ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-3 V2.3.2 (2023-01)
ETSI EN 301 489-17 V3.3.1 (2024-09)

TEST REPORT

For

Renesas Design Korea Inc.

7th SiliconPark, 35 Pangyo-ro 255 beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 13486
Republic of Korea

Tested Model: RRQ61001-009
Multiple Model: RRQ61001-010

Report Type:	**Product Type:**
Revised Report	RRQ61001 Module

Report Number:	2502Q45193E-02M1
Report Date:	2026/2/6
Reviewed By:	Carlos Wu Project Engineer
Approved By:	Rocky Xiao RF Supervisor
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) (No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China) Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	2502Q45193E-02	Original Report	2025/8/16
2.0	2502Q45193E-02M1	Revised Report	2026/2/6

Note:
The report has been revised:
1. Add a photo for RF cable.

This report is to supersede the test report 2502Q45193E-02 which was issued on 2025/8/16.

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	RRQ61001 Module
EUT Model:	RRQ61001-009
Multiple Model:	RRQ61001-010
Model Difference:	Please refer to the DoS
Rated Input Voltage:	1.8~3.6Vdc (Typical:3.3Vdc)
Serial Number:	2YVJ-1
EUT Received Date:	2025/2/25
EUT Received Status:	Good

Objective

This report is prepared on behalf of ***Renesas Design Korea Inc.*** in accordance with ETSI EN 301 489-1 V2.2.3 (2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility;

ETSI EN 301 489-3 V2.3.2 (2023-01) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard for ElectroMagnetic Compatibility;

ETSI EN 301 489-17 V3.3.1 (2024-09) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility.

The objective is to determine the compliance of EUT with: ETSI EN 301 489-1 V2.2.3 (2019-11), ETSI EN 301 489-3 V2.3.2 (2023-01), ETSI EN 301 489-17 V3.3.1 (2024-09).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.2.3 (2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

Declarations

The information marked ▲ is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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Each test item follows the test standard(s) without deviation.

SYSTEM TEST CONFIGURATION

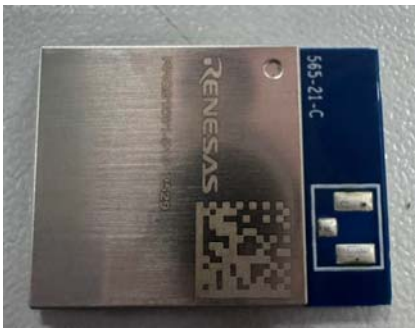
Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

Test mode:

M1: Operating & WIFI Link

Production information:

<table>
<tr><th>Model</th><th colspan="2">Difference</th><th>Other</th></tr>
<tr><td>RRQ61001-009</td><td>
</td><td>With external antenna port</td><td rowspan="2">The hardware and software are same</td></tr>
<tr><td>RRQ61001-010</td><td>
</td><td>Without external antenna port</td></tr>
</table>

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No software was used.

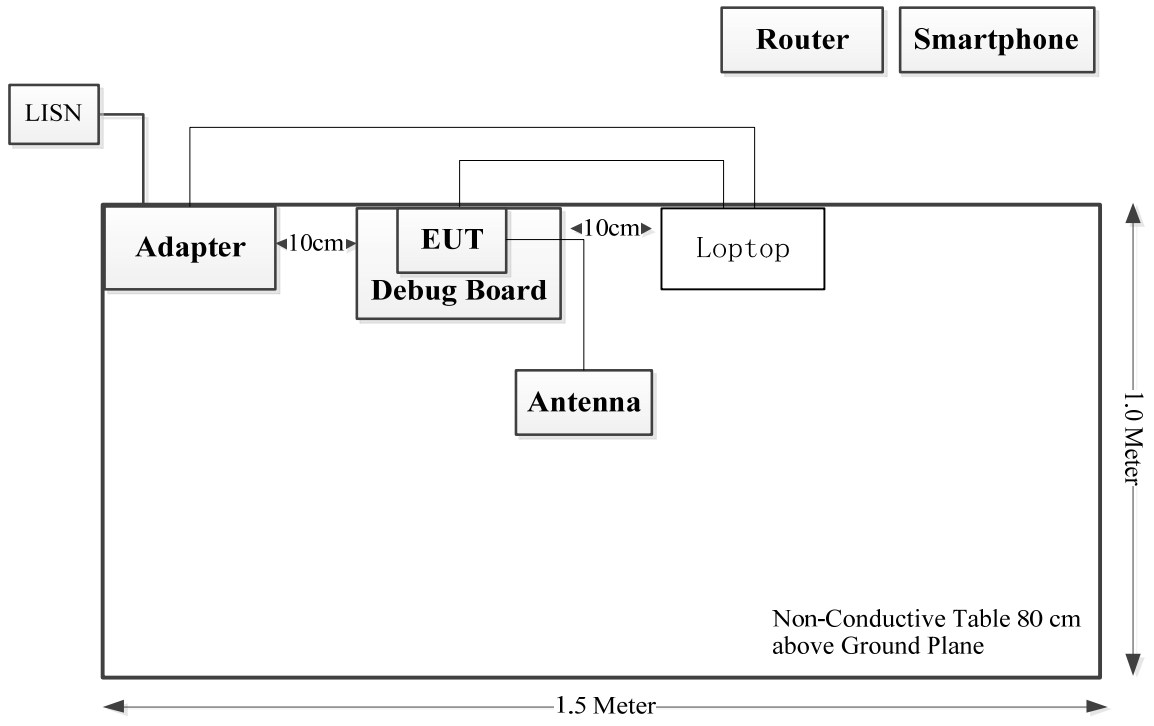
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
unknown	Debug Board	unknown	2YVE-8
MEGGER	Laptop	Z140C-Xpress_PRO	MECERZ140C-Xpress 200713332
Azeyoo	Laptop	AL141U	unknown
TEKA	Adapter	TEKA-TE120300EU	unknown
TENDA	Router	F6	E6895010048000097
Apple	Smartphone	A1524	FK1R96VYG5QT

Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
USB Cable	NO	NO	1.1	EUT	Laptop
DC Cable	NO	NO	1.6	EUT	Adapter

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission					
R&S	LISN	ENV216	101614	2024/9/5	2025/9/4
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2024/9/5	2025/9/4
R&S	EMI Test Receiver	ESCI	101121	2024/9/5	2025/9/4
Audix	Test Software	E3	191218 V9	N/A	N/A
Radiated emissions below 1GHz					
Sunol Sciences	Hybrid Antenna	JB3	A060611-1	2023/9/6	2026/9/5
Narda	Coaxial Attenuator	779-6dB	04269	2023/9/6	2026/9/5
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2024/7/1	2025/6/30
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-04	2024/7/1	2025/6/30
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2024/7/1	2025/6/30
Sonoma	Amplifier	310N	185914	2024/8/26	2025/8/25
R&S	EMI Test Receiver	ESCI	100224	2024/8/26	2025/8/25
Audix	Test Software	E3	191218 V9	N/A	N/A
Radiated emissions above 1GHz					
AH	Horn Antenna	SAS-571	1177	2023/2/22	2026/2/21
HUBER+SUHNER	Coaxial Cable	SUCOFLEX 126EA	MY369/26/26EA	2025/7/1	2026/6/30
AH	Preamplifier	PAM-0118P	530	2025/6/3	2026/6/2
Agilent	Spectrum Analyzer	E4440A	MY44303352	2024/10/22	2025/10/21
Audix	Test Software	E3	191218 V9	N/A	N/A
E-Microwave	Band Rejection Filter	OBSF-2400-2483.5-S	OE01601525	2025/2/20	2026/2/19
ESD					
TESEQ	ESD Generator	NSG 438	1019	2024/9/6	2025/9/5
EFT & Surge & Dips					
EM TEST	Single-phase Toroidal Transformer With Autowinding	V4780	0811-10	2025/6/25	2026/6/24
EM TEST	Ultra Compact Generator	UCS 500N5	V1204111721	2025/6/25	2026/6/24
Flicker					
EVERFINE	Harmonic & Flicker Measurement System	HFM3000	P630850CD1411115	2024/9/5	2025/9/4
EVERFINE	Harmonic & Flicker Testing Power Source	HFS-4000	P624486CD1411122	2024/9/5	2025/9/4
CS					
HP	Signal Generator	8648A	3426A00831	2025/3/28	2026/3/27
AR	Power Amplifier	15A250	12934	N/A	N/A
Werlatone	Dual Directional Coupler	C5091-10	113192	N/A	N/A
NARDA	Coaxial Attenuator	769-6	02754	N/A	N/A
HP	Power Meter	EPM-441A	GB37481494	2024/9/5	2025/9/4
Agilent	Power sensor	8482A	US37296108	2024/9/5	2025/9/4
COM-POWER	CDN	M325E	521064	2025/6/25	2026/6/24

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RS					
AR	Antenna	ATL80M1G	0351400	N/A	N/A
AR	Antenna	ATT700M12G	0349410	N/A	N/A
HP	Signal Generator	8665B	3438a00584	2024/9/5	2025/9/4
AR	Power Amplifier	500W1000C	0353561	N/A	N/A
AR	Power Amplifier	60S1G6	0348711	N/A	N/A
PASTERNACK	Dual Directional Coupler	PE2239-30	1711	N/A	N/A
Agilent	Power Meter	E4419B	MY45103907	2024/10/18	2025/10/17
Agilent	E-Series Avg Power Sensor	E9301A	MY41497625	2024/10/18	2025/10/17
Agilent	E-Series Avg Power Sensor	E9301A	MY41497628	2024/9/5	2025/9/4

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Item:	Conducted emission	Radiated emissions below 1GHz	Radiated emissions above 1GHz	EMS*	Flicker
Temperature:	23.6℃	21.5℃	27.5℃	24.7~25.7℃	24.9℃
Relative Humidity:	66%	55%	35%	50~63%	59%
ATM Pressure:	100.9kPa	101.3kPa	99.6kPa	99.8kPa	99.8kPa
Tester:	Yukin Qiu	Zoo Zou	Ethan Wu	Yolo Fan	Yolo Fan
Test Date:	2025/3/12	2025/2/28	2025/7/29	2025/8/6	2025/8/6

Note: The relative humidity of ESD test site is 50%.

SUMMARY OF TEST RESULTS

SN	Rule and Clause	Description of Test	Test Result
1	EN 301 489-1 Clause 8.2	Enclosure of ancillary equipment measured on a stand alone basis	Compliant
2	EN 301 489-1 Clause 8.3	DC power input/output ports	Not applicable
3	EN 301 489-1 Clause 8.4	AC mains power input/output ports	Compliant
4	EN 301 489-1 Clause 8.5	Harmonic current emissions (AC mains input port)	Not applicable
5	EN 301 489-1 Clause 8.6	Voltage fluctuations and flicker (AC mains input port)	Compliant
6	EN 301 489-1 Clause 8.7	Wired network ports	Not applicable
7	EN 301 489-1 Clause 9.2	Radio frequency electromagnetic fields (80 MHz to 6 000 MHz)	Compliant
8	EN 301 489-1 Clause 9.3	Electrostatic discharges	Compliant
9	EN 301 489-1 Clause 9.4	Fast transients, common mode	Compliant
10	EN 301 489-1 Clause 9.5	Radio frequency, common mode	Compliant
11	EN 301 489-1 Clause 9.6	Transients and surges in the vehicular environment	Not applicable
12	EN 301 489-1 Clause 9.7	Voltage dips and short interruptions	Compliant
13	EN 301 489-1 Clause 9.8	Surges	Compliant

Note:
Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

1 - ENCLOSURE OF ANCILLARY EQUIPMENT MEASURED ON A STAND ALONE BASIS

Test method

The test method shall be in accordance with CENELEC EN 55032 (2015), annex A.2.

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
−compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
−non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
−compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
−non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB

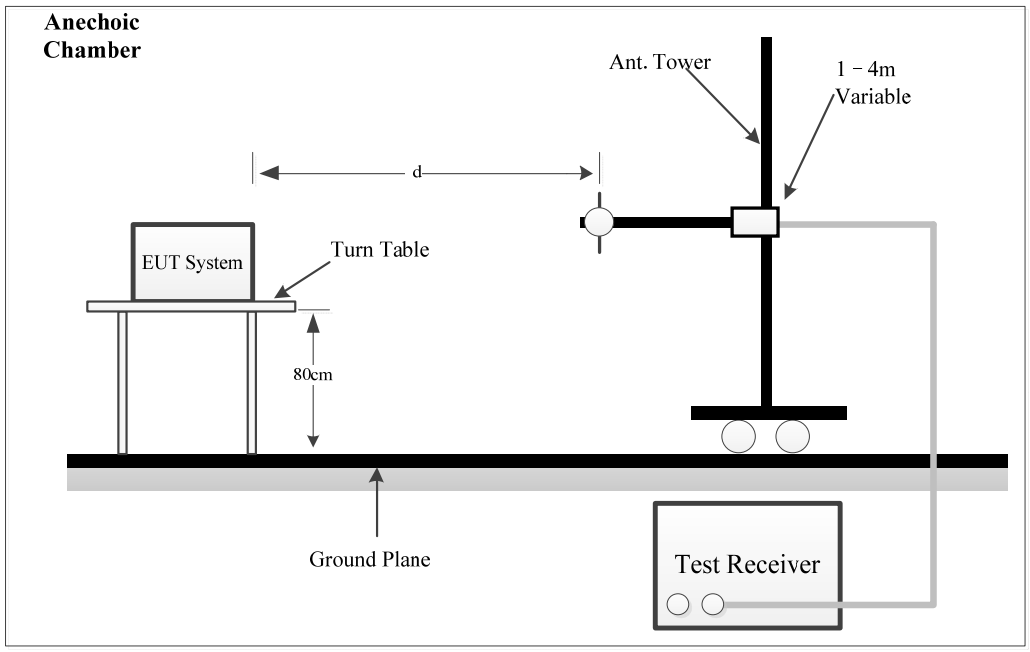
Table 1 - Values of U_{cispr}

Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC)(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)(6 GHz to 18 GHz)	5.5 dB

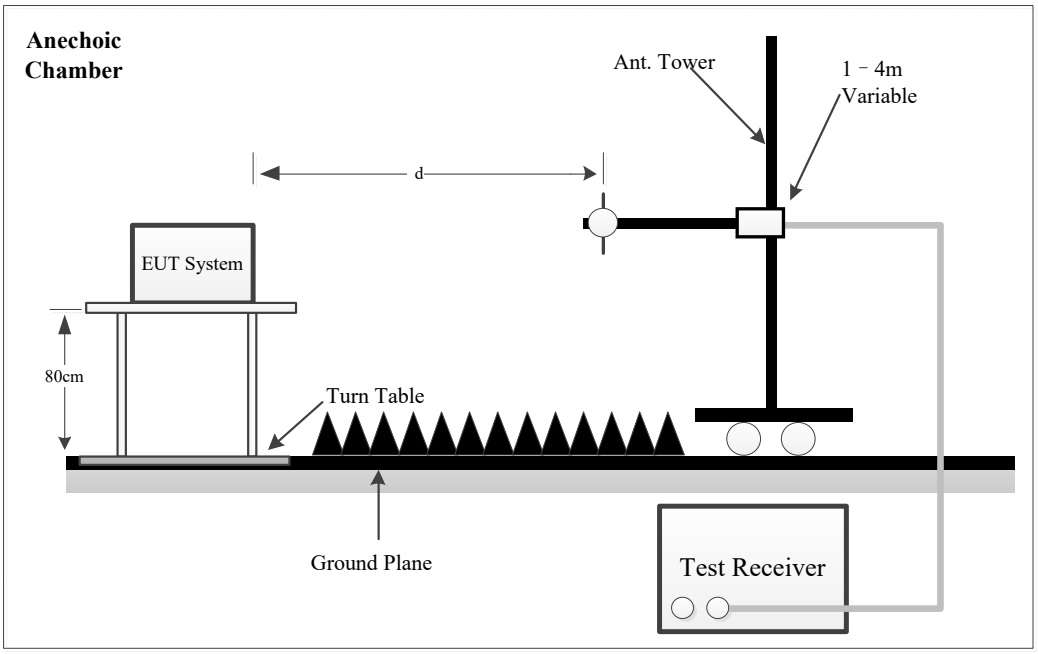
Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests below 1GHz were performed in 3 meters, above 1GHz were performed in the 3 meters. The specification used was EN 55032 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle. The spacing between the peripherals was 10cm.

EMI Test Receiver and Spectrum Analyzer Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver(Below 1GHz) and Spectrum Analyzer(Above 1GHz) were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30MHz - 1000 MHz	100 kHz	300 kHz	/	Peak
	/	/	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	Peak
	1MHz	10Hz	/	Average

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak detection mode above 1GHz.

If the maximized peak measured value complies with under the QP limit more than 6dB, then it is unnecessary to perform an QP measurement.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor
Factor = Antenna Factor + Cable Loss- Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

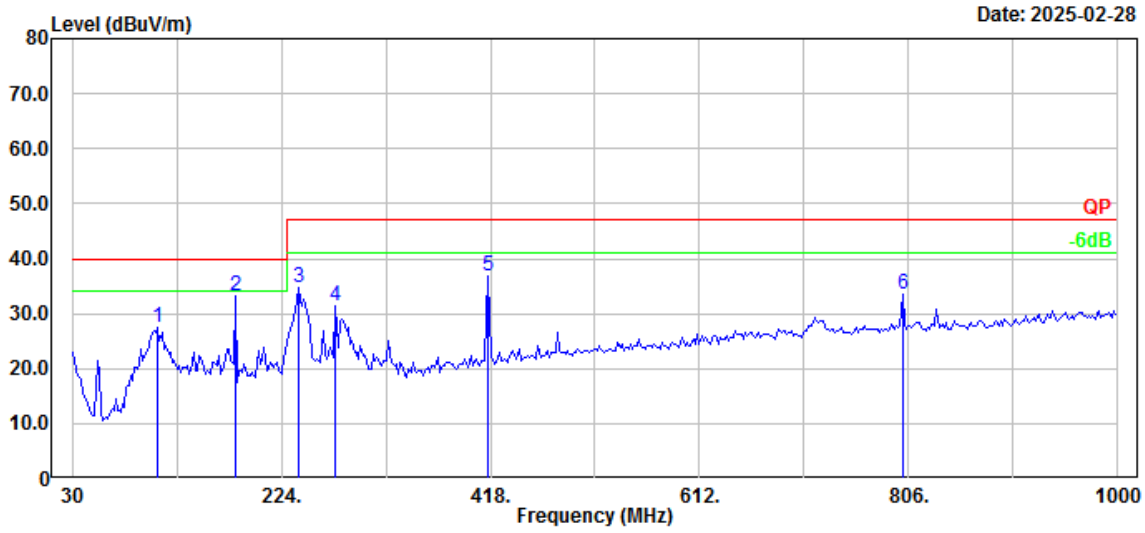
Test Data

Please refer to following table and plots:

Below 1G

Project No.: 2502Q45193E-RF
Polarization: Horizontal
Test Mode: M1
Note:

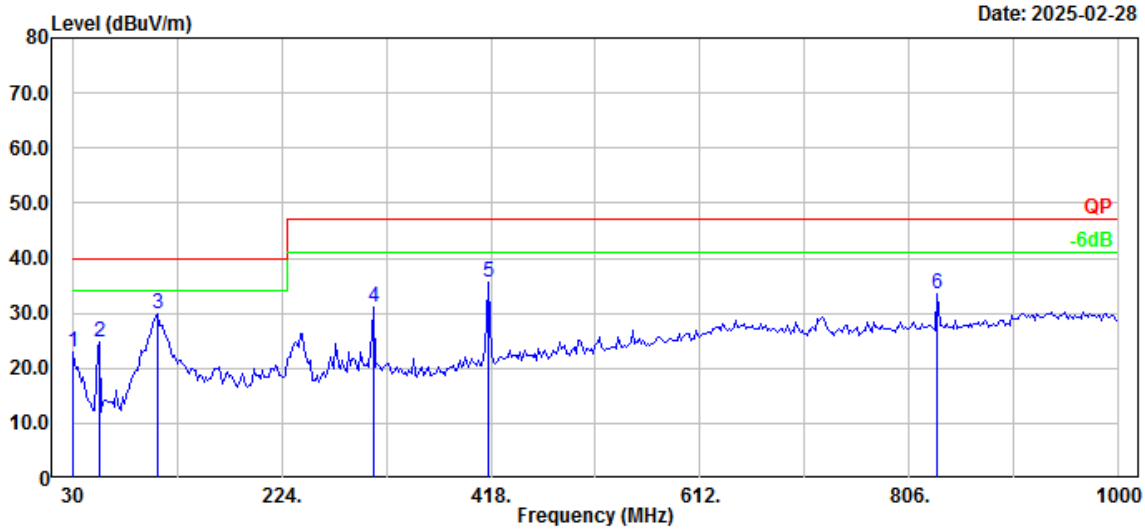
Serial No.: 2YVJ-1
Tester: Zoo Zou



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	109.54	39.10	-11.49	27.61	40.00	12.39	Peak
2	181.32	45.66	-12.33	33.33	40.00	6.67	Peak
3	239.52	46.42	-11.77	34.65	47.00	12.35	Peak
4	274.44	41.40	-9.92	31.48	47.00	15.52	Peak
5	416.06	43.26	-6.58	36.68	47.00	10.32	Peak
6	800.18	33.12	0.46	33.58	47.00	13.42	Peak

Project No.: 2502Q45193E-RF
Polarization: Vertical
Test Mode: M1
Note:

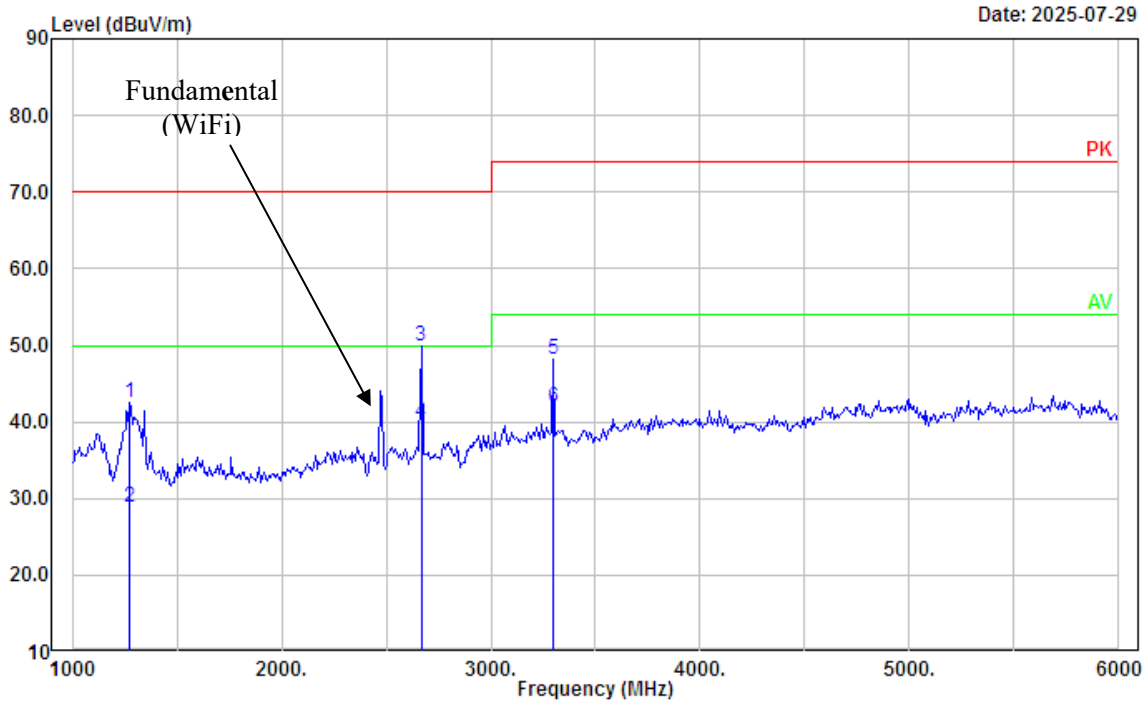
Serial No.: 2YVJ-1
Tester: Zoo Zou



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	30.00	26.88	-3.80	23.08	40.00	16.92	Peak
2	55.22	41.20	-16.55	24.65	40.00	15.35	Peak
3	109.54	41.47	-11.49	29.98	40.00	10.02	Peak
4	309.36	40.45	-9.31	31.14	47.00	15.86	Peak
5	416.06	42.15	-6.58	35.57	47.00	11.43	Peak
6	831.22	32.68	0.73	33.41	47.00	13.59	Peak

Above 1G

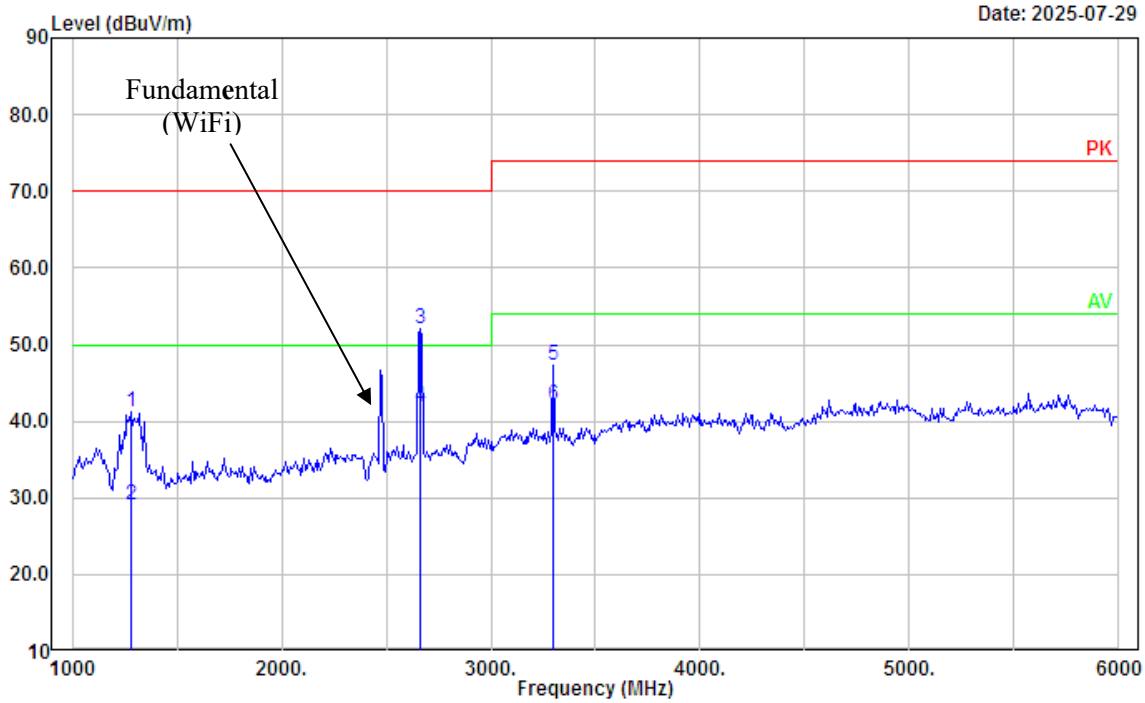
Project No.: 2502Q45193E-RF Serial No.: 2YVJ-1
Polarization: Horizontal Tester: Ethan Wu
Test Mode: M1
Note:



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement
1	1275.36	57.00	-14.58	42.42	70.00	27.58	Peak
2	1275.36	43.40	-14.58	28.82	50.00	21.18	Average
3	2666.67	59.38	-9.43	49.95	70.00	20.05	Peak
4	2666.67	49.37	-9.43	39.94	50.00	10.06	Average
5	3297.10	56.36	-8.29	48.07	74.00	25.93	Peak
6	3297.10	50.23	-8.29	41.94	54.00	12.06	Average

Project No.: 2502Q45193E-RF
Polarization: Vertical
Test Mode: M1
Note:

Serial No.: 2YVJ-1
Tester: Ethan Wu



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement
1	1282.61	55.74	-14.54	41.20	70.00	28.80	Peak
2	1282.61	43.60	-14.54	29.06	50.00	20.94	Average
3	2659.42	61.57	-9.47	52.10	70.00	17.90	Peak
4	2659.42	51.33	-9.47	41.86	50.00	8.14	Average
5	3297.10	55.55	-8.29	47.26	74.00	26.74	Peak
6	3297.10	50.48	-8.29	42.19	54.00	11.81	Average

3 - AC MAINS POWER INPUT/OUTPUT PORTS

Test method

The test method shall be in accordance with CENELEC EN 55032(2015), annex A.3, and the Artificial Mains Networks (AMNs) shall be connected to the AC mains power source.
The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see clause 4.3) for measurements in the transmit mode of operation.
For emission measurements on AC output ports of the EUT the relevant port shall be connected via an AMN to a load drawing the rated current of the source. In case where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
-compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
-non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
-compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
-non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

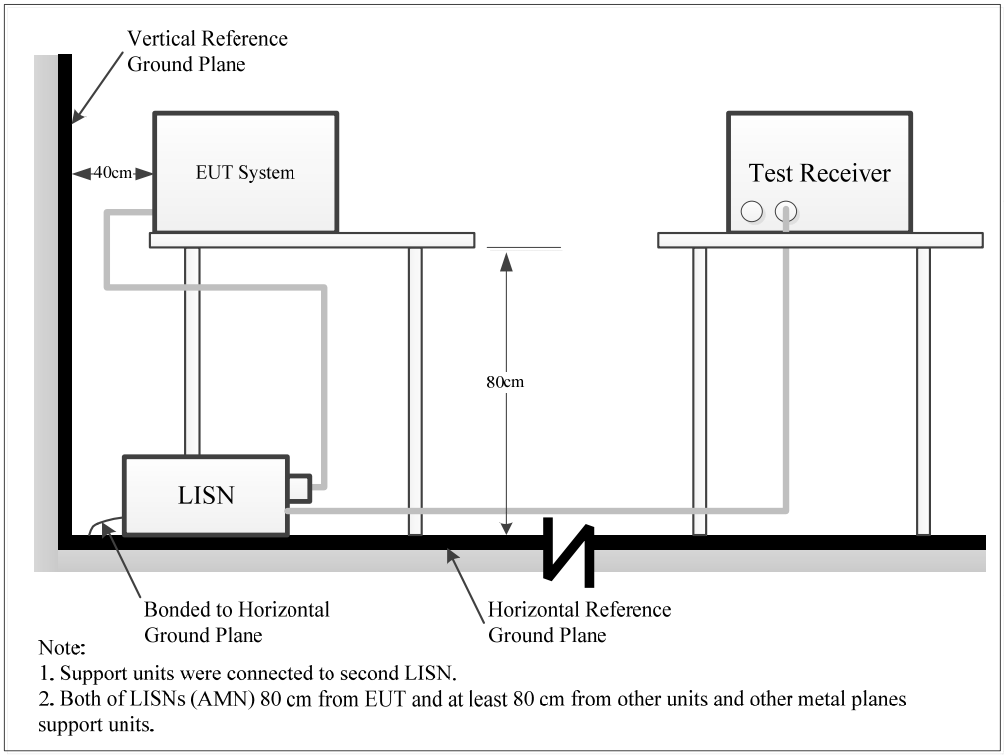
Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.12 dB (150 kHz to 30 MHz), and conducted disturbance at telecommunication port using AAN is 5.0 dB (150 kHz to 30 MHz).

Table 1 - Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (9 kHz to 150 kHz)	3.8 dB
(150 kHz to 30 MHz)	3.4 dB
Conducted disturbance at mains port using voltage probe (9 kHz to 30 MHz)	2.9 dB
Conducted disturbance at telecommunication port using AAN (150 kHz to 30 MHz)	5.0 dB
Conducted disturbance at telecommunication port using CVP (150 kHz to 30 MHz)	3.9 dB
Conducted disturbance at telecommunication port using CP (150 kHz to 30 MHz)	2.9 dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup



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

The setup of EUT is according with per EN 301 489-1 measurement procedures. The specification used was with the EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle.

