



EMI TEST REPORT

Test Report No. : 26CE0142-HO-2a

Applicant : Rinnai Corporation
Type of Equipment : Remote controller for water heater
Model No. : MC-502RC-1US-S
Test standard : FCC Part 15 Subpart C
Section 15.207, Section 15.249: 2006
FCC ID : T2GMC-502RC-1US-S
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

January 31 to February 2, 2006

Tested by:

Kenichi Adachi

Kenichi Adachi
EMC Services

Approved by :

Hiroka Umeiyama

Hiroka Umeiyama
EMC Services

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(01.06.05)

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SECTION 1: Client information

Company Name : Rinnai Corporation
Address : 103 International Drive, Peachtree City, GA 30269 U.S.A.
Telephone Number : (800)-621-9419
Facsimile Number : (678)-829-1666
Contact Person : Donald Emen

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1
Rating : DC 2.3V to 3.0V (Lithium battery)
Country of Manufacture : Japan
Receipt Date of Sample : January 31, 2006
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

Model No: MC-502RC-1US-S is Remote controller for water heater.

Clock frequency	4.915MHz(Main clock), 32.768kHz (Sub clock), 14.7456MHz (PLL reference oscilation)
Equipment Type	Transceiver
Frequency of Operation	916.2204MHz to 922.6716MHz
Channel spacing	921.6kHz
Type of Modulation	FSK (for Transmitter)
Antenna Type	Derivative chip antenna
Method of frequency generation	Synthesizer
ITU code	173KF1D (for Transmitter)
Power Supply (Inner)	DC 2.2V

FCC 15.31 (e)

Power section uses size AA alkaline batteries which are connected in two series and two parallels (DC3.0V). Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2006
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.249 Operation within the bands 902 – 928MHz, 2400 – 2483.5MHz, 5725 – 5875MHz, and 24.0 – 24.25GHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin *0)	Result
1	Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements	FCC: Section 15.207	- *1)	N/A	N/A	N/A *1)
2	Electric Field Strength of Fundamental Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.249	Radiated	N/A	1.5dB 918.985MHz, Horizontal, QP	Complied
3	Electric Field Strength of Spurious Emission	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.249, Section 15.209 *2)	Radiated	N/A	6.3dB 1832.375MHz, Horizontal, AV	Complied
4	-20dB bandwidth	FCC: ANSI C63.4:2003 13. Measurement of intentional radiators	FCC Section 15.215	Radiated	N/A	-	Complied

Note: UL Apex's EMI Work procedures No. QPM05 and QPM15.

*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

*1) This test is not applicable since the EUT does not have AC power port.

*2) The limit for above 1GHz was applied with Section 15.209 which is more stringent.

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.4.1	-	Radiated	N/A	N/A	N/A

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3.4 Confirmation

UL Apex Co., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications, FCC Part15 Subpart C 2006.

3.5 Uncertainty

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Loop antenna is $\pm 4.41\text{dB}(3\text{m})/\pm 4.39\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.59\text{dB}(3\text{m})/\pm 4.58\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 4.62\text{dB}(3\text{m})/\pm 4.60\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 5.27\text{dB}$.

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.6 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.3 shielded room.

3.7 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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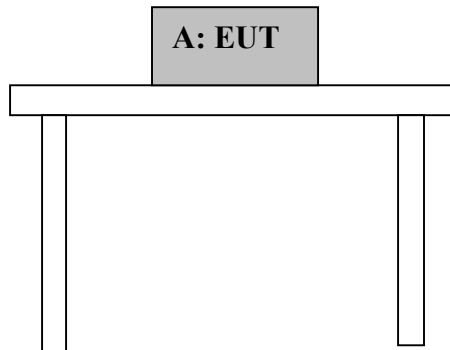
MF060b(01.06.05)

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : Transmitting mode

4.2 Configuration and peripherals



* Setup was taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Remote controller for water heater	MC-502RC-1US-S	1	Rinnai Corporation	T2GMC-502RC-1US-S

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

5.1 Operating environment

Test place : No.2 semi anechoic chamber.
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a platform of nominal size, 0.5m by 1.0m, raised 80cm above the conducting ground plane.

The EUT was set on the center of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna varied in height above the conducting ground plane to obtain the maximum signal strength.

A drawing of the set up is shown in the photos of APPENDIX 1.

5.3 Test conditions

Frequency range : 30MHz-10000MHz
Test distance : 3m
EUT position : Tabletop
EUT operation mode : Transmitting

5.4 Test procedure

The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver or the Spectrum Analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

5.5 Results

Summary of the test results: Pass

Date: January 31 to February 2, 2006

Tested by: Kenichi Adachi

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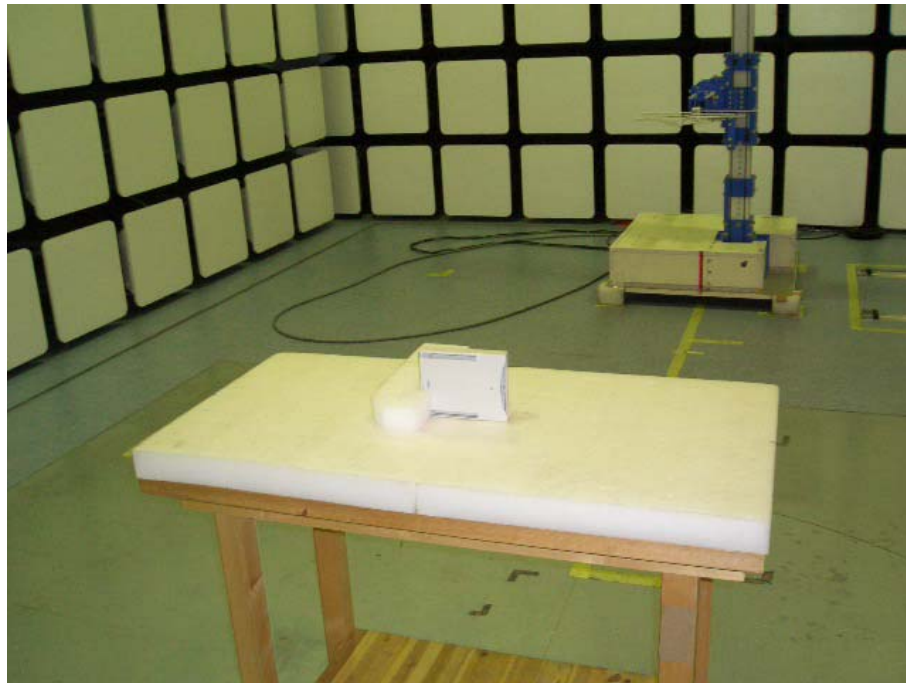
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APPENDIX 1: Photographs of test setup

Radiated Emission **Front**



Rear



Worst Case Position
(Tx: Horizontal :Y-axis / Vertical :Z-axis)

X-axis



Y-axis



Z-axis



APPENDIX 2:Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2005/04/11 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	RE	2006/02/02 * 12
MRENT-23	Spectrum Analyzer	Advantest	R3273	RE	2006/01/10 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2005/02/24 * 12
MPA-09	Pre Amplifier	Agilent	8447D	RE	2005/09/07 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2005/12/16 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2005/10/10 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2005/10/14 * 12
MOS-02	Digital Humidity Indicator	N.T	NT-1800	RE	2004/11/25 * 24
MCC-25	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	RE	2005/08/30 * 12
MPA-10	Pre Amplifier	Agilent	8449B	RE	2005/09/07 * 12
MCC-47	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	RE	2005/08/30 * 12
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2006/01/09 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated emission

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APPENDIX 3: Data of EMI test

Radiated Emission (Fundamental and Spurious emission)

(Tx: Ch. 1)

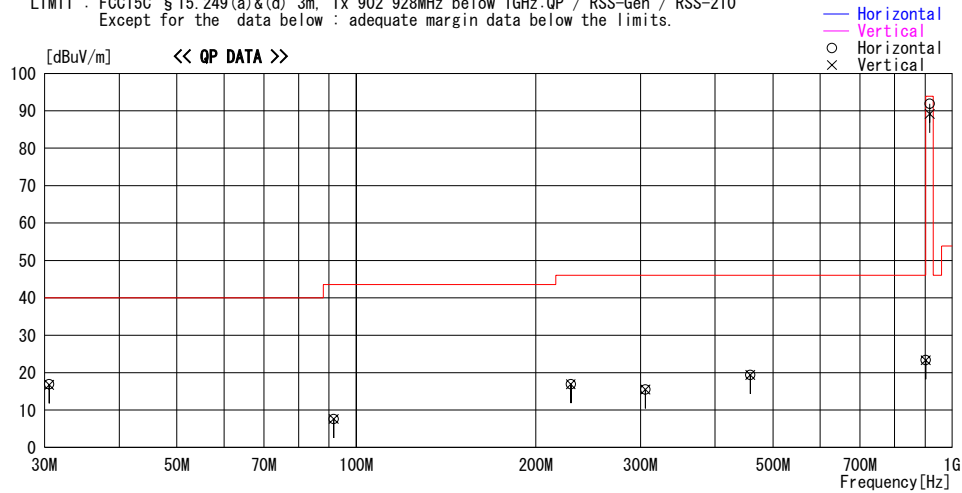
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/01 22:24:11

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1
Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 1 (916.2204MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C §15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP / RSS-Gen / RSS-210
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.541	21.6	QP	18.0	-22.7	16.9	0	300	Hori.	40.0	23.1	
30.541	21.5	QP	18.0	-22.7	16.8	0	100	Vert.	40.0	23.3	
91.622	21.4	QP	8.2	-22.0	7.6	0	300	Hori.	43.5	35.9	
91.622	21.4	QP	8.2	-22.0	7.6	0	100	Vert.	43.5	35.9	
229.055	20.6	QP	16.9	-20.6	16.9	0	300	Hori.	46.0	29.1	
229.055	20.6	QP	16.9	-20.6	16.9	0	100	Vert.	46.0	29.1	
305.407	20.7	QP	14.3	-19.5	15.5	0	100	Hori.	46.0	30.5	
305.407	20.7	QP	14.3	-19.5	15.5	0	100	Vert.	46.0	30.5	
458.110	21.4	QP	17.8	-19.8	19.4	0	100	Hori.	46.0	26.6	
458.110	21.4	QP	17.8	-19.8	19.4	0	100	Vert.	46.0	26.6	
902.000	20.1	QP	20.9	-17.7	23.3	0	100	Hori.	46.0	22.7	
902.000	20.1	QP	20.9	-17.7	23.3	0	100	Vert.	46.0	22.7	
916.220	88.0	QP	21.3	-17.4	91.9	11	142	Hori.	93.9	2.0	carrier (MAX)
916.220	85.3	QP	21.3	-17.4	89.2	343	112	Vert.	93.9	4.7	carrier

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)
The spurious emissions were applied to the limit in Section 15.209.

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Radiated Emission (Spurious emission)

(Tx: Ch. 1)

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/02 01:25:50

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1

Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 1 (916.2204MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:PK / RSS-Gen / RSS-210
FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:AV / RSS-Gen / RSS-210

Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
1832.375	52.0	PK	29.1	-29.7	51.4	43	115	Hori.	73.9	22.5
1832.375	48.2	AV	29.1	-29.7	47.6	43	115	Hori.	53.9	6.3
1832.514	50.0	PK	29.1	-29.7	49.4	312	136	Vert.	73.9	24.5
1832.514	45.8	AV	29.1	-29.7	45.2	312	136	Vert.	53.9	8.7
2748.685	47.2	PK	31.2	-29.1	49.3	0	119	Hori.	73.9	24.6
2748.685	41.2	AV	31.2	-29.1	43.3	0	119	Hori.	53.9	10.6
2748.766	46.4	PK	31.2	-29.1	48.5	10	100	Vert.	73.9	25.4
2748.766	39.3	AV	31.2	-29.1	41.4	10	100	Vert.	53.9	12.5
3664.708	45.3	PK	32.0	-28.6	48.7	273	114	Hori.	73.9	25.2
3664.708	36.1	AV	32.0	-28.6	39.5	273	114	Hori.	53.9	14.4
3664.980	44.7	PK	32.0	-28.6	48.1	335	163	Vert.	73.9	25.8
3664.980	35.7	AV	32.0	-28.6	39.1	335	163	Vert.	53.9	14.8
4581.012	41.3	PK	34.3	-27.9	47.7	303	154	Hori.	73.9	26.2
4581.012	29.3	AV	34.3	-27.9	35.7	303	154	Hori.	53.9	18.2
4581.071	41.9	PK	34.3	-27.9	48.3	46	104	Vert.	73.9	25.6
4581.071	28.9	AV	34.3	-27.9	35.3	46	104	Vert.	53.9	18.6
5497.332	41.2	PK	36.3	-27.3	50.2	333	100	Hori.	73.9	23.7
5497.332	28.2	AV	36.3	-27.3	37.2	333	100	Hori.	53.9	16.7
5497.332	40.8	PK	36.3	-27.3	49.8	0	110	Vert.	73.9	24.1
5497.332	28.3	AV	36.3	-27.3	37.3	0	110	Vert.	53.9	16.6
6413.543	40.3	PK	36.9	-26.4	50.8	0	100	Hori.	73.9	23.1
6413.543	27.9	AV	36.9	-26.4	38.4	0	100	Hori.	53.9	15.5
6413.543	39.7	PK	36.9	-26.4	50.2	0	100	Vert.	73.9	23.7
6413.543	27.9	AV	36.9	-26.4	38.4	0	100	Vert.	53.9	15.5
9162.204	42.3	PK	36.9	-25.6	53.6	0	100	Hori.	73.9	20.3
9162.204	29.7	AV	36.9	-25.6	41.0	0	100	Hori.	53.9	12.9
9162.204	42.5	PK	36.9	-25.6	53.8	0	100	Vert.	73.9	20.1
9162.204	29.7	AV	36.9	-25.6	41.0	0	100	Vert.	53.9	12.9

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

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Radiated Emission (Fundamental and Spurious emission)

(Tx: Ch. 4)

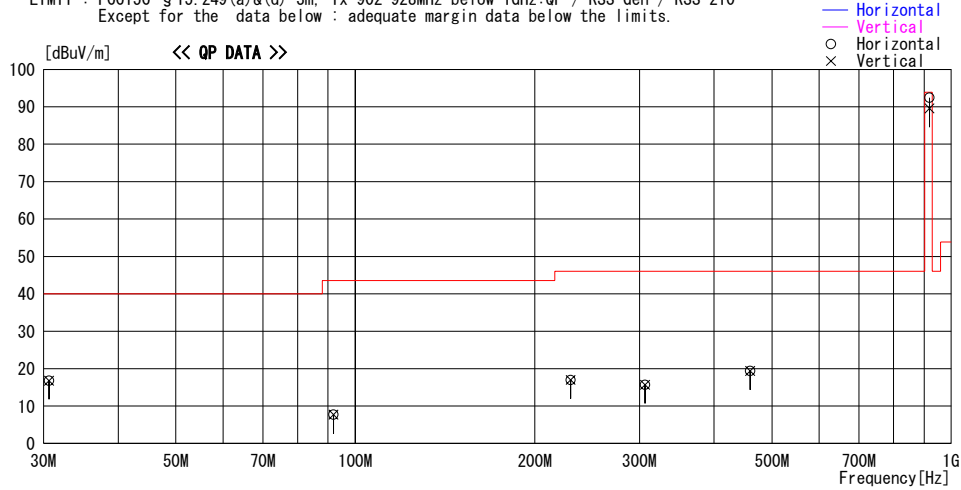
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/01 22:44:10

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1
Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 4 (918.9852MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C §15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP / RSS-Gen / RSS-210
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.633	21.5	QP	18.0	-22.7	16.8	0	300	Hori.	40.0	23.2	
30.633	21.5	QP	18.0	-22.7	16.8	0	100	Vert.	40.0	23.2	
91.899	21.4	QP	8.3	-22.0	7.7	0	300	Hori.	43.5	35.8	
91.899	21.4	QP	8.3	-22.0	7.7	0	100	Vert.	43.5	35.8	
229.746	20.7	QP	16.9	-20.6	17.0	0	300	Hori.	46.0	29.0	
229.746	20.7	QP	16.9	-20.6	17.0	0	100	Vert.	46.0	29.0	
306.328	20.7	QP	14.4	-19.4	15.7	0	100	Hori.	46.0	30.3	
306.328	20.7	QP	14.4	-19.4	15.7	0	100	Vert.	46.0	30.3	
459.493	21.4	QP	17.8	-19.8	19.4	0	100	Hori.	46.0	26.6	
459.493	21.4	QP	17.8	-19.8	19.4	0	100	Vert.	46.0	26.6	
918.985	88.4	QP	21.4	-17.4	92.4	14	147	Hori.	93.9	1.5	carrier (MAX)
918.985	85.6	QP	21.4	-17.4	89.6	341	114	Vert.	93.9	4.3	carrier

CHART: WITH FACTOR ANT TYPE : 30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)
The spurious emissions were applied to the limit in Section 15.209.

Radiated Emission (Spurious emission)

(Tx: Ch. 4)

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/02 02:21:20

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1

Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 4 (918.9852MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:PK / RSS-Gen / RSS-210
FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:AV / RSS-Gen / RSS-210

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
1837.974	49.7	PK	29.2	-29.7	49.2	45	112	Hori.	73.9	24.7
1837.974	46.7	AV	29.2	-29.7	46.2	45	112	Hori.	53.9	7.7
1837.975	48.4	PK	29.2	-29.7	47.9	320	140	Vert.	73.9	26.0
1837.975	45.1	AV	29.2	-29.7	44.6	320	140	Vert.	53.9	9.3
2756.986	47.3	PK	31.2	-29.1	49.4	0	121	Hori.	73.9	24.5
2756.986	41.1	AV	31.2	-29.1	43.2	0	121	Hori.	53.9	10.7
2756.923	46.3	PK	31.2	-29.1	48.4	13	100	Vert.	73.9	25.5
2756.923	40.3	AV	31.2	-29.1	42.4	13	100	Vert.	53.9	11.5
3675.810	45.5	PK	32.1	-28.6	49.0	270	116	Hori.	73.9	24.9
3675.810	36.3	AV	32.1	-28.6	39.8	270	116	Hori.	53.9	14.1
3675.962	44.6	PK	32.1	-28.6	48.1	332	164	Vert.	73.9	25.8
3675.962	35.8	AV	32.1	-28.6	39.3	332	164	Vert.	53.9	14.6
4594.816	41.6	PK	34.4	-27.9	48.1	298	152	Hori.	73.9	25.8
4594.816	29.4	AV	34.4	-27.9	35.9	298	152	Hori.	53.9	18.0
4594.930	41.8	PK	34.4	-27.9	48.3	50	105	Vert.	73.9	25.6
4594.930	29.2	AV	34.4	-27.9	35.7	50	105	Vert.	53.9	18.2
5513.911	41.1	PK	36.3	-27.3	50.1	331	100	Hori.	73.9	23.8
5513.911	28.3	AV	36.3	-27.3	37.3	331	100	Hori.	53.9	16.6
5513.911	41.0	PK	36.3	-27.3	50.0	0	109	Vert.	73.9	23.9
5513.911	28.2	AV	36.3	-27.3	37.2	0	109	Vert.	53.9	16.7
6432.896	40.2	PK	36.9	-26.4	50.7	0	100	Hori.	73.9	23.2
6432.896	27.9	AV	36.9	-26.4	38.4	0	100	Hori.	53.9	15.5
6432.896	40.4	PK	36.9	-26.4	50.9	0	100	Vert.	73.9	23.0
6432.896	27.8	AV	36.9	-26.4	38.3	0	100	Vert.	53.9	15.6
9189.852	42.4	PK	36.8	-25.6	53.6	0	100	Hori.	73.9	20.3
9189.852	29.8	AV	36.8	-25.6	41.0	0	100	Hori.	53.9	12.9
9189.852	42.2	PK	36.8	-25.6	53.4	0	100	Vert.	73.9	20.5
9189.852	29.7	AV	36.8	-25.6	40.9	0	100	Vert.	53.9	13.0

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

Radiated Emission (Fundamental and Spurious emission)

(Tx: Ch. 8)

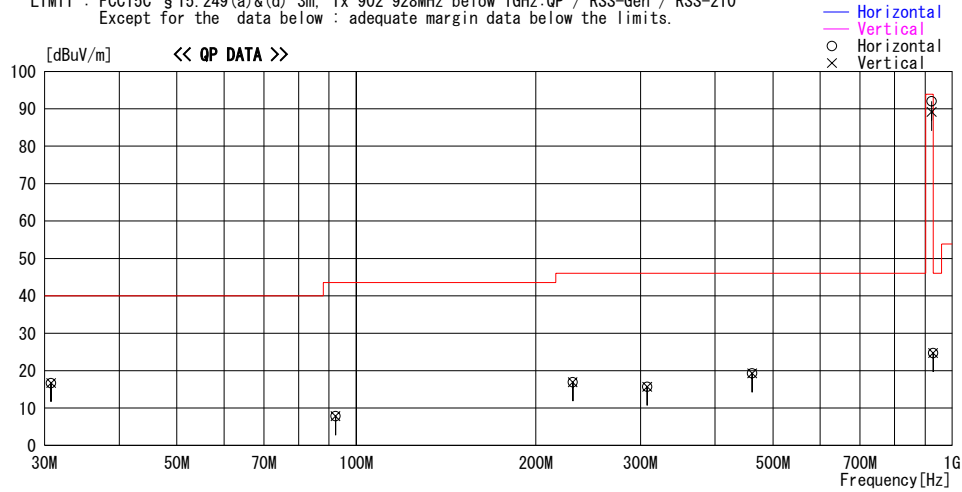
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/01 23:37:39

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1
Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 8 (922.6716MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C §15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP / RSS-Gen / RSS-210
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
30.756	21.5	QP	17.9	-22.7	16.7	0	300	Hori.	40.0	23.3	
30.756	21.5	QP	17.9	-22.7	16.7	0	100	Vert.	40.0	23.3	
92.267	21.4	QP	8.4	-22.0	7.8	0	300	Hori.	43.5	35.7	
92.267	21.4	QP	8.4	-22.0	7.8	0	100	Vert.	43.5	35.7	
230.668	20.6	QP	16.9	-20.6	16.9	0	300	Hori.	46.0	29.1	
230.668	20.6	QP	16.9	-20.6	16.9	0	100	Vert.	46.0	29.1	
307.557	20.7	QP	14.4	-19.4	15.7	0	100	Hori.	46.0	30.3	
307.557	20.7	QP	14.4	-19.4	15.7	0	100	Vert.	46.0	30.3	
461.336	21.3	QP	17.8	-19.8	19.3	0	100	Hori.	46.0	26.7	
461.336	21.3	QP	17.8	-19.8	19.3	0	100	Vert.	46.0	26.7	
922.672	87.8	QP	21.5	-17.3	92.0	15	143	Hori.	93.9	1.9	carrier (MAX)
922.672	85.0	QP	21.5	-17.3	89.2	341	112	Vert.	93.9	4.7	carrier
928.000	20.3	QP	21.7	-17.3	24.7	0	100	Hori.	46.0	21.3	
928.000	20.3	QP	21.7	-17.3	24.7	0	100	Vert.	46.0	21.3	

CHART: WITH FACTOR ANT TYPE : 30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)
The spurious emissions were applied to the limit in Section 15.209.

Radiated Emission (Spurious emission)

(Tx: Ch. 8)

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/02/02 02:55:10

Applicant : Rinnai Corporation
Kind of EUT : Remote controller for water heater
Model No. : MC-502RC-1US-S
Serial No. : 1

Report No. : 26CE0142-HO
Power : DC 3.0V
Temp./Humi. : 25deg. C. / 32%
Operator : Kenichi Adachi

Mode / Remarks : Transmitting ch 8 (922.6716MHz), power -3dBm, EUT-max-axis(H: Y, V: Z)

LIMIT : FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:PK / RSS-Gen / RSS-210
FCC15C § 15.249(a)&(d) 3m, Tx 902~928MHz below 1GHz:QP, above 1GHz:AV / RSS-Gen / RSS-210

Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]
1845.293	52.0	PK	29.3	-29.7	51.6	47	116	Hori.	73.9	22.3
1845.293	47.9	AV	29.3	-29.7	47.5	47	116	Hori.	53.9	6.4
1845.263	51.6	PK	29.3	-29.7	51.2	324	145	Vert.	73.9	22.7
1845.263	47.4	AV	29.3	-29.7	47.0	324	145	Vert.	53.9	6.9
2768.015	46.9	PK	31.2	-29.1	49.0	0	123	Hori.	73.9	24.9
2768.015	40.4	AV	31.2	-29.1	42.5	0	123	Hori.	53.9	11.4
2768.180	46.4	PK	31.2	-29.1	48.5	5	100	Vert.	73.9	25.4
2768.180	39.7	AV	31.2	-29.1	41.8	5	100	Vert.	53.9	12.1
3690.786	45.5	PK	32.1	-28.6	49.0	275	117	Hori.	73.9	24.9
3690.786	36.5	AV	32.1	-28.6	40.0	275	117	Hori.	53.9	13.9
3690.586	45.2	PK	32.1	-28.6	48.7	338	159	Vert.	73.9	25.2
3690.586	36.2	AV	32.1	-28.6	39.7	338	159	Vert.	53.9	14.2
4613.280	41.5	PK	34.5	-27.9	48.1	307	151	Hori.	73.9	25.8
4613.280	29.5	AV	34.5	-27.9	36.1	307	151	Hori.	53.9	17.8
4613.578	41.6	PK	34.5	-27.9	48.2	44	103	Vert.	73.9	25.7
4613.578	29.3	AV	34.5	-27.9	35.9	44	103	Vert.	53.9	18.0
5536.030	41.3	PK	36.3	-27.3	50.3	336	100	Hori.	73.9	23.6
5536.030	28.4	AV	36.3	-27.3	37.4	336	100	Hori.	53.9	16.5
5536.030	41.4	PK	36.3	-27.3	50.4	0	112	Vert.	73.9	23.5
5536.030	28.5	AV	36.3	-27.3	37.5	0	112	Vert.	53.9	16.4
6458.701	40.4	PK	36.9	-26.4	50.9	0	100	Hori.	73.9	23.0
6458.701	28.0	AV	36.9	-26.4	38.5	0	100	Hori.	53.9	15.4
6458.701	40.5	PK	36.9	-26.4	51.0	0	100	Vert.	73.9	22.9
6458.701	27.8	AV	36.9	-26.4	38.3	0	100	Vert.	53.9	15.6
9226.716	41.7	PK	36.8	-25.6	52.9	0	100	Hori.	73.9	21.0
9226.716	29.8	AV	36.8	-25.6	41.0	0	100	Hori.	53.9	12.9
9226.716	41.8	PK	36.8	-25.6	53.0	0	100	Vert.	73.9	20.9
9226.716	29.7	AV	36.8	-25.6	40.9	0	100	Vert.	53.9	13.0

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

UL Apex Co., Ltd.

Head Office EMC Lab.

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Facsimile : +81 596 24 8124

MF060b(01.06.05)

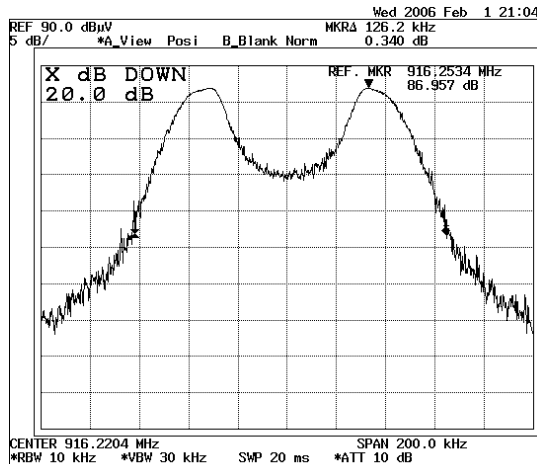
-20dB Bandwidth

Company : Rinnai Corporation
Equipment : Remote Controller for water heater
Model : MC-502RC-1US-S
S/N : 1
Power : DC 3V
Mode : Transmitting

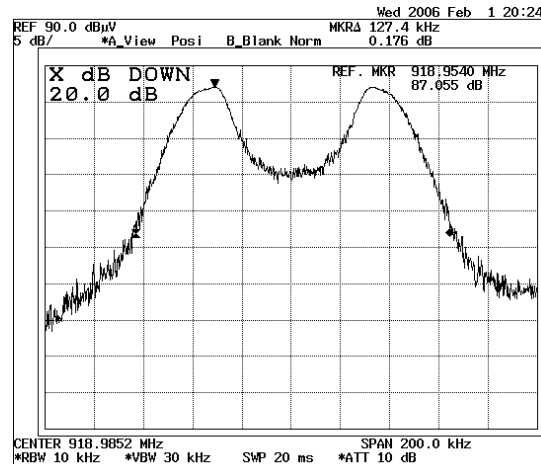
UL-Apex
Head Office EMC Lab. No.2 Semi Anechoic Chamber
Regulation : FCC 15.215
Test Distance : 3m
Date : 02/01/2006
Temperature : 25 deg.C.
Humidity : 32 %
Engineer : Kenichi Adachi

FREQ [MHz]	-20dB Bandwidth [kHz]
916.2204	126.20
918.9852	127.40
922.6716	131.60

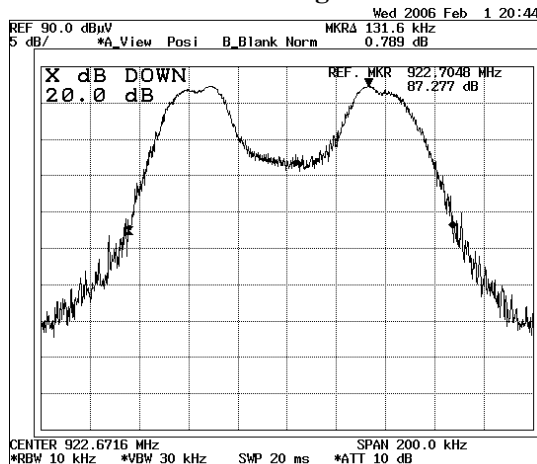
Ch.: Low



Ch.: Mid



Ch.: High



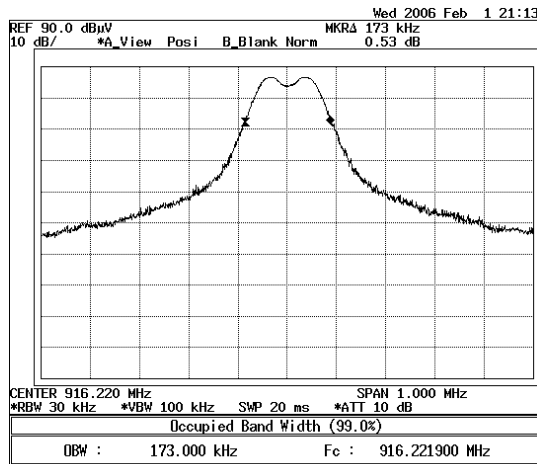
99% Occpied Bandwidth

Company : Rinnai Corporation
Equipment : Remote Controller for water heater
Model : MC-502RC-1US-S
S/N : 1
Power : DC 3V
Mode : Transmitting

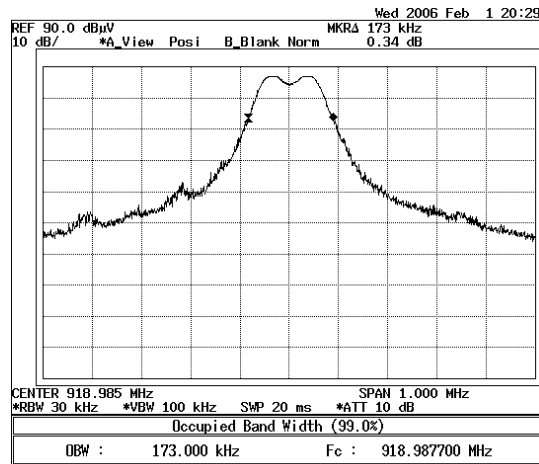
UL-Apex
Head Office EMC Lab. No.2 Semi Anechoic Chamber
Regulation : RSS-Gen 4.4.1
Test Distance : 3m
Date : 02/01/2006
Temperature : 25 deg.C.
Humidity : 32 %
Engineer : Kenichi Adachi

FREQ [MHz]	99% Occpied Bandwidth [kHz]
916.2204	173.00
918.9852	173.00
922.6716	173.00

Ch.: Low



Ch.: Mid



Ch.: High

