KTL EMC Test Report : 5G9250GUS2

Applicant : Serco Geografix Ltd

Apparatus : Field Management Unit (FMU2)

Authorised by :

K J Anderson, Principal EMC and Radio Group Engineer

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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.

Test performed by:

KTL
Saxon Way
Priory Park West
Hull HU13 9PB
United Kingdom

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806
Email: ktl@ktl.com
Web site: www.ktl.com

Tests performed by:

M. E. Leach Senior EMC and Radio Engineer

Report author: As above.

1.2 Tests Requested By

This testing in this report was requested by:

Serco Geografix Ltd
Hurricane Way
Norwich
NP6 6EW
United Kingdom

1.3 Manufacturer

As above.

1.4 Apparatus Assessed

The following apparatus was assessed between 22/11/06 and 13/12/06:

Field Management Unit (FMU2)

The above equipment was a battery powered hand held field-management unit as part of a curfew monitoring system. The equipment is primarily a site-monitoring unit used in a human electronic tag system, which has, transmit and receive capabilities. The units primary function is to transmit every 120 seconds + 15 seconds when the unit is powered on and to monitor RF transmissions from a Personal Identification Device (PID) attached to a human subject.

1.4 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
Manually Activated Transmitter Duration	Title 47 of the CFR : 2004, Part 15 Subpart (c) 15.231(a 1)	ANSI C63.4: 2003	PASS
Automatically Activated Transmitter Duration	Title 47 of the CFR : 2004, Part 15 Subpart (c) 15.231(a 2)	ANSI C63.4: 2003	PASS
None Periodic Operation And Maximum Transmission Duration in 1 Hour	Title 47 of the CFR : 2004, Part 15 Subpart (c) 15.231(a 3)	ANSI C63.4: 2003	PASS
Transmitter 20dB Bandwidth	Title 47 of the CFR : 2004, Part 15 Subpart (c) 15.231(c)	ANSI C63.4: 2003	PASS
Transmitter Fundamental Field Strength	Title 47 of the CFR :2004, Part 15 Subpart (c) 15.231(b)	ANSI C63.4: 2003	PASS
REFE	Title 47 of the CFR : 2004, Part 15 Subpart (c) 15.231(b1,b2,b3)	ANSI C63.4: 2003	PASS

Abbreviations used in the above table:

Mod : Modification
CFR : Code of Federal Regulations
REFE : Radiated Electric Field Emissions
ANSI : American National Standards Institution

1.5 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.

KTL Hull is a listed electromagnetic compatibility Conformance Assessment Body (CAB) for EC access to the US market. (Decision No 3/2000 of the Joint Committee established under the Agreement on Mutual Recognition between the European Community and the United States of America. This decision was effective from 16th January 2001).

FCC Facility Registration number (3m semi anechoic chamber) : 90743

1.6 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2: Measurement Uncertainty

2.1 Introduction

The standard ISO/IEC 17025 used for laboratory accreditation requires laboratories to estimate measurement uncertainty using accepted methods of analysis.

Where required, the reported expanded uncertainty is based on a standard uncertainty providing a confidence level of approximately 95%.

Measurement uncertainty is calculated using the methods defined in the NAMAS document NIS81: May 1994.

KTL measurement uncertainty is recorded in the KTL document UNC/RFG/001 Issue 16.

2.2 Application of Measurement Uncertainty

The following procedure is used when determining the result of a measurement :

(i) If specification limits are not exceeded by the measured result, extended by the positive component of the expanded uncertainty interval at a confidence level of 95%, then a pass result is recorded.

(ii) Where a specification limit is exceeded by the result even when the result is decreased by the negative component of the expanded uncertainty interval, a fail result is recorded.

(iii) Where measured result is below a limit, but by a margin less than the positive measurement uncertainty component, it is not possible to record a pass based on a 95% confidence level. However, the result indicates that a pass result is more probable than a fail result.

(iv) Where a measured result is above a limit, but by a margin less than the negative measurement uncertainty component, it is not possible to record a fail based on a 95% confidence level. However the result indicates that a fail is more probable than a pass.

2.3 Measurement Uncertainty Values

For the test data recorded in accordance with note (iii) of Section 2.2 the following measurement uncertainty was calculated :

Test type	Quantity	Quantity range	Expanded uncertainty
Radiated electric field emissions at the 3m alternative test site	Amplitude	30MHz to 300MHz Horizontal	±5.0 dB
		30MHz to 300MHz Vertical	±4.7 dB
		300MHz to 1000MHz Horizontal	±5.2 dB
		300MHz to 1000MHz Vertical	±5.6 dB

Section 3: Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment.

Appendix A: Formal 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
Pol	: Polarisation	Freq	: Frequency
H	: Horizontal Polarisation	Av	: Average Detector
V	: Vertical Polarisation	SD	: Spec Distance
Pk	: Peak Detector	MD	: Measurement Distance
QP	: Quasi-Peak Detector	VBW	Video Bandwidth
RBW	Resolution Bandwidth		

A1 Radiated Electric Field Emissions

Preliminary radiated electric field emissions testing was performed using a peak detector in an absorber lined screened room.

The following test site was used for final measurements as specified by the standard tested to :

10m 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 Transmitting 62.5ms every second	
Regulation	Title 47 of the CFR :2004, Part 15 Subpart (c) Clause 15.231(b)
Measurement standard	ANSI C63.4:2003
Frequency range	9KHz to 5GHz
EUT sample number	S06
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix E)	Photograph 1

The worst case radiated emission measurements are listed below:

Ref No.	Freq (MHz)	Det.	Angle Deg.	Height (cm)	Pol	MD (m)	Result at MD (dBμV/m)	Spec. Limit (dBμV/m)	Margin (dB)	Summary
1	128.002[3]	QP	135	100	V	3	32.7	43.5	-10.8	Pass
2	128.002[3]	PK	135	100	V	3	35.2	63.5	-28.3	Pass
3	160.003	QP	50	100	V	3	33.0	60.8	-27.8	Pass
4	160.003	PK	50	100	V	3	35.8	60.8	-25.0	Pass
5	433.898	Pk*	228	108	V	3	74.7	80.8	-6.1	Pass
6	480.000	QP	148	100	V	3	32.9	60.8	-27.9	Pass
7	480.000	Pk	148	100	V	3	38.2	60.8	-22.6	Pass
8	867.796	QP	319	100	V	3	37.8	60.8	-23.0	Pass
9	867.796	Pk	319	100	V	3	44.6	60.8	-16.2	Pass
10	1301.820[3]	Pk	127	100	V	3	52.2	74.0	-21.8	Pass
11	1301.820[3]	Av[2]	127	100	V	3	48.1	54.0	-5.9	Pass
12	2169.480	Pk	148	100	H	3	51.5	60.8	-9.3	Pass
13	2169.480	Av[2]	148	100	H	3	47.4	60.8	-13.4	Pass
14	2603.470	Pk	289	127	V	3	55.7	60.8	-5.1	Pass[4]
15	2603.470	Av[2]	289	127	V	3	51.6	60.8	-9.2	Pass
16	3037.570	Pk	208	100	H	3	55.3	60.8	-5.5	Pass[4]
17	3037.570	Av[2]	208	100	H	3	51.2	60.8	-9.6	Pass
18	3471.170	Pk	238	100	H	3	55.3	60.8	-5.5	Pass[4]
19	3471.170	Av[2]	238	100	H	3	51.2	60.8	-9.6	Pass

*Fundamental Carrier power
[1]See section 2.2 Note (iii).
[2]See Appendix F for peak detector to average correction factor.
[3]Emission within section 15.205 restricted bands of operation
[4]*See section 2.2 Note (iii).

