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Report On

Limited FCC and Industry Canada Testing of the
Garmin International Inc VHF 200i
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 80 and
Industry Canada RSS-182

COMMERCIAL-IN-CONFIDENCE

FCC ID: IPH-GARVHF12
IC ID: 1792A-GARVHF12D

Document 75916212 Report 01 Issue 2

April 2012



Product Service

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COMMERCIAL-IN-CONFIDENCE

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PREPARED FOR

Garmin International Inc
1200 E. 151st Street
Olathe
KS 66062-3426
USA

PREPARED BY

Natalie Bennett
Senior Administrator - Technical

APPROVED BY

Mark Jenkins
Authorised Signatory

DATED

17 April 2012

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler

This report has been revised to issue 2 to correct the IC ID and include the declared variants.





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CONTENTS

Section		Page No
1	REPORT SUMMARY	3
1.1	Introduction	4
1.2	Brief Summary of Results	5
1.3	Application Form	6
1.4	Product Information	18
1.5	Test Conditions	18
1.6	Deviations from the Standard	18
1.7	Modification Record	18
2	TEST DETAILS	19
2.1	Emission Limitations	20
3	TEST EQUIPMENT USED	24
3.1	Test Equipment Used	25
3.2	Measurement Uncertainty	26
4	ACCREDITATION, DISCLAIMERS AND COPYRIGHT.....	27
4.1	Accreditation, Disclaimers and Copyright.....	28



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SECTION 1

REPORT SUMMARY

Limited FCC and Industry Canada Testing of the
Garmin International Inc VHF 200i
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Limited FCC and Industry Canada Testing of the Garmin International Inc VHF 200i to the requirements of FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182.

Objective	To perform Limited FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Garmin International Inc
Model Number(s)	VHF 200i
Declared Variant(s)	VHF 200 VHF100i and VHF100
Serial Number(s)	1GA003166
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182 (Issue 5 January 2012)
Incoming Release Date	Application Form 12 September 2011
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	174414 08 November 2011
Start of Test	11 December 2011
Finish of Test	12 December 2011
Name of Engineer(s)	G Lawler



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182 is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
Transmit				
2.1	80.211, 4.4, 6.3, 6.3.1 and 6.9	Emission Limitations	Pass	



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1.3 APPLICATION FORM

APPLICANT'S DETAILS	
CATEGORY OF APPLICANT (please tick relevant box opposite)	(a) <input checked="" type="checkbox"/> MANUFACTURER (b) <input type="checkbox"/> IMPORTER (c) <input type="checkbox"/> DISTRIBUTOR (d) <input type="checkbox"/> AGENT
If box (b), (c) or (d) is ticked complete details in box below with respect to the manufacturer	
COMPANY NAME : Garmin International, Inc.	
ADDRESS : 1200 E. 151st Street Olathe, KS 66062-3426 USA	
NAME FOR CONTACT PURPOSES : Trey Cauldwell	
TELEPHONE NO : +1 913 440 2447	FAX NO : +1 913 397-8282
E-MAIL : trey.cauldwell@garmin.com	

MANUFACTURER'S DETAILS	
COMPANY NAME :	Kanematsu Corporation
ADDRESS :	2-1 Seavans N Bldg, Shibaura-1 Chome, Minato-ku, Tokyo, 105-8005, Japan
NAME FOR CONTACT PURPOSES :	Kotaro Sugiyama
TELEPHONE NO : +81-3-5440-8300	FAX NO : +81-3-5440-6515
E-MAIL : kotaro_sugiyama@kanematsu.co.jp	



TYPE DESIGNATION (1)	
The type designation may be either a single alphanumeric code or an alphanumeric/code divided into two parts.	
Please fill in	
TYPE DESIGNATION AS A SINGLE ALPHANUMERIC CODE	
For EU/Australia/NZ/International	VHF 200i (VHF100i as a listed variant)
For USA/Canada:	VHF 200 (VHF100 as a listed variant)

- (1) This is the manufacturer's numeric or alphanumeric code or name that is specific to a particular equipment. It may contain information in coded form on the characteristics of the equipment e.g. frequency, power. The manufacturer is free to choose the form of the type designation.
- (2) This is the number, code or trade name used by the manufacturer to describe a series or 'family' of equipment of substantially the same mechanical and electrical construction which will include a number of related equipments. This number is often referred to as the "model number".
- (3) This is the manufacturer's identification number given to a specific equipment in the series or 'family' of equipments. It is often referred to as the "identification number".

TYPE OF EQUIPMENT	
<input type="checkbox"/> <u>Base Station</u>	(Equipment fitted with an antenna socket for use with an external antenna, and intended for use in a fixed location).
<input checked="" type="checkbox"/> <u>Mobile Station</u>	(Mobile equipment fitted with an antenna socket, for use with an external antenna, normally used in a vehicle or as a transportable station).
<input type="checkbox"/> <u>Handportable</u>	(fitted with an antenna socket)
<input type="checkbox"/>	(without an external antenna socket integral antenna equipment, but fitted with a permanent internal or a temporary internal 50 ohm R.F. connector which allows access to the transmitter output and the receiver input)
<input type="checkbox"/> <u>Other</u>	

BASE STATION
Not Applicable
MOBILE STATION
<input type="checkbox"/> Transmitter
<input type="checkbox"/> Receiver
<input checked="" type="checkbox"/> Transceiver
<input type="checkbox"/> Remote Control Head
HANDPORTABLE
Not Applicable



Product Service

TRANSMITTER TECHNICAL CHARACTERISTICS	
TRANSMITTER FREQUENCY	
Method of frequency generation	
<input type="checkbox"/>	CRYSTAL
<input checked="" type="checkbox"/>	SYNTHESIZER
<input type="checkbox"/>	OTHER
TRANSMITTER CHANNEL SWITCHING FREQUENCY RANGE	
156.025 MHz – 157.425 MHz (MHz Range)	
TRANSMITTER FREQUENCY ALIGNMENT RANGE (6)	
Not Applicable	



TRANSMITTER RF POWER CHARACTERISTICS	
MAXIMUM RATED TRANSMITTER OUTPUT POWER as stated by manufacturer 25 W AT TRANSMITTER RF OUTPUT CONNECTOR (as declared by manufacturer)	
Is transmitter intended for : Continuous duty <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Intermittent duty <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If intermittent state DUTY CYCLE 5% TX, 5% RX, 90% Idle	
Is transmitter output power variable?	
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
<input type="checkbox"/> continuously variable <input checked="" type="checkbox"/> stepped 25 dB per step 25 maximum RF output power (Watts) 1 minimum RF output power (Watts)	The power can be set for 1W or 25W

TRANSMITTER - MODULATION	
<input checked="" type="checkbox"/> FREQUENCY (FM 5 kHz)	
<input type="checkbox"/> Phase	



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TRANSMITTER MODULATION INPUT CHARACTERISTICS		
Modulation input signal level for 60% of maximum deviation at at		
Microphone socket	12mV	Impedance 2k Ohms
Accessory socket	12mV	Impedance 2k Ohms
Other (4)	mV	Impedance Ohms
Lowest audio modulation frequency transmitted by the equipment		
Hz		

(4) For use where direct connection is provided for test purposes.

TRANSMITTER MODULATION INPUT CHARACTERISTICS (ETS 300 113 Only)
Not Applicable



INTERFACE FOR DATA TRANSMISSION (ETS 300 113 only)
Not Applicable
RECEIVER TECHNICAL CHARACTERISTICS
RECEIVER - FREQUENCY
METHOD OF FREQUENCY GENERATION
<input type="checkbox"/> CRYSTAL
<input checked="" type="checkbox"/> SYNTHESIZER
<input type="checkbox"/> OTHER
INTERMEDIATE FREQUENCIES
<input checked="" type="checkbox"/> 1st 21.6 MHz
<input checked="" type="checkbox"/> 2nd 450 kHz
<input type="checkbox"/> 3rd Not Applicable
Is local oscillator injection frequency higher or lower than the receiver nominal frequency?
<input type="checkbox"/> Higher
<input checked="" type="checkbox"/> Lower
RECEIVER CHANNEL SWITCHING FREQUENCY RANGE
156.025 MHz – 163.275 MHz (MHz Range)
RECEIVER FREQUENCY ALIGNMENT RANGE
Not Applicable



RECEIVER AUDIO (AF) CHARACTERISTICS			
MAXIMUM RATED AUDIO (AF) FREQUENCY OUTPUT POWER			
INTO LOUDSPEAKER	Watts		
TO LINE	Watts		
INTO EARPIECE	Watts		
BALANCED		<input checked="" type="checkbox"/>	NO
UNBALANCED		<input checked="" type="checkbox"/>	YES
Does connection carry DC voltage?		<input checked="" type="checkbox"/>	NO
If yes, state value		Not Applicable	
Normal Audio load impedance			
AT LOUDSPEAKER	4 ohms		
AT EARPIECE	16 ohms		
AT LINE OUTPUT	Not Applicable		
At audio accessory connection or facility socket (if fitted)			
Output	2 Watts		
Impedance	4 ohms		
Max input level at audio accessory socket			
	mV		
Impedance	ohms		



