

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

of

WPS Main Controller

MODEL: IT-640

FCC ID: ST2-IT640 IC: 6012A-IT640

July 22, 2014

| | |
|--|---|
| <p>This report concerns (check one): Original grant <input checked="" type="checkbox"/> Class II change <input type="checkbox"/></p> <p>Equipment type: <u>Low Power Intentional Radiator</u></p> | |
| <p>Deferred grant requested per 47 CF 0.457(d)(1)(ii)? yes <input type="checkbox"/> no <input checked="" type="checkbox"/></p> <p style="padding-left: 150px;">If yes, defer until: _____ (date)</p> <p>Company agrees to notify the Commission by _____ (date)</p> <p>of the intended date of announcement of the product so that the grant can be issued on that date.</p> | |
| <p>Transition Rules Request per 15.37? yes <input type="checkbox"/> no <input checked="" type="checkbox"/></p> <p>If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision.</p> | |
| <p>Report prepared for:</p> <p>Report prepared by:</p> <p>Report number:</p> | <p style="text-align: center;">CENTRAK, INC.</p> <p style="text-align: center;">Advanced Compliance Lab</p> <p style="text-align: center;">0048-140701-02</p> |



Lab Code: 200101

The test result in this report IS supported and covered by the NVLAP accreditation

Table of Contents

| | |
|--|-----------|
| Report Cover Page | 1 |
| Table of Contents | 2 |
| Figures | 3 |
| 1. GENERAL INFORMATION | 4 |
| 1.1 Verification of Compliance | 4 |
| 1.2 Equipment Modifications | 5 |
| 1.4 Test Methodology..... | 6 |
| 1.5 Test Facility | 6 |
| 1.6 Test Equipment..... | 6 |
| 1.7 Statement for the Document Use..... | 7 |
| 2. PRODUCT LABELING..... | 8 |
| 3. SYSTEM TEST CONFIGURATION..... | 9 |
| 3.1 Justification | 9 |
| 3.2 Special Accessories | 9 |
| 3.3 Configuration of Tested System | 9 |
| 4. SYSTEM SCHEMATICS | 14 |
| 5. RADIATED EMISSION DATA | 15 |
| 5.1 Field Strength Calculation..... | 15 |
| 5.2 Test Methods and Conditions..... | 15 |
| 5.3 Test Data | 15 |
| 5.4 125KHz Transmission Radiated Test Data..... | 20 |
| 6. EUT RECEIVING MODE VERIFICATION | 22 |
| 7. CONDUCTED EMISSION DATA..... | 23 |
| 8. PHOTOS OF TESTED EUT..... | 27 |

Figures

| | |
|---|--------------|
| Figure 2.1 ID Label..... | 8 |
| Figure 2.2 Location of Label on Back of the EUT..... | 8 |
| Figure3.1 Radiated Emission and Conducted Emission Test Setup..... | 10-12 |
| Figure3.2 Conducted Emission Test Setup..... | 13 |
| Figure 4.1 EUT Schematics..... | 14 |
| Figure 8.1-8.x EUT Details..... | 28-37 |

1. GENERAL INFORMATION**1.1 Verification of Compliance**

EUT: WPS Main Controller

Model: IT-640

Applicant: CENTRAK, INC.

Test Type: FCC Part 15 Sub Part 15.249 & 15.209
IC RSS-210 (Issue 8) A2.9 & RSS-Gen (Issue 3)
CERTIFICATION

Result: PASS

Tested by: ADVANCED COMPLIANCE LABORATORY

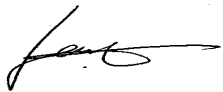
Test Date: July 2-17, 2014

Report Number: 0048-140701-02

The above equipment was tested by Compliance Laboratory, Advanced Technologies, Inc. for compliance with the requirement set forth in the FCC/IC rules and regulations Part 15 subpart C. This said equipment in the configuration described in the report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

| | Prob. Dist. | Uncertainty(dB) | Uncertainty(dB) | Uncertainty(dB) |
|---------------------------------|-------------|-----------------|-----------------|-----------------|
| | | 30-1000MHz | 1-6.5GHz | Conducted |
| Combined Std. Uncertainty u_c | norm. | ± 2.36 | ± 2.99 | ± 1.83 |