Notes:

1. Testing below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.4:2003 section 8.2.1. Testing from 30MHz to 1GHz was in accordance with ANSI C63.4:2003 section 8.2.3 and testing above 1 GHz was in accordance with ANSI C63.4:2003 section 8.2.4
2. All other emissions in the restricted bands defined in 47CFR15.205(a) were greater than 10 dB below the 47CFR15.209 limit.
3. In accordance with section 15.231 (b) the maximum permitted fundamental field strength at 3 meters is :
4. $$uV/m \text{ at 3 meters} = 41.6667(f) - 7083.333$$

   Where (f) is in MHz

   10996.68uV/m = 80.83dBμV/m

5. In accordance with 15.231(b), the maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level
6. . The lowest operating frequency of the EUT was 32.4 KHz and a declaration from the client is contained in Appendix D of this test report. Therefore the lowest measurement frequency range was decided according to 47 CFR 15:2004 part 15 (a) section15.33. Plots are contained in Appendix B of this test report
7. The highest operating frequency of the EUT was 433.92MHz and a declaration from the client is contained in Appendix D of this test report. Therefore the highest measurement frequency range was decided according to 47 CFR 15:2004 part 15 (a) section15.33. Plots are contained in Appendix B of this test report

Radiated emission limits (47 CFR 15:2004 Clause 15.231 (b) for the maximum permitted fundamental field strength and the maximum permitted unwanted emission levels:

Fundamental Frequency (MHz)	Field strength of Fundamental (μV/m)	Field strength of Spurious Emissions (μV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250
Above 470	12500	1250

** Linear interpolations

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strength are as follows: for the band 130-174MHz, uV/m at 3 meters = 56.81818(F)-6136.3636; for the band 260-470MHz, uV/m at 3 meters = 41.6667(F)-7083.3333. The maximum permitted unwanted emission level is 20dB below the maximum permitted level.

Radiated emission limits (47 CFR 15:2004 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	210	3	46.4
Above 960	500	3	54.0

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 (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

A2 Transmitter 20dB Bandwidth

Title 47 of the CFR: 2004, Part 15 Subpart (c) 15.231(c) requires the measurement of the occupied bandwidth of the transmitted fundamental frequency. The bandwidth is determined at the point's 20dB down from the modulated carrier. To determine the occupied bandwidth a RBW of 30KHz and a VBW three times greater than the RBW (100KHz) was used. The spectrum analyser was then set to take a peak hold measurement. The peak level was found and set to a 0dB reference point and markers offset by -20dB determined the bandwidth. The formal measurements are detailed below:

Test Details Normal operating mode	
Regulation	Title 47 of the CFR :2004, Part 15 Subpart (c) 15.231(c)
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Measured 20 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
0.1658	1.0848	0.919	Pass

Plots of the 20 dB bandwidth are contained in Appendix B of this test report.

A3 Transmitter Transmission Duration and Operation.

Title 47 of the CFR: 2004, Part 15 Subpart (c) 15.231(a) requires the following conditions to comply with the provisions for periodic operation:

Measurements of the transmission duration of a manually activated transmitter; measurements of the transmission duration for a automatically activated transmitter. Measurements to determine none periodic operation over four consecutive transmissions confirming the time between each transmission is not the same and confirmation the total transmission time duration does not exceed two seconds per hour. Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 300KHz and a video Bandwidth of 1MHz the sweep time was set accordingly to capture the transmission duration times and the total transmission time duration over 60 minuets. The formal measurements are detailed below

Test Details: Normal operating mode	
Regulation	Title 47 of the CFR :2004, Part 15 Subpart (c) 15.231(a1, a2, a3)
EUT sample number	S10
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Manually Activated Transmitter Duration (Seconds)	Limit (Seconds)	Margin (Seconds)	Result
3.75	5	1.25	Pass

Automatically Activated Transmitter Duration (Seconds)	Limit (Seconds)	Margin (Seconds)	Result
0.06	5	4.94	Pass

Four consecutive Automatically Activated Transmissions	None Periodic Operation (Seconds)	Result
1	136.5	Pass
2	129.0	
3	133.5	
4	129.0	

Maximum transmission period is 120seconds, therefore

Number of transmissions in 1 hour (albeit periodic for this example):

(60 x 60) seconds 3600 seconds

3600/120 = 30 individual transmissions in the 1-hour allocated.

Each transmission = 62.5ms,

Therefore
30 x 62.5ms = 1.875s maximum.

Recorded Transmission Time Duration In 1 Hour:

Total Transmission Time Duration In 1 Hour (Seconds)	Limit (Seconds)	Margin (Seconds)	Result
1.875	2	0.125	Pass

Plots of the transmission duration, non-periodic operation transmissions and total transmission time in 60 minuets are contained in Appendix B of this test report.

Appendix B: **Supporting Graphical Data**

This appendix contains graphical data obtained during testing.

Notes:

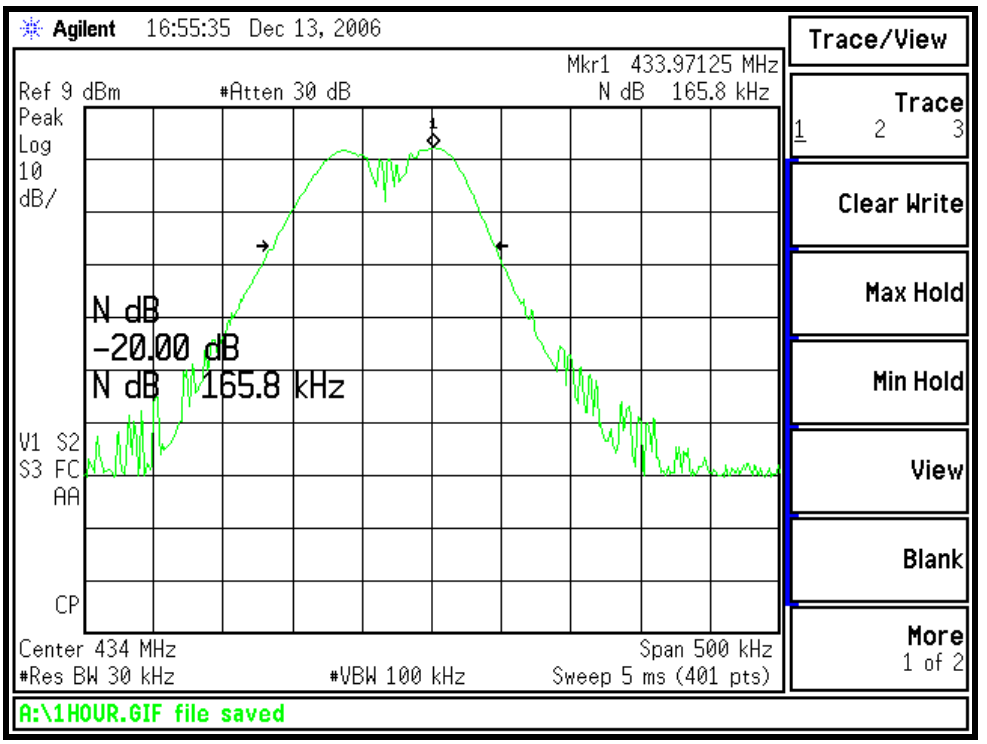
(a) The radiated electric field emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A.

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

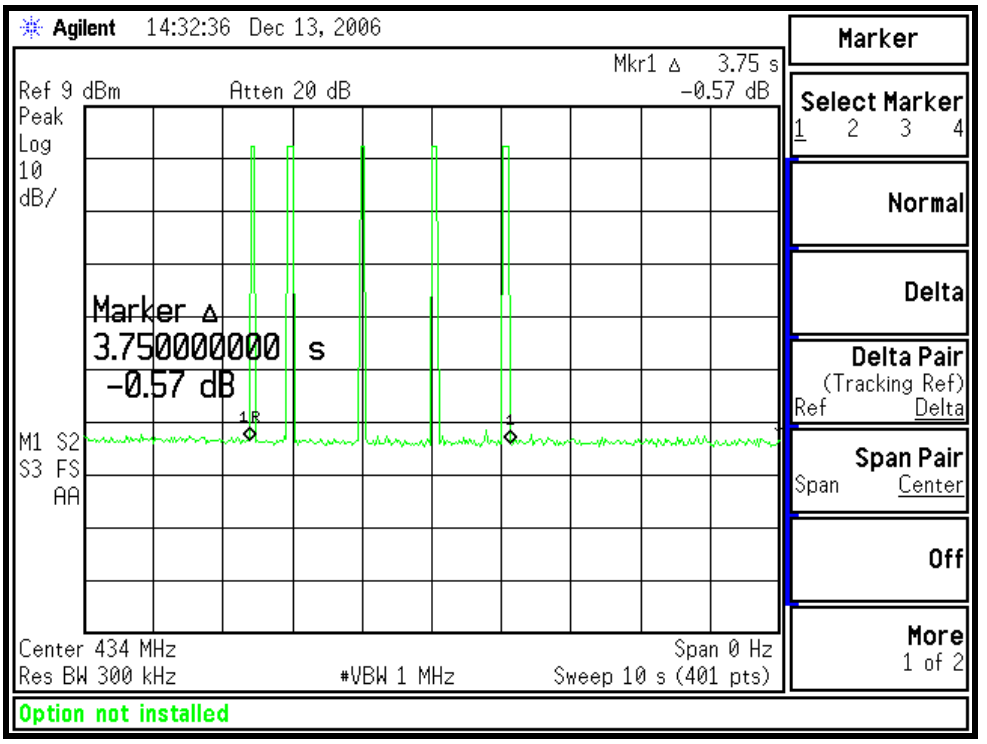
(c) Appendix C details the numbering system used to identify the sample and its modification state.

