REPORT ON THE EMC TESTING

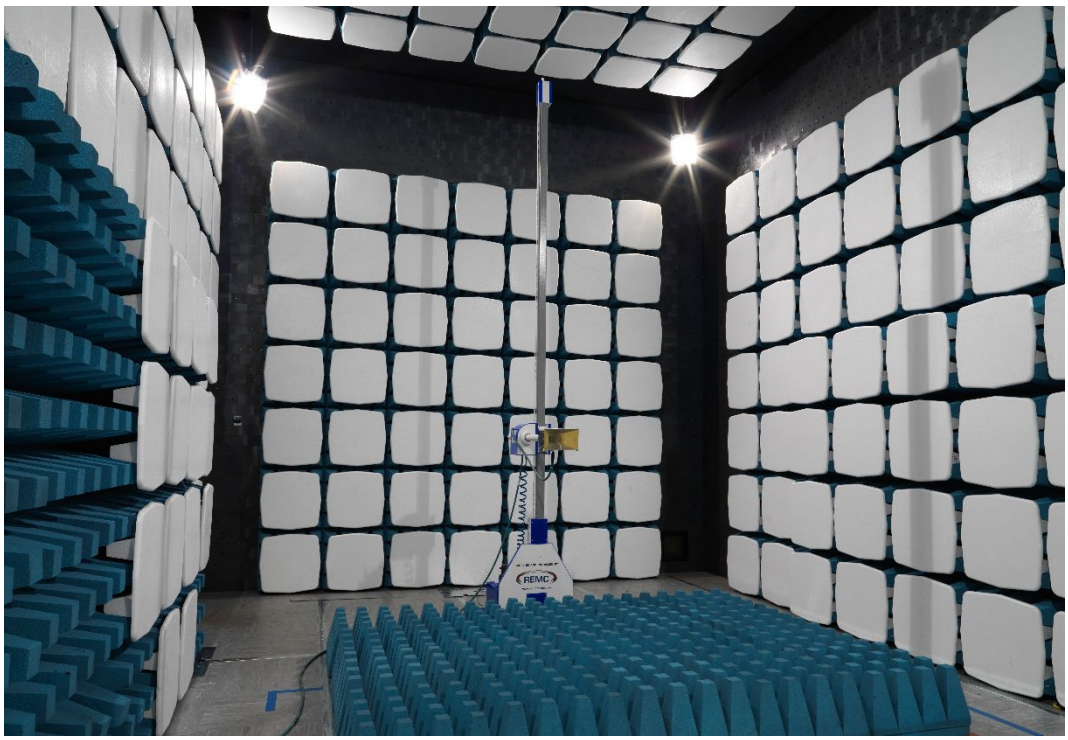
FOR

U-TOUCH POLAND SP. Z O.O.

ON A

NEC MULTISYNC M751 IGB

REPORT NUMBER: TRA-060945-44-00A



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Report Number: TRA-060945-44-00A
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REPORT ON THE EMC TESTING OF A
U-TOUCH POLAND SP. Z O.O.
NEC MULTISYNC M751 IGB
WITH RESPECT TO SPECIFICATION(S)
EN 55035: 2017 +A11:2020, EN 55032: 2015 +AC: 2016-07 +A11: 2020 +A1: 2020,
EN 61000-3-2:2019 +A1:2021 AND EN 61000-3-3:2013 +A1:2019 +A2:2021

TEST DATE: 11/04/23 TO 20/04/23

Written by: Digitally signed by Max Leach Date: 2023.04.26 11:30:31 +01'00'

M Leach
Senior EMC Engineer

Approved by: Digitally signed by Martin Baker Date: 2023.04.26 11:30:47 +01'00'

M Baker
Department Manager - EMC

Date: 26/04/2023

Distribution:
Copy 1: Element Materials Technology
Copy 2: U-Touch Poland Sp. z o.o.

1 Revision Record

Issue Number	*Issue Date*	*Revision History*
A	26/04/2023	Original

2 Contents

3 Introduction

This report TRA-060945-44-00A presents the results of the EMC testing on a NEC MultiSync M751 IGB to specification(s):

EN 55035:2017 +A11:2020, EN 55032:2015 +AC: 2016-07 +A11:2020 +A1:2020,
EN 61000-3-2:2019 +A1:2021 and EN 61000-3-3:2013 +A1:2019 + A2:2021

The testing was carried out for U-Touch Poland Sp. z o.o. by Element Materials Technology, an independent test house, at their EMC test facility located at:

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☒ Unit E
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Hedon Road
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This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test and measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Element Materials Technology's own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

It is Element Materials Technology policy to always use the latest version of any applicable base test standards. Where a product specification calls up a superseded dated revision or an undated basic standard, the latest version will be used. This may be a deviation to the product standard if dated references have been used.

Throughout this report EUT denotes equipment under test.

4 Specification References

- EN 61000-4-2:2009 'EMC Immunity, Electrostatic Discharge'
- EN 61000-4-3:2006 +A2:2010 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test'
- EN 61000-4-4:2012 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrical fast transient/burst immunity test'
- EN 61000-4-5:2014 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test'
- EN 61000-4-6:2014 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to conducted disturbances, induced by radio-frequency fields'
- EN 61000-4-8:2010 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity Power Frequency Magnetic Field'
- EN 61000-4-9:1994 +A1:2001 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Pulse Magnetic Field'
- EN 61000-4-9:2016* 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to Pulse Magnetic Field'
- EN 61000-4-11:2020 'Electromagnetic compatibility (EMC). Testing and measurement techniques. Voltage dips, short interruptions and voltage variations immunity tests for equipment with input currents up to 16 A per phase'
- EN 61000-3-2:2019 + A1:2021 'Limits for Harmonic Current Emissions (Equipment input current ≤ 16 A/phase)'
- EN 61000-3-3:2013+ A1:2019 +A2:2021 'Limitation of voltage changes, voltage fluctuations and flicker in the public low-voltage supply systems, for equipment with rated current ≤ 16 A/phase and not subject to conditional connection'
- EN 55011:2016 +A1:2017* 'Industrial, scientific and medical (ISM) radio frequency equipment – Radio disturbance characteristics – Limits and methods of measurement'
- EN 55022:2010 +AC:2011* +AC:2015* 'Information technology equipment - Radio disturbance characteristics – Limits and methods of measurement'
- EN 55014-1:2021 'Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission'
- EN 55016-2-1:2014 +A1:2017 'Specification for radio disturbance and immunity measuring apparatus and methods – Conducted Disturbance Measurements'
- EN 55016-2-2:2011* 'Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-2: Methods of measurement of disturbances and immunity – Measurement of disturbance power'
- EN 55016-2-3:2017 +A1:2019 'Specification for radio disturbance and immunity measuring apparatus and methods – Radiated Disturbance Measurements'
- EN 55032 2015 +AC 2016-07 +A11 2020 +A1 2020 'Electromagnetic compatibility of multimedia equipment - Emission requirements'
- EN 55035:2017 'Electromagnetic compatibility of multimedia equipment – Immunity requirements'
- CISPR 11:2015 'Industrial, scientific and medical (ISM) radio frequency equipment – Radio disturbance characteristics – Limits and methods of measurement'
- CISPR 14-1:2020 'Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission'
- CISPR 16-2-1:2014 +A1:2017 'Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements'
- CISPR 16-2-2:2010* 'Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-2: Methods of measurement of disturbances and immunity – Measurement of disturbance power'
- CISPR 16-2-3:2016 +A1:2019 'Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated Disturbance Measurements'
- CISPR 22:2008 'Information technology equipment - Radio disturbance characteristics – Limits and methods of measurement'
- CISPR 32:2015 +A1:2019 'Electromagnetic compatibility of multimedia equipment – Emission requirements'
- CISPR 35:2016 'Electromagnetic compatibility of multimedia equipment – Immunity requirements'
- ANSI C63.4-2014 'American National Standard for Methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz'

*Indicates a specification or standard or specific amendment that is not listed on the Element Materials Technology's UKAS scope of accreditation.
CISPR 32:2015 +A1:2019 / EN 55032 2015 +AC 2016-07 +A11 2020 +A1 2020 fall under Element flexible UKAS scope of accreditation, which assumes temporary accreditation against the reported edition, until formal acceptance by the laboratories accrediting body 0026 UKAS scope of accreditation. During this intermediate period, Element considers itself UKAS accredited for the listed reference standard.

5 Summary

TEST REPORT NUMBER:	TRA-060945-44-00A
WORKS ORDER NUMBER	TRA-060945-02
PURPOSE OF TEST:	Electromagnetic Compatibility – Emissions and Susceptibility
TEST SPECIFICATION(S):	EN 55035:2017 +A11:2020, EN 55032:2015 +AC: 2016-07 +A11:2020 +A1:2020, EN 61000-3-2:2019 +A1:2021 and EN 61000-3-3:2013 +A1:2019 + A2:2021
EQUIPMENT UNDER TEST (EUT):	NEC MultiSync M751 IGB
MANUFACTURER/AGENT:	U-Touch Poland Sp. z o.o.
ADDRESS:	Kroczymiech 60B 32-500 Chrzanow
CLIENT CONTACT:	Natalia Rosa ☎ +48 664 114 915 ✉ natalia.rosa@u-touch.pl
TEST DATE:	11/04/23 to 20/04/23
TESTED BY:	M Leach Element Materials Technology

5.1 EUT Compliance Statement

The EUT has been tested to specification(s):

EN 55035:2017 +A11:2020, EN 55032:2015 +AC: 2016-07 +A11:2020 +A1:2020,
EN 61000-3-2:2019 +A1:2021 and EN 61000-3-3:2013 +A1:2019 + A2:2021

The EUT was found to comply. Note should be taken of any modifications given in section 6 of this report.

The decision rule for compliance is inherent within the above specification(s) and is based on recorded level by the lab, irrespective of the Measurement Uncertainty values.

5.2 Accreditation Statement

The product standard listed and base standards are covered under the scope of Elements UKAS accreditation

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF communiqué dated April 2017).

5.3 Test Summary

The standards listed in the table below and marked as applicable are called up by the EMC Directive Official Journal (OJ) or the product standard(s) listed below:

EN 55035:2017 +A11:2020, EN 55032:2015 +AC: 2016-07 +A11:2020 +A1:2020, EN 61000-3-2:2019 +A1:2021 and EN 61000-3-3:2013 +A1:2019 + A2:2021

Test Method and Description	*Test Result*	*Test Order*	*Note*
IEC / EN 61000-4-2 Electrostatic Discharge Immunity	Pass	7	
IEC / EN 61000-4-3 Radiated RF Immunity	Pass	5	
IEC / EN 61000-4-4 Electrical Fast Transient/Burst Immunity	Pass	8	
IEC / EN 61000-4-5 Surge Immunity	Pass	10	
IEC / EN 61000-4-6 Conducted RF Immunity	Pass	6	
CISPR / EN 55035 Broadband Impulse Noise Immunity	Not Applicable		1
IEC / EN 61000-4-8 Power Frequency Magnetic Field Immunity	Not Applicable		
IEC / EN 61000-4-11 Voltage Dips, Short Interruptions and Voltage Variations Immunity	Pass	9	
Conducted Emissions – Power Port	Pass	2	
Conducted Emissions – Telecommunication Port	Not Applicable		1
Radiated Emissions – Enclosure	Pass	1	
IEC / EN 61000-3-2 Harmonic Current Emissions	Pass	3	
IEC / EN 61000-3-3 Voltage Fluctuations and Flicker	Pass	4	

NOTES:
[1] Not applicable, EUT contains no test port.

6 EMC Modifications

No modifications were carried out during the test programme.

7 Equipment Under Test (EUT) and Test Specific Information

7.1 EUT Identification

Name:	NEC MultiSync® M751 IGB
Model Number:	M751 IGB
Serial Number:	31000194DB
Build Level / Revision:	Prototype
Software Revision:	Prototype

7.1.1 Auxiliary Equipment

No auxiliary equipment was part of the system under test.

7.2 EUT Cable / Port Identification

Port Type		*Cable Description*	*Part Number (If applicable)*	*Outdoor Cable Y / N*	*Test Length*	*Max. Installation Length*
1	AC Power Input	Unscreened 3 core	N/A	N	1.8 m	1.8 m
2	USB-B	Screened multicore	N/A	N	3 m	< 3 m
3	HDMI In 1	Screened multicore	N/A	N	3 m	< 3 m

Note: All other ports were left unterminated at the request of U-Touch Poland Sp. z o.o.

7.3 Associated Equipment

The following equipment was not part of the system under test but needed to exercise and/or monitor the EUT during the testing.

[1]

Name:	Lenovo Laptop
Model Number:	B50-80
Serial Number:	MP103NJL
Brief Description:	Support laptop for monitoring the EUT touch screen function

7.4 EUT Description

The EUT is a touch screen display designed for use with NEC monitors.

7.5 EUT Intended Installation / Use Environment

The EUT is intended for operation in a light industrial / residential environment, examples include: houses, shops and business premises, cinemas, sports centres, workshops and laboratories.

7.6 EUT Operating Modes

7.6.1 Emissions Operating Mode 1 – HDMI 1 (4k) mode

The EUT was powered from a 230 Vac / 50 Hz mains supply. The HDMI In 1 and USB-B ports were connected to a support laptop running 'touchCount' test software. The test software communicated with the EUT via the USB-B port and was used to verify correct operation of the EUT by showing a number '1' on the laptop screen every time the EUT touch screen was touched with the test pen. A number '0' was displayed when the test pen was not in contact with the EUT touch screen. The test software also displayed a dot on the laptop screen at the point where the test pen made contact with the EUT touchscreen. Any image shown on the support laptop screen was displayed on the EUT screen via the HDMI In 1 port. The test pen was then attached to a moving test finger which set the test pen to touch the EUT touch screen once every 3 seconds.

7.6.2 Emissions Operating Mode 2 – Compute Module mode

The EUT was powered from a 230 Vac / 50 Hz mains supply and was running 'touchCount' test software. The test software was used to verify correct operation of the EUT by showing a number '1' on the EUT touch screen every time the EUT touch screen was touched with the test pen. A number '0' was displayed when the test pen was not in contact with the EUT touch screen. The test software also displayed a dot on the EUT touch screen at the point where the test pen made contact with the EUT touchscreen. The test pen was then attached to a moving test finger which set the test pen to touch the EUT touch screen once every 3 seconds.

7.6.3 Emissions Operating Mode 3 – HDMI 2 (4k) mode

The EUT was powered from a 230 Vac / 50 Hz mains supply. The HDMI In 2 and USB-B ports were connected to a support laptop running 'touchCount' test software. The test software communicated with the EUT via the USB-B port and was used to verify correct operation of the EUT by showing a number '1' on the laptop screen every time the EUT touch screen was touched with the test pen. A number '0' was displayed when the test pen was not in contact with the EUT touch screen. The test software also displayed a dot on the laptop screen at the point where the test pen made contact with the EUT touchscreen. Any image shown on the support laptop screen was displayed on the EUT screen via the HDMI In 1 port. The test pen was then attached to a moving test finger which set the test pen to touch the EUT touch screen once every 3 seconds.

7.6.4 Immunity Operating Mode – HDMI 1 (4k) mode

The EUT was powered from a 230 Vac / 50 Hz mains supply. The HDMI In 1 and USB-B ports were connected to a support laptop running 'touchCount' test software. The test software communicated with the EUT via the USB-B port and was used to verify correct operation of the EUT by showing a number '1' on the laptop screen every time the EUT touch screen was touched with the test pen. A number '0' was displayed when the test pen was not in contact with the EUT touch screen. The test software also displayed a dot on the laptop screen at the point where the test pen made contact with the EUT touchscreen. Any image shown on the support laptop screen was displayed on the EUT screen via the HDMI In 1 port. The test pen was then attached to a moving test finger which set the test pen to touch the EUT touch screen once every 3 seconds.

7.7 EUT Immunity Testing Pass / Fail Criteria

The following EUT specific pass / fail criteria have been provided / discussed with the customer and enables a determination of compliance with the selected standard when the criteria are met.

Transient specific criteria apply to the following tests, if undertaken:

IEC / EN 61000-4-2 Electrostatic Discharge
IEC / EN 61000-4-4 Electrical Fast Transient / Burst Immunity Test
IEC / EN 61000-4-5 Voltage Surge Immunity Test

Continuous criteria apply to the following tests, if undertaken:

IEC / EN 61000-4-3 Radiated RF Immunity test
IEC / EN 61000-4-6 Conducted RF Immunity test

7.7.1 Transient Performance Criteria

During the test the number on the laptop screen and EUT touch screen shall continue to correctly change from ‘0’ to ‘1’ once every 3 seconds. The dot displayed on the laptop screen and EUT touch screen shall continue to correctly show the point of contact between the test pen and EUT touch screen once every 3 seconds.

7.7.2 Continuous Performance Criteria

During the test the number on the laptop screen and EUT touch screen may cease to correctly change from ‘0’ to ‘1’ once every 3 seconds and the dot displayed on the laptop screen and EUT touch screen may cease to correctly show the point of contact between the test pen and EUT touchscreen once every 3 seconds providing correct operation resumes upon completion of the test.

7.7.3 Criteria for Voltage Dips and Interruptions

[1] Short duration dips

During the test the number on the laptop screen and EUT touch screen shall continue to correctly change from ‘0’ to ‘1’ once every 3 seconds. The dot displayed on the laptop screen and EUT touch screen shall continue to correctly show the point of contact between the test pen and EUT touch screen once every 3 seconds.

[2] 5s Interruption

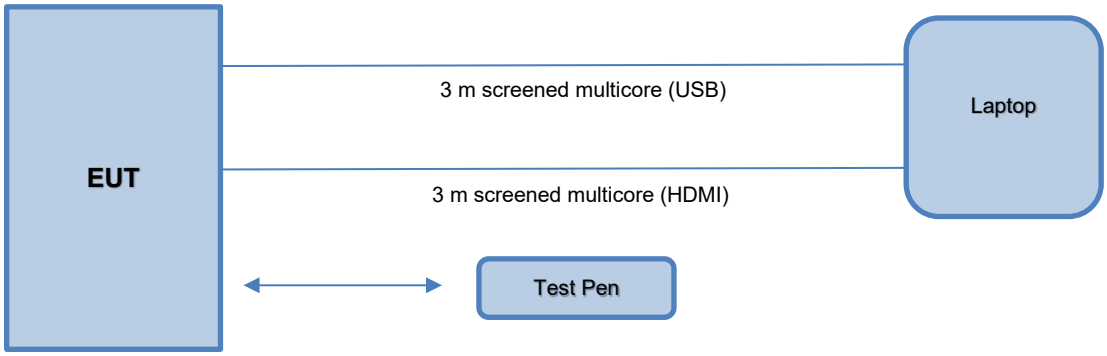
During the test the EUT may power down and all functions may be lost. All functions should be recoverable upon completion of the test.

7.8 EUT Monitoring

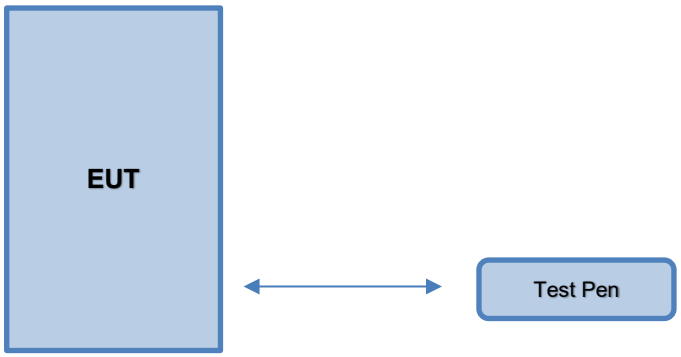
During testing the support laptop screen and EUT touch screen were observed for correct operation.

7.9 EUT Block Diagrams

HDMI 1 (4k) mode



Compute Module mode



7.10 EUT Selection Configuration and Loading

The EUT had only one configuration. All ports were terminated and exercised in accordance with the manufacturer's instructions.

8 IEC / EN 61000-4-2 Electrostatic Discharge

8.1 Test Purpose

This test simulates human body static discharge that equipment may be subject to. The test also includes discharges that may occur in the vicinity of the equipment thereby setting up a rapidly fluctuating short-term electric field.

8.2 Test Parameters

Test Chamber:	Hull Lab 17
Test Standard:	IEC 61000-4-2 / EN 61000-4-2
Energy Storage Capacitor	150 pF
Discharge Resistance	330 Ω
Output Voltage	Up to 8 kV – Contact Discharge Up to 15 kV – Air Discharge
Operating Mode:	Immunity operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass
Performance Criteria:	Criteria for transient phenomena, defined in section 7.7

8.3 Environmental Conditions

Testing will only be carried out (unless otherwise stated so in this section) if the following environmental conditions are met:

Ambient temperature in the range 15°C to 35°C
Relative humidity in the range 30% to 60%
Atmospheric pressure in the range 860 mbar to 1060 mbar

8.3.1 Actual Conditions

Temperature:	20°C
Humidity:	50%RH
Atmospheric Pressure:	1010mbar

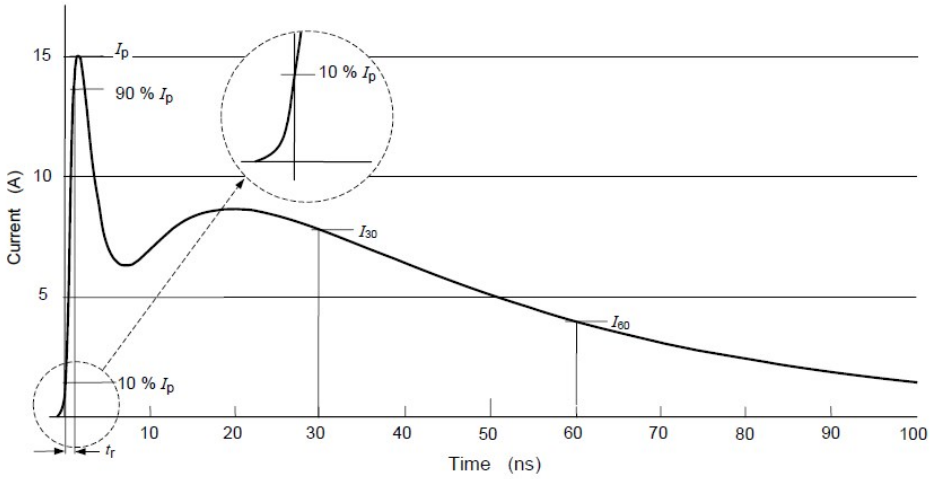
8.4 Electrostatic Discharge Pulse Parameters

The Electrostatic Pulse is a high voltage, low current pulse applied to the equipment in one of three methods;

- Direct contact discharges applied to accessible conductive surfaces
- Indirect contact discharges applied to adjacent coupling planes
- Direct air discharges applied to non-conductive surfaces and general non-metallic enclosures.

Each applied pulse consists of a rise time of between 0.7 ns and 1 ns with an initial peak current for the 2 kV, 4 kV, 6 kV & 8 kV of 7.5 A, 15 A, 22.5 A & 30 A respectively.

The ideal waveform for a 4 kV discharge is detailed below.



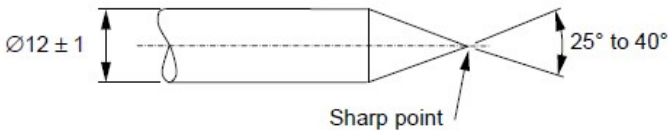
8.5 Test Method (Contact Discharge)

With the equipment set up as defined in IEC / EN 61000-4-2, contact discharges were applied to the horizontal and vertical coupling planes then directly to the conductive surfaces of the equipment in a sequential manner. Discharges are applied initially at a rate of 1 per second to determine susceptibility, then longer periods are applied to determine if a system failure has occurred.

Metallic surfaces declared by the manufacturer to have an insulated coating are treated as air discharge points.

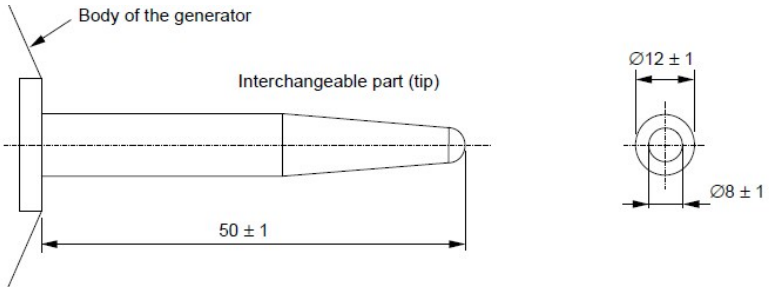
Where an EUT is defined as a class II apparatus then contact points will be connected to ground using two 470 kΩ resistors to provide a leakage path to ground to prevent charge build up.

The contact discharge electrode is as defined below;



8.6 Test Method (Air Discharge)

With the equipment set up as defined in IEC / EN 61000-4-2, air discharges were applied to all normally accessible non-conductive surfaces. The electrode as defined below was charged to the test voltage then as fast as possible (without causing mechanical damage) perpendicularly presented to the test points as defined in the following table in turn.



8.7 Test Levels and Discharge Application

The following test voltages were used for contact and air discharge:

Air Discharge	±2 kV	☒	Contact Discharge	±2 kV	☒
	±4 kV	☒		±4 kV	☒
	±6 kV	☐		±6 kV	☐
	±8 kV	☒		±8 kV	☐
	±15 kV	☐			
	N/A	☐			

☒ A minimum of ten discharges at each polarity and at each test voltage were applied.

☐ A minimum of 50 discharges at each point with a minimum of 4 test points as per EN 55024:2010 Section 4.2.1(a) where applied.

8.8 Test Equipment

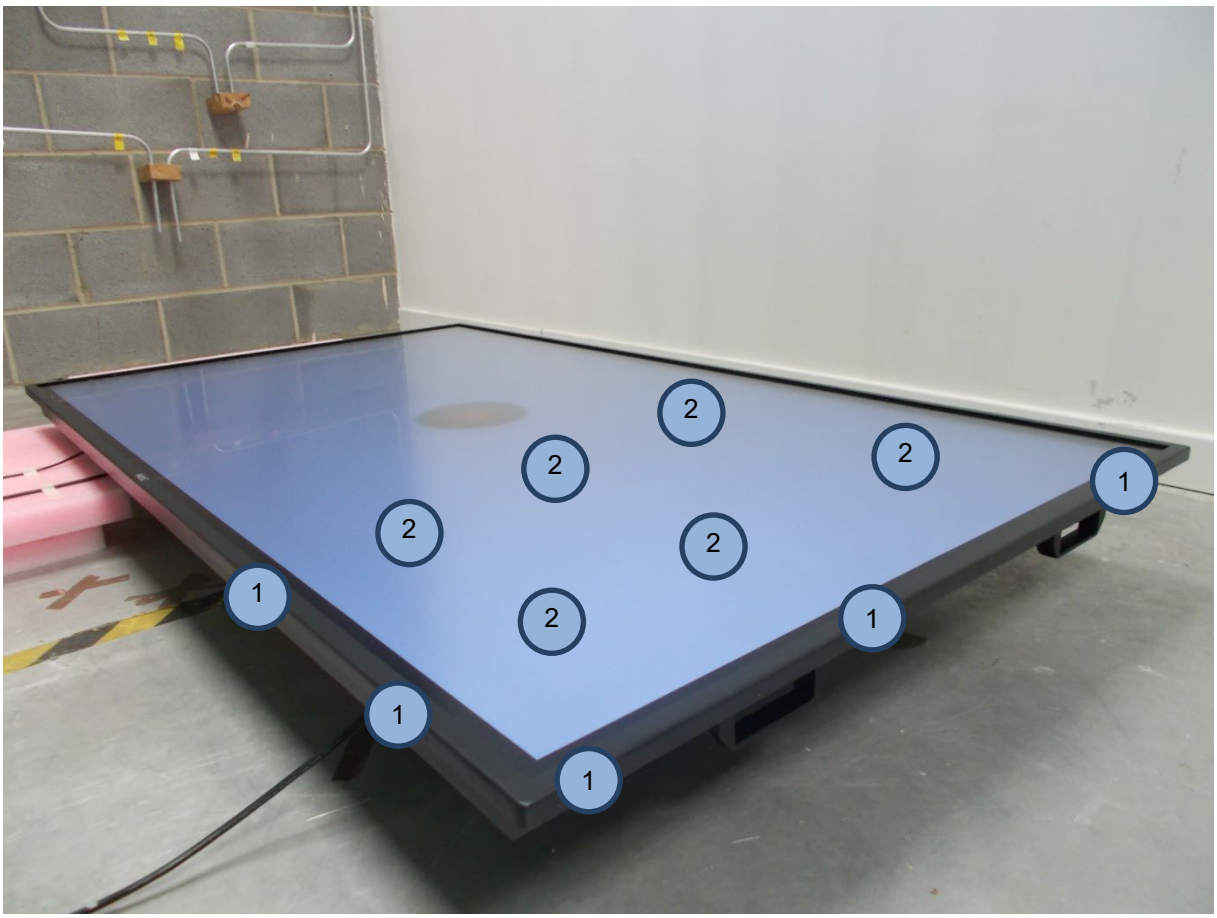
Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
ESD Gun	Schaffner	NSG435	1865	H273
VCP	Element	-	-	H735
Screened Room	Element	Lab 17	-	H717

8.9 EUT Test Results

8.9.1 Initial test equipment checks

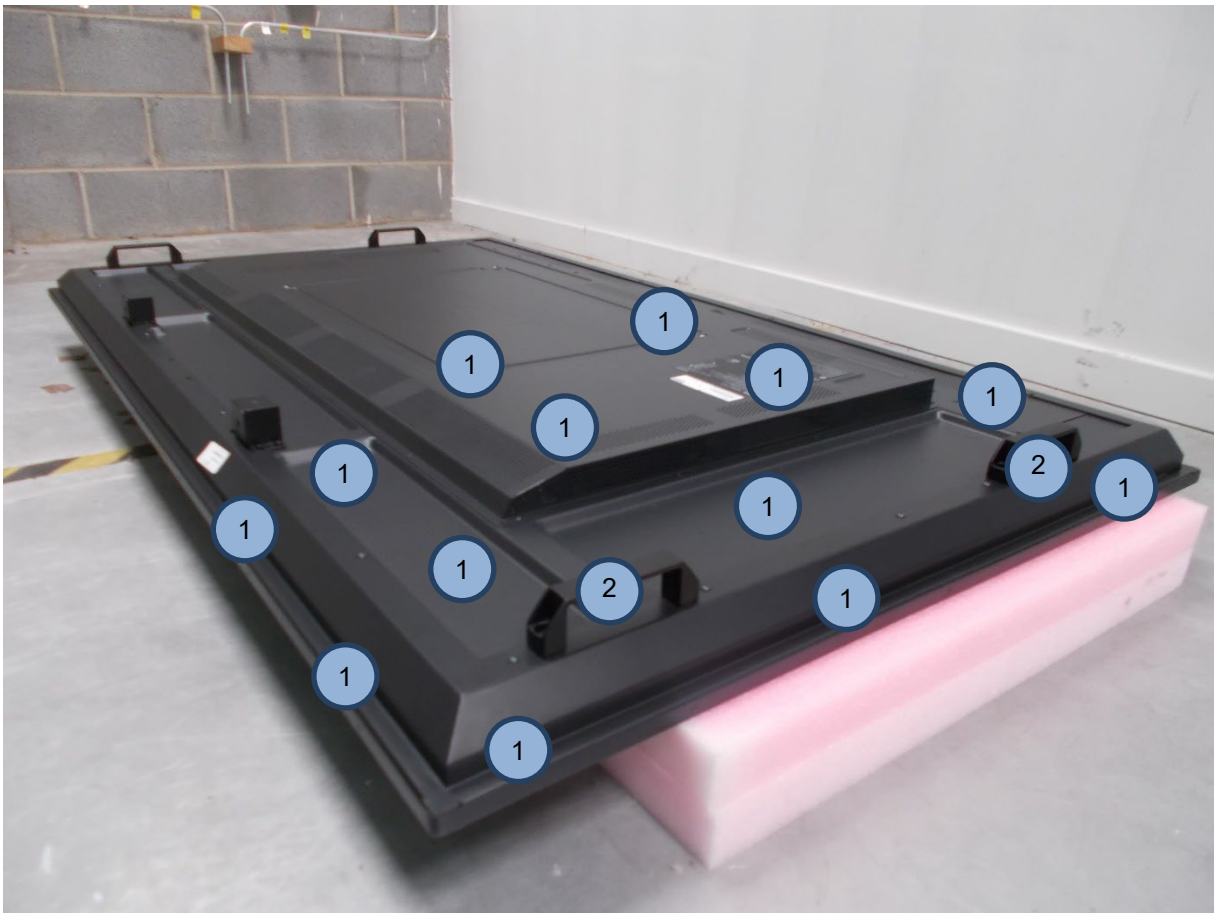
Check	*Result*
ESD generator pulse verification	Pass

8.9.2 M751

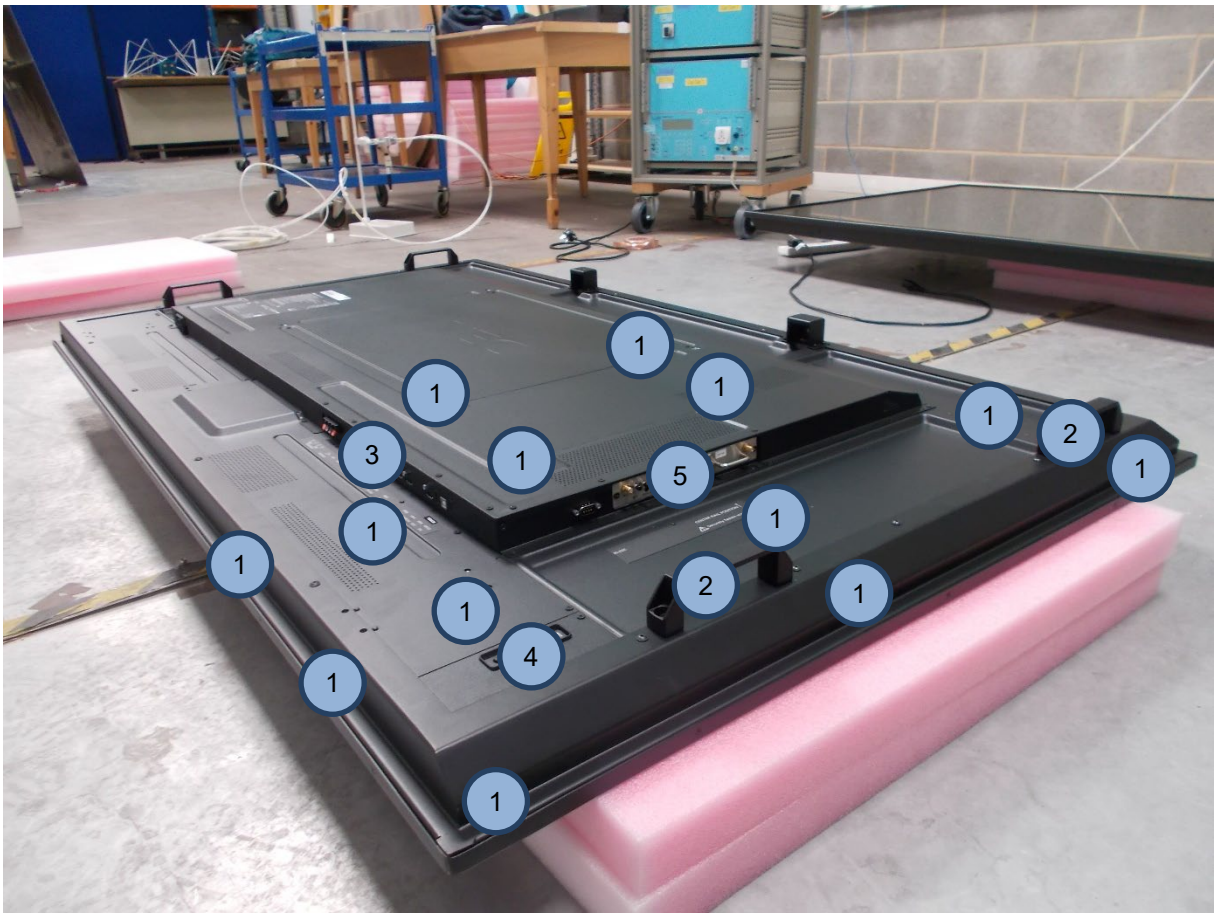


	EUT Test Points	*Discharge Type*	*Test Result*	*Notes*
1	Case	Contact	Pass	
2	Screen	Air	Pass	

	EUT Test Points	*Discharge Type*	*Test Result*	*Notes*
1	Case	Contact	Pass	
2	Screen	Air	Pass	

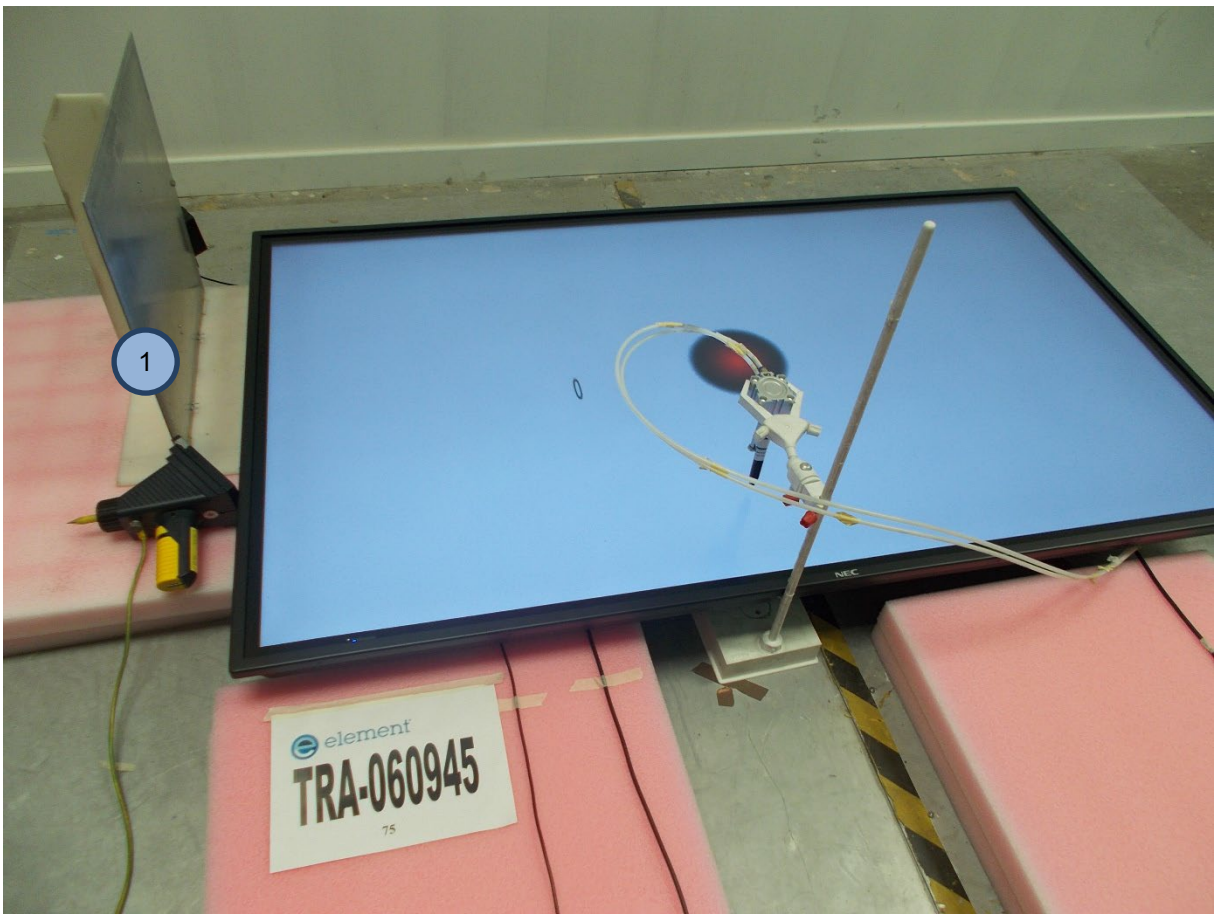


	EUT Test Points	*Discharge Type*	*Test Result*	*Notes*
1	Case	Contact	Pass	
2	Handle	Contact	Pass	



	EUT Test Points	*Discharge Type*	*Test Result*	*Notes*
1	Case	Contact	Pass	
2	Handle	Contact	Pass	
3	Connector shells	Contact	Pass	
4	Control panel	Air	Pass	
5	Slot in PC panel	Contact	Pass	

8.9.3 Vertical Coupling Plane



	EUT Test Points	***Discharge Type***	***Test Result***	***Notes***
1	VCP x all 4 sides	Contact	Pass	

9 IEC / EN 61000-4-3 Radiated RF Immunity Test

9.1 Test Purpose

This test simulates the threat imposed by operating the equipment in the vicinity of intentional transmitters both fixed and mobile.

The specification calls up a uniform field test area, Element meet the field uniformity requirements set out in IEC / EN 61000-4-3 in the frequency range 80 MHz to 6 GHz.

No corrections to the selected test levels below were made to factor the uncertainty budget for this test, as instructed by the reference standard, hence field strength is as reported.

9.2 Test Parameters

Test Chamber:	Hull Lab 6
Test Standard:	IEC / EN 61000-4-3
Frequency Range:	80 MHz to 1 GHz
Spot Frequencies (GHz):	0.08, 1, 1.6, 2.6, 3.5 and 5
Modulation Type 1:	Amplitude modulation (AM) Depth: 80% Sine wave signal: 1 kHz
Application Method:	Free field antenna
Frequency Step Increment:	1 %
Dwell Time per momentary Frequency:	3 seconds
Number of EUT Faces Tested:	4 Faces
Operating Mode:	Immunity operating mode 1 as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass
Acceptable Performance Criteria:	Criteria for continuous phenomena, defined in section 7.7

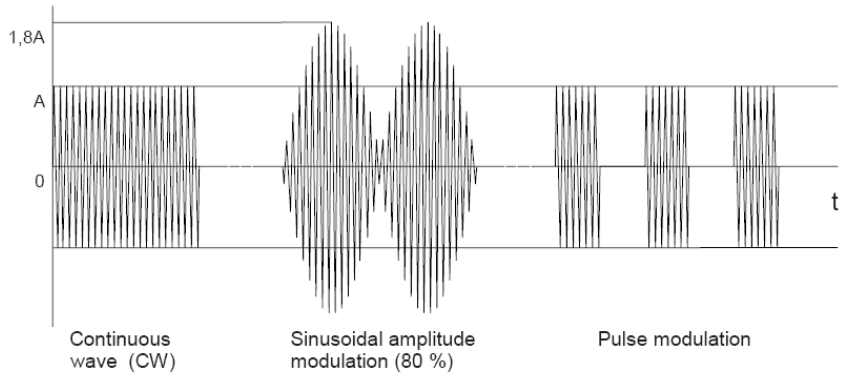
9.3 Environmental Conditions

Temperature:	20°C
Humidity:	50% RH

Limits: No specific environmental conditions exist for this test. The specification prohibits testing if humidity is so high as to cause condensation on the EUT.

9.4 Modulation Parameters

The modulation scheme(s) selected by the product specification are to simulate actual threats from transmitters. These schemes are illustrated in the following diagrams:



Key

A = The signal amplitude needed to obtain the required CW field strength (10 V/m r.m.s.)

9.5 Test Levels

The test field strength columns below give values of the unmodulated carrier signal. For testing of equipment, this carrier signal modulated with a signal as detailed in the product specification.

Frequency Range	***Test level***				
	1 V/m	***3 V/m***	***10 V/m***	***20 V/m***	***Other***
80 MHz to 1 GHz		X			
Spot Frequencies		X			

9.6 Test Method

Before testing the intensity of the calibrated field strength was checked to verify that the test equipment / system is operating properly. The test field was then generated using the values obtained from the calibration.
The EUT is initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the uniformed field area (unless partial illumination is being applied).
The frequency ranges to be considered were swept incrementally, with the signal modulated according to product specification, pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. The step size shall not exceed 1 % of the preceding frequency value.
The dwell time of the modulated carrier at each frequency was considered based the time necessary for the EUT to be exercised and to respond.
The test was performed with the generating antenna facing each side of the EUT. When equipment can be used in different orientations (i.e. vertical or horizontal) all sides were exposed to the field during the test.
The polarization of the field generated by each antenna required testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

9.7 Test Equipment

Type of Equipment	Maker/Supplier	Model Number	Serial Number	Element Number
Signal Generator	Agilent	EXG N5171B	MY53050700	H698
Amplifier	Amplifier Research	250W1000A	0326726	H644
Amplifier	TMD	PTS9612	17402	H700
Directional Coupler	Narda	3020A	40816	H379
30 dB Attenuator	Sematron UK	LWS-2-30	-	H396
RF Power Meter	Amplifier Research	PM2002	305887	H380
Bi-Log Antenna	Schaffner	CBL6140A	1058	H648
DRG Horn Antenna	EMCO	3115	9303-4027	H130
Semi-Anechoic Chamber	Ray Proof	Lab 6	-	H706

9.8 Test Results

9.8.1 Initial test equipment checks

Check	Result
Calibrated field presence	Pass

9.8.2 Testing

Orientation: Antenna toward front face of EUT

Antenna polarization: Vertical

Applicable	Test Frequency	Test Level	Modulation	Result	Notes
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward front face of EUT

Antenna polarization: Horizontal

Applicable	Test Frequency	Test Level	Modulation	Result	Notes
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward right hand side of EUT

Antenna polarization: Vertical

Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward right hand side of EUT

Antenna polarization: Horizontal

Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward left hand side of EUT

Antenna polarization: Vertical

Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward left hand side of EUT

Antenna polarization: Horizontal

Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward rear face of EUT

Antenna polarization: Vertical

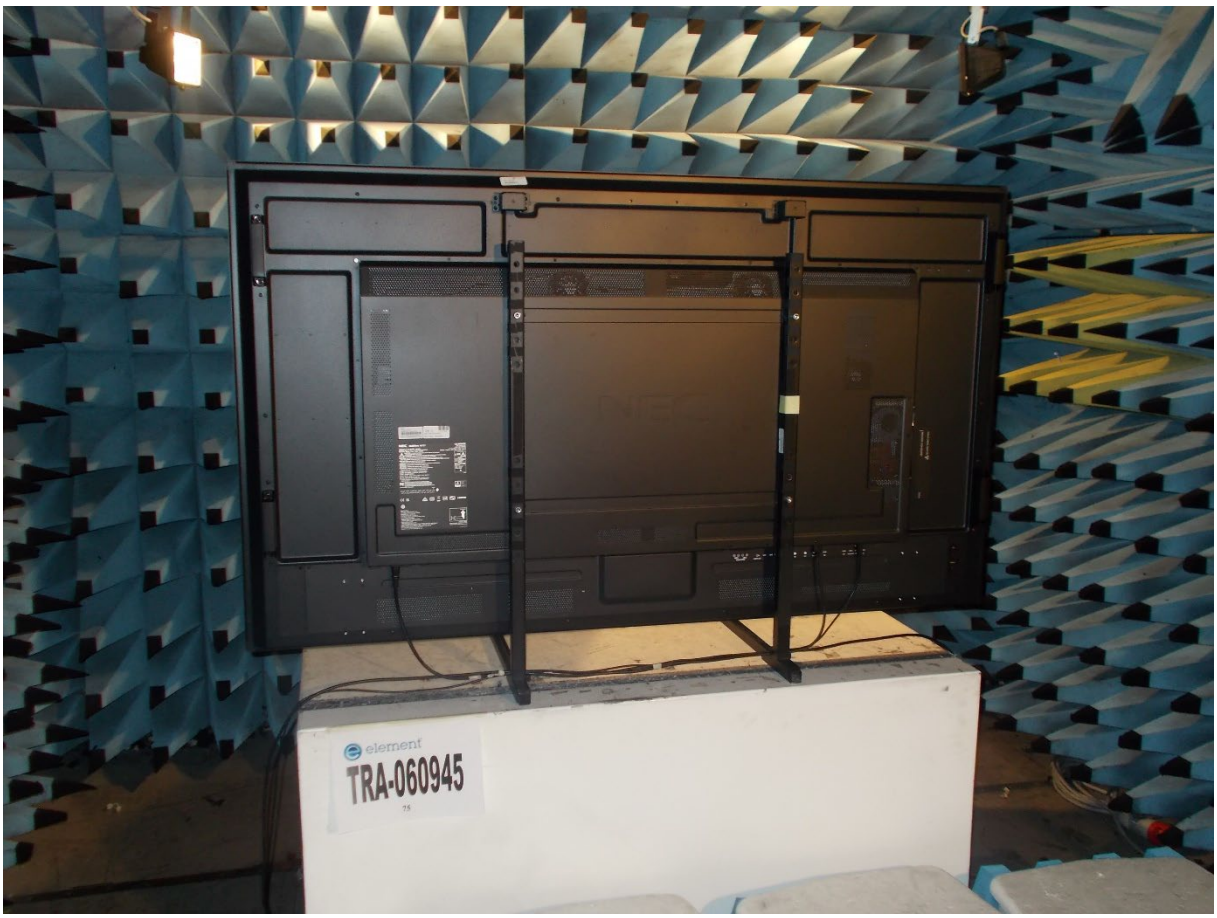
Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

Orientation: Antenna toward rear face of EUT

Antenna polarization: Horizontal

Applicable	*Test Frequency*	*Test Level*	*Modulation*	*Result*	*Notes*
☒	80 MHz to 1 GHz	3 V/m	1	Pass	
☒	Spot Frequencies	3 V/m	1	Pass	

9.9 Test Photograph



10 IEC / EN 61000-4-4 Electrical Fast Transient/Burst Immunity Test

10.1 Test Purpose

This test evaluates the ability of equipment to repetitive electrical fast transients that can be present on supply, signal, control and earth ports. Transients of this nature are typically caused by inductive load switching with a level of up to 4 kV.

10.2 Test Parameters

Test Chamber:	Hull Lab 17
Test Standard:	IEC / EN 61000-4-4
Power Lines Tested:	AC Power Input
Signal Lines Tested:	None
Application Method:	Direct Application Via CDN
Burst Frequency:	5 kHz
Dwell Time:	1 minute per test level per line application
Applied Polarity:	Positive and Negative
Operating Mode:	Immunity operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass
Performance criteria:	Criteria for transient phenomena, defined in section 7.7

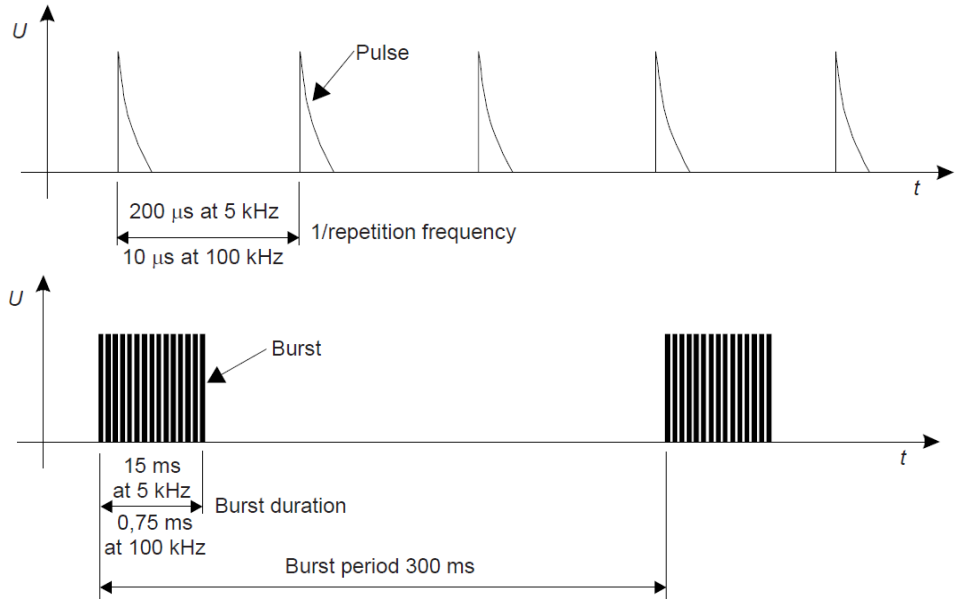
10.3 Environmental Conditions

Temperature:	20°C
Humidity:	50%RH

Limits: No specific environmental conditions exist for this test. The specification prohibits testing if humidity is so high as to cause condensation on the EUT.

10.4 Transient Pulse Parameters

The transient pulse is a complex waveform consisting of a 15 ms (5 kHz repetitive spikes) or 0.75 ms (100 kHz repetitive spikes) bursts of noise repeated every 300 ms. This noise consists of a fast-transient pulse, 5 ns Rise time, 50 ns duration with a repetition of either 5 kHz or 100 kHz. This covered in the following diagrams:



10.5 Test Levels and Transient Application

Unless specified, application of the transient pulse for Mains and dc supply lines uses the test generator CDN. Application of the transient pulse for signal lines uses the capacitive clamp method.

For mains and dc lines, the transient pulse was applied to all individual conductors simultaneously. Live, Neutral and Earth (or Live and Neutral for Class II equipment) for mains and Positive and Negative supply for dc equipment.

AC Supply Line	±0.5 kV	☒	DC Supply Line	±0.5 kV	☐
	±1 kV	☒		±1 kV	☐
	±2 kV	☐		±2 kV	☐
	±4 kV	☐		±4 kV	☐
	Not Applicable	☐		Not Applicable	☒

Signal Lines	±0.5 kV	☐
	±1 kV	☐
	±2 kV	☐
	±4 kV	☐
	Not Applicable	☒

10.6 Test Method (Mains and DC Lines)

With the EUT setup as per section 11 of EN 61000-4-4, transients were applied to the selected cable at the voltage levels defined above using the transient generator CDN (Coupling Decoupling Network). The transient application was applied to all conductors within the line under test simultaneously for a period of 1 minute per voltage level per polarity.

10.7 Test Method (Signal Lines)

With the EUT setup as per section 11 of EN 61000-4-4, the cable under test was passed through the capacitive clamp with the transient generator connection side of the clamp being closest to the EUT end of the cable. The cable under test was passed through the clamp and the transient application was applied to all conductors within the line under test simultaneously for a period of 1 minute per voltage level per polarity.

10.8 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Transient Generator	EMC Partners	Transient 2000	925	H639
Screened Room	Element	Lab 17	-	H717

10.9 Test Results

10.9.1 Initial test equipment checks

Check	*Result*
EFT/B Present at CDN Output	Pass

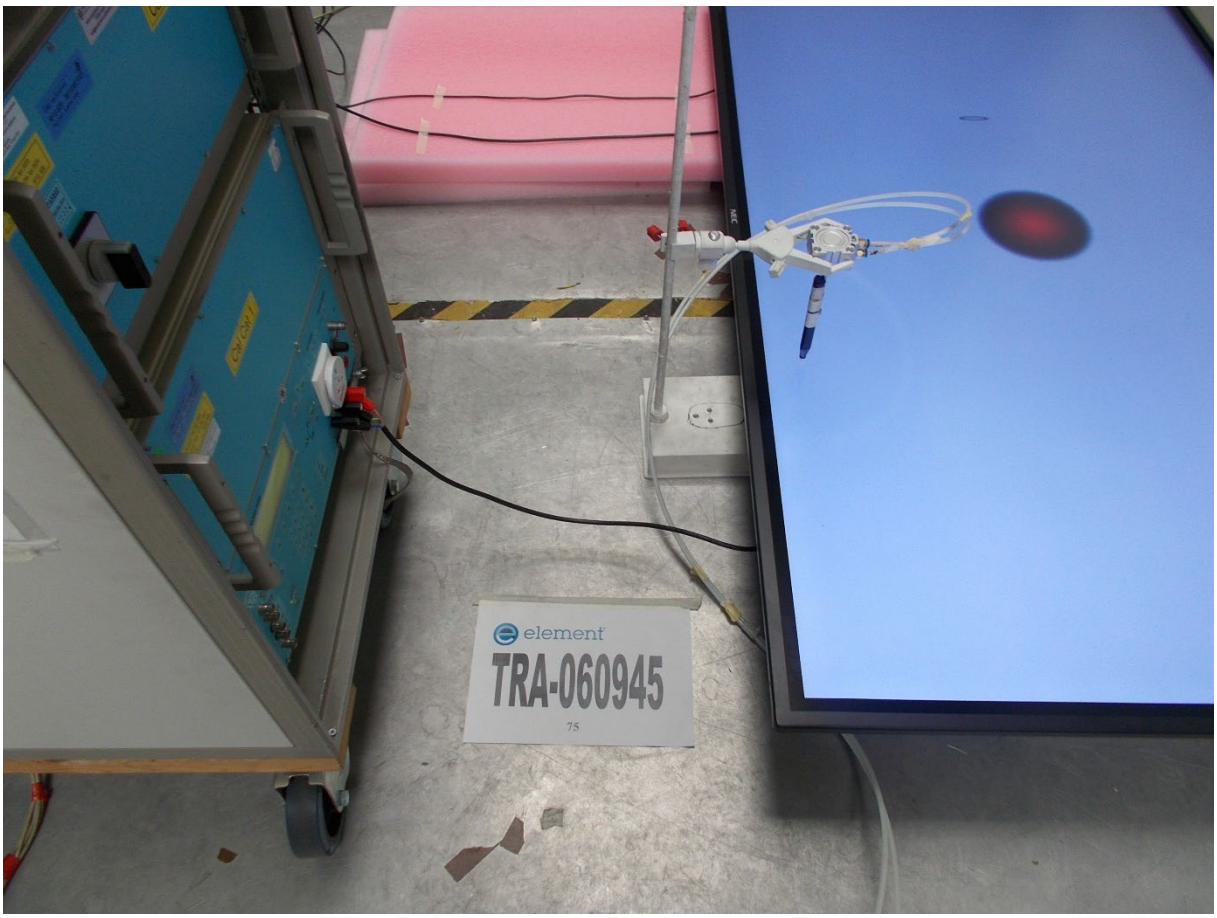
10.9.2 Testing

Line Under Test: AC Power Input

Test Duration: 1 Minute

Test Level	*Result*	*Notes*
+0.5 kV	Pass	
-0.5 kV	Pass	
+1 kV	Pass	
-1 kV	Pass	

10.10 Test Photograph



11 IEC / EN 61000-4-5 Surge Immunity Test

11.1 Test Purpose

This test evaluates the ability of equipment to unidirectional surges caused by over-voltages from switching and lightning transients that can be present on supply, signal, control and earth ports.

11.2 Test Parameters

Test Chamber:	Hull Lab 17
Test Standard:	IEC / EN 61000-4-5
Power Lines Tested:	AC Power Input
Signal Lines Tested:	None
Application Method:	Common Mode Mains 12 Ω / 9 µF Differential Mode Mains 2 Ω / 18 µF Signal Line CDN 42 Ω Per Line (1.2 µs/50 µs) Signal Line CDN 40 Ω Per Line (10 µs/700 µs)
Equipment Earth Classification:	Earthed, common mode tests applicable
Waveform Type:	1.2 µs // 50 µs (8 µs // 20 µs)
Application:	5 discharges per polarity per applied voltage
Applied Polarity:	Positive and Negative
Mains Synchronisation:	0º, 90º, 180º, 270º
Time Interval Between Discharges:	30 Seconds
Operating Mode:	Immunity operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass
Performance Criteria:	Criteria for transient tests, defined in section 7.7

11.3 Environmental Conditions

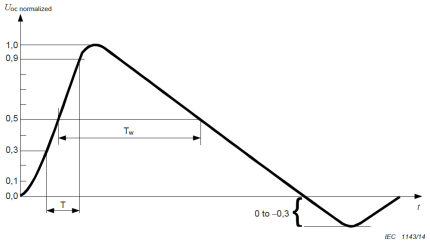
Temperature:	20°C
Humidity:	50% RH

Limits: No specific environmental conditions exist for this test. The specification prohibits testing if humidity is so high as to cause condensation on the EUT.

11.4 Transient Pulse Parameters

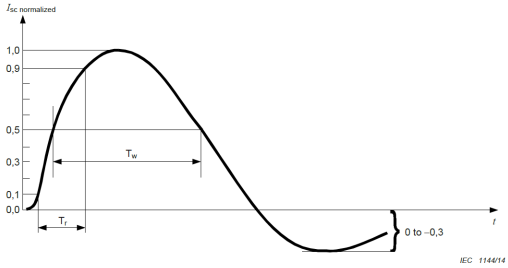
Transient parameters are shown overleaf. The waveform parameters are defined for both open circuit and short circuit conditions. These are as follows:

[1] 1.2 µs / 50 µs Open circuit voltage waveform, 8 µs / 20 µs Short circuit current waveform
[2] 10 µs / 700 µs Open circuit voltage waveform, 5 µs / 320 µs Short circuit current waveform



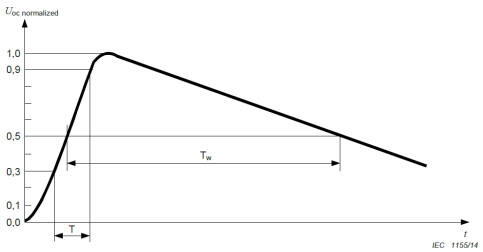
Front time: $T_f = 1{,}67 \times T = 1{,}2\ \mu s \pm 30\ \%$
Duration: $T_d = T_w = 50\ \mu s \pm 20\ \%$

1.2 µs / 50 µs Open circuit voltage waveform



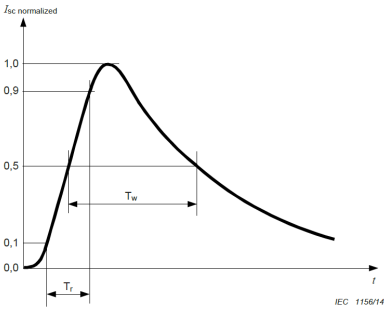
Front time: $T_f = 1{,}25 \times T_r = 8\ \mu s \pm 20\ \%$
Duration: $T_d = 1{,}18 \times T_w = 20\ \mu s \pm 20\ \%$

8 µs / 20 µs Short circuit current waveform



Front time: $T_f = 1{,}67 \times T = 10\ \mu s \pm 30\ \%$
Duration: $T_d = T_w = 700\ \mu s \pm 20\ \%$

10 µs / 700 µs Open circuit voltage waveform



Front time: $T_f = 1{,}25 \times T_r = 5\ \mu s \pm 20\ \%$
Duration: $T_d = T_w = 320\ \mu s \pm 20\ \%$

5 µs / 320 µs Short circuit current waveform

11.5 Test Levels and Transient Application

Common mode application of the pulse is on a single line with respect to earth. For single phase mains this is L-E and N-E.

Differential mode application of the pulse is on a pair lines with the return path being one of the pair. For single phase mains this is L-N.

AC Supply Line – Common Mode	±0.5 kV	☒	AC Supply Line – Differential Mode	±0.5 kV	☒
	±1 kV	☒		±1 kV	☒
	±2 kV	☒		±2 kV	☐
	±4 kV	☐		±4 kV	☐
	Not Applicable	☐		Not Applicable	☐
DC Supply Line – Common Mode	±0.5 kV	☐	DC Supply Line – Differential Mode	±0.5 kV	☐
	±1 kV	☐		±1 kV	☐
	±2 kV	☐		±2 kV	☐
	±4 kV	☐		±4 kV	☐
	Not Applicable	☒		Not Applicable	☒
Signal / Control Lines (1.2 µs/50 µs)	±0.5 kV	☐	Signal / Control Lines (10 µs/700 µs)	±0.5 kV	☐
	±1 kV	☐		±1 kV	☐
	±2 kV	☐		±2 kV	☐
	±4 kV	☐		±4 kV	☐
	Not Applicable	☒		Not Applicable	☒

11.6 Test Method (Mains and DC Lines)

With the equipment set up as either 10 cm insulated support from the ground reference plane or 80 cm insulated support from the ground reference plane. The surges were applied via the generator CDN to provide a coupling impedance of 12 Ω for common mode or 2 Ω for differential mode application. 5 surges were applied at each polarity, voltage level and phase angle.
30 second surge application interval was used for this test unless otherwise stated in the result section.

11.7 Test Method (Signal Lines)

With the equipment set up as either 10 cm insulated support from the ground reference plane or 80cm insulated support from the ground reference plane. The surges were applied via the generator CDN to provide a coupling impedance of 40 Ω for the 10 µs/700 µs surges and 42 Ω for the 1.2 µs/50 µs surges. 5 surges were applied with a time between surges of one minute.
For shielded signal lines the application of the surge was direct via the shielded connection of the cable using the 2 Ω source impedance of the generator. For signal cables that are shielded but only terminated at one end, the cable is treated as an un-shielded cable.
30 second surge application interval was used for this test unless otherwise stated in the result section.

11.8 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Transient Generator	EMC Partners	Transient 2000	925	H639
Screened Room	Element	Lab 17	-	H717

11.9 Test Results

11.9.1 Initial test equipment checks

Check	*Result*
Open circuit surge output waveform	Pass

11.9.2 Testing

Mains Line, Common Mode:

Line Under Test: AC Power Input

Test application interval: 30 Seconds

Phase angles tested: 0º, 90º, 180º, 270º

Test Level	*Result*	*Notes*
+0.5 kV	Pass	L-E, N-E
-0.5 kV	Pass	L-E, N-E
+1 kV	Pass	L-E, N-E
-1 kV	Pass	L-E, N-E
+2 kV	Pass	L-E, N-E
-2 kV	Pass	L-E, N-E

Mains Line, Differential Mode:

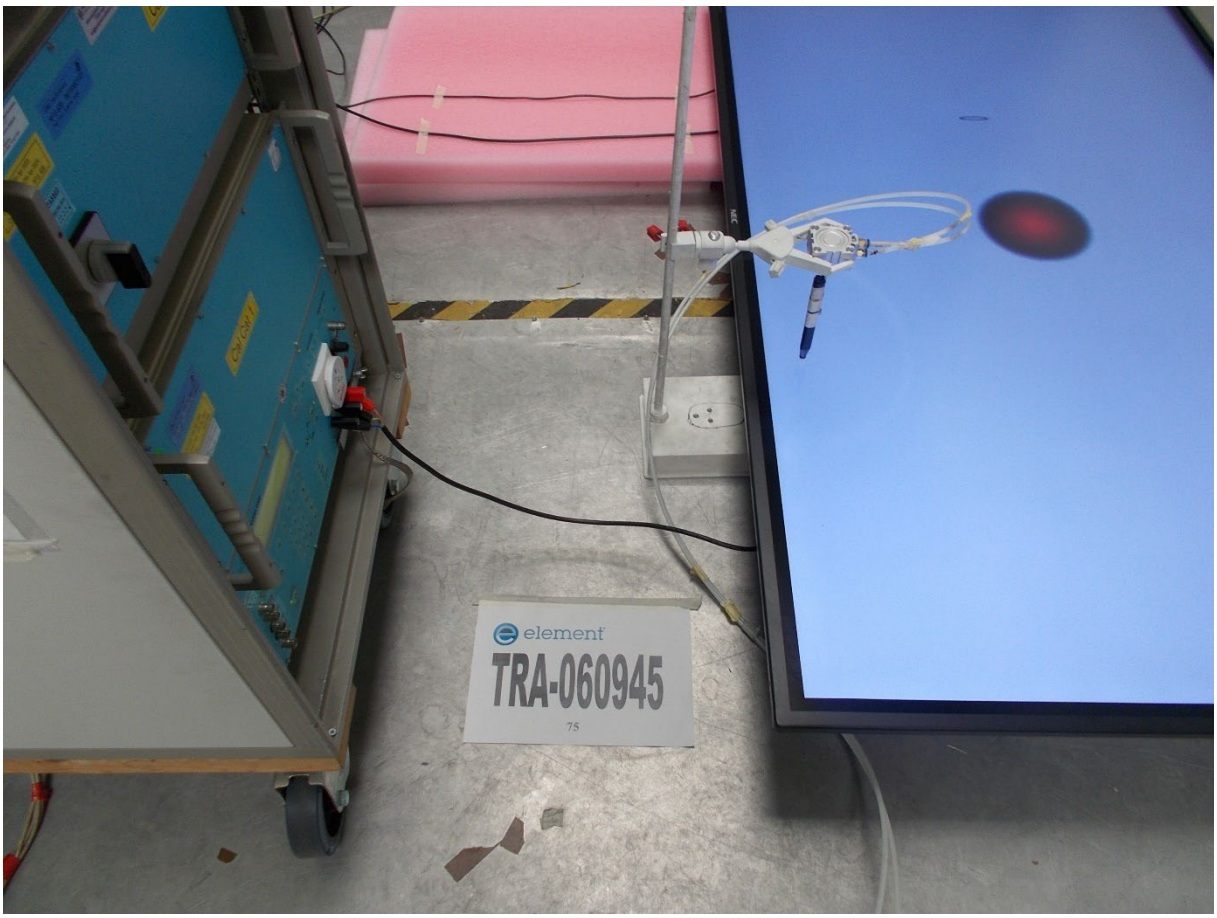
Line Under Test: AC Power Input

Test application interval: 30 Seconds

Phase angles tested: 0º, 90º, 180º, 270º

Test Level	*Result*	*Notes*
+0.5 kV	Pass	L-N
-0.5 kV	Pass	L-N
+1 kV	Pass	L-N
-1 kV	Pass	L-N

11.10 Test Photograph



12 IEC / EN 61000-4-6 Conducted RF Immunity Test

12.1 Test Purpose

This test simulates the threat imposed by operating the equipment in the vicinity of intentional transmitters both fixed and mobile. It simulates the main coupling method for longer wavelengths (3.75 m to 2 km / 3 m to 2 km / 1.3 m to 2 km) that couple onto cables that interface with the EUT.
Three coupling methods are used depending upon the type of cable under test:

- Coupling / Decoupling Network (CDN)
- EM Clamp
- Current Clamp

No corrections to the selected test levels below were made to factor the uncertainty budget for this test, as instructed by the reference standard, hence field strength is as reported.
The test setup used complies with all the dimension requirements set out in IEC / EN 61000-4-6

12.2 Test Parameters

Test Chamber:	Hull Lab 17
Test Standard:	IEC / EN 61000-4-6
Power Lines Tested:	AC Power Input
Signal Lines Tested:	None
Application Method:	Direct coupling via CDN
Frequency Range:	150 kHz to 80 MHz
Spot Frequencies:	80 MHz
Modulation Type 1:	Amplitude modulation (AM) Depth: 80 % Sine wave signal: 1 kHz
Modulation Type 2:	Not Applicable
Frequency Step Increment:	1 %
Dwell Time per momentary Frequency:	3 seconds
Operating Mode:	Immunity operating mode as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass
Acceptable Performance Criteria:	Criteria for continuous phenomena, defined in section 7.7

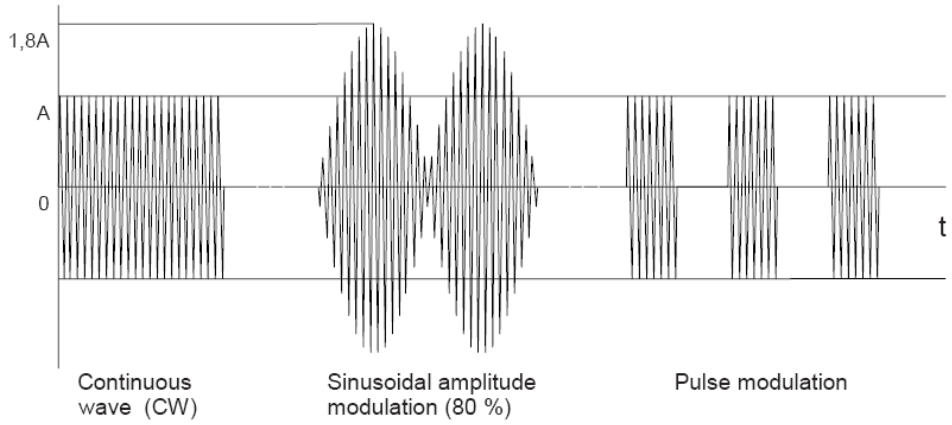
12.3 Environmental Conditions

Temperature:	20°C
Humidity:	50%RH

Limits: No specific environmental conditions exist for this test. The specification prohibits testing if humidity is so high as to cause condensation on the EUT.

12.4 Modulation Parameters

The modulation scheme(s) selected by the product specification to simulate actual threats from transmitters. These schemes are illustrated in the following diagrams:



12.5 Test Levels

The test field strength columns below give values of the unmodulated carrier signal. For testing of equipment, this carrier signal modulated with a signal as detailed in the product specification.

Frequency Range	***Test level***			
	1 Vrms	***3 Vrms***	***10 Vrms***	***Other***
150 kHz to 80 MHz		X		
Spot Frequencies		X		

12.6 Test Method

Before testing the intensity of the calibrated test level was checked to verify that the test equipment/system is operating properly. The test level was then generated using the values obtained from the calibration.

The test was performed with the test generator connected to each of the coupling devices (CDN, EM clamp, current clamp) in turn. All other cables not under test were either disconnected (when functionally allowed) or provided with decoupling networks or unterminated CDNs only, excluding the reference CDN which was 50 Ω terminated on the RF port.

The frequency ranges to be considered were swept incrementally, with the signal modulated according to product specification, pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. The step size shall not exceed 1 % of the preceding frequency value.

The dwell time of the modulated carrier at each frequency was considered based the time necessary for the EUT to be exercised and to respond.

12.7 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Signal Generator	Rohde & Schwarz	SMG	883744/070	H016
Amplifier	Amplifier Research	150L	9937	H119
Dual Directional Coupler	Amplifier Research	DDC/ARH/1/01	11526	H108
Power Meter and Head	Amplifier Research	PM2002	301553	H381
Coupling Decoupling Network	MEB	M3-801/6	10239	H187
Screened Room	Element	Lab 17	-	H717

12.8 Test Results

12.8.1 Initial test equipment checks

Check	*Result*
CDN level presence	Pass

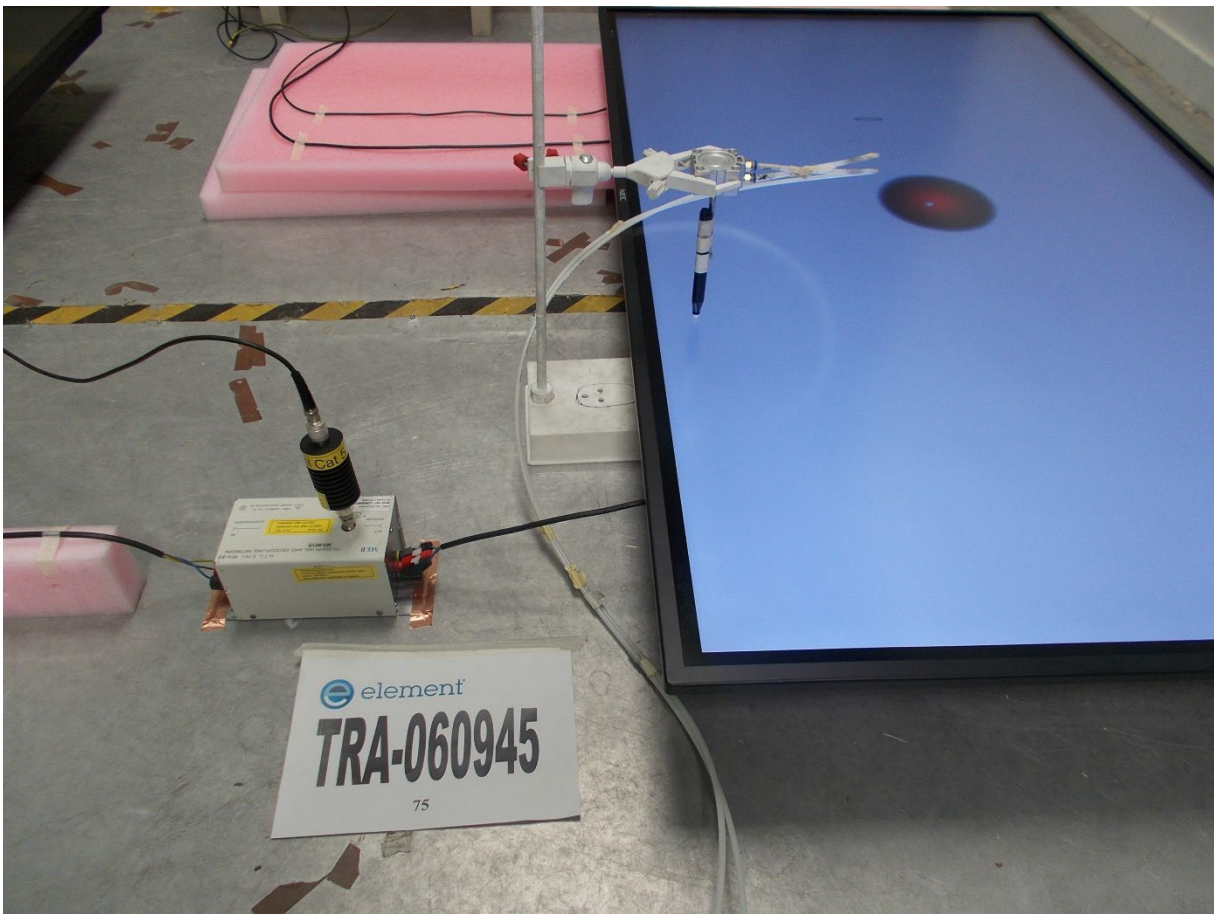
12.8.2 Testing

Line Under Test: AC Power Input

Application Method: Direct Coupling via CDN (Coupling/decoupling Network)

Test Level	*Result*	*Notes*
3 Vrms	Pass	

12.9 Test Photograph



13 IEC / EN 61000-4-11 - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

13.1 Test Purpose

This test simulates short duration dips and interruptions that the equipment may be subjected to when connected to the public utility supply.

Voltage dips and short interruptions are caused by faults in the network, primarily short circuits in installations or by sudden large changes of load. In certain cases, two or more consecutive dips or interruptions may occur. Voltage variations are caused by continuously varying loads connected to the network.

The test setup used follows the guidance set out in IEC / EN 61000-4-11, the test generator is UKAS calibrated and meets the technical requirements stated in IEC / EN 61000-4-11.

13.2 Test Parameters

Test Chamber:	Hull Lab 17
Test Standard:	IEC / EN 61000-4-11
Power Lines Tested:	AC Power Input
Reduction Repetition Rate:	10 seconds
Operating Mode:	Immunity operating mode as defined in section 7.6
Acceptable Performance Criteria	Refer to individual test results
Single / 3 Phase Port	Single Phase (L, N, E)
Deviations from Standard:	None
Test Result:	Pass
Performance criteria	Criteria for voltage dips, defined in section 7.7

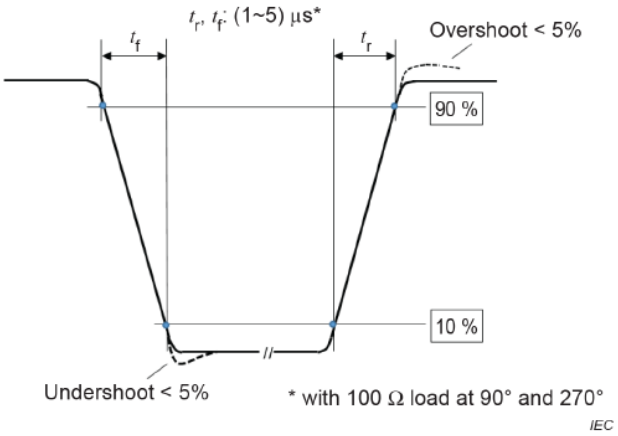
13.3 Environmental Conditions

Temperature:	20°C
Humidity:	50%RH

Limits: No specific environmental conditions exist for this test. The specification prohibits testing if humidity is so high as to cause condensation on the EUT.

13.4 Voltage Dips and Short Interruptions Parameters

The voltage dips and short interruptions consist of a change in voltage from U_T to the required voltage level in an abrupt manor (1 µs to 5 µs voltage rise / fall time). Occurring on the 0 degree of the ac cycle except when voltage dips and interrupts of less than one cycle of the ac mains voltage are required.



Representation of a Voltage Dip

13.5 Test Application and Levels

For the voltage dips test of single-phase systems, the test is applied once.

For the voltage dips test of three-phase systems with neutral, each individual voltage (phase-to-neutral and phase-to-phase) shall be tested, one at a time.

For the voltage dips test of three-phase systems without neutral, each phase-to-phase voltage shall be tested, one at a time.

Phase Shift:	0°
Reduction Repetition Rate:	10 seconds
Number of Reductions/Interruptions:	3
Reduction:	100 % dip for 10 ms / 0.5 cycles
	30 % dip for 500 ms / 25 cycles
Interruption:	100% interruption for 5000 ms / 250 Cycles

13.6 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Transient Generator	EMC Partners	Transient 2000	925	H639
Screened Room	Element	Lab 17	-	H717

13.7 Test Results

13.7.1 Initial test equipment checks

Check	*Result*
Interruption Duration	Pass

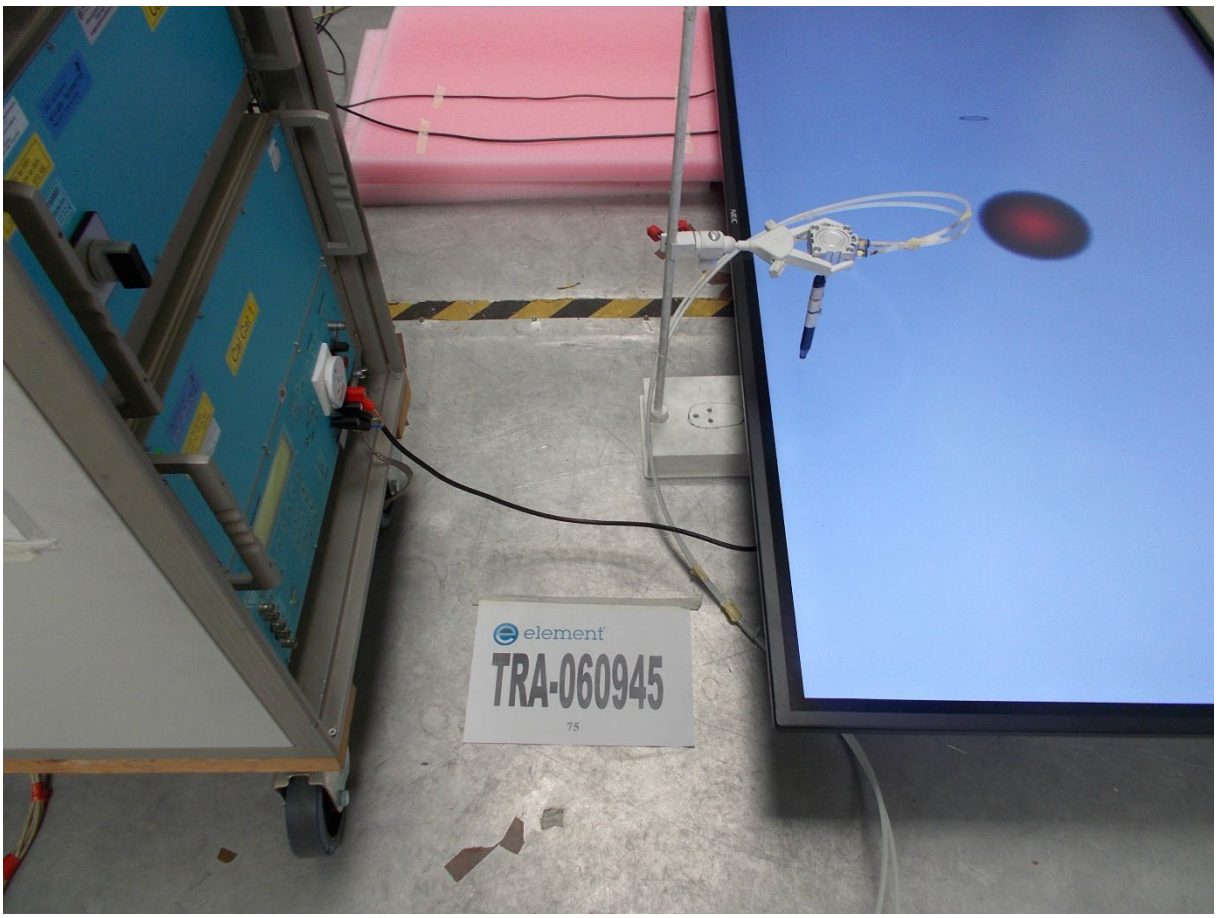
13.7.2 Testing

Line Under Test: AC Power Input

Dips Parameter	*Result*	*Notes*
100 % dip for 10 ms / 0.5 cycles	Pass	
30 % dip for 500 ms / 25 cycles	Pass	

Interruption Parameter	*Result*	*Notes*
100% reduction for 5000 ms	Pass	During the test the EUT powered down and all functions were lost. All functions were recoverable upon completion of the test.

13.8 Test Photograph



14 CISPR 32 / EN 55032 Conducted Emissions Power Port

14.1 Test Purpose

This test measures conducted noise that may be present on an EUT's power supply cable. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT. Specifically, but not limited to Long Wave and Medium Wave broadcast.

14.2 Test Parameters

Test Chamber:	Hull Lab 10
Test Standard:	CISPR 32 / EN 55032
Power Lines Tested:	AC Power Input
EUT Classification:	B
Frequency Range:	150 kHz to 30 MHz
Frequency Step Size:	4.5 kHz (150 kHz - 30 MHz)
Measurement Bandwidth:	9 kHz (150 kHz - 30 MHz)
Detectors:	Peak (Pre-scan) Quasi-peak (Final Measurements) CISPR Average (Final Measurements)
Quasi-peak Detector Dwell:	Minimum 2 s per frequency point
LISN Type:	CISPR 16
EUT Measurement Height:	0.8 m Insulated Support (Table)
EUT Operation Voltage:	230 Vac
EUT Operating Frequency:	50 Hz
Operating Mode:	Emissions operating mode 1 as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass

14.3 Environmental Conditions

Temperature:	20°C
Humidity:	50% RH

Limits: No specific environmental conditions exist for this test.

14.4 Test Limits

14.4.1 Class B

Detector	*Frequency Range*	*Limit*
Quasi-Peak	150 kHz to 500 kHz 500 kHz to 5 MHz 5 MHz to 30 MHz	66 dBµV to 56 dBµV* 56 dBµV 60 dBµV
Average	150 kHz to 500 kHz 500 kHz to 5 MHz 5 MHz to 30 MHz	56 dBµV to 46 dBµV* 46 dBµV 50 dBµV
*Decreasing Linearly with the logarithm of frequency		

14.5 Test Method

The test setup used complies with all the dimension requirements set out in CISPR 32 / EN 55032CLASS B. Measurement instrumentation used meets the requirements of CISPR 16-4-2 and expanded laboratory uncertainties U_{lab} are less than or equal to U_{cispr} Table 1. Therefore, no compensation is required to the actual measured level in determining compliance with the applied limit.

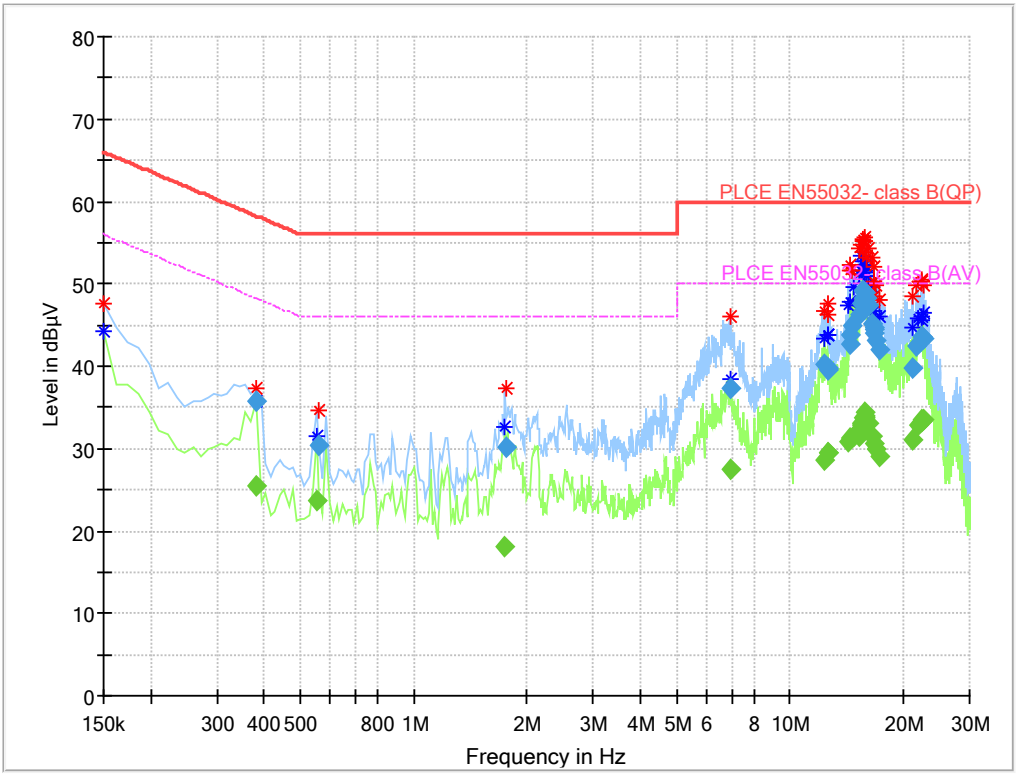
With the EUT setup as shown in the typical setup diagram, in Section 7, EUT block diagram. The test frequency range was scanned under computer control using a Line Impedance Stabilisation Network (LISN) as a measurement transducer.

14.6 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Receiver/Analyser	Rohde & Schwarz	ESU40	100005	H701
LISN	Rohde & Schwarz	ESH3-Z5	838576/002	H189
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	H680

14.7 Test Results

14.7.1 Conducted Emissions Test Data



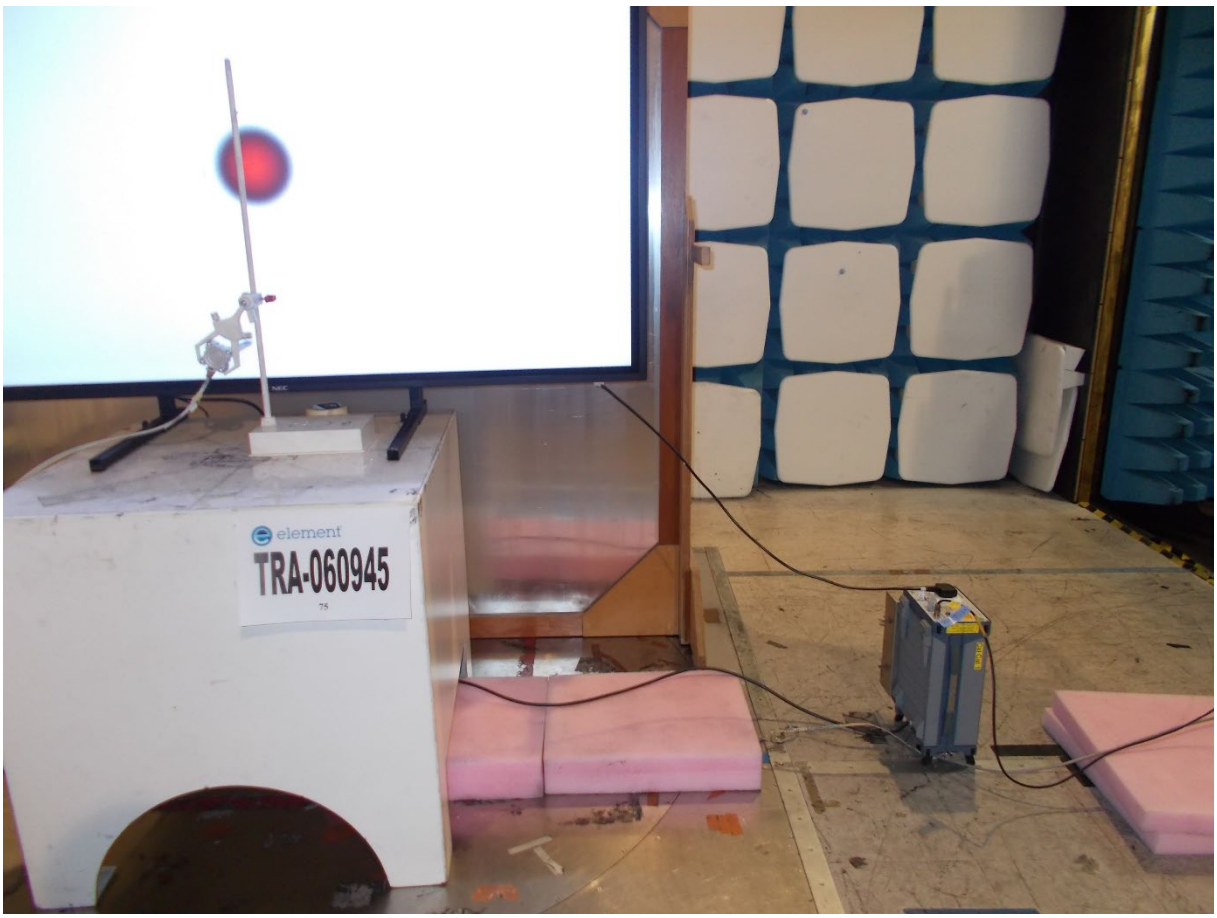
The above plot shows some formal measurements that are significantly below the preview peak hold. These emissions were manually investigated for a minimum time period of 60seconds. During this time period the emissions were found to occur at a time interval of less than once in a 15 second period and therefore considered transient in nature as per the guidelines in CISPR16-2-3 and are deemed a pass result.

The above plot is generated from combined live and neutral max hold Peak and Average detector preview scans. The blue markers are maximised Quasi-Peak detectors. The green markers are maximised Average detectors. Both are required for the formal assessment. The above emissions are listed in the following tables.

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.383075	35.68	58.21	22.54	15000.0	9.000	N	GND	9.9
0.558338	30.48	56.00	25.52	15000.0	9.000	N	GND	9.9
1.761188	30.08	56.00	25.92	15000.0	9.000	L1	GND	10.1
6.942813	37.32	60.00	22.68	15000.0	9.000	L1	GND	10.7
12.367338	40.25	60.00	19.75	15000.0	9.000	N	GND	11.1
12.556988	39.77	60.00	20.23	15000.0	9.000	N	GND	11.2
12.598325	39.47	60.00	20.53	15000.0	9.000	N	GND	11.2
14.383550	42.68	60.00	17.32	15000.0	9.000	L1	GND	11.3
14.520263	43.89	60.00	16.11	15000.0	9.000	N	GND	11.2
14.675675	44.85	60.00	15.15	15000.0	9.000	N	GND	11.2
15.254275	46.15	60.00	13.85	15000.0	9.000	N	GND	11.2
15.430763	47.54	60.00	12.46	15000.0	9.000	L1	GND	11.4
15.548088	48.29	60.00	11.71	15000.0	9.000	N	GND	11.3
15.651113	49.15	60.00	10.85	15000.0	9.000	N	GND	11.3
15.695275	49.11	60.00	10.89	15000.0	9.000	L1	GND	11.4
15.878713	48.90	60.00	11.10	15000.0	9.000	N	GND	11.3
16.027613	48.31	60.00	11.69	15000.0	9.000	N	GND	11.3
16.200000	47.36	60.00	12.64	15000.0	9.000	L1	GND	11.4
16.531888	45.06	60.00	14.94	15000.0	9.000	N	GND	11.3
16.620725	44.51	60.00	15.49	15000.0	9.000	N	GND	11.3
16.624763	44.79	60.00	15.21	15000.0	9.000	N	GND	11.3
16.730200	43.97	60.00	16.03	15000.0	9.000	N	GND	11.3
16.953038	43.13	60.00	16.87	15000.0	9.000	L1	GND	11.5
17.227363	41.95	60.00	18.05	15000.0	9.000	L1	GND	11.5
21.149663	39.86	60.00	20.14	15000.0	9.000	N	GND	11.5
21.753175	42.41	60.00	17.59	15000.0	9.000	L1	GND	11.7
22.306088	43.65	60.00	16.35	15000.0	9.000	L1	GND	11.8
22.440875	43.66	60.00	16.34	15000.0	9.000	L1	GND	11.8

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.383413	25.51	48.21	22.69	15000.0	9.000	N	GND	9.9
0.553388	23.73	46.00	22.27	15000.0	9.000	N	GND	9.9
1.738013	18.06	46.00	27.94	15000.0	9.000	L1	GND	10.1
6.943938	27.51	50.00	22.49	15000.0	9.000	L1	GND	10.7
12.354850	28.71	50.00	21.29	15000.0	9.000	N	GND	11.1
12.599563	29.53	50.00	20.47	15000.0	9.000	N	GND	11.2
14.352500	30.85	50.00	19.15	15000.0	9.000	L1	GND	11.3
14.491900	31.32	50.00	18.68	15000.0	9.000	N	GND	11.2
14.703138	31.41	50.00	18.59	15000.0	9.000	N	GND	11.2
15.244825	31.54	50.00	18.46	15000.0	9.000	N	GND	11.2
15.429188	32.74	50.00	17.26	15000.0	9.000	L1	GND	11.4
15.502825	32.97	50.00	17.03	15000.0	9.000	L1	GND	11.4
15.640875	33.75	50.00	16.25	15000.0	9.000	N	GND	11.3
15.733538	34.01	50.00	15.99	15000.0	9.000	L1	GND	11.4
15.768363	34.33	50.00	15.67	15000.0	9.000	L1	GND	11.4
15.855763	33.72	50.00	16.28	15000.0	9.000	N	GND	11.3
16.063388	33.16	50.00	16.84	15000.0	9.000	N	GND	11.3
16.186150	33.01	50.00	16.99	15000.0	9.000	L1	GND	11.4
16.521413	31.53	50.00	18.47	15000.0	9.000	L1	GND	11.4
16.777138	30.56	50.00	19.44	15000.0	9.000	L1	GND	11.5
16.932225	29.97	50.00	20.03	15000.0	9.000	L1	GND	11.5
17.218250	29.09	50.00	20.91	15000.0	9.000	L1	GND	11.5
21.148763	30.96	50.00	19.04	15000.0	9.000	N	GND	11.5
21.796825	32.75	50.00	17.25	15000.0	9.000	L1	GND	11.7
22.343600	33.36	50.00	16.64	15000.0	9.000	N	GND	11.6
22.421850	33.56	50.00	16.44	15000.0	9.000	N	GND	11.6
22.582200	33.51	50.00	16.49	15000.0	9.000	L1	GND	11.8

14.8 Test Photograph



15 CISPR 32 / EN 55032 Radiated Emissions E-Field

15.1 Test Purpose

This test measures radiated electromagnetic emissions that may emanate from EUT enclosures and cables. This test ensures the protection of broadcast and telecommunication services used in the vicinity of the EUT.

15.2 Test Parameters

Test Chamber:	Hull Lab 10
Test Standard:	CISPR 32 / EN 55032
EUT Classification:	Class B
Highest EUT Clock Frequency Used / Generated:	1000 MHz
Frequency Range:	30 MHz to 1 GHz 1 GHz to 6 GHz
Measurement Bandwidth:	120 kHz (≤1 GHz) 1 MHz (≥1 GHz)
Video Bandwidth:	1 MHz (≤1 GHz) 3 MHz (≥1 GHz)
Detectors:	Peak (≤1 GHz scan / ≥1 GHz Final Measurements) Average (≥1 GHz Final Measurements) Quasi-peak (≤1 GHz Final Measurements)
Quasi-peak Detector Dwell:	Minimum 2 s per frequency point
EUT Measurement Height:	0.8 m Insulated Support (Table)
EUT Operation Voltage:	230 Vac
EUT Operating Frequency:	50 Hz
Operating Mode:	Emissions operating mode1 (< 1 GHz) and Mode 2 (> 1 GHz) as defined in section 7.6
Deviations From Standard:	None
Test Result:	Pass

15.3 Environmental Conditions

Temperature:	20°C
Humidity:	50% RH

Limits: No specific environmental conditions exist for this test.

