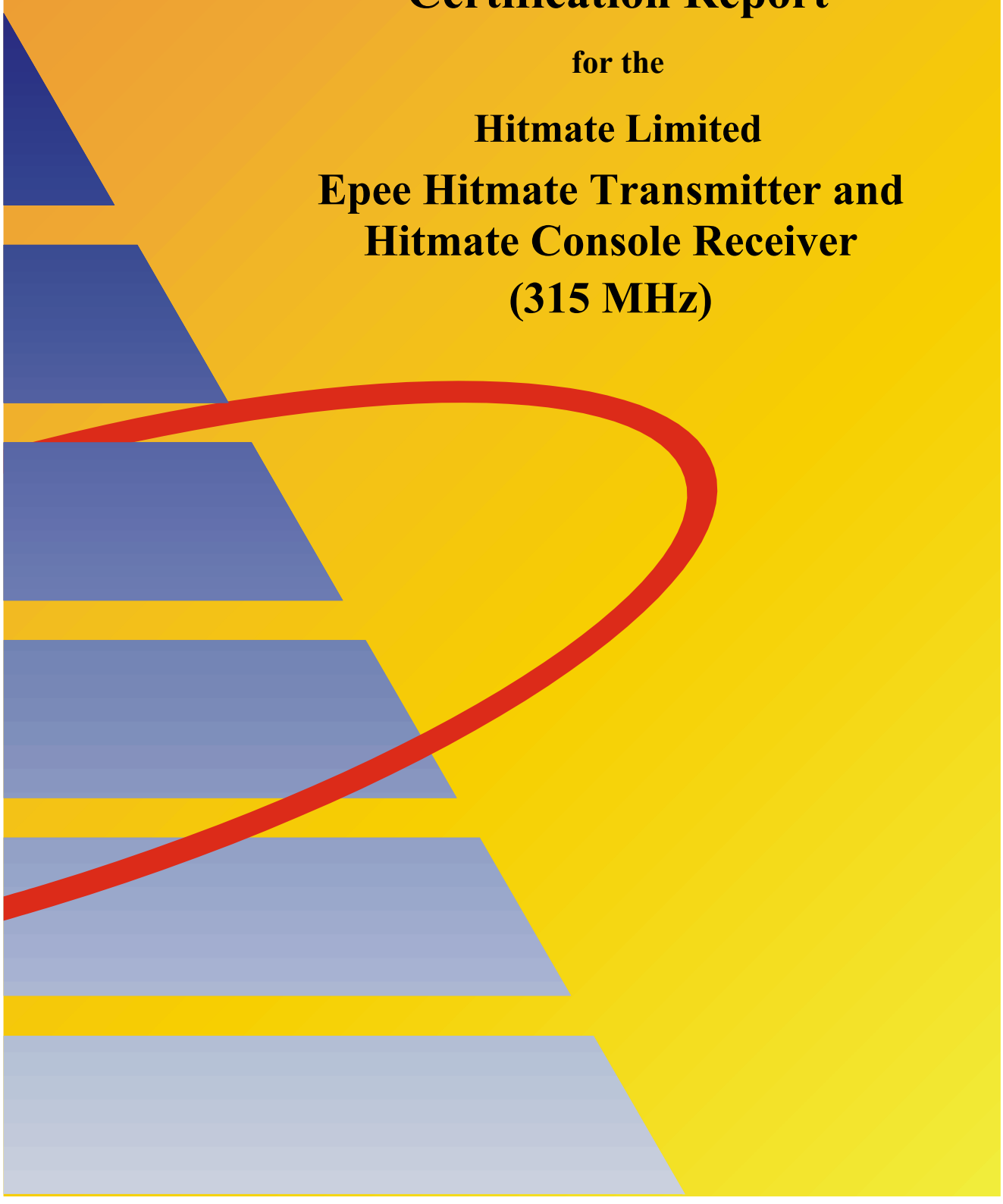
FCC Part 15
Certification Report

for the

Hitmate Limited

Epee Hitmate Transmitter and Hitmate Console Receiver (315 MHz)



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Project Engineer: R. P. St John James

Approval Signatory

Approved signatories: S. M. Connolly ☑ I. P. Kenney ☐ R. P. St John James ☐

The above named are authorised Hursley EMC Services engineers.

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Contents

Document History

Issue#1: 9th July 2009 was withdrawn and replaced by Issue#2: product name corrected.

1.0 DECLARATION

1.1 Statement of Compliance

The Equipment Under Test (EUT), as described and reported within this document, complies with the Part 15 of the FCC CFR 47 regulations. The EUT operates at a frequency of 315 MHz and complies with the emission requirements.

Note: The EUT is a battery-operated device and therefore only radiated emission measurements were performed in the frequency range 30.0 MHz to 3.5 GHz.

1.2 Related Submittal(s)

This is a single application for certification of a 315 MHz Transmitter.

Note: The receiver used with the system complies with FCC Part 15B limits for Digital Equipment (unintentional transmitters).

1.3 EUT Manufacturer

Trade name:	Hitmate
Manufacturer name:	Hitmate Limited 19 Riverside Drive Richmond Surrey TW10 7QA United Kingdom
Company representative:	Mr Ian Bowden Tel: +44 (0) 20 8948 8147

2.0 EUT DESCRIPTION

2.1 Identity

EUT:	Epee Hitmate Transmitter Model: EH2100	s/n 12
	Hitmate Console Receiver Model: HC2100	s/n 12

In addition, another EH2100 (s/n 46) was modified to transmit continuously and was used for the transmit power and spurious emission tests.

Sample build: Prototype

2.2 Product Operation

The transmitter and receiver are used for sword fencing. At the end of the sword is a press switch and when this is depressed (e.g. when the sword tip hits an opponent) the transmitter is triggered and activates an LED and buzzer on the receiver. The transmitter is connected to the sword via a 3-wire cable.

Both the transmitter and receiver are powered by 9V alkaline batteries. When triggered the transmitter transmits three 20ms pulses on a 300ms period and then stops transmitting until re-triggered. The transmitter is manually operated and uses an integrated antenna with no external antenna port connections.

2.3 Support Equipment

None: tested stand-alone.

2.4 Exerciser Program

For the purposes of measurement a transmitter was modified to repeatedly transmit. In normal operations the transmitter will only transmit when the transmit button is manually operated.

Before the start of the tests the transmitter was fitted with a new alkaline battery. The receiver was also fitted with a new battery.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Hursley EMC Services Ltd Unit 16, Brickfield Lane, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester; FCC & Industry Canada Registered
Test Date	8th to the 26th June 2009

3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.4:2003. Final radiated testing was performed at an EUT to antenna distance of three metres.

Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:1996.

3.3 Radiated Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Instrumentation used in the chamber as below:

Computer	Animal Systems PC
Spectrum analyser	Hewlett Packard 8568B, 30 to 1000 MHz range in peak hold mode Hewlett Packard 8593EM, >1.0 GHz, 1.0 MHz bandwidth, average and peak detector
Pre-amplifier	Hewlett Packard 8447D, 30 to 1000 MHz Hewlett Packard 8449B, 1.0 to 26.5 GHz
Antennae	Chase CBL6140 Bilog Schwarzbeck BBHA9120B Horn, 1.0 to 10.0 GHz
Cable	Sucoflex, 18GHz SMA-N

The data obtained from the profile scan was used as a guide for the final Open Area Test Site (OATS) measurements.