(d) 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.

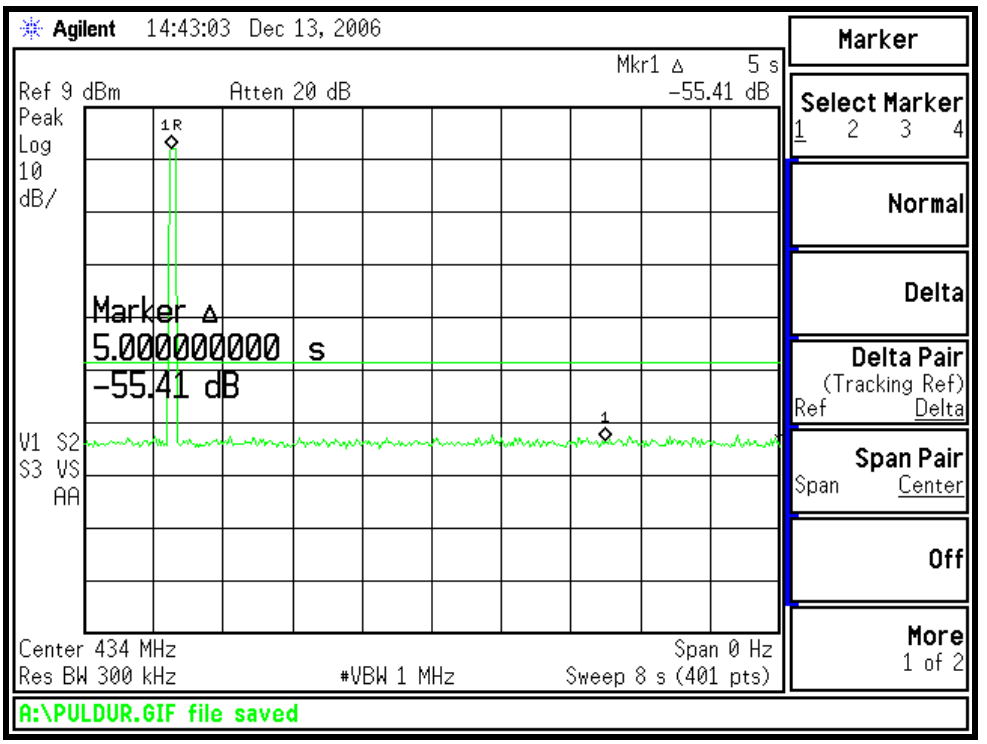
(e) The limit line shown on the radiated emission plots is the15.209 limit for general requirements; any emissions detected within the restricted bands of operation (defined in section 15.205) were formally assessed against the 15.209 limits. All emissions outside the restricted band were formally assessed against the limits in 15.231(b).



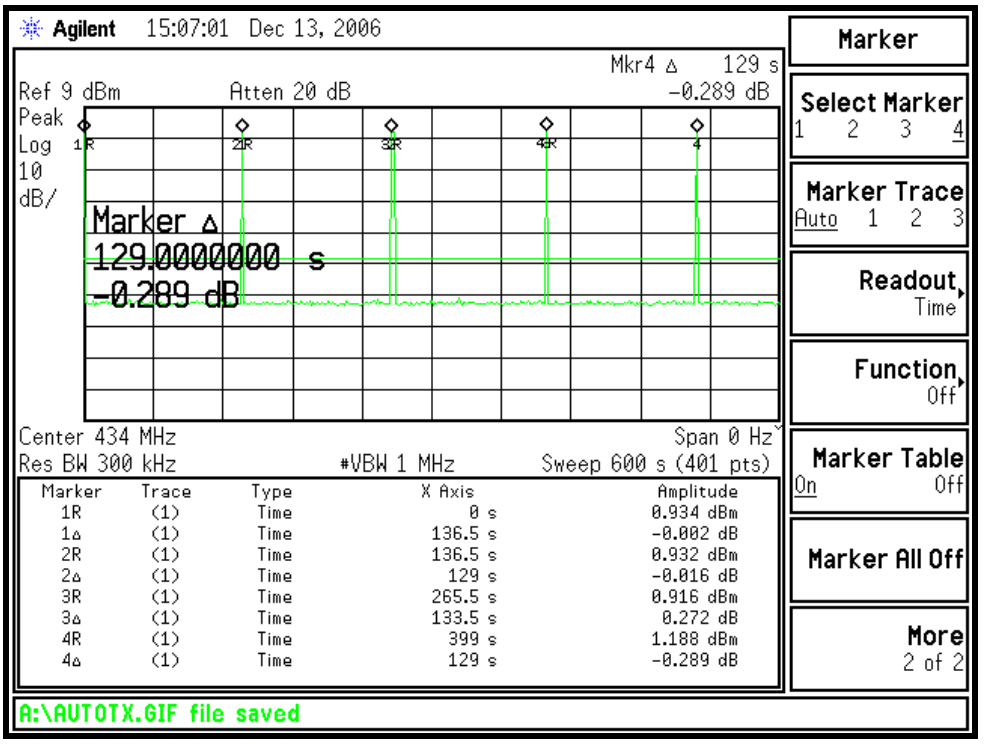
20 dB Bandwidth from the modulated carrier



