EMI TEST REPORT

Test Report No. : 22CE0032-YW-1

Applicant:	**Tohoku Alps Co., Ltd.**
Type of Equipment:	**Keyless Entry System (Transmitter)**
Model No.:	**72147-S5A-A / 72147-S9V-Y**
Test standard:	**FCC Part 15 Subpart C Section 15.231**
FCC ID:	**NHVWB1U523**
Test Result:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of A-Pex International 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.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test: October 28, 2001 **Issued date:** November 1, 2001

Tested by: Makoto Kosaka
EMC Section

Approved by: Kazutoyo Nakanishi
Site Operation Manager of EMC Section

A-pex International Co., Ltd.
YOKOWA LAB.
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 JAPAN
Telephone: int +81 596 39 1485
Facsimile: int +81 596 39 0232

CONTENTS

PAGE

SECTION 1: Client information

Company name : Tohoku Alps Co., Ltd.

Address : 6-3-36 Nakazato, Furukawa-city, Miyagi-pref.
989-6181 Japan

Telephone Number : +81-229-23-5111

Facsimile Number : +81-229-22-3755

Contact Person : Koichi Abe

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

2.1 Identification of E.U.T.

Type of Equipment : Keyless Entry System (Transmitter)

Model No. : 72147-S5A-A

FCC ID : NHVWB1U523

Serial No. : sample No. 1

Condition of EUT : Engineering prototype

Country of Manufacture : Japan

Receipt Date of Sample : October 25, 2001

2.2 Product Description

Model: 72147-S5A-A, referred to as the EUT in this report, is a Transmitter of Keyless Entry System.
Model: 72147-S9V-Y and 72147-S5A-A are deemed to be equal about the level of EMC since they have few differences as remarked below; 72147-S5A-A which is a top - level model, therefore, was measured as a representative.

Model	PWB	Parts on PWB	Software (basic control)
72147-S5A-A	Original	Loaded three SW (Lock, Unlock, PANIC)	Original
72147-S9V-Y	Same as 72147-S5A-A	Loaded two SW (Lock, Unlock)	Same as 72147-S5A-A

Carrier Frequency : 433.920 MHz

Modulation : FSK

Other Clock Frequency : 4.19MHz

Information antenna : Integral / P.C.B pattern antenna

Operation Voltage : Lithium Battery DC 3.0V(CR2025)

SECTION 3: Test specification, methods & procedures

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart C Intentional Radiators
Section 15.231 Periodic operation in the band 40.66 – 40.70 MHz and above 70MHz

3.2 Methods & Procedures

No.	Item	Test Procedure	Specification	Remarks
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:1992	Section 15.231	3m
2	Electric Field Strength of Spurious Emission	ANSI C63.4:1992	Section 15.205 Section 15.209 Section 15.231	3m
3	-20dB Bandwidth	ANSI C63.4:1992	Section 15.231	3m

3.3 Additions or deviations to standards

No addition, deviation nor exclusion have been made from standards.

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

4.1 Operating Modes

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

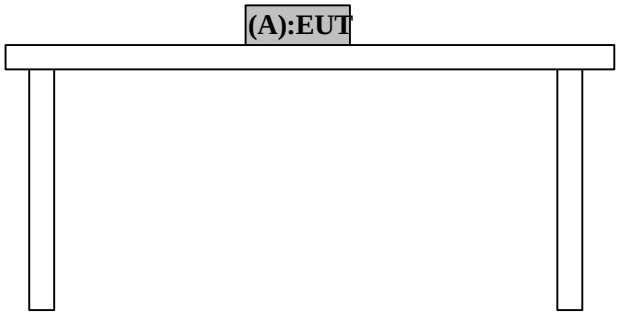
The operating mode/system were as follows:

Operation Mode : Transmitting

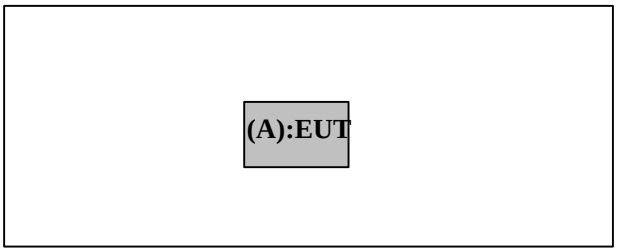
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

Front View



Top View



*Test data was taken under worse case conditions.

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Keyless Entry System (Transmitter)	72147-S5A-A	Sample No.1	Tohoku Alps Co., Ltd.	NHVWB1U523

SECTION 5: Summary of test results

5.1 Test results

No.	Item	Test Procedure	Specification	Worst margin	Result
1	Electric Field Strength of Fundamental Emission	ANSI C63.4:1992	Section 15.231	10.1dB (433.898MHz: Horizontal)	Complied
2	Electric Field Strength of Spurious Emission	ANSI C63.4:1992	Section 15.205 Section 15.209 Section 15.231	24.4dB (1301.715MHz: Horizontal) 10.8dB (867.806MHz: Horizontal)	Complied
3	-20dB Bandwidth	ANSI C63.4:1992	Section 15.231	Refer to 5.7	Complied

A-PEX INTERNATIONAL hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC Part 15 Subpart C Section 15.231(b) and 15.205.

5.2 Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±3.3dB.

☐ The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).

■ The data listed in this test report has enough margin, more than 3.3dB.

5.3 Test Location

A-PEX International Co., Ltd. Yokowa No.3 test site
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 Japan
Telephone number : +81-596-39-1485
Facsimile number : +81-596-39-0232
This site has been fully described in a report submitted to FCC office, and listed on September 12, 2000 (Registration number: 90412). *NVLAP Lab. code : 200109-0

5.4 Photographs of test setup

Refer to Appendix 1.

5.5 Test instruments

Refer to Appendix 2.

5.6 Data of EMI Test

Refer to Appendix 3.

5.7 -20dB Bandwidth

Bandwidth Limit: Fundamental Frequency 433.92MHz x 0.25% = 1.0848MHz

Bandwidth Limit	measurement data (20dB down) Center Freq: 433.9380MHz	Result
Upper frequency Limit (434.4624MHz:542.4kHz)	434.142MHz(204kHz)	Complied
Lower frequency Limit (433.3776MHz:542.4kHz)	433.707MHz(231kHz)	Complied
-20dB Bandwidth (1.0848MHz)	Uf + Lf = 435kHz	Complied

Refer to Appendix 4.

SECTION 6: Radiated emission

6.1 Operating environment

The test was carried out in an open site.

Temperature : See data
Humidity : See data

6.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1m, raised 80cm above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was 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.

6.3 Test conditions

Frequency range : 30MHz-4500MHz
Test distance : 3m
EUT position : Table top

6.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on an open test site with a ground plane and at a distance of 3m.
Pre check measurements were performed at high-level of 80-90MHz, 270-290MHz and 500-700MHz in a screened room. Otherwise the noise from EUT might have been concealed by the ambient noise.
Measurements were performed with a quasi-peak detector.
The measuring antenna height was varied between 1 to 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.
The EUT was put into operation at Transmitting mode.
The radiated emission measurements were made with the following detector function of the test receiver.

Frequency Range	: 30MHz-1000MHz	: 1000MHz-4500MHz
Test Instrument	: Test receiver	: Spectrum analyzer
Detector Type	: QP	: RBW / VBW
IF Bandwidth	: 120kHz	: 1MHz / 10Hz

6.5 Results

Summary of the test results: Pass

Date: 2001-10-28 Tested by: M. Kosaka

APPENDIX 1: Photographs of test setup

APPENDIX 2: Test instruments

APPENDIX 3: Data of EMI test

APPENDIX 4: Wave shape of bandwidth

A-pex International Co., Ltd.
YOKOWA LAB.
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 JAPAN
Telephone: int +81 596 39 1485
Facsimile: int +81 596 39 0232

Radiated emission

A-pex International Co., Ltd.
YOKOWA LAB.
108 Yokowa-cho, Ise-shi, Mie-ken 516-1106 JAPAN
Telephone: int +81 596 39 1485
Facsimile: int +81 596 39 0232

Test Report No : 22CE0032-YW-1

APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No.	Test Item	Calibration Date * Interval(month)
AF-01	Pre Amplifier	Hewlett Packard	8447D	RE	2001/03/31 * 12
AT-06	Attenuator	Anritsu	MP721B	RE	2001/03/31 * 12
BA-03	Biconical Antenna	Schwarzbeck	BBA9106	RE	2001/05/01 * 12
LA-06	Logperiodic Antenna	Schwarzbeck	UHALP9108-A	RE	2001/05/01 * 12
SA-04	Spectrum Analyzer	Hewlett Packard	8567A	RE	2001/03/31 * 12
TR-06	Test Receiver	Rohde & Schwarz	ESVS10	RE	2001/08/24 * 12
CC-3ORC	Yokowa No.3 open coaxial(0.01-1000MHz)	A-PEX	CC-31,CC-32,CC-33,CC-34,CC-35,CC-36,CC-37,SW-31,SW-32	RE	2001/03/31 * 12
YOATS-03	Open Test Site	JSE	10m	RE	2001/05/01 * 12
AF-04	Pre Amplifier	Hewlett Packard	8449B	RE	2000/11/05 * 12
HA-01	Horn Antenna	A.H.Systems	SAS-200/571	RE	2001/05/20 * 12
SA-05	Spectrum Analyzer	Advantest	R3271	RE	2001/02/01 * 12
CC-C28G	Microwave Cable	Suhner	CC-C2,CC-C8	RE	2001/09/14 * 12

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

DATA OF RADIATION TEST(30MHz-4500MHz)

A-PEX INTERNATIONAL CO., LTD.
YOKOWA NO.3 OPEN SITE

COMPANY : Tohoku Alps Co., Ltd.
EQUIPMENT : keyless Entry System (Transmitter)
MODEL : 72147-S5A-A
POWER : DC3.0V(CR2025)
Mode : Transmitting
Serial No. : sample No.1
Temperature : 23℃
Humidity : 68%

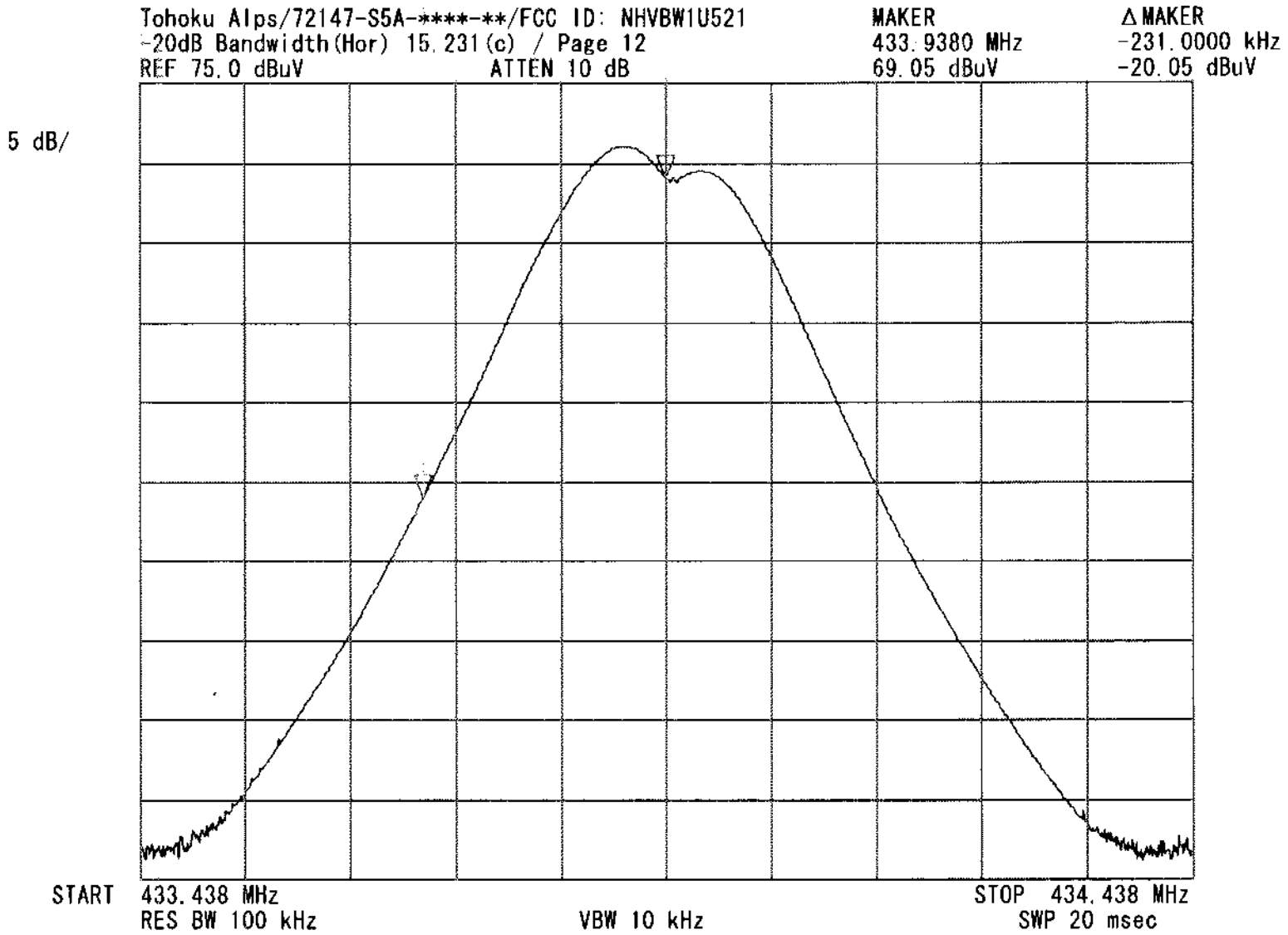
REPORT NO : 22CE0032-YW-1
REGULATION : FCC15.231(b)/15.205
TEST DISTANCE : 3m
DATE : 2001/10/28
FCC ID : NHVWB1U523

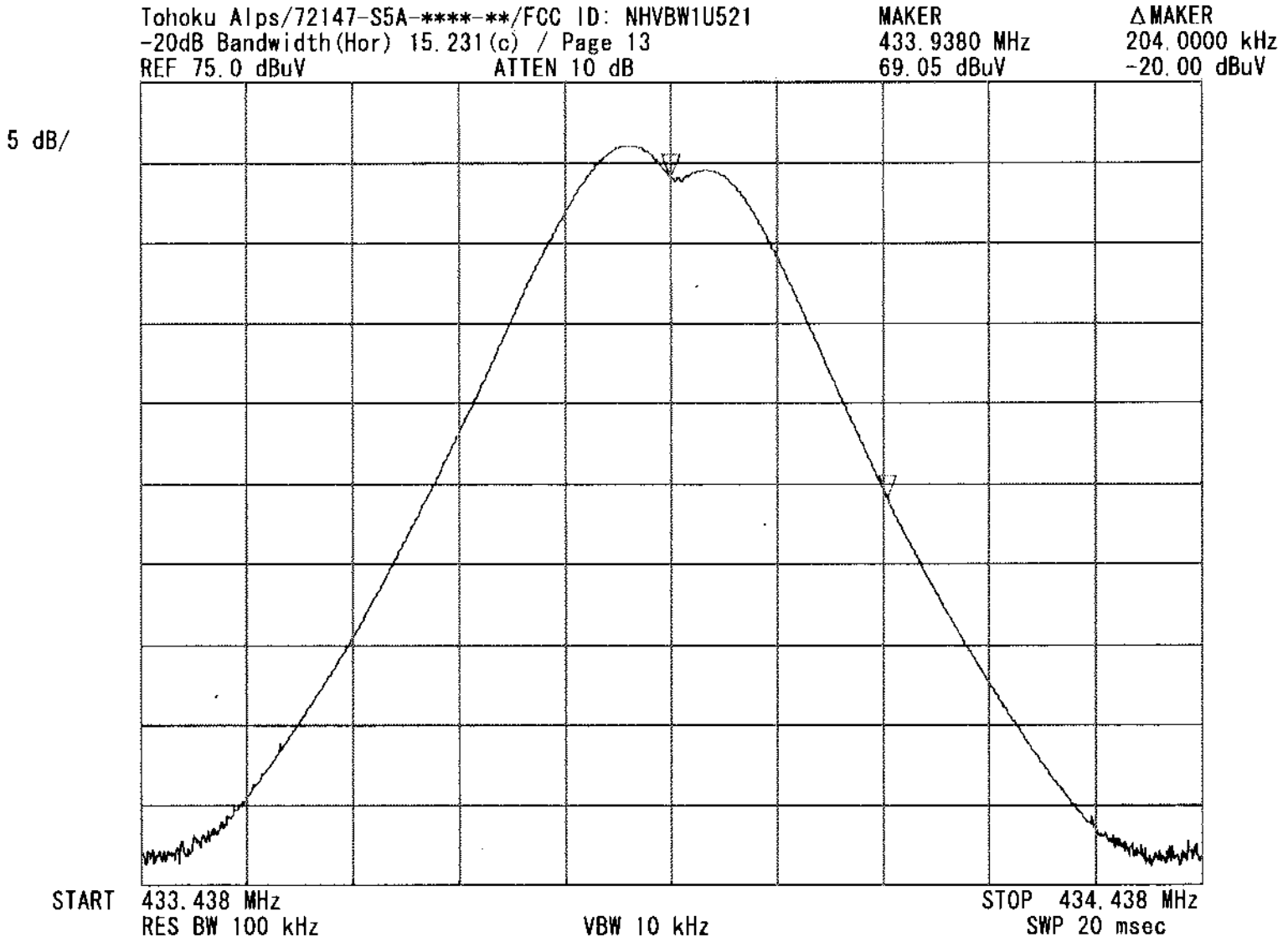
ENGINEER : Makoto Kosaka

Below 1GHz QP DETECT(Test Receiver: BW 120kHz)
Above 1GHz AV DETECT (Spectrum Analyzer : RBW 1MHz and VBW 10Hz)

No.	FREQ	READING		ANT	ATTEN	CABLE	AMP	RESULT		LIMIT	MARGIN	
		HOR	VER	Factor		LOSS	GAIN	HOR	VER		HOR	VER
	[MHz]	[dB μ V]		[dB]	[dB]	[dB]	[dB]	[dB μ V/m]		dB μ V/m	[dB]	[dB]
1	433.898	71.6	56.4	16.3	5.9	4.5	27.6	70.7	55.5	80.8	10.1	25.3
2	867.806	41.8	34.3	22.1	5.9	6.8	26.6	50.0	42.5	60.8	10.8	18.3
3	1301.715	34.4	31.2	26.3	0.0	3.9	35.0	29.6	26.4	54.0	24.4	27.6
4	1735.617	37.6	36.3	28.8	0.0	4.5	34.6	36.3	35.0	60.8	24.5	25.8
5	2169.515	33.9	31.2	30.7	0.0	5.2	34.4	35.4	32.7	60.8	25.4	28.1

REMARKS
ANTENNA TYPE: 30-300MHz Biconical / 300-1000MHz Logperiodic / 1-4.5GHz DRG Horn
CALCULATION(30MHz to 1000MHz) : READING + ANT Factor + ATTEN + Cable Loss - AMP Gain
CALCULATION(1.0GHz to 4.5GHz) : READING + ANT Factor + Cable Loss - AMP Gain
* Spurious emission didn't occur for the harmonics order from 6 to 10.
*Except for the above table : All other spurious emissions were less than 20dB for the limit.


Tohoku Alps/72147-S5A-****-**/FCC ID: NHVBW1U521
-20dB Bandwidth(Hor) 15.231(c) / Page 12
REF 75.0 dBuV
ATTEN 10 dB
MAKER
433.9380 MHz
69.05 dBuV
ΔMAKER
-231.0000 kHz
-20.05 dBuV
5 dB/
START 433.438 MHz
RES BW 100 kHz
VBW 10 kHz
STOP 434.438 MHz
SWP 20 msec


Tohoku Alps/72147-S5A-****-**/FCC ID: NHVBW1U521
-20dB Bandwidth(Hor) 15.231(c) / Page 13
REF 75.0 dBuV
ATTEN 10 dB
MAKER
433.9380 MHz
69.05 dBuV
ΔMAKER
204.0000 kHz
-20.00 dBuV
5 dB/
START 433.438 MHz
RES BW 100 kHz
VBW 10 kHz
STOP 434.438 MHz
SWP 20 msec