

Date : 2018-03-15 Page 1 of 37 No. : HM18010034

**Applicant:** Gatekeeper Systems (HK) Ltd.

36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay,

Hong Kong

**Manufacturer:** Gatekeeper Systems (HK) Ltd.

36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay,

Hong Kong

**Description of Sample(s):** Product: Module

Brand Name: Gatekeeper Systems

Model Number: N-9390 FCC ID: W3Z-N9390

**Date Sample(s) Received:** 2018-01-18

**Date Tested:** 2018-02-28 to 2018-03-05

**Investigation Requested:** Perform ElectroMagnetic Interference measurement in accordance

with FCC 47CFR [Codes of Federal Regulations] Part 15: 2016 and

ANSI C63.10:2013 for FCC Certification.

**Conclusion(s):** 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.

**Remark(s):** ---

CHEUNG Chi, Kenneth Authorized Signatory

ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.



Date: 2018-03-15 **Page 2 of 37** : HM18010034 No. **CONTENT:** Cover Page 1 of 37 Content Page 2 of 37 1.0 **General Details** 1.1 Equipment Under Test [EUT] Page 3 of 37 Description of EUT operation 1.2 Description of EUT Operation 1.3 Date of Order Page 3 of 37 Page 3 of 37 1.4 Submitted Sample Page 3 of 37 1.5 **Test Duration** 1.6 Country of Origin Page 3 of 37 2.0 **Technical Details** 2.1 Investigations Requested Page 4 of 37 2.2 Test Standards and Results Summary Page 4 of 37 3.0 **Test Results** 3.1 **Emission** Page 5-31 of 37 Appendix A List of Measurement Equipment Page 32 of 37 Appendix B Photographs Page 33-37 of 37



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#### 1.0 General Details

# 1.1 Equipment Under Test [EUT] Description of Sample(s)

Product: Module

Manufacturer: Gatekeeper Systems (HK) Ltd.

36/F, Tower 2, Times Square, 1 Matheson Street, Causeway Bay, Hong

Kong

Brand Name: Gatekeeper Systems

Model Number: N-9390

Rating: CR123A x 2=3.0Vd.c

(CR123A x2 are parallel connected)

#### 1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a "module" mounted on shopping cart handle to communicate with remote controlled (lock function) wheels of Gatekeeper Systems (HK) Ltd., which is 2.4GHz transceiver.

The N-9390 Operational mode transmissions are modulated at FSK (Frequency Shift Keying), with a deviation of 19 kHz (Carson's rule bandwidth about 80 kHz) and MSK (Minimum Shift Keying). The EUT was tested under test mode which was set in maximum output power (RF output Power = 0.0 dBm) and transmit continuously.

#### 1.3 Date of Order

2018-01-18

#### 1.4 Submitted Sample(s):

2 Samples

#### 1.5 Test Duration

2018-02-28 to 2018-03-05

#### 1.6 Country of Origin

China



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2.0 Technical Details

#### 2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 Regulations and ANSI C63.10:2013 for FCC Certification.

### 2.2 Test Standards and Results Summary Tables

EMISSION Results Summary										
Test Condition	Test Requirement	Test Method	Class /	Test F	Result					
			Severity	Pass	Fail					
Field Strength of Fundamental & Harmonics Emissions	FCC 47CFR 15.249	ANSI C63.10:2013	N/A							
AC power-line conducted emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	N/	'A					
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A							

Note: N/A - Not Applicable



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3.0 Test Results

3.1 Emission

#### 3.1.1 Field Strength of Fundamental & Harmonics Emissions

Test Requirement: FCC 47CFR 15.249 Test Method: ANSI C63.10:2013

Test Date: 2018-02-28

Mode of Operation: 1. Tx Mode (FSK)

2. Tx Mode (MSK)

#### **Test Method:**

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. For emission measurements above 1 GHz, the sample was placed 1.5m 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. In the frequency range of 9kHz to 30MHz, The center of the loop antenna shall be 1 meter above the ground and rotated loop axis for maximum reading. The emissions worst-case are shown in Test Results of the following pages.

Remark: 3 orthogonal axis apply to hand-held device only.

\*: Semi-anechoic chamber located on the G/F of The Hong Kong Standards and Testing Centre Ltd. FCC Test Firm Registration Number <u>723883</u>
Designation Number <u>HK0001</u>



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### **Spectrum Analyzer Setting:**

9KHz – 30MHz (Pk & Av) RBW: 10kHz

VBW: 30kHz Sweep: Auto

Span: Fully capture the emissions being measured

Trace: Max. hold

30MHz - 1GHz (QP) RBW: 120kHz

VBW: 120kHz Sweep: Auto

Span: Fully capture the emissions being measured

Trace: Max. hold

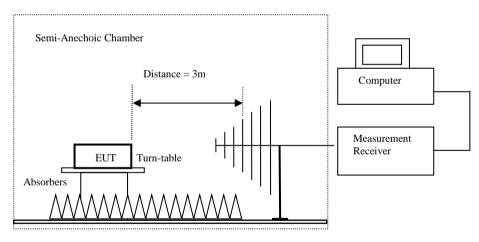
Above 1GHz (Pk & Av) RBW: 3MHz

VBW: 3MHz Sweep: Auto

Span: Fully capture the emissions being measured

Trace: Max. hold

#### **Test Setup:**



Ground Plane

Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

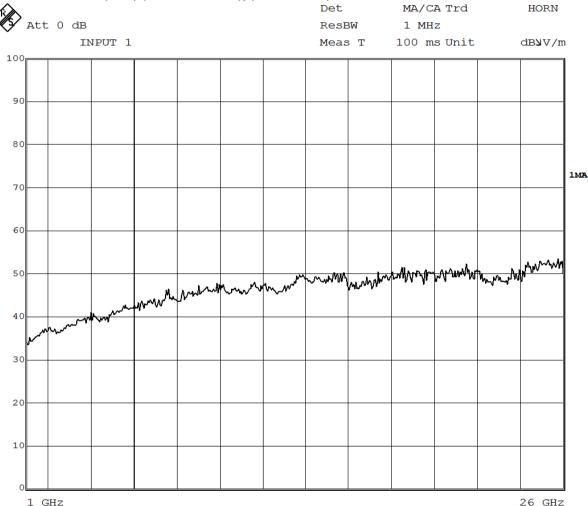


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#### Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Fundamental frequency [MHz]	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

### Result of TX mode (FSK) (Lowest Channel), (Above 1GHz): Pass





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	Field Strength of Fundamental and Harmonics Emissions									
	Peak Value									
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field				
	Level @3m	Factor	Strength	Strength		Polarity				
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	μV/m					
2402.0	58.1	27.9	86.0	19,952.6	500,000	Vertical				
* 4804.0	12.1	32.1	44.2	162.2	5,000	Vertical				
7206.0	3.1	38.6	41.7	121.6	5,000	Vertical				
9608.0					5,000	Vertical				
* 12010.0					5,000	Vertical				
14412.0					5,000	Vertical				
16814.0	E	missions detec	cted are more	than	5,000	Vertical				
* 19216.0		20 dB below	its	5,000	Vertical					
21618.0			5,000	Vertical						
24020.0					5,000	Vertical				

	Field Strength of Fundamental and Harmonics Emissions									
			A	Average Valu	e					
F	requency	Measured	Correction	Field	Field	Limit @3m	E-Field			
		Level @3m	Factor	Strength	Strength		Polarity			
	MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$				
	2402.0	46.9	27.9	74.8	5,495.4	50,000	Vertical			
*	4804.0	2.3	32.1	34.4	52.5	500	Vertical			
	7206.0	-1.2	38.6	37.4	74.1	500	Vertical			
	9608.0		-		-	500	Vertical			
*	12010.0					500	Vertical			
	14412.0					500	Vertical			
	16814.0	E	missions detec	cted are more	than	500	Vertical			
*	19216.0		20 dB below	the FCC Lim	iits	500	Vertical			
	21618.0	500 Verti								
	24020.0					500	Vertical			



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### Result of TX mode (FSK) (Middle Channel), (Above 1GHz): Pass

1 GHz

\							Det		MA/C	A Trd		HORN
Att	0 dB						Resi	ВW	1 MH	Z		
	I	NPUT 1					Meas	5 T	100 m	s Unit		dB <b>u</b> V/m
00												
90												
80												
70												
60												
50		who has			M . AA / A-1	Mark Barbard	Mun	h_4/~hp/~		mp.h./4h.J	Marchy v An	MM
40	alester Vel	-de-lim	~~~~~	Window	ζον.	-19"		,				
Í												
30												
20												
10												

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

26 GHz



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Result of TX mode (FSK) (Middle Channel), (Above 1GHz): Pass

