



DATE: 05 January 2015

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

FCC Radio Test Report

for

SuperCom Ltd.

Equipment under test:

PURECOM v1.0 Monitoring Base Unit

**PRF-PURECOM10MF; PRF-PURECOM10A*;
PRF-PURECOM10F*; PRF-PURECOM10M***

*See customer's Declaration on page 5

Approved by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

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This report relates only to items tested.



Measurement/Technical Report for SuperCom Ltd.

PURECOM v1.0 Monitoring Base Unit

**PRF-PURECOM10MF, PRF-PURECOM10A*;
PRF-PURECOM10F*; PRF-PURECOM10M***

FCC ID: W5P-PRF-PURECOM10

This report concerns: Original Grant: X
Class I change:
Class II change:

Equipment Type: Part 15 Low Power Transmitter
Below 1705 kHz

Limits used: 47CFR15 Section 15.209

Measurement procedure used is ANSI C63.4: 2003.

Application for Certification
prepared by:
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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):	PURECOM v1.0 Monitoring Base Unit
Equipment Model No.:	PRF-PURECOM10MF, PRF-PURECOM10A*; PRF-PURECOM10F*; PRF-PURECOM10M*
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

*See customer's declaration on following page.



ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

1.2

SuperCom Ltd.



Date: January 6, 2015

DECLARATION

I HEREBY DECLARE THAT THE

PRF-PURECOM10MF (PureCom 1.0 with analog modem and fingerprint reader) **IS A FULL CONFIGURATION MODEL.**

OTHER MODELS, WHICH INCLUDE:

PRF-PURECOM10F – PureCom 1.0 with fingerprint reader

PRF-PURECOM10M – PureCom 1.0 with analog modem

PRF-PURECOM10A – PureCom 1.0 without analog modem and without fingerprint reader

DIFFER FROM THE PRF-PURECOM10MF ONLY BY SOFTWARE AND/OR EXTRACTED COMPONENTS/ASSEMBLIES.

Please relate to them all (from an EMC/Radio point of view) as the same product.

Thank you,

Signature: _____
Printed Name: Zeev Lavi
Project Manager



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 a monitoring base station, with ability to read RF transmissions and transmit LF radio transmissions to tags around it, with fully connectivity to IP networking on the background.

The EUT has ability to alert the monitoring application (server side) on various events and tempers around it.

1.4 Test Methodology

Both conducted and 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

Both conducted and 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**

Testing was performed in the installation position.

The EUT incorporates the following modules:

1. A cellular GSM single modular approved transmitter approved under FCC ID: W5P-HE910.
2. A Texas Instrument Wifi/Bluetooth module FCC approved under FCC ID: Z64-WL18SBMOD
3. A 125 kHz LF transmitter tested under this report.

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

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.

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

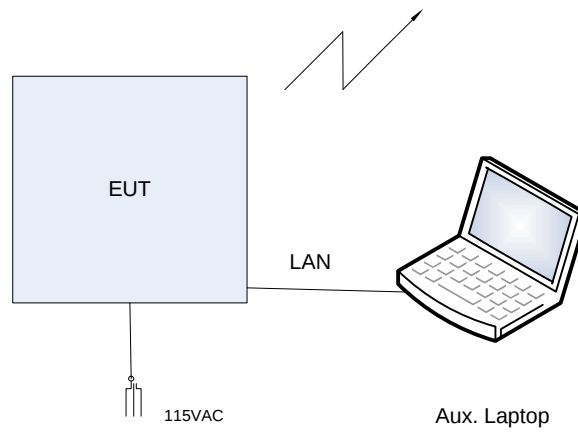


Figure 1. Configuration of Tested System

3. Test Set-up Photos



Figure 2. Conducted Emission Test



Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test

4. Conducted Emission From AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207

4.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 4.1. 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 an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. 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 μ Hn 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 0.40 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.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk 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 Measure Data

JUDGEMENT: Passed by 13.58dB

The margin between the emission levels and the specification limit is, in the worst case, 16.67 dB for the phase line at 0.158 MHz and 13.58 dB at 0.230 MHz for the neutral line.

