

TEST NUMBER - 263-05

TEST REPORT TO

INDUSTRY CANADA RSS 210 SECTION 6.2.2  
FEDERAL COMMUNICATIONS COMMISSION CFR47 PART15.249

Low Power License-Exempt Radio Communication Devices  
Intentional Radiators

Radiated testing only

for

Tour Andover Controls  
1 High Street  
N. Andover, MA 01845  
(978) 975-9570

of

ROAMIO with Bluetooth

Model ROAMIOBT

FCC ID: DVE-ROAMIO2  
IC: 1026A-ROA

on

8/12/2005

Tested By:

Clifton P. Brick

Reviewed By:

Larry K. Stillings

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TEST DESCRIPTION

1. TEST OBJECTIVE

To test the ROAMIOBT OPL 9724 to RSS 210 / Part 15 Subpart C Rules and write a report.

2. E.U.T. DESCRIPTION

GENERAL

The ROAMIOBT is an industrial control component that operates in the 2400-2483.5 MHz Frequency Band. The ROAMIOBT uses FHSS modulation using channels on a 1MHz spacing on 79 channels from 2402 to 2480 MHz with approximately 1MHz occupied bandwidth per channel.

SERIAL NUMBERS:

production prototype

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### TEST RESULTS AND CONCLUSIONS

PRODUCT TESTED - ROAMIOBT

MODEL NUMBER - ROAMIOBT

#### RADIATED TEST RESULTS

The test results show that the emissions radiated from this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C.

#### OCCUPIED BANDWIDTH & OUTPUT POWER

The test results show that the occupied bandwidth and output power of this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C .

#### CONDUCTED TEST RESULTS

The test results show that the emissions conducted through the power line from this equipment are in compliance with IC Rules RSS 210 / FCC Rules Part 15 Subpart C.

#### ANALYSIS AND CONCLUSIONS

Based upon the radiated measurements we find that this equipment is within the limits of the IC Rules RSS 210 / FCC Rules Part 15 Subpart C. All results are based on a test of one sample, and represent other production units, only in as much as a sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

**NOTES** (Special conditions unique to this test)

None.

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## TEST PROCEDURES

### 1. TEST EQUIPMENT

- A. HP 8593E (9 kHz - 26.5 GHz) Spectrum Analyzer, S/N 3829A03887.  
Calibration Date 1-17-2005, calibrated annually.
- B. Com-Power Biconilog Antenna, Model AC220, S/N 25509.  
Calibration Date 7-11-2005, calibrated annually.
- C. Electro-Metrics Double Ridged Guide Antenna, Model EM-6961, S/N 6337.  
Calibration Date: 7-30-2004, calibrated biannually.
- D. HP 1 - 26.5 GHz Preamplifier, Model 08449B, S/N 3008A01323.  
Calibration Date: 8-3-2004, calibrated biannually.

### 2. FREQUENCY RANGE TO BE SCANNED.

- A. Radiated Test from 30 MHz to 40 GHz (or the 10<sup>th</sup> harmonic of the highest frequency whichever is lower).
- B. Conducted Test from 150 kHz to 30 MHz.

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### 3. TEST PROCEDURES.

#### **Radiated test procedure:**

The EUT, associated cables and peripheral devices are placed on the supporting table and any support equipment is placed off the site. The EUT is turned on and any necessary operating or test software installed and allowed to warm up. The EUT is pre-scanned in our ferrite tile lined chamber where it is rotated 360 degrees and examined in both horizontal and vertical polarization, the equipment was examined in three orthogonal planes, examined at 85 and 115 percent of input voltage or if battery operated new batteries were used. all emission frequencies are identified and recorded. The EUT is then moved to the OATS and the frequency band from 30 MHz to 40 GHz is scanned, all frequencies identified in the chamber are investigated, as well as harmonic frequencies of the EUT. When an emission is found the emission is maximized by varying the bundle position of the connecting cables, the antenna height, the antenna polarization (vertical and horizontal) and the table orientation (360 degrees). The maximum reading is recorded and the next signal is searched for.

All measurements are made according to the procedures defined in:  
"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" (ISBN 0-7381-3844-4).

