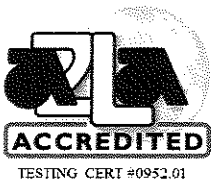
ORIGINAL

TEST REPORT



TESTING CERT #0952.01

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This laboratory is accredited by American Association For Laboratory Accreditation.
The tests reported herein have been performed in accordance with its terms of accreditation.

Test Report No. : **R281009**
Issue Date : **January 17, 2018**

EUT Information

Applied Standard : **FCC Part 15, Subpart B**
Trade Name : **LAUREL**
Category : **NOTESORTER**
Model Name : **K4**
Serial Number : **Syoukai14004**

JEL Limited

Contents

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Statement

Client

Company name	: LAUREL BANK MACHINES CO., LTD.
Address	: 1-2,Toranomon 1-chome, Minato-ku, Tokyo, 105-8414 Japan
Telephone	: +81 3 3502 3311
Facsimile	: +81 3 3580 9362

Equipment Under Test (EUT)

Trade name	: LAUREL
Category	: NOTESORTER
Model name	: K4
Serial number	: Syoukai14004
Intended environment	: Financial Institution
Date of receipt	: November 26, 2017
EUT condition	: Production model, not damaged
Highest frequency	: 500MHz

Test Performed

Test started	: December 5, 2017
Test completed	: December 7, 2017
Location	: 2971 Nakabyo, Abiko-shi, Chiba-ken, 270-1121, Japan

Test Results

Purpose of the test	: Compliance test to the following standard
Applied standard	: FCC Part 15, Subpart B
Classification	: Class A
Results	: **PASS**

Test Results Overview

Measurement		Results*	Test method
Radiated disturbance	(30 - 5000MHz)	Pass	ANSI C 63.4:2014
Conducted disturbance	(0.15 - 30MHz)	Pass	ANSI C 63.4:2014

* : The compliance statement is based on nominal value only.

Measurement Uncertainty

Radiated disturbance up to 1GHz	: +4.7 [dB], -4.7 [dB] (k=2)
Radiated disturbance above 1GHz	: +5.9 [dB], -5.9 [dB] (k=2)
Conducted disturbance (0.15 - 30MHz)	: +3.0 [dB], -3.0 [dB] (k=2)

The coverage factor k=2 yields approx. a 95% level of confidence for near-normal distribution typical of most measurement results. The data shown in this test report for Measurement Uncertainty is required to present the data per aforementioned standard according to CISPR 16-4-2.

Laboratory's Signatory

Report number	: R281009
Issue date	: January 17, 2018

This test report is issued under the authority of:

F. miyauchi

Fumio Miyauchi, Manager, EMC Dept.

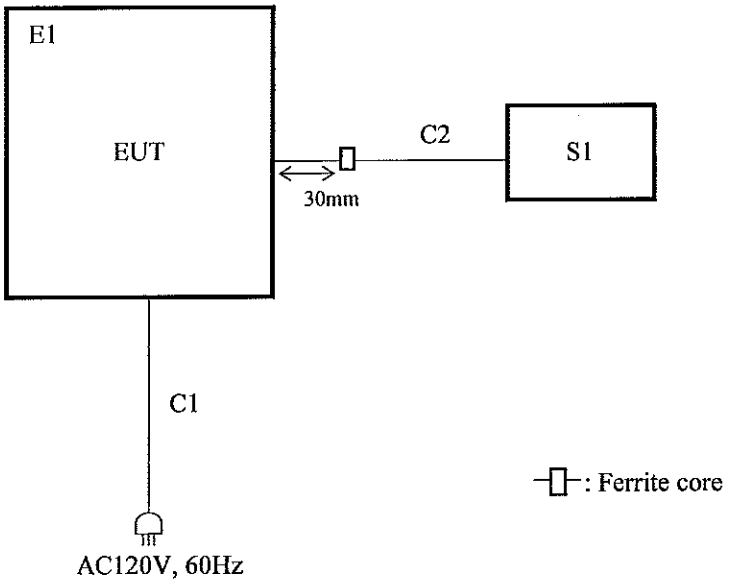
The test was supervised by:

K. Asano

Kenji Asano, Test Engineer

The results in this report apply only to the sample(s) tested.
The report shall not be reproduced except in full without the written approval of JEL Limited.

Configuration of the EUT



■Equipment Under Test (EUT)

ID	Category	Model name	Serial number	Manufacturer	Remarks
E1	NOTESORTER	K4	Syoukai14004	LAUREL PRECISION MACHINES CO., LTD.	Refer to note FCC ID: 2ARVCK4K8K12

Note: Rated input power: AC 100-240V, 50/60Hz, 335W.

■Support Equipment

ID	Category	Model name	Serial number	Manufacturer	Remarks
S1	Customer display	CD8-L1	None	consmoIT	-

■Cable List

ID	Type	Length	Shielding	Remarks
C1	AC Power Cable	2.5 m	No	3-wire
C2	Modular cable	1.5 m	No	6-wire, Ferrite core: TKK, TFT152613N, 3-turn

■Dimensions of the EUT

ID	Width	Depth	Height	Remarks
-	0.88 m	0.46 m	0.7 m	EUT system, Actual measurement

Condition of the EUT

Operating Mode of the EUT

The tests have been conducted with the following operational mode(s) of the EUT.

Name of mode in the report	Description
Working	①ビルプレス下降(Bill Press Descent) ②集積車駆動(Accumulated car Drive) ③搬送モーター駆動(Transport moter Drive) ④ゲート駆動(Gate Drive) ⑤搬送モーター停止(Transport moter Stop) ⑥集積車停止(Accumulated car Stop) ⑦ビルプレス上昇(Bill Press Rising) ⑧待機状態(Waiting state) 以後上記(①～⑧)を繰り返す。(①～⑧ repeat) ⑨Customer displayの7セグLED点滅繰り返し(常時) (Customer display 7SEGLED Flashing all the time)

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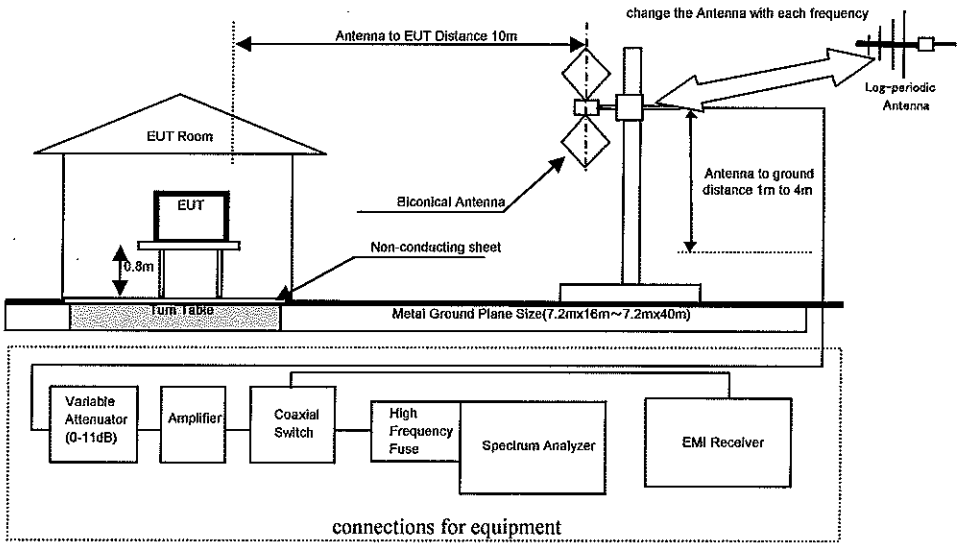
Test Site Description

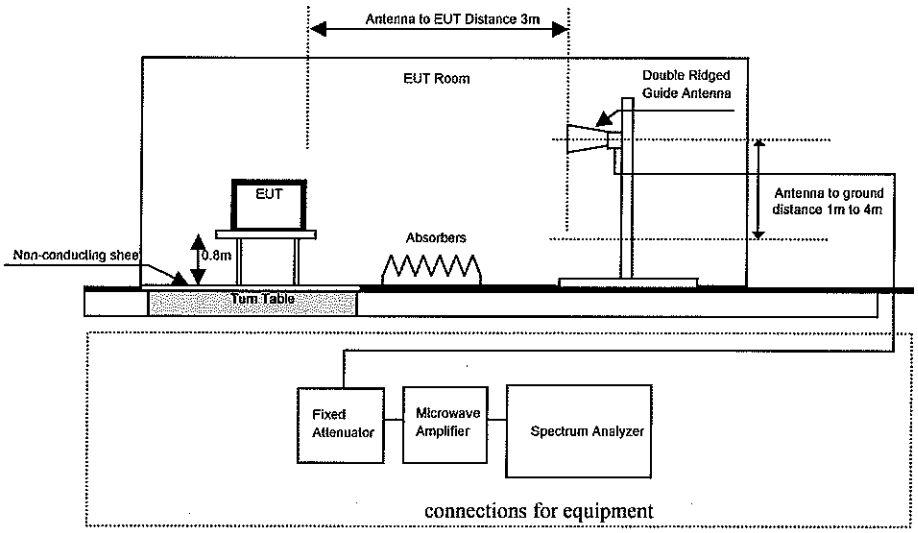
1-Facility

All the testing facilities are periodically serviced as a daily check for equipment and cables systems, an every 6 months facility check for the facilities and a monthly check and annual calibration for testing equipment according to ISO/IEC 17025:2005. All the testing facilities are used as the same specifications shown below. In this product, there used No.2 open test site for radiated emission and No.6 shielded room for conducted emission. There are descriptions both for radiated disturbance measurement and conducted disturbance measurement.

2-1 Radiated Disturbance Measurement (up to 1GHz)

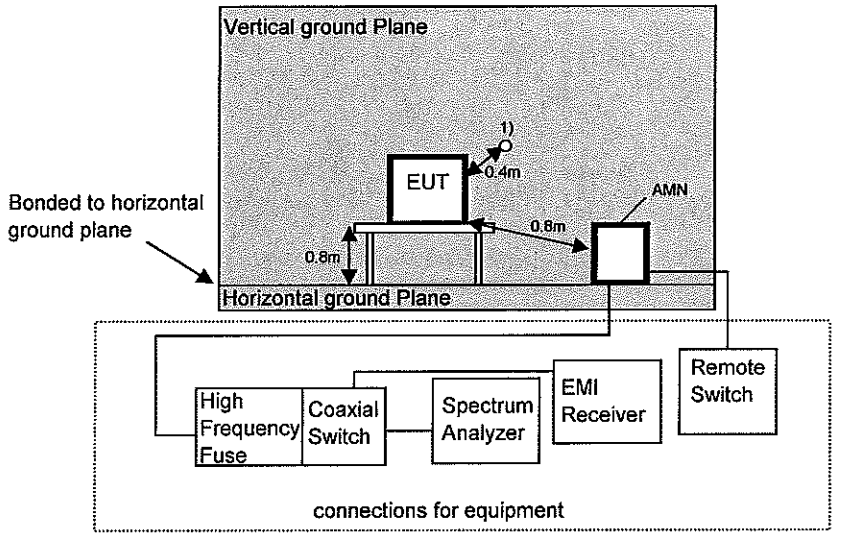


2-2 Radiated Disturbance Measurement (above 1GHz)



Test Site Description

2-3 Conducted Disturbance Measurement



Note 1) Distance of Vertical ground plane and EUT is 0.4m

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Test Procedure

Radiated Disturbance Measurements

■up to 1GHz

・Test site is met the requirements of CISPR16-1-4 and the distance between the EUT and the antenna is adjusted to 10m.
・The turntable can be rotated 360 degrees.
・The antenna can be adjusted between 1m and 4m in height above the ground.
・The EUT is placed on the turntable covered with non-conducting sheet.
・Measurements are carried out using a spectrum analyzer with peak detectors (100kHz bandwidth) and an EMI receiver with quasi-peak detectors (120kHz bandwidth).(Refer to the list of test equipments used for the test.)
・Biconical antenna and logperiodic antenna are used as wideband antenna.
・The Biconical antenna is used in the frequency range of 30MHz to 300MHz and the Logperiodic antenna is used in the frequency range of 300MHz to 1GHz.
・A variable attenuator is used for verifying amplifier's linearity.
・Rotating the turntable and adjusting the height of the antenna are carried out by control buttons on the console.
・Measurement is carried out by a JEL operator as manual operation as follows:
-search for some of high disturbance frequency points than the other points by the following settings: bandwidth 100kHz, frequency span 10MHz between 30MHz and 300MHz and frequency span 50MHz between 300MHz and 1GHz.
-search the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point.
-set the height of the antenna with the maximum level of the disturbance wave from 1m to 4m.
-read the disturbance level by the EMI receiver with quasi-peak detectors (120kHz bandwidth)
-make measurement to vertical and horizontal polarization.
-calculate the measurement result with the following equation:
(Measurement result = reading value + antenna factor + antenna cable loss - amp. gain)

■above 1GHz

・Test site is met the requirements of CISPR16-1-4 and the distance between the EUT and the antenna is adjusted to 3m.
・The turntable can be rotated 360 degrees.
・The antenna can be adjusted between 1m and 4m in height above the ground.
・A double-ridged guide antenna is used for the test and is placed on a metal ground plane. The antenna height is specified in "General description of radiated disturbance measurement above 1GHz".
・The EUT is placed on the turntable covered with non-conducting sheet.
・Measurements are carried out using a spectrum analyzer with peak detectors (RBW:1MHz, VBW:3MHz) and with average detectors (RBW:1MHz, VBW:30Hz[1Hz]). (Refer to the list of the equipments used for the test.)
・Installed the specified wave-absorber on the ground plane between the antenna and EUT.
・A fixed attenuator is used for verifying amplifier's linearity.
・Rotating the turntable is carried out by control buttons on the console.
・Measurement is carried out by a JEL operator as manual operation as follows:
-search for some of high disturbance frequency points than the other points by the following settings: frequency span 100MHz between 1GHz and 2GHz and frequency span 500MHz between 2GHz and 18GHz
-search the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point.
-make measurement with the antenna in fixed position or with scanning, depending on the height of EUT.
-set the frequency span to be 5MHz for the scanned frequency, then read the disturbance levels with Peak detector and Average detector.
-make measurement to vertical and horizontal polarization.
-calculate the measurement result with the following equation:
(Measurement result = reading value + antenna factor + antenna cable loss - amp. gain)

Test Procedure

Conducted Disturbance Measurements

・The measurements is carried out on horizontal ground plane in a shielded room.
・An AMN(Artificial Mains Network) with a nominal impedance (50Ω/50μH) as defined in CISPR16-1-2, shall be utilized.
・The AMN is grounded on a horizontal metal ground plane.
・Measurement is carried out using a spectrum analyzer with peak detectors (10kHz bandwidth) and an EMI receiver with quasi-peak detectors and average detector. (Refer to the list of test equipments used for the test.)
・The shortest distance between the EUT and the AMN is 0.8m.
・The EUT is placed on a horizontal metallic ground plane covered with non-conducting sheet.
・A remote switch is used for changing phases between Line (L) and Neutral(N).
・Measurement is carried out as manual operation as follows:
–detect the maximized emission level using the maxhold function after setting the spectrum analyzer bandwidth 10kHz and the frequency range from 150kHz to 1MHz , 1MHz to 5MHz and 5MHz to 30MHz.
–search the maximum frequency point of the disturbance wave in each frequency range.
–read the disturbance level of quasi-peak, average and Line (L) and Neutral(N) in 9kHz bandwidth by the EMI receiver.
–calculate the measurement result with the following equation.
(Measurement result= reading value + LISN(AMN) voltage division factor + cable loss)

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List of equipment used for the tests (Vol. 410)

Item	Model Name	Serial No.	Manufacturer	Interval	Effective Until
EMI test receiver	ESVS10	833269003	R&S	1 year	Nov 01, 2018
Spectrum analyzer	TR4173E	05590011	Advantest	1 year	Sep 01, 2018
Pre-amplifier	8447D	2443A03915	HP	1 year	Apr 01, 2018
Biconical antenna	BBA9106	None	Schwarzbeck	1 year	Aug 01, 2018
Log-periodic antenna	USLP9143	123	Schwarzbeck	1 year	Aug 01, 2018
Step Attenuator	8494B	2812A16216	HP	1 year	Mar 01, 2018
Coaxial Switch	AV210	650003	Stack Elec.	1 year	Dec 01, 2018
High frequency fuse holder	MP612A	AN002	Anritsu	1 year	Mar 01, 2018
Thermometer/Hygrometer	3-4110-01	002	Isuzu	3 years	Jun 01, 2018
EMI test receiver	FCKL1528	1528-227	Schwarzbeck	1 year	Mar 01, 2018
Spectrum analyzer	E4401B	US39390292	HP	1 year	Sep 01, 2018
LISN (AMN)	ESH2-Z5	892602018	R&S	1 year	Jul 01, 2018
High pass filter	KFL-007	8S-1366-1	Kyoritsu	1 year	Mar 01, 2018
Coaxial Switch	AV210	650007	Stack Elec.	1 year	Dec 01, 2018
High frequency fuse holder	MP612A	AN009	Anritsu	1 year	Mar 01, 2018
Thermometer/Hygrometer	3-4110-01	008	Isuzu	3 years	Jun 01, 2018
Microwave pre-amplifier	QLW-0118	33603939	Jel	1 year	Jul 01, 2018
Double ridge guide antenna	3115	8906-3186	EMCO	1 year	Jan 01, 2018
Spectrum analyzer	E7405A	MY45109378	Agilent	1 year	Sep 01, 2018

Note : The tests were performed on December 5, 6 and 7, 2017.

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Results

Radiated Disturbance Measurements (30MHz to 1000MHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 5, 2017
Test venue : No.2 Open site
Distance : 10m
Detection : Q.P.
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

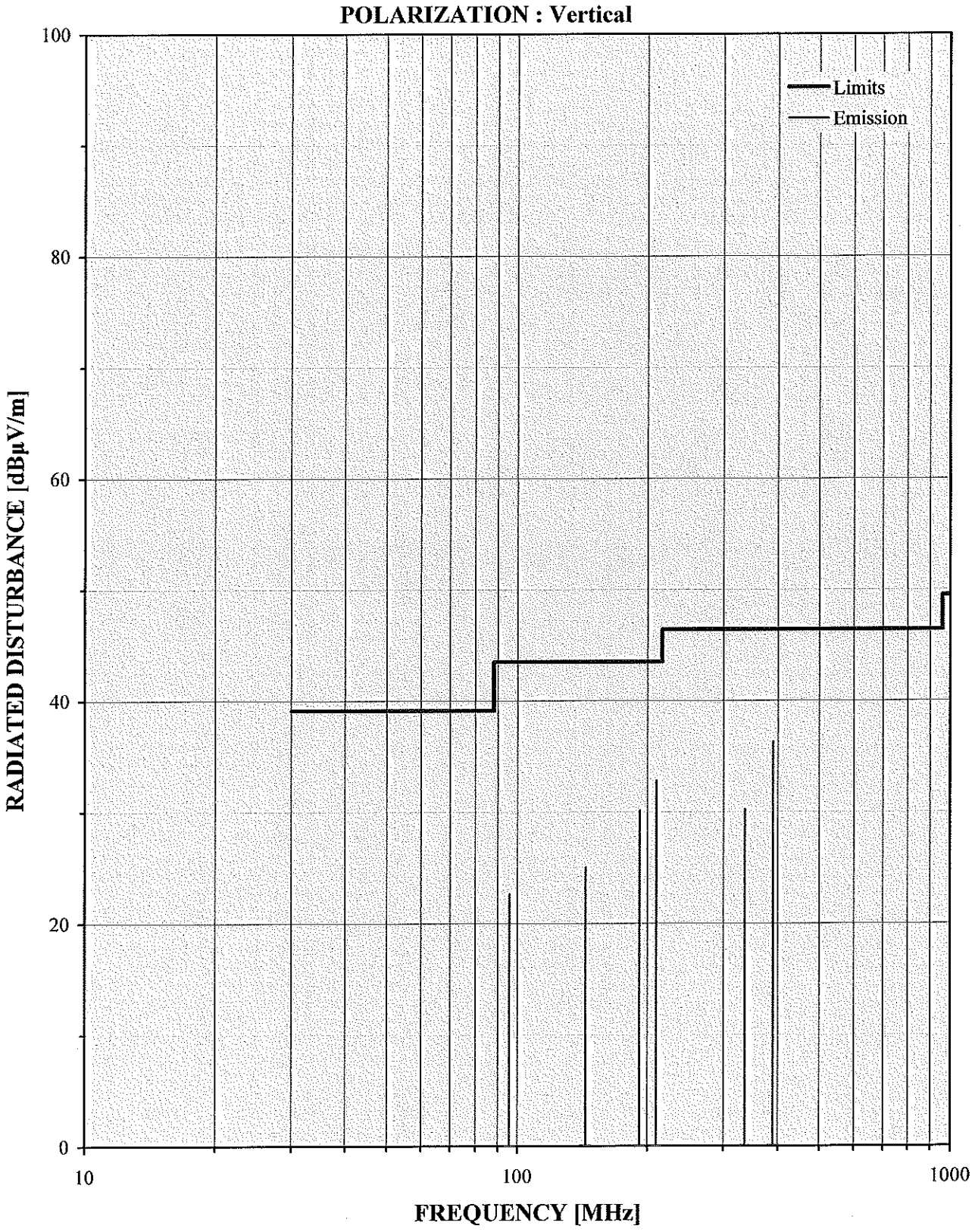
Polarization Vertical

DATA No. 1 (Refer to Graph 1)

Frequency (MHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
96.00	31.9	-9.3	22.6	43.5	20.9
144.00	28.2	-3.2	25.0	43.5	18.5
192.00	30.7	-0.6	30.1	43.5	13.4
210.00	32.8	0.0	32.8	43.5	10.7
336.00	35.4	-5.2	30.2	46.4	16.2
390.00	38.8	-2.5	36.3	46.4	10.1

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 1


POLARIZATION : Vertical
Limits
Emission
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
10
100
1000
FREQUENCY [MHz]

Radiated Disturbance Measurements (30MHz to 1000MHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 5, 2017
Test venue : No.2 Open site
Distance : 10m
Detection : Q.P.
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

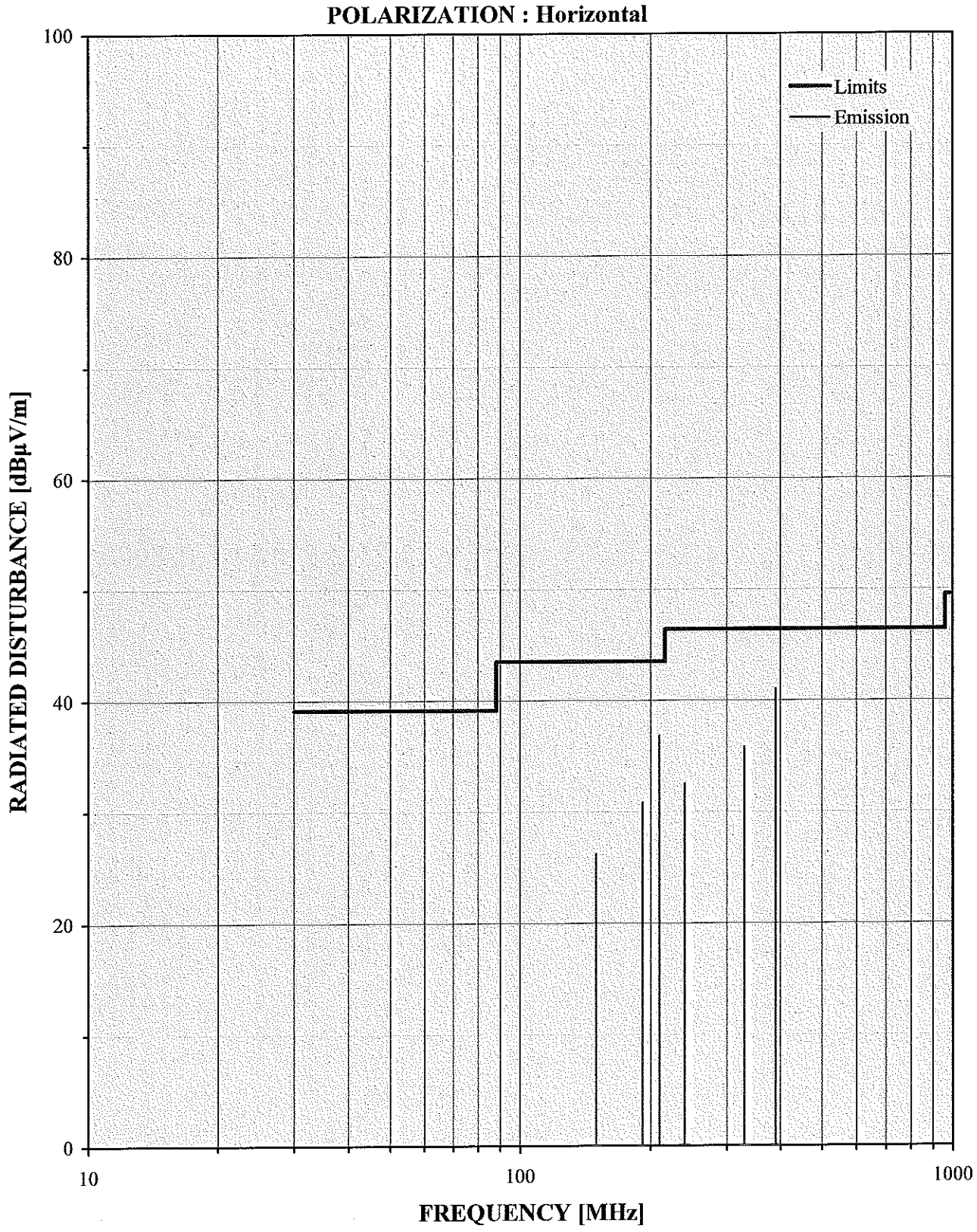
Polarization Horizontal

DATA No. 2 (Refer to Graph 2)

Frequency (MHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
150.00	29.0	-2.8	26.2	43.5	17.3
192.00	31.4	-0.6	30.8	43.5	12.7
210.00	36.8	0.0	36.8	43.5	6.7
240.00	31.6	0.9	32.5	46.4	13.9
330.00	41.3	-5.5	35.8	46.4	10.6
390.01	43.5	-2.5	41.0	46.4	5.4

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 2


POLARIZATION : Horizontal
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
10
100
1000
FREQUENCY [MHz]
Limits
Emission

Radiated Disturbance Measurements (1GHz to 5GHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 6, 2017
Test venue : No.2 Open site
Distance : 3m
Detection : Peak
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

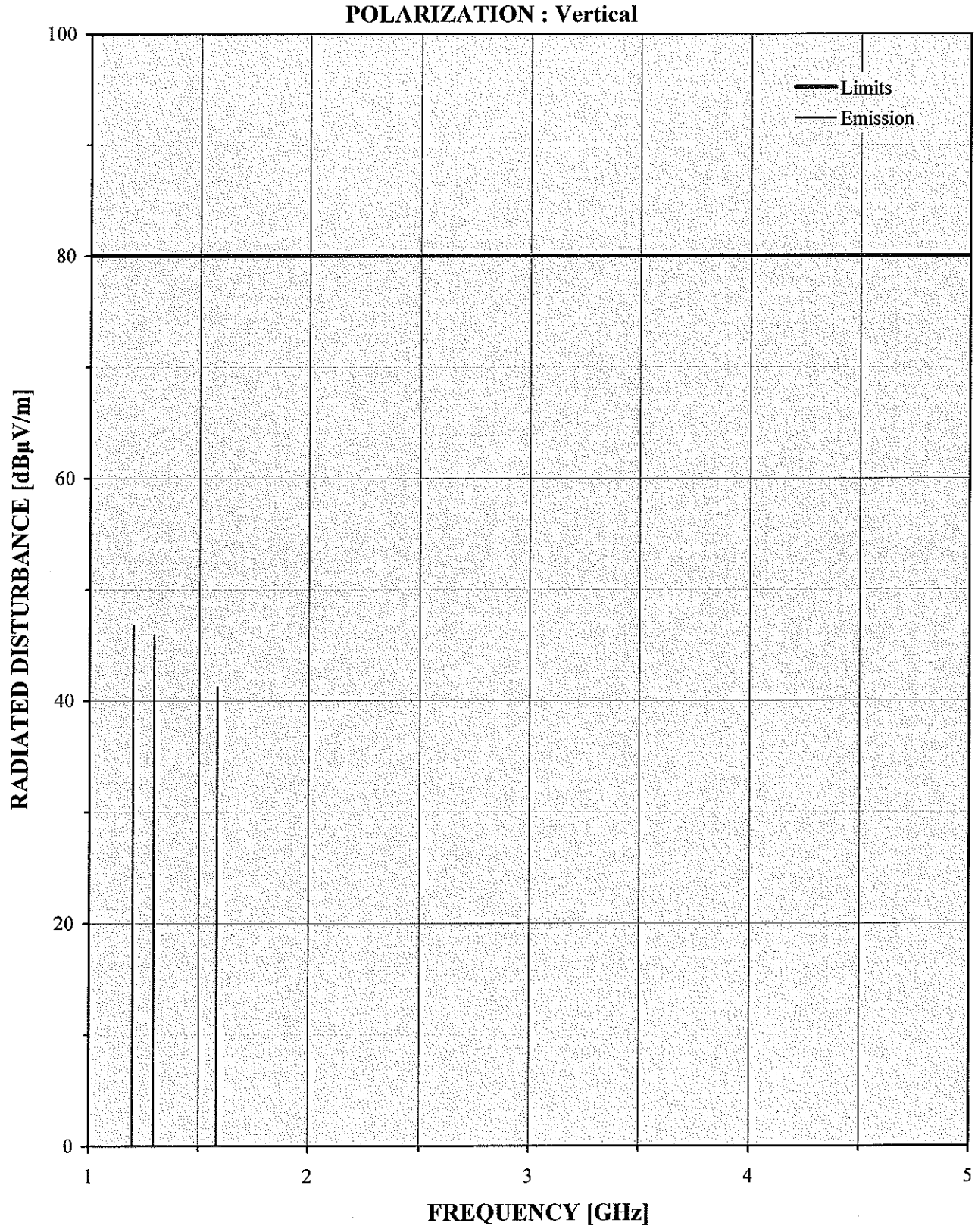
Polarization Vertical

DATA No. 3 (Refer to Graph 3)

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	58.5	-11.8	46.7	80.0	33.3
1.296	58.4	-12.5	45.9	80.0	34.1
1.584	54.6	-13.4	41.2	80.0	38.8

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 3


POLARIZATION : Vertical
Limits
Emission
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
1
2
3
4
5
FREQUENCY [GHz]

Radiated Disturbance Measurements (1GHz to 5GHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 6, 2017
Test venue : No.2 Open site
Distance : 3m
Detection : Average
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

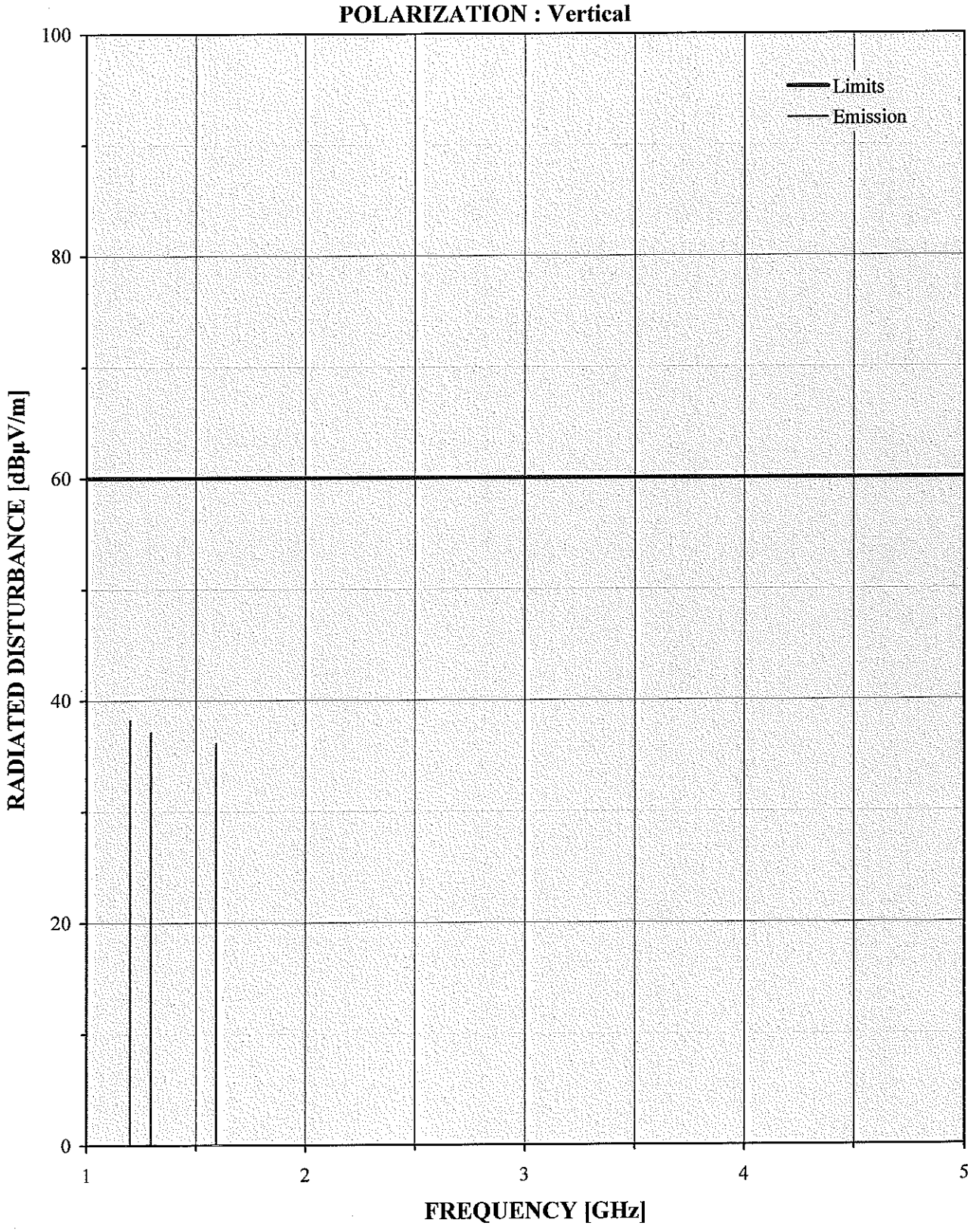
Polarization Vertical

DATA No. 4 (Refer to Graph 4)

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	50.0	-11.8	38.2	60.0	21.8
1.295	49.6	-12.5	37.1	60.0	22.9
1.594	49.5	-13.4	36.1	60.0	23.9

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 4


POLARIZATION : Vertical
Limits
Emission
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
1
2
3
4
5
FREQUENCY [GHz]

Radiated Disturbance Measurements (1GHz to 5GHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 6, 2017
Test venue : No.2 Open site
Distance : 3m
Detection : Peak
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

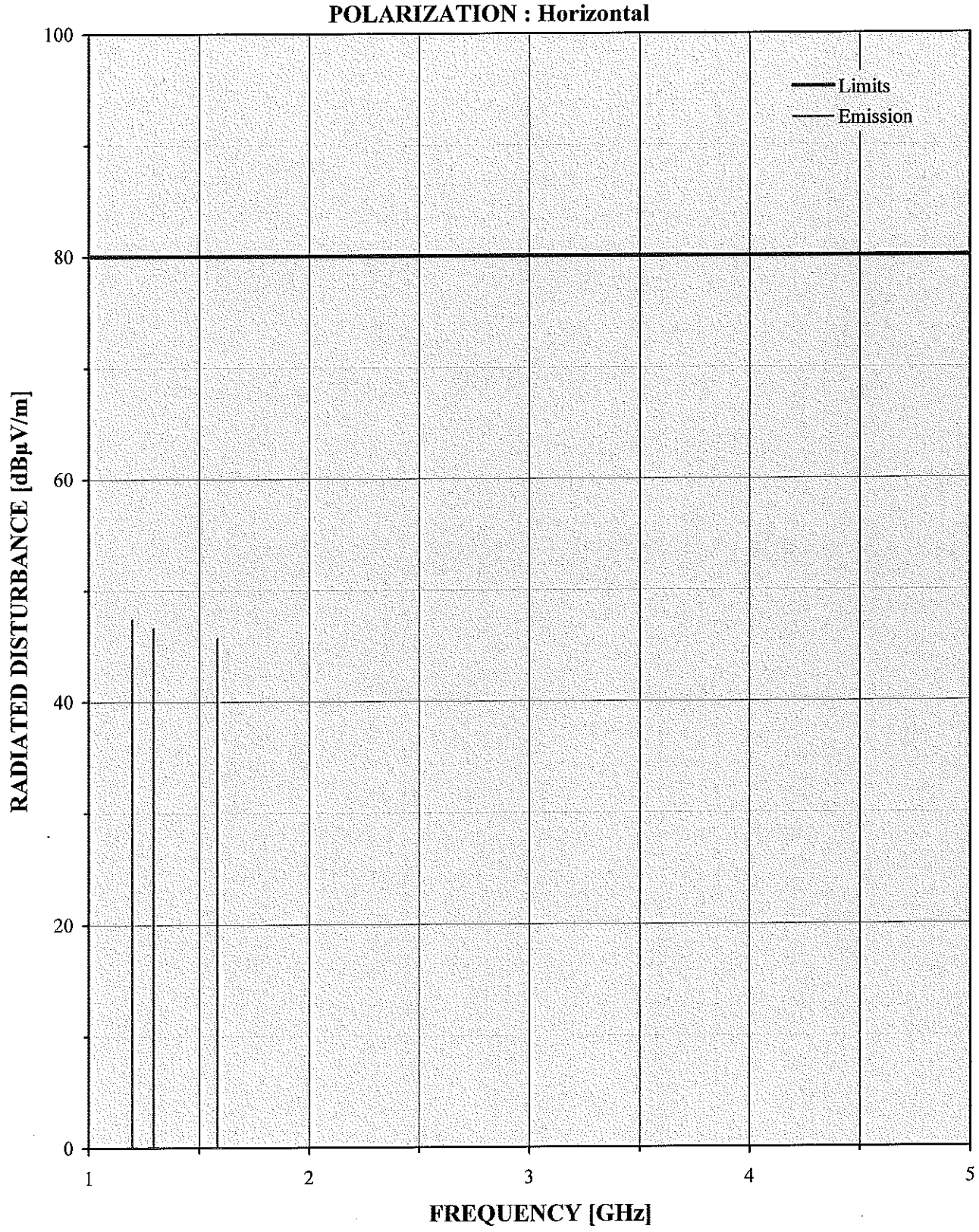
Polarization Horizontal

DATA No. 5 **(Refer to Graph 5)**

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	59.2	-11.8	47.4	80.0	32.6
1.295	59.1	-12.5	46.6	80.0	33.4
1.584	59.1	-13.4	45.7	80.0	34.3

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 5


POLARIZATION : Horizontal
Limits
Emission
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
1
2
3
4
5
FREQUENCY [GHz]

Radiated Disturbance Measurements (1GHz to 5GHz)

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Operating mode of EUT during the test

Working

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 6, 2017
Test venue : No.2 Open site
Distance : 3m
Detection : Average
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

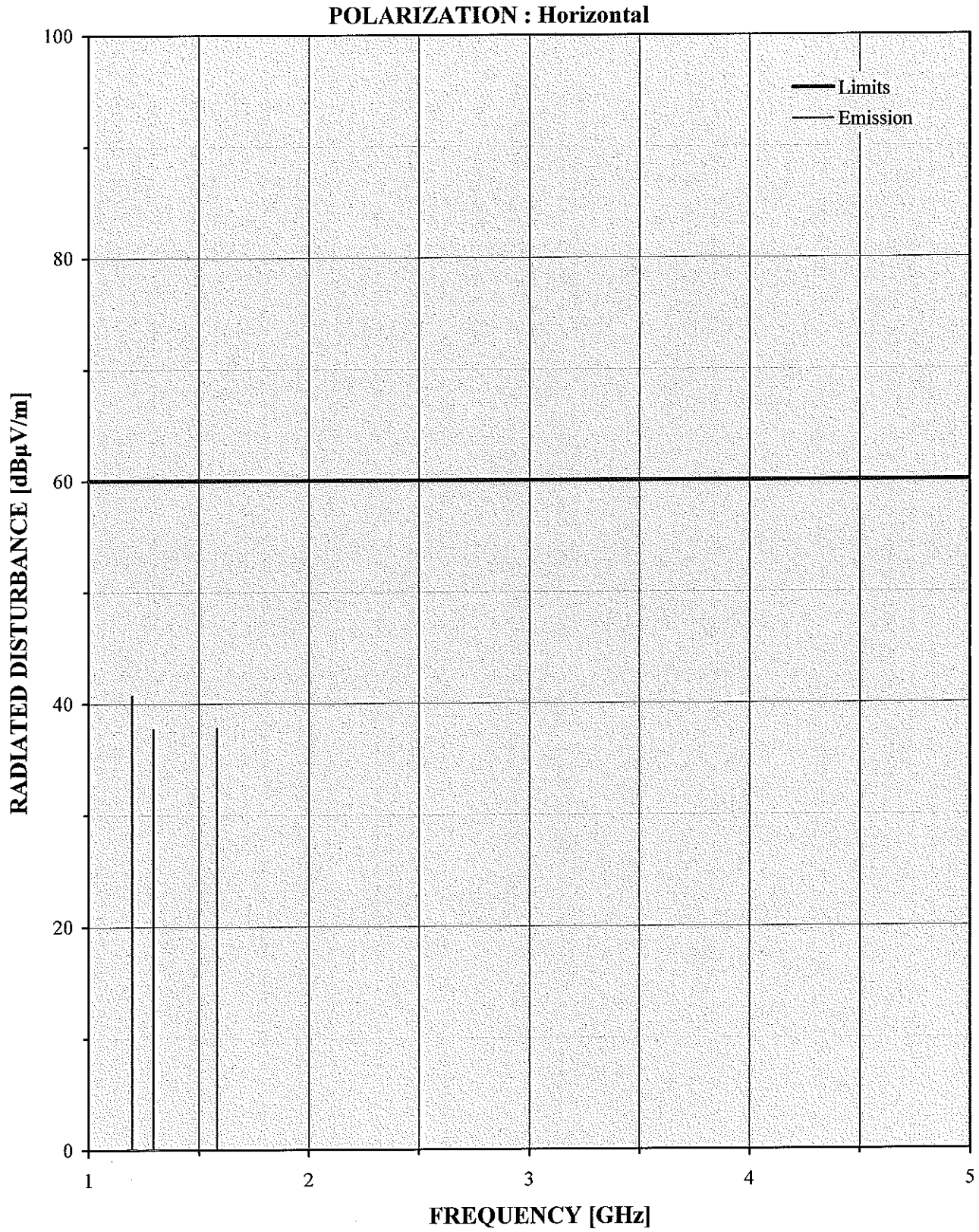
Polarization Horizontal

DATA No. 6 (Refer to Graph 6)

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	52.5	-11.8	40.7	60.0	19.3
1.296	50.2	-12.5	37.7	60.0	22.3
1.584	51.2	-13.4	37.8	60.0	22.2

Note
- A sample calculation: Cor. F. (correction factor)= antenna factor + cable loss- amp.gain
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 6


POLARIZATION : Horizontal
Limits
Emission
RADIATED DISTURBANCE [dBμV/m]
100
80
60
40
20
0
1
2
3
4
5
FREQUENCY [GHz]

Conducted Disturbance Measurements

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 7, 2017
Test venue : No.6 Shield room
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

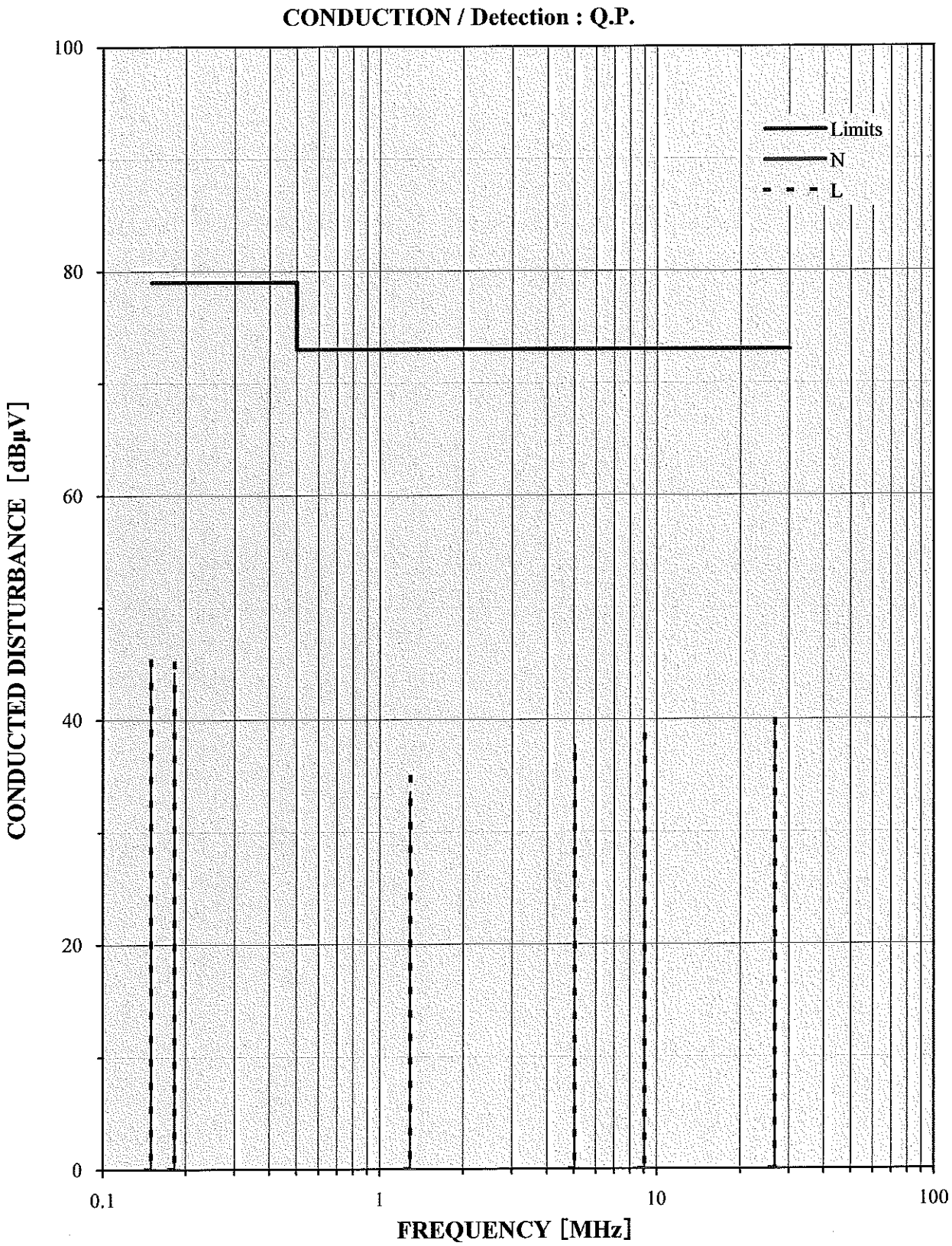
Detection Q.P.

DATA No. 7 **(Refer to Graph 7)**

Frequency (MHz)	Reading (dBμV) N	Reading (dBμV) L	Cor.F. (dB) N	Cor.F. (dB) L	Result (dBμV) N	Result (dBμV) L	Limits (dBμV)	Margin (dB) N	Margin (dB) L
0.150	35.0	35.0	10.3	10.3	45.3	45.3	79.0	33.7	33.7
0.182	33.9	34.8	10.3	10.3	44.2	45.1	79.0	34.8	33.9
1.291	23.1	24.5	10.4	10.4	33.5	34.9	73.0	39.5	38.1
5.043	27.1	26.2	10.6	10.6	37.7	36.8	73.0	35.3	36.2
9.034	28.0	28.0	10.6	10.6	38.6	38.6	73.0	34.4	34.4
26.736	28.8	28.8	10.8	11.1	39.6	39.9	73.0	33.4	33.1

Note
- A sample calculation: Cor. F. (correction factor)= LISN(AMN) voltage division factor + cable loss
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 7


CONDUCTION / Detection : Q.P.
CONDUCTED DISTURBANCE [dBμV]
100
80
60
40
20
0
0.1
1
10
100
FREQUENCY [MHz]
Limits
N
L

Conducted Disturbance Measurements

Test Specification

Applied standard : FCC Part 15, Subpart B
Class A

EUT

Category : NOTESORTER
Model Name : K4
Serial Number : Syoukai14004

Test Condition

Applied Power : AC 120V, 60Hz
Single phase 3-wire
Date : December 7, 2017
Test venue : No.6 Shield room
Temperature : 18℃
Humidity : 51%
Operator : K. Asano

Operating mode of EUT during the test

Working

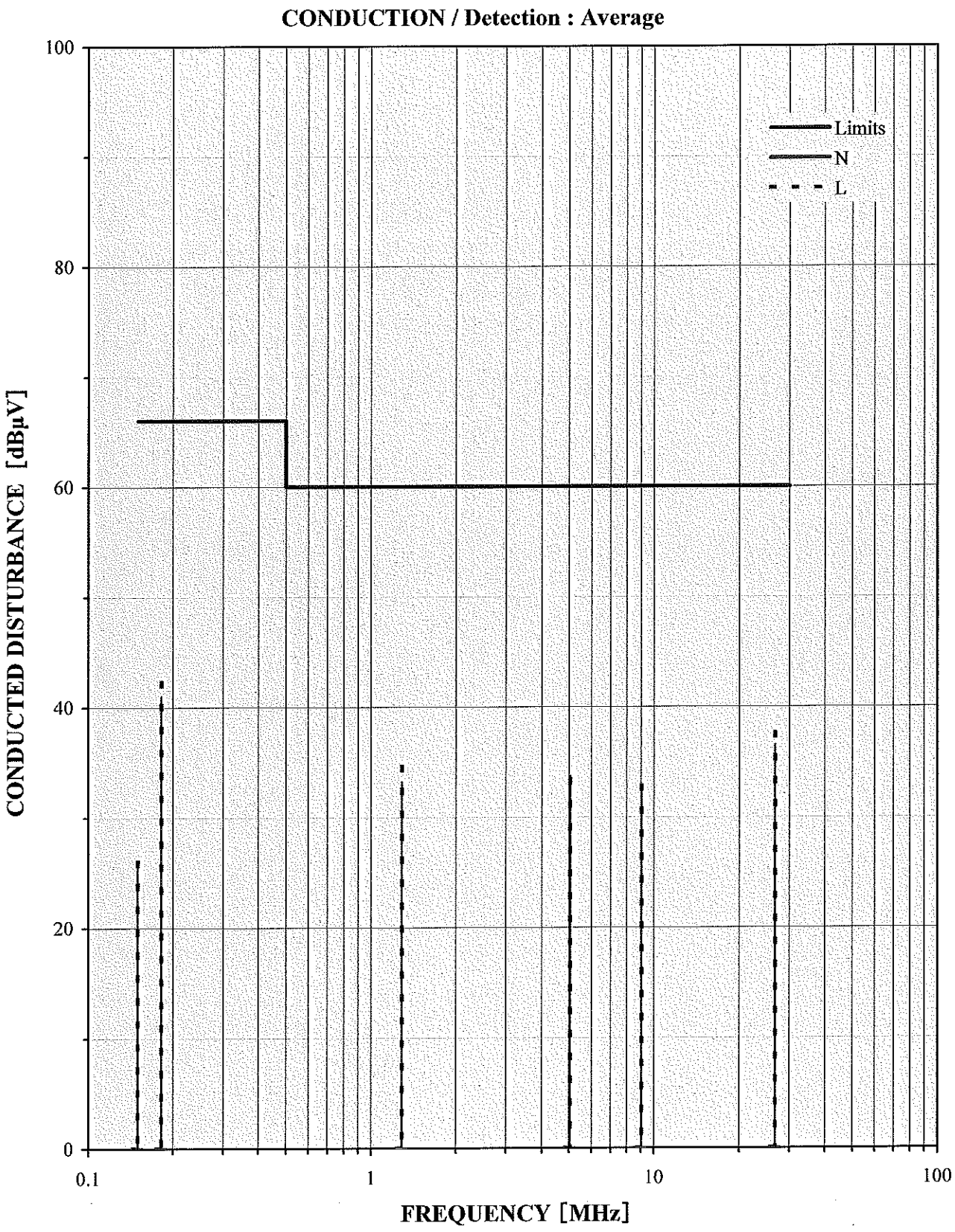
Detection **Average**

DATA No. 8 **(Refer to Graph 8)**

Frequency (MHz)	Reading (dBμV) N	Reading (dBμV) L	Cor.F. (dB) N	Cor.F. (dB) L	Result (dBμV) N	Result (dBμV) L	Limits (dBμV)	Margin (dB) N	Margin (dB) L
0.150	15.8	15.7	10.3	10.3	26.1	26.0	66.0	39.9	40.0
0.182	30.7	32.0	10.3	10.3	41.0	42.3	66.0	25.0	23.7
1.291	22.8	24.2	10.4	10.4	33.2	34.6	60.0	26.8	25.4
5.043	23.1	22.8	10.6	10.6	33.7	33.4	60.0	26.3	26.6
9.034	22.0	22.2	10.6	10.6	32.6	32.8	60.0	27.4	27.2
26.736	25.7	26.5	10.8	11.1	36.5	37.6	60.0	23.5	22.4

Note
- A sample calculation: Cor. F. (correction factor)= LISN(AMN) voltage division factor + cable loss
Result = Reading + Cor. F.
Margin = Limit- Result

Graph 8


CONDUCTION / Detection : Average
CONDUCTED DISTURBANCE [dBµV]
100
80
60
40
20
0
0.1
1
10
100
FREQUENCY [MHz]
Limits
N
L