Final Measurements

The system under test was transferred to the OATS from the semi-anechoic chamber. The data obtained from the chamber profile-scan was used to guide the test engineer. Each emission from the transmitter was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. The worst-case data is presented in this report. Test instrumentation used in the OAT's measurements was as follows:

Computer	Animal Systems PC
Spectrum analyser	Hewlett Packard 8593EM, >1.0 GHz, 1.0 MHz bandwidth, average & peak detector
Pre-amplifier	Hewlett Packard 8449B, 1.0 to 26.5GHz
Receiver	Rohde & Schwarz Model ESVP 30-1000MHz set to CISPR Quasi-Peak
Antennae	Schwarzbeck VULB 9163, 30 to 1000 MHz Schwarzbeck BBHA9120B Horn, 1.0 to 10.0 GHz
Cable	Sucoflex, 18GHz SMA-N

3.4 Conducted Emissions

Note: The transmitter is battery powered therefore the conducted emissions test does not apply.

3.5 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	23 degrees Celsius	39 to 40% relative	1012 to 1026 millibars

3.6 EMC Test Equipment

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
010	1	HP	85680B	2601A02322	Spectrum analyser	27/10/2009
021	1	Rohde Schwarz	ESIB	100192	Test receiver (40GHz)	27/01/2010
026	LAB	Chase	CBL6140	1036	Antenna X-wing (20-2000MHz)	Internal
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	23/02/2010
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	10/09/2009
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	03/02/2010
099	1	HP	8596-EM	3911A00146	Spectrum analyser (9kHz-12.8GHz)	12/01/2010
109	1	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (30-3000MHz)	05/12/2009
127	1	Schwarzbeck	BBHA9120B	391	Horn antenna (1-10GHz)	05/12/2009
240	1	Sucoflex	106	52427/6	Cable SMA (18GHz)	21/01/2010
241	1	Rohde Schwarz	ESVP	879962/049	Test receiver (30-1300MHz)	18/02/2010

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate. 'Internal' means internally calibrated using HEMCS procedures

4.0 TEST DATA

4.1 Transmitter – Radiated Emissions

A search was made of the frequency spectrum from 30.0 MHz to 3.5 GHz and the measurements reported are the highest emissions relative to the FCC CFR 47 Section 15.231 limits at a measuring distance of three metres

Frequency	Actual quasi-peak value @ 3m		Specified limit @ 3m	
MHz	dBµV/m	µV/m	dBµV/m	µV/m
* 315.207	74.0	5,011.9	75.6	6,042
630.133	52.8	436.5	62.0	1,250
944.927	46.4	208.9	62.0	1,250

*315.207 was the recorded transmitter frequency. The measured level of 74dBµV/m does not take into account the provision of 15.35 (c) for pulse duty cycle. The duty cycle is pulse On for 20ms, pulse Off for 80ms giving a duty cycle of 20/100 in any 100ms period. This is a duty cycle of 0.2 which equates to -14dB. The peak level is 3dB higher than the quasi-peak level, a reduction of 11dB can therefore be applied to the recorded transmitter level giving a corrected reading of 74 - 11 = 63 dBµV/m.

Frequency	Actual average value @ 3m		Specified average limit @ 3m	
GHz	dBµV/m	µV/m	dBµV/m	µV/m
1.260	28.7	27.23	62.0	1,250
1.578	28.6	26.9	62.0	1,250
1.892	28.1	25.4	62.0	1,250

Frequency	Actual peak value @ 3m		Specified peak limit @ 3m	
GHz	dBµV/m	µV/m	dBµV/m	µV/m
1.260	45.9	197.24	82.0	12,500
1.578	45.9	197.2	82.0	12,500
1.892	45.5	188.36	82.0	12,500

Procedure: In accordance with ANSI C63.4:2003.

Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector. With the transmitter in standby all results were below the noise floor of the measuring system (30.0 MHz to 3.5 GHz).

TEST ENGINEER: Rob St John James

Test Data (continued)

4.2 Receiver – Radiated Emissions

Frequency GHz	Actual Quasi-peak value @ 3m		Specified average limit @ 3m	
	dBµV/m	µV/m	dBµV/m	µV/m
311.055	22.0	12.59	46.0	200
313.989	24.5	16.8	46.0	200
315.036	26.8	21.9	46.0	200
315.699	27.0	22.4	46.0	200
316.509	25.2	18.2	46.0	200
317.334	23.5	15.0	46.0	200

Frequency GHz	Actual average value @ 3m		Specified limit @ 3m	
	dBµV/m	µV/m	dBµV/m	µV/m
1.264	28.7	27.2	54.0	500

Frequency GHz	Actual peak value @ 3m		Specified limit @ 3m	
	dBµV/m	µV/m	dBµV/m	µV/m
1.264	43.6	151.4	74.0	5000

Procedure: In accordance with CNS 13438.

Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector.

TEST ENGINEER: Rob St John James

4.3 Modulation Bandwidth

Section 15.231 (C) (and Industry Canada RSS-210 A1.1.3)

A small loop antenna was placed in a jig under the Transmitter; the output from the loop antenna was fed via a 10 dB attenuator into the input of the spectrum analyzer. The bandwidth of the transmitter was measured at the point at which the waveform envelope was 20 dB below the modulated carrier peak.

The bandwidth of the 315 MHz Transmitter was measured as less than 193 kHz

The limit is 0.25% of the transmitter frequency which equates to 787.5 kHz.

The 99% bandwidth was measured as 306 kHz using a Rohde & Schwarz ESIB receiver.

