

Exhibit 3.b.2

## Test Report. Conducted emissions

**Table of contents**

Table of contents .....	1
1. Test Setup and Procedures.....	2
1.1. Description of the device .....	2
1.2. Measurement procedures .....	3
1.2.1. Introduction of the Measurements .....	3
1.2.2. RF Output Power .....	3
1.2.3. Occupied Bandwidth.....	4
1.2.4. Number of Hopping Frequencies .....	5
1.2.5. Carrier Frequency Separation .....	6
1.2.6. Dwell Time .....	7
1.2.7. Band-edge compliance.....	10
1.2.8. Spurious RF conducted emissions .....	11
2. Test Equipment.....	13
3. Requirements and Results .....	13
3.1. AC Power line Conducted Emissions .....	13
3.2. Antenna terminal conducted emissions.....	13
Appendix A. Output Power measurements .....	15
A1. Highest channel.....	15
A2. Middle channel .....	16
A3. Lowest channel .....	17
Appendix B. Occupied Bandwidth measurement.....	18
B1. Highest channel.....	18
B2. Middle channel.....	19
B3. Lowest channel .....	20
Appendix C. Number of Hopping Frequencies .....	21
Appendix D. Carrier Frequency Separation measurements.....	22
Appendix E. Dwell Time measurements .....	23
E1. Maximum transmit time per channel.....	23
E2. Number of times the hopping pattern repeats within a 20 seconds interval .....	24
Appendix F. Band edge compliance.....	25
F1. Low frequency (902 MHz) .....	25
F2. High frequency (928 MHz) .....	26
Appendix G. Spurious emissions at antenna terminal measurements .....	27
G1. Lowest channel, up to 1 GHz.....	27
G2. Lowest channel, 1GHz to 2.9 GHz .....	28
G3. Lowest channel, 2.9GHz to 10 GHz .....	29
G4. Middle channel, up to 1 GHz.....	30
G5. Middle channel, 1GHz to 2.9 GHz .....	31
G6. Middle channel, 2.9 GHz to 10 GHz .....	32
G7. Highest channel, up to 1 GHz.....	33
G8. Highest channel, 1 GHz to 2.9 GHz.....	34
G9. Highest channel, 2.9 GHz to 10 GHz.....	35

## 1. Test Setup and Procedures

### 1.1. Description of the device

This report contains the test data performed on the device described below:

FCC ID	TKY-TMS800
Manufacturer	Lexycom Technologies, Inc.
Model Number	Tiamis-800
Serial Number	Sample2
Device description	Frequency hopping, software defined radio transceiver. Frequency Band of operation - 902...928 MHz Maximum output power at antenna - 1 Watt Modulation - CPFSK OC-BW - 250 kHz Frequency channel separation - 250 kHz Frequency stability - < 1 ppm Lowest channel of operation - 902.25 MHz Highest channel of operation - 927.75 MHz
Power input	A 12 VDC power supply was used to power the EUT.
Grounding	The EUT was ungrounded during the test.
Support equipment	A personal computer (laptop) was used in between the tests to change the EUT's configuration. Every time after the setup the computer was disconnected from the EUT.
Interconnect cables	The EUT was connected to the personal computer via a 6 foot long RS232 cable during the setup only. During the tests the cable was removed.
Operating mode	During all tests the EUT was switched either to a hopping mode or to a single frequency mode as was required by the test. If the EUT was programmed to operate in the single frequency mode, the EUT was using one of the three frequency channels: the lowest (902.25 MHz), the middle channel (915 MHz), or the highest channel (927.75 MHz).

## **1.2. Measurement procedures**

### **1.2.1. Introduction of the Measurements**

As the device's operating channel frequency and mode of operation are conveniently selected using a personal computer, the serial interface method of programming the device by means of a personal computer were used in all of the following tests.

To perform the tests, the following documents were used as the guidelines to the extent specified herein:

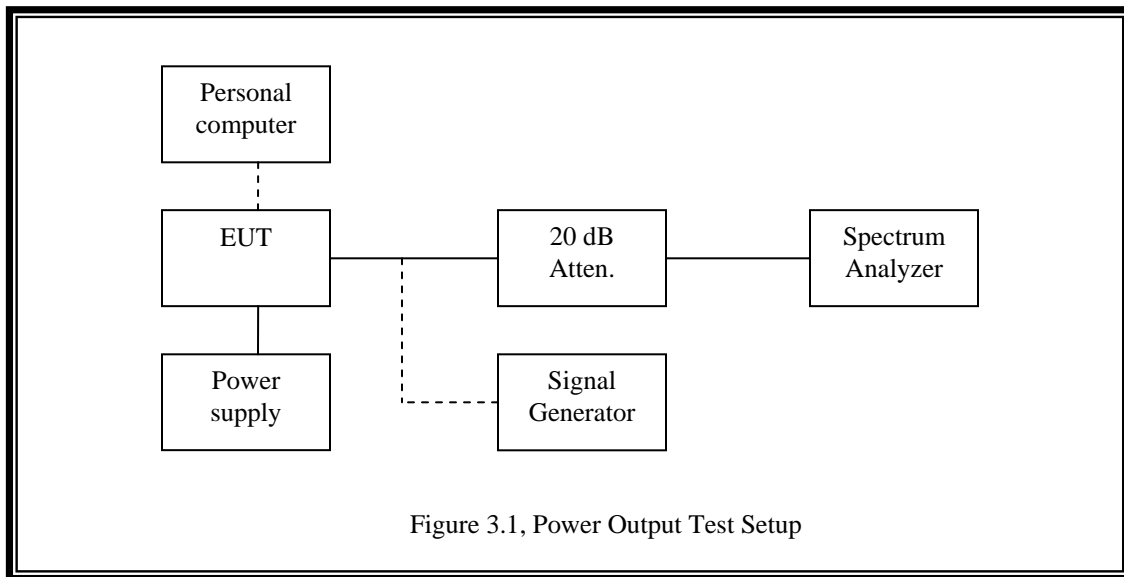
Federal Communications Commission "Code of Federal Regulations" Title 47, Part 15, Subpart C, dated 1 October 2004

ANSI C63.4-2003, "American National Standard for Methods of Measurement of Radio-Noise Emissions for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

Public Notice DA00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, released March 30, 2000

### **1.2.2. RF Output Power**

The RF output power into a 50 Ohms load was tested at low, mid, and high frequency channels. For each test the following setup was used:

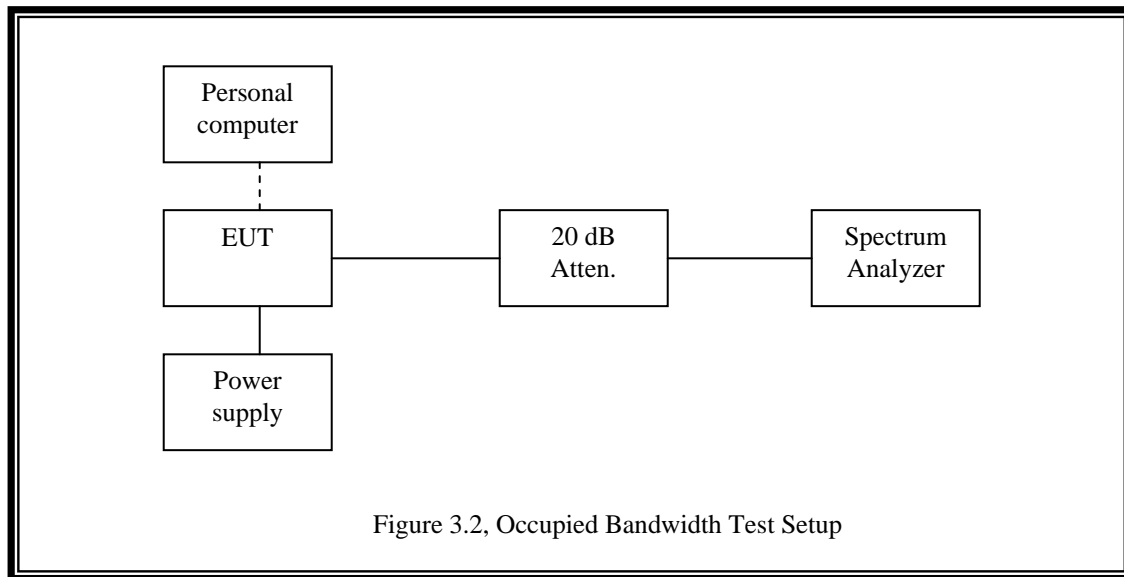


#### Procedure:

1. The Test Equipment and EUT set up per Figure 3.1.
2. The signal generator was used to confirm the signal loss in the 20 dB attenuator. The measured loss was used to offset the amplitude measurements of the spectrum analyzer.
3. The EUT was programmed to operate in a single channel transmit mode and during the test it was transmitting at its maximum data rate. The frequency channel of operation was selected via the personal computer. The frequency channels were switched between the lowest (902.25 MHz), the middle (915 MHz), and the highest (927.75 MHz) channels. After the selection was made, the personal computer was disconnected from the EUT.
4. The results were max hold until the trace stabilized.
5. The marker-to-peak method was used to determine the peak output power.
6. The plots were recorded and can be found in the Appendix A of this document.

### **1.2.3. Occupied Bandwidth**

The occupied bandwidth was measured using the following setup:

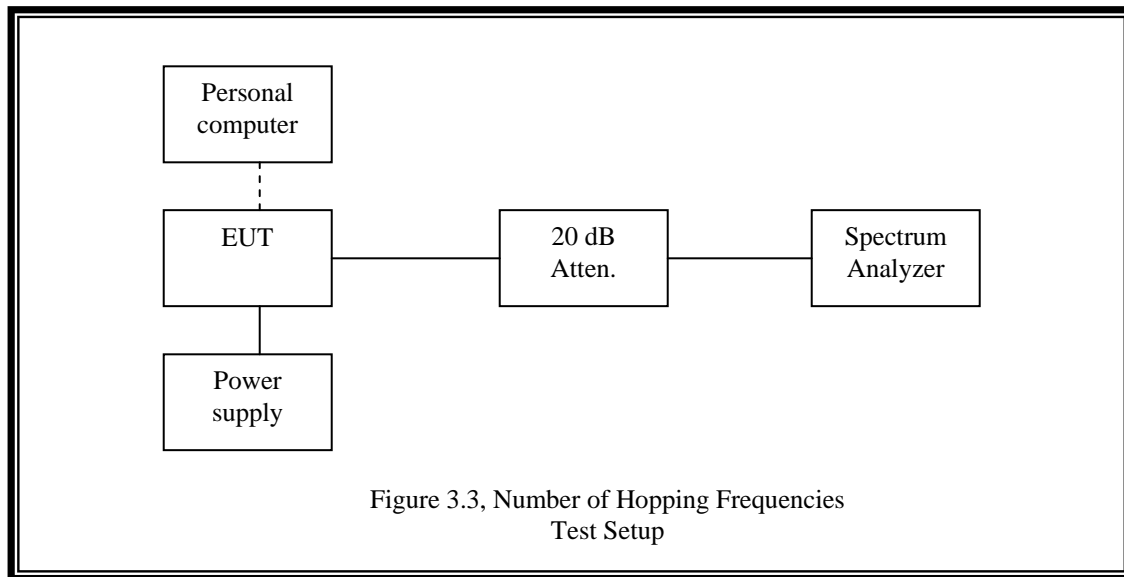


#### Procedure:

1. The Test Equipment and EUT set up per Figure 3.2.
2. The EUT was placed into a single channel transmit mode and transmitting at its maximum data rate.
3. The EUT was programmed to operate in a single channel transmit mode and during the test it was transmitting at its maximum data rate. The frequency channel of operation was selected via the personal computer. The frequency channels were switched between the lowest (902.25 MHz), the middle (915 MHz), and the highest (927.75 MHz) channels. After the selection was made, the personal computer was disconnected from the EUT.
4. The reference level of the spectrum analyzer for each channel was set to the level of output power measured during the steps described in the Section 1.2.3 of this document.
5. The results were max hold until the trace stabilized.
6. The marker-delta method was used to determine the 20 dB occupied bandwidth.
7. The plots were recorded and can be found in the Appendix B of this document.

#### **1.2.4. Number of Hopping Frequencies**

The number of hopping frequencies was counted. The setup, which was used to determine the number of hopping frequencies is shown below:

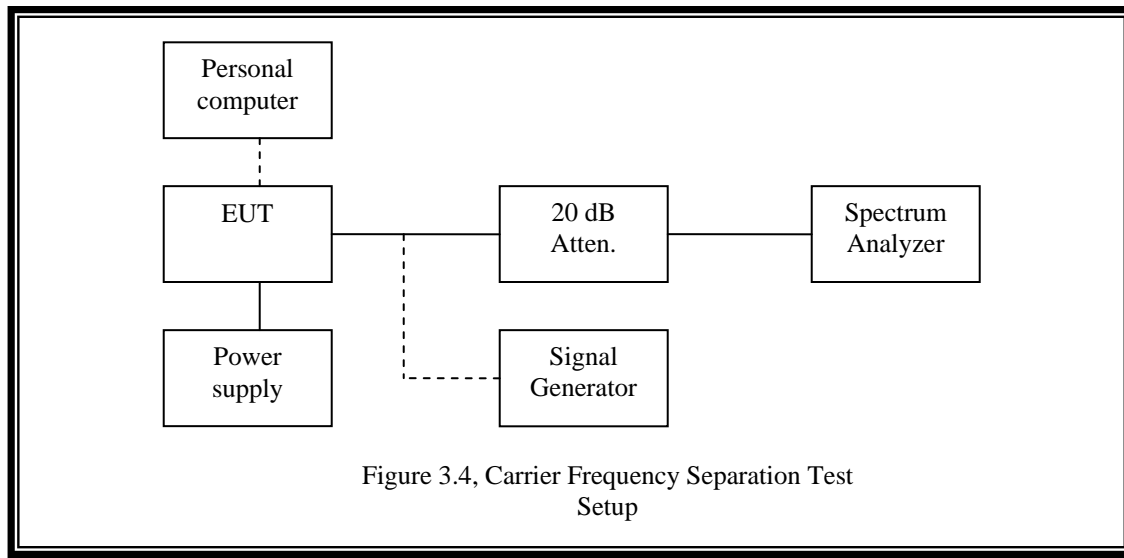


Procedure:

1. The Test Equipment and EUT set up per Figure 3.3.
2. The EUT was placed into a hopping mode and it was transmitting at its maximum data rate.
3. The results were max hold until the trace stabilized.
4. The hopping channels were counted.
5. The plot was recorded and can be found the Appendix C of this document.

### 1.2.5. Carrier Frequency Separation

The carrier frequency separation was measured using the following setup:

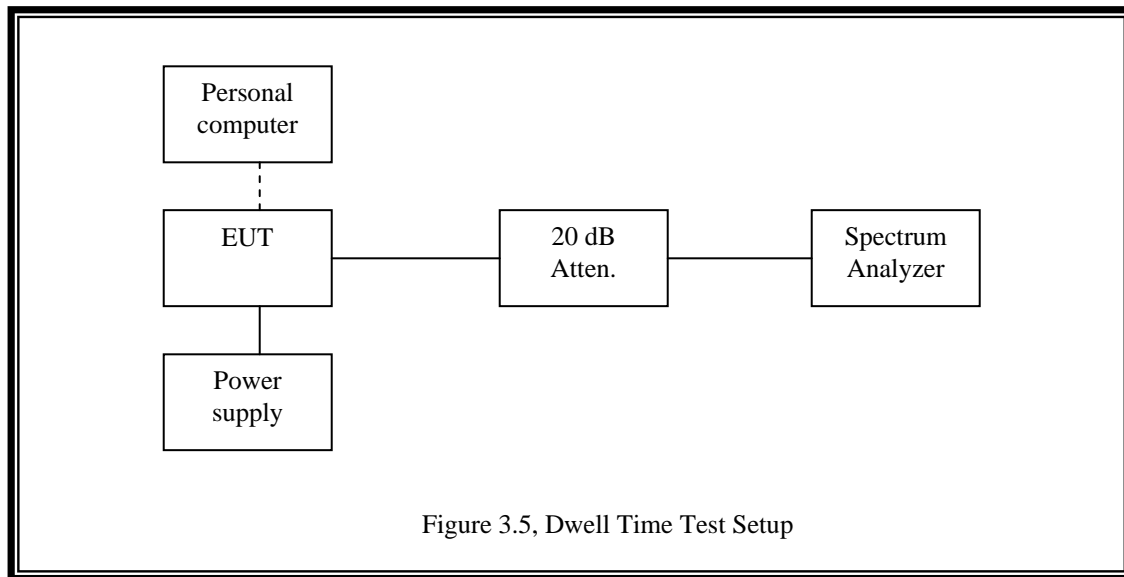


Procedure:

1. The Test Equipment and EUT set up per Figure 3.4.
2. The signal generator was used to confirm the signal loss in the 20 dB attenuator. The measured loss was used to offset the amplitude measurements of the spectrum analyzer.
3. The EUT was placed into a hopping mode and it was transmitting at its maximum data rate.
4. The results were max hold until the trace stabilized.
5. The marker was placed at the center frequency of one of the hopping channels. The marker-delta function was used to determine the frequency separation to the adjacent channel.
6. The plot was recorded and can be found in the Appendix D of this document.

### 1.2.6. Dwell Time

The dwell time of the EUT was calculated using the steps listed below. To confirm the steps of the calculations the following test equipment setup was used:



To determine the average dwell time of the EUT on any frequency the following steps were taken:

*Step 1. Determine the EUT's maximum transmit time on any frequency channel*

By the design, the maximum time the EUT will dwell on any frequency channel is limited to ~20.7 msec. During this time the transceiver switches between transmit and receive modes of operation. The maximum time allocated for the EUT's transmit mode within every 20.7 msec interval is limited to ~15.7 msec.

The procedure listed below shows how the EUT's maximum transmit time on any frequency channel was verified. The plot of the measurements can be found in the Appendix E of this document.

Procedure:

1. The Test Equipment and EUT set up per Figure 3.5.
2. The EUT was placed into a hopping mode and it was transmitting at its maximum data rate.
3. The single sweep was used to capture the EUT's maximum transmit time on a selected frequency channel. The sweep time setting on the spectrum analyzer was big enough to capture one EUT's transmission.
4. The marker was placed at the beginning of the recorded pulse on the spectrum analyzer's screen. The marker-delta function was used to determine the duration of the recorded pulse.



5. The plot was recorded and can be found in the Appendix E, Section E.1 of this document.

*Step 2. Determine the number of occurrences of each frequency channel of EUT's hopping patten within a 20 seconds interval*

As explained above, if the EUT's dwell time on each frequency channel is limited to maximum of 20.7 msec, and using the EUT's hopping pattern length of 128 channels, the EUT's hopping patten will repeat every 2.65 sec:

$$\text{HoppingPatternDuration} = 20.7 \text{ msec} * 128 = \sim 2.65 \text{ sec}$$

Therefore, the number of times each frequency channel will be used by the EUT within a 20 seconds interval can be found as:

$$\begin{aligned} \text{NumOfTimesEachChannelIsUsed} &= 20 \text{ sec} / \text{HoppingPatternDuration} = \\ &= 20 \text{ sec.} / 2.65 \text{ sec} = 7.55 \text{ times} \rightarrow \text{rounding it up} = 8 \text{ times} \end{aligned}$$

To confirm the calculations above, the following test procedure was used:

Procedure:

1. The Test Equipment and EUT set up per Figure 3.5.
2. The EUT was placed into a hopping mode and it was transmitting at its maximum data rate.
3. The spectrum analyzer was set to have a sweep time of 20 seconds.
4. The results were max hold until the end of a single sweep. The sequence of 8 pulses appeared on the spectrum analyzer's screen.
5. The marker was placed at the first pulse on spectrum analyzer's screen.
6. The marker-delta function was used to determine the time difference to the adjacent pulse on spectrum analyzer's screen. The measured time difference is the hopping pattern duration.
7. The plot was recorded and can be found in the Appendix E, Section E.2 of this document.

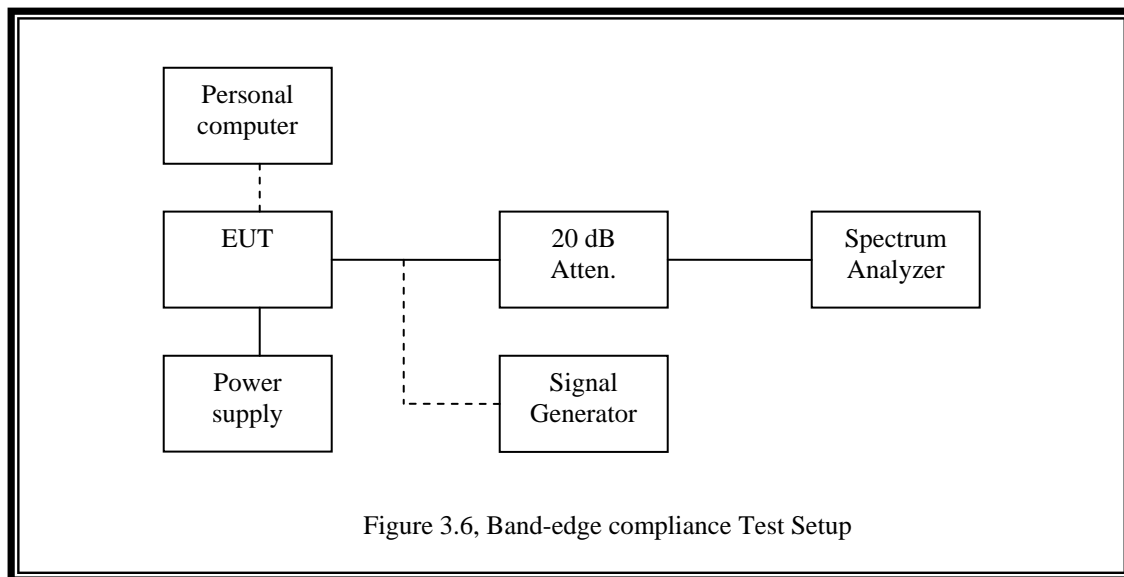
*Step 3. Calculate the EUT's dwell time on any frequency within a 20 seconds interval*

The EUT's dwell time per frequency channel in every 20 seconds interval can be found as:

$$\begin{aligned} \text{DwellTimePerChannel} &= \text{MaxTransmitTimePerChannel} * 8 = 15.7 \text{ msec} * \\ &8 = \mathbf{125.6 \text{ msec.}} \end{aligned}$$

### 1.2.7. Band-edge compliance

The EUT's band-edge compliance was confirmed using the following setup:

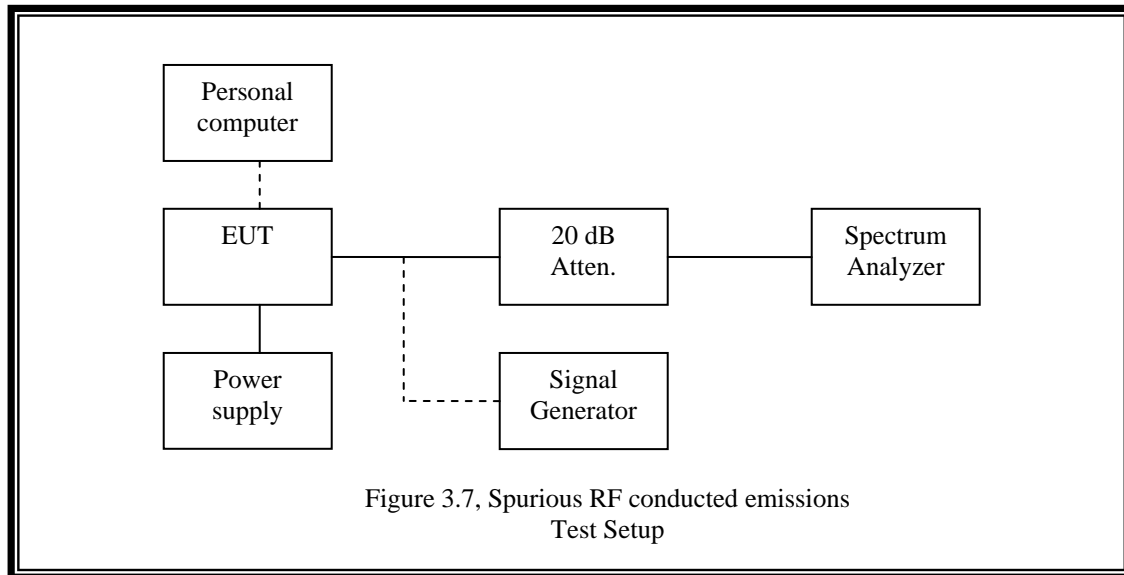


#### Procedure:

1. The Test Equipment and EUT set up per Figure 3.6.
2. The signal generator was used to confirm the signal loss in the 20 dB attenuator. The measured loss was used to offset the amplitude measurements of the spectrum analyzer.
3. The EUT was placed into a hopping mode and it was transmitting at its maximum data rate.
4. The results were max hold until the trace stabilized.
5. The marker was placed at the frequency of the band-edge (902 and 928 MHz) or at the highest modulation product outside of the band if the level was greater than that at the band edge.
6. The marker-delta and the marker-to-peak functions were used to find the amplitude difference between the amplitude of the signal at the edge of the band and the peak of the in-band emission.
7. The limit lines on the spectrum analyzer's screen show the compliance limits.
8. The test was repeated for the low (902 MHz) and for the high (928 MHz) band edges.
9. The plots were recorded and can be found in the Appendix F of this document.

### 1.2.8. Spurious RF conducted emissions

The spurious RF conducted emissions were measured using the following setup:



#### Procedure:

1. Test Equipment and EUT setup per Figure 3.7.
2. The signal generator was used to confirm the signal loss in the 20 dB attenuator. The measured loss was used to offset the amplitude measurements of the spectrum analyzer.
3. The range of the frequencies investigated included the lowest frequency generated by the EUT to ten times the fundamental output frequency of the transmitter. Attention was paid to the local oscillator frequency, intermediate frequency, image frequency, harmonics of the fundamental, as well as mixer products and intermodulation products of all of the above.
4. The EUT was programmed to operate in a single channel transmit mode and during the test it was transmitting at its maximum data rate. The frequency channel of operation was selected via the personal computer. The frequency channels were switched between the lowest (902.25 MHz), the middle (915 MHz), and the highest (927.75 MHz) channels. After the selection was made, the personal computer was disconnected from the EUT.
5. The results were max hold until the trace stabilized.

6. Spurious levels were measured and recorded. The apparatus attenuation values for each frequency were added to the measurements to determine the respective spurious level.
7. To cover the entire band of interest, the measurements were performed in two iterations – up to 1 GHz and above.
8. The plots were recorded and can be found in the Appendix G of this document.

## 2. Test Equipment

The list of the test equipment used during the test can be found in the Table 1 below.

<u>Equipment description</u>	<u>Manufacturer</u>	<u>Model No</u>	<u>Serial No</u>
20 dB Attenuator	Mini-Circuits	BW-N20W5	-
Spectrum Analyzer	Hewlett Packard	8594A	3647U02796
Spectrum Analyzer	Hewlett Packard	8562A	XX33A01071
Signal Generator	Hewlett Packard	8657A	3109A03742

The equipment is maintained and calibrated on a regular basis. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

## 3. Requirements and Results

### 3.1. AC Power line Conducted Emissions

Since the EUT was powered by 12 VDC from a power supply, no AC line conducted emissions tests were performed.

### 3.2. Antenna terminal conducted emissions

All of the antenna terminal conducted emissions were performed in accordance with the test procedures listed in the Section 1.2.1 through the Section 1.2.8 of this document.

Results. The results of the tests are summarized in the table below.

<u>Measurement</u>	<u>Result</u>	<u>Pass/Fail</u>
Output Power	Lowest channel = 29.23 dBm Mid channel = 29.75 dBm Highest channel = 28.06 dBm	pass
Occupied Bandwidth	Lowest channel = 210 kHz Mid channel = 210 kHz Highest channel = 198 kHz	pass
Number of Hopping Channels	128	pass

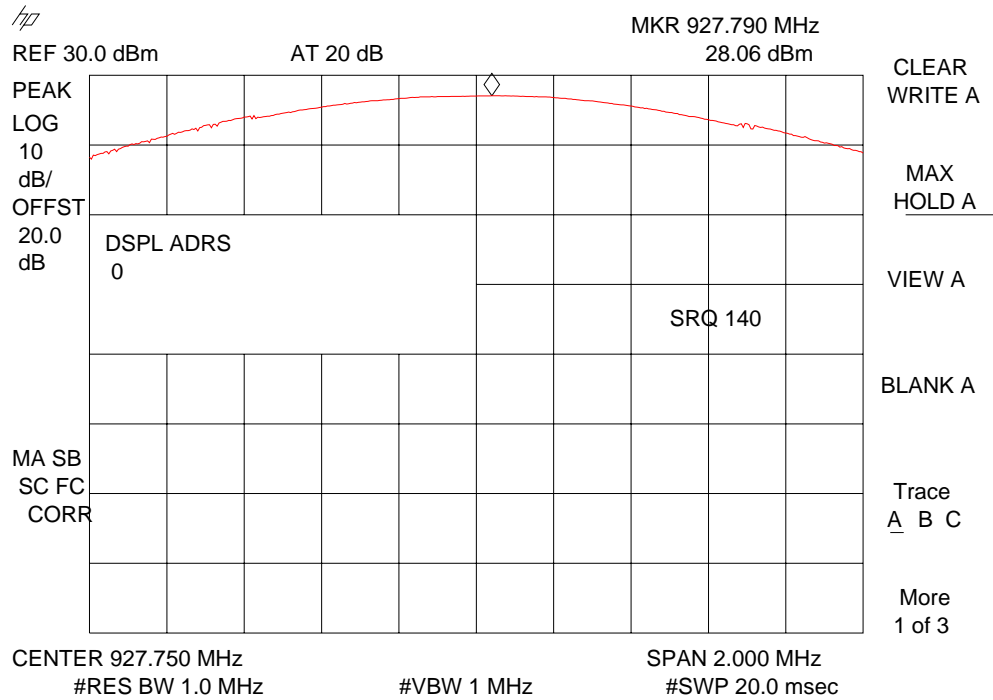
<u>Measurement</u>	<u>Result</u>	<u>Pass/Fail</u>
Carrier Frequency Separation	250 kHz	pass
Dwell Time	125.6 msec	pass
Band-edge compliance	902 MHz edge -> -29.24 dB 928 MHz edge -> -29.87 dB	pass
Spurious emissions at the antenna terminal		pass

The detailed results of the tests can be found in the Appendix A through the Appendix G of this document.

As can be seen from the test results, the EUT did meet the antenna terminal conducted emissions limits.

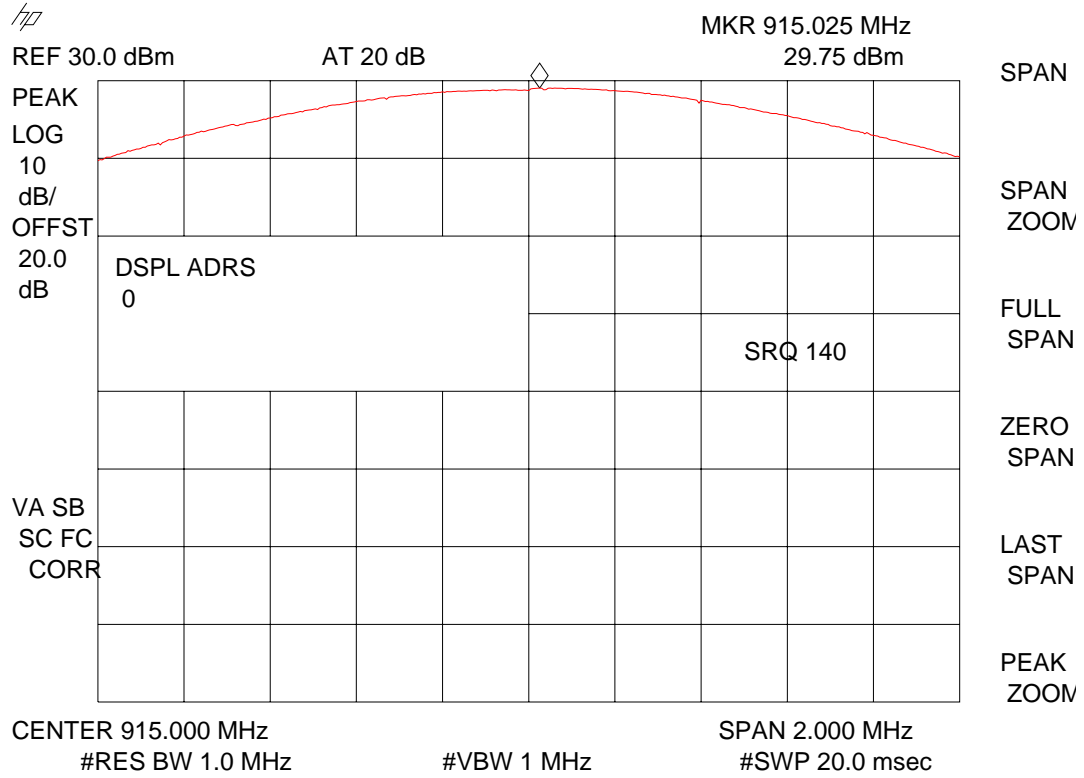
## Appendix A. Output Power measurements

### A1. Highest channel



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Output Power  
 TEST PARAMETERS : Highest channel (927.75 MHz)

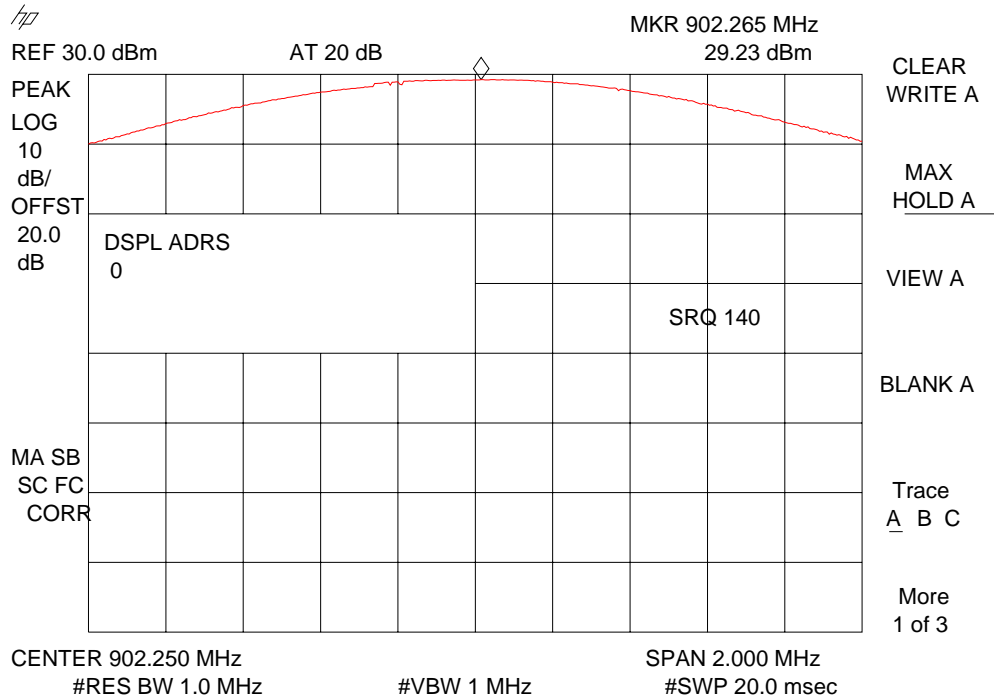
**A2. Middle channel**



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Output Power  
 TEST PARAMETERS : Middle channel (915 MHz)



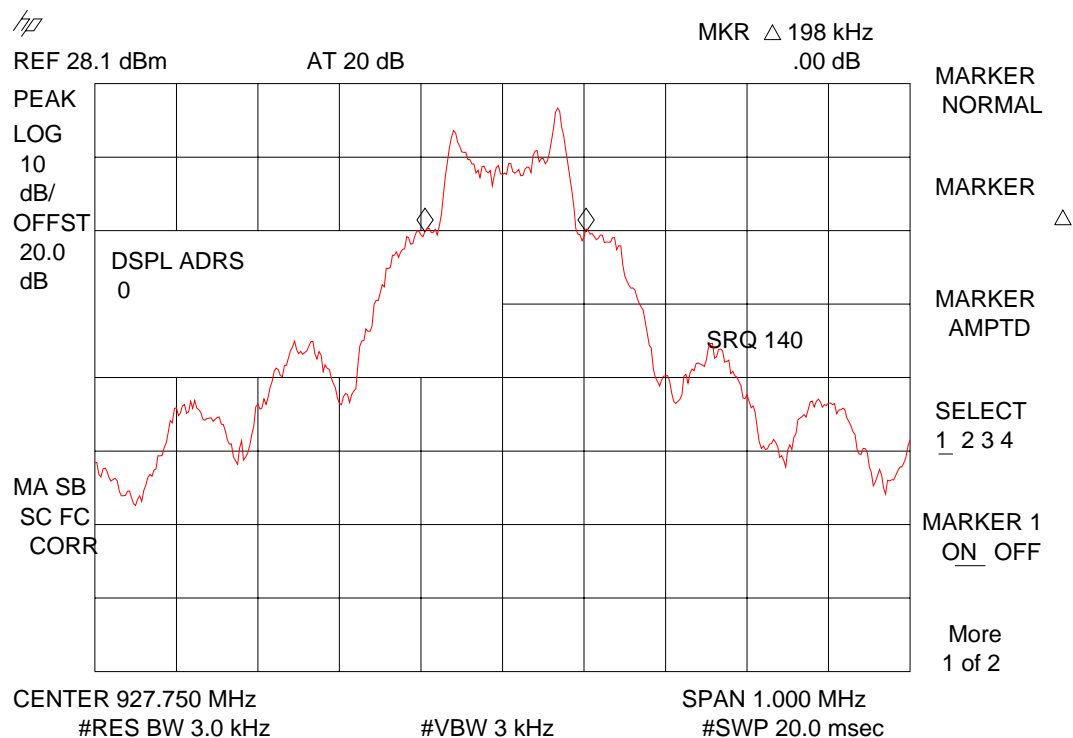
**A3. Lowest channel**



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Output Power  
 TEST PARAMETERS : Lowest channel (902.25 MHz)

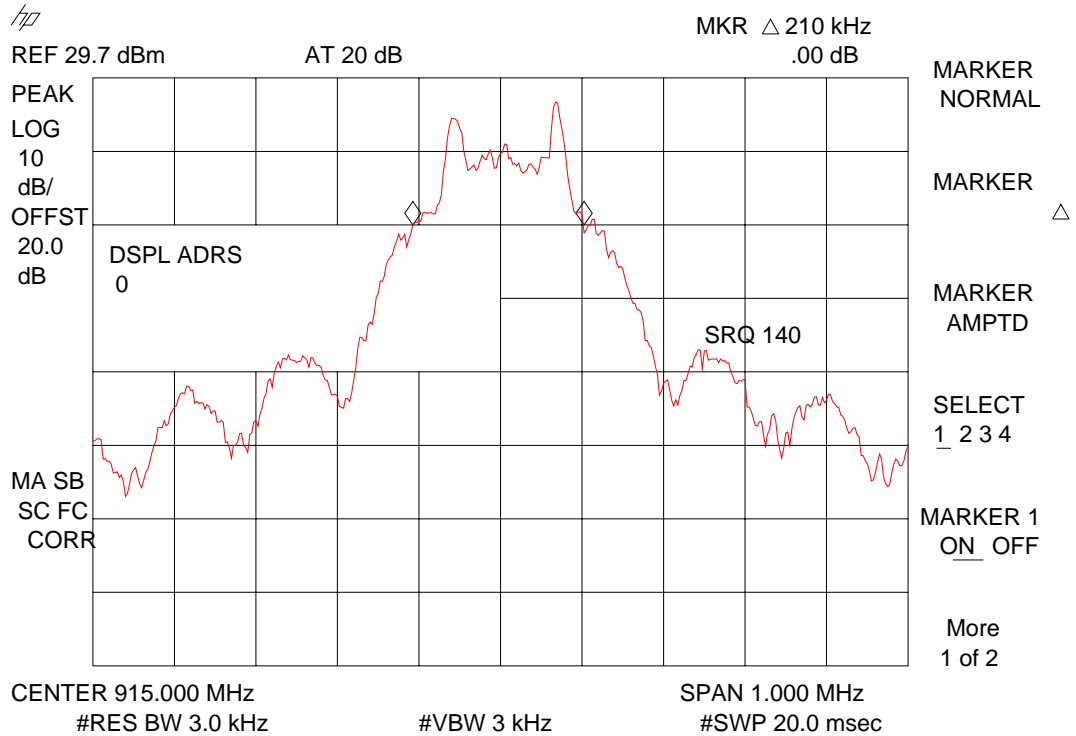
## Appendix B. Occupied Bandwidth measurement

### B1. Highest channel



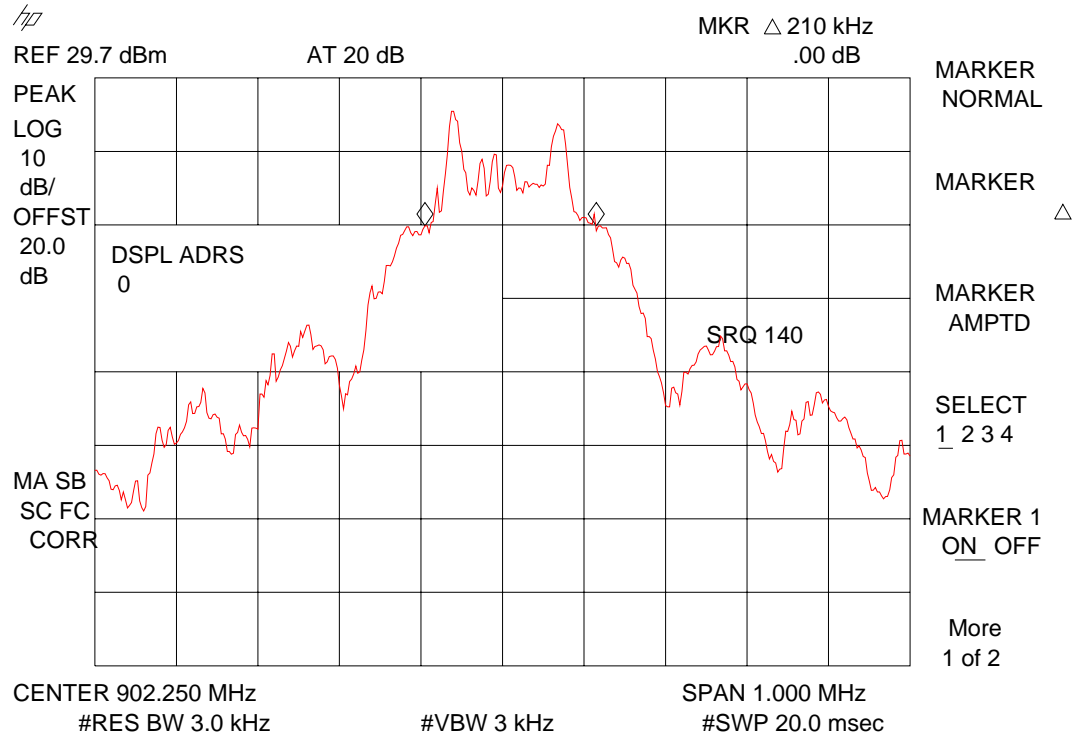
MANUFACTURER : Lexycom Technologies  
MODEL NUMBER : Tiamis-800  
SERIAL NUMBER : Sample2  
TEST MODE : Occupied Bandwidth  
TEST PARAMETERS : Highest channel (927.75 MHz)

**B2. Middle channel**



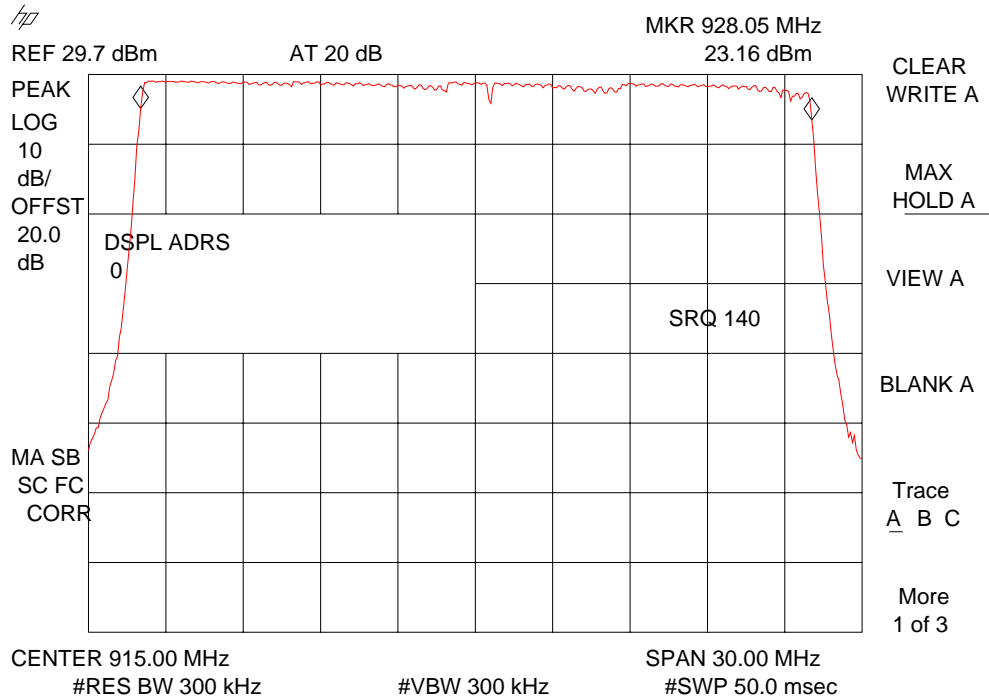
MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Occupied Bandwidth  
 TEST PARAMETERS : Middle channel (915 MHz)

**B3. Lowest channel**



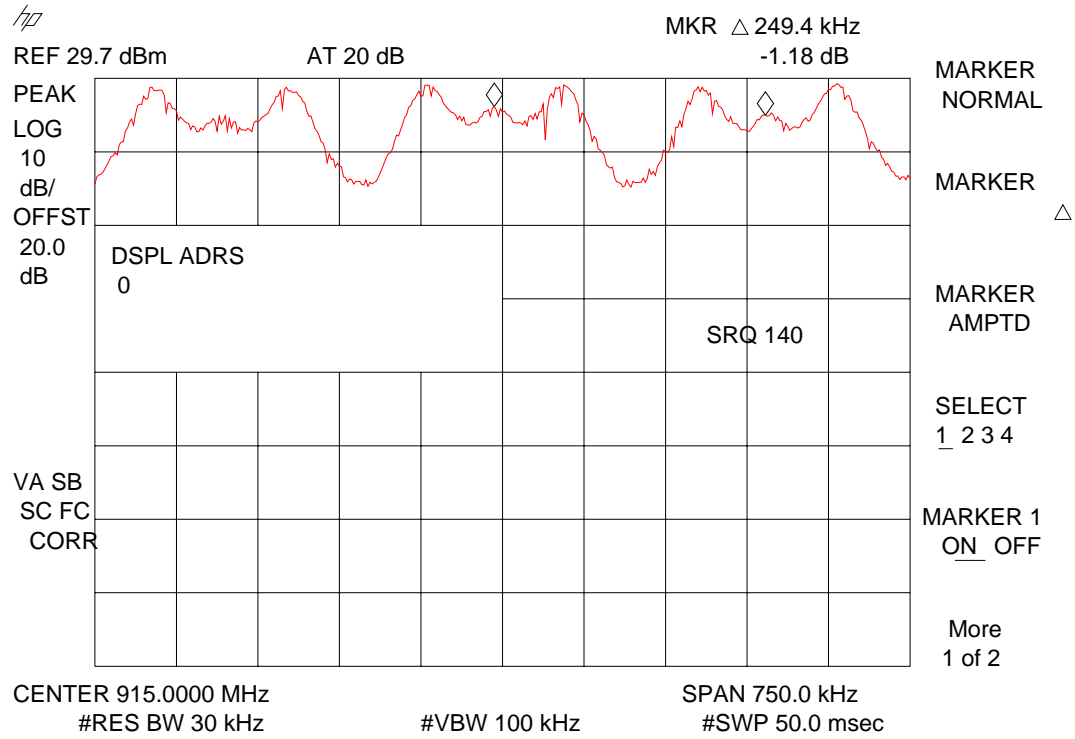
MANUFACTURER : Lexycom Technologies  
MODEL NUMBER : Tiamis-800  
SERIAL NUMBER : Sample2  
TEST MODE : Occupied Bandwidth  
TEST PARAMETERS : Lowest channel (902.25 MHz)

## Appendix C. Number of Hopping Frequencies



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Number of Hopping Frequencies  
 TEST PARAMETERS : Hopping mode, all 103 frequency hopping channels are used

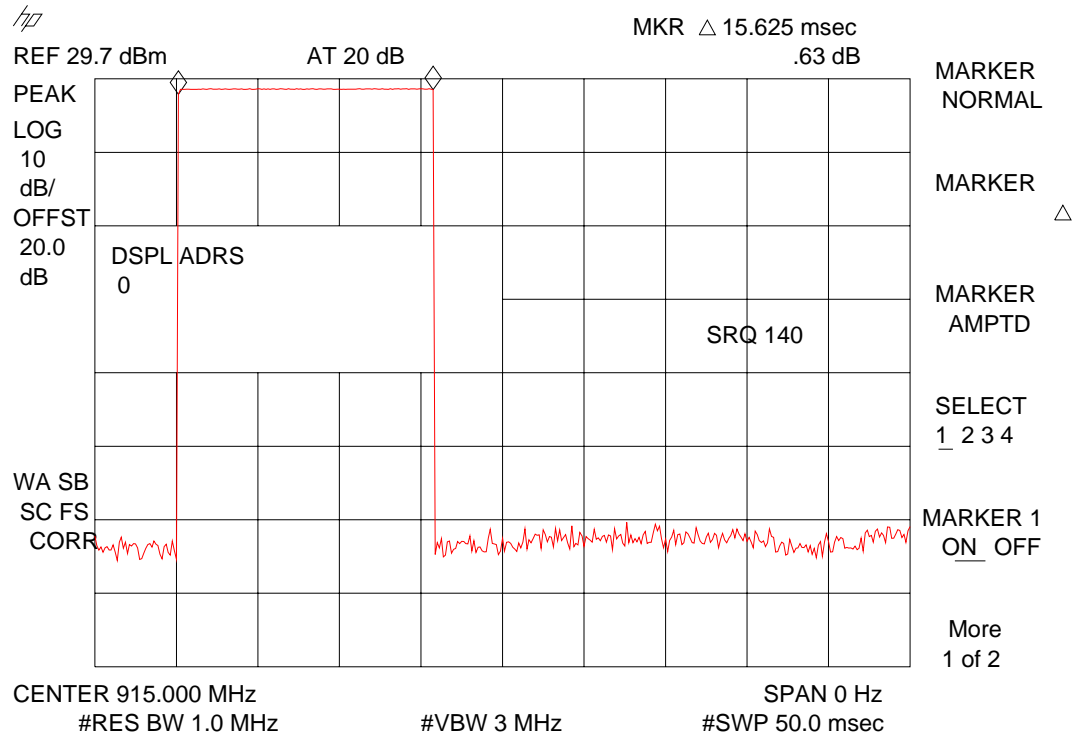
## Appendix D. Carrier Frequency Separation measurements



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Carrier frequency separation  
 TEST PARAMETERS : Hopping mode

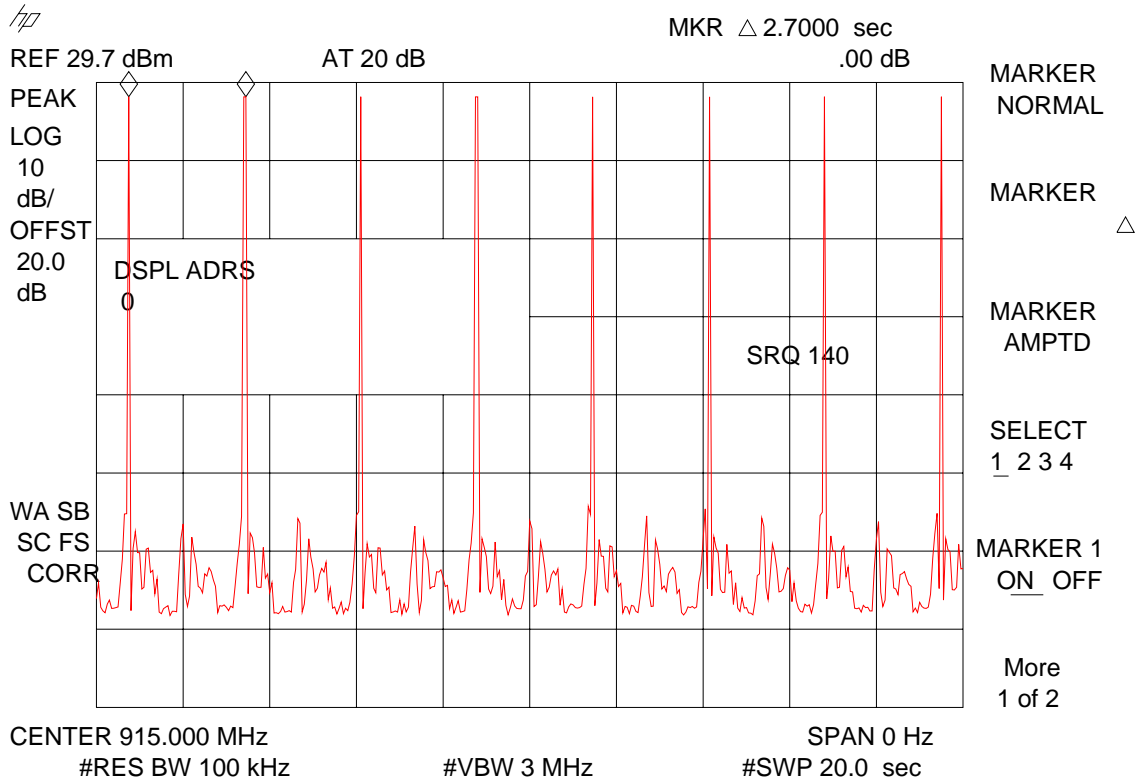
## Appendix E. Dwell Time measurements

### E1. Maximum transmit time per channel



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Dwell time measurements. Showing the maximum transmit time on each frequency.  
 TEST PARAMETERS : Hopping mode, SA is tuned to one channel (center frequency is 915 MHz)

**E2. Number of times the hopping pattern repeats within a 20 seconds interval**

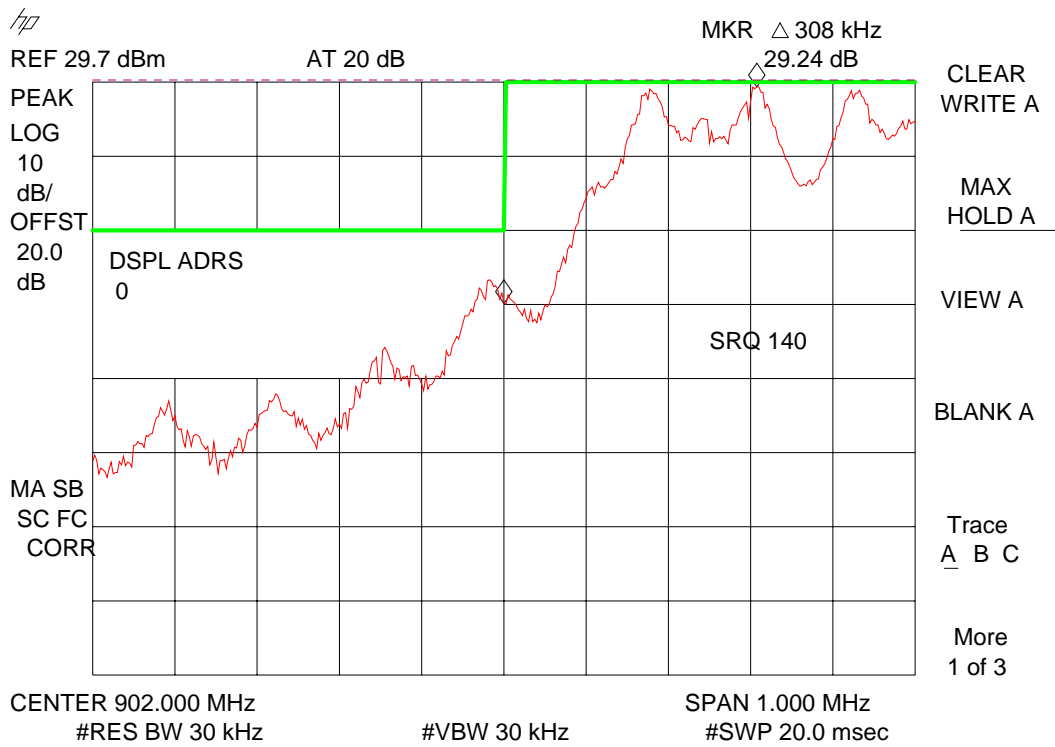


MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Dwell time measurement. Plot showing that the hopping pattern repeats maximum of 8 time every 20 seconds  
 TEST PARAMETERS : Hopping mode, SA is tuned to one channel (center frequency is 915 MHz)



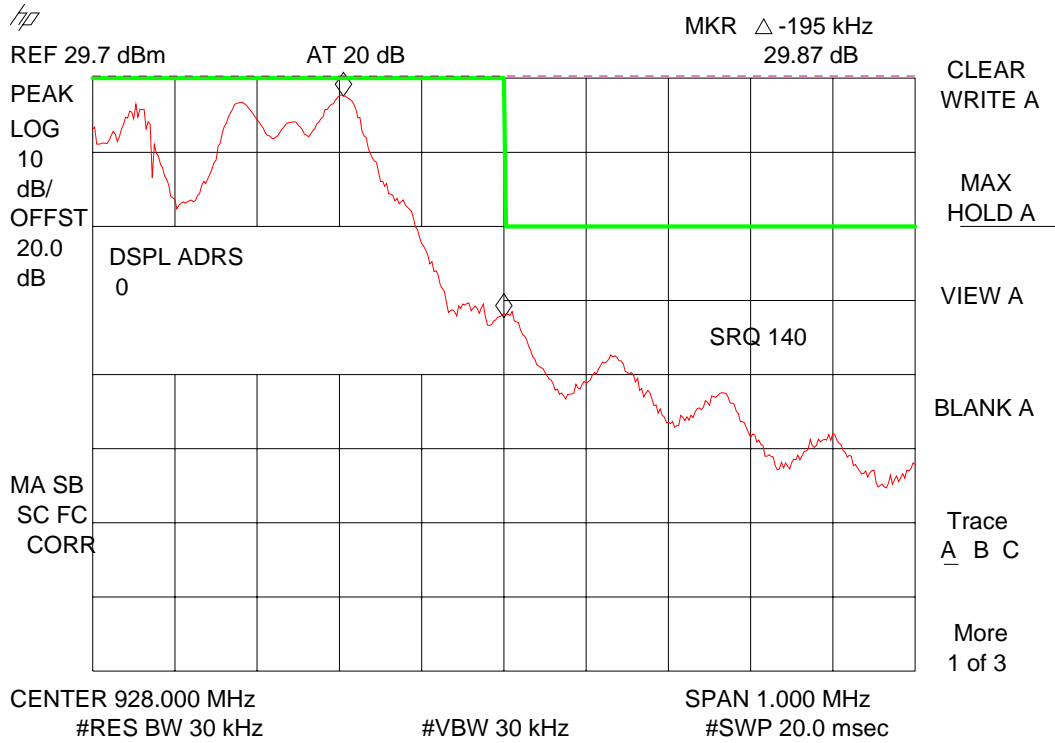
## Appendix F. Band edge compliance

### F1. Low frequency (902 MHz)



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Band edge compliance, low frequency  
 TEST PARAMETERS : Hopping mode

**F2. High frequency (928 MHz)**



MANUFACTURER : Lexycom Technologies  
 MODEL NUMBER : Tiamis-800  
 SERIAL NUMBER : Sample2  
 TEST MODE : Band edge compliance, high frequency  
 TEST PARAMETERS : Hopping mode









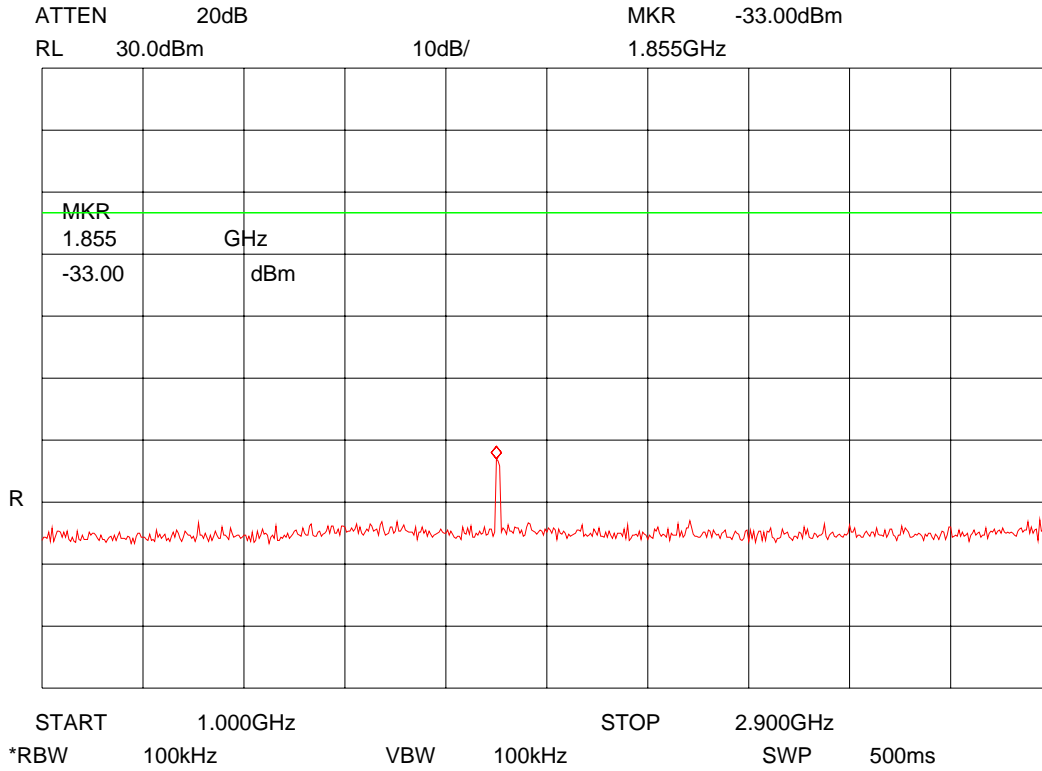








**G8. Highest channel, 1 GHz to 2.9 GHz**



MANUFACTURER : Lexycom Technologies  
MODEL NUMBER : Tiamis-800  
SERIAL NUMBER : Sample2  
TEST MODE : Spurious emissions at antenna terminal, 1 GHz to 2.9 GHz  
TEST PARAMETERS : Highest channel (927.75 MHz)

