



EMC TEST REPORT For CE

Test Report No. : KES-E1-18T0177-R1

Date of Issue : Sep. 13, 2018

Product name : NVR

Model/Type No. : TRM-1610M

Variant Model : -

Applicant : Hanwha Techwin Co., Ltd.

Applicant Address : 6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, 13488, 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 : Feb. 01, 2018
Aug. 30, 2018

Test date : Feb. 13, 2018 ~ Feb. 20, 2018
Sep. 10, 2018 ~ Sep. 11, 2018

Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Sung Min, Choi
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Feb. 23, 2018	KES-E1-18T0177	Issued
Sep. 13, 2018	KES-E1-18T0177-R1	Additional test due to the standard update. (Radiated Electric Field Emission (Above 1 GHz), Radiated Electric Field Immunity)

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1.0 General Product Description

Main Specifications of EUT are:

Display		
Network Camera	Inputs	Max. 16CH (4 PoE)
	Resolution	CiF ~ 12MP
	Protocols	SUNAPI, ONVIF
Live	Local Display	HDMI / VGA
	Multi-Channel Display	[Local monitor] 1 / 2V / 3V / 4 / 6 / 8 / 9 / 13 / 16 / Auto sequence, [Web] 1 / 4 / 9 / 16 / Auto sequence
	Performance	[Local Monitor] - 12M (30fps). - 8.3M (120fps) - 1080p (480fps)
Performance		
Operating System	Embedded	Linux
Record	Compression	H.265, H.264, MJPEG, WiseStream(H.265, H.264)
	Recording Bandwidth	Max. 128Mbps(80Mbps)
	Resolution	CiF ~ 12MP
	Type	Manual, Schedule (Continuous / Event), Event (Pre / Post), Emergency
	Retention	Retention per channel (1 ~ 400 days)
	Event Trigger	Alarm Input (16), Video Loss, Camera Event(Sensor, MD, Video Analytics, Defocus)
	Event Action	e-Mail, Alarm Out, Buzzer, Monitor Out, vms
Search & Play	Playback Bandwidth	32Mbps (16CH simultaneously)
	User	Max. 4 Users (Local 1, Remote 3)
	Mode	Date & Time(Calendar)/Event Log list / Smart Search(Virtual Line w/ direction, Enter/Exit)
	Simultaneous playback	Max. 16CH(Local Monitor, CMS)



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 ☐ 230Vac ☐ 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	TRM-1610M	-	Hanwha Techwin (Tianjin) Co.,Ltd	EUT

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1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook1	LG15N54	410NZXE015458	LG	-
Adapter1	ADP-90WH B	84ZW19F1747	DELTA ELECTRONICS(JIANGSU) LTD.	-
Notebook2	RV518	HTK991NC600187E	SAMSUNG	-
Adapter2	ADP-60ZH	AD-6019R	DELTA ELECTRONICS, INC.	-
Monitor1	LS23C340	ZXPCHTMF A02346H	SAMSUNG	-
Monitor1 Adapter	A4514_DSM	CN07BN4400721AS E38GCOY0XS	SAMSUNG	-
Monitor2	LS23A300	ZS2XHVNB9023492 Z	SAMSUNG	-
Monitor2 Adapter	PN3014	-	SAMSUNG	-
Camera	LVN-6030R	ZHH070GJC00005B	Hanwha Techwin (Tianjin) Co.,Ltd	-
Mouse	-	-	-	-
USB 3.0 Memory	-	-	SanDisk	-
Speaker 5	BR10000A CUVE	-	BEIJING EDIFIER HI-TECH GROUP.	-
Alarm1	-	-	-	-
Alarm2	-	-	-	-
Router	N604R	-	IPTIME	-
Adapter	SSA021F0900S0 KODM	-	SHENZHEN KUANTEN LIMITED	-

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Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook1	NT500R5M	0Q7491AJ800552B	SAMSUNG	-
Adapter1	A13-040N2A	AD-4019C	Chicony Power Technology Co., Ltd.	-
Notebook2	NT630Z5J	JK9091EF400142M	SAMSUNG	-
Adapter2	A13-040N2A	CN60BA4400313AD 0N843KO2OO	Chicony Power Technology (suzhou)Co., Ltd.	-
Monitor1	24M47VQ	702NTQDA3604	LG	-
Monitor1 Adapter	PN3014	EAY62768621	Shenzhen Honor Electronic Co., Ltd.	
Monitor2	HSTND-7041-L	6CM6020YQQ	HP Inc.	-
Camera	SNV-6012M	C93A6V3DB000ZT	Hanwha Techwin (Tianjin) Co.,Ltd	-
Mouse	-	-	-	-
USB 3.0 Memory	-	-	SanDisk	-
Speaker	BR10000A CUVE	-	BEIJING EDIFIER HI-TECH GROUP.	-
Alarm1	-	-	-	-
Alarm2	-	-	-	-
Router	A3004NS	-	IPTIME	-
Adapter	SSA021F0900S0 KODM	-	SHENZHEN KUANTEN LIMITED	-
Notebook1	NT500R5M	0Q7491AJ800552B	SAMSUNG	-

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1.6 External I/O Cabling

■ 12 V (dc) Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NVR (EUT)	HDMI	Monitor1	HDMI	1.7	S
	VGA	Monitor2	VGA	1.6	U
	USB	Mouse	-	1.7	U
	USB3.0	USB3.0 Memory	-	-	-
	Control Box	Control Box	Main Connector	3.0	S
	POE1	Cmaera	POE	3.2	U
	Viewer	Notebook1	RJ-45	3.1	U
	GPS ANT	GPS Antenna	-	3.0	U
	AUDIO	Speaker	-	1.6	U
	Alarm Block	Alarm1	-	3.0	U
	Alarm Block	Alarm2	-	3.0	U

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Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NVR (EUT)	HDMI	Monitor1	HDMI	1.7	S
	VGA	Monitor2	VGA	1.6	U
	USB	Mouse	-	1.7	U
	USB3.0	USB3.0 Memory	-	-	-
	Control Box	Control Box	Main Connector	3.0	S
	POE1	Camera	POE	3.2	U
	Viewer	Notebook1	RJ-45	3.1	U
	GPS ANT	GPS Antenna	-	3.0	U
	AUDIO	Speaker	-	1.6	U
	Alarm Block	Alarm1	-	3.0	U
	Alarm Block	Alarm2	-	3.0	U

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* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

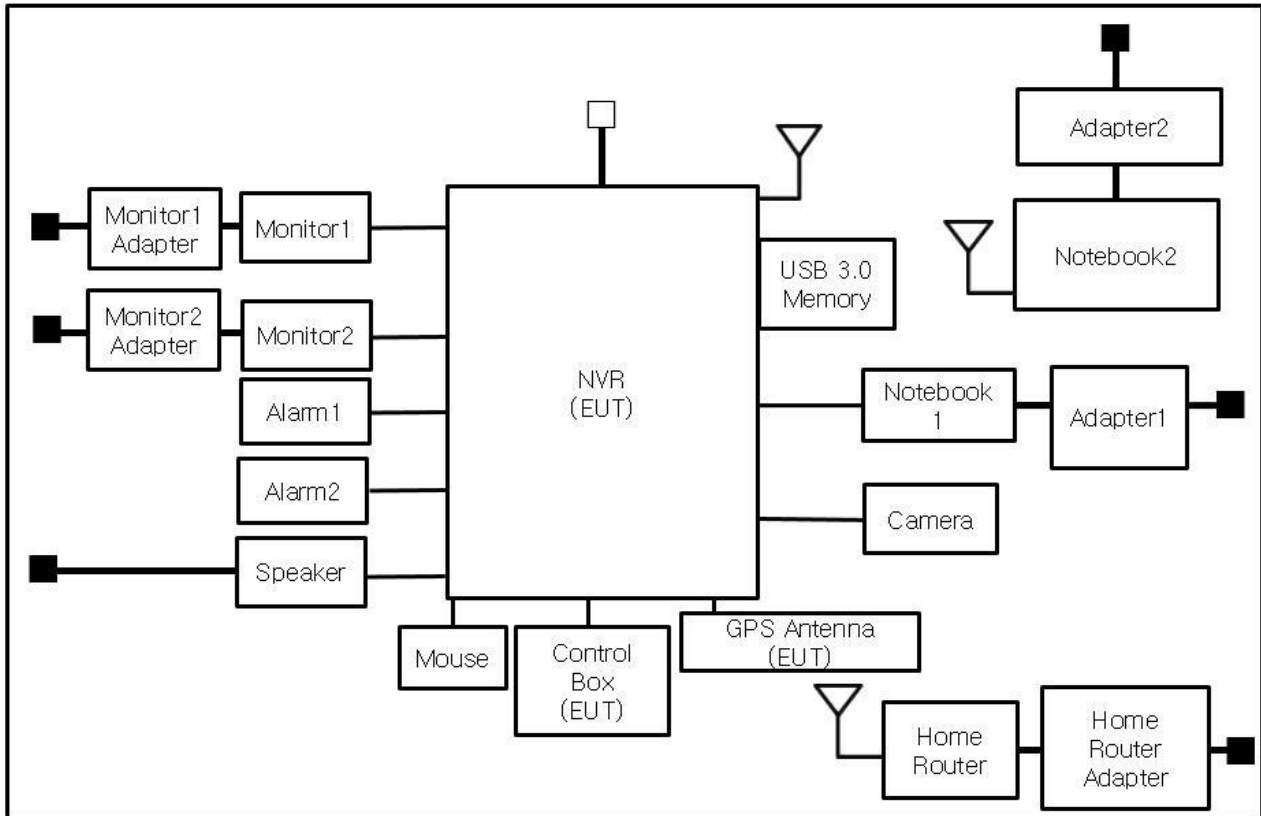
Test mode	operating
12 V (dc)	EUT Monitoring, Ping test

