Test Report:	5W45892.1
Applicant:	InGrid, Inc. 1055 Westlakes Drive Suite 300 Berwyn, PA 19312
Apparatus:	InGrid Signal Extender SE430
FCC ID:	S9PSE430
In Accordance With:	FCC Part 15 Subpart C, 15.247 FHSS System and Digitally Modulated Radiators 902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	 Sim Jagpal, Resource Manager
Date:	12 July 2005
Total Number of Pages:	62

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	InGrid Signal Extender SE430
Specification:	FCC Part 15 Subpart C, 15.247
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Roman Kuleba

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows: InGrid Signal Extender SE430

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1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
1	InGrid Signal Extender SE430, FP-mode (hopping on)	# 09, Item No. 2
2	InGrid Signal Extender SE430, EP-mode (hopping off)	# 49, Item No. 5

The first samples were received on: June 06, 2005

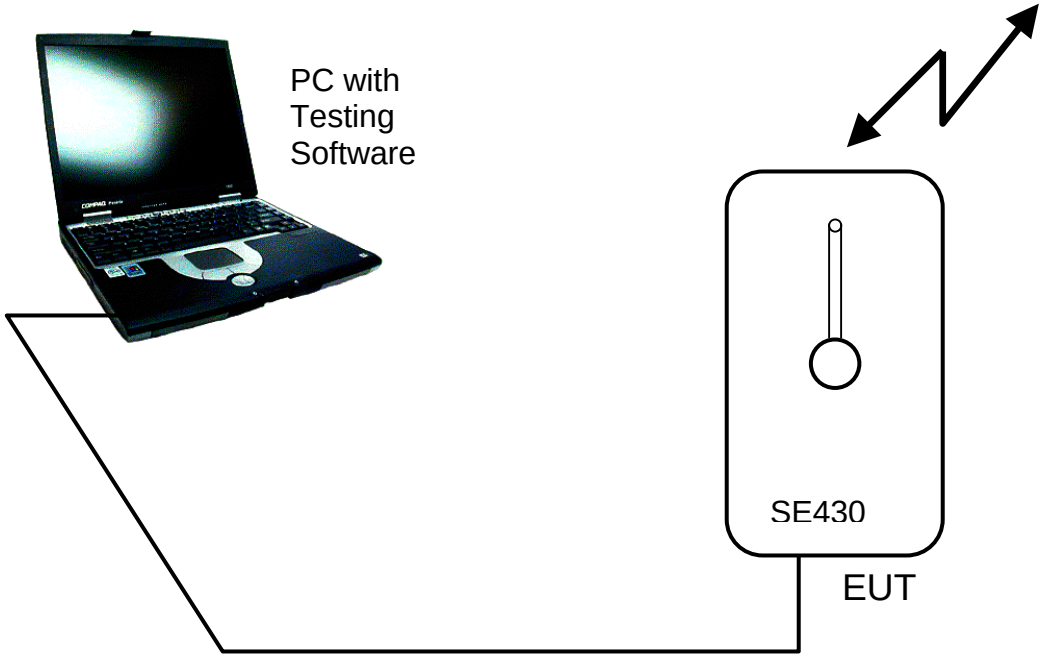
1.3 Theory of Operation

Signal Extender SE430 is an interior/perimeter intrusion sensor used as a building component in InGrid Wireless Security System. The system requires no special wiring. Central control (KeyPad) receives information from all components (Signal Extenders) and is wired into the phone system to signal the monitoring station.
The InGrid Wireless Security System uses DECT protocol for communications between units that can be configured as DECT Fixed Part (FP) and DECT Portable Part (PP). The communications protocol is based on ETSI standard ETS-300-175-1 to 9. The frame format is based on DECT half bit rate and modified from 24 timeslots to 8 timeslots and 95 possible RF carriers. At least 75 (up to 95) carriers are used in any system.
Frequency hopping is implemented on a frame by frame basis. The system uses encryption based on DECT. An InGrid Wireless Security System may have 1 Fixed Part (FP) and up to 9 Portable Parts (PP) active at any one time. Any unit may act as FP, and in a system of many units the unit designated as FP may periodically change.

1.4 Technical Specifications of the EUT

Manufacturer:	Securinex Inc.
Operating Frequency:	2401.0560 - 2482.2720 MHz
Peak Output Power:	18.7 dBm
Emission Designator	807K7 F1D
Rated Power:	23 dBm
Modulation:	GFSK
Antenna Data:	Integrated PCB Antenna, 3 dBi

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.247

FHSS System and Digitally Modulated Radiators

902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Rhode & Schwarz	FSP40	FA001920	Mar. 22, 05	Mar. 22, 06
Signal Generator	Rohde & Schwarz	SMR40	FA001879	NCR**	NCR**
Power Meter	Hewlett Packard	E4418B	FA001678	Mar 8, 05	Mar 8, 06
Power Sensor	Hewlett Packard	8487A	FA001419	Apr. 29, 05	Apr. 29, 06
RF AMP	JCA	4-8 GHz	FA001497	COU*	COU*
RF AMP	JCA	2-4 GHz	FA001496	COU*	COU*
RF AMP	Narda	5 - 18GHz	FA001409	COU*	COU*
RF AMP	Narda	18 - 26.5GHz	FA001550	COU*	COU*
High Pass Filter (3.9GHz)	K&L	11SH10-4000	FA001340	COU*	COU*
Attenuator, 20 dB	Narda	776B-20	FA001153	COU*	COU*
Horn Antenna	EMCO #2	3115	FA000825	Dec. 14, 04	Dec. 14, 05
Horn Antenna	EMCO #1	3115	FA000649	Dec. 22, 04	Dec. 22, 05
Horn Antenna	EMCO #5	3116	FA001847	Apr 25, 05	Apr 25, 06
LISN	EMCO	4825/2	FA001545	Jan. 13, 05	Jan. 13, 06
Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18, 05	May 18, 06
Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18, 05	May 18, 06
Bilog	Schaffner	CBL6112B	FA001504	NCR**	NCR**

* COU (Calibrate on Use)

** NCR (No Calibration Required)

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	Y	Pass
15.209(a)	Radiated Emissions within Restricted Bands	Y	Pass
15.247(a)(1)	Frequency hopping systems	Y	Pass
15.247(a)(1)(i)	Frequency hopping systems operating in the 902-928 MHz band	N	N/A
15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725-5850 MHz band	N	N/A
15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400-2483.5 MHz band	Y	Pass
15.247(a)(2)	Systems using digital modulation techniques	N	N/A
15.247(b)(1)	Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band	Y	Pass
15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902-928 MHz band	N	N/A
15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands	Y	Pass
15.247(b)(4)	Maximum peak output power	Y	Pass
15.247(c)(1)	Fixed point-to-point Operation with directional antenna gains greater than 6 dBi	N	N/A
15.247(c)(2)	Transmitters operating in the 2400-2483.5 MHz band that emit multiple directional beams	N	N/A
15.247(d)	Radiated Emissions Not in Restricted Bands	Y	Pass
15.247(e)	Power Spectral Density for Digitally Modulated Devices	N	N/A
15.247(f)	Time of Occupancy for Hybrid Systems	Y	Pass

Notes:

Appendix A : Test Results

Conducted Disturbance at Mains Port

Criteria: Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (MHz)	Emission (dBµV) Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Conditions:

Sample Number:	1	**Temperature:**	25 °C
Date:	June 6, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See Attached Plots and Table

Additional Observations: None

Conducted Disturbance at Mains, continued

Test Date: June 6, 2005

Engineer's Name: Roman Kuleba

Tested as per: Table Top

Mains Input Voltage: 120 VAC | **Mains Input Frequency: 60 Hz**

Spectrum plots for each frequency band can be found at the back of this section. *All plots were generated with a peak detector.

Port Investigation Data

Port under test: AC Mains Input

Results: Refer to Plots of this section and table.

Conductor	Frequency (MHz)	Detector	Emission Level (dBuV)	LISN Loss (dB)	Cable Loss (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
Phase	0.1672	Quasi Peak	35.1	0.00	0.00	35.10	65.1	30.0
		Average	13.7	0.00	0.00	13.70	55.1	41.4
	0.2071	Quasi Peak	36.0	0.00	0.20	36.20	63.3	27.1
		Average	24.5	0.00	0.20	24.70	53.3	28.6
	0.2585	Quasi Peak	35.6	0.00	0.20	35.80	61.5	25.7
		Average	23.8	0.00	0.20	24.00	51.5	27.5
Neutral	0.2053	Quasi Peak	35.7	0.00	0.20	35.90	63.4	27.5
		Average	22.7	0.00	0.20	22.90	53.4	30.5
	0.2659	Quasi Peak	35.6	0.00	0.20	35.80	61.2	25.4
		Average	21.7	0.00	0.20	21.90	51.2	29.3
	0.3681	Quasi Peak	34.5	0.00	0.20	34.70	58.5	23.8
		Average	22.6	0.00	0.20	22.80	48.5	25.7

Notes

None

Deviations

None

Test Result

Final Test Result: Pass

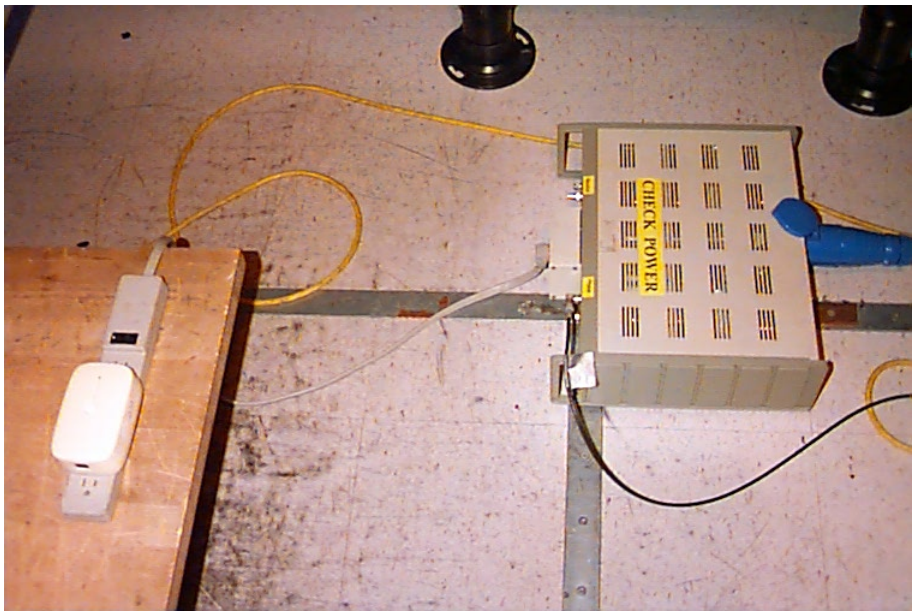
Conducted Disturbance at Mains, continued

Conducted Disturbance at Mains Test Equipment Used						
CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	LISN	EMCO	4825/2	FA001545	Jan. 13/05	Jan. 13/06
1 Year	Receiver	Rohde & Schwarz	ESHS 10	FA001918	Feb. 28/05	Feb. 28/06
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	May 18/05	May 18/06
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	May 18/05	May 18/06
1 Year	Transient Limiter	Hewlett-Packard	11947A	FA000975	May 25/05	May 25/06

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

Conducted Disturbance at Mains, continued

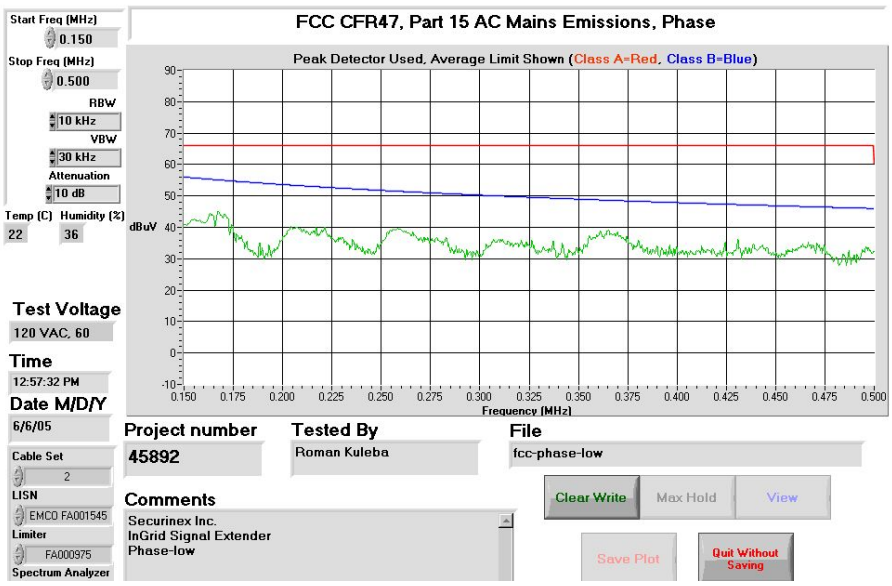
Conducted Disturbance at Mains, Setup Photos



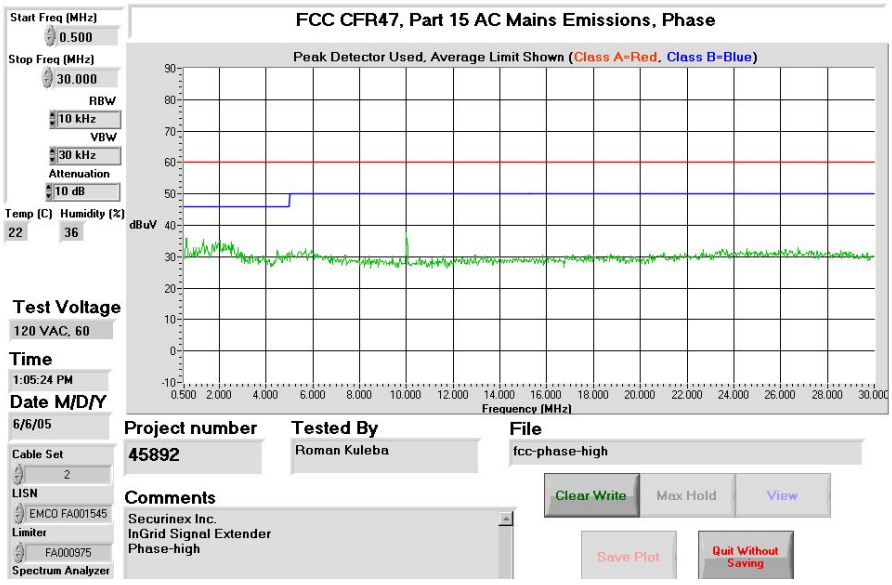
Conducted Disturbance at Mains, continued

Conducted Disturbance at Mains, Plots

Phase, 150 – 500 kHz



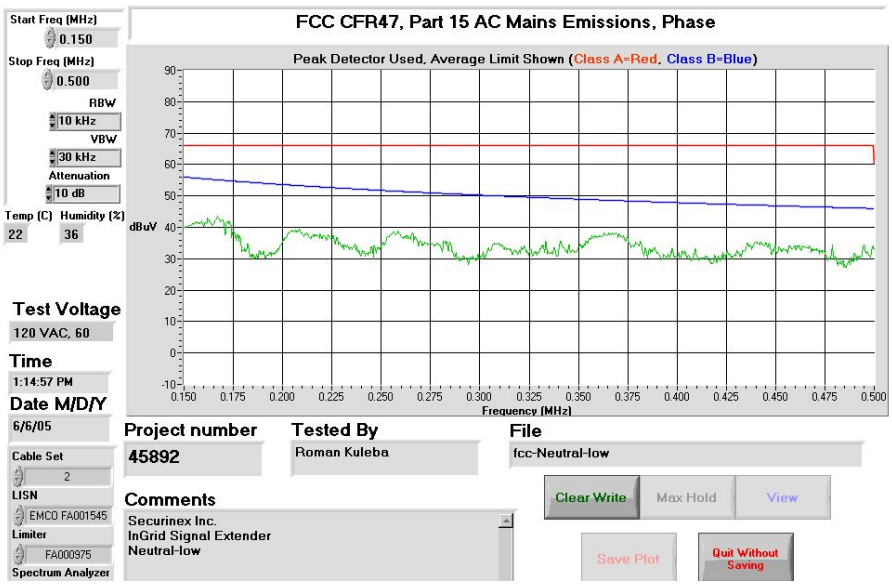
Phase, 500 kHz – 30 MHz



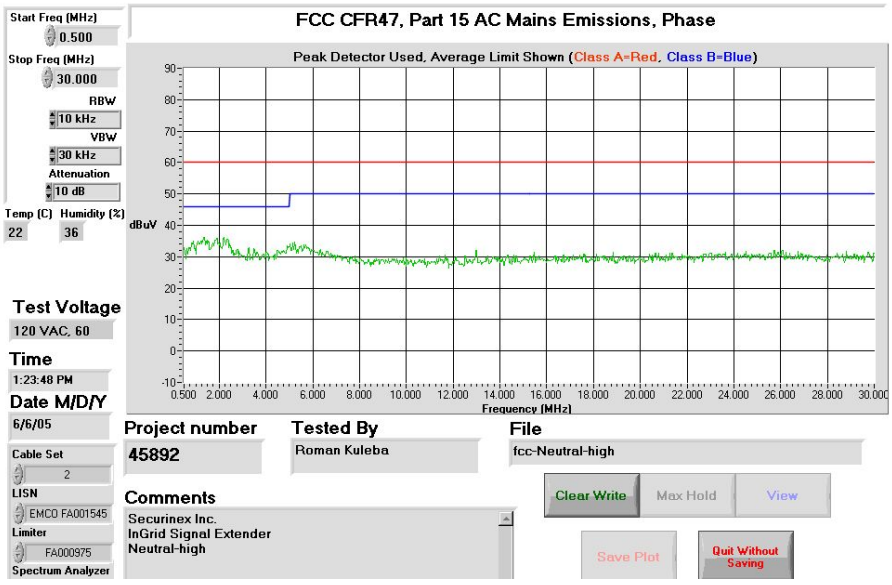
Conducted Disturbance at Mains, continued

Conducted Disturbance at Mains Plots, continued

Neutral, 150 – 500 kHz



Neutral, 500 kHz – 30 MHz



Radiated Emissions not in Restricted Bands

Criteria: Clause 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Conditions:

Sample Number:	1	**Temperature:**	25 °C
Date:	June 7, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See Attached Table and Plots.

