

FCC Test Report

Project No. : 1906T025
Equipment : USB Keyboard
Test Model : SKILLER SGK5
Series Model : N/A
Applicant : Sharkoon Technologies GmbH
Address : Grüninger Weg 48 35415 Pohlheim | Germany

Date of Receipt : 2019/6/6
Date of Test : 2019/6/6 ~ 2019/6/18
Issued Date : 2019/7/11
Tested by : BTL Inc.

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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	2019/7/11

1. CERTIFICATION

Equipment : USB Keyboard
Brand Name : Sharkoon
Test Model : SKILLER SGK5
Series Model : N/A
Applicant : Sharkoon Technologies GmbH
Date of Test : 2019/6/6 ~ 2019/6/18
Test Sample : Engineering Sample
Standard(s) : FCC Part 15, Subpart B Class B
ICES-003 Issue 6: 2016(updated April 2017) Class B
ANSI C63.4-2014

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCE-1-1906T025) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Emission				
Standard(s)	Test Item	Limit	Judgment	Remark
FCC Part 15, Subpart B ICES-003 Issue 6: 2016(updated April 2017)	Conducted emission	Class B	PASS	-----
	Radiated emission Below 1 GHz	Class B	PASS	-----
	Radiated emission Above 1 GHz	-----	N/A	NOTE (1) NOTE (2)

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report.
- (2) The EUT's max operating frequency is 256 KHz which does not exceeds 108 MHz, so the test will be not performed.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

C03: (VCCI RN: C-20022; FCC RN: 325517; FCC DN: TW1115)
No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Below 1 GHz):

OS02: (VCCI RN:R-20013; FCC RN: 376329; FCC DN: TW1010)
No.132-1, Ln. 329, Sec. 2, Balian Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95%**.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. Conducted emission test:

Test Site	Method	Measurement Frequency Range	U, (dB)
C03	CISPR	150 kHz ~ 30MHz	2.30

B. Radiated emission test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
OS02 (10m)	CISPR	30MHz ~ 200MHz	V	3.84
		30MHz ~ 200MHz	H	3.34
		200MHz ~ 1,000MHz	V	3.74
		200MHz ~ 1,000MHz	H	3.06

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above.

These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR} , as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR} .

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	USB Keyboard
Brand Name	Sharkoon
Test Model	SKILLER SGK5
Series Model	N/A
Model Difference	N/A
Power Source	DC voltage supplied from host system.
Power Rating	DC 5V
Products Covered	N/A

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	USB

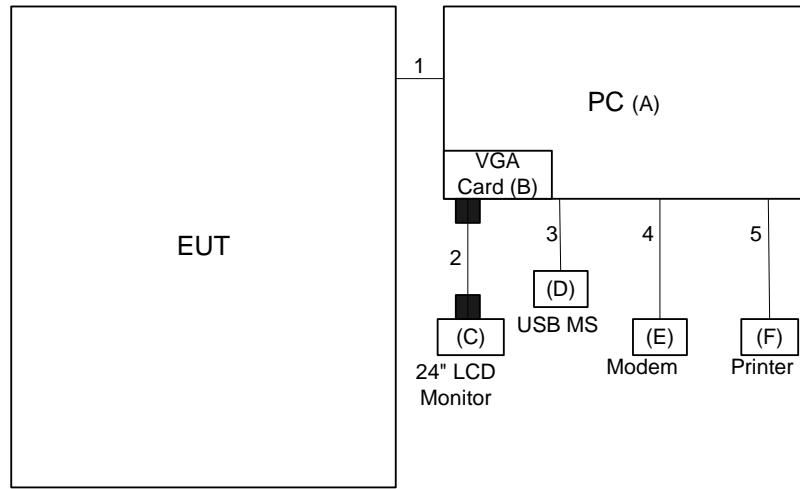
Conducted emission test	
Final Test Mode	Description
Mode 1	USB

Radiated emission test	
Final Test Mode	Description
Mode 1	USB

3.3 EUT OPERATING CONDITIONS

The PC exercise program (BurninTEST V8.0) used during radiated and/or conducted emissions measurement was designed to exercise the various system components in a manner similar to a typical use.

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



■ Ferrite core

3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	PC	DELL	OptiPlex 790 MT	DOC	64NJVBX
B	VGA Card	Gigabyte	GTX 550 Ti	DOC	122951008613
C	24" LCD Monitor	DELL	U2410f	DOC	CN-OJ257M-72872-09J-067L
D	USB Mouse	DELL	MOCZUL	DOC	CN-049TWY-PRC00-79E-01HA
E	Modem	ACEEX	DM-1414V	DOC	8041708
F	Printer	HP	SNPRH-1504	DOC	N/A

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	NO	1.7m	USB Cable
2	YES	YES	1.8m	D-SUB Cable
3	YES	NO	1.7m	USB Cable
4	YES	NO	1.7m	RS232 Cable
5	YES	NO	1.7m	USB Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSIONS TEST

4.1.1 LIMITS (FREQUENCY RANGE 150 KHZ-30MHZ)

Frequency Range (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101339	2020/2/27
2	Test Cable	EMCI	EMCCFD300-BM -BMR-6000	170714	2019/8/7
3	EMI Test Receiver	R&S	ESR	101854	2019/12/24
4	Measurement Software	Farad	EZ EMC (Ver. NB-03A1-01)	N/A	N/A

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
 All calibration period of equipment list is one year.

4.1.3 TEST PROCEDURE

- a. The EUT was placed 0.8 m from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

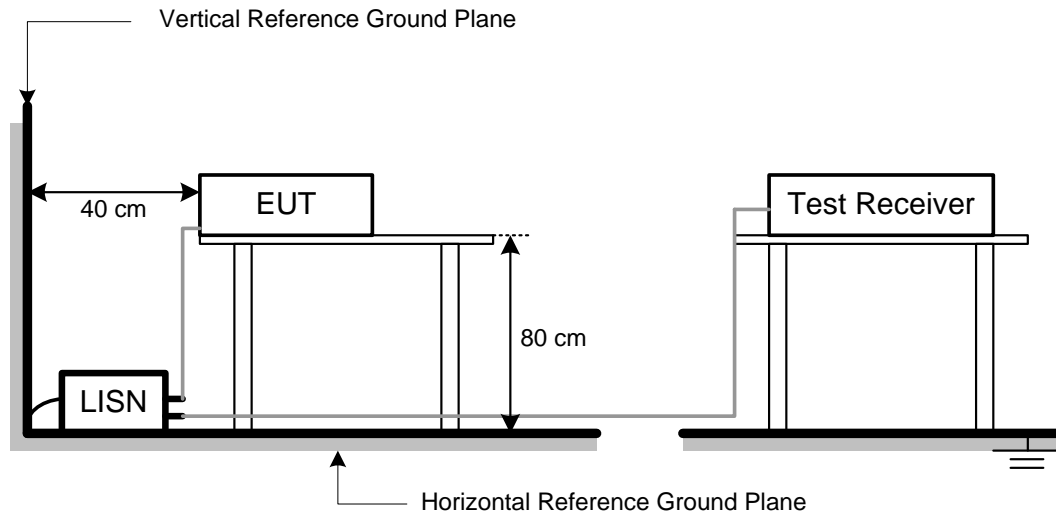
NOTE:

- a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
- b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT : shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn't perform.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

