



EMC TEST REPORT For CE

Test Report No. : KES-E1-19T0782
Date of Issue : Dec. 10, 2019
Product name : NVR
Model/Type No. : LRN-410S
Variant Model : -
Applicant : Hanwha Techwin Co., Ltd.
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : 1. HANWHA TECHWIN (TIANJIN) CO.,LTD.
2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.
3. D-TECH CO.,LTD.
Manufacturer Address : 1. No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA, Tianjin,
300385, People's Republic of China
2. Lot O-2, Que Vo Industrial Zone extended area,
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
3. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do,
Korea (Suwon Industrial Complex)
Date of Receipt : Nov. 19, 2019
Test date : Dec. 04, 2019 ~ Dec. 05, 2019
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dong In, Kim
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Dec. 10, 2019	KES-E1-19T0782	Issued

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1.0 General Product Description

Main Specifications of EUT are:

		LRN-410S	Functions	
Performance				
Record	Compression	H.265, H.264, MJPEG		IP address, Add profile edit, Bitrate, Compression, GOP, Quality, Camera MD setup, Wisestream, Dynamic GOV/FPS, VA Setup
	Record Rate(Analog)			Camera video setup (Simple focus, Brightness/Contrast, Flip/Mirror, IRIS, WDR, D&N, SSNR, Shutter, SDDR, DIS), Fisheye Dewarping Mode, Hallway View Setup, Camera Webpage
	Recording Bandwidth	Max. 30Mbps		
	Resolution	5MP ~ CIF		
	Mode	Normal, Schedule(Continuous/Event), Event (Pre/Post), Dual track Recording		
	Event Trigger	Alarm Input, Video Loss, Camera Event(Alarm, MD, Video Analytics, Defocus)		
Search & Play	Event Action	e-Mail, PTZ Preset, Buzzer, Monitor Out	PTZ	Control
	Playback Bandwidth	Max. 32Mbps(4CH simultaneously)	Smart phone	Control
	User	Max. 4 Users (Local 1, Remote 3)		Support Model
	Simultaneous playback	Max. 4CH(Local Monitor, Network)		Protocol Support
Storage	Fisheye Dewarping	WEB / CMS / Mobile		Control
	Supported HDD	Up to 6TB		Max. Remote Users
	HDD Slot	SATA 1ea(Max. 6TB)	Redundancy	Failover
	External			ARB
Backup	RAID		Easy configuration	Support
	File backup	BU/Exe(GUI), JPG/AVI(Network)	Coaxial Control	P2P(QR code)
Function		Multi channel(Upto 4CH) Play, Date-Time/Title display	Interface	
			HDMI	1EA
Network			VGA	
Protocol		IPv4, IPv6, TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTSP, NTP, HTTP, DHCP (Server, Client), PPPoE, SMTP, ICMP, IGMP, ARP, DNS, DDNS, uPnP, HTTPS, SNMP, ONVIF (Profile-S), SUNAPI(Server, Client)	Audio	
			Ethernet	RJ-45(10/100BASE-T) x 1 RJ-45(PoE+) x 4
DDNS		Wisenet DDNS	Alarm	
			USB	2EA(Front 1, Rear 1)
Transmission Bandwidth		Max. 20Mbps	Power inlet	
			System	
Audio	Input/Output	4CH(network)	System Control	Mouse, IR remocon, Web
	Compression	G.711, G.726, AAC(16/48KHz)	Language	English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese, Japanese, Thai, Vietnamese
Audio Communication		2-Way	Environmental	
			Operating Temperature	0°C to +40°C(32°F to 104°F)
Max Remote Users		Search(3), Live Unicast(10), Multicast(20)	Operating Humidity	20% ~ 85% RH
Security		HTTPS(SSL) Login Authentication	Electrical	
		Digest Login Authentication	Power Input	54VDC / 1.20A
		IP Address Filtering	Power Consumption	Max. 55.7W(1HDD, PoE on) Max. 12.7W(1HDD, PoE off)
		User access log	PoE Budget	Max. 35W
		802.1X Authentication(EAP-TLS, EAP-LEAP)	Mechanical	
		Device Certificate(Hanwha Techwin Root CA)	Color / Material	Black / Metal
Viewer Software		SSM, Webviewer, Smart Viewer, Wisenet mobile	Dimension (WxHxD)	W300.0 x H47.1 x D208.4 mm (11.8" x 1.85" x 8.2") (1U)
		Support SDK/CGI(SUNAPI) for integration to 3rd party VMS	Weight	0.99Kg (2.18lb)

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1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage ☒ 230 Vac ☐ 100 Vac ☐ 24 Vac ☐ 12 Vdc ☒ PoE
Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NVR	LRN-410S	-	HANWHA TECHWIN (TIANJIN) CO., LTD	EUT
NVR Adaptor	FSP065-DWAN3	-	FSP TECHNOLOGY INC.	-
HDD	WD10EURX-63C57Y0	-	Western Digital	1TB

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	NT730U3E	JJRE91CF200065A	SAMSUNG	-
Notebook Adaptor	PA-1600-66	AD-6019P	LITEON	-
Monitor	24M47VQ	702NTQDA3604	LG	-
Monitor Adaptor	ADS-40FSG-19 19025GPG-1	EAY62768621	Shenzhen Honor Electronic Co., Ltd.	-
Network Camera	QNV-6023R	-	HANWHA TECHWIN (TIANJIN) CO., LTD	-
Mouse	-	-	-	-
USB Memory	-	-	Transcend	16G

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1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NVR (EUT)	RJ-45 1	Notebook	RJ-45 1	3.0	U
	HDMI	Monitor	HDMI	1.4	S
	RJ-45 2	Network Camera	RJ-45 2	3.0	U
	USB Slot	Mouse	USB	1.2	U
	USB Slot	USB Memory	USB	-	U

