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DATE: 09 February 2015

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

for

Micronet Ltd.

Equipment under test:

Mobile Data Terminal (MDT)

M317

WiFi Transmitter

Approved by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

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This report relates only to items tested.



ISRAEL TESTING LABORATORIES
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Measurement/Technical Report for Micronet Ltd.

Mobile Data Terminal (MDT)

M317

FCC ID: U8ONB860

09 February 2015

This report concerns:

Original Grant:

Class I Change:

Class II Change: X

Equipment type:

Spread Spectrum/Digital Device
2400-2483.5 MHz

Limits used:

47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 v03r02 June 5, 2014 and ANSI C63.4-2003.

Application for Certification
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1. General Information

1.1 Administrative Information

Manufacturer:	Micronet Ltd.
Manufacturer's Address:	P.O.B. 11524, 27 Hametsuda St., Azor, 58001 Israel Tel : +972-3-558 4884 Fax: +972-3-558 4885
Manufacturer's Representative:	Erez Cohen-Zedek
Equipment Under Test (E.U.T):	Mobile Data Terminal (MDT)
Equipment Model No.:	M317
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	27.11.2014
Start of Test:	27.11.2014
End of Test:	27.11.2014
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 M-317 provides Original Equipment Manufacturers (OEMs) and Telematics Service Providers (TSP's) with a rugged and versatile vehicle-centric mobile-computing platform for a variety of Mobile Resource Management (MRM) applications. The E.U.T. includes new BT\WiFi 3G - approved transmitters.

1.4 *Test Methodology*

Radiated testing was performed according to the procedures in KDB 558074 D01 v03r02 June 5, 2014 and 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):

± 5.2 dB

Note: See ITL Procedure No. PM 198.

2. System Test Configuration

2.1 *Justification*

The product was originally authorized for FCC certification under FCC ID: U8ONB860.

The device contains both a 2402.0-2480.0 MHz Bluetooth radio and a WiFi radio.

No changes have been made to either radio.

The Class II Permissive changes to the original product are as follows:

1. The two separate radio boards were merged into one board.
2. DVI connector was added for camera option.

For Wifi/BT evaluation, 11Mbps was chosen as representative data rate. RF output and spurious emissions were retested.

2.2 *EUT Exercise Software*

No special exercise software was used.

2.3 *Special Accessories*

No special accessories were needed to achieve compliance.

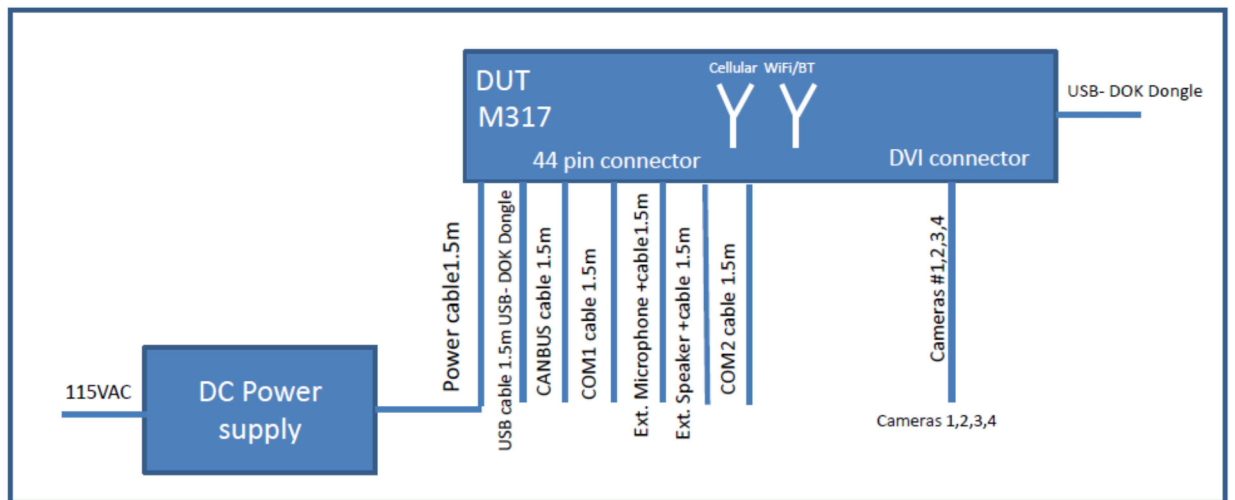
2.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

The EUT was transmitting BT/WiFi modulation with SW application (MTS_WiLink6&7).

