Flom Test Labs
EMI, EMC, RF Testing Experts Since 1963
toll-free: (866) 311-3268
fax: (480) 926-3598
http://www.flomlabs.com
info@flomlabs.com

Transmitter Certification

of

FCC ID: ROJEXPLORER-700
Model: Explorer 700

to

Federal Communications Commission

15.247 and Confidentiality

Date of report: April 20, 2006 (Amended June 6, 2006)
Date of revision: January 3, 2008

On the Behalf of the Applicant: Thrane & Thrane A/S

At the Request of: Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

Attention of: Morten Becker Saul
+45 39 55 8209
Email: mbs@thrane.com

Supervised by: David E. Lee, FCC/IC Compliance Manager

List of Exhibits

(FCC **Certification** (Transmitters) - Revised 9/28/98)

Applicant: Thrane & Thrane A/S

FCC ID: ROJEXPLORER-700

By Applicant:

1. Letter of Authorization

2. Confidentiality Request: 0.457 And 0.459

3. Identification Drawings, 2.1033(c)(11)
   - Label
   - Location of Label
   - Compliance Statement
   - Location of Compliance Statement

4. Photographs, 2.1033(c)(12)

5. Documentation: 2.1033(c)
   - (3) User Manual
   - (9) Tune Up Info
   - (10) Schematic Diagram
   - (10) Circuit Description
   - Block Diagram
   - Parts List
   - Active Devices

6. MPE Report

By M.F.A. Inc.:

A. Testimonial & Statement of Certification

The Applicant has been cautioned as to the following:

15.21 **Information to the User**.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) **Special Accessories**.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Table of Contents

Required information per ISO/IEC Guide 17025-2005, paragraph 13.2:

a)	**Test Report**
b) Laboratory: (FCC: 31040/SIT) (Canada: IC 2044)	M. Flom Associates, Inc. 3356 N. San Marcos Place, Suite 107 Chandler, AZ 85225
c) Report Number:	d0640017B
d) Client:	Thrane & Thrane A/S Lundtoftegardsvej 93D DK-2800 Lyngby, Denmark
e) Identification: EUT Description:	Explorer 700 FCC ID: ROJEXPLORER-700 Imarsat Terminal
f) EUT Condition:	Not required unless specified in individual tests.
g) Report Date: EUT Received:	April 20, 2006 April 17, 2006
h, j, k):	As indicated in individual tests.
i) Sampling method:	No sampling procedure used.
l) Uncertainty:	In accordance with MFA internal quality manual.
m) Supervised by:	 David E. Lee, FCC/IC Compliance Manager
n) Results:	The results presented in this report relate only to the item tested.
o) Reproduction:	This report must not be reproduced, except in full, without written permission from this laboratory.

Sub-part 2.1033(c)(14):

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

X	15 Subpart C – Unlicensed Low Power Devices
	21 – Domestic Public Fixed Radio Services
	22 – Public Mobile Services
	22 Subpart H - Cellular Radiotelephone Service
	22.901(d) - Alternative technologies and auxiliary services
	23 – International Fixed Public Radiocommunication services
	24 – Personal Communications Services
	25 – Satellite Communications
	74 Subpart H - Low Power Auxiliary Stations
	80 – Stations in the Maritime Services
	80 Subpart E - General Technical Standards
	80 Subpart F - Equipment Authorization for Compulsory Ships
	80 Subpart K - Private Coast Stations and Marine Utility Stations
	80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
	80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
	80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
	80 Subpart V - Emergency Position Indicating Radio Beacons (EPIRB'S)
	80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
	80 Subpart X - Voluntary Radio Installations
	87 – Aviation Services
	90 – Private Land Mobile Radio Services
	94 – Private Operational-Fixed Microwave Service
	95 Subpart A - General Mobile Radio Service (GMRS)
	95 Subpart C - Radio Control (R/C) Radio Service
	95 Subpart D - Citizens Band (CB) Radio Service
	95 Subpart E - Family Radio Service
	95 Subpart F - Interactive Video and Data Service (IVDS)
	97 - Amateur Radio Service
	101 – Fixed Microwave Services

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-1992/2003, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.

A2LA

"A2LA has accredited M. Flom Associates, Inc. Chandler, AZ for technical competence in the field of Electrical Testing. The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 – 1999 'General Requirements for the Competence of Testing and Calibration Laboratories' and any additional program requirements in the identified field of testing."

Certificate Number: **2152-01**

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2, Part 25, 15.247 (Bluetooth), 15.247 (802.11a/b/g) and Confidentiality
Sub-part 2.1033
(c)(1):

Name and Address of Applicant: Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

Manufacturer: Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

(c)(2): **FCC ID**: ROJEXPLORER-700

Model Number: Explorer 700

(c)(3): **Instruction Manual(s):**

Please see attached exhibits

(c)(4): **Type of Emission**: Bluetooth

(c)(5): **Frequency Range, MHz**: 2402 – 2480

(c)(6): **Power Rating, Watts**: 0.10
____ Switchable X Variable ____ N/A

(c)(7): **Maximum Power Rating, Watts**: 1.0

DUT Results: Passes X Fails ____

Subpart 2.1033 (continued)
(c)(8): Voltages & currents in all elements in final RF stage, including final transistor or solid-state device:

Immarsat:

Collector Current, A	=	3.2
Collector Voltage, Vdc	=	8.5
Supply Voltage, Vdc	=	10 – 32 (Battery 11.1 Nominal)

(c)(9): **Tune-Up Procedure**:

Please see attached exhibits

(c)(10): **Circuit Diagram/Circuit Description**:
Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

Please see attached exhibits

(c)(11): **Label Information**:

Please see attached exhibits

(c)(12): **Photographs**:

Please see attached exhibits

(c)(13): **Digital Modulation Description**:

___ Attached Exhibits
_X_ N/A

(c)(14): **Test and Measurement Data**:

Follows

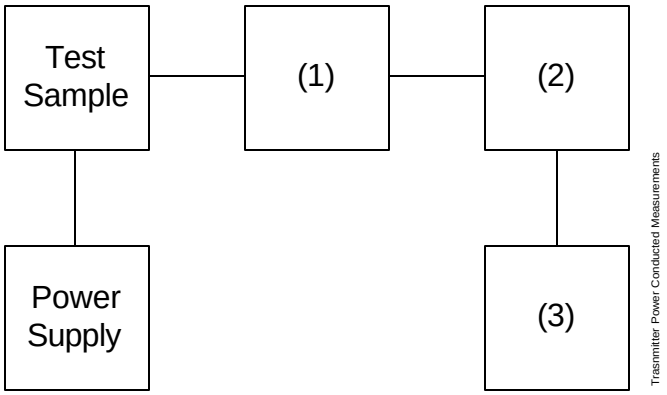
Name of Test: Carrier Output Power (Conducted)
Specification: 15.247(b)
Guide: ANSI/TIA/EIA-603C: 2004

Measurement Procedure

A) The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an RF Power Meter.

B) Measurement accuracy is ±3%.

Transmitter Test Set-Up: RF Power Output



	Asset	Description	s/n	Cycle	Last Cal
(1) **Coaxial Attenuator**					
	i00231/2	PASTERNACK PE7021-30 (30 dB)	231 or 232	NCR	
X	i00122/3	NARDA 766 (10 dB)	7802 or 7802A	NCR	
(2) **Power Meter**					
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo.	Oct-05
	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo.	Jan-06
(3) **Frequency Counter**					
X	i00048	HP 8566B Spectrum Analyzer*	2511A01467	12 mo.	Oct-05
	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo.	Jan-06

* Peak Conducted Power measured with RBW=VBW=3MHz

Name of Test: Carrier Output Power (Conducted)

Measurement Results
(Worst case)

Bluetooth:

Frequency of Carrier, MHz = 2402.0, 2443.0, 2480.0
Ambient Temperature = 23°C ± 3°C

Power Setting	RF Power, dBm	RF Power, Watts
High	19.45	0.10

Name of Test: Carrier Power (Radiated)
Specification: 15.247(b)
Guide: ANSI C63.4: 2003

Measurement Procedure (Radiated)

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t=((E \times R)^2/49.2)$ watts, where R = 3m.

2. Measurement accuracy is ±1.5 dB.

Test Equipment

	Asset	Description	s/n	Cycle	Last Cal
Transducer					
	i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-05
X	i00089	Aprel 2001 200MHz-1GHz	001500	24 mo.	Sep-05
X	i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Jan-05
Amplifier					
X	i00028	HP 8449A	2749A00121	12 mo.	May-05
Spectrum Analyzer					
X	i00029	HP 8563E	3213A00104	12 mo.	Jan-06
X	i00033	HP 85462A	3625A00357	12 mo.	Sep-05

Measurement Results

2006-Apr-18 Tue 15:20:00
State: 2:High Power Ambient Temperature: 30°C ± 3°C
Bluetooth

Frequency Tuned, MHz	Frequency Emission, MHz	Meter, dBuV/m	CF, dB	Corrected , dBuV/m
2402.000000	2402.100000	78.3	36.8	115.1
2441.000000	2441.010000	76.7	37.7	114.4
2480.000000	2480.010000	77.6	37.1	114.7

Performed by: David E. Lee, FCC/IC Compliance Manager

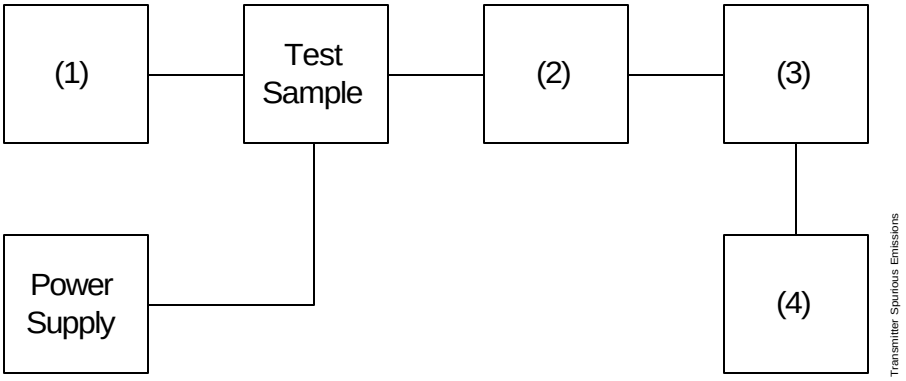
Name of Test: Unwanted Emissions (Transmitter Conducted)
Specification: 15.247(d)
Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.13

Measurement Procedure

A) The emissions were measured for the worst case as follows:
   1). within a band of frequencies defined by the carrier frequency plus and minus one channel.
   2). from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.

B) The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.

Transmitter Test Set-Up: Spurious Emission



	Asset	Description	s/n		
(1) **Audio Oscillator/Generator (Not Required)**					
(2) **Coaxial Attenuator**					
	i00231/2	PASTERNACK PE7021-30 (30 dB)	231 or 232	NCR	
	i0012/3	NARDA 766 (10 dB)	7802 or 7802A	NCR	
(3) **Filters; Notch, HP, LP, BP**					
X	-	Band Pass, 3GHz (Applicant Supplied)	-	NCR	
X	-	High Pass, 3.7GHz	-	NCR	
(4) **Spectrum Analyzer**					
X	i00033	HP 85462A	3625A00357	12 mo.	Sep-05
X	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo.	May-05

Name of Test: Unwanted Emissions (Transmitter Conducted)

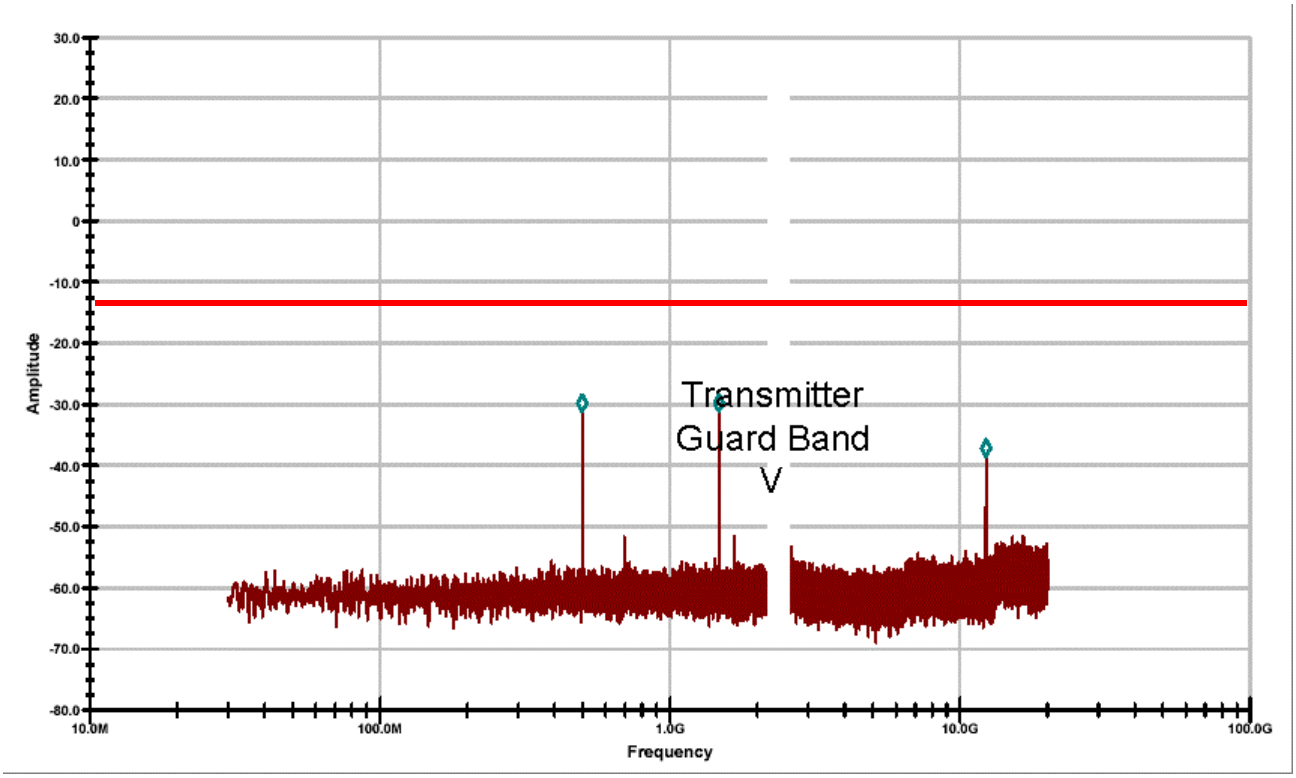
Measurement Results
(Worst Case)

Bluetooth:

