ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

ACCREDITED
TESTING Cert No.1152.01

DATE: 05 February 2015

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Cardo Peripheral Systems

Equipment under test:

Rider Communication System

scala rider PACKTALK
2405 MHz Transmitter

Approved by: _____

M. Zohar, Test Engineer

Approved by: _____

I. Raz, EMC Laboratory Manager

ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

ACCREDITED
TESTING Cert No.1152.01

Measurement/Technical Report for
Cardo Peripheral Systems

Rider Communication System

scala rider PACKTALK

FCC ID: Q95ER19

IC: 4668A-ER19

05 February 2015

This report concerns:	Original Grant: X Class I Change: Class II Change:
Equipment type:	Digital Transmission System
Limits used:	47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 v03r02 and ANSI C63.4-2009.

Application for Certification
prepared by:
R. Pinchuck
ITL (Product Testing) Ltd.
1 Bat Sheva St.
Lod 7116002
Israel
e-mail Rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Avi Moato
Cardo Peripheral Systems
13 Hamifal St.
Or Yehuda, 60221, Israel
Tel: +972-3-735-3111
Fax: +972-3562-3360
e-mail: moato@cardosystems.com

TABLE OF CONTENTS

1. General Information

1.1 *Administrative Information*

Manufacturer:	Cardo Peripheral Systems
Manufacturer's Address:	13 Hamifal St., Or Yehuda, 60221 Israel Tel: +972-3-735-3111 Fax: +972-3562-3360
Manufacturer's Representative:	Avi Moato
Equipment Under Test (E.U.T):	Rider Communication System
Equipment Model No.:	scala rider PACKTALK
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	11.11.2014
Start of Test:	11.11.2014
End of Test:	22.01.2015
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C RSS-210, Issue 8, 2010

1.2 *List of Accreditations*

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. US1004.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 *Product Description*

Communication and entertainment system for motorcycle helmets.
The scala rider PACKTALK offers the following key features:
Intercom Options
Multiple Device Connectivity
Entertainment Options
Cardo community and Cardo SmartSet APP
Advanced Technology

1.4 Test Methodology

Radiated testing was performed according to the procedures in KDB 558074 D01 v03r02, ANSI C63.4: 2009 and RSS-Gen Issue 4. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 *Test Facility*

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is US1004.

1.6 *Measurement Uncertainty*

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.98 dB

Note: See ITL Procedure No. PM 198.

2. System Test Configuration

2.1 *Justification*

Radiated emission screening was performed in 3 orthogonal orientations to determine the worst case.

The fundamental results are shown in the below table:

Frequency (GHz)	X axis (dBuV/m)	Y axis (dBuV/m)	Z axis (dBuV/m)
2.405	57.3	60.4	49.1

In all axes the spurious levels were under the noise level.

According to above results the worst case was the y axis.

The unit was transmitting continuously at the frequency of 2405 MHz (the only operational channel) with one modulation mode: O-QPSK.

2.2 *EUT Exercise Software*

No special exercise software was used.

2.3 *Special Accessories*

No special accessories were needed to achieve compliance.

2.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.

2.5 *Configuration of Tested System*

Figure 1. Configuration of Tested System

3. Conducted & Radiated Measurement Test Set-up Photo

Figure 2. Conducted Emission Test

Figure 3. Radiated Emission Test

Figure 4. Radiated Emission Test

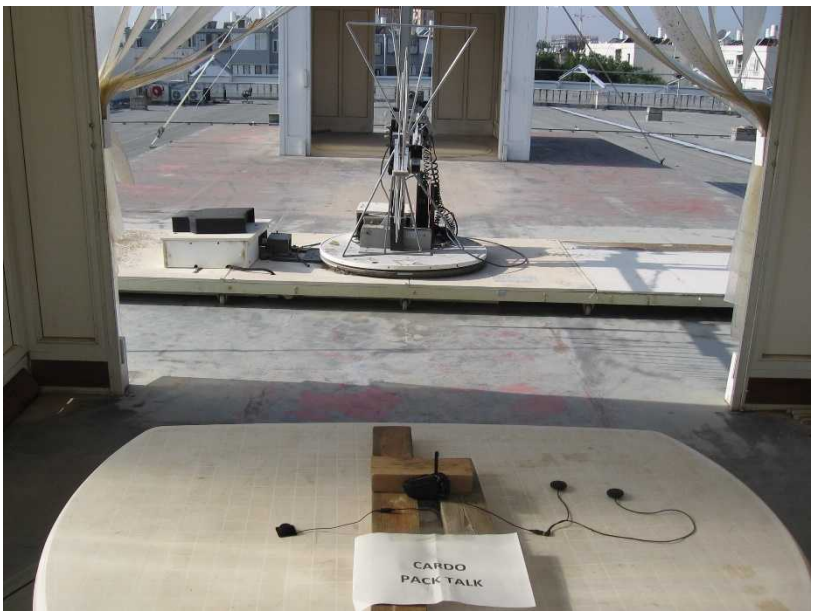

Figure 5. Radiated Emission Test

4. Conducted Emission From AC Ports

4.1 *Test Specification*

F.C.C., Part 15, Subpart C, 15.207

4.2 *Test Procedure*

The E.U.T operation mode and test setup are as described in Section 2. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room (see Section 3), with the E.U.T placed on a 0.8 meter high wooden table. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.80 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in the photograph, *Figure 2. Conducted Emission Test.*

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are pre-loaded to the receiver and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 *Test Results*

The E.U.T met the requirements of the FCC Part 15, Subpart C, 15.207 specifications.

The margin between the emission levels and the specification limit is, in the worst case, 22.39 dB for the phase line at 0.322 MHz and 26.96 dB at 0.314 MHz for the neutral line.

The details of the highest emissions are given in *Figure 6* to *Figure 9.*

TEST PERSONNEL:

Tester Signature: _____ Date: 26.01.15

Typed/Printed Name: M. Zohar

Conducted Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C, Class B
Lead:	Phase
Detectors:	Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	214 kHz	32.29	-30.75
2	Average	218 kHz	17.85	-35.03
1	Quasi Peak	322 kHz	37.26	-22.39
2	Average	322 kHz	22.94	-26.71
2	Average	554 kHz	13.22	-32.77
1	Quasi Peak	630 kHz	25.84	-30.15
1	Quasi Peak	1.014 MHz	22.62	-33.37
2	Average	1.014 MHz	12.71	-33.28
2	Average	1.466 MHz	12.75	-33.25
1	Quasi Peak	1.498 MHz	21.76	-34.24
2	Average	2.29 MHz	11.92	-34.07
1	Quasi Peak	2.686 MHz	20.11	-35.88
1	Quasi Peak	3.626 MHz	17.66	-38.33
2	Average	3.662 MHz	9.68	-36.31
1	Quasi Peak	6.338 MHz	15.51	-44.49
2	Average	8.414 MHz	8.04	-41.95
2	Average	14.722 MHz	8.21	-41.78
1	Quasi Peak	16.702 MHz	16.97	-43.02
1	Quasi Peak	21.13 MHz	18.54	-41.45
2	Average	24.502 MHz	13.47	-36.52

Date: 20.JAN.2015 10:53:15

Figure 6. Detectors: Quasi-peak, Average

Note: DELTA LIMIT refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C, Class B
Lead:	Phase
Detectors:	Quasi-peak, Average

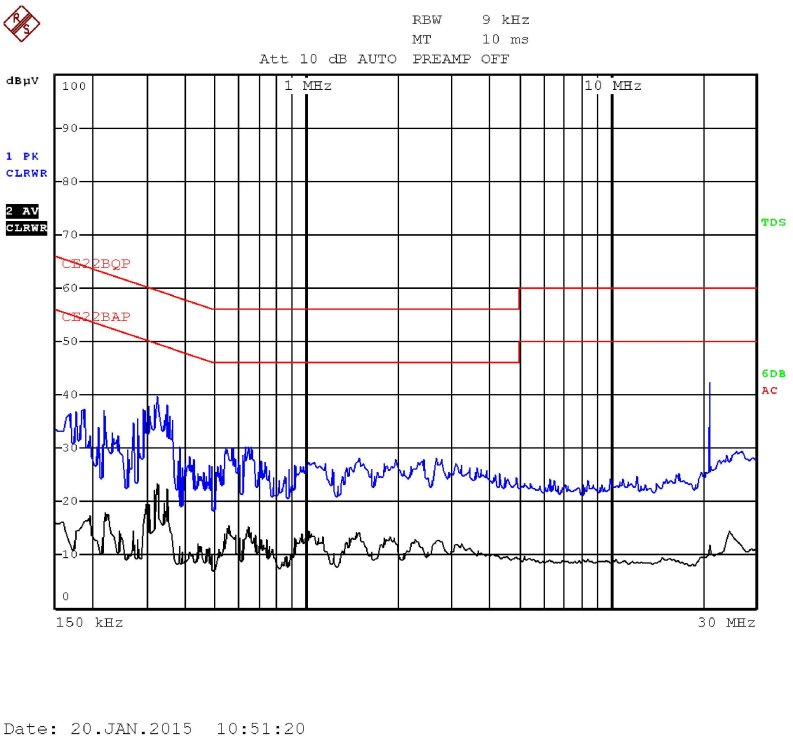

Figure 7 Detectors: Quasi-peak, Average

Conducted Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C, Class B
Lead:	Neutral
Detectors:	Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	202 kHz	29.93	-33.59
2	Average	242 kHz	15.73	-36.29
1	Quasi Peak	314 kHz	32.89	-26.96
2	Average	322 kHz	19.82	-29.83
1	Quasi Peak	586 kHz	24.95	-31.04
2	Average	646 kHz	13.98	-32.01
2	Average	1.082 MHz	12.59	-33.40
1	Quasi Peak	1.11 MHz	22.75	-33.24
1	Quasi Peak	1.438 MHz	22.03	-33.96
2	Average	1.438 MHz	11.00	-34.99
2	Average	2.378 MHz	11.89	-34.10
1	Quasi Peak	2.842 MHz	22.84	-33.15
2	Average	3.61 MHz	9.64	-36.35
1	Quasi Peak	3.766 MHz	21.79	-34.20
2	Average	8.794 MHz	8.15	-41.84
1	Quasi Peak	10.314 MHz	17.39	-42.60
2	Average	14.394 MHz	9.47	-40.52
1	Quasi Peak	17.13 MHz	20.01	-39.98
2	Average	24.154 MHz	16.70	-33.29
1	Quasi Peak	28.03 MHz	24.42	-35.57

Date: 20.JAN.2015 10:58:49

Figure 8. Detectors: Quasi-peak, Average

Note: DELTA LIMIT refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C, Class B
Lead:	Neutral
Detectors:	Quasi-peak, Average

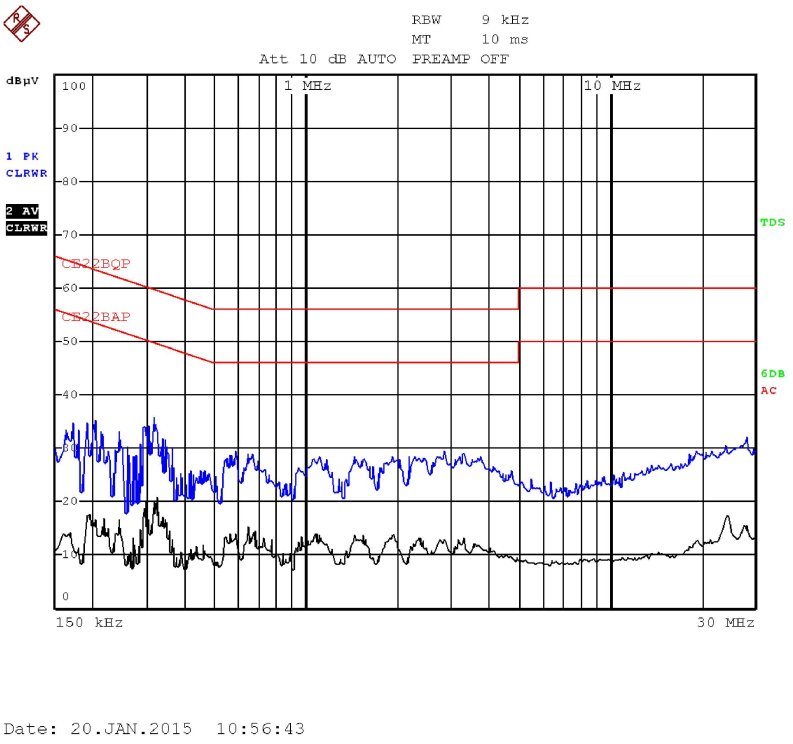

Figure 9 Detectors: Quasi-peak, Average

5. 6 dB Minimum Bandwidth

5.1 *Test procedure*

The E.U.T operation mode and test set-up are as described in Section 2.

See Section 2.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

The E.U.T was tested at the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded.

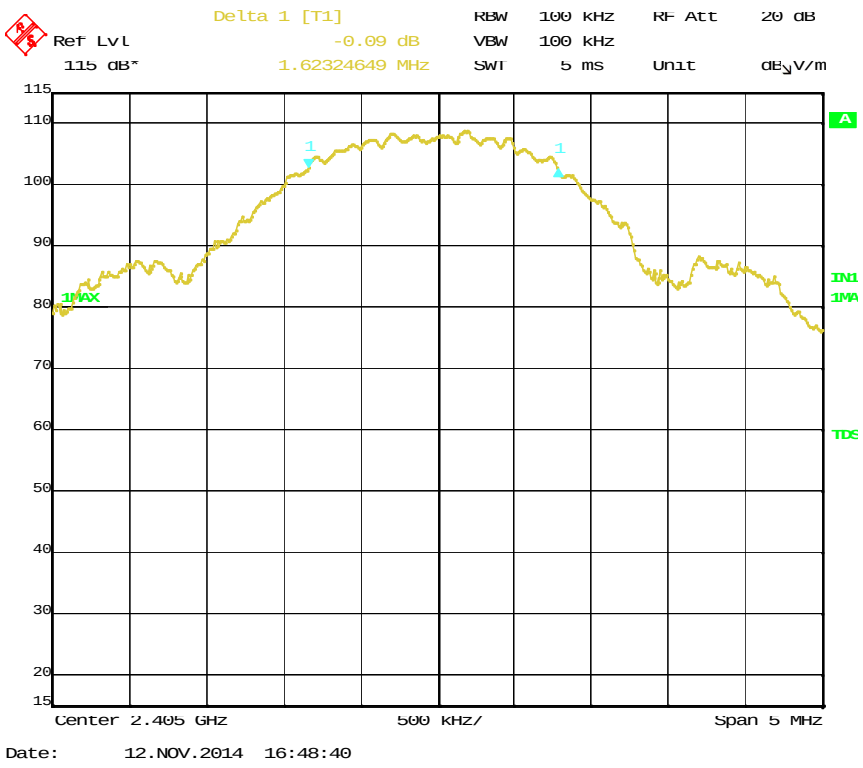

Figure 10 — 2405 MHz Channel

5.2 *Results Table*

E.U.T Description: Rider Communication System
Model No.: scala rider PACKTALK
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation	Reading (MHz)	Specification (MHz)
2405.00	O-QPSK	1.62	>0.5

Figure 11 6 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 16.12.14

Typed/Printed Name: M. Zohar

5.3 *Test Equipment Used; 6 dB Minimum Bandwidth*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 12 Test Equipment Used

6. 26 dB Minimum Bandwidth

6.1 *Test procedure*

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 2.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

The E.U.T was tested at the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The spectrum bandwidth of the E.U.T. at the point of 26 dB below maximum peak power was measured and recorded.

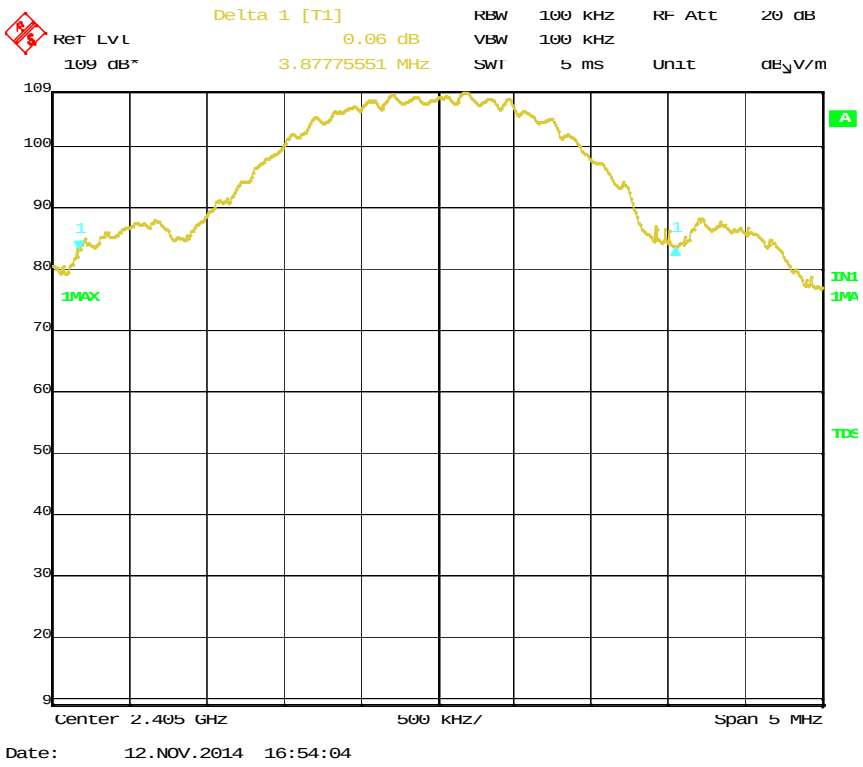

Figure 13 — 2405 MHz Channel

6.2 *Results Table*

E.U.T Description: Rider Communication System
Model No.: scala rider PACKTALK
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation	Reading (MHz)
2405.00	O-QPSK	3.87

Figure 14 26 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 16.12.14

Typed/Printed Name: M. Zohar

6.3 *Test Equipment Used; 26 dB Minimum Bandwidth*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 15 Test Equipment Used

7. Maximum Transmitted Peak Power Output

7.1 *Test procedure*

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

The E.U.T was tested at the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in

Figure 1.

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

E - Field Strength (V/m)

d – Distance from transmitter (m)

G – Antenna gain

P – Peak power (W)

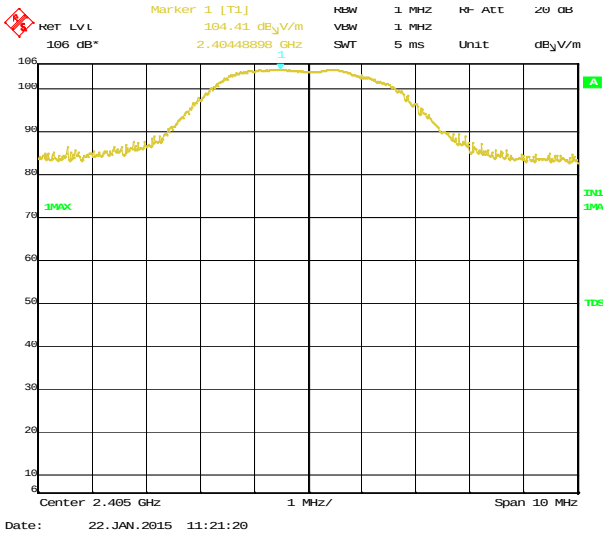

Figure 16. 2405 MHz channel, Vertical

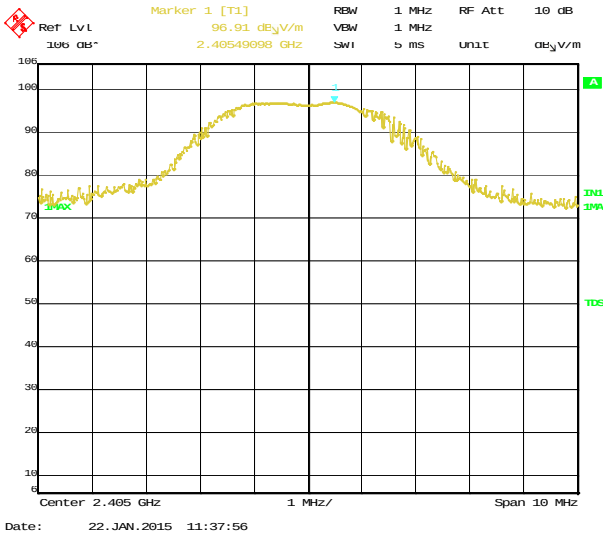

Figure 17. 2405 MHz channel, Horizontal

7.2 *Results Table*

E.U.T. Description: Rider Communication System
Model No.: scala rider PACKTALK
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C Section 15.247(b)

Operation Frequency (MHz)	Antenna Polarization	Modulation	Power (dBuV/m)	Power (dBm)	power (W)	Specification (W)	Margin (W)
2405.00	V	O-QPSK	104.4	9.2	0.008	1.0	-0.992
2405.00	H	O-QPSK	96.9	1.7	0.001	1.0	-0.999

Figure 18 Maximum Peak Power Output

JUDGEMENT: Passed by 0.992 W

TEST PERSONNEL:

Tester Signature: _____ Date: 26.01.15

Typed/Printed Name: Moshe Zohar

7.3 *Test Equipment Used; Maximum Transmitted Peak Power Output*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 19 Test Equipment Used

8. Band Edge Spectrum

[In Accordance with section 15.247(c)]

8.1 *Test procedure*

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

The E.U.T was tested at the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The E.U.T evaluated in vertical polarity antenna for find worst case.

The RBW was set to 100 kHz and VBW to 100 kHz.

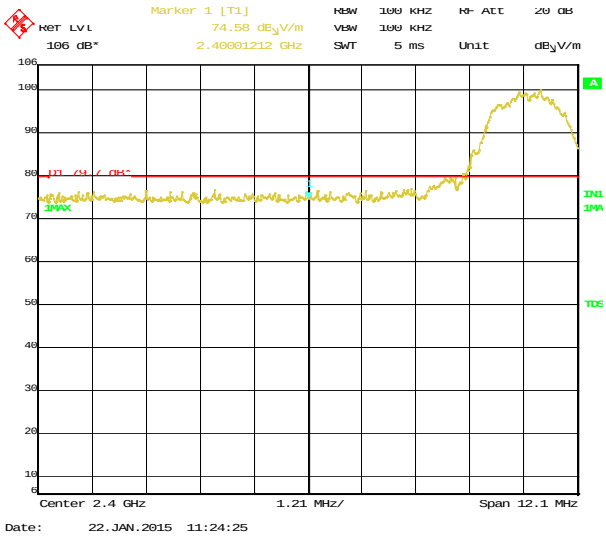

Figure 20 —Lower Band Edge, O-QPSK

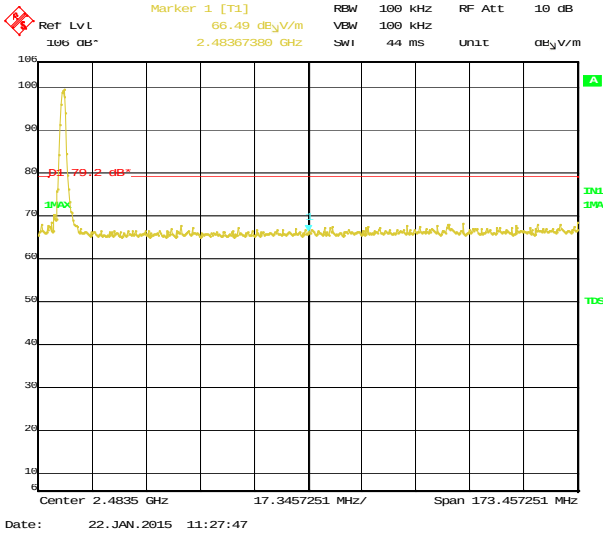

Figure 21 —Upper Band Edge, O-QPSK

8.2 *Results Table*

E.U.T. Description: Rider Communication System
Model No.: scala rider PACKTALK
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Specification (dBm)	Margin (dB)
2405.0	O-QPSK	2400.0	74.6	79.7	-5.1
2405.0	O-QPSK	2483.5	66.5	79.2	-12.7

Figure 22 Band Edge Spectrum

JUDGEMENT: Passed by 5.1 dB

TEST PERSONNEL:
Tester Signature: _____ Date: 26.01.15
Typed/Printed Name: M. Zohar

8.3 *Test Equipment Used; Band Edge Spectrum*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 23 Test Equipment Used

9. Radiated Emission, 9 kHz – 30 MHz

9.1 *Test Specification*

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

9.2 *Test Procedure*

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at 2.405 GHz using a peak detector.

9.3 *Measured Data*

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

TEST PERSONNEL:

Tester Signature: _____ Date: 16.12.14

Typed/Printed Name: M. Zohar

9.4 *Test Instrumentation Used, Radiated Measurements*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 24 Test Equipment Used

9.5 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

No external pre-amplifiers are used.

10. Spurious Radiated Emission, 30 – 25000 MHz

10.1 *Radiated Emission 30-25000 MHz*

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1.*

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.
In the frequency range 1-6.0 GHz, a computerized EMI receiver complying with CISPR 16 requirements was used.
In the frequency range 6.0-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.
The test distance was 3 meters.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was operated at 2.405 GHz using a peak detector.

10.2 *Test Data*

JUDGEMENT: Passed by 1.9 dB

For the operation frequency of 2405 MHz, the margin between the emission level and the specification limit is in the worst case 1.9 dB at the frequency of 2390.00MHz, horizontal polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C specification.

The details of the highest emissions are given in *Figure 25* to *Figure 26.*

TEST PERSONNEL:

Tester Signature: _____ Date: 26.01.15

Typed/Printed Name: M. Zohar

Radiated Emission Above 1 GHz

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: 2405 MHz

Freq. (MHz)	Polarity (H/V)	Peak Amp (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2390.0	H	62.4	74.0	-11.6
2390.0	V	63.6	74.0	-10.4
4810.0	H	57.8	74.0	-16.2
4810.0	V	59.2	74.0	-14.8
7215.0	H	57.1	74.0	-16.9
7215.0	V	58.5	74.0	-15.5
2483.5	H	57.9	74.0	-16.1
2483.5	V	54.1	74.0	-19.9

Figure 25. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Average
Operation Frequency: 2405 MHz

Freq. (MHz)	Polarity (H/V)	Average Amp (dBµV/m)	Average Specification (dB µV/m)	Average Margin (dB)
2390.0	H	52.1	54.0	-1.9
2390.0	V	44.9	54.0	-9.1
4810.0	H	50.1	54.0	-3.9
4810.0	V	50.3	54.0	-3.7
7215.0	H	35.4	54.0	-18.6
7215.0	V	39.8	54.0	-14.2
2483.5	H	41.4	54.0	-12.6
2483.5	V	42.6	54.0	-11.4

Figure 26. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Intermodulation Radiated Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Frequency: 2405 MHz + 2402 MHz

Frequency (MHz)	Modulation	Polarity (H/V)	Peak Reading (dBµV/m)	Peak Specification (dB µV/m)	Peak Margin (dB)
2399.0	PT + standard	H	57.1	73.0	-15.9
2399.0	PT + standard	V	74.3	80.0	-5.7
2396.0	PT + standard	H	52.5	73.0	-20.5
2396.0	PT + standard	V	73.6	80.0	-6.4
2393.0	PT + standard	H	52.7	73.0	-20.3
2393.0	PT + standard	V	73.7	80.0	-6.3
2390.0	PT + standard	H	64.1	74.0	-9.9
2390.0	PT + standard	V	68.3	74.0	-5.7

Note: All the above results was OATS background noise

Figure 27. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Intermodulation Radiated Emission

E.U.T Description	Rider Communication System
Type	scala rider PACKTALK
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Test Distance: 3 meters
Frequency: 2405 MHz + 2402 MHz

Frequency range: 1.0 GHz to 25.0 GHz
Detector: Average

Frequency (MHz)	Modulation	Polarity (H/V)	AVG. Reading (dBµV/m)	AVG. Specification (dB µV/m)	AVG. Margin (dB)
2399.0	PT + standard	H	N/A	N/A	N/A
2399.0	PT + standard	V	N/A	N/A	N/A
2396.0	PT + standard	H	N/A	N/A	N/A
2396.0	PT + standard	V	N/A	N/A	N/A
2393.0	PT + standard	H	N/A	N/A	N/A
2393.0	PT + standard	V	N/A	N/A	N/A
2390.0	PT + standard	H	41.1	54.0	-12.9
2390.0	PT + standard	V	43.1	54.0	-10.9

Note: All the above results was OATS background noise

Figure 28. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

10.3 *Test Instrumentation Used, Radiated Measurements Above 1 GHz*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 29 Test Equipment Used

11. Transmitted Power Density

[In accordance with section 15.247(d)]

11.1 *Test procedure*

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

The E.U.T was tested at the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 1*.

The E.U.T was tested in vertical antenna test polarity for worst case.

The spectrum analyzer was set to 3 kHz resolution BW and sweep time of 1 second for each 3 kHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

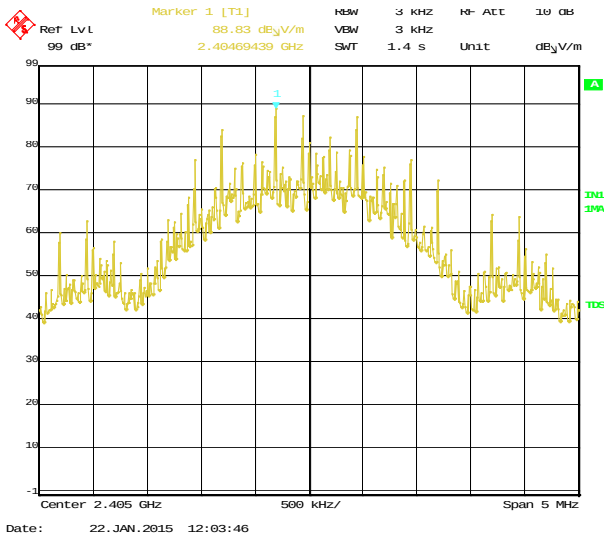

Figure 30 — 2405 MHz Channel, O-QPSK, Vertical

11.2 *Results Table*

E.U.T. Description: Rider Communication System
Model No.: scala rider PACKTALK
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Reading Spectrum Analyzer (dBµV/m)	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
2405.0	O-QPSK	88.8	-6.4	8.0	-14.4

Figure 31 Test Results

JUDGEMENT: Passed by 14.4 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 26.01.15

Typed/Printed Name: M. Zohar

11.3 *Test Equipment Used; Transmitted Power Density*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 32 Test Equipment Used

12. Antenna Gain/Information

The antenna gain is 0dBi, external.

13. Average Factor Calculation

1. Burst duration =0.56 msec
2. Time between bursts = <100msec
3. Pulse duration = 1 (worst scenario)
4. pulse period = 1 (worst scenario)
5. $$\text{AverageFactor} = 20\log\left[\frac{\text{Pulse duration}}{\text{Pulse period}} \times \frac{\text{burst duration}}{100\text{msec}} \times \text{Num of burst within } 100\text{msec}\right]$$

$$\text{Average Factor} = 20\log\left[\frac{0.56}{100} * 6\right] = -29.4dB$$

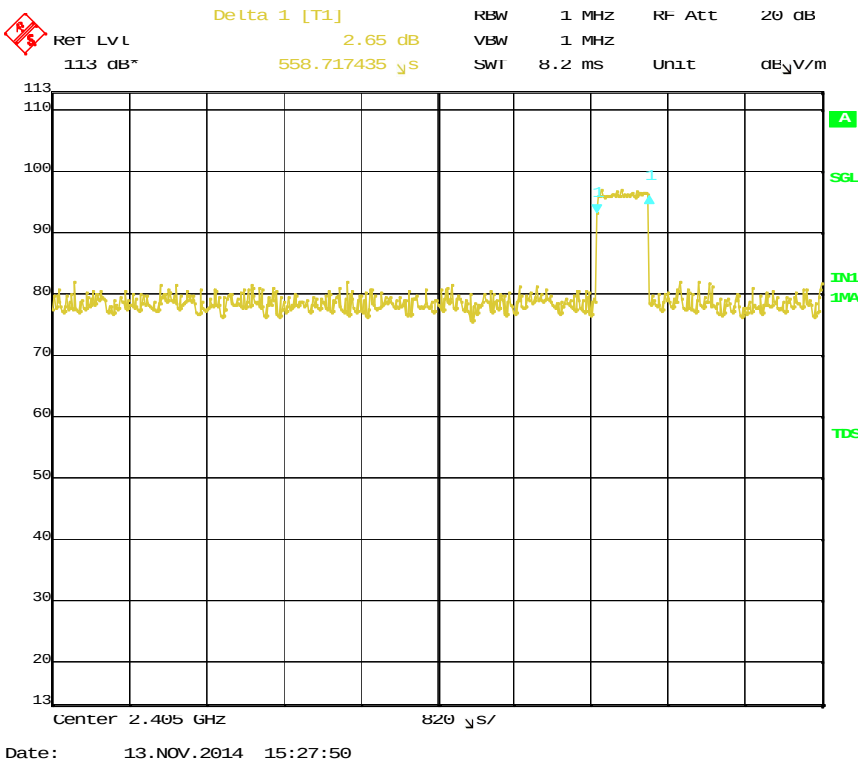

Figure 33. Burst Duration

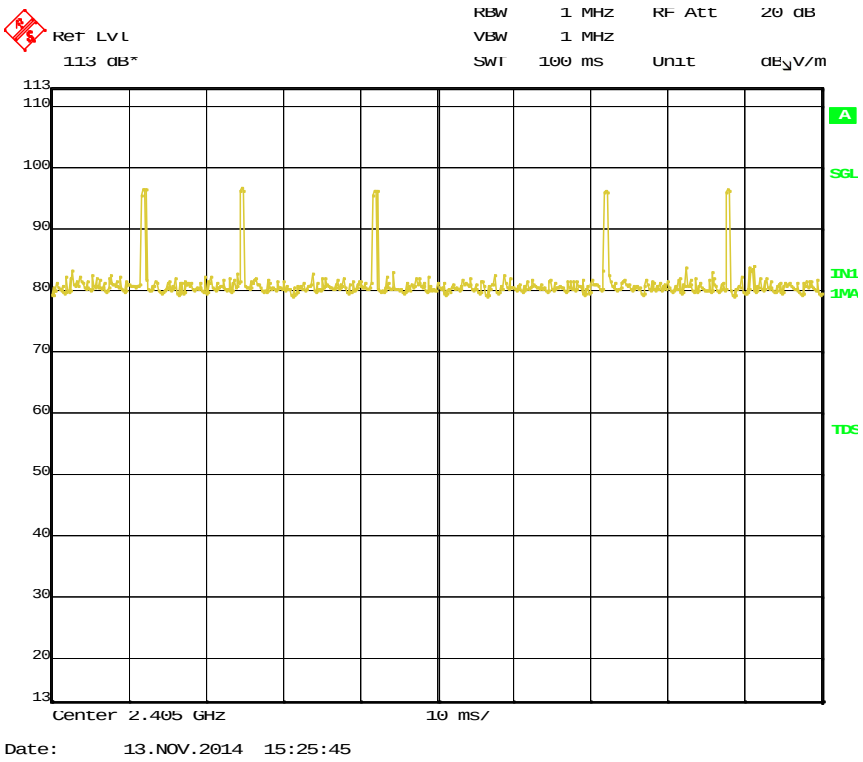

Figure 34. Number of Bursts in 100msec

13.1 *Test Equipment Used, Average Factor Calculation*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	R&S	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Biconilog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	6142	March 14, 2012	3 years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

14. R.F Exposure/Safety

Typical use of the E.U.T. is as a Rider Communication System.

The typical placement of the E.U.T. is on the outside of a motorcycle helmet (See photo on following page). The typical distance between the E.U.T. and the user in the worst case application, is 3 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

(a) FCC limits at 2405 MHz is: $1\frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 104.4 dBuV/m (Peak) = 8.31764 mW

G_T- Antenna Gain, 0 dBi = 1 numeric

R- Distance from Transmitter using 3cm worst case

(c) The peak power density is:

$$S = \frac{(8.32 \times 1)}{4\pi (3)^2} = 0.0736 \frac{mW}{cm^2}$$

(d) Intermodulated RF Exposure

2405 MHz - Transmitted Power 104.4 dBuV/m (Peak) = 8.31764 mW
Bluetooth - Transmitted Power 105.86 dBuV/m = 11.64 mW

$$S = \frac{(8.32 + 11.64)}{4\pi (3)^2} = 0.1765 \frac{mW}{cm^2}$$

(e)These are below the FCC limit.

15. APPENDIX A - CORRECTION FACTORS

15.1 *Correction factors for CABLE*

from EMI receiver to test antenna at 3 meter range.

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
0.010	0.4	50.00	1.2
0.015	0.2	100.00	0.7
0.020	0.2	150.00	20.1
0.030	0.3	200.00	2.3
0.050	0.3	300.00	2.9
0.075	0.3	500.00	3.8
0.100	0.2	750.00	4.8
0.150	0.2	1000.00	5.4
0.200	0.3	1500.00	6.7
0.500	0.4	2000.00	9.0
1.00	0.4	2500.00	9.4
1.50	0.5	3000.00	9.9
2.00	0.5	3500.00	10.2
5.00	0.6	4000.00	11.2
10.00	0.8	4500.00	12.1
15.00	0.9	5000.00	13.1
20.00	0.8	5500.00	13.5
		6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long

2. The cable is manufactured by Huber + Suhner

15.2 *Correction factors for CABLE* from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

15.3 *Correction factors for CABLE*

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

15.4 *Correction factors for Bilog ANTENNA*

Model: 3142
Antenna serial number: 1250
3 meter range

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		

15.5 *Correction factors for Horn ANTENNA.*

Model: 3115

Antenna serial number: 6142

3 meter range

FREQUENCY (MHz)	Antenna Factor (dB/m)	FREQUENCY (MHz)	Antenna Factor (dB/m)
1000	23.9	10500	38.4
1500	25.4	11000	38.5
2000	27.3	11500	39.4
2500	28.5	12000	39.2
3000	30.4	12500	39.4
3500	31.6	13000	40.7
4000	33	14000	42.1
4500	32.7	15000	40.1
5000	34.1	16000	38.2
5500	34.5	17000	41.7
6000	34.9	17500	45.7
6500	35.1	18000	47.7
7000	35.9		
7500	37.5		
8000	37.6		
8500	38.3		
9000	38.5		
9500	38.1		
10000	38.6		

15.6 *Correction factors for LOG PERIODIC ANTENNA*

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

15.7 *Correction factors for Double-Ridged Waveguide Horn*

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

15.8 *Correction factors for Horn Antenna*

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

15.9 *Correction factors for ACTIVE LOOP ANTENNA*

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

16. Comparison Industry Canada Requirements With FCC

Cardo Peripheral Systems M/N: scala rider PACKTALK
IC: 4668A-ER19 FCC ID: Q95ER19

Test	FCC	IC
❑ Conducted Emission	15.207	RSS 210 Issue 8 Clause 2.5
❑ Radiated Emission	15.209	RSS 210 Issue 8 Clause 2.5
❑ Max power / Peak power	15.247(b)(3)	RSS 210 Issue 8 A8.4(4)
❑ 6dB BW	15.247(a)2	RSS 210 Issue 8 A8.2a
❑ Power density	15.247(e)	RSS 210 Issue 8 A8.2b
❑ Spurious radiated emission in the restricted band	15.205(c)	RSS 210 Issue 8 2.5 RSS Gen 7.2.2 (Table 1)
❑ Band edge spectrum	15.247(d)	RSS 210 Issue 8 A8.5
❑ RF Exposure Limits	1.1310	RSS 102 4.4