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Report On

FCC Testing of the
Microlise Ltd MTU4-A (Internal Antenna)
In accordance with FCC CFR 47 Part 22

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FCC ID: OUUMTU4

Document 75916503 Report 07 Issue 1

July 2012



Product Service

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COMMERCIAL-IN-CONFIDENCE

REPORT ON

FCC Testing of the
Microlise Ltd MTU4-A (Internal Antenna)
In accordance with FCC CFR 47 Part 22

Document 75916503 Report 07 Issue 1

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PREPARED FOR

Microlise Ltd
Farrington Way
Eastwood
Nottingham
NG16 3AG

PREPARED BY

Natalie Bennett
Senior Administrator (Technical)

APPROVED BY

Mark Jenkins
Authorised Signatory

DATED

25 July 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 22. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler



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SECTION 1

REPORT SUMMARY

FCC Testing of the
Microlise Ltd MTU4-A (Internal Antenna)
In accordance with FCC CFR 47 Part 22



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Microlise Ltd MTU4-A (Internal Antenna) to the requirements of FCC CFR 47 Part 22.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Microlise Ltd
Model Number(s)	MTU4-A
Serial Number(s)	301934040760729
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 22 (2011)
Incoming Release Date	Application Form 23 January 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	PO241451 22 December 2011
Start of Test	3 July 2012
Finish of Test	8 July 2012
Name of Engineer(s)	G Lawler
Related Document(s)	ANSI C63.4: 2009



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 22 is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
GPRS 850 - Internal Antenna				
2.1	22.913 (a)	Effective Radiated Power	Pass	
2.2	22.917	Emission Limitations for Cellular Equipment	Pass	



1.3 APPLICATION FORM

APPLICANT'S DETAILS	
COMPANY NAME :	Microlise Limited
ADDRESS :	Farrington Way, Eastwood, Nottingham, NG16 3AG
NAME FOR CONTACT PURPOSES :	Ian Dickinson
TELEPHONE NO: +44 (1773) 537306	FAX NO: +44 (1773) 537373
	E-MAIL: ian.dickinson@microlise.com

EQUIPMENT INFORMATION			
Model name/number	MTU4-A	Identification/Part number	MTU4-A
Hardware Version	1.0	Software Version	1.0
Manufacturer	Microlise Limited	Country of Origin	United Kingdom.
FCC ID	OUUMTU4	Industry Canada ID	Not yet issued
Technical description (a brief description of the intended use and operation)			
Vehicle tracking and telematics device			
<u>Supply Voltage:</u>			
☐	AC mains	State AC voltage V	and AC frequency Hz
☒	DC (external)	State DC voltage 6-36 V	and DC current ...2 A
☒	DC (internal)	State DC voltage 3.7 V	and Battery type Li-ion.....
<u>Frequency characteristics:</u> (Telit GE864 GSM module)			
Transmitter Frequency range	824.2 MHz to 1909.8 MHz	Channel spacing	200 kHz. (if channelized)
Receiver Frequency range	869.2 MHz to 1989.8 MHz	Channel spacing	200 kHz (if channelized)
Designated test frequencies:			
Bottom: MHz	Middle: MHz	Top: MHz	
Intermediate Frequencies : MHz			
Highest Internally Generated Frequency : MHz			
<u>Power characteristics:</u>			
Maximum transmitter power	2 W	Minimum transmitter power	W
☐	Continuous transmission	(if variable)	
☒	Intermittent transmission	State duty cycle ...100% (worst case)...	
If intermittent, can transmitter be set to continuous transmit test mode? N			
<u>Antenna characteristics:</u>			
☒	Antenna connector (MTU4-A-B only)	State impedance	50 ohm
☐	Temporary antenna connector	State impedance	ohm
☒	Integral antenna (MTU4-A only)	State gain	-1.5 to -1.3 dBi
<u>Modulation characteristics:</u>			
☐	Amplitude	☒	Other
☐	Frequency	Details: GMSK	
☐	Phase	(GMSK, QSPK etc)	
Can the transmitter operate un-modulated?		N	
ITU Class of emission: 300KGXW.			
<u>Frequency characteristics:</u> (Bluegiga WT32 Bluetooth module)			
Transmitter Frequency range	2400. MHz to 2483.5 MHz	Channel spacing	1 MHz(if channelized)
Receiver Frequency range	2400. MHz to 2483.5. MHz	Channel spacing	1 MHz(if channelized)
Designated test frequencies:			
Bottom: MHz	Middle: MHz	Top: MHz	
Intermediate Frequencies : 1.5 MHz			
Highest Internally Generated Frequency : MHz			

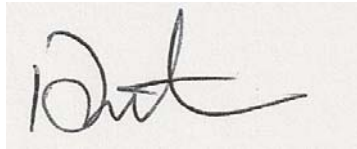


EQUIPMENT INFORMATION			
Power characteristics:			
Maximum transmitter power	0dBm	Minimum transmitter power (if variable)	 W
[]	Continuous transmission		
[X]	Intermittent transmission	State duty cycle80%.....	
	If intermittent, can transmitter be set to continuous transmit test mode? N		
Antenna characteristics:			
[]	Antenna connector	State impedance	ohm
[]	Temporary antenna connector	State impedance	ohm
[X]	Integral antenna	State gain	1.5 dBi
Modulation characteristics:			
[]	Amplitude	[X]	Other
[]	Frequency	Details: ...GFSK / n/4DQPSK / 8DQPSK..	
[]	Phase	(GMSK, QSPK etc)	
Can the transmitter operate un-modulated?		N	
ITU Class of emission: ...1M00F9W.....			
Frequency characteristics: (uBlox LEA-6 GPS receiver)			
Transmitter Frequency range ...N/A..... MHz to		Channel spacing	
		(if channelized)	
Receiver Frequency range1575.42 MHz to		Channel spacing	
(if different)		(if channelized)	
Designated test frequencies:			
Bottom: MHz Middle:		Top:	
Intermediate Frequencies :		MHz	
Highest Internally Generated Frequency :			
Power characteristics: (Not applicable – receive only)			
Maximum transmitter power	 W	Minimum transmitter power (if variable)	 W
[]	Continuous transmission		
[]	Intermittent transmission	State duty cycle	
	If intermittent, can transmitter be set to continuous transmit test mode? Y/N		
Antenna characteristics:			
[X]	Antenna connector (MTU4-A-B only)	State impedance ...50.....	ohm
[]	Temporary antenna connector	State impedance	ohm
[X]	Integral antenna (MTU4-A only)	State gain	26 dB (inc. LNA)
Modulation characteristics:			
[]	Amplitude	[]	Other
[]	Frequency	Details:	
[]	Phase	(GMSK, QSPK etc)	
Can the transmitter operate un-modulated?		Y/N	
ITU Class of emission:			
Battery/Power Supply			
Model name/number	...MTU4 battery pack.....	Identification/Part number	...SPEC-MI71331/04 .
Manufacturer	...PMBL Limited.....	Country of Origin	...United Kingdom.....
Ancillaries (if applicable)			
Model name/number		Identification/Part number	
Manufacturer		Country of Origin	
Extreme conditions:			
Maximum temperature	...85 °C	Minimum temperature	-40 °C
Maximum supply voltage	36 V	Minimum supply voltage	6 V



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

A handwritten signature in black ink, appearing to read 'Ian Dickinson', on a light-colored rectangular background.

Signature :

Name :

Ian Dickinson

Position held :

Director of Technical Services

Date :

23 January 2012



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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Microlise Ltd MTU4-A (Internal Antenna). 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.

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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

FCC Testing of the
Microlise Ltd MTU4-A (Internal Antenna)
In accordance with FCC CFR 47 Part 22



2.1 EFFECTIVE RADIATED POWER

2.1.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.913 (a)

2.1.2 Equipment Under Test and Modification State

MTU4-A (Internal Antenna) S/N: 301934040760729 - Modification State 0

2.1.3 Date of Test

3 July 2012

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

Measurements of the fundamental from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The fundamental frequency was maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. A peak detector was used with the trace set to max hold. The maximum result was recorded.

The EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result (ERP) was determined by a calculation using the signal generator level, antenna gain and cable loss.

The measurements were performed at a 3m distance unless otherwise stated.

