

APPLICATION FOR VERIFICATION
On Behalf of
Superior Electronics Corporation

SPLIT-SERIES KEYPAD
Model No.: SK-4131-SPKQ

FCC ID: K4E4131SPKQ

Prepared for : Superior Electronics Corporation
Address : No. 10, Lane 31, Chongde St., Sinyi District, Taipei City
110. Taiwan
Prepared by : Accurate Technology Co., Ltd.
Address : F1, Bldg. A&D, Changyuan New Material Port, Keyuan
Rd., Science & Industry Park, Nanshan District, Shenzhen
518057, P.R. China

Tel: +86-755-26503290
Fax: +86-755-26503396

Report No. : ATE20161145
Date of Test : June 17, 2016
Date of Report : June 17, 2016

TABLE OF CONTENTS

Description	Page
Test Report Declaration	
1. TEST RESULTS SUMMARY	4
2. GENERAL INFORMATION.....	5
2.1. Description of Device (EUT).....	5
2.2. Special Accessory and Auxiliary Equipment.....	5
2.3. Description of Test Facility	6
2.4. Measurement Uncertainty.....	6
3. POWER LINE CONDUCTED MEASUREMENT.....	7
3.1. For Power Line Conducted Emission.....	7
3.2. The Emission Limit.....	7
3.3. Power Line Conducted Emission Measurement Results.....	7
4. RADIATED EMISSION MEASUREMENT	8
4.1. For Radiated Emission Measurement	8
4.2. TEST CONFIGURATION.....	8
4.3. Block Diagram of Test Setup	9
4.4. Radiated Emission Limit	9
4.5. EUT Configuration on Measurement	9
4.6. Operating Condition of EUT	10
4.7. Test Procedure	10
4.8. Radiated Emission Noise Measurement Result.....	11
5. ANTENNA REQUIREMENT.....	16
5.1. The Requirement	16
5.2. Antenna Construction.....	16

Test Report Declaration

Applicant& address : Superior Electronics Corporation
No. 10, Lane 31, Chongde St., Sinyi District, Taipei City 110.
Taiwan

Manufacturer& address : Superior Electronics Corporation
No. 10, Lane 31, Chongde St., Sinyi District, Taipei City 110.
Taiwan

Product : SPLIT-SERIES KEYPAD

Model No. : SK-4131-SPKQ

Trade name : N/A

Measurement Procedure Used:

**FCC Rules and Regulations Part 15 Subpart C 15.207&15.209
FCC/ANSI C63.4-2014**

The device described above is tested by Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both radiated and conducted emissions. The measurement results are contained in this test report and Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

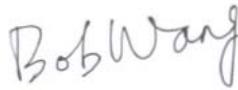
This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Accurate Technology Co., Ltd.

Date of Test :
Date of Report :

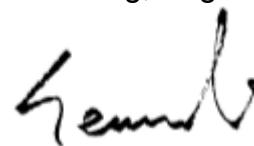
June 17, 2016

June 17, 2016

Prepared by :


(Bob Wang, Engineer)

Approved & Authorized Signer :


(Sean Liu, Manager)

1. TEST RESULTS SUMMARY

Test Items	Test Standard	Test Results
Power Line Conducted Emission	FCC Part 15.207	N/A (Battery power supply)
Radiated Emission	FCC Part 15.209	Pass

Remark: "N/A" means "Not applicable".

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

The submitted sample is a SPLIT-SERIES KEYPAD.

The sample is powered by DC 12-24V .

		SPLIT-SERIES KEYPAD
Frequency	:	125KHz
Number of Channels	:	1
Modulation Type	:	GFSK
Type of Antenna	:	Internal Antenna
Max antenna gain	:	0dBi
Power Supply	:	DC 12-24V

2.2. Special Accessory and Auxiliary Equipment

N/A

2.3. Description of Test Facility

EMC Lab : Accredited by TUV Rheinland Shenzhen, May 10, 2004

Listed by FCC

The Registration Number is 253065

Listed by FCC

The Registration Number is 752051

Listed by Industry Canada

The Registration Number is 5077A-1

Listed by Industry Canada

The Registration Number is 5077A-2

Accredited by China National Accreditation Committee for Laboratories

The Certificate Registration Number is L3193

Name of Firm : Accurate Technology Co., Ltd.

