EMC EMISSIONS - TEST REPORT (Full)

Test Report No.	**BC400283-1**	Issue Date:	**Fri 2/Jul/2004**
Model / Serial No.	**Z-PC / SN: 001**		
Product Type	**USB Wireless Transceiver**		
Client	**INTERTest**		
Manufacturer	**Casaworks**		
License holder	**Metrics Technology, Inc. DBA CasaWorks**		
Address	**3830 Commons Ave. NE**		
	Albuquerque, NM 87109		
Test Criteria Applied	**FCC CFR47 Part 15**		
Test Result	**PASS**		
Test Project Number	**BC300322**		
References		Title 47 CFR 15: RADIO FREQUENCY DEVICES	
Total Pages Including Appendices:	28		

Reviewed By :

Approved By :

International Approval Laboratories and its professional staff hold government and professional organization certifications and are members of IEEE, NVLAP, and VCCI.

NVLAP
Lab Code: 200624-0

Accredited

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be ±2.30dB and for Radiated Emissions is calculated to be ±3.60dB in the frequency range of 30MHz – 200MHz and ±3.38dB in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 18-Jun-2004

Testing Start Date: 18-Jun-2004

Testing End Date: 18-Jun-2004

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

The tests were performed according to following regulations:

1. FCC CFR47 Part 15.207
2. FCC CFR47 Part 15.209
3. FCC CFR47 Part 15.249

Emission Test Results:

Conducted Emissions, Powerline - 15.207 - (Not Applicable)

Test Result

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Conducted Emissions, Data I/O (Ethernet, RJ11, etc.) - (Not Applicable)

Test Result

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated Emissions (Electric Field) - 15.209 - PASS

Test Result

Minimum limit margin -13.0 dB at 10000.00 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Fundamental Field Strength Measurement
Radiated Emissions (Electric Field) - 15.249(a) - PASS

Test Result

Minimum limit margin -0.30 dB at 908.20 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated Emissions Harmonic Emissions
Radiated Emissions (Electric Field) - 15.249(a) - PASS

Test Result

Minimum limit margin -4.30 dB at 2725.08 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

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Average Measurements for Emissions >1GHz
Radiated Emissions (Electric Field) - 15.249(d) – PASS

Test Result

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: No other emissions observed other than the fundamental and harmonics

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GENERAL REMARKS:

The following remarks are to be considered as "where applicable" and are taken into account while completing any FCC/IC/ETSI radio tests at International Approvals Laboratories, LLC.

Testing was performed in 3 different orthogonal axis to determine the worst case emissions from the device. The worst case emissions measurements are shown in this report.

FCC CFR47 Part 15.31: Measurement Standards: In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths: FCC Part 15.35 was utilized when performing the measurements within this report.

In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

The actual test distance for the FCC Part 15.209 testing was conducted at 10m for the fact that the device was being tested to EN55022 Class B from 30 MHz to 1000 MHz (meets/exceeds the FCC Part 15.209 & 109B limits) The data is automatically extrapolated back to the FCC 3m limits and measurements are corrected to better show the compliance to FCC requirements and reduce confusion. A correction factor of 10.54dB is used in cases of 30MHz and up for a difference between 10m and 3m measurement distances. All measurements that are lesser than 30MHz where applicable are accompanied with the fall of measurements and calculations to support the interpolation.

The Duty Cycle Correction Calculations are detailed in the operational description for this device.

Modifications required to pass: **NONE**

Test Specification Deviations: **NONE**

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Required Information In Accordance to FCC CFR 47 Part 2.1033:

Rule Part 11, 15 & 18 Devices	*Other Rule Part Devices*	*Description*	*Comments*
2.1033(b)(1)	**2.1033(c)(1)**	*Manu. Contact*	See Page 1 of this report
2.1033(b)(2)	**2.1033(c)(2)**	*FCC Identifier*	
2.1033(b)(3)	**2.1033(c)(3)**	*Users Manual to include Operating, installation*	Attached as Exhibit
	2.1033(c)(4)	*Emissions Designator per 2.*	
	2.1033(c)(5)	*Frequency Range*	Not Applicable to Part 15 Devcies
	2.1033(c)(6)	*Power range and controls*	Not Applicable to Part 15 Devcies
	2.1033(c)(7)	*Maximum power ouput rating*	Not Applicable to Part 15 Devcies
	2.1033(c)(8)	*DC Voltage and Current suplying final RF stages*	Not Applicable to Part 15 Devcies
2.1033(b)(3)	**2.1033(c)(9)**	*Tune –up procedure*	Please refer to the users manual for applicability
2.1033(b)(4&5)	**2.1033(c)(10)**	*Complete Circuit Diagrams and circuit operation description*	Attached as Exhibit
2.1033(b)(7)	**2.1033(c)(11)**	*Photographs/drawings of the identification label & its location on the device*	Attached as Exhibit
2.1033(b)(7)	**2.1033(c)(12)**	*Photographs of the external and internal surfaces, and construction*	Attached as Exhibit
	2.1033(c)(13)	*Digital Modulation*	Not Applicable
2.1033(b)(6)	**2.1033(c)(14)**	*Report of Measurement Data Required by 2.1046 – 2.1057*	See Data Below (This report consists of the testing required under Part 15.231)
2.1033(b)(8)		*Description of publicly available support equipment used during test*	Refer to Exhibit B of this report (Client Test Plan)
2.1033(b)(9)		*Statement of Autorization to Part 15.37 of CFR47*	The equipment herein is being authorized in accordance to 15.37 of the CFR47 Rules.
2.1033(b)(10)		*Direct Sequence Spread Spectrum Devices (DSSS)*	Exhibit of compliance to 15.247(e)
2.1033(b)(10)		*Frequency Hopping Devices*	Exhibit of compliance to 15.247(a)(1)
2.1033(b)(11)		*Scanning receiver construction*	Exhibit stating compliance to construction in accordance to 15.121.
15.31	**15.31**	*Transmitter Supply Voltage*	Testing herein was completed in accordance to FCC CFR47 Part 15.31