Frequency of carrier, MHz	=	2402.0, 2442.0, 2480.0
Spectrum Searched, GHz	=	0 to 10 x F_C
Maximum Response, Hz	=	N/A
All Other Emissions	=	= 20 dB Below Limit

Measurement Results

(direct connection)

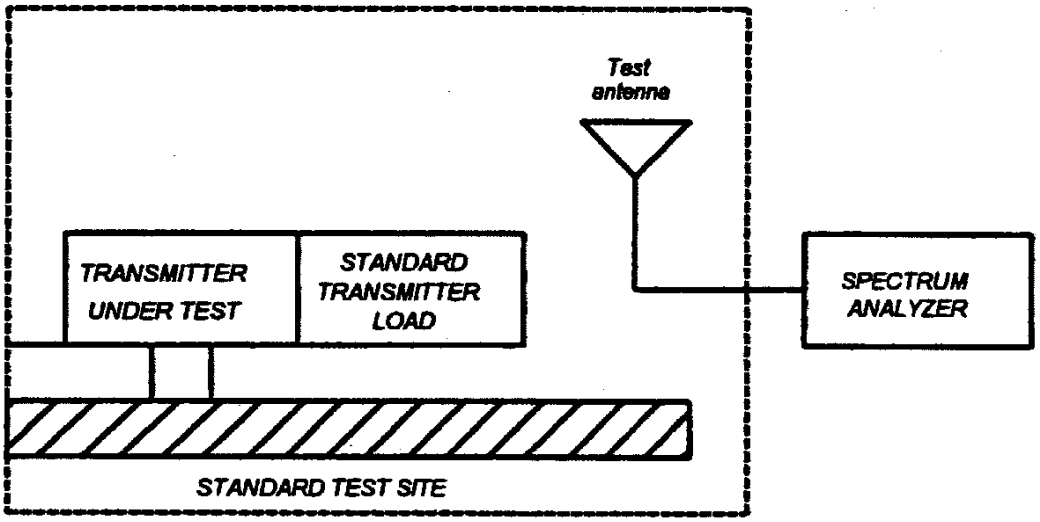


Name of Test: Field Strength of Spurious Radiation
Specification: 15.247(c)
Guide: ANSI/TIA/EIA-603-C, 47 CFR 22.917

Measurement Procedure

Definition:
Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

Method of Measurement:
A) Connect the equipment as illustrated
B) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth 100 kHz (<1 GHZ), 1 MHZ (> 1GHz).
2) Video Bandwidth = 3 times Resolution Bandwidth, or 30 kHz (22.917)
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Mean or Average Power
C) Place the transmitter to be tested on the turntable in the standard test site.



Name of Test: Field Strength of Spurious Radiation (Cont.)

D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to ± the test bandwidth (see section 1.3.4.4).

E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.

F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.

Test Equipment

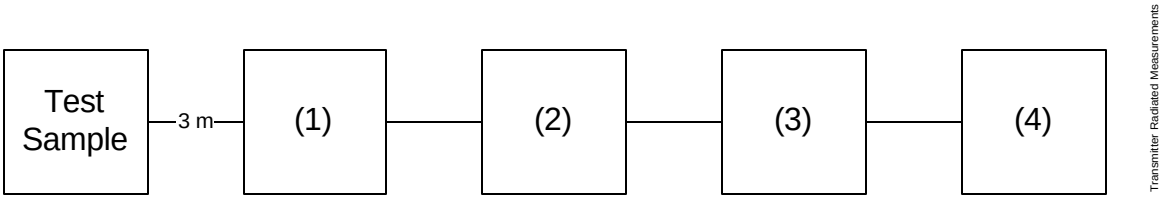
	Asset	Description	s/n	Cycle	Last Cal
Transducer					
	i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-05
X	i00089	Aprel 2001 200MHz-1GHz	001500	24 mo.	Sep-05
X	i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Jan-05
Amplifier					
X	i00028	HP 8449A	2749A00121	12 mo.	May-05
Spectrum Analyzer					
X	i00029	HP 8563E	3213A00104	12 mo.	Jan-06
X	i00033	HP 85462A	3625A00357	12 mo.	Sep-05
Substitution Generator					
X	i00286	SMT 03, R&S, Signal Generator	826211/005	12 mo.	Jul-05
Substitution Antenna					
X	i00091	APREL 3115 1GHz-18GHz	001469	24 mo.	Sep-04

Name of Test: Transmitter Spurious (Radiated)

Transmitter Radiated Measurements

Summary:

Frequency of carrier, MHz	=	2402.0, 2441.0, 2480.0
Spectrum Searched, GHz	=	0 to 10 x F_C
Maximum Response, Hz	=	N/A
All Other Emissions	=	= 20 dB Below Limit



Test Equipment

	Asset (as applicable)	Description	s/n	Cycle Per ANSI C63.4-1992/2000 Draft, 10.1.4	Last Cal
(1) Transducer					
X	i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-05
	i00065	EMCO 3301-B Active Monopole	2635	24 mo.	Sep-05
X	i00089	Aprel 2001 200MHz-1GHz	001500	24 mo.	Sep-05
X	i00103	EMCO 3115 1GHz-18GHz	9208-3925	24 mo.	Jan-04
X	i00085	EMCO 3116 18GHz-40GHz	2076	24 mo.	Sep-05
(3) Amplifier					
X	i00028	HP 8449A	2749A00121	12 mo.	May-05
(4) Spectrum Analyzer					
X	i00029	HP 8563E	3213A00104	12 mo.	May-05
X	i00033	HP 85462A	3625A00357	12 mo.	Sep-05
	i00048	HP 8566B	2511AD1467	12 mo.	Jun-05

Name of Test: Restricted Bands of Operation
Specification: 47 CFR 15.205
Test Equipment: As per attached page

Measurement Procedure

The EUT was set up on a three-meter open field site according to the procedure on ANSI C63.4.

Sensitivity of system was measured:

Below 2 GHz:

CISPR Bandwidths	=	8 dBµV
1 MHz RBW, 1 MHz VBW	=	12 dBµV
1 MHz RBW, 10 Hz VBW	=	3 dBµV

Above 2 GHz:

1 MHz RBW, 1 MHz VBW	=	33 dBµV
1 MHz RBW, 10 Hz VBW	=	22 dBµV

Sensitivity of system with preamps:

Below 2 GHz:

Preamps are not used in this range.

Above 2 GHz:

Peak	=	3 dBµV
Average	=	-8 dBµV

Cable Loss:

915 MHz	=	-0.8 dBµV
2450 MHz	=	-3 dBµV

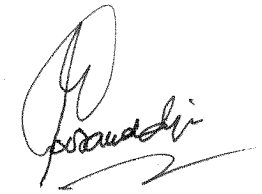
Note:

dB loss vs. frequency included in programmed software.

Reference Level Offset:

set @ 1 dB, accounts for cable and connector loss.

Test Results: No harmonic or spurious emissions were detected in the restricted bands in excess of the limits of 15.205. System measurement sensitivity was –130 dBm.



Performed by: Hoosamuddin S. Bandukwala,
Compliance Test Manager

Test Setup: Radiated Emissions – 15.247

Test Setup: Radiated Emissions

Measurement Results

2006-Apr-18 Tue 11:39:00
State: 2:High Power Ambient Temperature: 23°C ± 3°C
Bluetooth

2402 MHz Tuned Frequency

No other emissions were detectable.

Emission Frequency MHz	Peak Reading dBµV	Peak Limit dBµV	Average Reading dBµV	Average limit dBµV
4804	65.97	74	44.13	54
7206	59.97	74	45.30	54
9608	57.97	74	44.30	54

2442 MHz Tuned Frequency

Emission Frequency MHz	Peak Reading dBµV	Peak Limit dBµV	Average Reading dBµV	Average limit dBµV
4884	69.97	74	42.13	54
7326	62.30	74	42.47	54
9768	50.74	74	40.63	54

No other emissions were detectable.

2480 MHz Tuned Frequency

Emission Frequency MHz	Peak Reading dBµV	Peak Limit dBµV	Average Reading dBµV	Average limit dBµV
4960	67.63	74	45.13	54
7440	61.30	74	45.80	54
9920	55.63	74	44.30	54

No other emissions were detectable.

Name of Test: Emission Masks (Occupied Bandwidth) – Bluetooth

Specification: 47 CFR 2.1049(c)(1), 15.247(a)(1)

Guide: ANSI C63.3: 2003

Measurement Procedure

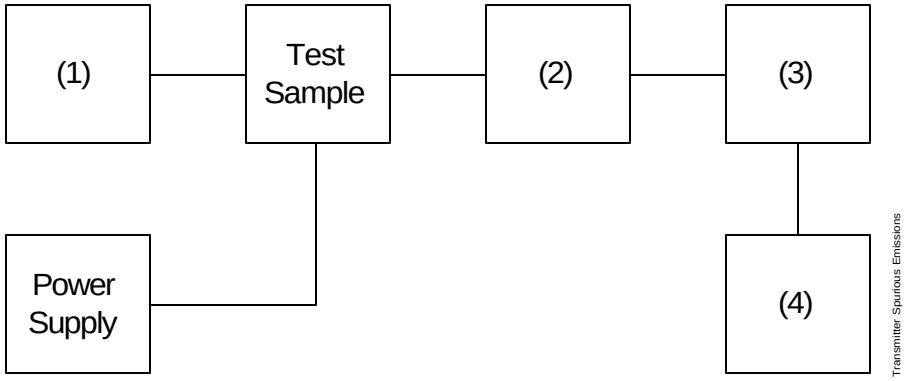
A) The EUT and test equipment were set up as shown below

B) Attenuator and Cable Offset = 33dB @ 2.4GHz

C) For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.

D) The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

Transmitter Test Set-Up: Occupied Bandwidth

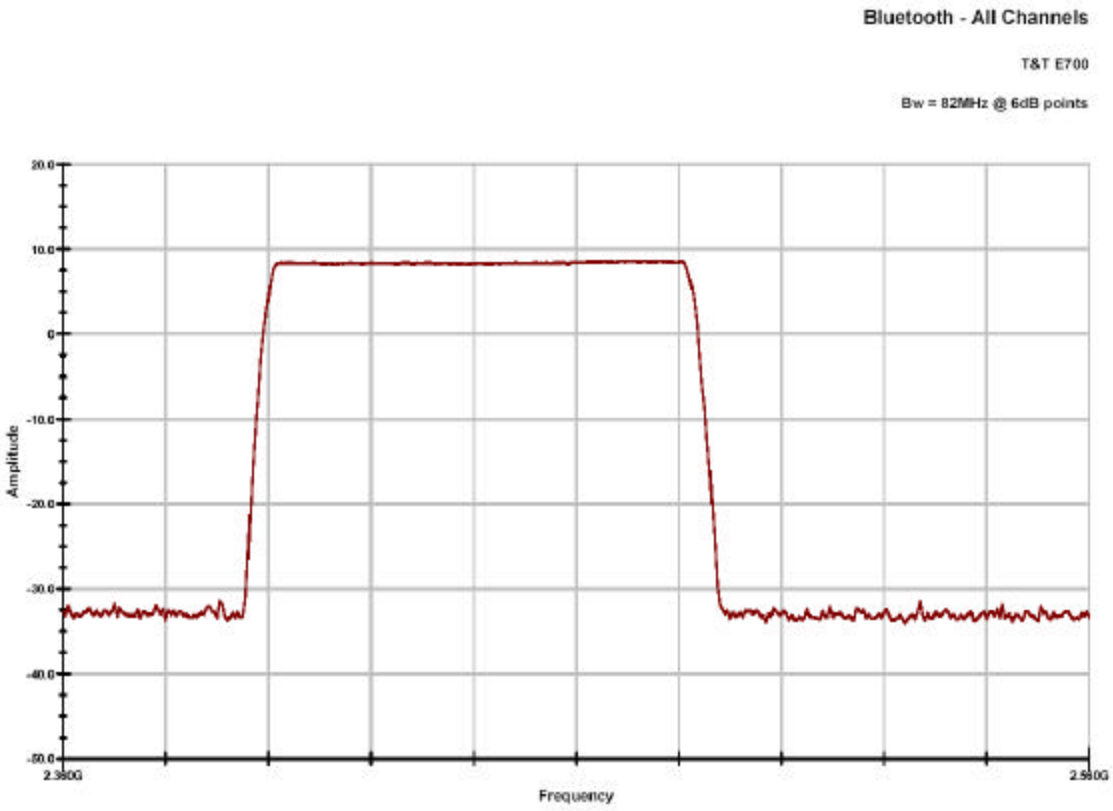


	Asset	Description	s/n	Cycle	Last Cal
(1) **Audio Oscillator/Generator (Not Required)**					
(2) **Coaxial Attenuator**					
X	i00231/2	PASTERNACK PE7021-30 (30 dB)	231 or 232	NCR	
	i00123	NARDA 766 (10 dB)	7802A	NCR	
(3) **Interface**					
X	i00021	HP 8954A Transceiver Interface	2146A00159	NCR	
(4) **Spectrum Analyzer**					
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo.	Oct-05
	i00029	HP 8563E Spectrum Analyzer	3213A00104	12 mo.	Jan-06