Site Location : F1, Bldg. A&D, Changyuan New Material Port, Keyuan Rd., Science & Industry Park, Nanshan District, Shenzhen 518057, P.R. China

2.4. Measurement Uncertainty

Conducted emission expanded uncertainty : $U=2.23\text{dB}$, $k=2$

Power disturbance expanded uncertainty : $U=2.92\text{dB}$, $k=2$

Radiated emission expanded uncertainty : $U=3.08\text{dB}$, $k=2$
(9kHz-30MHz)

Radiated emission expanded uncertainty : $U=4.42\text{dB}$, $k=2$
(30MHz-1000MHz)

Radiated emission expanded uncertainty : $U=4.06\text{dB}$, $k=2$
(Above 1GHz)

3. POWER LINE CONDUCTED MEASUREMENT

3.1. For Power Line Conducted Emission

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCS30	100307	Jan. 9, 2016	1 Year
2.	L.I.S.N.	Schwarzbeck	NLSK8126	8126431	Jan. 9, 2016	1 Year
3.	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100815	Jan. 9, 2016	1 Year
4.	50Ω Coaxial Switch	Anritsu Corp	MP59B	6200283933	Jan. 9, 2016	1 Year

Expanded Uncertainty: U= 2.23dB, k=2

3.2. The Emission Limit

3.2.1. Conducted Emission Measurement Limits According to Section 15.107(a)

Frequency (MHz)	Limit dB(µV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0

* Decreases with the logarithm of the frequency.

3.3. Power Line Conducted Emission Measurement Results

N/A

Because of battery power supply.

4. RADIATED EMISSION MEASUREMENT

4.1. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 9, 2016	1 Year
2.	Test Receiver	Rohde & Schwarz	ESCS30	100307	Jan. 9, 2016	1 Year
3.	Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 14, 2016	1 Year
4.	Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 14, 2016	1 Year
5.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 14, 2016	1 Year
6.	50 Coaxial Switch	Anritsu Corp	MP59B	6200506474	Jan. 9, 2016	1 Year
12.	Pre-Amplifier	Rohde & Schwarz	CBLU11835 40-01	3791	Jan. 9, 2016	1 Year

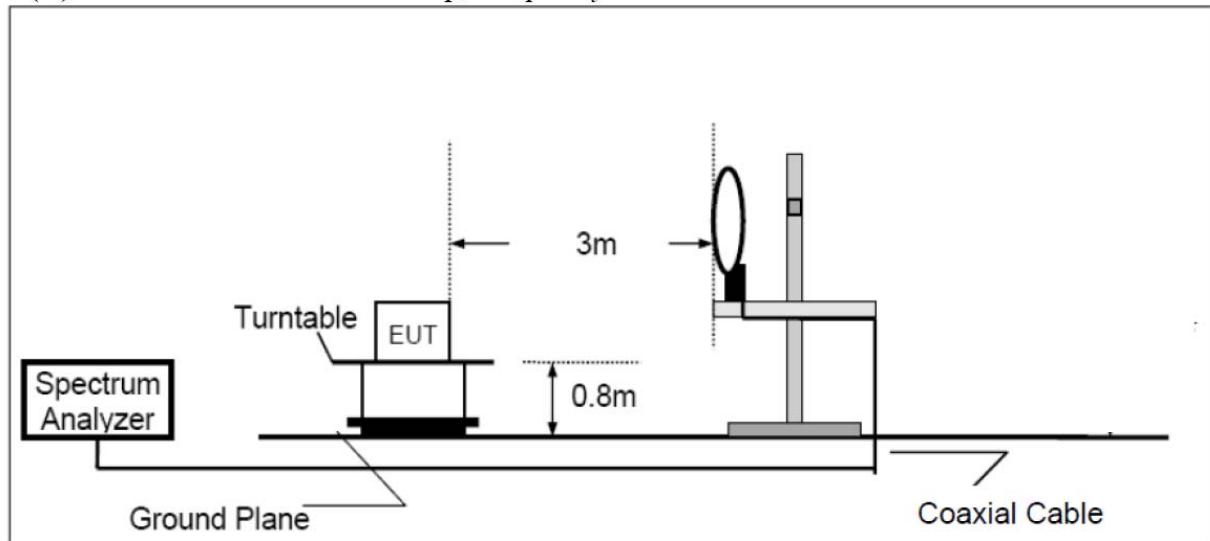
Expanded Uncertainty (9kHz-30MHz): $U=3.08\text{dB}$, $k=2$

Expanded Uncertainty (30MHz-1000MHz): $U=4.42\text{dB}$, $k=2$

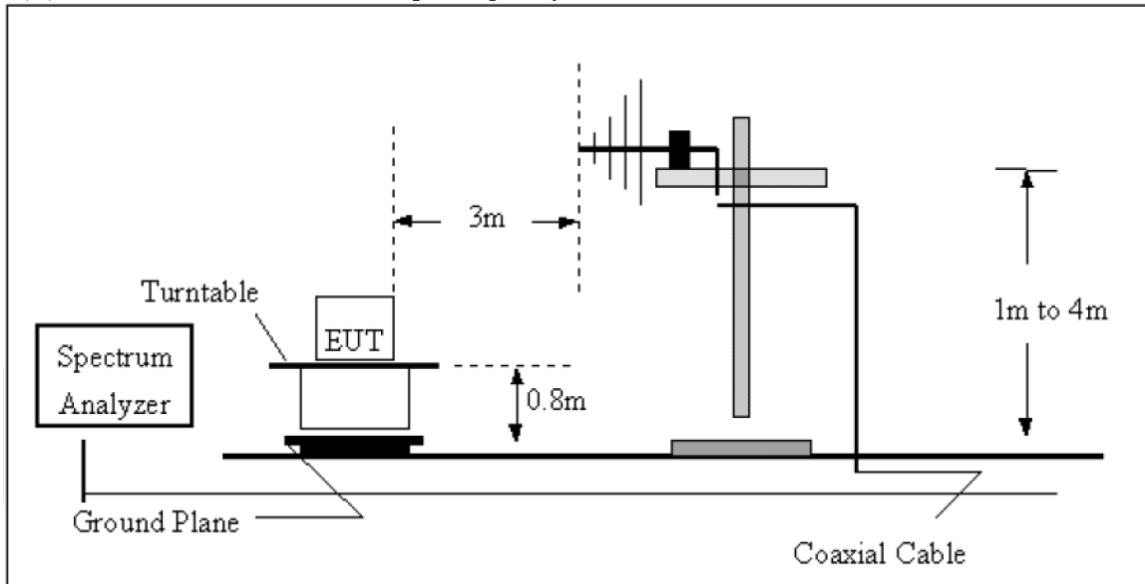
Expanded Uncertainty (Above 1GHz): $U=4.06\text{dB}$, $k=2$

4.2. TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz



4.3. Block Diagram of Test Setup

4.3.1. Block diagram of connection between the EUT and simulators



4.4. Radiated Emission Limit

Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

Limit: $2400/125=19.2\mu\text{V}/\text{m}$ @ 300m

Distance Correction Factor = $40\log(\text{test distance}/\text{specific distance})$

4.5. EUT Configuration on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.6.Operating Condition of EUT

- 4.6.1.Setup the EUT and simulator as shown as Section 4.2.
- 4.6.2.Turn on the power of all equipment.
- 4.6.3.Let the EUT work in test mode and measure it.

4.7.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10:2013 on radiated emission measurement.

From 9kHz to 30MHz at distance 3m The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

From 30MHz to 1000MHz at distance 3m The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The final measurement will be performed with an EMI Receiver set to Quasi Peak detector for the frequency bands 9kHz to 90kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).

The final level, expressed in dB_{UV}/m, is arrived at by taking the reading from the EMI receiver(Level dB_{UV}) and adding the antenna correction factor and cable loss factor(Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwidth during the measurement is as follows:

9kHz – 150kHz: ResBW:200Hz

150kHz – 30MHz: ResBW:9kHz

The bandwidth of the EMI test receiver (R&S ESCS30) is set at 120kHz from 30MHz to 1000MHz.

4.8.Radiated Emission Noise Measurement Result

PASS.

From 9 kHz to 30MHz (DC 12V)

Frequency (MHz)	Quasi Peak (dB μ V/m)	Azimuth	Polarity (H/V)	Factors (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.125	72.56	147	H	-56.36	105.7	-33.14
2.02	36.24	34	H	-54.15	69.5	-33.26
14.25	38.77	210	H	-53.01	69.5	-30.73
0.125	73.27	220	V	-56.36	105.7	-32.43
3.68	43.50	320	V	-51.27	69.5	-26.00
17.35	35.57	54	V	-51.25	69.5	-33.93

From 9 kHz to 30MHz (DC 24V)

Frequency (MHz)	Quasi Peak (dB μ V/m)	Azimuth	Polarity (H/V)	Factors (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.125	69.04	41	H	-56.77	105.7	-36.66
2.02	40.84	154	H	-54.32	69.5	-28.66
14.25	36.55	222	H	-52.16	69.5	-32.95
0.125	71.50	75	V	-56.01	105.7	-34.20
3.68	42.95	290	V	-53.12	69.5	-26.55
17.35	35.71	259	V	-51.31	69.5	-33.79

Part 15 Section 15.31(f)(2) (9kHz-30MHz)

Limit at 3m=Limit at 300m-40*log(300(m)/3(m))

Limit at 3m=Limit at 30m-40*log(30(m)/3(m))



ACCURATE TECHNOLOGY CO., LTD.

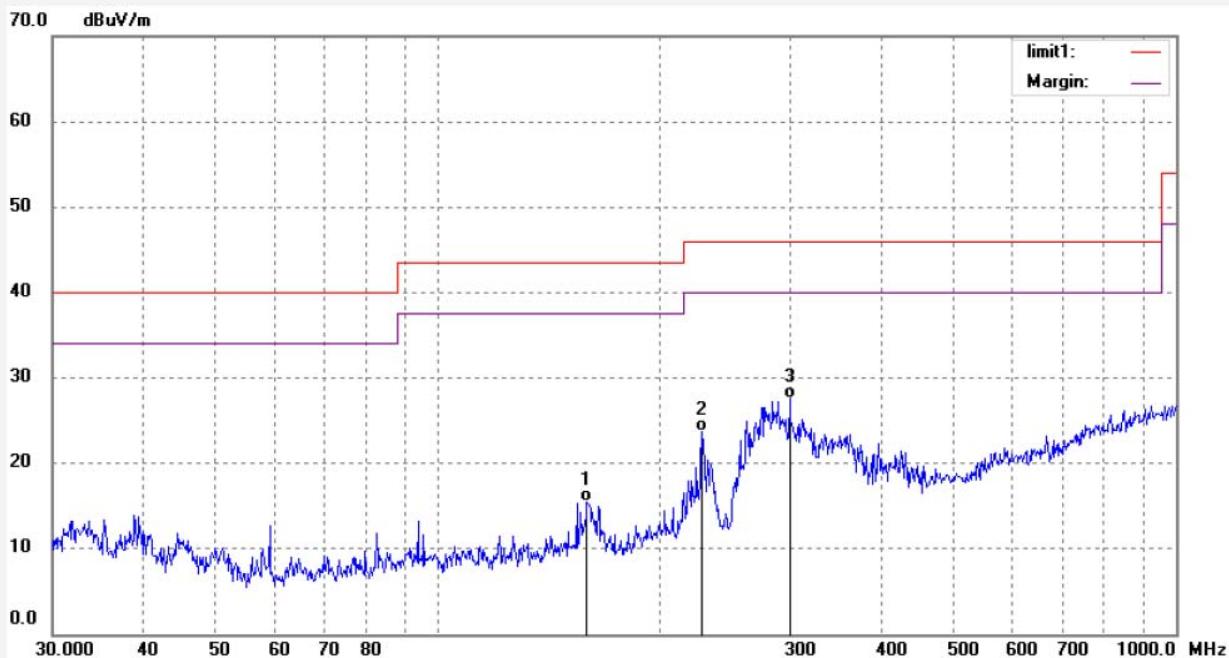
F1,Bldg.A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: Ricky 2016 #798
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: SPLIT-SERIES KEYPAD
Mode: TX 125KHz
Model: SK-4131-SPKQ
Manufacturer: Superior Electronics Corporation

Polarization: Vertical
Power Source: DC 12V
Date: 16/06/17/
Time: 8/57/51
Engineer Signature: Ricky
Distance: 3m

Note: Report No.:ATE20161145



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	159.1983	36.93	-21.42	15.51	43.50	-27.99	QP			
2	227.8155	42.11	-18.33	23.78	46.00	-22.22	QP			
3	299.6441	43.86	-16.28	27.58	46.00	-18.42	QP			



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: Ricky 2016 #797

Polarization: Horizontal

Standard: FCC Class B 3M Radiated

Power Source: DC 12V

Test item: Radiation Test

Date: 16/06/17/

Temp. (C)/Hum.(%) 25 C / 55 %

Time: 8/56/38

EUT: SPLIT-SERIES KEYPAD

Engineer Signature: Ricky

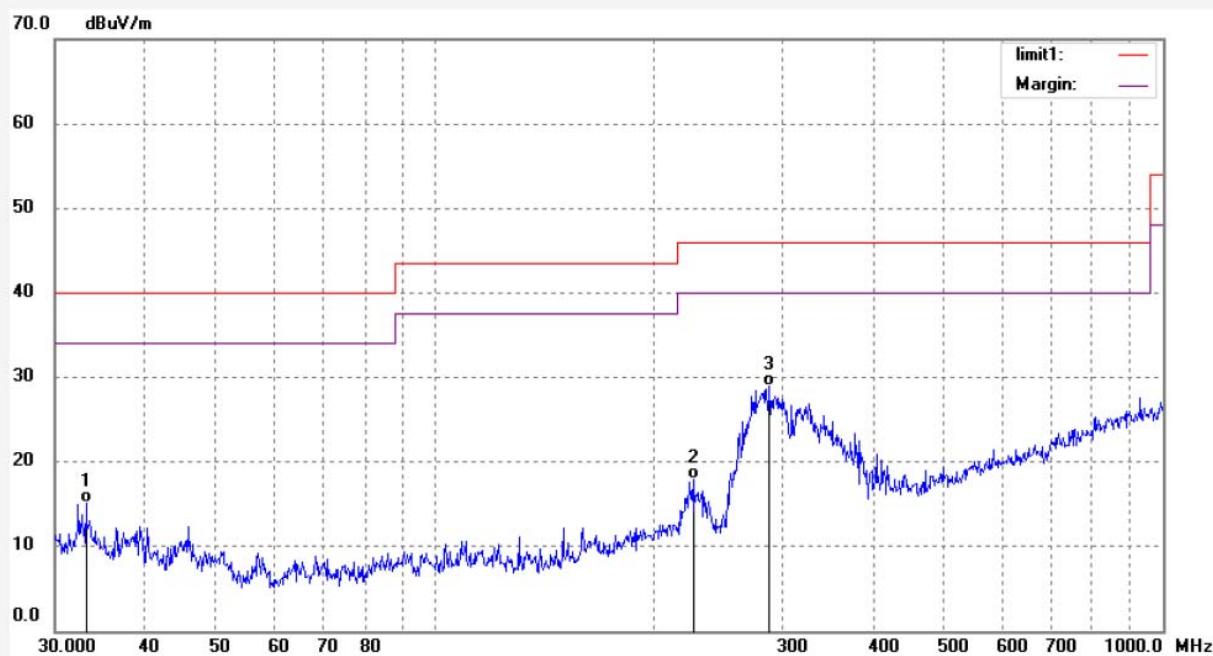
Mode: TX 125KHz

Distance: 3m

Model: SK-4131-SPKQ

Manufacturer: Superior Electronics Corporation

Note: Report No.:ATE20161145



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.1015	32.30	-17.24	15.06	40.00	-24.94	QP			
2	226.2202	36.32	-18.35	17.97	46.00	-28.03	QP			
3	288.2840	45.57	-16.53	29.04	46.00	-16.96	QP			

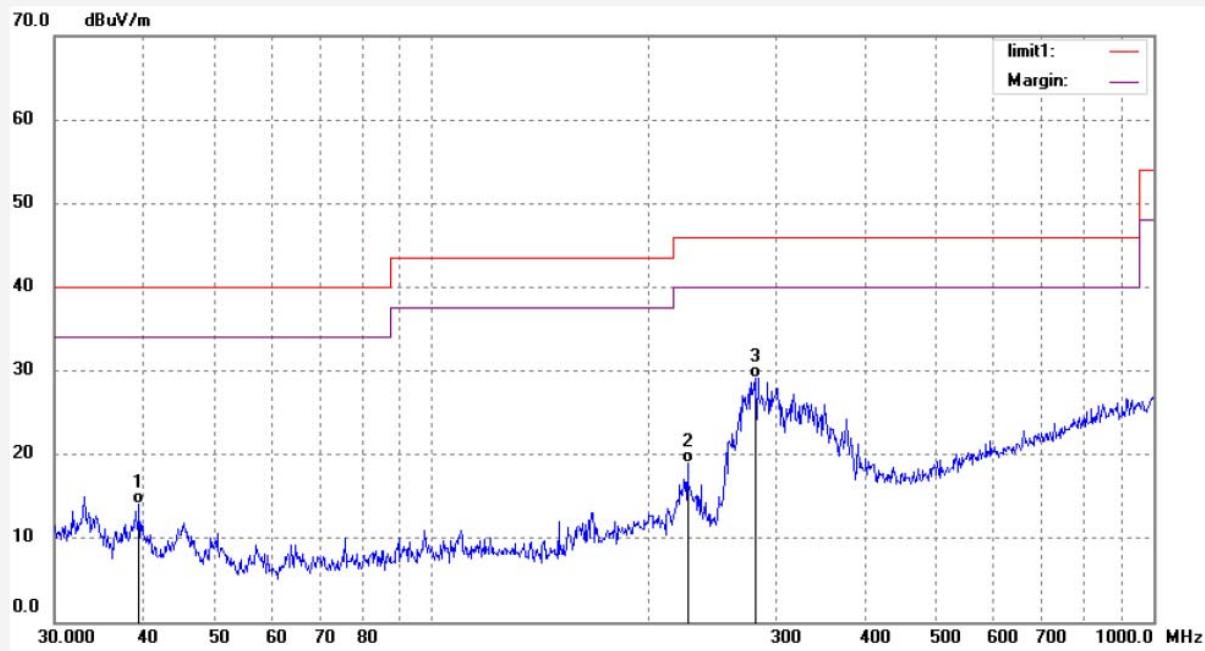


ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: Ricky 2016 #796	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 24V
Test item: Radiation Test	Date: 16/06/17/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 8/55/55
EUT: SPLIT-SERIES KEYPAD	Engineer Signature: Ricky
Mode: TX 125KHz	Distance: 3m
Model: SK-4131-SPKQ	
Manufacturer: Superior Electronics Corporation	
Note: Report No.:ATE20161145	



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	39.3204	33.03	-18.88	14.15	40.00	-25.85	QP			
2	226.2202	37.27	-18.35	18.92	46.00	-27.08	QP			
3	281.2800	45.77	-16.68	29.09	46.00	-16.91	QP			



