Test Report

According to

MIL-STD-461E
(CE102; RE102; RS103)

Product： Rack-mount Fanless Computer

Trade Name： N/A

Model Number： HORUS200-XXXX
(X= 0~9 , A~Z, a~z, - or blank)

Prepared for

Perfectron Co., Ltd. Taiwan Branch

2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist.,
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Issued by

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Remark:
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The test result in this report is only subjected to the test sample.

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Statement of Compliance

Applicant： **Perfectron Co., Ltd. Taiwan Branch**
2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 23146, Taiwan (R.O.C.)

Manufacturer： **Perfectron Co., Ltd. Taiwan Branch**
2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist.,
New Taipei City 23146, Taiwan (R.O.C.)

Product： Rack-mount Fanless Computer

Model No.： HORUS200-XXXX (X= 0~9 , A~Z, A~Z, - OR BLANK)

Additional Description：
1.) The test model is "**HORUS200**" and included in this report.
2.) The differences for all models included in this report are for different markets.
3.) For more detail specification about EUT, please refer to the user's manual.

Tested Power Voltage： DC 24 V

Date of Test： Sep. 09 ~ 22, 2019

Revision of Report: Rev. 01

Measurement Procedures and Standards Used：

☒ Test result is compliance with MIL-STD-461E (CE102; RE102; CS101; RS103)

Applicable Standards			
Standard	**Special**	**Location of Test**	**Test Result**
MIL-STD-461E (CE102)	Frequency Range: 10 kHz - 30 MHz	IETC LAB	PASS
MIL-STD-461E (RE102)	Frequency Range: 10 kHz - 18 GHz	IETC LAB	PASS
MIL-STD-461E (RS103)	Frequency Range: 1.5 MHz - 200 MHz	NCSIST LAB *	PASS
	Frequency Range: 200 MHz – 3.2 GHz	IETC LAB	PASS
	Frequency Range: 3.0 GHz – 5.0 GHz	NCSIST LAB *	PASS

Note: 1. " * " means external resources / subcontractors (NCSIST LAB, TAF Accreditation No.: 0533) was used to perform testing.
2. The test mode for final test are as following:
- Mode 1: Working Mode

The measurement results in this test report were performed at Interocean EMC Technology Corp. the responsibility of measurement result is only subjected to the tested sample.
This report shows the EUT is technically compliance with the above official standards.
This report shall not be partial reproduced without written approval by Interocean EMC Technology Corporation.

Report Issued: 2019/10/07

Project Engineer: Zac Lin Approved: Vin Chou
Zac Lin Vin Chou

Test Facility

Site Description : ☒Chamber 3 & 6 (IETC LAB) ☒RS Chamber (NCSIST LAB)

Name of Firm : Interocean EMC Technology Corp.

Company web : http://www.ietc.com.tw

Location : No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.

Site Filing :

- Federal Communication Commissions – USA
  Designation No.: TW1020 (Test Firm Registration #: 651092)
  Designation No.: TW1113 (Test Firm Registration #: 959554)
- Innovation, Science and Economic Development Canada (ISED)
  CAB identifier: TW1113 (Ref. No 14962756)
- Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan
  Member No.: 1349
  Registration No. (Conducted Room): C-11094
  Registration No. (Conducted Room): T-11562
  Registration No. (OATS 1): R-11040; G-10274

Site Accreditation :

- Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
  Accreditation No.:
  SL2-IN-E-0026 for CNS 13438 / CISPR 22
  SL2-R1-E-0026 for CNS 13439 / CISPR 13
  SL2-R2-E-0026 for CNS 13439 / CISPR 13
  SL2-L1-E-0026 for CNS 14115 / CISPR 15
- Taiwan Accreditation Foundation (TAF)
  Accreditation No.: 1113
- American Association for Laboratory Accreditation (A2LA)
  Certificate Number: 4891.01
- Vehicle Safety Certification Center (VSCC)
  Approval No.: TW16-11
- TüV NORD
  Certificate No: TNTW0801R

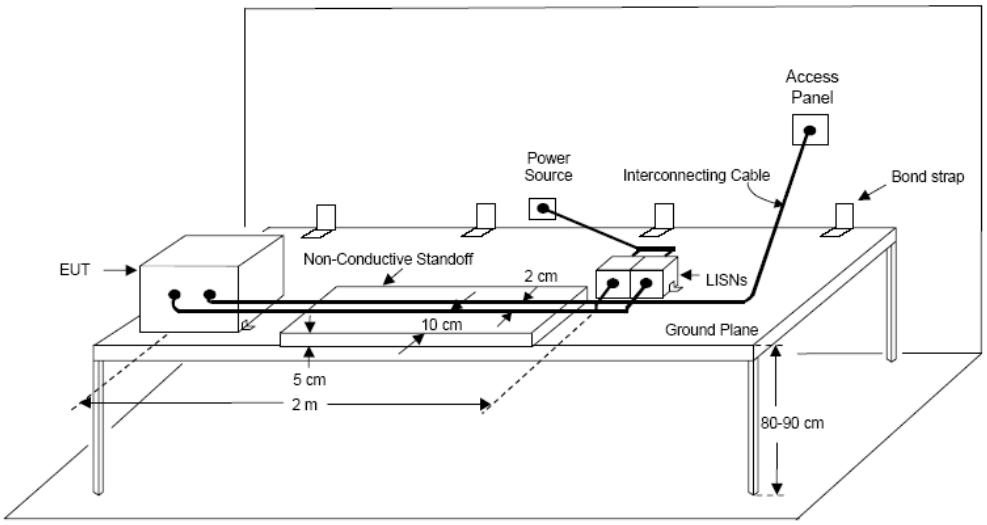
1 Conducted emissions, power leads Test (CE102)

1.1 Instrument

EMI Test Receiver	Rohde & Schwarz	ESR7	101422	2019/12/10
DC LISN	Schwarzbeck	NNBL 8226	8226-519	2020/05/22
DC LISN	Schwarzbeck	NNBL 8226	8226-520	2020/05/22
RF Cable	EMCI	EMC104	CBL63	2020/03/10
RF Cable	EMCI	EMC104	CBL64	2020/03/10

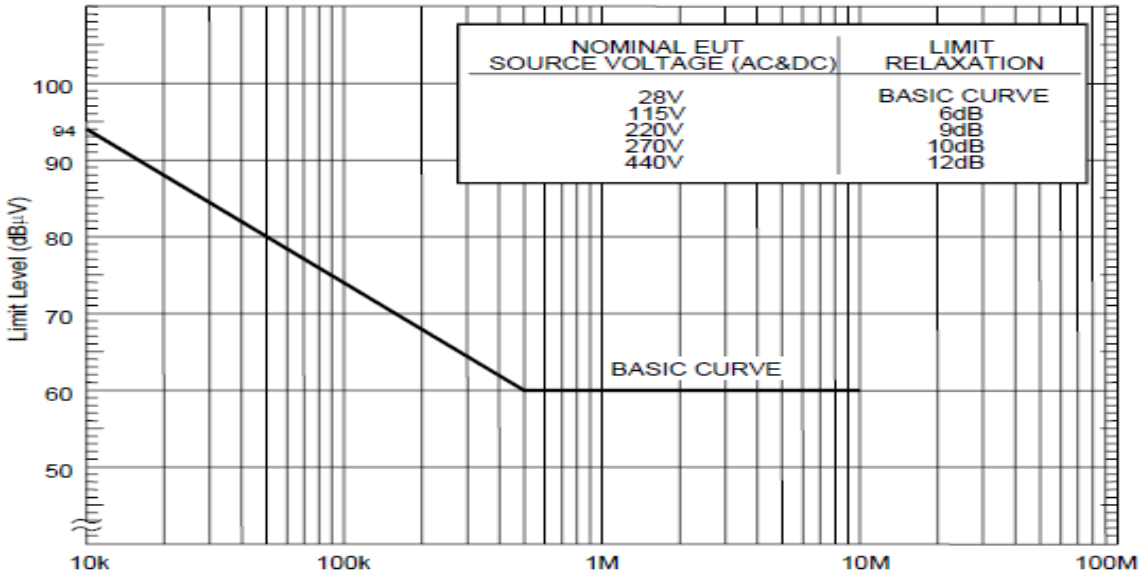
Note: The above equipments are within the valid calibration period.

1.2 Block Diagram of Test Configuration



1.3 Test Limit

This Limit level is according to **MIL-STD-461E** sub clause 5.5.2 **CE102 limit figure CE102-1**.



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1.4 Configuration of Measurement

1.4.1 Calibration. Perform the measurement system check using the measurement system check setup of MIL-STD-461E Figure CE102-2.

(a) Turn on the measurement equipment and allow a sufficient time for stabilization.

(b) Apply a signal level that is at least 6 dB below the limit at 10 kHz, 100 kHz, 2 MHz and 10 MHz to the power output terminal of the LISN. At 10 kHz and 100 kHz, use an oscilloscope to calibrate the signal level and verify that it is sinusoidal. At 2 MHz and 10 MHz, use a calibrated output level directly from a 50Ω signal generator.

(c) Scan the measurement receiver for each frequency in the same manner as a normal data scan. Verify that the measurement receiver indicates a level within ±3 dB of the injected level. Correction factors shall be applied for the 20 dB attenuator and the voltage drop due to the LISN 0.25 μF coupling capacitor.

(d) If readings are obtained which deviate by more than ±3 dB, locate the source of the error and correct the deficiency prior to proceeding with the testing.

(e) Repeat MIL-STD-461E sub clause 5.5.3.4a(2) through MIL-STD-461E sub clause 5.5.3.4a(4) for each LISN.

1.4.2 EUT testing. Perform emission data scans using the measurement setup of **MIL-STD-461E Figure CE102-3**.

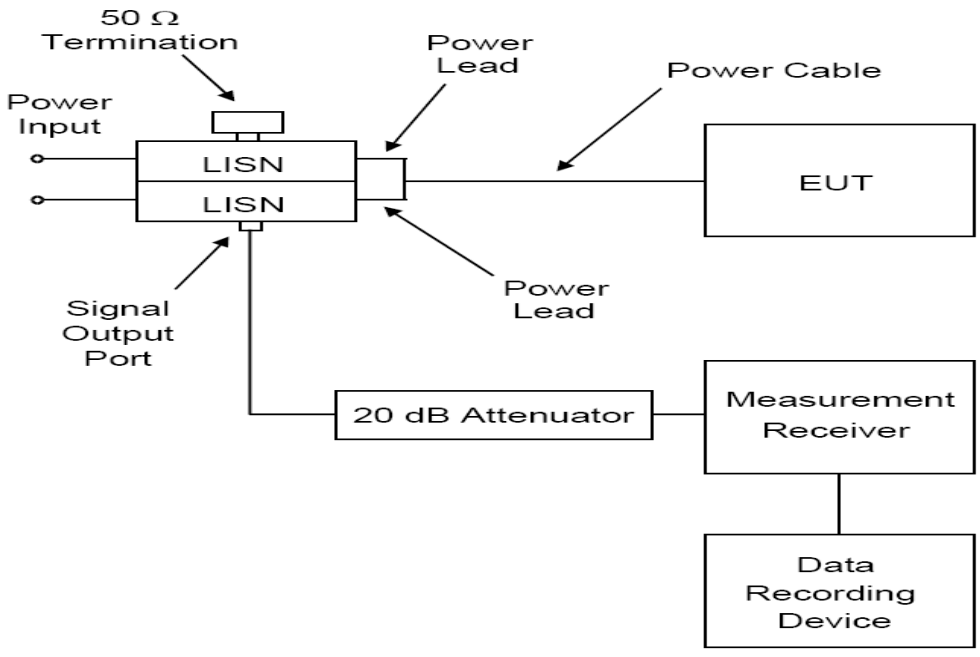
(a) Turn on the EUT and allow a sufficient time for stabilization.

(b) Select an appropriate lead for testing.

(c) Scan the measurement receiver over the applicable frequency range, using the bandwidths and minimum measurement times in the MIL-STD-461E Table II.

(d) Repeat MIL-STD-461E sub clause 5.5.3.4b(2) and MIL-STD-461E sub clause 5.5.3.4b(3) for each power lead.

FIGURE CE102-3. Measurement setup.



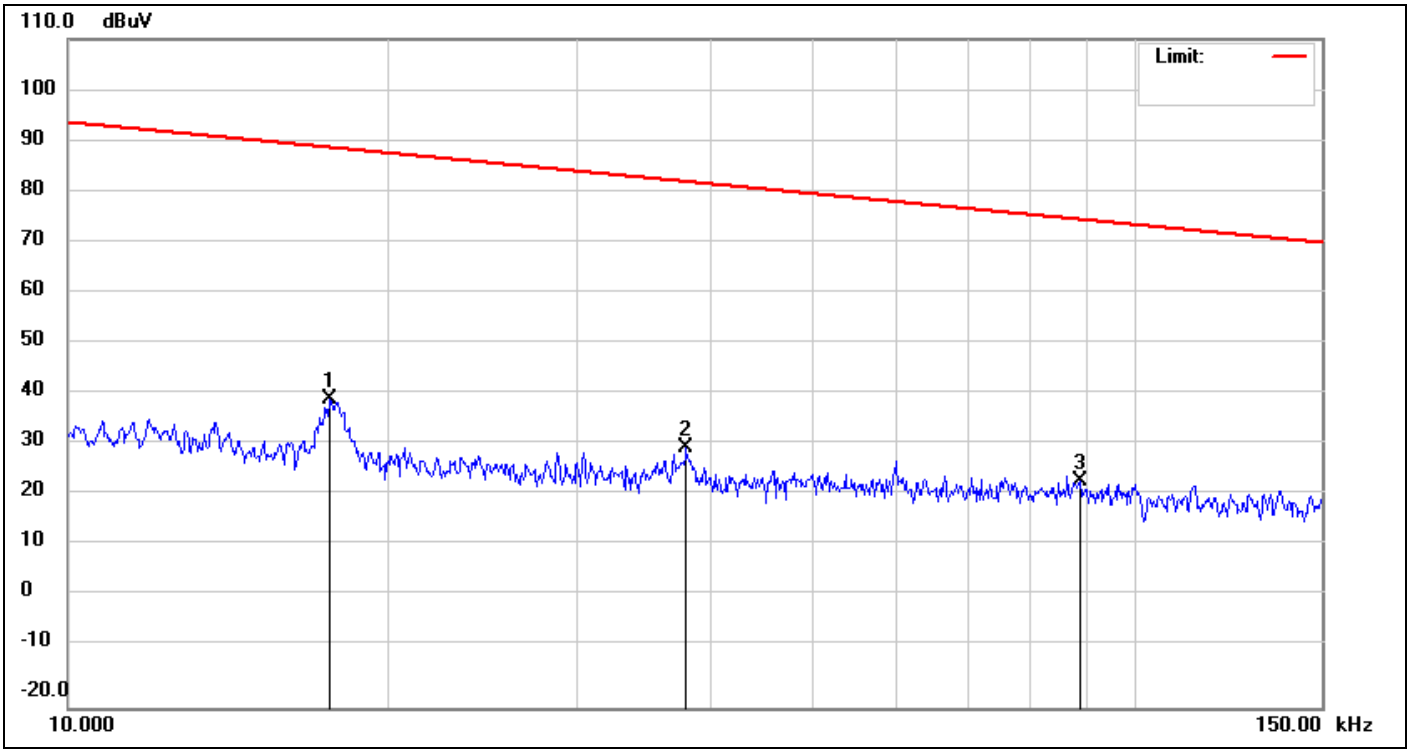
1.5 System Calibration Check

Based on MIL-STD-461E sub clause 5.5.3.4 system calibration requirement to verify the calibration level within ±3 dB at 10 kHz, 100 kHz, 2 MHz and 10 MHz.

1.6 Test Result

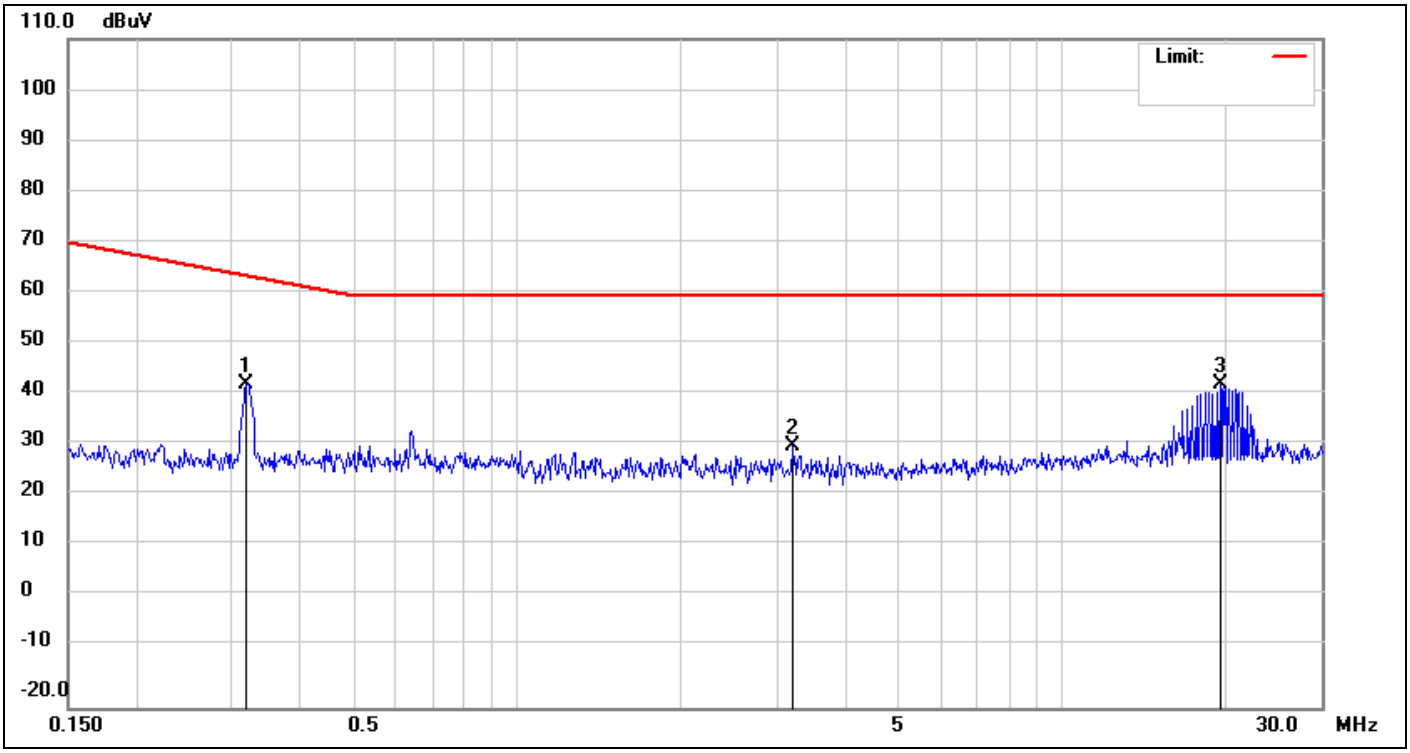
The final test data is shown as following pages.

