

TEST REPORT

Test Report No. :MH/2021/20093**Applicant : Sixfab, Inc.****Address : 75 E. Santa Clara St. Suite 900 San Jose, CA 95113, USA****Manufacturer : Sixfab, Inc.****Address : 75 E. Santa Clara St. Suite 900 San Jose, CA 95113, USA****Equipment Under Test (EUT) :****Name : 3G/4G & LTE Base HAT****Brand Name : Sixfab****Model No.: S121****Added Model(s) : N/A****Standards:**

EN 55032 : 2015+A11:2020	
EN 61000-3-2 : 2014	EN 61000-3-3 : 2013+A1:2019
EN 55024 : 2010+A1:2015	
IEC 61000-4-2 : 2008	IEC 61000-4-6 : 2013
IEC 61000-4-3 : 2006+A1:2007+A2:2010	IEC 61000-4-8 : 2009
IEC 61000-4-4 : 2012	IEC 61000-4-11 : 2004+A1:2017
IEC 61000-4-5 : 2014+A1:2017	

In the configuration tested, the EUT complied with the standards specified above.

Date of Sample Receipt : Feb. 25, 2021**Date of Test : Mar. 08 ~ 16, 2021****Date of Issue : Mar. 29, 2021****Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Approved By**Date**

Mar. 29, 2021

Eddy Cheng (Asst. Supervisor)

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Revision History

Revision	Description	Issue Date	Remark
00	Original.	Mar. 29, 2021	MH/2021/20093

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1. General Description

1.1 General Description of EUT

Name of EUT	3G/4G & LTE Base HAT
Brand Name	Sixfab
Model No.(s)	S121
Added Model(s)	N/A
Variant Description	N/A

1.2 Details of EUT

Power Supply	AC100~240V, 50/60Hz
Modes/Function	Mode 1. EUT+Earphone+USB K/B & Mouse+Copy USB HDD Data to EUT+Mini-HDMI*2+LAN Link+WiFi Link+BT Link+GPS/GNSS On+LTE B1 Link+Adapter Mode 2. EUT+Earphone+USB K/B & Mouse+Copy EUT Data to USB HDD+Mini-HDMI*2+LAN Link+WiFi Link+BT Link+GPS/GNSS On+WCDMA B1 Link+Adapter Mode 3. EUT+Earphone+USB K/B & Mouse+Worst USB HDD Copy+Mini-HDMI*2+LAN Link+WiFi Link+BT Link+GPS/GNSS On+GSM 900 Link+Adapter
Adapter	Model No.: KSA-15E-051300HE Supplier : Raspberry Pi I/P : AC 100-240V, 50/60Hz, 0.5A O/P : DC 5.1V, 3A
Highest internal frequency	2.4GHz

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1.3 Description of Support Units

PRODUCT	MANUFACTURER	MODEL NO.	SERIAL NO.
Monitor	DELL	P2415Qb	CN-0GTTPW-74261-559-0AUL
Monitor	DELL	P2415Qb	CN-0GTTPW-74261-559-0C5L
HDD	Transcend	TS1TSJ25M3E	D56608-1239
Mouse	DELL	MS111-T	CN-OKW2YH-71616-345-OL7T
BT Mouse	Logitech	M555b	N/A
Keyboard	Logitech	Y-U0009	1243MG0015H
GPS Signal Generator	Spectracom	GSG53 GNSS4	200218
Radio Communication Analyzer	R&S	CMW500	N/A
AP	BUFFALO	WZR-HP-G300NH2	44066221202559[[G]]
Earphone	EDSDS	EDS-C415	N/A

Support Equipment Used in Tested Cable

Cable Type	Core	Length	Shielding/Non-shielding
USB cable*2	N/A	1.5m	Shielding
HDMI cable*2	N/A	1.5m	Shielding
USB cable	N/A	0.5m	Shielding
Audio cable	N/A	1.5m	Non-shielding
RJ45 cable	N/A	1.5m	Non-shielding

1.4 Operation Procedure

Mode 1 & 3

1. Let EUT install with SIM Card, Audio Port connect to EARPHONE, USB Port to USB K/B & Mouse & USB HDD, LAN Port to remote PC, Mini-HDMI*2 Port to screen*2, Type-C Port connect to Adapter to turn it on.
2. Turn on BT to link BT Mouse.
3. Turn on WiFi and connect to WiFi AP (2.4G), turn on the Terminal window, and execute ping 192.168.1.1. (WiFi AP IP)
4. Set up a GPS simulator, EUT opens the Terminal window, before and after the test, execute python3 GPS.py to confirm the reception.
5. At the top right of the screen, you can show LAN IP, EUT opens the Terminal window, and executes ping remote PC IP.
6. Set up base station, set according to test mode (LTE B1 or GSM900) Link.
7. Run Data R/W of USB HDD according to test mode.
8. Run the VLC program to turn the COLOR BAR.
9. Start the test.

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1.5 The worst case of the EUT

EUT will be carried out in the worst case as followings:

Worst Case:

CE Worst case : Mode 1

ISN Worst case : Mode 1

Below 1GHz RE Worst case : Mode 3

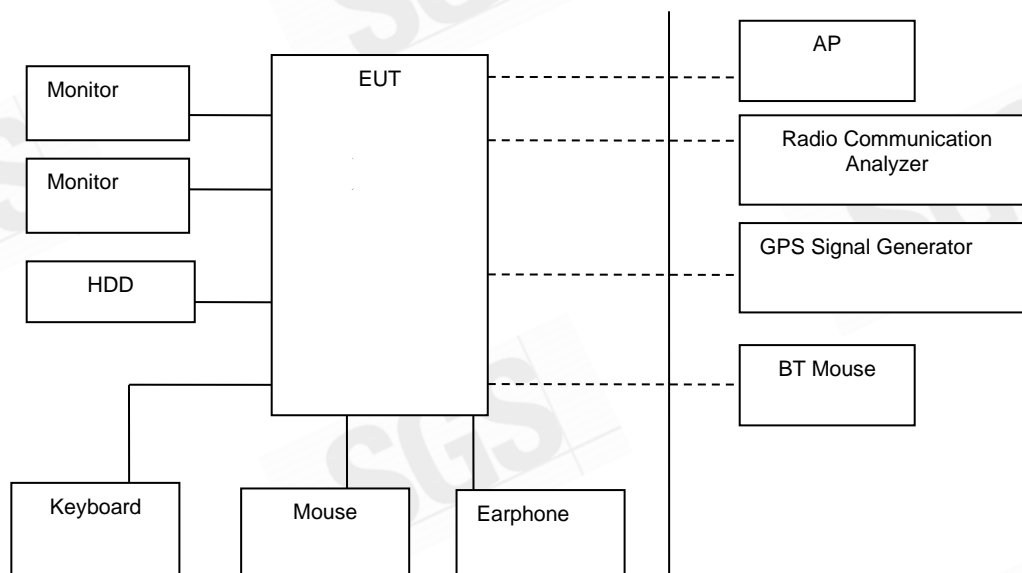
Above 1GHz RE Worst case : Mode 1

1.6 Modification List

No modification by SGS Taiwan Electromagnetic Compatibility Laboratory.

1.7 Configuration of Tested System

Mode 1 & 3



1.8 Accessories Cable List

Cable Type	Core	Length	Shielding/Non-shielding
USB cable	N/A	1.5m	Shielding
USB cable	N/A	0.1m	Shielding
Antenna cable*3	N/A	0.1m	Non-shielding

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1.9 Decision Rules of Results

Reported measurement data comply with EN 55032 : 2015+A11:2020.

Measurement instrumentation uncertainty shall not be taken into account in the determination of compliance.

1.10 Summary of Results

Standard	Emission	
	Test Type	Result
EN 55032 : 2015+A11:2020	Conducted Emission	PASS
	ISN	PASS
	Radiated Emission	PASS
EN 61000-3-2 : 2014	Harmonic current emissions	PASS
EN 61000-3-3 : 2013+A1:2019	Voltage changes, voltage fluctuations & flicker	PASS

Immunity (EN 55024 : 2010+A1:2015)			
Standard	Test Type	Performance Criteria	Result
IEC 61000-4-2 : 2008	ESD	B	PASS
IEC 61000-4-3 : 2006+A1:2007+A2:2010	RS	A	PASS
IEC 61000-4-4 : 2012	EFT	B	PASS
IEC 61000-4-5 : 2014+A1:2017	Surge	B	PASS
IEC 61000-4-6 : 2013	CS	A	PASS
IEC 61000-4-8 : 2009	PFMF	A	PASS
IEC 61000-4-11 : 2004+A1:2017	DIP	C/C/B	PASS

1.11 Reporting Statements of Conformity

The conformity statement in this report is based solely on the test results, measurement uncertainty is excluded.

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2. EMISSION

EN 55032 : 2015+A11:2020

2.1 Test Results

	Results
Conducted Emission	Pass
Radiated Emission	Pass

2.2 Limit

Maximum permissible level of Line Conducted Emission

FREQUENCY (MHz)	Class A(dBuV)		Class B(dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Note : The lower limit shall apply at the transition frequency.

Maximum permissible level of Common Mode Conducted Emission (Telecommunication Ports)

CLASS A

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87	84 - 74	53 - 43	40 - 30
0.5 - 30.0	87	74	43	30

CLASS B

FREQUENCY (MHz)	Voltage Limit(dBuV)		Current Limit(dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74	74 - 64	40 - 30	30 - 20
0.5 - 30.0	74	64	30	20

Note : The lower limit shall apply at the transition frequency.

Maximum permissible level of Radiated Emission measured at 10 meter

FREQUENCY (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	40	30
230 - 1000	47	37

Note : The lower limit shall apply at the transition frequency.

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Maximum permissible level of Radiated Emission measured at 3 meter

FREQUENCY (MHz)	Class A(dBuV/m)	Class B(dBuV/m)
	Quasi - peak	Quasi - peak
30 - 230	50	40
230 - 1000	57	47

Note : The lower limit shall apply at the transition frequency.

Limits above 1 GHz**Limits for radiated disturbance of Class A ITE at a measurement distance of 3m**

Frequency range GHz	Average Limit dB(μV/m)	Peak Limit dB(μV/m)
1 to 3	56	76
3 to 6	60	80

Note : The lower limit applies at the transition frequency.

Limits for radiated disturbance of Class B ITE at a measurement distance of 3m

Frequency range GHz	Average Limit dB(μV/m)	Peak Limit dB(μV/m)
1 to 3	50	70
3 to 6	54	74

Note : The lower limit applies at the transition frequency.

Requirements for radiated emissions from FM receivers

Frequency range (MHz)	Measurement				Harmonics
	Facility	Distance m	Detector type / Bandwidth	Fundamental	
30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	50	42
230 to 300	OATS/SAC				42
300 to 1000	OATS/SAC				46
30 to 230	OATS/SAC	3	Quasi Peak / 120 kHz	60	52
230 to 300	OATS/SAC				52
300 to 1000	OATS/SAC				56

These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits

Note : SAC : Semi Anechoic Chamber
OATS : Open Area Test Site

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2.3 Methods and Procedures

Standard	Edition	Description
EN 55032	2015+A11:2020	Electromagnetic compatibility of multimedia equipment -Emission requirements

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2.4 Test of Conducted Emission & ISN

2.4.1 Test Instruments

SGS Conducted_Emission HWAYA Conducted Room No.B_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 7	100924	2020/10/28	2021/10/27
Coaxial Cables	EMC Instruments Corp.	HY-CEB-CABLE	HYCE-2000-02	2020/12/15	2021/12/14
Pulse Limiter	R&S	ESH3Z2	102099	2020/6/16	2021/6/15
LISN	TESEQ	NNB 51	36061	2021/3/3	2022/3/2
LISN	TESEQ	NNB 51	36062	2020/4/17	2021/4/16
ISN	TESEQ	ISN T800	30842	2020/8/26	2021/8/25
ISN	TESEQ	ISN T8-Cat6	38889	2021/2/25	2022/2/24
Communication Tester	R&S	CMU200	114273	2020/5/31	2021/5/30
Communication Tester	R&S	CMW500	152303	2021/2/24	2022/2/23
Communication Tester	Anritsu	MT8820C	6201300479	2020/11/4	2021/11/3
Test Software	Farad	EZ-EMC	Ver. SGS-03A2-5	N.C.R.	N.C.R.

Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan

Measurement Uncertainty of Conducted Emission

Expanded uncertainty U_{lab} (k=2) of Conducted Emission is 2.28 dB.

Expanded uncertainty U_{lab} (k=2) of ISN Conducted Emission is 2.77 dB.

Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Conducted Emission measurement is 3.44 dB.

Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of ISN Conducted Emission measurement is 4.59 dB.