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**RSS 210 TEST LIMITS**

1. RSS 210 Section 6.2.2, Table 3 Radiation Limits (Quasi-Peak):  
 FCC Part 15.209, 15.235, 15.249 Radiation Limits (Quasi-Peak):

Frequency MHz	Distance meters	Limit dBμV/m	Limit μV/m
1.705 - 30	30	29.5*	30*
30 - 88	3	40.0	100
49.82 - 49.90	3	80.0*	10,000*
88 - 216	3	43.5	150
216 - 960	3	46.0	200
902 - 928	3	94.0	50,000
2400 - 2483.5	3	94.0	50,000
960 - 1000	3	54.0	500
1000 - 40000	3	54.0*	500*

\*NOTE: Average Limits

2. RSS 210 Section 6.6a Conduction Limits (Quasi-Peak):  
 FCC Part 15.207 Conduction Limits (Quasi-Peak)

Frequency MHz	Quasi-Peak Limit dBμV	Average Limit dBμV
0.150 - 0.500	66 to 56	56 to 46
0.500 - 5.0	56	46
5.0 - 30.0	60	50

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### TEST FACILITY DESCRIPTION

Compliance Worldwide is located on 357 Main Street in Sandown, New Hampshire. The conducted and radiated test sites, located at C.W. are used for Federal Communications Commission (FCC) testing and Industry Canada Testing. A site description is on file with the FCC in Columbia, MD USA. Site information is also on file with Industry Canada, anyone wishing to review this Test Facility Description is referred to file number **IC 3023**. This is currently on file at Industry Canada, 1241 Clyde Avenue, Ottawa, ON K2C 1Y3.

The radiated site is a 3/10 meter indoor site with an enclosure for the product and a basement for the personnel, support equipment and test equipment.

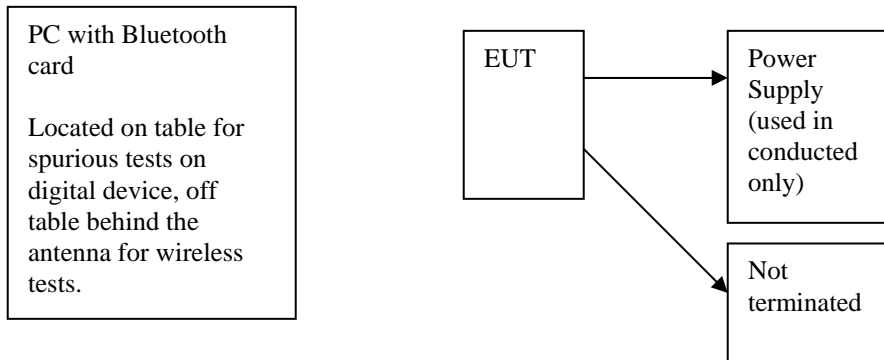
The conducted site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical metal wall required by EN 55022.

Both sites are designed to test products or systems 1.5 meter x 1.0 meter, floor standing or table top.



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**TEST SET UP  
AND  
PERIPHERAL CONNECTION INFORMATION**



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PLEASE NOTE - EUT (equipment under test) is ROAMIOBT.

The cables directly connected to this equipment are listed below.

Connection Descriptions

1. 4 wire flexible coiled phone cord  
(description)

EUT  
(from device)

AC Mains Via poer supply for conducted not terminated for radiated  
(to device)

CABLE LENGTH 5m (S) SHIELDED or (U) UNSHIELDED U

2. Serial Cable  
(description)

EUT  
(from device)

PC for setup, not terminated during testing  
(to device)

CABLE LENGTH 2.5m (S) SHIELDED or (U) UNSHIELDED S

3. N/A  
(description)

(from device)

(to device)

CABLE LENGTH \_\_\_\_\_ (S) SHIELDED or (U) UNSHIELDED \_\_\_\_\_

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### RADIATED TEST RESULTS

Frequency Range: 30 - 25,000 MHz.  
Measurement Distance: 3.0 Meters.  
Bandwidth: 120 kHz, Per ANSI C63.4-2003.\*  
Detector Functions: Peak, Quasi Peak, Average  
Video Filter: 300 kHz  
Table Height: 0.8 meters  
Antenna Height Variation: 1 - 4 Meters.  
Horizontal and Vertical Polarization Measurements Taken.  
\*Measurement Bandwidth is 1 MHz above 1 GHz

**PLEASE SEE NEXT PAGE FOR RADIATED TEST DATA**

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**Radiated Tabular Data**

Pol. (H/V)	Frequency (GHz)	Peak Amplitude (dBuV/m)	Avg Amplitude (dBuV/m)	Avg Limit (dBuV/m)	Margin (dBuV/m)
V	4.8036	60.50	38.58*	54	-13.50
V	4.8836	60.52	41.60*	54	-12.40
V	4.9597	60.05	42.57*	54	-11.43
V	7.4395	53.03*		54	-0.97
V	7.3255	61.60	42.68*	54	-11.32
V	7.2055	56.94	39.73*	54	-14.27
V	9.9195	44.30*		54	-9.70
V	9.7673	46.20*		54	-7.80

All other spurious were greater than 15dB below the limit using a peak detector.