EUT Test operating S/W		
Name	Version	Manufacture Company
WebViewer	-	Hanwha Techwin Co., Ltd.

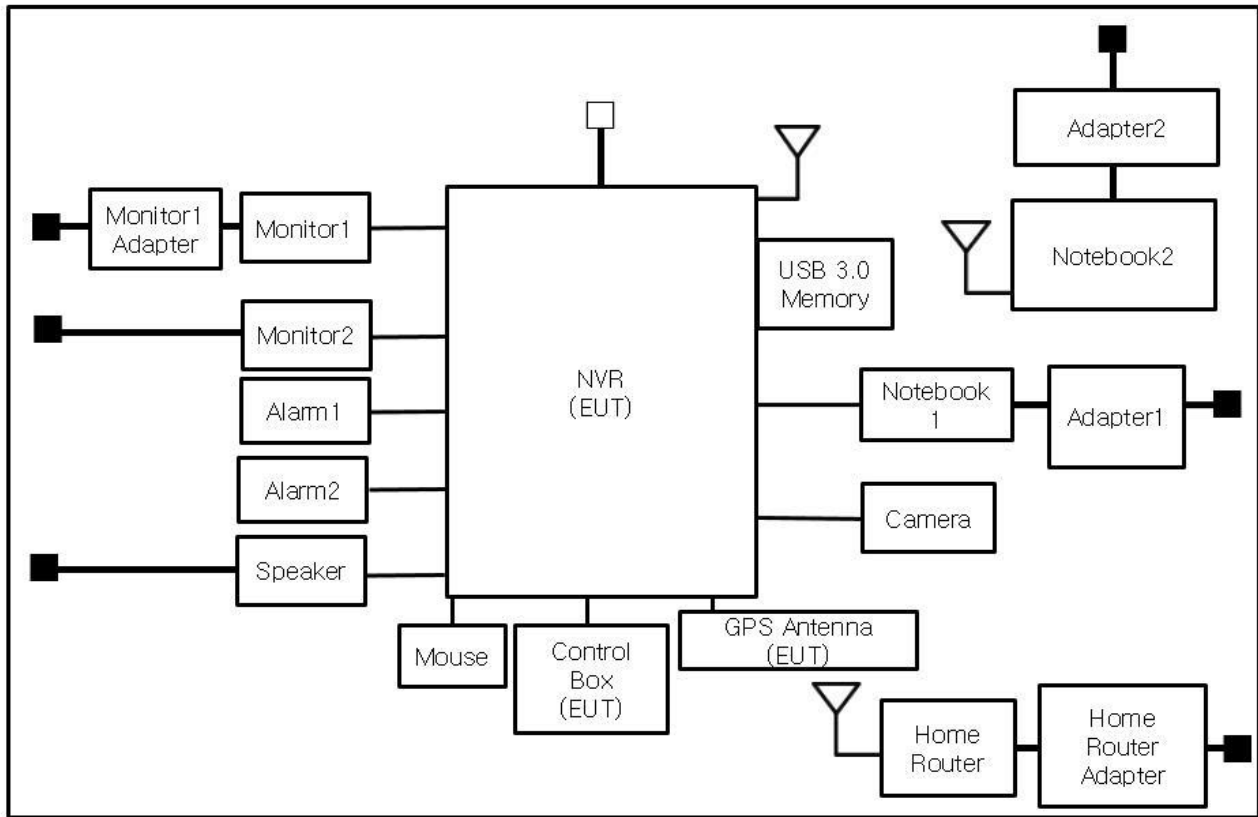
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1.8 Configuration

- AC Main
 □ DC Main
- 12 V (dc) Mode



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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-Aechoic 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-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Aechoic 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-4308, C-4798, T-2311, G-914
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 17 07 01633 001

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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 55011:2009/A1:2010

☒ Group 1

☐ Group 2

☒ Class A

☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☐ EN 55032:2012/AC:2015

☐ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013

☒ EN 50121-3-2:2016



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-
- | | | |
|---|----------------------------------|----------------------------------|
| ☐ VCCI V-3 / 2015.04 | ☐ Class A | ☐ Class B |
| ☐ AS/NZS CISPR22:2009 +A1:2010 | ☐ 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

Feb. 13, 2018

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, 27, 2018
☒	LISN	ENV216	R & S	101787	01, 05, 2019
☒	LISN	ESH2-Z5	R & S	100450	04, 27, 2018
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 27, 2018

Test Conditions

Temperature: 21,5 °C
Relative Humidity: 42,3 % 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 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Feb. 13, 2018

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, 18, 2018
☒	AMPLIFIER	SCU 01	R & S	100603	11, 27, 2018
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	716	11, 28, 2018

Test Conditions

Temperature: 21,2 °C

Relative Humidity: 41,0 % 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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2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Sep. 10, 2018

Test Location

Electro wave Shieldroom #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, 2019
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 31, 2019
☒	ATTENUATOR	8491A	HP	35496	03, 21, 2019
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 02, 2019

Test Conditions

Temperature: 22,6 °C
Relative Humidity: 56,6 % 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.



2.4 Harmonic Current Emissions

Test Date

N/A

Test Location

Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	dpa.control	EM TEST	5.4.11.0	-
☐	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	08, 09, 2018
☐	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Relative Humidity: °C
 % 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

N/A : Because the EUT power is less than 75 W, limits are not specified.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

General performance criteria

The general principles (performance criteria) for the evaluation of the immunity test results are the following.

Performance criterion A

The apparatus shall continue to operate as intended during and 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. 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, either of these may be derived 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. The performance level may be replaced by a permissible loss of performance. During the test, 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, either of these may be derived 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.



3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Feb. 19, 2018

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	ESS01Z0454	-
☒	HCP	-	KES	-	10, 11, 2018
☒	VCP	-	KES	-	-

Test Conditions

Temperature: 22,4 °C
Relative Humidity: 42,6 % R.H.
Atmospheric Pressure: 101,3 kPa



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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	Air	HCP	VCP
	☒ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
	☒ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
	☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
	☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
	☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

Notes: HCP: Horizontal coupling plane

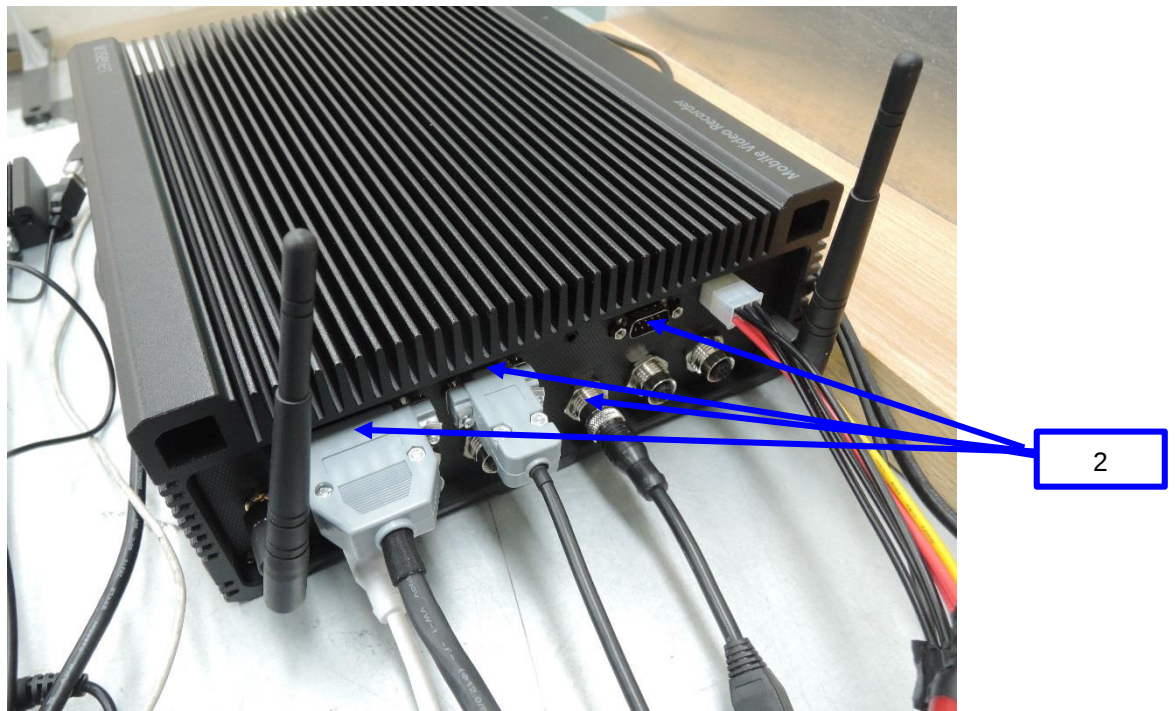
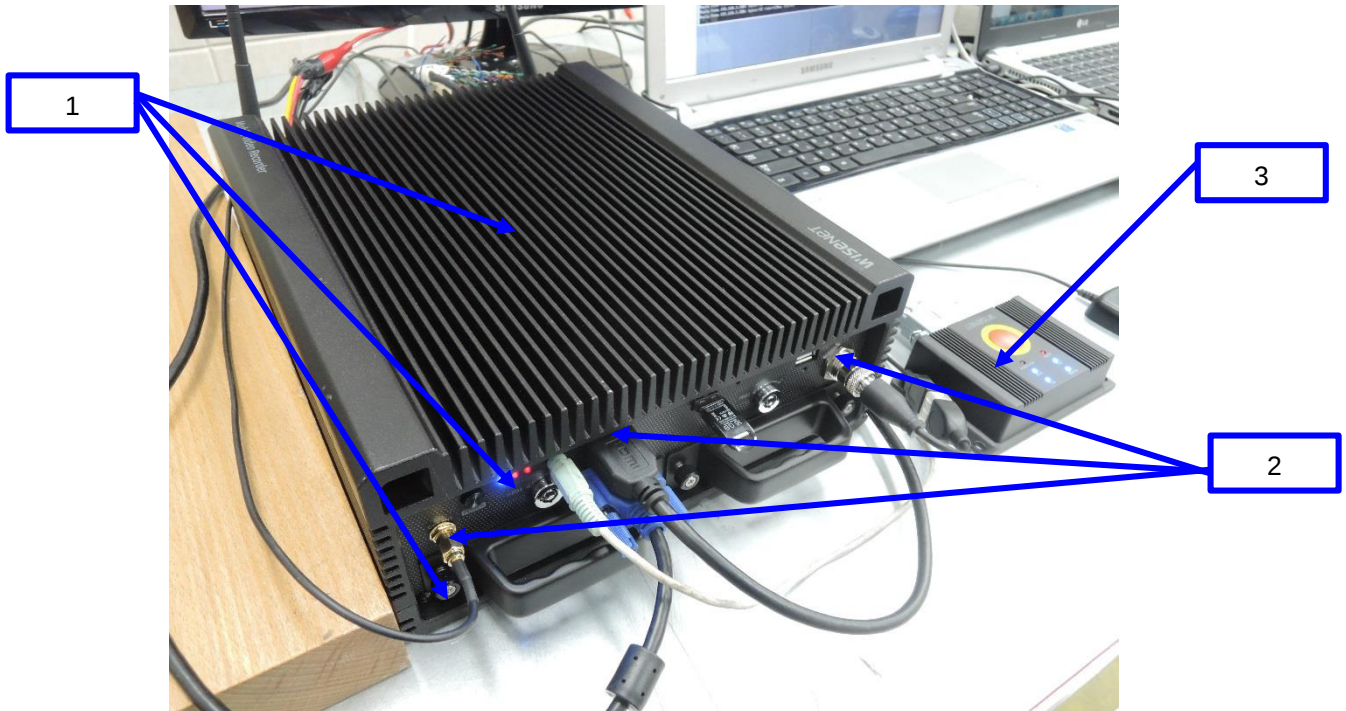
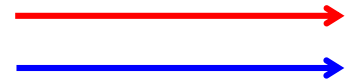
VCP: Vertical coupling plane

Required Performance Criteria: ☒ B

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Location of Discharge:

Air
Contact



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Test Data

Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure, screw	Contact Discharge	A	-
2	Front port, Rear port	Contact Discharge	A	-
3	Control box	Contact Discharge	A	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

RemarksPASS Required Performance Criteria.

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3.2 Radiated Electric Field Immunity

Reference Standard

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

Test Date

Sep. 11, 2018

Test Location

EMS-RS: ☒ SEMI ANECHOIC CHAMBER #3 ☒ SEMI ANECHOIC CHAMBER #4(10m)

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, 2019
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 06, 2019
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 06, 2019
☒	POWER METER	NRP2	R & S	103475	08, 06, 2019
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 06, 2019
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 06, 2019
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	KY TELECOM	KY150001	08, 06, 2019
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 02, 2019
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 06, 2019
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	05, 18, 2019
☒	POWER METER	E4419B	Agilent	GB40203000	05, 18, 2019
☒	CW POWER SENSOR	E4412A	Agilent	US38488240	05, 18, 2019
☒	CW POWER SENSOR	E4412A	Agilent	MY41501662	05, 18, 2019



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Test Conditions

Temperature: 22,5 °C
Relative Humidity: 56,9 % R.H.
Atmospheric Pressure: 100,1 kPa

Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Frequency Range: ☒ 80 MHz to 800 MHz [20V/m]
[Field Strength] ☒ 800 MHz to 1 GHz [20 V/m]
☒ 1,4 GHz to 2,0 GHz [10 V/m]
☒ 2,0 GHz to 2,7 GHz [5 V/m]
☒ 5,1 GHz to 6,0 GHz [3 V/m]

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: ☒ A

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Test Data

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

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

Feb. 19, 2018

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, 2018
☐	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2018
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 27, 2018

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 42,1 % R.H.
Atmospheric Pressure: 100,9 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 kHz ☐ 100 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ A

Test Data

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

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

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

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
L1 – L2	A	A

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
Control box	A	A
PoE1	A	A
Viewer	A	A
GPS ANT	A	A
Alarm Block	A	A

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

Feb. 19, 2018

Test Location

EMS-Surge: 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, 2018
☐	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 27, 2018
☐	CDN	CNV 508N1	EM TEST	P1610176296	11, 28, 2018
☒	CDN	CNV 504N7.3	EM TEST	P1744207079	12, 18, 2018

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 42,1 % R.H.
Atmospheric Pressure: 100,9 kPa



Test Specifications

AC Power Lines

Source Impedance: 42 ohm for common mode

Surge Amplitude : Common Mode

☐ 2 kV

Differential Mode

☐ 1 kV

Number of Surges: ☐ 5 surges per angle

Angle: ☐ 0°, 90°, 180°, 270° (input a.c. DC power port)

Polarity: ☐ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ B

Other supply

Source Impedance: 42 ohm for common mode

Surge Amplitude: Common Mode

☐ 2 kV

Differential Mode

☒ 1 kV

Number of Surges: ☒ 5 Surges

Polarity: ☒ Positive & Negative

Repetition Rate: ☒ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☒ B

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Test Data☒ Line to Line – Differential Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
L1 – L2	A	A

☐ Line to Ground – 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

RemarksPASS Required Performance Criteria.

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3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Feb. 19, 2018

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, 27, 2018
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 27, 2018
☒	CDN	CDN M016	TESEQ	43694	11, 27, 2018
☐	CDN	CDN M016	TESEQ	43697	11, 27, 2018
☒	CDN	CDN T800	TESEQ	42800	11, 27, 2018
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 28, 2018

Test Conditions

Temperature: 21,4 °C
Relative Humidity: 42,1 % 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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ A

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Test Data

☐ Input a.c. power ports

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

☒ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L1 – L2	CDN	A

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
Control box, GPS ANT	EM Injection Clamp	A
Alarm Block	EM Injection Clamp	A
PoE1, Viewer	CDN T800	A

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.



APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description:

Conducted Emission

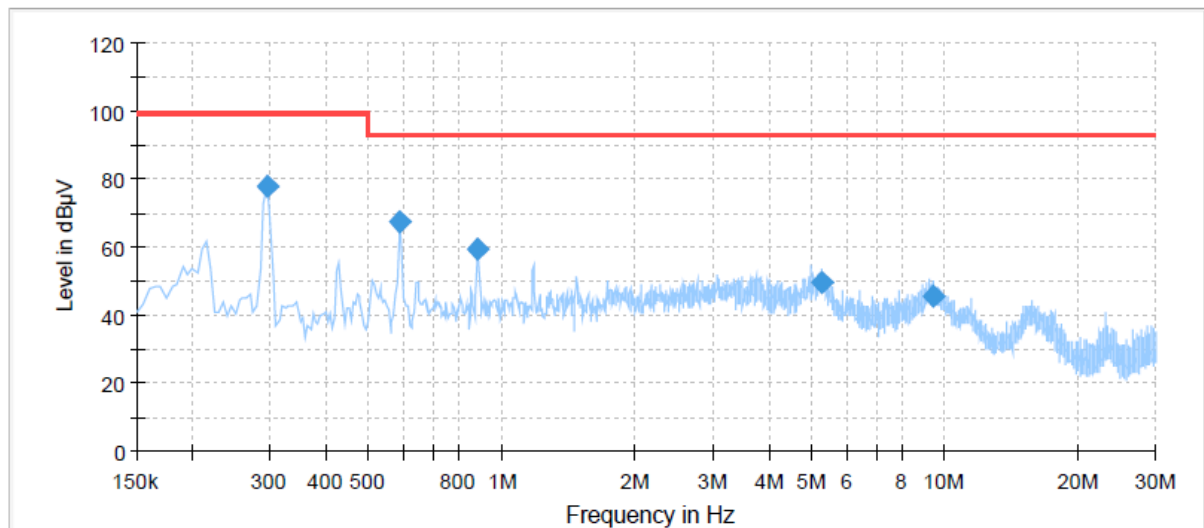
Model No.:

TRM-1610M

Mode

Operator Name:

KES



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.295000	77.99	---	99.00	21.01	1000.0	9.000	L1	19.4
0.590000	67.70	---	93.00	25.30	1000.0	9.000	L1	19.7
0.885000	59.38	---	93.00	33.62	1000.0	9.000	L1	19.9
5.300000	49.46	---	93.00	43.54	1000.0	9.000	L1	19.7
9.425000	45.54	---	93.00	47.46	1000.0	9.000	L1	19.9



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[NEUTRAL]

Common Information

Test Description:

Conducted Emission

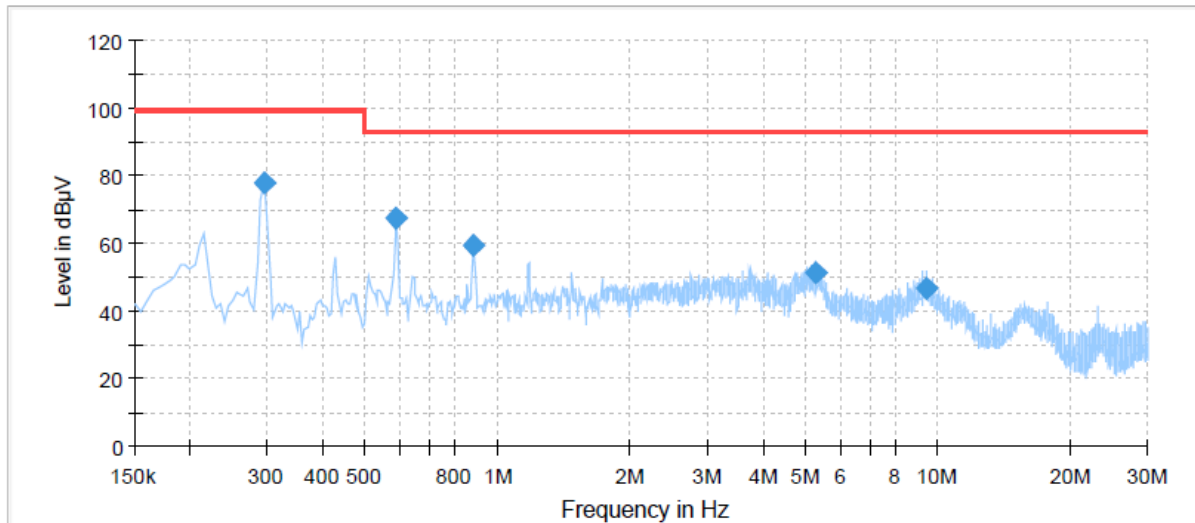
Model No.:

TRM-1610M

Mode

Operator Name:

KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.295000	77.93	---	99.00	21.07	1000.0	9.000	N	19.4
0.590000	67.52	---	93.00	25.48	1000.0	9.000	N	19.7
0.885000	59.20	---	93.00	33.80	1000.0	9.000	N	19.9
5.300000	51.51	---	93.00	41.49	1000.0	9.000	N	19.7
9.425000	46.94	---	93.00	46.06	1000.0	9.000	N	19.9

◆ 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))

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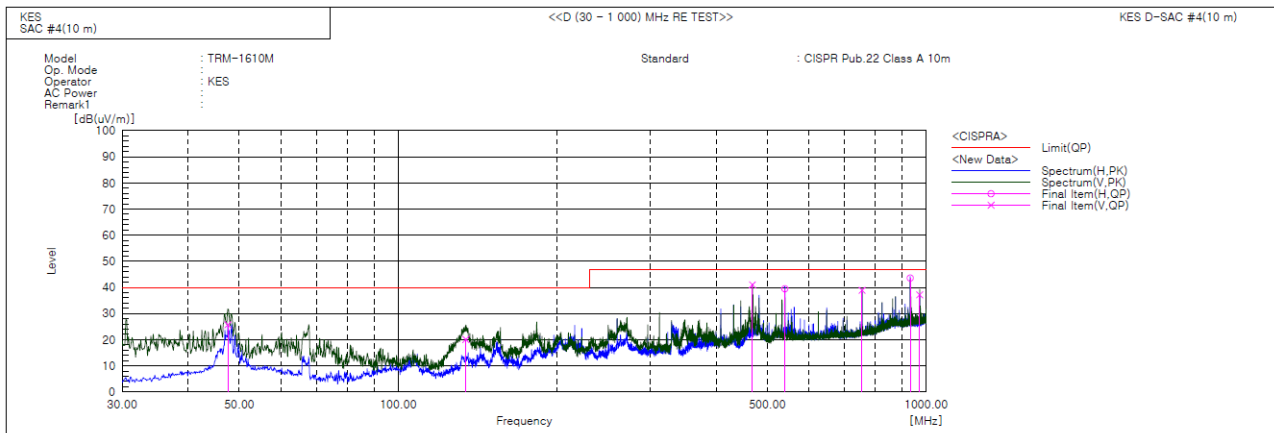
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Radiated Electric Field Emissions(Below 1 GHz)



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	47.581	V	54.0	-28.3	25.7	40.0	14.3	150.0	263.0	
2	134.275	V	52.6	-32.5	20.1	40.0	19.9	100.0	189.0	
3	468.683	V	60.8	-19.8	41.0	47.0	6.0	150.0	243.0	
4	539.978	H	56.9	-17.4	39.5	47.0	7.5	400.0	155.0	
5	756.045	V	53.4	-14.5	38.9	47.0	8.1	150.0	10.0	
6	933.070	H	54.9	-11.3	43.6	47.0	3.4	100.0	149.0	
7	971.991	V	48.1	-10.9	37.2	47.0	9.8	150.0	83.0	

◆ Calculation – SAC #4(10 m)

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

Margin(QP)[dB] = Limit[dB(μ V/m)] - Result(QP) [dB(μ V/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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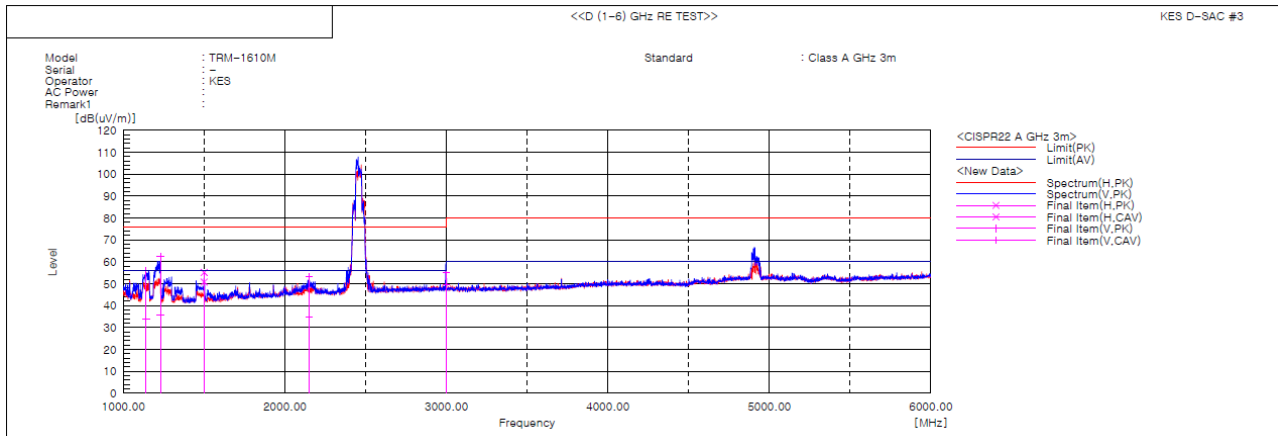
3701, 40, Simin-daero 365beon-gil,
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Radiated Electric Field Emissions(Above 1 GHz)



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	4911.000	V			14.3							100.0	43.2	
2	3000.009	V	47.8	42.1	7.5	55.3	49.6	80.0	60.0	24.7	10.4	100.0	19.2	
3	2454.000	V			5.8			76.0	56.0			100.0	25.1	
4	2151.668	V	48.3	30.3	4.7	53.0	35.0	76.0	56.0	23.0	21.0	100.0	20.6	
5	1500.060	H	54.9	50.5	0.3	55.2	50.8	76.0	56.0	20.8	5.2	100.0	37.7	
6	1229.699	V	63.5	36.6	-1.1	62.4	35.5	76.0	56.0	13.6	20.5	100.0	33.0	
7	1141.001	V	57.3	35.5	-1.4	55.9	34.1	76.0	56.0	20.1	21.9	100.0	27.8	

◆ Calculation

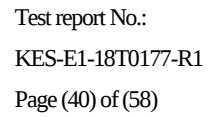
Over Limit [dB] = (Read Level[dB μ V] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dB μ V]

Over Limit : Margin, Read Level : Reading value, Ant Factor : ANT Factor,

Cable Loss : Cable loss, Preamp Factor : Preamp Factor

2.4 GHz and 4.9 GHz are excluded from measurements with fundamental frequency and harmonic frequency.

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Test Data - Voltage Fluctuations

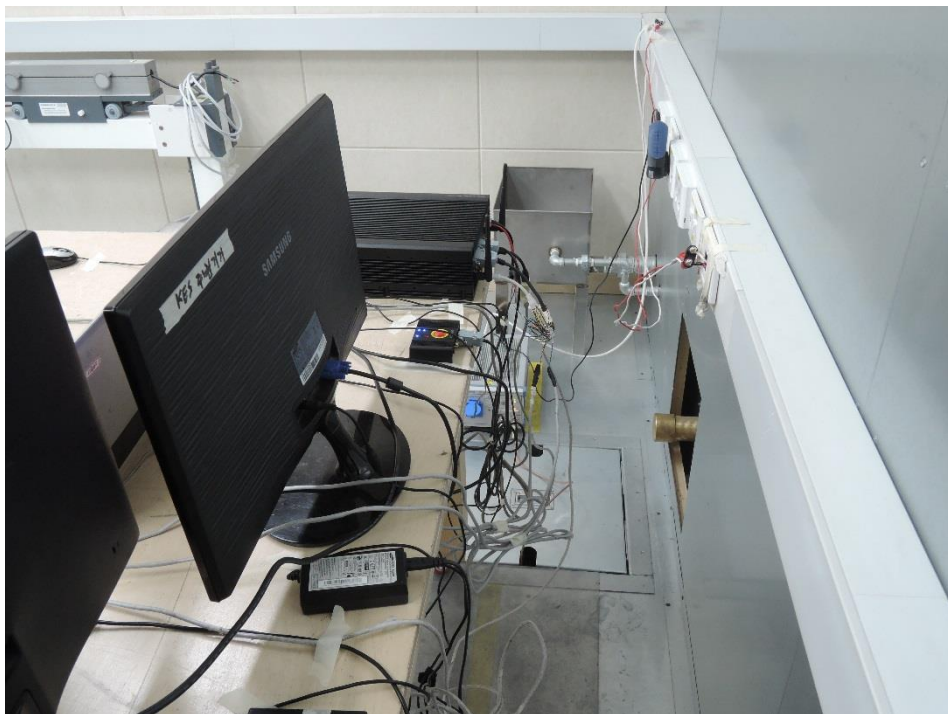
Maximum Flicker results

	EUT values	Limit	Result
Pst	N/A		
Plt			
dc [%]			
dmax [%]			
Tmax [s]			

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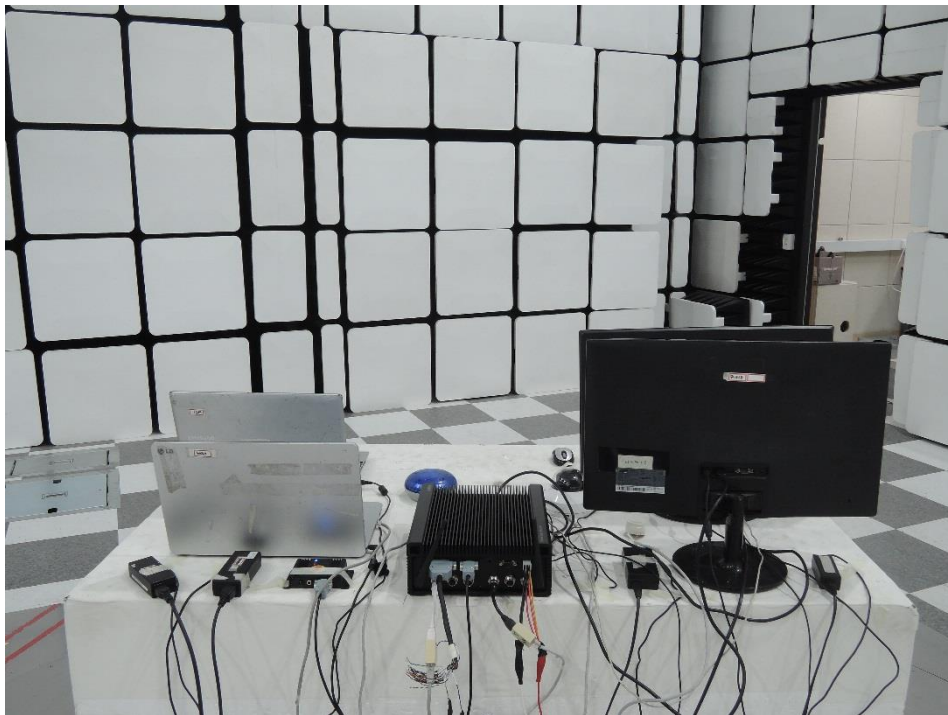
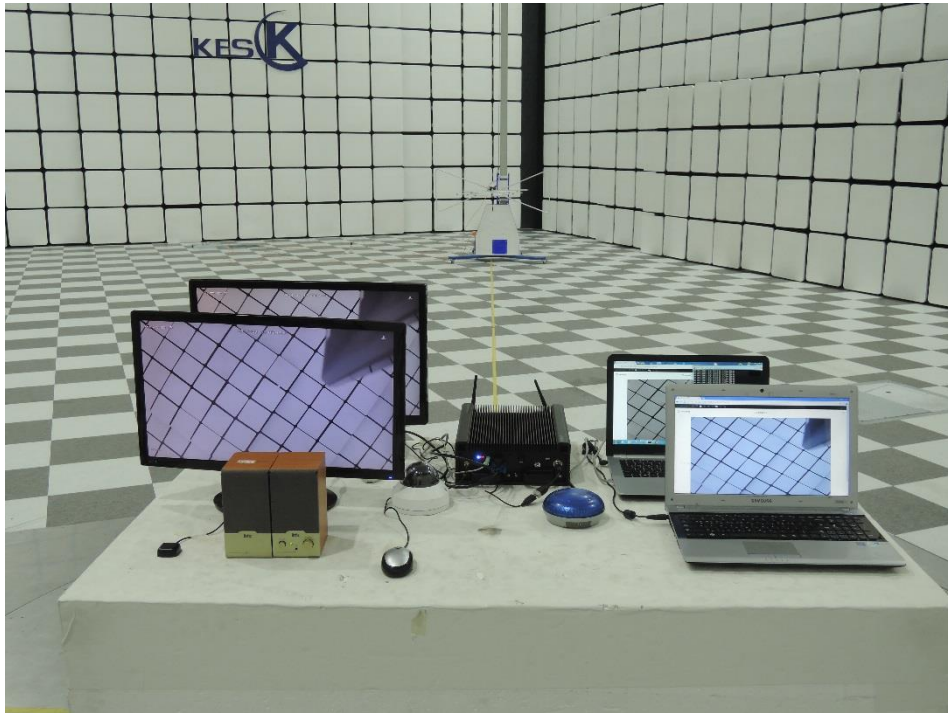
Test Setup Photos and Configuration

Conducted Voltage Emissions



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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

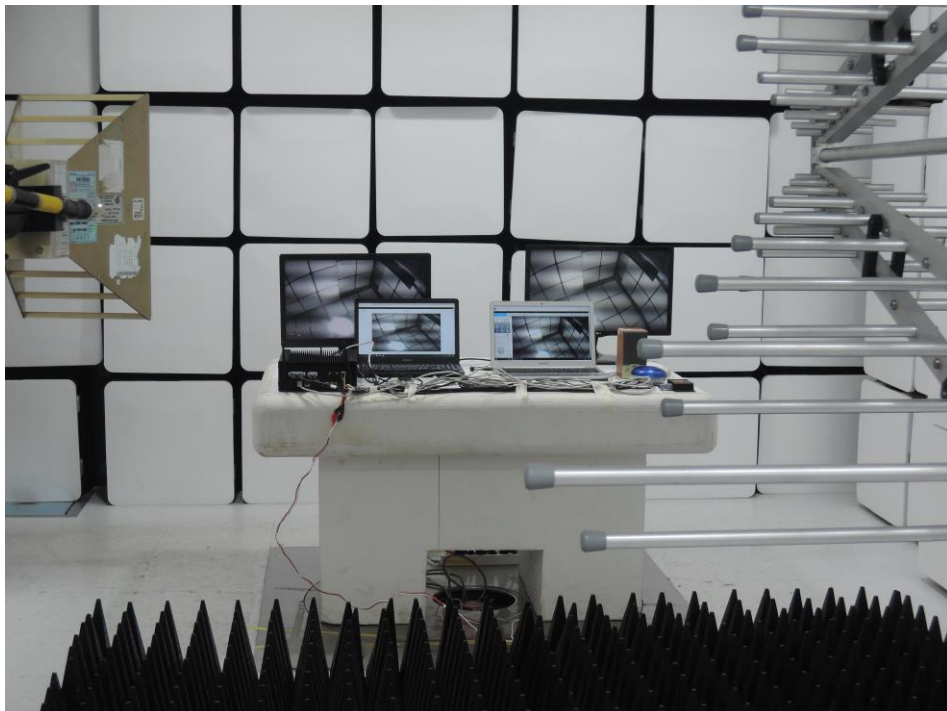
N/A

Electrostatic Discharge

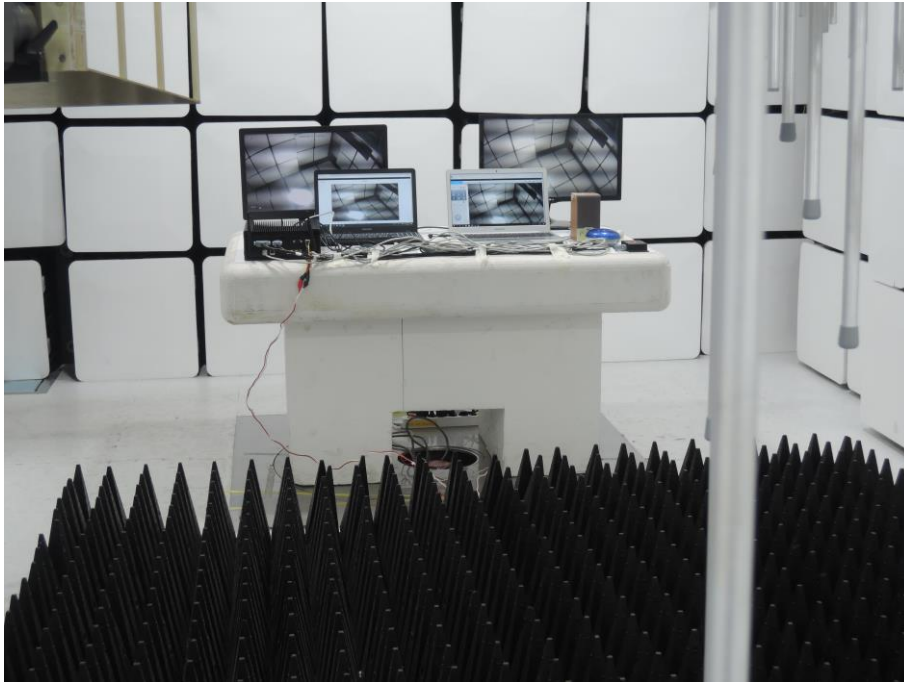
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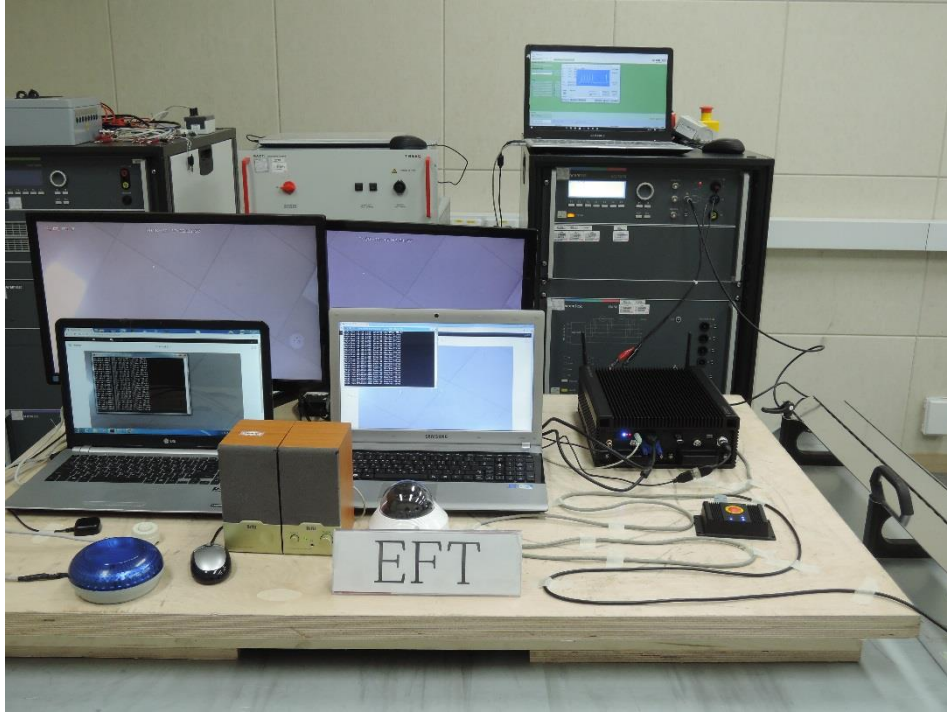
Radiated Electric Field Immunity



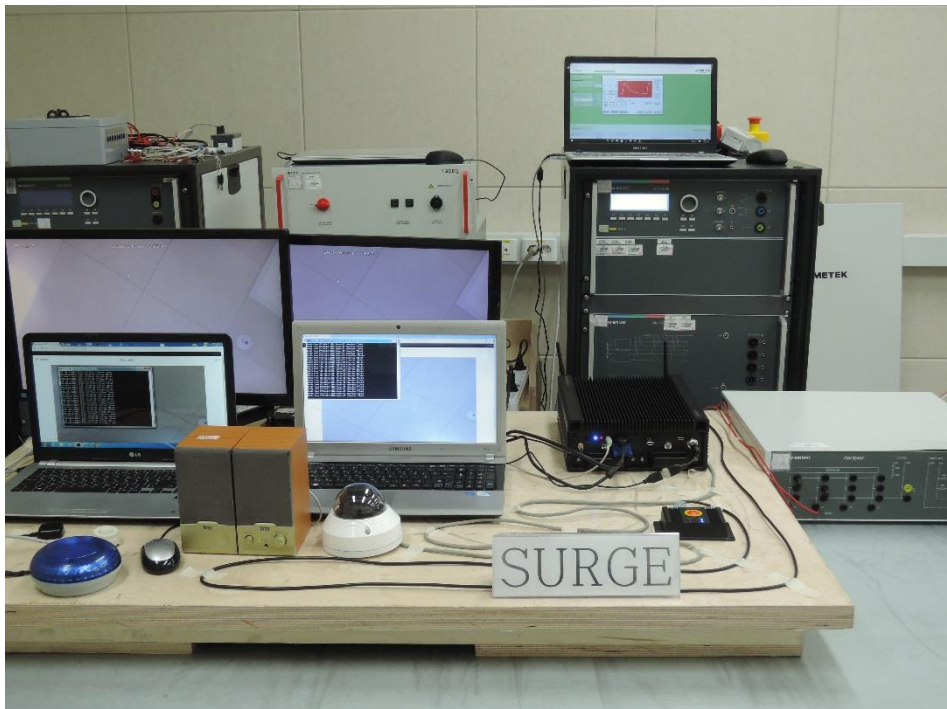
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Electrical Fast Transients/Bursts



Surge Transients



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Conducted Disturbance



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EUT External Photographs

(Top)



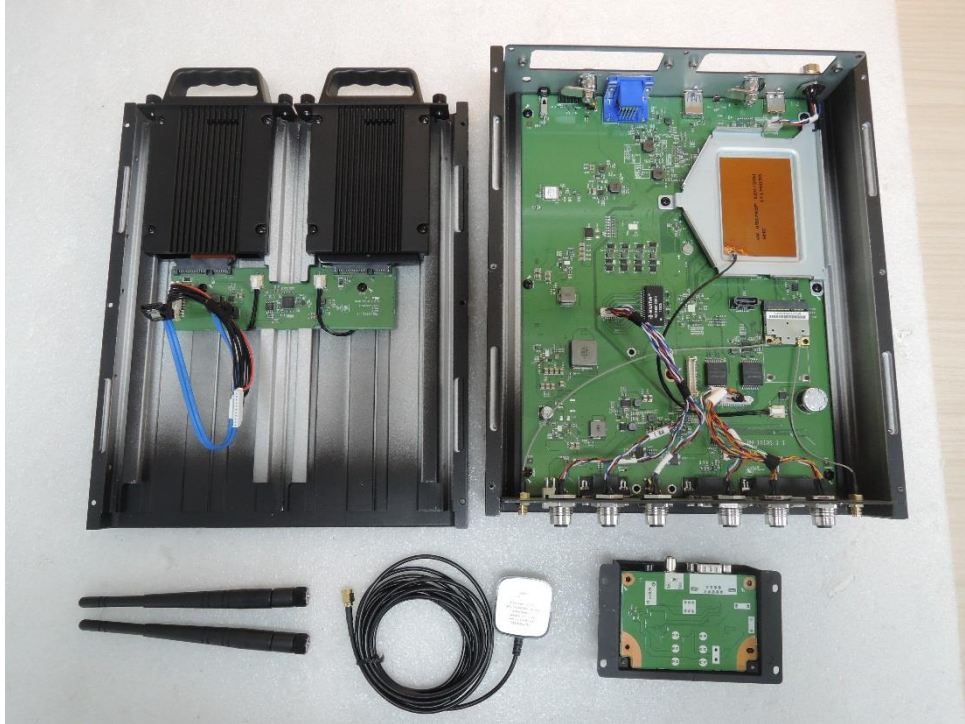
(Bottom)



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EUT Internal Photographs

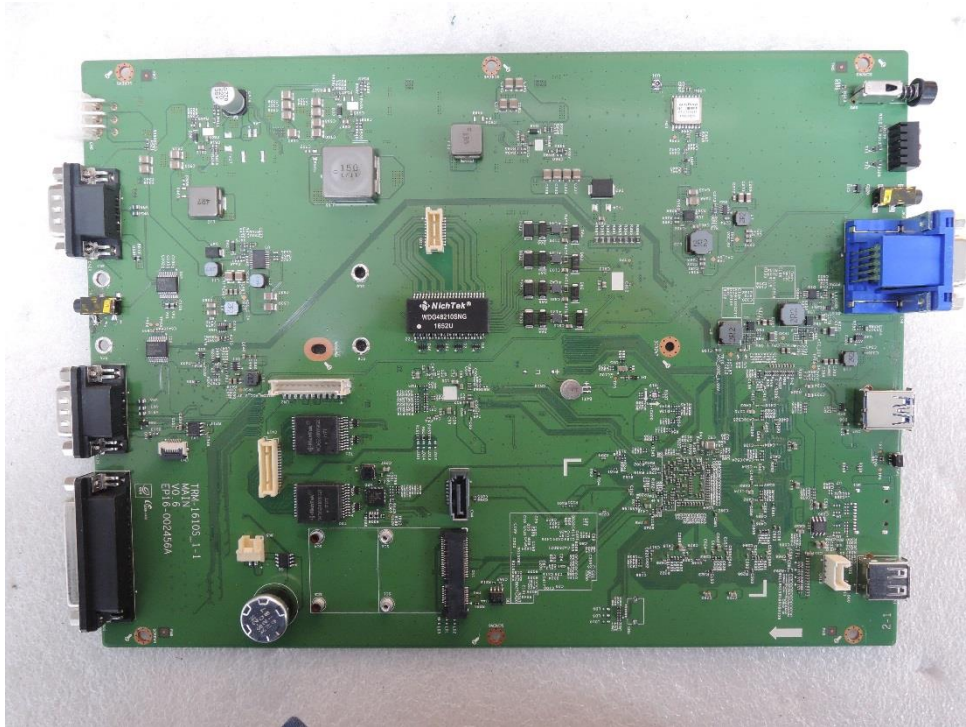
(Internal View)



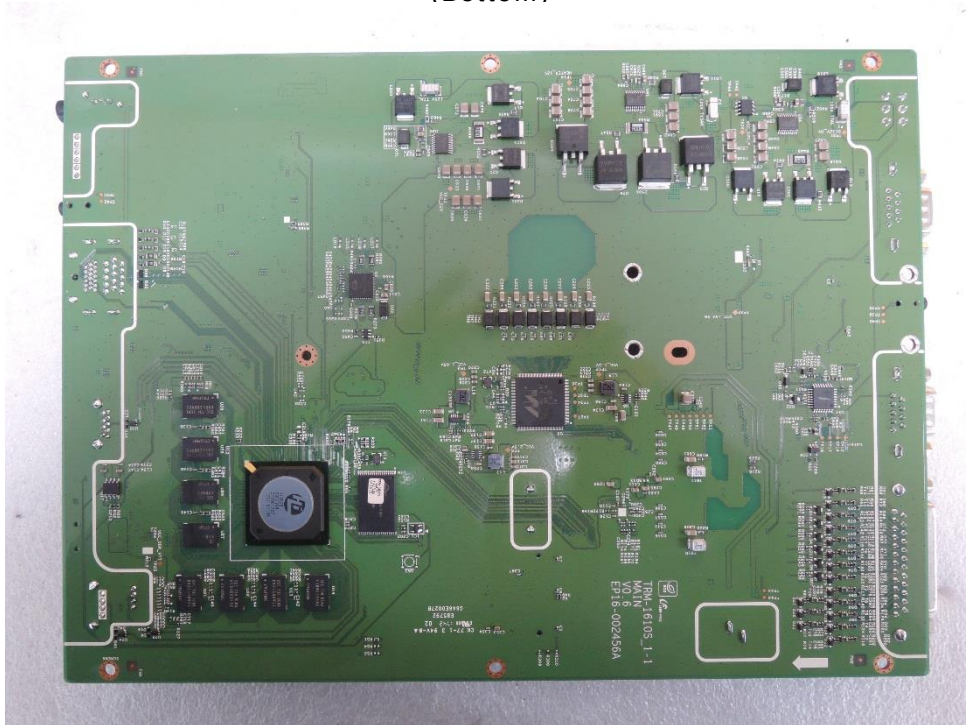
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EUT Internal View – Main board

(Top)



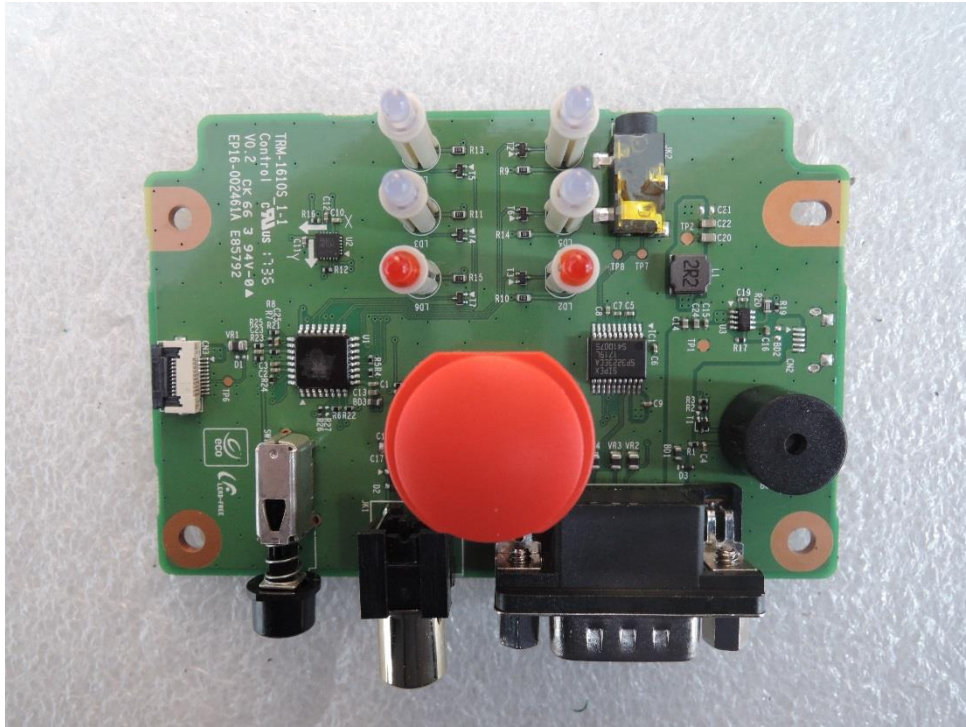
(Bottom)



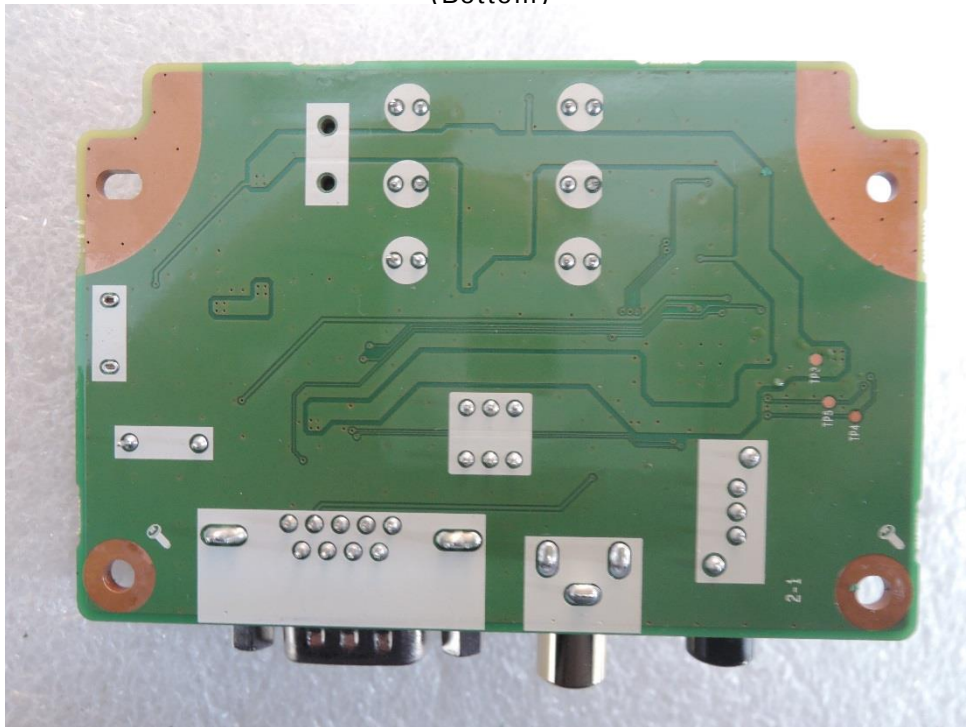
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EUT Internal View – Control box board

(Top)



(Bottom)



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EUT Internal View – GPS Antenna

(Top)



EUT Internal View – Module

(Top)



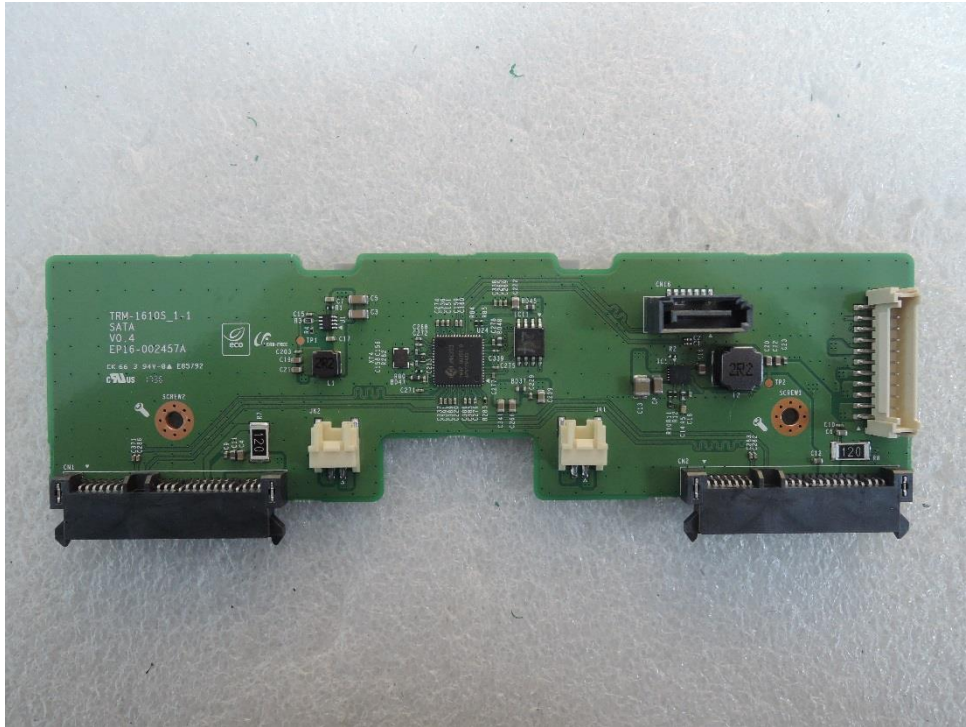
(Bottom)



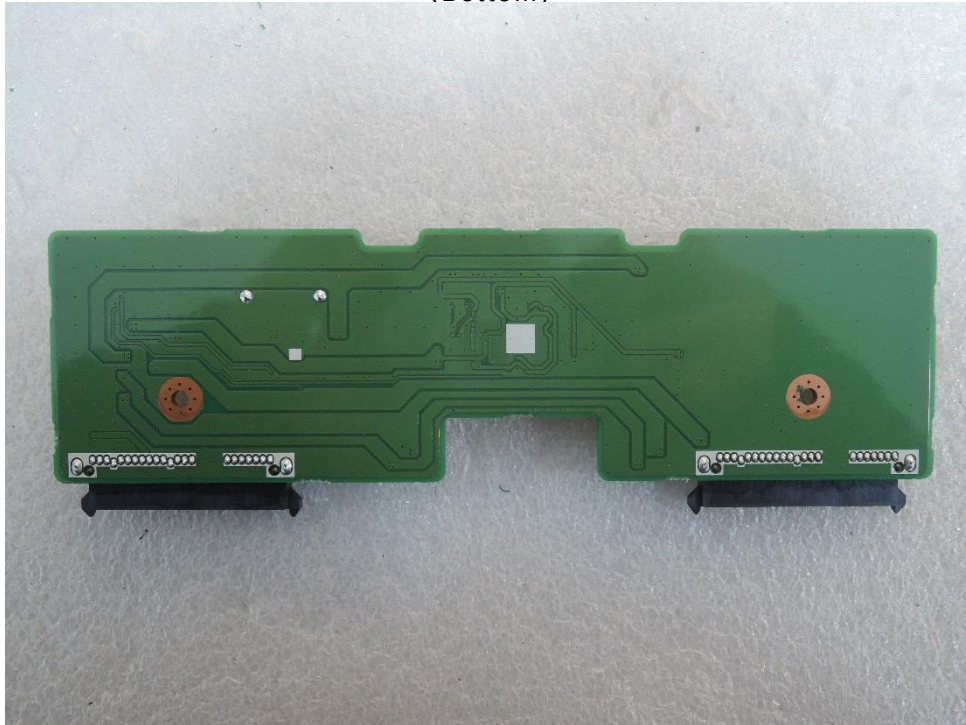
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EUT Internal View – SATA board

(Top)



(Bottom)



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EUT Internal View – SSD

(Top)



(Bottom)



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Label and Location



NVR

Model No : TRM-1610M

Manufacturer : Hanwha Techwin (Tianjin) Co.,Ltd.

Made in China

