

***Electromagnetic Emissions Test Report
In Accordance With Industry Canada
Radio Standards Specification 210
And FCC Part 15 Sections 15.209, 15.231
on the
Savi Technology, Inc.
Transmitter
Model: SMR-650P-110 and SMR-650P-111***

UPN: 2404A-650P
FCC ID: KL7-650MR-V1


GRANTEE: Savi Technology, Inc.
615 Tasman Drive
Sunnyvale, CA. 94089-1707

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Ave
Sunnyvale, CA 94086

REPORT DATE: December 16, 2003

FINAL TEST DATE: December 8, December 9 and
December 11, 2003

AUTHORIZED SIGNATORY:


Mark Briggs
Vice President of Engineering



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Equipment Name and Model:

Transceiver, SMR-650P-110 and SMR-650P-111

Manufacturer:

Savi Technology, Inc.

Tested to applicable standard:

RSS210, Issue 5, February 1996
Low Power License-Exempt Radio Communication Devices
FCC Part 15 Subpart C

Test Report Prepared For:

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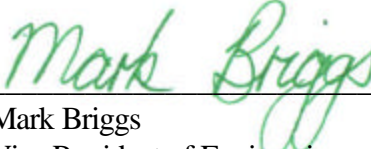
Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 **SV1**, Dated July 3, 1997

Declaration of Compliance

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4 as detailed in section 5.3 of RSS-210, Issue 5); and that the equipment performed in accordance with the data submitted in this report.

Signature



Name

Mark Briggs

Title

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Date: December 16, 2003

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SCOPE

An electromagnetic emissions test has been performed on the Savi Technology, Inc. model SMR-650P-110 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and Industry Canada Radio Standards Specification RSS-210 for Low Power, License-Exempt Radio Communication Devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Savi Technology, Inc. model SMR-650P-110 and therefore apply only to the tested sample. The sample was selected and prepared by Eugene Schlindwein of Savi Technology, Inc..

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators and Industry Canada RSS-210 for Low Power, License-Exempt Radio Communication Devices. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules and Industry Canada Radio Standards Procedure RSP-100.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of the Savi Technology's SMR-650P-110 complied with the requirements of Subpart C of Part 15 of the FCC Rules for low power intentional radiators and Industry Canada specification RSS 210 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands).

Maintenance of FCC compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

TEST RESULTS SUMMARY**15.231 / RSS 210 Section 6.1**

| FCC Part 15 Section | RSS 210 Section | Description | Comments | Result |
|---------------------|--------------------|--|--|----------------|
| 15.207 / 15.107 | | AC Conducted Emissions, 0.15 – 30 MHz | -5.6dB @ 1.169MHz | Pass |
| | 6.6 / 7.4 | AC Conducted emissions 0.45 – 30 MHz | -3.7dB @ 1.169MHz | Pass |
| 15.231 (a) (1) | 6.1.1(a) (1) | Duration of manually activated transmission | N/A | |
| 15.231 (a) (2) | 6.1.1(a) (2) | Duration of automatically activated transmission | 5 seconds or less for control signals (Wake-Up and Control signals) Refer to the operational description for detailed description and timing diagrams. | |
| 15.231 (a) (3) | 6.1.1(a) (3) | Transmissions at predetermined / regular intervals are not permitted | All transmissions are triggered via the Personal Data Terminal by the end-user. Refer to the operational description for detailed description and timing diagrams. | |
| 15.231 (a) (4) | 6.1.1(a) (4) | Pendency of transmissions used during emergencies involving fire, security, and safety of life | Not applicable | |
| 15.231 (b) | 6.1.1(b) / Table 1 | Transmitter Radiated Emissions, 433.92 MHz | 92.2dBuV/m Peak; 80.2dBuV/m Average. Highest fundamental level was in pulsed control mode. | Pass (-0.6dB) |
| 15.231 (b) | 6.1.1(b) / Table 1 | Transmitter Radiated Spurious Emissions, 30-4339.2 MHz | 40.1dBuV/m Average @ 1735.7 MHz (-13.9dB) Highest spurious level was in Wake-Up mode. | Pass (-13.9dB) |
| 15.231 (c) | 6.1.1 (c) | Bandwidth | Measured bandwidth was 448 kHz. The maximum permitted is 0.25% of the fundamental frequency (1MHz) | |
| 15.231 (d) | 6.1.1 (d) | Frequency Stability | N/A for devices operating at 433.926 MHz | |
| 15.231 (e) | 6.1.1 (e) | Duration of transmission | 1 second or less - Refer to the operational description for detailed description and timing diagrams. | |
| 15.231 (e) | 6.1.1 (e) | Transmitter Radiated Emissions, 433.92 MHz | 92.2dBuV/m Peak; 72.2dBuV/m Average | Pass (-0.7dB) |
| 15.231 (e) | 6.1.1 (e) | Transmitter Radiated Spurious Emissions, 30-4339.2 MHz | 28.1dBuV/m Average @ 867.8 MHz (-24.8dB) | Pass (-24.8dB) |
| 15.109 | 7.3 | Receiver Spurious Emissions | -12.0dB @ 423.200 | Pass (-12dB) |

Note 2 – As the device is intended for hand-held operation it was tested in all three orthogonal orientations.

Note 3 – There are two different peak signal levels from the device. The lower level is for the Wake-Up signal which is a single transmission of 5 seconds duration. The higher level is for pulsed transmission signals. Data signal transmissions have a total duration of 1 second and a duty cycle of 10%. Pulsed control signals have duration of 5 seconds and a duty cycle of 25%.

15.209 / RSS 210 Table 3 – Operation at 123 kHz

| FCC Part 15 Section | RSS 210 Section | Description | Comments | Result |
|---------------------|-----------------|--|---|-------------------|
| 15.207 / 15.107 | | AC Conducted Emissions, 0.15 – 30 MHz | -5.7dB @ 1.169MHz | Pass |
| | 6.6 / 7.4 | AC Conducted emissions 0.45 – 30 MHz | -3.6dB @ 1.169MHz | Pass |
| 15.209 | 6.2.1 | Transmitter Fundamental Signal Emissions, 0.123 MHz | -7.9 dBuV/m @ 123 kHz | Complies (note 1) |
| 15.231 (b) | 6.2.1 | Transmitter Radiated Spurious Emissions, 0.123 – 1.3 MHz | All spurious emissions from the 123kHz transmitter were more than 20dB below the limit. | Complies (note 1) |
| | RSP 100 | Bandwidth | 14 kHz | N/A |

Note 1 – As the device is intended for hand-held operation it was tested in all three orthogonal orientations.

15.209 / RSS 210 Table 3 – Operation at 433.92 MHz)

| FCC Part 15 Section | RSS 210 Section | Description | Comments | Result |
|---------------------|-----------------|---|--------------------------------------|-------------------|
| 15.207 / 15.107 | | AC Conducted Emissions, 0.15 – 30 MHz | -5.6dB @ 1.169MHz | Pass |
| | 6.6 / 7.4 | AC Conducted emissions 0.45 – 30 MHz | -3.7dB @ 1.169MHz | Pass |
| 15.209 | 6.2.1 | Transmitter Radiated Emissions, 433.92 MHz | 45.1 dBuV/m @ 433.92 (-0.9 dB) | Complies (Note 2) |
| 15.231 (b) | 6.2.1 | Transmitter Radiated Spurious Emissions, (Other than control) 30-4340 MHz | 26.5 dBuV/m @ 867.853 MHz (-19.5 dB) | Complies (Note 3) |
| | RSP 100 | Bandwidth | 448 kHz | N/A |

Note 1 – As the device is intended for hand-held operation it was tested in all three orthogonal orientations.

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with NAMAS document NIS 81.

| Measurement Type | Frequency Range (MHz) | Calculated Uncertainty (dB) |
|---------------------|--------------------------|--------------------------------|
| <hr/> | | |
| Conducted Emissions | 0.15 to 30 | ± 2.4 |
| Radiated Emissions | 30 to 1000 | ± 3.6 |

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The Savi Technology, Inc. models SMR-650P-110 and SMR-650P-111 are transceivers that are designed connect to a hand-held personal data terminal (PDT) to communicate with Savi's RFID tags. The devices transmit at 123 kHz and at 433.92 MHz to initiate responses from tags within its vicinity. The tag's transmit at 433.92 MHz, so the devices also contains a receiver operating at 433.92 MHz with an LO at 423.2 MHz.

The only difference between the -110 and the -111 models is in the type of connector attached to the end of the integral serial cable. The -110 uses a DB9 connector and the -111 uses a proprietary connector for the Symbol series of hand-held PDTs. As the only software available to control the SMR-650P-11x devices for the purposes of FCC and Industry Canada compliance testing (i.e. continuously transmit modes) is a laptop PC, the -110 variant was tested.

The SMR-650P-110 and -111 both have a serial (RS-232) interface and operate from internal, rechargeable batteries. The device has an external DC input used to recharge the batteries via adapter. Although it is intended to be used as a hand held device operating from the internal batteries it is capable of operation while connected to the external AC-DC adapter. For this reason all tests were performed with the AC-DC adapter connected.

The 123 kHz transmitter operates under part 15.209 of the FCC's rules and RSS 210 Table 3 of Industry Canada's rules.

The 433.92 MHz transceiver operates under sections 15.209 and 15.231 of the FCC rules and Table 3 and section 6.1.1 of RSS 210. The 433.92 MHz transmissions consist of both data and control signals. When operating under 15.231 rules, the data signals are 10 mS long and have a duty cycle of no more than 10% measured in a 100 mS period. There are two types of control signals, one that has a 24% duty cycle and another, the Wake-Up signal that is a 2.5 second transmission. When operated under 15.209 rules, 433.92 MHz transmissions may be continuous.

Normally, the EUT would be used in conjunction with a hand-held device. The EUT was, therefore, treated as table-top equipment and tested in all three orthogonal orientations during testing to simulate the end-user environment. The electrical rating of the EUT adapter is 100-240VAC, 50-60Hz, 0.2A.

The sample was received on December 8, 2003 and tested on December 8, December 9 and December 11, 2003. The EUT consisted of the following component(s):

| Manufacturer/Model/Description | Serial Number |
|--|---------------|
| Savi Technology, Inc. SMR-650P-110 Transceiver | 443503120001 |

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 6.5 cm wide by 2.5 cm deep by 9 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for emissions testing:

| Manufacturer/Model/Description | Serial Number | FCC ID Number |
|--------------------------------|----------------|---------------|
| Winbook/WinBook XL/Laptop | H1106589 | DoC |
| PowDec/WP05050I/Charger | WP05050I-1.3 | N/A |
| IBM/ThinkPad/Laptop | 78-48-24897/11 | AN09611TBOON |

Note: Note the WinBook was used for digital device emissions tests. The IBM Thinkpad laptop was used for all other tests. The laptop was used to terminate the serial port. The actual serial peripheral would be a hand-held Personal Data Terminal and not a PC (the EUT is not considered to be a PC peripheral). The PDT's do not have the operating software to control the EUT as required for the tests (continuously transmitting).

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

| Port | Connected To | Cable(s) | | |
|---------------------|---------------|--------------------------|-----------------------|------------|
| | | Description | Shielded / Unshielded | Length (m) |
| EUT RS232 | Laptop RS232 | Integral cable | unshielded | 0.15 |
| EUT DC in | AC-DC adapter | Adapter's integral cable | unshielded | .5 |
| AC-DC Adapter AC | AC outlet | 3-wire | unshielded | 1.2 |

EUT OPERATION

During testing the EUT was configured to continuously transmit a modulated signal at either 123kHz or 433.92 MHz for transmit-mode tests and was configured in receiver mode for receive mode tests.

ANTENNA SYSTEM

The antenna system used with the Savi Technology, Inc. model SMR-650P-110 and SMR-650P-111 is permanently attached.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken on December 8, December 9 and December 11, 2003 at the Elliott Laboratories Open Area Test Site located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4-1992.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION**RECEIVER SYSTEM**

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES**EUT AND CABLE PLACEMENT**

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions, which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS, SECTION 15.207 & 15.107(a)

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

| Frequency (MHz) | Average Limit (dBuV) | Quasi Peak Limit (dBuV) |
|--------------------|---|---|
| 0.150 to 0.500 | Linear decrease on logarithmic frequency axis between 56.0 and 46.0 | Linear decrease on logarithmic frequency axis between 66.0 and 56.0 |
| 0.500 to 5.000 | 46.0 | 56.0 |
| 5.000 to 30.000 | 50.0 | 60.0 |

CONDUCTED EMISSIONS SPECIFICATION LIMITS, RSS 210

| Frequency Range (MHz) | Class B Limit (uV) | Class B Limit (dBuV) |
|-----------------------------|--------------------------|----------------------------|
| 0.450 to 30.000 | 250 | 48 |

FUNDAMENTAL AND HARMONIC LIMITS 15.231 (b) / RSS 210 Table 1

The table below shows the limits for both the Fundamental and Harmonic emissions for each frequency band of operation detailed in Section 15.231 (b) for control signals.

| Operating Frequency (MHz) | Field strength (microvolts/m) | Harmonics (microvolts/m) |
|---------------------------------|----------------------------------|-----------------------------|
| 70 - 130 | 1250 | 125 |
| 130 - 174 | 1250 - 3750 | 125 - 375 |
| 174 - 260 | 3750 | 375 |
| 260 - 470 | 3750 - 12,500 | 375 - 1250 |
| Above 470 | 12,500 | 1250 |

FUNDAMENTAL AND HARMONIC LIMITS 15.231 (e)/RSS 210 Table 4

The table below shows the limits for both the Fundamental and Harmonic emissions (that do not fall in restricted bands) for each frequency band of operation detailed in Section 15.231 (e) for data signals.

| Operating Frequency (MHz) | Field strength (microvolts/m) | Harmonics (microvolts/m) |
|---------------------------|-------------------------------|--------------------------|
| 70 - 130 | 500 | 50 |
| 130 - 174 | 500 - 1500 | 50 - 150 |
| 174 - 260 | 1500 | 150 |
| 260 - 470 | 1500 - 5000 | 150 - 500 |
| Above 470 | 5000 | 500 |

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.209 / RSS 210 Table 3

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands and the limits for all emissions for a low power device operating under the general rules of RSS 210 and FCC Part 15 Subpart C.

| Frequency Range (MHz) | Limit (uV/m @ 3m) | Limit (dBuV/m @ 3m) |
|-----------------------|-------------------------------------|---|
| 0.009-0.490 | $2400/F_{\text{KHz}} @ 300\text{m}$ | $67.6-20*\log_{10}(F_{\text{KHz}}) @ 300\text{m}$ |
| 0.490-1.705 | $24000/F_{\text{KHz}} @ 30\text{m}$ | $87.6-20*\log_{10}(F_{\text{KHz}}) @ 30\text{m}$ |
| 1.705 to 30 | 30 @ 30m | 29.5 @ 30m |
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

RADIATED EMISSIONS SPECIFICATION LIMITS, SECTION 15.109 / RSS 210 Table 3 (RECEIVER)

The table below shows the limits for emissions from the receiver.

| Frequency Range (MHz) | Limit (uV/m @ 3m) | Limit (dBuV/m @ 3m) |
|-----------------------------|----------------------|------------------------|
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40 * \text{LOG}_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_C = R_R + F_d$$

and

$$M = R_C - L_S$$

where:

R_R = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_C = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 4339.25MHz, 08-Dec-03**Engineer: Marissa Faustino**

| <u>Manufacturer</u> | <u>Description</u> | <u>Model #</u> | <u>Assett #</u> | <u>Cal Due</u> |
|---------------------|---|----------------|-----------------|----------------|
| EMCO | Horn Antenna, D. Ridge 1-18GHz | 3115 | 487 | 24-Apr-04 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 24-Jan-04 |
| Filtek | High Pass Filter, 1GHz | HP12/1000-5BA | 956 | 11-Mar-04 |
| Hewlett Packard | EMC Spectrum Analyzer, Opt. 026 □ 9 KHz - 26.5GHz | 8593EM | 1141 | 19-Mar-04 |
| EMCO | Log Periodic Antenna, 0.2-1 GHz | 3146 | 1294 | 17-Apr-04 |
| Rohde & Schwarz | Test Receiver, 9kHz-2750MHz | ESCS 30 | 1337 | 27-Dec-03 |

Radiated Emissions, 30 - 2,000 MHz, 09-Dec-03**Engineer: Joseph Cadigal**

| <u>Manufacturer</u> | <u>Description</u> | <u>Model #</u> | <u>Assett #</u> | <u>Cal Due</u> |
|---------------------|-------------------------------------|----------------|-----------------|----------------|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 10-Jan-04 |
| Filtek | High Pass Filter, 1GHz | HP12/1000-5BA | 955 | 03-Apr-04 |
| EMCO | Horn Antenna, D. Ridge 1-18GHz | 3115 | 1242 | 09-Oct-04 |
| Hewlett Packard | EMC Spectrum Analyzer, 9KHz - 22GHz | 8593EM | 1319 | 20-Nov-04 |
| EMCO | Log Periodic Antenna, 0.2-2 GHz | 3148 | 1321 | 31-Mar-04 |
| Rohde & Schwarz | Test Receiver, 0.009-2000 MHz | ESN | 1332 | 24-Jul-04 |

Radiated Emissions, 30 - 2,000 MHz, 11-Dec-03**Engineer: Yu Chien Ho**

| <u>Manufacturer</u> | <u>Description</u> | <u>Model #</u> | <u>Assett #</u> | <u>Cal Due</u> |
|---------------------|-------------------------------------|----------------|-----------------|----------------|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 10-Jan-04 |
| Filtek | High Pass Filter, 1GHz | HP12/1000-5BA | 956 | 11-Mar-04 |
| EMCO | Horn Antenna, D. Ridge 1-18GHz | 3115 | 1242 | 09-Oct-04 |
| Hewlett Packard | EMC Spectrum Analyzer, 9KHz - 22GHz | 8593EM | 1319 | 20-Nov-04 |
| EMCO | Log Periodic Antenna, 0.2-2 GHz | 3148 | 1321 | 31-Mar-04 |
| Rohde & Schwarz | Test Receiver, 0.009-2000 MHz | ESN | 1332 | 24-Jul-04 |

Conducted Emissions - AC Power Ports, 11-Dec-03**Engineer: Yu Chien Ho**

| <u>Manufacturer</u> | <u>Description</u> | <u>Model #</u> | <u>Assett #</u> | <u>Cal Due</u> |
|----------------------|---------------------------------|----------------------|-----------------|----------------|
| Elliott Laboratories | FCC / CISPR LISN | LISN-3, OATS | 304 | 01-Jul-04 |
| Fischer Custom Comm. | LISN, Freq. 0.9 -30 MHz, 16 Amp | FCC-LISN-50/250-16-2 | 1079 | 01-Jul-04 |
| Rohde & Schwarz | Test Receiver, 0.009-2000 MHz | ESN | 1332 | 24-Jul-04 |
| Rohde & Schwarz | Pulse Limiter | ESH3 Z2 | 1398 | 10-Jan-04 |

Radiated Emissions, 30 - 1000 MHz, 18-Dec-03**Engineer: jmartinez**

| <u>Manufacturer</u> | <u>Description</u> | <u>Model #</u> | <u>Assett #</u> | <u>Cal interval</u> |
|---------------------|---------------------------------|----------------|-----------------|---------------------|
| EMCO | Biconical Antenna, 30-300 MHz | 3110B | 801 | 12 |
| EMCO | Log Periodic Antenna, 0.2-1 GHz | 3146 | 1294 | 12 |
| Rohde & Schwarz | Test Receiver, 9kHz-2750MHz | ESCS 30 | 1337 | 12 |

EXHIBIT 2: Test Measurement Data

The following data includes conducted emission measurements of the Savi Technology, Inc. model SMR-650P-110 and SMR-650P-111 and maximized radiated emissions measurements of the complete system.

T 53670_Radio 26 Pages

T 53670_Digital 14 Pages



EMC Test Data

| | | | |
|-----------------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | EN 301 489-3, EN60601-1-2 | Environment: | |

EMC Test Data

For The

Savi

Model

SMR-650P-110

Date of Last Test: 12/23/2003



EMC Test Data

| | | | |
|-----------------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | EN 301 489-3, EN60601-1-2 | Environment: | |

EUT INFORMATION

General Description

The EUT is a transceiver which is designed to communicate with Savi's RFID tags. The device transmits at 123 kHz and at 433.92 MHz to initiate responses from tags within its vicinity. The tag's transmit at 433.92 MHz, so the EUT also contains a receiver operating at 433.92 MHz. The device has a serial (RS-232) interface to connect directly to a hand held PC or similar device and operates from internal, rechargeable batteries. The device has an external DC input used to recharge the batteries via adapter. It is intended to be used as a hand held device although it can operate while connected to the external AC-DC adapter. The 123 kHz transmitter operates under part 15.209 of the FCC's rules. The 433.92 MHz transceiver operates under sections 15.209 and 15.231 of the FCC rules. The 433.92 MHz transmissions consist of both data and control signals. When operating under 15.231 rules, the data signals are 10 mS long and have a duty cycle of no more than 10% measured in a 100 mS period. There are two types of control signals, one that has a 24% duty cycle and another, the Wake-Up signal, that is a 2.5 second transmission. When operated under 15.209 rules. 433.92 MHz transmissions may be continuous. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT adapter is 100-240VAC, 50-60Hz, 0.2A.

Equipment Under Test

| Manufacturer | Model | Description | Serial Number | FCC ID |
|-----------------------|--------------|-------------|---------------|--------------|
| Savi Technology, Inc. | SMR-650P-110 | Transceiver | 443503120001 | KL7-650MR-V1 |

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 6.5 cm wide by 2.5 cm deep by 9 cm high.

Modification History

| Mod. # | Test | Date | Modification |
|--------|------|------|--------------|
| 1 | - | - | None |

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.



EMC Test Data

| | | | |
|-----------------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | EN 301 489-3, EN60601-1-2 | Environment: | |

Test Configuration #2

Local Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|------------|-----------------|----------------|--------------|
| Winbook | Winbook XL | Laptop Computer | H1106587 | DoC |
| IBM | ThinkPad | Laptop Computer | 78-48-24897/11 | ANO9611TBOON |
| PowDec | WP05050I | Charger | WP05050I-1.3 | none |

Note the WinBook was used for digital device emissions tests. The IBM Thinkpad laptop was used for all other tests. The laptop was used to terminate the serial port. The actual serial peripheral would be a hand-held Personal Data Terminal and not a PC (the EUT is not considered to be a PC peripheral). The PDT's do not have the operating software to control the EUT as required for the tests (continuously transmitting).

Remote Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| none | | | | |

Interface Cabling and Ports

| Port | Connected To | Cable(s) | | |
|--------|--------------|-------------|------------------------|-----------|
| | | Description | Shielded or Unshielded | Length(m) |
| Serial | Laptop | DB9 | Shielded | 0.2 |
| DC | Charger | Multiwire | Shielded | 2 |

EUT Operation During Emissions

The EUT was set to continuously transmit at either 123kHz or 433.92 MHz with no modulation.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/9/2003

Test Engineer: Joseph Cadigal

Test Location: SVOATS #2

Config. Used: 2

Config Change: none

EUT Voltage: 120V/60Hz

General Test Configuration

The 123kHz MHz transmitter was set to maximum output level during the test.

The measurement antenna was located 3m and/or 10m from the EUT. The measurement data has been extrapolated to the appropriate distance.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19°C

Rel. Humidity: 69%

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|----------------------|------------|--------|-----------|
| 1 | RE, 0.123 - 1.23 MHz | FCC 15.209 | Pass | see below |

Modifications Made During Testing:

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: Radiated Emissions, 0.009 - 1000 MHz: Transmit Mode (132kHz)

sn: 0443503120001

Measurements of the fundamental signal were made on the OATS at test distances of 3m and 10m and are recorded in the table below.

| Frequency | Level | AF | Level | Pol | Detector | Azimuth | Height | Comments |
|-----------------|-------|-------------------|--------------|---------|-----------|---------|--------|------------------------|
| kHz | dBμV | dBm ⁻¹ | dBμV/m | (O / I) | Pk/QP/Avg | degrees | meters | |
| flat | | | | | | | | |
| 123.000 | 91.5 | 10.4 | 101.9 | O | Pk | 269 | 1.0 | Tested at 3m - Note 1 |
| 123.000 | 82.5 | 10.4 | 92.9 | I | Pk | 256 | 1.0 | Tested at 3m - Note 1 |
| side | | | | | | | | |
| 123.000 | 87.8 | 10.4 | 98.2 | O | Pk | 200 | 1.0 | Tested at 3m - Note 1 |
| 123.000 | 88.2 | 10.4 | 98.6 | I | Pk | 159 | 1.0 | Tested at 3m - Note 1 |
| standing | | | | | | | | |
| 123.000 | 80.3 | 10.4 | 90.7 | O | Pk | 89 | 1.0 | Tested at 3m - Note 1 |
| 123.000 | 81.6 | 10.4 | 92.0 | I | Pk | 155 | 1.0 | Tested at 3m - Note 1 |
| flat | | | | | | | | |
| 123.000 | 62.8 | 10.4 | 73.2 | O | Pk | 49 | 1.0 | Tested at 10m - Note 2 |
| 123.000 | 58.9 | 10.4 | 69.3 | I | Pk | 152 | 1.0 | Tested at 10m - Note 2 |
| side | | | | | | | | |
| 123.000 | 62.3 | 10.4 | 72.7 | O | Pk | 264 | 1.0 | Tested at 10m - Note 2 |
| 123.000 | 58.5 | 10.4 | 68.9 | I | Pk | 174 | 1.0 | Tested at 10m - Note 2 |
| standing | | | | | | | | |
| 123.000 | 59.1 | 10.4 | 69.5 | O | Pk | 225 | 1.0 | Tested at 10m - Note 2 |
| 123.000 | 52.7 | 10.4 | 63.1 | I | Pk | 135 | 1.0 | Tested at 10m - Note 2 |

Note 1: The maximum signal level was with the device oriented **101.9 dBuV/m EUT laying flat**

Note 2: The maximum signal level was with the device oriented **73.2 dBuV/m EUT laying flat**

Note 3: Polarization of O indicates the loop was facing the EUT, I indicates that the loop was perpendicular to the EUT.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Extrapolation Factor Calculation:

Level at 3m: 101.9 dB μ V/m
 Level at 10m: 73.2 dB μ V/m
 Extrapolation from 3m to 10m: 54.9 dB
 Extrapolation from 10m to 300m: **81.1** (This factor used to calculate the level in the table below)

| Frequency | Level | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|-----------|--------------|------------|--------|-----------|---------|--------|----------|
| KHz | dB μ V/m | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 123 | -7.9 | 25.8 | -33.7 | Pk | 89 | 1.0 | Note 1 |
| 246 | - | 19.8 | >20dB | Pk | - | - | Note 2 |
| 369 | - | 16.3 | >20dB | Pk | - | - | Note 2 |
| 492 | - | 33.8 | >20dB | Pk | - | - | Note 3 |
| 615 | - | 31.8 | >20dB | Pk | - | - | Note 3 |
| 738 | - | 30.2 | >20dB | Pk | - | - | Note 3 |
| 861 | - | 28.9 | >20dB | Pk | - | - | Note 3 |
| 984 | - | 27.7 | >20dB | Pk | - | - | Note 3 |
| 1107 | - | 26.7 | >20dB | Pk | - | - | Note 3 |
| 1230 | - | 25.8 | >20dB | Pk | - | - | Note 3 |

| | |
|---------|--|
| Note 1: | Level calculated by applying the extrapolation factor calculated from the measurements at 3m and 10m to the measurement recorded at 10m. |
| Note 2: | Preliminary measurements showed there to be no significant signals at a distance of 3m from the EUT other than the fundamental signal. Apart from the fundamental transmission, all signals below 490kHz were less than 52dB μ V/m (1.85dB μ A/m) at a distance of 3m, which is equivalent to a level of -28dB μ V/m at the specification distance of 300m if using the suggested extrapolation factor of $40\log(\text{measurement distance/specification distance})$. |
| Note 3: | Preliminary measurements showed there to be no significant signals at a distance of 3m from the EUT other than the fundamental signal. All signals above 490kHz were less than 43.4dB μ V/m (-8.2dB μ A/m) at a distance of 3m, which is equivalent to a level of 3.4dB μ V/m at the specification distance of 30m if using the suggested extrapolation factor of $40\log(\text{measurement distance/specification distance})$. |



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/11/2003
Test Engineer: Yu-Chien Ho
Test Location: SVOATS #2

Config. Used: #2
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 3 meters from the EUT.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions: Temperature: 13.3 °C
Rel. Humidity: 46 %

