



EMC TEST REPORT For RCM

Test Report No. : KES-E1-19T0801
Date of Issue : Dec. 16, 2019
Product name : NVR
Model/Type No. : LRN-1610S
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. 08, 2019
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dong In, Kim
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

**KES Co., Ltd.**

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Dec. 16, 2019	KES-E1-19T0801	Issued

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1.0 General Product Description

Main Specifications of EUT are:

LRN-1610S			Functions		
Display				Item	IP address, Add profile edit, Bitrate, Compression, GOP, Quality, Camera MD setup, Wisestream, Dynamic GOV/FPS, VA Setup Camera video setup (Simple focus, Brightness/Contrast, Flip/Mirror, IRIS, WDR, D&N, SSNR, Shutter, SDR, DIS), Fisheye Dewarping Mode, Hallway View Setup, Camera Webpage
Network camera	Inputs	Max. 16CH			
	Resolution	5MP ~ CIF			
	Protocols	Wisenet, ONVIF			
Decoding	Local Display	HDMI: 1920x1080, 1280x720	PTZ	Control	Via GUI, Webviewer
	Resolution	5MP(90fps), 3MP(120fps), 2MP(2400fps), 720p(480fps), D1(480fps)			
Performance			Smart phone	Support Model	iOS, Android
Record	Compression	H.265, H.264, MJPEG		Protocol Support	RTP, RTSP, HTTP, HTTPS, CGI(SUNAPI)
	Record Rate(Analog)			Control	Live(Multi-Profile Support), Playback
	Recording Bandwidth	Max. 100Mbps		Max. Remote Users	Search(3), Live Unicast(10)
	Resolution	5MP ~ CIF	Redundancy	Failover	
	Mode	Normal, Schedule(Continuous/Event), Event (Pre/Post), Dual track Recording		ARB	Support
	Event Trigger	Alarm Input, Video Loss, Camera Event(Alarm, MD, Video Analytics, Defocus)	Easy configuration		P2P(QR code)
	Event Action	e-Mail, PTZ Preset, Buzzer, Monitor Out	Coaxial Control		
Search & Play	Playback Bandwidth	Max. 32Mbps(16CH simultaneously)	Interface		
	User	Max. 4 Users (Local 1, Remote 3)	HDMI	1EA	
	Simultaneous playback	Max. 16CH(Network) Max. 8CH(Local Monitor)	VGA	1EA	
	Fisheye Dewarping	WEB / CMS / Mobile	Audio		
Storage	Supported HDD	Up to 6TB	Ethernet	RJ-45(10/100/1000BASE-T) x 1 RJ-45(PoE+) x 16	
	HDD Slot	SATA 2ea(Max. 12TB)	Alarm		
	External		USB	2EA(Front 1, Rear 1)	
	RAID		Power inlet	AC 1EA	
Backup	File backup	BU/Exe(GUI), JPG/AVI(Network)	System		
	Function	Multi channel(Upto 8CH) Play, Date-Time/Title display	System Control		Mouse, IR remocon, Web
Network			Language		
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)		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		
	DDNS		Wisenet DDNS		
	Transmission Bandwidth		Max. 100Mbps		
Audio	Input/Output	16CH(network)	Environmental		
	Compression	G.711, G.726, AAC(16/48KHz)	Operating Temperature		
	Audio Communication	2-Way	Operating Humidity		
Max Remote Users	Search(3), Live Unicast(10), Multicast(20)		Electrical		
	HTTPS(SSL) Login Authentication Digest Login Authentication IP Address Filtering User access log 802.1X Authentication(EAP-TLS, EAP-		Power Input		
Security			Power Consumption		
			PoE Budget		
			Mechanical		
			Color / Material		
		Dimension (WxHxD)			
		Weight			

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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 ☒ 240 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-1610S	-	HANWHA TECHWIN (TIANJIN) CO., LTD	EUT
HDD	WD10EURX-63C57Y0	-	Western Digital	-
PSU	DPS-200PB185 C	HAPD194104036	DELTA ELECTRONICS, INC.	-

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



1.6 External I/O Cabling

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

* Unshielded=U, Shielded=S

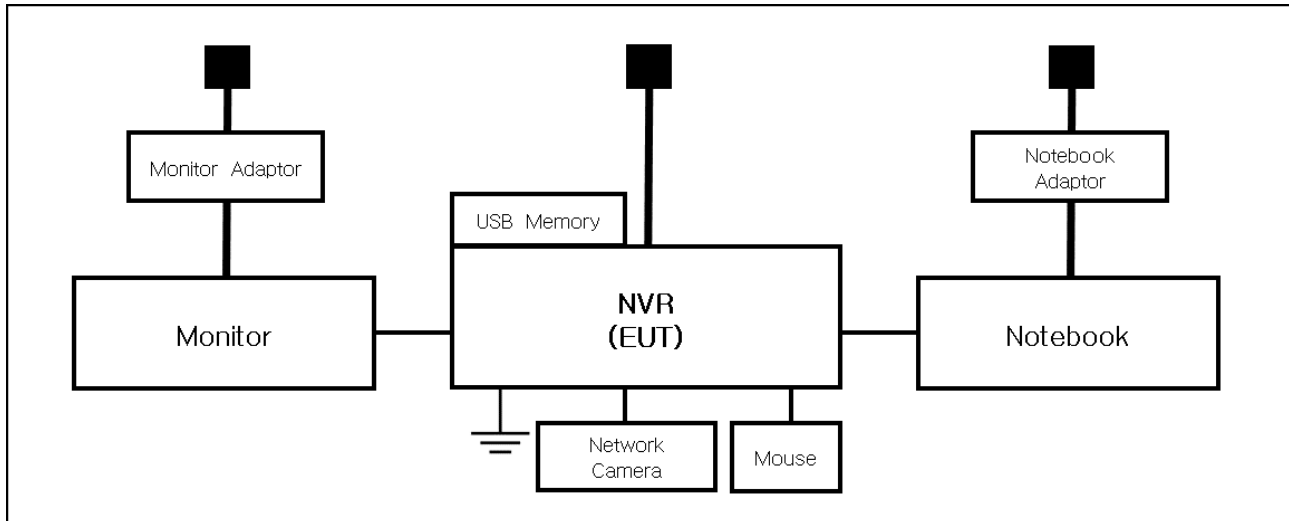
1.7 EUT Operating Mode(s)

Test mode	operating
Operate	Monitoring EUT, Ping Test

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

1.8 Configuration

■ AC Main
 □ DC Main



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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 55032:2015

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ 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 C63.4-2009 | | |
|
☐ 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. 08, 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: 21,8 °C
Relative Humidity: 50,2 % 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.

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2.2 Conducted Emissions at Telecommunication Ports

Test Date

Dec. 08, 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: 21,8 °C
Relative Humidity: 50,2 % 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.

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2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Dec. 08, 2019

Test Location☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4(10 m)**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: 22,2 °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

RemarksSee Appendix A for test data.

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2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Dec. 08, 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: 22,5 °C
Relative Humidity: 50,1 % 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.



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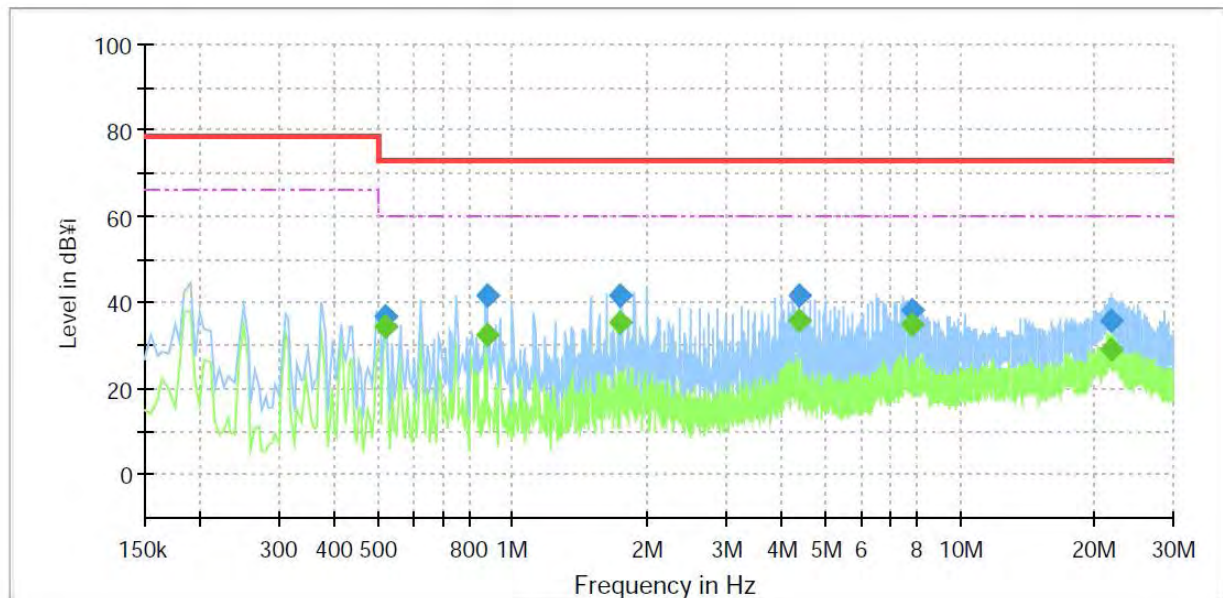
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description: Conducted Emission
Model No.: LRN-1610S
Phase: L1
Mode:
Operator Name: KES



Final_Result

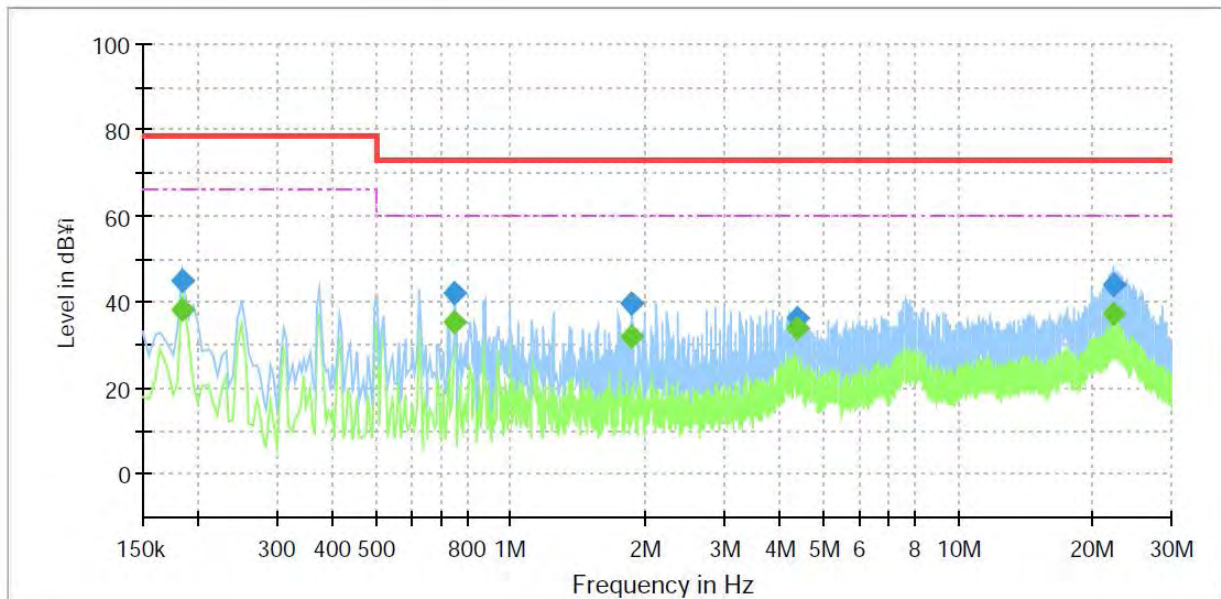
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.520000	---	34.26	60.00	25.74	1000.0	9.000	L1	19.9
0.520000	36.59	---	73.00	36.41	1000.0	9.000	L1	19.9
0.875000	---	32.41	60.00	27.59	1000.0	9.000	L1	20.3
0.875000	41.42	---	73.00	31.58	1000.0	9.000	L1	20.3
1.745000	---	35.29	60.00	24.71	1000.0	9.000	L1	20.4
1.745000	41.42	---	73.00	31.58	1000.0	9.000	L1	20.4
4.365000	---	35.96	60.00	24.04	1000.0	9.000	L1	19.7
4.365000	41.41	---	73.00	31.59	1000.0	9.000	L1	19.7
7.790000	---	34.65	60.00	25.35	1000.0	9.000	L1	20.1
7.790000	38.08	---	73.00	34.92	1000.0	9.000	L1	20.1
21.700000	---	28.94	60.00	31.06	1000.0	9.000	L1	20.4
21.700000	35.98	---	73.00	37.02	1000.0	9.000	L1	20.4