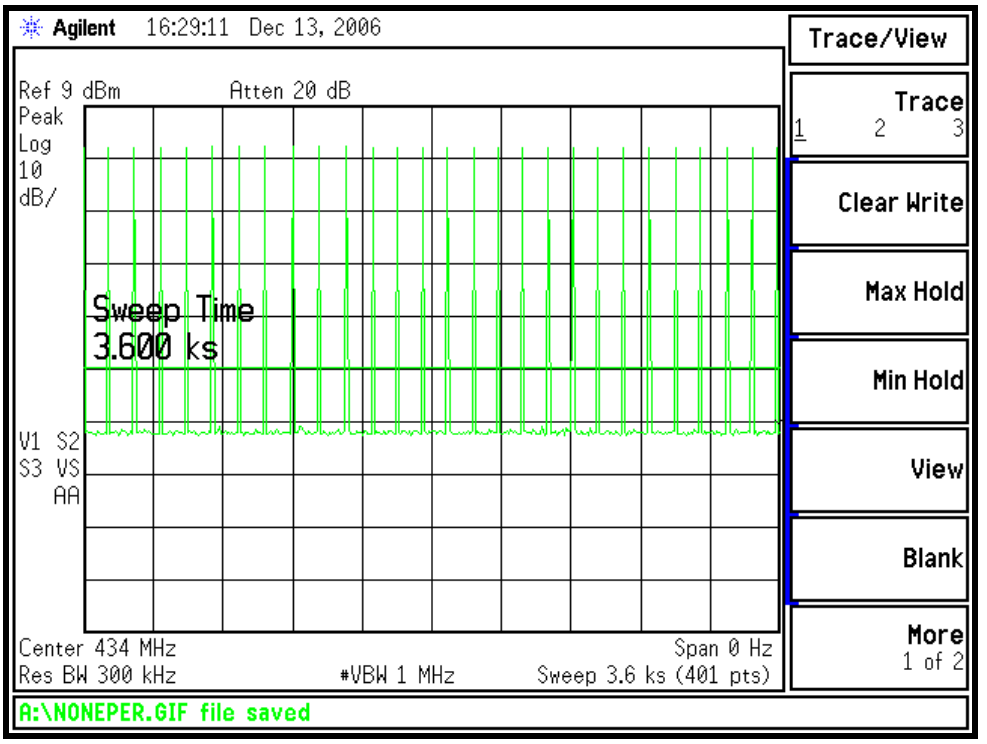
Manually Activated Transmitter Duration



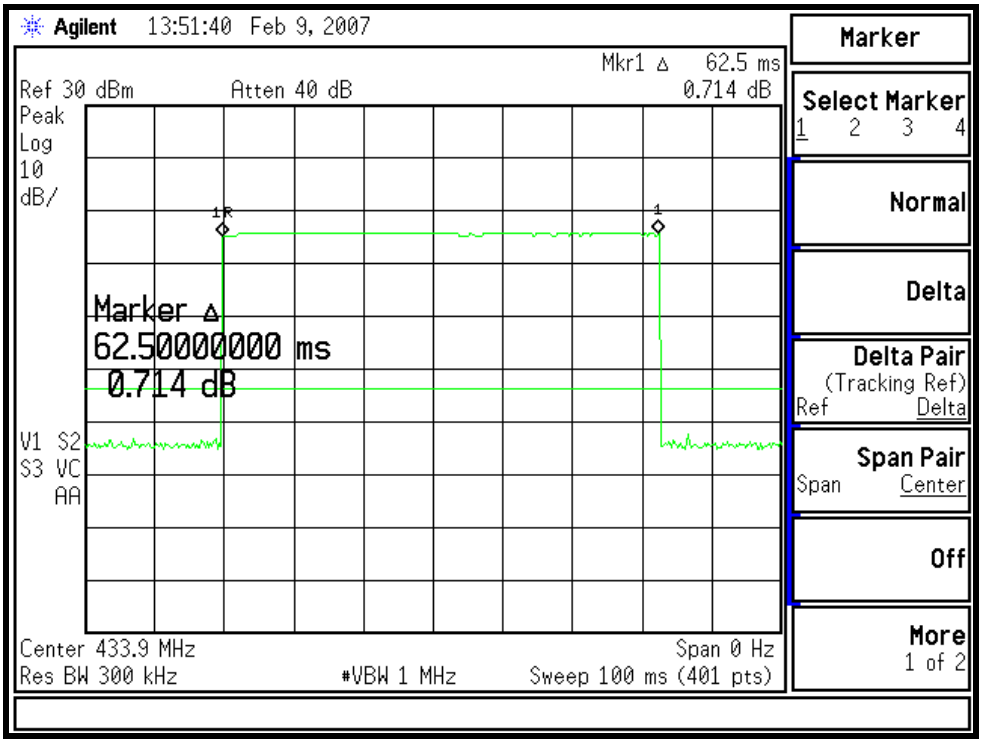
Automatically Activated Transmitter Duration



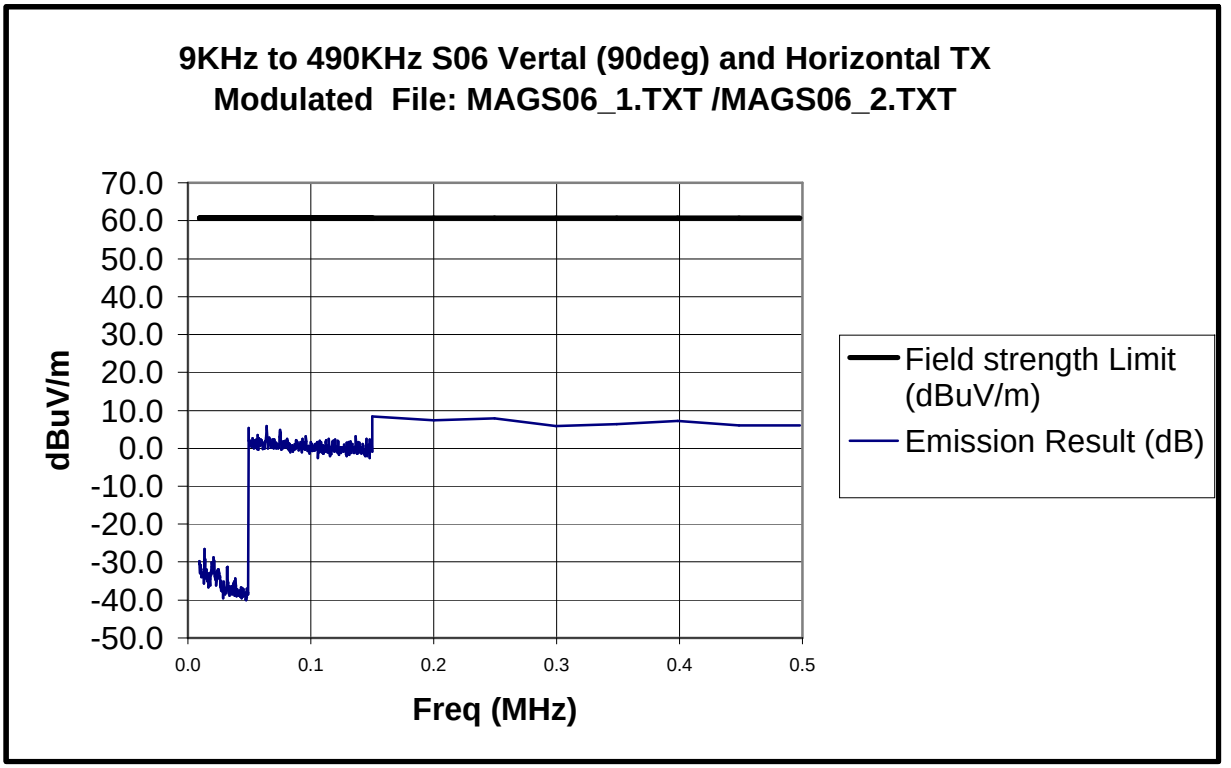
None Periodic Operation



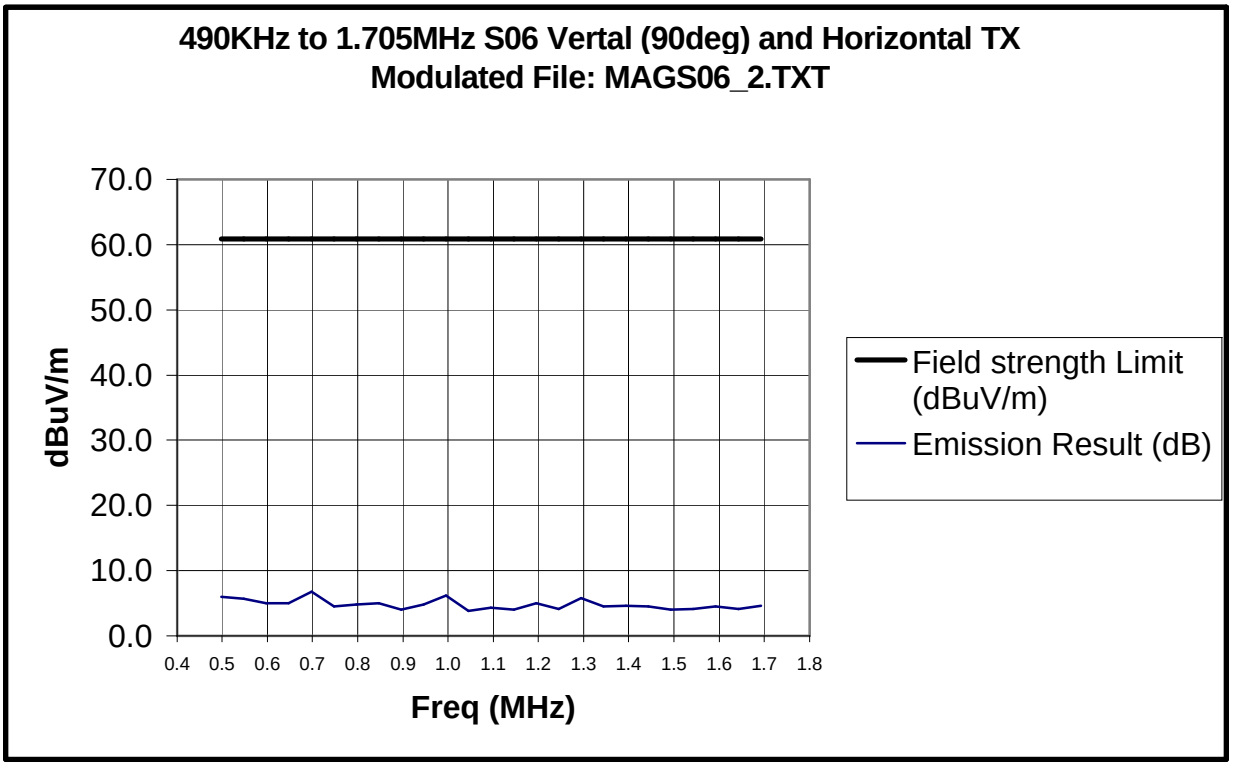
Total Transmission Time Duration In 1 Hour



