Prüfbericht – Produkte
Test Report - Products

Prüfbericht-Nr.: *Test report no.:*	CN21W4NS 001	**Auftrags-Nr.:** *Order no.:*	238517891 (P00338775)	Seite 1 von 33 *Page 1 of 33*
Kunden-Referenz-Nr.: *Client reference no.:*	238517891	**Auftragsdatum:** *Order date:*	23 Aug 2021	
Auftraggeber: *Client:*	AKCess Pro Limited 121/39 RS Tower, Fl.9, Ratchadaphisek Rd Dindaeng, Dindaeng, BANGKOK, 10400 Thailand			
Prüfgegenstand: *Test item:*	sensorProbe2+			
Bezeichnung/Typ-Nr.: *Identification / Type no.:*	sensorProbe2+ , sensorProbe2			
Auftrags-Inhalt: *Order content*:	TUV Rheinland - EMC service			
Prüfgrundlage: *Test specification:*	FCC 47 CFR Part 15, Subpart B :2019 ICES-003_2020 Issue 7			
Wareneingangsdatum: *Date of sample receipt:*	20 Jul. 2021			
Prüfmuster-Nr.: *Test sample no:*	A003115476			
Prüfzeitraum: *Testing period:*	02 Sep. 2021 - 03 Sep. 2021			
Ort der Prüfung: *Place of testing:*	458-19, Sec..2, Fenliao Rd., Linkou Dist, New Taipei City			
Prüflaboratorium: *Testing laboratory:*	Taoyuan Testing Laboratories			
Prüfergebni*: *Test result*:*	Pass			

Geprüft von / *tested by:*

15 Sep. 2021 Sky Huang / Project Engineer

Kontrolliert von / reviewed by:

15 Sep. 2021 Hugo Chang / Manager

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht
** Legend:*	*1 = very good* *P(ass) = passed a.m. test*	*2 = good*	*3 = satisfactory* *F(ail) = failed a.m. test specification(s)*	*4 = sufficient* *N/A = not applicable*	*5 = poor* *N/T = not tested*

V05

TEST SUMMARY

FCC 47 CFR Part 15, Subpart B:2019

Report Section	Basic Standard	Test Item	Result
5.1.1	15.107	AC Power Line Conducted Emissions	Pass
5.1.2	15.109	Radiated Emissions up to 1 GHz	Pass
5.1.2	15.109	Radiated Emissions above 1 GHz	Pass

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Report Section	Basic Standard	Test Item	Result
5.1.1	3.2.1	AC Power Line Conducted Emissions	Pass
5.1.2	3.2.2	Radiated Emissions up to 1 GHz	Pass
5.1.3	3.2.2	Radiated Emissions above 1 GHz	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Contents

HISTORY OF THIS TEST REPORT

Report No.	Description	Date Issued
CN21W4NS 001	Original Release	2021-09-15

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
Appendix EP - Photographs of EUT

Applied Standard and Test Levels

Standards
FCC 47 CFR Part 15, Subpart B:2019
ICES-003_2020 Issue 7
ANSI C63.4:2014

1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

2. Test Sites

2.1 Test Laboratory

Taoyuan Testing Laboratories

4F-1, No. 38, Huaya 1st Road, Guishan District,
Taoyuan City, 333
Taiwan (R.O.C.)

2.2 Test Facility

New Taipei Testing Laboratories

No.458-18 & 19, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

Emission Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission(LISN)(150kHz - 30MHz)	2.69 dB
Radiated Emission (30 MHz ~ 1 GHz)	2.60 dB
Radiated Emission (Above 1 GHz)	3.08 dB

3. General Product Information

3.1 Product Function and Intended Use

The tested sample is " sensorProbe2+" connect to computer and other information technology equipment via LAN interface observe Temperature and humidity.

Model differences: main model has 4 sensor ports, series model has 2 functioning sensor ports disabled under software control
Series model: sensorProbe2.

3.2 Rating and Physical Characteristics

Model:	SensorProbe2+
Product Input Voltage:	120Vac/60Hz for Adapter
FCC ID	2ARUS SP2P

3.3 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 25MHz , for detailed internal source, please refer to the manufacturer's specifications.

3.4 Noise Suppression Parts

Please refer to Attachment Photo Documentation for details.

3.5 Submitted Documents

1) User Manual
2) Circuit Diagram
3) Rating Label.

4. Test Set-up and Operation Modes

4.1 Test Operation and Test Software

EMC Operation Descriptions.

1. The EUT was powered by Adapter.
2. The EUT is connected to the notebook via a LAN cable.
3. Monitor EUT's Web status via notebook.

The final mode as following configurations:

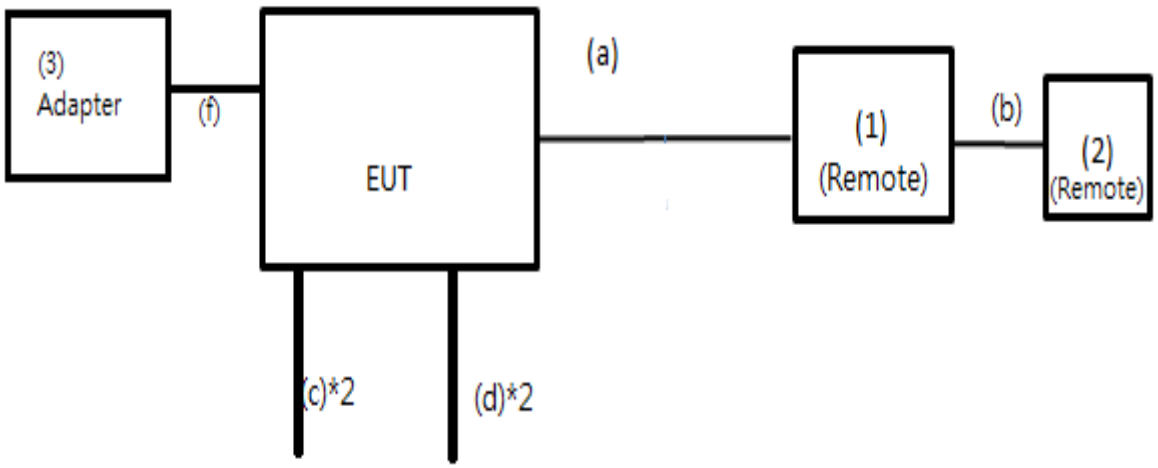
Test final mode are presented in the report as below.

Mode	Test Condition
Emission Final tests	
1	Sensor +LAN Link+AC 120V

Test Condition

Test Item	Ambient Temperature	Relative Humidity	Tested by
Conducted Emission (AC Mains)	24°C	65 %	Sky Huang
Radiated Emission(below 1GHz)	20 ~ 22°C	59 ~ 62 %	Sky Huang
Radiated Emission(above 1GHz)	20 ~ 22°C	59 ~ 62 %	Sky Huang

4.2 Test Setup Diagram



4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

Support Unit

Support Unit					
No.	Description	Brand	Model	S/N	Remark
1	Notebook	HP	15-da1046TX	CND9111RHH	
2	Adapter	HP	TPN-CA16	L25298-002	For NB

Accessory List					
No.	Description	Brand	Model	S/N	Remark
3	Adapter	TOKPOWER	TAP40-050S600U1	N/A	For EUT

Interface Cable					
No.	Description	Shielded Type	Ferrite Core (Qty)	Length (cm)	Remark
a	LAN Cable	N/A	N/A	1000	
b	Adapter Cable	N/A	N/A	100	
c	Sensor Cable*2	N/A	N/A	100	For EUT(THS01)
d	Sensor Cable*2	N/A	N/A	100	For EUT(TMP01)
f	Adapter Cable	N/A	N/A	180	For EUT

5. Test Results

5.1 Emission Test

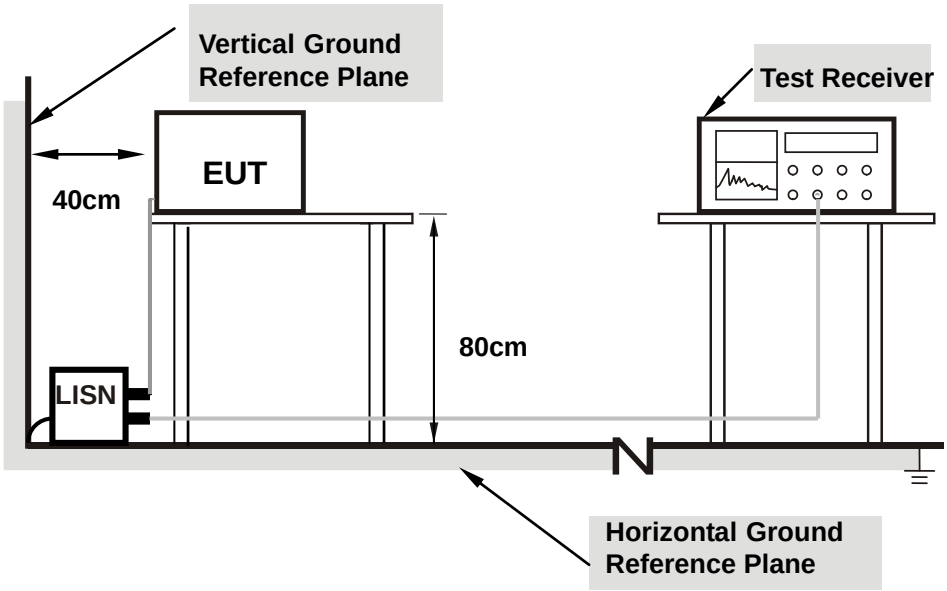
5.1.1 Conducted Emission (AC Mains)

Limit

Frequency (MHz)	Class A (dBµV)		Class B (dBµV)	
	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

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through an Artificial Mains Network (AMN). Other support units were connected to the power mains through another AMN. The two AMNs provide 50 Ohm/ 50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

Test Instruments (LinKou: Shield Room)

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI 3	101094	2020/11/17	2021/11/17
Two-Line V-Network (for EUT)	Rohde & Schwarz	ENV216	101938	2020/09/10	2021/09/10
Two-Line V-Network	Schwarzbeck	NSLK 8127	8127-00975	2020/10/29	2021/10/29
Test Software	Audix	e3	Ver. 9	N/A	N/A

Test Result

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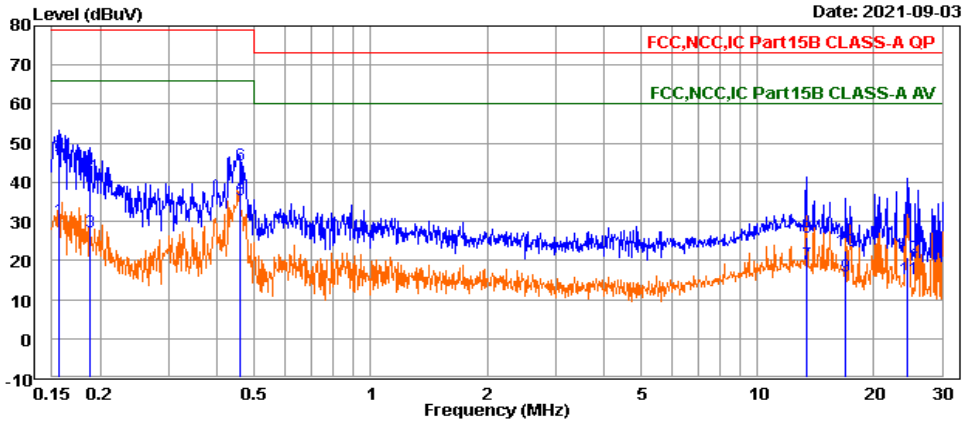
Table 1 Results Conducted Emission 0.15 - 30 MHz (Mode 1)(Line)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



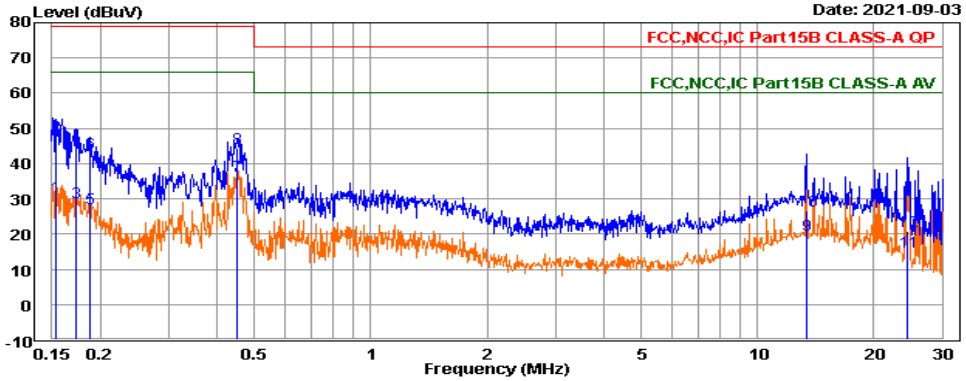
Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Pol/Phase	Note	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.16	30.24	20.58	9.66	66.00	-35.76	line1		Average
2	0.16	46.66	37.00	9.66	79.00	-32.34	line1		QP
3	0.19	27.13	17.48	9.65	66.00	-38.87	line1		Average
4	0.19	43.29	33.64	9.65	79.00	-35.71	line1		QP
5	0.46	35.53	25.88	9.65	66.00	-30.47	line1		Average
6	0.46	44.29	34.64	9.65	79.00	-34.71	line1		QP
7	13.38	19.11	9.35	9.76	60.00	-40.89	line1		Average
8	13.38	25.92	16.16	9.76	73.00	-47.08	line1		QP
9	16.91	15.87	6.12	9.75	60.00	-44.13	line1		Average
10	16.91	22.53	12.78	9.75	73.00	-50.47	line1		QP
11	24.46	15.17	5.47	9.70	60.00	-44.83	line1		Average
12	24.46	20.95	11.25	9.70	73.00	-52.05	line1		QP

Note: Level = Reading + Factor
Margin = Level – Limit

Table 2 Results Conducted Emission 0.15 - 30 MHz (Mode 1)(Neutral)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Pol/Phase	Note	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.15	30.61	20.93	9.68	66.00	-35.39	neutral		Average
2	0.15	47.87	38.19	9.68	79.00	-31.13	neutral		QP
3	0.17	28.90	19.23	9.67	66.00	-37.10	neutral		Average
4	0.17	45.37	35.70	9.67	79.00	-33.63	neutral		QP
5	0.19	27.23	17.56	9.67	66.00	-38.77	neutral		Average
6	0.19	43.11	33.44	9.67	79.00	-35.89	neutral		QP
7	0.45	36.42	26.76	9.66	66.00	-29.58	neutral		Average
8	0.45	44.57	34.91	9.66	79.00	-34.43	neutral		QP
9	13.38	19.80	9.98	9.82	60.00	-40.20	neutral		Average
10	13.38	26.69	16.87	9.82	73.00	-46.31	neutral		QP
11	24.46	15.10	5.27	9.83	60.00	-44.90	neutral		Average
12	24.46	20.92	11.09	9.83	73.00	-52.08	neutral		QP

Note: Level = Reading + Factor
Margin = Level – Limit

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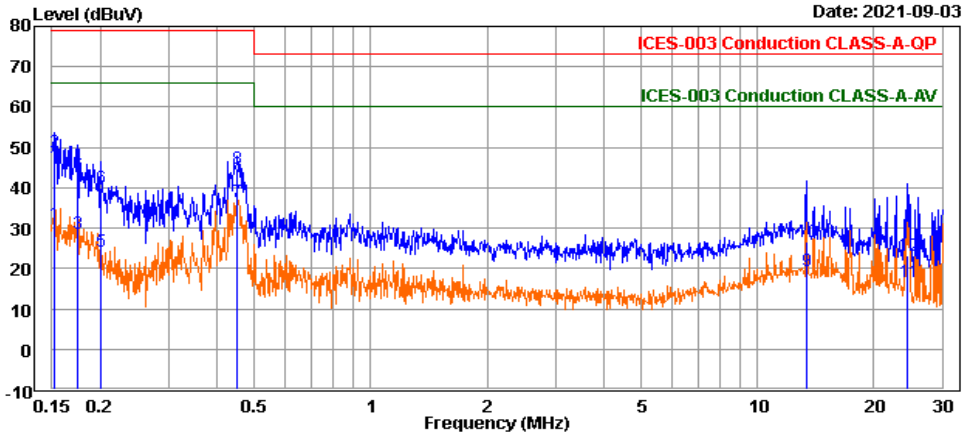
Table 3 Results Conducted Emission 0.15 - 30 MHz (Mode 1)(Line)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



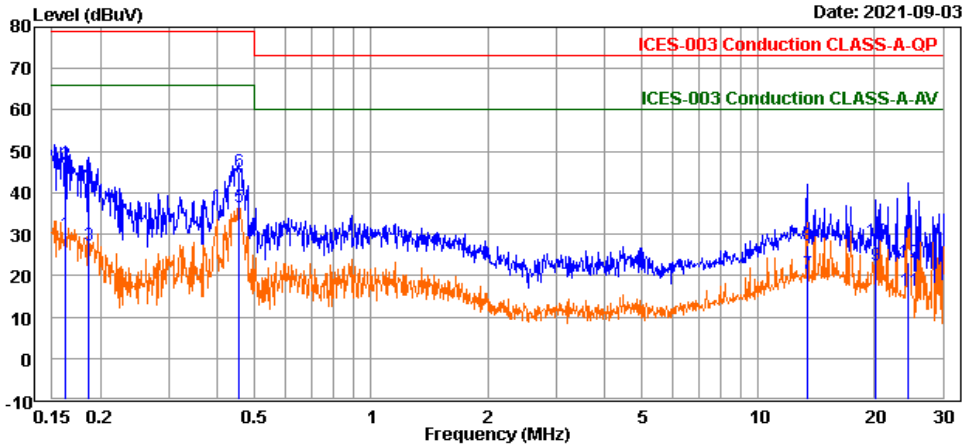
Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Pol/Phase	Note	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.15	30.93	21.27	9.66	66.00	-35.07	line1		Average
2	0.15	48.85	39.19	9.66	79.00	-30.15	line1		QP
3	0.18	28.67	19.02	9.65	66.00	-37.33	line1		Average
4	0.18	45.26	35.61	9.65	79.00	-33.74	line1		QP
5	0.20	24.17	14.52	9.65	66.00	-41.83	line1		Average
6	0.20	39.99	30.34	9.65	79.00	-39.01	line1		QP
7	0.45	36.49	26.84	9.65	66.00	-29.51	line1		Average
8	0.45	44.83	35.18	9.65	79.00	-34.17	line1		QP
9	13.38	19.60	9.84	9.76	60.00	-40.40	line1		Average
10	13.38	26.45	16.69	9.76	73.00	-46.55	line1		QP
11	24.46	16.62	6.92	9.70	60.00	-43.38	line1		Average
12	24.46	23.06	13.36	9.70	73.00	-49.94	line1		QP

Note: Level = Reading + Factor
Margin = Level – Limit

Table 4 Results Conducted Emission 0.15 - 30 MHz (Mode 1)(Neutral)

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, , Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



Trace: 1

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Pol/Phase	Note	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB			
1	0.16	30.09	20.41	9.68	66.00	-35.91	neutral		Average
2	0.16	46.72	37.04	9.68	79.00	-32.28	neutral		QP
3	0.19	27.37	17.70	9.67	66.00	-38.63	neutral		Average
4	0.19	43.02	33.35	9.67	79.00	-35.98	neutral		QP
5	0.45	36.66	27.00	9.66	66.00	-29.34	neutral		Average
6	0.45	44.93	35.27	9.66	79.00	-34.07	neutral		QP
7	13.38	20.44	10.62	9.82	60.00	-39.56	neutral		Average
8	13.38	27.28	17.46	9.82	73.00	-45.72	neutral		QP
9	20.13	22.35	12.52	9.83	60.00	-37.65	neutral		Average
10	20.13	28.29	18.46	9.83	73.00	-44.71	neutral		QP
11	24.46	16.32	6.49	9.83	60.00	-43.68	neutral		Average
12	24.46	23.08	13.25	9.83	73.00	-49.92	neutral		QP

Note: Level = Reading + Factor
Margin = Level – Limit

5.1.2 Radiated Emission (up to 1 GHz)

Limit

Radiated Emissions Limits at 10 meters		
Frequency (MHz)	Class A	Class B
	dBµV/m	dBµV/m
30 - 88	39	29.5
88 - 216	43.5	33.1
216 - 960	46.4	35.6
Above 960	49.5	43.5

Radiated Emissions Limits at 3 meters		
Frequency (MHz)	Class A	Class B
	dBµV/m	dBµV/m
30 - 88	49.5	40
88 - 216	54	43.5
216 - 960	56.9	46
960 - 1000	60	54

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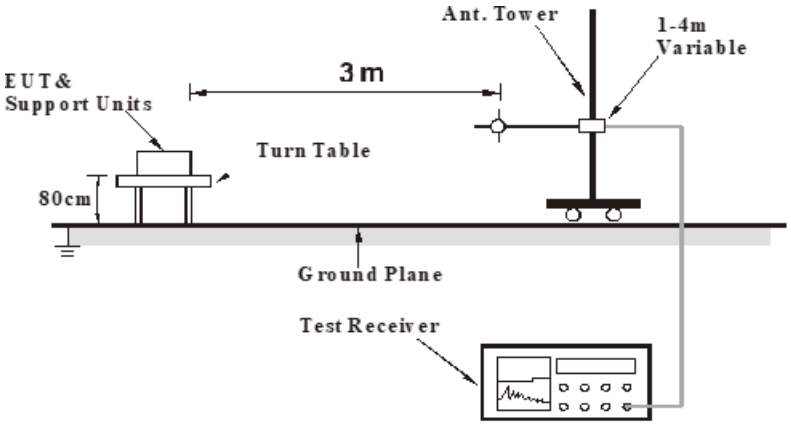
Radiated Emissions Limits at 10 meters		
Frequency (MHz)	Class A	Class B
	dBµV/m	dBµV/m
30 - 88	40.0	30.0
88 - 216	43.5	33.1
216 - 230	46.4	35.6
230 - 960	47.0	37.0
960 - 1000	49.5	43.5

Radiated Emissions Limits at 3 meters		
Frequency (MHz)	Class A	Class B
	dBµV/m	dBµV/m
30 - 88	50.0	40.0
88 - 216	54.0	43.5
216 - 230	56.9	46.0
230 - 960	57.0	47.0
960 - 1000	60.0	54.0

Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. All emanations from a class A digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. 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 from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The calculation formula is explained as follows:
Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.

Test Instruments

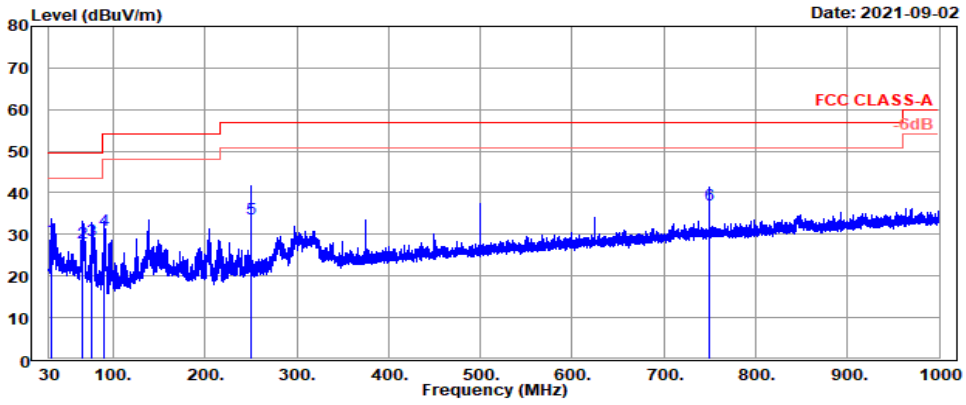
Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESR7	102108	2021/04/14	2022/04/14
Spectrum Analyzer	Rohde & Schwarz	FSV-40	101508	2021/03/16	2022/03/16
Pre-Amplifier	Agilent	8447D	2944A10772	2021/02/18	2022/02/18
Pre-Amplifier	EMCI	EMC051845SE	980633	2021/02/09	2022/02/09
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2021/02/19	2022/02/19
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/01	2021/12/01
Loop Antenna	Electro-Metrics	EMCI LPA600	287	2021/01/15	2022/01/15
Test Software	Audix	e3	Ver. 9	N/A	N/A

Test Result

FCC 47 CFR Part 15, Subpart B:

Table 5 Results Enclosure Radiated Emission 30 – 1000 MHz
Horizontal

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, , Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

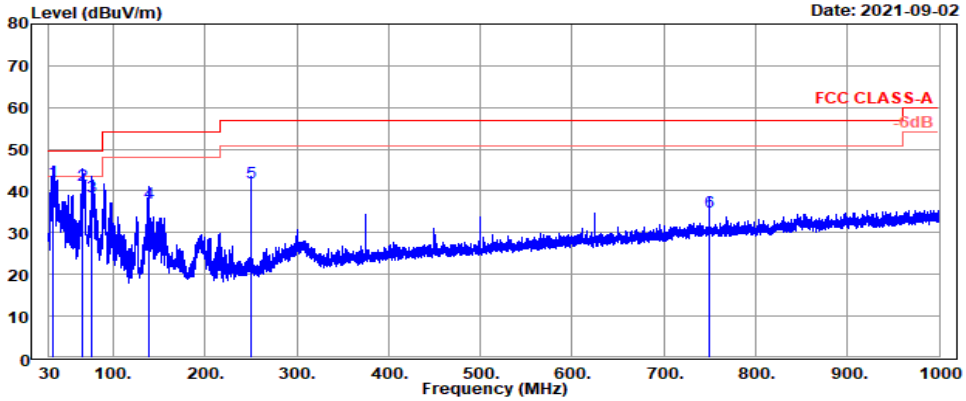


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	32.52	29.04	36.20	-7.16	49.50	-20.46	300	103	QP	Horizontal	
2	66.28	28.13	36.20	-8.07	49.50	-21.37	100	131	QP	Horizontal	
3	77.14	28.46	38.23	-9.77	49.50	-21.04	201	360	QP	Horizontal	
4	90.33	30.90	43.22	-12.32	54.00	-23.10	300	245	QP	Horizontal	
5	250.00	33.86	40.28	-6.42	56.90	-23.04	100	24	QP	Horizontal	
6	750.03	37.09	34.32	2.77	56.90	-19.81	100	174	QP	Horizontal	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

Table 6 Results Enclosure Radiated Emission 30 – 1000 MHz
Vertical

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	34.56	42.32	49.32	-7.00	49.50	-7.18	100	205	QP	Vertical	
2	66.28	41.25	49.32	-8.07	49.50	-8.25	100	4	QP	Vertical	
3	77.14	38.54	48.31	-9.77	49.50	-10.96	100	342	QP	Vertical	
4	138.35	37.15	43.27	-6.12	54.00	-16.85	100	140	QP	Vertical	
5	250.00	41.90	48.32	-6.42	56.90	-15.00	100	318	QP	Vertical	
6	750.03	35.08	32.31	2.77	56.90	-21.82	171	0	QP	Vertical	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

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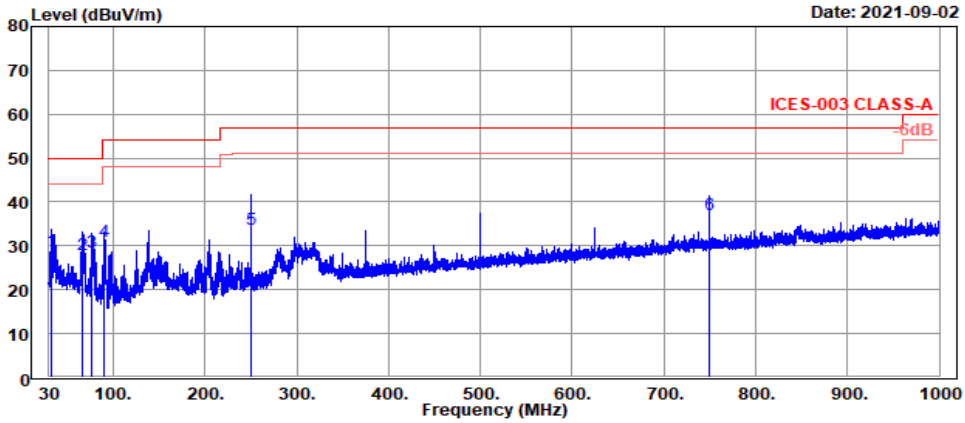
Table 7 Results Enclosure Radiated Emission 30 – 1000 MHz

Horizontal

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	32.52	29.04	36.20	-7.16	50.00	-20.96	300	103	QP	Horizontal	
2	66.28	28.13	36.20	-8.07	50.00	-21.87	100	131	QP	Horizontal	
3	77.14	28.46	38.23	-9.77	50.00	-21.54	201	360	QP	Horizontal	
4	90.33	30.90	43.22	-12.32	54.00	-23.10	300	245	QP	Horizontal	
5	250.00	33.86	40.28	-6.42	57.00	-23.14	100	24	QP	Horizontal	
6	750.03	37.09	34.32	2.77	57.00	-19.91	100	174	QP	Horizontal	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

Table 8 Results Enclosure Radiated Emission 30 – 1000 MHz
Vertical

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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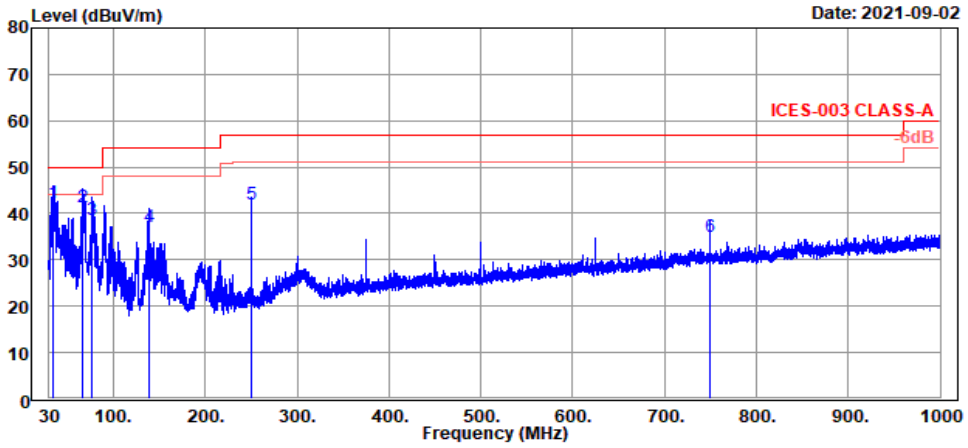


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	34.56	42.32	49.32	-7.00	50.00	-7.68	100	205	QP	Vertical	
2	66.28	41.25	49.32	-8.07	50.00	-8.75	100	4	QP	Vertical	
3	77.14	38.54	48.31	-9.77	50.00	-11.46	100	342	QP	Vertical	
4	138.35	37.15	43.27	-6.12	54.00	-16.85	100	140	QP	Vertical	
5	250.00	41.90	48.32	-6.42	57.00	-15.10	100	318	QP	Vertical	
6	750.03	35.08	32.31	2.77	57.00	-21.92	171	0	QP	Vertical	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

5.1.3 Radiated Emission (above 1 GHz)

Limit

Radiated Emissions Limits at 10 meters (dBµV/m)				
Frequency (MHz)	Class A		Class B	
	Average	Peak	Average	Peak
1000 - 3000	49.5	69.5	43.5	63.5
Above 3000	49.5	69.5	43.5	63.5

Radiated Emissions Limits at 3 meters (dBµV/m)				
Frequency (MHz)	Class A		Class B	
	Average	Peak	Average	Peak
1000 - 3000	60	80	54	74
Above 3000	60	80	54	74

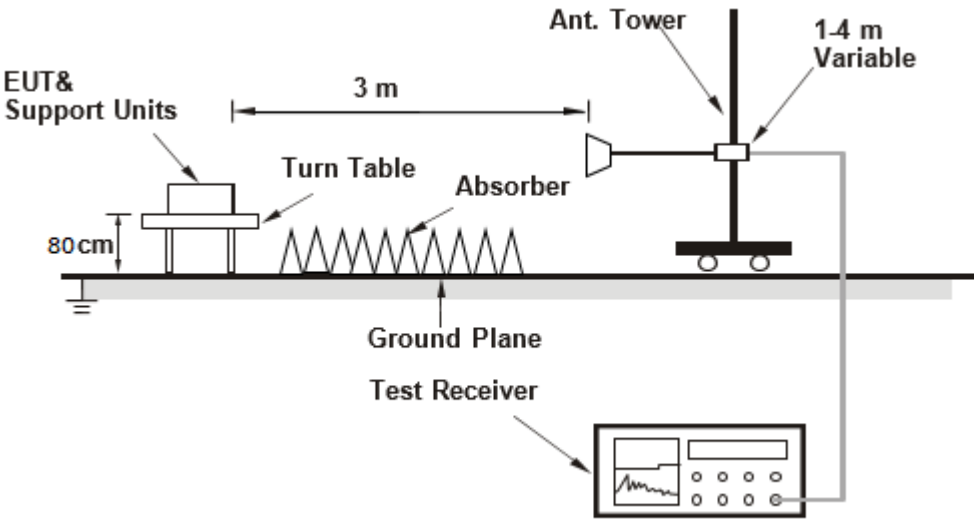
Notes:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.
4. All emanations from a class A digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Frequency Range of Radiated Measurement (For unintentional radiators)

Highest frequency generated or used in the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (GHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Test Setup



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Test Procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. For frequency range 1 GHz ~ 18 GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3 dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
f. The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
g. The calculation formula is explained as follows:
   Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
   Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1 GHz.

Test Instruments

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESR7	102108	2021/04/14	2022/04/14
Spectrum Analyzer	Rohde & Schwarz	FSV-40	101508	2021/03/16	2022/03/16
Pre-Amplifier	Agilent	8447D	2944A10772	2021/02/18	2022/02/18
Pre-Amplifier	EMCI	EMC051845SE	980633	2021/02/09	2022/02/09
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2021/02/19	2022/02/19
Horn Antenna	ETS-Lindgren	3117	00218930	2020/12/01	2021/12/01
Loop Antenna	Electro-Metrics	EMCI LPA600	287	2021/01/15	2022/01/15
Test Software	Audix	e3	Ver. 9	N/A	N/A

Test Result

FCC 47 CFR Part 15, Subpart B

Table 9 Results Enclosure Radiated Emission 1000 – 18000 MHz
Horizontal

TUV Rheinland Taiwan Ltd.
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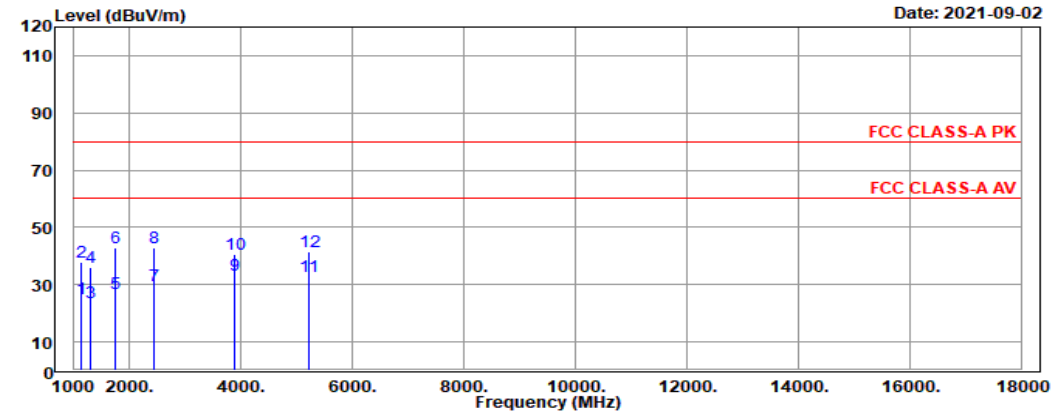
Tel:+886-2172-1000 Fax:+886-2172-1322



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1124.67	24.96	44.56	-19.60	60.00	-35.04	200	191	Average	Horizontal	
2	1124.67	38.04	57.64	-19.60	80.00	-41.96	200	191	Peak	Horizontal	
3	1310.72	23.64	42.52	-18.88	60.00	-36.36	100	173	Average	Horizontal	
4	1310.72	36.08	54.96	-18.88	80.00	-43.92	100	173	Peak	Horizontal	
5	1756.50	27.09	43.87	-16.78	60.00	-32.91	200	188	Average	Horizontal	
6	1756.50	43.12	59.90	-16.78	80.00	-36.88	200	188	Peak	Horizontal	
7	2436.50	29.54	43.18	-13.64	60.00	-30.46	300	182	Average	Horizontal	
8	2436.50	42.92	56.56	-13.64	80.00	-37.08	300	182	Peak	Horizontal	
9	3879.61	33.12	43.75	-10.63	60.00	-26.88	300	10	Average	Horizontal	
10	3879.61	40.74	51.37	-10.63	80.00	-39.26	300	10	Peak	Horizontal	
11	5217.89	32.78	41.59	-8.81	60.00	-27.22	200	48	Average	Horizontal	
12	5217.89	41.37	50.18	-8.81	80.00	-38.63	200	48	Peak	Horizontal	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

Table 10 Results Enclosure Radiated Emission 1000 – 18000 MHz
Vertical

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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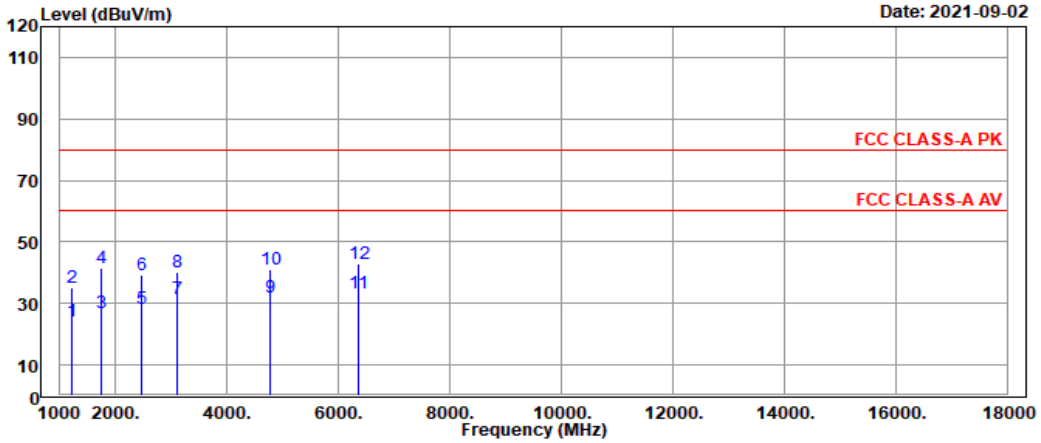

	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1223.83	24.30	43.25	-18.95	60.00	-35.70	100	300	Average	Vertical	
2	1223.83	35.21	54.16	-18.95	80.00	-44.79	100	300	Peak	Vertical	
3	1756.50	27.06	43.84	-16.78	60.00	-32.94	300	308	Average	Vertical	
4	1756.50	41.67	58.45	-16.78	80.00	-38.33	300	308	Peak	Vertical	
5	2462.94	28.36	41.85	-13.49	60.00	-31.64	200	177	Average	Vertical	
6	2462.94	39.18	52.67	-13.49	80.00	-40.82	200	177	Peak	Vertical	
7	3108.00	31.66	43.51	-11.85	60.00	-28.34	300	89	Average	Vertical	
8	3108.00	40.01	51.86	-11.85	80.00	-39.99	300	89	Peak	Vertical	
9	4774.00	31.89	41.27	-9.38	60.00	-28.11	300	253	Average	Vertical	
10	4774.00	41.03	50.41	-9.38	80.00	-38.97	300	253	Peak	Vertical	
11	6356.89	33.37	40.57	-7.20	60.00	-26.63	300	128	Average	Vertical	
12	6356.89	42.72	49.92	-7.20	80.00	-37.28	300	128	Peak	Vertical	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

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Table 11 Results Enclosure Radiated Emission 1000 – 18000 MHz

Horizontal

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
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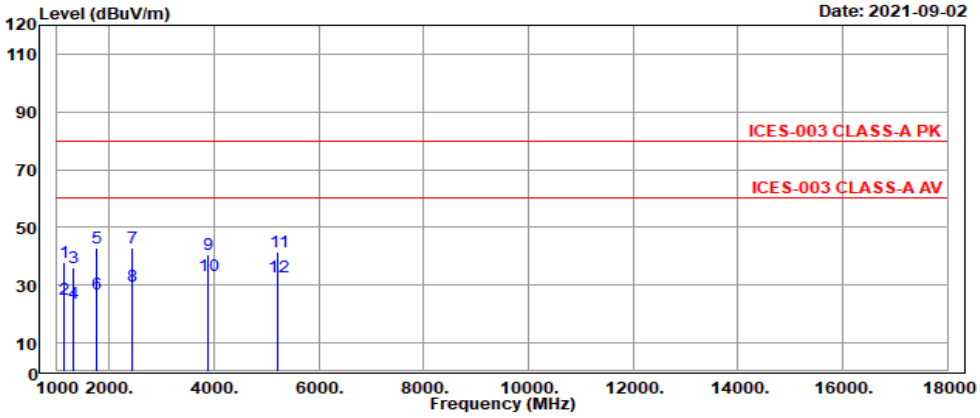
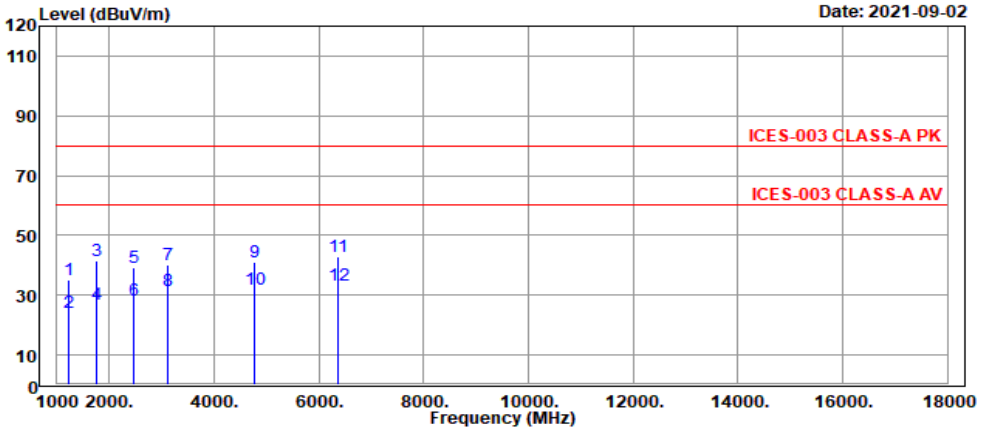


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1124.67	38.04	57.64	-19.60	80.00	-41.96	200	191	Peak	Horizontal	
2	1124.67	24.96	44.56	-19.60	60.00	-35.04	200	191	Average	Horizontal	
3	1310.72	36.08	54.96	-18.88	80.00	-43.92	100	173	Peak	Horizontal	
4	1310.72	23.64	42.52	-18.88	60.00	-36.36	100	173	Average	Horizontal	
5	1756.50	43.12	59.90	-16.78	80.00	-36.88	200	188	Peak	Horizontal	
6	1756.50	27.09	43.87	-16.78	60.00	-32.91	200	188	Average	Horizontal	
7	2436.50	42.92	56.56	-13.64	80.00	-37.08	300	182	Peak	Horizontal	
8	2436.50	29.54	43.18	-13.64	60.00	-30.46	300	182	Average	Horizontal	
9	3879.61	40.74	51.37	-10.63	80.00	-39.26	300	10	Peak	Horizontal	
10	3879.61	33.12	43.75	-10.63	60.00	-26.88	300	10	Average	Horizontal	
11	5217.89	41.37	50.18	-8.81	80.00	-38.63	200	48	Peak	Horizontal	
12	5217.89	32.78	41.59	-8.81	60.00	-27.22	200	48	Average	Horizontal	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

Table 12 Results Enclosure Radiated Emission 1000 – 18000 MHz
Vertical

TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



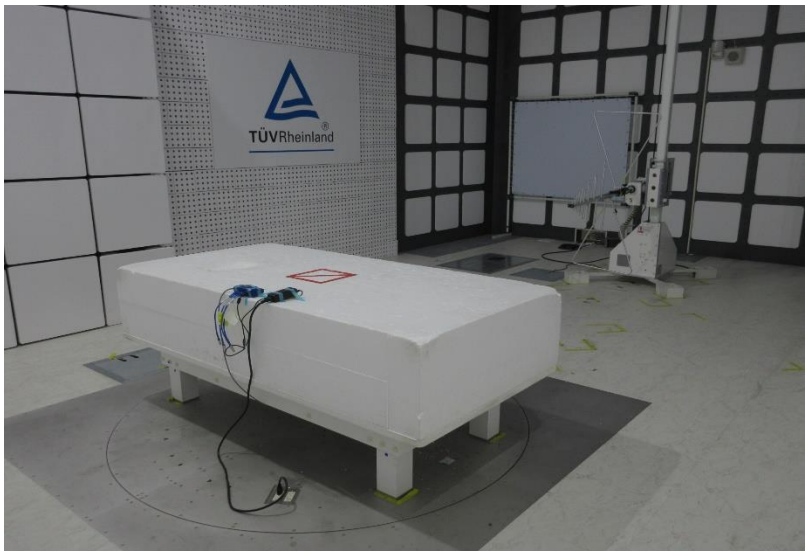
	Freq	Level	Read Level	Factor	Limit Line	Over Limit	APos	TPos	Remark	Pol/Phase	Note
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg			
1	1223.83	35.21	54.16	-18.95	80.00	-44.79	100	300	Peak	Vertical	
2	1223.83	24.30	43.25	-18.95	60.00	-35.70	100	300	Average	Vertical	
3	1756.50	41.67	58.45	-16.78	80.00	-38.33	300	308	Peak	Vertical	
4	1756.50	27.06	43.84	-16.78	60.00	-32.94	300	308	Average	Vertical	
5	2462.94	39.18	52.67	-13.49	80.00	-40.82	200	177	Peak	Vertical	
6	2462.94	28.36	41.85	-13.49	60.00	-31.64	200	177	Average	Vertical	
7	3108.00	40.01	51.86	-11.85	80.00	-39.99	300	89	Peak	Vertical	
8	3108.00	31.66	43.51	-11.85	60.00	-28.34	300	89	Average	Vertical	
9	4774.00	41.03	50.41	-9.38	80.00	-38.97	300	253	Peak	Vertical	
10	4774.00	31.89	41.27	-9.38	60.00	-28.11	300	253	Average	Vertical	
11	6356.89	42.72	49.92	-7.20	80.00	-37.28	300	128	Peak	Vertical	
12	6356.89	33.37	40.57	-7.20	60.00	-26.63	300	128	Average	Vertical	

Note: Level = Read Level + Factor
Over Limit = Level – Limit Line

6. Photographs of Test Setup

Photograph 1: Set-up for Conducted Emission (AC Mains)

Photograph 2: Set-up for Radiated Emission (up to 1 GHz)



Photograph 3: Set-up for Radiated Emission (above 1 GHz)