



DATE: 18 February 2015

**I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
SuperCom Ltd.**

**Equipment under test:
WWAN Cellular Module
RI7HE910**

Approved by: 
M. Zohar

Approved by: 
D. Shidlow

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.
This report relates only to items tested.



Measurement/Technical Report for SuperCom Ltd.

WWAN Cellular Module

RI7HE910

FCC ID: W5P-HE910

This report concerns:

Original Grant:

Class I change:

Class II change: X

Equipment Type:

PCB - PCS Licensed Transmitter

Limits used:

47CFR15 Section 15.209

Measurement procedure used is ANSI C63.4: 2003.

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")

Ze'ev Lavi

SuperCom Ltd.

1 Arie Shenkar St.

Herzliya 4672501

Israel

Tel: + 972 - 9 - 889 - 0800

Fax: + 972 - 9 - 889 - 0814

e-mail: Zeev@SuperCom.com



TABLE OF CONTENTS

1.	GENERAL INFORMATION -----	4
1.1	Administrative Information	4
1.2	List of Accreditations	5
1.3	Product Description	6
1.4	Test Methodology	6
1.5	Test Facility	6
1.6	Measurement Uncertainty	6
2.	SYSTEM TEST CONFIGURATION -----	7
2.1	Justification	7
2.2	Special Accessories	7
2.3	Equipment Modifications	7
2.4	Configuration of Tested System	8
3.	TEST SET-UP PHOTOS -----	9
4.	INTERMODULATION RADIATED EMISSION -----	11
4.1	Test Procedure	11
4.2	Measured Data	12
8.1	Test Instrumentation Used, Intermodulation Radiated Emission Measurements	17
5.	ANTENNA GAIN/INFORMATION -----	18
6.	R.F EXPOSURE/SAFETY -----	19
7.	APPENDIX A - CORRECTION FACTORS -----	20
7.1	Correction factors for CABLE	20
7.2	Correction factors for CABLE	21
7.3	Correction factors for LOG PERIODIC ANTENNA	22
7.4	Correction factors for BICONICAL ANTENNA	23
7.5	Correction factors for ACTIVE LOOP ANTENNA	24



1. General Information

1.1 Administrative Information

Manufacturer:	SuperCom Ltd.
Manufacturer's Address:	1 Arie Shenkar St. Herzeliya, 4672501 Israel Tel: 972-9-889-0800 Fax: 972-9-889-0814
Manufacturer's Representative:	Ehud Bachman
Equipment Under Test (E.U.T):	WWAN Cellular Module
Equipment Model No.:	RI7HE910
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	30.11.2014
Start of Test:	30.11.2014
End of Test:	01.12.2014
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C



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 Number 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

The EUT is cellular GSM module.

1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Radiated 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

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):

± 4.96 dB

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



2. System Test Configuration

2.1 **Justification**

A C2PC of the W5P-HE910 FCC Grant is being requested in order to:

1) allow simultaneous transmission of the approved FCC ID: W5P-HE910 module and the FCC approved module under FCC ID: Z64-WL18SBMOD;

and

2) grant limited modular approval of the FCC ID: W5P-HE910 module in the new host, the PurCom v1.0 being submitted under FCC ID:W5P-PRF-PURECOM10.

Testing was performed in the installation position.

Intermodulation testing of the 2 FCC approved modules was performed and RF exposure was calculated.

2.2 **Special Accessories**

No special accessories were needed to achieve compliance.

2.3 **Equipment Modifications**

No equipment modifications were required to achieve compliance.

2.4 Configuration of Tested System

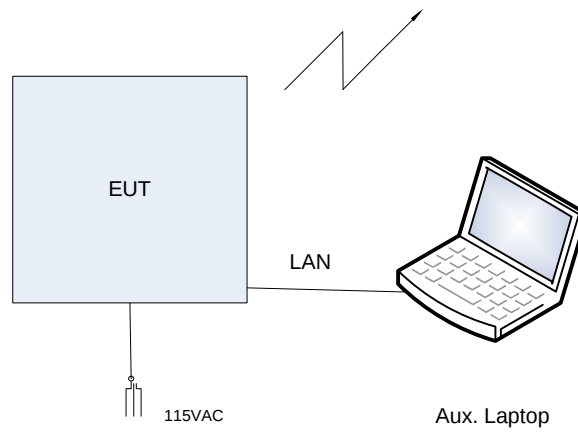


Figure 1. Configuration of Tested System

3. Test Set-up Photos



Figure 2. Radiated Emission Test



Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test

4. Intermodulation Radiated Emission

4.1 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.

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 E.U.T was evaluated in 2 modulations: Cellular and Bluetooth/WiFi.

The frequency range 30 MHz-1000 MHz was scanned and the list of the highest emissions was verified and updated accordingly.

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.

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 30-1000 MHz, the readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

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.)



4.2 **Measured Data**

JUDGEMENT: Passed

The margin between the emission level and the specification limit was 4.1 dB in the worst case at the frequency of 5376.0 MHz, vertical polarization.

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

TEST PERSONNEL:

Tester Signature:  _____

Date: 13.01.15

Typed/Printed Name: M. Zohar



Intermodulation Radiated Emission

E.U.T Description WWAN Cellular Module

Type RI7HE910

Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical

Frequency range: 30 MHz to 25.0 GHz

Test Distance: 3 meters

Detector: Peak, QP, Average

Frequency (MHz)	Modulation	Polarity (H/V)	QP Reading (dBμ V/m)	QP. Specification (dB μV/m)	QP Margin (dB)
572.0	Cellular+BT	H	30.5	46.5	-16.0
572.0	Cellular+BT	V	37.5	46.5	-9.0

**Figure 5. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Quasi Peak**

Frequency (MHz)	Modulation	Polarity (H/V)	Peak Reading (dBμ V/m)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2059.0	Cellular+BT	H	61.5	74.0	-12.5
2059.0	Cellular+BT	V	61.0	74.0	-13.0
5376.0	Cellular+BT	H	63.7	74.0	-10.3
5376.0	Cellular+BT	V	63.5	74.0	-10.5
3546.0	Cellular+BT	H	67.0	74.0	-7.0
3546.0	Cellular+BT	V	66.9	74.0	-7.1
5033.0	Cellular+BT	H	63.2	74.0	-10.8
5033.0	Cellular+BT	V	63.4	74.0	-10.6

**Figure 6. 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 WWAN Cellular Module
Type RI7HE910
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical

Frequency range: 30 MHz to 25.0 GHz

Test Distance: 3 meters

Detector: Average

Frequency (MHz)	Modulation	Polarity (H/V)	Average Reading (dB μ V/m)	Average Specification (dB μ V/m)	Average Margin (dB)
2059.0	Cellular+BT	H	47.2	54.0	-6.8
2059.0	Cellular+BT	V	47.1	54.0	-6.9
5376.0	Cellular+BT	H	49.8	54.0	-4.2
5376.0	Cellular+BT	V	49.8	54.0	-4.2
3546.0	Cellular+BT	H	43.1	54.0	-10.9
3546.0	Cellular+BT	V	43.1	54.0	-10.9
5033.0	Cellular+BT	H	49.7	54.0	-4.3
5033.0	Cellular+BT	V	49.6	54.0	-4.4

**Figure 7. 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

E.U.T Description WWAN Cellular Module
Type RI7HE910
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 30 MHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak, QP

Frequency (MHz)	Modulation	Polarity (H/V)	QP Reading (dB μ V/m)	QP. Specification (dB μ V/m)	QP Margin (dB)
572.0	Cellular+WiFi	H	34.3	46.5	-12.2
572.0	Cellular+WiFi	V	37.4	46.5	-9.1

**Figure 8. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Quasi Peak**

Frequency (MHz)	Modulation	Polarity (H/V)	Peak Reading (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2059.0	Cellular+WiFi	H	61.2	74.0	-12.8
2059.0	Cellular+WiFi	V	60.9	74.0	-13.1
5376.0	Cellular+WiFi	H	64.6	74.0	-9.4
5376.0	Cellular+WiFi	V	63.7	74.0	-10.3
3546.0	Cellular+WiFi	H	66.6	74.0	-7.4
3546.0	Cellular+WiFi	V	67.8	74.0	-6.2
5033.0	Cellular+WiFi	H	63.7	74.0	-10.3
5033.0	Cellular+WiFi	V	64.4	74.0	-9.6

**Figure 9. 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 WWAN Cellular Module

Type RI7HE910

Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical

Frequency range: 30 MHz to 25.0 GHz

Test Distance: 3 meters

Detector: Average

Frequency (MHz)	Modulation	Polarity (H/V)	Average Reading (dB μ V/m)	Average Specification (dB μ V/m)	Average Margin (dB)
2059.0	Cellular+WiFi	H	47.1	54.0	-6.9
2059.0	Cellular+WiFi	V	46.8	54.0	-7.2
5376.0	Cellular+WiFi	H	49.8	54.0	-4.2
5376.0	Cellular+WiFi	V	49.9	54.0	-4.1
3546.0	Cellular+WiFi	H	43.1	54.0	-10.9
3546.0	Cellular+WiFi	V	43.1	54.0	-10.9
5033.0	Cellular+WiFi	H	49.6	54.0	-4.4
5033.0	Cellular+WiFi	V	49.7	54.0	-4.3

**Figure 10. 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

8.1 Test Instrumentation Used, Intermodulation Radiated Emission Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	Rohde & Schwarz	ESIB7	100120	December 19, 2013	1 year
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	December 1, 2013	1 year
Active Loop Antenna	EMCO	6502	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 11. Test Equipment Used



5. Antenna Gain/Information

Antenna for cellular GSM modular approved model under FCC ID: W5P-HE910.
Gain 1dBi, internal

W1910 / W1911 Datasheet version 1.0 Penta Band Stubby Antenna. (02/10)

Penta Band Stubby Antenna

Pulse Part Numbers: W1910 / W1911

Antenna for Texas Instrument Wifi/Bluetooth module FCC approved under
FCC ID: Z64-WL18SBMOD Gain 0.54 dBi, internal

Multilayer Chip Antennas For IEEE802.11a/b/g/n

ANT Series ANT016008LCD2442MA1

6. R.F Exposure/Safety

Typical use of the E.U.T. is as a monitoring base unit.

The typical placement of the E.U.T. is on a flat surface. The typical distance between the E.U.T. and the user in the worst case application, is 20 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

- (a) FCC limits at 2400 MHz is: $0.55 \frac{mW}{cm^2}$

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 32.8 dBm (Peak) = 1900 mW

G_T- Antenna Gain, 1 dBi = 1.25 numeric

R- Distance from Transmitter using 20cm worst case

- (c) The peak power density is:

$$S = \frac{1900 \times 1.25}{4\pi (20)^2} = 0.476 \frac{mW}{cm^2}$$

- (d) This is below the FCC limit.

- (e) Explanation of Calculations:

Per the original RF Calculation for the FCC ID: W5P-HE910 approved cellular modem (which was under FCC ID: RI7HE910 before the FCC ID Change was granted), the maximum peak power of the cellular modem is 32.8 dBm = 1900 mW at 824.2 MHz with the limit at 0.55 mW/cm².

The Wifi maximum transmitting power is 14 dB lower (25 times smaller) than the cellular radio, therefore the WiFi transmission is negligible in the calculation.

Distance of antenna to general public is 20 cm.

Maximum antenna gain from frequency range of 824-960 MHz is 1dBi = 1.25 numeric

7. APPENDIX A - CORRECTION FACTORS

7.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



7.2 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.

7.3 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 38M30.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".



7.4 Correction factors for BICONICAL ANTENNA
Type BCD-235/B,
at 3 meter range

FREQUENCY	AFE
(MHz)	(dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".



7.5 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