

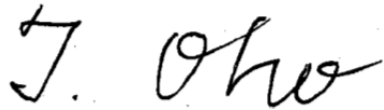
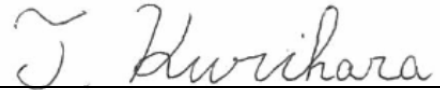
# RADIO TEST REPORT

(for Bluetooth classic)

Project No. : JB-Z0346  
 Client : Sony Corporation  
 Address : 1-7-1 Konan Minato-ku Tokyo, 108-0075 Japan  
 Type of Equipment : Wireless Stereo Headset  
 Model No. : WI-SP500  
 FCC ID : AK8WISP500  
 Regulation Applied : 47 CFR Part 15 Subpart C  
**Final Judgment** : **Passed**  
 Sample Receipt : September 22, 2017  
 Testing : September 26, 2017 - October 10, 2017  
 Reported : October 11, 2017

Reported by :

Approved Signatory :

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

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 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.....	3
1.3. Tested Methodology .....	4
1.4. Measurement Procedures .....	4
1.5. Test Facility.....	6
1.6. Uncertainty .....	6
<b>2. System Test Configuration.....</b>	<b>7</b>
2.1. Validation .....	7
2.2. Test Operating Conditions .....	7
2.3. EUT Modifications .....	7
2.4. Configuration of Tested System .....	8
<b>3. Test Data.....</b>	<b>10</b>
3.1. 20dB Bandwidth.....	10
3.2. Carrier Frequency Separation.....	12
3.3. Number of Hopping Frequencies .....	13
3.4. Time of Occupancy (Dwell Time).....	14
3.5. Maximum Peak Conducted Output Power.....	17
3.6. Radiated Spurious Emissions.....	18
3.7. Conducted Spurious Emissions for Band Edge.....	69
<b>4. Method of Calculation.....</b>	<b>70</b>
<b>5. List of Test Equipment .....</b>	<b>72</b>
5.1. Antenna-port Conducted Measurements.....	72
5.2. Radiated Spurious Emissions.....	72
<b>6. Photographs of test setup .....</b>	<b>73</b>
6.1. Antenna-port Conducted Measurements Photo(s) .....	73
6.2. Radiated Spurious Emissions Measurement Photo(s).....	74

### 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 : Wireless Stereo Headset  
 Trade Name : SONY  
 Model No. : WI-SP500  
 Serial No. : 1, 29  
 Power Rating : DC 3.7 V

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

Model No. : None

#### Radio specification

Function of the Equipment : Transceiver  
 Operating Frequency : 2402 - 2480 MHz  
 Modulation Type : FHSS (GFSK,  $\pi/4$ DQPSK, 8DPSK)  
 Channel Spacing : 1 MHz  
 Channel Bandwidth : 1 MHz  
 Number of channels : 79  
 Antenna Type : Chip antenna  
 Antenna connector Type : None  
 Antenna Gain : +1.6 dBi  
 Operating Temperature : +0 to +40 deg.C

### 1.2. Summary of Test Result

Test Item	Worst Margin	Test Frequency band	Results
AC Power-line Conducted Emissions	-	150 kHz - 30 MHz	N/A *2
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	26.09 dB	Carrier	Complied
Radiated Spurious Emissions	4.2 dB (AV) 9924.003 MHz Vertical	9 kHz - 25 GHz (excluding carrier and band edge)	Complied
Conducted Spurious Emissions for Band Edge *1	26.49 dB 2399.52 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)



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;

	9 kHz - 30 MHz	30 MHz - 1000 MHz	1 GHz - 25 GHz
Antenna	Loop Antenna	Bi-conical Antenna, Log-periodic Antenna	Horn Antenna
Antenna scanning range	1 m, Vertical, 360 degrees	1 - 4 m, Horizontal and Vertical	1 - 4 m *, 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	1 GHz - 25 GHz
Detector	Peak / Average	Quasi-peak	Quasi-peak	Peak / Average
RBW	9 kHz (6 dB) *1	9 kHz (6 dB) *1	120 kHz (6 dB)	1 MHz (6 dB)
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

\*1: 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 (-20 dBc) 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 - 30 MHz	30 MHz - 25 GHz
Detector	Peak	Peak	Peak
RBW	300 Hz (6dB) *	10 kHz (6dB) *	100 kHz (6dB)
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 414788 D01.

## 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

## Radiated Spurious Emission

Semi-Anechoic chamber  
 4th Site  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:

A2LA Certificate No. : 3203.01  
Cert. Validated Date : 31 Oct 2019

## 1.6. Uncertainty

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

Test Item	Frequency	Distance	4th Site	EMC Site
AC Power-line Conducted Emissions	150 kHz - 30 MHz	-	± 3.34 dB	± 3.34 dB
Radiated Emissions	below 30 MHz	3m	± 2.59 dB	± 2.59 dB
	30 - 300 MHz	3m	± 4.18 dB	± 4.18 dB
	300 - 1000 MHz	3m	± 4.04 dB	± 4.04 dB
	1 - 6 GHz	3m	± 4.63 dB	± 4.63 dB
	6 - 18 GHz	3m	± 5.31 dB	± 5.31 dB
	18 - 26.5 GHz	3m	± 5.78 dB	± 5.78 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
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	2402 MHz, 2441 MHz, 2480 MHz
	EDR	3DH5	
Conducted Spurious Emissions for Band Edge	BDR	DH5	2402 MHz
	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.

The Software for Operating Mode

Name : Lab Test Tool

Version : 2.1.0.13769

Special accessories needed for connecting the EUT to achieve compliance:

Item	Manufacturer	Model No.	Serial No.	Remark
Personal Computer	SONY	PCG-4121AN	27547114 1000852	-
AC Adapter	SONY	VPG-AC19C37	0099484	-

### 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	Wireless Stereo Headset	SONY	WI-SP500	29

#### Support equipment for operation

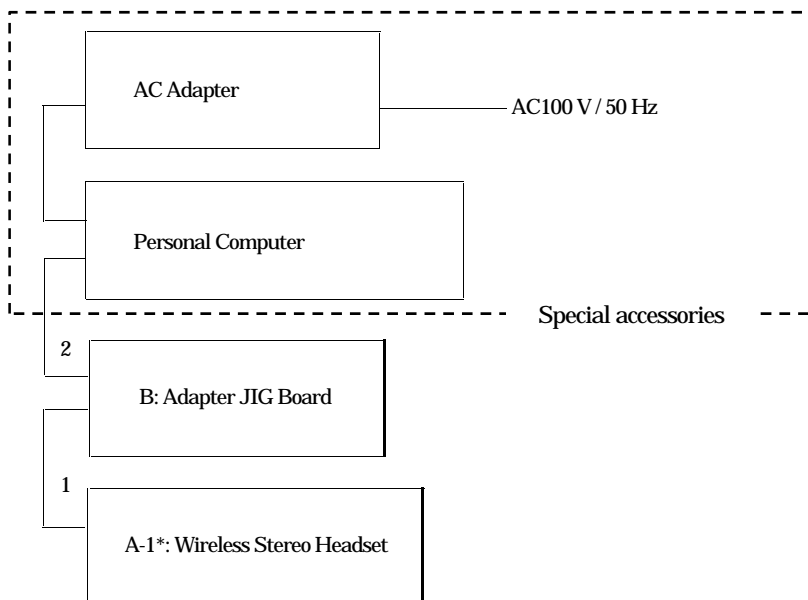
Symbol	Item	Manufacturer	Model No.	Serial No.
B	Adapter Jig Board	-	USB-UART JIG	-

#### Type of cable

Symbol	Description	Identification (Manufacturer etc.)	Shielded YES / NO	Ferrite Core	Length (m)	Bundled
1	JIG Cable	-	YES	NO	0.2	-
2	USB Cable	-	YES	NO	0.5	-

### System configuration

\*: EUT





Radiated Spurious Emissions Measurement

The equipment under test (EUT)

Symbol	Item	Manufacturer	Model No.	Serial No.
A-2	Wireless Stereo Headset	SONY	WI-SP500	1

Support equipment for operation

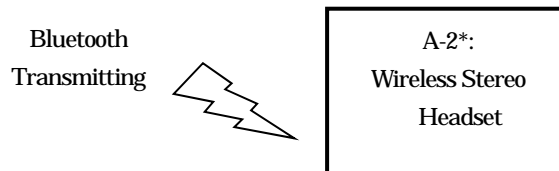
Symbol	Item	Manufacturer	Model No.	Serial No.
-	-	-	-	-

Type of cable

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

System configuration

\*: EUT



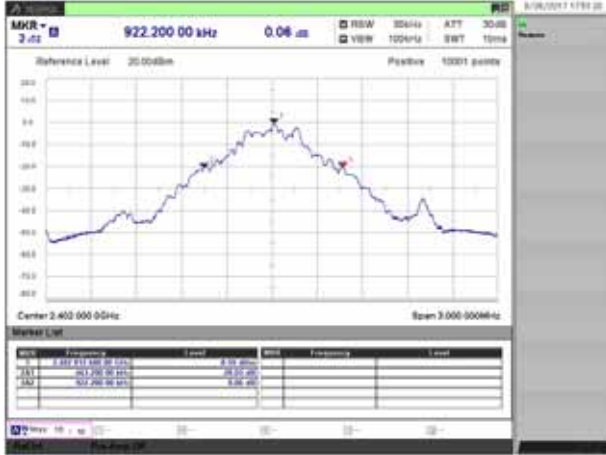
### 3. Test Data

#### 3.1. 20dB Bandwidth

- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Result [MHz]	Limit [MHz]
BDR	DH5	2402	0.922	-
		2441	0.922	-
		2480	0.920	-
EDR	3DH5	2402	1.246	-
		2441	1.248	-
		2480	1.246	-

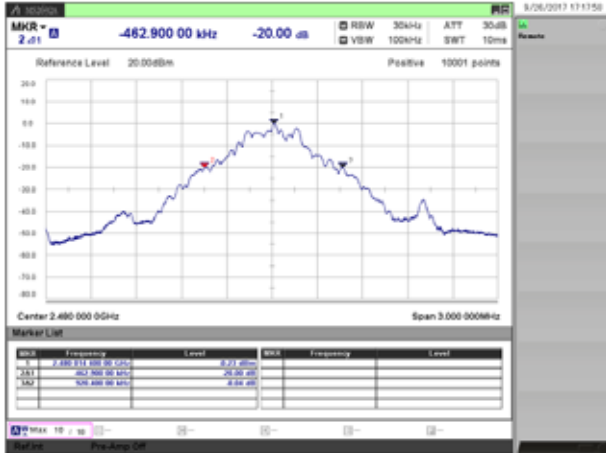
[BDR / 2402MHz]



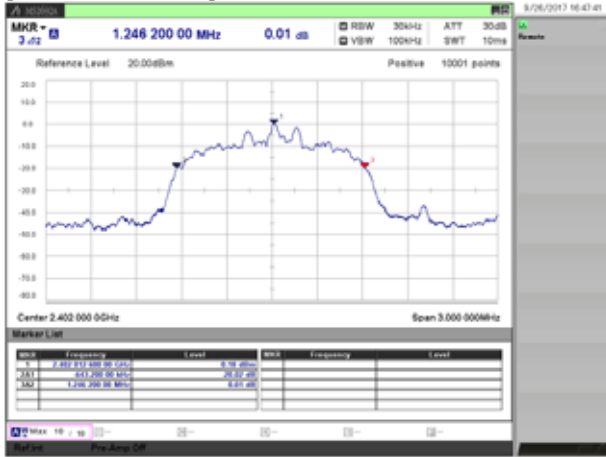
[BDR / 2441MHz]



[BDR / 2480MHz]



[EDR / 2402MHz]



[EDR / 2441MHz]



[EDR / 2480MHz]



### 3.2. Carrier Frequency Separation

- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Reading [kHz]	Limit [kHz]
BDR	DH5	945.3	614.8
EDR	3DH5	986.1	832.0

[BDR]



[EDR]



### 3.3. Number of Hopping Frequencies

- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 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]

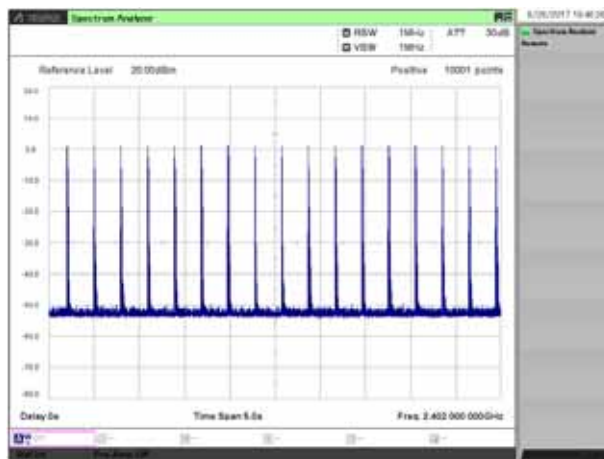
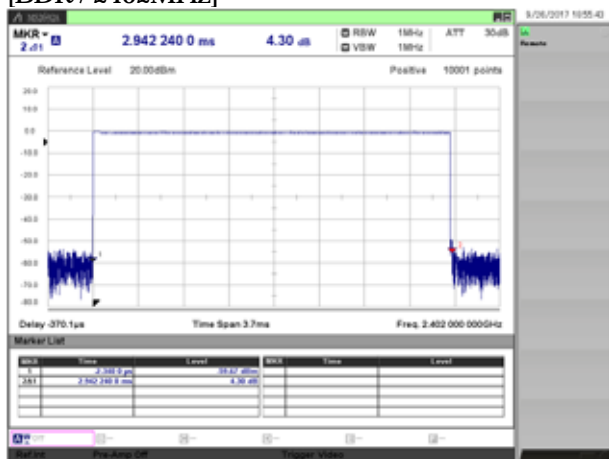


3.4. Time of Occupancy (Dwell Time)

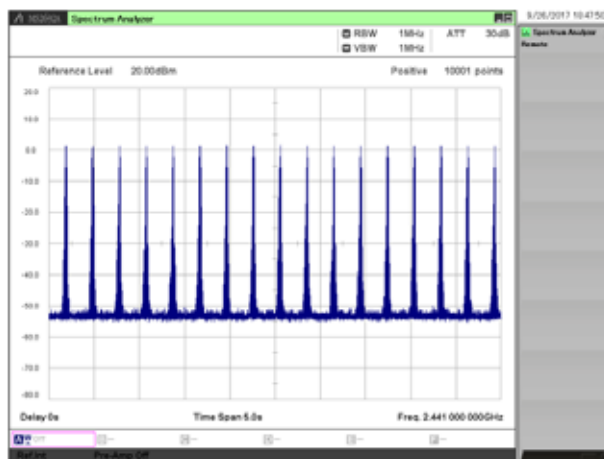
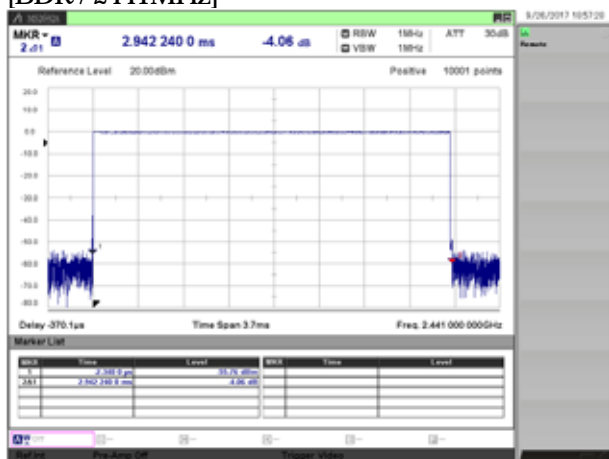
- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 2017
- 4) Measured by : M. KOUGA
- 5) Operating mode : Transmitting mode

Mode		Channel [MHz]	Dwell Time [msec]	Cycle [time]	Result [msec]	Limit [msec]
BDR	DH5	2402	2.94	17.0	316.1	400.0
		2441	2.94	17.0	316.1	400.0
		2480	2.94	17.0	316.1	400.0
EDR	3DH5	2402	2.94	17.0	315.4	400.0
		2441	2.94	17.0	315.4	400.0
		2480	2.94	17.0	315.4	400.0

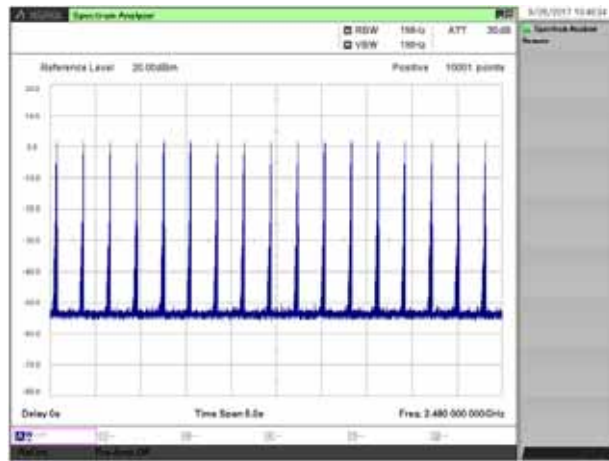
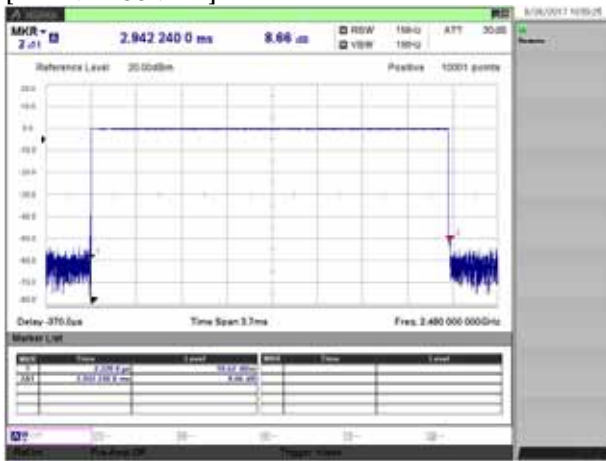
[BDR / 2402MHz]



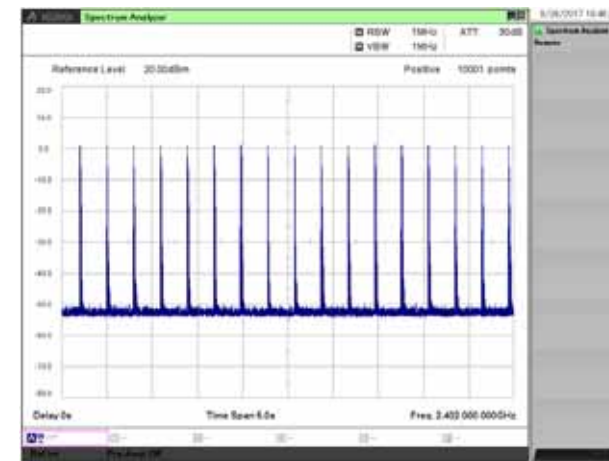
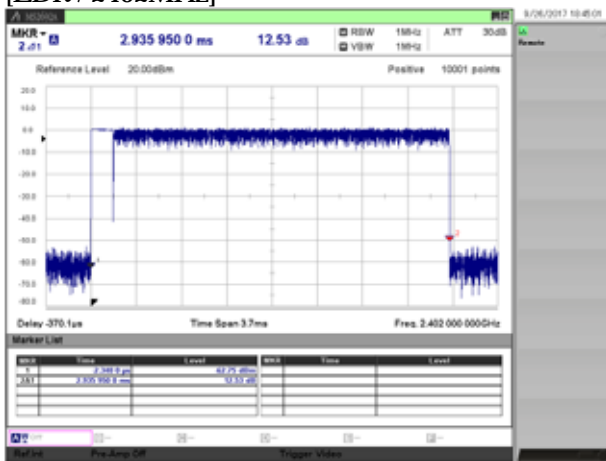
[BDR / 2441MHz]



