



**DATE: 21 June 2014**

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

# **FCC Radio Test Report**

**for**

**Micronet Ltd.**

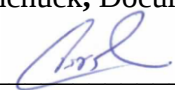
**Equipment under test:**

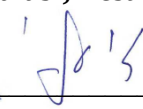
**Mobile Data Terminal (MDT)**

**M317**

**2.4 GHz Bluetooth**

Written by:   
R. Pinchuck, Documentation

Approved by:   
A. Sharabi, Test Engineer

Approved by:   
I. Raz, EMC Laboratory Manager

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 Micronet Ltd.

### Mobile Data Terminal (MDT)

**M317**

**FCC ID: U8ONB860**

**IC ID: 12186A-NB860**

**21 June 2014**

This report concerns:

Original Grant: X

Class I Change:

Class II Change:

Equipment type:

Spread Spectrum Transmitter

Limits used:

47CFR15 Section 15.247

Measurement procedure used is Public Notice: DA 00-705 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems and 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](mailto:rpinchuck@itl.co.il)

Applicant for this device:

(different from "prepared by")

Erez Cohen-Zedek  
Micronet Ltd.  
P.O.B. 11524, 27 Hametsuda St.,  
Azor 5800171  
Israel  
Tel: +972-3-558-4884  
Fax: +972-3-558-4885  
e-mail: [erez.cohen-zedek@micronet-inc.com](mailto:erez.cohen-zedek@micronet-inc.com)

# TABLE OF CONTENTS

|            |                                                                      |           |
|------------|----------------------------------------------------------------------|-----------|
| <b>1.</b>  | <b>GENERAL INFORMATION -----</b>                                     | <b>5</b>  |
| 1.1        | Administrative Information .....                                     | 5         |
| 1.2        | List of Accreditations .....                                         | 6         |
| 1.3        | Product Description .....                                            | 7         |
| 1.4        | Test Methodology .....                                               | 7         |
| 1.5        | Test Facility .....                                                  | 7         |
| 1.6        | Measurement Uncertainty .....                                        | 7         |
| <b>2.</b>  | <b>SYSTEM TEST CONFIGURATION -----</b>                               | <b>8</b>  |
| 2.1        | Justification .....                                                  | 8         |
| 2.2        | EUT Exercise Software .....                                          | 8         |
| 2.3        | Special Accessories .....                                            | 8         |
| 2.4        | Equipment Modifications .....                                        | 8         |
| 2.5        | Configuration of Tested System .....                                 | 8         |
| <b>3.</b>  | <b>RADIATED MEASUREMENT TEST SET-UP PHOTOS -----</b>                 | <b>9</b>  |
| <b>4.</b>  | <b>6DB MINIMUM BANDWIDTH -----</b>                                   | <b>11</b> |
| 4.1        | Test Specification .....                                             | 11        |
| 4.2        | Test procedure .....                                                 | 11        |
| 4.3        | Test Results.....                                                    | 15        |
| 4.4        | Test Equipment Used. 6dB Bandwidth .....                             | 16        |
| <b>5.</b>  | <b>26DB BANDWIDTH-----</b>                                           | <b>17</b> |
| 5.1        | Test Specification .....                                             | 17        |
| 5.2        | Test procedure .....                                                 | 17        |
| 5.3        | Test Results.....                                                    | 20        |
| 5.4        | Test Equipment Used, 26 dB Bandwidth .....                           | 21        |
| <b>6.</b>  | <b>20DB BANDWIDTH-----</b>                                           | <b>22</b> |
| 6.1        | Test Specification .....                                             | 22        |
| 6.2        | Test procedure .....                                                 | 22        |
| 6.3        | Test Results.....                                                    | 25        |
| 6.4        | Test Equipment Used.....                                             | 26        |
| <b>7.</b>  | <b>NUMBER OF HOPPING FREQUENCIES SECTION 15.247(A)(1)(III) -----</b> | <b>27</b> |
| <b>8.</b>  | <b>CHANNEL FREQUENCY SEPARATION -----</b>                            | <b>35</b> |
| 8.1        | Test Specification .....                                             | 35        |
| <b>9.</b>  | <b>RADIATED POWER OUTPUT -----</b>                                   | <b>39</b> |
| 9.1        | Test Specification .....                                             | 39        |
| 9.2        | Test procedure .....                                                 | 39        |
| 9.3        | Results Calculation.....                                             | 42        |
| 9.4        | Test Equipment Used, Radiated Maximum Power Output .....             | 43        |
| <b>10.</b> | <b>DWELL TIME ON EACH CHANNEL -----</b>                              | <b>44</b> |
| 10.1       | Test Specification .....                                             | 44        |
| 10.2       | Test Procedure .....                                                 | 44        |
| 10.3       | Test Results.....                                                    | 44        |
| 10.4       | Test Equipment Used, Dwell Time .....                                | 46        |
| <b>11.</b> | <b>BAND EDGE -----</b>                                               | <b>47</b> |
| 11.1       | Test procedure .....                                                 | 47        |
| 11.2       | Results table.....                                                   | 50        |
| 11.3       | Test Equipment Used, Band edge Spectrum .....                        | 51        |
| <b>12.</b> | <b>RADIATED EMISSION, 9 KHZ – 30 MHZ -----</b>                       | <b>52</b> |
| 12.1       | Test Specification .....                                             | 52        |
| 12.2       | Test Procedure .....                                                 | 52        |
| 12.3       | Measured Data .....                                                  | 52        |
| 12.4       | Test Instrumentation Used, Radiated Measurements.....                | 53        |
| 12.5       | Field Strength Calculation .....                                     | 54        |



|            |                                                              |           |
|------------|--------------------------------------------------------------|-----------|
| <b>13.</b> | <b>SPURIOUS RADIATED EMISSION 30 – 25,000 MHZ -----</b>      | <b>55</b> |
| 13.1       | Test Specification.....                                      | 55        |
| 13.2       | Test Procedure.....                                          | 55        |
| 13.3       | Test Data.....                                               | 56        |
|            | Test Instrumentation Used, Radiated Measurements.....        | 61        |
| 13.4       | Field Strength Calculation 30 – 1000 MHz .....               | 62        |
| <b>14.</b> | <b>ANTENNA GAIN/INFORMATION-----</b>                         | <b>63</b> |
| <b>15.</b> | <b>R.F EXPOSURE/SAFETY-----</b>                              | <b>64</b> |
| <b>16.</b> | <b>16. APPENDIX B - CORRECTION FACTORS -----</b>             | <b>65</b> |
| 16.1       | Correction factors for CABLE.....                            | 65        |
| 16.2       | Correction factors for CABLE.....                            | 66        |
| 16.3       | Correction factors for CABLE.....                            | 67        |
| 16.4       | Correction factors for LOG PERIODIC ANTENNA .....            | 68        |
| 16.5       | Correction factors for LOG PERIODIC ANTENNA .....            | 69        |
| 16.6       | Correction factors for BICONICAL ANTENNA.....                | 70        |
| 16.7       | Correction factors for Double-Ridged Waveguide Horn .....    | 71        |
| 16.8       | Correction factors for Horn Antenna .....                    | 72        |
| 16.9       | Correction factors for Horn Antenna .....                    | 73        |
| 16.10      | Correction factors for ACTIVE LOOP ANTENNA .....             | 74        |
| <b>17.</b> | <b>COMPARISON INDUSTRY CANADA REQUIREMENTS WITH FCC-----</b> | <b>75</b> |



## 1. General Information

### 1.1 Administrative Information

|                                |                                                                                                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------|
| Manufacturer:                  | Micronet Ltd.                                                                                                |
| Manufacturer's Address:        | P.O.B. 11524,<br>27 Hametsuda St.,<br>Azor, 58001<br>Israel<br>Tel : +972-3-558 4884<br>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:      | 01.06.14                                                                                                     |
| Start of Test:                 | 01.06.14                                                                                                     |
| End of Test:                   | 08.06.14                                                                                                     |
| Test Laboratory Location:      | I.T.L (Product Testing) Ltd.<br>Kfar Bin Nun,<br>ISRAEL 99780                                                |
| Test Specifications:           | FCC Part 15, Sub-Part C<br>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.), Registration No. 90715.
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 4025B-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**

Both conducted and radiated testing was performed according to the procedures in Public Notice: DA 00705 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems and ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### **1.5 Test Facility**

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing November 21, 2012).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

### **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):

$\pm 4.98$  dB

Note: See ITL Procedure No. PM 198.

## 2. System Test Configuration

### 2.1 Justification

Unit was tested at installation position, transmitting continuously at the low channel (2402MHz) the middle channel (2441MHz) and the higher channel (2480MHz), modulated with two types of modulations: standard Bluetooth modulation and Extended Data Rate modulation.

