



RADIO TEST REPORT

Test Report No. : 27LE0180-YK-A-R1

Applicant : NEC Corporation
Type of Equipment : Factory Computer FC-NOTE series
Model No. : FC-N21S/BY5SS
FCC ID : BSFFC-N21S
Test standard : FCC Part 15 Subpart C 2007
Section 15.207, Section 15.247
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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. Original test report number of this report is 27LE0180-YK-A.

Date of test: August 2 to 10, 2007

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SECTION 1: Client information

| | |
|------------------|----------------------------------------------------------|
| Company Name | : NEC Corporation |
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| Telephone Number | : +81-43-333-1031 |
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| Contact Person | : Aya Igarashi |

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

2.1 Identification of E.U.T.

| | |
|------------------------|-----------------------------------------------|
| Type of Equipment | : Factory Computer FC-NOTE series |
| Model No. | : FC-N21S/BY5SS |
| Serial No. | : S760538MA |
| Rating | : DC16V/3A AC Adaptor: AC100-240V, 50/60Hz |
| Country of Manufacture | : Japan |
| Receipt Date of Sample | : August 1, 2007 |
| Condition of EUT | : Production model |
| Modification of EUT | : No modification by the test lab. |

2.2 Product Description

FC-N21S/BY5SS is Factory Computer FC-NOTE series.
EUT's Clock frequencies are 1.2GHz (CPU), 40MHz(Wireless LAN port).
FCC/IC granted RF module (model No.: WM3945ABG, FCC ID: FD9WM3945ABG / IC Number: 1000M-3945ABG) is installed in the EUT.

The EUT has variant models as follows:

[Example]

FC-N21S/ u v w x y z :

u= Keyboard :

B: Standard keyboard, C: Keyboard with backlight, E: Standard keyboard with cover,
F: Keyboard with backlight with cover

v= OS :

Y: Windows XP Professional SP2 English version, X: Windows XP Professional SP2 Japanese version

w= Memory capacities :

5: 2GBytes, 2: 256Mbytes, 3: 512Mbytes, 4: 1Gbytes

y= HDD / Battery :

S: Standard HDD(60GB) & Standard Battery,
W: Wide range Temperature HDD(40GB) & Wide range Temperature Battery,
F: Silicon Disk (IDE 8GB) & Standard Battery,
L: Silicon Disk (IDE 8GB) & Light Battery

z= WLAN / Security :

S: With Wireless LAN
W: With Wireless LAN & fingerprint authentication
F: With fingerprint authentication
Z: -

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IEEE802.11b / 11g / 11a WLAN

| | | | |
|------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Equipment Type | Transceiver | | |
| Frequency of Operation | 11b/11g | 2412MHz - 2462MHz | |
| | 11a | Low | 5180MHz - 5240MHz *1) |
| | | Mid | 5260MHz - 5320MHz *1) *2) |
| | | Upper | 5745MHz - 5805MHz *1) |
| | | | 5825MHz |
| Channel Support | 11b/11g (11Channels) | 2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462MHz | |
| | 11a (13 Channels) | 5180, 5200, 5220, 5240, 5260, 5280, 5300, 5320MHz 5745, 5765, 5785, 5805, 5825MHz | |
| Type of Modulation | 11b | DSSS (DBPSK, DQPSK, CCK) | |
| | 11g/a | OFDM (BPSK, QPSK, 16QAM, 64QAM) | |
| Channel spacing | 11b/11g | 5MHz | |
| | 11a | 20MHz | |
| ITU code | D1D, G1D | | |
| Antenna Type | Monopole | | |
| Antenna Connector Type | U.FL R-SMT | | |
| Antenna Gain | 11b/11g | Main: max +0.81dBi Aux: max +0.22dBi | |
| | 11a | Main: max +0.41dBi(5180-5320MHz), -0.82dBi(5745MHz-5820MHz) Aux: max -1.12dBi(5180-5320MHz), -1.46dBi(5745MHz-5820MHz) | |

*1) Refer to 27LE0180-YK-B (FCC part 15E (FCC 15.407) report).

*2) Refer to 27LE0221-HO-A (FCC Part 15E (FCC 15.407 DFS) report).

Remarks : This Wireless Module consists of 1 chip each of 2.4GHz band and 5GHz band.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

| | | |
|--------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Specification | : | FCC Part15 Subpart C: 2007 |
| 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 |

FCC 15.31 (e)

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

FCC Part 15.203 Antenna requirement

This EUT complies with the requirement of 15.203, because a unique coupling (antenna connector, Type: U.FL R-SMT) is used for this EUT.

3.2 Procedures and results

| No. | Item | Test Procedure | Specification | Remarks | Deviation | Worst margin | Results |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------|-----------|-----------------------------------------------------------------------------------------------------|----------|
| 1 | Conducted emission | FCC: ANSI C63.4:2003 7. AC powerline conducted emission measurements IC: RSS-Gen 7.2.2 | FCC: Section 15.207 IC: RSS-Gen 7.2.2 | - | N/A | [Tx] 11.5dB 0.21818MHz AV, N [Rx] 11.4dB 0.21833MHz AV, N | Complied |
| 2 | 6dB Bandwidth | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.6.2 | FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a) | Conducted | N/A | See data. | Complied |
| 3 | Maximum Peak Output Power | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.8 | FCC: Section 15.247(b)(3) IC: RSS-210 A8.4(4) | Conducted | N/A | | Complied |
| 4 | Restricted Band Edges | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.247 (d) IC: RSS-210 A8.5 | Conducted/ Radiated | N/A | | Complied |
| 5 | Power Density | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: - | FCC: Section 15.247 (e) IC: RSS-210 A8.2(b) | Conducted | N/A | | Complied |
| 6 | Spurious Emission | FCC: ANSI C63.4:2003 13. Measurement of intentional radiators IC: RSS-Gen 4.9 RSS-Gen 4.10 | FCC: Section 15.247(d) IC: RSS-210 A8.5 RSS-Gen 7.2.1 and 7.2.3 | Conducted/ Radiated | N/A | [Tx] 3.8dB 453.821MHz QP, Vert. [Rx] 3.8dB 453.751MHz, 453.765MHz QP, Vert. | Complied |

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

*These tests were also referred to "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

| No. | Item | Test Procedure | Specification | Remarks | Deviation | Worst margin | Results |
|-----|-------------------------|----------------|---------------|-----------|-----------|--------------|---------|
| 1 | 99% Occupied Band Width | RSS-Gen 4.6.1 | RSS-Gen 4.6.1 | Conducted | N/A | N/A | N/A |

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3.4 Uncertainty

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

Conducted Emission

The measurement uncertainty for this test is $\pm 2.66\text{dB}$.

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

Spurious Emission (Radiated)

The measurement uncertainty for this test using Biconical antenna is $\pm 4.59\text{dB}(3\text{m})$.

The measurement uncertainty for this test using Logperiodic antenna is $\pm 4.62\text{dB}(3\text{m})$.

The measurement uncertainty for this test using Horn antenna is $\pm 5.27\text{dB}$.

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is $\pm 3.0\text{dB}$.

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 | IC4247 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | IC4247-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | IC4247-3 | 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 | IC4247-4 | 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 | - |

* 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, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

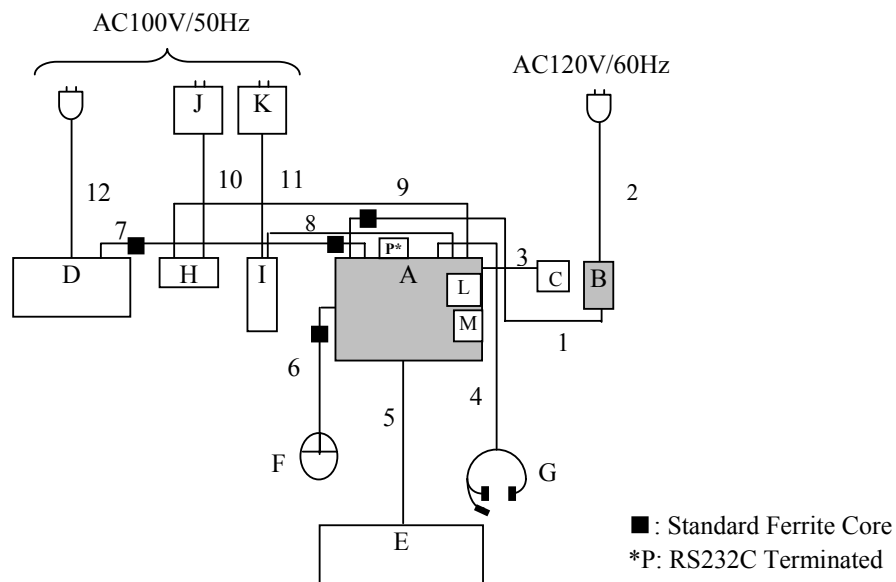
4.1 Operating Modes

The mode was used as shown on the following table:

| Test Item | Test mode | Test frequency |
|---------------------------------------------------------------------------------------|------------------------------------------|----------------|
| Conducted Emission Spurious Emission | 11b, Transmitting (Tx), 11Mbps, Main ANT | 2412MHz |
| | 11g, Transmitting (Tx), 54Mbps, Main ANT | 2437MHz |
| | | 2462MHz |
| | 11b, Receiving (Rx), 11Mbps, Main ANT | 2437MHz |
| | 11g, Receiving (Rx), 54Mbps, Main ANT | |
| 6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth | 11a, Transmitting (Tx), 12Mbps, Main ANT | 5825MHz |
| | 11a, Receiving (Rx), 12Mbps, Main ANT | 5825MHz |
| | 11b, Transmitting (Tx), 11Mbps, Main ANT | 2412MHz |
| | 11g, Transmitting (Tx), 54Mbps, Main ANT | 2437MHz |
| | | 2462MHz |
| | 11a, Transmitting (Tx), 12Mbps, Main ANT | 5825MHz |

Taking into consideration preliminary test result and antenna gain, the formal test was performed with the above modes, which had the maximum power.