Result of 1	tesuit of 1x mode (FSK) (Wilddie Channel), (Above 1GHz): Pass										
	Field Strength of Fundamental and Harmonics Emissions										
	Peak Value										
Frequenc	су	Measured	Correction	Field	Field	Limit @3m	E-Field				
		Level @3m	Factor	Strength	Strength		Polarity				
MHz		$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$					
2440.	.0	57.4	27.9	85.3	18,407.7	500,000	Vertical				
* 4880.	.0	9.9	32.1	42.0	125.9	5,000	Vertical				
* 7320.	.0	2.8	38.6	41.4	117.5	5,000	Vertical				
9760.	.0					5,000	Vertical				
* 12200	0.0					5,000	Vertical				
14640	0.0					5,000	Vertical				
17080	0.0	Е	missions detec	cted are more	than	5,000	Vertical				
* 19520	0.0		20 dB below	its	5,000	Vertical					
21960	0.0				5,000	Vertical					
24400	0.0					5,000	Vertical				

	Field Strength of Fundamental and Harmonics Emissions									
		A	Average Valu	e						
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field				
	Level @3m	Factor	Strength	Strength		Polarity				
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$					
2440.0	45.1	27.9	73.0	4,466.8	50,000	Vertical				
* 4880.0	2.4	32.1	34.5	53.1	500	Vertical				
* 7320.0	-1.4	38.6	37.2	72.4	500	Vertical				
9760.0		-	-	-	500	Vertical				
* 12200.0					500	Vertical				
14640.0					500	Vertical				
17080.0	E	missions detec	cted are more	than	500	Vertical				
* 19520.0		20 dB below	the FCC Lim	its	500	Vertical				
21960.0			500	Vertical						
24400.0	1				500	Vertical				



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#### Result of TX mode (FSK) (Highest Channel), (Above 1GHz): Pass

		Det	MA/CA Trd	HORN
Att 0 dB		ResBW	1 MHz	
INPUT 1		Meas T	100 ms Unit	dB <b>y</b> v/m
	no-Lil		Jana Marine	
ment the second and a second	- monthy man 1	C - SANDA - MANAGAN .		Walter of Carlin
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WAY WAY WAY I WAY				
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Result of TX mode (FSK) (Highest Channel), (Above 1GHz): Pass

Result of 1 X n	Result of TX mode (FSK) (Highest Channel), (Above IGHz): Pass										
	Field Strength of Fundamental and Harmonics Emissions										
			Peak Value								
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field					
	Level @3m	Factor	Strength	Strength		Polarity					
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$						
2480.0	57.9	27.9	85.8	19,498.4	500,000	Vertical					
* 4960.0	11.1	32.1	43.2	144.5	5,000	Vertical					
* 7440.0	2.1	38.6	40.7	108.4	5,000	Vertical					
9920.0					5,000	Vertical					
* 12400.0	<u> </u>				5,000	Vertical					
14880.0	<u> </u>				5,000	Vertical					
17360.0	E	missions detec	cted are more	than	5,000	Vertical					
* 19840.0		20 dB below	its	5,000	Vertical						
22320.0		5,000 Vertical									
24800.0	1				5,000	Vertical					

	Field Strength of Fundamental and Harmonics Emissions								
		A	Average Valu	e					
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field			
	Level @3m	Factor	Strength	Strength		Polarity			
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$				
2480.0	45.7	27.9	73.6	4,786.3	50,000	Vertical			
* 4960.0	3.2	32.1	35.3	58.2	500	Vertical			
* 7440.0	-0.8	38.6	37.8	77.6	500	Vertical			
9920.0					500	Vertical			
* 12400.0					500	Vertical			
14880.0					500	Vertical			
17360.0	Е	missions detec	cted are more	than	500	Vertical			
* 19840.0		20 dB below	its	500	Vertical				
22320.0	500 Ve								
24800.0					500	Vertical			

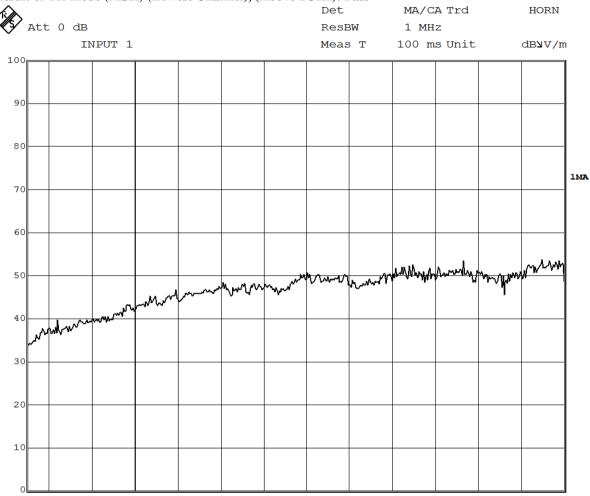
Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.



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Result of TX mode (MSK) (Lowest Channel), (Above 1GHz): Pass

1 GHz



26 GHz



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Result of TX mode (MSK) (Lowest Channel), (Above 1GHz): Pass

ves	tesuit of 1x mode (MSK) (Lowest Channel), (Above 1GHz): Pass										
	Field Strength of Fundamental and Harmonics Emissions										
				Peak Value							
F	requency	Measured	Correction	Field	Field	Limit @3m	E-Field				
		Level @3m	Factor	Strength	Strength		Polarity				
	MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$					
	2401.0	58.4	27.9	86.3	20,653.8	500,000	Vertical				
*	4802.0	11.6	32.1	43.7	153.1	5,000	Vertical				
	7203.0	2.4	38.6	41.0	112.2	5,000	Vertical				
	9604.0					5,000	Vertical				
*	12005.0					5,000	Vertical				
	14406.0					5,000	Vertical				
	16807.0	Е	missions detec	cted are more	than	5,000	Vertical				
*	19208.0	Ī	20 dB below	its	5,000	Vertical					
	21609.0	Ī		5,000	Vertical						
	24010.0	Ī				5,000	Vertical				

	Field Strength of Fundamental and Harmonics Emissions									
	Average Value									
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field				
	Level @3m	Factor	Strength	Strength		Polarity				
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$					
2401.0	47.3	27.9	75.2	5,754.4	50,000	Vertical				
* 4802.0	2.1	32.1	34.2	51.3	500	Vertical				
7203.0	-0.8	38.6	37.8	77.6	500	Vertical				
9604.0		•	•	•	500	Vertical				
* 12005.0					500	Vertical				
14406.0					500	Vertical				
16807.0	E	missions detec	cted are more	than	500	Vertical				
* 19208.0	]	20 dB below	its	500	Vertical					
21609.0		500 Vertice								
24010.0					500	Vertical				

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.



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#### Result of TX mode (MSK) (Middle Channel), (Above 1GHz): Pass

							Det		MA/C	A Trd		HORN
Att	0 dB						ResE	3W	1 MH	Z		
	II	IPUT 1					Meas	Т	100 m	s Unit		dB <b>y</b> V/n
									_			MAN
				۱		لسريون	~~~~~~~	<b>୵</b> ୄ୷୵୷ <sup>୷୷</sup>	<del>/^^</del> / <del>/</del> ^~	<sub>┲</sub> ╱╾ <sub>╈</sub> ╱┷╍╽ <sub>╇</sub> ┦	<del>╵</del> ╲┰┢┖┰╱ <sup>╱</sup>	) Pr
		ı,M.	~~~	Marylyrage	words	4,,,,,,,,	www	"				
	wharm											
٧٠,	<b>, ,</b>											
1 0												26 GHz



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Result of TX mode (MSK) (Middle Channel), (Above 1GHz): Pass

IZ C2	desuit of TA mode (MSK) (which e Channel), (Above 1GHz): Fass						
	Field Strength of Fundamental and Harmonics Emissions						
				Peak Value			
F	requency	Measured	Correction	Field	Field	Limit @3m	E-Field
		Level @3m	Factor	Strength	Strength		Polarity
	MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$	
	2442.0	58.3	27.9	86.2	20,417.4	500,000	Vertical
*	4884.0	11.6	32.1	43.7	153.1	5,000	Vertical
*	7326.0	3.4	38.6	42.0	125.9	5,000	Vertical
	9768.0					5,000	Vertical
*	12210.0					5,000	Vertical
	14652.0					5,000	Vertical
	17094.0	E	5,000	Vertical			
*	19536.0	20 dB below the FCC Limits 5,000 Vertica					
	21978.0	Ī				5,000	Vertical
	24420.0	Ī				5,000	Vertical

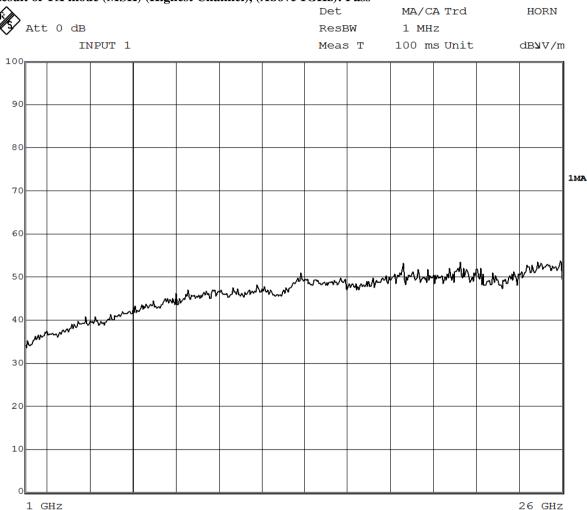
	Field Strength of Fundamental and Harmonics Emissions					
		A	Average Valu	e		
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field
	Level @3m	Factor	Strength	Strength		Polarity
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$	
2442.0	46.2	27.9	74.1	5,069.9	50,000	Vertical
* 4884.0	1.8	32.1	33.9	49.5	500	Vertical
* 7326.0	-0.6	38.6	38.0	79.4	500	Vertical
9768.0		•		•	500	Vertical
* 12210.0	I				500	Vertical
14652.0					500	Vertical
17094.0	Emissions detected are more than 500 Vertical					
* 19536.0	20 dB below the FCC Limits 500 Vertical					
21978.0	]	500	Vertical			
24420.0					500	Vertical

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.



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### Result of TX mode (MSK) (Highest Channel), (Above 1GHz): Pass





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Result of TX mode (MSK) (Highest Channel), (Above 1GHz): Pass

Kesi	tesuit of TA mode (MSK) (Highest Channel), (Above 1GHz): Pass						
	Field Strength of Fundamental and Harmonics Emissions						
				Peak Value			
F	requency	Measured	Correction	Field	Field	Limit @3m	E-Field
		Level @3m	Factor	Strength	Strength		Polarity
	MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$	
	2481.1	57.9	27.9	85.8	19,498.4	500,000	Vertical
*	4962.2	11.2	32.1	43.3	146.2	5,000	Vertical
*	7443.3	2.1	38.6	40.7	108.4	5,000	Vertical
	9924.4					5,000	Vertical
*	12405.5	Ī				5,000	Vertical
	14886.6	Ī				5,000	Vertical
	17367.7	Emissions detected are more than 5,000 Vertice					
*	19848.8	20 dB below the FCC Limits 5,000 Vertica					
	22329.9	Ī				5,000	Vertical
	24811.0	İ				5,000	Vertical

	Field Strength of Fundamental and Harmonics Emissions						
		A	Average Valu	e			
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field	
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
2481.1	45.8	27.9	73.7	4,841.7	50,000	Vertical	
* 4962.2	1.9	32.1	34.0	50.1	500	Vertical	
* 7443.3	-1.1	38.6	37.5	75.0	500	Vertical	
9924.4		-			500	Vertical	
* 12405.5					500	Vertical	
14886.6					500	Vertical	
17367.7	Emissions detected are more than 500 Vertical						
* 19848.8	20 dB below the FCC Limits 500 Vertical						
22329.9	500 Vertical						
24811.0					500	Vertical	

Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

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

\*: 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 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Calculated measurement uncertainty : 9kHz to 30MHz 2.4dB

30MHz to 18GHz 5.0dB 18GHz – 26.5Hz: 5.24dB



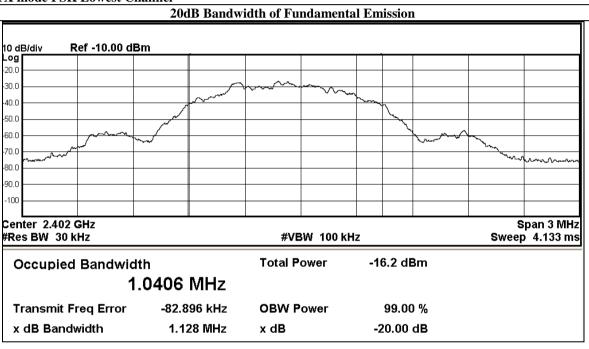
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#### **Limits for 20dB Bandwidth of Fundamental Emission:**

Frequency Range [MHz]	20dB Bandwidth [MHz]
2402.0	1.13

#### TX mode FSK Lowest Channel



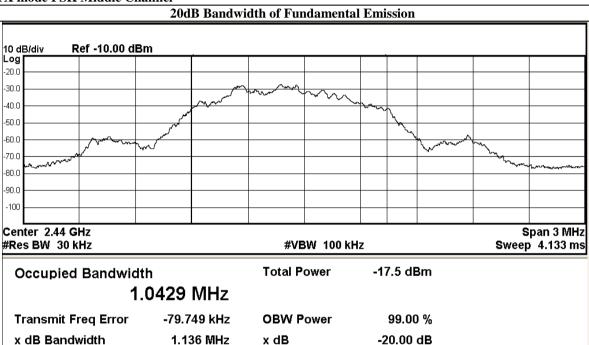


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Frequency Range	20dB Bandwidth
[MHz]	[MHz]
2440.0	1.14

#### TX mode FSK Middle Channel



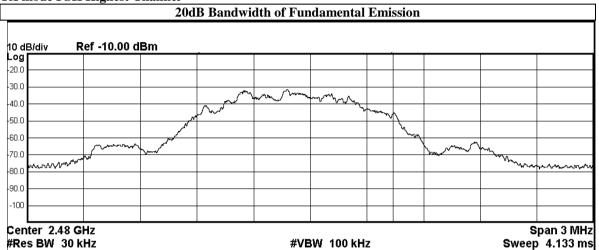


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Frequency Range	20dB Bandwidth
[MHz]	[MHz]
2480.0	1.12

TX mode FSK Highest Channel



Occupied Bandwidth	ո 0383 MHz	Total Power	-21.8 dBm	
Transmit Freq Error	-81.151 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.123 MHz	x dB	-20.00 dB	

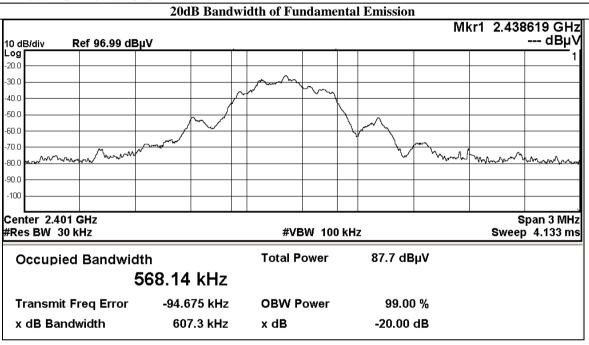


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Frequency Range	20dB Bandwidth
[MHz]	[MHz]
2401.0	0.607

#### TX mode MSK Lowest Channel



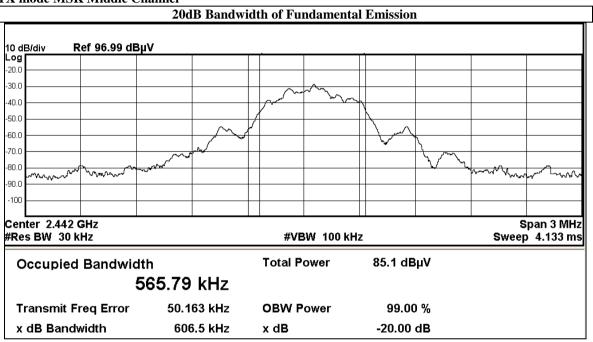


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Frequency Range	20dB Bandwidth
[MHz]	[MHz]
2442.0	0.607

#### TX mode MSK Middle Channel



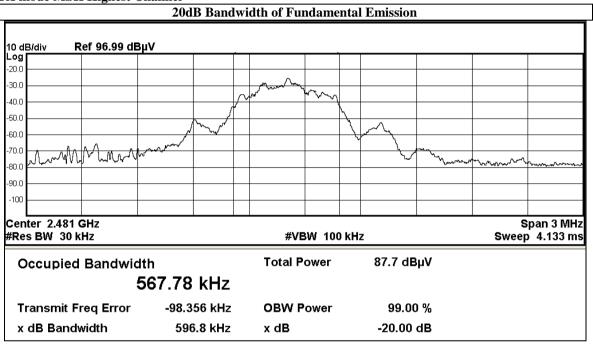


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Frequency Range	20dB Bandwidth
[MHz]	[MHz]
2481.1	0.597

### TX mode MSK Highest Channel



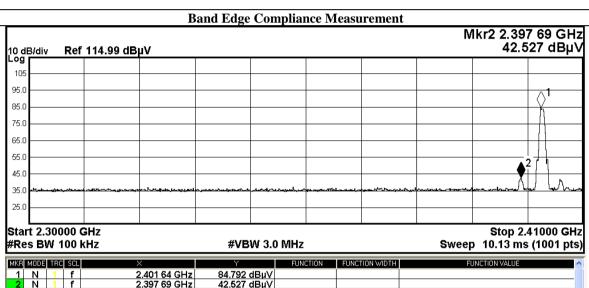


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#### **Band Edge Measurement:**

#### TX mode FSK

Frequency Range	Radiated Emission Attenuated below the Fundamental
[MHz]	[dB]
2400MHz – Lowest Fundamental	42.3



MKF	MODE	TRC	SCL	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE ^
1	N	1	f	2.401 64 GHz	84.792 dBµV			
2	N	1	f	2.397 69 GHz	42.527 dBµV			
3								
4								

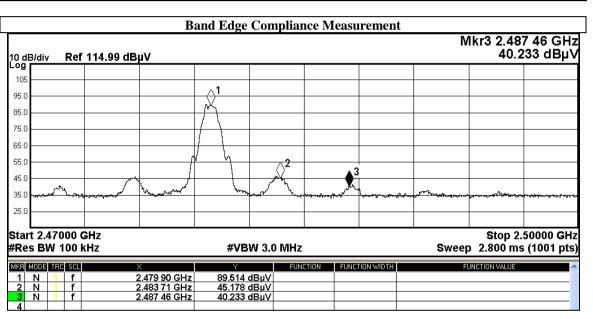


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#### **Band Edge Measurement:**

#### TX mode FSK

Frequency Range	Radiated Emission Attenuated below the Fundamental
[MHz]	[dB]
Highest Fundamental – 2483.5MHz	44.3



Result of TX mode FSK, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions							
			Peak Value				
Frequency	Frequency Measured Correction Field Field Limit @3m E-Field						
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
2397.6	15.4	27.6	43.0	141.3	5,000	Vertical	
2487.5	13.5	28.0	41.5	118.9	5,000	Vertical	

Field Strength of Fundamental and Harmonics Emissions							
		A	Average Valu	e			
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field	
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
2397.6	4.3	27.6	31.9	39.4	500	Vertical	
2487.5	3.8	28.0	31.8	38.9	500	Vertical	

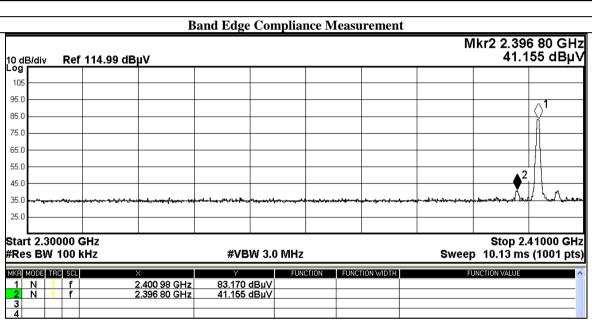


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#### **Band Edge Measurement:**

#### TX mode MSK

Frequency Range	Radiated Emission Attenuated below the Fundamental
[MHz]	[dB]
2400MHz – Lowest Fundamental	42.0



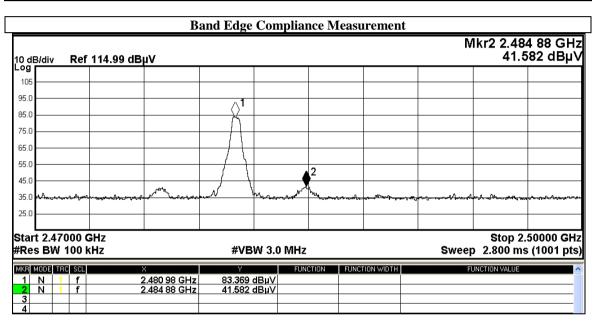


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**Band Edge Measurement:** 

#### TX mode MSK

Frequency Range	Radiated Emission Attenuated below the Fundamental
[MHz]	[dB]
Highest Fundamental – 2483.5MHz	41.8



Result of TX mode MSK, Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions								
Peak Value								
Frequency	Frequency Measured Correction Field Field Limit @3m E-Field							
	Level @3m	Factor	Strength	Strength		Polarity		
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$			
2396.8	16.4	27.9	44.3	164.1	5,000	Vertical		
2484.9	14.8	28.0	42.8	138.0	5,000	Vertical		

Field Strength of Fundamental and Harmonics Emissions							
		A	Average Valu	e			
Frequency	Frequency Measured Correction Field Field Limit @3m E-Field						
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
2396.8	3.1	27.9	31.0	35.5	500	Vertical	
2484.9	3.4	28.0	31.4	37.2	500	Vertical	



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

Frequency Range [MHz]	Quasi-Peak Limits [µV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
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.

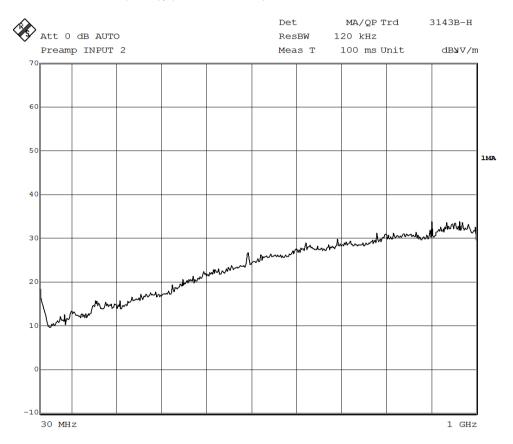
Result of TX mode (MSK), (9kHz - 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits



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### Result of TX mode (MSK), (30MHz - 1GHz): PASS



Field Strength of Fundamental and Harmonics Emissions							
		Qı	ıasi-Peak Va	lue			
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field	
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
89.2	2.0	7.1	9.1	2.9	100	Vertical	
132.7	3.6	7.7	11.3	3.7	150	Horizontal	
224.8	2.4	11.8	14.2	5.1	150	Horizontal	
293.4	0.2	13.0	13.2	4.6	200	Horizontal	
374.9	6.1	16.3	22.4	13.2	200	Horizontal	
464.7	4.9	18.2	23.1	14.3	200	Horizontal	

Remarks: Tx mode was tested in both FSK and MSK modulation, MSK modulation was the worst case found in Tx mode.



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Result of Receiver mode, (9kHz - 30MHz): PASS

Emissions detected are more than 20 dB below the Limits

**Result of Receiver mode, (30MHz – 1GHz): PASS** Emissions detected are more than 20 dB below the Limits

Result of Receiver mode, (1GHz - 18GHz): PASS

Result of Receiver mode, (1911z 1991iz). Tripp							
Field Strength of Fundamental and Harmonics Emissions							
Peak Value							
Frequency	Frequency Measured Correction Field Field Limit @3m E-Field						
	Level @3m	Factor	Strength	Strength		Polarity	
MHz	dBμV/m	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$		
2442.0	2.8	27.9	30.7	34.3	5,000	Vertical	

Field Strength of Fundamental and Harmonics Emissions										
Average Value										
Frequency	Measured	Correction	Field	Field	Limit @3m	E-Field				
	Level @3m	Factor	Strength	Strength		Polarity				
MHz	$dB\mu V/m$	$dB\mu V/m$	$dB\mu V/m$	$\mu V/m$	$\mu V/m$					
2442.0	-0.1	27.9	27.8	24.5	500	Vertical				

#### Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : (9kHz – 30MHz): 2.4dB

(30MHz – 18GHz): 5.0dB (18GHz - 26GHz): 5.24dB



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### Appendix A

### LIST OF MEASUREMENT EQUIPMENT

#### **Radiated Emission**

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3		2017/04/24	2018/04/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM355	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00201783	2017/03/15	2019/03/15
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2017/06/01	2018/06/01
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2016/04/27	2018/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2016/05/13	2018/05/13
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2016/05/11	2018/05/11
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2016/05/11	2018/05/11
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2016/03/16	2018/03/16

#### Remarks:

CM Corrective Maintenance

N/A Not Applicable or Not Available

TBD To Be Determined



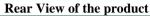
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### Appendix B

### **Photographs of EUT**

Front View of the product







Rear View of the product



Rear View of the product





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Photographs of EUT

**Inner View of the Product** 



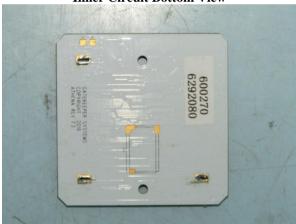
**Inner View of the Product** 



**Inner Circuit Top View** 



**Inner Circuit Bottom View** 





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Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz to 30MHz)



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Photographs of EUT

Measurement of Radiated Emission Test Set Up (30MHz to 1000MHz)



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Photographs of EUT

Measurement of Radiated Emission Test Set Up (Above 1000MHz)



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

### **Conditions of Issuance of Test Reports**

- 1. All samples and goods are accepted by The Hong Kong Standards & Testing Centre Limited (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The Company provides its services on the basis that such terms and conditions constitute express agreement between the Company and any person, firm or company requesting its services (the "Clients").
- 2. Any report issued by the Company as a result of this application for testing service (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to his customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
- 3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
- 4. The Report refers only to the sample tested and does not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.
- 5. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
- 6. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
- 7. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
- 8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
- 9. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.
- 10. Issuance records of the Report are available on the internet at www.stc-group.org. Further enquiry of validity or verification of the Reports should be addressed to the Company.