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Test report No.:
TRECEE18-0080

EMC TEST REPORT

Test report No.	:	TRECEE18-0080
Applicant	:	DASAN Network Solutions, Inc.
Address	:	DASAN Tower, 49, Daewangpangyo-ro644Beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do 463-400 KOREA
Manufacturer	:	DASAN Network Solutions, Inc.
Address	:	DASAN Tower, 49, Daewangpangyo-ro644Beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do 463-400 KOREA
Type of equipment	:	SWITCH
Model name	:	V2428PS
Variant Model name	:	DH-2328PF
Date of incoming	:	April 26, 2018
Date of test	:	May 16 ~ May 23, 2018
Date of issue	:	June 01, 2018
Test standards	:	EN 300 386 V 2.1.1 (2016-07)
Test result	:	☒ Comply ☐ Not comply

Summary

The test results presented in this test report are limited only to the sample supplied by Applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of Lab-T, Inc.

Prepared by	**Approved by**
Jong-Hyuk Kim / EMC test engineer	Cheol-Ho Lee / Technical manager

If this test report is required to confirmation of authenticity, please contact to info@lab-t.net

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1. Revision history

Issued report No.	Version	Issued date	Revisions
TRECEE18-0080	Rev. 00	June 01, 2018	Original

2. Information of test laboratory

Corporate name	Lab-T, Inc.
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* Lab-T, Inc. has been accredited / filed / authorized by the agencies listed in the following table.

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	KT703	
Site filing	USA	FCC	133186	
	Japan	VCCI	R-4282, C-4764, T-2276, G-886, G-887	
	Canada	IC	22000	
Certification	Korea	KC	KR0159	
	EU	TUV	CARAT 15 09 93449 001	

- Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

3. Applicant information

Applicant	DASAN Network Solutions, Inc.
Address	DASAN Tower, 49, Daewangpangyo-ro644Beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400 KOREA

Manufacturer	DASAN Network Solutions, Inc.
Address	DASAN Tower, 49, Daewangpangyo-ro644Beon-gil Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400 KOREA
Country of origin	Korea / China

Factory	DASAN Network Solutions, Inc.
Address	No.1, Songgang Avenue, Songgang Street, Bao'an District Shenzhen, Guangdong, China

4. Description of EUT (Equipment under test)

4.1 Product description

Name of EUT	SWITCH
Model name	V2428PS
Rating	AC 100 - 240 V, 50 / 60 Hz
Input rating (Use for adaptor)	Not applicable

4.2 Product specification

Model	V2428PS
CPU	Built-in CPU, single-core processor, 1GHz
Flash Memory	512M
SDRAM	DDRIII 512MB
SFP Port	Supports 1000Base-X modules. Does not support 100Base-FX.
Power Supply	■ AC input Rated voltage range: 100V to 240V Maximum voltage range: 90V to 264V Frequency: 50/60 Hz Rated current: 5.5-2.5A ■ HVDC input Voltage range: 192V to 290V Current range: 2.5A to 3.5A
EEE	Supported
PoE	All the RJ45 ports are PoE-capable. Ports 1-4 are HPoE-capable with the maximum power output of 90W. Ports 5-24 support the maximum power output of 30W. The maximum output power of PoE/PoE+/HPoE is 370W.
Power Consumption	Less than 40W with no PoE load Less than 460W with PoE full load
Operating Temperature	0ºC to 50ºC
Storage Temperature	-40ºC to 70ºC
Operating Humidity	10% to 90% (RH)
Storage Humidity	5% to 90% (RH)
Fan	Speed adjustment and fault alarm
Temperature Warning	Supported
Dimensions (W x D x H)	440 mm x 260 mm x 44 mm
Weight	≤5.5 kg (with package)

4.3 EUT internal operating frequency

Frequency (㎒)	Description	Frequency (㎒)	Description
1 000	-	-	-

4.4 Details information of multi-listing model

Division	Model name
1	DH-2328PF
* Different model names are used for different markers.	

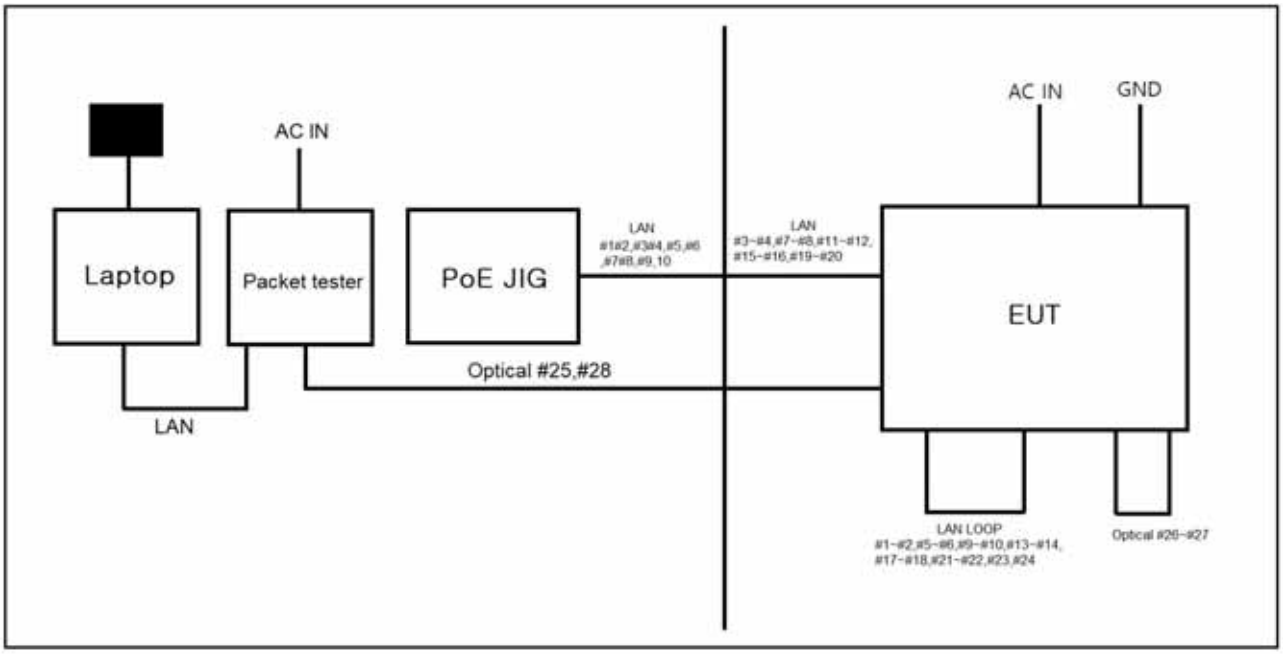
4.5 Peripheral equipment

Product	Model name	Serial No.	Manufacturer
SWITCH (EUT)	V2428PS	-	DASAN Network Solutions, Inc. / Korea (China)
POE JIG	-	-	DASAN Network Solutions, Inc. / Korea (China)
Packet tester	BigTao200		Beijing Teletest Tech. / -
Laptop	Compaq nx 6320	CNU7200THR	HP / -
Laptop adapter	PPP009D	-	HP / -

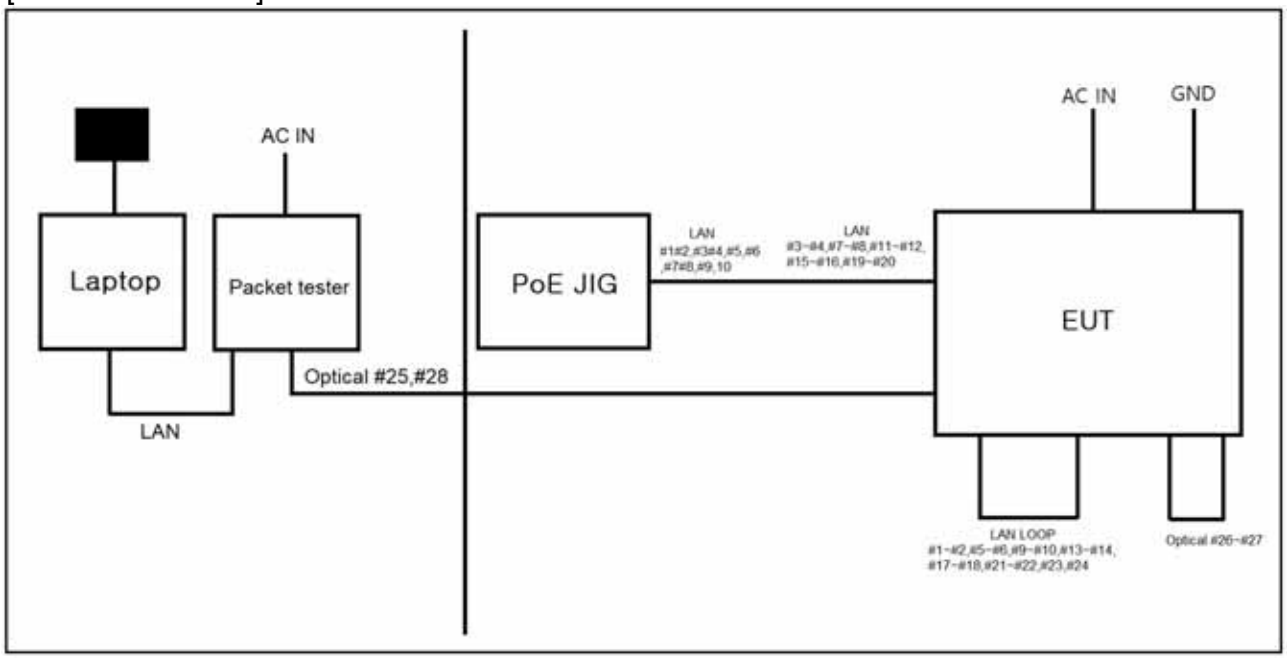
4.6 Connection cable

Start-up device		Connected end device		Cable specifications	
Name	I/O port	Name	I/O port	Length(m)	Spec.
SWITCH (EUT)	LAN #3~#4,#7~#8, #11~#12,#15~#16, #19~#20	POE JIG	LAN #1#2,#3#4, #5,#6,#7,#8 #9,10	5.0	Unshield
	LAN #1~#2,#5~#6, #9~#10,#13~#14, #17~#18,#21~#22, #23, #24	EUT (Loop)	LAN #1~#2,#5~#6, #9~#10,#13~#14, #17~#18,#21~#22,#23,#24	5.0	Unshield
	Optical #26~#27	EUT (Loop)	Optical #26~#27	0.3	Unshield
	Optical #25~#28	Packet tester	Optical #25~#28	5.0	Unshield
	GND	Earth	-	1.5	Unshield
	AC In	AC Power source	-	1.5	Unshield
Packet tester	LAN	Laptop	LAN	1.0	Unshield
	AC In	AC Power source	-	1.5	Unshield
Laptop Adapter	DC In	Adapter	DC Out	0.8	Unshield
	AC In	AC Power source	-	1.2	Unshield

4.7 Test set-up configuration



[Radiated emission]



4.8 EUT operating test mode(s)

- Check and test the continuous data transmission / reception status using a packet tester connected to the equipment under test.
- Radioactive emission test When testing, PoE JIG is tested next to the EUT.

4.9 EUT modifications

- No modifications

5. Test standards and performance criteria

5.1 Standards

- The following standards have been applied:

Test items	Applied standard	Result
Emission _ EN 300 386 V 2.1.1 (2016-07)		
Conducted emission (AC/DC mains power ports)	EN 55032:2015 (Class A)	C
Conducted emission (Asymmetric mode)	EN 55032:2015 (Class A)	C
Radiated emission (30 MHz to 1 000 MHz)	EN 55032:2015 (Class A)	C
Radiated emission (1 000 MHz to 6 000 MHz)	EN 55032:2015 (Class A)	C
Harmonics current emission	EN 61000-3-2:2014	C
Voltage fluctuations and flickers emission	EN 61000-3-3:2013	C
Immunity _ EN 300 386 V 2.1.1 (2016-07) (Other than telecommunication centres)		
Electrostatic discharge immunity	EN 61000-4-2:2009	C
Radiated electromagnetic fields immunity (80 MHz to 6 000 MHz)	EN 61000-4-3:2006+A2:2010	C
Fast transients/burst immunity	EN 61000-4-4:2012	C
Surges immunity	EN 61000-4-5:2014+A1:2017	C
Continuous conducted signals immunity (0.15 MHz to 80 MHz)	EN 61000-4-6:2014	C
Voltage dips and short interruptions immunity	EN 61000-4-11:2004+A1:2017	C
* C=Comply, N/A=Not applicable		

5.2 Performance criteria

5.2.1 General immunity conditions

5.2.1.1 General

If the minimum performance level or permissible performance loss is not specified in the following clauses or by the manufacturer, then either of these may be deduced from the product description and documentation, and what the user may reasonably expect from the apparatus if used as intended.

5.2.1.2 General performance criteria

The general performance criteria apply for those ports for which no specific performance criteria are defined (e.g. auxiliary ports) in the present document.

Where the specific immunity criteria are not relevant or in appropriate, relevant justification shall be included in the test report highlighting how the EUT was fully exercised and met the general immunity criteria defined in this clause.

- Performance criterion A:

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

- Performance criterion B:

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the exposure to an electromagnetic phenomenon, degradation of performance is, however, allowed.

No change of actual operating state or stored data is allowed. If the minimum performance level or The permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

- Performance criterion C:

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or, in the case of switching equipment, by normal subsequent use.

5.2.2 Switching equipment specific requirements

5.2.2.1 General

The general conditions of clause 9 apply.

For switching equipment with less than 32 subscriber lines (analogue or digital), all the lines shall be driven. For switching equipment with more than 32 subscriber lines (analogue or digital) a choice of at least 32 lines shall be made among the available lines. In this case, as it is impossible to do tests at all ports, single ports of each type shall be selected for the testing. At least one port of each type shall be tested.

The ports shall be configured with their nominal impedance for a connection to another port. Auxiliary equipment or loopback may be used to simulate the functional termination of the ports.

Connections have to be provided which shall be established before the start of the tests and then maintained.

5.2.2.2 General performance criteria

For the switching equipment the following main signal ports are recognized:

• Analogue ports (e.g. analogue subscribers' lines, analogue interfaces to transmission equipment);

• Digital ports (e.g. digital subscribers' lines (ISDN), digital connections to transmission equipment).

The interfaces shall operate as described in the clauses 11.3.1 and 11.3.2.

5.2.2.3 Digital port performance criteria

- Performance criterion A (continuous phenomena)

During the sweep:

• The established connections shall be maintained throughout testing and the transfer of information shall be within the limits of the manufacturer's specification;

• Loss of frame alignment or loss of synchronization is not allowed during each individual exposure (if applicable).

For selected frequencies (see clause 11.2.2):

• It shall be possible to establish a connection between two ports;

• It shall be possible to clear a connection in a controlled manner.

- Performance criterion B (transient phenomena)

The established connections shall be maintained throughout testing except in the case of surge immunity testing at 1 kV where disconnection is allowed on the port being tested:

• It shall be possible to establish a connection between two ports after the end of the transient disturbances;

• It shall be possible to clear a connection in a controlled manner after the end of the transient disturbances.

- Performance criterion C (interruptions)

The general performance criterion C applies.

5.2.2.4 Analogue port performance criteria

- Performance criterion A (continuous phenomena)

During the sweep:

• The established connections shall be maintained throughout testing;

• the noise level at a two wire analogue interface shall be less than -40 dBm at 600 Ω (ignoring the nominal impedance of the port for practical reasons) if not otherwise stated by the manufacturer. The measurement shall be done selectively with a bandwidth ≤ 100 Hz at 1 kHz;

• dialling tones shall be available (if applicable)

For selected frequencies (see clause 11.2.2):

• It shall be possible to establish a connection between two ports;

• It shall be possible to clear a connection in a controlled manner.

- Performance criterion B (transient phenomena)

Established connections shall be maintained throughout testing except in the case of surge Immunity testing at 1 kV where disconnection is allowed on the port being tested:

• It shall be possible to establish a connection between two ports after the end of the transient disturbances;

• It shall be possible to clear a connection in a controlled manner after the end of the transient disturbances.

- Performance criterion C (interruptions)

The general performance criterion C applies.

5.2.3 Transmission equipment specific requirements

5.2.3.1 General

The general conditions of clause 9 apply. An appropriate test signal shall be used. The test signal shall be stated in the test report. The preferred test signal is the Pseudo Random Bit Sequence (PRBS) appropriate for the bit rate of the channel (Recommendation ITU-T O.150 [i.13]). The modes of operation during testing shall be recorded in the test report. 5.2.3.1 Specific immunity performance criteria

5.2.3.2 General performance criteria

5.2.3.2.1 Digital signal ports

The performance of the equipment shall be verified for digital signal ports:

• By measuring the number of induced bit errors on the main signal port during all exposures;

• By testing the functionality of the main signal port and the other signal ports after the exposure;

• By verifying that corruption of software and data held in memory has not occurred.

* Performance criteria

- Performance criterion A (continuous phenomena)

The performance of the equipment shall be verified by measuring the additional errors induced due to the application of any electromagnetic phenomena. During the test sweep the established connection shall be maintained throughout the testing and the transfer of information shall be without any additional reproducible bit errors or loss of synchronization. If a degradation in performance is observed and the system is adaptive i.e. has the capability to automatically re-train in the presence of an interfering signal, then for Conducted Immunity tests only the following procedure shall be followed:

1) For each range of interfering frequencies where a degradation in performance is observed, three frequencies (beginning, middle and end) shall be identified.

2) At each of the frequencies identified in step 1, the interfering signal shall be turned on and the system allowed to re-train. If the system is able to re-train and then function without any additional reproducible bit errors or loss of synchronization then the system's performance is considered acceptable.

3) The frequencies identified in 1 and the data rates achieved in 2 shall be recorded in the test report.

- Performance criterion B (transient phenomena)

Loss of frame alignment is not allowed during each individual exposure. No alarms shall be generated as a result of the electromagnetic stress.

The above does not apply to surge testing where some loss of frame alignment may be expected. For this test, the EUT shall operate as intended following the cessation of the exposure.

- Performance criterion C (interruptions)

The general performance criterion C applies.

5.2.3.2.2 Analogue voice frequency signal ports

The performance of the equipment shall be verified for analogue voice frequency signal ports:

• By measuring the audio signal break-through (demodulated 1 kHz) on the signal port during continuous exposures in both signal path directions covering both analogue to digital conversion and digital to analogue conversion;

• By testing the functionality of the main signal port and the other signal ports after the transient exposures;

• By verifying that corruption of software and data held in memory has not occurred.

* Performance criteria

- Performance criterion A (continuous phenomena)

The noise signal level received from the EUT measured in an impedance of 600 Ω shall not be greater than -40 dBm. The measurement shall be done selectively with a bandwidth ≤ 100 Hz at 1 kHz.Connections shall be maintained throughout the test.

- Performance criterion B (transient phenomena)

The established connections shall be maintained throughout testing except in the case of surge immunity testing at 1 kV where disconnection is allowed on the port being tested.

The EUT shall return automatically to normal performance after the cessation of the exposure.

5.2.3.2.3 SDH and PDH interfaces

Tributary and aggregate interfaces

The criteria specified in clause 12.3.1 apply to the interfaces specified in ETSI EN 300 166 [i.3] (electrical interface) and ETSI ETS 300 232 [i.4], Recommendations ITU-T G.783 [i.25] and G.798 [i.26] (optical interfaces).

5.2.3.2.4 ISDN interfaces

- Primary rate access ISDN interfaces

The criteria specified in clause 12.3.1 apply to the interfaces specified in ETSI EN 300 011-1 [i.1].

- Network termination NT1 for ISDN "U" interfaces

The criteria specified in clause 12.3.1 apply to the interfaces specified in Recommendation ITU-T G.961 [i.12].

- Basic access ISDN interfaces

The criteria specified in clause 12.3.1 apply to the interfaces specified in ETSI EN 300 012-1 [i.2].

5.2.3.2.5 Analogue interfaces

- Trunk interfaces and leased line interfaces

The criteria specified in clause 12.3.2 apply to the interfaces specified in Recommendation ITU-T G.712 [i.8].

- Subscriber interfaces

The criteria specified in clause 12.3.2 apply to the interfaces specified in Recommendation ITU-T Q.552 [i.14].

5.2.3.2.6 V.10, V.11, V.24, V.28, V.36, X.24 and similar V.- and X.- series interfaces

The criteria specified in clause 12.3.1 apply to the interfaces specified in Recommendations ITU-T V. 10 [i.15], V.11 [i.16], V.24 [i.17], V.28 [i.18], V.36 [i.19] and X.24 [i.20].

5.2.3.2.7 Ethernet and packet-data interfaces

To the interfaces specified in ISO/IEC/IEEE 8802-3 [i.5] and Recommendation ITU-T X.25 [i.21], the criteria below apply.

- Performance criterion A (continuous phenomena)

For interfaces which are intended for the transmission of third party data traffic, a selected port shall Be connected to test equipment (e.g. a data communications analyser) as a single point-to-point data link. This will avoid excessive failed transmission attempts caused by data collisions and bus contention problems.

The interface shall be suitably exercised and monitored throughout the test period for errored frames. No more than 5 % additional errored frames above the quiescent level shall be permitted during the exposure.

- Performance criterion B (transient phenomena)

The established connections shall be maintained throughout testing except in the case of surge immunity testing at 1 kV where disconnection is allowed on the port being tested.

5.2.3.2.8 Service and maintenance interfaces

The functional performance of ports of this type not intended to be permanently connected and therefore not subjected to immunity testing shall be verified according to the manufacturer's specification following cessation of the electromagnetic exposure on other ports.

5.2.3.2.9 Synchronization interfaces

The performance of slave clocks specified in Recommendations ITU-T G.812 [i.9] and G.813 [i.10] shall be checked with the equipment synchronized with an external source.

- Performance criterion A (continuous phenomena)

During the exposure, synchronization shall not be lost.

- Performance criterion B (transient phenomena)

No alarm indications shall persist after the exposure. The functional performance according to the manufacturer's specification shall be verified following cessation of the exposure.

5.2.3.2.10 Remote alarm interfaces

These interfaces are defined by the manufacturer.

- Performance criterion A (continuous phenomena)

No false alarms shall occur during continuous exposures.

- Performance criterion B (transient phenomena)

No false alarm indications shall persist after the exposure.

5.2.2.3 Digital Subscriber Line (DSL) Access Systems

5.2.2.3.1 Specific Immunity performance criteria

The performance of the equipment shall be verified by:

• Measuring the additional errors induced due to the application of any electromagnetic phenomena.
• Measuring the audio signal break-through (demodulated 1 kHz) at any POTS port whilst continuous interference phenomena are applied.
• Testing the functionality of the system at the cessation of test.
• Ensuring that any software or stored data corruption has not occurred.
• For ISDN ports the performance requirements of clause 12.3.4 shall apply.

- Performance Criteria A (continuous phenomena)

• During the test sweep the established connection shall be maintained throughout the testing and the transfer of information shall be without any additional reproducible bit errors or loss of synchronization. If a degradation in performance is observed and the system is adaptive i.e. has the capability to automatically re-train in the presence of an interfering signal, then for Conducted Immunity tests only the following procedure shall be followed:

1) For each range of interfering frequencies where a degradation in performance is observed, three frequencies (beginning, middle and end) shall be identified.
2) At each of the frequencies identified in step 1, the interfering signal shall be turned on and the system is allowed to re-train. If the system is able to re-train and then function without any additional reproducible bit errors or loss of synchronization then the system's performance is considered acceptable.
3) The frequencies identified in 1 and the data rates achieved in 2 shall be recorded in the test report.

• During the test sweep the demodulated noise level at the POTS port shall be less than -40 dBm at 600 Ω (ignoring the nominal port impedance for practical reasons) if not otherwise stated by the manufacturer. The measurement shall be done selectively with a bandwidth ≤ 100 Hz at 1 kHz.
As an alternative method the acoustic Sound Pressure Level (SPL) at the receiver of a telephone Connected to the two-wire analogue interface shall not exceed 55 dB (SPL) when measured in a bandwidth ≤ 100 Hz at 1 kHz.

- Performance Criteria B (transient phenomena)

The general performance criteria B shall apply in that errors are acceptable during the application of the test. However the application of the test shall not cause the system to lose the established connection or delay function (e.g. by re-train). At the cessation of the test the system shall continue to function in the state established prior to the application of the test, without user intervention.

The above performance criteria do not apply to surge testing. For this test, the EUT shall not lose the established connection and shall operate as intended following the cessation of the exposure.

- Performance Criteria C (interruptions)

The general performance criteria C shall apply.

5.2.4 Power supply equipment specific conditions

5.2.4.1 General

His clause is not applicable to power supplies i.e. DC/DC converters, AC/DC adapters and supplies Incorporated within network equipment. It is intended for power supplies aimed at the generation of power for distribution within telecomm centres.

5.2.4.2 Specific immunity performance criteria

The ports of the power supply equipment (figure 6) that shall be monitored during the tests can be categorized as one of:

• DC secondary interface;
• AC secondary interface; or
• Control/signal interface.

The manufacturer shall, at the time of submission of the equipment for test, supply the following information to be recorded in the test report:

• The primary functions of the power supply equipment to be tested;
• The intended functions of the power supply equipment, which shall be in accordance with the documentation accompanying the equipment and sales literature as appropriate;
• The auxiliary equipment to be combined with the power supply equipment;
• A list of ports, classified as AC/DC power port or control/signal port;
• The operating conditions.

5.2.4.3 Alternating current secondary interface

- Performance criterion A (continuous phenomena)

During the exposure, the AC secondary range shall be in accordance with the normal service condition defined in ETSI ETS 300 132-1 [15].

The long-term voltage fluctuations at the AC secondary interface shall be within ±10 % of the nominal voltage. During and after the exposure, the EUT shall operate without alarms, false alarm indications (power supply failure, protection failure, etc.) and false display indications.

- Performance criterion B (transient phenomena)

Voltage interruptions at the AC secondary interface shall last no longer than 20 ms.

The time between two voltage interruptions shall be no less than 10 s.

The voltage fluctuations at the AC secondary interface shall be in accordance with the requirements of ETSI ETS 300 132-1 [15]:

• For < 500 ms with respect to rms value: no worse than ±15 % of nominal value;
• For < 2 ms with respect to actual value: no worse than ±40 % of nominal value.

The frequency at the AC secondary interface shall not vary by more than ±3 Hz and shall return to the nominal value within 5 s.

Peaks with a duration shorter than 0,25 of one period (5 ms for a 50 Hz system), which appear during the exposure, are permissible.

After the exposure, the EUT shall operate without alarms or false alarm indications (power supply failure, protection failure, etc.) or false display indications.

Self-recovery to normal performance shall occur at the cessation of the exposure.

5.2.4.4 Direct current secondary interface

- Performance criterion A (continuous phenomena)

During the exposure, the DC secondary voltage range shall be in accordance with the normal service conditions defined in ETSI EN 300 132-2 [16] for 48 V DC or ETSI EN 300 132-3-1 [28] for 260 V DC to 400 V DC.

The maximum level of wide band noise at the DC secondary interface shall not exceed the limits specified in table 11 of the present document (this requirement is taken from the ETSI EN 300 132-2 [16]).

Table 11: Level of wide band noise

Frequency	Voltages
25 Hz ~ 5 kHz	10 mV Upsorms (measured over a 50 Ω impedance)

The reference method of measurement is with a psophometer that shall conform to Recommendation ITU-T O.41 [20]. During and after the exposure, the EUT shall operate without alarms or false alarm Indications (power supply failure, protection failure, etc.) and false display indications.

- Performance criterion B (transient phenomena)

After the exposure, the EUT shall operate without alarms or false alarm indications (power supply failure, protection failure, etc.) and false display indications:

- The DC secondary voltage during the exposure shall not exceed the following value:
- For - 48 V DC nominal value: - 60 V;
- For - 60 V DC nominal value: - 75 V;
- Short peaks, which appear during the application of the tests, shall be ignored.

5.2.4.4.1 Control/signal interface

The control and signal ports need not be monitoring during the tests, because they are not considered to be primary functions.

5.2.4.4.2 Tertiary supply interface

To be considered only for special cases.

Performance criteria should be derived from the product specifications.

5.2.5 Supervisory equipment specific conditions

5.2.5.1 Specific immunity performance criteria

- Performance criterion A (continuous phenomena)

The connection between the supervising and supervised equipment shall be maintained.

No supervisory functions shall be affected by EMC testing.

No false alarms, such as signal lamps or printer misprints shall occur.

- Performance criterion B (transient phenomena)

The supervisory equipment shall not affect the normal operation of the equipment being supervised.

The operating speed of the supervising equipment may be reduced.

Any minor priority supervisory function may be affected during EMC testing.

These functions shall resume normal performance at cessation of the exposure. For example, false alarms shall reset.

- Result

A: Packet loss result (0)

B: Packet loss result (> 0)

6. Emission test results

6.1 Conducted emission (AC/DC mains power ports)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 55032:2015 (Class A)
Test date	2018.05.16
Test facility	Shielded room (#1)
Test voltage	AC 230 V, 50 Hz
Temperature	24.5 °C
Relative humidity	51.4 % R.H.
Test result	Comply

6.1.1 Measurement procedure

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room.
Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m ± 25 % above the reference ground plane. Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN & ISN, if any. Unused measuring port of the LISN & ISN was resistively terminated by 50 ohm terminator. The measuring port of the LISN for EUT was connected to spectrum analyzer. Using conducted emission test software, the emissions were scanned with peak detector mode. After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has quasi-peak detector and CISPR average detector. By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.

6.1.2 Measurement uncertainty

Conducted emission	Uncertainty	Confidence level of approximately
9 ㎑ ~ 30 ㎒	1.78 ㏈	Least about 95 %, k = 2

* Measurement uncertainty is calculated in accordance with CISPR 16-4-2.

6.1.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
EMI Test Receiver	ESR7	R&S	101440	2018.12.15
PULSE LIMITER	VTSD 9561-F	Schwarzbeck	9561-F189	2019.04.23
LISN	ENV216	R&S	101883	2019.04.24
LISN Control Unit	LISN Controller	TSJ	04494-1	-
LISN Control Unit	LISN Controller	TSJ	04494-2	-

* All test equipment used is calibrated on a regular basis.

6.1.4 Limits of conducted emissions from the AC/DC mains power ports

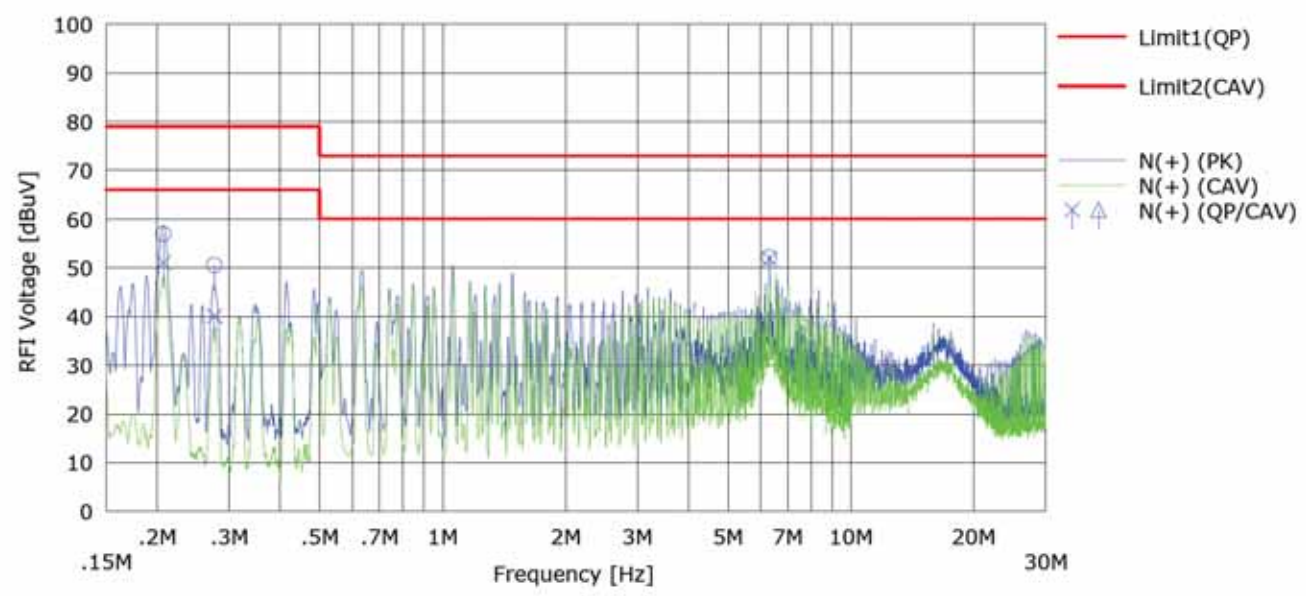
* Class A equipment

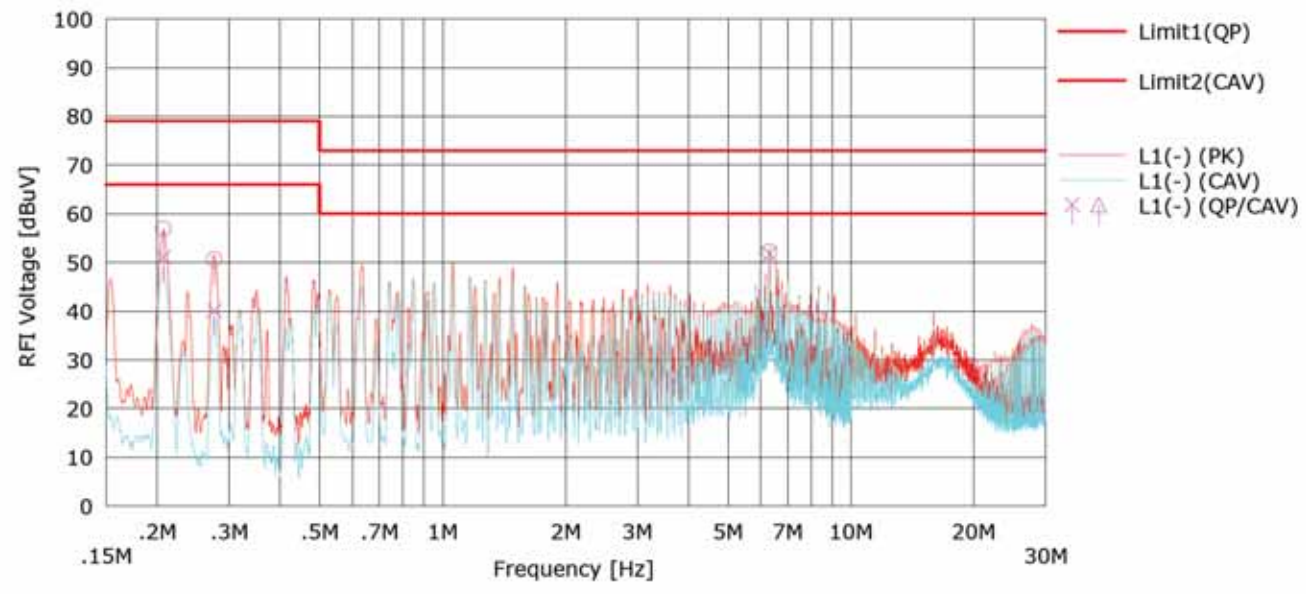
Frequency range (㎒)	Coupling device (EN 55032 see table A.7)	Detector type / bandwidth	Class A limits (dB(μV))
0.15 to 0.50	AMN	Quasi Peak / 9 kHz	79
0.50 to 30			73
0.15 to 0.50	AMN	Average / 9 kHz	66
0.50 to 30			60
* Apply across the entire frequency range.			

* Class B equipment

Frequency range (㎒)	Coupling device (EN 55032 see table A.7)	Detector type / bandwidth	Class B limits (dB(μV))
0.15 to 0.50	AMN	Quasi Peak / 9 kHz	66 – 56
0.50 to 5			56
5 to 30			60
0.15 to 0.50	AMN	Average / 9 kHz	56 – 46
0.50 to 5			46
5 to 30			50
* Apply across the entire frequency range.			

6.1.5 Conducted emissions from the AC/DC mains power ports test data



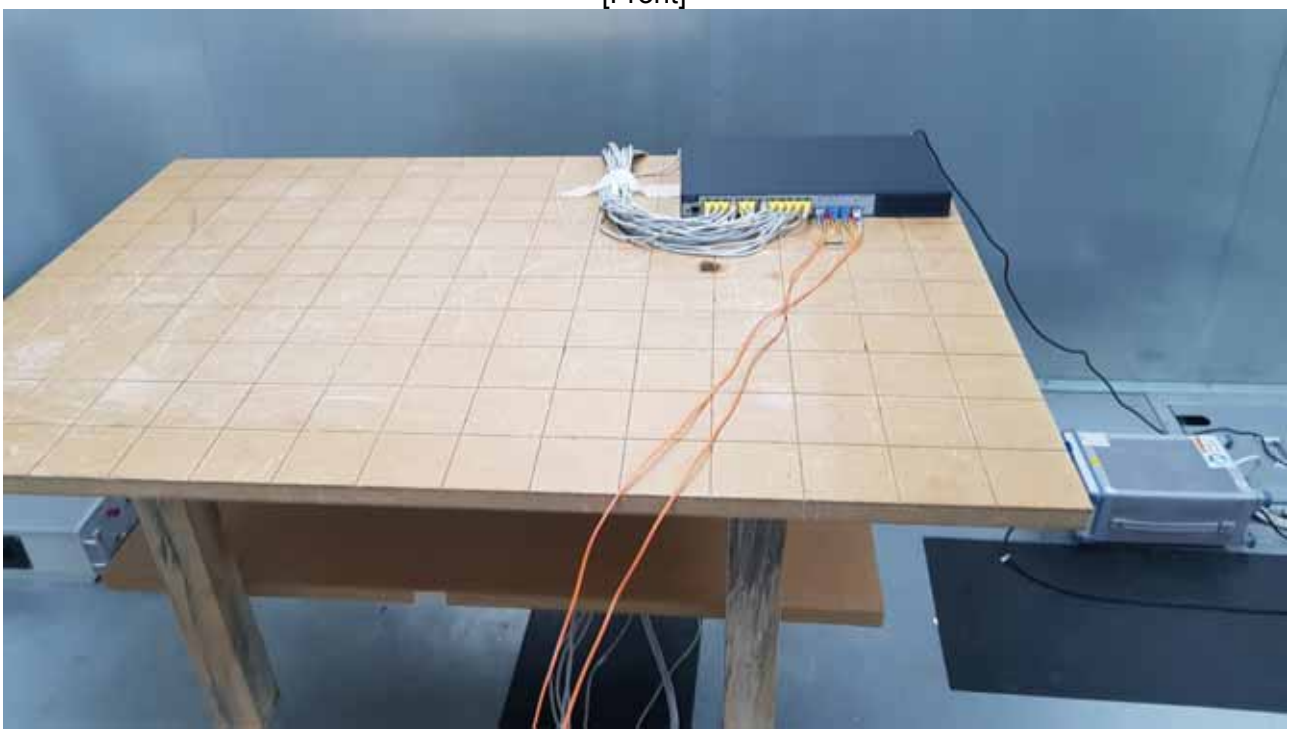


NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.20707	37.0	31.2	19.9	56.9	51.1	79.0	66.0	22.1	14.9	N(+)
2	0.27622	30.8	20.4	19.7	50.5	40.1	79.0	66.0	28.5	25.9	N(+)
3	6.31949	32.1	31.8	20.0	52.1	51.8	73.0	60.0	20.9	8.2	N(+)
4	0.20709	37.0	31.2	19.9	56.9	51.1	79.0	66.0	22.1	14.9	L1(-)
5	0.27611	30.9	20.4	19.7	50.6	40.1	79.0	66.0	28.4	25.9	L1(-)
6	6.31849	32.1	31.7	20.0	52.1	51.7	73.0	60.0	20.9	8.3	L1(-)

* Remark: “L1”: Line (-), “N”: Neutral (+)
* Results [dB(μV)] = Reading [dB(μV)] + C.FACTOR [dB]
* C.FACTOR [dB] = LISN insertion Loss [dB] + Cable loss [dB] + Pulse limiter factor [dB]
* Margin [dB] =Limit [dB(μV)] - Result [dB(μV)]
* QP: Quasi-peak , CAV: CISPR average

6.1.6 Test setup photos

[Front]



[Rear]

6.2 Conducted emission (Asymmetric mode)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 55032:2015 (Class A)
Test date	2018.05.16
Test facility	Shielded room (#1)
Test voltage	AC 230 V, 50 Hz
Temperature	24.6 °C
Relative humidity	52.5 % R.H.
Test result	Comply

6.2.1 Measurement procedure

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room.
Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m ± 25 % above the reference ground plane.
Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN & ISN, if any. Unused measuring port of the LISN & ISN was resistively terminated by 50 ohm terminator. The measuring port of the ISN for EUT was connected to spectrum analyzer. Using conducted emission test software, the emissions were scanned with peak detector mode. After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has quasi-peak detector and CISPR average detector. By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.

6.2.2 Measurement uncertainty

Conducted emission	Uncertainty	Confidence level of approximately
9 kHz ~ 30 MHz	2.78 dB	Least about 95 %, k = 2

* Measurement uncertainty is calculated in accordance with CISPR 16-4-2.

6.2.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
EMI Test Receiver	ESR7	R&S	101440	2018.12.15
PULSE LIMITER	VTSD 9561-F	Schwarzbeck	9561-F189	2019.04.23
LISN	ENV216	R&S	101883	2019.04.24
ISN	ENY81	R&S	100203	2019.04.24
ISN	ENY81-CA6	R&S	101693	2019.04.24

* All test equipment used is calibrated on a regular basis.

6.2.4 Limits of asymmetric mode conducted emissions.

* Class A equipment

Applicable to
1. wired network ports (3.1.32)
2. optical fibre ports (3.1.25) with metallic shield or tension members
3. antenna ports (3.1.3)

Frequency range (MHz)	Coupling device (EN 55032 see table A.8)	Detector type / bandwidth	Class A voltage limits (dB(μV))	Class A current limits (dB(μA))
0.15 to 0.5	AAN	Quasi Peak / 9 kHz	97 to 87	n/a
0.5 to 30			87	
0.15 to 0.5	AAN	Average / 9 kHz	84 to 74	
0.5 to 30			74	
0.15 to 0.5	CVP and current probe	Quasi Peak / 9 kHz	97 to 87	53 to 43
0.5 to 30			87	43
0.15 to 0.5	CVP and current probe	Average / 9 kHz	84 to 74	40 to 30
0.5 to 30			74	30
0.15 to 0.5	Current Probe	Quasi Peak / 9 kHz	n/a	53 to 43
0.5 to 30				43
0.15 to 0.5	Current Probe	Average / 9 kHz		40 to 30
0.5 to 30				30

The choice of coupling device and measurement procedure is defined in Annex C.
AC mains ports that also have the function of a wired network port shall meet the limits given in Table A.9.
The measurement shall cover the entire frequency range.
The application of the voltage and/or current limits is dependent on the measurement procedure used.
Refer to Table C.1 for applicability.
Testing is required at only one EUT supply voltage and frequency.
Applicable to ports listed above and intended to connect to cables longer than 3 m.

* Class B equipment

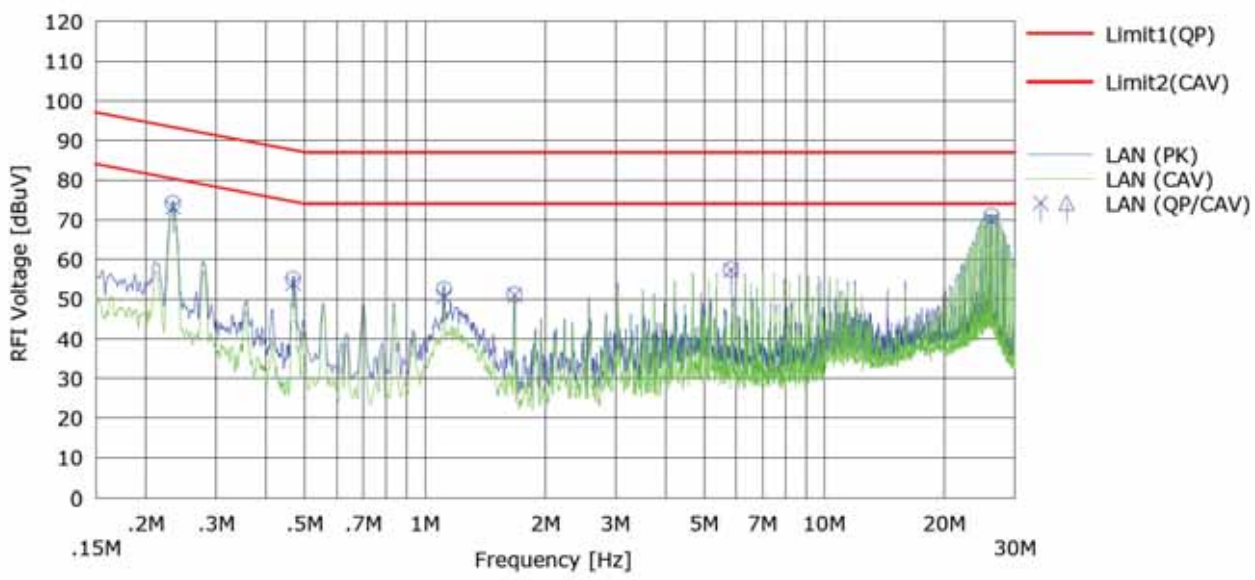
Applicable to
1. wired network ports (3.1.32)
2. optical fibre ports (3.1.25) with metallic shield or tension members
3. broadcast receiver tuner ports (3.1.8)
4. antenna ports (3.1.3)

Frequency range (MHz)	Coupling device (EN 55032 see table A.8)	Detector type / bandwidth	Class B voltage limits (dB(μV))	Class B current limits (dB(μA))
0.15 to 0.5	AAN	Quasi Peak / 9 kHz	84 to 74	n/a
0.5 to 30			74	
0.15 to 0.5	AAN	Average / 9 kHz	74 to 64	
0.5 to 30			64	
0.15 to 0.5	CVP and current probe	Quasi Peak / 9 kHz	84 to 74	40 to 30
0.5 to 30			74	30
0.15 to 0.5	CVP and current probe	Average / 9 kHz	74 to 64	30 to 20
0.5 to 30			64	20
0.15 to 0.5	Current Probe	Quasi Peak / 9 kHz	n/a	40 to 30
0.5 to 30				30
0.15 to 0.5	Current Probe	Average / 9 kHz		30 to 20
0.5 to 30				20

The choice of coupling device and measurement procedure is defined in Annex C.
Screened ports including TV broadcast receiver tuner ports are measured with a common-mode impedance Of 150 Ω. This is typically accomplished with the screen terminated by 150 Ω to earth.
AC mains ports that also have the function of a wired network port shall meet the limits given in Table A.10.
The measurement shall cover the entire frequency range.
The application of the voltage and/or current limits is dependent on the measurement procedure used.
Refer to Table C.1 for applicability.
Measurement is required at only one EUT supply voltage and frequency.
Applicable to ports listed above and intended to connect to cables longer than 3 m.

6.2.5 Asymmetric mode conducted emissions test data

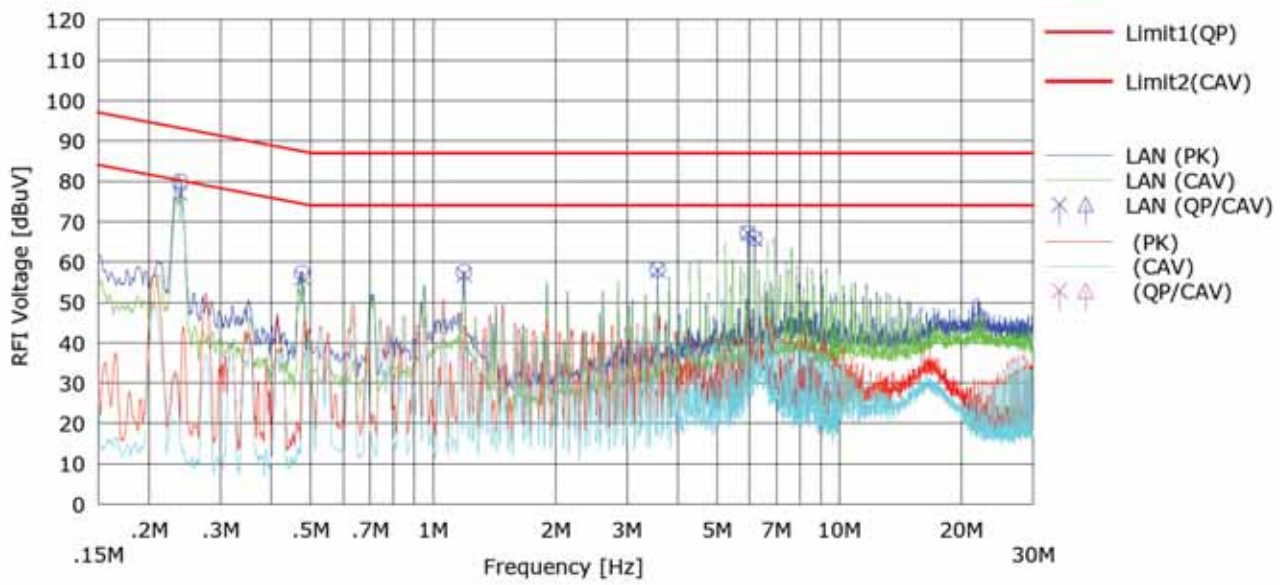
- LAN (10 Mbps) -



NO	FREQ [MHz]	READING QP [dBuV]	READING CAV [dBuV]	C.FACTOR [dB]	RESULT QP [dBuV]	RESULT CAV [dBuV]	LIMIT QP [dBuV]	LIMIT CAV [dBuV]	MARGIN QP [dBuV]	MARGIN CAV [dBuV]	PHASE
1	0.23390	54.1	53.1	20.0	74.1	73.1	93.3	80.3	19.2	7.2	LAN
2	0.46785	35.2	34.0	19.9	55.1	53.9	87.6	74.6	32.5	20.7	LAN
3	1.11724	32.6	30.7	19.9	52.5	50.6	87.0	74.0	34.5	23.4	LAN
4	1.67637	31.3	31.2	19.8	51.1	51.0	87.0	74.0	35.9	23.0	LAN
5	5.85150	37.4	37.3	20.0	57.4	57.3	87.0	74.0	29.6	16.7	LAN
6	26.27671	50.2	49.1	20.8	71.0	69.9	87.0	74.0	16.0	4.1	LAN

* Results [dB(μV)] = Reading [dB(μV)] + C.FACTOR [dB]
* C.FACTOR [dB] = ISN insert Loss [dB] + Cable loss [dB] + Pulse limiter factor [dB]
* Margin [dB] = Limit [dB(μV)] - Result [dB(μV)]
* QP Quasi-peak: CAV: CISPR average

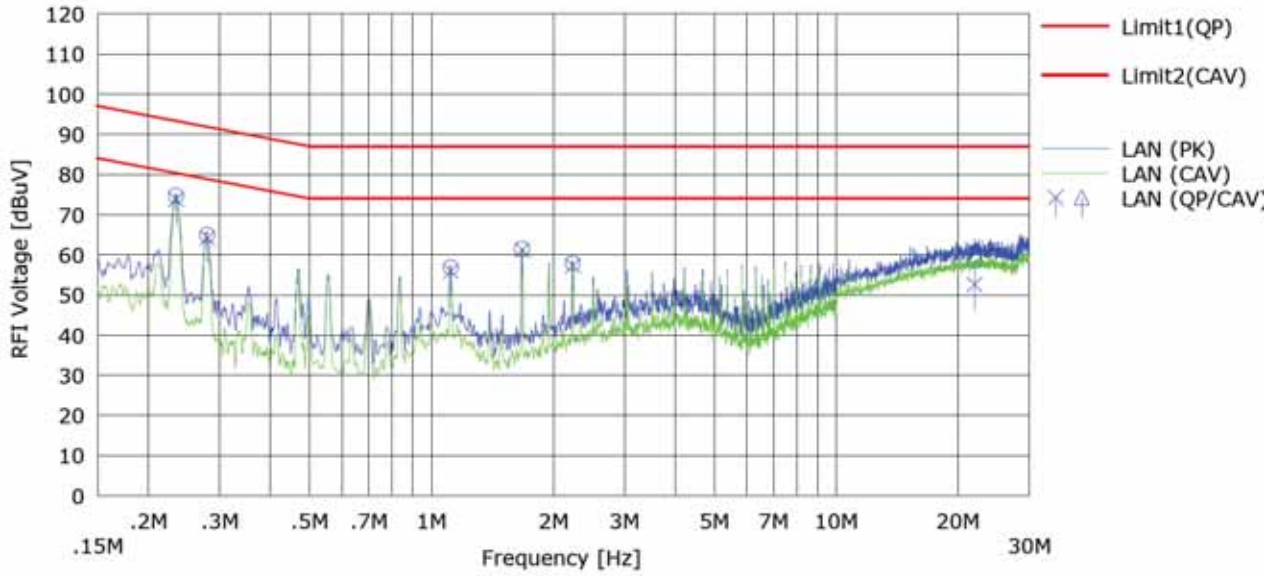
- LAN (1 000 Mbps) -



NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.23830	60.2	57.1	19.8	80.0	76.9	93.2	80.2	13.2	3.3	LAN
2	0.47672	37.5	36.4	19.7	57.2	56.1	87.4	74.4	30.2	18.3	LAN
3	1.19211	37.8	37.1	19.7	57.5	56.8	87.0	74.0	29.5	17.2	LAN
4	3.57487	38.4	38.2	19.7	58.1	57.9	87.0	74.0	28.9	16.1	LAN
5	5.95712	47.3	47.3	19.8	67.1	67.1	87.0	74.0	19.9	6.9	LAN
6	6.19550	45.9	45.8	19.9	65.8	65.7	87.0	74.0	21.2	8.3	LAN

* Results [dB(μV)] = Reading [dB(μV)] + C.FACTOR [dB]
* C.FACTOR [dB] = ISN insert Loss [dB] + Cable loss [dB] + Pulse limiter factor [dB]
* Margin [dB] = Limit [dB(μV)] - Result [dB(μV)]
* QP Quasi-peak: CAV: CISPR average

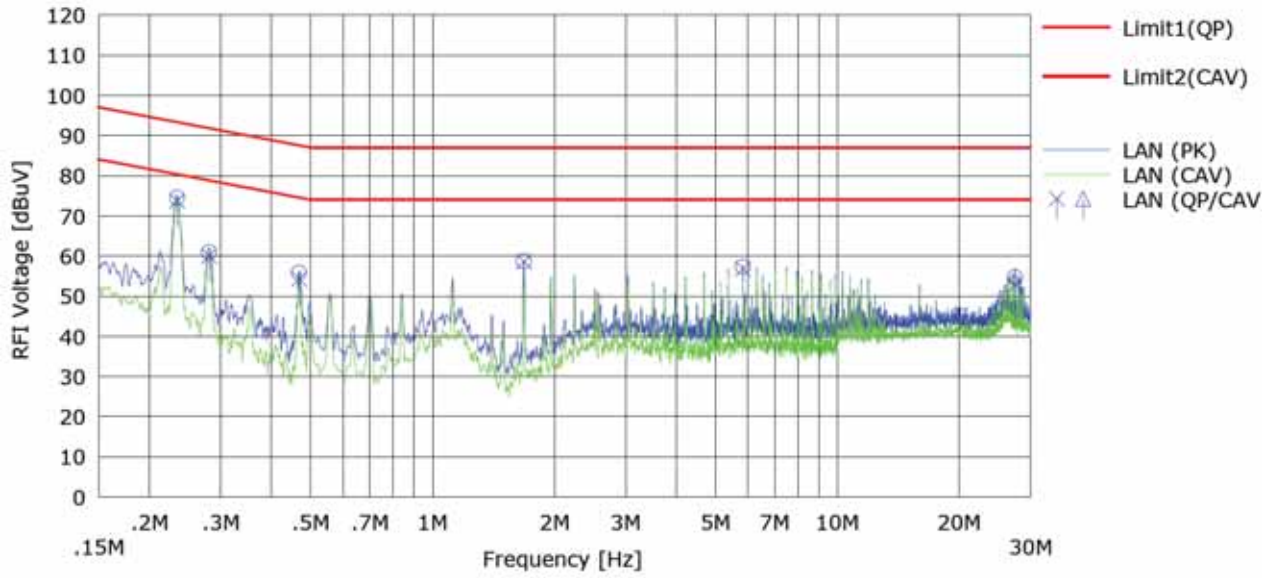
- PoE (10 Mbps) -



NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.23408	54.7	53.8	20.0	74.7	73.8	93.3	80.3	18.6	6.5	LAN
2	0.27955	44.9	44.2	20.0	64.9	64.2	91.8	78.8	26.9	14.6	LAN
3	1.11750	36.9	36.0	19.9	56.8	55.9	87.0	74.0	30.2	18.1	LAN
4	1.67749	41.6	41.4	19.8	61.4	61.2	87.0	74.0	25.6	12.8	LAN
5	2.23699	38.0	37.4	19.9	57.9	57.3	87.0	74.0	29.1	16.7	LAN
6	21.98640	37.8	31.9	20.7	58.5	52.6	87.0	74.0	28.5	21.4	LAN

* Results [dB(μV)] = Reading [dB(μV)] + C.FACTOR [dB]
* C.FACTOR [dB] = ISN insert Loss [dB] + Cable loss [dB] + Pulse limiter factor [dB]
* Margin [dB] = Limit [dB(μV)] - Result [dB(μV)]
* QP Quasi-peak: CAV: CISPR average

- PoE (100 Mbps) -

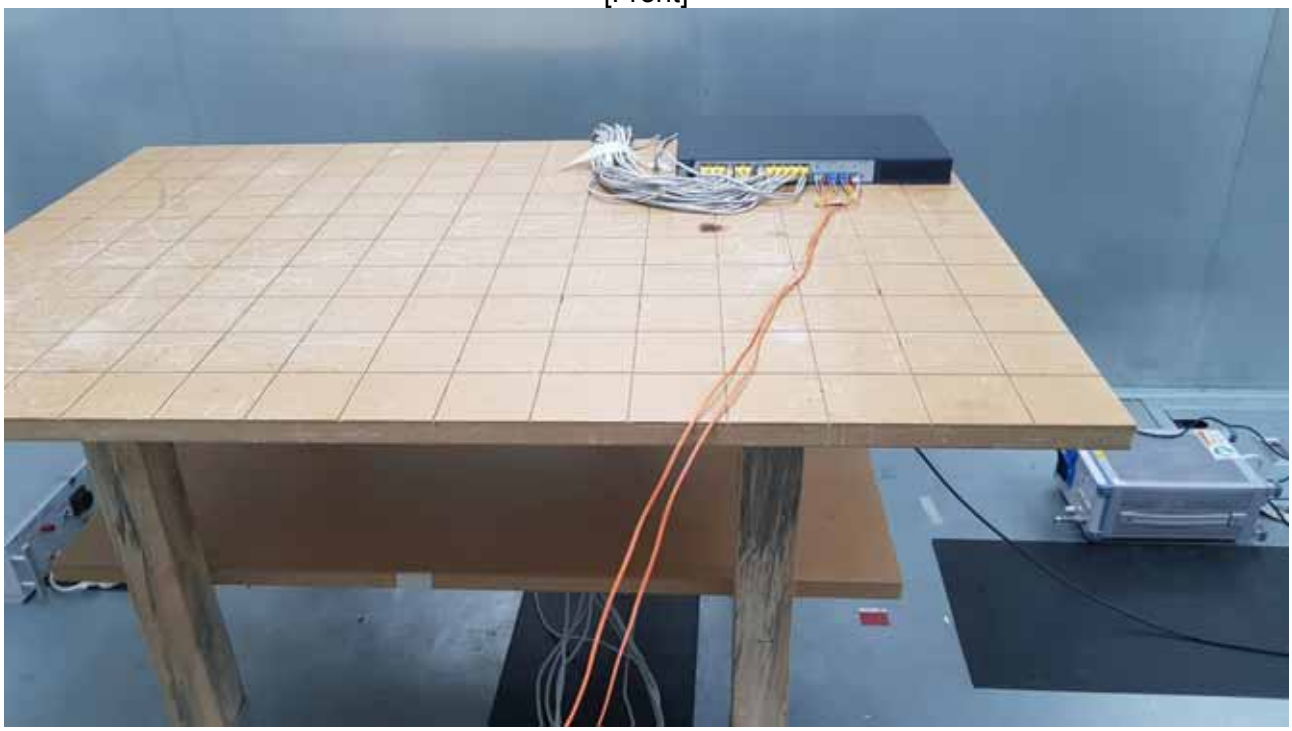


NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.23427	54.7	53.9	19.8	74.5	73.7	93.3	80.3	18.8	6.6	LAN
2	0.28082	41.2	40.3	19.7	60.9	60.0	91.8	78.8	30.9	18.8	LAN
3	0.46833	36.1	34.6	19.7	55.8	54.3	87.5	74.5	31.7	20.2	LAN
4	1.68338	39.1	39.0	19.6	58.7	58.6	87.0	74.0	28.3	15.4	LAN
5	5.85162	37.5	37.0	19.8	57.3	56.8	87.0	74.0	29.7	17.2	LAN
6	27.50849	34.5	32.6	20.2	54.7	52.8	87.0	74.0	32.3	21.2	LAN

* Results [dB(μV)] = Reading [dB(μV)] + C.FACTOR [dB]
* C.FACTOR [dB] = ISN insert Loss [dB] + Cable loss [dB] + Pulse limiter factor [dB]
* Margin [dB] = Limit [dB(μV)] - Result [dB(μV)]
* QP Quasi-peak: CAV: CISPR average

6.2.6 Test setup photos

[Front]



[Rear]

6.3 Radiated emission (30 MHz to 1 000 MHz)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 55032:2015 (Class A)
Test date	2018.05.16
Test facility	10 m Chamber
Test voltage	AC 230 V, 50 Hz
Temperature	21.5 °C
Relative humidity	67.1 % R.H.
Test result	Comply

6.3.1 Measurement procedure

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 10 m away from the interference receiving antenna in the 10 m semi-anechoic chamber.
Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m ± 25 % above the reference ground plane. Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them.
The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report. For 30 MHz ~ 1 000 MHz frequency range, quasi-peak detector with 120 kHz RBW was used.

6.3.2 Measurement uncertainty

Radiated emission	Uncertainty	Confidence level of approximately
30 MHz to 1 000 MHz	5.03 dB	Least about 95 %, k = 2

* Measurement uncertainty is calculated in accordance with CISPR 16-4-2.

6.3.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
EMI test receiver	ESU40	R&S	100445	2018.12.15
Preamplifier	MLA-10k01-b01-27	TSJ	1870367	2019.04.23
Bi-Log antenna	VULB9160	Schwarzbeck	3381	2019.06.15
Attenuator	50FPE-006N	JFW	-	2019.04.23
Antenna mast	5977	TOKIN	-	-
Controller	5909L	TOKIN	141909L-1	-
Turn table	5983-1.5	TOKIN	-	-

* All test equipment used is calibrated on a regular basis.

6.3.4 Limits for radiated emission

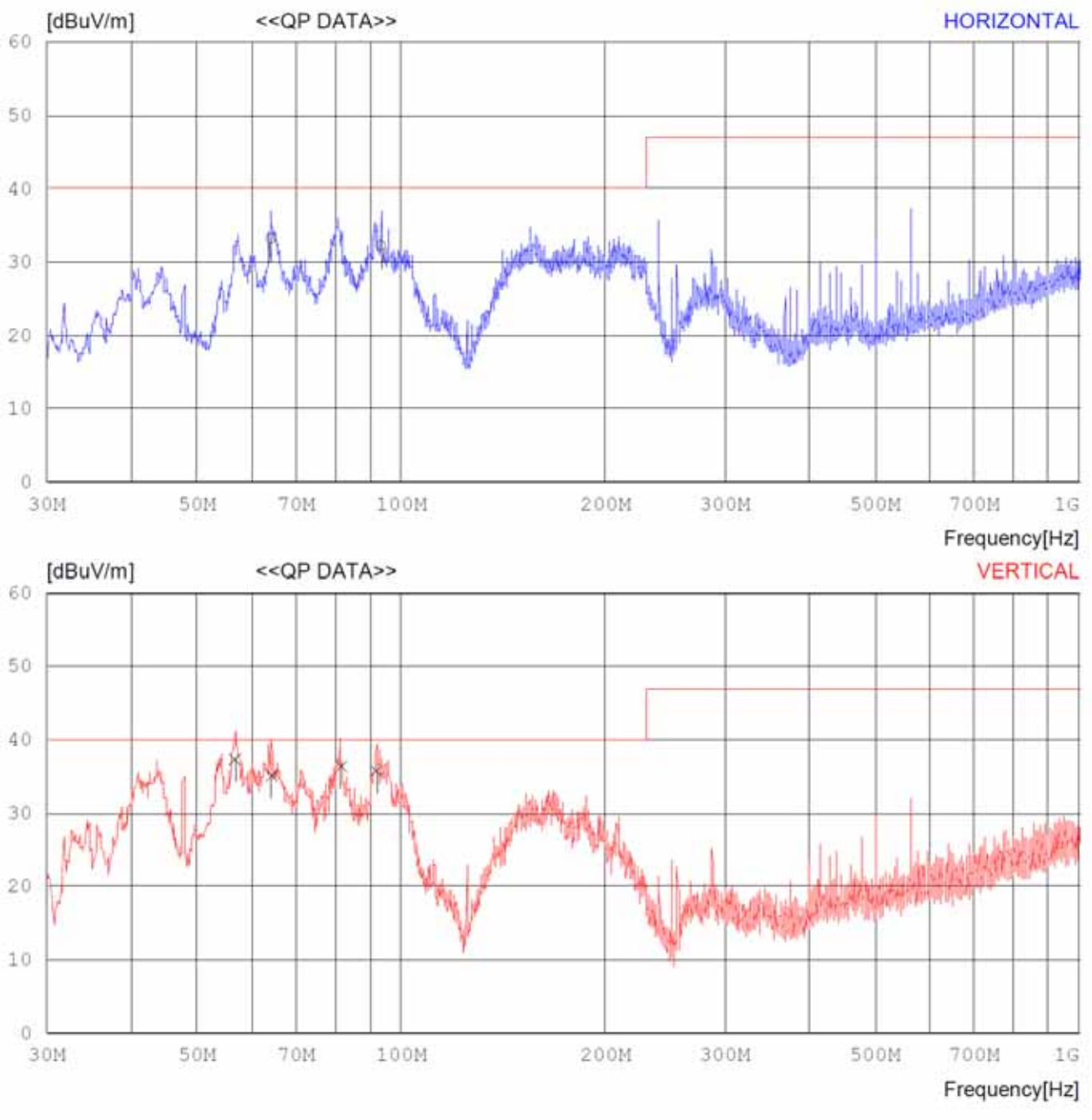
* Class A equipment

Frequency range (㎒)	Measurement		Class A limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	40
230 to 1 000			47
30 to 230	3		50
230 to 1 000			57

* Class B equipment

Frequency range (㎒)	Measurement		Class B limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	30
230 to 1 000			37
30 to 230	3		40
230 to 1 000			47

6.3.5 Radiated emission test data

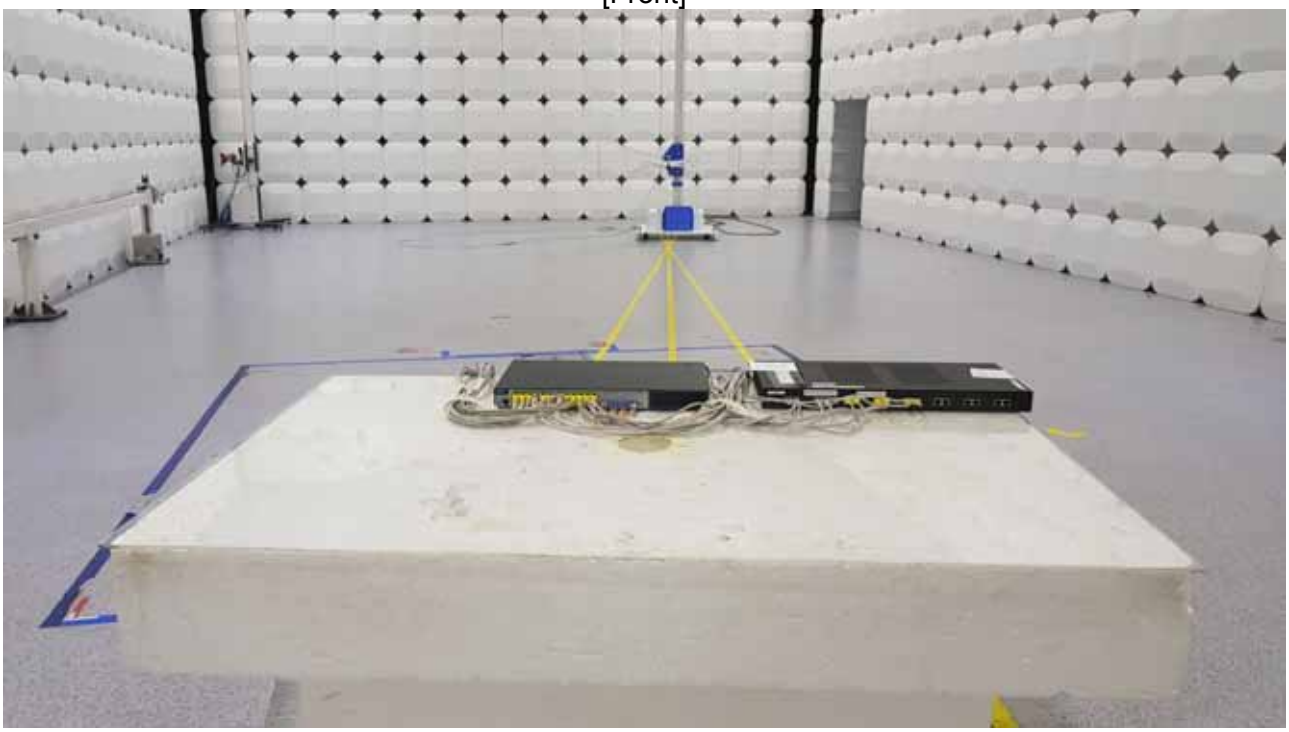


No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	64.193	45.3	17.2	-29.2	0.0	33.3	40.0	6.7	300	9
2	93.170	46.8	14.2	-28.7	0.0	32.3	40.0	7.7	400	0
----- Vertical ------										
3	56.796	48.5	18.2	-29.3	0.0	37.4	40.0	2.6	100	294
4	64.435	47.2	17.2	-29.2	0.0	35.2	40.0	4.8	100	289
5	81.288	51.2	14.2	-29.0	0.0	36.4	40.0	3.6	200	289
6	91.837	50.4	14.0	-28.6	0.0	35.8	40.0	4.2	100	338

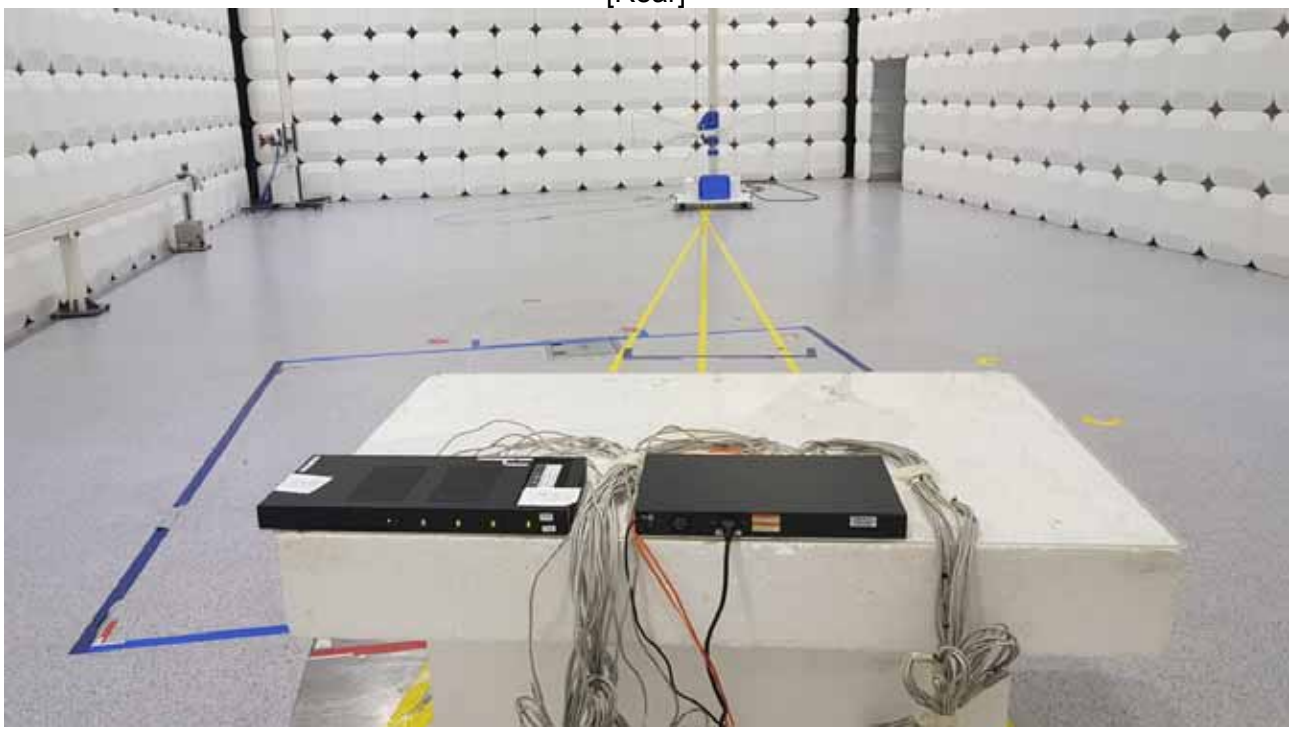
* Results [dB(μV/m)] = Reading [dB(μV)] + Antenna factor [dB/m] - Loss [dB]
* Loss = Cable loss [dB] - Amp gain [dB]
* Margin [dB] = Limit [dB(μV/m)] - Results [dB(μV/m)]
* QP: Quasi-peak

6.3.6 Test setup photos

[Front]



[Rear]



6.4 Radiated emission (1 000 MHz to 6 000 MHz)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 55032:2015 (Class A)
Test date	2018.05.16
Test facility	10 m Chamber
Test voltage	AC 230 V, 50 Hz
Temperature	20.5 °C
Relative humidity	69.7 % R.H.
Test result	Comply

6.4.1 Measurement procedure

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 3 m away from the interference receiving antenna in the 10 m semi-anechoic chamber.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m ± 25 % above the reference ground plane. Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For peak and CISPR average detector with 1 MHz RBW were used for above 1 ~ 6 GHz frequency range.

6.4.2 Measurement uncertainty

Radiated emission	Uncertainty	Confidence level of approximately
1 GHz to 6 GHz	5.63 dB	Least about 95 %, k = 2

* Measurement uncertainty is calculated in accordance with CISPR 16-4-2.

6.4.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
Horn antenna	3117	ETS	00168719	2019.09.01
EMI Test Receiver	ESU40	R&S	100445	2018.12.15
Preamplifier	MLA-0108-C02-39	TSJ	027	2019.04.23
Turn Table	5983-1.5	TOKIN	-	-
Controller	C3000	Innco	40040217	-
Antenna Mast	MA4640-XPET-0800	Innco	578	-

* All test equipment used is calibrated on a regular basis

6.4.4 Limits for radiated emission

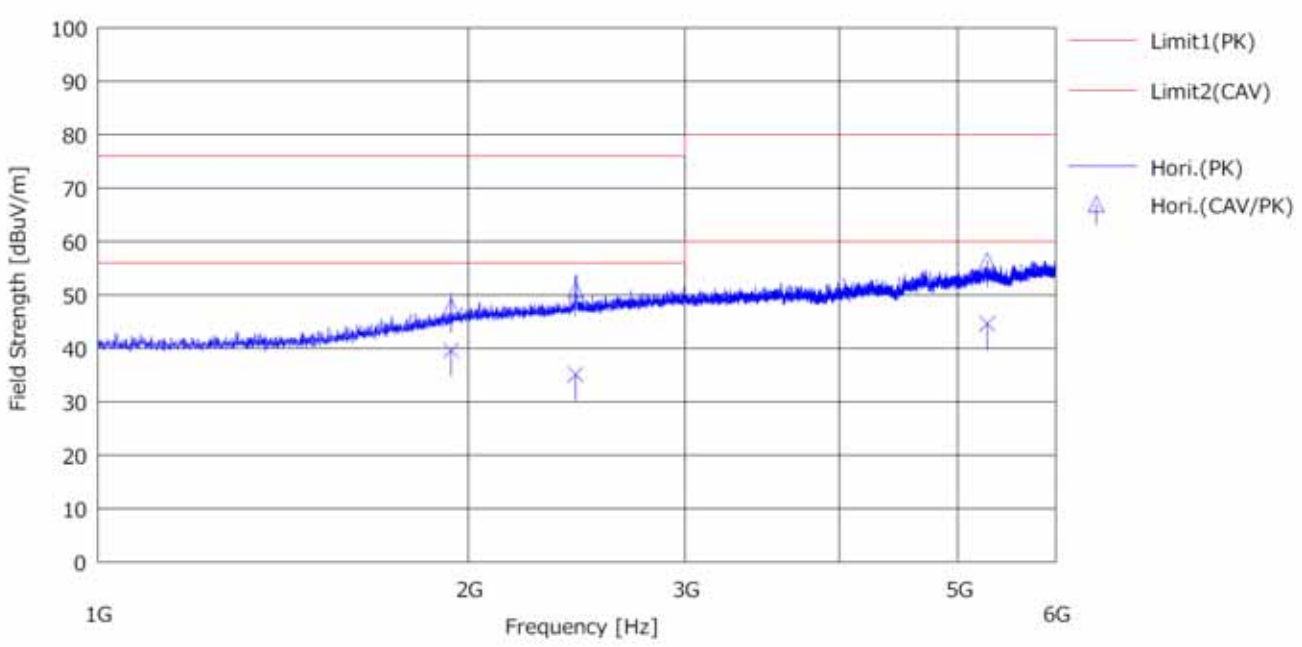
* Class A equipment

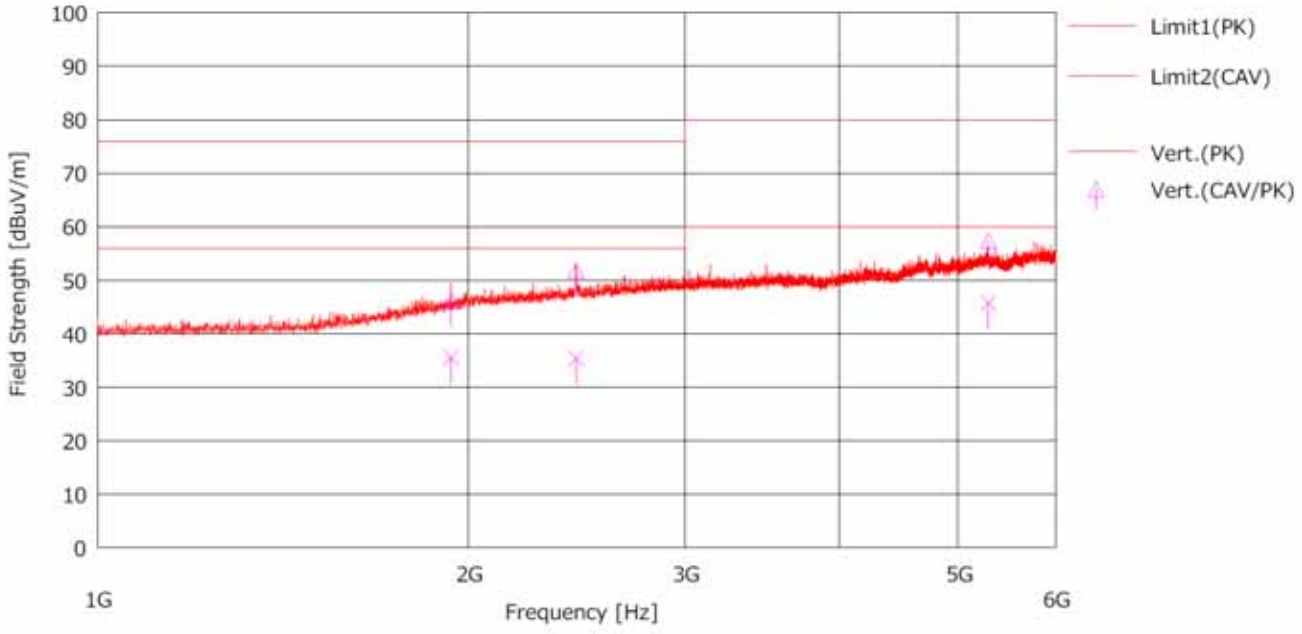
Frequency range (㎒)	Measurement		Class A limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	FSOATS
1 to 3	3	Average / 1 MHz	56
3 to 6			60
1 to 3		Peak / 1 MHz	76
3 to 6			80

* Class B equipment

Frequency range (㎒)	Measurement		Class B limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	FSOATS
1 to 3	3	Average / 1 MHz	50
3 to 6			54
1 to 3		Peak / 1 MHz	70
3 to 6			74

6.4.5 Radiated emission test data



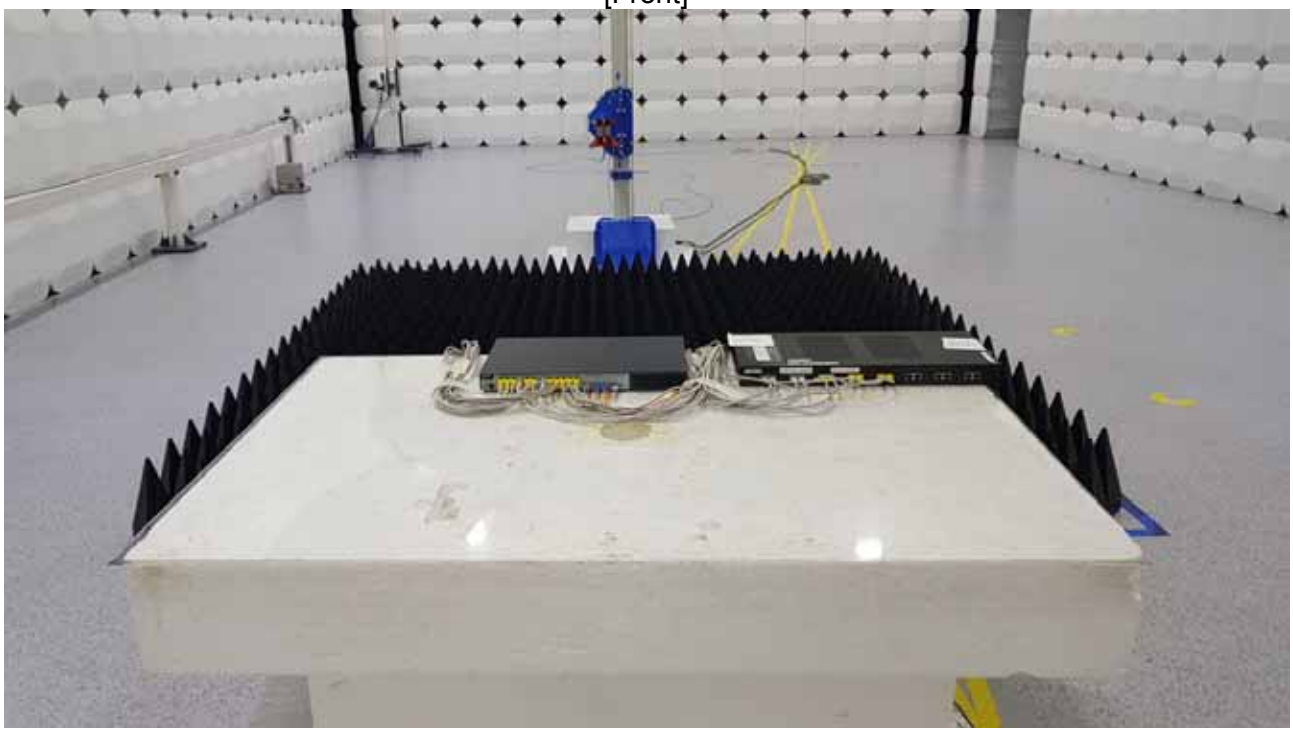


No.	Freq.	Reading		Ant.Fac	Loss	Gain	S.Fac	Result		Limit		Margin		Pola.	Height	Angle	Ant. Type
		<CAV>	<PK>					<CAV>	<PK>	<PK>	<CAV>	<PK>	<CAV>				
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	dBuV/m	dBuV/m	dBuV/m	dBuV/m	[dB]	[dB]	[H/V]	[cm]	[deg]	
1	1937.499	42.6	50.8	31.2	-36.1	0.0	1.9	39.6	47.8	76.0	56.0	28.2	16.4	Hori.	99	361	8719K
2	2445.611	36.4	52.3	32.1	-35.3	0.0	1.9	35.1	51.0	76.0	56.0	25.0	20.9	Hori.	99	361	8719K
3	5281.222	38.4	50.2	34.3	-30.0	0.0	1.9	44.6	56.4	80.0	60.0	23.6	15.4	Hori.	99	361	8719K
4	1937.586	38.5	49.2	31.2	-36.1	0.0	1.9	35.5	46.2	76.0	56.0	29.8	20.5	Vert.	99	361	8719K
5	2447.962	36.7	53.1	32.1	-35.3	0.0	1.9	35.4	51.8	76.0	56.0	24.2	20.6	Vert.	99	361	8719K
6	5292.492	39.6	51.2	34.3	-30.0	0.0	1.9	45.8	57.4	80.0	60.0	22.6	14.2	Vert.	99	361	8719K

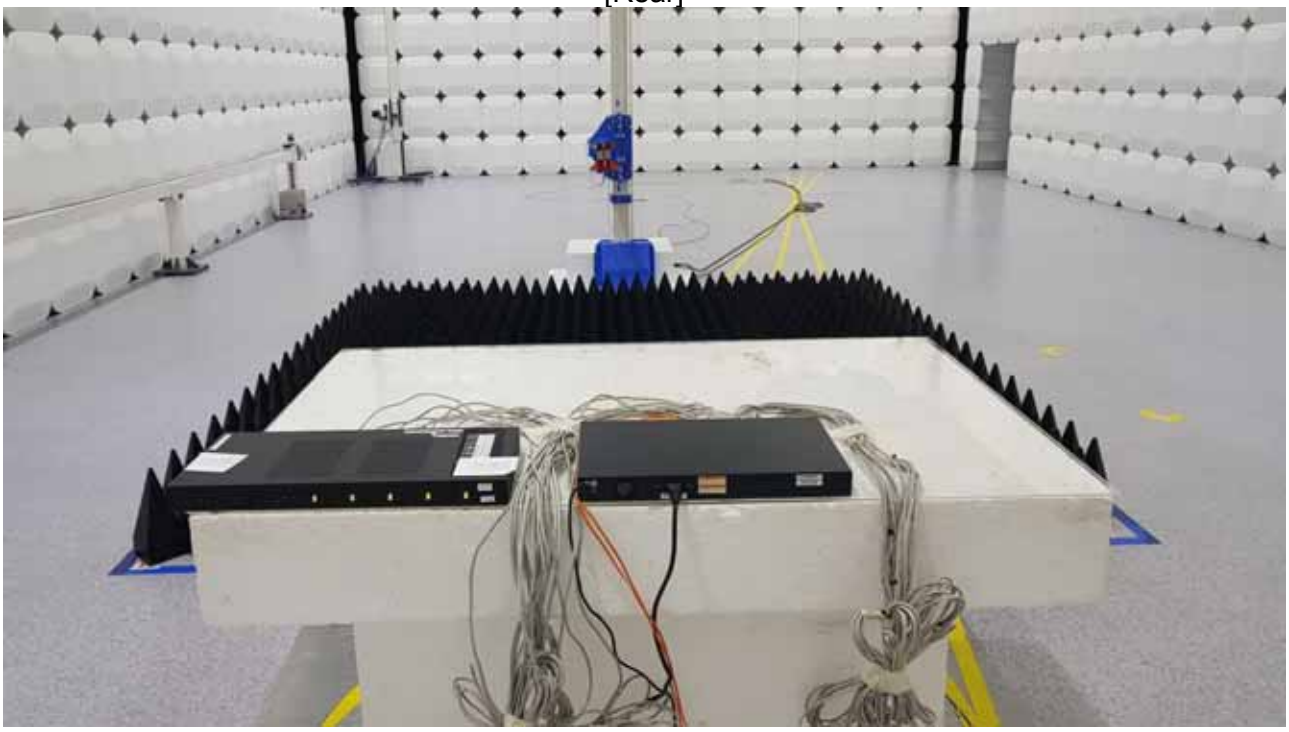
* Results [dB(μV/m)] = Reading [dB(μV)] + Antenna factor [dB/m] - Loss [dB]
* Loss = Cable loss [dB] - Amp gain [dB]
* Margin [dB] = Limit [dB(μV/m)] - Results [dB(μV/ m)]
* PK = Peak, CAV = CISPR Average

6.4.6 Test setup photos

[Front]



[Rear]



6.5 Harmonics current emission

Test standard	EN 61000-3-2:2014
Test date	2018.05.16
Test facility	Shielded room (#1)
Test voltage	AC 230 V, 50 Hz
Temperature	21.5 °C
Relative humidity	54.7 % R.H.
Test result	Comply

6.5.1 Measurement procedure

Harmonics of the fundamental current were measured up to 2 kHz using a universal power analyzer. The measurements were carried out under steady conditions and using average. Before making measurements, it is necessary for the EUT to decide which class the EUT fulfills into; A, B, C or D. The test set-up photo is included In appendix 3. (Remark: The input power of the EUT is lower than 75 W. According to the cause 7 in EN 61000-3-2:2014, no limit applies for the EUT. See next page for harmonics on AC mains test data.)

Observation time	150 s
Windows width	10 periods

6.5.2 Measurement uncertainty

Measurement uncertainty is calculated in accordance with EN 61000-3-2.

The measurement uncertainty is given with confidence of least about 95 % with the coverage factor, k = 2.

6.5.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
Digital power analyzer (Harmonics & Flicker)	DPA 500N	EMTEST	P1437139796	2019.04.24
AC power supply	PCR4000M	KIKUSUI	UK001881	2019.04.23

* All test equipment used is calibrated on a regular basis.

6.5.4 Measurement result

Report title:	T1804-0152
Company Name:	LAB-T
Date of test:	16.Mai 2018
Measurement file name:	Harmonics_3_2_Ed4.rsd
Tester:	KJH
Standard used:	EN/IEC 61000-3-2 Ed.4 Quasi-stationary Equipment class A <= 200% of the limit (Limit factor: 1.00)
Observation time:	150s
Windows width:	10 periods - (EN/IEC 61000-4-7 Edition 2002 + A1:2008)
Customer:	DASAN Network Solutions, Inc.
E. U. T.:	SWITCH
Temperature :	21.5
Humidity :	54.7

Test Result	
E. U. T.:	PASS
Power Source:	PASS

E. U. T. Result

Harmonic(s) > 200%:	
Order (n):	None
Harmonic(s) with average > 90%:	
Order (n):	None
Harmonic(s) between 150% and 200% during more than 10% of the test time or max. 10min:	
Order (n):	None

Power Source Result

First dataset out of limit:	
DS (time):	None
Harmonic(s) out of limit:	
Order (n):	None

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	632.906E-3			
2	658.315E-6			PASS
3	109.895E-3	5.309	2.07	PASS
4	877.282E-6			PASS
5	54.554E-3	5.317	1.03	PASS
6	690.454E-6			PASS
7	31.464E-3	4.540	693.00E-3	PASS
8	707.030E-6			PASS
9	17.130E-3	4.758	360.00E-3	PASS
10	711.987E-6			PASS
11	8.694E-3	2.927	297.00E-3	PASS
12	722.818E-6			PASS
13	7.720E-3	4.084	189.00E-3	PASS
14	724.815E-6			PASS
15	4.969E-3			PASS
16	693.082E-6			PASS
17	3.769E-3			PASS
18	695.259E-6			PASS
19	2.676E-3			PASS
20	688.259E-6			PASS
21	4.644E-3			PASS
22	793.520E-6			PASS
23	5.903E-3	6.704	88.05E-3	PASS
24	692.229E-6			PASS
25	4.957E-3			PASS
26	819.056E-6			PASS
27	3.111E-3			PASS
28	759.701E-6			PASS
29	2.841E-3			PASS
30	823.222E-6			PASS
31	3.562E-3			PASS
32	779.136E-6			PASS
33	6.399E-3	10.428	61.36E-3	PASS
34	779.909E-6			PASS
35	9.197E-3	15.896	57.86E-3	PASS
36	711.734E-6			PASS
37	10.924E-3	19.959	54.73E-3	PASS
38	723.740E-6			PASS
39	10.631E-3	20.476	51.92E-3	PASS
40	717.687E-6			PASS

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.

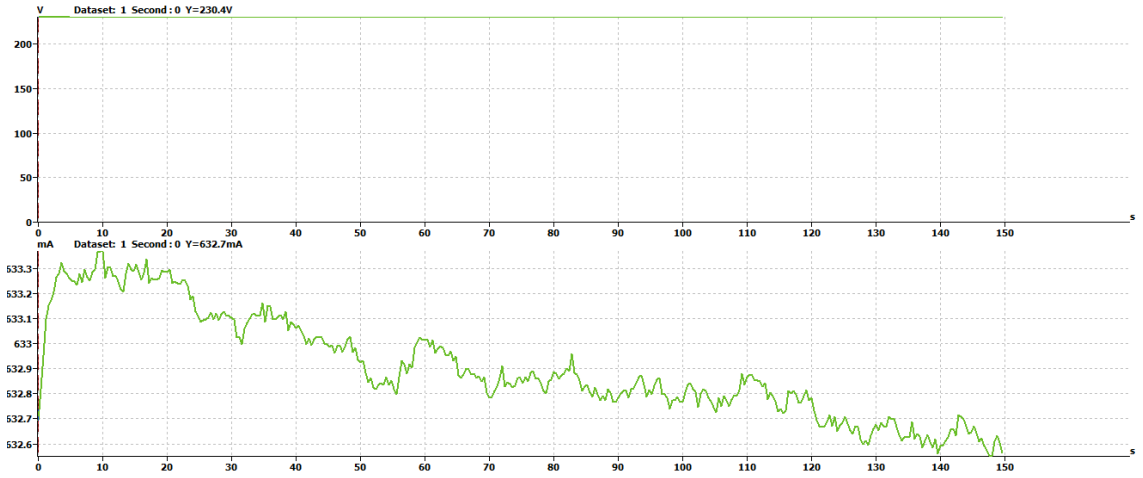
Maximum harmonic current results

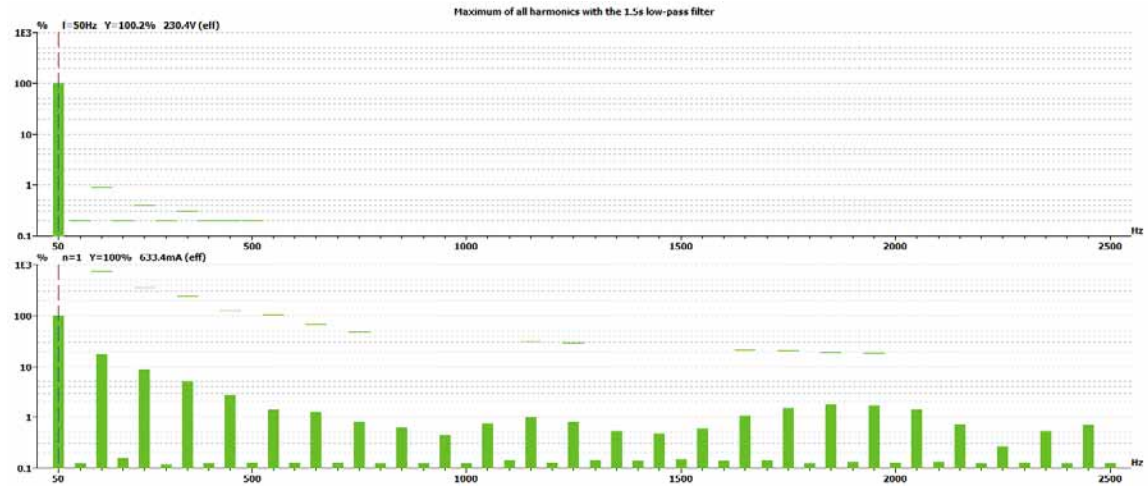
Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	633.382E-3			
2	768.397E-6			PASS
3	110.093E-3	2.393	4.60	PASS
4	973.313E-6			PASS
5	54.739E-3	2.401	2.28	PASS
6	750.964E-6			PASS
7	31.666E-3	2.056	1.54	PASS
8	778.535E-6			PASS
9	17.240E-3	2.155	800.00E-3	PASS
10	795.894E-6			PASS
11	8.816E-3	1.336	660.00E-3	PASS
12	807.147E-6			PASS
13	7.867E-3	1.873	420.00E-3	PASS
14	808.199E-6			PASS
15	5.116E-3	1.705	300.00E-3	PASS
16	773.947E-6			PASS
17	3.914E-3			PASS
18	767.308E-6			PASS
19	2.784E-3			PASS
20	767.064E-6			PASS
21	4.776E-3			PASS
22	891.748E-6			PASS
23	6.063E-3	3.099	195.66E-3	PASS
24	812.101E-6			PASS
25	5.101E-3	2.834	180.00E-3	PASS
26	906.883E-6			PASS
27	3.267E-3			PASS
28	862.064E-6			PASS
29	2.957E-3			PASS
30	918.626E-6			PASS
31	3.712E-3			PASS
32	853.011E-6			PASS
33	6.597E-3	4.838	136.36E-3	PASS
34	884.610E-6			PASS
35	9.331E-3	7.257	128.58E-3	PASS
36	776.531E-6			PASS
37	11.056E-3	9.091	121.62E-3	PASS
38	842.203E-6			PASS
39	10.753E-3	9.319	115.38E-3	PASS
40	801.363E-6			PASS

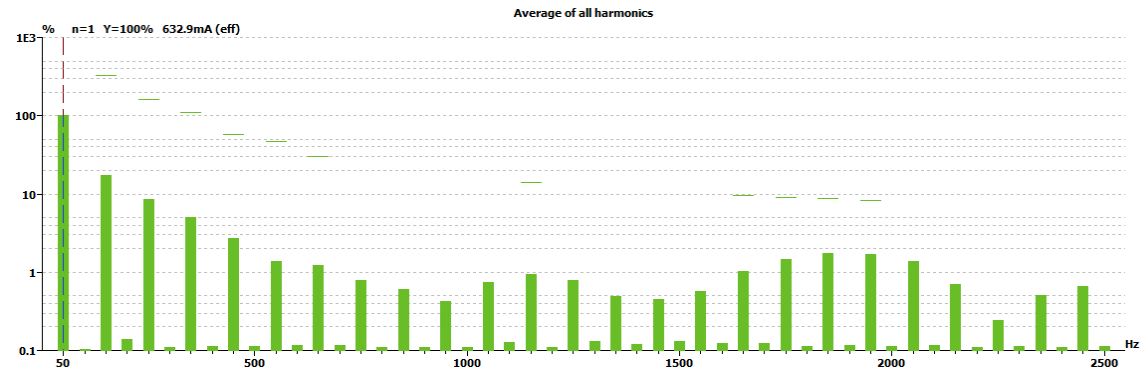
Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	230.38	100.164		
2	185.63E-3	0.081	0.2	PASS
3	81.13E-3	0.035	0.9	PASS
4	22.71E-3	0.010	0.2	PASS
5	8.36E-3	0.004	0.4	PASS
6	9.45E-3	0.004	0.2	PASS
7	5.62E-3	0.002	0.3	PASS
8	7.28E-3	0.003	0.2	PASS
9	7.38E-3	0.003	0.2	PASS
10	7.53E-3	0.003	0.2	PASS
11	6.64E-3	0.003	0.1	PASS
12	8.32E-3	0.004	0.1	PASS
13	7.34E-3	0.003	0.1	PASS
14	6.87E-3	0.003	0.1	PASS
15	6.33E-3	0.003	0.1	PASS
16	8.97E-3	0.004	0.1	PASS
17	7.33E-3	0.003	0.1	PASS
18	7.09E-3	0.003	0.1	PASS
19	7.72E-3	0.003	0.1	PASS
20	5.67E-3	0.002	0.1	PASS
21	8.58E-3	0.004	0.1	PASS
22	6.35E-3	0.003	0.1	PASS
23	7.53E-3	0.003	0.1	PASS
24	5.38E-3	0.002	0.1	PASS
25	6.35E-3	0.003	0.1	PASS
26	6.16E-3	0.003	0.1	PASS
27	4.96E-3	0.002	0.1	PASS
28	5.51E-3	0.002	0.1	PASS
29	6.13E-3	0.003	0.1	PASS
30	4.61E-3	0.002	0.1	PASS
31	6.28E-3	0.003	0.1	PASS
32	6.26E-3	0.003	0.1	PASS
33	8.90E-3	0.004	0.1	PASS
34	5.44E-3	0.002	0.1	PASS
35	8.04E-3	0.003	0.1	PASS
36	6.82E-3	0.003	0.1	PASS
37	10.02E-3	0.004	0.1	PASS
38	7.66E-3	0.003	0.1	PASS
39	6.72E-3	0.003	0.1	PASS
40	5.60E-3	0.002	0.1	PASS


V Dataset: 1 Second : 0 Y=230.4V
mA Dataset: 1 Second : 0 Y=632.7mA


Maximum of all harmonics with the 1.5s low-pass filter
% f=50Hz Y=100.2% 230.4V (eff)
% n=1 Y=100% 633.4mA (eff)
Hz


Average of all harmonics
% n=1 Y=100% 632.9mA (eff)
Hz

6.5.5 Setup photos

6.6 Voltage fluctuations and flicker emission

Test standard	EN 61000-3-3:2013
Test date	2019.05.16
Test facility	Shielded room (#1)
Test voltage	AC 230 V, 50 Hz
Temperature	21.1 °C
Relative humidity	54.8 % R.H.
Test result	Comply

6.6.1 Measurement procedure

The voltage changes at the supply terminals were measured across the complex reference impedance Z = (0.4 + j0.25) Ω. The short-term flicker values are measured during a time interval of 10 min. Dc = relative voltage change between two steady states and dmax = maximum single voltage change, are measured over the reference impedance. The test set-up photo Is included in appendix 3.

Short time (Pst)	10 min
Observation time	120 min (12 Flicker measurement)
Flicker impedance	Zref (IEC 60725)

6.6.2 Measurement uncertainty

Measurement uncertainty is calculated in accordance with EN 61000-3-3.
The measurement uncertainty is given with confidence of least about 95 % with the coverage factor, k = 2.

6.6.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
Digital power analyzer (Harmonics & Flicker)	DPA 500N	EMTEST	P1437139796	2018.04.25
AC power supply	PCR4000M	KIKUSUI	UK001881	2018.04.24

* All test equipment used is calibrated on a regular basis.

6.6.4 Measurement result

Report title:	T1804-0152
Company Name:	LAB-T
Date of test:	16.Mai 2018
Tester:	KJH
Standard used:	EN/IEC 61000-3-3 Ed.3 Flicker
Short time (Pst):	10 min
Observation time:	120 min (12 Flicker measurements)
Flickermeter:	230V / 50Hz according IEC 61000-4-15 Ed.2
Flicker Impedance:	Zref (IEC 60725)
Customer:	DASAN Network Solutions, Inc.
E. U. T.:	SWITCH
Temperature :	21.1
Humidity :	54.8

Test Result	PASS

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.177	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Detail Flicker data

Flicker measurement 1	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.177	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 2	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.066	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 3	EUT values	Limit	Result
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.067	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 4	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.064	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 5	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.064	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 6	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.065	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 7	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.063	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 8	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.064	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 9	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.066	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 10	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.066	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 11	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.065	4.00	PASS
Tmax [s]	0.000	0.50	PASS

Flicker measurement 12	**EUT values**	**Limit**	**Result**
Pst	0.028	1.00	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.065	4.00	PASS
Tmax [s]	0.000	0.50	PASS

6.6.5 Setup photos

7. Immunity test results (Other than telecommunication centres)

7.1 Electrostatic discharge immunity

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-2:2009
Test date	2018.05.17
Test facility	Shielded room (#2)
Test voltage	AC 230 V, 50 Hz
Temperature	23.2 °C
Relative humidity	54.7 % R.H.
Air pressure	99.4 kPa
Performance criterion	B
Test result	Comply

7.1.1 Measurement procedure

A ground reference plane was located on the floor, and connected to earth via a low impedance connection. The return cable of the ESD generator was connected to the reference plane. In case of table top equipment, EUT was placed on the reference plane on 80 cm of insulating support.
Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to between 0.05 m and 0.15 m the reference ground plane. And a vertical coupling plane (VCP) of (0.5 x 0.5) m was located 10 cm from the EUT's sides. The VCP was connected to the reference plane via a cable with a 470 kΩ (2ea) resistor. The test was made by applying contact and air discharges to the EUT and contact discharges to the VCP/HCP. When applying the discharges to the VCP the tip of the generator was located at the middle edge of the VCP. The VCP was located 10 cm from each side of the EUT.

* Conditions during testing

Discharge	Test levels	Number of discharge
HCP/VCP	± 6 kV	10
Contact	± 6 kV	
Air	± 2 kV, ± 4 kV, ± 8 kV	

7.1.2 Measurement uncertainty

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least about 95 % confidence.

7.1.3 Test equipment used

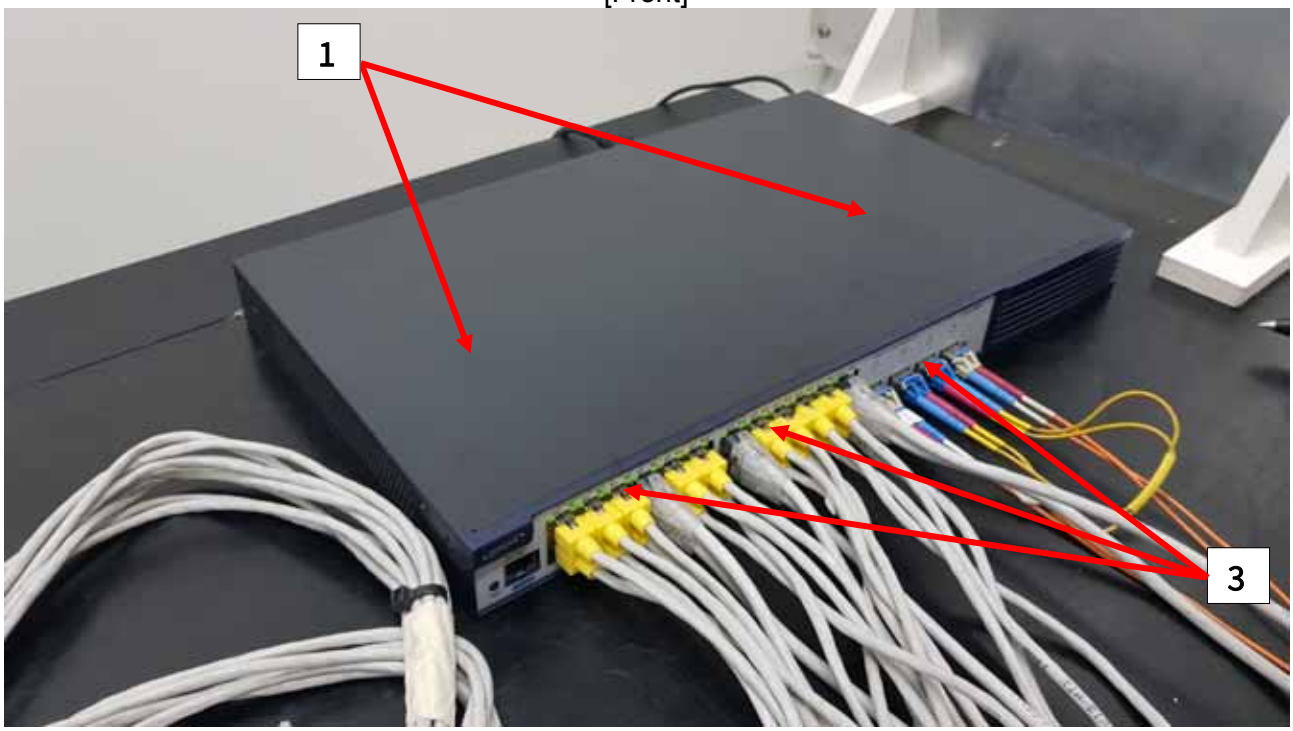
Equipment	Model	Manufacturer	Serial number	Next cal. date
ESD-generator	ESD 30N	EMTEST	P1442142210	2019.01.05

* All test equipment used is calibrated on a regular basis.

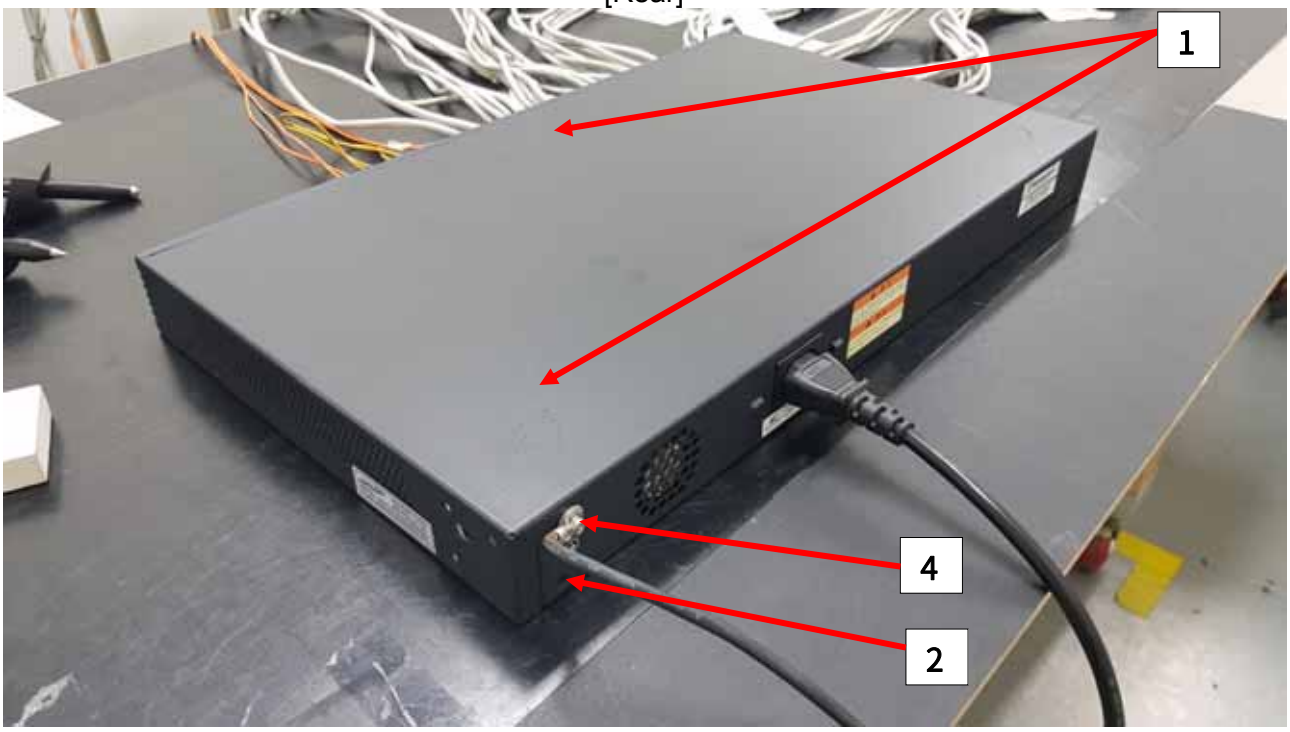
7.1.4 Test point and result

Air
Contact

[Front]



[Rear]



* Indirect applied

ESD point	Test levels	Discharge	Results
HCP	± 6 kV	Contact	A
VCP	± 6 kV	Contact	A

* Directly applied

ESD point	Test levels	Discharge	Results
(1) Enclosure	± 6 kV	Contact	A
(2) Screw	± 6 kV	Contact	A
(3) Port	± 6 kV	Contact	A
(4) GND	± 6 kV	Contact	A

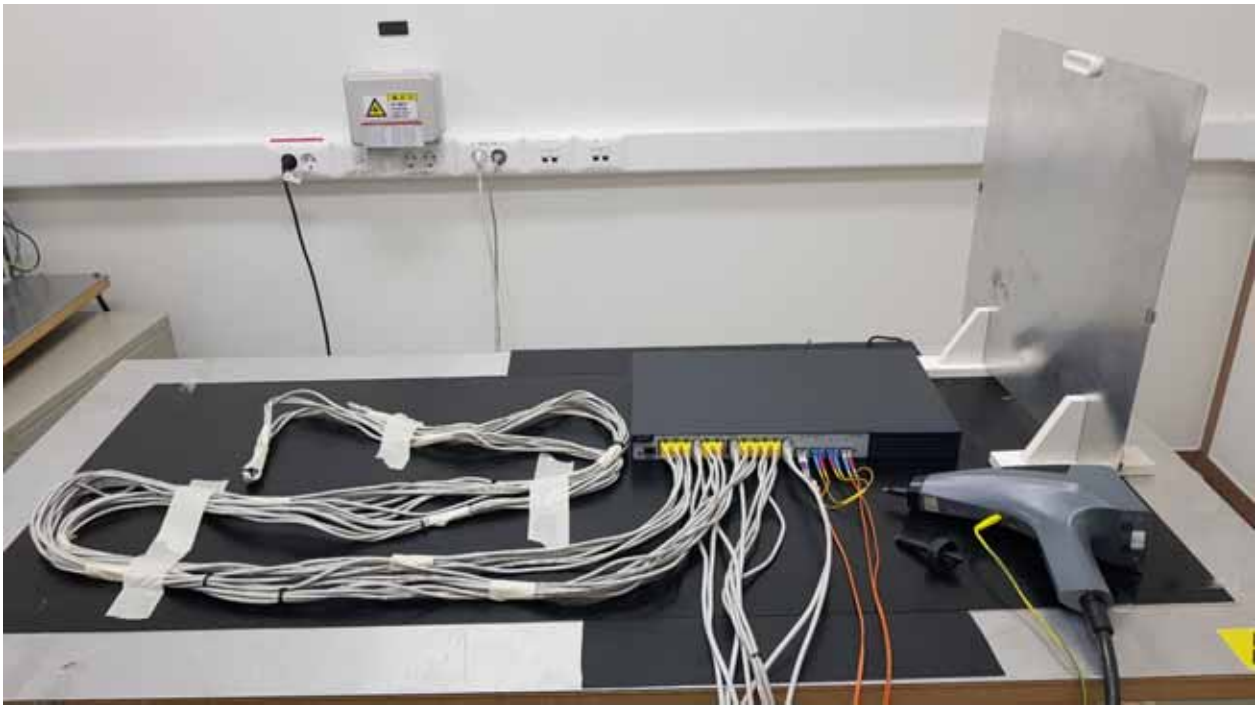
*** Comment / Performance**

- Passed as EUT was in normal operation during the test.
- The enclosures consists of metallic parts excluded from the air discharge test.

*** Packet loss**

Interface	Tx Packet	Rx Packet	Packet size	Loss	Criteria	Result
Enclosure	127,575,401	127,575,401	1514	0	B	A

7.1.5 Test setup photos



7.2 Radiated electromagnetic fields immunity (80 MHz to 6 000 MHz)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-3:2006+A2:2010
Test date	2018.05.23
Test facility	3 m Chamber
Test voltage	AC 230 V, 50 Hz
Temperature	21.4 °C
Relative humidity	50.5 % R.H.
Air pressure	99.3 kPa
Performance criterion	A
Test result	Comply

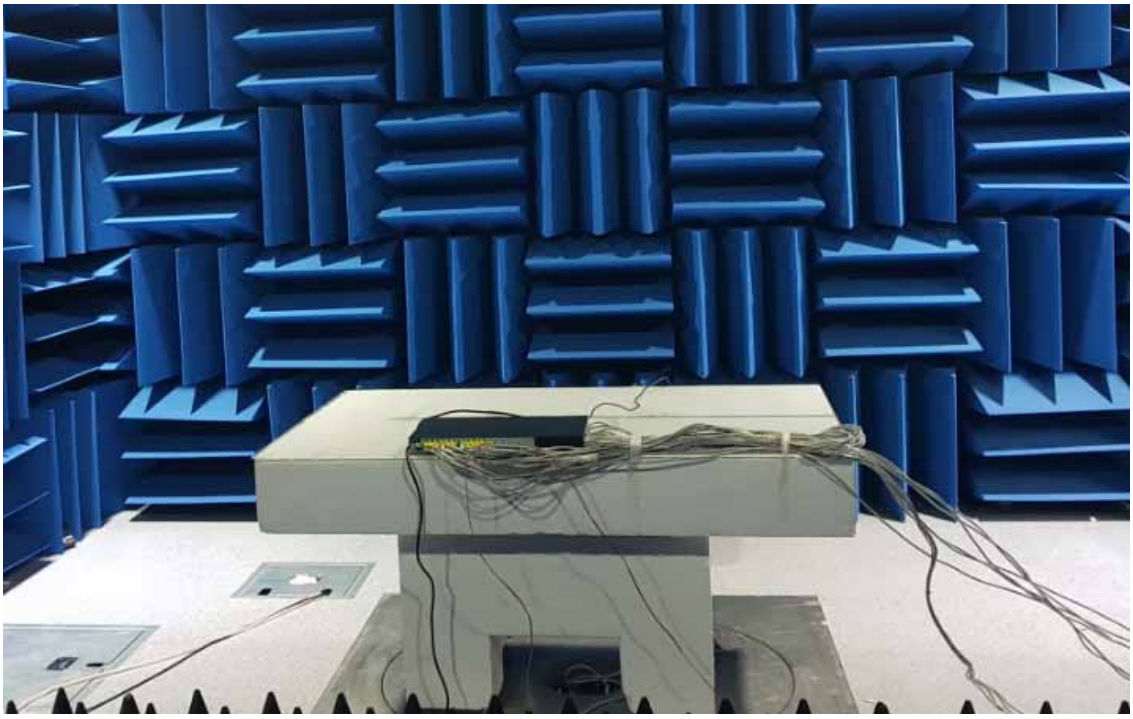
7.2.1 Measurement procedure

The EUT has been placed in center of a wooden turntable. The height of this table was 0.8 m. Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to between 0.05 m and 0.15 m the reference ground plane. The field strength was monitored by an isotropic sensor during the complete test. The isotropic sensor was located beside the equipment. The antenna has been orientated for both horizontal and vertical polarization. The distance between antennas the equipment under testing was at least 3 m. The tests have been performed with the antenna facing each of the four side of the EUT.

* Conditions during testing

Frequency range / Test level	80 ㎒ to 690 ㎒ / 3 V/m
	690 ㎒ to 6 000 ㎒ / 10 V/m
Modulation	AM 80 % (1 ㎑ Sine wave)
Step	1 % step
Dwell time	1 s

7.2.2 Test configuration



7.2.3 Measurement uncertainty

The measurement uncertainty is 1.92 V/m.

Measurement uncertainty is calculated in accordance with CISPR 16-4-2.

The measurement uncertainty is given with a confidence of least about 95 %.

The measurement uncertainty is calculated as the uncertainty of the electric field intensity detected by the probe(s). The uncertainty calculations exclude influence of phenomena like inhomogeneity of the electric field intensity.

7.2.4 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
Log periodic antenna	VULP9118E	Schwarzbeck	937	-
Signal Generator	SMB100A	R&S	108981	2019.04.23
Power Meter	NRP2	R&S	104027	2019.04.23
Power Sensor	NRP-Z91	R&S	102854	2019.04.23
Power Sensor	NRP-Z91	R&S	102855	2019.04.23
Directional Coupler	C3908-10	Welartone	106598	2019.04.23
POWER AMPLIFIER	MT400D	PRANA	1631	-
Horn Antenna	3117	ETS	00161011	2019.04.03
Directional Coupler	CHP-272L-40F-40R	ATM	Q801811-01	2019.04.23
POWER AMPLIFIER	SV120D	PRANA	1632	-
Directional Coupler	C10117-10	Werlatone	108785	2019.01.11
POWER AMPLIFIER	UX100DC	PRANA	1512-1798	-

* All test equipment used is calibrated on a regular basis.

7.2.5 Measurement result

* 80 ㎒ ~ 690 ㎒

Test level	Exposed side	Performance result	
		Horizontal	Vertical
3 V/m	Front side	A	A
	Back side	A	A
	Left side	A	A
	Right side	A	A

* 690 ㎒ to 1 000 ㎒

Test level	Exposed side	Performance result	
		Horizontal	Vertical
10 V/m	Front side	A	A
	Back side	A	A
	Left side	A	A
	Right side	A	A

* 1 000 ㎒ to 6 000 ㎒

Test level	Exposed side	Performance result	
		Horizontal	Vertical
10 V/m	Front side	A	A
	Back side	A	A
	Left side	A	A
	Right side	A	A

*** Comment / Performance**

- Passed as EUT was in normal operation during the test.

*** Packet loss**

Interface	Tx Packet	Rx Packet	Packet size	Loss	Criteria	Result
Enclosure	1,046,118,292	1,046,118,292	1514	0	A	A

7.2.6 Test setup photos

[80 MHz to 1 000 MHz]

[1 000 MHz to 6 000 MHz]

7.3 Fast transients/burst immunity

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-4:2012
Test date	2018.05.17
Test facility	Shielded room (#2)
Test voltage	AC 230 V, 50 Hz
Temperature	23.5 °C
Relative humidity	56.1 % R.H.
Air pressure	99.4 kPa
Performance criterion	B
Test result	Comply

7.3.1 Measurement procedure

The EUT has been placed on a wooden table 10 cm above the reference ground plane.
The reference ground plane exceeded the projected geometry of the EUT and the capacitive clamp by more than 20 cm. The clamp has placed directly on the reference ground plane.
The distance between the EUT and all other conductive structures except the ground plane beneath the EUT was more than 50 cm. The distance between noise generator and EUT was about 50 cm.

* Conditions during testing

Test level	AC power ports: ± 1 kV
	DC power ports: ± 1 kV
	Signal lines ports (Indoor, outdoor): ± 0.5 kV
Repetition rate	5 kHz
Reis time	Calibration of the coupling/decoupling network (5.5 ± 1.5) ns
	Calibration of the capacitive coupling clamp (5 ± 1.5) ns
Pulse width	Calibration of the coupling/decoupling network (45 ± 15) ns
	Calibration of the capacitive coupling clamp (50 ± 15) ns
Burst duration	15 ms
Burst period	300 ms
Coupling time	60 s

7.3.2 Measurement uncertainty

It has been demonstrated that the burst generator meets the specified requirements in the standard with at least about 95 % confidence.

7.3.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. Date
Ultra compact simulator	UCS 500N5T	EMTEST	P1434138611	2019.01.11
CAPACITIVE COUPLING CLAMP	HFK	EMTEST	P1413132724	2019.04.23
Motorized Variac	MV 2616	EMTEST	P1445143106	-

* All test equipment used is calibrated on a regular basis.

7.3.4 Measurement result

* Main power ports

Coupling point	Test level	Results (Positive / Negative)
L	± 1 kV	A
N	± 1 kV	A
L-N	± 1 kV	A
PE	± 1 kV	A
L-PE	± 1 kV	A
N-PE	± 1 kV	A
L-N-PE	± 1 kV	A

* Signal lines ports

Coupling point	Test level	Results (Positive / Negative)
LAN	± 0.5 kV	A
PoE	± 0.5 kV	A

*** Comment / Performance**

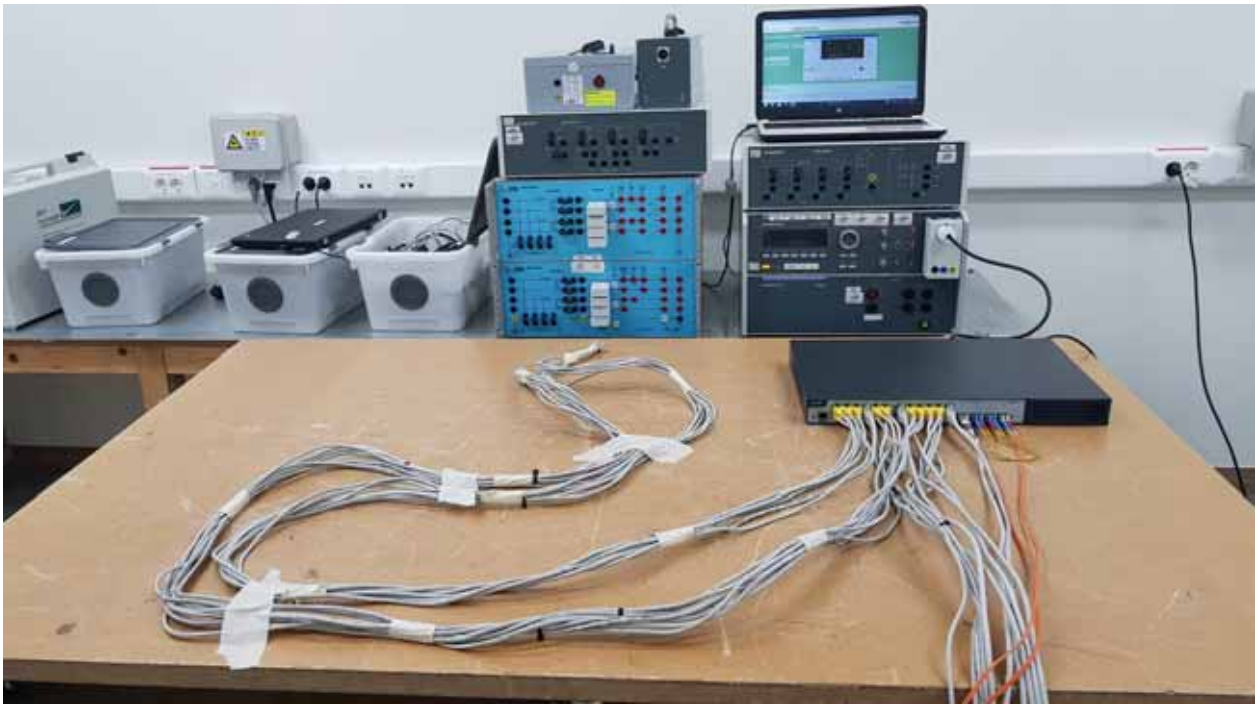
- Passed as EUT was in normal operation during the test.

*** Packet loss**

Interface	Tx Packet	Rx Packet	Packet size	Loss	Criteria	Result
AC MAIN	85,165,415	85,165,415	1514	0	B	A
SIGNAL	8,505,026	8,505,026	1514	0	B	A

7.3.5 Test setup photos

[Main]



[Signal]

7.4 Surges immunity

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-5:2014+A1:2017
Test date	2018.05.17
Test facility	Shielded room (#2)
Test voltage	AC 230 V, 50 Hz
Temperature	23.2 °C
Relative humidity	54.9 % R.H.
Air pressure	99.4 kPa
Performance criterion	B
Test result	Comply

7.4.1 Measurement procedure

The test consists of the injection of slow high energy transients in the AC/DC mains supply lines in both line-to-line and line-to-ground coupling mode, and into the signal and extra low voltage supply lines in line-to-ground coupling mode. The impedance of the transient generator is characterized by the shape of the open-circuit voltage and the circuit current pulses. To simulate typical installation impedances, 40 are inserted when the generator when extra low voltage and signal lines are tested, and 10 are inserted when the line-to-ground test is conducted on the AC/DC mains lines. The test pulses are coupled into the leads to be tested by means of appropriate coupling networks, which maintain the test pulses within their specification. The reference ground plane exceeded the projected geometry of the EUT and the back filler by more than 20 ㎝. The back filler has been placed directly on a separated reference ground plane. Both ground planes were connected together. The ground terminal of the back filler has been connected directly with its reference ground plane.

* Conditions during testing

Test level	AC power ports:	(Line - Line) ± 0.5 kV, ± 1 kV (Line - Ground) ± 0.5 kV, ± 1 kV, ± 2 kV
	Outdoor signal lines ports: (Unscreened cables)	(Line - Ground) ± 0.5 kV, ± 1 kV
	Outdoor signal lines ports: (Screened cables)	(Line - Line) ± 0.5 kV (Line - Ground) ± 0.5 kV, ± 1 kV
	Indoor signal lines ports:	(Line - Ground) ± 0.5 kV
Open-circuit voltage	AC power ports:	1.2 / 50 μs
	Outdoor signal lines ports:	10 / 700 μs (Unscreened cables) 1.2 / 50 μs (Screened cables)
	Indoor signal lines ports:	1.2 / 50 μs
Short-circuit current	AC power ports:	8 / 20 μs
	Outdoor signal lines ports:	5 / 320 μs (Unscreened cables) 8 / 20 μs (Screened cables)
	Indoor signal lines ports:	8 / 20 μs
Number of surge / time	1 time / 20 s	
Angle (AC power)	0 °, 90 °, 180 °, 270 °	
Number of surge	5 surge / polarity	

7.4.2 Measurement uncertainty

It has been demonstrated that the surge generator meets the specified requirements in the standard with at least about 95 % confidence.

7.4.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. Date
Ultra Compact Simulator	UCS 500N5T	EMTEST	P1434138611	2019.01.11
Motorized Variac	MV 2616	EMTEST	P1445143106	-
High Speed Coupling / Decoupling Network for Burst and Surge	CNI 508N2	EMTEST	P1445143088	2019.01.12

* All test equipment used is calibrated on a regular basis.

7.4.4 Measurement result

* Main power ports

Coupling point	Test level	Results (Positive / Negative)
L-N	± 0.5 kV, ± 1 kV	A
L-PE	± 0.5 kV, ± 1 kV, ± 2 kV	A
N-PE	± 0.5 kV, ± 1 kV, ± 2 kV	A

* Signal lines ports

Coupling point	Test level	Results (Positive / Negative)
LAN	± 0.5 kV	A

*** Comment / Performance**

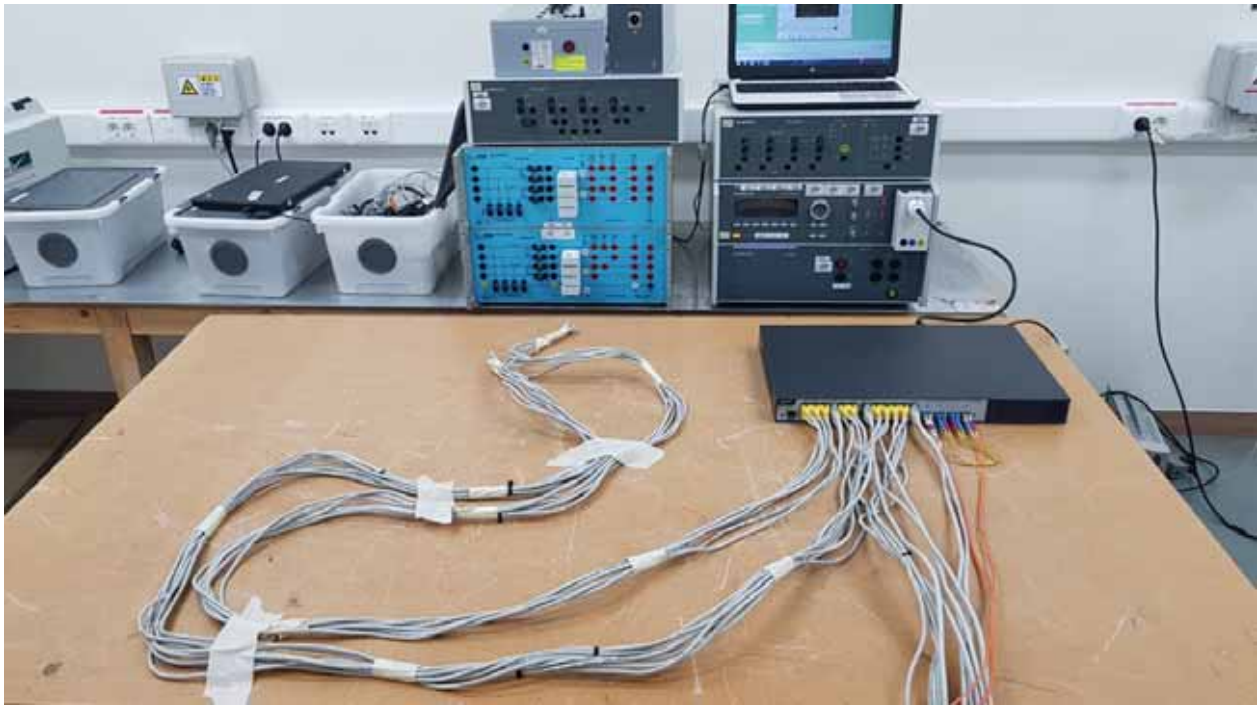
- Passed as EUT was in normal operation during the test.

*** Packet loss**

Interface	Tx Packet	Rx Packet	Packet size	Loss	Criteria	Result
AC MAIN	510,301,606	510,301,606	1514	0	B	A
SIGNAL	42,525,133	42,525,133	1514	0	B	A

7.4.5 Test setup photos

[Main]



[Signal]

7.5 Continuous conducted signals immunity (0.15 MHz to 80 MHz)

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-6:2014
Test date	2018.05.17
Test facility	Shielded room (#2)
Test voltage	AC 230 V, 50 Hz
Temperature	21.5 °C
Relative humidity	55.6 % R.H.
Air pressure	99.4 kPa
Performance criterion	A
Test result	Comply

7.5.1 Measurement procedure

The EUT has been placed on a wooden table 10 cm above the reference ground plane.
The reference ground plane exceeded the projected geometry of the EUT and the CDN by more than 30 cm. The CDN has been placed directly on the reference ground plane. The cable between CDN and EUT has a length of 30 cm.

* Conditions during testing

Frequency rang	0.15 ㎒ to 80 ㎒
Test level	3 V r.m.s
Test modulation	80 % AM (1 ㎑ sine wave)
Step	1 % step
Dwell time	1 s

7.5.2 Measurement uncertainty

The measurement uncertainty is 1.29 dB.

Measurement uncertainty is calculated in accordance with EN 61000-4-6 Annex G.

The measurement uncertainty is given with confidence of least about 95 %.

7.5.3 Test equipment used

Equipment	Model	Serial number	Manufacturer	Next cal. date
Continuous Wave Simulator	CWS 500N1	EMTEST	P1446143191	2019.04.24
6 dB Attenuator	ATT 6/80	EMTEST	P1451146000	2019.04.24
CDN	M3-32A	EMTEST	P1451145953	2019.04.24
CDN	M1	EMTEST	P1450144873	2019.04.24
CDN	T8	EMTEST	P1450144951	2019.04.24

* All test equipment used is calibrated on a regular basis.

7.5.4 Measurement result

* AC power ports

Coupling point	Coupling device	Results
L-N-PE	M3	A

* Signal line ports

Coupling point	Coupling device	Results
LAN	T8	A
PoE	T8	A
GND	M1	A

*** Comment / Performance**

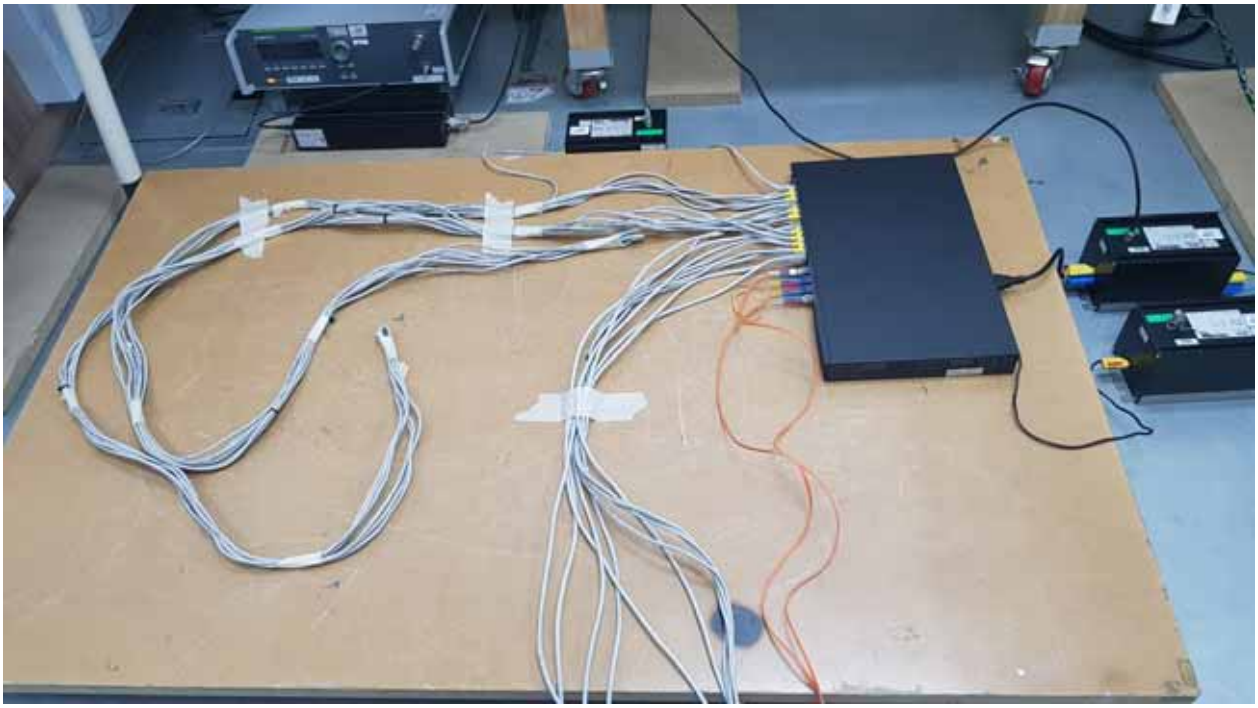
- Passed as EUT was in normal operation during the test.

*** Packet loss**

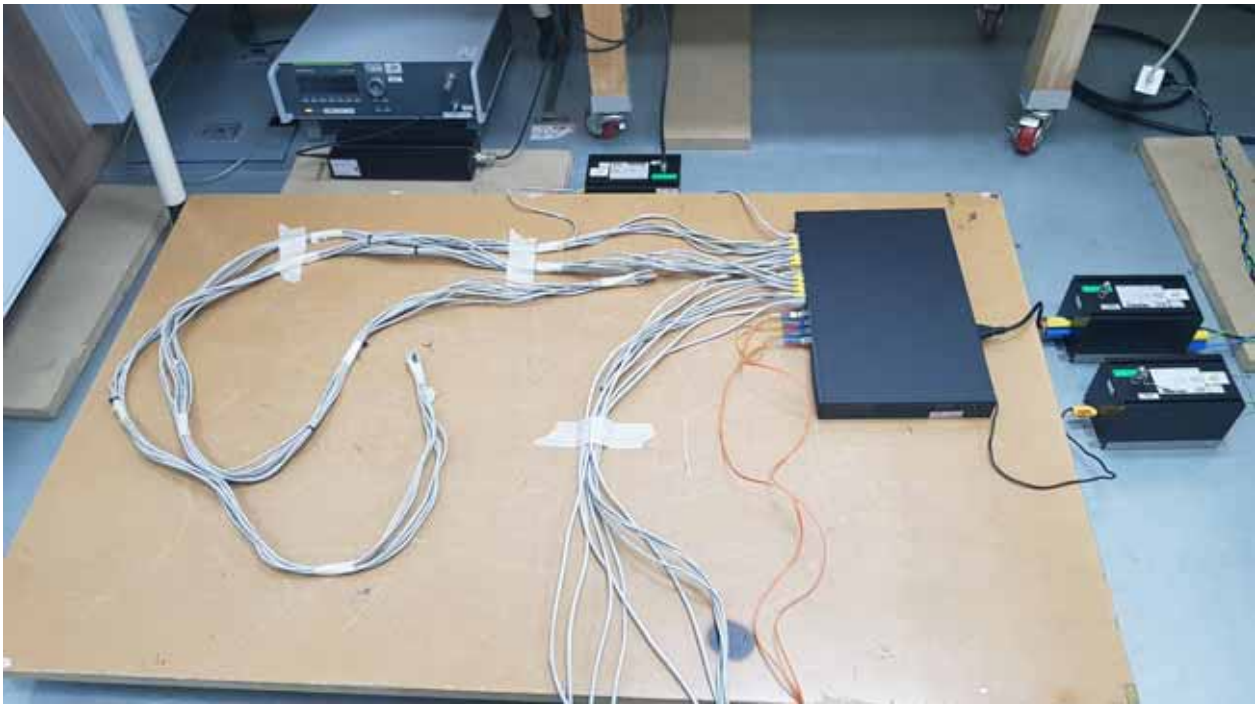
Interface	Tx Packet	Rx Packet	Packet size	Loss	Criteria	Result
AC MAIN	255,150,803	255,150,803	1514	0	A	A
SIGNAL	254,179,584	254,179,584	1514	0	A	A
GND	254,956,842	254,956,842	1514	0	A	A

7.5.5 Test setup photos

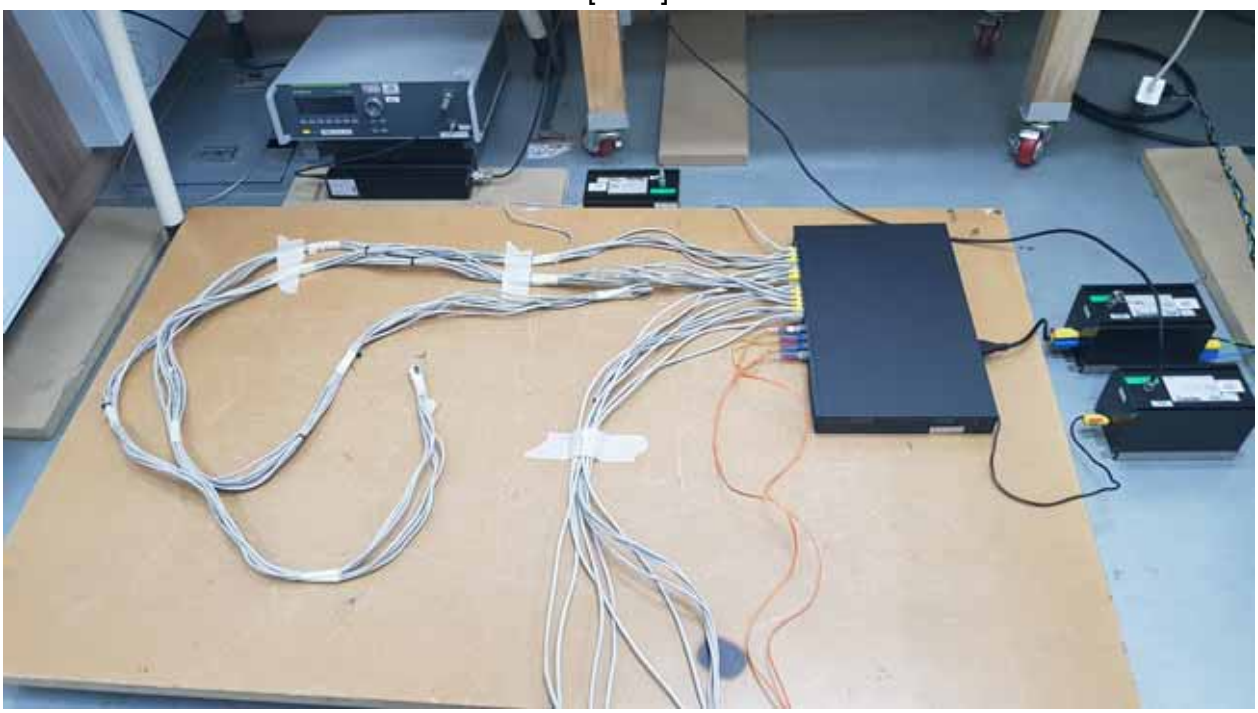
[Main]



[Signal]



[GND]



7.6 Voltage dips and short interruptions

Test standard	EN 300 386 V 2.1.1 (2016-07) EN 61000-4-11:2004+A1:2017
Test date	2018.05.17
Test facility	Shielded room (#2)
Test voltage	AC 100 V, 50 Hz AC 240 V, 50 Hz
Temperature	21.5 °C
Relative humidity	56.0 % R.H.
Air pressure	99.4 kPa
Performance criterion	B or C
Test result	Comply

7.6.1 Measurement procedure

The EUT is tested to each of the specified voltage variations, three times at 10 s interval for the most representative modes of operations. The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested.

* Conditions during testing

Number of dips	3 T
Duration	10 s
Test levels	Residual voltage: 0 %, Cycle: 1
	Residual voltage: 70 %, Cycle: 25
	Residual voltage: 0 %, Cycle: 250

7.6.2 Measurement uncertainty

It has been demonstrated that the surge generator meets the specified requirements in the standard with at least about 95 % confidence.

7.6.3 Test equipment used

Equipment	Model	Manufacturer	Serial number	Next cal. date
Ultra compact simulator	UCS 500N5T	EMTEST	P1434138611	2019.01.11
Motorized variac	MV 2616	EMTEST	P1445143106	-

* All test equipment used is calibrated on a regular basis.

7.6.4 Measurement result

* AC 100 V, 50 Hz

Residual voltage (%)	Cycle	Angle(°)	Count Number	Results
0	1	0 / 180	3 T	A
70	25		3 T	A
0	250		3 T	B

* AC 240 V, 50 Hz

Residual voltage (%)	Cycle	Angle(°)	Count Number	Results
0	1	0 / 180	3 T	A
70	25		3 T	A
0	250		3 T	B

*** Comment / Performance**

- During the test of power attenuation 0 % (250 cycles), the reset occurred but it passed as It complied the test standard.

7.6.5 Test setup photos

8. Photographs of the product

[Front]

[Rear]

[Left]

[Right]

[Inside]

[Main Board front]

[Main Board rear]

[SMPS front]

[SMPS rear]