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TRANSMITTER AND RECEIVER CHARACTERISTICS	
ITU DESIGNATION OR CLASS OF EMISSION	16K0G3EJN, 16K0G2BJN
CHANNEL SEPARATION	25kHz
State the maximum number of channels over which the equipment can operate	73 Channels

EXTREME TEMPERATURE RANGE over which equipment is to be type tested
[<input checked="" type="checkbox"/>] -15°C to +55°C

CONSTRUCTION OF EQUIPMENT
[X] Single unit (5)

(5) Unit means a physically separate item of the equipment.

AUTOMATIC EQUIPMENT SWITCH OFF
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.
[] Applies V Cut-off voltage
[] Does not apply



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POWER SOURCE
12 DC Voltage (V)
6 DC Maximum Current (A)
BATTERY
Not Applicable

SIGNALLING (See note (c)) (I-ETS 300 219 only)
Not Applicable

DUPLEX OPERATION (BASE STATION ONLY)
Not Applicable

COMMUNAL SITE OPERATION (1)
Not Applicable



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ALIGNMENT RANGE	
<p>The definition of the alignment range AR1 and AR2 are given in Sub Clauses 3.1.2 and 3.1.3 of the Standard. The applicant should ensure that the sample equipment(s) submitted are operational on the appropriate channel(s) as given in Sub Clauses 3.1.5 through to 3.1.11 and tick the appropriate box.</p>	
3.1.5	One sample single channel equipment of category AR1 []
or 3.1.6	Three samples of single channel equipments of category AR2 []
or 3.1.7	One sample two channel equipment of category AR1 []
or 3.1.8	Three samples of two channel equipment of category AR2 []
or 3.1.9	One sample multichannel equipment of category AR1 []
or 3.1.10	Three samples of multichannel equipment of category AR2 []
or 3.1.11	One sample of multichannel equipment of category AR2 where the switching range equals the alignment range []
<p>If more than one option of the equipment is being submitted with different Type Designations, one or three samples, as appropriate, of each version shall be submitted.</p>	

CHANNEL IDENTIFICATION			
<p>Each equipment, whether one or more submitted for tests shall carry clear identification (such as a serial number), together with the frequencies associated with the channel identification displayed on the equipment.</p>			
Equipment Identification eg Serial Number	Channel No.	Transmit Nominal Freq MHz	Receive Nominal Freq MHz
Sample 1	60	156,025	160,625
	16	156,800	156,800
	88	157,425	157,425
Sample 2	60	156,025	160,625
	16	156,800	156,800
	88	157,425	157,425



OTHER ITEMS SUPPLIED		
Spare batteries e.g. (portable equipment)	<input type="checkbox"/>	Yes
	<input checked="" type="checkbox"/>	No
Battery charging device	<input type="checkbox"/>	Yes
	<input checked="" type="checkbox"/>	No
Special tools for dismantling equipment	<input type="checkbox"/>	Yes
	<input checked="" type="checkbox"/>	No
Encoder	<input type="checkbox"/>	Yes
	<input checked="" type="checkbox"/>	No
Test interface box (if applicable) or where appropriate the RF test fixture	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Full documentation on equipment (Handbook and circuit diagrams)	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
Others	<input type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If Yes, please specify :		



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DECLARATION		
Are the equipments submitted representative production models?	<input type="checkbox"/>	Yes
	<input checked="" type="checkbox"/>	No
If not are the equipments pre-production models?	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If pre-production equipments are submitted will the final production equipments be identical in <u>all</u> respects with the equipment tested	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If no supply full details		
Will labelling of the equipment comply with the Requirements of appropriate standards ?	<input checked="" type="checkbox"/>	Yes
	<input type="checkbox"/>	No
If no supply full details		

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature : *Trey Caldwell*
 Name : *TREY CAULDWELL*
 Position held : *Design Engineer*
 Date : *12/9/11*

BABT formally certifies that the manufacturer's declaration as typed out in this report, is a true and accurate record of the original received from the applicant.



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Garmin International Inc VHF 200i. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 12 V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.



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SECTION 2

TEST DETAILS

Limited FCC and Industry Canada Testing of the
Garmin International Inc VHF 200i
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 80 and Industry Canada RSS-182



2.1 EMISSION LIMITATIONS

2.1.1 Specification Reference

FCC CFR 47 Part 2, FCC CFR 47 Part 80, Clause 80.211
Industry Canada RSS-182, Clause 4.4, 6.3, 6.3.1 and 6.9

2.1.2 Equipment Under Test and Modification State

VHF 200i S/N: 1GA003166 - Modification State 0

2.1.3 Date of Test

12 December 2011

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The EUT was connected to a spectrum analyser via a 30 dB attenuator. The resolution bandwidth and video bandwidth were set to 300 Hz and 1 kHz respectively. The EUT was configured to transmit three different packet data loads. These were 11110000, 10101010 and PRBS. The reference level was set to the power measured in 80.215 (FCC) and 6.2 (RSS-182). The traces were recorded and are shown below.

Using a spectrum analyser, the emissions were measured between the range 9 kHz to 2 GHz. The path loss between the EUT and the spectrum analyser was measured and the highest value of attenuation across the range was entered as a reference level offset. The resolution bandwidth and video bandwidth were set to 30 kHz and 100 kHz respectively. Due to the burst nature of the signal, the spectrum analyser was set to measure only during the burst (gated trigger).

The trace was set to max hold and a peak detector was used to give the worst case result. The traces were recorded as shown on the following page.

2.1.6 Environmental Conditions

Ambient Temperature	19.9°C
Relative Humidity	35.0%



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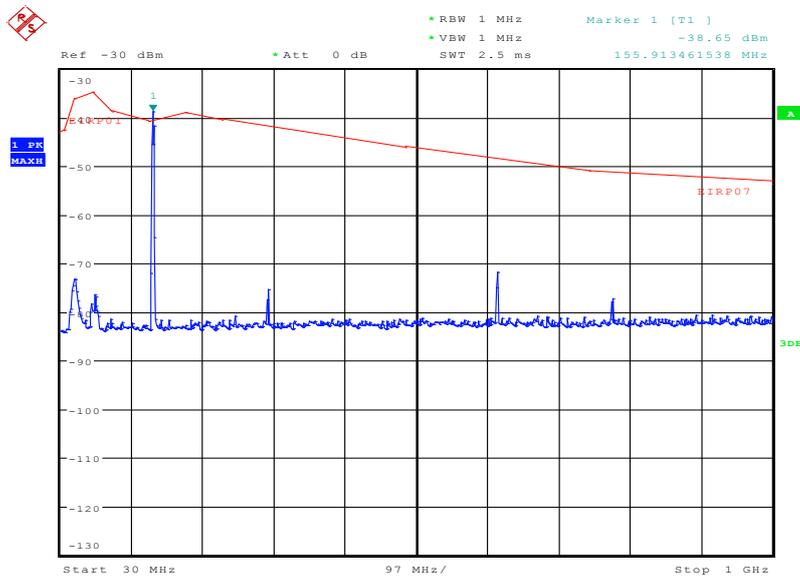
2.1.7 Test Results