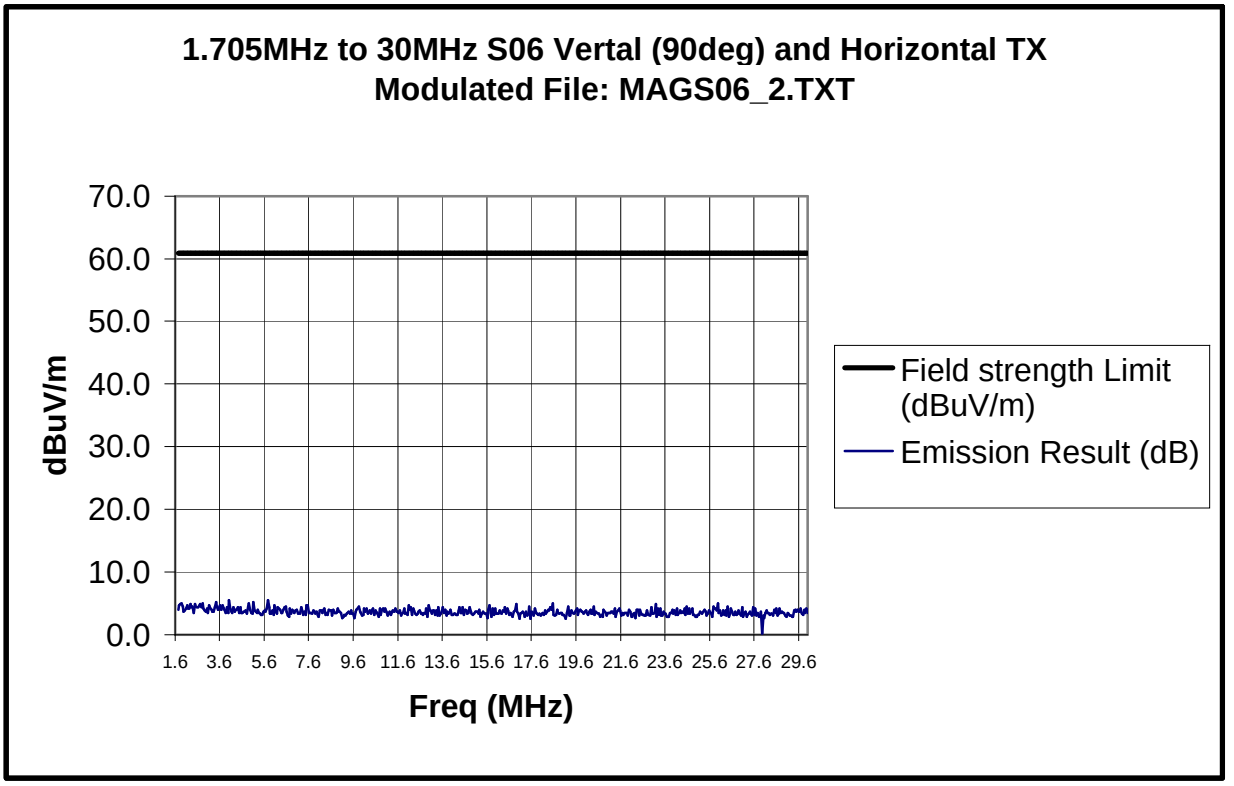
Transmitter Pulse Duration And Duty Cycle



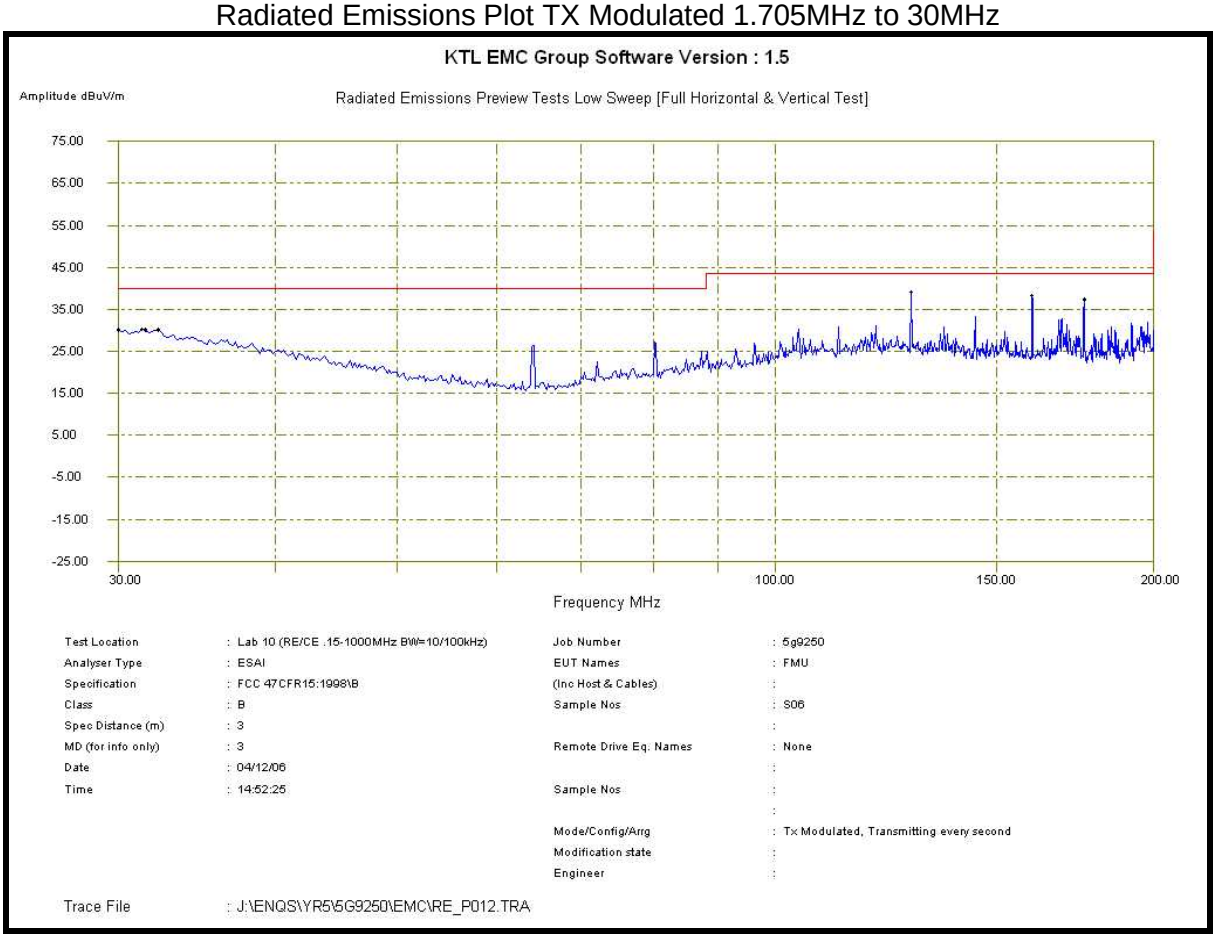
Radiated Emissions Plot TX Modulated 9KHz to 490KHz



