Advanced
Compliance Laboratory

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ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

of

RANGE EXTENDER
MODEL: IT-665 / IT-665H
FCC ID: ST2-IT665 IC:6012A-IT665

September 20, 2019

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

Test Specifications:
____FCC Part 15C Sec. 15.249
____Industry Canada RSS-210 (Issue 8) & RSS-Gen (Issue 3)

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.

Report prepared for:	CENTRAK, INC.
Report prepared by:	Advanced Compliance Lab
Report number:	0048-190826-01

NVLAP®

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

Table of Contents

Figures

1. GENERAL INFORMATION

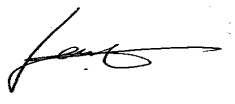
1.1 Verification of Compliance

EUT:	RANGE EXTENDER
Model:	IT-665 / IT-665H (all models are electrical identical)
Applicant:	CENTRAK, INC. 826 Yardley-Newtown Road Newtown, PA 18940, USA
Manufacturer:	CENTRAK, INC.
Test Type:	FCC Part 15.249 & 15.209 IC RSS-210 (Issue 9) A2.9 & RSS-Gen (Issue 5)
Result:	PASS
Tested by:	ADVANCED COMPLIANCE LABORATORY
Test Complete Date:	September 20, 2019
Report Number:	0048-190826-01

The above equipment was tested by Compliance Laboratory, Advanced Technologies, Inc. for compliance with the requirement set forth in the FCC rules and regulations Part 15 subpart C & IC RSS-210/RSS-Gen. 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 September 20, 2019

1.2 Equipment Modifications

N/A

1.3 Product Information

System Configuration

ITEM	DESCRIPTION	FCC/IC ID	CABLE
Product	RANGE EXTENDER IT-665 / IT-665H (1)	ST2-IT665 6012A-IT665	
Housing	PLASTICS		
Power Supply	24V DC Battery		
Operation Freq.	904MHz ~ 926MHz		
Receiver	IT-665H(RX)	Verification	

(1) EUT submitted for grant.

1.4 Test Methodology

Radiated tests were performed according to the procedures in ANSI C63.4-2014 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 Hillsborough, New Jersey, USA. This site is accepted by FCC to perform measurements under Part 15 or 18 (US5347) and also designated by IC as " **site IC 3130A**". ACL is recognized by ISED as a wirless testing laboratory (CAB ID: US0100) . 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	25/09/20
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	12/11/19
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	13/11/19
Electro-Meterics	ALR-25M/30	289	10KHz-30MHz Active Loop Antenna	28/05/20
COM-POWER	L1215A	191994	Line Impedance Stabilization Networks	24/03/20
Fischer Custom	LISN-2	900-4-0009	Line Impedance Stabilization Networks	18/03/20
EMCO	3115	4945	Double Ridge Guide Horn Antenna	28/11/19
Agilent	E4440A	US40420700	PSA Spectrum Analyzer	17/06/20

All Test Equipment Used are Calibrated Traceable to NIST Standards. Calibration interval: 2 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. & Canada Government.

2. PRODUCT LABELING

Centrak Range Extender
Model No.: IT-665 / IT-665H
FCC ID: ST2-IT665 IC: 6012A-IT665

This device complies with part 15 of the FCC Rules and 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 FCC/IC ID Label
(Only ID show on the EUT)

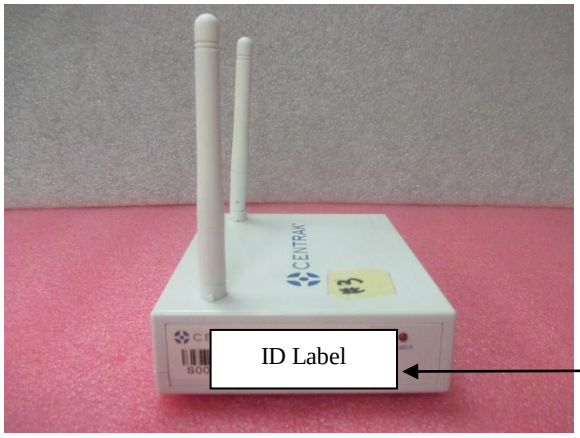


Figure 2.2 Location of the Label

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). Customized antenna on PCB was used.
Testing was performed as EUT was continuously operated at the following frequency channels: Low=904MHz, Middle= 915MHz, High=926MHz.

Fresh external battery was used for extended operating time. However, EUT was checked with the internal battery and it was confirmed that the readings obtained with the fresh external battery remain representative of the device as marketed.

3.2 Special Accessories

N/A

3.3 Configuration of Tested System

The following figure(s) illustrate this system, which is tested standing along.

Figure 3.1 Radiated 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. The frequency range from 9KHz 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: September 20, 2019

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

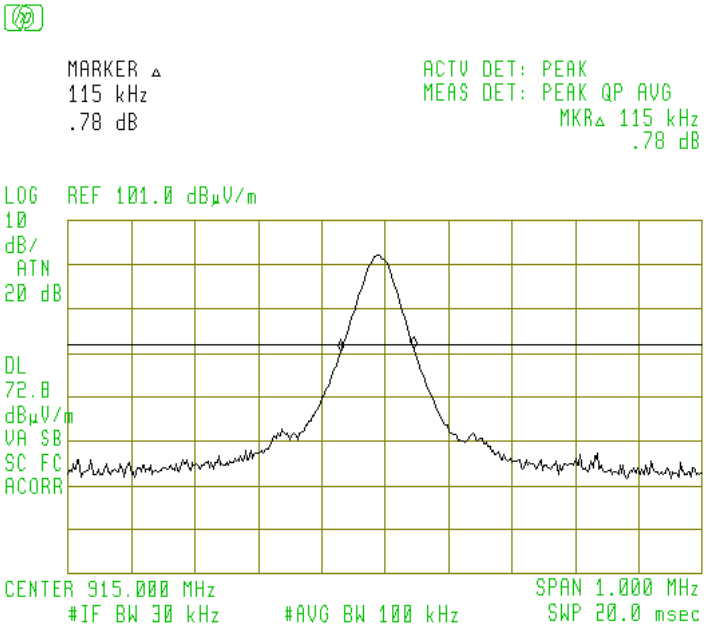
Frequency (MHz)	Polarity (V,H) Position (X)	Antenna Height (m)	Azimuth (Degree)	Peak /QP Reading at 3m (2) (dBuV/m)	FCC/IC 3m Peak Limit (3) (dBuV/m)	Difference To Peak Limit (dBuV/m)	Average Reading with Correction (>1GHz) (dBuV/m)	FCC/IC 3m QP/Average Limit (1) (dBuV/m)	Difference To AVG Limit (dBuV/m)
904	V	1.1	270	89.6				94	-4.4
1808	V	1.1	180	50.2	74	-23.8	22.2	54	-31.8
2712	V	1.1	270	50.1	74	-23.9	22.1	54	-31.9
904	H	1.1	270	93.6				94	-0.4
1808	H	1.0	270	53.8	74	-20.2	25.8	54	-28.2
2712	H	1.0	330	52.6	74	-21.4	24.6	54	-29.4
915	V	1.1	090	90.2				94	-3.8
1830	V	1.1	180	50.8	74	-23.2	22.8	54	-31.2
2745	V	1.1	270	50.6	74	-23.4	22.6	54	-31.4
915	H	1.0	090	93.2				94	-0.8
1828	H	1.1	270	53.6	74	-20.4	25.6	54	-28.4
2745	H	1.1	330	53.1	74	-20.9	25.1	54	-28.9
926	V	1.1	045	88.9				94	-5.1
1852	V	1.1	180	50.9	74	-23.1	22.9	54	-31.1
2778	V	1.1	270	51.5	74	-22.5	23.5	54	-30.5
926	H	1.0	000	92.2				94	-1.8
1852	H	1.1	270	53.2	74	-20.8	25.2	54	-28.8
2778	H	1.1	330	53.2	74	-20.8	25.2	54	-28.8

(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.

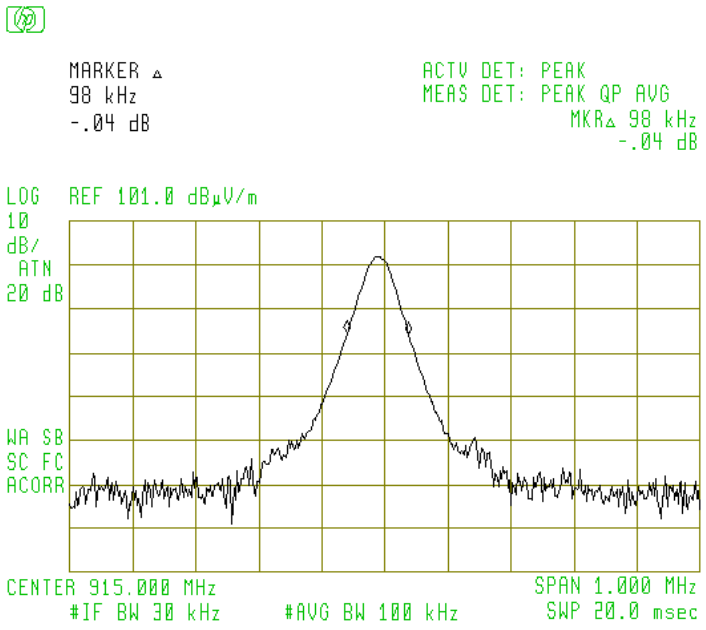
Other Spurious outside of the band 902-928MHz

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)
294	V/Y	1.1	220	31.9		46.5	-14.6
494	V/Y	1.1	090	36.4		46.5	-10.1
600	V/Y	1.1	160	37.2		46.5	-9.3
687	V/Y	1.1	220	39.5		46.5	-7.0
718	V/Y	1.0	180	39.4		46.5	-7.1
873	V/Y	1.0	100	40.9		46.5	-5.6
496	H/X	1.2	150	34.0		46.5	-12.5
640	H/X	1.0	180	35.6		46.5	-10.9
690	V/Y	1.1	220	37.0		46.5	-9.5
703	V/Y	1.0	180	38.7		46.5	-7.8
714	H/X	1.0	180	38.7		46.5	-7.8
894	H/X	1.1	120	40.4		46.5	-6.1

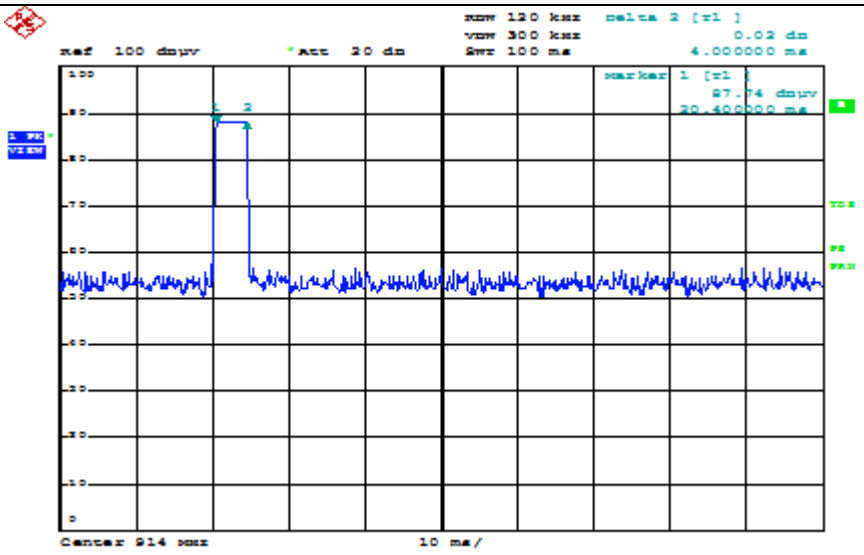
Comparing to the limit defined in FCC Sec. 15.209/IC RSS-Gen, emissions below the limit by 20dB were not recorded.



20dB Bandwidth Plot



99% Bandwidth Plot



Duty Cycle Plot

6. EUT RECEIVING MODE VERIFICATION

Radiated Test Data for Receiving Mode (915MHz)

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)
53.5	H	1.8	180	35.8		40.0	-4.2
75.0	H	1.8	235	33.0		40.0	-7.0
160.5	H	1.6	180	34.7		43.5	-8.8
192.1	H	1.6	180	37.9		43.5	-5.6
325	H	1.1	235	33.3		46.5	-13.2
550	H	1.0	235	34.0		46.5	-12.5
765	H	1.0	135	37.5		46.5	-9.0
53.0	V	1.2	090	34.3		40.0	-5.7
80.3	V	1.2	045	32.9		40.0	-7.1
160	V	1.1	045	33.6		43.5	-9.9
180.5	V	1.1	270	35.0		43.5	-8.5
250	V	1.2	045	33.5		46.5	-13.0
510	V	1.1	090	33.8		46.5	-12.7
770	V	1.1	090	36.3		46.5	-10.2

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