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

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

TEST PERSONNEL:

Tester Signature:  _____

Date: 13.01.15

Typed/Printed Name: M. Zohar



Conducted Emission

E.U.T Description PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
Serial Number: Not Designated

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

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA	LIMIT dB
2 Average	154 kHz	38.75		-17.02
1 Quasi Peak	158 kHz	48.88		-16.67
1 Quasi Peak	178 kHz	45.68		-18.89
2 Average	178 kHz	28.30		-26.27
2 Average	198 kHz	23.91		-29.78
1 Quasi Peak	222 kHz	37.55		-25.18
2 Average	222 kHz	25.23		-27.50
1 Quasi Peak	242 kHz	31.94		-30.08
2 Average	242 kHz	20.38		-31.64
1 Quasi Peak	266 kHz	31.95		-29.28
2 Average	266 kHz	20.48		-30.75
1 Quasi Peak	278 kHz	41.27		-19.59
2 Average	286 kHz	21.38		-29.26
1 Quasi Peak	306 kHz	31.38		-28.69
2 Average	310 kHz	19.49		-30.47
1 Quasi Peak	374 kHz	31.39		-27.01
1 Quasi Peak	398 kHz	29.74		-28.15
1 Quasi Peak	418 kHz	32.00		-25.48
2 Average	418 kHz	23.53		-23.95
2 Average	27.274 MHz	31.07		-18.92

Date: 8.DEC.2014 08:17:58

Figure 6. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta 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.

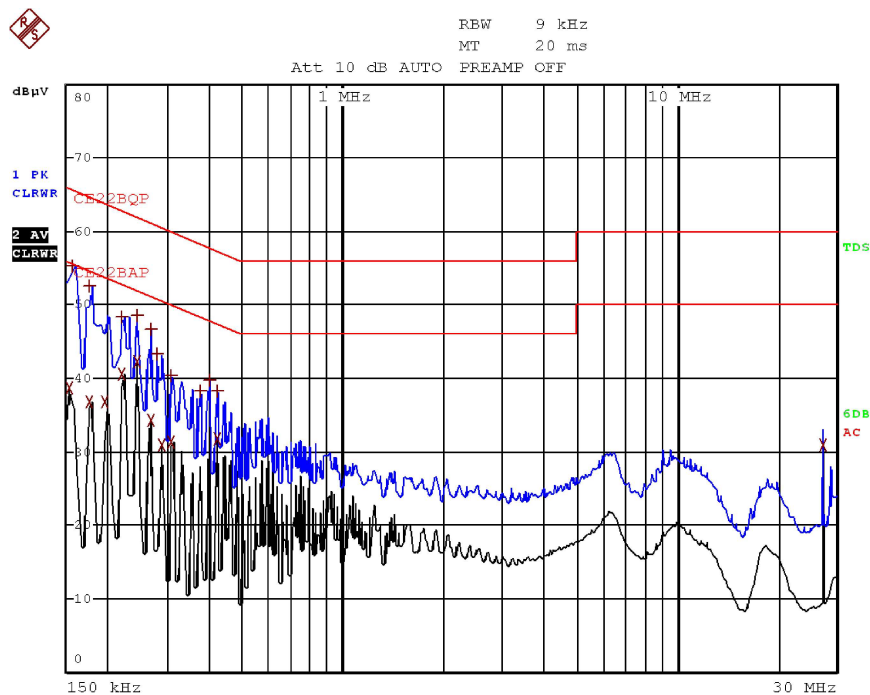
Conducted Emission

E.U.T Description PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Lead: Phase

Detectors: Peak, Quasi-peak, Average



Date: 8.DEC.2014 08:17:14

Figure 7. Detectors: Peak, Quasi-peak, Average

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB μV).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.
5. Average detection is designated by the second dash mark (from the top) of each vertical line.



