# TEST REPORT

Report Number : A-002-13-C

Date of Issue: 21 June 2013

FCC Rules and Regulations Part 95 : Radio Control (R/C) Radio Service

This test report is to certify that the device was tested according to the requirements of the above and these results met the specifications of requirements.
The results of this report should not be construed to imply compliance of devices other than the sample tested.
Without the laboratory approval by the documents, this report should not be copied in part.

**1. Applicant**

| | |
|---|---|
| Company Name | : JAPAN REMOTE CONTROL CO., LTD. |
| Mailing Address | : 2-2-12 EIWA, HIGASHIOSAKA-CITY, OSAKA, 577-0809 JAPAN |

**2. Identification of Tested Device**

| | |
|---|---|
| Type of Device | : Radio Control (R/C) Transmitter |
| Equipment Authorization | : ☐ DoC ☒ Certification ☐ Verification |
| FCC ID | : AXGL25-N4580 |
| Device Name | : L25 FM TRANSMITTER |
| Model Number | : L25-N4580-40 |
| Serial Number | : 1773306 |
| Trade Name | : JR PROPO |
| Type of Test | : ☐ Production ☐ Pre-production ☒ Prototype |

**3. Test Items**

| | | | |
|---|---|---|---|
| Maximum Transmit Power (Conducted) | ☐ Pass | ☐ Fail | ☒ N/A |
| Maximum Transmit Power (Radiated) | ☒ Pass | ☐ Fail | ☐ N/A |
| R/C Transmitter Channel Frequencies | ☒ Pass | ☐ Fail | ☐ N/A |
| Emission Bandwidth | ☒ Pass | ☐ Fail | ☐ N/A |
| Antenna Conducted Spurious Emissions | ☐ Pass | ☐ Fail | ☒ N/A |
| Radiated Emission of Transmitter (Spurious and Harmonics) | ☒ Pass | ☐ Fail | ☐ N/A |
| Modulation Characteristics | ☒ Pass | ☐ Fail | ☐ N/A |

Refer the below reason(s) with respect to the decision and justification not to test.
(*1) EUT Specifications (*2) Request of Applicant (*3) According to Test Plan

KEC Electronic Industry Development Center Testing Division
3-2-2, Hikari-dai, Seika-cho, Soraku-gun, Kyoto 619-0237 Japan

**Test Engineer(s)**

Hironobu Matsuyama

Naoki Norimoto

Approved by Ikuya Minematsu / Group Manager

M130809: This page (Page 1 of 14) is amended for the original test report (Report No. A-002-13-C, dated 21 June 2013).

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# 1. LABORATORY INFORMATION

## 1.1. Laboratory Accreditation

The KEC has been accredited by the following organizations based on their criteria for testing laboratory (ISO/IEC 17025).

(1) American Association for Laboratory Accreditation (A2LA) : Accreditation Number: 2070.01
(2) Japan Accreditation Board for Conformity Assessment (JAB) : Accreditation Number: RTL02810
(3) Voluntary EMC Laboratory Accreditation Center Inc. (VLAC) : Accreditation Number: VLAC-005

## 1.2. Test Facility

All tests described in this report were performed by:

Name: KEC Electronic Industry Development Center
Testing Division

Address: 3-2-2, Hikari-dai, Seika-cho, Soraku-gun, Kyoto 619-0237 Japan

| | | | | | | |
|---|---|---|---|---|---|---|
| Anechoic Chamber | : ☐ No.1 | ☐ No.2 | ☐ No.3 | ☐ No.6 | ☐ No.7 |
| | ☐ No.8 | ☐ No.9 | ☒ No.10 | ☒ No.11 | ☐ No.12 |
| Shielded Room | : ☐ No.1 | ☐ No.7 | ☐ No.8 | ☒ No.9 | ☐ No.10 |
| Harmonic Current Meas. Room | : ☐ | | | | |

## 1.3. Measurement Uncertainty

The result of a measurement is only an approximation or estimate of the value of a specific quantity.
And thus the measurand is complete only when a statement of uncertainty is given.
KEC quotes Measurement Uncertainty (U) as follows.