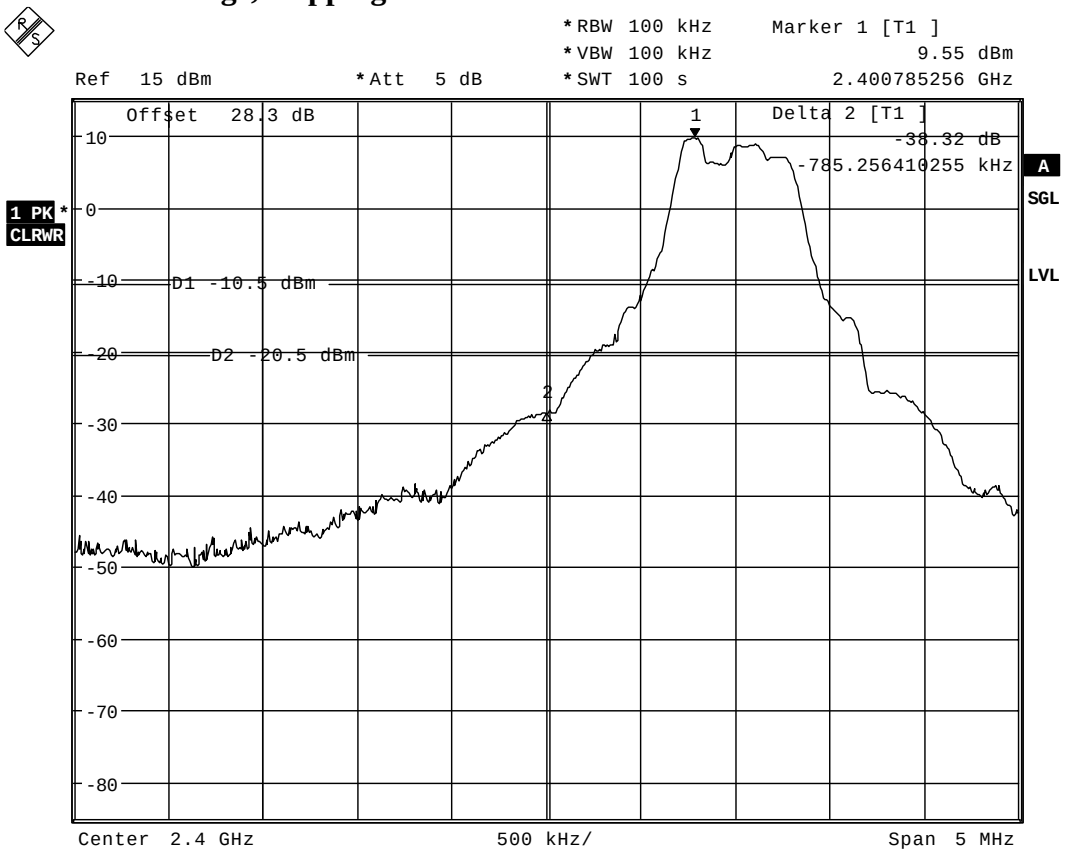
Additional Observations:

The Spectrum was searched from 30 MHz to the 10th Harmonic.

The EUT was measured on three orthogonal axes.

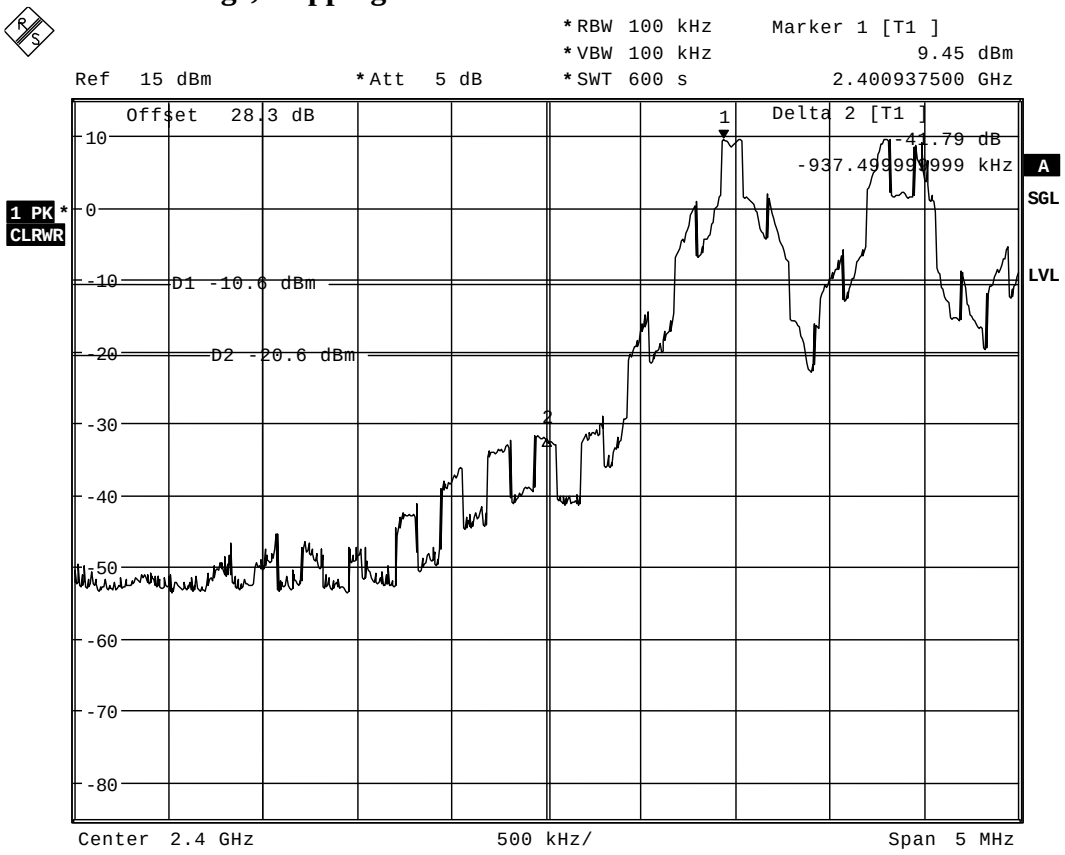
Radiated Emissions not in Restricted Bands, continued

Lower Band Edge, Hopping Off:



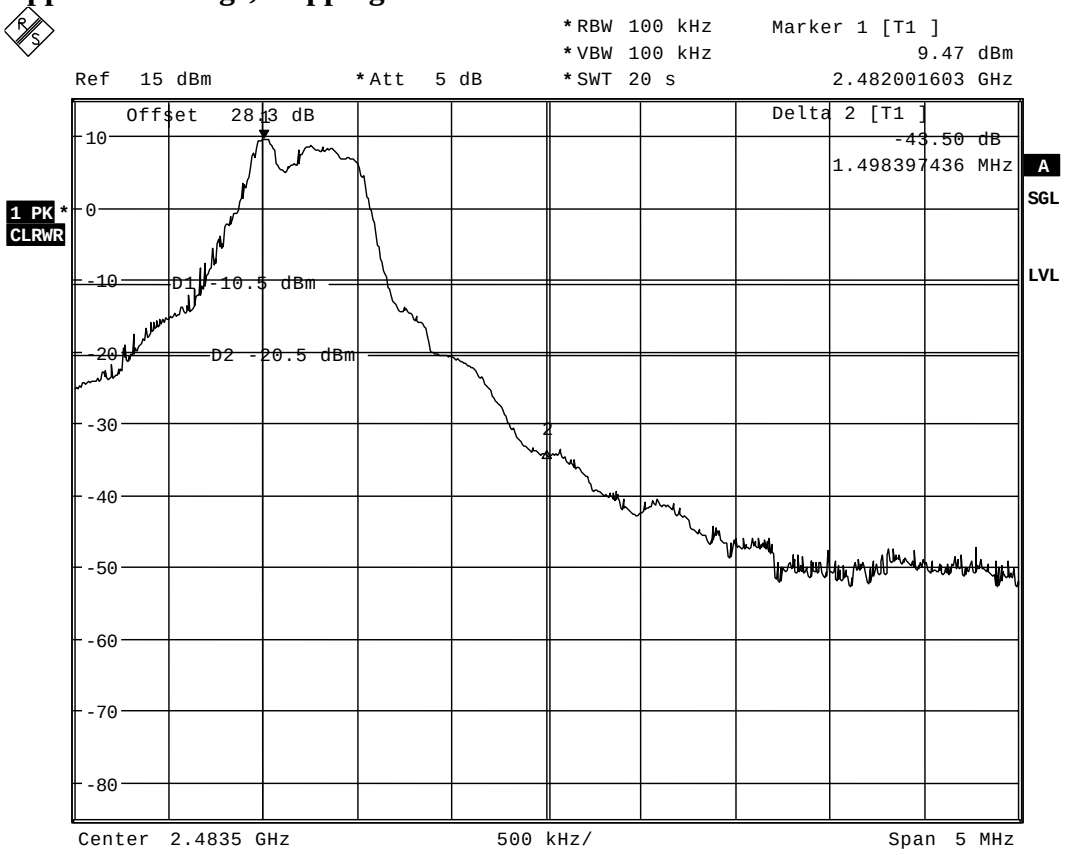
Radiated Emissions not in Restricted Bands, continued

Lower Band Edge, Hopping On:



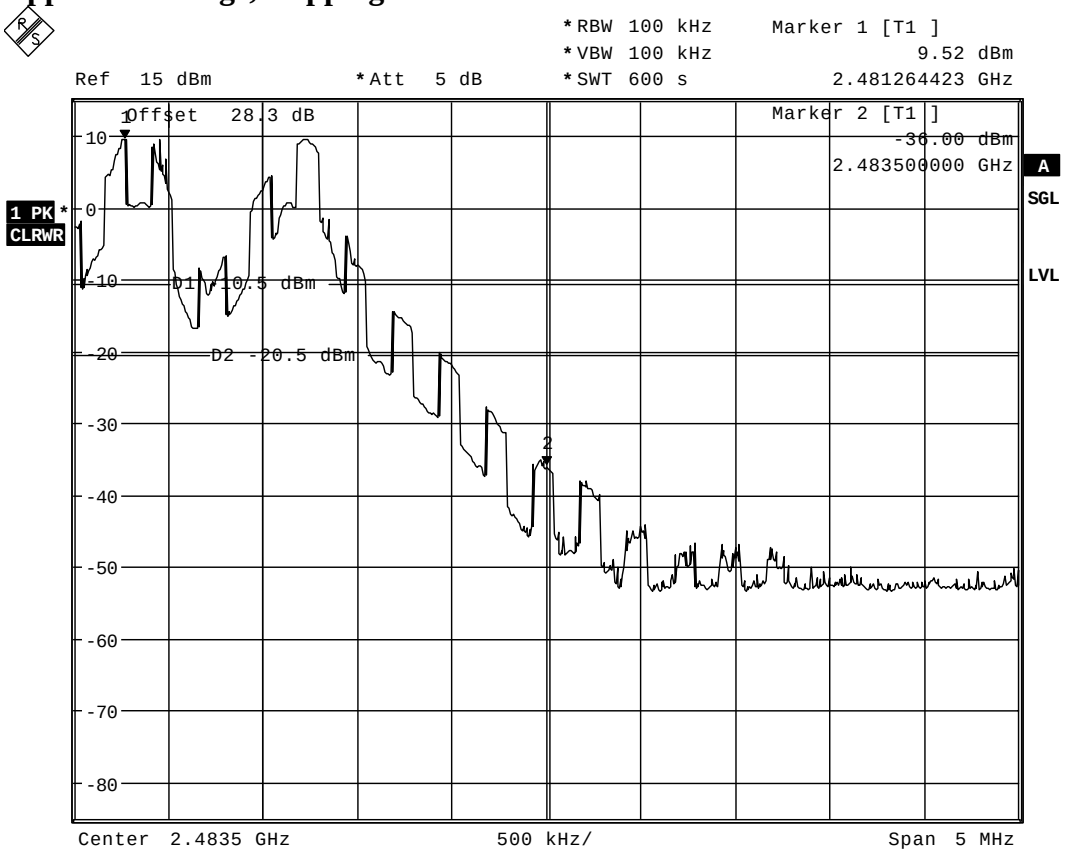
Radiated Emissions not in Restricted Bands, continued

Upper Band Edge, Hopping Off:



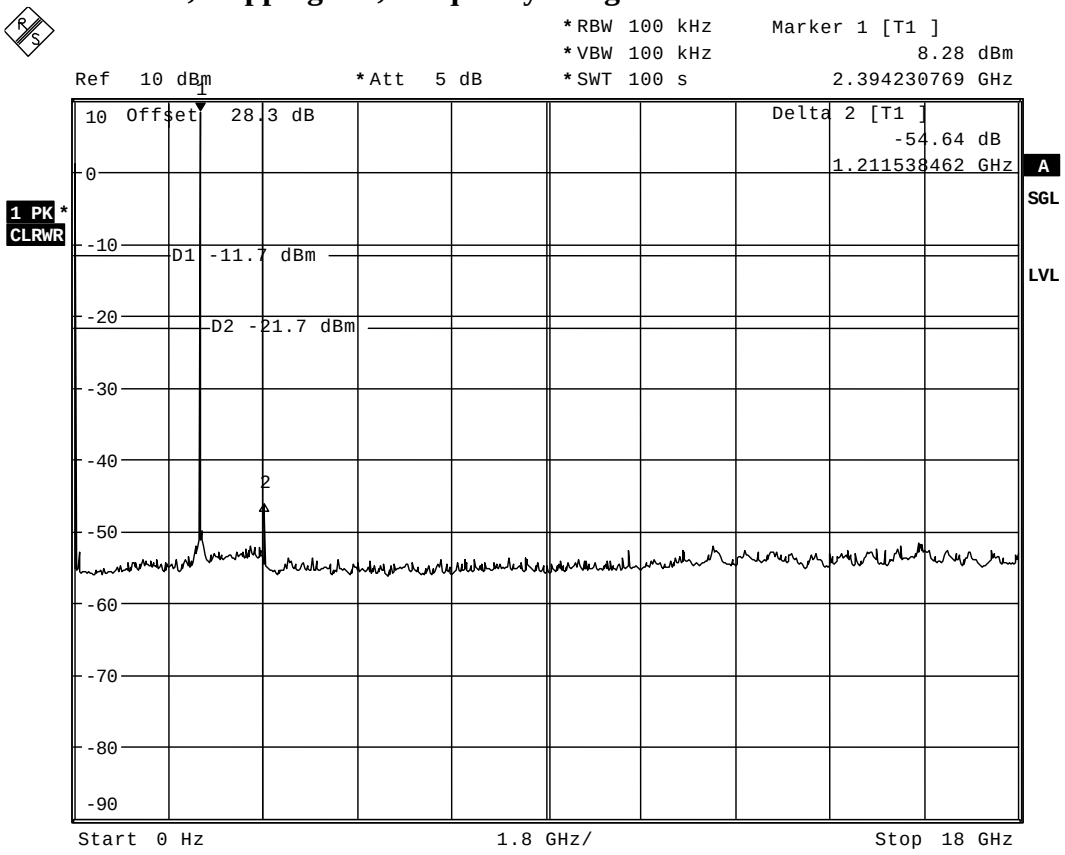
Radiated Emissions not in Restricted Bands, continued

Upper Band Edge, Hopping On:



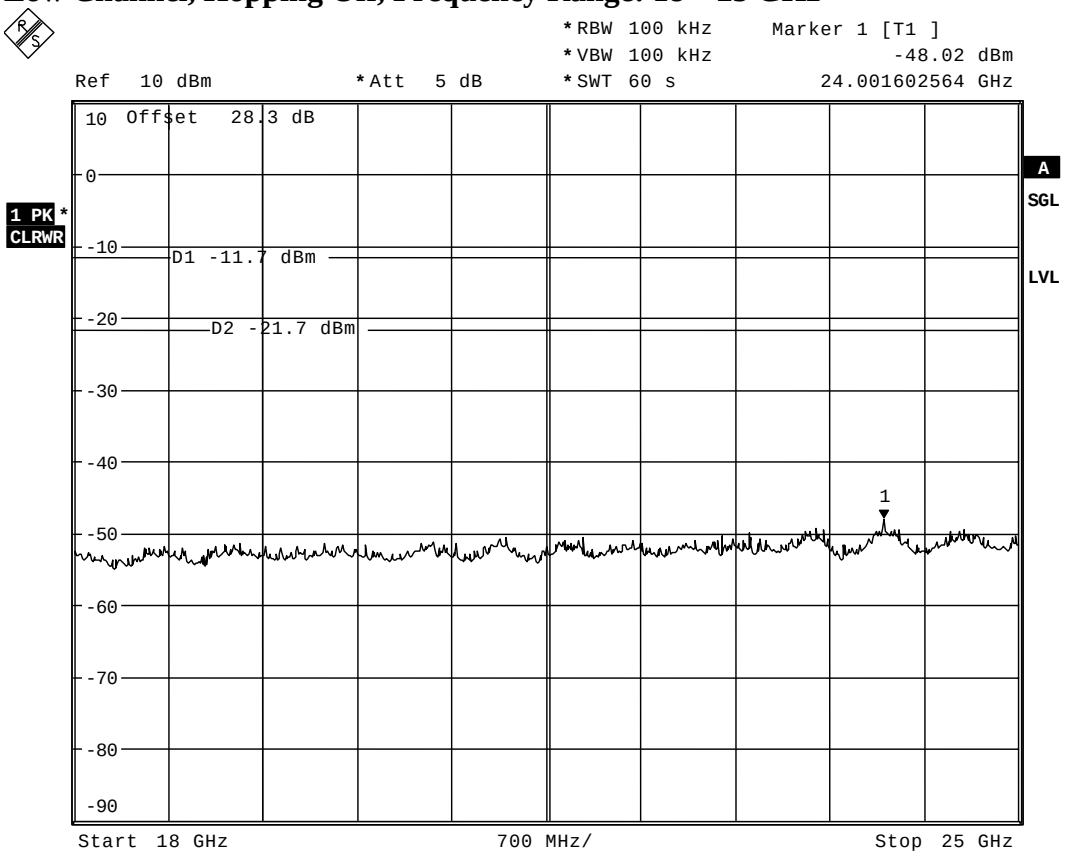
Radiated Emissions not in Restricted Bands, continued