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|---------------------|------------|--------|--------------------------------|
| 1 | RE, 30 - 1735.68MHz | FCC 15.209 | Pass | -0.9dB @ 433.926Laying Flat |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: Preliminary Radiated Emissions, 30-1000 MHz

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|------------|--------|-----------|---------|--------|---------------------------------------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 433.926 | 45.1 | h | 46.0 | -0.9 | QP | 360 | 1.0 | Fundamental Signal |
| 433.926 | 45.1 | h | 46.0 | | Pk | 360 | 1.0 | Fundamental Signal with peak detector |
| 867.853 | 26.5 | h | 46.0 | -19.5 | QP | 230 | 1.4 | |
| 1301.760 | 28.7 | h | 54.0 | -25.3 | Avg | 172 | 1.0 | Restricted Band Signal |
| 1301.760 | 41.6 | h | 74.0 | -32.4 | Pk | 172 | 1.0 | Restricted Band Signal |
| Sideways. | | | | | | | | |
| 1735.680 | 48.0 | v | 74.0 | -26.0 | Pk | 165 | 1.0 | |
| 1735.680 | 33.6 | v | 54.0 | -20.4 | Avg | 165 | 1.0 | |

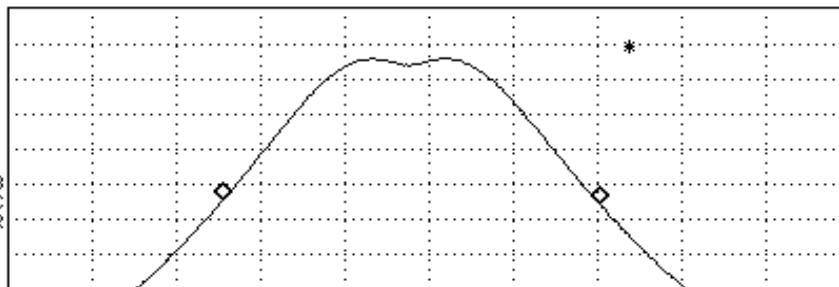
Run #2: 20dB Bandwidth

1/2

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 448 kHz
-1.55 dB

LOG REF 87.0 dBμV
S
dB/
#ATN
0 dB

VA SB
SC FC
CORR



CENTER 433.950 MHz SPAN 1.000 MHz
RL #IF BW 100 kHz #AVG BW 100 kHz SWP 20.0 msec

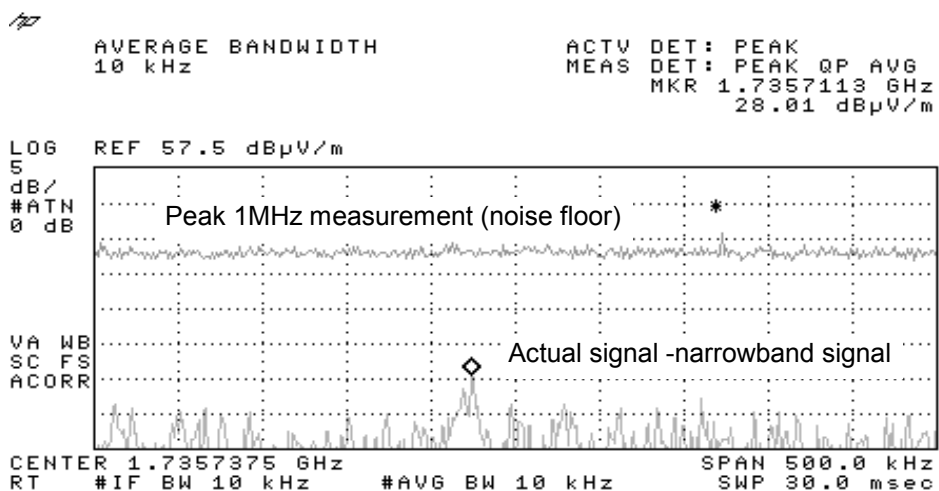
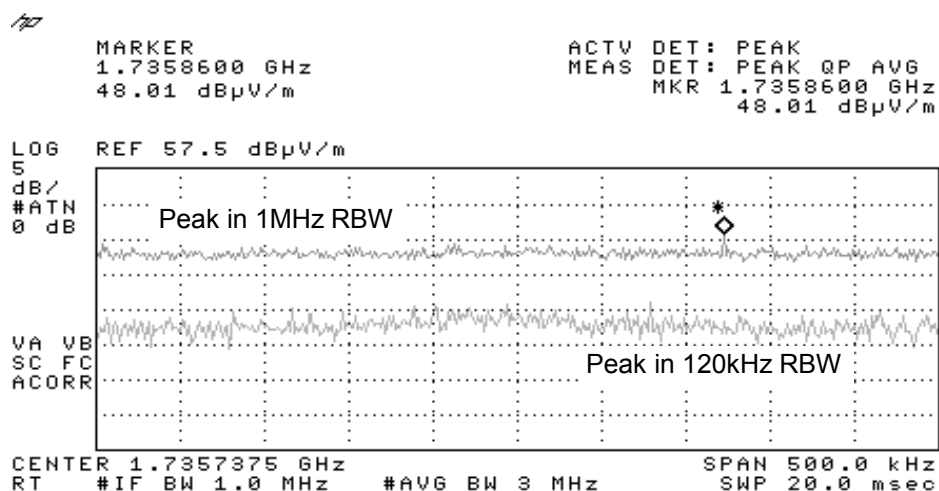


EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Data to demonstrate compliance with FCC 15.209(c) (spurious level < fundamental level)

| | | | | | | | | |
|----------|------|---|------|-------|-----|-----|-----|------------------------------------|
| 433.926 | 45.1 | h | 46.0 | -0.9 | QP | 360 | 1.0 | Fundamental Signal |
| 433.926 | 46.2 | h | - | - | Pk | 360 | 1.0 | Fundamental Signal - peak detector |
| 1735.680 | 48.0 | v | 74.0 | -26.0 | Pk | 165 | 1.0 | Peak detector with 1MHz - note 1 |
| 1735.680 | 37.1 | v | - | - | Pk | 165 | 1.0 | Peak detector with 100kHz - note 2 |
| 1735.680 | 33.6 | v | 54.0 | -20.4 | Avg | 165 | 1.0 | |



- Note 1: The signal transmitted was a narrowband CW signal. Measurement of the third harmonic in a 1MHz bandwidth (peak) was of the system noise floor.
- Note 2: The plots above show that the 4th harmonic measured in a 120kHz bandwidth is below the fundamental signal level. When measured in 1MHz the peak and average measurements are of the instrumentation noise floor and demonstrate compliance with the 15.209 limits that require the 1MHz measurement bandwidth.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/8/2003
Test Engineer: Marissa Faustino
Test Location: SVOATS #1

Config. Used: 2
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions: Temperature: 13 °C
Rel. Humidity: 59 %

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|---|---------------|--------|----------------------|
| 1a | RE, 30 - 4339.25MHz, Pulsed Data Signals | FCC 15.231(a) | Pass | -0.6dB @ 433.926 MHz |
| 1b | RE, 30 - 4339.25MHz, Pulsed Control Signals | FCC 15.231(e) | Pass | -0.7dB @ 433.926 MHz |
| 1c | RE, 30 - 1000MHz: Tx Harmonics | EN55011A | Pass | -10.5dB @ 867.800MHz |
| 2 | 20-dB Bandwidth | 15.231(c) | Pass | 448 kHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1a: Radiated Emissions, 30-4339.250MHz Control Signals with 25% duty cycle (12dB ACF)

| Frequency | Level | Pol | FCC 15.231(a) | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|---------------|--------|-----------|---------|--------|------------------------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 433.926 | 80.2 | h | 80.8 | -0.6 | Avg | 331 | 1.0 | Fundamental Signal |
| 433.926 | 92.2 | h | 100.8 | -8.6 | Pk | 331 | 1.0 | Fundamental Signal |
| 1301.760 | 33.7 | h | 54.0 | -20.3 | Avg | 139 | 1.0 | Restricted Band Signal |
| 1301.760 | 31.5 | v | 54.0 | -22.5 | Avg | 165 | 1.0 | Restricted Band Signal |
| 867.800 | 36.1 | h | 60.8 | -24.7 | Avg | 153 | 1.6 | |
| 1301.760 | 45.7 | h | 74.0 | -28.3 | Pk | 139 | 1.0 | Restricted Band Signal |
| 1301.760 | 43.5 | v | 74.0 | -30.5 | Pk | 165 | 1.0 | Restricted Band Signal |
| 867.800 | 30.0 | v | 60.8 | -30.8 | Avg | 336 | 1.0 | |
| 867.800 | 48.1 | h | 80.8 | -32.7 | Pk | 153 | 1.6 | |
| 867.800 | 42.0 | v | 80.8 | -38.8 | Pk | 336 | 1.0 | |
| Sideways. | | | | | | | | |
| 1301.760 | 33.5 | h | 54.0 | -20.5 | Avg | 204 | 1.0 | Restricted Band Signal |
| 1301.760 | 30.3 | v | 54.0 | -23.7 | Avg | 59 | 1.0 | Restricted Band Signal |
| 867.800 | 34.5 | v | 60.8 | -26.3 | Avg | 336 | 1.0 | |
| 867.800 | 33.0 | h | 60.8 | -27.8 | Avg | 225 | 1.5 | |
| 1301.760 | 45.5 | h | 74.0 | -28.5 | Pk | 204 | 1.0 | Restricted Band Signal |
| 1735.680 | 31.0 | v | 60.8 | -29.8 | Avg | 6 | 1.0 | |
| 1301.760 | 42.3 | v | 74.0 | -31.7 | Pk | 59 | 1.0 | Restricted Band Signal |
| 867.800 | 46.5 | v | 80.8 | -34.3 | Pk | 336 | 1.0 | |
| 867.800 | 45.0 | h | 80.8 | -35.8 | Pk | 225 | 1.5 | |
| 1735.680 | 43.0 | v | 80.8 | -37.8 | Pk | 6 | 1.0 | |
| Standing | | | | | | | | |
| 1301.760 | 27.0 | v | 54.0 | -27.0 | Avg | 40 | 1.0 | Restricted Band Signal |
| 867.800 | 32.6 | h | 60.8 | -28.2 | Avg | 226 | 1.0 | |
| 867.800 | 31.5 | v | 60.8 | -29.3 | Avg | 0 | 1.0 | |
| 1735.680 | 28.8 | v | 60.8 | -32.0 | Avg | 222 | 1.0 | |
| 1301.760 | 39.0 | v | 74.0 | -35.0 | Pk | 40 | 1.0 | Restricted Band Signal |
| 867.800 | 44.6 | h | 80.8 | -36.2 | Pk | 226 | 1.0 | |
| 867.800 | 43.5 | v | 80.8 | -37.3 | Pk | 0 | 1.0 | |
| 1735.680 | 40.8 | v | 80.8 | -40.0 | Pk | 222 | 1.0 | |

Note - Average values are calculated from the peak measurement by applying a -12dB correction factor assuming a duty cycle of no more than 25% in any 100ms period. The orientation of the device that produced the highest signal level at the fundamental frequency (433.9 MHz) had been previously determined during preliminary testing. All other signals were measured with the device in all three orientations to determine the worst case.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1b: Radiated Emissions, 30-4339.250MHz Data Signals with 10% duty cycle (20dB ACF)

| Frequency | Level | Pol | FCC 15.231(e) | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|---------------|--------|-----------|---------|--------|--------------------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 433.926 | 92.2 | h | 92.9 | -0.7 | Pk | 331 | 1.0 | Fundamental Signal |
| 433.926 | 72.2 | h | 72.9 | -0.7 | Avg | 331 | 1.0 | Fundamental Signal |
| 867.800 | 48.1 | h | 72.9 | -24.8 | Pk | 153 | 1.6 | |
| 867.800 | 28.1 | h | 52.9 | -24.8 | Avg | 153 | 1.6 | |
| 1301.760 | 25.7 | h | 54.0 | -28.3 | Avg | 139 | 1.0 | |
| 1301.760 | 45.7 | h | 74.0 | -28.3 | Pk | 139 | 1.0 | |
| 1301.760 | 43.5 | v | 74.0 | -30.5 | Pk | 165 | 1.0 | |
| 1301.760 | 23.5 | v | 54.0 | -30.5 | Avg | 165 | 1.0 | |
| 867.800 | 42.0 | v | 72.9 | -30.9 | Pk | 336 | 1.0 | |
| 867.800 | 22.0 | v | 52.9 | -30.9 | Avg | 336 | 1.0 | |
| Sideways. | | | | | | | | |
| 867.800 | 26.5 | v | 52.9 | -26.4 | Avg | 336 | 1.0 | |
| 867.800 | 46.5 | v | 72.9 | -26.4 | Pk | 336 | 1.0 | |
| 867.800 | 25.0 | h | 52.9 | -27.9 | Avg | 225 | 1.5 | |
| 867.800 | 45.0 | h | 72.9 | -27.9 | Pk | 225 | 1.5 | |
| 1301.760 | 45.5 | h | 74.0 | -28.5 | Pk | 204 | 1.0 | |
| 1301.760 | 25.5 | h | 54.0 | -28.5 | Avg | 204 | 1.0 | |
| 1735.680 | 43.0 | v | 74.0 | -31.0 | Pk | 6 | 1.0 | |
| 1735.680 | 23.0 | v | 54.0 | -31.0 | Avg | 6 | 1.0 | |
| 1301.760 | 22.3 | v | 54.0 | -31.7 | Avg | 59 | 1.0 | |
| 1301.760 | 42.3 | v | 74.0 | -31.7 | Pk | 59 | 1.0 | |
| Standing | | | | | | | | |
| 867.800 | 24.6 | h | 52.9 | -28.3 | Avg | 226 | 1.0 | |
| 867.800 | 44.6 | h | 72.9 | -28.3 | Pk | 226 | 1.0 | |
| 867.800 | 23.5 | v | 52.9 | -29.4 | Avg | 0 | 1.0 | |
| 867.800 | 43.5 | v | 72.9 | -29.4 | Pk | 0 | 1.0 | |
| 1735.680 | 40.8 | v | 74.0 | -33.2 | Pk | 222 | 1.0 | |
| 1735.680 | 20.8 | v | 54.0 | -33.2 | Avg | 222 | 1.0 | |
| 1301.760 | 39.0 | v | 74.0 | -35.0 | Pk | 40 | 1.0 | |
| 1301.760 | 19.0 | v | 54.0 | -35.0 | Avg | 40 | 1.0 | |