Exhibits Including (where applicable):

1. Users Manual
2. Operation Description
3. Block Diagram
4. Report of Measurement
5. External & Internal Photographs
6. Schematic
7. Parts List
8. Tuning Procedure (if applicable)
9. Test Setup Photograph
10. Label Drawings and or Photograpghs
11. Description of Support Equipment (where Applicable)

Required Information in Accordance to Industry Canada Regulations (In addition to the above):

Information Required	*Description*	*Comments*
Modulation Type	(i.e. ASK, NON, FSK, DSSS, FHSS, etc.)	**N/A**
Emissions Designator	Per TRC-49	**N/A**
In Country Representative	Contact Information	**N/A**
99% Bandwidth Measurement	Per RSS-210	**N/A**

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Test-setup photo(s):
Conducted Emissions

Not Applicable Unit is Battery Powered

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
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Test-setup photo(s):
Radiated Emissions

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Test-setup photo(s):
Radiated Emissions

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Appendix A

Test Data Sheets

and

Test Equipment Used

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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Part 15.249 (a)
Fundamental Field Strength

Part 15.249 (c)
Emissions outside Frequency Band

Part 15.249 (d)
Emissions > 1GHz

Part 15.205
Restricted Bands of Operation

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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

Test Report #:	**BC400283 Run 01**	Test Area:	Pinewood Site 1 (3m)	Temperature:	22 °C
Test Method:	FCC CFR47 Part 15.249/205	Test Date:	18-Jun-2004	Relative Humidity:	48 %
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	96 kPa
EUT Serial #:	001			Page:	1 of 1
Manufacturer:	Metrics				
EUT Description:	USB Wireless Transceiver				
Notes:					

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m) 15.249 (a)(c)(d) 15.205	(dB)
The following duty cycle was declared by the manufacturer.								
Duty Cycle = active / 100ms. = **NO DUTY CYCLE WAS DECLARED BY THE CLIENT THEREFORE, NO CORRECTION WAS USED.**								
Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.								
The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.249 emissions and delta limits were calculated as follows:								
Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission								
The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.249 and the emission/limit delta was calculated.								
the DCCF is calculated as follows $20*\log_{10}$(duty cycle in 100mS) "not to exceed 20dB"								
DCCF Methods were not utilized in any case of 15.249(d) for the fact that it is a maximum peak specification.								
All emissions that fall under the 15.205 restricted band limits will always meet the 15.249(d) limit, even with utilizing the 20dBmaximum DCCF.								
Part 15.249(a) "Limit = 94dBuV/m", Part 15.249(a) "Harmonic Limit = 74dBuV/m" and 15.205 "Limit = 54dBuV/m" Respectively								
Worst Case Position across 3 separate orthogonal axis								
908.20	69.2 Pk	2.2 / 22.3 / 0.0	93.7	V / 1.4 / 115.0	0	93.7	94	0.3
908.18	62.3 Pk	2.2 / 22.3 / 0.0	86.8	H / 1.5 / 223.0	0	86.8	94	7.2
Only the worst case emissions are shown below. All other data is kept on file.								
1816.66	58.1 Pk	3.1 / 28.3 / 37.2	52.3	V / 1.0 / 129.0	0	52.3	74	21.7
2725.08	51.8 Pk	4.3 / 31.1 / 37.5	49.7	V / 1.1 / 215.0	0	49.7	54	4.3
3633.61	47.5 Pk	5.0 / 33.2 / 37.9	47.9	H / 2.5 / 158.0	0	47.9	54	6.1
4541.96	46.5 Pk	6.7 / 33.6 / 39.5	47.3	V / 1.0 / 51.0	0	47.3	54	6.7
5450.09	40.5 Pk	6.8 / 35.6 / 38.5	44.4	H / 1.0 / 0.0	0	44.4	54	9.6
6357.92	44.4 Pk	8.3 / 36.5 / 38.9	50.2	H / 1.0 / 0.0	0	50.2	74	23.8
7266.02	32.1 Pk	8.2 / 37.5 / 40.8	37.1	V / 1.0 / 0.0	0	37.1	54	16.9
8174.12	44.5 Pk	8.4 / 38.1 / 45.3	45.7	V / 1.0 / 0.0	0	45.7	54	8.3
9082.22	45.2 Pk	8.6 / 39.8 / 47.0	46.7	H / 1.0 / 0.0	0	46.7	54	7.3