Wei Li
Lab Manager
Advanced Compliance Lab

Date July 22, 2014

1.2 Equipment Modifications

N/A

1.3 Product Information

System Configuration

| ITEM | DESCRIPTION | ID | CABLE |
|-----------------|-------------------------------|--------------------------------------|-------|
| Product | IT-640 (1) | FCC ID: ST2-IT640 IC: 6012A-IT640 | |
| Housing | Metal | | |
| Power Supply | AC/DC Adaptor from AC main | | |
| Operation Freq. | 904MHz ~ 926MHz and 125KHz | | |
| Receiver | IT-640(RX) | Verification | |

(1) EUT submitted for grant.

1.4 Test Methodology

Radiated tests were performed according to the procedures in ANSI C63.4-2003 at an antenna to EUT distance of 3/10 meters.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated and conducted data are located at Somerset, New Jersey, which is designated by IC as "site IC 3130". This site is also accepted by FCC to perform measurements under Part 15 or 18 (Registration # 90601). The NVLAP Lab code for accreditation of FCC EMC Test Method is: 200101-0.

1.6 Test Equipment

| Manufacture | Model | Serial No. | Description | Cal Due dd/mm/yy |
|------------------|------------|----------------|--|---------------------|
| Hewlett-Packard | HP8546A | 3448A0029 0 | EMI Receiver | 15/10/14 |
| EMCO | 3104C | 9307-4396 | 20-300MHz Biconical Antenna | 15/01/15 |
| EMCO | 3146 | 9008-2860 | 200-1000MHz Log-Periodic Antenna | 15/01/15 |
| Fischer Custom | LISN-2 | 900-4-0008 | Line Impedance Stabilization Networks | 28/05/15 |
| Electro-Meterics | ALR-25M/30 | 289 | 10KHz-30MHz Active Loop Antenna | 18/03/15 |
| Fischer Custom | LISN-2 | 900-4-0009 | Line Impedance Stabilization Networks | 24/03/15 |
| EMCO | 3115 | 4945 | Double Ridge Guide Horn Antenna | 22/01/15 |

All Test Equipment Used are Calibrated Traceable to NIST Standards. Calibration Interval: two year.

1.7 Statement for the Document Use

This report shall not be reproduced except in full, without the written approval of the laboratory. And this report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

2. PRODUCT LABELING

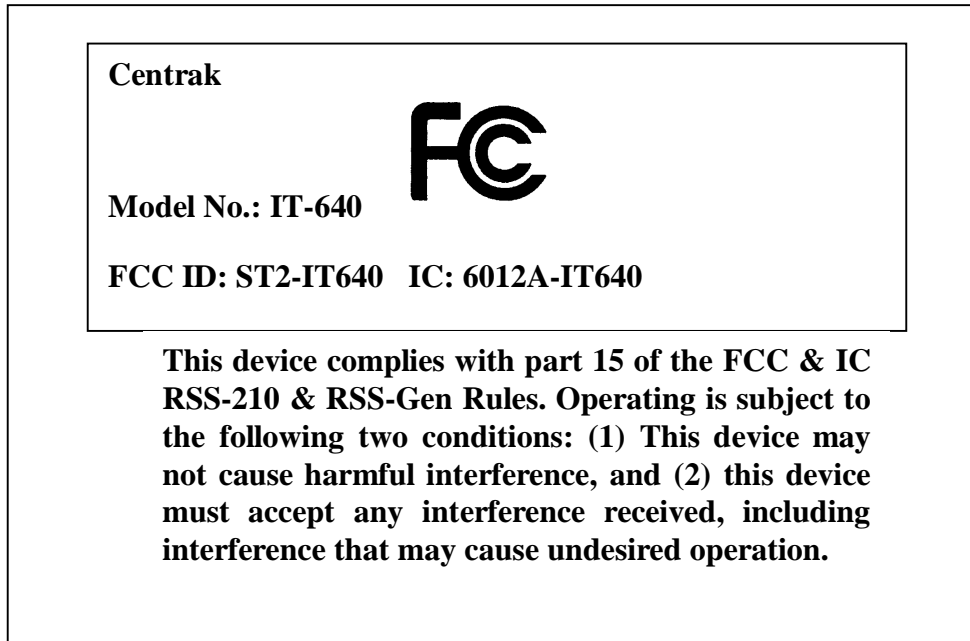


Figure 2.1 ID Label

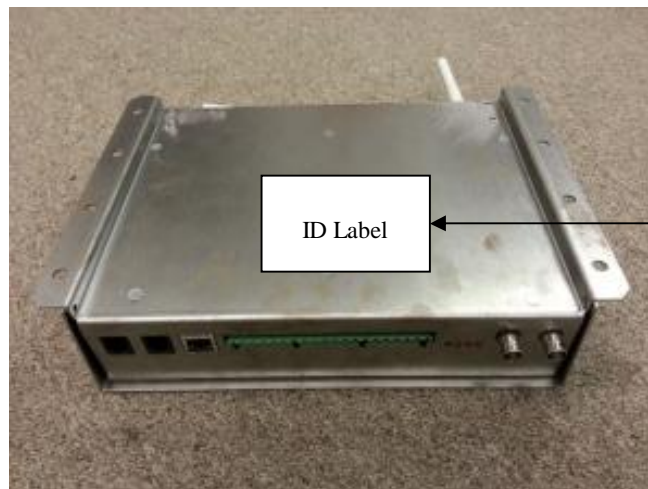


Figure 2.2 Location of the Label

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). And its antenna was permanently attached to the EUT with max length, 3”.

Testing was performed as EUT was continuously operated at the following frequency channels: Low=904MHz, Middle= 915MHz, High=926MHz for 900MHz Band and 125KHz for LF band, which will not be operated simultaneously.

3.2 Special Accessories

N/A

3.3 Configuration of Tested System

Figure 3.1 to Figure 3.3 illustrate this system, which is tested standing along.







Figure 3.1 Radiated Test Setup



Figure 3.2 Conducted Test Setup

4. SYSTEM SCHEMATICS

See Attachment.

Figure 4.1 System Schematics

5. RADIATED EMISSION DATA

5.1 Field Strength Calculation

The corrected field strength is automatically calculated by EMI Receiver using following:

$$FS = RA + AF + CF + AG$$

where FS: Corrected Field Strength in dB μ V/m

RA: Amplitude of EMI Receiver before correction in dB μ V

AF: Antenna Factor in dB/m

CF: Cable Attenuation Factor in dB

AG: Built-in Preamplifier Gain in dB (Stored in receiver as part of the calibration data)

THE "DUTY CYCLE CORRECTION FACTOR" FOR SPURIOUS RADIATED EMISSIONS IS;
20 log * (4 ms / 100 ms) = -28 dB, WHICH WAS USED TO CORRECT THE AVERAGE RADIATED EMISSION READINGS.

5.2 Test Methods and Conditions

The initial step in collecting radiated data is a EMI Receiver scan of the measurement range below 30MHz using peak detector and 9KHz IF bandwidth / 30KHz video bandwidth. For the range 30MHz - 1GHz, 100KHz IF bandwidth / 100KHz video bandwidth are used. Both bandwidths are 1MHz for above 1GHz measurement. Up to 10th harmonics were investigated.

5.3 Test Data

The following data lists the significant emission frequencies, polarity and position, peak reading of the EMI Receiver, the FCC limit, and the difference between the peak reading and the limit. Explanation of the correction and calculation are given in section 5.1.

Test Personnel: _____



Typed/Printed Name: Edward Lee

Date: July 22, 2014

Radiated Test Data (CH-904MHz/915MHz/926MHz)

Operation Mode: Continuous, Vertical Orientation

| Frequency (MHz) | Polarity (V,H) Position (X,Y,Z) | Antenna Height (m) | Azimuth (Degree) | Peak /QP Reading at 3m (2) (dBuV/m) | FCC/IC 3m Peak Limit (3) (dBuV/m) | Difference To Peak Limit (dBuV/m) | Average Reading with Correction (>1GHz) (dBuV/m) | FCC/IC 3m QP/Average Limit (1) (dBuV/m) | Difference To AVG Limit (dBuV/m) |
|--------------------|--|--------------------------|---------------------|---|--|--|---|---|---|
| 904 | V/Z | 1.1 | 135 | 90.7 | | | | 94 | -3.3 |
| 1808 | V/Z | 1.1 | 135 | 49.0 | 74 | -25 | 21 | 54 | -33 |
| 2712 | V/Z | 1.1 | 135 | 47.2 | 74 | -26.8 | 19.2 | 54 | -34.8 |
| 904 | H/Z | 1.0 | 270 | 88.6 | | | | 94 | -5.4 |
| 1808 | H/Z | 1.0 | 235 | 48.4 | 74 | -25.6 | 20.4 | 54 | -33.6 |
| 2712 | H/Z | 1.0 | 235 | 45.8 | 74 | -28.2 | 17.8 | 54 | -36.2 |
| | | | | | | | | | |
| 915 | V/Z | 1.1 | 135 | 90.1 | | | | 94 | -3.9 |
| 1830 | V/Z | 1.1 | 135 | 49.1 | 74 | -24.9 | 21.1 | 54 | -32.9 |
| 2745 | V/Z | 1.1 | 135 | 49.6 | 74 | -24.4 | 21.6 | 54 | -32.4 |
| 915 | H/Z | 1.0 | 270 | 88.4 | | | | 94 | -5.6 |
| 1828 | H/Z | 1.0 | 235 | 47.9 | 74 | -26.1 | 19.9 | 54 | -34.1 |
| 2745 | H/Z | 1.0 | 235 | 45.4 | 74 | -28.6 | 17.4 | 54 | -36.6 |
| | | | | | | | | | |
| 926 | V/Z | 1.1 | 270 | 88.4 | | | | 94 | -5.6 |
| 1852 | V/Z | 1.1 | 135 | 47.8 | 74 | -26.2 | 19.8 | 54 | -34.2 |
| 2778 | V/Z | 1.1 | 135 | 48.2 | 74 | -25.8 | 20.2 | 54 | -33.8 |
| 926 | H/Z | 1.0 | 090 | 88.3 | | | | 94 | -5.7 |
| 1852 | H/Z | 1.0 | 235 | 47.7 | 74 | -26.3 | 19.7 | 54 | -34.3 |
| 2778 | H/Z | 1.0 | 235 | 44.8 | 74 | -29.2 | 16.8 | 54 | -37.2 |

(1) The limit for emissions within the 902-928MHz band is 50mV(94dB) per FCC Sec. 15.249 & IC RSS-210 Annex 2.9. The limit for its harmonics is 500uV (54dB). Other spurious emissions shall be lower than either its fundamental by 50dB or the limit defined in Sec. 15.209, whichever is higher.

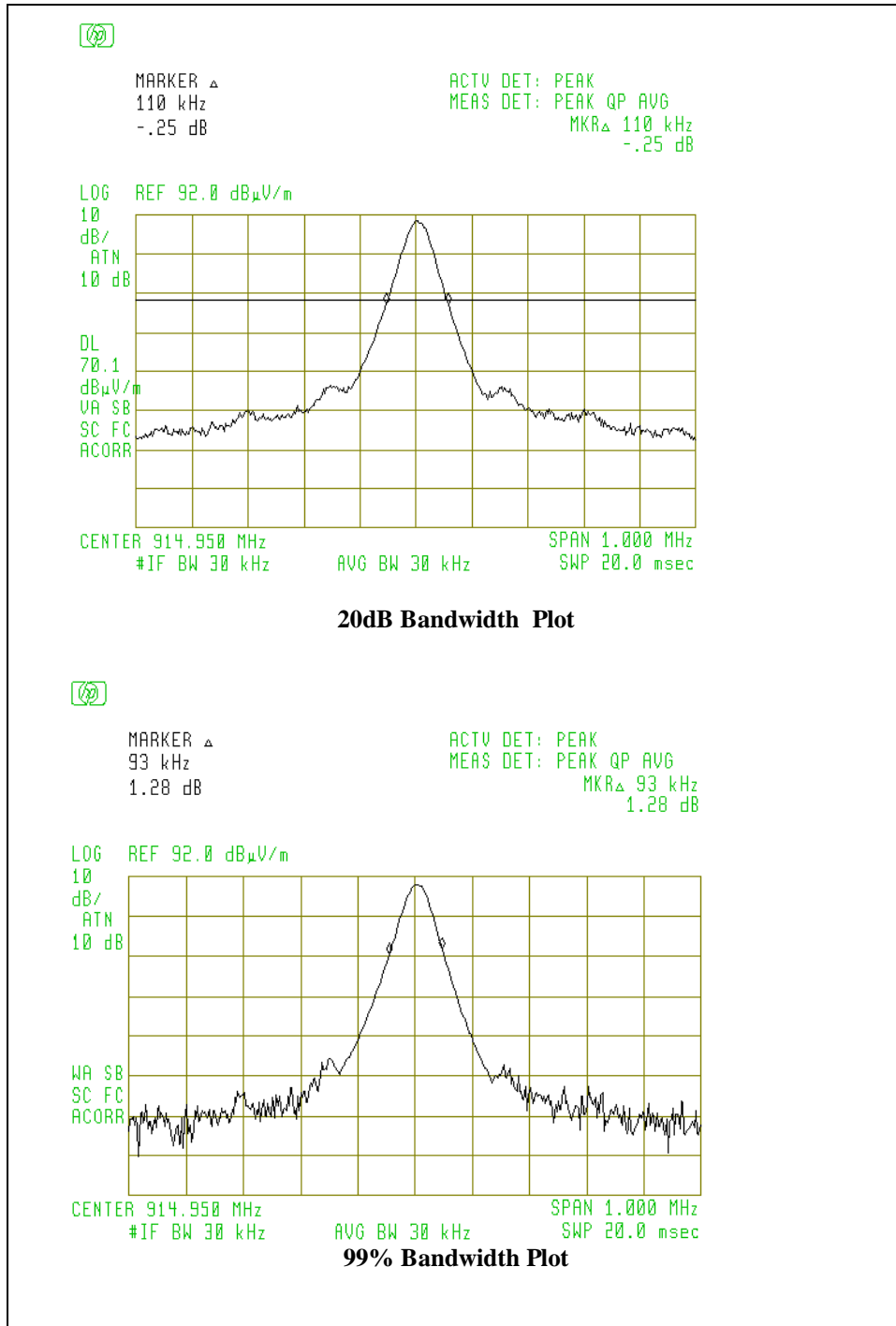
(2) If the peak reading is less than the FCC/IC quasi-peak or average limit, it'll be not necessary to show the measured/ calculated quasi-peak or average reading.

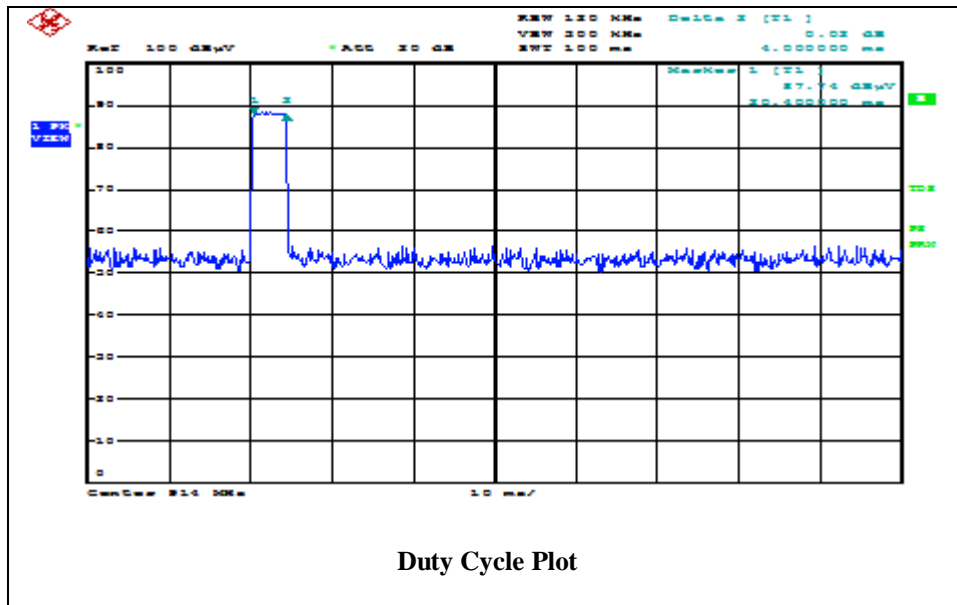
(3) For above 1GHz range, peak reading shall meet the limit: average Limit+20dB.