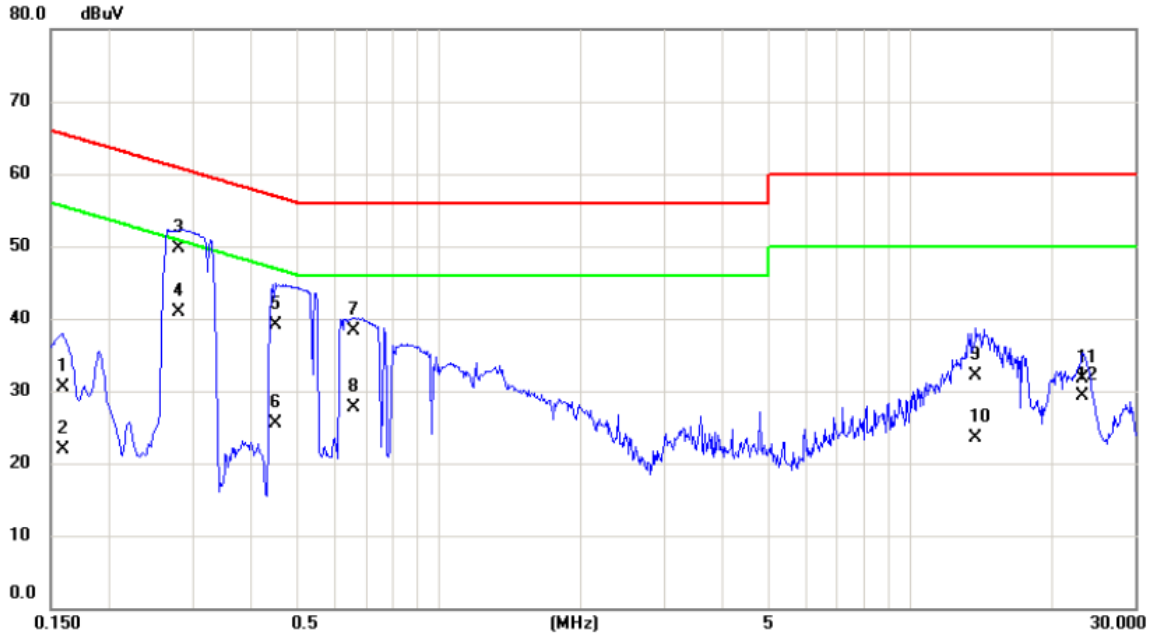
4.1.5 TEST SETUP



4.1.6 TEST RESULTS

EUT :	USB Keyboard	Model Name :	SKILLER SGK5
Temperature :	25°C	Relative Humidity :	45%
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		

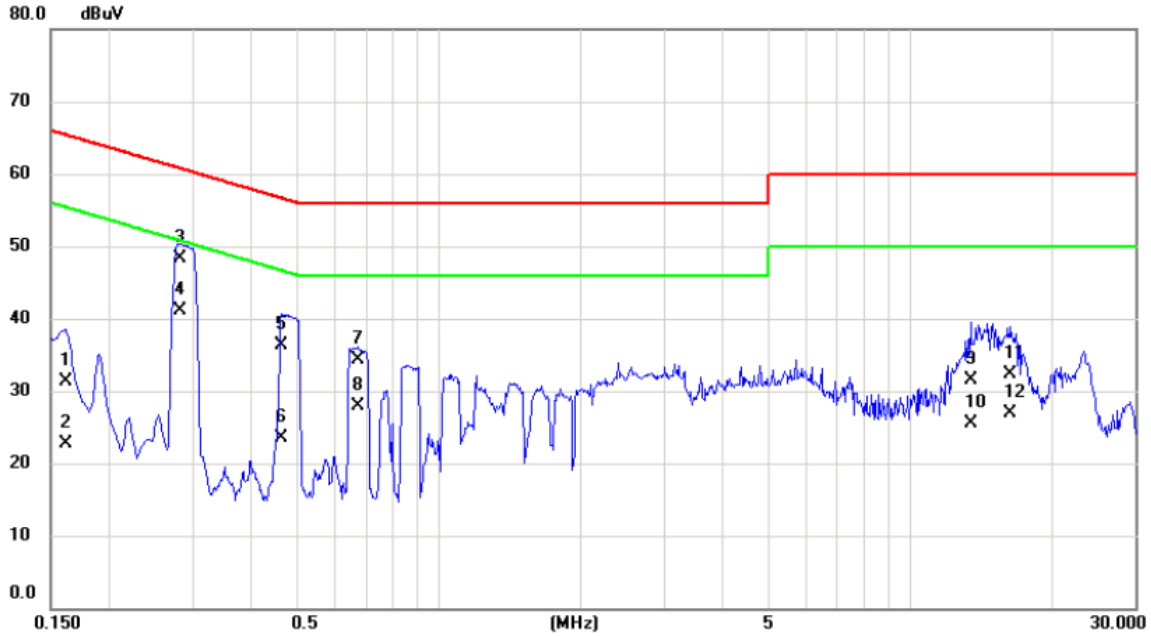
Phase: Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1590	20.80	9.69	30.49	65.52	-35.03	QP	
2		0.1590	12.20	9.69	21.89	55.52	-33.63	AVG	
3		0.2805	40.00	9.69	49.69	60.80	-11.11	QP	
4	*	0.2805	31.30	9.69	40.99	50.80	-9.81	AVG	
5		0.4492	29.50	9.69	39.19	56.89	-17.70	QP	
6		0.4492	15.90	9.69	25.59	46.89	-21.30	AVG	
7		0.6585	28.70	9.70	38.40	56.00	-17.60	QP	
8		0.6585	18.00	9.70	27.70	46.00	-18.30	AVG	
9		13.7738	22.10	9.91	32.01	60.00	-27.99	QP	
10		13.7738	13.60	9.91	23.51	50.00	-26.49	AVG	
11		23.2148	21.80	9.93	31.73	60.00	-28.27	QP	
12		23.2148	19.30	9.93	29.23	50.00	-20.77	AVG	