| | |
|---|---|
| Maximum Transmit Power (Conducted Measurement) | +/- 0.6dB |
| Maximum e.i.r.p. Spectral Density | +/- 0.6dB |
| Frequency Range | +-1.9% |
| Emission Bandwidth | +-1.9% |
| Occupied Bandwidth | +-1.9% |
| Dwell Time | +-2.4% |
| Hopping Sequence | +-2.4% |
| Carrier Frequency | $+/- 2.4\times10^{-7}$ |
| Spurious Emissions at Frequency Range from 9kHz up to 26.5GHz (Conducted Measurement) | +/- 0.7dB |
| Spurious Emissions at Frequency Range from 26.5GHz up to 40GHz (Conducted Measurement) | +/- 2.1dB |
| Spurious Emissions at Frequency Range from 30MHz up to 300MHz (Radiated Measurement) | +/- 3.6dB |
| Spurious Emissions at Frequency Range from 300MHz up to 1000MHz (Radiated Measurement) | +/- 3.2dB |
| Spurious Emissions at Frequency Range from 1GHz up to 12.75GHz (Radiated Measurement) | +/- 4.2dB |
| Spurious Emissions at Frequency Range from 12.75GHz up to 18GHz (Radiated Measurement) | +/- 5.2dB |
| Spurious Emissions at Frequency Range from 18GHz up to 40GHz (Radiated Measurement) | +/- 6.0dB |
| Frequency Tolerance of Carrier Signal | $+/- 1.0\times10^{-7}$ |

Expiration Date : 2013/9/30

The above values are calculated as Expanded Uncertainty (k=2 [95%]).

[Note]

If the measured result is below the specification limit and a margin is less than the above measurement uncertainty, it is impossible to determine compliance at a level of confidence of 95%. However, the measured result indicates high probability that the tested device complies with the specification limit.

# 2. GENERAL INFORMATION

## 2.1. Product Description

(1) Frequency Range : 72.010 ~ 72.990MHz

(2) Antenna Gain : -6dBi

(3) Antenna Type : Rod Antenna

(4) Modulation : FSK

(5) Modulation / Speeding : F1D

(5) Rated Power Supply : DC 9.6V (Ni-MH Battery ×8)

# 3. TESTED SYSTEM

## 3.1. Reference Rule and Specification

| | |
|---|---|
| (1) Reference Rule and Regulation | : FCC Part 2 Sec2.1046, Sec2.1047, Sec2.1049(C)(1), Sec2.1053, Sec2.1051, Sec2.1055 and Sec2.1057.<br>☒ Section 95 623<br>☒ Section 95 633<br>☒ Section 95 635 (b)<br>☒ Section 95 639 |
| (2) Test Procedure | : ANSI C63.4-2003 + ANSI TIA-603-C-2004 |

## 3.2. Date of Test

Receipt of Test Sample : 29 May 2013
Condition of Test Sample : ☒ Damage is not found on the set.
☐ Damage is found on the set. (Details are described in this report)

Test Completed on : 14 June 2013
Condition of Test Sample : ☒ Damage is not found on the set.
☐ Damage is found on the set. (Details are described in this report)

## 3.3. Deviation of Standard

☒ without deviation, ☐ with deviation (details are found inside of this report)

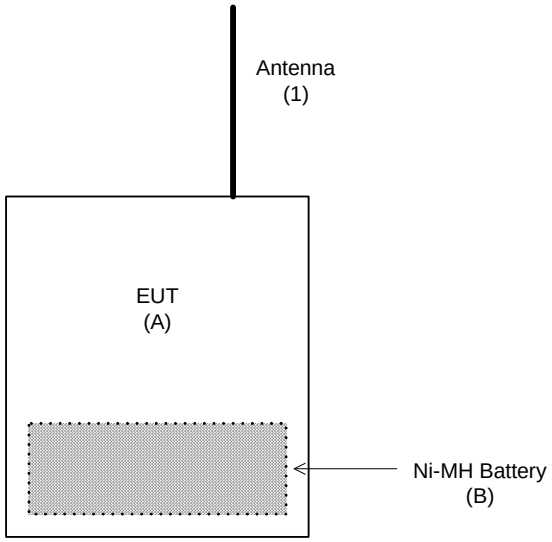
## 3.4. Test Mode

| Mode No. | Operation Mode |
|---|---|
| A | EUT Continuously transmits modulated signal at a single channel (72.550MHz) |

[Note]

(1) The test modes were planned by TÜV Rheinland JAPAN EMC Test Plan (EMC Test Plan_Ref: 12030291).
(2) The test program was prepared by applicant.
(3) Radiated emission of transmitter and Maximum Transmit Power (Radiated) were performed 3-othganal axis, and the data of the producing the maximum emissions were reported at each frequency.

## 3.5. Block Diagram of TEST System




## 3.6. List of Test System

| No. | Device Name | Model Number | Serial Number | Trade Name | Note |
|---|---|---|---|---|---|
| A | L25 FM TRANSMITTER | L25-N4580-40 | 1773306 | JR PROPO | EUT |
| B | Ni-MH Battery | 8H2000SC | - | - | 9.6V, 200mA |

[Note]
(1): Option of EUT

## 3.7. List of Cables

| No. | Cable Name | Shielded (Y/N) | Length (m) | Note | |
|---|---|---|---|---|---|
| 1 | Built-in Rod Antenna | - | 1.15 | - | - |

[Note]
(1) : Undetachable cable type
(2) : Accessories cable of EUT
(3) : 3-wires type,earth plug is grounded
(4) : 2-wires type

# 4. MAXIMUM TRANSMIT POWER (RADIATED)

## 4.1. Test Procedure

(1) Place the transmitter to be tested (EUT) on the turntable.
(2) For carrier frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer (*1) with the test antenna at horizontal polarity.
Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
(3) Repeat step (2) for carrier frequency with the test antenna polarized vertically.
(4) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
(5) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a carrier frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
(6) Repeat step (5) with both antenna vertically polarized for carrier frequency.
(7) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps (5) and (6) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.

[Note]

(*1) Spectrum Analyzer Set Up Conditions
Frequency range : 9kHz – 1GHz
Resolution bandwidth : 10kHz
Video bandwidth : 300kHz
Sweep time : Auto
Detector function : RMS Average

## 4.2. Test Results

| Carrier Frequency (MHz) | Spectrum Analyzer Reading | | RF Meter Reading | | Antenna Gain (dBi) | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|---|---|---|---|---|---|---|---|---|---|
| | Horizontal ( dBμV ) | Vertical ( dBμV ) | Horizontal (dBm) | Vertical (dBm) | | | | | |
| 72.55 | 100.3 | 97.5 | 18.4 | 16.9 | 2.15 | 0.5 | 17.9 | 61.7 | 750.0 |

[Note]
(1) ERP(dBm) = RF Meter Reading(dBm) + Antenna Gain(dBi) - 2.15(dB) - Cable Loss(dB)

| Tested Date | Environment | |
|---|---|---|
| | Temperature | Humidity |
| 5 June 2013 | 19 °C | 43 % |

M130702: This page (Page 7 of 14) is amended for the original test report (Report No. A-002-13-C, dated 21 June 2013).

## 5. R/C TRANSMITTER CHANNEL FREQUENCIES

### 5.1. Test Procedure

(1) Connect the equipment as illustrated.
(2) Operate the equipment in standby conditions for 15 minutes before proceeding.
(3) Record the carrier frequency of the transmitter as *MCF*MHz.
(4) Calculate the Frequency Drift by the following
Frequency Drift (%)

$$= (\frac{MCF_{MHz}}{ACF_{MHz}} - 1) \times 100$$

(5) Repeat with following conditions
Temperature: -30 °C ~ +50 °C
(Only at the time of 20 °C, it is measured also with minimum voltage. )

### 5.2. Test Result

**Test Voltage : 9.6V**

| ACF [ MHz ] | MCF [ MHz ] | TEMPERATURE [ ℃ ] | FREQUENCY DRIFT [ % ] | LIMIT [ % ] |
|---|---|---|---|---|
| 72.550000 | 72.550164 | -30 | 0.000226 | ±0.002 |
| | 72.550400 | -20 | 0.000551 | |
| | 72.550652 | -10 | 0.000899 | |
| | 72.550551 | 0 | 0.000760 | |
| | 72.550503 | +10 | 0.000693 | |
| | 72.550659 | +20 | 0.000908 | |
| | 72.549960 | +30 | -0.000055 | |
| | 72.549870 | +40 | -0.000179 | |
| | 72.549850 | +50 | -0.000207 | |

**Temperature : 20℃**

| ACF [ MHz ] | MCF [ MHz ] | SUPPLIED VOLTAGE [ V ] | FREQUENCY DRIFT [ % ] | LIMIT [ % ] |
|---|---|---|---|---|
| 72.550000 | 72.550659 | 8.5 | 0.000908 | ±0.002 |

[Note]
Reduced primary supply voltage to the operating and point which shall be specified by the manufacturer.

| Tested Date | Environment | |
|---|---|---|
| | Temperature | Humidity |
| 14 June 2013 | 24 °C | 45 % |

# 6. EMISSION BANDWIDTH

## 6.1. Test Procedure

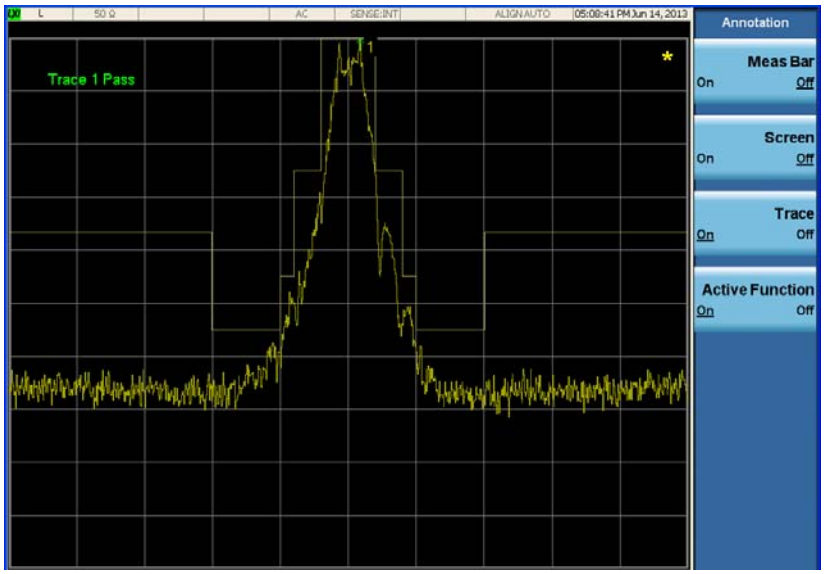
(1) Connect the EUT RF output port to spectrum analyzer via calibrated coaxial cable and suitable attenuator (if necessary).
(2) Activates the EUT System and execute the software prepared for test (if necessary).
(3) To find out the maximum emission condition, the transmitting data rate of EUT is set to maximum data rate (if necessary).
(4) The Spectrums are scanned and allow the trace stabilized.
(5) The emission bandwidth were measured by using “Trace Mode” and “Occupied BW” function of the spectrum analyzer (*1).

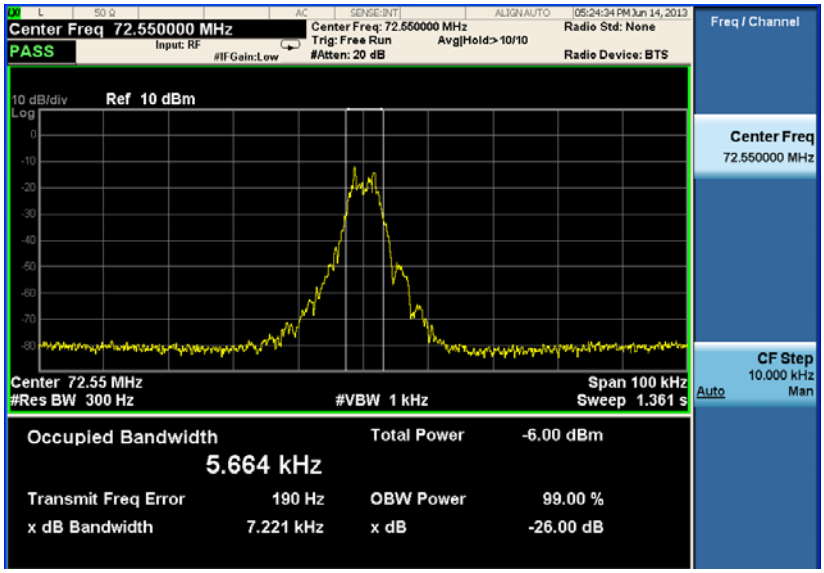
[Note]
(*1) Spectrum Analyzer Set Up Conditions

| | |
|---|---|
| Resolution bandwidth | : 300 Hz |
| Video bandwidth | : ≧3×RBW |
| Sweep | : Auto |
| Trace Mode | : Max Hold |

## 6.2. Test Results

Modulation
Trace mode of Spectrum Analyzer : Maximum Hold




| Frequency [ MHz ] | Emission Bandwidth [ kHz ] | LIMIT [ kHz ] |
|---|---|---|
| 72.550 | 5.664 (*1) | 8 |
| | 7.221 (*2) | |

[Note]
(*1) 99% Occupied Bandwidth
(*2) 26dB Emission Bandwidth

| Tested Date | Environment | |
|---|---|---|
| | Temperature | Humidity |
| 14 June 2013 | 24 °C | 45 % |

# 7. RADIATED EMISSION of TRANSMITTER (SPURIOUS and HARMONICS)

## 7.1. Test Procedure

(1) Place the transmitter to be tested (EUT) on the turntable.
(2) Measurements are investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to tenth harmonic of the carrier.
(3) For each spurious frequency, raise and lower the test antenna from 1m to 4m to obtain a maximum reading on the spectrum analyzer (*1) with the test antenna at horizontal polarity.
Then the turntable should be rotated 360° to determine the maximum reading. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
(4) Repeat step (3) for each spurious frequency with the test antenna polarized vertically.
(5) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At the lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3m above the ground.
(6) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
(7) Repeat step (6) with both antennas vertically polarized for each spurious frequency.
(8) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps (6) and (7) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
(9) The levels record in step (8) are the absolute levels of radiated spurious emissions in dBm.
The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions (dBc) =

$$10\log_{10}\left[\frac{\text{TX power in watts}}{0.001}\right] - \text{the levels in step (8)}$$

Note : It is permissible to use other antennas provided they can be referenced to a dipole.

[Note]

(*1) Spectrum Analyzer Set Up Conditions

| | |
|---|---|
| Frequency range | : 9kHz – 1GHz |
| Resolution bandwidth | : 10kHz |
| Video bandwidth | : 300kHz |
| Sweep time | : Auto |
| Detector function | : RMS Average |

## 7.2. Test Results

| Carrier Frequency (MHz) | Spectrum Analyzer Reading | | RF Meter Reading | | Antenna Gain (dBi) | Cable Loss (dB) | ERP (dBm) | RF Output Power (mW) | Limit (mW) |
|---|---|---|---|---|---|---|---|---|---|
| | Horizontal ( dBμV ) | Vertical ( dBμV ) | Horizontal (dBm) | Vertical (dBm) | | | | | |
| 72.55 | 100.3 | 97.5 | 18.4 | 16.9 | 2.15 | 0.5 | 17.9 | 61.7 | 750.0 |

| Measured Frequency (MHz) | Spectrum Analyzer Reading | | RF Meter Reading | | Antenna Gain (dBi) | Cable Loss (dB) | ERP (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Horizontal ( dBμV ) | Vertical ( dBμV ) | Horizontal (dBm) | Vertical (dBm) | | | | | |
| 145.10 | 44.8 | 38.5 | -34.1 | -35.8 | 2.15 | 0.7 | -34.8 | -26.0 | 8.8 |
| 217.65 | 43.1 | 36.4 | -31.5 | -32.8 | 2.15 | 0.8 | -32.3 | -26.0 | 6.3 |
| 290.20 | 37.1 | 34.1 | -38.4 | -37.2 | 2.15 | 0.9 | -38.1 | -26.0 | 12.1 |
| 362.75 | 37.6 | 37.5 | -40.1 | -39.5 | 2.15 | 1.1 | -40.6 | -26.0 | 14.6 |
| 435.30 | 28.2 | 27.2 | -47.4 | -47.6 | 2.15 | 1.2 | -48.6 | -26.0 | 22.6 |
| 507.85 | 27.0 | 25.6 | -49.6 | -48.9 | 2.15 | 1.3 | -50.2 | -26.0 | 24.2 |
| 580.40 | 19.7 | 15.9 | -54.0 | -55.8 | 2.15 | 1.4 | -55.4 | -26.0 | 29.4 |
| 652.95 | 21.9 | 19.6 | -51.9 | -50.7 | 2.15 | 1.4 | -52.1 | -26.0 | 26.1 |
| 725.50 | 26.4 | 24.6 | -44.8 | -45.0 | 2.15 | 1.5 | -46.3 | -26.0 | 20.3 |
| 798.05 | 27.2 | 24.1 | -42.9 | -44.3 | 2.15 | 1.6 | -44.5 | -26.0 | 18.5 |
| 870.60 | 18.8 | 15.2 | -49.5 | -51.9 | 2.15 | 1.7 | -51.2 | -26.0 | 25.2 |
| 943.15 | 23.4 | 19.5 | -45.1 | -47.4 | 2.15 | 1.7 | -46.8 | -26.0 | 20.8 |

[Note]

(1) ERP(dBm) = RF Meter Reading(dBm) + Antenna Gain(dBi) - 2.15(dB) - Cable Loss(dB)

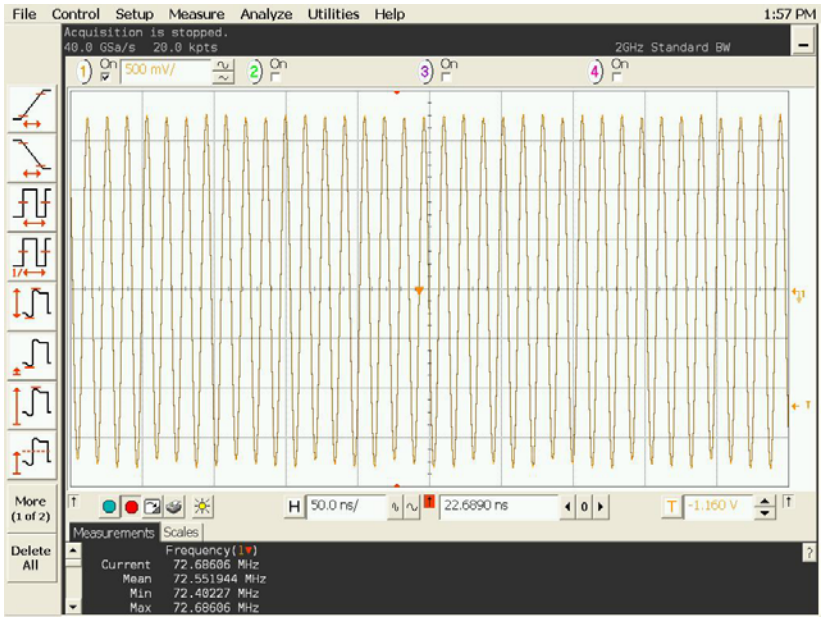
(2) For the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, the value of the twelve highest spurious emissions relative to the limit were reported.

| Tested Date | Environment | |
|---|---|---|
| | Temperature | Humidity |
| 5 June 2013 | 19 °C | 43 % |

# 8. MODULATION CHARACTERISTICS

## 8.1. Test Results

Waveform (F1D)




| Tested Date | Environment | |
|---|---|---|
| | Temperature | Humidity |
| 14 June 2013 | 24 °C | 45 % |

## 9. USED TEST EQUIPMENTS AND CALIBRATION STATUS

・Maximum Transmit Power (Radiated)
・Radiated Emission of Transmitter (Spurious and Harmonics)

| KEC No. | Equipment | Manufacturer | Model No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| AM-098 | Pre-Amplifier | SONOMA | SONOMA 310N | 2013/03 | 2014/03 |
| AN-054 | Loop Antenna | ROHDE & SCHWARZ | HFH2-Z2 | 2012/10 | 2013/10 |
| AN-220 | LPDA Antenna | Schwarzbeck | UHALP 9108A | 2013/04 | 2014/04 |
| AN-296 | Biconical Antenna | Schwarzbeck | VHBB9124 | 2013/04 | 2014/04 |
| AT-100 | 3dB Attenuator | JFW | 50HF-003 | 2013/03 | 2014/03 |
| AT-101 | 3dB Attenuator | JFW | 50HF-003 | 2013/03 | 2014/03 |
| FS-099 | Test Receiver | ROHDE & SCHWARZ | ESS | 2012/12 | 2013/12 |
| MM-302 | RF Selector | TOYO | NS4900 | 2013/04 | 2014/04 |
| SA-058 | Spectrum Analyzer | Agilent | N9010A | 2013/04 | 2014/04 |

・R/C Transmitter Channel Frequencies
・Emission Bandwidth
・Modulation Characteristics

| KEC No. | Equipment | Manufacturer | Model No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| AT-148 | Fixed Attenuator | Anritsu | 41KC-10 | 2013/03 | 2014/03 |
| CL-622 | Coaxial Cable | Suhner | Sucoflex 106 | 2013/03 | 2014/03 |
| SA-058 | Spectrum Analyzer | Agilent | N9010A | 2013/04 | 2014/04 |
| SF-093 | Temperature (& Humidity) Chamber | ESPEC CORP. | SH-641 | 2012/07 | 2013/07 |

Note : (*1) We check the performance, before using this device.

The overall program of calibration and verification of equipment is designed and operated so as to ensure that measurements made by KEC are traceable to national standards of measurement or equivalent abroad.