2.4.2 Measurement Level Calculation

Factor = LISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

2.4.3 Measurement Level Calculation

Factor = ISN insertion loss + Cable loss + Pulse Limiter insertion loss

Measurement Level = Reading Level + Factor

Over (Margin) = Measurement Level – Limit

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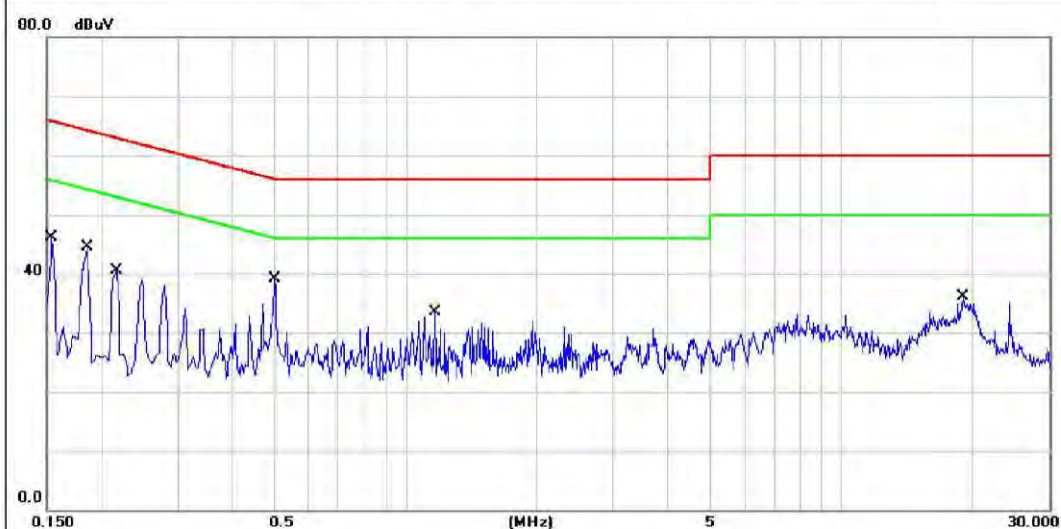
2.4.4 Measurement Data(CE)

Model No.:S121

Mode_1_L

Site: : Conduction Room B	Date: 2021/3/11	Time: 下午 03:47:06
Limit: EN 55032 Class B Conduction(QP)	Phase: L1	Temperature: 23 °C
Mode: Mode 1	Power: AC230V/50Hz	Humidity: 62 %RH
Report: MH-2021-20093		Air Pressure: 990 hpa
Tester: Terry Wu		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		MHz	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1545	19.19	19.78	38.97	65.75	-26.78	QP	
2		0.1545	3.40	19.78	23.18	55.75	-32.57	AVG	
3		0.1860	19.37	19.77	39.14	64.21	-25.07	QP	
4		0.1860	2.34	19.77	22.11	54.21	-32.10	AVG	
5		0.2175	16.48	19.79	36.27	62.91	-26.64	QP	
6		0.2175	2.28	19.79	22.07	52.91	-30.84	AVG	
7		0.5010	12.75	20.35	33.10	56.00	-22.90	QP	
8	*	0.5010	5.05	20.35	25.40	46.00	-20.60	AVG	
9		1.1715	6.20	20.10	26.30	56.00	-29.70	QP	
10		1.1715	-1.10	20.10	19.00	46.00	-27.00	AVG	
11		19.1220	9.68	20.22	29.90	60.00	-30.10	QP	
12		19.1220	0.78	20.22	21.00	50.00	-29.00	AVG	

*:Maximum data x:Over limit l:over margin

Page: 1

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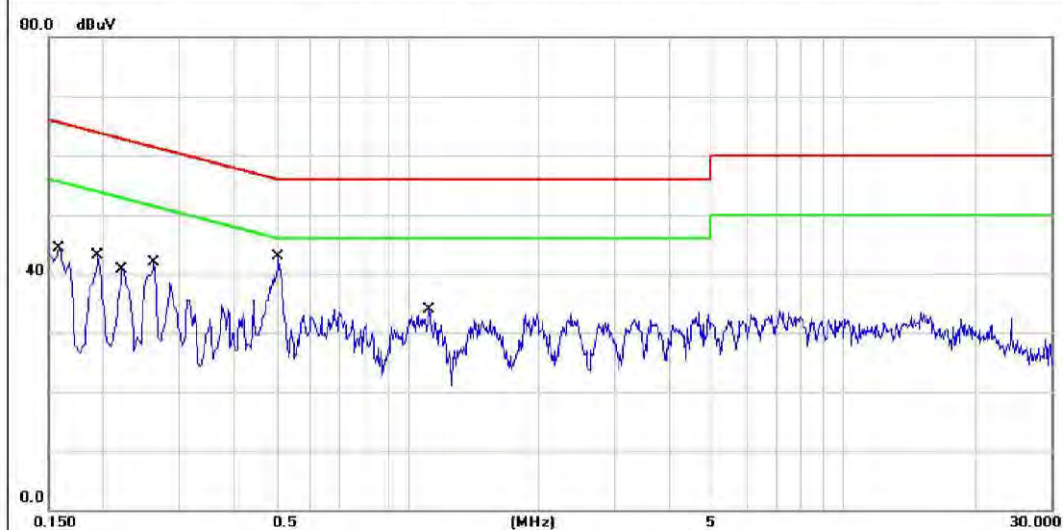
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Mode_1_N

Site: : Conduction Room B	Date: 2021/3/11	Time: 下午 03:50:30
Limit: EN 55032 Class B Conduction(QP)	Phase: N	Temperature: 23 °C
Mode: Mode 1	Power: AC230V/50Hz	Humidity: 62 %RH
Report: MH-2021-20093		Air Pressure: 990 hpa
Tester: Terry Wu		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq. MHz	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.1590	22.58	19.77	42.35	65.52	-23.17	QP	
2		0.1590	5.95	19.77	25.72	55.52	-29.80	AVG	
3		0.1950	21.85	19.75	41.60	63.82	-22.22	QP	
4		0.1950	5.95	19.75	25.70	53.82	-28.12	AVG	
5		0.2220	18.25	19.79	38.04	62.74	-24.70	QP	
6		0.2220	4.80	19.79	24.59	52.74	-28.15	AVG	
7		0.2625	15.83	19.87	35.70	61.35	-25.65	QP	
8		0.2625	4.33	19.87	24.20	51.35	-27.15	AVG	
9		0.5055	17.95	20.35	38.30	56.00	-17.70	QP	
10	*	0.5055	12.75	20.35	33.10	46.00	-12.90	AVG	
11		1.1220	9.45	20.05	29.50	56.00	-26.50	QP	
12		1.1220	5.05	20.05	25.10	46.00	-20.90	AVG	

*:Maximum data x:Over limit l:over margin

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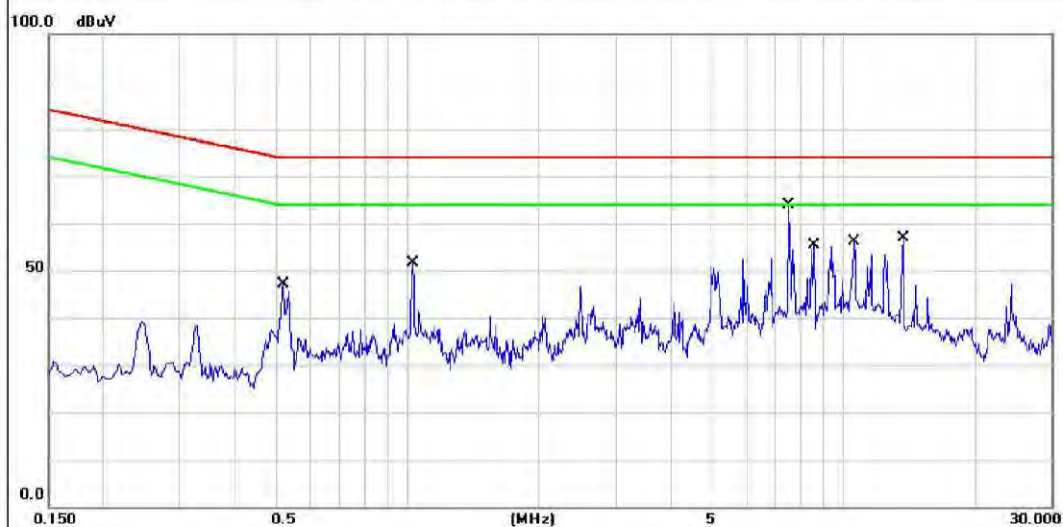
2.4.5 Measurement Data(ISN)

Model No.:S121

Mode_1_10M

Site: Conduction Room B Date: 2021/3/11 Time: 下午 04:05:12
 Limit: EN 55032 ISN Voltage - Class B (QP) Phase: Temperature: 23 °C
 Mode: Mode 1 Power: AC230V/50Hz Humidity: 62 %RH
 Report: MH-2021-20093 Air Pressure: 990 hpa
 Tester: Terry Wu
 Note: LAN Port 10Mbps;10%;250ms

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No.	Mk	Freq. MHz	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.5190	26.44	20.06	46.50	74.00	-27.50	QP	
2		0.5190	26.34	20.06	46.40	64.00	-17.60	AVG	
3		1.0275	31.39	19.61	51.00	74.00	-23.00	QP	
4	*	1.0275	29.59	19.61	49.20	64.00	-14.80	AVG	
5		7.4985	39.69	19.51	59.20	74.00	-14.80	QP	
6		7.4985	27.79	19.51	47.30	64.00	-16.70	AVG	
7		8.5875	29.06	19.49	48.55	74.00	-25.45	QP	
8		8.5875	18.50	19.49	37.99	64.00	-26.01	AVG	
9		10.5990	30.53	19.47	50.00	74.00	-24.00	QP	
10		10.5990	20.83	19.47	40.30	64.00	-23.70	AVG	
11		13.7490	29.60	19.53	49.13	74.00	-24.87	QP	
12		13.7490	18.12	19.53	37.65	64.00	-26.35	AVG	

*:Maximum data x:Over limit !:over margin

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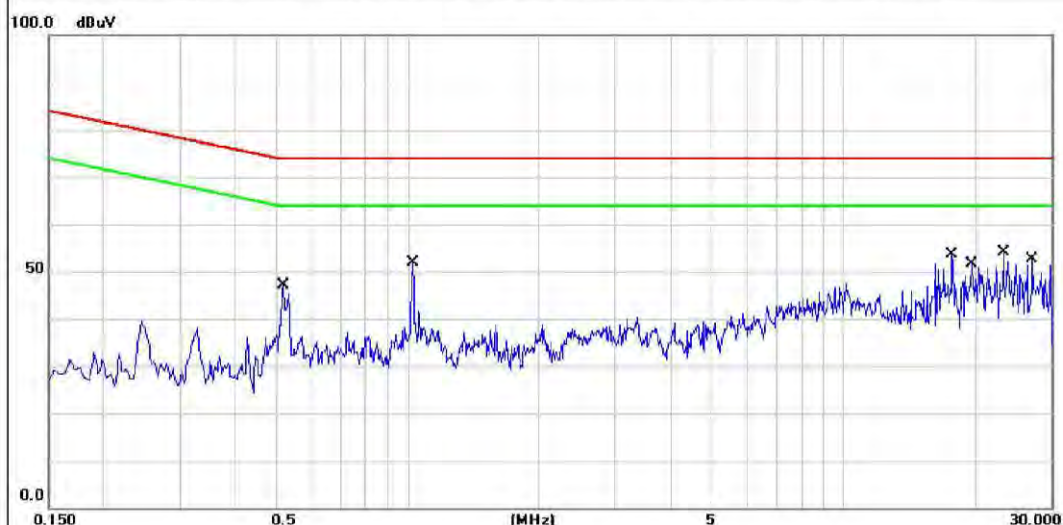
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Mode_1_100M

Site: : Conduction Room B Date: 2021/3/11 Time: 下午 04:01:16
Limit: EN 55032 ISN Voltage - Class B (QP) Phase: Temperature: 23 °C
Mode: Mode 1 Power: AC230V/50Hz Humidity: 62 %RH
Report: MH-2021-20093 Air Pressure: 990 hpa
Tester: Terry Wu
Note: LAN Port 100Mbps;10%;250ms

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		MHz	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.5190	26.54	20.06	46.60	74.00	-27.40	QP	
2		0.5190	26.44	20.06	46.50	64.00	-17.50	AVG	
3		1.0275	30.99	19.61	50.60	74.00	-23.40	QP	
4	*	1.0275	29.19	19.61	48.80	64.00	-15.20	AVG	
5		17.8305	29.03	19.60	48.63	74.00	-25.37	QP	
6		17.8305	10.35	19.60	29.95	64.00	-34.05	AVG	
7		19.7070	25.36	19.64	45.00	74.00	-29.00	QP	
8		19.7070	7.35	19.64	26.99	64.00	-37.01	AVG	
9		23.3250	30.86	19.75	50.61	74.00	-23.39	QP	
10		23.3250	10.23	19.75	29.98	64.00	-34.02	AVG	
11		27.1590	25.70	19.89	45.59	74.00	-28.41	QP	
12		27.1590	7.52	19.89	27.41	64.00	-36.59	AVG	

*:Maximum data x:Over limit l:over margin

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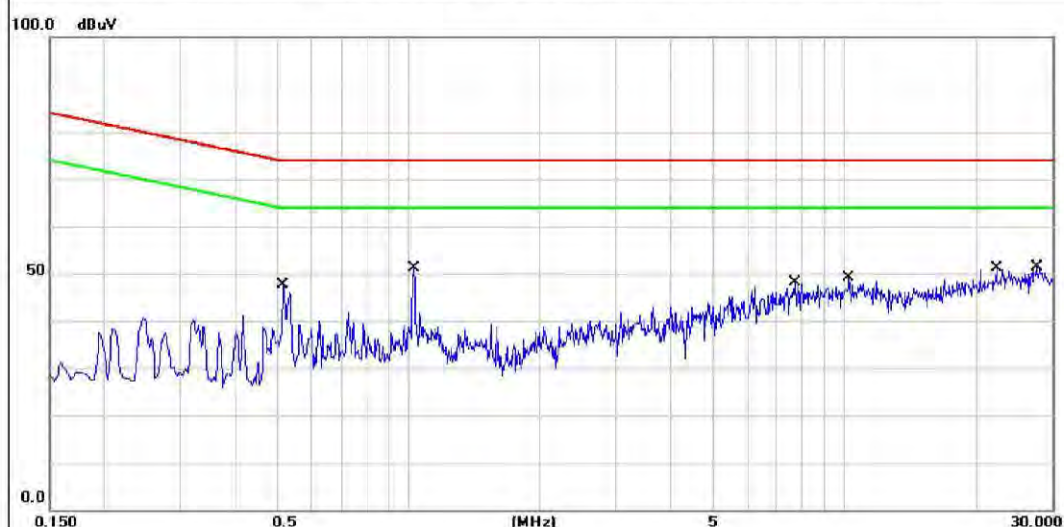
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Mode_1_1G

Site: : Conduction Room B	Date: 2021/3/11	Time: 下午 03:58:01
Limit: EN 55032 ISN Voltage - Class B (QP)	Phase:	Temperature: 23 °C
Mode: Mode 1	Power: AC230V/50Hz	Humidity: 62 %RH
Report: MH-2021-20093		Air Pressure: 990 hpa
Tester: Terry Wu		
Note: LAN Port 1Gbps;10%;250ms		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq. MHz	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.5144	26.52	20.08	46.60	74.00	-27.40	QP	
2		0.5144	26.22	20.08	46.30	64.00	-17.70	AVG	
3		1.0275	31.29	19.61	50.90	74.00	-23.10	QP	
4	*	1.0275	29.49	19.61	49.10	64.00	-14.90	AVG	
5		7.6920	20.37	19.51	39.88	74.00	-34.12	QP	
6		7.6920	13.32	19.51	32.83	64.00	-31.17	AVG	
7		10.2660	22.37	19.46	41.83	74.00	-32.17	QP	
8		10.2660	16.23	19.46	35.69	64.00	-28.31	AVG	
9		22.3170	23.33	19.72	43.05	74.00	-30.95	QP	
10		22.3170	9.64	19.72	29.36	64.00	-34.64	AVG	
11		27.6495	23.82	19.91	43.73	74.00	-30.27	QP	
12		27.6495	7.43	19.91	27.34	64.00	-36.66	AVG	

*:Maximum data x:Over limit l:over margin

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2.5 Test of Radiated Emission

2.5.1 Test Instruments

Below 1GHz

SGS Radiated_Below_1GHz HWAYA 10m EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 7	100950	2020/11/30	2021/11/29
EMI Test Receiver	R&S	ESCI 3	101343	2021/2/2	2022/2/1
Broadband Antenna	SCHWAZBECK	VULB9168	9168-628	2020/9/8	2021/9/7
Broadband Antenna	SCHWAZBECK	VULB9168	9168-629	2020/9/14	2021/9/13
Loop Antenna	COM-POWER	AL-130	121060	2020/5/8	2021/5/7
Pre Amplifier	EMC Instruments	EMC330	980178	2020/3/31	2021/3/30
Pre Amplifier	EMC Instruments	EMC330	980179	2020/3/31	2021/3/30
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150917	2020/9/18	2021/9/17
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150919	2020/9/18	2021/9/17
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150820	2020/9/18	2021/9/17
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150918	2020/9/18	2021/9/17
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150821	2020/9/18	2021/9/17
Coaxial Cable	EMC Instruments	EMCCFD400-NM-NM	150822	2020/9/18	2021/9/17
Communication Tester	R&S	CMU200	114273	2020/5/31	2021/5/30
Communication Tester	R&S	CMW500	152303	2021/2/24	2022/2/23
Communication Tester	Anritsu	MT8820C	6201300479	2020/11/4	2021/11/3
Site NSA	SGS	10m Chamber	10M SAC	2020/12/31	2021/12/30
Test S/W	Farad	EZ-EMC	Ver. SGS 10m-03A2-5	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					
Measurement Uncertainty of Radiated Emission					
Expanded uncertainty Ulab (k=2) of Radiated Emission is 4.43 dB.(30MHz-1000MHz)					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.22 dB.(30MHz-1000MHz)					

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Above 1GHz

SGS Radiated_Above_1GHz HWAYA 966B_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	R&S	FSV 40	101419	2020/5/29	2021/5/28
EMI Test Receiver	R&S	ESR 7	101507	2020/8/27	2021/8/26
Horn Antenna	Schwarzbeck	BBHA9120D	BBHA9120D673	2020/11/23	2021/11/22
Pre Amplifier	R&S	SCU-18	10203	2020/3/26	2021/3/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY 5817/4	2020/3/26	2021/3/25
Coaxial Cable	EMC Instruments	EMC104-SM-SM	140923	2020/9/29	2021/9/28
Coaxial Cable	EMC Instruments	EMC104-SM-SM	140925	2020/9/29	2021/9/28
Coaxial Cable	EMC Instruments	EMC104-SM-SM	140927	2020/9/29	2021/9/28
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	520415/2	2020/6/5	2021/6/4
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	MY 2153/2	2020/6/5	2021/6/4
Communication Tester	R&S	CMU200	114273	2020/5/31	2021/5/30
Communication Tester	R&S	CMW500	152303	2021/2/24	2022/2/23
Communication Tester	Anritsu	MT8820C	6201300479	2020/11/4	2021/11/3
Site VSWR	SGS	966 Chamber B	SAC-B	2020/10/8	2021/10/7
Test Software	Farad	EZ-EMC	Ver. SGS-03A2-5	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					
Measurement Uncertainty of Radiated Emission					
Expanded uncertainty U _{lab} (k=2) of Radiated Emission measurement is 4.90 dB.(1-6GHz)					
Expanded uncertainty CISPR 16-4-2:2011+A1:2014+A2:2018 (k=2) of Radiated Emission measurement is 5.18 dB.(1-6GHz)					

2.5.2 Measurement Level Calculation

Correction Factor = Antenna Factor + Cable loss- Amplifier Gain

Measurement Level = Reading Level + Correction Factor

Over (Margin) = Measurement Level – Limit

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2.5.3 Measurement Data

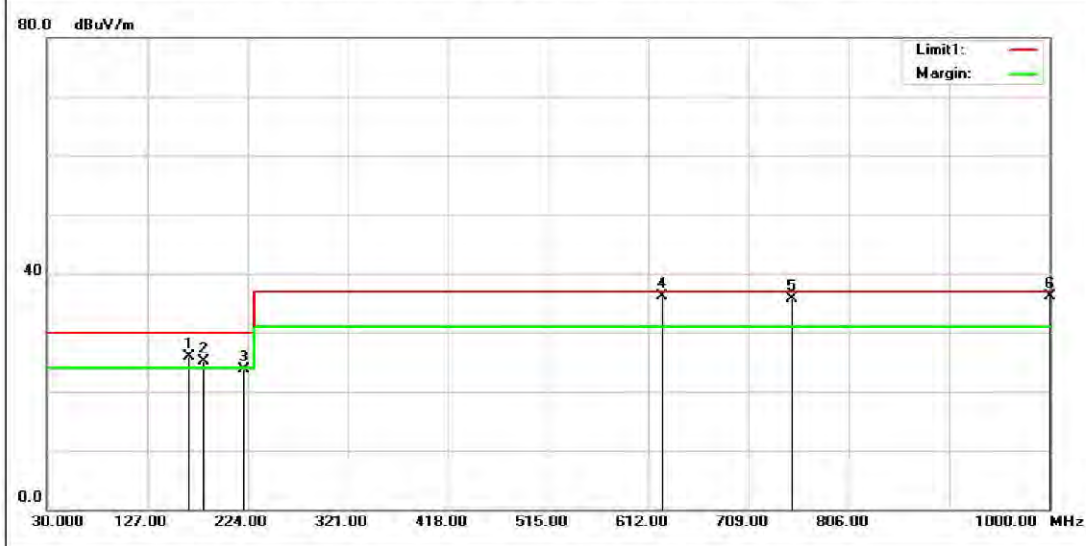
Below 1GHz

Model No.:S121

Mode_3_H

Site: SGS 10m Chamber	Date: 2021/3/16	Time: 上午 03:29:21
Limit: EN55032 Class B 10m Radiation	Polarization: Horizontal	Temperature: 20 °C
Mode: Mode 3	Power: AC230V/50Hz	Humidity: 52 %RH
Report: File :MH-2021-20093	Distance: 10m	Air Pressure: 990 hpa
Tester: Jeffrey Chou		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Height	Degree	Detector	Comment
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)		
1	l	166.8700	37.03	-11.11	25.92	30.00	-4.08			QP	
2	l	182.2900	37.63	-12.52	25.11	30.00	-4.89			QP	
3	l	220.7800	37.56	-13.93	23.63	30.00	-6.37			QP	
4	*	625.0200	37.57	-1.50	36.07	37.00	-0.93	136	360	QP	
5	l	750.0100	34.49	1.20	35.69	37.00	-1.31			QP	
6	l	1000.0000	33.04	3.00	36.04	37.00	-0.96			QP	

*:Maximum data x:Over limit l:over margin

Page: 1

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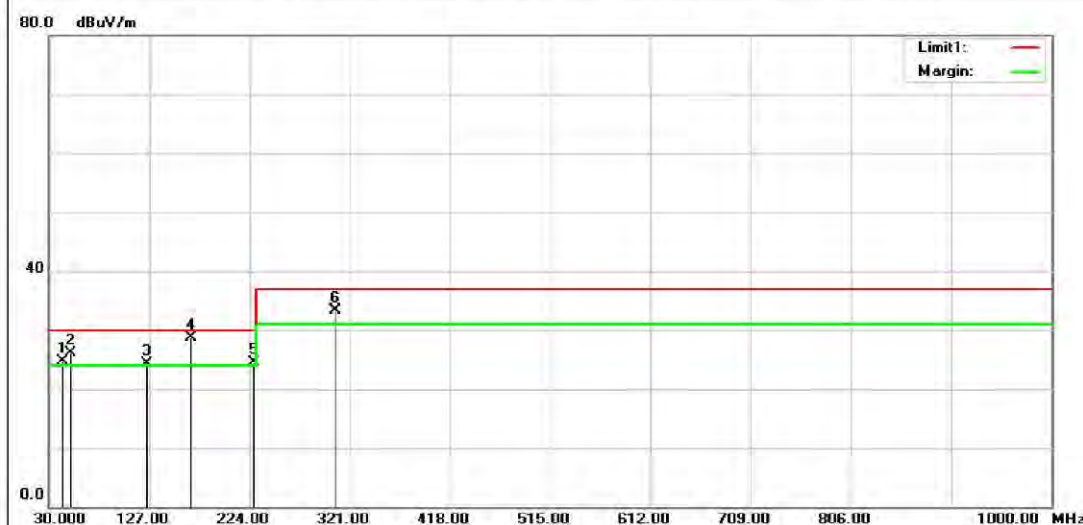
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Mode_3_V

Site: SGS 10m Chamber	Date: 2021/3/16	Time: 上午 03:29:20
Limit: EN55032 Class B 10m Radiation	Polarization: Vertical	Temperature: 20 °C
Mode: Mode 3	Power: AC230V/50Hz	Humidity: 52 %RH
Report: File :MH-2021-20093	Distance: 10m	Air Pressure: 990 hpa
Tester: Jeffrey Chou		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Height	Degree	Detector	Comment
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)		
1		43.1500	35.44	-10.74	24.70	30.00	-5.30			QP	
2		51.2200	37.15	-11.13	26.02	30.00	-3.98			QP	
3		125.0600	36.85	-12.55	24.30	30.00	-5.70			QP	
4	*	166.8900	39.52	-10.79	28.73	30.00	-1.27	110	26	QP	
5		228.8500	38.04	-13.57	24.47	30.00	-5.53			QP	
6		307.4200	43.05	-9.84	33.21	37.00	-3.79			QP	

*:Maximum data x:Over limit t:over margin

Page: 1

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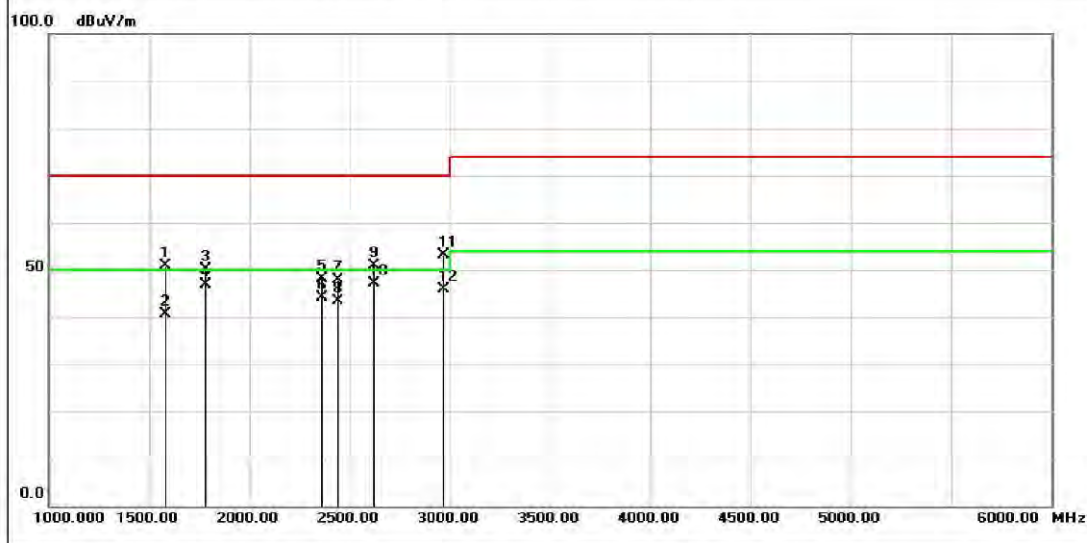
Above 1GHz

Model No.:S121

Mode_1_H

Site: SGS 966 Chamber B	Date: 2021/3/8	Time: 下午 10:22:51
Limit: EN 55032 Class B 1G-6G(Peak)	Polarization: Horizontal	Temperature: 20 °C
Mode: Mode 1	Power: AC 230V/50Hz	Humidity: 65 %RH
Report: MH-2021-20093	Distance: 3m	Air Pressure: 990 hpa
Tester: Ken Chen		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Over (dB)	Height (cm)	Degree (deg.)	Detector	Comment
1		1585.000	65.42	-14.47	50.95	70.00	-19.05			peak	
2		1585.000	55.10	-14.47	40.63	50.00	-9.37			AVG	
3		1780.000	64.12	-13.90	50.22	70.00	-19.78			peak	
4		1780.000	60.87	-13.90	46.97	50.00	-3.03			AVG	
5		2365.000	58.69	-10.53	48.16	70.00	-21.84			peak	
6		2365.000	54.56	-10.53	44.03	50.00	-5.97			AVG	
7		2445.000	58.64	-10.81	47.83	70.00	-22.17			peak	
8		2445.000	54.07	-10.81	43.26	50.00	-6.74			AVG	
9		2625.000	61.47	-10.57	50.90	70.00	-19.10	100	39	peak	
10	*	2625.000	57.66	-10.57	47.09	50.00	-2.91	100	39	AVG	
11		2970.000	63.13	-10.10	53.03	70.00	-16.97			peak	
12		2970.000	55.88	-10.10	45.78	50.00	-4.22			AVG	

