

**RADIO TEST REPORT**

(for Bluetooth classic)

Project No. : JB-Z0280  
 Client : Sony Corporation  
 Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
 Type of Equipment : Digital Music Player  
 Model No. : NW-A45  
 FCC ID : AK8NWA40  
 Regulation Applied : 47 CFR Part 15 Subpart C  
**Final Judgment : Passed**  
 Sample Receipt : April 24, 2017  
 Testing : May 03, 2017 - May 24 2017  
 Reported : May 24, 2017  
 Amend Reported : June 28, 2017

Reported by :

Approved Signatory :



Takanori Oho  
 Technical Manager  
 EMC/RF Test Laboratory, Main Lab.  
 Design Technology Division  
 Sony Global Manufacturing & Operations Corporation

Teruki Kurihara  
 Technical Manager  
 EMC/RF Test Laboratory, Main Lab.  
 Design Technology Division  
 Sony Global Manufacturing & Operations Corporation

*Notice*

- \* *These test results relate only to the items (combination equipment, test configuration, operation condition etc.) tested.*
  - \* *This report shall not be reproduced except in full, without written approval of the laboratory.*
  - \* *This report must not be used by the client to claim product endorsement by A2LA or any agency of the U.S. Government.*
  - \* *All test results are traceable to the national and / or international standards.*
- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in Sony Global Manufacturing & Operations Corporation EMC/RF Test Laboratory.*



TESTING CERT #3203.01

## TABLE OF CONTENTS

<b>1. General Information .....</b>	<b>3</b>
1.1. Description of Equipment Under Test (EUT).....	3
1.2. Summary of Test Result.....	4
1.3. Tested Methodology .....	5
1.4. Measurement Procedures .....	5
1.5. Test Facility.....	8
1.6. Uncertainty .....	8
<b>2. System Test Configuration.....</b>	<b>9</b>
2.1. Validation .....	9
2.2. Test Operating Conditions .....	9
2.3. EUT Modifications .....	9
2.4. Configuration of Tested System .....	10
<b>3. Test Data.....</b>	<b>12</b>
3.1. AC Power-line Conducted Emissions .....	12
3.2. 20dB Bandwidth.....	13
3.3. Carrier Frequency Separation.....	15
3.4. Number of Hopping Frequencies .....	16
3.5. Time of Occupancy (Dwell Time).....	17
3.6. Maximum Peak Conducted Output Power.....	20
3.7. Radiated Spurious Emissions.....	21
3.8. Conducted Spurious Emissions for Band Edge.....	71
<b>4. Method of Calculation.....</b>	<b>72</b>
<b>5. List of Test Equipment .....</b>	<b>74</b>
5.1. AC Power-line Conducted Emissions .....	74
5.2. Antenna-port Conducted Measurements.....	74
5.3. Radiated Spurious Emissions.....	74
<b>6. Photographs of test setup .....</b>	<b>75</b>
6.1. AC Power-line Conducted Emissions Measurements Photo(s).....	75
6.2. Antenna-port Conducted Measurements Photo(s) .....	75
6.3. Radiated Spurious Emissions Measurement Photo(s).....	76

Note

- indicates that the listed condition, standard or equipment is applicable for this report.
- indicates that the listed condition, standard or equipment is not applicable for this report.

## 1. General Information

### 1.1. Description of Equipment Under Test (EUT)

#### General specification

Test Sample Condition :  Prototype  Pre-production  Mass-production  
 Type of Equipment : Digital Music Player  
 Trade Name : SONY  
 Model No. : NW-A45  
 Serial No. : 1000106, 1000182  
 Power Rating : DC 3.7V

#### Similar model (to be covered by this Report)

Model No. :

Model No.	Point of Difference
NW-A45	Memory size only. (16 GB) *EUT
NW-A46	Memory size only. (32 GB)
NW-A47	Memory size only. (64 GB)

This point of difference do not affect the measurement results.

Total 3 models are covered by this report.

#### Radio specification

Function of the Equipment : Transceiver  
 Operating Frequency : 2402 - 2480MHz  
 Modulation Type : FHSS (GFSK,  $\pi/4$ DQPSK, 8DPSK)  
 Channel Spacing : 1MHz  
 Channel Bandwidth : 1MHz  
 Number of channels : 79  
 Antenna Type : Inverted-F antenna  
 Antenna connector Type : None  
 Antenna Gain : -0.72 dBi  
 Operating Temperature : +5 to +35 deg.C

## 1.2. Summary of Test Result

Test Item	Worst Margin	Test Frequency band	Results
AC Power-line Conducted Emissions	12.90 dB (QP) 0.150 MHz L1	150 kHz - 30 MHz	Complied
20dB Bandwidth	Refer to the test data	Carrier	Complied
Carrier Frequency Separation	Refer to the test data	Carrier	Complied
Number of Hopping Frequencies	Refer to the test data	Carrier	Complied
Time of Occupancy (Dwell Time)	Refer to the test data	Carrier	Complied
Maximum Peak Conducted Output Power	21.94 dB	Carrier	Complied
Radiated Spurious Emissions	5.4 dB (AV) 7206.038 MHz Vertical	9 kHz - 25 GHz (excluding carrier and band edge)	Complied
Conducted Spurious Emissions for Band Edge *1	33.00 dB Margin 2399.98 MHz	Carrier band edge	Complied

\*1: Conducted Spurious Emission was tested for the only frequencies in the non-restricted carrier band edges, since the spurious emissions in other non-restricted band were complied with Radiated Spurious Emission measurement.

\*2: This item was not applied to the EUT since its transmission is stopped when the battery is being charged by the PC connected to AC Power-line.

## Other requirements

Part 15.31(e) Supply voltage requirement

: Complied (The EUT was tested with a new battery)

Part 15.203 / 212 Antenna requirement

: Complied (The EUT has an internal antenna which cannot be replaced by users)

## 1.3. Tested Methodology

Test Standard : 47 CFR Part15 Subpart C Section 15.207 / 15.247  
 Test Method : ANSI C63.10 - 2013  
 DA 00-705 (March 30, 2000)

## Test Condition

## Radiated Spurious Emissions

Test Distance :  3 m  10m (9kHz - 30 MHz)  
 3 m  10m (30 - 1000 MHz)  
 3 m (1 - 25 GHz)

Dimensions of the EUT table : 0.8m (below 1GHz) or 1.5m (above 1GHz) height, 1.5m width and 1m depth.

## AC Power-line Conducted Emissions

Dimensions of the EUT table : 0.8m height, 2m width and 1m depth.

## 1.4. Measurement Procedures

We performed the measurements in accordance with NV3-12, available upon the request.

- No deviation  
 Deviation from the above procedure

The summary of the above procedure is mentioned below

Antenna-port Conducted Measurements

1. Antenna-port of the EUT was connected to the power sensor (Maximum peak conducted output power) or spectrum analyzer. (other test items).
2. For each EUT operation mode, the Antenna-port Conducted Measurements were measured with power meter or spectrum analyzer.

Test Item	Detector	RBW
<b>* Antenna-port Conducted Measurements</b>		
20dB Bandwidth	Peak	30 kHz
Carrier Frequency Separation	Peak	100 kHz
Number of Hopping Frequencies	Peak	100 kHz
Time of Occupancy (Dwell Time)	Peak	1 MHz
Maximum Peak Conducted Output Power	Peak	N/A
Conducted Spurious Emissions for Band Edge	Peak	100 kHz

AC Power-line Conducted Emissions

1. The non-conductive table (EUT table) made of ( FRP,  wood,  other non-conductive material) was placed 0.4 m from its rear to the vertical reference ground plane.
2. The EUT was placed on the center of tabletop and its rear was flush with the rear of the table, connected through a LISN to the input power mains.
3. The LISN was placed in 80 cm from the nearest part of the EUT chassis.
4. The excess length of the AC cable between the EUT and the LISN receptacle, or an adaptor or extension cable connected to and measured with LISN, was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
5. The connection of the all other equipment to the second LISN was performed. The second LISN was terminated with a 50-ohm terminator.
6. Interconnecting cables that hang closer than 40 cm to the horizontal reference ground plane was folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between the horizontal reference ground plane and the tabletop.
7. Find the worst mode and arrangement of the EUT according to the follows:
  - Connecting all peripherals and change the position of peripherals and cables.
  - Changing the all test operation modes of the EUT.
  - On every condition, exploring the highest emissions with the spectrum analyzer.  
(150kHz - 30MHz, peak detector, RBW: 10 kHz)
8. On the worst condition of the EUT found in above, choose the 6 highest emissions on the spectrum data. The final measurements carried out on these emissions with EMI test receiver.  
(quasi-peak and average detector, RBW: 9 kHz)

Radiated Spurious Emissions

1. The non-conductive table (EUT table) made of ( FRP,  Styrene Foam,  other non-conductive material) was placed in the center of the turntable.
2. The EUT was placed on the center of the tabletop.
3. The test antenna was placed away from the EUT at test distance.
4. The limits were compensated the distance factor with follows;  
 9 kHz - 490 kHz [Limit at 3m] = [Limit at 300m] + 40log (300[m] / 3[m])  
 490 kHz - 30 MHz [Limit at 3m] = [Limit at 30m] + 40log (30[m] / 3[m])
5. Find the worst arrangement of the EUT according to follows;
  - Rotating the turntable and/or scanning the antenna.
  - On every condition, exploring the highest emissions with the spectrum analyzer. (9 kHz - 25 GHz, peak detector)
6. On the worst arrangement of the EUT found in above, choose the three highest harmonics or spurious emissions on the spectrum data.(\*excluding carrier band edges)  
 The final measurements of all test operating modes carried out on these emissions as follows;

The test antenna and the turntable were performed with follows;

	9kHz - 30MHz	30MHz - 1000MHz	above 1GHz
Antenna	Loop Antenna	Bi-conical Antenna, Log-periodic Antenna	Horn Antenna
Antenna scanning range	1m, Vertical, 360 degrees	1 - 4m, Horizontal and Vertical	1 - 4m *, Horizontal and Vertical
Turntable rotating range	360 degrees	360 degrees	360 degrees

\*: Final measurements are performed keeping the antenna in the "cone of radiation" from EUT area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.

Instruments settings were carried out with follows;

	9 kHz - 90 kHz 110 kHz - 490 kHz	90 kHz- 110 kHz 490 kHz - 30 MHz	30 MHz - 1000 MHz	above 1GHz
Detector	Peak / Average	Quasi-peak	Quasi-peak	Peak / Average
RBW	9 kHz (6dB) *	9 kHz (6dB) *	120 kHz (6dB)	1 MHz (6dB)
VBW	N/A	N/A	N/A	3 MHz (for peak) 10 Hz (for average)
Instrument	EMI test receiver	EMI test receiver	EMI test receiver	Spectrum analyzer

\*: When the measurement frequencies below 150 kHz, RBW: 200 Hz was used.

7. If the final measurement result exceeded the limit(FCC 15.209(a)) in non-restricted band(excluding carrier band edges), the measurement is carried out additionally and compared with the limit (-20dBc) with follows;

Measurement points

- Fundamental Frequency
- Frequency that exceeded the limit in non-restricted band (excluding carrier band edges)

	9 kHz - 150 kHz	150 kHz - 30MHz	above 30MHz
Detector	Peak	Peak	Peak
RBW	6dB RBW: 300 Hz *	6dB RBW: 10 kHz *	6dB RBW: 100 kHz
Instrument	Spectrum analyzer	Spectrum analyzer	Spectrum analyzer

\*: Correction factor of RBW was compensated to a measurement result by the following formula.

$$C.F. \text{ of RBW [dB]} = 10 * \log (100\text{kHz} / \text{used RBW})$$

8. Although these tests were performed other than open field area test site, adequate comparison measurements were confirmed against 30 m open field area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

## 1.5. Test Facility

Address of Test Facility  
 Test Facility Name : Sony Global Manufacturing & Operations Corporation  
 EMC/RF Test Laboratory, Main Lab.  
 Address : Kisarazu Site 8-4 Shiomi Kisarazu-shi, Chiba, 292-0834 Japan  
 Phone : +81 438 37 2750

AC Power-line Conducted Emissions  
 Shielded Room  
 4th Site  EMC Site

Radiated Spurious Emission  
 Semi-Anechoic chamber  
 EMC Site

Antenna-port Conducted Measurements \*  
 Shielded Room  
 4th Site SR1

\*Note: This item contains the following

- 20dB Bandwidth
- Carrier Frequency Separation
- Number of Hopping Frequencies
- Time of Occupancy (Dwell Time)
- Maximum Peak Conducted Output Power
- Conducted Spurious Emissions for Band Edge

A2LA Accreditation for Test Facility

The above test facility has been fully reported to A2LA and accepted as follows:  
 Effective dates: 2015-09-15 through 2017-10-31

## 1.6. Uncertainty

Test Item	Frequency	4th Site SR1
Conducted Output Power	1 - 6GHz	± 0.84 dB
Conducted Spurious Emissions	below 6GHz	± 0.89 dB

Test Item	Frequency	Distance	4th Site	EMC Site
AC Power-line Conducted Emissions	150kHz - 30MHz	-	± 3.34 dB	± 3.35 dB
Radiated Emissions	below 30 MHz	3m	± 2.59 dB	± 3.12 dB
	30 - 300 MHz	3m	± 4.18 dB	± 5.26 dB
	300 - 1000 MHz	3m	± 4.04 dB	± 4.37 dB
	1 - 6 GHz	3m	± 4.63 dB	± 4.90 dB
	6 - 18 GHz	3m	± 5.31 dB	± 5.50 dB
	18 - 26.5 GHz	3m	± 5.78 dB	± 5.63 dB

## 2. System Test Configuration

### 2.1. Validation

The system was configured for testing in a typical (as a customer would normally use it).  
The tests were conducted with the worst case modes as follows.

### 2.2. Test Operating Conditions

The tests have been carried out the following conditions.

Test Items	Operating Mode *1	Packet type *2,3	Test Channels
AC Power-line Conducted Emissions *4	BDR	DH5	2441MHz
Carrier Frequency Separation, Number of Hopping Frequencies, Time of Occupancy (Dwell Time)	BDR	DH5	Hopping ON
	EDR	3DH5	
20dB Bandwidth, Maximum Peak Conducted Output Power, Radiated Spurious Emissions	BDR	DH5	2402MHz, 2441MHz, 2480MHz
	EDR	3DH5	
Conducted Spurious Emissions for Band Edge	BDR	DH5	2402MHz
	EDR	3DH5	

Note:

\*1: Inquiry mode was not performed based on the result of pre-compliance testing.

\*2: The worst packet type has been decided based on the result of maximum duty cycle and pre-compliance testing in the actual product specification.

\*3: Packet type for EDR has been decided based on the result of Maximum Peak Conducted Output Power.

\*4: The final test was performed with the representative mode that had been found as the worst emission mode while exploratory testing.

The Software for Operating Mode

Name: Diagnosis

Version: 2.03.02

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
-	-	-	-	-

### 2.3. EUT Modifications

- No equipment modification to achieve compliance to the standard levels was done during the tests.  
 Equipment was modified to achieve compliance to the standard level as below.

Responsible Party Signature

\_\_\_\_\_  
 Typed/ Print Name :  
 Responsible Party :  
 Position :  
 Date :

2.4. Configuration of Tested System

Antenna-port Conducted Measurements

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-1	Digital Music Player	SONY	NW-A45	1000106

Support equipment for operation

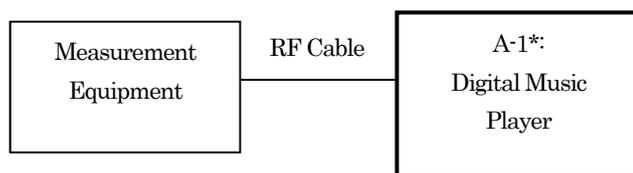
Symbol	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
-	-	-	-	-	-	-

System configuration

\*: EUT



Radiated Spurious Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-2	Digital Music Player	SONY	NW-A45	1000182

Support equipment for operation

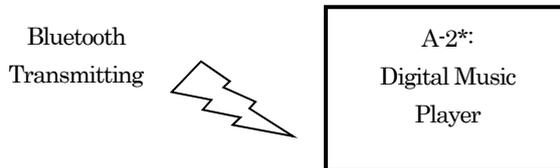
Symbol	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
-	-	-	-	-	-	-

System configuration

\*: EUT



AC Power-line Conducted Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-2	Digital Music Player	SONY	NW-A45	1000182

Support equipment for operation

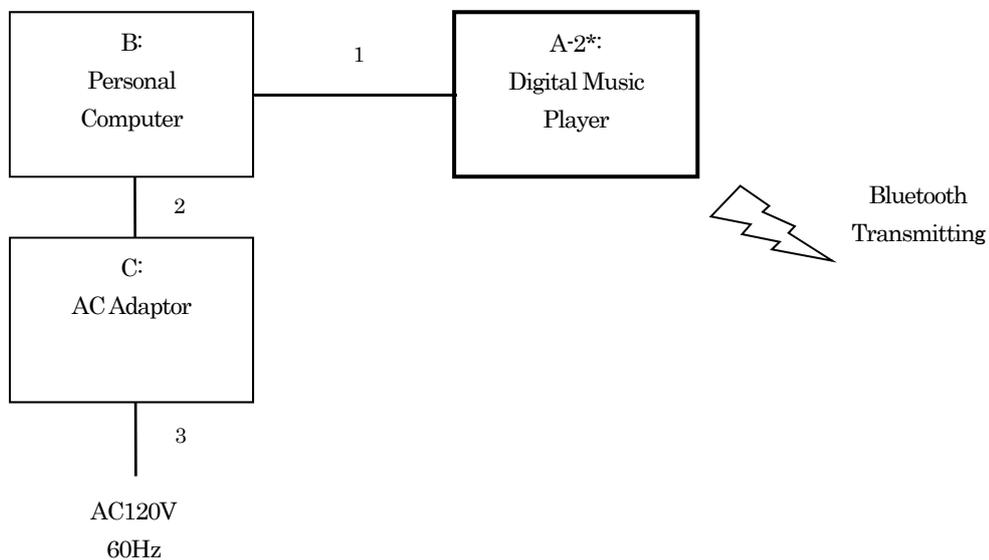
Symbol	Item	Manufacturer	Model No.	Serial No.
B	Personal Computer	HP	HSTNN-I42C	JPH6308MMN
C	AC Adaptor	HP	HSTNN-CA41	WDVTN0CGC9X3WG 0C

Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
1	USB cable	SONY	YES	NO	1.0	-
2	DC cable	-	NO	NO	1.8	-
3	AC cable	-	NO	NO	0.9	-

System configuration

\*: EUT

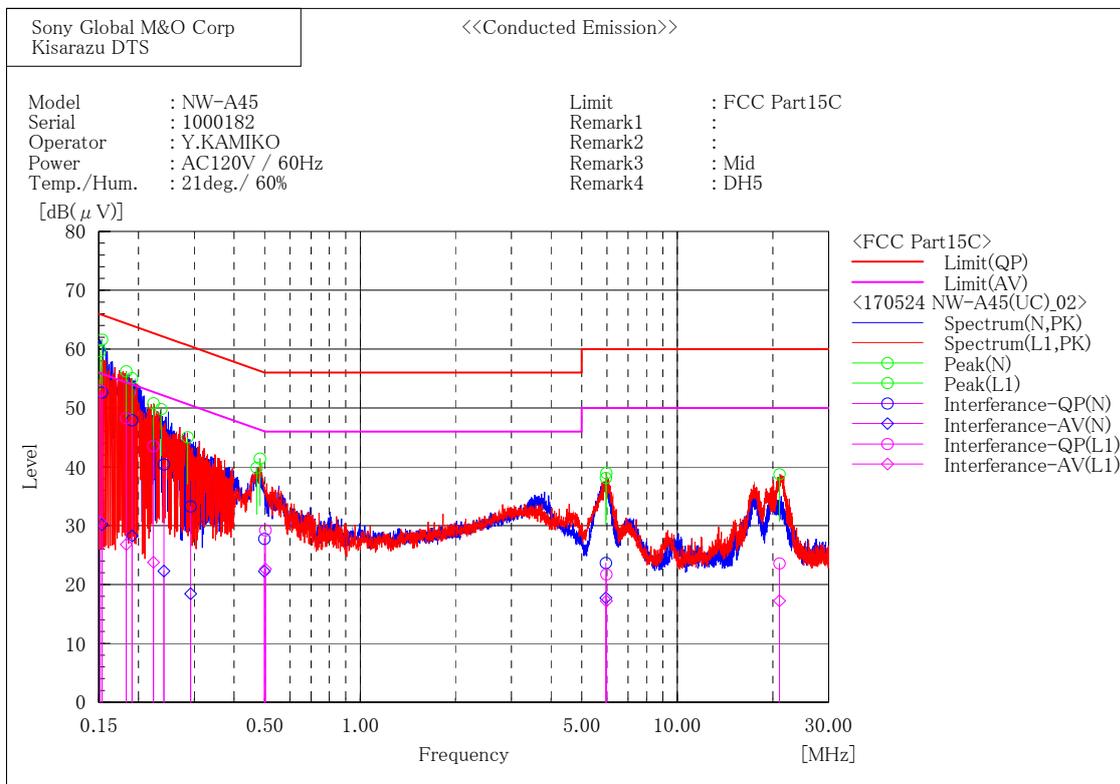


### 3. Test Data

#### 3.1. AC Power-line Conducted Emissions

1) Date of measurement : May 24, 2017

[BDR (DH5) / 2441MHz]



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.154	36.5	14.0	16.1	52.6	30.1	65.8	55.8	13.2	25.7
2	0.191	31.7	12.1	16.2	47.9	28.3	64.0	54.0	16.1	25.7
3	0.241	24.7	6.6	15.7	40.4	22.3	62.1	52.1	21.7	29.8
4	0.292	17.4	2.5	15.9	33.3	18.4	60.5	50.5	27.2	32.1
5	0.499	11.6	6.2	16.1	27.7	22.3	56.0	46.0	28.3	23.7
6	5.960	7.6	1.7	16.0	23.6	17.7	60.0	50.0	36.4	32.3

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.152	37.0	14.7	16.0	53.0	30.7	65.9	55.9	12.9	25.2
2	0.183	32.0	10.5	16.3	48.3	26.8	64.3	54.3	16.0	27.5
3	0.223	27.7	8.0	15.8	43.5	23.8	62.7	52.7	19.2	28.9
4	0.503	13.1	6.5	16.1	29.2	22.6	56.0	46.0	26.8	23.4
5	5.981	5.7	1.2	16.0	21.7	17.2	60.0	50.0	38.3	32.8
6	21.018	7.2	0.9	16.4	23.6	17.3	60.0	50.0	36.4	32.7

3.2. 20dB Bandwidth

- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Result [MHz]	Limit [MHz]
BDR	DH5	2402	1.040	-
		2441	1.036	-
		2480	1.040	-
EDR	3DH5	2402	1.280	-
		2441	1.281	-
		2480	1.285	-

[BDR / 2402MHz]



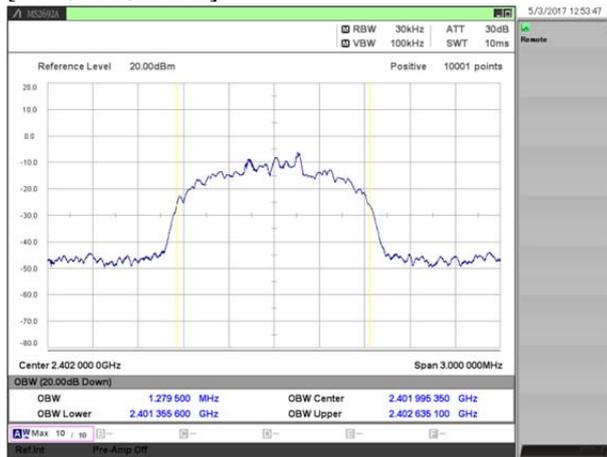
[BDR / 2441MHz]



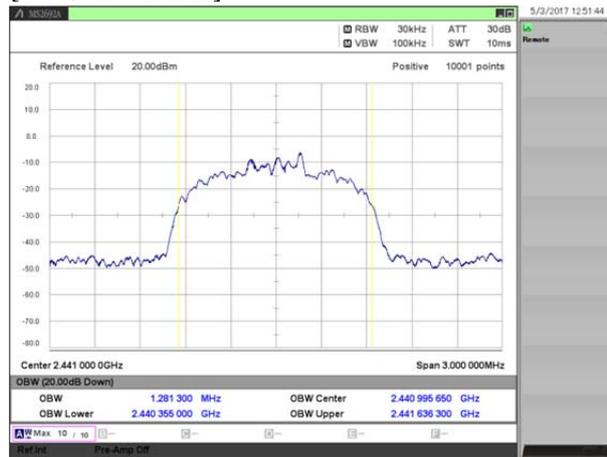
[BDR / 2480MHz]



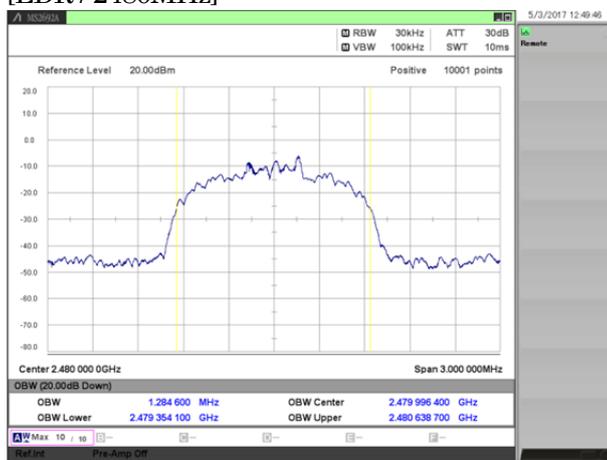
[EDR / 2402MHz]



[EDR / 2441MHz]



[EDR / 2480MHz]



### 3.3. Carrier Frequency Separation

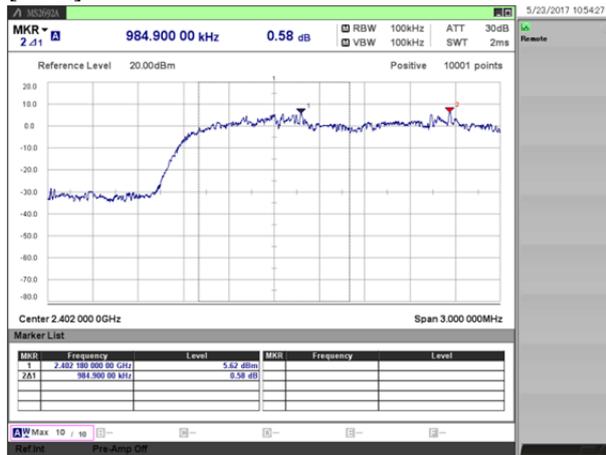
- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Reading [kHz]	Limit [kHz]
BDR	DH5	939.9	≥ 693.2
EDR	3DH5	984.9	≥ 856.4

[BDR]



[EDR]

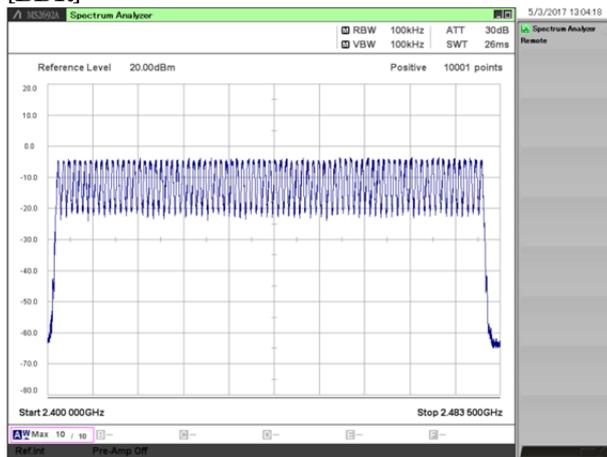


### 3.4. Number of Hopping Frequencies

- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Number [channel]	Limit [channel]
BDR	DH5	79	≥ 15
EDR	3DH5	79	≥ 15

[BDR]



[EDR]



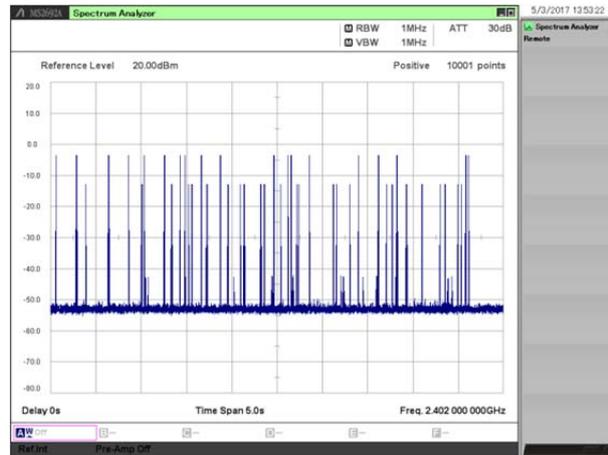
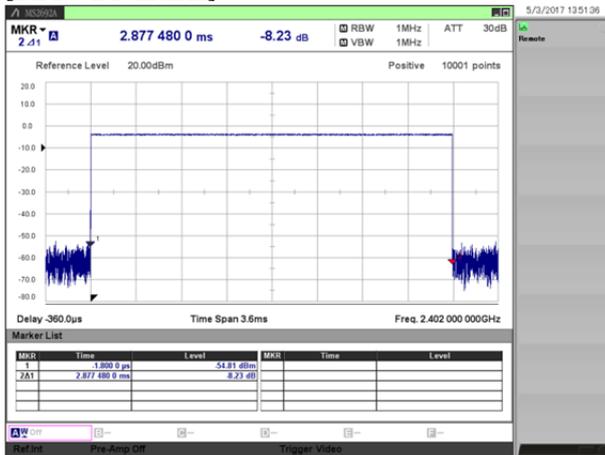
3.5. Time of Occupancy (Dwell Time)

- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

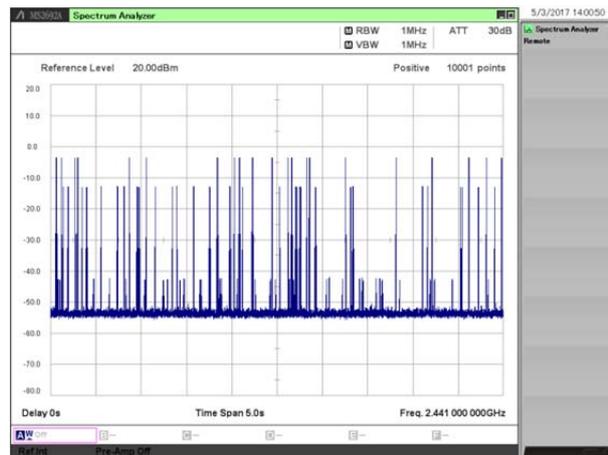
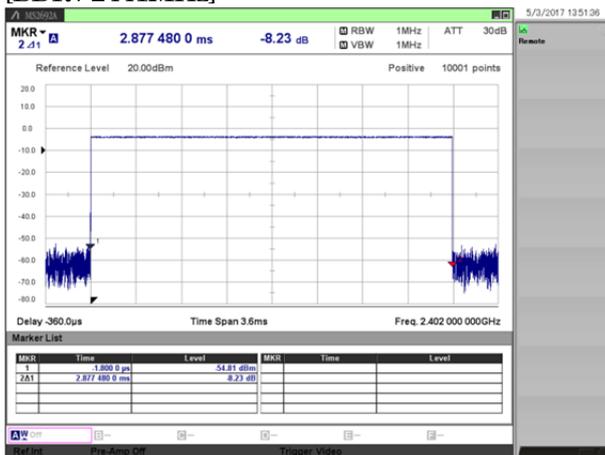
Mode		Channel [MHz]	Dwell Time [msec]	Cycle *1 [time]	Result [msec]	Limit [msec]
BDR	DH5	2402	2.88	16.7	303.1	≤ 400.0
		2441	2.88	16.7	303.2	≤ 400.0
		2480	2.88	16.0	291.0	≤ 400.0
EDR	3DH5	2402	2.88	18.5	337.1	≤ 400.0
		2441	2.88	17.7	321.9	≤ 400.0
		2480	2.88	15.3	279.5	≤ 400.0

\*1: The average appearance of the 6 measurements.

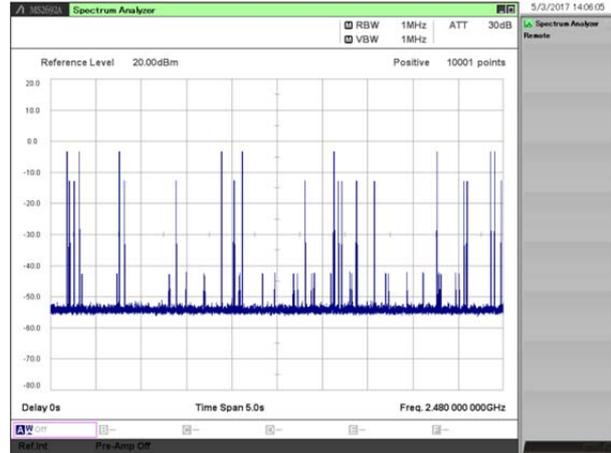
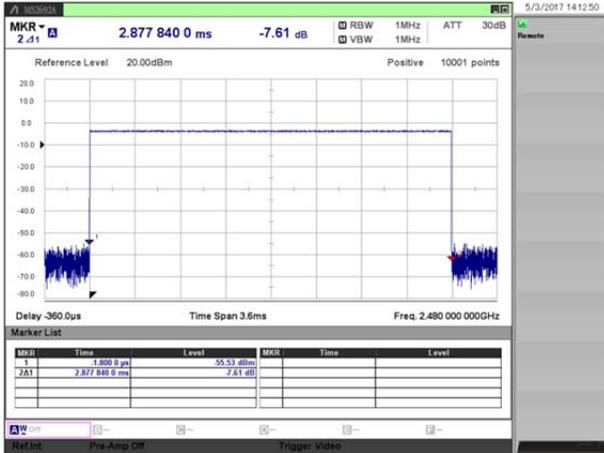
[BDR / 2402MHz]



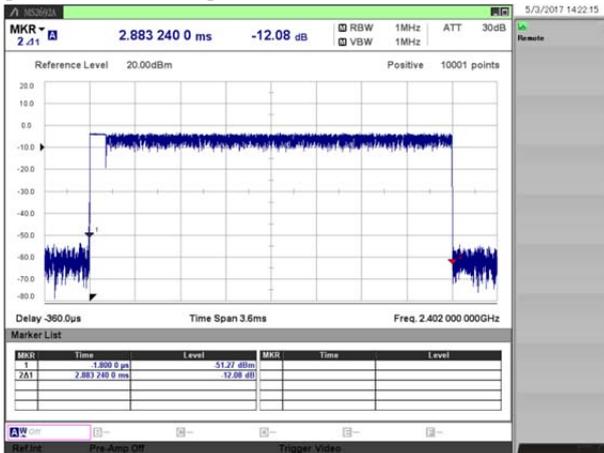
[BDR / 2441MHz]



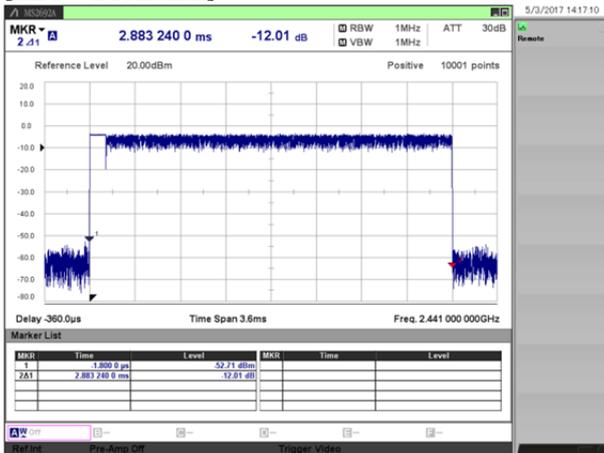
[BDR / 2480MHz]



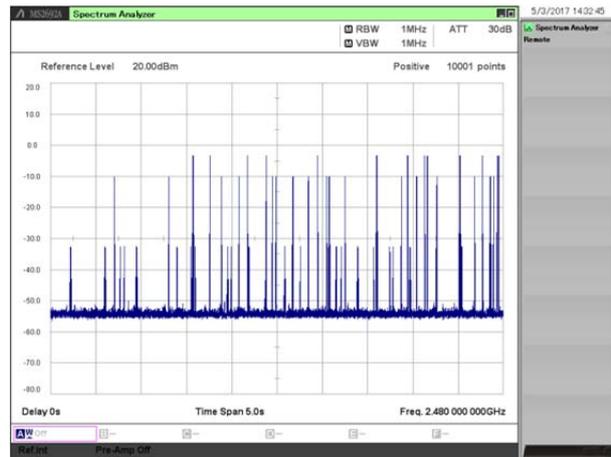
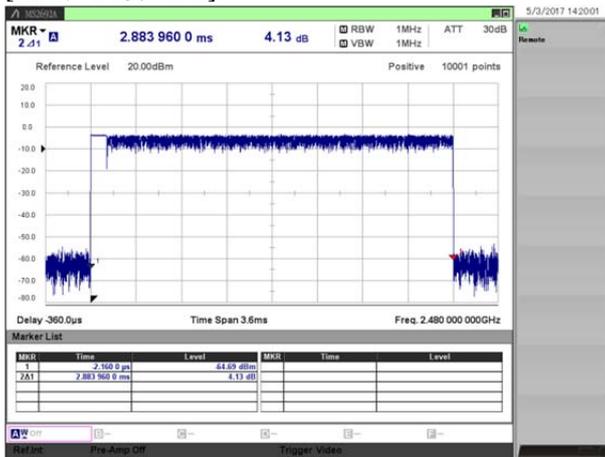
[EDR / 2402MHz]



[EDR / 2441MHz]



[EDR / 2480MHz]



## 3.6. Maximum Peak Conducted Output Power

- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

## Peak Conducted Output Power

Mode		Channel [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Result(PK) [W]	Limit [dBm]	Limit [W]	Margin [dB]
BDR	DH5	2402	-2.88	10.17	7.29	0.00536	30.0	1.0	22.71
		2441	-2.88	10.17	7.29	0.00536	30.0	1.0	22.71
		2480	-2.70	10.17	7.47	0.00558	30.0	1.0	22.53
EDR	2DH5	2402	-2.33	10.17	7.84	0.00608	30.0	1.0	22.16
		2441	-2.43	10.17	7.74	0.00594	30.0	1.0	22.26
		2480	-2.21	10.17	7.96	0.00625	30.0	1.0	22.04
	3DH5	2402	-2.19	10.17	7.98	0.00628	30.0	1.0	22.02
		2441	-2.32	10.17	7.85	0.00610	30.0	1.0	22.15
		2480	-2.11	10.17	8.06	0.00640	30.0	1.0	21.94

## Average Conducted Output Power (for SAR measurement)

Mode		Channel [MHz]	Reading(AV) [dBm]	C.F. [dB]	Duty Factor [dB]	Result(AV) [dBm]	Result(AV) [W]
BDR	DH5	2402	-4.36	10.17	1.12	6.93	0.00493
		2441	-4.32	10.17	1.12	6.97	0.00498
		2480	-4.14	10.17	1.12	7.15	0.00519
EDR	2DH5	2402	-5.83	10.17	1.12	5.46	0.00352
		2441	-5.90	10.17	1.12	5.39	0.00346
		2480	-5.59	10.17	1.12	5.70	0.00372
	3DH5	2402	-5.82	10.17	1.12	5.47	0.00352
		2441	-5.90	10.17	1.12	5.39	0.00346
		2480	-5.58	10.17	1.12	5.71	0.00372

## Duty Cycle check

Mode		Channel [MHz]	T(on+off) [msec]	T(on) [msec]	Duty Cycle [%]
BDR	DH1	2441	1.250	0.377	30.16
	DH3	2441	2.500	1.650	66.00
	DH5	2441	3.740	2.890	77.27
EDR	2DH1	2441	1.250	0.388	31.04
	2DH3	2441	2.500	1.650	66.00
	2DH5	2441	3.740	2.890	77.27
	3DH1	2441	1.250	0.388	31.04
	3DH3	2441	2.500	1.650	66.00
	3DH5	2441	3.740	2.890	77.27

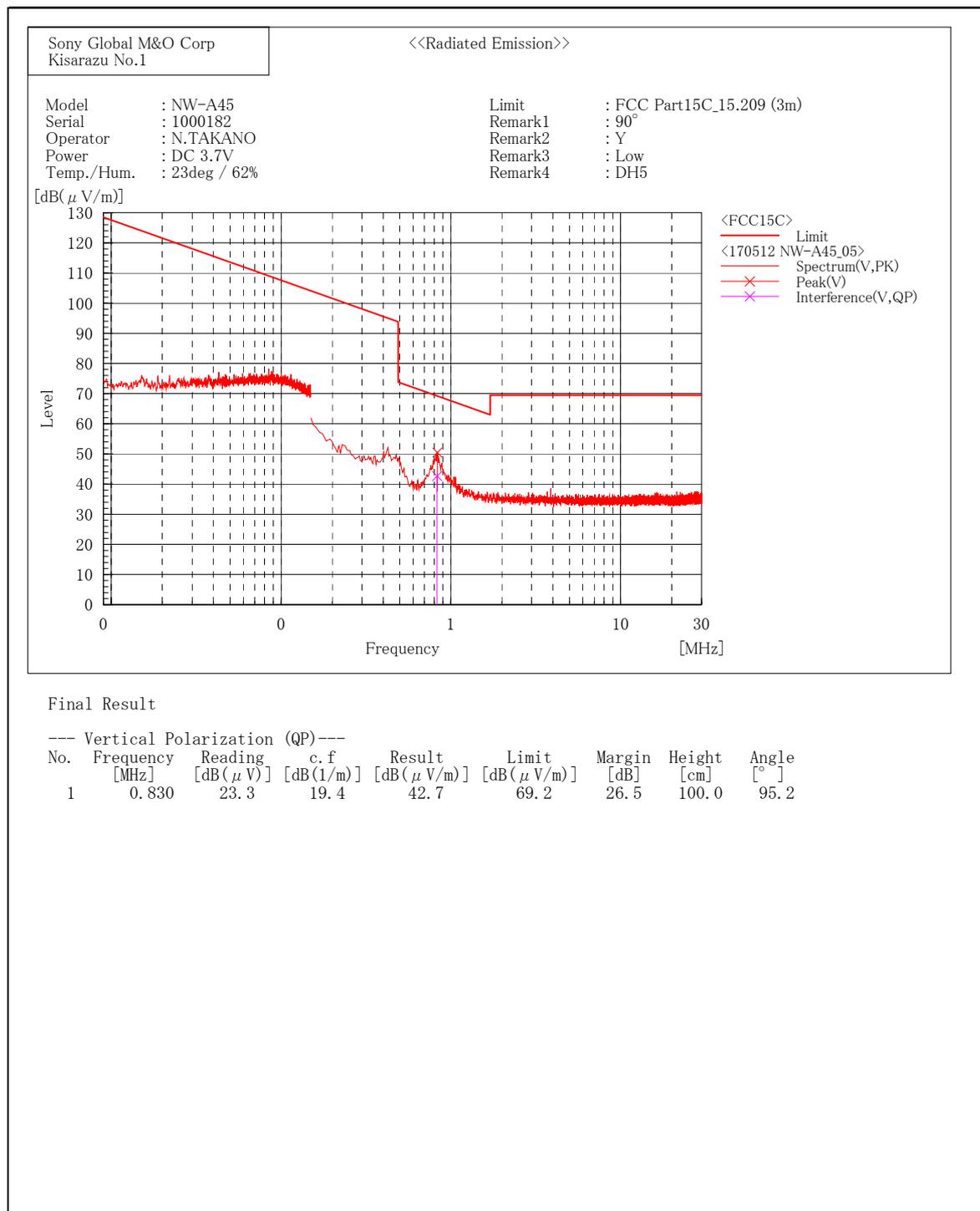
### 3.7. Radiated Spurious Emissions

1) Date of measurement

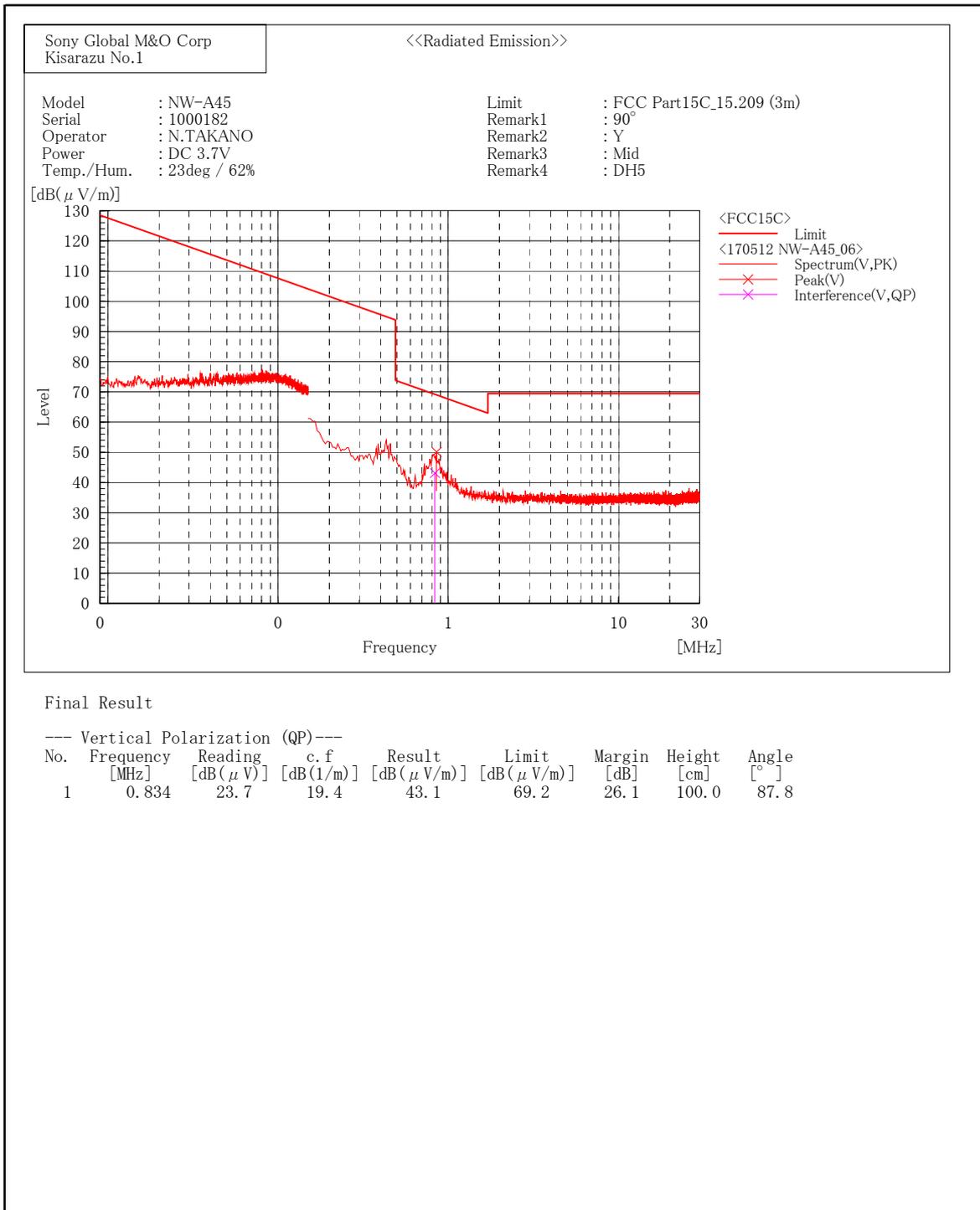
9kHz - 30MHz : May 12, 2017 (all mode)  
 30MHz - 1000MHz : May 10, 2017 (all mode)  
 1GHz - 6GHz : May 08, 2017 (mode: BDR / Mid, EDR / Low, EDR / Mid)  
 : May 12, 2017 (mode: others)  
 6GHz - 18GHz : May 12, 2017 (mode: BDR)  
 : May 15, 2017 (mode: others)  
 18GHz - 24.835GHz : May 09, 2017 (all mode)

#### 9 kHz - 30 MHz

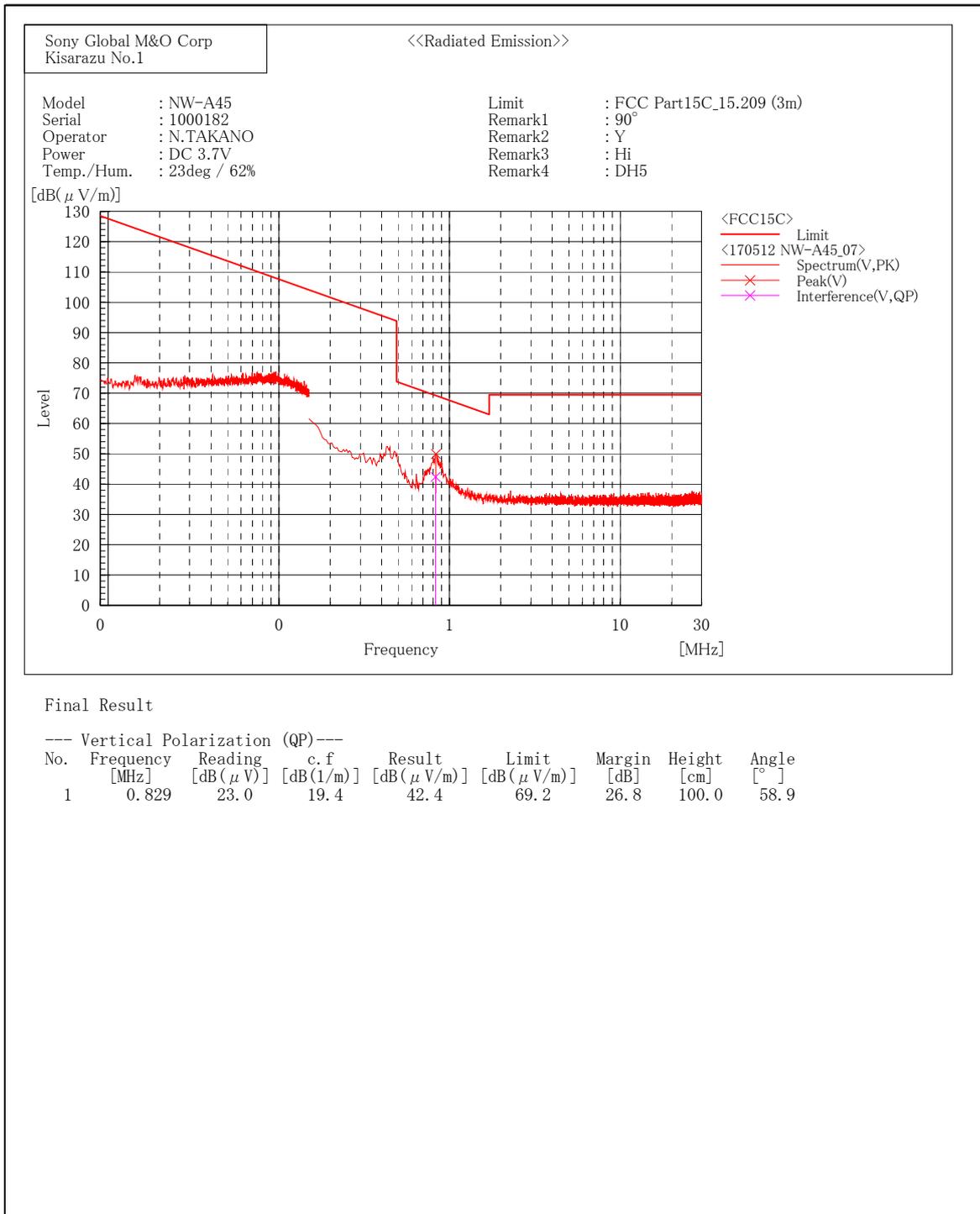
[BDR( DH5 )/2402MHz]



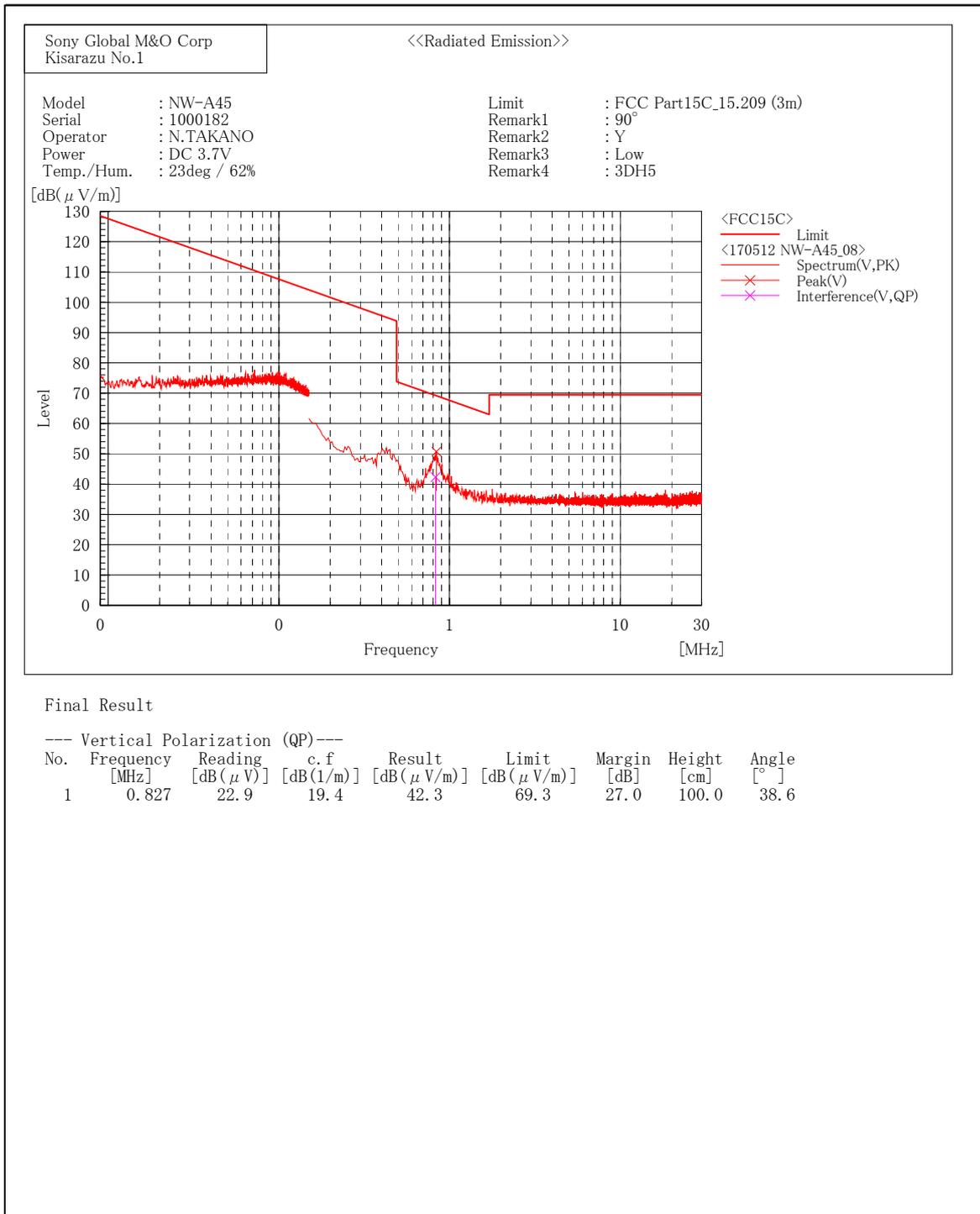
[BDR( DH5 )/2441MHz]



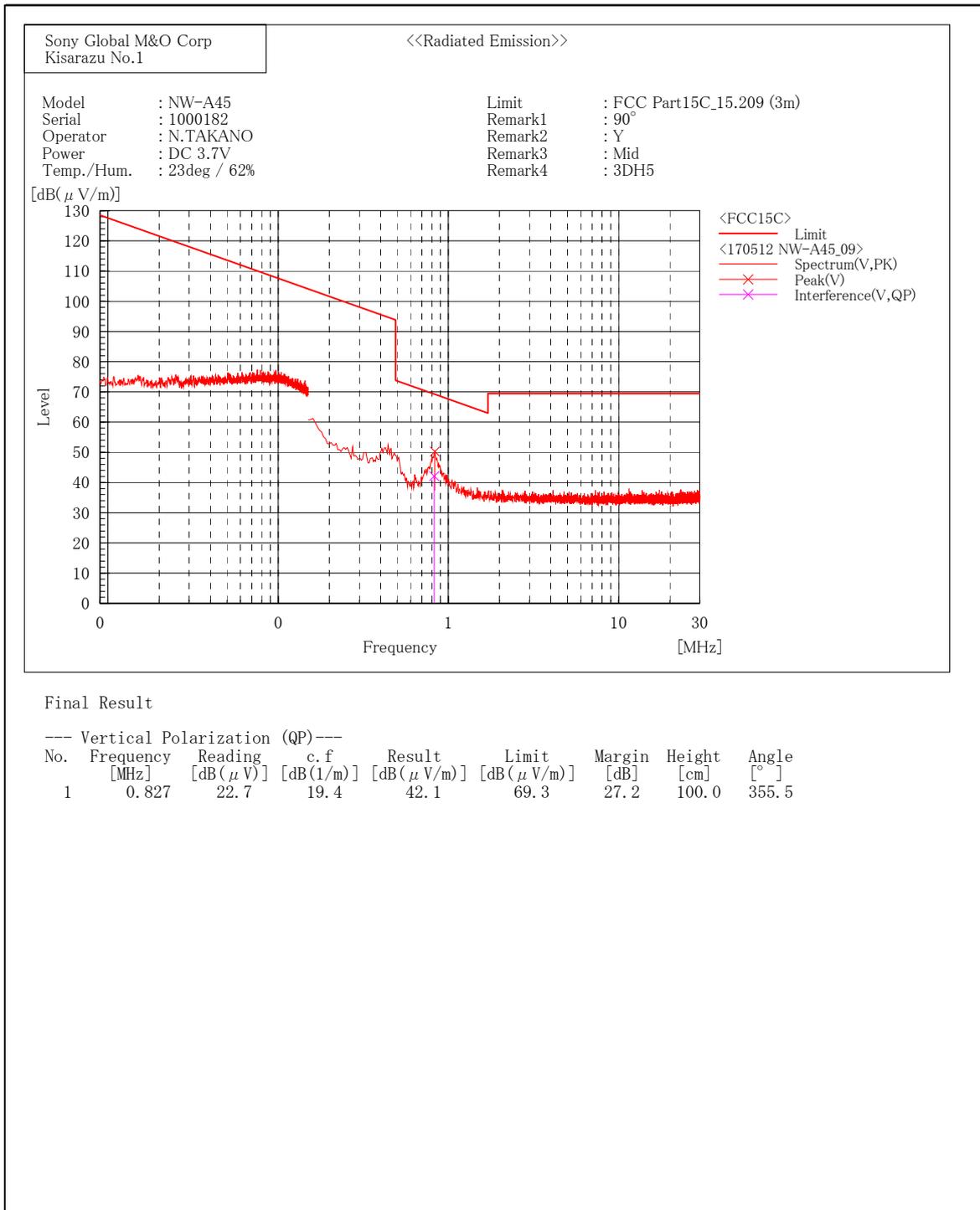
[BDR( DH5 )/2480MHz]



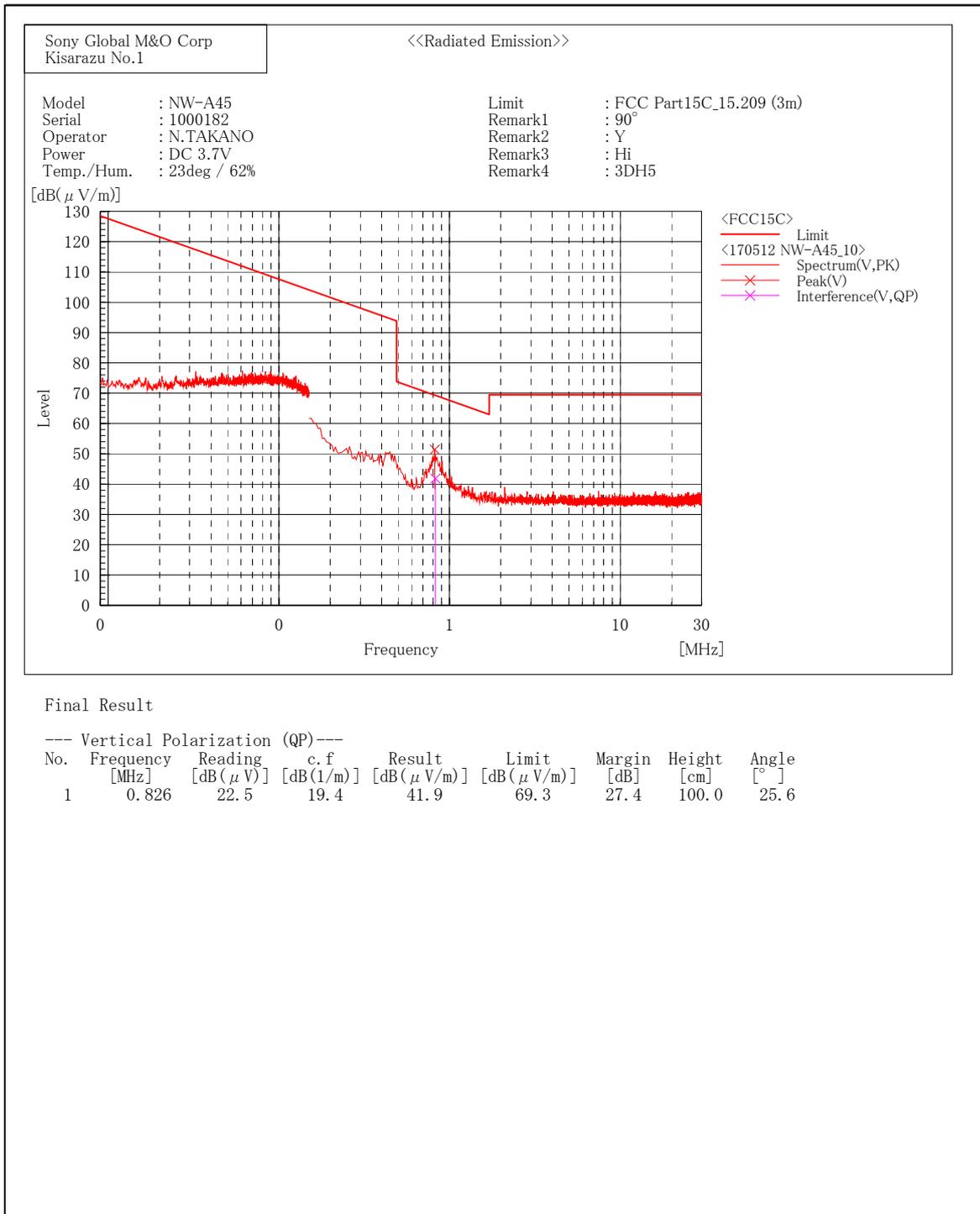
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]

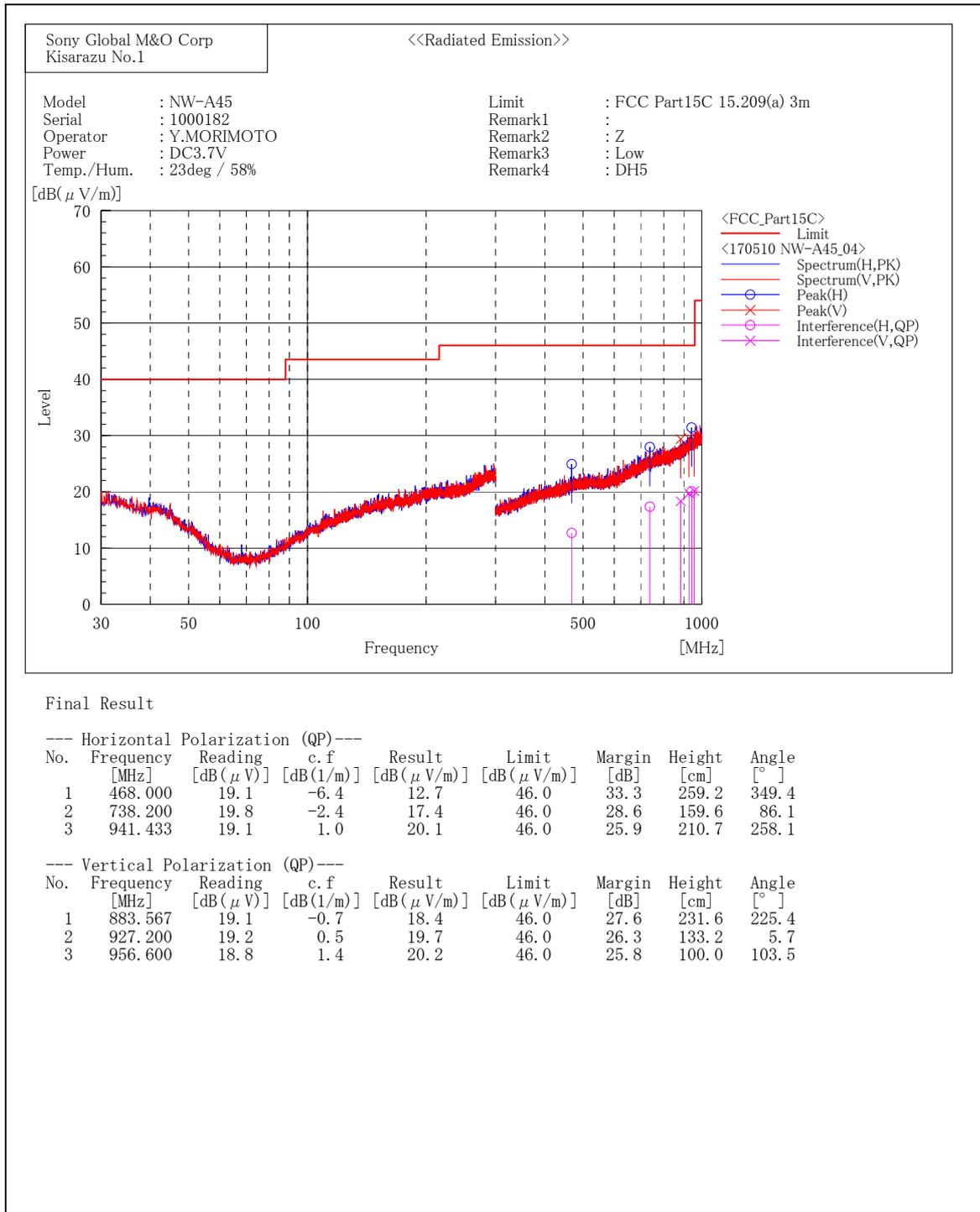


[EDR( 3DH5 )/2480MHz]

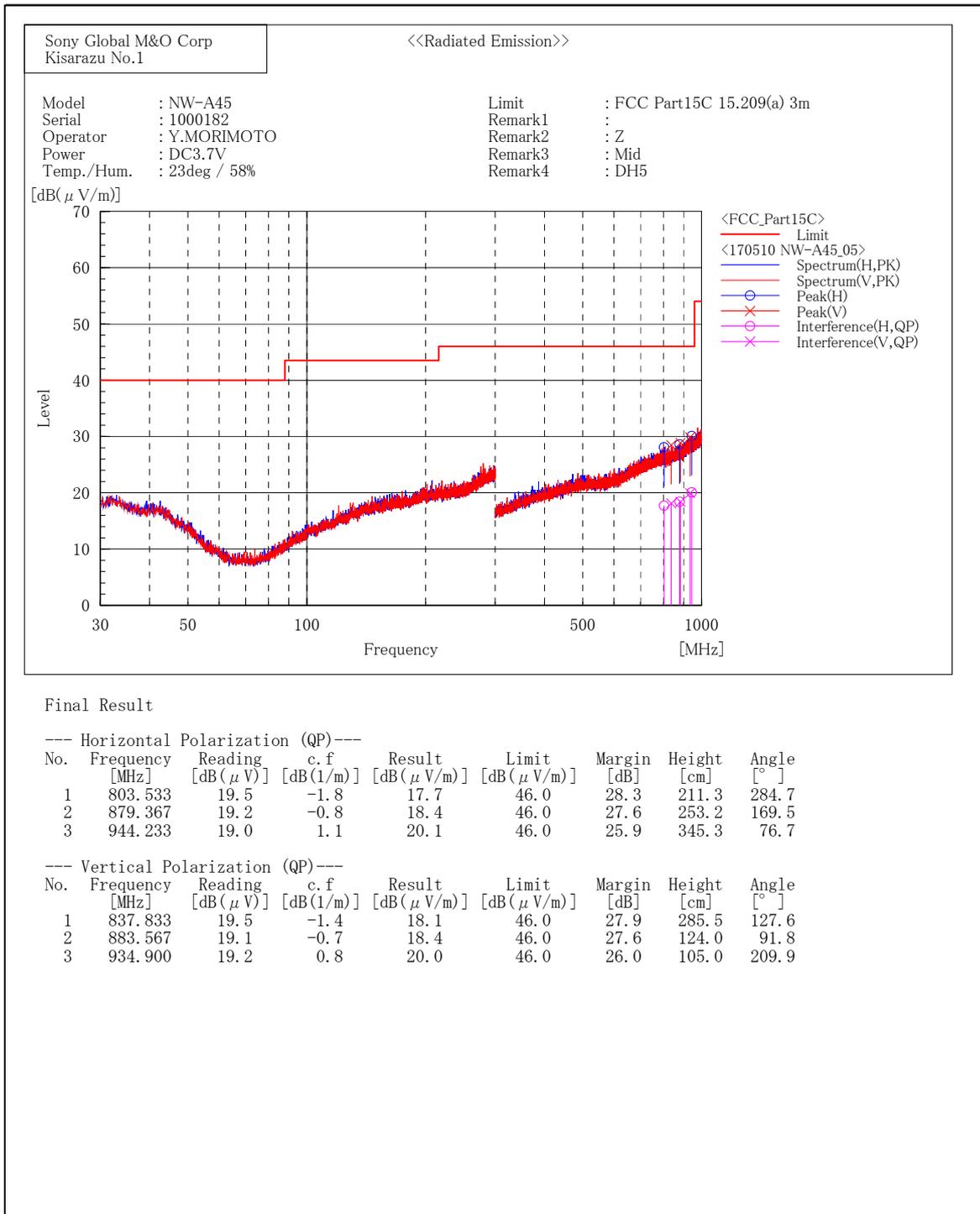


30 MHz - 1000 MHz

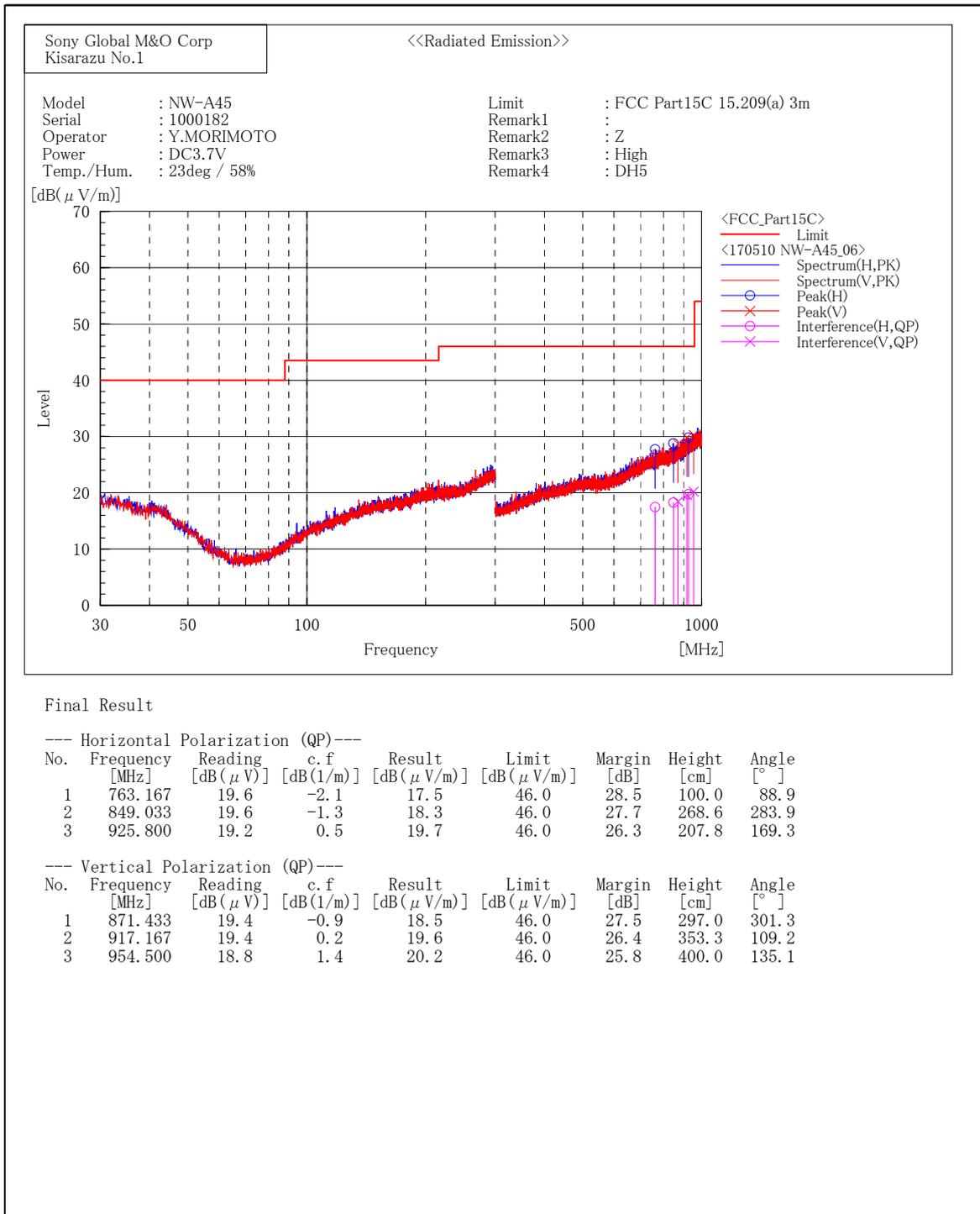
[BDR( DH5 )/2402MHz]



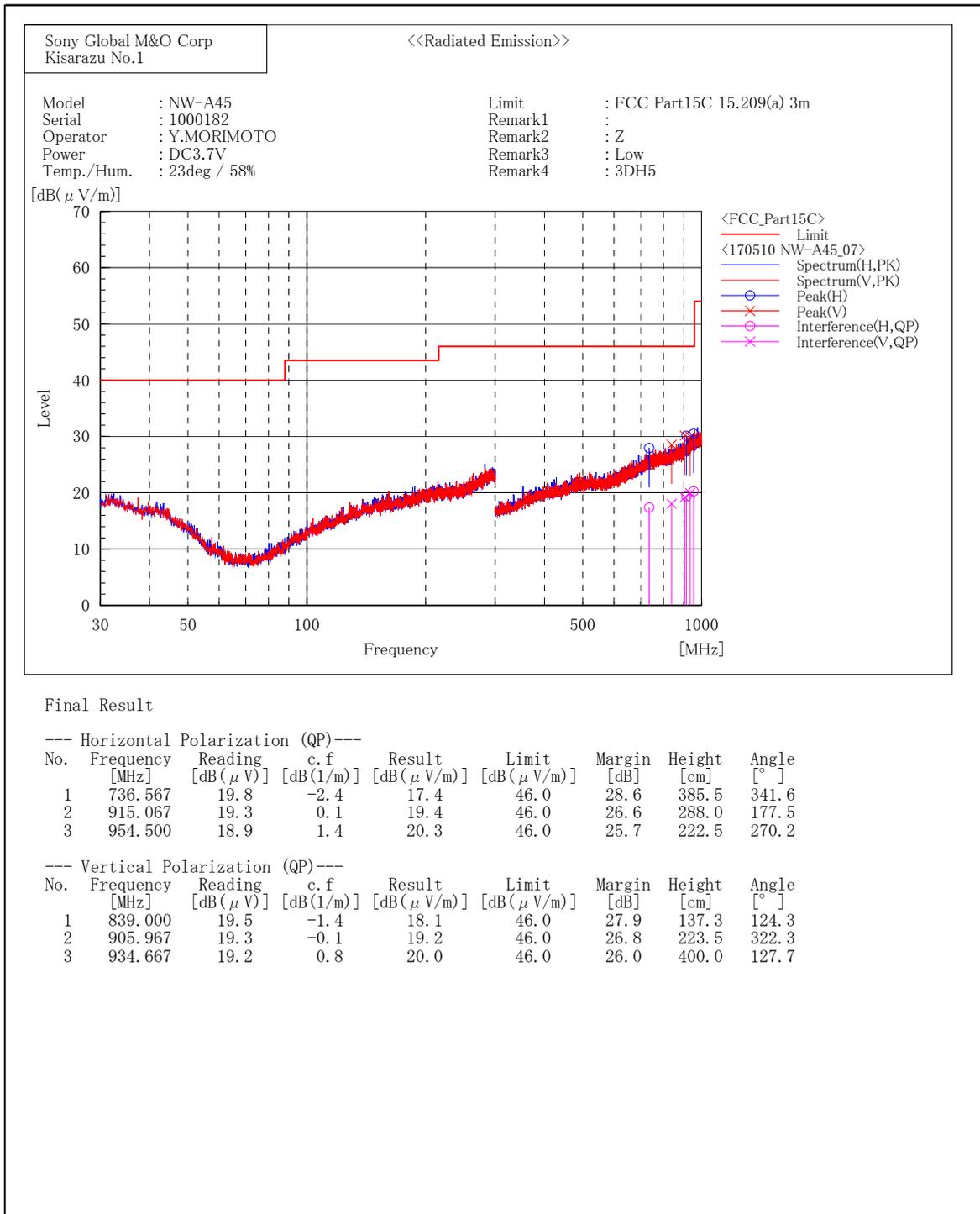
[BDR( DH5 )/2441MHz]



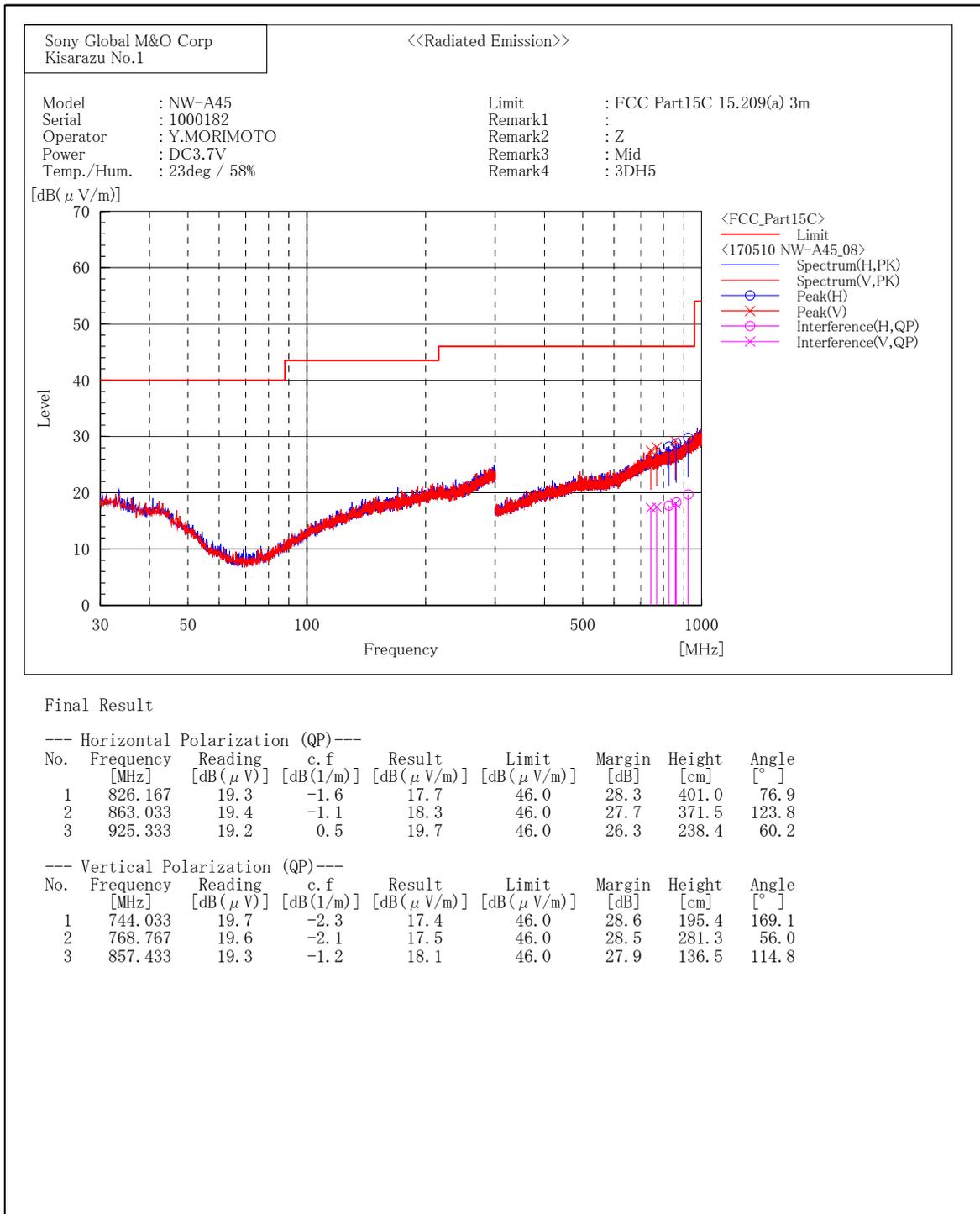
[BDR( DH5 )/2480MHz]



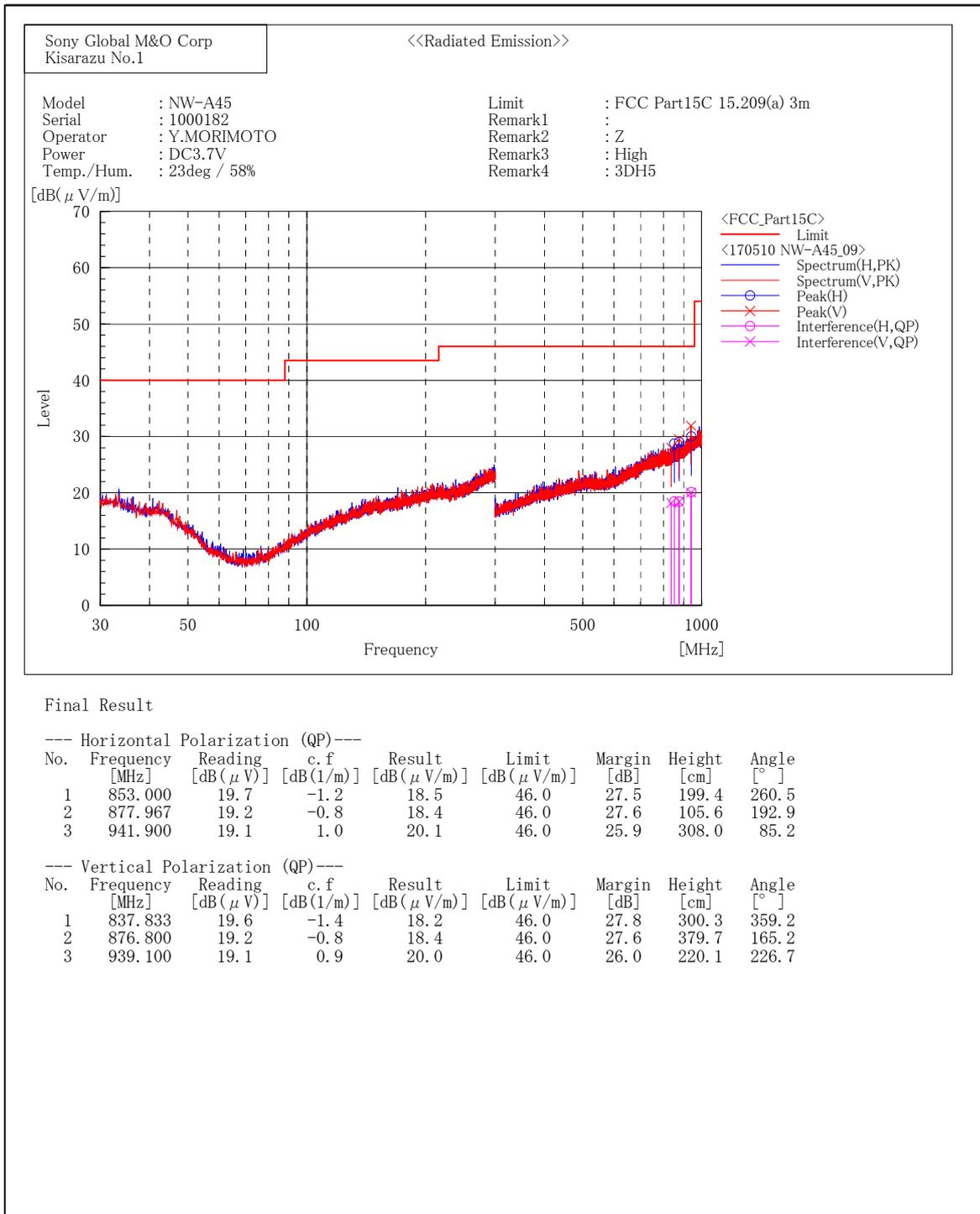
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]

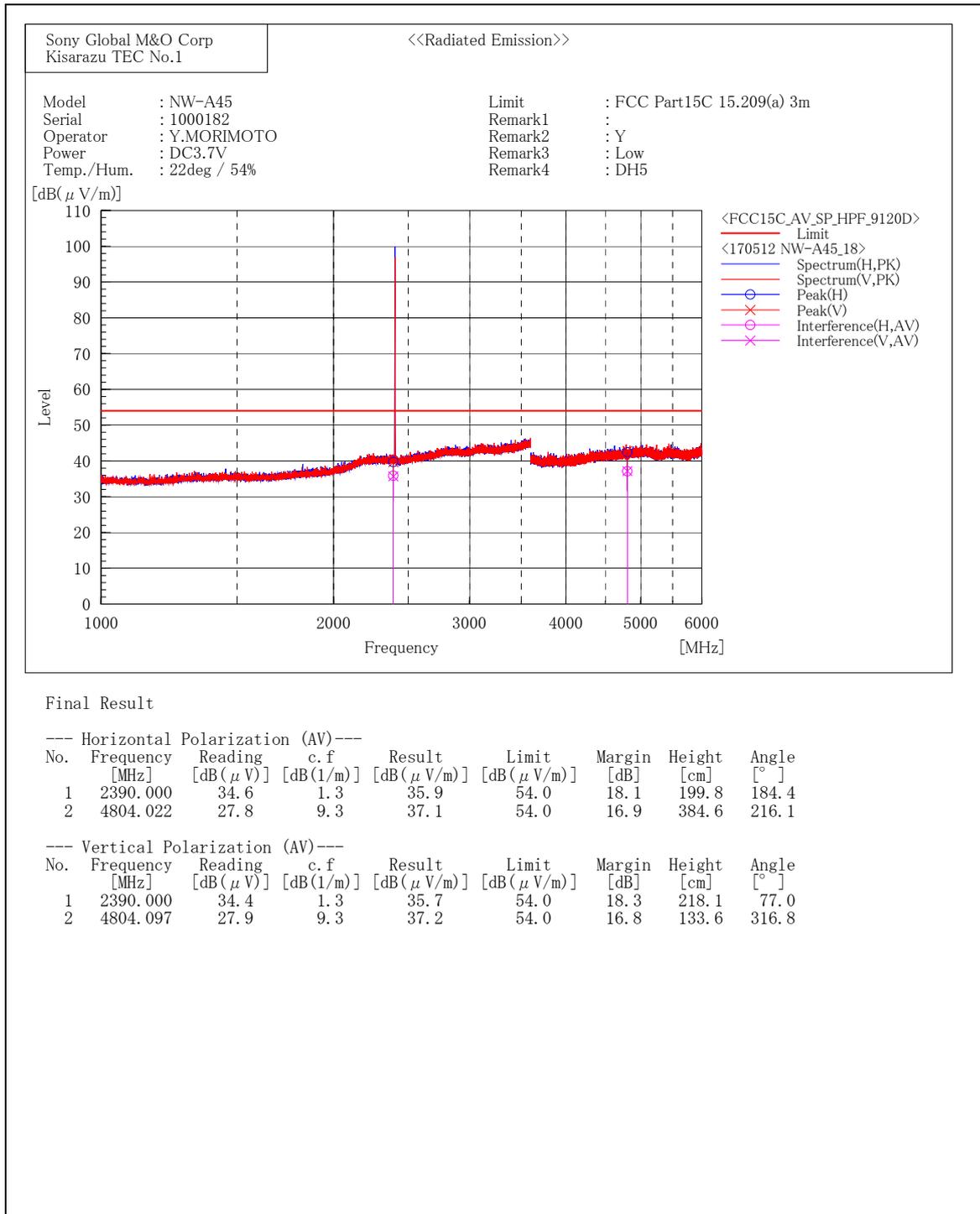


[EDR( 3DH5 )/2480MHz]

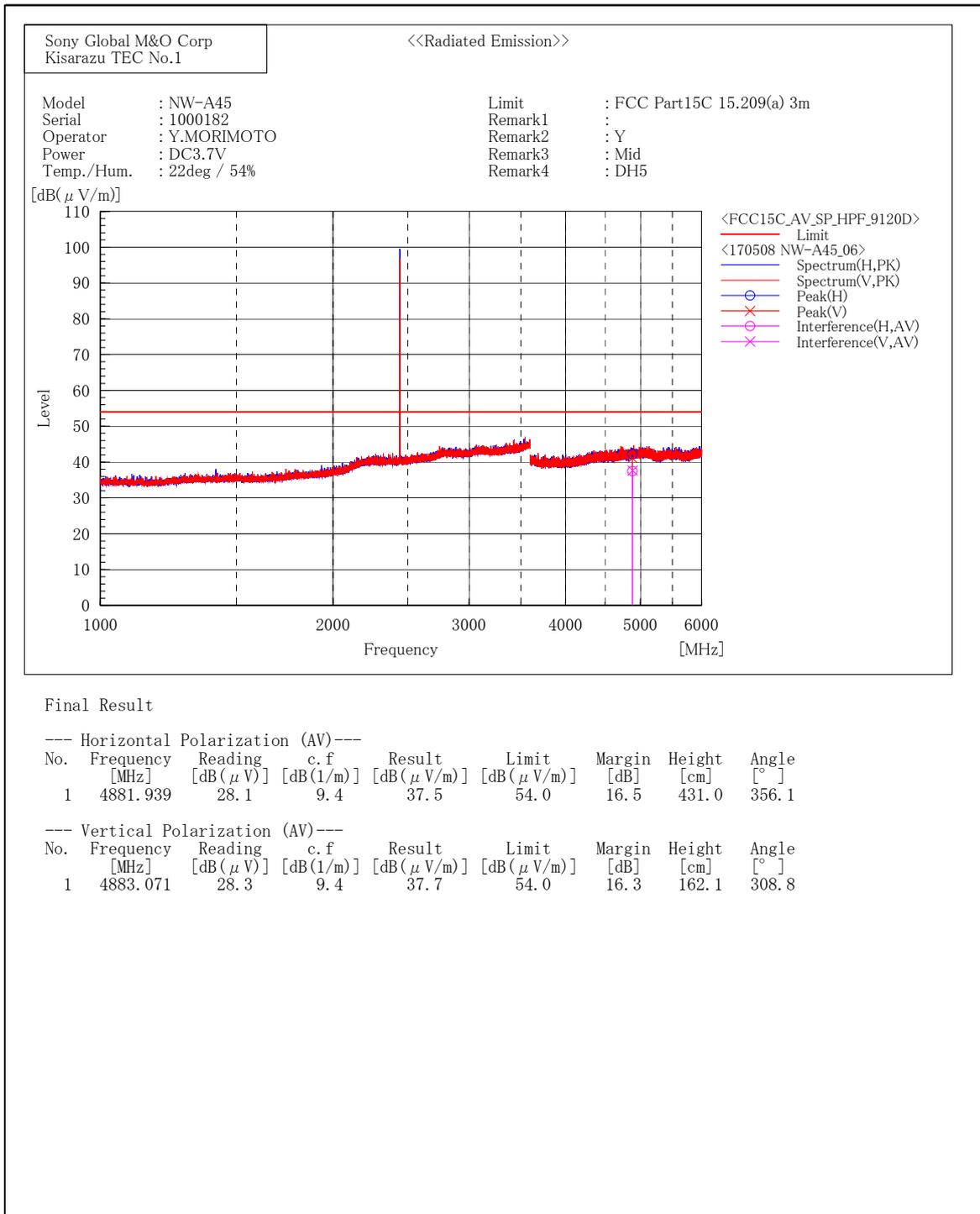


1GHz - 6 GHz

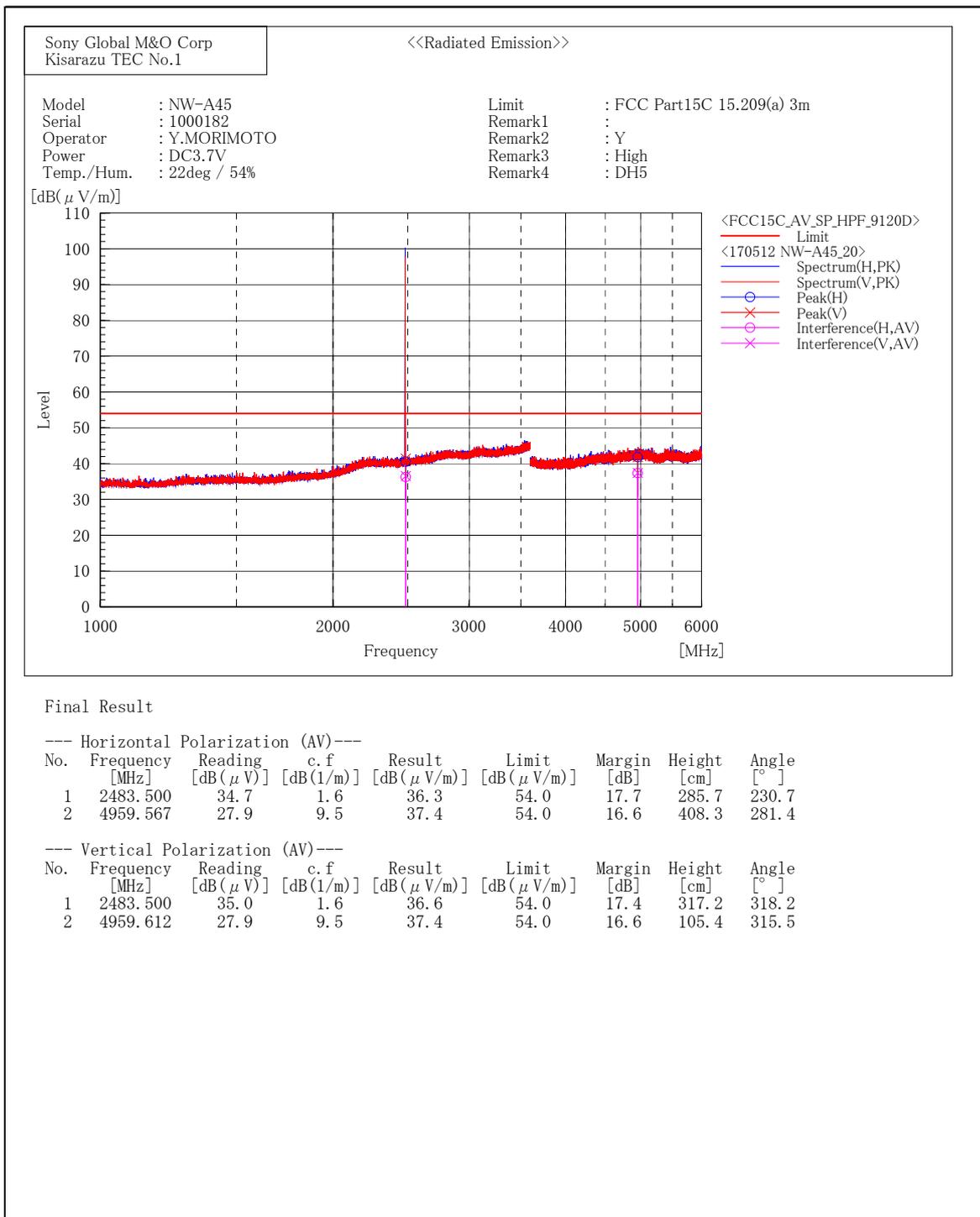
[BDR( DH5 )/2402MHz]



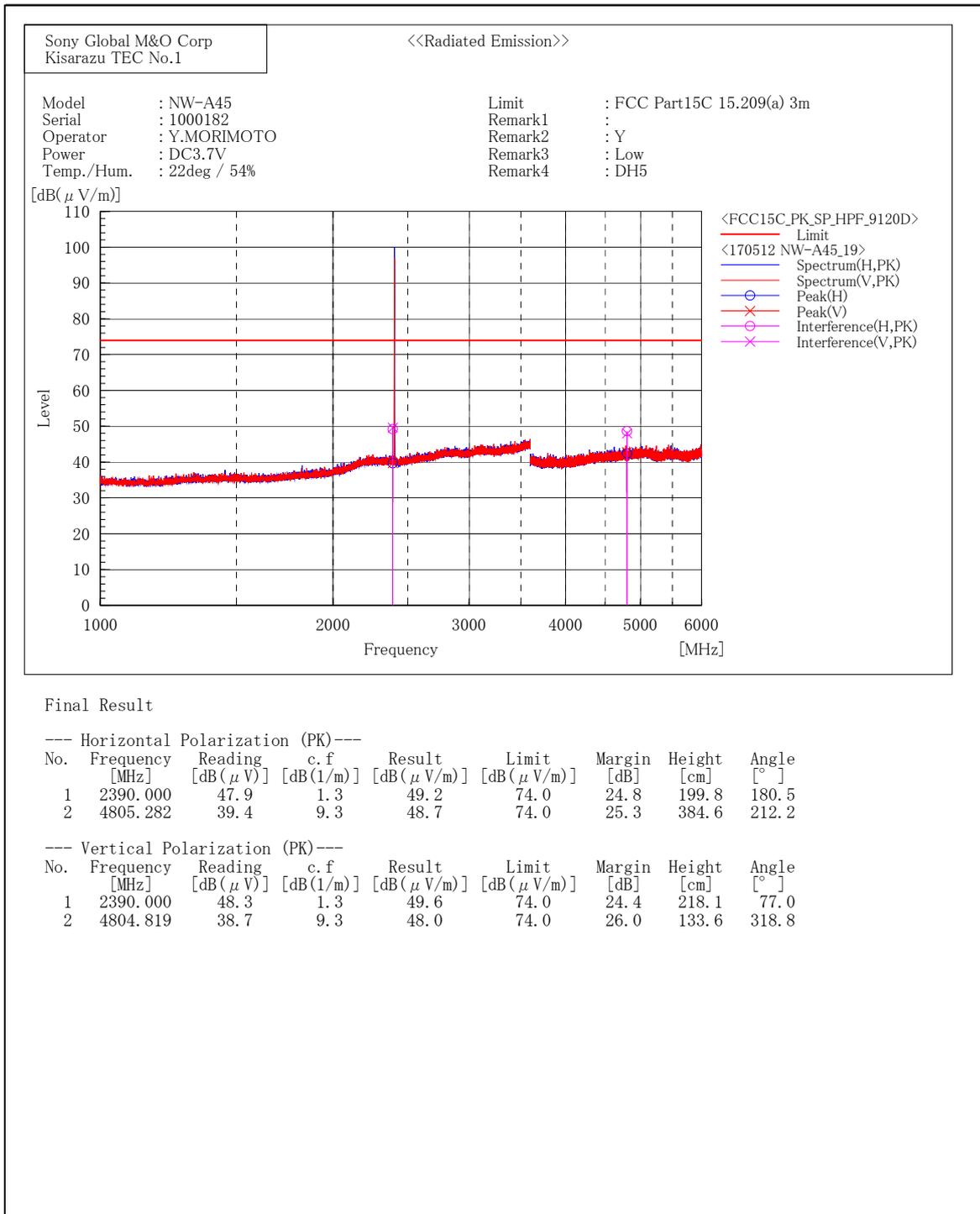
[BDR( DH5 )/2441MHz]



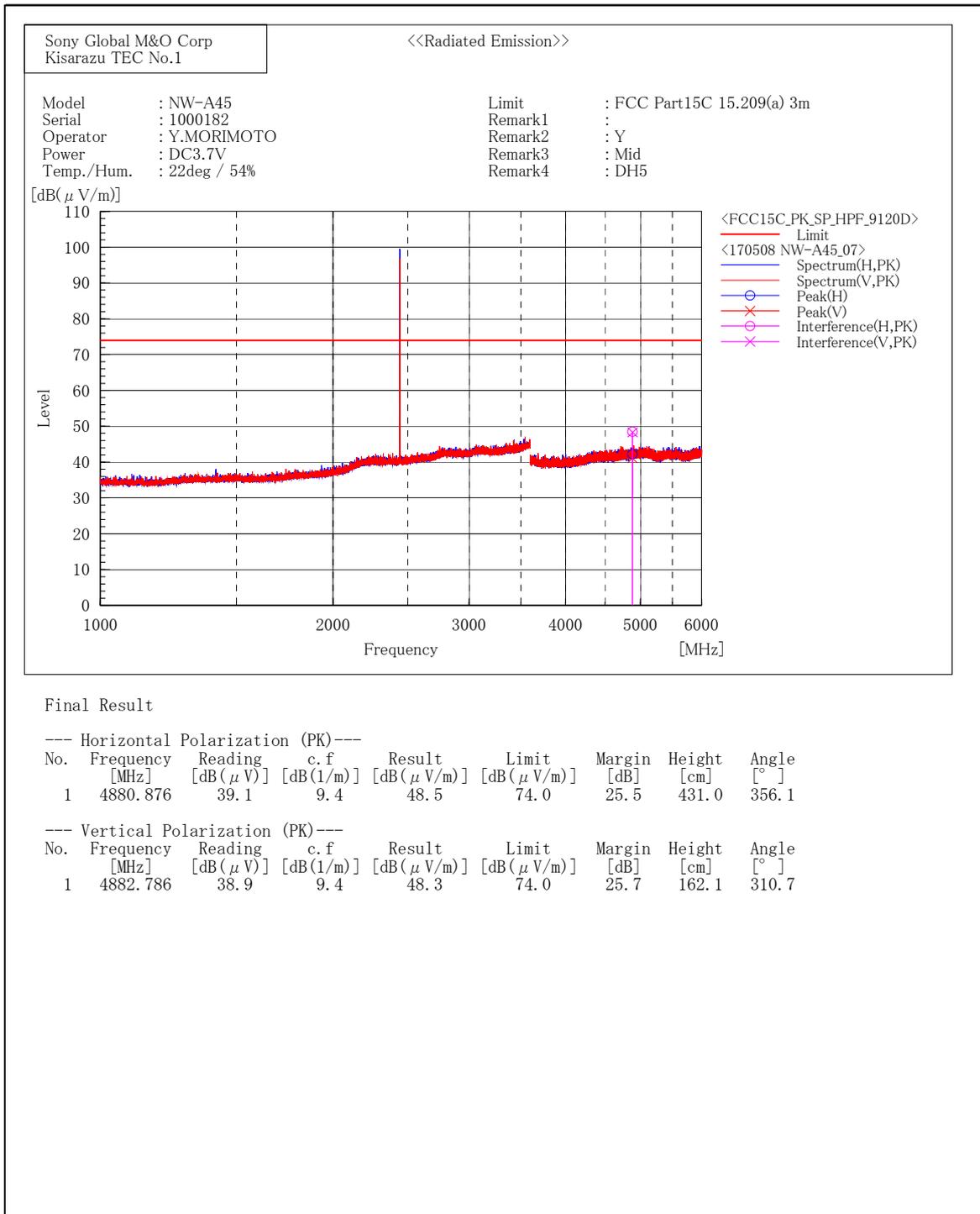
[BDR( DH5 )/2480MHz]



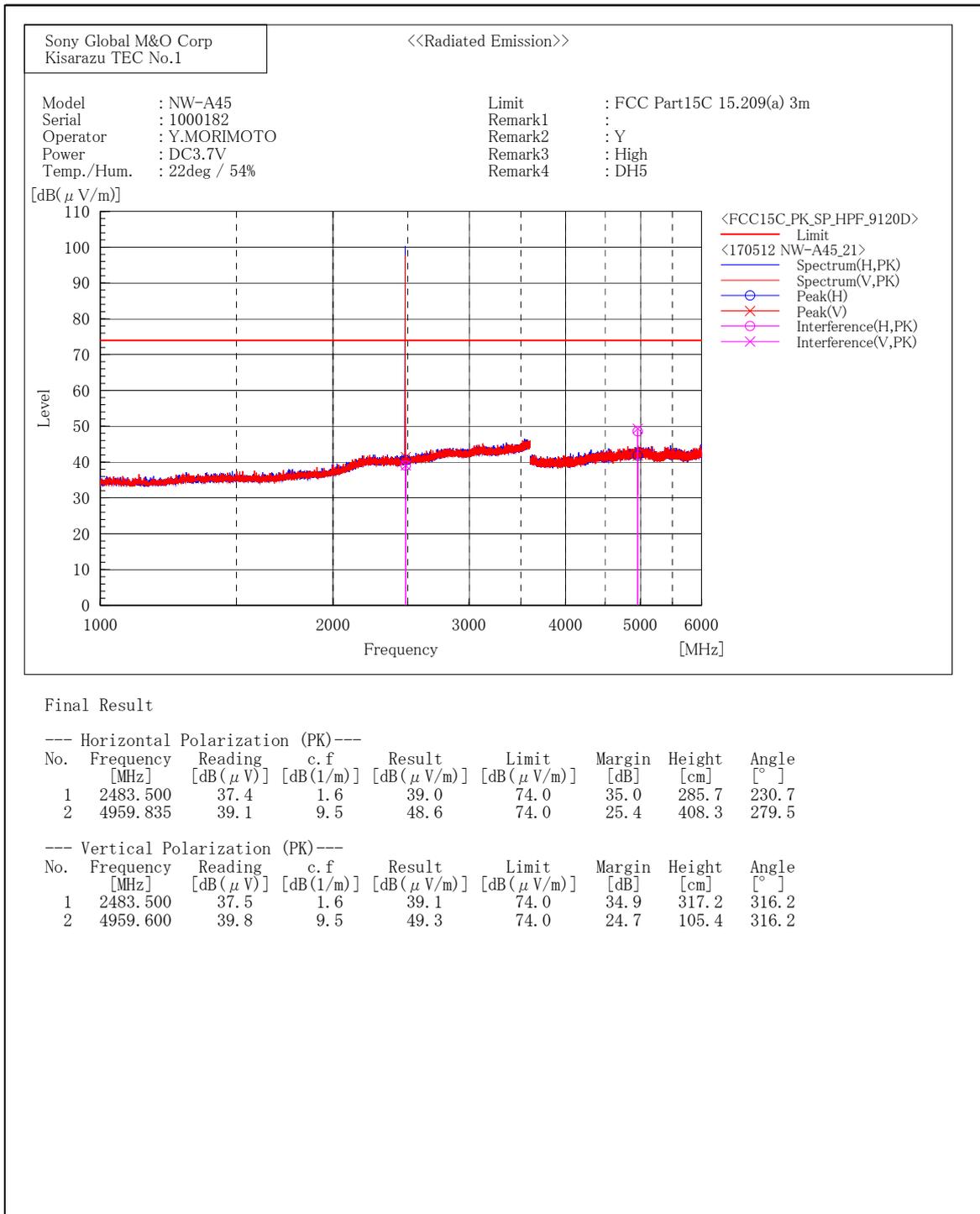
[BDR( DH5 )/2402MHz]



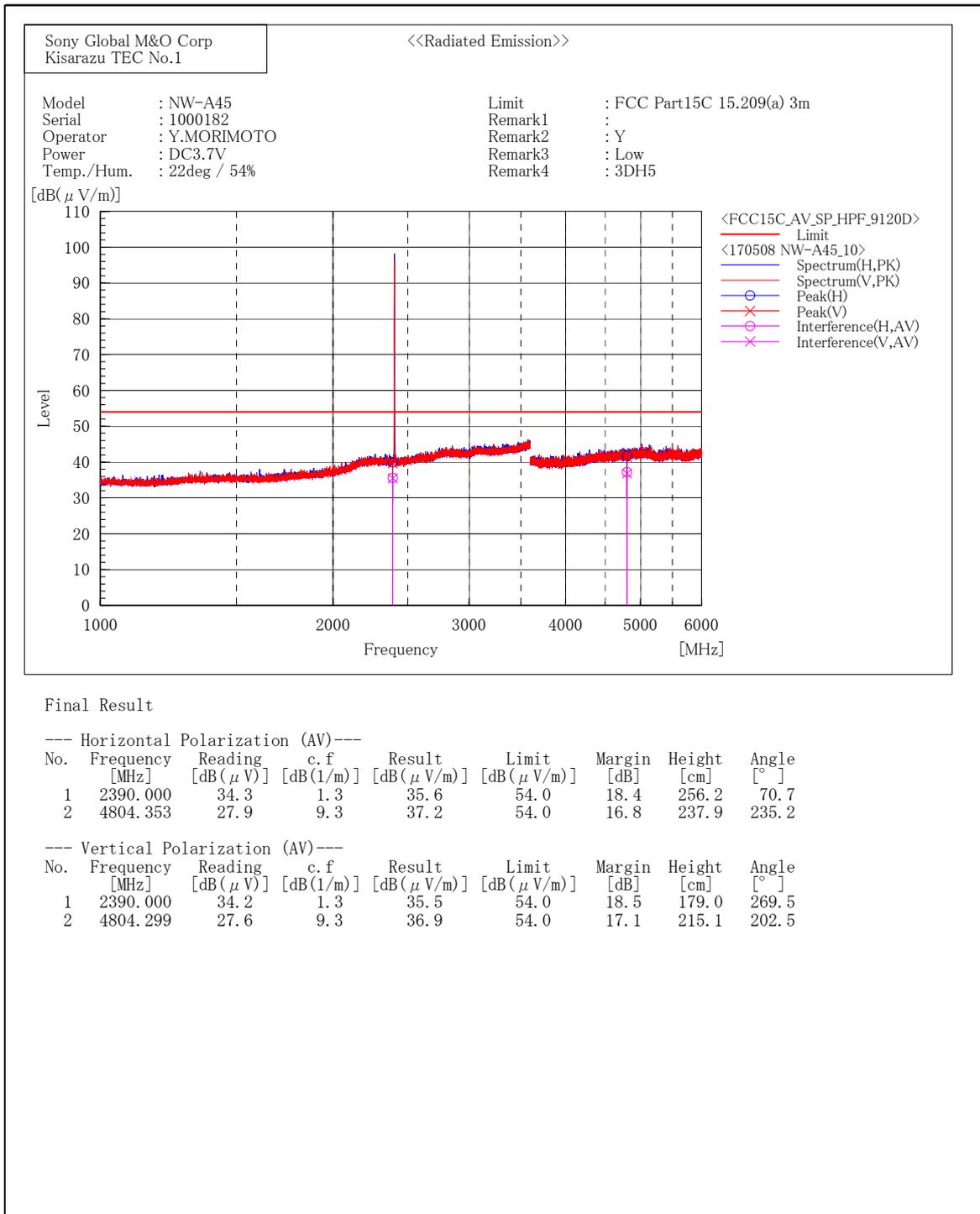
[BDR( DH5 )/2441MHz]



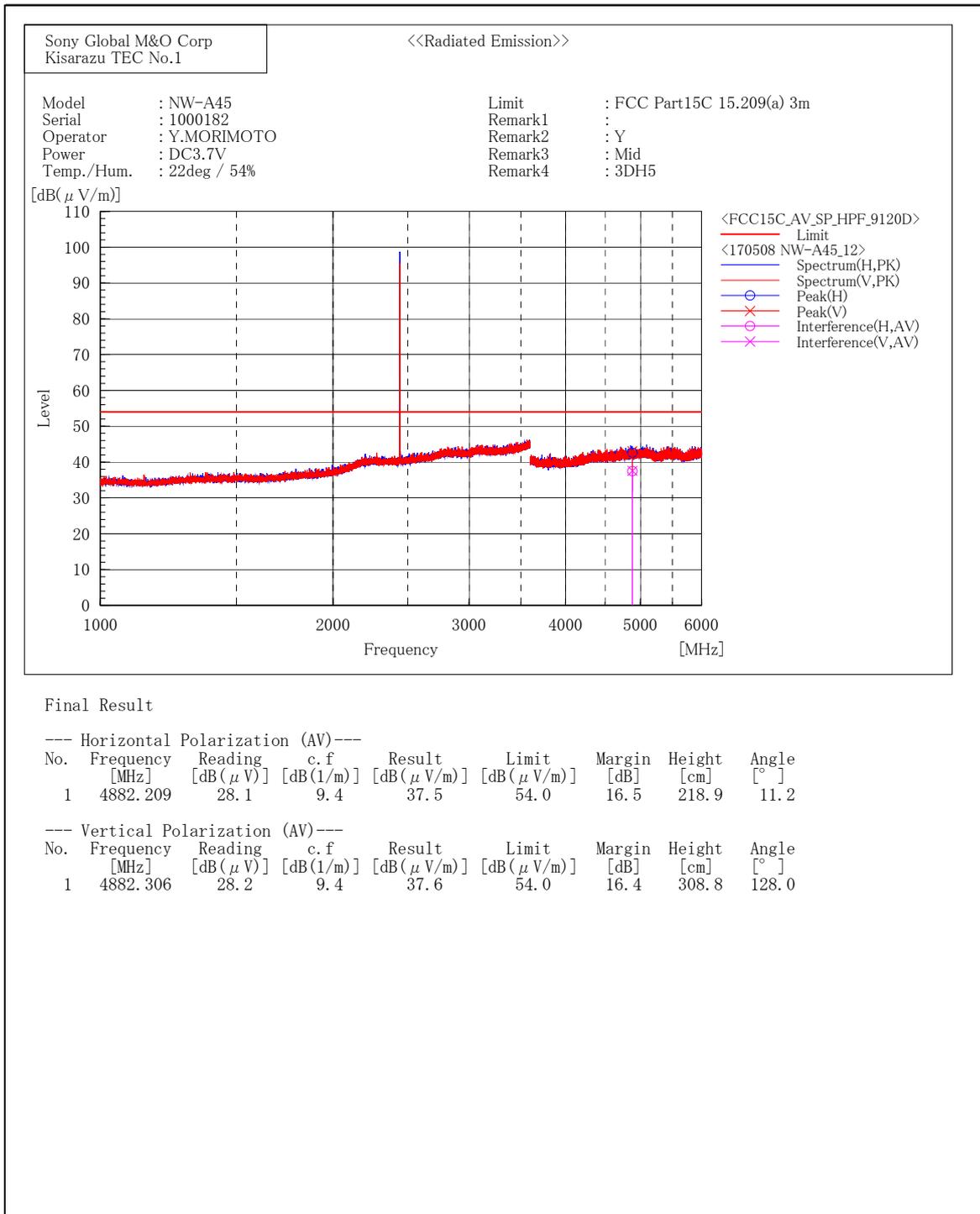
[BDR( DH5 )/2480MHz]



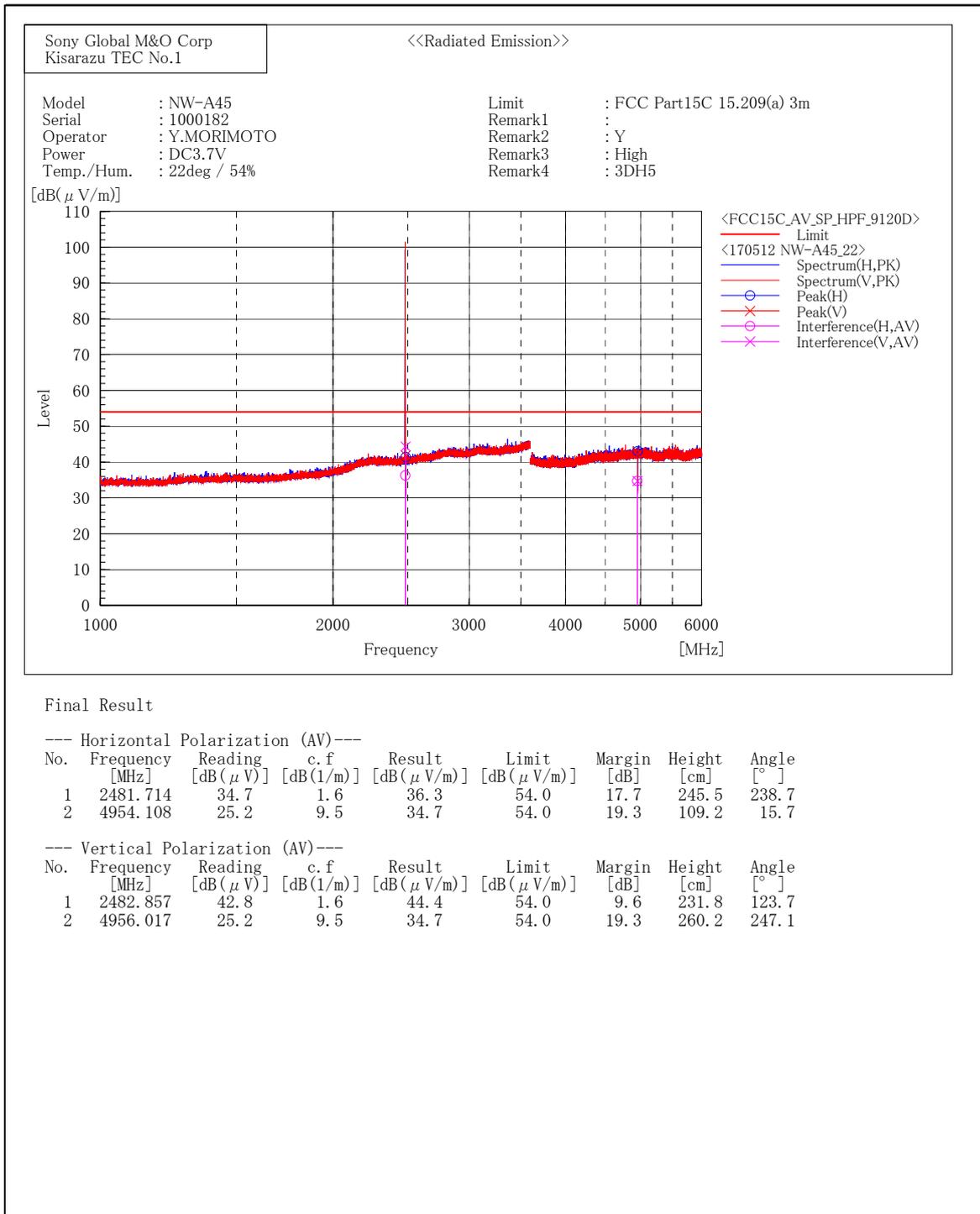
[EDR( 3DH5 )/2402MHz]



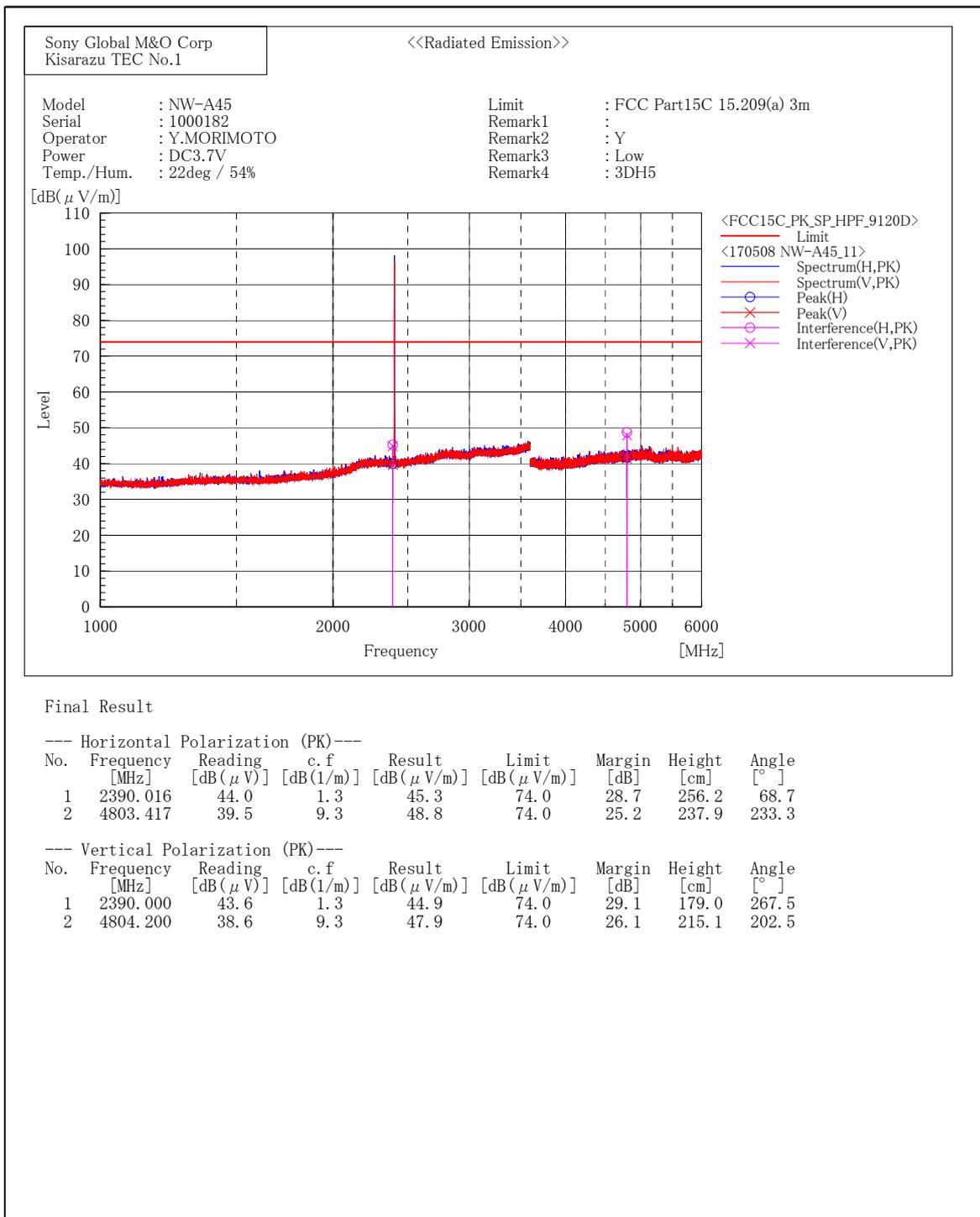
[EDR( 3DH5 )/2441MHz]



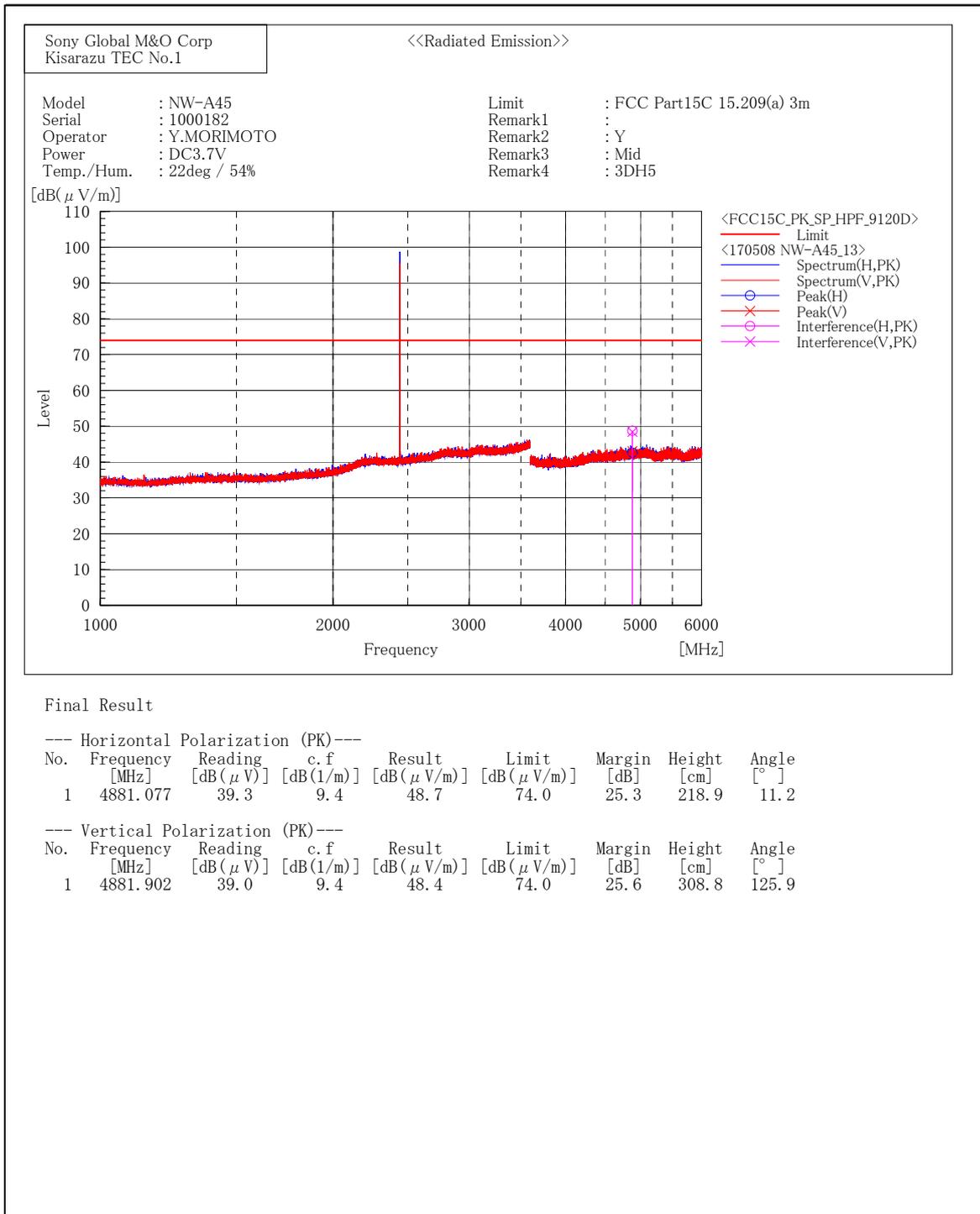
[EDR( 3DH5 )/2480MHz]



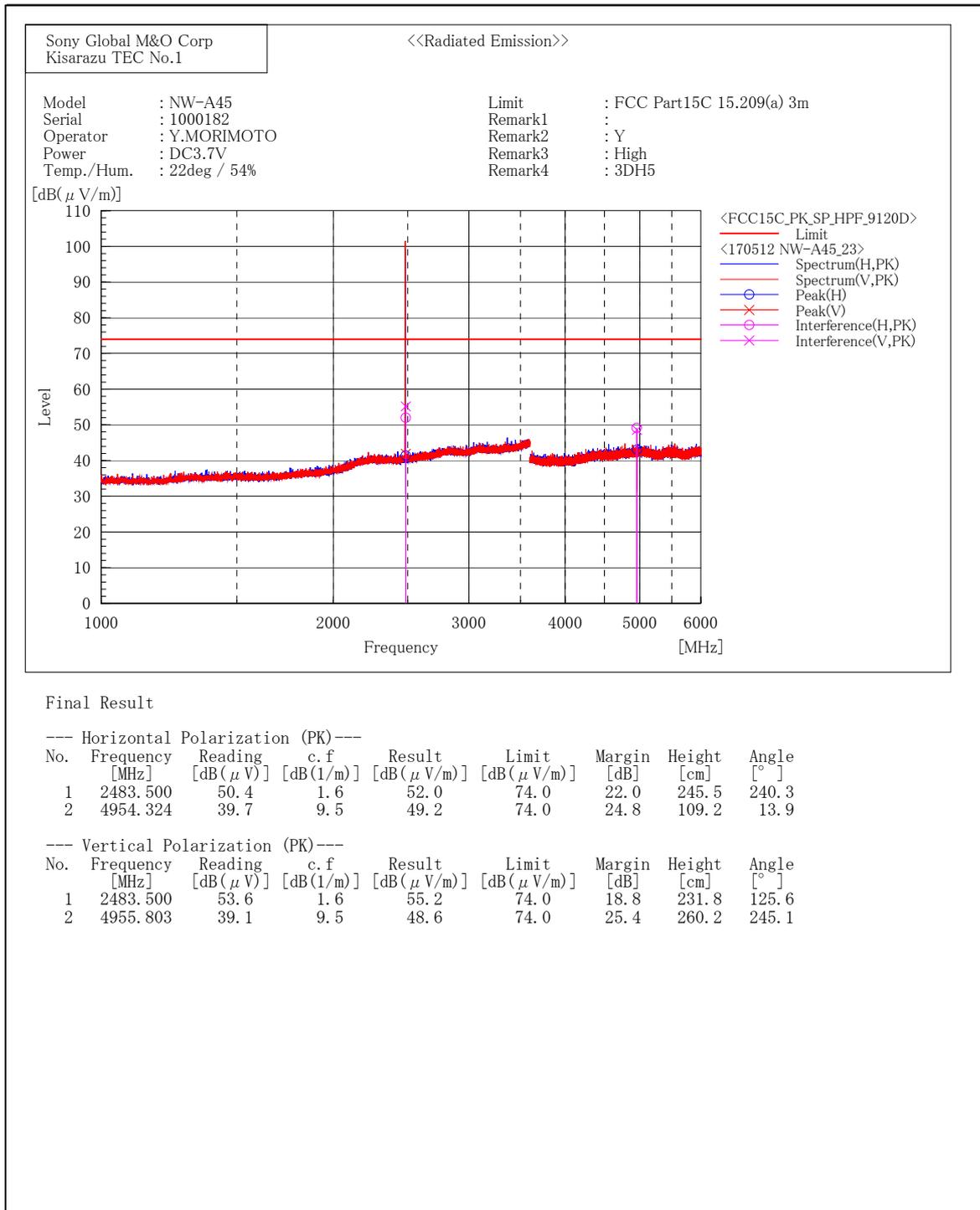
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]

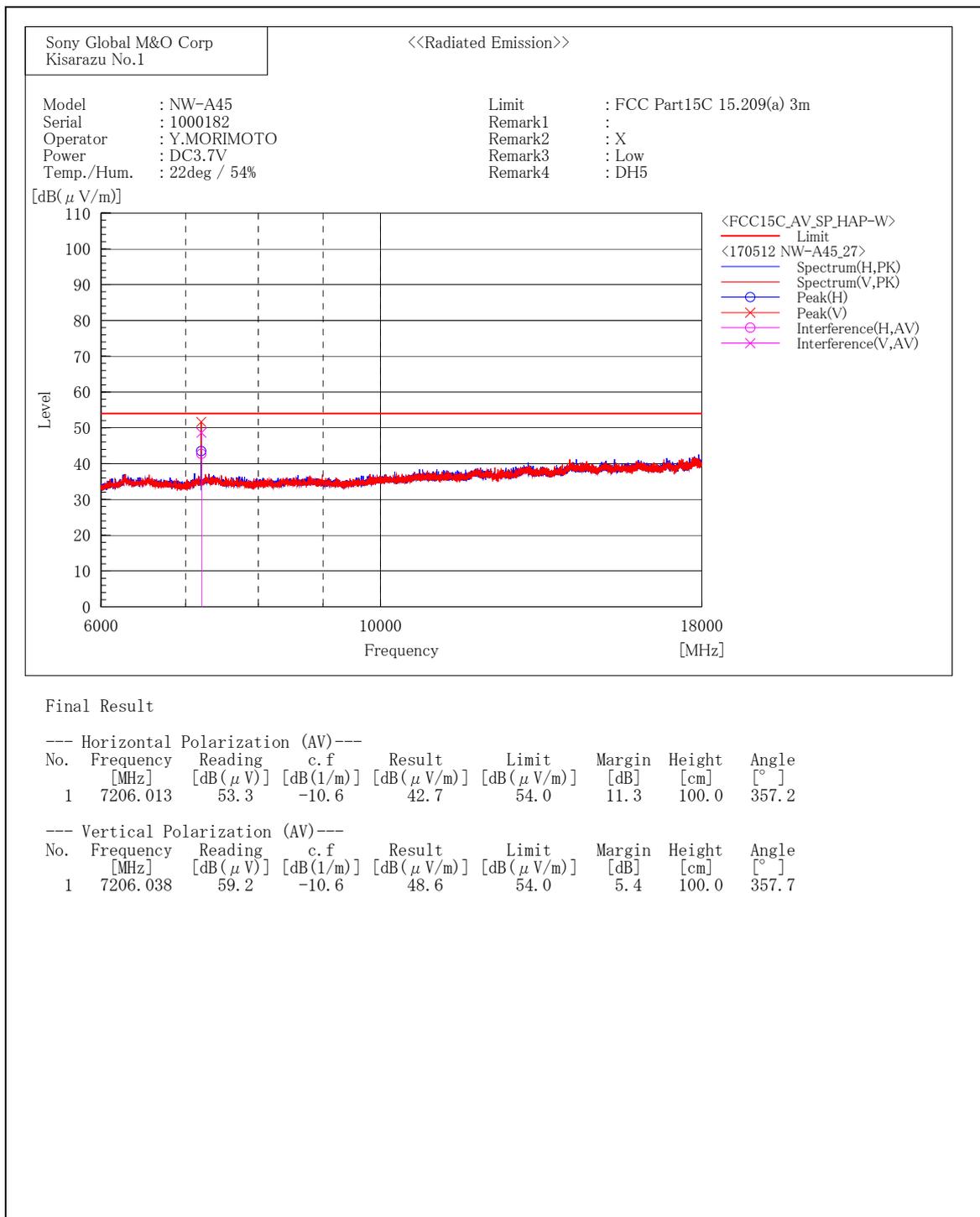


[EDR( 3DH5 )/2480MHz]

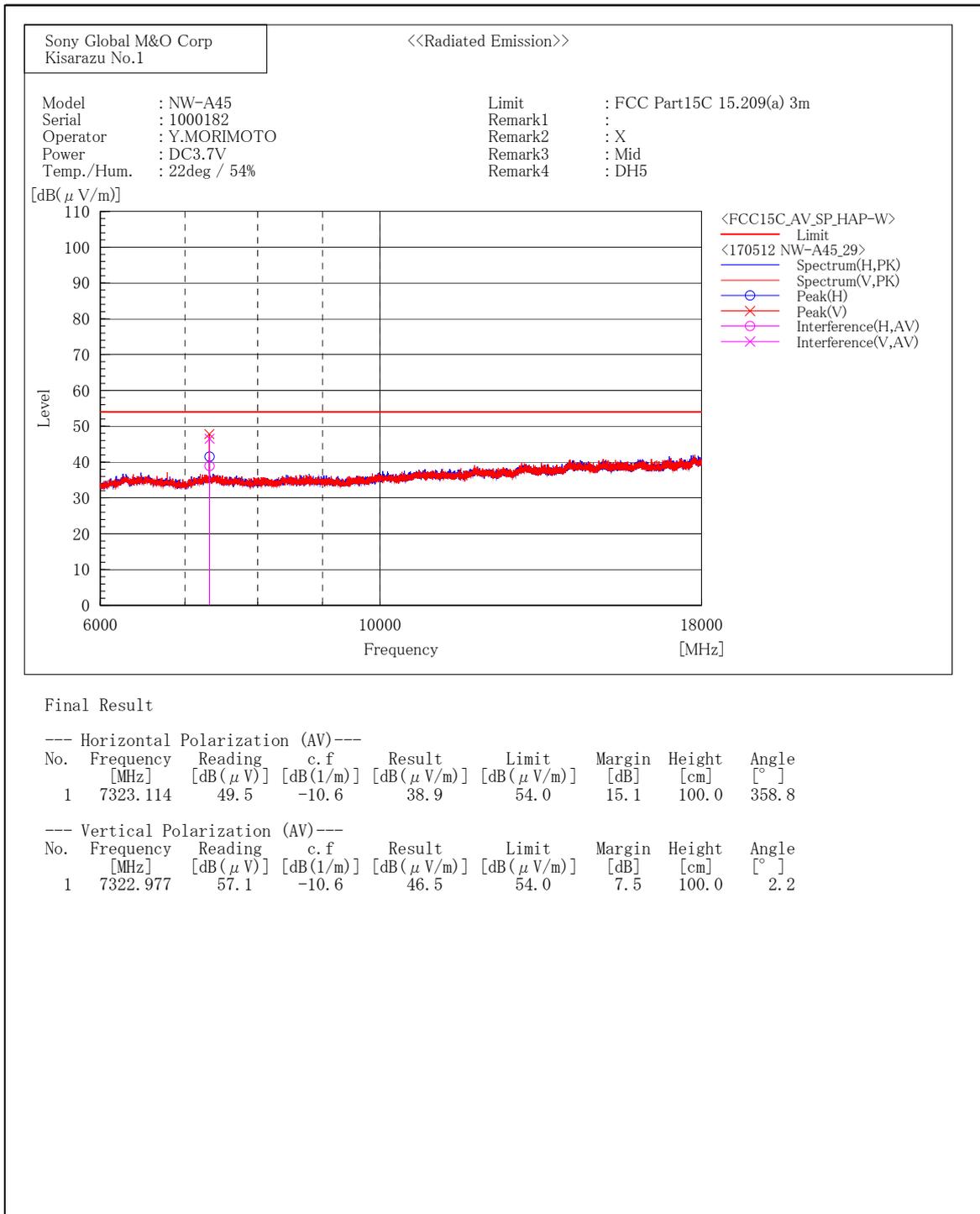


6 GHz - 18 GHz

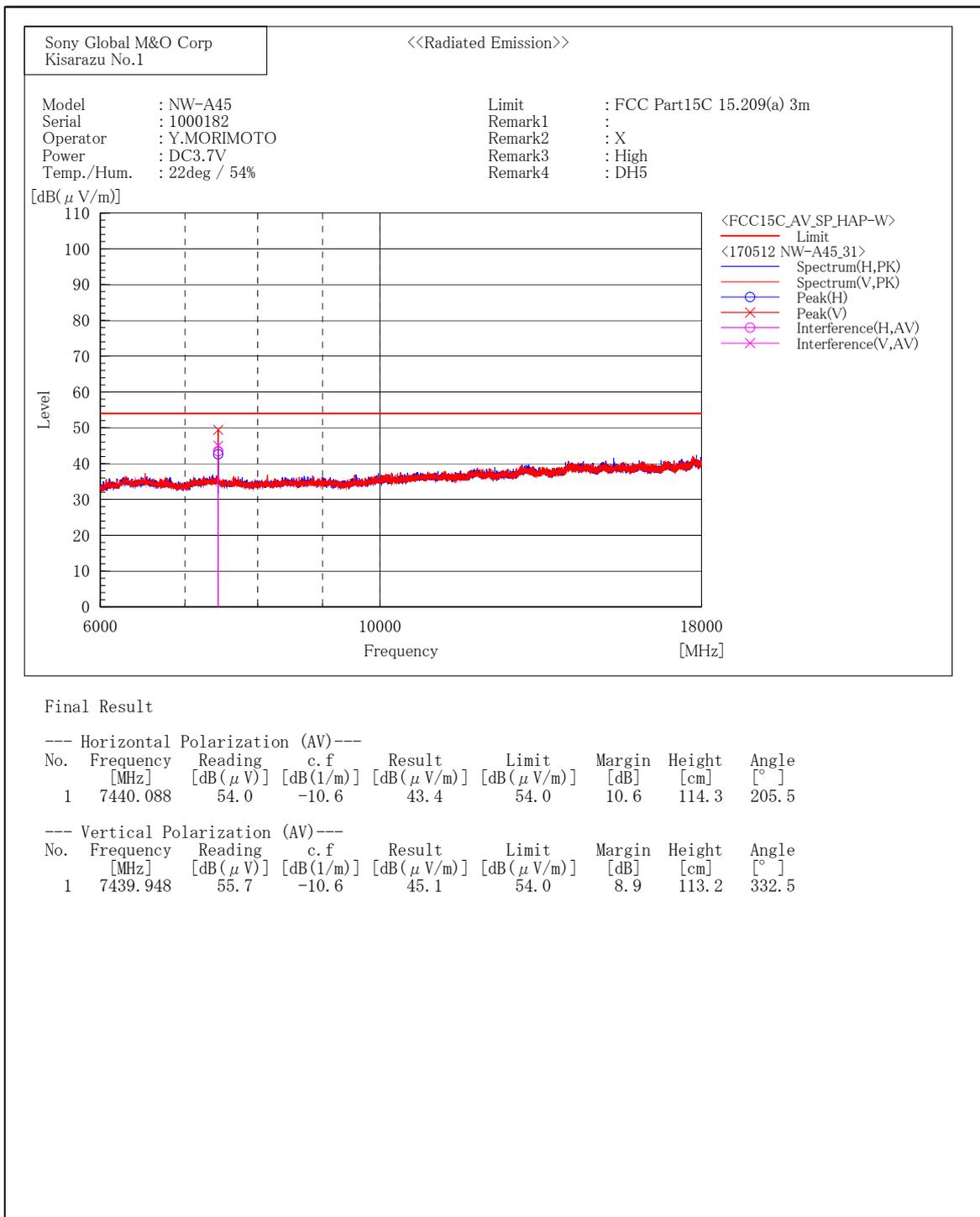
[BDR( DH5 )/2402MHz]



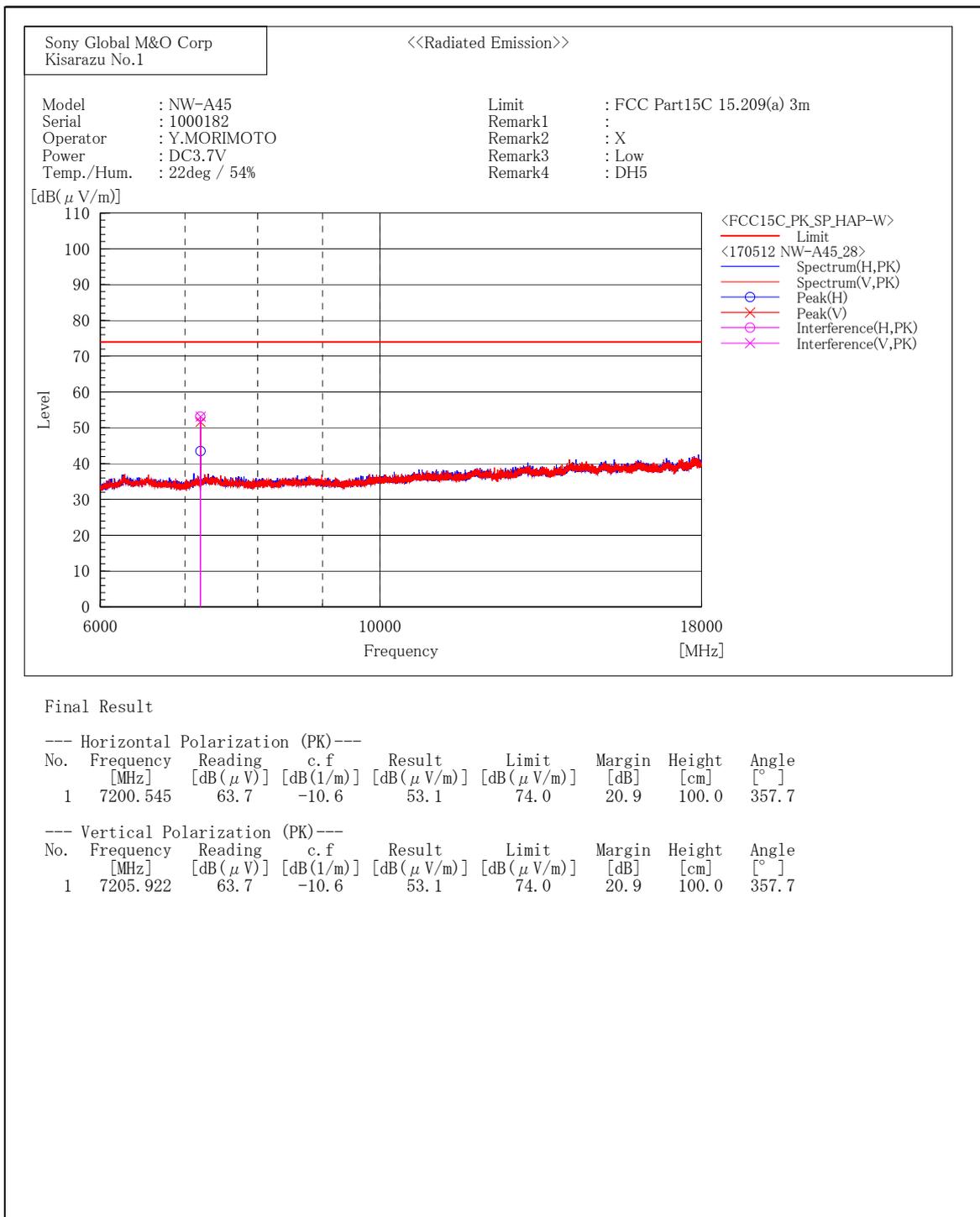
[BDR( DH5 )/2441MHz]



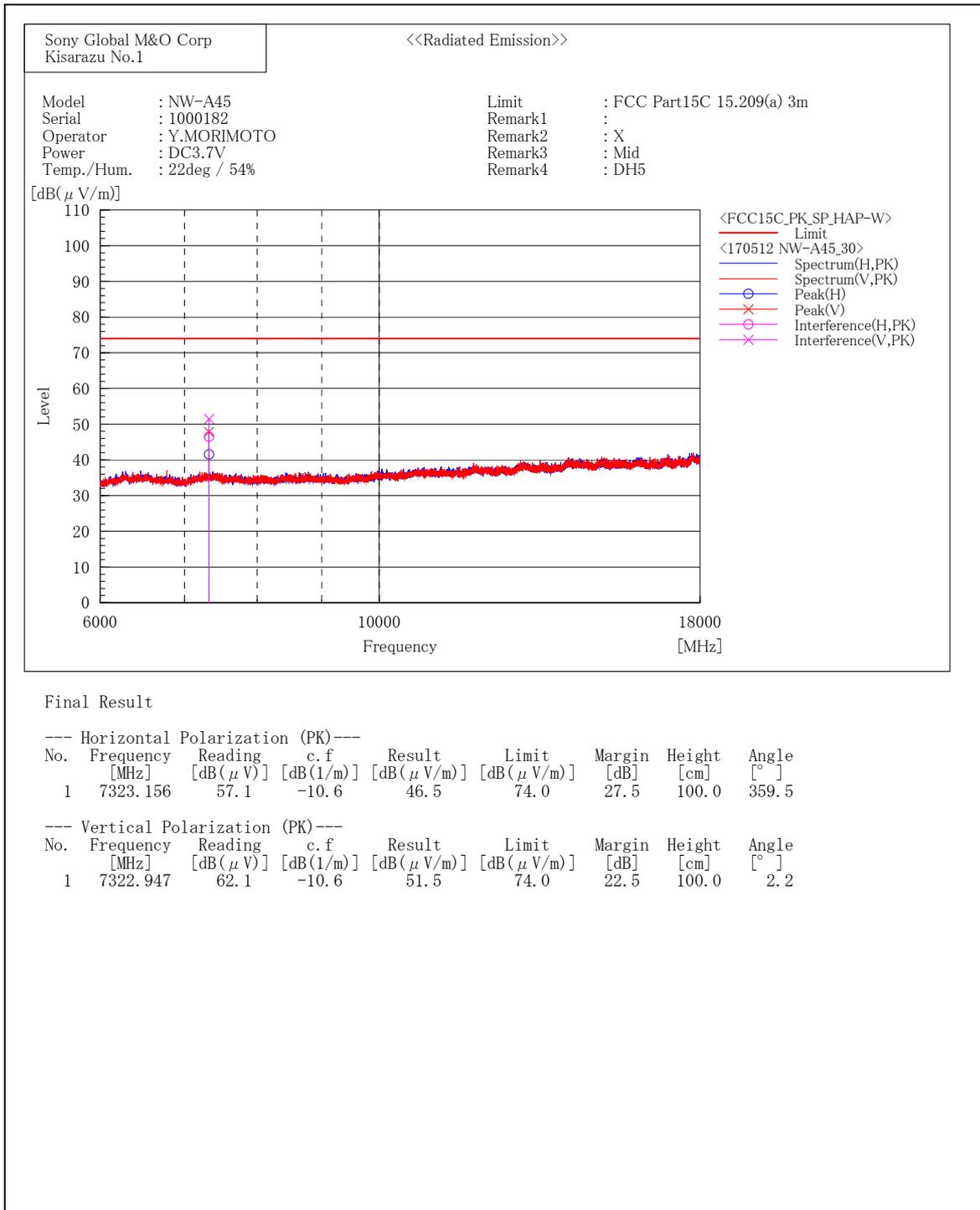
[BDR( DH5 )/2480MHz]



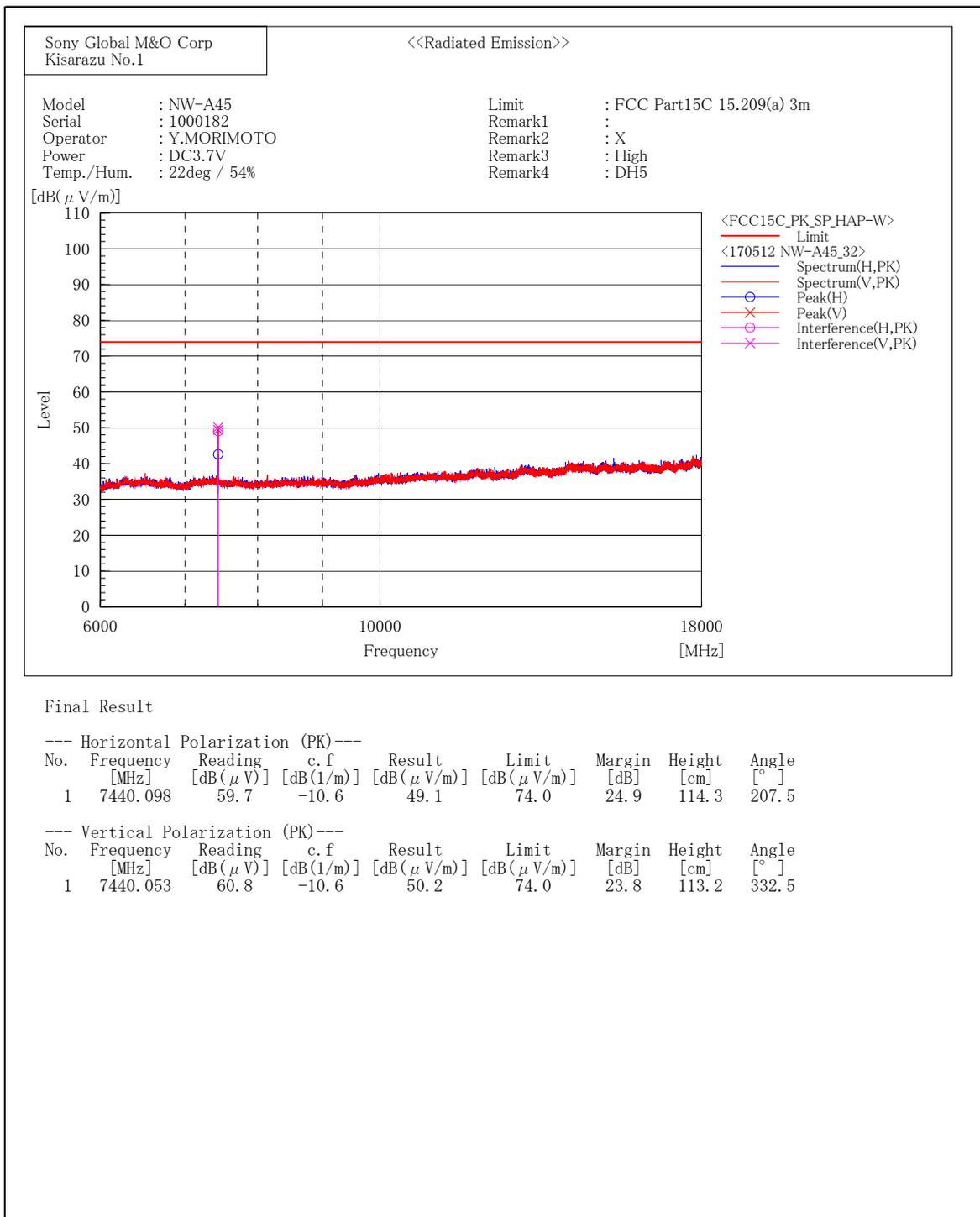
[BDR( DH5 )/2402MHz]



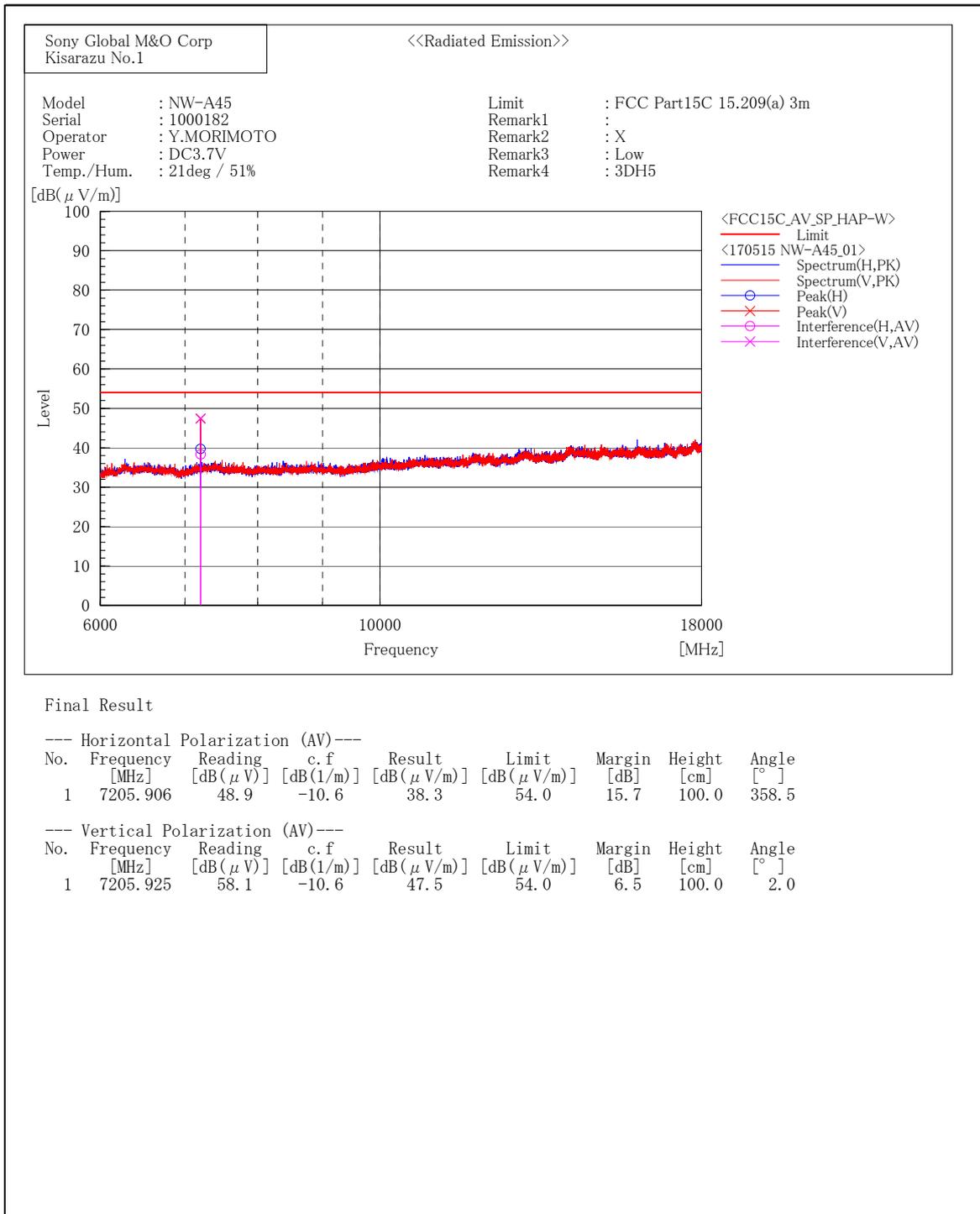
[BDR( DH5 )/2441MHz]



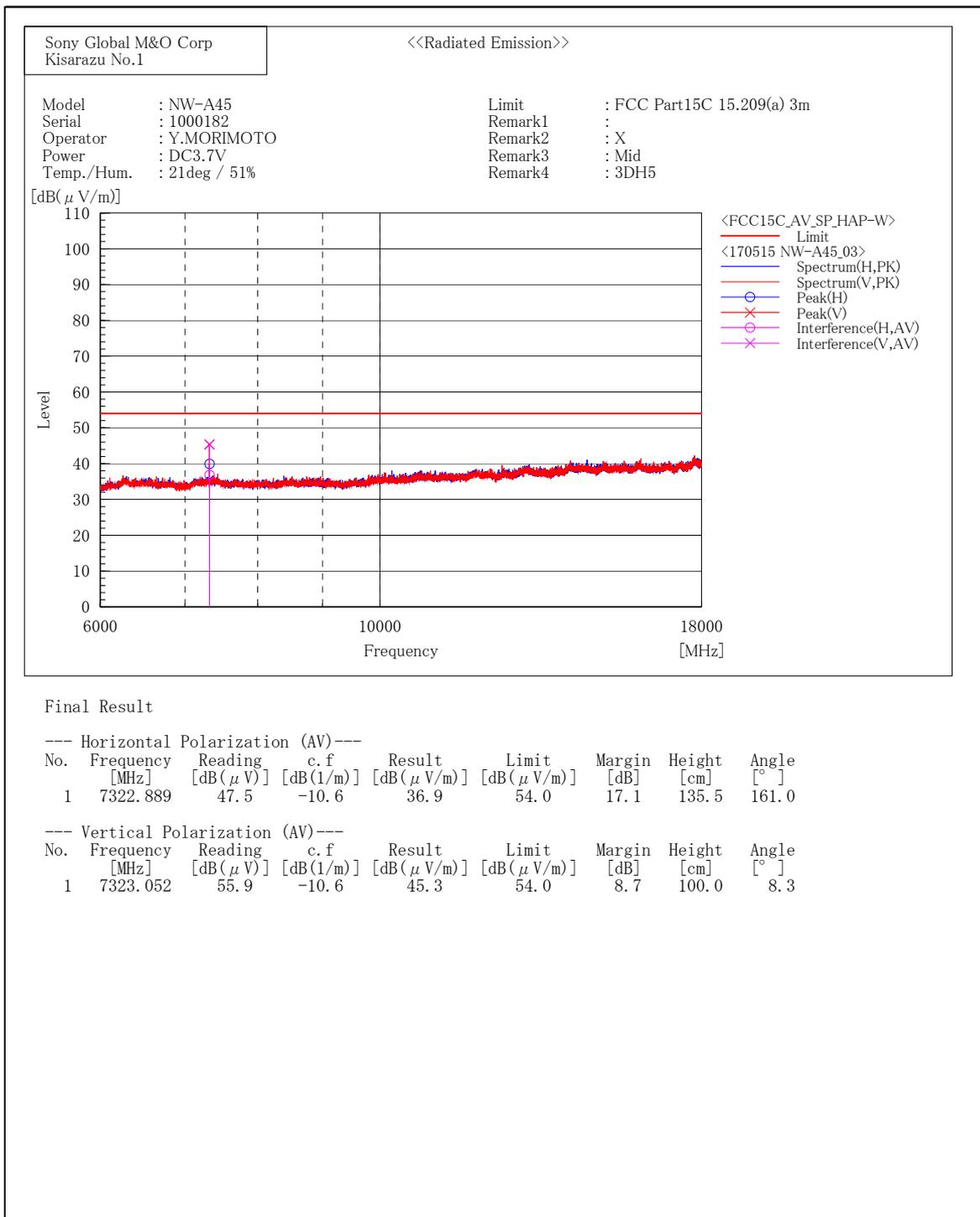
[BDR( DH5 )/2480MHz]



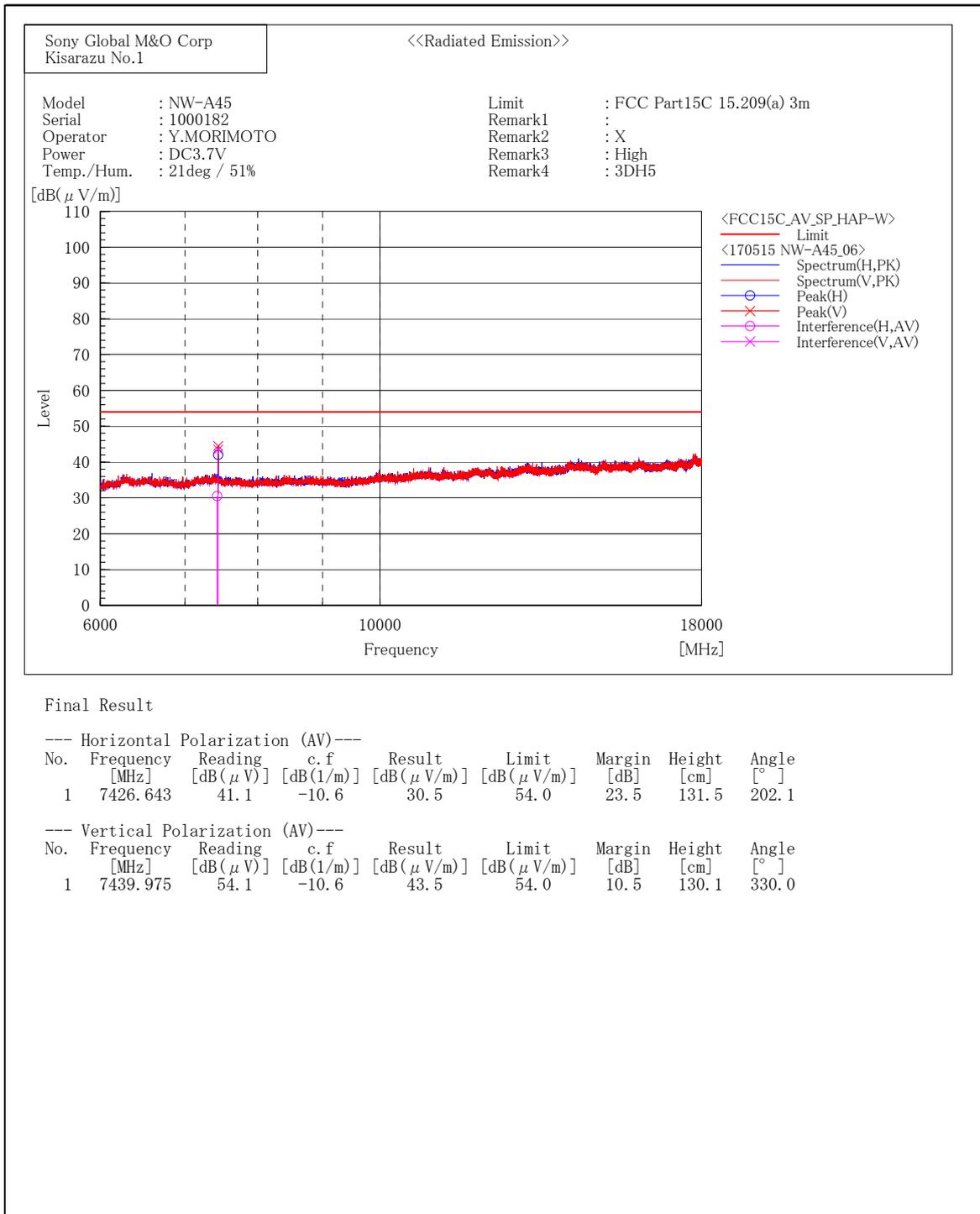
[EDR( 3DH5 )/2402MHz]



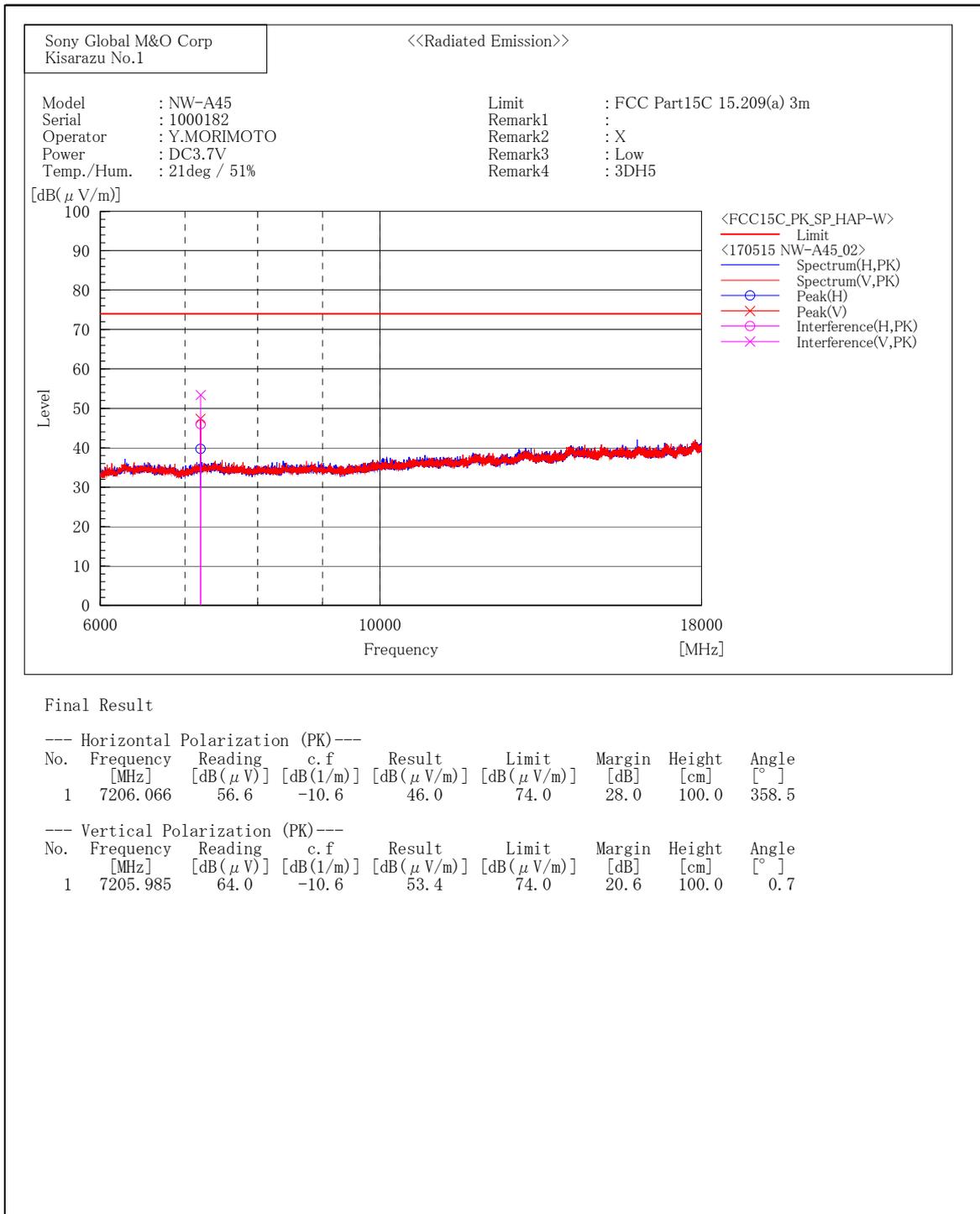
[EDR( 3DH5 )/2441MHz]



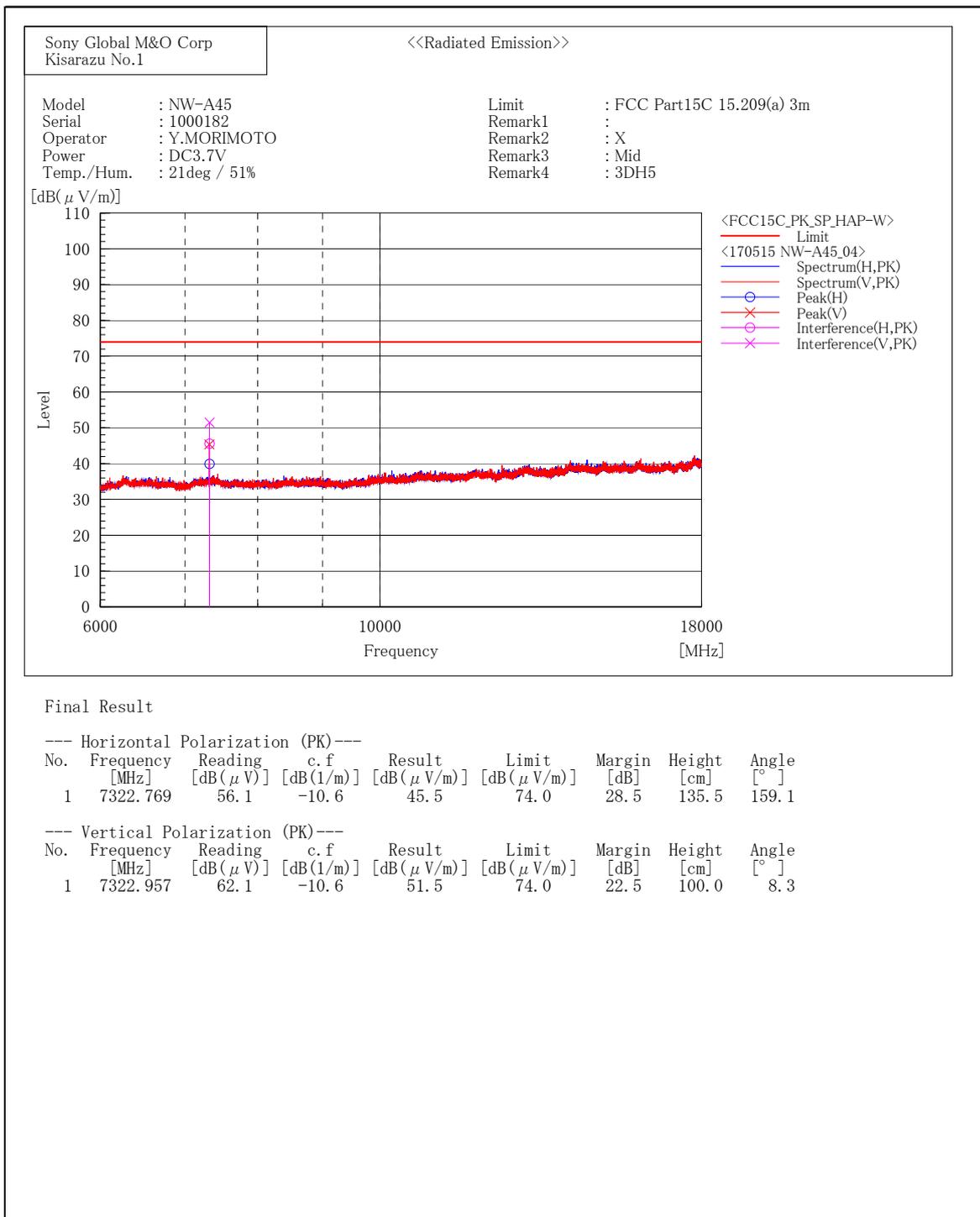
[EDR( 3DH5 )/2480MHz]



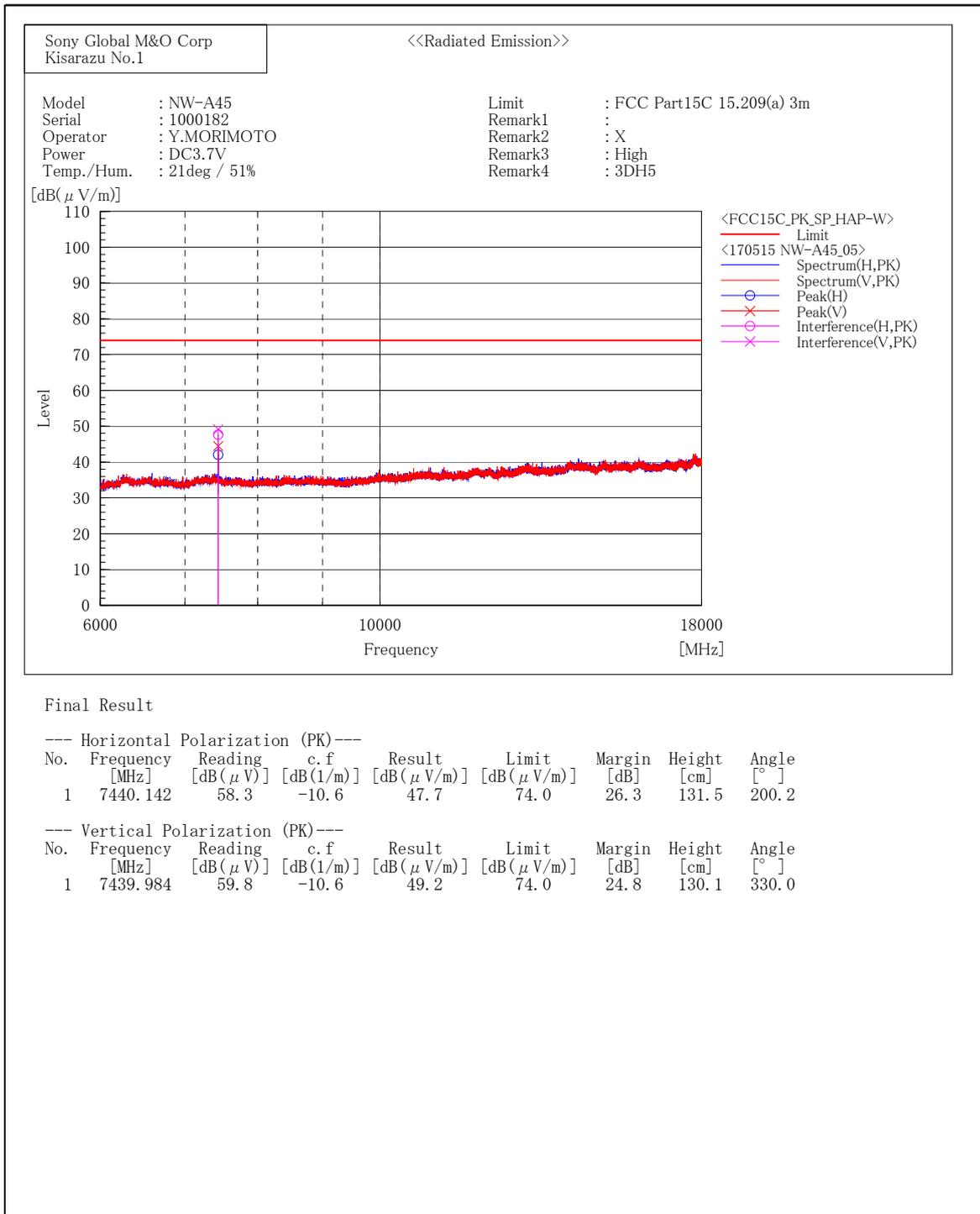
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]

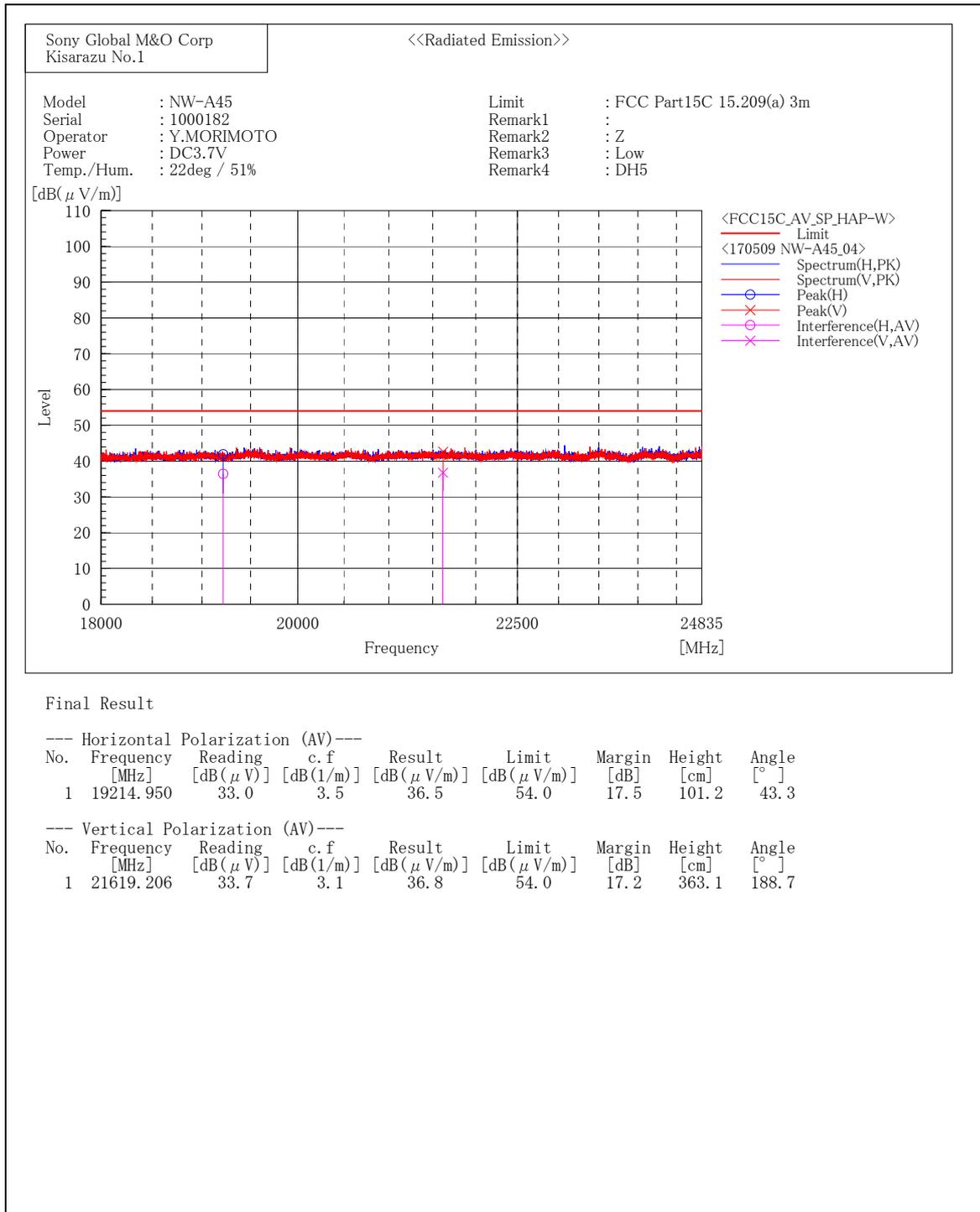


[EDR( 3DH5 )/2480MHz]

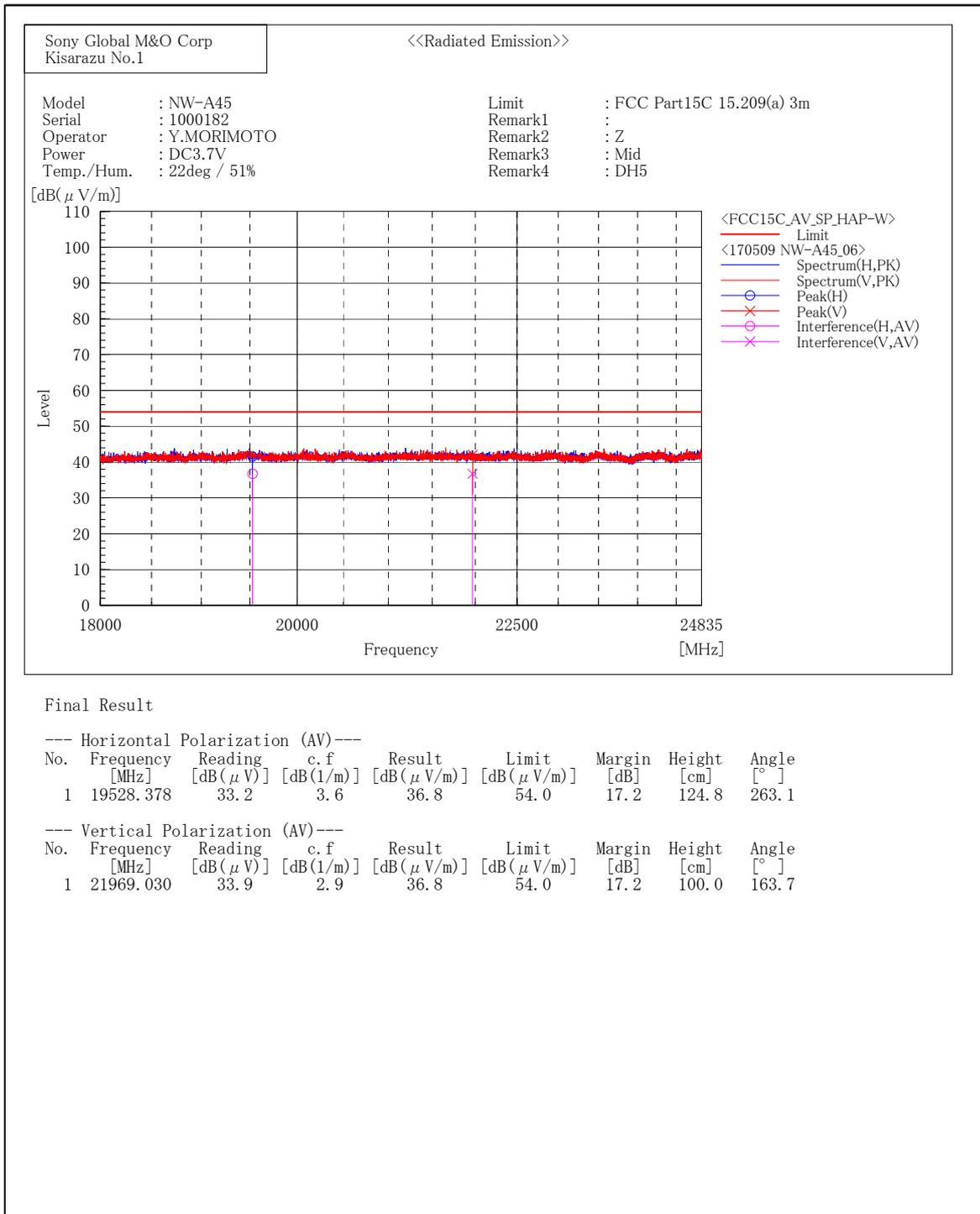


**18 GHz – 24.835 GHz**

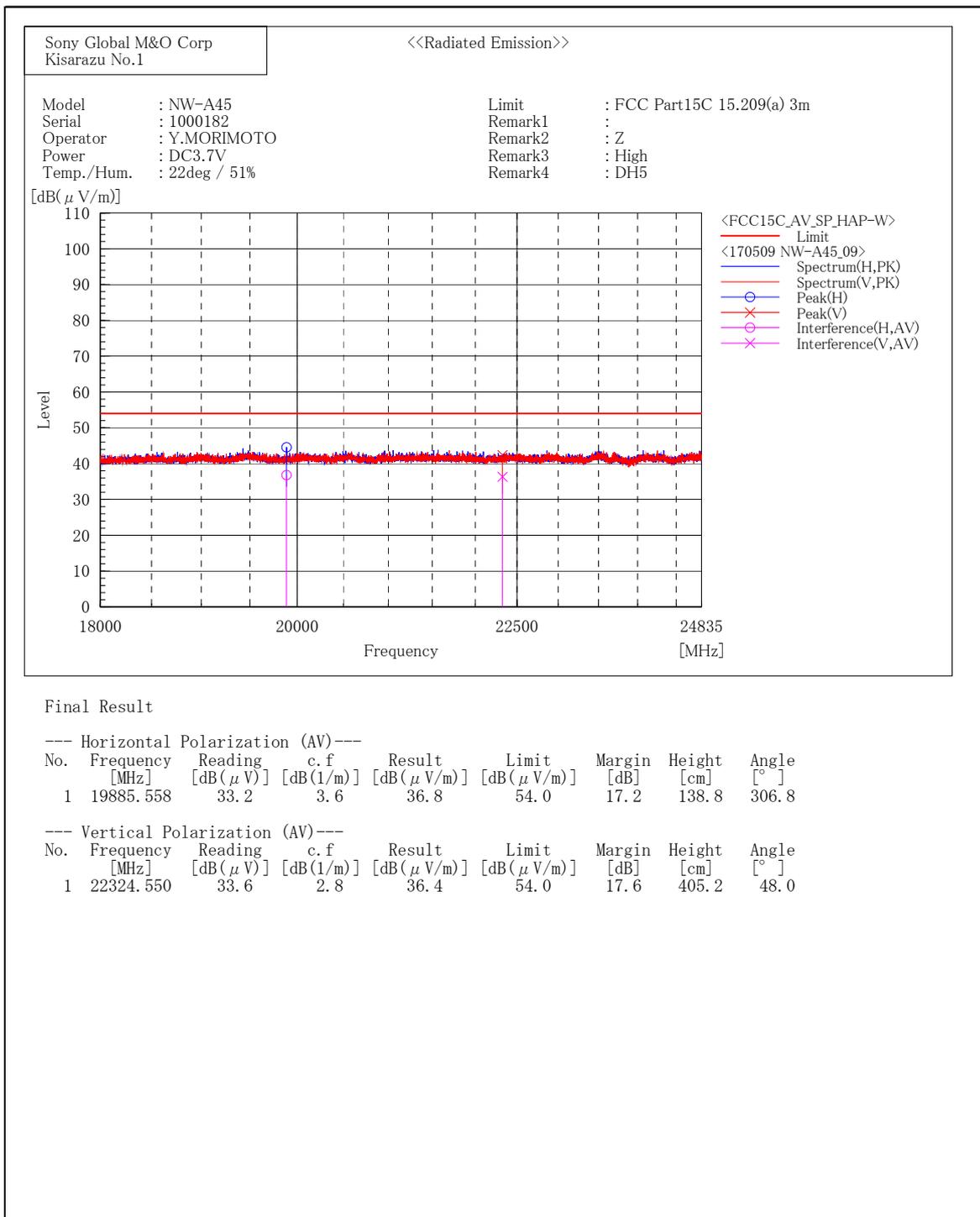
[BDR( DH5 )/2402MHz]



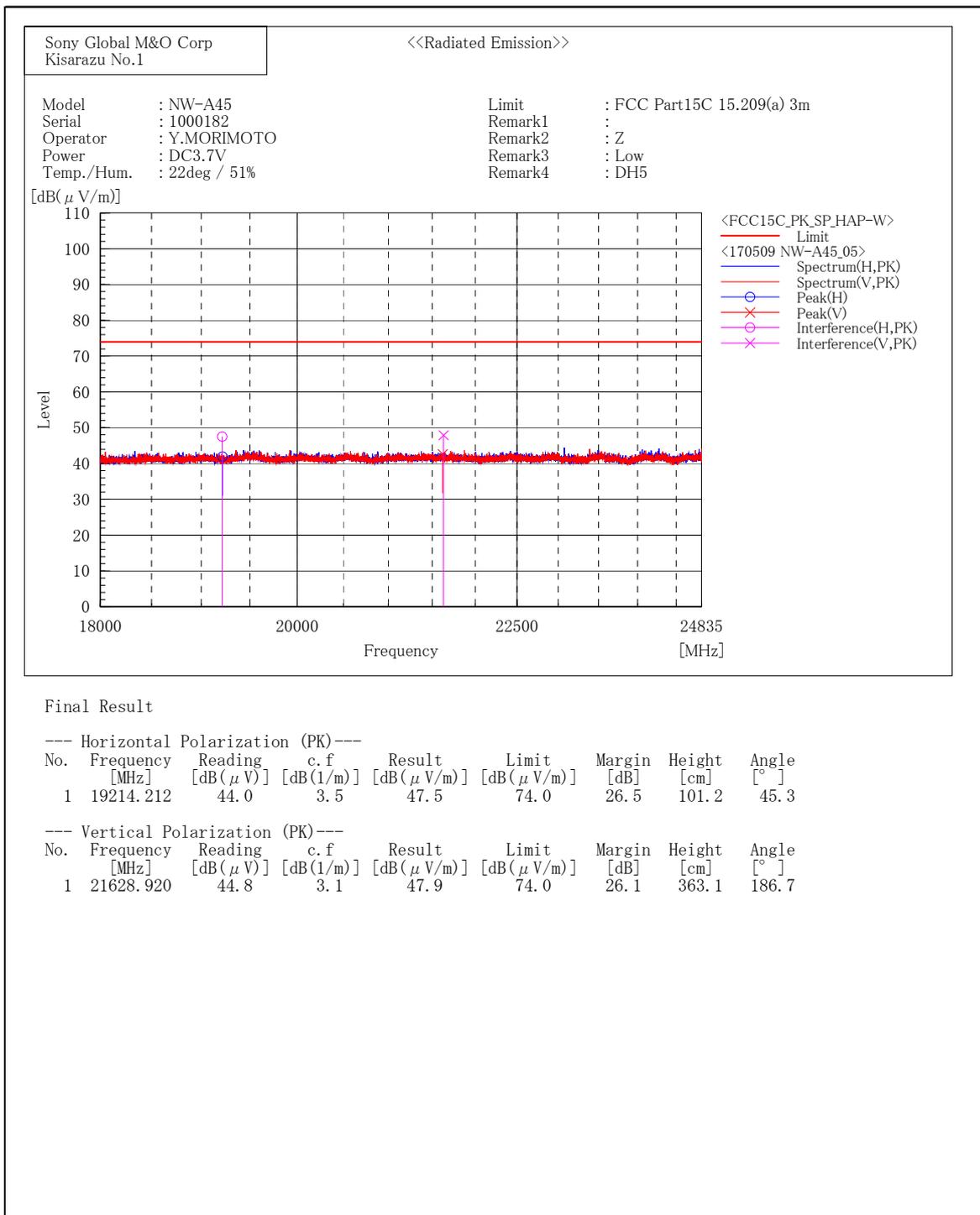
[BDR( DH5 )/2441MHz]



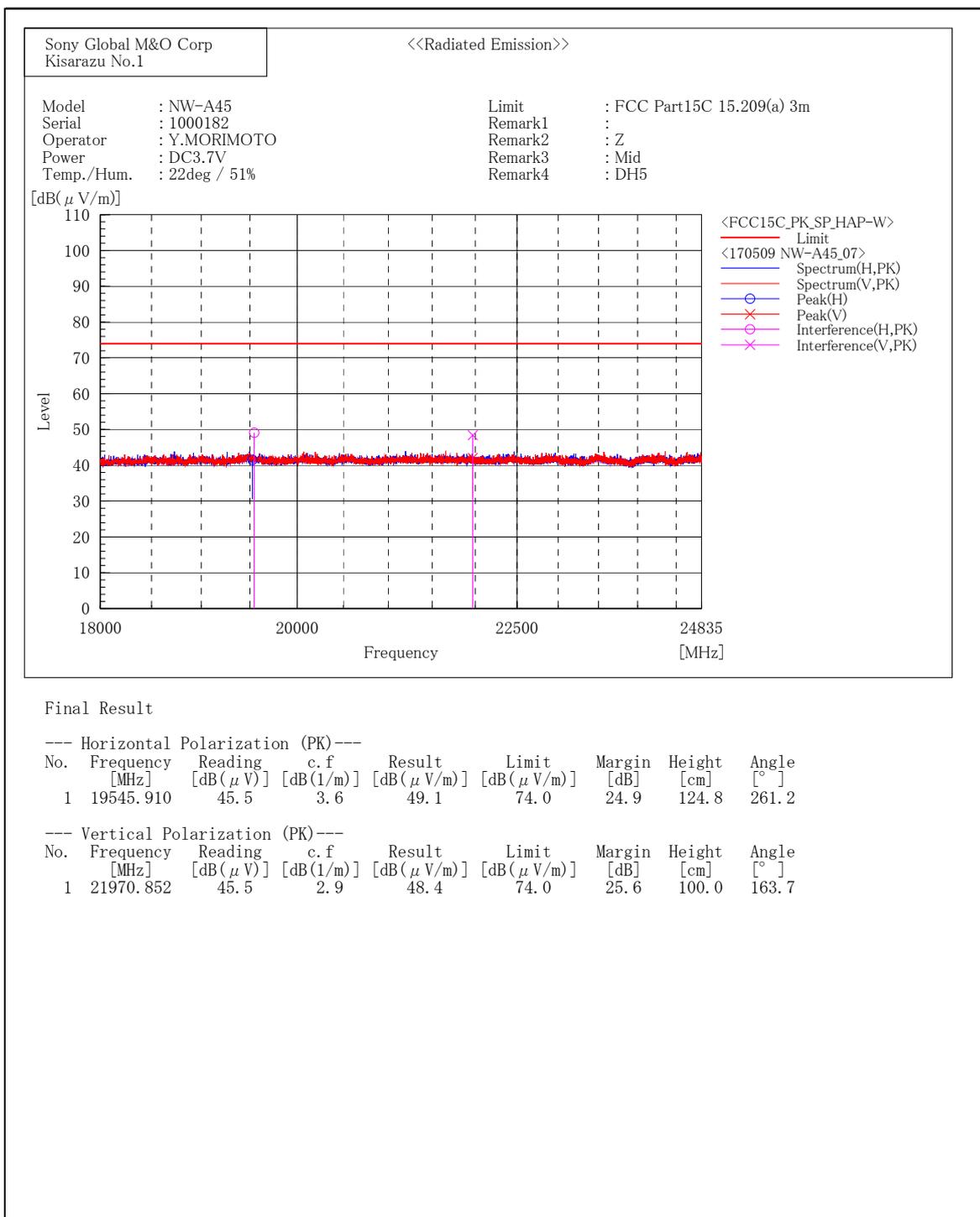
[BDR( DH5 )/2480MHz]



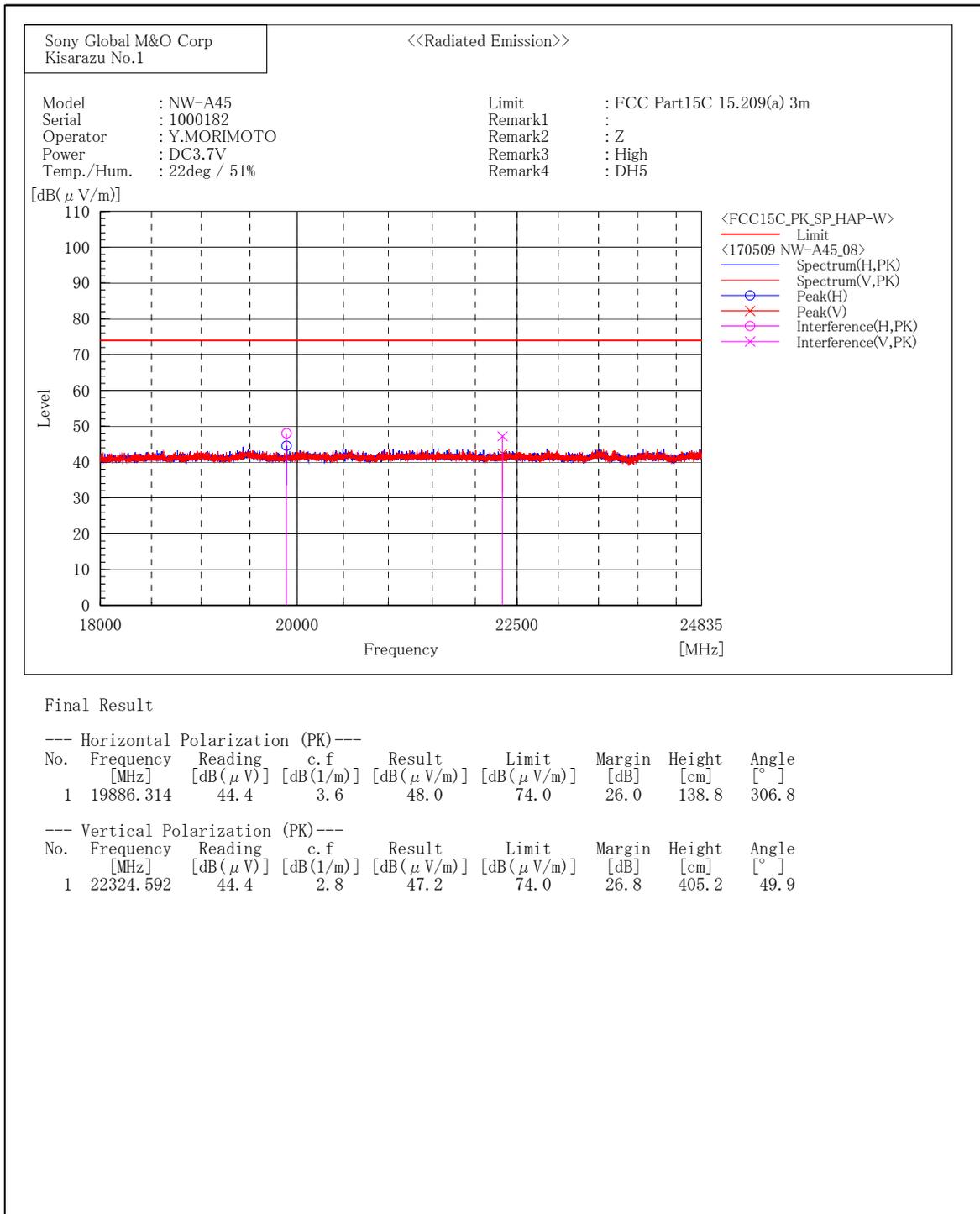
[BDR( DH5 )/2402MHz]



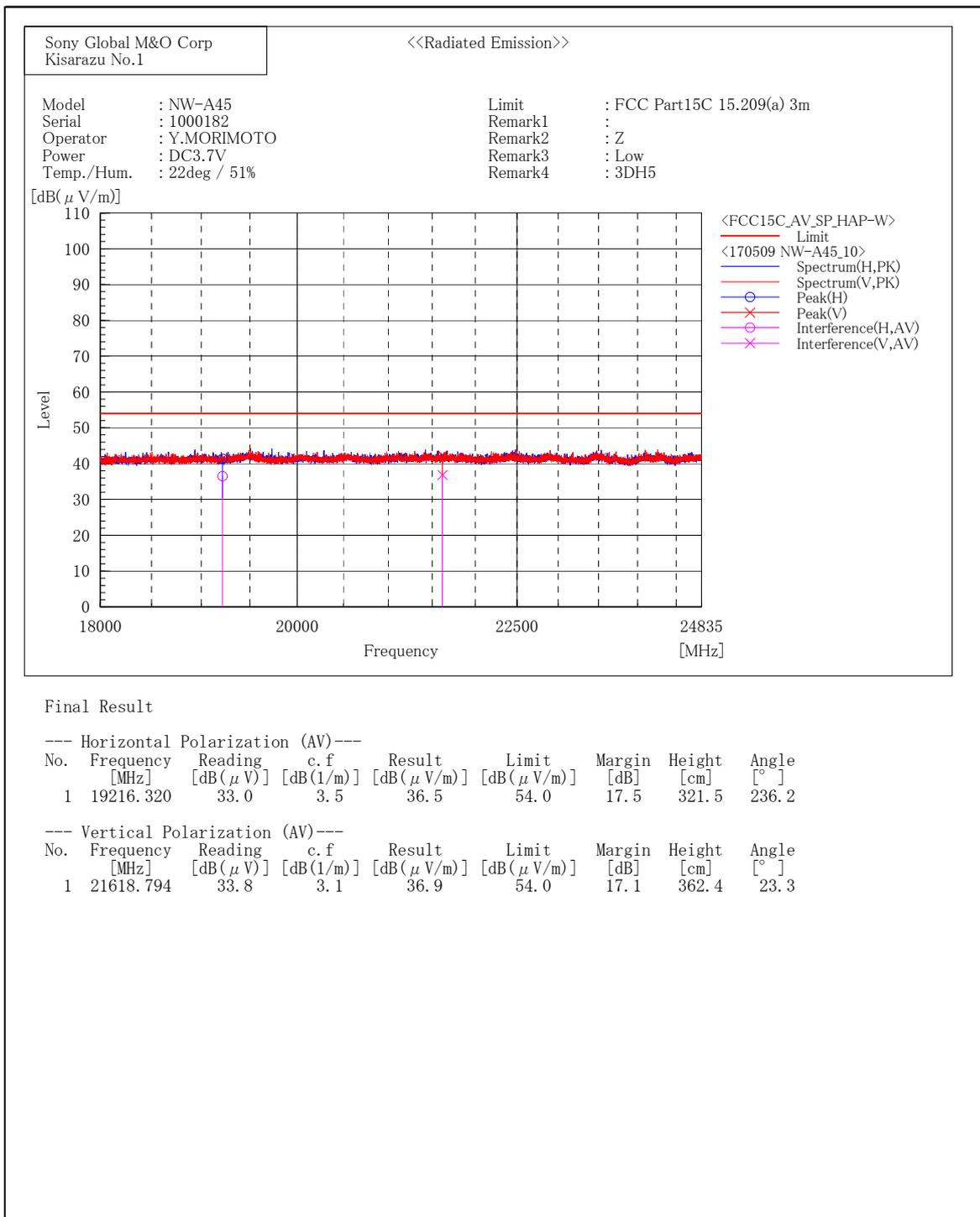
[BDR( DH5 )/2441MHz]



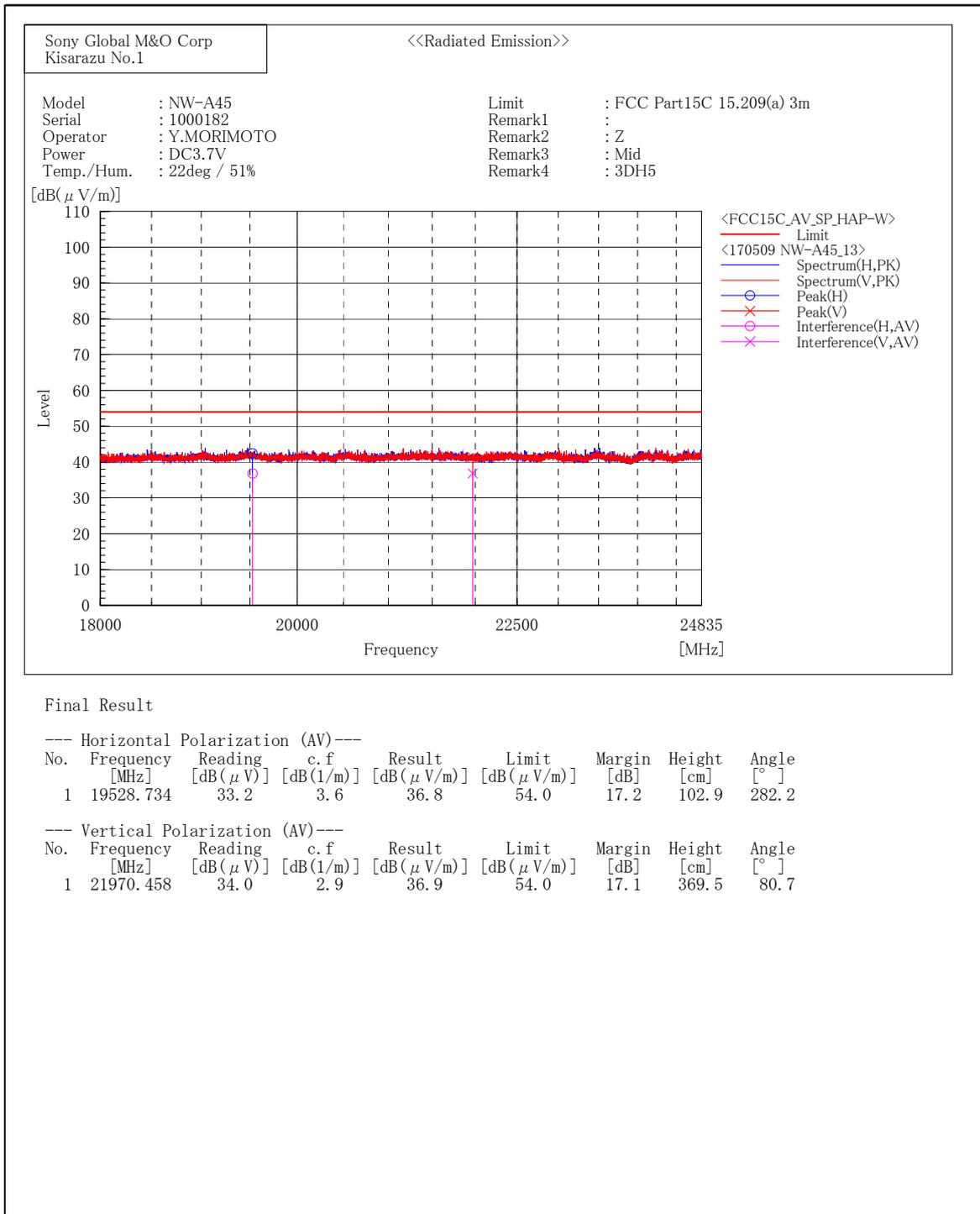
[BDR( DH5 )/2480MHz]



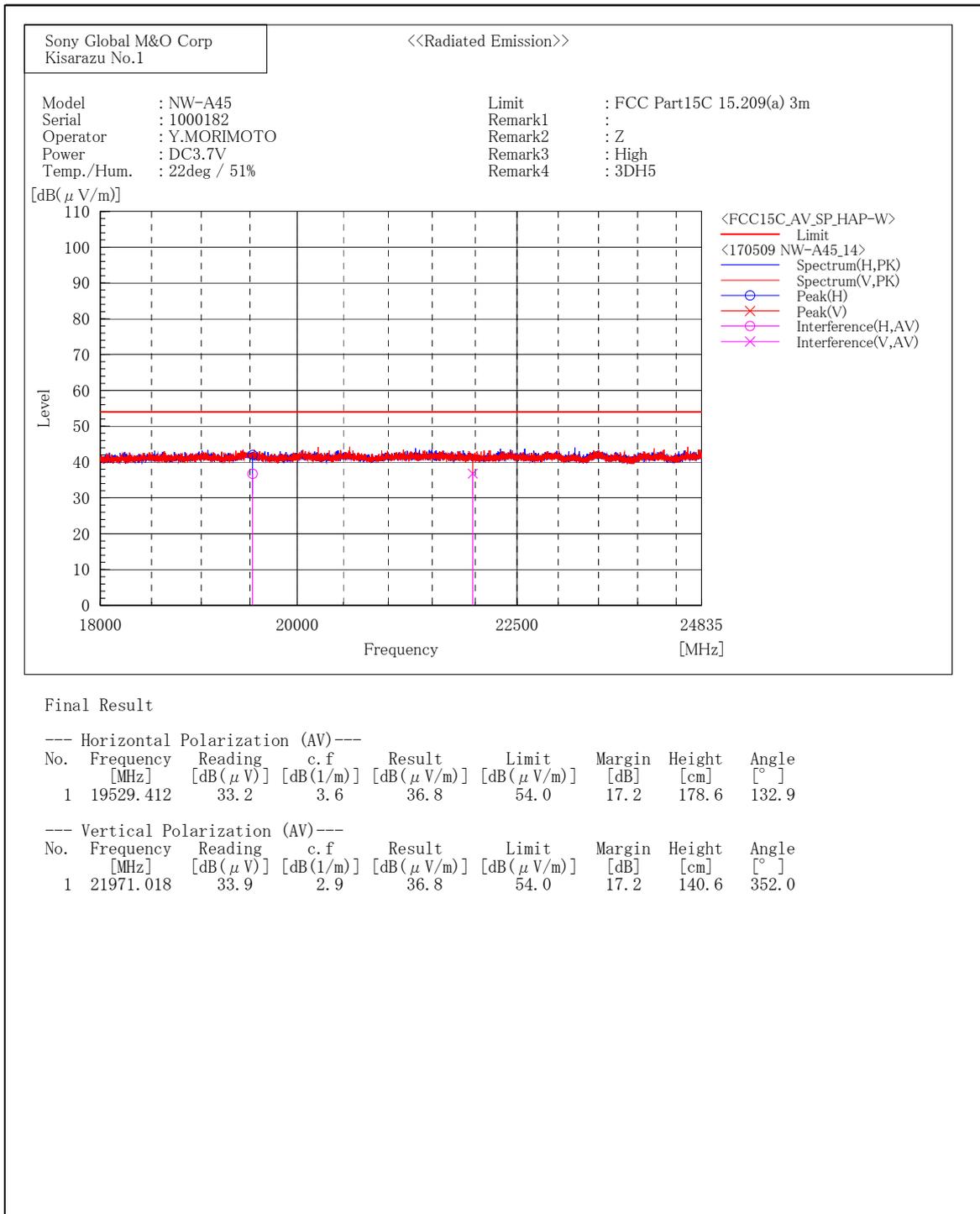
[EDR( 3DH5 )/2402MHz]



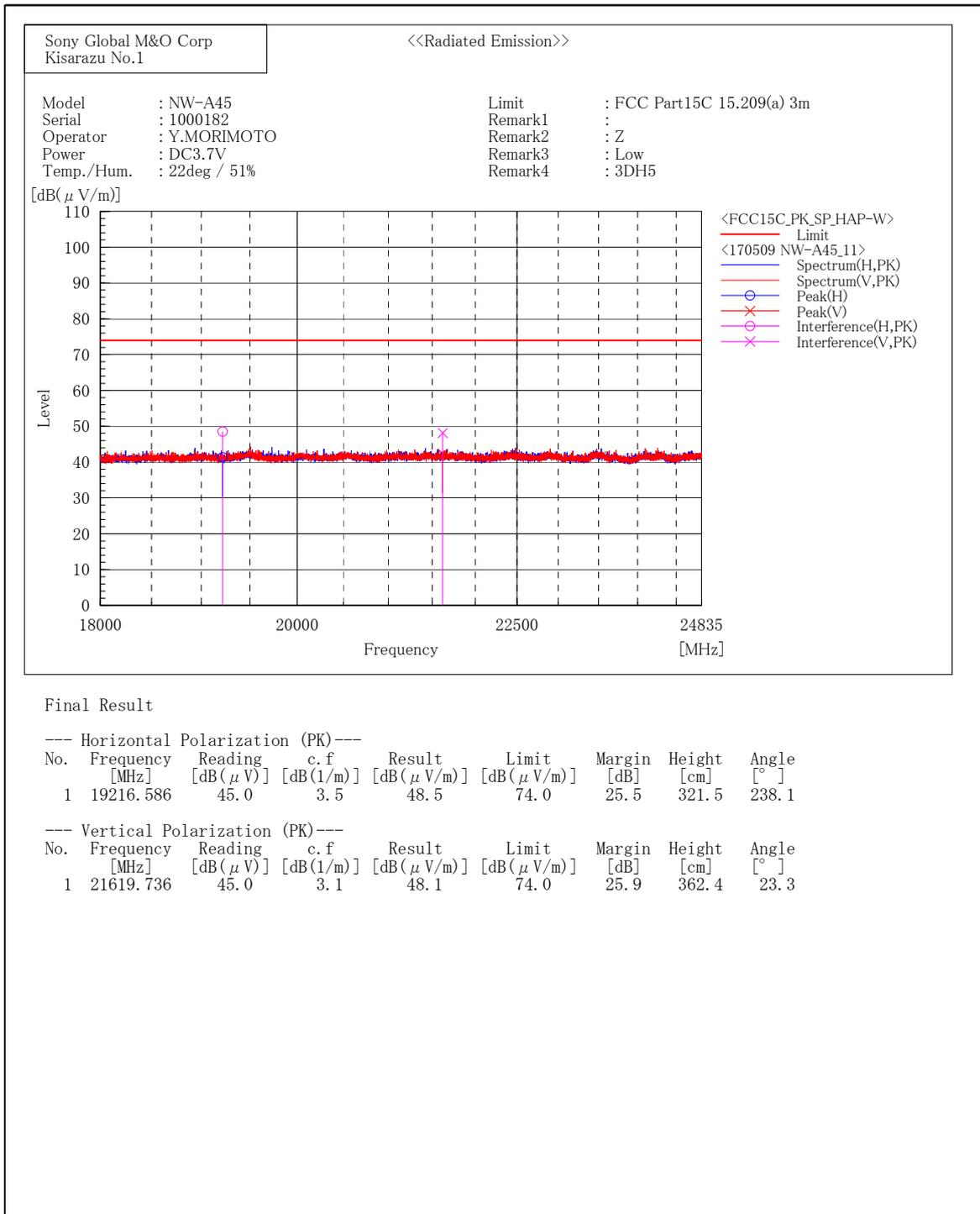
[EDR( 3DH5 )/2441MHz]



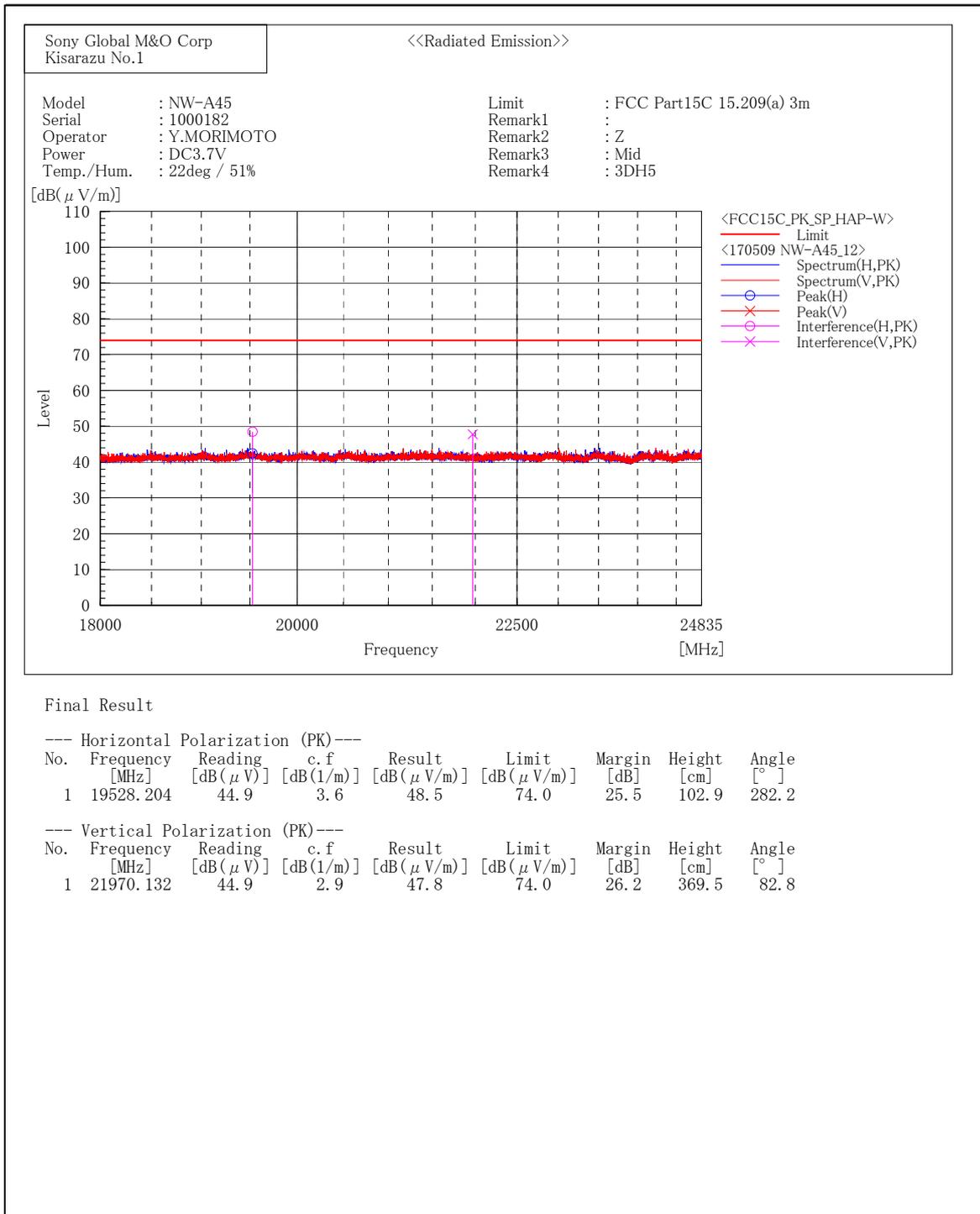
[EDR( 3DH5 )/2480MHz]



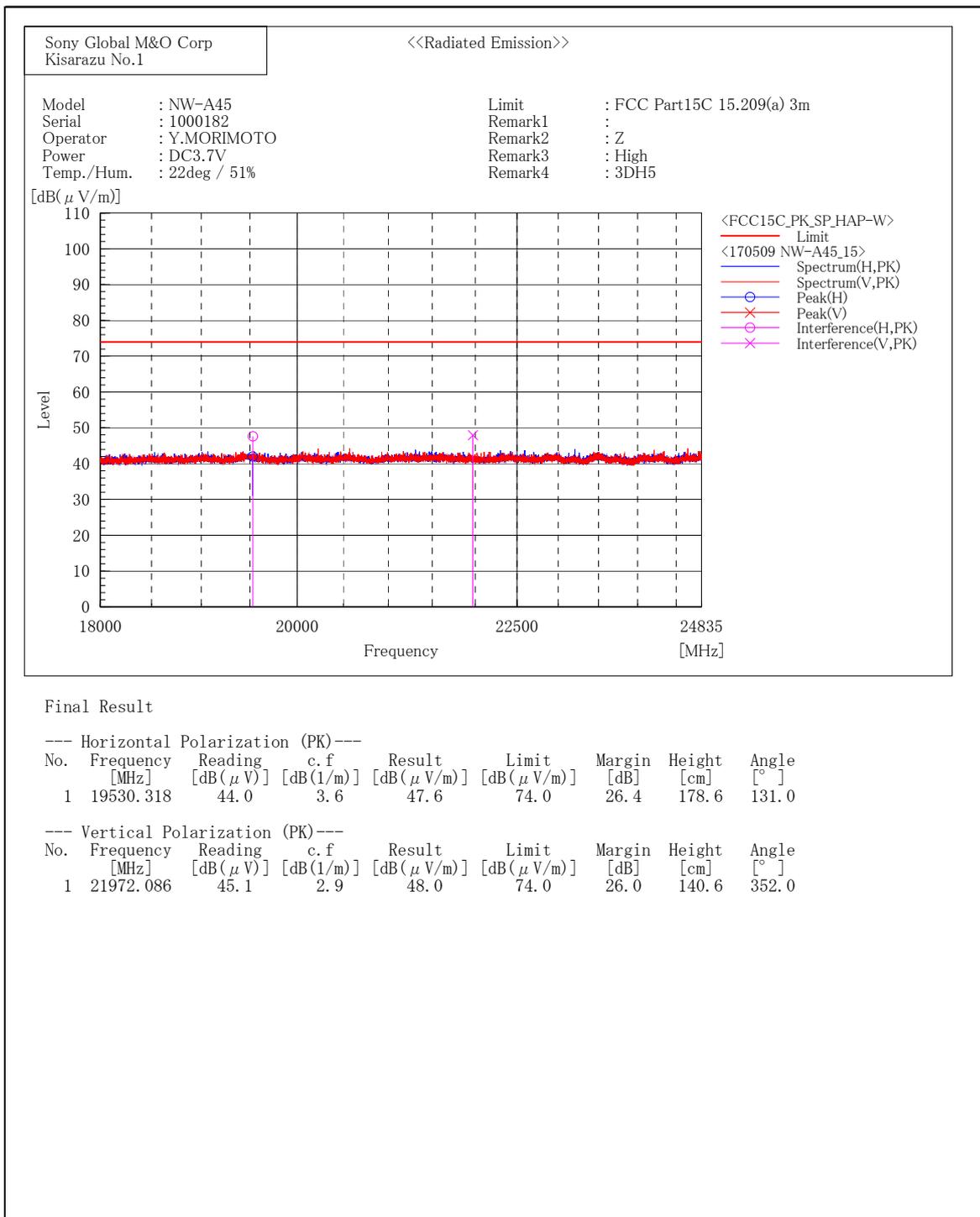
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]



[EDR( 3DH5 )/2480MHz]

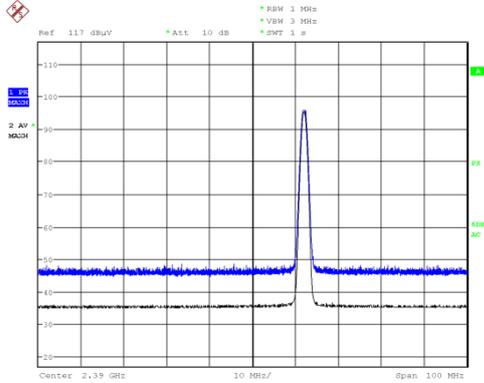


### 2.4GHz Restricted-Band Edge (Plot data)

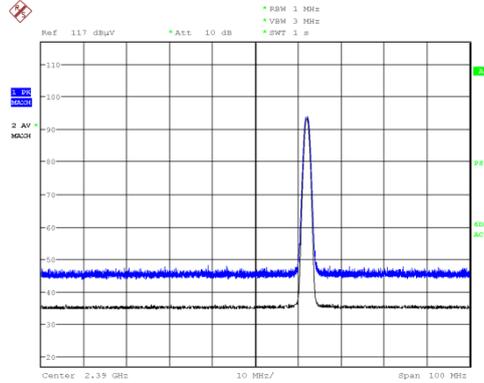
These plot data show peak (trace blue) and average (trace black) spectrum for worst case emissions in the restricted band edges. (Restricted band edges: below 2390MHz and above 2483.5MHz)  
The result of the final radiated emissions measurement refers in previous pages.

#### [BDR / 2402MHz]

Horizontal

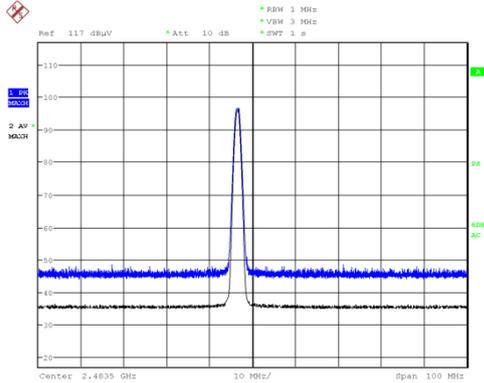


Vertical

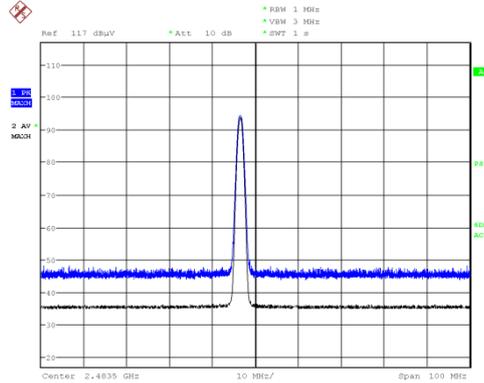


#### [BDR / 2480MHz]

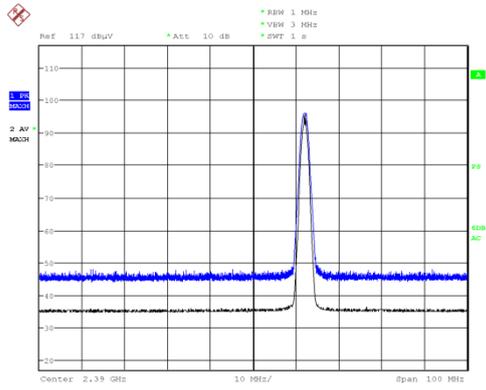
Horizontal



Vertical

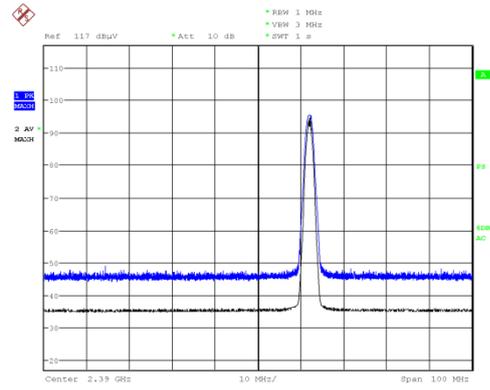


[EDR / 2402MHz]  
Horizontal



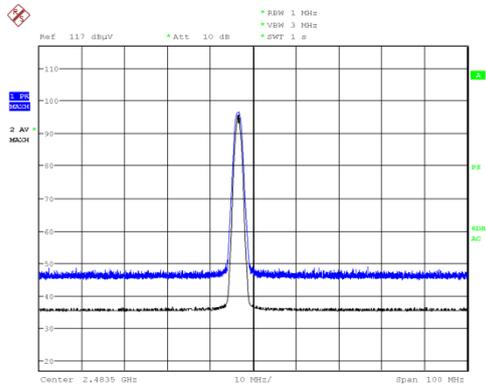
Date: 19.MAY.2017 22:56:51

Vertical



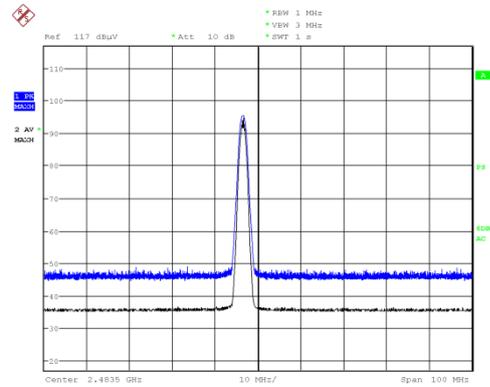
Date: 19.MAY.2017 22:51:58

[EDR / 2480MHz]  
Horizontal



Date: 19.MAY.2017 23:03:29

Vertical



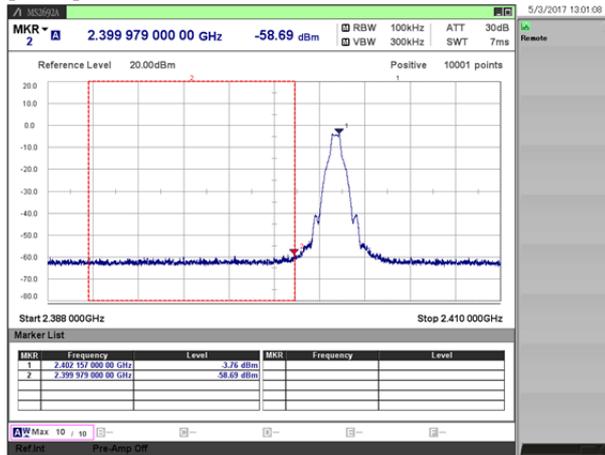
Date: 19.MAY.2017 23:09:29

### 3.8. Conducted Spurious Emissions for Band Edge

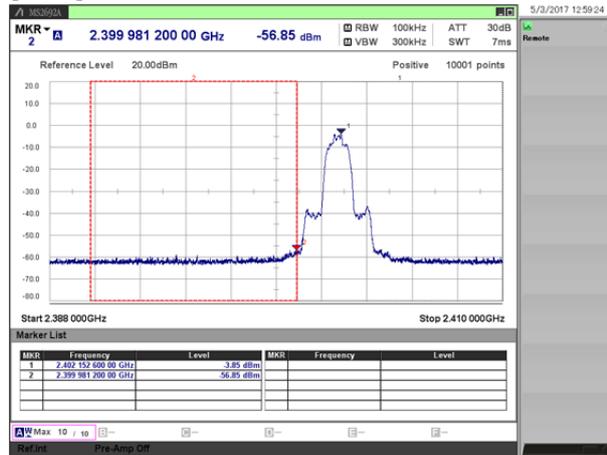
- 1) Ambient temperature : 22.5 deg.C
- 2) Relative humidity : 41.0 %
- 3) Date of measurement : May 03, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Frequency [MHz]	Reading(PK) [dBm]	C.F. [dB]	Result(PK) [dBm]	Limit [dBm]	Margin [dB]
BDR	DH5	2402	2399.98	-58.69	10.55	-48.14	-13.2	34.92
			2402.16	-3.76	10.55	6.79	-	-
EDR	3DH5	2402	2399.98	-56.85	10.55	-46.30	-13.3	33.00
			2402.15	-3.85	10.55	6.70	-	-

[BDR]



[EDR]



## 4. Method of Calculation

### 4.1. AC Power-line Conducted Emissions Measurement

Method of calculation : Software  
 The Software for Calculation Name : EP5/ CE  
 Version : Ver5.0.0

$$\text{Test Result [ dBuV ]} = \text{Meter Reading [ dBuV ]} + \text{C.F. [ dB ]}$$

Notes :

- (a) Meter Reading : Reading of the EMI test receiver or spectrum analyzer.
- (b) C.F. : System Loss + Correction Factor of LISN.

### 4.2. Time of Occupancy (Dwell Time) Measurement

Method of calculation : Software  
 The Software for Calculation Name : SW-308  
 Version : Ver.3.0

$$\text{Test Result [ msec ]} = \text{Dwell Time [ msec ]} * \text{Cycle [ time ]} * 31.6 [ \text{sec} ] / \text{Sweep Time [ sec ]}$$

Notes :

- (a) Dwell Time : Transmission duration of 1 hopping.
- (b) Cycle : Number of hopping appearances on the spectrum analyzer.  
(The average of 5 measurements if it is random hopping equipment)
- (c) 31.6 :  $0.4 [ \text{sec} ] * \text{Number of Hopping Frequencies}(79)$
- (d) Sweep Time : Sweep time settings on the spectrum analyzer.

### 4.3. Maximum Peak Conducted Output Power Measurement

Method of calculation : Software  
 The Software for Calculation Name : SW-308  
 Version : Ver. 3.0

$$\text{Test Result [ dBm ]} = \text{Meter Reading [ dBm ]} + \text{C.F. [ dB ]}$$

$$\text{Duty Cycle [ \% ]} = \text{Tx ON Time} / (\text{Tx ON Time} + \text{Tx OFF Time}) * 100$$

Notes :

- (a) Meter Reading : Reading of the spectrum analyzer.
- (b) C.F. : System Cable Loss + EUT Cable Loss

## 4.4. Radiated Spurious Emission Measurement

Method of calculation : Software  
The Software for Calculation Name : V-Scan  
Version : Ver.4.0.30

Test Result [ dBuV/m ] = Meter Reading [ dBuV ] + C.F. [ dB/m ]

Notes :

- (a) Meter Reading : Reading of the EMI test receiver or spectrum analyzer.  
(b) C.F. :  Antenna Factor (including Balun Loss) + System GainLoss  
:  Antenna Factor (including Balun Loss) + System GainLoss + 20 log (3 m/ 10 m)

## 4.5. Conducted Spurious Emission for Band Edge Measurement

Method of calculation : Software  
The Software for Calculation Name : SW-308  
Version : Ver. 3.0

Test Result [ dBm ] = Meter Reading [ dBm ] + C.F. [ dB ]

Notes :

- (a) Meter Reading : Reading of the spectrum analyzer.  
(b) C.F. : System Cable Loss + EUT Cable Loss

## 5. List of Test Equipment

All test results are traceable to the national and/or international standards.

### 5.1. AC Power-line Conducted Emissions

#### 4th Site Shielded Room 1

	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M515	EMI Receiver	ESCI	100606	Rohde & Schwarz	12	16.08.04
x	CS043	4th Site CE Cable SYSTEM	-	-	EMC/RF Test Lab.	12	17.01.16
x	M664	6dB Attenuator	6806.01A	N/A	HUBER+SUHNER AG	12	17.01.16
x	M619	HIGH FREQUENCY FUSE	MP612A	N/A	Anritsu	12	17.01.16
x	M026	LISN (for Peripheral)	KNW-407	8-541-1	Kyoritsu	12	17.02.16
-	M116	LISN	KNW-242	8-888-6	Kyoritsu	12	16.07.16
-	M505	LISN	ENV216	100425	Rohde & Schwarz	12	16.06.23
x	M833	AMN (for EUT)	ENV216	100293	Rohde & Schwarz	12	17.01.11
-	M152	50 ohm Terminator	CT-01	N/A	TME	12	17.01.15
-	M153	50 ohm Terminator	CT-01	N/A	TME		16.06.23
-	M159	50 ohm Terminator	T1302	N/A	Stack	12	16.07.16
x	M165	50 ohm Terminator	T1302	N/A	Stack	12	16.06.02
x	M690	Thermo Meter	AD-5640A	201304	A&D	12	16.11.07
x	M634	AC Volt Meter	205207	81BA0323	Yokogawa	12	17.01.15

### 5.2. Antenna-port Conducted Measurements

#### 4th Site Shielded Room 1

	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	-	Shield Room	B83117-B2432-T161	P26428	Albatross Project	-	-
x	W100	Spectrum Analyzer	MS2692A	6201338954	Anritsu	12	17.04.14
x	W006	Power Meter	N1911A	MY50000295	Keysight Technologies	12	16.10.03
x	W007	Power Sensor	N1922A	MY50180022	Keysight Technologies	12	16.10.03
x	W029	10dB Attenuator	8493C	76549	Keysight Technologies	12	16.08.01
x	WC05	RF Cable	SUCOFLEX 102	34287	HUBER + SUHNER	12	16.11.04
x	M720	Thermometer	TH-321	140044	AS ONE	12	16.06.02

### 5.3. Radiated Spurious Emissions

#### EMC Site 3m Semi-Anechoic Chamber

	Ctrl#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M115	Semi-Anechoic Chamber	-	7D1-8A11	Otsuka Science	12	16.06.03
x	M686	EMI Receiver	N9038A	MY52260113	Keysight Technologies	12	16.12.08
x	M959	EMI Receiver	ESU40	100041	Rohde & Schwarz	12	16.11.01
x	A073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	16.10.04
x	A089	Biconical Antenna	BBA9106	VHA91032835	Schwarzbeck	12	17.01.15
x	A088	Log periodic Antenna	UHALP9108A1	0643	Schwarzbeck	12	17.01.15
x	A064	Horn Antenna	BBHA9120D	746	Schwarzbeck	12	17.01.14
x	A078	Horn Antenna	HAP06-18W	00000070	TOYO Corporation	12	17.02.20
x	A058	Horn Antenna	HAP18-26W	00000016	TOYO Corporation	12	17.02.13
x	CS017	N-RE Cable SYSTEM 1	-	-	EMC/RF Test Lab.	12	17.01.13
x	CS018	N-RE Cable SYSTEM 2	-	-	EMC/RF Test Lab.	12	17.01.13
x	CS045	N-3m EMF Cable SYSTEM	-	-	EMC/RF Test Lab.	12	17.01.13
x	CS074/075	N-RE Cable SYSTEM 4	-	-	EMC/RF Test Lab.	12	17.01.13
x	M126	Step Attenuator	8494H	3837M01144	Keysight Technologies	12	17.01.13
x	M752	Pre Amplifier	310N	320621	SONOMA INSTRUMENT	12	17.01.13
x	M128	Attenuator (3dB)	8491A	53541	Keysight Technologies	12	17.01.13
x	M609	Attenuator (3dB)	8491B	MY39265960	Keysight Technologies	12	17.01.13
x	M737	GHz Filter Box	FB-G1	001	Sony Global M&O	12	17.01.13
x	M687	Thermo Meter	AD-5640A	201301	A&D	12	16.10.06

About calibration interval

Valid until the end of the month listed in "Cal. Int." column.