### 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 needed 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.

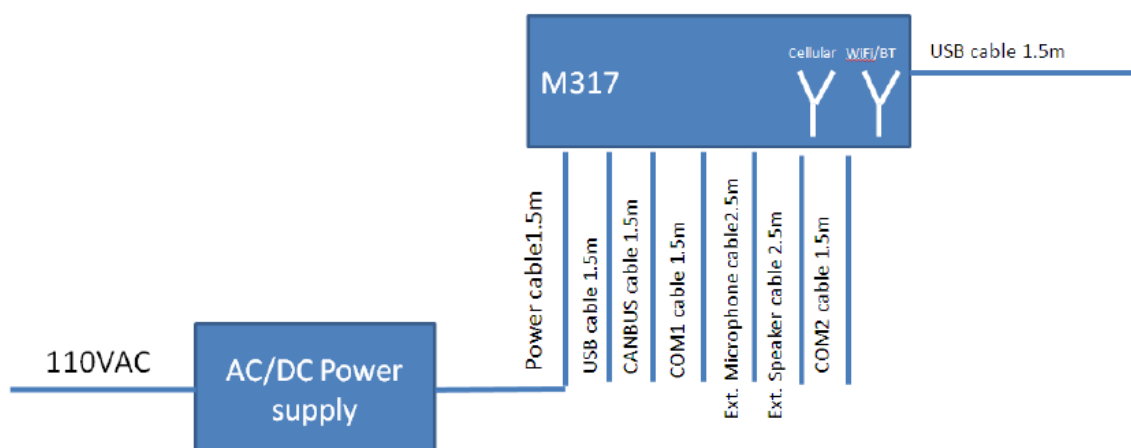


Figure 1. Configuration of Tested System

### 3. Radiated Measurement Test Set-up Photos

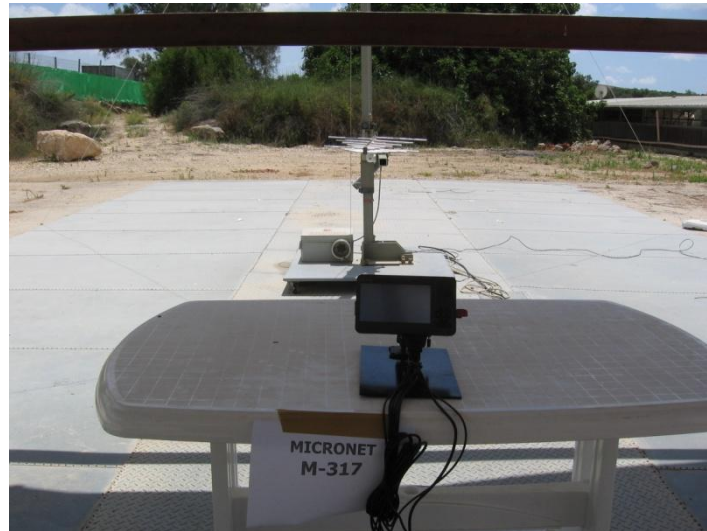


Figure 2. Radiated Emission Test

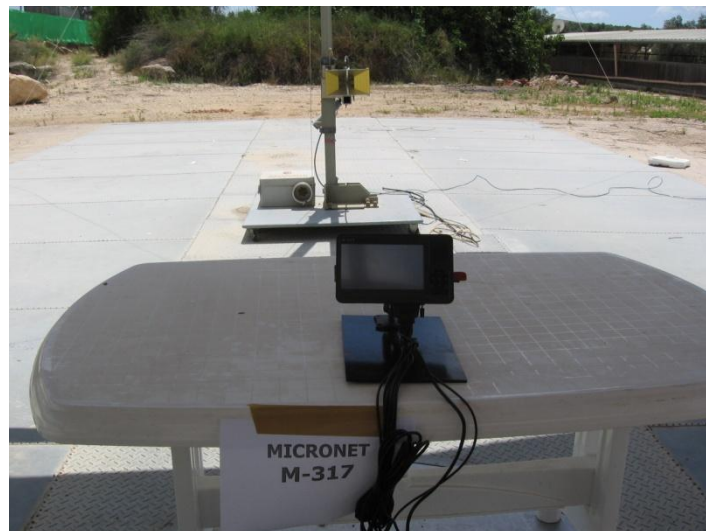
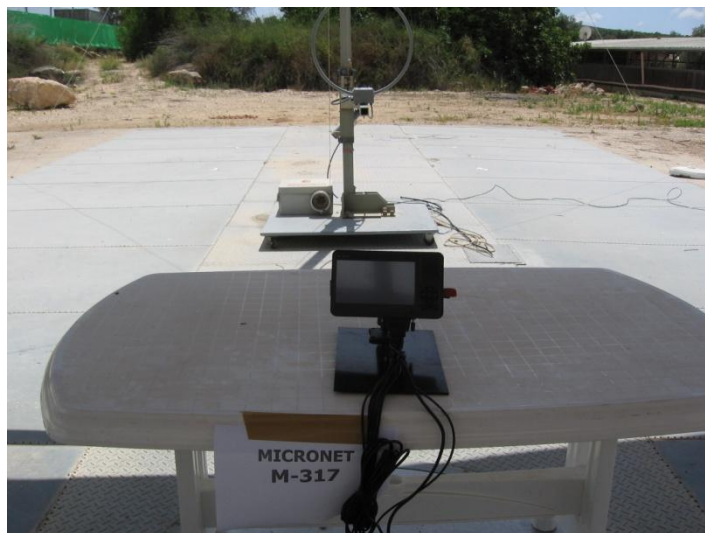


Figure 3. Radiated Emission Test



**Figure 4. Radiated Emission Test**



**Figure 5. Radiated Emission Test**

## 4. 6dB Minimum Bandwidth

### 4.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

### 4.2 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 100 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 in three frequencies: Low, Mid and High.

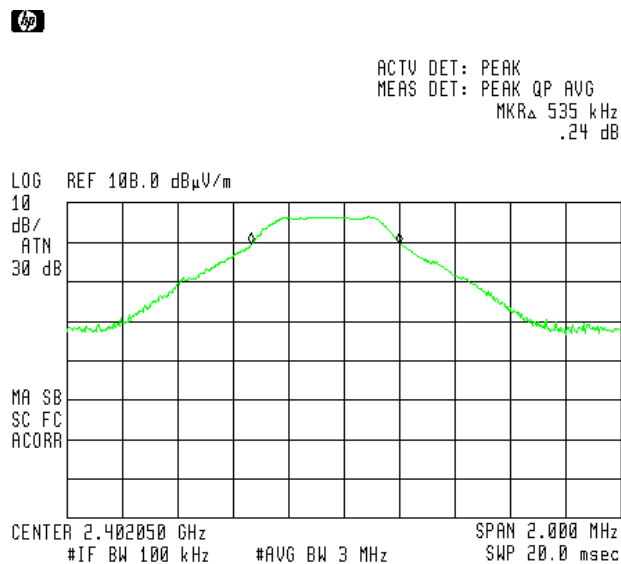
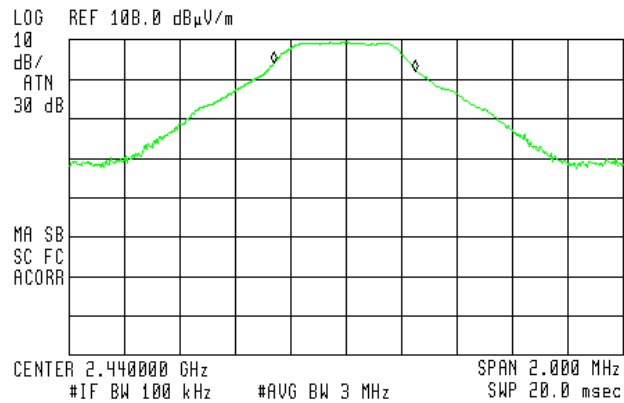


Figure 6. Low Channel , Standard Modulation



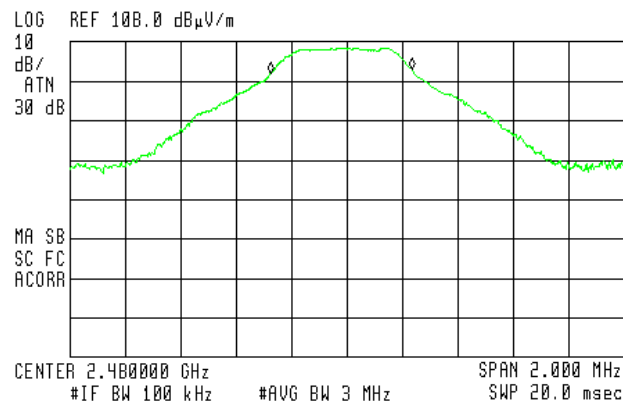
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR $\Delta$  510 kHz  
-1.82 dB



**Figure 7. Mid Channel, Standard Modulation**



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR $\Delta$  510 kHz  
1.00 dB



**Figure 8. High Channel, Standard Modulation**



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.090 MHz  
.41 dB

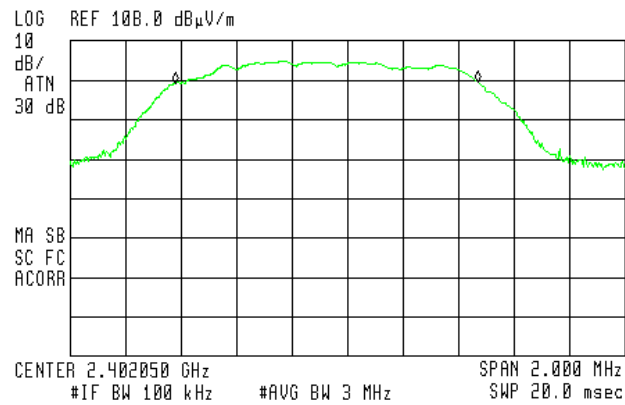


Figure 9. Low Channel , EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.085 MHz  
.38 dB

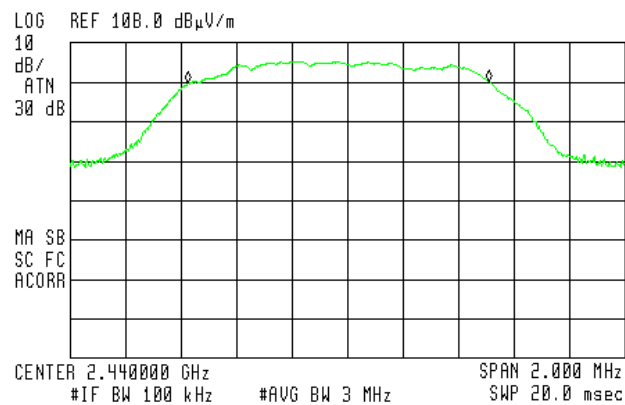
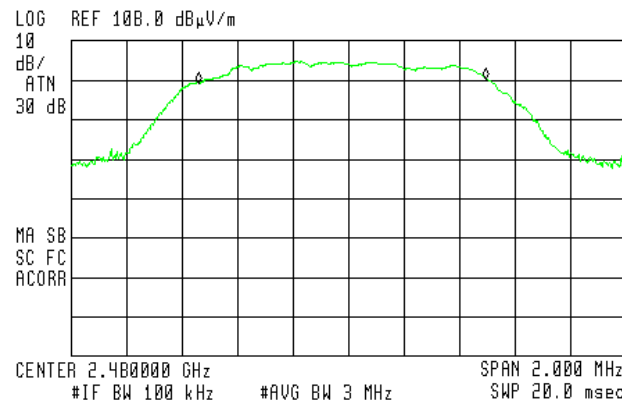


Figure 10. Mid Channel, EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.035 MHz  
.99 dB



**Figure 11. High Channel, EDR Modulation**

### 4.3 Test Results

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

Model: M317

Serial Number: Not Designated

| Operation Frequency (MHz) | Modulation | Bandwidth Reading (MHz) | Specification (MHz) |
|---------------------------|------------|-------------------------|---------------------|
| Low                       | Standard   | 0.535                   | >0.5                |
| Mid                       | Standard   | 0.51                    | >0.5                |
| High                      | Standard   | 0.51                    | >0.5                |
| Low                       | EDR        | 1.090                   | >0.5                |
| Mid                       | EDR        | 1.085                   | >0.5                |
| High                      | EDR        | 1.035                   | >0.5                |

**Figure 12 Test Results**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

#### 4.4 Test Equipment Used; 6dB Bandwidth

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Horn Antenna            | ETS          | 3115          | 29845         | March 14, 2012   | 3 Years |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A     |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A     |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A     |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A     |

**Figure 13 Test Equipment Used**

## 5. 26dB Bandwidth

### 5.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

### 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 100 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 in three frequencies: Low, Mid and High

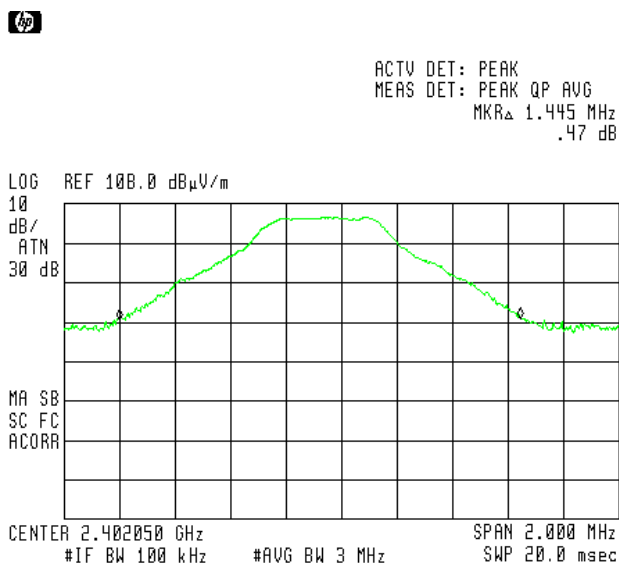


Figure 14. Low Channel , Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.420 MHz  
.99 dB

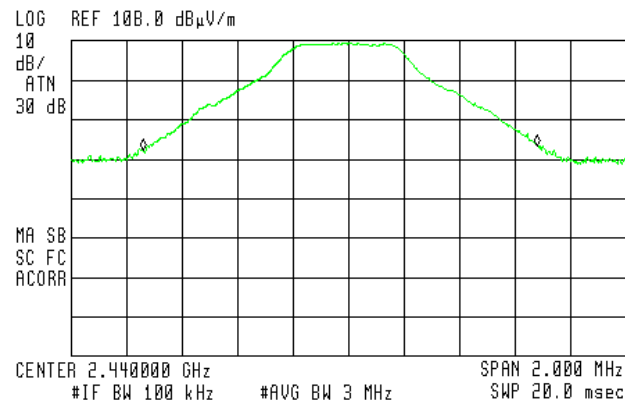


Figure 15. Mid Channel, Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.445 MHz  
-.94 dB

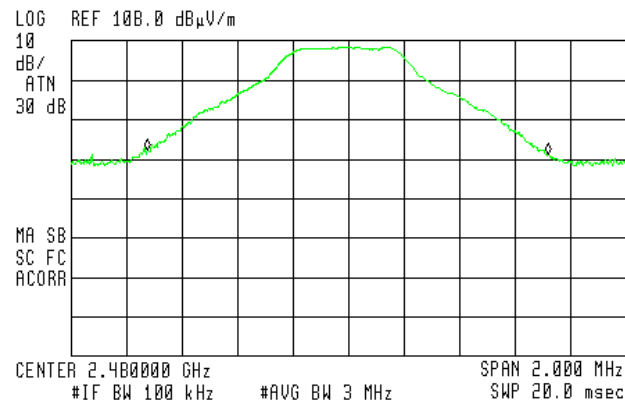


Figure 16. High Channel, Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.745 MHz  
.81 dB

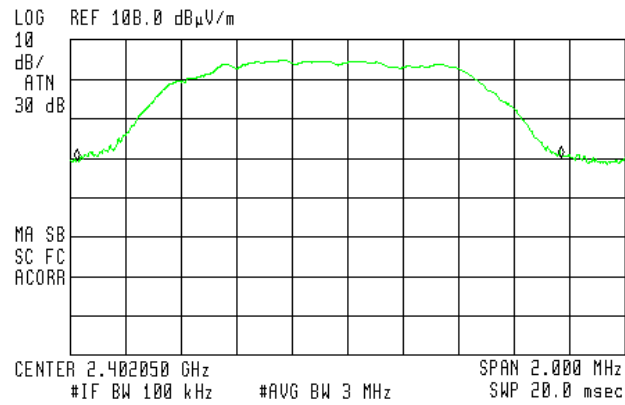


Figure 17. Low Channel , EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.725 MHz  
1.01 dB

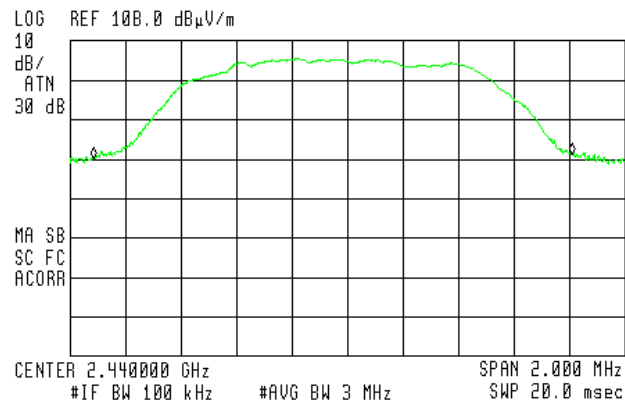


Figure 18. Mid Channel, EDR Modulation

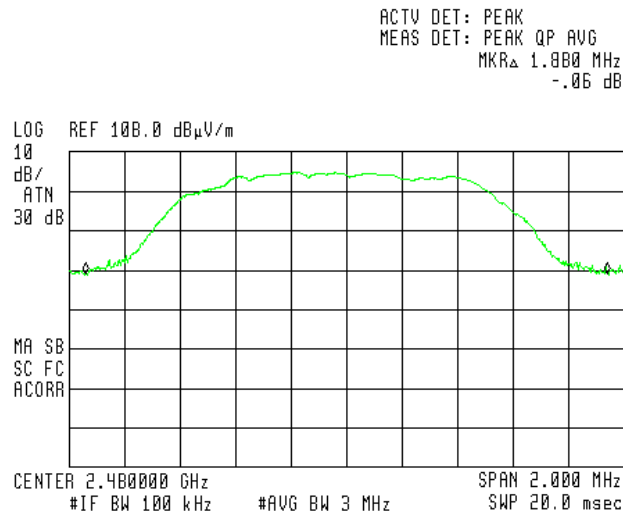


Figure 19. High Channel, EDR Modulation

### 5.3 Test Results

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

Model: M317

Serial Number: Not Designated

| Operation Frequency (MHz) | Modulation | Bandwidth Reading (MHz) |
|---------------------------|------------|-------------------------|
| Low                       | Standard   | 1.445                   |
| Mid                       | Standard   | 1.420                   |
| High                      | Standard   | 1.445                   |
| Low                       | EDR        | 1.745                   |
| Mid                       | EDR        | 1.725                   |
| High                      | EDR        | 1.880                   |

Figure 20 26 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

#### 5.4 Test Equipment Used, 26 dB Bandwidth

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Horn Antenna            | ETS          | 3115          | 29845         | March 14, 2012   | 3 Years |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A     |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A     |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A     |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A     |

**Figure 21 Test Equipment Used**

## 6. 20dB Bandwidth

### 6.1 Test Specification

Specification: FCC Part 15, Subpart C (15.247-a2)

### 6.2 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 30 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 in three frequencies: Low, Middle and High.

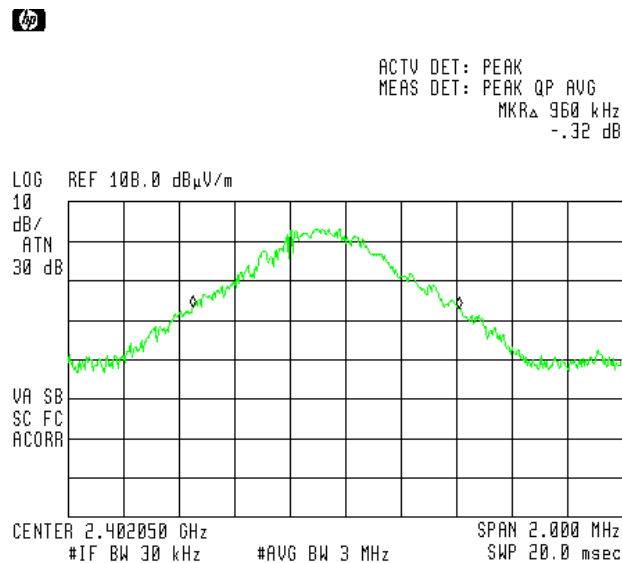


Figure 22. Low Channel , Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>Δ</sub> 970 kHz  
-1.00 dB

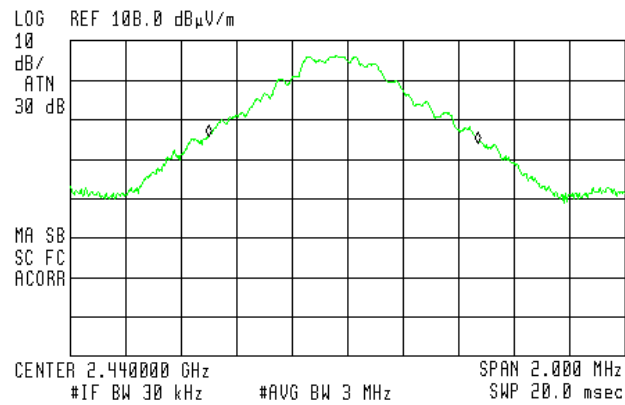


Figure 23. Mid Channel, Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>Δ</sub> 975 kHz  
-.07 dB

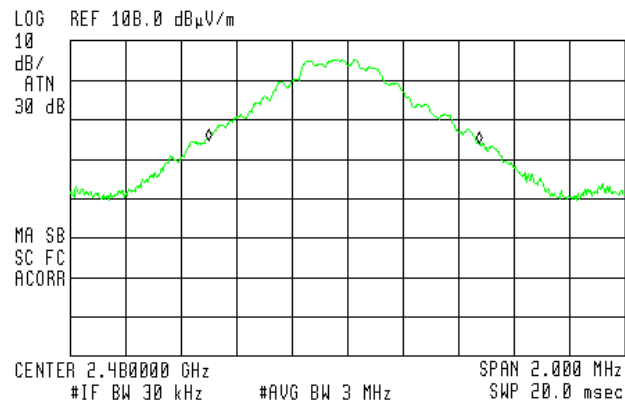


Figure 24. High Channel, Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.385 MHz  
.29 dB

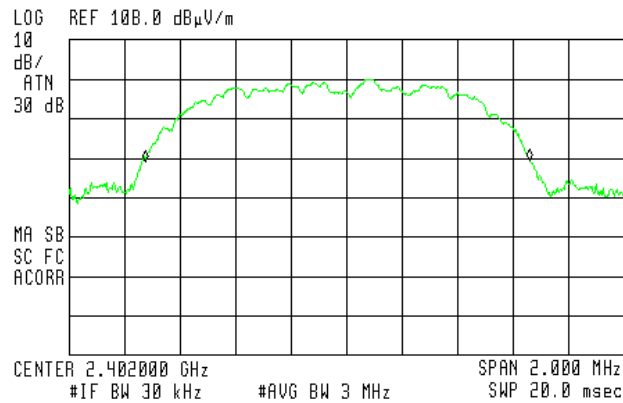


Figure 25. Low Channel , EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.365 MHz  
.35 dB

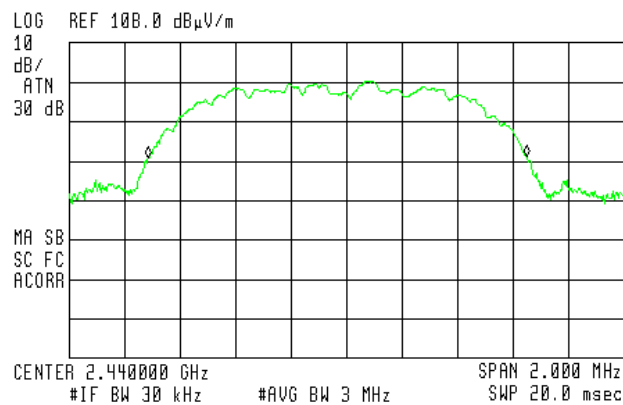


Figure 26. Mid Channel, EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRA 1.370 MHz  
-.01 dB

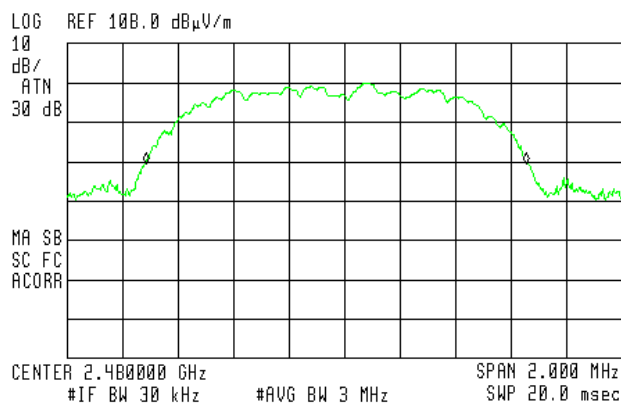


Figure 27. High Channel, EDR Modulation

### 6.3 Test Results

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

Model: M317

Serial Number: Not Designated

| Operation Frequency (MHz) | Modulation | Bandwidth Reading (MHz) |
|---------------------------|------------|-------------------------|
| Low                       | Standard   | 0.960                   |
| Mid                       | Standard   | 0.970                   |
| High                      | Standard   | 0.975                   |
| Low                       | EDR        | 1.385                   |
| Mid                       | EDR        | 1.365                   |
| High                      | EDR        | 1.370                   |

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

#### 6.4 Test Equipment Used; 20dB Bandwidth

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Horn Antenna            | ETS          | 3115          | 29845         | March 14, 2012   | 3 Years |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A     |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A     |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A     |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A     |

**Figure 28 Test Equipment Used**

## 7. Number of Hopping Frequencies Section 15.247(a)(1)(iii)

### 7.1 Test Specification

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

### 7.2 Test Procedure

The E.U.T. was set to hopping mode.

The spectrum analyzer was set to the following parameters:

Span: Every 40 MHz Frequency

Band of Operation: 2402-2481 MHz

RBW: 30kHz

VBW: 300kHz

Detector Function: Peak

Trace: Maximum Hold

The number of hopping frequencies is 79 (See plots).

## Number of Hopping Frequencies

|                   |                               |
|-------------------|-------------------------------|
| E.U.T Description | Mobile Data<br>Terminal (MDT) |
| Type              | M317                          |
| Serial Number:    | Not Designated                |

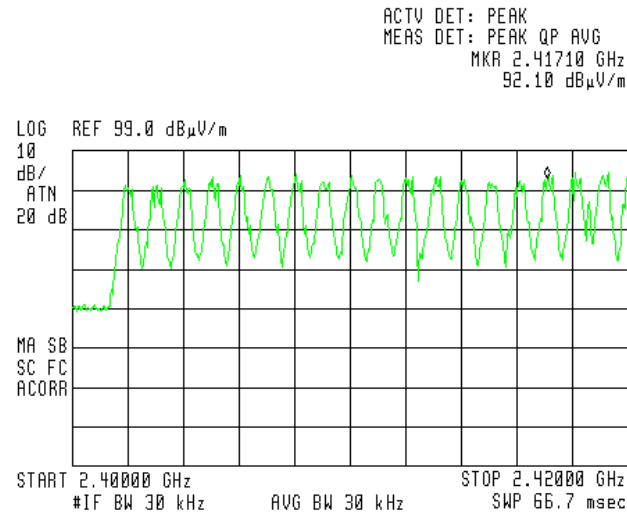


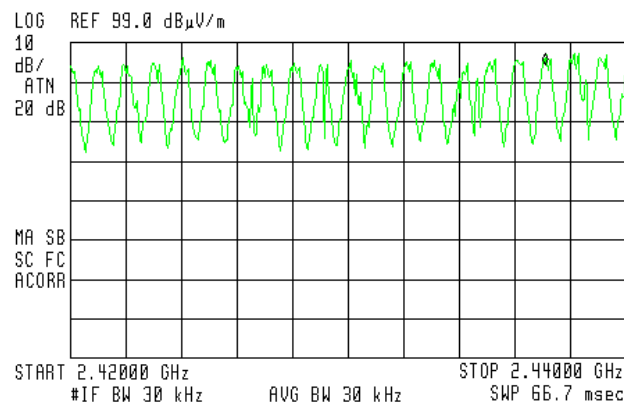
Figure 29. Frequency Hopping, Standard modulation

## Number of Hopping Frequencies

|                   |                               |
|-------------------|-------------------------------|
| E.U.T Description | Mobile Data<br>Terminal (MDT) |
| Type              | M317                          |
| Serial Number:    | Not Designated                |



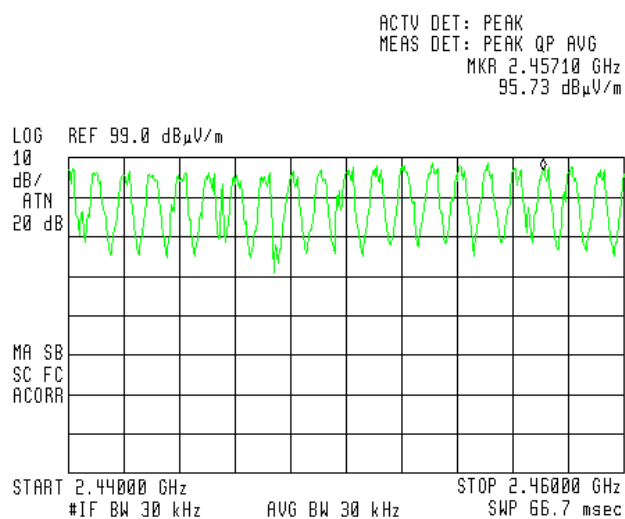
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.43710 GHz  
93.53 dB $\mu$ V/m



**Figure 30. Frequency Hopping, Standard modulation**

## Number of Hopping Frequencies

|                   |                               |
|-------------------|-------------------------------|
| E.U.T Description | Mobile Data<br>Terminal (MDT) |
| Type              | M317                          |
| Serial Number:    | Not Designated                |



**Figure 31. Frequency Hopping, Standard modulation**

## Number of Hopping Frequencies

E.U.T Description    Mobile Data Terminal (MDT)  
Type                    M317  
Serial Number:        Not Designated

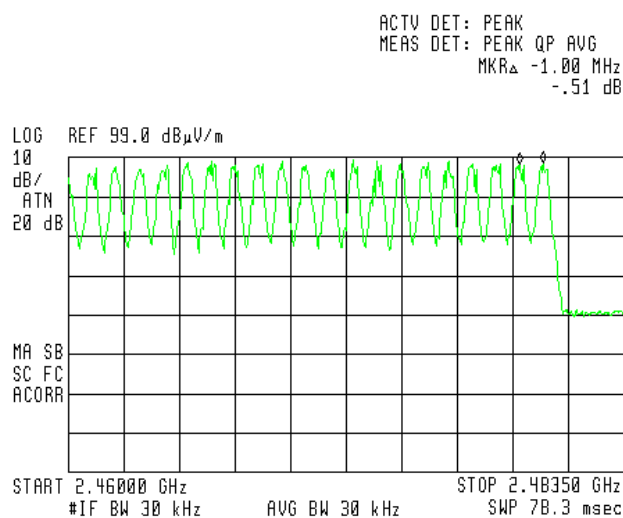


Figure 32. Frequency Hopping, Standard modulation

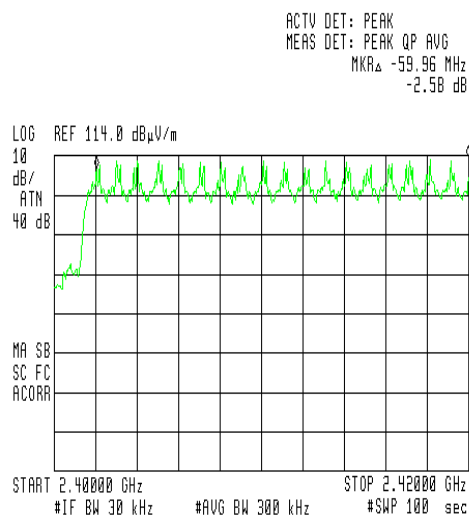
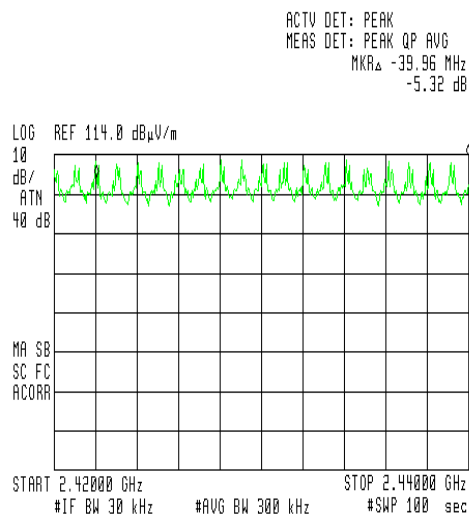
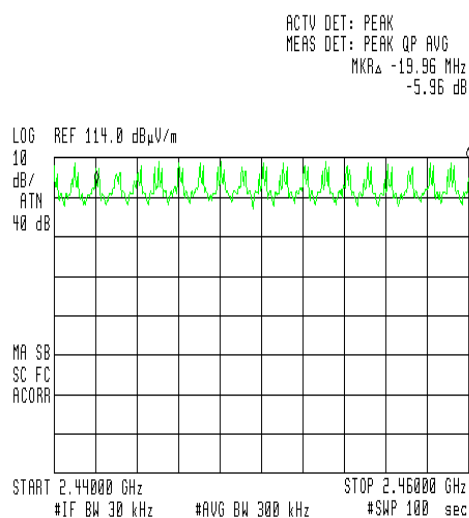


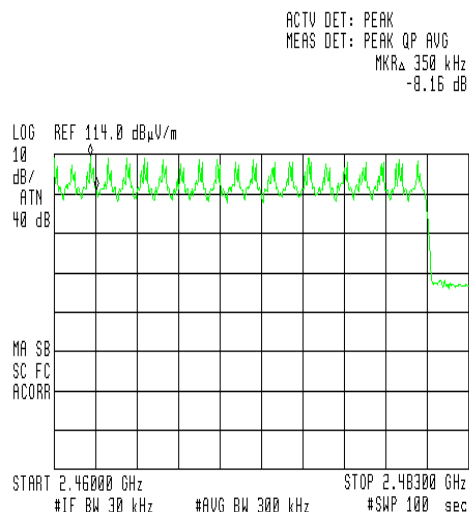
Figure 33. Frequency Hopping, EDR modulation



**Figure 34. Frequency Hopping, EDR modulation**



**Figure 35. Frequency Hopping, EDR modulation**



**Figure 36. Frequency Hopping, EDR modulation**

### 7.3 Results table

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

Model No.: M317

Serial Number: Not Designated

Specification: FCC Part 15, Subpart C, 15.247(a)(1)(iii)

| Modulation | Number of Hopping Frequencies | Specification |
|------------|-------------------------------|---------------|
| Standard   | 79                            | >75           |
| EDR        | 79                            | >75           |

**Figure 37 Number of Hopping Frequencies**

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi



#### **7.4 Test Instrumentation Used**

| Instrument        | Manufacturer | Model        | Serial Number | Calibration           |        |
|-------------------|--------------|--------------|---------------|-----------------------|--------|
|                   |              |              |               | Last Calibration Date | Period |
| Spectrum Analyzer | HP           | 8564E        | 3442A00275    | March 2, 2014         | 1 year |
| Cable             | Rhophase     | KPS-5000-KPS | A1674         | June 1, 2014          | 1 year |

## 8. Channel Frequency Separation

### 8.1 Test Specification

Specification: FCC Part 15, Subpart C, 15.247(a) (1)

### 8.2 Test procedure

The E.U.T. was set to hopping mode.

The spectrum analyzer was set to the following parameters:

Span: 2 MHz

RBW: 10kHz

VBW: 10kHz

Detector Function: Peak

Trace: Maximum Hold

The marker delta function to determine the separation between the peaks of the adjacent channels was used.

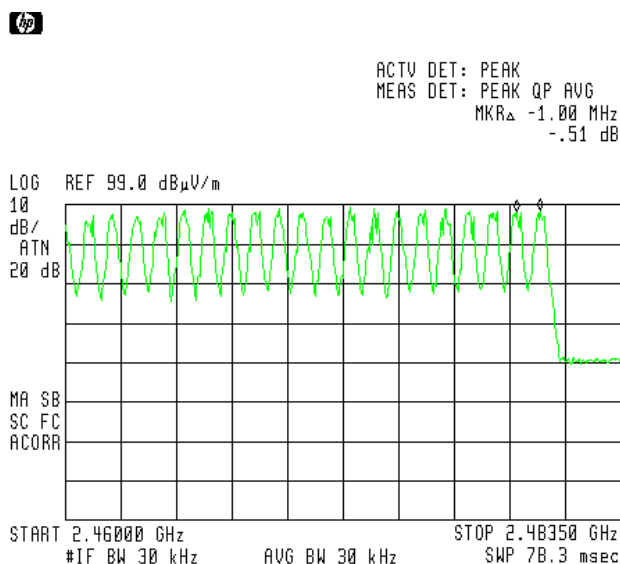
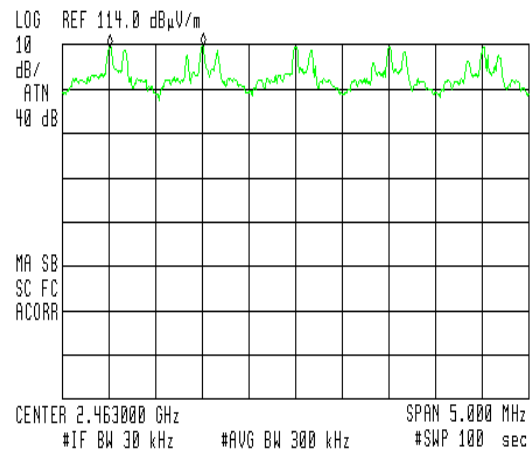


Figure 38. Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ -1.000 MHz  
-1.10 dB



**Figure 39. EDR Modulation**

### 8.3 Results table

E.U.T. Description: Mobile Data Terminal (MDT) Model No.: M317

Serial Number: Not Designated

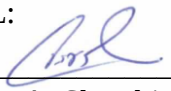
Specification: FCC Part 15, Subpart C, 15.247(a) (1)

| Modulation | Channel<br>Frequency<br>Separation<br>(kHz) | Specification<br>(kHz) | Margin<br>(kHz) |
|------------|---------------------------------------------|------------------------|-----------------|
| Standard   | 1000.0                                      | 975.0                  | 25.0            |
| EDR        | 1000.0                                      | 913.0                  | 67.0            |

**Figure 40 Channel Frequency Separation**

JUDGEMENT: Passed by 25.0 kHz

TEST PERSONNEL:

Tester Signature:   
Typed/Printed Name: A. Sharabi

Date: 22.07.14



#### **8.4 Test Instrumentation Used; Channel Frequency Separation**

| Instrument        | Manufacturer | Model        | Serial Number | Calibration           |        |
|-------------------|--------------|--------------|---------------|-----------------------|--------|
|                   |              |              |               | Last Calibration Date | Period |
| Spectrum Analyzer | HP           | 8564E        | 3442A00275    | March 2, 2014         | 1 year |
| Cable             | Rhophase     | KPS-5000-KPS | A1674         | June 1, 2014          | 1 year |

## 9. Radiated Power Output

### 9.1 Test Specification

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

### 9.2 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 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

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

The E.U.T. was tested in three operating channels and frequencies (1 (2.402 GHz); 8 (2.441 GHz); 14 (2.480 GHz)).

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:

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

E- Field Strength (v/m)

d- Distance from transmitter (m)

G- Antenna gain

P- Peak power (W)

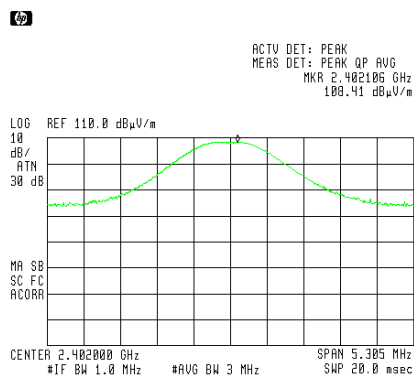


Figure 41 2402.00 MHz – Horizontal, Standard Modulation

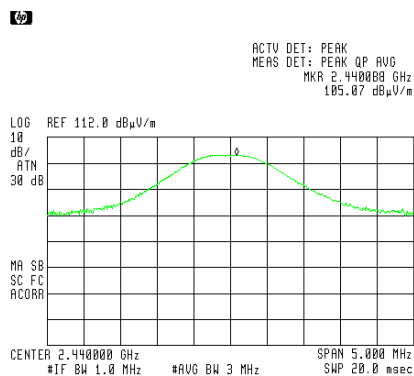


Figure 42 2440.00 MHz – Horizontal, Standard Modulation

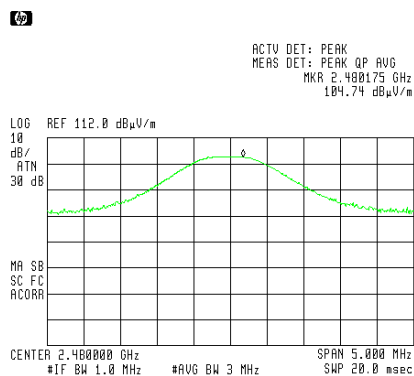


Figure 43 2480.00 MHz – Horizontal, Standard Modulation

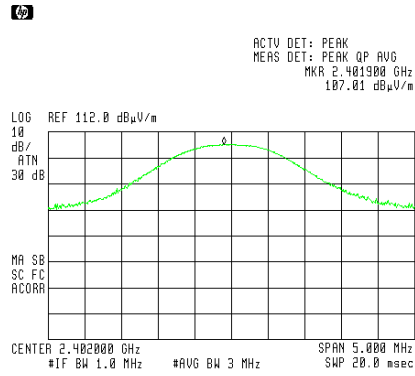


Figure 44 2402.00 MHz – Horizontal, EDR Modulation

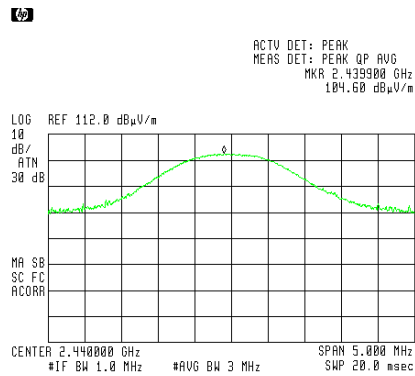


Figure 45 2441.00 MHz – Horizontal, EDR Modulation

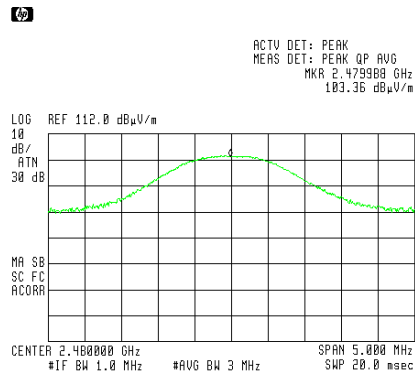


Figure 46 2480.00 MHz – Horizontal, EDR Modulation

### 9.3 Results Calculation

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

Model No.: M317

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C

The following calculations were used to determine maximum radiated power output.

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

| Operation Frequency (MHz) | Modulation | Polarization | Power (dBuV/m) | Power (W) | Power (mW) | Specification (mW) | Margin (mW) |
|---------------------------|------------|--------------|----------------|-----------|------------|--------------------|-------------|
| Low                       | Standard   | H            | 108.41         | 0.0092    | 9.2        | 1000               | -990.8      |
| Mid                       | Standard   | H            | 105.07         | 0.0044    | 4.4        | 1000               | -995.6      |
| High                      | Standard   | H            | 104.74         | 0.0039    | 3.9        | 1000               | -996.1      |
| Low                       | EDR        | H            | 107.01         | 0.0066    | 6.6        | 1000               | -993.4      |
| Mid                       | EDR        | H            | 104.60         | 0.0039    | 3.9        | 1000               | -996.1      |
| High                      | EDR        | H            | 103.36         | 0.0031    | 3.1        | 1000               | -996.9      |

Figure 47 Radiated Power Output

JUDGEMENT: Passed by 990.8mW

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

#### 9.4 Test Equipment Used, Radiated Maximum Power Output

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| Receiver                | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Horn Antenna            | ETS          | 3115          | 29845         | March 14, 2012   | 3 Years |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A     |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A     |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A     |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A     |

**Figure 48 Test Equipment Used**

## 10. Dwell Time on Each Channel

### 10.1 Test Specification

FCC Part 15, Section 15.247(a)(1)(iii)

### 10.2 Test Procedure

The E.U.T. was tested in radiated mode using the substitutional antenna. The spectrum analyzer was set to 30 kHz RBW and 300 kHz VBW.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### 10.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Section 15.247(a)(1)(iii).

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

Additional information of the results is given in *Figure 49* to *Figure 52*.

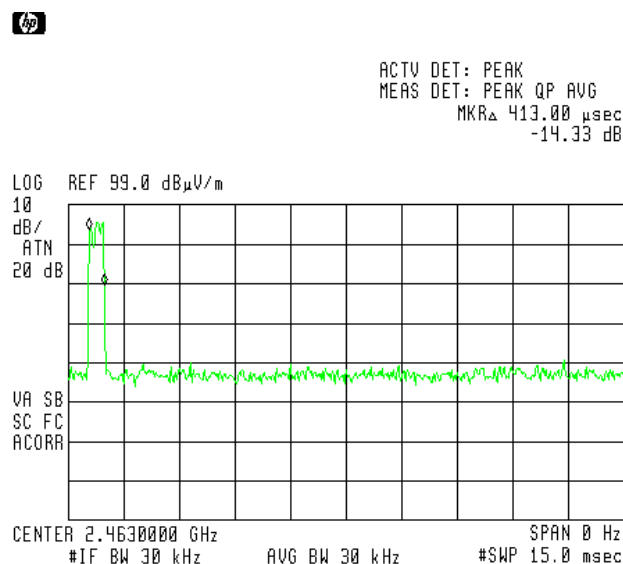
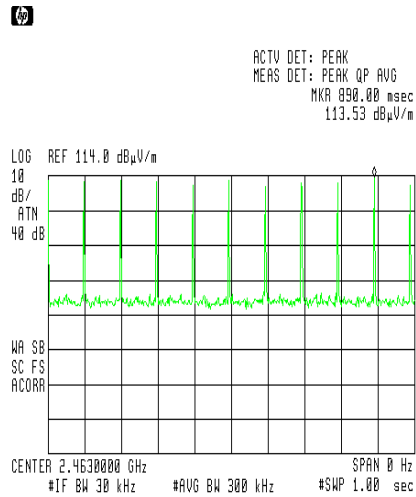
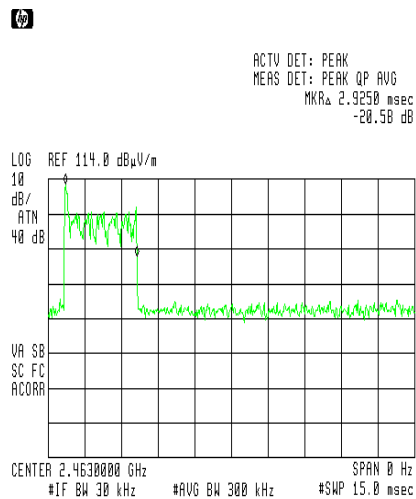


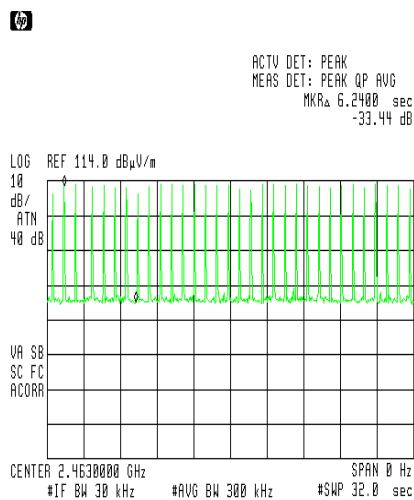
Figure 49 — Ton=413usec , standard Modulation



**Figure 50 — Dwell time at 2.463GHz, standard Modulation**  
[11 X 413usecX31.6 =143, limit 400msec]



**Figure 51 — Ton=2.9msec , EDR Modulation**



**Figure 52 — Dwell time at 2.480GHz , EDR Modulation**  
[32 X 2.9msec =92.8, limit 400msec]

#### 10.4 Test Equipment Used, Dwell Time

| Instrument        | Manufacturer | Model | Serial Number | Calibration           |        |
|-------------------|--------------|-------|---------------|-----------------------|--------|
|                   |              |       |               | Last Calibration Date | Period |
| Spectrum Analyzer | HP           | 8564E | 3442A00275    | March 2, 2014         | 1 year |

**Figure 53 Test Equipment Used**

## 11. Band Edge

[In Accordance with section 15.247(d)]

### 11.1 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 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at the Low and the High channels correspondingly.

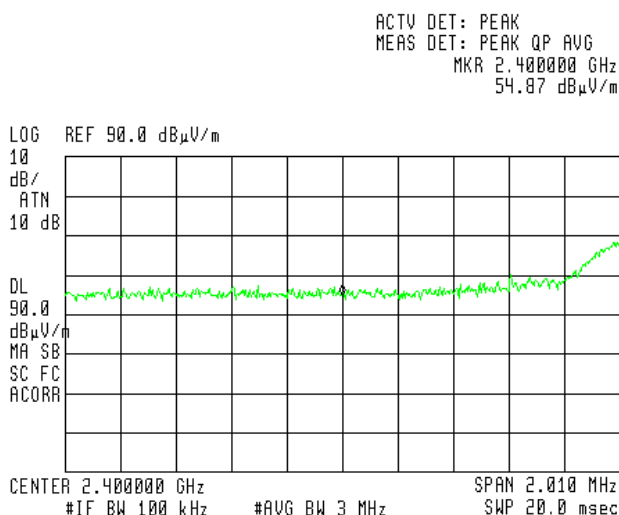


Figure 54 — Lower Band Edge ,Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.483495 GHz  
54.11 dB $\mu$ V/m

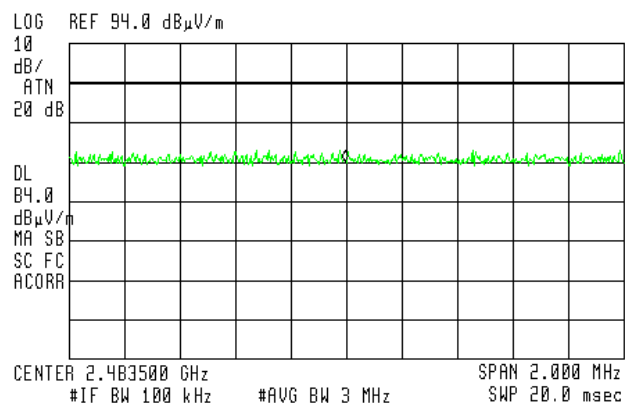


Figure 55 — Upper Band Edge, Standard Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.480000 GHz  
57.96 dB $\mu$ V/m

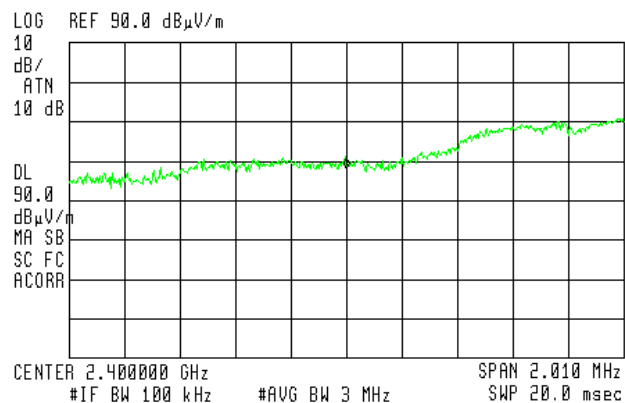
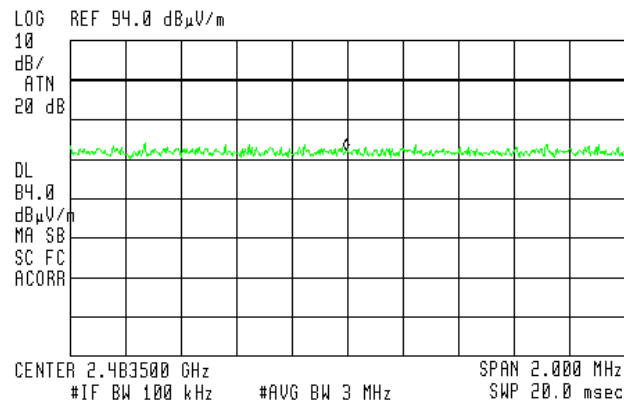


Figure 56 — Lower Band Edge, EDR Modulation



ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 2.483495 GHz  
66.08 dBμV/m



**Figure 57 — Upper Band Edge, EDR Modulation**

## 11.2 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 (d))

| Operation Frequency (MHz) | Modulation | Band Edge Frequency (MHz) | Spectrum Level (dBuV/m) | Specification (dBuV/m) | Margin (dB) |
|---------------------------|------------|---------------------------|-------------------------|------------------------|-------------|
| 2402                      | Standard   | 2400.0                    | 54.87                   | 90.0                   | -35.13      |
| 2480                      | Standard   | 2483.5                    | 64.11                   | 84.0                   | -19.89      |
| 2402                      | EDR        | 2400.0                    | 57.96                   | 90.0                   | -32.04      |
| 2480                      | EDR        | 2483.5                    | 66.08                   | 84.0                   | -17.92      |

**Figure 58 Band Edge**

JUDGEMENT: Passed by 17.92 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

### 11.3 Test Equipment Used, Band Edge Spectrum

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period  |
|-------------------------|--------------|---------------|---------------|------------------|---------|
| Receiver                | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year  |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year  |
| Horn Antenna            | ETS          | 3115          | 29845         | March 14, 2012   | 3 Years |
| Antenna-Log Periodic    | ARA          | LPD-2010/A    | 1038          | April 2, 2013    | 2 years |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A     |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A     |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A     |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A     |

**Figure 59 Test Equipment Used**

## 12. Radiated Emission, 9 kHz – 30 MHz

### 12.1 Test Specification

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

### 12.2 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.

### 12.3 Measured Data

JUDGEMENT: Passed

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

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

#### 12.4 Test Instrumentation Used, Radiated Measurements

| Instrument              | Manufacturer | Model         | Serial Number | Calibration      | Period |
|-------------------------|--------------|---------------|---------------|------------------|--------|
| EMI Receiver            | HP           | 85422E        | 3906A00276    | January 15, 2014 | 1 year |
| RF Section              | HP           | 85420E        | 3705A00248    | January 15, 2014 | 1 year |
| Active Loop Antenna     | EMCO         | 6502          | 9506-2950     | November 4, 2013 | 1 year |
| Antenna Mast            | ARA          | AAM-4A        | 1001          | N/A              | N/A    |
| Turntable               | ARA          | ART-1001/4    | 1001          | N/A              | N/A    |
| Mast & Table Controller | ARA          | ACU-2/5       | 1001          | N/A              | N/A    |
| Printer                 | HP           | LaserJet 2200 | JPKGC19982    | N/A              | N/A    |

**Figure 60 Test Equipment Used**

## 12.5 **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 $\mu$ V/m]

RA: Receiver Amplitude [dB $\mu$ 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.

## 13. Spurious Radiated Emission 30 – 25,000 MHz

### 13.1 Test Specification

30 MHz- 25,000 MHz, F.C.C., Part 15, Subpart C

### 13.2 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 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 1-2.9 GHz, a computerized EMI receiver complying with CISPR 16 requirements was used.

In the frequency range 2.9-25.0 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.)



### 13.3 Test Data

JUDGEMENT: Passed

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

For the operation channel 1 (2.402 GHz), the margin between the emission level and the specification limit is 1.6 db in the worst case at the frequency of 2390.00 MHz, horizontal polarization.

For the operation channel 8 (2.441 GHz), the margin between the emission level and the specification limit is 9.2 db in the worst case at the frequency of 4882.00 MHz, vertical polarization.

For the operation channel 14 (2.480 GHz), the margin between the emission level and the specification limit is 9.4 db in the worst case at the frequency of 4960.00 MHz, horizontal polarization.

Interval modulation testing was conducting while EUT was transmitting simultaneously at 2.4 GHz and cellular modem. Not results were detected.

TEST PERSONNEL:

Tester Signature: 

Date: 22.07.14

Typed/Printed Name: A. Sharabi

## Radiated Emission

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

| Operation Frequency<br>(MHz) | Modulation | Freq.<br>(MHz) | Polarity<br>(H/V) | Peak Reading<br>(dBμV/m) | Peak. Specification<br>(dB μV/m) | Peak. Margin<br>(dB) |
|------------------------------|------------|----------------|-------------------|--------------------------|----------------------------------|----------------------|
| 2402.0                       | Standard   | 2390.0         | H                 | 63.8                     | 74.0                             | -10.2                |
| 2402.0                       | Standard   | 2390.0         | V                 | 58.6                     | 74.0                             | -15.4                |
| 2402.0                       | Standard   | 4804.0         | H                 | 55.0                     | 74.0                             | -19.0                |
| 2402.0                       | Standard   | 4804.0         | V                 | 51.5                     | 74.0                             | -22.5                |
| 2441.0                       | Standard   | 4882.0         | H                 | 51.9                     | 74.0                             | -22.1                |
| 2441.0                       | Standard   | 4882.0         | V                 | 48.4                     | 74.0                             | -25.6                |
| 2480.0                       | Standard   | 4960.0         | H                 | 49.1                     | 74.0                             | -24.9                |
| 2480.0                       | Standard   | 4960.0         | V                 | 47.3                     | 74.0                             | -26.7                |
| 2480.0                       | Standard   | 2483.5         | H                 | 48.4                     | 74.0                             | -25.6                |
| 2480.0                       | Standard   | 2483.5         | V                 | 46.9                     | 74.0                             | -27.1                |

**Figure 61. 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

E.U.T Description Mobile Data Terminal (MDT)  
Type M317  
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical  
Test Distance: 3 meters

Frequency range: 1.0 GHz to 25.0 GHz  
Detector: Average

| Operation Frequency<br>(MHz) | Modulation | Freq.<br>(MHz) | Polarity<br>(H/V) | Average Reading<br>(dBμV/m) | Average Specification<br>(dB μV/m) | Average Margin<br>(dB) |
|------------------------------|------------|----------------|-------------------|-----------------------------|------------------------------------|------------------------|
| 2402.0                       | Standard   | 2390.0         | H                 | 52.4                        | 54.0                               | -1.6                   |
| 2402.0                       | Standard   | 2390.0         | V                 | 48.9                        | 54.0                               | -5.1                   |
| 2402.0                       | Standard   | 4804.0         | H                 | 48.0                        | 54.0                               | -6.0                   |
| 2402.0                       | Standard   | 4804.0         | V                 | 45.7                        | 54.0                               | -8.3                   |
| 2441.0                       | Standard   | 4882.0         | H                 | 43.4                        | 54.0                               | -10.6                  |
| 2441.0                       | Standard   | 4882.0         | V                 | 44.8                        | 54.0                               | -9.2                   |
| 2480.0                       | Standard   | 4960.0         | H                 | 44.6                        | 54.0                               | -9.4                   |
| 2480.0                       | Standard   | 4960.0         | V                 | 43.7                        | 54.0                               | -10.3                  |
| 2480.0                       | Standard   | 2483.5         | H                 | 40.0                        | 54.0                               | -14.0                  |
| 2480.0                       | Standard   | 2483.5         | V                 | 39.8                        | 54.0                               | -14.2                  |

**Figure 62. 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

## Radiated Emission

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

| Operation Frequency<br>(MHz) | Modulation | Freq.<br>(MHz) | Polarity<br>(H/V) | Peak Reading<br>(dBμV/m) | Peak. Specification<br>(dB μV/m) | Peak. Margin<br>(dB) |
|------------------------------|------------|----------------|-------------------|--------------------------|----------------------------------|----------------------|
| 2402.0                       | EDR        | 2390.0         | H                 | 58.7                     | 74.0                             | -15.3                |
| 2402.0                       | EDR        | 2390.0         | V                 | 55.8                     | 74.0                             | -18.2                |
| 2402.0                       | EDR        | 4804.0         | H                 | 53.5                     | 74.0                             | -20.5                |
| 2402.0                       | EDR        | 4804.0         | V                 | 48.9                     | 74.0                             | -25.1                |
| 2441.0                       | EDR        | 4882.0         | H                 | 49.0                     | 74.0                             | -25.0                |
| 2441.0                       | EDR        | 4882.0         | V                 | 47.4                     | 74.0                             | -26.6                |
| 2480.0                       | EDR        | 4960.0         | H                 | 46.8                     | 74.0                             | -27.2                |
| 2480.0                       | EDR        | 4960.0         | V                 | 44.8                     | 74.0                             | -29.2                |
| 2480.0                       | EDR        | 2483.5         | H                 | 51.6                     | 74.0                             | -22.4                |
| 2480.0                       | EDR        | 2483.5         | V                 | 48.9                     | 74.0                             | -25.1                |

**Figure 63. 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

E.U.T Description Mobile Data Terminal (MDT)  
Type M317  
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical  
Test Distance: 3 meters

Frequency range: 1.0 GHz to 25.0 GHz  
Detector: Average

| Operation Frequency<br>(MHz) | Modulation | Freq.<br>(MHz) | Polarity<br>(H/V) | Average Reading<br>(dBμV/m) | Average Specification<br>(dB μV/m) | Average Margin<br>(dB) |
|------------------------------|------------|----------------|-------------------|-----------------------------|------------------------------------|------------------------|
| 2402.0                       | EDR        | 2390.0         | H                 | 48.9                        | 54.0                               | -5.1                   |
| 2402.0                       | EDR        | 2390.0         | V                 | 44.8                        | 54.0                               | -9.2                   |
| 2402.0                       | EDR        | 4804.0         | H                 | 49.4                        | 54.0                               | -4.6                   |
| 2402.0                       | EDR        | 4804.0         | V                 | 47.8                        | 54.0                               | -6.2                   |
| 2441.0                       | EDR        | 4882.0         | H                 | 42.4                        | 54.0                               | -11.6                  |
| 2441.0                       | EDR        | 4882.0         | V                 | 41.9                        | 54.0                               | -12.1                  |
| 2480.0                       | EDR        | 4960.0         | H                 | 40.6                        | 54.0                               | -13.4                  |
| 2480.0                       | EDR        | 4960.0         | V                 | 40.6                        | 54.0                               | -13.4                  |
| 2480.0                       | EDR        | 2483.5         | H                 | 41.5                        | 54.0                               | -12.5                  |
| 2480.0                       | EDR        | 2483.5         | V                 | 38.7                        | 54.0                               | -15.3                  |

**Figure 64. 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

### 13.4 Test Instrumentation Used, Radiated Measurements

| Instrument                           | Manufacturer    | Model            | Serial No. | Last Calibration Date | Period  |
|--------------------------------------|-----------------|------------------|------------|-----------------------|---------|
| EMI Receiver                         | HP              | 85422E           | 3906A00276 | January 15, 2014      | 1 Year  |
| RF Filter Section                    | HP              | 85420E           | 3705A00248 | January 15, 2014      | 1 Year  |
| Antenna Biconical                    | EMCO            | 3104             | 2606       | August 30, 2012       | 2 Years |
| Antenna Log Periodic                 | ARA             | LPD-2010/A       | 1038       | April 2, 2013         | 2 Years |
| Double Ridged Waveguide Horn Antenna | EMCO            | 3115             | 29845      | 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 21, 2013       | 1 Year  |
| Low Noise Amplifier                  | Sophia Wireless | LNA 28-B         | 232        | August 28, 2013       | 1 Year  |
| Spectrum Analyzer                    | HP              | 8592L            | 3826A01204 | February 28, 2014     | 1 Year  |
| Spectrum Analyzer                    | HP              | 8564E            | 3442A00275 | March 2, 2014         | 1 Year  |
| Antenna Mast                         | ARA             | AAM-4A           | 1001       | N/A                   | N/A     |
| Turntable                            | ARA             | ART-1001/4       | 1001       | N/A                   | N/A     |
| Mast & Table Controller              | ARA             | ACU-2/5          | 1001       | N/A                   | N/A     |
| Printer                              | HP              | LaserJet 2200    | JPKG19982  | N/A                   | N/A     |

#### 13.4 **Field Strength Calculation 30 – 1000 MHz**

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

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

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

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

No external pre-amplifiers are used.



## 14. Antenna Gain/Information

The antenna gain is 3.40 dBi, integral.

## 15. 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 1.1310 Requirements

(a) FCC limits at 2480 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<sub>t</sub>- Transmitted Power 108.41 dBuV/m = 9.2 mW \*

\*Note- Since testing was radiated transmitted power includes antenna gain.

G<sub>T</sub>- Antenna Gain, 3.40 dBi = 2.2 numeric

R- Distance from Transmitter using 20 cm worst case

(c) The peak power density is :

$$S = \frac{9.2}{4\pi(20)^2} = 0.0018 \frac{mW}{cm^2}$$

(d) This is below the FCC limit.

## 16. . APPENDIX B - CORRECTION FACTORS

### 16.1 Correction factors for CABLE

from EMI receiver  
to test antenna  
at 3 meter range.

| FREQUENCY<br>(MHz) | CORRECTION<br>FACTOR<br>(dB) | FREQUENCY<br>(MHz) | CORRECTION<br>FACTOR<br>(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".

## 16.2 Correction factors for CABLE

from EMI receiver  
to test antenna  
at 3 meter range.

| FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(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.

### 16.3 Correction factors for CABLE

from spectrum analyzer  
to test antenna above 2.9 GHz

| FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(dB) | FREQUENCY<br>(GHz) | CORRECTION<br>FACTOR<br>(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.

#### 16.4 Correction factors for LOG PERIODIC ANTENNA

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

##### Distance of 3 meters

| FREQUENCY<br>(MHz) | AFE<br>(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<br>(MHz) | AFE<br>(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".

**16.5 Correction factors for LOG PERIODIC ANTENNA**  
**Type SAS-200/511**  
**at 3 meter range.**

| FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(dB) |
|--------------------|---------------------------|
| 1.0                | 24.9                      |
| 1.5                | 27.8                      |
| 2.0                | 29.9                      |
| 2.5                | 31.2                      |
| 3.0                | 32.8                      |
| 3.5                | 33.6                      |
| 4.0                | 34.3                      |
| 4.5                | 35.2                      |
| 5.0                | 36.2                      |
| 5.5                | 36.7                      |
| 6.0                | 37.2                      |
| 6.5                | 38.1                      |

| FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(dB) |
|--------------------|---------------------------|
| 7.0                | 38.6                      |
| 7.5                | 39.2                      |
| 8.0                | 39.9                      |
| 8.5                | 40.4                      |
| 9.0                | 40.8                      |
| 9.5                | 41.1                      |
| 10.0               | 41.7                      |
| 10.5               | 42.4                      |
| 11.0               | 42.5                      |
| 11.5               | 43.1                      |
| 12.0               | 43.4                      |
| 12.5               | 44.4                      |
| 13.0               | 44.6                      |

**NOTES:**

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

## 16.6 Correction factors for BICONICAL ANTENNA

**Type BCD-235/B,  
at 3 meter range**

| FREQUENCY<br>(MHz) | AFE<br>(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".



### 16.7 Correction factors for Double-Ridged Waveguide Horn

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

| FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(dB 1/m) | ANTENNA<br>Gain<br>(dBi) | FREQUENCY<br>(GHz) | ANTENNA<br>FACTOR<br>(dB 1/m) | ANTENNA<br>Gain<br>(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                     |                    |                               |                          |



**16.8 Correction factors for**

**Horn Antenna  
Model: SWH-28  
at 1 meter range.**

| <b>FREQUENCY</b><br>(GHz) | <b>APE</b><br>(dB /m) | <b>Gain</b><br>(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                 |

## 16.9 Correction factors for

## Horn Antenna Model: V637

| FREQUENCY<br>(GHz) | AFE<br>(dB /m) | Gain<br>(dB1) |
|--------------------|----------------|---------------|
| 26.0               | 43.6           | 14.9          |
| 27.0               | 43.7           | 15.1          |
| 28.0               | 43.8           | 15.3          |
| 29.0               | 43.9           | 15.5          |
| 30.0               | 43.9           | 15.8          |
| 31.0               | 44.0           | 16.0          |
| 32.0               | 44.1           | 16.2          |
| 33.0               | 44.1           | 16.4          |
| 34.0               | 44.1           | 16.7          |
| 35.0               | 44.2           | 16.9          |
| 36.0               | 44.2           | 17.1          |
| 37.0               | 44.2           | 17.4          |
| 38.0               | 44.2           | 17.6          |
| 39.0               | 44.2           | 17.8          |
| 40.0               | 44.2           | 18.0          |



**16.10 Correction factors for ACTIVE LOOP ANTENNA**

**Model 6502**

**S/N 9506-2950**

| <b>FREQUENCY</b> | <b>Magnetic<br/>Antenna<br/>Factor</b> | <b>Electric<br/>Antenna<br/>Factor</b> |
|------------------|----------------------------------------|----------------------------------------|
| <b>(MHz)</b>     | <b>(dB)</b>                            | <b>(dB)</b>                            |
| .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                                    |

## 17. Comparison Industry Canada Requirements With FCC

**Micronet Ltd. M/N: M317**

**IC: 1286A-NB860 FCC ID: U8ONB860**

| Test                                                | FCC          | IC                                                |
|-----------------------------------------------------|--------------|---------------------------------------------------|
| ❑ Radiated Emission                                 | 15.209       | RSS 210 Issue 8<br>Clause 2.5                     |
| ❑ Max power /<br>Peak power                         | 15.247(b)(3) | RSS 210 Issue 8<br>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<br>RSS Gen 7.2.2<br>(Table 1) |
| ❑ Band edge spectrum                                | 15.247(d)    | RSS 210 Issue 8 A8.5                              |
| ❑ RF Exposure Limits                                | 1.1310       | RSS 102 4.4                                       |