# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR FCC CERTIFICATION

| | |
|---|---|
| **Test Report No.** | **: E047R-020** |
| **Applicant** | **: KI RYUNG ELECTRONICS CO., LTD.** |
| **Address** | **: 219-6, Gasan-Dong, Kumchun-Ku, Seoul, 153-023, Korea** |
| **Manufacturer** | **: KI RYUNG ELECTRONICS CO., LTD.** |
| **Address** | **: 219-6, Gasan-Dong, Kumchun-Ku, Seoul, 153-023, Korea** |
| **Type of Equipment** | **: Satellite Radio Receiver (FM Transmitter)** |
| **FCC ID.** | **: P3HSP-R1** |
| **Model Name** | **: SP-R1** |
| **Multiple Model Name** | **: N/A** |
| **Serial number** | **: N/A** |
| **Total page of Report** | **: 15 pages (including this page)** |
| **Date of Incoming** | **: June 20, 2004** |
| **Date of Issuing** | **: July 08, 2004** |

## SUMMARY

The equipment complies with the regulation of ***FCC CRF 47 PART 15, SUBPART C, SECTION 15.239***.

This test report contains only the results 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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EMC Div.
ONETECH Corp.

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**EMC Testing Dept** : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-City, Kyunggi-Do 464-860 Korea. (TEL: +82-31-765-8289, FAX: +82-31-766-2904)

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## 1. VERIFICATION OF COMPLIANCE

-. APPLICANT : KI RYUNG ELECTRONICS CO., LTD.
-. ADDRESS : 219-6, Gasan-Dong, Kumchun-Ku, Seoul, 153-023, Korea
-. CONTACT PERSON : Mr. In-Kyoung, Kim / Q.C Assistant Manager
-. TELEPHONE NO : +82-2-3282-2264
-. BRAND NAME : Clarion
-. FCC ID : P3HSP-R1
-. MODEL NO/NAME : SP-R1
-. SERIAL NUMBER : N/A
-. DATE : July 08, 2004

| | |
|---|---|
| DEVICE TYPE | Low Power Communication Device Transmitter |
| E.U.T. DESCRIPTION | Satellite Radio Receiver (FM Transmitter) |
| THIS REPORT CONCERNS | ORIGINAL GRANT |
| MEASUREMENT PROCEDURES | Charter 7 and 13 of ANSI C63.4: 2001 |
| 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 15.239 |
| MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE | No |
| FINAL TEST WAS CONDUCTED ON | 3 METER OPEN AREA TEST SITE |

-. This device has shown compliance with the conducted emissions limits in 15.107 adopted under FCC 02-107 (ET Docket 98-80). The device may be marketed after July 11, 2005 affected by the 15.37(j) transition provisions.

-. 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 KI RYUNG ELECTRONICS CO., LTD., Model SP-R1 (referred to as the EUT in this report) is Satellite Radio Receiver that has the FM transmitter from 88.1 MHz to 91.3 MHz for audio signal of FM radio receiver. Product specification described herein was obtained from product data sheet or user's manual.

| | |
|---|---|
| CHASSIS TYPE | Plastic |
| LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz) | Main Board : 7.3728 MHz, 7.6 MHz<br>RF Module Board : 12.288 MHz, 7.3728 MHz |
| POWER REQUIREMENT | DC 12V from a AC/DC Adaptor |
| TX FREQUENCY RANGE | 88.1 MHz ~ 91.3 MHz (Step freq. : 0.2 MHz) |
| NUMBER OF LAYERS | Main Board : 6 Layers<br>RF Module Board : 8 Layers |
| EXTERNAL CONNECTOR | RF Antenna In, FM Output, Audio Input, Power In |

## 2.2 Model Differences

-. The difference(s) compared to the EUT is as follows: none

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

-. Original submittal only

## 2.4 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 |
|---|---|---|---|---|
| SP-R1 | KI RYUNG ELECTRONICS CO., LTD. | P3HSP-R1 | Satellite Radio Receiver(EUT) | - |
| NL20-120200-I1 | Leader Electronics Inc. | N/A | AC/DC Adaptor | EUT |
| - | - | N/A | External Antenna | EUT |
| SMS-015N | Sungil Precision Co., Ltd. | N/A | Speaker | EUT |



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### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in chapter 7, 13 of ANSI C63.4: 2001. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

### 2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-City, 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 |
|---|---|---|---|
| Main Board | KI RYUNG ELECTRONICS CO., LTD. | N/A | N/A |
| RF Module Board | KI RYUNG ELECTRONICS CO., LTD. | JUPITER2.5 | N/A |

## 3.2 EUT exercise Software

The Model, SP-R1 is included a FM transmitter designed to operate on function in the 88.1 ~ 91.3 MHz. When a 12 VDC supply voltage is connected, the transmitter is activated and connected speaker was set at maximum output mode.
91.3 MHz was measured as the highest output power. Data from this channel was determined to be worst case.

## 3.3 Cable Description

| Product Name | Power Cord Shielded (Y/N) | I/O cable Shielded (Y/N) | Length (M) |
|---|---|---|---|
| Satellite Radio Receiver(EUT) | Y | - | 1.8(P) |
| External Antenna | N/A | N | 1.8(D) |
| AC/DC Adaptor | N/A | N | 1.2 (D) |
| SPEAKER | N/A | N | 1.2(D) |

* The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

## 3.4 Noise Suppression Parts on Cable

| Product Name | Ferrite Bead (Y/N) | Location | Metal Hood (Y/N) | Location |
|---|---|---|---|---|
| Satellite Radio Receiver(EUT) | N | N/A | Y | EUT END |
| External Antenna | N | N/A | N | N/A |
| AC/DC Adaptor | Y | EUT END | Y | EUT END |
| SPEAKER | N | N/A | Y | BOTH END |

## 3.5 Equipment Modifications

To achieve compliance to FCC part 15 rules, the following change(s) was made by ONETECH Corp. during compliance testing:

"There were no Modified items during EMI test"



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### 3.6 Configuration of Test System

**Line Conducted Test**: The EUT was connected to AC/DC adaptor and AC/DC adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.4: 2001 7.2.3 to determine the worse operating conditions.

**Radiated Emission Test**: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4: 2001 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter open area test site.

**Occupied Bandwidth Measurement**:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer.

### 3.7 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

**Antenna Construction:**

FM transmitter antenna of the EUT is fixed inside the EUT, no consideration of replacement by the user.

## 4. PRELIMINARY TEST

### 4.1 AC Power line Conducted Emission Test

During Preliminary Test, the following operating mode was investigated

| Operation Mode | The Worse operating condition (Please check one only) |
|---|---|
| Transmit RF Signal continuously | 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) |
|---|---|
| Transmit RF Signal continuously | 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 : 39 % Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.207 (a)

Type of Test : Low Power Communication Device Transmitter

Result : PASSED BY –6.72 dB at 0.20 MHz

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EUT : Satellite Radio Receiver Date: June 20, 2004

Operating Condition : Transmit the RF signal.

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

| Frequency (MHz) | Line | Peak (dBuV) | | Margin (dB) |
|---|---|---|---|---|
| | | Emission level | Q.P Limits | |
| 0.20 | H | 56.89 | 63.61 | -6.72 |
| 0.30 | N | 42.39 | 60.11 | -17.72 |
| 1.02 | N | 38.68 | 56.00 | -17.32 |
| 2.21 | H | 35.47 | 56.00 | -20.53 |
| 3.77 | N | 37.92 | 56.00 | -18.08 |
| 4.01 | H | 37.12 | 56.00 | -18.88 |
| **Frequency (MHz)** | **Line** | **Average (dBuV)** | | **Margin (dB)** |
| | | **Emission level** | **Limits** | |
| 0.20 | H | 33.24 | 53.61 | -20.37 |
| 0.30 | N | 26.58 | 50.11 | -23.53 |
| 1.02 | N | 21.80 | 46.00 | -24.20 |
| 3.77 | N | 22.24 | 46.00 | -23.76 |

Line Conducted Emission Tabulated Data

Remark : "H": Hot Line, "N": Neutral line

See next page for an overview sweep performed with peak and average detector.

**Tested by: Sue-Yong, Lee / Test Engineer**




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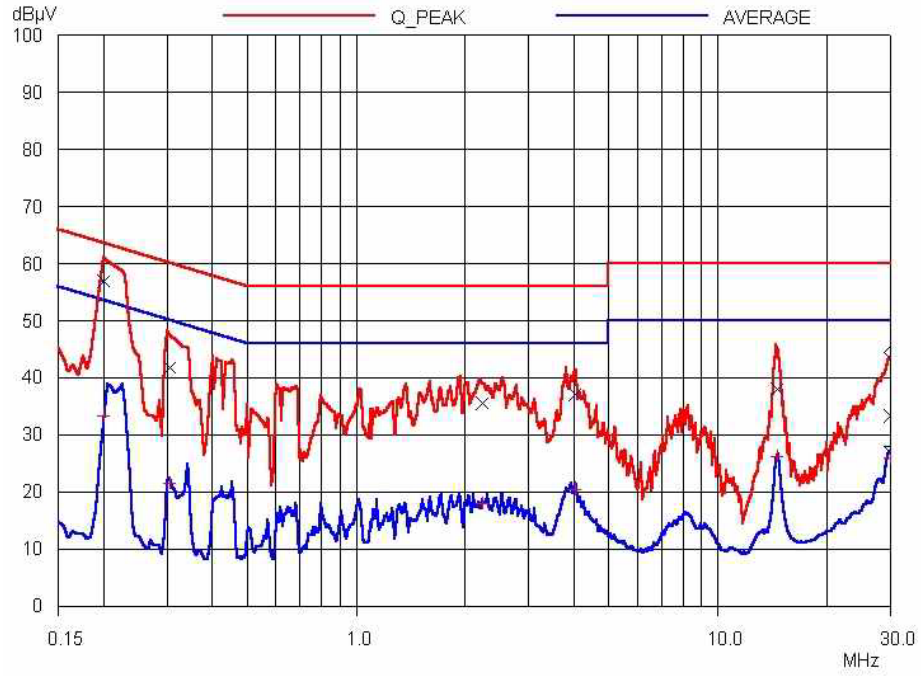
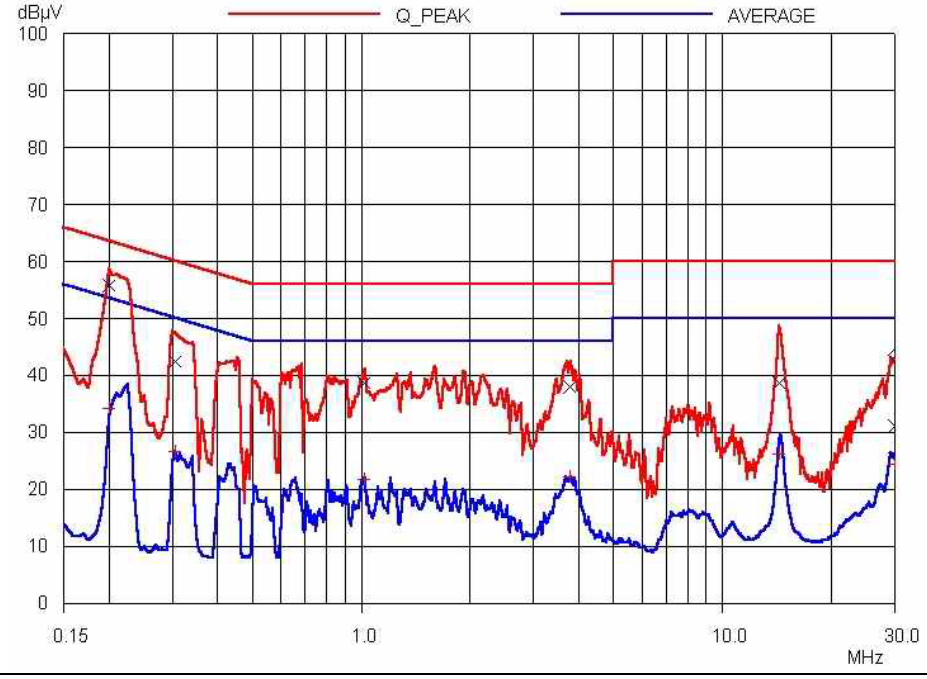



**HOT LINE**




**NEUTRAL LINE**



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### 5.2 Radiated Emission Test (Within the permitted 200 kHz band)

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

Humidity Level : 52 % Temperature: 23 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (b)
Type of Test : Low Power Communication Device Transmitter
Result : PASSED BY – 5.00 dB at 88.10 MHz

EUT : Satellite Radio Receiver Date: June 28, 2004
Operating Condition : Transmit the RF signal.
Distance : 3 Meter

| Radiated Emission | | | Ant | Correction Factors | | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | Detect Mode | Pol. | Ant. (dBuV/m) | Cable (dB) | Amp. (dBuV/m) | (dBuV/m) | (dB) |
| 88.10 | 33.45 | Peak | V | 8.04 | 1.51 | 43.00 | 48.00 | -5.00 |
| 88.10 | 32.15 | Peak | H | 8.04 | 1.51 | 41.70 | 48.00 | -6.30 |
| 91.30 | 31.40 | Peak | V | 8.70 | 1.50 | 41.60 | 48.00 | -5.20 |
| 91.30 | 31.50 | Peak | H | 8.70 | 1.50 | 41.60 | 48.00 | -6.40 |

Radiated Emission Tabulated Data

Remark: Per 15.31(m), because the EUT's frequency range is between 1 MHz to 10 MHz, two channels (near top and near bottom) were tested.

Average detector mode was not measured, because peck emission values were under average limit.

**Tested by: Sue-Young, Lee/ Test Engineer**



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### 5.3 Radiated Emission Test (Outside of the specified 200 kHz band)

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

Humidity Level : 52 % Temperature: 23 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209 (a)

Type of Test : Low Power Communication Device Transmitter

Result : PASSED BY –8.50dB at 129.81MHz

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EUT : Satellite Radio Receiver Date: June 28, 2004

Operating Condition : Transmit the RF signal.

Frequency range : 30MHz – 1000MHz

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

Distance : 3 Meter

Remark : Other emissions

| Radiated Emission | | Ant | Correction Factors | | Total | FCC | |
|---|---|---|---|---|---|---|---|
| Freq. (MHz) | Amp. (dBuV) | Pol. | Ant. (dBuV/m) | Cable (dB) | Amp. (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
| 100.74 | 22.71 | H | 10.51 | 1.50 | 34.72 | 43.52 | -8.80 |
| 129.81 | 19.59 | V | 13.76 | 1.67 | 35.02 | 43.52 | -8.50 |
| 144.35 | 16.58 | H | 14.39 | 1.75 | 32.72 | 43.52 | -10.80 |
| 640.49 | 11.84 | V | 19.88 | 3.80 | 35.52 | 46.02 | -10.50 |
| 661.81 | 10.15 | V | 20.34 | 3.83 | 34.32 | 46.02 | -11.70 |

**Tested by: Sue-Young, Lee/ Test Engineer**




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## 5.4 Bandwidth of the operating frequency

| | | |
|---|---|---|
| Humidity Level | : 52 % | Temperature: 23 °C |
| Limits apply to | : FCC CFR 47, PART 15, SUBPART C, SECTION 15.239 (a) | |
| Result | : PASSED | |

| | |
|---|---|
| EUT | : Satellite Radio Receiver |
| Operating Condition | : Transmit the RF signal. |
| Minimum Resolution Bandwidth | : 10 kHz |
| Remark | : Refer to test data in next page. |

Date: June 28, 2004

**Tested by: Sue-Young, Lee/ Test Engineer**




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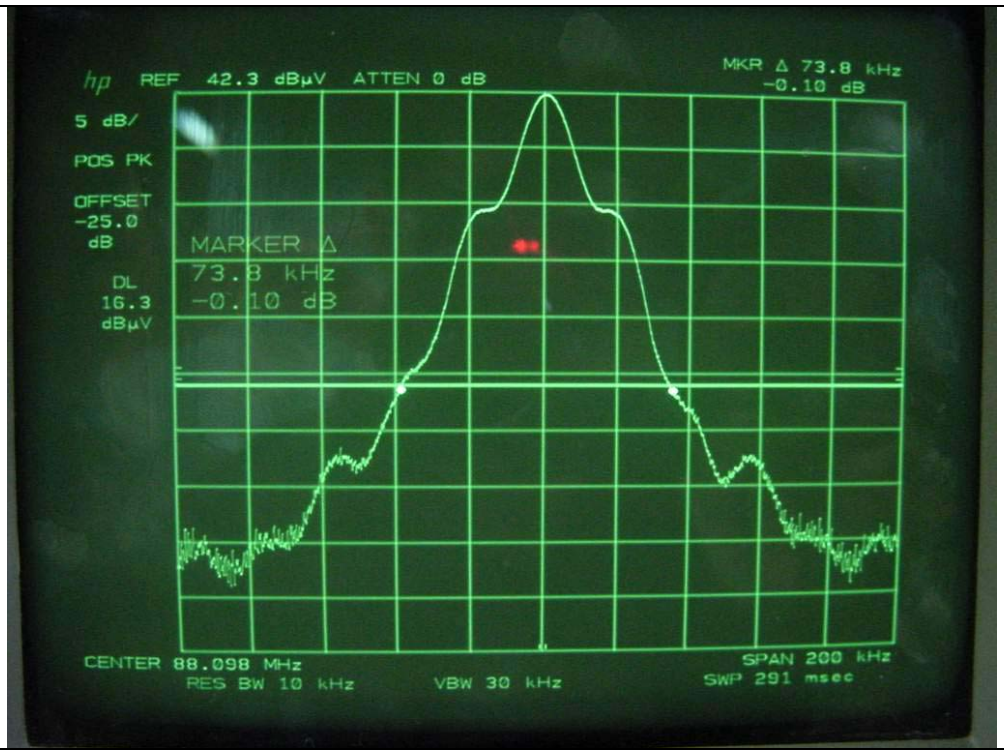
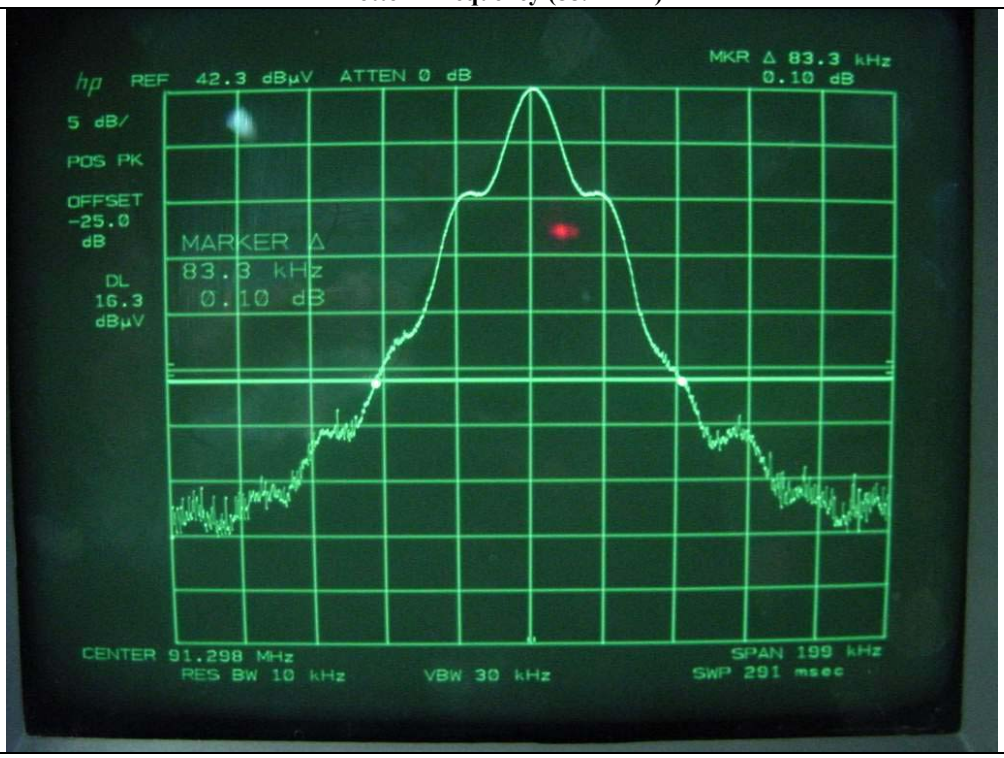



**Bottom Frequency (88.1MHz)**




**Top Frequency (91.3MHz)**

## 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 | NOV/03 | 12MONTH | ■ |
| 2. | Test receiver | R/S | ESHS 10 | 834467/007 | APR/04 | 12MONTH | ■ |
| 3. | Spectrum analyzer | HP | 8566B | 3407A08547 | MAY/04 | 12MONTH | ■ |
| 4. | Spectrum analyzer | HP | 8568B | 3109A05456 | MAY/04 | 12MONTH | ■ |
| 5. | RF preselector | HP | 85685A | 3107A01264 | MAY/04 | 12MONTH | ■ |
| 6. | Quasi-Peak Adapter | HP | 85650A | 3107A01542 | MAY/04 | 12MONTH | ■ |
| 7. | TRILOG Broadband Antenna | Schwarzbeck | VULB9163 | VULB9163 166 | FEB/04 | 12MONTH | |
| 8. | Biconical antenna | EMCO | 3104C | 9109-4443 | MAY/04 | 12MONTH | |
| | | | | 9109-4444 | JUL/03 | 12MONTH | |
| | | Schwarzbeck | VHA9103 | 91031852 | JAN/04 | 12MONTH | ■ |
| 9. | Log Periodic antenna | EMCO | 3146 | 9109-3213 | AUG/03 | 12MONTH | |
| | | | | 9109-3214 | JUL/03 | 12MONTH | |
| | | | | 9109-3217 | MAY/04 | 12MONTH | |
| | | Schwarzbeck | 9108-A(494) | 62281001 | JAN/04 | 12MONTH | ■ |
| 10. | LISN | EMCO | 3825/2 | 9109-1867 | AUG/03 | 12MONTH | ■ |
| | | | | 9109-1869 | OCT/03 | 12MONTH | |
| 11. | Position Controller | EMCO | 1090 | 9107-1038 | N/A | N/A | ■ |
| 12. | Turn Table | EMCO | 1080-1.21 | 9109-1576 | N/A | N/A | ■ |
| 13. | Antenna Master | EMCO | 1070-1 | 9109-1624 | N/A | N/A | ■ |



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