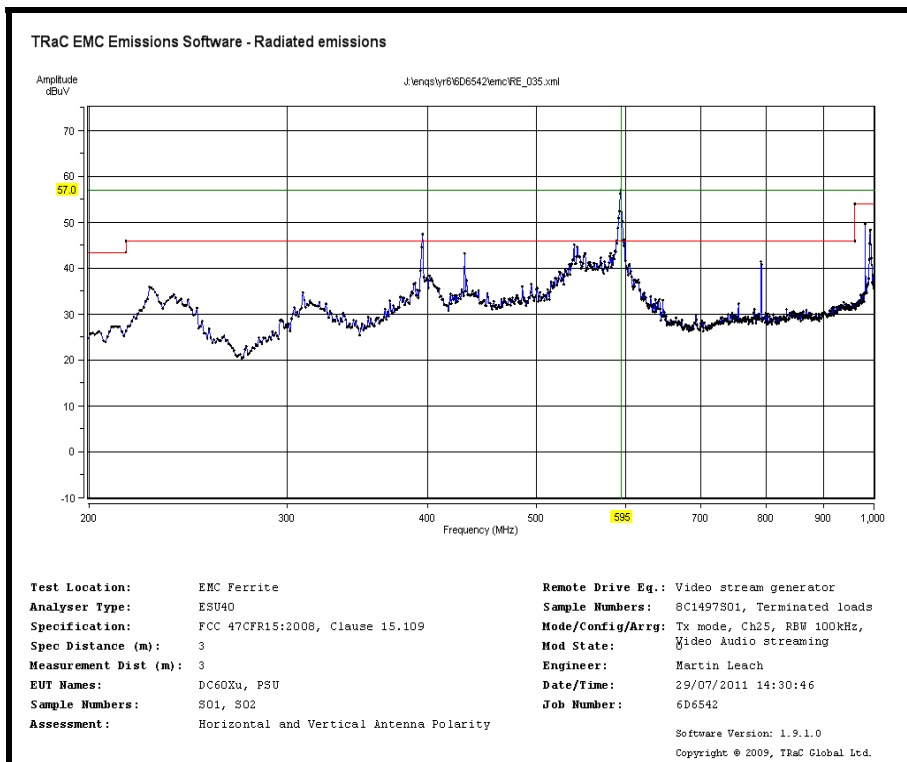
Radiated Transmitter Emissions Channel 20 2450MHz (15.209)



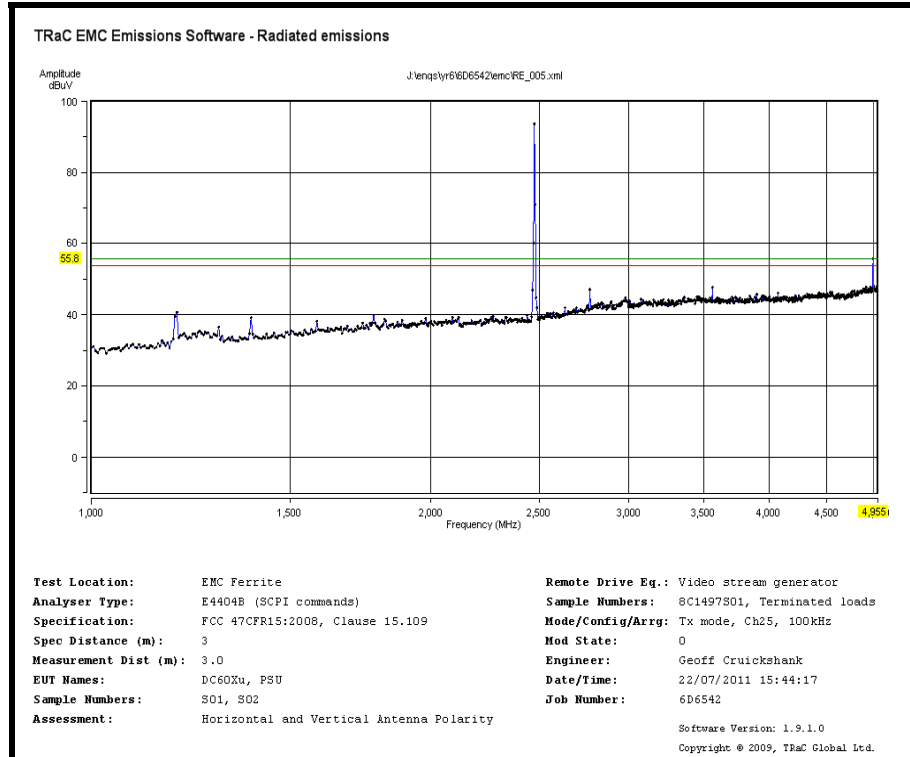
Radiated Transmitter Emissions Channel 20 2450MHz (15.209)



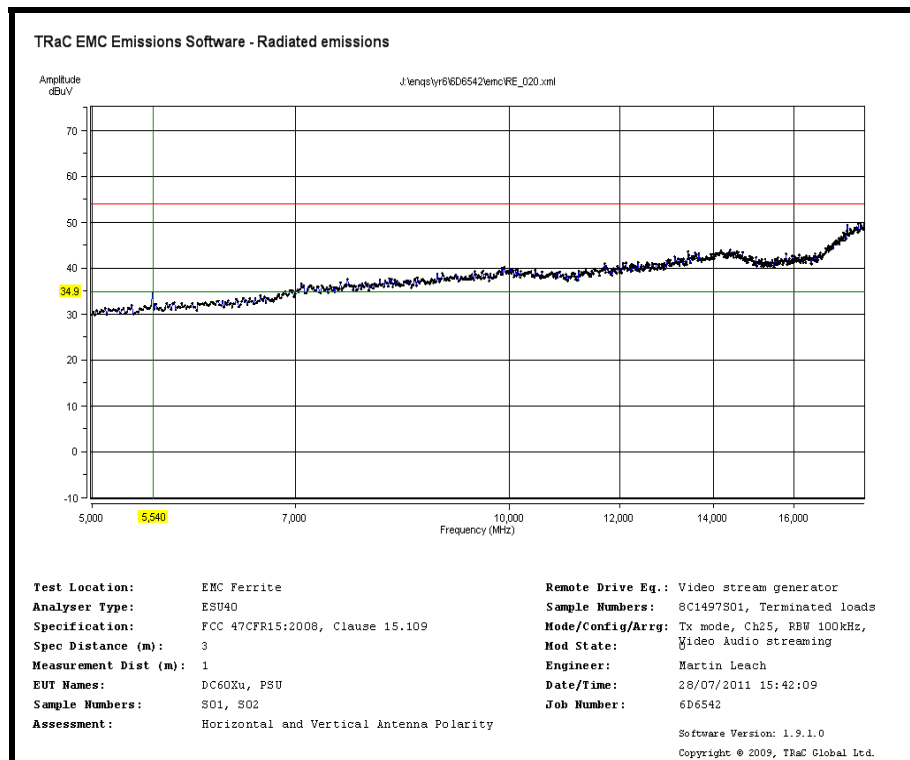
Radiated Transmitter Emissions Channel 25 2475MHz (15.209)



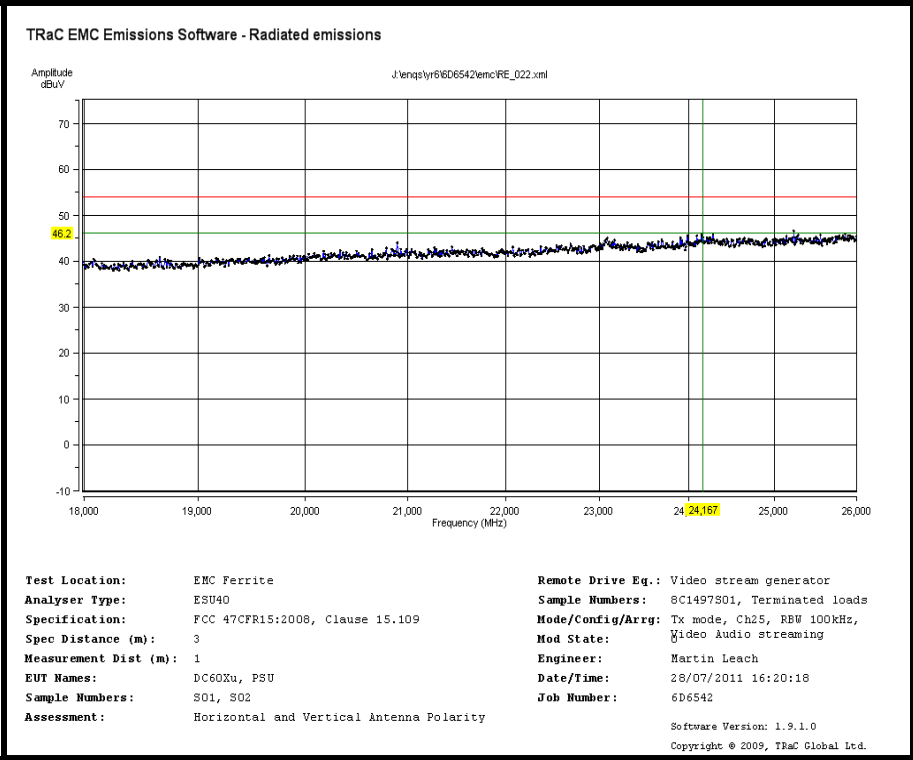
Radiated Transmitter Emissions Channel 25 2475MHz (15.209)



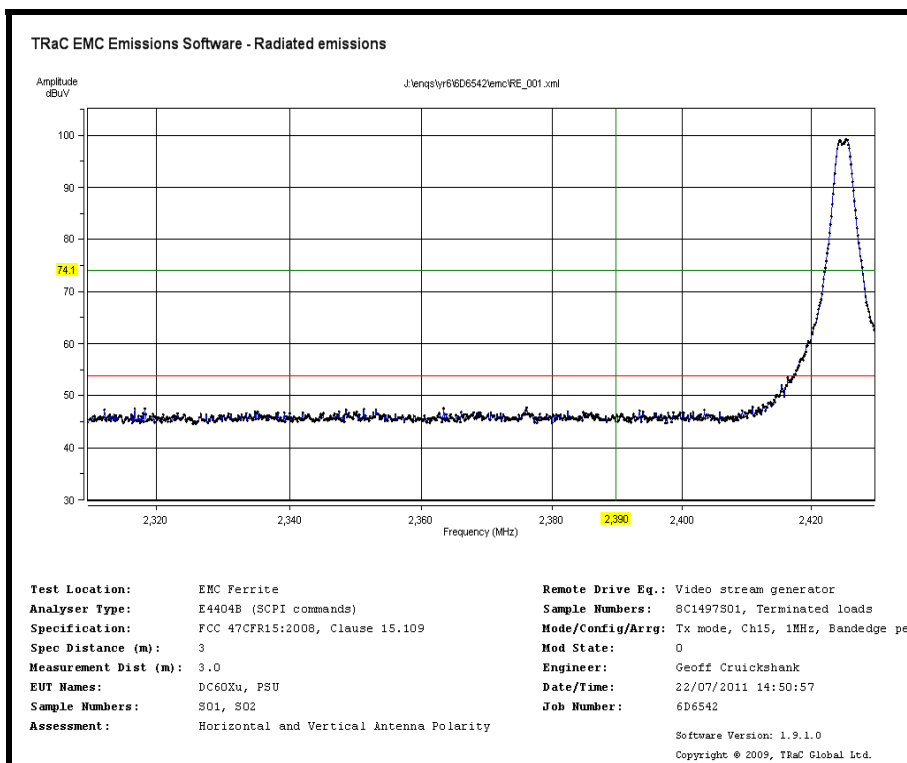
Radiated Transmitter Emissions Channel 25 2475MHz (15.209)



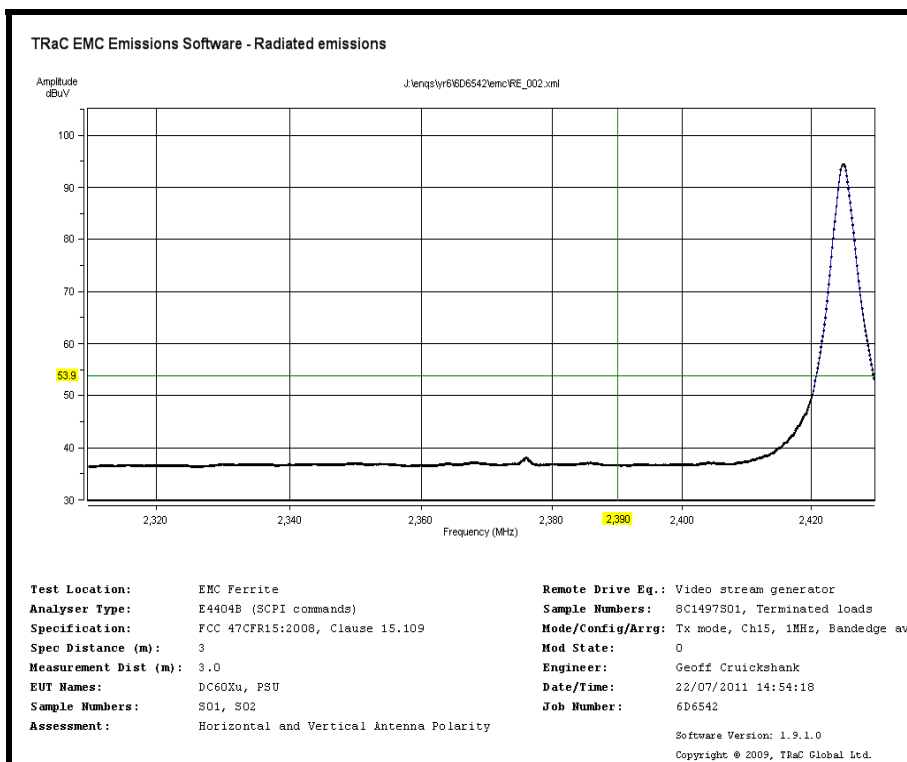
Radiated Transmitter Emissions Channel 25 2475MHz (15.209)



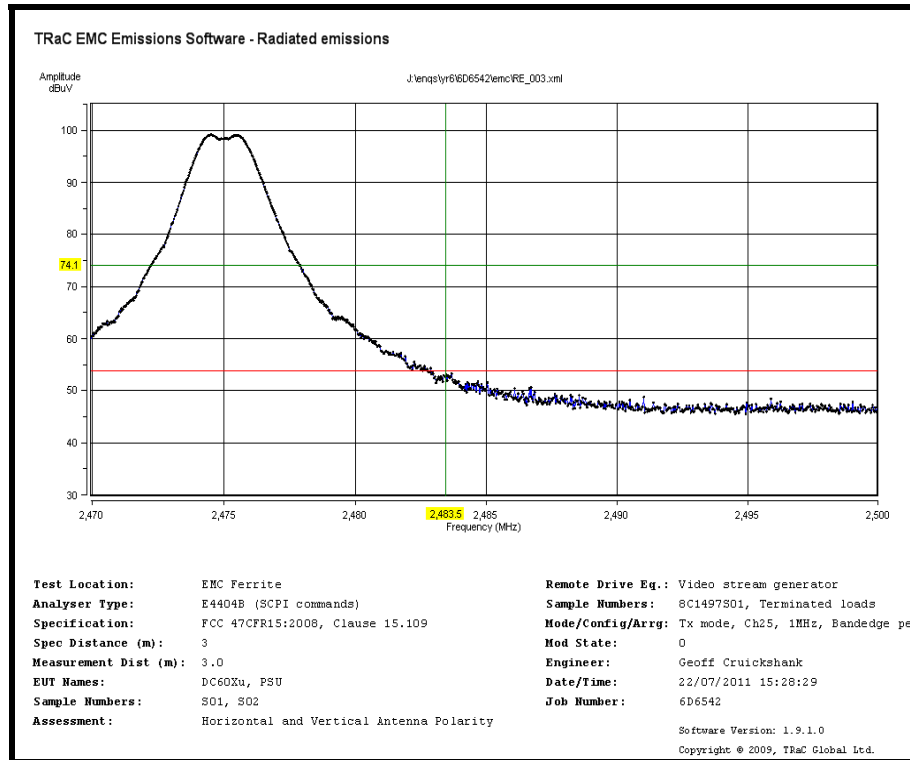
Radiated Transmitter Emissions Channel 25 2475MHz (15.209)



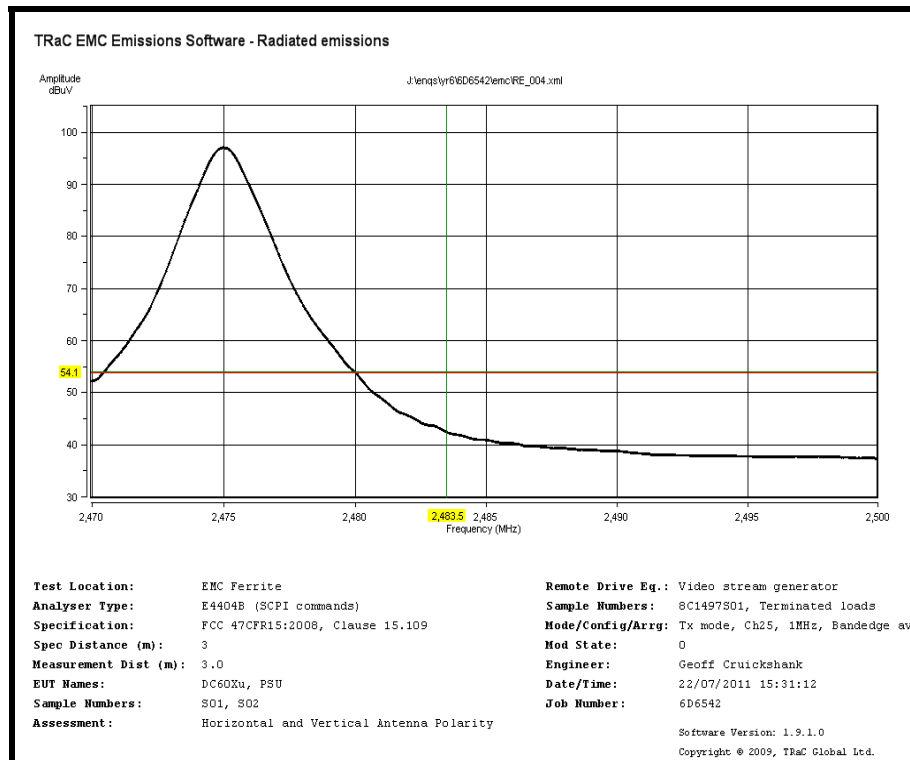
Radiated Transmitter Emissions Channel 15 2425MHz (15.209) Band Edge Compliance
Peak Detector Preview: RBW 1MHz



Radiated Transmitter Emissions Channel 15 2425MHz (15.209) Band Edge Compliance
Average Detector Preview: RBW 1MHz

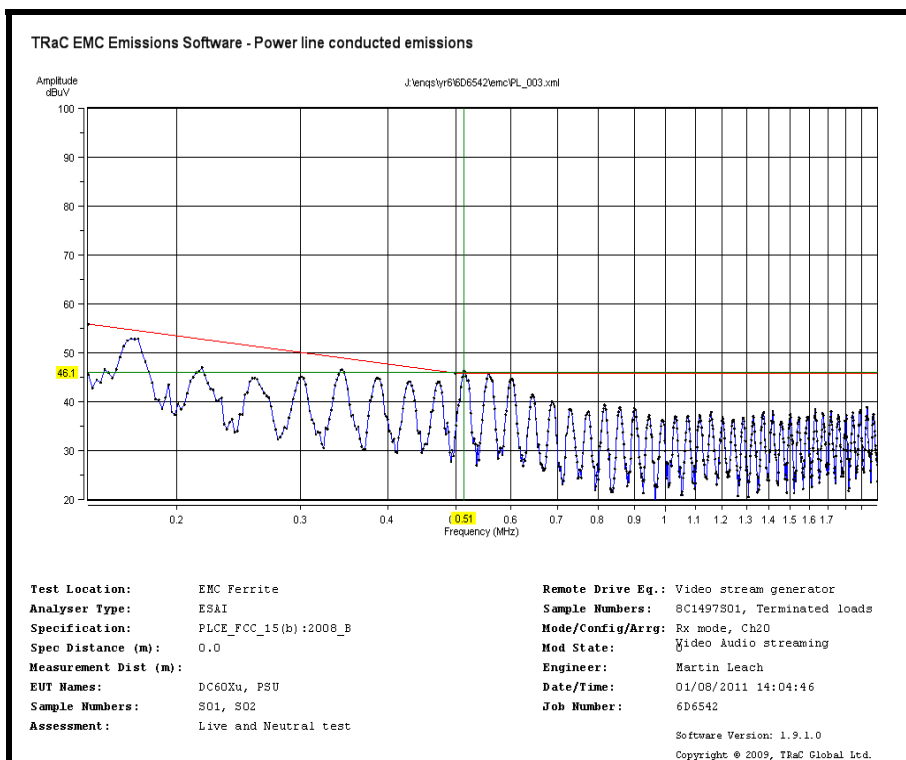


Radiated Transmitter Emissions Channel 25 2475MHz (15.209) Band Edge Compliance Peak Detector Preview: RBW 1MHz

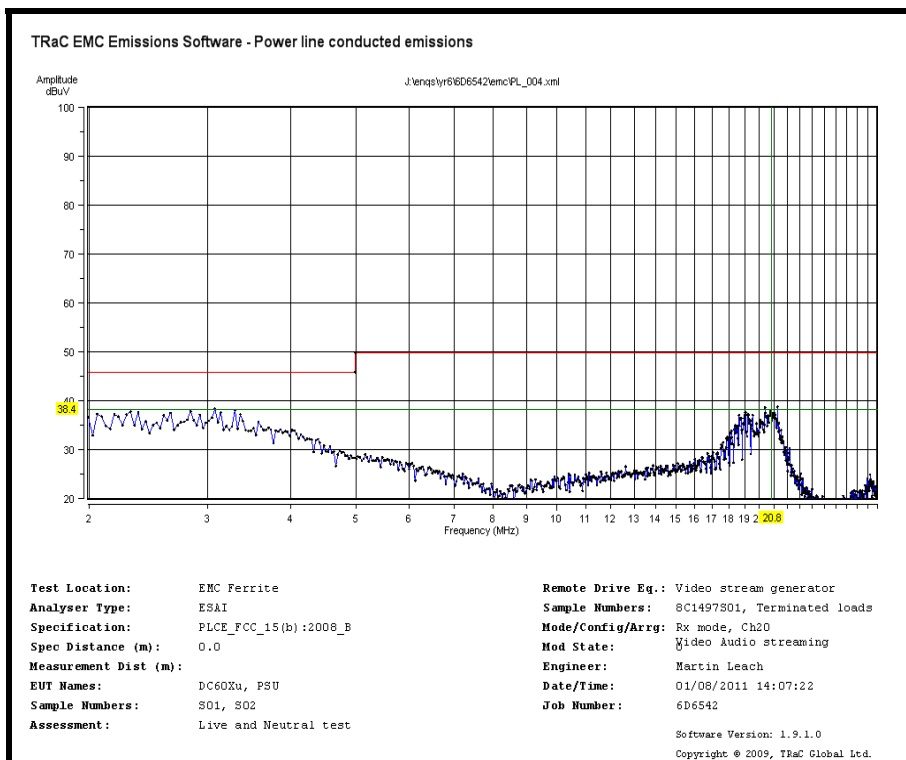


Radiated Transmitter Emissions Channel 25 2475MHz (15.209) Band Edge Compliance Average Detector Preview: RBW 1MHz

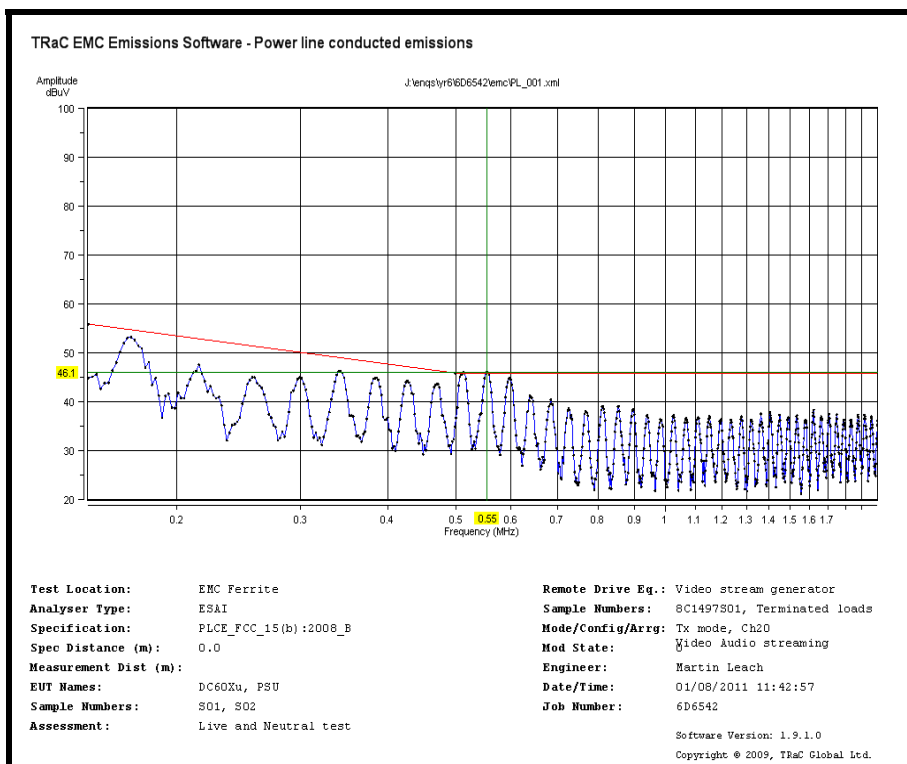
B3 Power Line Conducted Emissions Graphical Data



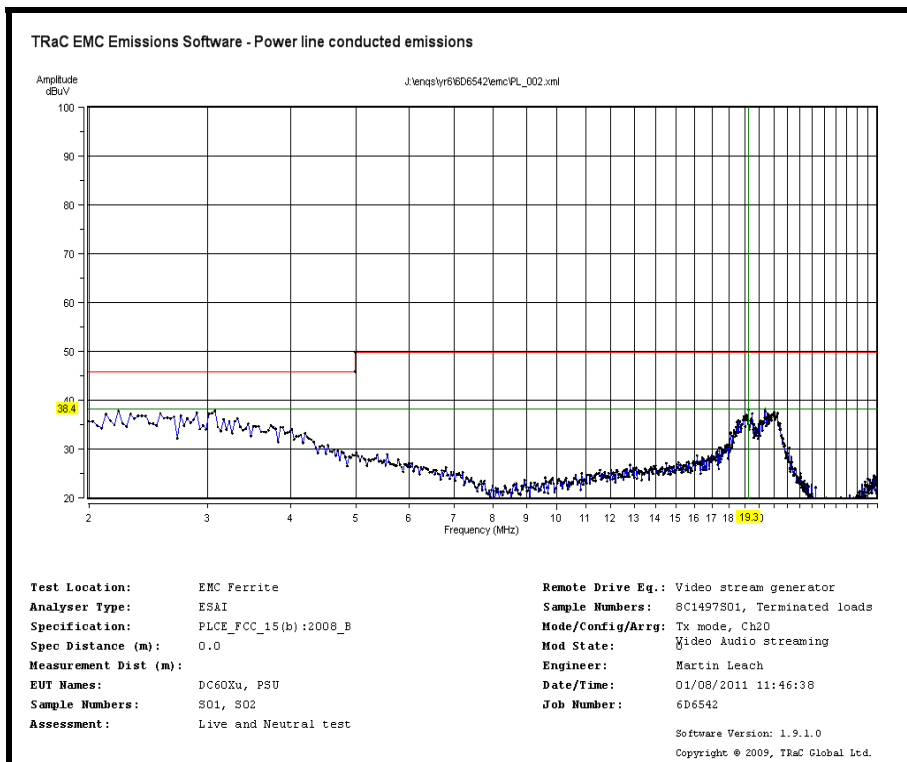
FCC Part 15C section 15.107 Power-Line Conducted Emissions



FCC Part 15C section 15.107 Power-Line Conducted Emissions



FCC Part 15C section 15.207 Power-Line Conducted Emissions



FCC Part 15C section 15.207 Power-Line Conducted Emissions

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 its modification state:

Sample No: Sxx Mod w

where:

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

The following terminology is used throughout the test report:

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

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

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

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

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

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

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

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

C1) Test samples

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

Sample No.	Description	Identification
S01	DC60Xu (Radiated Sample)	PAPW00000173
S02	ACBEL Switch mode power supply	C1122146899B
S03	DC60Xu (Conducted Sample)	PAPW00000135
S11	DC60Xu (Radiated Sample)	PAPW00000020

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

Sample No.	Description	Identification
8C1497S01	MPEG Playout station	S/N: PACE0000015767

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

TRaC Identification	Description
REF915	110Vac 60Hz power supply
RFG675	NTSC colour television
RFG636	110Vac 60Hz power supply

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode: TX
<p>All tests detailed in this report excluding: PLCE and REFE (15.107 and 15.109)</p>	<p>The EUT was powered via REF915 110Vac power supply. The EUT was transmitting on maximum power, 100% duty cycle using O-QPSK with half-sine pulse-shaping - 8-symbol listen-before send for CSMA-CA - Bit rate 250kb/s, symbol rate 62.5ksymbol/s with 4-bit 16-ary orthogonal symbols, chip rate 2000kchip/s) modulation at centre frequencies $F_c = 2405 + (5 \times (k - 11))$ in MHz, where $k = 15, 20$ and 25</p> <p>EUT was tuned to and recording an externally streamed MPEG video from the playout station. The streamed MPEG had the following characteristics:</p> <ul style="list-style-type: none"> • Frequency: 567.000MHz • Bit Rate: 38,428,638bps • Modulation: QAM-B (256 QAM) • Symbol rate: 5,360,537 bd <p>All unused port were terminated with representative loads</p>

Test	Description of Operating Mode RX
<p>Radiated Electric Field Emissions 15.109 digital circuitry and PLCE (15.107)</p>	<p>The EUT was powered via REF915 110Vac power supply. The EUT was in continuous Receive mode</p> <p>EUT was tuned to and recording an externally streamed MPEG video from the playout station. The streamed MPEG had the following characteristics:</p> <ul style="list-style-type: none"> • Frequency: 567.000MHz • Bit Rate: 38,428,638bps • Modulation: QAM-B (256 QAM) • Symbol rate: 5,360,537 bd <p>All unused port were terminated with representative loads</p>

C3) EUT Configuration Information.

Sample	Internal Configuration Details
S01	Single possible internal configuration
S02	Single possible internal configuration
S03	Single possible internal configuration
S11	Single possible internal configuration

C4) List of EUT Ports

The table below describes the termination of EUT ports:

Sample : S01

Tests : Radiated Electric Field Emissions Restricted band 15.205, General Radiated Emission limits 15.209 (30MHz to 25GHz), 15.109 digital circuitry (1000MHz to 25GHz), Power Line Conducted Emissions 15.207 and Power Line Conducted Emissions 15.107

Port	Description of Cable Attached	Cable length	Equipment Connected
dc power port	2 core unscreened	1.8m	S02
Cable in	75 Ohm coaxial cable	>1	8C1497S01
To TV	75 Ohm coaxial cable	1m	Re-modulated load box
HDMI	HDMI cable	1m	HDMI load box

Sample : S02

Tests : Radiated Electric Field Emissions Restricted band 15.205, General Radiated Emission limits 15.209, 15.109 digital circuitry, RF Antenna Port Conducted Spurious Emissions, 6dB Bandwidth, Power Spectral Density and Conducted Fundamental Carrier Power.

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	REF915
dc power port	2 core unscreened	1.8m	S01 or S03

Sample : S02

Tests : Power Line Conducted Emissions 15.107 and Power Line Conducted Emissions 15.207

Port	Description of Cable Attached	Cable length	Equipment Connected
ac power port	None	N/A	RFG636
dc power port	2 core unscreened	1.8m	S01

Sample : S03

Tests : RF Antenna Port Conducted Spurious Emissions, 6dB Bandwidth, Power Spectral Density and Conducted Fundamental Carrier Power

Port	Description of Cable Attached	Cable length	Equipment Connected
Antenna port 0	50Ohm coax	1.04cm	RFG404
Antenna port 1	50Ohm coax	4cm	50Ohm load
dc power port	2 core unscreened	1.8m	S02
Cable in	75 Ohm coaxial cable	>1	8C1497S01
To TV	75 Ohm coaxial cable	1m	Re-modulated load box
HDMI	HDMI cable	1m	HDMI load box

C5 Details of Equipment Used

For Radiated Electric Field Emissions 30MHz to 1GHz:

Lab 10				
RFG/REF No	Type	Description	Manufacturer	Date Calibrated.
274	ATS	Ferrite Lined Chamber	Panashield	10/07/11
679	CBL6111	Blue Bilog Antenna (0.03 – 1GHz)	Chase	05/05/11
008	8447D	Pre-amp (0.1 – 1300MHz)	H & P	16/02/11
126	ESV20	Test Receiver	R & S	18/05/11
404	E4407B	Spectrum Analyser	Agilent	17/05/11
643	N-type	Sucotest Microwave Cable 1m	Huber & Suhner	17/09/10
651	N-type	Sucotest Microwave Cable 7m	Huber & Suhner	17/09/10
678	N-type	Sucotest Microwave Cable 2m	Huber & Suhner	28/03/11
636	NSG1007	110Vac / 60Hz	Schaffner	N/A
REF887	34405A	Multi-meter	Agilent	25/08/10

For Radiated Electric Field Emissions 1GHz to 18GHz:

Lab 10				
RFG/REF No	Type	Description	Manufacturer	Date Calibrated
274	ATS	Ferrite Lined Chamber	Panashield	10/07/11
129	3115	Horn Antennas	EMCO	11/08/09
307	HP8449B	Microwave Pre-Amp (1-26.5GHz)	HP	01/03/10
643	N-type	Sucotest Microwave Cable 1m	Huber & Suhner	17/09/10
651	N-type	Sucotest Microwave Cable 7m	Huber & Suhner	17/09/10
678	N-type	Sucotest Microwave Cable 2m	Huber & Suhner	28/03/11
404	E4407B	Spectrum Analyser	Agilent	17/05/11
636	NSG1007	110Vac / 60Hz	Schaffner	N/A
REF887	34405A	Multi-meter	Agilent	25/08/10

For Radiated Electric Field Emissions 1GHz to 18GHz:

Lab 16				
RFG/REF No	Type	Description	Manufacturer	Date Calibrated
REF886	Lab 16	Large Anechoic Chamber	Rainford EMC systems	27/07/10
REF880	HL050	Log Perodic Antenna (1-26.5GHz)	R&S	14/05/10
913	HP8449B	Microwave Pre-Amp (1-26.5GHz)	HP	07/01/11
404	E4407B	Spectrum Analyser	Agilent	17/05/11
452	SMA	1m 50Ohm coaxial UTIFLEX cable	Teledyne Reynolds	25/05/11
REF881	N-type	50Ohm coaxial HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF882	N-type	50Ohm coaxial HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF884	N-type	50Ohm coaxial HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF885	N-type	50Ohm coaxial HF RF coaxial cable	Teledyne Reynolds	06/06/11
REF915	PCR500L	ac/dc Power Supply	Kikusui	N/A
REF887	34405A	Multi-meter	Agilent	25/08/10

Details of Equipment Used continued:

For power line conducted emissions:

RFG/REF No	Type	Description	Manufacturer	Date Calibrated
n/a	Lab 5	Small Screened Chamber	TRaC	N/A
189	ESH3-Z5	Single-phase LISN	R & S	09/06/11
680	ESH3-Z2	Pulse Limiter	R & S	20/06/11
214	ESAI	Spec Analyser/Test Receiver (LF/HF)	R & S	31/03/11
294	BNC	RF coaxial cable (Lab 5)	TRaC	17/09/10
298	BNC	RF coaxial cable (Lab 5)	TRaC	17/09/10
636	NSG1007	110Vac / 60Hz	Schaffner	N/A
REF887	34405A	Multi-meter	Agilent	25/08/10

For Conducted Measurements:

RFG/REF No	Type	Description	Manufacturer	Date Calibrated.
404	E4407B	Spectrum Analyser	Agilent	17/05/11
REF 835/836	N10149 N1911A	Power head and meter	Agilent	10/08/10
REF887	34405A	Multi-meter	Agilent	25/08/10
REF915	PCR500L	ac/dc Power Supply	Kikusui	N/A

Appendix D:

Additional Information

No additional information is included within this test report.

Appendix E:

Photographs and Figures

No photographs are contained within this test report at the request of the client. Photographs associated to this test report are contained in a separate document: Appendix E Photos.doc

Appendix F:

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/cm² 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

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

Sample No.	S03	
Maximum peak output power at the antenna terminal:	1.15	dBm
Maximum peak output power at the antenna terminal:	1.30316678	mW
Power density	1.00000000	mW/cm ²
Antenna gain (typical):	7.09	dBi
Maximum antenna gain:	5.116818355	numeric
Prediction frequency:	2475	MHz

Result

Prediction Frequency (MHz)	Maximum allowable antenna gain: (dBi)	Power density limit (S) (mW/cm ²)	Distance (R) cm required to be less than 1mW/cm ²
2475	7.09	1.000000	0.728442151



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