Advanced
Compliance Laboratory

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ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

of

Star

MODEL: IT-103C

FCC ID: ST2-IT103C IC: 6012A-IT103C

August 15, 2014

This report concerns (check one): Original grant __x__ Class II change _____
Equipment type: Low Power Intentional Radiator

Deferred grant requested per 47 CF 0.457(d)(1)(ii)? yes _____ no __x__
If yes, defer until: _____ (date)
Company agrees to notify the Commission by _____ (date)
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? yes _____ no __x__
If no, assumed Part 15, Subpart B for unintentional radiators - the new 47 CFR [10-1-90 Edition] provision.

Report prepared for:	CENTRAK, INC.
Report prepared by:	Advanced Compliance Lab
Report number:	0048-140701-01

NVLAP®

Lab Code: 200101 **The test result in this report IS supported and covered by the NVLAP accreditation**

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1. GENERAL INFORMATION

1.1 Verification of Compliance

EUT:	Star
Model:	IT-103C
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 1~ August 15, 2014
Report Number:	0048-140701-01

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 August 15, 2014

1.2 Equipment Modifications

N/A

1.3 Product Information

System Configuration

ITEM	DESCRIPTION	ID	CABLE
Product	Star IT-103C (1)	FCC ID: ST2-IT103C IC: 6012A-IT103C	
Housing	PLASTICS		
Power Supply	AC/DC Adapter, I/P:100V-240Vac,100mA; O/P:3.3Vdc, 500mA &PoE 24V		
Operation Freq.	904MHz ~ 926MHz		
Receiver	IT-103C(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 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	3448A00290	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

Centrak Star

Model No.: IT-103C

FCC ID: ST2-IT103C IC: 6012A-IT103C

This device complies with part 15 of the FCC & IC RSS-210 & RSS-Gen Rules. Operating is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Figuare 2.1 ID Label

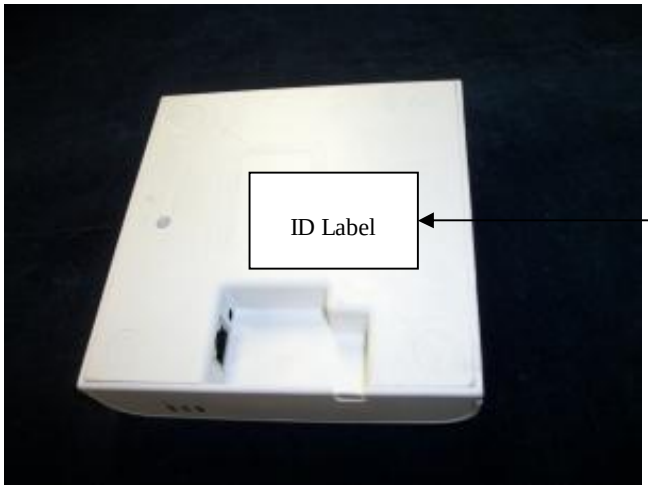


Figure 2.2 Location of the Label

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it).

Antenna Information: two identical fixed monopole antenna for 900MHz band, permanently attached to the PCB with max length, 4". 1.5dBi max. gain. Each time, only one antenna was used for transmitting the signal.

Testing was performed as EUT was continuously operated at the following frequency channels: Low=904MHz, Middle= 915MHz, High=926MHz for 900MHz Band. It has 2 modes, AC/DC adaptor mode and PoE mode under test.

