

FCC - TEST REPORT

Report Number : **60.790.18.001.01R02** Date of Issue : May 16, 2018

Model : **SBC-D04, SBC-D03**

Product Type : **LEVO TT HMI-GPS, LEVO TT HM**

Applicant : **DAYTON INDUSTRIAL CO., LTD**

Address : **2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong**

Production Facility : **KENDY ENTERPRISE LTD**

Address : **2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong**

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:	LEVO TT HMI-GPS, LEVO TT HM
Model no.:	SBC-D04, SBC-D03
FCC ID:	O4GTTHMI
Rating:	12 VDC
Frequency:	2457MHz, 2402MHz-2480MHz
Antenna gain:	0 dBi
Number of operated channel:	40
Modulation:	GFSK



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 Hong Kong Ltd.
3/F, West Wing, Lakeside 2,
10 Science Park West Avenue,
Science Park, Shatin, Hong Kong

Site 2

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 2
FCC Title 47 Part 15.207 Conduct Emission	NIL
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	Site 2
FCC Title 47 Part 15.203 Antenna Requirement	Site 2

4.1 Test Equipment Site List

Radiated emission Test – Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7
Attenuator	Agilent	8491A	MY39264334	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Bandwidth Test– Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2018-7-7
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2018-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2018-7-7

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted RF test	2.04dB

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	NIL	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
FCC Title 47 Part 15.215 20dB & 99% Bandwidth	12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FCC Title 47 Part 15.203 Antenna Requirement	13	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6 General Remarks

Remarks

Client informs that the product LEVO TT HM, model SBC-D03 has the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with LEVO TT HMI-GPS, model SBC-D04. The only difference lies on that, SBC-D04 has GPS receiving feature, while SBC-D03 not has. (Client's conformation letter shown at appendix C)

EMC Tests were performed on model: SBC-D04.

SUMMARY:

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

■ - Performed

□ - **Not** Performed

- The Equipment Under Test

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

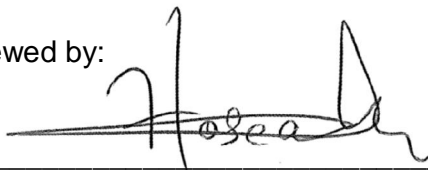
□ - **Does not** fulfill the general approval requirements.

Sample Received Date: February 28, 2018

Testing Start Date: March 7, 2018

Testing End Date: April 9, 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: SBC-D04
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.205,15.209 & 15.249, Antenna: Horizontal
 Comment: 12 VDC
 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
37.556	17.86	40	-22.14	Quasi Peak
197.595	21.87	43.5	-21.63	Quasi Peak
324.016	28.89	46	-17.11	Quasi Peak
875.409	31.04	46	-14.96	Quasi Peak
1257.563	33.61	54	20.39	Peak
2457.000	92.16	114	-21.84	Peak
2457.000	84.98	94	-9.02	Average
2561.625	43.07	54	-10.93	Peak
4913.906	57.36	74	-16.64	Peak
4913.906	40.10	54	-13.9	Average

Radiated Emission

EUT: SBC-D04
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.205,15.209 & 15.249, Antenna: Vertical
 Comment: 12 VDC
 Remark: 9kHz to 25GHz

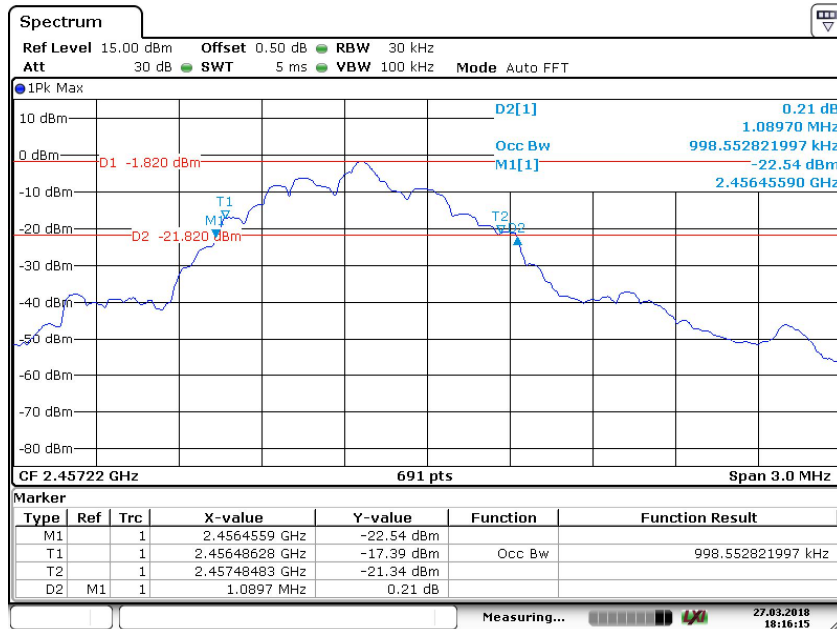
Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
60.611	20.16	40	-19.84	Quasi Peak
252.023	22.35	46	-23.65	Quasi Peak
287.966	25.85	46	-20.15	Quasi Peak
874.330	-26.74	46	-19.26	Quasi Peak
1254.938	33.35	54	-20.65	Peak
2457.000	87.87	114	-26.13	Peak
2457.000	78.65	94	-15.35	Average
2561.688	42.97	54	-11.03	Peak
4913.906	49.53	74	-24.47	Peak
4913.906	37.87	54	-16.13	Average

7.2 20dB & 99% Bandwidth

EUT: SBC-D04
 Op Condition: Operated, TX Mode (2457MHz)
 Test Specification: FCC15.215
 Comment: 12 VDC

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



Date: 27.MAR.2018 18:16:14

20dB bandwidth
1089.700 kHz

99% bandwidth
998.553 kHz



7.3 Antenna Requirement

EUT: SBC-D04
Op Condition: Operated, TX Mode
Test Specification: FCC15.203
Comment: 12 VDC

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)

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)]
· [$\sqrt{f(\text{GHz})}$] ≤ 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 a)

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

The power of EUT measured (2457MHz) is: $-1.35\text{dBm} = 0.733\text{mW}$

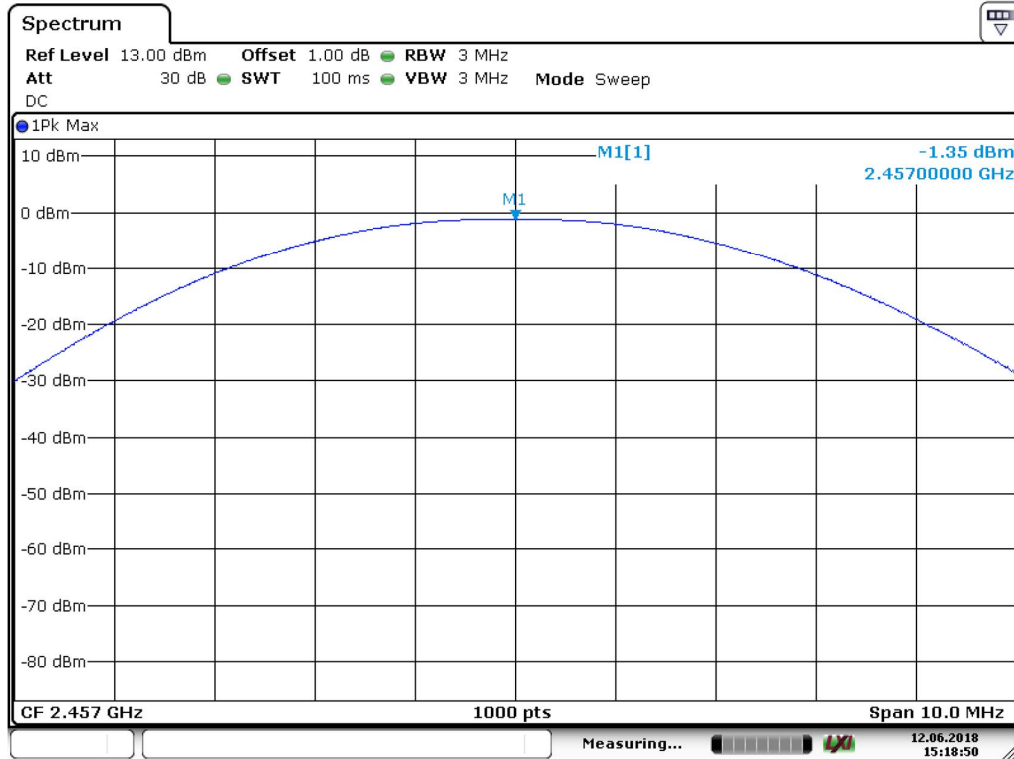
Which is smaller than the Numeric threshold.

Therefore, the device is exempt from stand-alone SAR test requirements.

Appendix A - Conducted power

EUT: SBC-D04
Op Condition: Operated, TX Mode (2457MHz)
Comment: 12 VDC
Remark: NA

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



Appendix A

To: TÜV SÜD HKG Ltd.

Attention: **Mr. Edmond Fung**

From:

Date: May 11, 2018

Fax No:

Total Page (Cover Included): 1

Declaration Letter

Subject:

We: DAYTON INDUSTRIAL CO., LTD

Officially notify TÜV SÜD HKG Ltd. that the product LEVO TT HMI, model SBC-D03 has the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with LEVO TT HMI-GPS, model SBC-D04. The only difference lies on that, SBC-D04 has GPS receiving feature, while SBC-D03 not has.

<<Additional Model >>: SBC-D03

<<Main Test Model >>: SBC-D04

<<Product>>: LEVO TT HMI-GPS, LEVO TT HMI

Applicant: DAYTON INDUSTRIAL CO., LTD

11 May 2018

(Date)



(Applicant's authorized signature and company stamp)

Name: LF Wong

Job title: Project Manager