



STC Test Report

Date : 2016-05-06

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No. : HM170231

Applicant: Gatekeeper System (HK) Ltd.
Unit 2305, Level 23, Tower 2, Metroplaza, No. 223 Hing Fong Road, Kwai Fong, N.T., Hong Kong

Manufacturer: Gatekeeper System (HK) Ltd.
Unit 2305, Level 23, Tower 2, Metroplaza, No. 223 Hing Fong Road, Kwai Fong, N.T., Hong Kong

Description of Sample(s):

Product:	Remote Controlled Locking Wheel
Brand Name:	Gatekeeper Systems
Model Number:	W-9470A
FCC ID:	W3Z-W9470A

Date Sample(s) Received: 2016-04-12

Date Tested: 2016-04-25

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014 and ANSI C63.10:2013 for FCC Certification.

Conclusion(s): The submitted product COMPLIED 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.



The Hong Kong Standards and Testing Centre Limited

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1.0 General Details

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

Product: Remote Controlled Locking Wheel
Manufacturer: Gatekeeper System (HK) Ltd.
Unit 2305, Level 23, Tower 2, Metroplaza, No. 223 Hing Fong Road,
Kwai Fong, N.T., Hong Kong
Brand Name: Gatekeeper Systems
Model Number: W-9470A
Rating: 3Vd.c. ("CR17450" Lithium Battery x 1)

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a Remote Controlled Locking Wheel of Gatekeeper System (HK) Ltd., it consist with two 2.4GHz transceivers.
The W-9470A has two modes which affect the characteristics of its RF emissions operational mode and program download mode. Operational mode transmissions are modulated at 20kbps FSK (Frequency Shift Keying), with a deviation of 19 kHz (Carson's rule bandwidth about 80 kHz). Program download mode transmissions are modulated with 500 kbps MSK (Minimum Shift Keying)

1.3 Date of Order

2016-04-12

1.4 Submitted Sample(s):

3 Sample(s)

1.5 Test Duration

2016-04-25

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: 2015 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 / Severity	Test Result	
				Pass	Fail
Field Strength of Fundamental & Harmonics Emissions	FCC 47CFR 15.249	ANSI C63.10:2013	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:	2016-04-25
Mode of Operation:	On Mode

Test Method:

The sample was placed 0.8m above the ground plane on a standard radiated emission test site. 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. 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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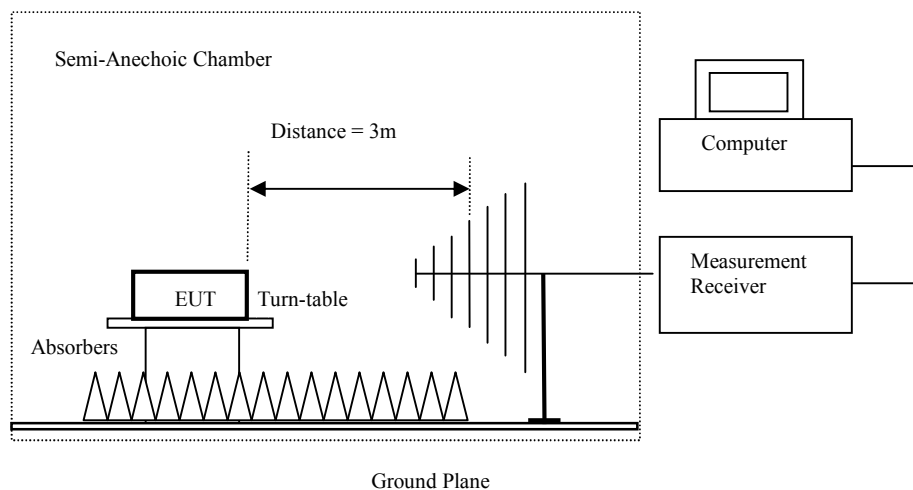
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Spectrum Analyzer Setting:

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:



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 Data mode, (Channel 2), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.4	56.4	27.9	84.3	16,405.9	500,000	Vertical
* 4802.7	15.1	32.1	47.2	229.1	5,000	Vertical
7204.3	2.5	38.6	41.1	113.5	5,000	Vertical
9605.6	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12007.0					5,000	Vertical
14408.4					5,000	Vertical
16809.8					5,000	Vertical
* 19211.2					5,000	Vertical
21612.6					5,000	Vertical
24014.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2401.4	54.4	27.9	82.3	13,031.7	50,000	Vertical
* 4802.7	9.2	32.1	41.3	116.1	500	Vertical
7204.3	-0.8	38.6	37.8	77.6	500	Vertical
9605.6	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12007.0					500	Vertical
14408.4					500	Vertical
16809.8					500	Vertical
* 19211.2					500	Vertical
21612.6					500	Vertical
24014.0					500	Vertical

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Result of Data mode, (Channel 126), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2426.2	55.2	27.9	83.1	14,288.9	500,000	Vertical
* 4852.3	15.0	32.1	47.1	226.5	5,000	Vertical
* 7278.4	2.3	38.6	40.9	110.9	5,000	Vertical
9704.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12131.0					5,000	Vertical
14557.2					5,000	Vertical
16983.4					5,000	Vertical
* 19409.6					5,000	Vertical
21835.8					5,000	Vertical
24262.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2426.2	53.8	27.9	81.7	12,161.9	50,000	Vertical
* 4852.3	9.2	32.1	41.3	116.1	500	Vertical
* 7278.4	0.1	38.6	38.7	86.1	500	Vertical
9704.8	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12131.0					500	Vertical
14557.2					500	Vertical
16983.4					500	Vertical
* 19409.6					500	Vertical
21835.8					500	Vertical
24262.0					500	Vertical

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Result of Data mode, (Channel 254), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2451.8	56.4	27.9	84.3	16,405.9	500,000	Vertical
* 4903.5	14.0	32.1	46.1	201.8	5,000	Vertical
* 7355.3	3.5	38.6	42.1	127.4	5,000	Vertical
9807.2	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12259.0					5,000	Vertical
14710.8					5,000	Vertical
17162.6					5,000	Vertical
* 19614.4					5,000	Vertical
22066.2					5,000	Vertical
24518.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2451.8	54.2	27.9	82.1	12,735.0	50,000	Vertical
* 4903.5	8.2	32.1	40.3	103.5	500	Vertical
* 7355.3	0.1	38.6	38.7	86.1	500	Vertical
9807.2	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12259.0					500	Vertical
14710.8					500	Vertical
17162.6					500	Vertical
* 19614.4					500	Vertical
22066.2					500	Vertical
24518.0					500	Vertical

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Result of Announce mode (Channel 8), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2403.5	55.2	27.9	83.1	14,288.9	500,000	Vertical
* 4807.3	10.2	32.1	42.3	130.3	5,000	Vertical
7211.3	1.7	38.6	40.3	103.5	5,000	Vertical
9614.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12017.5					5,000	Vertical
14421.0					5,000	Vertical
16824.5					5,000	Vertical
* 19228.0					5,000	Vertical
21631.5					5,000	Vertical
24035.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2403.5	48.6	27.9	76.5	6,683.4	50,000	Vertical
* 4807.3	3.3	32.1	35.4	58.9	500	Vertical
7211.3	-1.0	38.6	37.6	75.9	500	Vertical
9614.0	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12017.5					500	Vertical
14421.0					500	Vertical
16824.5					500	Vertical
* 19228.0					500	Vertical
21631.5					500	Vertical
24035.0					500	Vertical

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Result of Announce mode (Channel 120), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2438.7	54.2	27.9	82.1	12,735.0	500,000	Vertical
* 4877.7	8.3	32.1	40.4	104.7	5,000	Vertical
* 7316.5	1.5	38.6	40.1	101.2	5,000	Vertical
9754.8	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12193.5					5,000	Vertical
14632.2					5,000	Vertical
17070.9					5,000	Vertical
* 19509.6					5,000	Vertical
21948.3					5,000	Vertical
24387.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2438.7	48.4	27.9	76.3	6,531.3	50,000	Vertical
* 4877.7	2.2	32.1	34.3	51.9	500	Vertical
* 7316.5	-0.5	38.6	38.1	80.4	500	Vertical
9754.8	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12193.5					500	Vertical
14632.2					500	Vertical
17070.9					500	Vertical
* 19509.6					500	Vertical
21948.3					500	Vertical
24387.0					500	Vertical

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Result of Announce mode (Channel 247), (Above 1GHz): Pass

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2478.6	54.0	27.9	81.9	12,445.1	500,000	Vertical
* 4957.1	8.2	32.1	40.3	103.5	5,000	Vertical
* 7436.1	2.5	38.6	41.1	113.5	5,000	Vertical
9914.4	Emissions detected are more than 20 dB below the FCC Limits				5,000	Vertical
* 12393.0					5,000	Vertical
14871.6					5,000	Vertical
17350.2					5,000	Vertical
* 19828.8					5,000	Vertical
22307.4					5,000	Vertical
24786.0					5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2478.6	47.4	27.9	75.3	5,821.0	50,000	Vertical
* 4957.1	0.1	32.1	32.2	40.7	500	Vertical
* 7436.1	0.2	38.6	38.8	87.1	500	Vertical
9914.4	Emissions detected are more than 20 dB below the FCC Limits				500	Vertical
* 12393.0					500	Vertical
14871.6					500	Vertical
17350.2					500	Vertical
* 19828.8					500	Vertical
22307.4					500	Vertical
24786.0					500	Vertical

Remarks:

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 1GHz 4.9dB
1GHz to 6GHz 4.02dB
6GHz to 18GHz 4.03dB

