

Nemko Test Report: 128858-2TRFWL

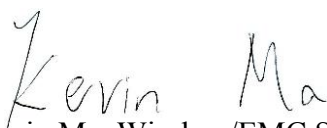
Applicant: BelAir Networks Inc.
603 March Road,
Ottawa, ON
K2K 2M5 Canada

Apparatus: ERM5

FCC ID: RAR20051001

In Accordance With: FCC Part 15 Subpart E, 15.407
Unlicensed National Information Infrastructure
Devices

Authorized By:


Kevin Ma, Wireless/EMC Specialist

Date: November 12, 2009

Total Number of Pages: 32

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart E. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	ERM5
Specification:	FCC Part 15 Subpart E, 15.407
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3 m Semi-Anechoic Chamber)
Tests Performed By:	Andrey Adelberg, Senior Wireless/EMC Specialist
Test Dates:	June–August 2009

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. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Enhanced Radio Module
Brand Name:	BelAir
Model Name or Number:	ERM5
Serial Number:	K002360442
Nemko Sample Number:	1
FCC ID:	RAR20051001
Date of Receipt:	June 10, 2009

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Host Unit
Brand Name:	BelAir
Model Name or Number:	BelAir100T
Serial Number:	BELAF2398
Nemko Sample Number:	1
Connection Port:	PCI connection

Description:	Ethernet Hub
Brand Name:	Airlink
Model Name or Number:	ASW105/A4
Serial Number:	0526A4A20149
Nemko Sample Number:	2
Connection Port:	Ethernet

Description:	Laptop
Brand Name:	Toshiba
Model Name or Number:	Satellite A10 PSA10C-00REH
Serial Number:	63042093J
Nemko Sample Number:	3
Connection Port:	Ethernet connection through Ethernet Hub

2.3 EUT Description

The EUT is a module designed to operate in the 5.725–5.825 GHz UNII band.



2.4 Technical Specifications of the EUT

Operating Bands: 5725–5825 MHz

Operating Frequency: 5745–5805 MHz (20 MHz channel)
5765–5805 MHz (40 MHz channel)
5765–5785 MHz (40 MHz channel)⁽¹⁾

Modulation: OFDM

Occupied Bandwidth: 20 and 40 MHz

Emission Designator: W7D

Antenna Data:

1. 10 dBi, Maxrad, MHO515010NM, N-Male
2. 10 dBi, MTI, MT-462008/N/A, SN 00004
3. 15 dBi, Maxrad Panel Antenna, WISP4959018MBV
4. 19 dBi, MTI, MT-485001
5. 23 dBi, Huber&Suhner, SPA 5600/9/23/0/V, SN 04375
6. 15 dBi, BelAir BAM Antenna BEL10008-A01
7. 10.5 dBi, BelAir B1BB025AA-A01
8. 22.5 dBi, MTI, MT-485028/N
9. 29 dBi, Maxrad Dish, MPRC2449

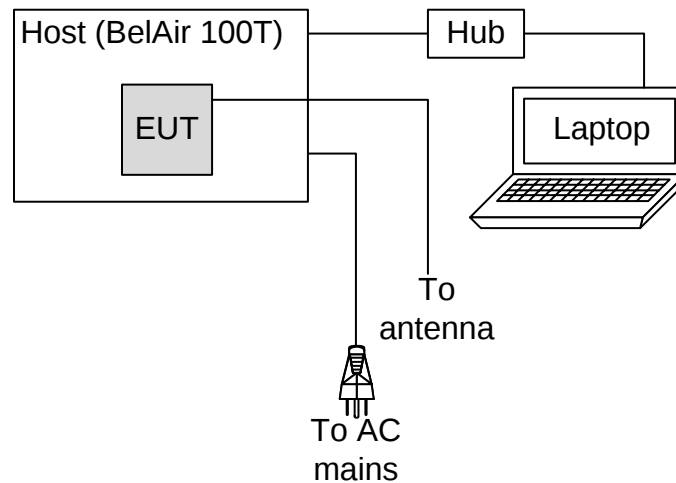
Antennas 1–3 are point-to-multipoint, the rest are point-to-point.

Power Supply 120 VAC, 60 Hz

Requirements:

⁽¹⁾ – For antennas: 22.5 dBi, 23 dBi and 29 dBi.

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

The EUT was controlled to transmit at desired frequency from laptop.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart E, 15.407
Unlicensed National Information Infrastructure Devices

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15–30 °C
Humidity range	:	20–75 %
Pressure range	:	86–106 kPa
Power supply range	:	±5 % of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/09	May 06/10
Bilog	Sunol	JB3	FA002108	Jan. 27/09	Jan. 27/10
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
International Power Supply	California Inst.	3001i	FA001021	Jan. 13/09	Jan. 13/10
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 16/08	Dec. 16/09
Horn Antenna #2	EMCO	3115	FA000825	Jan. 21/09	Jan. 21/10
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 2/08	Oct 2/09
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 40	FA002071	Nov. 25/08	Nov. 25/09
Horn 18 – 26.5 GHz	Electro-Metrics	SH-50/60-1	FA000479	COU	COU
Horn 26.5 – 40 GHz	Electro-Metrics	SH-50/60-2	FA000485	COU	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU
Frequency Counter	HP	5352B	FA001915	Jan 08/09	Jan 08/10
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR	NCR
Multimeter	Fluke	16	FA001831	Jan 13/09	Jan 13/10
Air probe	Fluke	None	FA001248	NCR	NCR
Attenuator	Narda	776B-20	FA001153	COU	COU

COU – Calibrate on Use

NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart E : 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 Report Summary)

4.1 FCC Part 15 Subpart E : 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
15.403(i)	Emission Bandwidth	Y	PASS
15.407(a)(2)	Peak Conducted Transmit Output Power	Y	PASS
15.407(b)	Spurious Emissions	Y	PASS
15.407(a)(2)	Peak Power Spectral Density	Y	PASS
15.407(a)(6)	Peak Excursion Measurement	Y	PASS
15.407(g)	Frequency stability	Y	PASS

Appendix A : Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dB μ V)

Emission (MHz)	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 Results: Pass

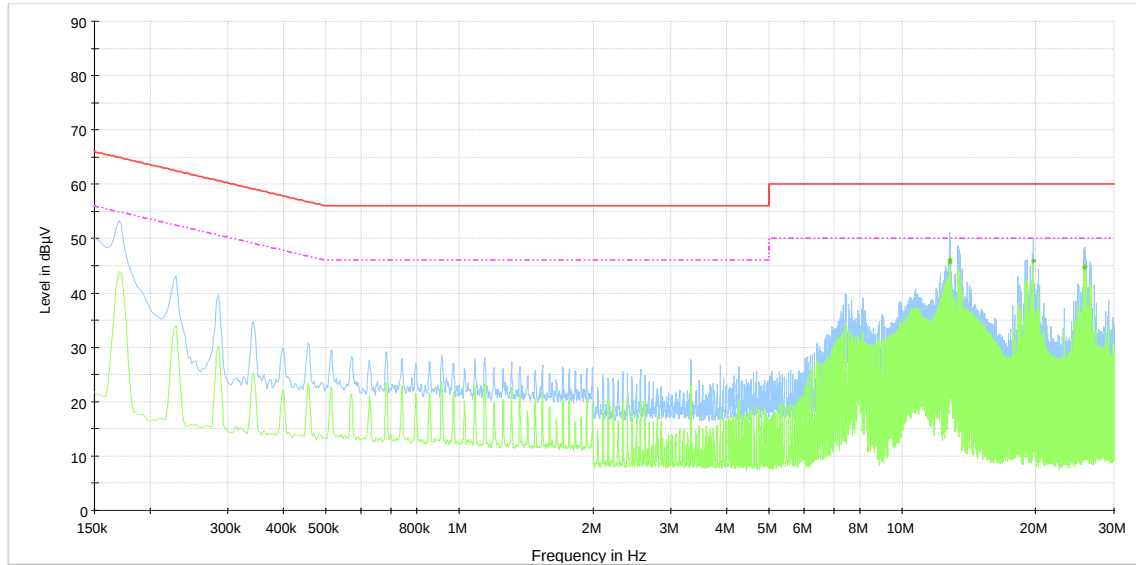
Additional Observations:

All plots were obtained using a sweeping receiver with an IF of 9 kHz using a Quasi-Peak and Average detector. The plots have been corrected with the cable loss and LISN loss to show compliance.

Frequency MHz	Average dB μ V	Meas. Time ms	Bandwidth kHz	Filter	Line	Corr. dB	Margin dB	Limit dB μ V
12.747250	45.6	100.0	9.000	On	Phase	10.5	4.4	50.0
12.808000	46.2	100.0	9.000	On	Phase	10.5	3.8	50.0
19.708750	45.9	100.0	9.000	On	Phase	10.7	4.1	50.0
25.693750	44.7	100.0	9.000	On	Phase	10.9	5.3	50.0
25.876000	44.8	100.0	9.000	On	Phase	10.9	5.2	50.0

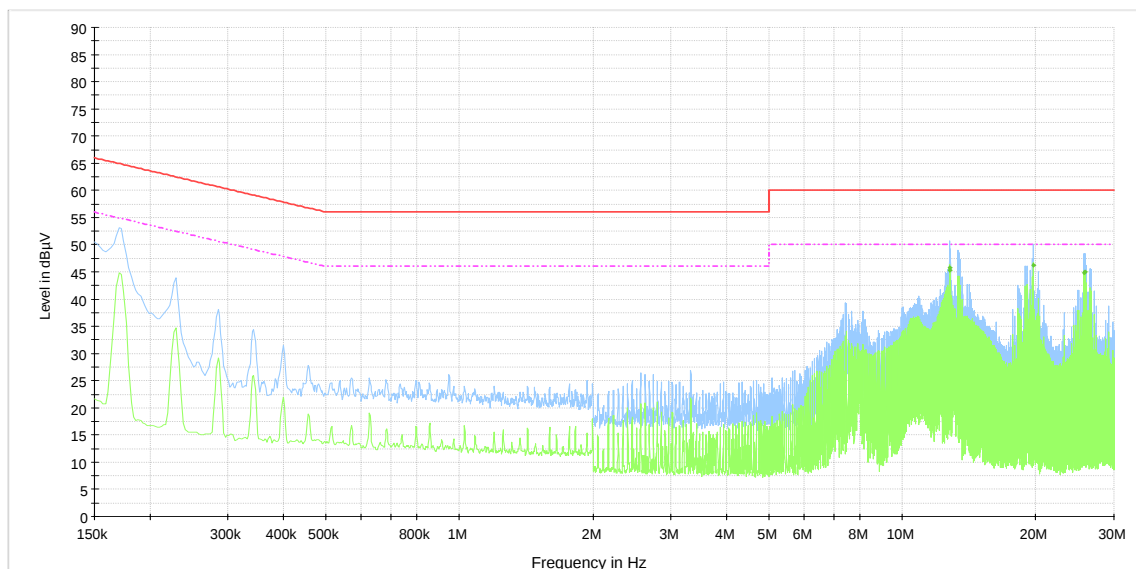
Frequency MHz	Average dB μ V	Meas. Time ms	Bandwidth kHz	Filter	Line	Corr. dB	Margin dB	Limit dB μ V
12.747250	45.3	100.0	9.000	On	Neutral	10.5	4.7	50.0
12.808000	45.8	100.0	9.000	On	Neutral	10.5	4.2	50.0
19.708750	46.2	100.0	9.000	On	Neutral	10.8	3.8	50.0
25.693750	44.8	100.0	9.000	On	Neutral	11.1	5.2	50.0
25.876000	45.0	100.0	9.000	On	Neutral	11.1	5.0	50.0

Phase:



Conducted Emissions on Phase Line
 — CISPR 22 Mains QP Class B.LimitLine
 - - - CISPR 22 Mains AV Class B.LimitLine
 — Preview Peak Result
 — Preview Average Result
 ♦ Final Average Result

Neutral:



Conducted Emissions on Neutral
 — CISPR 22 Mains QP Class B.LimitLine
 - - - CISPR 22 Mains AV Class B.LimitLine
 — Preview Peak Result
 — Preview Average Result
 ♦ Final Average Result

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		Measurement Distance (meters)
	(μ V/m)	(dB μ V/m)	
0.009–0.490	2400/F	67.6–20log(F)	300
0.490–1.705	24000/F	87.6–20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
Above 960	500	54.0	3

Note: F = fundamental frequency in kHz

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to the 40 GHz.

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

Peak Detector with 100 kHz/300 kHz RBW/VBW was used for measurements below 1 GHz and 1 MHz/3 MHz RBW/VBW for frequencies above 1 GHz. Since EUT has 100 % duty cycle average measurements were performed at the frequencies above 1 GHz with 1 MHz/10 Hz RBW/VBW spectrum analyzer settings.

The EUT was scanned with scanned with all modulation bandwidths. The highest gain antenna of each type was chosen for the test. Only the worst case of data is provided.

Antenna	Emission Frequency, MHz	FS Peak, dBμV/m	FS Peak Limit, dBμV/m	Margin, dB	FS Avg, dBμV/m	FS Avg Limit, dBμV/m	Margin, dB
Flat 23 dBi (4)	11530	65.87	74.00	8.13	50.87	54.00	3.13
	11570	64.31	74.00	9.69	50.47	54.00	3.53
	11610	63.22	74.00	10.78	50.01	54.00	3.99
Omni 10 dBi (1)	11530	64.91	74.00	9.09	51.40	54.00	2.60
	11570	62.53	74.00	11.47	48.47	54.00	5.53
	11610	61.58	74.00	12.42	47.60	54.00	6.40
90 deg Sector 15 dBi (3)	11530	63.46	74.00	10.54	49.73	54.00	4.27
	11570	62.33	74.00	11.67	49.09	54.00	4.91
	11610	61.98	74.00	12.02	47.84	54.00	6.16
Patch 15 dBi (8)	11530	64.80	74.00	9.20	49.56	54.00	4.44
	11570	63.98	74.00	10.02	49.84	54.00	4.16
	11610	59.69	74.00	14.31	45.86	54.00	8.14
Dish 29 dBi (9)	11530	69.87	74.00	4.13	53.10	54.00	0.90
	11570	70.37	74.00	3.63	53.42	54.00	0.58
	11610	68.43	74.00	5.57	53.19	54.00	0.81

Note: Field Strength (FS) result includes antenna factor, cable losses and amplifier gain where applicable.
Number in parentheses indicates the antenna number from the table above.

The EUT can have one of the following antennae:

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

The highest gain antenna of each type was chosen for the test.

Clause 15.403(i) Emission Bandwidth

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement

Test Results: Pass
Refer to tables below and sample plots:

26 dB Bandwidth:

Frequency MHz	Channel Bandwidth MHz	Measured 26 dB BW MHz
5745	20	19.31
5785	20	19.55
5805	20	19.71
5765	40	42.79
5805	40	41.82

Clause 15.407(a)(3) Power Limits for the 5.725–5.825 GHz band

For the band 5.725–5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Method:

FCC Public Notice Ref: DA: 02-2138

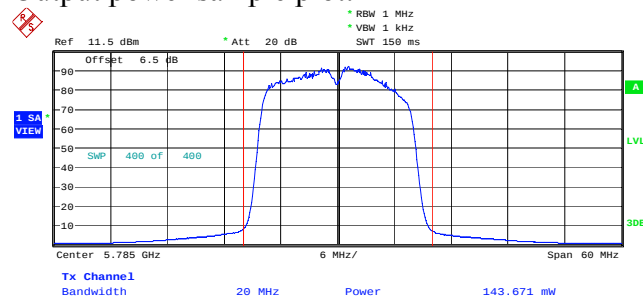
Measurement Procedure for Peak Transmit Power in UNII Band

The output RF power was measured on the antenna port by means of a spectrum analyzer and following the 'Method 3' procedure (since the maximum resolution bandwidth of a spectrum analyser is less than 40 MHz channel).

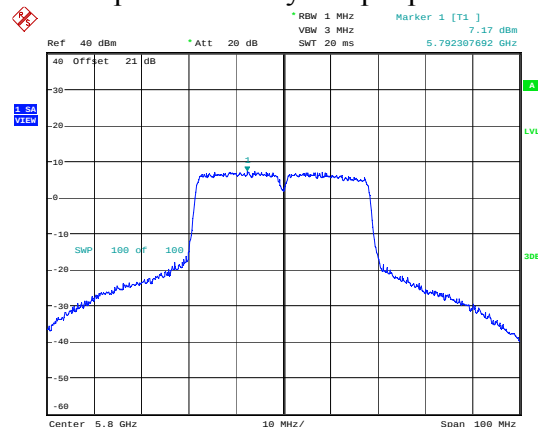
Test Results:

Pass

Output power sample plot:



Power spectral density sample plot:



Point-to-Multipoint

Output Power

20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5745	10	1,2	1	9	38	155.041	21.90	27.00	5.10	30.90	36.00	5.10
5785	10	1,2	1	9	40	143.671	21.57	27.00	5.43	30.57	36.00	5.43
5805	10	1,2	1	9	40	147.179	21.68	27.00	5.32	30.68	36.00	5.32
5745	15	3	1	14	31	75.305	18.77	22.00	3.23	32.77	36.00	3.23
5785	15	3	1	14	32	70.001	18.45	22.00	3.55	32.45	36.00	3.55
5805	15	3	1	14	32	72.367	18.60	22.00	3.40	32.60	36.00	3.40

Peak Output power limit = (30 dBm or 17 dBm + 10 log B) – (antenna gain – 6 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Output Power

40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5765	10	1,2	1	9	40	128.948	21.10	27.00	5.90	30.10	36.00	5.90
5805	10	1,2	1	9	25	29.595	14.71	27.00	12.29	23.71	36.00	12.29
5765	15	3	1	14	37	95.485	19.80	22.00	2.20	33.80	36.00	2.20
5805	15	3	1	14	1	9.272	9.67	22.00	12.33	23.67	36.00	12.33

Peak Output power limit = (30 dBm or 17 dBm + 10 log B) – (antenna gain – 6 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV

Point-to-Multipoint

PSD

20 MHz channel

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5745	10	1, 2	1	9	38	12.02	14.00	1.98
5785	10	1, 2	1	9	40	11.91	14.00	2.09
5805	10	1, 2	1	9	40	11.85	14.00	2.15
5745	15	3	1	14	31	8.80	9.00	0.20
5785	15	3	1	14	32	8.92	9.00	0.08
5805	15	3	1	14	32	8.45	9.00	0.55

PSD Limit = 17 dBm – (antenna gain – 6 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

PSD

40 MHz channel

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5745	10	1, 2	1	9	40	7.75	14.00	6.25
5785	10	1, 2	1	9	25	1.27	14.00	12.73
5805	15	3	1	14	37	6.32	9.00	2.68
5745	15	3	1	14	1	-4.30	9.00	13.30

PSD Limit = 17 dBm – (antenna gain – 6 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV

Point-to-Point

Output Power for antennas below 23 dBi

20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5745	19	6	1	18	32	84.325	19.26	30.00	10.74	37.26	53.00	15.74
5785	19	6	1	18	40	143.671	21.57	30.00	8.43	39.57	53.00	13.43
5805	19	6	1	18	35	100.779	20.03	30.00	9.97	38.03	53.00	14.97
5745	22.5	5	1	21.5	30	67.039	18.26	30.00	11.74	39.76	53.00	13.24
5785	22.5	5	1	21.5	40	143.671	21.57	30.00	8.43	43.07	53.00	9.93
5805	22.5	5	1	21.5	32	72.367	18.60	30.00	11.40	40.10	53.00	12.90
5745	23	4	1	22	30	67.039	18.26	30.00	11.74	40.26	53.00	12.74
5785	23	4	1	22	40	143.671	21.57	30.00	8.43	43.57	53.00	9.43
5805	23	4	1	22	32	72.367	18.60	30.00	11.40	40.60	53.00	12.40
5745	10.5	7	1	9.5	38	155.041	21.90	30.00	8.10	31.40	53.00	21.60
5785	10.5	7	1	9.5	40	143.671	21.57	30.00	8.43	31.07	53.00	21.93
5805	10.5	7	1	9.5	40	147.179	21.68	30.00	8.32	31.18	53.00	21.82
5745	15	8	1	14	35	115.574	20.63	30.00	9.37	34.63	53.00	18.37
5785	15	8	1	14	40	143.671	21.57	30.00	8.43	35.57	53.00	17.43
5805	15	8	1	14	38	131.209	21.18	30.00	8.82	35.18	53.00	17.82

Peak Output power limit = 30 dBm or 17 dBm + 10 log B

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Output Power for antennas above 23 dBi

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5745	29	9	1	28	25	48.317	16.84	25.00	8.16	44.84	53.00	8.16
5785	29	9	1	28	40	143.671	21.57	25.00	3.43	49.57	53.00	3.43
5805	29	9	1	28	27	51.146	17.09	25.00	7.91	45.09	53.00	7.91

Peak Output power limit = 30 dBm or 17 dBm + 10 log B – (antenna gain – 23 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Point-to-Point

Output Power for antennas below 23 dBi

40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5765	19	6	1	18	34	66.114	18.20	30.00	11.80	36.20	53.00	16.80
5805	19	6	1	18	0	5.961	7.75	30.00	22.25	25.75	53.00	27.25
5765	22.5	5	1	21.5	32	51.482	17.12	30.00	12.88	38.62	53.00	14.38
5785	22.5	5	1	21.5	35	71.873	18.57	30.00	11.43	40.07	53.00	12.93
5765	23	4	1	22	32	51.482	17.12	30.00	12.88	39.12	53.00	13.88
5785	23	4	1	22	34	63.520	18.03	30.00	11.97	40.03	53.00	12.97
5765	10.5	7	1	9.5	39	114.608	20.59	30.00	9.41	30.09	53.00	22.91
5805	10.5	7	1	9.5	25	30.243	14.81	30.00	15.19	24.31	53.00	28.69
5765	15	8	1	14	37	95.485	19.80	30.00	10.20	33.80	53.00	19.20
5805	15	8	1	14	1	9.272	9.67	30.00	20.33	23.67	53.00	29.33

Peak Output power limit = 30 dBm or 17 dBm + 10 log B

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Output Power for antennas above 23 dBi

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PTX Cond. (mW)	PTX Cond. (dBm)	Limit (dBm)	Margin (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5765	29	6	1	28	27	38.417	15.85	25.00	9.15	43.85	53.00	9.15
5785	29	6	1	28	30	43.023	16.34	25.00	8.66	44.34	53.00	8.66

Peak Output power limit = 30 dBm or 17 dBm + 10 log B - (antenna gain – 23 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Point-to-Point

PSD for antennas below 23 dBi

20 MHz channel

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5745	19	6	1	18	32	9.30	17.00	7.70
5785	19	6	1	18	40	11.91	17.00	5.09
5805	19	6	1	18	35	9.95	17.00	7.05
5745	22.5	5	1	21.5	30	8.13	17.00	8.87
5785	22.5	5	1	21.5	40	11.91	17.00	5.09
5805	22.5	5	1	21.5	32	8.54	17.00	8.46
5745	23	4	1	22	30	8.13	17.00	8.87
5785	23	4	1	22	40	11.91	17.00	5.09
5805	23	4	1	22	32	8.54	17.00	8.46
5745	10.5	7	1	9.5	38	12.02	17.00	4.98
5785	10.5	7	1	9.5	40	11.91	17.00	5.09
5805	10.5	7	1	9.5	40	11.85	17.00	5.15
5745	15	8	1	14	35	10.92	17.00	6.08
5785	15	8	1	14	40	11.91	17.00	5.09
5805	15	8	1	14	38	11.42	17.00	5.58

PSD Limit = 17 dBm

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

PSD for antennas above 23 dBi

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5745	29	9	1	28	25	6.39	12.00	5.61
5785	29	9	1	28	40	11.91	12.00	0.09
5805	29	9	1	28	27	6.67	12.00	5.33

PSD Limit = 17 dBm - (antenna gain – 23 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Point-to-Point

PSD for antennas below 23 dBi

40 MHz channel

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5765	19	6	1	18	34	4.79	17.00	12.21
5805	19	6	1	18	0	-4.24	17.00	21.24
5765	22.5	5	1	21.5	32	3.69	17.00	13.31
5785	22.5	5	1	21.5	35	5.67	17.00	11.33
5765	23	4	1	22	32	3.69	17.00	13.31
5785	23	4	1	22	34	4.81	17.00	12.19
5765	10.5	7	1	9.5	39	7.61	17.00	9.39
5805	10.5	7	1	9.5	25	1.27	17.00	15.73
5765	15	8	1	14	37	6.32	17.00	10.68
5805	15	8	1	14	1	-4.30	17.00	21.30

PSD Limit = 17 dBm

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

PSD for antennas above 23 dBi

Frequency (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW power setting	PSD Conducted (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
5765	29	9	1	28	27	2.22	12.00	9.78
5785	29	9	1	28	30	2.90	12.00	9.10

PSD Limit = 17 dBm - (antenna gain – 23 dBi)

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

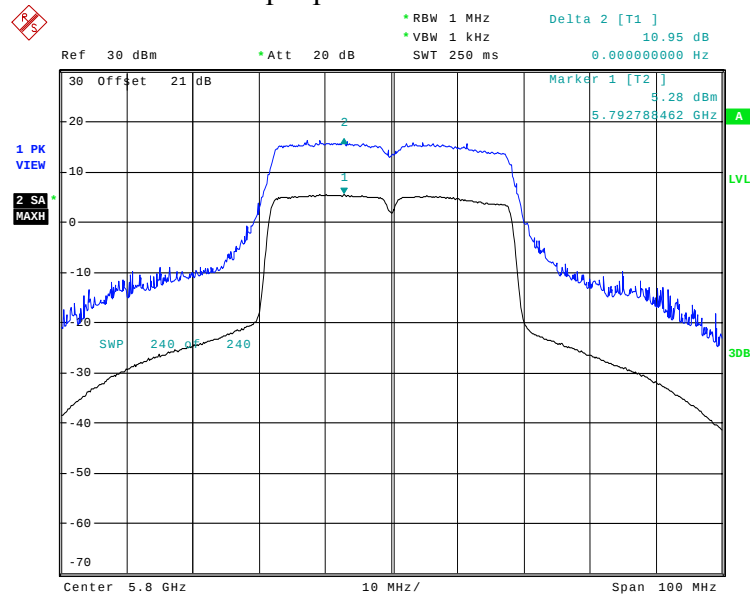
Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Clause 15.407(a)(6) Peak Excursion

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Method: FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power in UNII Band

Test Results: Pass
Peak excursion sample plot:



20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	Excursion (dB)	Limit (dB)	Margin (dB)
5745	10	1,2	1	9	38	9.96	13.00	3.04
5785	10	1,2	1	9	40	10.35	13.00	2.65
5805	10	1,2	1	9	24	10.86	13.00	2.14
5745	15	3	1	14	23	10.25	13.00	2.75
5785	15	3	1	14	26	10.79	13.00	2.21
5805	15	3	1	14	5	10.88	13.00	2.12
5745	19	6	1	18	5	10.63	13.00	2.37
5785	19	6	1	18	6	10.35	13.00	2.65
5805	19	6	1	18	L3	10.86	13.00	2.14
5745	22.5	5	1	21.5	0	10.63	13.00	2.37
5785	22.5	5	1	21.5	0	10.35	13.00	2.65
5805	22.5	5	1	21.5	L0	10.86	13.00	2.14
5745	23	4	1	22	L20	10.63	13.00	2.37
5785	23	4	1	22	L1	10.35	13.00	2.65
5805	23	4	1	22	L0	10.86	13.00	2.14
5745	10.5	7	1	9.5	37	10.63	13.00	2.37
5785	10.5	7	1	9.5	38	10.35	13.00	2.65
5805	10.5	7	1	9.5	24	10.86	13.00	2.14
5745	15	8	1	14	23	10.63	13.00	2.37
5785	15	8	1	14	26	10.35	13.00	2.65
5805	15	8	1	14	5	10.86	13.00	2.14
5745	29	9	1	28	25	10.23	13.00	2.77
5785	29	9	1	28	40	10.47	13.00	2.53
5805	29	9	1	28	27	10.17	13.00	2.83

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Only Omni-Directional Rod and 90 degrees Sectional antennas (1, 2 and 3) are point-to-multipoint antennas. The rest of antennas are directional or point-to point antennas.

40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	Excursion (dB)	Limit (dB)	Margin (dB)
5765	10	1,2	1	9	40	10.45	13.00	2.55
5805	10	1,2	1	9	25	11.60	13.00	1.40
5765	15	3	1	14	37	10.58	13.00	2.42
5805	15	3	1	14	1	11.60	13.00	1.40
5765	19	6	1	18	34	10.58	13.00	2.42
5805	19	6	1	18	0	11.60	13.00	1.40
5765	22.5	5	1	21.5	32	10.58	13.00	2.42
5785	22.5	6	1	21.5	35	11.60	13.00	1.40
5765	23	4	1	22	32	10.58	13.00	2.42
5785	23	4	1	22	34	11.60	13.00	1.40
5765	10.5	7	1	9.5	39	10.58	13.00	2.42
5805	10.5	7	1	9.5	25	11.60	13.00	1.40
5765	15	8	1	14	37	10.58	13.00	2.42
5805	15	8	1	14	1	11.60	13.00	1.40
5765	29	9	1	28	27	10.48	13.00	2.52
5805	29	9	1	28	30	11.59	13.00	1.41

Note: antenna gain considered as a combination of the actual antenna gain with the cable.

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Only Omni-Directional Rod and 90 degrees Sectional antennas (1, 2 and 3) are point-to-multipoint antennas. The rest of antennas are directional or point-to point antennas.

Clause 15.407(b)(4) Undesirable emission limits for transmitters in the 5.725–5.825 GHz band

For transmitters operating in the 5.725–5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

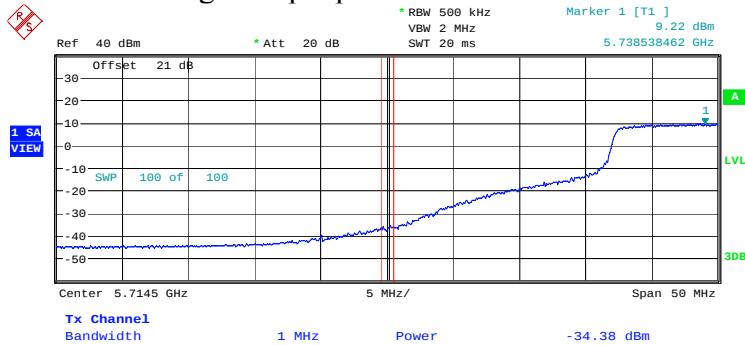
Test Results: Pass

Test Data:

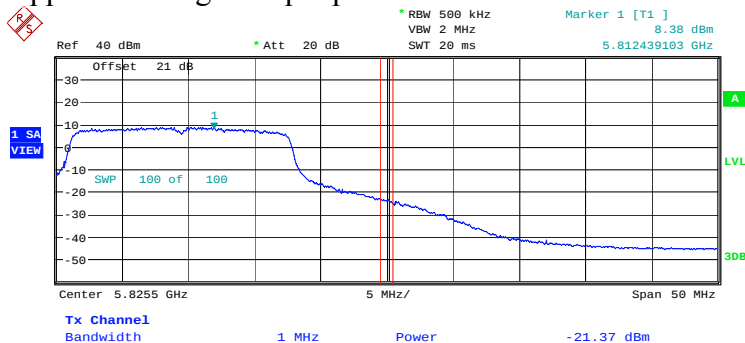
The spectrum was searched from 30 MHz to the 40 GHz using Sample detector with 1 MHz RBW, 3 MHz VBW. All emissions were measured using power averaging over 100 sweeps. The test was performed conducted at the antenna port.

Radiated emissions measurements were performed using 1 MHz RBW/VBW at the distance of 3 m. No emissions were detected with 20 dB below the limit.

Lower band edge sample plot:



Upper band edge sample plot:



Band edge test at the 5715 MHz
20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5745	10	1, 2	1	9	40	-39.49	-30.49	-27.00	3.49
5745	10.5	7	1	9.5	40	-39.49	-29.99	-27.00	2.99
5745	15	3, 8	1	14	39	-41.65	-27.65	-27.00	0.65
5745	19	6	1	18	32	-54.37	-36.37	-27.00	9.37
5745	22.5	5	1	21.5	30	-56.83	-35.33	-27.00	8.33
5745	23	4	1	22	30	-56.83	-34.83	-27.00	7.83
5745	29	9	1	28	25	-60.43	-32.43	-27.00	5.43

Band edge test at the 5725 MHz
20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5745	10	1, 2	1	9	38	-26.85	-17.85	-17.00	0.85
5745	10.5	7	1	9.5	38	-26.85	-17.35	-17.00	0.35
5745	15	3, 8	1	14	35	-31.86	-17.86	-17.00	0.86
5745	19	6	1	18	32	-36.76	-18.76	-17.00	1.76
5745	22.5	5	1	21.5	30	-39.00	-17.50	-17.00	0.50
5745	23	4	1	22	30	-39.00	-17.00	-17.00	0.00
5745	29	9	1	28	25	-45.30	-17.30	-17.00	0.30

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Band edge test at the 5715 MHz
40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5765	10	1, 2	1	9	40	-36.32	-27.32	-27.00	0.32
5765	10.5	7	1	9.5	39	-37.81	-28.31	-27.00	1.31
5765	15	3, 8	1	14	37	-41.11	-27.11	-27.00	0.11
5765	19	6	1	18	35	-45.03	-27.03	-27.00	0.03
5765	22.5	5	1	21.5	32	-49.94	-28.44	-27.00	1.44
5765	23	4	1	22	32	-49.94	-27.94	-27.00	0.94
5765	29	9	1	28	27	-55.04	-27.04	-27.00	0.04

Band edge test at the 5725 MHz
40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5765	10	1, 2	1	9	40	-27.25	-18.25	-17.00	1.25
5765	10.5	7	1	9.5	40	-27.25	-17.75	-17.00	0.75
5765	15	3, 8	1	14	37	-31.00	-17.00	-17.00	0.00
5765	19	6	1	18	34	-35.89	-17.89	-17.00	0.89
5765	22.5	5	1	21.5	33	-38.50	-17.00	-17.00	0.00
5765	23	4	1	22	32	-39.61	-17.61	-17.00	0.61
5765	29	9	1	28	28	-45.65	-17.65	-17.00	0.65

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Band edge test at the 5825 MHz
20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5805	10	1, 2	1	9	40	-29.75	-20.75	-17.00	3.75
5805	10.5	7	1	9.5	40	-29.75	-20.25	-17.00	3.25
5805	15	3, 8	1	14	38	-31.51	-17.51	-17.00	0.51
5805	19	6	1	18	35	-35.00	-17.00	-17.00	0.00
5805	22.5	5	1	21.5	32	-40.64	-19.14	-17.00	2.14
5805	23	4	1	22	32	-40.64	-18.64	-17.00	1.64
5805	29	9	1	28	27	-45.26	-17.26	-17.00	0.26

Band edge test at the 5835 MHz
20 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5805	10	1, 2	1	9	40	-46.03	-37.03	-27.00	10.03
5805	10.5	7	1	9.5	40	-46.03	-36.53	-27.00	9.53
5805	15	3, 8	1	14	40	-46.03	-32.03	-27.00	5.03
5805	19	6	1	18	40	-46.03	-28.03	-27.00	1.03
5805	22.5	5	1	21.5	38	-48.88	-27.38	-27.00	0.38
5805	23	4	1	22	36	-50.22	-28.22	-27.00	1.22
5805	29	9	1	28	32	-55.02	-27.02	-27.00	0.02

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449

Band edge test at the 5715 MHz
40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5805	10	1, 2	1	9	25	-26.68	-17.68	-17.00	0.68
5805	10.5	7	1	9.5	25	-26.68	-17.18	-17.00	0.18
5805	15	3, 8	1	14	1	-31.99	-17.99	-17.00	0.99
5805	19	6	1	18	0	-35.14	-17.14	-17.00	0.14
5785	22.5	5	1	21.5	35	-38.70	-17.20	-17.00	0.20
5785	23	4	1	22	34	-39.32	-17.32	-17.00	0.32
5785	29	9	1	28	31	-45.40	-17.40	-17.00	0.40

Band edge test at the 5725 MHz
40 MHz channel

Freq. (MHz)	G _{ANT} (dBi)	Antenna number	Cable loss (dB)	G _{ANT+CABLE} (dBi)	SW Power Setting	BE power (dBm/MHz)	BE EIRP (dBm/MHz)	BE limit (dBm/MHz)	Margin (dB)
5805	10	1, 2	1	9	33	-36.97	-27.97	-27.00	0.97
5805	10.5	7	1	9.5	33	-36.97	-27.47	-27.00	0.47
5805	15	3, 8	1	14	29	-41.71	-27.71	-27.00	0.71
5805	19	6	1	18	25	-45.05	-27.05	-27.00	0.05
5785	22.5	5	1	21.5	35	-48.93	-27.43	-27.00	0.43
5785	23	4	1	22	34	-50.37	-28.37	-27.00	1.37
5785	29	9	1	28	30	-55.39	-27.39	-27.00	0.39

Antenna Type	Antenna Gain, dBi	Antenna #	Antenna Info
Omni directional Rod	10	1	Maxrad, MHO515010NM
		2	MTI, MT-462008/N/A
90 degrees Sectional	15	3	Maxrad, Panel Antenna, WISP4959018MBV
Flat	23	4	Huber&Suhner, SPA 5600/9/23/0/V
	22.5	5	MTI, MT-485028/N
	19	6	MTI, MT-485001
Patch	10.5	7	BelAir, B1BB025AA-A01
	15	8	BelAir, BAM Antenna BEL10008-A0
Dish parabolic	29	9	Maxrad, Dish, MPRC2449



Nemko Canada Inc.

Clause 15.407(g) Frequency stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

Test Results: Pass

Test Data:

The frequency stability test was performed in the -30 to $+50$ °C temperature range at 5.725–5.825 GHz frequency range. The input voltage was varied ± 15 % at the room temperature.

Maximum frequency drift results:

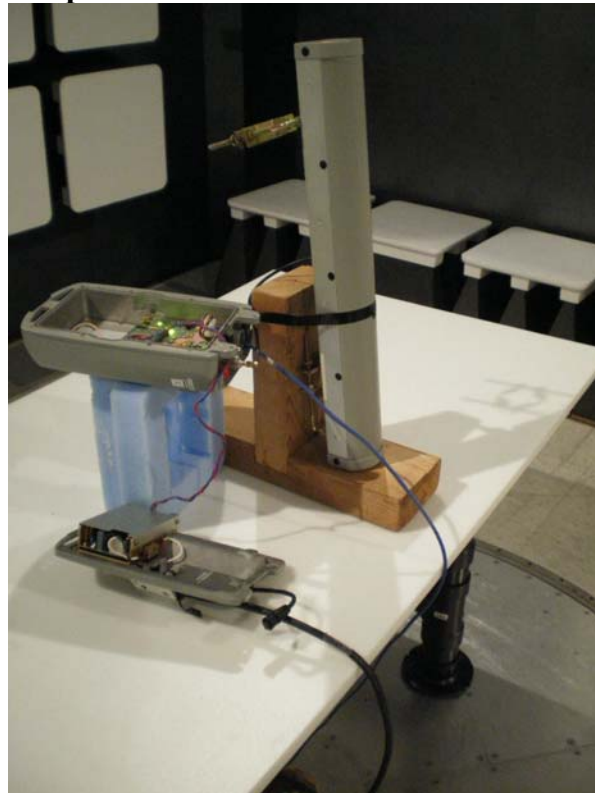
5.725–5.825 GHz range: 155 kHz

Appendix B : Setup Photographs

Conducted Emissions Setup:

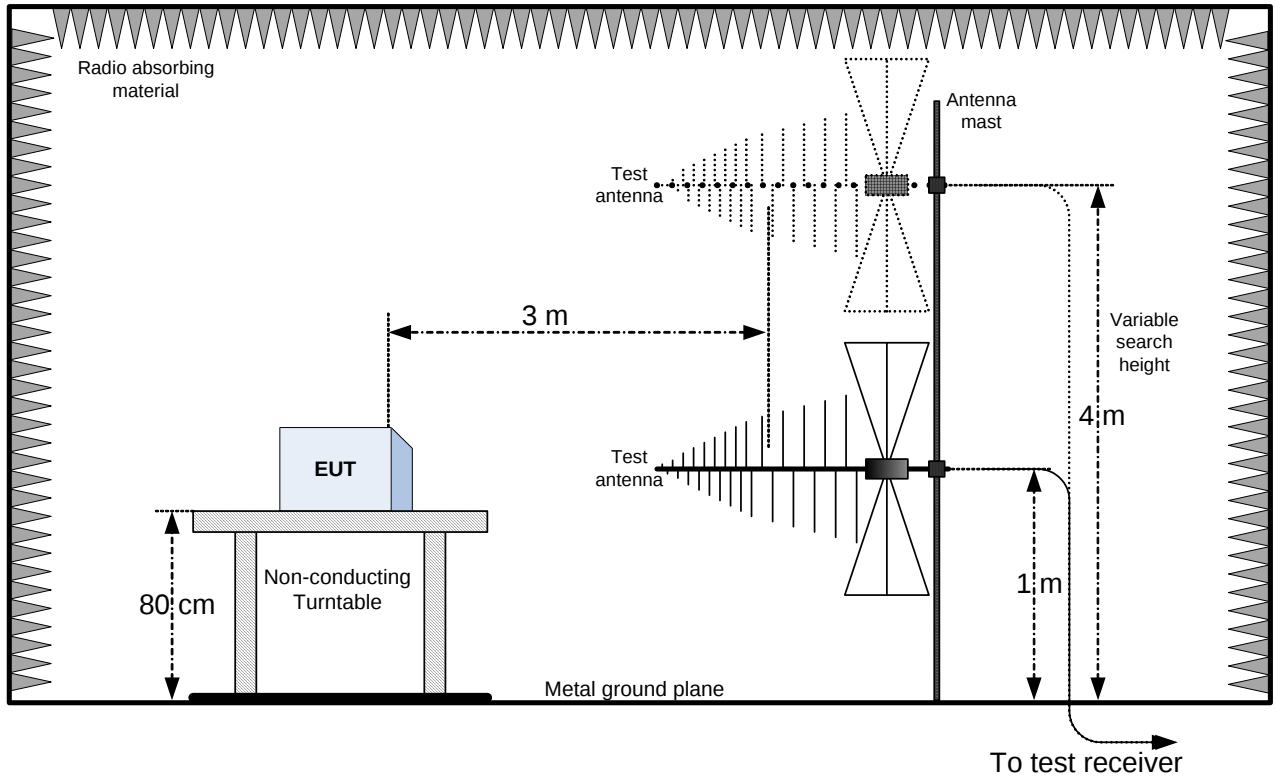


Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30 MHz Test Site



AC Power Line Conducted Emissions