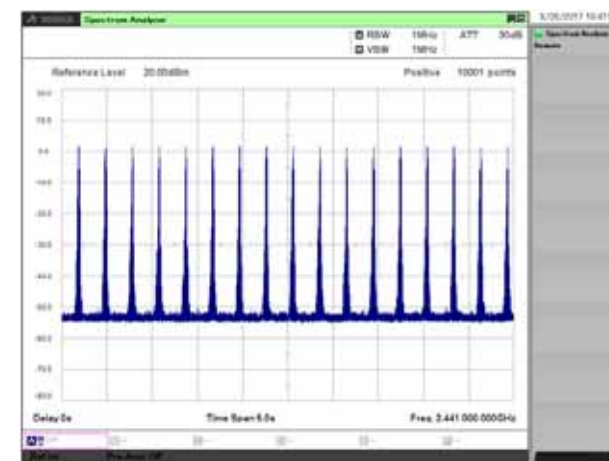
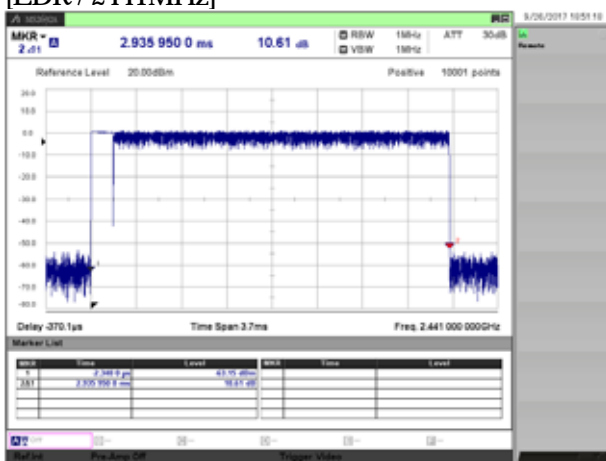
[BDR / 2480MHz]



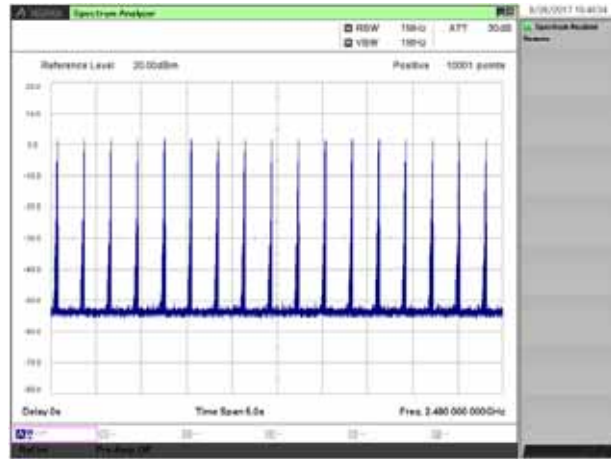
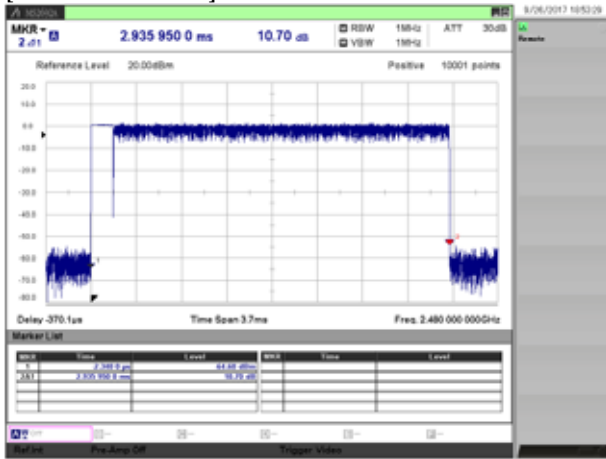
[EDR / 2402MHz]



[EDR / 2441MHz]



[EDR / 2480MHz]





## 3.5. Maximum Peak Conducted Output Power

- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 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	0.17	0.89	1.06	0.00128	30.0	1.0	28.94
		2441	0.64	0.89	1.53	0.00142	30.0	1.0	28.47
		2480	0.72	0.89	1.61	0.00145	30.0	1.0	28.39
EDR	2DH5	2402	2.28	0.89	3.17	0.00207	30.0	1.0	26.83
		2441	2.66	0.89	3.55	0.00226	30.0	1.0	26.45
		2480	2.77	0.89	3.66	0.00232	30.0	1.0	26.34
	3DH5	2402	2.57	0.89	3.46	0.00222	30.0	1.0	26.54
		2441	2.94	0.89	3.83	0.00242	30.0	1.0	26.17
		2480	3.02	0.89	3.91	0.00246	30.0	1.0	26.09

## 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	-1.50	0.89	1.07	0.46	0.00111
		2441	-0.98	0.89	1.07	0.98	0.00125
		2480	-0.84	0.89	1.07	1.12	0.00129
EDR	2DH5	2402	-1.93	0.89	1.04	0.00	0.00100
		2441	-1.37	0.89	1.04	0.56	0.00114
		2480	-1.19	0.89	1.04	0.74	0.00119
	3DH5	2402	-1.93	0.89	1.04	0.00	0.00100
		2441	-1.36	0.89	1.04	0.57	0.00114
		2480	-1.19	0.89	1.04	0.74	0.00119

## Duty Cycle check

Mode		Channel [MHz]	T(on+off) [msec]	T(on) [msec]	Duty Cycle [%]
BDR	DH1	2441	1.250	0.425	34.00
	DH3	2441	2.500	1.700	68.00
	DH5	2441	3.750	2.930	78.13
EDR	2DH1	2441	1.250	0.431	34.48
	2DH3	2441	2.500	1.700	68.00
	2DH5	2441	3.750	2.950	78.67
	3DH1	2441	1.250	0.431	34.48
	3DH3	2441	2.500	1.700	68.00
	3DH5	2441	3.750	2.950	78.67

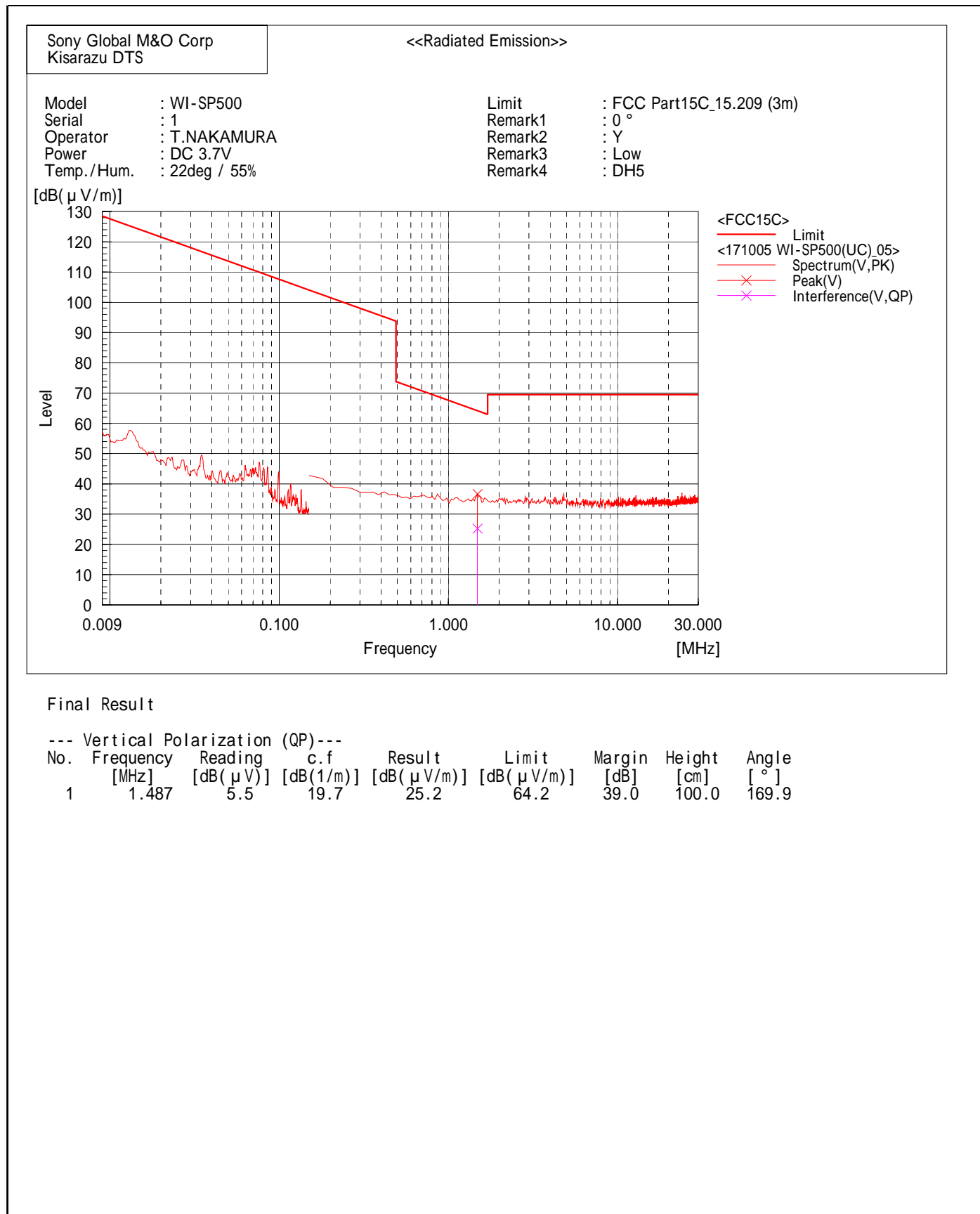
### 3.6. Radiated Spurious Emissions

#### 1) Date of measurement

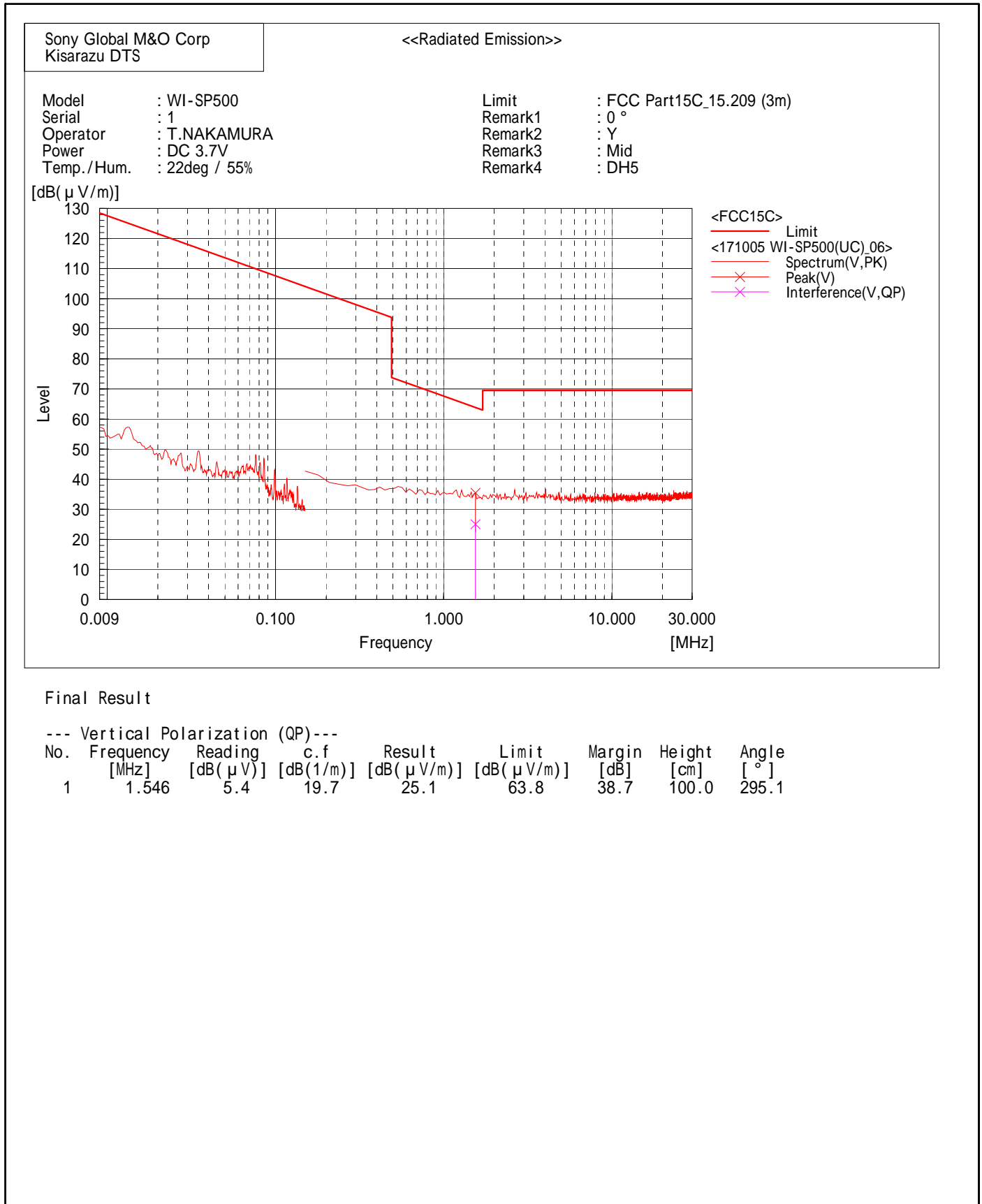
9 kHz - 30 MHz : October 05, 2017 (all mode)  
30 MHz - 1000 MHz : October 05, 2017 (all mode)  
1 GHz - 6 GHz : October 03, 2017 - October 04, 2017(all mode)  
6 GHz - 18 GHz : October 10, 2017 (all mode)  
18 GHz - 24.835 GHz : October 10, 2017 (all mode)

9 kHz - 30 MHz

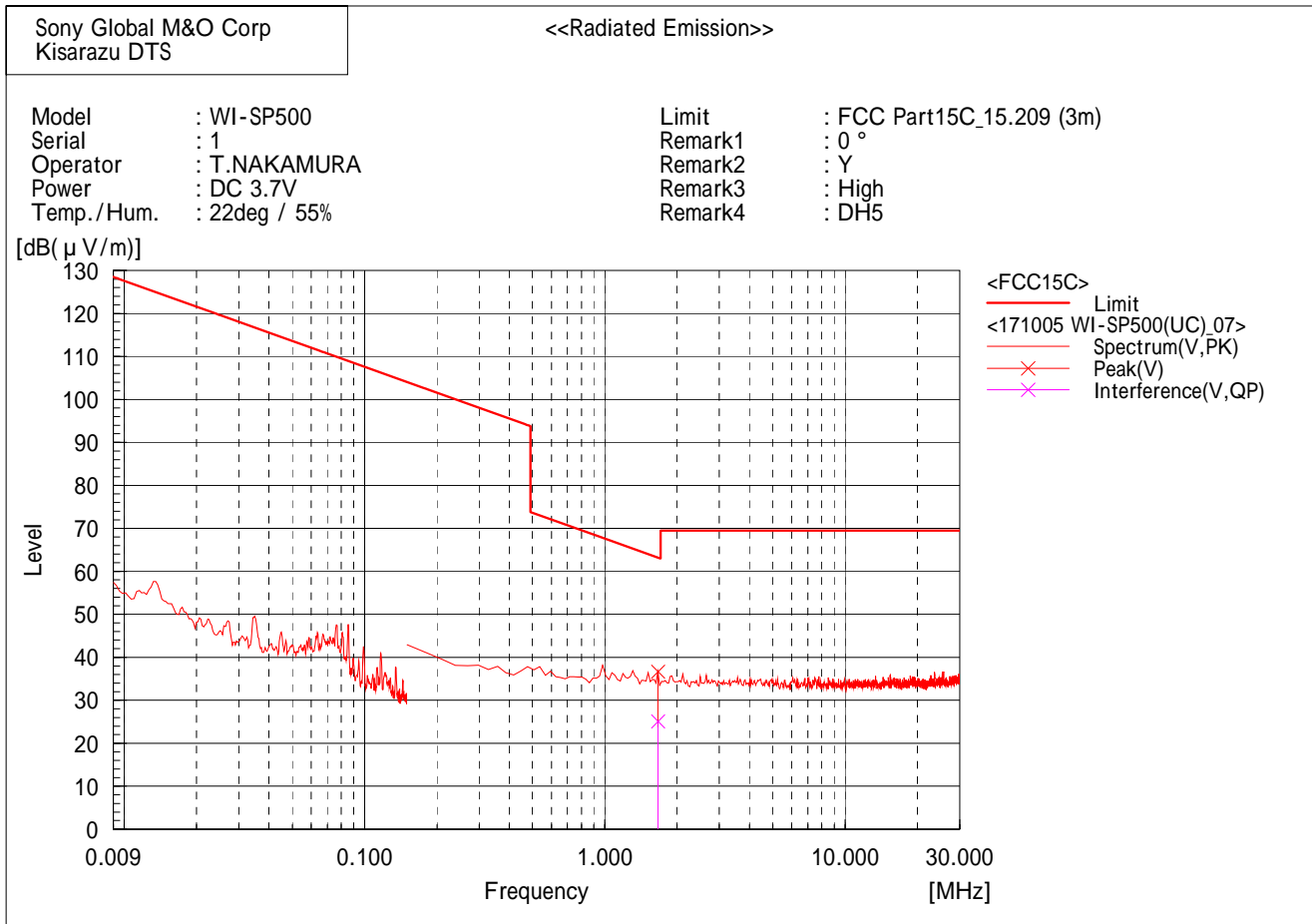
[BDR( DH5 )/2402MHz]



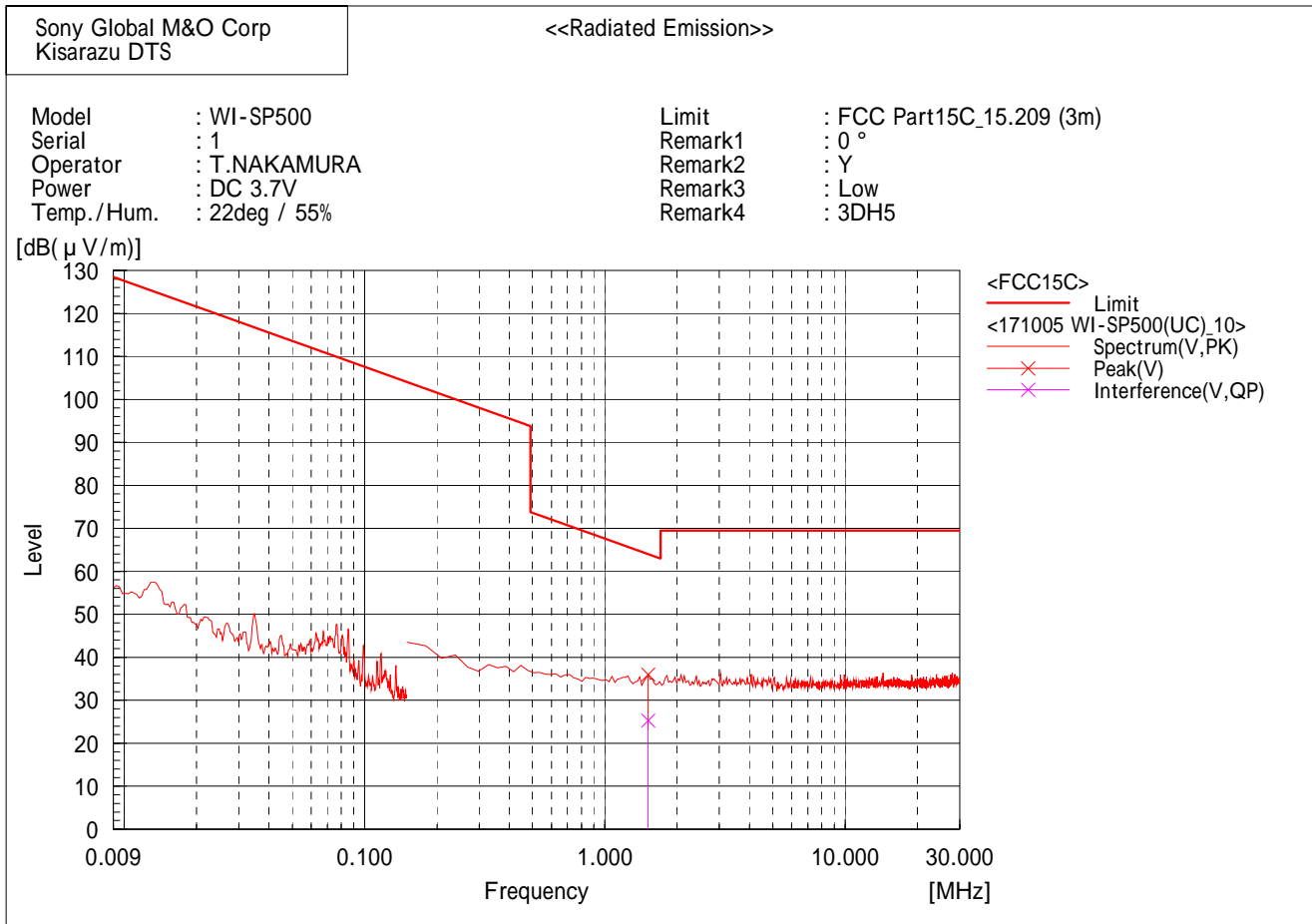
[BDR( DH5 )/2441MHz]



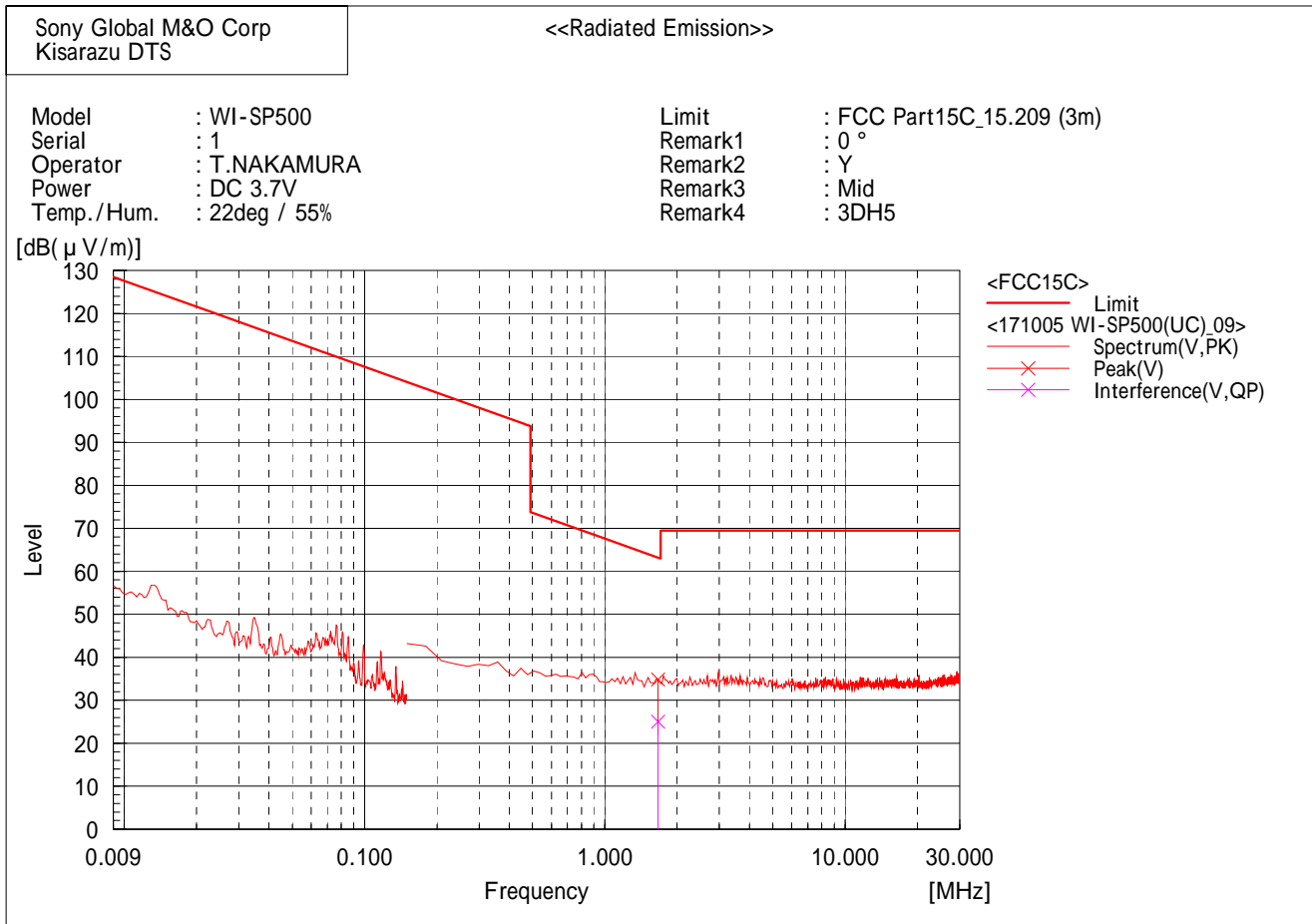
[BDR( DH5 )/2480MHz]



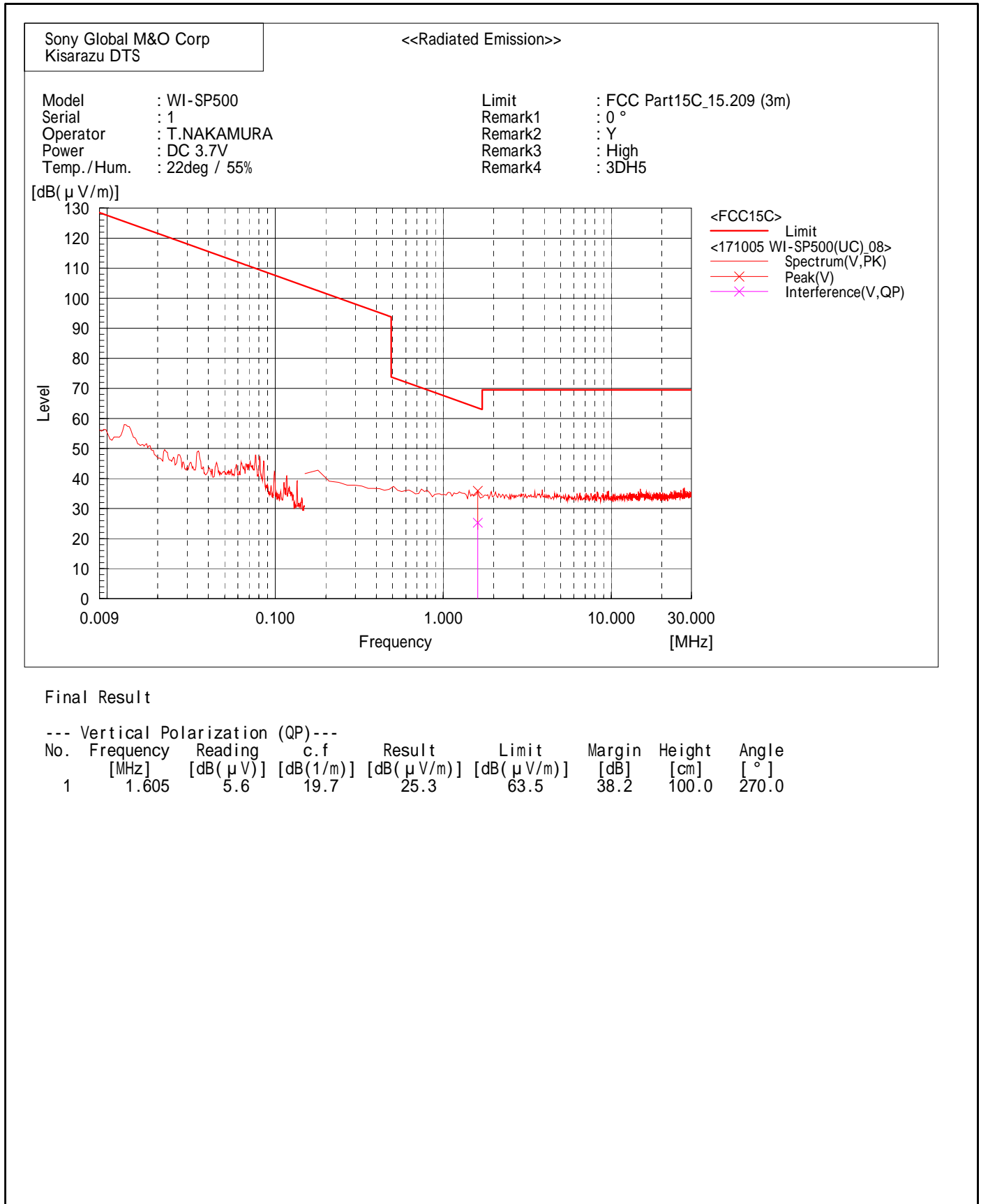
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]



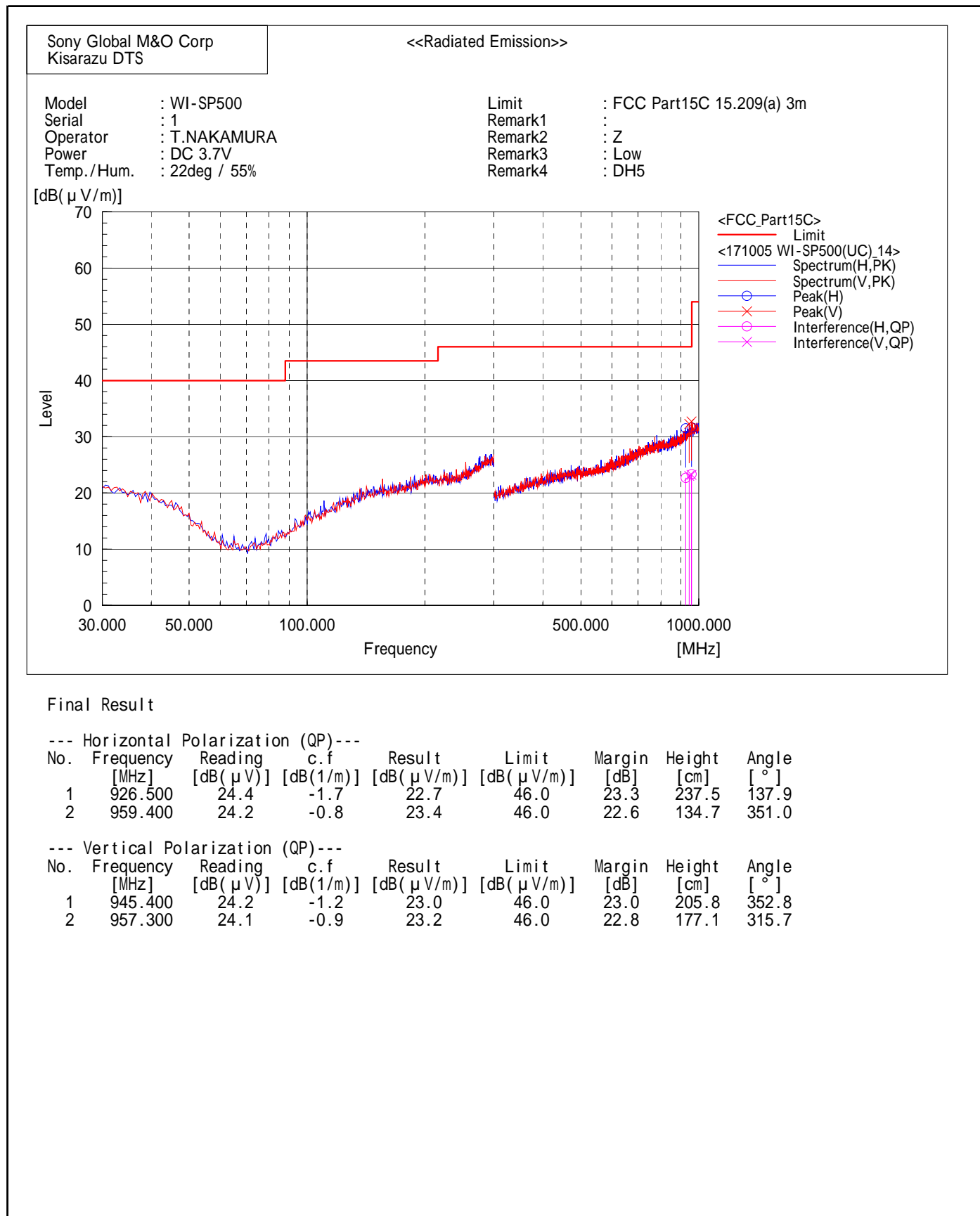
[EDR( 3DH5 )/2480MHz]



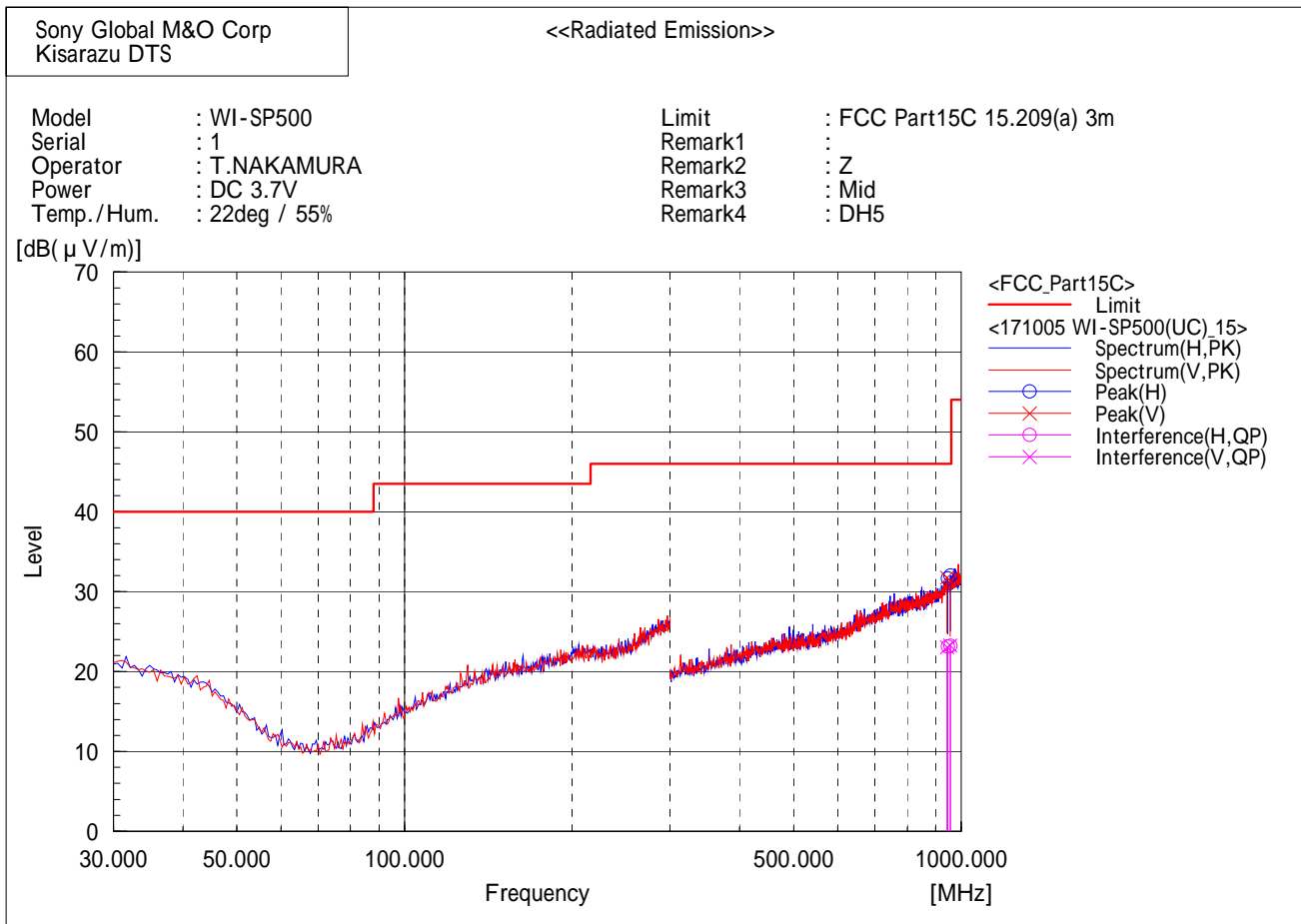


30 MHz - 1000 MHz

[BDR( DH5 )/2402MHz]



[BDR( DH5 )/2441MHz]



Final Result

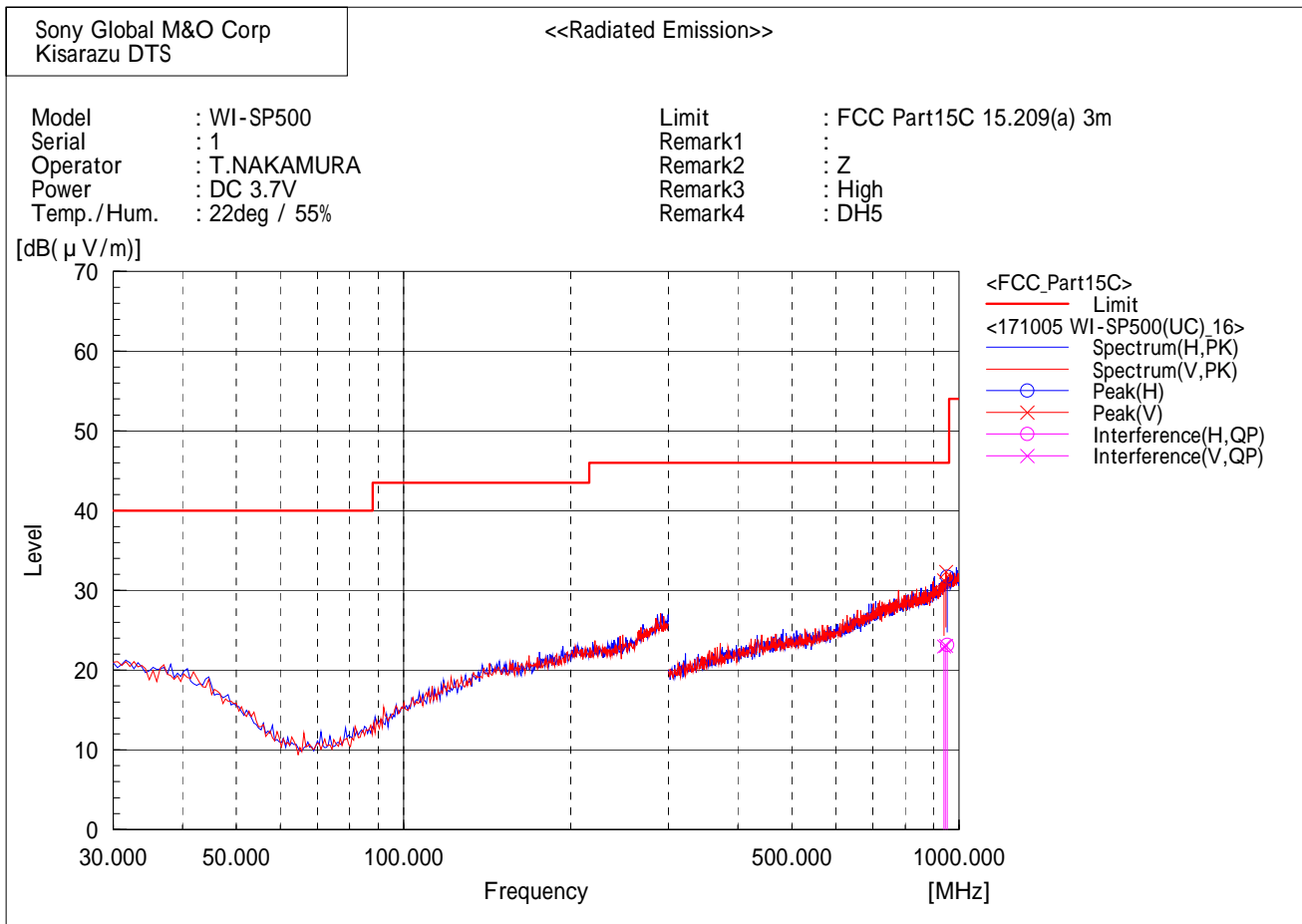
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	946.800	24.2	-1.1	23.1	46.0	22.9	311.0	171.0
2	956.600	24.1	-0.9	23.2	46.0	22.8	205.4	293.2

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	943.300	24.3	-1.2	23.1	46.0	22.9	164.3	265.2
2	955.900	24.2	-0.9	23.3	46.0	22.7	188.2	194.6

[BDR( DH5 )/2480MHz]



Final Result

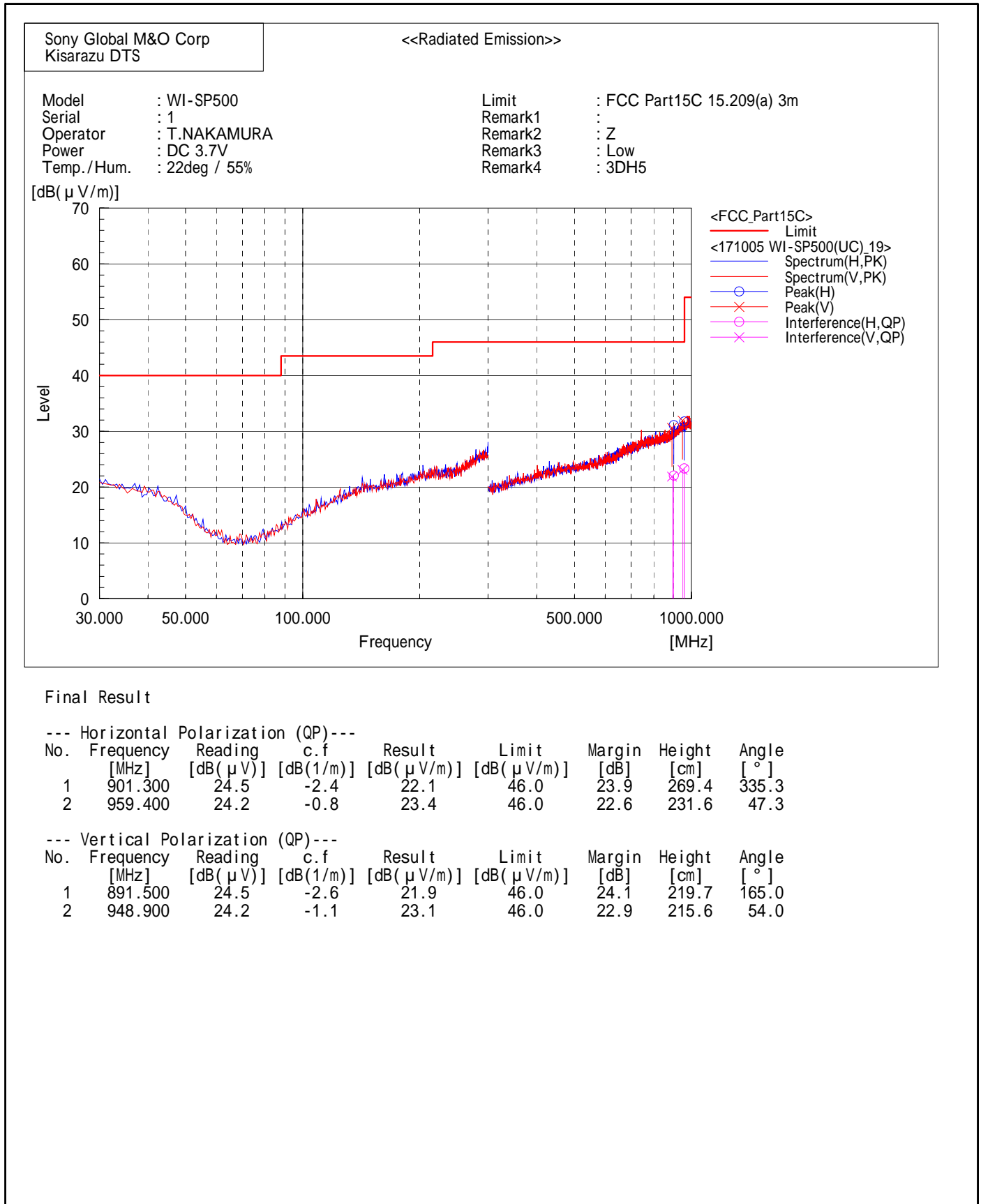
--- Horizontal Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	952.400	24.2	-1.0	23.2	46.0	22.8	261.1	21.5

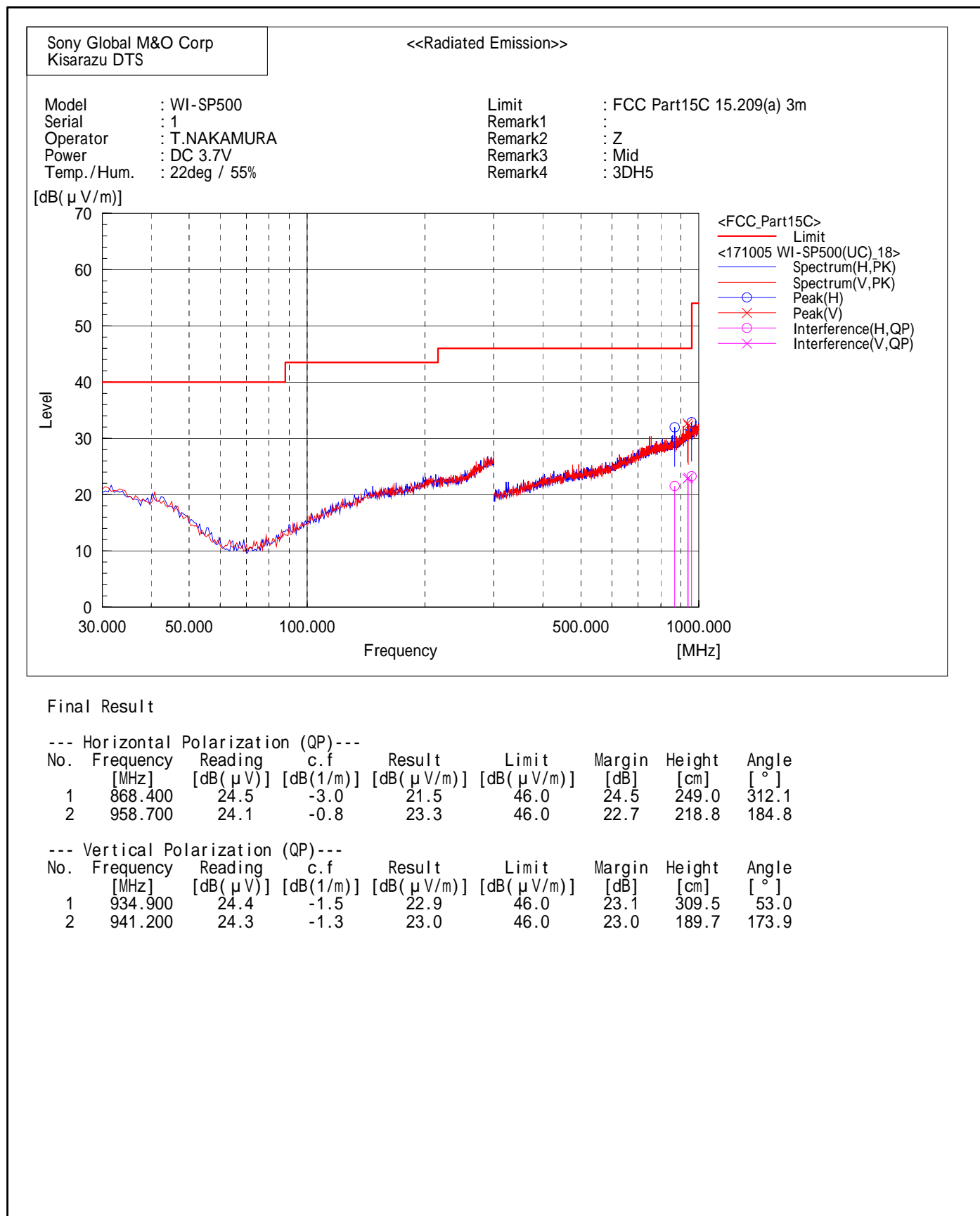
--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	939.800	24.3	-1.3	23.0	46.0	23.0	268.2	322.6
2	947.500	24.2	-1.1	23.1	46.0	22.9	203.8	24.8

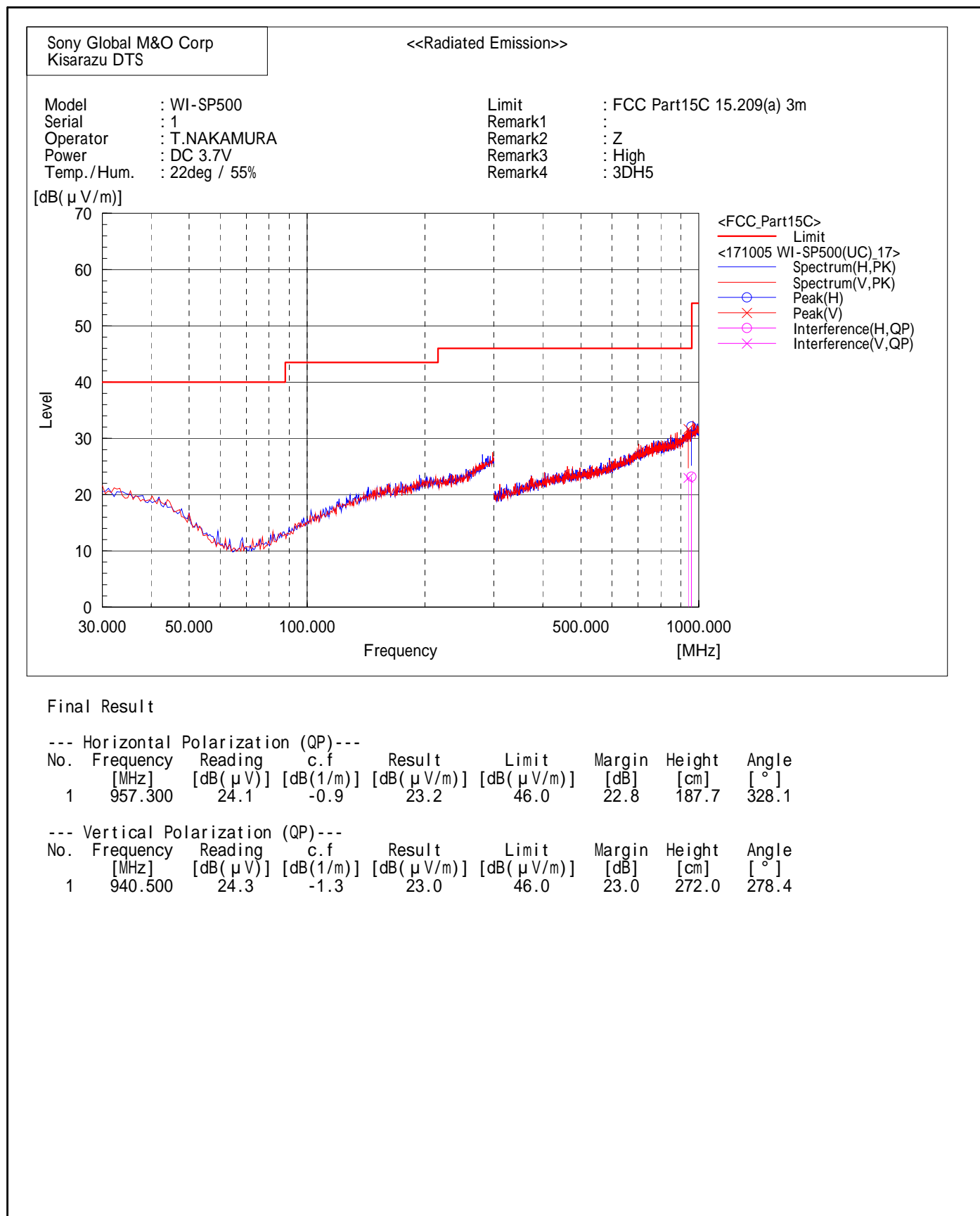
[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]

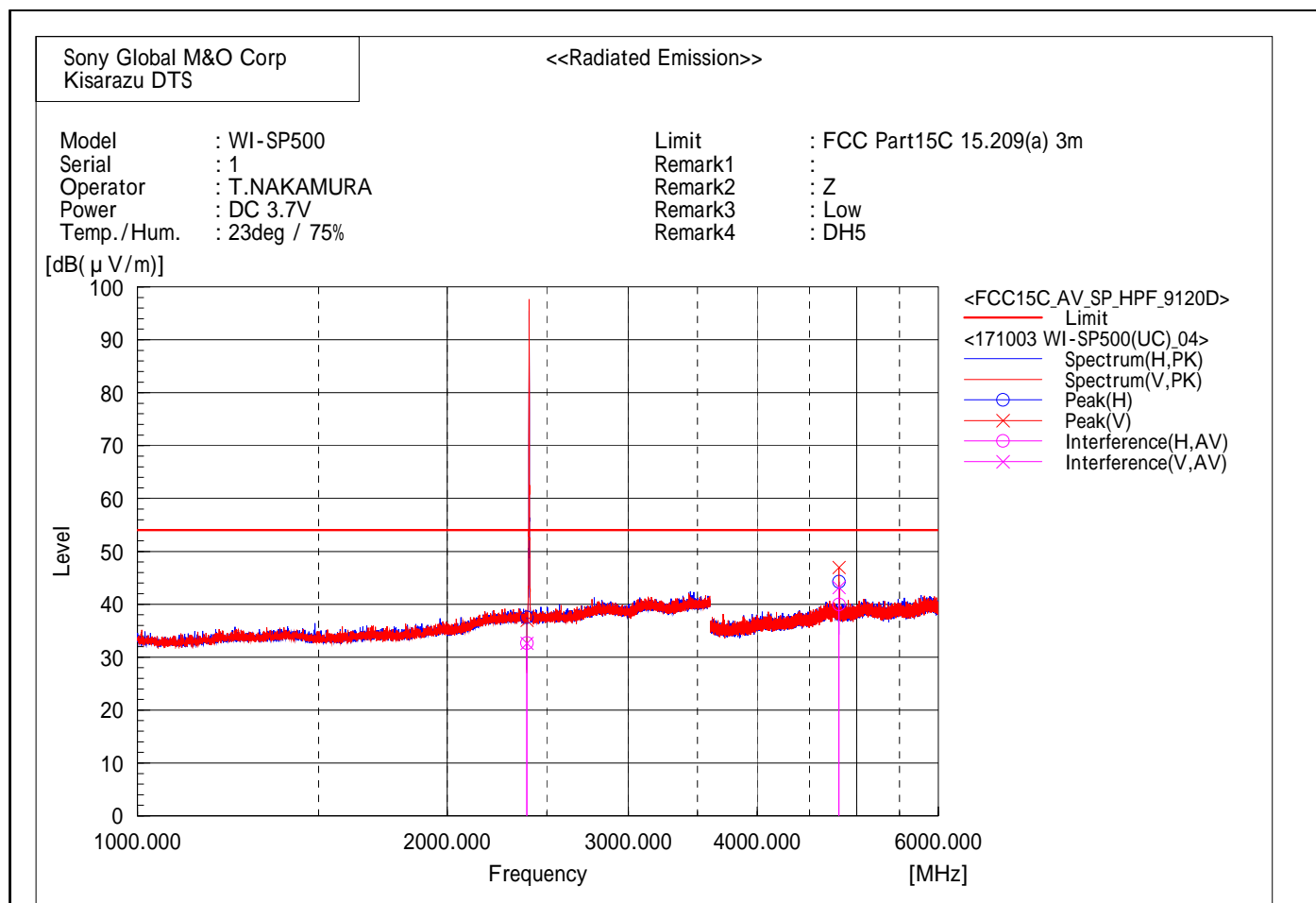


[EDR( 3DH5 )/2480MHz]



1GHz - 6 GHz

[BDR( DH5 )/2402MHz]



Final Result

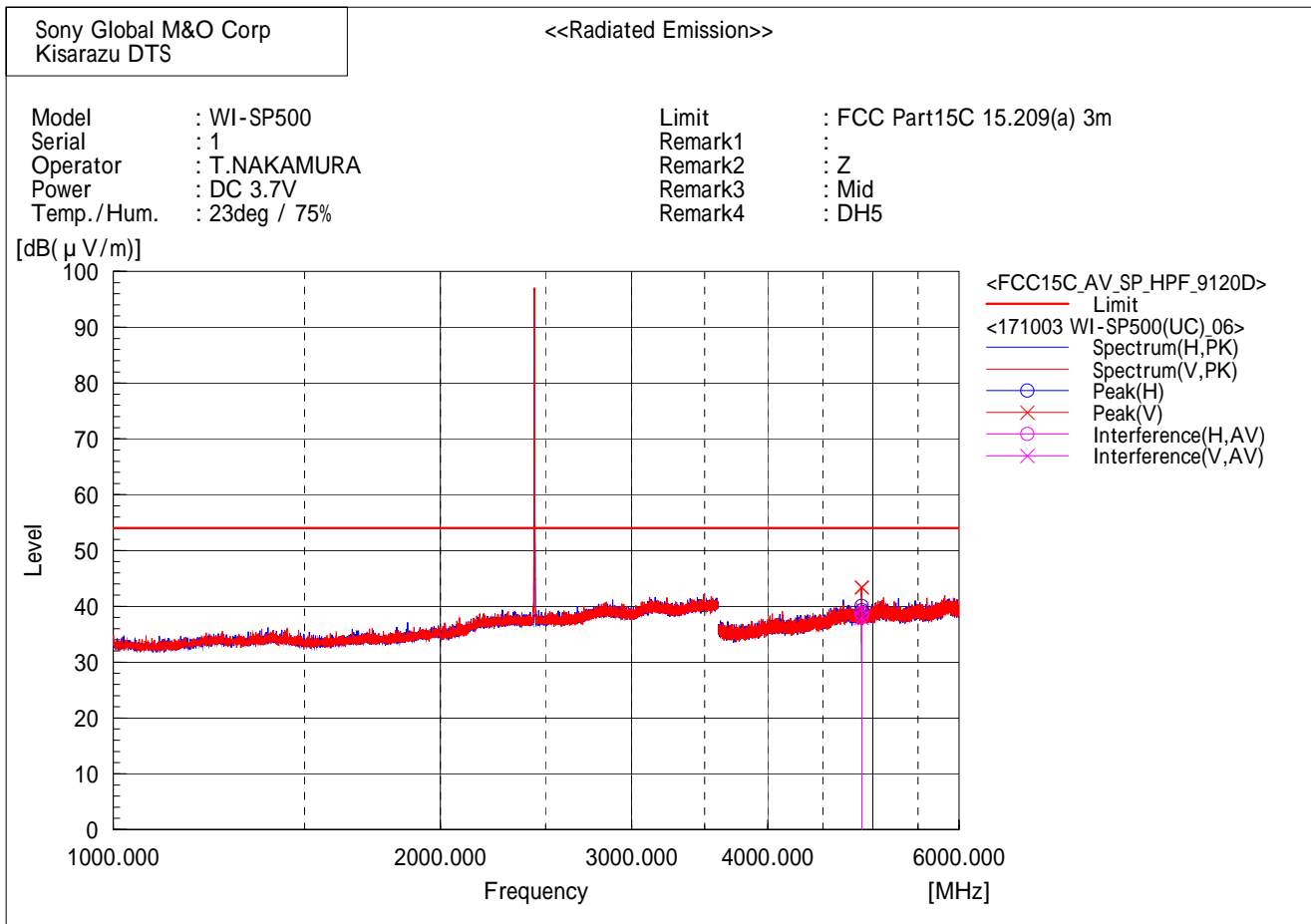
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	34.8	-2.1	32.7	54.0	21.3	177.0	323.2
2	4803.974	37.5	2.5	40.0	54.0	14.0	148.6	15.2

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	34.7	-2.1	32.6	54.0	21.4	151.5	196.7
2	4803.979	40.7	2.5	43.2	54.0	10.8	100.0	78.4

[BDR( DH5 )/2441MHz]



Final Result

--- Horizontal Polarization (AV)---

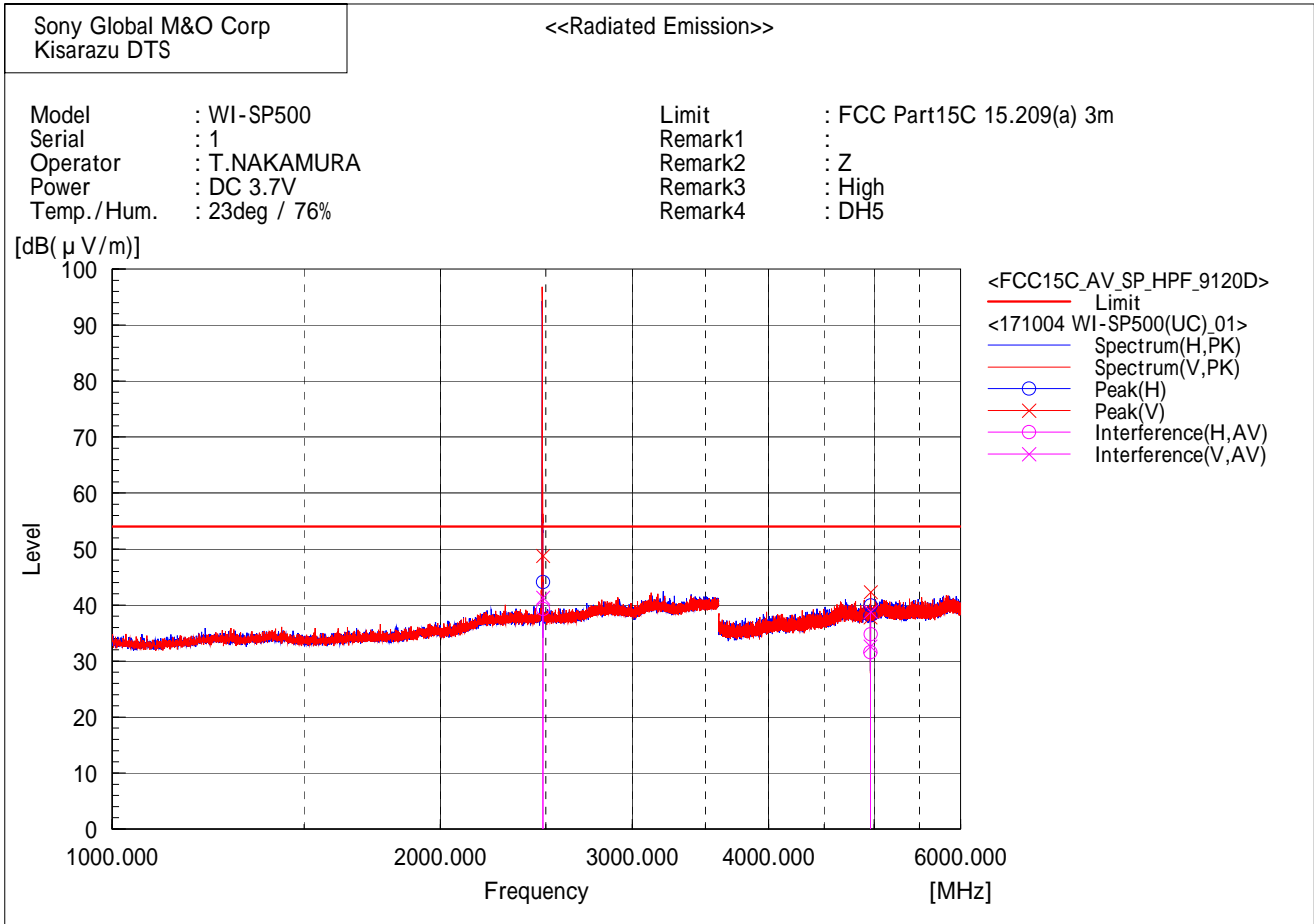
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4881.991	35.7	2.4	38.1	54.0	15.9	100.0	76.0
2	4884.024	36.4	2.4	38.8	54.0	15.2	136.2	50.8

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4882.018	35.5	2.4	37.9	54.0	16.1	100.0	95.7
2	4883.988	37.1	2.4	39.5	54.0	14.5	110.8	39.7



[BDR( DH5 )/2480MHz]



Final Result

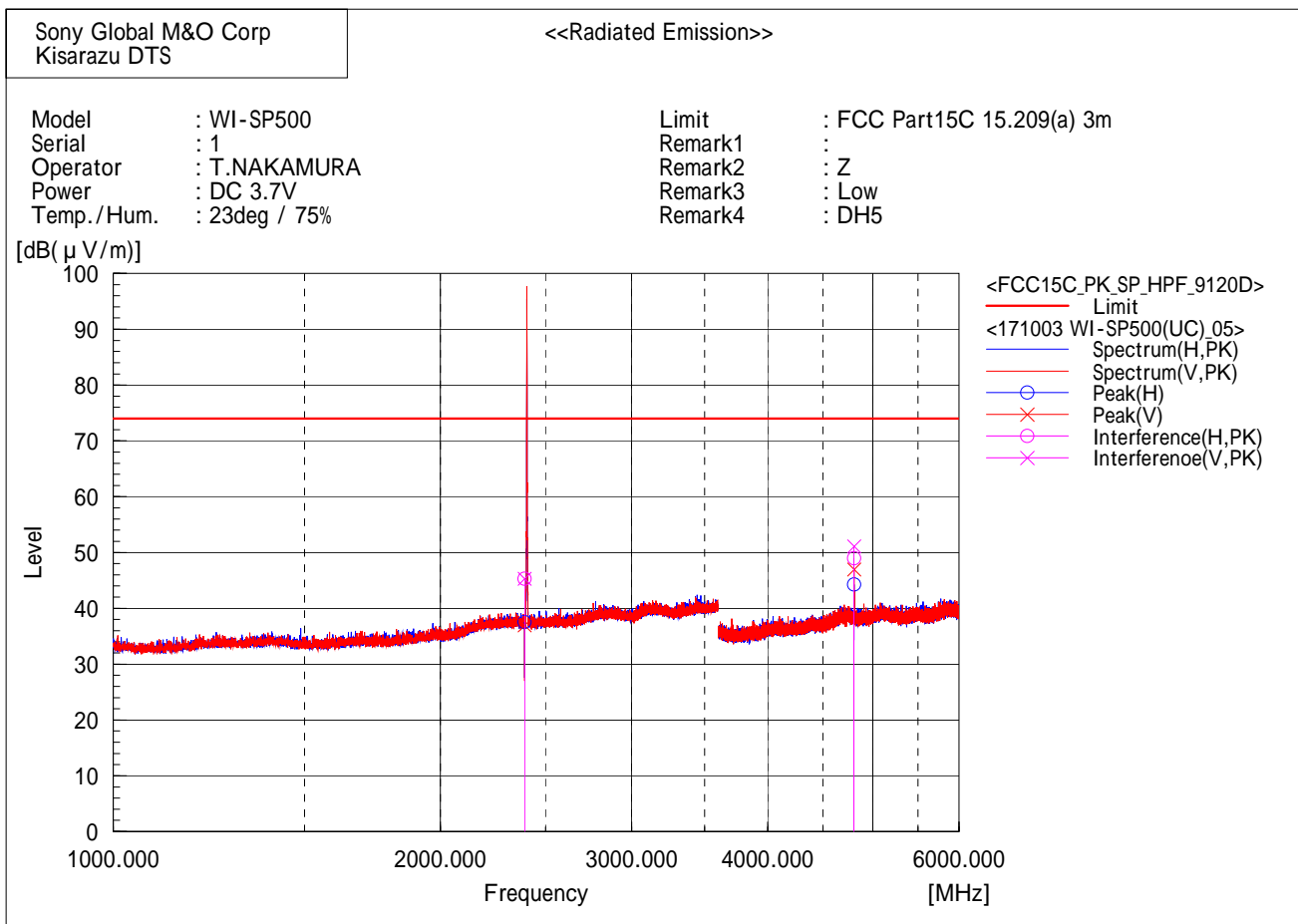
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	41.1	-1.8	39.3	54.0	14.7	296.4	319.2
2	4960.000	29.1	2.5	31.6	54.0	22.4	274.8	13.0
3	4962.017	32.3	2.5	34.8	54.0	19.2	210.2	228.6

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	43.1	-1.8	41.3	54.0	12.7	319.0	306.0
2	4960.000	30.1	2.5	32.6	54.0	21.4	194.4	347.2
3	4961.977	36.3	2.5	38.8	54.0	15.2	100.0	47.0

[BDR( DH5 )/2402MHz]



Final Result

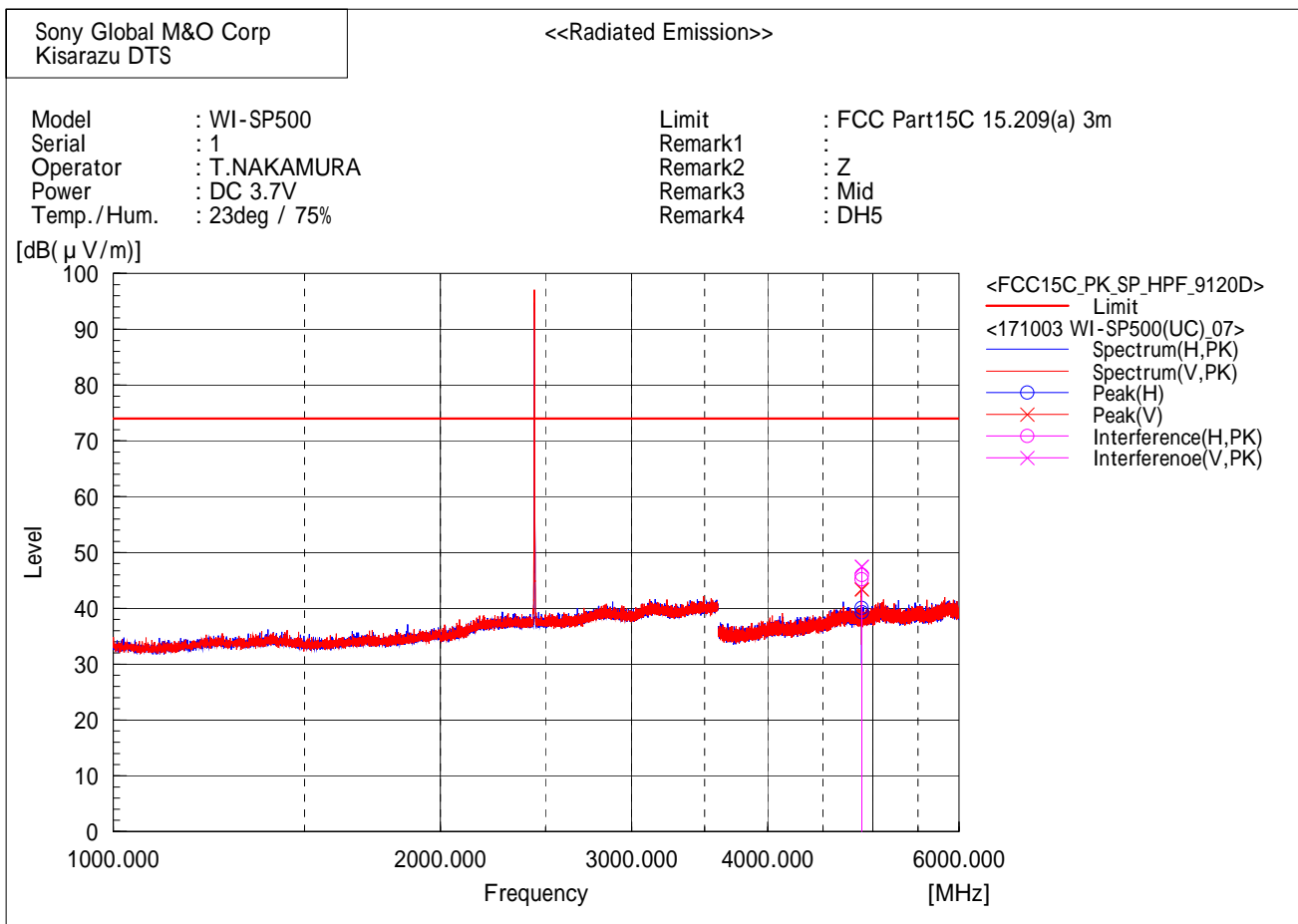
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	47.4	-2.1	45.3	74.0	28.7	177.0	323.2
2	4804.488	46.5	2.5	49.0	74.0	25.0	148.6	15.2

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	47.4	-2.1	45.3	74.0	28.7	151.5	196.7
2	4804.329	48.6	2.5	51.1	74.0	22.9	100.0	78.4

[BDR( DH5 )/2441MHz]



Final Result

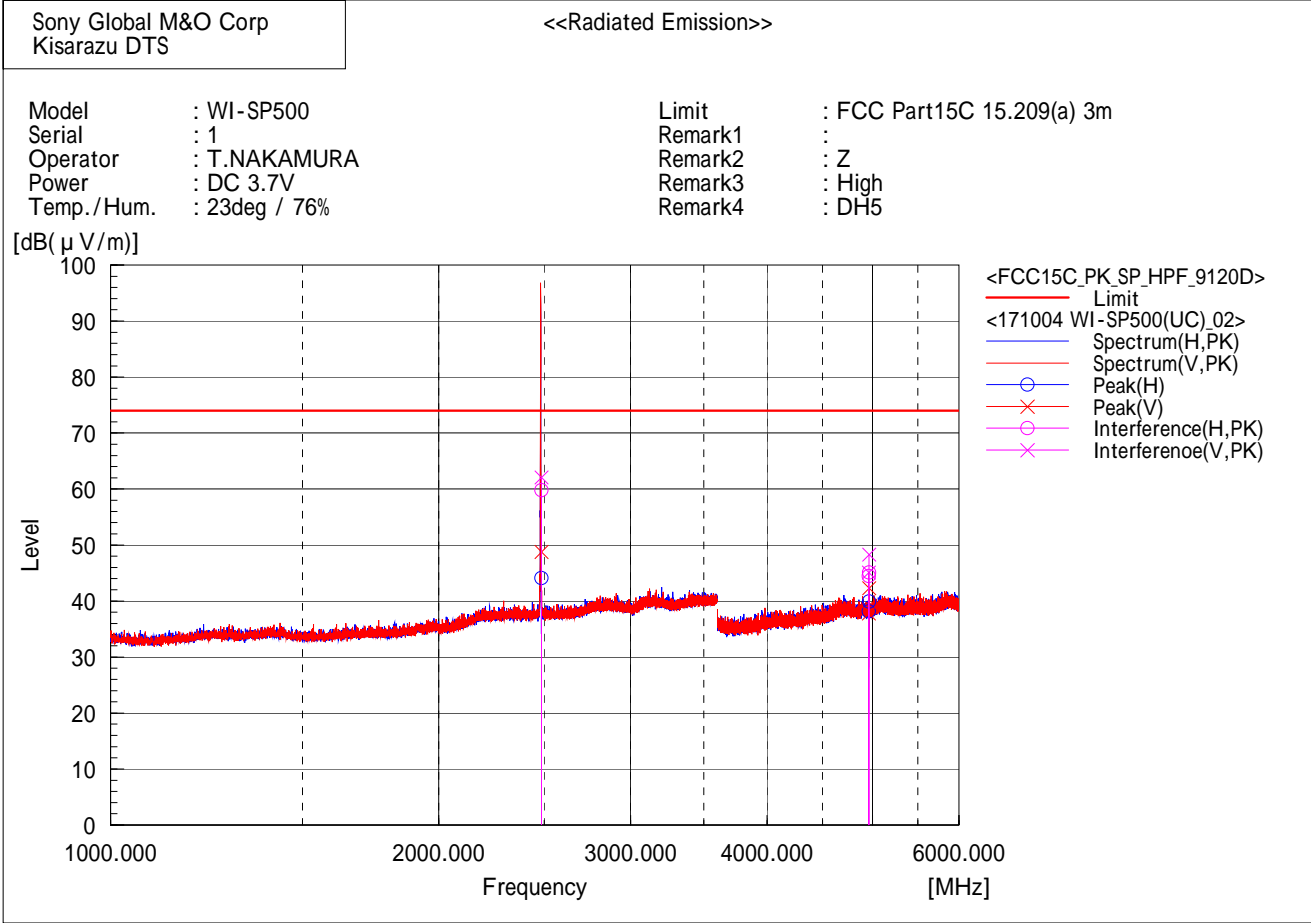
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4882.070	42.8	2.4	45.2	74.0	28.8	258.4	294.2
2	4883.936	43.6	2.4	46.0	74.0	28.0	100.0	236.9

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4882.403	45.1	2.4	47.5	74.0	26.5	100.0	95.7
2	4883.903	45.1	2.4	47.5	74.0	26.5	110.8	39.7

[BDR( DH5 )/2480MHz]



Final Result

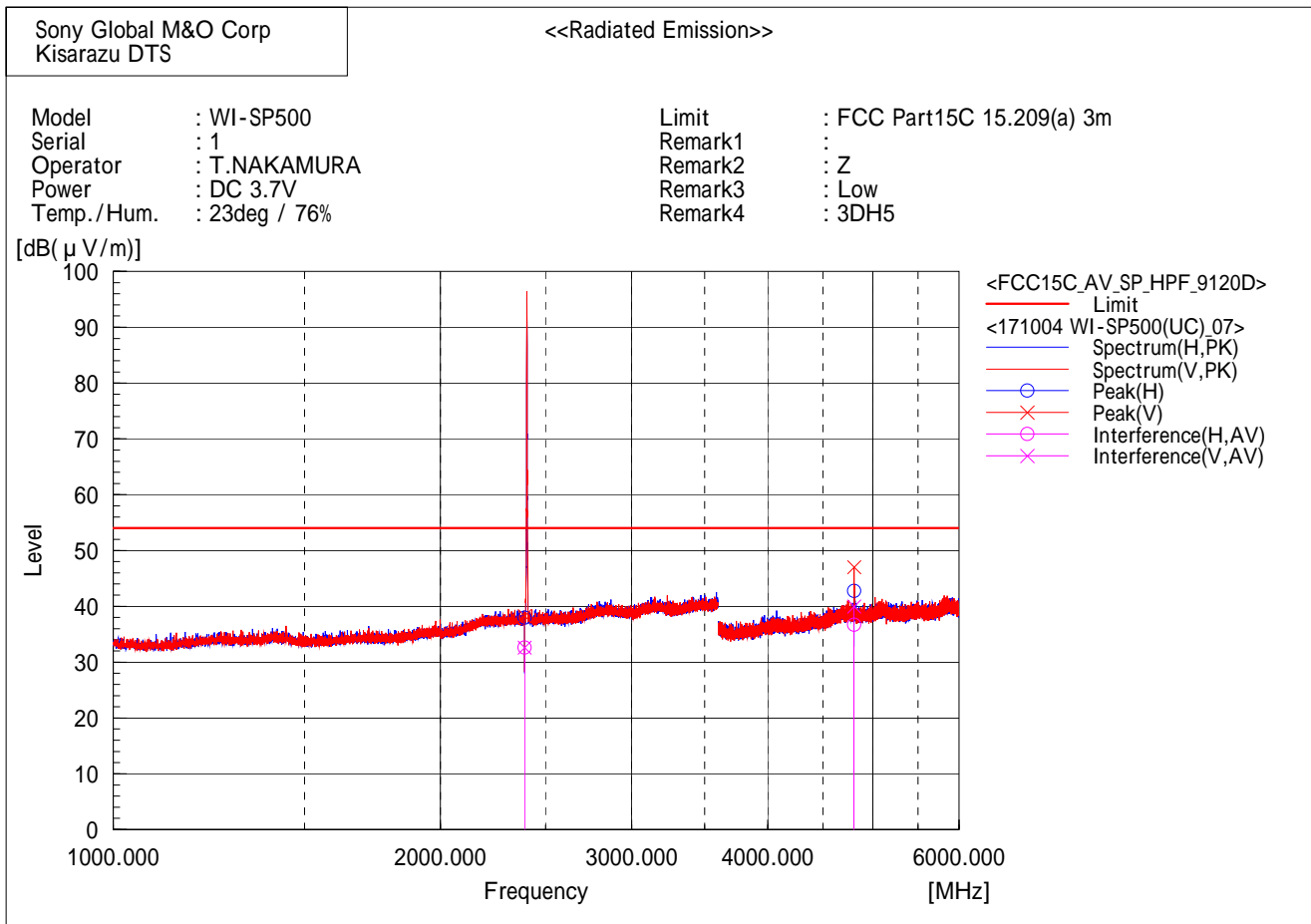
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	61.6	-1.8	59.8	74.0	14.2	296.4	319.2
2	4960.000	42.0	2.5	44.5	74.0	29.5	274.8	13.0
3	4962.069	42.6	2.5	45.1	74.0	28.9	210.2	228.6

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	63.9	-1.8	62.1	74.0	11.9	319.0	306.0
2	4960.000	42.6	2.5	45.1	74.0	28.9	194.4	347.2
3	4962.055	45.8	2.5	48.3	74.0	25.7	100.0	47.0

[EDR( 3DH5 )/2402MHz]



Final Result

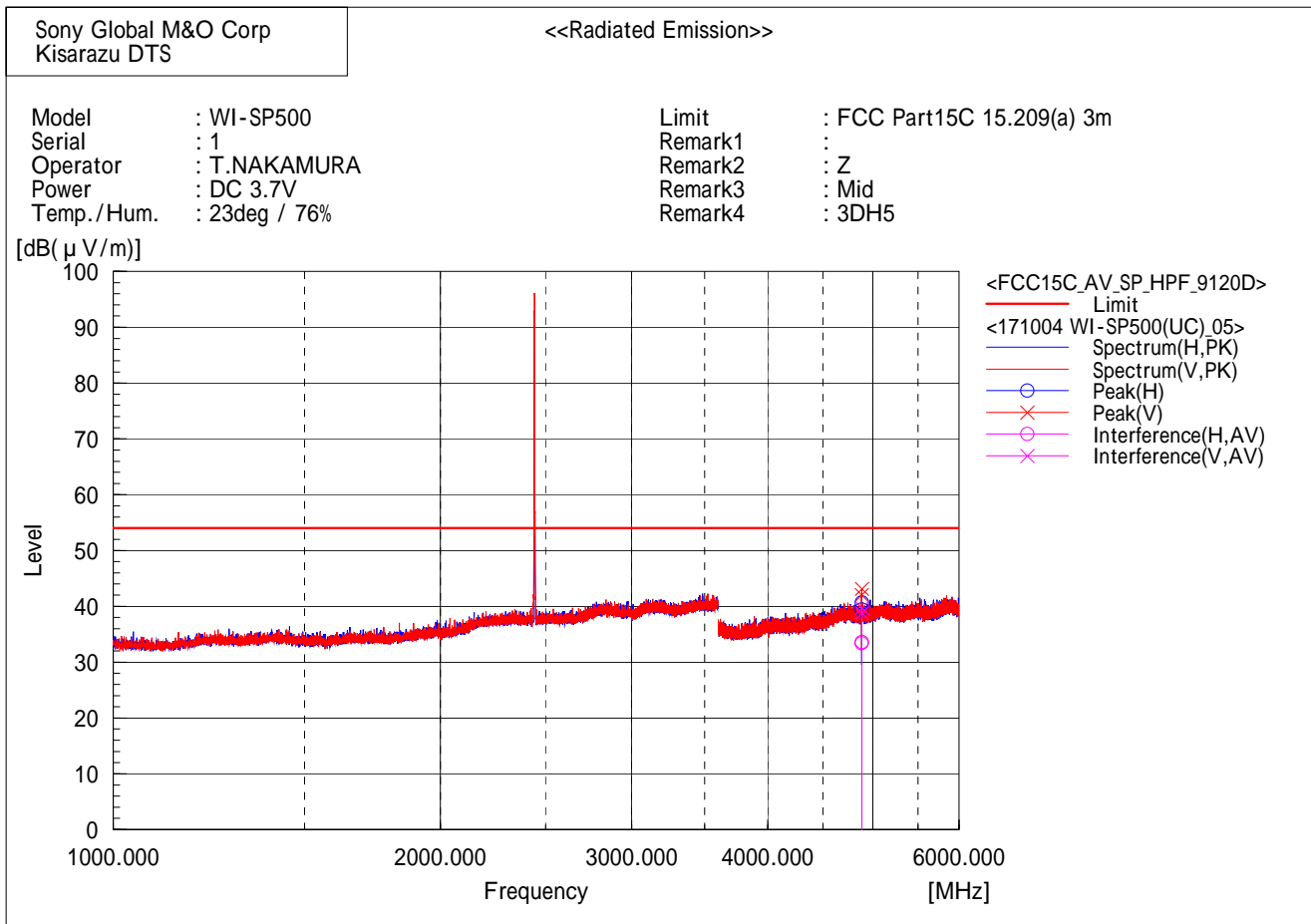
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	34.7	-2.1	32.6	54.0	21.4	244.2	275.9
2	4804.039	34.2	2.5	36.7	54.0	17.3	100.0	23.6

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2390.000	34.7	-2.1	32.6	54.0	21.4	152.3	35.7
2	4803.985	37.5	2.5	40.0	54.0	14.0	100.0	52.5

[EDR( 3DH5 )/2441MHz]



Final Result

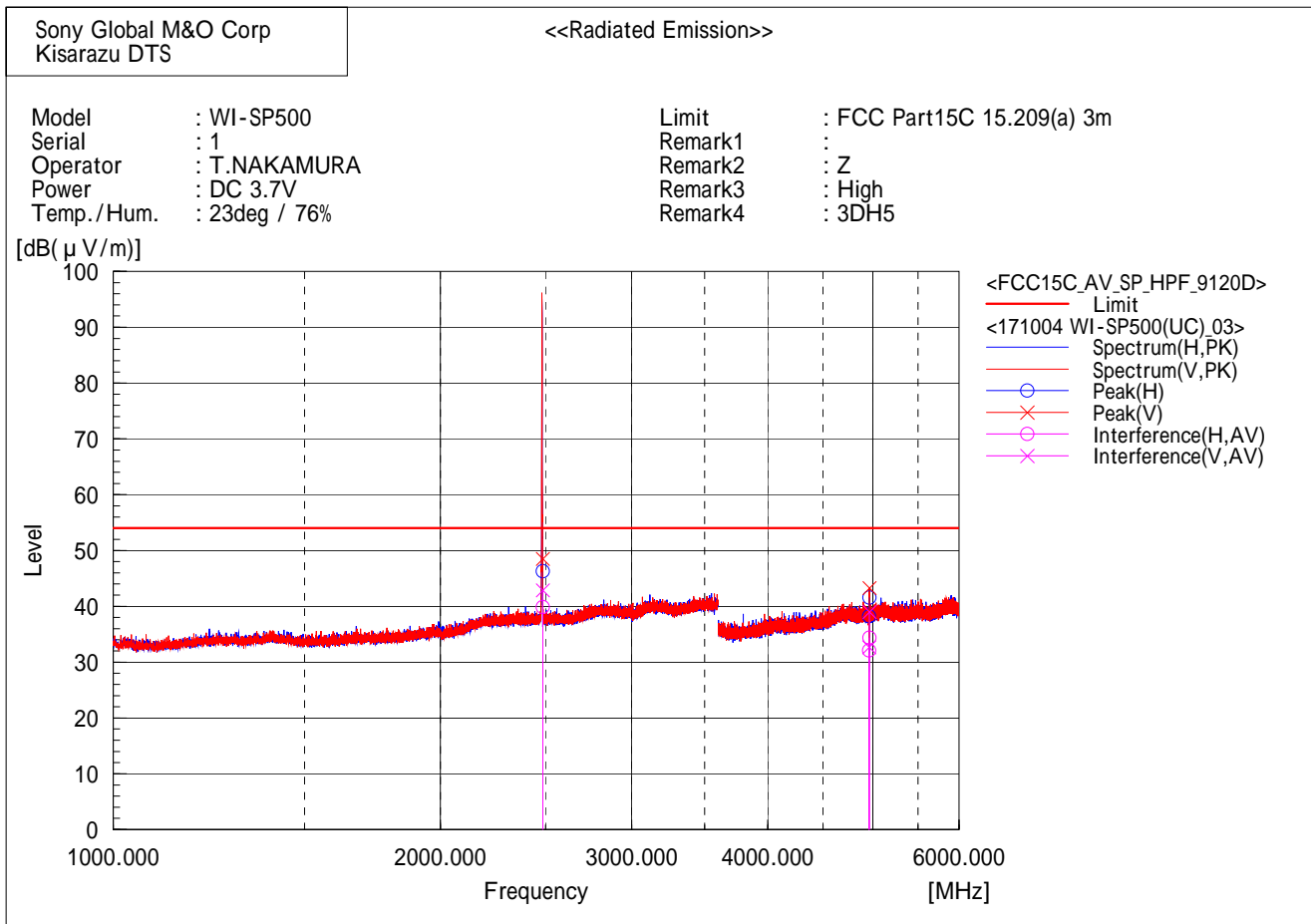
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4882.141	31.0	2.4	33.4	54.0	20.6	304.5	323.5
2	4883.989	31.2	2.4	33.6	54.0	20.4	322.9	236.7

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	4882.973	36.4	2.4	38.8	54.0	15.2	184.9	38.2
2	4883.994	37.3	2.4	39.7	54.0	14.3	100.0	44.5

[EDR( 3DH5 )/2480MHz]



Final Result

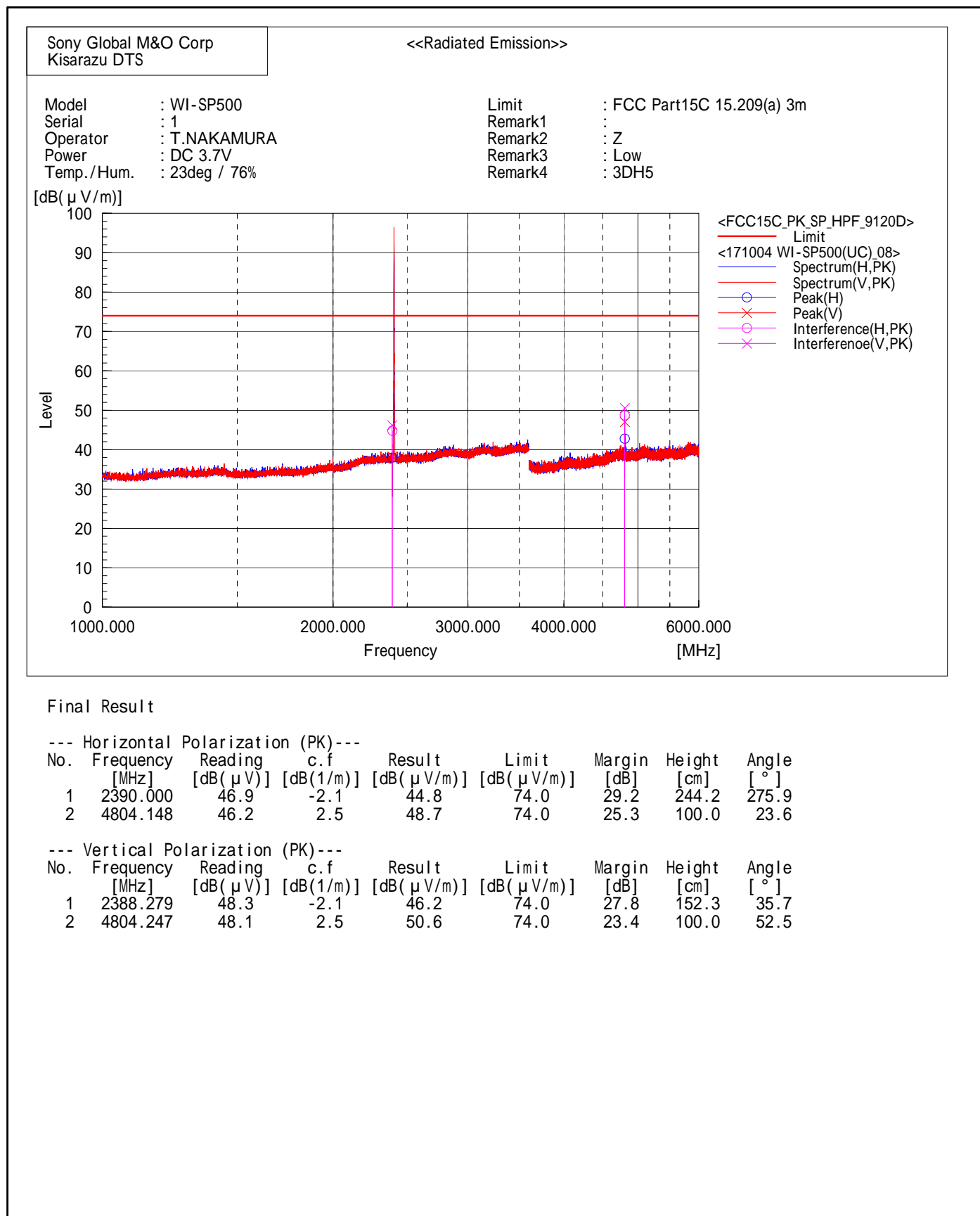
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	41.7	-1.8	39.9	54.0	14.1	144.1	320.9
2	4960.000	29.6	2.5	32.1	54.0	21.9	247.9	330.0
3	4962.020	31.9	2.5	34.4	54.0	19.6	221.8	221.2

--- Vertical Polarization (AV)---

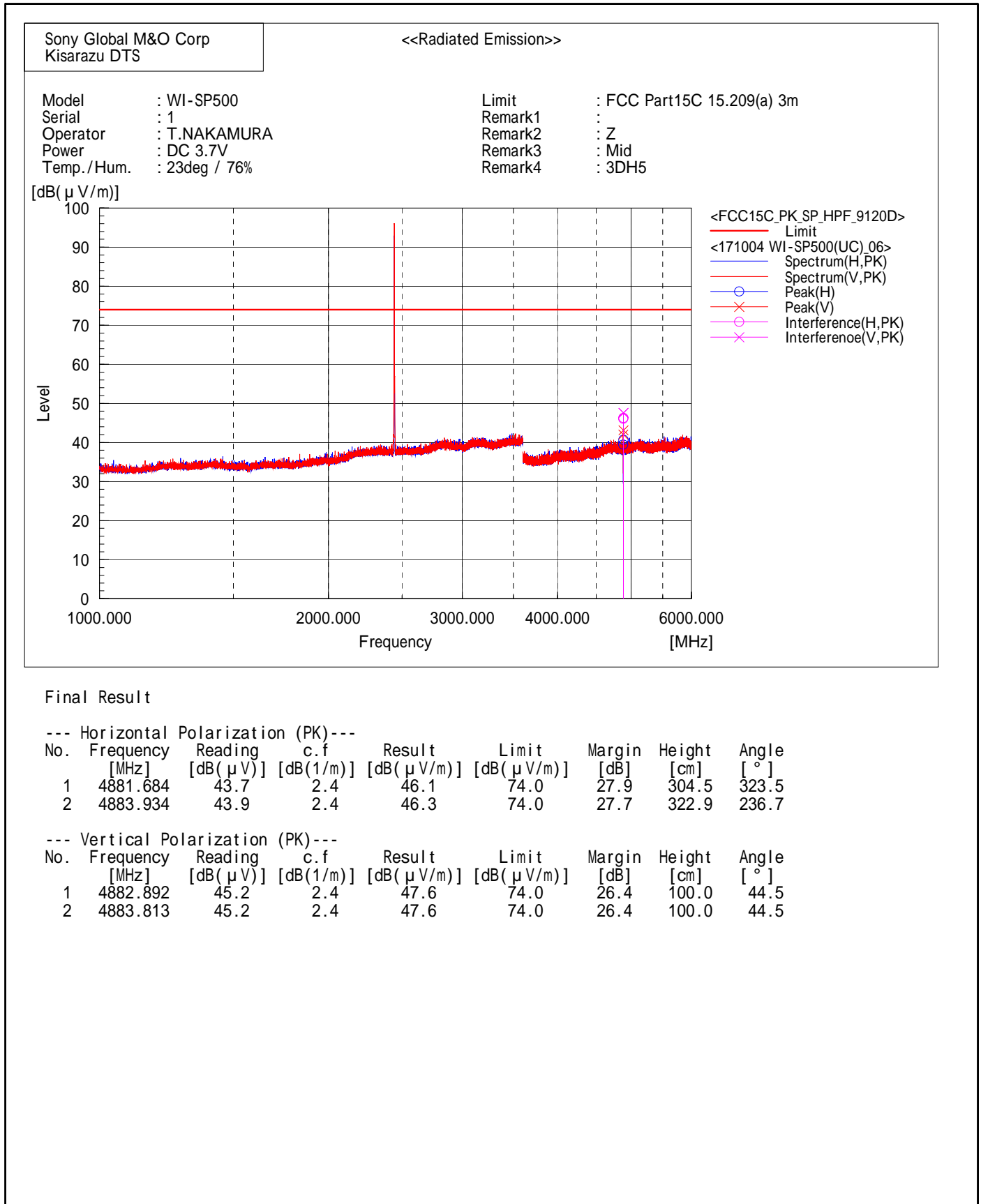
No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	44.7	-1.8	42.9	54.0	11.1	318.6	303.3
2	4960.000	30.2	2.5	32.7	54.0	21.3	163.4	70.9
3	4962.012	36.5	2.5	39.0	54.0	15.0	153.8	69.0

[EDR( 3DH5 )/2402MHz]

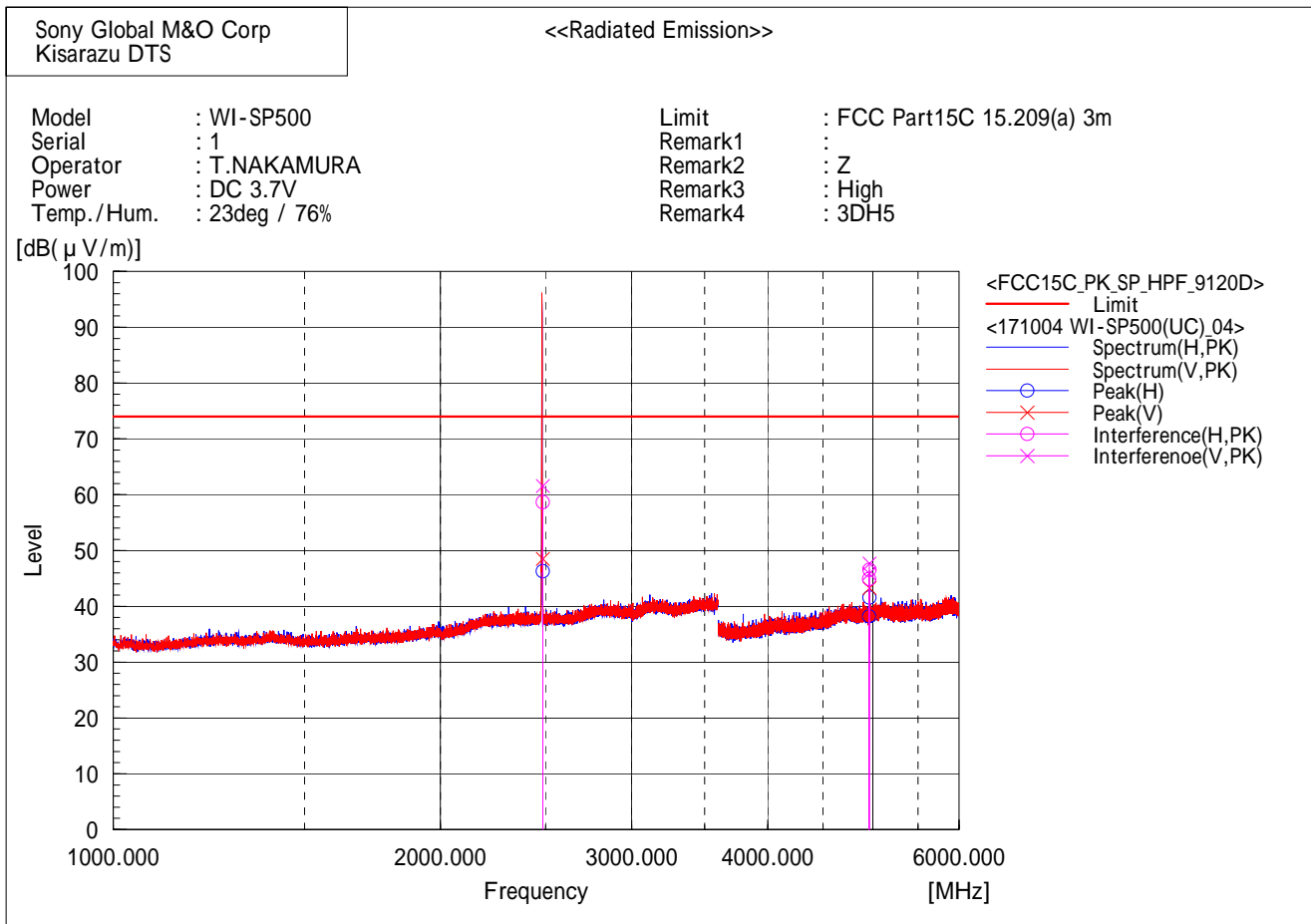




[EDR( 3DH5 )/2441MHz]



[EDR( 3DH5 )/2480MHz]



Final Result

--- Horizontal Polarization (PK)---

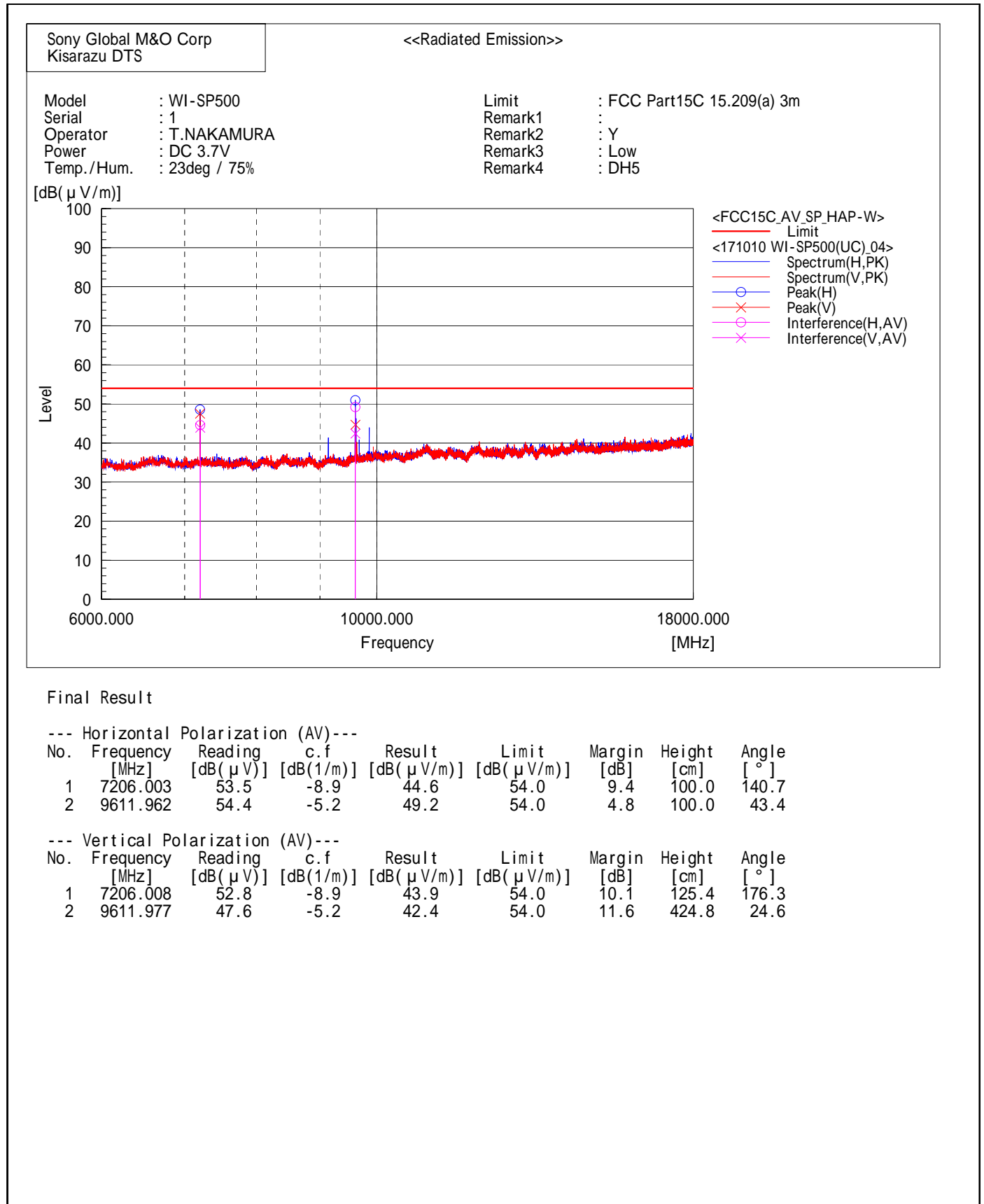
No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	60.5	-1.8	58.7	74.0	15.3	144.1	320.9
2	4960.000	42.4	2.5	44.9	74.0	29.1	247.9	330.0
3	4961.844	44.0	2.5	46.5	74.0	27.5	221.8	221.2

--- Vertical Polarization (PK)---

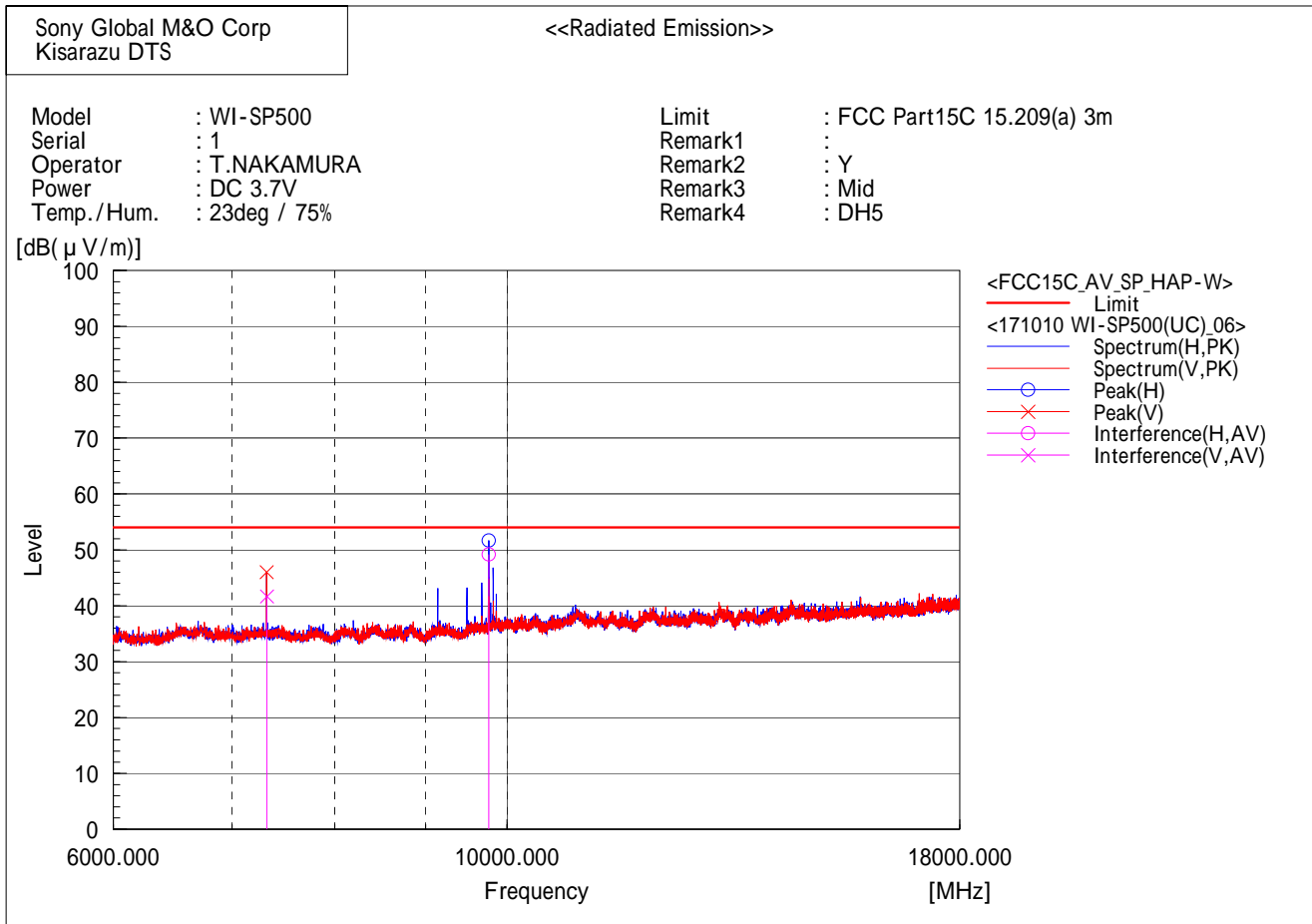
No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	2483.500	63.4	-1.8	61.6	74.0	12.4	318.6	303.3
2	4960.000	43.4	2.5	45.9	74.0	28.1	163.4	70.9
3	4961.773	45.2	2.5	47.7	74.0	26.3	153.8	69.0

6 GHz - 18 GHz

[BDR( DH5 )/2402MHz]



[BDR( DH5 )/2441MHz]



Final Result

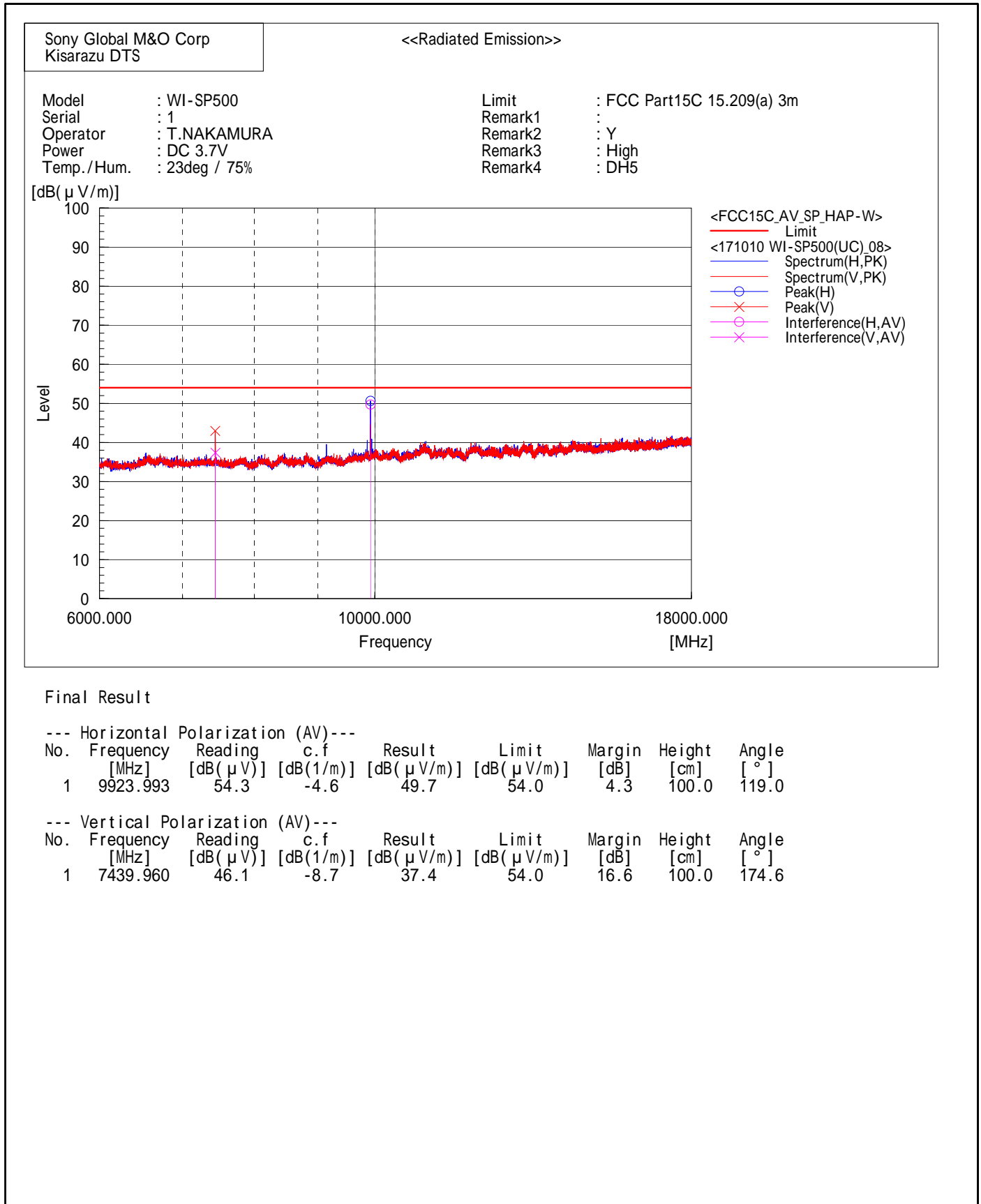
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9767.988	54.0	-4.8	49.2	54.0	4.8	100.0	44.8