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

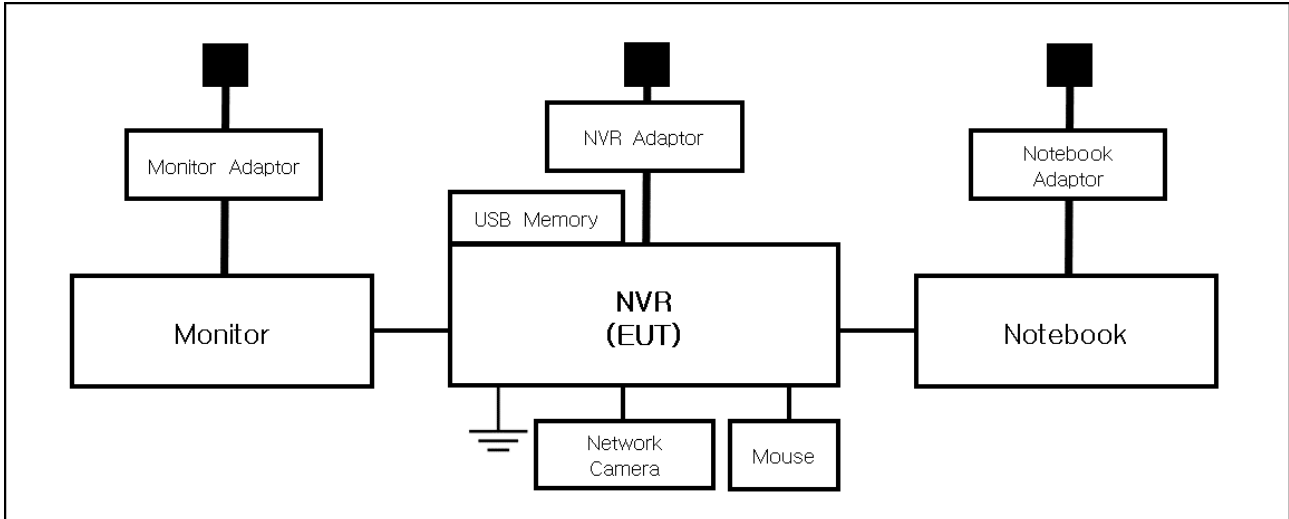
Test Mode	operating
Operate	Monitoring EUT, Ping Test

EUT Test operating S/W		
Name	Version	Manufacture Company
-	-	-

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1.8 Configuration

■ AC Main
 □ DC Main



1.9 Remarks when standards applied

N/A

1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2012

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298-1
JAPAN	VCCI	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	 R-20056, C-20036, T-20040, G-20057
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0003

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☒ EN 55032:2012/AC:2013

☒ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☐ EN 61326-1:2013



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- | | | |
|---|----------------------------------|----------------------------------|
| ☐ VCCI-CISPR 32:2016 | ☐ Class A | ☐ Class B |
| ☐ AS/NZS CISPR32:2015 | ☐ Class A | ☐ Class B |
| ☐ 47 CFR Part 15, Subpart B | | |
| ☐ CISPR 22:2009 +A1:2010 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2014 | | |
| ☐ IC Regulation ICES-003 : 2016 | | |
| ☐ CAN/CSA CISPR 22-10 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2014 | | |
| ☐ RE- Directive 2014/53/EU | | |
| ☐ EN 301 489-1 V1.9.2 | | |
| ☐ Equipment for fixed use | | |
| ☐ Equipment for vehicular use | | |
| ☐ Equipment for portable use | | |
| ☐ EN 301 489-3 V1.6.1 | | |
| ☐ EN 301 489-17 V2.2.1 | | |
| ☐ EN 60945:2002 | | |

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2.1 Conducted Emissions at Mains Power Ports

Test Date

Dec. 04, 2019

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 22, 2020
☒	LISN	ENV216	R & S	101787	01, 04, 2020
☒	LISN	ESH2-Z5	R & S	100450	04, 22, 2020
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 25 2020

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 49,6 % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

Dec. 04, 2019

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 22, 2020
☒	LISN	ENV216	R & S	101787	01, 04, 2020
☒	LISN	ESH2-Z5	R & S	100450	04, 22, 2020
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 25, 2020
☐	8-WIRE ISN CAT3,5	ENY81	R & S	100174	01, 07, 2020
☒	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	01, 07, 2020

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 49,6 % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.



2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Dec. 04, 2019

Test Location

☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4(10m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 09, 2020
☒	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2020
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020

Test Conditions

Temperature: 21,9 °C
Relative Humidity: 49,9 % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Dec. 04, 2019

Test Location

SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESR7	R & S	101190	08, 06, 2020
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 27, 2020
☐	ATTENUATOR	8491A	HP	35496	03, 11, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2020

Test Conditions

Temperature: 22,1 °C
Relative Humidity: 50,3 % R.H.

Frequency Range of Measurement

1 GHz to 6 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.



2.5 Harmonic Current Emissions

Test Date

Dec. 04, 2019

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: 21,5 °C
Relative Humidity: 52,3 % R.H.

Classification of Equipment for Harmonic Current Emissions

- ☒ Class A
☐ Class B
☐ Class C(Below 25 W)
☐ Class C(Above 25 W)
☐ Class D

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.



2.6 Voltage Fluctuations and Flicker

Test Date

Dec. 04, 2019

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	net.control	EM TEST	2.1.4	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: 21,5 °C
Relative Humidity: 52,3 % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 Alarm systems-Part 4: Electromagnetic compatibility Product family standard: Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test report, based on the following criteria:

Electrostatic discharge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Radiated electromagnetic fields

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.

Fast transient burst / slow high energy voltage surge

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the application of discharge is permissible, providing
That there is no residual is permissible, providing that there is no residual change in the EUT or
any
change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the application of discharge is permissible, providing
That there is no residual is permissible, providing that there is no residual change in the EUT or
any
change in outputs, which could be interpreted by associated equipment as a change,
and no such flickering of indicators oeuvres at $U = 130 \text{ dB}\mu\text{V}$.
For component of CCTV systems, where the status is monitored by observing the TV picture,
then deterioration of the picture is allowed at $U = 140 \text{ dB}\mu\text{V}$, providing:
(a) there is no permanent damage or change to the EUT
(e.g. no corruption of memory or changes to programmable settings etc.)
(b) at $U = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is so minor that the system could
still be used; and
(c) there in no observable deterioration of the picture at $U = 120 \text{ dB}\mu\text{V}$.

Voltage dip/interruption / Voltage variation

There shall be no damage, malfunction or change of status due to the conditioning.
Flickering of an indicator during the conditioning is permissible, providing that there is no
residual
change in the EUT or any change in outputs, which could be interpreted by associated
equipment
as a change. The EUT shall meet the acceptance criteria for the functional test, after the
conditioning.

3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Dec. 05, 2019

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS05X4620	02, 22, 2022
☒	HCP	-	KES	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: 21,6 °C
Relative Humidity: 49,5 % R.H.
Atmospheric Pressure: 101,0 kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative

Number of Discharge: 10 at all locations for Air discharge
10 at all locations for Contact discharge

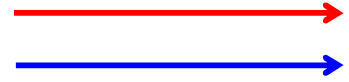
Discharge Voltage:	Contact ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	Air ☒ 2 kV ☒ 4 kV ☐ 6 kV ☒ 8 kV ☐ 15 kV	HCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	VCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV
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Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

Location of Discharge:

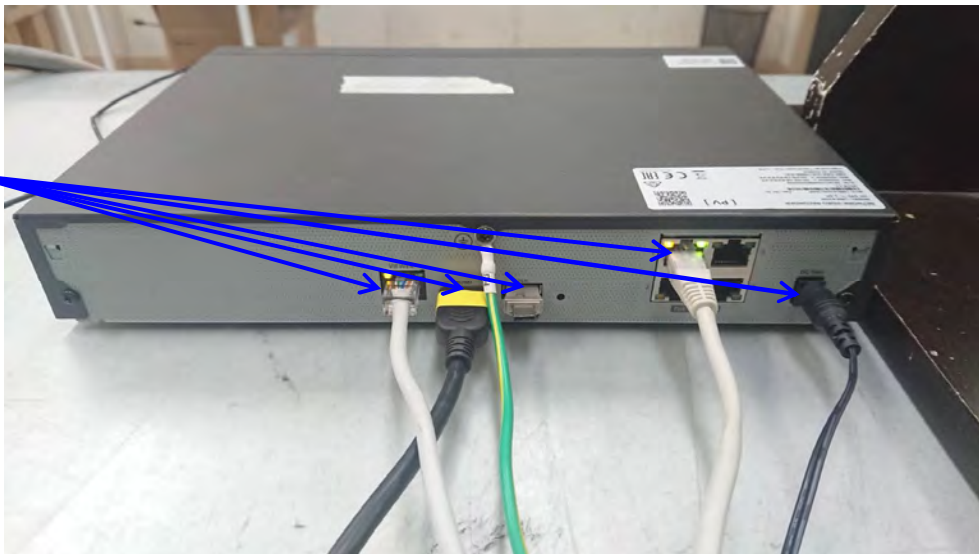
Air
Contact



1



2



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Test Data

Indirect Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	HCP Contact	Contact Discharge	Complied	-
2	VCP Contact	Contact Discharge	Complied	-

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure	Contact Discharge	Complied	-
2	Port	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria



3.2 Radiated Electric Field Immunity

Reference Standard

EN 61000-4-3:2006 +A2:2010

Test Date

Dec. 05, 2019

Test Location

EMS-RS: ☐ SEMI ANECHOIC CHAMBER #2 ☒ SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	R & S	177586	08, 06, 2020
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 06, 2020
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 06, 2020
☒	POWER METER	NRP2	R & S	103475	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 06, 2020
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	KY TELECOM	KY150001	08, 06, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2020

Test Conditions

Temperature: 22,3 °C
Relative Humidity: 50,5 % R.H.
Atmospheric Pressure: 101,3 kPa



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Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m
☒ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz
☒ 80 MHz to 2,7 GHz

Modulation: ☒ AM, 80 %, 1 kHz sine wave
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

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Test Data

Side Exposed	Observations	
	Horizontal	Vertical
Front	Complied	Complied
Right	Complied	Complied
Back	Complied	Complied
Left	Complied	Complied

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012

Test Date

Dec. 05, 2019

Test Location

EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 27, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2020
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 27, 2020

Test Conditions

Temperature: 21,6 °C
Relative Humidity: 49,5 % R.H.
Atmospheric Pressure: 101,0 kPa

Test Specifications

Pulse Amplitude & Polarity:
(AC Power Lines) ☐ ± 1.0 kV ☒ ± 2.0 kV
☐ ± 4.0 kV

Pulse Amplitude & Polarity:
(Other supply / Signal Lines) ☐ ± 0.5 kV ☒ ± 1.0 kV
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 klz ☒ 100 klz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

Test Data

☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L	Complied	Complied
N	Complied	Complied
PE	Complied	Complied
L – N	Complied	Complied
L – PE	Complied	Complied
N – PE	Complied	Complied
L – N – PE	Complied	Complied

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45 1	Complied	Complied
RJ-45 2	Complied	Complied

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria



3.4 Surge Transients

Reference Standard

EN 61000-4-5:2014

Test Date

Dec. 05, 2019

Test Location

EMS-EFT: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 27, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2020
☐	CDN	CNV 508N1	EM TEST	P1610176296	11, 27, 2020

Test Conditions

Temperature: 21,6 °C
Relative Humidity: 49,5 % R.H.
Atmospheric Pressure: 101,0 kPa



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Test Specifications

AC Power Lines

Source Impedance: 12 ohm for common Mode and 2 ohm for differential Mode

Surge Amplitude :

Common Mode

☒ (0,5 / 1,0 / 2,0) kV

Differential Mode

☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 surges per angle

Angle:

☒ 0°, 90°, 180°, 270° (input a.c. power port)

Polarity:

☒ Positive & Negative

Repetition Rate:

☒ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

Other supply / Signal Lines

Source Impedance:

42 ohm for common Mode

Surge Amplitude:

Common Mode

☐ (0,5 / 1,0) kV

Number of Surges:

☐ 5 Surges

Polarity:

☐ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ Complied

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Test Data☒ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – N	Complied	Complied

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L – PE	Complied	Complied
N – PE	Complied	Complied

Signal Lines☐ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
-	-	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria
☐ NOT APPLICABLE

RemarksPASS Required Performance Criteria

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3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Dec. 04, 2019

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.11	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 25, 2020
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 25, 2020
☒	CDN	CDN M016	TESEQ	43694	11, 25, 2020
☐	CDN	CDN M016	TESEQ	43697	11, 25, 2020
☒	CDN	CDN T800	TESEQ	42800	11, 25, 2020
☐	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 26, 2020

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 49,6 % R.H.
Atmospheric Pressure: 100,9 kPa

Test Specifications

Frequency range: ☒ 150 kHz to 100 MHz ☐ 150 kHz to 80 MHz

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms
☒ 10 Vrms

Modulation: ☒ AM, 80 %, 1 kHz sine wave
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

Test Data

☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L - N - PE	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45 1	CDN	Complied
RJ-45 2	CDN	Complied

Notes: CDN = Coupling Decoupling Network
"blank" = Not performed

Observations:
Complied - No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

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3.6 Voltage Dips and Short Interruptions

Reference Standard

EN 61000-4-11:2004

Test Date

Dec. 05, 2019

Test Location

EMS-Voltage dip: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 27, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2020

Test Conditions

Temperature: 21,6 °C
Relative Humidity: 49,5 % R.H.
Atmospheric Pressure: 101,0 kPa

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Test Specifications & Observations/Remarks

- Voltage Dips and Short Interruptions

<u>Test Level</u>	<u>Duration [in period/ms (50 Hz)]</u>	<u>Results</u>
☒ 20 % dip	☒ 250 / 5 000	<u>Complied</u>
☒ 30 % dip	☒ 25 / 500	<u>Complied</u>
☒ 60 % dip	☒ 10 / 200	<u>Complied</u>
☒ 100 % dip	☒ 250 / 5 000	<u>Complied</u>

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>

Observations:

Complied – No degradation of function

Test Results

- ☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria
☐ NOT APPLICABLE

Remarks

PASS Required Performance Criteria

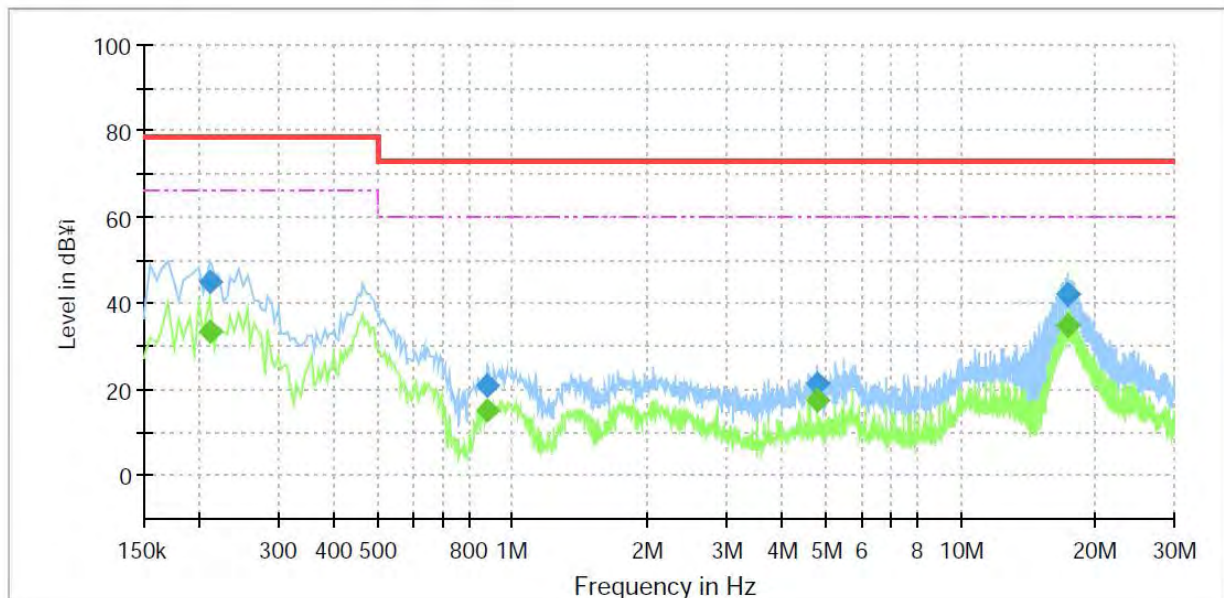
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description: Conducted Emission
 Model No.: LRN-410S
 Phase: L1
 Mode:
 Operator Name: KES



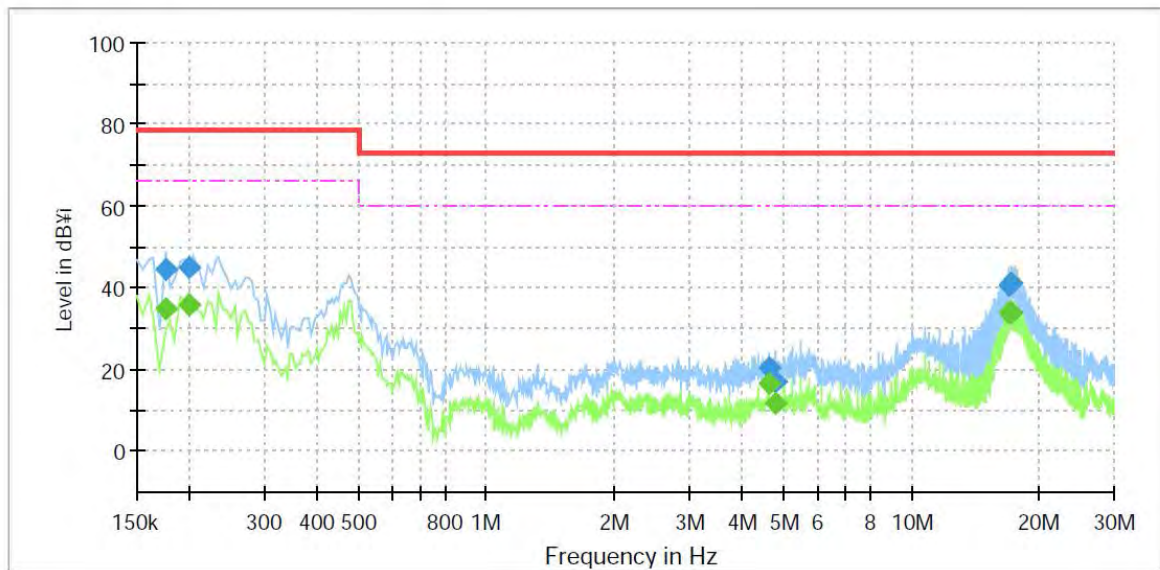
Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	---	33.61	66.00	32.39	1000.0	9.000	L1	19.5
0.210000	44.79	---	79.00	34.21	1000.0	9.000	L1	19.5
0.880000	---	15.30	60.00	44.70	1000.0	9.000	L1	20.3
0.880000	20.69	---	73.00	52.31	1000.0	9.000	L1	20.3
4.810000	---	17.74	60.00	42.26	1000.0	9.000	L1	19.7
4.810000	21.43	---	73.00	51.57	1000.0	9.000	L1	19.7
17.265000	---	35.06	60.00	24.94	1000.0	9.000	L1	20.3
17.265000	42.00	---	73.00	31.00	1000.0	9.000	L1	20.3
17.280000	---	35.06	60.00	24.94	1000.0	9.000	L1	20.3
17.280000	41.89	---	73.00	31.11	1000.0	9.000	L1	20.3

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	LRN-410S
Phase:	N
Mode:	
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.175000	---	34.85	66.00	31.15	1000.0	9.000	N	19.5
0.175000	44.41	---	79.00	34.59	1000.0	9.000	N	19.5
0.200000	---	36.05	66.00	29.95	1000.0	9.000	N	19.5
0.200000	44.86	---	79.00	34.14	1000.0	9.000	N	19.5
4.610000	---	16.69	60.00	43.31	1000.0	9.000	N	19.7
4.610000	20.22	---	73.00	52.78	1000.0	9.000	N	19.7
4.790000	---	11.95	60.00	48.05	1000.0	9.000	N	19.7
4.790000	17.07	---	73.00	55.93	1000.0	9.000	N	19.7
17.040000	---	33.68	60.00	26.32	1000.0	9.000	N	20.3
17.040000	40.49	---	73.00	32.51	1000.0	9.000	N	20.3
17.200000	---	34.07	60.00	25.93	1000.0	9.000	N	20.3
17.200000	41.09	---	73.00	31.91	1000.0	9.000	N	20.3

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

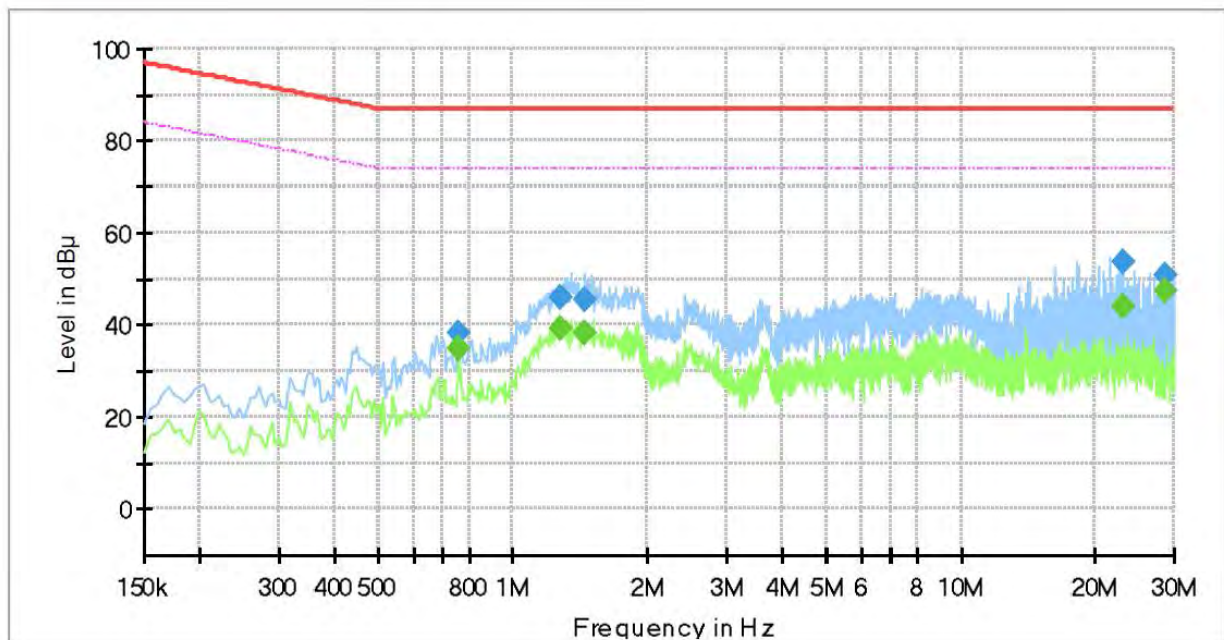
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

Conducted Emissions at Telecommunication Ports

■ RJ-45 1
 [1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	LRN-410S
Mode :	RJ-45 1
Speed :	1 000 Mbps
Operator Name:	KES



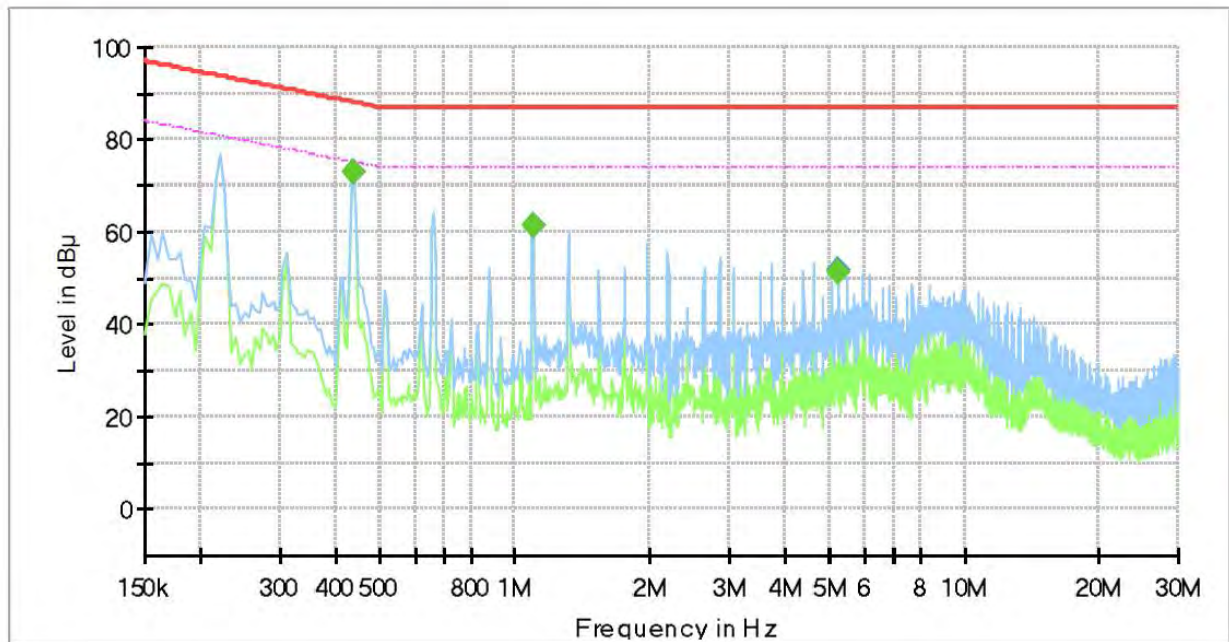
Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.760000	---	34.90	74.00	39.10	1000.0	9.000	Single Line	19.6
0.760000	38.04	---	87.00	48.96	1000.0	9.000	Single Line	19.6
1.275000	---	38.97	74.00	35.03	1000.0	9.000	Single Line	19.5
1.275000	45.78	---	87.00	41.22	1000.0	9.000	Single Line	19.5
1.445000	---	38.25	74.00	35.75	1000.0	9.000	Single Line	19.5
1.445000	45.65	---	87.00	41.35	1000.0	9.000	Single Line	19.5
23.125000	---	44.23	74.00	29.77	1000.0	9.000	Single Line	19.7
23.125000	53.91	---	87.00	33.09	1000.0	9.000	Single Line	19.7
28.685000	---	47.59	74.00	26.41	1000.0	9.000	Single Line	19.8
28.685000	50.97	---	87.00	36.03	1000.0	9.000	Single Line	19.8

■ RJ-45 2
[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	LRN-410S
Mode :	RJ-45 2
Speed :	1 000 Mbps
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.440000	---	72.94	75.06	2.12	1000.0	9.000	Single Line	19.6
0.440000	72.97	---	88.06	15.09	1000.0	9.000	Single Line	19.6
1.100000	---	61.44	74.00	12.56	1000.0	9.000	Single Line	19.5
1.100000	61.44	---	87.00	25.56	1000.0	9.000	Single Line	19.5
5.270000	---	51.09	74.00	22.91	1000.0	9.000	Single Line	19.5
5.270000	51.62	---	87.00	35.38	1000.0	9.000	Single Line	19.5

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))



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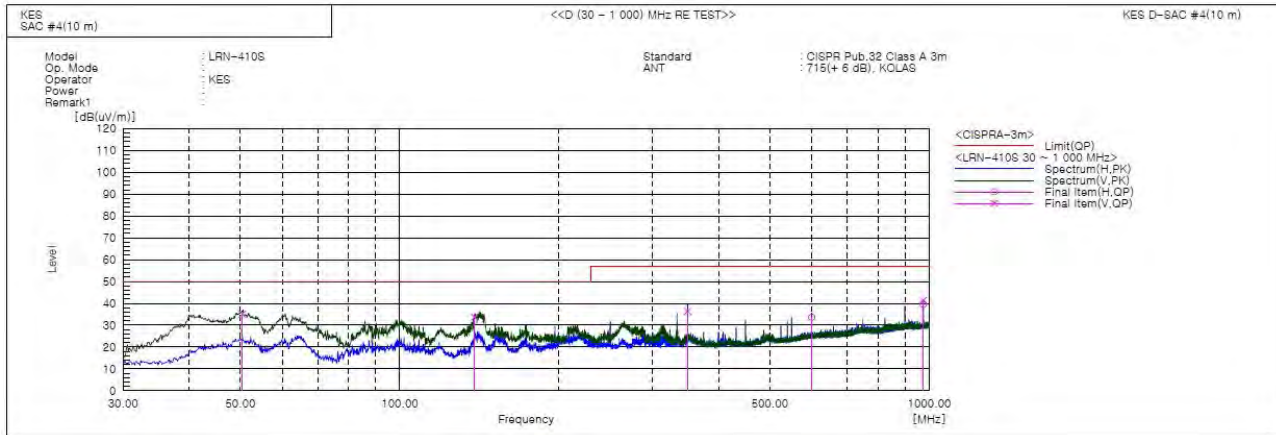
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Radiated Electric Field Emissions(Below 1 GHz)



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	50.435	V	56.9	-21.9	35.0	50.0	15.0	159.0	89.0	
2	138.416	V	60.6	-27.0	33.6	50.0	16.4	100.0	82.0	
3	349.973	V	53.9	-17.6	36.3	57.0	20.7	103.0	40.0	
4	599.967	H	45.2	-11.6	33.6	57.0	23.4	155.0	244.0	
5	974.917	V	48.8	-7.5	41.3	57.0	15.7	386.0	155.0	
6	974.924	H	47.1	-7.5	39.6	57.0	17.4	100.0	82.0	

◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)]

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



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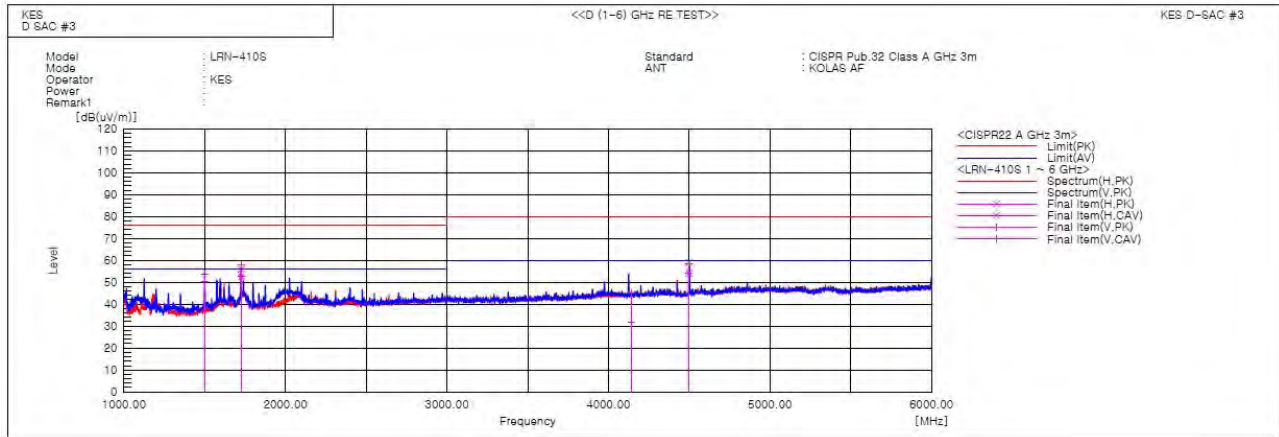
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Radiated Electric Field Emissions(Above 1 GHz)



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1500.150	V	60.0	56.7	-6.5	53.5	50.2	76.0	56.0	22.5	5.8	100.0	136.8	
2	1724.770	H	60.4	56.9	-4.4	56.0	52.5	76.0	56.0	20.0	3.5	100.0	202.6	
3	1724.800	V	62.5	57.3	-4.4	58.1	52.9	76.0	56.0	17.9	3.1	100.0	136.4	
4	4139.917	V	40.2	26.9	5.0	45.2	31.9	80.0	60.0	34.8	28.1	100.0	251.8	
5	4499.340	H	53.1	48.2	5.9	59.0	54.1	80.0	60.0	21.0	5.9	100.0	231.0	
6	4499.420	V	52.5	48.3	5.9	58.4	54.2	80.0	60.0	21.6	5.8	100.0	257.8	

◆ Calculation

Result(PK/CAV) [dB(μV/m)] = (Reading(PK/CAV)[dB(μV)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

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Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.065			
2	0.003	0.313	1.080	n/a
3	0.053	2.318	2.300	PASS
4	0.005	1.186	0.430	PASS
5	0.052	4.587	1.140	PASS
6	0.004	1.389	0.300	n/a
7	0.051	6.675	0.770	PASS
8	0.004	1.608	0.230	n/a
9	0.050	12.438	0.400	PASS
10	0.005	2.651	0.184	n/a
11	0.048	14.554	0.330	PASS
12	0.004	2.859	0.153	n/a
13	0.046	22.047	0.210	PASS
14	0.004	2.696	0.131	n/a
15	0.044	29.417	0.150	PASS
16	0.003	3.008	0.115	n/a
17	0.042	31.613	0.132	PASS
18	0.004	3.619	0.102	n/a
19	0.039	33.084	0.118	PASS
20	0.003	3.697	0.092	n/a
21	0.036	22.468	0.161	PASS
22	0.003	3.692	0.084	n/a
23	0.033	22.822	0.147	PASS
24	0.003	3.851	0.077	n/a
25	0.031	22.854	0.135	PASS
26	0.003	3.702	0.071	n/a
27	0.028	22.396	0.125	PASS
28	0.002	3.613	0.066	n/a
29	0.025	21.432	0.116	PASS
30	0.002	3.567	0.061	n/a
31	0.022	20.232	0.109	PASS
32	0.002	3.459	0.058	n/a
33	0.019	18.941	0.102	PASS
34	0.002	3.415	0.054	n/a
35	0.017	17.292	0.096	PASS
36	0.001	2.799	0.051	n/a
37	0.014	15.482	0.091	PASS
38	0.001	2.647	0.048	n/a
39	0.012	13.765	0.087	PASS
40	0.001	2.437	0.046	n/a

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.

**KES Co., Ltd.**

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Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.065			
2	0.004	0.248	1.620	n/a
3	0.054	1.554	3.450	PASS
4	0.006	0.895	0.645	PASS
5	0.053	3.077	1.710	PASS
6	0.005	1.073	0.450	n/a
7	0.052	4.477	1.155	PASS
8	0.004	1.244	0.345	n/a
9	0.050	8.345	0.600	PASS
10	0.006	2.013	0.276	PASS
11	0.049	9.808	0.495	PASS
12	0.005	2.164	0.230	n/a
13	0.047	14.790	0.315	PASS
14	0.004	2.068	0.197	n/a
15	0.044	19.756	0.225	PASS
16	0.004	2.306	0.173	n/a
17	0.042	21.188	0.199	PASS
18	0.004	2.774	0.153	n/a
19	0.039	22.181	0.178	PASS
20	0.004	2.833	0.138	n/a
21	0.036	22.585	0.161	PASS
22	0.004	2.804	0.125	n/a
23	0.034	22.965	0.147	PASS
24	0.003	2.934	0.115	n/a
25	0.031	22.980	0.135	PASS
26	0.003	2.880	0.106	n/a
27	0.028	22.527	0.125	PASS
28	0.003	2.834	0.099	n/a
29	0.025	21.540	0.116	PASS
30	0.003	2.795	0.092	n/a
31	0.022	20.408	0.109	PASS
32	0.002	2.734	0.086	n/a
33	0.020	19.128	0.102	PASS
34	0.002	2.716	0.081	n/a
35	0.017	17.422	0.096	PASS
36	0.002	2.216	0.077	n/a
37	0.014	15.584	0.091	PASS
38	0.002	2.130	0.073	n/a
39	0.012	13.887	0.087	PASS
40	0.001	1.889	0.069	n/a

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.

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Test Data - Voltage Fluctuations

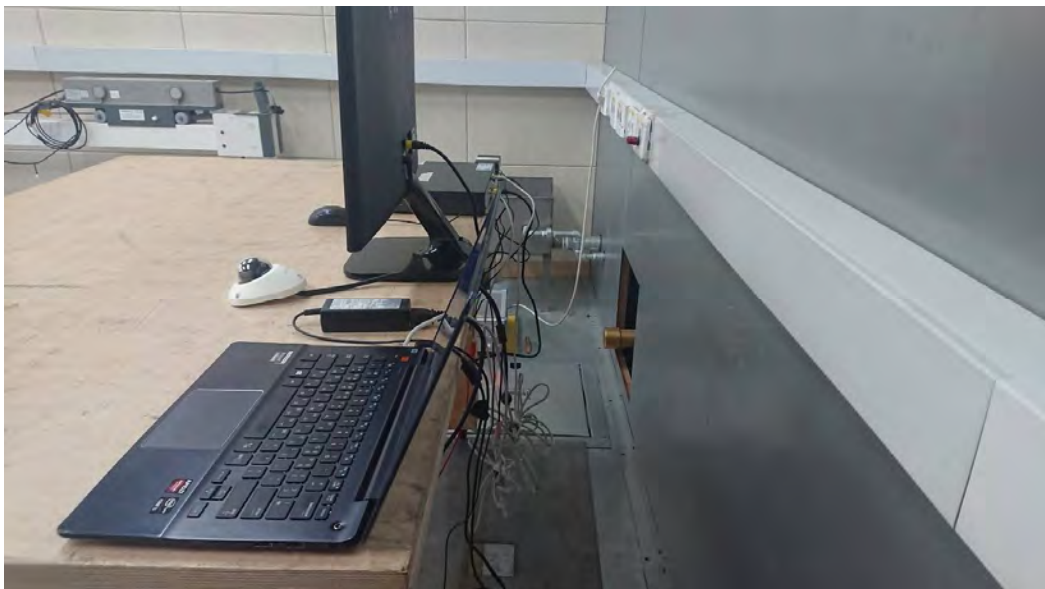
Maximum Flicker results

Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

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Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports



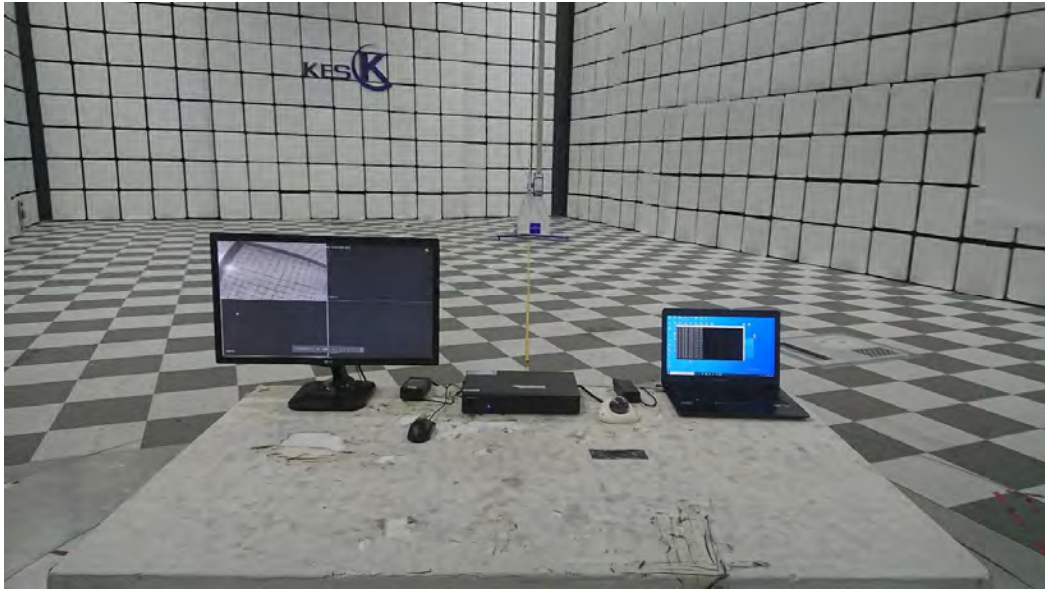
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Conducted Emissions at Telecommunication Ports



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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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Harmonic Current Emissions and Voltage Fluctuations and Flicker



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Electrostatic Discharge



Radiated Electric Field Immunity



Electrical Fast Transients/Bursts



Surge Transients



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Conducted Disturbance



Voltage Dips and Short Interruptions



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EUT External Photographs

(Top)



(Bottom)



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EUT Internal Photographs

(Internal View)



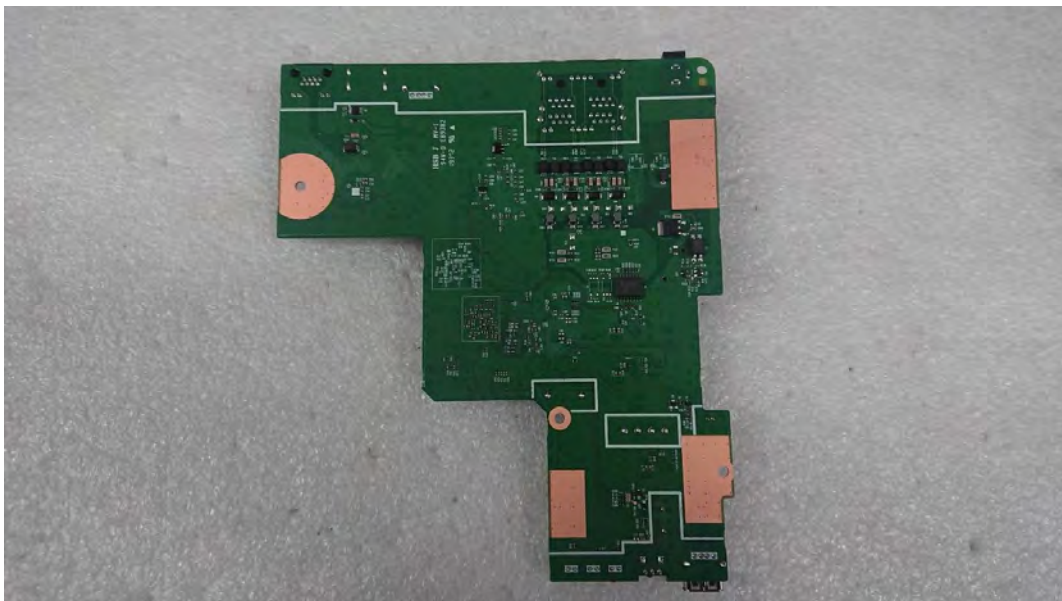
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EUT Internal View – Main Board

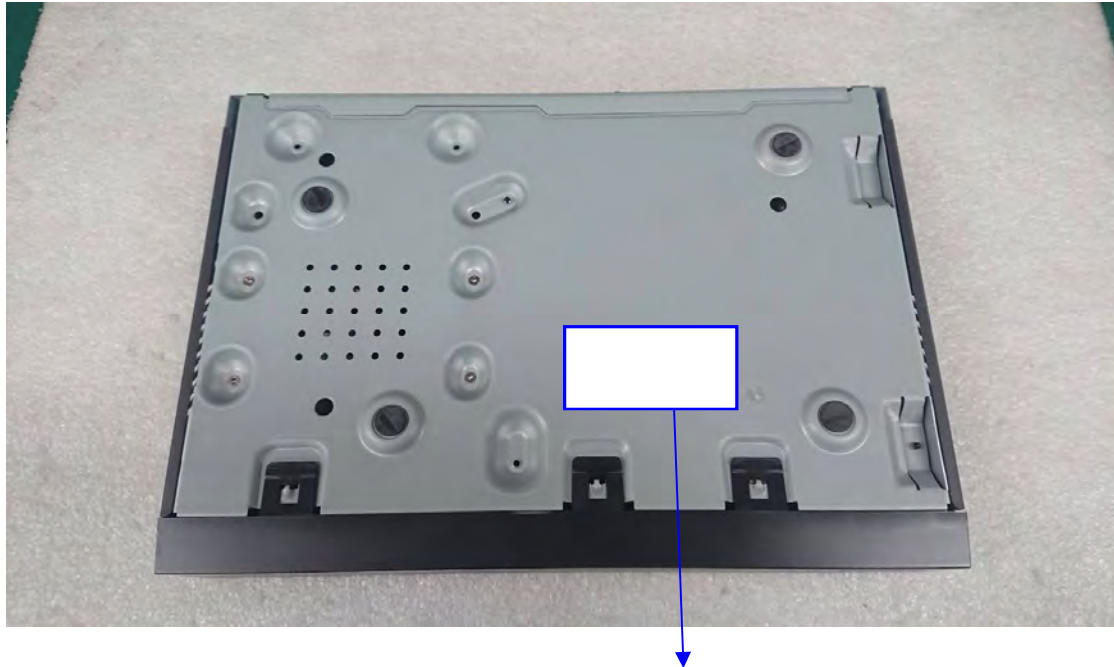
(Top)



(Bottom)



Label and Location



NVR

Model No : LRN-410S

Manufacturer : HANWHA TECHWIN (TIANJIN) CO.,LTD.

Made in China

