



Test Report

Date : 2018-11-01
No. : HM18070010

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Applicant: Purekeys BV
Moermansweg 2 unit 6, 9723 HM Groningen, The Netherlands

Manufacturer: Zhuhai Heng Yu New Technology Company Limited.
Heng Ke Technology Campus, Jin Hai Avenue, San Zao, Jinwan District, Zhuhai, Guang Dong, P.R.C. 519040

Description of Sample(s): Product: Purekeys Wireless Keyboard
Brand Name: Purekeys
Model Number: K103EN-RF
FCC ID: 2AELMK103ENRF1

Date Sample(s) Received: 2018-07-17

Date Tested: 2018-08-03 to 2018-08-14

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2017 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



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1.0 General Details

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

Product:	Purekeys Wireless Keyboard
Manufacturer:	Zhuhai Heng Yu New Technology Company Limited. Heng Ke Technology Campus, Jin Hai Avenue, San Zao, Jinwan District, Zhuhai, Guang Dong, P.R.C. 519040
Brand Name:	Purekeys
Model Number:	K103EN-RF
Rating:	Keyboard: 4.5Vd.c. ("AAA"*4)

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a 2.4GHz Wireless Keyboard. The EUT type of modulation is GFSK, the channel frequency range 2404-2480MHz.

1.3 Date of Order

2018-07-17

1.4 Submitted Sample(s):

2 Samples

1.5 Test Duration

2018-08-03 to 2018-08-14

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 / Severity	Test Result	
				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:	2018-08-03
Mode of Operation:	1. Tx Mode [#]

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 723883
Designation Number HK0001

The Tx mode of the EUT was set to continuous transmit fixed at frequencies, 2408MHz, 2435MHz and 2467MHz during test.

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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

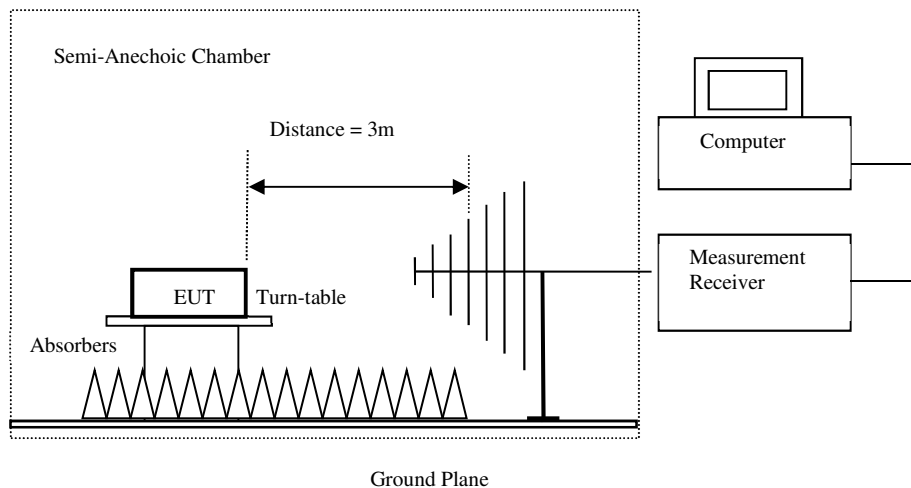
30MHz – 1GHz (QP)

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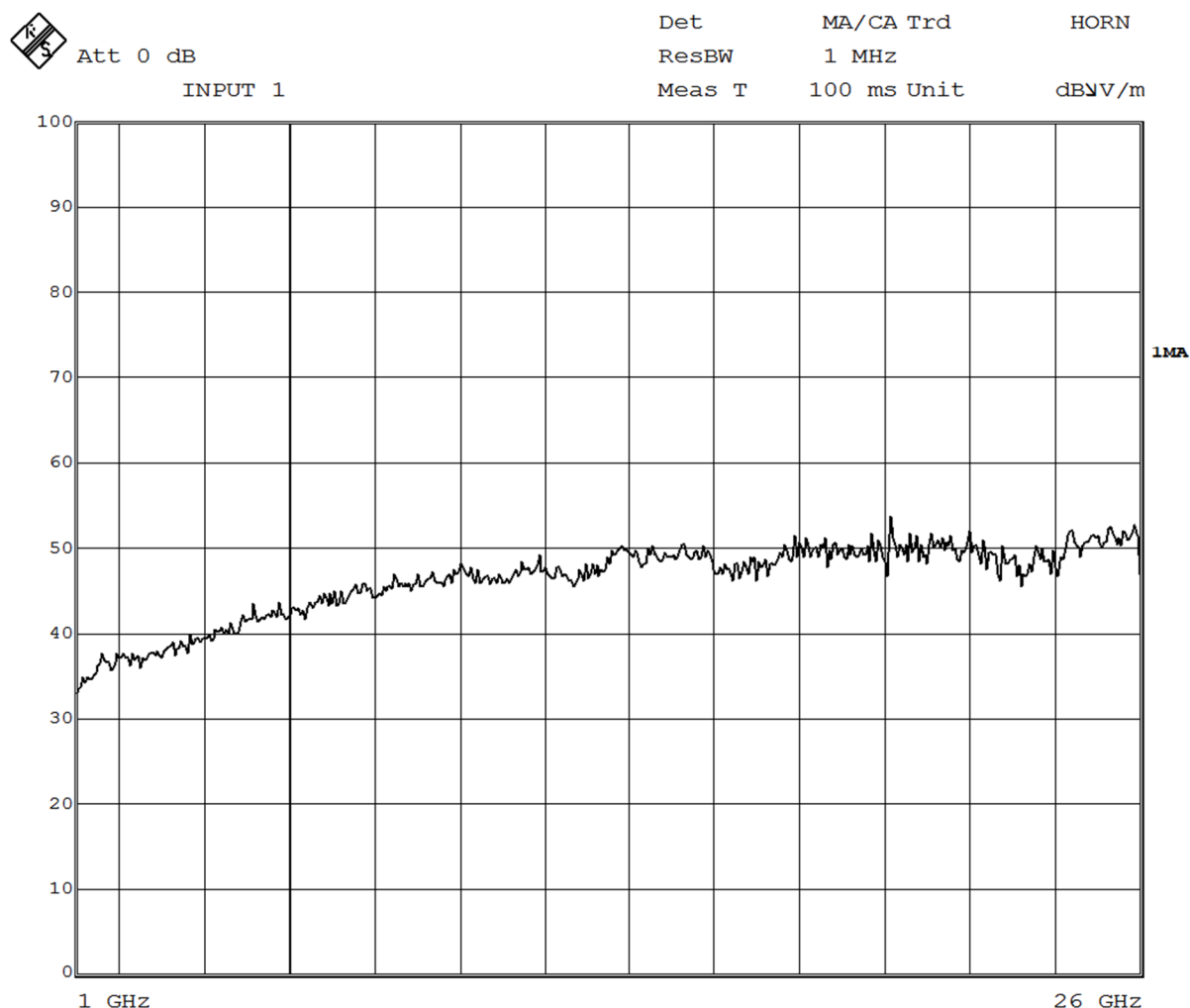
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Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

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 (Lowest Channel), (Above 1GHz): Pass





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

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2408.0	51.3	27.9	79.2	9,120.1	500,000	Horizontal
* 4816.0	1.5	32.1	33.6	47.9	5,000	Horizontal
7224.0	0.9	38.6	39.5	94.4	5,000	Horizontal
9632.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12040.0					5,000	Horizontal
14448.0					5,000	Horizontal
16856.0					5,000	Horizontal
* 19264.0					5,000	Horizontal
21672.0					5,000	Horizontal
24080.0					5,000	Horizontal

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2408.0	43.2	27.9	71.1	3,589.2	50,000	Horizontal
* 4816.0	0.4	32.1	32.5	42.2	500	Horizontal
7224.0	-1.3	38.6	37.3	73.3	500	Horizontal
9632.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12040.0					500	Horizontal
14448.0					500	Horizontal
16856.0					500	Horizontal
* 19264.0					500	Horizontal
21672.0					500	Horizontal
24080.0					500	Horizontal

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 (Middle Channel), (Above 1GHz): Pass



Att 0 dB

INPUT 1

Det

MA/CA Trd

HORN

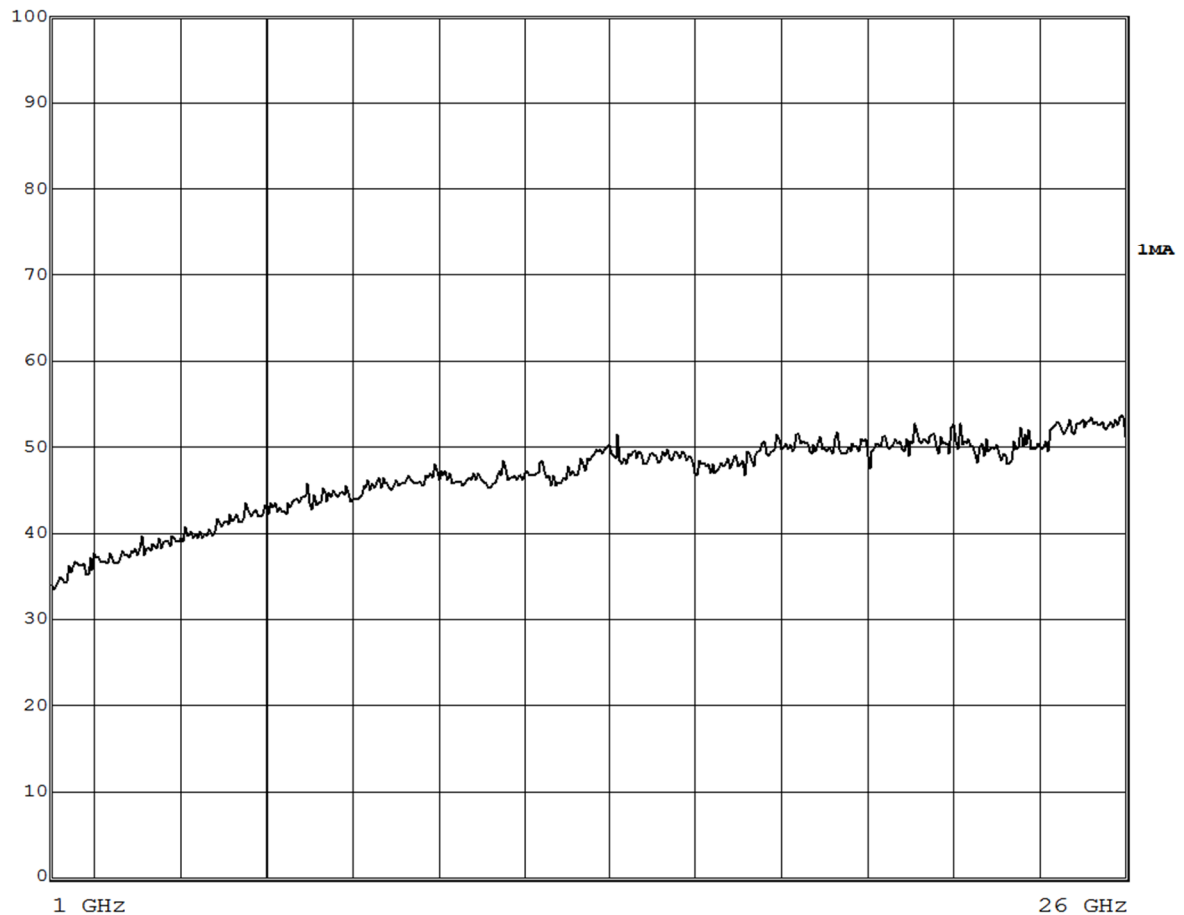
ResBW

1 MHz

Meas T

100 ms Unit

dB μ V/m



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Result of TX mode (Middle Channel), (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
2435.0	53.7	27.9	81.6	12,022.6	500,000	Horizontal
* 4870.0	2.4	32.1	34.5	53.1	5,000	Horizontal
* 7305.0	0.3	38.6	38.9	88.1	5,000	Horizontal
9740.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12175.0					5,000	Horizontal
14610.0					5,000	Horizontal
17045.0					5,000	Horizontal
* 19480.0					5,000	Horizontal
21915.0					5,000	Horizontal
24350.0					5,000	Horizontal

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
2435.0	45.8	27.9	73.7	4,841.7	50,000	Horizontal
* 4870.0	1.5	32.1	33.6	47.9	500	Horizontal
* 7305.0	-0.8	38.6	37.8	77.6	500	Horizontal
9740.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12175.0					500	Horizontal
14610.0					500	Horizontal
17045.0					500	Horizontal
* 19480.0					500	Horizontal
21915.0					500	Horizontal
24350.0					500	Horizontal

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 (Highest Channel), (Above 1GHz): Pass



Att 0 dB

INPUT 1

Det

MA/CA Trd

HORN

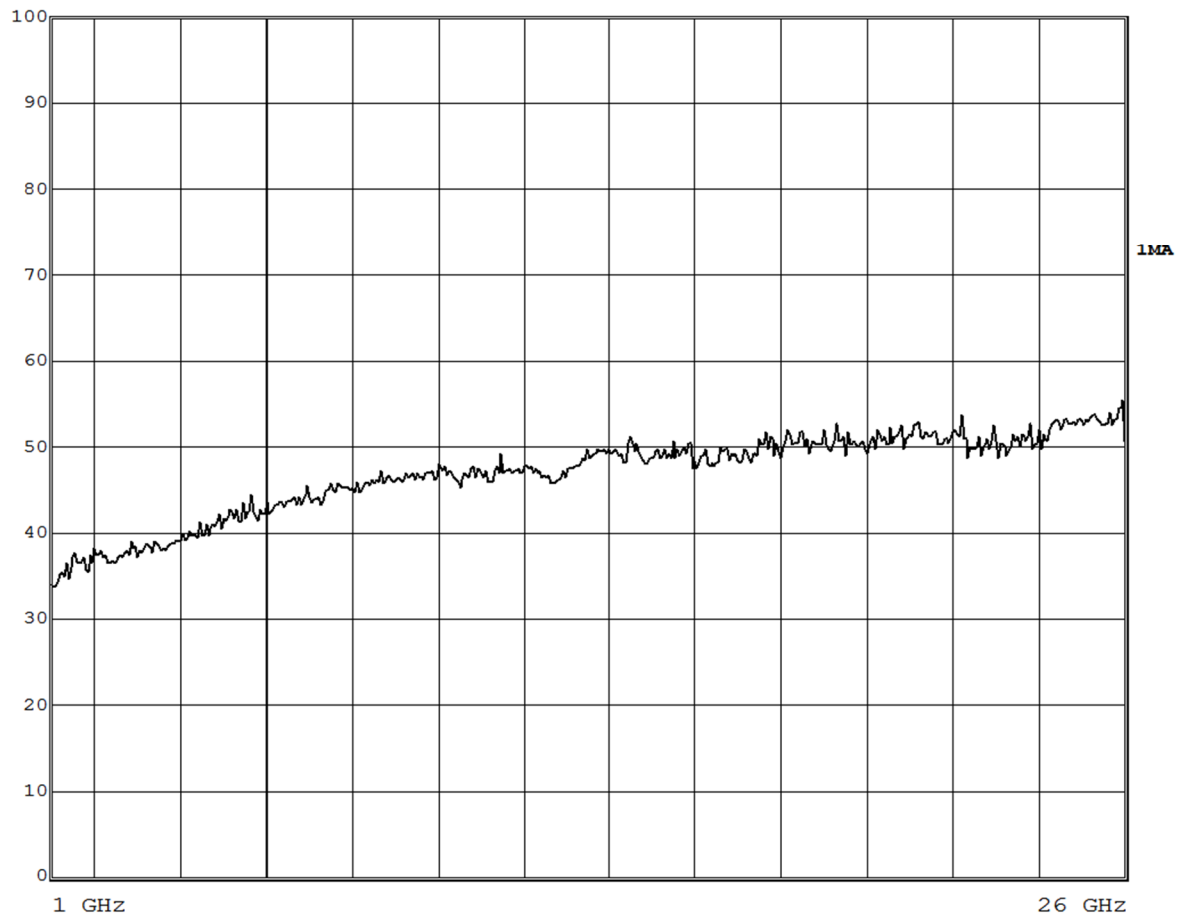
ResBW

1 MHz

Meas T

100 ms Unit

dB μ V/m



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Result of TX mode (Highest Channel), (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
2467.0	50.7	27.9	78.6	8,511.4	500,000	Horizontal
* 4934.0	1.6	32.1	33.7	48.4	5,000	Horizontal
* 7401.0	0.3	38.6	38.9	88.1	5,000	Horizontal
9868.0	Emissions detected are more than 20 dB below the FCC Limits				5,000	Horizontal
* 12335.0					5,000	Horizontal
14802.0					5,000	Horizontal
17269.0					5,000	Horizontal
* 19736.0					5,000	Horizontal
22203.0					5,000	Horizontal
24670.0					5,000	Horizontal

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
2467.0	43.8	27.9	71.7	3,845.9	50,000	Horizontal
* 4934.0	-1.1	32.1	31.0	35.5	500	Horizontal
* 7401.0	-1.5	38.6	37.1	71.6	500	Horizontal
9868.0	Emissions detected are more than 20 dB below the FCC Limits				500	Horizontal
* 12335.0					500	Horizontal
14802.0					500	Horizontal
17269.0					500	Horizontal
* 19736.0					500	Horizontal
22203.0					500	Horizontal
24670.0					500	Horizontal

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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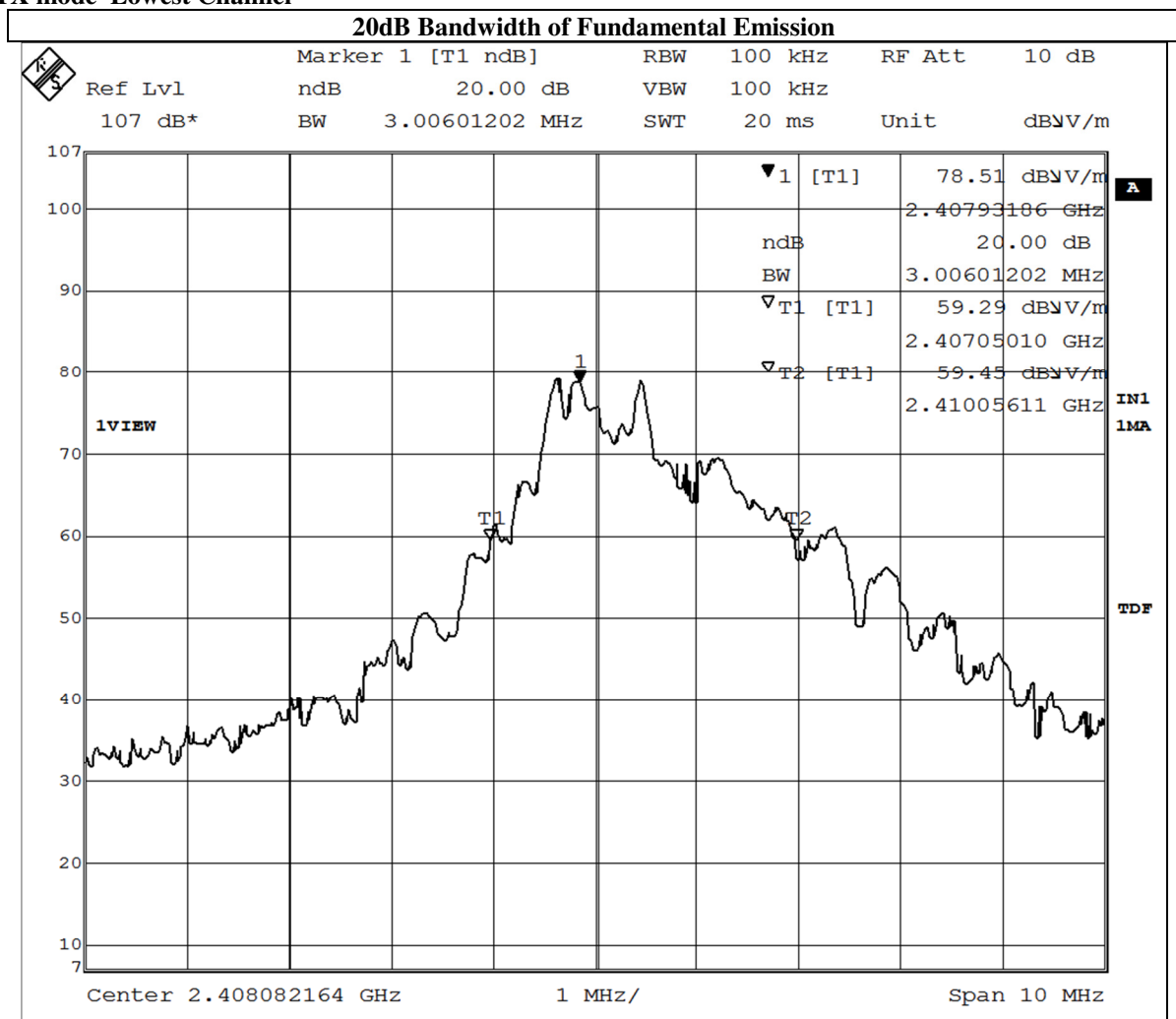
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Limits for 20dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [MHz]
2408.0	3.01

TX mode Lowest Channel



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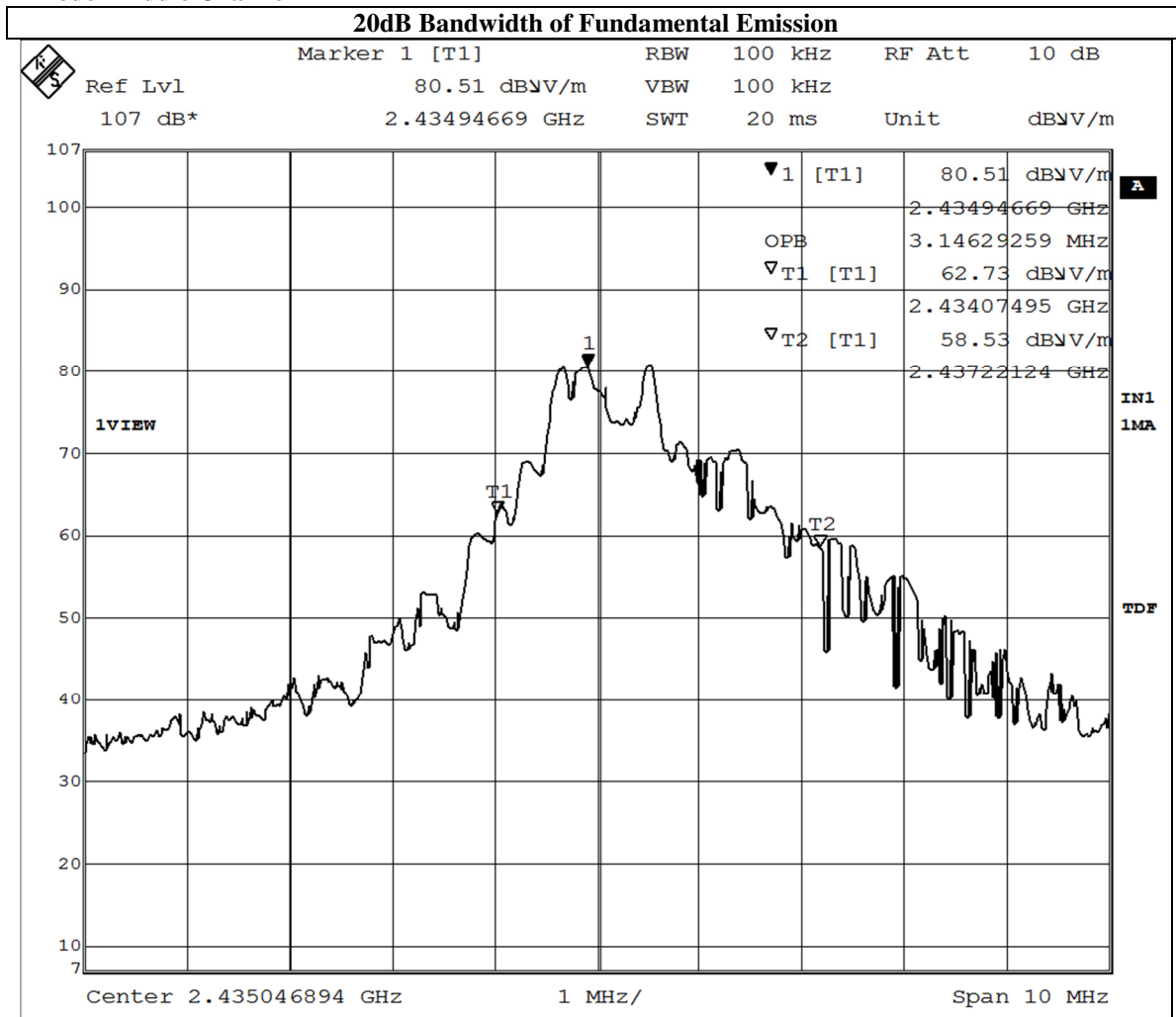
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2435.0	3.15

TX mode Middle Channel



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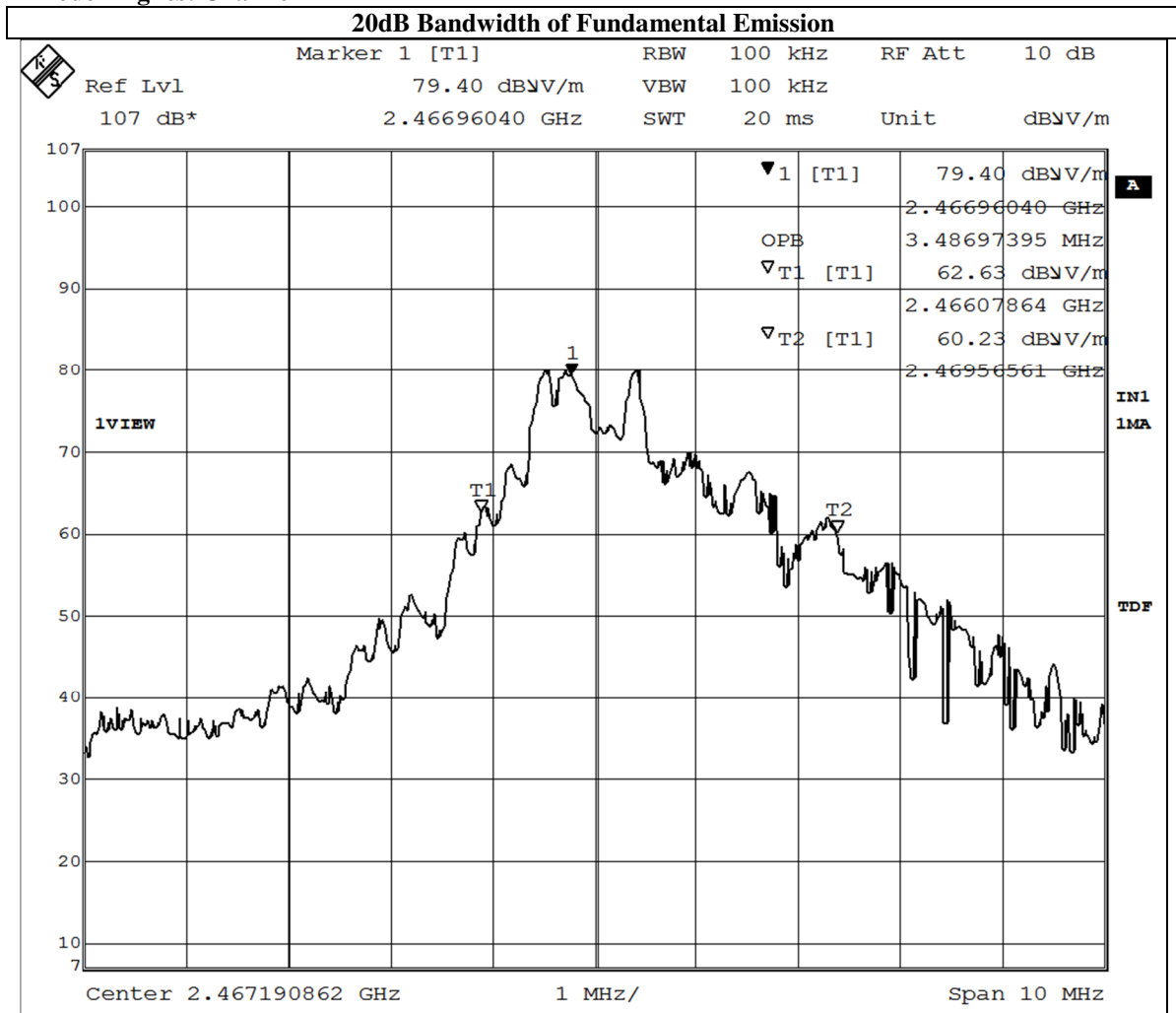
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Frequency Range [MHz]	20dB Bandwidth [MHz]
2467.0	3.49

TX mode Highest Channel



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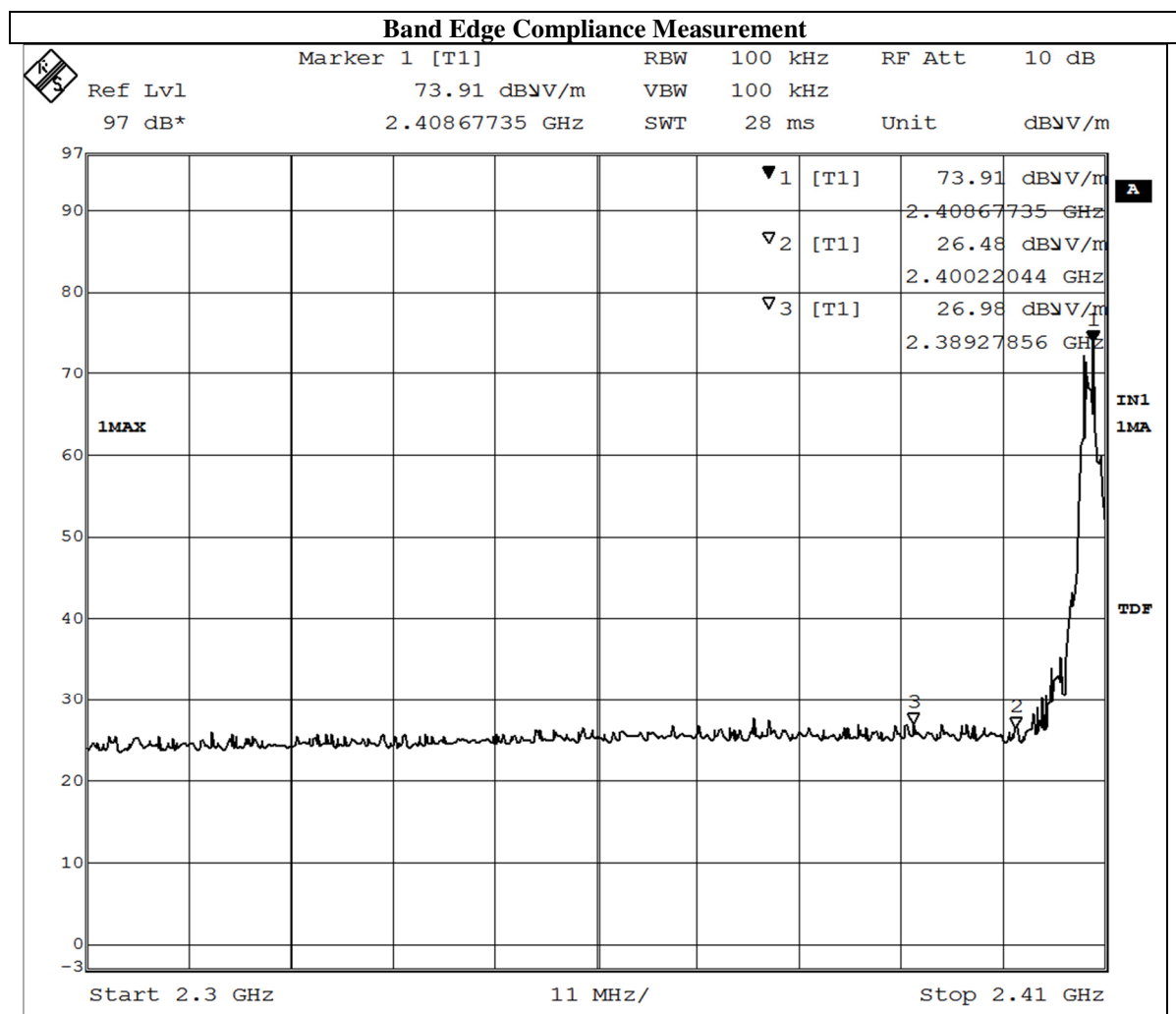
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Band Edge Measurement:

TX mode

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400MHz – Lowest Fundamental	47.4



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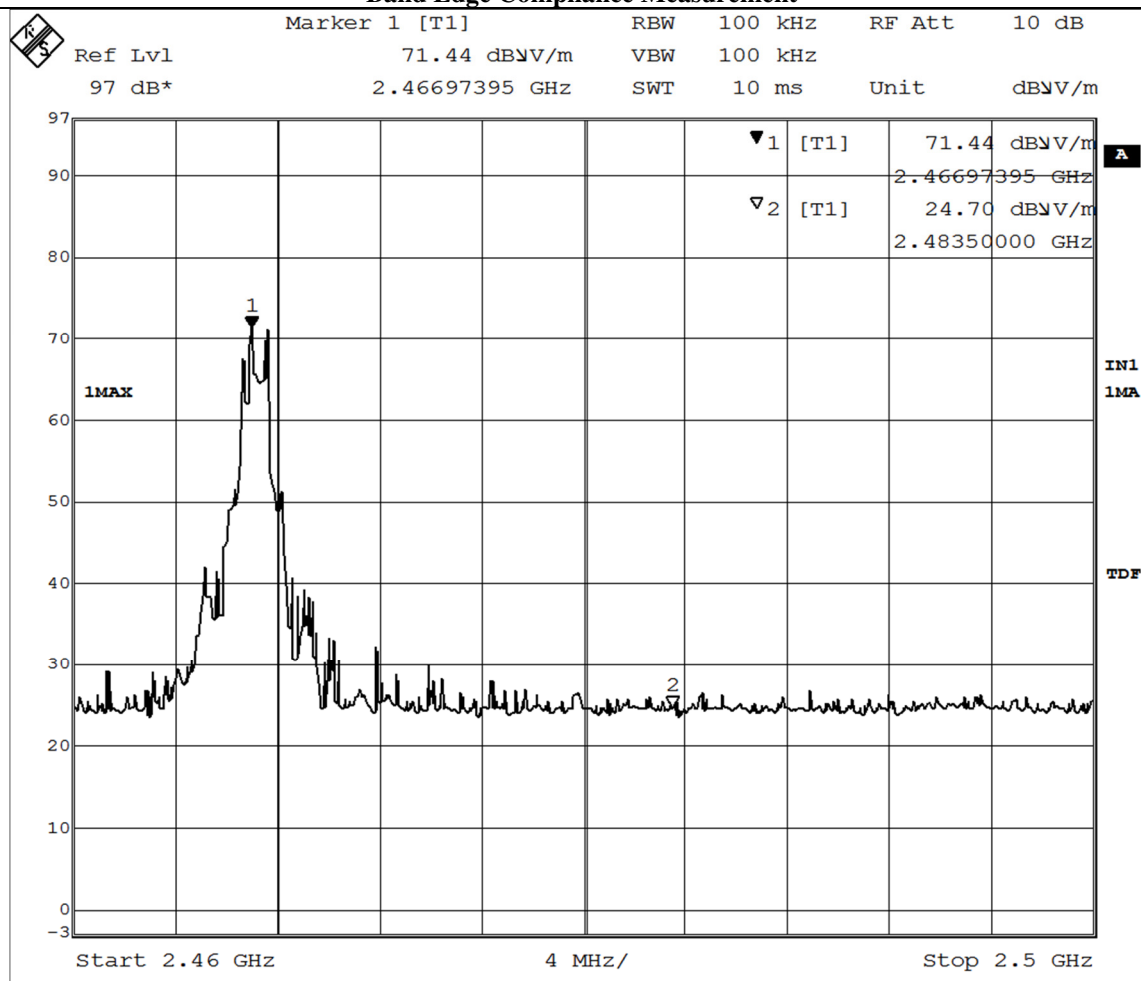
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Band Edge Measurement:

TX mode

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental – 2483.5MHz	46.7

Band Edge Compliance Measurement



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Result of TX mode , Band-edge measurement: PASS

Field Strength of Fundamental and Harmonics Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2389.3	6.3	27.9	34.2	51.3	5,000	Vertical
2484.0	6.9	27.9	34.8	55.0	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2389.3	2.1	27.9	30.0	31.6	500	Vertical
2484.0	2.3	27.9	30.2	32.4	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, (9kHz – 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

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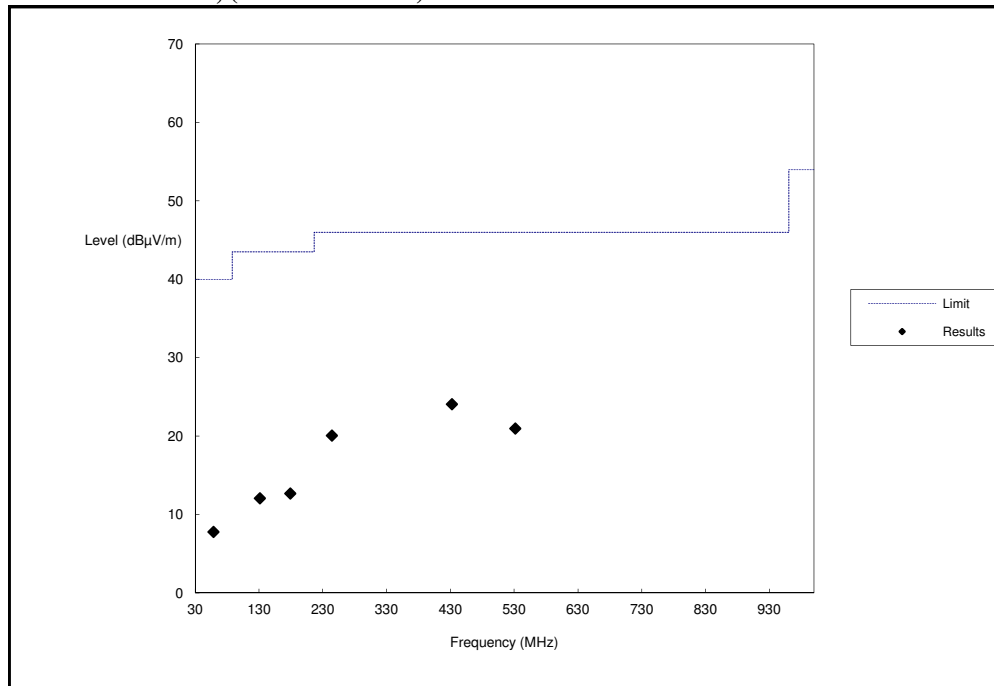


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Result of Tx mode, (30MHz – 1GHz): PASS



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
58.1	1.2	6.6	7.8	2.5	100	Vertical
130.9	4.5	7.6	12.1	4.0	150	Horizontal
178.5	2.3	10.4	12.7	4.3	150	Horizontal
243.8	7.5	12.6	20.1	10.1	200	Horizontal
432.0	6.7	17.4	24.1	16.0	200	Horizontal
531.2	-0.1	21.1	21.0	11.2	200	Horizontal



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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 dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2435.3	2.9	27.9	30.8	34.7	5,000	Vertical

Field Strength of Fundamental and Harmonics Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2435.3	-0.8	27.9	27.1	22.6	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 – 1GHz): 5.0dB
(1GHz - 18GHz): 5.0dB
(1GHz - 18GHz): 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 TURNABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2018/04/24	2019/04/24
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	2018/06/01	2019/06/01
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2018/04/27	2020/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2018/05/13	2020/05/13
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2018/03/16	2020/03/16

Remarks:

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

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Appendix B

Photograph(s) of EUT

Front View of the product



Rear View of the product



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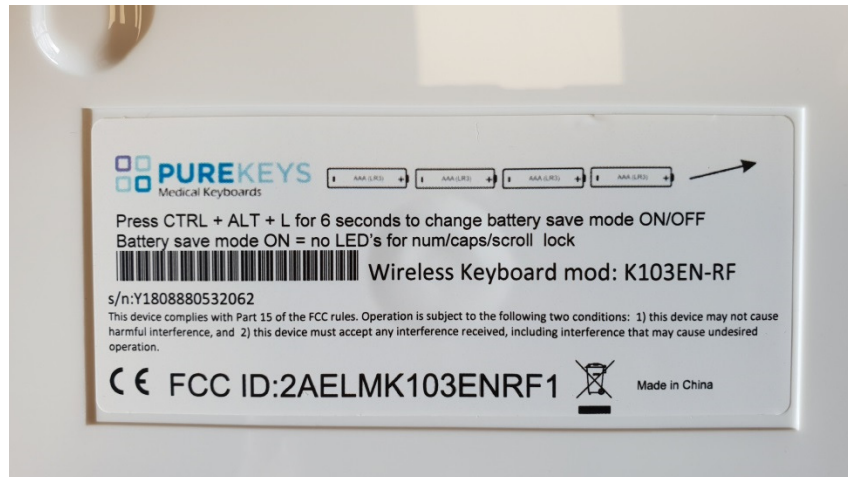
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Photograph(s) of EUT

Rear View of the Product with Label



Inner View of the Product



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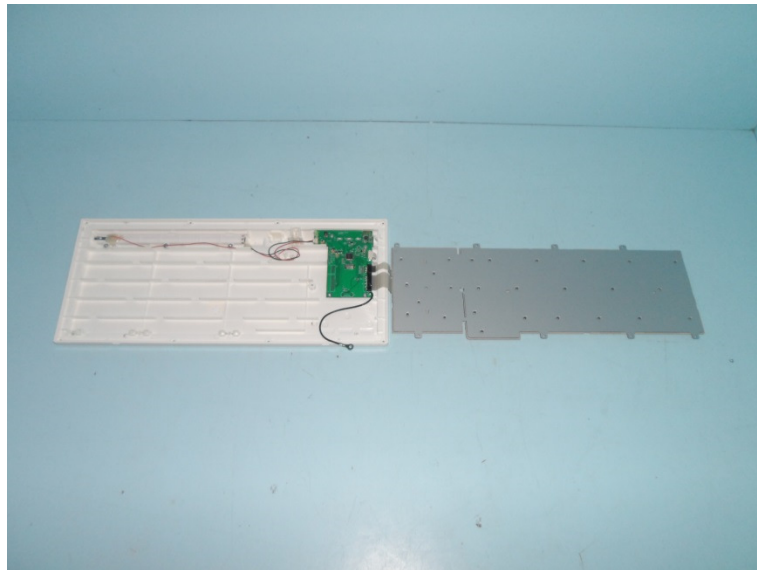
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Photograph(s) of EUT

Inner View of the Product



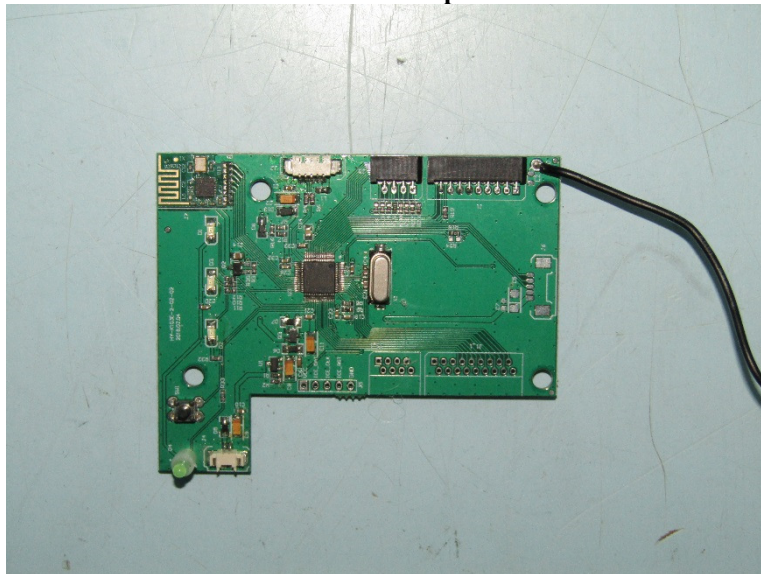
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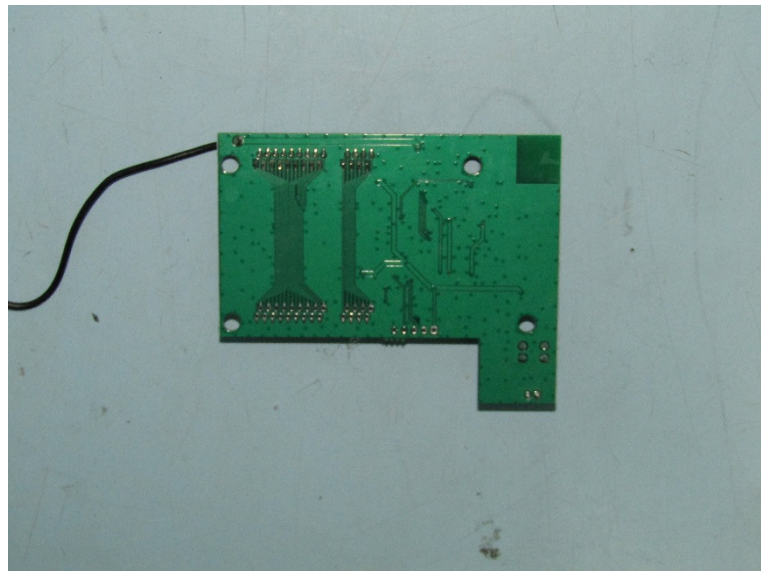
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Photograph(s) of EUT

Inner Circuit Top View



Inner Circuit Bottom View



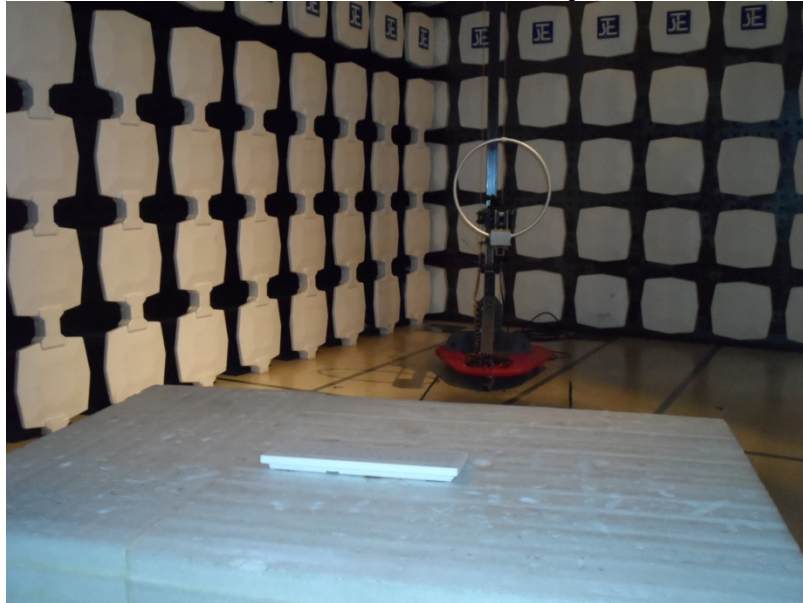
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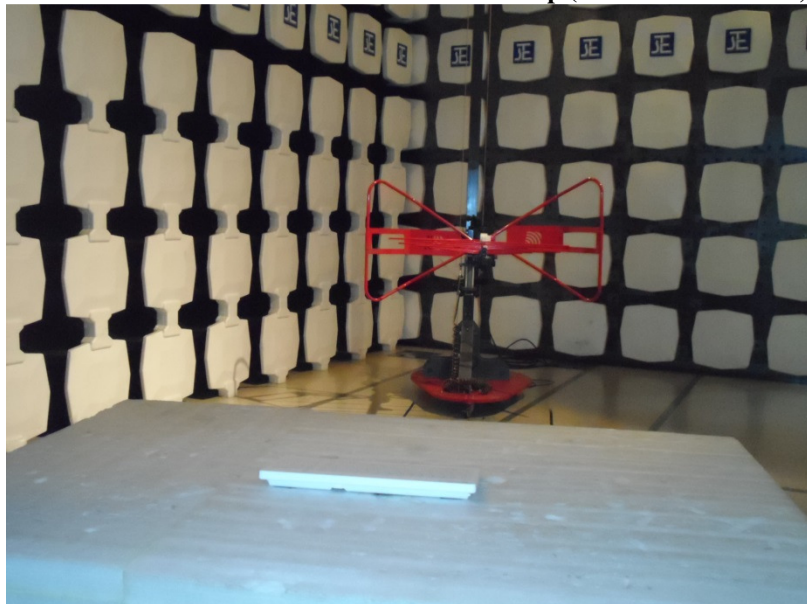
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Photograph(s) of EUT

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



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



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Photograph(s) of EUT

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



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

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