4.4 Transmission Time

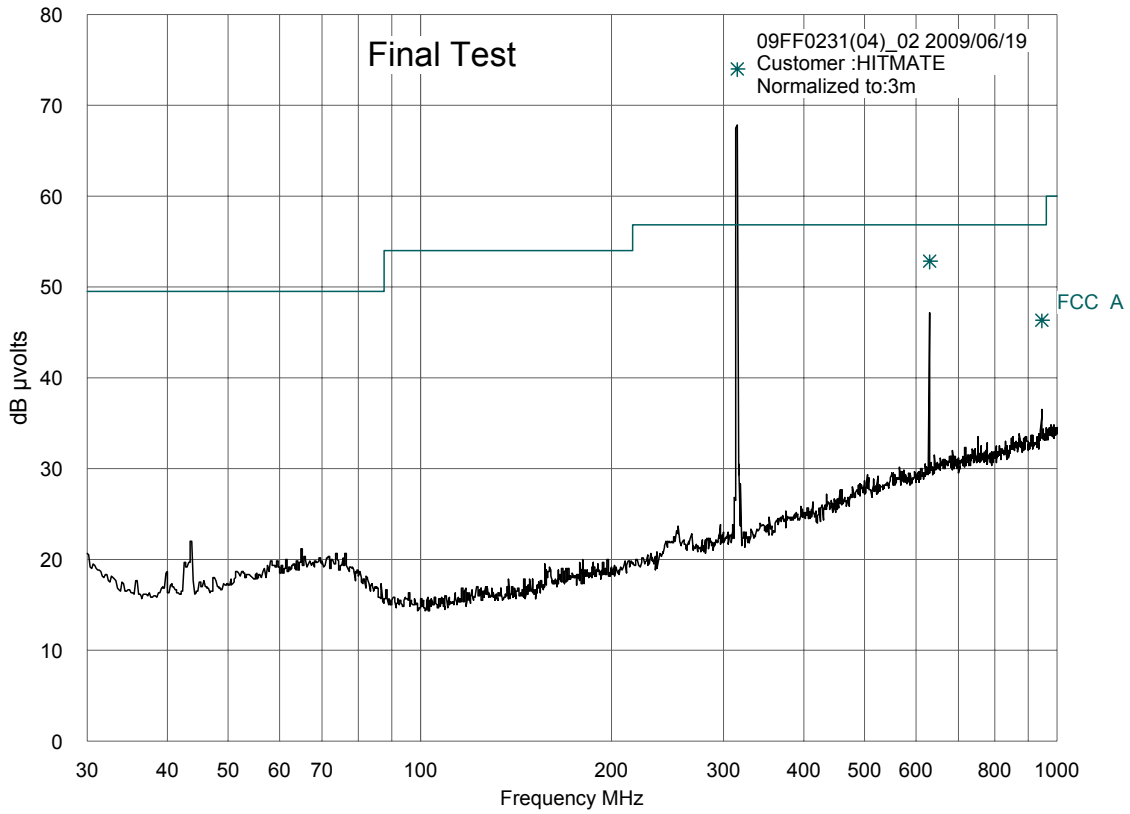
Section 15.231 a (I)

A small loop antenna was placed in a jig under the Transmitter; the output from the loop antenna was fed via a 10 dB attenuator into the input of the spectrum analyzer. The spectrum analyser was placed on zero span with a sweep time of one second and a bandwidth of 10 kHz. The Tx button was depressed and the transmitter output was recorded on the analyser.

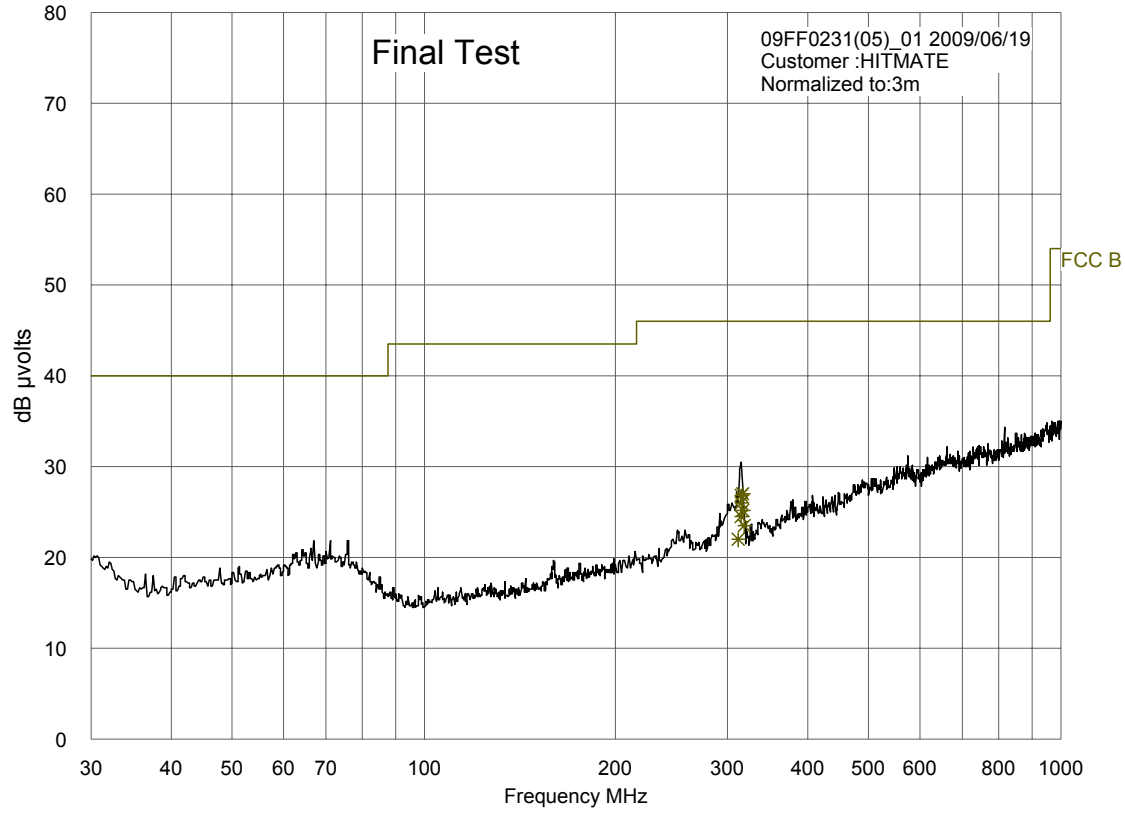
The transmitter was on for less than 300ms, the limit is 5s after the Tx button is released.

5.0 TEST PLOTS

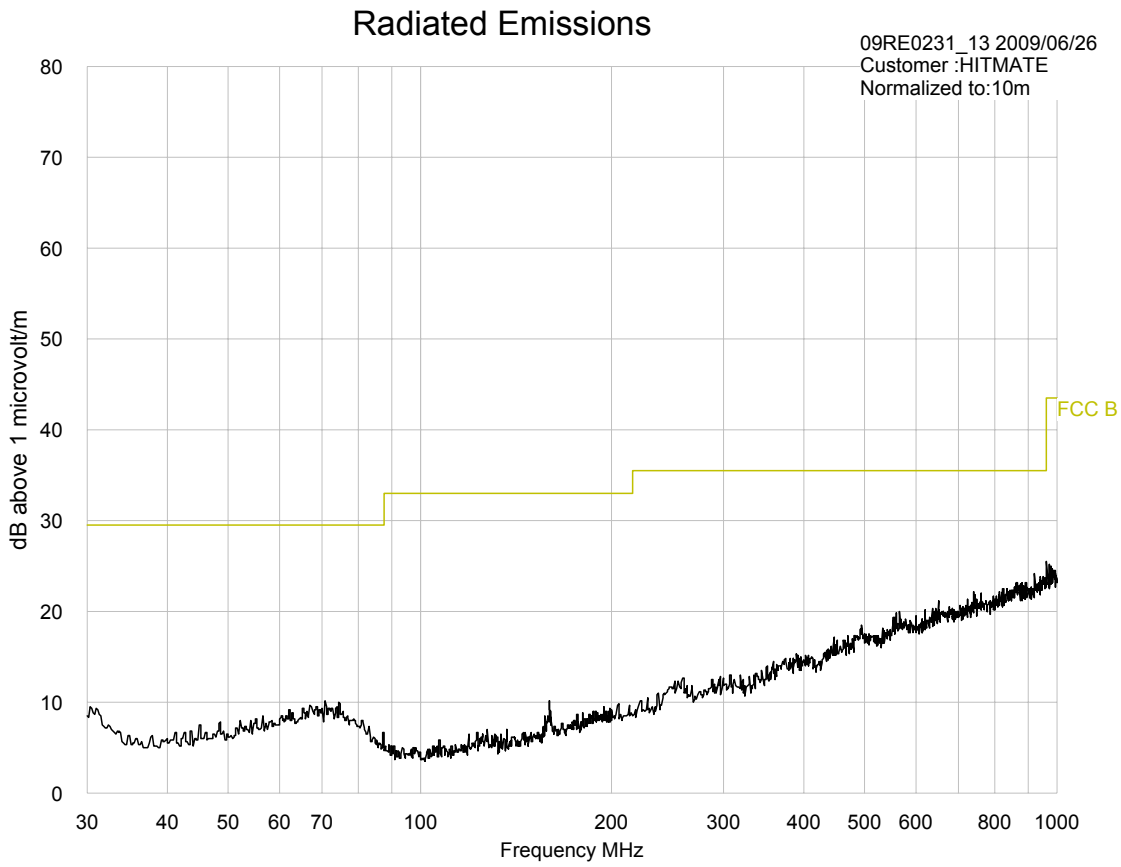
5.1 Transmitter Emission Plot, 30 to 1000 MHz



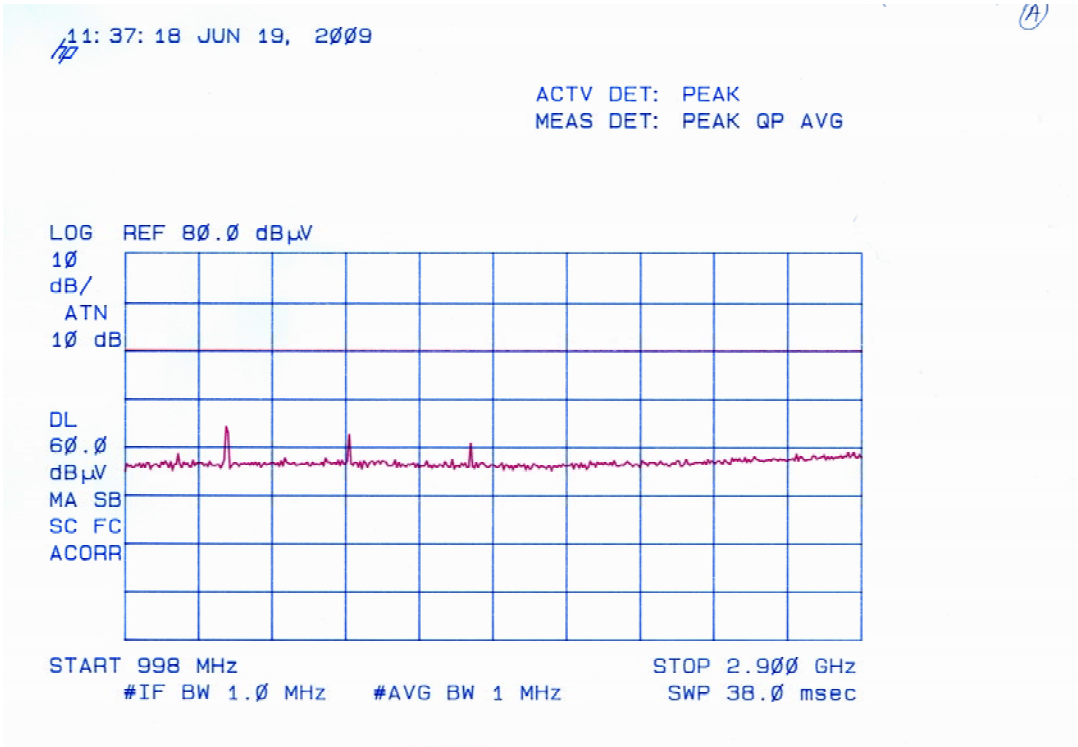
5.2 Receiver Emissions Plot, 30 to 1000 MHz

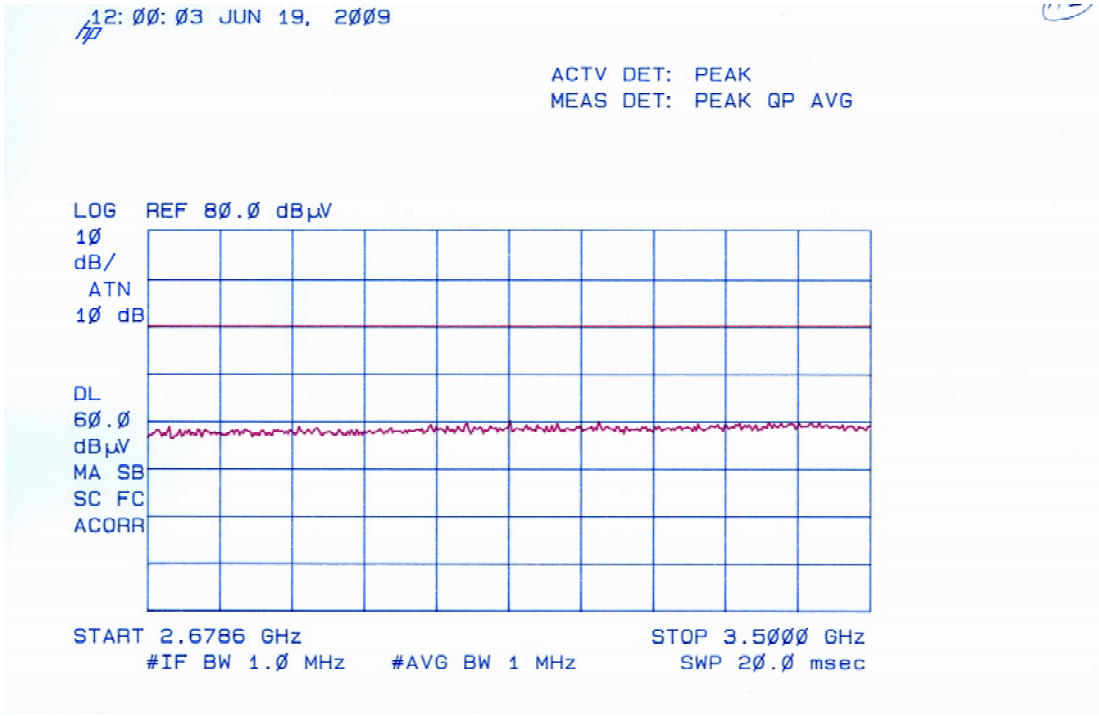


5.3 Transmitter Emissions (Idle) Plot, 30 to 1000 MHz

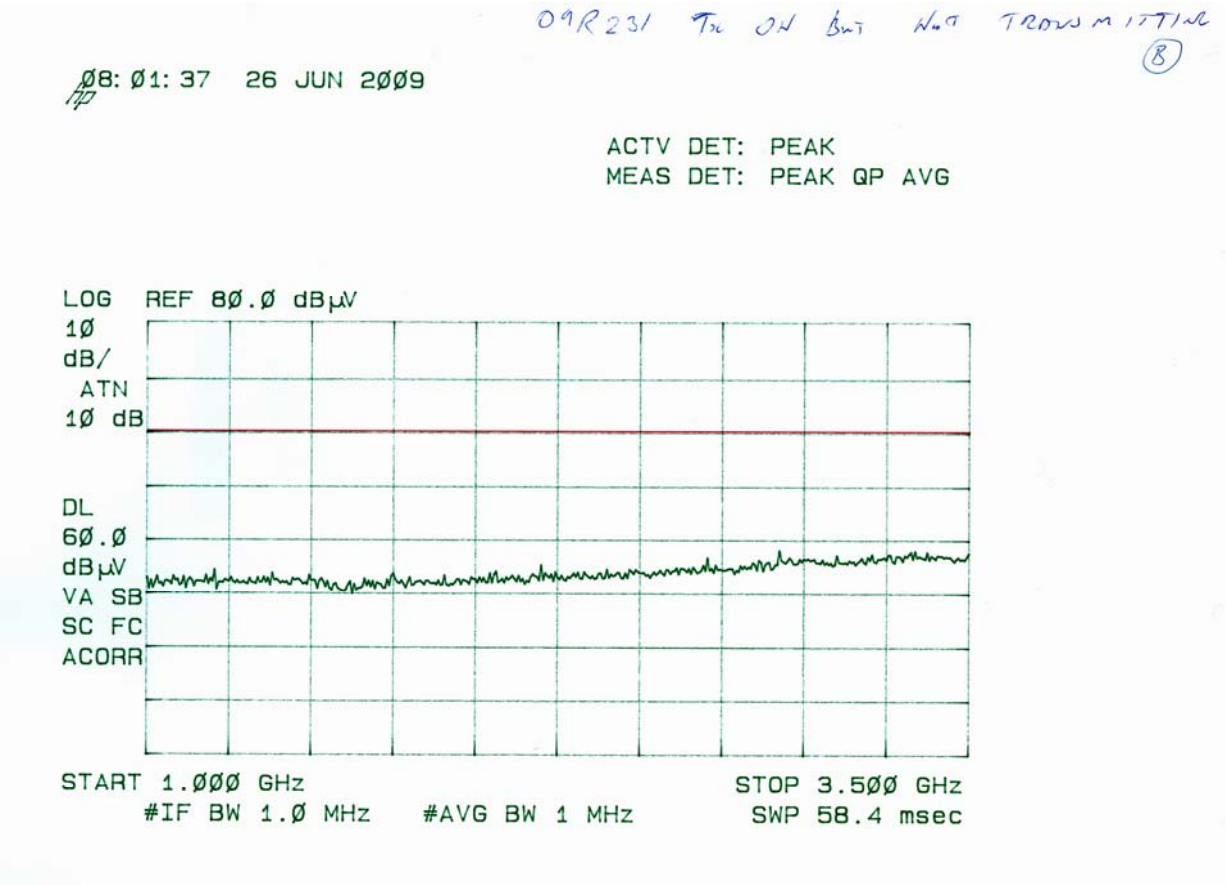


5.4 Transmitter Emissions Plots, 1 to 3.5 GHz

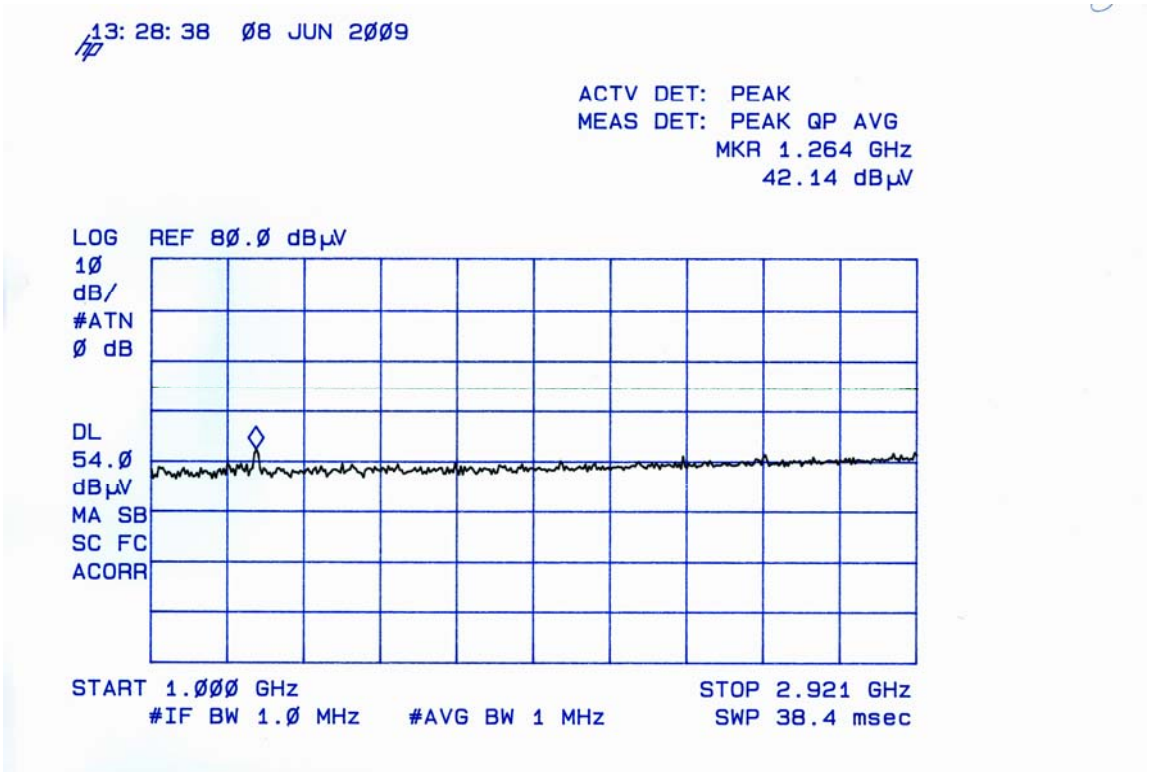


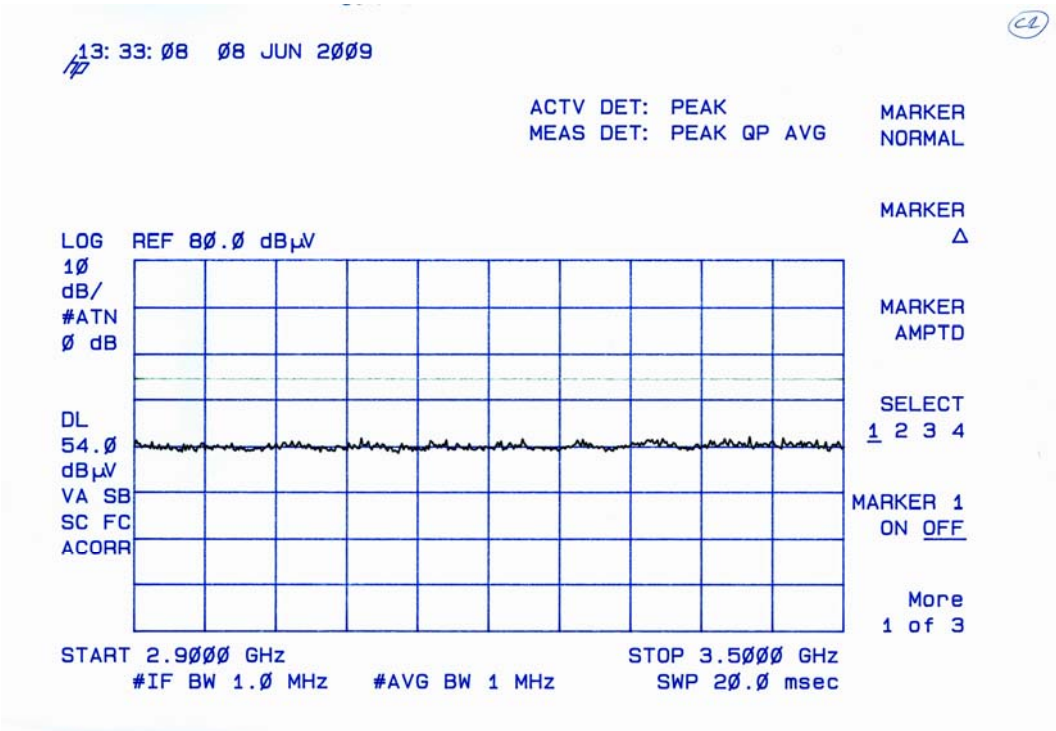


5.5 Transmitter Emission (Idle) plot, 1 to 3.5 GHz

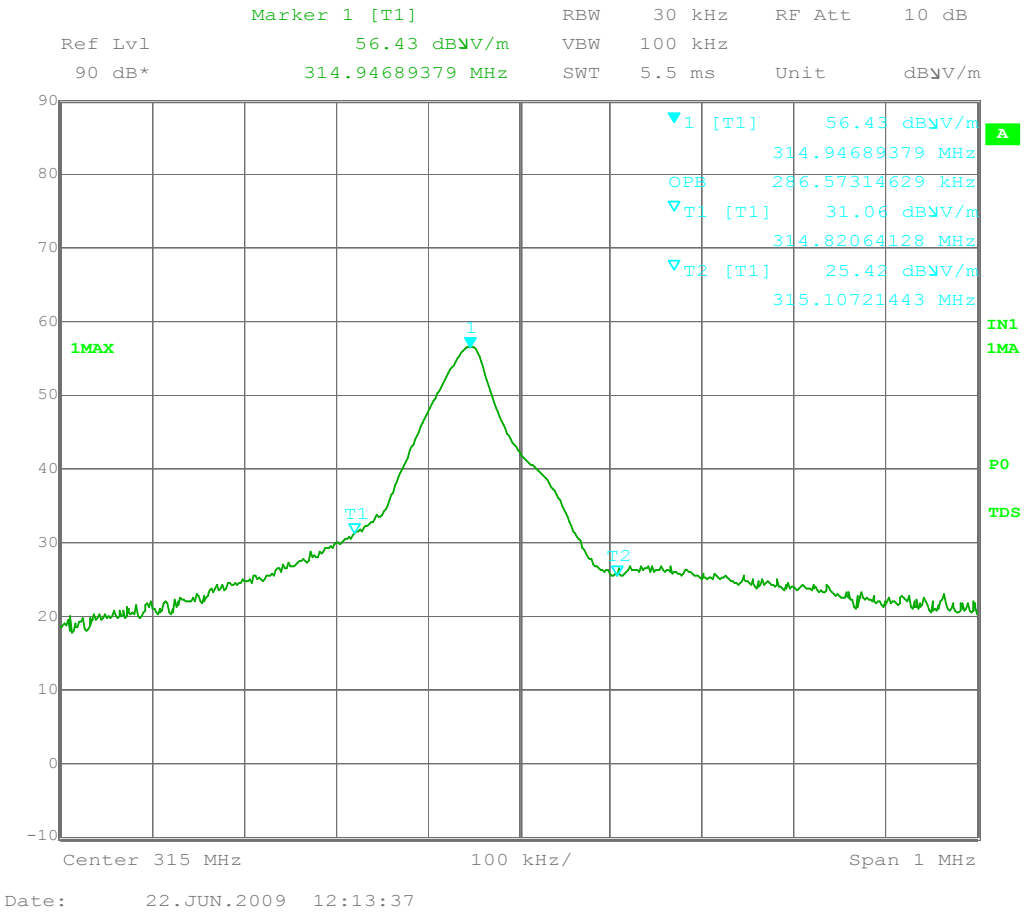


5.6 Receiver Emission Plots, 1 to 3.5 GHz

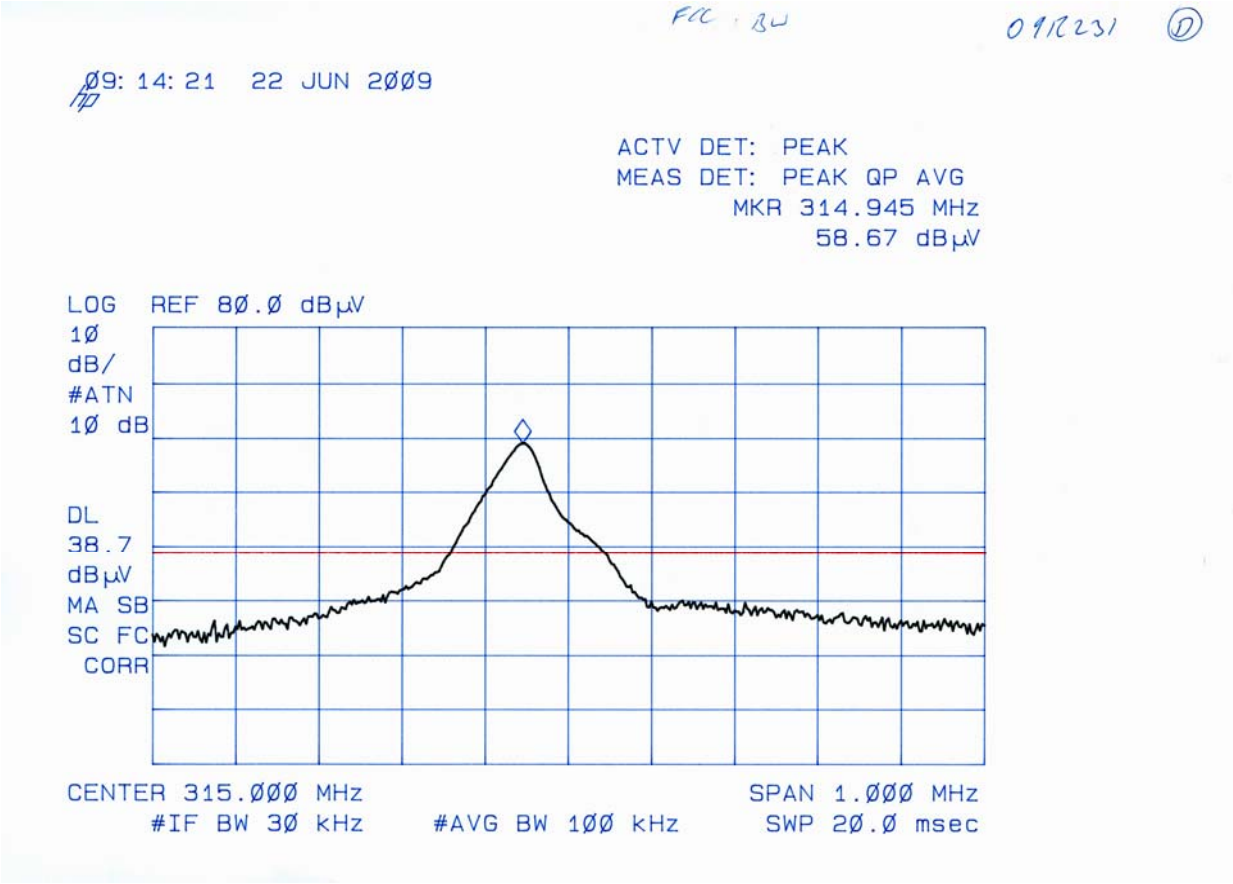




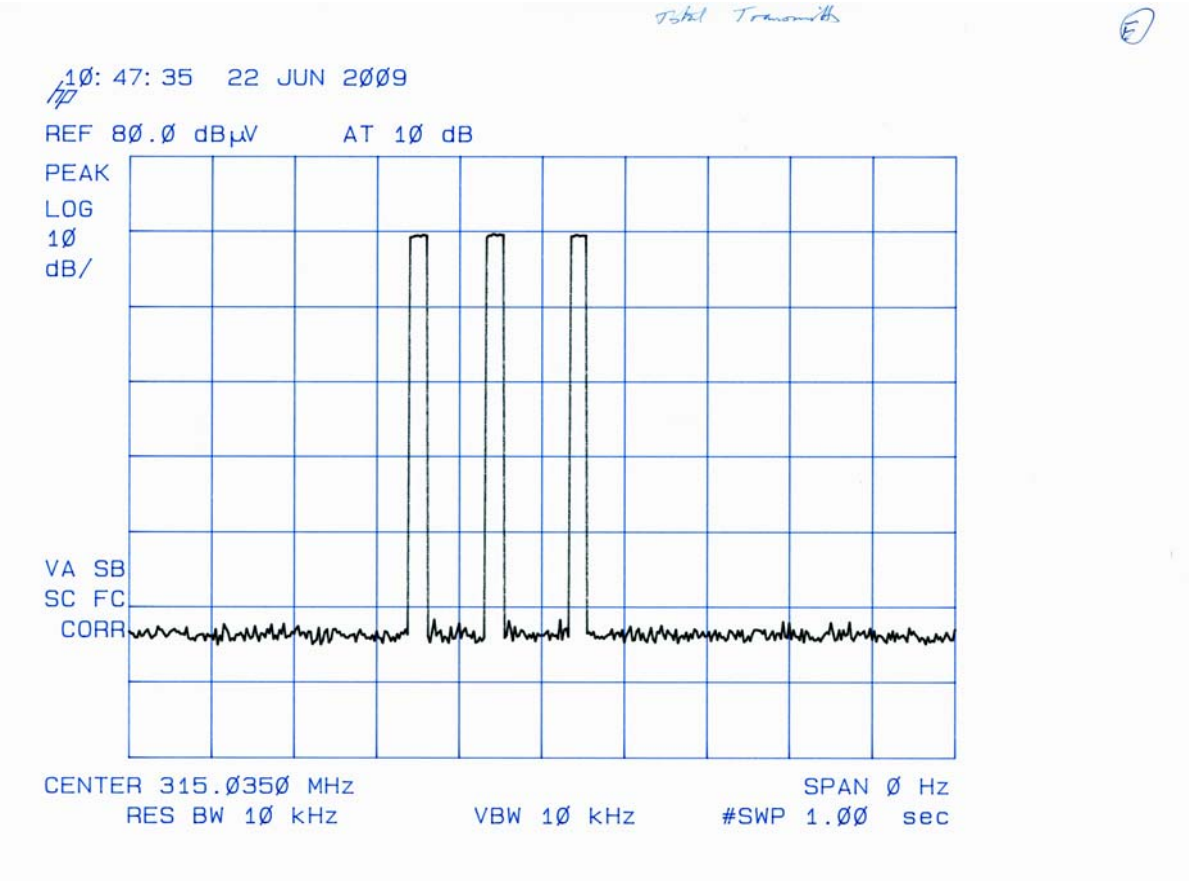
5.7 99% Bandwidth Plot



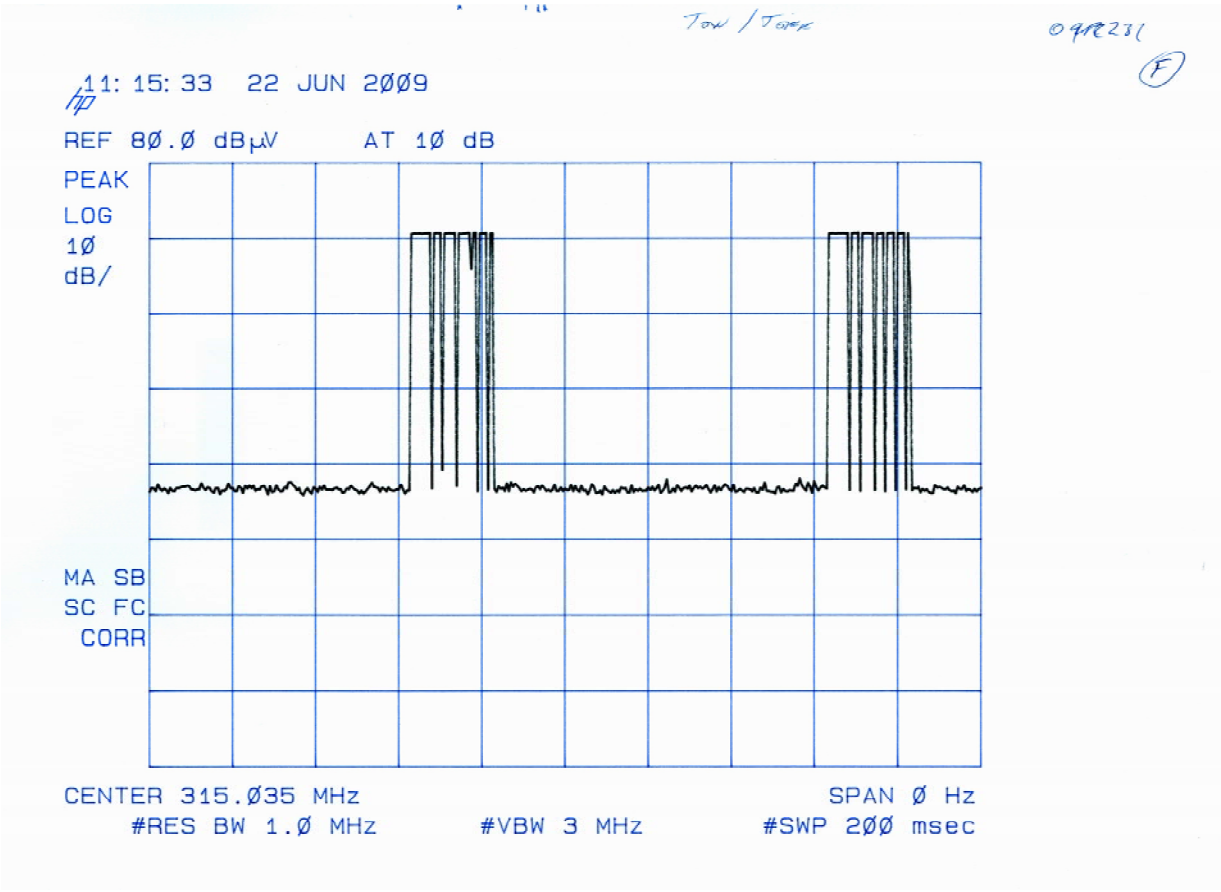
5.8 Bandwidth Plot



5.9 Transmitter On Time Plot



5.10 Transmitter Duty Cycle Plot



6.0 PHOTO LOG

Transmitter

Receiver

Photo Log (continued)

Transmitter with sword attached

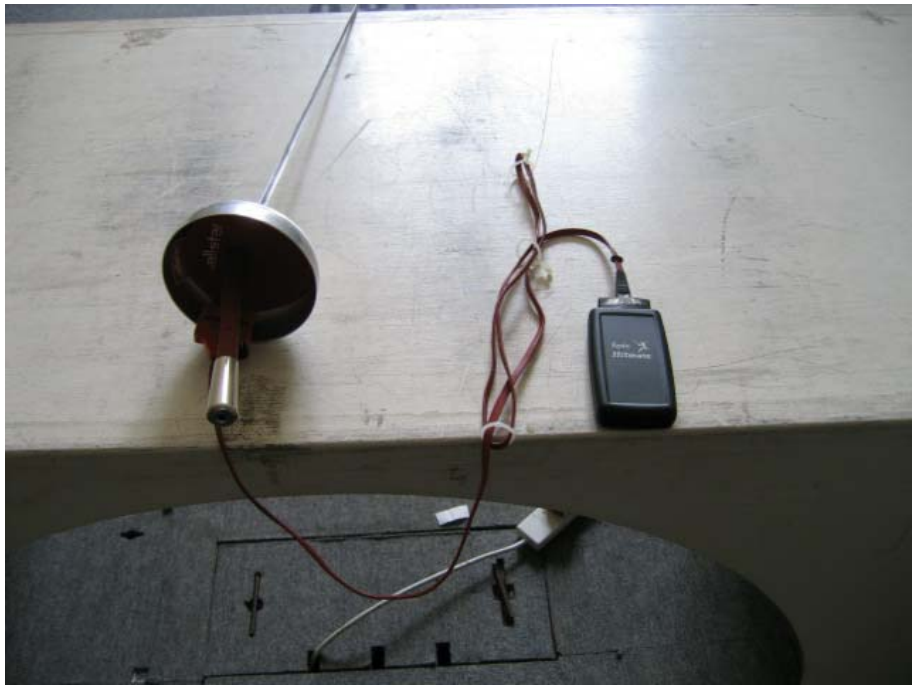
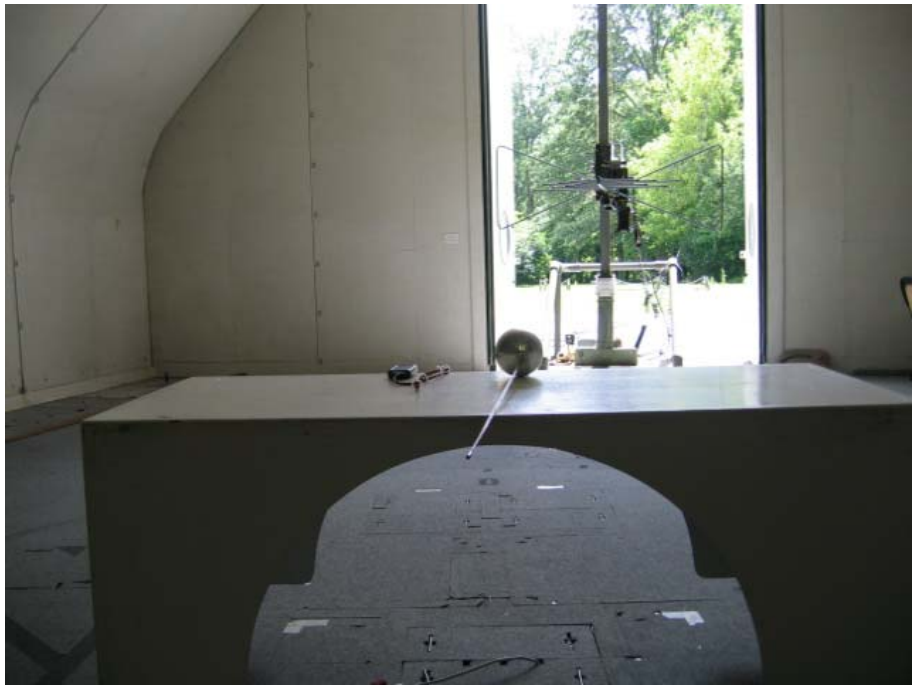


Photo Log (continued)

Open area test site measurements with Trilog Antenna



7.0 FCC LETTER

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,

Thomas Phillips
Electronics Engineer

8.0 INDUSTRY CANADA LETTER

Industry Canada Industrie Canada

June 20th, 2008

OUR FILE: 46405-7104
Submission No: 126749

Hursley EMC Services Ltd.
Unit 16, Brickfield Lane, Eastleigh
Hampshire SO53 4DP
United Kingdom

Attention: Rob St. John James

Dear Sir/Madame:

The Bureau has received your application for the registration / renewal of a 3m/10m open area test site. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought **(7104A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- Your primary code is: **7104**

- The company number associated to the site(s) located at the above address is: **7104A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 meter OATS or 3 meter chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca Please reference our file and submission number above for all correspondence.

Yours sincerely,

Stephane Proulx
Acting Wireless Laboratory Manager
Certification and Engineering Bureau
Industry Canada
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2
Canada

Canada