Conducted Emission

E.U.T Description PURECOM v1.0 Monitoring Base Unit

Type PRF-PURECOM10MF

Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB	
1 Quasi Peak	150 kHz	43.75	-22.25	
2 Average	162 kHz	35.36	-19.99	
2 Average	186 kHz	34.05	-20.15	
2 Average	210 kHz	35.37	-17.83	
2 Average	230 kHz	38.86	-13.58	
1 Quasi Peak	234 kHz	37.98	-24.32	
1 Quasi Peak	254 kHz	41.25	-20.37	
2 Average	254 kHz	32.51	-19.11	
2 Average	274 kHz	32.10	-18.89	
2 Average	298 kHz	29.02	-21.27	
1 Quasi Peak	318 kHz	33.16	-26.59	
1 Quasi Peak	418 kHz	27.96	-29.52	
2 Average	462 kHz	25.84	-20.80	
2 Average	482 kHz	26.35	-19.94	
1 Quasi Peak	586 kHz	19.31	-36.68	
1 Quasi Peak	610 kHz	19.55	-36.44	
1 Quasi Peak	834 kHz	24.21	-31.78	
1 Quasi Peak	6.238 MHz	27.35	-32.64	
1 Quasi Peak	27.274 MHz	28.32	-31.67	
2 Average	27.274 MHz	27.97	-22.02	

Date: 8.DEC.2014 08:24:09

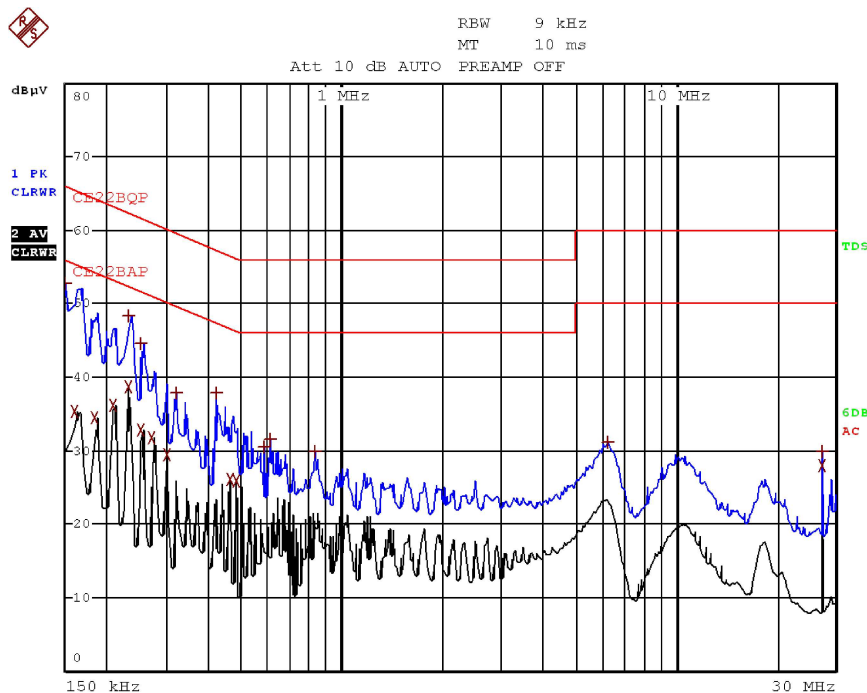
Figure 8. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta 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 PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
Serial Number: Not Designated

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



Date: 8.DEC.2014 08:23:23

Figure 9 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Notes:

1. Horizontal axis shows logarithmic frequency scale.
2. The vertical axis shows amplitude (in dB µV).
3. Peak detection is designated by the top of each vertical line.
4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.
5. Average detection is designated by the second dash mark (from the top) of each vertical line.



4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	January 1, 2014	1 Year
Transient Limiter	HP	11947A	3107A03041	May 13, 2014	1Year
EMI Receiver	Rohde & Schwarz	ESC17	100724	December 17, 2013	1Year

Figure 10 Test Equipment Used

5. 26dB Minimum Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C, Part 2.1049

5.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 1 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 125 KHz.

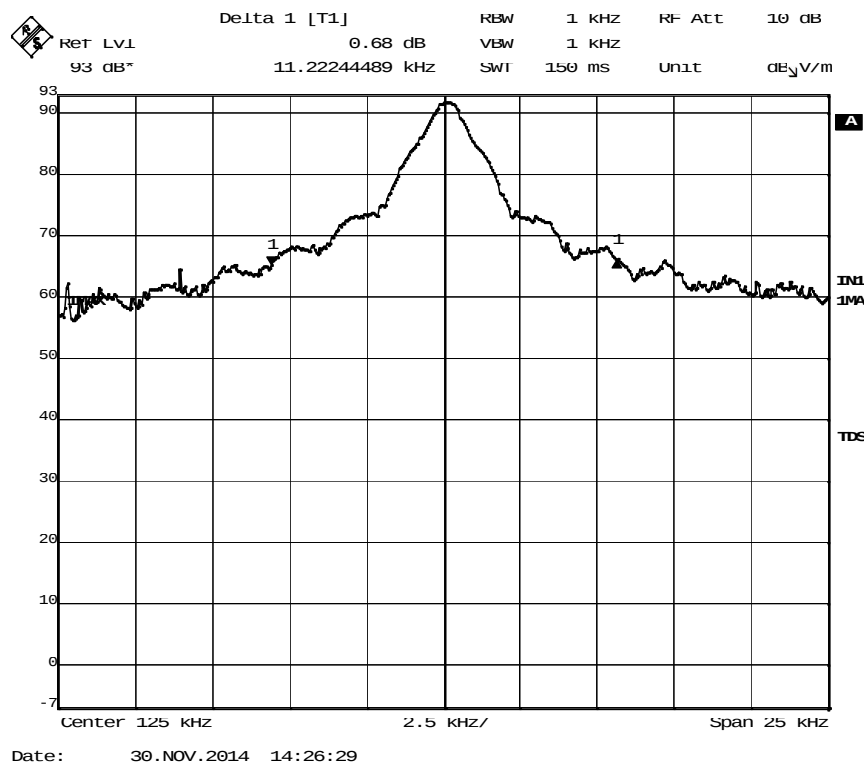


Figure 11. 26dB Bandwidth



5.3 Test Results

E.U.T Description: PURECOM v1.0 Monitoring Base Unit

Model: PRF-PURECOM10MF

Serial Number: Not Designated

Operational Antenna (kHz)	Bandwidth Reading (kHz)
125	11.2

Figure 12 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 13.01 15

Typed/Printed Name: M. Zohar



5.4 Test Equipment Used; 26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESCI7	100724	December 17, 2013	1 Year
Active Loop Antenna	EMCO	6502	2950	November 4, 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 13 Test Equipment Used



6. Field Strength of Fundamental

6.1 Test Specification

F.C.C., Part 15, Subpart C, 15.209

6.2 Test Procedure

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

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (125 kHz) and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

.

6.3 Test Results

JUDGEMENT: Passed

The EUT met the FCC Part 15, Subpart C, Section 15.209 specification requirements.

The details of the highest emissions are given in *Figure 14*.

TEST PERSONNEL:

Tester Signature: 

Date: 13.01.15

Typed/Printed Name: M. Zohar

Antenna Type	Peak Reading (dBmV/m)	Average Factor (dB)	AVG Result (dBμV/m)	Limit (dBmV/m)	Margin (dB)
Internal LF ANT	91.6	N/A	N/A	105.7	-14.1

Figure 14 Test Results



Field Strength of Fundamental

E.U.T Description PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
Serial Number: Not Designated

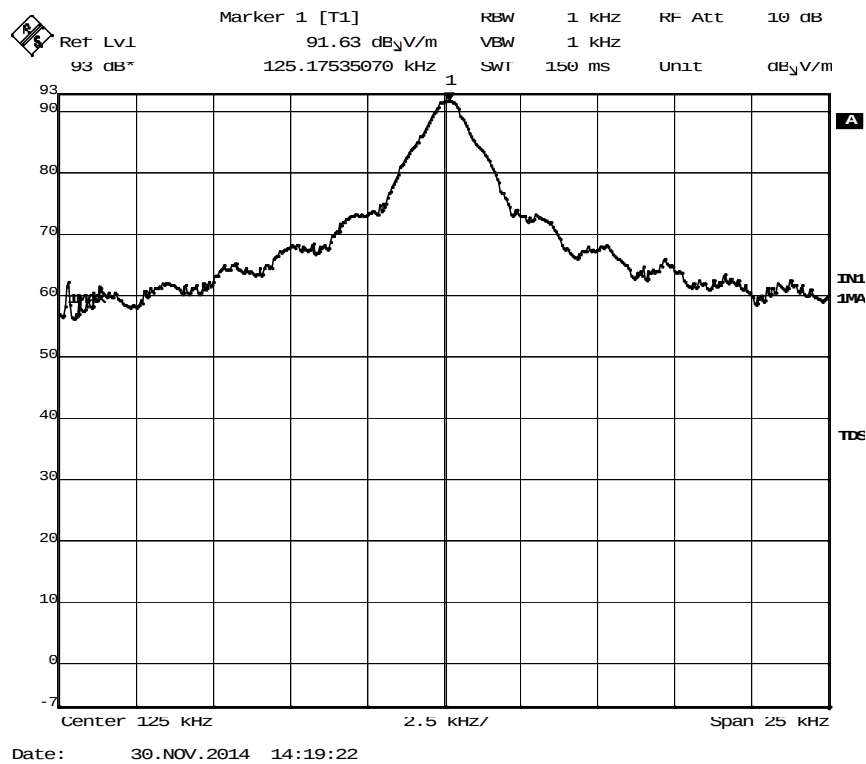


Figure 15. Field Strength of Fundamental
Detector: Peak, Internal Antenna



6.4 Test Equipment Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESCI7	100724	December 17, 2013	1 Year
Active Loop Antenna	EMCO	6502	2950	November 4, 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 16. Test Equipment Used

7. Radiated Emission, 9 kHz – 30 MHz

7.1 Test Specification

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

7.2 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-30MHz, 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 the frequency of 125 kHz. This frequency was measured using a peak detector.

7.3 Test Results

Antenna Type	Frequency (kHz)	Peak Reading (dBuV/m)	AVG. FAC (dBuV/m)	AVG RESULT (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Internal LF ANT	250.0	57.3	N/A	N/A	99.6	-42.3
	375.0	50.1	N/A	N/A	96.1	-46.0

JUDGEMENT: Passed

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, Section 209 specification.

TEST PERSONNEL:

Tester Signature: 

Date: 13.01.15

Typed/Printed Name: M. Zohar



7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESCI7	100724	December 17, 2013	1 Year
Active Loop Antenna	EMCO	6502	2950	November 4, 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 17. Test Equipment Used

7.5 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 [dB μ V/m]

RA: Receiver Amplitude [dB μ V]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

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

No external pre-amplifiers are used.

8. Intermodulation Radiated Emission

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.

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.)



8.2 **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 PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
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 18. 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 19. 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 PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
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 20. 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 PURECOM v1.0 Monitoring Base Unit
Type PRF-PURECOM10MF
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 21. 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 22. 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 PURECOM v1.0 Monitoring
Base Unit
Type PRF-PURECOM10MF
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Test Distance: 3 meters

Frequency range: 30 MHz to 25.0 GHz
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 23. 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
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	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. 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



10. 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 RF Calculation of the Grant for the FCC ID: W5P-HE910 approved cellular modem, the maximum peak power of the cellular modem is 32.8 dBm = 1900 mW at 824.2 MHz with the limit at $0.55 mW/cm^2$.

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

11. APPENDIX A - CORRECTION FACTORS

11.1 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".



11.2 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.



11.3 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".



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

FREQUENCY (MHz)	AFE (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".



11.5 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