Job No.:	19A081602V	Polarization:	L1
Standard:	MIL-STD-461E (1999)_CE102_28V_0.01~30M	Power Source:	DC 24 V
Test item:	Conduction Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 11:11:52
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	None
Model:	HORUS200	RBW: 1 kHz	VBW: 1 kHz
Description:			



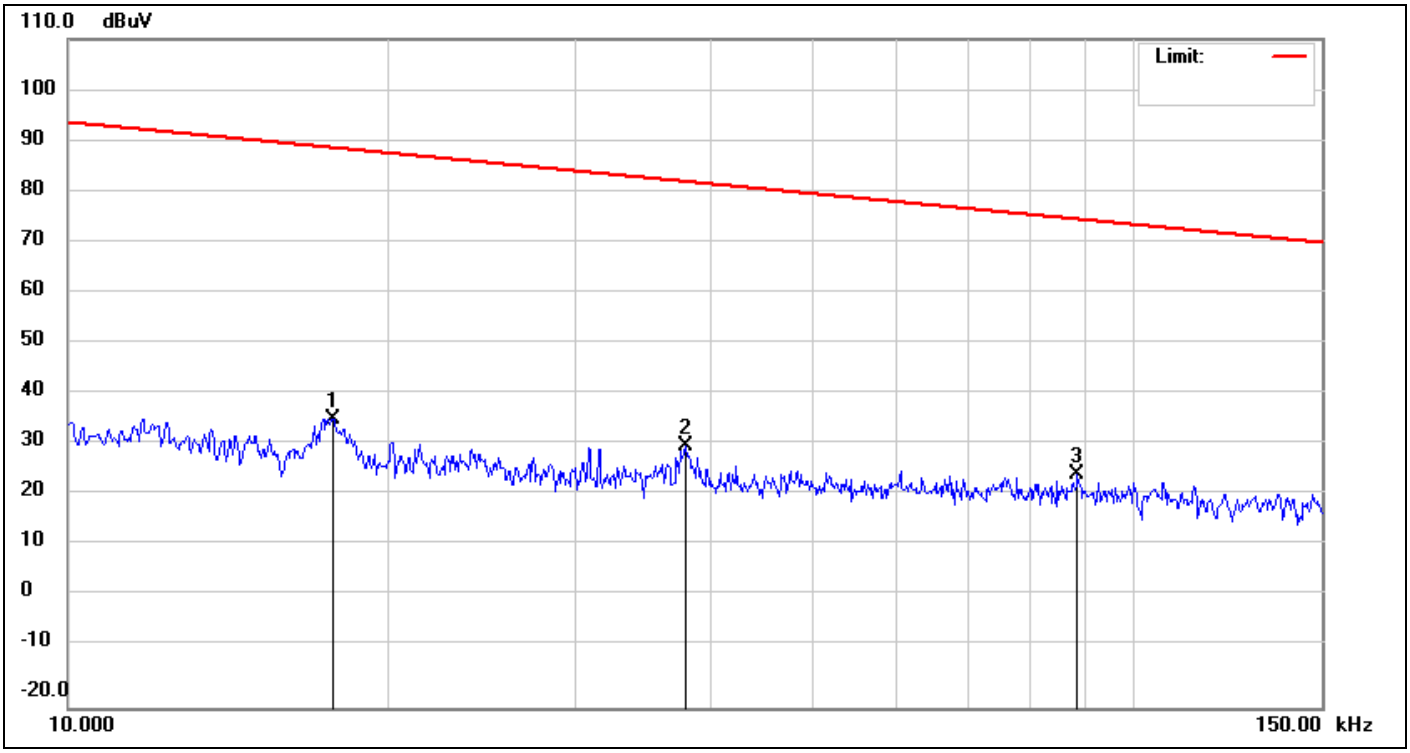
No.	Frequency (KHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	17.6120	36.93	2.97	39.90	89.08	-49.18	peak	P	
2	38.0030	29.71	0.84	30.55	82.39	-51.84	peak	P	
3	88.9420	23.65	0.27	23.92	75.00	-51.08	peak	P	

Job No.:	19A081602V	Polarization:	L1
Standard:	MIL-STD-461E (1999)_CE102_28V_0.01~30M	Power Source:	DC 24 V
Test item:	Conduction Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 11:10:56
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	None
Model:	HORUS200	RBW: 10 kHz	VBW: 10 kHz
Description:			



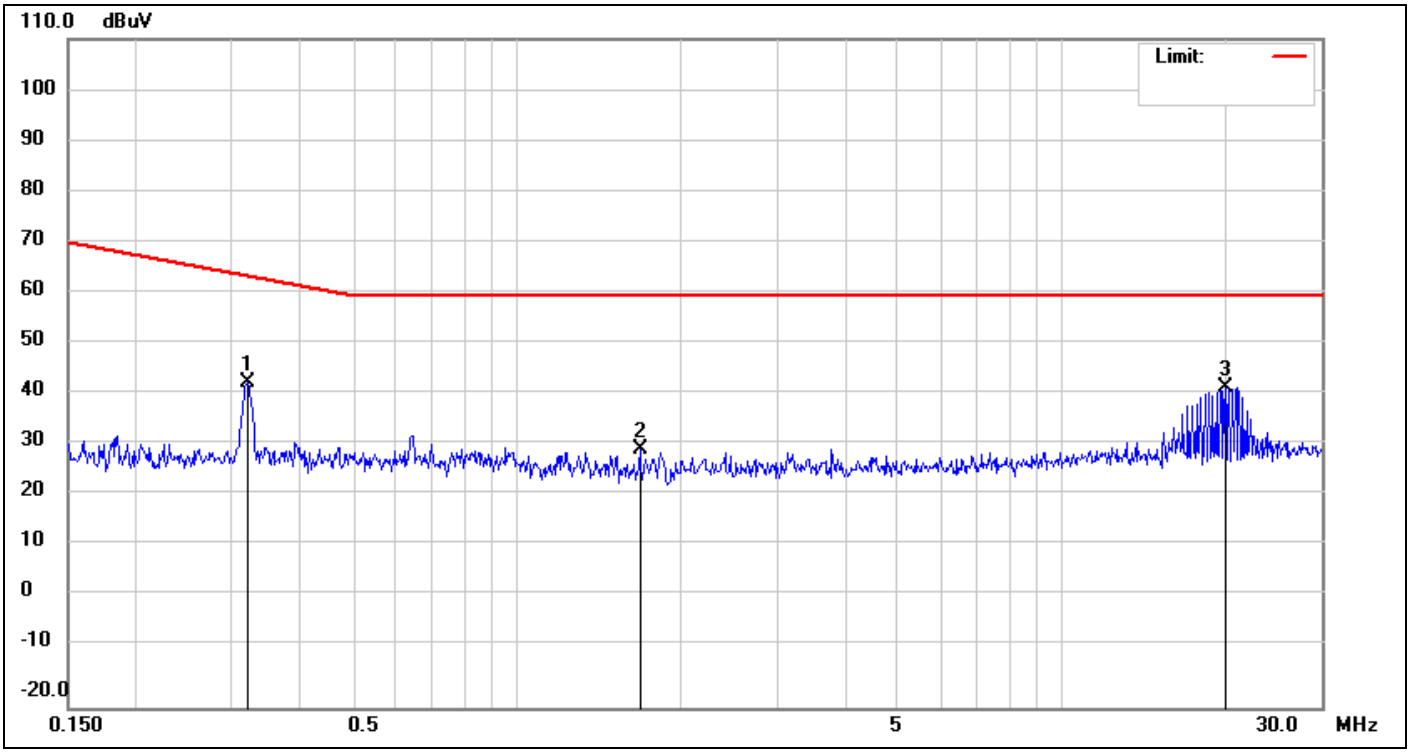
No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)			
1	0.3183	42.68	0.29	42.97	63.92	-20.95	peak	P	
2	3.2069	30.54	0.32	30.86	60.00	-29.14	peak	P	
3	19.5316	42.20	0.63	42.83	60.00	-17.17	peak	P	

Job No.:	19A081602V	Polarization:	N
Standard:	MIL-STD-461E (1999)_CE102_28V_0.01~30M	Power Source:	DC 24 V
Test item:	Conduction Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 11:13:14
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	None
Model:	HORUS200	RBW: 1 kHz	VBW: 1 kHz
Description:			



No.	Frequency (KHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	17.7070	33.12	3.04	36.16	89.03	-52.87	peak	P	
2	37.9000	29.92	0.91	30.83	82.42	-51.59	peak	P	
3	88.4610	25.06	0.31	25.37	75.05	-49.68	peak	P	

Job No.:	19A081602V	Polarization:	N
Standard:	MIL-STD-461E (1999)_CE102_28V_0.01~30M	Power Source:	DC 24 V
Test item:	Conduction Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 11:13:53
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	None
Model:	HORUS200	RBW: 10 kHz	VBW: 10 kHz
Description:			



No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)			
1	0.3200	42.78	0.30	43.08	63.88	-20.80	peak	P	
2	1.6802	29.67	0.42	30.09	60.00	-29.91	peak	P	
3	19.9500	41.63	0.61	42.24	60.00	-17.76	peak	P	

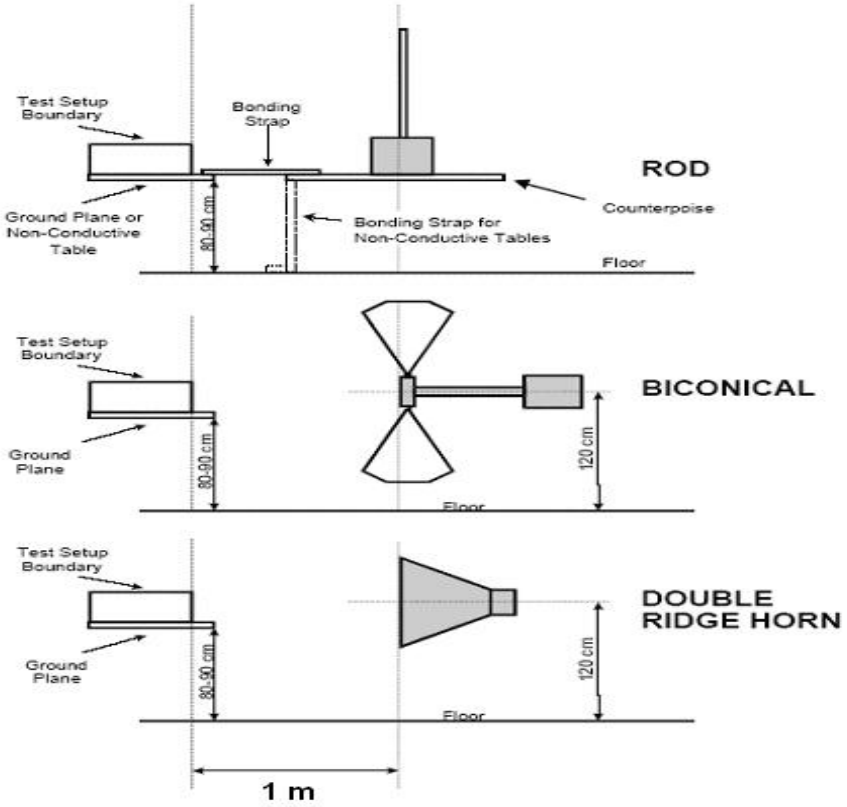
2 Radiated emissions, electric field Test (RE102)

2.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESR7	101422	2019/12/10
Spectrum Analyzer	R&S	FSP30	100002	2020/03/24
Monopole Antenna	ETS-Lindgren	3301C	00211334	2019/12/17
Biconical Antenna	Schwarzbeck	VHBB 9124 & BBA 9106	9124-743	2020/06/24
Horn Antenna	Schwarzbeck	VUSLP 9111B	911B-146	2020/06/24
Horn Antenna	Schwarzbeck	BBHA 9120	9120D-583	2019/10/15
Pre-Amplifier	EMCI	EMC01640	980105	2020/08/19
Pre-Amplifier	EMCI	EMC051845	980131	2020/05/23
DC LISN	Schwarzbeck	NNBL 8226	8226-519	2020/05/22
DC LISN	Schwarzbeck	NNBL 8226	8226-520	2020/05/22
RF Cable	EMCI	EMC104	CBL63	2020/03/10
RF Cable	EMCI	EMC104	CBL64	2020/03/10
RF Cable	EMCI	EMC104	CBL61	2020/03/10

Note: The above equipments are within the valid calibration period.

2.2 Block Diagram of Test Configuration



2.3 RE102 Application

2.3.1 This requirement is applicable for radiated emissions from equipment and subsystem enclosures, all interconnecting cables, and antennas designed to be permanently mounted to EUTs (receivers and transmitters in standby mode). The requirement does not apply at the transmitter fundamental frequencies. The requirement is applicable as follows:

☒	Ground	2 MHz to 18 GHz*
☐	Ships, surface	10 kHz to 18 GHz*
☐	Submarines	10 kHz to 18 GHz*
☒	Aircraft (Army)	10 kHz to 18 GHz (Helicopters 10 kHz to 2 MHz only)
☐	Aircraft (Air Force and Navy)	2 MHz to 18 GHz*
☐	Space	10 kHz to 18 GHz*

* Testing is required up to 1 GHz or 10 times the highest intentionally generated frequency within the EUT, whichever is greater. Measurements beyond 18 GHz are not required.

FIGURE: RE102-4. RE102 limit for ground applications

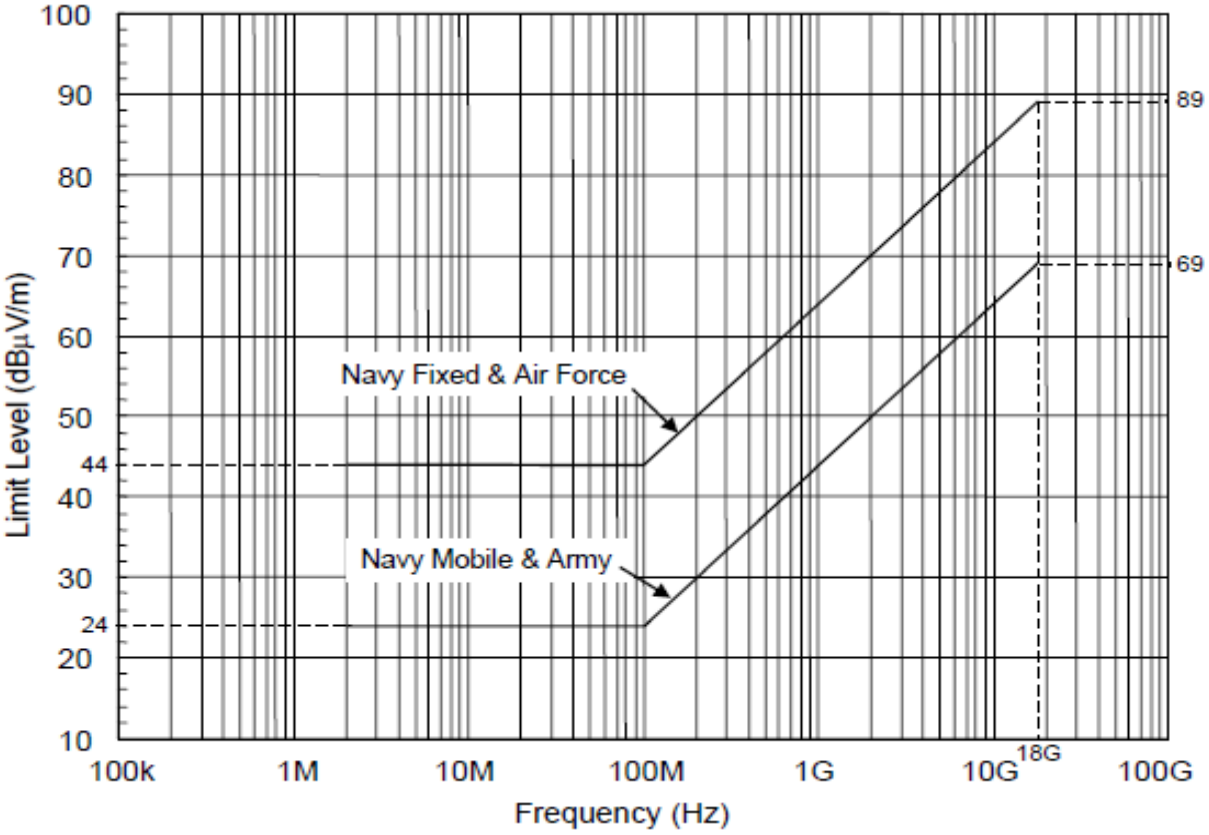
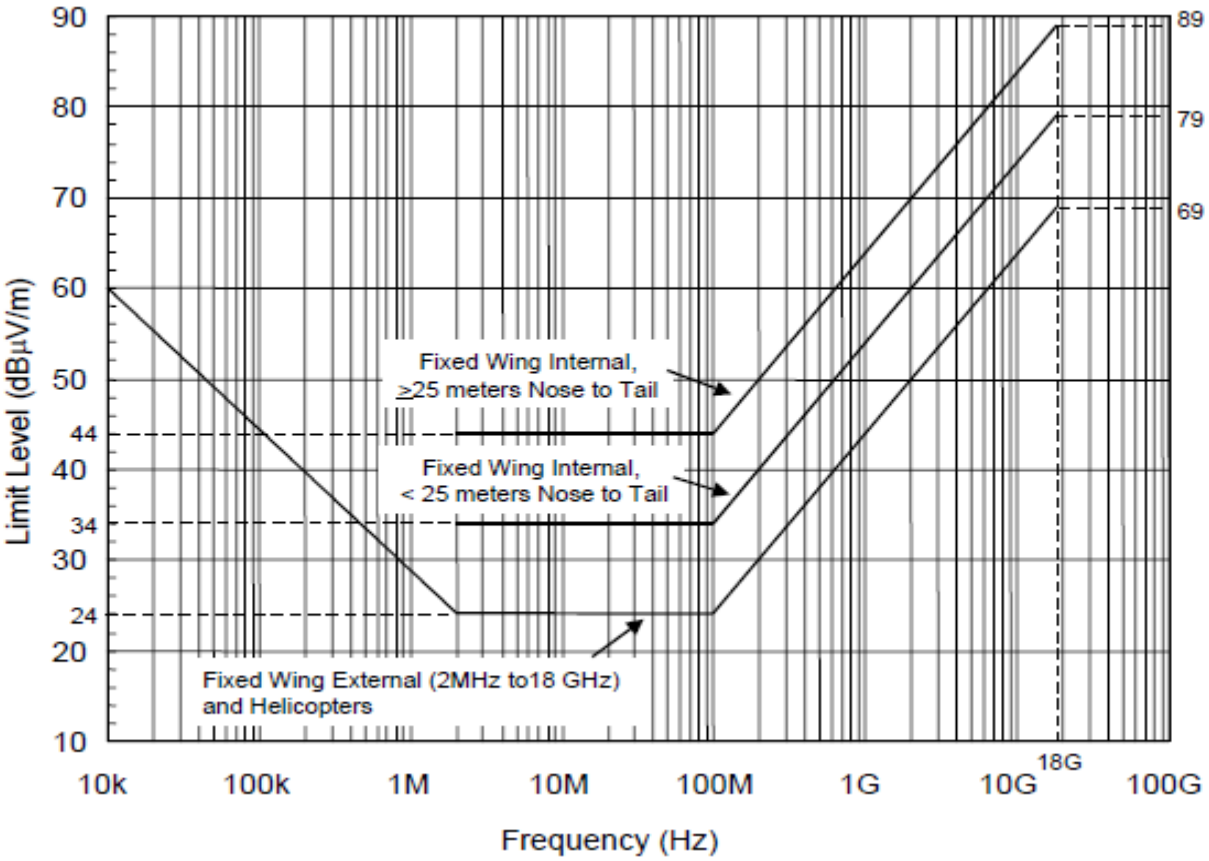


FIGURE: RE102-3. RE102 limit for aircraft and space system applications



2.4 Configuration of Measurement

2.4.1 Verify that the ambient requirements specified in MIL-STD-461E sub clause 4.3.4 are met. Take plots of the ambient when required by the referenced paragraph.

2.4.2 Turn on the measurement equipment and allow a sufficient time for stabilization.

2.4.3 Using the system check path of MIL-STD-461E Figure RE102-5, perform the following evaluation of the overall measurement system from each antenna to the data output device at the highest measurement frequency of the antenna. For rod antennas that use passive matching networks, the evaluation shall be performed at the center frequency of each band. For active rod antennas, the evaluation shall be performed at the lowest frequency of test, at a mid-band frequency, and at the highest frequency of test.

2.4.4 Turn on the measurement equipment and allow sufficient time for stabilization.

(a) Apply a calibrated signal level, which is at least 6 dB below the limit (limit minus antenna factor), to the coaxial cable at the antenna connection point.

(b) Scan the measurement receiver in the same manner as a normal data scan. Verify that the data recording device indicates a level within ±3 dB of the injected signal level.

(c) For the 104 cm rod antenna, remove the rod element and apply the signal to the antenna matching network through a 10 pF capacitor connected to the rod mount.

(d) If readings are obtained which deviate by more than ±3 dB, locate the source of the error and correct the deficiency prior to proceeding with the testing.

2.4.5 Using the measurement path of MIL-STD-461E Figure RE102-5, perform the following evaluation for each antenna to demonstrate that there is electrical continuity through the antenna.

(a) Radiate a signal using an antenna or stub radiator at the highest measurement frequency of each antenna.

(b) Tune the measurement receiver to the frequency of the applied signal and verify that a received signal of appropriate amplitude is present. Note: This evaluation is intended to provide a coarse indication that the antenna is functioning properly. There is no requirement to accurately measure the signal level.

2.4.6 Turn on the EUT and allow sufficient time for stabilization.

2.4.7 Using the measurement path of MIL-STD-461E Figure RE102-5, determine the radiated emissions from the EUT and its associated cabling.

(a) Scan the measurement receiver for each applicable frequency range, using the bandwidths and minimum measurement times in Table II.

(b) Above 30 MHz, orient the antennas for both horizontally and vertically polarized fields.

(c) Take measurements for each antenna position determined under MIL-STD-461E sub clause 5.16.3.3c(2)(c) above.

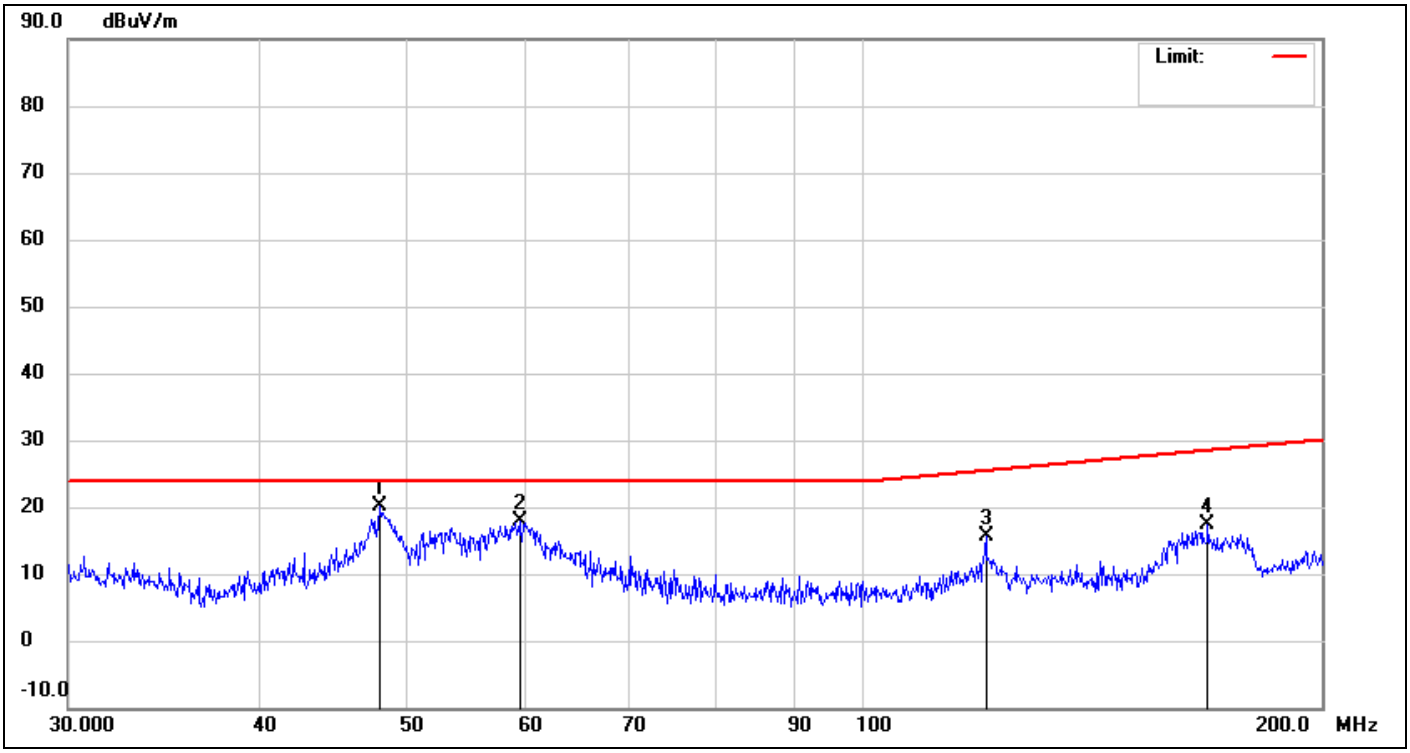
2.5 System Calibration Check

Based on MIL-STD-461E sub clause 5.16.3.4 system calibration requirement to verify the calibration level within ±3 dB in all test frequency.

2.6 Test Result

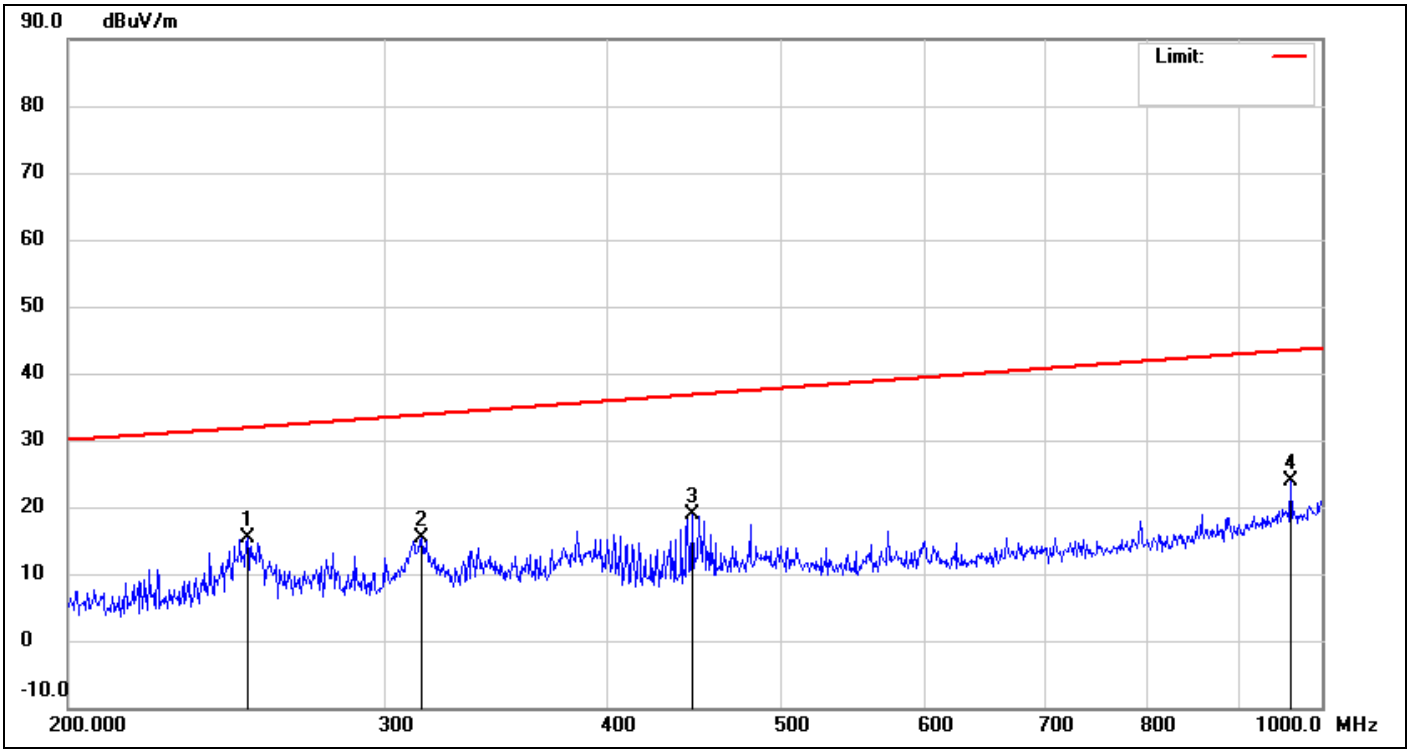
The final test data is shown as following pages.

Job No.:	19A081602V	Polarization:	Horizontal
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:40:51
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 100 kHz	VBW: 100 kHz
Description:			



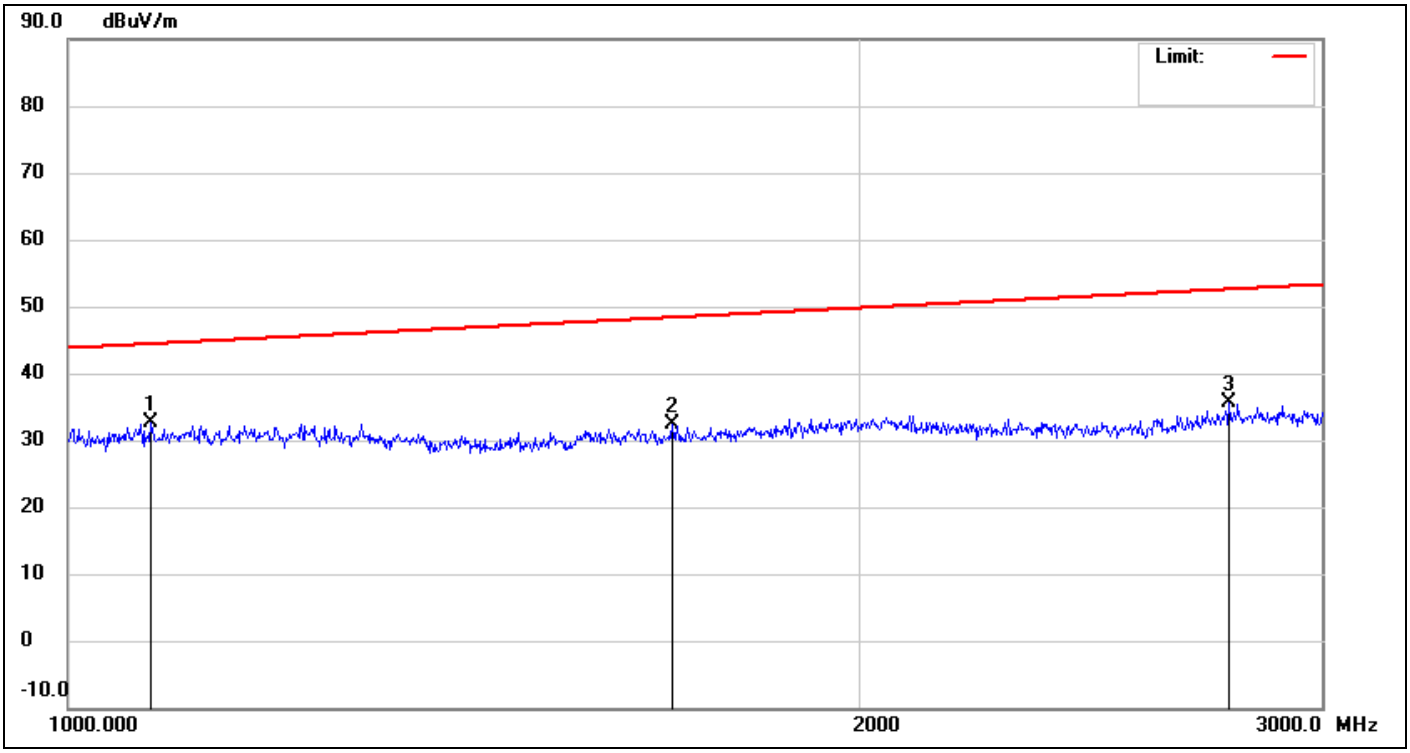
No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	48.1143	49.67	-29.49	20.18	24.00	-3.82	peak	P	
2	59.3921	48.15	-30.21	17.94	24.00	-6.06	peak	P	
3	120.2880	44.58	-29.03	15.55	25.60	-10.05	peak	P	
4	168.2884	43.97	-26.67	17.30	28.51	-11.21	peak	P	

Job No.:	19A081602V	Polarization:	Horizontal
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:45:23
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 100 kHz	VBW: 100 kHz
Description:			



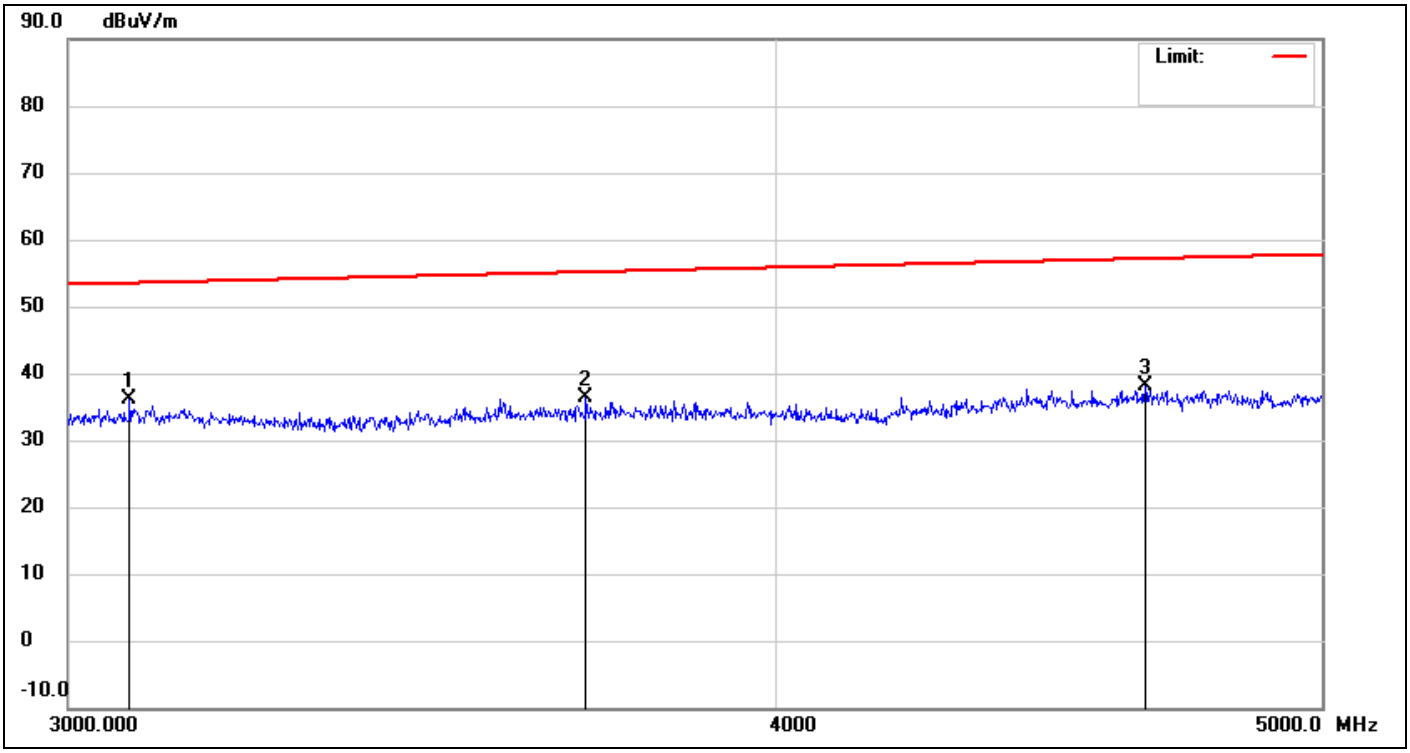
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	251.7577	43.97	-28.50	15.47	32.00	-16.53	peak	P	
2	314.8760	42.51	-27.11	15.40	33.94	-18.54	peak	P	
3	445.7764	44.31	-25.39	18.92	36.95	-18.03	peak	P	
4	960.5628	39.26	-15.31	23.95	43.60	-19.65	peak	P	

Job No.:	19A081602V	Polarization:	Horizontal
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:57:22
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 1000 kHz	VBW: 1000 kHz
Description:			



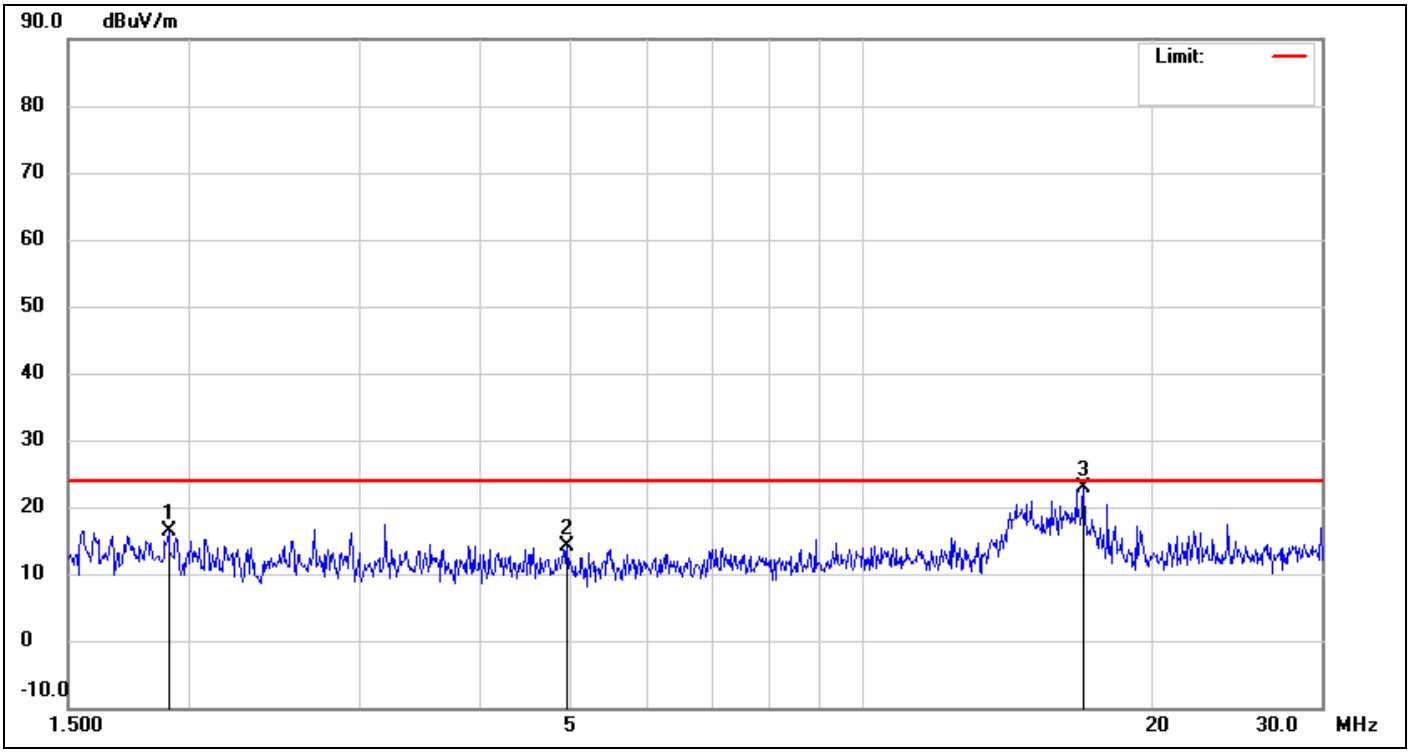
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	1075.2018	73.87	-41.36	32.51	44.58	-12.07	peak	P	
2	1698.1359	71.44	-39.10	32.34	48.54	-16.20	peak	P	
3	2765.7587	71.05	-35.44	35.61	52.77	-17.16	peak	P	

Job No.:	19A081602V	Polarization:	Horizontal
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:56:48
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 1000 kHz	VBW: 1000 kHz
Description:			



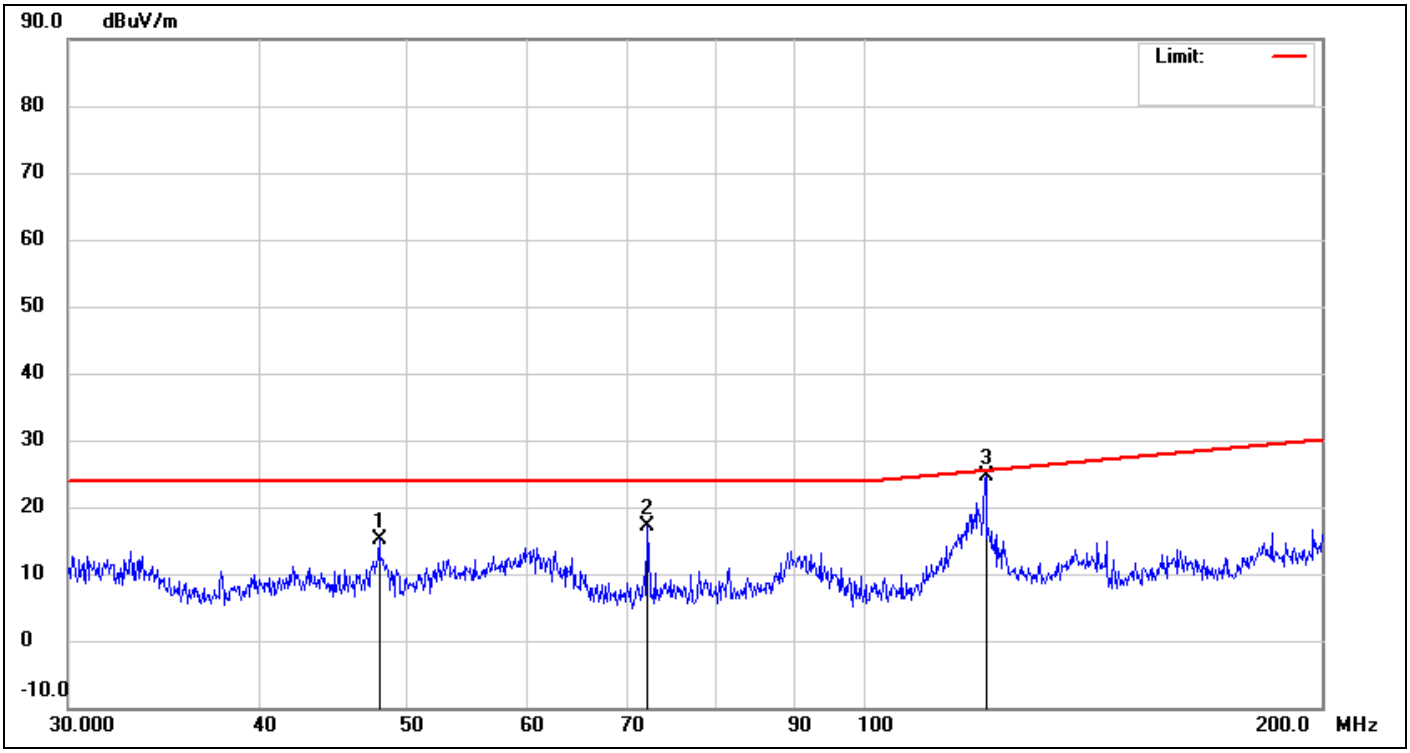
No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	3076.0390	70.64	-34.46	36.18	53.69	-17.51	peak	P	
2	3704.6296	69.60	-33.16	36.44	55.30	-18.86	peak	P	
3	4652.5316	67.78	-29.76	38.02	57.27	-19.25	peak	P	

Job No.:	19A081602V	Polarization:	Vertical
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 11:04:35
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 10 kHz	VBW: 10 kHz
Description:			



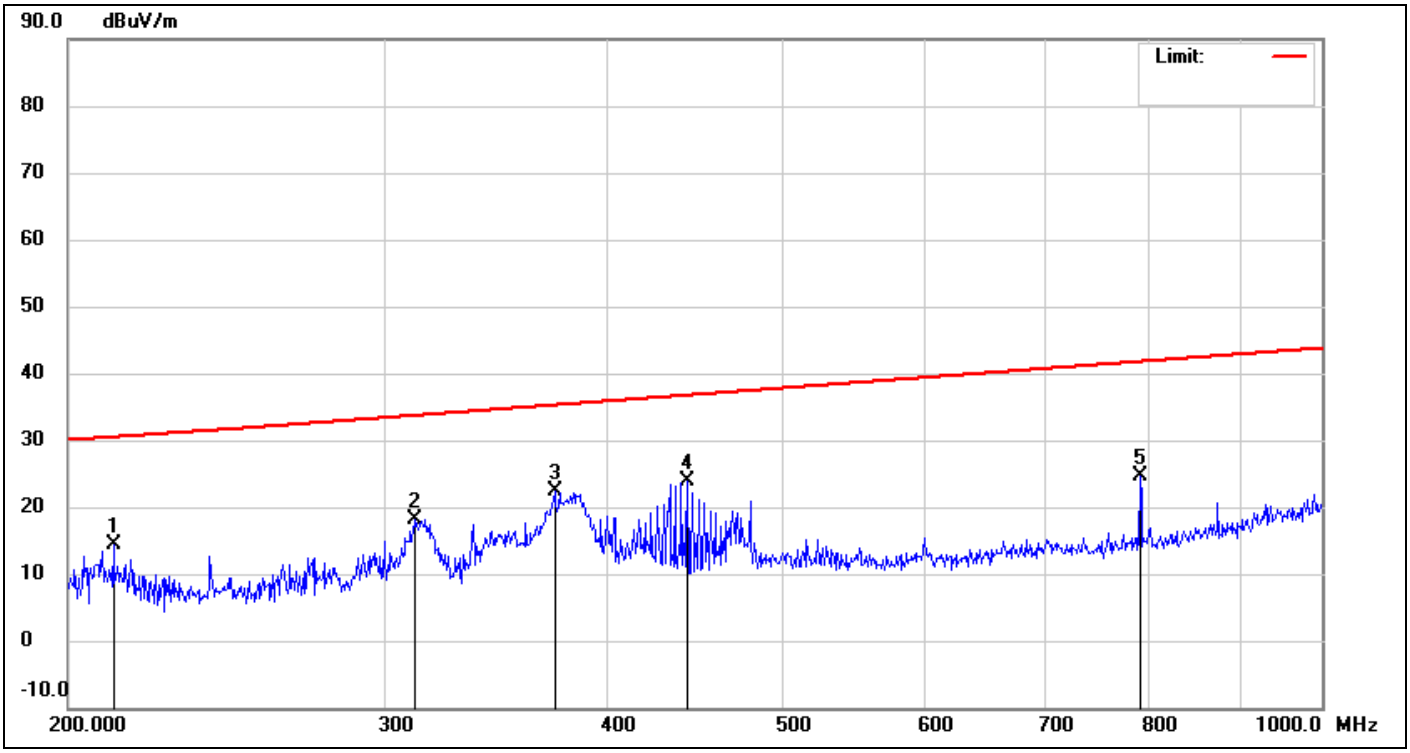
No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	1.9062	17.42	-1.12	16.30	24.00	-7.70	peak	P	
2	4.9420	15.42	-1.33	14.09	24.00	-9.91	peak	P	
3	16.9795	23.26	-0.34	22.92	24.00	-1.08	peak	P	

Job No.:	19A081602V	Polarization:	Vertical
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:39:11
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 100 kHz	VBW: 100 kHz
Description:			



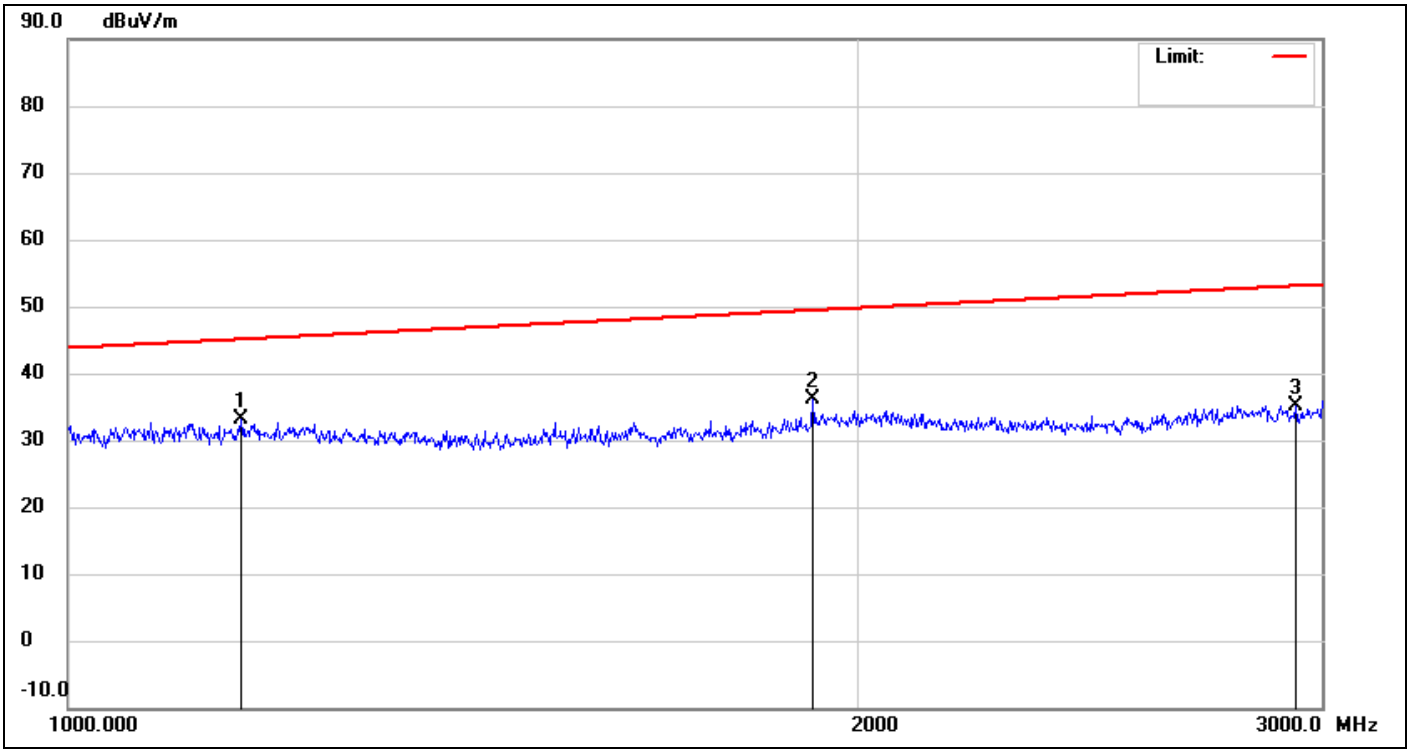
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	48.0231	44.50	-29.48	15.02	24.00	-8.98	peak	P	
2	72.0721	48.02	-31.00	17.02	24.00	-6.98	peak	P	
3	120.2880	53.64	-29.03	24.61	25.60	-0.99	peak	P	

Job No.:	19A081602V	Polarization:	Vertical
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:44:08
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 100 kHz	VBW: 100 kHz
Description:			



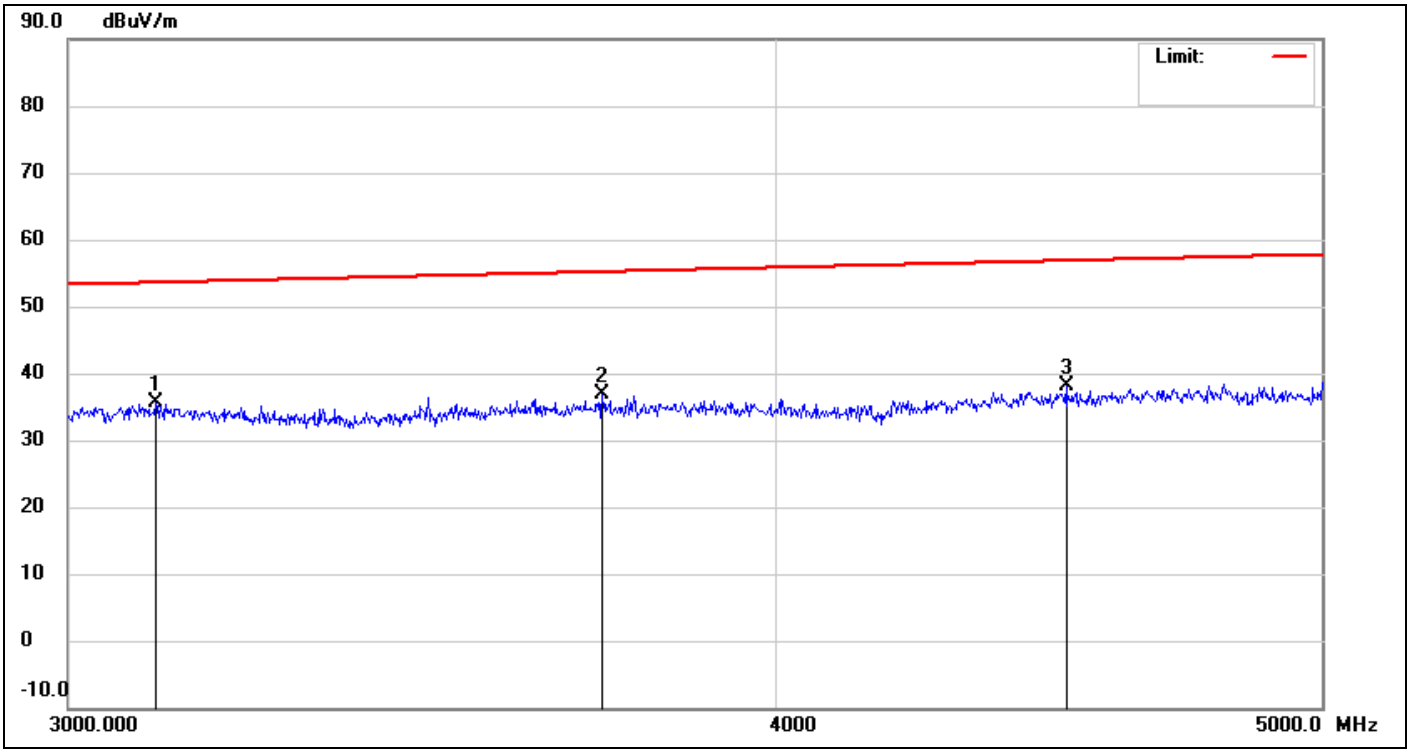
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	211.9302	44.11	-29.62	14.49	30.51	-16.02	peak	P	
2	312.3523	45.40	-27.17	18.23	33.87	-15.64	peak	P	
3	373.4482	48.37	-26.06	22.31	35.42	-13.11	peak	P	
4	442.9158	49.22	-25.41	23.81	36.89	-13.08	peak	P	
5	791.8617	44.44	-19.93	24.51	41.93	-17.42	peak	P	

Job No.:	19A081602V	Polarization:	Vertical
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:55:03
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 1000 kHz	VBW: 1000 kHz
Description:			



No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	1163.7046	74.15	-41.01	33.14	45.26	-12.12	peak	P	
2	1920.4810	74.57	-38.44	36.13	49.60	-13.47	peak	P	
3	2931.5797	70.06	-34.82	35.24	53.27	-18.03	peak	P	

Job No.:	19A081602V	Polarization:	Vertical
Standard:	MIL-STD-461E (1999)_RE102_Ground	Power Source:	DC 24V
Test item:	Radiation Test	Date:	2019 / 9 / 9
Temp.(℃)/Hum.(%):	22.3(℃)/55%	Time:	上午 10:55:42
Company:	Perfectron Co., Ltd. Taiwan Branch	Engineer Signature:	Harvey Tsai
Trade Name:	Rack-mount Fanless Computer	Distance:	1 m
Model:	HORUS200	RBW: 1000 kHz	VBW: 1000 kHz
Description:			



No.	Frequency	Reading	Factor	Result	Limit	Margin	Detector	P/F	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)			
1	3109.2144	70.13	-34.41	35.72	53.78	-18.06	peak	P	
2	3729.3129	69.87	-33.07	36.80	55.36	-18.56	peak	P	
3	4505.1874	68.35	-30.33	38.02	57.00	-18.98	peak	P	

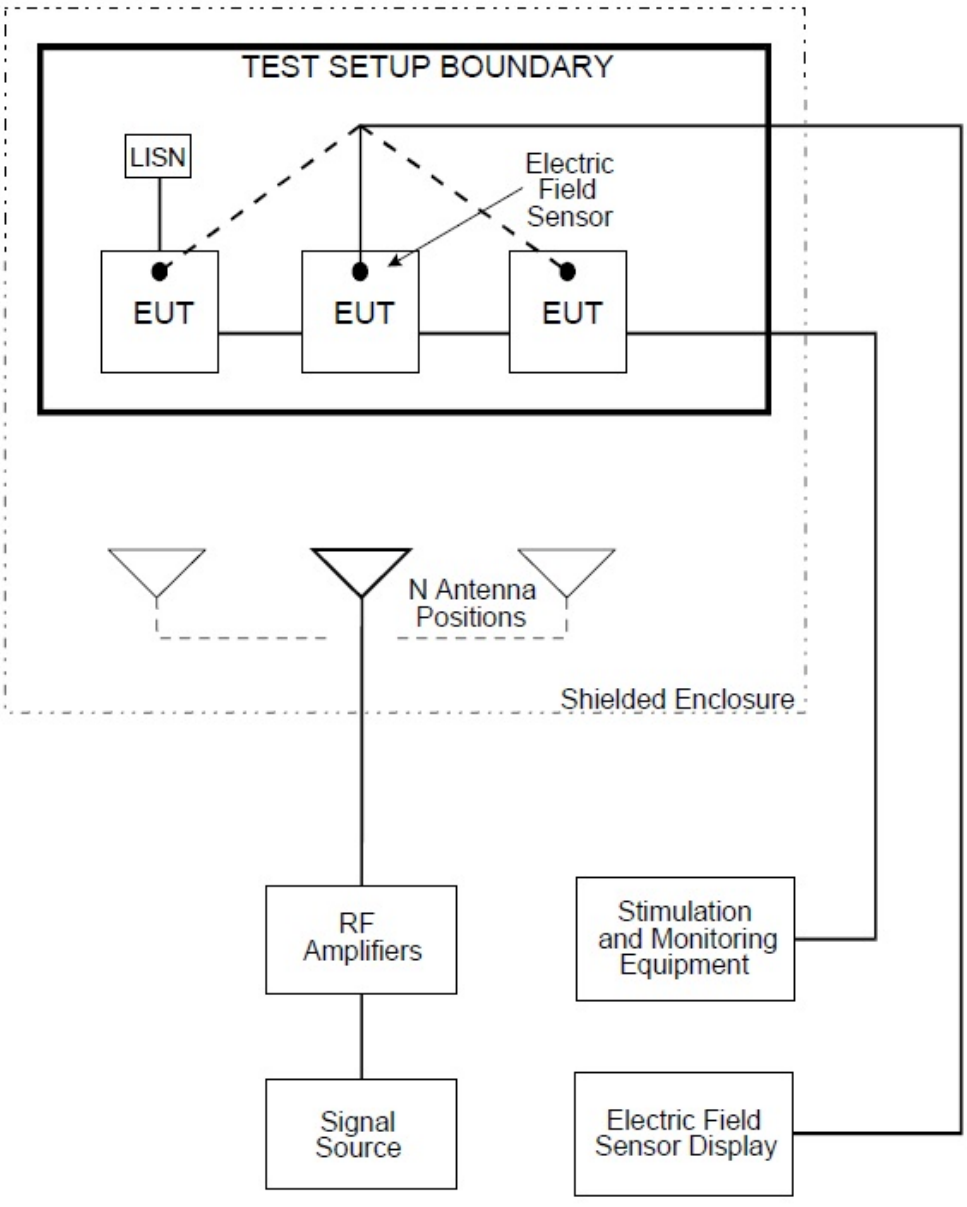
3 Radiated susceptibility, electric field Test (RS103)

3.1 Instrument

Instrument	Manufacturer	Model	Calibration Date	Next Cal. Date
Signal Generator	R&S	SMC100A	2019/05/26	2020/05/25
RF Power Amplifier	R&K	A080M102-5555R	N.C.R.	N.C.R.
RF Power Amplifier	R&K	A701M402-4747R	N.C.R.	N.C.R.
RF Power Amplifier	R&K	A009K251-5757R	N.C.R.	N.C.R.
Attenuator	SCHAFFNER	ATN6075	N.C.R.	N.C.R.
Horn Antenna	ETS-Lindgren	3106B	N.C.R.	N.C.R.
Horn Antenna	Schwarzbeck	BBHA 9120 E	N.C.R.	N.C.R.

Note: The above equipments are within the valid calibration period.

3.2 Block Diagram of Test Configuration



3.3 Test Limit

According to MIL-STD-461E sub clause 5.19.2 RS103 limit.

3.4 Configuration of Measurement

3.4.1 Turn on the measurement equipment and EUT and allow a sufficient time for stabilization.

3.4.2 Assess the test area for potential RF hazards and take necessary precautionary steps to assure safety of test personnel.

3.4.3 Calibration.

(a) Electric field sensor procedure. Record the amplitude shown on the electric field sensor display unit due to EUT ambient. Reposition the sensor, as necessary, until this level is < 10% of the applicable field strength to be used for testing.

(b) Receive antenna procedure (> 1 GHz), according to MIL-STD-461E sub clause 5.19.3.4 c. (2)(a)~(e).

3.4.4 EUT Testing.

(a) E-Field sensor procedure.

- Set the signal source to 1 kHz pulse modulation, 50% duty cycle, and using appropriate amplifier and transmit antenna, establish an electric field at the test start frequency. Gradually increase the electric field level until it reaches the applicable limit.

- Scan the required frequency ranges in accordance with the rates and durations specified in Table III. Maintain field strength levels in accordance with the applicable limit. Monitor EUT performance for susceptibility effects.

(b) Receive antenna procedure. According to MIL-STD-461E sub clause 5.19.3.4 d. (2)(a)~(c).

(c) If susceptibility is noted, determine the threshold level in accordance with MIL-STD-461E sub clause 4.3.10.4.3 and verify that it is above the limit.

(d) Perform testing over the required frequency range with the transmit antenna vertically polarized. Repeat the testing above 30 MHz with the transmit antenna horizontally polarized.

(e) Repeat MIL-STD-461E sub clause 5.19.3.4d for each transmit antenna position required by MIL-STD-461E sub clause 5.19.3.3e.

3.5 Test Result

The final test data is shown as following pages.

RS103 Test Data

Applicant：Perfectron Co., Ltd. Taiwan Branch	Date of Measurement：2019 / 09 / 22
EUT：Rack-mount Fanless Computer	Temp./Humidity/Atm.press.：24.3°C / 45% / 998hPa
M/N：HORUS200	Test Mode：Working Mode
Input Voltage：DC 24 V	Test Engineer：Scott Chang

Frequency Range (MHz)	Field Intensity （V/m）	Modulation	Antenna Polarity		Position	Results
			Horizontal	Vertical		
200-3200	50	PM 50%	○	○	X-axis	As in note

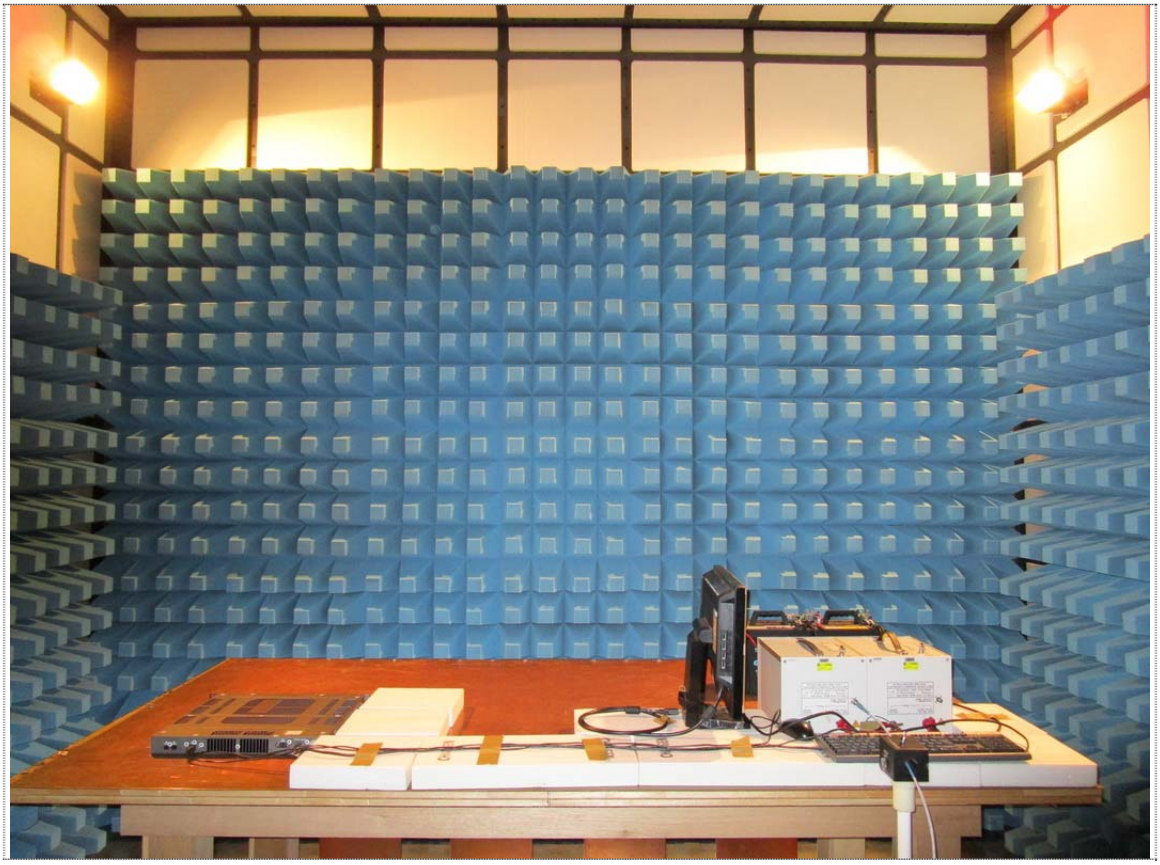
NOTE：

- Run BurnIn H patten
- Monitoring method: Observe screen then record the phenomena.

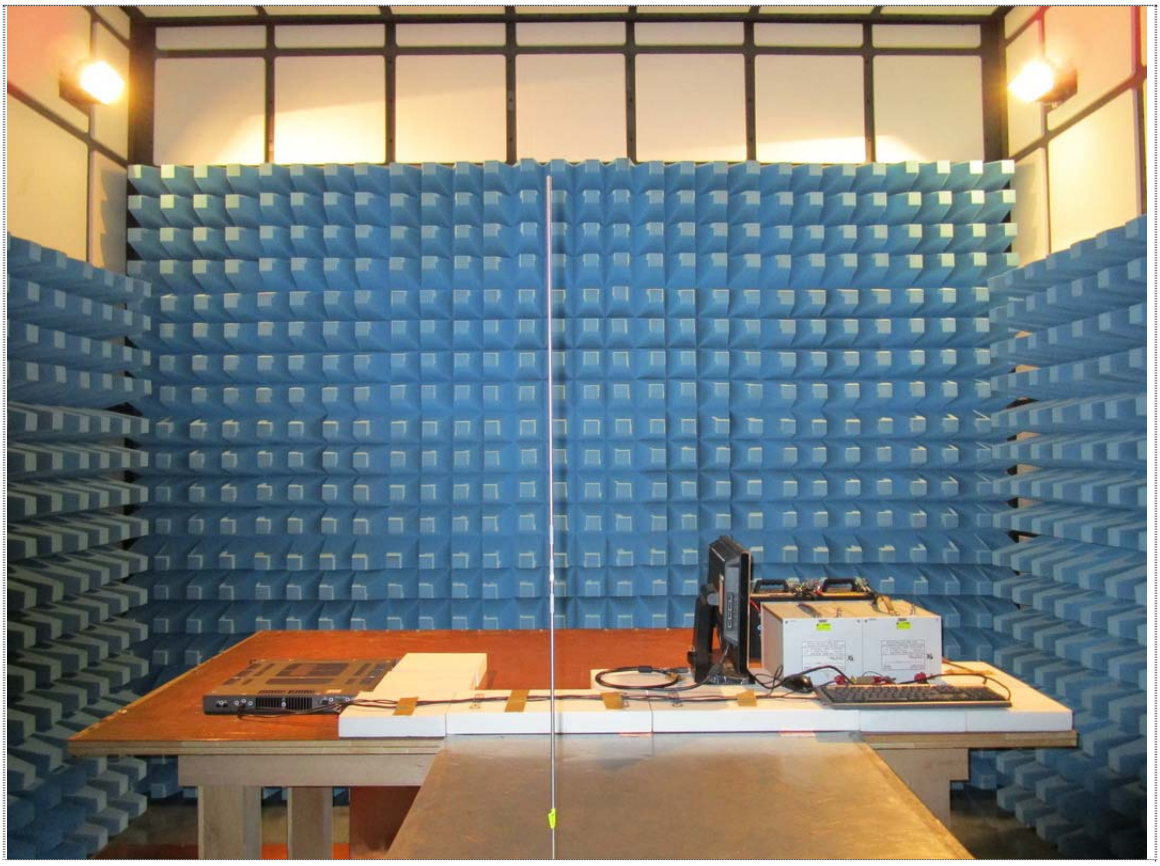
- Before the test: The screen shows image is in normal state.
- During the test: The screen shows image is in normal state.
- After the test: The screen shows image is in normal state.

4 Photographs of Test

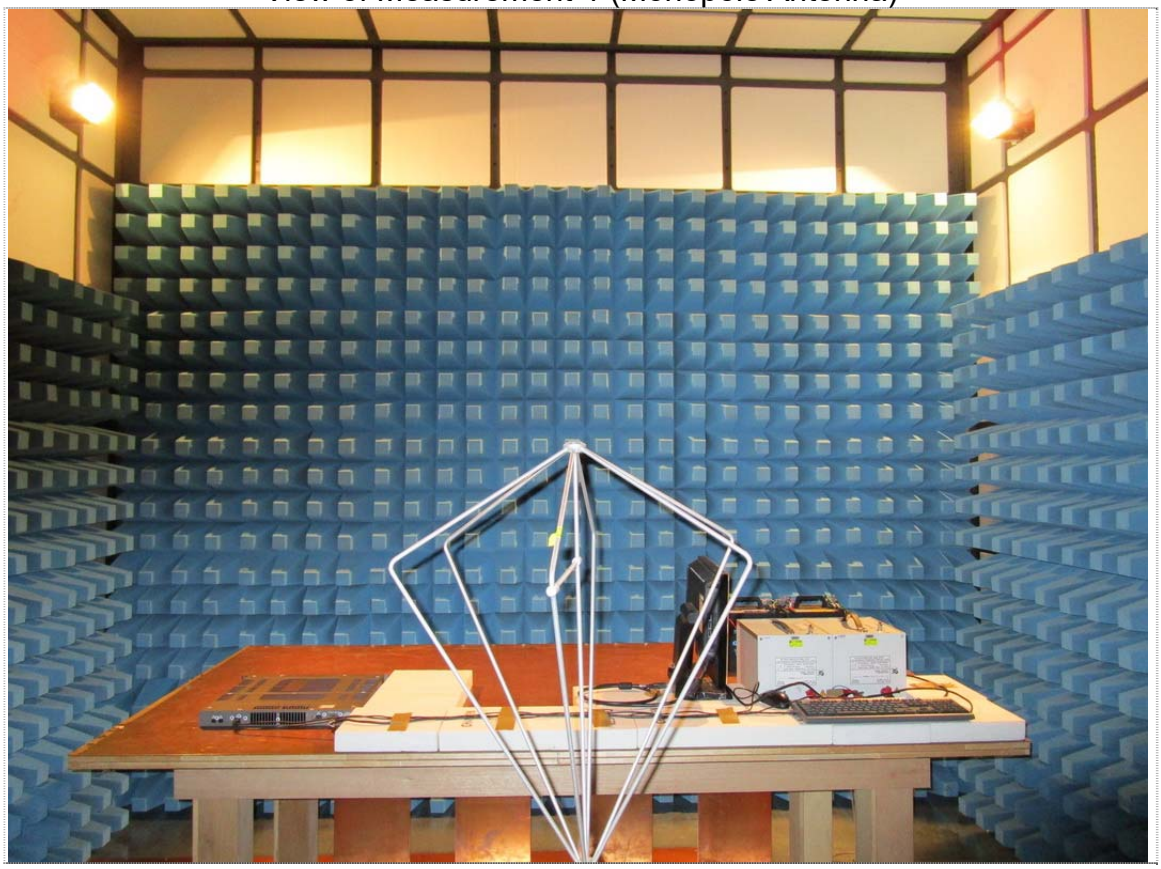
4.1 Conducted emissions, power leads Test (CE102)



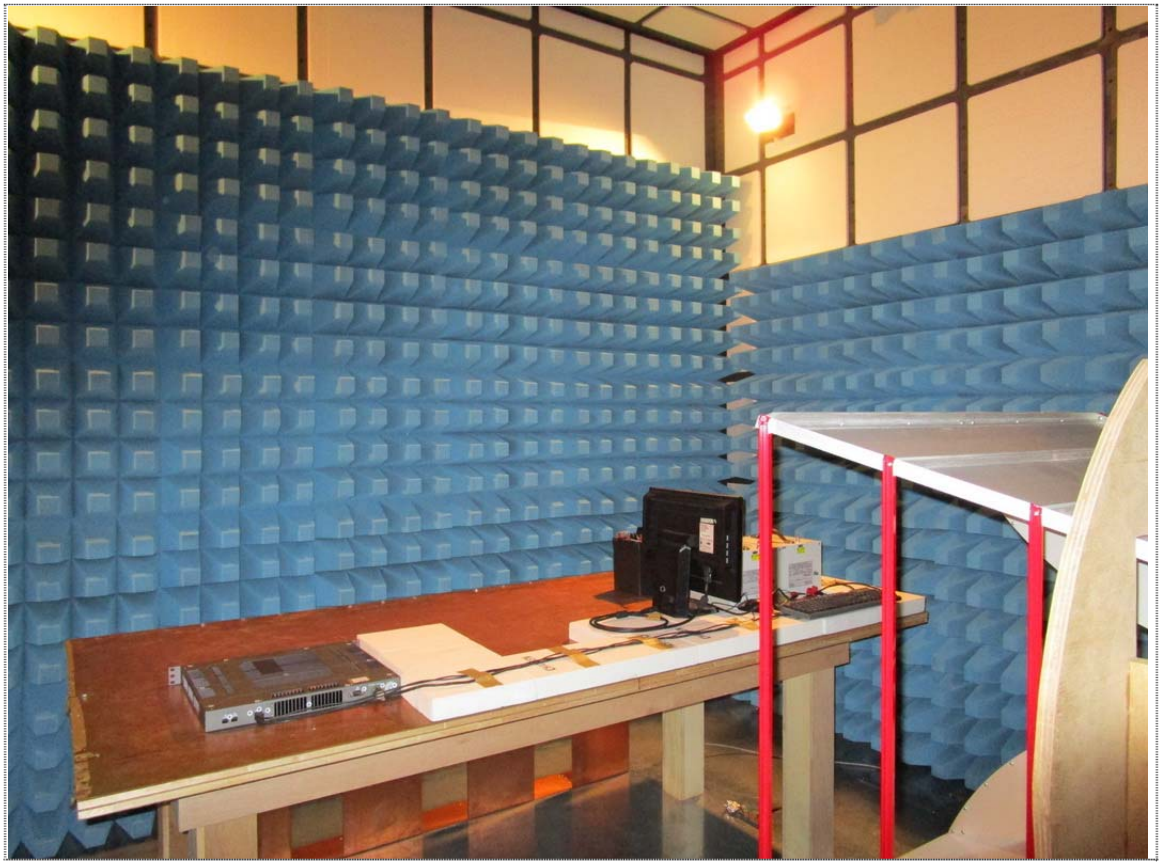
4.2 Radiated emissions, electric field Test (RE102)



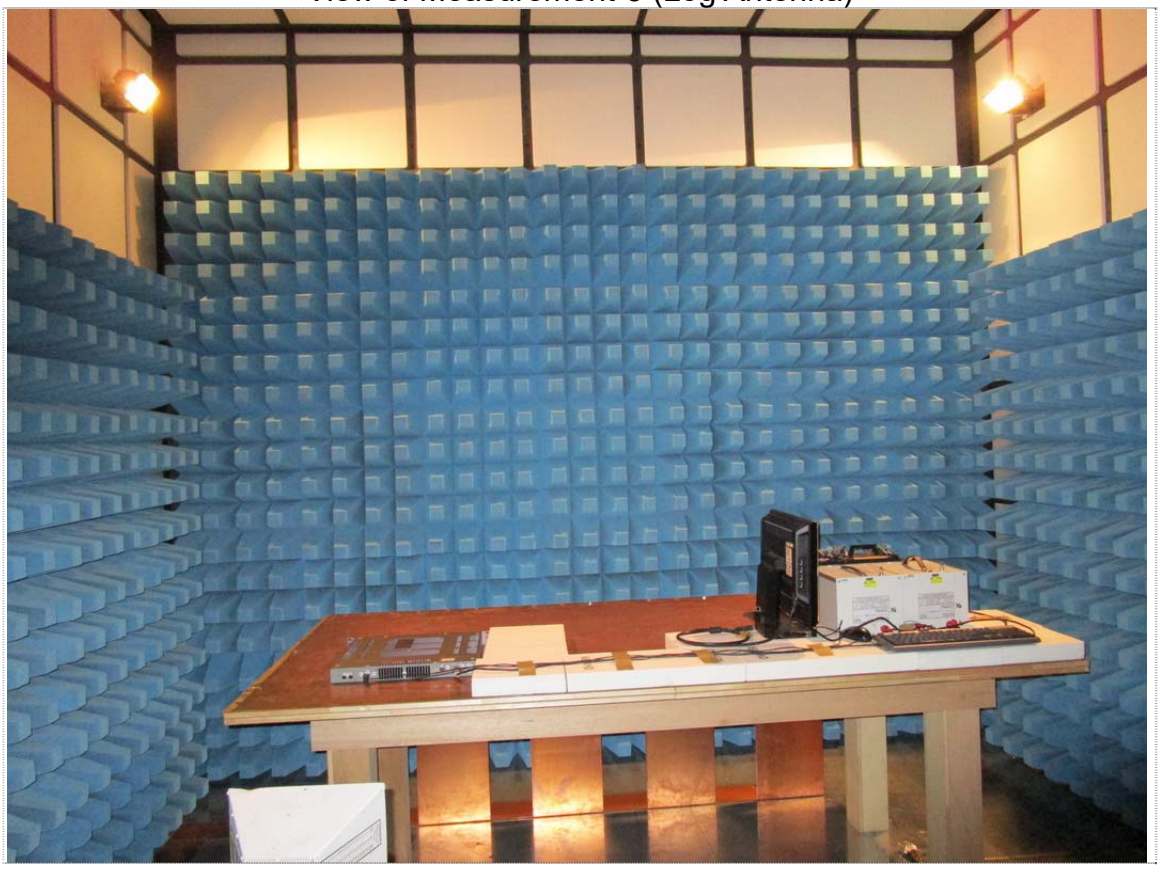
View of Measurement-1 (Monopole Antenna)



View of Measurement-2 (Biconical Antenna)

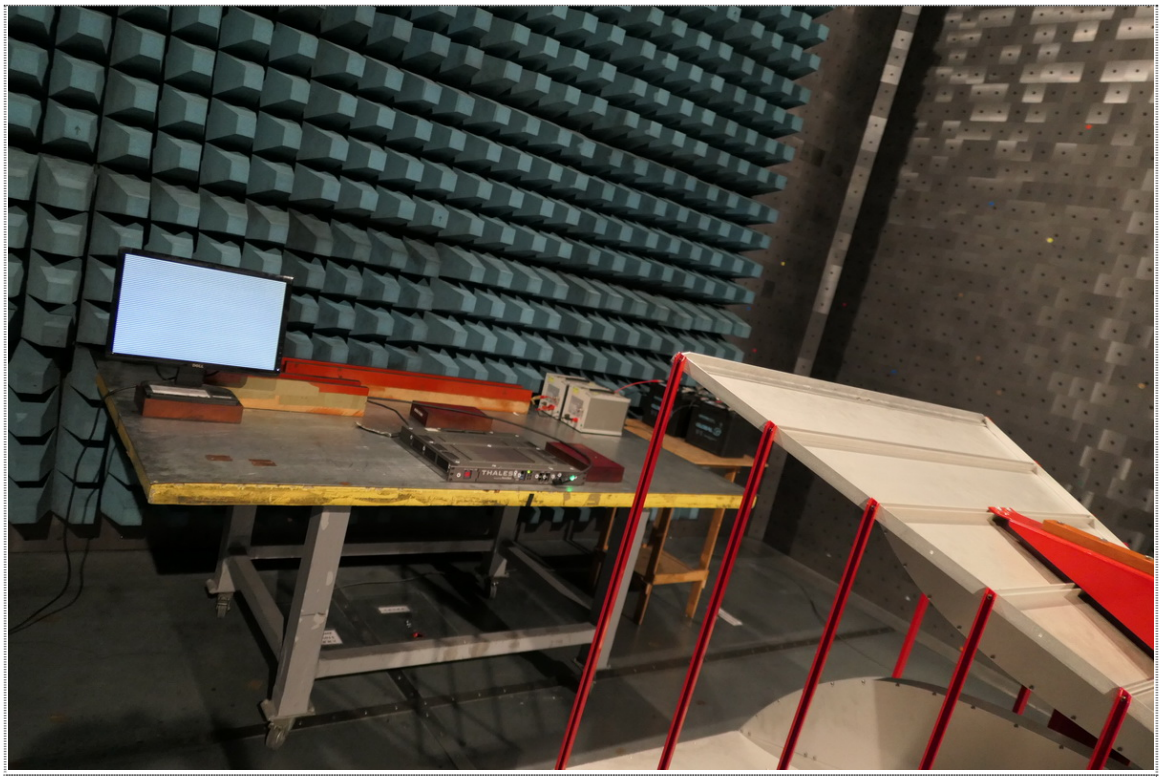


View of Measurement-3 (Log Antenna)

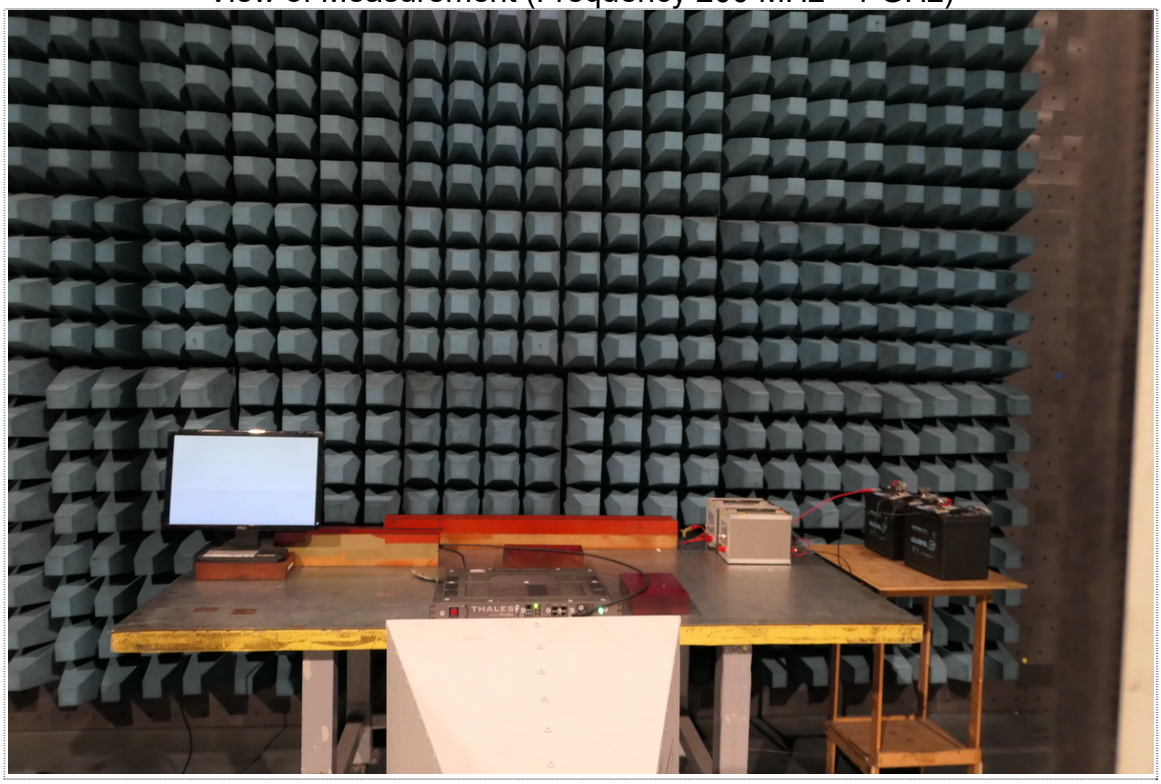


View of Measurement-4 (Horn Antenna)

4.3 Radiated susceptibility, electric field Test (RS103)



View of Measurement (Frequency 200 MHz - 1 GHz)



View of Measurement (Frequency 1 GHz – 3.2 GHz)

5 Photographs of EUT

5.1 Model No.: HORUS200

Front View of EUT

Rear View of EUT

附錄 1：MIL-STD-461E (RS103) (Test by NCSIST LAB)

(RS103) Frequency Range: 1.5 MHz - 200 MHz

(RS103) Frequency Range: 3.0 GHz - 5.0 GHz

國家中山科學研究院
電磁相容試驗室
National Chung Shan Institute of Science & Technology
ElectroMagnetic Compatibility Laboratory

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P.O. Box No. 90008-22-22, Lung-Tan, Tao-Yuan,325, Taiwan, R.O.C.
TEL: 886-3-4712201
EXT: 359716、359726
FAX: 886-3-4716878

Doc. No.	EMCRPT-AT-108-055
Revision	A

Total pages (including this page): 22

國家中山科學研究院 測試報告專用章 電磁相容試驗室

TAF
Testing Laboratory
0533

Title：

Test Report for Rack-mount Fanless Computer

APPLICANT	Applicant: Perfectron Co., Ltd. Taiwan Branch Business Uniform No.: 53000789 TEL: 02-89118077 # 514 Address: 2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)

附註：
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2. 本報告僅對檢送樣品負責。
   This report relates only to the item(s) tested.
3. 本報告須加蓋本試驗室檢驗章及簽名始生效。
   This report should be invalid without the examination stamp and signature of this institute.
4. 樣品保存自簽發日起 30 天。
   The tested item(s) will be retained for thirty days from the date issued.

國家中山科學研究院
電磁相容試驗室
National Chung Shan Institute of Science & Technology
ElectroMagnetic Compatibility Laboratory

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TEL: 886-3-4712201
EXT: 359716、359726
FAX: 886-3-4716878

TESTING REPORT

EQUIPMENT TYPE :	Rack-mount Fanless Computer
MODEL NO. :	HORUS200
MANUFACTURER :	Perfectron Co., Ltd. Taiwan Branch
ADDRESS :	2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)
RECEIVED DATE :	Sept. 18 , 2019
TESTED DATE :	Sept. 23 , 2019
COMPLTED DATE :	Sept. 23 , 2019
REFERENCE STD :	MIL-STD-461E ,Ground Army
TEST METHOD :	RS103 (1.5MHz~200MHz, 3GHz~5GHz)
INPUT POWER :	DC 24V
PERIPHERY :	Monitor: LG/22MP58VQ
VGA CABLE :	With core(Both ends of the cable) & Shielding
POWER CORD :	With Shielding
TEST RESULT :	PASS (Refer to Section 7*)
APPLICANT :	Perfectron Co., Ltd. Taiwan Branch
ADDRESS :	2F., No. 190, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 23146, Taiwan (R.O.C.)
TESTED LAB :	Electronic Systems Research Division, EMC Lab., NCSIST
LAB LOCATION :	Building W43, No.566, Ln. 134, Long-yuan Rd., Long-tan Township, Tao-yuan Country 325, Taiwan (R.O.C.) Tel.: +886-3-471-2201 EXT.: 359716, 359726 Fax.: +886-3-4716878

核准簽名：(報告簽署人/試驗室負責人)/日期
Approved Signature :（Report Signer /Chief of LAB.）Shiue-Tain Huang
2019.10.1

EMCRPT-AT-108-055A

CONTENTS

1. SCOPE OF WORK

The Rack-mount Fanless Computer, manufactured by Perfectron Co., Ltd. Taiwan Branch, has been tested Reference to the following specification:

◇ MIL-STD-461E, 20 August 1999, " Requirements for the control of electromagnetic interference characteristics of subsystems and equipment " applications for **RS103(1.5MHz~200MHz, 3GHz~5GHz)**.

2. TEST LABORATORY

The Rack-mount Fanless Computer r was carried out in the EMC Laboratory at NCSIST, Tao Yuan, Taiwan, R.O.C.
Ambient conditions in the test site:

Parameter	Actual	Note
Temperature [℃]	18.8℃~24.3℃	
Relative Humidity [%RH]	50%~56%	

For details about the measurement facilities and instruments used, Please reference to Chapter 8.

3. TEST PERIOD

The Rack-mount Fanless Computer was received for test on 18 Sept. 2019, and then the test was completed on 23 Sept. 2019.

4. EQUIPMENT UNDER TEST

4.1 Equipment submitted for tests

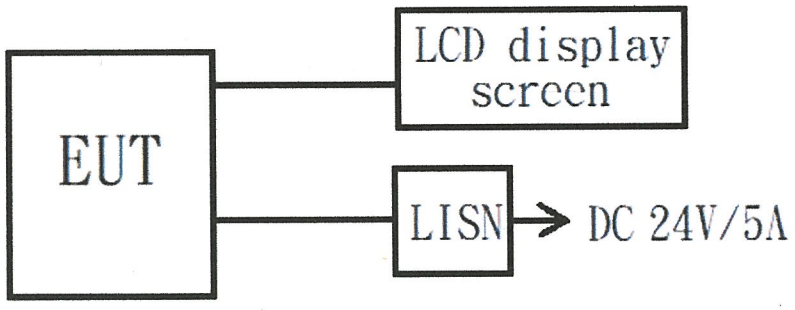
Overall designation of system/product :

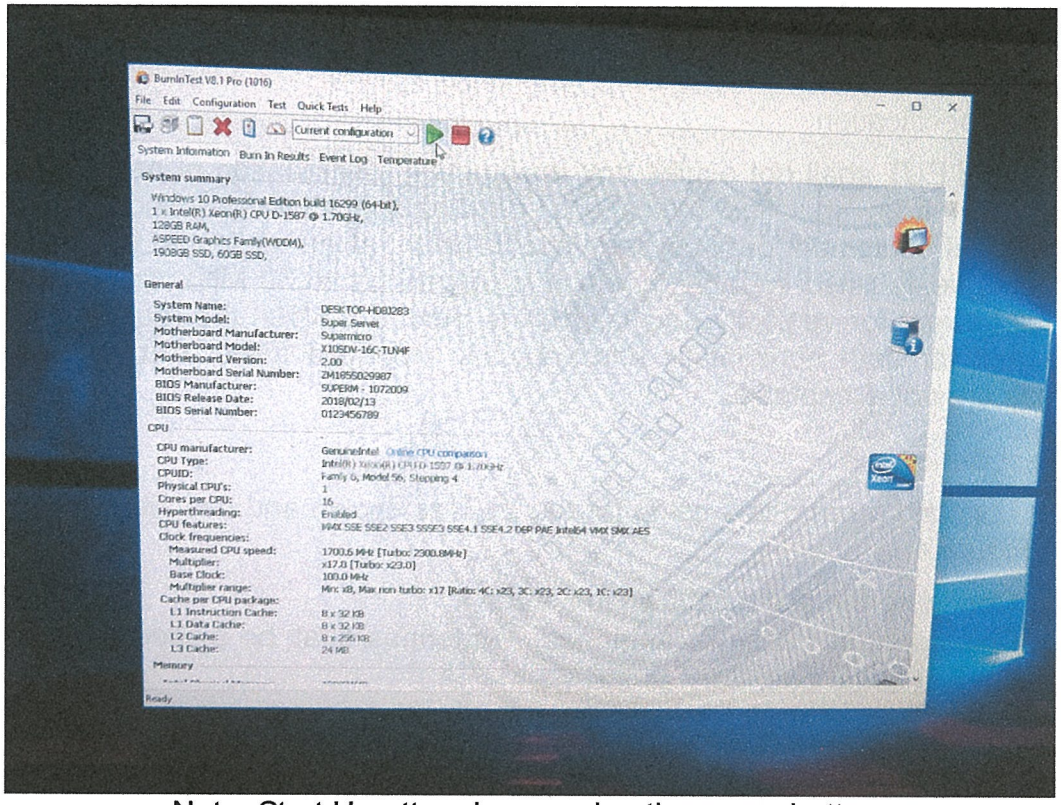
Item	Manufacturer	Model No.
EUT (Rack-mount Fanless Computer)	Perfectron Co., Ltd. Taiwan Branch	HORUS200

Hereafter the test sample is referred to as **EUT** (**E**quipment **U**nder **T**est).

4.2 Modes of operation

(1) Except for power lead and VGA port, other I/O ports are not connected.
(2) EUT is plugged into the power lead and VGA cable to perform functional tests. The Burn-in Test program is opened during the test. When the H-pattern is executed, the screen will display the code to start running. If the screen of the running program is blacked out or disappears, the determination fails.





Note: Start H-pattern by pressing the green button.

4.3 Modifications during testing

No modification of the EUT was made during the compliance test.

5. EVALUATION OF PERFORMANCE DURING THE TEST

5.1 Criteria of acceptance

To pass the test, the EUT shall meet the following criteria:

Emission tests:

◇ Comply with the emission limits given in the standard.

Susceptibility tests:

◇ Shall not exhibit any malfunction, degradation of performance, or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification.

6. EMC TESTS

6.1 RS103

6.1.1 Test specification

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to the radiated electric fields listed in Table 1. which is 50V/m. Up to 30 MHz, the requirement shall be met for vertically polarized fields. Above 30MHz, the requirement shall be met for both horizontally and vertically polarized fields. Circular polarized fields are not acceptable.

6.1.2 Test Set-up

Maintain a basic test setup for the EUT as shown and described in Figure 3 and Figure 4.

Configure the test as shown in Figure 1.

(1) Placement of transmits antennas. Antennas shall be placed 1 meter from the test setup boundary as follows:

(a) 1.5 MHz to 200 MHz: Test setup boundaries $\leq$ 3 meters. Center the antenna between the edges of the test setup boundary. The boundary includes all enclosures of the EUT and the 2 meters of exposed interconnecting and power leads. Interconnecting leads shorter than 2 meters are acceptable when they represent the actual platform installation.

(b) 200 MHz and above. Multiple antenna positions may be required as shown in Figure 2. Determine the number of antenna positions (N) as follows:

1 For testing from 200 MHz up to 1GHz, place the antenna in a sufficient number of positions such that the entire width of each EUT enclosure and the first 35 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna.

2 For testing at 1 GHz and above, place the antenna in a sufficient number of positions such that the entire width of each EUT enclosure and the first 7 cm of cables and leads interfacing with the EUT enclosure are within the 3 dB beam width of the antenna.

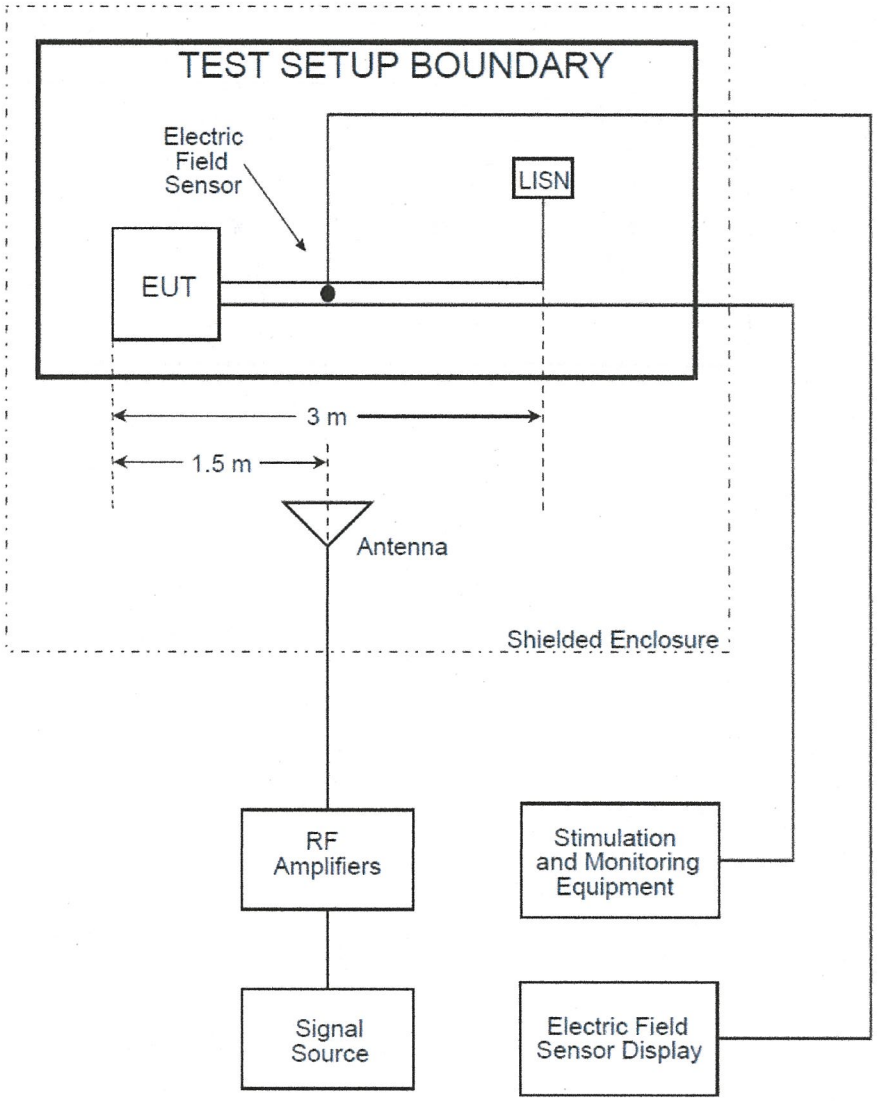


Figure 1. RS103 Test equipment configuration

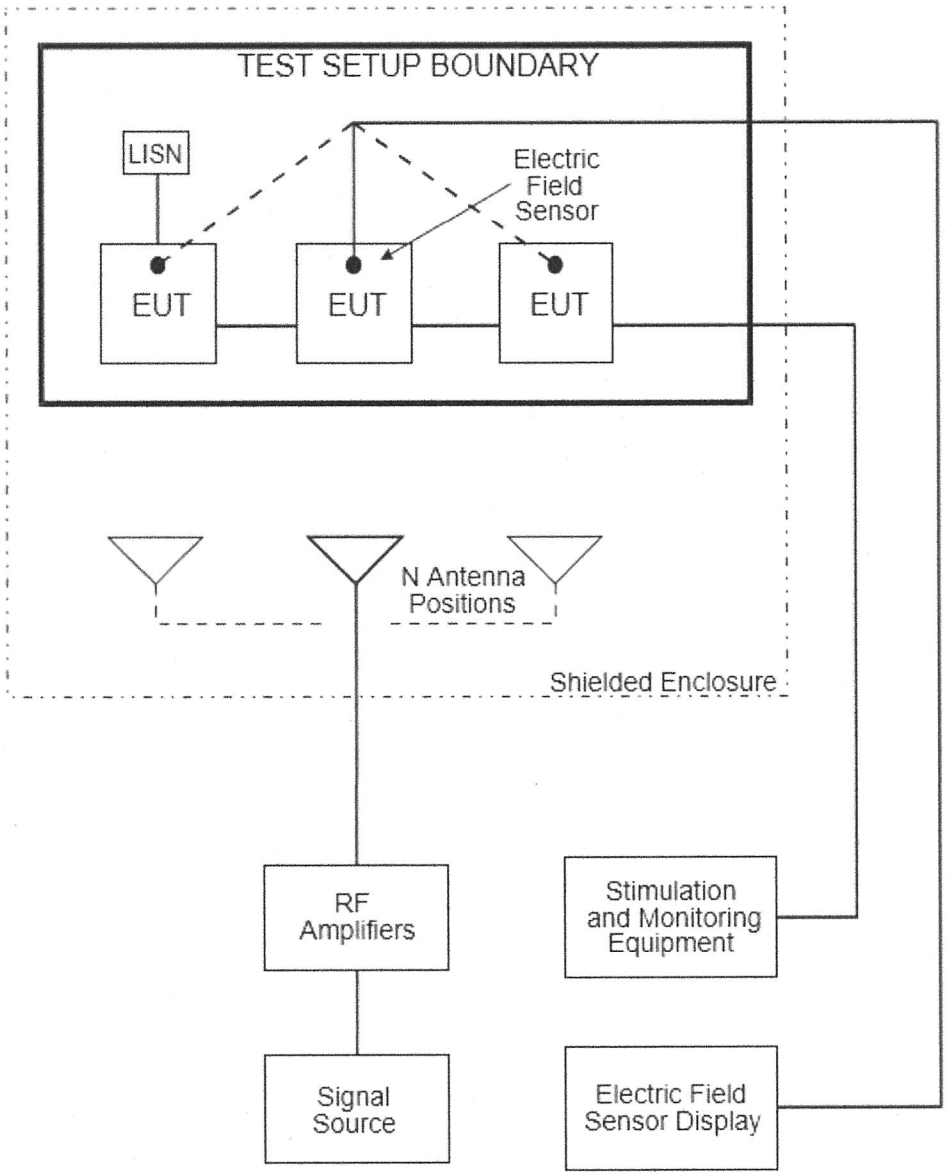


Figure 2. RS103 Multiple test antenna locations for frequency > 200 MHz.

6.1.3 Test Procedures

(1) Turn on the measurement equipment and allow sufficient time for stabilization.
(2) Set the signal source to 1 kHz pulse modulation, 50% duty cycle. Using an appropriate amplifier and transmit antenna, establish an electric field at the test start frequency. Gradually increase the input power level until it corresponds to the applicable level recorded during the calibration routine.
(3) Scan the required frequency ranges in accordance with the rates and durations specified in Table 2 while assuring the correct transmitter input power is adjusted in accordance with the calibration data collected. Constantly monitor the EUT for susceptibility conditions.
(4) If susceptibility is noted, determine the threshold level and verify that it is above the limit.
(5) Perform testing over the required frequency range with the transmit antenna vertically polarized. Repeat the testing above 30MHz with the transmit antenna horizontally polarized.

Table 1. RS103 Test Limited Level

		LIMIT LEVEL (VOLTS/METER)							
PLATFORM / FREQ RANGE		AIRCRAFT (EXTERNAL OR SAFETY CRITICAL)	AIRCRAFT INTERNAL	ALL SHIPS (ABOVE DECKS) AND SUBMARINES (EXTERNAL)*	SHIPS (METALLIC) (BELOW DECKS)	SHIPS (NON-METALLIC) (BELOW DECKS)	SUBMARINES (INTERNAL)	GROUND	SPACE
2 MHz	A	200	200	200	10	50	5	50	20
↓	N	200	200	200	10	50	5	10	20
30 MHz	AF	200	20	-	-	-	-	10	20
30 MHz	A	200	200	200	10	10	10	50	20
↓	N	200	200	200	10	10	10	10	20
1 GHz	AF	200	20	-	-	-	-	10	20
1 GHz	A	200	200	200	10	10	10	50	20
↓	N	200	200	200	10	10	10	50	20
18 GHz	AF	200	60	-	-	-	-	50	20
18 GHz	A	200	200	200	10	10	10	50	20
↓	N	200	60	200	10	10	10	50	20
40 GHz	AF	200	60	-	-	-	-	50	20

KEY: A = Army
N = Navy
AF = Air Force

* For equipment located external to the pressure hull of a submarine but within the superstructure, use SHIPS (METALLIC)(BELOW DECKS)

Table 2. Susceptibility Scanning

Frequency Range	Analog Scans Maximum Scan Rates	Stepped Scans Maximum Step Size
30Hz - 1MHz	0.0333 f_0 / sec	0.05 f_0
1MHz~30MHz	0.00667 f_0 / sec	0.01 f_0
30MHz~1GHz	0.00333 f_0 / sec	0.005 f_0
1GHz~8GHz	0.000667 f_0 / sec	0.001 f_0
8GHz~40GHz	0.000333 f_0 / sec	0.0005 f_0

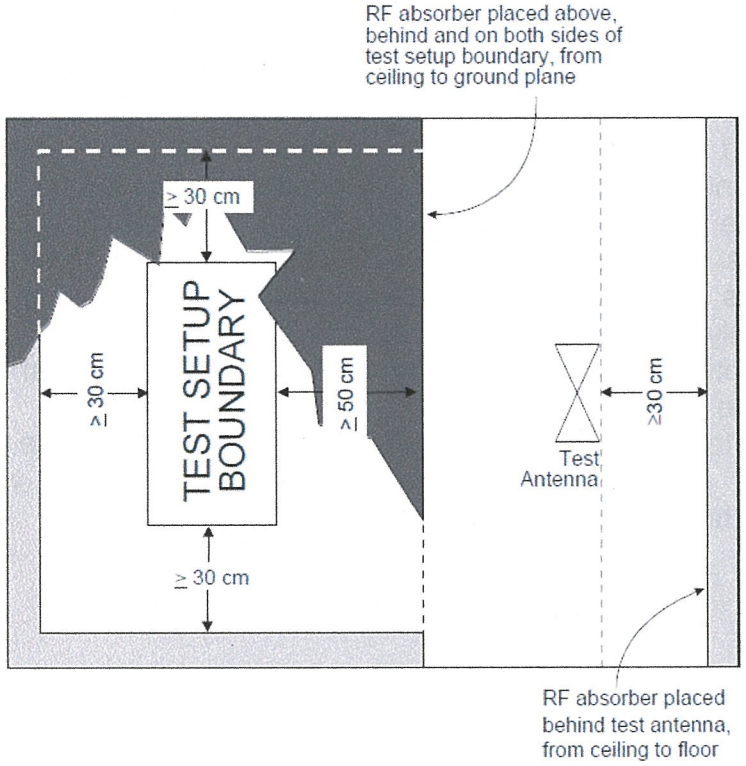


Figure 3. Typical Test Setup in RF Absorber Loading Chamber

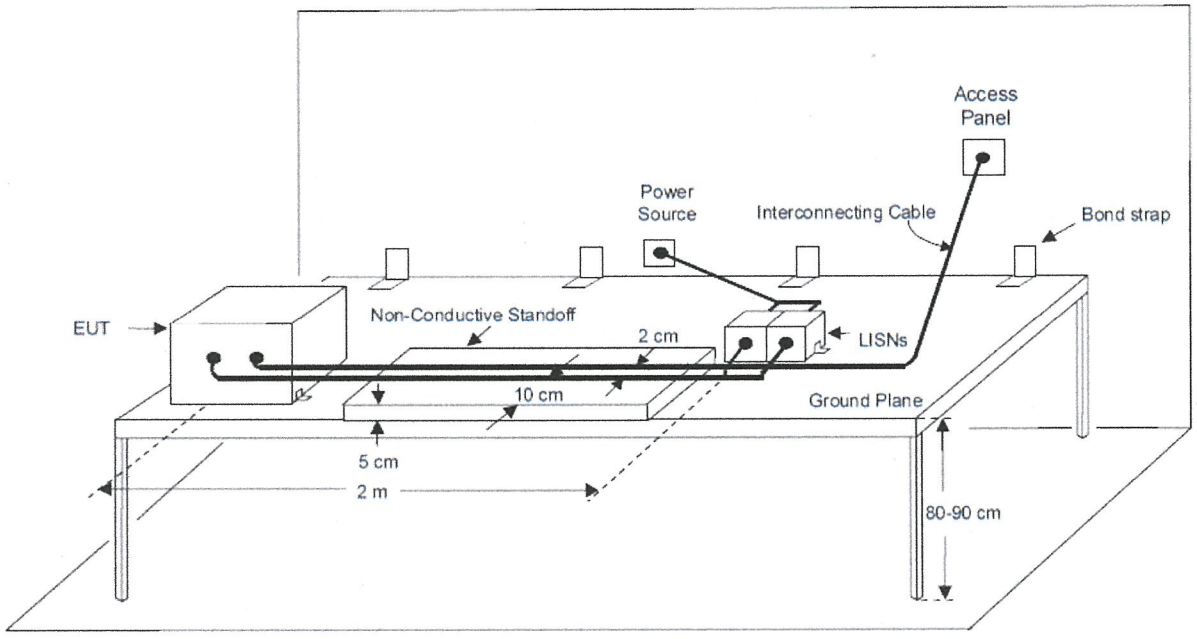


Figure 4. General Test Setup

7. SUMMARY OF TEST RESULTS

The Rack-mount Fanless Computer, manufactured by Perfectron Co., Ltd. Taiwan Branch, has been tested according to the following specification:

Test Item	Description	Test Specification	Test Result
MIL-STD-461E, 20 August 1999, Requirements For The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.			
RS103	Radiated Susceptibility, Electric Field, 2 MHz to 40 GHz	1.5MHz~200MHz, 50 V/m 3GHz~5GHz, 50 V/m	*PASS

*RS103 test specification based on MIL-STD-461E shall be tested from 2MHz to 40GHz. The applicant's requirement is only from 1.5MHz to 200MHz and 3GHz to 5GHz.

8. TEST FACILITIES AND INSTRUMENTS

The following test facilities and instruments were used during the tests:

Instrument	Manufacturer	Model #	Serial #
RS103			
Computer	HP	L1G77AV	U11794
Susceptibility S/W	CSIST	MEMC	N/A
Antenna	AR	AT3000	303961
Antenna	EMCO	Biconical 3109	91042543
Antenna	EMCO	Horn 3115	9312-4196
Signal generation	Agilent	N5183A	MY49060306
E-field Monitor	AR	FM7004	9209-1197
Field-Sensor	AR	FP7040	0342955
Amplifier	AR	2500A225	0464728
Amplifier	AR	500T2G8	322407

9. ATTACHMENT

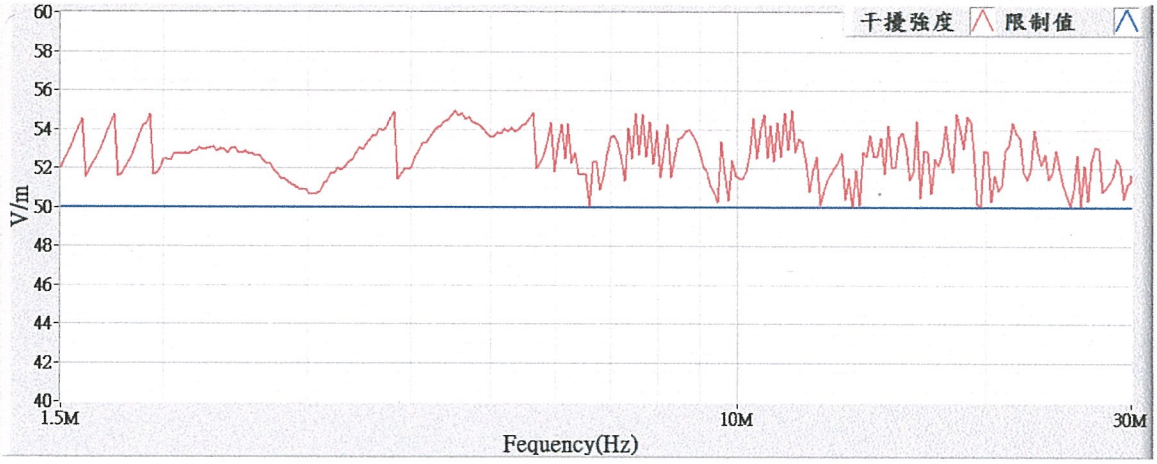
9.1 Test Data

RS103:

Vertical Polarization (1.5MHz to 30MHz):

MIL-STD-461E RS103 Test Report

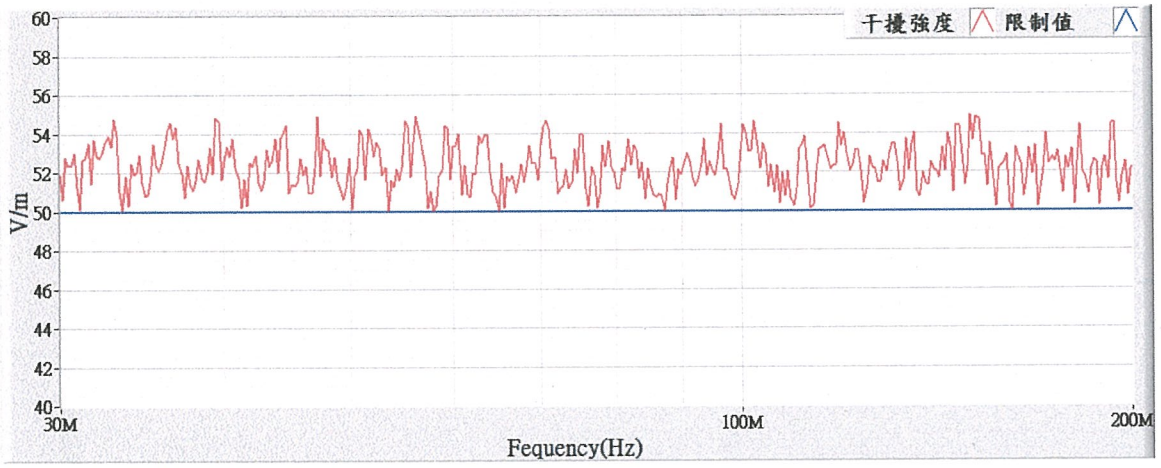
RS103 Test information	Meteorological information
EUT Name:Rack mount Fanless computer Horus200	**Temperature(℃):19.3**
Test date:2019/9/23	**Humidity(%):56**
Test time:下午 08:51	**Operator:Wang, Chen-Chien**
Test mode:	
Polarization:Vertical	
Limit Level:50V/m	
Modulation:1k Hz Pulse modulation, 50% duty cycle.	



Horizontal Polarization (30MHz to 200MHz):

MIL-STD-461E RS103 Test Report

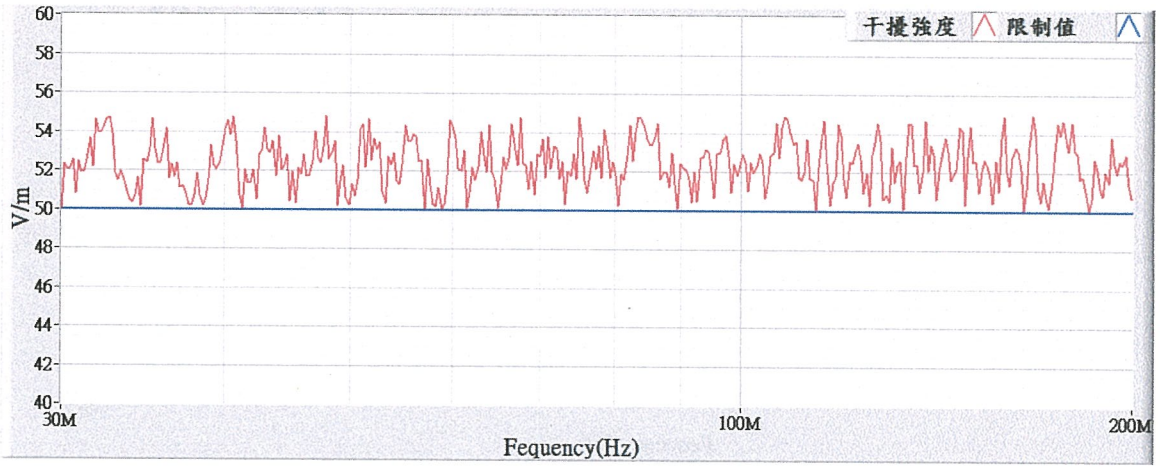
RS103 Test information	Meteorological information
EUT Name:Rack mount Fanless computer Horus200	**Temperature(℃):18.8**
Test date:2019/9/23	**Humidity(%):53**
Test time:下午 07:06	**Operator:Wang, Chen-Chien**
Test mode:	
Polarization:Horizontal	
Limit Level:50V/m	
Modulation:1k Hz Pulse modulation, 50% duty cycle.	



Vertical Polarization (30MHz to 200MHz):

MIL-STD-461E RS103 Test Report

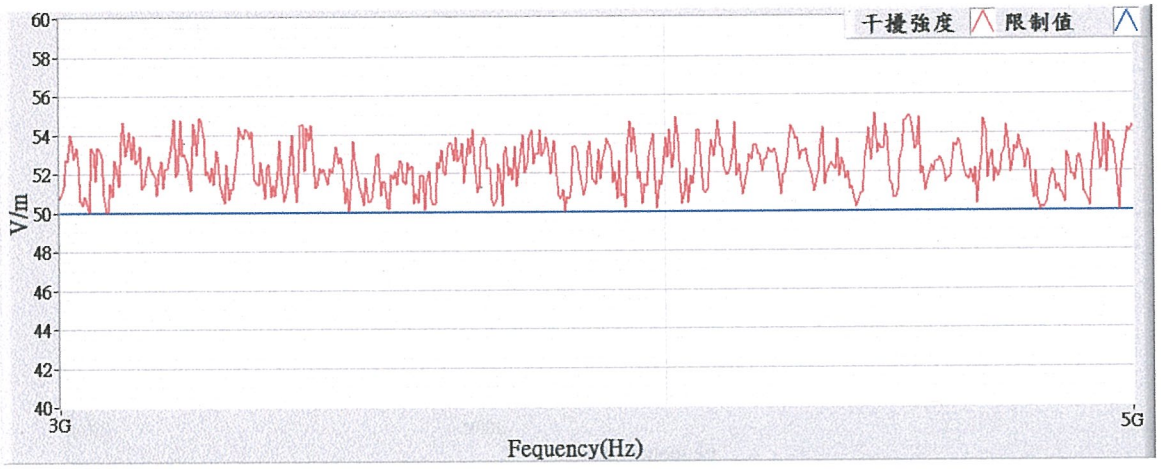
RS103 Test information	Meteorological information
EUT Name:Rack mount Fanless computer Horus200	**Temperature(℃):18.8**
Test date:2019/9/23	**Humidity(%):53**
Test time:下午 07:52	**Operator:Wang, Chen-Chien**
Test mode:	
Polarization:Vertical	
Limit Level:50V/m	
Modulation:1k Hz Pulse modulation, 50% duty cycle.	



Horizontal Polarization (3GHz to 5GHz):

MIL-STD-461E RS103 Test Report

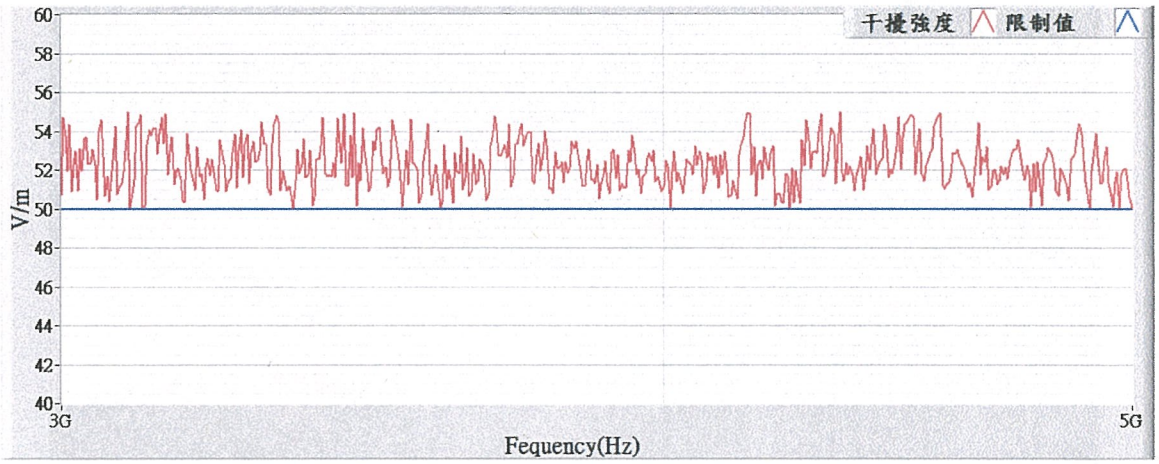
RS103 Test information	Meteorological information
EUT Name:Rack mount Fanless computer Horus200	**Temperature(℃):20**
Test date:2019/9/23	**Humidity(%):55**
Test time:下午 06:17	**Operator:Feng, Chia-Shin**
Test mode:	
Polarization:Horizontal	
Limit Level:50V/m	
Modulation:1k Hz Pulse modulation, 50% duty cycle.	



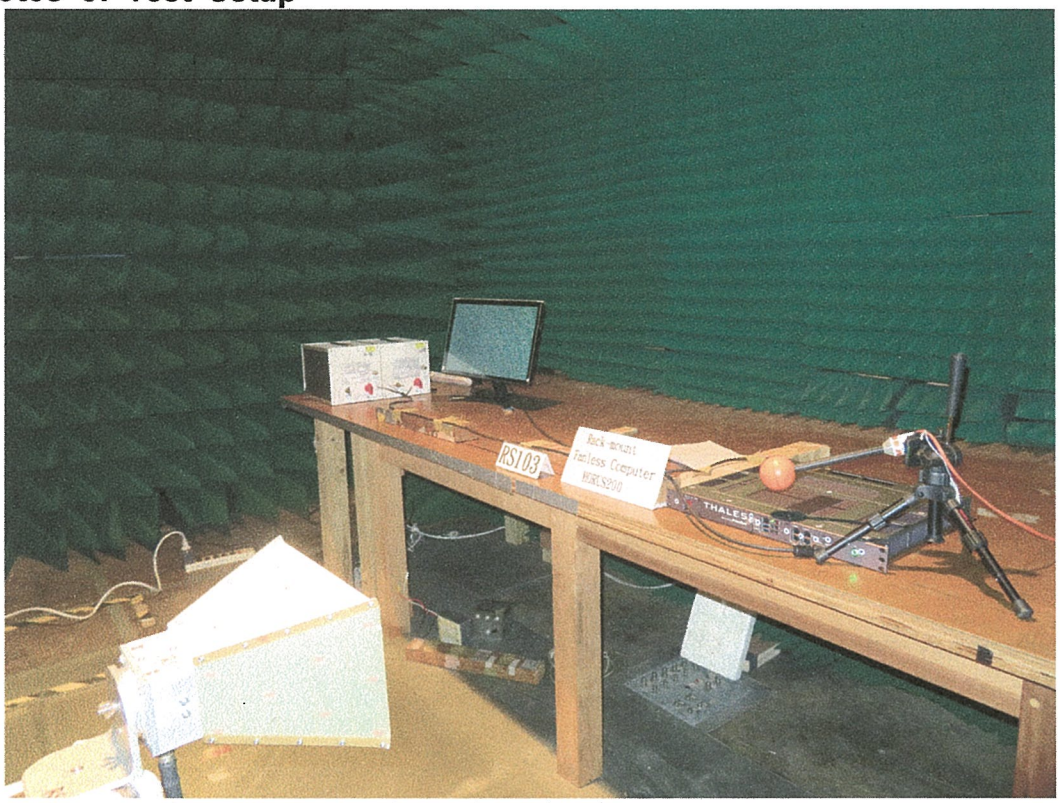
Vertical Polarization (3GHz to 5GHz):

MIL-STD-461E RS103 Test Report

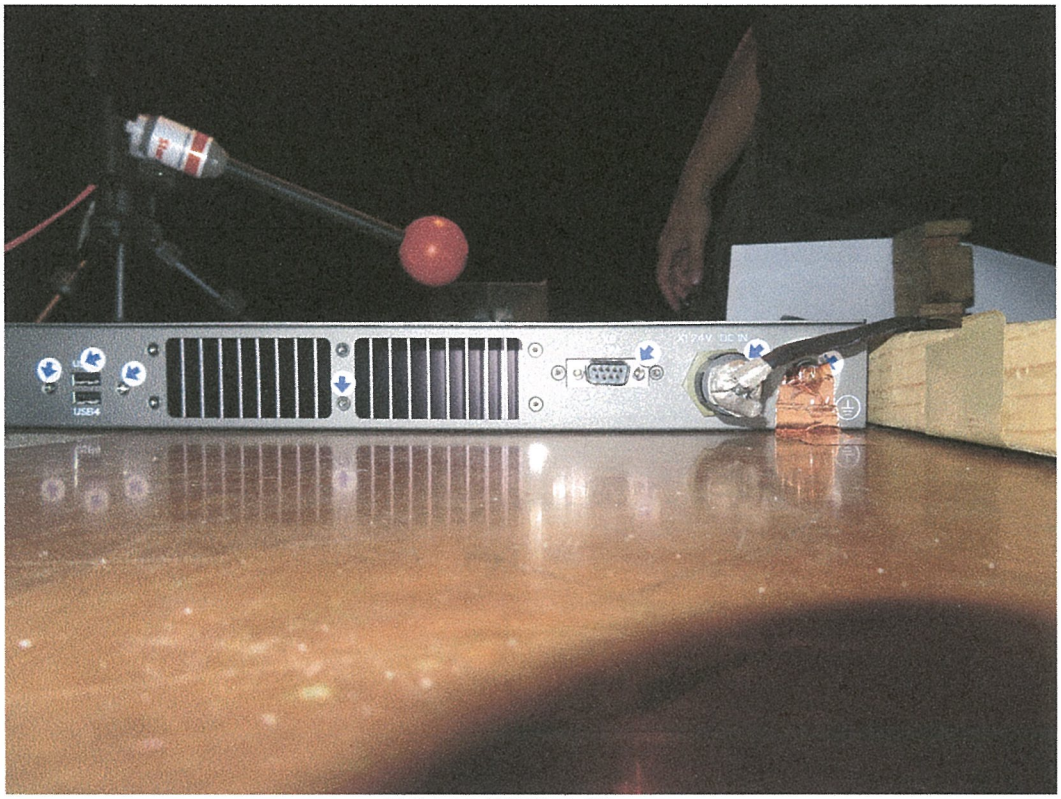
RS103 Test information	Meteorological information
EUT Name:Rack mount Fanless computer Horus200 **Test date:2019/9/23** **Test time:下午 05:24** **Test mode:** **Polarization:Vertical** **Limit Level:50V/m** **Modulation:1k Hz Pulse modulation, 50% duty cycle.**	**Temperature(℃):24.3** **Humidity(%):50** **Operator:Feng, Chia-Shin**



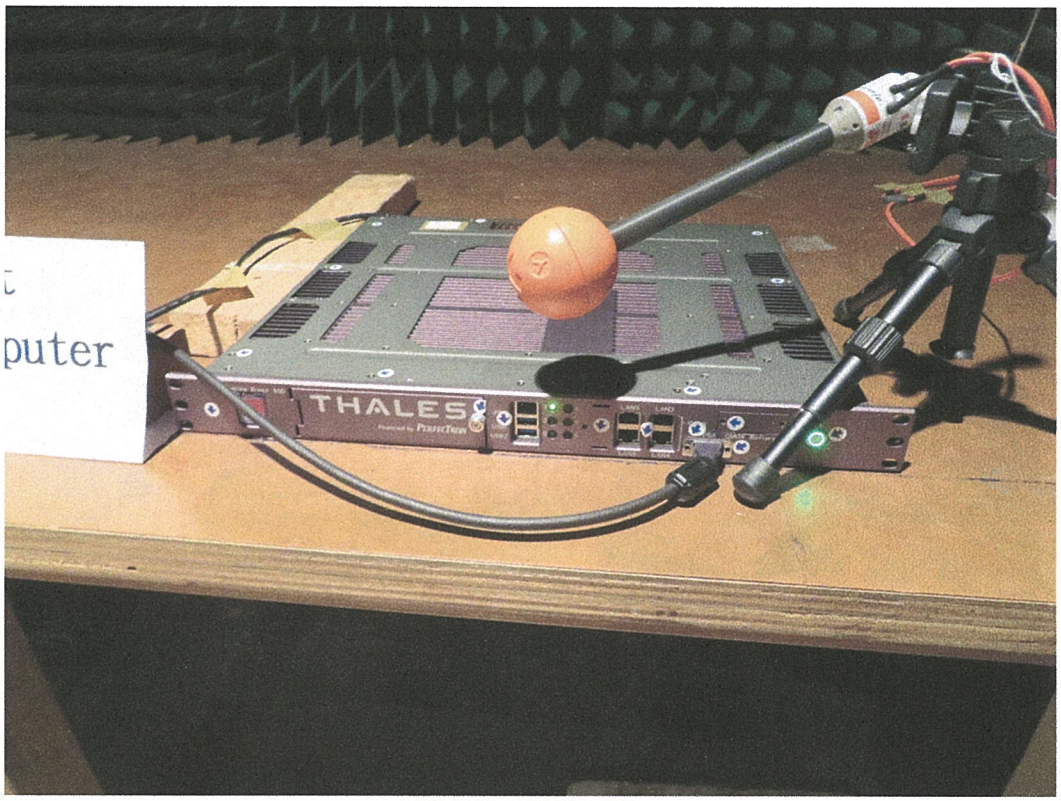
9.2 Photos of Test Setup



RS103 TEST (1)



RS103 TEST (2)

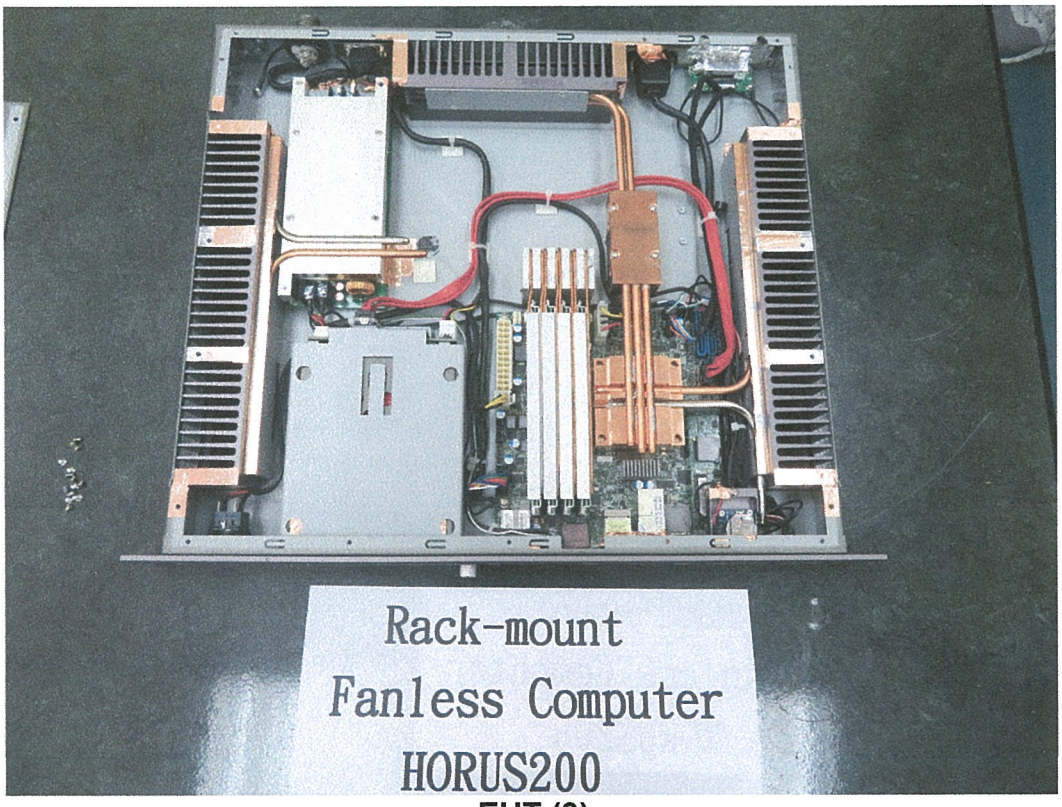


RS103 TEST (3)

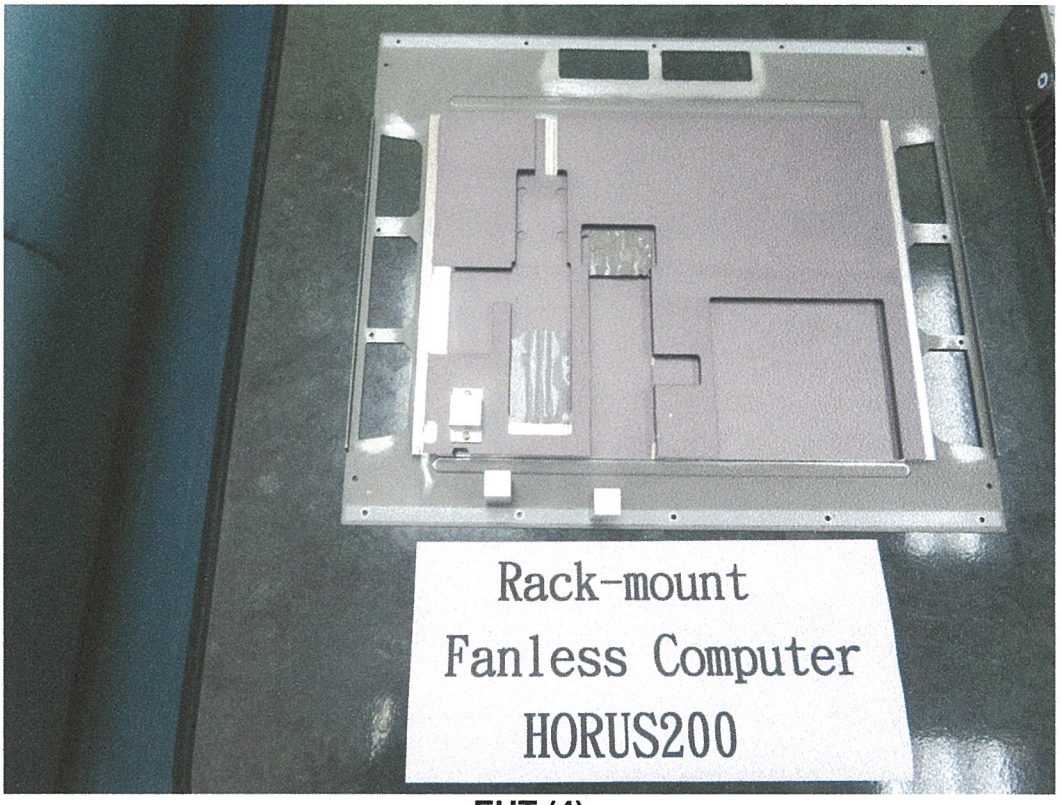
EUT (1)


Rack-mount
Fanless Computer
HORUS200

EUT (2)


Rack-mount
Fanless Computer
HORUS200

EUT (3)



EUT (4)