



## Compliance Test Report for FCC

|   |  |  |   |   |            |
|---|--|--|---|---|------------|
| Report Number   |  | ESTF150210-002                                     |   |   |            |
| Applicant   | Company name   | SHIN-OH ELECTRONICS CO., LTD.                      |   |   |            |
|   | Address  | #729-5, Bonoh-Dong, Ansan-City, Kyounggi-Do, Korea |   |   |            |
|   | Telephone  | 82-31-406-3702                                     |   |   |            |
| Product   | Product name   | WIRELESS LAN CARD                                  |   |   |            |
|   | Model No.  | SP-1001  | Manufacturer                                | SHIN-OH ELECTRONICS CO., LTD.   |            |
|   | Serial No.   | NONE   | Country of origin                           | KOREA   |            |
| Test date   | 2002-09-24   | ~  | 2002-10-01                                  | Date of issue   | 2002-10-23 |
| Testing location  | ESTECH. Co., Ltd.<br>97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea |  |   |   |            |
| Standard  | FCC PART 15.247 2002 , ANSI C 63.4 2001  |  |   |   |            |
| Test item   | <input checked="" type="checkbox"/> Conducted Emission                         | <input type="checkbox"/> Class A                   | <input checked="" type="checkbox"/> Class B | Test result   | OK         |
|   | <input checked="" type="checkbox"/> Radiated Emission                          | <input type="checkbox"/> Class A                   | <input checked="" type="checkbox"/> Class B | Test result   | OK         |
| Measurement facility registration number  |  | 94696  |   |   |            |
| Tested by   | Senior Engineer J.M. Yang  |  | (Signature)                                 |  |            |
| Reviewed by   | Director T.K. Lee  |  | (Signature)                                 |  |            |
| Abbreviation  | OK, Pass = Passed, Fail = Failed, N/A = not applicable                         |  |   |   |            |
| <p>* Note</p> <ul style="list-style-type: none"> <li>- This test report is not permitted to copy partly without our permission</li> <li>- This test result is dependent on only equipment to be used</li> <li>- This test result based on a single evaluation of one sample of the above mentioned</li> </ul> |  |  |   |   |            |

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Appendix 1. Spectral diagram

Appendix 2. Photographs of EUT in side PCB

Appendix 3. Block diagram of EUT

Appendix 4. Circuit Diagram



## 1. Laboratory Information

### 1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report.

ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

### 1.2 Test Lab.

Corporation Name : ESTECH Co. Ltd

Head Office : 3 rd Fl., Chungdam Bldg., 119-1 Chungdam-dong Kangnam-gu , Seoul, Korea  
(Safety & Telecom. Test Lab)

EMC Test Lab : 58-1 Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea  
97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea

Branch Office : USA-ESTECH INC.

21801 Stevens Creek Blvd. Suite 2A Cupertino, CA95014

### 1.3 Official Qualification(s)

MIC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

## 2. Description of EUT

### 2.1 Summary of Equipment Under Test

Product : WIRELESS LAN CARD  
Model Number : SP-1001  
Serial Number : NONE  
Manufacturer : SHIN-OH ELECTRONICS CO., LTD.  
Country of origin : KOREA  
Rating : PC Power using (DC 3.3V, DC5V)  
Receipt Date : 2002-09-11

### 2.2 General descriptions of EUT

LANCASTER(SP-1001) Wireless LAN PC card is fully Compatible with IEEE 802.11b Standard and Supports a high Data rate up to 11Mbps. "LANCASTER(SP-1001) Wireless LAN PC Card" will operate in 2.4 GHz Direct Sequence Spread Spectrum (DSSS) for wireless networks in the home or office environment. You can use internet within wireless Network at anytime in anyplace. In addition, the EnGenius Wireless LAN PC Card uses a 64/128-bit WEP Encryption for a secure network connection. The LANCASTER(SP-1001) Wireless LAN PC Card is compatible with Windows 98, ME, 2000, and XP.

### 3. Test Standards

Test Standard : FCC PART 15 (2002)

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.4 (2001)

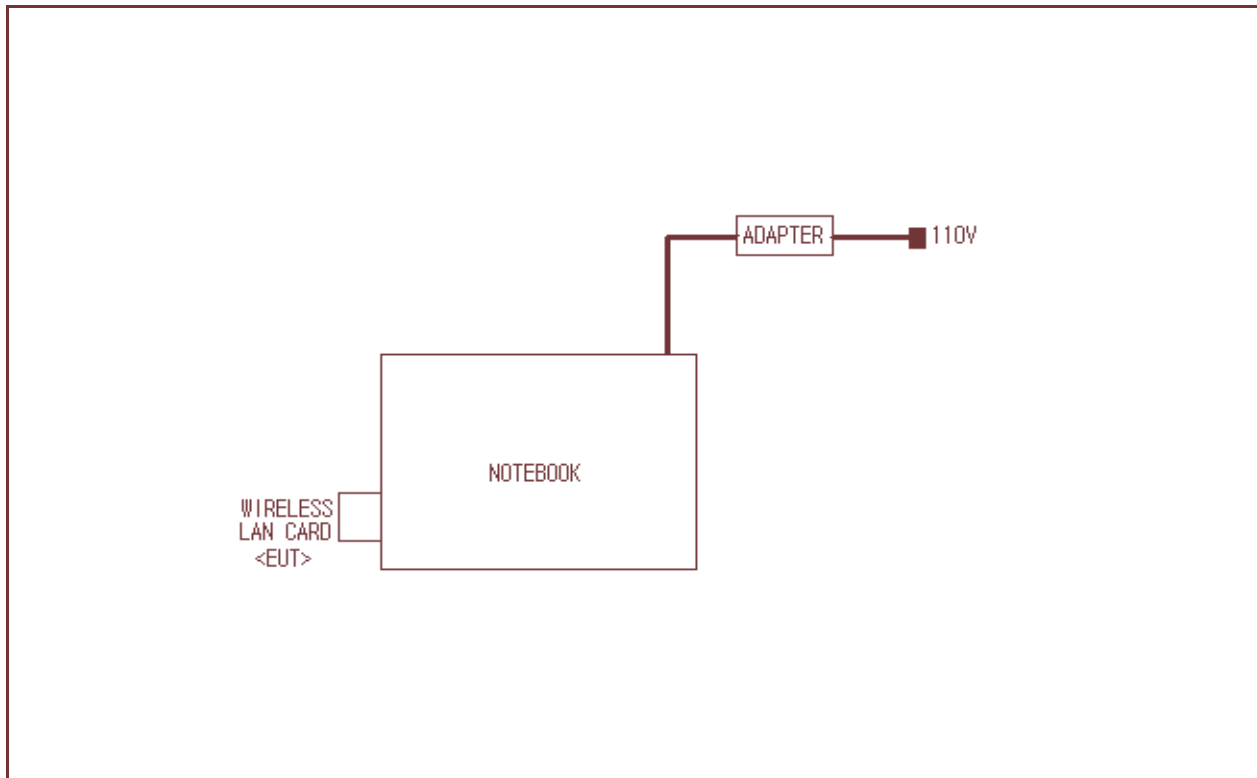
This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

## 4. Measurement Condition

### 4.1 EUT Operation.

- \* The EUT was in the following operation mode during all testing
- \* The operational conditions of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission
- \* Each channel RX/TX, we tested EUT at each channel TX mode(1.6.11) and RX mode

### 4.2 Configuration and Peripherals



### 4.3 EUT and Support equipment

| Equipment Name    | Model Name | S/N         | Manufacturer                  | Remark (FCC ID) |
|-------------------|------------|-------------|-------------------------------|-----------------|
| WIRELESS LAN CARD | SP-1001    | NONE        | SHIN-OH ELECTRONICS CO., LTD. | EUT             |
| NOTEBOOK COMPUTER | 2662-E6U   | FX-X8468    | IBM                           | ANOSY3W26629DX  |
| ADAPTER           | 02K6555    | 1ZORN8731L9 | IBM                           | -               |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |
|                   |            |             |                               |                 |

### 4.4 Cable Connecting

| Start Equipment   |          | End Equipment     |          | Cable Standard |          | Remark |
|-------------------|----------|-------------------|----------|----------------|----------|--------|
| Name              | I/O port | Name              | I/O port | Length         | Shielded |        |
| WIRELESS LAN CARD | PCMCIA   | NOTEBOOK COMPUTER | PCMCIA   | 0              | -        | -      |
| NOTEBOOK COMPUTER | POWER    | ADAPTER           | -        | 2              | N        | -      |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |
|                   |          |                   |          |                |          |        |



## 5. Bandwidth at 6 dB below

### 5.1 Test procedure

The bandwidth at 6dB below was measured in accordance to FCC Part 15 (2002). The bandwidth at 6dB down from the highest inband spectral density is measured with spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

### 5.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100KHz
- . VBW= 100KHz
- . Span= 30MHz
- . Sweep= suitable duration based on the EUT specification.

#### 6dB Bandwidth Test Instruments

| Description                                | Model                         | Serial Number |
|--|-------------------------------|---------------|
| Spectrum Analyzer                          | HP 8563E                      | 3623A05297    |
| Coax cables:<br>-Spectrum Analyzer <=> EUT | Length: 87.3cm<br>Loss: 2.3dB | -             |

### 5.3 Measurement results

EUT: SP-1001, s/n: None, TX mode:11Mbps

| Center Frequency (MHz) | Lower Frequency (MHz) | Upper Frequency (MHz) | Bandwidth at 6dB below(MHz) | Limit (KHz) |
|------------------------|-----------------------|-----------------------|-----------------------------|-------------|
| 2412(ch.1)             | 2407.34               | 2418.25               | 11.20                       | >500        |
| 2437(ch.6)             | 2432.05               | 2443.2                | 11.15                       | >500        |
| 2462(ch.11)            | 2457.05               | 2467.25               | 10.20                       | >500        |



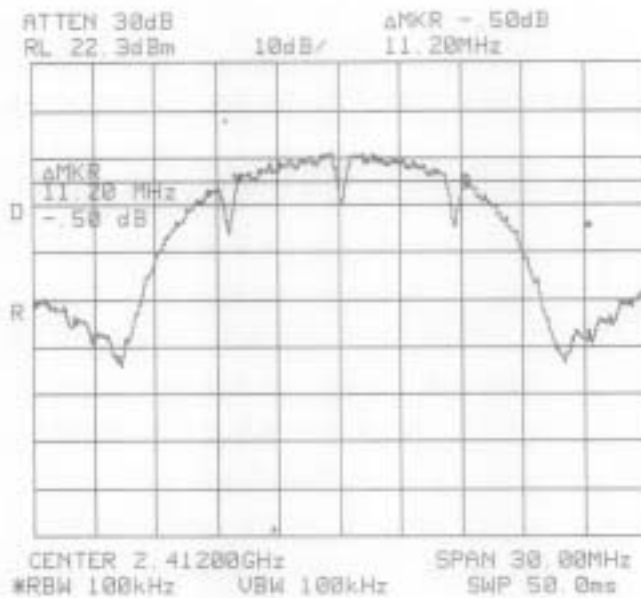
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## 5.4 Trace data

### 5.4.1 Channel 1 (2412 MHz)



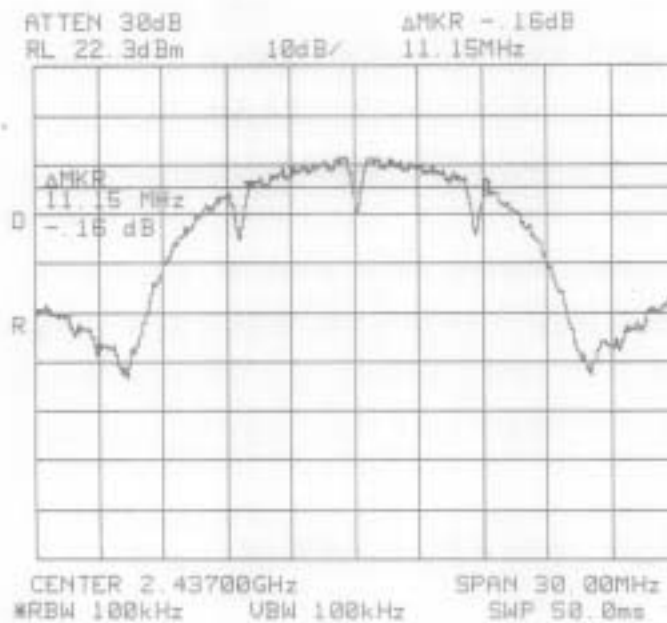


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### 5.4.2 Channel 6 (2437 MHz)



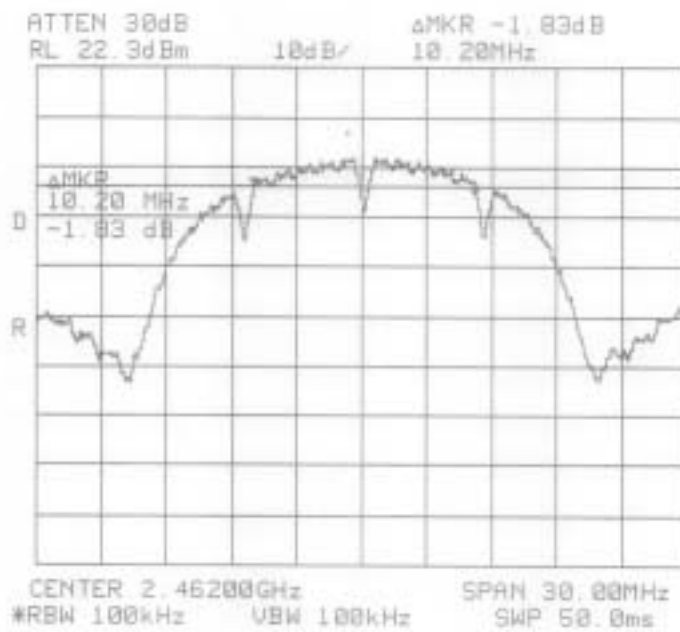


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### 5.4.3 Channel 11 (2462 MHz)



## 6. Occupied bandwidth / band-edge(at 20dB below), and out of band emissions.

### 6.1 Test procedure

The bandwidth at 20dB below was measured in accordance to FCC part 15( 2002). The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

### 6.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 100KHz
- . VBW= 100KHz
- . Span= 30MHz
- . Sweep= suitable duration based on the EUT specification.

#### 20dB Bandwidth Test Instruments

| Description                | Model          | Serial Number |
|----------------------------|----------------|---------------|
| Spectrum Analyzer          | HP 8563E       | 3623A05297    |
| Coax cables:               | Length: 87.3cm | -             |
| -Spectrum Analyzer <=> EUT | Loss: 2.3dB    | -             |

### 6.3 Measurement results of occupied bandwidth / band-edge

EUT: SP-1001, s/n: None, TX mode: 11Mbps

| Center Frequency (MHz) | Lower Frequency (MHz) | Upper Frequency (MHz) | Bandwidth at 20dB below(MHz) | Margin to Lower limit (MHz) | Margin to Upper limit (MHz) |
|------------------------|-----------------------|-----------------------|------------------------------|-----------------------------|-----------------------------|
| 2412(ch.1)             | 2403.30               | 2420.95               | 17.65                        | 3.30                        | -                           |
| 2437(ch.6)             | 2428.30               | 2445.90               | 17.65                        | -                           | -                           |
| 2462(ch.11)            | 2453.35               | 2470.85               | 17.50                        | -                           | 12.65                       |

### 6.4 Measurement results of out of band emissions

All conducted emission in any 100KHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density.



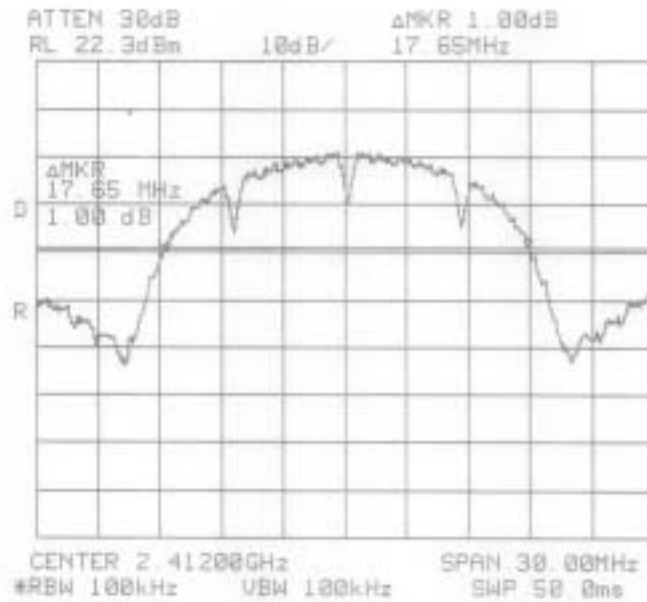
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## 6.5 Trace data of band-edge

### 6.5.1 Channel 1 (2412 MHz)





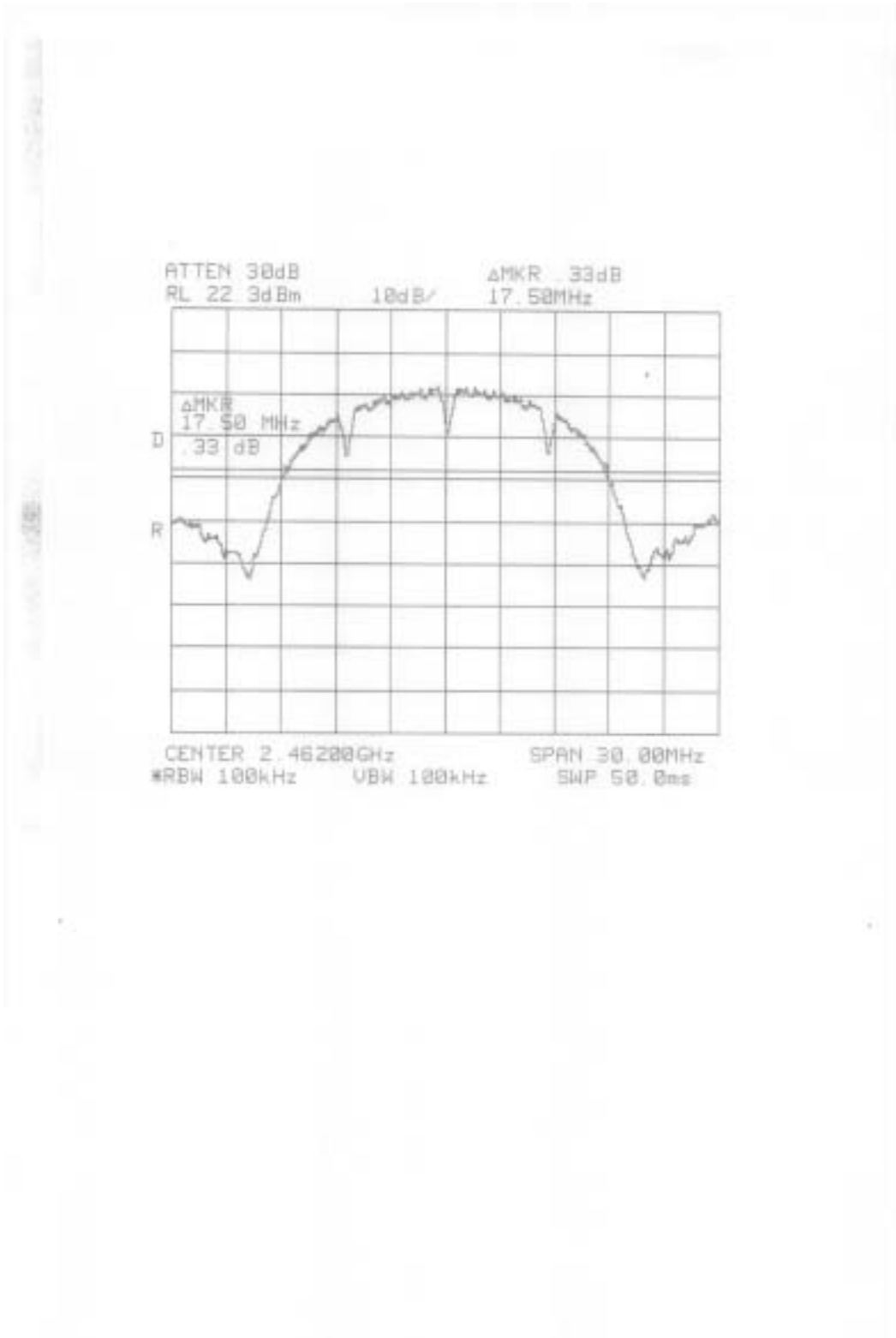


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### 6.5.3 Channel 11 (2462 MHz)







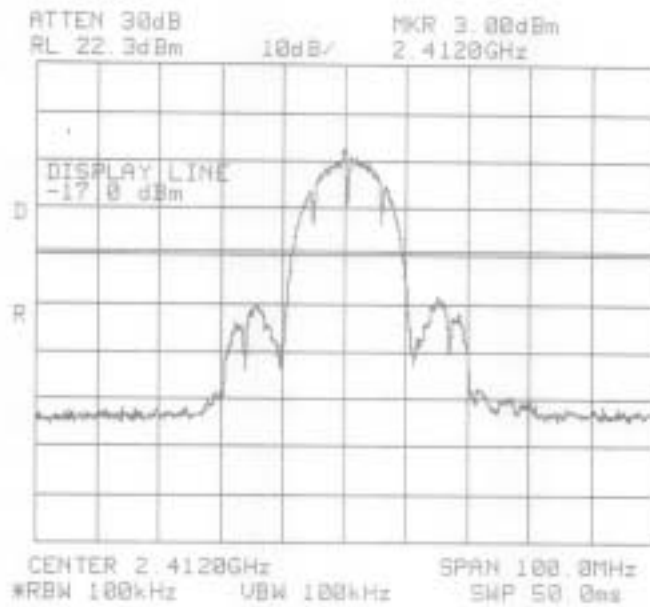
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## 6.6 Trace data of out of band emission

### 6.6.1 Channel 1 (2412 MHz)



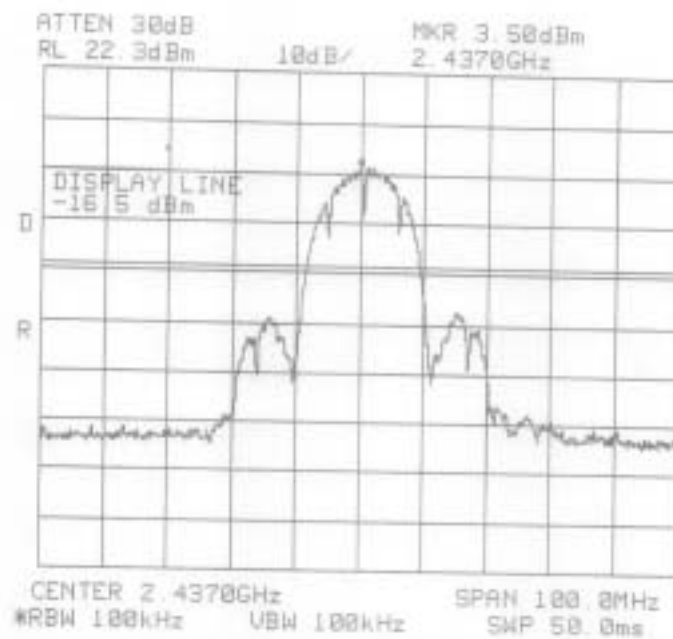


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### 6.6.2 Channel 6 (2437 MHz)



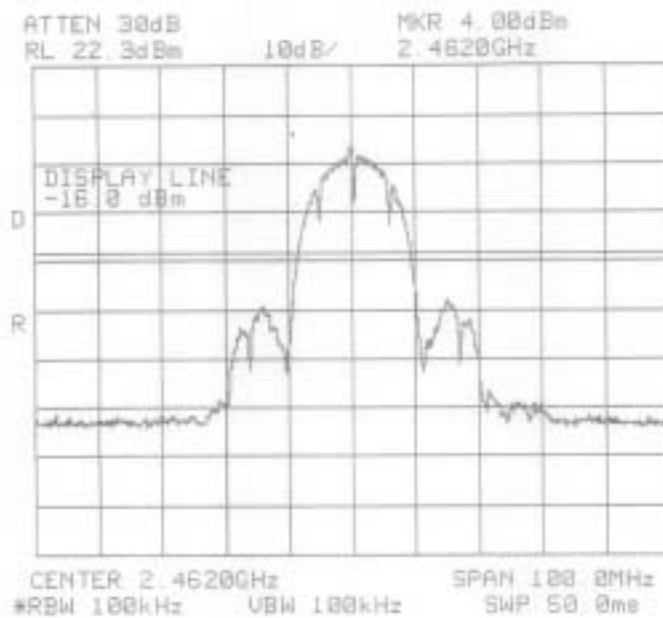


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### 6.6.3 Channel 11 (2462 MHz)



## 7. Transmitter output power

### 7.1 Test procedure

The transmitter output power of EUT was measured in accordance to FCC part 15( 2002). A transmitter antenna terminal of EUT is connected to the input of a RF power sensor. Measurement is made while EUT is operating in transmission mode at the appropriate center frequency.

#### RF Output Power Test Instruments

| Description                                | Model                         | Serial Number |
|--|-------------------------------|---------------|
| Power Meter                                | HP E4418A                     | GB38272717    |
| Power Sensor                               | HP 8481A                      | 3318A96478    |
| Coax cables:<br>-Spectrum Analyzer <=> EUT | Length: 40.8cm<br>Loss: 0.5dB | -             |

### 7.2 Measurement results

EUT: SP-1001, s/n: None, TX mode: 11Mbps

| Measured Frequency (MHz) | Power Meter Reading (dBm) | Cable Loss (dB) | Result |        | Limit[1W] (dBm) | Margin (dB) |
|--------------------------|---------------------------|-----------------|--------|--------|-----------------|-------------|
|                          |                           |                 | (dBm)  | (W)    |                 |             |
| 2412(ch.1)               | 12.07                     | 0.5             | 12.53  | 0.0179 | 30.0            | 17.47       |
| 2437(ch.6)               | 12.37                     | 0.5             | 12.87  | 0.0194 | 30.0            | 17.13       |
| 2462(ch.11)              | 12.37                     | 0.5             | 12.87  | 0.0194 | 30.0            | 17.13       |

### 7.3 Maximum Peak Output Power

EUT: SP-1001, s/n: None, TX mode: 11Mbps

| Measured Frequency (MHz) | E.I.R.P. (dBm) | Ant. Polarization (H/V) |
|--------------------------|----------------|-------------------------|
| 2414(ch.1)               | 12.85          | H                       |
| 2437(ch.6)               | 11.4           | H                       |
| 2462(ch.11)              | 8.55           | H                       |

## 8. Transmitter power spectral density

### 8.1 Test procedure

The peak power density was measured in accordance to FCC part 15( 2002). The peak power density was measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

### 8.2 Test instruments and measurement setup

The spectrum analyzer is set to as following.

- . RBW= 3KHz
- . VBW= 100KHz
- . Span= 10MHz
- . Sweep= 2.8 seconds (suitable duration based on the EUT specification.)

The peak power density Test Instruments

| Description                                | Model                         | Serial Number |
|--|-------------------------------|---------------|
| Spectrum Analyzer                          | HP 8563E                      | 3623A05297    |
| Coax cables:<br>-Spectrum Analyzer <=> EUT | Length: 87.3cm<br>Loss: 2.3dB | -             |

### 8.3 Measurement results

EUT: SP-1001, s/n: None, TX mode: 11Mbps

| Center Frequency (MHz) | Measured Frequency (MHz) | Spectrum analyzer Reading (dBm) | Cable loss (dB) | Result (dBm) | Limit (dBm) | Margin (dB) |
|------------------------|--------------------------|---------------------------------|-----------------|--------------|-------------|-------------|
| 2412(ch.1)             | 2411.32                  | -11.00                          | 2.3             | -8.70        | 8.0         | 16.70       |
| 2437(ch.6)             | 2437.82                  | -10.34                          | 2.3             | -8.04        | 8.0         | 16.04       |
| 2462(ch.11)            | 2461.32                  | -10.17                          | 2.3             | -7.87        | 8.0         | 15.87       |



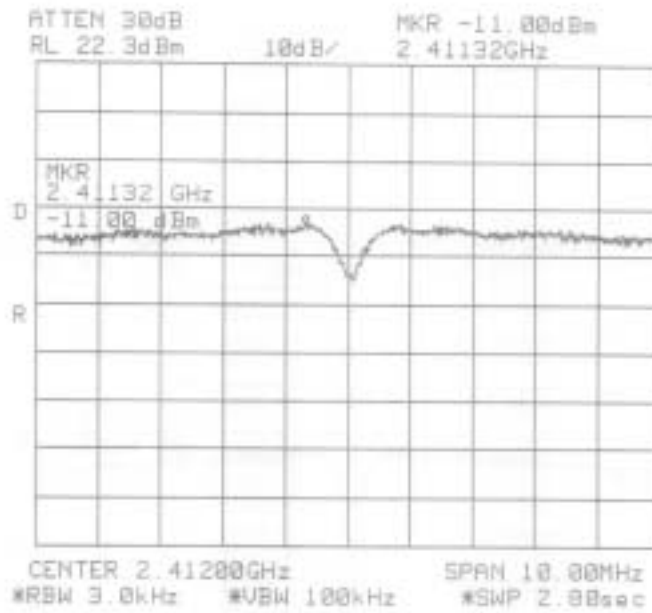
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## 8.4 Trace data

### 8.4.1 Channel 1 (2412 MHz)



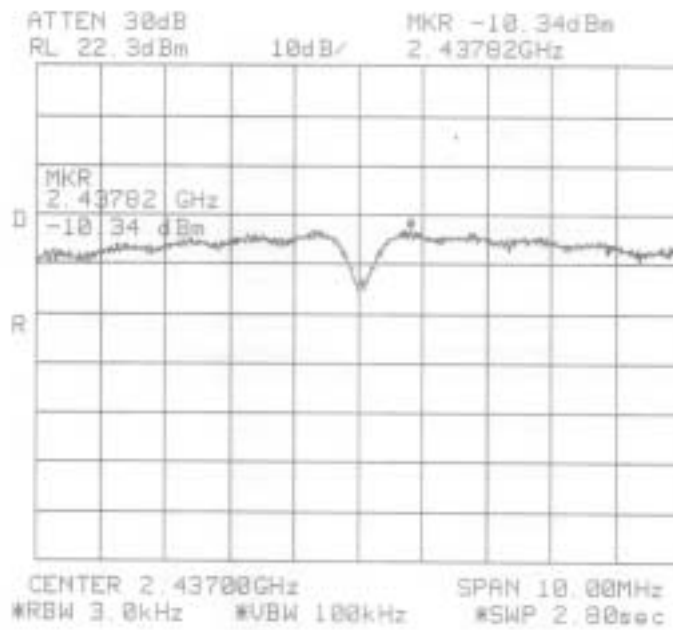


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### 8.4.2 Channel 6 (2437 MHz)



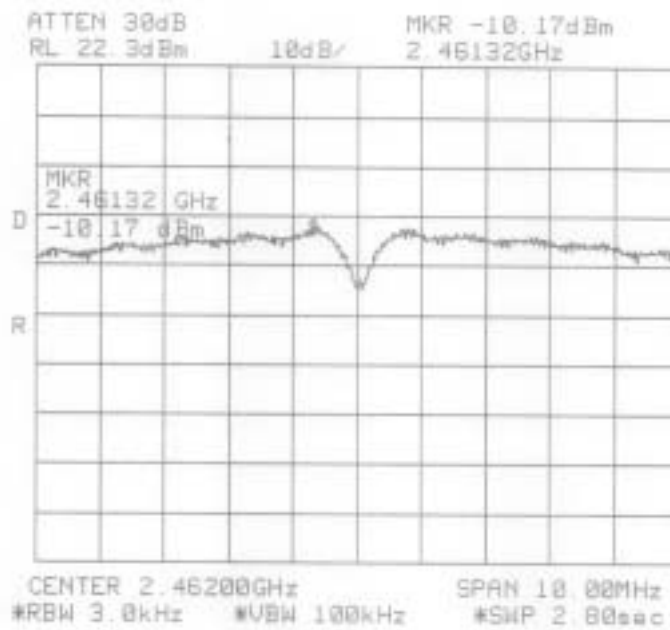


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### 8.4.3 Channel 11 (2462 MHz)





## 9. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 to 30 MHz was measured in accordance to FCC Part 15 (2002) & ANSI C 63.4 (2001) The test setup was made according to FCC Part 15 (2002) & ANSI C 63.4 (2001) in a shielded. The EUT was placed on a non-conductive table at least 80 above the ground plan. A grounded vertical reference plane was positioned in a distance of 40cm from the EUT. The distance from the EUT to other metal surfaces was at least 0.8m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0m.. The test receiver with Quasi Peak detector complies with CISPR 16.

### 9.1 Measurement equipments

| Equipment Name | Type      | Manufacturer    | Serial No. | Next Calibration date |
|----------------|-----------|-----------------|------------|-----------------------|
| LISN           | ESH3-Z5   | Rohde & Schwarz | 838979/010 | 2003. 2. 1            |
| LISN           | NNLA8120A | Schwarzbeck     | NONE       | 2003. 2. 1            |
| TEST Receive   | ESPC      | Rohde & Schwarz | 845296/021 | 2003. 6. 21           |
| Pulse Limiter  | ESH3Z2    | Rohde & Schwarz | NONE       | 2003. 7. 4            |

### 9.2 Environmental Condition

Test Place : Shield Room  
 Temperature (°C) : 22 °C  
 Humidity (%) : 62 %

### 9.3 Test data

#### 9.3.1 Ch.1(2412MHz) TX mode 11Mbps

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V)        | Line<br>(H/N) | Correction Factor |               | Limit<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) | Margin<br>(dB $\mu$ V) |
|--------------------|--------------------------------|---------------|-------------------|---------------|-----------------------|------------------------|------------------------|
|                    |                                |               | Lisn<br>(dB)      | Cable<br>(dB) |                       |                        |                        |
| 0.15               | 54.05                          | H             | 0.07              | 0.0           | 65.87                 | 54.12                  | -11.75                 |
| 0.19               | 50.65                          | H             | 0.07              | 0.0           | 64.21                 | 50.74                  | -13.47                 |
| 0.28               | 46.42                          | H             | 0.07              | 0.1           | 60.77                 | 46.58                  | -14.19                 |
| 0.37               | 31.50                          | N             | 0.07              | 0.1           | 58.52                 | 31.70                  | -26.82                 |
| 0.38               | 39.20                          | H             | 0.07              | 0.1           | 58.39                 | 39.41                  | -18.98                 |
| 0.47               | 37.71                          | N             | 0.07              | 0.2           | 56.60                 | 37.96                  | -18.64                 |
| 0.56               | 35.93                          | H             | 0.08              | 0.2           | 56.00                 | 36.21                  | -19.79                 |
| 0.74               | 34.83                          | H             | 0.09              | 0.2           | 56.00                 | 35.12                  | -20.88                 |
| 0.94               | 32.84                          | H             | 0.10              | 0.2           | 56.00                 | 33.14                  | -22.86                 |
| 1.12               | 31.27                          | H             | 0.10              | 0.2           | 56.00                 | 31.58                  | -24.42                 |
| 4.19               | 31.39                          | H             | 0.20              | 0.3           | 56.00                 | 31.89                  | -24.11                 |
| 4.96               | 32.39                          | H             | 0.23              | 0.3           | 56.00                 | 32.92                  | -23.08                 |
| 6.50               | 40.88                          | H             | 0.31              | 0.4           | 60.00                 | 41.57                  | -18.43                 |
| 7.68               | 42.30                          | H             | 0.36              | 0.4           | 60.00                 | 43.11                  | -16.89                 |
| 9.45               | 39.38                          | H             | 0.42              | 0.6           | 60.00                 | 40.37                  | -19.63                 |
| 10.40              | 34.53                          | H             | 0.46              | 0.6           | 60.00                 | 35.61                  | -24.39                 |
| 13.42              | 29.54                          | H             | 0.65              | 0.7           | 60.00                 | 30.93                  | -29.07                 |
| 16.12              | 30.27                          | H             | 0.79              | 0.8           | 60.00                 | 31.86                  | -28.14                 |
| Remark             | H : Hot Line, N : Neutral Line |               |                   |               |                       |                        |                        |

### 9.3.2 Ch.6(2437MHz) TX mode 11Mbps

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V)        | Line<br>(H/N) | Correction Factor |               | Limit<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) | Margin<br>(dB $\mu$ V) |
|--------------------|--------------------------------|---------------|-------------------|---------------|-----------------------|------------------------|------------------------|
|                    |                                |               | Lisn<br>(dB)      | Cable<br>(dB) |                       |                        |                        |
| 0.15               | 47.41                          | H             | 0.07              | 0.0           | 65.93                 | 47.48                  | -18.45                 |
| 0.19               | 44.62                          | N             | 0.07              | 0.0           | 64.21                 | 44.71                  | -19.50                 |
| 0.23               | 39.04                          | H             | 0.07              | 0.1           | 62.43                 | 39.16                  | -23.27                 |
| 0.28               | 42.49                          | N             | 0.07              | 0.1           | 60.90                 | 42.64                  | -18.26                 |
| 0.37               | 32.26                          | H             | 0.07              | 0.1           | 58.52                 | 32.47                  | -26.05                 |
| 0.46               | 35.26                          | N             | 0.07              | 0.2           | 56.67                 | 35.51                  | -21.16                 |
| 0.56               | 30.37                          | H             | 0.08              | 0.2           | 56.00                 | 30.65                  | -25.35                 |
| 0.66               | 34.15                          | N             | 0.08              | 0.2           | 56.00                 | 34.43                  | -21.57                 |
| 0.83               | 27.59                          | N             | 0.09              | 0.2           | 56.00                 | 27.88                  | -28.12                 |
| 1.12               | 27.68                          | H             | 0.10              | 0.2           | 56.00                 | 27.99                  | -28.01                 |
| 1.30               | 27.62                          | H             | 0.11              | 0.2           | 56.00                 | 27.96                  | -28.04                 |
| 4.36               | 28.68                          | H             | 0.21              | 0.3           | 56.00                 | 29.19                  | -26.81                 |
| 6.50               | 38.31                          | H             | 0.31              | 0.4           | 60.00                 | 39.00                  | -21.00                 |
| 9.45               | 35.74                          | H             | 0.42              | 0.6           | 60.00                 | 36.73                  | -23.27                 |
| 10.00              | 32.03                          | N             | 0.36              | 0.6           | 60.00                 | 32.99                  | -27.01                 |
| 10.57              | 27.40                          | N             | 0.39              | 0.6           | 60.00                 | 28.41                  | -31.59                 |
| 15.37              | 25.52                          | H             | 0.76              | 0.8           | 60.00                 | 27.08                  | -32.92                 |
| 16.12              | 26.52                          | N             | 0.63              | 0.8           | 60.00                 | 27.95                  | -32.05                 |
| Remark             | H : Hot Line, N : Neutral Line |               |                   |               |                       |                        |                        |

### 9.3.3 Ch.11(2462MHz) TX mode 11 Mbps

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V)        | Line<br>(H/N) | Correction Factor |               | Limit<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) | Margin<br>(dB $\mu$ V) |
|--------------------|--------------------------------|---------------|-------------------|---------------|-----------------------|------------------------|------------------------|
|                    |                                |               | Lisn<br>(dB)      | Cable<br>(dB) |                       |                        |                        |
| 0.15               | 47.31                          | H             | 0.07              | 0.0           | 66.00                 | 47.38                  | -18.62                 |
| 0.19               | 44.36                          | N             | 0.07              | 0.0           | 64.21                 | 44.45                  | -19.76                 |
| 0.23               | 38.66                          | H             | 0.07              | 0.1           | 62.36                 | 38.78                  | -23.58                 |
| 0.28               | 42.85                          | N             | 0.07              | 0.1           | 60.77                 | 43.01                  | -17.76                 |
| 0.29               | 34.61                          | H             | 0.07              | 0.1           | 60.64                 | 34.77                  | -25.87                 |
| 0.47               | 36.83                          | N             | 0.07              | 0.2           | 56.54                 | 37.08                  | -19.46                 |
| 0.65               | 33.79                          | N             | 0.08              | 0.2           | 56.00                 | 34.07                  | -21.93                 |
| 0.74               | 29.31                          | N             | 0.09              | 0.2           | 56.00                 | 29.60                  | -26.40                 |
| 0.84               | 31.67                          | N             | 0.09              | 0.2           | 56.00                 | 31.96                  | -24.04                 |
| 1.02               | 29.93                          | N             | 0.09              | 0.2           | 56.00                 | 30.22                  | -25.78                 |
| 1.40               | 28.79                          | N             | 0.10              | 0.2           | 56.00                 | 29.13                  | -26.87                 |
| 4.54               | 28.66                          | H             | 0.21              | 0.3           | 56.00                 | 29.17                  | -26.83                 |
| 5.12               | 26.26                          | N             | 0.20              | 0.3           | 60.00                 | 26.77                  | -33.23                 |
| 6.71               | 35.79                          | H             | 0.32              | 0.4           | 60.00                 | 36.50                  | -23.50                 |
| 6.87               | 32.96                          | H             | 0.33              | 0.4           | 60.00                 | 33.69                  | -26.31                 |
| 7.50               | 30.33                          | N             | 0.29              | 0.4           | 60.00                 | 31.06                  | -28.94                 |
| 10.48              | 28.15                          | H             | 0.47              | 0.6           | 60.00                 | 29.24                  | -30.76                 |
| 16.25              | 26.64                          | N             | 0.63              | 0.8           | 60.00                 | 28.07                  | -31.93                 |
| Remark             | H : Hot Line, N : Neutral Line |               |                   |               |                       |                        |                        |

### 9.3.4 RX mode (Channel 6 : 2437MHz)

| Frequency<br>(MHz) | Reading<br>(dB $\mu$ V)        | Line<br>(H/N) | Correction Factor |               | Limit<br>(dB $\mu$ V) | Result<br>(dB $\mu$ V) | Margin<br>(dB $\mu$ V) |
|--------------------|--------------------------------|---------------|-------------------|---------------|-----------------------|------------------------|------------------------|
|                    |                                |               | Lisn<br>(dB)      | Cable<br>(dB) |                       |                        |                        |
| 0.15               | 47.03                          | H             | 0.07              | 0.0           | 66.00                 | 47.10                  | -18.90                 |
| 0.19               | 44.95                          | N             | 0.07              | 0.0           | 64.21                 | 45.04                  | -19.17                 |
| 0.28               | 42.41                          | N             | 0.07              | 0.1           | 60.77                 | 42.57                  | -18.20                 |
| 0.37               | 32.30                          | N             | 0.07              | 0.1           | 58.46                 | 32.51                  | -25.95                 |
| 0.38               | 31.32                          | H             | 0.07              | 0.1           | 58.39                 | 31.53                  | -26.86                 |
| 0.47               | 36.17                          | N             | 0.07              | 0.2           | 56.54                 | 36.42                  | -20.12                 |
| 0.56               | 27.99                          | N             | 0.07              | 0.2           | 56.00                 | 28.26                  | -27.74                 |
| 0.74               | 29.79                          | N             | 0.09              | 0.2           | 56.00                 | 30.08                  | -25.92                 |
| 0.84               | 30.57                          | N             | 0.09              | 0.2           | 56.00                 | 30.86                  | -25.14                 |
| 1.02               | 29.33                          | N             | 0.09              | 0.2           | 56.00                 | 29.62                  | -26.38                 |
| 1.40               | 28.19                          | N             | 0.10              | 0.2           | 56.00                 | 28.53                  | -27.47                 |
| 4.36               | 28.73                          | H             | 0.21              | 0.3           | 56.00                 | 29.24                  | -26.76                 |
| 6.50               | 37.40                          | H             | 0.31              | 0.4           | 60.00                 | 38.09                  | -21.91                 |
| 6.71               | 31.23                          | N             | 0.27              | 0.4           | 60.00                 | 31.88                  | -28.12                 |
| 9.60               | 30.11                          | H             | 0.43              | 0.6           | 60.00                 | 31.11                  | -28.89                 |
| 10.74              | 29.98                          | H             | 0.49              | 0.6           | 60.00                 | 31.10                  | -28.90                 |
| 15.37              | 26.45                          | H             | 0.76              | 0.8           | 60.00                 | 28.01                  | -31.99                 |
| 15.74              | 26.97                          | N             | 0.62              | 0.8           | 60.00                 | 28.39                  | -31.61                 |
| Remark             | H : Hot Line, N : Neutral Line |               |                   |               |                       |                        |                        |

## 9.4 Photographs of test setup

[ Front ]



[ Rear ]



## 10. Measurement of radiated disturbance (30MHz – 1GHz)

Above 30 MHz Electric Field strength was measured in accordance with FCC Part 15 (2002) & ANSI C 63.4 (2001). The test setup was made according to FCC Part 15 (2002) & ANSI C 63.4 (2001) on an open test site, which allows a 3m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test set-up.

### 10.1 Measurement equipments

| Equipment Name        | Type      | Manufacturer      | Serial No. | Next Calibration date |
|-----------------------|-----------|-------------------|------------|-----------------------|
| Receiver              | ESPC      | Rohde & Schwarz   | 845296/021 | 2003.6.21             |
| LogBicon Antenna      | VULB 9160 | S/B               | 3107       | 2003.6.7              |
| Turn Table            | 2087      | EMCO              | 2129       | -                     |
| Antenna Mast          | 2070-01   | EMCO              | 9702-203   | -                     |
| Amplifier             | 310N      | Sonoma Instrument | 185817     | 2002.11.13            |
| ANT Mast Controller   | 2090      | EMCO              | 1535       | -                     |
| Turn Table Controller | 2090      | EMCO              | 1535       | -                     |

### 10.2 Environmental Condition

Test Place : Open site (3m)  
 Temperature (°C) : 28 °C  
 Humidity (%) : 40 %

### 10.3 Test data

#### 10.3.1 Ch.1(2412MHz) TX mode 11Mbps

Measurement Distance : 3 m

| Frequency (MHz) | Reading (dB $\mu$ V)         | Position (V/H) | Height (m) | Correction Factor |            | Result Value         |                       |                       |
|-----------------|------------------------------|----------------|------------|-------------------|------------|----------------------|-----------------------|-----------------------|
|                 |                              |                |            | Ant Factor (dB)   | Cable (dB) | Limit (dB $\mu$ V/m) | Result (dB $\mu$ V/m) | Margin (dB $\mu$ V/m) |
| 43.74           | 16.50                        | V              | 1.0        | 12.74             | 1.0        | 40.0                 | 30.24                 | -9.76                 |
| 44.17           | 15.50                        | V              | 1.0        | 12.74             | 1.0        | 40.0                 | 29.24                 | -10.76                |
| 110.00          | 6.20                         | V              | 1.0        | 11.07             | 1.6        | 43.5                 | 18.87                 | -24.63                |
| 132.02          | 11.00                        | H              | 2.1        | 12.78             | 1.7        | 43.5                 | 25.51                 | -17.99                |
| 176.00          | 7.50                         | H              | 1.4        | 12.80             | 2.1        | 43.5                 | 22.35                 | -21.15                |
| 198.00          | 10.00                        | H              | 1.4        | 10.52             | 2.2        | 43.5                 | 22.70                 | -20.80                |
| 220.00          | 11.50                        | H              | 1.5        | 10.76             | 2.3        | 43.5                 | 24.56                 | -18.94                |
| 229.10          | 12.50                        | H              | 1.3        | 11.19             | 2.3        | 43.5                 | 26.04                 | -17.46                |
| 240.02          | 15.00                        | H              | 1.1        | 11.71             | 2.4        | 46.0                 | 29.11                 | -16.89                |
| 259.82          | 17.00                        | H              | 1.3        | 12.13             | 2.4        | 46.0                 | 31.57                 | -14.43                |
| 307.98          | 17.00                        | H              | 1.0        | 13.37             | 2.7        | 46.0                 | 33.09                 | -12.91                |
| 324.85          | 12.50                        | H              | 1.0        | 13.76             | 2.8        | 46.0                 | 29.03                 | -16.97                |
| 328.01          | 4.00                         | H              | 1.0        | 13.83             | 2.8        | 46.0                 | 20.61                 | -25.39                |
| 336.06          | 10.50                        | H              | 1.0        | 14.00             | 2.8        | 46.0                 | 27.32                 | -18.68                |
| 396.00          | 14.50                        | H              | 1.0        | 15.23             | 3.1        | 46.0                 | 32.86                 | -13.14                |
| 734.00          | 8.10                         | H              | 1.3        | 20.85             | 4.4        | 46.0                 | 33.31                 | -12.69                |
| 801.46          | 5.20                         | H              | 1.3        | 21.77             | 4.7        | 46.0                 | 31.67                 | -14.33                |
|                 |                              |                |            |                   |            |                      |                       |                       |
|                 |                              |                |            |                   |            |                      |                       |                       |
|                 |                              |                |            |                   |            |                      |                       |                       |
| Remark          | H : Horizontal, V : Vertical |                |            |                   |            |                      |                       |                       |









### 10.4 Setup for Radiated Test : 30 ~ 1 GHz

[ Front ]



[ Rear ]



## 11. Measurement of radiated disturbance (1GHz – 25GHz)

Above 1 GHz Electric Field strength was measured in accordance with FCC Part 15 (2002) & ANSI C 63.4 (2001). The test setup was made according to FCC Part 15 (2002) & ANSI C 63.4 (2001) on an Anechoic chamber, which allows a 3m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated.

### 11.1 Measurement equipments

| Equipment Name | Type                 | Manufacturer           | Serial No. |
|----------------|----------------------|------------------------|------------|
| Test Receiver  | ESI40                | Rohde & Schwarz        | 100072     |
| Horn Ant.      | BBHA 9120D           | Schwarzbeck            | 259        |
| Horn Ant.      | BBHA917D             | Schwarzbeck            | 167        |
| RF Amp         | AMF-4D-001180-24-109 | MITEQ                  | 832938     |
| Filter         | 11SH10-4500          | K&amp;l Microwave Inc. | 1          |
|                |                      |                        |            |
|                |                      |                        |            |











## 12. Photographs of EUT

[ Front ]



[ Rear ]



◆ Ch.1(2412MHz) TX mode 11Mbps  
\*HOT

ESTECH  
HOT

24 Sep 2002 18:58

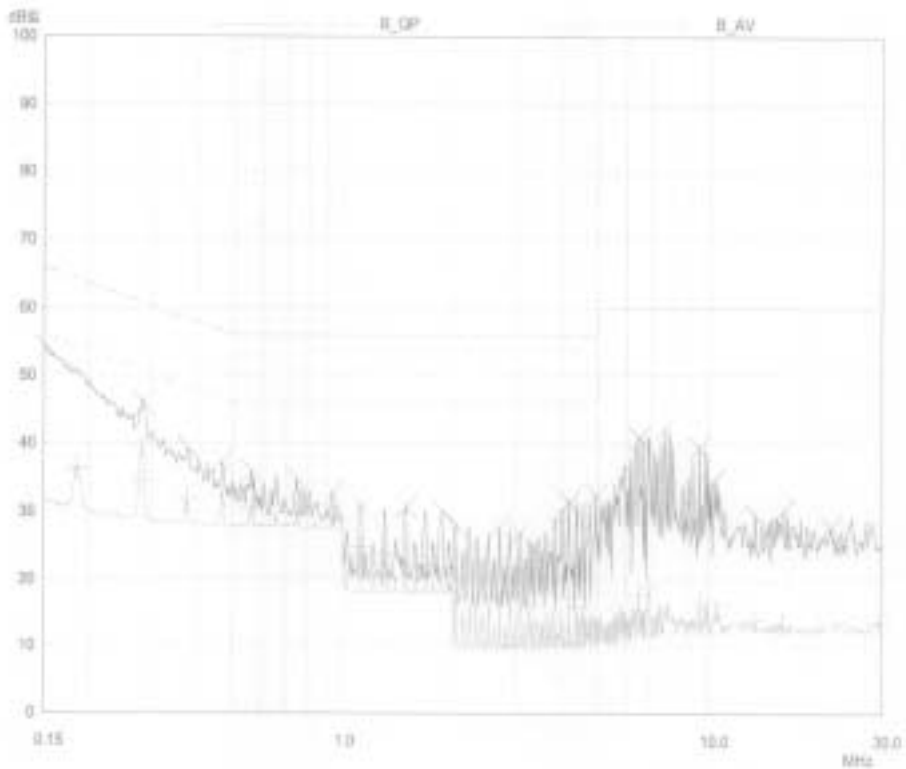
EUT: SP-1001  
 Manuf: SHIN-ON ELECTRONICS CO., LTD.  
 Op Cond: 220V  
 Operator: JMYang  
 Test Spec: CLASS B  
 Comment:

File: 877110\_Txdat1 : SHIN-ON ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequencies |       | Receiver Settings |       |          |        |      |        |
|-------------|-------|-------------------|-------|----------|--------|------|--------|
| Start       | Stop  | Step              | IF BW | Detector | M-Time | Absn | OpType |
| 150kHz      | 30MHz | 0.5%              | 10kHz | PK+AV    | 20msec | Auto | RBW    |

Process Measurement: XPK / + AV  
 Max Time: see scan settings  
 Subranges: 25  
 Acc Margin: 60 dB



◆ Ch.1(2412MHz) TX mode 11Mbps  
 \*NETRUL

ESTECH  
 NEUTRAL

24 Sep 2012 15:52

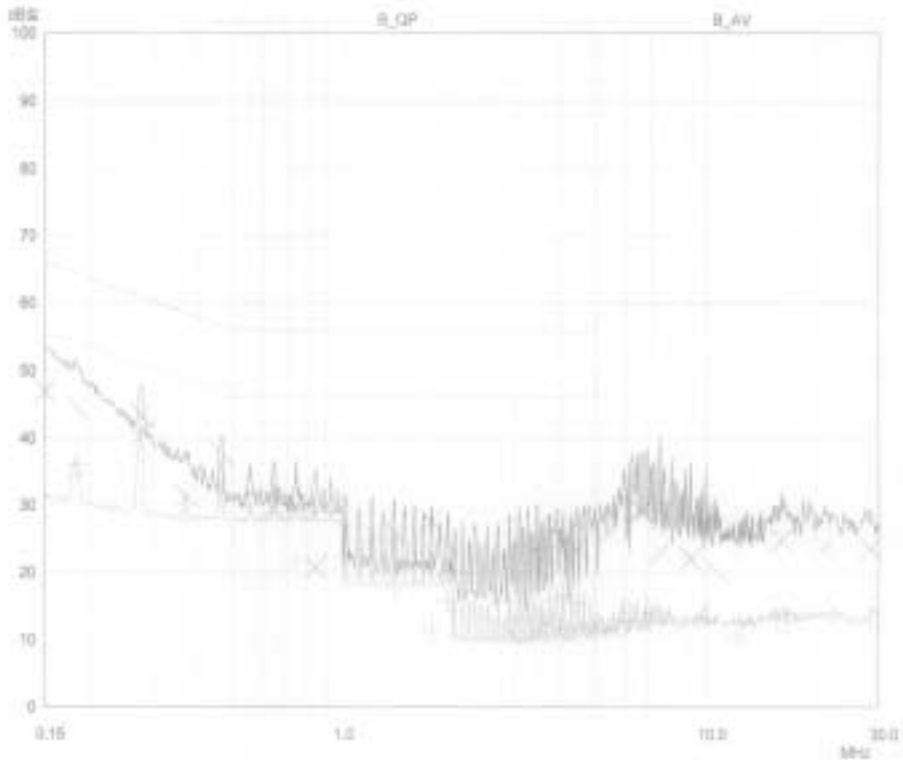
EUT: SP-1001  
 Manuf: SHIN-ON ELECTRONICS CO., LTD.  
 Op Cond: 320V  
 Operator: JMYoung  
 Test Spec: CLASS B  
 Comment:

File: 07710\_n.dat: SHIN-ON ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |         |       |       |
|-------------|-------|------|-------------------|----------|---------|-------|-------|
| Start       | Stop  | Step | IF BW             | Detector | SA-Time | Atten | OpRgn |
| 150kHz      | 30kHz | 0.0% | 10kHz             | PK+AV    | 20msac  | Auto  | 60dB  |

Final Measurement: X QP / + AV  
 Meas Time: 1sec  
 Subranges: 25  
 Acc Margin: 60 dB



◆ Ch.6(2437MHz) TX mode 11Mbps  
\*HOT

ESTECH

24 Sep 2002 10:29

HOT

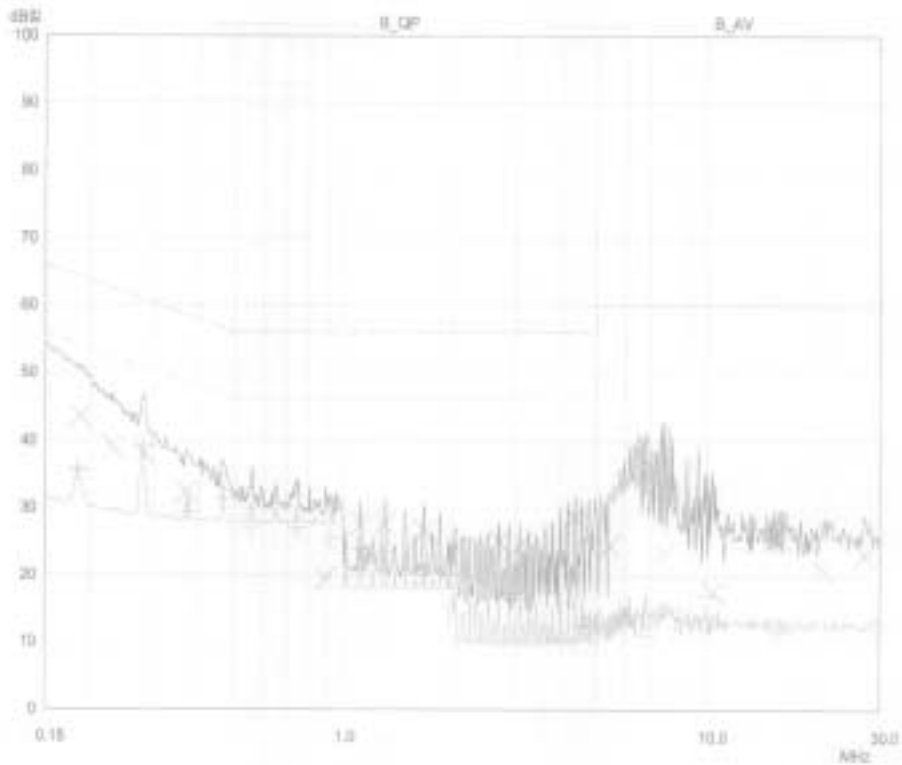
EUT: SP-1001  
 Manuf: SHIN-CH ELECTRONICS CO., LTD.  
 Op Cond: 200V  
 Operator: JMYang  
 Test Spec: CLASS B  
 Comment:

File: 97760\_h\_001: SHIN-CH ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |        |       |       |
|-------------|-------|------|-------------------|----------|--------|-------|-------|
| Start       | Stop  | Step | IF BW             | Detector | M-Time | Aden. | Cycle |
| 150kHz      | 30MHz | 0.5% | 10kHz             | PK+AV    | 20msec | Auto  | 50dB  |

Final Measurement: XQP/+AV  
 Meas Time: 1sec  
 Subranges: 25  
 Acc Margin: 60 dB



◆ Ch.6(2437MHz) TX mode 11Mbps  
 \*NETRUL

ESTECH  
 NEUTRAL

24 Sep 2012 15:39

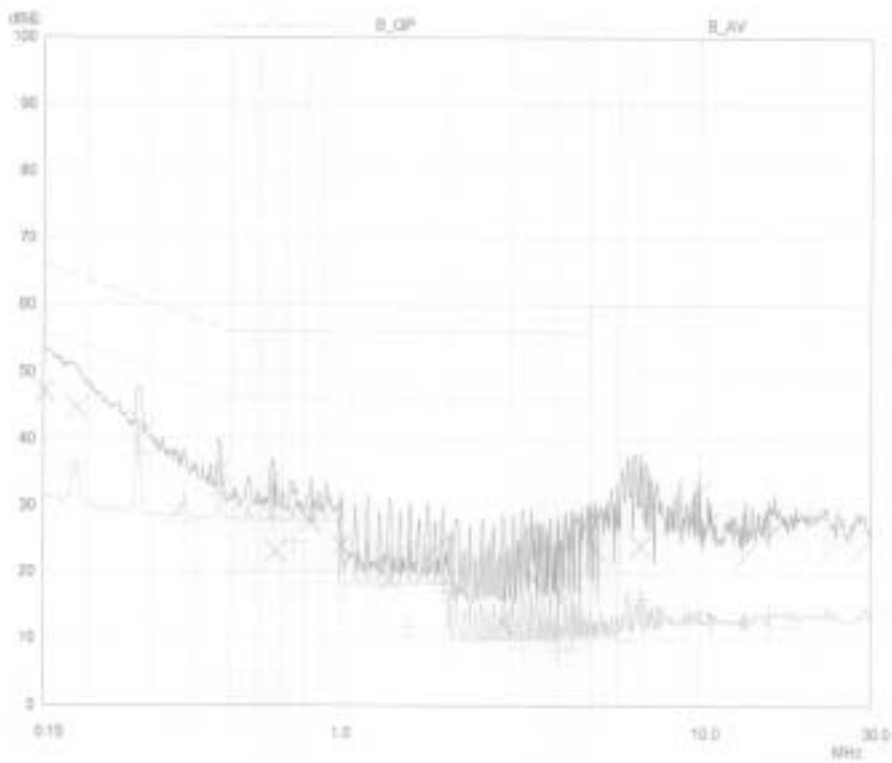
EUT: SP-1001  
 Manuf: SHIN-CH ELECTRONICS CO., LTD.  
 Op Cond: 200V  
 Operator: JMYing  
 Test Spec: CLASS B  
 Comment:

File: 97790\_n.dat : SHIN-CH ELECTRONICS CO., LTD.

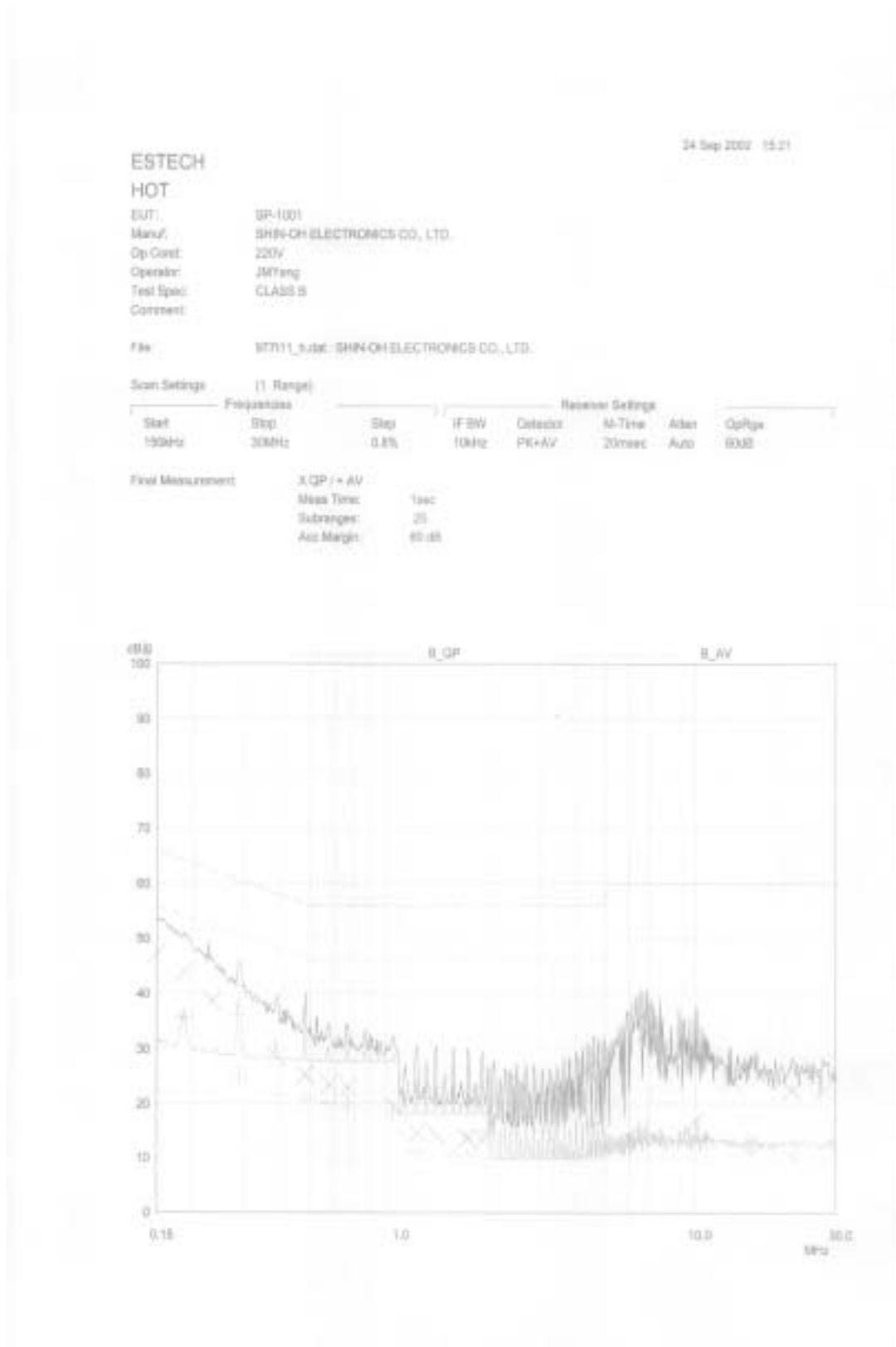
Scan Settings: [1 Range]

| Frequencies |        |      | Receiver Settings |          |        |      |        |
|-------------|--------|------|-------------------|----------|--------|------|--------|
| Start       | Stop   | Step | IF BW             | Detector | M-Time | Aden | Coffgn |
| 100kHz      | 500kHz | 0.0% | 10kHz             | PK+AV    | 20mses | Auto | 60dB   |

Final Measurement: XQP I + AV  
 Meas Time: 1sec  
 Subrange: 25  
 Acc Margin: 60 dB



◆ Ch.11(2462MHz) TX mode 11Mbps  
\*HOT



◆ Ch.11(2462MHz) TX mode 11Mbps  
 \*NETRUL

ESTECH  
 NEUTRAL

24 Sep 2002 15:17

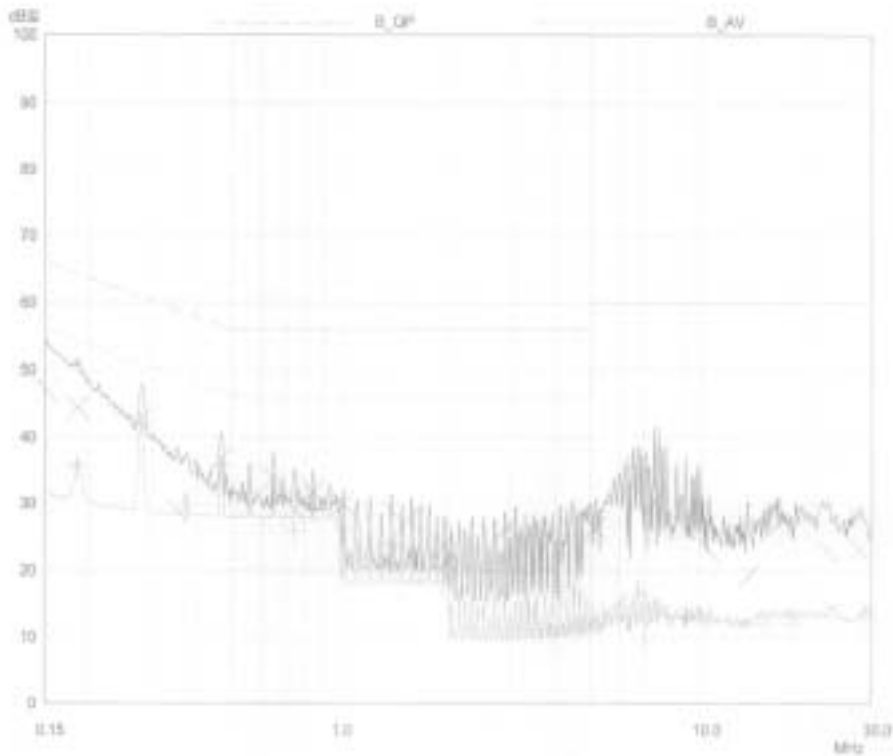
EUT: SP-1001  
 Manuf: SHIN-CH ELECTRONICS CO., LTD.  
 Op Cond: 220V  
 Operator: JMYang  
 Test Spec: CLASS B  
 Comment:

File: 977111\_1.dat : SHIN-CH ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |        |       |        |
|-------------|-------|------|-------------------|----------|--------|-------|--------|
| Start       | Stop  | Step | RF BW             | Detector | M-Time | Atten | OpType |
| 130Hz       | 304Hz | 0.0% | 10kHz             | PK+AV    | 20ms   | Auto  | 60dB   |

Final Measurement: X QP / + AV  
 Meas Time: 1sec  
 Subranges: 25  
 Acc Margin: 60 dB





# Appendix 1. Spectral diagram

- ◆ RX mode
- \*HOT

ESTECH  
HOT

24 Sep 2002 14:12

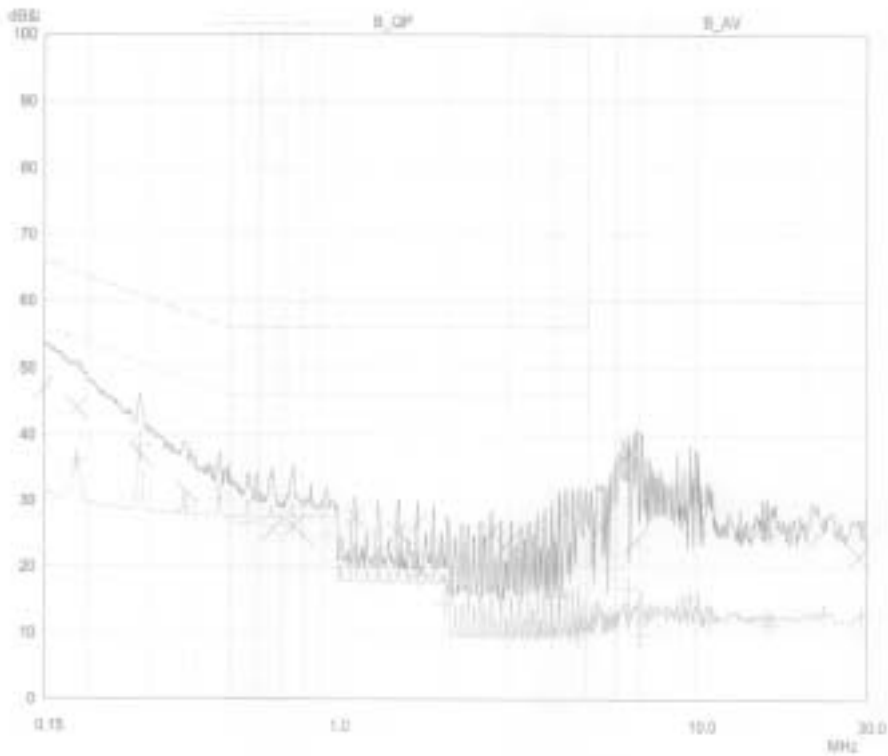
EUT: GP-1001  
Manuf: SHEN-DH ELECTRONICS CO., LTD.  
Op Cond: 230V  
Operator: JMYang  
Test Spec: CLASS B  
Comment:

File: 87700\_n.dat | SHEN-DH ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequencies |       |      | Receiver Settings |          |        |       |        |
|-------------|-------|------|-------------------|----------|--------|-------|--------|
| Start       | Stop  | Step | F BW              | Detector | M-Time | Alert | Op Rpt |
| 150kHz      | 30MHz | 0.8% | 150Hz             | PK+AV    | 20ms   | Auto  | dB     |

Final Measurement: X QP / + AV  
Max Time: 1sec  
Subranges: 25  
Acc Margin: 60 dB



◆ RX mode  
\*NETRUL

24 Sep 2012 14:04

ESTECH  
NEUTRAL

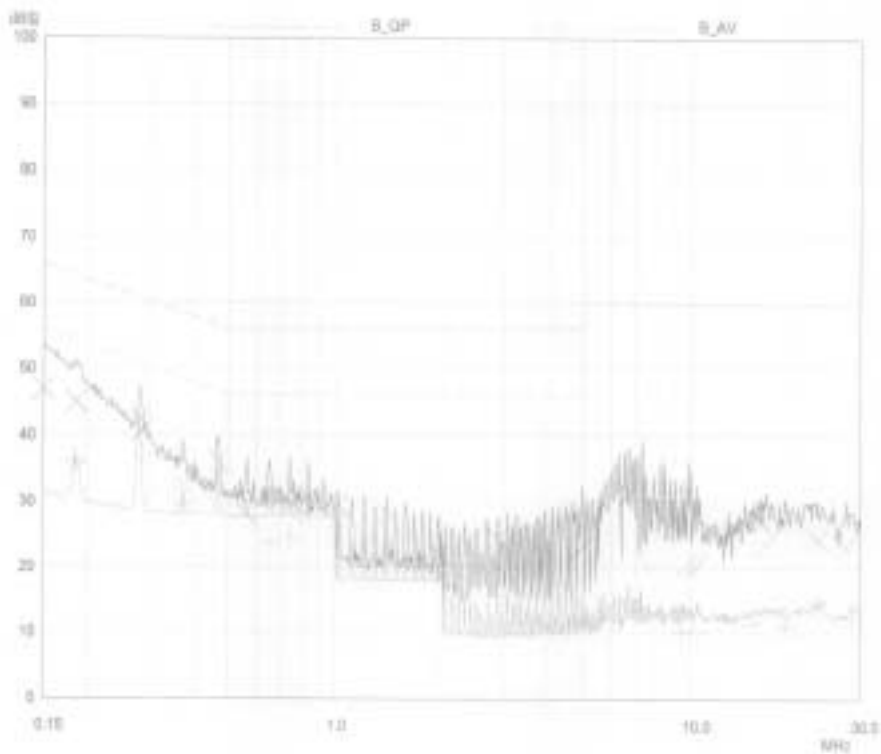
EU1: SP1001  
Manuf: SHN-OH ELECTRONICS CO., LTD.  
Op Cond: 320V  
Operator: JMYang  
Test Spec: CLASS B  
Comment:

File: 87708\_s.usd: SHN-OH ELECTRONICS CO., LTD.

Scan Settings (1 Range)

| Frequency |       |      | Receiver Settings |          |        |      |       |
|-----------|-------|------|-------------------|----------|--------|------|-------|
| Start     | Stop  | Step | F BW              | Detector | M-Time | Aten | CoRge |
| 100kHz    | 33MHz | 0.2% | 100Hz             | PW+AV    | 20Hz   | Auto | 80dB  |

Final Measurement: X GP / +AV  
Max Time: 1sec  
Subrange: 25  
Acc Magn: 60 dB



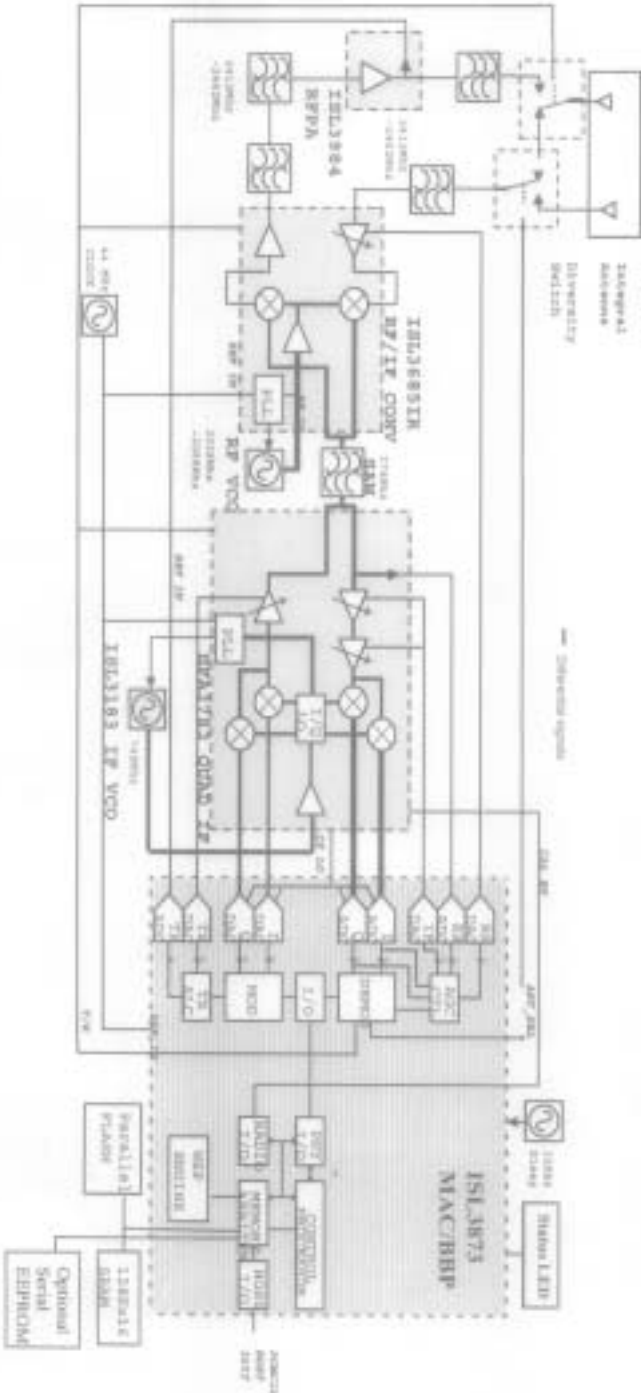
## Appendix 2. Photographs of EUT in side PCB



# Appendix 3. Block diagram of EUT

## System Overview

### SP-1001 Block Diagram



## Appendix 4. Circuit Diagram