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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Part 15.209 (a)
Spurious Emissions Field Strength

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

Test Report #:	**BC400283 Run 02**	Test Area:	Pinewood Site 1 (3m)	Temperature:	56 °C
Test Method:	FCC pt. 15.209	Test Date:	18-Jun-2004	Relative Humidity:	20.5 %
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	80 kPa
EUT Serial #:	001			Page:	1 of 6
Manufacturer:	Metrics				
EUT Description:	USB Wireless Transceiver				
Notes:					

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dbuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <30MHz	DELTA2 (dB) 15.209 >30MHz
No emissions found: 4 to 8 GHz Horizontal.						
Noise floor.						
4000.00	30.6 Av	5.7 / 34.4 / 38.7	32.0	H / 1.0 / 180.0	N/A	-22.0
No emissions found: 4 to 8 GHz Vertical.						
Noise floor.						
8000.00	30.9 Av	8.3 / 37.7 / 40.5	36.5	V / 1.0 / 180.0	N/A	-17.5
No emissions found: 8 to 10 GHz Vertical						
Noise floor.						
9000.00	40.8 Av	8.5 / 40.0 / 46.8	42.4	V / 1.0 / 270.0	N/A	-11.5
No emissions found: 8 to 10 GHz Horizontal.						
Noise floor.						
10000.0	40.9 Av	9.5 / 38.9 / 48.3	41.0	H / 1.0 / 270.0	N/A	-13.0
No emissions found: 1 to 4 GHz Horizontal.						
Noise floor.						
2000.00	32.0 Av	3.2 / 29.1 / 37.3	27.1	V / 1.0 / 270.0	N/A	-26.9
No emissions found: 1 to 4 GHz Vertical.						
Noise floor.						
4000.00	31.8 Av	5.7 / 34.4 / 37.6	34.2	V / 1.0 / 270.0	N/A	-22.2
No emissions found below 30 MHz, Horizontal.						
12.00	10.6 Qp	0.4 / 10.3 / 0.0	21.3	H / 1.0 / 270.0	-28.2	N/A
No emissions found below 30 MHz, Vertical.						
24.00	8.7 Qp	0.5 / 9.4 / 0.0	18.6	V / 1.0 / 270.0	-30.9	N/A
47.27	34.4 Qp	0.8 / 11.2 / 28.7	17.6	V / 1.0 / 0.0	N/A	-22.4
48.92	34.5 Qp	0.8 / 11.0 / 28.8	17.5	V / 1.0 / 0.0	N/A	-22.5
60.00	34.0 Qp	0.8 / 9.1 / 28.8	15.1	V / 1.0 / 0.0	N/A	-24.9

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

Test Report #:	**BC400283 Run 02**	Test Area:	Pinewood Site 1 (3m)	Temperature:	56	°C
Test Method:	FCC pt. 15.209	Test Date:	18-Jun-2004	Relative Humidity:	20.5	%
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	80	kPa
EUT Serial #:	001			Page:	2 of 6	
Manufacturer:	Metrics					
EUT Description:	USB Wireless Transceiver					
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dbuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <30MHz	DELTA2 (dB) 15.209 >30MHz
144.00	39.6 Qp	1.2 / 12.7 / 28.5	25.0	V / 1.0 / 0.0	N/A	-18.5
32.63	34.6 Qp	0.6 / 13.2 / 28.6	19.8	V / 1.0 / 90.0	N/A	-20.2
32.63	34.5 Qp	0.6 / 13.2 / 28.6	19.7	V / 1.0 / 180.0	N/A	-20.3
191.99	33.5 Qp	1.4 / 13.6 / 28.6	19.9	V / 1.0 / 180.0	N/A	-23.6
32.63	34.2 Qp	0.6 / 13.2 / 28.6	19.4	V / 1.0 / 270.0	N/A	-20.6
The following were maximized between 30 and 200 MHz.						
32.63	36.2 Qp	0.6 / 13.2 / 28.6	21.4	V / 1.0 / 196.0	N/A	-18.6
144.00	40.9 Qp	1.2 / 12.7 / 28.5	26.3	V / 1.0 / 332.0	N/A	-17.2
No emissions found: 0Deg, Horizontal.						
144.00	44.0 Qp	1.2 / 12.7 / 28.5	29.4	H / 1.6 / 90.0	N/A	-14.1
No emissions found: 180Deg, Horizontal.						
144.00	44.5 Qp	1.2 / 12.7 / 28.5	29.9	H / 1.6 / 270.0	N/A	-13.6
The following were maximized between 30 and 200 MHz.						
144.00	45.3 Qp	1.2 / 12.7 / 28.5	30.8	H / 1.3 / 205.0	N/A	-12.7
240.00	38.1 Qp	1.6 / 11.2 / 28.7	22.2	V / 1.0 / 0.0	N/A	-23.8
312.00	26.4 Qp	2.0 / 15.3 / 28.8	14.9	V / 1.0 / 0.0	N/A	-31.1
336.00	29.8 Qp	2.0 / 14.3 / 28.6	17.5	V / 1.0 / 0.0	N/A	-28.5
432.00	25.0 Qp	2.2 / 16.0 / 28.6	14.7	V / 1.0 / 0.0	N/A	-31.3
444.00	25.5 Qp	2.2 / 16.0 / 28.6	15.1	V / 1.0 / 0.0	N/A	-30.9
468.00	29.1 Qp	2.3 / 16.9 / 28.6	19.7	V / 1.0 / 0.0	N/A	-26.3

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Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

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Test Method:	FCC pt. 15.209	Test Date:	18-Jun-2004	Relative Humidity:	20.5	%
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	80	kPa
EUT Serial #:	001			Page:	3 of 6	
Manufacturer:	Metrics					
EUT Description:	USB Wireless Transceiver					
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dbuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <30MHz	DELTA2 (dB) 15.209 >30MHz
480.00	41.0 Qp	2.3 / 17.2 / 28.4	32.1	V / 1.0 / 0.0	N/A	-13.9
492.00	30.4 Qp	2.3 / 17.4 / 28.4	21.7	V / 1.0 / 0.0	N/A	-24.3
504.00	29.7 Qp	2.3 / 18.1 / 28.6	21.6	V / 1.0 / 0.0	N/A	-24.4
516.00	29.5 Qp	2.3 / 18.2 / 28.7	21.4	V / 1.0 / 0.0	N/A	-24.6
995.89	26.6 Qp	2.2 / 23.5 / 28.3	24.0	V / 1.0 / 0.0	N/A	-30.0
504.00	30.2 Qp	2.3 / 18.1 / 28.6	22.0	V / 1.0 / 90.0	N/A	-24.0
516.00	31.1 Qp	2.3 / 18.2 / 28.7	22.9	V / 1.0 / 90.0	N/A	-23.1
528.00	28.9 Qp	2.3 / 17.0 / 28.6	19.6	V / 1.0 / 90.0	N/A	-26.4
240.00	38.4 Qp	1.6 / 11.2 / 28.7	22.5	V / 1.0 / 180.0	N/A	-23.5
336.00	33.9 Qp	2.0 / 14.3 / 28.6	21.6	V / 1.0 / 180.0	N/A	-24.4
432.00	33.1 Qp	2.2 / 16.0 / 28.6	22.7	V / 1.0 / 180.0	N/A	-23.3
444.00	30.0 Qp	2.2 / 16.0 / 28.6	19.6	V / 1.0 / 180.0	N/A	-26.4
995.89	25.9 Qp	2.2 / 23.5 / 28.3	23.3	V / 1.0 / 270.0	N/A	-30.7
The following were maximized between 200 and 1000 MHz						
516.00	33.8 Qp	2.3 / 18.2 / 28.7	25.6	V / 1.2 / 61.0	N/A	-20.4
240.00	39.3 Qp	1.6 / 11.2 / 28.7	23.5	V / 1.2 / 166.0	N/A	-22.5
479.99	44.0 Qp	2.3 / 17.2 / 28.4	35.1	V / 1.2 / 45.0	N/A	-10.9
No higher emissions found: 0Deg, Horizontal.						
240.00	46.7 Qp	1.6 / 11.2 / 28.7	30.8	H / 1.0 / 90.0	N/A	-15.2
216.00	30.2 Qp	1.5 / 10.9 / 28.5	14.2	H / 1.0 / 90.0	N/A	-29.3
228.00	30.8 Qp	1.6 / 10.9 / 28.6	14.7	H / 1.0 / 90.0	N/A	-31.3
288.00	32.1 Qp	1.9 / 13.4 / 28.7	18.8	H / 1.0 / 90.0	N/A	-27.2
No higher emissions found: 180Deg, Horizontal						

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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

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EUT Serial #:	001			Page:	4 of 6
Manufacturer:	Metrics				
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Level Key	
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Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dbuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <30MHz	DELTA2 (dB) 15.209 >30MHz
336.00	36.0 Qp	2.0 / 14.3 / 28.6	23.7	H / 1.0 / 270.0	N/A	-22.3
312.00	27.8 Qp	2.0 / 15.3 / 28.8	16.3	H / 1.0 / 270.0	N/A	-29.7
288.00	32.5 Qp	1.9 / 13.4 / 28.7	19.1	H / 1.0 / 270.0	N/A	-26.9
240.00	47.4 Qp	1.6 / 11.2 / 28.7	31.6	H / 1.0 / 270.0	N/A	-14.4
228.00	32.2 Qp	1.6 / 10.9 / 28.6	16.1	H / 1.0 / 270.0	N/A	-29.9
216.00	30.4 Qp	1.5 / 10.9 / 28.5	14.3	H / 1.0 / 270.0	N/A	-29.2
233.49	34.2 Qp	1.6 / 11.1 / 28.7	18.2	H / 1.0 / 270.0	N/A	-27.8
236.05	36.6 Qp	1.6 / 11.2 / 28.7	20.7	H / 1.0 / 270.0	N/A	-25.3
243.43	32.4 Qp	1.7 / 11.4 / 28.7	16.8	H / 1.0 / 270.0	N/A	-29.2
The following were maximized between 200 and 1000 MHz.						
336.00	40.1 Qp	2.0 / 14.3 / 28.6	27.7	H / 1.0 / 242.0	N/A	-18.3
240.00	48.0 Qp	1.6 / 11.2 / 28.7	32.1	H / 1.3 / 270.0	N/A	-13.9