\*shows actual measured value, peak emissions below average limit used at several measurements.

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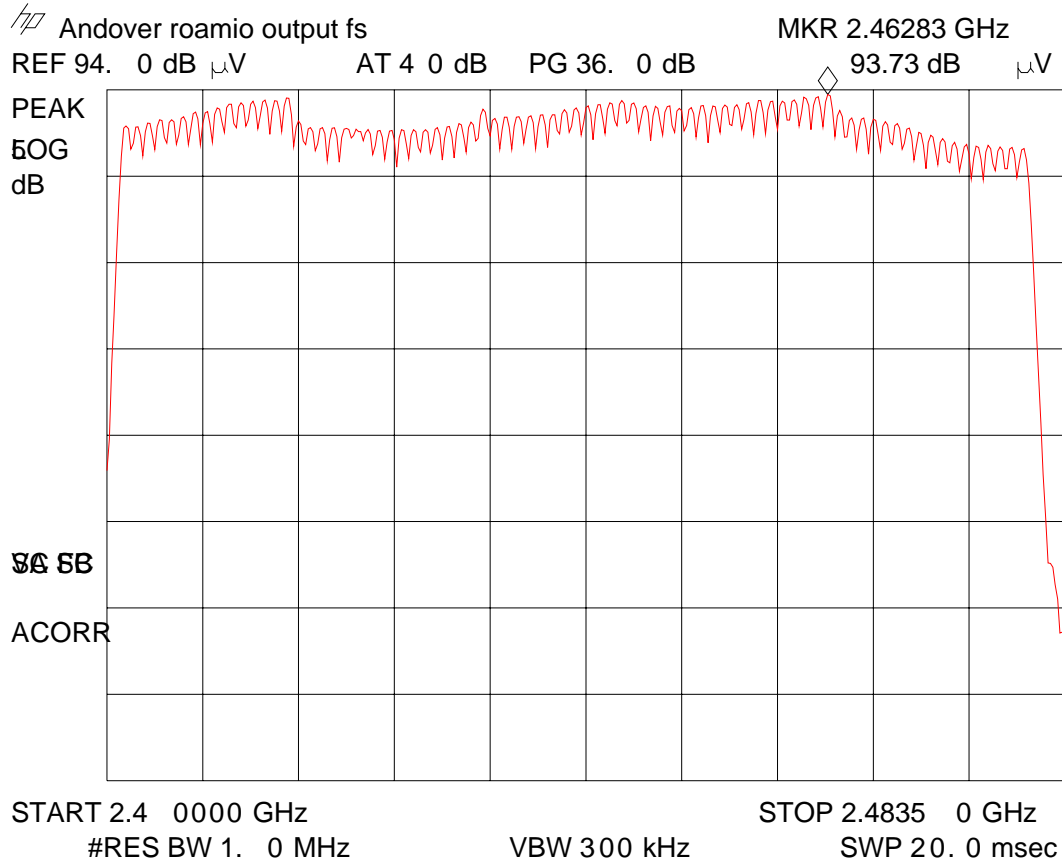
**RADIATED OUTPUT POWER & OCCUPIED BANDWIDTH TEST RESULTS**

Frequency Range: 2400 - 2483.5 MHz.  
Measurement Distance: 3.0 Meters.  
Bandwidth: As Noted, Per ANSI C63.4-2003.  
Detector Functions: Peak, Quasi Peak, Average.  
Video Filter: as shown  
Table Height: 0.8 meters  
Antenna Height Variation: 1 - 4 Meters.  
Horizontal and Vertical Polarization Measurements Taken, Worst Case Reported.

**PLEASE SEE NEXT PAGE(S) FOR OCCUPIED BANDWIDTH RADIATED TEST DATA**

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**Output Power Plot**  
(at max. modulation EUT transmission is within the band)

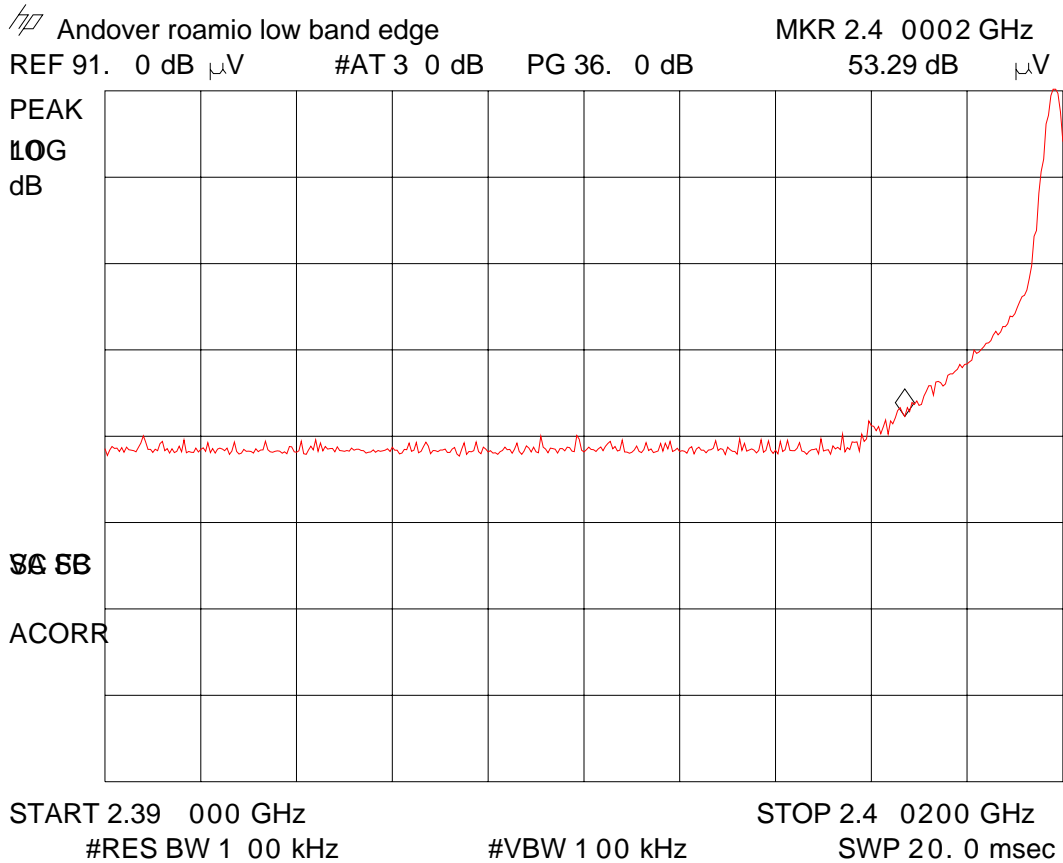


Frequency (MHz)	Pol. (H/V)	Peak Amplitude (dBuV/m)	Avg Limit (dBuV/m)	Peak Margin (dBuV/m)
2462.83	V	93.73	94.0	-0.27

Plot show EUT emission maximized and then max held until trace stabilized.

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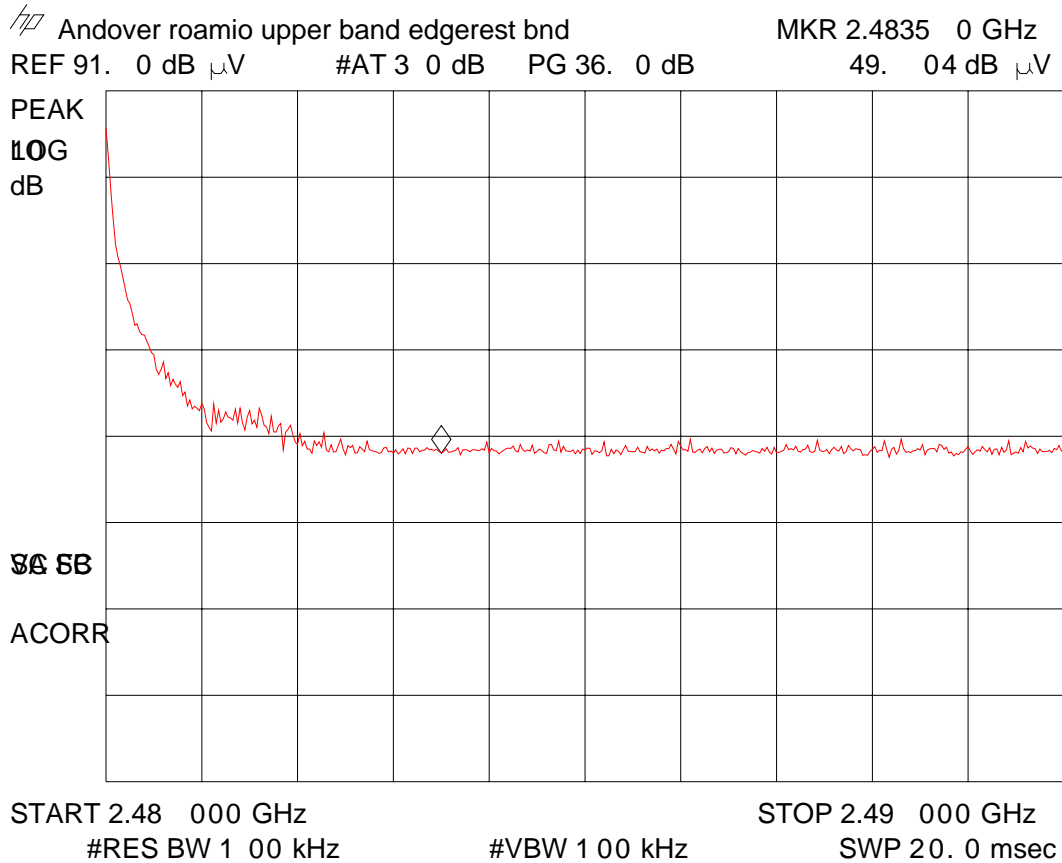
**Lower Band Edge**  
(at max. modulation EUT transmission is within the band)