Other Spurious outside of the band 902-928MHz

| Frequency (MHz) | Polarity (V,H) Position (X,Y,Z) | Antenna Height (m) | Azimuth (Degree) | Peak Reading at 3m (2) (dBuV/m) | Peak Reading After Correction (dBuV/m) | FCC/IC 3m Limit (1) (dBuV/m) | Difference (dBuV/m) |
|----------------------------|--|-----------------------------------|-----------------------------|--|---|---|--------------------------------|
| 53.8 | H/Z | 1.4 | 180 | 34.9 | | 40.0 | -5.1 |
| 140.5 | H/Z | 1.3 | 180 | 34.4 | | 43.5 | -9.1 |
| 500 | H/Z | 1.0 | 045 | 39.1 | | 46.5 | -7.4 |
| 750 | H/Z | 1.0 | 090 | 41.2 | | 46.5 | -5.3 |
| 875 | H/Z | 1.0 | 235 | 42.7 | | 46.5 | -3.8 |
| 142.6 | V/Z | 1.1 | 135 | 39.3 | | 43.5 | -4.2 |
| 152.8 | V/Z | 1.1 | 180 | 40.9 | | 43.5 | -2.6 |
| 500 | V/Z | 1.1 | 235 | 39.3 | | 46.5 | -7.2 |

Comparing to the limit defined in Sec. 15.209 & RSS-210, emissions below the limit by 20dB were not recorded.





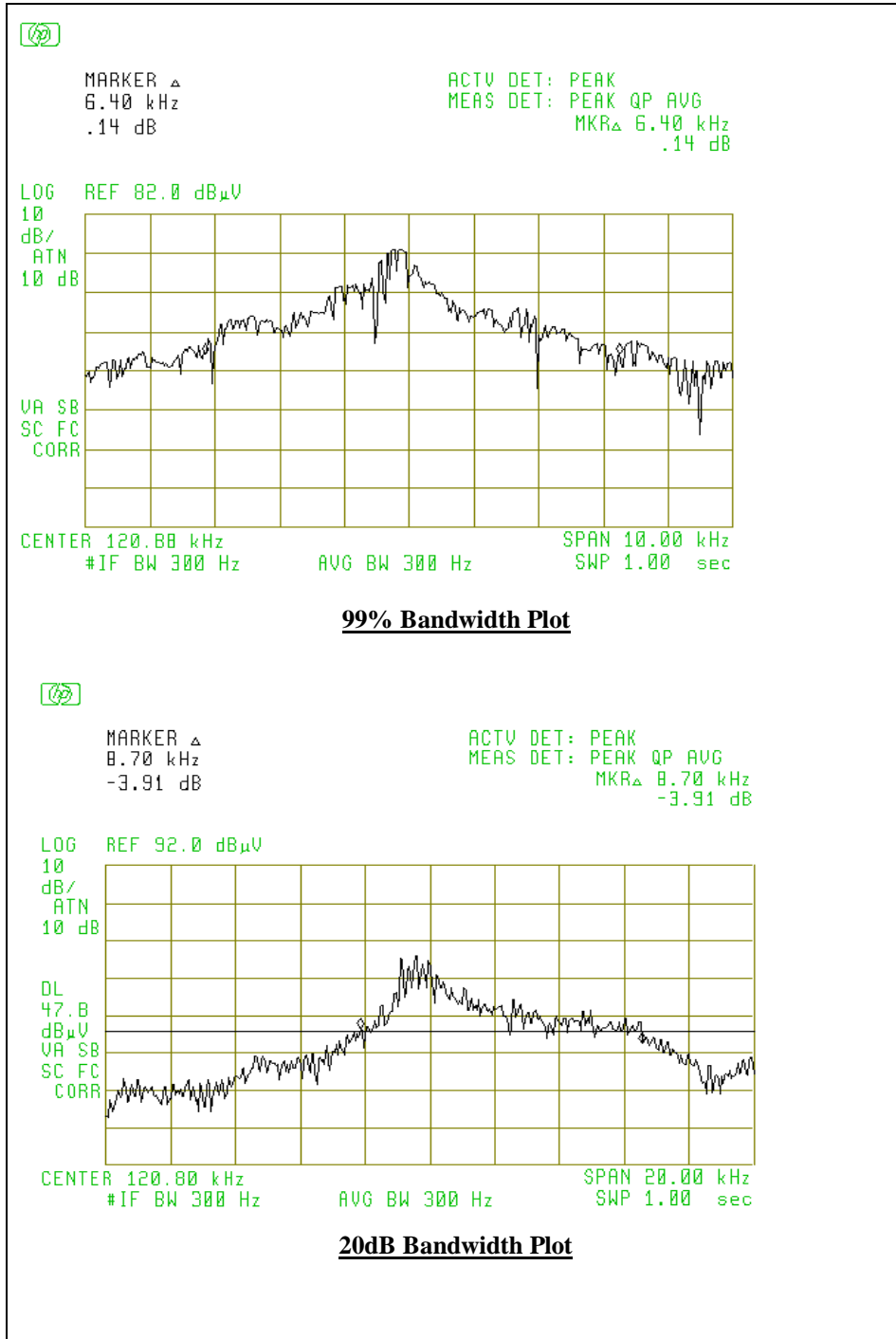
5.4 125KHz Transmission Radiated Test Data**EUT is powered by battery and represents the worst case at Vertical Orientation**

| Frequency (MHz) | Polarity (V,H) Position X | Antenna Height (m) | Azimuth (Degree) | Peak Reading at 3m (2) (dBuV/m) | Reading After Correction (dBuV/m) | FCC Limit@ 3m (1) (dBuV/m) | Difference (dBuV/m) |
|----------------------------|--|-----------------------------------|-----------------------------|---|--|---|--------------------------------|
| 0.122 | Loop | 1.0 | 000 | 99.2 | | 105.6 | -6.4 |
| 0.242 | Loop | 1.0 | 000 | 60.0 | | 99.6 | -39.6 |
| 0.368 | Loop | 1.0 | 000 | 78.7 | | 96.1 | -17.4 |
| 0.489 | Loop | 1.0 | 000 | 52.4 | | 73.7 | -21.3 |
| 0.623 | Loop | 1.0 | 000 | 57.9 | | 71.0 | -13.1 |
| 0.845 | Loop | 1.0 | 030 | 61.6 | | 69.0 | -7.4 |
| 1.086 | Loop | 1.0 | 020 | 57.8 | | 66.8 | -9 |

(1) The limit for emissions per Sec. 15.209 with distance correction factor (40dB/decade at $f < 30\text{MHz}$).

(2) If each peak reading is less than the FCC QP or average limit, it'll be not necessary to show the measured/ calculated QP or average reading (QP detector shall be used except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, in which an average detector shall be employed).

125KHz LF Band



6. EUT RECEIVING MODE VERIFICATION

Radiated Test Data for Receiving Mode (Vertical Orientation)

| Frequency (MHz) | Polarity (V,H) Position (X,Y,Z) | Antenna Height (m) | Azimuth (Degree) | Peak Reading at 3m (2) (dBuV/m) | FCC/IC 3m Limit (1) (dBuV/m) | Difference (dBuV/m) |
|--------------------|--|--------------------------|---------------------|---|--|------------------------|
| 32.1 | H/Z | 1.4 | 135 | 34.2 | 40.0 | -5.8 |
| 53.8 | H/Z | 1.4 | 180 | 34.9 | 40.0 | -5.1 |
| 140.5 | H/Z | 1.3 | 180 | 34.4 | 43.5 | -9.1 |
| 500 | H/Z | 1.0 | 045 | 39.1 | 46.5 | -7.4 |
| 750 | H/Z | 1.0 | 090 | 41.2 | 46.5 | -5.3 |
| 875 | H/Z | 1.0 | 235 | 42.7 | 46.5 | -3.8 |
| 33.8 | V/Z | 1.2 | 180 | 35.1 | 40.0 | -4.9 |
| 126.1 | V/Z | 1.1 | 135 | 35.8 | 43.5 | -7.7 |
| 142.6 | V/Z | 1.1 | 135 | 39.3 | 43.5 | -4.2 |
| 152.8 | V/Z | 1.1 | 180 | 40.9 | 43.5 | -2.6 |
| 500 | V/Z | 1.1 | 235 | 39.3 | 46.5 | -7.2 |

(1) Receiving mode spurious emissions shall be lower than the limit defined in Sec. 15.209 & RSS-Gen

(2) If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated average reading.

7. CONDUCTED EMISSIONS DATA

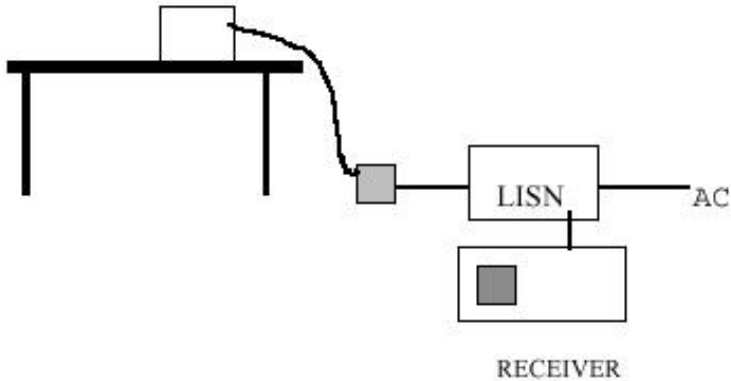
7.1 Test Methods and Conditions

The EUT exercise program was loaded during the conducted emission test. EMI Receiver was scanned from 150KHz to 30MHz with maximum hold mode for maximum emission. The IF Bandwidth is 9KHz. Recorded data was sent to the plotter to generate output in linear format. At the input of the spectrum analyzer, a HP transient limiter is inserted for protective purpose. This limiter has a 10 dB attenuation in the range of 150KHz to 30MHz. That factor was automatically compensated by the receiver, so the readings are the corrected readings. The reference of the plots is using FCC Part 15 & CISPR22 Class B limit given as following:

| Conducted Emission Technical Requirements | | | | |
|---|-----------------|--------------|-----------------|--------------|
| Frequency Range | Class A | | Class B | |
| | Quasi-Peak dBuV | Average dBuV | Quasi-Peak DBuV | Average dBuV |
| 150kHz -0.5MHz | 79 (8912uV) | 66 (1995uV) | 66-56 | 56-46 |
| 0.5MHz-30MHz | 73 (4467uV) | 60 (1000uV) | --- | --- |
| 0.5MHz- 5MHz | --- | --- | 56 | 46 |
| 5MHz-30MHz | --- | --- | 60 | 50 |

Emissions that have peak values close to (or over) the specification limit (if any) are also measured in the quasi-peak mode to determine the compliance.

7.2 Measurement Instrument Configuration for Conducted Emission



7.3 Testing Data

The following plots show the neutral and line conducted emissions for the typical operation condition (Transmitting and receiving). The conducted test data shows the worst case emissions still below the FCC Part 15/CISPR22 Class B limits.

Test Personnel:

Tester Signature



Date 07/22/2014

Typed/Printed Name: Edward Lee