12 V DC Supply

Radiated

156.025 MHz

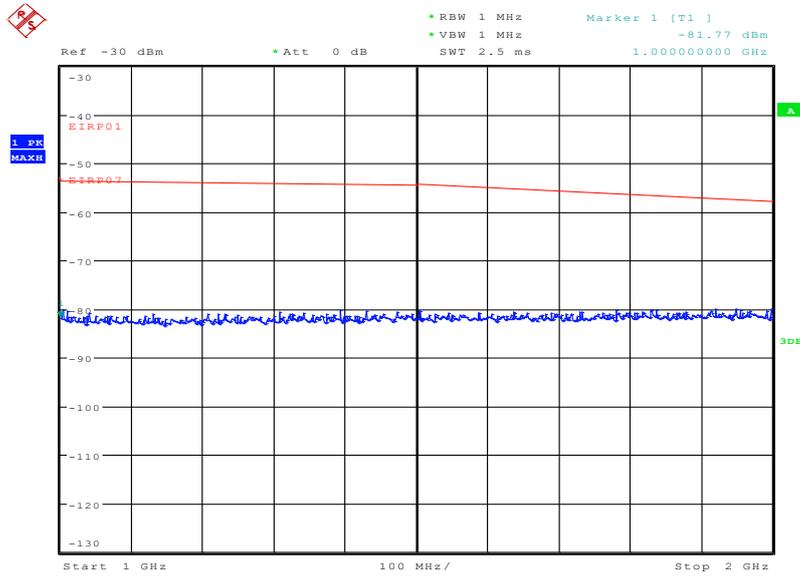
30 MHz to 1 GHz



Date: 12.DEC.2011 18:52:42



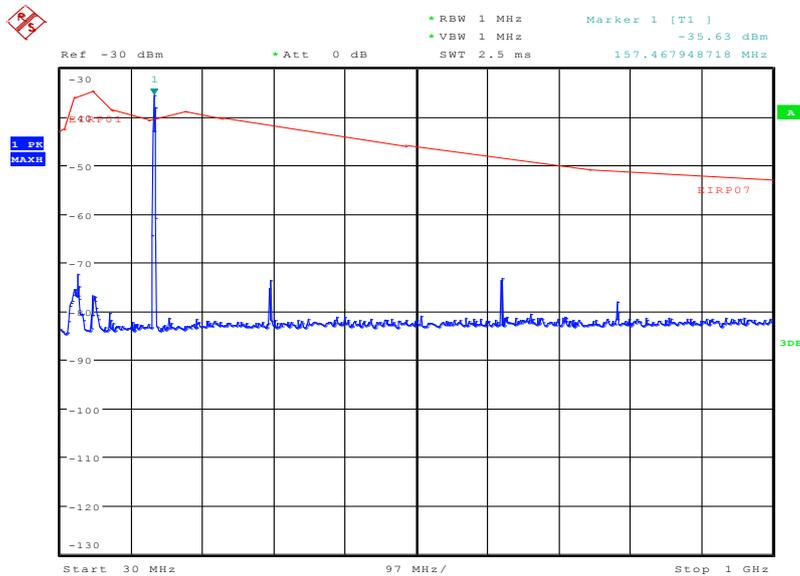
1 GHz to 2 GHz



Date: 12.DEC.2011 18:54:27

157.425 MHz

30 MHz to 1 GHz

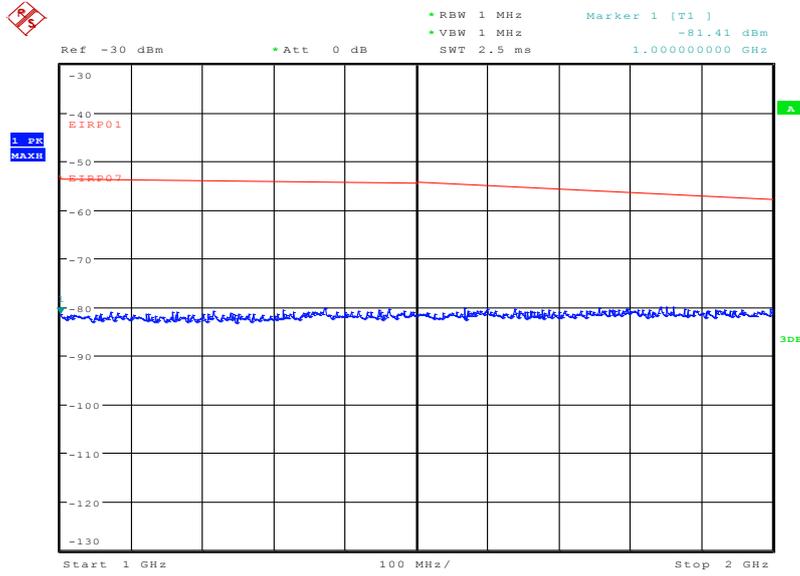


Date: 12.DEC.2011 19:28:29



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1 GHz to 2 GHz



Date: 12.DEC.2011 19:26:53

Limit Clause 80.211

Outside the Emission Mask

>250 % of authorised bandwidth $43+10 \log P$ **OR** -13 dBm



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SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - Radiated Emissions					
Termination 50ohm/50W	Bird	8085	389	12	5-Sep-2012
Modulation Analyser	Hewlett Packard	8901B	555	12	24-Nov-2012
Audio Analyser	Hewlett Packard	8903B	1350	12	9-Nov-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Power Attenuator (30dB)	Rohde & Schwarz	RBV	2746	12	22-Mar-2012
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Sensor Module	Hewlett Packard	11722A	3293	12	11-Nov-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
LISN, 5µH +10µF	ACME LISN Foundry	Def Stan 59-41/411	3904		14-Jun-2012
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU

TU – Traceability Unscheduled



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3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Emission Limitations	Radiated: ± 3.08 dB Conducted: ± 3.454 dB



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SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

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