3.2 Special Accessories

N/A

3.3 Configuration of Tested System

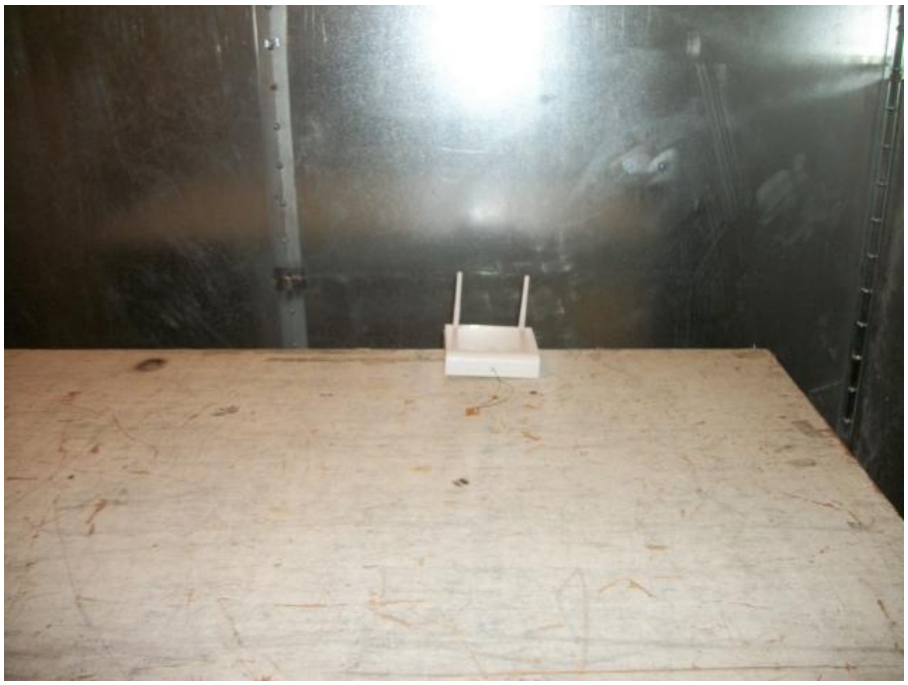
Figure 3.1 to Figure 3.3 illustrate this system, which is tested standing along.

AC/DC Adaptor mode

POE Mode

Figure 3.1 Radiated Test Setup

AC/DC Mode



POE mode

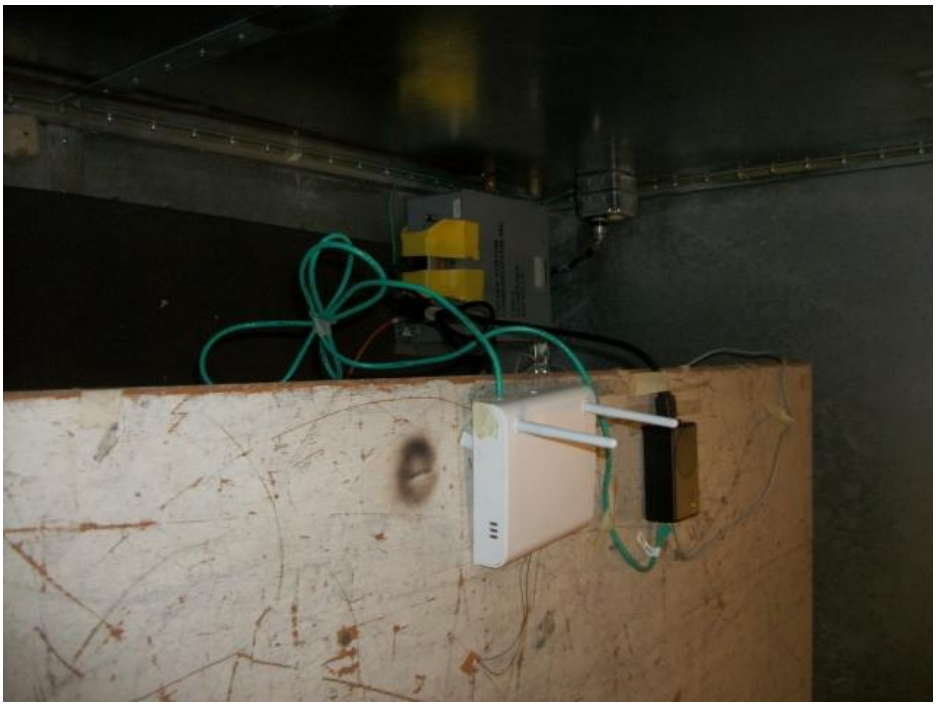


Figure 3.2 Conducted Test Setup

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 dBμV/m
RA: Amplitude of EMI Receiver before correction in dBμV
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 10^{th} 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: August 15, 2014

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

Operation Mode: AC/DC Adapter, Vertical Orientation

Frequency (MHz) (4)	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	090	91.4				94	-2.6
1808	V/Z	1.1	090	50.6	74	-23.4	22.6	54	-31.4
2712	V/Z	1.1	090	50.4	74	-23.6	22.4	54	-31.6
904	H/Z	1.0	000	89.9				94	-4.1
1808	H/Z	1.1	235	50.8	74	-23.2	22.8	54	-31.2
2712	H/Z	1.1	235	51.8	74	-22.2	23.8	54	-30.2
915	V/Z	1.1	090	91.2				94	-2.8
1830	V/Z	1.1	090	50.7	74	-23.3	22.7	54	-31.3
2745	V/Z	1.1	090	50.6	74	-23.4	22.6	54	-31.4
915	H/Z	1.0	180	88.5				94	-5.5
1828	H/Z	1.1	235	50.8	74	-23.2	22.8	54	-31.2
2745	H/Z	1.1	235	51.9	74	-22.1	23.9	54	-30.1
926	V/Z	1.1	090	91.6				94	-2.4
1852	V/Z	1.1	090	50.7	74	-23.3	22.7	54	-31.3
2778	V/Z	1.1	090	50.6	74	-23.4	22.6	54	-31.4
926	H/Z	1.0	180	89.5				94	-4.5
1852	H/Z	1.1	235	50.5	74	-23.5	22.5	54	-31.5
2778	H/Z	1.1	235	50.6	74	-23.4	22.6	54	-31.4

(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.
(4) For frequency range below 30MHz and up to 10^{th} harmonics, there is no significant emission (lower than 20dB below the limit) founded.

Operation Mode: POE, 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	090	91.9				94	-2.1
1808	V/Z	1.1	135	50.9	74	-23.1	22.9	54	-31.1
2712	V/Z	1.1	135	51.3	74	-22.7	23.3	54	-30.7
904	H/Z	1.0	090	88.2				94	-5.8
1808	H/Z	1.1	135	50.5	74	-23.5	22.5	54	-31.5
2712	H/Z	1.1	135	51.0	74	-23	23	54	-31.0
915	V/Z	1.1	330	90.3				94	-3.7
1830	V/Z	1.1	090	51.6	74	-22.4	23.6	54	-30.4
2745	V/Z	1.1	090	50.4	74	-23.6	22.4	54	-31.6
915	H/Z	1.0	090	88.8				94	-5.2
1828	H/Z	1.1	135	49.8	74	-24.2	21.8	54	-32.2
2745	H/Z	1.1	135	49.2	74	-24.8	21.2	54	-32.8
926	V/Z	1.1	330	92.1				94	-1.9
1852	V/Z	1.1	090	50.8	74	-23.2	22.8	54	-31.2
2778	V/Z	1.1	090	50.3	74	-23.7	22.3	54	-31.7
926	H/Z	1.0	090	88.6				94	-5.4
1852	H/Z	1.1	180	49.9	74	-24.1	21.9	54	-32.1
2778	H/Z	1.1	180	48.9	74	-25.1	20.9	54	-33.1

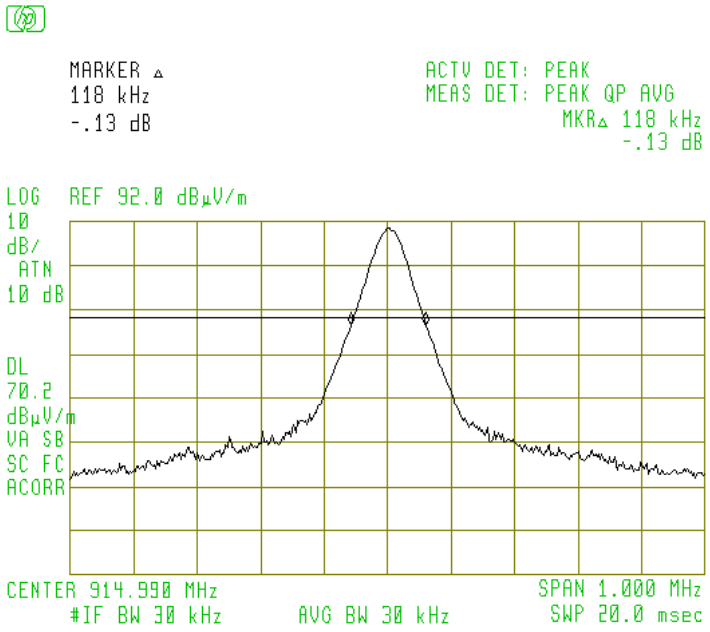
Other Spurious outside of the band 902-928MHz

(worst case data recorded)

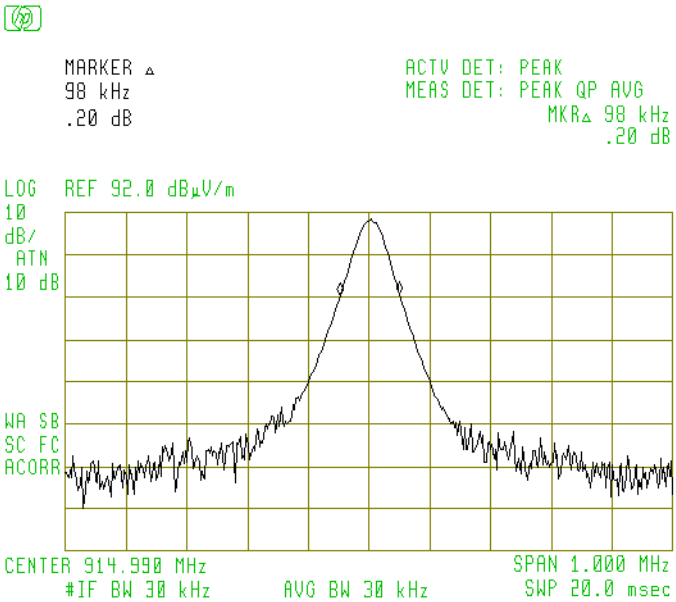
Frequency (MHz)	Polarity (V,H) Position (X,Y,Z)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	Peak Reading After Correction (dBuV/m)	FCC/IC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
55.1	H/Z	1.4	180	35.2*		40.0	-4.8
62.3	H/Z	1.3	180	36.3		40.0	-3.7
250	H/Z	1.1	135	40.3		46.5	-6.2
375	H/Z	1.0	235	44.3*		46.5	-2.2
746	H/Z	1.0	235	44.2		46.5	-2.3
876	H/Z	1.0	180	42.6		46.5	-3.9
54.7	V/Z	1.1	090	37.4*		40.0	-2.6
61.5	V/Z	1.1	235	36.0*		40.0	-4
104.0	V/Z	1.1	090	41.9*		43.5	-1.6
114.0	V/Z	1.1	090	42.0*		43.5	-1.5
375	V/Z	1.1	135	43.0		46.5	-3.5
750	V/Z	1.1	135	42.1		46.5	-4.4
875	V/Z	1.1	000	42.2		46.5	-3.2

* quasi-peak reading for high level emission points.

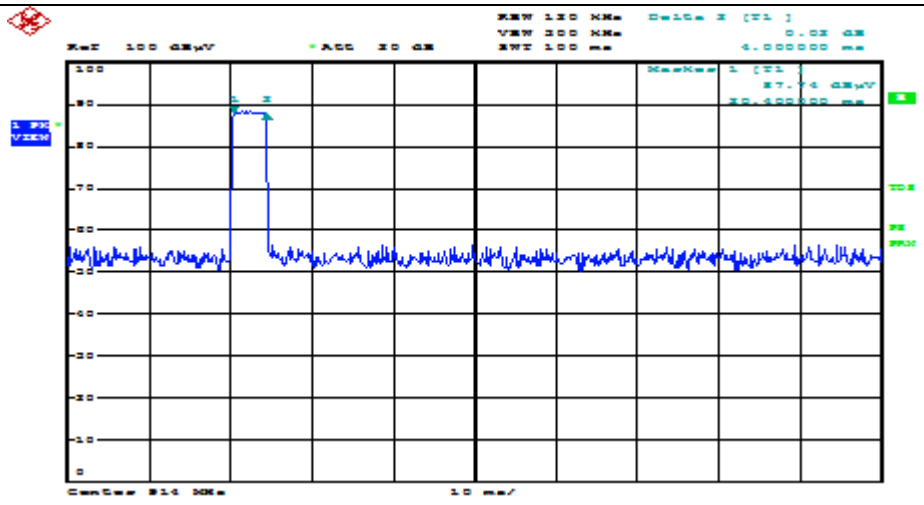
Comparing to the limit defined in Sec. 15.209 &RSS-210, emissions below the limit by 20dB were not recorded.



20dB Bandwidth Plot



99% Bandwidth Plot



Duty Cycle Plot

6. EUT RECEIVING MODE VERIFICATION

Radiated Test Data for Receiving Mode (worst case: Vertical Orientation)

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)
55.1	H/Z	1.4	180	35.2*		40.0	-4.8
62.3	H/Z	1.3	180	36.3		40.0	-3.7
250	H/Z	1.1	135	40.3		46.5	-6.2
375	H/Z	1.0	235	44.3*		46.5	-2.2
746	H/Z	1.0	235	44.2		46.5	-2.3
876	H/Z	1.0	180	42.6		46.5	-3.9
54.7	V/Z	1.1	090	37.4*		40.0	-2.6
61.5	V/Z	1.1	235	36.0*		40.0	-4
104.0	V/Z	1.1	090	41.9*		43.5	-1.6
114.0	V/Z	1.1	090	42.0*		43.5	-1.5
375	V/Z	1.1	135	43.0		46.5	-3.5
750	V/Z	1.1	135	42.1		46.5	-4.4
875	V/Z	1.1	000	42.2		46.5	-3.2

* quasi-peak reading for high level emission points.

(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

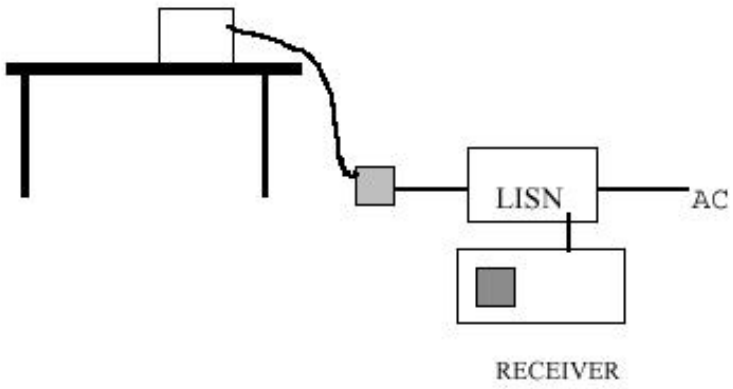
7.1 Test Methods and Conditions

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				
	Class A		**Class B**	
Frequency Range	**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.

Operation Mode: AC/DC Adapter

Highest Data for AC Main Conducted Emissions						
Frequency (KHz)	150	190	320	1030	1740	
Peak Reading (dBuV) from Line*	43.35	41.29	38.05	31.51	31.28	
Frequency (KHz)	150	190	260	320	1030	
Peak Reading(dBuV) from Neutral *	42.29	44.30	37.86	38.71	32.30	

Operation Mode: POE

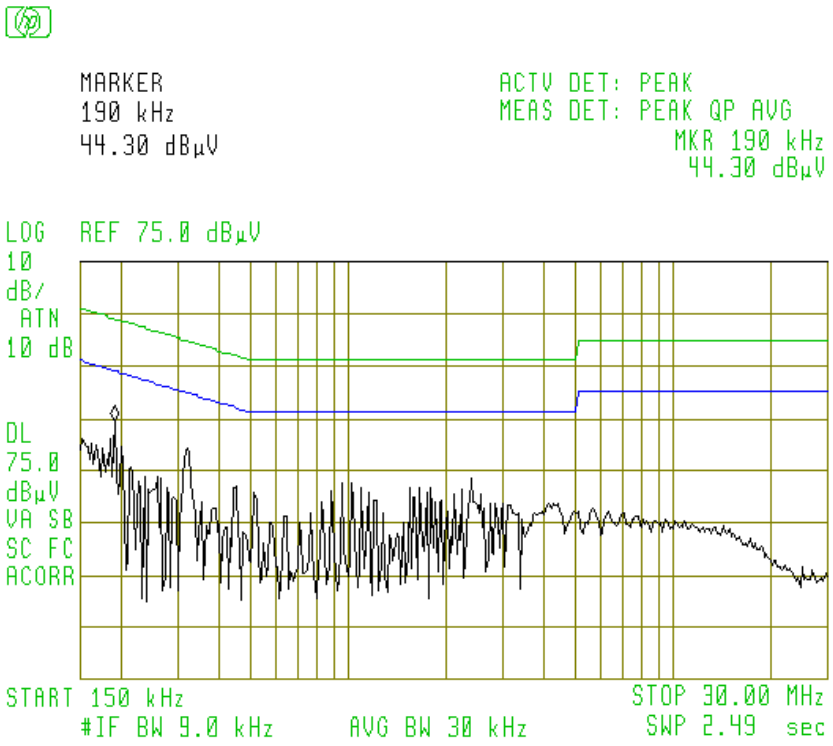
Highest Data for AC Main Conducted Emissions						
Frequency (KHz)	7480	17590	23480	25130	28310	
Peak Reading (dBuV) from Line*	34.14	33.16	40.11	43.58	42.49	
Frequency (KHz)	200	410	2660	18320	25130	
Peak Reading(dBuV) from Neutral *	30.41	34.46	30.71	37.53	45.17	

* If each peak reading is less than the FCC average limit, it'll be not necessary to show the measured/ calculated Quasi-peak & average reading.

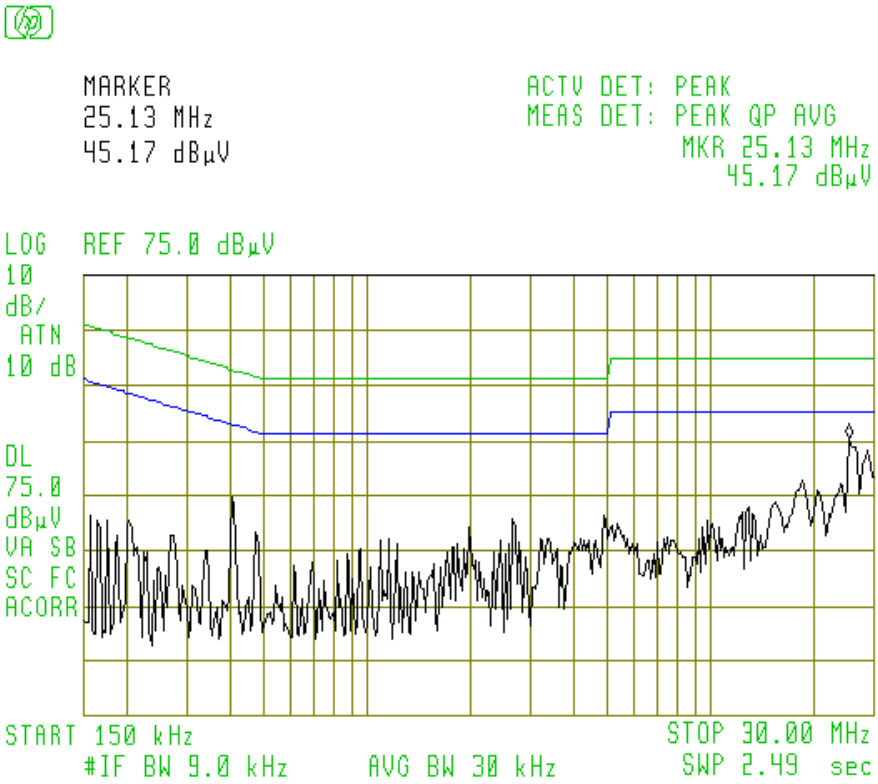
Test Personnel:

Tester Signature  Date 08/19/2014

Typed/Printed Name: Edward Lee



Line Conducted Emission



Neutral Conducted Emission