Marker is at the band edge 2400MHz, the limit is 54 dBuV/m at 3m, EUT meets this limit by 0.71dB using a peak detector.

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**Upper Band Edge**  
(at max. modulation EUT transmission is within the band)



Marker is at the band edge 2483.5MHz, the limit is 54 dBuV/m at 3m, EUT meets this limit by 4.96dB using a peak detector.



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### CONDUCTED TEST RESULTS

Frequency Range:	150 kHz to 30.0 MHz.
Bandwidth:	9 kHz per ANSI C63.4-2003.
Detector Functions:	Peak, Quasi-Peak, Average
Table Height:	0.8 meters
Video Bandwidth:	30 kHz.

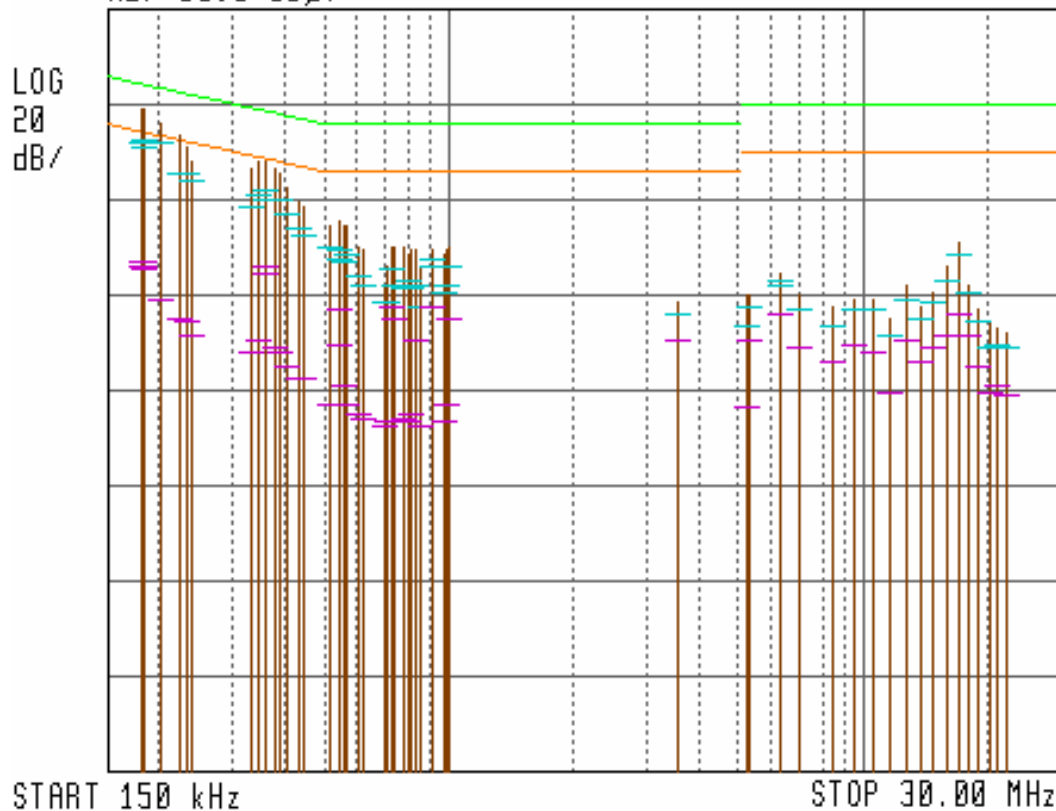
Phase and Neutral Measurements Taken.

**PLEASE SEE NEXT PAGE FOR CONDUCTED TEST DATA**

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Conducted 120V 60Hz Phase Data Log Plot

14:21:47 AUG 18, 2005 120VAC 60HZ PHASE  
263-05 TOUR ANDOVER CONTROLS ROOM IO BLUETOOTH  
REF 80.0 dB $\mu$ V



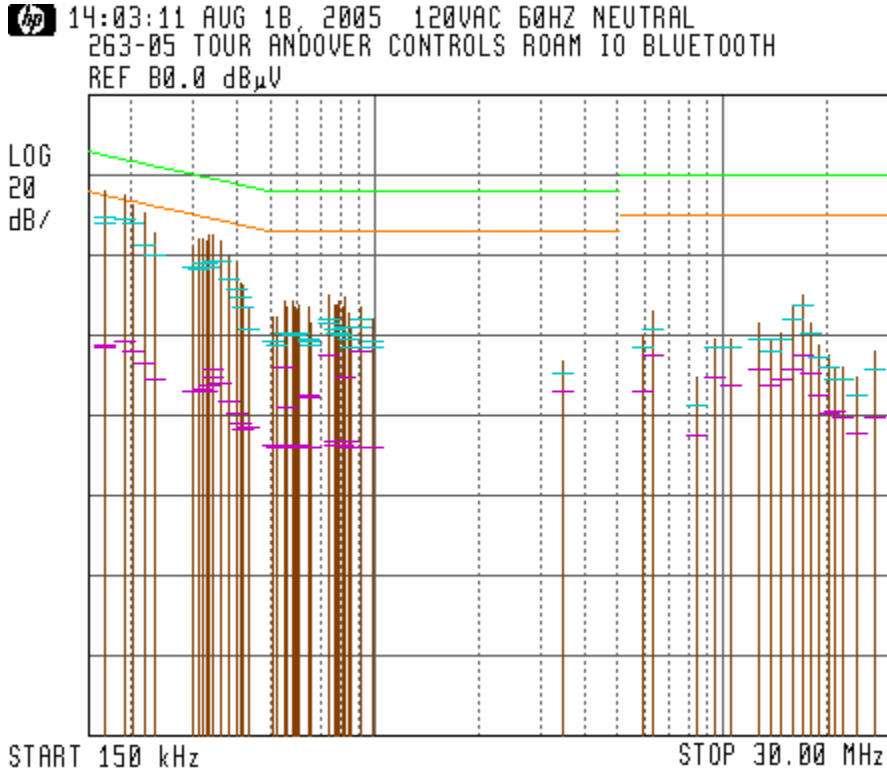
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**Conducted 120V 60Hz Phase Tabular Data**

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.180569	57.25	52.23	26.26	64.51	54.51	-12.28	-28.25
0.181716	59.07	52.00	27.02	64.45	54.45	-12.45	-27.43
0.184031	59.19	51.28	27.63	64.34	54.34	-13.06	-26.71
0.184976	59.51	53.17	26.03	64.29	54.29	-11.12	-28.26
0.185265	57.17	53.06	26.22	64.28	54.28	-11.22	-28.06
0.202083	56.38	52.34	19.40	63.57	53.57	-11.23	-34.17
0.225195	53.96	46.24	15.59	62.68	52.68	-16.44	-37.09
0.234493	51.54	45.79	14.43	62.33	52.33	-16.54	-37.90
0.239931	48.21	44.32	11.47	62.12	52.12	-17.80	-40.65
0.335109	46.89	39.17	8.43	59.38	49.38	-20.21	-40.95
0.345679	48.19	41.54	11.22	59.13	49.13	-17.59	-37.91
0.362744	48.26	40.19	25.16	58.72	48.72	-18.53	-23.56
0.363176	46.65	41.84	26.17	58.71	48.71	-16.87	-22.54
0.379504	46.85	40.73	9.64	58.32	48.32	-17.59	-38.68
0.390913	46.17	40.91	8.75	58.05	48.05	-17.14	-39.30
0.404608	42.96	37.55	5.11	57.78	47.78	-20.23	-42.67
0.433294	40.03	34.01	3.37	57.25	47.25	-23.24	-43.88
0.445093	38.82	32.83	3.18	57.03	47.03	-24.20	-43.85
0.514394	35.18	30.26	-2.02	56.00	46.00	-25.74	-48.02
0.542618	36.02	27.74	9.86	56.00	46.00	-28.26	-36.14
0.545883	36.02	29.95	17.56	56.00	46.00	-26.05	-28.44
0.557294	35.21	27.31	1.72	56.00	46.00	-28.69	-44.28
0.565788	34.85	28.51	-2.15	56.00	46.00	-27.49	-48.15
0.602710	30.16	24.09	-4.81	56.00	46.00	-31.91	-50.81
0.620794	29.75	22.38	-5.64	56.00	46.00	-33.62	-51.64
0.699725	22.88	18.82	-6.89	56.00	46.00	-37.18	-52.89
0.707888	26.51	18.91	-6.62	56.00	46.00	-37.09	-52.62
0.730180	30.63	25.59	17.80	56.00	46.00	-30.41	-28.20
0.733889	30.05	22.60	15.43	56.00	46.00	-33.40	-30.57
0.780240	30.29	22.19	-5.50	56.00	46.00	-33.81	-51.50
0.797003	28.69	23.36	-6.55	56.00	46.00	-32.64	-52.55
0.808248	29.67	21.73	-4.84	56.00	46.00	-34.27	-50.84
0.826399	29.38	22.87	10.76	56.00	46.00	-33.13	-35.24
0.853910	25.73	17.64	-6.87	56.00	46.00	-38.36	-52.87
0.913008	29.60	26.40	17.77	56.00	46.00	-29.60	-28.23
0.913898	29.49	28.47	17.66	56.00	46.00	-27.53	-28.34
0.974510	28.70	20.84	-6.06	56.00	46.00	-35.16	-52.06
0.981813	29.41	22.71	-2.28	56.00	46.00	-33.29	-48.28
1.003429	30.09	26.73	15.84	56.00	46.00	-29.27	-30.16
3.563911	18.63	16.13	10.94	56.00	46.00	-39.87	-35.06
5.220273	20.59	13.80	-2.87	60.00	50.00	-46.20	-52.87

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
5.251760	19.99	17.68	10.92	60.00	50.00	-42.32	-39.08
6.299260	25.26	23.09	16.54	60.00	50.00	-36.91	-33.46
6.300301	25.06	22.34	16.31	60.00	50.00	-37.66	-33.69
6.941375	20.03	16.86	9.61	60.00	50.00	-43.14	-40.39
8.400639	18.34	14.02	6.57	60.00	50.00	-45.98	-43.43
9.449061	19.41	17.36	10.00	60.00	50.00	-42.64	-40.00
10.485310	19.53	17.48	8.44	60.00	50.00	-42.52	-41.56
11.548243	15.38	11.66	-0.25	60.00	50.00	-48.34	-50.25
12.601173	22.72	19.73	11.30	60.00	50.00	-40.27	-38.70
13.628894	17.87	15.80	6.25	60.00	50.00	-44.20	-43.75
14.679423	20.85	18.80	9.27	60.00	50.00	-41.20	-40.73
15.749219	26.84	23.79	11.34	60.00	50.00	-36.21	-38.66
16.816471	31.01	28.81	16.20	60.00	50.00	-31.19	-33.80
17.848333	23.01	21.24	11.72	60.00	50.00	-38.76	-38.28
18.870758	17.38	15.01	5.24	60.00	50.00	-44.99	-44.76
19.951990	14.74	9.51	0.17	60.00	50.00	-50.49	-49.83
20.996780	13.27	10.41	1.18	60.00	50.00	-49.59	-48.82
22.018974	12.83	9.03	-0.76	60.00	50.00	-50.97	-50.76

Conducted 120V 60Hz Neutral Data Log Plot



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**Conducted 120V 60Hz Neutral Tabular Data**

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.166803	56.46	48.37	18.20	65.18	55.18	-16.81	-36.98
0.167399	54.07	50.04	17.36	65.15	55.15	-15.11	-37.79
0.192531	55.11	49.23	18.51	63.94	53.94	-14.71	-35.43
0.201066	52.97	48.71	16.22	63.61	53.61	-14.90	-37.39
0.219503	50.98	43.26	13.20	62.90	52.90	-19.64	-39.70
0.233953	46.15	40.48	9.31	62.35	52.35	-21.87	-43.04
0.301905	41.80	37.14	6.25	60.22	50.22	-23.08	-43.97
0.310978	44.50	36.47	6.07	59.95	49.95	-23.48	-43.88
0.321725	44.59	38.56	7.32	59.70	49.70	-21.14	-42.38
0.329218	43.96	37.27	6.38	59.52	49.52	-22.25	-43.14
0.330256	43.37	38.36	6.59	59.49	49.49	-21.13	-42.90
0.333925	45.08	37.46	7.93	59.41	49.41	-21.95	-41.48
0.340776	43.72	38.96	9.88	59.24	49.24	-20.28	-39.36
0.342649	45.25	38.82	11.46	59.20	49.20	-20.38	-37.74
0.360676	43.96	38.83	8.67	58.77	48.77	-19.94	-40.10
0.381783	40.66	34.58	3.83	58.27	48.27	-23.69	-44.44
0.401939	38.00	31.67	0.87	57.83	47.83	-26.16	-46.96
0.411808	33.66	29.43	-1.40	57.65	47.65	-28.22	-49.05
0.414958	32.82	27.15	-3.11	57.59	47.59	-30.44	-50.70
0.436969	27.39	21.81	-2.50	57.18	47.18	-35.37	-49.68
0.507021	24.79	18.41	-7.22	56.00	46.00	-37.59	-53.22
0.525374	25.18	18.04	-7.71	56.00	46.00	-37.96	-53.71
0.550266	29.05	21.29	12.73	56.00	46.00	-34.71	-33.27
0.556308	26.98	21.38	2.00	56.00	46.00	-34.62	-44.00
0.582668	28.86	20.43	-6.66	56.00	46.00	-35.57	-52.66
0.587911	27.17	20.48	-7.59	56.00	46.00	-35.52	-53.59
0.595983	26.66	21.45	-7.32	56.00	46.00	-34.55	-53.32
0.608233	28.25	21.39	-6.77	56.00	46.00	-34.61	-52.77
0.642038	27.35	19.25	4.87	56.00	46.00	-36.75	-41.13
0.644668	26.25	18.52	5.14	56.00	46.00	-37.48	-40.86
0.653923	23.35	17.99	-7.61	56.00	46.00	-38.01	-53.61
0.733109	30.62	23.35	15.80	56.00	46.00	-32.65	-30.20
0.733201	28.27	24.22	15.74	56.00	46.00	-31.78	-30.26
0.768929	27.91	22.14	-6.35	56.00	46.00	-33.86	-52.35
0.771351	27.57	22.14	-6.96	56.00	46.00	-33.86	-52.96
0.779509	28.24	20.85	-6.40	56.00	46.00	-35.15	-52.40
0.786159	28.85	20.79	-6.46	56.00	46.00	-35.21	-52.46
0.805816	27.01	20.27	-7.06	56.00	46.00	-35.73	-53.06
0.820995	29.74	22.62	10.34	56.00	46.00	-33.38	-35.66
0.839318	26.06	19.26	-6.49	56.00	46.00	-36.74	-52.49
0.856468	22.41	17.07	-8.12	56.00	46.00	-38.93	-54.12

Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	QP Limit (dBuV)	Avg Limit (dBuV)	QP Margin (dB)	Avg Margin (dB)
0.915353	26.98	23.01	16.24	56.00	46.00	-32.99	-29.76
0.915489	27.02	24.03	16.19	56.00	46.00	-31.97	-29.81
0.991549	24.00	17.31	-7.44	56.00	46.00	-38.69	-53.44
0.992141	23.60	18.67	-7.44	56.00	46.00	-37.33	-53.44
3.470033	14.19	10.78	5.88	56.00	46.00	-45.22	-40.12
5.843295	20.07	17.03	5.86	60.00	50.00	-42.97	-44.14
6.298289	26.25	22.09	15.34	60.00	50.00	-37.91	-34.66
8.374870	9.82	3.27	-4.75	60.00	50.00	-56.73	-54.75
9.445881	19.17	17.18	10.29	60.00	50.00	-42.82	-39.71
10.480003	19.39	17.16	8.13	60.00	50.00	-42.84	-41.87
12.595253	23.25	19.73	11.64	60.00	50.00	-40.27	-38.36
13.642929	18.58	16.58	8.15	60.00	50.00	-43.42	-41.85
14.674625	21.14	19.14	9.45	60.00	50.00	-40.86	-40.55
15.746399	27.81	24.42	11.78	60.00	50.00	-35.58	-38.22
16.811630	30.64	28.39	15.75	60.00	50.00	-31.61	-34.25
17.842580	23.59	21.12	10.90	60.00	50.00	-38.88	-39.10
18.866684	17.65	14.81	5.12	60.00	50.00	-45.19	-44.88
19.964558	15.68	12.55	0.56	60.00	50.00	-47.45	-49.44
20.989961	12.57	9.07	1.17	60.00	50.00	-50.93	-48.83
22.009995	12.26	9.38	-0.07	60.00	50.00	-50.62	-50.07
24.168028	10.18	5.83	-3.70	60.00	50.00	-54.17	-53.70
27.203124	16.17	11.68	-0.29	60.00	50.00	-48.32	-50.29

TEST NUMBER - 263-05

### NOTES AND COMMENTS

(Special conditions unique to this test)

EUT was examined with and without (on battery power) its power supply as well as in 3 orthogonal planes. Worst case is as shown in the setup photos.