



Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

EMC TEST REPORT

PRODUCT	Tedee Keypad PRO
BRAND	Tedee
MODEL	TKV2.0
APPLICANT	Tedee Sp. z o.o.
FCC ID	2BCK5TKV20
ISSUE DATE	November 19, 2024
STANDARD(S)	FCC Part 15, Subpart B, ANSI C63.4-2014, ICES-003 Issue 7.

Prepared by: *Li Liukai*

李柳凱

Reviewed by: *Qin Yabin*

秦亞賓

Approved by: *Zhang Min*

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1 Summary of Test Report

1.1 Test Standard (s)

No.	Test Standard(s)	Title
1	FCC Part 15, Subpart B	Radio frequency devices
2	ANSI C63.4	Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
3	ICES-003	Information Technology Equipment (Including Digital Apparatus)-Limits and Methods of Measurement
NOTE: According to customer requirements, test and report using the latest version of the standard.		

1.2 Summary of Test Results

No.	Item(s)	FCC Standard(s)	IC Standard(s)	Verdicts for Single Item	Detailed Results
1	Radiated Emission	15.109(a)	3.2.2	Pass	See section 6.1
2	AC Conducted Emission	15.107(a)	3.2.1	N/A	N/A
NOTE: The TKV2.0, manufactured by Tedee Sp. z o.o. is a new product for testing. Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3. Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report. This project EUT can only be powered by battery or DC power supply, so we only test Radiated Emission.					

2 General Information of The Laboratory

2.1 Testing Laboratory

Lab Name	Industrial Internet Innovation Center (Shanghai) Co.,Ltd.
Address	Building 4, No. 766, Jingang Road, Pudong, Shanghai, China
Telephone	021-68866880
FCC Registration No.	708870
FCC Designation No.	CN1364
IC designation No.	10766A
CAB identifier	CN0067

2.2 Laboratory Environmental Requirements

Temperature	15℃~35℃
Relative Humidity	25%RH~75%RH
Atmospheric Pressure	86kPa~106kPa
Supply Voltage	Battery powered or DC 12V powered

2.3 Project Information

Project Manager	Zhang Heng
Test Date	September 26, 2024 to October 29, 2024

3 General Information of The Customer

3.1 Applicant

Company	Tedee Sp. z o.o.
Address	Karola Bohdanowicza 21/57 Street
Telephone	+48 519 176 611

3.2 Manufacturer

Company	Tedee Sp. z o.o.
Address	Karola Bohdanowicza 21/57 Street
Telephone	+48 519 176 611

3.3 Factory

Company	N/A
Address	N/A

4 General Information of The Product

4.1 Product Description for Equipment under Test (EUT)

Product	Tedee Keypad PRO
Model	TKV2.0
Date of Receipt	October 28, 2024
EUT ID*	S13aa
SN/IMEI	N/A
Supported Radio Technology and Bands	BT 5.0 LE NFC
Hardware Version	P3
Software Version	V2.0
NOTE1: EUT ID is the internal identification code of the laboratory. NOTE2: Photographs of EUT are shown in ANNEX A of this test report. NOTE3: Samples in the test report are provided by the customer. The test results are only applicable to the samples received by the laboratory.	

4.2 Description for Auxiliary Equipment (AE)

AE ID*	Description	Model	SN/Remark
AE1	DC Cable	N/A	N/A
AE2	Battery	LR03	1.5V
AE3	Storage battery	N/A	DC 12V
AE4	Phone	Nop-an00	N/A
AE5	BT connection software	nRF connect	N/A
NOTE: *AE ID is the internal identification code of the laboratory.			

5 Test Configuration Information

5.1 Laboratory Environmental Conditions

5.1.1 Permanent Facilities

Semi-anechoic chamber SAC3-1 (9 m*8m*6.2m) & SAC3-2 (9.8m*6.7m*6.7m)	
Shielding effectiveness	0.014MHz ~1MHz, >60dB; 1MHz~1000MHz, >90dB.
Electrical insulation	> 2M Ω
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< $\pm$ 4 dB, 3m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (SVSWR)	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

Shielded room	
Shielding effectiveness	0.014MHz~1MHz, >60dB; 1MHz~1000MHz, >90dB.
Electrical insulation	> 2 M Ω
Ground system resistance	< 4 Ω

5.2 Decision of final test mode

The EUT was tested in conjunction with the accessories in Section 4.2. We tested all of the following test modes and selected the worst mode from the test results and recorded them in the report.

The test configuration modes are as the following:

Test Item	Test setup and operating modes
Radiated emission	30MHz-18GHz frequency range: Mode 1: BT connect mode+ AE2+ AE4+ AE5 Mode 2: BT connect mode+ AE1+ AE3+ AE4+ AE5
Note: 1. The worst case of radiated emission for 30MHz-1GHz is Mode 2 and for 1GHz -18GHz is Mode 1.	

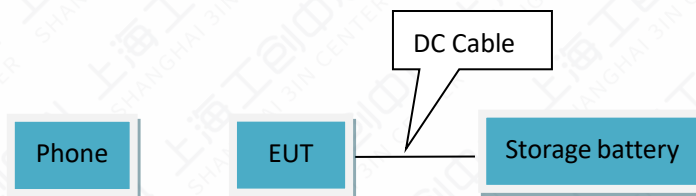
5.3 EUT System Operation

1. Connect the EUT with AE.
2. Setup the EUT according to the standard, connect the EUT and Phone with nRF connect APK.
3. Start testing and monitoring the function.

5.4 EUT Connection Diagram of Test System



<Figure 5.5-1> Mode 1



<Figure 5.5-2> Mode 2

5.5 Test Equipment Utilized

No.	Name	Model	S/N	SW Version	HW Version	Manufacturer	Cal. Date	Cal. Interval
1	Test Receiver	ESR7	102399	1.4	00	R&S	2024-06-07	1 year
2	Test Receiver	FSW43	101943	1.12	00	R&S	2024-08-21	1 year
3	Trilog Antenna	VULB9162	00426	N/A	N/A	Schwarzbeck	2024-08-02	1 year
4	Double Ridged Guide Antenna	ETS-3117	00135885	N/A	N/A	ETS	2024-03-26	1 year
5	EMI Test Software	EMC32 V10.60.20	N/A	N/A	N/A	R&S	N/A	N/A
6	Preamplifier	SCU08F1	8320024	N/A	N/A	R&S	2023-10-16	1 year
7	Preamplifier	SCU18	10155	N/A	N/A	R&S	2023-10-16	1 year

5.6 Measurement Uncertainty

Item (s)	Uncertainty
Radiated Emission 30MHz-1000MHz	4.86 dB
Radiated Emission 1000MHz-18000MHz	5.58 dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.	

6 Test Results

6.1 Radiated Emission

6.1.1 Method of Measurement

- a. For 30MHz -1000MHz, the EUT was placed on the top of a rotating 0.8m table above the ground at a semi-anechoic chamber. The distance between the EUT and the received antenna was 3 meters. The table was rotated 360 degree and the received antenna mounted on a variable-height antenna tower was varied from 1m to 4m to find the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were set during the measurement.
- b. For 1000MHz -18000MHz, the EUT was placed on the top of a 0.8m table above the ground at a 3m fully anechoic chamber. The maximal emission value was acquired by adjusting the antenna height, The table was rotated 360 degrees to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were set during the measurement

6.1.2 EUT Connection Diagram of Test System

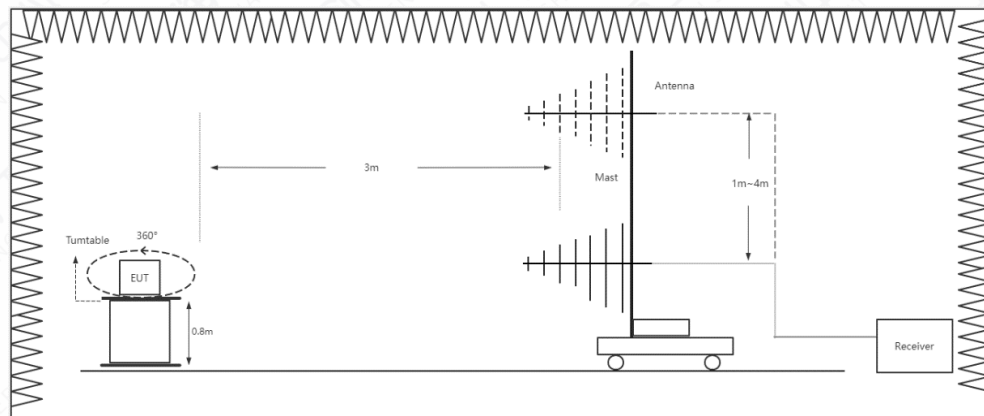


Figure 6.1.2-1 RE 30MHz-1GHz Connection Diagram

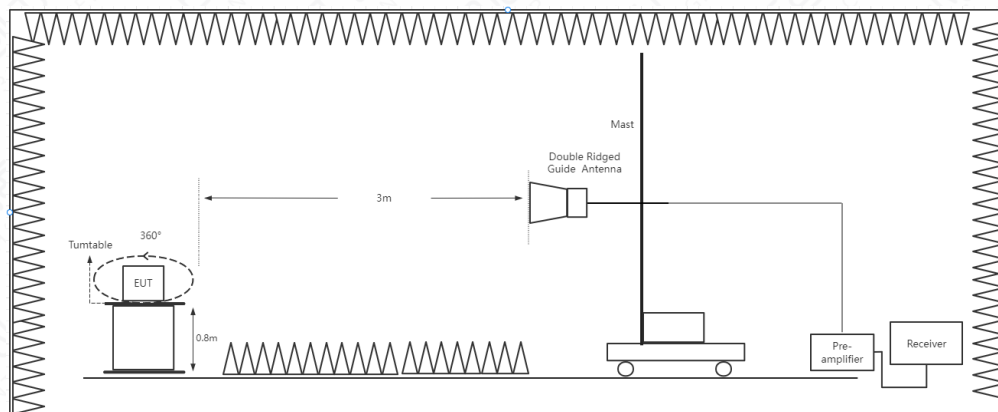


Figure 6.1.2-2 RE Above 1GHz Connection Diagram

6.1.3 Test Condition

Frequency Range (MHz)	RBW/VBW	Sweep Time (s)
30-1000	120kHz/300kHz	AUTO
1000-18000	1MHz/3MHz	AUTO

6.1.4 Limit/Criterion

Frequency Range (MHz)	Quasi-Peak (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
30-88	40	N/A	N/A
88-216	43.5	N/A	N/A
216-960	46	N/A	N/A
Above 960	54	N/A	N/A
Above 1000	N/A	74	54

6.1.5 Test environmental conditions

Temperature	25.8℃
Relative Humidity	47.3%RH
Atmospheric Pressure	101.5 kPa

6.1.6 Test Results

Mode	Frequency (MHz)	Test Results	Verdicts
Mode 2: BT connect mode+ AE1+ AE3+ AE4+ AE5	30-1000	See Annex A.1-1	Pass
Mode 1: BT connect mode+ AE2+ AE4+ AE5	1000-18000	See Annex A.1-2 & A.1-3	Pass
NOTE Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A			

Annex A: Measurement Data

A.1 Radiated Emission

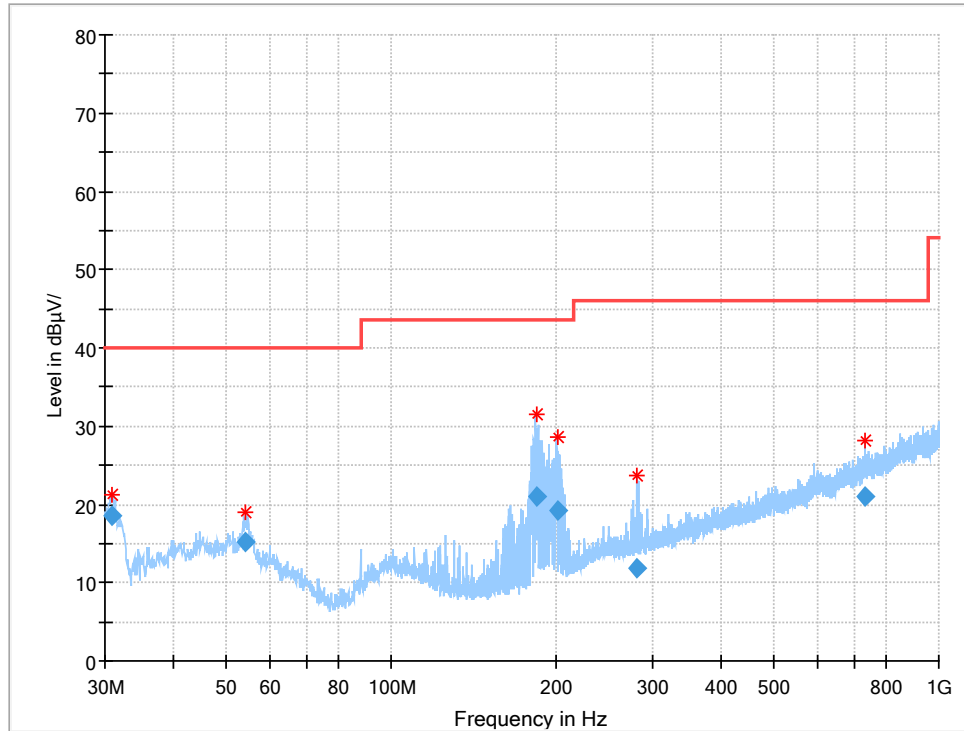


Figure A.1-1 Mode 2 (30M-1GHz)

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.792000	18.57	40.00	21.43	100.0	V	0.0	-16.1
54.175560	15.11	40.00	24.89	100.0	V	358.0	-11.8
183.959760	20.91	43.50	22.59	200.0	H	291.0	-14.0
201.170840	19.17	43.50	24.33	100.0	H	107.0	-13.0
281.883160	11.90	46.00	34.10	100.0	H	63.0	-10.3
733.938880	20.98	46.00	25.02	200.0	V	84.0	-0.4

Note:

1.Horizontal and vertical polarity is all have been tested, the result of them is synthesized in the above data diagram.

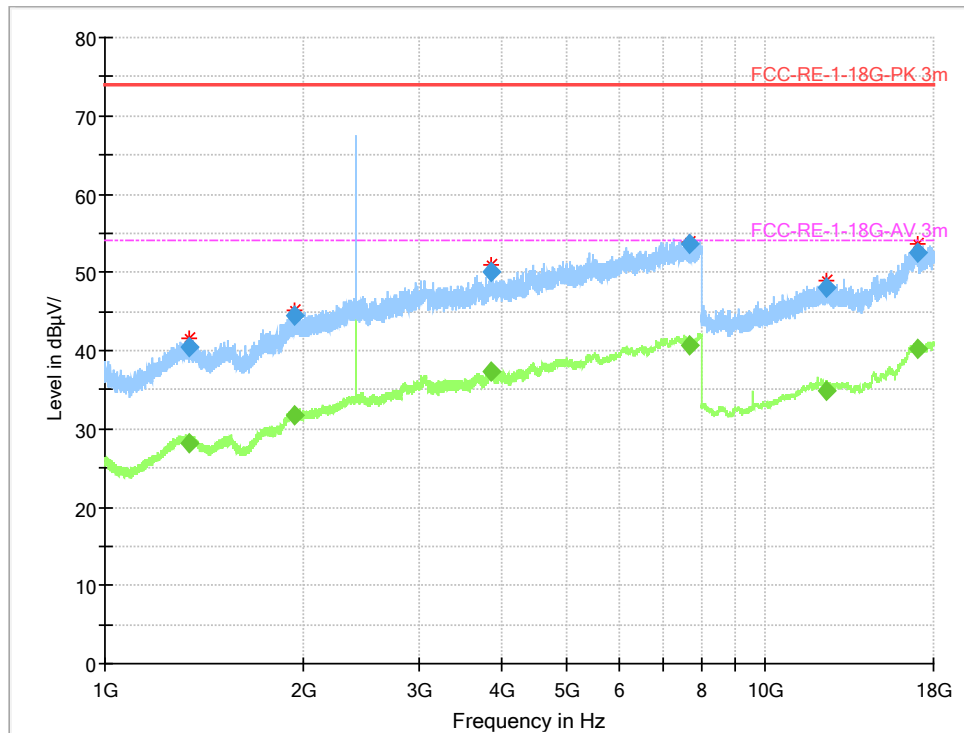


Figure A.1-2 Mode 1 (1GHz-18GHz)-H

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1342.211250	---	28.20	54.00	25.80	185.0	H	1.0	3.1
1342.211250	40.42	---	74.00	33.58	185.0	H	1.0	3.1
1940.701250	---	31.78	54.00	22.22	115.0	H	255.0	6.7
1940.701250	44.56	---	74.00	29.44	115.0	H	255.0	6.7
3848.351250	50.00	---	74.00	24.00	185.0	H	179.0	13.3
3848.351250	---	37.39	54.00	16.61	185.0	H	179.0	13.3
7670.712500	---	40.72	54.00	13.28	204.0	H	0.0	20.7
7670.712500	53.73	---	74.00	20.27	204.0	H	0.0	20.7
12411.238750	47.99	---	74.00	26.01	109.0	H	359.0	15.3
12411.238750	---	34.90	54.00	19.10	109.0	H	359.0	15.3
16996.478750	---	40.12	54.00	13.88	215.0	H	1.0	22.0
16996.478750	52.49	---	74.00	21.51	215.0	H	1.0	22.0

Note: The signal over the limit is the main frequency signal.

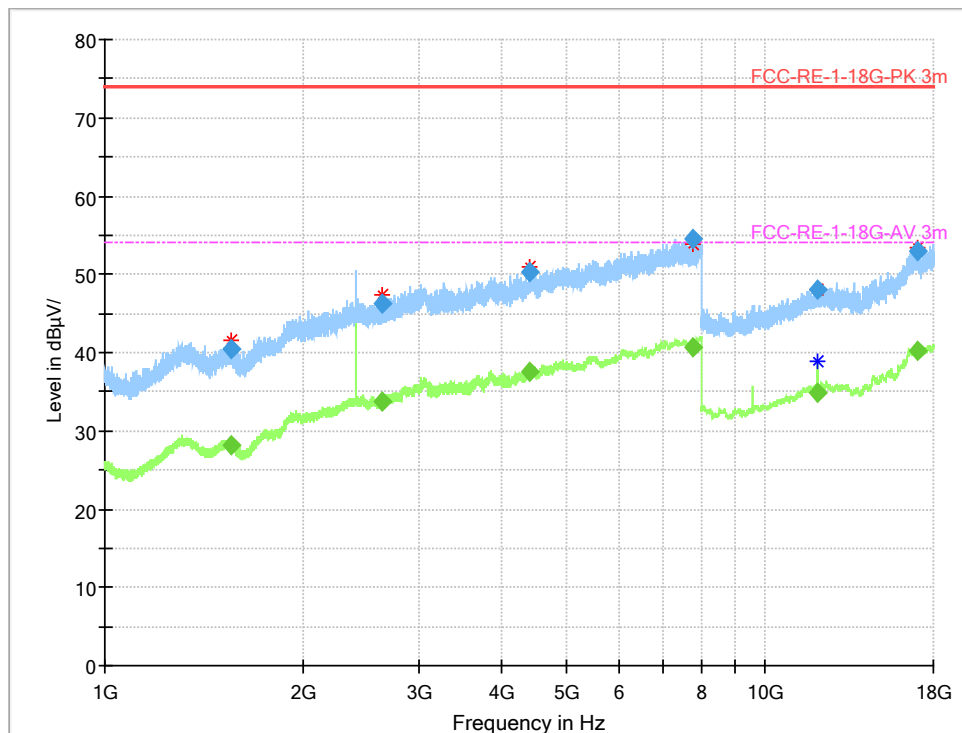


Figure A.1-3 Mode 1 (1GHz-18GHz)-V

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1551.497500	---	28.07	54.00	25.93	187.0	V	0.0	3.0
1551.497500	40.42	---	74.00	33.58	187.0	V	0.0	3.0
2632.585000	---	33.80	54.00	20.20	115.0	V	117.0	9.1
2632.585000	46.16	---	74.00	27.84	115.0	V	117.0	9.1
4409.190000	---	37.50	54.00	16.50	201.0	V	245.0	14.2
4409.190000	50.18	---	74.00	23.82	201.0	V	245.0	14.2
7776.107500	54.60	---	74.00	19.40	115.0	V	331.0	20.6
7776.107500	---	40.73	54.00	13.27	115.0	V	331.0	20.6
12004.945000	---	34.77	54.00	19.23	211.0	V	132.0	14.0
12004.945000	47.98	---	74.00	26.02	211.0	V	132.0	14.0
16992.465000	---	40.19	54.00	13.81	185.0	V	132.0	22.0
16992.465000	52.88	---	74.00	21.12	185.0	V	132.0	22.0

Annex B: Revised History

Version	Revised Content
V0	Initial

Annex C: Accreditation Certificate