2.1.6 Environmental Conditions

Ambient Temperature	22.0°C
Relative Humidity	63.0%

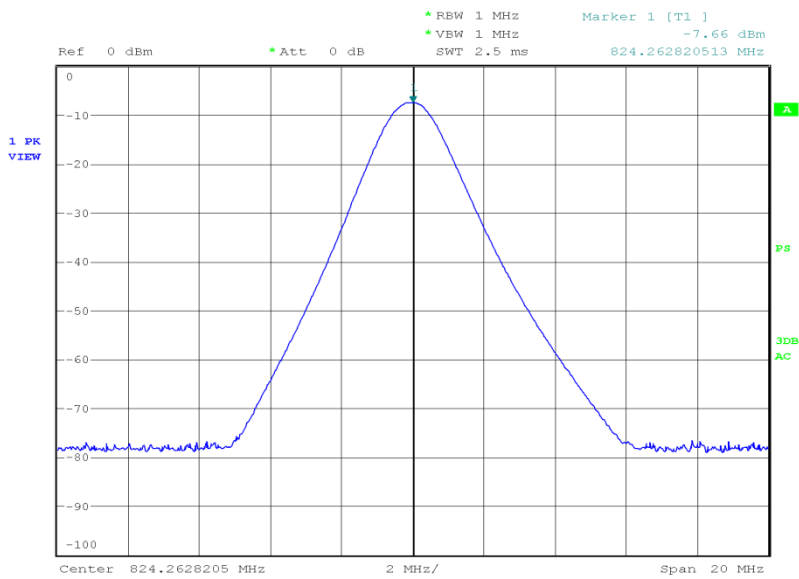


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2.1.7 Test Results

824.20 MHz

Result (dBm)	Result (W)
24.97	0.314



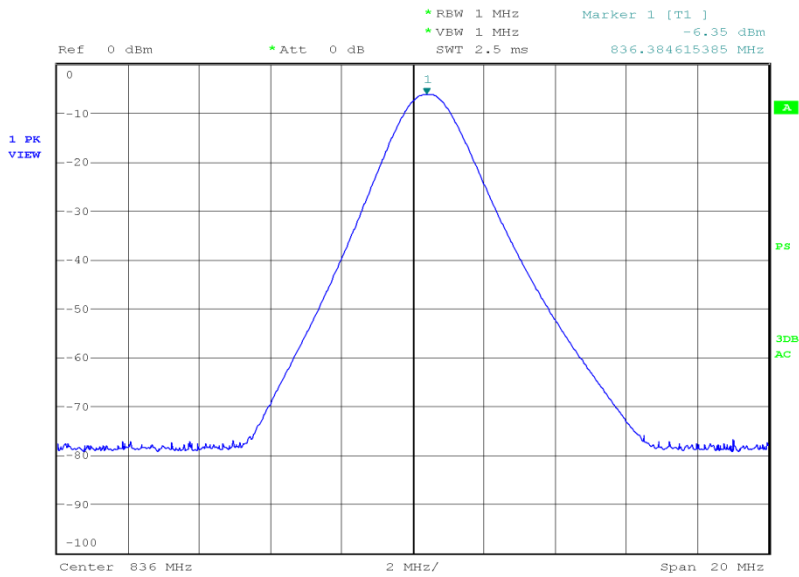
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836.40 MHz

Result (dBm)	Result (W)
25.71	0.372



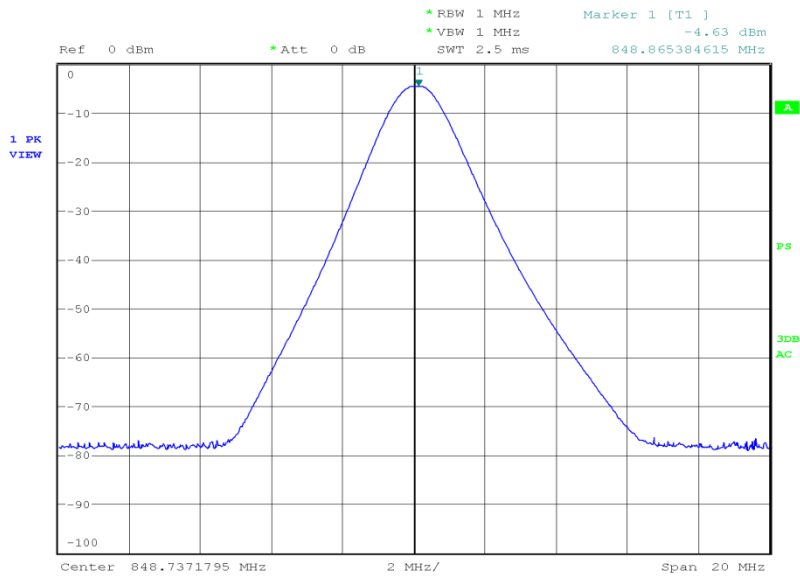
Date: 3.JUL.2012 23:35:08



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848.80 MHz

Result (dBm)	Result (W)
27.33	0.541



Date: 3.JUL.2012 23:40:27

Limit Clause

Mobile – 7 W or 38.45 dBm
Base Stations – 500 W or 57 dBm



2.2 EMISSION LIMITATIONS FOR CELLULAR EQUIPMENT

2.2.1 Specification Reference

FCC CFR 47 Part 22, Clause 22.917

2.2.2 Equipment Under Test and Modification State

MTU4-A (Internal Antenna) S/N: 301934040760729- Modification State 0

2.2.3 Date of Test

3 July 2012 & 7 July 2012

2.2.4 Test Equipment Used

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

2.2.5 Test Procedure

A preliminary profile of the Spurious Radiated Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

The EUT was set to transmit on maximum power with modulation. The EUT was tested on bottom, middle and top channels at maximum power.

For any emissions found the EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result was determined by a calculation using the signal generator level, antenna gain and cable loss.

The measurements were performed at a 3m distance unless otherwise stated.

2.2.6 Environmental Conditions

Ambient Temperature	22.0°C
Relative Humidity	63.0%

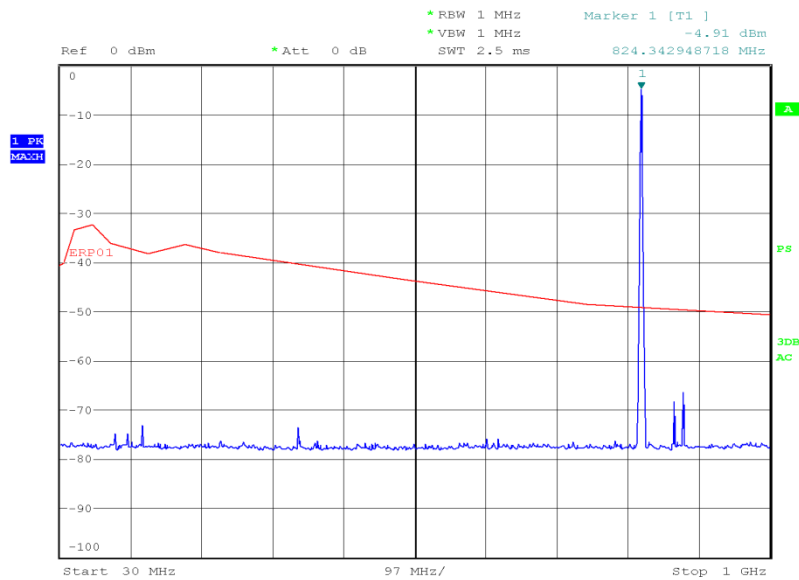


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2.2.7 Test Results

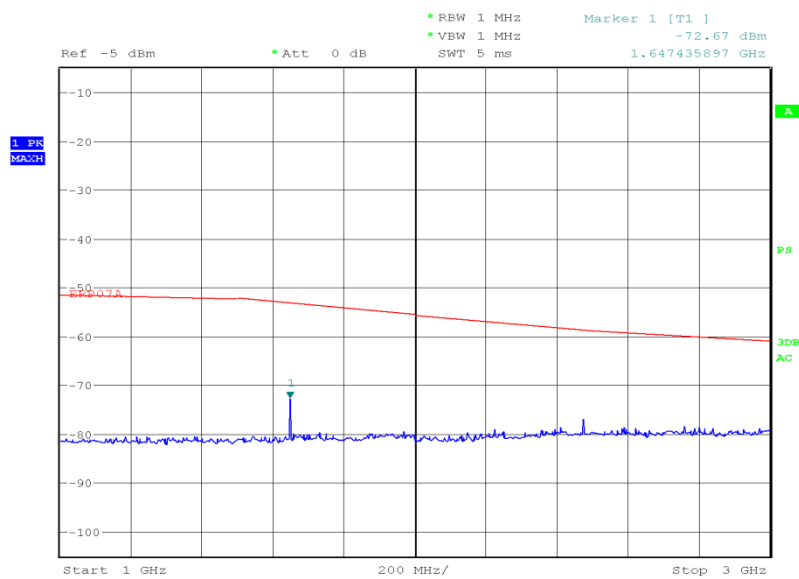
824.20 MHz

30 MHz to 1 GHz



Date: 3.JUL.2012 18:55:06

1 GHz to 3 GHz

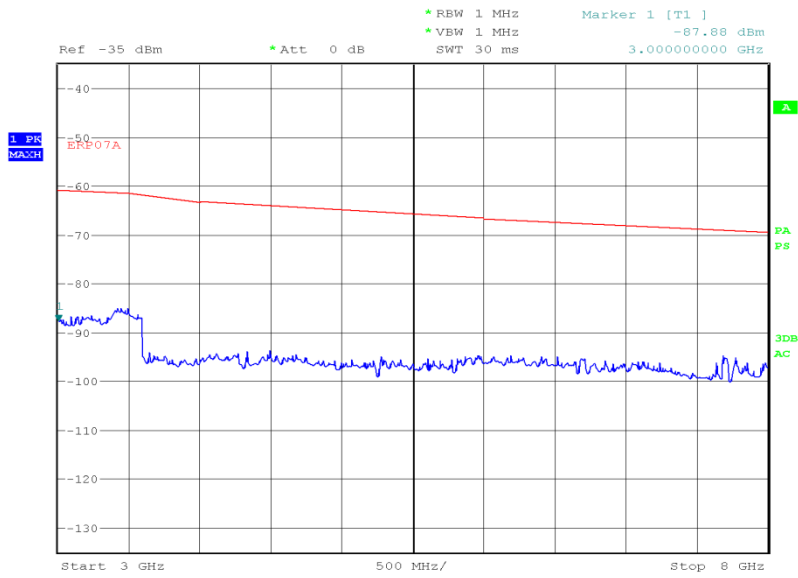


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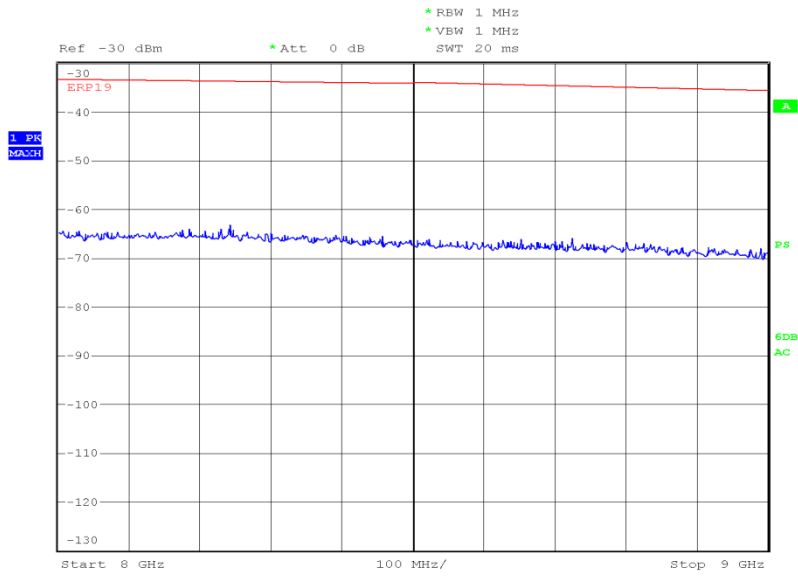
Product Service

3 GHz to 8 GHz



Date: 3.JUL.2012 21:49:30

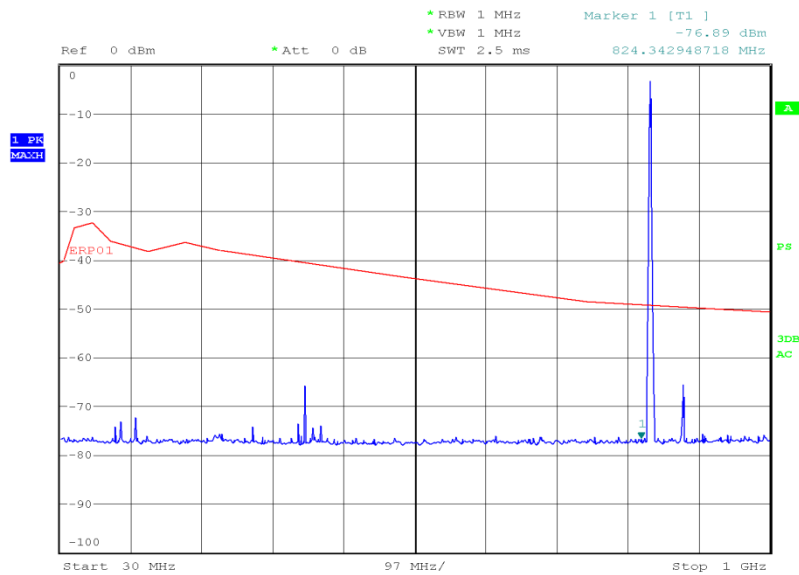
8 GHz to 9 GHz



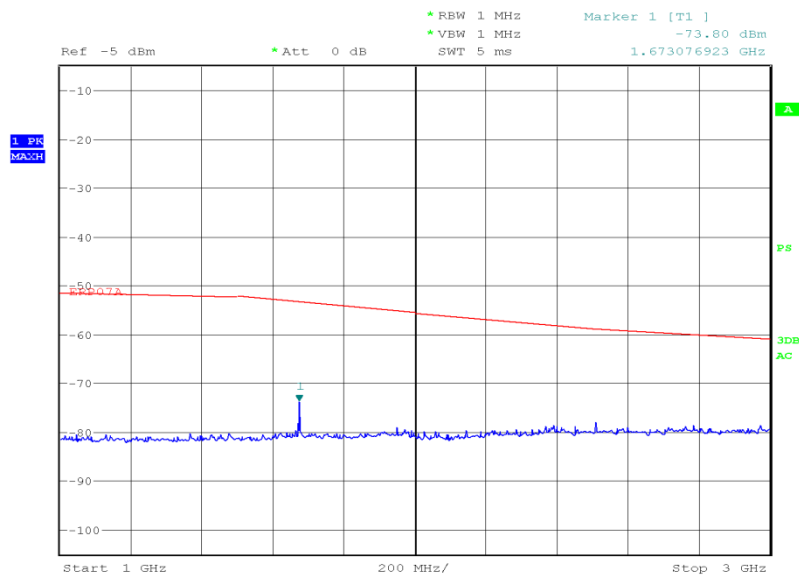
Date: 7.JUL.2012 08:07:36



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836.40 MHz30 MHz to 1 GHz

Date: 3.JUL.2012 19:03:58

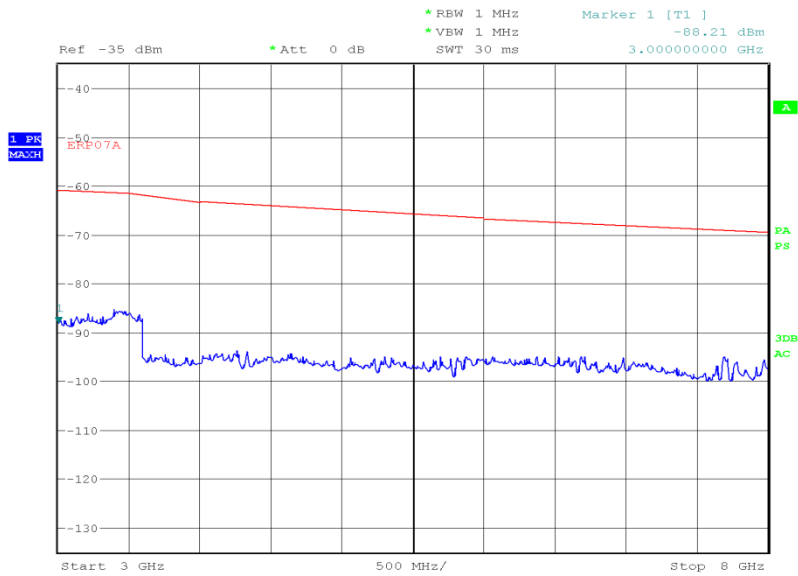
1 GHz to 3 GHz

Date: 3.JUL.2012 21:54:13



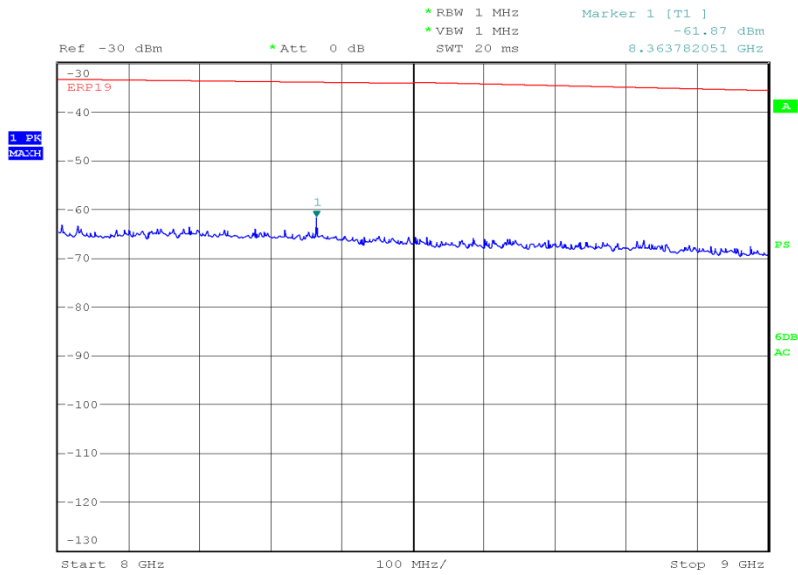
Product Service

3 GHz to 8 GHz



Date: 3.JUL.2012 21:51:26

8 GHz to 9 GHz



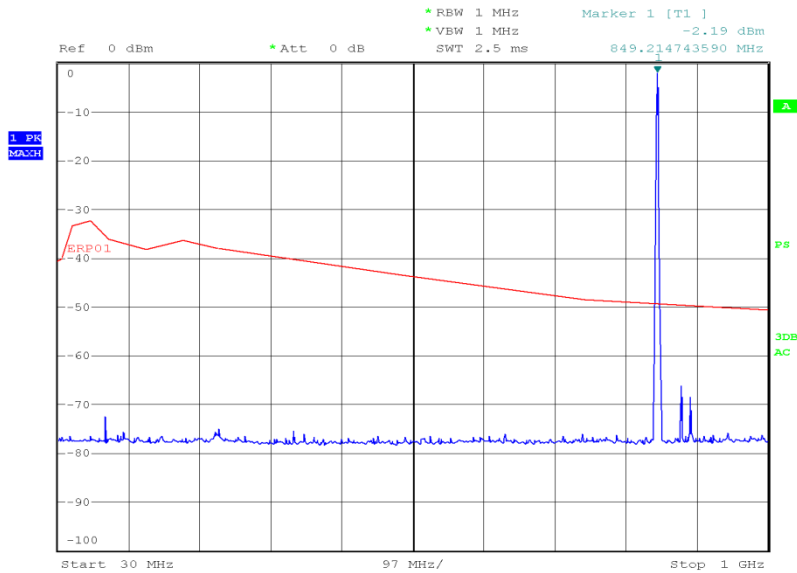
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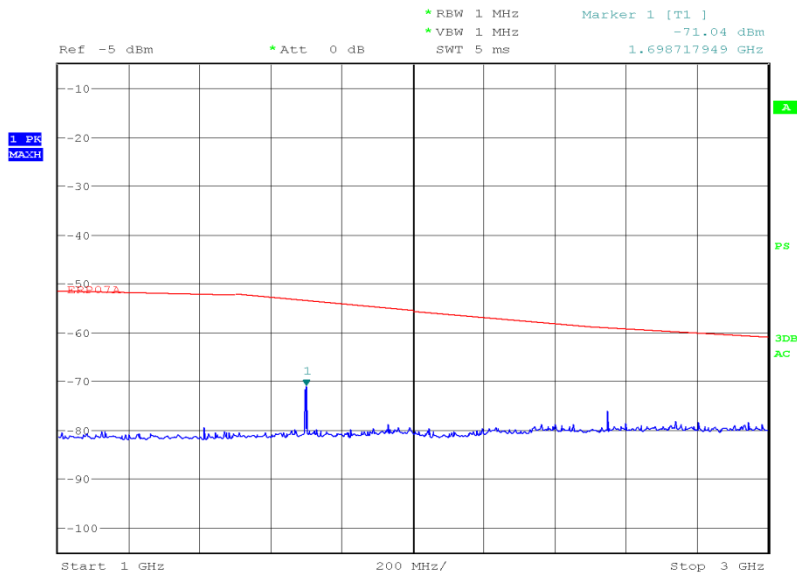
848.80 MHz

30 MHz to 1 GHz



Date: 3.JUL.2012 19:06:12

1 GHz to 3 GHz

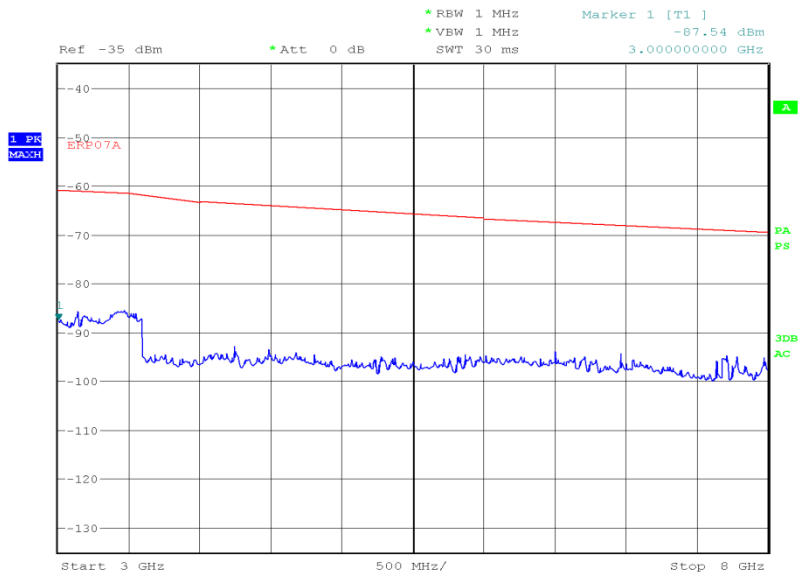


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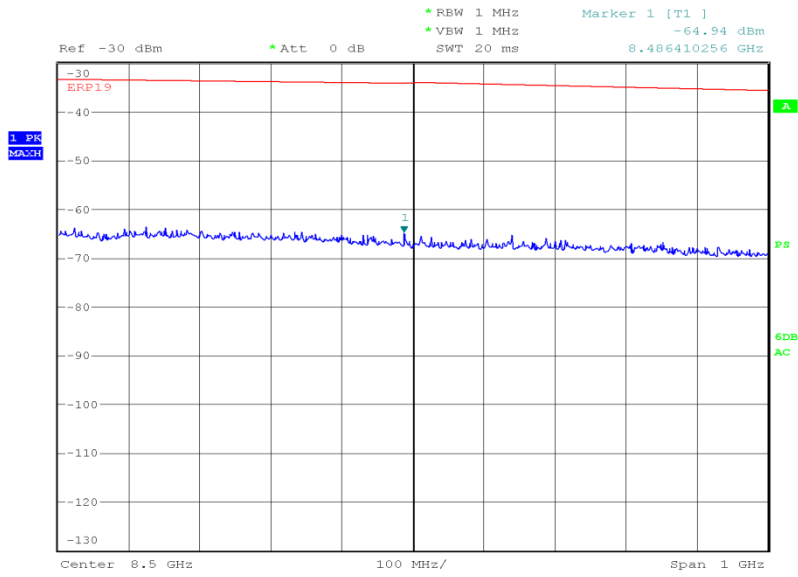
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3 GHz to 8 GHz



Date: 3.JUL.2012 22:14:35

8 GHz to 9 GHz



Date: 7.JUL.2012 08:13:26

Limit Clause

43+10log(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 – Effective Radiated Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	8-Dec-2012
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Section 2.2 – Emission Limitations for Cellular Equipment					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	8-Dec-2012
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	2-Aug-2012
Pre-Amplifier	Phase One	PS04-0086	1533	12	20-Sep-2012
Pre-Amplifier	Phase One	PS04-0087	1534	12	26-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	8-Jun-2013
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
High Pass Filter (3GHz)	RLC Electronics	F-100-3000-5-R	3349	12	29-May-2013
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	16-Apr-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	27-Jan-2013
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	mature GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	mature GmbH	NCD	3917	-	TU
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	12	8-Jul-2012

TU – Traceability Unscheduled



3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Effective Radiated Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Emission Limitations for Cellular Equipment	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB



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SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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