*:Maximum data x:Over limit l:over margin

Page: 1

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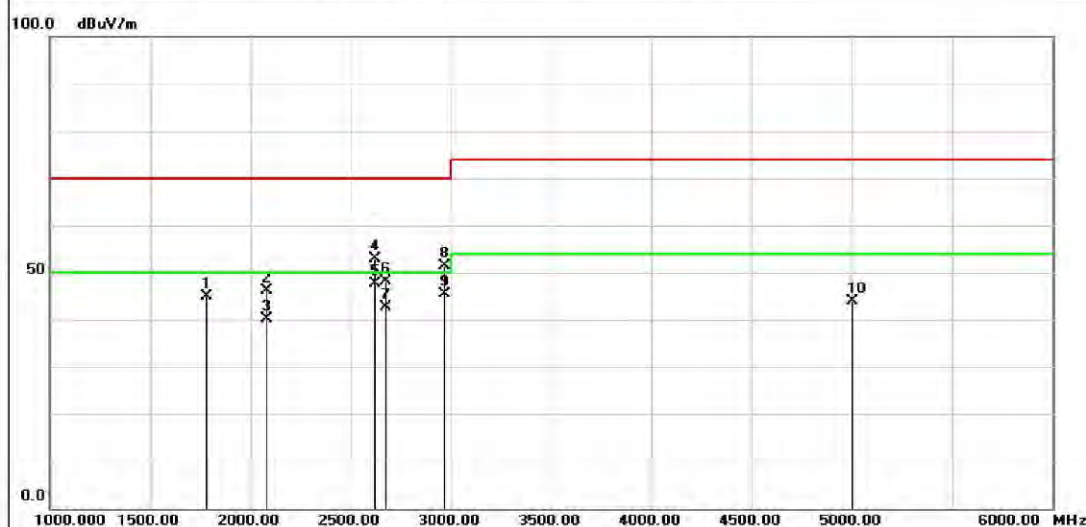
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Mode_1_V

Site: SGS 966 Chamber B	Date: 2021/3/8	Time: 下午 10:08:16
Limit: EN 55032 Class B 1G-6G(Peak)	Polarization: Vertical	Temperature: 20 °C
Mode: Mode 1	Power: AC 230V/50Hz	Humidity: 65 %RH
Report: MH-2021-20093	Distance: 3m	Air Pressure: 990 hpa
Tester: Ken Chen		
Note:		

SGS Taiwan Ltd.-Electromagnetic Compatibility Laboratory Address: No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333



No.	Mk	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Measurement (dBuV/m)	Limit (dBuV/m)	Over (dB)	Height (cm)	Degree (deg.)	Detector	Comment
1		1780.000	58.84	-13.90	44.94	70.00	-25.06			peak	
2		2080.000	58.26	-12.20	46.06	70.00	-23.94			peak	
3		2080.000	52.45	-12.20	40.25	50.00	-9.75			AVG	
4		2625.000	63.42	-10.57	52.85	70.00	-17.15	100	248	peak	
5	*	2625.000	58.22	-10.57	47.65	50.00	-2.35	100	248	AVG	
6		2675.000	58.57	-10.49	48.08	70.00	-21.92			peak	
7		2675.000	53.18	-10.49	42.69	50.00	-7.31			AVG	
8		2970.000	61.58	-10.10	51.48	70.00	-18.52			peak	
9		2970.000	55.46	-10.10	45.36	50.00	-4.64			AVG	
10		5000.000	49.47	-5.70	43.77	74.00	-30.23			peak	

*:Maximum data x:Over limit f:over margin

Page: 1

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3. Harmonics

EN 61000-3-2 : 2014

3.1 Test Results

EN 61000-3-2 : 2014	PASS
---------------------	------

3.2 Methods and Procedures

Standard	Edition	Description
EN 61000-3-2	2014	Limits - Limits for harmonic current emissions (equipment input current up to and including 16 A per phase).

3.3 Test Instruments

SGS Harmonic EN61000-3-2 HwaYa_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Power Analyzer	TESEQ	CCN 1000-1	1504A02654	2020/9/21	2021/9/20
AC Power Source	TESEQ	NSG 1007	1504A02654	2020/9/21	2021/9/20
Test Software	TESEQ	Win2100 V4	Ver. 4.14.0	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

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3.4 Measurement Data

Model No.:S121

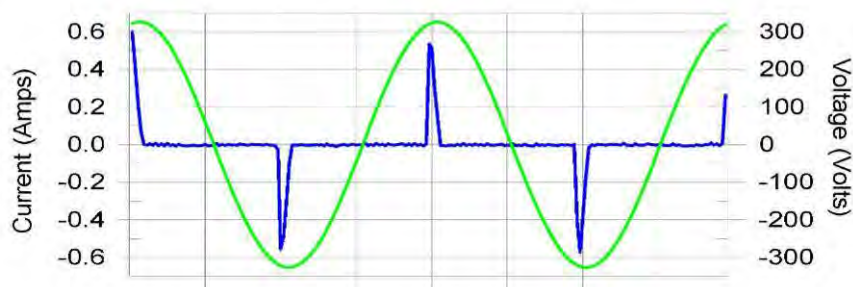
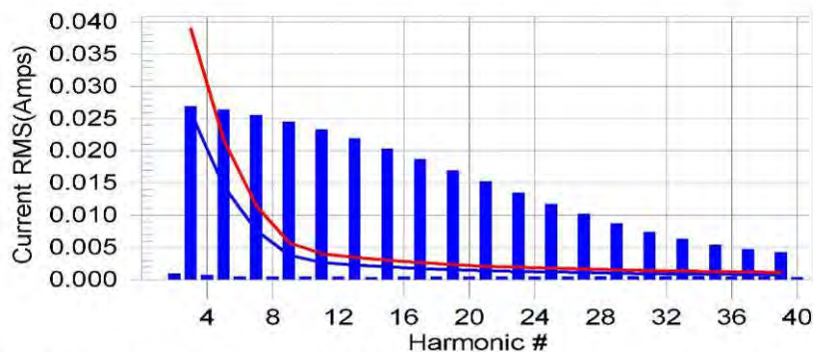
Mode_1

Ametek CTS
Reinach, Switzerland3/11/2021
7:32 PM**Harmonics – Class-D per Ed. 5.0 (2018)(Run time) incl. inter-harmonics**

EUT: Equipment Under Test
Test category: Class-D per Ed. 5.0 (2018) (European limits)
Test date: 2021/3/11
Test duration (min): 10
Comment: Temperature (C) 21 Humidity (%) 67
Customer: Customer

Tested by: Shan Wang
Test Margin: 100
Start time: 下午 07:05:30
End time: 下午 07:15:41
Data file name: H-000065.cts_data

Test Result: N/L Source qualification: Normal

Current & voltage waveformsHarmonics and Class D limit lineEuropean Limits

Test result: N/L Worst harmonics H0-0.0% of 150% limit, H0-0% of 100% limit

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Ametek CTS
Reinach, Switzerland3/11/2021
7:32 PM

Current Test Result Summary (Run time)

EUT: Equipment Under Test
 Test category: Class-D per Ed. 5.0 (2018) (European limits)
 Test date: 2021/3/11
 Test duration (min): 10
 Comment: Temperature (C) 21 Humidity (%) 67
 Customer: Customer

Tested by: Shan Wang
 Test Margin: 100
 Start time: 下午 07:05:30
 End time: 下午 07:15:41
 Data file name: H-000065.cts_data

Test Result: N/L Source qualification: Normal
 THCA: 0.075 I-THD(%): 226.2 POHC(A): 0.030 POHC Limit(A): 0.003

Highest parameter values during test:

V_RMS (Volts): 231.14 Frequency(Hz): 50.00
 I_Peak (Amps): 0.629 I_RMS (Amps): 0.109
 I_Fund (Amps): 0.033 Crest Factor: 6.629
 Power (Watts): 7.6 Power Factor: 0.362

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	0.000	N/A	0.001	0.000	N/A	N/L
3	0.027	0.026	N/A	0.033	0.039	N/A	N/L
4	0.001	0.000	N/A	0.001	0.000	N/A	N/L
5	0.026	0.014	N/A	0.032	0.022	N/A	N/L
6	0.000	0.000	N/A	0.001	0.000	N/A	N/L
7	0.026	0.008	N/A	0.031	0.011	N/A	N/L
8	0.000	0.000	N/A	0.001	0.000	N/A	N/L
9	0.024	0.004	N/A	0.029	0.006	N/A	N/L
10	0.000	0.000	N/A	0.001	0.000	N/A	N/L
11	0.023	0.003	N/A	0.028	0.004	N/A	N/L
12	0.000	0.000	N/A	0.001	0.000	N/A	N/L
13	0.022	0.002	N/A	0.026	0.003	N/A	N/L
14	0.000	0.000	N/A	0.001	0.000	N/A	N/L
15	0.020	0.002	N/A	0.023	0.003	N/A	N/L
16	0.000	0.000	N/A	0.001	0.000	N/A	N/L
17	0.019	0.002	N/A	0.021	0.003	N/A	N/L
18	0.000	0.000	N/A	0.001	0.000	N/A	N/L
19	0.017	0.002	N/A	0.019	0.002	N/A	N/L
20	0.000	0.000	N/A	0.001	0.000	N/A	N/L
21	0.015	0.001	N/A	0.017	0.002	N/A	N/L
22	0.000	0.000	N/A	0.001	0.000	N/A	N/L
23	0.013	0.001	N/A	0.014	0.002	N/A	N/L
24	0.000	0.000	N/A	0.001	0.000	N/A	N/L
25	0.012	0.001	N/A	0.012	0.002	N/A	N/L
26	0.000	0.000	N/A	0.001	0.000	N/A	N/L
27	0.010	0.001	N/A	0.010	0.002	N/A	N/L
28	0.001	0.000	N/A	0.001	0.000	N/A	N/L
29	0.009	0.001	N/A	0.009	0.002	N/A	N/L
30	0.001	0.000	N/A	0.001	0.000	N/A	N/L
31	0.007	0.001	N/A	0.008	0.001	N/A	N/L
32	0.001	0.000	N/A	0.001	0.000	N/A	N/L
33	0.006	0.001	N/A	0.007	0.001	N/A	N/L
34	0.001	0.000	N/A	0.001	0.000	N/A	N/L
35	0.005	0.001	N/A	0.006	0.001	N/A	N/L
36	0.000	0.000	N/A	0.001	0.000	N/A	N/L
37	0.005	0.001	N/A	0.006	0.001	N/A	N/L
38	0.000	0.000	N/A	0.001	0.000	N/A	N/L
39	0.004	0.001	N/A	0.005	0.001	N/A	N/L
40	0.000	0.000	N/A	0.001	0.000	N/A	N/L

Note: The EUT power level is below 75.0 Watts and therefore has no defined limits

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Ametek CTS
Reinach, Switzerland3/11/2021
7:32 PM

Voltage Source Verification Data (Run time)

EUT: Equipment Under Test
 Test category: Class-D per Ed. 5.0 (2018) (European limits)
 Test date: 2021/3/11
 Test duration (min): 10
 Comment: Temperature (C) 21 Humidity (%) 67
 Customer: Customer

Tested by: Shan Wang
 Test Margin: 100
 Start time: 下午 07:05:30
 End time: 下午 07:15:41
 Data file name: H-000065.cts_data

Test Result: N/L Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 231.14
 I_{Peak} (Amps): 0.629
 I_{Fund} (Amps): 0.033
 Power (Watts): 7.6
 Frequency(Hz): 50.00
 I_{RMS} (Amps): 0.109
 Crest Factor: 6.629
 Power Factor: 0.362

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.022	0.462	4.79	OK
3	0.412	2.080	19.82	OK
4	0.015	0.462	3.18	OK
5	0.041	0.924	4.47	OK
6	0.020	0.462	4.29	OK
7	0.032	0.693	4.56	OK
8	0.014	0.462	3.05	OK
9	0.021	0.462	4.44	OK
10	0.011	0.462	2.43	OK
11	0.018	0.231	7.92	OK
12	0.009	0.231	3.72	OK
13	0.015	0.231	6.41	OK
14	0.005	0.231	2.07	OK
15	0.015	0.231	6.37	OK
16	0.004	0.231	1.82	OK
17	0.015	0.231	6.65	OK
18	0.012	0.231	5.31	OK
19	0.018	0.231	7.96	OK
20	0.014	0.231	6.17	OK
21	0.019	0.231	8.28	OK
22	0.004	0.231	1.69	OK
23	0.015	0.231	6.58	OK
24	0.005	0.231	2.16	OK
25	0.015	0.231	6.32	OK
26	0.003	0.231	1.22	OK
27	0.013	0.231	5.46	OK
28	0.003	0.231	1.29	OK
29	0.013	0.231	5.48	OK
30	0.006	0.231	2.45	OK
31	0.011	0.231	4.84	OK
32	0.002	0.231	1.02	OK
33	0.011	0.231	4.83	OK
34	0.003	0.231	1.20	OK
35	0.008	0.231	3.68	OK
36	0.002	0.231	1.05	OK
37	0.008	0.231	3.39	OK
38	0.002	0.231	1.01	OK
39	0.007	0.231	2.99	OK
40	0.013	0.231	5.58	OK

Note : Equipment with a rated power of 75 W or less other than lighting equipment, the limits are not specified in this edition of the standard.