Note - Average values are calculated from the peak measurement by applying a -20B correction factor assuming a duty cycle of no more than 10% in any 100ms period. The orientation of the device that produced the highest signal level at the fundamental frequency (433.9 MHz) had been previously determined during preliminary testing. All other signals were measured with the device in all three orientations to determine the worst case.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1c: Radiated Emissions, Transmitted Signal harmonics below 1GHz for EN 60601-1-2 (Tested at 10m)

EUT tested operating at its maximum power and in the orientation that generated the highest signal level at 3m

| Frequency | Level | Pol | EN 55011 A | | Detector | Azimuth | Height | Comments |
|-----------|--------|-----|------------|--------|-----------|---------|--------|----------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 867.800 | 36.5 | H | 47.0 | -10.5 | QP | 72 | 1.0 | |
| 867.800 | 34.5 | V | 47.0 | -12.5 | QP | 175 | 1.0 | |

Run #2: 20dB Bandwidth

1/2

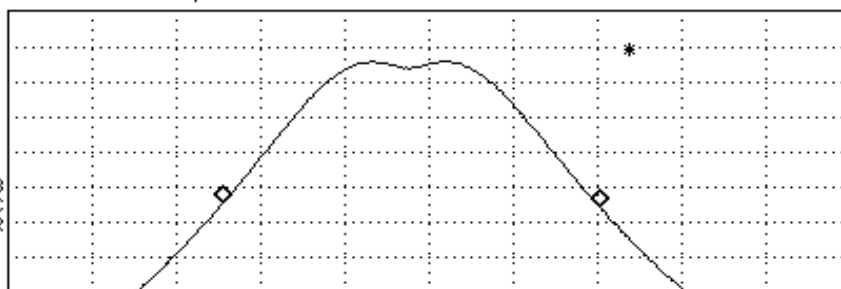
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 448 kHz
-1.55 dB

LOG REF 87.0 dBμV

S
dB/
#ATN
0 dB

VA SB
SC FC
CORR

CENTER 433.950 MHz SPAN 1.000 MHz
RL #IF BW 100 kHz #AVG BW 100 kHz SWP 20.0 msec





EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/9/2003

Test Engineer: Joseph Cadigal

Test Location: SVOATS #2

Config. Used: 2

Config Change: None

EUT Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19°C

Rel. Humidity: 69%

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|-------------------------------------|--------------------|--------|----------------------|
| 1 | RE, 30 - 4339.25MHz, Wake-Up Signal | FCC 15.231(a) | Pass | -1.3dB @ 433.926 MHz |
| 2 | RE, 30-1300, Receive-Mode | FCC 15.109/RSS 210 | Pass | -12.0dB @ 423.200 |
| 2b | RE, Receiver Emissions | EN55011 | Pass | -19.1dB @ 423.200MHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: Radiated Emissions, 30-4339.250MHz Wake-Up Control Signal

sn: 0443503120001

| Frequency | Level | Pol | FCC 15.231(a) | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|---------------|--------|-----------|---------|--------|------------------------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 433.926 | 79.5 | h | 80.8 | -1.3 | Avg | 360 | 1.0 | Fundamental Signal |
| 433.926 | 79.8 | h | 100.8 | -21.0 | Pk | 360 | 1.0 | Fundamental Signal |
| 1301.760 | 43.7 | h | 74.0 | -30.3 | Pk | 172 | 1.0 | Restricted Band Signal |
| 1301.760 | 33.6 | h | 54.0 | -20.4 | Avg | 172 | 1.0 | Restricted Band Signal |
| 867.800 | 48.0 | h | 80.8 | -32.8 | Pk | 176 | 1.4 | |
| 867.800 | 45.8 | h | 60.8 | -15.0 | Avg | 176 | 1.4 | |
| Sideways. | | | | | | | | |
| 1735.680 | 48.7 | v | 74.0 | -25.3 | Pk | 165 | 1.0 | |
| 1735.680 | 40.1 | v | 54.0 | -13.9 | Avg | 165 | 1.0 | |

Note - Testing was performed with the EUT in all three orientations during the measurements for the control signal. As the control signal and wake-up signals use the same curcuitry, measurements of the Wake-Up signal were made with the device in the orinetations that produced the highest signal levels during the pulsed control signal measurements.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/9/2003

Test Engineer: Joseph Cadigal

Test Location: SVOATS #2

Config. Used: 2

Config Change: None

EUT Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 3 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19°C

Rel. Humidity: 69%

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|-------------------------------------|--------------------|--------|-----------------------------|
| 1 | RE, 30 - 4339.25MHz, Wake-Up Signal | FCC 15.231(a) | Pass | -3.0dB @ 433.926Laying Flat |
| 2 | RE, 30-1300, Receive-Mode | FCC 15.109/RSS 210 | Pass | -12.0dB @ 423.200 |
| 2b | RE, Receiver Emissions | EN55011 | Pass | -19.1dB @ 423.200MHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1a: Radiated Emissions, 30-1300MHz Receive-Mode (FCC 15.109/RSS 210)

| Frequency | Level | Pol | 15.109/RSS 210 | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|----------------|--------|-----------|---------|--------|----------|
| MHz | dBuV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 423.200 | 34.0 | h | 46.0 | -12.0 | QP | 0 | 1.1 | LO |
| 846.400 | 24.0 | h | 46.0 | -22.0 | QP | 99 | 1.1 | LO x 2 |
| 1269.600 | 42.2 | h | 74.0 | -31.8 | Pk | 205 | 1.7 | LO x 3 |
| 1269.600 | 29.6 | h | 54.0 | -24.4 | Avg | 205 | 1.7 | LO x 3 |
| 423.200 | 31.3 | v | 46.0 | -14.7 | QP | 190 | 1.0 | LO |
| 846.400 | 24.1 | v | 46.0 | -21.9 | QP | 190 | 1.0 | LO x 2 |
| 1269.600 | 43.8 | v | 74.0 | -30.2 | Pk | 0 | 1.0 | LO x 3 |
| 1269.600 | 31.6 | v | 54.0 | -22.4 | Avg | 0 | 1.0 | LO x 3 |
| Side | | | | | | | | |
| 423.200 | 30.8 | h | 46.0 | -15.2 | QP | 54 | 2.1 | LO |
| 846.400 | 24.7 | h | 46.0 | -21.3 | QP | 185 | 1.4 | LO x 2 |
| 1269.600 | 42.7 | h | 74.0 | -31.3 | Pk | 310 | 1.7 | LO x 3 |
| 1269.600 | 29.5 | h | 54.0 | -24.5 | Avg | 310 | 1.7 | LO x 3 |
| 423.200 | 29.0 | v | 46.0 | -17.0 | QP | 160 | 1.3 | LO |
| 846.400 | 23.2 | v | 46.0 | -22.8 | QP | 329 | 1.0 | LO x 2 |
| 1269.600 | 43.2 | v | 74.0 | -30.8 | Pk | 0 | 1.0 | LO x 3 |
| 1269.600 | 32.4 | v | 54.0 | -21.6 | Avg | 0 | 1.0 | LO x 3 |
| Up | | | | | | | | |
| 423.200 | 29.1 | h | 46.0 | -16.9 | QP | 45 | 1.9 | LO |
| 846.400 | 20.9 | h | 46.0 | -25.1 | QP | 0 | 2.0 | LO x 2 |
| 1269.600 | 42.1 | h | 74.0 | -31.9 | Pk | 154 | 1.5 | LO x 3 |
| 1269.600 | 30.2 | h | 54.0 | -23.8 | Avg | 154 | 1.5 | LO x 3 |
| 423.200 | 31.0 | v | 46.0 | -15.0 | QP | 124 | 1.0 | LO |
| 846.400 | 23.4 | v | 46.0 | -22.6 | QP | 332 | 1.0 | LO x 2 |
| 1269.600 | 43.0 | v | 74.0 | -31.0 | Pk | 319 | 1.0 | LO x 3 |
| 1269.600 | 31.9 | v | 54.0 | -22.1 | Avg | 319 | 1.0 | LO x 3 |

Run #2b: Radiated Emissions, Receiver emissions for EN 60601-1-2 (Tested at 10m)

EUT tested operating at its maximum power and in the orientation that generated the highest signal level at 3m

| Frequency | Level | Pol | EN 55011 A | | Detector | Azimuth | Height | Comments |
|-----------|--------|-----|------------|--------|-----------|---------|--------|-------------|
| MHz | dBuV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 423.200 | 27.9 | h | 47.0 | -19.1 | QP | 11 | 2.1 | LO, flat |
| 846.400 | 21.9 | h | 47.0 | -25.1 | QP | 253 | 2.0 | LO x 2,side |



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Conducted Emissions - Power Ports

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/11/2003
Test Engineer: Yu-Chien Ho
Test Location: SVOATS #2

Config. Used: 2
Config Change: None
EUT Voltage: Refer to individual run

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment.

Ambient Conditions:
Temperature: 13.3 °C
Rel. Humidity: 46 %

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|-------------------------|------------|--------|-------------------|
| 1 | CE, AC Power, 120V/60Hz | EN 55022 B | Pass | -5.6dB @ 1.169MHz |
| 2 | CE, AC Power, 120V/60Hz | EN 55022 B | Pass | -5.7dB @ 1.169MHz |
| 3 | CE, AC Power, 230V/50Hz | EN 55022 B | Pass | -4.5dB @ 0.742MHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

UHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|-------|---------|-----------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 40.4 | Neutral | 46.0 | -5.6 | Average | |
| 1.023 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.169 | 39.3 | Line | 46.0 | -6.7 | Average | |
| 0.877 | 38.4 | Neutral | 46.0 | -7.6 | Average | |
| 1.169 | 44.3 | Neutral | 56.0 | -11.7 | QP | |
| 1.169 | 44.1 | Line | 56.0 | -11.9 | QP | |
| 1.023 | 43.5 | Line | 56.0 | -12.5 | QP | |
| 0.877 | 42.3 | Neutral | 56.0 | -13.7 | QP | |
| 0.150 | 39.7 | Neutral | 56.0 | -16.3 | Average | |
| 0.150 | 39.2 | Line | 56.0 | -16.8 | Average | |
| 0.150 | 43.8 | Neutral | 66.0 | -22.2 | QP | |
| 0.150 | 43.5 | Line | 66.0 | -22.5 | QP | |

| Frequency | Level | AC | RSS 210 | | Detector | Comments |
|-----------|-------|---------|---------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 44.3 | Neutral | 48.0 | -3.7 | QP | |
| 1.169 | 44.1 | Line | 48.0 | -3.9 | QP | |
| 1.023 | 43.5 | Line | 48.0 | -4.5 | QP | |
| 0.877 | 42.3 | Neutral | 48.0 | -5.7 | QP | |

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

LHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|-------|---------|-----------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 40.3 | Line | 46.0 | -5.7 | Average | |
| 1.023 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.170 | 39.8 | Neutral | 46.0 | -6.2 | Average | |
| 0.877 | 38.3 | Neutral | 46.0 | -7.7 | Average | |
| 1.169 | 44.4 | Line | 56.0 | -11.6 | QP | |
| 1.170 | 44.3 | Neutral | 56.0 | -11.7 | QP | |
| 1.023 | 43.5 | Line | 56.0 | -12.5 | QP | |
| 0.877 | 42.3 | Neutral | 56.0 | -13.7 | QP | |
| 0.150 | 39.8 | Neutral | 56.0 | -16.2 | Average | |
| 0.150 | 39.4 | Line | 56.0 | -16.6 | Average | |
| 0.150 | 43.9 | Neutral | 66.0 | -22.1 | QP | |
| 0.150 | 43.6 | Line | 66.0 | -22.4 | QP | |



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #3: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz

UHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|------------|---------|-----------|--------|----------|----------|
| MHz | dB μ V | Line | Limit | Margin | QP/Ave | |
| 0.742 | 41.5 | Line | 46.0 | -4.5 | Average | |
| 1.040 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.188 | 40.0 | Line | 46.0 | -6.0 | Average | |
| 0.444 | 40.1 | Neutral | 47.0 | -6.9 | Average | |
| 0.891 | 37.0 | Line | 46.0 | -9.0 | Average | |
| 0.889 | 36.0 | Neutral | 46.0 | -10.0 | Average | |
| 1.188 | 44.9 | Line | 56.0 | -11.1 | QP | |
| 1.040 | 43.6 | Line | 56.0 | -12.4 | QP | |
| 0.150 | 43.3 | Line | 56.0 | -12.7 | Average | |
| 0.150 | 42.4 | Neutral | 56.0 | -13.6 | Average | |
| 0.742 | 42.0 | Line | 56.0 | -14.0 | QP | |
| 0.891 | 41.4 | Line | 56.0 | -14.6 | QP | |
| 0.444 | 40.6 | Neutral | 57.0 | -16.4 | QP | |
| 0.889 | 39.4 | Neutral | 56.0 | -16.6 | QP | |
| 0.150 | 49.3 | Neutral | 66.0 | -16.7 | QP | |
| 0.150 | 48.7 | Line | 66.0 | -17.3 | QP | |

