TRaC RADIO TEST REPORT

FOR

Savox

ON

CBU

DOCUMENT NO. TRA-010248-W-US-4

HULL
Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.
T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com
www.tracglobal.com

TRaC Wireless Test Report **:** TRA-010248-W-US-4

Applicant **:** Savox Communications UK

Apparatus **:** CBU

Specification(s) **:** CFR47 Part 15 C 15.247:October 2012

FCCID **:** TUF024

Purpose of Test **:** Certification

Authorised by **:** 

: Radio Product Manager

Issue Date **: 1st March 2013**
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Contents

Section 1: Introduction

1.1 General

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

Test performed at:

TRaC Telecoms & Radio [X]
Unit E
South Orbital Trading Park
Hedon Road
Hull, HU9 1NJ.
United Kingdom.

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806

TRaC Telecoms & Radio [ ]
Moss View
Nipe Lane
Up Holland
West Lancashire, WN8 9PY
United Kingdom

Telephone: +44 (0) 1695 556666
Fax: +44 (0) 1695 577077

Email: test@tracglobal.com
Web site: http://www.tracglobal.com

Tests performed by: K J Anderson

Report author: K J Anderson

1.2 Tests Requested By

This testing in this report was requested by:

Savox Communications UK
Sutton Road
Wigginton
York
YO32 2RB
United Kingdom

1.3 Manufacturer

SAVOX Communications Oy Ab
Sinikalliontie 3 B
02630 Espoo
Finland

1.4 Apparatus Assessed

The following apparatus was assessed between: 04/10/12 and 29/11/12

CBU

The apparatus is a neck worn radio controller designed to be used with the Savox WPTT containing an IEE 802.15.4 radio module.

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
Unintentional Radiated Spurious Emissions	Title 47 of the CFR: Part 15 Subpart B; 15.109	ANSI C63.4	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(µV/m)	±1.6dB
150 kHz to 30 MHz	Amplitude dB(µV/m)	±2.1dB
30MHz to 300MHz Horizontal	Amplitude dB(µV/m)	±5.1dB
30MHz to 300MHz Vertical	Amplitude dB(µV/m)	±5.2dB
300MHz to 1GHz Horizontal	Amplitude dB(µV/m)	±5.4dB
300MHz to 1GHz Vertical	Amplitude dB(µV/m)	±5.2dB
1GHz to 18GHz Horizontal	Amplitude dB(µV/m)	±4.4dB
1GHz to 18GHz Vertical	Amplitude dB(µV/m)	±4.4dB
18GHz to 26.5GHz Horizontal	Amplitude dB(µV/m)	±4.2dB
18GHz to 26.5GHz Vertical	Amplitude dB(µV/m)	±4.2dB
26.5GHz to 40GHz Horizontal	Amplitude dB(µV/m)	±4.3dB
26.5GHz to 40GHz Vertical	Amplitude dB(µV/m)	±4.3dB

Power Line Conducted Emissions

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

Section 3: Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A: Formal Emission Test Results

Abbreviations used in the tables in this appendix:

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

A1 6 dB Bandwidth

This test was not performed at the request of the client

A2 Transmitter Peak Output Power

This test was not performed at the request of the client

A3 Antenna Gain

This test was not performed at the request of the client

A4 Transmitter Power Spectral Density

This test was not performed at the request of the client

A5 RF Antenna Conducted Spurious Emissions

This test was not performed at the request of the client

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 filed 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 : [X]

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

Test Details: 2405 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	S14
Modification state	0
SE in test environment	Test Laptop
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst case radiated emission measurements for spurious emissions:

TX 2405 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	2400	Pk	47.1	5.3	29.6	34.6	47.4	-9.5	N/A	-38.0	56.3

Emission at 2400 MHz was to determine band edge compliance, the limit is based on the measured peak carrier field strength.

All other emissions were at least 20 dB below the test limit.

Test Details: 2440 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	S14
Modification state	0
SE in test environment	Test Laptop
SE isolated from EUT	None
EUT set up	Refer to Appendix C

TX 2440 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	No Significant Emissions Within 20 dB of the limit										

Test Details: 2480 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	S14
Modification state	0
SE in test environment	Test Laptop
SE isolated from EUT	None
EUT set up	Refer to Appendix C

TX 2480 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	2483.5	Av	48.0	4.9	29.9	34.6	48.2	-9.5	N/A	38.7	54.0

All other emissions were at least 20 dB below the test limit.

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	CH11: 2405MHz, CH18: 2450MHz and CH26: 2480MHz
EUT sample number	S14
Modification state	0
SE in test environment	None
SE isolated from EUT	Test Laptop
EUT set up	Refer to Appendix C

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	2405.000	Pk	51.3	4.9	29.6	0	85.8	-9.5	76.3	137.0
2	2440.000	Pk	51.5	4.7	29.8	0	86.0	-9.5	76.5	137.0
3	2480.000	Pk	51.4	4.9	29.9	0	86.2	-9.5	76.7	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: 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 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:

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

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)

This test was not performed as the device is a battery powered device with no facility for connection to an ac power line.

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 : [X]

Test Details: 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 25GHz
EUT sample number	S14
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

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: Clause 15.33.

Radiated emission limits (47 CFR 15: 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 μV/m	Field strength dBμV/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:

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

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)

This test was not performed as the device is a battery powered device with no facility for connection to an ac power line.

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

Notes:

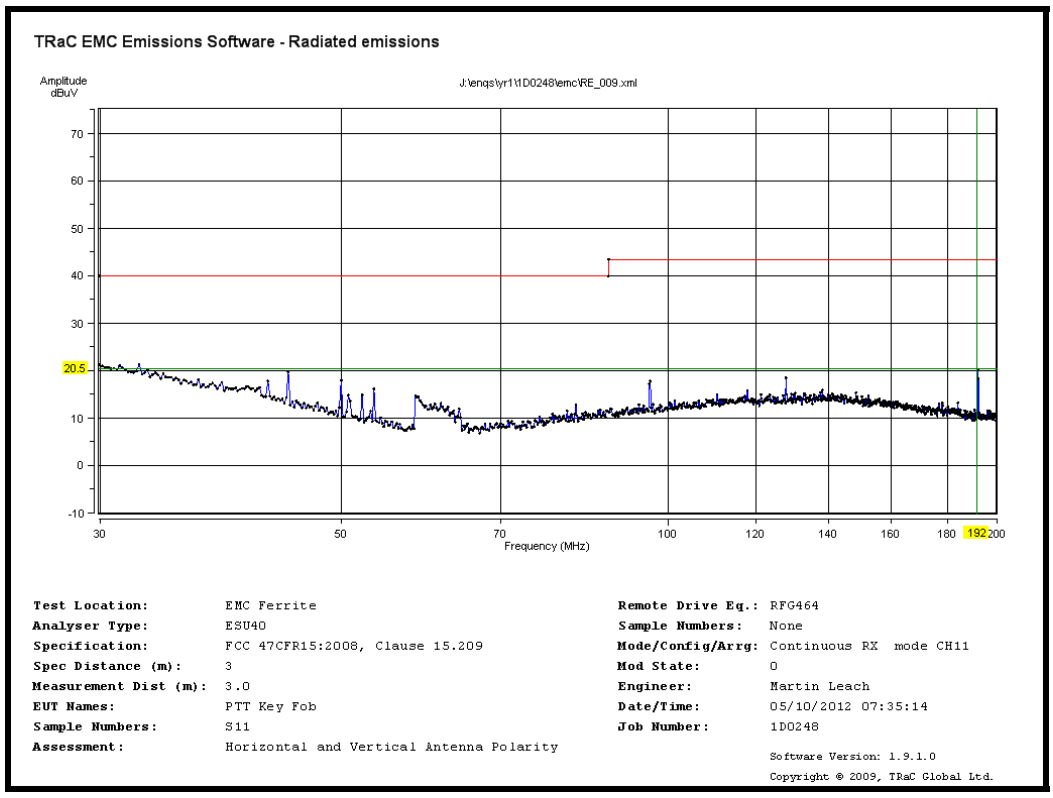
(a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.

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

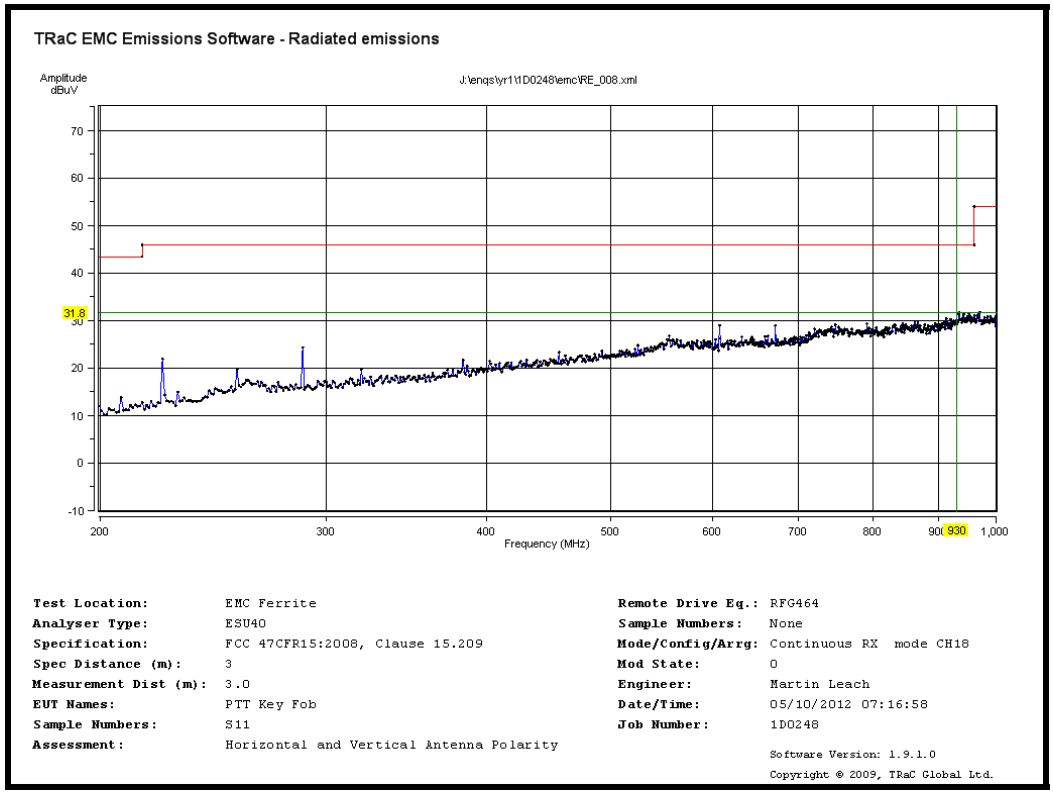
(c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.

(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.



Radiated RX Mode Ch11 2405MHz Emissions (15.109)



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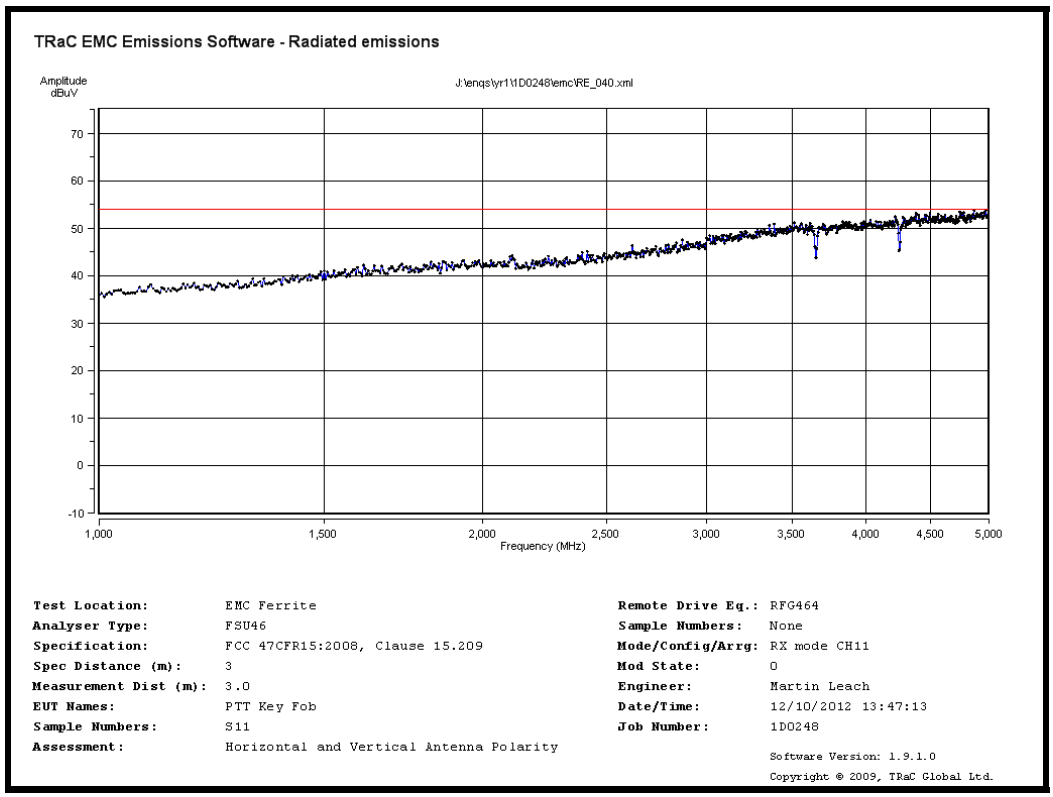

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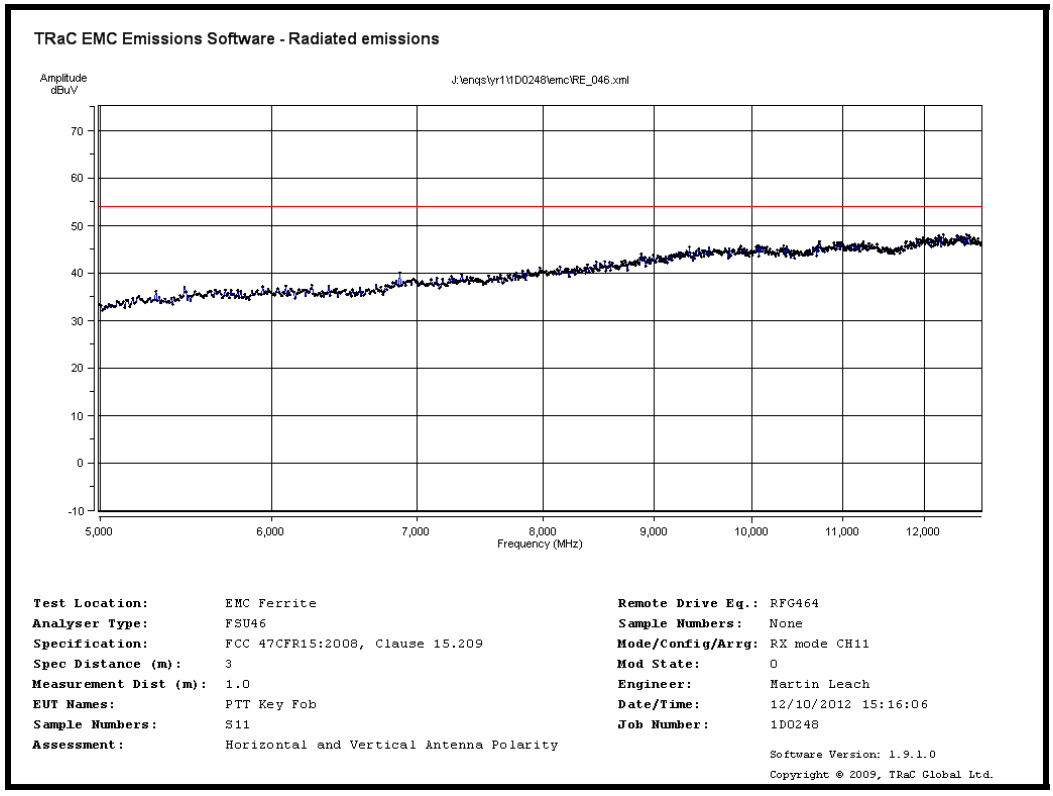

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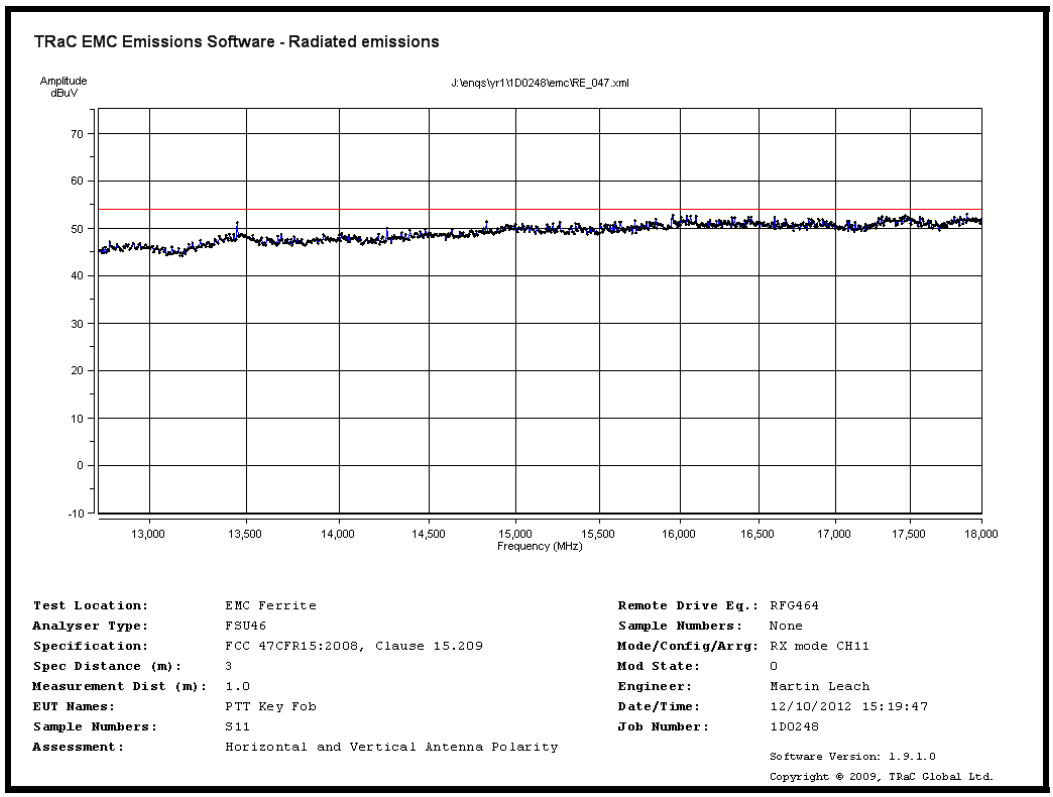

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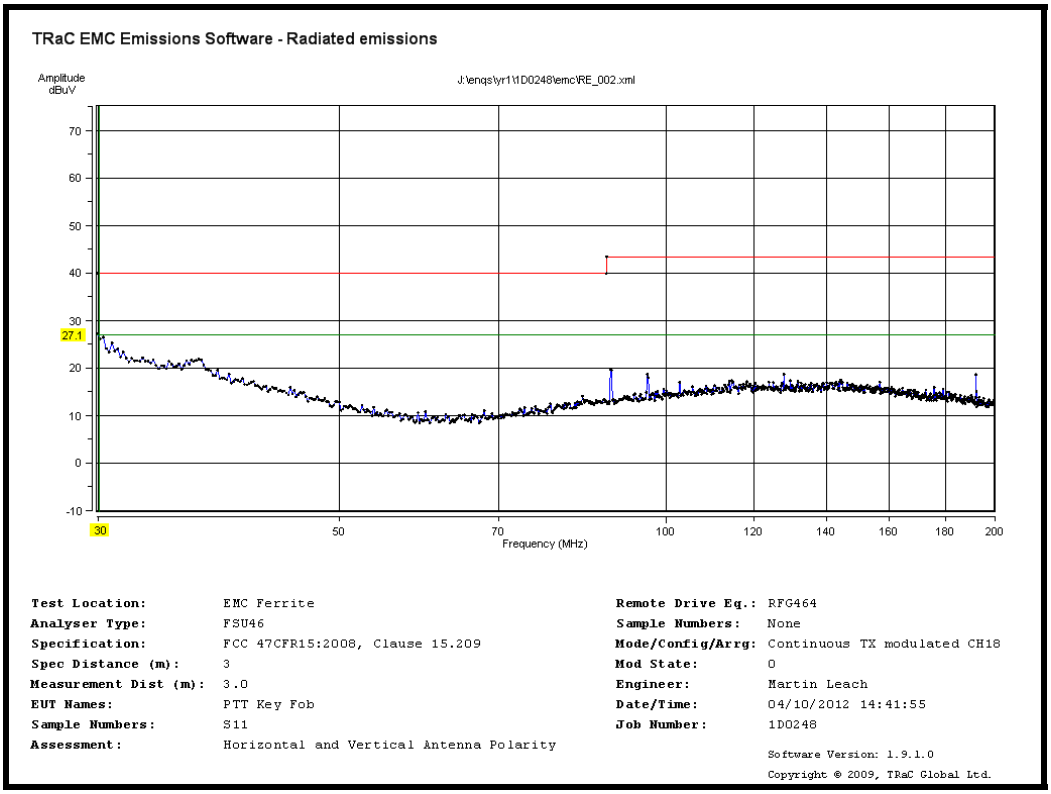

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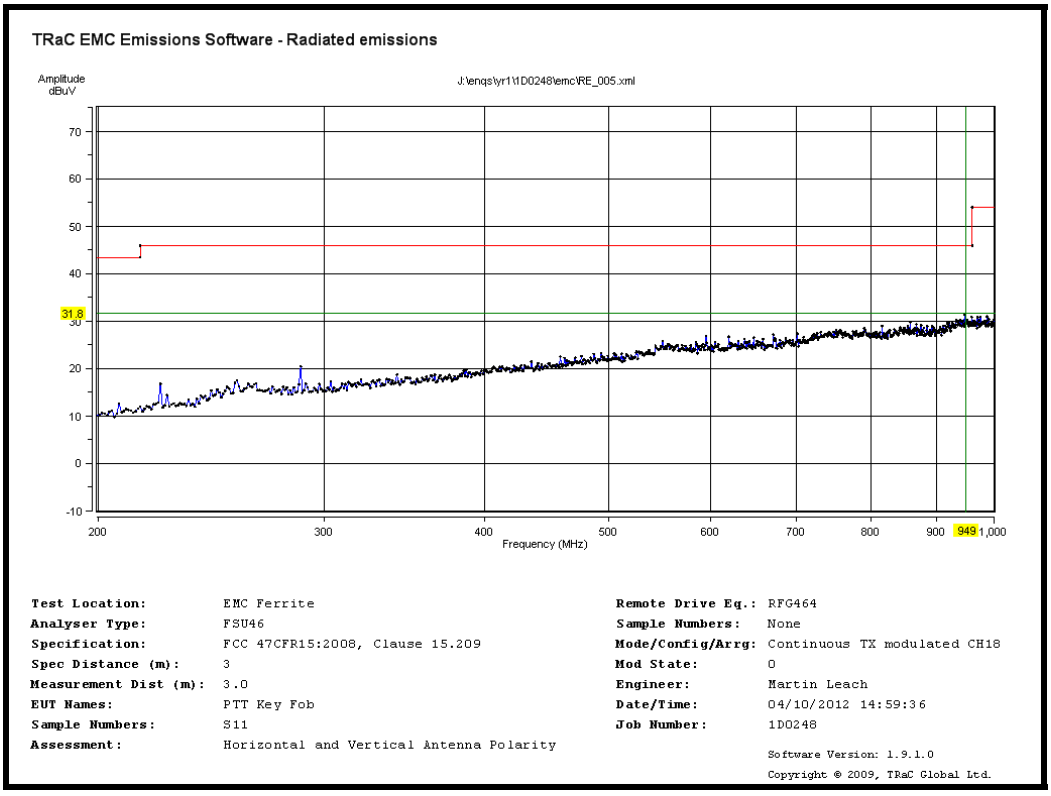
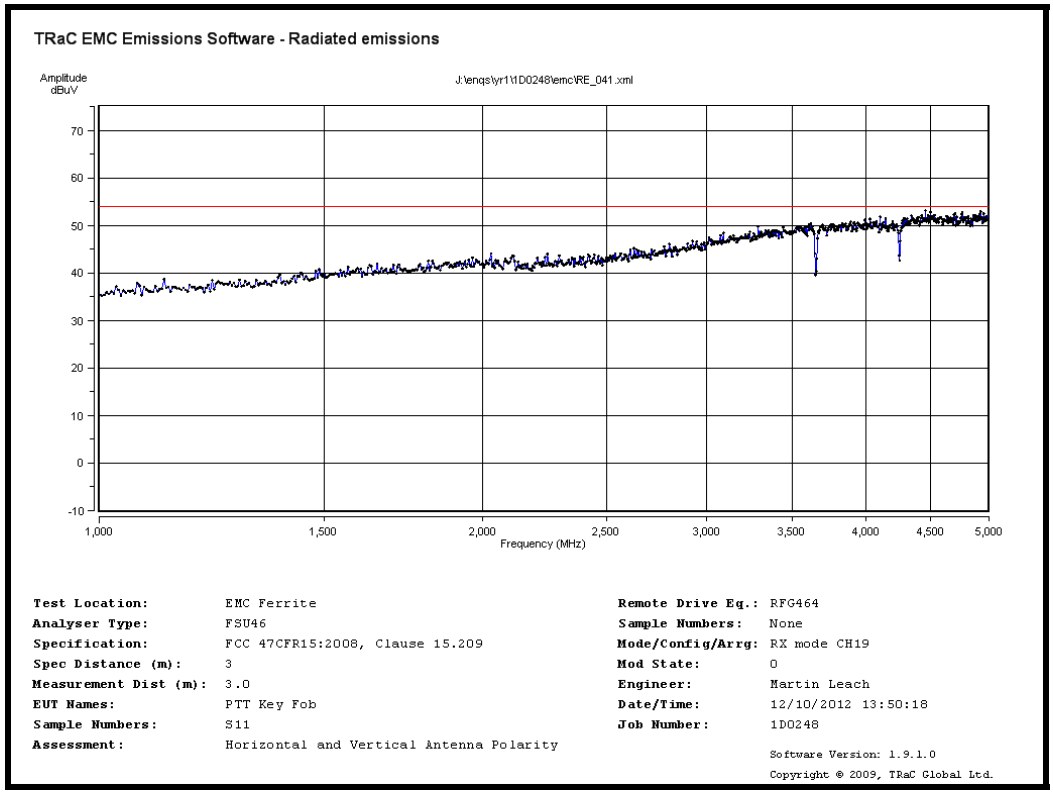


Radiated RX Mode Ch20 2450MHz Emissions (15.109)



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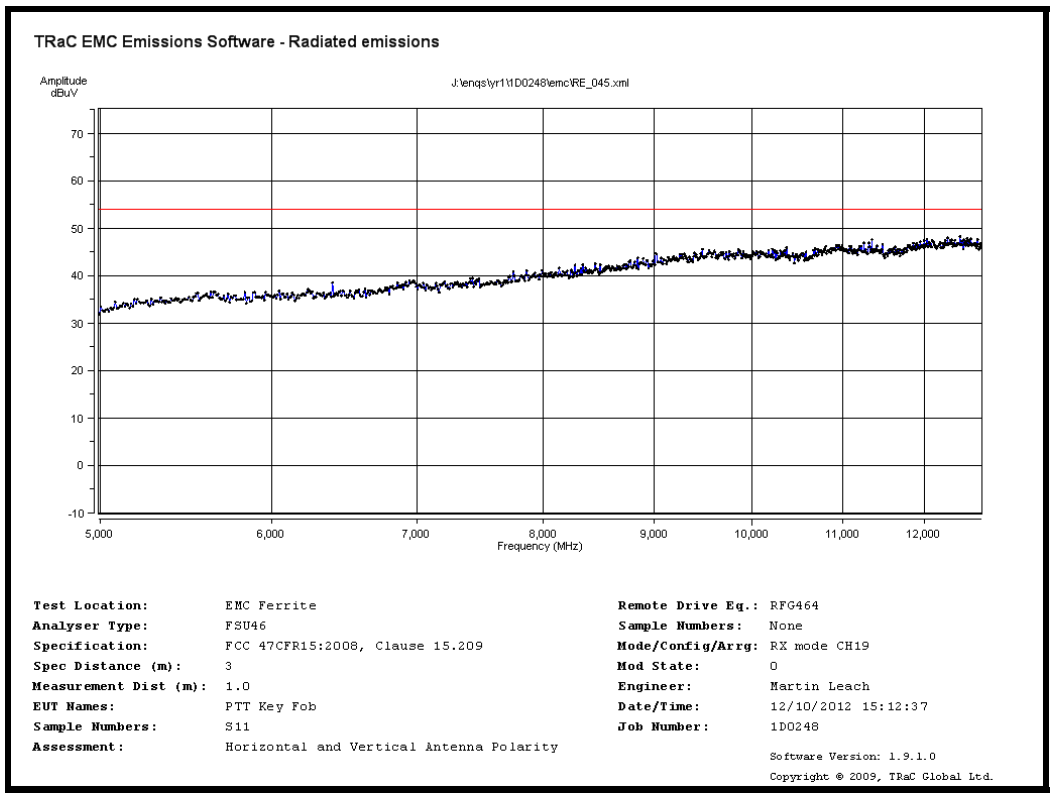

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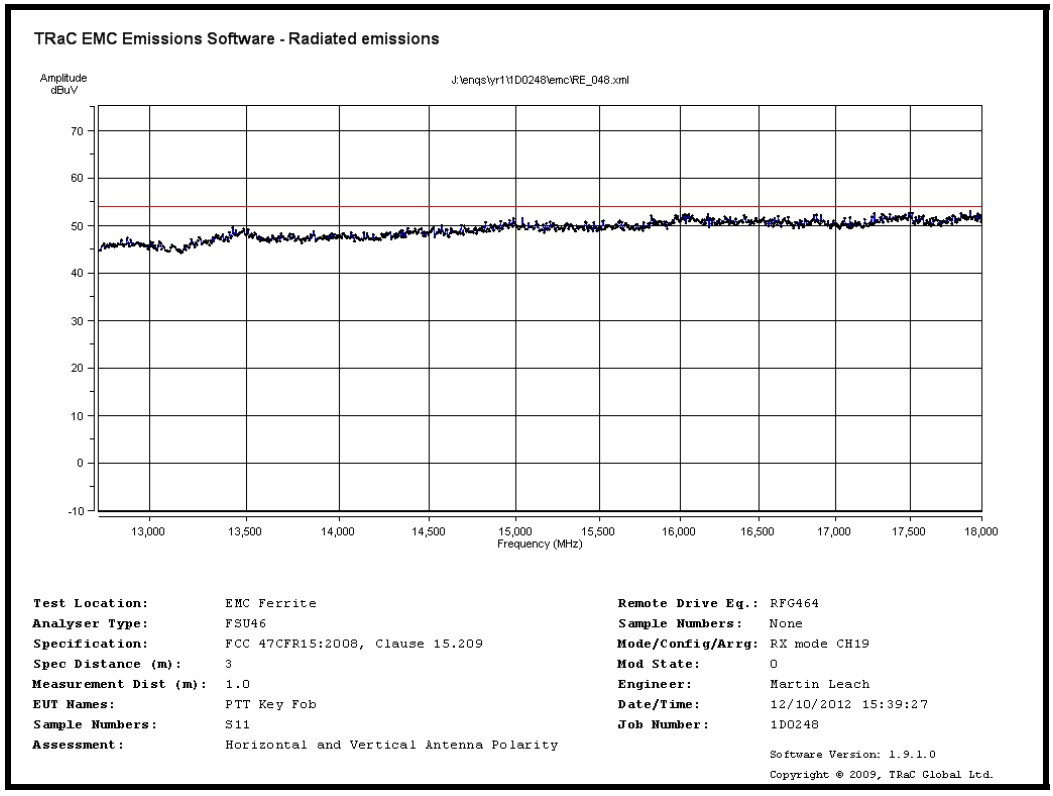

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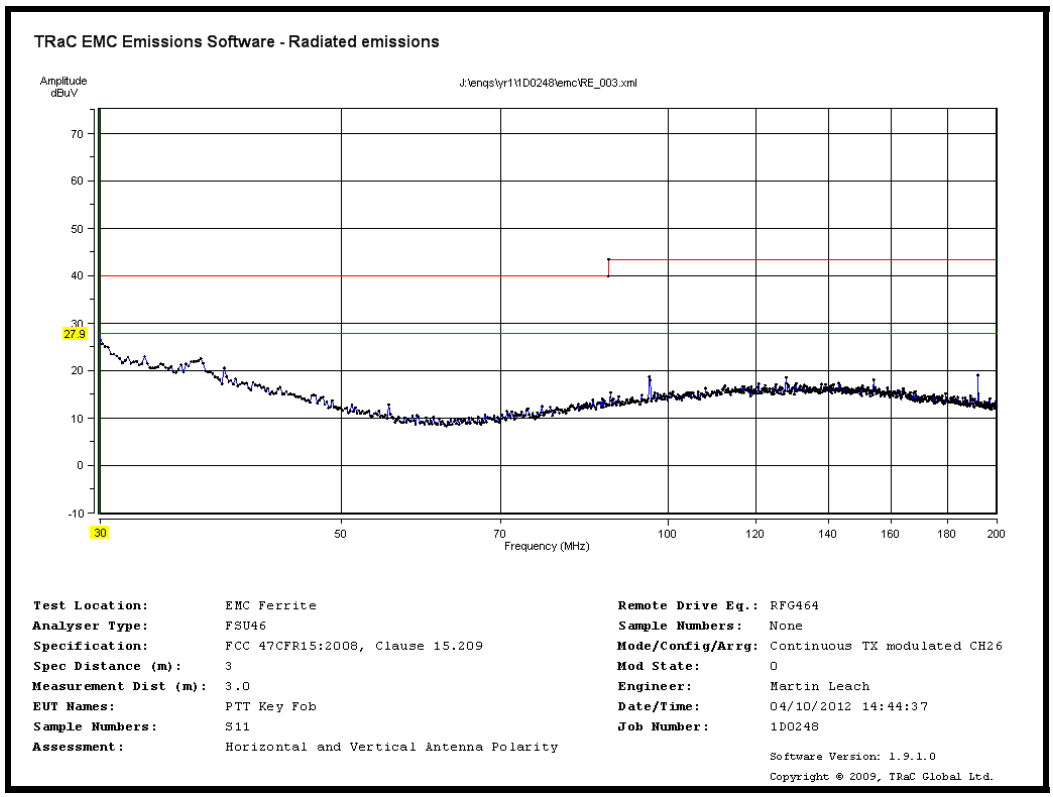

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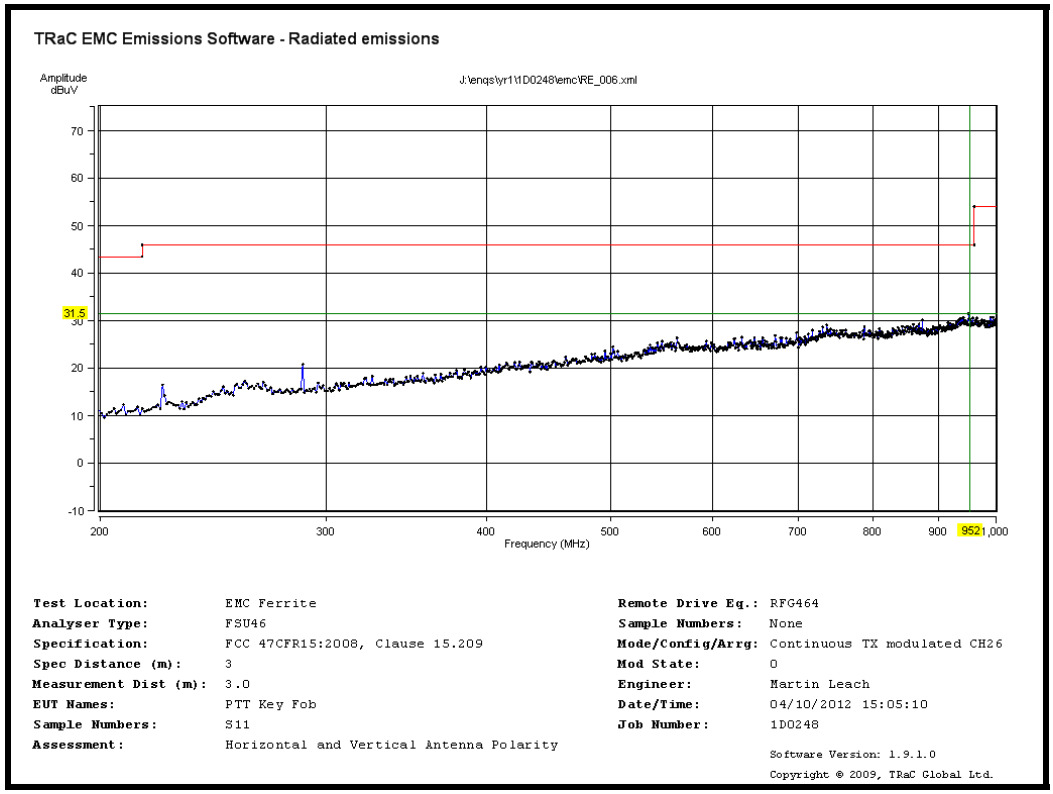

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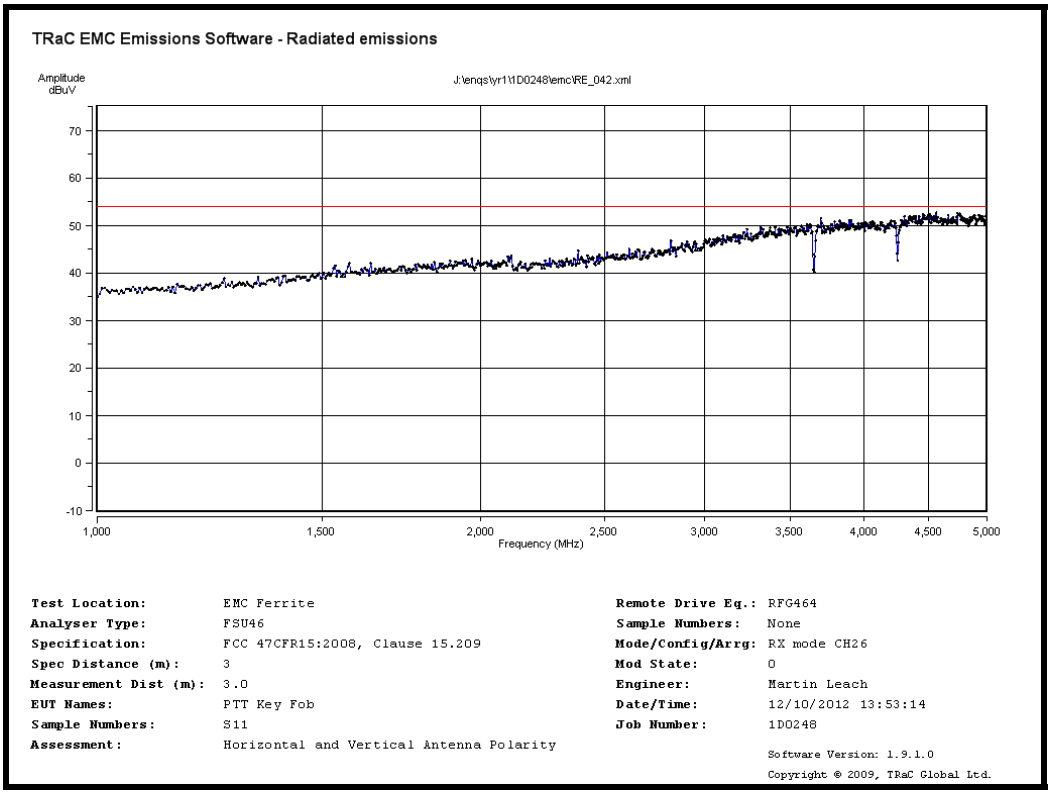

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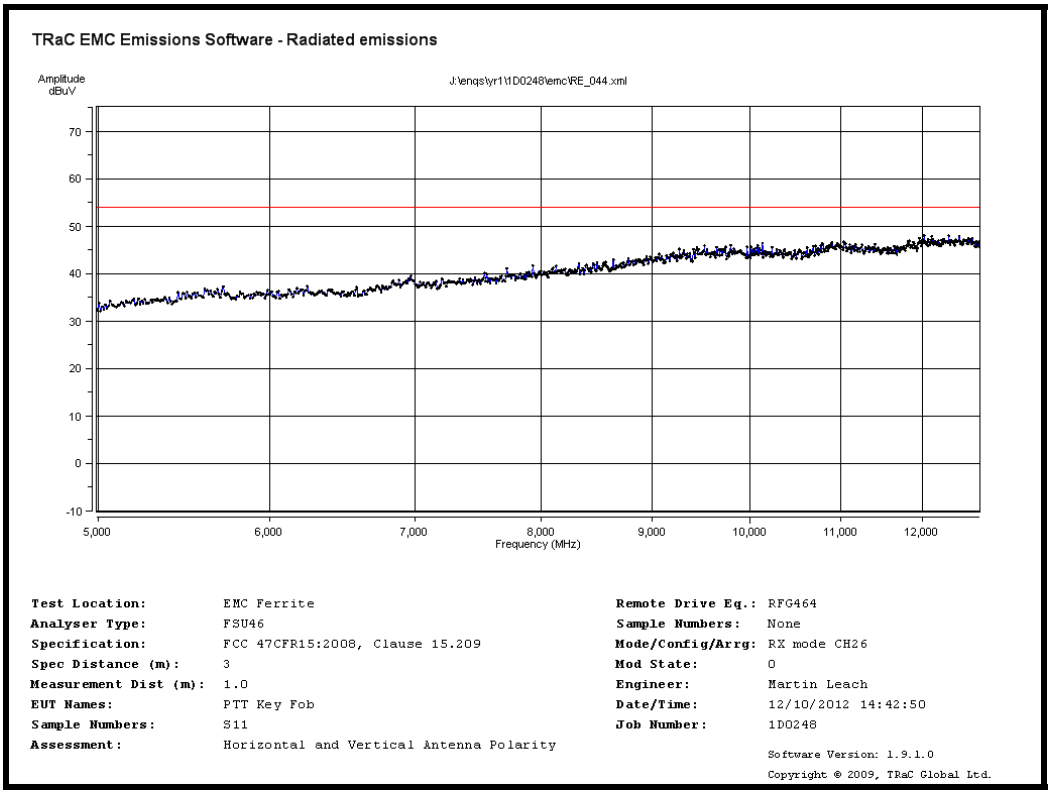

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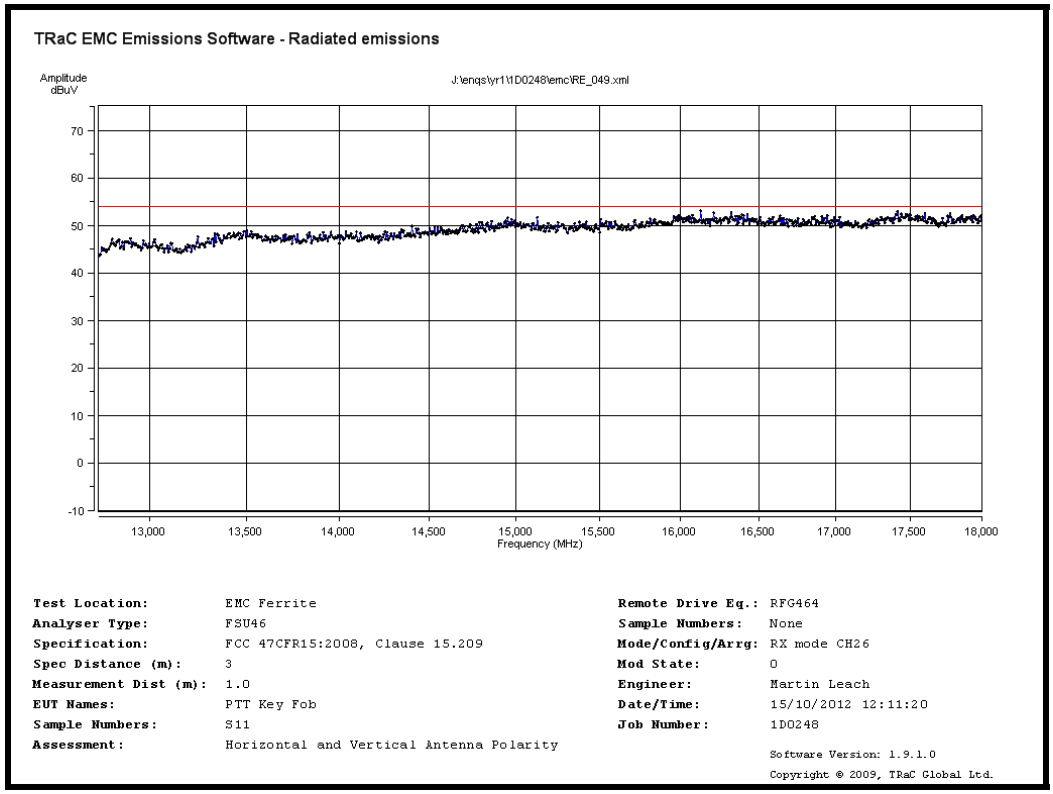

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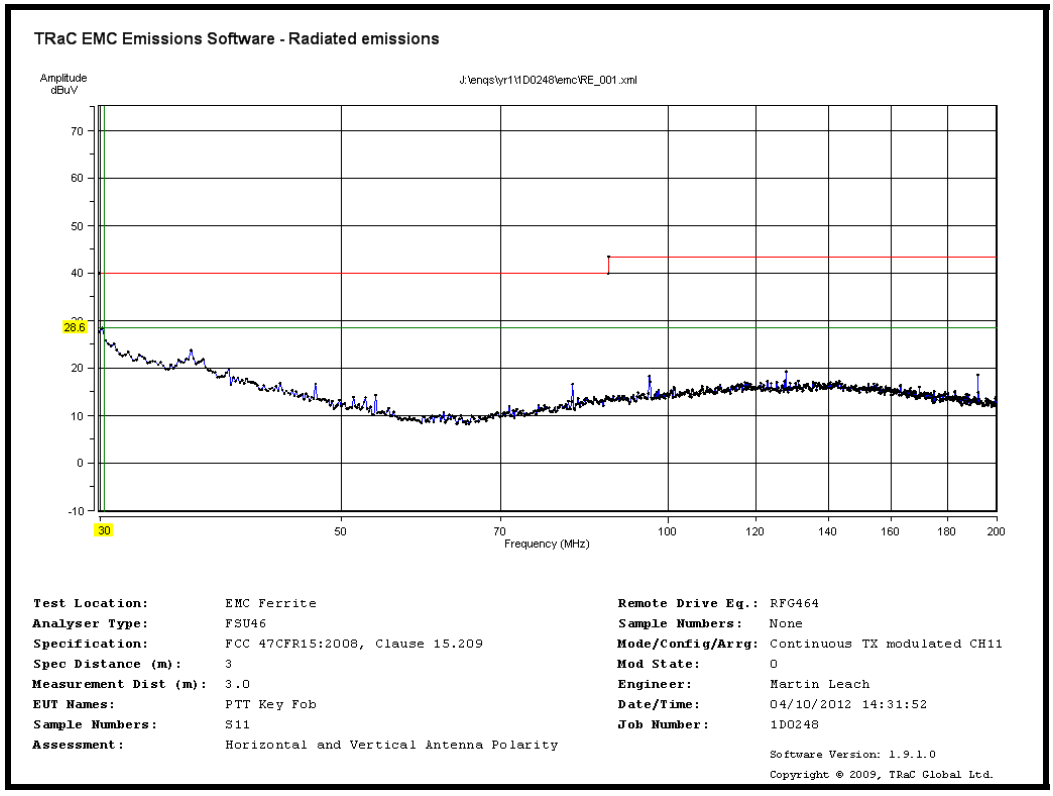
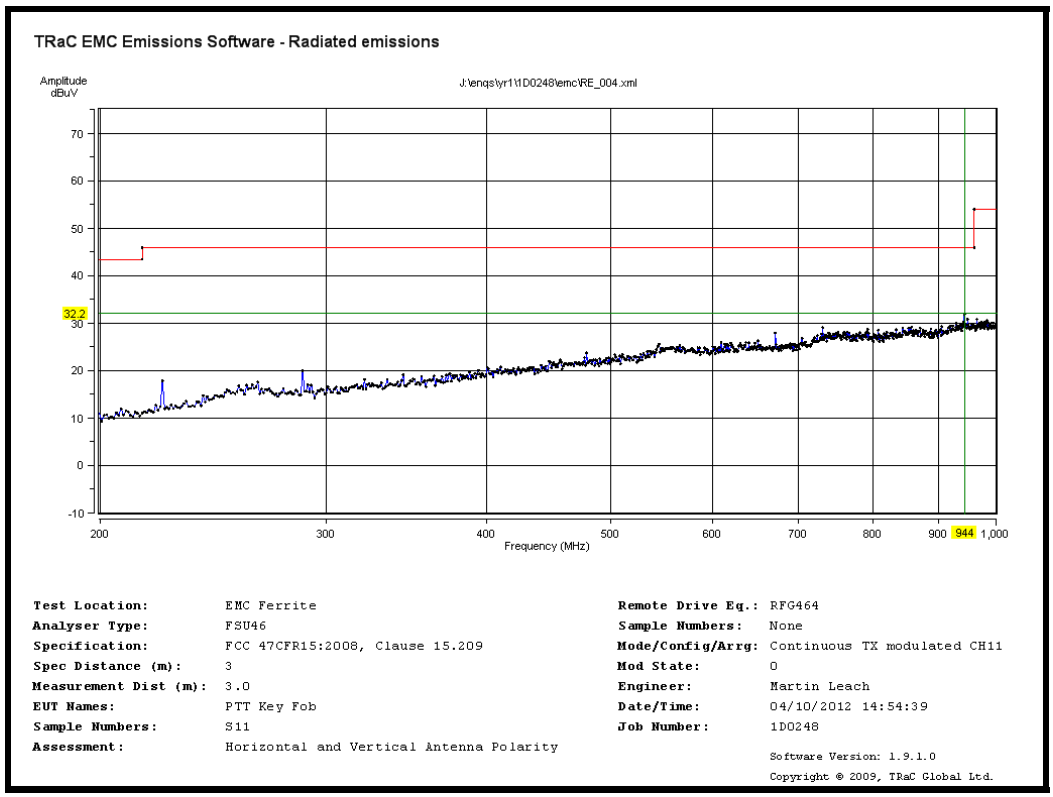


Radiated Transmitter Emissions Channel 11 2405MHz (15.209)



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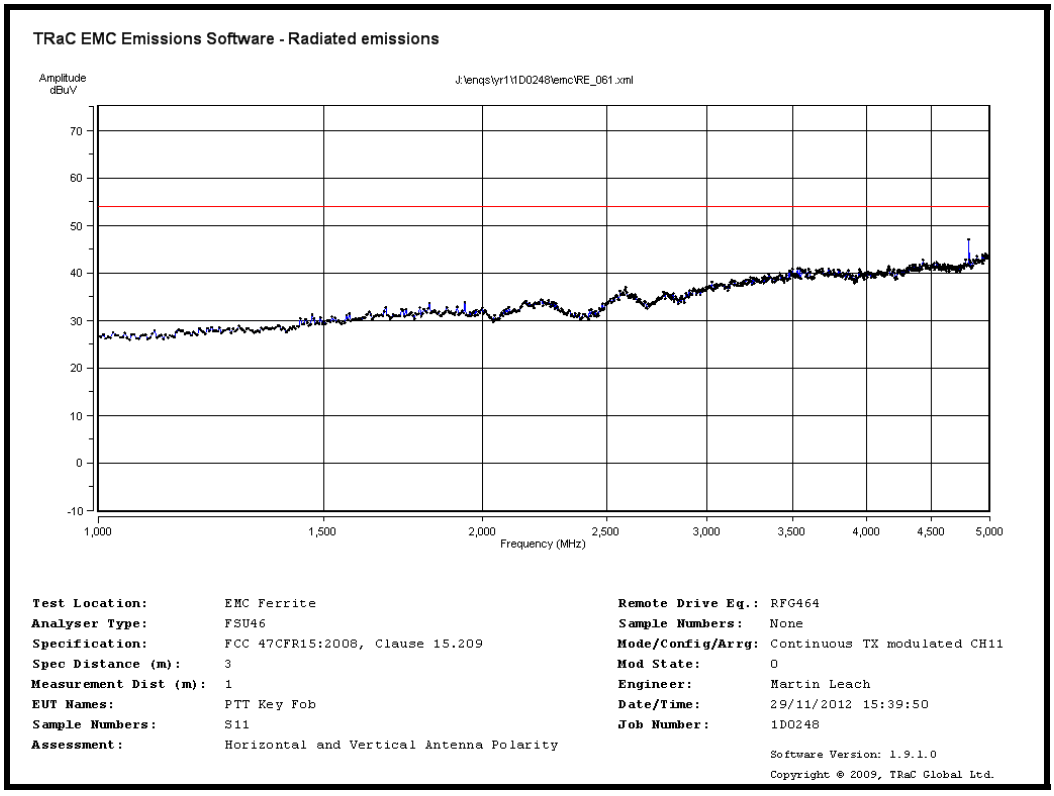

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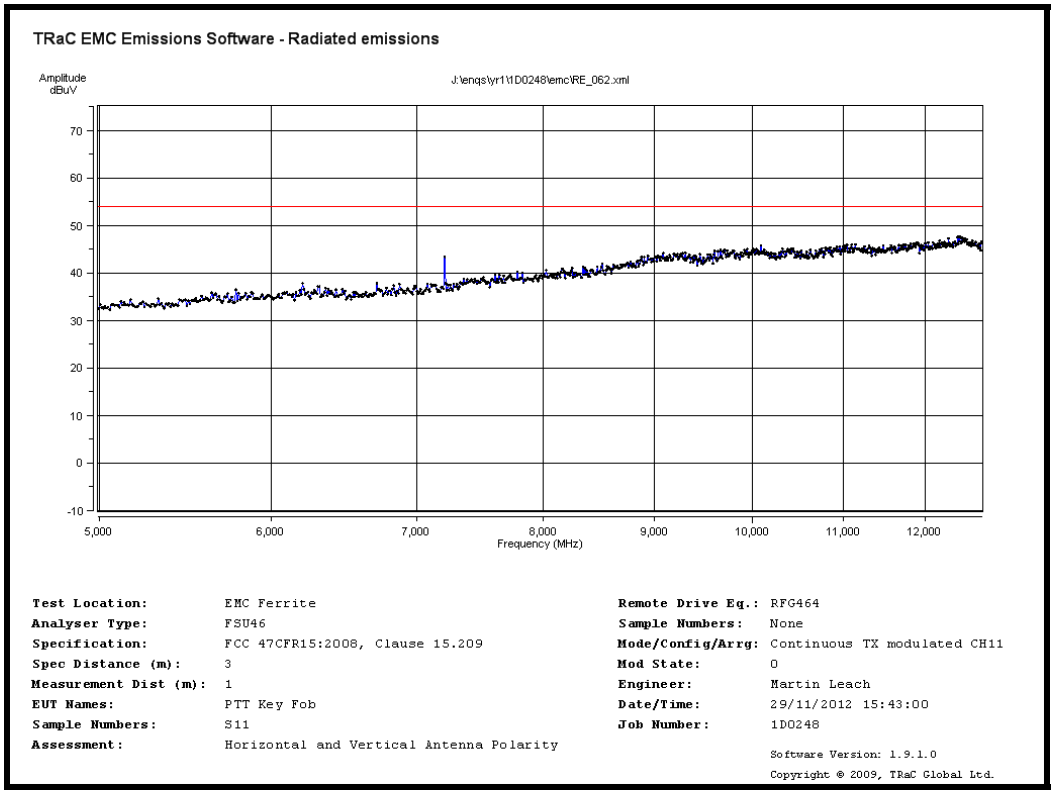

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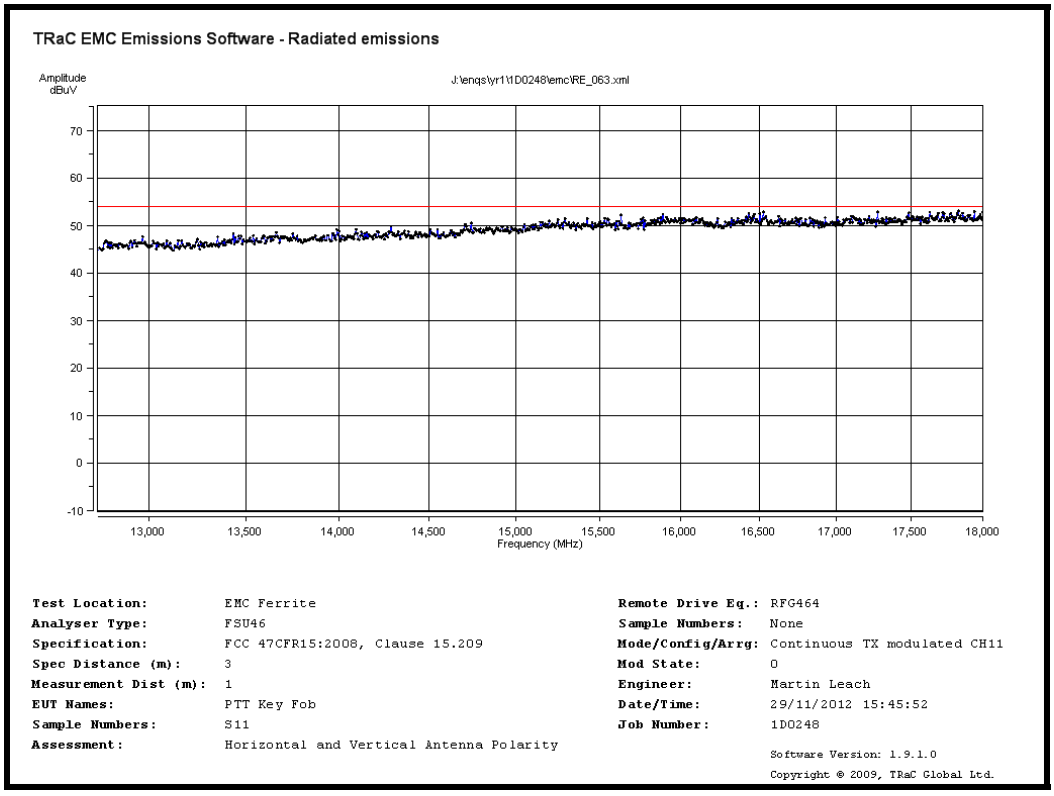

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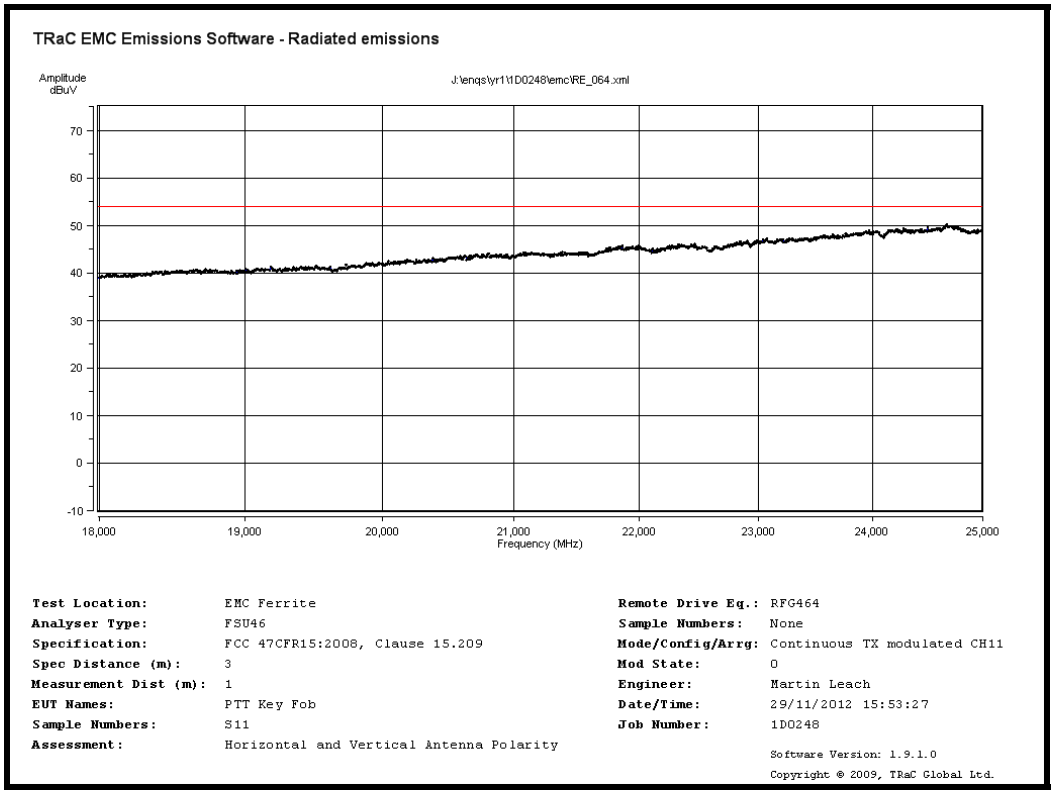
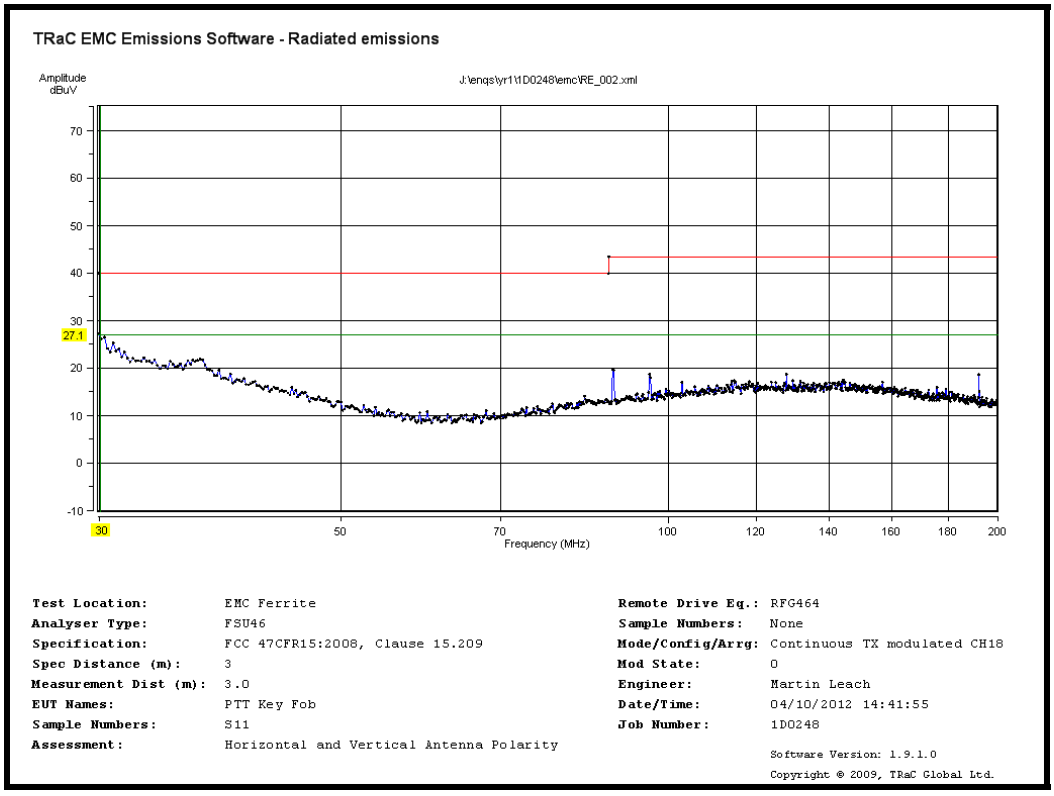
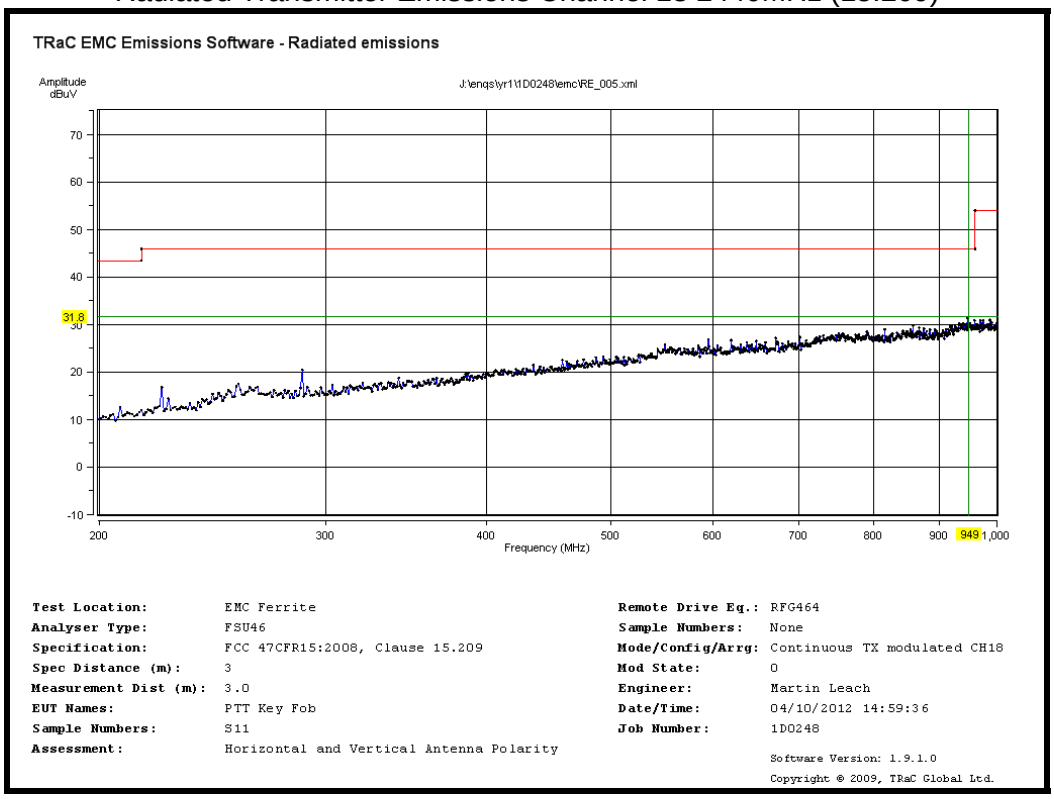


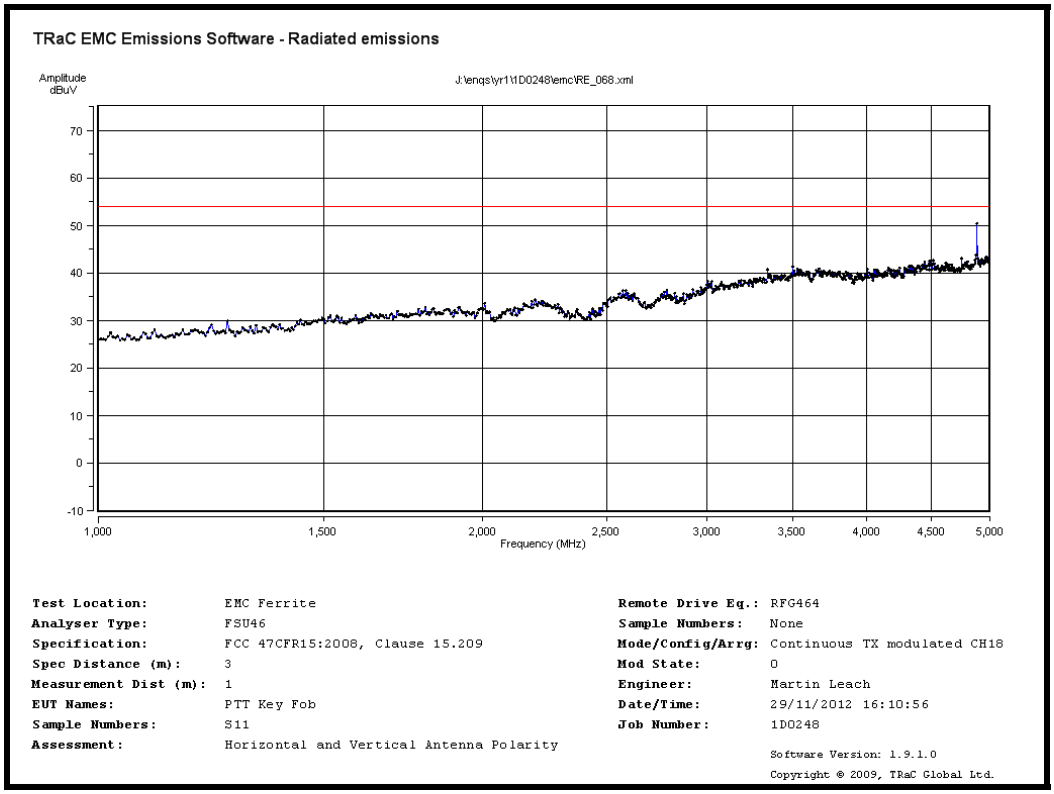
Radiated Transmitter Emissions Channel 11 2405MHz (15.209)



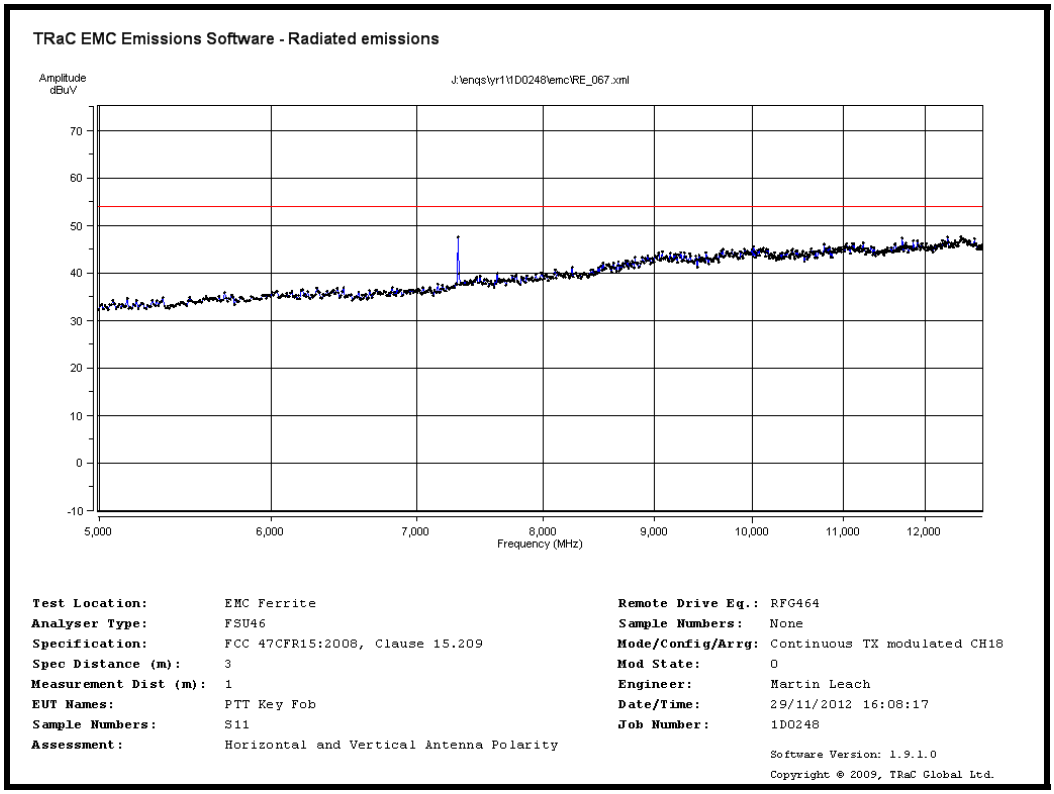
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



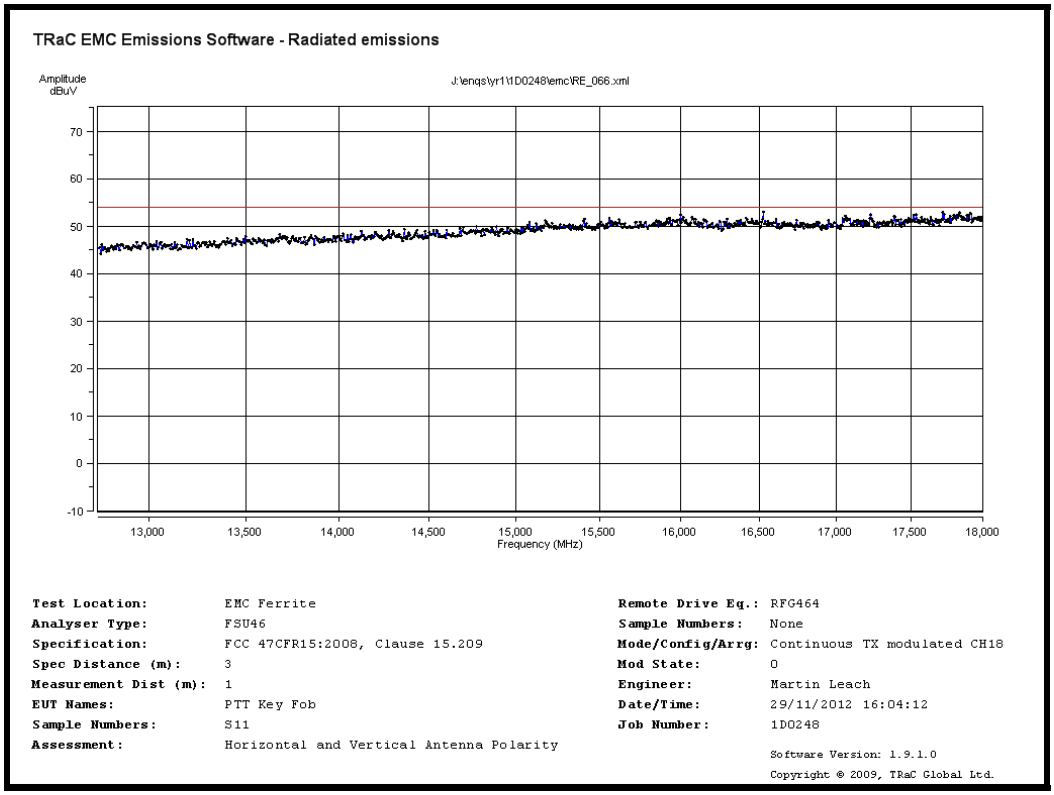
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



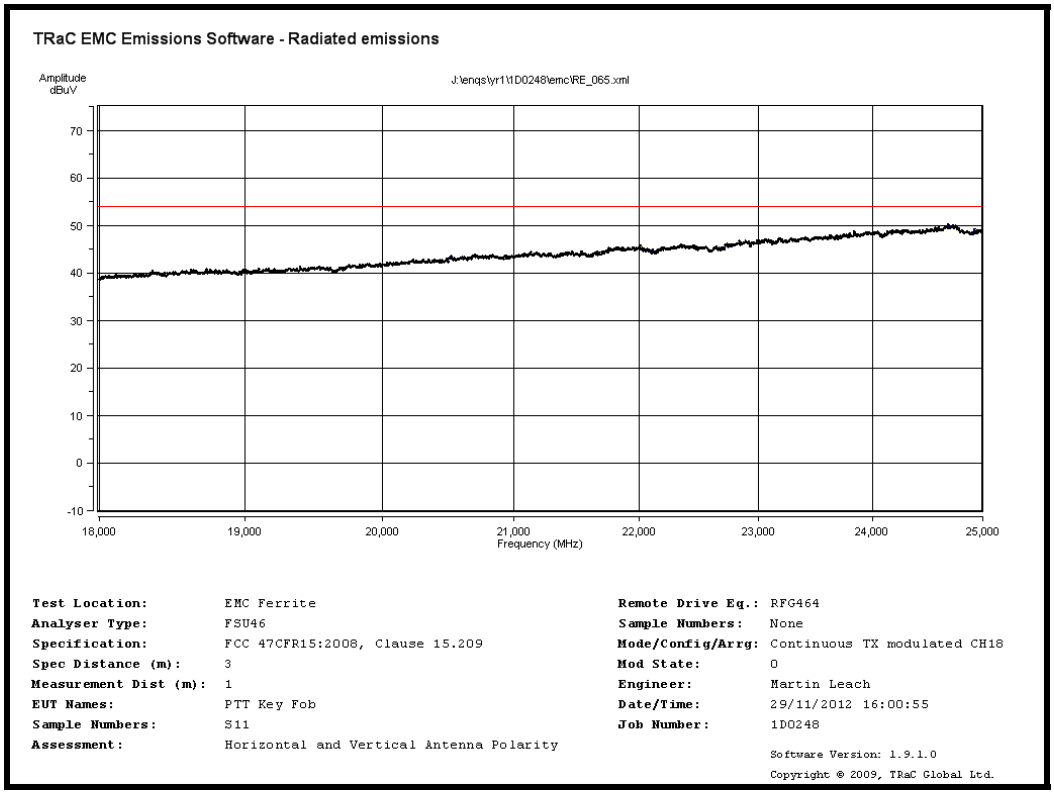
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



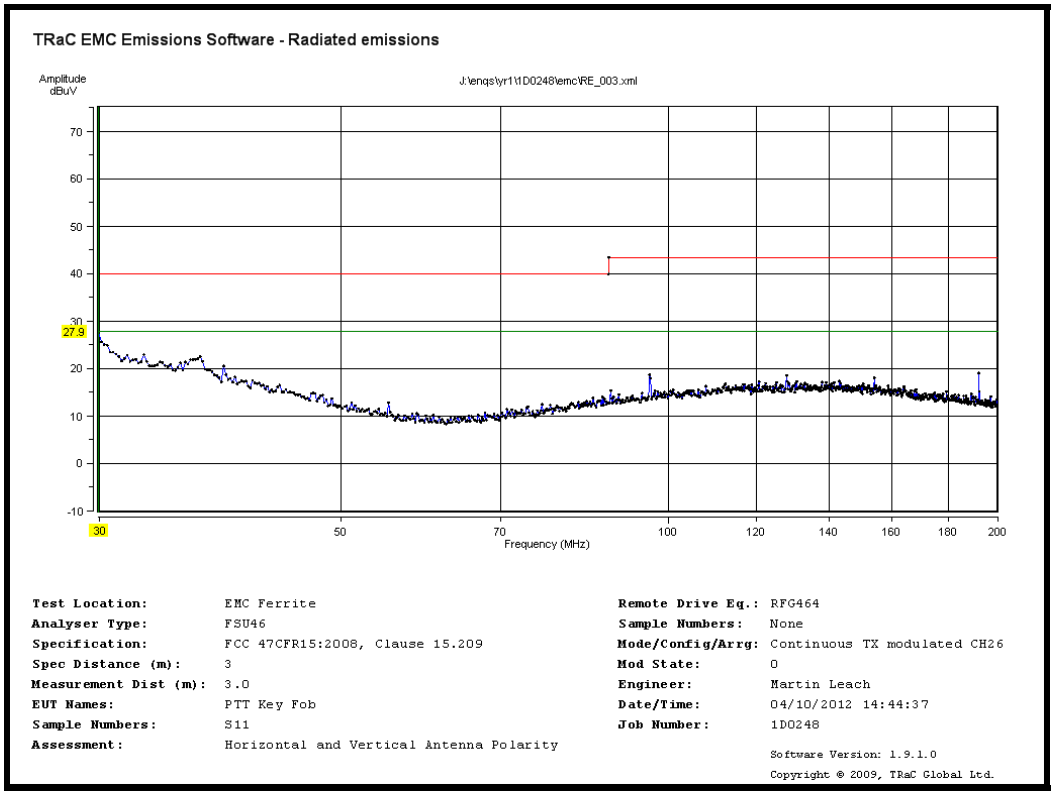
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



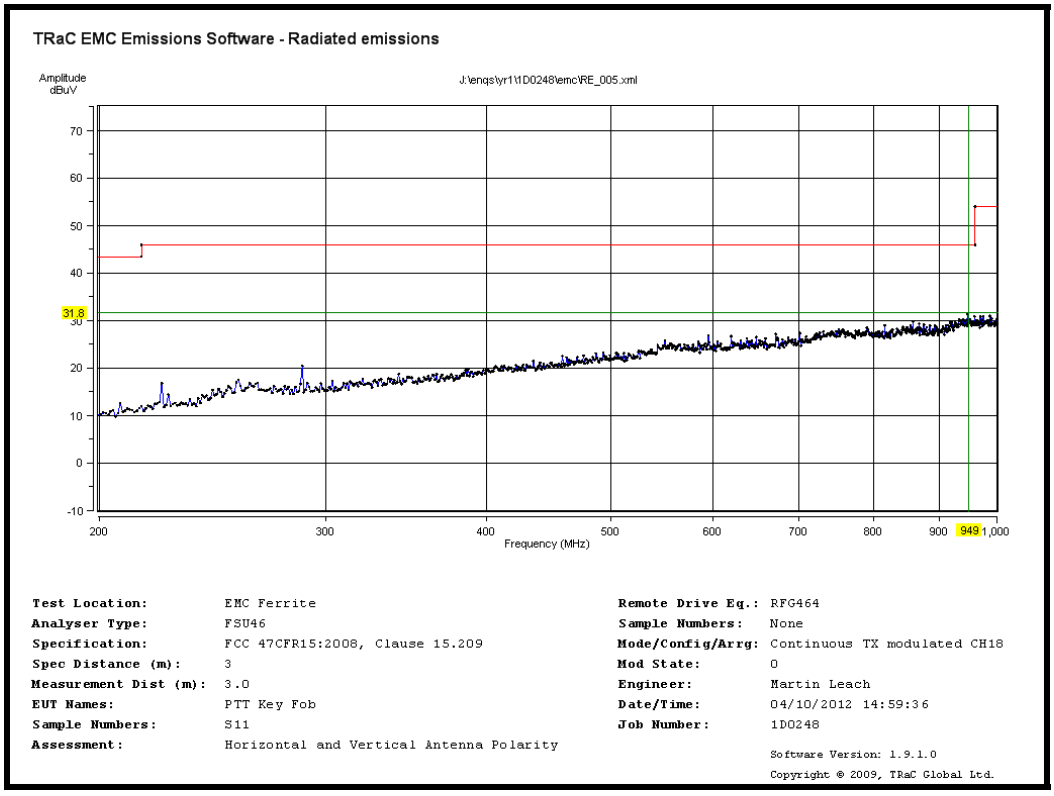
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



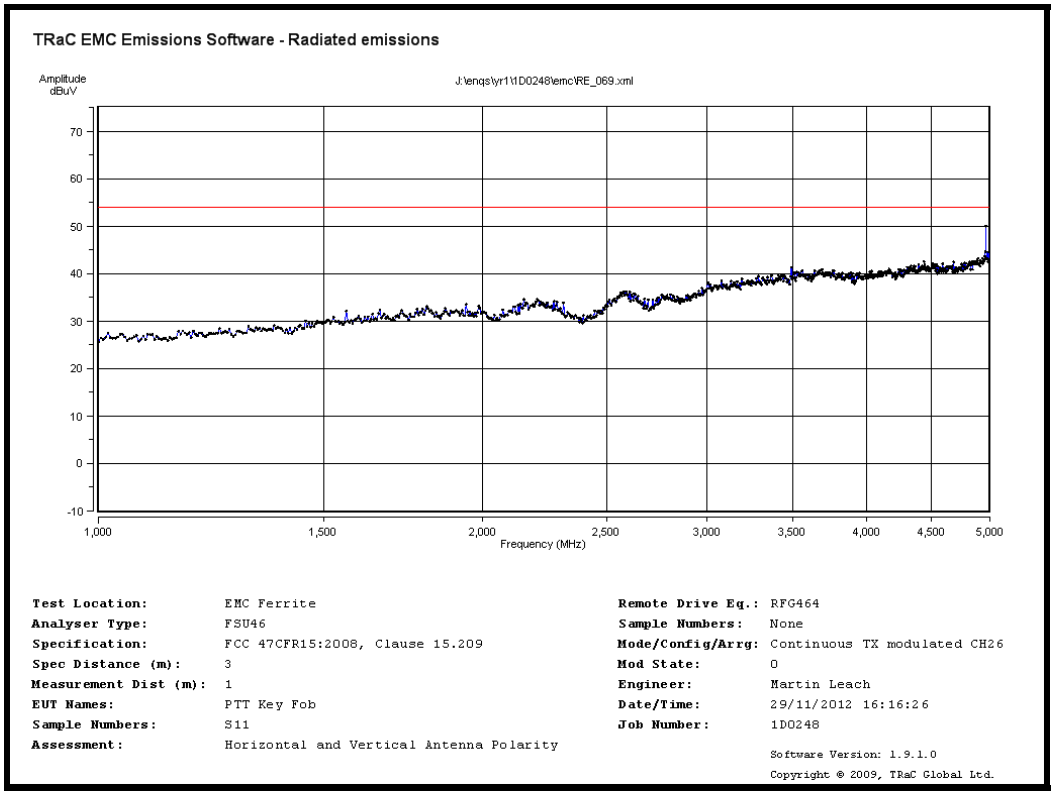
Radiated Transmitter Emissions Channel 18 2440MHz (15.209)



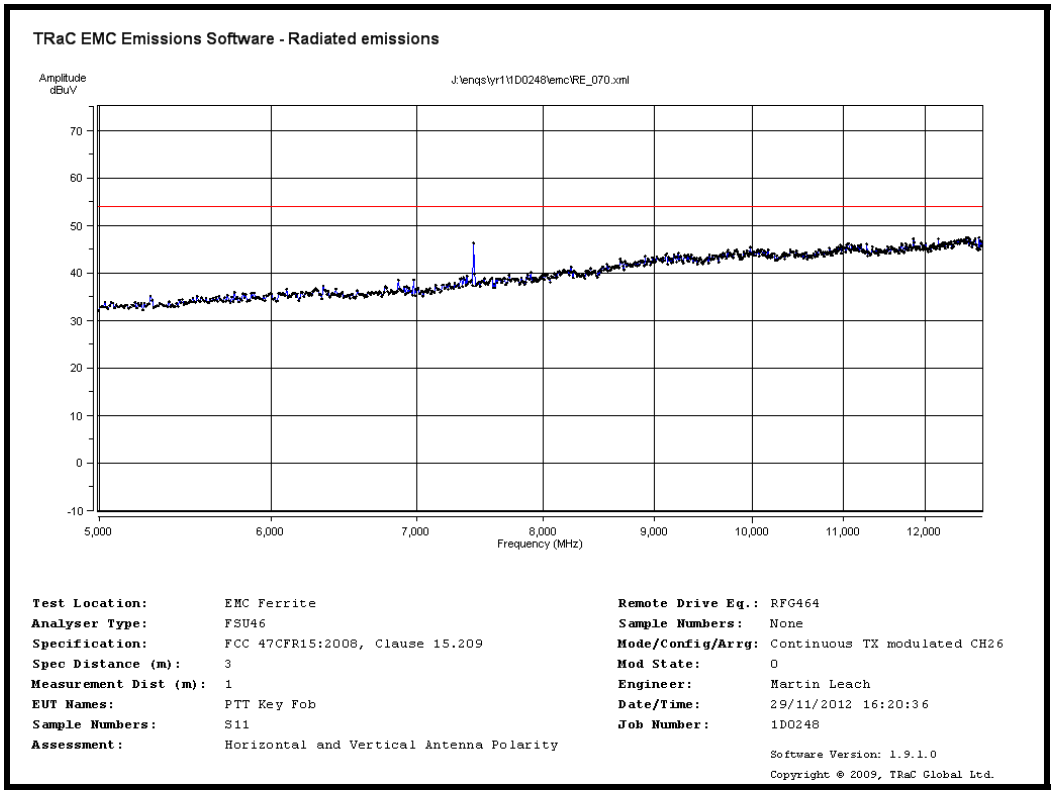
Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



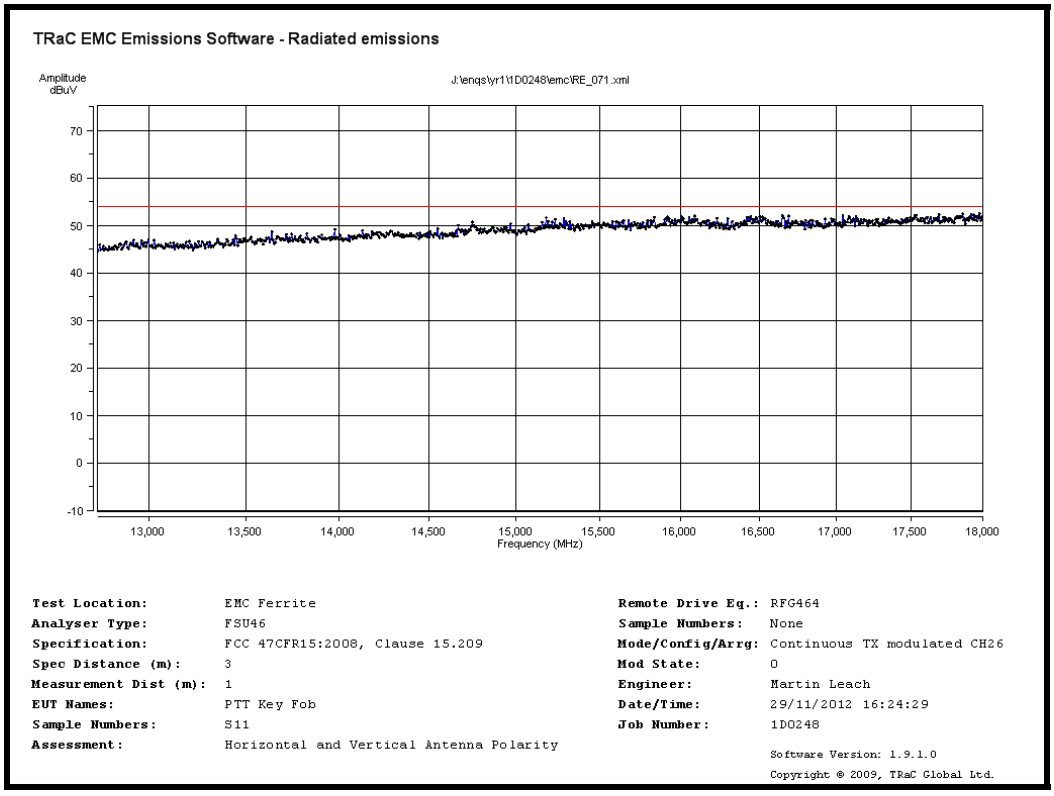
Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



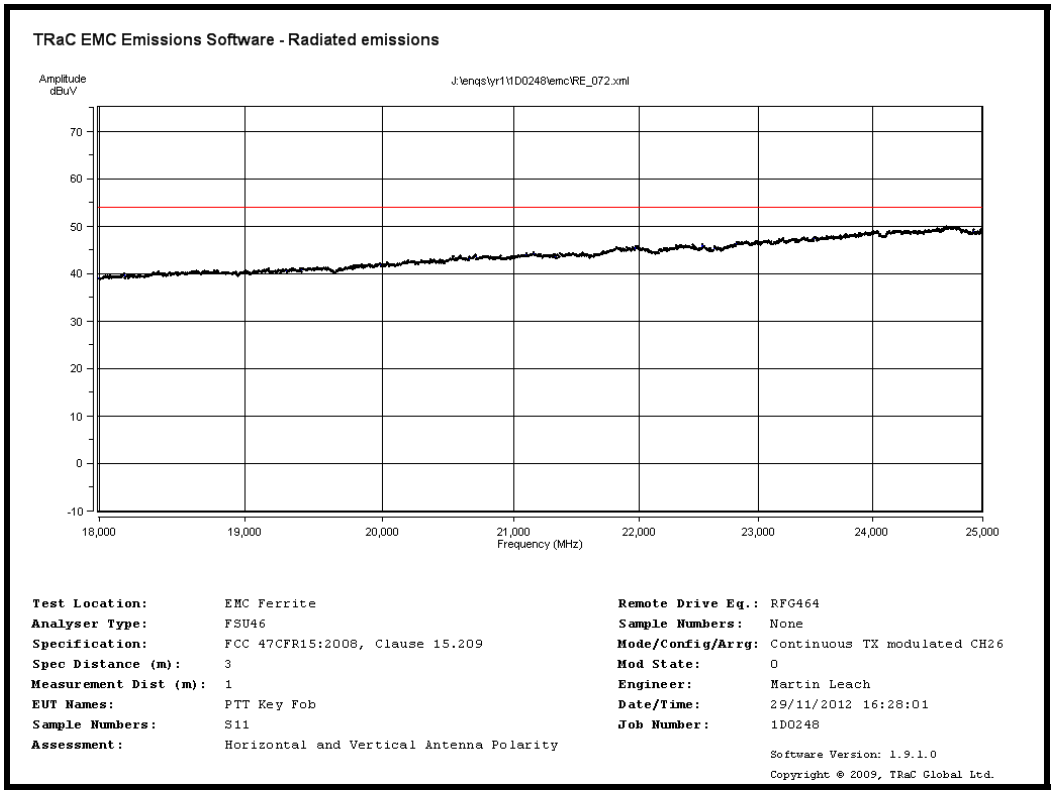
Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



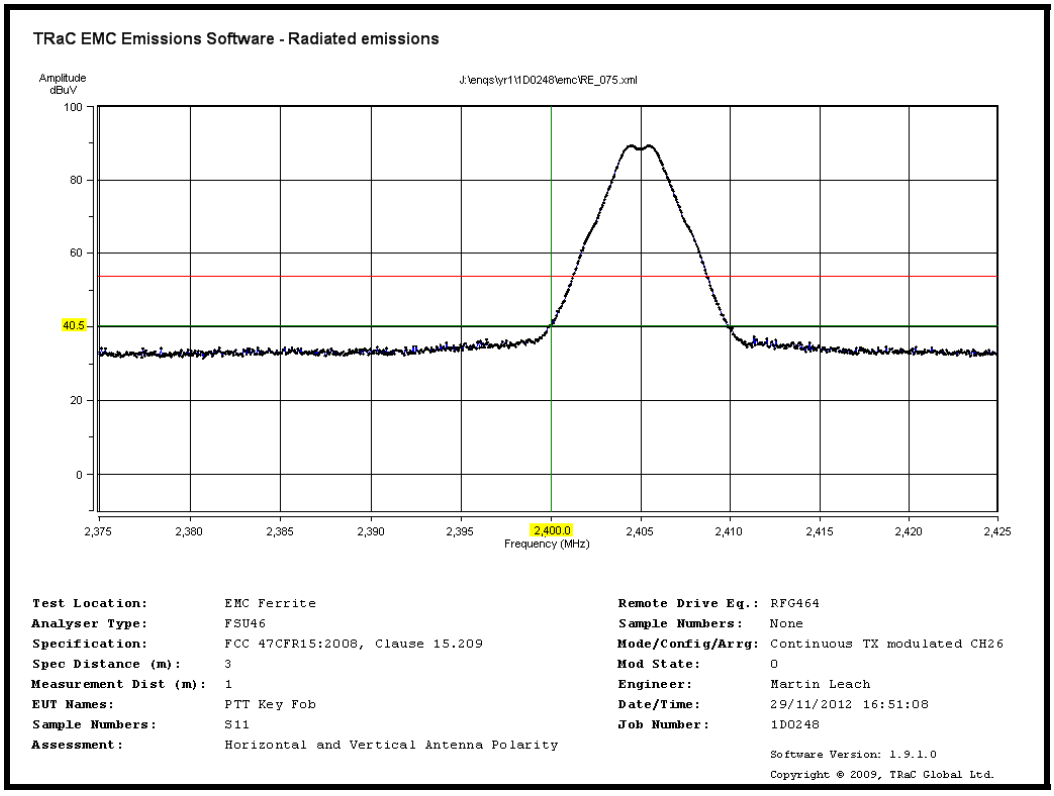
Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



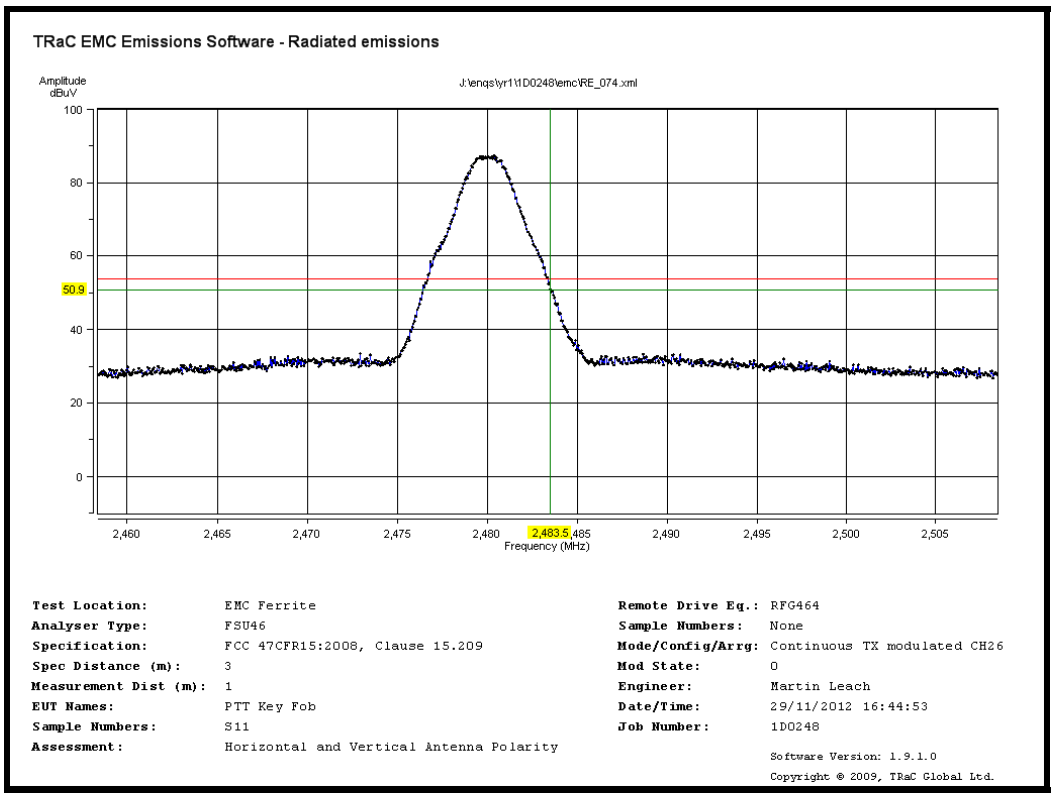
Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



Radiated Transmitter Emissions Channel 26 2480MHz (15.209)



Radiated Transmitter Emissions Channel 11 2405MHz (15.209) Band Edge Compliance



Radiated Transmitter Emissions Channel 26 2405MHz (15.209) Band Edge Compliance

Appendix C: Additional Test and Sample Details

This appendix contains details of:

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

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

Sample No: Sxx Mod w

where:

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

The following terminology is used throughout the test report:

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

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

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

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

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

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

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

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

C1) Test samples

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

Sample No.	Description	Identification
S14	CBU Radiated Sample	None
S18	CBU Conducted Sample	None

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

TRaC Identification	Description
	Test Laptop

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode: Transmit
Radiated Transmitter Spurious Emissions (Cabinet and Antenna radiation)	The EUT was transmitting on maximum power 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 Fc = 2405 + 5 (k - 11) in MHz

Test	Description of Operating Mode: Receive/Standby mode
Radiated Receiver spurious Emissions	The EUT was placed in continuous receive mode during the test.

C3) EUT Configuration Information.

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

C4) List of EUT Ports

The table below describes the termination of EUT ports:

Sample : S14/S18
Tests : all

Port	Description of Cable Attached	Cable length	Equipment Connected
Battery	2 core unscreened	1.5m	dc PSU
Serial data*	Multicore unscreened	20 cm	Laptop

*used only during setup

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:

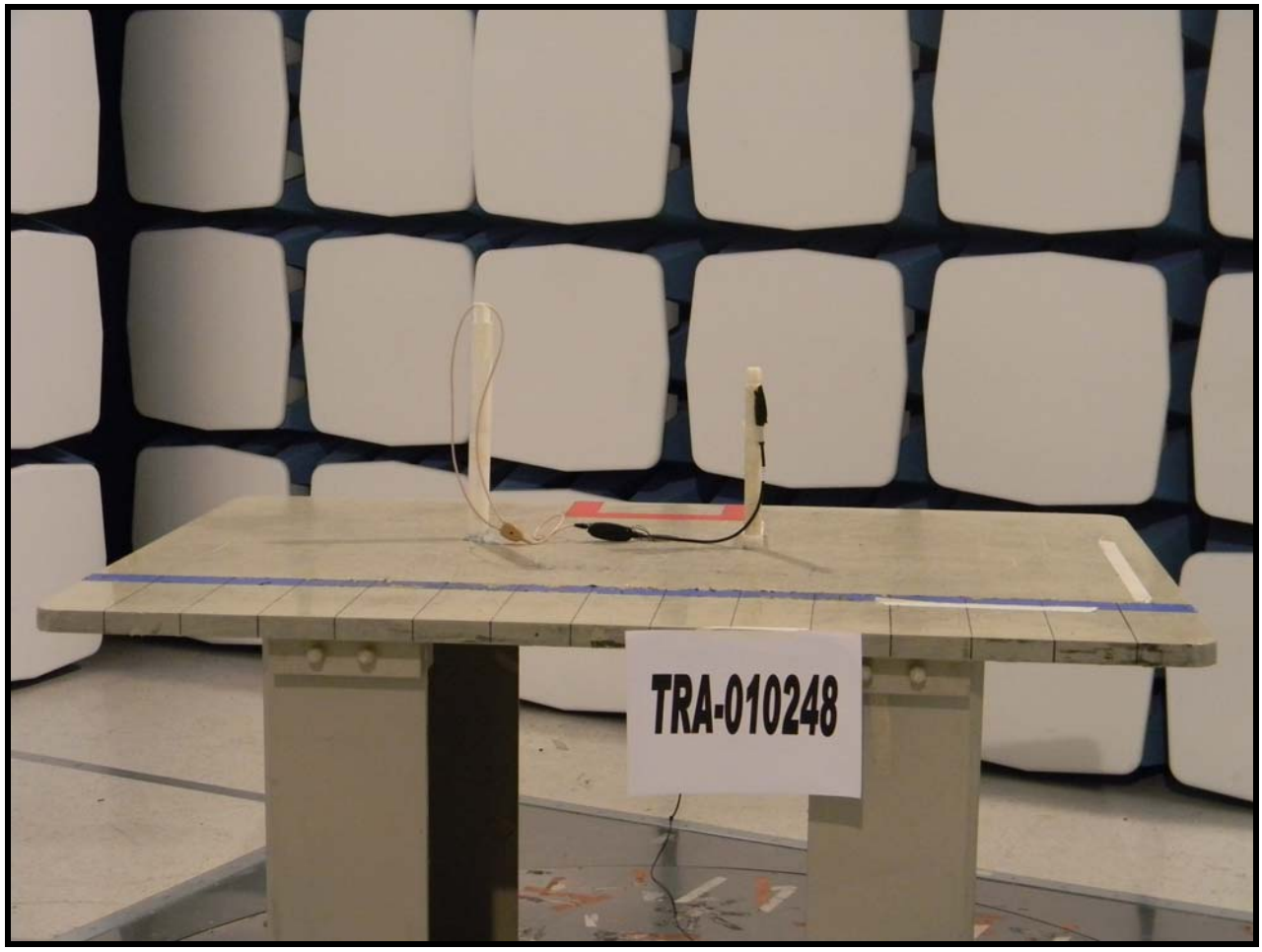
Lab 16				
RFG/REF No	Type	Description	Manufacturer	Date Calibrated
REF886	Lab 16	Large Anechoic Chamber	Rainford EMC systems	27/07/10
REF880	HL050	Log Perodic Antenna (1-26.5GHz)	R&S	14/05/10
913	HP8449B	Microwave Pre-Amp (1-26.5GHz)	HP	07/01/11
404	E4407B	Spectrum Analyser	Agilent	17/05/11
452	SMA	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

Appendix D: Additional Information

No additional information is included within this test report.

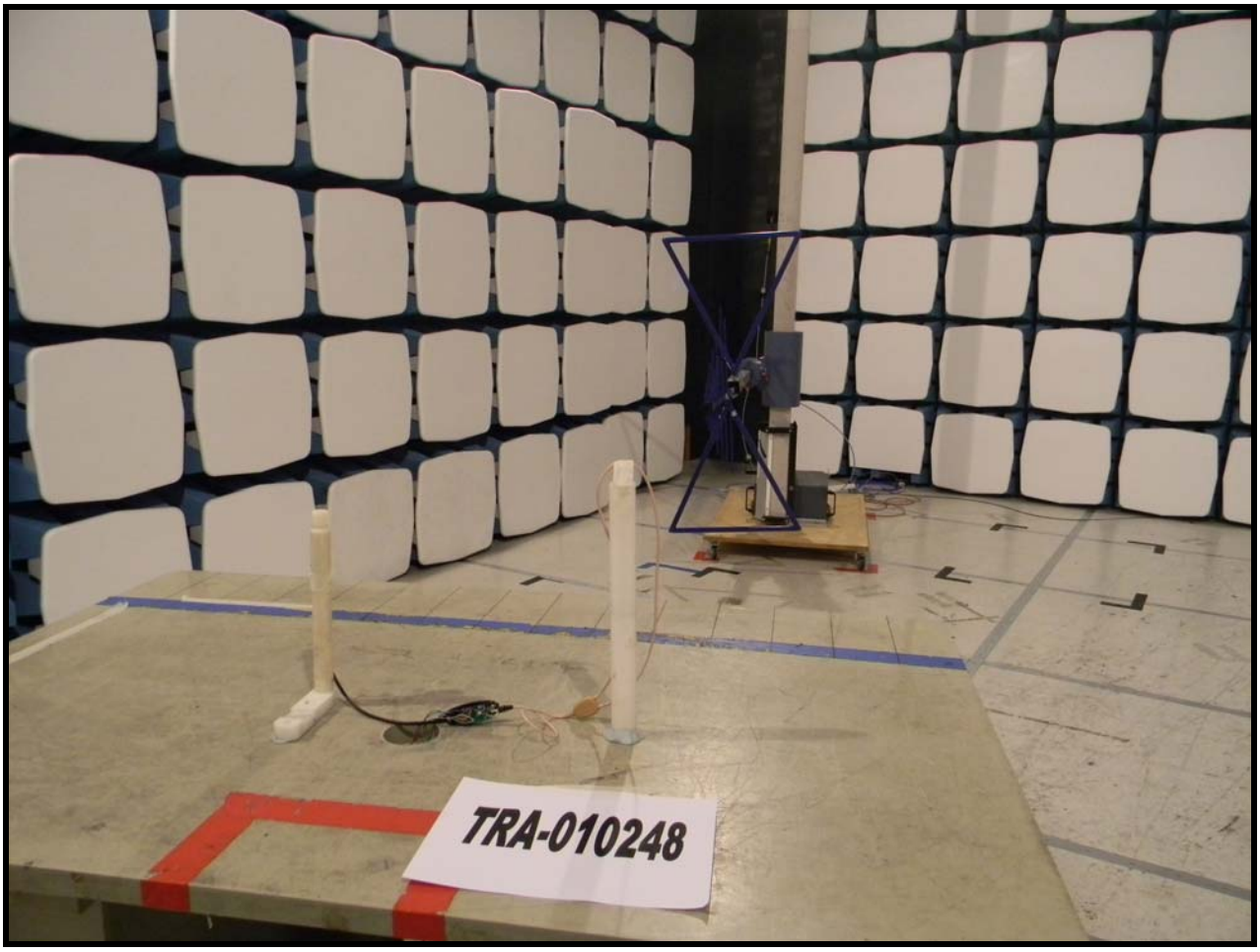
Appendix E: Photographs and Figures

Photograph 1 Radiated Spurious Emissions - Front View
Photograph 2 Radiated Spurious Emissions - Front View Close Up
Photograph 3 Radiated Spurious Emissions - Rear View



Photograph 1

Photograph 2



Photograph 3

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/cm^2 power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

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

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

where:
S = power density
EIRP = Equivalent Isotropic Radiated power
R = distance to the centre of radiation of the antenna

Sample No.	S14	
Maximum peak EIRP:	-9.0	dBm
Maximum peak EIRP:	0.13	mW
Power density limit	1	mW/cm^2
Prediction frequency:	2440	MHz

Result

Prediction Frequency (MHz)	Maximum peak EIRP: (mW)	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 1mW/cm^2
2480	0.13	1.000000	0.1

HULL
Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.
T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com
www.tracglobal.com