The spacing between the peripherals was 10cm.

The adapter was connected to AC230V/50Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz - 30 MHz	9 kHz

Test Procedure

During the conducted emissions test, the adapter was connected to the main outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Reading + Factor
Factor = attenuation caused by cable loss + voltage division factor of AMN

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

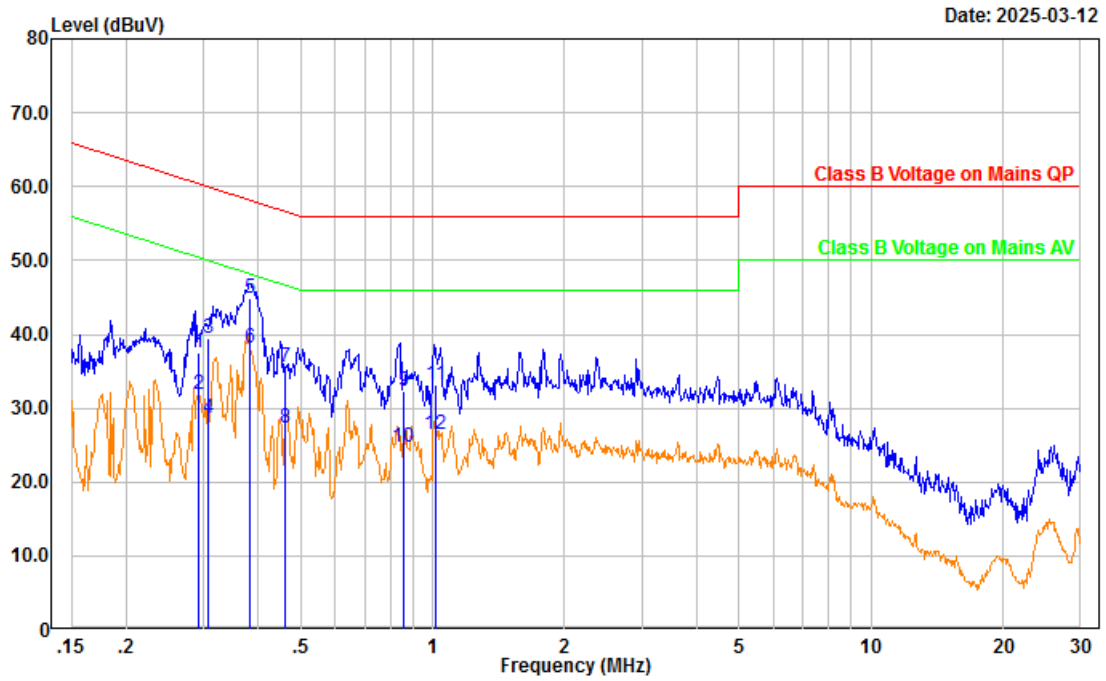
Margin = Limit – Result

Test Data

Please refer to following table and plots:

Project No.: 2502Q45193E-RF
Port: Line
Test Mode: M1
Note:

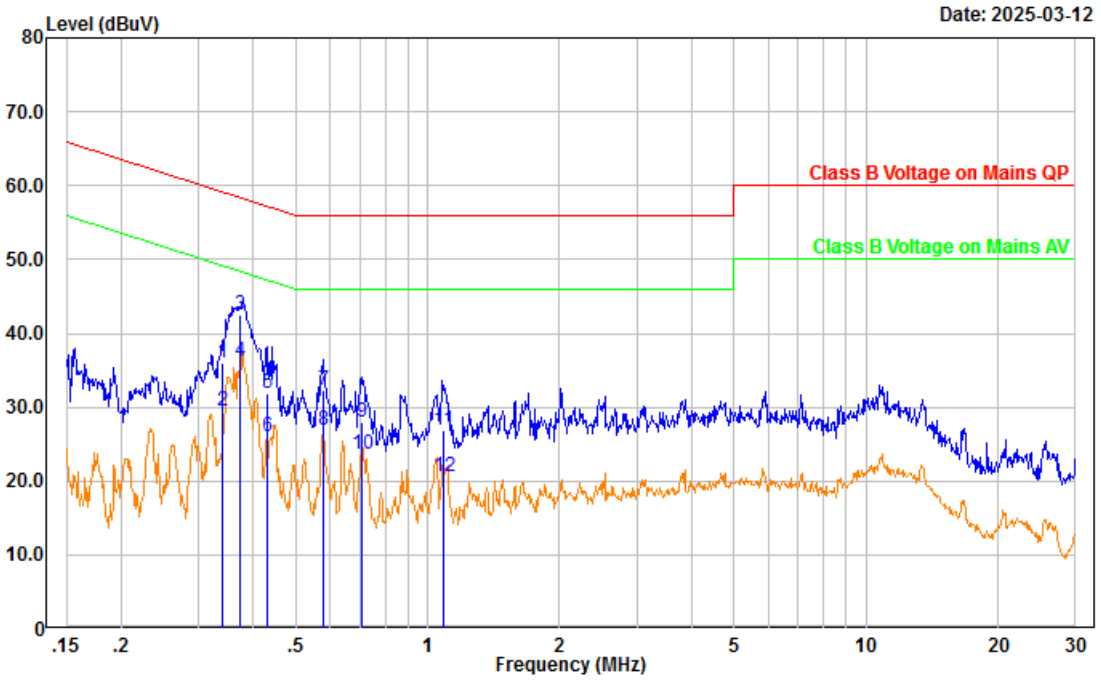
Serial No.: 2YVJ-1
Tester: Yukin Qiu



No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Measurement
1	0.293	26.77	10.82	37.59	60.45	22.86	QP
2	0.293	21.15	10.82	31.97	50.45	18.48	Average
3	0.307	28.67	10.82	39.49	60.04	20.55	QP
4	0.307	17.82	10.82	28.64	50.04	21.40	Average
5	0.383	34.00	10.84	44.84	58.22	13.38	QP
6	0.383	27.42	10.84	38.26	48.22	9.96	Average
7	0.462	24.71	10.84	35.55	56.66	21.11	QP
8	0.462	16.51	10.84	27.35	46.66	19.31	Average
9	0.855	21.36	10.86	32.22	56.00	23.78	QP
10	0.855	13.89	10.86	24.75	46.00	21.25	Average
11	1.012	22.24	10.85	33.09	56.00	22.91	QP
12	1.012	15.58	10.85	26.43	46.00	19.57	Average

Project No.: 2502Q45193E-RF
Port: neutral
Test Mode: M1
Note:

Serial No.: 2YVJ-1
Tester: Yukin Qiu



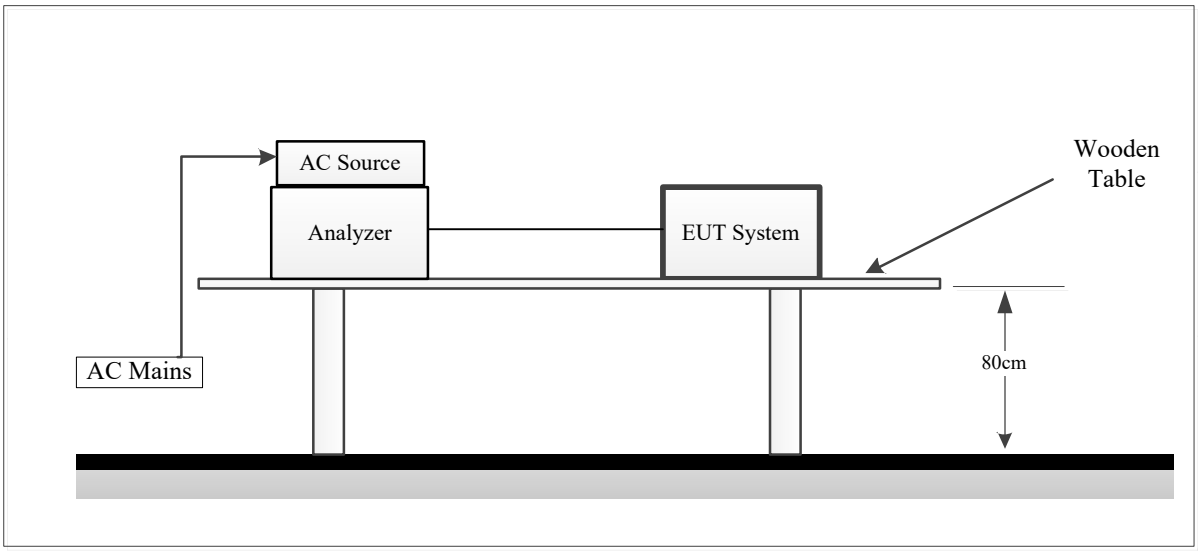
No.	Frequency (MHz)	Reading (dBµV)	Factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Measurement
1	0.340	25.17	10.78	35.95	59.21	23.26	QP
2	0.340	18.71	10.78	29.49	49.21	19.72	Average
3	0.372	31.62	10.77	42.39	58.45	16.06	QP
4	0.372	25.33	10.77	36.10	48.45	12.35	Average
5	0.432	21.11	10.76	31.87	57.21	25.34	QP
6	0.432	15.26	10.76	26.02	47.21	21.19	Average
7	0.579	21.48	10.72	32.20	56.00	23.80	QP
8	0.579	16.24	10.72	26.96	46.00	19.04	Average
9	0.707	17.27	10.76	28.03	56.00	27.97	QP
10	0.707	12.83	10.76	23.59	46.00	22.41	Average
11	1.086	15.96	10.86	26.82	56.00	29.18	QP
12	1.086	9.68	10.86	20.54	46.00	25.46	Average

5 - VOLTAGE FLUCTUATIONS AND FLICKER (AC MAINS INPUT PORT)

Test method

For equipment with an input current up to and including 16A per phase, if no conditional connection is needed, the limits from CENELEC EN 61000-3-3 (2013), clause 5 shall apply together with the evaluation requirements of CENELEC EN 61000-3-3 (2013), clause 6.

Test System Setup



Flicker Test Limits:

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions described in clause 6 and annex A. Tests made to prove compliance with the limits are considered to be type tests.
The following limits apply:
- the value of Pst shall not be greater than 1,0;
- the value of Plt shall not be greater than 0,65;
- the value of d(t) during a voltage change shall not exceed 3,3 % for more than 500 ms;
- the relative steady-state voltage change, dc, shall not exceed 3,3 %;
- the maximum relative voltage change dmax, shall not exceed

a) 4 % without additional conditions;
b) 6 % for equipment which is:
– switched manually, or
- switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

Note: The cycling frequency will be further limited by the Pst and Plt limit. For example: a dmax of 6 % producing a rectangular voltage change characteristic twice per hour will give a Plt of about 0,65.
c) 7 % for equipment which is
- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

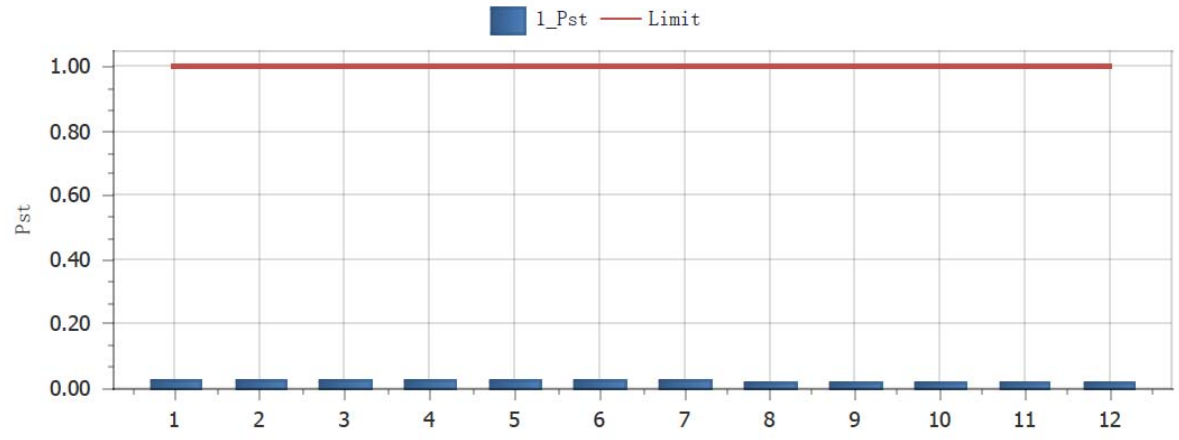
In the case of equipment having several separately controlled circuits in accordance with 6.6,limits b) and c) shall apply only if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energized immediately on restoration of supply after a power supply interruption, limits a)

shall apply; for all equipment with manual switching, limits b) or c) shall apply depending on the rate of switching. Pst and Plt requirements shall not be applied to voltage changes caused by manual switching. The limits shall not be applied to voltage changes associated with emergency switching or emergency interruptions.

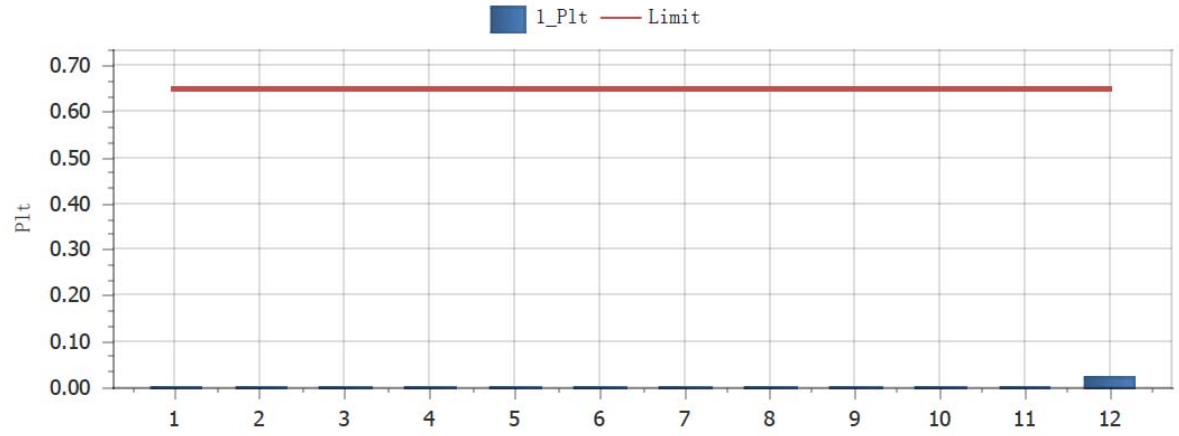
Test Data

Please refer to following tables:

Pst and Limit



Plt and Limit



Relevant Parameter and Judgment During Test Period

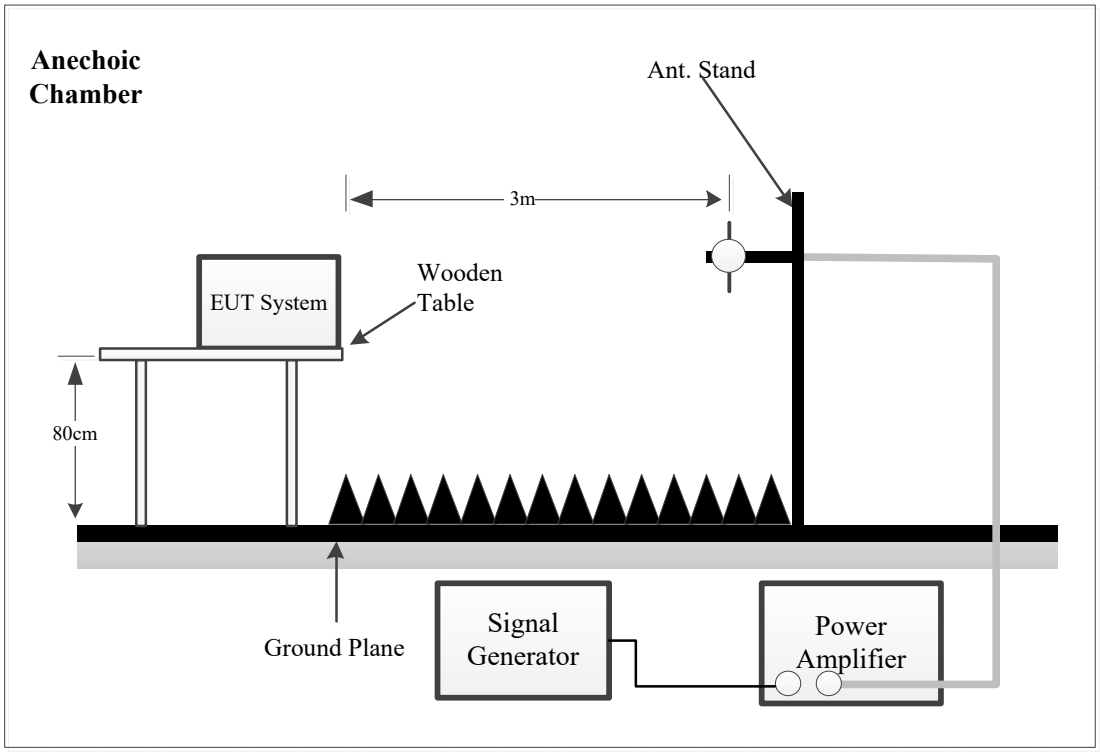
Voltage at end of test	229.356V		
Voltage Fluctuation and Flicker	Test Value	Test Limit	Result
Tmax	0ms	500ms	Pass
dc	0.00%	3.30%	Pass
dmax	0.00%	4.00%	Pass
Pst	0.026	1.000	Pass
Plt	0.022	0.650	Pass

7 - RADIO FREQUENCY ELECTROMAGNETIC FIELDS (80 MHZ TO 6 000 MHZ)

Test method

The test method shall be in accordance with CENELEC EN 61000-4-3 (2006), A1 (2008) and A2 (2010), clauses 6, 7 and 8.

Test System Setup



Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

Performance Criterion: A

General Performance Criteria:

A. The apparatus shall continue to operate as intended during and after the test. The manufacturer specifies some minimum performance level. The performance level may be specified by the manufacture as a permissible loss of performance.
B. The apparatus shall continue to operate as intended after the test. This indicates that the EUT does not need to function at normal performance levels during the test, but must recover. Again some minimal performance is defined by the manufacture. No change in operating state or loss or data is permitted.
C. Temporary loss of function is allowed. Operation of the EUT may stop as long as it is either automatically reset or can be manually restored by operation of the controls.
D. The apparatus is broken, cannot be normal operated.

Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this antenna and measured individually.
In order to judge the EUT performance, a CCD camera and Smartphone were used to monitor the EUT.

Test Data

Please refer to following tables:

Test Mode: M1
Note:

Condition of Test	Remarks
Field Strength:	3V/m
RF Signal:	1 kHz, 80% AM, sine wave
Sweep Frequency Step:	1 %, logarithmic
Dwell Time:	1 Sec

Table 1: Radiated RF-Electromagnetic Field Immunity, Swept Test

Frequency Range (MHz)	Front Side		Rear Side		Left Side		Right Side		Top Side		Bottom Side	
	V	H	V	H	V	H	V	H	V	H	V	H
80-1000	A	A	A	A	A	A	A	A	A	A	A	A
1000-6000	A	A	A	A	A	A	A	A	A	A	A	A
Required Performance Criteria: A Description of Performance reduction: N/A												

Test Result: Compliant

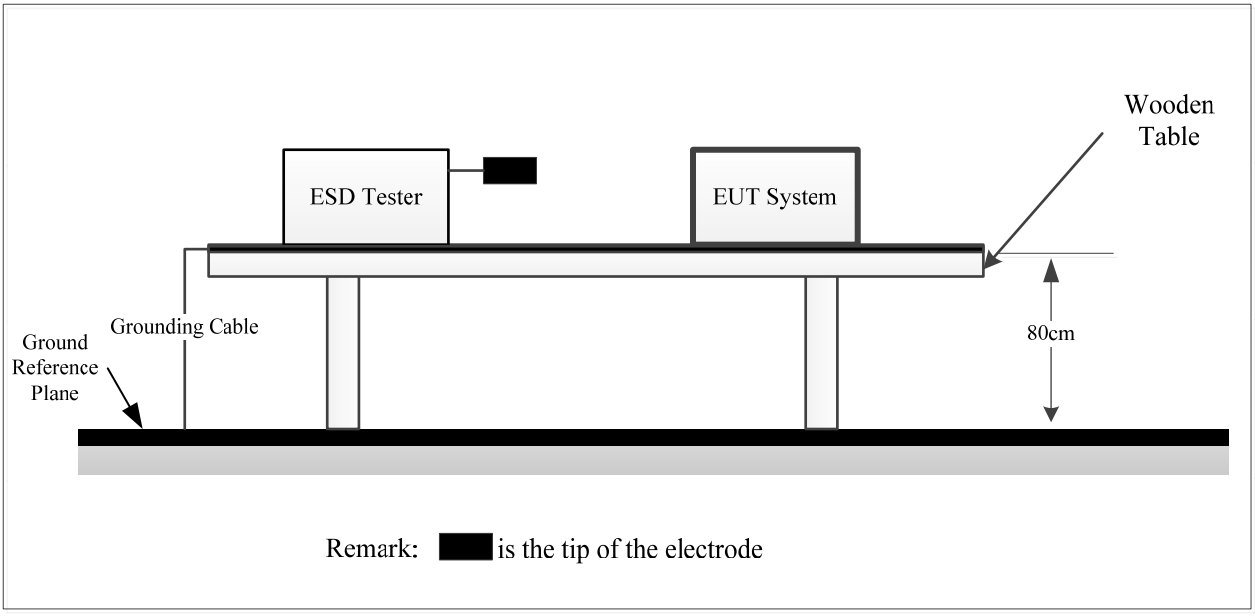
Note: “A” stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

8 - ELECTROSTATIC DISCHARGES

Test method

The test method shall be in accordance with CENELEC EN 61000-4-2 (2009), clauses 6, 7 and 8.

Test System Setup



EN61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by *0.5-millimeter* thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Level

Level	Test Voltage Contact Discharge (±kV)	Test Voltage Air Discharge (±kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Performance criterion: B

Test Procedure

Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:

All the procedure shall be same as Section 8.3.1of IEC 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane:

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane:

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m×0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Test Data

Please refer to following tables:

Test Mode: M1
Note:

Table 1: Electrostatic Discharge Immunity (Air Discharge)

Test Point(s) Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15 kV
Non-metallic Shell	A	A	A	A	A	A	/	/
Antenna	A	A	A	A	A	A	/	/
Seam	A	A	A	A	A	A	/	/
Required Performance Criteria: B Description of Performance reduction: N/A								

Table 2: Electrostatic Discharge Immunity (Direct Contact)

Test Point(s) Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
/	/	/	/	/	/	/	/	/
Required Performance Criteria: B Description of Performance reduction: N/A								

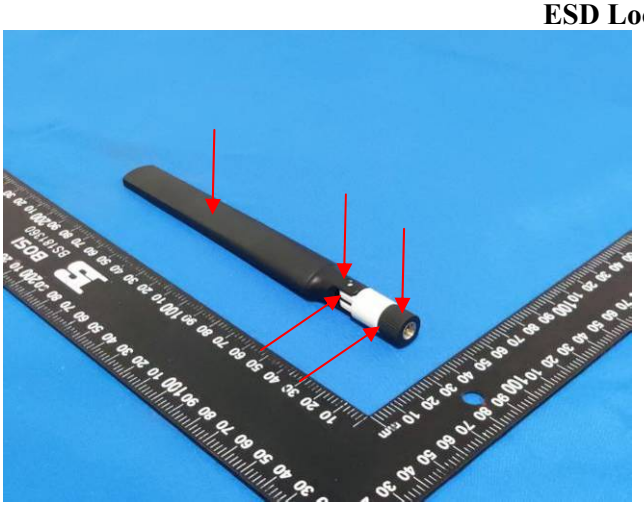
Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

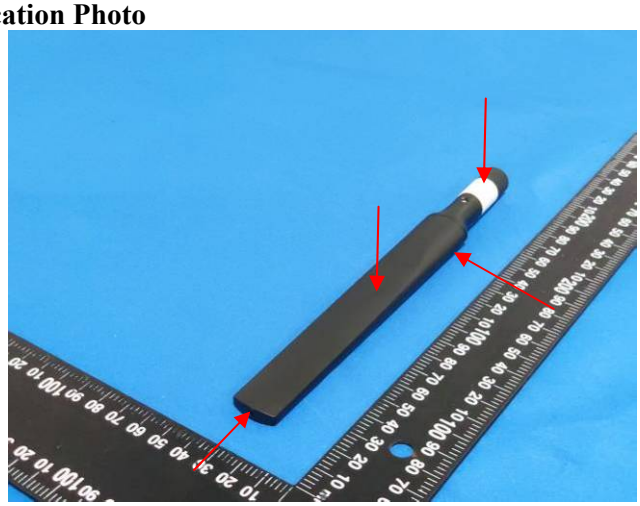
EUT Side	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/
Top Side	A	A	A	A	/	/	/	/
Bottom Side	A	A	A	A	/	/	/	/
Required Performance Criteria: B Description of Performance reduction: N/A								

Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

EUT Side	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/
Required Performance Criteria: B Description of Performance reduction: N/A								

ESD Location Photo





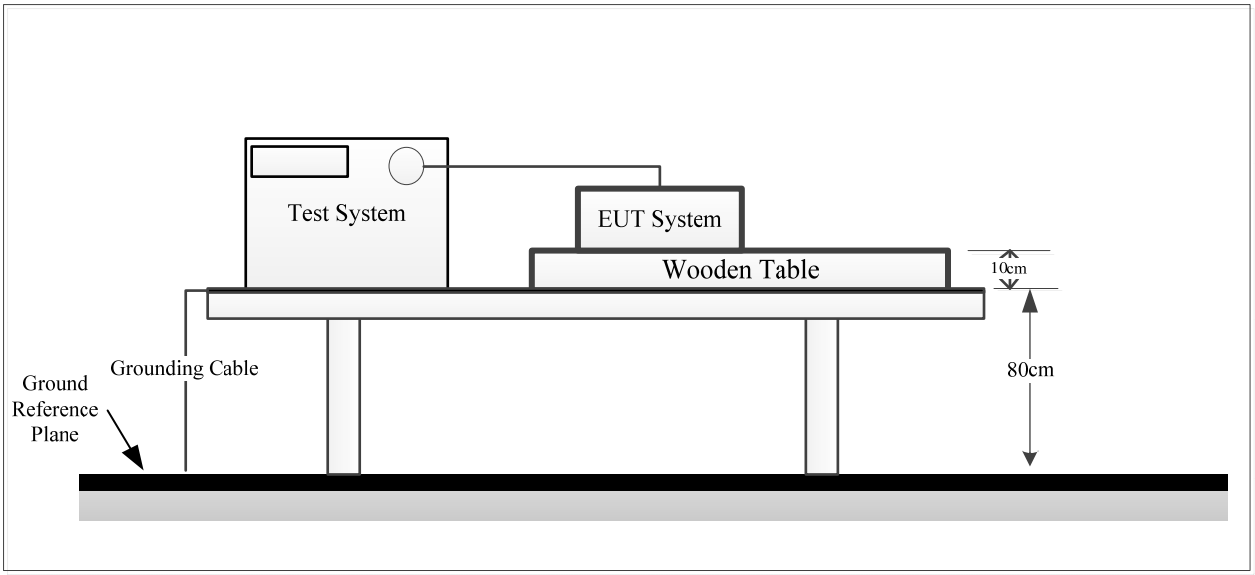
Air Discharge: → Direct Contact: →

9 - FAST TRANSIENTS, COMMON MODE

Test method

The test method shall be in accordance with CENELEC EN 61000-4-4 (2012), clauses 7 and 8.

Test System Setup



Test Level

Open Circuit Output Test Voltage ±10%		
Level	**On Power Supply Lines**	**On I/O (Input/Output) Signal data and control lines**
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

Performance Criterion: B

Test Procedure

The EUT was arranged for Power Line Coupling and for I/O Line Coupling through a capacitive clamp, where applicable. (Note: The I/O coupling test using a capacitive clamp is performed on the I/O interface cables that are longer in length than 3 meters.) A metal ground plane 2.4 meter by 2.0 meter was placed between the floor and the table and is connected to the earth by a 2.0 meter ground rod. The ground rod is connected to the test facility's electrical earth.

Test Data

Please refer to following tables:

Test Mode: M1
Note:

Table 1: AC Power Input Port

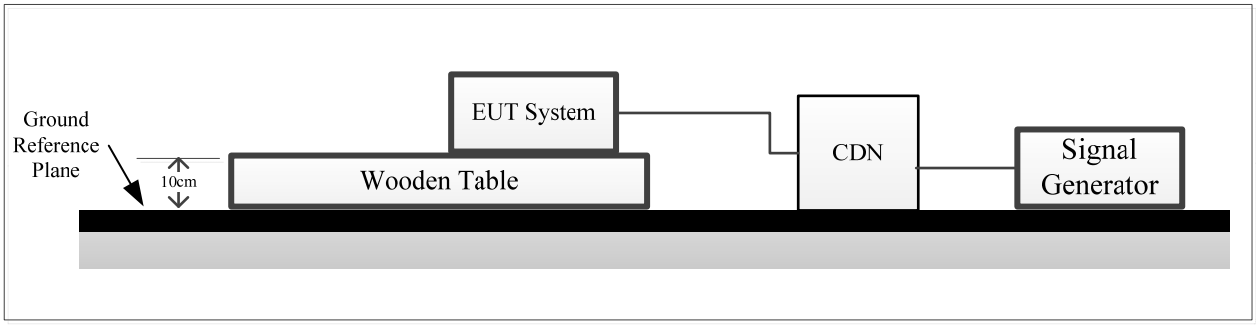
Test Line (s)	Test Level (kV)							
	+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
L	A	A	A	A	/	/	/	/
N	A	A	A	A	/	/	/	/
Earth	/	/	/	/	/	/	/	/
L+N	A	A	A	A	/	/	/	/
L + Earth	/	/	/	/	/	/	/	/
N + Earth	/	/	/	/	/	/	/	/
L + N + Earth	/	/	/	/	/	/	/	/
Required Performance Criteria: B Description of Performance reduction: N/A								

10 - RADIO FREQUENCY, COMMON MODE

Test method

The test method shall be in accordance with CENELEC EN 61000-4-6 (2014), clauses 6 and 8.

Test System Setup



Test Level

Level	Voltage Level (r.m.s.) (U_0)
1	1
2	3
3	10
X	Special

Performance Criterion: A

Test Procedure

1) Let the EUT work in test mode and test it.
2) The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
3) The disturbance signal described below is injected to EUT through CDN.
4) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
5) The frequency range is swept from 150 kHz to 80 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.
6) Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s.
7) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

Test Data

Please refer to following tables:

Test Mode: M1
Note:

Test Data:

Table 1: AC power Input Port

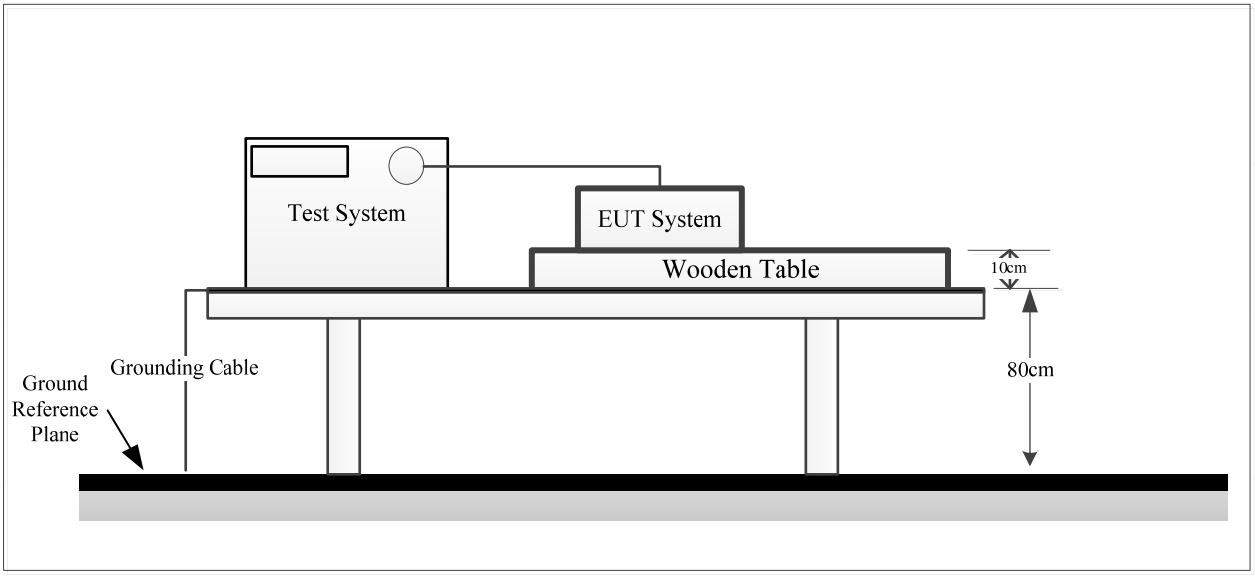
Signal Type	Frequency Range (MHz)	Voltage Level (r.m.s.)	Perform Criterion
Modulation: Amplitude 80%, 1kHz sine wave Dwell Time 1 Sec	0.15-80	3V	A
Required Performance Criteria: A Description of Performance reduction: N/A			

12 - VOLTAGE DIPS AND SHORT INTERRUPTIONS

Test method

The test method shall be in accordance with CENELEC EN 61000-4-11 (2004), clause 8 or for equipment requiring a mains current of greater than 16 A “CENELEC EN 61000-4-34 (2007), A1 (2009)”, clause 8 shall be used.

Test System Setup



Test Level and Performance Criterion

Test Level	Voltage dip and short interruptions (%) Residual	Duration (in period)	Performance criterion
1	0	0.5	B
2	0	1	B
3	70	25	C
4	0	250	C

Test Procedure

1) The interruption is introduced at selected phase angles with specified duration.
2) Record any degradation of performance.

Test Data

Please refer to following tables:

Test Mode: M1
Note:

Table 1: Voltage Dips/Interruptions Test

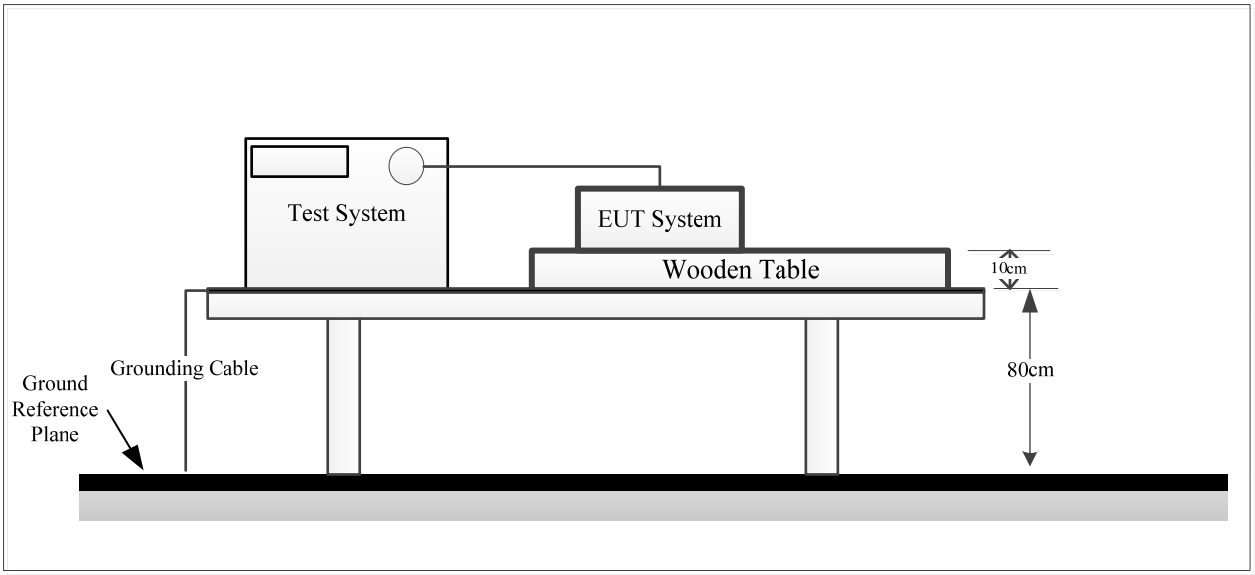
Residual Voltage (%)	Td (Number of cycles)	Phase Angle (°)	N	Result	Required Performance Criteria
0	0.5	0/90/180/270	3	A	B
0	1	0/90/180/270	3	A	B
70	25	0/90/180/270	3	A	C
0	250	0/90/180/270	3	A	C
Description of Performance reduction: N/A					

13 - SURGES

Test method

The test method shall be in accordance with CENELEC EN 61000-4-5 (2014): + A1 (2017), clauses 7 and 8.

Test System Setup



Test Level

Level	Open Circuit Output Test Voltage ±10%
1	0.5 kV
2	1 kV
3	2 kV
4	4 kV
X	Special

Performance Criterion: B

Test Procedure

1) For line to line coupling mode, provide a 0.5 kV 1.2/50us voltage surge (at open-circuit condition).
2) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
3) Different phase angles are done individually.
4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

Test Data

Please refer to following tables:

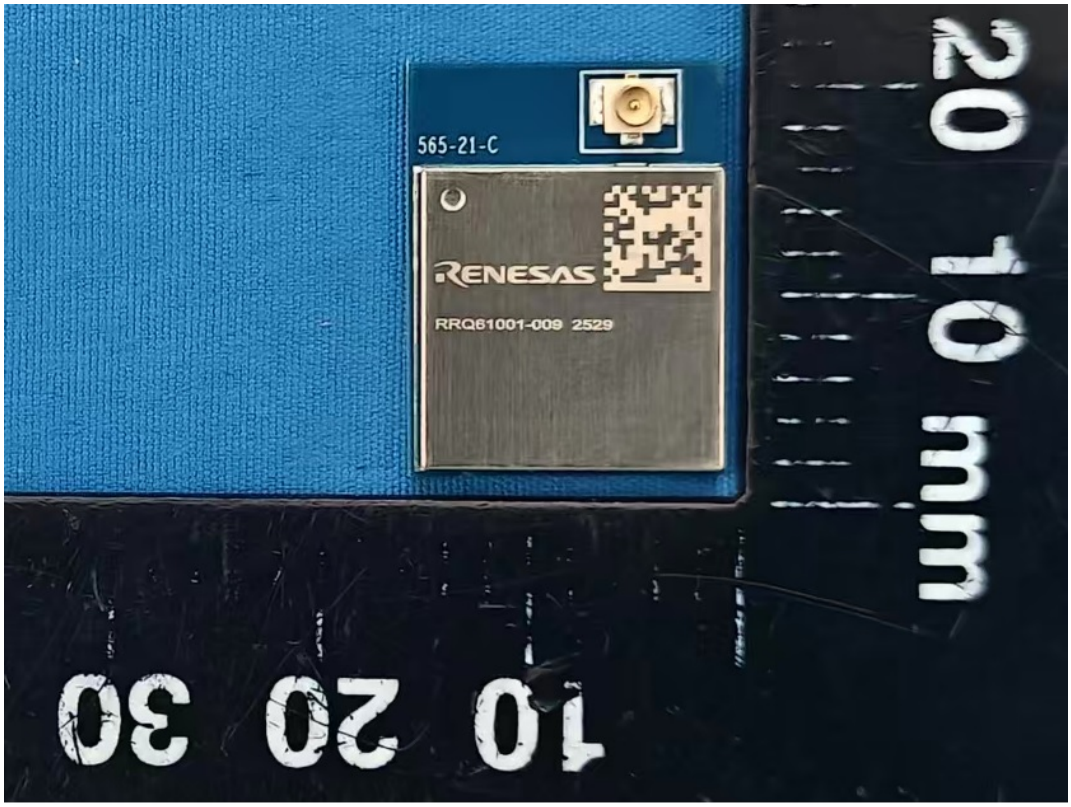
Test Mode: M1
Note:

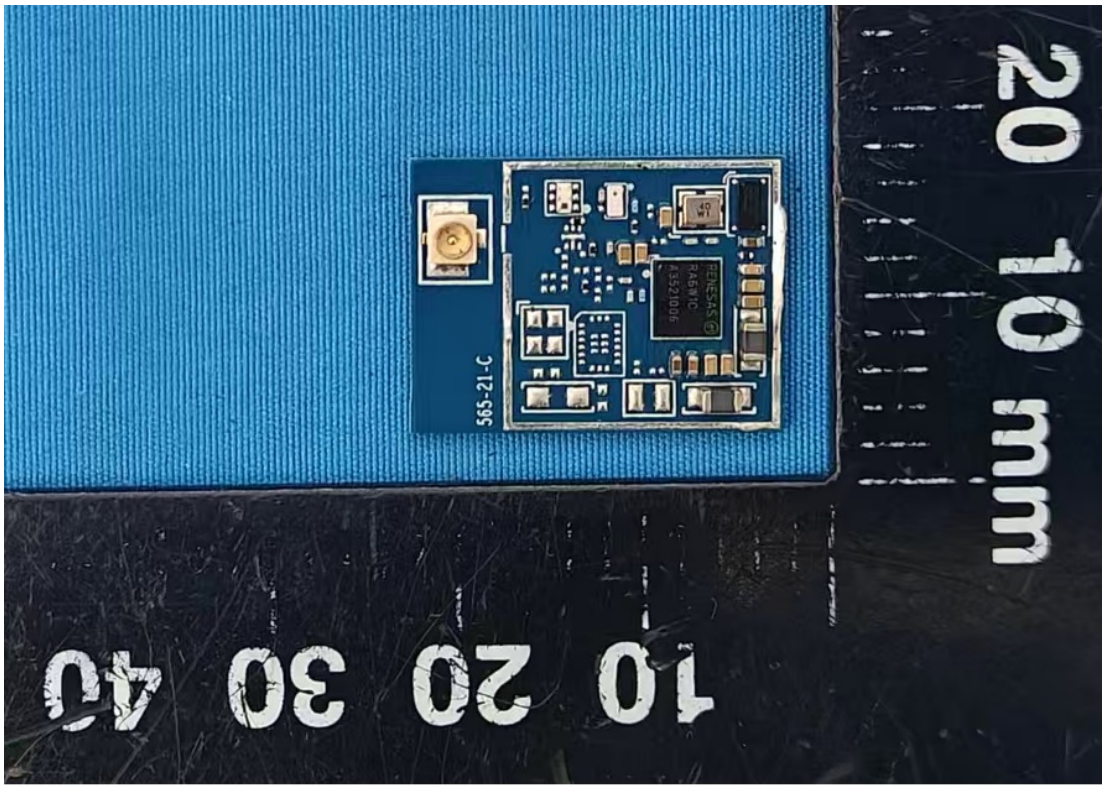
Table 1: AC power Input Port

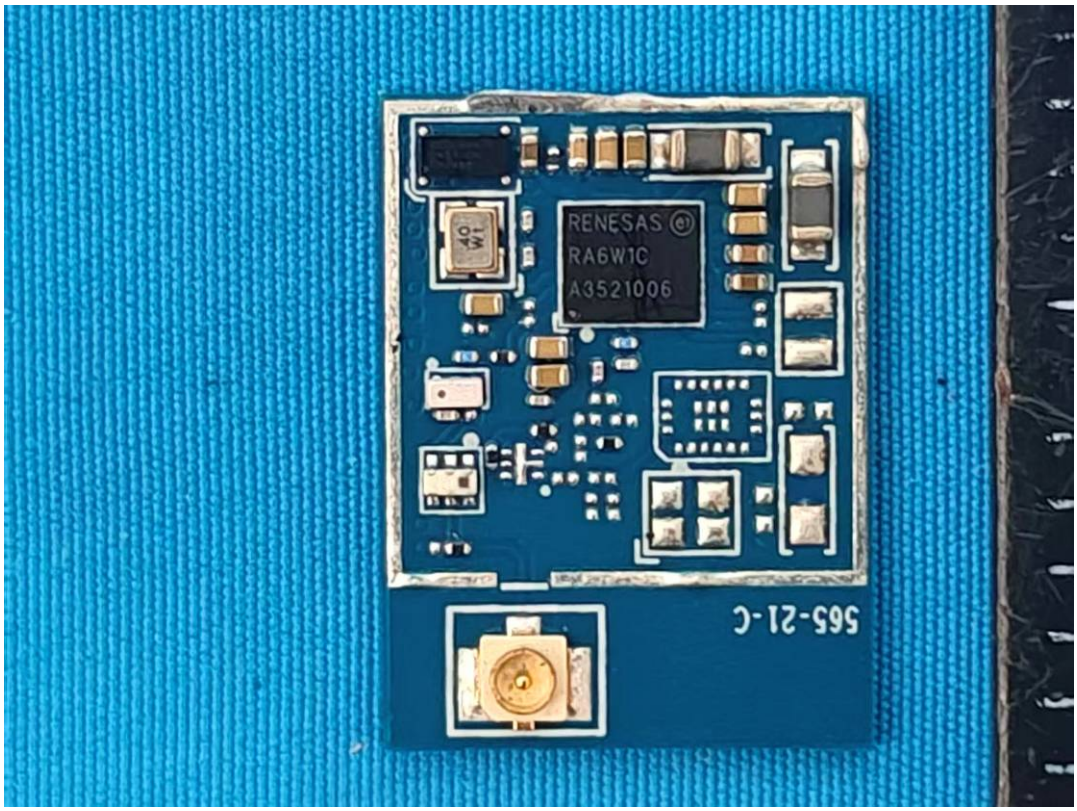
No.	Test Voltage	Poll	Path	Phase Angle	Perform Criterion
1	0.5kV	+	L - N	0/90/180/270	A
1	0.5kV	-	L - N	0/90/180/270	A
2	1kV	+	L - N	0/90/180/270	A
2	1kV	-	L - N	0/90/180/270	A
Required Performance Criteria: B Description of Performance reduction: N/A					

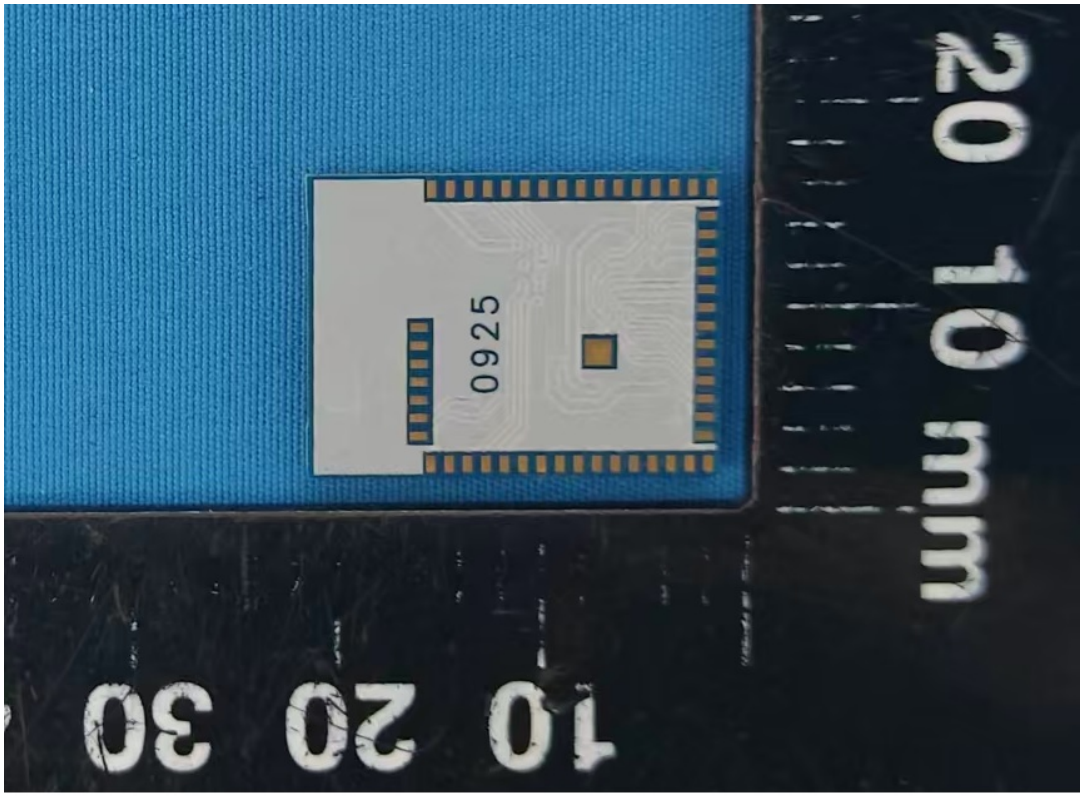
EXHIBIT A - EUT PHOTOGRAPHS

Model: RRQ61001-009

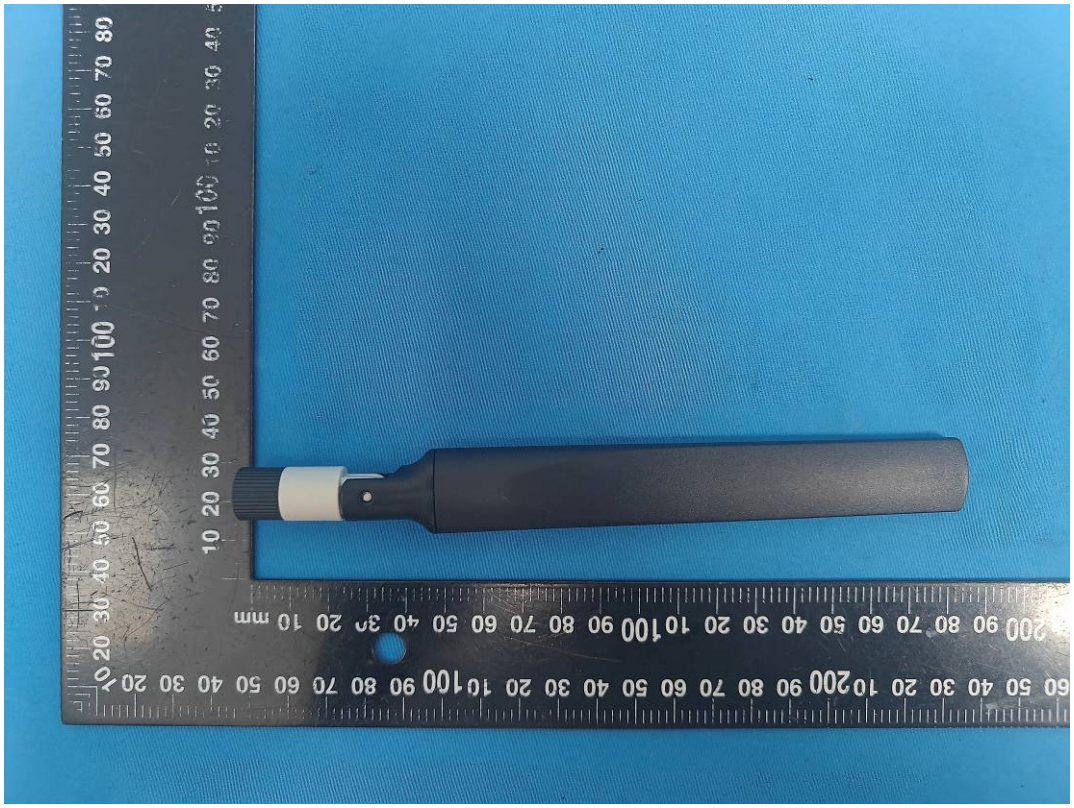





RENESAS
RA6W1C
A3521006
565-21-C


0925
10 20 30
20 10 mm

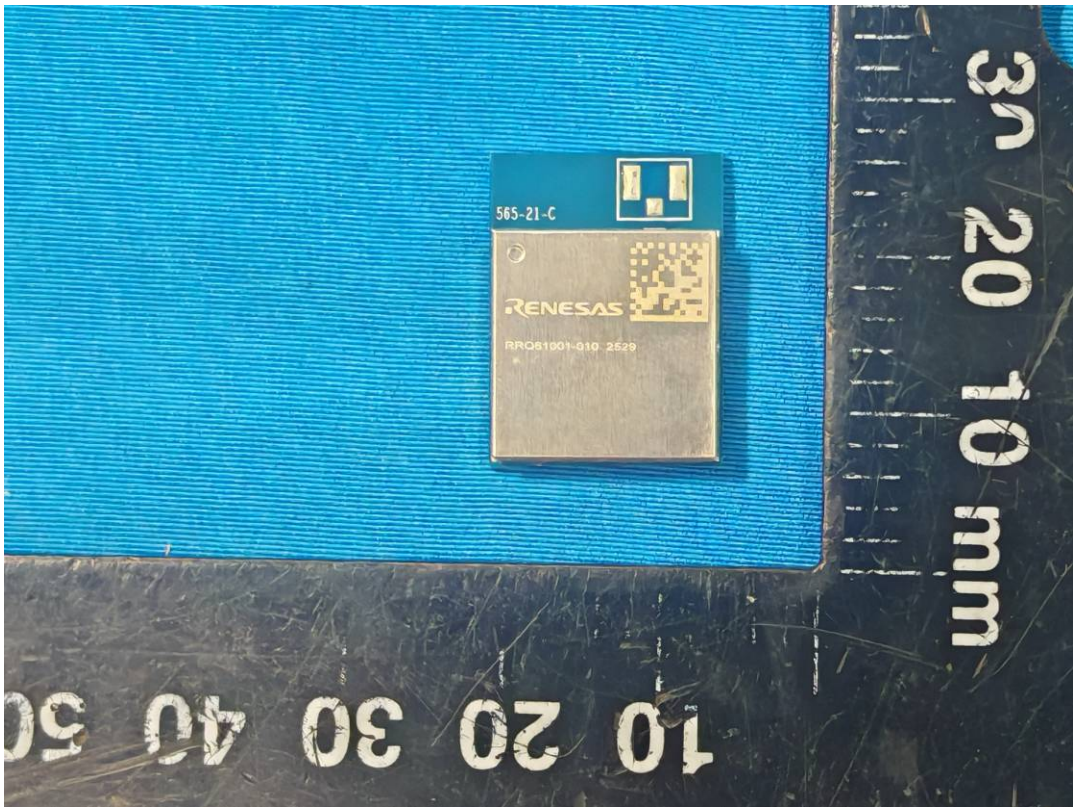
Antenna

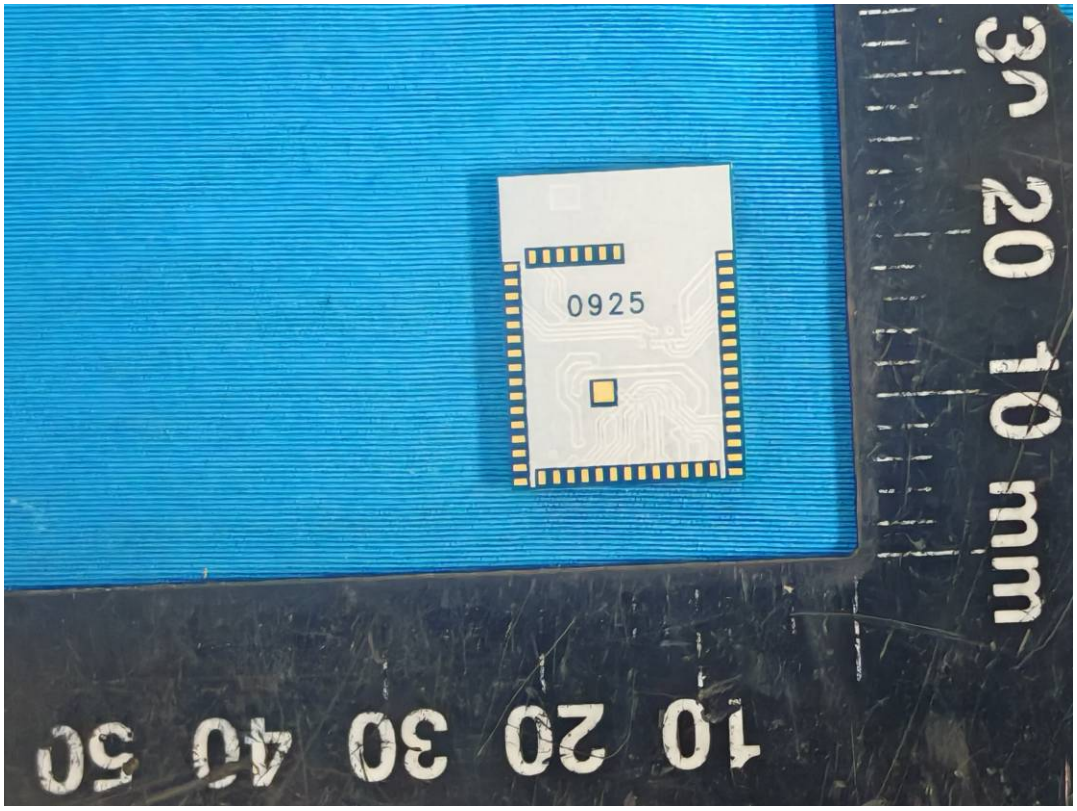


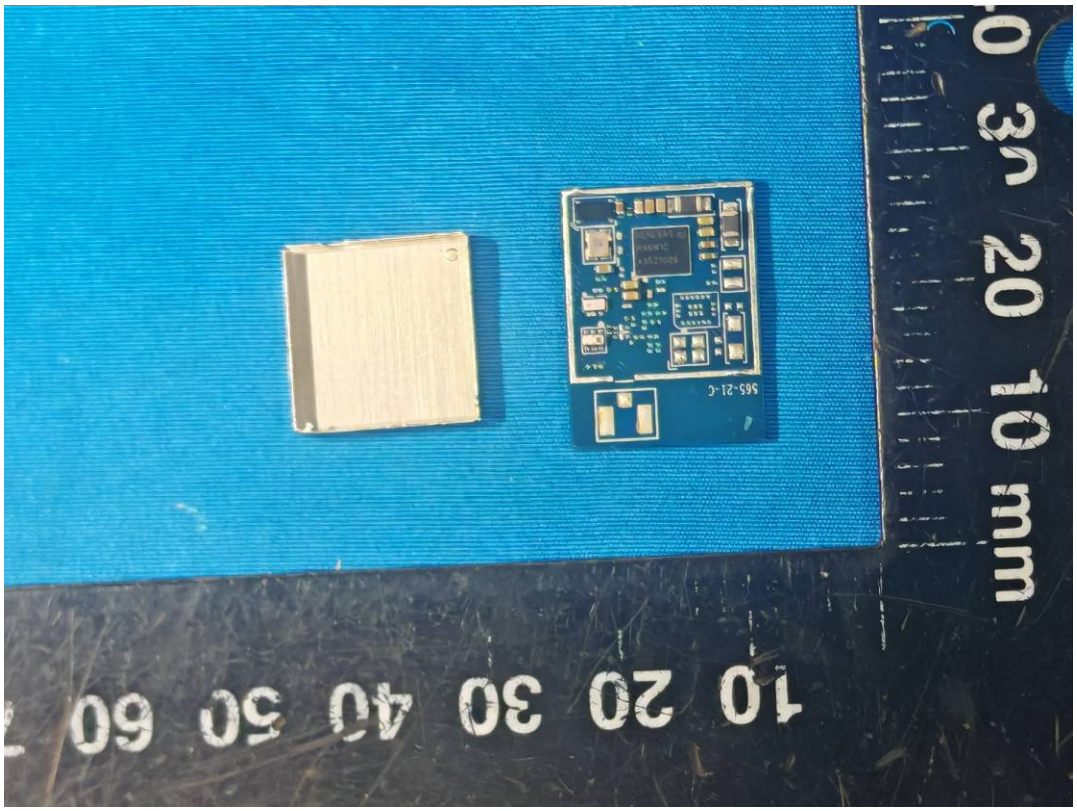
RF Cable

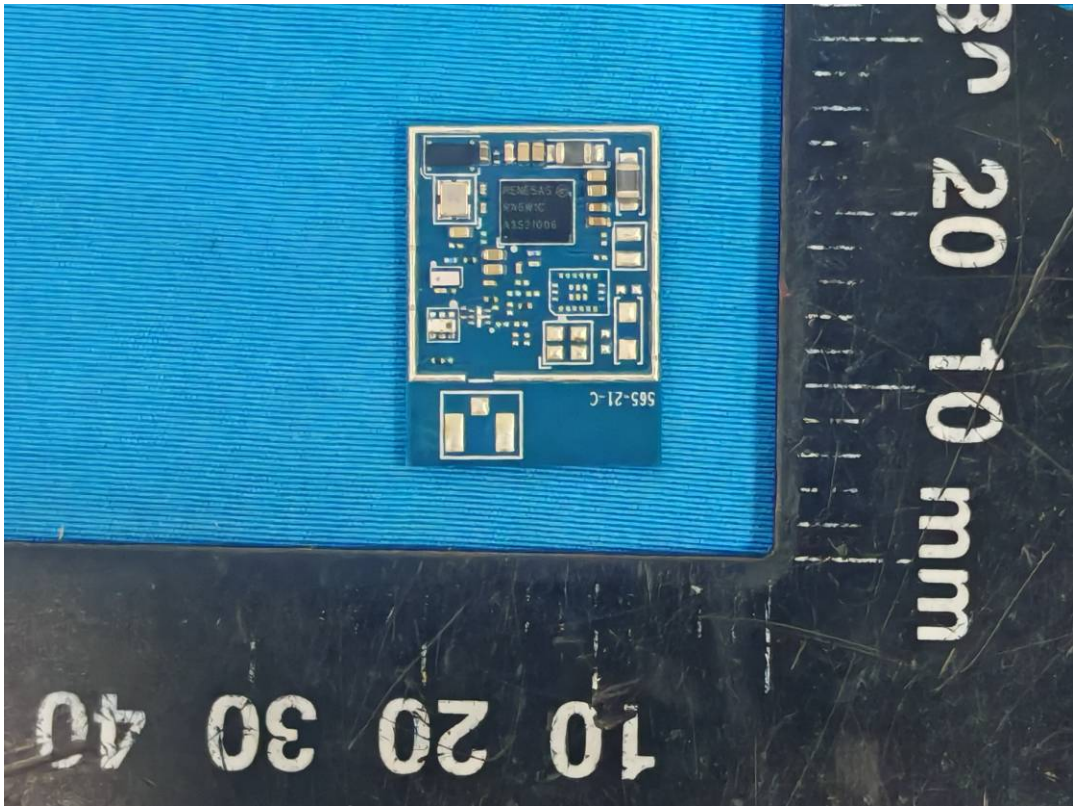


Model: RRQ61001-010






565-21-C
10 20 30 40 50 60
0 3n 20 10 mm


565-21-C
10 20 30 40
3n 20 10 mm

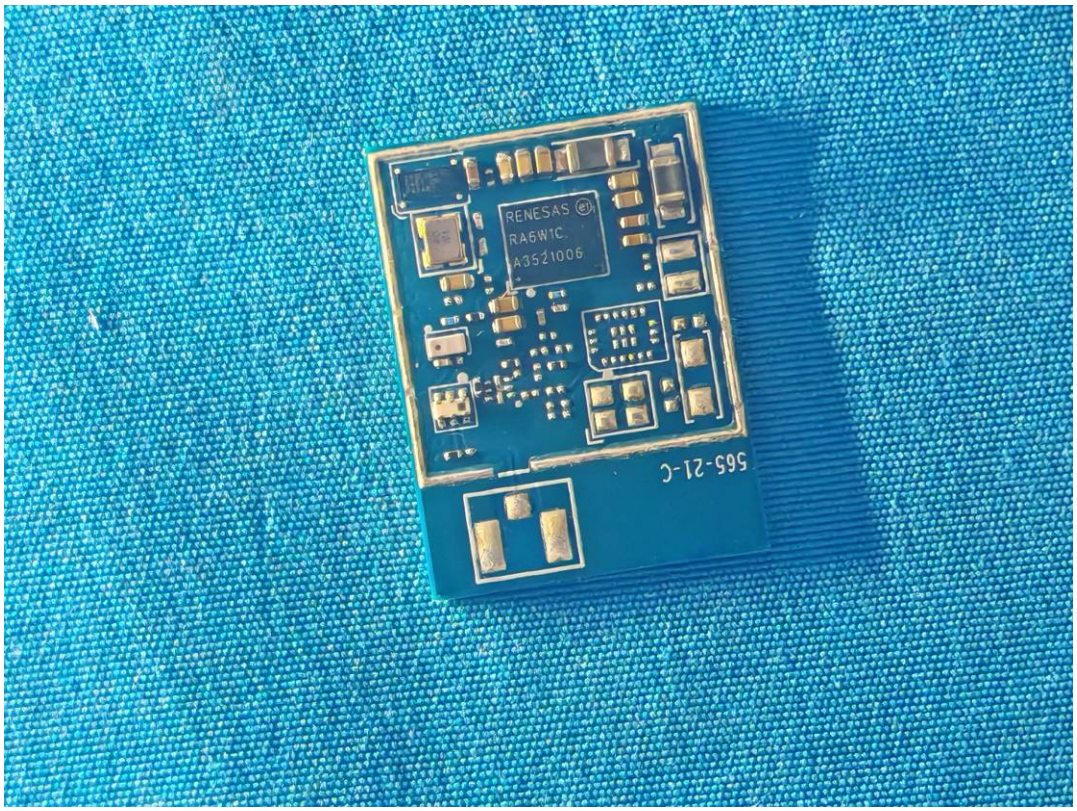
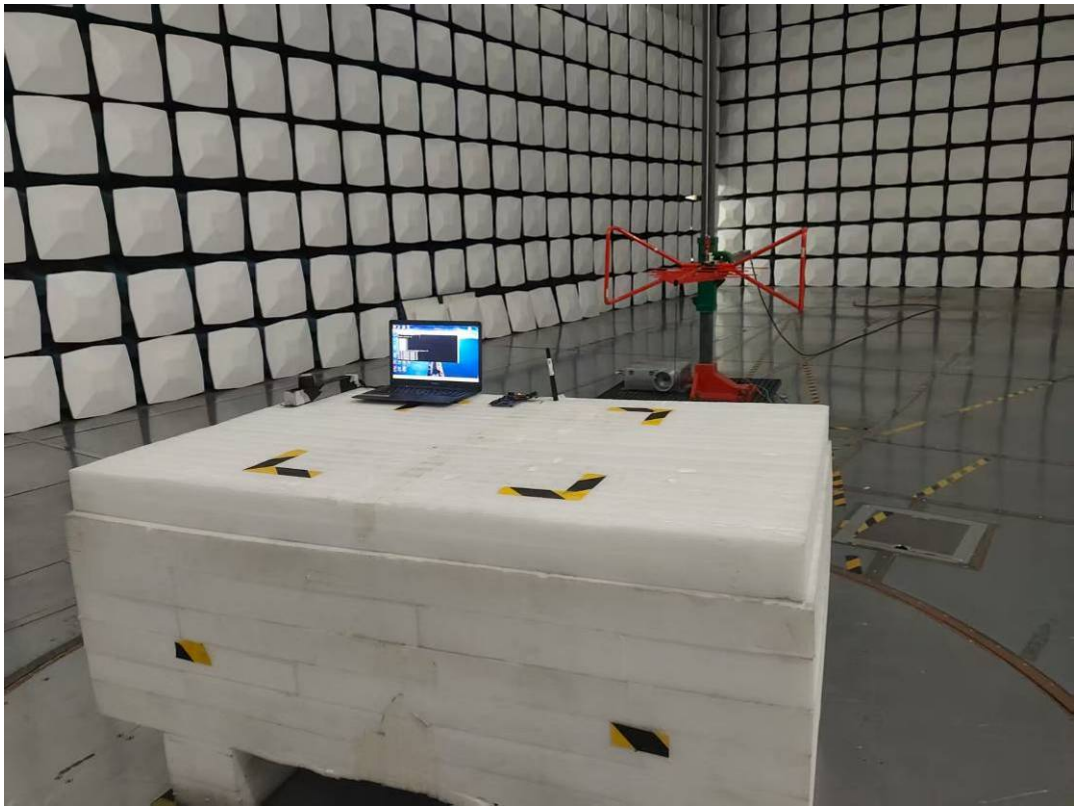

RENESAS
RA6W1C
A3521006
565-21-C

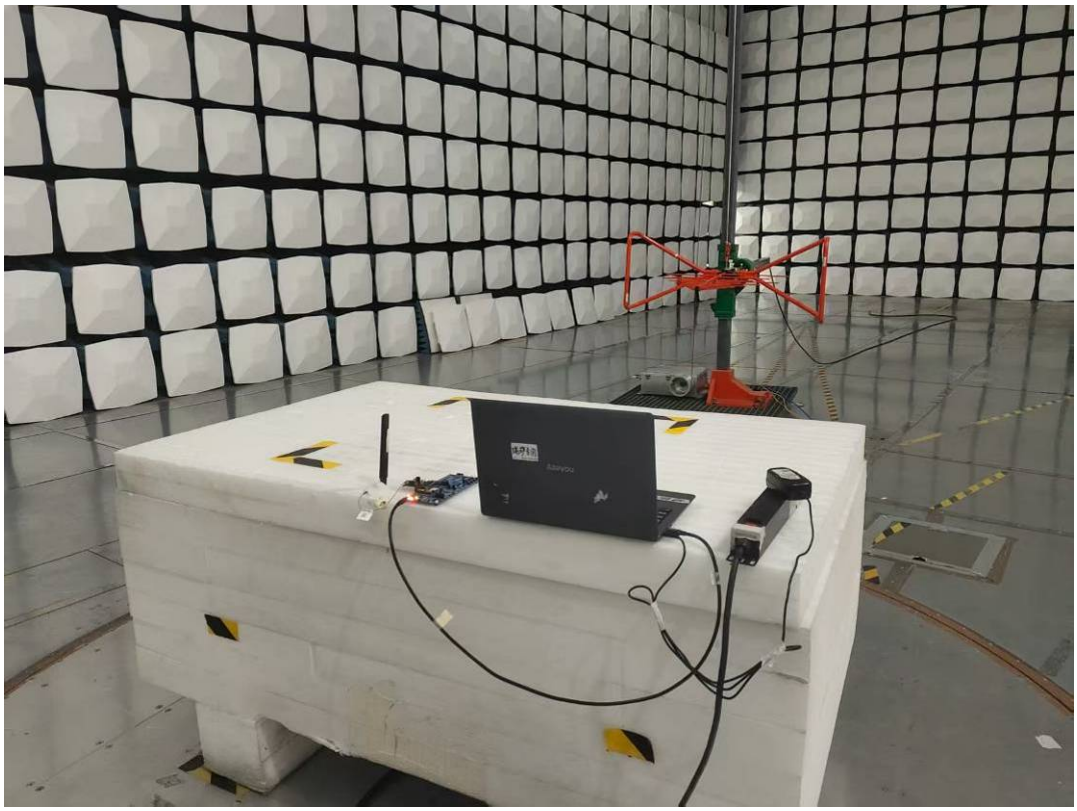
EXHIBIT B - TEST SETUP PHOTOGRAPHS

RE

RE Below 1GHz front View



RE Below 1GHz rear View



RE Above 1GHz front View

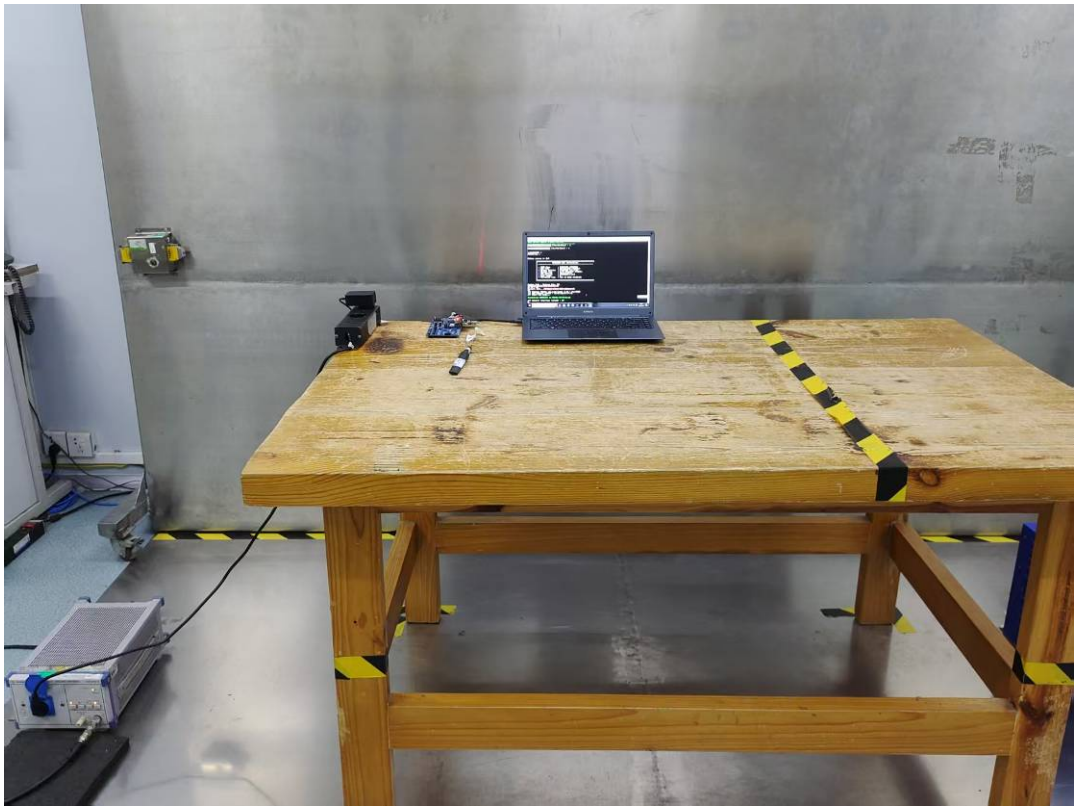


RE Above 1GHz rear View

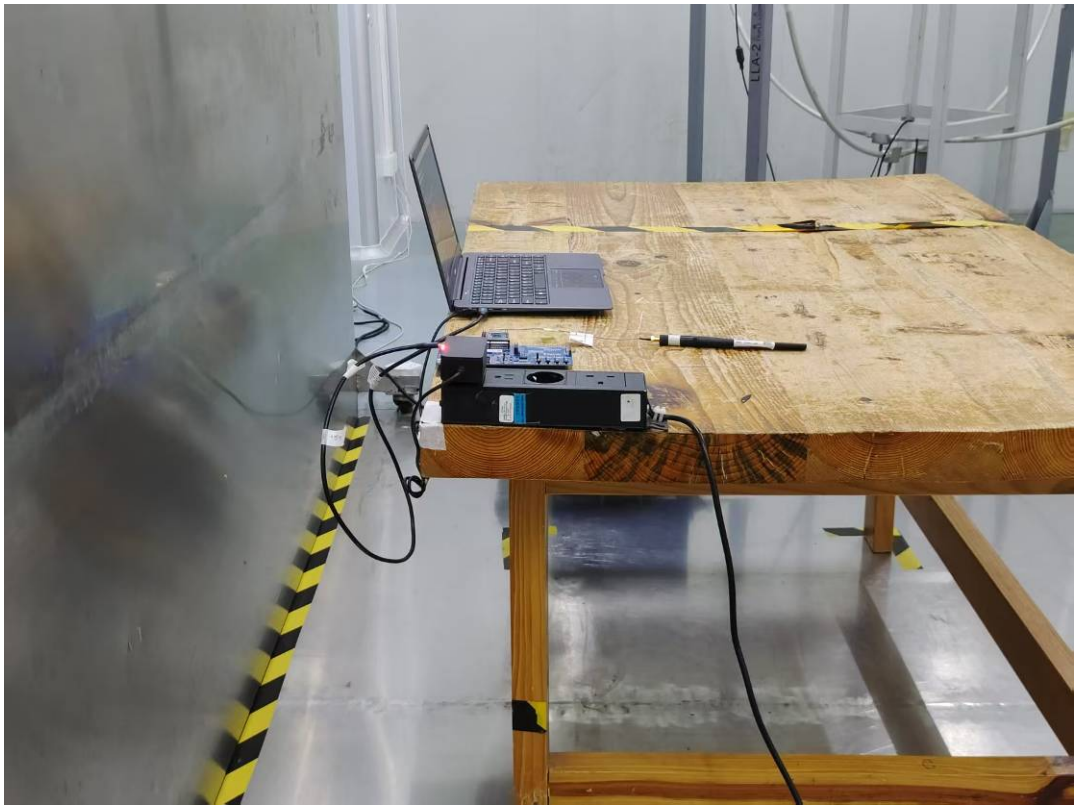


CE_AC

CE front View

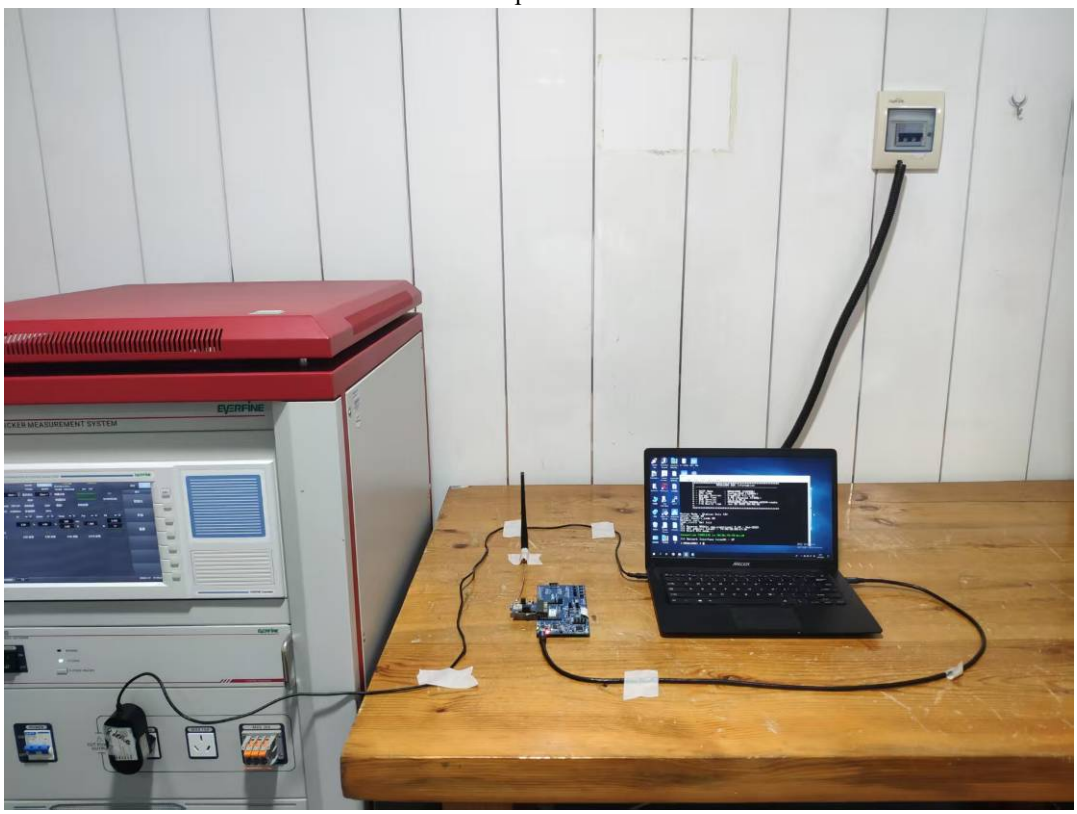


CE side View



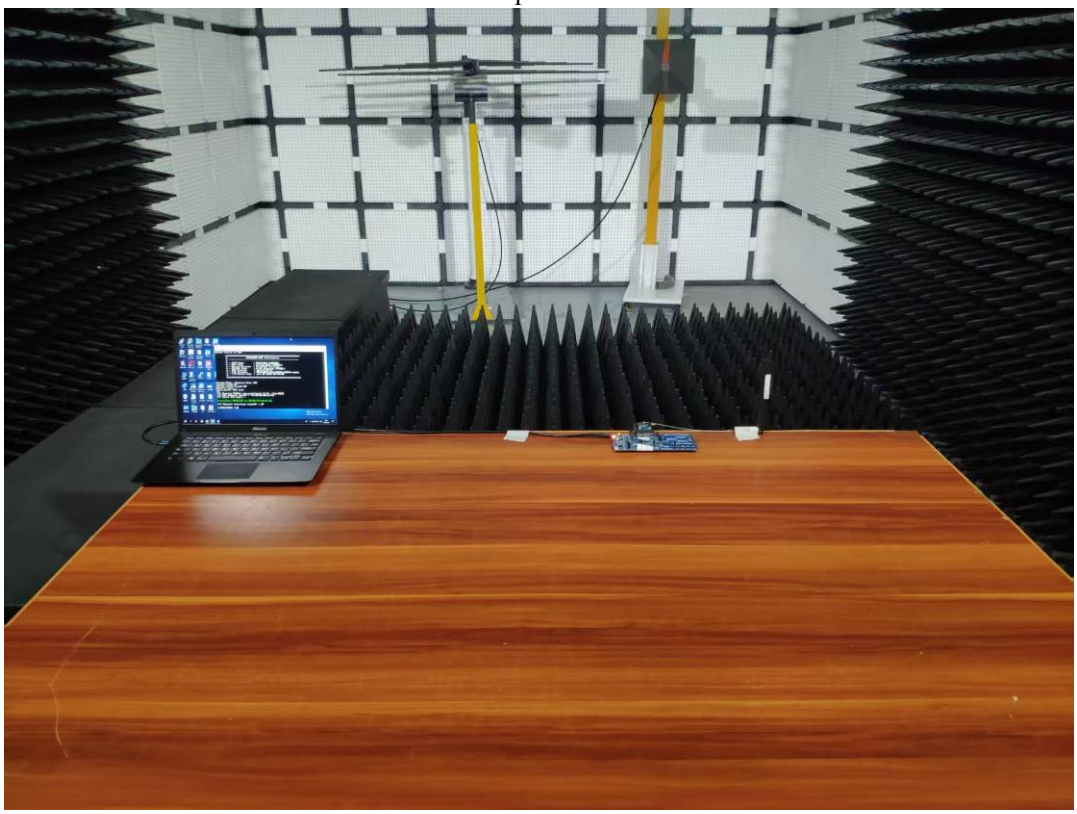
Flicker

Test Setup Photo View



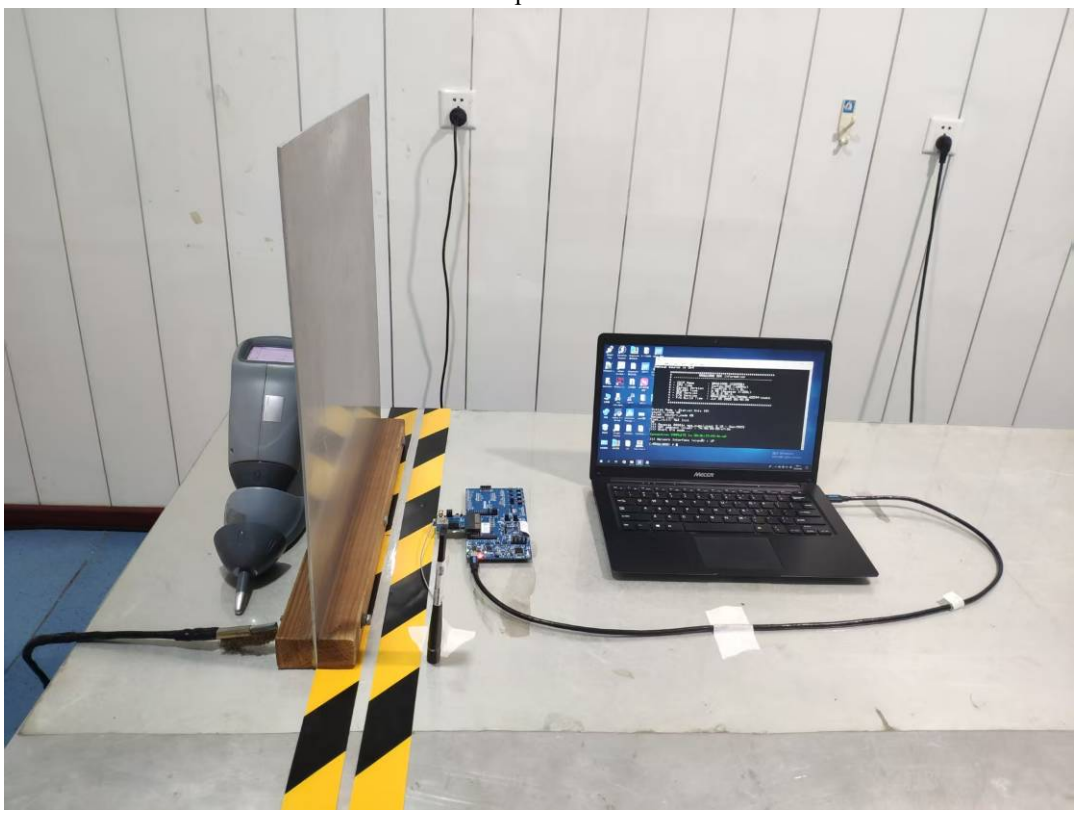
RS

Test Setup Photo View



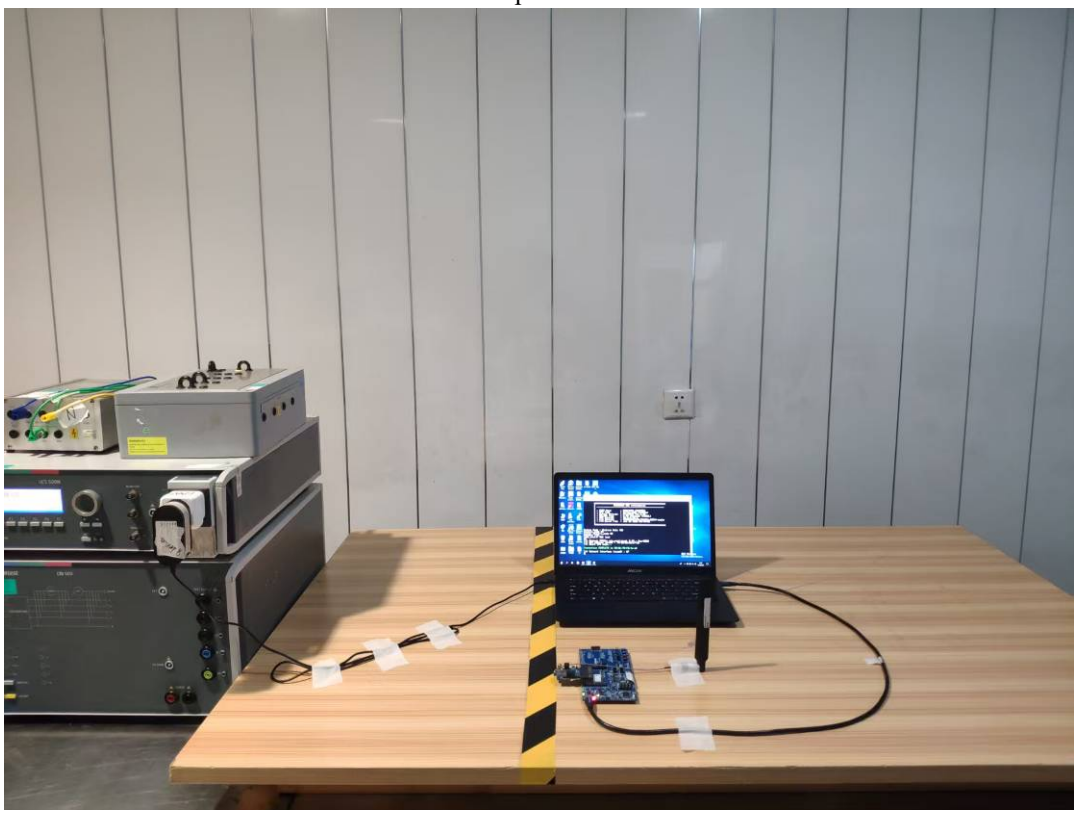
ESD

Test Setup Photo View



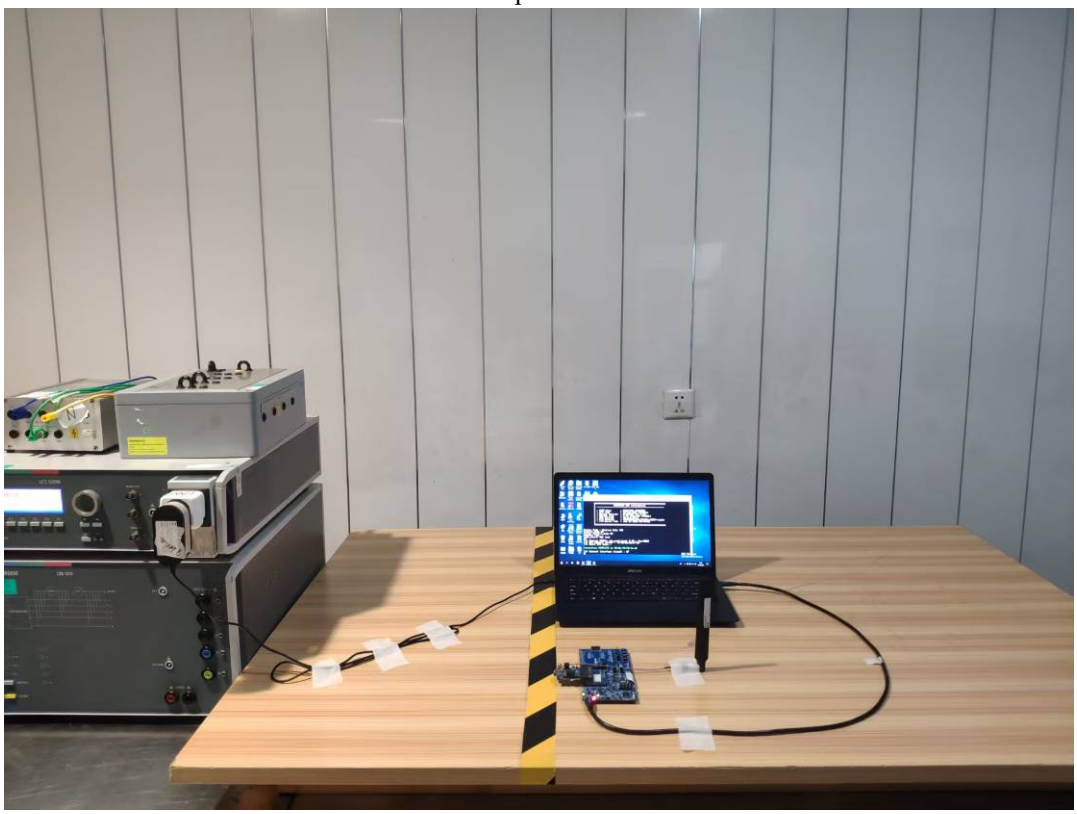
EFT

Test Setup Photo View



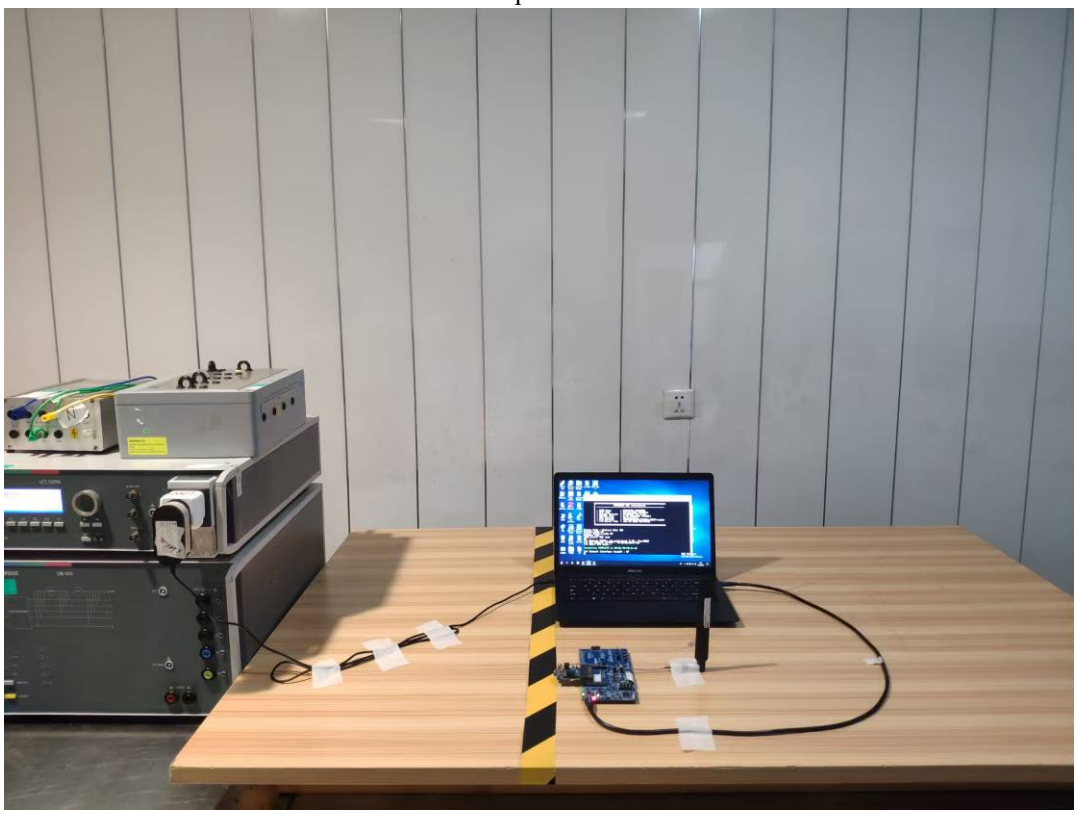
Dips

Test Setup Photo View



Surge

Test Setup Photo View



CS

Test Setup Photo View



EXHIBIT C - DECLARATION OF SIMILARITY LETTER

Renesas Design Korea Inc.
Add: 7th SiliconPark, 35 Pangyo-ro 255 beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 13486
Republic of Korea
Tel: + 82-2-567-1903
Email: kn.kim.pv@renesas.com

DECLARATION OF SIMILARITY

Date: 2025-02-24

To whom it may concern

Dear Sir or Madam:

We, Renesas Design Korea Inc., hereby declare that the product, named RRQ61001 Module, model RRQ61001-010 is electrically similar with the model RRQ61001-009 which was tested by Bay Area Compliance Laboratories Corp.(Dongguan).

The differences between those models and that are declared similar are as follows:

Model	Difference		Other
RRQ61001-009		With external antenna port	Only the different model name and with or without external antenna port. The software is same.
RRQ61001-010		Without external antenna port	

Please contact me should there be need for any additional clarification or information.

Best Regards,

Signature:
Printed Name: Kui Nam Kim
Title: Vice President

*******END OF REPORT*******