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NEUTRAL LINE

Common Information

Test Description: Conducted Emission
 Model No.: LRN-1610S
 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)
0.185000	---	38.15	66.00	27.85	1000.0	9.000	N	19.5
0.185000	45.24	---	79.00	33.76	1000.0	9.000	N	19.5
0.750000	---	35.33	60.00	24.67	1000.0	9.000	N	20.1
0.750000	42.29	---	73.00	30.71	1000.0	9.000	N	20.1
1.870000	---	32.13	60.00	27.87	1000.0	9.000	N	20.5
1.870000	39.93	---	73.00	33.07	1000.0	9.000	N	20.5
4.360000	---	33.68	60.00	26.32	1000.0	9.000	N	19.7
4.360000	36.55	---	73.00	36.45	1000.0	9.000	N	19.7
22.320000	---	37.48	60.00	22.52	1000.0	9.000	N	20.5
22.320000	44.00	---	73.00	29.00	1000.0	9.000	N	20.5

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

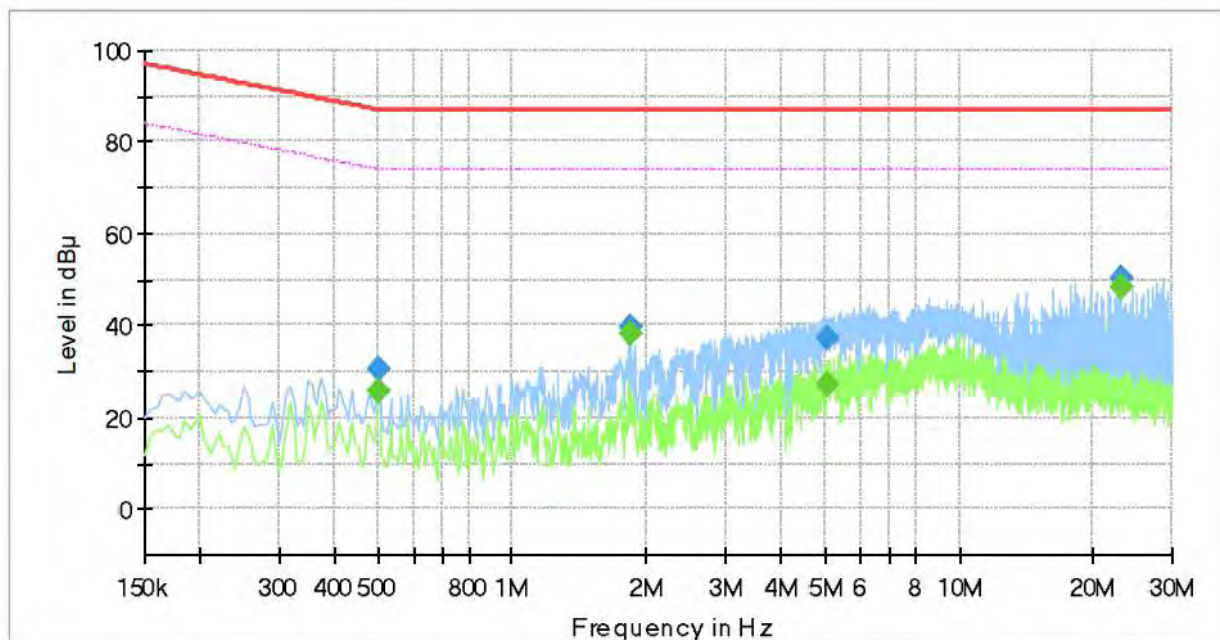
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

Conducted Emissions at Telecommunication Ports

■ NETWORK 1 [1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	LRN-1610S
Mode :	RJ-45 1
Speed :	1 000 Mbps
Operator Name:	KES



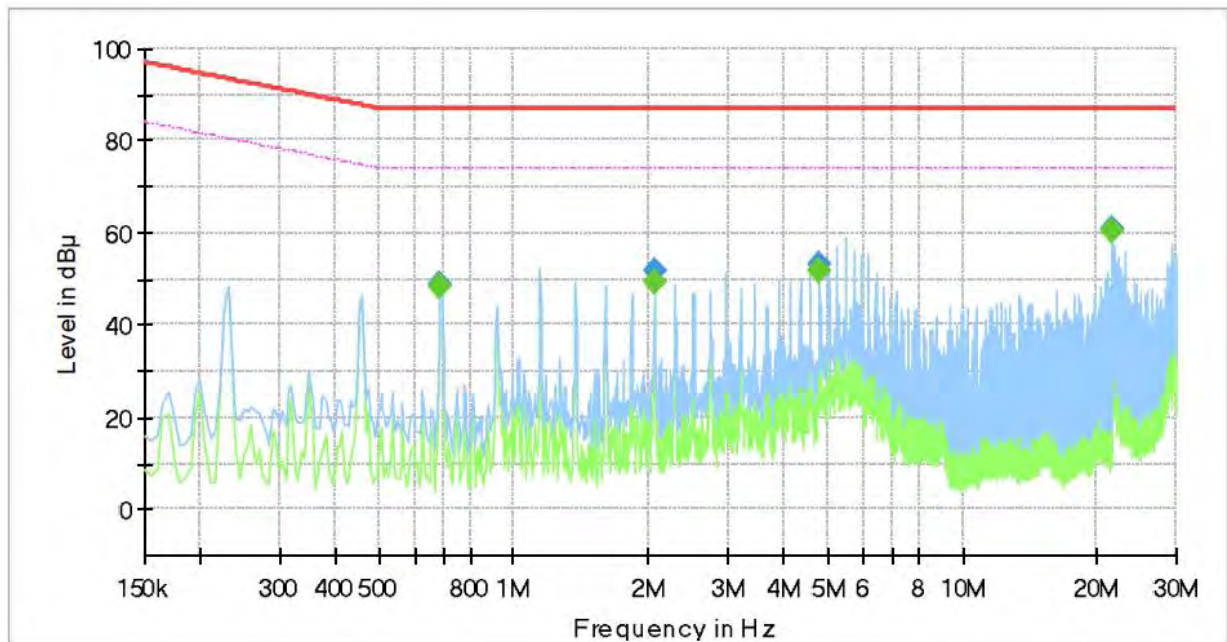
Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.500000	---	25.71	74.00	48.29	1000.0	9.000	Single Line	19.6
0.500000	30.63	---	87.00	56.37	1000.0	9.000	Single Line	19.6
1.830000	---	38.23	74.00	35.77	1000.0	9.000	Single Line	19.5
1.830000	39.78	---	87.00	47.22	1000.0	9.000	Single Line	19.5
5.050000	---	27.36	74.00	46.64	1000.0	9.000	Single Line	19.5
5.050000	37.34	---	87.00	49.66	1000.0	9.000	Single Line	19.5
23.130000	---	48.35	74.00	25.65	1000.0	9.000	Single Line	19.7
23.130000	50.16	---	87.00	36.84	1000.0	9.000	Single Line	19.7

■ NETWORK 2 [1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	LRN-1610S
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)
0.685000	---	48.59	74.00	25.41	1000.0	9.000	Single Line	19.6
0.685000	48.84	---	87.00	38.16	1000.0	9.000	Single Line	19.6
2.060000	---	49.54	74.00	24.46	1000.0	9.000	Single Line	19.5
2.060000	51.62	---	87.00	35.38	1000.0	9.000	Single Line	19.5
4.810000	---	51.67	74.00	22.33	1000.0	9.000	Single Line	19.5
4.810000	53.01	---	87.00	33.99	1000.0	9.000	Single Line	19.5
21.665000	---	60.24	74.00	13.76	1000.0	9.000	Single Line	19.7
21.665000	60.97	---	87.00	26.03	1000.0	9.000	Single Line	19.7

◆ 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))

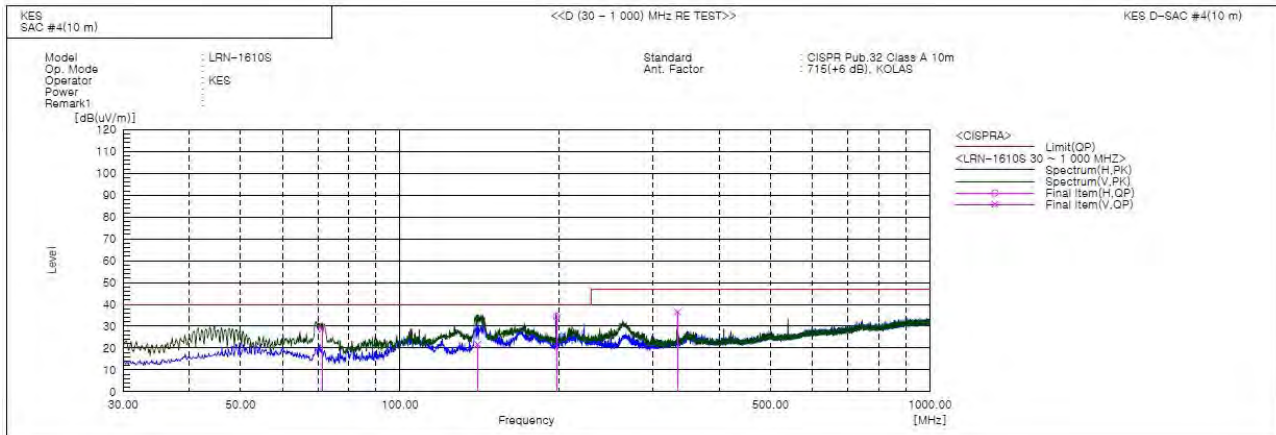


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Radiated Electric Field Emissions(Below 1 GHz)



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	71.303	V	54.2	-25.4	28.8	40.0	11.2	105.0	241.0	
2	140.155	V	47.8	-26.1	21.7	40.0	18.3	114.0	163.0	
3	197.431	H	56.5	-22.0	34.5	40.0	5.5	389.0	161.0	
4	334.116	V	53.2	-16.7	36.5	47.0	10.5	126.0	163.0	

◆ Calculation

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

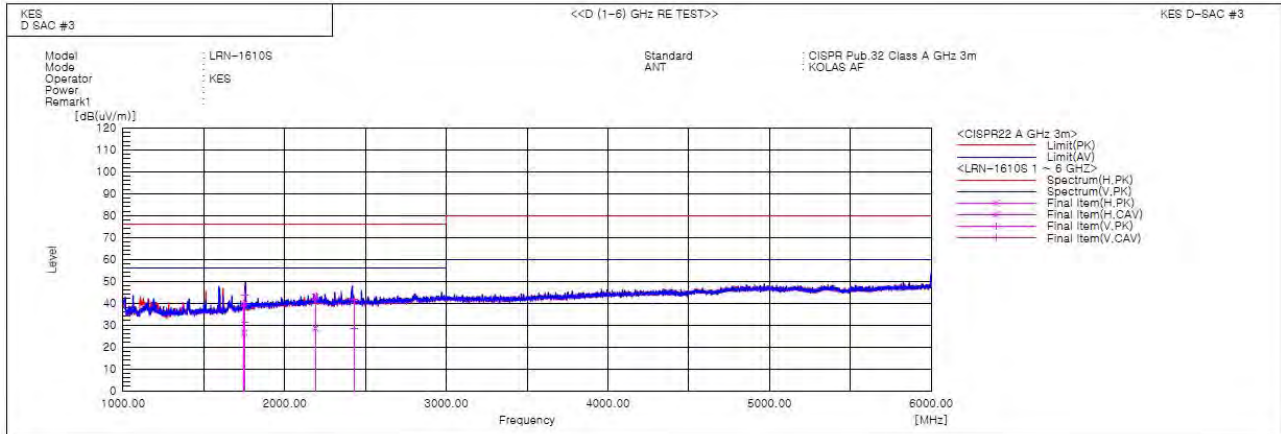


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Radiated Electric Field Emissions(Above 1 GHz)



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	1749.101	H	43.8	30.7	-4.1	39.7	26.6	76.0	56.0	36.3	29.4	100.0	71.9	
2	1750.101	V	47.9	35.5	-4.0	43.9	31.5	76.0	56.0	32.1	24.5	100.0	120.9	
3	2191.331	H	44.2	29.8	-1.3	42.9	28.5	76.0	56.0	33.1	27.5	100.0	143.7	
4	2427.658	V	42.2	28.7	-0.5	41.7	28.2	76.0	56.0	34.3	27.8	100.0	10.2	

◆ 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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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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EUT External Photographs

(Top)



(Bottom)



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EUT Internal Photographs

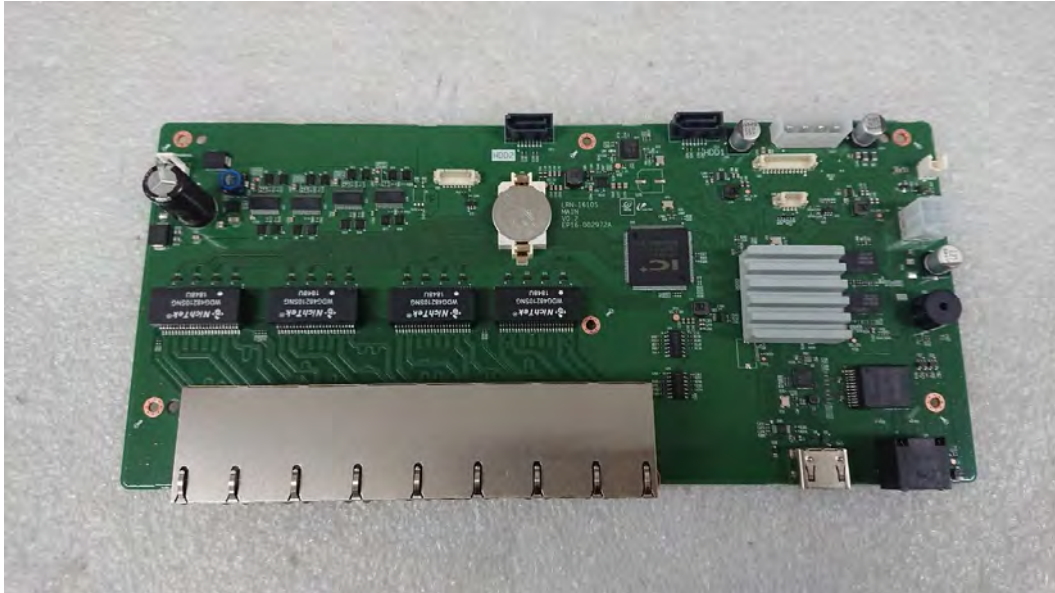
(Internal View)



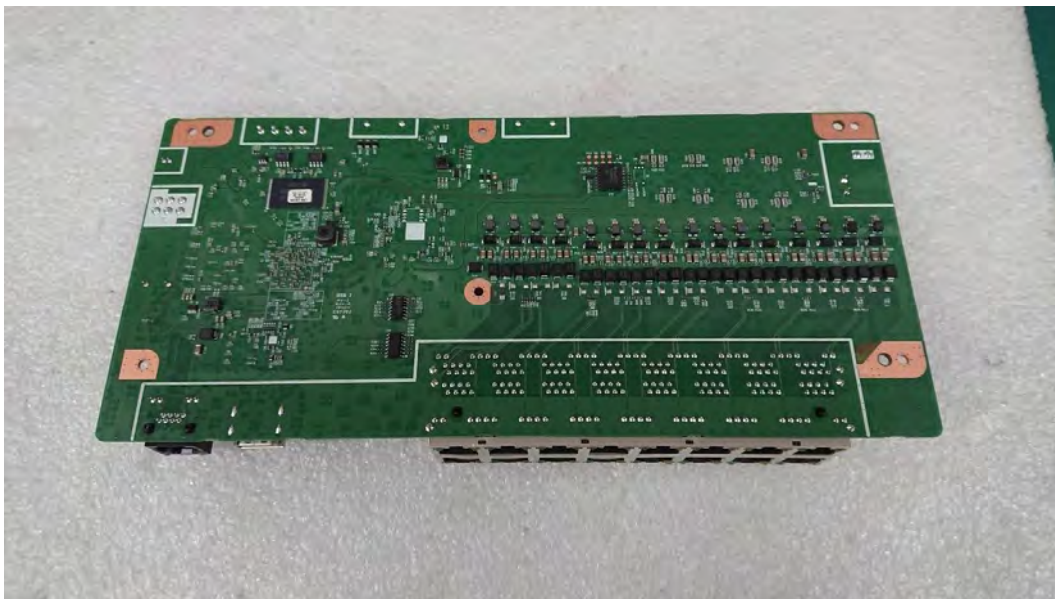
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EUT Internal View – Main Board

(Top)



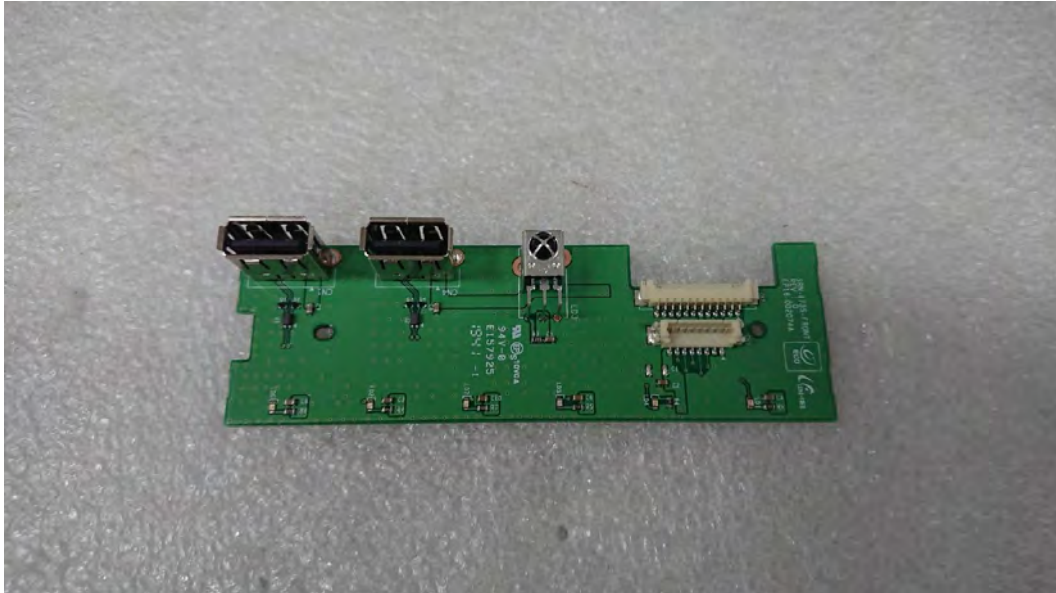
(Bottom)



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EUT Internal View – Sub Board

(Top)



(Bottom)