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4. Flicker

EN 61000-3-3 : 2013+A1:2019

4.1 Test Results

EN 61000-3-3 : 2013+A1:2019	PASS
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4.2 Methods and Procedures

Standard	Edition	Description
EN 61000-3-3	2013+A1:2019	Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

4.3 Test Instruments

SGS Flicker EN61000-3-3 HwaYa_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Power Analyzer	TESEQ	CCN 1000-1	1504A02654	2020/9/21	2021/9/20
AC Power Source	TESEQ	NSG 1007	1504A02654	2020/9/21	2021/9/20
Test Software	TESEQ	Win2100 V4	Ver. 4.14.0	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

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4.4 Measurement Data

Model No.:S121

Mode_1

Ametek CTS
Reinach, Switzerland3/11/2021
7:31 PM

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

EUT: Equipment Under Test
Test category: All parameters (European limits)
Test date: 2021/3/11
Test duration (min): 10
Comment: Temperature (C) 21 Humidity (%) 67
Customer: Customer

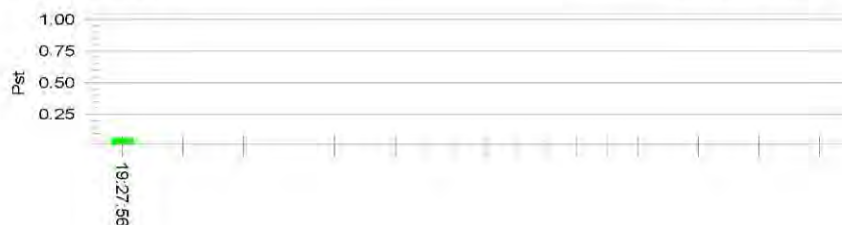
Tested by: Shan Wang
Test Margin: 100
Start time: 下午 07:17:35
End time: 下午 07:28:02
Data file name: F-000066.cts_data

Test Result: Pass

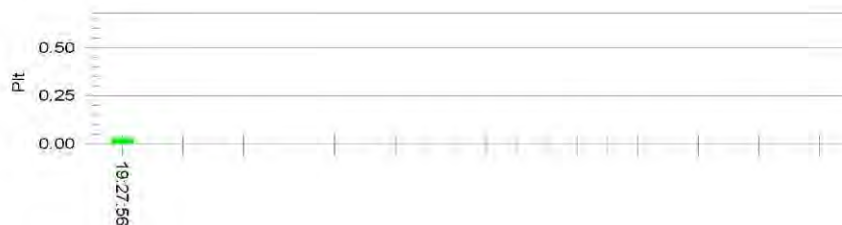
Status: Test Completed

Pst and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	231.12		
T-max (mS):	0	Test limit (mS):	500.0
Highest dc (%):	0.00	Test limit (%):	3.30
Highest dmax (%):	0.00	Test limit (%):	4.00
Highest Pst (10 min. period):	0.064	Test limit:	1.000
Highest Plt (2 hr. period):	0.028	Test limit:	0.650

Teseq AG Win2100 V4.26.0

Page 1 of 1

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5. IMMUNITY

EN 55024 : 2010+A1:2015

5.1 Test Results

Standard	Performance Criteria	Result
IEC 61000-4-2 : 2008	B	PASS
IEC 61000-4-3 : 2006+A1:2007+A2:2010	A	PASS
IEC 61000-4-4 : 2012	B	PASS
IEC 61000-4-5 : 2014+A1:2017	B	PASS
IEC 61000-4-6 : 2013	A	PASS
IEC 61000-4-8 : 2009	A	PASS
IEC 61000-4-11 : 2004+A1:2017	C/C/B	PASS

5.2 Performance Criteria Description

Criterion A - The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion B - The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

Criterion C - Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls.

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5.3 Test of IEC 61000-4-2

5.3.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-2	2008	Electrostatic Discharge (ESD)

5.3.2 Test Instruments

SGS ESD EN61000-4-2 HwaYa No.1_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
ESD Simulator	NoiseKen	ESS-B3011	ESS12Z5075	2020/9/21	2021/9/20
HCP	N/A	1.6 x 0.8 m	N/A	N.C.R.	N.C.R.
VCP	N/A	0.5 x 0.5 m	N/A	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.3.3 EUT Operating Condition

Environment :

Temperature	Humidity
22 °C	56 %RH

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5.3.4 Results of Electrostatic Discharge Test (ESD)

Model No.: S121

Tested By : Ricky Chen
Tested Date : Mar. 10, 2021
Test Mode : Mode 1
Basic Standard : IEC 61000-4-2
Discharge Impedance : 330 ohm / 150 pF
Discharge Voltage : Air Discharge : $\pm 2, 4, 8$ kV
Contact Discharge : $\pm 2, 4$ kV
HCP/VCP : $\pm 2, 4$ kV

Polarity : Positive/Negative
 Number of Discharge : 25 times at each test point
 Discharge Mode : Single Discharge
 Discharge Period : 1 second

Note 1 : For contact discharge, the EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity. All tests according to sec. 4.2.1 of EN 55024 : 2010+A1:2015.

A.Observations :

Test points: N/A

Direct Application			Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge
2, 4, 8(Air.)	+/-	N/A	N/A	N/A
2. 4(Cont.)	+/-	N/A	N/A	N/A

Remark: N/A : Not Applicable.

B.Observations :

Test points: 1. Front side. 2. Rear side. 3. Left side. 4. Right side.

Indirect Application					Test Results	
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling	Vertical Coupling		
2, 4	+/-	1 - 4	A	A		

Remark: A : No degradation of performance or loss of function.

N/A : Not Applicable.

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5.4 Test of IEC 61000-4-3

5.4.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-3	2006+A1:2007+A2:2010	Radio-Frequency Electromagnetic Field Susceptibility Test, RS

5.4.2 Test Instruments

SGS RS EN61000-4-3 HWAYA SAC-F EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
RS Test Site	Chance Most	8*5*3 Chamber	SAC-F	2021/2/24	2022/2/23
Signal Generator	R&S	SMB 100A	114674	2020/11/6	2021/11/5
Power Sensor	R&S	NRP-Z11	112186	2020/4/13	2021/4/12
Power Sensor	R&S	NRP-Z11	111682	2020/4/15	2021/4/14
Power Amplifier	R&S	BBA100	101075	N.C.R.	N.C.R.
Power Amplifier	R&S	BBA100	101021	N.C.R.	N.C.R.
Power Amplifier	R&S	BBA150	102229	N.C.R.	N.C.R.
E-Field Generating Antenna	ifi	EFG-3	U2137-0217	N.C.R.	N.C.R.
High Gain Log-Per. Antenna	R&S	HL046E	100112	N.C.R.	N.C.R.
Calibrated Broadband Log-Per. Test-Antenna	Schwarzbeck	STLP 9149	9149-151	N.C.R.	N.C.R.
Electric Field Probes	AR	FL7006+FI7000	0330722+0330847	2020/7/24	2021/7/23
Communication Tester	R&S	CMU200	114273	2020/5/31	2021/5/30
Communication Tester	R&S	CMW500	152303	2021/2/24	2022/2/23
Test Software	R&S	EMC 32	V10.20.01	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.4.3 EUT Operating Condition

Environment :

Temperature	Humidity
22 °C	59 %RH

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5.4.4 Results of Radiated Radio Frequency Electromagnetic (RS)

Model No.: S121

Tested By : Chuck Lu
Tested Date : Mar. 15, 2021
Test Mode : Mode 1
Basic Standard : IEC 61000-4-3
Frequency range : 80 MHz - 1000 MHz
Field strength : 3 V/m
Modulation : 80% AM (1kHz)
Frequency step : 1 % of fundamental
Polarity of Antenna : Horizontal and Vertical
Dwell Time : 3 seconds
Test distance : 3 m

No.	Frequency (MHz)	Antenna Orientation	Observation	EUT Orientation
1	80 - 1000	Vertical/Horizontal	A	0 degree
2	80 - 1000	Vertical/Horizontal	A	90 degree
3	80 - 1000	Vertical/Horizontal	A	180 degree
4	80 - 1000	Vertical/Horizontal	A	270 degree

Remark: A : No degradation of performance or loss of function.

N/A : Not Applicable.

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5.5 Test of IEC 61000-4-4

5.5.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-4	2012	Electrical fast transient/burst requirements

5.5.2 Test Instruments

SGS EFT EN61000-4-4 HwaYa No.2 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Burst Generator	TESEQ	NSG 3060	1763	2020/7/21	2021/7/20
Clamp	Thermo	CCL	612359	2020/12/29	2021/12/28
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.5.3 EUT Operating Condition

Environment :

Temperature	Humidity
23 °C	61 %RH

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5.5.4 Results of Electrical Fast Transient (EFT)

Model No.: S121

Tested By : Chuck Lu
 Tested Date : Mar. 15, 2021
 Test Mode : Mode 1
 Basic Standard : IEC 61000-4-4
 Test Voltage : AC Input: ± 1 kV, DC Input: ± 0.5 kV
 Signal/Comm. : ± 0.5 kV
 Polarity : Positive/Negative
 Impulse Frequency : 5 kHz
 Tr/Th : 5/50ns
 Burst : 15ms/300ms

Observation :

Test Point	Polarity	Test Level (kV)	Results
L	+/-	1	B
N	+/-	1	B
PE	+/-	1	N/A
L-N	+/-	1	B
L-PE	+/-	1	N/A
N-PE	+/-	1	N/A
L-N-PE	+/-	1	N/A
DC Input	+/-	0.5	N/A
Signal/Comm.	+/-	0.5	B

Remark: B : During test, the EUT's function degradation. After test, it recovery by itself.

N/A : The EUT power from AC mains (without PE exist), no necessary to perform test.

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5.6 Test of IEC 61000-4-5

5.6.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-5	2014+A1:2017	Surge immunity test

5.6.2 Test Instruments

SGS Surge EN61000-4-5 HwaYa No.2 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Surge Tester	TESEQ	NSG3060	1763	2020/7/21	2021/7/20
Surge Tester	TESEQ	NSG3060	1976	2020/7/21	2021/7/20
Surge Tester	TESEQ	CDN3061	1541	2020/7/21	2021/7/20
Universal Surge CDN	EMC Partner	CDN-UTP8-ED3	CDN-UTP8-1516	2020/6/20	2021/6/19
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.6.3 EUT Operating Condition

Environment :

Temperature	Humidity
23 °C	61 %RH

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5.6.4 Results of Surge Test

Model No.: S121

Tested By : Chuck Lu
 Tested Date : Mar. 15, 2021
 Test Mode : Mode 1
 Basic Standard : IEC 61000-4-5
 Test Rate : 1 pulse every minute
 No. of Tests : 5 positive and 5 negative pulses
 Waveform : 1.2/50 μ s (8/20 μ s)

Observation Description

AC input line:

Test Point	Phase Angle (degree)	Polarity (+/-)	Test Level (kV)	Observation
L – N	0, 90, 180, 270	+/-	1	A
L – PE	0, 90, 180, 270	+/-	2	N/A
N – PE	0, 90, 180, 270	+/-	2	N/A

Remark: A : No degradation of performance or loss of function.

N/A : The EUT power from AC mains (without PE exist) and no signal/Comm. port cable exist, no necessary to perform test.

DC input line:

Test Point	Phase Angle (degree)	Polarity (+/-)	Test Level (kV)	Observation
DC input	No phase angle (degree)	+/-	0.5	N/A

Remark: N/A : The EUT power from AC mains, no necessary to perform test.

Signal line:

Test Rate : 1 pulse every minute
 No. of Tests : 5 positive and 5 negative pulses
 Waveform : 10/700 μ s

Observation Description

Signal line:

Test Point	Phase Angle (degree)	Polarity (+/-)	Test Level (kV)	Observation
Signal I/O	No phase angle (degree)	+/-	1	N/A

Remark: N/A : POE LAN not use in outdoor, no necessary to perform test.

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5.7 Test of IEC 61000-4-6

5.7.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-6	2013	Immunity to conducted disturbances, induced by radio-frequency fields.

5.7.2 Test Instruments

SGS CS EN61000-4-6 HWAYA SR-D EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Signal Generator	Agilent	8648C	4108A05772	2020/3/26	2021/3/25
Power Sensor	R&S	NRVD	837794/029	2020/8/17	2021/8/16
Power Sensor	R&S	URV5-Z2	835640/015	2020/8/17	2021/8/16
Power Sensor	R&S	URV5-Z2	835640/016	2020/8/17	2021/8/16
Dual Directional Coupler	OSR	C21A8	33	N.C.R.	N.C.R.
Conducted Immunity System	Frankonia	CIT-10	102D3226	N.C.R.	N.C.R.
CDN	TESEQ	CDN M116	37673	2020/5/7	2021/5/6
CDN	FCC	FCC-801-M3-16A	99122	2020/5/11	2021/5/10
CDN	TESEQ	CDN T8-10	37212	2020/5/11	2021/5/10
CDN	TESEQ	CDN ST08A	30191	2021/3/2	2022/3/1
EM Injection Clamp	TESEQ	KEMZ 801A	33430	2020/6/4	2021/6/3
Test Software	Audix	i2	20191209	N.C.R.	N.C.R.
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.7.3 EUT Operating Condition

Environment :

Temperature	Humidity
21 °C	45 %RH

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5.7.4 Results of Immunity to Conducted Disturbances (CS)

Model No.: S121

Tested By : Jack Hsu
Tested Date : Mar. 11, 2021
Test Mode : Mode 1
Basic Standard : IEC 61000-4-6
Frequency range : 0.15 MHz - 80 MHz
Field strength : 3 Vrms
Modulation : 80% AM, 1 kHz Sinewave
Frequency step : 1 % of fundamental
Dwell Time : 3 seconds
Coupling Method : CDN 2 Lines, RJ45

Cable Description	Frequency (MHz)	Observation
AC input	0.15 – 80	A
DC input	0.15 – 80	N/A

Signal Ports

Cable Description	Frequency (MHz)	Observation
Signal/Comm.	0.15 – 80	A

Remark: A : No degradation of performance or loss of function.