Low Channel, Hopping Off, Frequency Range: 0 Hz – 18 GHz



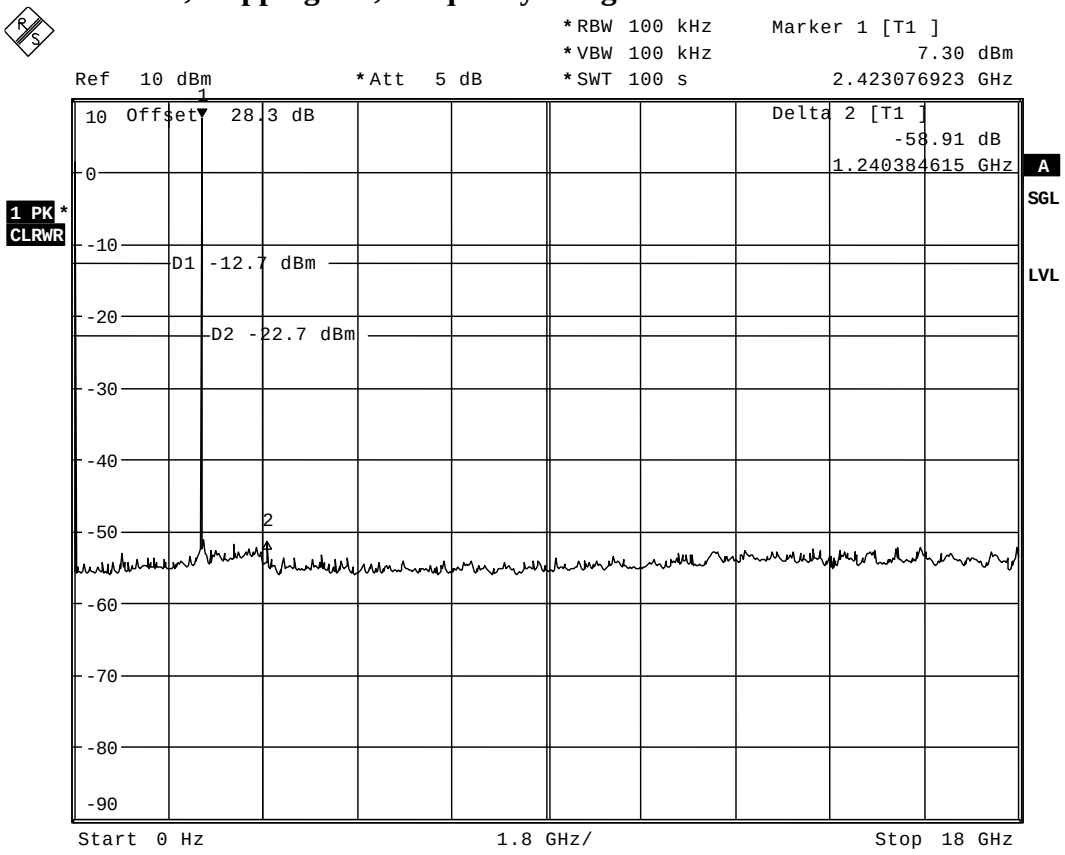
Radiated Emissions not in Restricted Bands, continued

Low Channel, Hopping Off, Frequency Range: 18 – 25 GHz



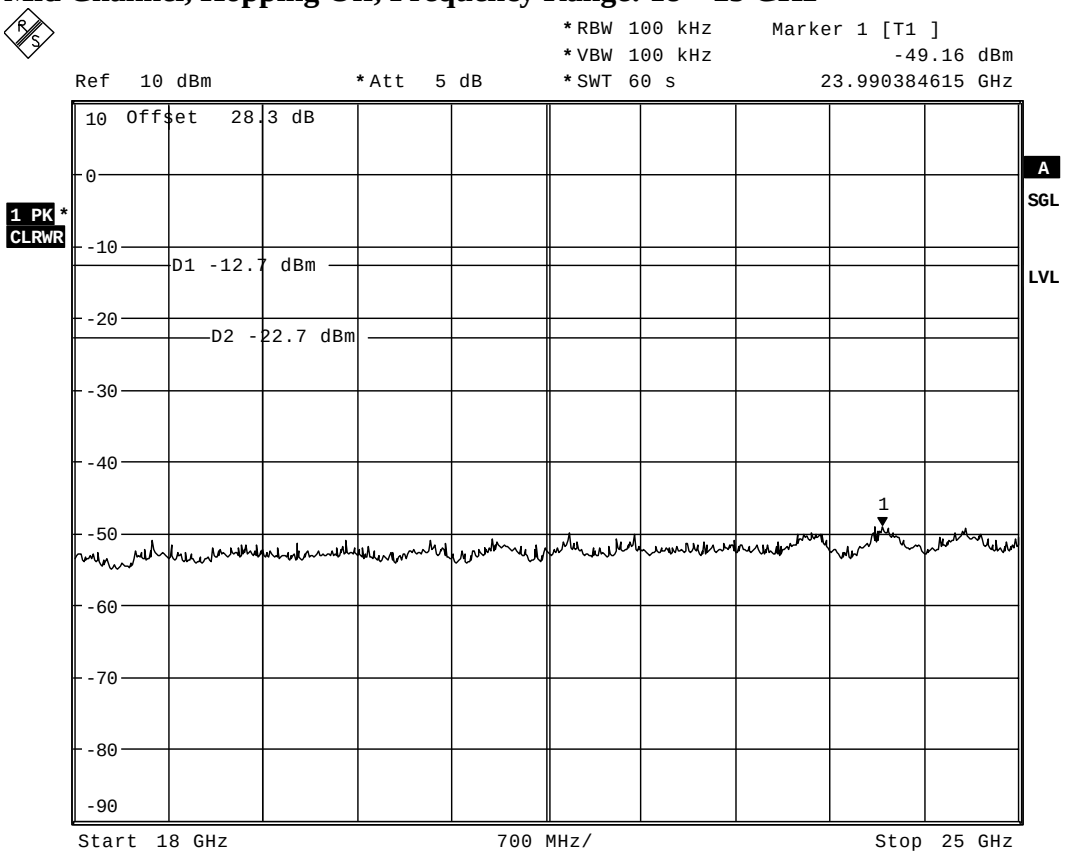
Radiated Emissions not in Restricted Bands, continued

Mid Channel, Hopping Off, Frequency Range: 0 Hz – 18 GHz



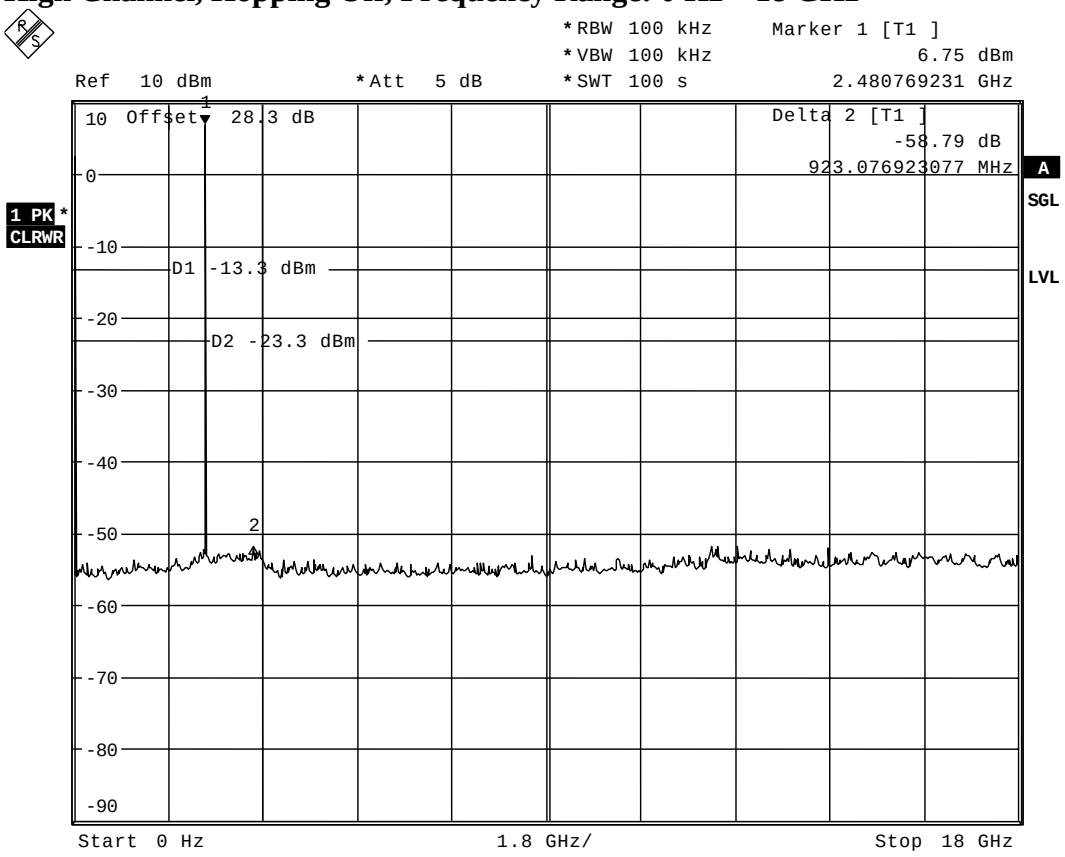
Radiated Emissions not in Restricted Bands, continued

Mid Channel, Hopping Off, Frequency Range: 18 – 25 GHz



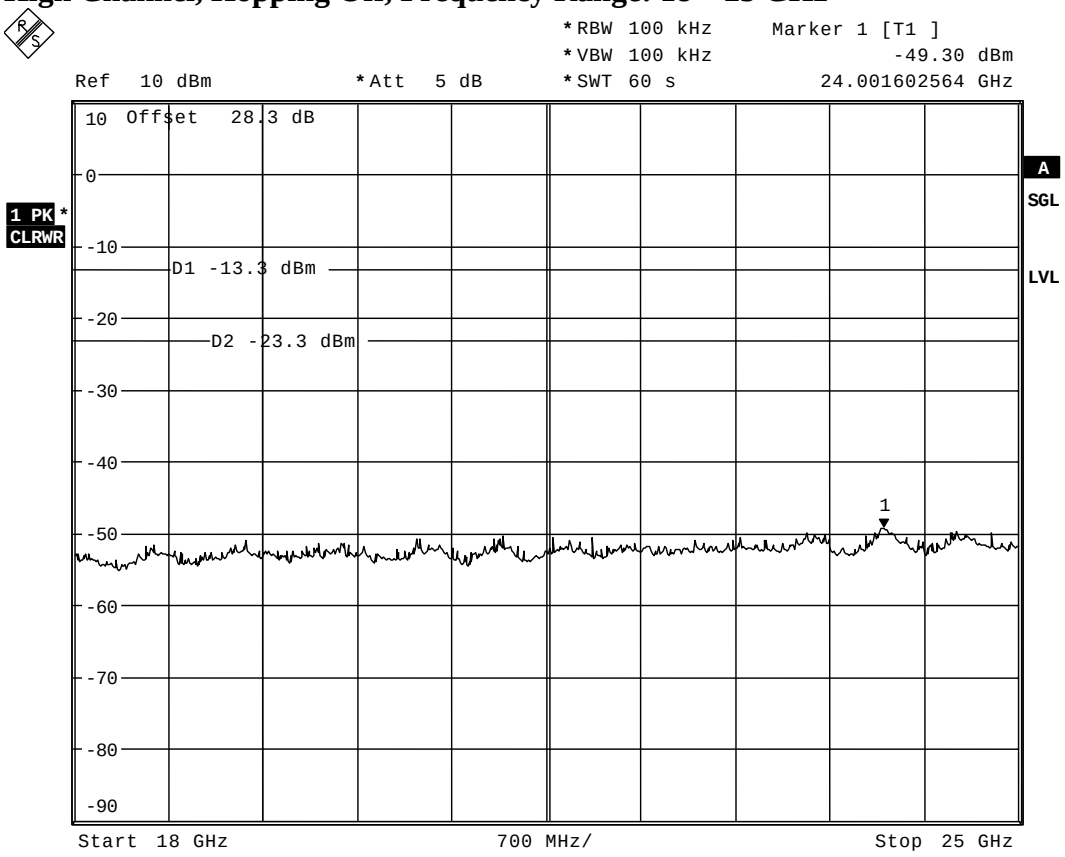
Radiated Emissions not in Restricted Bands, continued

High Channel, Hopping Off, Frequency Range: 0 Hz – 18 GHz



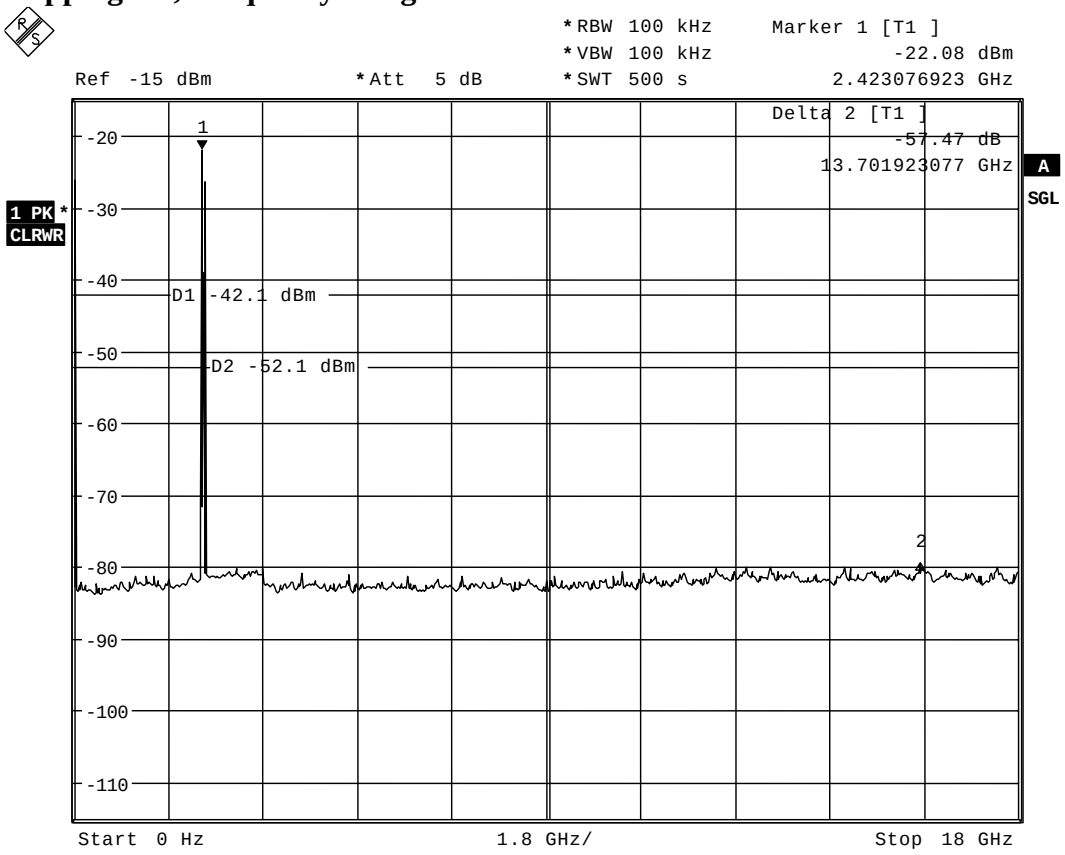
Radiated Emissions not in Restricted Bands, continued

High Channel, Hopping Off, Frequency Range: 18 – 25 GHz



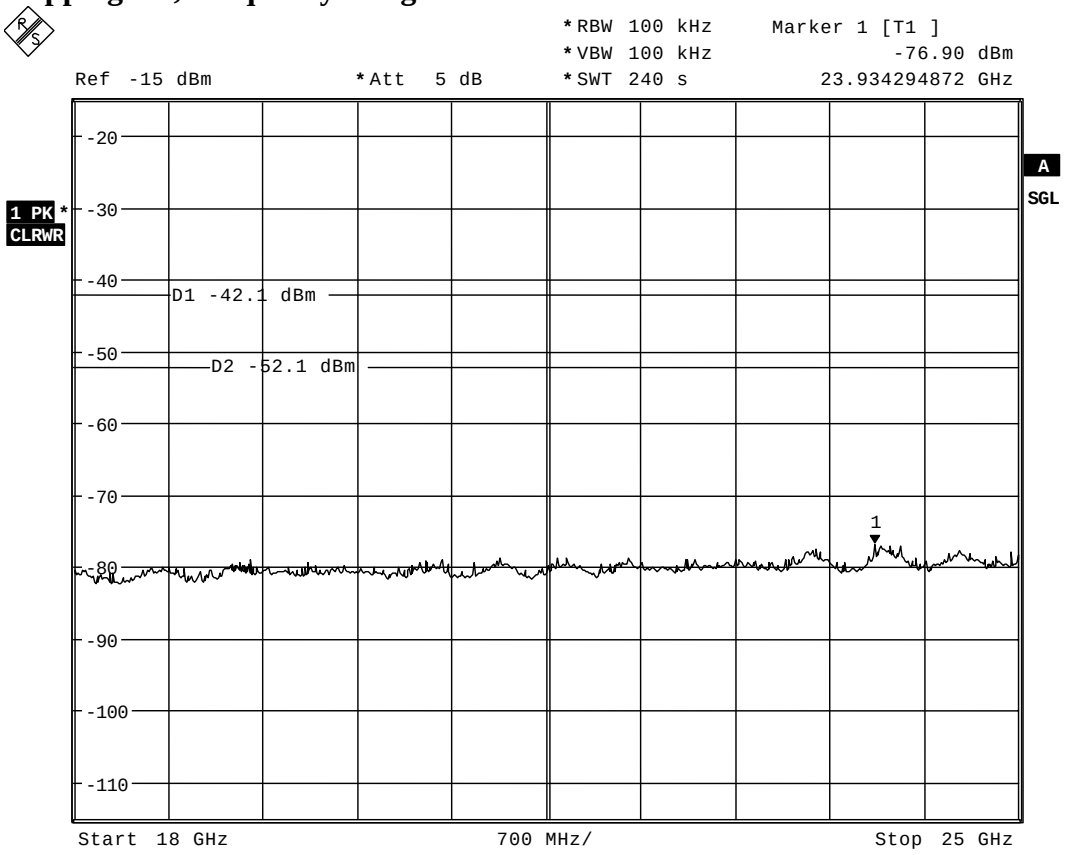
Radiated Emissions not in Restricted Bands, continued

Hopping On, Frequency Range: 0 Hz – 18 GHz



Radiated Emissions not in Restricted Bands, continued

Hopping On, Frequency Range: 18 – 25 GHz



Radiated Emissions not in Restricted Bands, continued

Below 1 GHz:

Freq. (MHz)	Antenna	Pol. V/H	RCVD Signal (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Field Str. (dBuV/m)	Limit (dBuV)	Margin (dB)
36.1	BC1	V	17.1	10.8	N/A	0.8	28.7	40	11.3
43.2	BC1	V	15.3	9.6	N/A	0.8	25.7	40	14.3
36.7	BC1	H	9.5	12.0	N/A	0.8	22.2	40	17.8
43.2	BC1	H	9.0	11.0	N/A	0.8	20.8	40	19.2

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: QP detector used

Radiated Emissions not in Restricted Bands, continued

Above 1 GHz (Harmonics):

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain / Cable Loss (dB)	Duty Cycle Corr.	Distance Correction	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	7203.168	Horn 2	V	66.6	36.3	42.7	-22.3	0.0	60.2	74	13.8	Peak
									37.9	54	16.1	Average
2	7203.168	Horn 2	H	70.0	36.3	42.7	-22.3	0.0	63.6	74	10.4	Peak
									41.3	54	12.7	Average

Sample Calculation:

Peak Emission = RCVD Signal (Peak) + AF – G_{AMP} = 72.8 dBuV + 33.3 dB/m – 45.8 dB = 60.3 dBuV/m
Avg. Emission = Peak Emission – Duty Cycle Corr. = 60.3 dBuV/m – 22.3 dB = 38.0 dBuV/m

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Detector Legend: Below 1GHz, Peak detector with 100 kHz RBW, 100KHz VBW
Above 1GHz, Peak detector with 1.0MHz RBW, 1.0MHz VBW
Note 3: The spectrum was investigated for radiated emissions from 30 MHz to 10th harmonic.