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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Radiated Electromagnetic Emissions

Test Report #:	**BC400283 Run 02**	Test Area:	Pinewood Site 1 (3m)	Temperature:	56	°C
Test Method:	FCC pt. 15.209	Test Date:	18-Jun-2004	Relative Humidity:	20.5	%
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	80	kPa
EUT Serial #:	001			Page:	5 of 6	
Manufacturer:	Metrics					
EUT Description:	USB Wireless Transceiver					
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dbuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <30MHz	DELTA2 (dB) 15.209 >30MHz
********** Measurement Summary **********						
10000.0	40.9 Av	9.5 / 38.9 / 48.3	41.0	H / 1.0 / 270.0	N/A	-13
9000.00	40.8 Av	8.5 / 40.0 / 46.8	42.4	V / 1.0 / 270.0	N/A	-11.6
8000.00	30.9 Av	8.3 / 37.7 / 40.5	36.5	V / 1.0 / 180.0	N/A	-17.5
4000.00	31.8 Av	5.7 / 34.4 / 37.6	34.2	V / 1.0 / 270.0	N/A	-19.8
2000.00	32.0 Av	3.2 / 29.1 / 37.3	27.1	V / 1.0 / 270.0	N/A	-26.9
995.89	26.6 Qp	2.2 / 23.5 / 28.3	24.0	V / 1.0 / 0.0	N/A	-30.0
528.00	28.9 Qp	2.3 / 17.0 / 28.6	19.6	V / 1.0 / 90.0	N/A	-26.4
516.00	33.8 Qp	2.3 / 18.2 / 28.7	25.6	V / 1.2 / 61.0	N/A	-20.4
504.00	30.2 Qp	2.3 / 18.1 / 28.6	22.0	V / 1.0 / 90.0	N/A	-24.0
492.00	30.4 Qp	2.3 / 17.4 / 28.4	21.7	V / 1.0 / 0.0	N/A	-24.3
479.99	44.0 Qp	2.3 / 17.2 / 28.4	35.1	V / 1.2 / 45.0	N/A	-10.9
468.00	29.1 Qp	2.3 / 16.9 / 28.6	19.7	V / 1.0 / 0.0	N/A	-26.3
444.00	30.0 Qp	2.2 / 16.0 / 28.6	19.6	V / 1.0 / 180.0	N/A	-26.4
432.00	33.1 Qp	2.2 / 16.0 / 28.6	22.7	V / 1.0 / 180.0	N/A	-23.3
336.00	40.1 Qp	2.0 / 14.3 / 28.6	27.7	H / 1.0 / 242.0	N/A	-18.3
312.00	27.8 Qp	2.0 / 15.3 / 28.8	16.3	H / 1.0 / 270.0	N/A	-29.7
288.00	32.5 Qp	1.9 / 13.4 / 28.7	19.1	H / 1.0 / 270.0	N/A	-26.9
243.43	32.4 Qp	1.7 / 11.4 / 28.7	16.8	H / 1.0 / 270.0	N/A	-29.2
240.00	48.0 Qp	1.6 / 11.2 / 28.7	32.1	H / 1.3 / 270.0	N/A	-13.9
236.05	36.6 Qp	1.6 / 11.2 / 28.7	20.7	H / 1.0 / 270.0	N/A	-25.3
233.49	34.2 Qp	1.6 / 11.1 / 28.7	18.2	H / 1.0 / 270.0	N/A	-27.8
228.00	32.2 Qp	1.6 / 10.9 / 28.6	16.1	H / 1.0 / 270.0	N/A	-29.9
216.00	30.4 Qp	1.5 / 10.9 / 28.5	14.3	H / 1.0 / 270.0	N/A	-29.2
191.99	33.5 Qp	1.4 / 13.6 / 28.6	19.9	V / 1.0 / 180.0	N/A	-23.6
144.00	45.3 Qp	1.2 / 12.7 / 28.5	30.8	H / 1.3 / 205.0	N/A	-12.7
60.00	34.0 Qp	0.8 / 9.1 / 28.8	15.1	V / 1.0 / 0.0	N/A	-24.9
48.92	34.5 Qp	0.8 / 11.0 / 28.8	17.5	V / 1.0 / 0.0	N/A	-22.5
47.27	34.4 Qp	0.8 / 11.2 / 28.7	17.6	V / 1.0 / 0.0	N/A	-22.4
32.63	36.2 Qp	0.6 / 13.2 / 28.6	21.4	V / 1.0 / 196.0	N/A	-18.6
24.00	8.7 Qp	0.5 / 9.4 / 0.0	18.6	V / 1.0 / 270.0	-30.9	N/A

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Radiated Electromagnetic Emissions

Test Report #:	**BC400283 Run 02**	Test Area:	Pinewood Site 1 (3m)	Temperature:	56 °C
Test Method:	FCC pt. 15.209	Test Date:	18-Jun-2004	Relative Humidity:	20.5 %
EUT Model #:	Z-PC	EUT Power:	5 VDC for USB	Air Pressure:	80 kPa
EUT Serial #:	001			Page:	6 of 6
Manufacturer:	Metrics				
EUT Description:	USB Wireless Transceiver				
Notes:					

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dbuV)	(m) (DEG)	15.209 <30MHz	15.209 >30MHz
12.00	10.6 Qp	0.4 / 10.3 / 0.0	21.3	H / 1.0 / 270.0	-28.2	N/A

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Bandwidth Measurement

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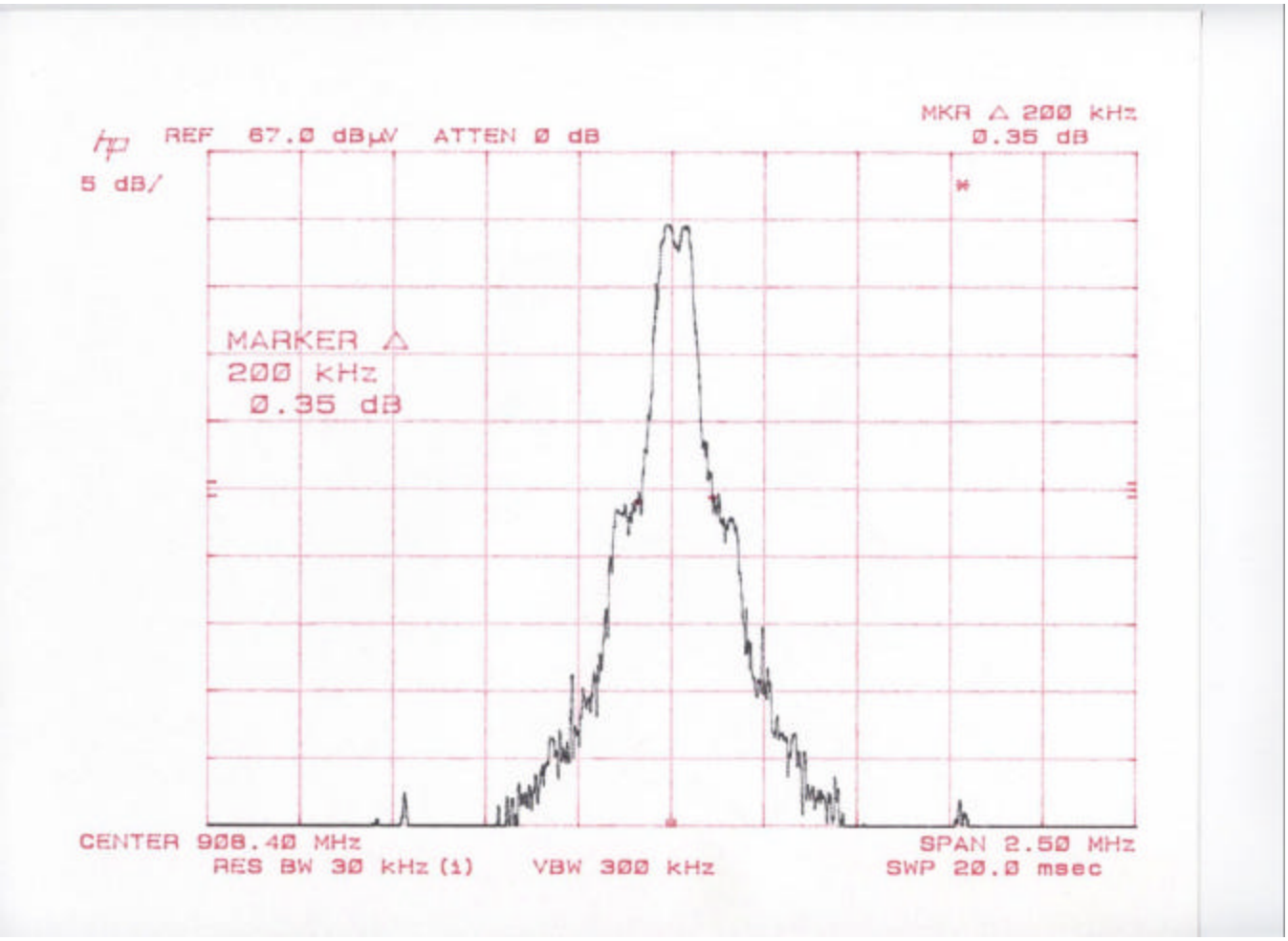
-20dBc Bandwidth Plot



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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Project Report

Begin Date: **End Date:** 6/18/2004 6/18/2004

Technician Karen Parker **Project:** BC400283

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
6	Hewlett-Packard	8594E	3223A00145	Spectrum Analyzer	R Radiated Emissions	For Cal	1/16/2004	1/16/2005
106	TENSOR	4105	2020	Ridged Guide Antenna 1-18GHz	R Radiated Emissions	For Cal	6/28/2004	6/28/2005
138	EMC TEST SYSTEMS	3109	3142	Biconical Antenna 30-300MHz	R Radiated Emissions	For Cal	10/3/2003	10/3/2004
171	Hewlett-Packard	85662A	1928A01169	Spectrum Analyzer - Display Section	R Radiated Emissions	For Cal	1/21/2004	1/21/2005
172	Hewlett-Packard	8566B	2430A00759	Spectrum Analyzer	R Radiated Emissions	For Cal	1/21/2004	1/21/2005
187	EMCO	3115	9205-3886	Horn Antenna 1-18GHz	R Radiated Emissions	For Cal	10/6/2003	10/6/2004
195	EMCO	6502	9205-2738	Magnetic loop	R Radiated Emissions	For Cal	6/2/2004	6/2/2005
202	Avantek	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	R Radiated Emissions	For Ver	4/7/2004	4/7/2005
203	Avantek	AFT97-8434-10F	1007	RF Pre-Amplifier (4-8 GHz)	R Radiated Emissions	For Ver	4/7/2004	4/7/2005
212	MITEQ	AM-2A-000110-N	848495	Amplifier	R Radiated Emissions	For Ver	5/27/2004	5/27/2005
213	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier	R Radiated Emissions	For Ver	6/5/2004	6/5/2005
217	EMCO	3146	9203-3376	Log Periodic Antenna	R Radiated Emissions	For Cal	10/3/2003	10/3/2004

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Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Appendix B

Test Plan

and

Constructional Data Form

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Appendix C

Measurement Protocol

And

Test Procedures

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MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the applicable limit.

To convert between dBµV and µV, the following conversions apply:

- dBµV = 20(log µV)
- µV = Inverse log(dBµV/20)

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dBmV:

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dBµV)		(dB)		(dBµV/m)	(dBµV/m)		(dBµV/m)		
14.0		**14.9**		**28.9**	**40.0**		**28.9**		**-11.1**

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Boulder, Colorado 80301
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DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 µH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

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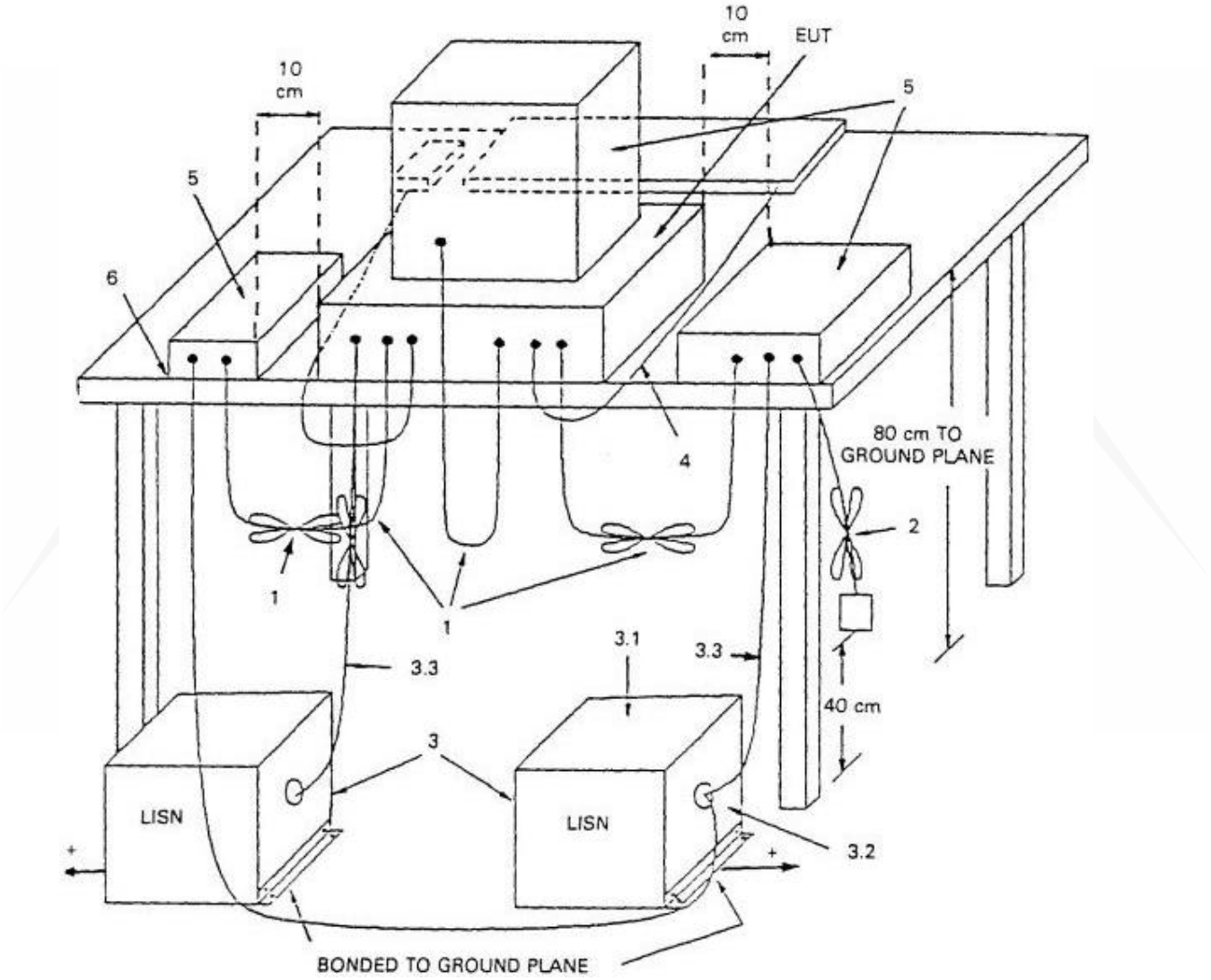
5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160

Conducted Emissions Diagram:



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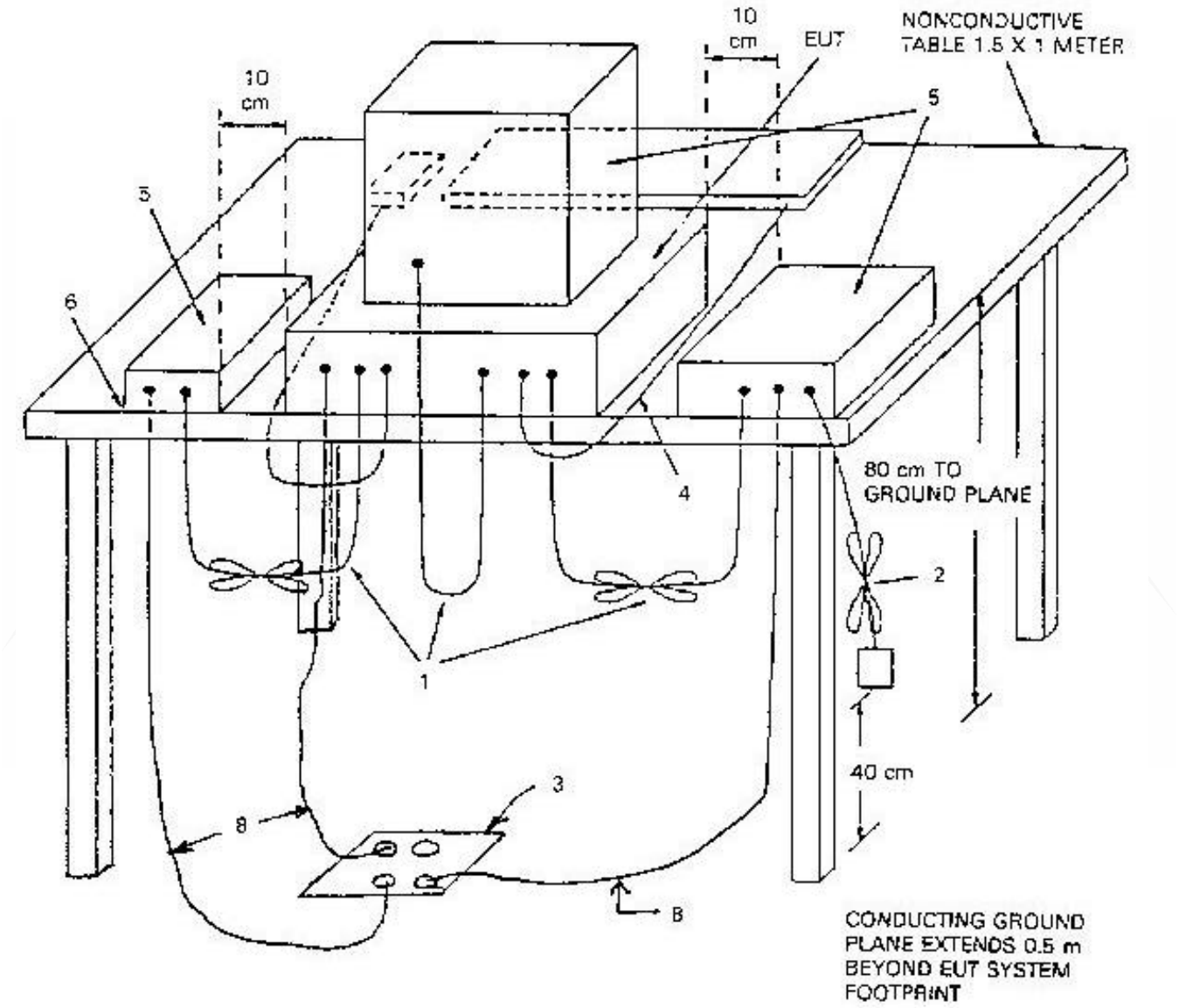
Radiated Emissions Diagram:



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5541 Central Avenue, Suite 110
Boulder, Colorado 80301
Voice: 303 786 7999 Fax: 303 449 6160