4.2 Configuration and peripherals



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

Description of EUT and support equipment

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|---------------------------------|------------------------|--------------------|---------------------|---------|
| A | Factory Computer FC-NOTE series | FC-N21S/BY5SS | S760538MA | NEC | EUT |
| B | AC Adaptor | AD7216N2L | F663AA00F701F | NEC | EUT |
| C | FDD | CF-VFUDU03 | 19308800-030322374 | Panasonic | - |
| D | Monitor | E173FPc | 64180-59T-197C | DELL | - |
| E | Keyboard | TK-U12FY | 040107169 | ELECOM | - |
| F | Mouse | M-UB48 | LZE0201001 | Logitech | - |
| G | Headset | HST601-BL | - | Arvel | - |
| H | Data Fax Modem | LFM-288BS | 56L10220306 | Logitec | - |
| I | 10M 5port HUB | LGH-M5P | 16440726704980 | Buffalo | - |
| J | AC Adapter | AM-128100AT | - | AMIGO | - |
| K | AC Adapter | DV-7580J | 0702 | DFE VAN ELE. | - |
| L | Compact Flash | Compact Flash 128MB | - | HAGIWARA SYS-COM | - |
| M | Compact Flash Card Adapter | HPC-ADP01 | MACS003467 | HAGIWARA SYS-COM | - |
| P | RS-232C Loopback Connector | - | - | NEC | - |

List of cables used

| No. | Name | Length (m) | Shield | |
|-----|------------------|------------|------------|------------|
| | | | Cable | Connector |
| 1 | DC cable | 1.9 | Unshielded | Unshielded |
| 2 | AC cable | 2.0 | Unshielded | Unshielded |
| 3 | FDD signal cable | 0.3 | Shielded | Shielded |
| 4 | Headset cable | 1.8 | Shielded | Shielded |
| 5 | Keyboard cable | 1.4 | Unshielded | Unshielded |
| 6 | Mouse cable | 0.8 | Shielded | Shielded |
| 7 | RGB cable | 1.8 | Shielded | Shielded |
| 8 | LAN cable | 5.0 | Unshielded | Unshielded |
| 9 | TEL cable | 2.4 | Unshielded | Unshielded |
| 10 | DC cable | 1.9 | Unshielded | Unshielded |
| 11 | DC cable | 1.9 | Unshielded | Unshielded |
| 12 | AC cable | 1.8 | Unshielded | Unshielded |

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a wooden table a wooden table of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cable and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

| | |
|--------------------------|--------------------------------------------------------|
| Detector | : quasi-peak and average detector (IF BW 9 kHz) |
| Measurement range | : 0.15-30MHz |
| Test data | : APPENDIX 2 |
| Test result | : Pass |

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SECTION 6: Spurious Emission

[Conducted]

Test Procedure

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2

Test result : Pass

[Radiated]

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.

The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).

The height of the measuring 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 with the Test Receiver, or 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.

In any 100kHz bandwidth outside the frequency 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 |
| Instrument used | Test Receiver / Spectrum Analyzer | Spectrum Analyzer |
| Detector | QP: BW 120kHz(T/R) | PK: RBW:1MHz/VBW: 1MHz |
| IF Bandwidth | 20dBc : RBW: 100kHz VBW: 300kHz (S/A) | AV: RBW:1MHz/VBW:10Hz 20dBc : RBW:100kHz/VBW:300kHz |

- 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.

Test data : APPENDIX 2

Test result : Pass

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SECTION 7: Bandwidth

Test Procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

| | |
|-------------|--------------|
| Test data | : APPENDIX 2 |
| Test result | : Pass |

SECTION 8: Maximum Peak Output Power

Test Procedure

The Maximum Peak Output Power was measured with a power meter (tested bandwidth: 50MHz) connected to the antenna port.
It was measured based on "Power Output Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

| | |
|-------------|--------------|
| Test data | : APPENDIX 2 |
| Test result | : Pass |

SECTION 9: Peak Power Density

[Conducted]

Test Procedure

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.
It was measured based on "PSD Option 1" of "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247".

| | |
|-------------|--------------|
| Test data | : APPENDIX 2 |
| Test result | : Pass |