

KTL Dallas, Inc.

Safety - EMC - Telecom - ISO Guide 25

DUPLICATE ORIGINAL

ENGINEERING TEST REPORT

ON

MODEL: HERA3b MW/CONVECTION OVEN

IN ACCORDANCE WITH:

FCC PART 18, SUBPART C

**INDUSTRIAL, SCIENTIFIC, MEDICAL EQUIPMENT
VERIFICATION**

REPORT NO.: 9L0403EUS.DUP

TEST FOR:

**TURBOCHEF TECHNOLOGIES, INC.
10500 METRIC DRIVE, SUITE 128
DALLAS, TEXAS 75243**

TESTED BY:

**KTL DALLAS, INC.
802 N. KEALY
LEWISVILLE, TEXAS 75057-3136**



NVLAP LAB CODE: 100426-0

DECEMBER 1999

This document contains 19 pages including this one.

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This report applies only to the items tested.

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EQUIPMENT: HERA3b MW/Convection Oven

Section 1. Summary of Test Results**General:****All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 18, Subpart C for Industrial, Scientific, Medical Equipment.

These tests were conducted using measurement procedures of ANSI C63.4-1992.

Abstract:

Name Of Test	Para. No.	Results
Conducted Emissions	18.307	N/A*
Radiated Emissions	18.305 (b)	Complies

*Conducted Emissions testing is not applicable to microwave ovens per the FCC.

THIS REPORT APPLIES ONLY TO THE ITEM (S) TESTED AND DOES NOT
CONSTITUTE ENDORSEMENT BY THE UNITED STATES OF AMERICA.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE
TEST SPECIFICATIONS HAVE BEEN MADE. **NONE.**

NVLAP Lab Code: 100351-0

TESTED BY: Ricky Hill DATE: 11/20/99
Ricky Hill, EMC Technician

APPROVED BY: Dale L. Reynolds, EMC Group Manager DATE: _____

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EQUIPMENT: HERA3b MW/Convection Oven

Section 2. Equipment Under Test (E.U.T.)

Manufacturer: TurboChef Technologies, Inc.

Model No.: HERA3b MW/Convection Oven

Serial No.: None



Production Unit



Pre-Production Unit

The E.U.T. was received on October 20, 1999, in good conduction.

Description of E.U.T.:

The E.U.T. (Equipment Under Test) is a counter top microwave oven used as a fast cook oven for consumer use.

Clock, Oscillator, Highest Frequencies Utilized:

1. 100 kHz
2. 2145 Hz Microwave
3. 4 MHz uP (Power Board)
4. 8 MHz uP
5. 20 MHz uP (Control Bd)

Modifications Incorporated in E.U.T.:

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

EQUIPMENT: HERA3b MW/Convection Oven

Justification:

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

(1) Stand alone, AC line powered oven.

Exercise Program:

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:

(1) Cook temp = 400°F, Convection air velocity = 60%, Microwave power = 100%.

EQUIPMENT: HERA3b MW/Convection Oven

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Description	Manufacturer	Model No.	Serial No.	Rev.	FCC ID Status
(A)*	MW/Convection Oven	TurboChef Tech., Inc.	HERA	None	3b	ACVJJW

* = E.U.T. (Equipment-Under-Test) or part of E.U.T.

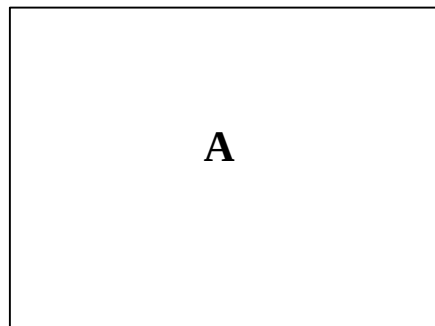
*FCC ID STATUS

- | | |
|--|--|
| 1. FCC DOC | 2. FCC A/B Verification |
| 3. None – (If performing FCC testing, contact lab manager) | 4. Certification (include FCC ID in parenthesis) |

Inter-connection Cables:

No cables used.

Configuration of the Equipment Under Test (E.U.T.):



EQUIPMENT: HERA3b MW/Convection Oven

Section 4. Conducted Emissions

N/A

Conducted Emissions testing is not applicable to microwave ovens per the FCC.

EQUIPMENT: HERA3b MW/Convection Oven

Section 5. Radiated Emissions**TESTED BY: Ricky Hill****Test Conditions:**

Test Number	Date of Test	Test Voltage	Temperature	Humidity
RE-04	11/20/99	208 Vac	24°C	56%
RE05	11/20/99	120-240 Vac	23°C	50%
MW-02	11/09/99	120-240 Vac	34°	24%

Minimum Standard:

(a) ISM equipment operating on a frequency specified in is permitted unlimited radiated energy in the band specified for that frequency.

(B) The field strength levels of emissions, which lie outside the bands specified in 18.301, unless otherwise indicated, shall not exceed the following:

Frequency(MHz)	Maximum Field Strength at 10 m	
	mV/m	dBmV/m
30 - 88	100	39.0
88 - 216	150	43.5
216 - 960	200	46.4
Above 960	500	54.0

Test Results: The E.U.T. complies.

Test # RE-03:

The worst case radiated emission level 52.4 dB μ V/m at 738.9 MHz at a distance of 10 meters in Horizontal polarization. This is 7.0 dB below the specification limit of 59.4 dB μ V/m.

Test # RE04:

No worst case radiated emissions were detected above the noise floor of the detector.

Test # MW-02:

The worst case microwave radiated emission is 66 dB μ V/m at 12.27 GHz at a distance of 3 meters in Vertical polarization. This is 3.4 dB below the specification limit of 66 dB μ V/m.

EQUIPMENT: HERA3b MW/Convection Oven

Measurement Data: See test data.

The equipment was prescanned in a shielded room using a spectrum analyzer and broadband antenna. A list of frequencies was compiled for investigation in the open field. The equipment was then moved to an open area test site where amplitude measurements were made at a distance of 10 meters. The bandwidth was set to 120 kHz and the detector function was CISPR Quasi-Peak. Any emission within 6 dB of the specification limit is re-measured using a reference tuned dipole antenna per ANSI C63.4.

Any emissions above 1 GHz were measured with a horn antenna and low noise pre-amplifier at a distance of 3 meters.

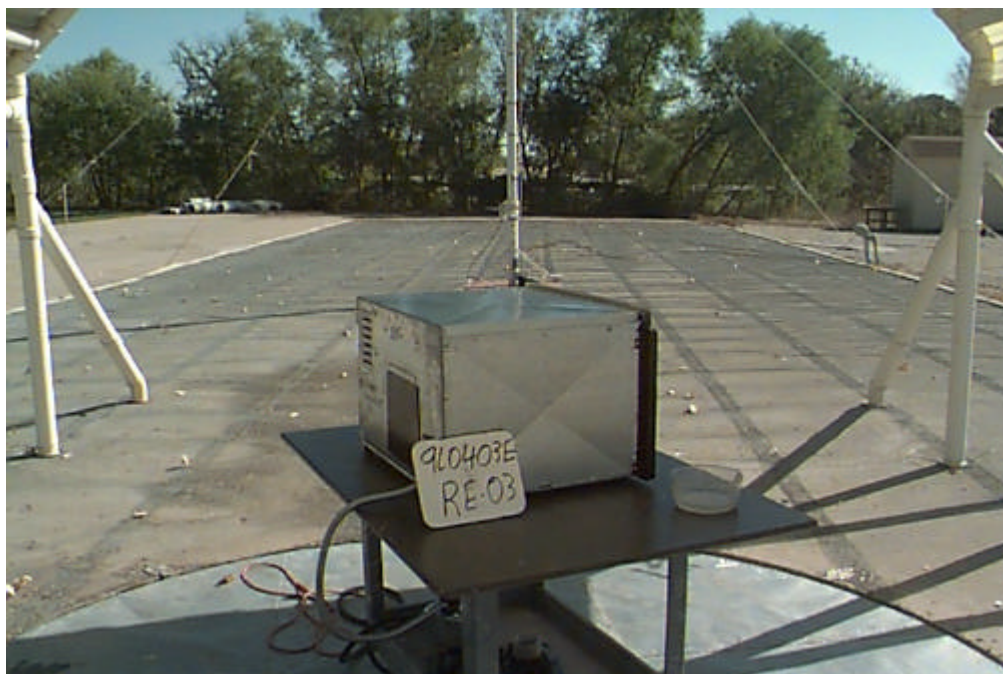
EQUIPMENT: HERA3b MW/Convection Oven

Test Data - Radiated Emissions Test # RE-03:

CLIENT NAME:		TURBOCHEF				W.O.#:9L0403E		DATE:		11/20/99					
EUT MODEL:		H3B				SERIAL #:		H3B-017		TIME:		1015			
EUT CONFIG.:		400DEG. 60% OVEN 100%MW						TECH.:		RLHILL					
TEST SPECIFICATION:		FCC 18						TEST NUMBER:		RE-03					
ROD ANT. #:		CABLE #:		4C		DETECT. TYPE:		PEAK		LOCATION:		C OATS			
BICON ANT. #:		2031		PREAMP. #:		2201		RES. BW (kHz):		100		DISTANCE (m):		10	
LOG ANT. #:		2019		LIMITER#		181		VIDEO BW (kHz):		100		EUT VOLTAGE:		208	
HORN ANT. #:				ATTEN. #:		N/A		TEMP. (deg. C):		24		EUT FREQ. (Hz):		60	
DIPOLE ANT #:				DETECTOR#:		660		HUMIDITY (%):		56		PHOTO ID:		9L0403E RE-03 RAD. EM.	
Emission Frequency (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	CR/SL Delta (dB)	Pass Fail Marginal	Notes				
53.6	V	0.0	60.5	11.0	3.4	27.2	47.7	59.4	-11.7	Pass	QP RECEIVER #100				
31.7	V	0.0	51.4	11.8	2.4	27.8	37.8	59.4	-21.6	Pass					
38.0	V	0.0	54.5	11.9	2.4	27.8	41.0	59.4	-18.4	Pass					
52.1	H	0.0	52.0	11.1	3.4	27.2	39.3	59.4	-20.1	Pass					
272.5	H	0.0	33.6	20.0	5.3	26.9	31.9	59.4	-27.5	Pass					
258.7	H	0.0	42.4	19.1	5.3	26.9	39.8	59.4	-19.6	Pass					
82.9	H	0.0	42.6	8.8	3.9	26.8	28.5	59.4	-30.9	Pass					
936.6	V	0.0	48.5	22.0	15.1	27.3	58.3	59.4	-1.1	Marginal					
936.6	V	0.0	30.0	22.0	15.1	27.3	39.8	59.4	-19.6	Pass	QP				
952.0	V	0.0	35.8	22.0	15.7	27.7	45.8	59.4	-13.6	Pass					
921.7	V	0.0	50.1	21.7	15.1	27.3	59.6	59.4	0.2	Marginal					
921.7	V	0.0	38.0	21.7	15.1	27.3	47.5	59.4	-11.9	Pass	QP				
891.9	V	0.0	46.4	21.9	14.6	27.7	55.2	59.4	-4.2	Pass					
891.9	V	0.0	41.5	21.9	14.6	27.7	50.3	59.4	-9.1	Pass	QP				
717.7	V	0.0	46.1	20.5	12.9	27.7	51.8	59.4	-7.6	Pass					
562.1	V	0.0	43.0	19.4	11.5	27.4	46.5	59.4	-12.9	Pass					
306.5	H	0.0	49.0	12.9	5.3	27.1	40.1	59.4	-19.3	Pass					
738.9	H	0.0	47.2	20.0	12.9	27.7	52.4	59.4	-7.0	Pass					
982.0	H	0.0	33.7	21.9	15.7	27.7	43.6	59.4	-15.8	Pass					
623.9	H	0.0	38.8	20.2	11.7	27.5	43.2	59.4	-16.2	Pass					
											SCAN FROM 30-1000MHZ				

EQUIPMENT: HERA3b MW/Convection Oven

Radiated Emissions Photographs for Test # RE-03:



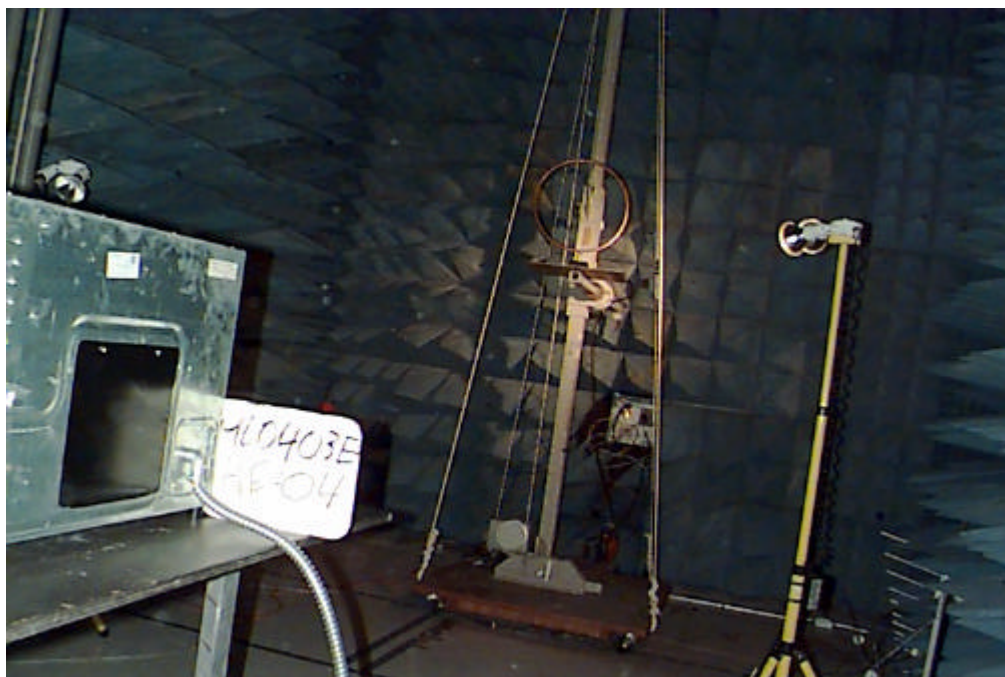
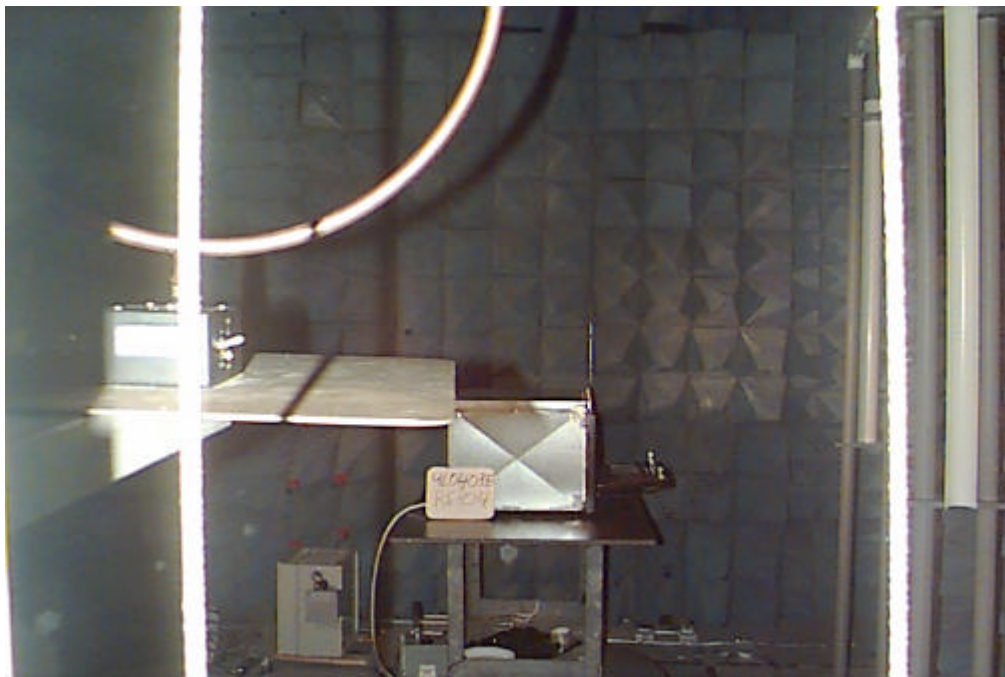
EQUIPMENT: HERA3b MW/Convection Oven

Test Data - Operating Frequency, Subpart C, Paragraph 18.301 Test # RE04:

Radiated Emissions									
FCC									
Complete <u> X </u>									
Preliminary <u> </u>		Page <u> 1 </u> of <u> 1 </u>							
Client: <u> Turbochef </u>			W.O.#: <u> 9L0403E </u>			Date: <u> 11/20/99 </u>			
EUT: <u> H3B </u>			S/N: <u> H3B-017 </u>			Specification: <u> FCC 18 </u>			
Tech: <u> RHILL </u>			Test #: <u> RE04 </u>		Lab: <u> AC 2 </u>		Photo ID: <u> 9L0403 RE04 </u>		
Equipment Used: <u> 249,AC4,G2000 </u>						Antenna Distance: <u> 3METERS </u> AND 2 MTR HIGH			
Configuration: <u> TEST 5A CONFIG. </u>									
IF Bandwidth: <u> MP5 </u>		Video Bandwidth <u> MP5 </u>		Detector: <u> </u> Peak <u> MP5 </u> Quasi Peak/Avg.					
Ambient Temperature: <u> 23 </u> C		EUT Power: <u> </u> 115 V.A.C. <u> X </u> 60 Hz <u> X </u> 1 Phase							
Relative Humidity: <u> 50 </u> %		<u> </u> 230 V.A.C. <u> </u> 50 Hz <u> </u> 3 Phase							
Atmospheric Pressure: <u> 1018 </u> mbar		<u> </u> X Other <u> 120-240 VAC </u>							
Freq. (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV) FCC	Pol.	Comments: L = LOOP N.F. = Noise Floor	
0.075	-5.1	61	0	0	55.9	69.4	L	N.F.	
0.14	-4.9	56.4	0	0	51.5	69.4	L	N.F.	
0.2	-4.4	53.7	0	0	49.3	69.4	L	N.F.	
2	-4.5	33.3	0	0	28.8	69.4	L	N.F.	
10	-2	14.8	0	0	12.8	69.4	L	N.F.	
15	-2.2	1.5	0	0	-0.7	69.4	L	N.F.	
18.3	29.8	-20.1	0	0	9.7	69.4	L	N.F.	
30	2.7	15.3	0	0	18	69.4	L	N.F.	
								Scanned 0.01-30MHz	

EQUIPMENT: HERA3b MW/Convection Oven

Operating Frequency, Subpart C, Paragraph 18.301 Photographs for Test # RE04:



EQUIPMENT: HERA3b MW/Convection Oven

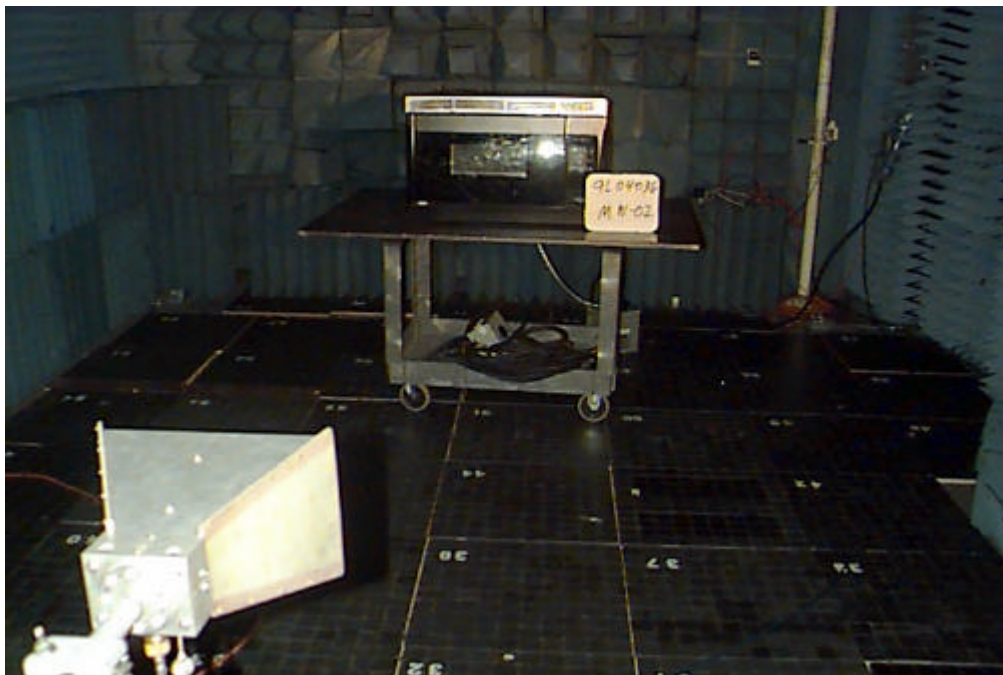
Test Data - Microwave Radiated Emissions Test # MW-02:

Microwave Radiated Emissions Data									
Complete ☒		Preliminary ☐		Page <u>1</u> of <u>1</u>					
Client: <u>TurboChef Technologies</u>				Test #: <u>MW-02</u>		W.O.#: <u>9L0403E</u>			
EUT: <u>H3b</u>				S/N: <u>017</u>		Photo ID: _____			
Technician: <u>RLHILL</u>		Specification: <u>FCC 18</u>		Lab: <u>ANC</u>		Date: <u>11/9/99</u>			
Equipment Used: <u>CF27,CF29,G2200,G1716,CF31,G2034,G2616,452</u>									
Configuration: <u>60% BLOWER, 100% MICROWAVE, 400F</u>									
Bandwidth: <u>1M</u>		Video Bandwidth: <u>1M</u>		Antenna Distance <u>3</u> m		Detector: _____			
Climatic Conditions:		EUT Power: <u>115</u> V.A.C. ☒ 60 Hz ☐ Peak							
Temperature: <u>34</u> C		<u>208</u> V.A.C. ☐ 50 Hz ☒ Average							
Relative Humidity: <u>24</u> %		<u>230</u> V.A.C. _____							
Atmospheric Pressure: <u>886</u> mbar		☒ Other <u>120-240</u> ☐ 1 Phase ☐ 3 Phase							
Freq. (GHz)	Meter Reading (dBm)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:
4.907	-60	33.3	7	29.825	107	58	69.4	v	
7.35	-60	36.3	9	34.16	107	59	69.4	v	
9.8	-62	37.7	11	33.78	107	60	69.4	v	
12.27	-60	38.7	13	32.87	107	66	69.4	v	
14.7	-65	43.4	13	43.76	107	55	69.4	v	noise floor
17.15	-65	43.3	9	42.73	107	52	69.4	v	noise floor
4.907	-54	33.3	7	29.825	107	64	69.4	h	
7.35	-68	36.3	9	34.16	107	51	69.4	h	
9.8	-60	37.7	11	33.78	107	62	69.4	h	
12.27	-65	38.7	13	32.87	107	61	69.4	h	noise floor
14.7	-65	43.4	13	43.76	107	55	69.4	h	noise floor
17.15	-65	43.3	9	42.73	107	52	69.4	h	noise floor
									scanned listed
									freq.

DATA\COMMON\FORMS\TESTDATASHEETS\MICRORE REV 030597

EQUIPMENT: HERA3b MW/Convection Oven

Microwave Radiated Emissions Photographs for Test # MW-02:



Section 6. Sample Calculations

Radiated Emissions:

Emissions are measured at a distance of 10 meters and corrected for antenna factor and cable loss.

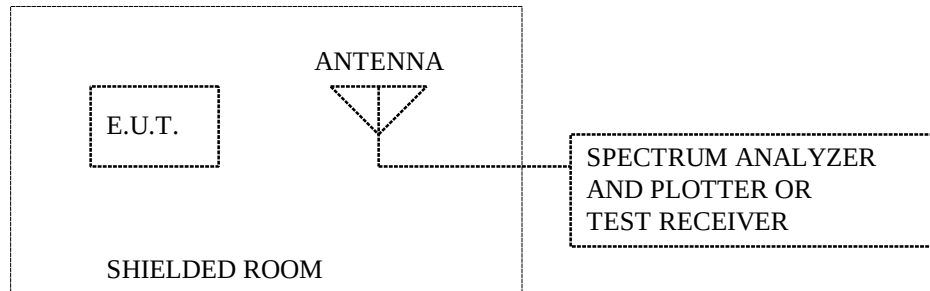
i.e. Received Signal = 25 dB μ V @ 100 MHz
 Antenna Factor & Cable Loss = 9.8 dB
 Field Intensity = 25 + 9.8 = 34.8 dB μ V/m @ 3 m

Field Strength limits are adjusted by a factor of 20 Log (d2/d1) where d1 is the measurement distance and d2 is the specified distance in meters. (i.e. if the specified distance is 300 meters and the emissions were measured at a distance of 10 meters, the new limit would be adjusted by adding 20 Log (300/10) = 29.5 dB.

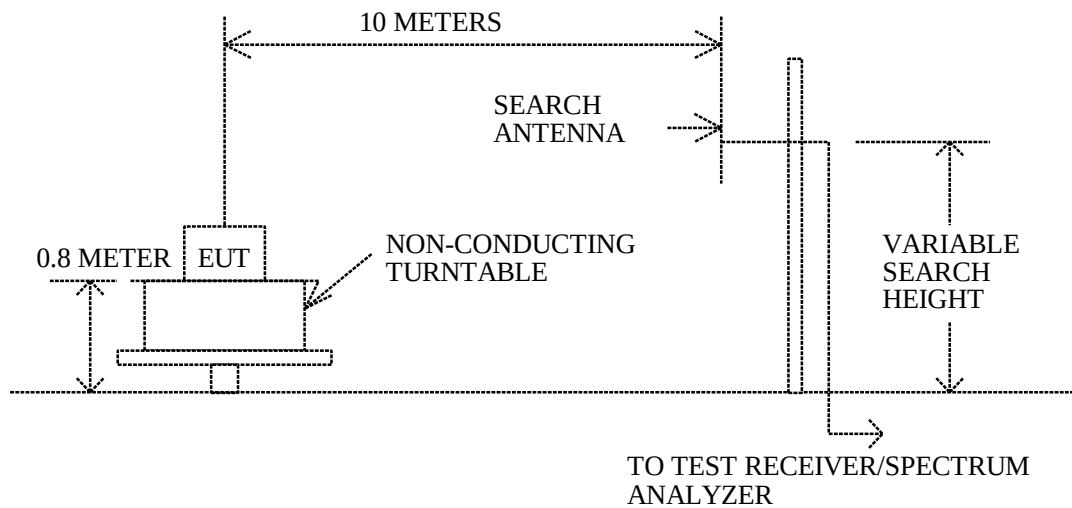
EQUIPMENT: HERA3b MW/Convection Oven

Section 7. Block Diagrams

Radiated Prescan:



Outdoor Test Site for Radiated Emissions:



EQUIPMENT: HERA3b MW/Convection Oven

Section 8. Test Equipment List

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

<u>KTL (ICC) ID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
C4C	C O.A.T.S. Cable Set			07/27/99
CF27	Cable (1 meter)			01/29/99
CF29	Cable (1 meter)			01/29/99
CF31	Storm Cable (7.6 meters)	Semi Flex		01/29/99
100	Polarad Receiver	Rohde & Schwarz ESV	872149/28	12/07/98
181	Limiter	Fischer FCC-45013-1.2	NSN	02/05/99
249	Receiver	Rohde & Schwarz ESH3	872079/016	12/12/98
452	Preamp 12-18 GHz	ICC LN12-18	452	06/22/99
660(a)	Spectrum Analyzer	Hewlett Packard 8567A	2541A00109	08/18/99
660(b)	Display Unit	Hewlett Packard 85662A	2542A10537	08/18/99
660(c)	Quasi-Peak Adapter	Hewlett Packard 85650A	2551A00608	08/18/99
G1716	Filter, High Pass 5 kHz	Solar 7930-5.0	933124	11/23/99
G2000	Amplifier	Hewlett Packard 8449A	2749A00159	06/11/99
G2019	LP Antenna	A.H. Systems SAS-200/510	821	01/25/99
G2031	Biconical Antenna	ICC BCON-30300	N/A	12/17/98
G2034	(TX)Horn Antenna	Electro Metrics RGA-60	6174	CNR
G2200	Amplifier	Hewlett Packard 8449A	2749A00159	06/11/99
G2201	27dB Gain Preamp	ICC 27dB LNA	946	04/14/99
G2616	Spectrum Analyzer	Tektronix 492P	B043496	11/11/98

*EQUIPMENT: HERA3b MW/Convection Oven***Test Equipment List (Continued):**

<u>KTL (ICC) ID</u>	<u>Nomenclature</u>	<u>Manufacturer Model Number</u>	<u>Serial Number</u>	<u>Calibration Date</u>
		ANECHOIC CHAMBER # 2		
	Antenna Tripod	Polarad HFU-2		CNR
		SITE C O.A.T.S. (OPEN AREA TEST SITE) 30 Meter Site		
	Turntable Flush Mounted, Metal Covered, 12 Foot	A.H. Systems (Automated)		CNR
	Antenna Mast, 5 Foot	ICC (Automated)		CNR

Calibration interval on all items is typically 12 months from the calibration date shown. Where relevant, measuring equipment is subjected to in-service checks between testing. Should any measurement equipment be utilized beyond its scheduled calibration date, the measuring equipment is subjected to in-service checks prior to use. KTL shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Legend:

CNR Calibration not required
N/A Not applicable
CBU Calibrated before use