Test Verification of Conformity

Verification Number: 18122726BKK-001

On the basis of the referenced test report(s), sample(s) tested of the below product have been found to comply with the standards harmonized with the directives listed on this verification at the time the tests were carried out. Other standards and Directives may be relevant to the product. This verification is part of the full test report(s) and should be read in conjunction with it <them>.

Once compliance with all product relevant CE mark directives are verified, including any relevant e.g. risk assessment and production control, the manufacturer may indicate compliance by signing a Declaration of Conformity themselves and applying the mark to products identical to the tested sample(s).

Applicant Name & Address:	Toshiba Carrier (Thailand) Co., Ltd. 144/9 Moo5 Bangkadi Industrial Park, Tivanon Rd. T. Bangkadi, A. Muang, Pathumthani 12000 THAILAND
Product Description:	Air conditioner
Ratings & Principle Characteristics:	220-240Va.c.; 50Hz
Models/Type References:	Indoor unit / Outdoor unit: RAS-B10TKVG-E / RAS-10TAVG-E RAS-B13TKVG-E / RAS-13TAVG-E RAS-B16TKVG-E / RAS-16TAVG-E RAS-18TKVG-E / RAS-18TAVG-E RAS-24TKVG-E / RAS-24TAVG-E
Brand Name(s):	Toshiba
Standard(s)/Directive(s):	EN 55014-1: 2017 EN 55014-2: 2015 EN 61000-3-2: 2014 EN 61000-3-3: 2013 Part of requirements as specified in 2014/30/EU, EMC Directives
Verification Issuing Office Name & Address:	Intertek Testing Services (Thailand) Ltd. 1285/5 Prachachuen Road, Wong-Sawang Sub-District, Bangsue District, Bangkok 10800
Test Report Number(s):	19033108BKK-001

Signature

Name: Chairat Saeheng
Position: Reviewer
Date: 29 March 2019

Intertek Testing Services (Thailand) Ltd.

Total Quality. Assured.

EMC TEST REPORT

This report is supplementary to report number 18122726BKK-001 and shall be used in conjunction with it.

Report No.	:	19033108BKK-001
Issue Date	:	29 March 2019
Client's Reference Number	:	00964602
Product Description	:	Air Conditioner
Model/Type	:	Indoor unit / Outdoor unit: RAS-B10TKVG-E / RAS-10TAVG-E RAS-B13TKVG-E / RAS-13TAVG-E RAS-B16TKVG-E / RAS-16TAVG-E RAS-18TKVG-E / RAS-18TAVG-E RAS-24TKVG-E / RAS-24TAVG-E
Manufacturer	:	Toshiba Carrier (Thailand) Co., Ltd.
Address	:	144/9 Moo5 Bangkadi Industrial Park, Tivanon Rd. T. Bangkadi, A. Muang, Pathumthani 12000 THAILAND
Test Conclusion	:	☒ Comply ☐ Non-comply

SUMMARY

The equipment comply with the requirements according to the following standards:
EN 55014-1: 2017
EN 55014-2: 2015
EN 61000-3-2: 2014
EN 61000-3-3: 2013

Prepared & Checked By:

Worraphob Charoenwong

Test Engineer, EMC Laboratory

Approved By:

Chairat Saeheng

Reviewer

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CONTENT

1. GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

EUT : Air Conditioner
Description of EUT:

This report is supplementary to 18122726BKK-001 issue date 12 March 2019 for add new indoor and outdoor model without testing.
Additional models are same construction and critical component as EUT in 18122726BKK-001 not have any difference to impact EMC compliance characteristic.

Additional model and base model testes in report 18122726BKK-001;

Additional model	Base model
RAS-B10TKVG-E / RAS-10TAVG-E	RAS-B10J2KVG-E / RAS-10J2AVG-E
RAS-B13TKVG-E / RAS-13TAVG-E	RAS-B13J2KVG-E / RAS-13J2AVG-E
RAS-B16TKVG-E / RAS-16TAVG-E	RAS-B16J2KVG-E / RAS-16J2AVG-E
RAS-18TKVG-E / RAS-18TAVG-E	RAS-18J2KVG-E / RAS-18J2AVG-E
RAS-24TKVG-E / RAS-24TAVG-E	RAS-24J2KVG-E / RAS-24J2AVG-E

After review, No additional test required.
Test data solely referred to 18122726BKK-001

EUT Model : Indoor unit / Outdoor unit:
RAS-B10TKVG-E / RAS-10TAVG-E
RAS-B13TKVG-E / RAS-13TAVG-E
RAS-B16TKVG-E / RAS-16TAVG-E
RAS-18TKVG-E / RAS-18TAVG-E
RAS-24TKVG-E / RAS-24TAVG-E

Rating : Refer to 18122726BKK-001

Main supply cord : Fixed Appliance for all model

Clock Frequency : 10.00MHz for all model

Data line : N/A

Control line : N/A

1.2 Description of Customer

Applicant	:	Toshiba Carrier (Thailand) Co.,Ltd.
Address	:	144/9 Moo5 Bangkadi Industrial Park, Tivanon Rd. T. Bangkadi, A. Muang, Pathumthani 12000 THAILAND
Telephone	:	02-021-3100#3445
Manufacturer	:	same as applicant
Address	:	same as applicant

1.3 Description of Test Handling

Sample received date	:	Refer to 18122726BKK-001
Test date	:	Refer to 18122726BKK-001
Test Facility	:	Refer to 18122726BKK-001
Tester	:	Refer to 18122726BKK-001
Remark	:	Refer to 18122726BKK-001

2. TEST SPECIFICATIONS

2.1 Mode of operation during the test / Test peripherals used

Within this test report, EUT has been measured with the temperature controller setting at the lowest position when in cooling mode, and at the highest position when in heating mode (if any).

The ambient temperature is defined at the temperature of the air flow to the indoor unit. The ambient temperature for testing is 15 ±5 °C when the EUT is operating in heating mode and 30 ±5 °C when it is operating in cooling mode. If it is impractical to keep the ambient temperature within this range, another temperature is also permissible, provided that the equipment operates in a stable manner (shall lie within 15 - 35°C).

Selected Test Supply 230Va.c.; 50Hz.

No test peripherals used.

2.2 Test Instruments

	Equipment	Type/Model	Manu.	I.D.
☒	EMI Receiver	ESR7	Rodge and Schwarz	E5-026
☒	LISN	NSLK8127	Schwarzbeck	E5-032
☒	Absorbing clamp	AMZ41	Schaffner	E5-004
☒	Click Analyzer	DIA1512D	Schaffner	E5-002
☒	Voltage probe	TK 9420	Schwarzbeck	E5-025
☒	Harmonics-Flicker-Dips/Interrupt Test System	Profline2105	Ametek	E5-030
☒	ESD Generator	NSG438	TESEQ	1226
☒	EM clamp	KEMZ 801AS50	TESEQ	38662
☒	Compact immunity test system	NSG 4070B-30	TESEQ	39604
☒	Dual directional coupler	DCP 0100A	TESEQ	40093
☒	Power Amplifier	CBA400M-110	TESEQ	T44431
☒	Current injection probe	CIP 9136A	TESEQ	35442
☒	Coupling/Decoupling network	CDN M332S	TESEQ	37751
☒	EFT, Surge, Dips Generator	NSG3040	TESEQ	E5-017
☒	Single Supply Source for PQT Testing	INA 6501	TESEQ	E5-021

☒ Test equipment applicable in this test report
☐ Test equipment not-applicable in this test report

2.3 Software

	Software	Manu.	Version
1	EMC Calculator	-	2018.07
2	DIS9966	Schaffner	2.5.0.0

2.4 Uncertainty Application

Uncertainty of Measurement applied according to CISPR 16-4-2. Reference U_{cispr} in the table as followed used as a reference value for the judgment.

Test Method	U_{cispr} (dB)	U_{Lab} (dB)
Conducted disturbance at mains port using AMN (150kHz - 30MHz)	3.4	4.25
Continuous disturbance power (30MHz - 300MHz)	4.5	3.46
Radiated disturbance (30MHz - 1000MHz)	6.3	S[1]

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

a) If U_{lab} is less than or equal to U_{cispr} in Table, then the test report may either state the value of U_{lab} or state that U_{lab} is less than U_{cispr}.
   – 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.

b) If U_{lab} exceeds U_{cispr} of Table, then the test report shall contain the value of U_{lab} (in dB) for the measurement instrumentation actually used for the measurements.
   – 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.

[1] Refer to subcontractor uncertainty of measurement, if applicable.

2.5 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service (Thailand) Limited.

Reference standard	Frequency	Test Method		Test Verdict
EN 55014-1	150kHz to 30MHz	☒	Mains Terminal Continuous Disturbance Voltage	Pass
		☒	Load Terminal Continuous Disturbance Voltage	Pass
		☒	Mains Terminal Discontinuous Disturbance Voltage/Click	Pass
	30MHz to 1000MHz	☒	Continuous Disturbance Power (30MHz - 300MHz)	Pass
		☐	Radiated Disturbance (30MHz - 1000MHz)	N/A (Note 1)
EN 61000-3-2		☒	Harmonic Current Emission	Pass
EN 61000-3-3		☒	Voltage Fluctuation and Flicker	Pass
EN 55014-2 Category II		☒	Electrostatic Discharge	Pass
		☐	RF Electromagnetic Field	N/A
		☒	Fast Transients	Pass
		☒	Surges	Pass
		☒	Injected Current up 230MHz	Pass
		☐	Injected Current up 80MHz	N/A
		☒	Voltage Dips	Pass

☒ Test topic applicable in this test report

☐ Test topic not-applicable in this test report

Remark:
Note 1: Not applicable, due to the EUT that contains clock frequency of less than 30MHz.
Note 2: Test data referred to 18122726BKK-001 issue date 12 March 2019 and has been transferred to put in this report without re-test.

EMISSION TEST
EN 55014-1: 2017

3. Mains/Load/Control Terminal Continuous Disturbance Voltage

Test conclusion: ☒ Pass ☐ Fail

Operating Condition: EUT is warmed up at least 15 minutes before measurement. Lowest temperature setting, maximum fan speed.

3.1 Test Method

- ❑ Test equipment as shown in the table in topic 2.2 is connected as shown in figure 1 topic 3.1.1 to measurement terminal Continuous Disturbance Voltage.
- ❑ EUT is configured by follow the particular requirement in the reference standards, if available. If the particular requirements are not specified, EUT shall be configured with appropriate load to maximize the disturbance signal.
- ❑ Mains terminal disturbance is measure at line to earth and neutral to earth.
- ❑ Pre-scan shall be done over the whole range of frequency as specified by the standard.
- ❑ At least 6 worst peaks which are closet to the limit(s) shall be selected to do the Final scan.
- ❑ Final scan shall be done by reduce the span zooming in to the selected peak and fine tune to the exact frequency which give the highest disturbance value. Re-measure at that frequency with peak detector and other detector according to the limit(s) applied.

3.1.1 Test Set up

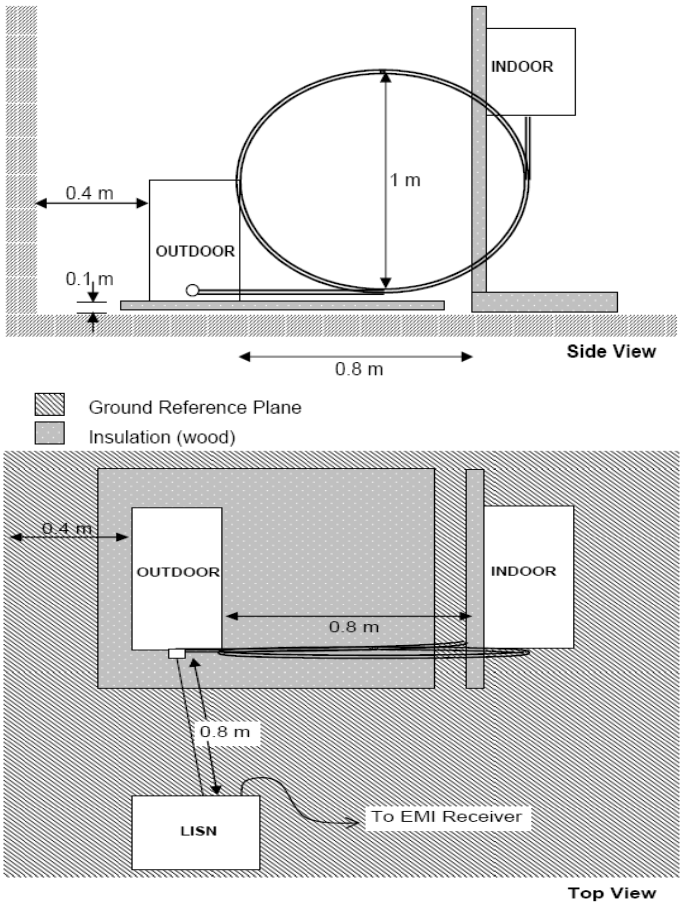

Figure 1: Drawing of Main Terminal Continuous Disturbance Voltage Measurement

3.1.2 Limit

Table 1: Limit for 50Ω/50μH LISN V-network

Frequency range	Main terminals Limits		Load terminals Limits	
(MHz)	dB(μv)		dB(μv)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	59 - 46 *	80	70
0.5 - 5	56	46	74	64
5 - 30	60	50	74	64
Note:	1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.			
	2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.			

3.2 Test Result

3.2.1 Test Environment

Temperature: 27.0°C Humidity 50.0%RH

3.2.2 Test Port

Main terminal for Line to Ground and Neutral to Ground.

The EUT cable has been fix to 0.8 m in length for testing.

3.2.3 Scanning trace and Final measurement

Main Terminal:

RAS-B10J2KVG-E / RAS-10J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.6340	50.10	56.00	-5.90	44.10	46.00	-1.90	N-PE
4.4700	49.20	56.00	-6.80	43.40	46.00	-2.60	N-PE
4.4860	49.20	56.00	-6.80	43.40	46.00	-2.60	L-PE
1.3820	47.90	56.00	-8.10	41.50	46.00	-4.50	L-PE
0.3580	49.50	58.77	-9.27	43.60	49.60	-6.00	N-PE
0.3900	49.10	58.06	-8.96	42.40	48.68	-6.28	L-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B13J2KVG-E / RAS-13J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
4.5060	44.90	56.00	-11.10	38.60	46.00	-7.40	N-PE
4.7420	44.50	56.00	-11.50	38.20	46.00	-7.80	L-PE
1.0460	43.10	56.00	-12.90	36.00	46.00	-10.00	L-PE
1.3140	42.20	56.00	-13.80	35.20	46.00	-10.80	N-PE
0.4260	43.60	57.33	-13.73	36.70	47.72	-11.02	N-PE
0.1660	53.40	65.15	-11.75	45.40	57.90	-12.50	L-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B16J2KVG-E / RAS-16J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
8.0980	49.60	60.00	-10.40	41.40	50.00	-8.60	L-PE
8.3100	48.90	60.00	-11.10	40.80	50.00	-9.20	N-PE
0.4020	45.90	57.81	-11.91	37.70	48.35	-10.65	N-PE
0.2780	46.20	60.87	-14.67	38.80	52.33	-13.53	N-PE
13.2140	42.90	60.00	-17.10	34.80	50.00	-15.20	L-PE
0.2020	48.00	63.52	-15.52	39.80	55.78	-15.98	L-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-18J2KVG-E / RAS-18J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
4.7060	42.80	56.00	-13.20	34.30	46.00	-11.70	L-PE
6.0220	42.70	60.00	-17.30	35.50	50.00	-14.50	L-PE
0.1860	49.30	64.21	-14.91	41.60	56.67	-15.07	L-PE
5.6340	43.30	60.00	-16.70	34.80	50.00	-15.20	N-PE
0.1860	47.00	64.21	-17.21	39.70	56.67	-16.97	N-PE
14.3660	39.30	60.00	-20.70	30.90	50.00	-19.10	N-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-24J2KVG-E / RAS-24J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.4100	49.00	57.64	-8.64	41.00	48.14	-7.14	L-PE
0.4780	45.80	56.37	-10.57	38.80	46.48	-7.68	N-PE
0.7260	43.50	56.00	-12.50	37.50	46.00	-8.50	L-PE
1.2260	43.30	56.00	-12.70	35.80	46.00	-10.20	N-PE
3.4340	40.60	56.00	-15.40	33.50	46.00	-12.50	N-PE
6.2660	41.50	60.00	-18.50	35.50	50.00	-14.50	L-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

Load Terminal:

RAS-B10J2KVG-E / RAS-10J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.1500	71.10	80.00	-8.90	58.50	70.00	-11.50	3-PE
1.1220	54.90	74.00	-19.10	48.60	64.00	-15.40	1-PE
1.1540	54.70	74.00	-19.30	48.60	64.00	-15.40	2-PE
4.4580	53.30	74.00	-20.70	47.70	64.00	-16.30	2-PE
0.2100	63.70	80.00	-16.30	52.30	70.00	-17.70	3-PE
27.4740	52.30	74.00	-21.70	45.40	64.00	-18.60	1-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B13J2KVG-E / RAS-13J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.1940	64.20	80.00	-15.80	54.90	70.00	-15.10	3-PE
27.4500	54.40	74.00	-19.60	48.30	64.00	-15.70	1-PE
0.2420	59.60	80.00	-20.40	51.70	70.00	-18.30	3-PE
4.5620	49.70	74.00	-24.30	44.40	64.00	-19.60	1-PE
0.1620	56.10	80.00	-23.90	50.20	70.00	-19.80	2-PE
4.3460	49.40	74.00	-24.60	43.70	64.00	-20.30	2-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B16J2KVG-E / RAS-16J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.1540	76.90	80.00	-3.10	66.90	70.00	-3.10	3-PE
0.1780	74.70	80.00	-5.30	65.20	70.00	-4.80	3-PE
8.5860	55.40	74.00	-18.60	45.20	64.00	-18.80	1-PE
15.5020	57.30	74.00	-16.70	49.00	64.00	-15.00	1-PE
15.4780	57.10	74.00	-16.90	49.00	64.00	-15.00	2-PE
8.6780	53.70	74.00	-20.30	43.60	64.00	-20.40	2-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-18J2KVG-E / RAS-18J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
0.1780	75.40	80.00	-4.60	65.70	70.00	-4.30	3-PE
0.3020	69.00	80.00	-11.00	59.40	70.00	-10.60	3-PE
29.9820	56.70	74.00	-17.30	48.80	64.00	-15.20	1-PE
29.9820	53.60	74.00	-20.40	45.80	64.00	-18.20	2-PE
4.2340	50.90	74.00	-23.10	45.40	64.00	-18.60	1-PE
4.2340	50.20	74.00	-23.80	45.20	64.00	-18.80	2-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-24J2KVG-E / RAS-24J2AVG-E

Freq List (MHz)	QP Level (dB(µV))	QP Limit (dB(µV))	QP Margin (dB)	AV Level (dB(µV))	AV Limit (dB(µV))	AV Margin (dB)	Path
18.0020	50.30	74.00	-23.70	50.00	64.00	-14.00	2-PE
18.0020	49.70	74.00	-24.30	49.40	64.00	-14.60	1-PE
17.9980	49.30	74.00	-24.70	49.00	64.00	-15.00	3-PE
0.7180	48.00	74.00	-26.00	41.80	64.00	-22.20	1-PE
4.7460	46.20	74.00	-27.80	40.80	64.00	-23.20	2-PE
4.8060	45.50	74.00	-28.50	39.90	64.00	-24.10	3-PE

The test result shown are 6 worst measurement result and sort by average margin.
The scanning result of the emission spectrum are shown in Appendix I.

4. Continuous Disturbance Power

Test conclusion: ☒ Pass ☐ Fail

Operating Condition: EUT is warmed up at least 15 minutes before measurement. Lowest temperature setting, maximum fan speed.

4.1 Test Method

- ❑ Test equipment as shown in the table in topic 2.2 is connected as shown in figure 2 topic 4.1.1 to measurement Continuous Disturbance Power.
- ❑ EUT is configured by follow the particular requirement in the reference standards, if available. If the particular requirements are not specified, EUT shall be configured with appropriate load to maximize the disturbance signal.
- ❑ Continuous disturbance power is measure over the 6m length cable by pre-scan 2m a time. The pre-scan is done at 0.1m (the closet to EUT), 3m and 5m.
- ❑ Pre-scan shall be done over the whole range of frequency as specified by the standard. One worst trace will be selected to report as a pre-scan trace.
- ❑ At least 6 worst peaks which are closet to the limit(s) shall be selected to do the Final scan. The selection will do base on the 3 scanning results as mention above. Different frequency will be selected.
- ❑ Final scan shall be done by reduce the span zooming in to the selected peak and fine tune to the exact frequency which give the highest disturbance value. Re-measure at that frequency with peak detector and other detector according to the limit(s) applied.

4.1.1 Test Set up

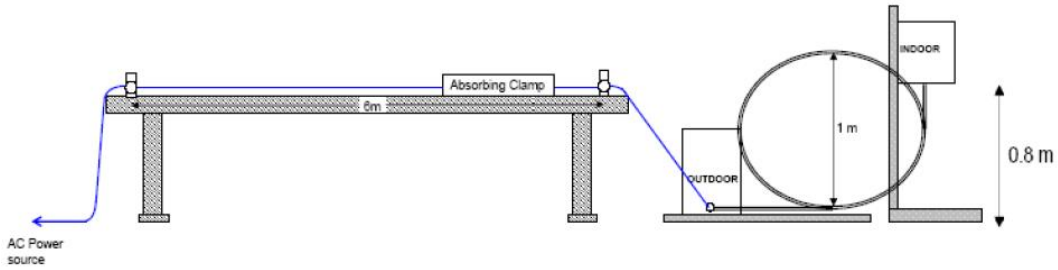

Figure 2: Drawing of Continuous Disturbance Power Measurement

4.1.2 Limit

Table 2: Allowable limit for noise power (Continuous noise)

Frequency (MHz)	Quasi-peak dB(pW)	Average dB(pW)
30 - 300	45 - 55*	35 - 45*
Note:	1. * means the limit increasing linearly with the frequency.	
	2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement with the receiver with average detector need not be carried out.	

4.2 Test Result

4.2.1 Test Environment

Temperature: 27.0°C Humidity 50.0%RH

4.2.2 Test Port

Around the power cable which has been extended to 6m.

4.2.3 Scanning trace and Final measurement

RAS-B10J2KVG-E / RAS-10J2AVG-E

Freq List (MHz)	QP Level (dB(pW))	QP Limit (dB(pW))	QP Margin (dB)	AV Level (dB(pW))	AV Limit (dB(pW))	AV Margin (dB)	Sensor
68.0000	44.90	46.40	-1.50	29.00	36.40	-7.40	Main
106.2000	44.10	47.82	-3.72	27.40	37.82	-10.42	Inter-con OD
35.8800	38.90	45.21	-6.31	25.70	35.21	-9.51	Inter-con OD
90.1600	39.80	47.22	-7.42	24.50	37.22	-12.72	Main
32.3200	36.60	45.08	-8.48	25.70	35.08	-9.38	Inter-con ID
62.3200	35.10	46.19	-11.09	18.90	36.19	-17.29	Inter-con ID

The test result shown are 6 worst measurement result and sort by quasi-peak margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B13J2KVG-E / RAS-13J2AVG-E

Freq List (MHz)	QP Level (dB(pW))	QP Limit (dB(pW))	QP Margin (dB)	AV Level (dB(pW))	AV Limit (dB(pW))	AV Margin (dB)	Sensor
80.2800	42.80	46.86	-4.06	34.30	36.86	-2.56	Inter-con ID
80.2800	43.60	46.86	-3.26	32.40	36.86	-4.46	Main
31.6400	40.60	45.06	-4.46	27.40	35.06	-7.66	Inter-con OD
77.8000	42.30	46.77	-4.47	33.10	36.77	-3.67	Inter-con OD
32.4000	38.10	45.08	-6.98	26.40	35.08	-8.68	Main
36.0400	32.50	45.22	-12.72	21.40	35.22	-13.82	Inter-con ID

The test result shown are 6 worst measurement result and sort by quasi-peak margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-B16J2KVG-E / RAS-16J2AVG-E

Freq List (MHz)	QP Level (dB(pW))	QP Limit (dB(pW))	QP Margin (dB)	AV Level (dB(pW))	AV Limit (dB(pW))	AV Margin (dB)	Sensor
82.1200	39.90	46.93	-7.03	25.90	36.93	-11.03	Main
80.1200	38.70	46.85	-8.15	34.10	36.85	-2.75	Inter-con OD
74.6800	37.00	46.65	-9.65	24.50	36.65	-12.15	Main
80.0800	34.30	46.85	-12.55	31.30	36.85	-5.55	Inter-con ID
93.5600	30.40	47.35	-16.95	18.20	37.35	-19.15	Inter-con ID
42.7600	25.90	45.47	-19.57	17.50	35.47	-17.97	Inter-con OD

The test result shown are 6 worst measurement result and sort by quasi-peak margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-18J2KVG-E / RAS-18J2AVG-E

Freq List (MHz)	QP Level (dB(pW))	QP Limit (dB(pW))	QP Margin (dB)	AV Level (dB(pW))	AV Limit (dB(pW))	AV Margin (dB)	Sensor
36.9200	41.50	45.25	-3.75	28.40	35.25	-6.85	Main
82.0400	43.10	46.92	-3.82	30.50	36.92	-6.42	Main
83.6000	42.80	46.98	-4.18	29.90	36.98	-7.08	Inter-con ID
35.8000	41.00	45.21	-4.21	27.30	35.21	-7.91	Inter-con OD
36.7200	40.00	45.24	-5.24	26.40	35.24	-8.84	Inter-con ID
83.5000	35.50	46.98	-11.48	23.90	36.98	-13.08	Inter-con OD

The test result shown are 6 worst measurement result and sort by quasi-peak margin.
The scanning result of the emission spectrum are shown in Appendix I.

RAS-24J2KVG-E / RAS-24J2AVG-E

Freq List (MHz)	QP Level (dB(pW))	QP Limit (dB(pW))	QP Margin (dB)	AV Level (dB(pW))	AV Limit (dB(pW))	AV Margin (dB)	Sensor
86.1200	45.60	47.07	-1.47	31.80	37.07	-5.27	Main
91.9600	44.80	47.29	-2.49	30.60	37.29	-6.69	Inter-con ID
105.6800	35.30	47.80	-12.50	22.20	37.80	-15.60	Main
80.0000	33.40	46.85	-13.45	21.20	36.85	-15.65	Inter-con OD
131.9200	32.10	48.77	-16.67	19.30	38.77	-19.47	Inter-con ID
92.1600	30.30	47.30	-17.00	20.50	37.30	-16.80	Inter-con OD

The test result shown are 6 worst measurement result and sort by quasi-peak margin.
The scanning result of the emission spectrum are shown in Appendix I.

Remark:

Main	=	Clamp on Main Cable, sensor head to Main.
Inter-con ID	=	Clamp on Inter-connecting cable, sensor head to Indoor.
Inter-con OD	=	Clamp on Inter-connecting cable, sensor head to Outdoor.

5. Main Terminal Discontinuous Disturbance Voltage

Test conclusion: ☒ Pass ☐ Fail

Operating Condition: EUT is warmed up at least 15 minutes before measurement. Lowest temperature setting, maximum fan speed.

5.1 Test Method

- ❑ Test equipment as shown in the table in topic 2.2 is connected as shown in figure 3 topic 5.1.1 to measurement Discontinuous Disturbance at Main Terminal.
- ❑ EUT is configured by follow the particular requirement in the reference standards, if available. If the particular requirements are not specified, EUT shall be configured with appropriate load to maximize the disturbance signal.
- ❑ The observation time is based on the EUT (ensure that cycle of operation shall be fully complete) or 120 minutes.
- ❑ Main Terminal Discontinuous Disturbance (Click) is measured by Discontinuous Disturbance Analyzer with the limit specified in 5.1.2 for the defined observation time.
- ❑ Test and conclusion of test result shall be referred to the flow chart in CISPR 14-1.

5.1.1 Test Set up

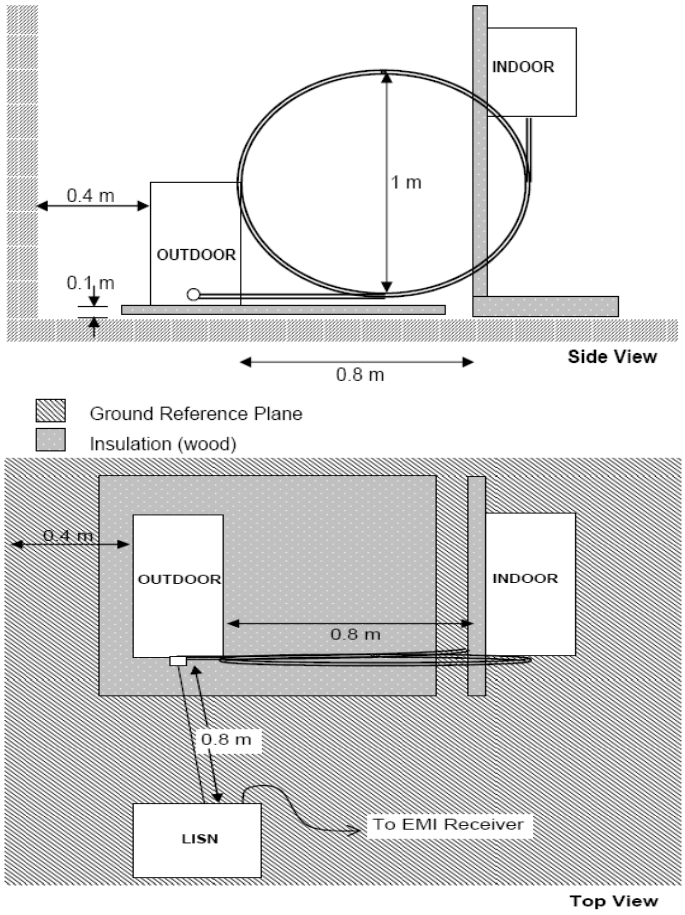

Figure 3: Drawing of Main Terminal Discontinuous Disturbance Voltage Measurement

5.1.2 Limit

The limit for Discontinue Disturbance depend on the average number of click per minute, Click rate *N*. There are two methods for determining the click rate:

☒ by measuring the number of clicks
☐ by counting the number of switching operations.

Table 3: Allowable limits for discontinuous noise terminal voltage

Frequency range	0.15	0.5	1.4	30
Limit	66	56	56	60

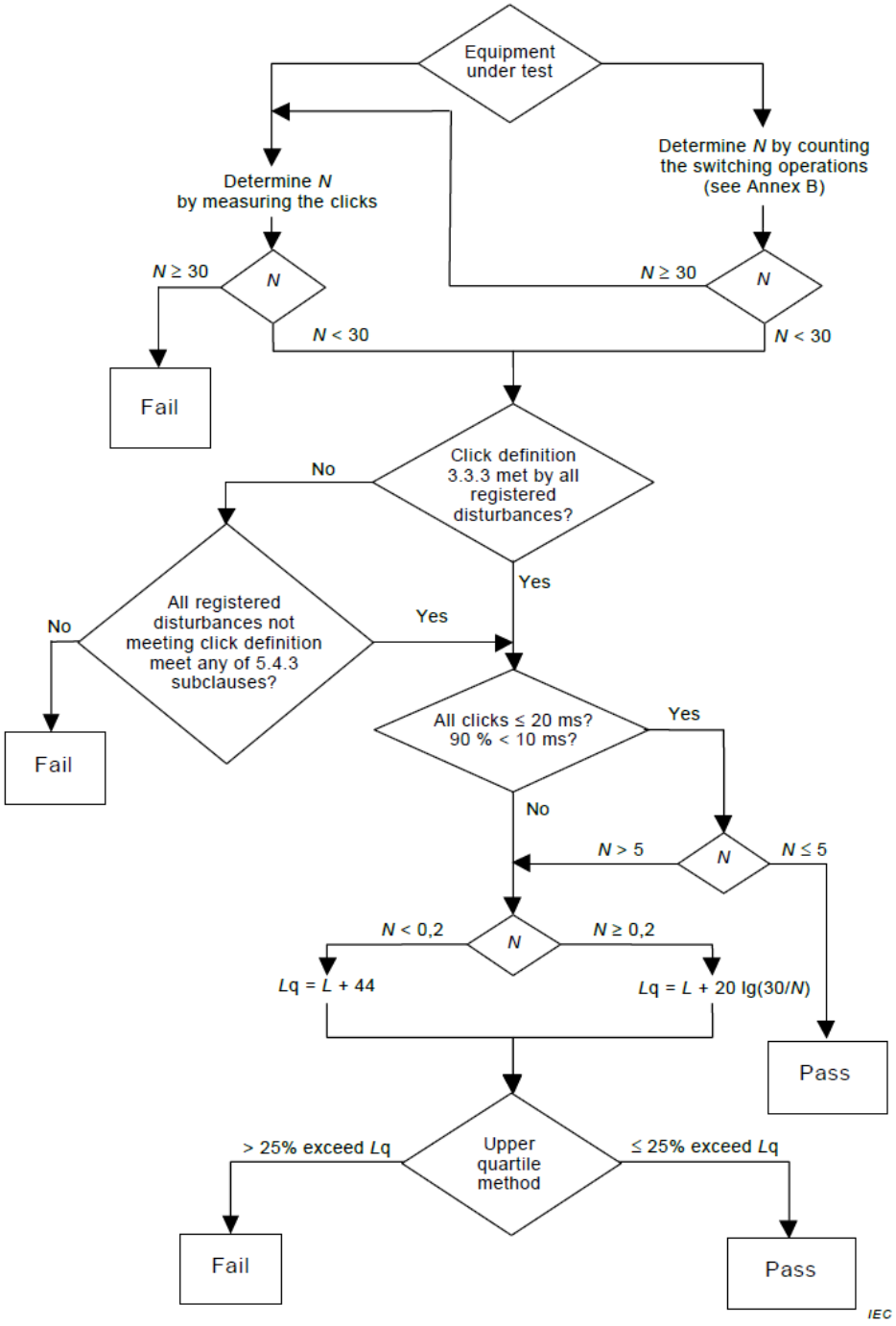

Figure 4: Flow Diagram for DIA (Refer CISPR 14-1)

5.2 Test Result

5.2.1 Test Environment

Temperature: 27.0°C Humidity 50.0%RH

5.2.2 Test Port

Main terminal for Line to Ground.

5.2.3 Measurement result

RAS-B13J2KVG-E / RAS-13J2AVG-E

EUT Operation mode:		Cooling, max fan speed		**EUT configuration:**		CISPR 14-1
EUT Interface:		Mains		**--**		--
Frequency (MHz)	**First measurement: Determine the limit L_q – Quasi-peak**					
	Limit *L* (dB(µV))	**Number of clicks – N1**	**Time of measurement *T* (min)**	**Click rate *N***	**Increasing ratio**	**Limit L_q (dB(µV))**
0.15	**66**	0	120	0.00	-	-
0.5	**56**	0	120	0.00	-	-
1.4	**56**	0	120	0.00	-	-
30	**60**	0	120	0.00	-	-

Second measurement with Limit = L_q (Upper quartile method):				
Frequency (MHz)	**Limit– Quasi-peak**			
	Limit Lq (dB(µV))	**Number of clicks – N2**	**Number of authorized clicks N2 ≤N1/4**	**Verdict**
0.15	-	-	-	Pass
0.5	-	-	-	Pass
1.4	-	-	-	Pass
30	-	-	-	Pass

Supplementary information:
N not more than 5 and no long click.

RAS-B16J2KVG-E / RAS-16J2AVG-E

EUT Operation mode:		Cooling, max fan speed		**EUT configuration:**		CISPR 14-1
EUT Interface:		Mains		**--**		--
Frequency (MHz)	**First measurement: Determine the limit L_q – Quasi-peak**					
	Limit *L* (dB(µV))	**Number of clicks – N1**	**Time of measurement *T* (min)**	**Click rate *N***	**Increasing ratio**	**Limit L_q (dB(µV))**
0.15	**66**	0	120	0.00	-	-
0.5	**56**	0	120	0.00	-	-
1.4	**56**	0	120	0.00	-	-
30	**60**	0	120	0.00	-	-

Second measurement with Limit = L_q (Upper quartile method):				
Frequency (MHz)	**Limit– Quasi-peak**			
	Limit Lq (dB(µV))	**Number of clicks – N2**	**Number of authorized clicks N2 ≤N1/4**	**Verdict**
0.15	-	-	-	Pass
0.5	-	-	-	Pass
1.4	-	-	-	Pass
30	-	-	-	Pass

Supplementary information:
N not more than 5 and no long click.

RAS-24J2KVG-E / RAS-24J2AVG-E

EUT Operation mode:		Cooling, max fan speed		**EUT configuration:**		CISPR 14-1
EUT Interface:		Mains		**--**		--
Frequency (MHz)	**First measurement: Determine the limit L_q – Quasi-peak**					
	Limit *L* (dB(µV))	**Number of clicks – N1**	**Time of measurement *T* (min)**	**Click rate *N***	**Increasing ratio**	**Limit L_q (dB(µV))**
0.15	**66**	0	120	0.00	-	-
0.5	**56**	0	120	0.00	-	-
1.4	**56**	0	120	0.00	-	-
30	**60**	0	120	0.00	-	-

Second measurement with Limit = L_q (Upper quartile method):				
Frequency (MHz)	**Limit– Quasi-peak**			
	Limit Lq (dB(µV))	**Number of clicks – N2**	**Number of authorized clicks N2 ≤N1/4**	**Verdict**
0.15	-	-	-	Pass
0.5	-	-	-	Pass
1.4	-	-	-	Pass
30	-	-	-	Pass

Supplementary information:
N not more than 5 and no long click.

6. Radiated Disturbance

Test conclusion: ☐ Pass ☐ Fail
Operating Condition: N/A

6.1 Test Method

- ❑ The Radiated Disturbance measurements were performed with EMI receiver to measure the emissions characteristic and to identify the frequency of emission that has the highest amplitude related to the EUT configuration. EUT configuration, cable configuration of operation are determined for product the maximum level of emission.
- ❑ Test equipment as shown in the table in topic 2.2 is connected as shown in figure 5 topic 6.1.1 to measurement Radiated Disturbance.
- ❑ EUT was placed on the 80 cm height non-metallic table on 1 m radius turntable.
- ❑ The Bi-log antenna (30MHz - 1000MHz) was used for received the noise of EUT and put on the antenna mast, which they were inside the semi-anechoic chamber. The testing method and EUT setup were performed according to CISPR 14-1.

6.1.1 Test Set up

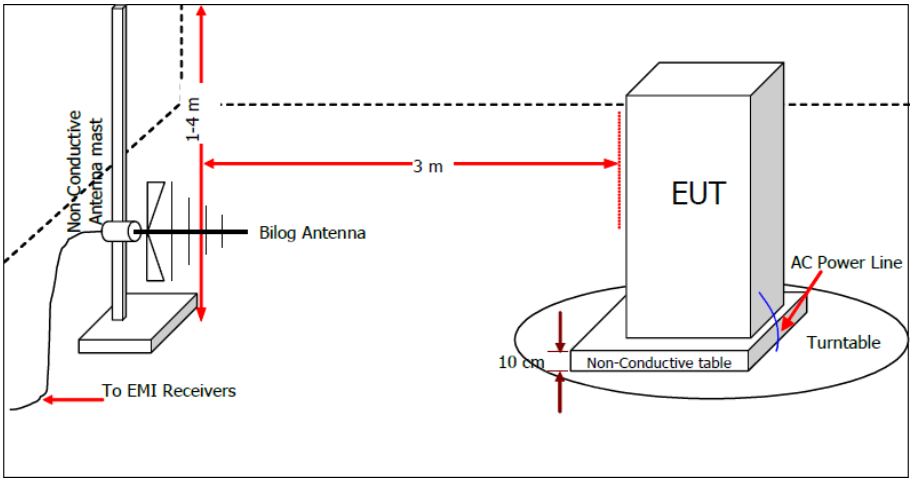

Figure 5: Drawing of Radiated Disturbance Measurement

6.1.2 Limit

Table 4: Radiated Disturbance limits in the frequency range 30MHz - 1000MHz

Frequency range (MHz)	Quasi-peak limits (SAC) dB(µV/m)
30 - 230	30
230 - 1000	37
Note:	Measurement may be made at closer, down to 3m. An inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.
	SAC = semi-anechoic chamber

6.2 Test Result

6.2.1 Test Environment

Temperature: -°C Humidity -%RH

6.2.2 Test port: Enclosure

6.2.3 Scanning trace and Final measurement

N/A

Harmonics Current Emission
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7. Harmonics Current Emission

Test conclusion: ☒ Pass ☐ Fail
Operating Condition: EUT is warmed up at least 15 minutes before measurement.
Lowest temperature setting, maximum fan speed.

7.1 Test set up drawing

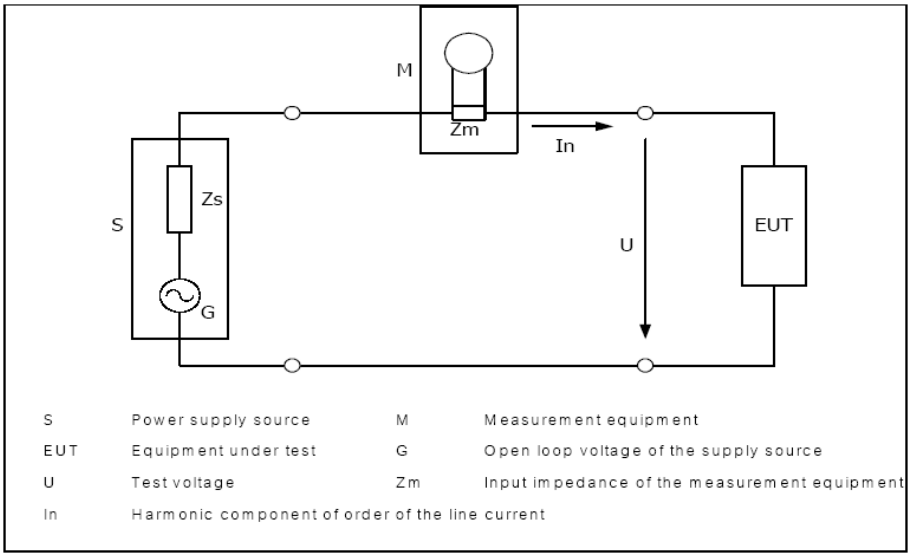

Figure 6: Harmonic Current Emission Measurement System

7.2 Limits

Harmonic Current Emission Limits (Class A equipment)	
Harmonic order (n)	Maximum permissible Harmonic current (A)
Odd harmonics	
3 5 7 9 11 13 $15 \leq n \leq 39$	2.30 1.14 0.77 0.40 0.33 0.21 $0.15 \frac{15}{n}$
Even harmonics	
2 4 6 $8 \leq n \leq 40$	1.08 0.43 0.30 $0.28 \frac{8}{n}$

7.3 Test Result

Harmonic Current Emission

RAS-B13J2KVG-E / RAS-13J2AVG-E

Phase	:	L	Measured I_{ref} (A)	:	4
THC/I_{ref} (%)	:	1.896	Limit (%)	:	50.1
PWHC/I_{ref} (%)	:	0.104	Limit (%)	:	0.251

Harm#	Harm(arg)	100%Limit	%of Limit	Harm(max)	150%Limit	%of Limit	Status
2	0.005	1.080	N/A	0.007	1.620	N/A	Pass
3	1.202	2.300	52.3	1.213	3.450	35.2	Pass
4	0.005	0.430	N/A	0.009	0.645	N/A	Pass
5	0.283	1.140	24.8	0.329	1.710	19.3	Pass
6	0.003	0.300	N/A	0.006	0.450	N/A	Pass
7	0.265	0.770	34.4	0.268	1.155	23.2	Pass
8	0.003	0.230	N/A	0.004	0.345	N/A	Pass
9	0.127	0.400	31.8	0.135	0.600	22.5	Pass
10	0.003	0.184	N/A	0.006	0.276	N/A	Pass
11	0.212	0.330	64.2	0.219	0.495	44.2	Pass
12	0.003	0.153	N/A	0.006	0.230	N/A	Pass
13	0.126	0.210	60.2	0.141	0.315	44.7	Pass
14	0.003	0.131	N/A	0.004	0.197	N/A	Pass
15	0.093	0.150	61.8	0.097	0.225	43.0	Pass
16	0.003	0.115	N/A	0.005	0.173	N/A	Pass
17	0.070	0.132	53.1	0.075	0.198	38.1	Pass
18	0.003	0.102	N/A	0.006	0.153	N/A	Pass
19	0.060	0.118	51.0	0.071	0.178	39.7	Pass
20	0.003	0.092	N/A	0.007	0.138	N/A	Pass
21	0.054	0.107	50.4	0.066	0.161	41.3	Pass
22	0.003	0.084	N/A	0.006	0.125	N/A	Pass
23	0.059	0.098	60.3	0.062	0.147	42.1	Pass
24	0.003	0.077	N/A	0.006	0.115	N/A	Pass
25	0.045	0.090	50.4	0.058	0.135	42.7	Pass
26	0.003	0.071	N/A	0.006	0.107	N/A	Pass
27	0.019	0.083	N/A	0.024	0.125	N/A	Pass
28	0.003	0.066	N/A	0.006	0.099	N/A	Pass
29	0.021	0.078	N/A	0.026	0.116	N/A	Pass
30	0.003	0.061	N/A	0.006	0.092	N/A	Pass
31	0.017	0.073	N/A	0.024	0.109	N/A	Pass
32	0.002	0.058	N/A	0.005	0.086	N/A	Pass
33	0.020	0.068	N/A	0.027	0.102	N/A	Pass
34	0.002	0.054	N/A	0.004	0.081	N/A	Pass
35	0.016	0.064	N/A	0.020	0.096	N/A	Pass
36	0.002	0.051	N/A	0.004	0.077	N/A	Pass
37	0.024	0.061	39.7	0.027	0.091	29.6	Pass
38	0.002	0.048	N/A	0.003	0.073	N/A	Pass
39	0.010	0.058	N/A	0.012	0.087	N/A	Pass
40	0.002	0.046	N/A	0.004	0.069	N/A	Pass

RAS-B16J2KVG-E / RAS-16J2AVG-E

Phase	:	L	Measured I_{ref} (A)	:	6.375
THC/I_{ref} (%)	:	2.322	Limit (%)	:	38.4
PWHC/I_{ref} (%)	:	0.092	Limit (%)	:	0.251

Harm#	Harm(arg)	100%Limit	%of Limit	Harm(max)	150%Limit	%of Limit	Status
2	0.014	1.080	N/A	0.022	1.620	N/A	Pass
3	1.389	2.300	60.4	1.402	3.450	40.7	Pass
4	0.004	0.430	N/A	0.006	0.645	N/A	Pass
5	0.823	1.140	72.2	0.844	1.710	49.4	Pass
6	0.002	0.300	N/A	0.003	0.450	N/A	Pass
7	0.620	0.770	80.5	0.622	1.155	53.9	Pass
8	0.002	0.230	N/A	0.003	0.345	N/A	Pass
9	0.219	0.400	54.7	0.222	0.600	37.0	Pass
10	0.002	0.184	N/A	0.002	0.276	N/A	Pass
11	0.005	0.330	N/A	0.007	0.495	N/A	Pass
12	0.002	0.153	N/A	0.002	0.230	N/A	Pass
13	0.100	0.210	47.7	0.105	0.315	33.5	Pass
14	0.001	0.131	N/A	0.001	0.197	N/A	Pass
15	0.095	0.150	63.7	0.097	0.225	43.2	Pass
16	0.001	0.115	N/A	0.002	0.173	N/A	Pass
17	0.073	0.132	55.5	0.075	0.198	38.0	Pass
18	0.001	0.102	N/A	0.001	0.153	N/A	Pass
19	0.006	0.118	N/A	0.011	0.178	N/A	Pass
20	0.001	0.092	N/A	0.001	0.138	N/A	Pass
21	0.046	0.107	42.9	0.049	0.161	30.7	Pass
22	0.001	0.084	N/A	0.001	0.125	N/A	Pass
23	0.046	0.098	46.8	0.048	0.147	32.4	Pass
24	0.001	0.077	N/A	0.002	0.115	N/A	Pass
25	0.014	0.090	N/A	0.016	0.135	N/A	Pass
26	0.001	0.071	N/A	0.001	0.107	N/A	Pass
27	0.034	0.083	N/A	0.037	0.125	N/A	Pass
28	0.001	0.066	N/A	0.001	0.099	N/A	Pass
29	0.031	0.078	N/A	0.032	0.116	N/A	Pass
30	0.001	0.061	N/A	0.001	0.092	N/A	Pass
31	0.019	0.073	N/A	0.020	0.109	N/A	Pass
32	0.001	0.058	N/A	0.001	0.086	N/A	Pass
33	0.011	0.068	N/A	0.012	0.102	N/A	Pass
34	0.001	0.054	N/A	0.001	0.081	N/A	Pass
35	0.008	0.064	N/A	0.009	0.096	N/A	Pass
36	0.001	0.051	N/A	0.001	0.077	N/A	Pass
37	0.020	0.061	N/A	0.022	0.091	N/A	Pass
38	0.001	0.048	N/A	0.001	0.073	N/A	Pass
39	0.029	0.058	N/A	0.030	0.087	N/A	Pass
40	0.001	0.046	N/A	0.001	0.069	N/A	Pass

RAS-24J2KVG-E / RAS-24J2AVG-E

Phase	:	L	Measured I_{ref} (A)	:	8.638
THC/I_{ref} (%)	:	2.273	Limit (%)	:	27.2
PWHC/I_{ref} (%)	:	0.138	Limit (%)	:	0.251

Harm#	Harm(arg)	100%Limit	%of Limit	Harm(max)	150%Limit	%of Limit	Status
2	0.047	1.080	N/A	0.054	1.620	N/A	Pass
3	1.404	2.300	61.0	1.433	3.450	41.5	Pass
4	0.023	0.430	N/A	0.027	0.645	N/A	Pass
5	0.513	1.140	45.0	0.521	1.710	30.5	Pass
6	0.008	0.300	N/A	0.010	0.450	N/A	Pass
7	0.715	0.770	92.8	0.717	1.155	62.1	Pass
8	0.003	0.230	N/A	0.004	0.345	N/A	Pass
9	0.217	0.400	54.2	0.221	0.600	36.9	Pass
10	0.004	0.184	N/A	0.006	0.276	N/A	Pass
11	0.226	0.330	68.4	0.233	0.495	47.0	Pass
12	0.007	0.153	N/A	0.009	0.230	N/A	Pass
13	0.047	0.210	N/A	0.051	0.315	N/A	Pass
14	0.005	0.131	N/A	0.006	0.197	N/A	Pass
15	0.101	0.150	67.5	0.103	0.225	45.8	Pass
16	0.002	0.115	N/A	0.002	0.173	N/A	Pass
17	0.114	0.132	86.0	0.114	0.198	57.7	Pass
18	0.004	0.102	N/A	0.005	0.153	N/A	Pass
19	0.065	0.118	54.9	0.071	0.178	40.1	Pass
20	0.006	0.092	N/A	0.007	0.138	N/A	Pass
21	0.038	0.107	N/A	0.041	0.161	N/A	Pass
22	0.004	0.084	N/A	0.005	0.125	N/A	Pass
23	0.078	0.098	79.9	0.079	0.147	54.1	Pass
24	0.001	0.077	N/A	0.002	0.115	N/A	Pass
25	0.039	0.090	N/A	0.041	0.135	N/A	Pass
26	0.003	0.071	N/A	0.003	0.107	N/A	Pass
27	0.032	0.083	N/A	0.035	0.125	N/A	Pass
28	0.004	0.066	N/A	0.005	0.099	N/A	Pass
29	0.021	0.078	N/A	0.023	0.116	N/A	Pass
30	0.003	0.061	N/A	0.004	0.092	N/A	Pass
31	0.038	0.073	N/A	0.039	0.109	N/A	Pass
32	0.002	0.058	N/A	0.002	0.086	N/A	Pass
33	0.046	0.068	N/A	0.047	0.102	N/A	Pass
34	0.003	0.054	N/A	0.004	0.081	N/A	Pass
35	0.030	0.064	N/A	0.034	0.096	N/A	Pass
36	0.005	0.051	N/A	0.006	0.077	N/A	Pass
37	0.034	0.061	N/A	0.035	0.091	N/A	Pass
38	0.005	0.048	N/A	0.006	0.073	N/A	Pass
39	0.055	0.058	95.3	0.056	0.087	64.2	Pass
40	0.004	0.046	N/A	0.005	0.069	N/A	Pass

Voltage Fluctuation and Flicker
EN 61000-3-3: 2013

8. Voltage Fluctuation and Flicker

Test conclusion: ☒ Pass ☐ Fail
Operating Condition: EUT is warmed up at least 15 minutes before measurement. Lowest temperature setting, maximum fan speed.

