Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	PDP TV
MODEL/TYPE NO	:	EPT- 4210BN
FCC ID	:	OIOEPT- 4210
APPLICANT	:	E-RAE Electronics Industry Co., Ltd. #371-51, Kasan-Dong, Keumcheon-Ku, Seoul, 153-023, Korea Attn.: Woon Seok, Yu **/** Deputy General Manager
FCC CLASSIFICATION	:	Class B personal computers and peripherals
FCC RULE PART(S)	:	FCC Part 15 Subpart B
FCC PROCEDURE	:	Certification
TRADE NAME	:	E-RAE
TEST REPORT No.	:	E04.0302.FCC.138N
DATES OF TEST	:	February 25 ~ 27, 2004
DATES OF ISSUE	:	March 02, 2004
TEST LABORATORY	:	ETL Inc (FCC Registration Number: 95422) #584 Sangwhal-ri, Kanam-myon, Yoju-kun, Kyounggi-do, 469-880, Korea Tel: (031) 885-0072 Fax: (031) 885-0074

This PDP TV, Model EPT-4210BN has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B:
I attest to the accuracy of data. All measurement here in was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.
The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Yo Han, Park

Yo Han, Park / Chief Engineer

ETL Inc.

#584 Sangwhal-ri, Kanam-myon, Yoju-kun,
Kyounggi-do, 469-880, Korea

Table of Contents

FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

General Information

Applicant Name : E-REA Electronics Industry Co., Ltd.

Address : 371-51,Kasan-Dong,Keumcheon-Ku,Seoul, 153-023, Korea

Attention : Woon Seok, Yu / Deputy General Manager

- **EUT Type:** PDP TV
- **Model Number:** EPT-4210BN
- **FCC ID:** OIOEPT- 4210
- **S/N:** N/A
- **FCC Rule Part(s):** FCC Part 15 Subpart B
- **Test Procedure:** ANSI C63.4-1992
- **FCC Classification:** Class B personal computers and peripherals
- **Dates of Tests:** February 25 ~ 27, 2004
- **Place of Tests:** ETL Inc
  EMC Testing Lab (FCC Registration Number: 95422)
  584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,
  Kyounggi-Do, Korea
  Tel: (031) 885-0072 Fax: (031) 885-0074
- **Test Report No.:** E04.0302.FCC.138N

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number: 95422).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the E-RAE Electronics Industry Co., Ltd., Model: EPT- 4210BN

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the E-RAE Electronics Industry Co., Ltd. PDP TV, EPT-4210BN

2.2 General Specification

● Chassis Type	: Metal
● List of Each OSC. Or X-Tal. Freq. (>=1MHz)	: X-Tal: 18.432, 20.25, 20.00MHz OSC: 80.00MHz
● Aspect Ratio	: 16:9
● Screen Size (H x V)	: 920.1 x 518.4mm
● Displayable Colors	: 16.77M(256 x 256 x 256)
● Brightness	: 1000cd/㎡(w/o filter)
● Contrast	: 1200:1
● Viewing Angle	: 160 ^{o}
● Input signal	: NTSC, SD, HD, VGA, SVGA
● Tuner	: NTSC-M
● RGB Input	: D-Sub (15pin), DVI-D with HDCP
● AC Input	: AC 100 – 240V, 50/60Hz, 4A
● Power Consumption	: 320W

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from another EMCO LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the ESHS30 EMI Test Receiver to determine the frequency producing the max. emission from the EUT. The frequency producing max. level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

3. DESCRIPTION OF TESTS

3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turntable. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the max. emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

4.2 EUT operation

Operating Mode	The worst operating condition
Stand-by mode	X
Component Input display mode	X
Composite Input display mode	X
1024 * 768 75Hz, Full " H" pattern display mode	O

O : Worst case investigated during the Test

4.3 Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

EUT – PDP TV

FCC ID	: OIOEPT- 4210
Model Name	: EPT- 4210BN
Serial No.	: N/A
Manufacturer	: E-REA Electronics Industry Co., Ltd.
Power Supply Type	: Switching
Power Cord	: Non-Shielded, Detachable, 2.3m
Data Cable	: 1.2m Shielded 15pin D-sub, 1.2m Shielded RCA, 1.2m Shielded S-VHS, 2.3m Unshielded external speaker

Support Unit 1-Persnal computer (DELL)

FCC ID	**: N/A (DoC)**
Model Name	**: Demension 4550**
Serial No.	**: 2LL11S**
Manufacturer	**: DELL**
Power Supply Type	**: Switching**
Power Cord	**: Non-shielded, Detachable: 1.2m**
Data Cable	**: Shielded Detachable: 1.2m**

Support Unit 2-Keyboard (COMPAQ)

