ENGINEERING TEST REPORT

Integrated UHF RFID Reader
Model No.: RD7950

FCC ID: GM3RD7950

Applicant:

Psion Teklogix Inc.
2100 Meadowvale Blvd.
Mississauga, ON
Canada L5N 7J9

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Frequency Hopping Spread Spectrum (FHSS) Operating in the Frequency Band 902 - 928 MHz

UltraTech's File No.: TEK-478F15C247

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: March 03, 2005	
Report Prepared by: Anca Dobre Issued Date: March 03, 2005	Tested by: Hung Trinh, EMC Technician Test Dates: February, 5-13, 2005

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	Test Report	OK
1	Test Setup Photos	Radiated Emissions Setup Photos	OK
2	External Photos of EUT	External EUT Photos	OK
3	Internal Photos of EUT	Internal EUT Photos	OK
4	Cover Letters	Letter from Ultratech for Certification Request	OK
5	Attestation Statements	• Letter from the Applicant to appoint Ultratech to act as an agent • Letter from the Applicant to request for Confidentiality Filing	OK OK
6	ID Label/Location Info	• ID Label • Location of ID Label	OK
7	Block Diagrams	Block Diagram	OK
8	Schematic Diagrams	Schematic Diagram	OK
9	Parts List/Tune Up Info	Parts List--RFID Main PCB Parts List--RFID Led Flexi	OK
10	Operational Description	General Description and Theory of Operation	OK
11	RF Exposure Info	Routine SAR evaluation is not required since the device is below the low power threshold.	OK
12	Users Manual	RD7950 Integrated UHF RFID Reader / Quick Start Guide	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Frequency Hopping Spread Spectrum Transceiver operating in the Frequency Band 902 – 928 MHz.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	Commercial, industrial or business

2.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19	2004	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	2003 2003	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1	2003	Specification for Radio Disturbance and Immunity measuring apparatus and methods
FCC Public Notice DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding to Spread Spectrum Devices

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	Psion Teklogix Inc.
Address:	2100 Meadowvale Blvd. Mississauga, ON Canada L5N 7J9
Contact Person:	Mr. Sada Dharwarkar Phone #: 905-812-6200 (3358) Fax #: 905-812-6301 Email Address: sdharwar@teklogix.com

MANUFACTURER	
Name:	Psion Teklogix Inc.
Address:	2100 Meadowvale Blvd. Mississauga, ON Canada L5N 7J9
Contact Person:	Mr. Sada Dharwarkar Phone #: 905-812-6200 (3358) Fax #: 905-812-6301 Email Address: sdharwar@teklogix.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Psion Teklogix Inc.
Product Name:	Integrated UHF RFID Reader
Model Name or Number:	RD7950
Serial Number:	Test Sample
Type of Equipment:	Frequency Hopping Spread Spectrum Transmitter
Input Power Supply Type:	5 V from the Psion Teklogix 7535 Handheld Computer which is intended for use with the Integrated UHF RFID Reader.
Primary User Functions of EUT:	To identify, locate and track pallets and/or items that carry the appropriate transponders.

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER		
Equipment Type:	Portable Transceiver	
Intended Operating Environment:	Commercial, industrial or business	
Power Supply Requirement:	5 V from the Psion Teklogix 7535 Handheld Computer which is intended for use with the Integrated UHF RFID Reader.	
RF Output Power Rating:	1 Watt	
Operating Frequency Range:	902-928 MHz	
RF Output Impedance:	50 Ohms	
Channel Spacing:	500 kHz	
Duty Cycle:	16%	
20 dB Bandwidth:	134.068 kHz	
Modulation Type:	FHSS	
Channel Occupancy:	83.88 ms within 20 second period	
Oscillator Frequencies:	16 MHz	
Antenna Connector Type	Integral (the antenna component is located inside the enclosure).	
Antenna Description:	Manufacturer:	Psion Teklogix
	Model:	1050385
	Frequency:	902-928 MHz
	Type of Antenna:	Circular Polarized Patch
	Impedance:	50 Ohms
	Gain:	0 dBi

3.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	*Tether Port	1	--	Hardwired to the enclosure shielded interconnecting cable

* The tether port is used to plug the Integrated UHF RFID Reader into the 7535 Hand-Held Computer.

3.5. ASSOCIATE DEVICE

The EUT was tested while connected to the following representative configuration of associate equipment necessary for intended use.

Associate Equipment # 1*	
Description:	Psion Teklogix 7535 Handheld Computer
Brand name:	Psion Teklogix
Model Name or Number:	7535
Serial Number:	N/A
Connected to EUT's Port:	Tether Port Interconnecting Cable

*EUT is intended to use only with Psion Teklogix 7535 Handheld Computer as associate device.

EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	5 V from 7535 Handheld Computer

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	• Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements. • The EUT operates in normal Frequency Hopping mode for occupancy duration and frequency separation.
Special Test Software:	Special software is provided by the Applicant to operate the EUT in hopping mode or at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.
Special Hardware Used:	None.
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as an integral antenna.

Transmitter Test Signals	
Frequency Band(s):	902-928 MHz
Test Frequency(ies): (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	903.138; 915.446; 927.262 MHz
Transmitter Wanted Output Test Signals:	
Transmitter Power (measured maximum output power):	0.867 Watts
Normal Test Modulation:	FHSS
Modulating signal source:	Internal

4.3. DRAWING OF TEST SETUP

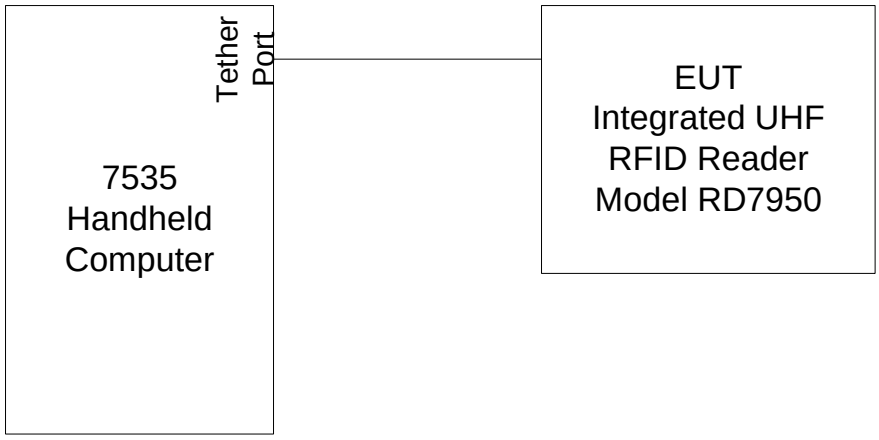


EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).
- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: February 17, 2004.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (Yes/No)
15.247 (a)(1)	Provisions for Frequency Hopping Systems	Yes
15.247(b)	Peak Output Power	Yes
15.247(a)(1)	20 dB Bandwidth of a Frequency Hopping System	Yes
15.247(b) & 1.1310	Maximum Peak Power (Conducted)	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Routine SAR evaluation is not required; the device is below the low power threshold.
15.247(c)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
15.109 (a)	Class B Radiated Emissions	Yes (See Note)

Note:

The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers. The engineering test report is available upon request.

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report and ANSI C63.4.

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4, FCC Section 15.247 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

The essential function of the EUT is to use radio frequency to identify, locate and track pallets and/or items that carry the appropriate transponders.

6.5. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	Manufacturer's Clarification
15.31	The hoping function must be disabled for tests, which should be performed with the EUT transmitting on the number of frequencies specified in this Section. The measurements made at the upper and lower ends of the band of operation should be made with the EUT tuned to the highest and lowest available channels.	Software was provided which allowed the hopping function to be disabled for testing and permitted the EUT to be tuned to the highest and lowest available channel.
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: ➢ The application (or intended use) of the EUT ➢ The installation requirements of the EUT ➢ The method by which the EUT will be marketed	The antenna is internal. It would need to go through several disassembly steps before the antenna could be accessed.
15.204	Provided the information for every antenna proposed for use with the EUT: ➢ type (e.g. Yagi, patch, grid, dish, etc…), ➢ manufacturer and model number ➢ gain with reference to an isotropic radiator	Type of antenna: Circular Polarized Patch Manufacturer: Psion Teklogix Model: 1050385 Frequency Range: 902-928 MHz Gain: 0 dBi
15.247(a)	Description of how the EUT meets the definition of a frequency hopping spread spectrum, found in Section 2.1. Based on the technical description.	The EUT hops every 350 to 360 msec, according to a pseudo random sequence, a total of 50 channels, and repeat in less than 20 sec.

FCC Section	FCC Rules	Manufacturer's Clarification
15.247(a)	Pseudo Frequency Hopping Sequence: Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, in order to demonstrate that the sequence meets the requirements specified in the definition of a frequency hopping spread spectrum system, found in Section 2.1	There is a pseudo random table, using the channel designation from 1 to 50. The hopping sequences are generated by a pseudo random number generator, generating 0 to 49, which corresponding to 1 to 50 channels.
15.247(a)	Equal Hopping Frequency Use: Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g. that each new transmission event begins on the next channel in the hopping sequence after final channel used in the previous transmission events).	Upon power up, the micro controller fetches an output from the random number generator to determine its starting frequency. From that point, the reader follows the sequence set by the hopping table. Example; 18, 9, 20, 11. The next time power up, the reader could start from a totally different stating frequency. Since the EUT follows only these 50 channels, it will guarantee that all channels are equally occupied.
15.247(g)	Describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system	This unit hops every 350 msec, which complies with the requirement of not more than 400 msec at any frequency.
15.247(h)	Describe how the EUT complies with the requirement that it not have the ability to coordinated with other FHSS is an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters	There is not a hop synchronization input to the EUT, and the hopping is totally according to the reader's internal table.
Public Notice DA 00-705	System Receiver Input Bandwidth: Describe how the associated receiver(s) complies with the requirement that its input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.	The EUT uses switchable low pass filters to ensure matching the receiver bandwidth to the transmitter bandwidth.
Public Notice DA 00-705	System Receiver Hopping Capability: Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals	The EUT is homodyne receiver; the received signal is a reflection of the transmitted signal. Therefore, the receiver automatically synchronizes with the transmitted signal.

6.6. PROVISIONS FOR FREQUENCY HOPPING SYSTEMS [§ 15.247 (a) (1)]

6.6.1. Limits

- § 15.247 (a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

- § 15.247 (a)(1)(i): For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

6.6.2. Method of Measurements

Refer to FCC 15.247(a)(1), ANSI C63.4 and Public Notice DA 00-705.

Carrier Frequency Separation:

The hopping function of the EUT is enabled. Use the spectrum analyzer setting as follows:
- Span = wide enough to capture the peaks of two adjacent channels
- RBW = 1% of the span
- VBW ≥ RBW
- Sweep = Auto
- Detector = peak
- Trace = max hold

Number of hopping frequency:

The hopping function of the EUT is enabled. Use the spectrum analyzer setting as follows:
- Span = the frequency band of operation
- RBW = 1% of the span
- VBW ≥ RBW
- Sweep = Auto
- Detector = peak
- Trace = max hold

Time of Occupancy (Dwell Time):

The hopping function of the EUT is enabled. Use the spectrum analyzer setting as follows:

- Span = 0 Hz centered on a hopping channel
- RBW = 1 MHz
- VBW ≥ RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector = peak
- Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g. date rate modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

20 dB Bandwidth:

Use the spectrum analyzer setting as follows:

- Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
- RBW = 1% of the 20 dB bandwidth
- VBW ≥ RBW
- Sweep = auto
- Detector = peak
- Trace = max hold
- The transmitter shall be transmitting at its maximum data rate.
- Allow the trace to stabilize.
- Use the marker-to-peak function to set the marker to the peak of the emission.
- Use the marker-delta function to measure 20 dB down on both sides of the emission.
- The 20 dB BW is the delta reading in frequency between two markers.

6.6.3. Test Arrangement

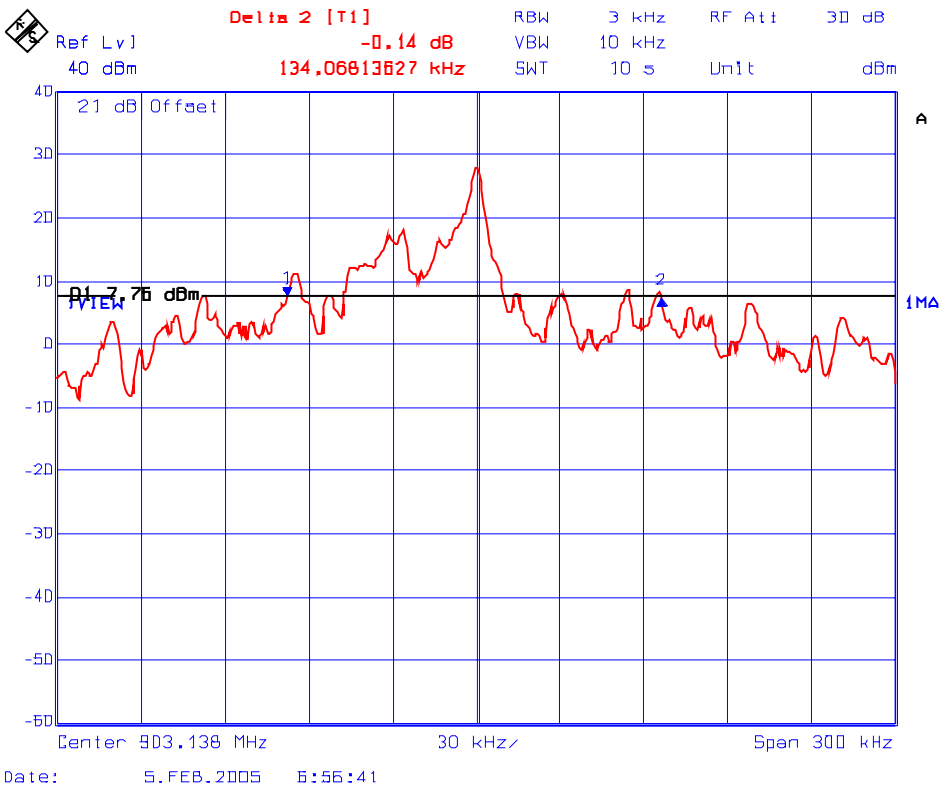
6.6.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9kHz – 40GHz

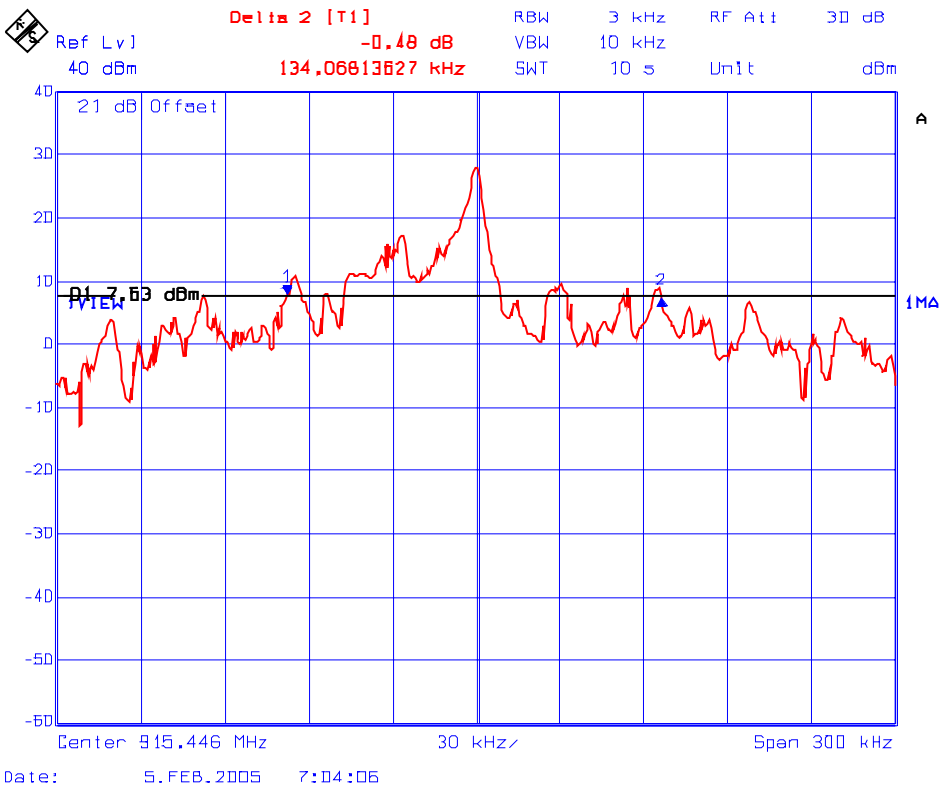
6.6.5. Test Data

Test Description	FCC Specification	Measured Values	Comments
20 dB BW of the hopping channel	500 kHz maximum	134.068 kHz	Pass; see plots 1 to 3 for measurement details.
Channel Hopping Frequency Separation	Minimum of 25 kHz or 20dB BW whichever is greater.	493 kHz	Pass; see plot 4 for measurement details.
Number hopping frequencies	At least 50 hopping frequencies	50 hopping frequencies	Pass; see plots 5 to 11 for measurement details
Average Time of Occupancy	Not greater than 0.4 seconds within 20 second period	89.88 ms within 20 second period	Pass; see plots 12 to 17 for measurement details.

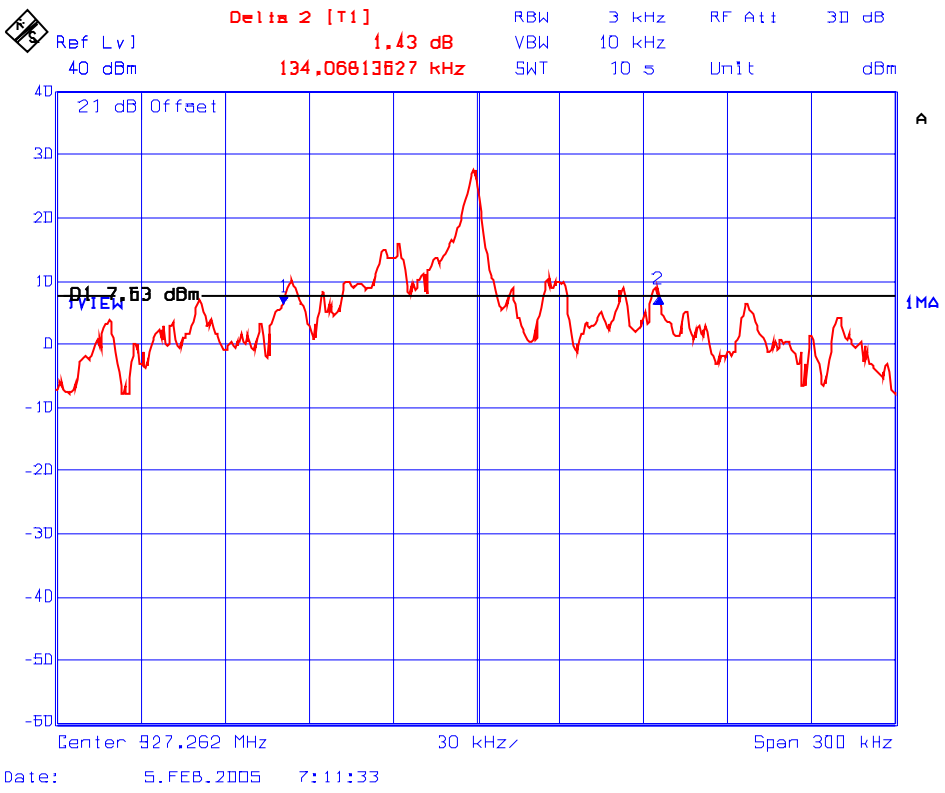
Plot 1:
20 dB Bandwidth
Test Frequency: 903.138 MHz



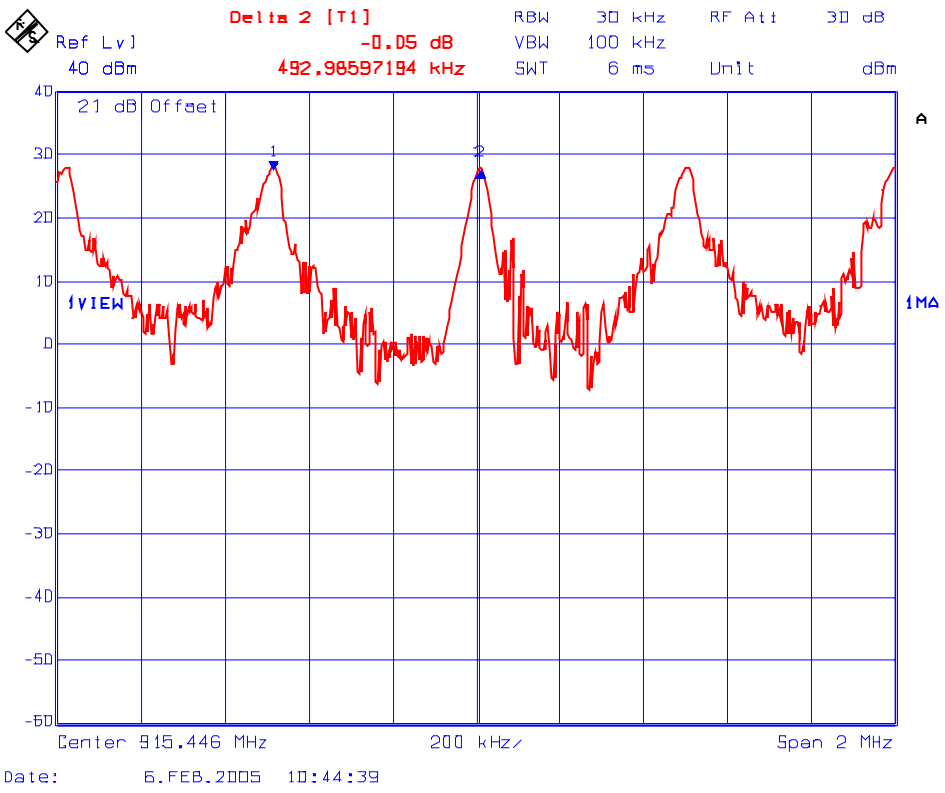
Plot 2:
20 dB Bandwidth
Test Frequency: 915.446 MHz



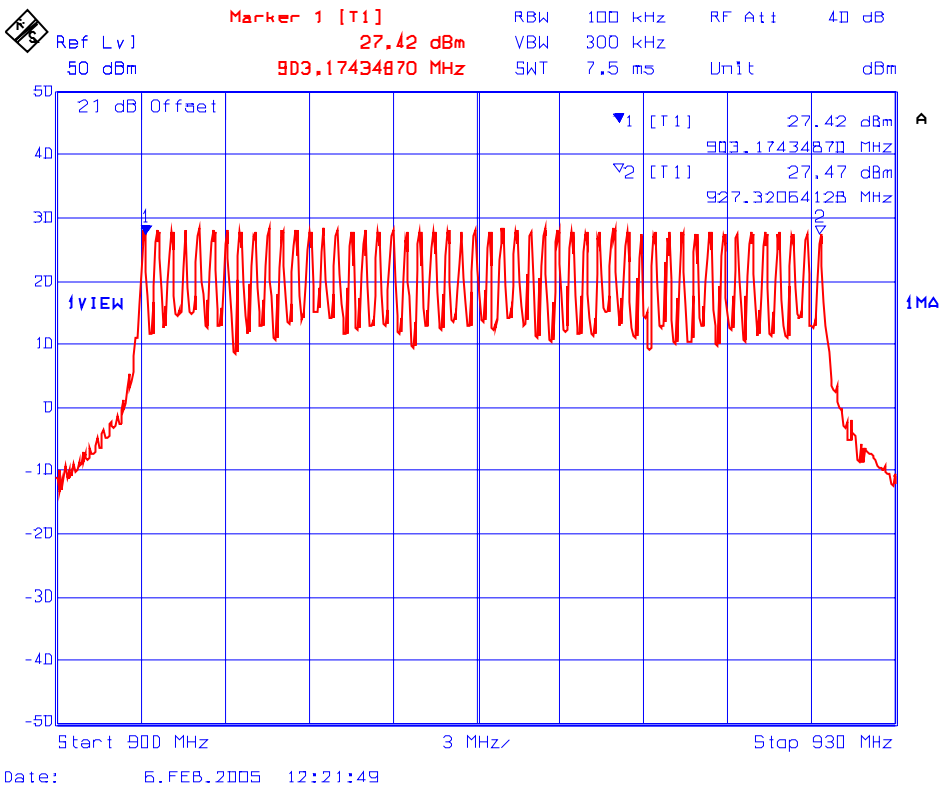
Plot 3:
20 dB Bandwidth
Test Frequency: 927.262 MHz



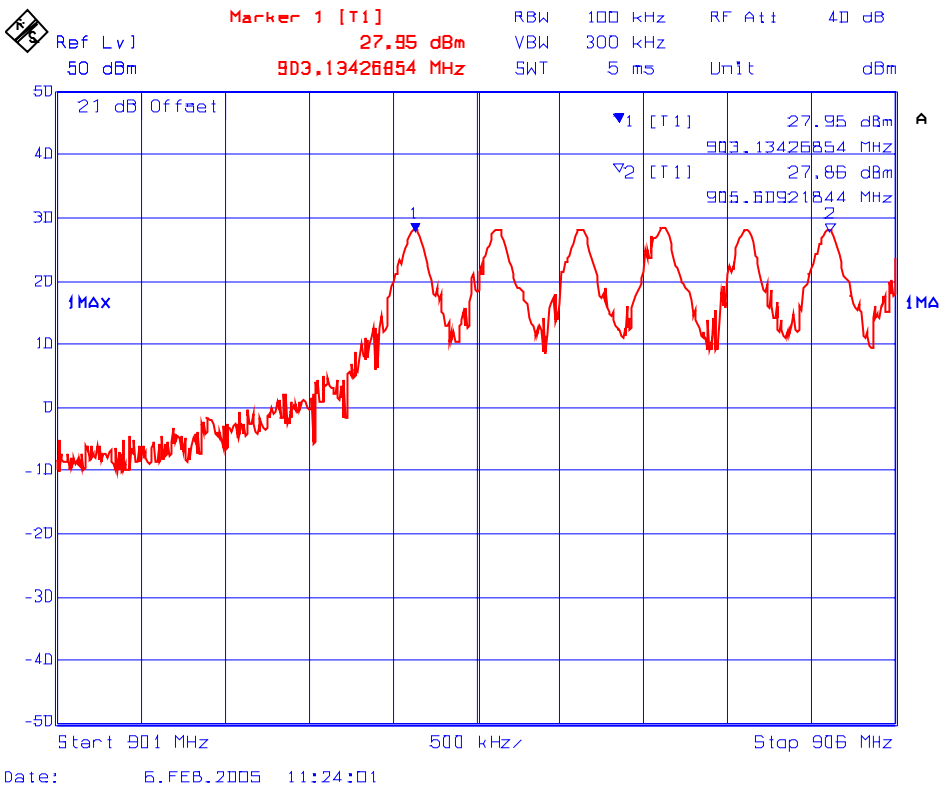
Plot 4:
Carrier Frequency Separation



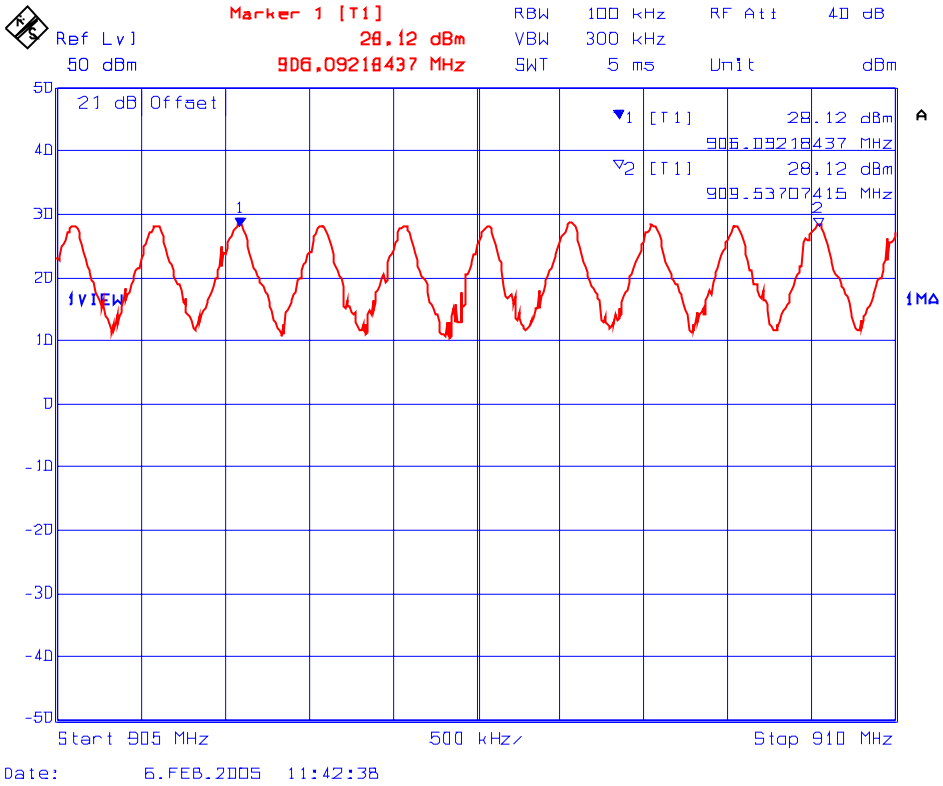
Plot 5:
Number of Hopping Frequencies
50 Hopping Frequencies (from 902 MHz to 928 MHz)



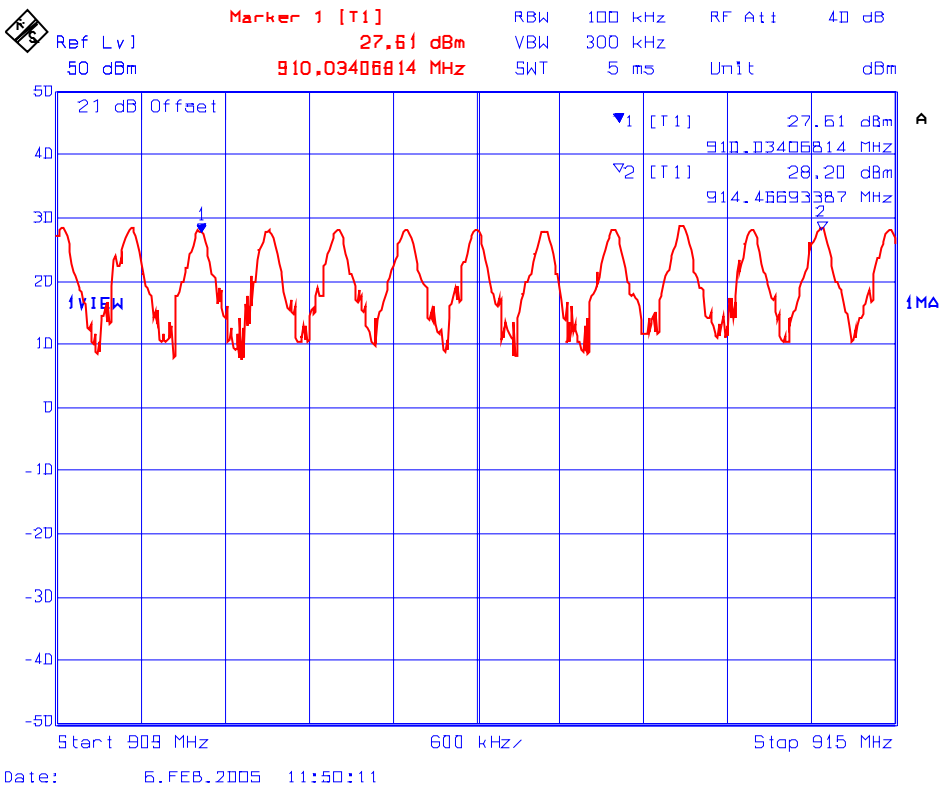
Plot 6:
Number of Hopping Frequencies
6 Hopping Frequencies (from 901 MHz to 906 MHz)



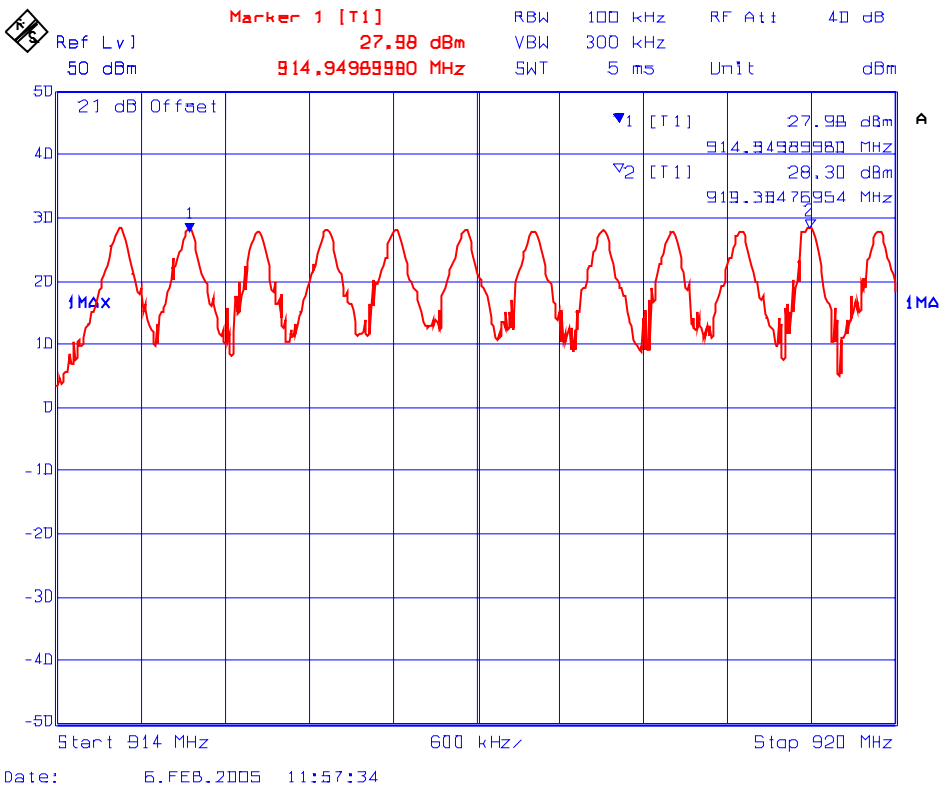
Plot 7:
Number of Hopping Frequencies
8 Hopping Frequencies (from 905 MHz to 910 MHz)



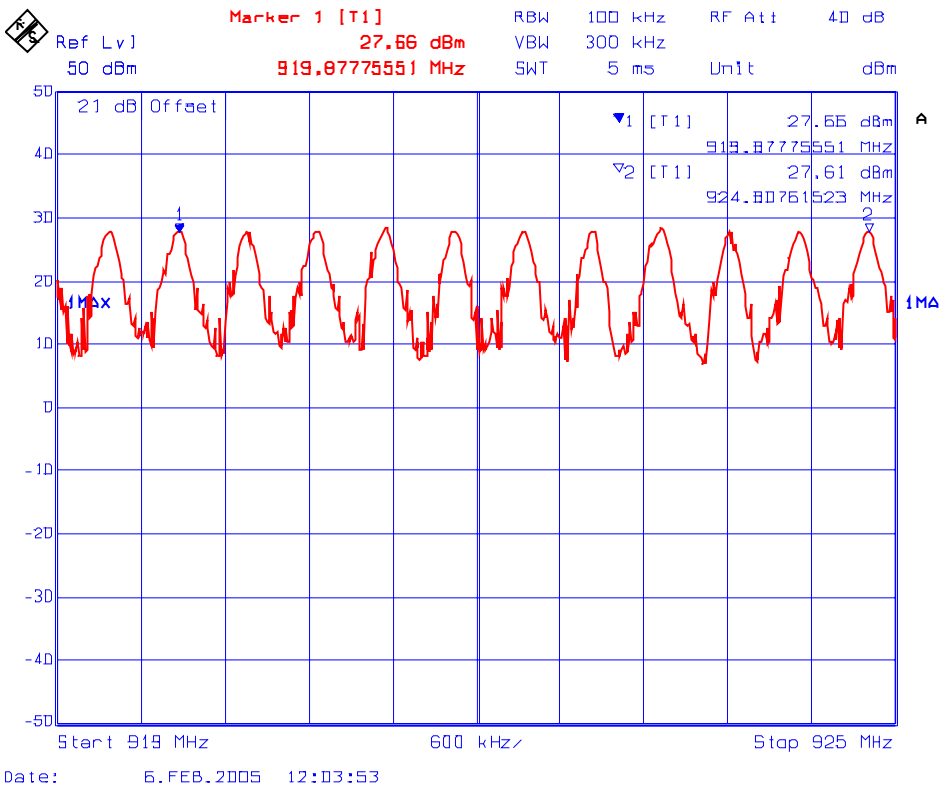
Plot 8:
Number of Hopping Frequencies
10 Hopping Frequencies (from 909 MHz to 915 MHz)



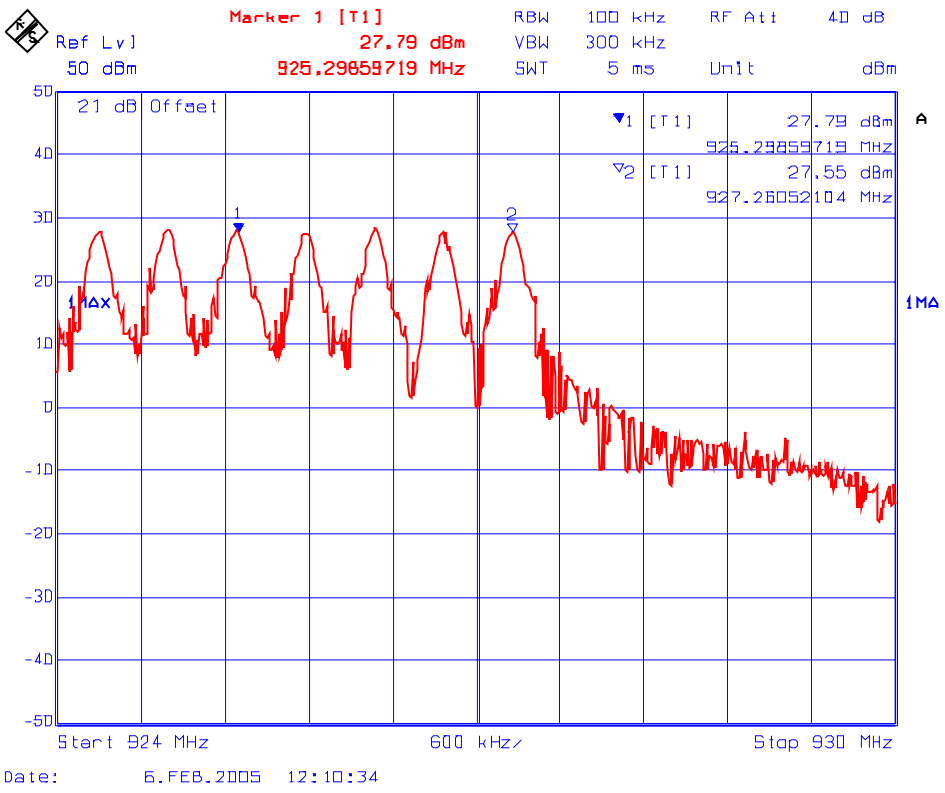
Plot 9:
Number of Hopping Frequencies
10 Hopping Frequencies (from 914 MHz to 920 MHz)



Plot 10:
Number of Hopping Frequencies
10 Hopping Frequencies (from 919 MHz to 925 MHz)

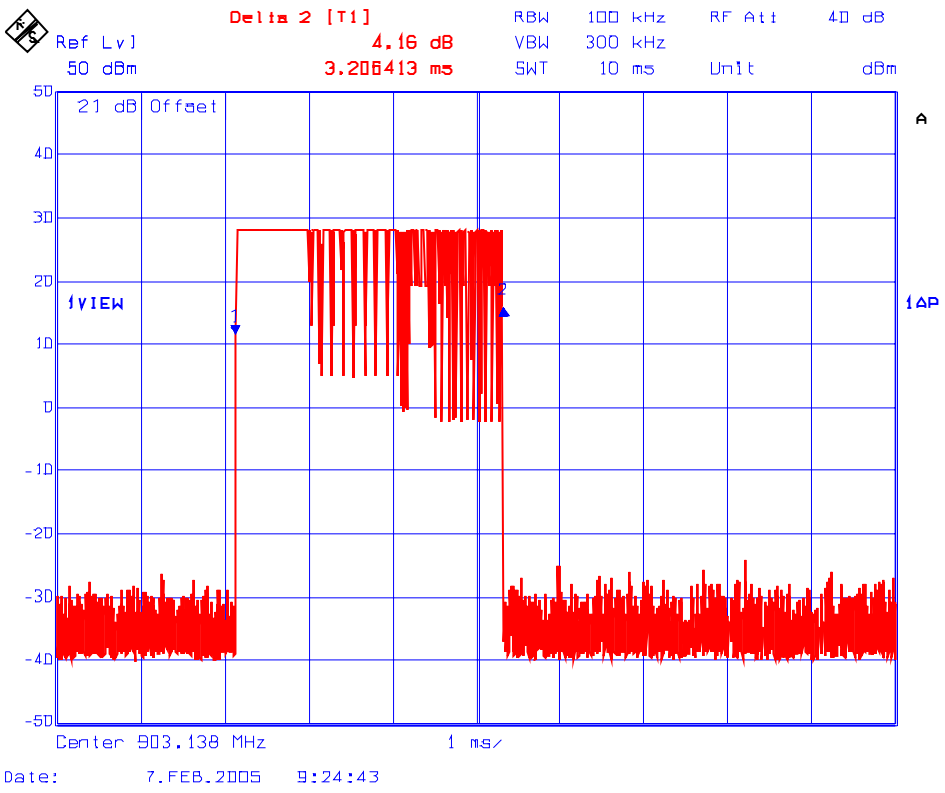


Plot 11:
Number of Hopping Frequencies
5 Hopping Frequencies (from 924 MHz to 930 MHz)



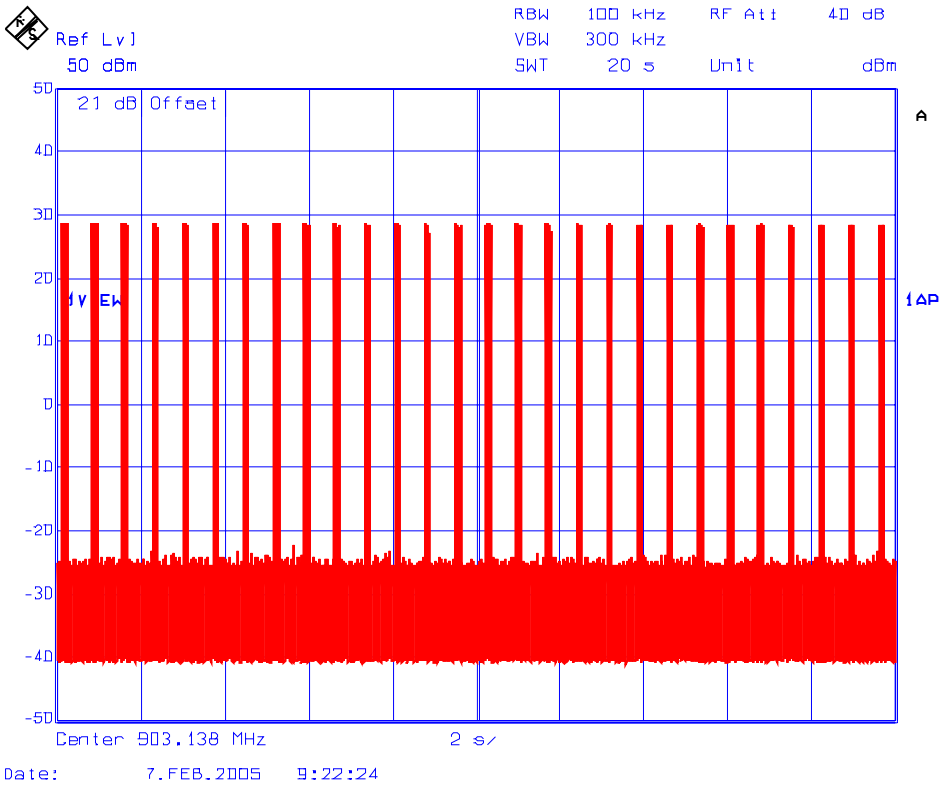
Plot 12:
Time of Occupancy
Test Frequency: 903.138 MHz

Dwell Time @ 903.138 MHz = 3.21 ms



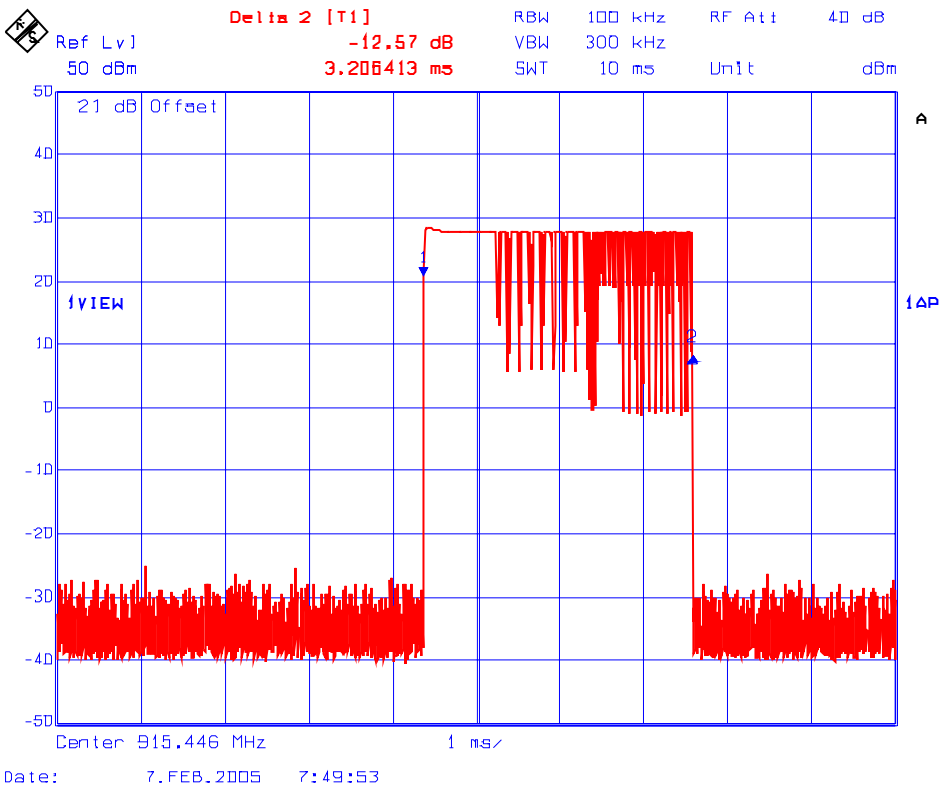
Plot 13:
Time of Occupancy
Test Frequency: 903.138 MHz

Average time of occupancy in 20 s = (Dwell Time @ 903.138 MHz) x (number of hops in 20 s)
= 3.21 ms x 28 = 89.88 ms



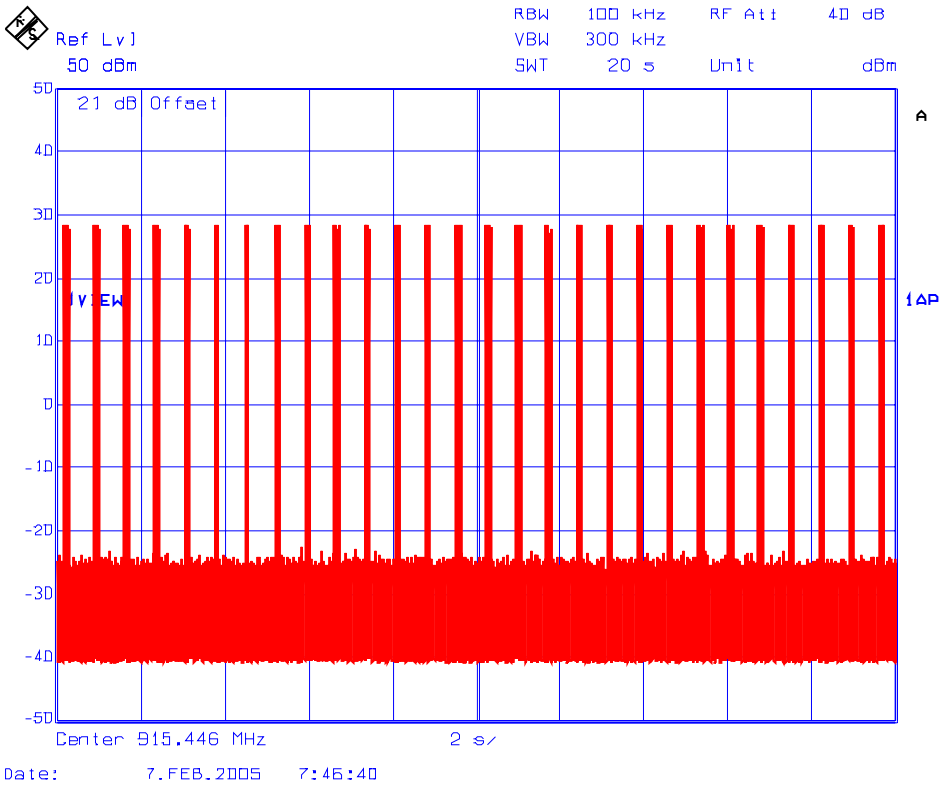
Plot 14:
Time of Occupancy
Test Frequency: 915.446 MHz

Dwell Time @ 915.446 MHz = 3.21 ms



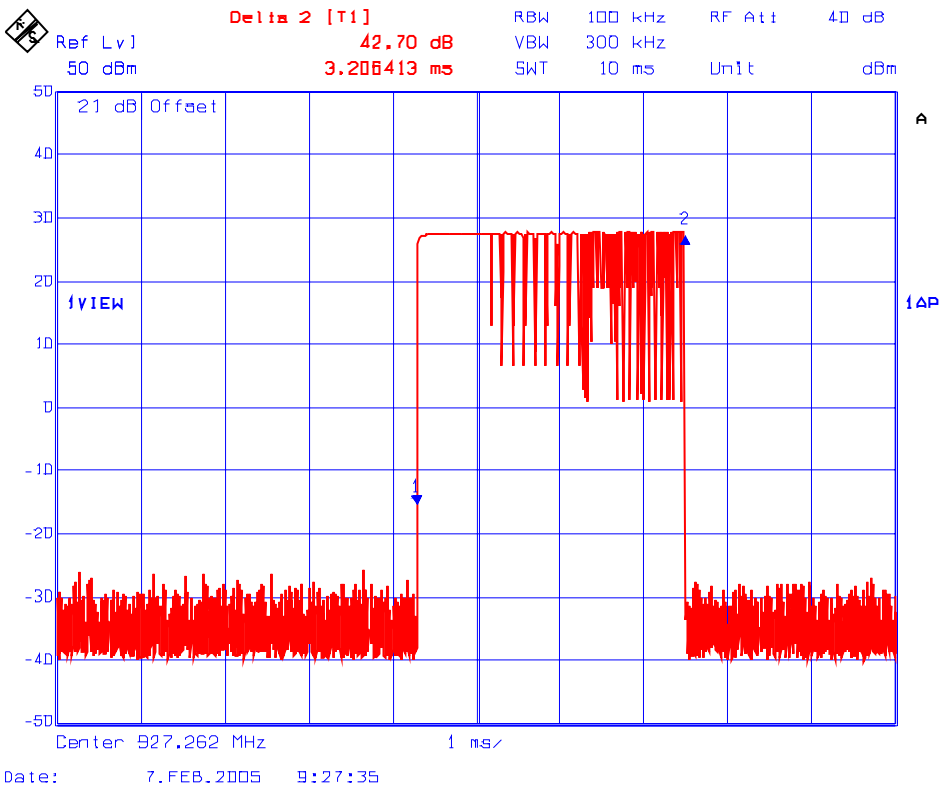
Plot 15:
Time of Occupancy
Test Frequency: 915.446 MHz

Average time of occupancy in 10 s = (Dwell Time @ 915.446 MHz) x (number of hops in 10 s)
= 3.21 ms x 28 = 89.88 ms



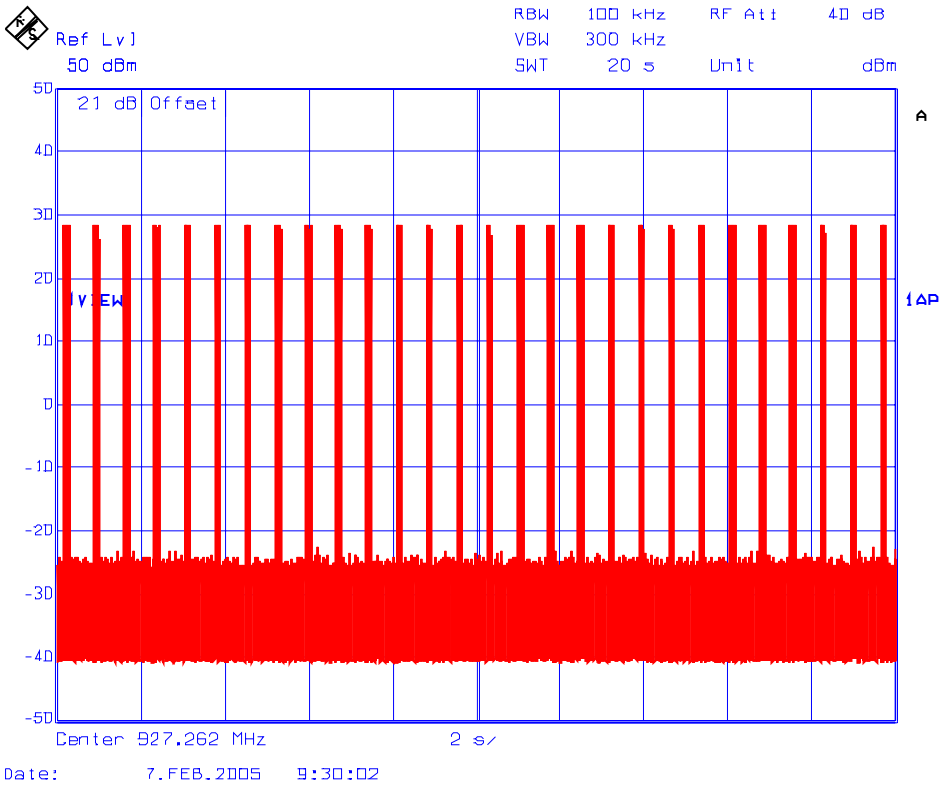
Plot 16:
Time of Occupancy
Test Frequency: 927.262 MHz

Dwell Time @ 927.262 MHz = 3.21 ms



Plot 17:
Time of Occupancy
Test Frequency: 927.262 MHz

Average time of occupancy in 10 s = (Dwell Time @ 927.262 MHz) x (number of hops in 10 s)
= 3.21 ms x 28 = 89.88 ms



FCC Specification	Manufacturer's Explanation
FCC Requirement @ Section 15.247(a)(1): The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals	Conform. Refer to section 6.5 of this report.
FCC Requirement @ Section 15.247(g): Describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system	Conform. Refer to section 6.5 of this report.
FCC Requirement @ Section 15.247(h): Describe how the EUT complies with the requirement that it does not have the ability to coordinated with other FHSS is an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters	Conform. Refer to section 6.5 of this report.

6.7. PEAK OUTPUT POWER & EQUIVALENT ISOTROPIC RADIATED POWER (EIRP) [§ 15.247(b)]

6.7.1. Limits

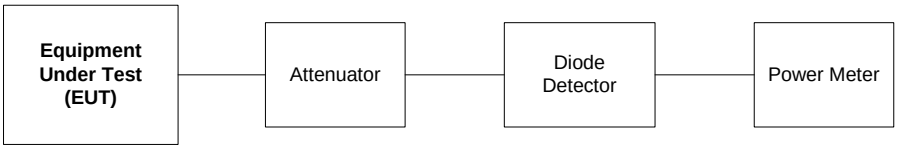
§15.247(b)(2): For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

§15.247(b)(4): If the antennas of directional gain greater than 6 dBi are used, the peak power from the intentional radiator shall be reduced below, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.7.2. Method of Measurements

Refer to Exhibit 8, Section 8.2 and ANSI C63.4.

6.7.3. Test Arrangement



6.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Hewlett Packard	436A	2709A27515	10kHz – 50 GHz, sensor dependent
Attenuator	Weinschel Corp	48-30-34	BM5354	DC – 18 GHz
Diode Detector	Narda	503A-03	0105	0.01 – 18 GHz

6.7.5. Test Data

Transmitter Channel	Frequency (MHz)	Peak Power at Antenna Terminal (dBm)	Maximum Antenna Gain (dBi)	Calculated EIRP (dBm)	Limit for Power at Antenna Port (dBm)	EIRP Limit (dBm)
1	903.138	29.14	0	29.14	30.0	36.0
26	915.446	29.22	0	29.22	30.0	36.0
50	927.262	29.38	0	29.38	30.0	36.0

6.8. TRANSMITTER BAND-EDGE & SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

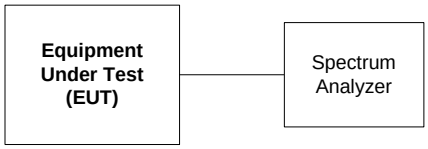
6.8.1. Limits

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power.

6.8.2. Method of Measurements

Refer to Exhibit 8, Section 8.3 of this test report.

6.8.3. Test Arrangement



6.8.4. Test Equipment List

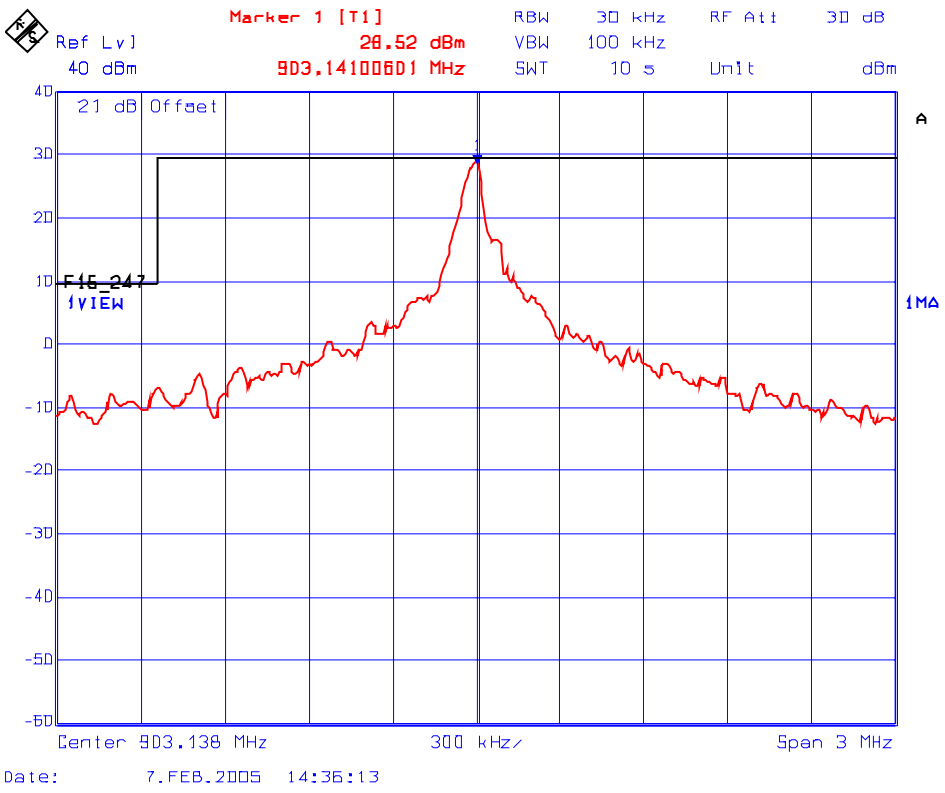
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK20/B4/B21	834157/005	9kHz – 40GHz

6.8.5. Test Data

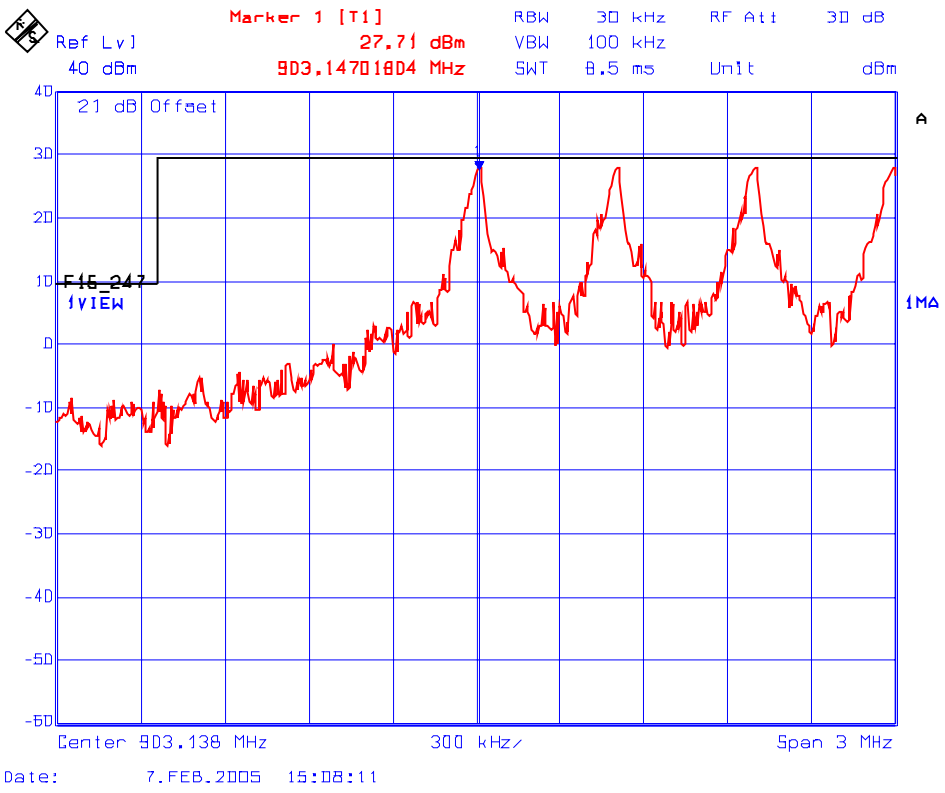
6.8.5.1. Band-Edge RF Conducted Emissions

Refer to the following test data plots (18 to 21) for measurements results.

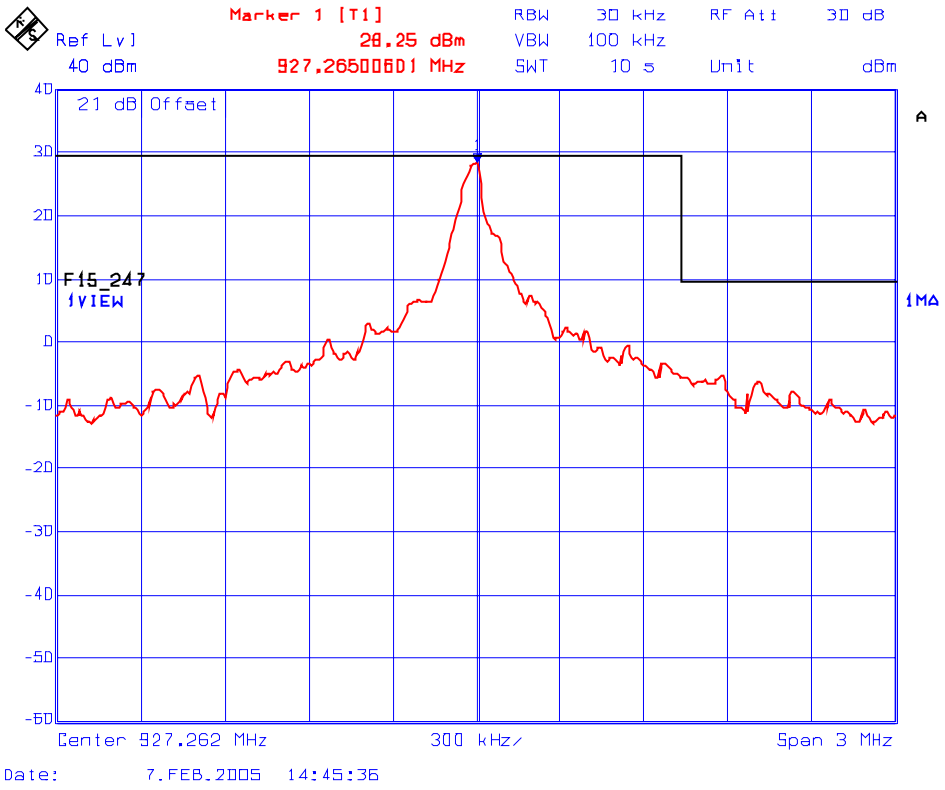
Plot 18:
Band-Edge RF Conducted Emissions
Low End of Frequency Band
Single Frequency Mode



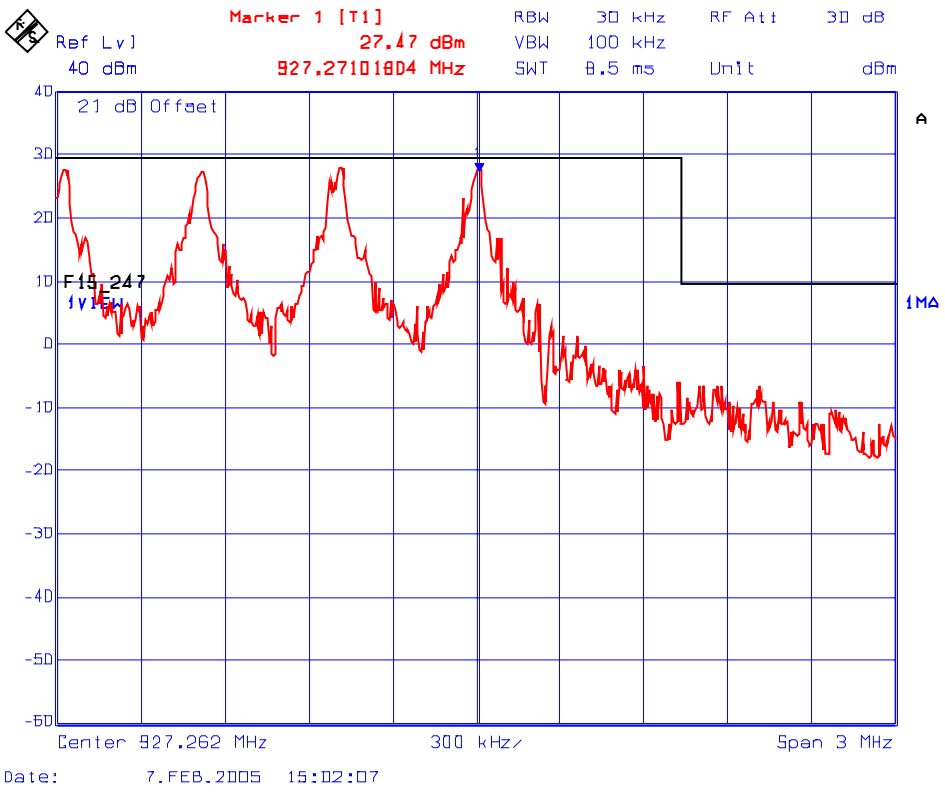
Plot 19:
Band-Edge RF Conducted Emissions
Low End of Frequency Band
Pseudorandom Channel Hopping Mode



Plot 20:
Band-Edge RF Conducted Emissions
High End of Frequency Band
Single Frequency Mode



Plot 21:
Band-Edge RF Conducted Emissions
High End of Frequency Band
Pseudorandom Channel Hopping Mode

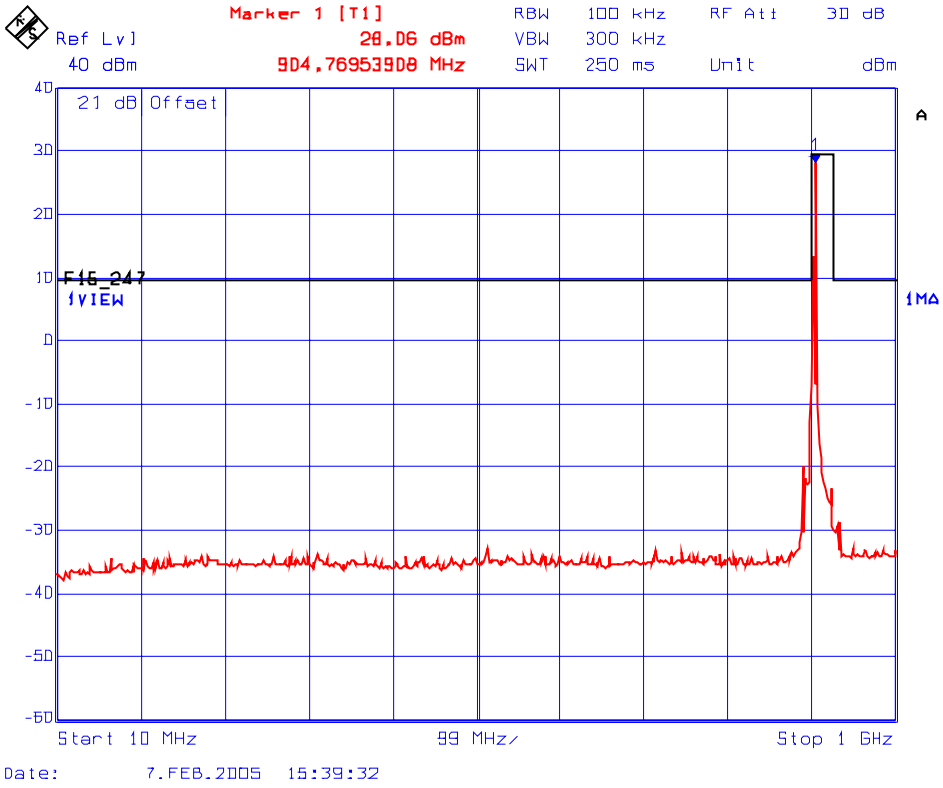


6.8.5.2. Spurious RF Conducted Emissions

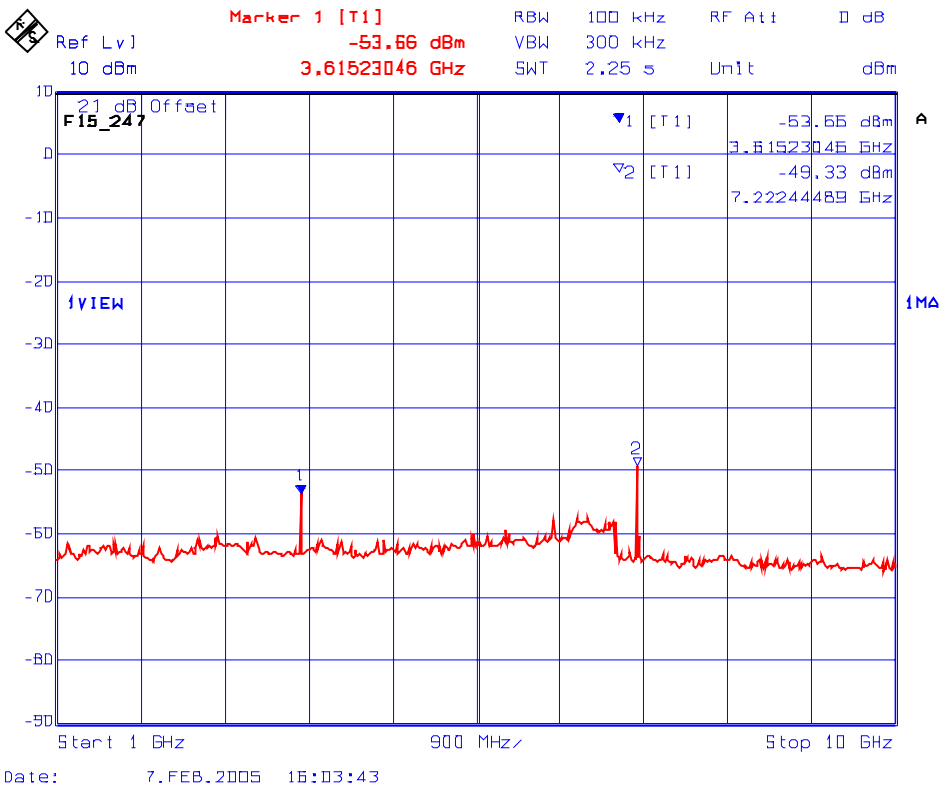
6.8.5.2.1. Lowest Frequency (903.138 MHz)

The emissions were scanned from 10 MHz to 10 GHz; refer to the following test data (plots 22 to 23) for measurement results.

Plot 22:
Spurious RF Conducted Emissions
Transmitter Frequency: 903.138 MHz



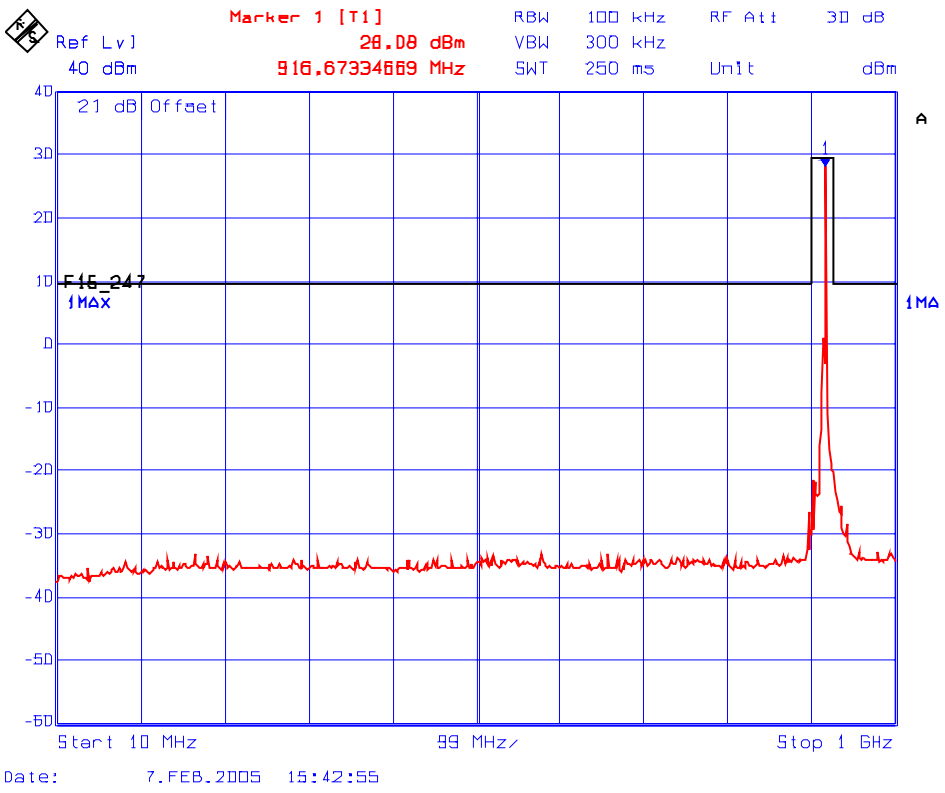
Plot 23:
Spurious RF Conducted Emissions
Transmitter Frequency: 903.138 MHz



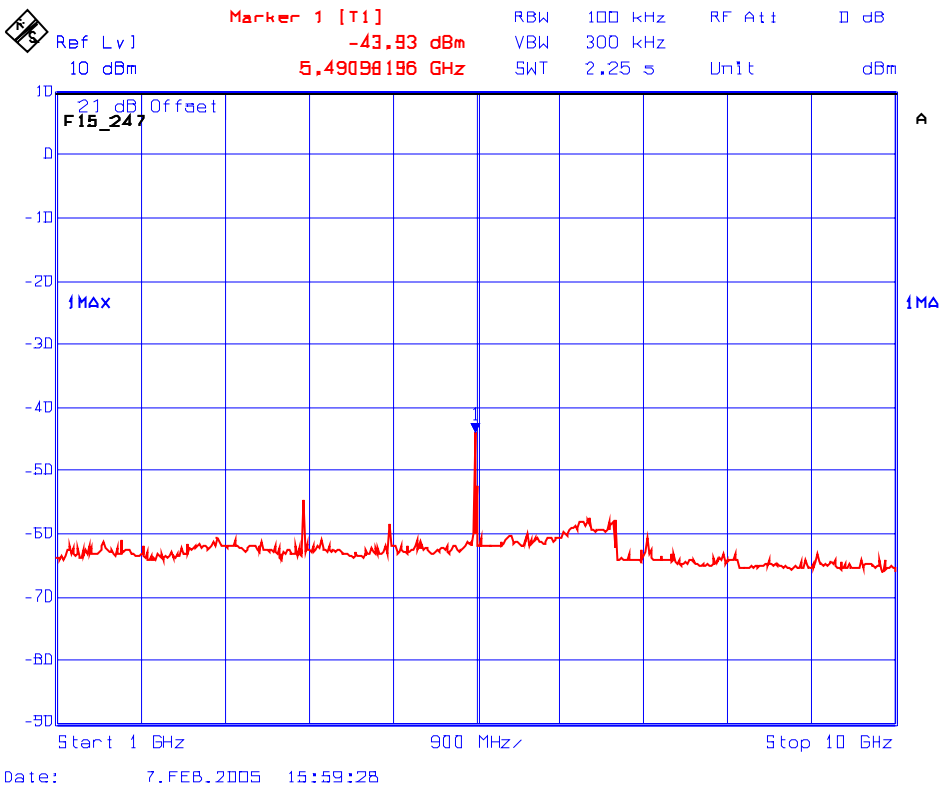
6.8.5.2.2. Middle Frequency (915.446 MHz)

The emissions were scanned from 10 MHz to 10 GHz; refer to the following test data (plots 24 to 25) for measurements results.

Plot 24:
Spurious RF Conducted Emissions
Transmitter Frequency: 915.446 MHz



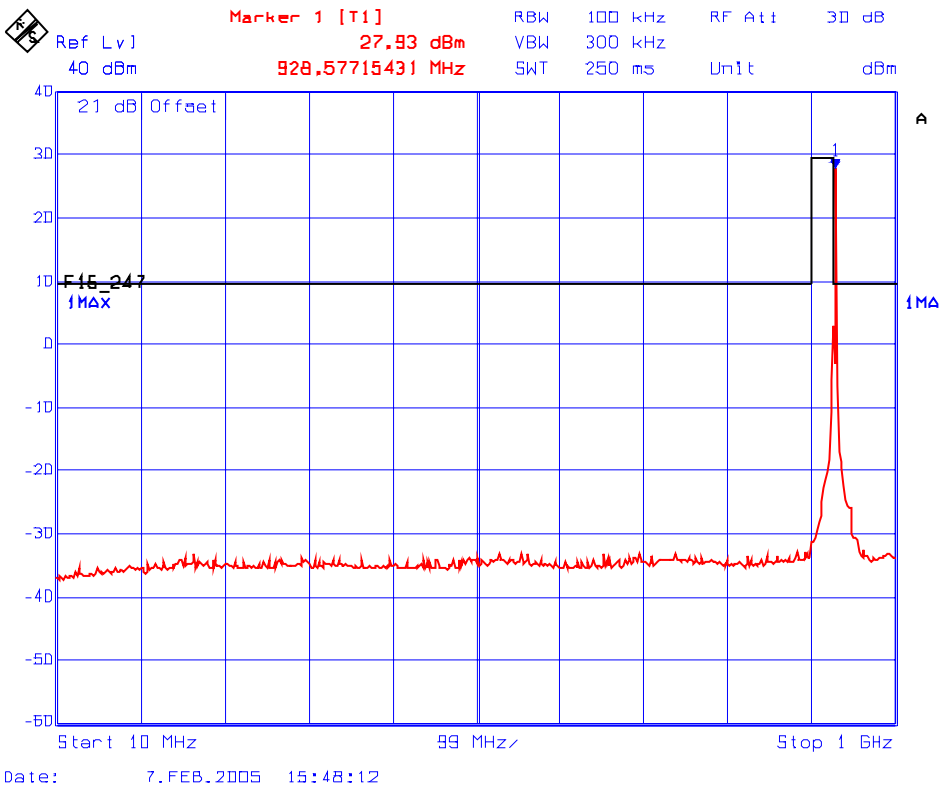
Plot 25:
Spurious RF Conducted Emissions
Transmitter Frequency: 915.446 MHz



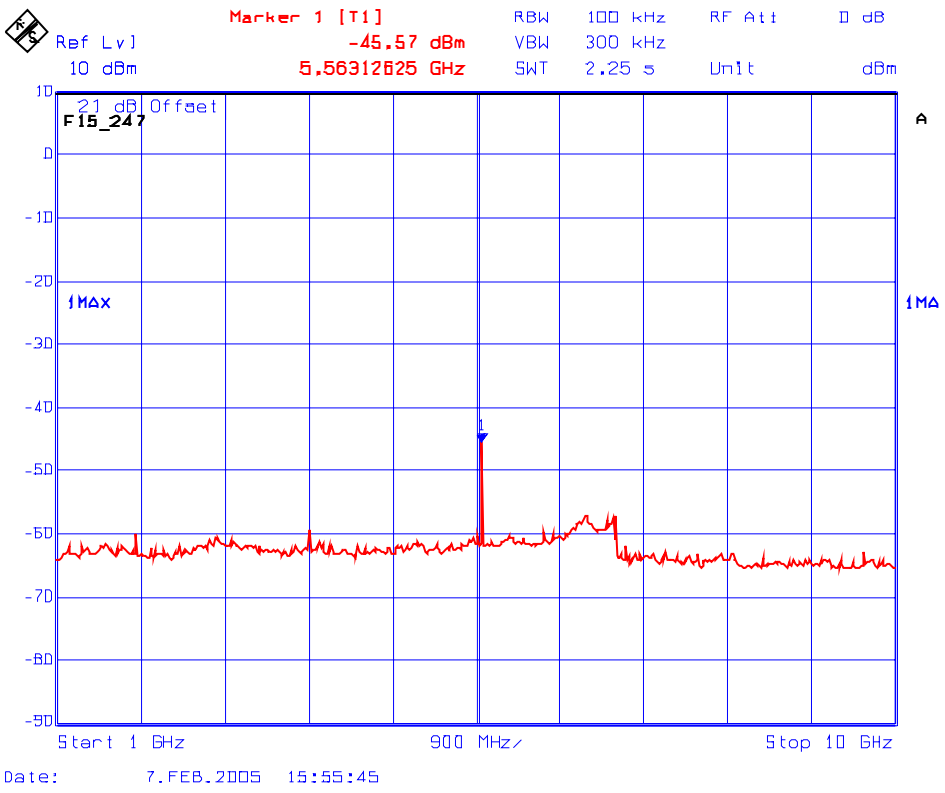
6.8.5.2.3. Highest Frequency (927.262 MHz)

The emissions were scanned from 10 MHz to 10 GHz; refer to the following test data (plots 26 to 27) for measurements results.

Plot 26:
Spurious RF Conducted Emissions
Transmitter Frequency: 927.262 MHz



Plot 27:
Spurious RF Conducted Emissions
Transmitter Frequency: 927.262 MHz



6.9. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METTERS [§§15.247 (d), 15.209 & 15.205]

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in section 15.209(a), which lesser attenuation.

All other emissions inside restricted bands specified in section 15.205(a) shall not exceed the general radiated emission limits specified in section 15.209(a).

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- @ **FCC 47 CFR 15.237(c)** - The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in **@15.35** for limiting peak emissions apply.

FCC 47 CFR 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 – 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 – 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 – 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 – 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 – 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 – 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 – 156.9	2200 - 2300	9000 - 9200	

FCC 47 CFR 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

6.9.1. Method of Measurements

Refer to Exhibit 8, Section 8.3 of this test report and ANSI 63.4 for detailed radiated emissions measurement procedures.

The following measurement procedures were also applied:

- Applies to harmonics/spurious that fall in the restricted bands listed in Section 15.205. the maximum permitted average field strength is listed in Section 15.209. A Pre-Amp and highpass filter are used for this measurement.
- For measurement below 1 GHz, set RBW = 100 KHz, VBW $\geq$ 100 KHz, SWEEP=AUTO.
- For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz (Peak) & VBW = 10 Hz (Average), SWEEP=AUTO.
- If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

6.9.2. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rohde & Schwarz	FSEK20/B4/B21	834157/005	9 kHz- 40 GHz
Microwave Amplifier	Hewlett Packard	8449B	3008A00769	1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
High Pass Filter	K & L	11SH10-4000/T12000	4	2 – 26 GHz

6.9.3. Test Data

6.9.3.1. Lowest Frequency (903.138 MHz)

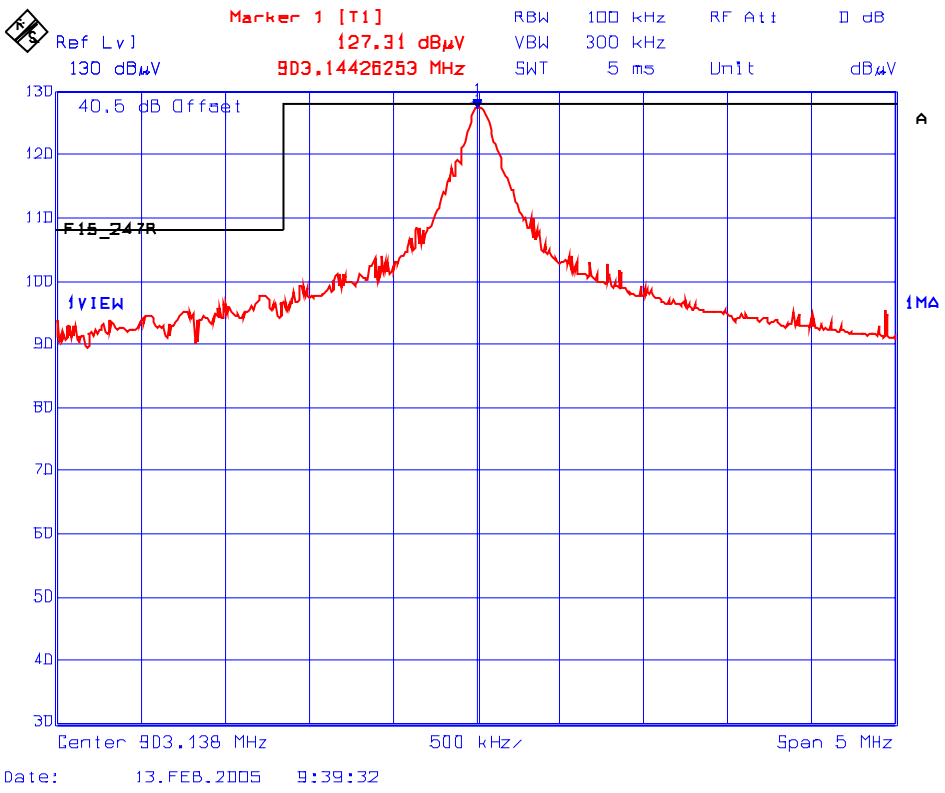
Fundamental Frequency: 903.138 MHz
Modulation: FHSS
Frequency Test Range: 10 MHz – 10 GHz

Frequency (MHz)	RF Peak Level @ 3m (dBµV/m)	RF Avg Level @ 3m (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
903.1	127.31	--	V	--	--	--	Pass
903.1	123.97	--	H	--	--	--	Pass
2709.4	60.33	40.67	V	54.0	107.3	-13.3	Pass*
2709.4	58.73	41.48	H	54.0	107.3	-12.5	Pass*
3612.6	66.66	39.11	V	54.0	107.3	-14.9	Pass*
3612.6	64.71	39.06	H	54.0	107.3	-14.9	Pass*
4515.7	53.82	37.68	V	54.0	107.3	-16.3	Pass*
4515.7	55.23	38.26	H	54.0	107.3	-15.7	Pass*
5418.8	61.34	39.58	V	54.0	107.3	-14.4	Pass*
5418.8	62.15	39.39	H	54.0	107.3	-14.6	Pass*

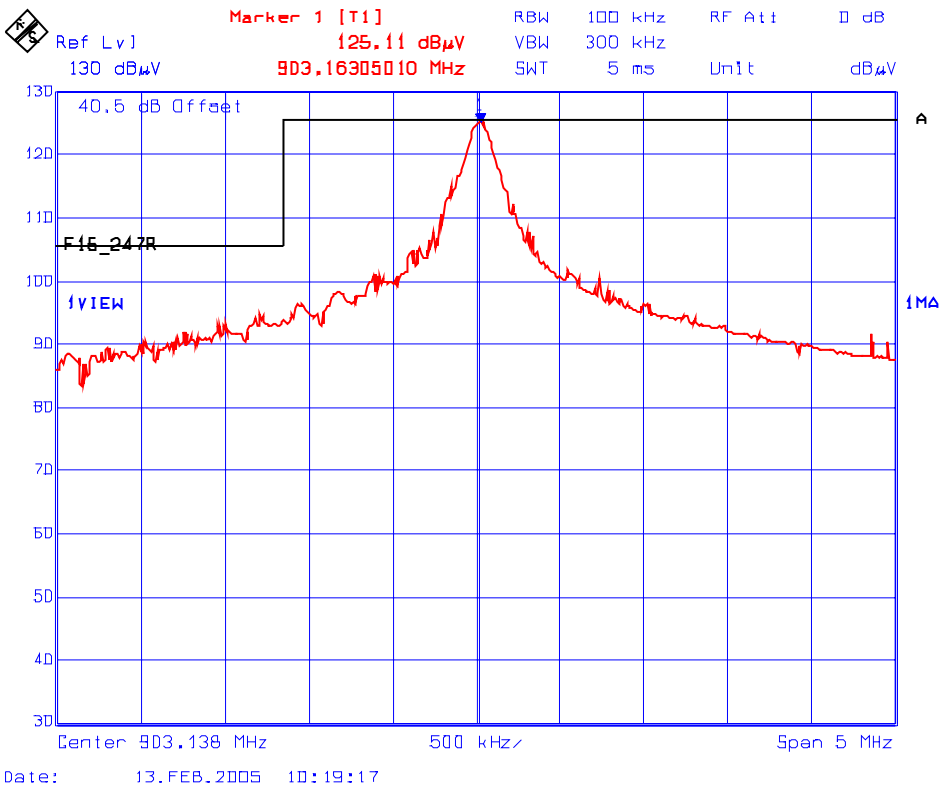
- All other spurious emissions and harmonics are more than 20 dB below the applicable limit. See test data plots (28 to 29) for band-edge emissions.
- Portable transmitter was placed in three different orthogonal positions for searching maximum field strength level.

* Frequency in restricted bands, therefore FCC 15.209 limit applied.

Plot #28:
Band-Edge Radiated Emissions @ 3 Meters (Vertical Polarization)
Low End of Frequency Band
Test Frequency: 903.138



Plot #29:
Band-Edge Radiated Emissions @ 3 Meters (Horizontal Polarization)
Low End of Frequency Band
Test Frequency: 903.138 MHz



6.9.3.2. Middle Frequency (915.446 MHz)

Fundamental Frequency: 915.446 MHz
Modulation: FHSS
Frequency Test Range: 10 MHz – 10 GHz

Frequency (MHz)	RF Peak Level @ 3m (dBµV/m)	RF Avg Level @ 3m (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
915.4	126.49	--	V	--	--	--	Pass
915.4	125.25	--	H	--	--	--	Pass
3661.8	58.63	39.59	V	54.0	106.5	-14.4	Pass*
3661.8	59.68	39.38	H	54.0	106.5	-14.6	Pass*
4577.2	53.79	37.17	V	54.0	106.5	-16.8	Pass*
4577.2	54.54	37.07	H	54.0	106.5	-16.9	Pass*
7323.6	54.46	38.89	V	54.0	106.5	-15.1	Pass*
7323.6	57.22	40.01	H	54.0	106.5	-14.0	Pass*

- All other spurious emissions and harmonics are more than 20 dB below the applicable limit.
- Portable transmitter was placed in three different orthogonal positions for searching maximum field strength level.

* Frequency in restricted bands, therefore FCC 15.209 limit applied.

6.9.3.3. Highest Frequency (927.262 MHz)

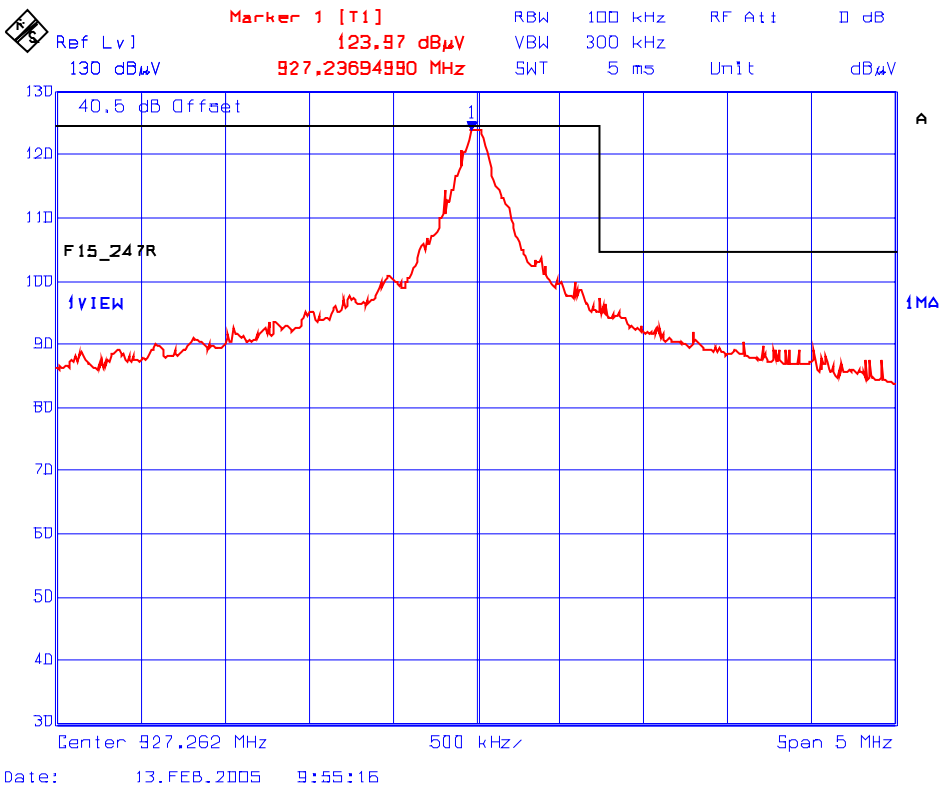
Fundamental Frequency:	927.262 MHz
Modulation:	FHSS
Frequency Test Range:	10 MHz – 10 GHz

Frequency (MHz)	RF Peak Level @ 3m (dBµV/m)	RF Avg Level @ 3m (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/ Fail
927.3	125.11	--	V	--	--	--	--
927.3	121.72	--	H	--	--	--	--
2781.8	56.10	36.12	V	54.0	105.1	-17.9	Pass*
2781.8	57.14	36.89	H	54.0	105.1	-17.1	Pass*
3709.0	55.50	37.59	V	54.0	105.1	-16.4	Pass*
3709.0	60.40	39.99	H	54.0	105.1	-14.0	Pass*
4636.3	54.06	36.50	V	54.0	105.1	-17.5	Pass*
4636.3	52.99	36.82	H	54.0	105.1	-17.2	Pass*
7418.1	54.22	39.45	V	54.0	105.1	-14.6	Pass*
7418.1	55.85	39.90	H	54.0	105.1	-14.1	Pass*

- All other spurious emissions and harmonics are more than 20 dB below the applicable limit. See test data plots (30 to 31).
- Portable transmitter was placed in three different orthogonal positions for searching maximum field strength level.

* Frequency in restricted bands, therefore FCC 15.209 limit applied.

Plot #30:
Band-Edge Radiated Emissions @ 3 Meters (Vertical Polarization)
Upper End of Frequency Band
Test Frequency: 927.262 MHz



Plot #31:
Band-Edge Radiated Emissions @ 3 Meters (Horizontal Polarization)
Upper End of Frequency Band
Test Frequency: 927.262 MHz

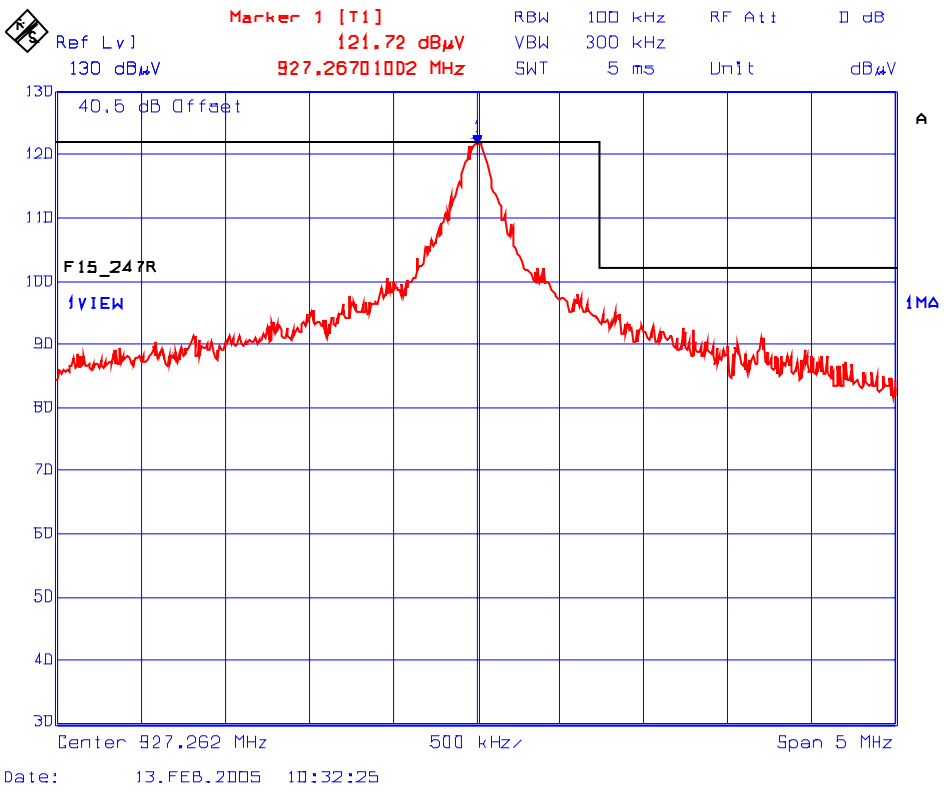


EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB and $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 8. MEASUREMENT METHODS

8.1. GENERAL TEST CONDITIONS

The following test conditions shall be applied throughout the tests covered in this report.

8.1.1. Normal temperature and humidity

- Normal temperature: +15°C to +35°C
- Relative Humidity: +20% to 75%

The actual values during tests shall be recorded in the test report.

8.1.2. Normal power source

8.1.2.1. Mains Voltage

The nominal test voltage of the equipment to be connected to mains shall be the nominal mains voltage which is the declared voltage or any of the declared voltages for which the equipment was designed. The frequency of test power source corresponding to the AC mains shall be between 59 Hz and 61 Hz.

8.1.2.2. Battery Power Source.

For operation from battery power sources, the nominal test voltage shall be as declared by the equipment manufacturer. This shall be recorded in the test report.

8.1.3. Operating Condition of Equipment under Test

- All tests were carried out while the equipment operated at the following frequencies:
  - The lowest operating frequency,
  - The middle operating frequency and
  - The highest operating frequency

- Modulation were applied using the Test Data sequence
- The transmitter was operated at the highest output power, or in the case the equipment able to operate at more than one power level, at the lowest and highest output powers

8.2. EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

8.2.1. Measurements of Transmitter Parameters (Duty Cycle & Peak Power)

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle Measurements

- Using a spectrum analyzer with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;

- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

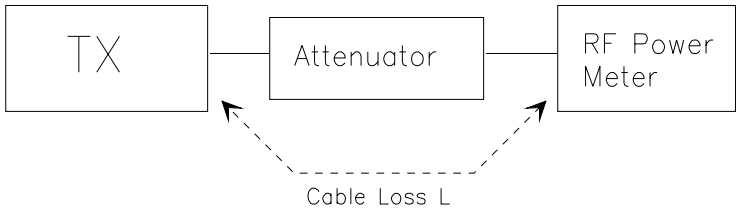
Step 2: Calculation of Peak and Average EIRP

- The peak output power of the transmitter shall be determined using a wideband, calibrated RF Peak Power Meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as “P” (in dBm);

- The Average EIRP shall be calculated from the above measured power output “A”, the observed duty cycle x, and the applicable antenna assembly gain “G” in dBi, according to the formula:

Peak EIRP = P + G
Average EIRP = Peak EIRP + 10log(1/x)

Figure 1



Step 3: Substitution Method. See Figure 2

(a) The measurements was performed in the absence of modulation (un-modulated)

(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).

(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)

(d) The dipole test antenna was used and tuned to the transmitter carrier frequency.

(e) The spectrum analyzer was tuned to transmitter carrier frequency. The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.

(f) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.

(g) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.

(h) The substitution dipole antenna and the signal generator replaced the transmitter and antenna under test in the same position, and the substitution dipole antenna was placed in vertical polarization. The test dipole antenna was lowered or raised as necessary to ensure that the maximum signal is stilled received.

(i) The input signal to the substitution antenna was adjusted in level until an equal or a known related level to that detected from the transmitter was obtained in the test receiver. The maximum carrier radiated power is equal to the power supply by the generator.

(j) The substitution antenna gain and cable loss were added to the signal generator level for the corrected ERP level.

(k) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.

(l) Actual gain of the EUT's antenna is the difference of the measured ERP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

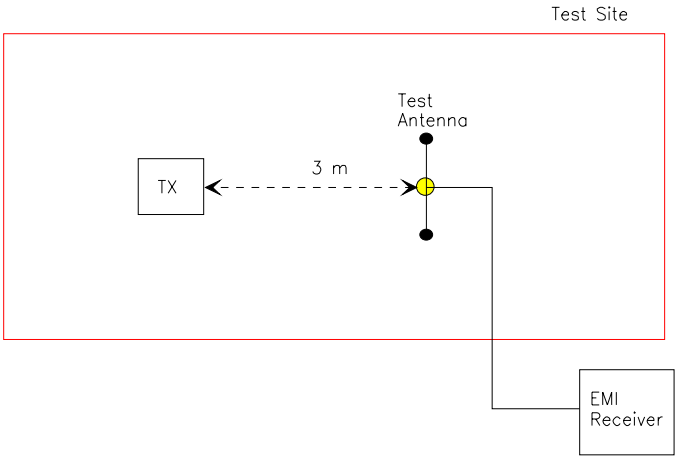
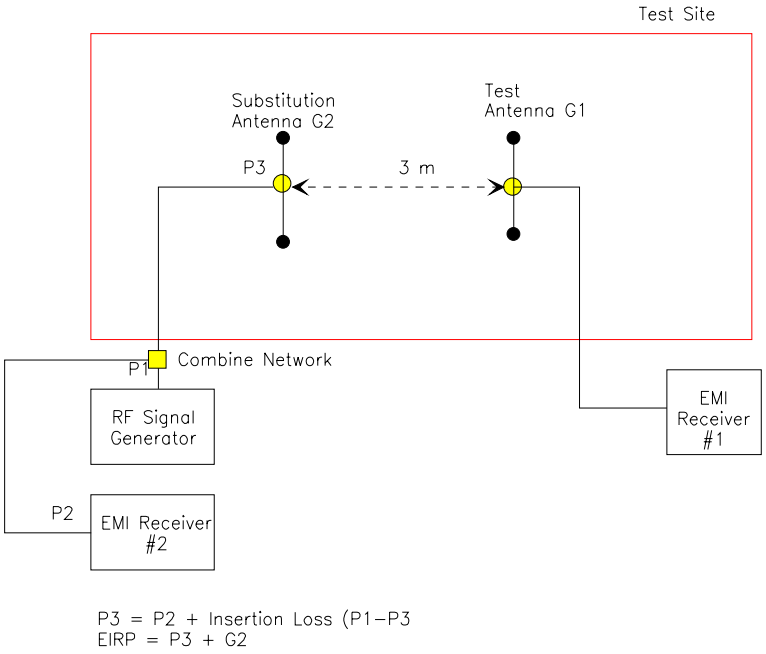


Figure 3



Use the following spectrum analyzer settings:

- Span = approximately 5 times the 20 dB BW, centered on a hopping channel
- RBW > 20 dB BW of the emission measured
- VBW = RBW
- Trace = max hold
- Allow the trace to stabilize
- Use the marker-to-marker function to set the marker to the peak of the emission.
- The indicated level is the peak output power (with the addition of the external attenuation and cable loss).
- The limit is specified in one of the subparagraph of this Section.
- Submit this plot.
- A peak responding power meter may be used instead of a spectrum analyzer.

8.3. SPURIOUS EMISSIONS (CONDUCTED & RADIATED)

For both conducted and radiated measurements, the spurious emissions were scanned from the lowest frequency generated by the EUT or 10 MHz whichever is lower to 10th harmonic of the highest frequency generated by the EUT.

8.3.1. Band-edge and Spurious Emissions (Conducted)

Band-edge Compliance of RF Conducted Emissions:

Use the following spectrum analyzer settings:

- The radio was connected to the measuring equipment via a suitable attenuator.
- Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
- RBW = 1 % of the span
- VBW = RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize
- Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge
- Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission.
- The marker-delta value now displayed must comply with the limit specified
- Now, using the same instrument settings, enable the hopping function of the EUT
- Allow the trace to stabilize
- Follow the same procedure listed above to determine if any spurious emissions cause by the hopping function also comply with the specify limits.
- Submit this plot

Spurious RF Conducted Emissions:
Use the following spectrum analyzer settings:

- The radio was connected to the measuring equipment via a suitable attenuator.

- Span = wide enough to capture the peak level of the in-band-emission and all spurious emissions (e.g. harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, sevral plots are required to cover this entire span.
- RBW = 100 kHz
- VBW = RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize
- Set the marker on the any spurious emission recorded. The level displayed must comply with the limit specified in this Section.
- Submit this plot

8.3.2. Spurious Emissions (Radiated)

- The radiated emission measurements were performed at the UltraTech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC, Industry Canada, ACA/Austel, NVLap and ITI.
- Radiated emissions measurements were made using the following test instruments:

1. Calibrated EMCO BiconiLog antenna in the frequency range from 30 MHz to 2000 MHz.
2. Calibrated Emco Horn antennas in the frequency range above 1000 MHz (1GHz - 40 GHz).
3. The test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

   - RBW = 100 kHz for f < 1GHz and RBW = 1 MHz for f $\geq$ 1 GHz
   - VBW = RBW
   - Sweep = auto
   - Detector function = peak
   - Trace = max hold
   - Follows the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc.. A pre-amp and highpass filter are required for this test, in order to provide the measuring system with sufficient sensitivity.
   - Allow the trace to stabilize.
   - The peak reading of the emission, after being corrected by the antenna correction factor, cable loss, pre-amp gain, etc…. is the peak field strength which comply with the limit specified in Section 15.35(b)

     Calculation of Field Strength:

     The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

     $$FS = RA + AF + CF - AG$$

Where FS = Field Strength
RA = Receiver/Analyzer Reading
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

Field Level = 60 + 7.0 + 1.0 - 30 = 38.0 dBuV/m.
Field Level = $10^{(38/20)}$ = 79.43 uV/m.

   - Submit this test data
   - Now set the VBW to 10Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel

of the hopping signal is less than 100ms, then the reading obtained may be further adjusted by a "duty cycle correction factor", derived from 10log(dwell time/100mS) in an effort to demonstrate compliance with the 15.209.

- Submit test data

Maximizing The Radiated Emissions:

- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

Step 1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

Step 2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

Step 3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

Step 4: Move the antenna over its full allowable range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.

Step 5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

Step 6: The effects of various modes of operation are examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

Step 7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

8.4. ALTERNATIVE TEST PROCEDURES

If the antenna conducted tests cannot be performed on this device, radiated tests show compliance with the peak output power limit specified in Section 15.247(b) and the spurious RF conducted emission limit specified in Section 15.247(c) are acceptable. As stated previously, a pre-amp, and, in the later case, a high pass filter, are required for the following measurements:

8.4.1. Peak Power Measurements

Calculate the transmitter's peak power using the following equation:

$E = 30PG/d$
$P = (Ed)^2/30G$

Where:

- E: measured maximum fundamental field strength in V/m. Utilizing a RBW, the 20 dB bandwidth of the emission VBW >RBW, peak detector function. Follow the procedures in C63.4 with respect to maximizing the emission
- G is numeric gain of the transmitting antenna with reference to an isotropic radiator
- D is the distance in meters from which the field strength was measured
- P is the distance in meters from which the field strength was measured

8.4.2. Spurious RF conducted emissions

The demonstrate compliance with the spurious RF conducted emission requirement of Section 15.247©, use the following spectrum analyzer settings:

- Span = wide enough to fully capture the emission being measured
- RBW = 100 kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Measure the field strength of both the fundamental and all spurious emissions with these settings.

Follow the procedures C62-4 with respect to maximizing the emissions. The measured field strength of all spurious emissions must be below the measured field strength of the fundamental emission by the amount specified in Section 15.247©. Note that if the emission falls in a Restricted Band, as defined in Section 15.205, the procedure for measuring spurious radiated emissions listed above must be followed