# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CLASS B CERTIFICATION

| | |
|---|---|
| **Test report file number** | **: E027R-029** |
| **Applicant** | **: HBrain Inc.** |
| **Address** | **: #702 Kwanglim Bldg 179 Kumi Dong, Bundang Gu, Seongnam, Gyeonggi Do, Korea** |
| **Manufacturer** | **: Meungsung Electronics** |
| **Address** | **: #293-18, Gongdan-Dong, Gumi-City, Kyung –Buk, Korea** |
| **Type of Equipment** | **: E-SolyGate** |
| **FCC ID** | **: QI5SOLYREF2002C06** |
| **Model / Type No.** | **: SOLY-REF2002-C** |
| **Serial number** | **: N/A** |
| **Total page of Report** | **: 14 pages (including this page)** |
| **Date of Incoming** | **: May 15, 2002** |
| **Date of issuing** | **: July 14, 2002** |

## SUMMARY

The equipment complies with the regulation; ***FCC CFR 47 PART 15 SUBPART B, Class B.***

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by:
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ONETECH Corp.

 

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## 1. VERIFICATION OF COMPLIANCE

APPLICANT : HBrain Inc.

ADDRESS : #702 Kwanglim Bldg 179 Kumi Dong, Bundang Gu, Seongnam, Gyeonggi Do, Korea

CONTACT PERSON : Tae-woo Kim / Division Manager

TELEPHONE NO : +82-31-726-1188

FCC ID : QI5SOLYREF2002C06

MODEL NO/NAME : SOLY-REF2002-C

SERIAL NUMBER : N/A

DATE : July 14, 2002

| | |
|---|---|
| DEVICE TYPE | Peripheral Device for Class B Computing Device<br>-Unintentional Radiator |
| E.U.T. DESCRIPTION | E-SolyGate |
| THIS REPORT CONCERNS | ORIGINAL GRANT |
| MEASUREMENT PROCEDURES | ANSI C63.4/1992 |
| TYPE OF EQUIPMENT TESTED | PRE-PRODUCTION |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED | CERTIFICATION |
| EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S) | FCC PART 15 SECTION 15.101 |
| MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE | Yes |
| FINAL TEST WAS CONDUCTED ON | 3 METER OPEN AREA TEST SITE |

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

 

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## 2. GENERAL INFORMATION

### 2.1 Product Description

The HBrain Inc., Model SOLY-REF2002-C (referred to as the EUT in this report) is an E-SolyGate, which is trade name of the Hbrain Inc., and EUT can control and monitor power line communication remotely with power line and ethernet. The EUT has an AC100-240V Power line port for power line communication and controlling control device through power line. It is only for communication, not supply electrical power to another system. Product specification described herein was obtained from product data sheet or user's manual.

| | |
|---|---|
| CHASSIS TYPE | Plastic - Coated |
| LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz) | 50.0MHz, 25.0MHz, and 10.0MHz on the main board, 3.6864MHz, 10.00MHz on the network interface module. |
| POWER REQUIREMENT | 1. AC Input for Power Line Communication: 100-240 V ac, 50/60 Hz<br>2. DC Input Voltage for Operation: +5V/1.5, +12V/0.8A |
| NUMBER OF LAYERS | 4Layers: main board, 2Layers: network interface module |
| SIZE | 250 x 180 x 40 (mm) |
| EXTERNAL CONNECTOR | LAN 2Ports, RS-232C Port, DC Input, AC 100-240V Power Port. |
| MEMORY | 64MB Flash / 64MB RAM |
| PROCESSOR | MPC850DCZT50A-50MHz |
| LED | RUN, EXT, INT, PKD |

Model Differences:

-. None

### 2.2 Related Submittal(s) / Grant(s)

Original submittal only.


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## 2.3 Test System Details

The model numbers for all the equipments which were used in the tested system is:

| Model | Manufacturer | FCC ID | Description | Connected to |
|---|---|---|---|---|
| SOLY-REF2002-C | HBrain Inc. | QI5SOLYREF2002C06 | E-SolyGate (EUT) | NOTEBOOK PC |
| PSD-202DAG3 | Samsung Elec. | DoC | SMPS | EUT |
| SENS V10 | Samsung Elec. | DoC | NOTEBOOK PC | - |
| AD-601P | Samsung Elec. | N/A | AC/DC ADAPTOR | NOTEBOOK PC |
| 2225C | HP | DSI6XU2225 | PRINTER | NOTEBOOK PC |

## 2.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4/1992.

Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

## 2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Si, Kyunggi-Do, 464-080, Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)

 

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# 3. SYSTEM TEST CONFIGURATION

## 3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER | MODEL/PART NUMBER | FCC ID |
|---|---|---|---|
| CPU Board | HBrain Inc. | N/A | N/A |

## 3.2 EUT exercise Software

The EUT and peripheral equipments were connected as follows;

The external ports on the EUT were 2 LAN Ports, a RS-232C Port, a DC Input port and a Power line port.

The LAN and/or RS-232C ports on the EUT were connected to LAN and/or RS-232C ports on the Note PC for transferring data and the other LAN port on the EUT was terminated as a resistor by using proper cable, and AC Power line cable for communication and the other equipment (same as EUT) were connected to together for communication through power line cable.

During the test, continuously communicated between the EUT and the other equipment (same as EUT) under above condition.

## 3.3 Cable Description

| | Power Cord Shielded (Y/N) | I/O cable Shielded (Y/N) | Length (M) |
|---|---|---|---|
| E-SolyGate (EUT) | N | Y | 1.5(P), 1.8 (D) |
| SMPS | N | N/A | 1.5(P) |
| Notebook PC | N | Y | 1.5(P), 1.2(D) |
| AC/DC ADAPTOR | N | N/A | 1.5(P) |
| PRINTER | N | Y | 1.5(P), 1.2 (D) |

* The marked “(P)” means the Power Cable, “(D)” means the Data Cable.


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## 3.4 Noise Suppression Parts on Cable

| | **Ferrite Bead (Y/N)** | **Location** | **Metal Hood (Y/N)** | **Location** |
|---|---|---|---|---|
| E-SolyGate (EUT) | N | N/A | Y | BOTH END |
| SMPS | N | N/A | - | - |
| Notebook PC | N | N/A | Y | BOTH END |
| AC/DC ADAPTOR | Y | NOTEPC END | Y | NOTEPC END |
| PRINTER | N | N/A | Y | BOTH END |

## 3.5 Equipment Modifications

To achieve compliance to CLASS B levels, the following change(s) was made by Hbrain during compliance testing:

-. Added electric conduction coating at inner parts of the EUT enclosure.

## 3.6 Configuration of Test System

Line Conducted Test: The power Line of the EUT, the SMPS for DC power of the EUT and the power line of another equipment (same as EUT) were connected to LISN together, all supporting equipment was connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4/1992 7.2.3 to determine the worse operating conditions.

Radiated Emission Test: Preliminary radiated emission test was conducted using the procedure in ANSI C63.4/1992 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 meters open area test site.



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## 4. PRELIMINARY TEST

### 4.1 Conducted Emission Test

During Preliminary Test, the following operating mode was investigated.

| **Operation Mode** | **The Worse operating condition (Please check one only)** |
|---|---|
| Stand by mode | |
| Continuously communication through the power line between an EUT and the other equipment (such as EUT) | X |

### 4.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated.

| **Operation Mode** | **The Worse operating condition (Please check one only)** |
|---|---|
| Stand by mode | |
| Continuously communication through the power line between an EUT and the other equipment (such as EUT) | X |



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## 5. FINAL RESULT OF MEASURMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

### 5.1 Conducted Emission Test

Humidity Level : 47 % Temperature : 22°C

Limits apply to : FCC CFR 47, PART 15, SUBPART B

Type of Test : CLASS B

Result : PASSED BY –7.84 dB at 6.38 MHz

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EUT : E-SolyGate Date: July 12 2002

Operating Condition : Continuously communication through power line between an EUT and the equipment such as EUT

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

| Power Line Conducted Emission | | | FCC CLASS B | |
|---|---|---|---|---|
| **Frequency (MHz)** | **Amplitude (dBuV)** | **Conductor** | **Limit (dBuV)** | **Margin (dB)** |
| 0.53 | 39.72 | HOT | 48.00 | -8.23 |
| 0.81 | 39.18 | HOT | 60.00 | -22.08 |
| 2.33 | 37.13 | HOT | 48.00 | -10.87 |
| 3.04 | 36.28 | HOT | 48.00 | -11.72 |
| 4.46 | 38.99 | HOT | 48.00 | -9.01 |
| 6.38 | 40.16 | HOT | 48.00 | -7.84 |
| 7.80 | 38.97 | HOT | 48.00 | -9.03 |
| 20.26 | 32.95 | NEUTRAL | 48.00 | -15.05 |

Line Conducted Emission Tabulated Data

Soung chel - You

**Tested by: Soung chel, You / Test Engineer**

 

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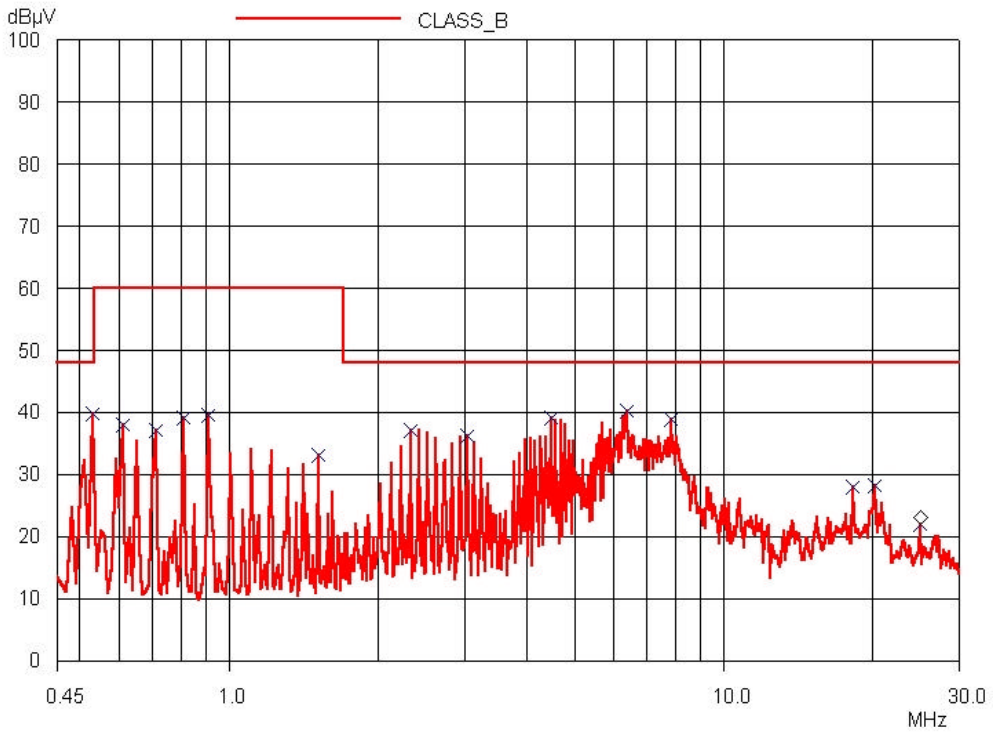
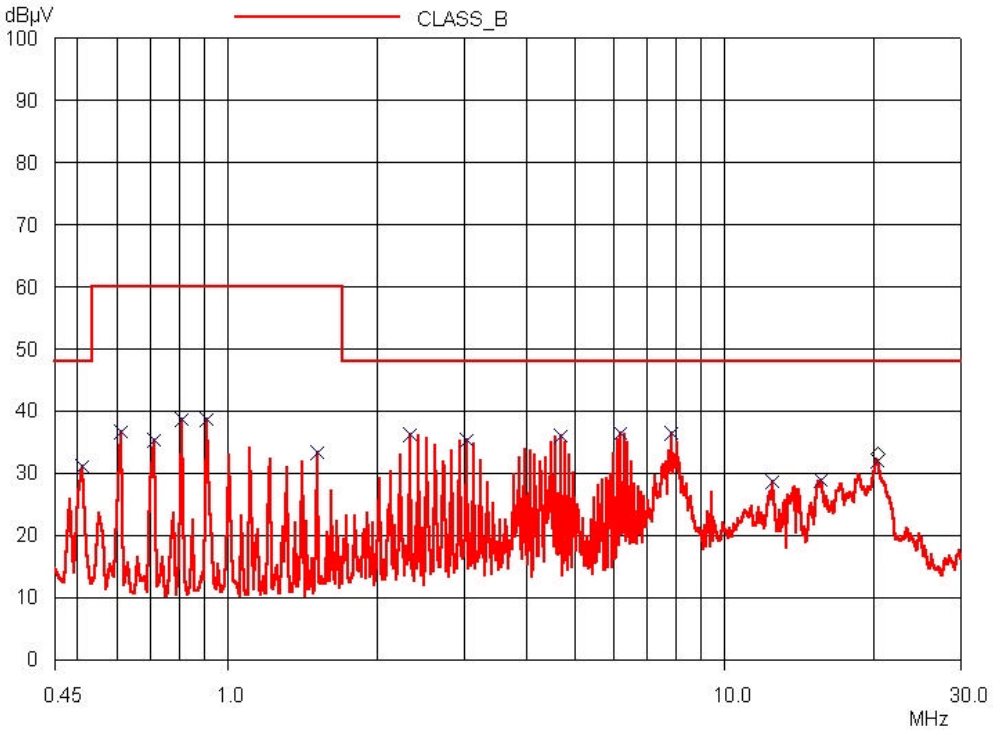



HOT LINE




NEUTRAL LINE

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## 5.2 Radiated Emission Test for frequency range (0.15 ~ 30MHz)

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 49 % Temperature : 24°C

Limits apply to : FCC CFR 47, PART 15, SUBPART C

Type of Test : CLASS B

Result : PASSED

EUT : E-SolyGate Date: July 12, 2002

Operating Condition : Continuously communication through power line between an EUT and the equipment such as EUT

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Distance : 3 Meter

| Radiated Emission | | Ant | Correction Factors | | Total | FCC CLASS B | |
|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | Pol. | Ant. (dBuV/m) | Cable (dB) | Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| | | | | | | | |
| | | | | | | | |
| | It was not observed any emission noise during the test. | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Radiated Emission Tabulated Data

Soung chel - You

**Tested by: Soung chel, You / Project Engineer**

 

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## 5.3 Radiated Emission Test for frequency range (30 ~ 1000MHz)

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 49 % Temperature : 24°C

Limits apply to : FCC CFR 47, PART 15, SUBPART B

Type of Test : CLASS B

Result : PASSED BY –4.05 dB at 75.0 MHz

EUT : E-SolyGate Date: July 12, 2002

Operating Condition : Continuously commu nication through power line between an EUT and the equipment such as EUT

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)

Distance : 3 Meter

| Radiated Emission | | Ant | Correction Factors | | Total | FCC CLASS B | |
|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | Pol. | Ant. (dBuV/m) | Cable (dB) | Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 50.00 | 21.90 | V | 10.79 | 0.93 | 33.62 | 40.00 | -6.38 |
| 75.00 | 27.88 | V | 7.07 | 1.00 | 35.95 | 40.00 | -4.05 |
| 124.85 | 22.90 | V | 13.20 | 1.25 | 37.35 | 43.50 | -6.15 |
| 150.00 | 24.00 | V | 13.48 | 1.35 | 38.83 | 43.50 | -4.67 |
| 400.00 | 24.00 | H | 15.22 | 2.43 | 41.65 | 46.00 | -4.35 |
| 450.00 | 22.42 | H | 16.30 | 2.55 | 41.27 | 46.00 | -4.73 |
| 500.00 | 17.90 | H | 17.52 | 2.68 | 38.10 | 46.00 | -7.90 |
| 699.60 | 17.50 | V | 20.81 | 3.31 | 41.82 | 46.00 | -4.18 |
| 800.00 | 15.50 | H | 21.26 | 3.71 | 40.47 | 46.00 | -5.53 |
| 850.00 | 15.70 | H | 22.23 | 3.95 | 41.78 | 46.00 | -4.22 |

Radiated Emission Tabulated Data

Soung chel - You

**Tested by: Soung chel, You / Project Engineer**

 

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## 6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

| | | |
|---|---|---|
| + | Meter reading | (dBuV) |
| + | Cable Loss | (dB) |
| + | Antenna Factor (Loss) | (dB/meter) |
| = | Corrected Reading | (dBuV/meter) |
| - | Specification Limit | (dBuV/meter) |
| = | dB Relative to Spec | (+/- dB) |



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## 7. LIST OF TEST EQUIPMENT

| No. | EQUIPMENTS | MFR. | MODEL | SER. NO. | LAST CAL | DUE CAL | USE |
|---|---|---|---|---|---|---|---|
| 1. | Test receiver | R/S | ESVS 10 | 827864/005 | OCT/01 | 12MONTH | ■ |
| 2. | Test receiver | R/S | ESHS10 | 834467/007 | APR/02 | 12MONTH | ■ |
| 3. | Spectrum analyzer | HP | 8568B | 3026A0226 | APR/02 | 12MONTH | ■ |
| 4. | RF preselector | HP | 85685A | 3107A01264 | APR/02 | 12MONTH | ■ |
| 5. | Quasi-Peak Adapter | HP | 85650A | 3107A01542 | APR/02 | 12MONTH | ■ |
| 6. | Loop antenna | EMCO | 6502 | 991220 | APR/02 | 12MONTH | ■ |
| 7. | Biconical antenna | EMCO | 3104C | 9109-4441<br>9109-4443<br>9109-4444 | APR/02 | 12MONTH | ■ |
| 8. | Log Periodic antenna | EMCO | 3146 | 9109-3213<br>9109-3214<br>9109-3217 | APR/02 | 12MONTH | ■ |
| 9. | LISN | EMCO | 3825/2 | 9109-1867<br>9109-1869 | JUL/02 | 12MONTH | ■ |
| 10. | Computer System<br>Hard disk drive | HP | 98581C<br>9153C | 98543A<br>CMC762Z9153 | N/A<br>N/A | N/A<br>N/A | ■<br>■ |
| 11. | Plotter | HP | 7475A | 30052 22986 | N/A | N/A | ■ |
| 12. | Position Controller | EMCO | 1090 | 9107-1038 | N/A | N/A | ■ |
| 13. | Turn Table | EMCO | 1080-1.21 | 9109-1576 | N/A | N/A | ■ |
| 14. | Antenna Master | EMCO | 1070-1 | 9109-1624 | N/A | N/A | ■ |

* Mark ■ mean used equipment.



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