EUT :	USB Keyboard	Model Name :	SKILLER SGK5
Temperature :	25°C	Relative Humidity :	45%
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		

Phase: Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1613	21.70	9.69	31.39	65.40	-34.01	QP	
2		0.1613	13.10	9.69	22.79	55.40	-32.61	AVG	
3		0.2827	38.60	9.68	48.28	60.74	-12.46	QP	
4	*	0.2827	31.40	9.68	41.08	50.74	-9.66	AVG	
5		0.4627	26.60	9.69	36.29	56.64	-20.35	QP	
6		0.4627	13.80	9.69	23.49	46.64	-23.15	AVG	
7		0.6720	24.70	9.70	34.40	56.00	-21.60	QP	
8		0.6720	18.20	9.70	27.90	46.00	-18.10	AVG	
9		13.4723	21.50	9.96	31.46	60.00	-28.54	QP	
10		13.4723	15.60	9.96	25.56	50.00	-24.44	AVG	
11		16.3208	22.40	9.99	32.39	60.00	-27.61	QP	
12		16.3208	17.00	9.99	26.99	50.00	-23.01	AVG	

4.2 RADIATED EMISSION TEST

4.2.1 LIMITS

Below 1 GHz

Measurement Method and Applied Limits:

ANSI C63.4:

Frequency Range (MHz)	Class A (at 10m)		Class B (at 3m)	
	(uV/m) Field strength	(dBuV/m) Field strength	(uV/m) Field strength	(dBuV/m) Field strength
30 - 88	90	39	100	40
88 - 216	150	43.5	150	43.5
216 - 960	210	46.4	200	46
Above 960	300	49.5	500	54

CISPR 22 or CAN/CSA-CISPR 22-10:

Frequency Range (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 - 230	40	30
230 - 1000	47	37

FCC Part 15, Subpart B, section 15.109(g) provides, as an alternative, compliance to the CISPR 22 (Third Edition) radiated emission limits in the 30 MHz to 1000 MHz range.

NOTE:

- (1) The limit for radiated test was performed according to as following:
FCC Part 15, Subpart B; ICES-003 Issue 6: 2016(updated April 2017)
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m) = 20log Emission level (uV/m).
3m Emission level = 10m Emission level + 20log(10m/3m).
- (4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

4.2.2 MEASUREMENT INSTRUMENTS LIST

Below 1 GHz and Above 1 GHz:

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	Schwarzbeck	VULB 9160	3176	2019/9/26
2	Pre-Amplifier	Anritsu	MH648A	M98457	2019/10/30
3	Test Cable	TIMES	LMR-400	10M-OS01	2019/12/7
4	Test Cable	EMCI	EMCCFD400-NM-NM-2 5000	171103	2019/12/7
5	EMI Test Receiver	R&S	ESCI	100080	2020/5/22
6	Measurement Software	Farad	EZ EMC (Ver. NB-03A1-01)	N/A	N/A

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.

All calibration period of equipment list is one year.

4.2.3 TEST PROCEDURE

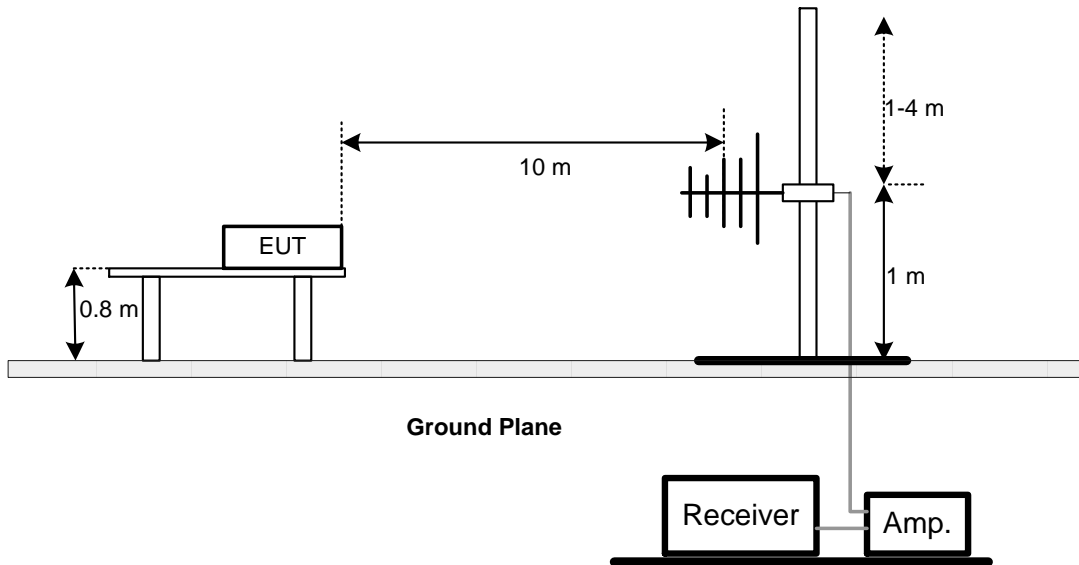
- a. The measuring distance of 10 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 m above the ground at a 10 m open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP

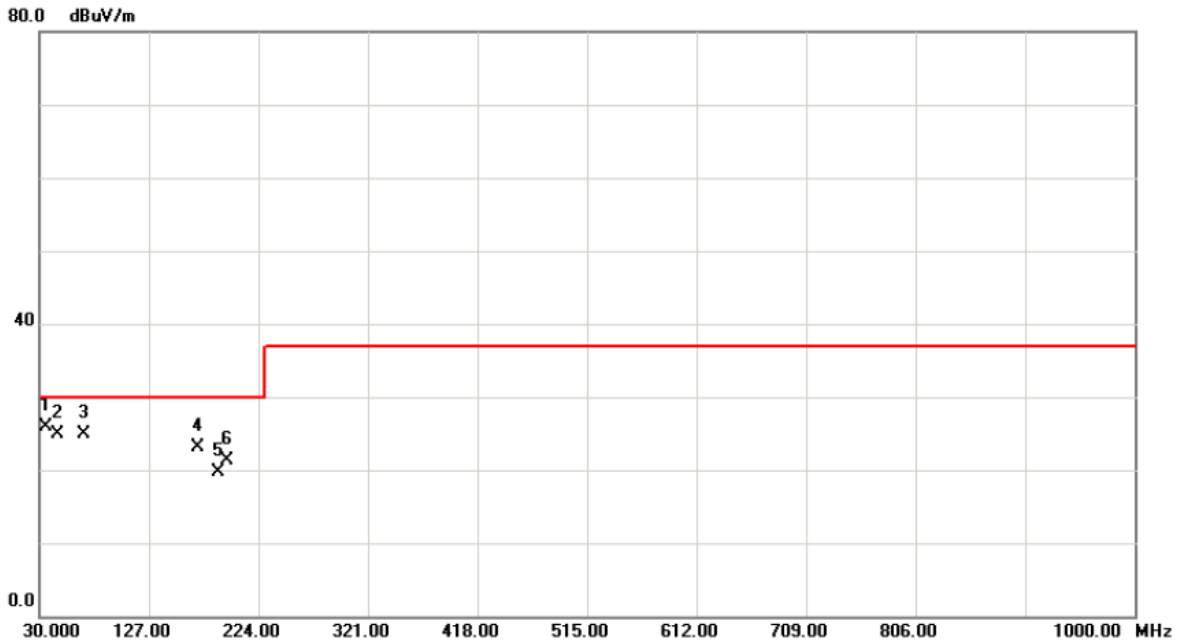
Below 1 GHz



4.2.6 TEST RESULTS-BELOW 1 GHZ

EUT :	USB Keyboard	Model Name :	SKILLER SGK5
Temperature :	26°C	Relative Humidity :	52%
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		

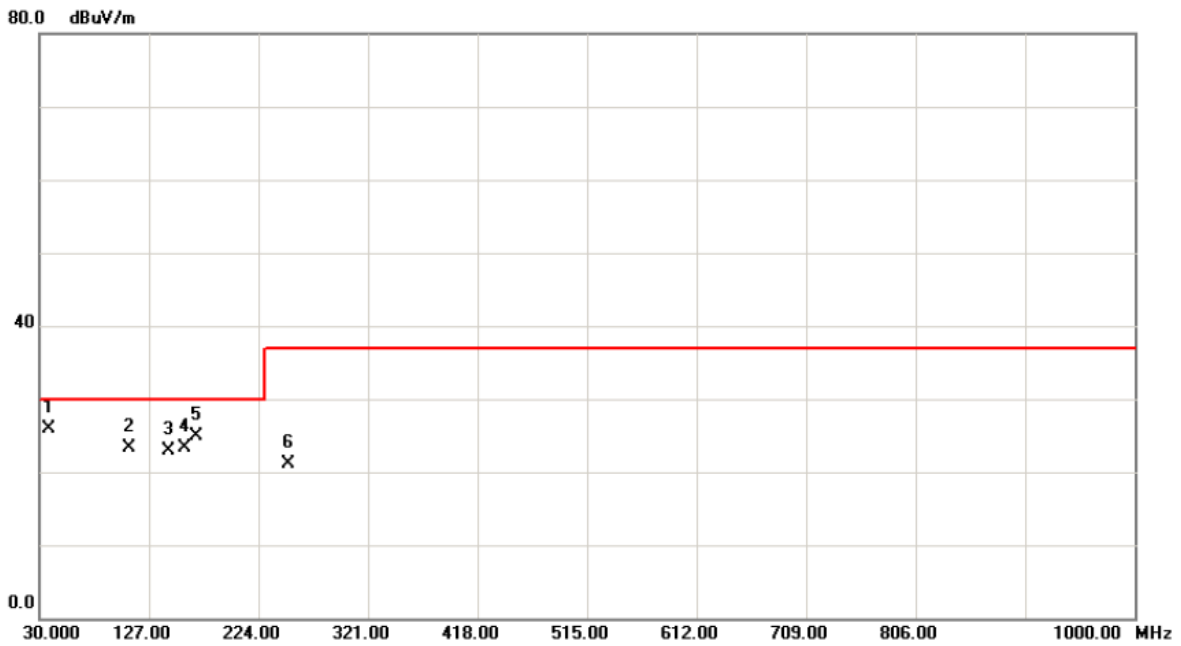
Polarization: Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	35.8200	30.92	-5.10	25.82	30.00	-4.18	QP	100	154	
2		46.1900	28.86	-4.03	24.83	30.00	-5.17	QP	100	311	
3		68.9700	31.93	-7.09	24.84	30.00	-5.16	QP	100	126	
4		169.5200	27.05	-3.95	23.10	30.00	-6.90	QP	100	322	
5		187.7700	24.85	-5.06	19.79	30.00	-10.21	QP	100	139	
6		195.3200	26.91	-5.56	21.35	30.00	-8.65	QP	100	75	

EUT :	USB Keyboard	Model Name :	SKILLER SGK5
Temperature :	26°C	Relative Humidity :	52%
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		

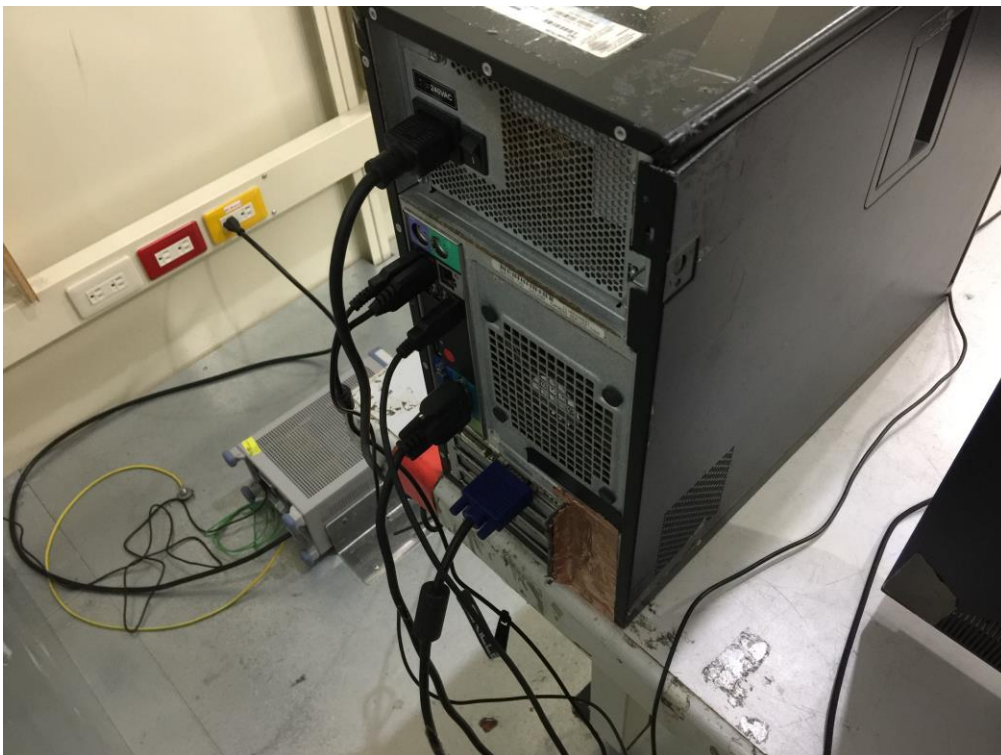
Polarization: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree	Comment
1	*	38.1900	30.99	-5.04	25.95	30.00	-4.05	QP	400	134	
2		109.2800	28.51	-5.26	23.25	30.00	-6.75	QP	400	206	
3		143.6900	26.38	-3.39	22.99	30.00	-7.01	QP	400	287	
4		158.9900	25.73	-2.34	23.39	30.00	-6.61	QP	400	321	
5		168.2400	28.66	-3.72	24.94	30.00	-5.06	QP	400	277	
6		249.7800	24.75	-3.73	21.02	37.00	-15.98	QP	400	114	

5. EUT TEST PHOTO

Conducted emission test photos



Radiated emission below 1 GHz test photos



End of Test Report