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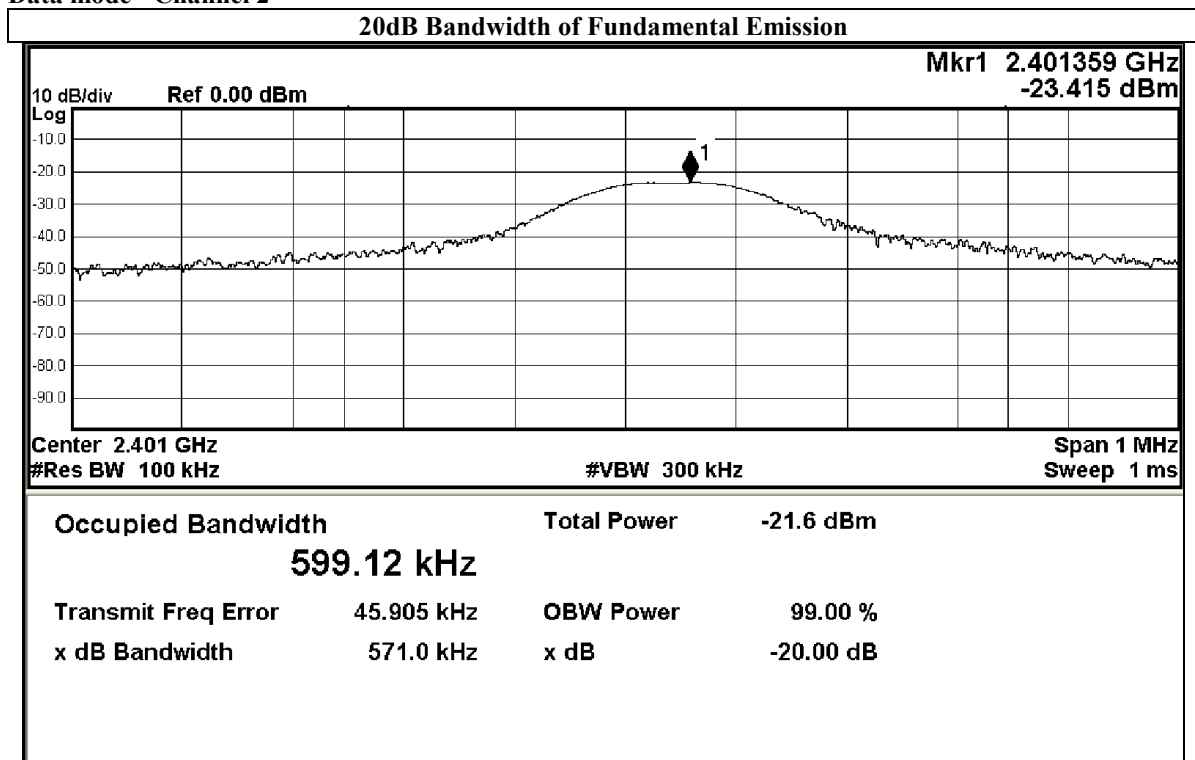
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Limits for 20dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [MHz]
2401.6	0.571

Data mode - Channel 2



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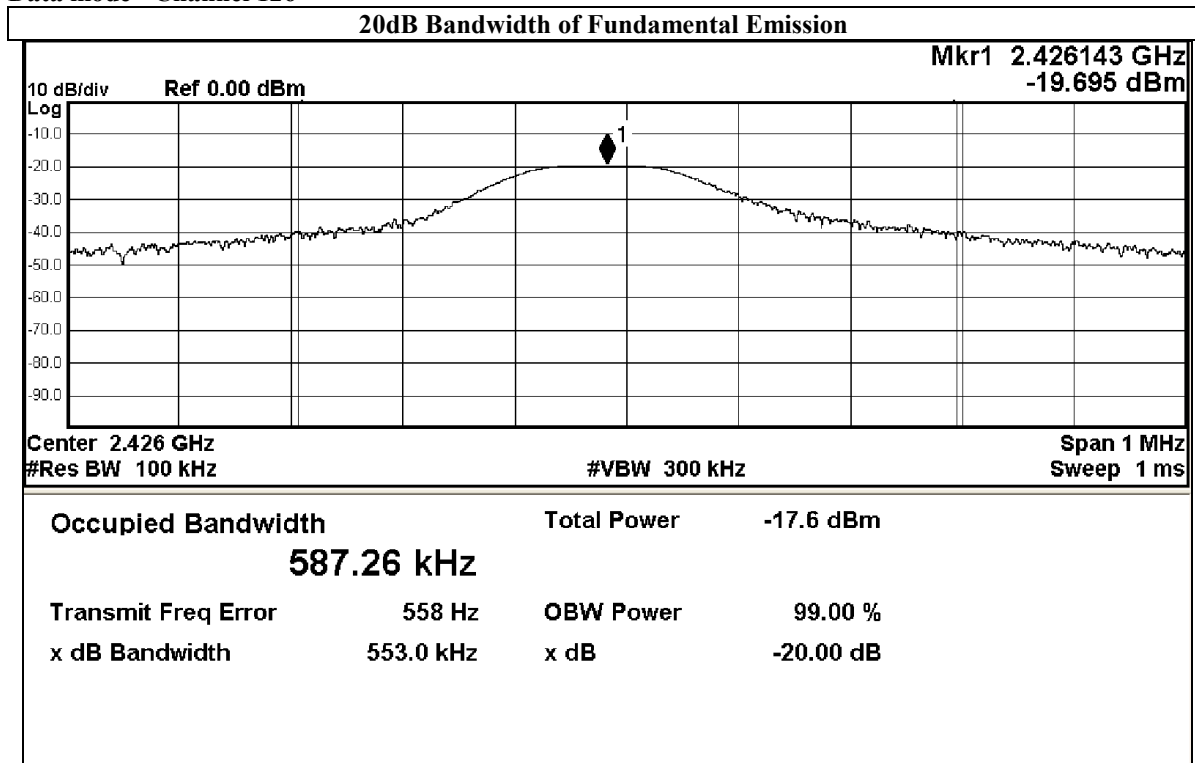
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2426.1	0.553

