



RADIO TEST REPORT

Test Report No. : 30LE0087-HO-02-A

Applicant : ALPS ELECTRIC CO., LTD.

Type of Equipment : Remote Controller

Model No. : NSG-MR3U

FCC ID : CWTSBRT0700

Test regulation : FCC Part 15 Subpart C: 2010

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.

Date of test: December 8, 2010 to January 6, 2011

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SECTION 1: Customer information

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

2.1 Identification of E.U.T.

Type of Equipment : Remote Controller
Model No. : NSG-MR3U
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC3.0V
Receipt Date of Sample : December 6, 2010
Country of Mass-production : China
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

General Specification

Clock frequency(ies) in the system : Remote Controller: 8MHz, RF4CE module: 32MHz, WLAN: 40MHz

Radio Specification

WLAN11b/g

Radio Type : Transceiver
Frequency of Operation : 2412-2462MHz
Modulation : DSSS, OFDM
Power Supply (radio part input) : DC 3.3V
Antenna type : Planar Inverted F Antenna
Antenna Gain : -1.2dBi

Zigbee (RF4CE)

Radio Type : Transceiver
Frequency of Operation : 2425-2475MHz
Modulation : DSSS
Power Supply (radio part input) : DC 2.8V
Antenna type : lambda/4 Metal Antenna
Antenna Gain : 1.1dBi

*For Zigbee (RF4CE) part, please see Test Report No. 30LE0087-HO-02-B of UL Japan, Inc.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

*The revision on December 6, 2010 does not affect the test specification applied to the EUT.

* The EUT complies with FCC Part 15 Subpart B: 2009,final revised on December 6, 2010 and effective January 5, 2011.

3.2 Procedures and results

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|--|--|----------|------------------------|
| Conducted Emission | FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements IC: RSS-Gen 7.2.4 | FCC: Section 15.207 IC: RSS-Gen 7.2.4 | N/A | N/A *1) | - |
| 6dB Bandwidth | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a) | See data. | Complied | Conducted |
| Maximum Peak Output Power | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.8 | FCC: Section 15.247(b)(3) IC: RSS-210 A8.4(4) | | Complied | Conducted |
| Power Density | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: - | FCC: Section 15.247 (e) IC: RSS-210 A8.2(b) | | Complied | Conducted |
| Spurious Emission Restricted Band Edges | FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247" IC: RSS-Gen 4.9 | FCC: Section15.247(d) IC: RSS-210 A8.5 RSS-Gen 7.2.3 | 8.9dB 2390.000MHz, PK, Hori (11g Tx 2412MHz) | Complied | Conducted/ Radiated |

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*1) The test was not applicable, because the EUT is a DC operated device.

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

FCC 15.31 (e)

This EUT provides stable voltage(DC3.3V) constantly to RF part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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 antenna requirement of Section 15.203.

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3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|------------------------|-------------------|-------------------|--------------|---------|-----------|
| 99% Occupied Bandwidth | IC: RSS-Gen 4.6.1 | IC: RSS-Gen 4.6.1 | N/A | N/A | Conducted |

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

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

| Test room (semi-anechoic chamber) | Radiated emission (10m*)(±dB) | | |
|--------------------------------------|----------------------------------|------------------|-----------------|
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz |
| No.1 | 3.3dB | 5.2dB | 5.2dB |
| No.2 | - | - | - |
| No.3 | - | - | - |
| No.4 | - | - | - |

*10m = Measurement distance

| Test room (semi-anechoic chamber) | Radiated emission | | | | | | |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
| | (3m*)(±dB) | | | | (1m*)(±dB) | | (0.5m*)(±dB) |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 3.5dB | 5.1dB | 5.2dB | 4.8dB | 5.1dB | 4.4dB | 4.3dB |
| No.2 | 4.0dB | 5.1dB | 5.2dB | 4.8dB | 5.0dB | 4.3dB | 4.2dB |
| No.3 | 4.2dB | 4.7dB | 5.2dB | 4.8dB | 5.0dB | 4.5dB | 4.2dB |
| No.4 | 4.0dB | 5.0dB | 5.1dB | 4.8dB | 5.0dB | 5.1dB | 4.2dB |

*3m/1m/0.5m = Measurement distance

| Power meter (±dB) | |
|-------------------|------------|
| Below 1GHz | Above 1GHz |
| 1.0dB | 1.0dB |

| Antenna terminal conducted emission and Power density (±dB) | | | Antenna terminal conducted emission (±dB) | | Channel power (±dB) |
|--|-----------|------------|--|---------------|------------------------|
| Below 1GHz | 1GHz-3GHz | 3GHz-18GHz | 18GHz-26.5GHz | 26.5GHz-40GHz | |
| 1.0dB | 1.1dB | 2.7dB | 3.2dB | 3.3dB | 1.5dB |

Radiated emission test(3m and/or 10m)

The data listed in this test report has enough margin, more than the site margin.

3.5 Test Location

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| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|----------------------------|-------------------------|------------------------|----------------------------|--|------------------------|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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

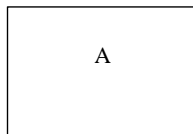
4.1 Operating Mode(s)

| Mode | Remarks* |
|---|------------|
| IEEE 802.11b (11b) | 1Mbps, PN9 |
| IEEE 802.11g (11g) | 6Mbps, PN9 |
| *Transmitting duty was 100% on all tests. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) | |
| EUT has the power settings by the software as follows; - Power settings: same as production model - Software: RFTest.exe, version 1.3 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. | |

*Details of Operating mode(s)

| Test Item | Operating Mode | Tested frequency |
|---|------------------|-------------------------------|
| Spurious Emission | 11b Tx 11g Tx | 2412MHz 2437MHz 2462MHz |
| Conducted Spurious Emission (below 30MHz) | 11b Tx 11g Tx | 2437MHz |
| 6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth | 11b Tx 11g Tx | 2412MHz 2437MHz 2462MHz |

4.2 Configuration and peripherals



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

Description of EUT

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|-------------------|--------------|---------------------|-------------------------|---------|
| A | Remote Controller | NSG-MR3U | UK34 *1) F35 *2) | ALPS ELECTRIC Co., Ltd. | EUT |

*1) Used for Radiated Emission test

*2) Used for Antenna Terminal Conducted test

SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

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

Test Antennas are used as below;

| | | | | |
|--------------|-------------|-----------------|----------------|------------|
| Frequency | Below 30MHz | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
| Antenna Type | Loop | Biconical | Logperiodic | Horn |

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

20dBc was applied to the frequency over the limit of FCC 15.209 / Table 2 of RSS-210 2.7 (IC) and outside the restricted band of FCC15.205 / Table 1 of RSS-210 2.7 (IC).

| | | | | |
|-----------------|----------------|---|------------------------|---|
| Frequency | Below 1GHz | Above 1GHz | | 20dBc |
| Instrument used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV | PK |
| IF Bandwidth | BW 120kHz(T/R) | RBW: 1MHz VBW: 3MHz | RBW: 1MHz VBW: 10Hz | RBW: 100kHz VBW: 300kHz (S/A) |
| Test Distance | 3m | 3m (below 10GHz), 1m*1) (above 10GHz), | | 3m (below 10GHz), 1m*1) (above 10GHz), |

*1) Distance Factor: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

| | |
|-------------------|-------------|
| Measurement range | : 30M-25GHz |
| Test data | : APPENDIX |
| Test result | : Pass |

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SECTION 6: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

| Test | Span | RBW | VBW | Sweep time | Detector | Trace | Instrument used |
|---|--|-----------------|--------------------|------------|----------|----------|--------------------------------|
| 6dB Bandwidth | 20MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Peak | Max Hold | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak | - | Power Meter (Sensor: 50MHz BW) |
| Peak Power Density | 18MHz | 30kHz | 100kHz | 600sec | Peak | Max Hold | Spectrum Analyzer *1) *2) |
| Conducted Spurious Emission *3) | 9kHz to 150kHz | 200Hz | 620Hz | Auto | Peak | Max Hold | Spectrum Analyzer |
| | 150kHz to 30MHz | 100kHz | 300kHz | | | | |
| | 30MHz-25GHz (Less or equal to 5GHz) | 100kHz | 300kHz | | | | |
| *1) PSD Option 1 of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247 ". | | | | | | | |
| *2) The test was not performed at RBW:3kHz however the measurement is to be performed with RBW:3kHz in the regulation, because, the measurement value with RBW:3kHz is less than the value of RBW:30kHz and the test data met the limit with RBW:30kHz. | | | | | | | |
| *3) In the frequency range below 150kHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.(9kHz-150kHz:RBW=200Hz) | | | | | | | |

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass