

FCC - TEST REPORT

Report Number : **60.790.18.021.01R02** Date of Issue : June 15, 2018

Model : PX102

Product Type : Bicycle crank arm power sensor

Applicant : 4iiii Innovations Inc.

Address : 141 2nd Ave East, Cochrane Alberta, Canada T4C 2B9

Production Facility : 4iiii Innovations Inc.

Address : 141 2nd Ave East, Cochrane Alberta, Canada T4C 2B9

Test Result : Positive Negative

Total pages including Appendices : 37

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2 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	Bicycle crank arm power sensor
Model no.:	PX102
FCC ID:	ZZNPX102
Rating:	1. 3.7VDC (1 x 3.7VDC internal rechargeable battery) 2. 5.0VDC (USB cable provided by client)
Frequency:	2457MHz
Antenna gain:	0 dBi
Number of operated channel:	1
Modulation:	GFSK

Auxiliary Equipment and Software Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Adapter	Apple	A1357	/
Smart Phone	Samsung	GT-N7108	RV1D31RD6EK

Auxiliary Software Used during Test:

DESCRIPTION	MANUFACTURER	NAME	S/N
Android App	4iii	fouriiii-podcwtest	/

- Note: 1. Adapter is used as a supporting device for Conducted Emission test.
2. Manufacture developed an Android App called "fouriiii-podcwtest", which was installed to the Samsung smart phone. Using this app, tester can search EUT's Bluetooth, and set the ANT+ test channel.

3 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-17 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart C — Unintentional Radiators

4 Details about the Test Laboratory

Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13 Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2,
Shenzhen 518052, P.R.China
FCC Registration Number: 502708

Emission Tests	
Test Item	Test Site
FCC Part 15 Subpart C	
FCC Title 47 Part 15.205, 15.209 & 15.249 & Radiated Emission	Site 1
FCC Title 47 Part 15.207 Conduct Emission	Site 1
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	Site 1
FCC Title 47 Part 15.203 Antenna Requirement	Site 1

4.1 Test Equipment Site List

Radiated emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Signal Analyzer	Rohde & Schwarz	FSV40	101031	2019-7-6
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2019-7-12
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted Emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2019-7-6
LISN	Rohde & Schwarz	ENV4200	100249	2019-7-6
LISN	Rohde & Schwarz	ENV432	101318	2019-7-6
LISN	Rohde & Schwarz	ENV216	100326	2019-7-6
ISN	Rohde & Schwarz	ENY81	100177	2019-7-6
ISN	Rohde & Schwarz	ENY81-CA6	101664	2019-7-6
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2019-6-30
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2019-6-30
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2019-7-6
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2019-7-6
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2019-7-6

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.46dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Conducted Emission at AC Power Line 150kHz-30MHz	3.21dB
Uncertainty for frequency test	0.6×10^{-7}



5 Summary of Test Results

Emission Tests				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
FCC Title 47 Part 15.205,15.209 & 15.249 Radiated Emission	10-11	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.207 Conduct Emission	12-13	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.203 Antenna Requirement	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6 General Remarks

Remarks

All mode has been tested, only worst case has shown.

SUMMARY:

- All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

- The Equipment Under Test

■ - **Fulfills** the general approval requirements.

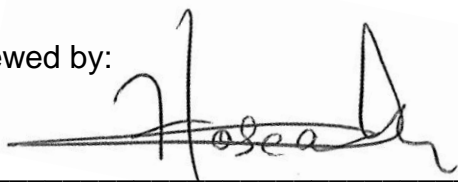
□ - **Does not** fulfill the general approval requirements.

Sample Received Date: April 10, 2018

Testing Start Date: April 11, 2018

Testing End Date: May 18, 2018

Reviewed by:



Hosea CHAN
EMC Project Engineer

Prepared by:



Eric LI
EMC Senior Project Engineer

7 Emission Test Results

7.1 Radiated Emission

EUT: PX102
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.205,15.209 & 15.249, Antenna: Horizontal
 Comment: 3.7VDC
 Remark: 9kHz to 25GHz

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector
37.412	17.48	40	-22.52	Quasi Peak
197.864	21.61	43.5	-21.89	Quasi Peak
324.123	28.15	46	-17.85	Quasi Peak
875.512	31.48	46	-14.52	Quasi Peak
2457.000	96.65	114	-17.35	Peak
2457.000	87.13	94	-6.87	Average
4913.906	55.48	74	-18.52	Peak
4913.906	23.46	54	-30.54	Average
8828.906	51.61	74	-22.39	Peak
8828.906	24.54	54	-29.46	Average

Radiated Emission

EUT: PX102
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.205,15.209 & 15.249, Antenna: Vertical
 Comment: 3.7VDC
 Remark: 9kHz to 25GHz

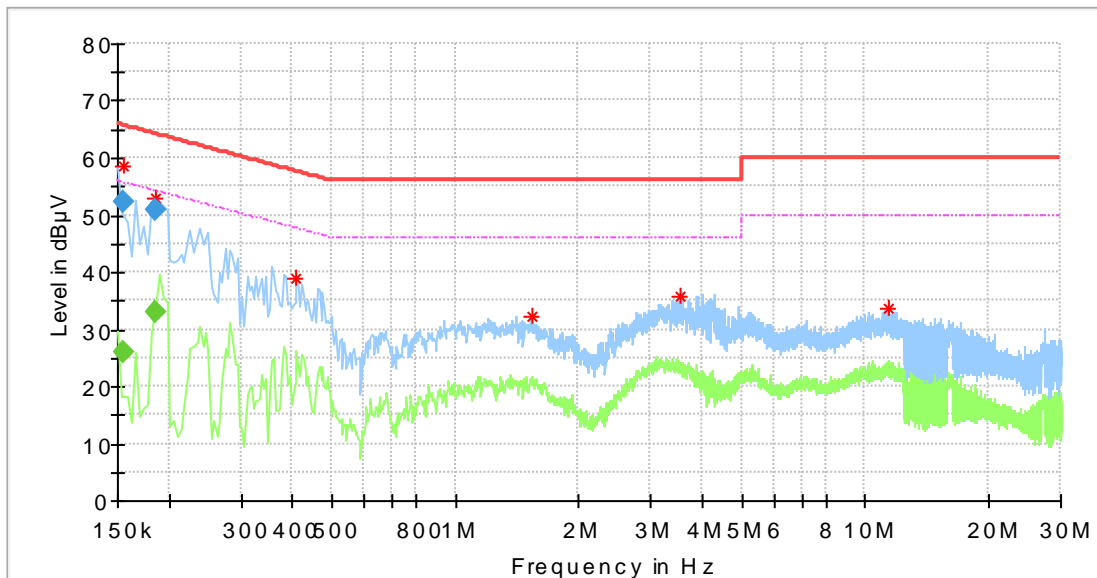
Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
60.611	20.12	40	-19.88	Quasi Peak
252.023	22.48	46	-23.52	Quasi Peak
287.966	25.35	46	-20.65	Quasi Peak
874.330	26.43	46	-19.57	Quasi Peak
2457.000	96.87	114	-17.13	Peak
2457.000	83.21	94	-10.79	Average
4913.906	52.45	74	-21.55	Peak
4913.906	30.87	54	-23.13	Average
8096.250	41.54	74	-32.46	Peak
8096.250	25.46	54	-28.54	Average

7.2 Conducted Emission

EUT: PX102
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.207, L Line
 Comment: 120 VAC

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.154500	58.42	---	66.00	-7.58
0.185500	52.82	---	64.21	-11.39
0.410000	38.98	---	57.65	-18.67
1.534000	32.37	---	56.00	-23.63
3.546000	35.95	---	56.00	-20.05
11.398000	33.59	---	60.00	-26.41

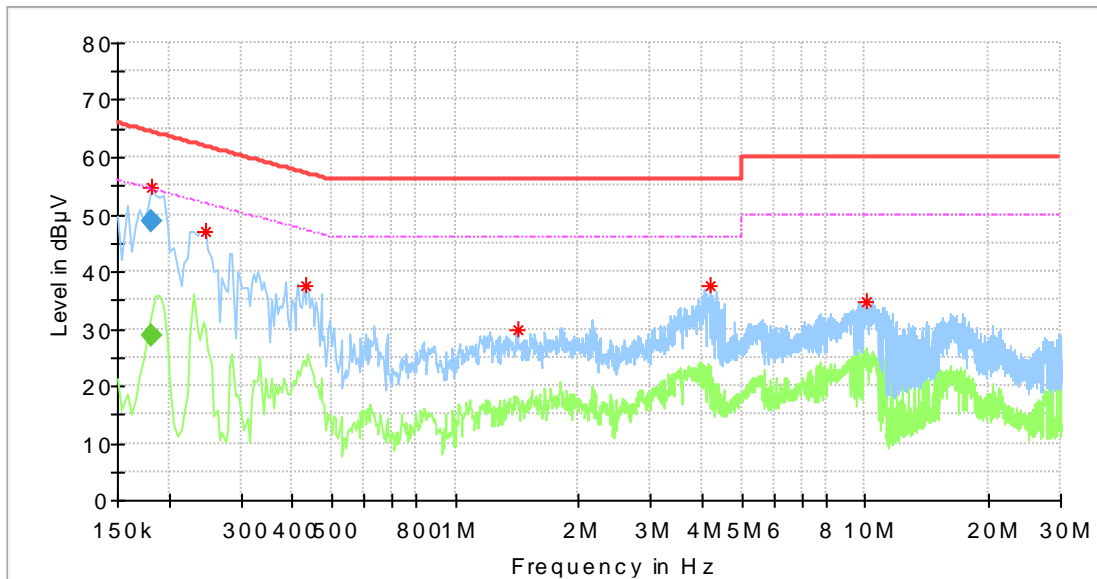
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.154500	---	26.06	55.75	-29.69
0.154500	52.39	---	65.75	-13.36
0.185500	---	33.08	54.24	-21.16
0.185500	50.91	---	64.24	-13.33

Conducted Emission

EUT: PX102
 Op Condition: Operated, TX Mode
 Test Specification: FCC15.207, N Line
 Comment: 120VAC

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.181500	54.75	---	64.39	-9.65
0.246000	46.98	---	61.89	-14.91
0.434000	37.71	---	57.18	-19.47
1.418000	29.96	---	56.00	-26.04
4.174000	37.39	---	56.00	-18.61
10.126000	34.80	---	60.00	-25.20

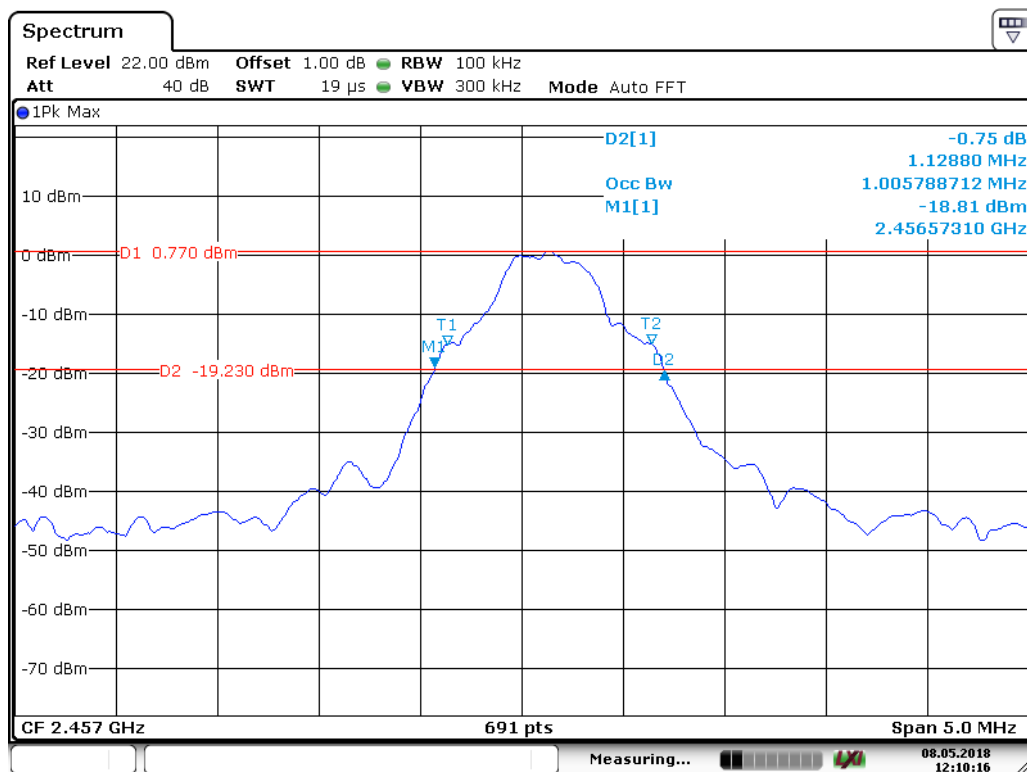
Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)
0.181500	---	28.81	54.42	-25.61
0.181500	48.84	---	64.42	-15.58

7.3 20dB & 99% Bandwidth

EUT: PX102
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.215
 Comment: 3.7VDC

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed



20dB bandwidth
1128.800 kHz

99% bandwidth
1005.789 kHz

7.4 Antenna Requirement

EUT: PX102
Op Condition: Operated, TX Mode
Test Specification: FCC15.203
Comment: 3.7VDC

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Limit

For intentional device, according to FCC Title 47 Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Connector Construction

The antenna used in this product is integrated PCB antenna, which in accordance to section 15.203, is considered sufficient to comply with the antenna requirement.

8 Appendix A - General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1, For frequencies between 100 MHz to 6GHz and test separation distances ≤ 50 mm, the Numeric threshold is determined as:

Step a)

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR

>> The fundamental frequency of the EUT is 2402-2480MHz,
the test separation distance is ≤ 50 mm.
(Manufacturer specified the separation distance is: 20mm)

Step b)

>> Numeric threshold (2457MHz), $\text{mW} / 20\text{mm} \cdot \sqrt{2.457\text{GHz}} \leq 3.0$
Numeric threshold (2457MHz) $\leq 38.278\text{mW}$

>> The power of EUT measured (2457MHz) is: $0.34\text{dBm} = 1.081\text{mW}$
Which is smaller than the Numeric threshold.
Therefore, the device is exempt from stand-alone SAR test requirements.

Appendix A - Conducted power

EUT: PX102
Op Condition: Operated, TX Mode (2457MHz)
Comment: 3.7VDC
Remark: NA

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

