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Report On

FCC Testing of the
Cobham Tactical Communications Inca Repeater
In accordance with FCC CFR 47 Part 15B

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FCC ID: QKE-90136040

Document 75925939 Report 01 Issue 2

July 2014



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PREPARED FOR

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DATED

14 May 2014

This report has been up-issued to Issue 2 to include the FCC ID.

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 15B. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

Tony Guy

Paul Joynson





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Cobham Tactical Communications Inca Repeater
In accordance with FCC CFR 47 Part 15B



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Cobham Tactical Communications Inca Repeater to the requirements of FCC CFR 47 Part 15B.

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	Cobham Tactical Communications
Model Number(s)	Inca Repeater
Serial Number(s)	891050
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15B (2013)
Incoming Release Date	Application Form 26 March 2014
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	23561-3 19 February 2014
Start of Test	14 March 2014
Finish of Test	21 March 2014
Name of Engineer(s)	P Joynson T Guy
Related Document(s)	ANSI C63.4 (2003)



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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 15B is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
Idle				
2.1	15.107	AC Line Conducted Emissions	Pass	ANSI C63.4 (2003)
2.2	15.109	Radiated Emissions	Pass	ANSI C63.4 (2003)



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1.3 APPLICATION FORM

APPLICANT'S DETAILS			
COMPANY NAME :	Cobham Spectronic A/S		
ADDRESS :	Skindbjerg Vej 44.....		
	DK- 8500 Grenaa.....		
	Denmark.....		
NAME FOR CONTACT PURPOSES :	..Lars Julsgaard.....		
TELEPHONE NO: ...+45 87918122.....	FAX NO: +45 87918181.....		
E-MAIL: Lars.Julsgaard@cobham.com.....			

EQUIPMENT INFORMATION			
Model name/number	Inca Repeater...	Identification/Part number	90136041.....
Hardware Version	0202.....	Software Version	...1.0.2.....
Manufacturer	Cobham Spectronic A/S	Country of Origin	Denmark.....
FCC ID	.....	Industry Canada ID	.....
Technical description (a brief description of the intended use and operation)			
Transmitter with repeater functionality operating in the VHF band – to be operated by professionals.			
<u>Supply Voltage:</u>			
☐ AC mains	State AC voltage V	and AC frequency Hz	
☒ DC (external)	State DC voltage ...12 V	and DC current .....2,5 A	
☐ DC (internal)	State DC voltage V	and Battery type	
<u>Frequency characteristics:</u>			
Transmitter Frequency range	150. MHz to ...174 MHz	Channel spacing ...12,5kHz.....	(if channelized)
Receiver Frequency range (if different)	to ...	Channel spacing	(if channelized)
Designated test frequencies:			
Bottom: .....150..... MHz	Middle: .....158 MHz	Top: .....174 MHz	
Intermediate Frequencies : MHz			
Highest Internally Generated Frequency : MHz			
<u>Power characteristics:</u>			
Maximum transmitter power	5 W	Minimum transmitter power (if variable)	0,320 W
☒ Continuous transmission		State duty cycle	
☐ Intermittent transmission		If intermittent, can transmitter be set to continuous transmit test mode? Y/N	
<u>Antenna characteristics:</u>			
☒ Antenna connector		State impedance .....50 ohm	
☐ Temporary antenna connector		State impedance ohm	
☐ Integral antenna Type		State gain dBi	
☐ External Antenna Type		State gain .....0... dBi	
<u>Modulation characteristics:</u>			
☐ Amplitude		☐ Other	
☒ Frequency		Details: ...FM.....	
☐ Phase		(GMSK, QSPK etc)	
Can the transmitter operate un-modulated?		Y	
ITU Class of emission:			
<u>Battery/Power Supply</u>			
Model name/number	.....	Identification/Part number	.....
Manufacturer	.....	Country of Origin	.....
<u>Ancillaries (if applicable)</u>			
Model name/number	.....	Identification/Part number	.....
Manufacturer	.....	Country of Origin	.....
<u>Extreme conditions:</u>			
Maximum temperature	55... °C	Minimum temperature	0 °C
Maximum supply voltage	15,6 V	Minimum supply voltage	10,0 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.

Signature : 

Name : Lars Julsgaard

Position held : Engineering Manager - HW & Partnering

Date : 26-03-2014



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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Cobham Tactical Communications Inca Repeater. 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 110 V AC supply.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: IMEI 004401115077063			
0	As supplied by manufacturer.	N/A	N/A
1	Software only modification adding shutdown functionality to the RF bias circuitry. This included implementation of 1 pin on microprocessor board. See manufacturer's technical documentation for further details.	Lars Julsgaard	10 March 2014

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.



