



# TEST REPORT



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**Test Report No.** : R281012  
**Issue Date** : January 17, 2018

## EUT Information

**Applied Standard** : FCC Part 15, Subpart B  
**Trade Name** : LAUREL  
**Category** : NOTESORTER  
**Model Name** : K12(JDU-65)  
**Serial Number** : Syoukai13017

**JEL Limited**

Contents

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<u>Text</u>	<u>Page</u>
Contents -----	2
Statement -----	3
Configuration of the EUT -----	4
Condition of the EUT -----	5
Test Site Description -----	6
Test Procedure -----	8
List of test equipment used for the test -----	10
Test results -----	11
Radiated disturbance -----	11
Conducted disturbance -----	23
Photograph of the EUT -----	27

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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 : K12(JDU-65)  
Serial number : Syoukai13017  
Intended environment : Financial Institution  
Date of receipt : November 26, 2017  
EUT condition : Production model, not damaged  
Highest frequency : 1000MHz

## Test Performed

Test started : December 5, 2017  
Test completed : December 6, 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 : R281012  
Issue date : January 17, 2018

This test report is issued under the authority of:



Fumio Miyauchi, Manager, EMC Dept.

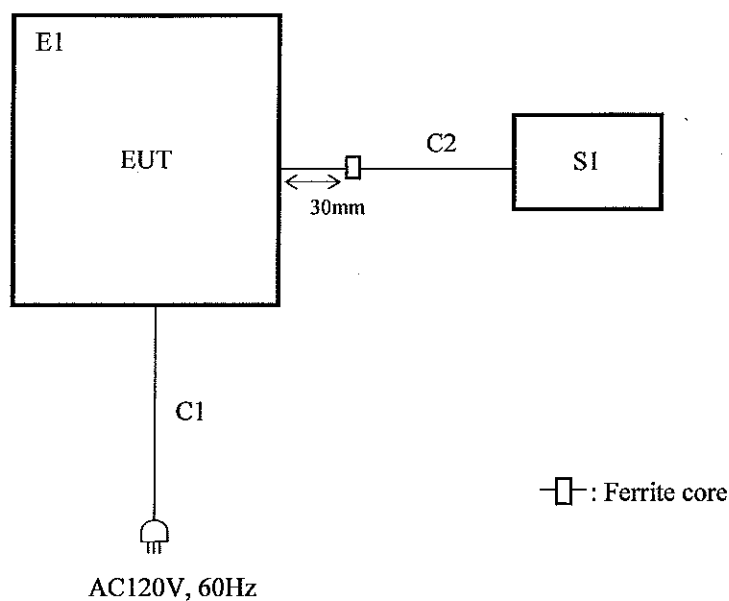
The test was supervised by:



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	K12	Syukai13017	LAUREL PRECISION MACHINES CO., LTD.	Refer to note FCC ID: 2ARVCK4K8K12

Note: Rated input power: AC 100-240V, 50/60Hz, 490W.

**■ 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
-	1.4 m	0.5 m	0.73 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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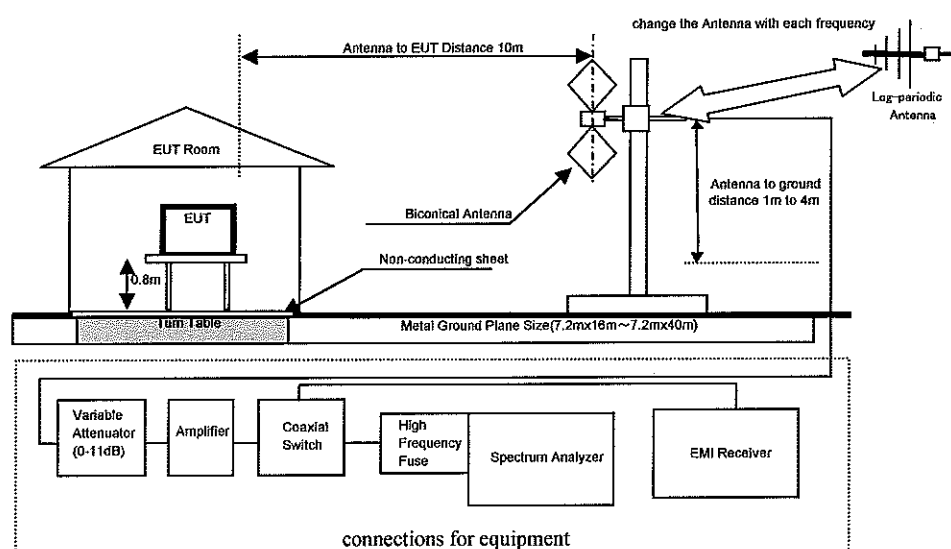
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## Test Site Description

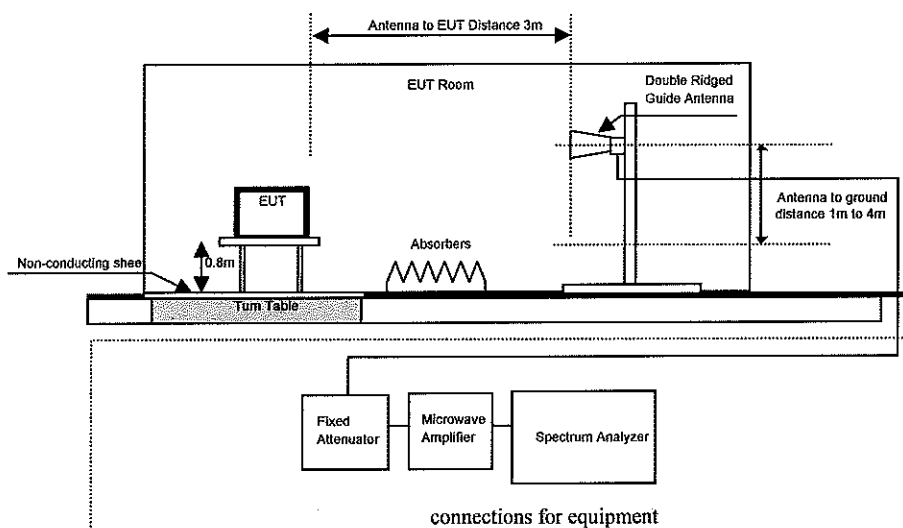
### 1-Facility

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)

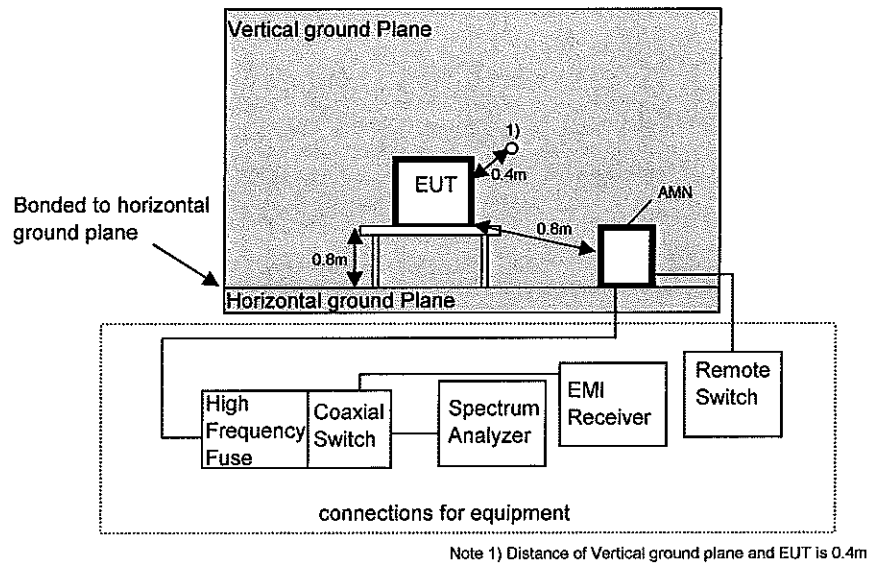


#### 2-2 Radiated Disturbance Measurement (above 1GHz)



## Test Site Description

### 2-3 Conducted Disturbance Measurement



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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 ( $50\Omega/50\mu\text{H}$ ) 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 and 6, 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 : K12(JDU-65)  
Serial Number : Syoukai13017

**Operating mode of EUT during the test**

Working

**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°C  
Humidity : 51%  
Operator : K. Asano

**Polarization Vertical**

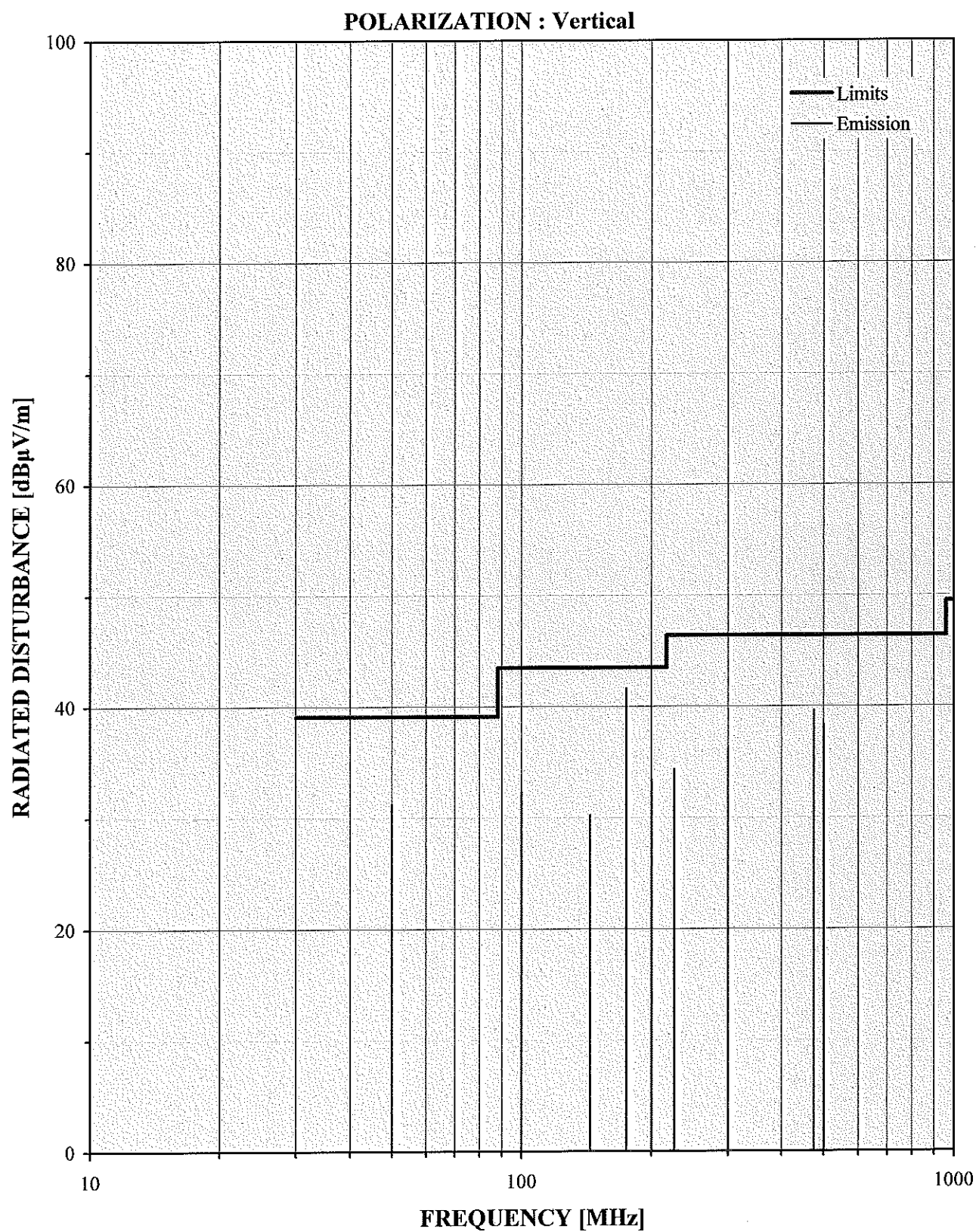
Frequency (MHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 1		(Refer to Graph 1 ) Margin (dB)
			Result (dBμV/m)	Limits (dBμV/m)	
50.00	39.4	-8.2	31.2	39.1	7.9
100.00	40.9	-8.6	32.3	43.5	11.2
144.00	33.4	-3.2	30.2	43.5	13.3
175.00	43.0	-1.4	41.6	43.5	1.9 *
200.00	33.7	-0.3	33.4	43.5	10.1
225.00	33.9	0.4	34.3	46.4	12.1
300.00	43.3	-7.0	36.3	46.4	10.1
475.00	40.2	-0.6	39.6	46.4	6.8
500.00	38.4	-0.1	38.3	46.4	8.1

**Note**

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

\* : This value should be taken with the measurement uncertainty.

**Graph 1**



**Radiated Disturbance Measurements (30MHz to 1000MHz)****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**Operating mode of EUT during the test**

Working

**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°C  
Humidity : 51%  
Operator : K. Asano

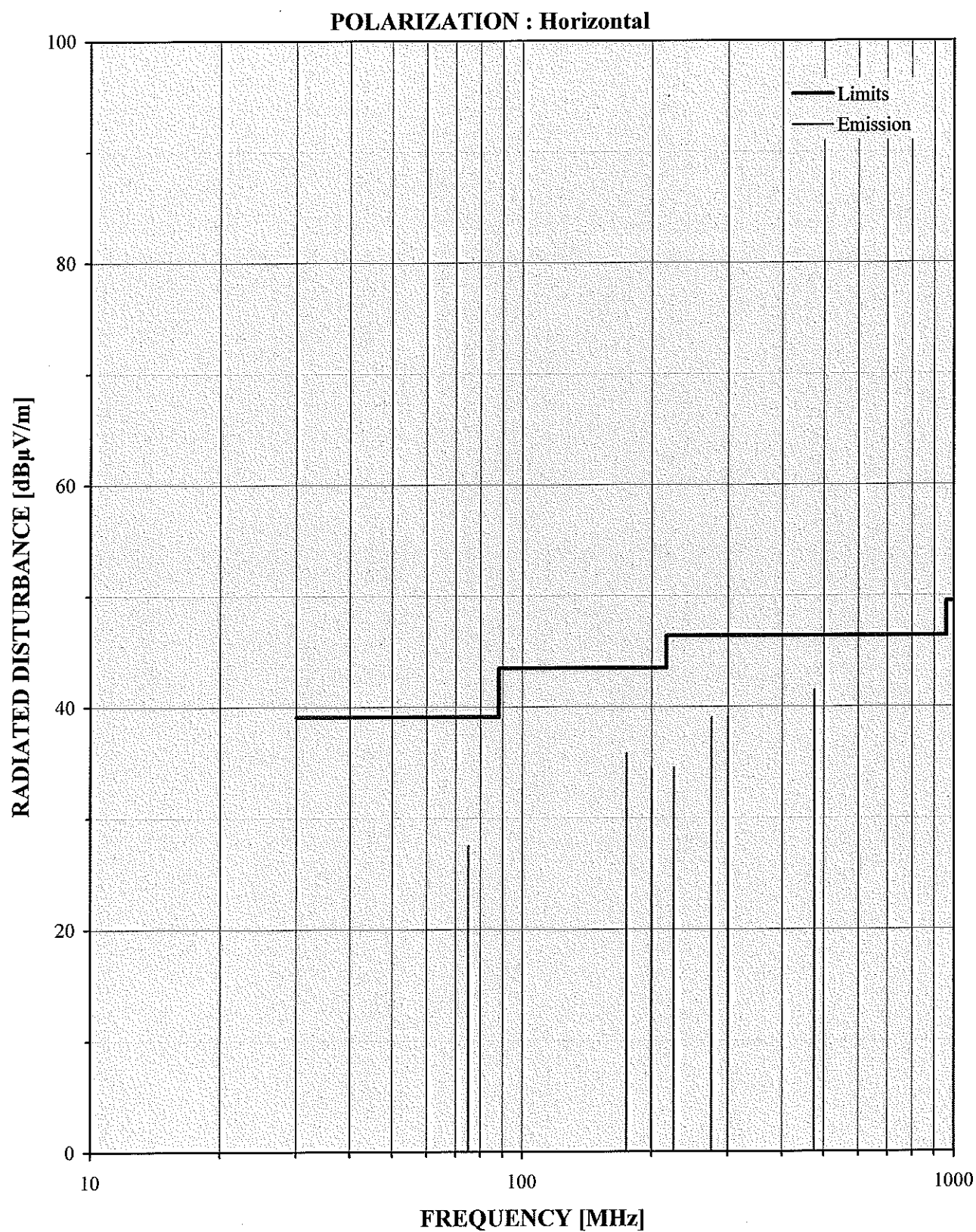
**Polarization Horizontal**

Frequency (MHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 2		(Refer to Graph 2 ) Margin (dB)
			Result (dBμV/m)	Limits (dBμV/m)	
75.00	39.8	-12.3	27.5	39.1	11.6
175.00	37.2	-1.4	35.8	43.5	7.7
200.00	34.7	-0.3	34.4	43.5	9.1
225.00	34.1	0.4	34.5	46.4	11.9
275.00	36.3	2.7	39.0	46.4	7.4
300.00	46.1	-7.0	39.1	46.4	7.3
475.00	42.1	-0.6	41.5	46.4	4.9

**Note**

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

**Graph 2**



**Radiated Disturbance Measurements (1GHz to 5GHz)****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**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 : Peak  
Temperature : 18°C  
Humidity : 51%  
Operator : K. Asano

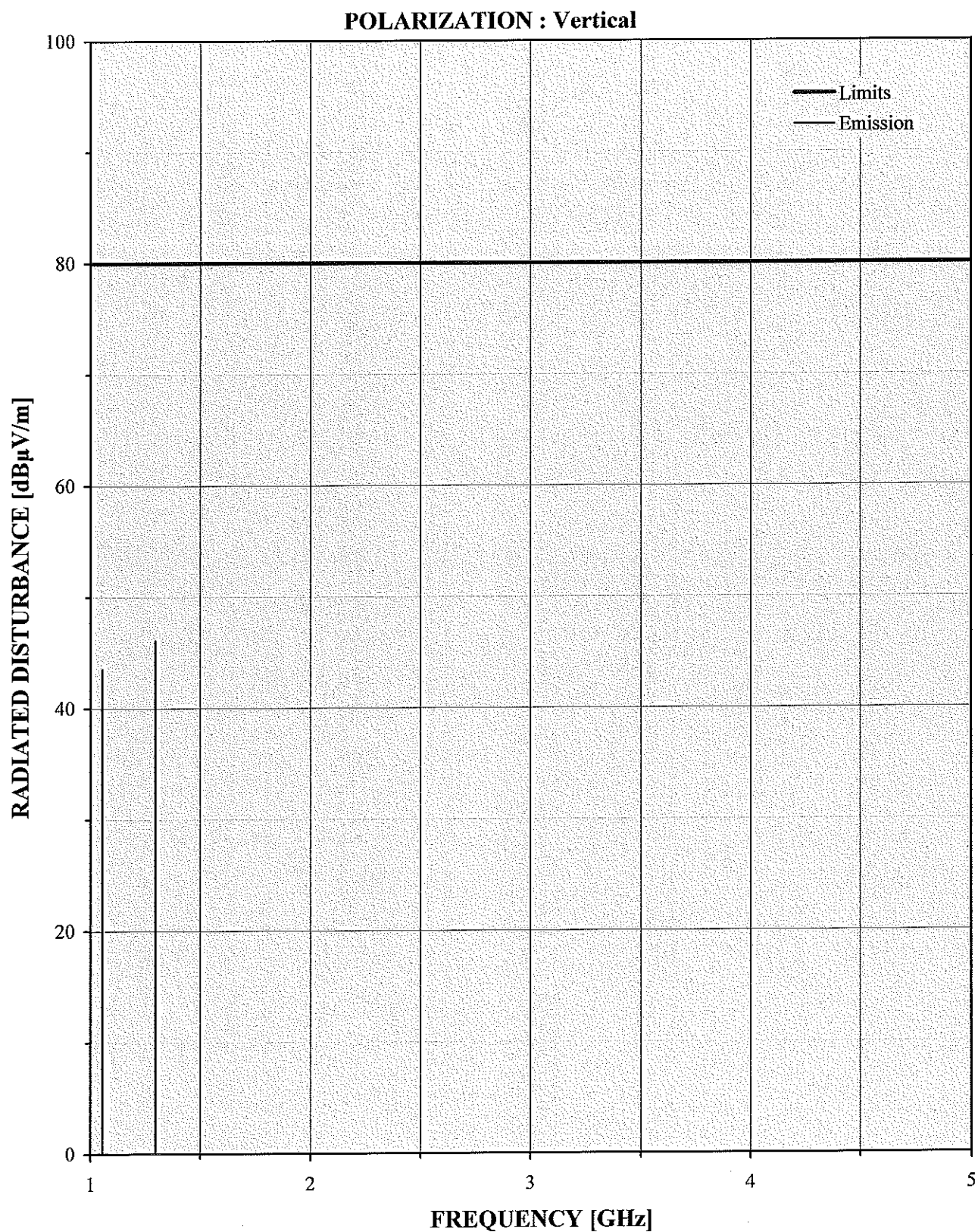
**Polarization Vertical**

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 3		(Refer to Graph 3)
			Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.055	54.4	-10.9	43.5	80.0	36.5
1.296	58.6	-12.5	46.1	80.0	33.9

**Note**

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

**Graph 3**



**Radiated Disturbance Measurements (1GHz to 5GHz)****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**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°C  
Humidity : 51%  
Operator : K. Asano

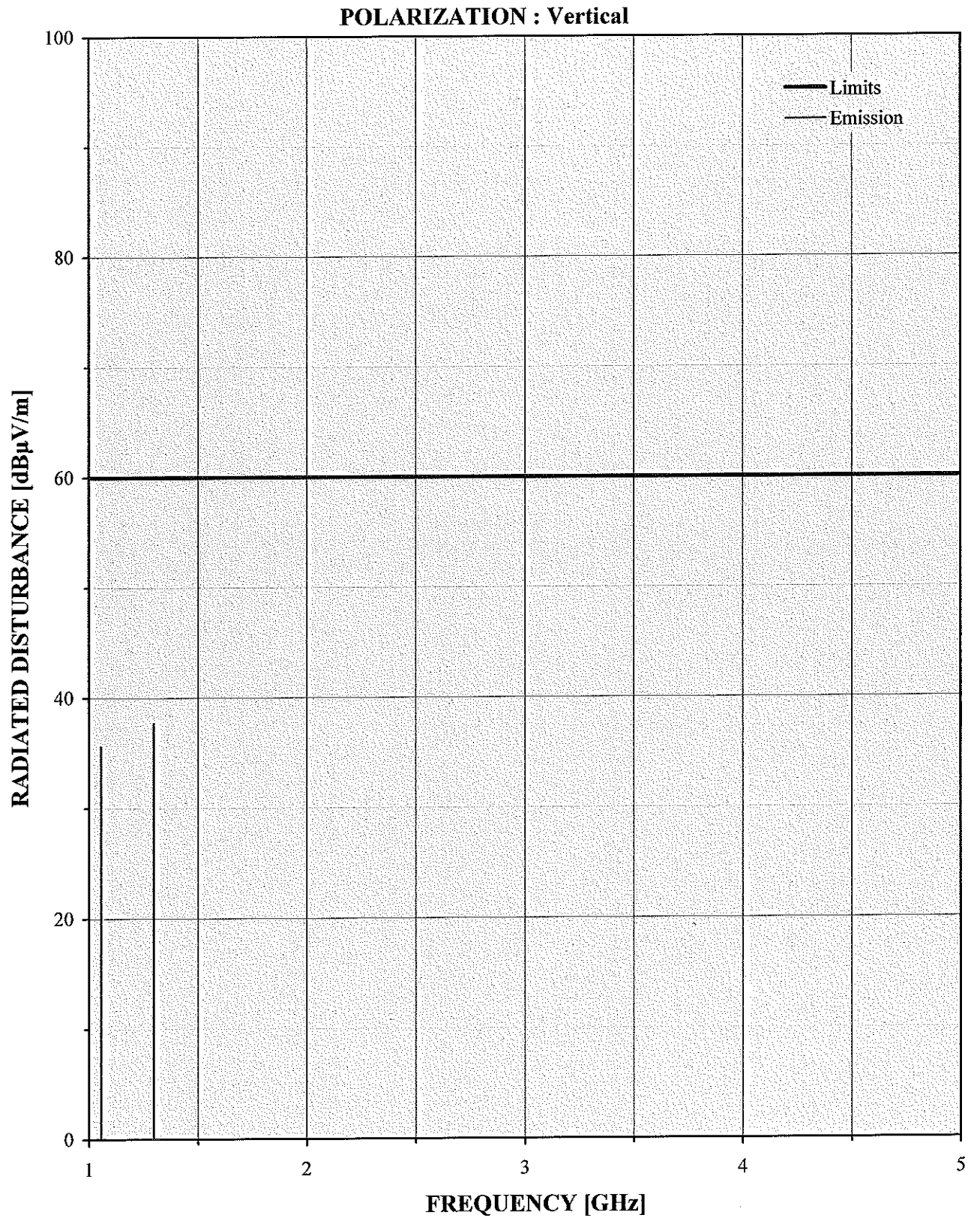
**Polarization Vertical**

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 4		(Refer to Graph 4 ) Margin (dB)
			Result (dBμV/m)	Limits (dBμV/m)	
1.056	46.5	-10.9	35.6	60.0	24.4
1.296	50.2	-12.5	37.7	60.0	22.3

**Note**

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

**Graph 4**



**Radiated Disturbance Measurements (1GHz to 5GHz)****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**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 : Peak  
Temperature : 18°C  
Humidity : 51%  
Operator : K. Asano

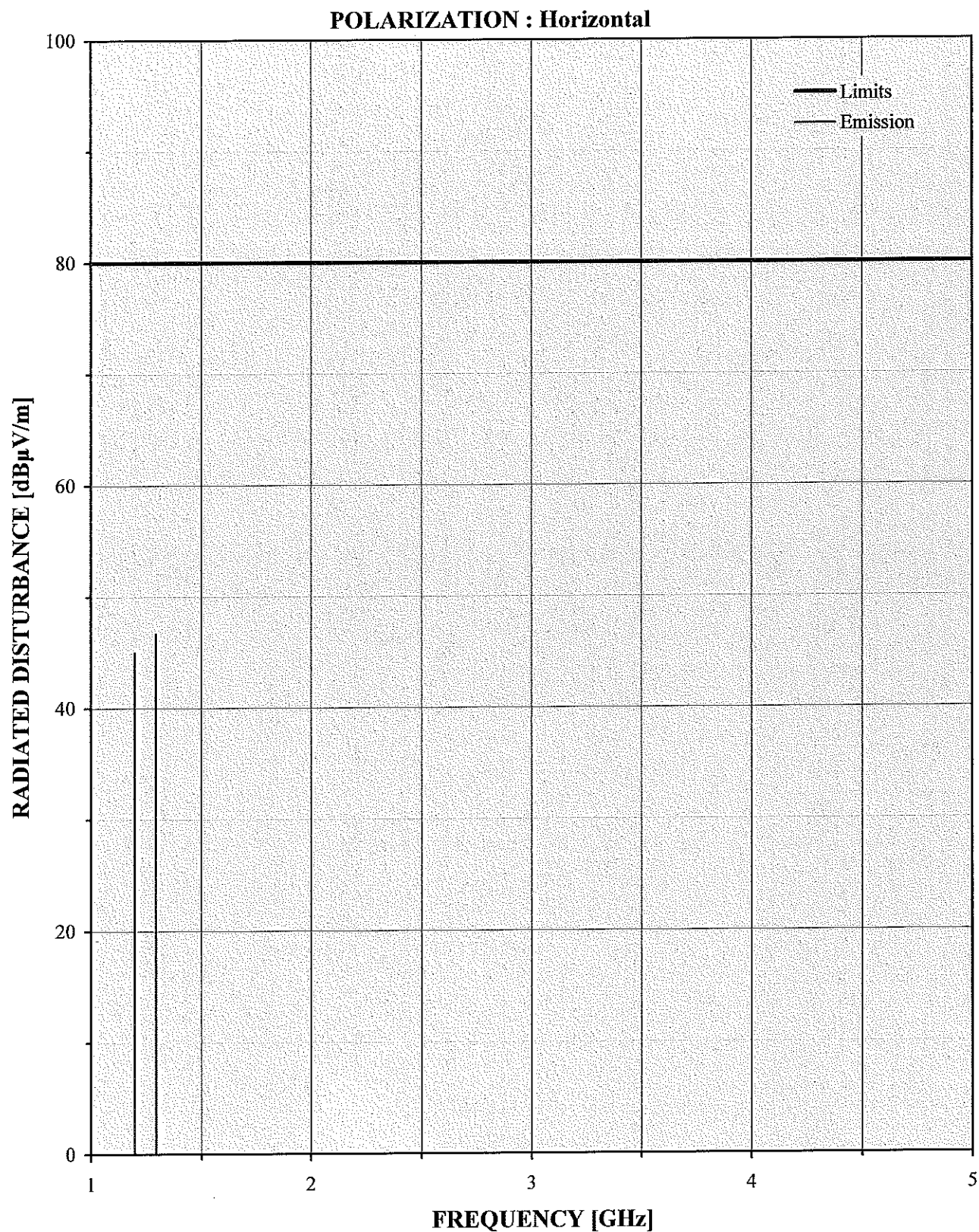
**Polarization Horizontal**

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 5 (Refer to Graph 5)		
			Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	56.8	-11.8	45.0	80.0	35.0
1.296	59.2	-12.5	46.7	80.0	33.3

**Note**

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

**Graph 5**



**Radiated Disturbance Measurements (1GHz to 5GHz)****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**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°C  
Humidity : 51%  
Operator : K. Asano

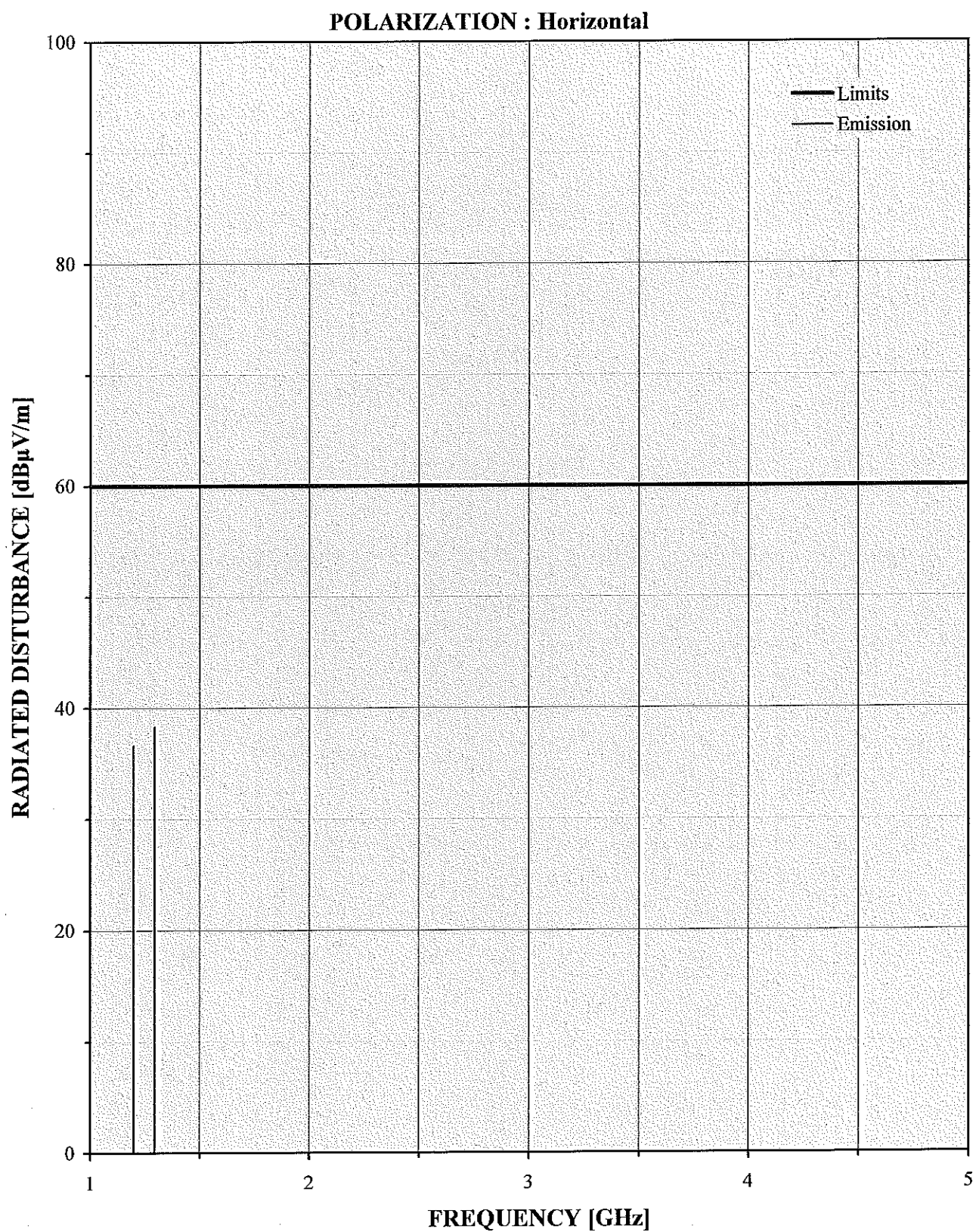
**Polarization Horizontal**

Frequency (GHz)	Reading (dBμV)	Cor.F. (dB/m)	DATA No. 6 (Refer to Graph 6)		
			Result (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1.200	48.4	-11.8	36.6	60.0	23.4
1.296	50.8	-12.5	38.3	60.0	21.7

**Note**

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

**Graph 6**



**Conducted Disturbance Measurements****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**Test Condition**

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

**Operating mode of EUT during the test**

Working

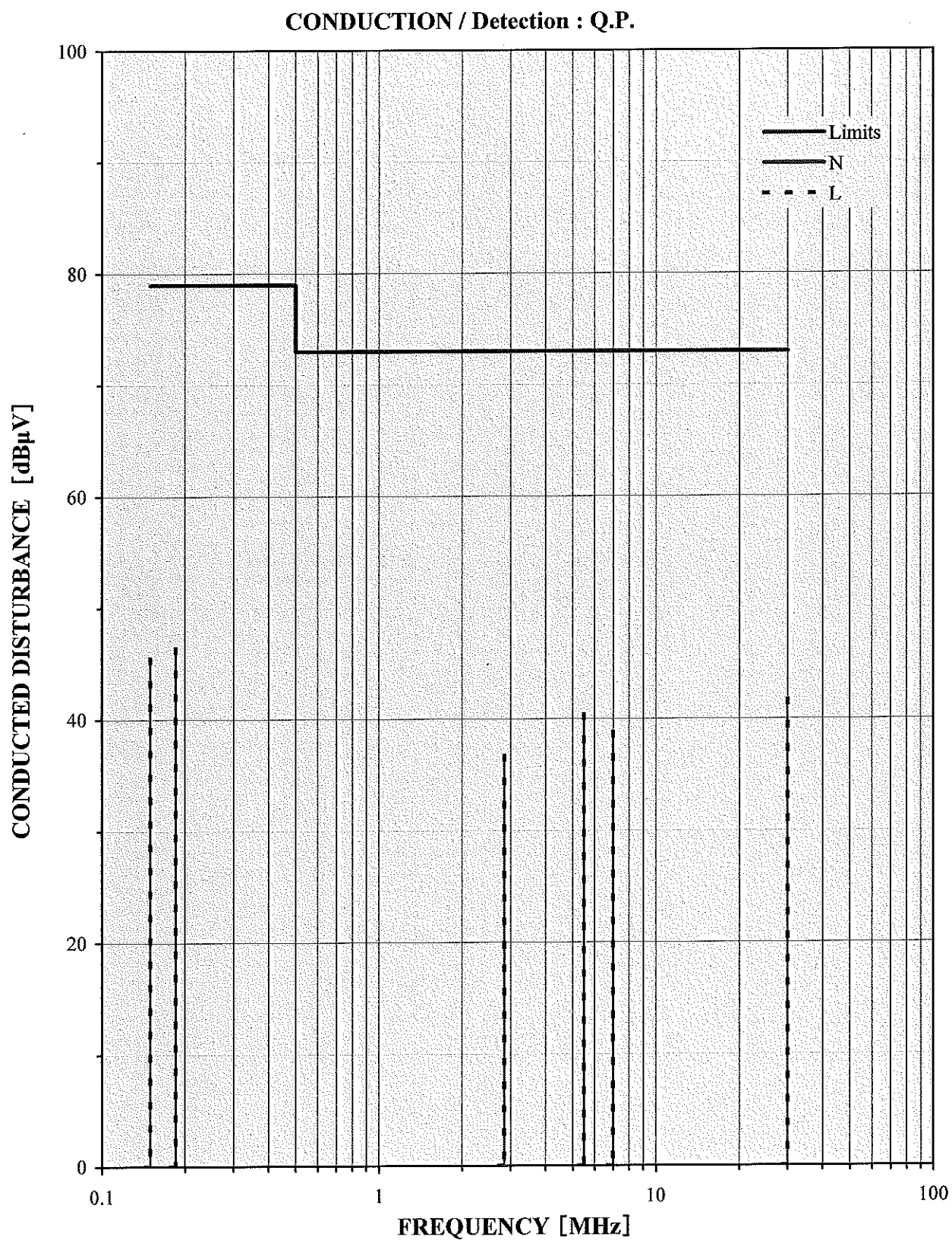
**Detection****Q.P.**

Frequency (MHz)	Reading (dBμV) N L		Cor.F. (dB) N L		DATA No. 7		(Refer to Graph 7)	
					Result		Limits	
					(dBμV) N L		(dBμV) N L	
0.150	35.2	35.2	10.3	10.3	45.5	45.5	79.0	33.5 33.5
0.185	35.8	36.1	10.3	10.3	46.1	46.4	79.0	32.9 32.6
2.840	25.8	26.2	10.4	10.5	36.2	36.7	73.0	36.8 36.3
5.489	29.5	29.8	10.6	10.6	40.1	40.4	73.0	32.9 32.6
6.984	28.2	28.2	10.6	10.6	38.8	38.8	73.0	34.2 34.2
29.976	30.8	30.5	10.7	11.2	41.5	41.7	73.0	31.5 31.3

**Note**

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

Graph 7



**Conducted Disturbance Measurements****Test Specification**

Applied standard : FCC Part 15, Subpart B  
Class A

**EUT**

Category : NOTESORTER  
Model Name : K12(JDU-65)  
Serial Number : Syoukai13017

**Test Condition**

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

**Operating mode of EUT during the test**

Working

<b>Detection</b>		<b>Average</b>				<b>DATA No. 8</b>		<b>(Refer to Graph 8 )</b>	
Frequency (MHz)	Reading		Cor.F.		Result		Limits	Margin	
	(dBμV)		(dB)		(dBμV)			(dB)	
	N	L	N	L	N	L		N	L
0.150	19.3	19.2	10.3	10.3	29.6	29.5	66.0	36.4	36.5
0.185	30.1	30.6	10.3	10.3	40.4	40.9	66.0	25.6	25.1
2.840	24.2	24.2	10.4	10.5	34.6	34.7	60.0	25.4	25.3
5.489	26.8	27.1	10.6	10.6	37.4	37.7	60.0	22.6	22.3
6.984	25.9	25.9	10.6	10.6	36.5	36.5	60.0	23.5	23.5
29.974	29.4	29.2	10.7	11.2	40.1	40.4	60.0	19.9	19.6

**Note**

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

Graph 8

