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Applicant (KMA001):K-MARK INDUSTRIAL LIMITED.Flat A, 7/F., Mai On Ind. Bldg., 17-21 Kung Yip Street,<br/>Kwai Chung, Hong Kong.

K-MARK INDUSTRIAL LIMITED.

Kwai Chung, Hong Kong.

Manufacturer:

**Description of Samples:** 

Brand Name: Model Number: FCC ID:

2009-04-14

2009-04-24

Product:

The Beacon II Knight and Hale KH-792 VEP-KH-792

Flat A, 7/F., Mai On Ind. Bldg., 17-21 Kung Yip Street,

**Date Samples Received:** 

Date Tested:

**Investigation Requested:** 

**Conclusions:** 

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2008 and ANSI C63.4:2003 for FCC Certification.

The submitted product <u>COMPLIED</u> with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remarks:** 

D.

Dr. LEE Kam Chuen, Authorized Signatory ElectroMagnetic Compatibility Department For and on behalf of The Hong Kong Standards and Testing Centre Ltd.

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# <u>Appendix A</u>

List of Measurement Equipment

# Appendix B

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# Appendix C

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#### Appendix D

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# 1.0 General Details

# 1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd. EMC Laboratory 10 Dai Wang Street, Taipo Industrial Estate New Territories, Hong Kong

Telephone:852 2666 1888Fax:852 2664 4353

### 1.2 Applicant Details Applicant

K-MARK INDUSTRIAL LIMITED. Flat A, 7/F., Mai On Ind. Bldg., 17-21 Kung Yip Street, Kwai Chung, Hong Kong.

# Manufacturer

K-MARK INDUSTRIAL LIMITED. Flat A, 7/F., Mai On Ind. Bldg., 17-21 Kung Yip Street, Kwai Chung, Hong Kong.



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#### 1.3 Equipment Under Test [EUT] Description of Sample

Product: Manufacturer: Brand Name: Model Number: Rating:

The Beacon II K-MARK INDUSTRIAL LIMITED. Knight and Hale KH-792 3Vd.c. ("CR2032" size battery x 1)

# 1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is a K-MARK INDUSTRIAL LIMITED., The Beacon II. The EUT is a button transmitter. Modulation by IC; and type is pulses modulation.

1.4 Date of Order

2009-04-14

## **1.5** Submitted Sample(s):

1 Sample

### 1.6 Test Duration

2009-04-24

1.7 Country of Origin

China



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#### 2.0 <u>Technical Details</u>

# 2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 2008 and ANSI C63.4:2003 for FCC Certification.

#### 2.2 Test Standards and Results Summary Tables

EMISSION Results Summary								
Test Condition Test Requirement Test Method Class / Test Result								
			Severity	Pass	Failed	N/A		
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231a	ANSI C63.4:2003	N/A	$\boxtimes$				
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:2003	N/A					

Note: N/A - Not Applicable



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<u>3.0</u>	Test Results

# 3.1 Emission

3.1.1 Radiated Emissions (30 – 1000MHz)

Test Requirement: Test Method: Test Date: Mode of Operation: FCC 47CFR 15.231a ANSI C63.4:2003 2009-04-24 Tx on mode

### **Test Method:**

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\*: Semi-anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.



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### Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:

	Frequency Range of	Field Strength of	Field Strength of	
	Fundamental	Fundamental Emission	Spurious Emission	
		[Average]	[Average]	
	[MHz]	[µV/m]	[µV/m]	
	40.66-40.70	2,250	225	
	70-130	1,250	125	
	130-174	1,250 to 3,750 *	125 to 375 *	
	174-260	3,750	375	
	260-470	3,750 to 12,500 *	375 to 1,250 *	
	Above 470	12,500	1,250	

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu$ V/m at 3 meters=56.81818(F)-6136.3636; for the band 260-470 MHz,  $\mu$ V/m at 3 meters =41.6667(F)-7083.3333. The maximum permissible unwanted emission level is 20dB below the maximum permitted fundamental level.

### **Results of Tx on mode: PASS**

Field Strength of Fundamental Emissions								
	Peak Value							
Frequency	Frequency Measured Correction Field Field Limit E-Field							
	Level @3m	Factor	Strength	Strength	@3m	Polarity		
MHz	dBµV	dB/m	dBµV/m_	μV/m	μV/m			
315.00	65.2	16.0	81.2	11,481.5	60,416.8	Horizontal		
630.20	41.7	23.1	64.8	1,737.8	6,041.7	Horizontal		
945.20	30.6	26.5	57.1	716.1	6,041.7	Horizontal		

Field Strength of Fundamental Emissions								
Average Value								
Frequency Measured Correction Field Field Limit E-Field								
	Level @3m	Factor	Strength	Strength	@3m	Polarity		
MHz dBµV dB/m d			_dBµV/m_	μV/m	μV/m			
315.00	51.9	16.0	67.9	2,483.1	6,041.7	Horizontal		
630.20	28.3	23.1	51.4	371.5	604.2	Horizontal		
945.20	17.4	26.5	43.9	156.7	604.2	Horizontal		

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#### **Results of Tx on mode: PASS**

3		Field Streng	th of Spuriou Quasi-Peak	s Emissions	5	
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	dBµV	dB/m	dBµV/m	μV/m	μV/m	
1260.00	< 1.0	32.2	< 33.2	< 45.7	604.2	Vertical
+ 1575.00	< 1.0	38.8	< 39.8	< 97.7	500.0	Vertical
1890.00	< 1.0	17.4	< 18.4	< 8.3	604.2	Vertical
+ 2205.00	< 1.0	17.2	< 18.2	< 8.1	500.0	Vertical
2520.00	< 1.0	18.8	< 19.8	< 9.8	604.2	Vertical
+ 2835.00	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
3150.00	< 1.0	20.6	< 21.6	< 12.0	604.2	Vertical

Remarks:

+:

\*. Adjusted by Duty Cycle = -13.27dB

> FCC Limit for Fundamental Average Measurement =  $41.6667(315)-7083.3333=6,041.7\mu V/m$ Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor includes Antenna Factor and Cable Attenuation. Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB

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#### Limits for Radiated Emissions [FCC 47 CFR 15.209]:

Frequency Range [MHz]	Quasi-Peak Limits [µV/m]
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

#### **Results of Tx on mode: PASS**

Emissions detected are more than 20dB below the limits.

#### Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30MHz

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.2dB



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#### 3.2 20dB Bandwidth of Fundamental Emission

Test Requirement: Test Method: Test Date: Mode of Operation: FCC 47 CFR 15.231a ANSI C63.4:2003 (Section 13.1.7) 2009-04-24 On mode

#### Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.



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Limits for 20 dB Bandwidth of Fundamental Emission: 20dB Bandwidth FCC Limits \* **Frequency Range** [MHz] [KHz] [KHz] 315 422.8 787.5 FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency) =(0.0025)(315)= 787.5KHz **20dB Bandwidth of Fundamental Emission** Marker 1 [T1 ndB] RBW 100 kHz RF Att 10 dB Ref Lvl 100 kHz ndB 20.00 dB VBW 102 dByV ВW 422.84569138 kHz SWT 5.5 ms dBYV Unit 102 [T1] 87.73 dBNV 1 A 315.06072144 MH .00 dB 20 90 nd 422.84569138 kHz BW  $\nabla_{\mathrm{T}}$ 67.66 dBW [T1] 80 314.84228457 MHz ▼<sub>T</sub>≵ 67.20 dBM [T1] 12A 026 MHz 2651 70 1VIEW 1MA PO 50 TDF 40 30 20 10 Center 315.0597194 MHz 100 kHz/ Span 1 MHz

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### Appendix A

### List of Measurement Equipment

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Radiated Emission							
EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL	
EM020	HORN ANTENNA	EMCO	3115	4032	2006/07/11	2009/07/11	
EM215	MULTIDEVICE CONTROLER	EMCO	2090	00024676	N/A	N/A	
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A	
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A	
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3		2008/12/01	2011/12/01	
EM174	BICONILOG ANTENNA	EMCO	3142B	1671	2008/01/24	2010/01/24	
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2008/06/16	2009/06/16	
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2006/07/26	2009/07/26	

#### **Remarks:-**

- CM Corrective Maintenance
- N/A Not Applicable or Not Available
- TBD To Be Determined



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### Appendix B

#### **Duty Cycle Correction During 100msec**

Each function key sends a different series of characters, but each packet period (100msec) never exceeds a series of 26 short (0.721msec) and 2 long (1.478msec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered (26x0.721)+(2x1.478)msec per 100msec=21.702msec duty cycle with 100msec. Figure A through C show the characteristics of the pulses train for one of these functions.

Remarks:

Duty Cycle Correction = -13.27dB

The following figures [Figure A to Figure C] showed the characteristics of the pulse train for one of these functions.



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Figure C [Transmission cease within 136.4ms (<5s) after deactivation] Delta 1 [T1] RBW 100 kHz RF Att 10 dB Ì Ref Lvl 0.60 dB VBW 100 kHz 102 dBMV 156.312625 ms SWP 6 s Unit dBYV 103 1 [T1] 78.21 dBV A 444.889780 ms [T1] 60 dB 91 156.312625 ms 80 T2A 70 1VTE 1AP 60 PO 50 TDF 40 30 20 1( 600 ms/ Center 315.0597194 MHz



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Appendix C

### Periodic Operation [FCC 47CFR 15.231(a2)]

According to FCC 47CFR15.231 (a2). A transmitter automatically activated must automatically deactivate within not more than 5 seconds of being released. The EUT ceases transmission almost immediately upon being released and appears to finish the current packet being transmitted. Therefore the longest period of time the transmitter should take to deactivate is a packet length.





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Appendix D

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**Inner** Circuit Top View







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\*\*\*\*\* End of Test Report \*\*\*\*\*



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