Note:
Harmonics that were found within Restricted Bands of Operation are reported in the following section, under *'Radiated Emissions within Restricted Bands'* (see table on page 32).

Radiated Emissions within Restricted Bands

Criteria: Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/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

Test Conditions:

Sample Number:	1	**Temperature:**	25 °C
Date:	June 9-10, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results:

See Attached Table and Plots for Results

Additional Observations:

The Spectrum was searched from 30 MHz to the 10th Harmonic.

These results apply to emissions found in the Restricted Bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axes.

Radiated Emissions within Restricted Bands, continued

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain / Cable Loss (dB)	Duty Cycle Corr.	Distance Correction	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	4802.112	Horn 2	V	72.8	33.3	45.8	-22.3	0.0	60.3	74	13.7	Peak
									38.0	54	16.0	Average
2	4883.328	Horn 2	V	71.9	33.3	44.6	-22.3	0.0	60.6	74	13.4	Peak
									38.3	54	15.7	Average
3	7324.992	Horn 2	V	74.0	36.4	43.7	-22.3	0.0	66.7	74	7.3	Peak
									44.4	54	9.6	Average
4	4964.544	Horn 2	V	60.5	33.3	43.9	-22.3	0.0	49.9	74	24.1	Peak
									27.6	54	26.4	Average
5	7446.816	Horn 2	V	75.5	36.4	44.2	-22.3	0.0	67.7	74	6.3	Peak
									45.4	54	8.6	Average
6	4802.112	Horn 2	H	69.5	33.1	45.8	-22.3	0.0	56.8	74	17.2	Peak
									34.5	54	19.5	Average
7	7324.992	Horn 2	H	73.7	36.4	43.7	-22.3	0.0	66.4	74	7.6	Peak
									44.1	54	9.9	Average
8	7446.816	Horn 2	H	73.2	36.4	44.2	-22.3	0.0	65.4	74	8.6	Peak
									43.1	54	10.9	Average

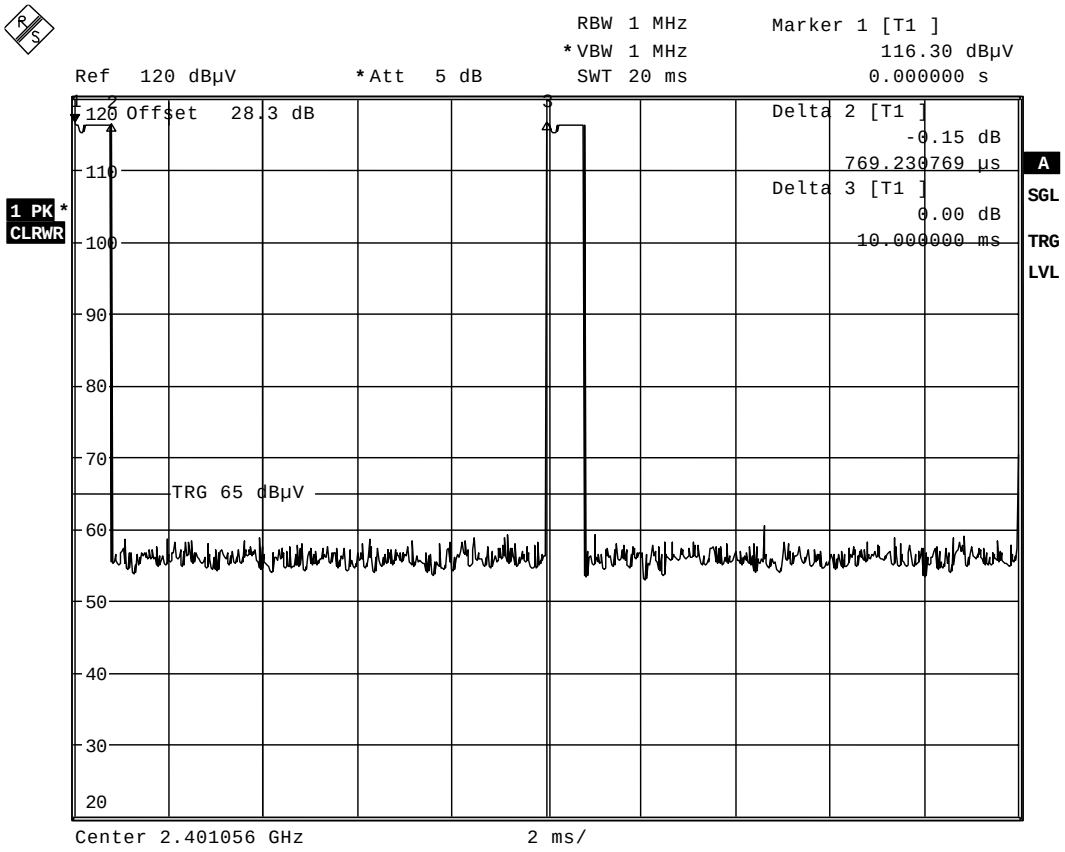
Sample Calculation:

Peak Emission = RCVD Signal (Peak) + AF – G_{AMP} = 72.8 dBuV + 33.3 dB/m – 45.8 dB = 60.3 dBuV/m
Avg. Emission = Peak Emission – Duty Cycle Corr. = 60.3 dBuV/m – 22.3 dB = 38.0 dBuV/m

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Detector Legend: Below 1GHz, Peak detector with 100 kHz RBW, 100KHz VBW
Above 1GHz, Peak detector with 1.0MHz RBW, 1.0MHz VBW
Note 3: The spectrum was investigated for radiated emissions from 30 MHz to 10th harmonic.

Radiated Emissions within Restricted Bands, continued

Duty Cycle:



Marker 2: $\Delta 2 = T_{ON} = 769.230769\ \mu s$

Marker 3: $\Delta 3 = T_{ON} + T_{OFF} = 10\ ms$

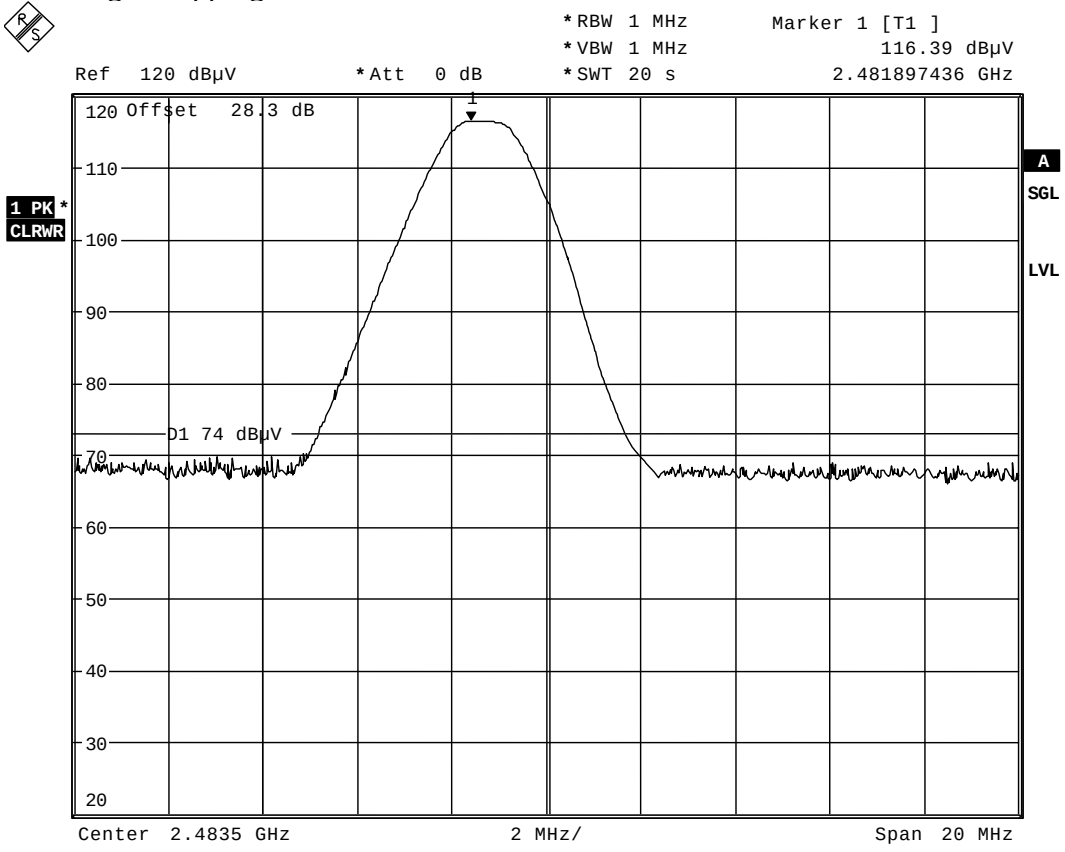
$$\text{Duty Cycle} = \frac{T_{ON}}{T_{ON} + T_{OFF}} \cdot 100\% = \frac{\Delta 2}{\Delta 3} \cdot 100\% = \frac{0.769230769\ \text{ms}}{10\ \text{ms}} \cdot 100\% = 7.69\%$$

Transmission-on-time within 100 milliseconds period: T = 7.692 ms

$$\text{Duty Cycle Correction} = 20 \cdot \log_{10}\left(\frac{T}{100\ \text{ms}}\right) = 20 \cdot \log_{10}\left(\frac{7.692\ \text{ms}}{100\ \text{ms}}\right) = -22.28\ \text{dB}$$

Radiated Emissions within Restricted Bands, continued

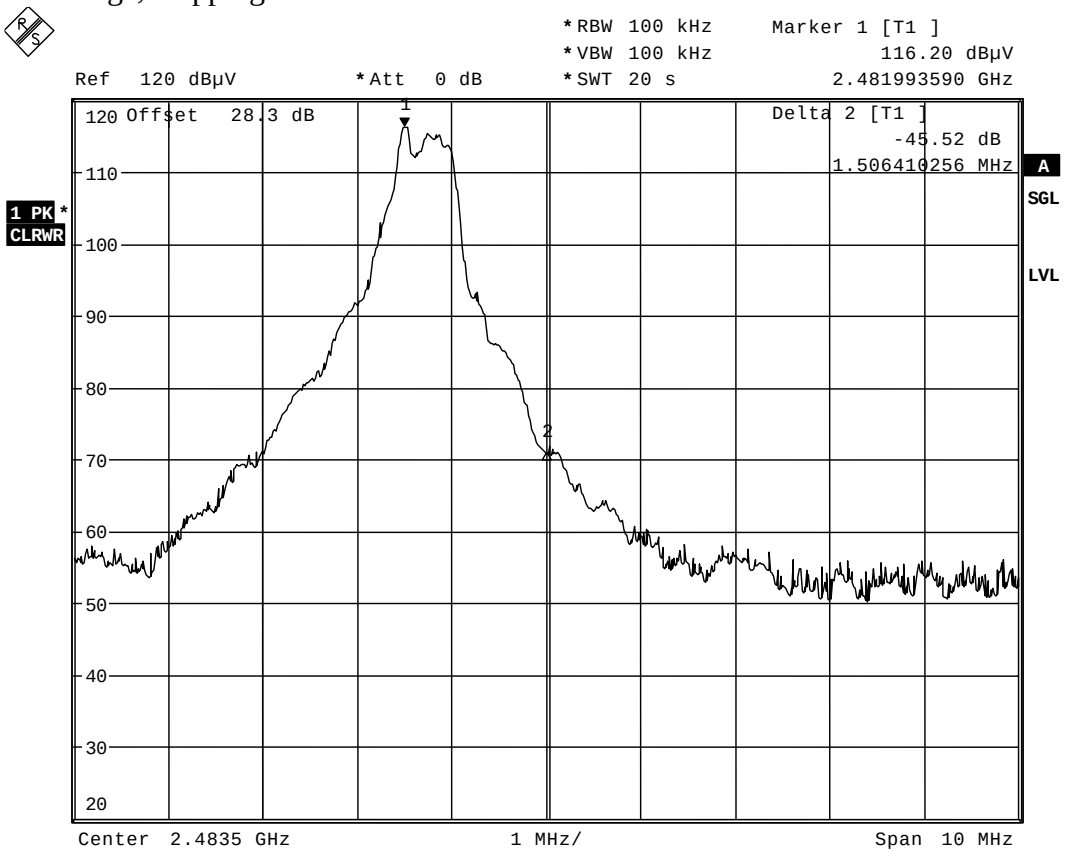
BandEdge, Hopping Off



Maximum Field-strength at the Highest Cannel: 116.39 dBµV/m

Radiated Emissions within Restricted Bands, continued

BandEdge, Hopping Off



Delta Marker Measurement for 2483.5 MHz Band Edge:

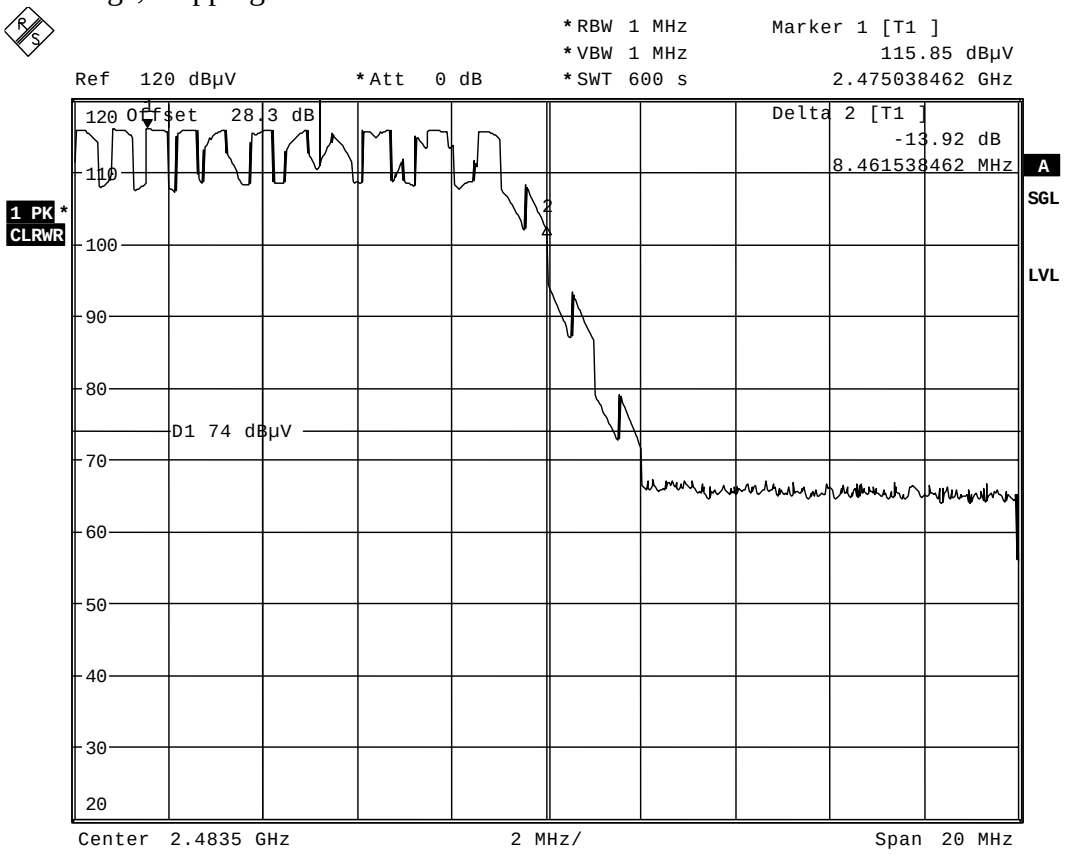
Measured Field Strength for High Channel in 1MHz RBW = 116.39 dBµV/m
Delta Marker at 2483.5 MHz = -45.52 dB

Peak Field Strength at 2483.5 MHz = 116.39 dBuV/m – 45.52 dB = 70.87 dBµV/m
Limit = 74 dBµV/m

Average Field Strength = Peak Field Strength – Duty Cycle Correction
Average Field Strength = 70.87 dBµV/m – 22.28 dB = 48.59 dBµV/m
Limit = 54 dBµV/m

Radiated Emissions within Restricted Bands, continued

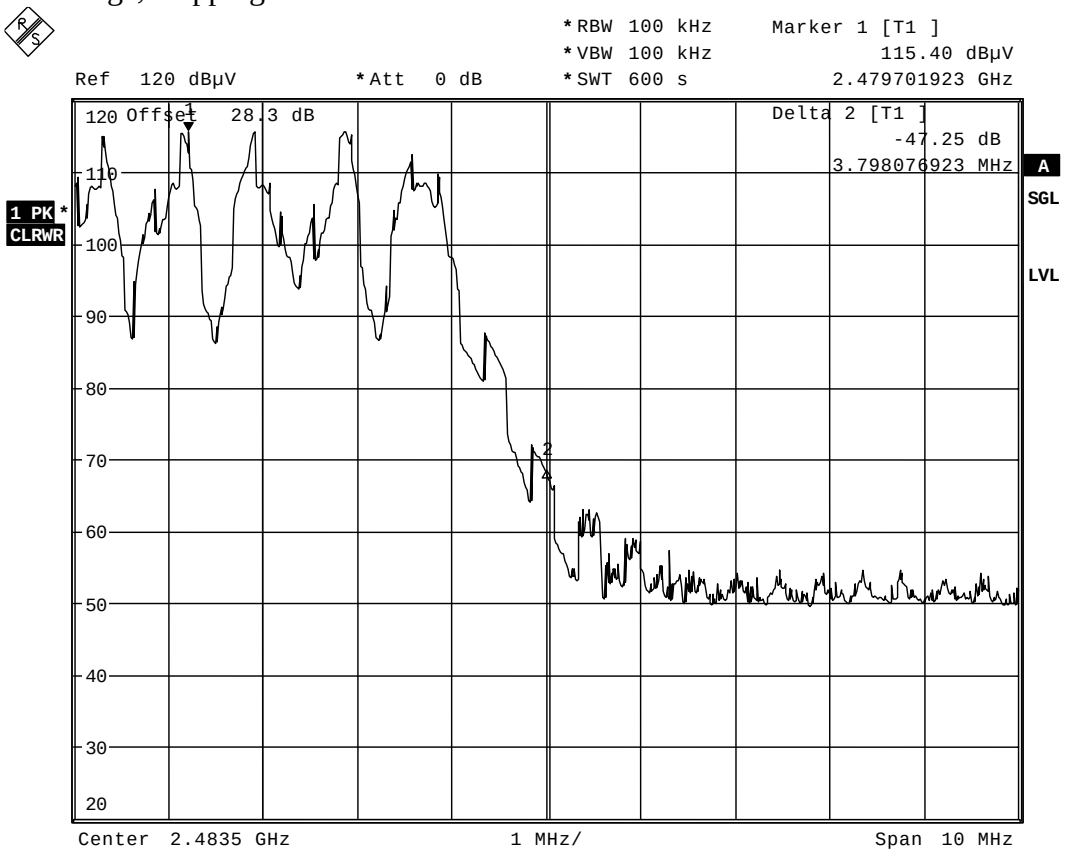
BandEdge, Hopping On



Maximum Field-strength at the Highest Channel: 115.85 dBµV/m

Radiated Emissions within Restricted Bands, continued

BandEdge, Hopping On



Delta Marker Measurement for 2483.5 MHz Band Edge:

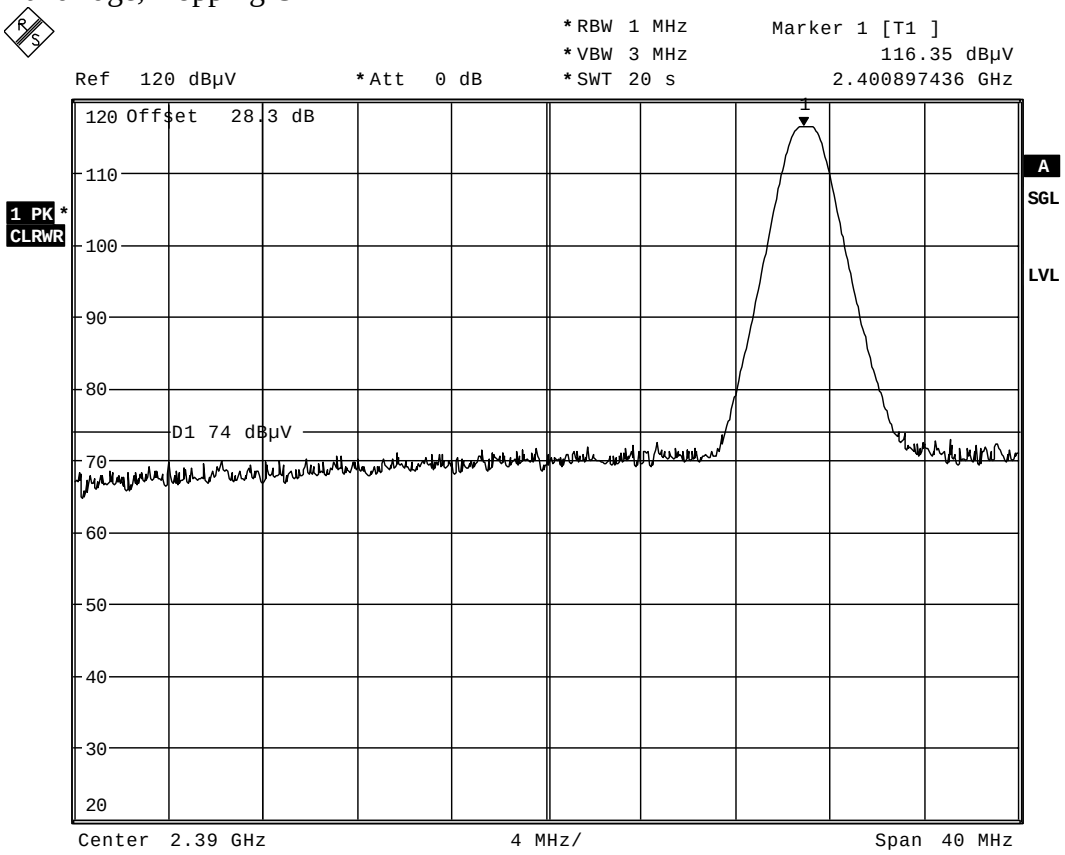
Measured Field Strength for High Channel in 1MHz RBW = 115.85 dBµV/m
Delta Marker at 2483.5 MHz = -47.25 dB

Peak Field Strength at 2483.5 MHz = 115.85 dBuV/m – 47.25 dB = 68.60 dBµV/m
Limit = 74 dBµV/m

Average Field Strength = Peak Field Strength – Duty Cycle Correction
Average Field Strength = 68.60 dBµV/m – 22.28 dB = 46.32 dBµV/m
Limit = 54 dBµV/m

Radiated Emissions within Restricted Bands, continued

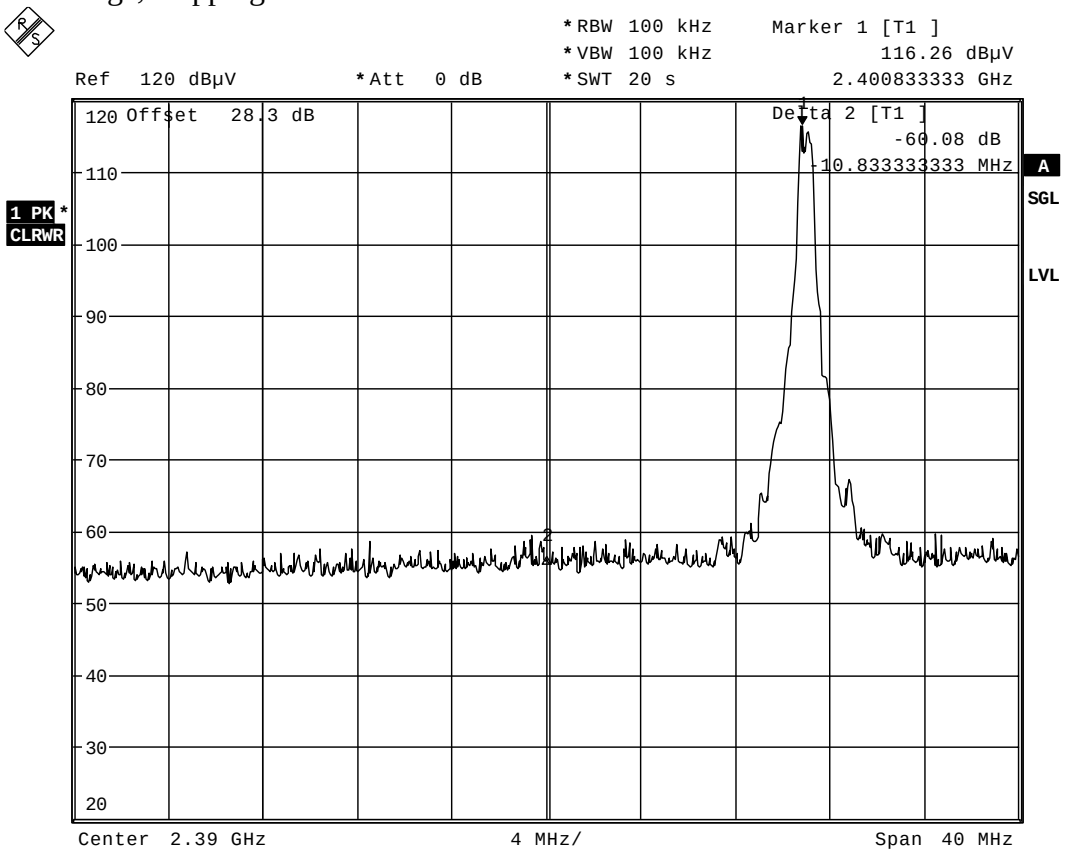
BandEdge, Hopping Off



Maximum Field-strength at the Lowest Channel: 116.35 dBµV/m

Radiated Emissions within Restricted Bands, continued

BandEdge, Hopping Off



Delta Marker Measurement for 2390 MHz Band Edge:

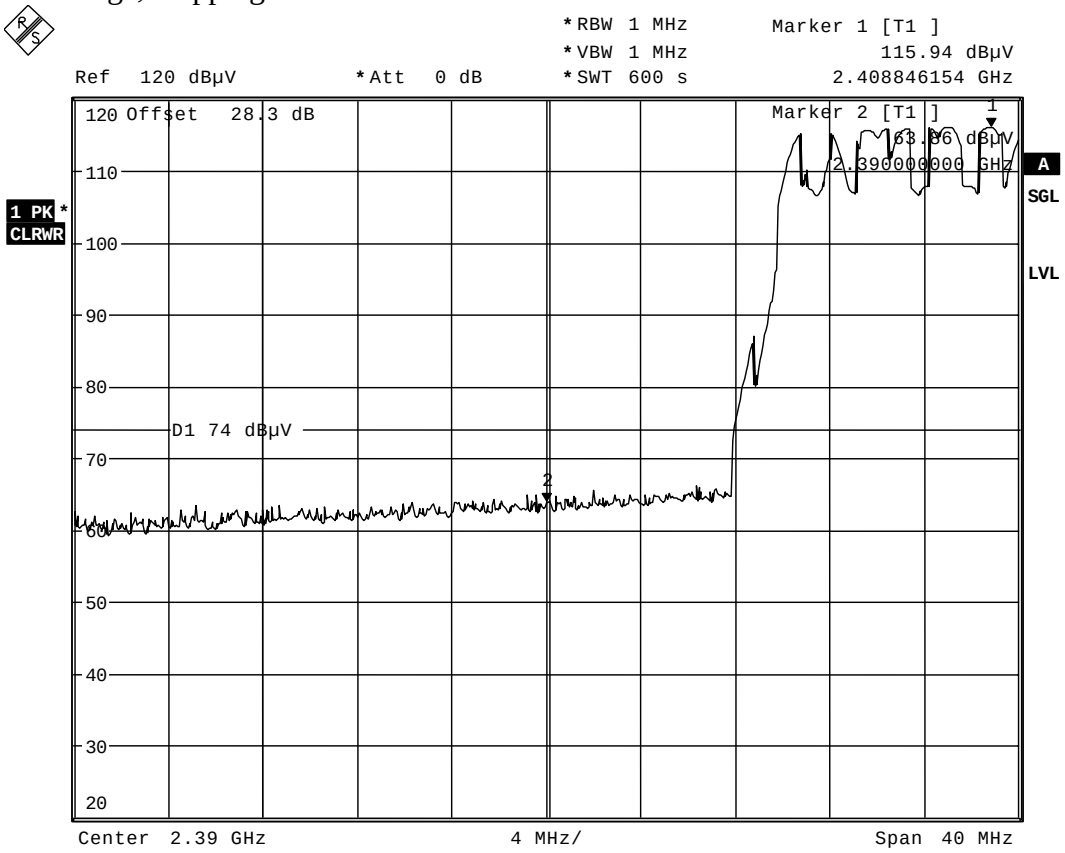
Measured Field Strength for High Channel in 1MHz RBW = 116.35 dBµV/m
Delta Marker at 2390 MHz = -60.08 dB

Peak Field Strength at 2390 MHz = 116.35 dBµV/m – 60.08 dB = 56.27 dBµV/m
Limit = 74 dBµV/m

Average Field Strength = Peak Field Strength – Duty Cycle Correction
Average Field Strength = 56.27 dBµV/m – 22.28 dB = 33.99 dBµV/m
Limit = 54 dBµV/m

Radiated Emissions within Restricted Bands, continued

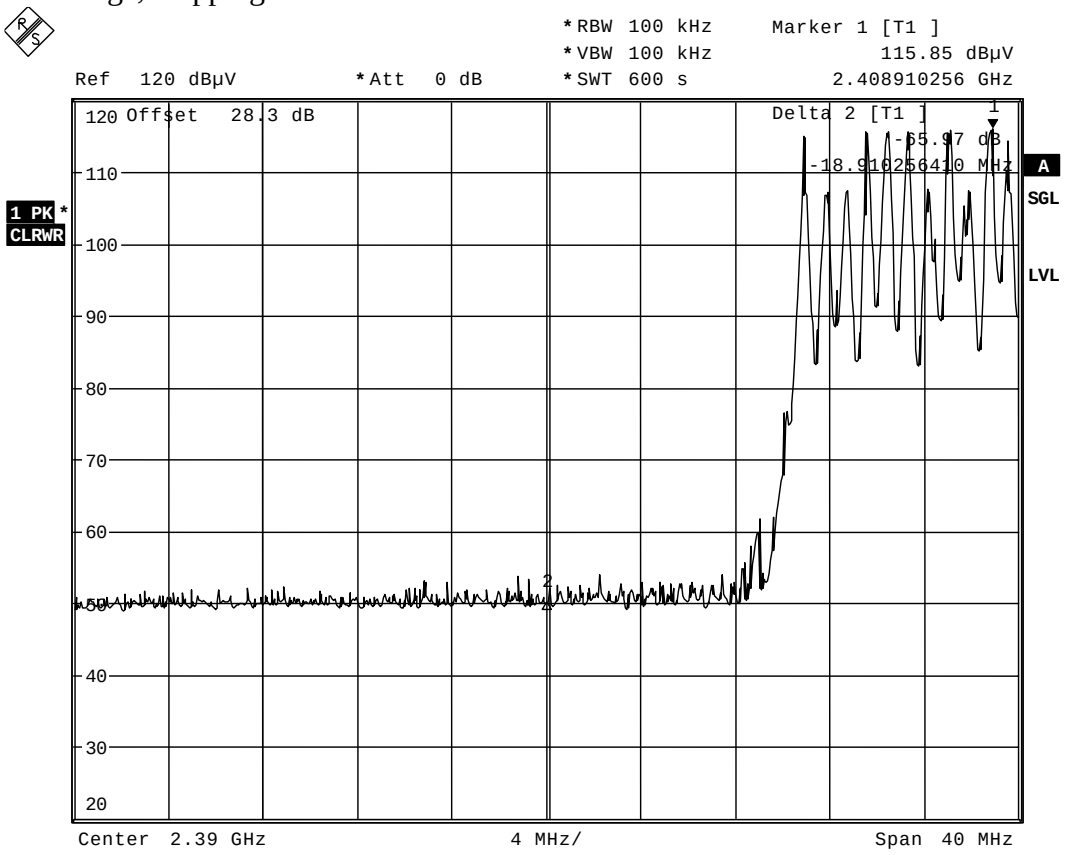
BandEdge, Hopping On



Maximum Field-strength at the Lowest Channel: 115.94 dBµV/m

Radiated Emissions within Restricted Bands, continued

BandEdge, Hopping On



Delta Marker Measurement for 2390 MHz Band Edge:

Measured Field Strength for High Channel in 1MHz RBW = 115.94 dBµV/m
Delta Marker at 2309 MHz = -65.97 dB

Peak Field Strength at 2390 MHz = 115.94 dBµV/m – 65.97 dB = 49.97 dBµV/m
Limit = 74 dBµV/m

Average Field Strength = Peak Field Strength – Duty Cycle Correction
Average Field Strength = 49.97 dBµV/m – 22.28 dB = 27.69 dBµV/m
Limit = 54 dBµV/m

Channel Separation and Occupied Bandwidth

Criteria: Clause 15.247(a)(1) Frequency hopping systems

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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly 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.

Test Conditions:

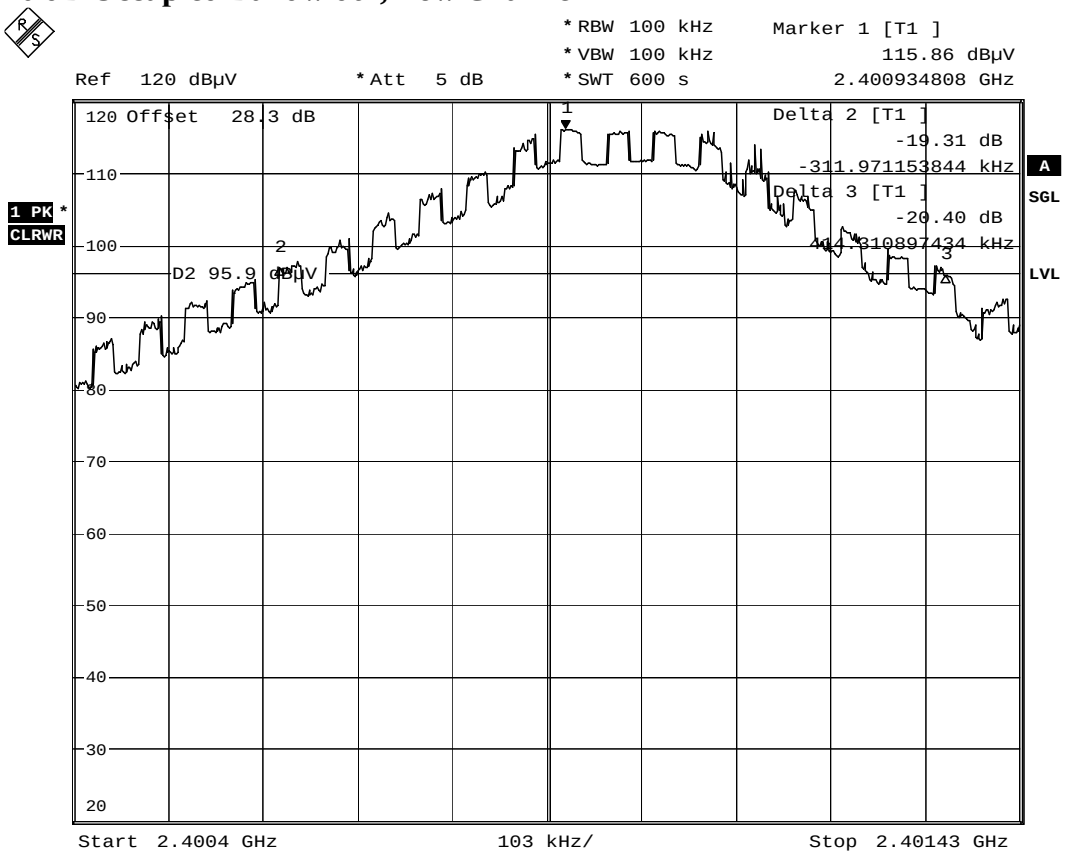
Sample Number:	1	**Temperature:**	25 °C
Date:	June 15, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Channel Separation (Spacing) and Occupied Bandwidth Test Results:

See attached plots and calculations.

Channel Separation and Occupied Bandwidth, continued

20 dB Occupied Bandwidth, Low Channel

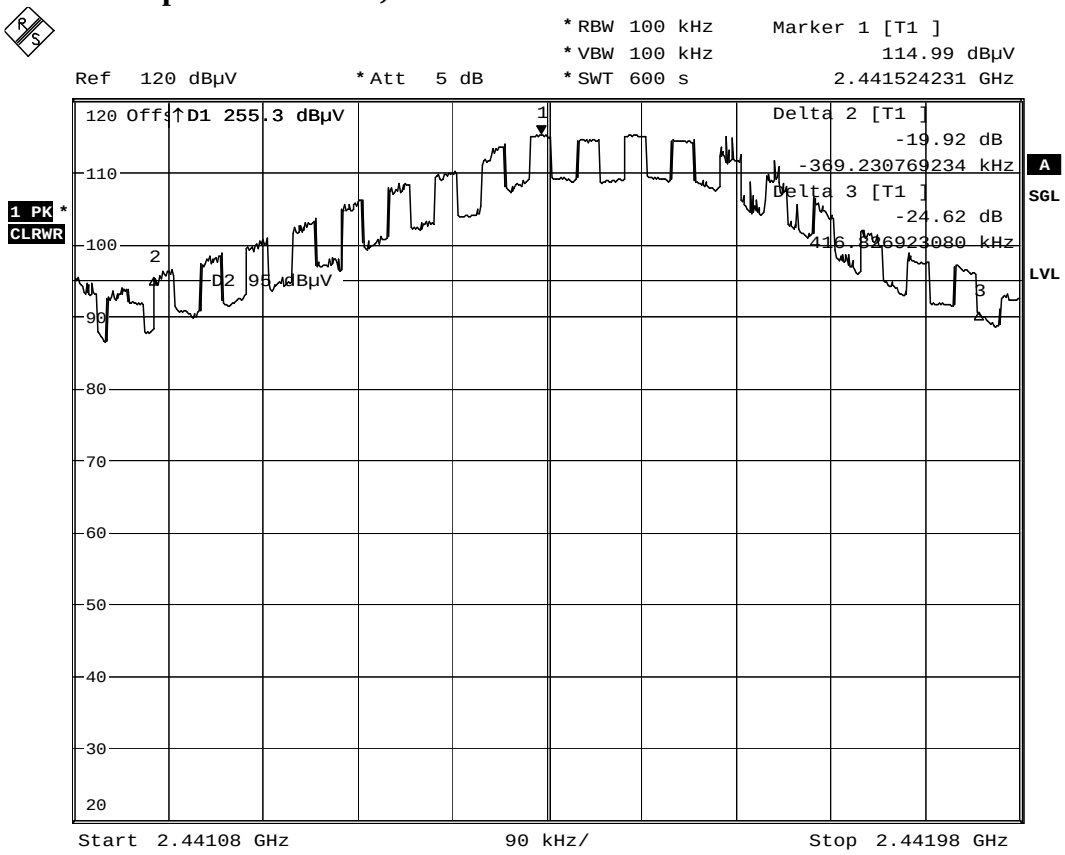


Date: 15.JUN.2005 16:58:54

Measured Occupied Bandwidth = 311.971 kHz + 414.311 kHz = 726.282 kHz

Channel Separation and Occupied Bandwidth, continued

20 dB Occupied Bandwidth, Mid Channel

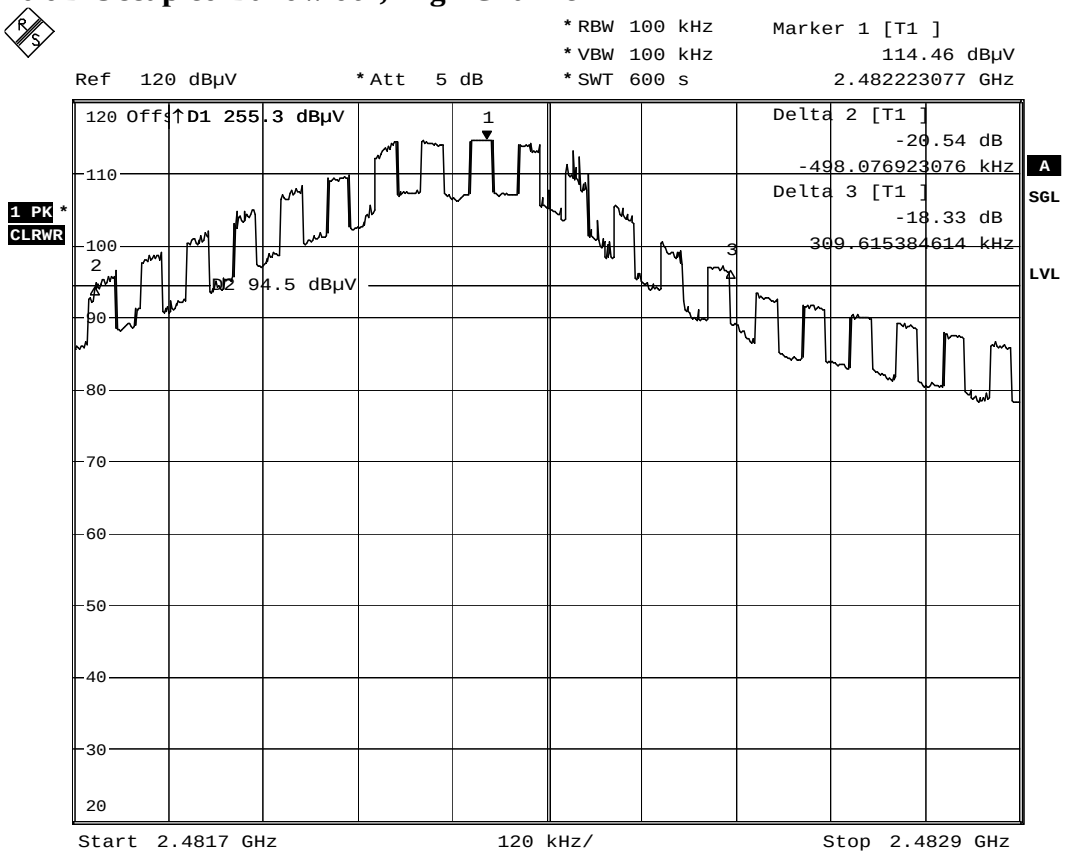


Date: 15.JUN.2005 17:43:57

Measured Occupied Bandwidth = 369.231 kHz + 416.827 kHz = 786.058 kHz

Channel Separation and Occupied Bandwidth, continued

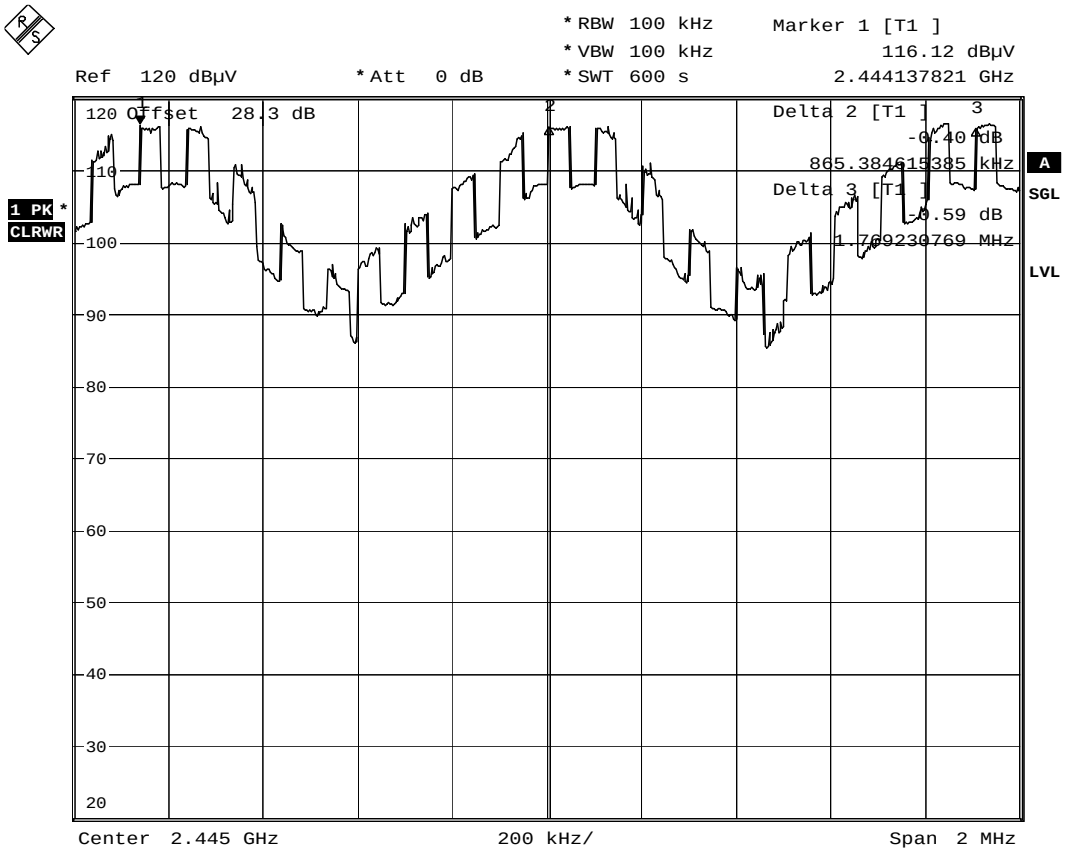
20 dB Occupied Bandwidth, High Channel



Date: 15.JUN.2005 18:07:56

Measured Occupied Bandwidth = 498.077 kHz + 309.615 kHz = 807.692 kHz

Channel Separation and Occupied Bandwidth, continued



Date: 10.JUN.2005 21:21:54

Nominal Channel Separation (Spacing): 864 kHz
Measured Channel Separation (Spacing): 865.384 kHz

Measured 20 dB Occupied Bandwidth: 807.692 kHz

Number of Hopping Channels and Time of Occupancy

Criteria: Clause 15.247(a)(1)(iii) Frequency hopping systems operating in the 2400-2483.5 MHz band

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

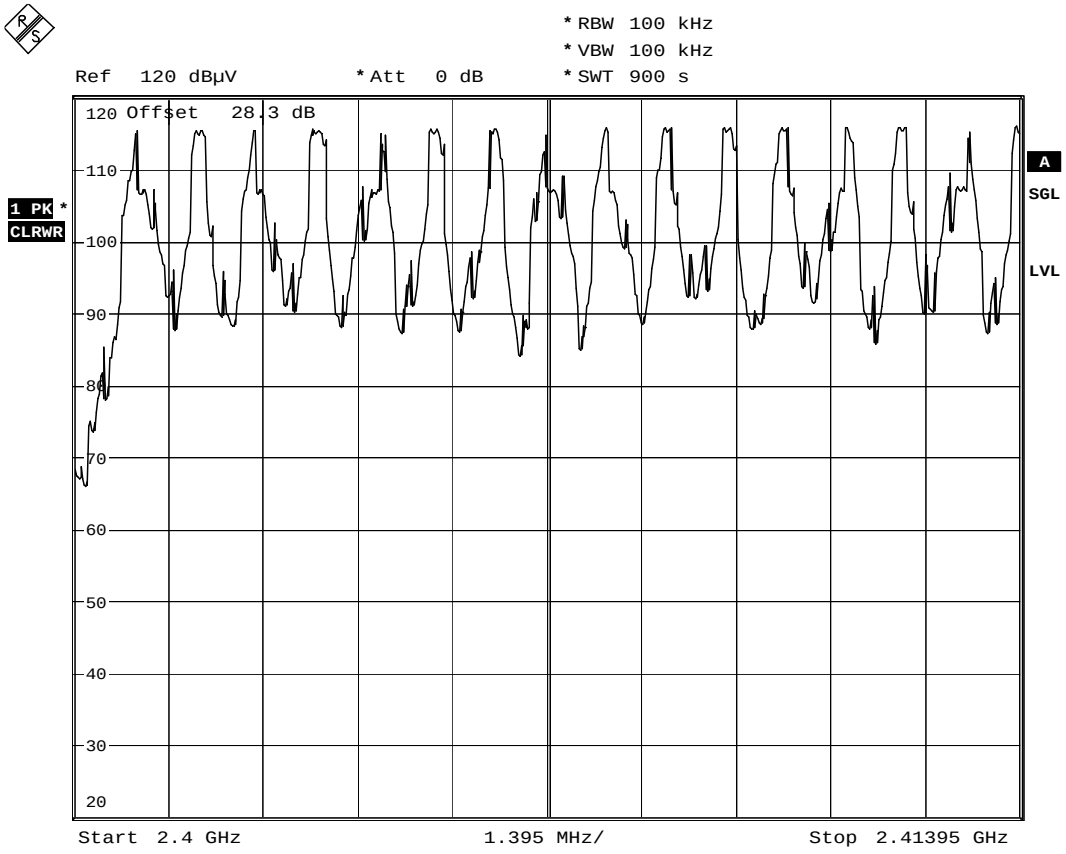
Test Conditions:

Sample Number:	1	**Temperature:**	25 °C
Date:	June 10, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See Attached Plots

Number of Hopping Channels and Time of Occupancy, continued

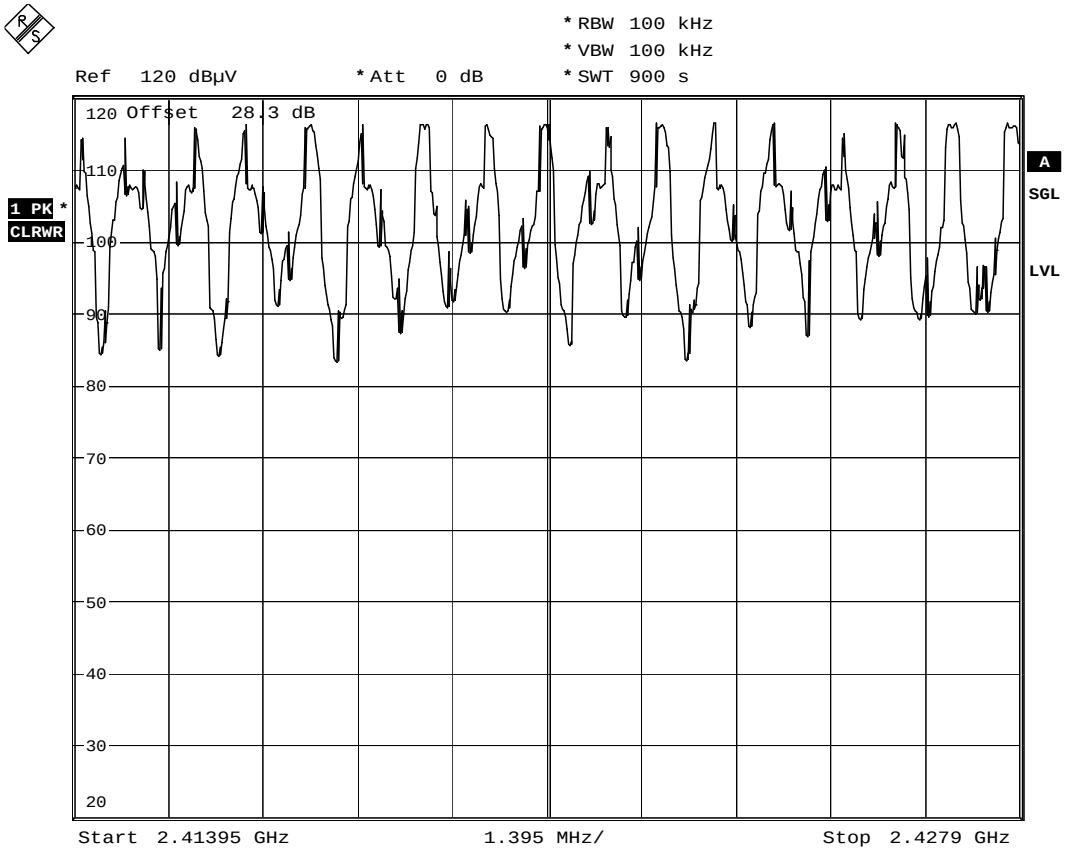
Number of Hopping Channels in Frequency Range 2400 – 2413.95 MHz: N1 = 15



