




RADIO TEST REPORT


Test Report No.: 10221735S

Applicant : TADANO LTD.
Type of Equipment : Remote Control Transmitter
Model No. : RCS-FT1
Test regulation : FCC Part15 Subpart C: 2013
FCC ID : SU6-RCSFT1-433
Test result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: February 17 to March 3, 2014

Tested by: 
Shinichi Takano
Engineer of WiSE Japan,
UL Verification Service

Approved by : 
Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10221735S

[illegible]

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SECTION 1: Customer information

Company Name : TADANO AMERICA CORPORATION
Address : 4242 West Greens Road Houston, TX 77066
Telephone Number : +1-281- 869-0030
Facsimile Number : +1-281- 869-0040
Contact Person : Tomoyuki Tsukuda

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

2.1 Identification of E.U.T.

Type of Equipment : Remote Control Transmitter
Model No. : RCS-FT1
Serial No. : Refer to 4.2 in this report.
Rating : DC6.0V
Receipt Date of Sample : February 14, 2014
Country of Mass-production : Taiwan
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: RCS-FT1 (referred to as the EUT in this report) is a Remote Control Transmitter.

Clock frequency(ies) in the system : 9.83MHz, 21.25MHz

<Radio part>

Equipment type : Transceiver
Frequency of operation : 433.3000-433.7875MHz
Type of modulation : FSK
Antenna type : Internal loop
Emission designation : F1D
Operating temperature range : -20 to +65 deg.C

FCC 15.31 (e)

The test was performed with a new battery (DC6.0V) and the stable voltage was supplied to the EUT during the tests. Therefore, the EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with this requirement since the antenna is mounted inside of the EUT.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2013,
final revised on September 30, 2013 and effective October 30, 2013
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.231 Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	N/A	N/A
Automatically deactivate	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.231 (a)(1)	Radiated	N/A	-	Complied
Electric field strength of Fundamental emission	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.231(b)	Radiated	N/A	0.5dB Freq.: 433.538MHz Polarization: Horizontal	Complied
Electric field strength of Spurious emission	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.205 FCC 15.209 FCC 15.231 (b)	Radiated	N/A	23.0dB Freq.: 2167.688MHz Polarization: Horizontal Detector: Average	Complied
20dB bandwidth	ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.231 (c)	Radiated	N/A	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 *1) The test is not applicable since the EUT does not have AC Mains.						

3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	RSS-210 A1.1.3 RSS-Gen 4.6.1	Radiated	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 * Other than above, no addition, exclusion nor deviation has been made from the standard.					

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3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Item	Frequency range	No.1 SAC ^{*1} (±)	No.2 SAC (±)	No.3 SAC (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-18GHz	4.9 dB	4.9 dB	4.9 dB

*1: SAC=Semi-Anechoic Chamber

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

Bandwidth Measurement:

Uncertainty for this test was: (±) 5.4%

3.5 Test location

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JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input checked="" type="checkbox"/> No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 Semi-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 Shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 Shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input checked="" type="checkbox"/> No.3 Shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 Shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input type="checkbox"/> No.5 Shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 Shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

The EUT exercise program used during testing was designed to exercise the various system components in a manner similar to typical use.

Test item	Operating mode	Tested frequency
Automatically deactivate	Normal use mode	433.5375MHz
Other items	Transmitting (FSK) *1)	433.5375MHz

*1) The software of this mode is the same as one of normal product, except that EUT continues to transmit when transmitter button is being pressed (For Normal use mode, EUT stops to transmit in a given time, even if transceiver button is being pressed.) End users cannot change the settings of the output power of the product.

Power settings : Setting is controlled by the firmware and cannot be changed.
Software : G489_FT2 Ver.05-06

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

4.2 Configuration and peripherals

A: EUT

* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Remote Control Transmitter	RCS-FT1	0400003	FUTABA CORPORATION	EUT

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SECTION 5: Automatically deactivate

Test procedure

The time was measured with a spectrum analyzer and a search coil placed by the EUT.

Limit: A manually transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Summary of the test results: Pass
Refer to APPENDIX 2.

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SECTION 6: Radiated emission (Fundamental and Spurious emission)

6.1 Operating environment

The test was carried out in a semi-anechoic chamber.

Temperature : Refer to APPENDIX 2.
Humidity : Refer to APPENDIX 2.

6.2 Test configuration

EUT was placed on a polyethylene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in Appendix 1.

6.3 Test conditions

Frequency range : 9kHz - 5GHz
EUT position : Table top

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m.
Frequency: From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg.to 360deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 2.

Frequency: From 30MHz to 5GHz at distance 3m (Refer to Figure 1).

The measuring antenna height was 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.

Measurements were performed with QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function.

<9kHz to 30MHz>

	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz
Detector type	PK/AV	QP	PK/AV	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz
Measuring antenna	Loop			

* FCC 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]= [Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz [Limit at 3m]= [Limit at 30m]-40log (3[m]/30[m])

<30MHz to 5GHz>

	30MHz to 1GHz	Above 1GHz	
Detector type	QP	PK	AV
IF Bandwidth	120kHz	RBW 1MHz, VBW:3MHz	RBW 1MHz, VBW:10Hz
Measuring antenna	Biconical (30-299.99MHz) Logperiodic (300MHz-1GHz)	Horn	

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The noise levels were measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined. With the position, the noise levels of all the frequencies were measured.

Combinations of the worst case

Antenna polarization	Carrier	Spurious	
		Below 1GHz	Above 1GHz
Horizontal	Y	Y	Y
Vertical	X	X	Z

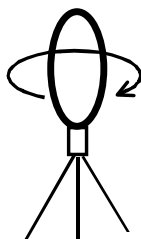
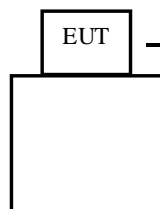
6.5 Results

Summary of the test results : Pass

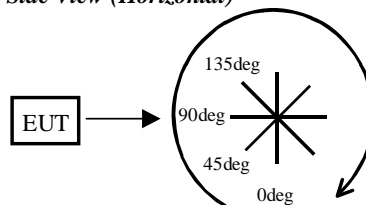
Refer to APPENDIX 2.

Figure 1. Direction of the Loop Antenna

Side View (Vertical)

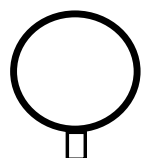
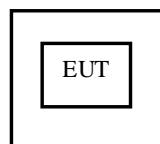


Side View (Horizontal)



Front side: 0 deg.
Forward direction: clockwise

Top View (Horizontal)



Antenna was not rotated.

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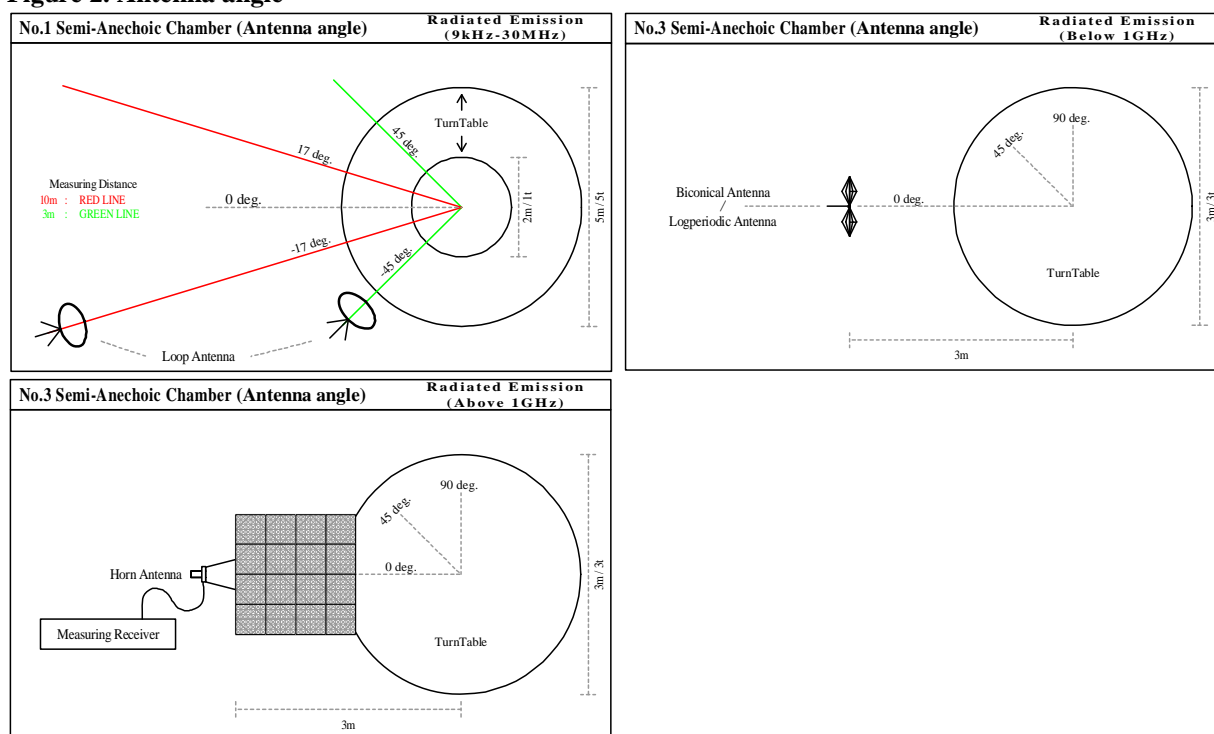
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Figure 2. Antenna angle



SECTION 7: 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Summary of the test results: Pass

Refer to APPENDIX 2.

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Automatically deactivate
Radiated emission
Bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission
Pre-check of the worst case

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APPENDIX 1: Data of Radio tests

Automatically deactivate: FCC 15.231(a)(1)

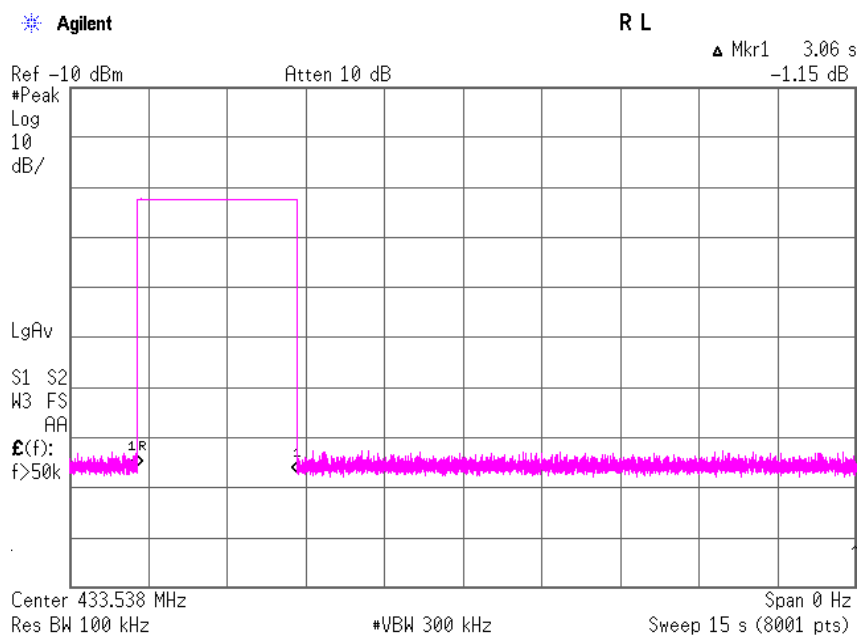
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No.3 Shielded Room

Company : TADANO AMERICA CORPORATION
Equipment : Remote Control Transmitter
Model : RCS-FT1
Sample No. : 0400003
Power : DC6V(Battery)
Mode : Transmitting (433.5375MHz)

Regulation : FCC Part15C Section 15.231(a)(1)
Regulation : RSS-210 A1.1.1(a)
Test Distance : -
Date : March 3, 2014
Temperature : 23deg.C
Humidity : 28%RH
Engineer : Shinichi Takano

Time of Transmitting [sec]	Limit [sec]	Result
3.06	5	PASS



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Radiated Emission (Electric Field Strength of Fundamental and Spurious Emission)

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No.3 Semi-Anechoic Chamber

Company : TADANO AMERICA CORPORATION
Equipment : Remote Control Transmitter
Model : RCS-FT1
Sample No. : 0400003
Power : DC6V(Battery)
Mode : Transmitting (433.5375MHz)

Regulation : FCC Part15C Section 15.231(b), 15.209
Regulation : RSS-210 A1.1(Table A), A1.1.2
Test Distance : 3m
Date : February 17, 2014
Temperature : 22deg.C
Humidity : 24%RH
Engineer : Shinichi Takano

Quasi-Peak detector

Frequency [MHz]	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark
	Hor	Ver					Hor	Ver		Hor	Ver	
433.538	86.3	84.2	16.7	9.2	31.9	-	80.3	78.2	80.8	0.5	2.6	Carrier
867.075	31.0	29.4	21.3	10.7	31.2	-	31.8	30.2	60.8	29.0	30.6	outside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

Peak detector

Frequency [MHz]	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark Inside or Outside of Restricted Bands
	Hor	Ver					Hor	Ver		Hor	Ver	
1300.613	47.0	44.7	24.8	4.6	38.7	-	37.7	35.4	73.9	36.2	38.5	inside
1734.150	46.1	46.9	26.1	4.6	38.6	-	38.2	39.0	80.8	42.6	41.8	outside
2167.688	49.1	48.7	26.7	5.1	38.5	-	42.4	42.0	80.8	38.4	38.8	outside
2601.225	44.5	44.3	27.1	5.8	38.1	-	39.3	39.1	80.8	41.5	41.7	outside
3034.763	42.9	43.1	28.2	6.2	38.1	-	39.2	39.4	80.8	41.6	41.4	outside
3468.300	45.2	45.4	28.0	6.5	38.0	-	41.7	41.9	80.8	39.1	38.9	outside
3901.838	44.2	42.8	28.5	6.7	37.8	-	41.6	40.2	73.9	32.3	33.7	inside
4335.375	43.0	42.9	29.1	7.1	37.5	-	41.7	41.6	73.9	32.2	32.3	inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

Average detector

Frequency [MHz]	Reading [dBuV]		Ant Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]		Limit [dBuV/m]	Margin [dB]		Remark
	Hor	Ver					Hor	Ver		Hor	Ver	
1300.613	36.5	33.7	24.8	4.6	38.7	-	27.2	24.4	53.9	26.7	29.5	inside
1734.150	36.3	39.2	26.1	4.6	38.6	-	28.4	31.3	60.8	32.4	29.5	outside
2167.688	44.5	43.5	26.7	5.1	38.5	-	37.8	36.8	60.8	23.0	24.0	outside
2601.225	33.1	32.6	27.1	5.8	38.1	-	27.9	27.4	60.8	32.9	33.4	outside
3034.763	31.7	31.8	28.2	6.2	38.1	-	28.0	28.1	60.8	32.8	32.7	outside
3468.300	34.0	33.9	28.0	6.5	38.0	-	30.5	30.4	60.8	30.3	30.4	outside
3901.838	31.8	31.8	28.5	6.7	37.8	-	29.2	29.2	53.9	24.7	24.7	inside
4335.375	31.7	31.7	29.1	7.1	37.5	-	30.4	30.4	53.9	23.5	23.5	inside

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

REMARKS

ANTENNA TYPE: 30-300MHz Biconical / 300-1000MHz Logperiodic / 1-5GHz Horn

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

*Below 30MHz: No noise detected signal from EUT.

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Burst rate confirmation (Fundamental)

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No.3 Semi-Anechoic Chamber

Company : TADANO AMERICA CORPORATION
Equipment : Remote Control Transmitter
Model : RCS-FT1
Sample No. : 0400003
Power : DC6V(Battery)
Mode : Transmitting (433.5375MHz)

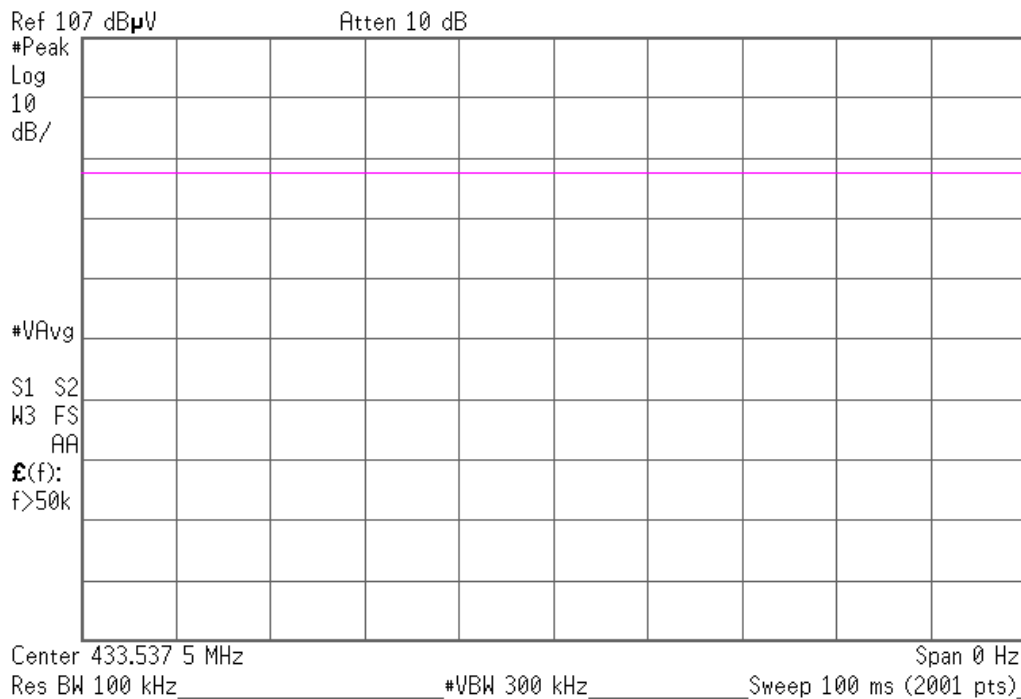
Regulation : FCC Part15C Section 15.231(b), 15.35(c)
Regulation : RSS-210 & RSS-Gen
Test Distance : 3m
Date : February 17, 2014
Temperature : 22deg.C
Humidity : 24%RH
Engineer : Shinichi Takano

ON time [msec]	Cycle [msec]	Duty (On time / Cycle)	Duty Factor [dB]
100	100	1.00	0.00

*Duty = 20log (On time / Cycle)

✱ Agilent

R L



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20dB Bandwidth: FCC 15.231(c) & Occupied bandwidth

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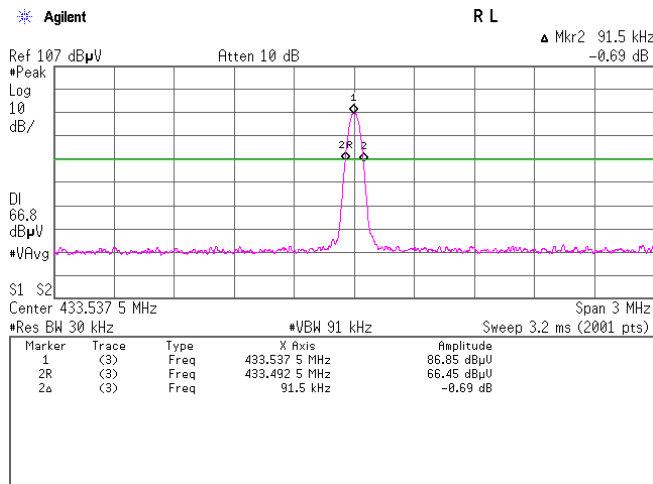
No.3 Semi-Anechoic Chamber

Company : TADANO AMERICA CORPORATION
Equipment : Remote Control Transmitter
Model : RCS-FT1
Sample No. : 0400003
Power : DC6V(Battery)
Mode : Transmitting (433.5375MHz)

Regulation : FCC Part15C Section 15.231(c)
Regulation : RSS-210 Annex A, A1.1.3 & RSS-Gen 4.6
Test Distance : 3m
Date : February 17, 2014
Temperature : 22deg.C
Humidity : 24%RH
Engineer : Shinichi Takano

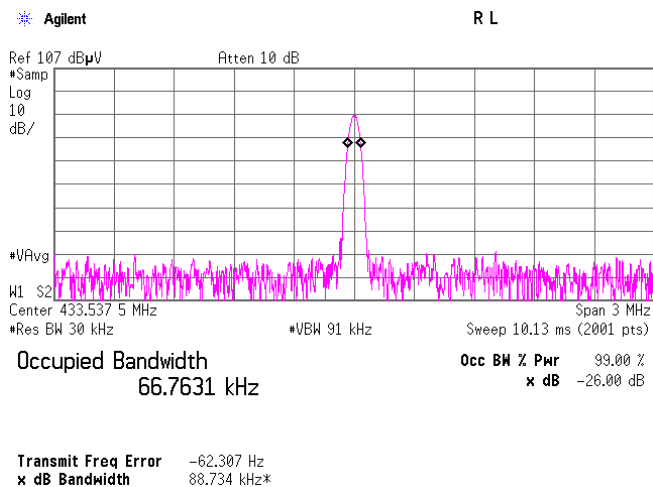
Bandwidth Limit : fundamental Frequency 433.5375MHz x 0.25% = 1083.844 kHz

20dB [kHz]	Bandwidth Limit [kHz]	Result
91.5	1083.844	Pass



Bandwidth Limit : fundamental Frequency 433.5375MHz x 0.25% = 1083.844 kHz

99% Occupied [kHz]	Bandwidth Limit [kHz]	Result
66.7631	1083.844	Pass



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2014/02/14 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2013/10/26 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271 (RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2013/10/26 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE,AD	2014/02/21 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE,AD	2013/03/28 * 12
SFL-01	Highpass Filter	MICRO-TRONICS	HPM50115	001	RE	2013/11/22 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2013/11/08 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2014/02/17 * 12
SAT6-07	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269 (RF Selector)	RE	2013/04/04 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/02/21 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2013/11/20 * 12
SJM-08	Measure	PROMART	SEN1935	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2013/07/03 * 12
SSP-01	Search Probe	Nisshin Electric	NSP-01	-	AD	-

The expiration date of the calibration is the end of the expired month .
 As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

RE: Radiated emission ,

AD: Automatically deactivate