Name of Test: Emission Masks (Occupied Bandwidth) - Bluetooth

Measurement Results

State: 2:High Power Ambient Temperature: 23°C ± 3°C



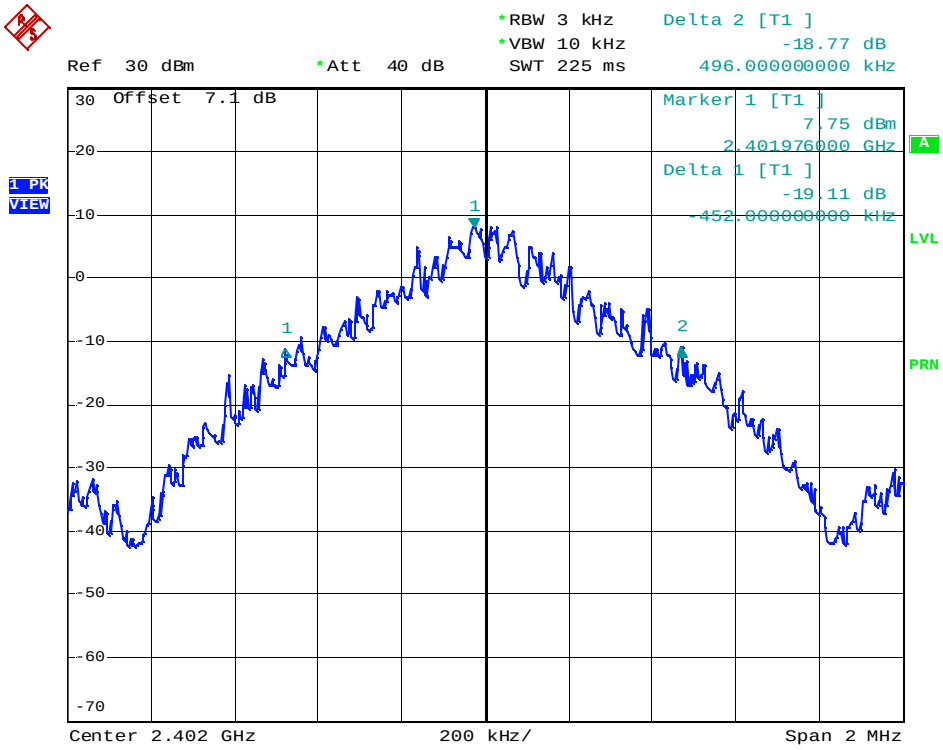
Numbers of hopping channels = 79

Performed by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

State 2: High Power Ambient Temperature: 23°C ± 3°C



20dB BW Low freq

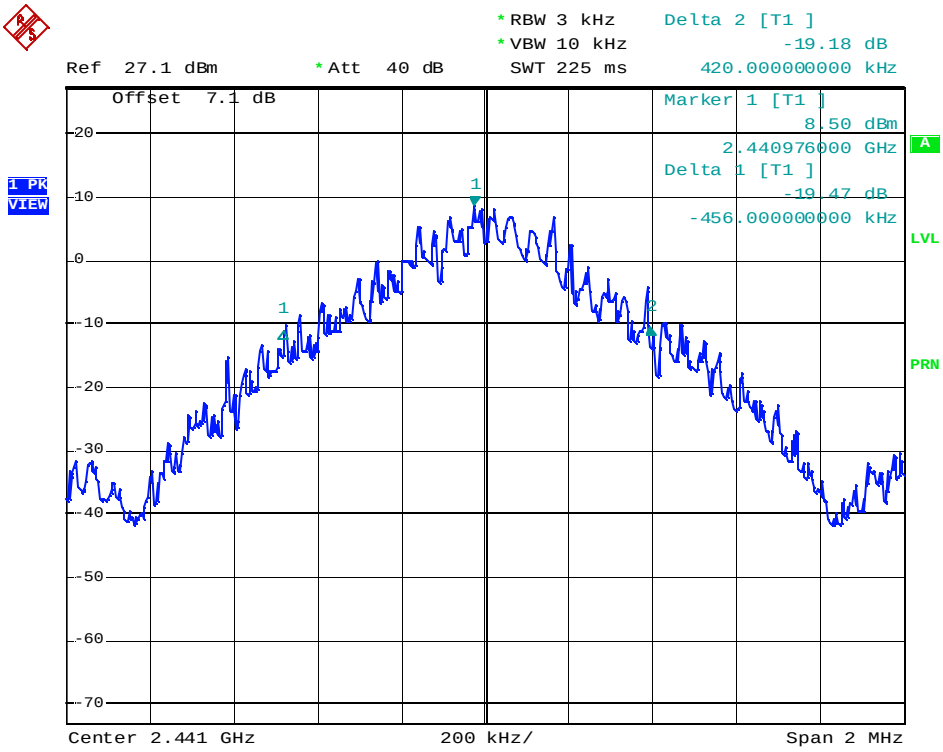
Measurements by Applicant

Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

State: 2: High Power Ambient Temperature: 23°C ± 3°C



20dB BW mid freq

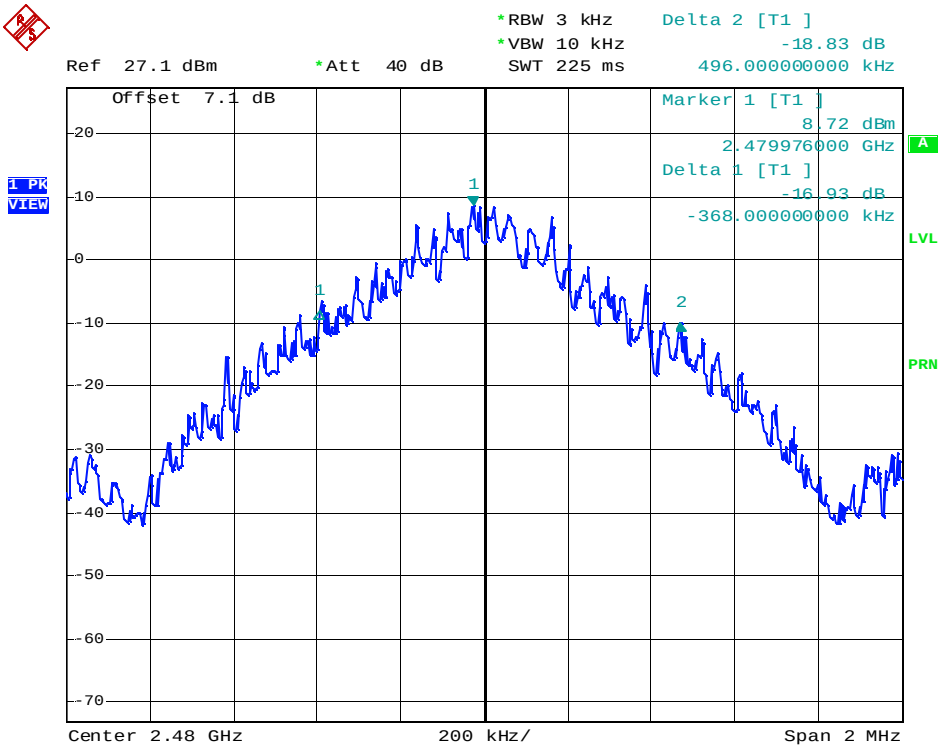
Measurements by Applicant

Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth) - Bluetooth

Measurement Results

State: 2: High Power Ambient Temperature: 23°C ± 3°C



20dB BW High Freq

Measurements by Applicant

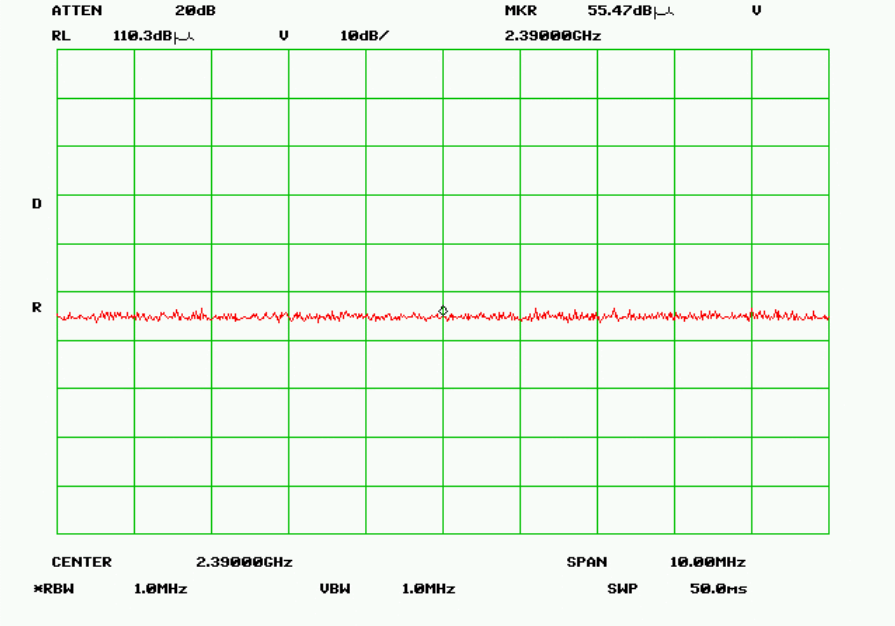
Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth) - Bluetooth

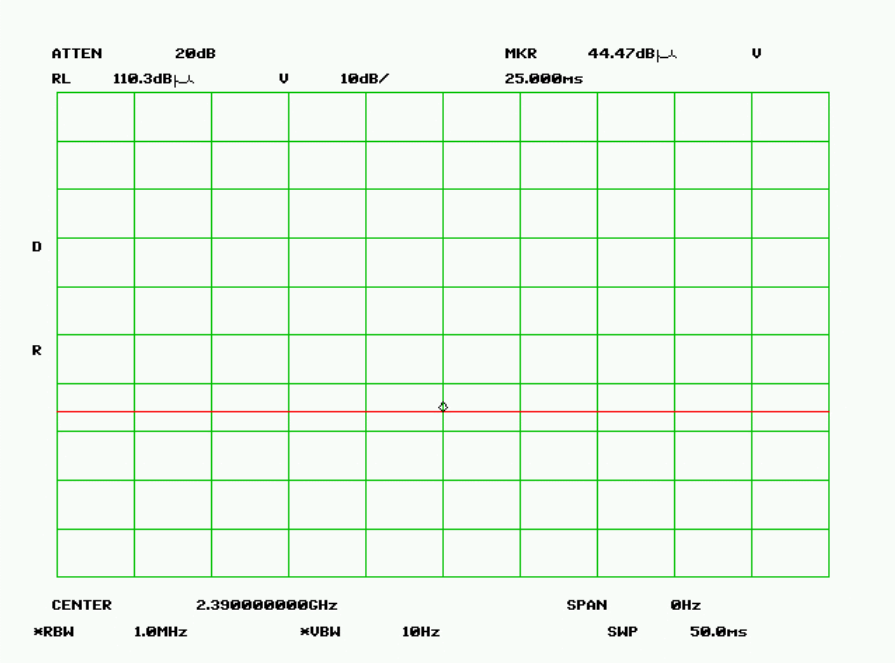
Measurement Results

State: 2: High Power Ambient Temperature: 23°C ± 3°C

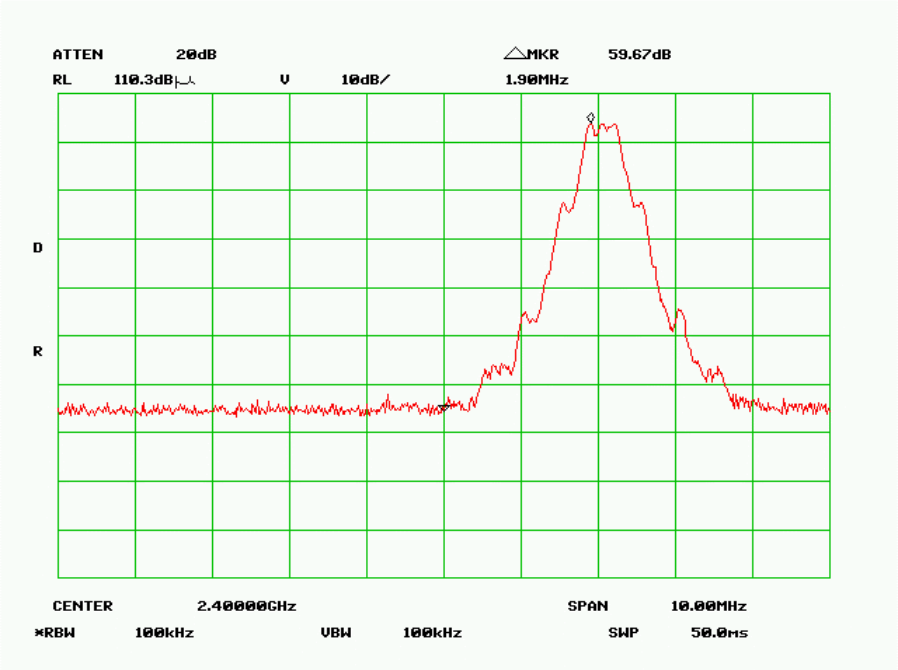
2390 Restricted Band Peak



2390 Restricted Band Average



2400 Band Edge



Measurements by Applicant

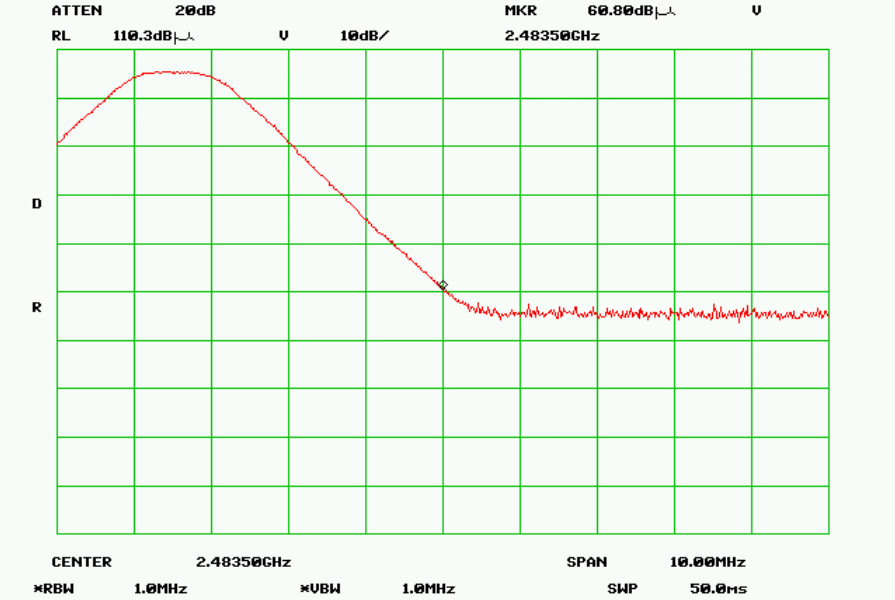
Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth) - Bluetooth

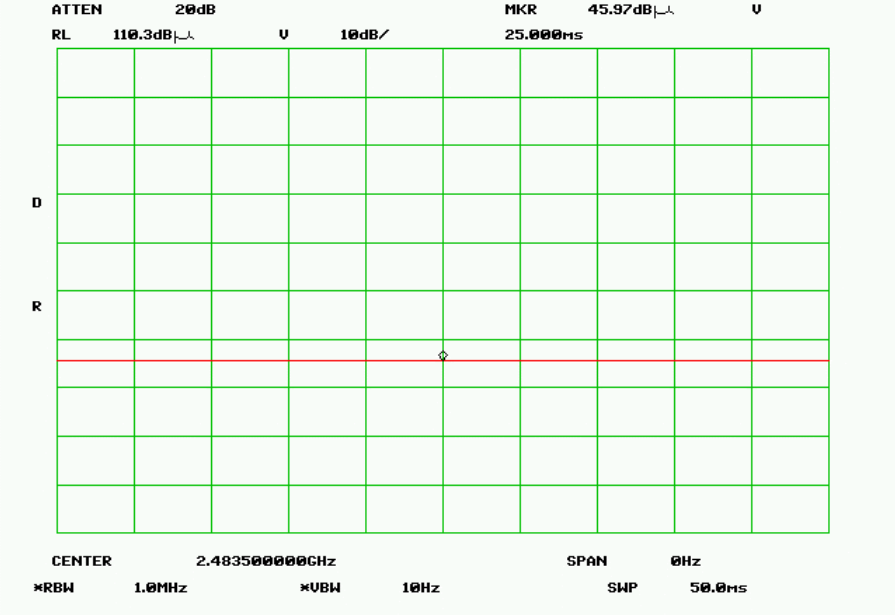
Measurement Results

State: 2: High Power Ambient Temperature: 23°C ± 3°C

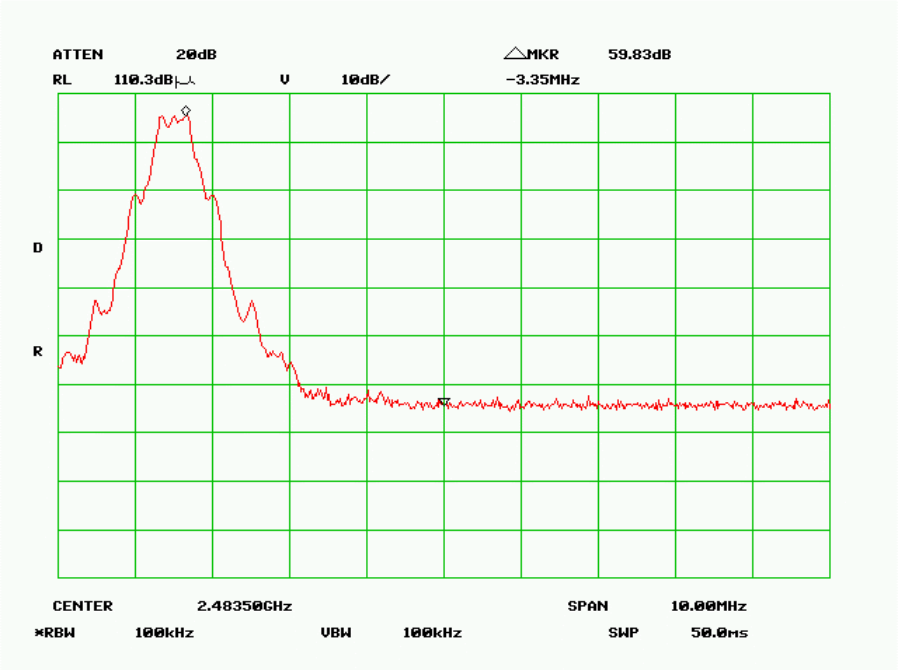
2438.5 Restricted Band Peak



2438.5 Restricted Band Average



2438.5 Band Edge



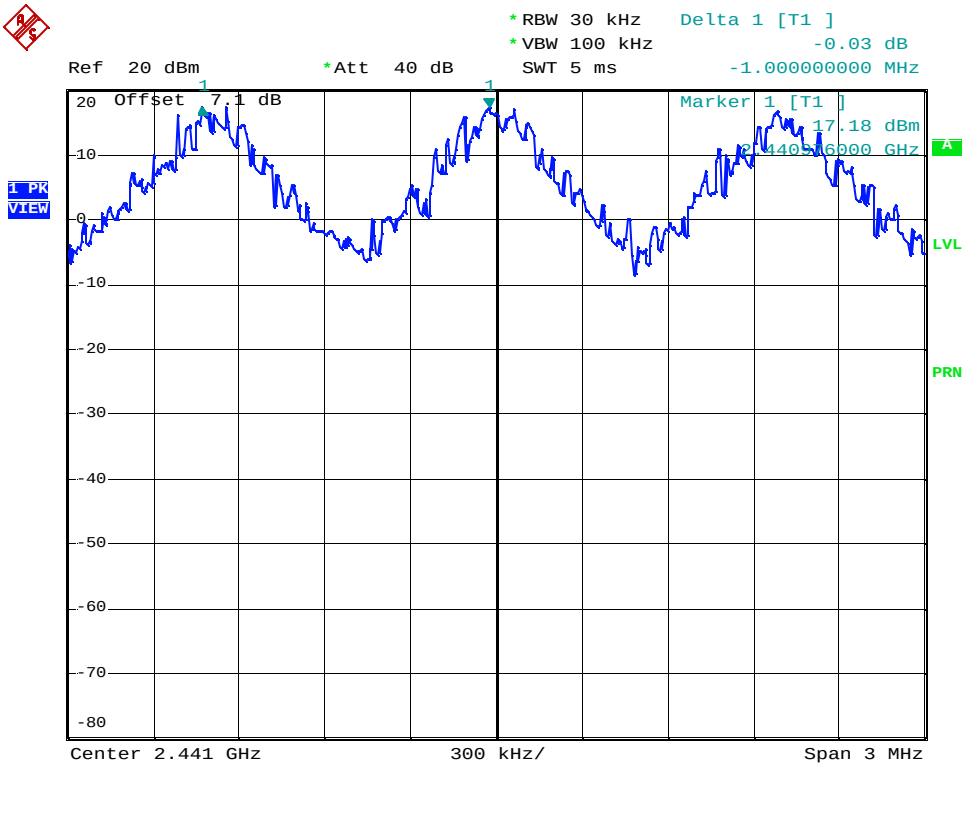
Measurements by Applicant

Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Emission Masks (Occupied Bandwidth) - Bluetooth

Measurement Results

State: 2: High Power Ambient Temperature: 23°C ± 3°C



Channel Separation

Measurements by Applicant

Verified by: David E. Lee, FCC/IC Compliance Manager

Name of Test: Bluetooth Hopping Parameters

Part 15.247 (a) (1) Hopping sequence.
As stated in the Bluetooth standard that can be seen below on “page59 of 790”. The hopping sequence is Random through all 79 RF channels. The hopping sequence is determined by the Bluetooth Clock, and BD_ADDR of the master.

2.2.2 Hopping characteristics

The basic piconet physical channel is characterized by a pseudo-random hopping through all 79 RF channels. The frequency hopping in the piconet physical channel is determined by the Bluetooth clock and BD_ADDR of the master. When the piconet is established, the master clock is communicated to the slaves. Each slave shall add an offset to its native clock to synchronize with the master clock. Since the clocks are independent, the offsets must be updated regularly. All devices participating in the piconet are time-synchronized and hop-synchronized to the channel.

The basic piconet physical channel uses the basic channel hopping sequence and is described in Section 2.6 on page 70.

2.2.3 Time slots

The basic piconet physical channel is divided into time slots, each 625 µs in length. The time slots are numbered according to the most significant 27 bits of the Bluetooth clock CLK_{27-1} of the piconet master. The slot numbering ranges from 0 to $2^{27}-1$ and is cyclic with a cyclic length of 2^{27}. The time slot number is denoted as k.

A TDD scheme is used where master and slave alternately transmit, see Figure 2.1 on page 59. The packet start shall be aligned with the slot start. Packets may extend over up to five time slots.

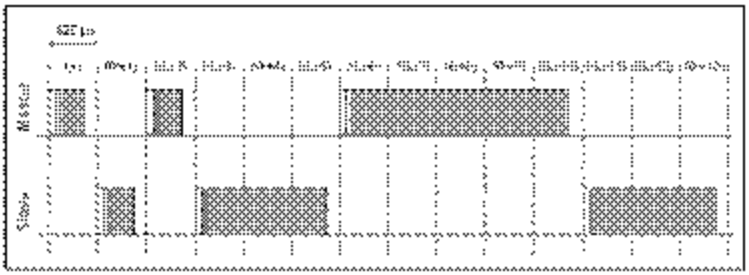


Figure 2.1: Multi-slot packet

The term *slot pair* is used to indicate two adjacent time slots starting with a master-to-slave transmission slot.

Name of Test: Bluetooth Hopping Parameters

Dwell Time.
On the physical layer 3 types of bursts is used in the Bluetooth standard. These can be seen below on “page 73 of 790”

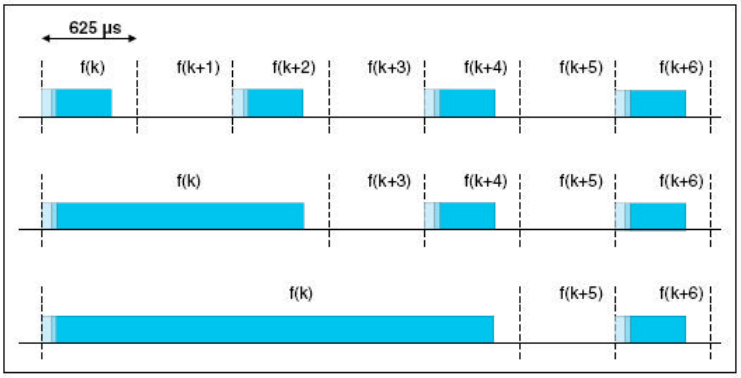


Figure 2.14: Single- and multi-slot packets.

When the adapted channel hopping sequence is used, the pseudo-random sequence contains only frequencies that are in the RF channel set defined by the *AFH_channel_map* input. The adapted sequence has similar statistical properties to the non-adapted hop sequence. In addition, the slave responds with its packet on the same RF channel that was used by the master to address that slave (or would have been in the case of a synchronous reserved slot without a validly received master-to-slave transmission). This is called the *same channel mechanism* of AFH. Thus, the RF channel used for the master to slave packet is also used for the immediately following slave to master packet. An example of the same channel mechanism is illustrated in Figure 2.15 on page 73. The same channel mechanism shall be used whenever the adapted channel hopping sequence is selected.

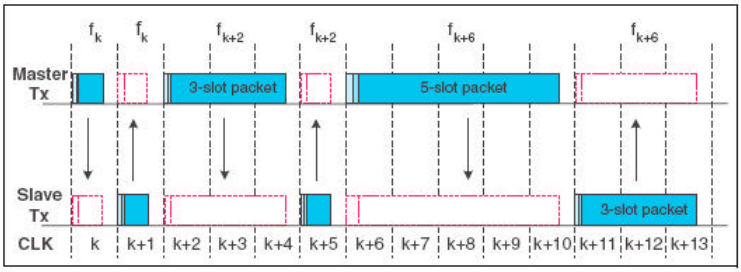


Figure 2.15: Example of the same channel mechanism.

M. Flom Associates, Inc.
3356 North San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
(480) 926-3100 phone, (480) 926-3598 fax

Name of Test: Bluetooth Hopping Parameters

In the following 3 plot measurements of the burst type can be seen.

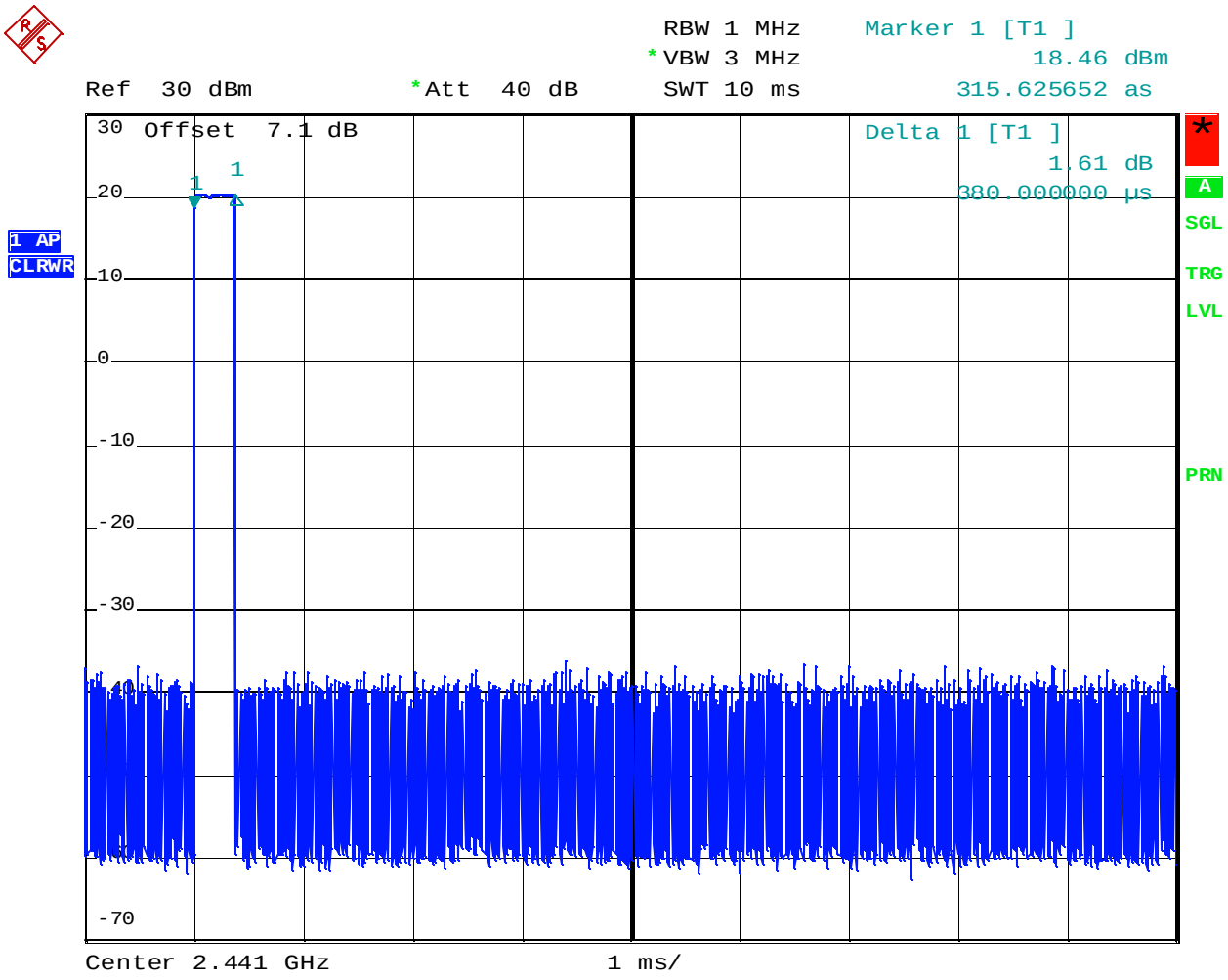


Figure 1. DH 1 (1 Burst long)

Name of Test: Bluetooth Hopping Parameters

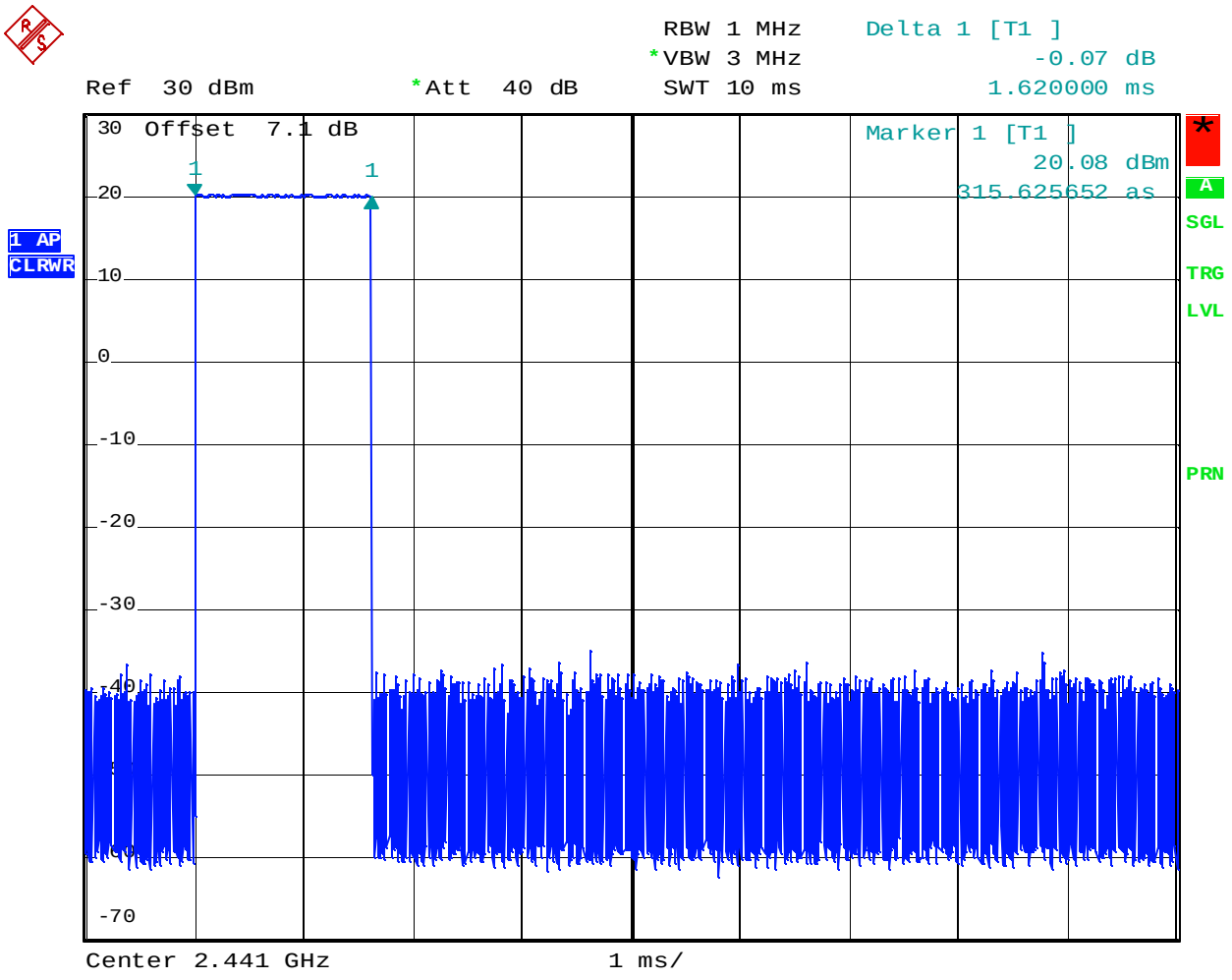


Figure 2. DH3 (3 Burst long)

Name of Test: Bluetooth Hopping Parameters

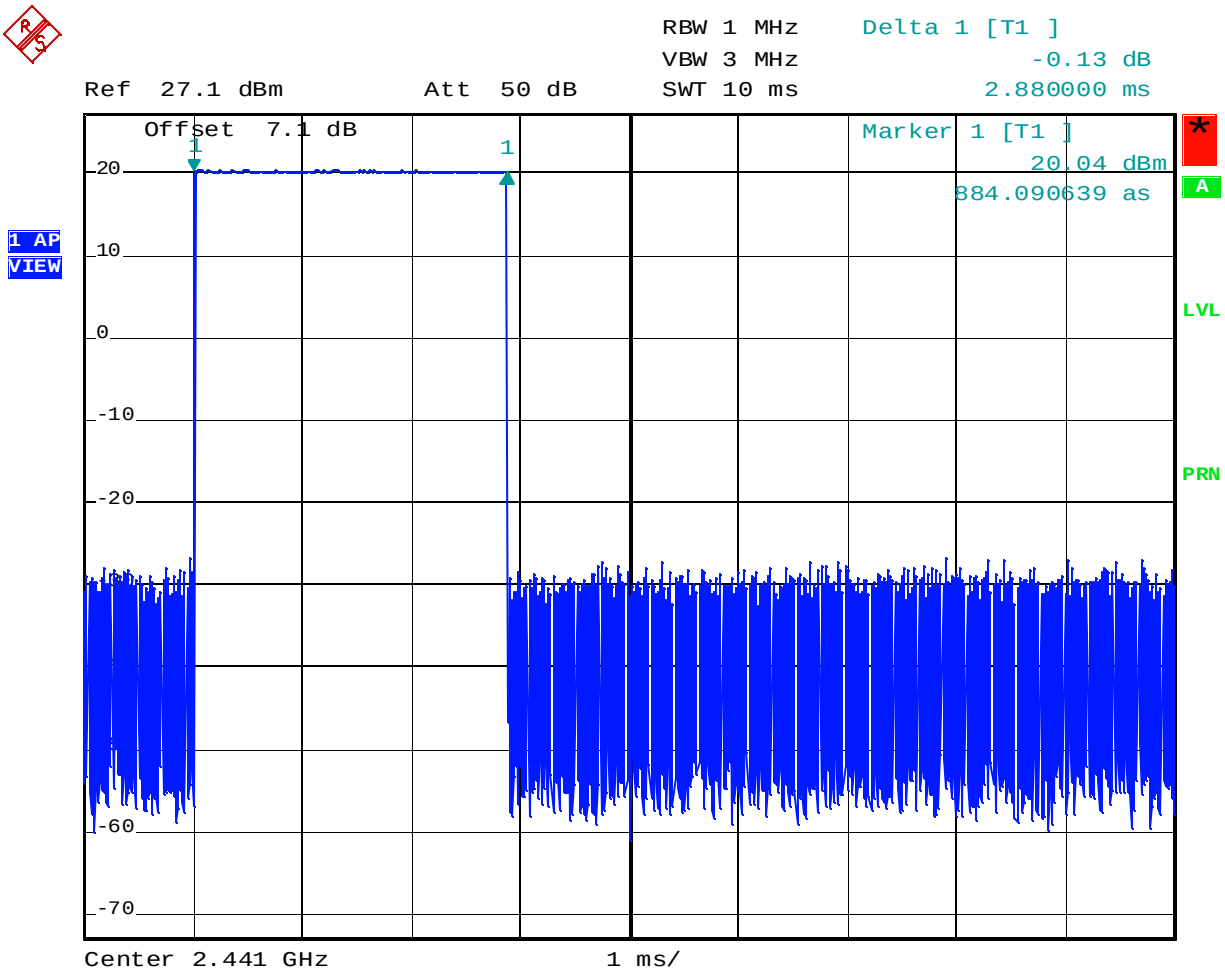


Figure 3. DH5 (5 burst long)

Name of Test: Bluetooth Hopping Parameters

As seen in the Bluetooth standard "page 73 of 790". When a transmitter is transmitting continually DH1 bursts. 800 bursts are bursted per second.

The 800 bursts are pseudo-random hopping through all 79 Channels. Therefore the average bursts at each RF channel is equal 800/79 per second.

To illustrate this, 2 examples are shown on the following two plots

Note that only the bursts at +10dBm is the channel. Bursts below 10dBm are adjacent channels. It can be seen that the measured burst count on the plots are equal to the Calculated. 800/79 = 10.13bursts.

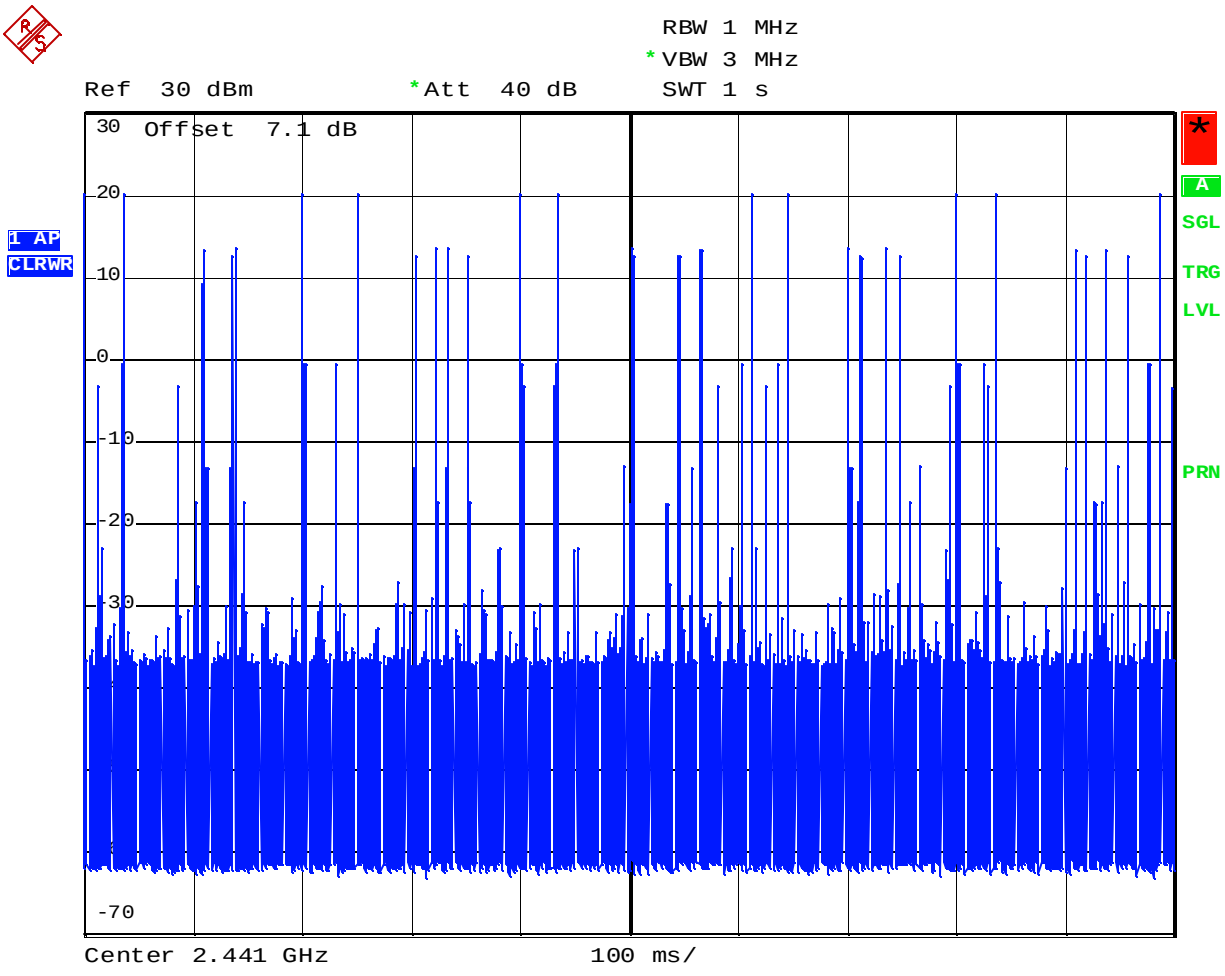


Figure 4. 10 DH 1 bursts

Name of Test: Bluetooth Hopping Parameters

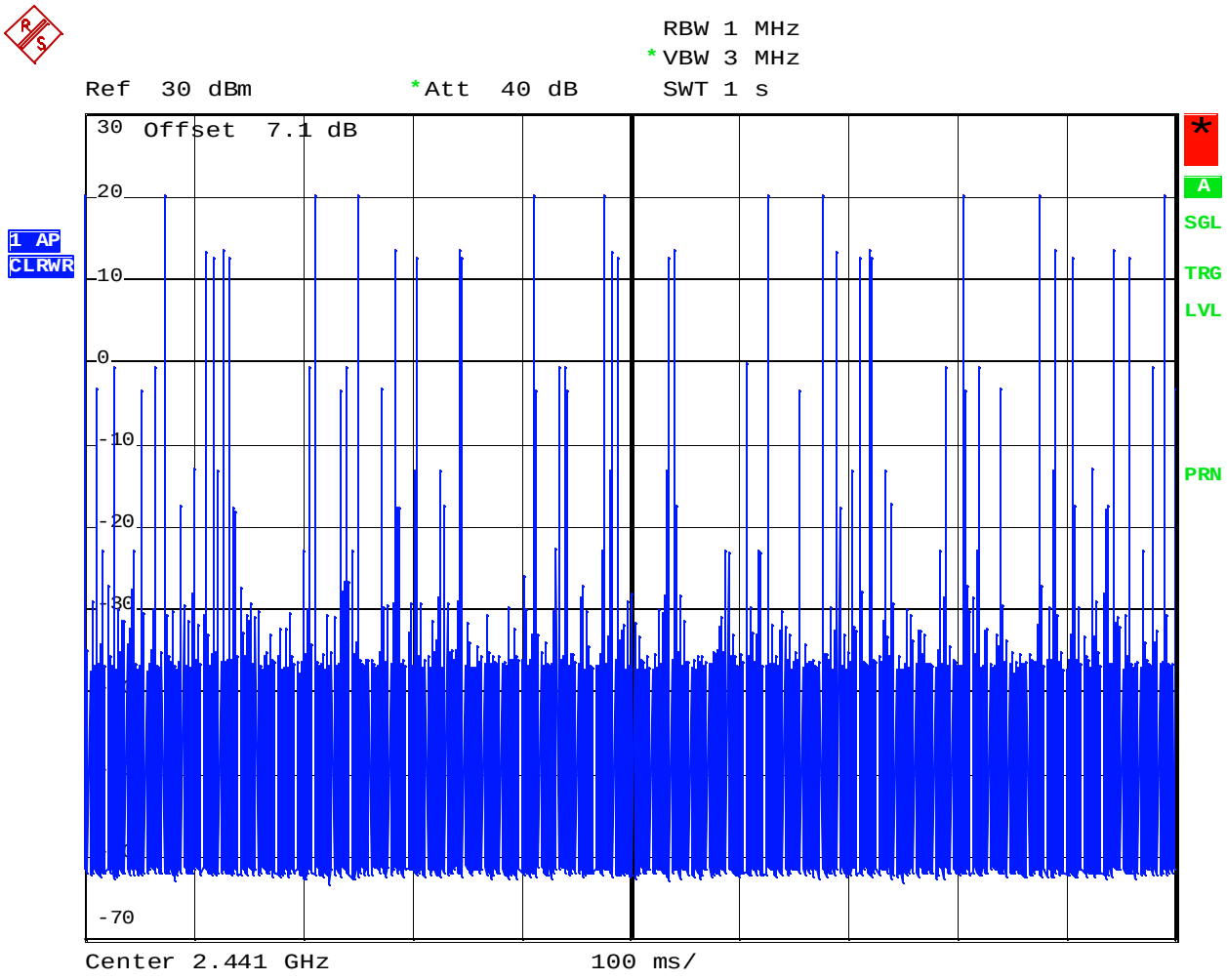


Figure 5. 10 DH 1 bursts

Name of Test: Bluetooth Hopping Parameters

The same calculation can be done on DH3, when a transmitter is transmitting continually DH3 bursts. 400 bursts are bursted per second.

The 400 bursts are pseudo-random hopping through all 79 Channels. Therefore the average bursts at each RF channel is equal 400/79 per second.

To illustrate this, 2 examples are shown on the following two plots

Note that only the bursts at +10dBm is the channel. Bursts below 10dBm are adjacent channels. It can be seen that the measured burst count on the plots are equal to the Calculated. 400/79 = 5.06bursts.

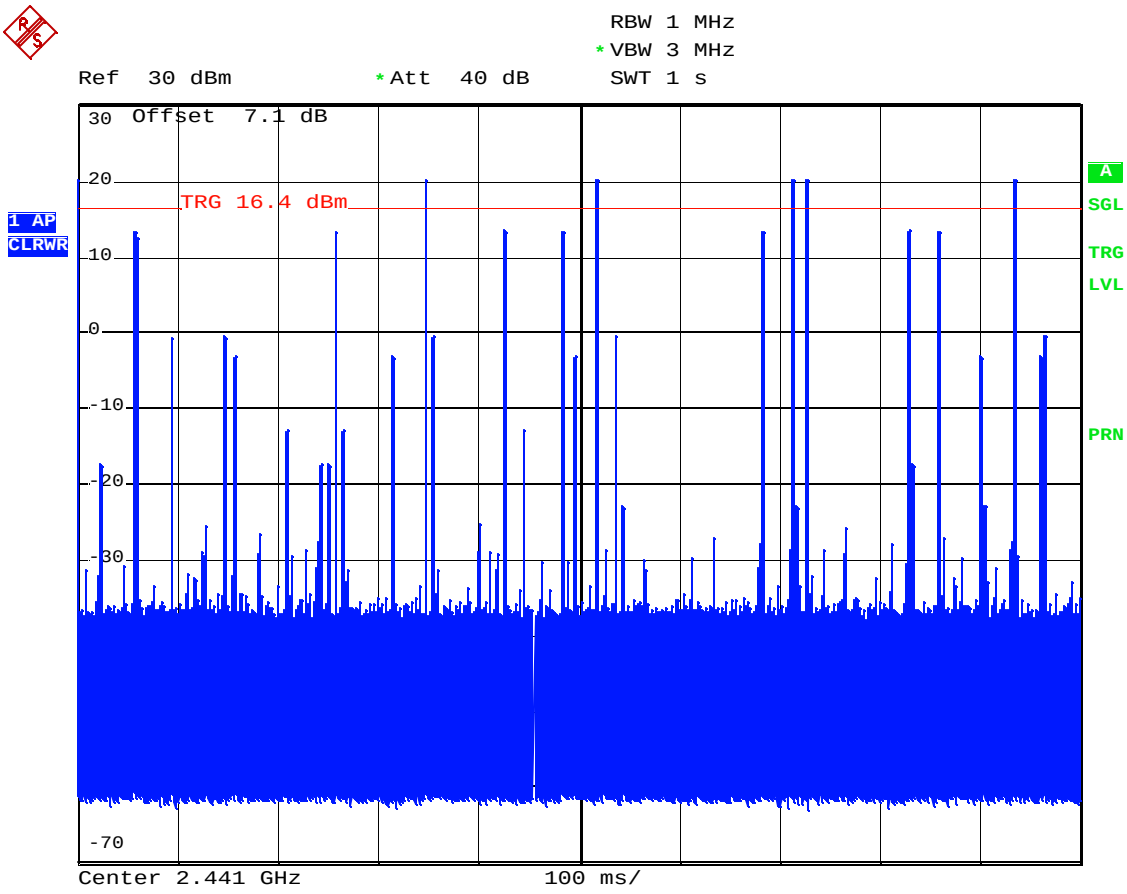
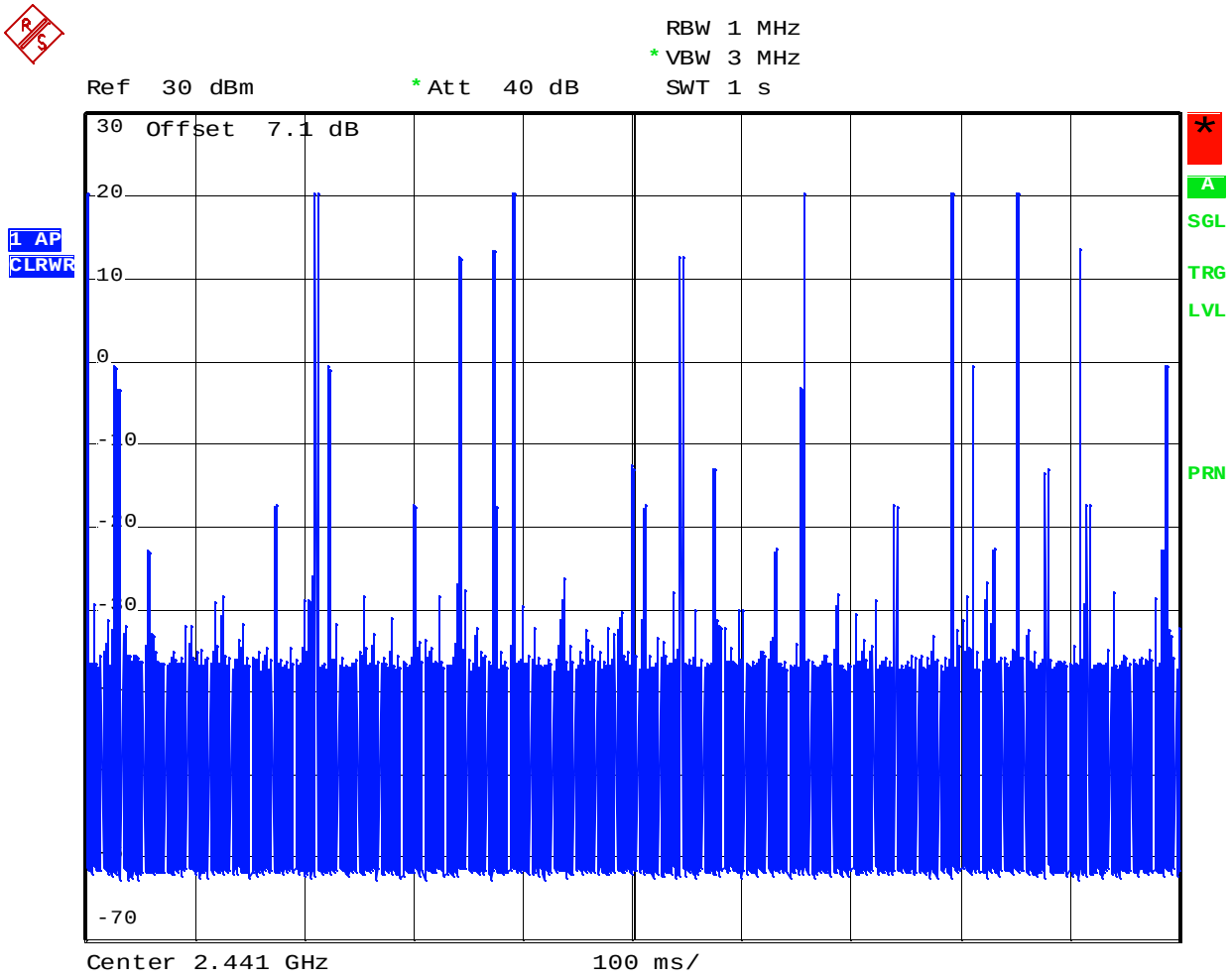


Figure 6. 5 DH 3 bursts

Name of Test: Bluetooth Hopping Parameters



Date: 4.APR.2006 14:24:15

Figure 7. 5 DH 3 bursts

Name of Test: Bluetooth Hopping Parameters

The same calculation can be done on DH5, when a transmitter is transmitting continually DH5 bursts. 267 bursts are bursted per second.

The 400 bursts are pseudo-random hopping through all 79 Channels. Therefore the average bursts at each RF channel is equal 267/79 per second.

To illustrate this, 2 examples are shown on the following two plots

Note that only the bursts at +10dBm is the channel. Bursts below 10dBm are adjacent channels. It can be seen that the measured burst count on the plots are equal to the Calculated. 267/79 = 3.75bursts.

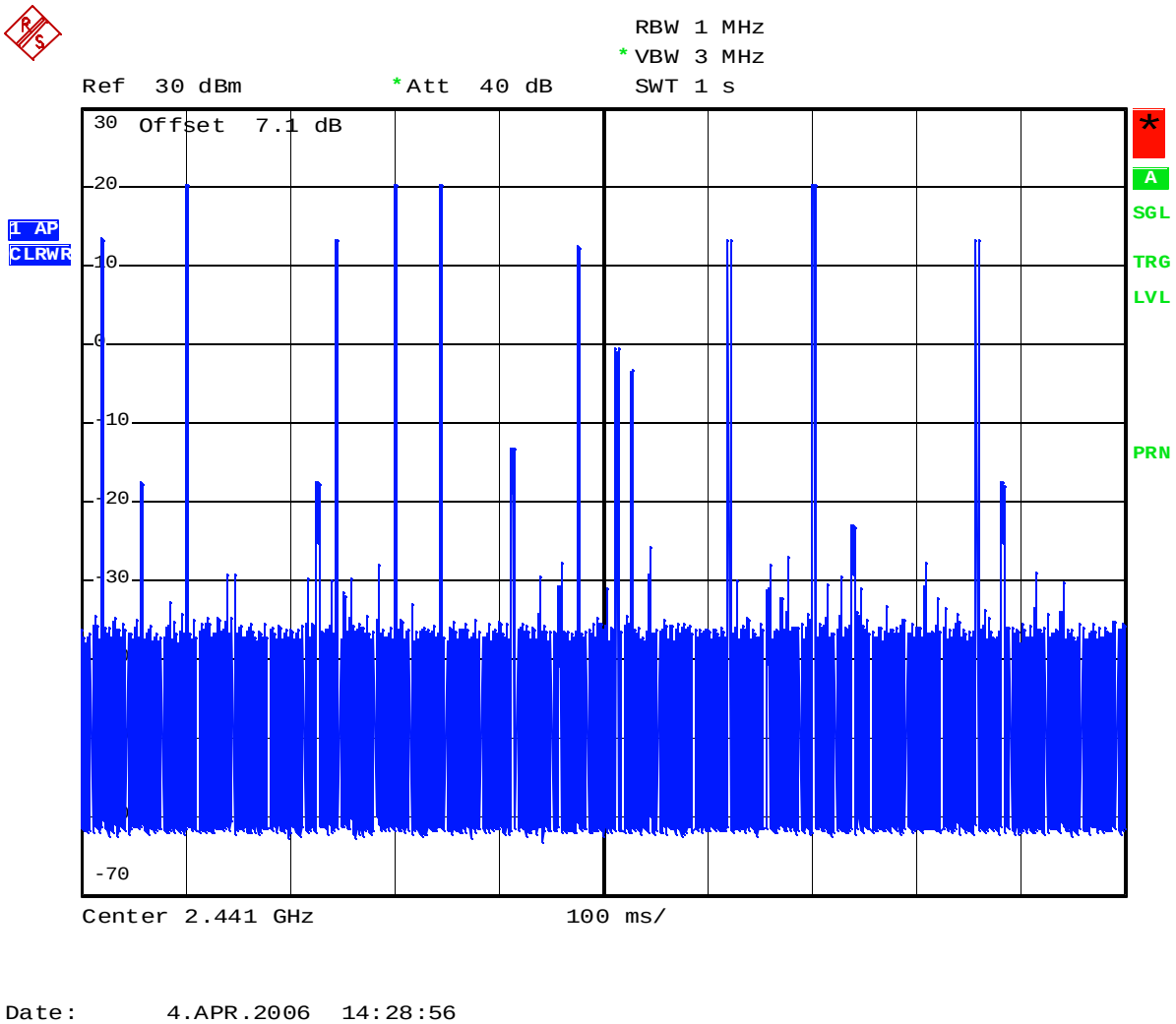


Figure 8. 4 DH 5 bursts

Name of Test: Bluetooth Hopping Parameters

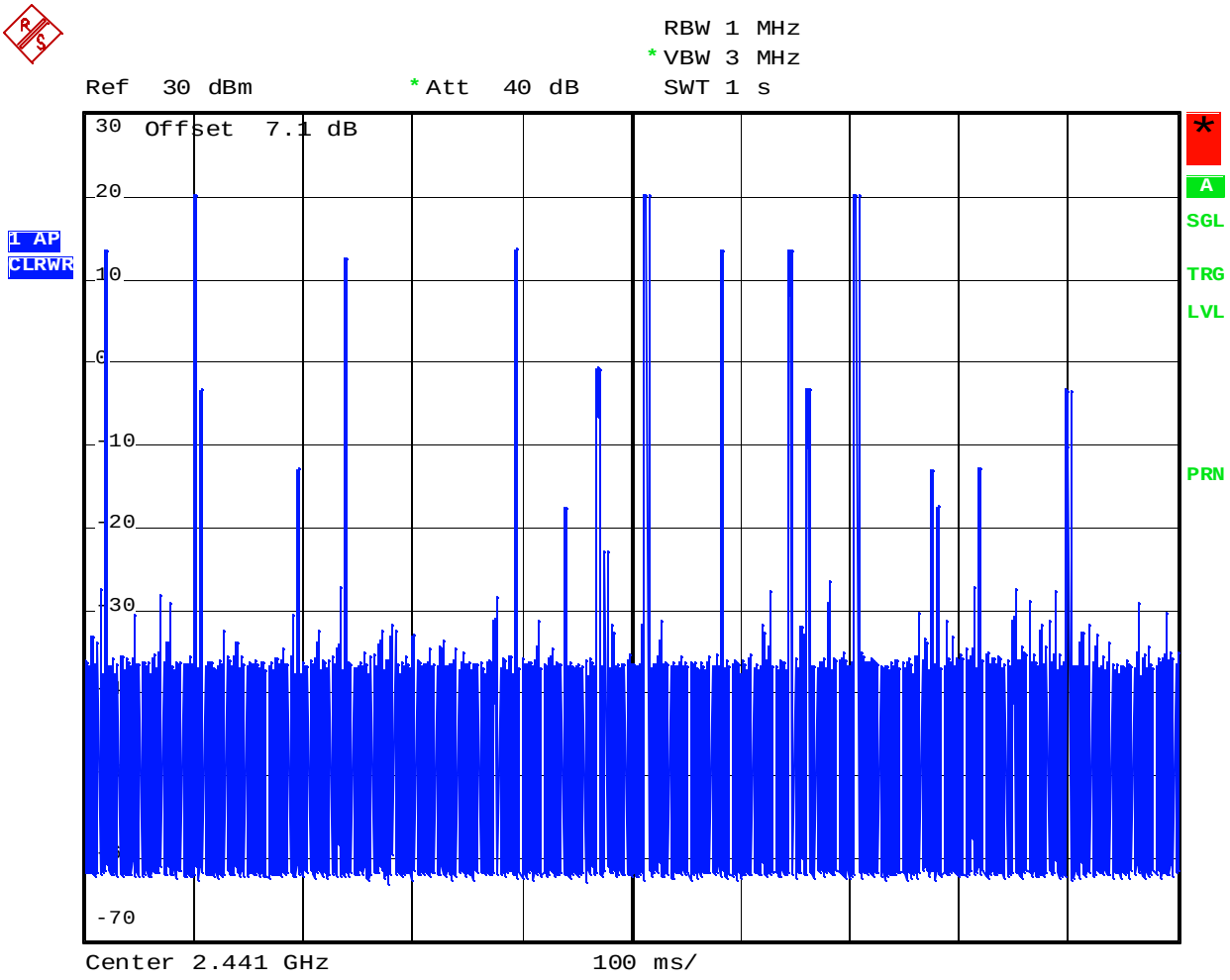


Figure 9. 3 DH 5 bursts

Frequency Hopping Spread Spectrum Information

The Bluetooth transceiver uses the RF Micro Devices / Silicon Wave SiW 3500 Chip

The SiW3500 single-chip IC is a complete Bluetooth wireless communications system on a single CMOS chip. The highly integrated IC combines a direct conversion radio modem with an ARM7TDMI core processor, Bluetooth baseband logic, and complete protocol software in ROM. All active RF components have been integrated making it a low total cost solution. The SiW3500 features an on-chip RF match circuit that allows direct insertion onto a PCB (no need for a module). It has been optimized for mobile phones and other battery powered devices. The SiW3500 is Bluetooth Specification Version 1.2 qualified (Certificate B02153) and therefore and meets the spectral density, occupancy and hopping requirements of 15.247

Datasheet is submitted with the exhibits.

In this application the SiW 3500 is followed by a HPA to make it a Class 1 Bluetooth device (100mW) and the following plots are provided to confirm the emissions after amplification.

6 db Bandwidth
Results: See plot under Occupied Bandwidth

20 db Bandwidth, 2402 MHz
Results: See plot under Occupied Bandwidth

20 db Bandwidth, 2440 MHz
Results: See plot under Occupied Bandwidth

20 db Bandwidth, 2480 MHz
Results: See plot under Occupied Bandwidth

Attested By: David E. Lee, FCC/IC Compliance Manager

Name of Test: Radiated Spurious Emissions

Guide: ANSI C63.4-1992/2003

Test Equipment: See attached test setup

Test Configuration of EUT:

1. The equipment was installed in a typical system and configured in accordance with the manufacturer's instructions. It was also operated in a manner which is representative of the typical usage for the EUT.

2. The equipment and I/O cable(s) were re-arranged to maximize each emission. For each change in configuration, the system was rotated through 360°. The antenna height was changed from one to six meters. Both horizontal and vertical polarization scans were used. The worst case is here reported.

3. For EUTs normally operated on top of a table, tests were performed with the EUT on a rotating non-conducting table top of size 1.0 by 1.5 meters, approximately 1.0 meter above the ground plane.

4. EUTs normally placed on the floor, tests were performed with the EUT on a rotating non-conducting platform, approximately 15 cm above the ground plane.

Test Procedure:

1. For AC powered equipment, the EUT was connected to the Public Utility Power Line through a Line Impedance Stabilization Network (LISN), (50 µH).

2. The test configuration consisted of the aforementioned equipment and peripherals, using ANSI C63.4-1992/2003.

3. Radiation emission tests were performed on all possible combinations.

4. Measurements were made with the EUT:
   A. POWERED ON and awaiting data input/output (quiescent mode)
   B. Receiving/sending data in a typical operation.

5. Each emission was maximized by varying the mode of operation, where applicable.

Name of Test: Radiated Spurious Emissions (Continued)

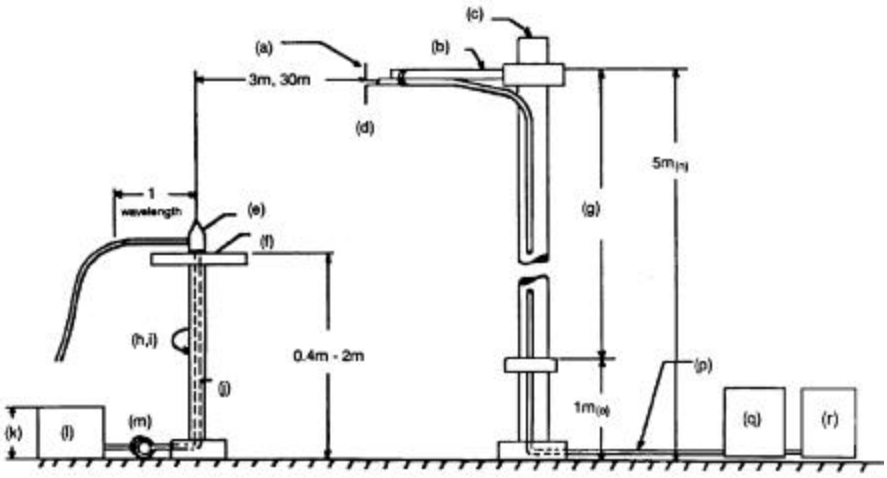
Measurement Distance, Meter	=	3
Height Above Ground, Meters	=	0.8
Spectrum Searched	=	Per 47 CFR 15.33
Resolution Bandwidth, kHz	=	120
Worst Case	=	Vertical

All Measurements Were Performed Automatically Using:
a. Sunol turntable with HPIB controls.
b. (EMCO #1053 antenna positioning tower with pneumatic and HPIB controls.

Measurement Results Follow:

Performed by: David E. Lee, FCC/IC Compliance Manager

Radiated Test Setup



Notes:

(a) Search Antenna - Rotatable on boom
(b) Non-metallic boom
(c) Non-metallic mast
(d) Adjustable horizontally
(e) Equipment Under Test
(f) Turntable
(g) Boom adjustable in height.
(h) External control cables routed horizontally at least one wavelength.
(i) Rotatable
(j) Cables routed through hollow turntable center
(k) 30 cm or less
(l) External power source
(m) 10 cm diameter coil of excess cable
(n) 25 cm (V), 1 m-7 m (V, H)
(o) 25 cm from bottom end of 'V', 1m normally
(p) Calibrated Cable at least 10m in length
(q) Amplifier (optional)
(r) Spectrum Analyzer

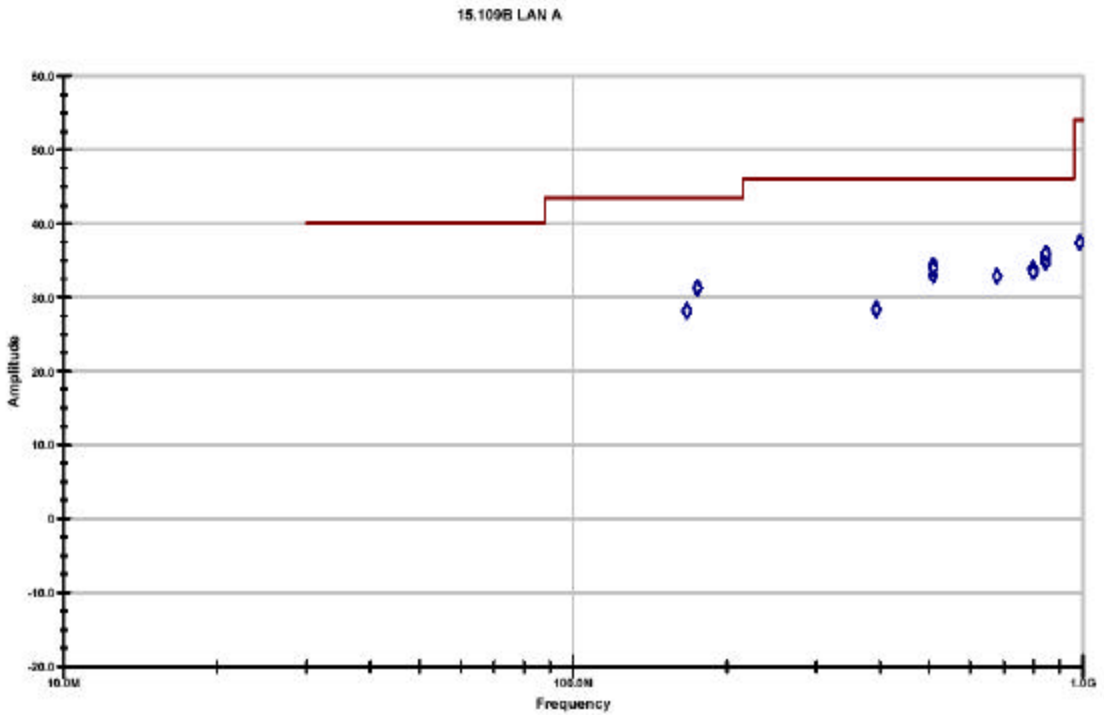
	Asset (as applicable)	Description	s/n	Cycle	Last Cal
				Per ANSI C63.4 -1992/2000 Draft, 10.1.4	
Transducer					
x	i00088	EMCO 3109-B 25MHz-300MHz	2336	24 mo.	Sep-05
x	i00089	Aprel 2001 200MHz-1GHz	001500	24 mo.	Sep-05
Amplifier					
	i00028	HP 8449A	2749A00121	12 mo.	May-05
Spectrum Analyzer					
	i00029	HP 8563E	3213A00104	12 mo.	Jan-06
x	i00033	HP 85462A	3625A00357	12 mo.	Sep-05

Miscellaneous

Microphone	No
Antenna	Yes
All Ports Terminated	Yes

Test Setup: Radiated Emissions – 15.209

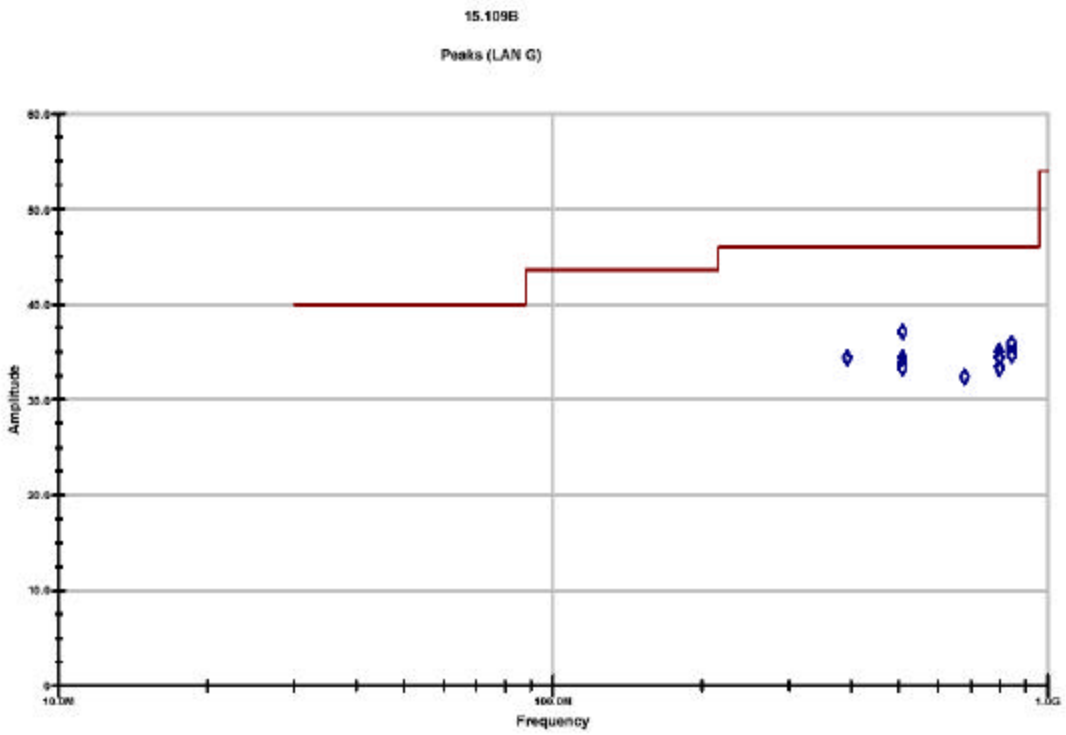
Name of Test: Radiated Spurious Emissions



Peaks Plotted for Imarsat, WLAN A and BT Transmitting

MHz	FCC_B	Out_Pks
167.093000	43.52	28.16
175.258000	43.52	31.23
393.265000	46.02	28.40
508.776000	46.02	34.18
508.857000	46.02	33.01
508.938000	46.02	34.35
509.000000	46.02	34.04
678.687000	46.02	32.88
797.351000	46.02	33.90
797.674000	46.02	33.60
797.917000	46.02	33.76
798.240000	46.02	33.44
844.477000	46.02	34.74
844.719000	46.02	34.93
845.042000	46.02	35.37
845.366000	46.02	34.89
845.608000	46.02	35.96
986.339000	53.98	37.40

Name of Test: Radiated Spurious Emissions



Peaks Plotted for Imarsat, WLAN G and BT Transmitting

MHz	FCC_B	Out_Pks
393.184000	46.02	34.39
508.776000	46.02	34.39
508.857000	46.02	33.75
508.938000	46.02	33.30
509.000000	46.02	37.10
678.687000	46.02	32.37
797.189000	46.02	34.50
797.432000	46.02	35.04
797.674000	46.02	33.51
797.755000	46.02	34.50
797.917000	46.02	34.30
798.078000	46.02	33.25
844.315000	46.02	35.12
844.558000	46.02	35.39
844.881000	46.02	35.90
845.123000	46.02	34.86
845.204000	46.02	34.64

Name of Test: A/C Powerline Conducted Emissions

Specification: FCC: 47 CFR 15.207

Measurement Procedure

1. A test sample was connected to the Public Utility lines through a LISN.

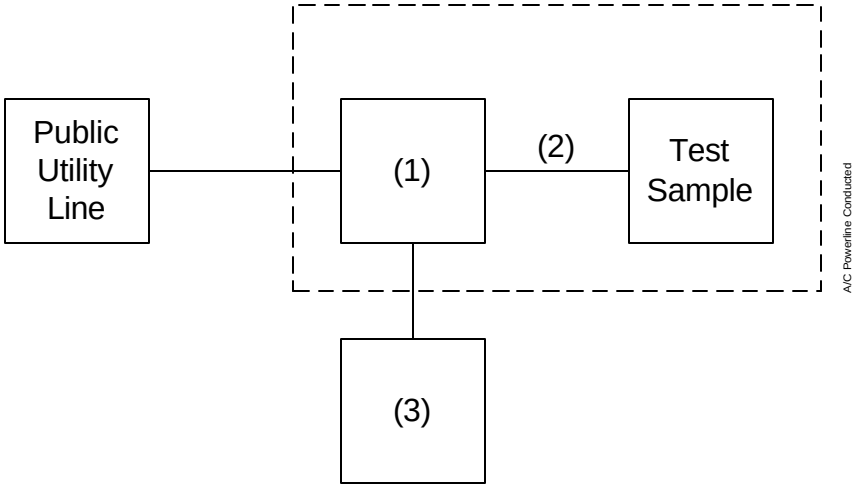
2. A reference level of 250 µV was set on the Spectrum Analyzer. The spectrum was searched over the range of 150 kHz to 30 MHz.

3. All other emissions were 20 dB or more below limit.

4. X The test sample used a charger.
   ____ The test sample does not use a charger.

5. Measurement Results: Attached.

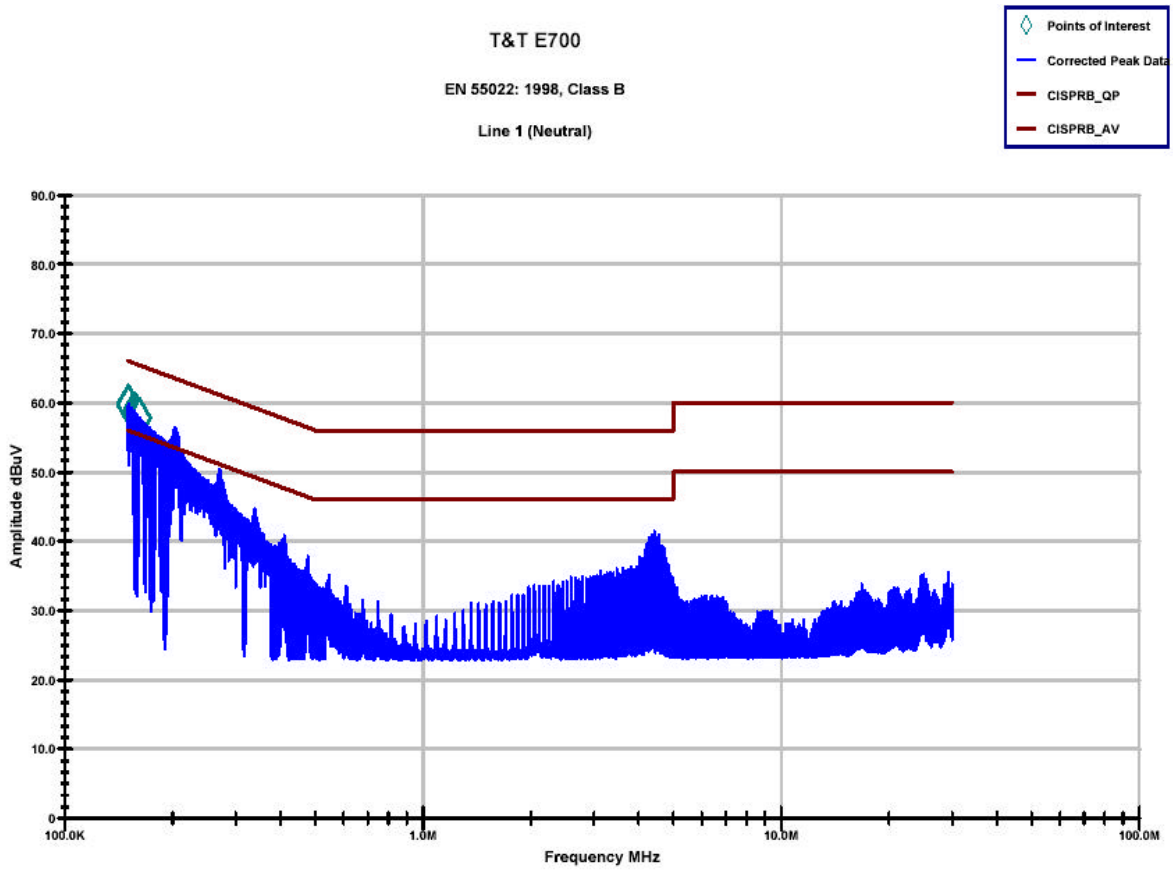
Test Set Up: A/C Powerline Conducted Measurements



	Asset	Description	s/n	Cycle	Last Cal
				Per ANSI C63.4 -1992/2000 Draft, 10.1.4	
(1) **Line Impedance Stabilization Network**					
X	i00244	Fischer 50-20-2-01	2047		
(2) **Screen Room**					
X	i00170	Lindgren LG170	4999		
(3) **Spectrum Analyzer**					
X	i00033	HP 85462A	3625A00357	12 mo.	Sep-05
	i00048	HP 8566B	2511AD1467	12 mo.	Jul-05

Test Setup: A/C Powerline Conducted Emissions

Results: A/C Powerline Conducted Emissions



Operator: del

08:27:11 AM, Tuesday, April 18, 2006 Job #: P0640003

Results: A/C Powerline Conducted Emissions

Line 1 (Average)

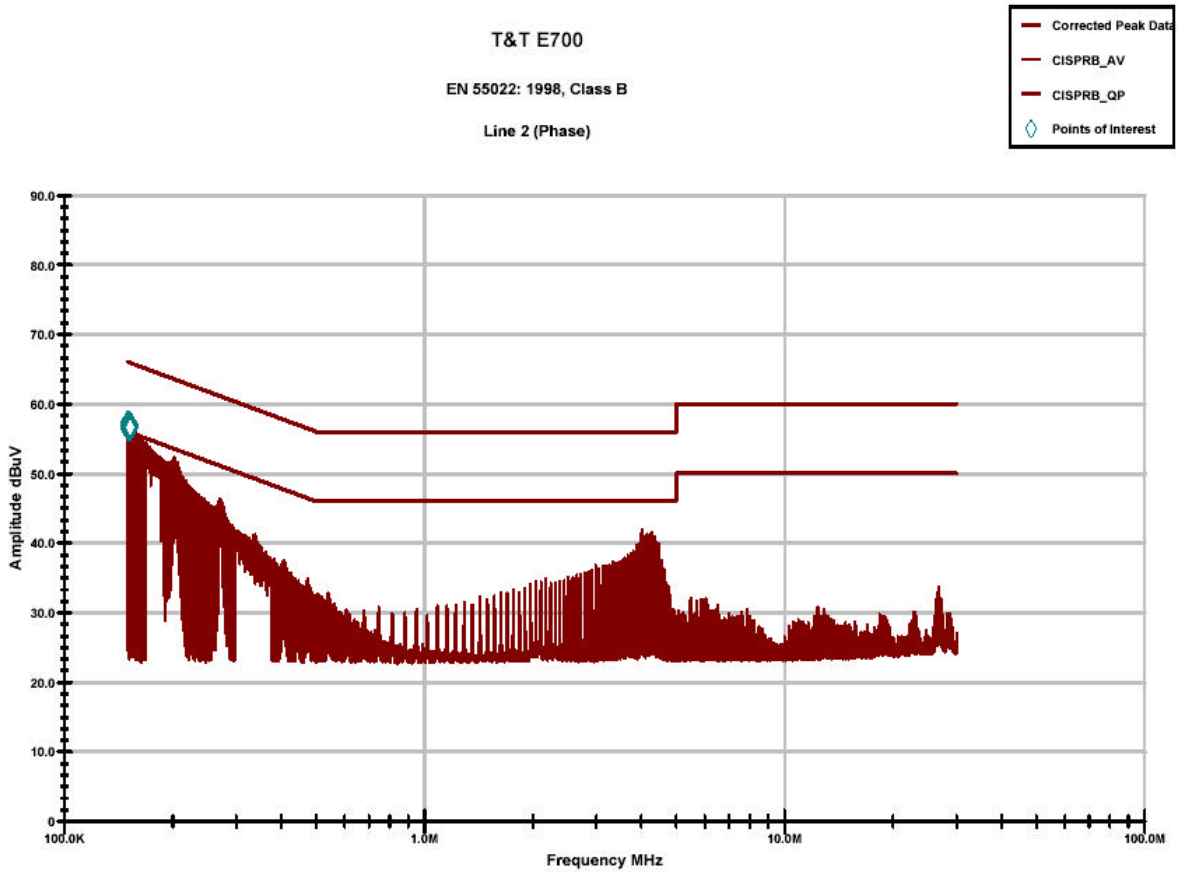
Frequency	Meas dBuV	LISN	Cable	Atten	Calc dBuV	Limit	Margin
150.00 KHz	13.83	0.30	0.02	10.00	24.15	56.00	-31.85
150.02 KHz	13.53	0.30	0.02	10.00	23.85	56.00	-32.15
150.02 KHz	13.73	0.30	0.02	10.00	24.05	56.00	-31.95
150.07 KHz	13.32	0.30	0.02	10.00	23.64	56.00	-32.36
150.10 KHz	14.53	0.30	0.02	10.00	24.85	56.00	-31.15
150.15 KHz	13.32	0.30	0.02	10.00	23.64	56.00	-32.36
150.31 KHz	13.11	0.30	0.02	10.00	23.43	55.99	-32.56
150.38 KHz	13.32	0.30	0.02	10.00	23.64	55.99	-32.35
150.48 KHz	13.39	0.30	0.02	10.00	23.71	55.99	-32.28
150.61 KHz	14.32	0.29	0.02	10.00	24.63	55.98	-31.35

Line 1 (Quasi-Peak)

Frequency	Meas dBuV	LISN	Cable	Atten	Calc dBuV	Limit	Margin
150.00 KHz	41.16	0.30	0.02	10.00	51.48	66.00	-14.52
150.02 KHz	41.14	0.30	0.02	10.00	51.46	66.00	-14.54
150.02 KHz	41.22	0.30	0.02	10.00	51.54	66.00	-14.46
150.07 KHz	41.07	0.30	0.02	10.00	51.39	66.00	-14.61
150.10 KHz	42.45	0.30	0.02	10.00	52.77	66.00	-13.23
150.15 KHz	41.22	0.30	0.02	10.00	51.54	66.00	-14.46
150.31 KHz	41.10	0.30	0.02	10.00	51.42	65.99	-14.57
150.38 KHz	41.09	0.30	0.02	10.00	51.41	65.99	-14.58
150.48 KHz	41.09	0.30	0.02	10.00	51.41	65.99	-14.58
150.61 KHz	42.33	0.29	0.02	10.00	52.64	65.98	-13.34

Performed by: David E. Lee, FCC/IC Compliance Manager

Results: A/C Powerline Conducted Emissions



Operator: del

09:02:24 AM, Tuesday, April 18, 2006 Job #: P0640003

Results: A/C Powerline Conducted Emissions

Line 2 (Average)

Frequency	Meas dBuV	LISN	Cable	Atten	Calc dBuV	Limit	Margin
150.05 KHz	12.81	0.30	0.02	10.00	23.13	56.00	-32.87
150.33 KHz	12.70	0.30	0.02	10.00	23.02	55.99	-32.97
151.03 KHz	12.63	0.29	0.02	10.00	22.94	55.97	-33.03
151.51 KHz	11.82	0.28	0.02	10.00	22.12	55.96	-33.83
152.48 KHz	11.39	0.28	0.02	10.00	21.69	55.93	-34.24
153.75 KHz	11.32	0.26	0.02	10.00	21.60	55.89	-34.29
156.75 KHz	10.96	0.23	0.02	10.00	21.22	55.81	-34.59
171.50 KHz	9.16	0.20	0.03	10.00	19.39	55.39	-36.00
194.25 KHz	9.02	0.20	0.04	10.00	19.26	54.74	-35.48
207.75 KHz	15.60	0.20	0.04	10.00	25.84	54.35	-28.51

Line 2 (Quasi-Peak)

Frequency	Meas dBuV	LISN	Cable	Atten	Calc dBuV	Limit	Margin
150.05 KHz	41.05	0.30	0.02	10.00	51.37	66.00	-14.63
150.33 KHz	40.87	0.30	0.02	10.00	51.19	65.99	-14.80
151.03 KHz	41.05	0.29	0.02	10.00	51.36	65.97	-14.61
151.51 KHz	40.67	0.28	0.02	10.00	50.98	65.96	-14.98
152.48 KHz	40.60	0.28	0.02	10.00	50.90	65.93	-15.03
153.75 KHz	40.41	0.26	0.02	10.00	50.69	65.89	-15.20
156.75 KHz	39.89	0.23	0.02	10.00	50.15	65.81	-15.66
171.50 KHz	37.96	0.20	0.03	10.00	48.19	65.39	-17.20
194.25 KHz	35.41	0.20	0.04	10.00	45.65	64.74	-19.09
207.75 KHz	34.33	0.20	0.04	10.00	44.57	64.35	-19.78

Performed by: David E. Lee, FCC/IC Compliance Manager

END OF TEST REPORT

Testimonial
and
Statement of Certification

This is to Certify:

1. **That** the application was prepared either by, or under the direct supervision of, the undersigned.

2. **That** the technical data supplied with the application was taken under my direction and supervision.

3. **That** the data was obtained on representative units, randomly selected.

4. **That**, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

Certifying Engineer: David E. Lee, FCC/IC Compliance Manager