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: Ricky 2016 #795

Polarization: Vertical

Standard: FCC Class B 3M Radiated

Power Source: DC 24V

Test item: Radiation Test

Date: 16/06/17/

Temp. (C)/Hum.(%) 25 C / 55 %

Time: 8/54/42

EUT: SPLIT-SERIES KEYPAD

Engineer Signature: Ricky

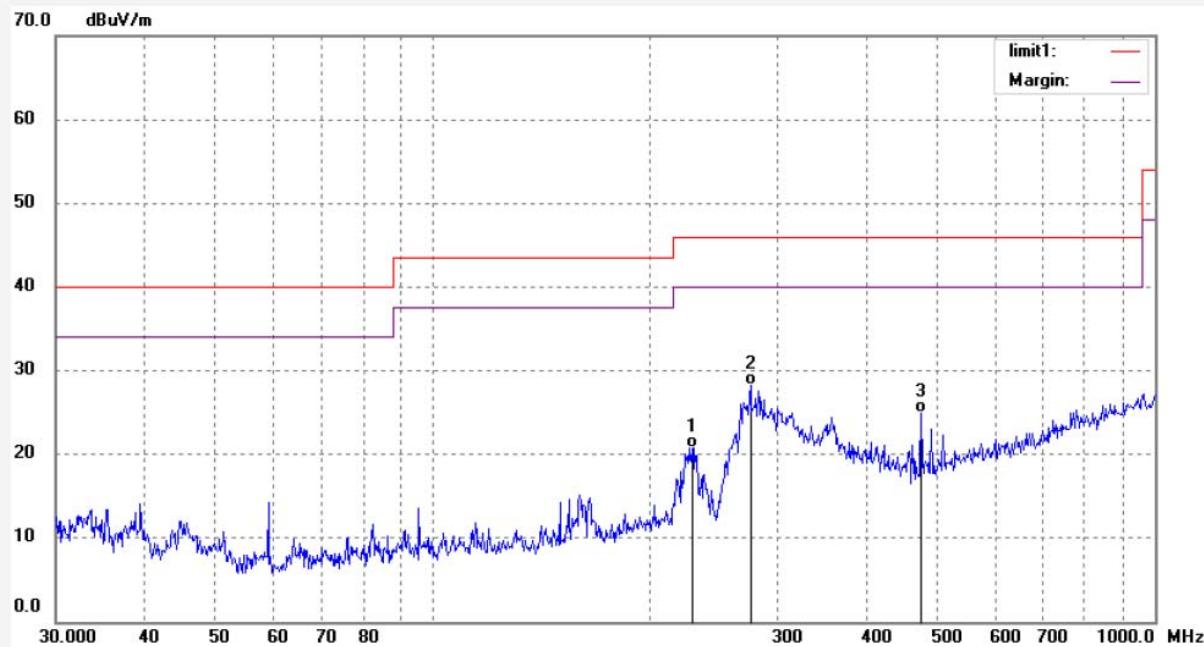
Mode: TX 125KHz

Distance: 3m

Model: SK-4131-SPKQ

Manufacturer: Superior Electronics Corporation

Note: Report No.:ATE20161145



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	228.6173	39.14	-18.32	20.82	46.00	-25.18	QP			
2	275.4124	45.16	-16.96	28.20	46.00	-17.80	QP			
3	474.7913	37.47	-12.52	24.95	46.00	-21.05	QP			

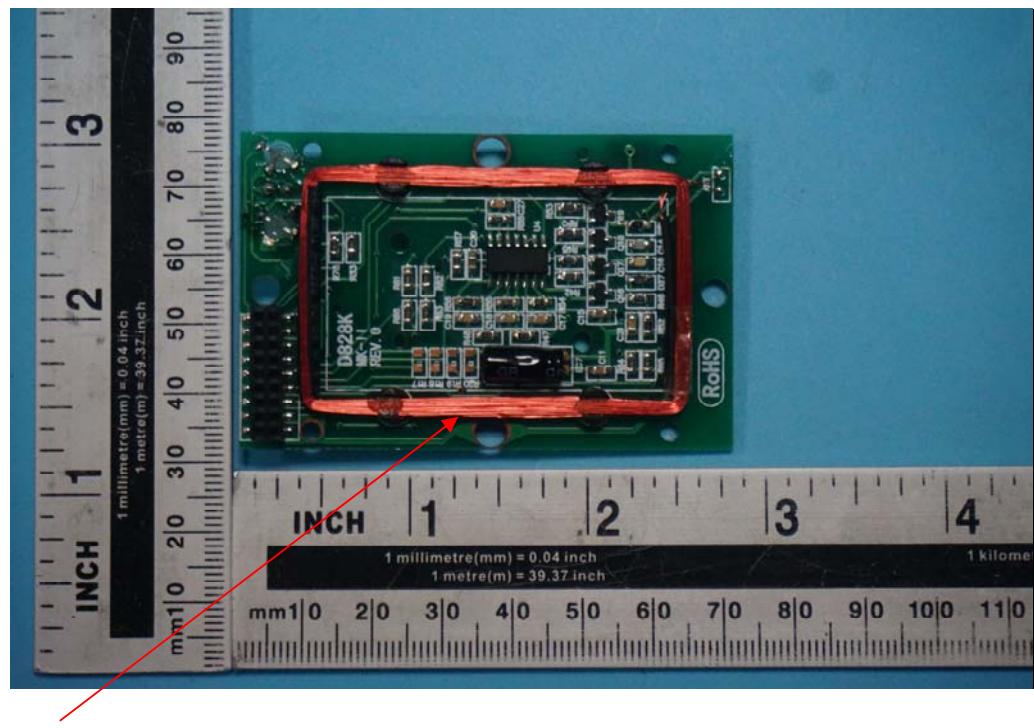
5. ANTENNA REQUIREMENT

5.1. The Requirement

According to Section 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.

5.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna