



RADIO TEST REPORT

Test Report No. : 10968259S-D-R2

Applicant : Japan Radio Co., Ltd.
Type of Equipment : Solid State Transmitter-Receiver
Model No. : NTG-420
Test regulation : FCC part 90 Subpart I: 2015
(Frequency Stability with variation temperature test only)
FCC ID : CKENTG420
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. This report is a revised version of 10968259S-D-R1. 10968259S-D-R1 is replaced with this report.

Date of test: April 13, 2016

Representative test engineer:


Masatoshi Nishiguchi
Engineer
Consumer Technology Division

Approved by :


Takahiro Hatakeda
Leader
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

REVISION HISTORY

Original Test Report No.: 10968259S-D

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CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures and results.....	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Frequency Stability.....	9
Contents of APPENDIXES.....	10
APPENDIX 1: Data of Radio tests	11
APPENDIX 2: Test instruments	13

SECTION 1: Customer information

Company Name : Japan Radio Co., Ltd.
Address : 1-1 Shimorenjyaku 5 chome, Mitaka-shi, Tokyo 181-8510, Japan
Telephone Number : +81-422-45-9831
Facsimile Number : +81-422-45-9683
Contact Person : Katsutoshi Ashida

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

2.1 Identification of E.U.T.

Type of Equipment : Solid State Transmitter-Receiver
Model Number : NTG-420
Serial Number : Refer to Section 4.2
Rating : DC 48 V
Size : Width 554 x Length 330 x Height 580 (mm)
Country of Mass-production : Japan
Condition of EUT : Production model
Receipt Date of Sample : March 10, 2016
Modification of EUT : The test lab did not make the modification to the EUT supplied from the customer to have it pass the tests.

2.2 Product Description

Model: NTG-420 (referred to as the EUT in this report) is a Solid State Transmitter-Receiver.

Radio Specification

Radio Type : Transceiver
Frequency of Operation : (Non-chirp pulse): 9410 MHz (P0N)
(Chirp pulse): 9440 MHz +/-15 MHz (Q0N)
(Non-Chirp/Chirp pulse): 9410 MHz and 9440 MHz(P0N/Q0N)
Clock frequency(ies) in the system : 84 MHz
RF output power (specification) : 200 W +1 dB/-3 dB (at EUT output port)
RF output power limit : None
Modulation type : (Non-chirp pulse): CW
(Chirp pulse): Frequency pulse modulation
(Non-Chirp/Chirp pulse): CW and Frequency pulse modulation
Antenna Connector Type : Wave guide
Intermediate frequency : 63 MHz (bandwidth 30 MHz)
Operating Temperature : -15 deg.C to +50 deg.C

(Antenna information) (* The antenna of the antenna gain maximum in the antenna with a used possibility.)
Model No. : NKE-378
Antenna type : 22 feet slotted array antenna
Antenna Gain (include cable loss) : 37 dBi max (= 38 dBi - cable loss 1 dB)

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999
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SECTION 3: Test specification, procedures and results

3.1 Test Specification

Test Specification : FCC Part 90: 2015, final revised on November 17, 2015
Title : PRIVATE LAND MOBILE RADIO SERVICES

3.2 Procedures and results

No.	Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst margin	Results
1	RF Output Power	FCC section 2.1046, TIA-603-D 2.2.1	FCC section 90.205(r), RSS-238 section 4.2	-	N/A	-	N/A *2)
2	Modulation Characteristics	FCC section 2.1047(a) and (b), TIA-603-D 2.2.3, 2.2.6	FCC section 90.207, RSS-238 section 3.2	-	N/A	-	N/A *2)
3	Emission Bandwidth and Emission Limitations	FCC section 2.1049, TIA-603-D 2.2.11, 1.3.4.4	FCC section 90.209,90.210(b), RSS-238 section 4.3	-	N/A	-	N/A *2)
4	Spurious Emission at Antenna Terminals	FCC section 2.1051, TIA-603-D 2.2.13	FCC section 90.210, 90.215, RSS-238 section 4.3	-	N/A	-	N/A *2)
5	Field Strength of Spurious Emission	FCC section 2.1053, TIA-603-D 2.2.12	FCC section 90.210, 90.215, RSS-238 section 4.3	Radiated	N/A	-	N/A *2)
6	Frequency Stability	FCC section 2.1055, TIA-603-D 2.2.2	FCC section 90.213, RSS-238 section 4.1	-	N/A	-	Complied *3)

Note: UL Japan, Inc.'s EMI Work Test Procedure 13-EM-W0420.

*1) These tests were also referred to "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards" (TIA-603-D: 2010) The procedure used by this test between the latest edition TIA-603-E and TIA-603-D wasn't changed, so it was tested using TIA-603-D.

*2) These tests is refer to report no.10968259S-C.

*3) This report is only the frequency stability test with variation of ambient temperature. The frequency stability test with variation of supply voltage is refer to report no.10968259S-C.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Confirmation

UL Japan, Inc. hereby confirms that E.U.T., in the configuration tested, complies with the specifications FCC part 90.

3.5 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.
Frequency Measurement uncertainty for this test was: $(\pm) 0.2 \%$

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3.6 Test Location

UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
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Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

3.7 Data of EMI, Test instruments, Test set up

Refer to APPENDIX.

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

4.1 Operating Modes

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

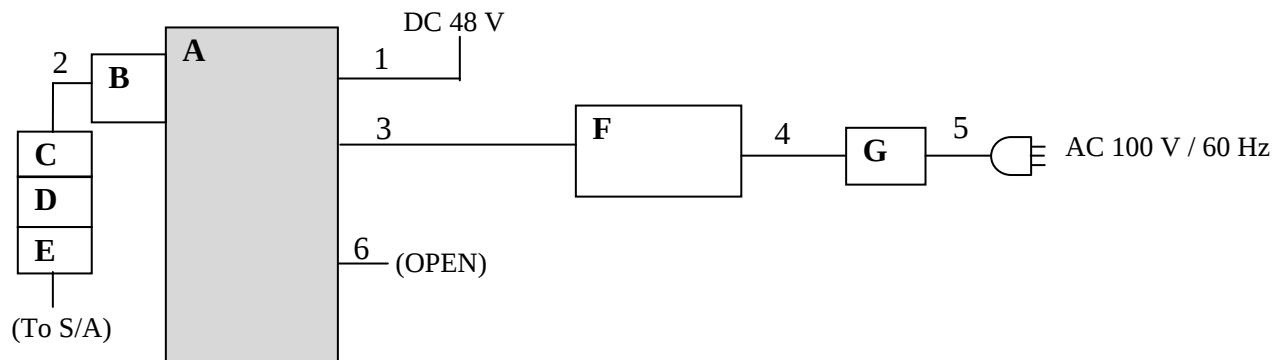
Test sequence is used: ((Non-chirp pulse): P, (Chirp pulse): Q, (Non-Chirp/Chirp pulse): P & Q))

- (1) Transmitting 9410 MHz, Transmission Table (1) No.5 (on 0.30 us., repetition 1864 Hz) , mode P (pulse modulation)
- (2) Transmitting 9440 MHz, Transmission Table (1) No.5 (on 9.1 us., repetition 1864 Hz) , mode Q (frequency modulation)

This EUT is two pulse radio-frequency output.

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

4.2 Configuration and peripherals



*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*S/A: spectrum analyzer.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Solid State Transmitter-Receiver	NTG-420	2016RRZ0004	Japan Radio Co., Ltd.	EUT
B	Wave guide to N transducer	35UM84N	175193-F	Anritsu	-
C	Attenuator (10dB)	PE7019-10	-	Pasternack	-
D	Attenuator (10dB)	PE7019-10	-	Pasternack	-
E	Attenuator (10dB)	PE7019-10	-	Pasternack	-
F	Personal Computer	HP ProBook450 G1	2CE4082KK0	HP	-
G	AC adapter	PPP009L-E	CT:WCNXA03U5 XCNE (4113257703)	HP	-

List of cables used

No.	Cable name	Length (m)	Shield	
			Cable	Connector
1	DC	1.7	Unshielded	Unshielded
2	Antenna	1.0	Shielded	Unshielded
3	LAN	20.24	Unshielded	Unshielded
4	DC	1.7	Unshielded	Unshielded
5	AC	1.0	Unshielded	Unshielded
6	Signal	14	Shielded	Unshielded

SECTION 5: Frequency Stability

5.1 Test Procedure : FCC part 2 section 2.1055, TIA-603-D section 2.2.2

Refer to FCC part 2, section 2.1055.

Temperature: -30 deg.C to +50 deg.C, at normal voltage. (step 10 deg.C.)

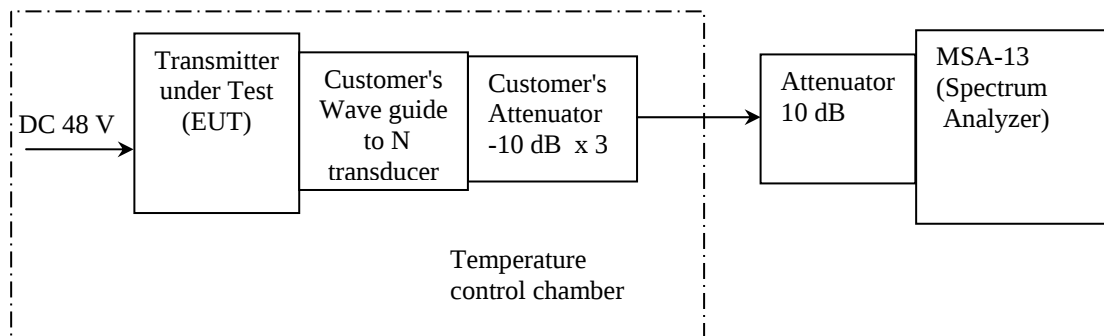
* The test with variation of input voltage is referring to report no.10968259S-C.

5.2 Test Data : APPENDIX 1

5.3 Test Result : Pass

5.4 Test Instrument : MSA-13, MAT-20, MCC-67, MCH-02

5.5 Measurement Block Diagram



Frequency Stability (FCC section 2.1055, TIA-603-D section 2.2.2)

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

Frequency stability

APPENDIX 2: Test instruments

Test instruments

APPENDIX 1: Data of Radio tests

Frequency Stability

Test place : UL Japan, Inc. Ise EMC Lab.
No.9 Measurement Room
Date : April 13, 2016
Temperature / Humidity : 26 deg.C , 35 %RH
Engineer : Masatoshi Nishiguchi
Mode : Transmitting 9410 MHz Transmission Table (1) No.5
(used frequency error function with occupied bandwidth function (spectrum analyzer))

Test Condition [deg.C] [V]	Test Timing	Measured frequency [MHz]	Frequency error [MHz]	Result [ppm]	RSS-238) *1 Limit [+/- ppm]	Margin [ppm]
50 deg.C	Power on	9410.710711	0.710711	75.53	1250.00	1174.47
	on 2 min.	9410.801646	0.801646	85.19	1250.00	1164.81
	on 5 min.	9410.791317	0.791317	84.09	1250.00	1165.91
	on 10 min.	9410.929531	0.929531	98.78	1250.00	1151.22
40 deg.C	Power on	9410.877860	0.877860	93.29	1250.00	1156.71
	on 2 min.	9411.594000	1.594000	169.39	1250.00	1080.61
	on 5 min.	9411.100000	1.100000	116.90	1250.00	1133.10
	on 10 min.	9411.070000	1.070000	113.71	1250.00	1136.29
30 deg.C	Power on	9411.600000	1.600000	170.03	1250.00	1079.97
	on 2 min.	9411.334000	1.334000	141.76	1250.00	1108.24
	on 5 min.	9411.177000	1.177000	125.08	1250.00	1124.92
	on 10 min.	9411.219000	1.219000	129.54	1250.00	1120.46
20 deg.C	Power on	9410.882041	0.882041	93.73	1250.00	1156.27
	on 2 min.	9411.155000	1.155000	122.74	1250.00	1127.26
	on 5 min.	9411.245000	1.245000	132.31	1250.00	1117.69
	on 10 min.	9411.220000	1.220000	129.65	1250.00	1120.35
10 deg.C	Power on	9411.138000	1.138000	120.94	1250.00	1129.06
	on 2 min.	9411.104000	1.104000	117.32	1250.00	1132.68
	on 5 min.	9411.086000	1.086000	115.41	1250.00	1134.59
	on 10 min.	9411.106000	1.106000	117.53	1250.00	1132.47
0 deg.C	Power on	9411.129000	1.129000	119.98	1250.00	1130.02
	on 2 min.	9411.033000	1.033000	109.78	1250.00	1140.22
	on 5 min.	9410.986913	0.986913	104.88	1250.00	1145.12
	on 10 min.	9410.953125	0.953125	101.29	1250.00	1148.71
-10 deg.C	Power on	9410.463895	0.463895	49.30	1250.00	1200.70
	on 2 min.	9410.615910	0.615910	65.45	1250.00	1184.55
	on 5 min.	9410.668515	0.668515	71.04	1250.00	1178.96
	on 10 min.	9410.659182	0.659182	70.05	1250.00	1179.95
-20 deg.C	Power on	9409.043894	-0.956106	-101.61	1250.00	1148.39
	on 2 min.	9410.536453	0.536453	57.01	1250.00	1192.99
	on 5 min.	9410.490913	0.490913	52.17	1250.00	1197.83
	on 10 min.	9410.486969	0.486969	51.75	1250.00	1198.25
-30 deg.C	Power on	9410.152061	0.152061	16.16	1250.00	1233.84
	on 2 min.	9410.064622	0.064622	6.87	1250.00	1243.13
	on 5 min.	9410.016030	0.016030	1.70	1250.00	1248.30
	on 10 min.	9410.004288	0.004288	0.46	1250.00	1249.54

Limit : 9410.0000 MHz +/-1250 ppm = +/- 11.762500 MHz

*1) (FCC) Frequency Lower Limit = $9300 + 1.5/T = 9300.00616$ MHz, Upper Limit = $9500 - 1.5/T = 9499.99384$ MHz. (FCC part 80)

Frequency Stability

Test place UL Japan, Inc. Ise EMC Lab.
No.9 Measurement Room
Date April 13, 2016
Temperature / Humidity 26 deg.C , 35 %RH
Engineer Masatoshi Nishiguchi
Mode Transmitting 9440 MHz Transmission Table (1) No.5
(used frequency error function with occupied bandwidth function (spectrum analyzer))

Test Condition [deg.C] [V]	Test Timing	Measured frequency [MHz]	Frequency error [MHz]	Result [ppm]	(RSS-238) *1 Limit [+/- ppm]	Margin [ppm]
50 deg.C	Power on	9439.703888	-0.296112	-31.37	1250.00	1218.63
	on 2 min.	9439.723146	-0.276854	-29.33	1250.00	1220.67
	on 5 min.	9439.739848	-0.260152	-27.56	1250.00	1222.44
	on 10 min.	9439.748548	-0.251452	-26.64	1250.00	1223.36
40 deg.C	Power on	9440.018388	0.018388	1.95	1250.00	1248.05
	on 2 min.	9440.103561	0.103561	10.97	1250.00	1239.03
	on 5 min.	9440.085298	0.085298	9.04	1250.00	1240.96
	on 10 min.	9440.078177	0.078177	8.28	1250.00	1241.72
30 deg.C	Power on	9440.275654	0.275654	29.20	1250.00	1220.80
	on 2 min.	9440.272526	0.272526	28.87	1250.00	1221.13
	on 5 min.	9440.271299	0.271299	28.74	1250.00	1221.26
	on 10 min.	9440.260602	0.260602	27.61	1250.00	1222.39
20 deg.C	Power on	9440.504222	0.504222	53.41	1250.00	1196.59
	on 2 min.	9440.377160	0.377160	39.95	1250.00	1210.05
	on 5 min.	9440.345922	0.345922	36.64	1250.00	1213.36
	on 10 min.	9440.338244	0.338244	35.83	1250.00	1214.17
10 deg.C	Power on	9440.143934	0.143934	15.25	1250.00	1234.75
	on 2 min.	9440.193965	0.193965	20.55	1250.00	1229.45
	on 5 min.	9440.242818	0.242818	25.72	1250.00	1224.28
	on 10 min.	9440.252997	0.252997	26.80	1250.00	1223.20
0 deg.C	Power on	9440.227152	0.227152	24.06	1250.00	1225.94
	on 2 min.	9440.177099	0.177099	18.76	1250.00	1231.24
	on 5 min.	9440.198928	0.198928	21.07	1250.00	1228.93
	on 10 min.	9440.218263	0.218263	23.12	1250.00	1226.88
-10 deg.C	Power on	9440.077125	0.077125	8.17	1250.00	1241.83
	on 2 min.	9440.031613	0.031613	3.35	1250.00	1246.65
	on 5 min.	9440.029261	0.029261	3.10	1250.00	1246.90
	on 10 min.	9440.042764	0.042764	4.53	1250.00	1245.47
-20 deg.C	Power on	9439.666905	-0.333095	-35.29	1250.00	1214.71
	on 2 min.	9439.620990	-0.379010	-40.15	1250.00	1209.85
	on 5 min.	9439.708016	-0.291984	-30.93	1250.00	1219.07
	on 10 min.	9439.727044	-0.272956	-28.91	1250.00	1221.09
-30 deg.C	Power on	9439.273276	-0.726724	-76.98	1250.00	1173.02
	on 2 min.	9439.336489	-0.663511	-70.29	1250.00	1179.71
	on 5 min.	9439.350520	-0.649480	-68.80	1250.00	1181.20
	on 10 min.	9439.376148	-0.623852	-66.09	1250.00	1183.91

Limit : 9440.0000 MHz +/-1250 ppm = +/- 11.800000 MHz

*1) (FCC) Frequency Lower Limit = 9300 + 1.5/T = 9300.00616 MHz, Upper Limit = 9500 -1.5/T = 9499.99384 MHz. (FCC part 80)

APPENDIX 2: Test instruments

Test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MOS-11	Thermo-Hygrometer	Custom	CTH-180	1101	AT	2016/01/21 * 12
MMM-14	DIGITAL HiTESTER	Hioki	3805	070500641	AT	2015/05/20 * 12
MCH-02	Temperature and Humidity Chamber	Tabai Espec	PL-4KP	14005424	AT	2016/01/26 * 12
MSW-03	Stop Watch	TRUSCO	T-709R	--	AT	2015/12/03 * 12
MSA-13	Spectrum Analyzer	Agilent	E4440A	MY461858 23	AT	2015/06/02 * 12
MAT-20	Attenuator(10dB)(above 1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-110	-	AT	2016/01/08 * 12
MCC-67	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX10 2	28635/2	AT	2015/04/09 * 12
MTW-07	Torque wrench	HUBER+SUHNER	74 Z-0-0-21	60855	AT	2015/03/05 * 36

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

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

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item: RE: Radiated Emission
AT: Antenna Terminal Conducted test

End of Report