8.1 Test set-up drawing

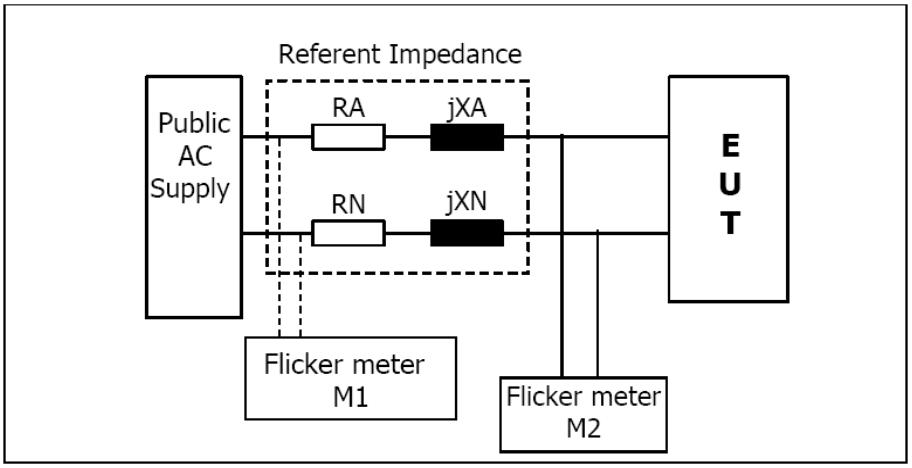

Figure 7: Drawing of Voltage Fluctuation and Flicker Measurement

8.2 Test Result

RAS-B13J2KVG-E / RAS-13J2AVG-E

Measurement Description	Measurement Result	Limit
Pst	0.203	1.000
Plt	0.149	0.650
dc[%]	0.00	3.30
dmax[%]	2.07	6.00
T-max [ms]	0.00	500.0

RAS-B16J2KVG-E / RAS-16J2AVG-E

Measurement Description	Measurement Result	Limit
Pst	0.178	1.000
Plt	0.157	0.650
dc[%]	0.00	3.30
dmax[%]	0.00	4.00
T-max [ms]	0.00	500.0

RAS-24J2KVG-E / RAS-24J2AVG-E

Measurement Description	Measurement Result	Limit
Pst	0.166	1.000
Plt	0.133	0.650
dc[%]	0.00	3.30
dmax[%]	-0.23	4.00
T-max [ms]	0.133	500.0

Immunity Test
EN 55014-2: 2015

Appliance Classification: Category II

Appliance shall fulfill the following immunity requirements

	Test Description	Performance criteria required
☒	ESD Immunity	B
☐	RF Electromagnetic Field	A
☒	EFT/Burst Immunity	B
☒	Surge Immunity	B
☒	Injected current up to 230MHz	A
☐	Injected current up to 80MHz	A
☒	Voltage dips	C

Performance criteria of test specification

Function	Criteria	During Test	After Test
Data storage	A	No loss or change of storage data	No loss or change of storage data
	B	loss or change of storage data can automatic recovered without operator resetting	No loss or change of storage data
	C	loss or change of storage data can recovered by operator resetting	No loss or change of storage data
Display	A	The display can show latest status	The display can show latest status
	B	The display cannot show latest status but can automatic recovered without operator resetting	The display can show latest status
	C	The display cannot show latest status recovered can be obtained by operator resetting	The display can show latest status

Test Verdict

Criterion A: Normal Performance within limits specified by the manufacturer, requestor or purchaser.
Criterion B: Continue to operate as intended after the test. Not degradation of performance or loss of function. During the test degradation of performance is allowed, however no change of actual operating state or stored date.
Criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

9. Electrostatic Discharge

Test conclusion: ☒ Pass ☐ Fail

Monitoring Condition: EUT and its display unit shall function appropriately as normal operation.

Test Requirement: B

9.1 Test set-up drawing

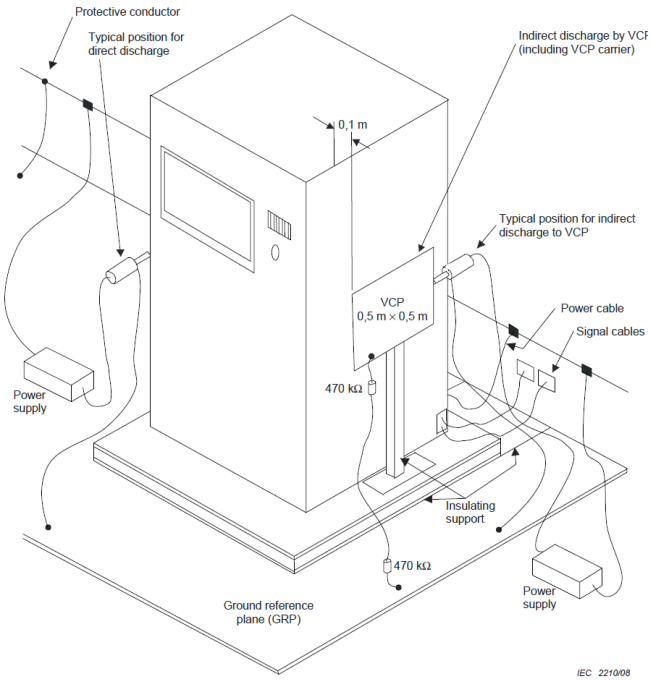

Figure 8: Drawing of ESD test set-up

9.2 Test Level

Port	Test Specification	Test set-up
Enclosure	±8kV Air Discharge	IEC 61000-4-2
	±4kV Contact Discharge	

9.3 Test Result

Test Environment

Temperature: 25.0°C Humidity 55.0%RH

RAS-B13J2KVG-E / RAS-13J2AVG-E

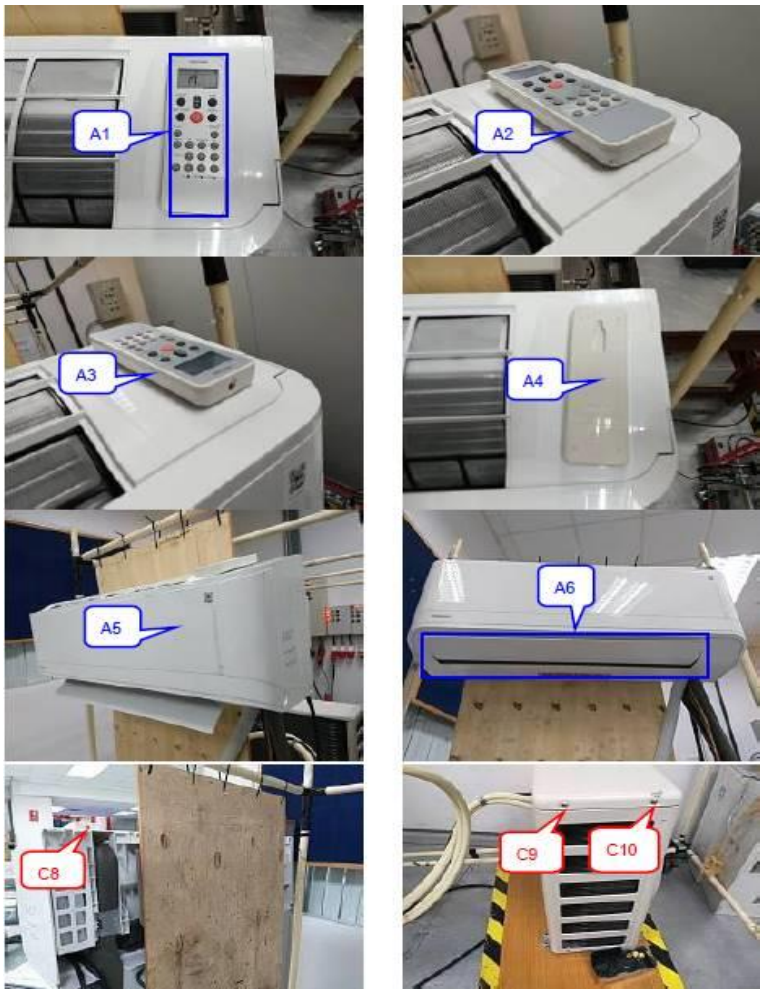

Figure 9: ESD test point model: RAS-B13J2KVG-E / RAS-13J2AVG-E

Test point	Test voltage (kV) /No. of Discharge	Test type	Observation	Test Verdict
A1-A6	±8/10	Air	Normal	B
C8-C10	±4/10	Contact	Normal	B
Indirect	±4/10	Contact	Normal	B

RAS-B16J2KVG-E / RAS-16J2AVG-E

Figure 10: ESD test point model: RAS-B16J2KVG-E / RAS-16J2AVG-E

Test point	Test voltage (kV) /No. of Discharge	Test type	Observation	Test Verdict
A1-A5	±8/10	Air	Normal	B
C10-C15	±4/10	Contact	Normal	B
Indirect	±4/10	Contact	Normal	B

RAS-24J2KVG-E / RAS-24J2AVG-E

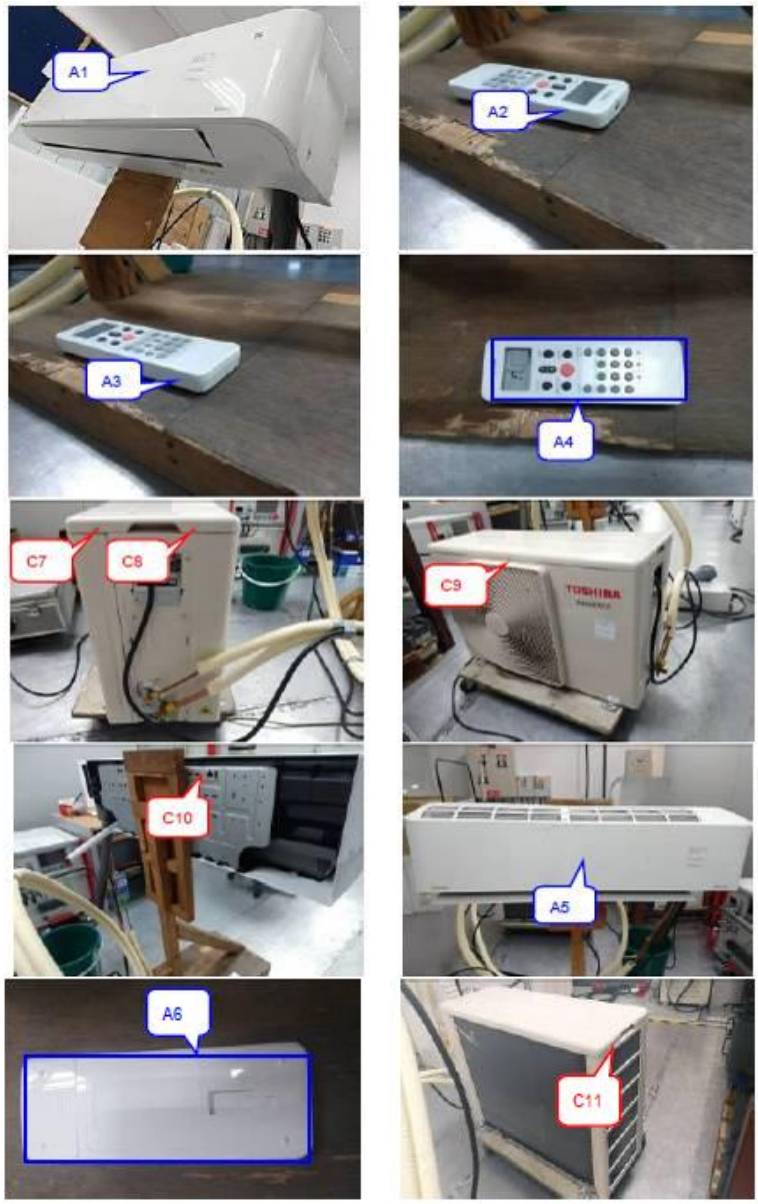

Figure 11: ESD test point model: RAS-24J2KVG-E / RAS-24J2AVG-E

Test point	Test voltage (kV) /No. of Discharge	Test type	Observation	Test Verdict
A1-A6	±8/10	Air	Normal	B
C7-C11	±4/10	Contact	Normal	B
Indirect	±4/10	Contact	Normal	B

10. RF Electromagnetic Field

Test conclusion: ☐ Pass ☐ Fail
Monitoring Condition: N/A
Test Requirement: -

10.1 Test set-up drawing

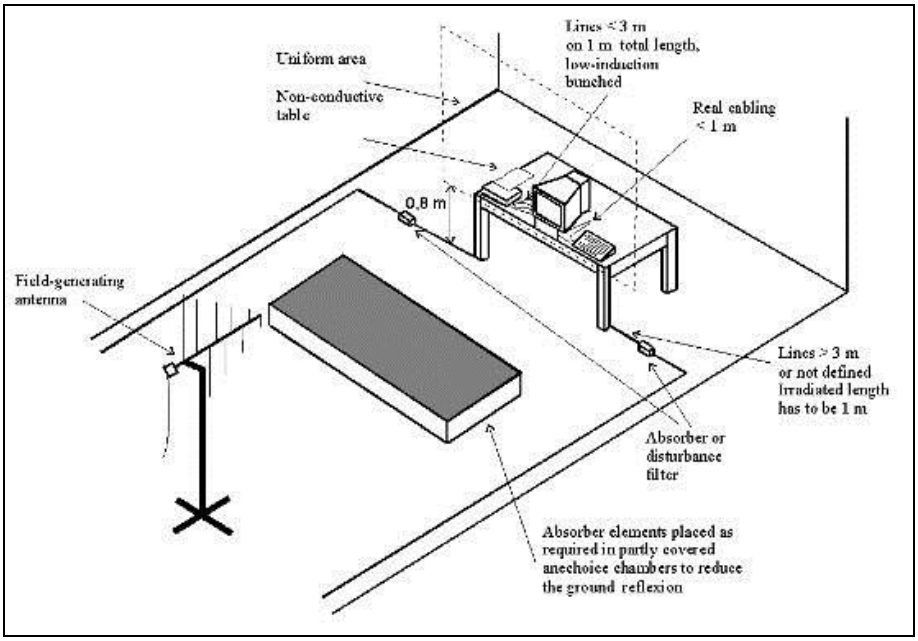

Figure 13: Drawing of RF Electromagnetic Field test set-up

10.2 Test Level

Port	Test Specification			Test set-up
Enclosure	80MHz - 1000 MHz	3V/m(r.m.s.) (unmodulated)	1kHz 80%AM	IEC 61000-4-3

11.3 Test Result

Test Environment

Temperature: -°C Humidity -%RH

N/A

11. Fast Transients

Test result:	☒ Pass ☐ Fail
Monitoring Condition	EUT and its display unit shall function appropriately as normal operation.
Test Requirement:	B

11.1 Test set-up drawing

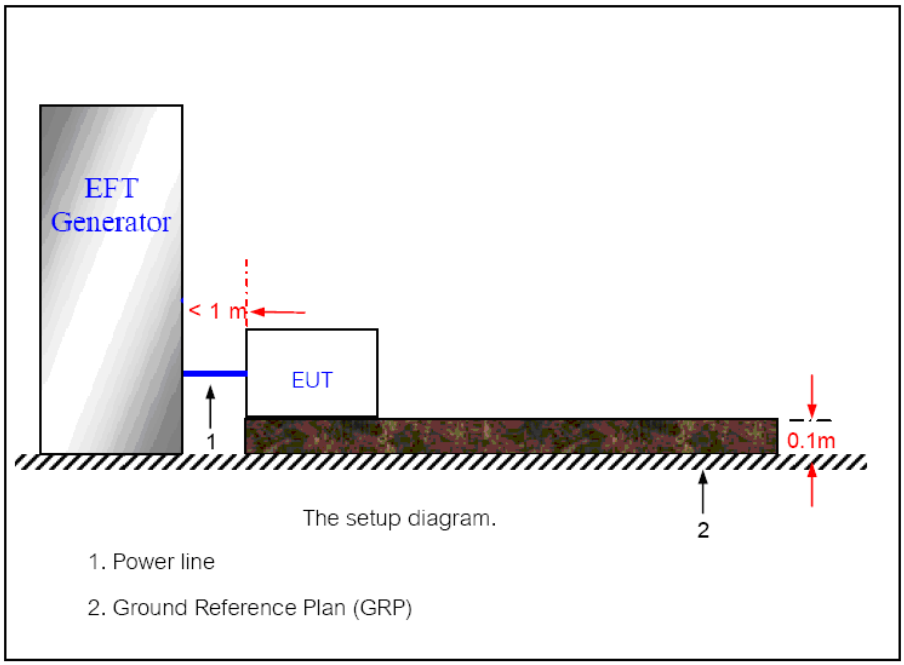

Figure 14: Drawing of Fast Transients test set-up

11.2 Test Level

Port	Test Specification		Test set-up
☐ Signal lines & control lines	0.5kV(peak)	5/50 ns (t_r/T_d) 5kHz repetition frequency	IEC 61000-4-4
☐ Input & output d.c. power ports			
☒ Input & output a.c. power ports	1kV(peak)		

11.3 Test Result

Test Environment

Temperature: 25.0°C Humidity 55.0%RH

RAS-B13J2KVG-E / RAS-13J2AVG-E

Coupling path	Test Specification	Observation	Test Verdict
L to G	1kV(peak)	Normal	B
N to G	1kV(peak)	Normal	B
PE to G	1kV(peak)	Normal	B
L, N, PE to G	1kV(peak)	Normal	B

RAS-B16J2KVG-E / RAS-16J2AVG-E

Coupling path	Test Specification	Observation	Test Verdict
L to G	1kV(peak)	Normal	B
N to G	1kV(peak)	Normal	B
PE to G	1kV(peak)	Normal	B
L, N, PE to G	1kV(peak)	Normal	B

RAS-24J2KVG-E / RAS-24J2AVG-E

Coupling path	Test Specification	Observation	Test Verdict
L to G	1kV(peak)	Normal	B
N to G	1kV(peak)	Normal	B
PE to G	1kV(peak)	Normal	B
L, N, PE to G	1kV(peak)	Normal	B

12. Surges

Test result	☒ Pass ☐ Fail
Monitoring Condition	EUT and its display unit shall function appropriately as normal operation.
Test Requirement:	B

12.1 Test set-up drawing

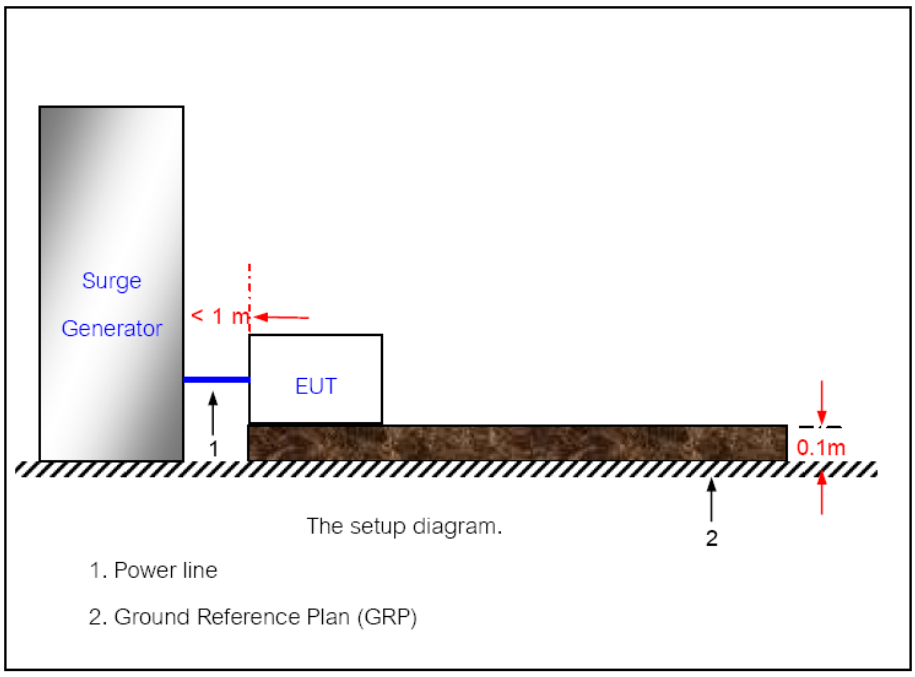

Figure 15: Drawing of Surges test set-up

12.2 Test Level

Port	Test Specification		Test set-up
Input a.c. power ports	1.2/50 (8/20) T_r/T_d μs		IEC 61000-4-5
	Phase-Phase	± 1kV	
	Phase-Neutral	± 1kV	
	Phase-Earth	± 2kV	
	Neutral-Earth	± 2kV	

12.3 Test Result

Test Environment

Temperature: 25.0°C Humidity 55.0%RH

RAS-B13J2KVG-E / RAS-13J2AVG-E

Coupling path	Test Level	No. of surge/pole	Phase Angle	Observation	Test Verdict
L-N	± 1kV	5	0°,90°, 180°, 270°	Normal	B
L-PE	± 2kV	5		Normal	B
N-PE	± 2kV	5		Normal	B

RAS-B16J2KVG-E / RAS-16J2AVG-E

Coupling path	Test Level	No. of surge/pole	Phase Angle	Observation	Test Verdict
L-N	± 1kV	5	0°,90°, 180°, 270°	Normal	B
L-PE	± 2kV	5		Normal	B
N-PE	± 2kV	5		Normal	B

RAS-24J2KVG-E / RAS-24J2AVG-E

Coupling path	Test Level	No. of surge/pole	Phase Angle	Observation	Test Verdict
L-N	± 1kV	5	0°,90°, 180°, 270°	Normal	B
L-PE	± 2kV	5		Normal	B
N-PE	± 2kV	5		Normal	B

13. Injected Current up to 230MHz

Test conclusion: ☒ Pass ☐ Fail

Monitoring Condition: EUT and its display unit shall function appropriately as normal operation.

Test Requirement: A

13.1 Test set-up drawing

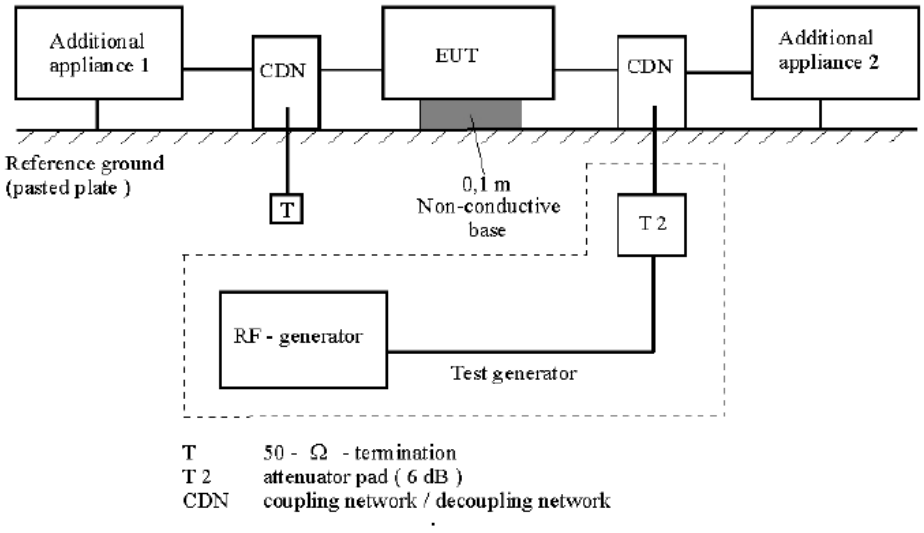

Figure 13: Drawing of Injected Current test set-up

13.2 Test Level

Environmental Phenomenon: RF Current common mode 1kHz, 80%AM

Port	Test Specification	Test set-up
☐Signal lines & control lines	0.15MHz - 230MHz 1V(r.m.s)(unmodulated) 150 Ω source impedance	IEC 61000-4-6
☐ Input & output d.c. power ports	0.15MHz - 230MHz 1V(r.m.s)(unmodulated) 150 Ω source impedance	
☒ Input & output a.c. power ports	0.15MHz - 230MHz 3V(r.m.s)(unmodulated) 150 Ω source impedance	

13.3 Test Result

Test Environment

Temperature: 25.0°C Humidity 55.0%RH

RAS-B13J2KVG-E / RAS-13J2AVG-E

Coupling path	Test Level	Frequency	Test specification	Observation	Test Verdict
Input a.c. power port	3V	0.15 - 230MHz	1kHz, 80% AM	Normal	A

RAS-B16J2KVG-E / RAS-16J2AVG-E

Coupling path	Test Level	Frequency	Test specification	Observation	Test Verdict
Input a.c. power port	3V	0.15 - 230MHz	1kHz, 80% AM	Normal	A

RAS-24J2KVG-E / RAS-24J2AVG-E

Coupling path	Test Level	Frequency	Test specification	Observation	Test Verdict
Input a.c. power port	3V	0.15 - 230MHz	1kHz, 80% AM	Normal	A

14. Injected Current up to 80MHz

Test conclusion: ☐ Pass ☐ Fail

Monitoring Condition: N/A

Test Requirement: -

14.1 Test set-up drawing

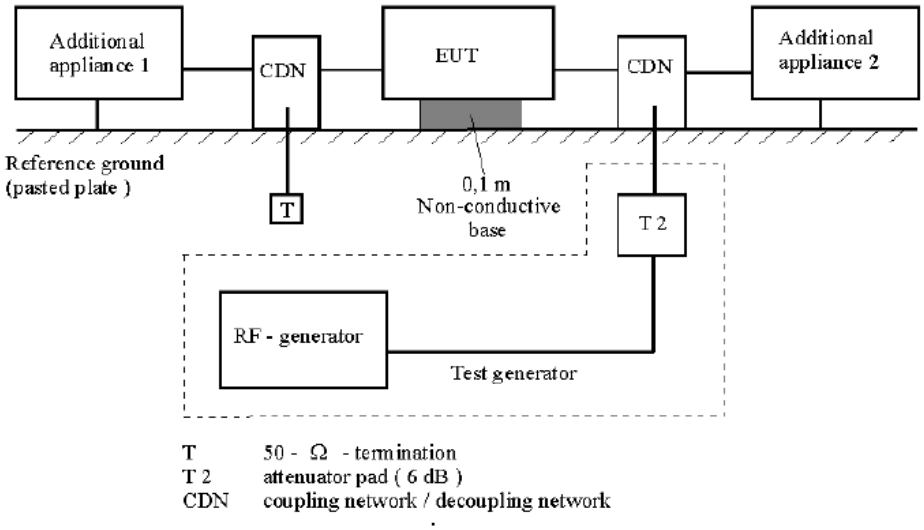

Figure 16: Drawing of Injected Current test set-up

14.2 Test Level

Environmental Phenomenon: RF Current common mode 1kHz, 80%AM

Port	Test Specification	Test set-up
☐Signal lines & Control lines	0.15MHz - 80MHz 1V(r.m.s)(unmodulated) 150 Ω source impedance	IEC 61000-4-6
☐ Input & Output d.c. power ports	0.15MHz - 80MHz 1V(r.m.s)(unmodulated) 150 Ω source impedance	
☒ Input & Output a.c. power ports	0.15MHz - 80MHz 3V(r.m.s)(unmodulated) 150 Ω source impedance	

14.3 Test Result

Test Environment

Temperature: -°C Humidity -%RH

N/A

15. Voltage dips

Test result ☒ Pass ☐ Fail

Monitoring Condition: EUT and its display unit shall function appropriately as normal operation.

Test Requirement: C

15.1 Test set-up drawing

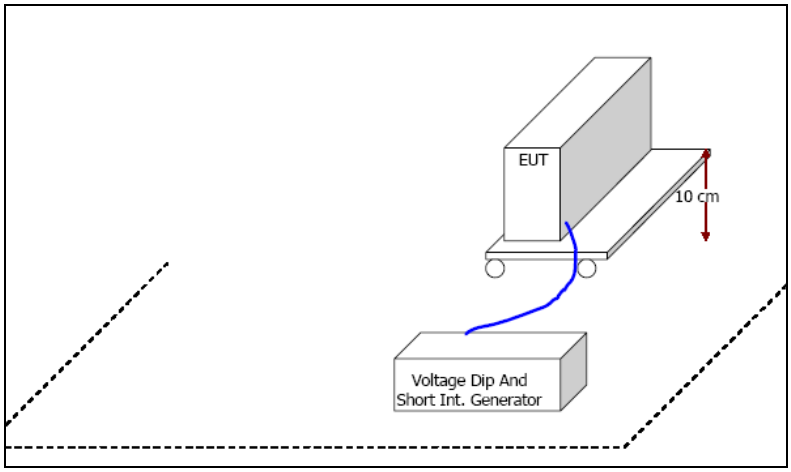

Figure 17: Drawing of Voltage Dips test set-up

15.2 Test Level

Port	Phenomena		Test level in % V_T	Duration (in period of the rated frequency) 50Hz / 60Hz	Test set-up
Input a.c. power ports	Voltage dips in %V_T	100	0	0.5 / 0.5	IEC 61000-4-11 Voltage change shall occur at zero crossing
		60	40	10 / 12	
		30	70	25 / 30	
V_T is the rated voltage of the EUT					

15.3 Test Result

Test Environment

Temperature: 25.0°C Humidity 55.0%RH

RAS-B13J2KVG-E / RAS-13J2AVG-E

Port	Input voltage	Reduction (%)	Duration (ms)	Observation	Test Verdict
Input a.c. power port	230V 50Hz	100	10	Normal	C
		60	200	Normal	C
		30	500	Normal	C

RAS-B16J2KVG-E / RAS-16J2AVG-E

Port	Input voltage	Reduction (%)	Duration (ms)	Observation	Test Verdict
Input a.c. power port	230V 50Hz	100	10	Normal	C
		60	200	Normal	C
		30	500	Normal	C

RAS-24J2KVG-E / RAS-24J2AVG-E

Port	Input voltage	Reduction (%)	Duration (ms)	Observation	Test Verdict
Input a.c. power port	230V 50Hz	100	10	Normal	C
		60	200	Normal	C
		30	500	Normal	C

APPENDIX I: EMISSION SPECTRUM

The following pages have shown the emission spectrum resulting from;

1. Main Terminal Continuous Disturbance Voltage measurement
2. Load Terminal Continuous Disturbance Voltage measurement
3. Continuous Power Disturbance measurement

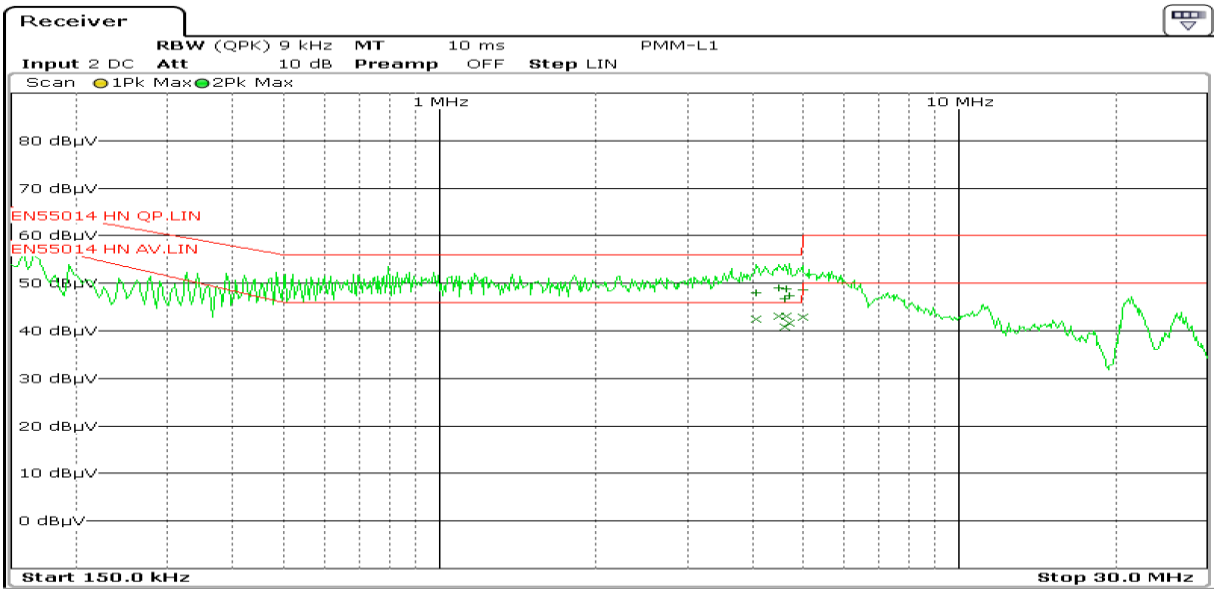

Figure AI.1: Main Terminal Disturbance Voltage, Line to Ground;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

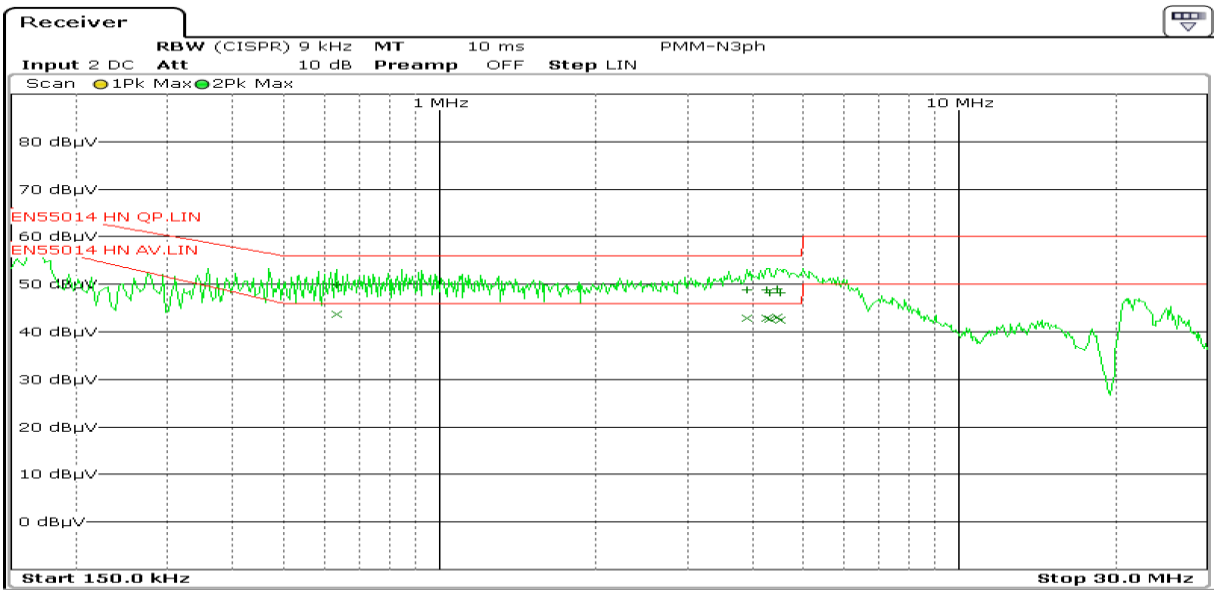

Figure AI.2: Main Terminal Disturbance Voltage, Neutral to Ground;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

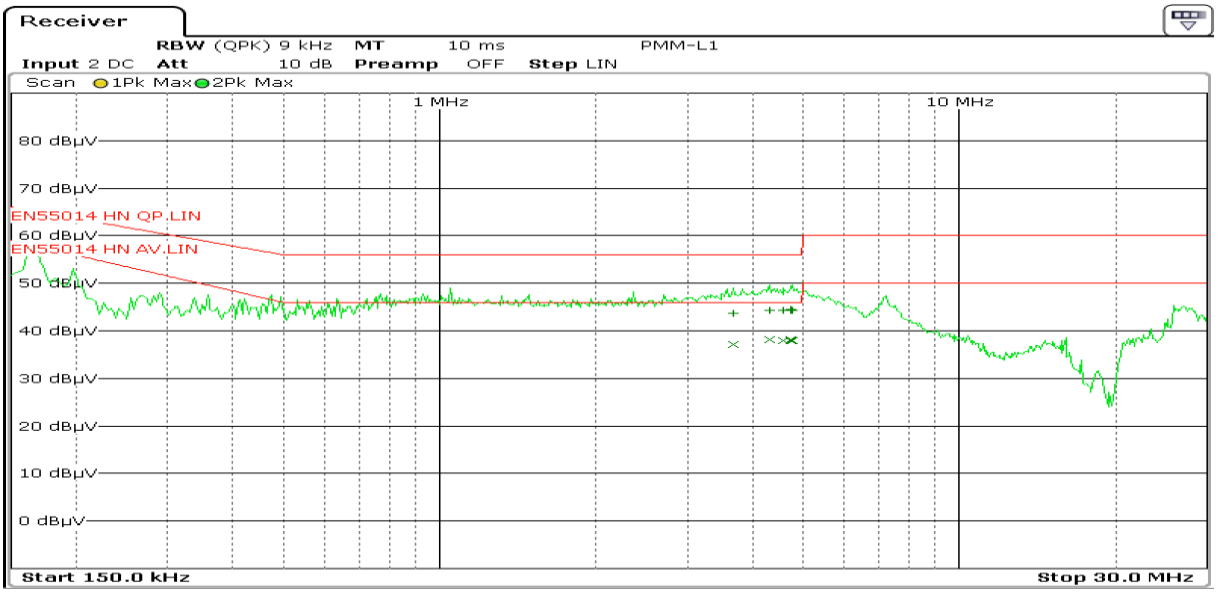

Figure Al.3: Main Terminal Disturbance Voltage, Line to Ground;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

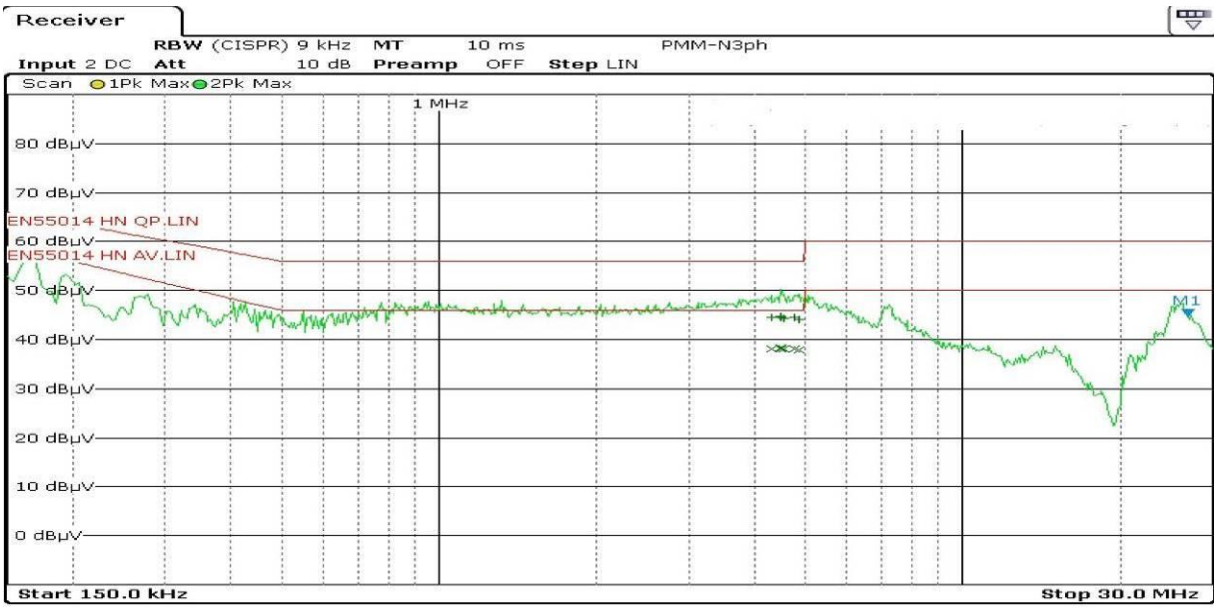

Figure Al.4: Main Terminal Disturbance Voltage, Neutral to Ground;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

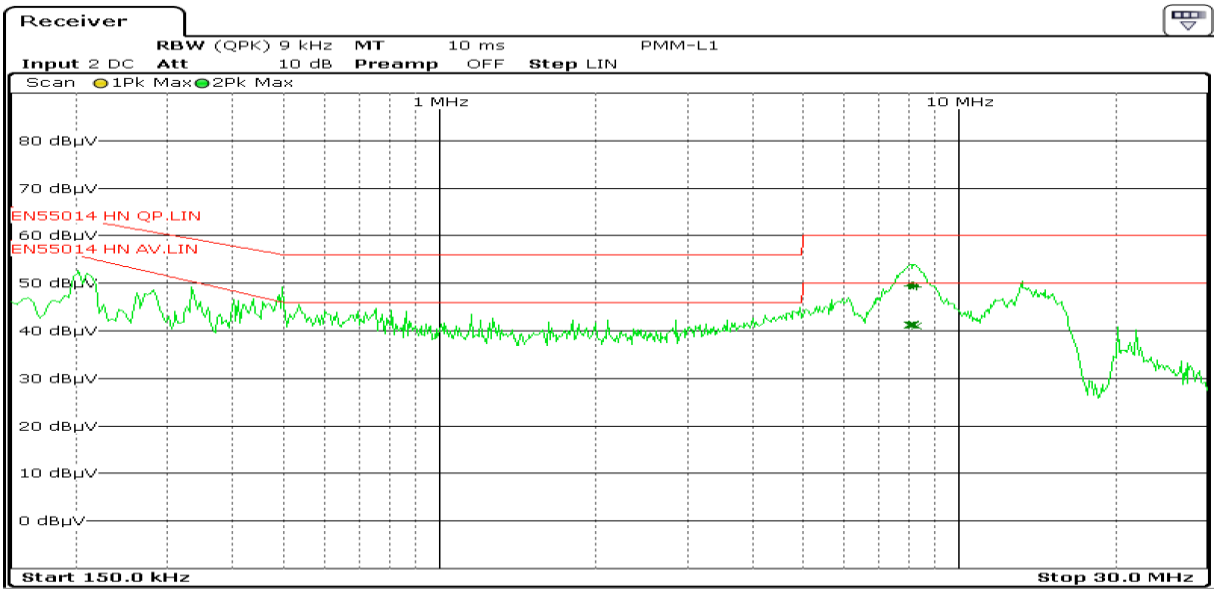

Figure Al.5: Main Terminal Disturbance Voltage, Line to Ground;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

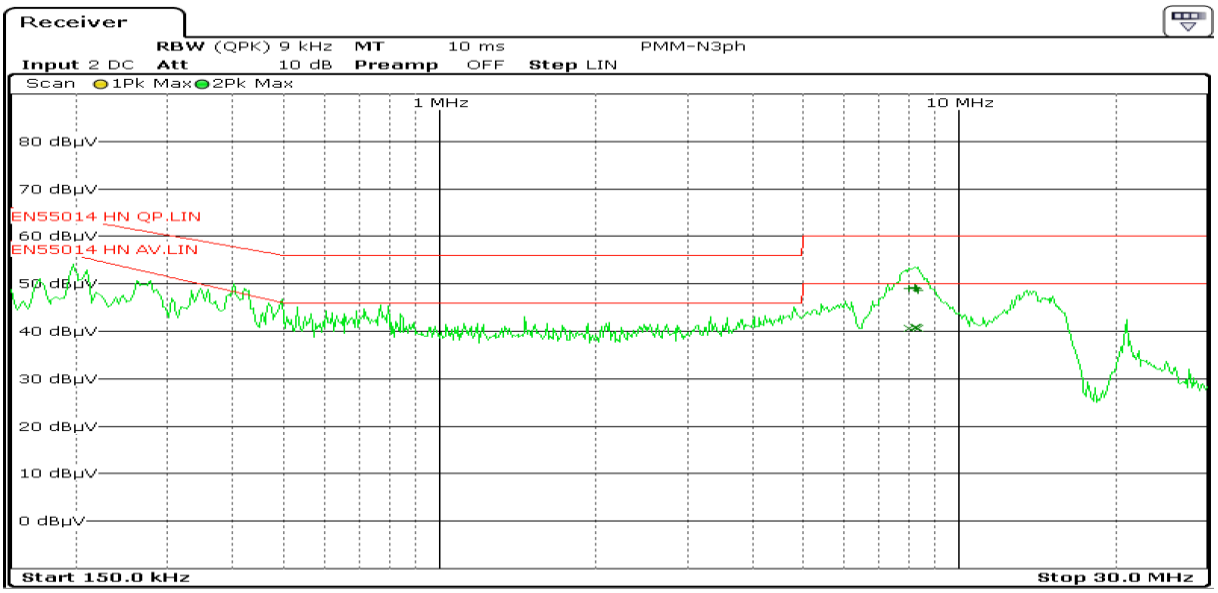

Figure Al.6: Main Terminal Disturbance Voltage, Neutral to Ground;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

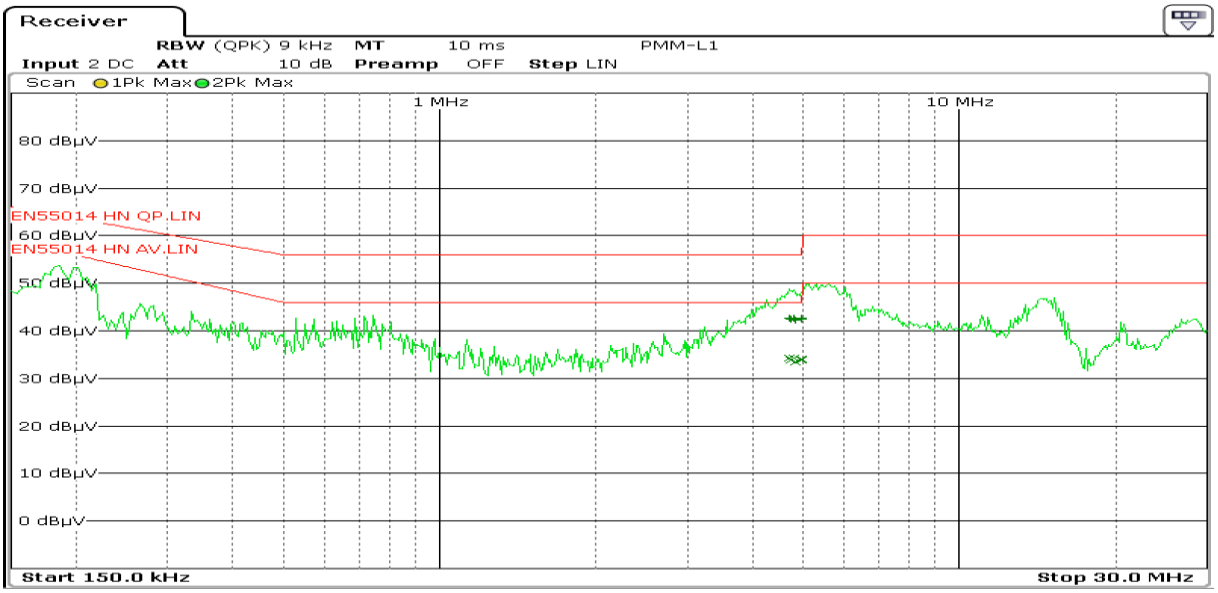

Figure Al.7: Main Terminal Disturbance Voltage, Line to Ground
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

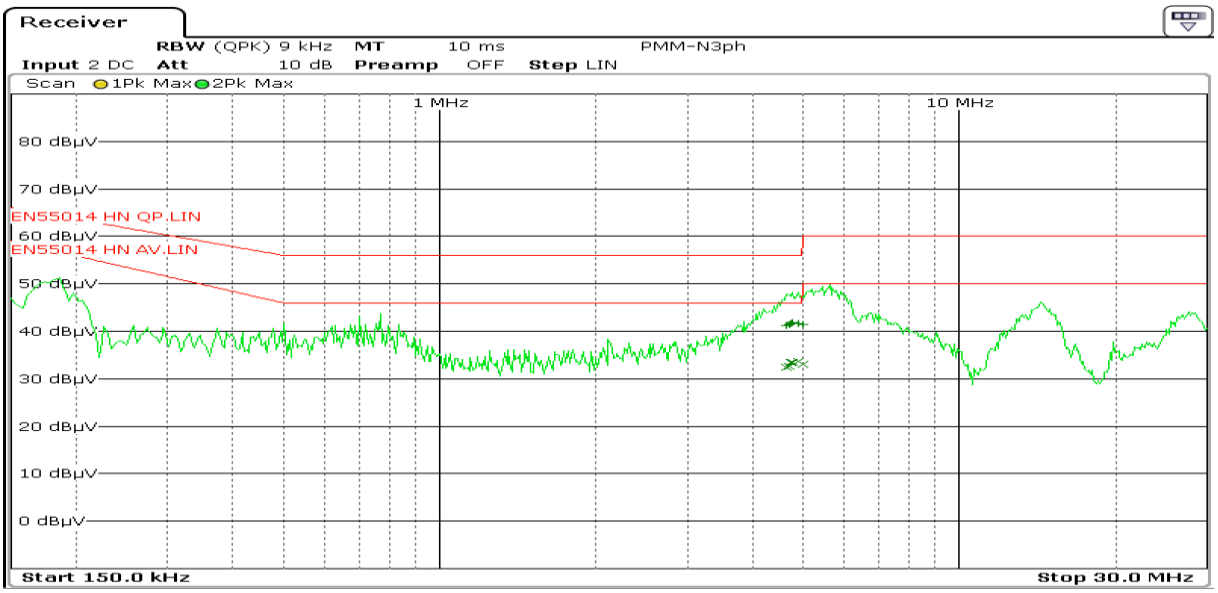

Figure Al.8: Main Terminal Disturbance Voltage, Neutral to Ground;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

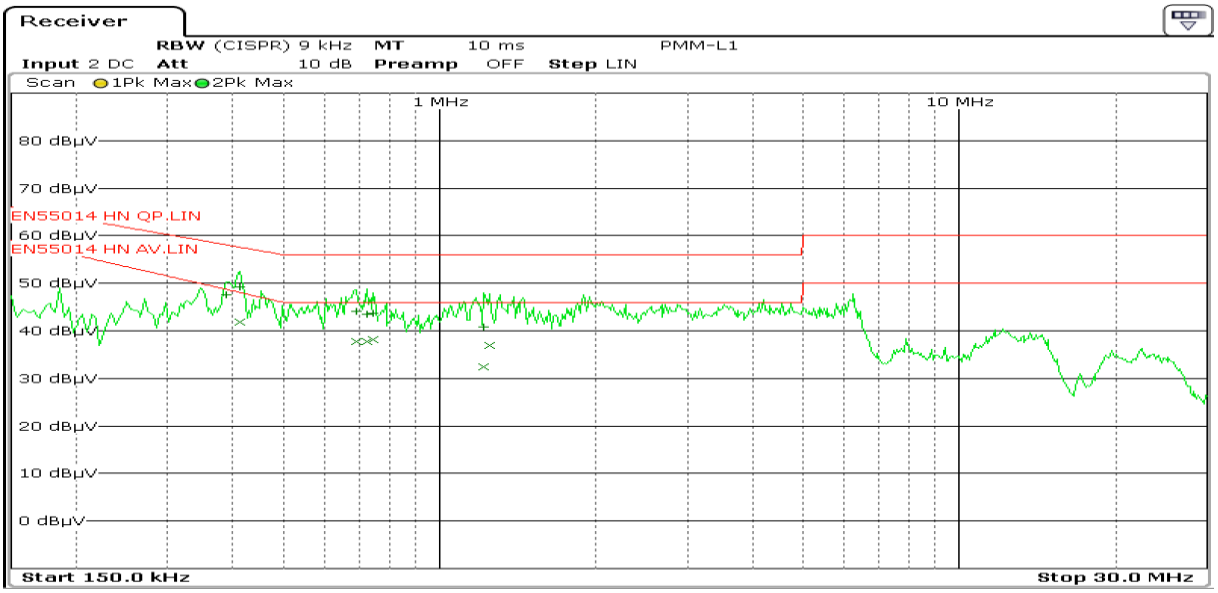

Figure Al.9 Main Terminal Disturbance Voltage, Line to Ground
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

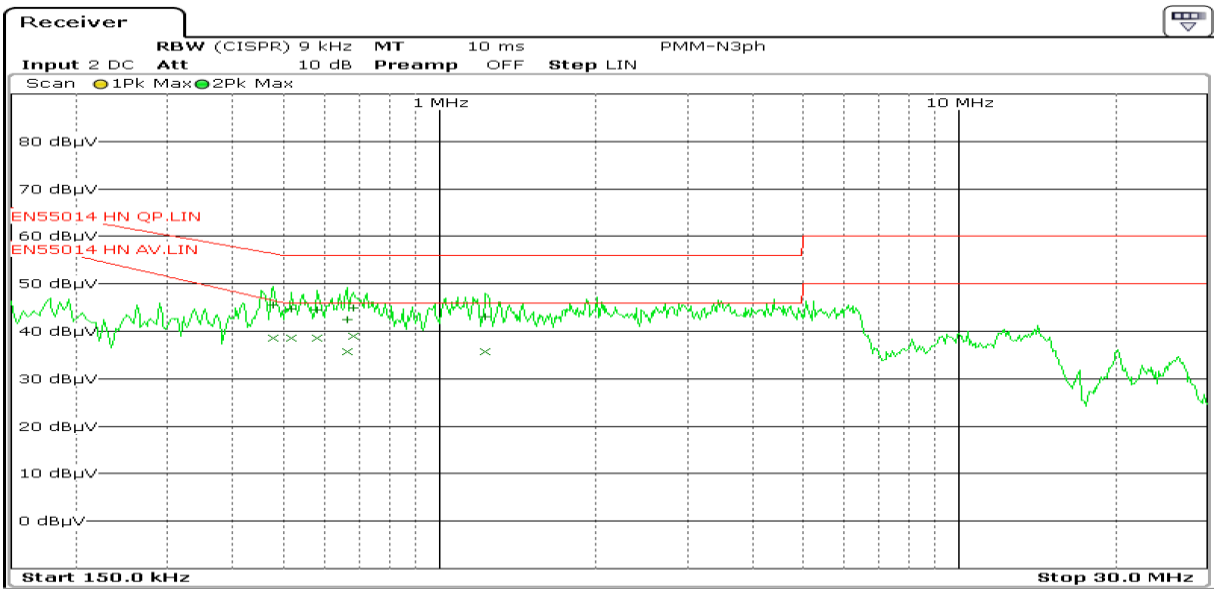

Figure Al.10: Main Terminal Disturbance Voltage, Neutral to Ground;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

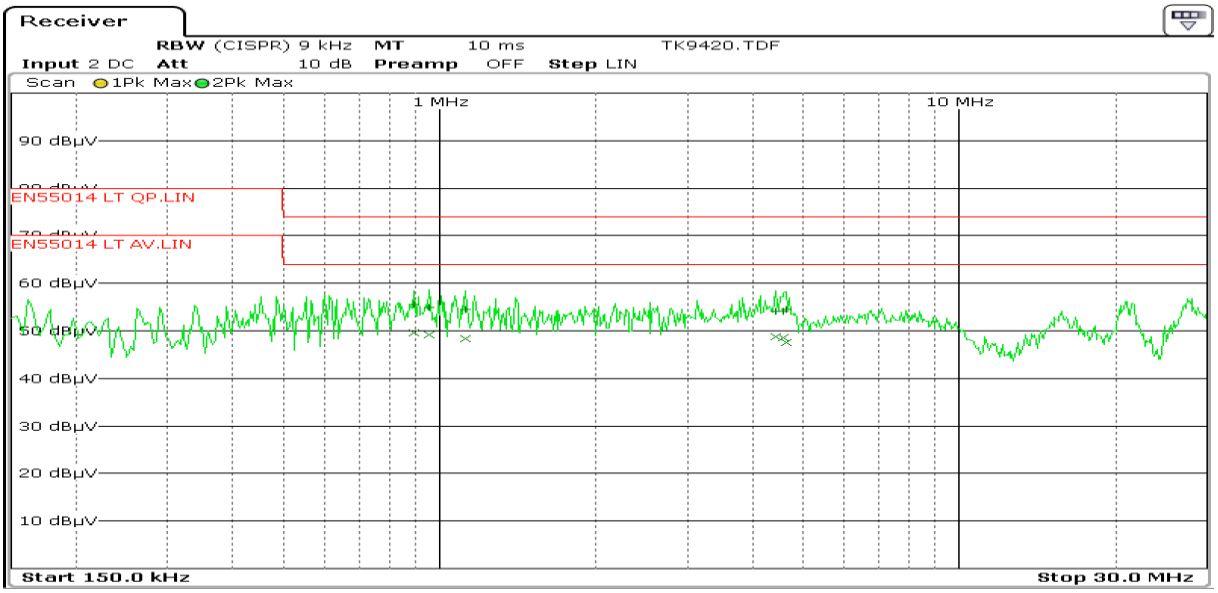

Figure Al.11: Load Terminal Disturbance Voltage, Terminal 1 to Ground;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

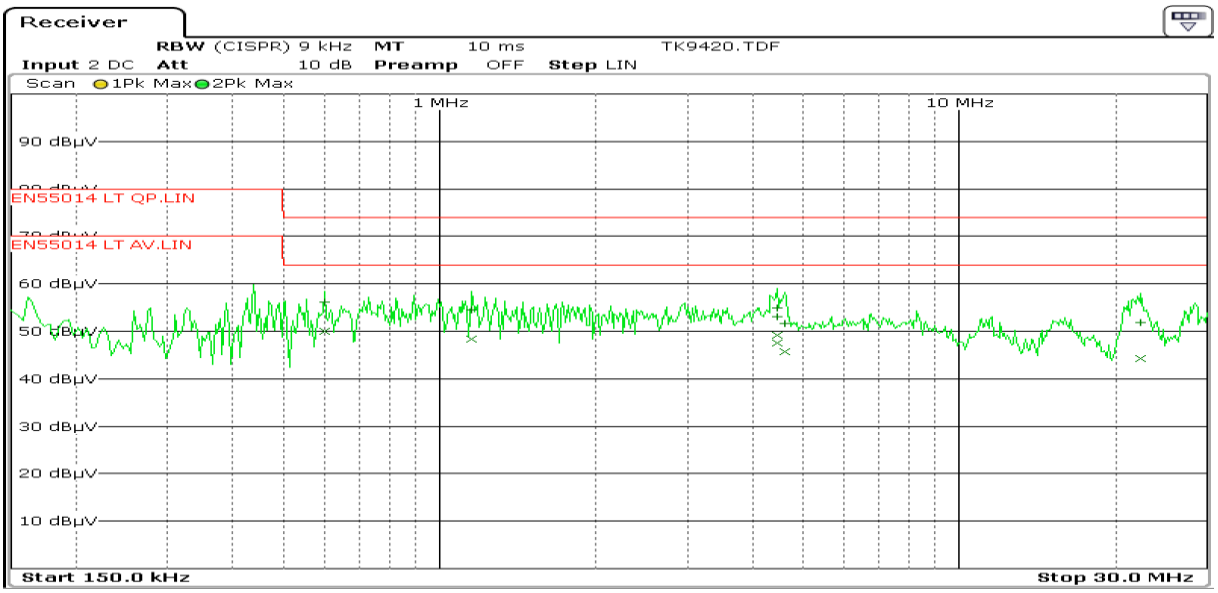

Figure Al.12: Load Terminal Disturbance Voltage, Terminal 2 to Ground;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

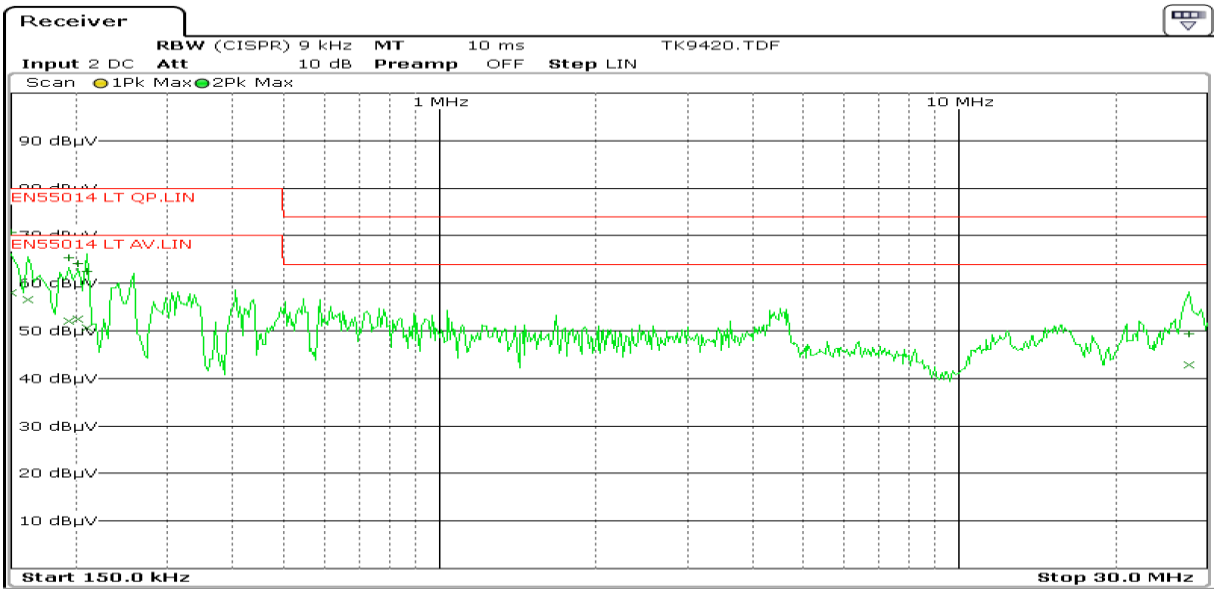

Figure Al.13: Load Terminal Disturbance Voltage, Terminal 3 to Ground;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

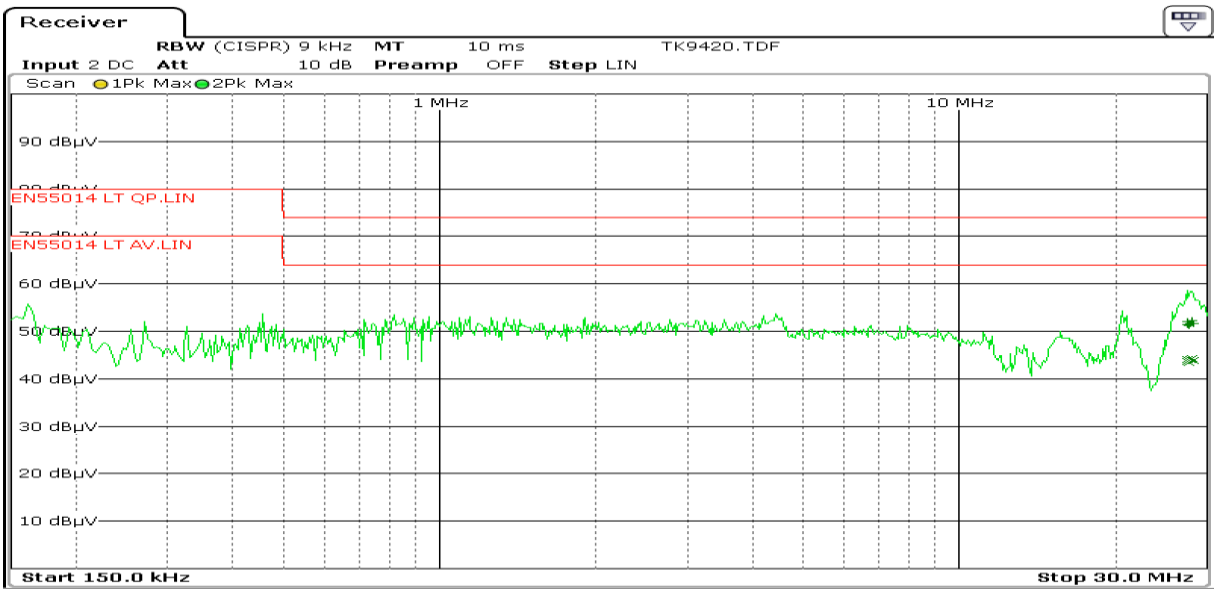

Figure Al.14: Load Terminal Disturbance Voltage, Terminal 1 to Ground;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

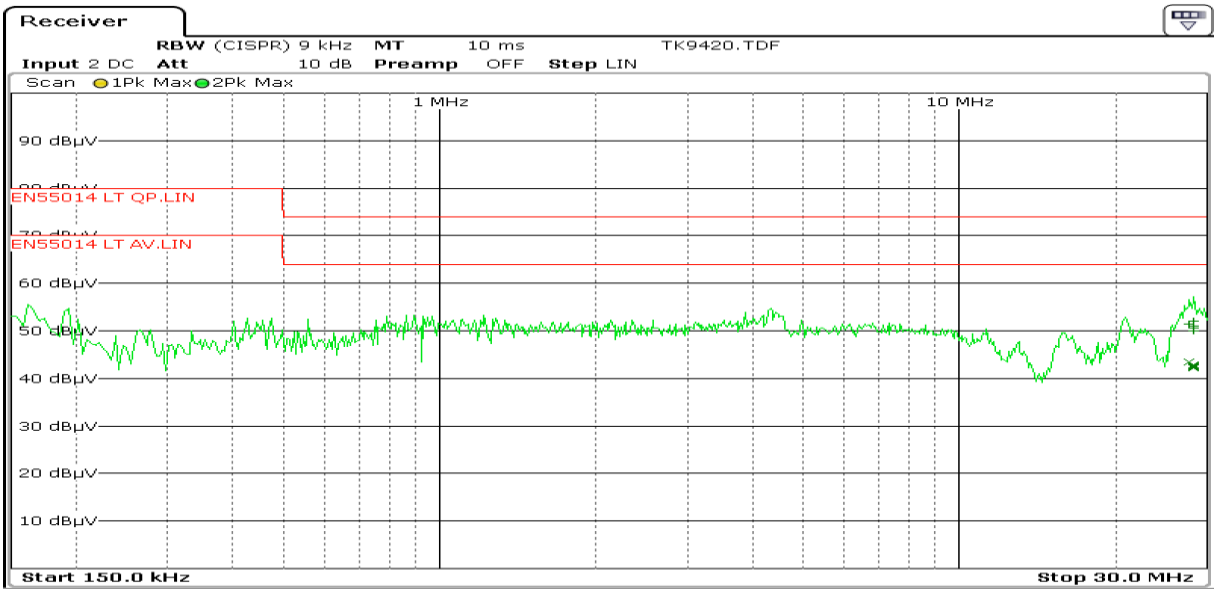

Figure Al.15: Load Terminal Disturbance Voltage, Terminal 2 to Ground;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

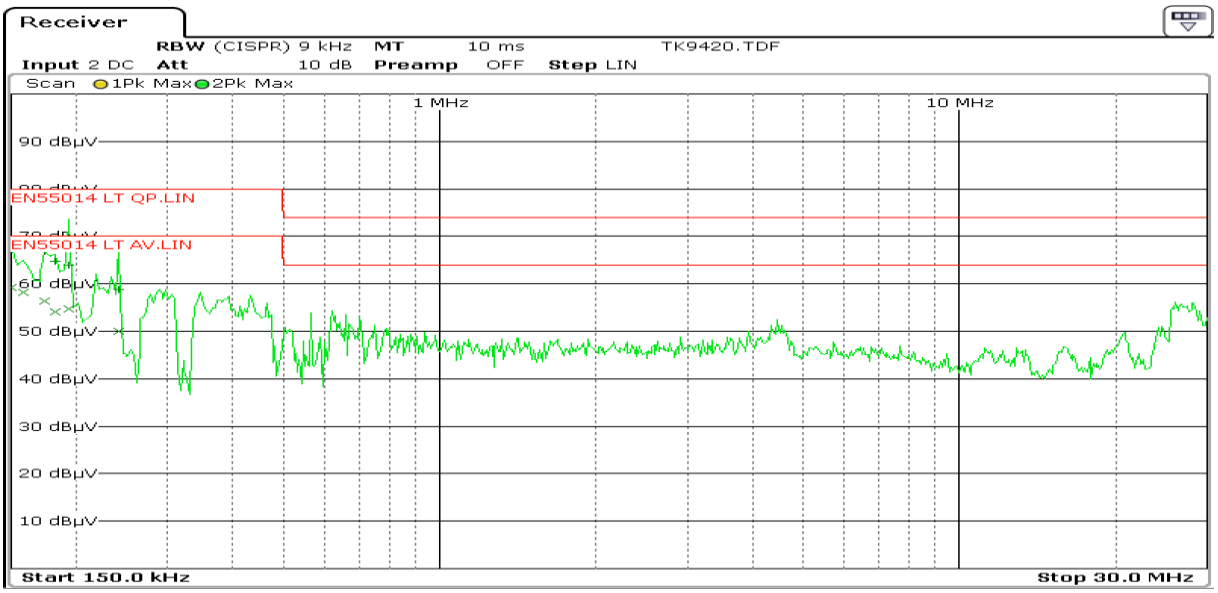

Figure Al.16: Load Terminal Disturbance Voltage, Terminal 3 to Ground;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

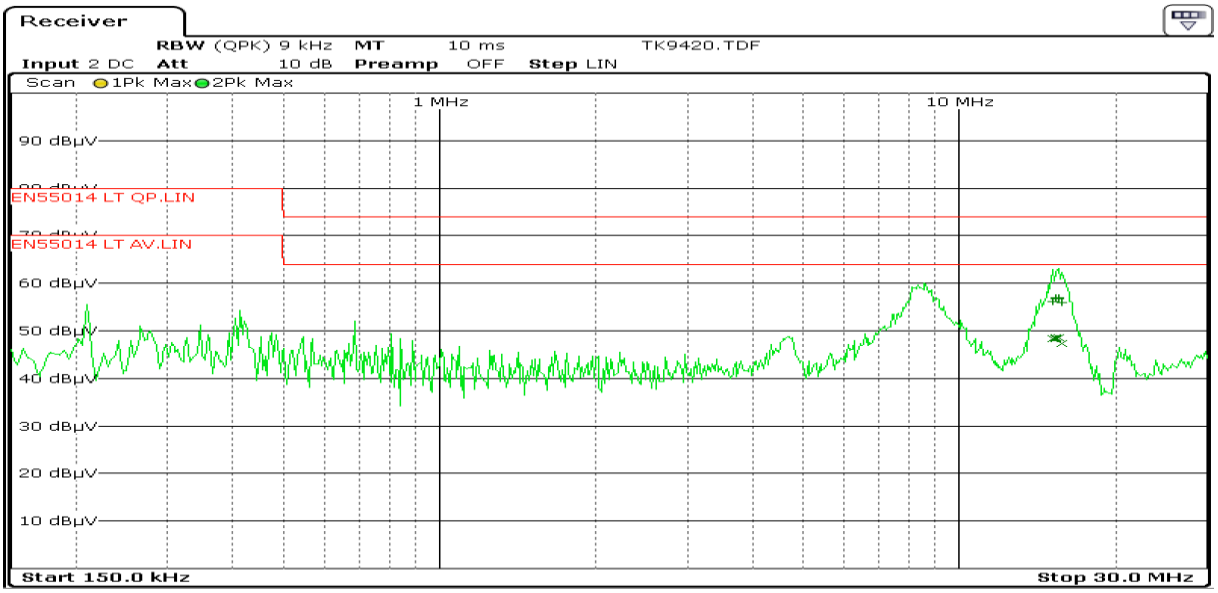

Figure Al.17: Load Terminal Disturbance Voltage, Terminal 1 to Ground;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

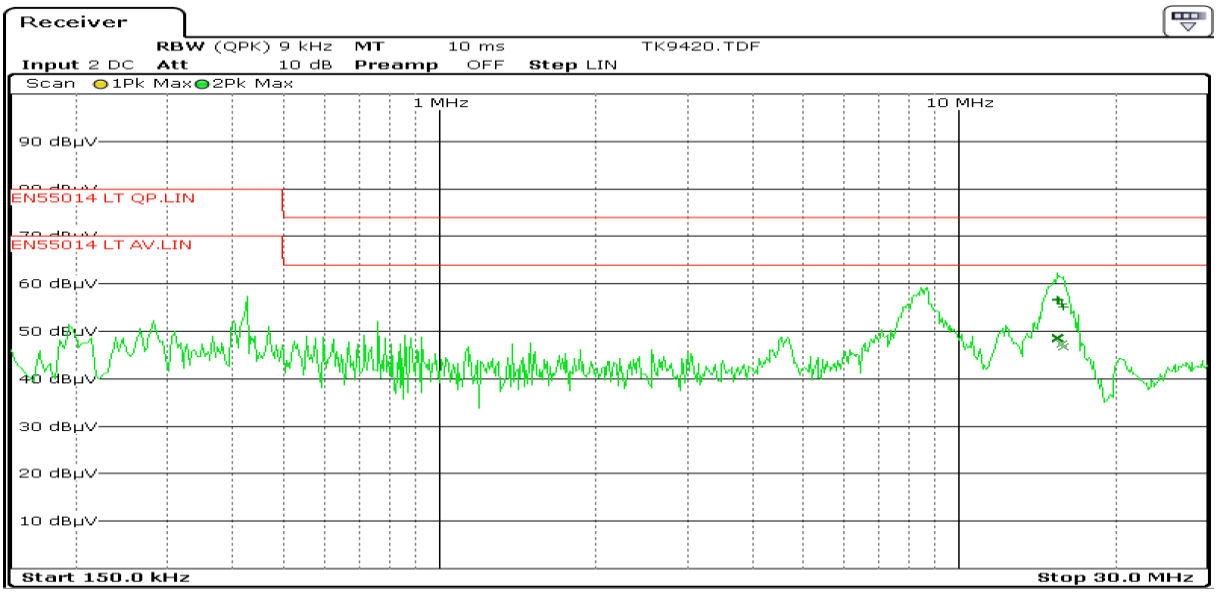

Figure Al.18: Load Terminal Disturbance Voltage, Terminal 2 to Ground;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

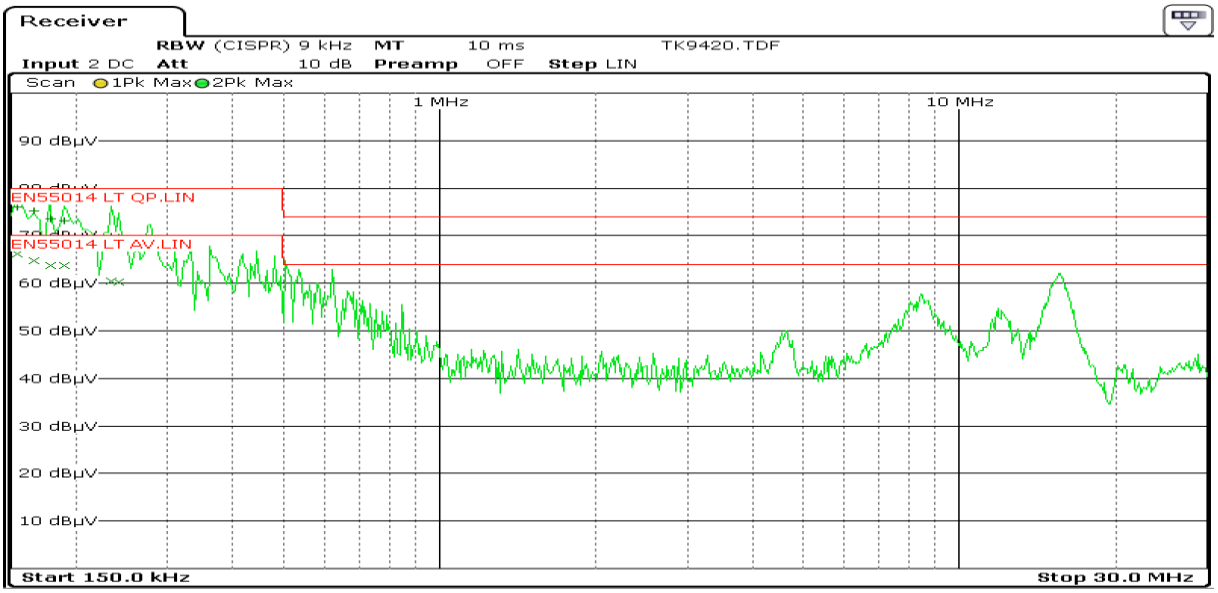

Figure Al.19: Load Terminal Disturbance Voltage, Terminal 3 to Ground;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

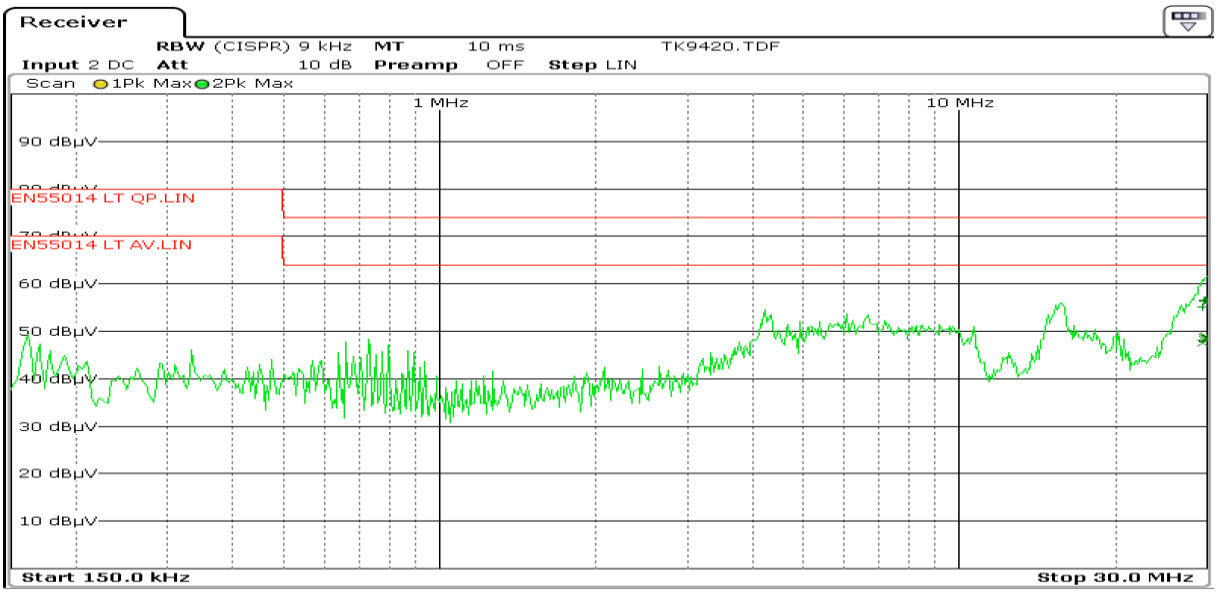

Figure Al.20: Load Terminal Disturbance Voltage, Terminal 1 to Ground;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

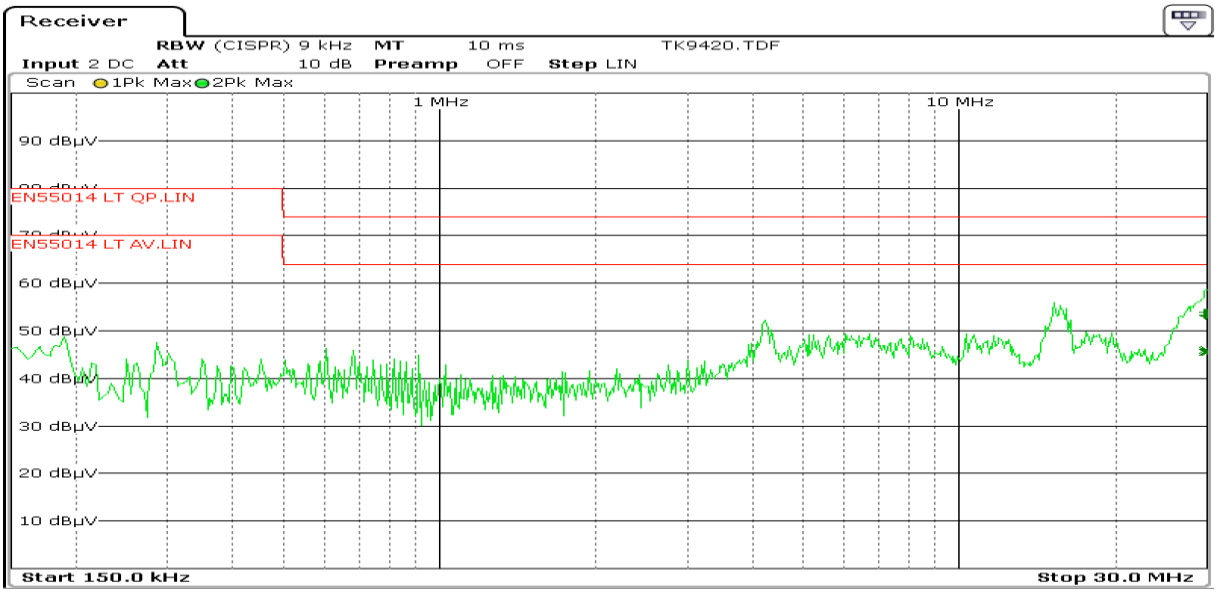

Figure Al.21: Load Terminal Disturbance Voltage, Terminal 2 to Ground;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

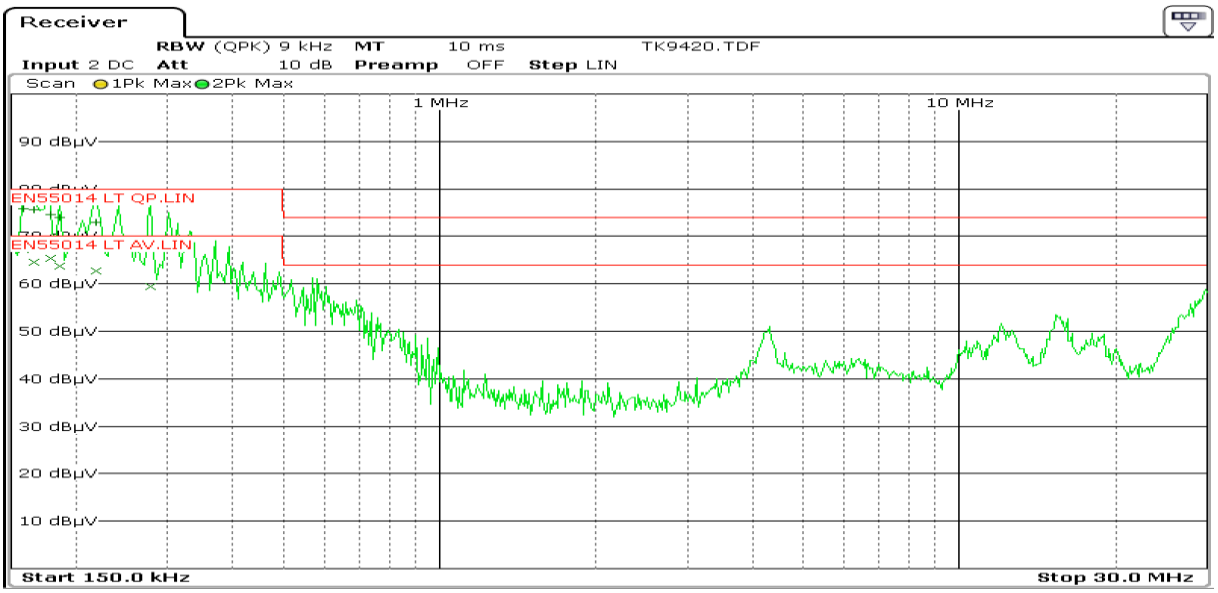

Figure Al.22: Load Terminal Disturbance Voltage, Terminal 3 to Ground;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

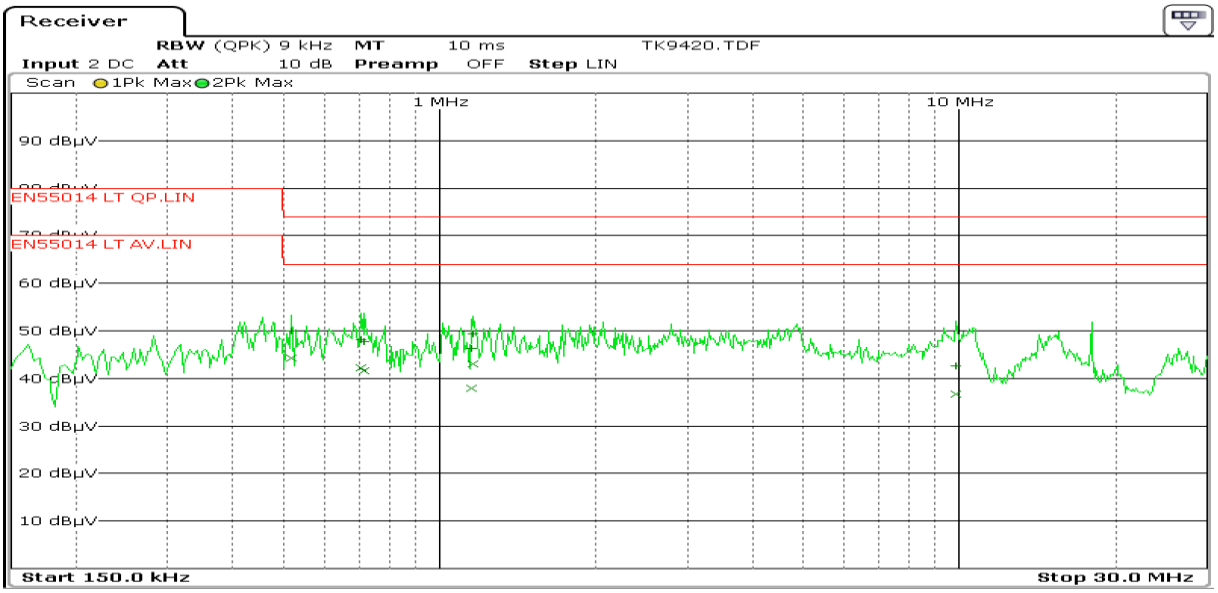

Figure Al.23: Load Terminal Disturbance Voltage, Terminal 1 to Ground;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

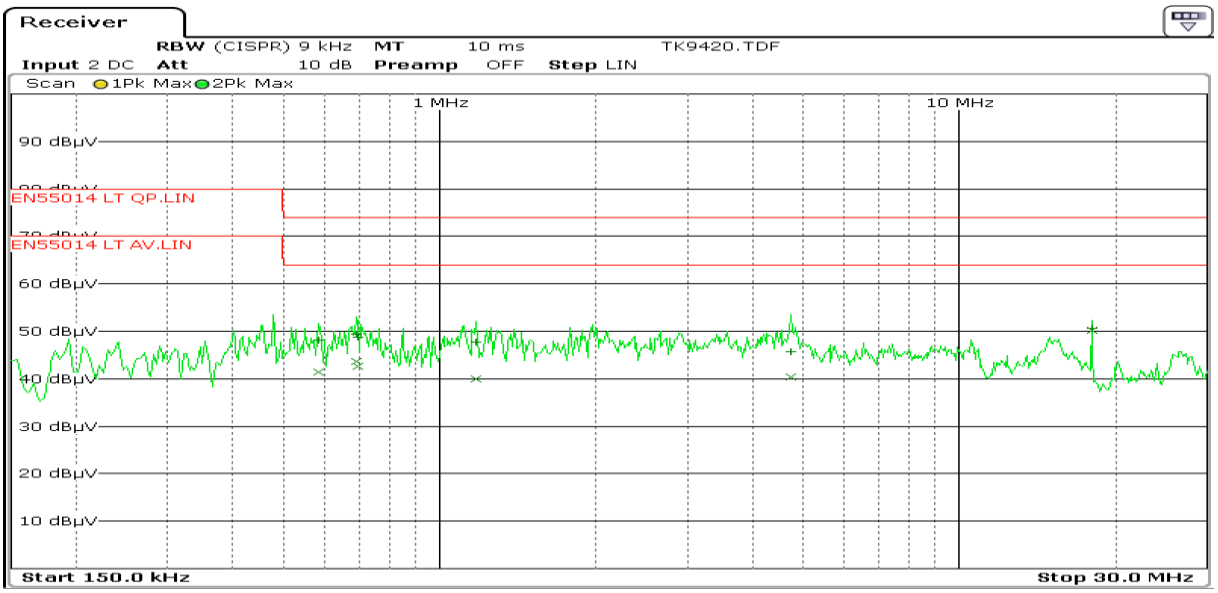

Figure Al.24: Load Terminal Disturbance Voltage, Terminal 2 to Ground;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

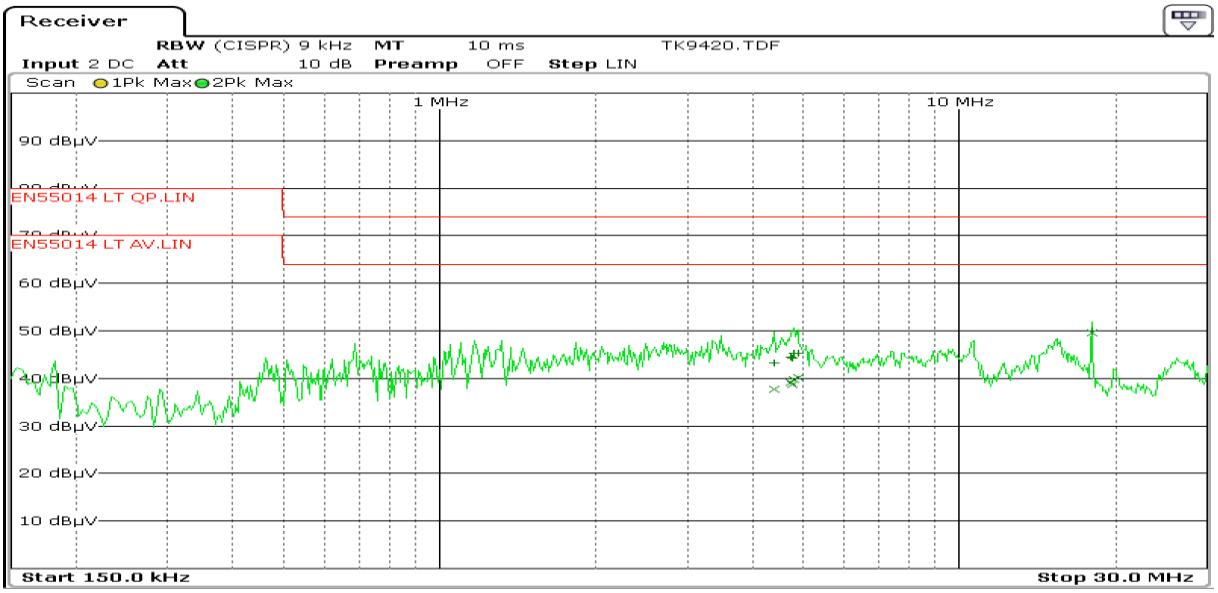

Figure Al.25: Load Terminal Disturbance Voltage, Terminal 3 to Ground;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

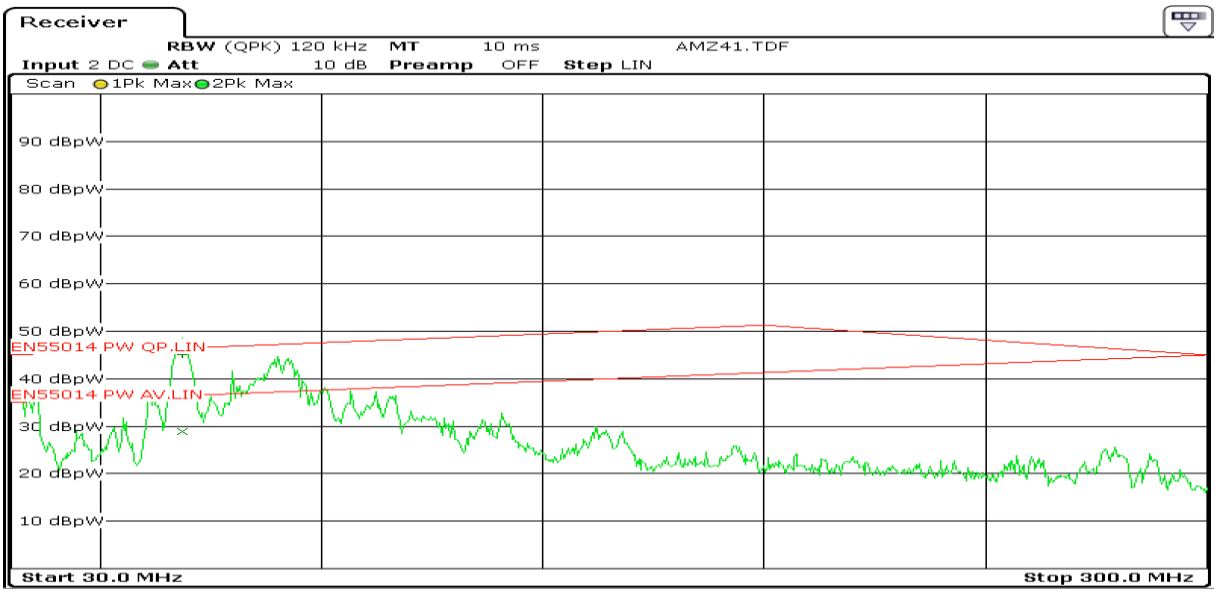

Figure Al.26: Continuous Power Disturbance, Sensor to mains;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

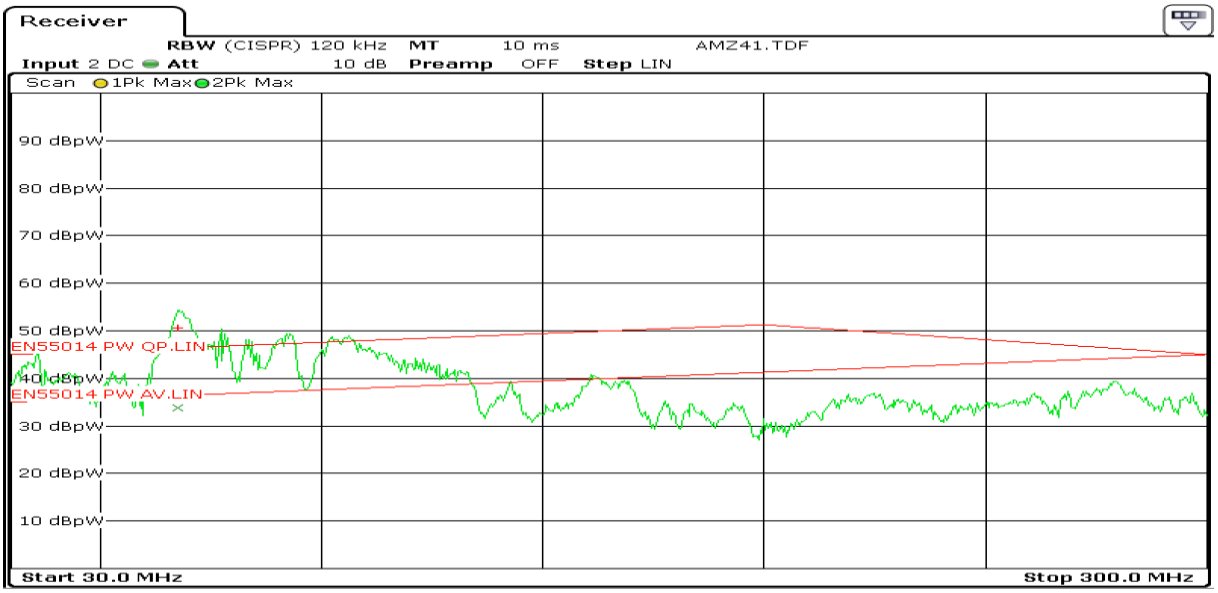

Figure Al.27: Continuous Power Disturbance, Sensor to Outdoor;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

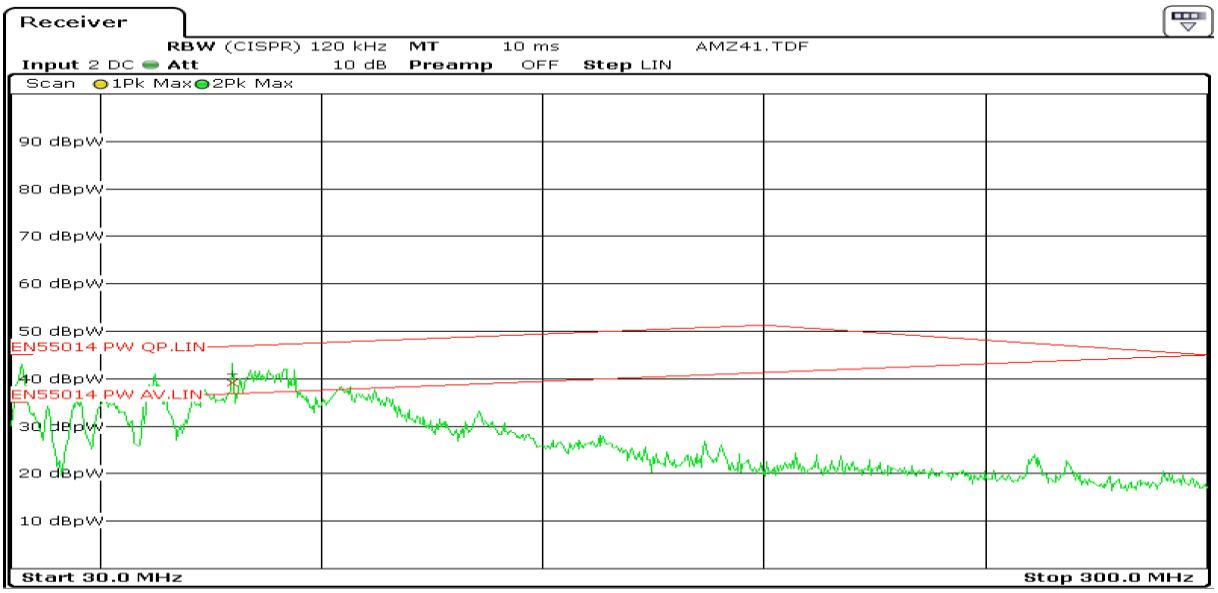

Figure Al.28: Continuous Power Disturbance, Sensor to Indoor;
Model: RAS-B10J2KVG-E / RAS-10J2AVG-E

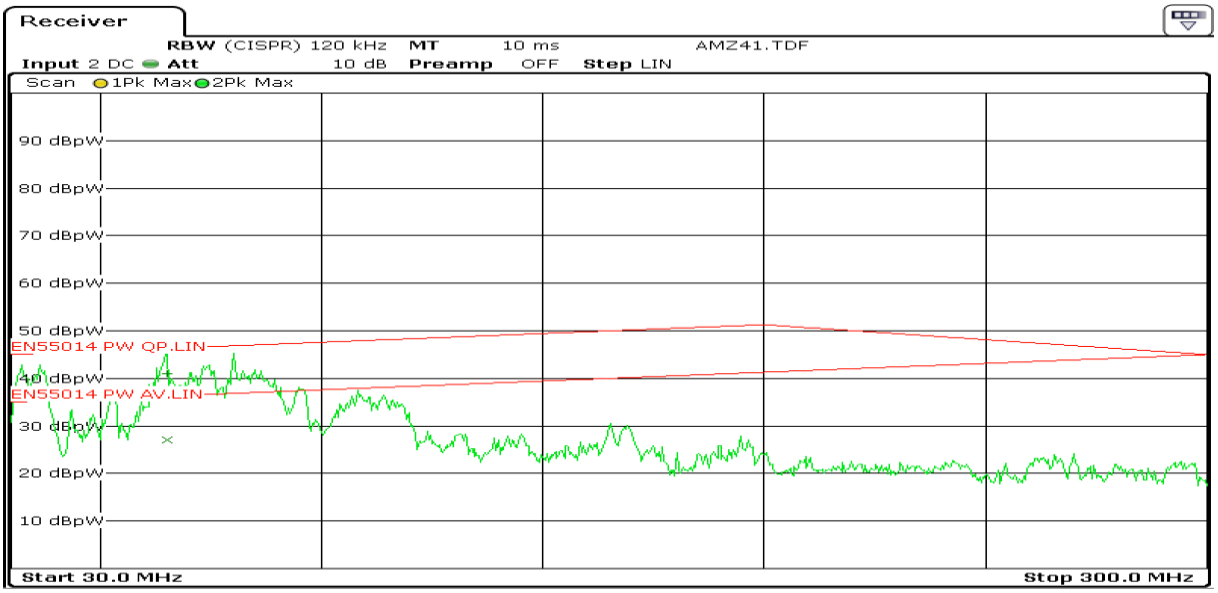

Figure Al.29: Continuous Power Disturbance, Sensor to mains;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

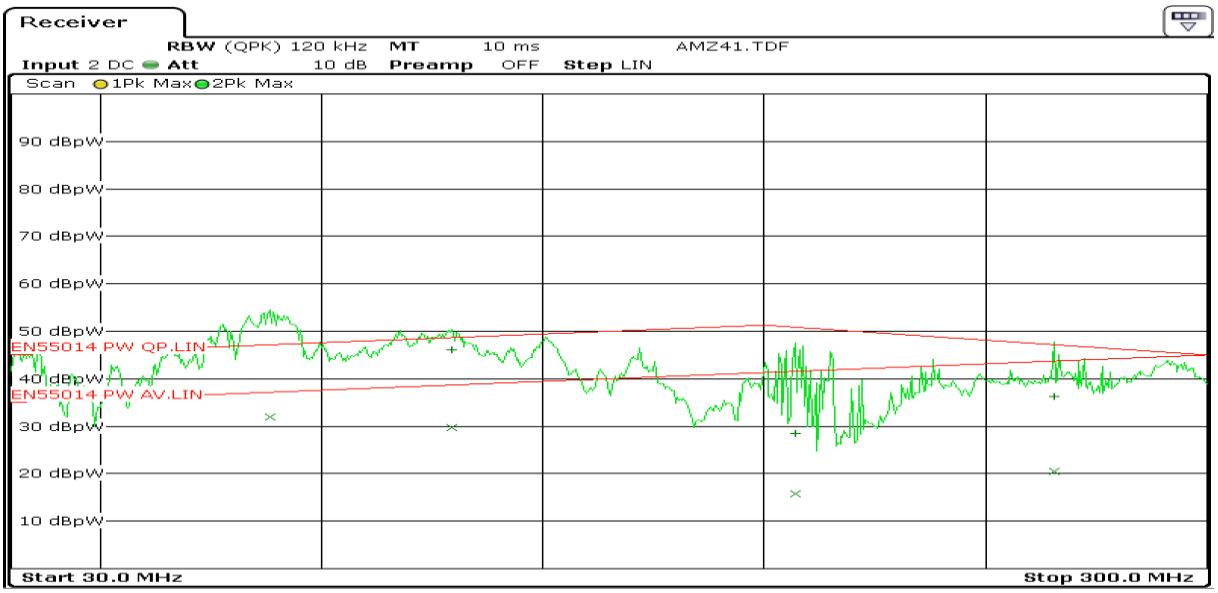

Figure Al.30: Continuous Power Disturbance, Sensor to Outdoor;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

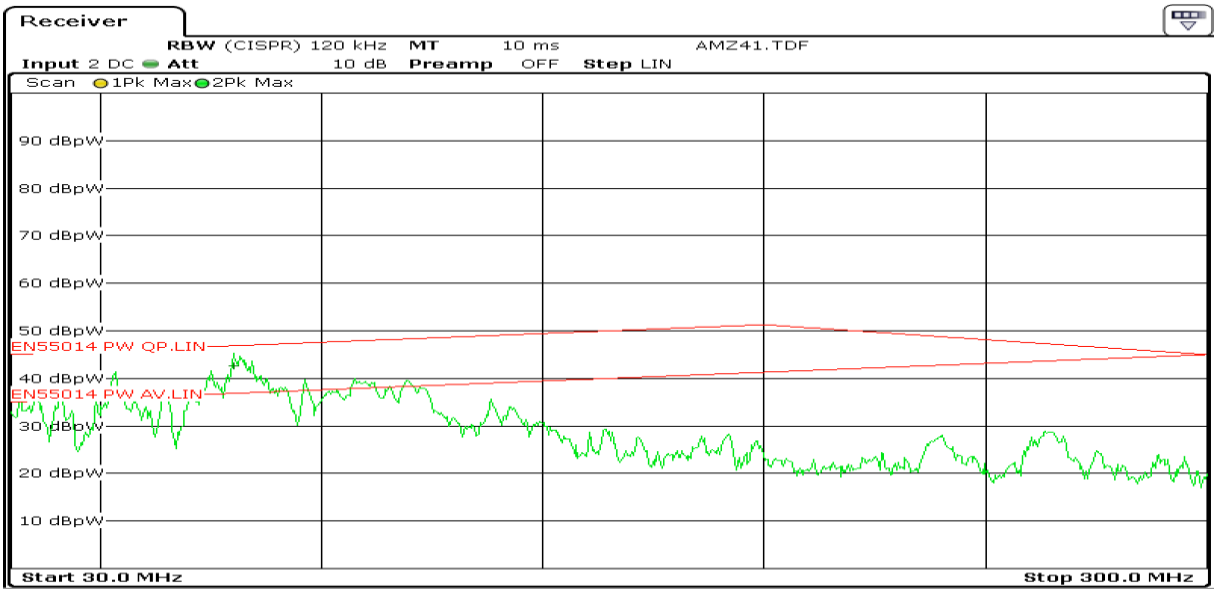

Figure Al.31: Continuous Power Disturbance, Sensor to Indoor;
Model: RAS-B13J2KVG-E / RAS-13J2AVG-E

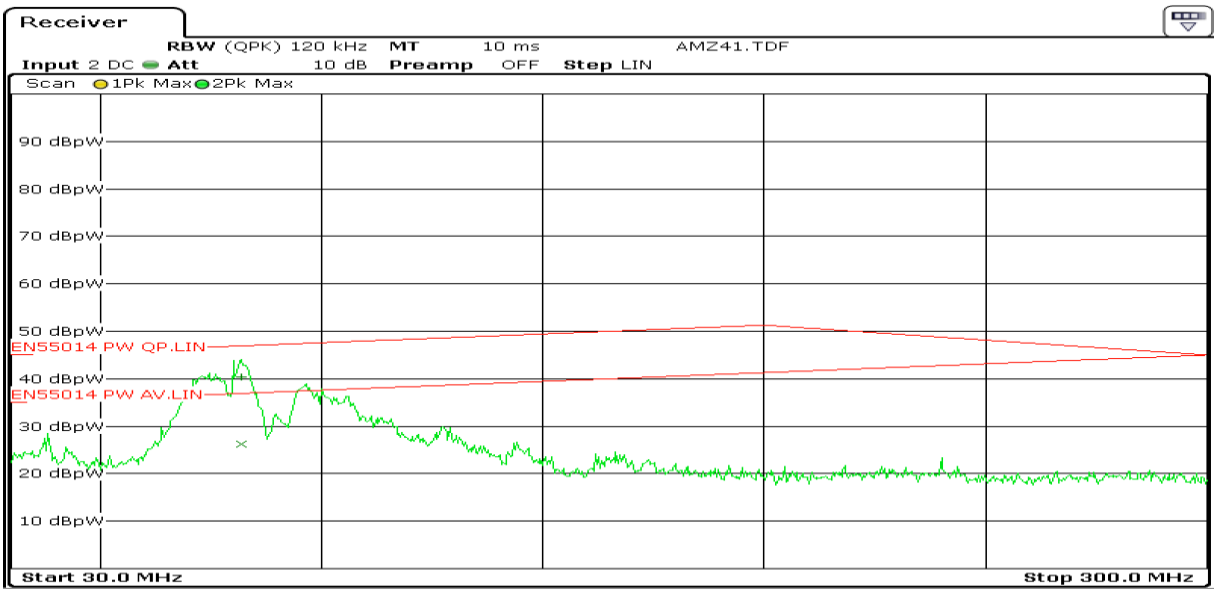

Figure Al.32: Continuous Power Disturbance, Sensor to mains;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

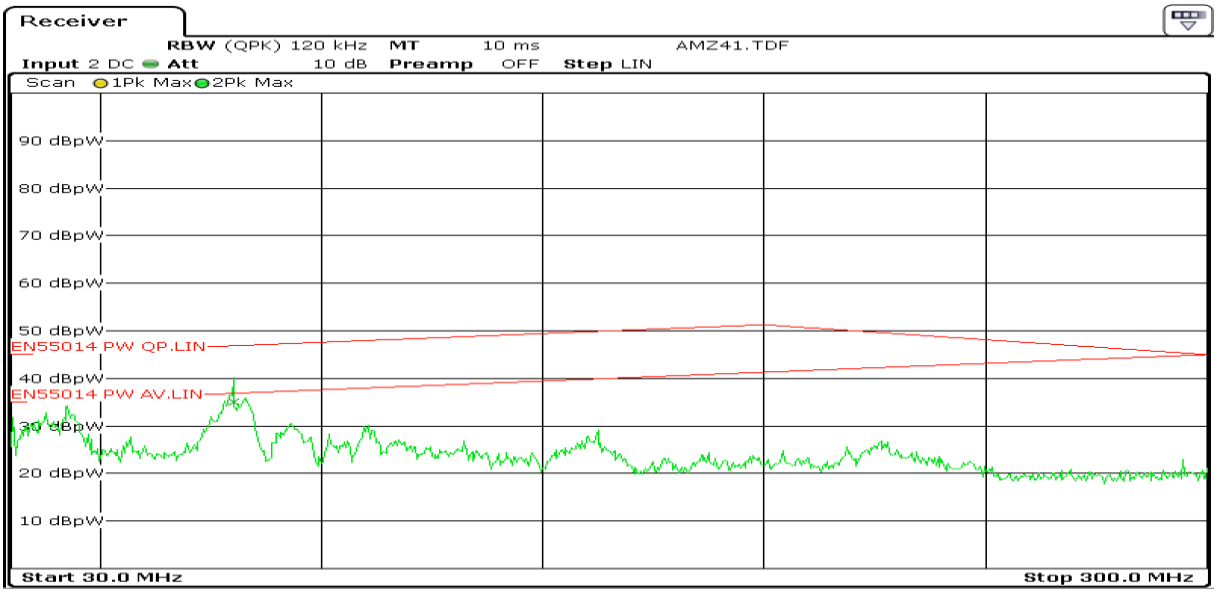

Figure Al.33: Continuous Power Disturbance, Sensor to Outdoor;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

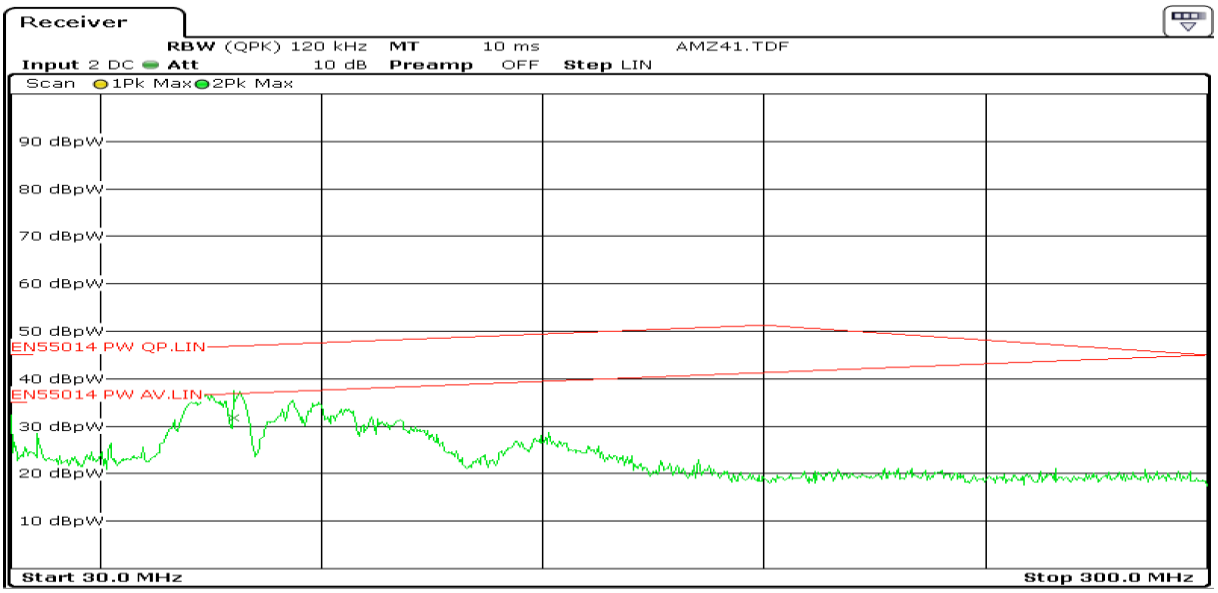

Figure Al.34: Continuous Power Disturbance, Sensor to Indoor;
Model: RAS-B16J2KVG-E / RAS-16J2AVG-E

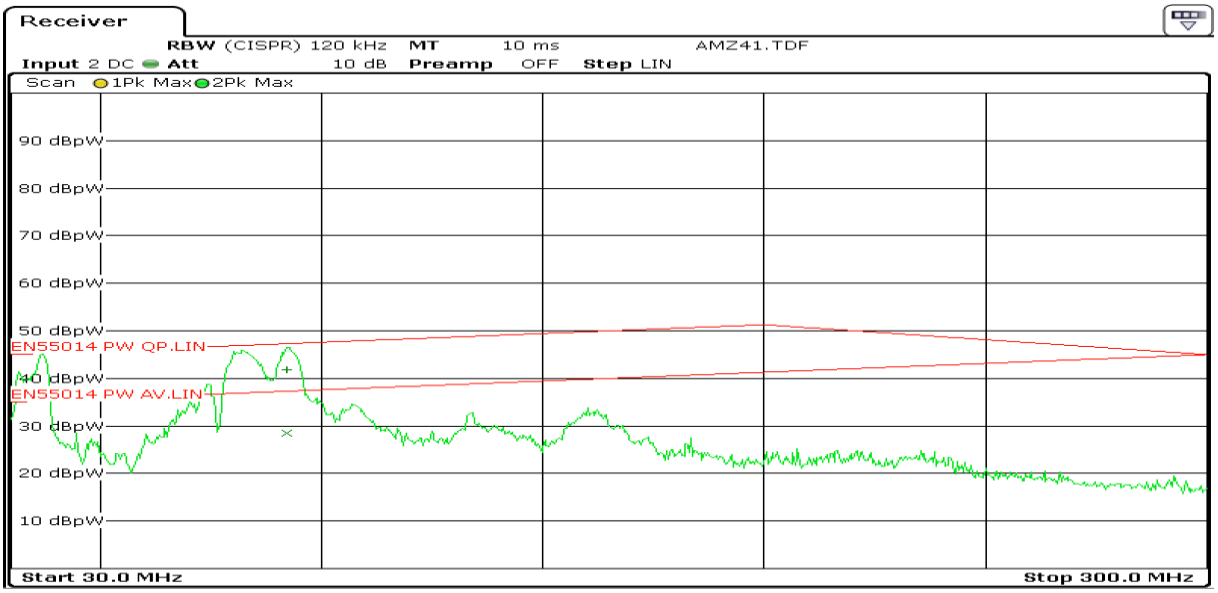

Figure Al.35: Continuous Power Disturbance, Sensor to mains;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

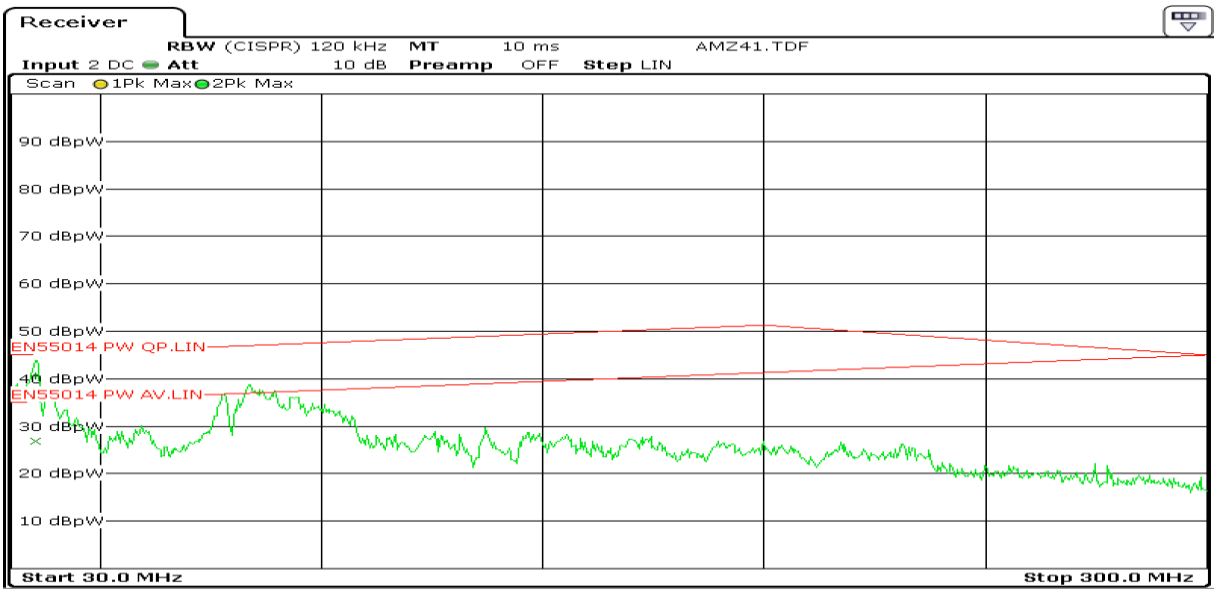

Figure Al.36: Continuous Power Disturbance, Sensor to Outdoor;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

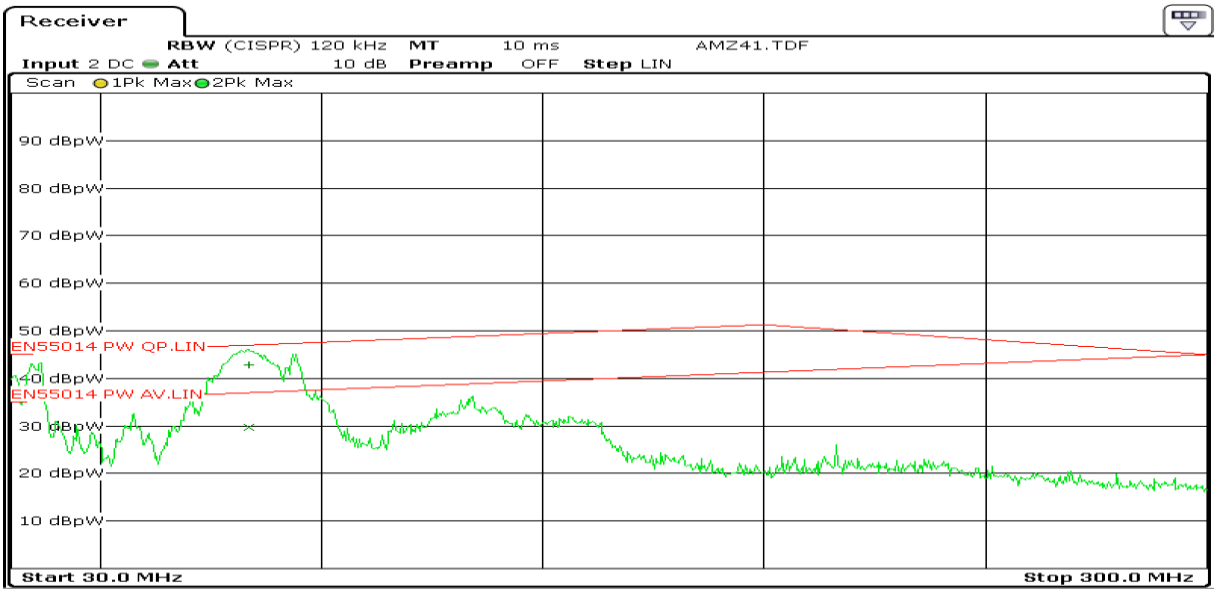

Figure AI.37: Continuous Power Disturbance, Sensor to Indoor;
Model: RAS-18J2KVG-E / RAS-18J2AVG-E

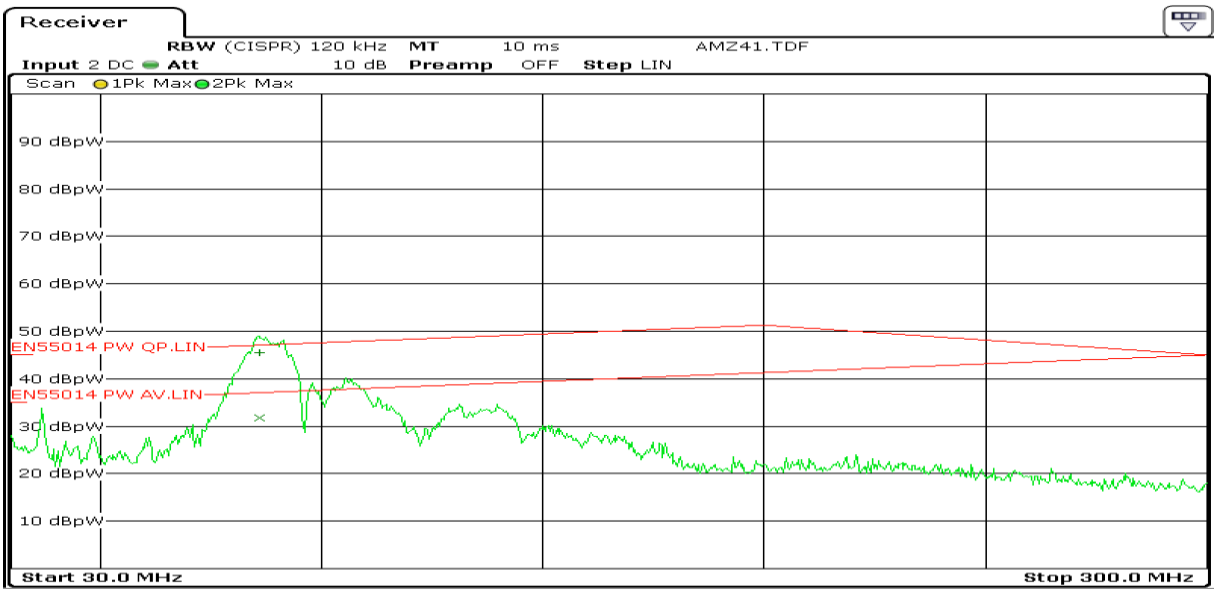

Figure AI.38: Continuous Power Disturbance, Sensor to mains;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

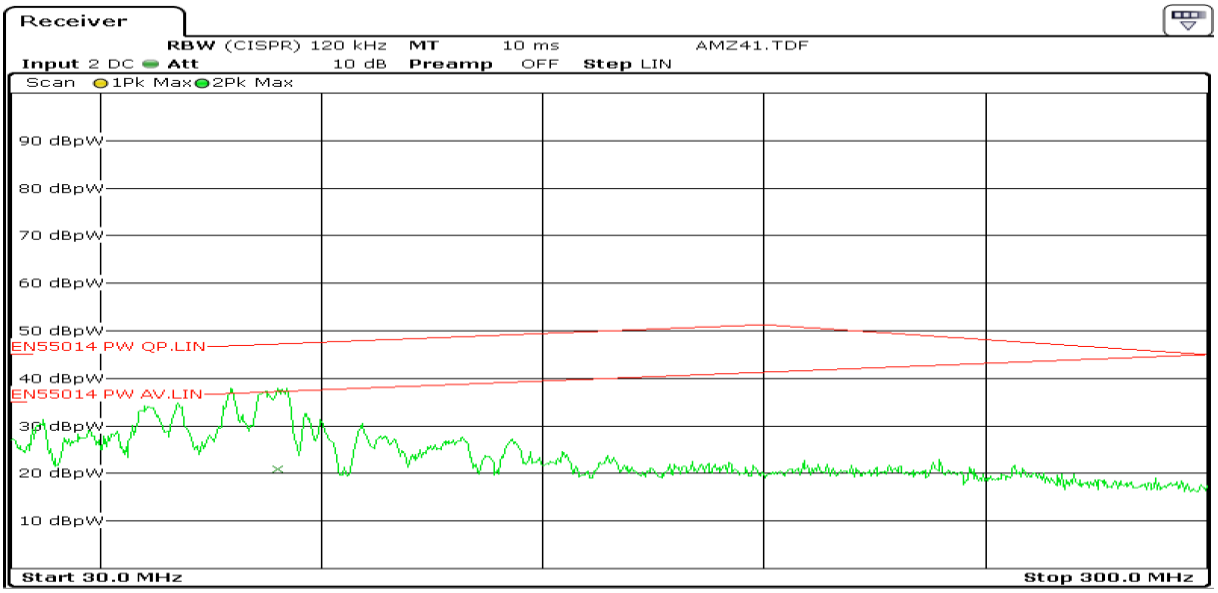

Figure AI.39: Continuous Power Disturbance, Sensor to Outdoor;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

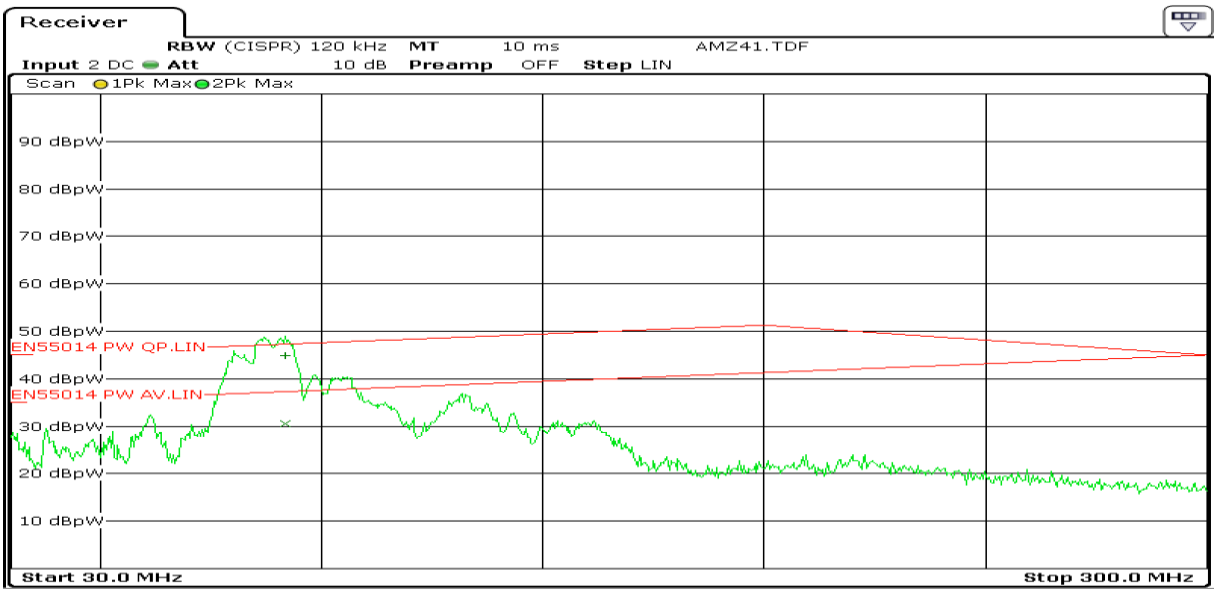

Figure AI.40: Continuous Power Disturbance, Sensor to Indoor;
Model: RAS-24J2KVG-E / RAS-24J2AVG-E

APPENDIX II: EUT PHOTOGRAPHS

Outdoor unit: RAS-10J2AVG-E

Outdoor unit: RAS-B10J2KVG-E

Figure AII.1: EUT Photos model: RAS-B10J2KVG-E / RAS-10J2AVG-E

Outdoor unit: RAS-13J2AVG-E

Outdoor unit: RAS-B13J2KVG-E

Figure AII.2: EUT Photos model: RAS-B13J2KVG-E / RAS-13J2AVG-E

Outdoor unit: RAS-16J2AVG-E

Outdoor unit: RAS-B16J2KVG-E

Figure AII.3: EUT Photos model: RAS-B16J2KVG-E / RAS-16J2AVG-E

Outdoor unit: RAS-18J2AVG-E

Outdoor unit: RAS-18J2KVG-E

Figure AII.4: EUT Photos model: RAS-18J2KVG-E / RAS-18J2AVG-E

Outdoor unit: RAS-24J2AVG-E

Outdoor unit: RAS-24J2KVG-E

Figure AII.5: EUT Photos model: RAS-24J2KVG-E / RAS-24J2AVG-E

APPENDIX III: MODELS INFORMATION

Additional model cover by this report and comparison with base model testes in report 18122726BKK-001;

Additional model	Base model
RAS-B10TKVG-E / RAS-10TAVG-E	RAS-B10J2KVG-E / RAS-10J2AVG-E
RAS-B13TKVG-E / RAS-13TAVG-E	RAS-B13J2KVG-E / RAS-13J2AVG-E
RAS-B16TKVG-E / RAS-16TAVG-E	RAS-B16J2KVG-E / RAS-16J2AVG-E
RAS-18TKVG-E / RAS-18TAVG-E	RAS-18J2KVG-E / RAS-18J2AVG-E
RAS-24TKVG-E / RAS-24TAVG-E	RAS-24J2KVG-E / RAS-24J2AVG-E

Figure AIII.1: Nameplate model: RAS-B10J2KVG-E

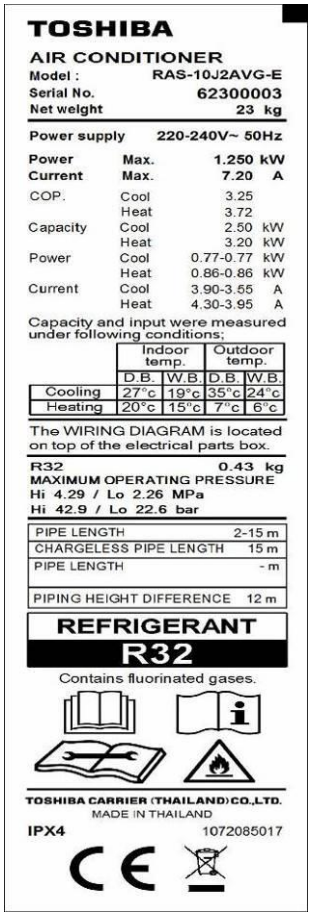

Figure AIII.2: Nameplate model: RAS-10J2AVG-E

Figure AIII.3: Nameplate model: RAS-B13J2KVG-E

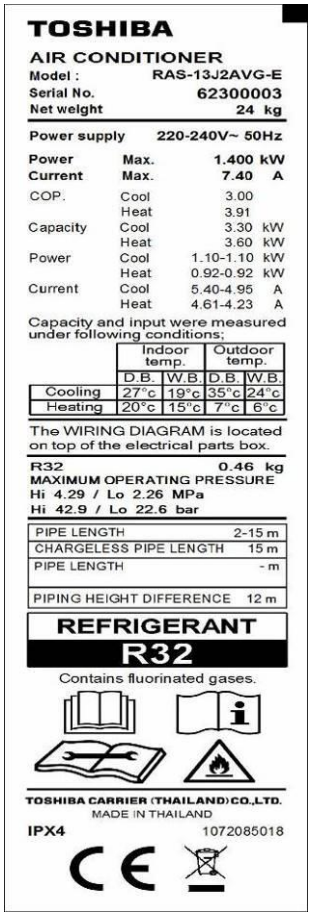

Figure AIII.4: Nameplate model: RAS-13J2AVG-E

Figure AIII.5: Nameplate model: RAS-B16J2KVG-E

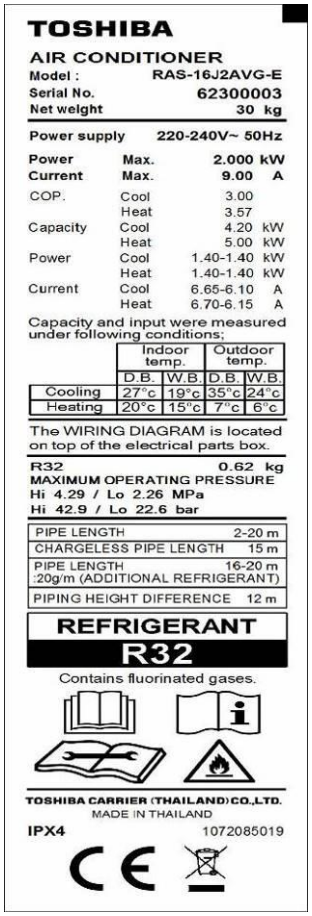

Figure AIII.6: Nameplate model: RAS-16J2AVG-E

Figure AIII.7: Nameplate model: RAS-18J2KVG-E

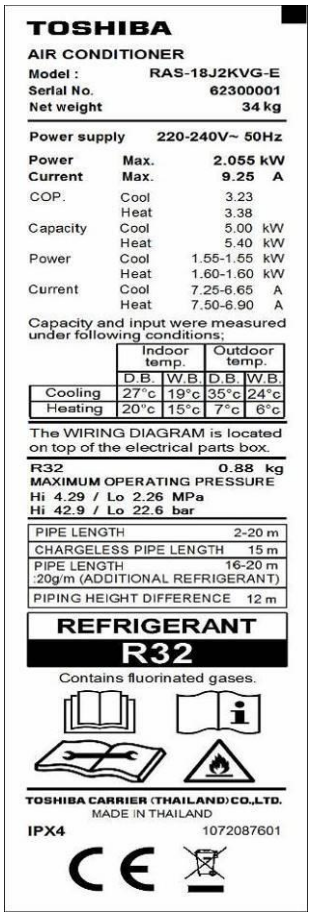

Figure AIII.8: Nameplate model: RAS-18J2AVG-E

Figure AIII.9: Nameplate model: RAS-24J2KVG-E

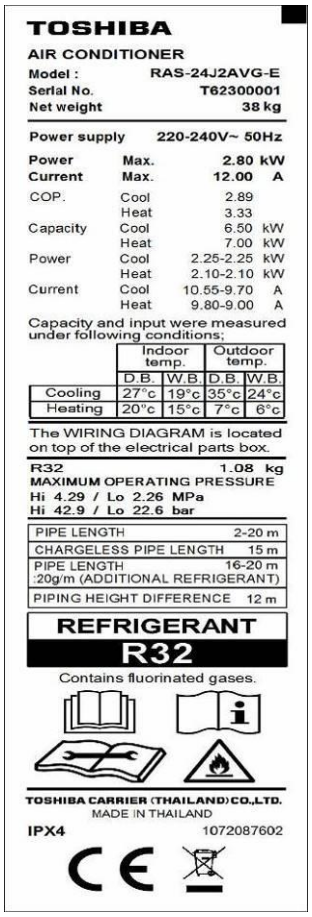

Figure AIII.10: Nameplate model: RAS-24J2AVG-E

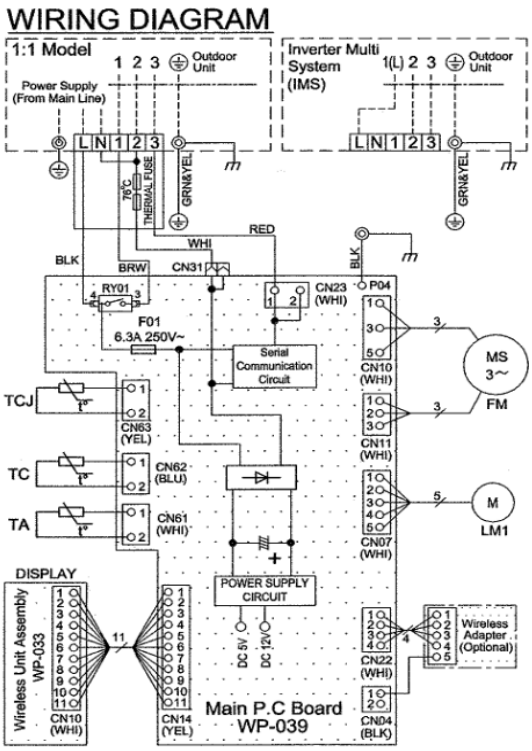

Figure AIII.11: Wiring Diagram model: RAS-B10J2KVG-E

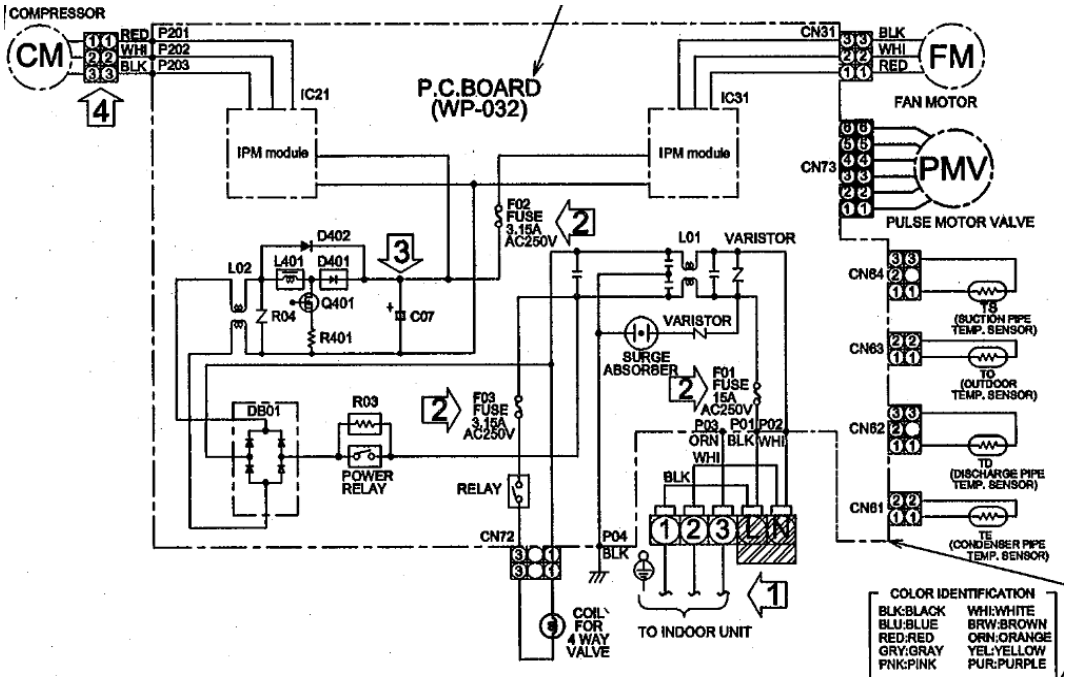

Figure AIII.12: Wiring Diagram model: RAS-10J2AVG-E

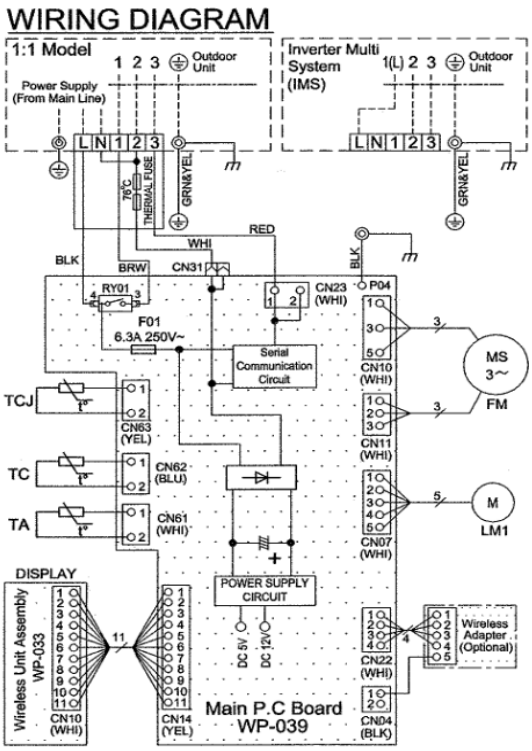

Figure AIII.13: Wiring Diagram model: RAS-B13J2KVG-E

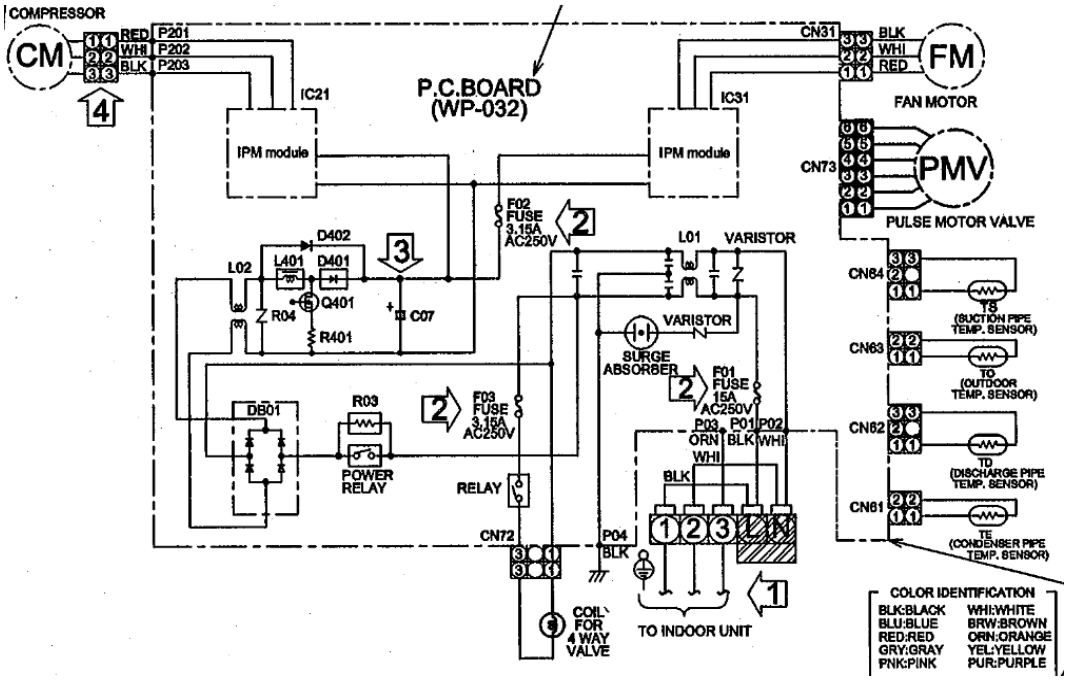

Figure AIII.14: Wiring Diagram model: RAS-13J2AVG-E

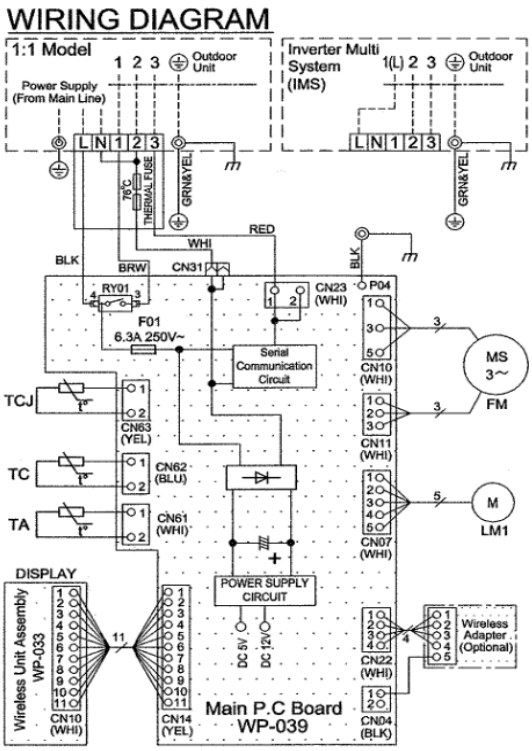

Figure AIII.15: Wiring Diagram model: RAS-B16J2KVG-E

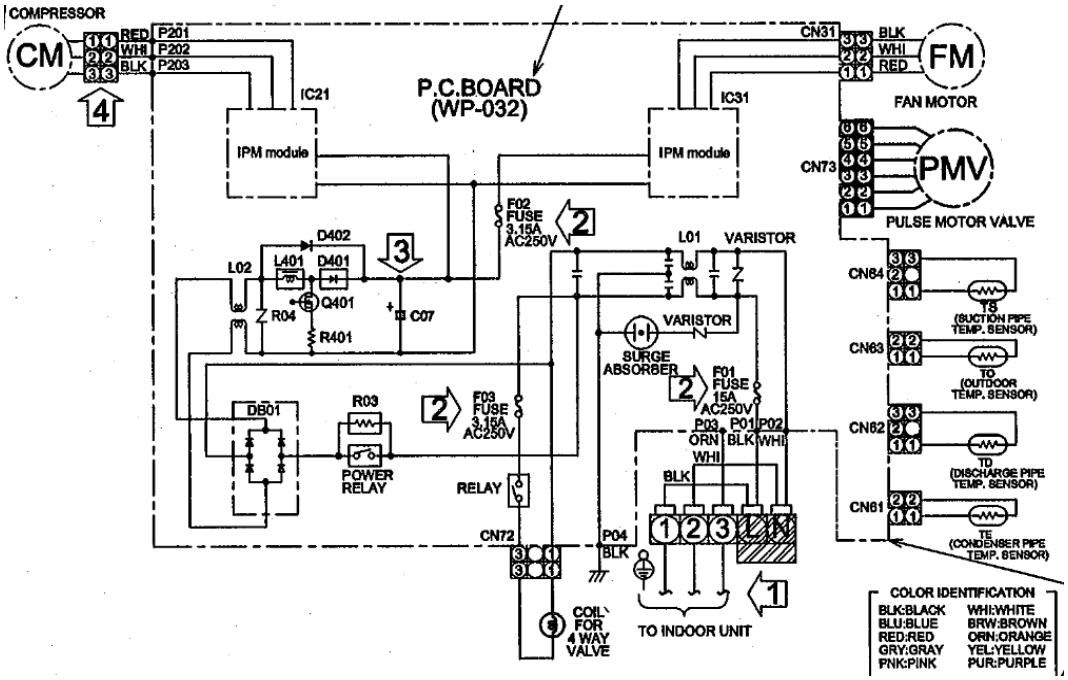

Figure AIII.16: Wiring Diagram model: RAS-16J2AVG-E

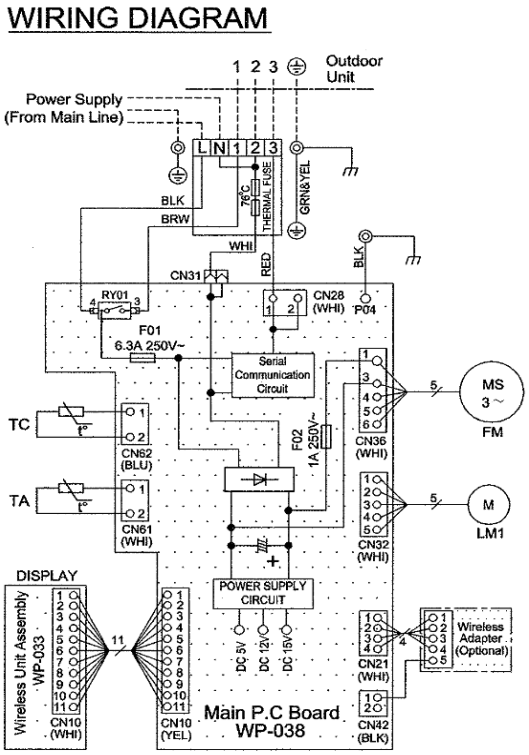

Figure AIII.17: Wiring Diagram model: RAS-18J2KVG-E

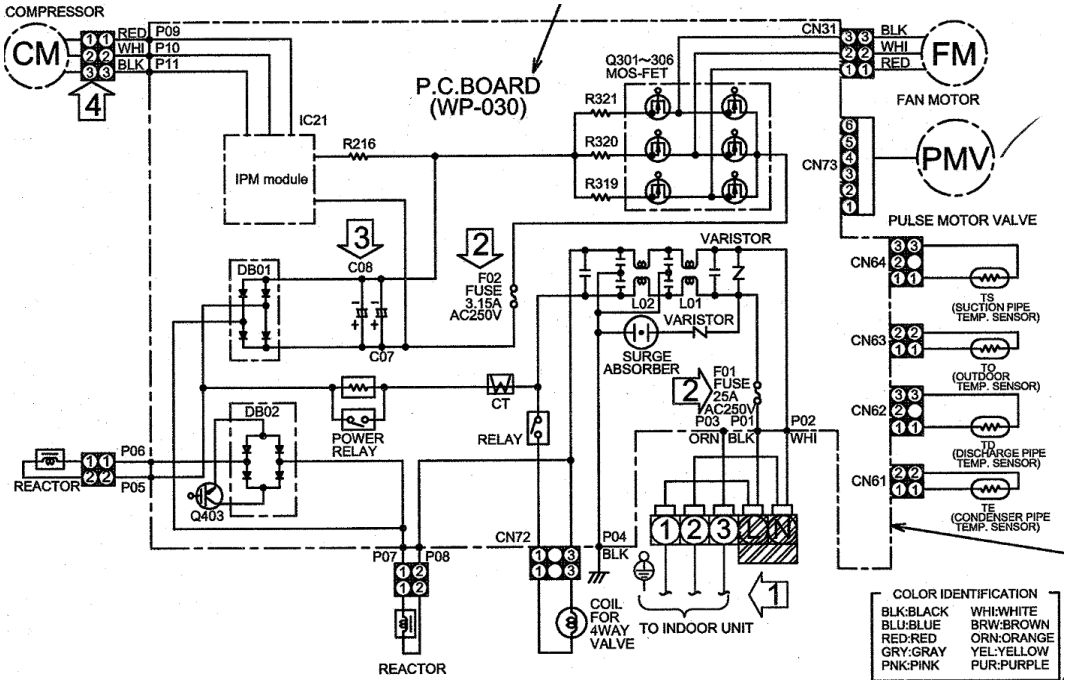

Figure AIII.18: Wiring Diagram model: RAS-18J2AVG-E

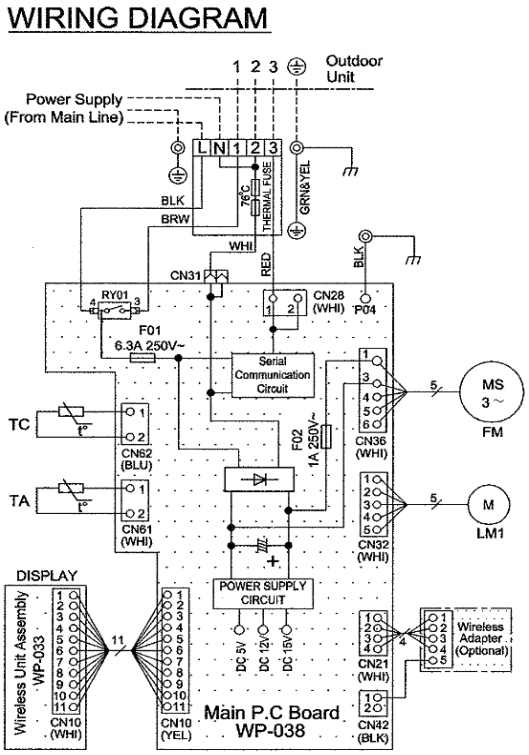

Figure AIII.19: Wiring Diagram model: RAS-24J2KVG-E

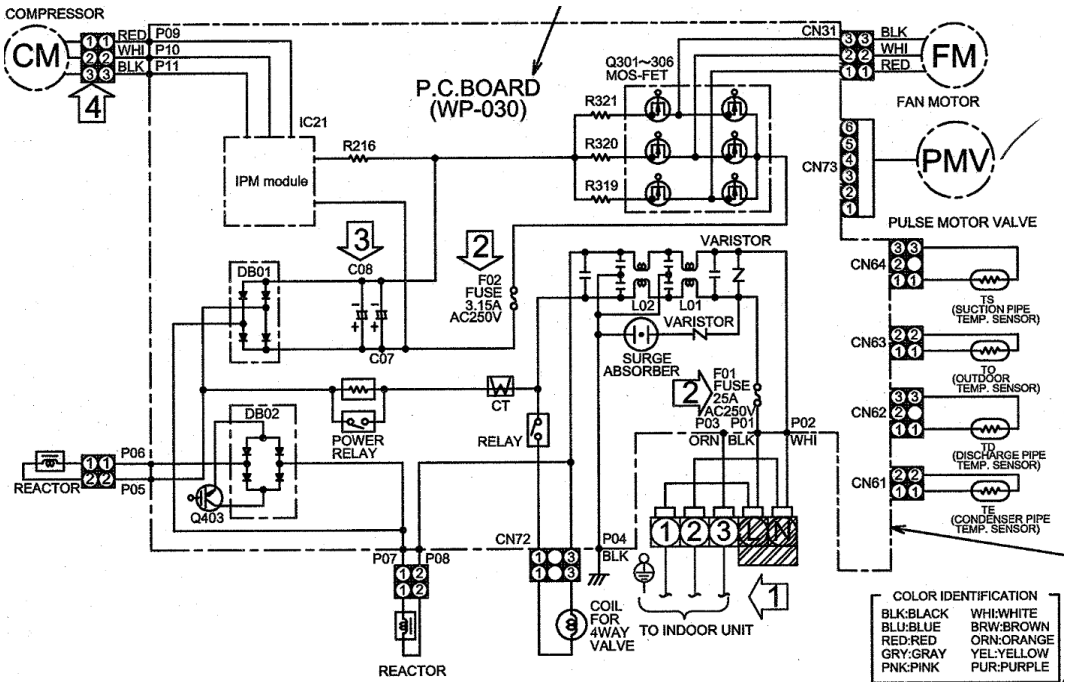

Figure AIII.20: Wiring Diagram model: RAS-24J2AVG-E

APPENDIX IV: PHOTO OF TEST SET UP

Figure AIV.1: Mains Terminal Continuous/Discontinuous Disturbance Voltage test set-up

Figure AIV.2: Continuous Disturbance Power test set-up

Figure AIV.3: Harmonic Current Emission, Voltage Fluctuation and Flicker test set-up

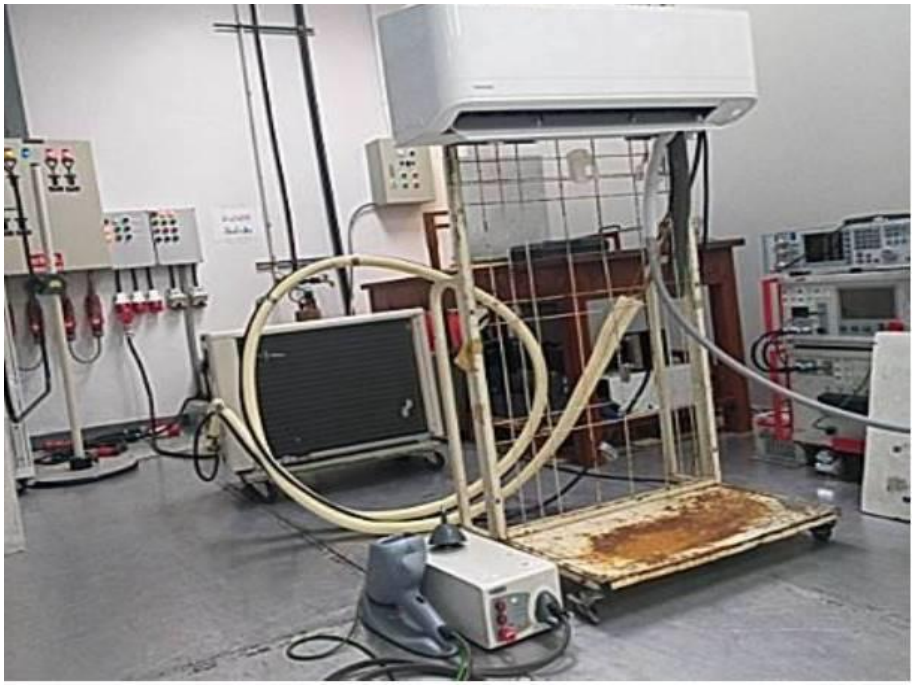

Figure AIV.4: Electrostatic Discharge, Injection Current test set-up

Figure AIV.5: Fast Transients, Surges, Voltage dips test set-up