FCC ID	**: N/A (DoC)**
Model Name	**: KB-9963**
Serial No.	**: 12310-AD1**
Manufacturer	**: COMPAQ**
Power Supply Type	**: N/A**
Power Cord	**: N/A**
Data Cable	**: Shielded, 1.5m**

Support Unit 3-Mouse (LOGITECH)

FCC ID	**: DZL211029**
Model Name	**: M-S34**
Serial No.	**: LZC01002314**
Manufacturer	**: LOGITECH**
Power Supply Type	**: N/A**
Power Cord	**: N/A**
Data Cable	**: None-Shielded, 1.2m**

Support Unit 4- USB Mouse (N/A)

FCC ID	**: N/A**
Model Name	**: HL898W**
Serial No.	**: HL08011837**
Manufacturer	**: N/A**
Power Supply Type	**: N/A**
Power Cord	**: N/A**
Data Cable	**: None-Shielded, 1.2m**

Support Unit 5- Serial Mouse (PETRA)

FCC ID	**: JKGMUS5S01**
Model Name	**: MUS5S**
Serial No.	**: E183027**
Manufacturer	**: PETRA**
Power Supply Type	**: N/A**
Power Cord	**: N/A**
Data Cable	**: Shielded, 1.2m**

Support Unit 6- SETTOP Box (LG)

FCC ID	**: N/A**
Model Name	**: SK-011T**
Serial No.	**: 212KC00414**
Manufacturer	**: LG**
Power Supply Type	**: N/A**
Power Cord	**: N/A**
Data Cable	**: Shielded, 1.2m**

5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

Test Rule Parts	Measurement Required	Result
15.107	Conducted Emissions Measurement	Passed by 10.54dB
15.109	Radiated Emissions Measurement	Passed by 3.22dB

The data collected shows that the **E-RAE Electronics Industry Co., Ltd. PDP TV, ELT-4210BN** complies with technical requirements of above rules part 15.107 and 15.109(g) Class B Limits (CISPR Publication 22).

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

5. TEST RESULTS

5.2 Conducted Emissions Measurement

EUT	PDP TV / ELT-4210BN (SN: N/A)
Limit apply to	FCC Part 15. 107 / CISPR Pub.22 Class B
Test Date	February 25, 2004
Operating Condition	1024 * 768 75Hz, Full " H" Pattern display Mode
Environment Condition	Humidity Level : 34 %RH, Temperature : 22°C
Result	Passed by 10.54dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarizations of Hot and neutral line.

Detector mode: CISPR Quasi-Peak mode (6dB Bandwidth: 9 KHz)

Frequency [MHz]	Reading [dBμV]		Phase (*H/**N)	Limit [dBμV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q.Peak	Average
0.215	52.47	-	H	63.01	53.01	10.54	-
0.279	47.49	-	N	60.85	50.85	13.36	-
0.870	43.10	-	H	56.00	46.00	12.90	-
1.304	43.72	23.59	H			12.28	22.41
3.696	41.95	-	H			14.05	-
4.131	44.31	24.29	H			11.69	21.71
16.36	43.85	-	N	60.00	50.00	16.15	-
16.80	43.51	-	H			16.49	-

NOTES:

1. *** H: HOT Line, **N: Neutral Line**
2. **Margin value = Limit – Reading**
3. **Measurement were performed at the HOST AC power inlet in the frequency band of 150kHz ~ 30MHz according to the FCC Part 15 CLASS B / CISPR 22 Class B**
4. **If the reading Quasi-Peak value is bellowed the average limit, don' t test average mode.**

Ho Jin, Kim

Test Engineer: H. J. Kim

5. TEST RESULTS

Line: HOT Line

ETL EMC Laboratory

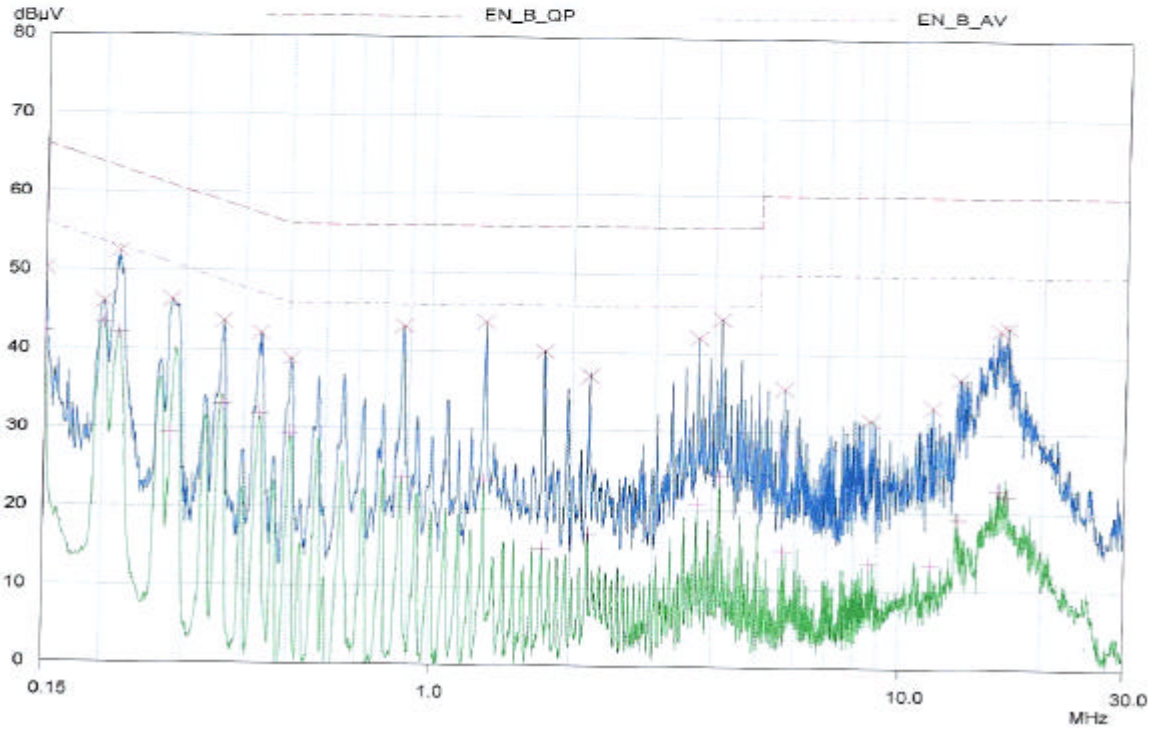
Conducted Emission Test Result

EUT:	EPT-4210BN
Manuf:	E-RAE
Op Cond:	
Operator:	
Test Spec:	FCC Part 15
Comment:	Hot
Result File:	4210bn.dat : HOT
Scan Settings	(3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	1000kHz	1000Hz	10kHz	PK+AV	10msec	Auto	OFF	60dB
1000kHz	5MHz	2kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB
5MHz	30MHz	5kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	9kHz	30MHz	Factor

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	10 dB



5. TEST RESULTS

Line: Neutral Line

ETL EMC Laboratory

Conducted Emission Test Result

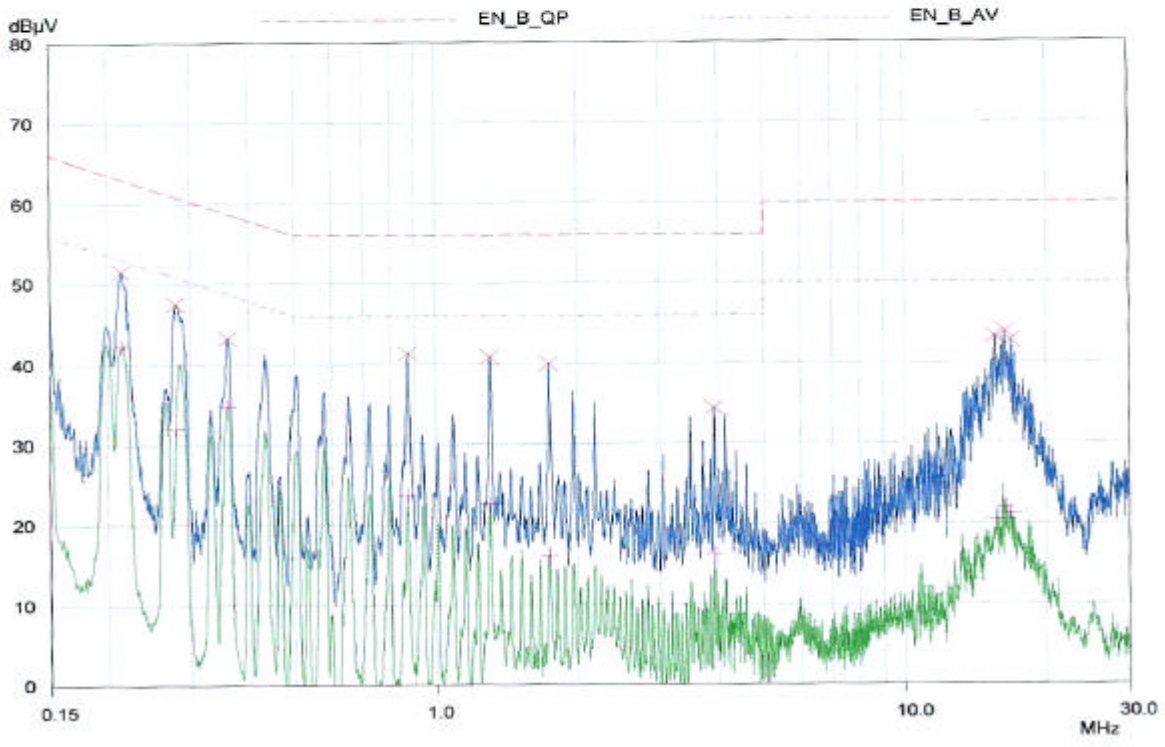
EUT:	EPT-4210BN
Manuf:	E-RAE
Op Cond:	
Operator:	
Test Spec:	FCC Part 15
Comment:	NEUTRAL
Result File:	4210BN2.dat : NEUTRAL

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	1000kHz	1000Hz	10kHz	PK+AV	10msec	Auto	OFF	60dB
1000kHz	5MHz	2kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB
5MHz	30MHz	5kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	9kHz	30MHz	Factor

Prescan Measurement:	Detectors:	X PK / + AV
	Meas Time:	see scan settings
	Peaks:	8
	Acc Margin:	10 dB



5. TEST RESULTS

5.3 Radiated Emissions Measurement

EUT	PDP TV / ELT-4210BN (SN: N/A)
Limit apply to	FCC Part 15. 109 (g) / CISPR Pub.22 Class B
Test Date	February 25, 2004
Operating Condition	1024 * 768 75Hz, Full " H" Pattern display Mode
Environment Condition	Humidity Level : 26 %RH, Temperature : 8℃
Result	Passed by 3.22dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode: CISPR Quasi-Peak mode (6dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dBμV]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [DbμV/m]	Limit [dBμV/m]	Margin [dB]
34.73	12.31	V	11.90	1.49	25.70	30.0	4.30
67.13	13.83	V	10.42	2.14	26.40	30.0	3.60
84.00	12.66	V	8.46	2.28	23.40	30.0	6.60
115.05	12.65	V	11.43	2.70	26.78	30.0	3.22
140.03	8.80	V	13.21	3.00	25.01	30.0	4.99
200.10	12.47	V	9.27	3.90	25.64	30.0	4.36
499.50	5.28	H	19.22	6.29	30.80	37.0	6.20
935.25	0.09	V	24.34	8.77	33.20	37.0	3.80

NOTES:

1. *** H: Horizontal polarization, ** V: Vertical polarization**
2. **Emission Level = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Emission Level**
4. **The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the FCC Part 15 CLASS B / CISPR 22 Class B.**

Ho Jin, Kim

Test Engineer: H. J. Kim

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor

dB(μV/m) = 20 $\log_{10}$ (μV /m) : Equation 1
dBμV = dBm + 107 : Equation 2

Example 1: @ 0.215MHz

Class A Limit = 1414.2μV = 63.0dBμV

Reading = 52.47dBμV

Convert to μV = 420.2μV

Margin = 63.01 – 52.47 = 10.54dBμV

= 10.54dBμV below Limit

Example 2: @ 115.05MHz

Class A Limit = 31.6μV = 30dBμV

Reading = 12.65dBμV

Antenna Factor + Cable Loss = 14.13dBμV

Total = 26.78dBμV

Margin = 30.00 – 26.78 = 3.22dBμV

= 3.22dBμV below Limit

7. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Due Date
☒	Spectrum Analyzer	E7402A	H.P	US39110107	04-06-07
☒	Spectrum Analyzer	R3261A	Advantest	21720033	04-10-24
☒	Receiver	ESVS 10	R & S	835165/001	04-03-21
☒	EMI TEST Receiver	ESHS30	Rohde & Schwarz	0401901/002	04-03-21
☐	Preamplifier	HP 8347A	HP	2834A00544	04-03-19
☒	LISN	3825/2	EMCO	9006-1669	05-01-12
☒	LISN	3825/2	EMCO	9208-1995	05-01-29
☒	TriLog Antenna	VULB9160	Schwarz Beck	3082	04-07-16
☐	LogBicon	VULB9165	Schwarz Beck	2023	04-05-17
☐	Dipole Antenna	VHAP	Schwarz Beck	964	04-05-09
☐	Dipole Antenna	VHAP	Schwarz Beck	965	04-07-05
☐	Dipole Antenna	UHAP	Schwarz Beck	949	04-07-05
☐	Dipole Antenna	UHAP	Schwarz Beck	950	04-05-09
☐	Double Ridged Horn	3115	EMCO	9809-2334	03-09-20
☒	Turn-Table	DETT-03	Daeil EMC	-	N/A
☒	Antenna Master	DEAM-03	Daeil EMC	-	N/A
☐	Plotter	7440A	H.P	2725A 75722	N/A
☒	Chamber	DTEC01	DAETONG	-	N/A
☐	Impedance Matching Pad	6001.01.A	SUNNER	3252	04-10-24
☐	Thermo Hygrograph	3-3122	ISUZU	3312201	04-12-20
☐	BaroMeter	-	Regulus	-	-