N/A : The EUT power from AC mains, no necessary to perform test.

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5.8 Test of IEC 61000-4-8

5.8.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-8	2009	Power Frequency Magnetic Field Immunity Test

5.8.2 Test Instruments

SGS PFMF EN61000-4-8 HwaYa_EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
Magnetic Field Generator	Narda S.T.S.	PMM 1008	0100X30601	2020/11/10	2021/11/9
AC CLAMP METER	CHY	96	12002769	2020/9/3	2021/9/2
Triax Elf Magnetic Field Meter	F.W. BELL	4180	1248004	2020/7/10	2021/7/9
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.8.3 EUT Operating Condition

Environment :

Temperature	Humidity
22 °C	60 %RH

5.8.4 Result of Immunity to Power Frequency Magnetic Field

Model No.: S121

Tested By : Chuck Lu
Tested Date : Mar. 15, 2021
Test Mode : Mode 1
Basic Standard : IEC 61000-4-8
Power Frequency : 50 and 60 Hz
Magnetic Field : 1 A/m(r.m.s)
Coil Orientation : X, Y, Z Axis
Observation : A

Remark: A : No degradation of performance or loss of function.
N/A : Not Applicable.

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5.9 Test of IEC 61000-4-11

5.9.1 Methods and Procedures

Standard	Edition	Description
IEC 61000-4-11	2004+A1:2017	Voltage dips, short interruptions and voltage variations immunity tests

5.9.2 Test Instruments

SGS DIP EN61000-4-11 HwaYa No.2 EMC					
EQUIPMENT TYPE	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due
EMS Multi-Tester	TESEQ	INA 6502	209	2020/7/21	2021/7/20
EMS Multi-Tester	TESEQ	NSG3060	1763	2020/7/21	2021/7/20
Testing Site : No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan					

5.9.3 EUT Operating Condition

Environment :

Temperature	Humidity
23 °C	61 %RH

5.9.4 Results of Voltage Dips Immunity Test

Model No.: S121

Tested By : Chuck Lu
 Tested Date : Mar. 15, 2021
 Test Mode : Mode 1
 Basic Standard : IEC 61000-4-11
 EUT Rated Voltage : 230 Volts.
 Reduction Voltage : 30, >95 % Ut
 Phase Angle : 0,180 degree
 Total events : 3 dropouts
 Event interval : 10 seconds

Environmental phenomena	Test specification (% reduction)	Duration (in periods of the rated frequency)	Observation
Voltage Interruptions	>95	250	C
Voltage dips	>95	0.5	A
	30	25	A

Remark: A : No degradation of performance or loss of function.

C : During and after test power turn off automatically. Turn ON/OFF by manual could return to normal operation.

N/A : Not Applicable.

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APPENDIX - Constructional Details

Photography of General Testing Set-up.....	44-53
Photographs of Product.....	54-58

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Photograph of Testing General Set-up

CE Testing Set-up

Model No.:S121

Mode_1_+



Mode_1_-



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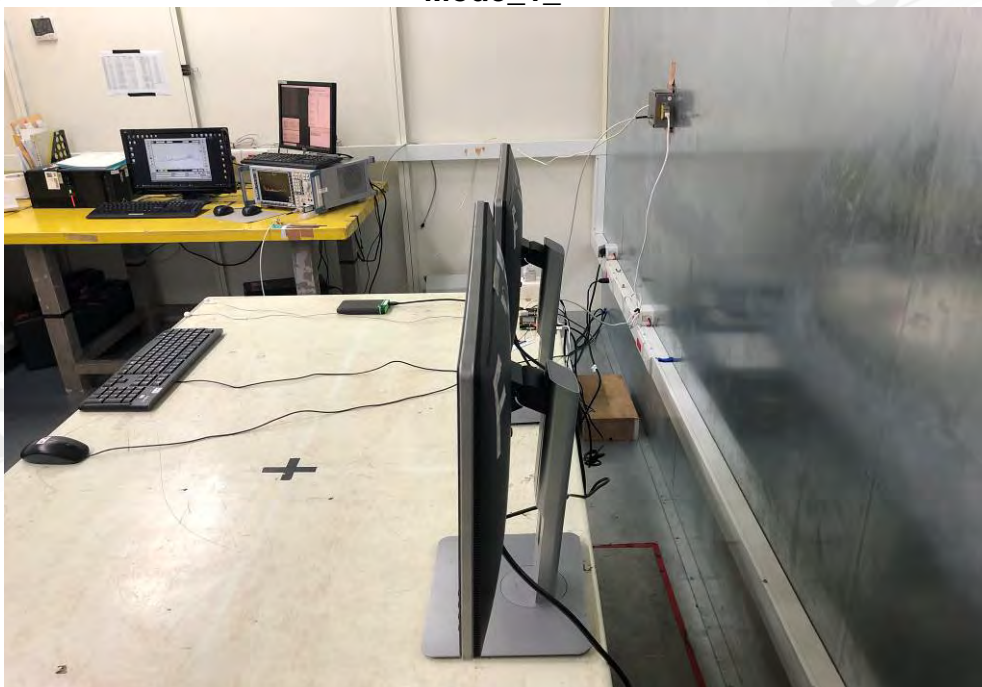
ISN Testing Set-up

Model No.:S121

Mode_1_+



Mode_1_-



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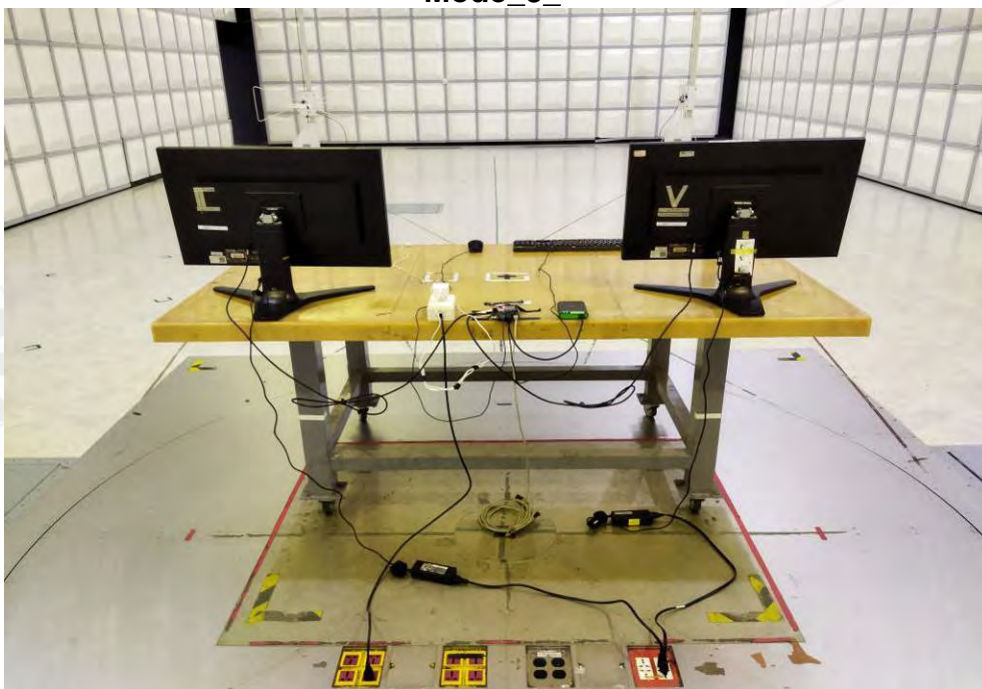
RE Testing Set-up Below 1GHz

Model No.:S121

Mode_3_+



Mode_3_-



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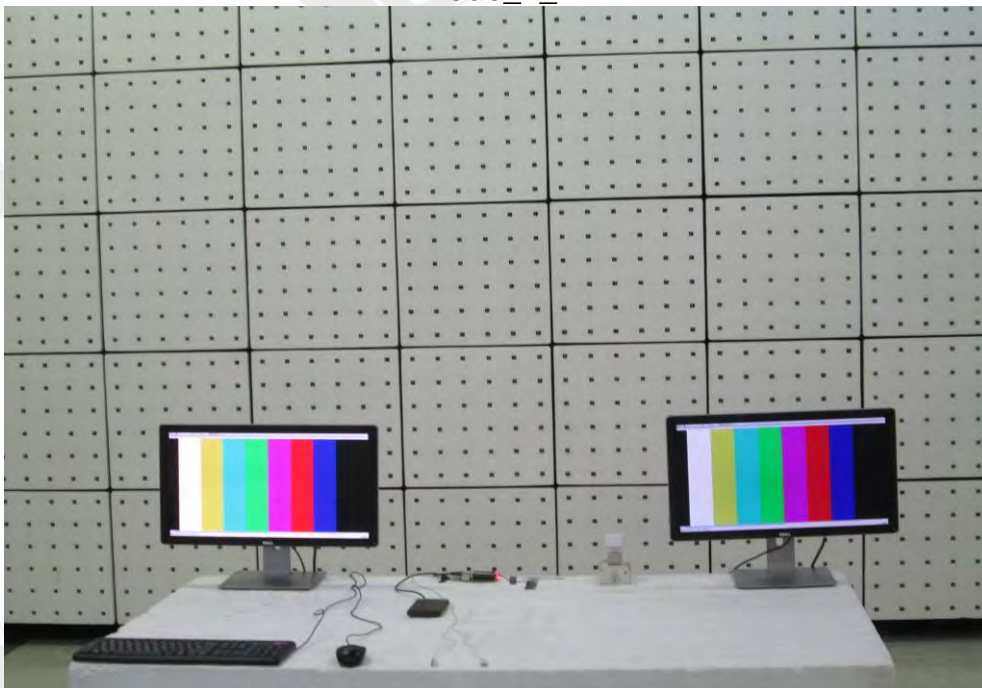
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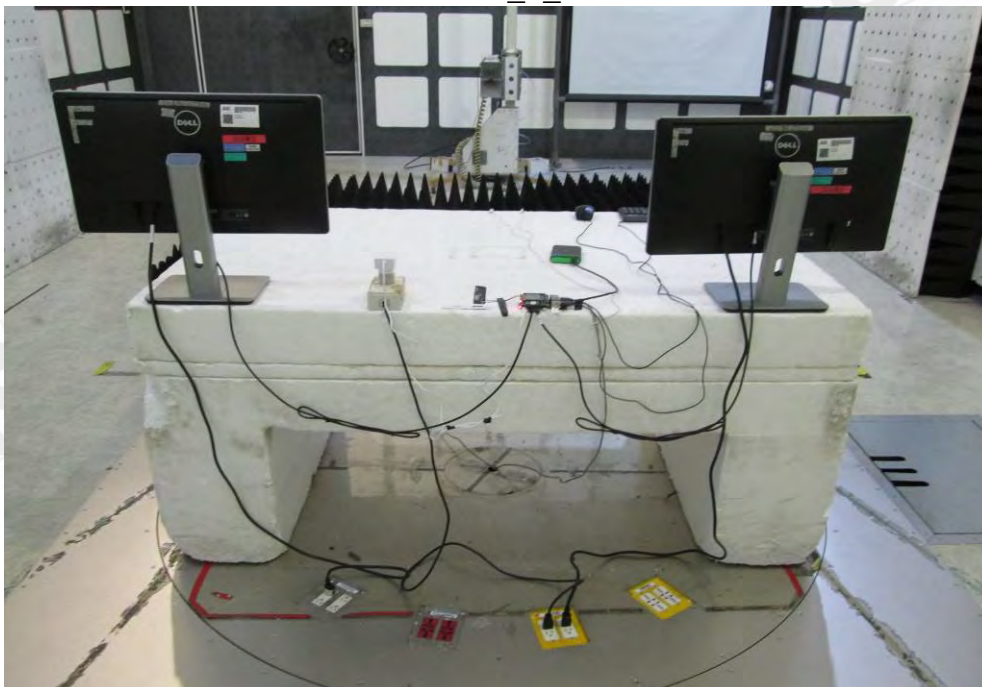
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Model No.:S121

Mode_1_+



Mode_1_-



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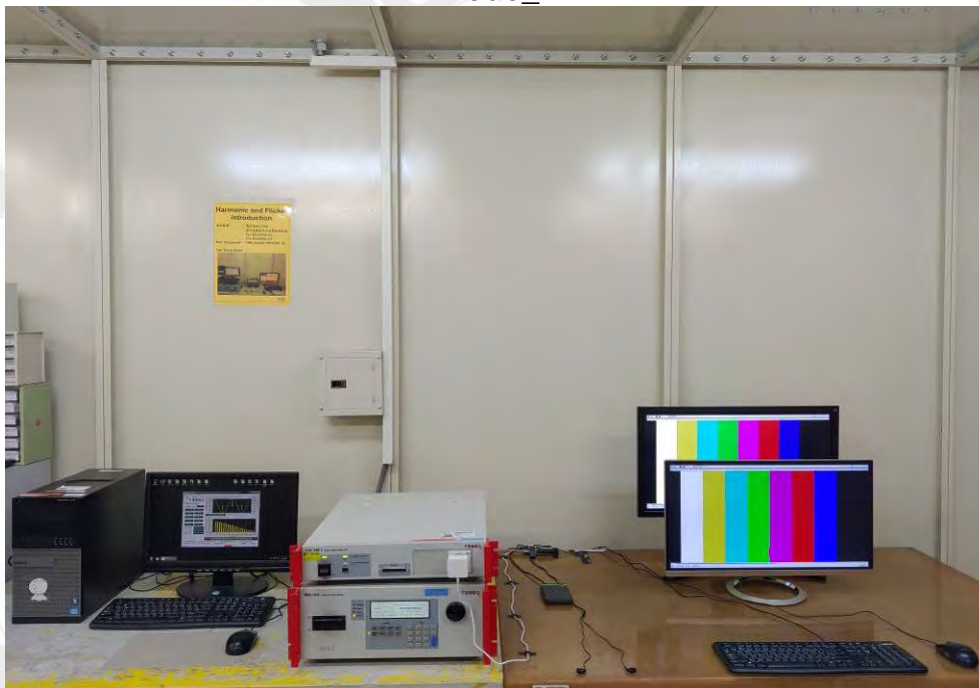
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HARMONIC Testing Set-up

Model No.:S121

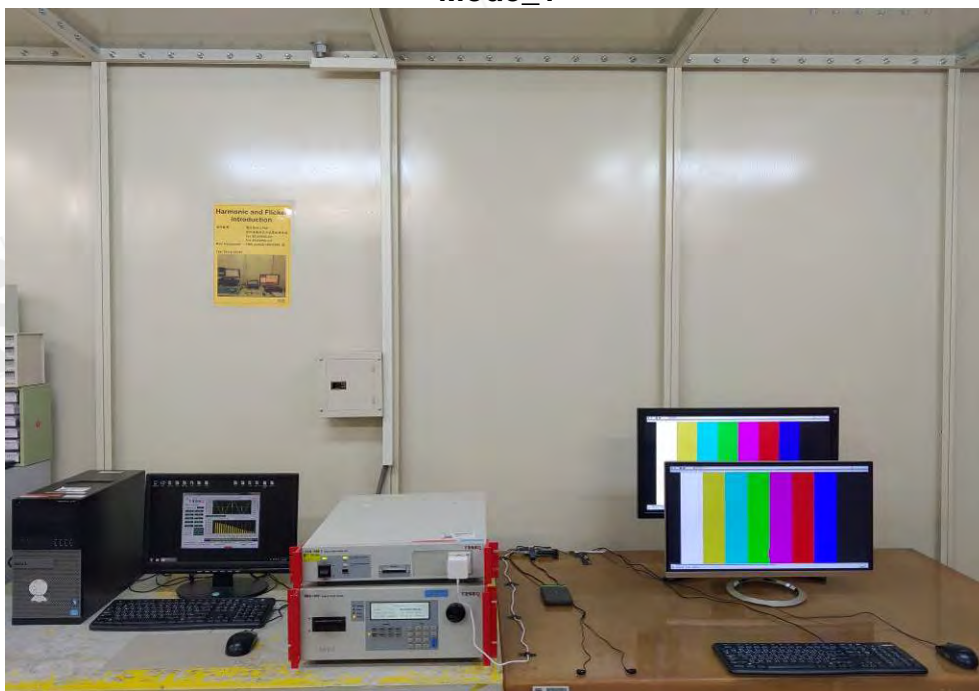
Mode_1



FLICKER Testing Set-up

Model No.:S121

Mode_1



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ESD Testing Set-up

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Mode_1



RS Testing Set-up

Model No.:S121

Mode_1



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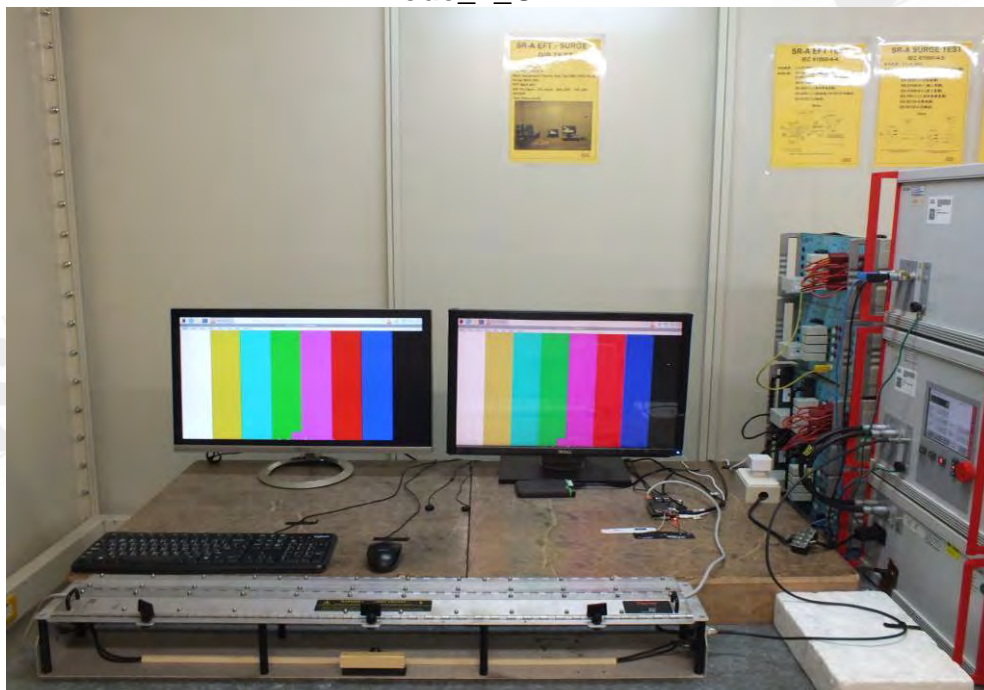
EFT Testing Set-up

Model No.:S121

Mode_1



Mode_1_CLAMP



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Surge Testing Set-up

Model No.:S121

Mode_1



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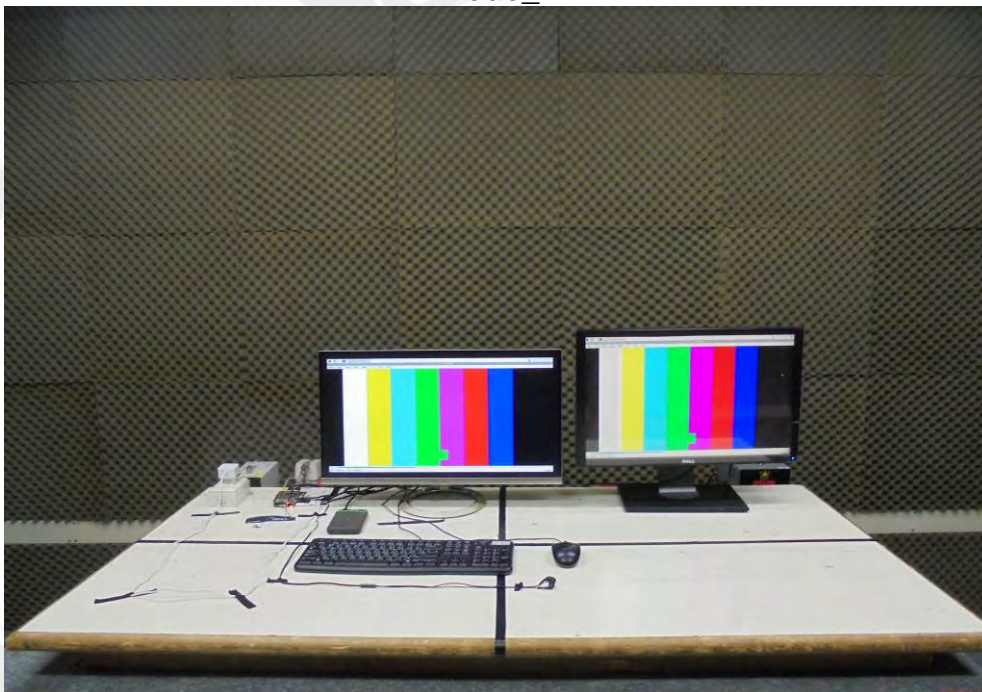
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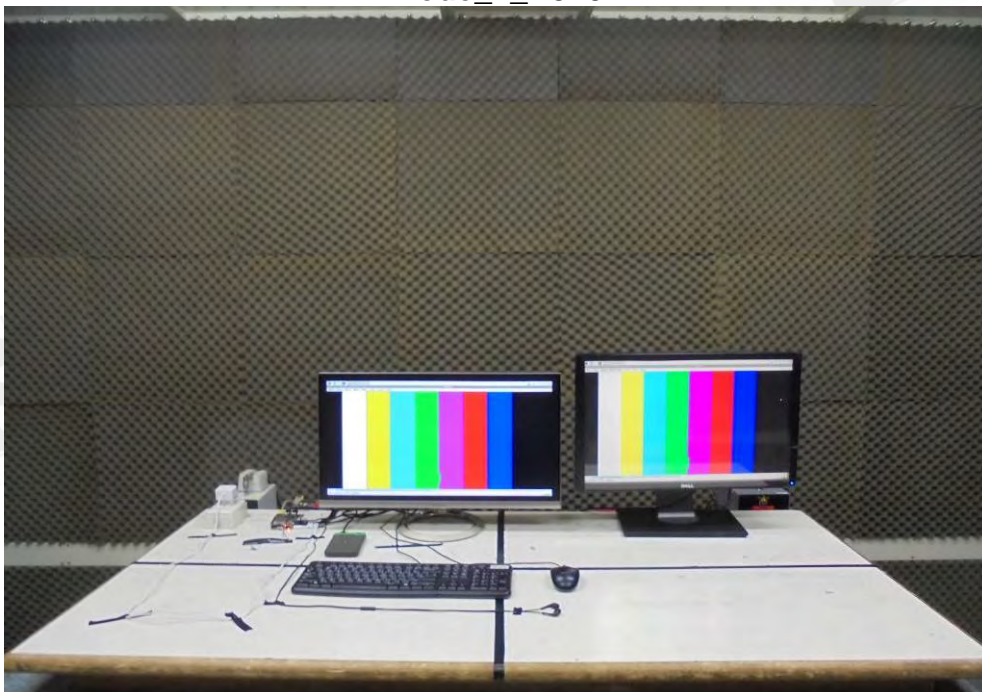
CS Testing Set-up

Model No.:S121

Mode_1



Mode_1_RJ45



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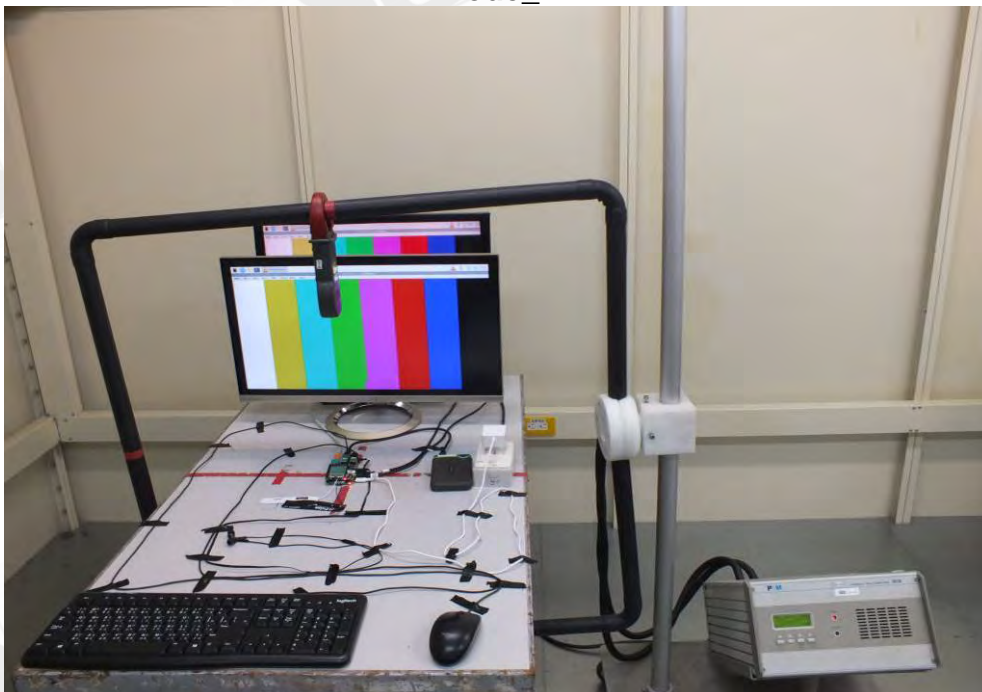
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PFMF Testing Set-up

Model No.:S121

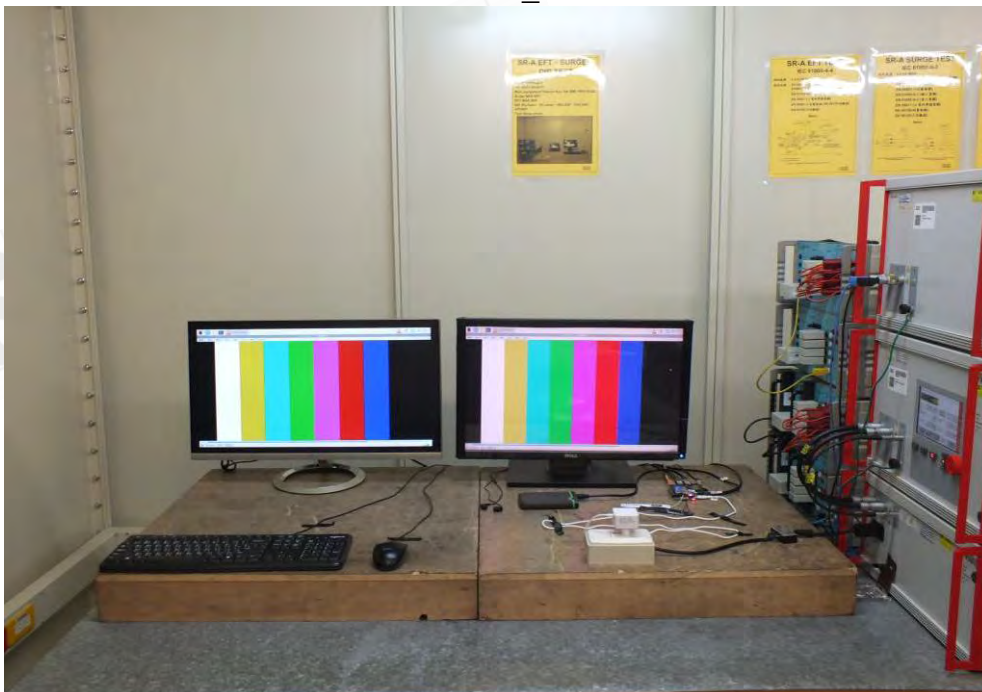
Mode_1



DIP Testing Set-up

Model No.:S121

Mode_1



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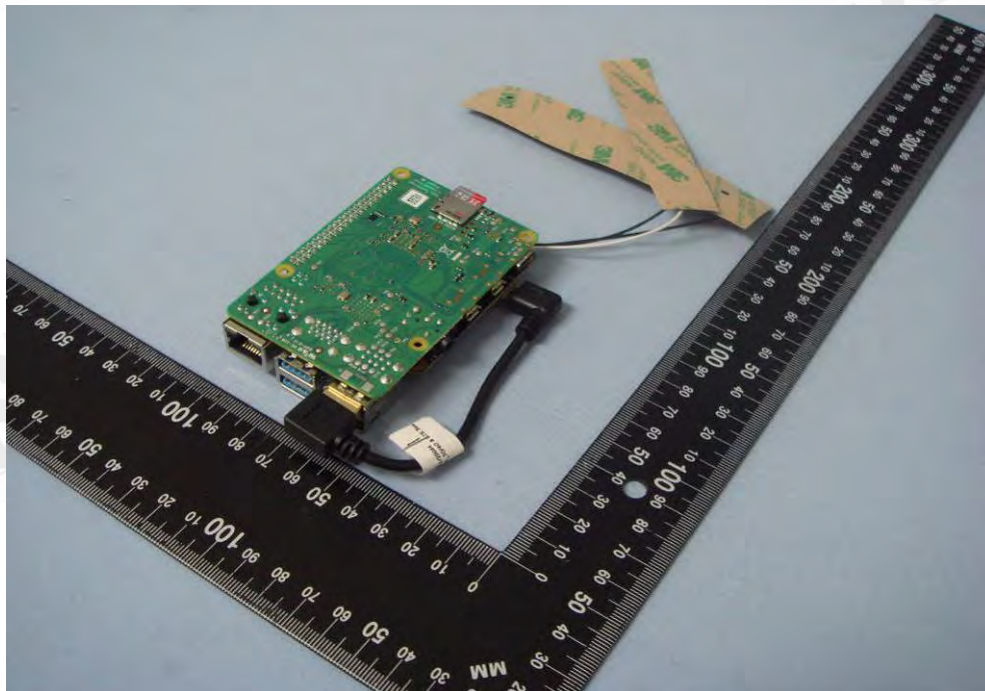
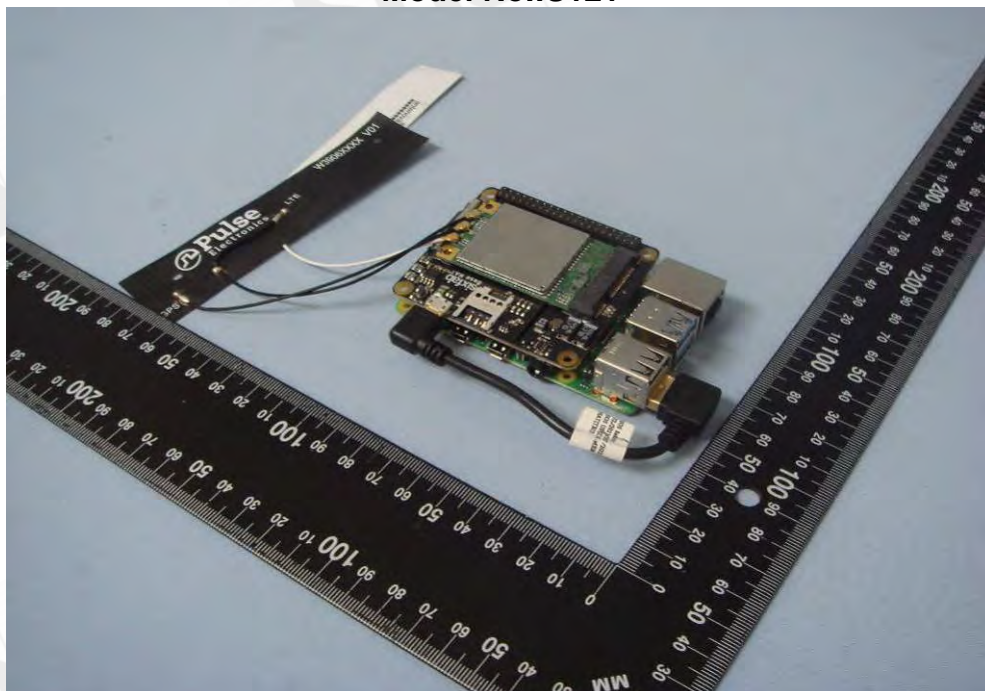
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Photographs of EUT Unit

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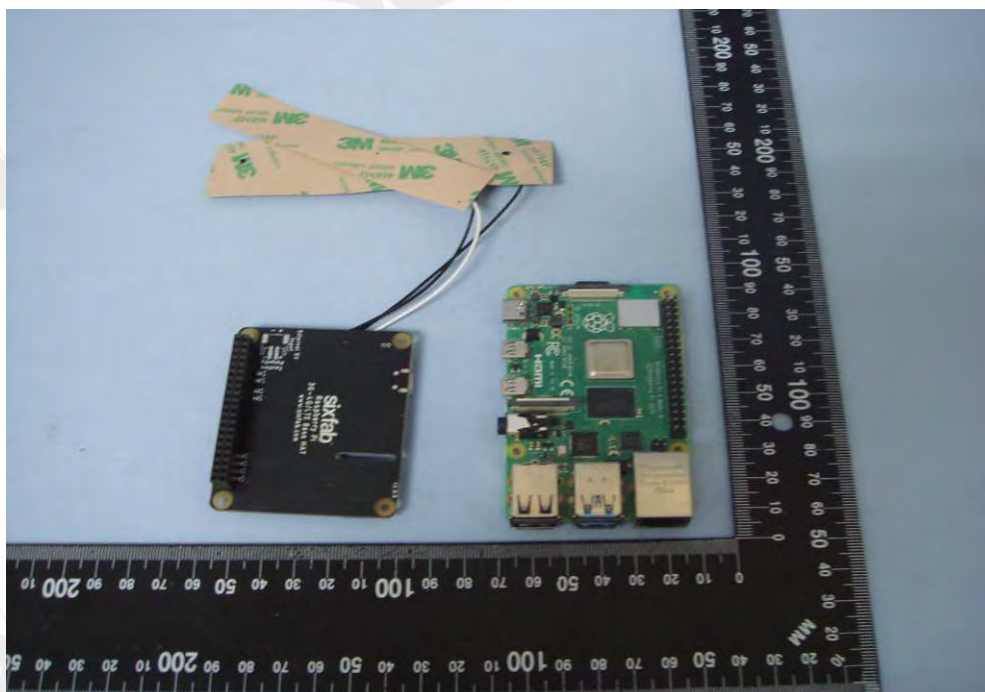
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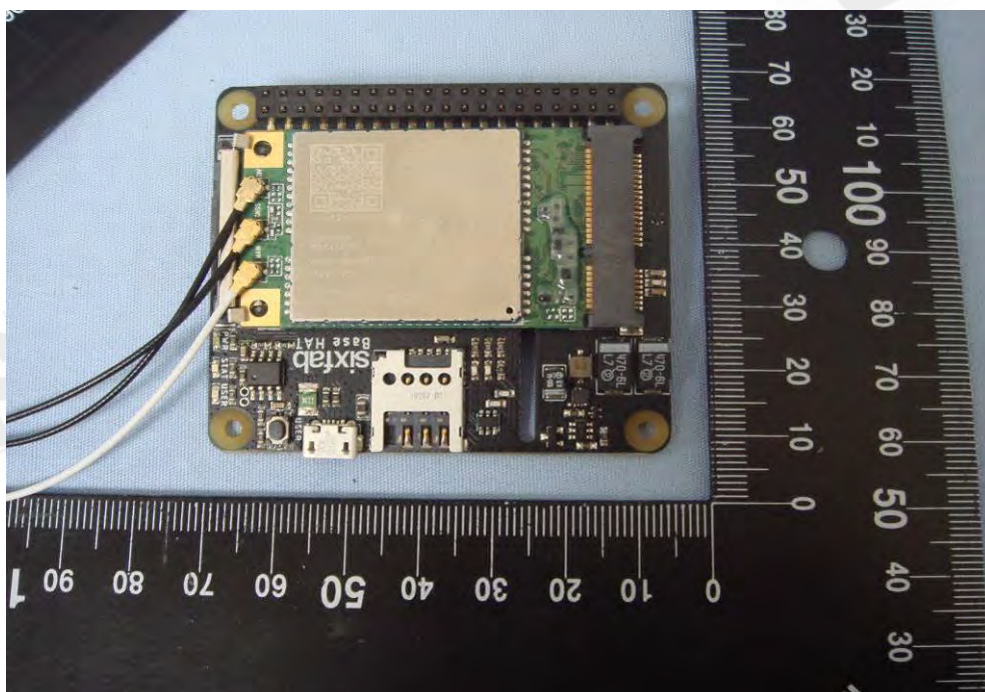
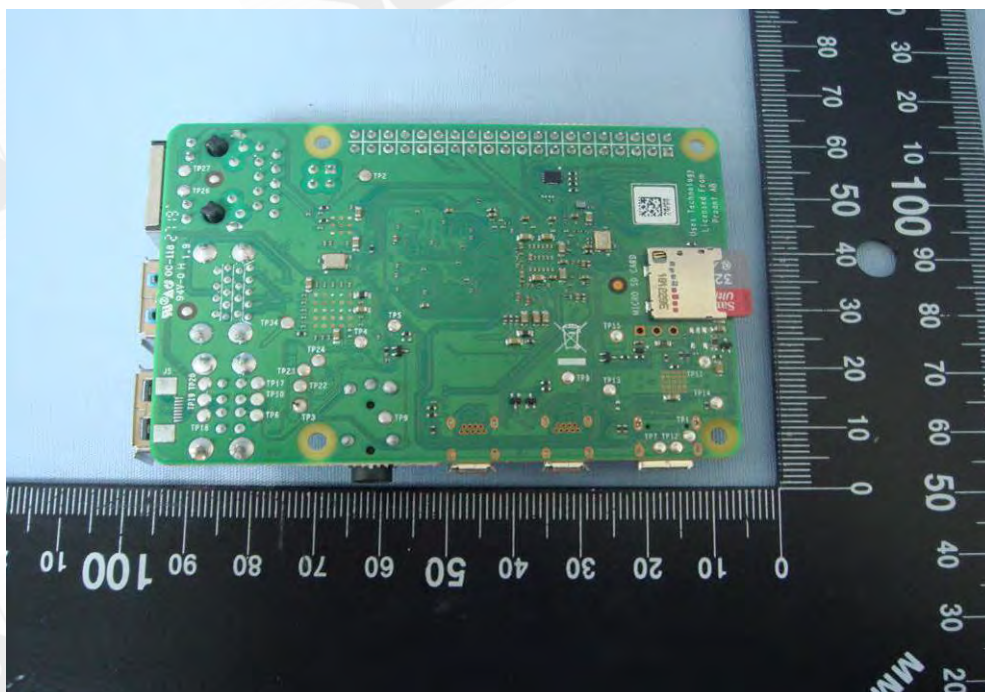
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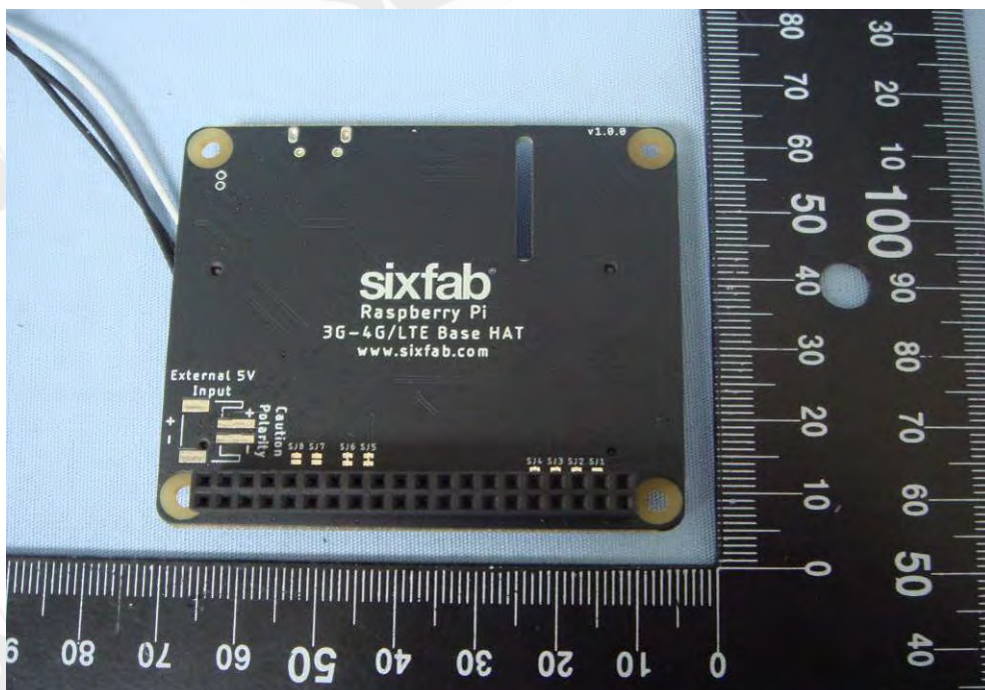
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