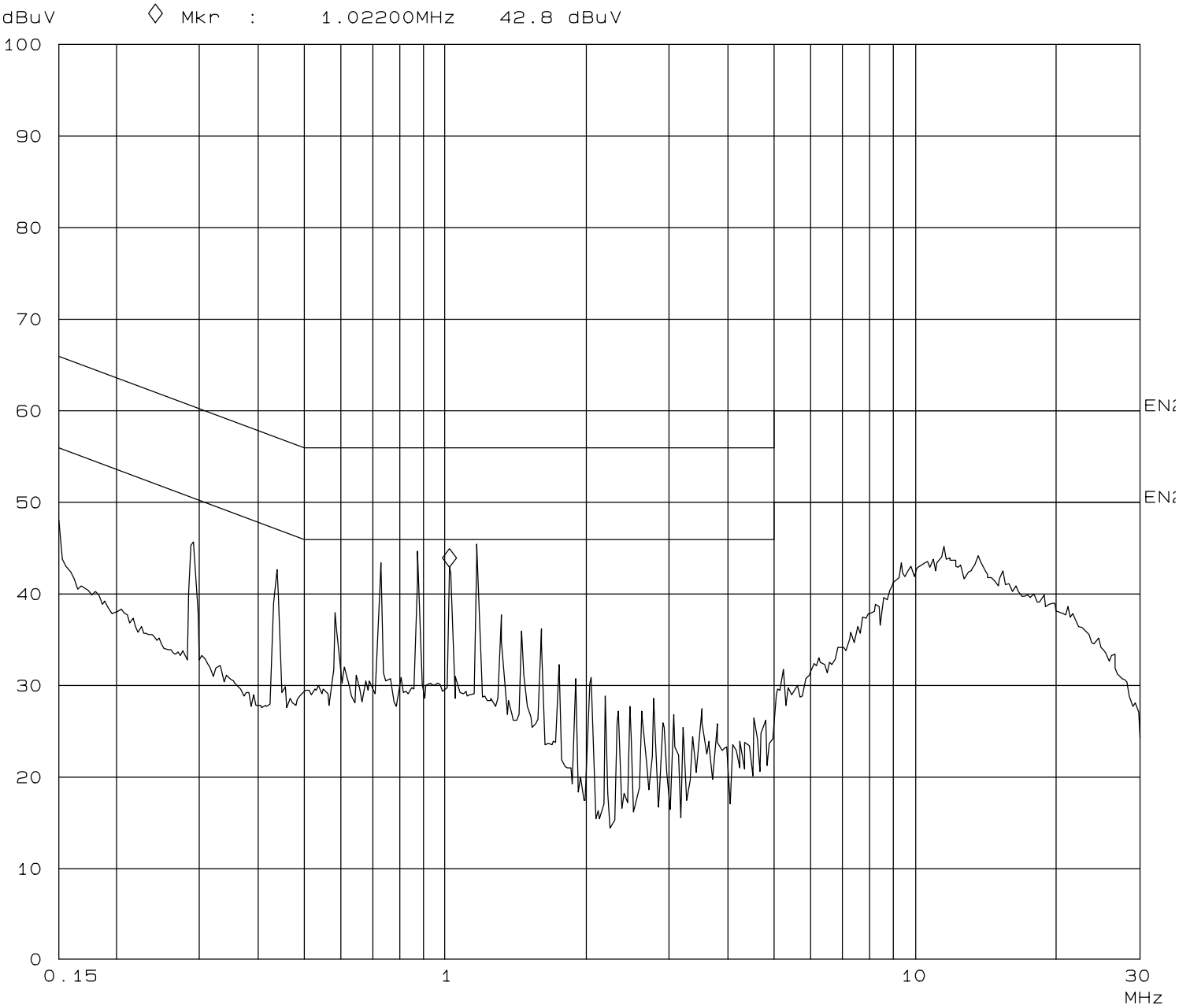
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 14:59

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 120V / 60Hz
Run No.1 120V Neutral



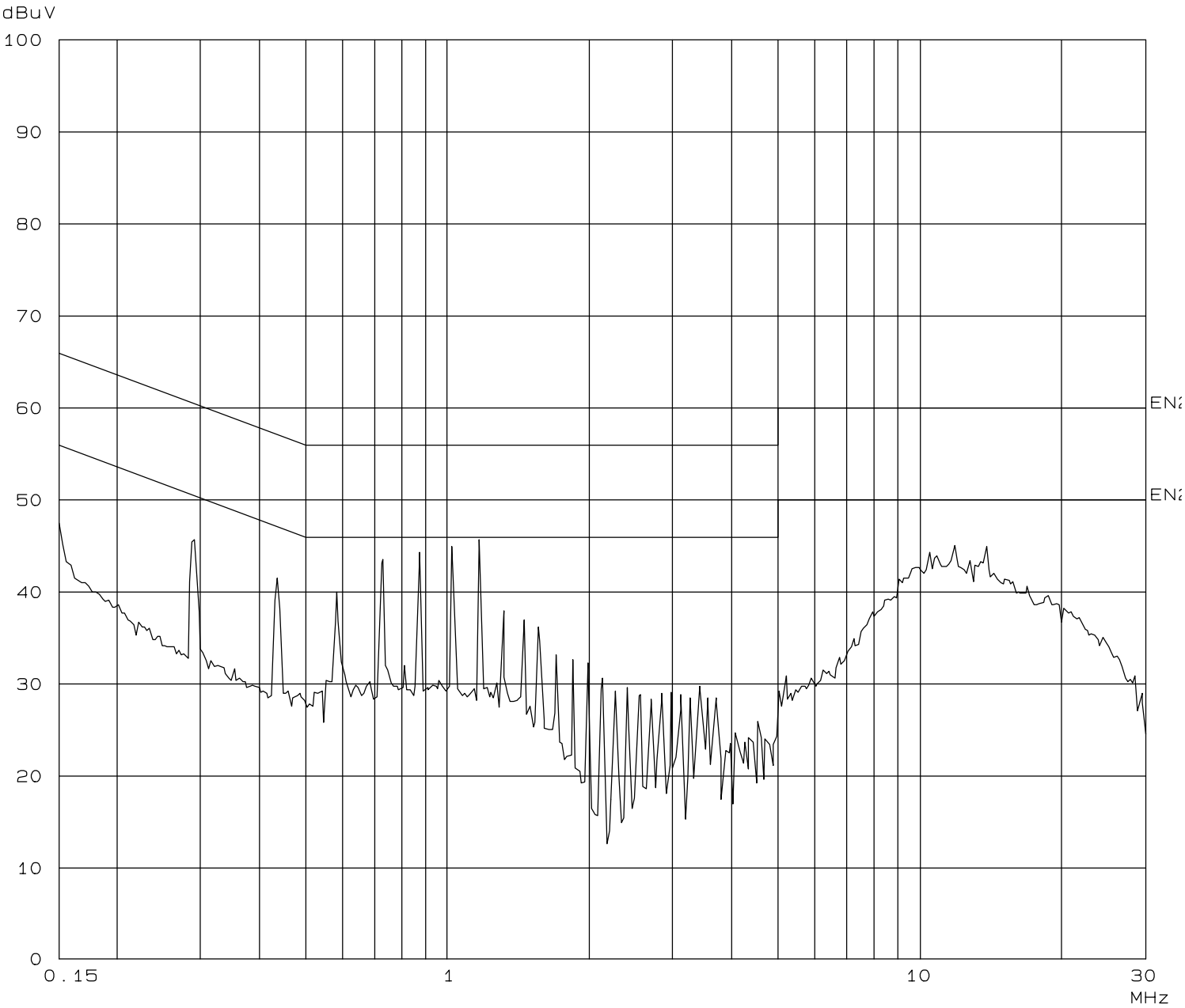
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 14: 49

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 120V / 60Hz
Run No.1 120V Line



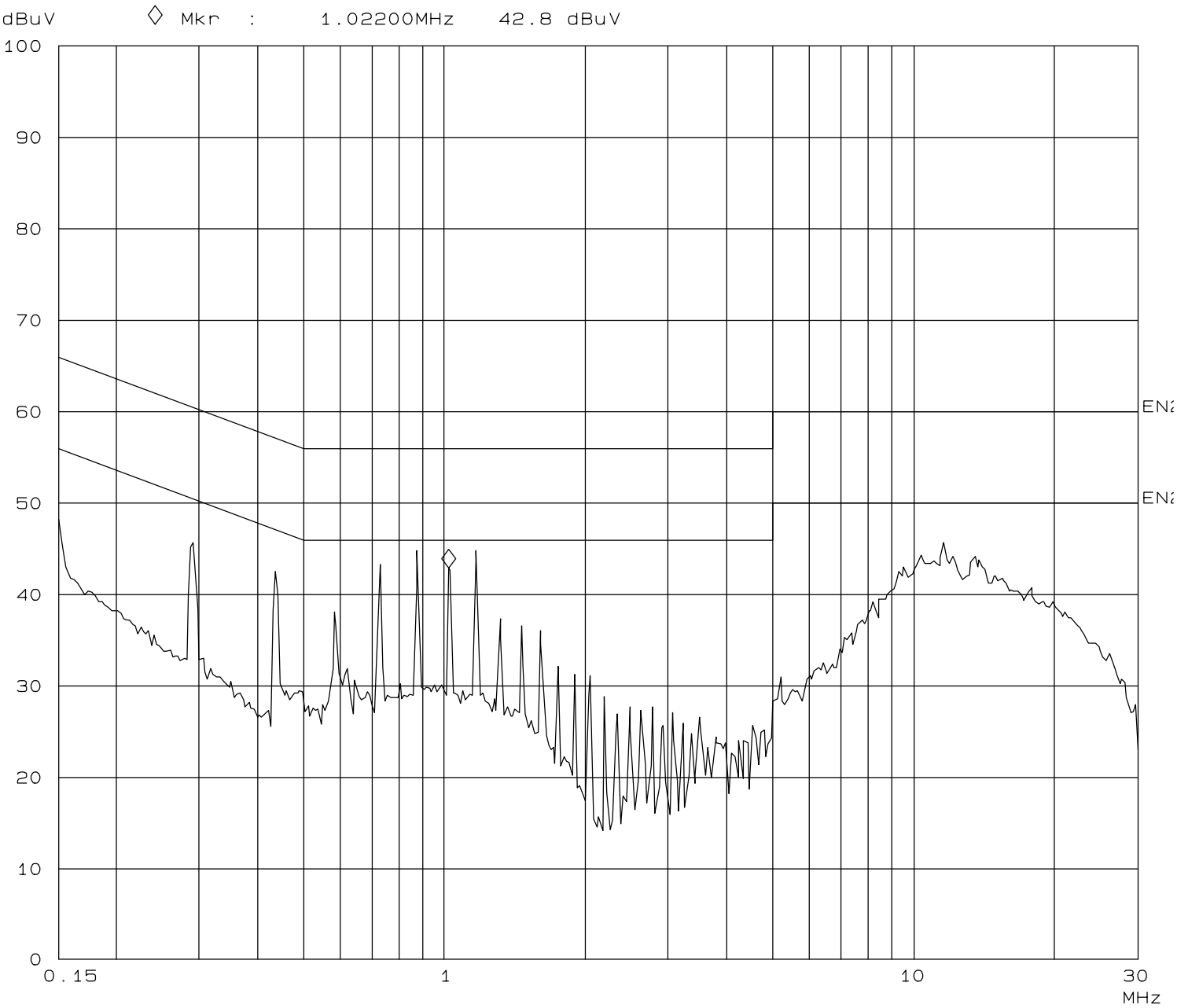
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15:18

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

LHF Test, 120V / 60Hz
Run No.2 120V Neutral



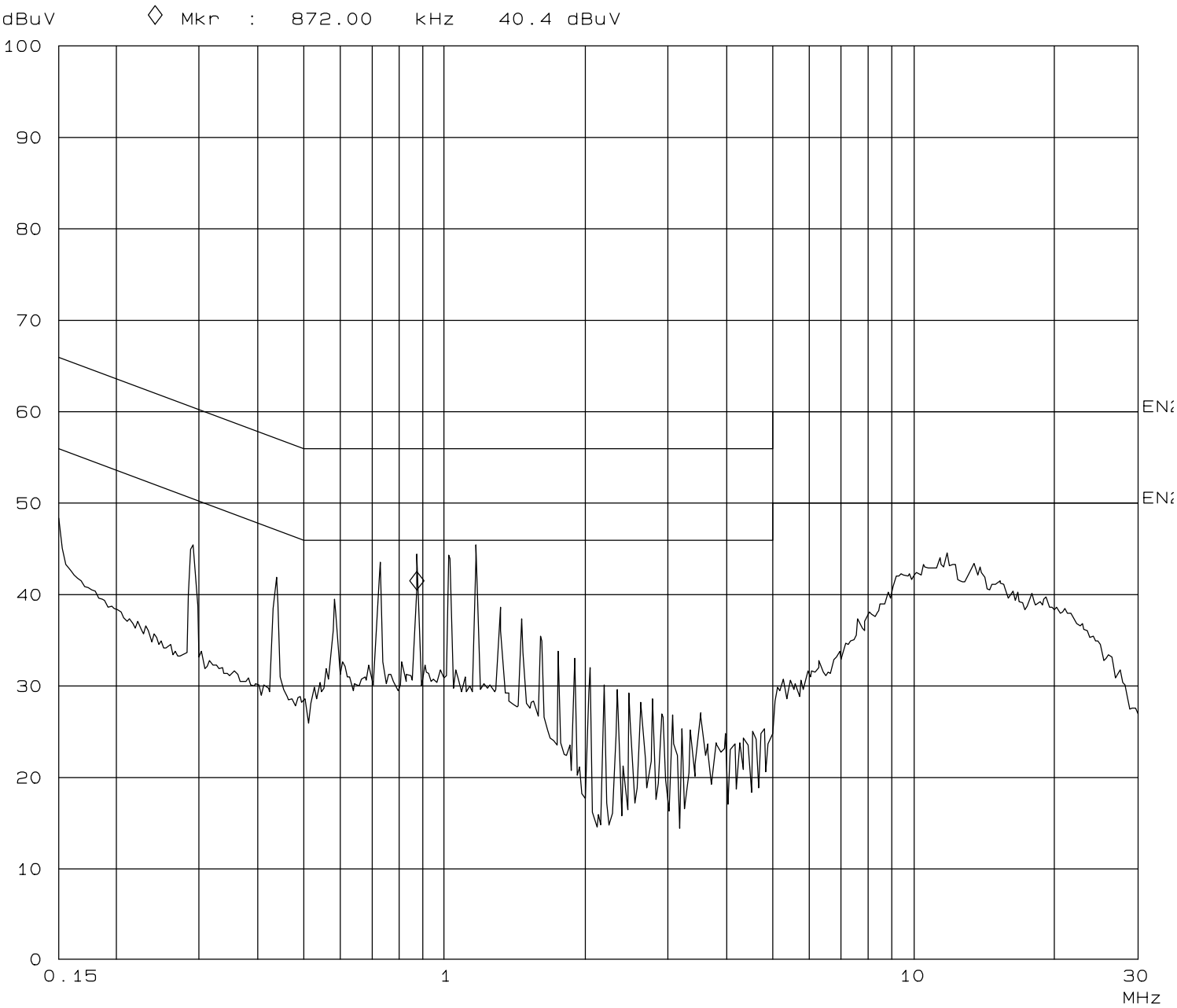
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15:10

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

LHF Test, 120V / 60Hz
Run No.2 120V Line



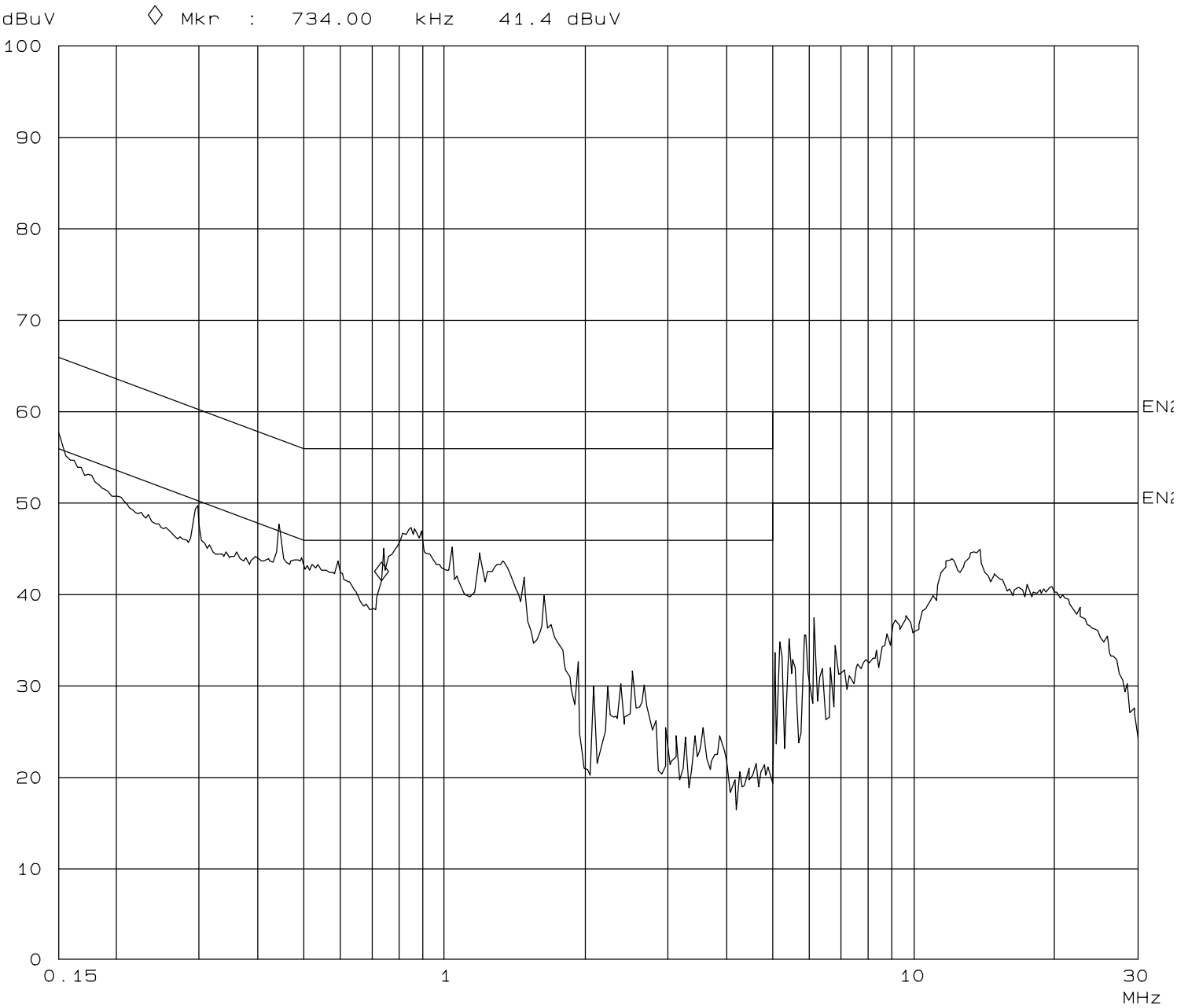
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15: 47

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 230V / 50Hz
Run No.3 230V Neutral



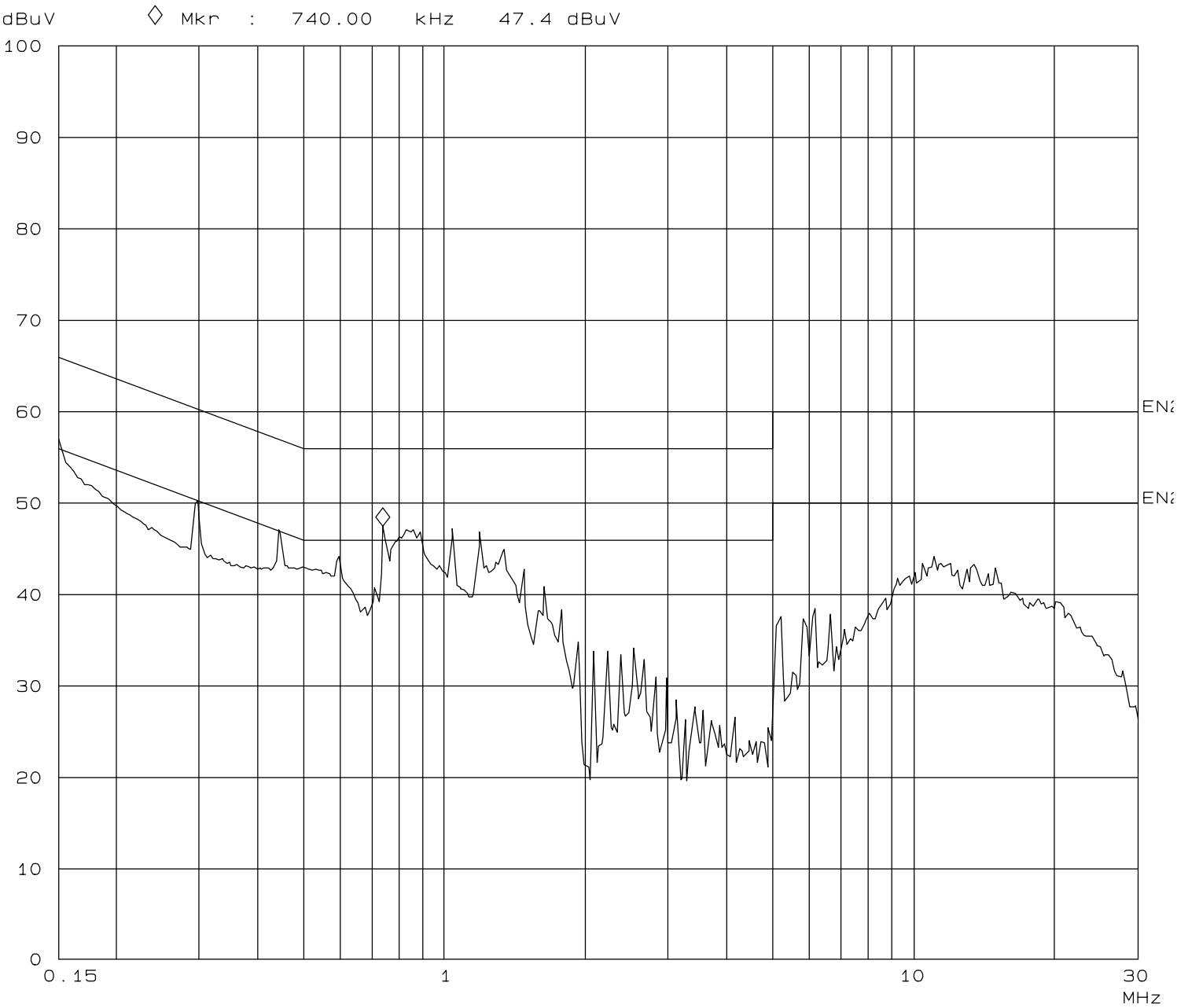
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15:28

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 230V / 50Hz
Run No.3 230V Line





EMC Test Data

| | | | |
|-----------------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | | Environment: | |

EMC Test Data

For The

Savi

Model

SMR-650P-110

Date of Last Test: 12/17/2003



EMC Test Data

| | | | |
|-----------------|------------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | Enter immunity spec on cover | Environment: | |

EUT INFORMATION

General Description

The EUT is a transceiver which is designed to communicate with Savi's RFID tags. The device transmits at 123 kHz and at 433.92 MHz to initiate responses from tags within its vicinity. The tag's transmit at 433.92 MHz, so the EUT also contains a receiver operating at 433.92 MHz. The device has a serial (RS-232) interface to connect directly to a hand held PC or similar device and operates from internal, rechargeable batteries. The device has an external DC input used to recharge the batteries via adapter. It is intended to be used as a hand held device although it can operate while connected to the external AC-DC adapter. The 123 kHz transmitter operates under part 15.209 of the FCC's rules. The 433.92 MHz transceiver operates under sections 15.209 and 15.231 of the FCC rules. The 433.92 MHz transmissions consist of both data and control signals. When operating under 15.231 rules, the data signals are 10 mS long and have a duty cycle of no more than 10% measured in a 100 mS period. There are two types of control signals, one that has a 24% duty cycle and another, the Wake-Up signal, that is a 2.5 second transmission. When operated under 15.209 rules. 433.92 MHz transmissions may be continuous. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT adapter is 100-240VAC, 50-60Hz, 0.2A.

Equipment Under Test

| Manufacturer | Model | Description | Serial Number | FCC ID |
|-----------------------|--------------|-------------|---------------|--------------|
| Savi Technology, Inc. | SMR-650P-110 | Transceiver | 443503120001 | KL7-650MR-V1 |

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 6.5 cm wide by 2.5 cm deep by 9 cm high.

Modification History

| Mod. # | Test | Date | Modification |
|--------|------|------|--------------|
| 1 | - | - | None |

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.



EMC Test Data

| | | | |
|-----------------|------------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| | | Account Manager: | Robert Holt |
| Contact: | Eugene Schlindwein | | |
| Emissions Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |
| Immunity Spec: | Enter immunity spec on cover | Environment: | |

Test Configuration #2

Local Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|------------|-----------------|----------------|--------------|
| Winbook | Winbook XL | Laptop Computer | H1106587 | DoC |
| IBM | ThinkPad | Laptop Computer | 78-48-24897/11 | ANO9611TBOON |
| PowDec | WP05050I | Charger | WP05050I-1.3 | none |

Note the WinBook was used for digital device emissions tests. The IBM Thinkpad laptop was used for all other tests. The laptop was used to terminate the serial port. The actual serial peripheral would be a hand-held Personal Data Terminal and not a PC (the EUT is not considered to be a PC peripheral). The PDT's do not have the operating software to control the EUT as required for the tests (continuously transmitting).

Remote Support Equipment

| Manufacturer | Model | Description | Serial Number | FCC ID |
|--------------|-------|-------------|---------------|--------|
| none | | | | |

Interface Cabling and Ports

| Port | Connected To | Cable(s) | | |
|--------|--------------|-------------|------------------------|-----------|
| | | Description | Shielded or Unshielded | Length(m) |
| Serial | Laptop | DB9 | Shielded | 0.2 |
| DC | Charger | Multiwire | Shielded | 2 |

EUT Operation During Emissions

The EUT was set to continuously transmit at either 123kHz or 433.92 MHz with no modulation.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Radiated Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/8/2003

Test Engineer: Juan Martinez

Test Location: SVOATS #1

Config. Used: 2

Config Change: None

EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.

Unless otherwise specified, the measurement antenna was located 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 13 °C

Rel. Humidity: 59 %

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|---------------------------------------|-----------|--------|---------------------|
| 1 | RE, 30 - 1000MHz, Maximized Emissions | EN55022 A | Pass | -7.0dB @ 200.453MHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: Preliminary Radiated Emissions, 30-1000 MHz

| Frequency | Level | Pol | EN55022 A | | Detector | Azimuth | Height | Comments |
|--------------------|--------|-----|-----------|--------|-----------|---------|--------|----------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| Laying Flat | | | | | | | | |
| 40.080 | 30.3 | v | 40.0 | -9.7 | QP | 174 | 1.0 | |
| 40.080 | 15.5 | h | 40.0 | -24.5 | QP | 205 | 2.0 | |
| 160.360 | 28.4 | v | 40.0 | -11.6 | QP | 360 | 1.0 | |
| 160.360 | 20.6 | h | 40.0 | -19.4 | QP | 269 | 2.8 | |
| 200.453 | 33.0 | v | 40.0 | -7.0 | QP | 0 | 1.0 | |
| 200.453 | 20.4 | h | 40.0 | -19.6 | QP | 136 | 2.8 | |
| 400.917 | 28.0 | h | 47.0 | -19.0 | QP | 360 | 1.0 | |
| 400.917 | 27.1 | v | 47.0 | -19.9 | QP | 34 | 1.0 | |
| 641.467 | 35.0 | h | 47.0 | -12.0 | QP | 302 | 1.2 | |
| 641.467 | 26.4 | v | 47.0 | -20.6 | QP | 277 | 1.0 | |
| Sideways. | | | | | | | | |
| 40.080 | 29.5 | v | 40.0 | -10.5 | QP | 174 | 1.0 | |
| 160.360 | 30.0 | v | 40.0 | -10.0 | QP | 360 | 1.0 | |
| 200.453 | 26.7 | v | 40.0 | -13.3 | QP | 0 | 1.0 | |
| Standing | | | | | | | | |
| 200.453 | 25.9 | v | 40.0 | -14.1 | QP | 0 | 1.0 | |
| 40.080 | 29.0 | v | 40.0 | -11.0 | QP | 160 | 1.0 | |
| 160.360 | 27.1 | v | 40.0 | -12.9 | QP | 360 | 1.0 | |

Run #2: Maximized Readings From Run #1

| Frequency | Level | Pol | EN55022 A | | Detector | Azimuth | Height | Comments |
|-----------|--------|-----|-----------|--------|-----------|---------|--------|-----------------|
| MHz | dBμV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 200.453 | 33.0 | v | 40.0 | -7.0 | QP | 0 | 1.0 | EUT flat |
| 40.080 | 30.3 | v | 40.0 | -9.7 | QP | 174 | 1.0 | EUT flat |
| 160.360 | 30.0 | v | 40.0 | -10.0 | QP | 360 | 1.0 | EUT on its side |
| 160.360 | 28.4 | v | 40.0 | -11.6 | QP | 360 | 1.0 | EUT flat |
| 641.467 | 35.0 | h | 47.0 | -12.0 | QP | 302 | 1.2 | EUT flat |
| 400.917 | 28.0 | h | 47.0 | -19.0 | QP | 360 | 1.0 | EUT flat |
| 160.360 | 20.6 | h | 40.0 | -19.4 | QP | 269 | 2.8 | EUT flat |



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Conducted Emissions - Power Ports

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/11/2003
Test Engineer: Yu-Chien Ho
Test Location: SVOATS #2

Config. Used: 2
Config Change: None
EUT Voltage: Refer to individual run

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment.

Ambient Conditions:
Temperature: 13.3 °C
Rel. Humidity: 46 %

Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|-------|-------------------------|------------|--------|-------------------|
| 1 | CE, AC Power, 120V/60Hz | EN 55022 B | Pass | -5.6dB @ 1.169MHz |
| 2 | CE, AC Power, 120V/60Hz | EN 55022 B | Pass | -5.7dB @ 1.169MHz |
| 3 | CE, AC Power, 230V/50Hz | EN 55022 B | Pass | -4.5dB @ 0.742MHz |

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

UHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|-------|---------|-----------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 40.4 | Neutral | 46.0 | -5.6 | Average | |
| 1.023 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.169 | 39.3 | Line | 46.0 | -6.7 | Average | |
| 0.877 | 38.4 | Neutral | 46.0 | -7.6 | Average | |
| 1.169 | 44.3 | Neutral | 56.0 | -11.7 | QP | |
| 1.169 | 44.1 | Line | 56.0 | -11.9 | QP | |
| 1.023 | 43.5 | Line | 56.0 | -12.5 | QP | |
| 0.877 | 42.3 | Neutral | 56.0 | -13.7 | QP | |
| 0.150 | 39.7 | Neutral | 56.0 | -16.3 | Average | |
| 0.150 | 39.2 | Line | 56.0 | -16.8 | Average | |
| 0.150 | 43.8 | Neutral | 66.0 | -22.2 | QP | |
| 0.150 | 43.5 | Line | 66.0 | -22.5 | QP | |

| Frequency | Level | AC | RSS 210 | | Detector | Comments |
|-----------|-------|---------|---------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 44.3 | Neutral | 48.0 | -3.7 | QP | |
| 1.169 | 44.1 | Line | 48.0 | -3.9 | QP | |
| 1.023 | 43.5 | Line | 48.0 | -4.5 | QP | |
| 0.877 | 42.3 | Neutral | 48.0 | -5.7 | QP | |

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

LHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|-------|---------|-----------|--------|----------|----------|
| MHz | dBμV | Line | Limit | Margin | QP/Ave | |
| 1.169 | 40.3 | Line | 46.0 | -5.7 | Average | |
| 1.023 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.170 | 39.8 | Neutral | 46.0 | -6.2 | Average | |
| 0.877 | 38.3 | Neutral | 46.0 | -7.7 | Average | |
| 1.169 | 44.4 | Line | 56.0 | -11.6 | QP | |
| 1.170 | 44.3 | Neutral | 56.0 | -11.7 | QP | |
| 1.023 | 43.5 | Line | 56.0 | -12.5 | QP | |
| 0.877 | 42.3 | Neutral | 56.0 | -13.7 | QP | |
| 0.150 | 39.8 | Neutral | 56.0 | -16.2 | Average | |
| 0.150 | 39.4 | Line | 56.0 | -16.6 | Average | |
| 0.150 | 43.9 | Neutral | 66.0 | -22.1 | QP | |
| 0.150 | 43.6 | Line | 66.0 | -22.4 | QP | |



EMC Test Data

| | | | |
|----------|----------------------------|------------------|-------------|
| Client: | Savi | Job Number: | J53657 |
| Model: | SMR-650P-110 | T-Log Number: | T53670 |
| Contact: | Eugene Schlindwein | Account Manager: | Robert Holt |
| Spec: | EN55022,FCC 15.231, 15.209 | Class: | A/B |

Run #3: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz

UHF

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|-----------|------------|---------|-----------|--------|----------|----------|
| MHz | dB μ V | Line | Limit | Margin | QP/Ave | |
| 0.742 | 41.5 | Line | 46.0 | -4.5 | Average | |
| 1.040 | 40.2 | Line | 46.0 | -5.8 | Average | |
| 1.188 | 40.0 | Line | 46.0 | -6.0 | Average | |
| 0.444 | 40.1 | Neutral | 47.0 | -6.9 | Average | |
| 0.891 | 37.0 | Line | 46.0 | -9.0 | Average | |
| 0.889 | 36.0 | Neutral | 46.0 | -10.0 | Average | |
| 1.188 | 44.9 | Line | 56.0 | -11.1 | QP | |
| 1.040 | 43.6 | Line | 56.0 | -12.4 | QP | |
| 0.150 | 43.3 | Line | 56.0 | -12.7 | Average | |
| 0.150 | 42.4 | Neutral | 56.0 | -13.6 | Average | |
| 0.742 | 42.0 | Line | 56.0 | -14.0 | QP | |
| 0.891 | 41.4 | Line | 56.0 | -14.6 | QP | |
| 0.444 | 40.6 | Neutral | 57.0 | -16.4 | QP | |
| 0.889 | 39.4 | Neutral | 56.0 | -16.6 | QP | |
| 0.150 | 49.3 | Neutral | 66.0 | -16.7 | QP | |
| 0.150 | 48.7 | Line | 66.0 | -17.3 | QP | |

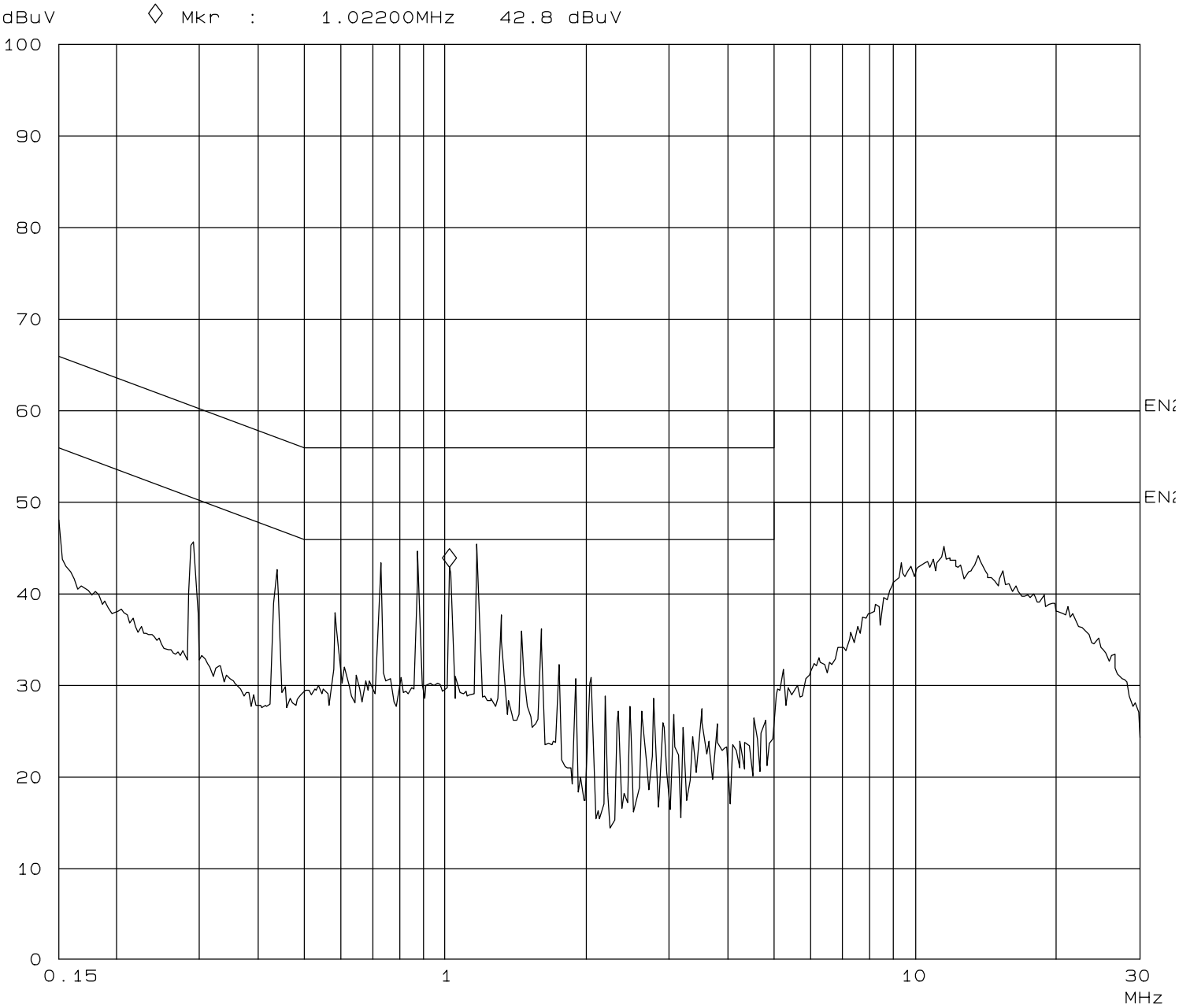
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 14:59

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 120V / 60Hz
Run No.1 120V Neutral



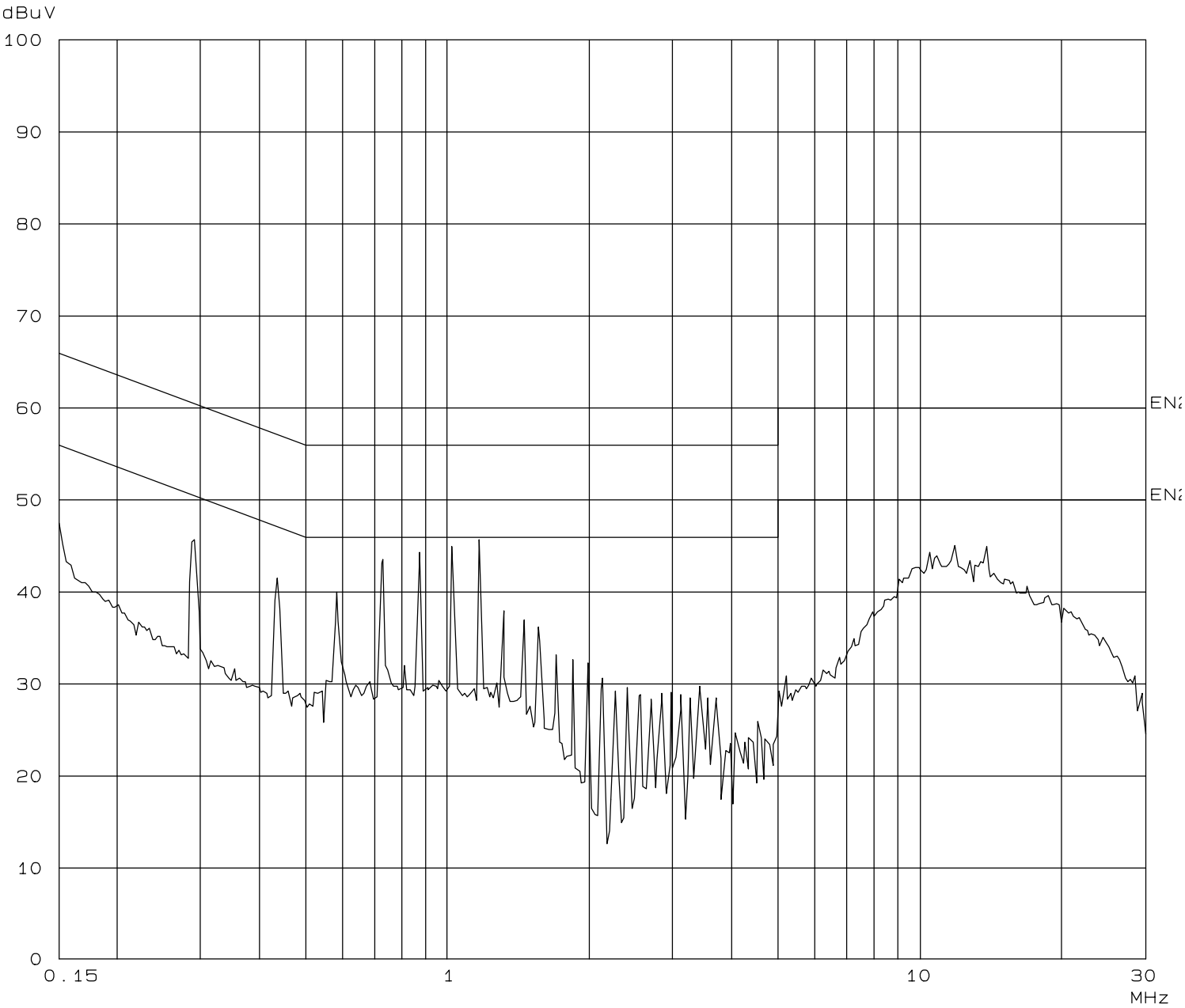
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 14: 49

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 120V / 60Hz
Run No.1 120V Line

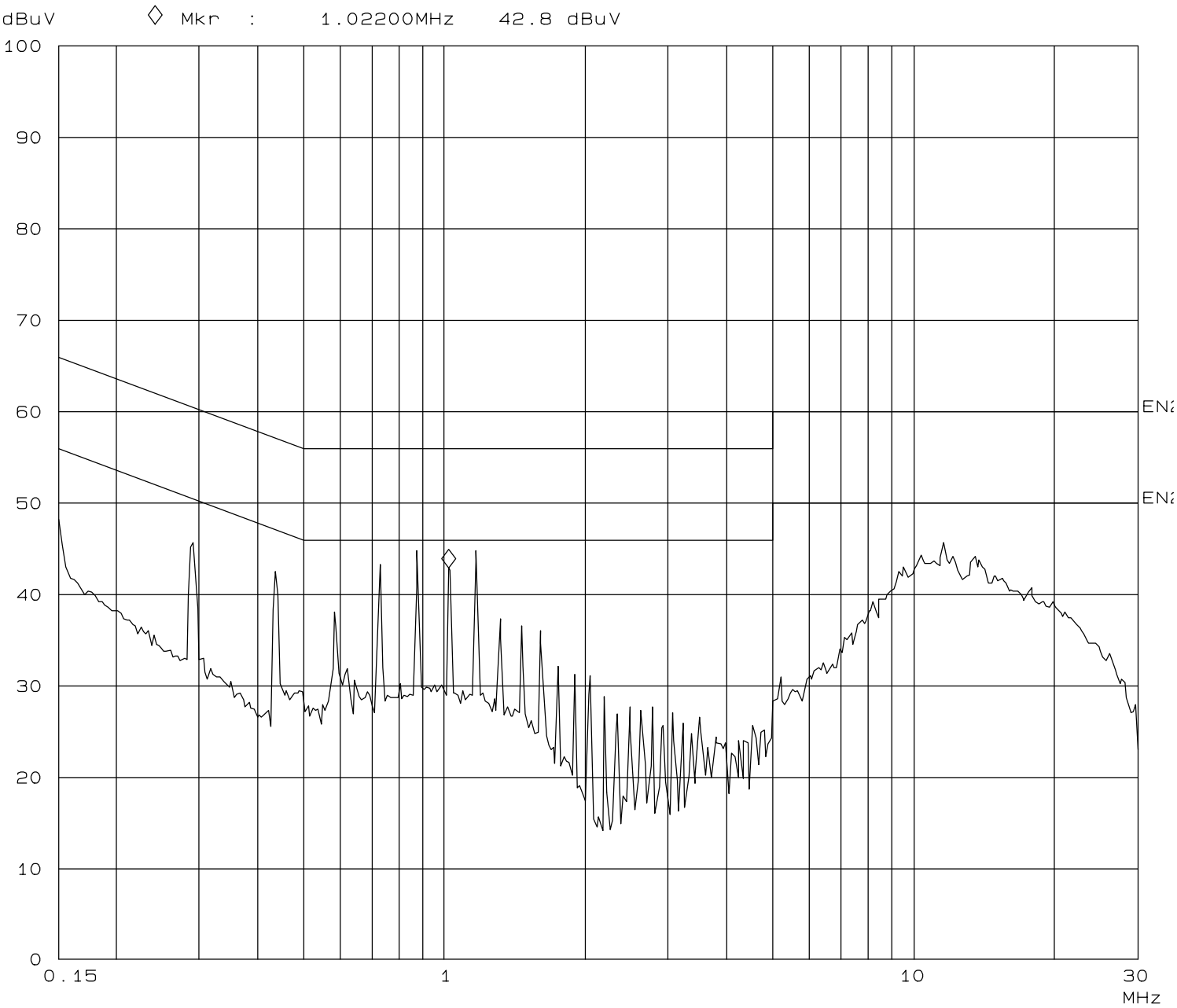


Elliott Laboratories
AC Conducted Emissions

11. Dec 03 15:18

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

LHF Test, 120V / 60Hz
Run No.2 120V Neutral



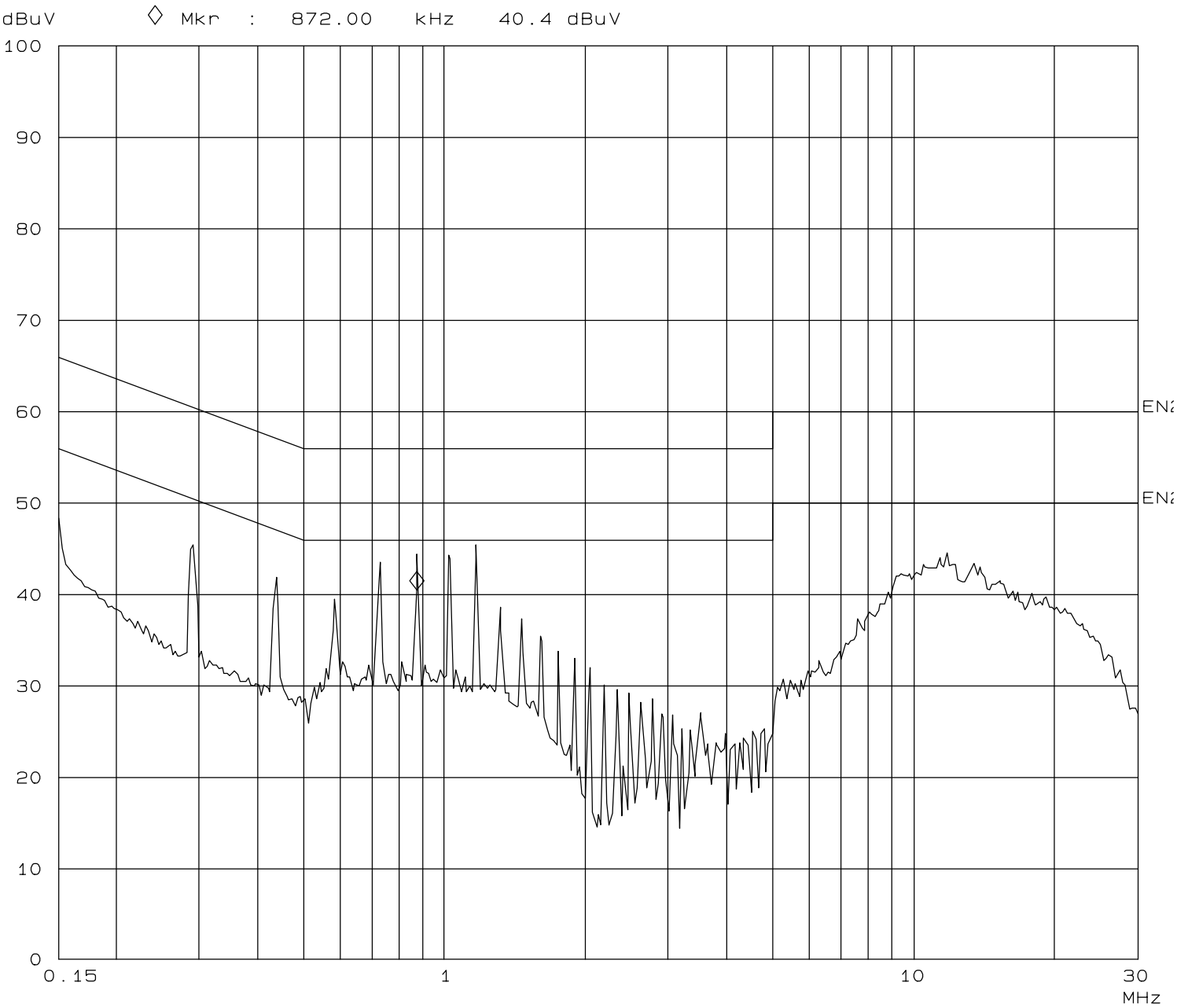
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15:10

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

LHF Test, 120V / 60Hz
Run No.2 120V Line



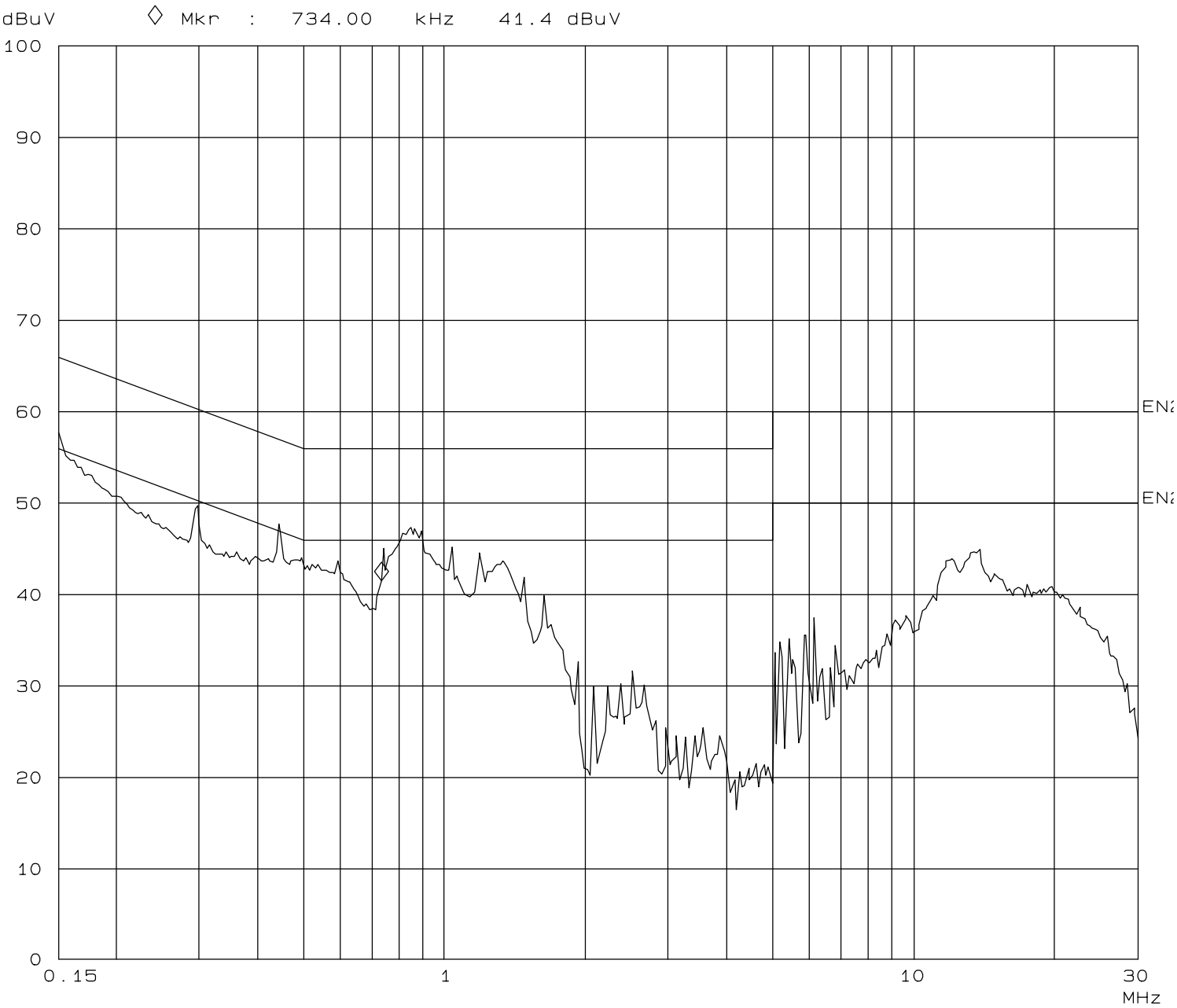
Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15: 47

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 230V / 50Hz
Run No.3 230V Neutral



Elliott Laboratories

AC Conducted Emissions

11. Dec 03 15:28

Operator: Yu-Chien Ho
Comment: Savi
SMR-650-110-111
J53657 / T53670

UHF Test, 230V / 50Hz
Run No.3 230V Line

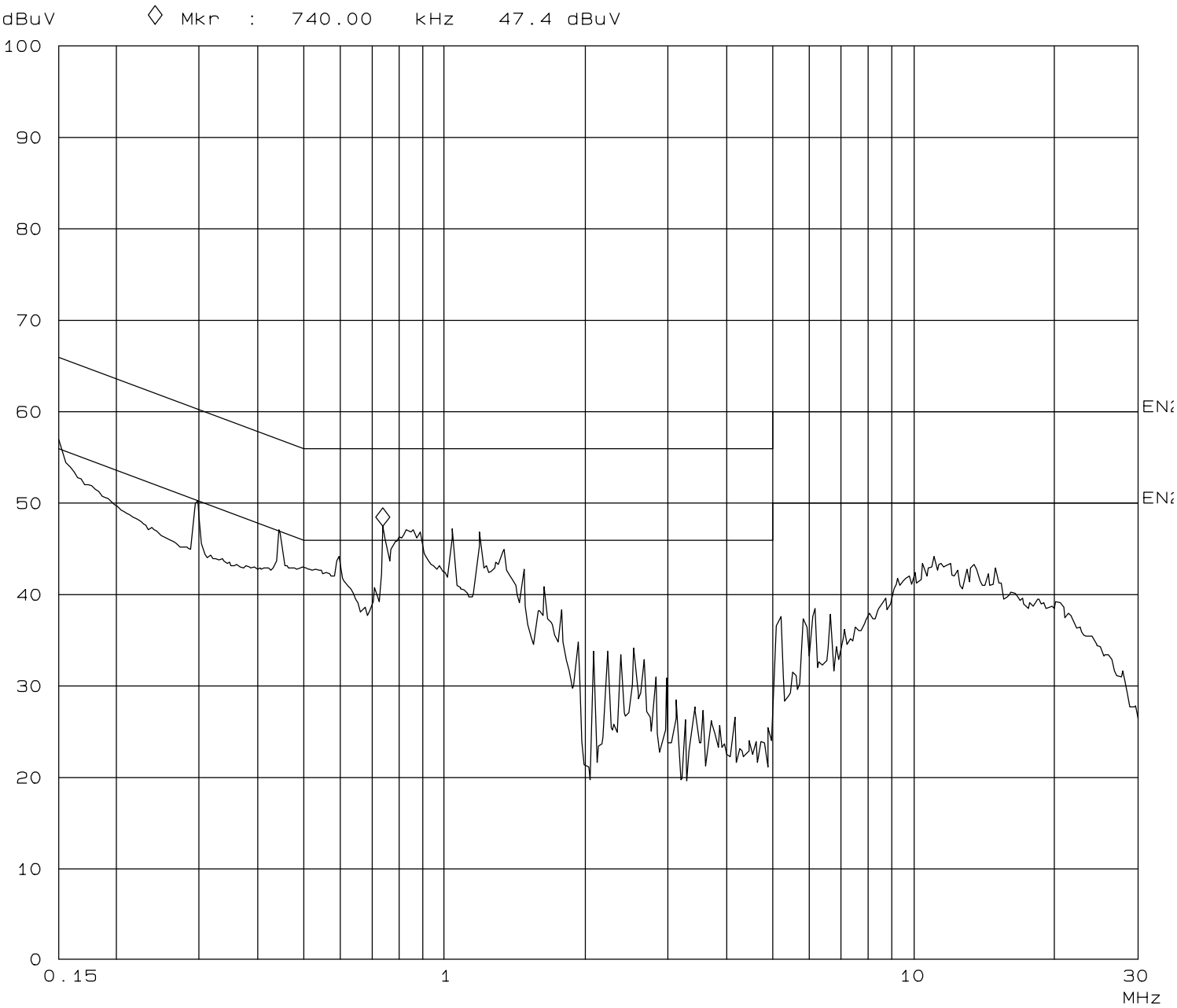


EXHIBIT 3: Test Configuration Photographs

Uploaded as A Separate Attachment

EXHIBIT 4: Label and Label Location

Uploaded as A Separate Attachment

***EXHIBIT 5: Detailed Photographs
of Savi Technology, Inc. Model SMR-650P-110 and SMR-650P-111 Construction***

Uploaded as A Separate Attachment

***EXHIBIT 6: Block Diagram
of Savi Technology, Inc. Model SMR-650P-110 and SMR-650P-111***

***EXHIBIT 7: Schematic Diagrams
of Savi Technology, Inc. Model SMR-650P-110 and SMR-650P-111***

Uploaded as A Separate Attachment

***EXHIBIT 8: Theory of Operation
for Savi Technology, Inc. Model SMR-650P-110 and SMR-650P-111***

EXHIBIT 9: Advertising Literature

Uploaded as A Separate Attachment

EXHIBIT 10: Operator's Manual

Uploaded as A Separate Attachment