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SECTION 2

TEST DETAILS

FCC Testing of the
Cobham Tactical Communications Inca Repeater
In accordance with FCC CFR 47 Part 15B



2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15B, Clause 15.107

2.1.2 Equipment Under Test and Modification State

Inca Repeater S/N: 891050 - Modification State 1

2.1.3 Date of Test

14 March 2014

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

A test environment and testing arrangement meeting the specification of ANSI C63.4 was used during all testing. The Equipment Under Test (EUT) was set upon a non-conducting platform at an elevation of 80 cm above a horizontal reference ground plane. A vertical reference ground plane was situated 40 cm from the EUT and bonded to the horizontal reference ground plane.

The EUT was powered by a Line Impedance Stabilization Network (LISN), whereby emissions measurements of the current-carrying conductors were made through this LISN. The LISN was bonded to the horizontal reference ground plane with a separation distance greater than 80 cm from the EUT. A mains supply cable of 1 m length was used to supply mains power to the EUT from the LISN.

A preliminary emissions scan was conducted for each current-carrying conductor of the EUT, using a peak detector over a frequency range of 150 kHz to 30 MHz. At least six of the greatest peak emissions, frequency positions were selected from each preliminary emissions scan for further evaluation as final measuring points.

Final measurement points were measured using quasi-peak and average detectors. All final measurements were assessed against the Class B emission limits in Clause 15.107 of FCC CFR 47 FCC Part 15.

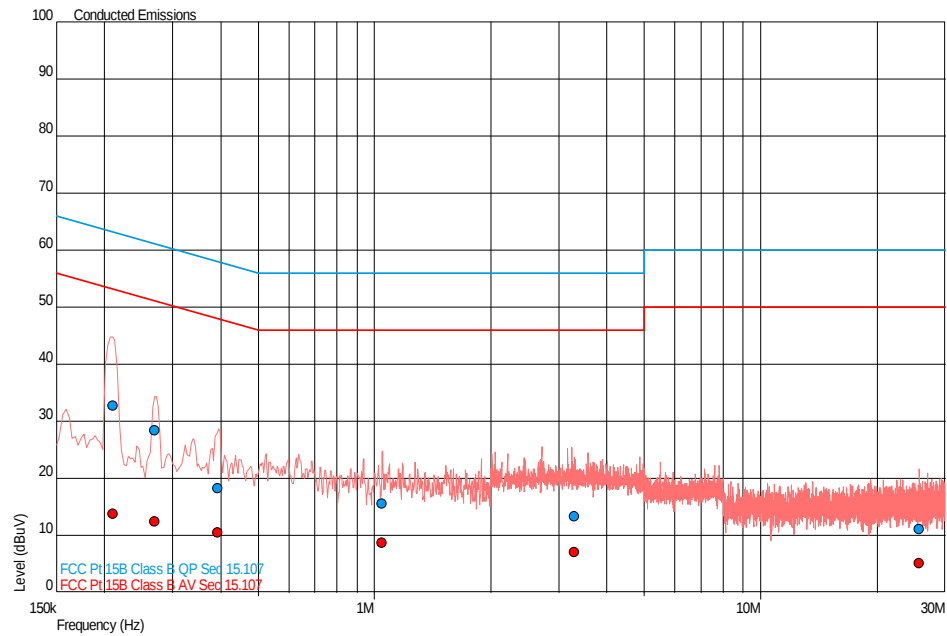
2.1.6 Environmental Conditions

Ambient Temperature	23°C
Relative Humidity	29%



2.1.7 Test Results

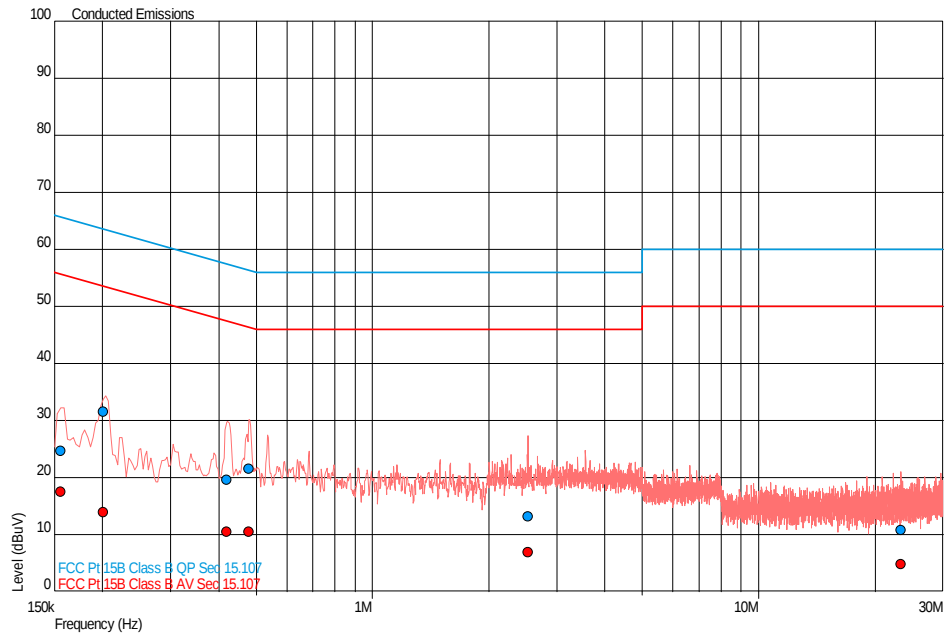
Live Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.210	32.8	63.2	-30.4	13.8	53.2	-39.4
0.270	28.4	61.1	-32.7	12.5	51.1	-38.6
0.392	18.2	58.0	-39.8	10.6	48.0	-37.5
1.046	15.5	56.0	-40.5	8.8	46.0	-37.2
3.284	13.3	56.0	-42.7	7.0	46.0	-39.0
25.720	11.1	60.0	-48.9	5.2	50.0	-44.8



Neutral Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.156	24.8	65.7	-40.9	17.5	55.7	-38.2
0.201	31.6	63.6	-31.9	13.9	53.6	-39.6
0.419	19.6	57.5	-37.9	10.6	47.5	-36.9
0.478	21.5	56.4	-34.8	10.5	46.4	-35.8
2.526	13.1	56.0	-42.9	6.9	46.0	-39.1
23.386	10.8	60.0	-49.2	4.9	50.0	-45.1



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2.2 RADIATED EMISSIONS

2.2.1 Specification Reference

FCC CFR 47 Part 15B, Clause 15.109

2.2.2 Equipment Under Test and Modification State

Inca Repeater S/N: 891050 - Modification State 1

2.2.3 Date of Test

21 March 2014

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 test environment and testing arrangement meeting the specification of ANSI C63.4 was used during all testing. The Equipment Under Test (EUT) was set upon a non-conducting platform at an elevation of 80 cm above a horizontal reference ground plane.

The horizontal reference ground plane encompasses a turntable which is used to adjust the azimuth of the EUT. An antenna positioner is used to elevate the measuring antenna above the horizontal reference ground plane whereby the antenna elevation is adjustable between 1 m and 4 m.

At least six of the greatest peak emissions, frequency positions were selected from the exploratory radiated emissions measurements for further evaluation as final measuring points.

To ascertain the azimuth and measuring antenna polarization that yields the highest peak emission level, each final measurement frequency was investigated by continuous azimuth emissions searching with the measuring antenna in both vertical and horizontal polarizations. For each final measurement frequency, the respective peak emission azimuth and measuring antenna polarization was used during a measuring antenna elevation search from 1 m to 4 m. Each final measurement frequency was then measured with the EUT azimuth, measuring antenna height and polarization that yielded the greatest peak emission level.

Final measurement points over the frequency range of 30 MHz to 1 GHz were measured using a quasi-peak detector. Final measurement points over the frequency range of 1 GHz and 2 GHz were measured using peak and average methods. Peak measurements were made using a peak detector with 1 MHz resolution and video bandwidths. Average measurements were made using a resolution bandwidth of 1 MHz and a video bandwidth of 10 kHz.

All final measurements were assessed against the class B emission limits in Clause 15.109 of FCC CFR 47 FCC Part 15.



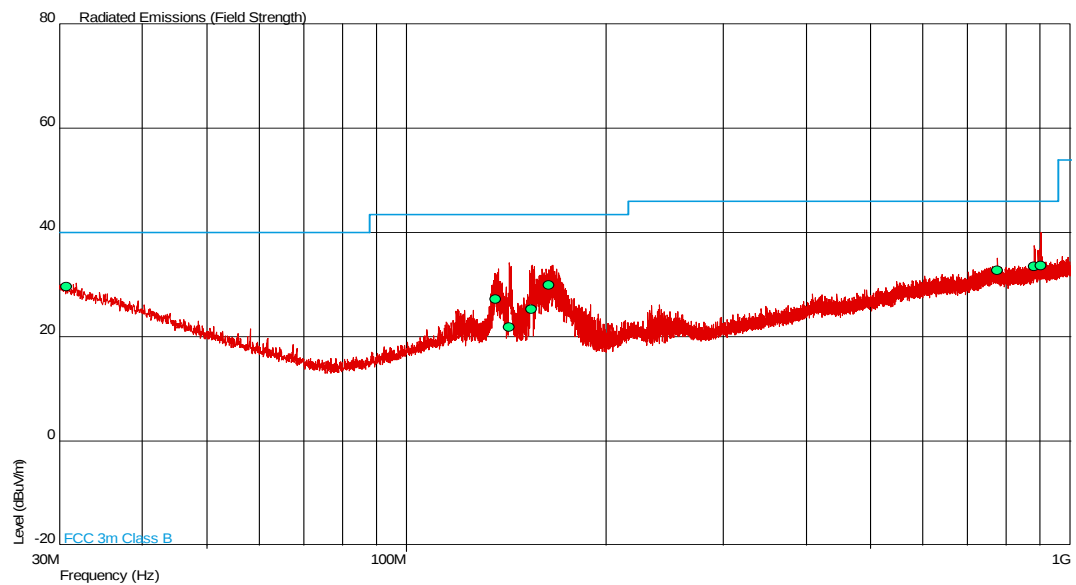
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2.2.6 Environmental Conditions

Ambient Temperature 21.3°C
Relative Humidity 33.5%

2.2.7 Test Results

30 MHz to 1 GHz

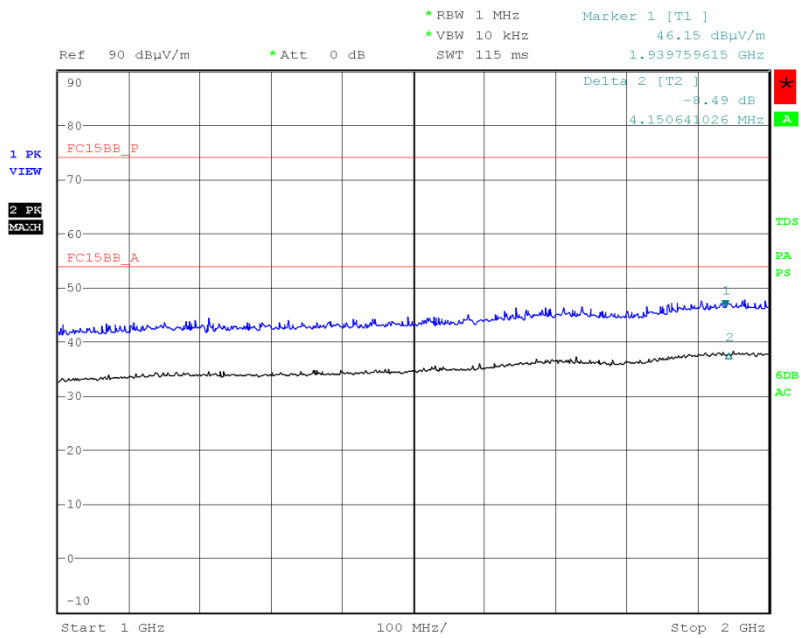


Frequency (MHz)	QP Level (dBμV/m)	QP Level (μV/m)	QP Limit (dBμV/m)	QP Limit (μV/m)	QP Margin (dBμV/m)	QP Margin (μV/m)	Angle (Deg)	Height (m)	Polarity
30.776	29.6	30.19	40.0	100	-10.4	-69.81	360	1.00	Horizontal
136.144	27.3	23.17	43.5	150	-16.2	-76.83	335	1.00	Vertical
142.560	21.9	12.45	43.5	150	-21.6	-87.55	0	1.20	Vertical
154.329	25.2	18.19	43.5	150	-18.3	-81.81	212	1.00	Vertical
163.742	30.0	31.62	43.5	150	-13.5	-68.38	217	1.15	Vertical
776.463	32.8	43.65	46.0	200	-13.2	-56.35	0	1.00	Horizontal
882.034	33.5	47.31	46.0	200	-12.5	-52.69	360	1.00	Vertical
901.394	33.6	47.86	46.0	200	-12.4	-52.14	260	2.59	Vertical



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1 GHz to 2 GHz



Date: 21.MAR.2014 15:18:48



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SECTION 3

TEST EQUIPMENT USED



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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 - AC Line Conducted Emissions					
Transient Limiter	Hewlett Packard	11947A	15	12	10-Dec-2014
3 phase LISN	Rohde & Schwarz	ESH2-Z5	323	12	16-Jan-2015
Screened Room (5)	Rainford	Rainford	1545	24	10-Jan-2015
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Section 2.2 - Radiated Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-Apr-2014
Load (50ohm/30W)	Weinschel	50T-054	285	12	12-Sep-2014
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2435	-	O/P Mon
Antenna (Bilog)	Chase	CBL6143	2904	24	10-Jun-2015
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3096	12	5-Mar-2015
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3098	12	27-Mar-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



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3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Radiated Emissions	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
AC Line Conducted Emissions	± 3.2 dB



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SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



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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
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