The SW application forces the module to transmit in each frequency/data rate/modulation.



- USB are loaded with DOK dongle
- Serial ports (COM1, COM2) - Tx shorted to Rx (through parallel resistor) with data loop-back.
- Can Bus with resistor shorted between the two signals.
- The all cameras were connected to the cables.
- DUT= Device Under Test.
- DOK= Disk On Key.
- The all cables are shielded.

Figure 1. Configuration of Tested System

3. Radiated Measurement Test Set-up Photo



Figure 2. Radiated Emission Test

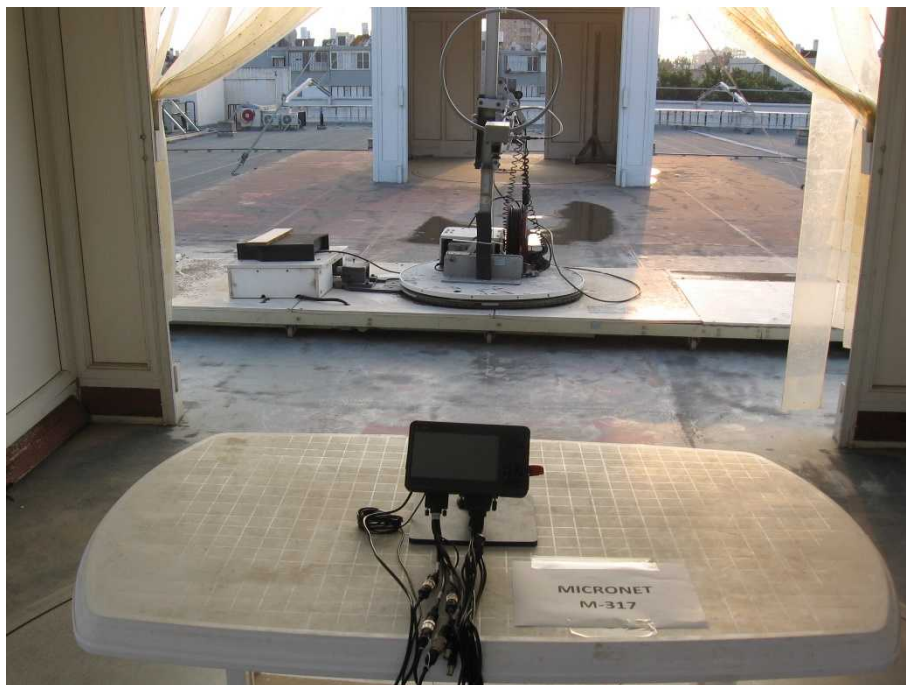


Figure 3. Radiated Emission Test

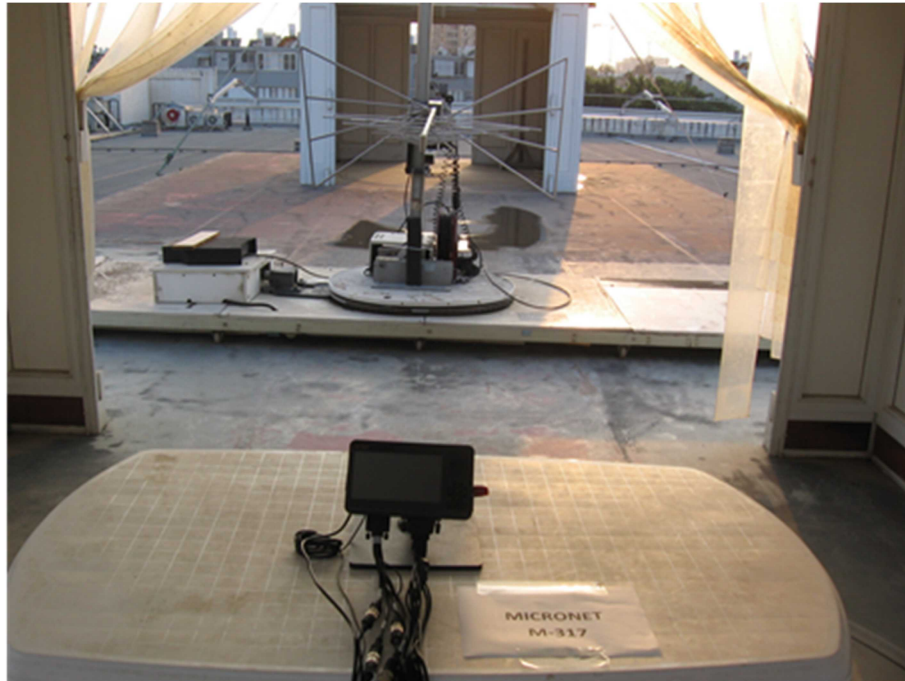


Figure 4. Radiated Emission Test

4. Maximum Transmitted Peak Power Output

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.

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 at low, mid and high channels. (2.412, 2.437 and 2.462 MHz).

The E.U.T was evaluated when the antenna was in horizontal polarity.

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:

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

E - Field Strength (V/m)

d – Distance from transmitter (m)

G – Antenna gain

P – Peak power (W)

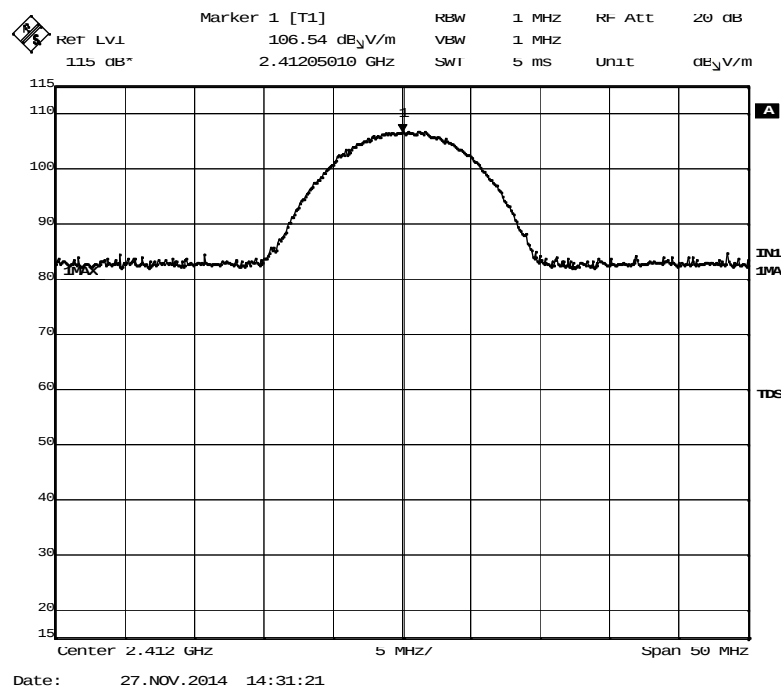


Figure 5 — Low Channel

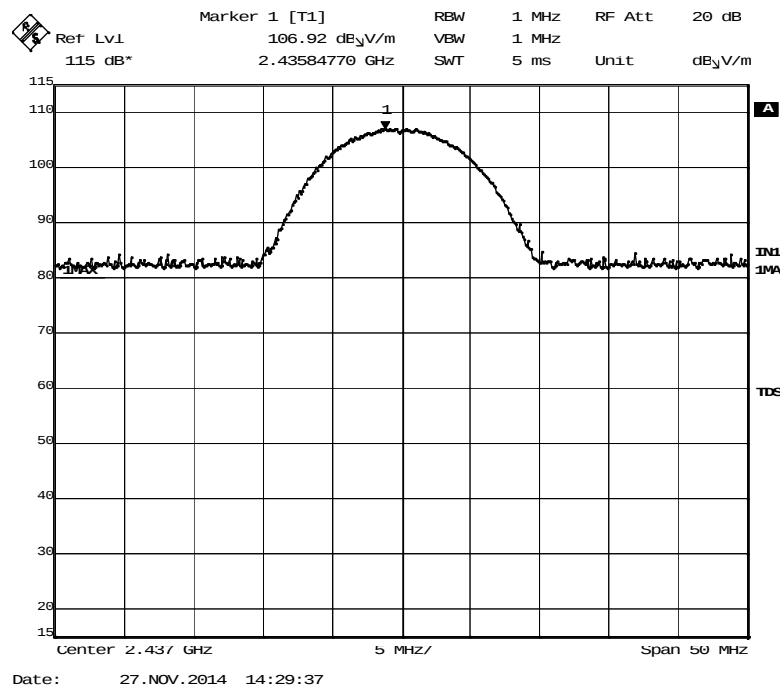


Figure 6 — Mid Channel

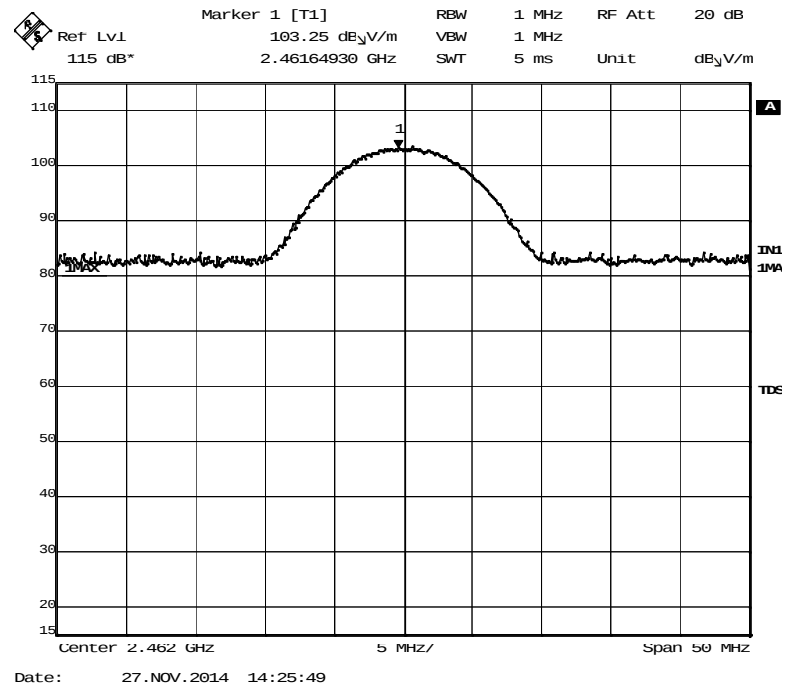


Figure 7 — High Channel

4.2 Results Table

E.U.T. Description: Mobile Data Terminal (MDT)

Model No.: M317

Serial Number: Not designated

Specification: F.C.C. Part 15, Subpart C Section 15.247(b)

Operation Frequency (MHz)	Modulation (Mbps)	Antenna Polarization	Field Level (dBuV/m)	Power (dBm)	Power (mW)	Specification (mW)	Margin (mW)
Low	11 Mbps	H	106.5	11.3	12.6	1000	-987.4
Mid	11 Mbps	H	106.9	11.7	12.7	1000	-987.3
High	11 Mbps	H	103.2	8.0	6.4	1000	-993.6

Figure 8 Maximum Transmitted Peak Power Output

JUDGEMENT: Passed by 987.3 mW

TEST PERSONNEL:

Tester Signature: _____

Date: 31.12.14

Typed/Printed Name: M. Zohar

4.3 Test Equipment Used. Peak Power Output

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	R&S	ESIB7	100120	December 19, 2013	1 year
Biconolog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 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 9 Test Equipment Used

5. Band Edge Spectrum

[In Accordance with section 15.247(c)]

5.1 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 at low and high channels with antenna at horizontal polarization.

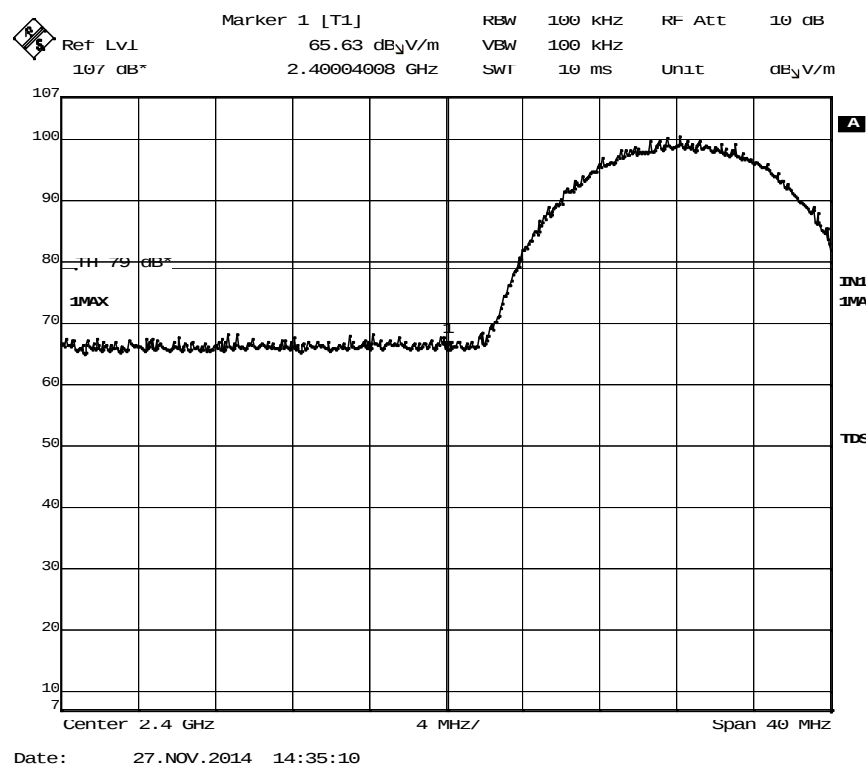


Figure 10 — Low Channel

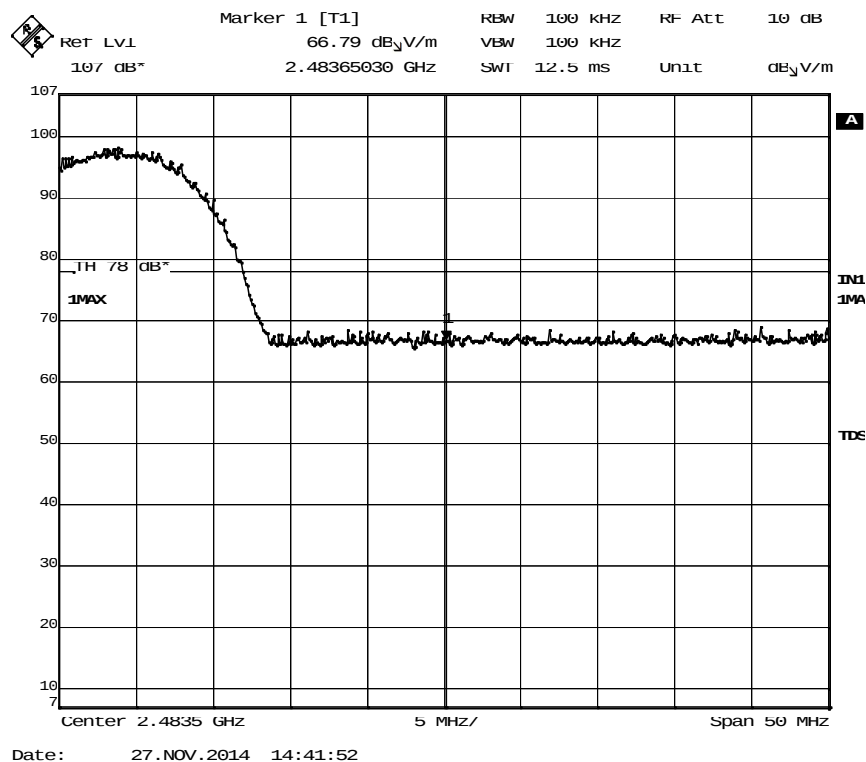


Figure 11 — High Channel

5.2 Results Table

E.U.T. Description: Mobile Data Terminal (MDT)
Model No.: M317
Serial Number: Not designated
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation (Mbps)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2402	11Mbps	2400.0	65.6	79.0	-13.4
2480	11Mbps	2483.5	66.8	78.0	-11.2

Figure 12 Band Edge Spectrum

JUDGEMENT: Passed by 11.2 dB

TEST PERSONNEL:

Tester Signature: _____

Date: 31.12.14

Typed/Printed Name: M. Zohar

5.3 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
Biconolog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 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. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

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

6.2 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 low, mid and high channels using a peak detector.

6.3 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: 31.12.14

Typed/Printed Name: M. Zohar

6.4 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
Biconolog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 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 14 Test Equipment Used

6.5 **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: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

7. Spurious Radiated Emission, 30 – 25000 MHz

7.1 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 1.0-6.0 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 the low, mid and high channels using a peak detector.



7.2 Test Data

JUDGEMENT: Passed by 11.9 dB

For the operation frequency of 11 Mbps, the margin between the emission level and the specification limit is in the worst case 11.9 dB at the frequency of 2390.0 MHz, vertical 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 15*.

TEST PERSONNEL:

Tester Signature:  _____

Date: 31.12.14

Typed/Printed Name: M. Zohar



Radiated Emission Above 1 GHz

E.U.T Description Mobile Data Terminal (MDT)
Type M317
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/Avg.
Operation Modulation: 11 Mbps

Freq.	Polarity	Peak Amp	Peak. Specification	Peak. Margin	Avg. Amp	Avg. Specification	Avg. Margin
(MHz)	(H/V)	(dBμ V/m)	(dB μ V/m)	(dB)	(dBμ V/m)	(dB μ V/m)	(dB)
2390.0	V	52.0	74.0	-22.0	42.1	54.0	-11.9
2390.0	H	50.2	74.0	-23.8	40.7	54.0	-13.3
4824.0	V	51.5	74.0	-22.5	40.2	54.0	-13.8
4824.0	H	53.6	74.0	-20.4	40.1	54.0	-13.9
4874.0	V	51.0	74.0	-23.0	39.9	54.0	-14.1
4874.0	H	53.1	74.0	-20.9	40.5	54.0	-13.5
4924.0	V	51.1	74.0	-22.9	39.0	54.0	-15.0
4924.0	H	52.0	74.0	-22.0	40.5	54.0	-13.5
2483.5	V	46.6	74.0	-27.4	36.9	54.0	-17.1
2483.5	H	51.3	74.0	-22.7	40.2	54.0	-13.8

Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak/Avg.

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/Avg. Amp” includes correction factor.

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

7.3 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
Biconolog Antenna	EMCO	3142B	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 Years
Active Loop Antenna	EMCO	6502	9506-2950	November 4, 2014	1 year
Horn Antenna	ARA	SWH-28	1007	March 30, 2014	3 years
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Spectrum Analyzer	HP	8564E	3442A00275	March 2, 2014	1 year
Low Noise Amplifier	Narda	LNA-DBS-0411N313	013	August 22, 2014	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 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



8. Antenna Gain/Information

The antenna gain is 3.40 dBi, integral.

9. R.F Exposure/Safety

Typical use of the E.U.T. is as a versatile vehicle-centric mobile –computing platform. The typical placement of the E.U.T. is on a vehicle dashboard or cabin. The 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 1.110 Requirements

(a) FCC limits at 2437 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 106.9 dBuV/m (peak) = 14.79 mW

G_T- Antenna Gain, 3.40 dBi= 2.2 numeric

R- Distance from Transmitter using 20 cm worst case

(c) The peak power density (time averaging) of the E.U.T. is:

$$S = \frac{14.79 \times 2.2}{4\pi (20)^2} = 0.0065 \frac{mW}{cm^2}$$

(e) This is below the FCC limit.

10. APPENDIX A - CORRECTION FACTORS

10.1 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

10.2 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.

10.3 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.



10.4 Correction factors for Double-Ridged Waveguide Horn

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

FREQUENCY	ANTENNA	ANTENNA	FREQUENCY	ANTENNA	ANTENNA
(GHz)	FACTOR	Gain	(GHz)	FACTOR	Gain
	(dB 1/m)	(dBi)		(dB 1/m)	(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			

10.5 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