15.4 Test Limits

Limits shown below are applied up to the frequency listed in the test parameters section.

15.4.1 Class B 30 MHz to 6 GHz

Detector	*Frequency Range*	*Limit at 3 m*
Quasi-Peak	30 MHz to 230 MHz 230 MHz to 1 GHz	40 dBµV/m 47 dBµV/m
Peak	1 GHz to 3 GHz 3 GHz to 6 GHz	70 dBµV/m 74 dBµV/m
Average	1 GHz to 3 GHz 3 GHz to 6 GHz	50 dBµV/m 54 dBµV/m

15.5 Test Method

The test setup used complies with all the dimension requirements set out in CISPR 32 / EN 55032. Measurement instrumentation used meets the requirements of CISPR 16-4-2 and expanded laboratory uncertainties U_{lab} are less than or equal to U_{cispr} Table 1. Therefore, no compensation is required to the actual measured level in determining compliance with the applied limit.

With the EUT setup as shown in the typical setup diagram, in Section 7, EUT block diagram. The test frequency range was scanned under computer control using an antenna as a measurement transducer.

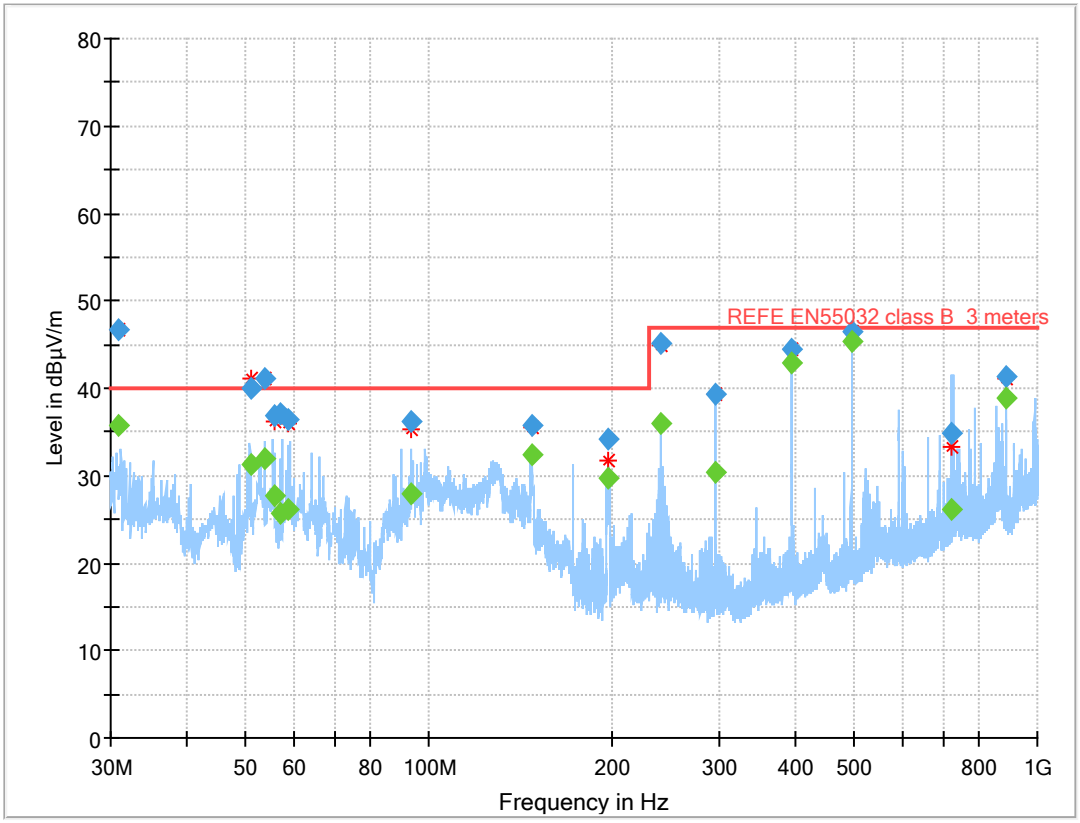
An initial scan is carried out in order to establish a frequency list that is attributable to the EUT. Any emissions measurements that fall within 10 dBµV/m of the limit line are then maximised by rotating the equipment through 360° and raising/lowering the antenna through 1 to 4 m height for each frequency of interest.

15.6 Test Equipment

Type of Equipment	*Maker or Supplier*	*Model Number*	*Serial Number*	*Element Number*
Receiver/Analyser	Rohde & Schwarz	ESU40	100005	H701
Pre-Amplifier	Sonoma	11909A	186878	H673
Pre-Amplifier	Hewlett Packard	8449B	3008A00873	H307
Bi-Log Antenna	Teseq	CBL6111D	31217	H679
Log-P Antenna	Rohde & Schwarz	HL050	100463	H682
Lab 10 cable 1.2 m	Teledyne Reynolds	106	-	H643
Lab 10 cable 1.5 m	Teledyne Reynolds	106	-	H801
Lab 10 cable 7 m	Teledyne Reynolds	106	-	H2261
Lab 10 cable 1 m	Teledyne Reynolds	269-8006-1000	-	H746
Lab 10 cable 1 m	Teledyne Reynolds	106	-	H690
Semi-Anechoic Chamber	Panashield	Lab 10	-	H710

15.7 Test Results

15.7.1 Radiated Emissions E-Field Test Data – 30 MHz to 1 GHz – Mode 1

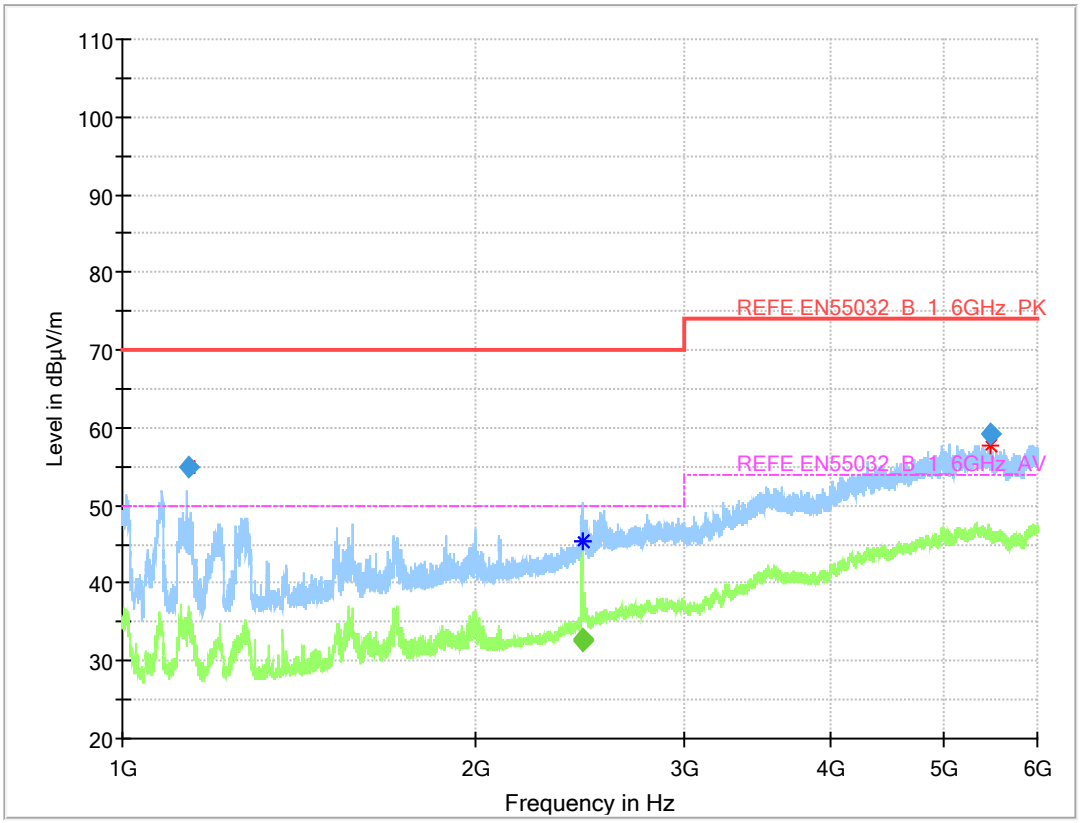


The above plot shows some formal measurements that are significantly below the preview peak hold. These emissions were manually investigated for a minimum time period of 60seconds. During this time period the emissions were found to occur at a time interval of less than once in a 15 second period and therefore considered transient in nature as per the guidelines in CISPR16-2-3 and are deemed a pass result.

The above plot is generated from a combined horizontal and vertical max hold Peak detector preview scan. The blue markers are maximised Peak detectors and are included for information only. The green markers are maximised Quasi-Peak detectors and are required for the formal assessment. The above emissions are listed in the following table.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.904013	35.74	40.00	4.26	15000.0	120.000	136.0	V	-10.0	-6.6
51.227480	31.37	40.00	8.63	15000.0	120.000	144.0	V	153.0	-17.0
53.573000	31.85	40.00	8.15	15000.0	120.000	170.0	V	1.0	-17.8
55.580840	27.66	40.00	12.34	15000.0	120.000	276.0	V	5.0	-18.5
57.107760	25.64	40.00	14.36	15000.0	120.000	100.0	V	5.0	-19.0
58.678533	26.06	40.00	13.94	15000.0	120.000	102.0	V	18.0	-19.5
93.308187	27.98	40.00	12.02	15000.0	120.000	171.0	V	-11.0	-15.1
147.255667	32.39	40.00	7.61	15000.0	120.000	110.0	H	39.0	-13.1
197.802147	29.78	40.00	10.22	15000.0	120.000	100.0	H	246.0	-15.4
239.986240	35.94	47.00	11.06	15000.0	120.000	102.0	H	256.0	-12.8
296.721333	30.34	47.00	16.66	15000.0	120.000	111.0	H	152.0	-11.3
395.613880	42.95	47.00	4.05	15000.0	120.000	98.0	H	330.0	-8.3
494.502653	45.39	47.00	1.61	15000.0	120.000	100.0	H	120.0	-6.1
724.282093	26.18	47.00	20.82	15000.0	120.000	106.0	H	260.0	-2.1
890.093893	38.99	47.00	8.01	15000.0	120.000	198.0	H	-2.0	-0.5

15.7.2 Radiated Emissions E-Field Test Data – 1 GHz to 6 GHz – Mode 2



The above plot shows some formal measurements that are significantly below the preview peak hold. These emissions were manually investigated for a minimum time period of 60seconds. During this time period the emissions were found to occur at a time interval of less than once in a 15 second period and therefore considered transient in nature as per the guidelines in CISPR16-2-3 and are deemed a pass result.

The above plot is generated from a combined horizontal and vertical max hold Peak detector and Average detector preview scan. The blue markers are maximised Peak detectors. The green markers are maximised Average detectors. Both are required for the formal assessment. The above emissions are listed in the following tables.

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1137.37400	54.84	70.00	15.16	15000.0	1000.000	166.0	H	260.0	-6.2
5474.60800	59.19	74.00	14.81	15000.0	1000.000	205.0	V	130.0	16.3

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2460.25000	32.51	50.00	17.49	15000.0	1000.000	200.0	H	229.0	2.8
2464.25000	32.87	50.00	17.13	15000.0	1000.000	200.0	H	229.0	2.8

15.8 Test Photographs

16 IEC / EN 61000-3-2 Harmonic Current Emissions

16.1 Test Purpose

This test measures deals with the limitation of harmonic currents injected into the public supply system.

This test is applicable to electronic/electrical equipment having an input current up to and including 16 A/phase and intended to be connected to the public low voltage distribution network of either 50 Hz or 60 Hz line frequency. There are no limits defined for equipment operating at a voltage less than 230 V.

16.2 Test Parameters

Test Chamber:	Lab 6
Test Standard:	IEC / EN 61000-3-2
Line Frequency:	50Hz
EUT Classification:	Class D
EUT Exemptions:	None
Measurement Duration:	5 Minutes (Defined by the 5% measurement repeatability)
Harmonic Current Repeatability:	+/- 5 % of the Applicable Limit
Operating Mode:	Emissions operating mode 1 as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass

16.3 Environmental Conditions

Temperature:	19°C
Humidity:	37% RH

Limits: No specific environmental conditions exist for this test.

16.4 Test Limit

Class D - Applicable To:

Equipment having a specified power according to 6.2.2 less than or equal to 600 W, of the following types:

• Personal computers and personal computer monitors
• Television Receivers
•

16.5 Test Method

The EUT was connected to a computer-controlled harmonics analyser. This provides an automated measurement of all harmonics up to the 40th over a time period that ensures a 5% repeatability is achieved on the measured results. In any case this measurement time is a minimum of 5 minutes.

16.6 Test Equipment

Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Harmonics & flicker Analyser	EM Test	DPA500N	P2109248818	H803
AC Power Source	EM Test	NETWAVE7	P2118251775	H804

16.7 Test Results

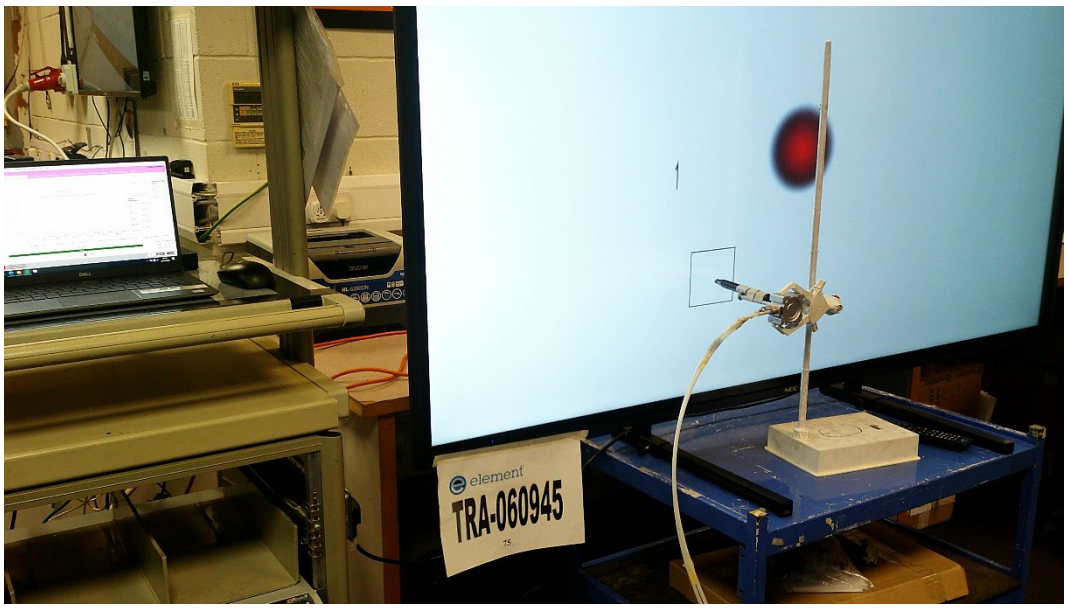
16.7.1 Harmonic Current Emissions Test Data

Average and Maximum harmonic current results									
Hn	Average				Maximum				Harmonic Result
	Ieff [A]	of Limit [%]	Limit [A]	Result	Ieff [A]	of Limit [%]	Limit [A]	Result	
1	0.865				0.873				
2	0.003				0.003				
3	0.251	38.778	0.648	PASS	0.253	26.043	0.972	PASS	PASS
4	0.002				0.003				
5	0.070	19.371	0.362	PASS	0.071	13.020	0.543	PASS	PASS
6	0.001				0.001				
7	0.015	7.863	0.191	PASS	0.015	5.303	0.286	PASS	PASS
8	0.001				0.001				
9	0.027	28.835	0.095	PASS	0.028	19.327	0.143	PASS	PASS
10	0.001				0.001				
11	0.025	37.876	0.067	PASS	0.025	25.390	0.100	PASS	PASS
12	0.001				0.001				
13	0.012	21.892	0.056	PASS	0.013	14.807	0.085	PASS	PASS
14	0.001				0.001				
15	0.013	27.545	0.049	PASS	0.014	18.568	0.073	PASS	PASS
16	0.001				0.001				
17	0.015	34.620	0.043	PASS	0.015	23.387	0.065	PASS	PASS
18	0.001				0.001				
19	0.010	26.048	0.039	PASS	0.010	17.737	0.058	PASS	PASS
20	0.001				0.001				
21	0.010	28.105	0.035	PASS	0.010	19.013	0.052	PASS	PASS
22	0.001				0.001				
23	0.011	33.331	0.032	PASS	0.011	22.466	0.048	PASS	PASS
24	0.001				0.001				
25	0.008	27.584	0.029	PASS	0.008	18.945	0.044	PASS	PASS
26	0.001				0.001				
27	0.008	27.845	0.027	PASS	0.008	19.044	0.041	PASS	PASS
28	0.001				0.001				
29	0.009	33.800	0.025	PASS	0.009	22.832	0.038	PASS	PASS
30	0.001				0.001				
31	0.007	29.680	0.024	PASS	0.007	20.130	0.036	PASS	PASS
32	0.001				0.001				
33	0.007	30.354	0.022	PASS	0.007	20.580	0.033	PASS	PASS
34	0.001				0.001				
35	0.008	36.373	0.021	PASS	0.008	24.461	0.031	PASS	PASS
36	0.001				0.001				
37	0.007	33.605	0.020	PASS	0.007	22.796	0.030	PASS	PASS
38	0.001				0.001				
39	0.006	33.635	0.019	PASS	0.006	22.868	0.028	PASS	PASS
40	0.001				0.001				

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Harmonic voltage results				
Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	229.886	99.950		
2	0.205	0.089	0.200	PASS
3	0.066	0.029	0.900	PASS
4	0.071	0.031	0.200	PASS
5	0.058	0.025	0.400	PASS
6	0.044	0.019	0.200	PASS
7	0.047	0.020	0.300	PASS
8	0.034	0.015	0.200	PASS
9	0.039	0.017	0.200	PASS
10	0.029	0.013	0.200	PASS
11	0.028	0.012	0.100	PASS
12	0.027	0.012	0.100	PASS
13	0.027	0.012	0.100	PASS
14	0.023	0.010	0.100	PASS
15	0.023	0.010	0.100	PASS
16	0.019	0.008	0.100	PASS
17	0.019	0.008	0.100	PASS
18	0.018	0.008	0.100	PASS
19	0.017	0.007	0.100	PASS
20	0.017	0.008	0.100	PASS
21	0.018	0.008	0.100	PASS
22	0.016	0.007	0.100	PASS
23	0.014	0.006	0.100	PASS
24	0.015	0.006	0.100	PASS
25	0.015	0.006	0.100	PASS
26	0.014	0.006	0.100	PASS
27	0.020	0.009	0.100	PASS
28	0.016	0.007	0.100	PASS
29	0.013	0.006	0.100	PASS
30	0.014	0.006	0.100	PASS
31	0.014	0.006	0.100	PASS
32	0.012	0.005	0.100	PASS
33	0.019	0.008	0.100	PASS
34	0.013	0.005	0.100	PASS
35	0.019	0.008	0.100	PASS
36	0.009	0.004	0.100	PASS
37	0.017	0.007	0.100	PASS
38	0.010	0.004	0.100	PASS
39	0.015	0.007	0.100	PASS
40	0.012	0.005	0.100	PASS

16.8 Test Photograph



17 IEC / EN 61000-3-3 Voltage Fluctuations and Flicker

17.1 Test Purpose

This test deals with the limitation voltage fluctuations and flicker impressed on the public supply system.

This test is applicable to electronic/electrical equipment having an input current up to and including 16 A/phase and intended to be connected to the public low voltage distribution network. There are no limits defined for equipment operating at a voltage less than 230 V or line frequency of 60 Hz.

17.2 Test Parameters

Test Chamber:	Lab 6
Test Standard:	IEC / EN 61000-3-3
Line Frequency:	50 Hz
EUT Exemptions:	None
EUT Measurement Height:	0.8 m
Flicker Measurement Duration:	(Pst) 10 minute measurement
D_{max} Limit	4%
Operating Mode:	Emissions operating mode 1 as defined in section 7.6
Deviations from Standard:	None
Test Result:	Pass

17.3 Environmental Conditions

Temperature:	19°C
Humidity:	37% RH

Limits: No specific environmental condition restrictions exist for this test.

17.4 Test Limits

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

NOTES:

2) Please refer to D_{max} test data overleaf, for details of the EUT cycling on/off period and repetition interval of the peak in-rush measurement.
3) For voltage changes caused by manual switching, equipment is deemed to comply without further testing if the maximum r.m.s. input current (including inrush current) evaluated over each 10 ms half-period between zero-crossings does not exceed 20 A, and the supply current after inrush is within a variation band of 1.5 A.

17.5 Test Method

The EUT was connected to a computer-controlled flicker analyser. This provides an automated measurement of all EUT applicable flicker parameters – Pst (short term flicker), Plt (long term flicker), d(t), dc and dmax.

17.6 Test Equipment

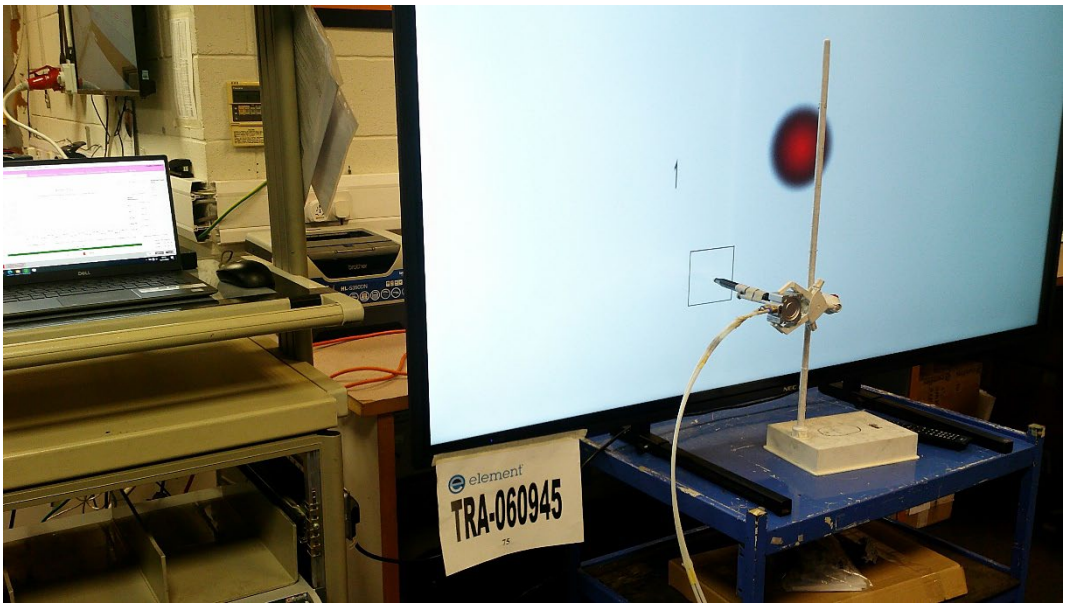
Type of Equipment	*Maker/Supplier*	*Model Number*	*Serial Number*	*Element Number*
Harmonics & flicker Analyser	EM Test	DPA500N	P2109248818	H803
AC Power Source	EM Test	NETWAVE7	P2118251775	H804

17.7 Test Results

17.7.1 P_{st} or P_{lt} Test Data

					Pst Data					
					Flicker (Line 1)					
	Meas.	P0,1	P1s	P3s	P10s	P50s	Pst	dc	dmax	Tmax
	No.							[%]	[%]	[s]
	1	0.033	0.03	0.029	0.027	0.023	0.118	0	0.4	0

17.8 Test Photograph



18 EMC Measurement Uncertainty

Transient testing:
Where a specification tolerance exists, the figure displayed is the calibration figure expanded by the calibration uncertainty. The worst case tolerance is then calculated and compared to the allowed specification tolerance.

Static Discharge (IEC / EN 61000-4-2)
The tolerance parameters of the ESD Generator meet the calibration requirements of the standard when expanded by the calibration laboratories' measurement uncertainty figure.

Voltage Surge (IEC / EN 61000-4-5)
The tolerance parameters of the Surge Generator meet the calibration requirements of the standard when expanded by the calibration laboratories' measurement uncertainty figure.

Electrical Fast Transients (IEC / EN 61000-4-4)
The tolerance parameters of the Transient Generator meet the calibration requirements of the standard when expanded by the calibration laboratories' measurement uncertainty figure.

Voltage Dips and Interruptions (IEC / EN 61000-4-11)
The tolerance parameters of the Voltage Dips and Interruptions Generator meet the calibration requirements of the standard when expanded by the calibration laboratories' measurement uncertainty figure.

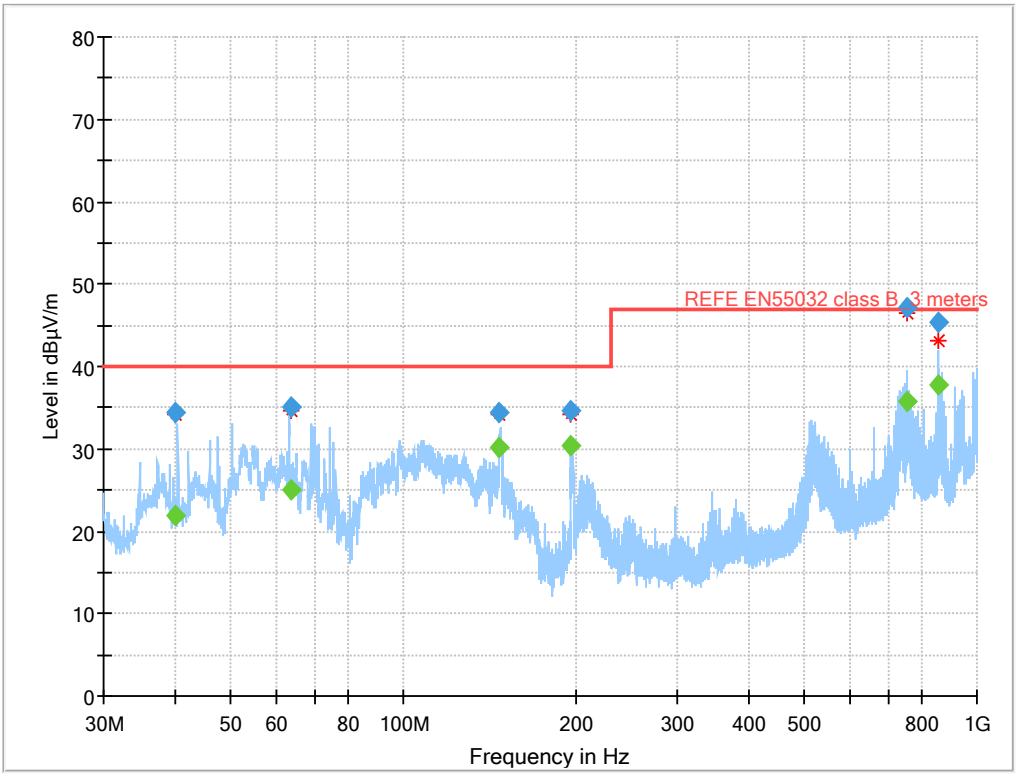
Emissions and Immunity testing (non-transient):
All uncertainties listed are standard uncertainties multiplied by a coverage factor K=2.00 to give a 95% confidence level.

Test / Measurement	***Budget Number***	***MU***
Conducted Emissions Including Discontinuous Emissions:		
Conducted Emissions 150 kHz to 30 MHz LISN Measurement	MU1006	**3.2 dB**
Radiated Emissions (E-Field):		
Radiated Emissions 30 MHz to 1 GHz using CBL6111/2 Bilog Antenna	MU1008	**5.3 dB**
Radiated Emissions 1 GHz to 18 GHz using HL050 Log Periodic Antenna	MU1009	**5.1 dB**
Radiated Immunity		
Re-establishment of pre-calibrated field level 80 MHz to 3 GHz	MU1013	**2.0 dB**
Re-establishment of pre-calibrated field level 3 GHz to 6 GHz	MU1015	**2.1 dB**
Conducted Immunity		
CDN Testing (inc. xDSL Broadband test), Re-establishment of pre-calibrated level	MU1001	**2.1 dB**
Cable Calibrations		
Cable calibration up to 18 GHz	MU5003	**0.6 dB**
Mains Harmonics and Flicker		
Dmax	MU1020	**4.14 %**
Flicker (Psc, Dc, Dt)	MU1021	**4.86 %**
Harmonics	MU1022	**1.86 %**

19 Annex A

The following radiated emission tests were made at the request of U-Touch Poland Sp z o.o.

19.1.1 Radiated Emissions E-Field Test Data – 30 MHz to 1 GHz – Mode 2

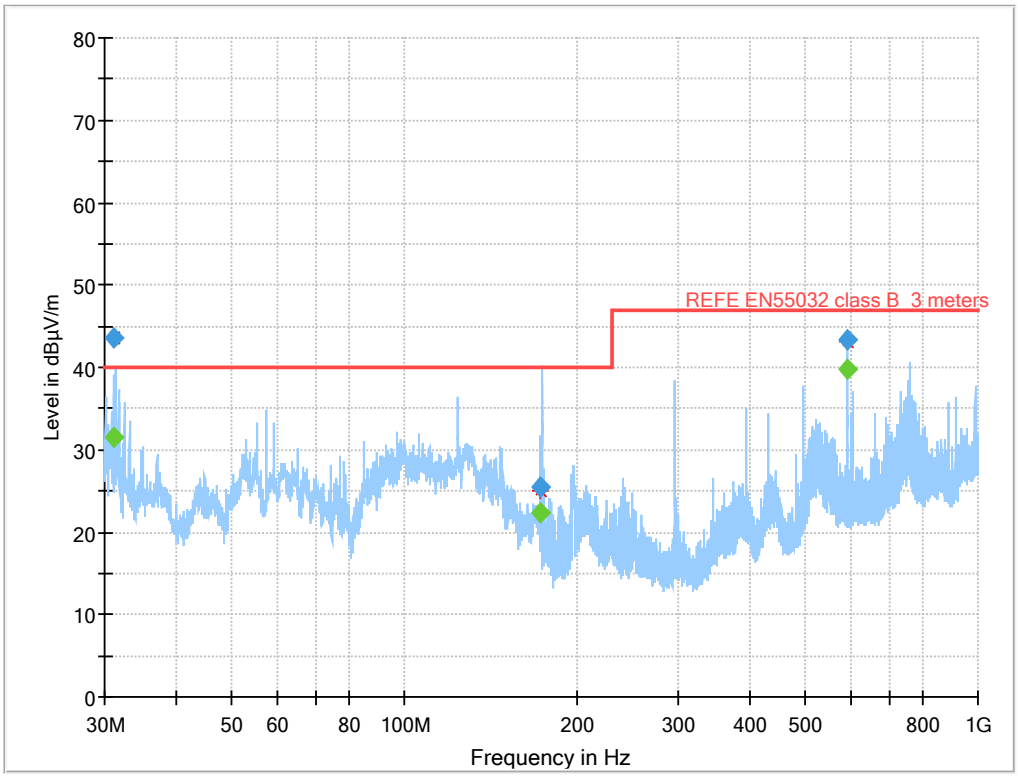


The above plot shows some formal measurements that are significantly below the preview peak hold. These emissions were manually investigated for a minimum time period of 60seconds. During this time period the emissions were found to occur at a time interval of less than once in a 15 second period and therefore considered transient in nature as per the guidelines in CISPR16-2-3 and are deemed a pass result.

The above plot is generated from a combined horizontal and vertical max hold Peak detector preview scan. The blue markers are maximised Peak detectors and are included for information only. The green markers are maximised Quasi-Peak detectors and are required for the formal assessment. The above emissions are listed in the following table.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
40.032307	22.00	40.00	18.00	15000.0	120.000	102.0	V	190.0	-11.3
63.556867	25.07	40.00	14.93	15000.0	120.000	132.0	V	357.0	-19.1
146.996760	30.09	40.00	9.91	15000.0	120.000	110.0	H	314.0	-13.1
196.278760	30.49	40.00	9.51	15000.0	120.000	144.0	V	354.0	-15.4
756.008827	35.86	47.00	11.14	15000.0	120.000	104.0	H	254.0	-1.5
857.214987	37.77	47.00	9.23	15000.0	120.000	102.0	H	222.0	0.4

19.1.2 Radiated Emissions E-Field Test Data – 30 MHz to 1 GHz – Mode 3



The above plot shows some formal measurements that are significantly below the preview peak hold. These emissions were manually investigated for a minimum time period of 60seconds. During this time period the emissions were found to occur at a time interval of less than once in a 15 second period and therefore considered transient in nature as per the guidelines in CISPR16-2-3 and are deemed a pass result.

The above plot is generated from a combined horizontal and vertical max hold Peak detector preview scan. The blue markers are maximised Peak detectors and are included for information only. The green markers are maximised Quasi-Peak detectors and are required for the formal assessment. The above emissions are listed in the following table.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.070413	31.58	40.00	8.42	15000.0	120.000	261.0	V	351.0	-6.7
172.863480	22.42	40.00	17.58	15000.0	120.000	115.0	H	88.0	-14.9
593.406413	39.83	47.00	7.17	15000.0	120.000	102.0	V	151.0	-4.3