Data mode - Channel 126



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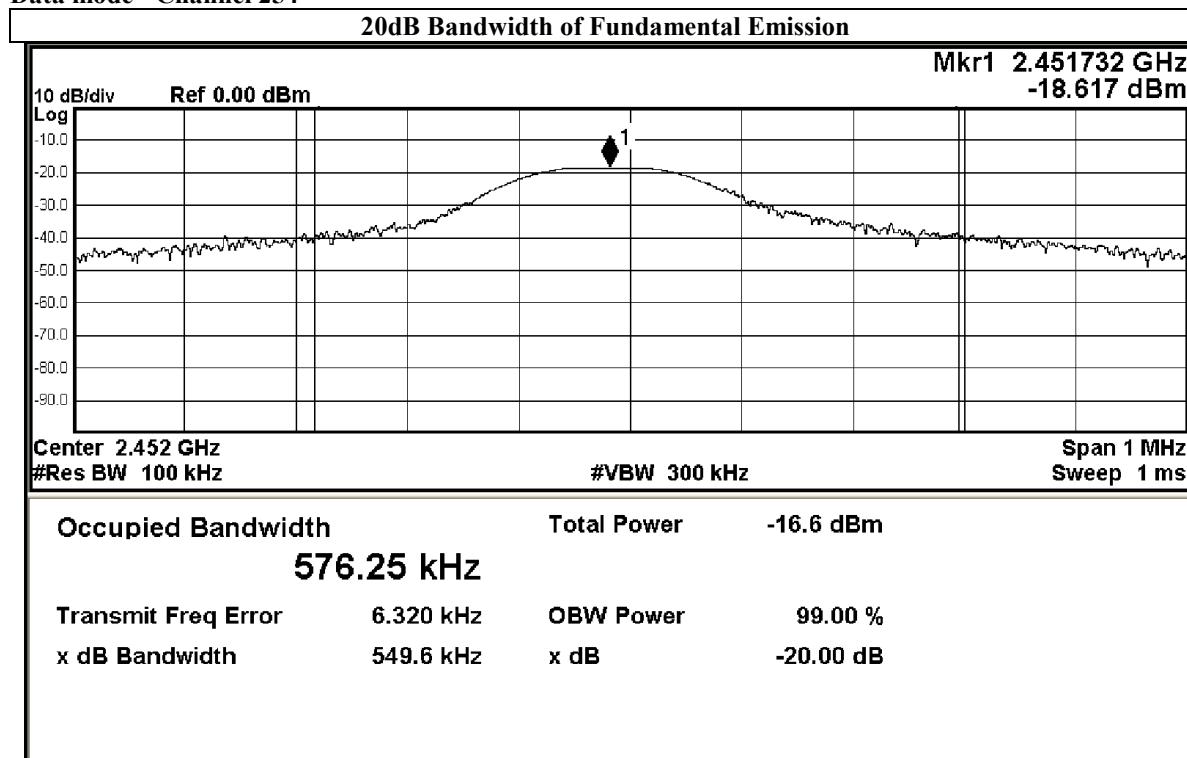
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2451.7	0.550

Data mode - Channel 254



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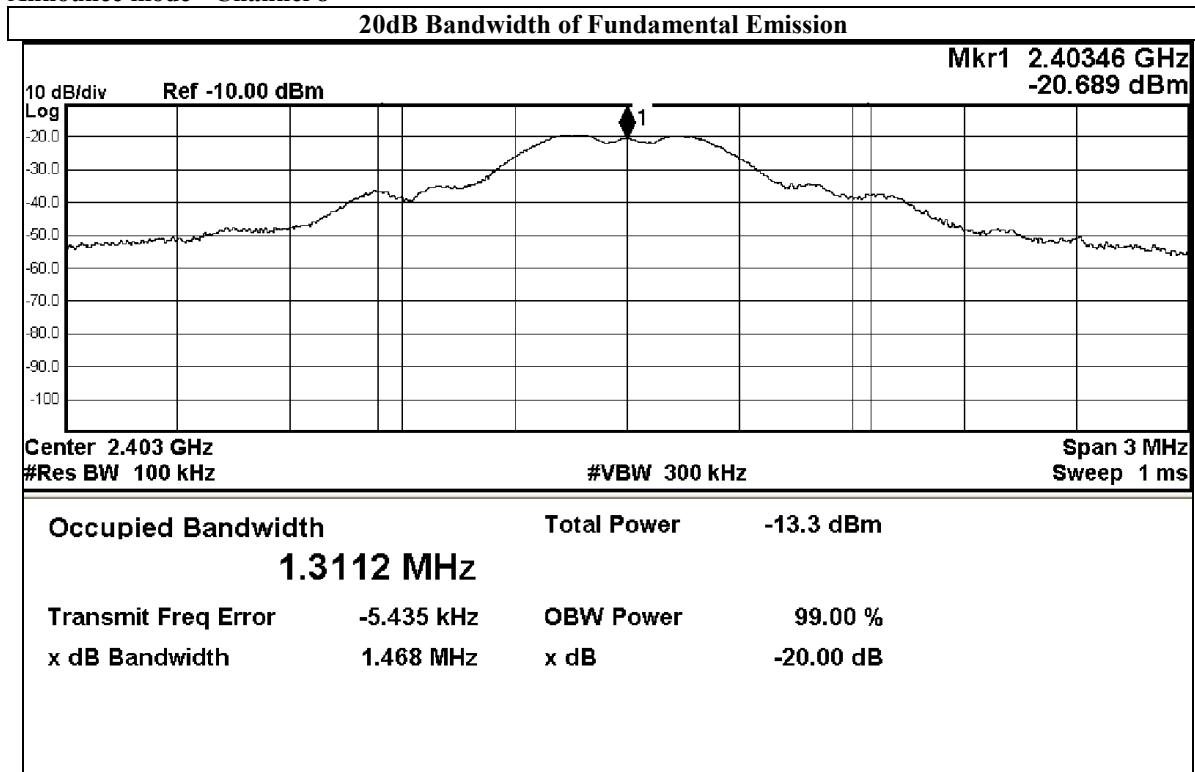
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2403.5	1.468

Announce mode - Channel 8



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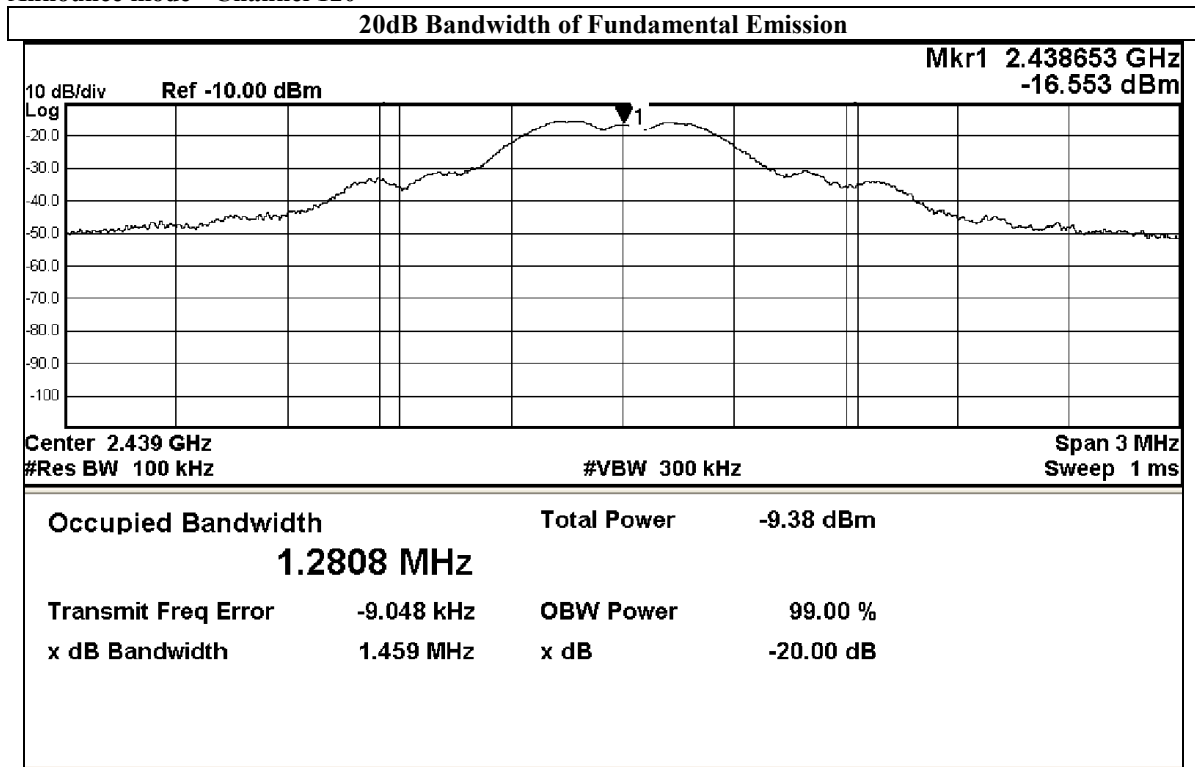
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2438.7	1.459

Announce mode - Channel 120



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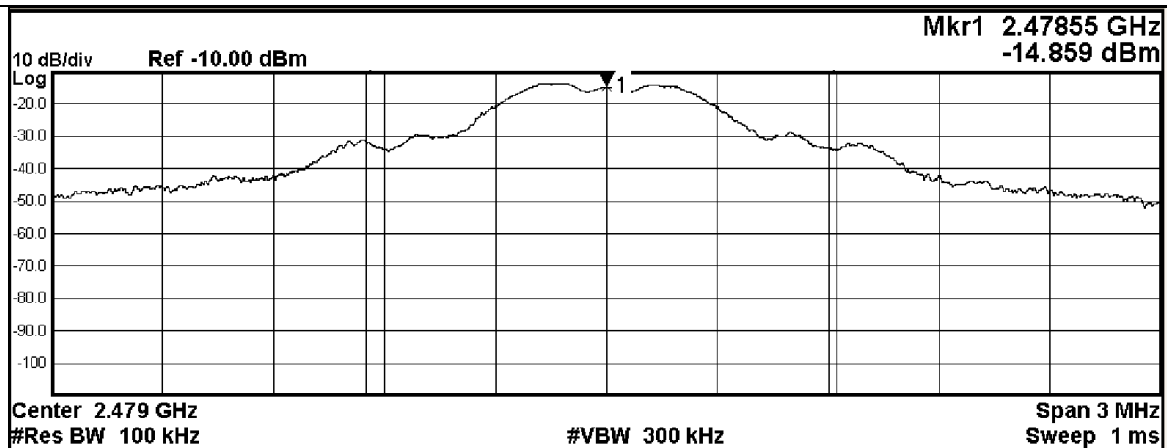
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2478.6	1.447

Announce mode - Channel 247

20dB Bandwidth of Fundamental Emission



Occupied Bandwidth	Total Power	-7.66 dBm
1.2736 MHz		
Transmit Freq Error	-13.430 kHz	OBW Power 99.00 %
x dB Bandwidth	1.447 MHz	x dB -20.00 dB

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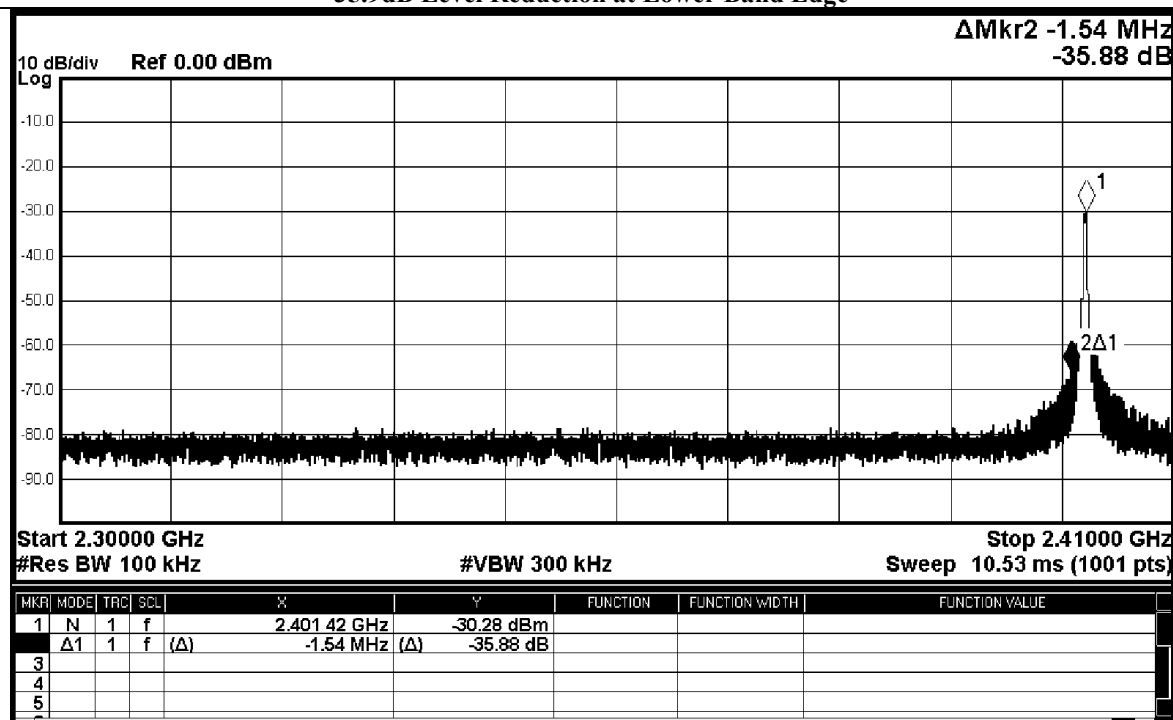
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Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Data mode – Lowest Fundamental	35.9

35.9dB Level Reduction at Lower Band Edge



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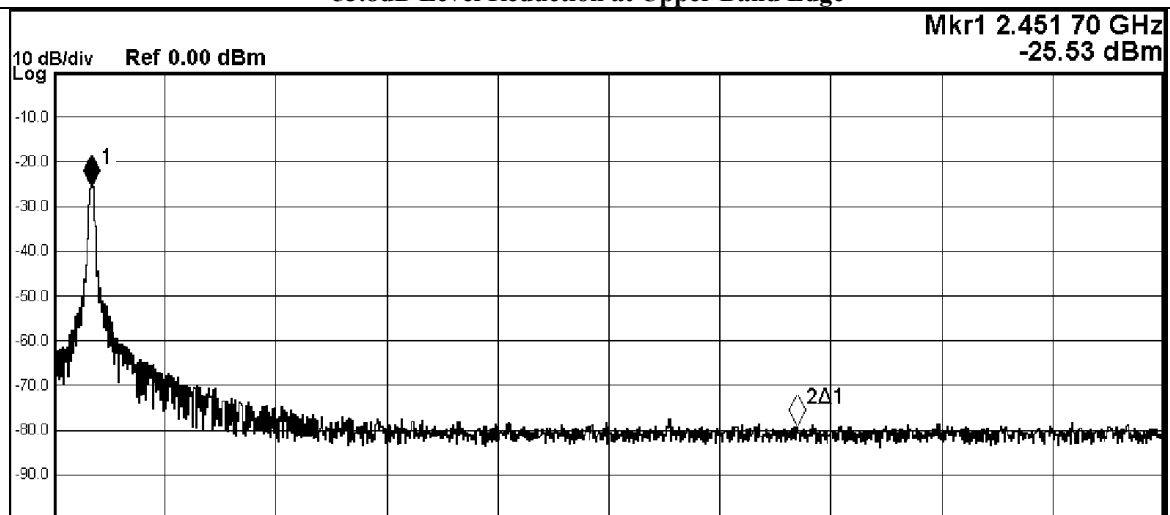
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Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Data mode – Highest Fundamental	53.8

53.8dB Level Reduction at Upper Band Edge



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
N	1	f		2.451 70 GHz	-25.53 dBm			
2	Δ1	1	f (Δ)	31.80 MHz (Δ)	-53.80 dB			
3								
4								
5								

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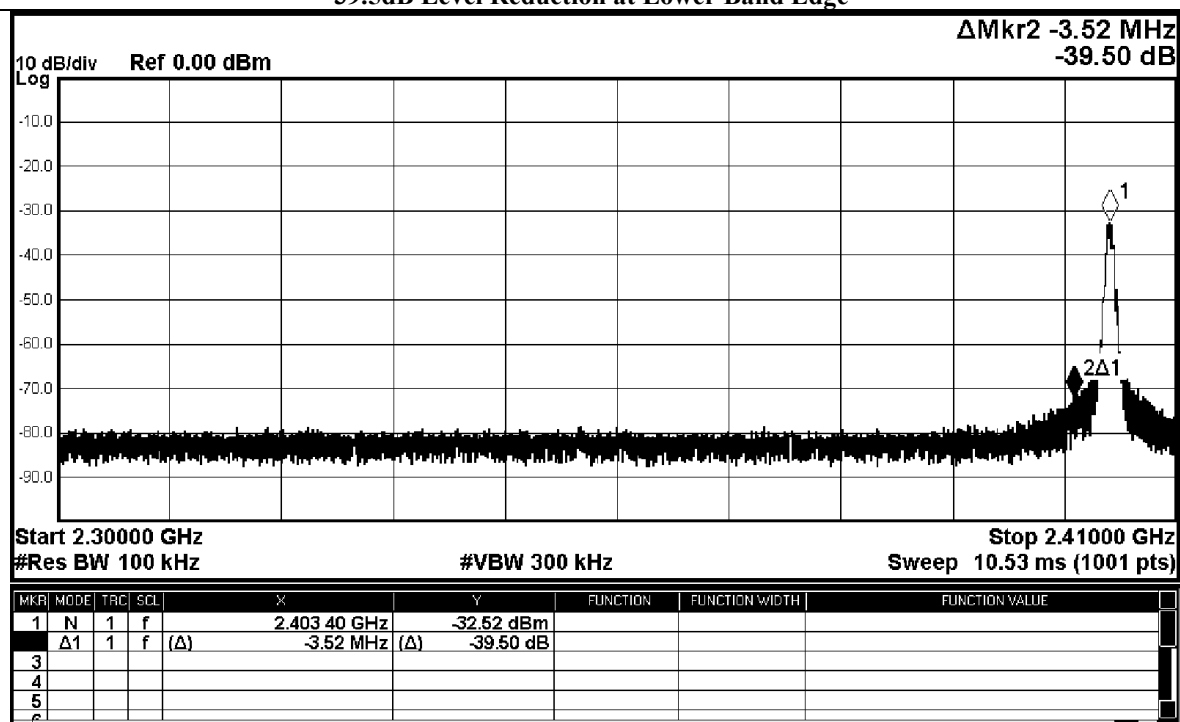
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Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Announce mode – Lowest Fundamental	39.5

39.5dB Level Reduction at Lower Band Edge



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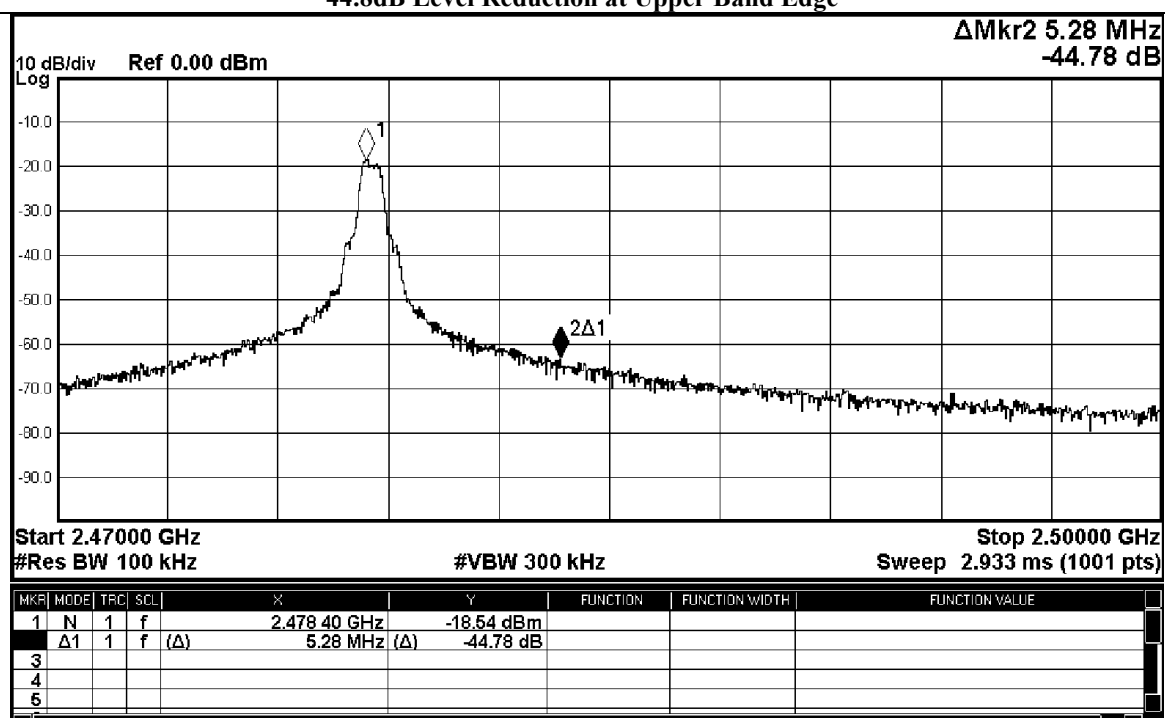
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Band Edge Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Announce mode – Highest Fundamental	44.8

44.8dB Level Reduction at Upper Band Edge



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Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

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 On mode, (9kHz – 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

Result of On mode, (30MHz – 1GHz): PASS

Field Strength of Fundamental and Harmonics Emissions Quasi-Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
63.4	0.3	9.2	9.5	3.0	100	Vertical
101.7	0.1	10.3	10.4	3.3	150	Vertical
210.4	0.2	14.0	14.2	5.1	150	Horizontal
246.5	0.7	15.7	16.4	6.6	200	Horizontal
337.9	0.5	18.6	19.1	9.0	200	Horizontal
421.3	0.5	21.1	21.6	12.0	200	Horizontal

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Result of On mode (Data mode, Band-edge measurement), (1GHz – 18GHz): PASS

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2399.1	22.4	27.9	50.3	327.3	5,000	Vertical
2485.1	12.3	28.0	40.3	103.5	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2399.1	16.9	27.9	44.8	173.8	500	Vertical
2485.1	5.8	28.0	33.8	49.0	500	Vertical

Result of On mode (Announce mode, Band-edge measurement), (1GHz – 18GHz): PASS

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2399.1	21.2	27.9	49.1	285.1	5,000	Vertical
2484.6	21.3	28.0	49.3	291.7	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2399.1	12.4	27.9	40.3	103.5	500	Vertical
2484.6	12.6	28.0	40.6	107.2	500	Vertical

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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

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2437.2	6.2	27.9	34.1	50.7	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBμV/m	Correction Factor dBμV/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
2437.2	5.1	27.9	33.0	44.7	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 : 30MHz to 1GHz 4.9dB
1GHz to 6GHz 4.02dB
6GHz to 18GHz 4.03dB

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Appendix A

LIST OF MEASUREMENT EQUIPMENT

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD062	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3117	00075933	2014/11/15	2016/11/15
EM215	MULTIDEVICE CONTROLLER	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-LINDGREN	FACT-3	--	2016/04/19	2017/04/19
EM320	BICONILOG ANTENNA	ETS-LINDGREN	3142D	00094856	2014/08/06	2016/08/06
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2015/06/01	2016/06/01
EM358	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2016/03/16	2018/03/16
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2016/04/27	2018/04/27
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

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



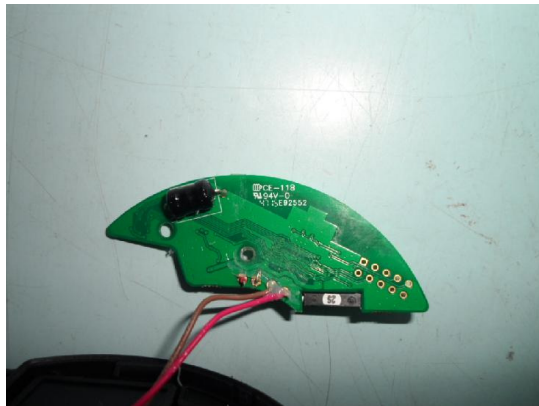
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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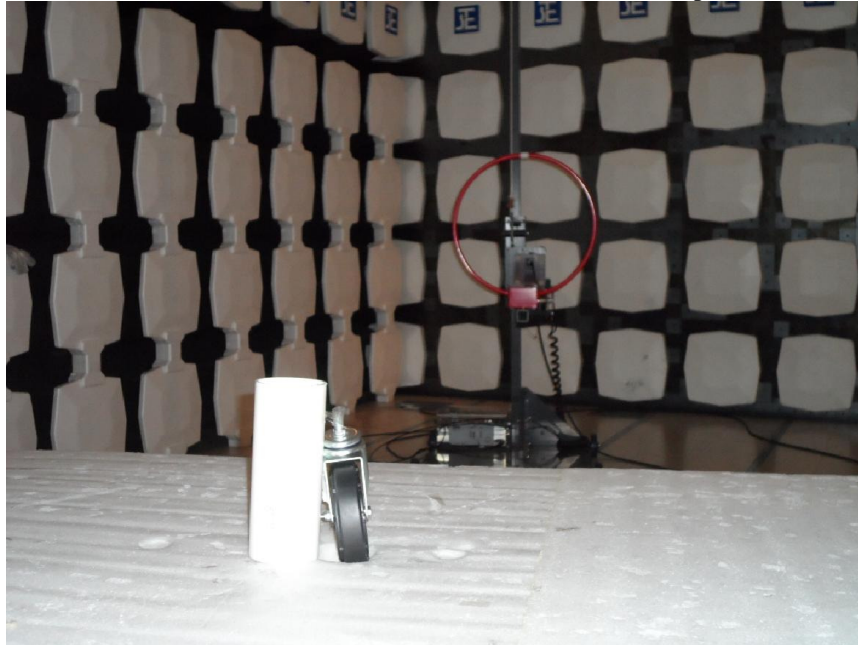
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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