Date: 10.JUN.2005 21:56:07

Number of Hopping Channels and Time of Occupancy, continued

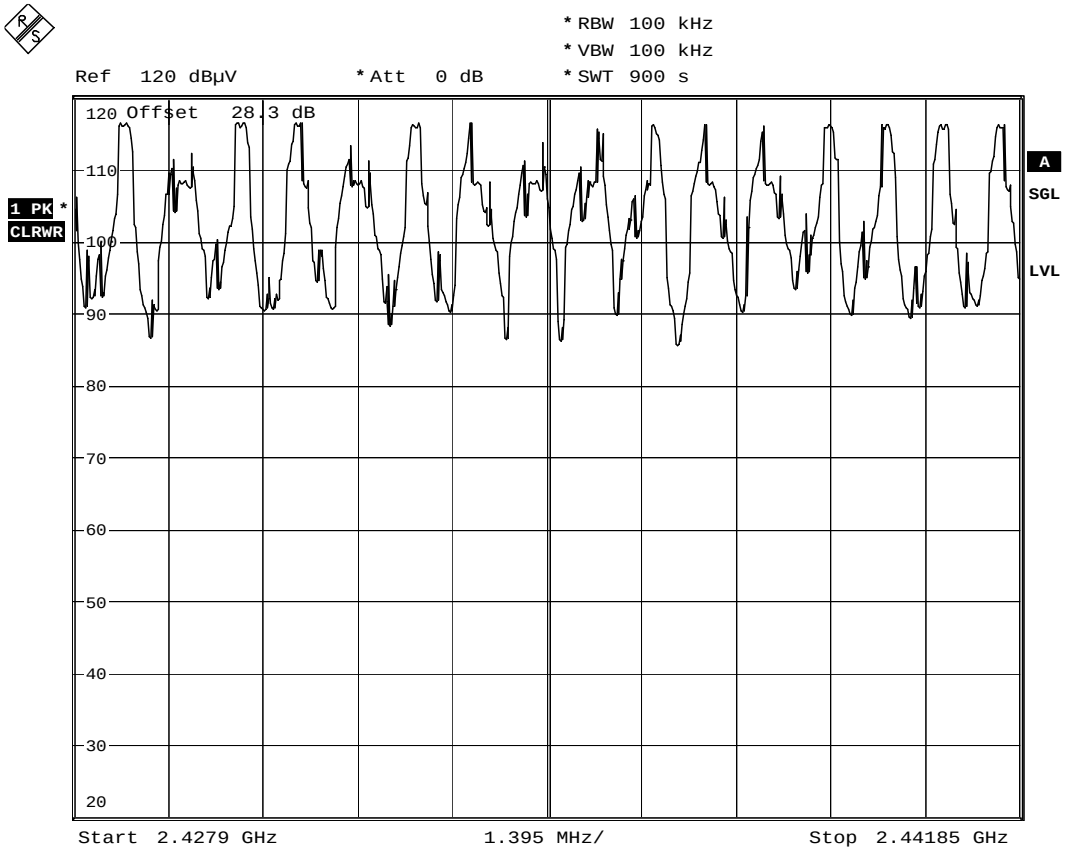
Number of Hopping Channels in Frequency Range 2413.95 – 2427.90 MHz: N2 = 17



Date: 10.JUN.2005 22:16:08

Number of Hopping Channels and Time of Occupancy, continued

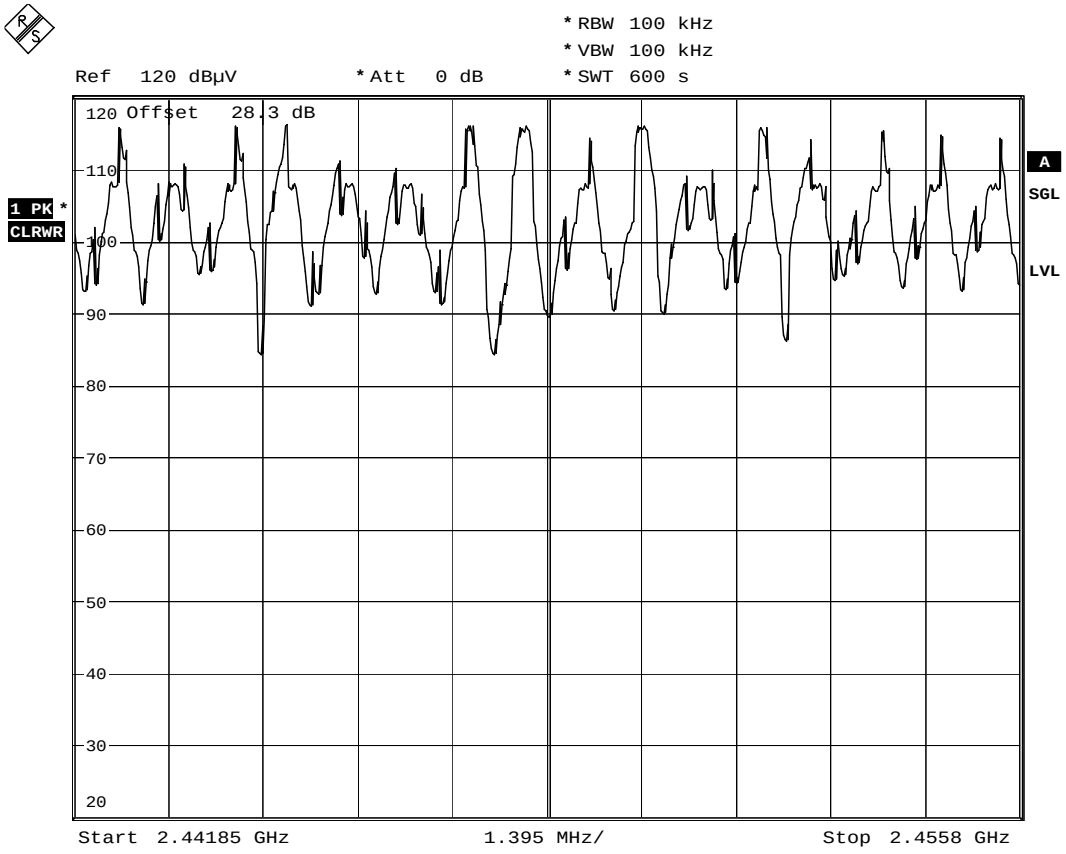
Number of Hopping Channels in Frequency Range 2427.90 – 2441.85 MHz: N3 = 16



Date: 10.JUN.2005 22:35:48

Number of Hopping Channels and Time of Occupancy, continued

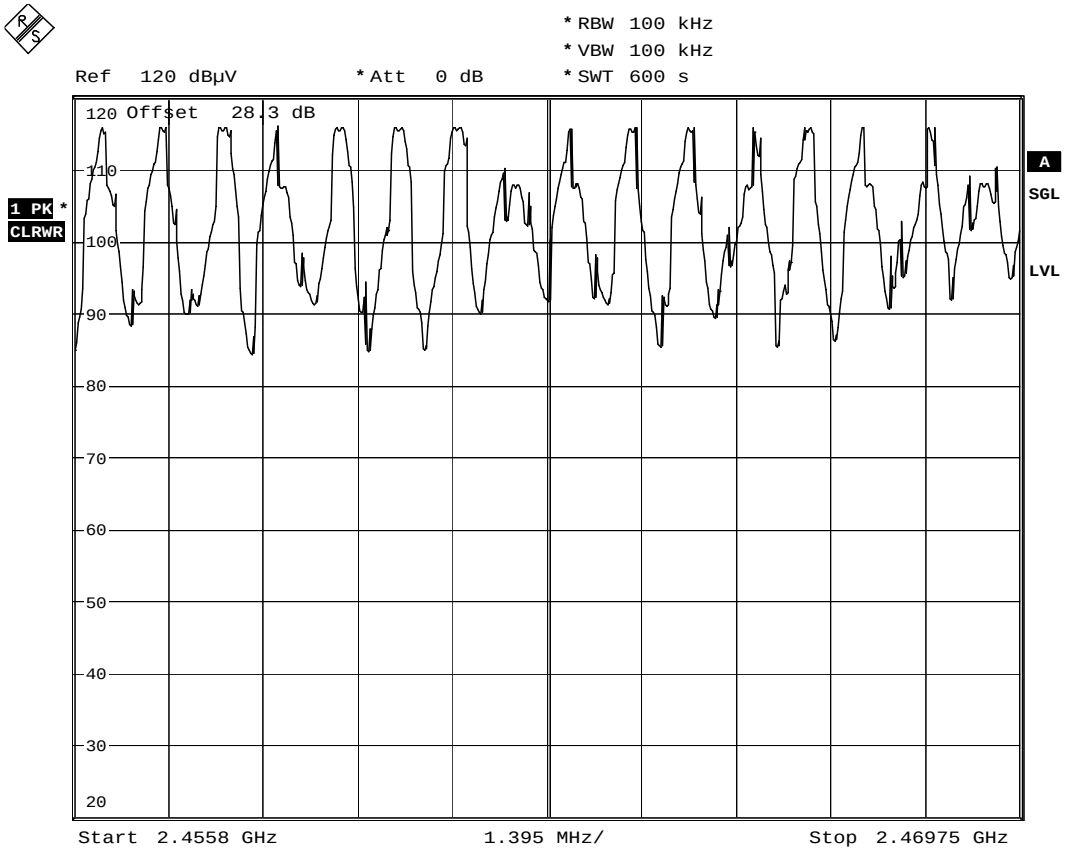
Number of Hopping Channels in Frequency Range 2441.85 – 2455.80 MHz: N4 = 16



Date: 10.JUN.2005 22:53:16

Number of Hopping Channels and Time of Occupancy, continued

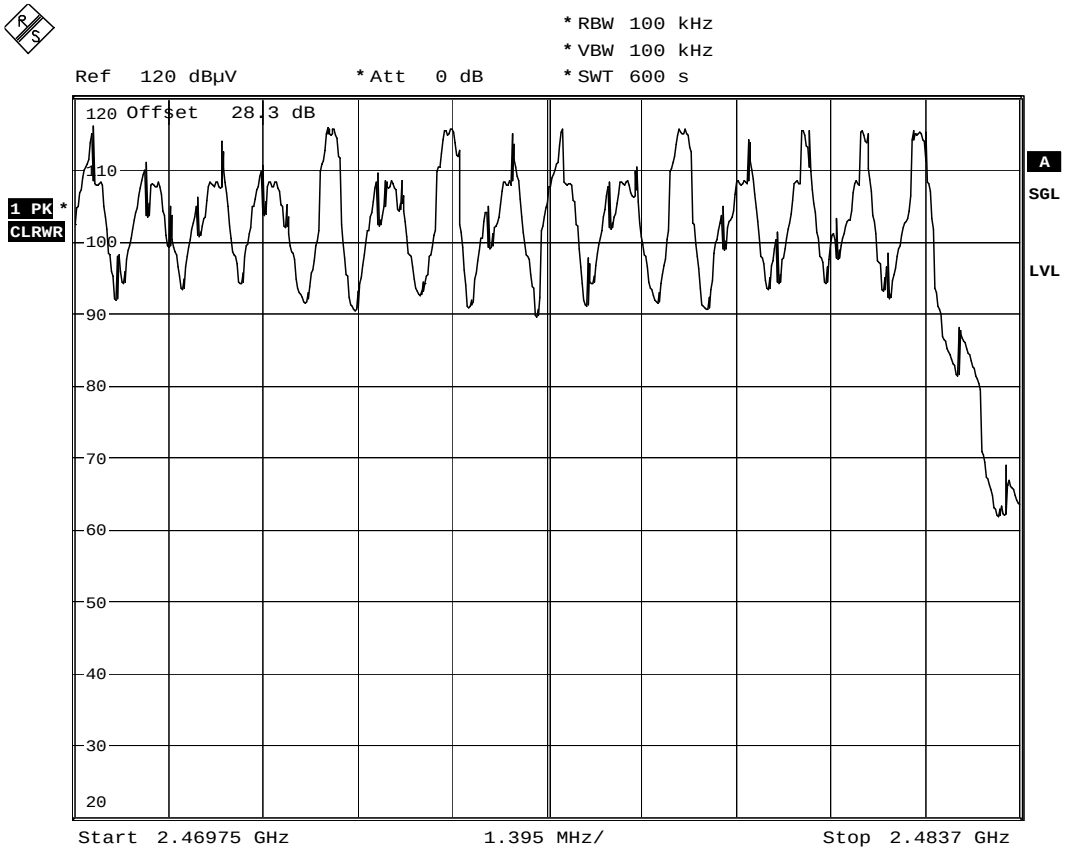
Number of Hopping Channels in Frequency Range 2455.80 – 2469.75 MHz: N5 = 16



Date: 10.JUN.2005 23:07:11

Number of Hopping Channels and Time of Occupancy, continued

Number of Hopping Channels in Frequency Range 2469.75 – 2483.50 MHz: N6 = 15

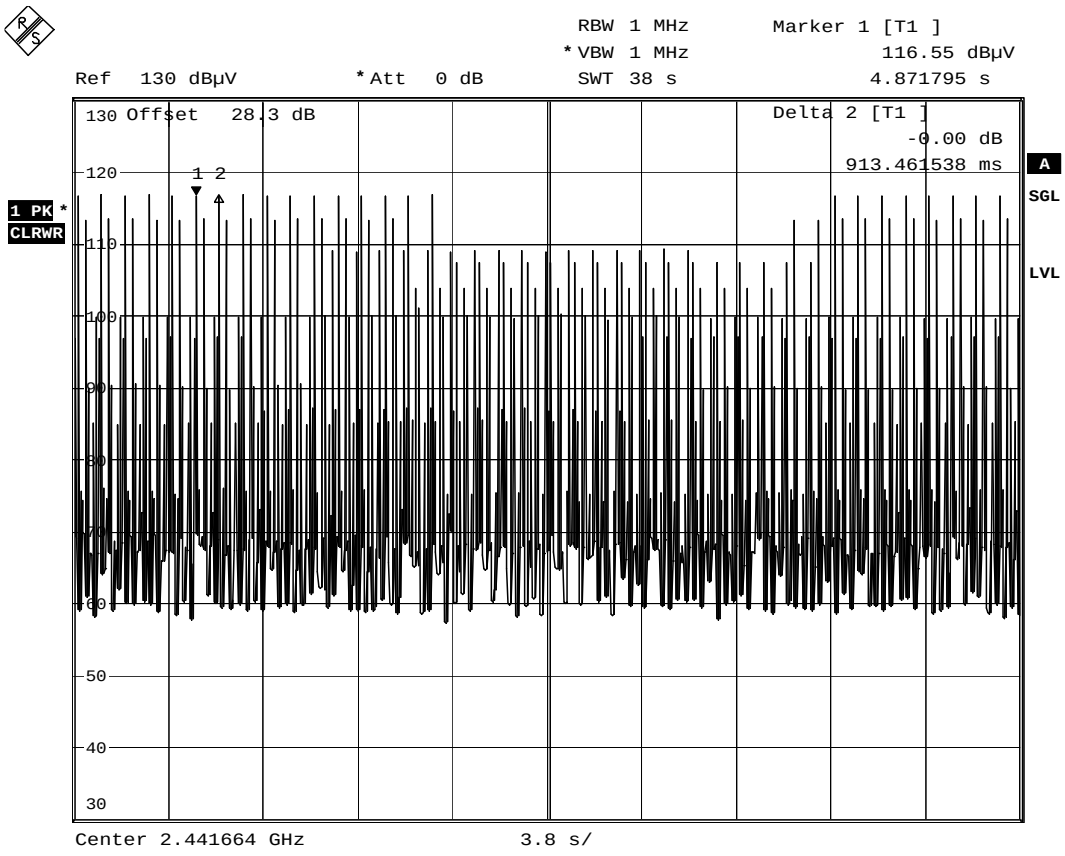


Date: 10.JUN.2005 23:19:54

Total number of Hopping Channels: N = N1 + N2 + N3 + N4 + N5 + N6 = 95

Number of Hopping Channels and Time of Occupancy, continued

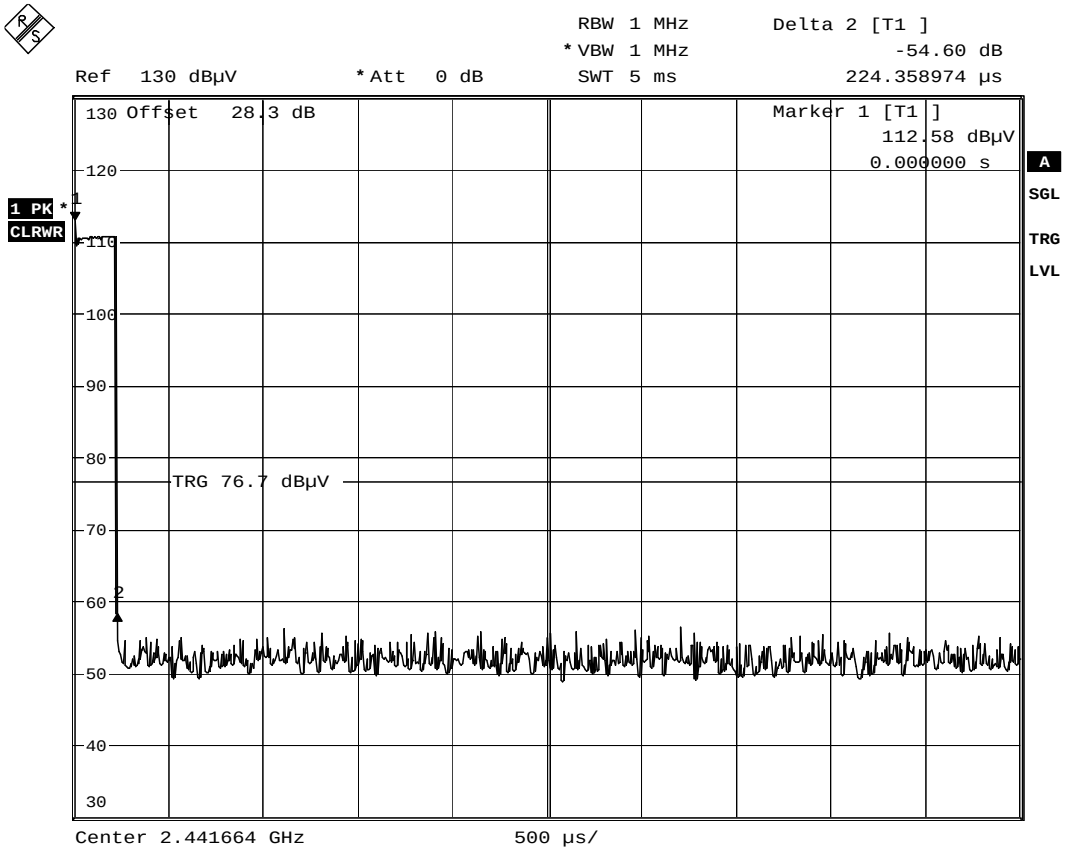
Time of Occupancy, Number of Hits within 38 seconds Frame:



Date: 13.JUN.2005 18:06:19

Number of Hopping Channels and Time of Occupancy, continued

Time of Occupancy, Single Pulse On Time:



Date: 13.JUN.2005 18:20:12

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

Number of Hopping Channels:	N = 95
Required Reference Time Frame:	T_{Ref} = 0.4 s × N = 38 s
Number of Hits in 38 seconds:	40 hits
Time of Occupancy Within 38 seconds Frame:	0.224358974 ms × 40 × 4 = 8.97 ms
Limit (Max. Allowed Time of Occupancy):	0.4 s = 400 ms

Maximum Peak Output Power of Frequency Hopping Systems

Criteria: Clause 15.247(b)(1) Maximum peak output power of Frequency hopping systems operating in the 2400-2483.5 MHz band and 5725-5850 MHz band

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Test Conditions:

Sample Number:	1	**Temperature:**	25 °C
Date:	June 7, 2005	**Humidity:**	45 %
Modification State:	0	**Tester:**	Roman Kuleba
		Laboratory:	Ottawa

Test Results: See Table

Conducted Output Power:

Measured output power = 18.7 dBm
Maximum output power = 18.7 dBm + 3.0 dBi = 21.7 dBm EIRP
Limit = 36 dBm EIRP

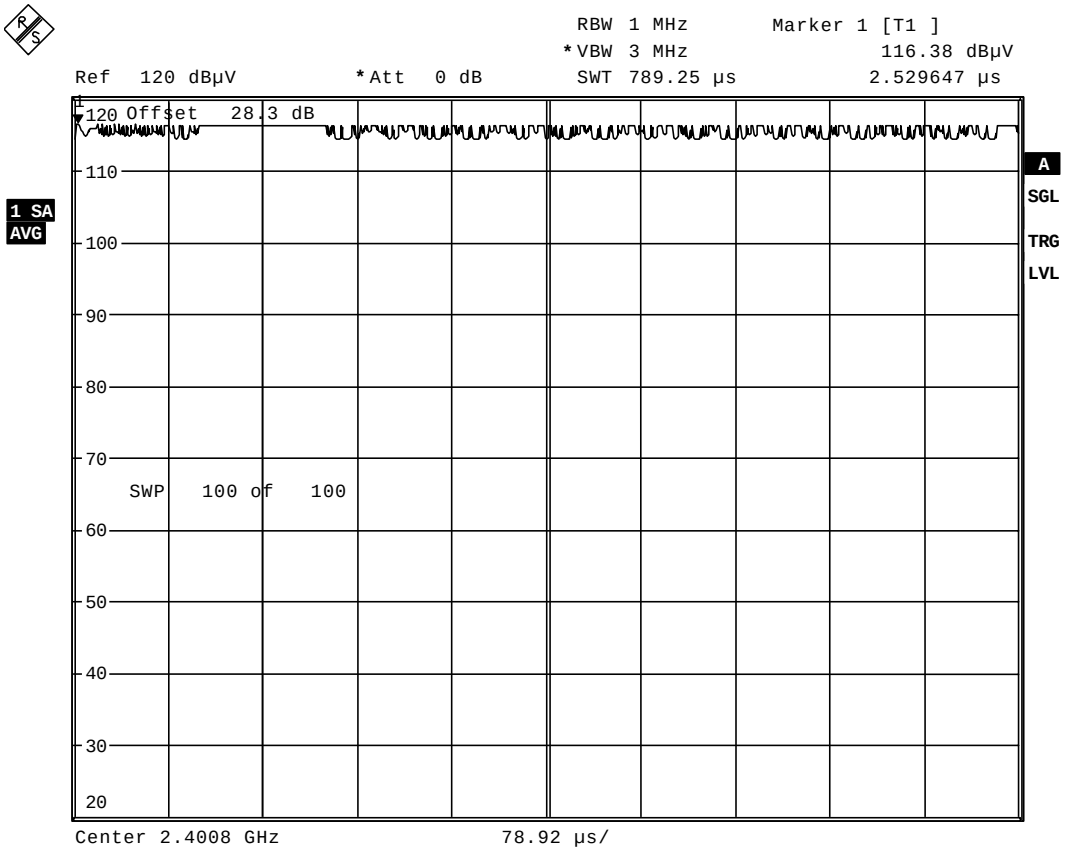
The output power was measured in accordance with FCC guidelines for Measurement of Digital Transmission Systems Operating under Section 15.247 issued on March 23, 2005.

The output power was measured at +/-15% of the supply voltage and found that there was no change.

Note: The EUT could not be modified by client to enable conducted RF output power measurements. Instead radiated RF power was measured and output conducted power was estimated based on the rated gain of the integrated antenna.

Maximum Peak Output Power of Frequency Hopping Systems, continued

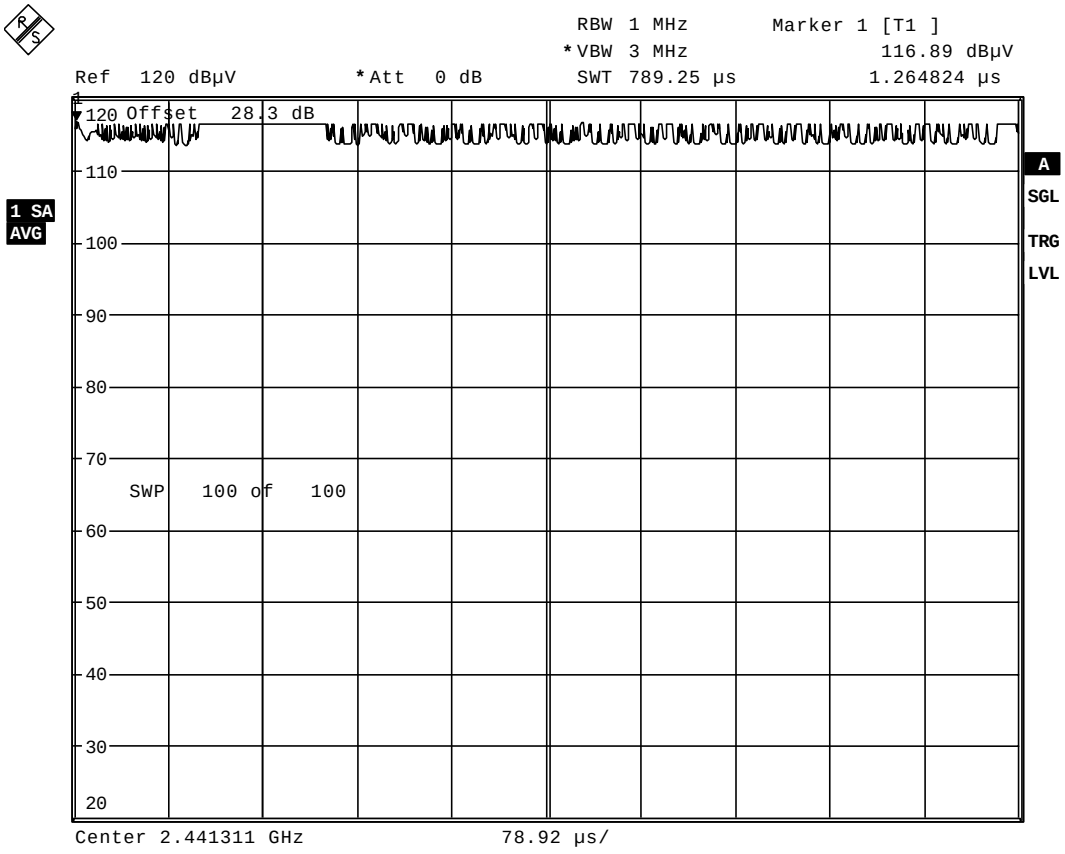
Low Channel



Measured Field Strength at 3m = 116.4 dBµV/m
EIRP = 21.2 dBm

Maximum Peak Output Power of Frequency Hopping Systems, continued

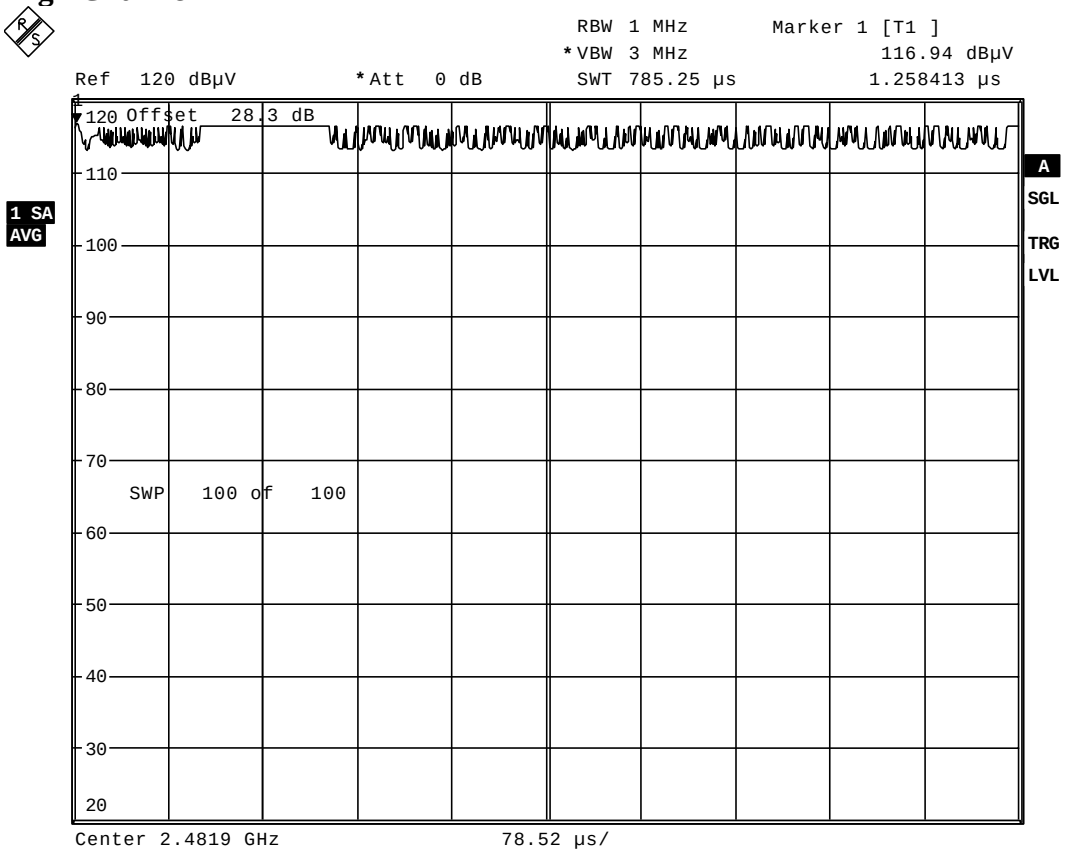
Mid Channel



Measured Field Strength at 3m = 116.9 dBµV/m
EIRP = 21.7 dBm

Maximum Peak Output Power of Frequency Hopping Systems, continued

High Channel



Measured Field Strength at 3m = 116.9 dBµV/m
EIRP = 21.7 dBm

Maximum Peak Output Power of Frequency Hopping Systems, continued

Radiated Output Power:

Channel	E-field @ 3 m (dBuV/m)	EIRP (W)	EIRP (dBm)	Antenna Gain (dBi)	Conducted Power (dBm)
Low (00)	116.4	0.131	21.2	3.0	18.2
Mid (2F)	116.9	0.147	21.7	3.0	18.7
High (5E)	116.9	0.147	21.7	3.0	18.7

Measured value (V/m) = $10^{(E-field)/20}$ = 0.7 V/m at R = 3 m

Antenna Gain (numeric) = $10^{(Ag/10)}$ = 1.995

Output Power (W) = $\frac{E^2 R^2}{30 \cdot G}$ = 73.7 mW = 18.7 dBm

E = Measured Value (V/m)
R = Measurement distance (m)
G = Antenna Gain (numeric)

Additional Observations:

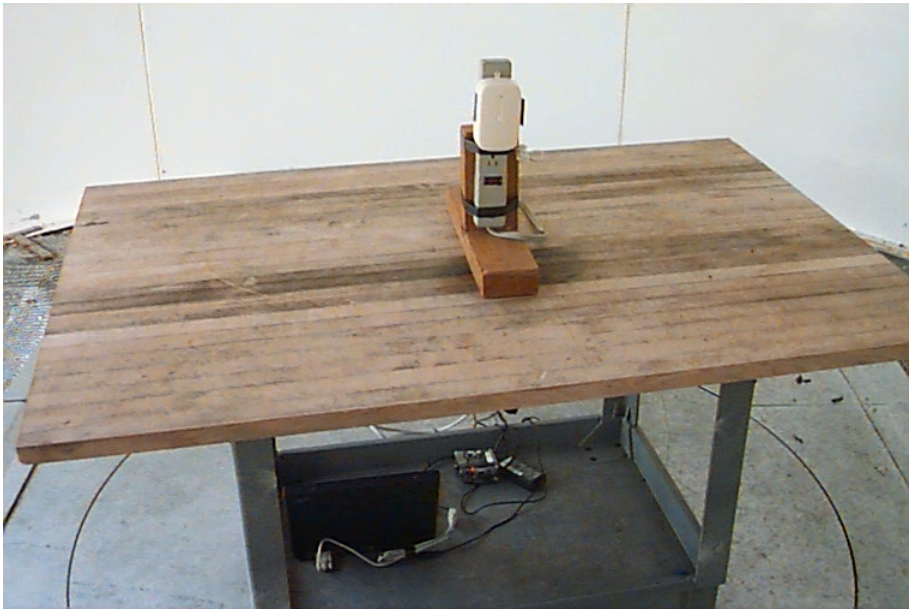
The output power was measured in accordance with FCC guidelines for Measurement of Digital Transmission Systems Operating under Section 15.247 issued on March 23, 2005, as follows:

Spectrum analyzer was set in zero-span mode with trace averaging.
RBW was set to 1 MHz, which was greater than EBW of the EUT.
VBW was set to 3 MHz.
Detector mode was set on 'SAMPLE'.
To ensure that averaging was done only within periods with the maximum power, video triggering was used and Sweep Time was set equal to the ON time of the transmitted pulse.
Readings were obtained on the temporal peak from 100 traces averaged.

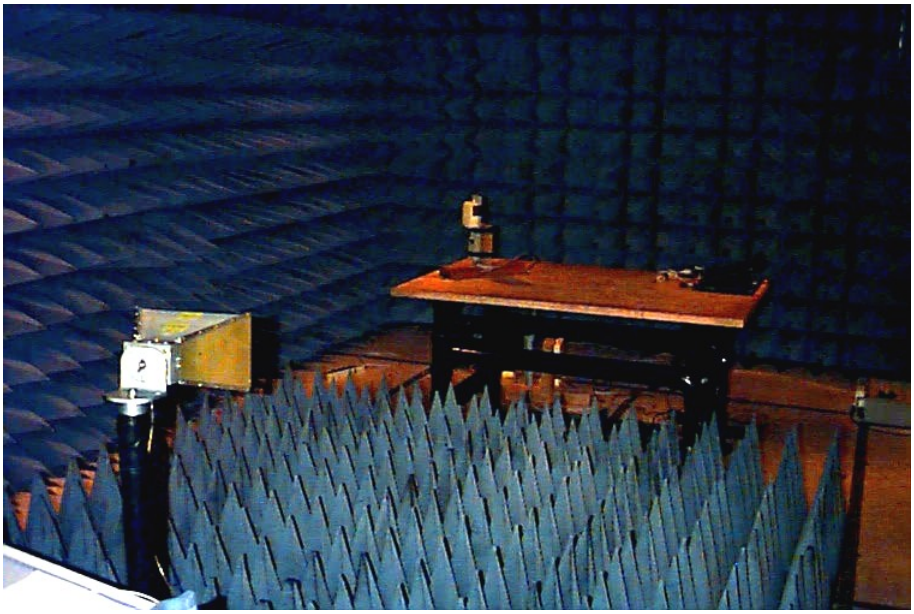
All Measurements were performed at 3 m distance.

Appendix B : Setup Photographs

Radiated Emissions Test Setup:

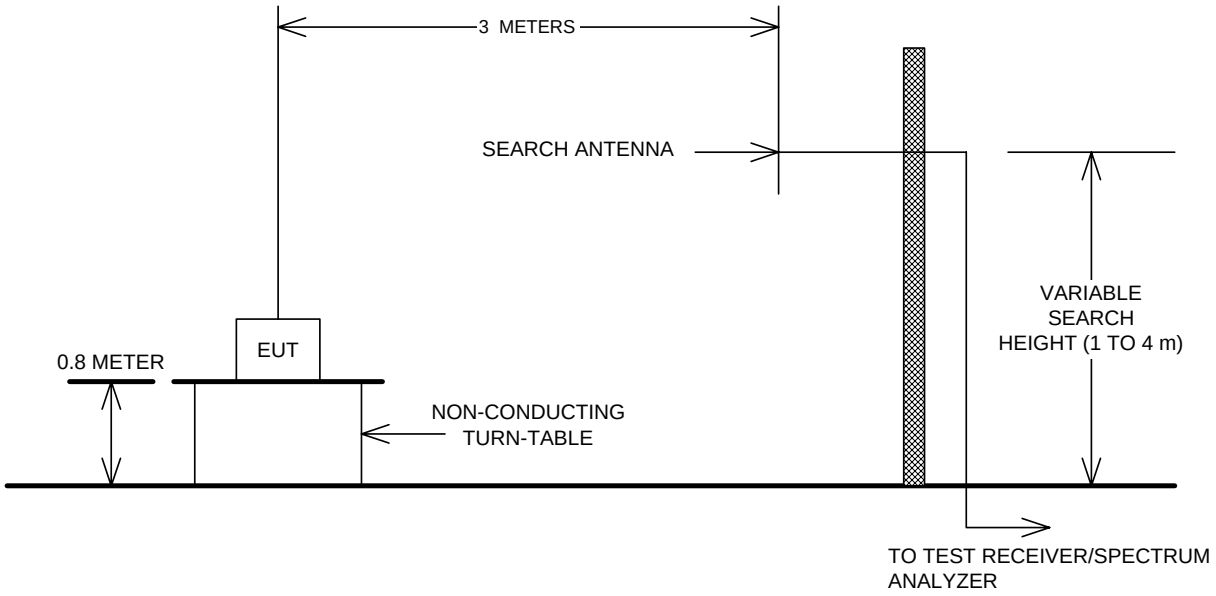


Radiated Emissions Test Setup:



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions