

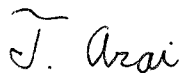
## RADIO TEST REPORT

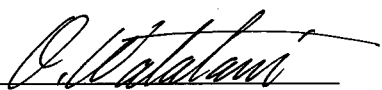
Test Report No.: 27HE0166-YK-A

Applicant : Alps Electric Co., Ltd.  
Type of Equipment : Remote Keyless Entry  
Model No. : TWB1U751  
FCC ID : CWTWB1U751  
Test Standard : FCC Part15 Subpart C: 2006  
Test Result : Complied

1. This test report shall not be reproduced except in full, 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 the above regulation.
4. The test results in this test report are traceable to the national or international standards.

Date of test: March 21 and 23, 2007

Tested by:   
Tatsuya Arai

Approved by:   
Osamu Watatani  
Manager of Yamakita EMC Lab.

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## 1 Applicant Information

Company Name : Alps Electric Co., Ltd.  
Address : 6-3-36 Furukawanakazato, Osaki-shi, Miyagi-ken, 989-6181 JAPAN  
Telephone Number : +81 229 23 5111  
Facsimile Number : +81 229 23 3755  
Contact Person : Yoshiaki Hayashi

## 2 Equipment under test (E.U.T.)

### 2.1 Identification of E.U.T.

Type of Equipment : Remote Keyless Entry  
Model No. : TWB1U751  
Serial No. : Automatically deactivate: #3, Other test: #2  
Rating : DC3V (Battery)  
Country of Manufacture : Japan  
Receipt Date of Sample : March 15, 2007  
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: TWB1U751 (referred to as the EUT in this report) is a Remote Keyless Entry, which is carried by the owner of the vehicle. It performs transmission through RF antenna to tuner, vehicle performs actions according to the signal. (Door lock or unlock, Panic)

Equipment type : Transmitter  
Frequency of operation : 315MHz  
Clock frequency : CPU: 4MHz  
Type of modulation : ASK  
Antenna type : Internal/PCB Pattern (Loop)  
Antenna connector type : None  
ITU code : A1D  
Operation temperature range : -10 to +60 deg.C.

\*FCC Part15.31 (e)

This test was performed with the new battery (DC 3V); therefore, this EUT complies with the requirement.

\*FCC Part15.203

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 requirement.

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Telephone: +81 465 77 1011 Facsimile: +81 465 77 2112

MF060b (14.06.06)

### 3 Test Specification, Procedures and Results

#### 3.1 Test specification

Test specification : FCC Part15 Subpart C: 2006  
 Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
 Section 15.209: 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: 2003 7. AC powerline conducted emission measurements	Section 15.207(a)	-	N/A *1	-	N/A
Automatically Deactivate	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.231(a)(1)	Radiated	N/A	-	Complied
Electric Field Strength of Fundamental Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.231 (b)	Radiated	N/A	4.8dB (Horizontal, PK)	Complied
Electric Field Strength of Spurious Emission	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.205 Section 15.209 Section 15.231 (b)	Radiated	N/A	2.3dB (3150.00MHz, Vertical, AV)	Complied
-20dB Bandwidth	ANSI C63.4: 2003 13. Measurement of intentional radiators	Section 15.231(c)	Radiated	N/A	-	Complied

\*1) The test is not applicable since the EUT has no AC mains.

Note: UL Apex's EMI Work Procedures No.QPM05.

\* Other than mentioned in 3.3, no addition, exclusion nor deviation has been made from the standard.

#### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2003 13. Measurement of intentional radiators RSS-Gen 4.4.1	RSS-Gen 4.4.1	Radiated	-	Complied

#### 3.4 Uncertainty

##### Radiated emission test

The measurement uncertainty (with 95% confidence level) for this test using Biconical antenna is  $\pm 4.5$ dB.  
 The measurement uncertainty (with 95% confidence level) for this test using Logperiodic antenna is  $\pm 4.3$ dB.  
 The measurement uncertainty (with 95% confidence level) for this test using Horn antenna is  $\pm 5.2$ dB.  
 The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

UL Apex Co., Ltd. Yamakita EMC Lab.  
907, Kawanishi, Yamakita-machi, Ashigarakami-gun, Kanagawa-ken 258-0124 JAPAN  
Telephone number : +81 465 77 1011  
Facsimile number : +81 465 77 2112  
NVLAP Lab. code : 200441-0

No. 1 test site has been fully described in a report submitted to FCC office, and accepted on August 26, 2005 (Registration No.: 95486).  
IC Registration No. : 2973B-1

No. 2 test site has been fully described in a report submitted to FCC office, and accepted on April 4, 2005 (Registration No.: 466226).  
IC Registration No. : 2973B-3

No. 1 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on November 2, 2005 (Registration No.: 95967).  
IC Registration No. : 2973B-2

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 shielded room	8.0 x 5.0 x 2.5	No.1 Semi-anechoic chamber	10.0 x 7.5 x 5.7
No.2 shielded room	5.0 x 4.0 x 2.5		
No.3 shielded room	4.0 x 5.0 x 2.7		

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## 4 System Test Configuration

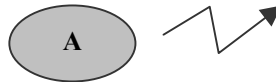
### 4.1 Justification

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

Test mode: Transmitting (315MHz)

\* The test was performed with the operation of continuous transmitting to be set as the maximum data rate.

### 4.2 Configuration of Tested System



\* Test data was taken under worse case conditions.

#### Description of EUT and support equipment

No.	Item	Model number	Serial number *1)	Manufacturer	FCC ID (Remarks)
A	Remote Keyless Entry	TWB1U751	#3 #2	Alps Electric Co., Ltd.	CWTWB1U751 (EUT)

\*1) Automatically deactivate: #3, Other test: #2

## 5 Automatically Deactivate

### 5.1 Operating environment

The test was carried out in No.1 anechoic chamber.

### 5.2 Test procedure

The bandwidth 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.

### 5.3 Results

Summary of the test results : Pass

Date : March 23, 2007

Test engineer : Tatsuya Arai

## 6 Radiated Emissions (Fundamental & Spurious)

### 6.1 Operating environment

The test was carried out in No.1 anechoic chamber.

Temperature : See test data  
Humidity : See test data

### 6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.5m by 0.5m, raised 80cm above the conducting ground plane. A drawing of the set up is shown in the photos of Appendix 1.

### 6.3 Test conditions

Frequency range : 30MHz - 4GHz  
EUT position : Table top  
EUT operation mode : Transmitting

### 6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured with a ground plane and at a distance of 3m. 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 of the test receiver.

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

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

The equipment was previously checked at each position of three axes X, Y and Z. The position in which the maximum noise occurred was chosen to put into measurement. See the table below and photographs in page 12. With the position, the noise levels of all the frequencies were measured.

	Below 1GHz	Above 1GHz
Horizontal	X	X
Vertical	Y	Y

### 6.5 Results

Summary of the test results : Pass

\* The data of carrier and spurious emission was corrected in accordance with FCC 15.231(b) and 15.35(c) (except for the spurious emission within the restricted band in FCC 15.205).

Date : March 21 and 23, 2007

Test engineer : Tatsuya Arai

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MF060b (14.06.06)



## 7 Bandwidth

### 7.1 Operating environment

The test was carried out in No.1 anechoic chamber.

### 7.2 Test procedure

The bandwidth was measured with a spectrum analyzer and an antenna which is placed by the EUT.

### 7.3 Results

Summary of the test results: Pass

Date : March 23, 2007

Test engineer : Tatsuya Arai

### **APPENDIX 1: Photographs of test setup**

Page 11 : Radiated emission  
Page 12 : Pre-check of the worst position

### **APPENDIX 2: Test Data**

Page 13 : Automatically Deactivate  
Page 14 - 16 : Radiated Emission  
Page 17 - 18 : -20dB Bandwidth and Occupied Bandwidth

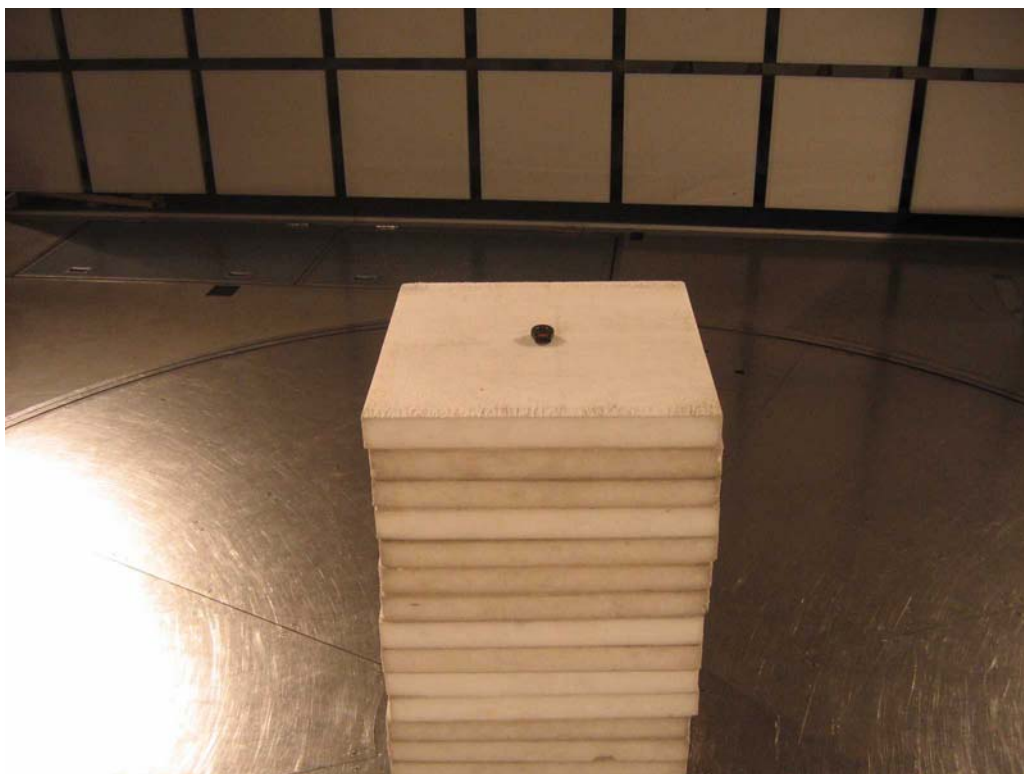
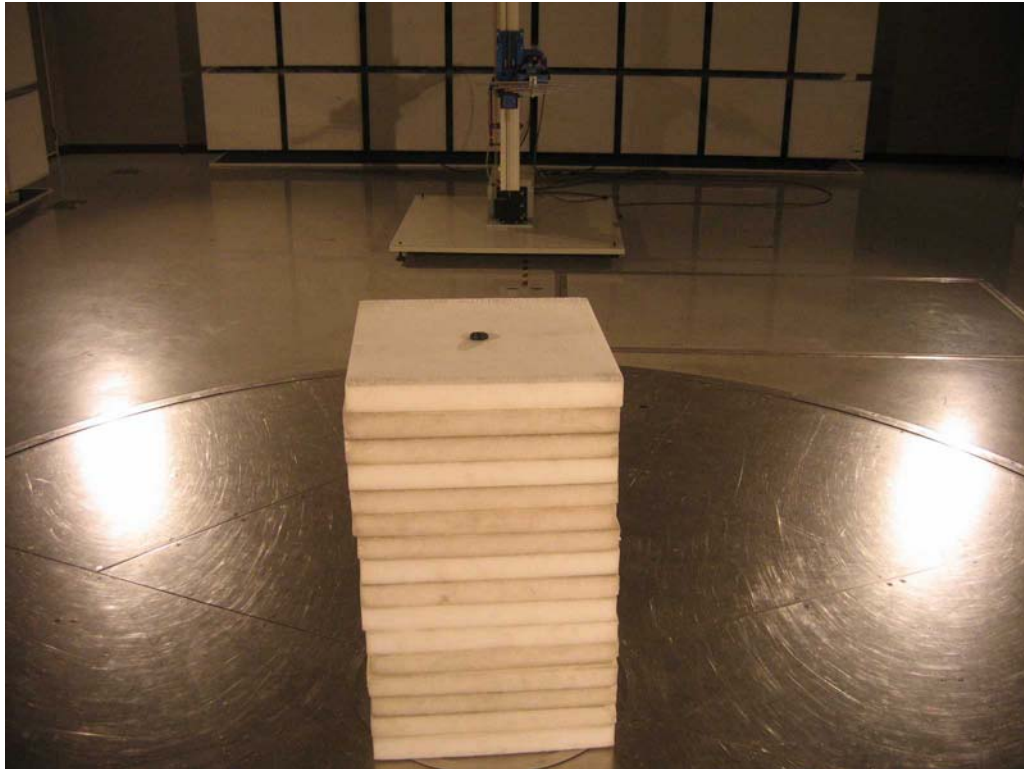
### **APPENDIX 3: Test instruments**

Page 19 : Test instruments

### **APPENDIX 4: Duty factor calculation and Transmitting time and interval**

Page 20 : Duty factor calculation and Transmitting time and interval

**Radiated emission**



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**Pre-check of the worst position**

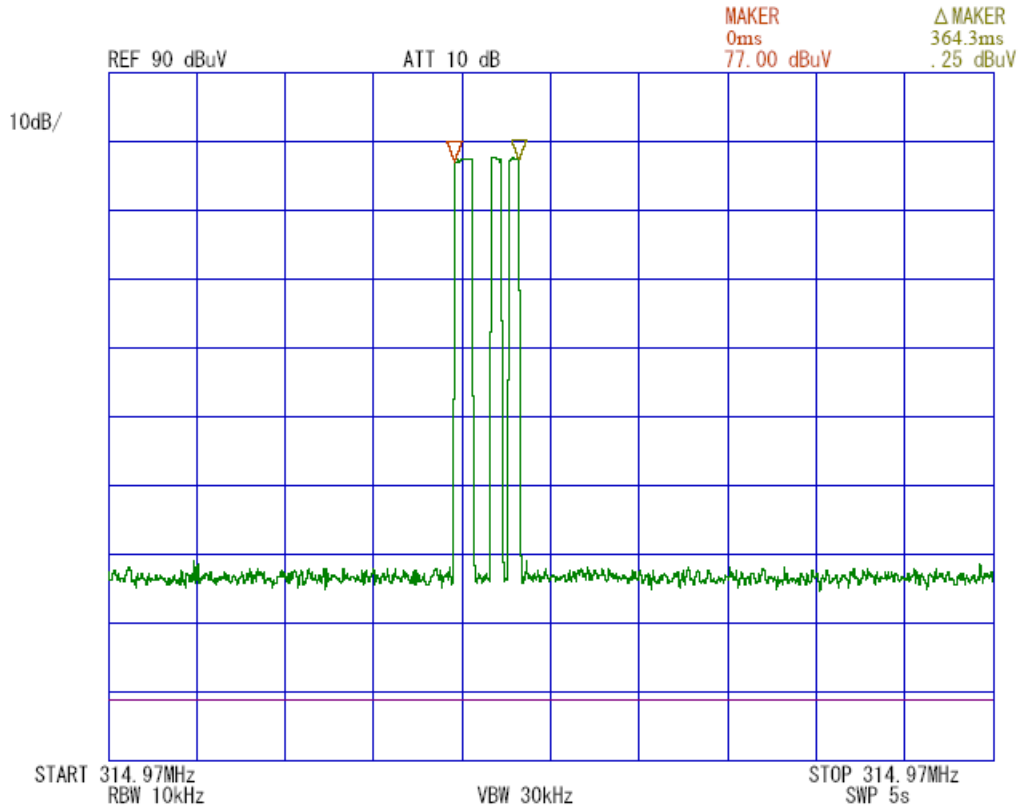


**Automatically deactivate: FCC 15.231(a)(1)**

**COMPANY** : Alps Electric Co., Ltd.  
**EQUIPMENT** : Remote Keyless Entry  
**MODEL NUMBER**: TWB1U751  
**SERIAL NUMBER**: #3  
**FCC ID** : CWTWB1U751  
**POWER** : DC3V(Battery)

**UL Apex Co.,Ltd. Yamakita No.1 Anechoic Chamber**  
**REPORT NO** : 27HE0166-YK-A  
**REGULATION** : Fcc Part15SubpartC 231(a)(1)  
**DATE** : 2007/03/23  
**TEMP./HUMI** : 25°C/35%  
**TEST MODE** : Transmitting (315.00MHz)  
**ENGINEER** : Tatsuya Arai

Time of Transmitting	Limit
[sec]	[sec]
0.36	5.00



# Electric Field Strength of Fundamental and Spurious emissions

UL Apex Co.,Ltd.  
YAMAKITA NO.1 ANECHOIC CHAMBER  
Report No. : 27HE0166-YK-A

Company : Alps Electric Co.,Ltd.  
Equipment : Remote keyless Entry  
Model : TWB1U751  
Sample No. : #2  
Power : DC 3.0V (Battery)  
Mode : Transmitting (315MHz)  
FCC ID : CWTWB1U751

Regulation : FCC Part15C Section 15.231(b)  
Test Distance : 3m  
Date : 2007/3/21  
Temperature : 25deg.C  
Humidity : 31%

ENGINEER : Tatsuya Arai

**Fundamental** : PK DETECT(Test Receiver : IF BW 120kHz)

No.	FREQ [MHz]	READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN [dB]	Duty Factor	RESULT		LIMIT [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
1	315.00	83.3	80.3	14.7	27.7	3.9	6.0	-9.4	70.8	67.8	75.6	4.8	7.8

**Spurious emission**:Below 1GHz PK DETECT(Test Receiver: BW 120kHz)  
:Above 1GHz AV DETECT (Test Receiver: BW 1MHz)

No.	FREQ [MHz]	READING		ANT Factor [dB]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN [dB]	Duty Factor	RESULT		LIMIT [dBuV/m]	MARGIN	
		HOR [dBuV]	VER [dBuV]						HOR [dBuV/m]	VER [dBuV/m]		HOR [dB]	VER [dB]
1	629.94	41.3	41.7	19.9	29.2	5.6	6.0	-9.4	34.2	34.6	55.6	21.4	21.0
2	944.91	39.1	34.7	22.8	28.8	7.0	6.1	-9.4	36.8	32.4	55.6	18.8	23.2
3	1260.00	51.9	53.2	24.6	37.3	4.8	0.0	-9.4	34.6	35.9	55.6	21.0	19.7
4	1890.00	45.5	44.4	29.1	36.7	5.9	0.0	-9.4	34.4	33.3	55.6	21.2	22.3
5	2520.00	53.4	52.7	29.8	36.8	6.6	0.0	-9.4	43.6	42.9	55.6	12.0	12.7
6	3150.00	59.3	61.0	31.4	37.3	7.6	0.0	-9.4	51.6	53.3	55.6	4.0	2.3

Sample Calculation :

RESULT=Reading + ANT Factor - Amp Gain + Cable Loss + ATT + Duty Factor(PK detect only)

\* Spurious emissions within the restricted bands were measured in accordance with Section 15.209. (p.15-16)

The data of carrier and spurious emission was corrected in accordance with FCC 15.231(b) and 15.35(c)  
(except for the spurious emission within the restricted band in FCC 15.205).

Except for the above table : All other spurious emissions were less than 20dB for the limit.

# DATA OF RADIATION TEST

UL Apex Co.,Ltd.  
YAMAKITA No.1 Anechoic chamber  
Report No. : 27HE0166-YK-A

Applicant : Alps Electric Co., Ltd.  
Kind of Equipment : Remote Keyless Entry  
Model No. : TWB1U751  
Serial No. : #2  
Power : DC3.0V  
Mode : Transmitting(315MHz)  
Remarks : PK (RBW: 1MHz, VBW: 1MHz)  
Date : 3/23/2007  
Test Distance : 3 m  
Temperature : 26 °C  
Humidity : 32 %  
Regulation : FCC Part15C § 15. 209 (PK Detection) 1-26GHz:3m/26-40GHz:1m

Engineer : Tatsuya Arai

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER					HOR [dB μ V/m]	VER		HOR [dB]	VER
1.	1575.00	BB	49.8	49.6	26.3	36.9	5.3	0.0	44.5	44.3	74.0	29.5	29.7
2.	2205.00	BB	46.5	44.9	29.9	36.7	6.3	0.0	46.0	44.4	74.0	28.0	29.6
3.	2835.00	BB	62.2	59.0	31.0	37.2	7.2	0.0	63.2	60.0	74.0	10.8	14.0

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

■ ANTENNA: KHA-01 (SAS-200 571) 1-18GHz  
■ CABLE: KCC-D11/D12 ■ PREAMP: KAF-02 (8449B) ■ SPECTRUMANALYZER: R3365A (KSA-01)

# DATA OF RADIATION TEST

UL Apex Co.,Ltd.  
YAMAKITA No.1 Anechoic chamber  
Report No. : 27HE0166-YK-A

Applicant : Alps Electric Co., Ltd.  
 Kind of Equipment : Remote Keyless Entry  
 Model No. : TWB1U751  
 Serial No. : #2  
 Power : DC3.0V  
 Mode : Transmitting (315MHz)  
 Remarks : AV (RBW: 1MHz, VBW: 10Hz)  
 Date : 3/23/2007  
 Test Distance : 3 m  
 Temperature : 26 °C  
 Humidity : 32 %  
 Regulation : FCC Part15C § 15.209 (AV Detection) 1-26GHz:3m/26-40GHz:1m

Engineer : Tatsuya Arai

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μ V/m]	MARGIN	
			HOR [dB μ V]	VER					HOR [dB μ V/m]	VER		HOR [dB]	VER
1.	1575.00	BB	39.9	39.5	26.3	36.9	5.3	0.0	34.6	34.2	54.0	19.4	19.8
2.	2205.00	BB	35.4	34.3	29.9	36.7	6.3	0.0	34.9	33.8	54.0	19.1	20.2
3.	2835.00	BB	50.3	48.1	31.0	37.2	7.2	0.0	51.3	49.1	54.0	2.7	4.9

CALCULATION: READING + ANT. FACTOR + CABLE LOSS - AMP. GAIN + ATTEN.

■ ANTENNA: KHA-01 (SAS-200 571) 1-18GHz  
 ■ CABLE: KGC-D11/D12 ■ PREAMP: KAF-02 (8449B) ■ SPECTRUMANALYZER: R3365A (KSA-01)



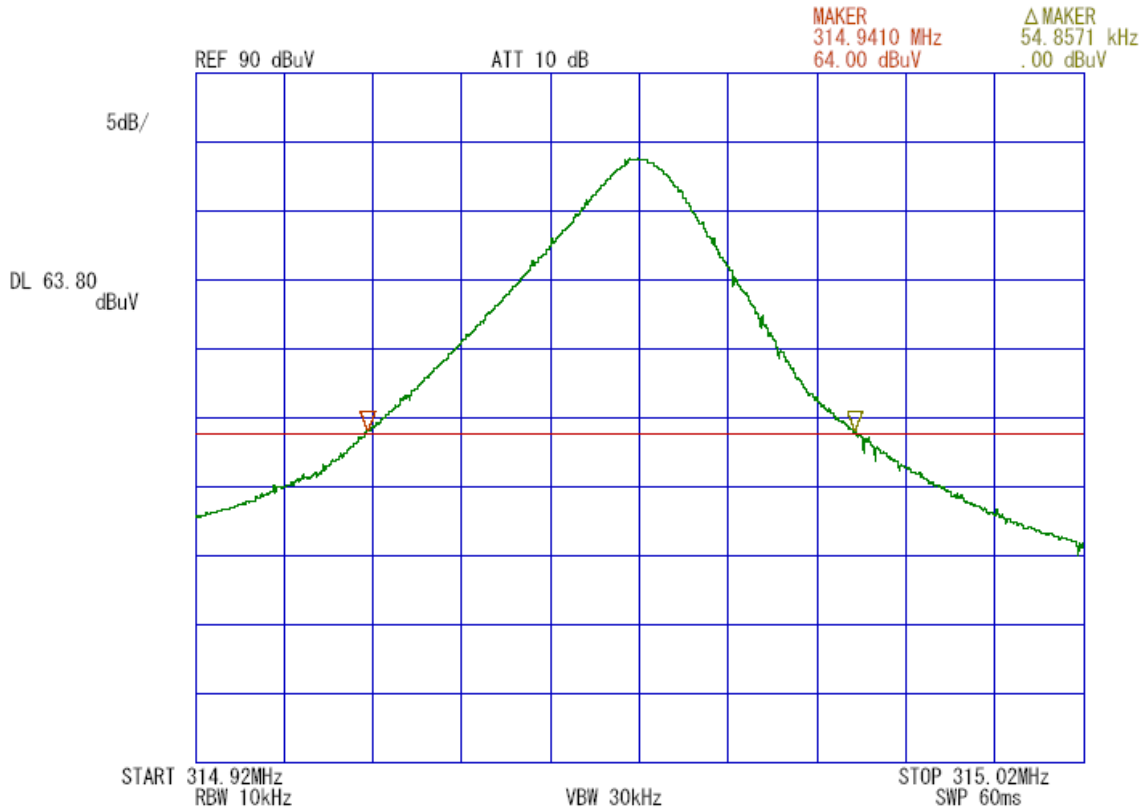
**-20dB Bandwidth: FCC 15.231(c)**

**COMPANY** : Alps Electric Co., Ltd.  
**EQUIPMENT** : Remote Keyless Entry  
**MODEL NUMBER**: TWB1U751  
**SERIAL NUMBER**: #2  
**FCC ID** : CWTWB1U751  
**POWER** : DC3V(Battery)

**UL Apex Co.,Ltd. Yamakita No.1 Anechoic Chamber**  
**REPORT NO** : 27HE0166-YK-A  
**REGULATION** : Fcc Part15SubpartC 231(c)  
**DATE** : 2007/03/23  
**TEMP./HUMI** : 25°C/35%  
**TEST MODE** : Transmitting (315.00MHz)  
**ENGINEER** : Tatsuya Arai

Bandwidth Limit : fundamental Frequency 315.00 X 0.25%= 787.500 kHz

-20dB Bandwidth	Bandwidth Limit	Result
[kHz]	[kHz]	
54.867	787.500	Pass

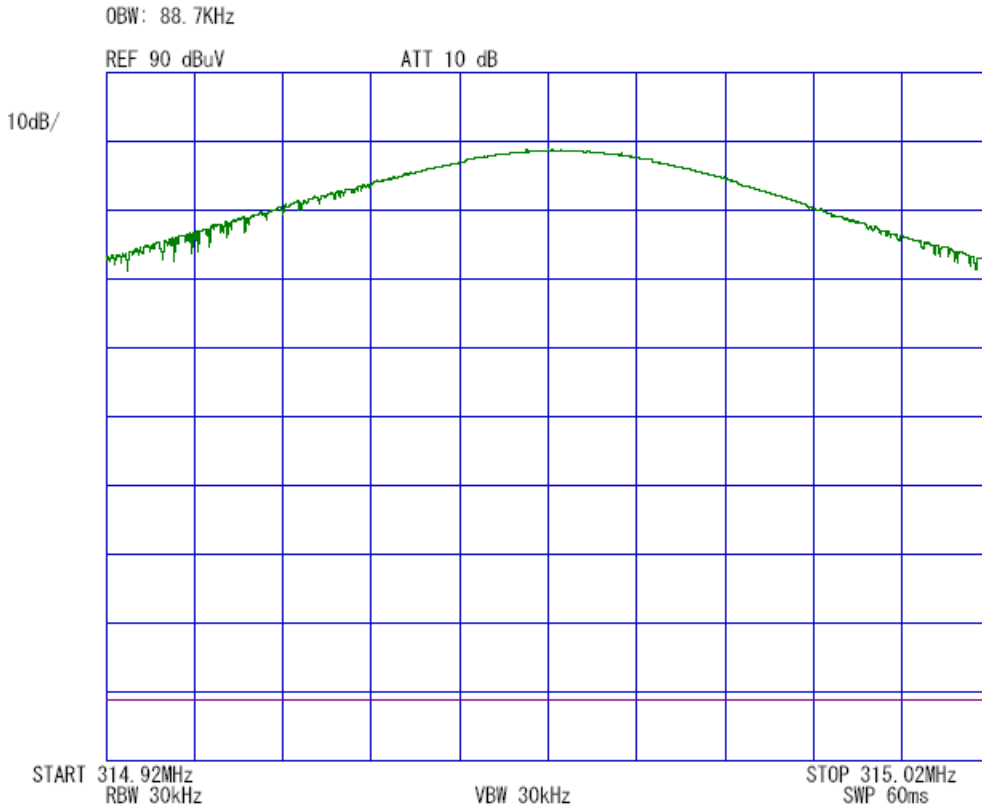


### Occupied Bandwidth(99%)

COMPANY : Alps Electrical Co., Ltd.  
EQUIPMENT : Remote Keyless Entry  
MODEL NUMBER: TWB1U751  
SERIAL NUMBER: #2  
FCC ID : CWTWB1U751  
POWER : DC3V(Battery)

UL Apex Co.,Ltd. Yamakita No.1 Anechoic Chamber  
REPORT NO : 27HE0166-YK-A  
DATE : 2007/3/23  
TEMP./HUMI : 25°C/35%  
TEST MODE : Transmitting (315.00MHz)  
ENGINEER : Tatsuya Arai

99% Occupied Bandwidth
[kHz]
88.7kHz



**APPENDIX 3**  
**Test Instruments**

**EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
YA-RE	Radiated emission(software)	UL-Apex	RE(Ver.1.5)	RE	-
KAEC-01(NSA)	Anechoic Chamber	JSE	Semi 3m	RE	2006/08/31 * 12
KAF-05	Pre Amplifier	Agilent	8447D	RE	2006/04/21 * 12
KAT6-01	Attenuator	INMET	18N-6dB	RE	2006/03/24 * 12
KBA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2007/01/06 * 12
KCC-30/31/32 /34/KRM-03	Coaxial Cable/RF Relay Matrix	Fujikura/Suhner/TSJ	5D-2W/S04272B/RFM-E421	RE	2006/11/27 * 12
KLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2007/01/06 * 12
KSA-04	Spectrum Analyzer	Advantest	R3271A	All	2006/09/05 * 12
KOS-02	Humidity Indicator	Custom	CTH-190	All	2006/07/10 * 24
KJM-01	Measure	TAJIMA	GL19-55	RE	-
KTR-02	Test Receiver	Rohde & Schwarz	ESGS30	RE	2006/11/25 * 12
KAF-02	Pre Amplifier	Hewlett Packard	8449B	RE	2006/04/24 * 12
KCC-D11/D12	Coaxial cable	Suhner/storm	SCOFLEX103/90-388-020	RE	2006/08/28 * 12
KHA-01	Horn Antenna	A.H.Systems	SAS-200/571	RE	2006/08/17 * 12
KSCA-01	Search coil	TSJ	SC01	AD/BW	Pre Check
KCC-A2	Coaxial Cable	Fujikura	5D-2W	AD/BW	2006/05/16 * 12

The expiration date of the calibration is the end of the expired month .

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

Test Item :

- RE: Radiated emission
- AD: Automatically deactivate
- BW: Bandwidth

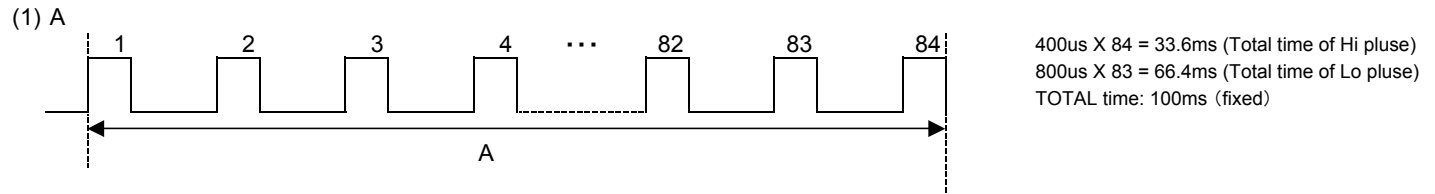
**TWB1U751 configuration of transmitting signal**

Hi pulse: Transmitting ON, Lo pulse: Transmitting OFF

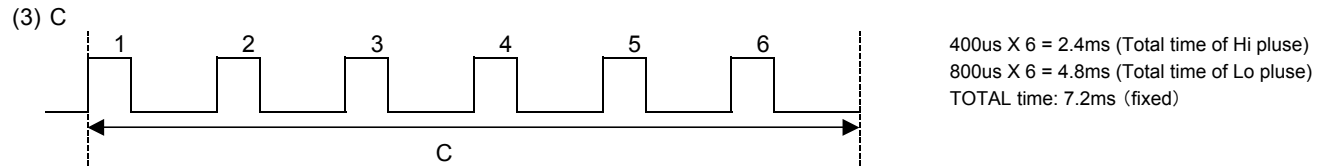
1. Configuration



2. Detail



(2) B  
Lo pulse of 103.2ms (fixed)



(4) D  
Hi pulse of 4ms (fixed)

(5) E  
Lo pulse of 4ms (fixed)

(6) F  
Signal of 67 bits. Total time is fluctuated because of PWM (Pulse Width Modulation).

	Logic "0"	Logic "1"
In case of Lo->Hi	800us	400us
In case of Hi->Lo	400us	800us

\*Total time fluctuates in following range depending on data contents.  
MIN: Convination of all short pluse (400us)  
1cycle: 400us X 67 = 26.8ms  
MAX: Convination of all long pluse (800us)  
1cycle: 800us X 67 = 53.6ms  
Worst case of F  
Hi pulse: 800us X 34 = 27.2ms  
Lo pulse: 400us X 33 = 13.2ms

(7) G  
Lo pulse of 45.6ms

**TWB1U751 Verification of maximum value of Duty ratio**

Pulse train where Duty ratio is maximum value is an interval of A (100ms).

Hi pluse of A : 400us×84 = 33.6ms  
Lo pluse of A : 800us×83 = 66.4ms  
Duty ratio : 33.6/(33.6+66.4) = 33.6%

	Total value of Hi pluse Width	Total value of Lo pluse Width	Total
C	2.4 ms	4.8 ms	7.2 ms
D	4.0 ms	0.0 ms	4.0 ms
E	0.0 ms	4.0 ms	4.0 ms
F	27.2 ms	13.2 ms	40.4 ms
G	0.0 ms	45.6 ms	45.6 ms
Total	33.6 ms	67.6 ms	101.2 ms

**Result**

Worst Duty ratio in 100ms: 33.6%  
Duty cycle factor: 20 log ( 100ms / 33.6ms ) = 9.47dB