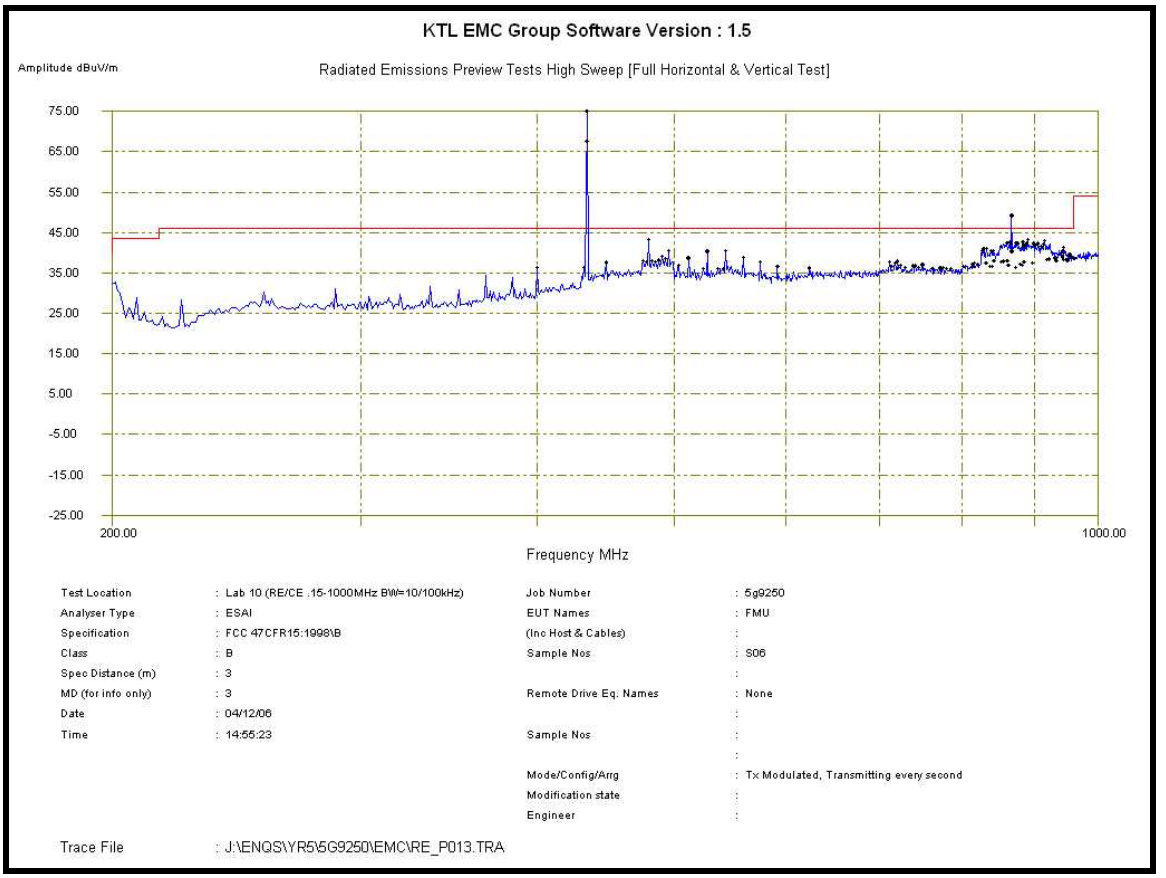
Radiated Emissions Plot TX Modulated 490KHz to 1.705MHz



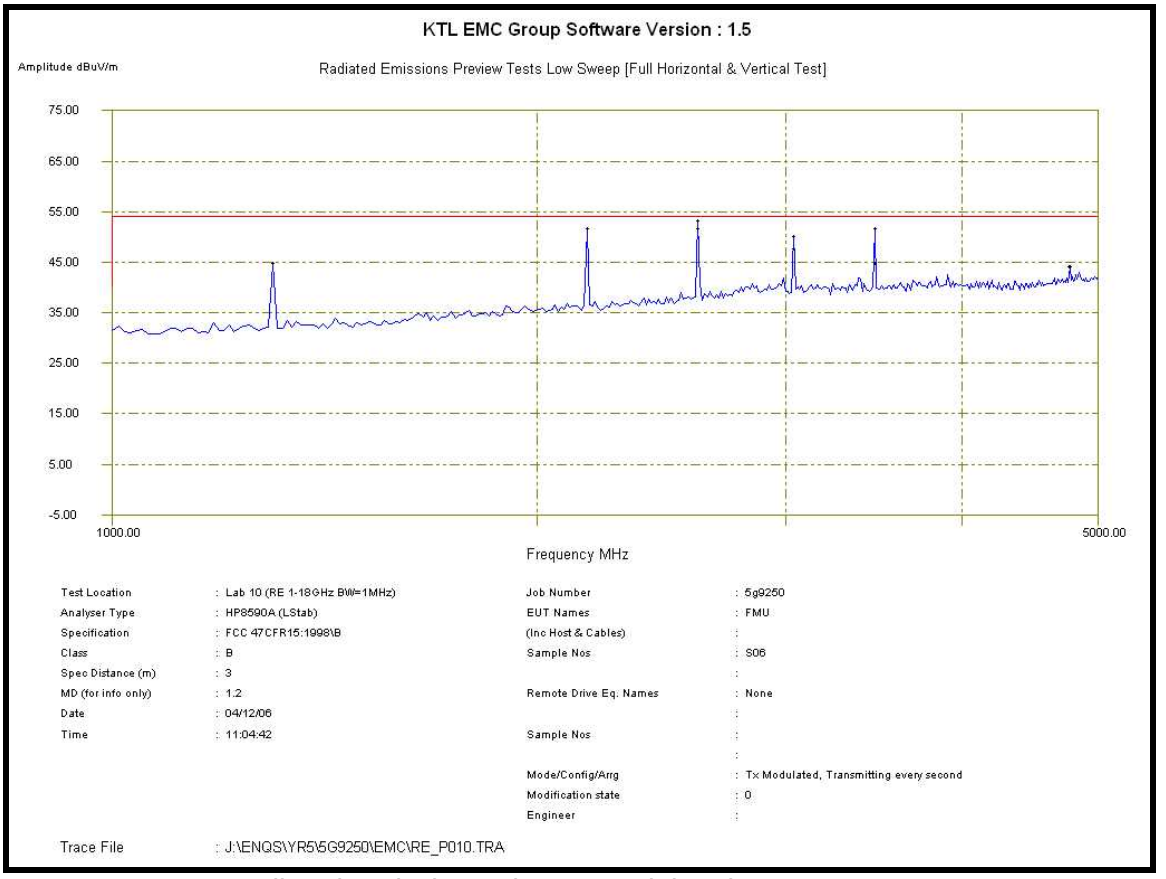
Radiated Emissions Plot TX Modulated 1.705MHz to 30MHz



Radiated Emissions Plot TX Modulated 30MHz to 200MHz



Radiated Emissions Plot TX Modulated 200MHz to 1000MHz



Radiated Emissions Plot TX Modulated 1GHz to 5GHz

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 KTL upon request.

C1) Test samples

The following samples of the apparatus were submitted for testing :

Sample No.	Description	Identification
S06	433.92MHz Field Management Unit (FMU2)Firmware: V1.17	1412
S10	433.92MHz Field Management Unit (FMU2)Firmware: V3.0	1395

C2) EUT Operating Mode During Testing.

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

Test	Description of Operating Mode S06 (Transmitting 62.5ms every second)
REFE	Modulated transmission, transmitting 62.5ms every second.
20dB Occupied Bandwidth	

Test	Description of Operating Mode S10 (Normal Operating Mode)
Manually Activated Transmitter Duration	Modulated transmission, transmitting 62.5ms for a maximum of 5 seconds. (Panic alarm mode)
None Periodic Operation	Modulated transmission, transmitting 62.5ms every 120 seconds plus 15 seconds. (Normal operating mode)
Automatically Activated Transmitter Duration	
Transmission Duration Pulse duration	
Total Transmission Time Duration In 1 Hour	
Duty Cycle	

C3) EUT Configuration Information.

The EUT's were submitted for testing in one single possible configuration.

Test	Configuration
S06	EUT was submitted for testing in one single possible configuration.
S10	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 : S06 and S10
Tests : ALL.

Port	Description of Cable Attached	Cable length	Equipment Connected
DC/RS232 Input	Un-terminated	N/A	N/A
External IR Wand	Un-terminated	N/A	N/A
Antenna	1/4 wave whip antenna, with the BNC shroud acting as a ground plane	NA	Antenna

C5) Details of test equipment used

For Radiated Electric Field Emissions 9KHz to 1GHz:

RFG No	Type	Description	Manufacturer	Date Calibrated.
274	ATS	Ferrite Lined Chamber	KTL	24/05/05
231	CBL6111	Blue Bilog Antenna (0.03 - 1GHz)	Chase	10/05/00
023	HFH2-Z2	Magnetic Loop Antenna	R & S	03/04/02
214	ESAI	Spec Analyser/Test Rxer (LF/HF)	R & S	21/11/06
127	HP8563E	Spectrum Analyser	HP	31/10/06
249	N-type	RF coaxial cable (Lab 10)	KTL	12/08/05
255	N-type	RF coaxial cable (Lab 10)	KTL	12/08/05
270	N-type	RF coaxial cable (Lab 10)	KTL	12/08/05

For Radiated Electric Field Emissions 1GHz to 5GHz

RFG No	Type	Description	Manufacturer	Date Calibrated
274	ATS	Ferrite Lined Chamber	KTL	24/05/05
129	3115	Horn Antenna	EMCO	29/07/98
307	HP8449B	Microwave Pre-Amp (1-26.5GHz)	HP	09/02/04
311	-	Sucoflex uW Adapter Cable 1m	Suhner	21/12/04
139	N-104	Sucoflex uW Cable 2m	Suhner	21/12/04
158	N-106	Sucoflex uW Cable 6m	Suhner	21/12/04
404	E4407B	Spectrum Analyser	Agilent	25/01/06

For Transmitter 20dB Bandwidth

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

For Duty Cycle correction factor

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

Manually Activated Transmitter Duration

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

None Periodic Operation

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

Automatically Activated Transmitter Duration

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

Transmission Duration Pulse duration

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

Total Transmission Time Duration In 1 Hour

RFG No	Type	Description	Manufacturer	Date Calibrated
404	E4407B	Spectrum Analyser	Agilent	25/01/06

Appendix D: Additional Information

The following information is a copy of an E-Mail from the client confirming the intentional radiator operates below 10GHz and also the confirmation of the lowest frequency used within the EUT:

Hi Martin

As discussed, the highest frequency of operation for the FMU is 433.92MHz (transmitter frequency) and similarly the lowest frequency of operation is 32.4 KHz for RTC.

With kindest regards

Anil

The following information is a copy of an E-Mail from the client confirming that the EUT does not transmit while the charger is connected:

Good morning Martin
Yes. Now the EUT won't transmit at all during charging.
Many thanks
Anil
-----Original Message-----
From: meleach@ktl.com [mailto:meleach@ktl.com]
Sent: 07 December 2006 09:47
To: Anil Fasiludeen
Subject: Receive mode

Good morning Anil,
I believe Mark Render sent you an email regarding the total TX time exceeding 2s yesterday, which was tested on the sample with a normal operating mode. I understand that the EUT will now no longer transmit when charging, can you confirm which of the samples does this as we require for the Canadian standards the radiated emissions when the EUT is in RX/Standby mode.

Best regards
Martin
KTL
Saxon Way, Priory Park West, Hull, HU13 9PB
Tel: 01482 801801 Fax: 01482 801806
Email: info@ktl.com Website: www.ktl.com

The following information is a copy of an E-Mail from the client confirming that the EUT will transmit every 120 seconds +15 seconds

Hi Martin

As discussed, here is the sample EUT for FCC test. (ID no is 1395 and firmware version no 3.0)
Just to confirm now it will only transmit every 120+15 seconds during its normal mode of operation.
Also, it won't transmit at all whilst charging.

Please don't hesitate to contact me, if you have any more questions.

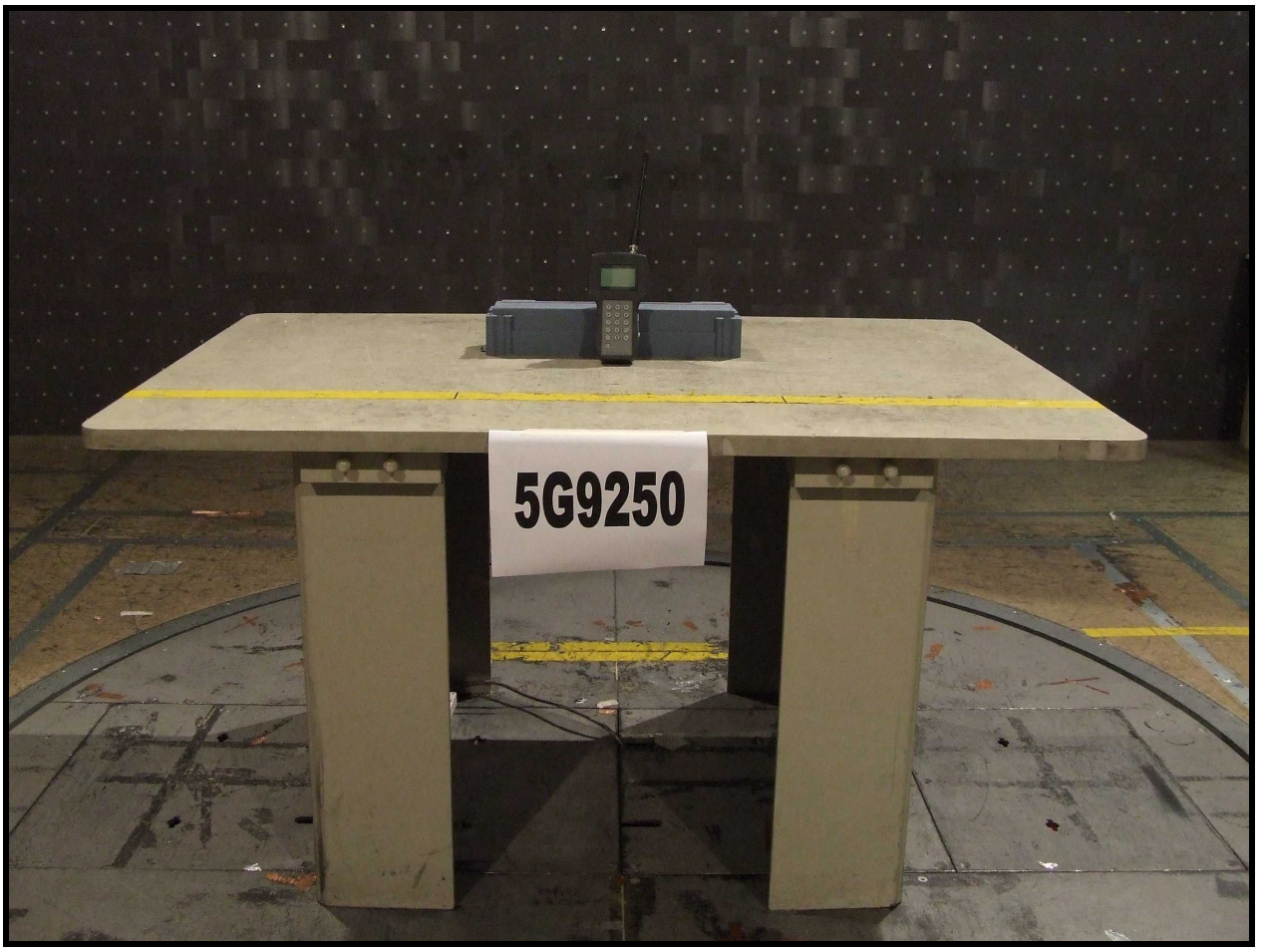
With kindest regards

Anil

Appendix E: Photographs and Figures

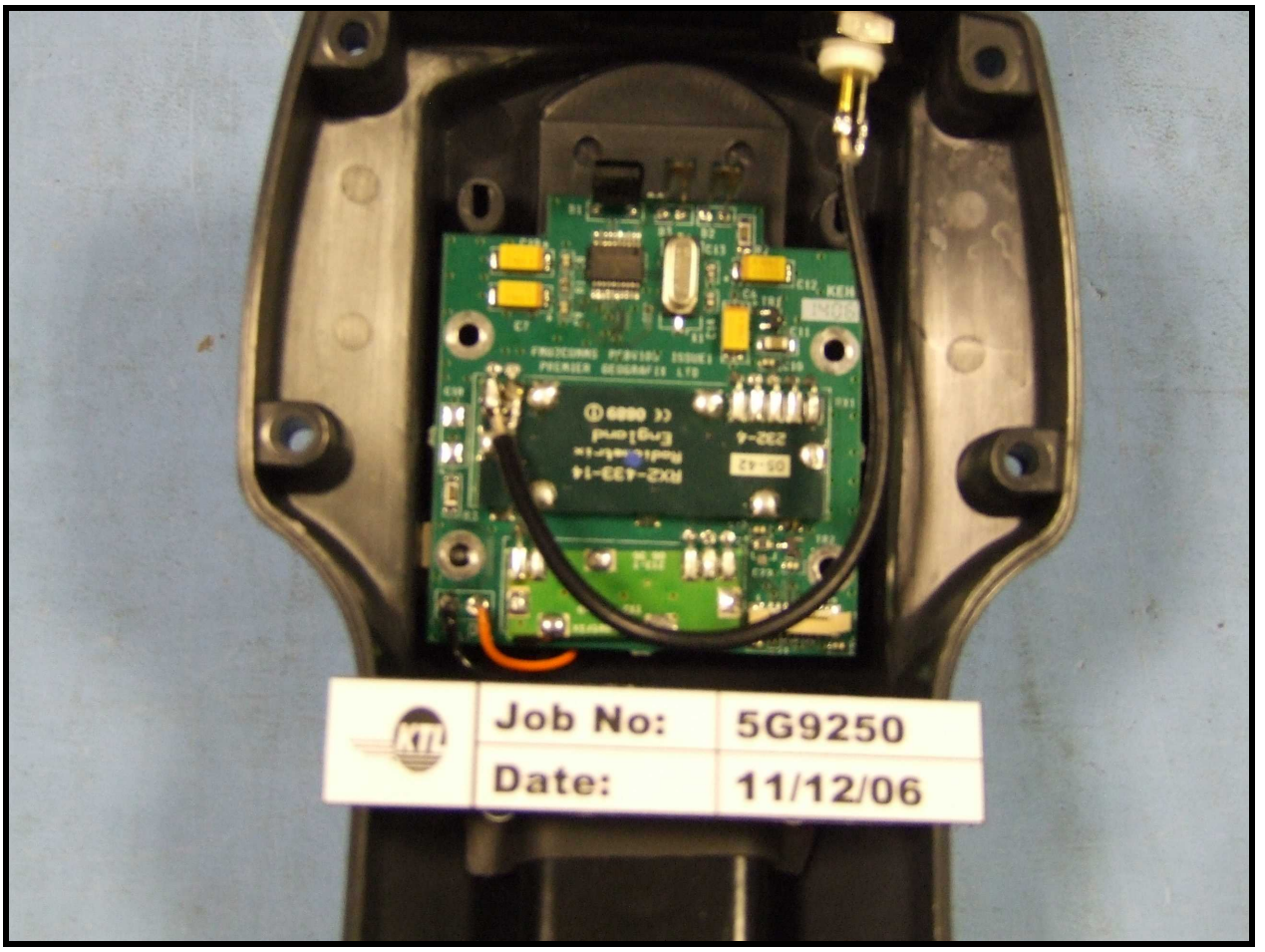
The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: front view.
2. Radiated electric field emissions arrangement: rear view.
3. Photo of the RF module front view
4. Photo of the RF module rear view

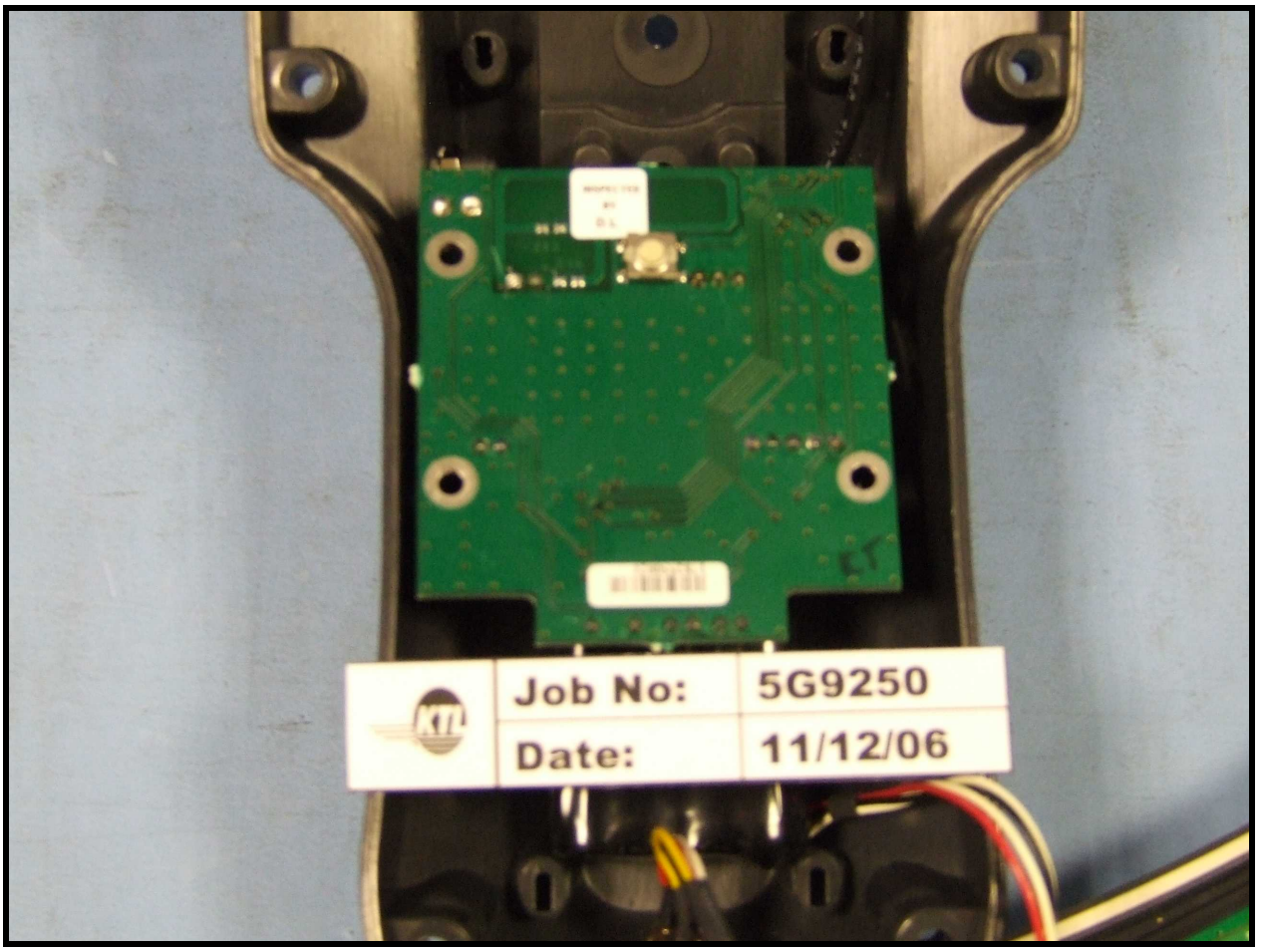


Photograph 1

Photograph 2



Photograph 3



Photograph 4

Appendix F: Calculation of the duty cycle correction factor

As the EUT will transmit pulsed periodic transmissions; the radiated emission measurements requiring an average detector function above 1000MHz were made using a peak detector. The formal measured emissions were then corrected using a calculated duty cycle factor in accordance with ANSI 63.4-2003 Annex H.4j

To determine the length pulse train the EUT was configured so that the pulse train was transmitted continuously. Using a spectrum analyser in zero span mode, centred on the fundamental carrier frequency with a RBW of 300KHz and a video Bandwidth of 1MHz the sweep time was set accordingly to capture the pulse train. The transmit pulsewidths and period was measured and the sweep time was then extended to 20 seconds to determine if the silent period was greater than or equal to 10 seconds. Plots of the pulse train are contained in Appendix B of this test report.

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

Correction factor dB = 20 x (Log_{10} Calculated Duty Cycle)

Therefore the calculated duty cycle was determined:

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

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

$$= \frac{62.5ms}{100ms} = 0.625$$

0.625 or 62.5%

Correction factor (dB) = 20 x (Log_{10} 0.625) = -4.1dB