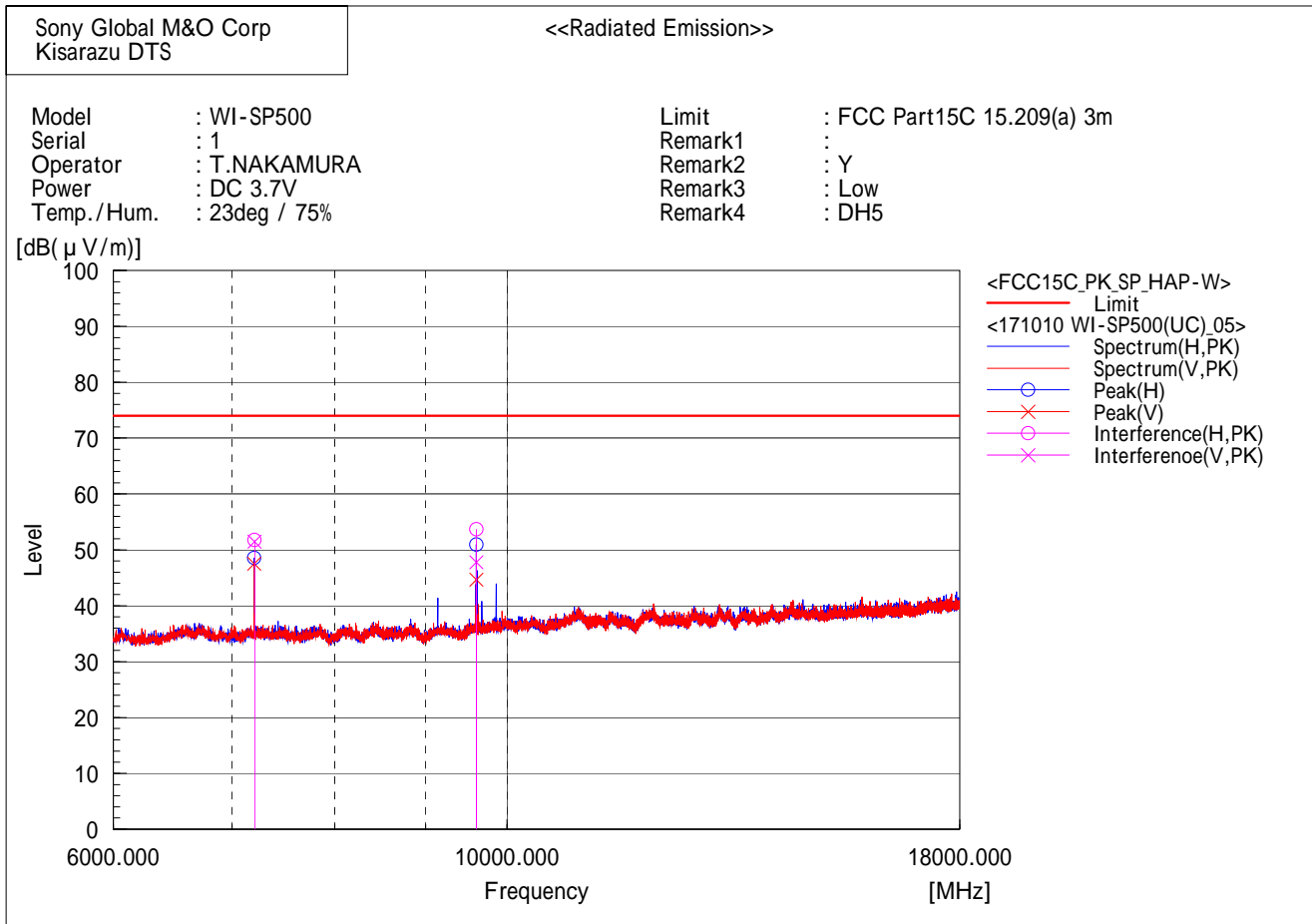
--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7322.971	50.4	-8.7	41.7	54.0	12.3	317.7	359.6

[BDR( DH5 )/2480MHz]



[BDR( DH5 )/2402MHz]



Final Result

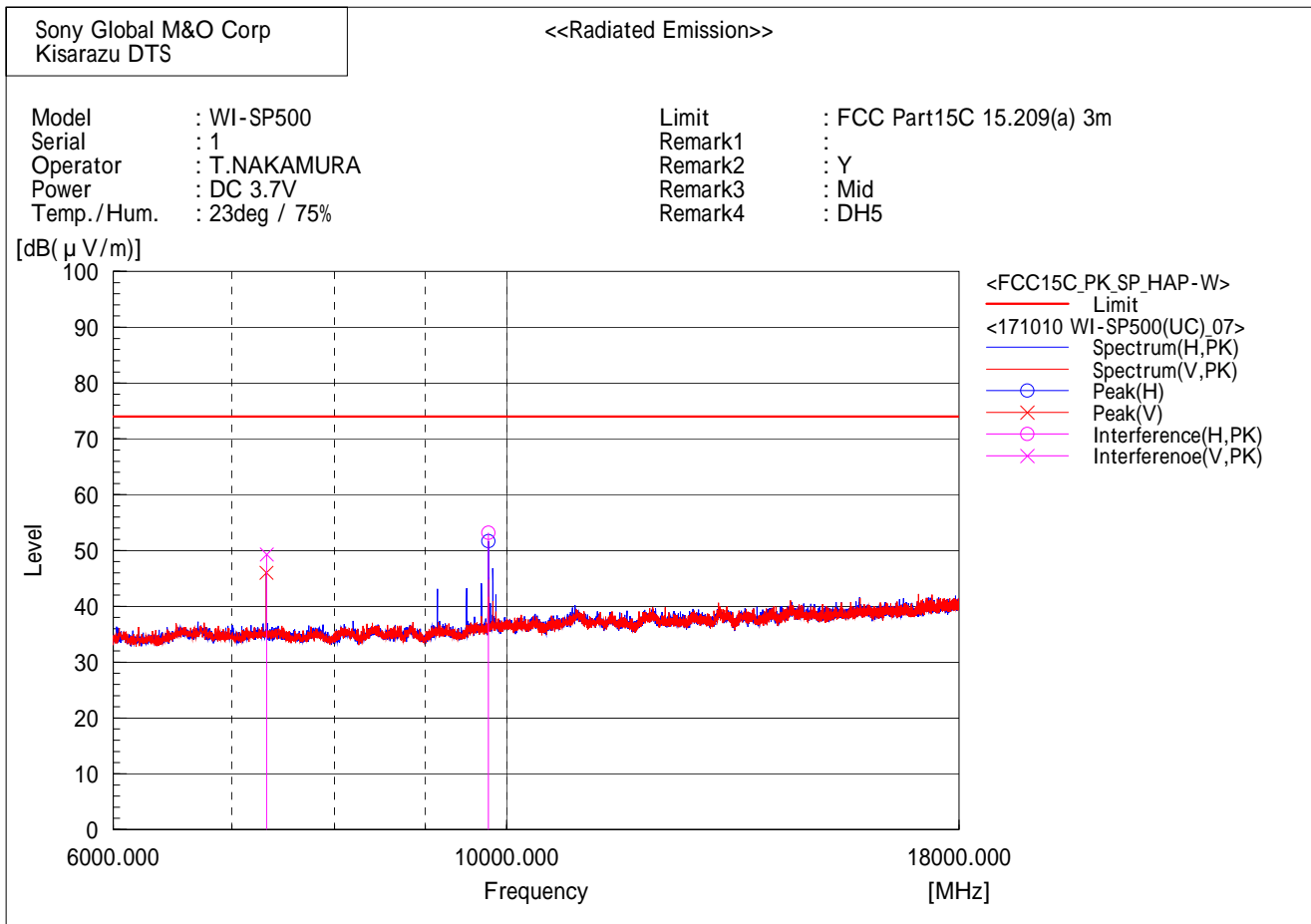
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.384	60.7	-8.9	51.8	74.0	22.2	100.0	142.6
2	9612.164	58.9	-5.2	53.7	74.0	20.3	100.0	43.0

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.487	60.4	-8.9	51.5	74.0	22.5	127.5	171.0
2	9611.778	53.0	-5.2	47.8	74.0	26.2	424.8	24.2

[BDR( DH5 )/2441MHz]



Final Result

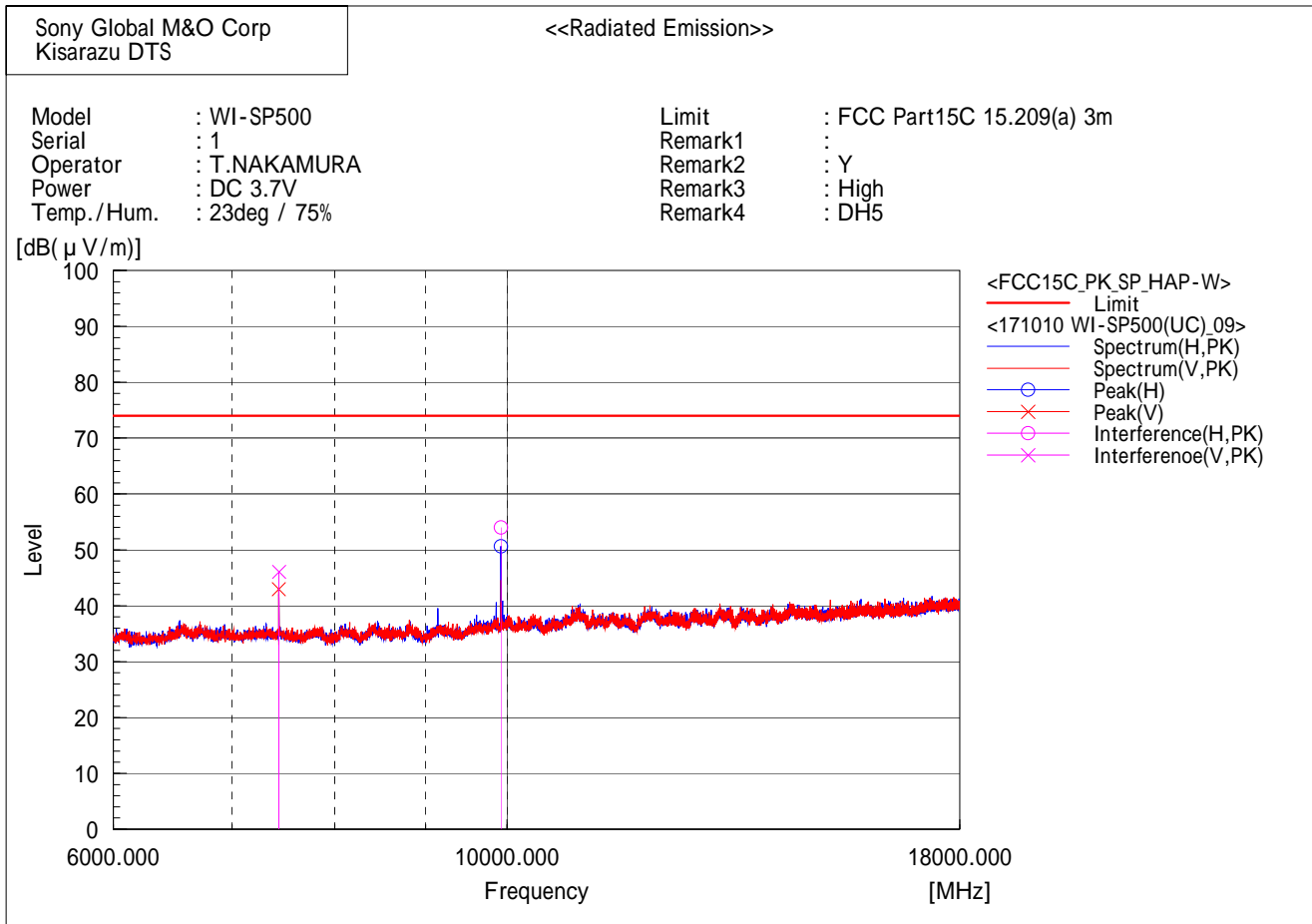
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9768.204	58.0	-4.8	53.2	74.0	20.8	100.0	44.7

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7323.321	58.0	-8.7	49.3	74.0	24.7	317.7	359.2

[BDR( DH5 )/2480MHz]



Final Result

--- Horizontal Polarization (PK)---

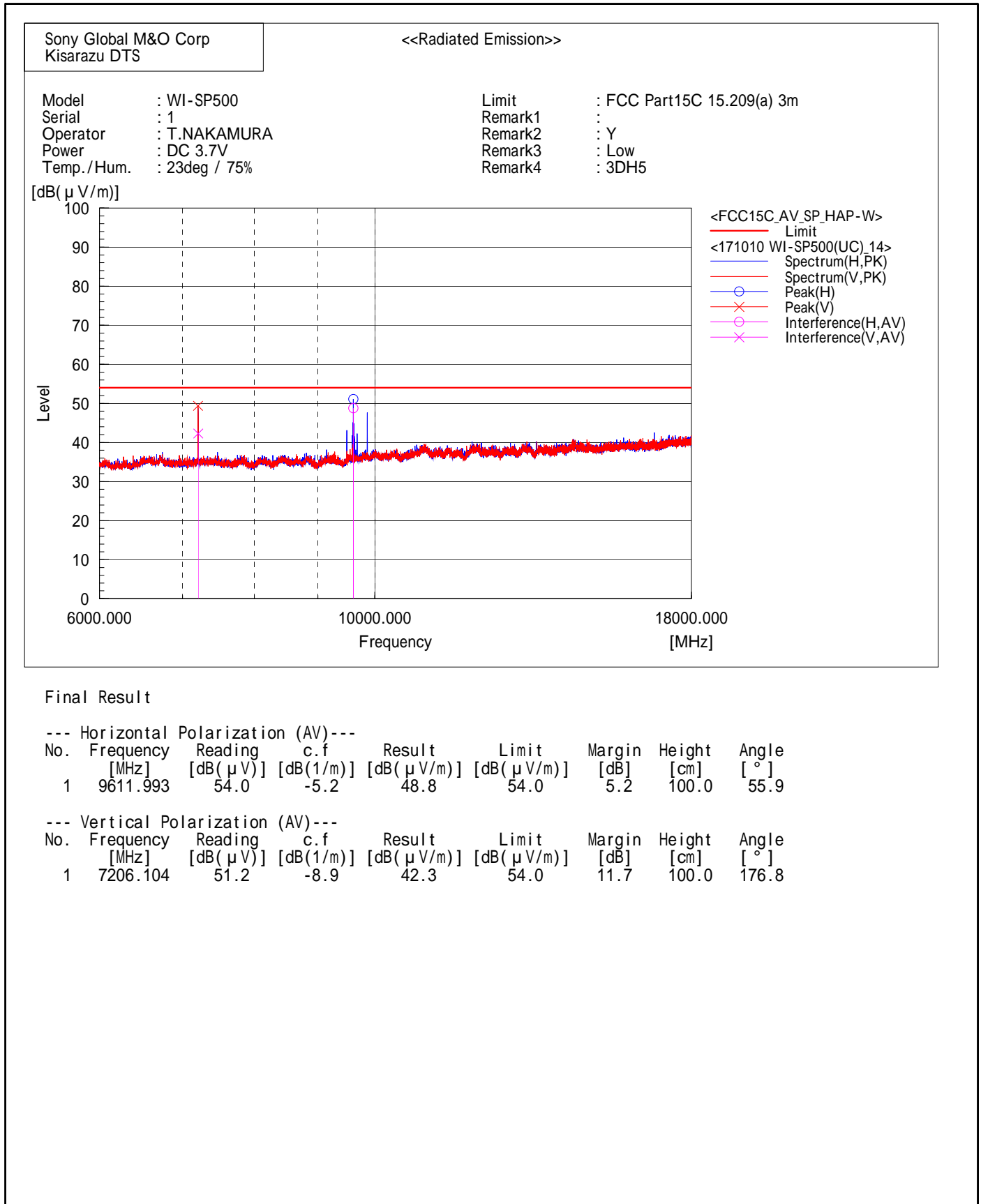
No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9924.290	58.6	-4.6	54.0	74.0	20.0	100.0	118.6

--- Vertical Polarization (PK)---

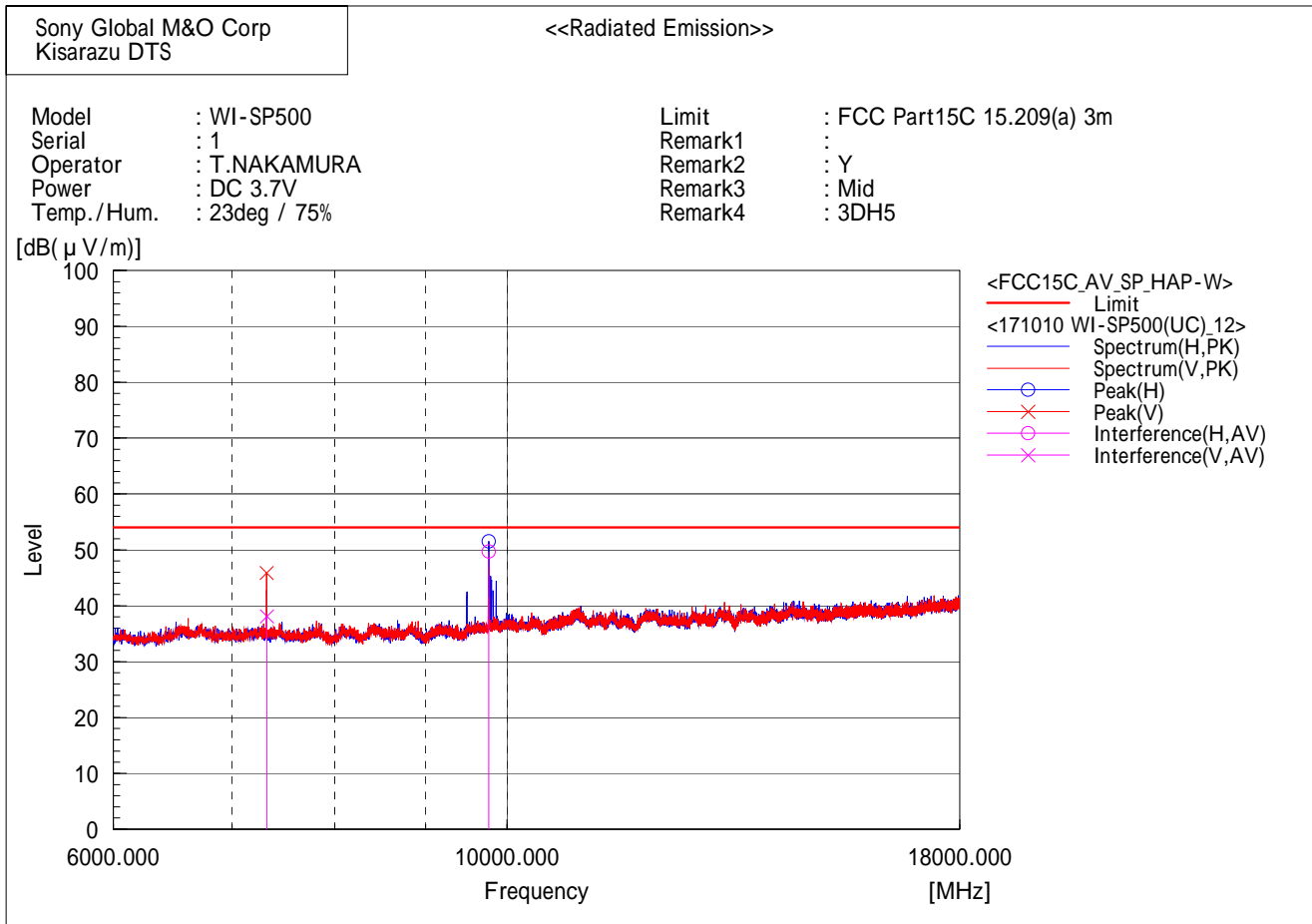
No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7439.552	54.8	-8.7	46.1	74.0	27.9	100.0	174.6



[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]



Final Result

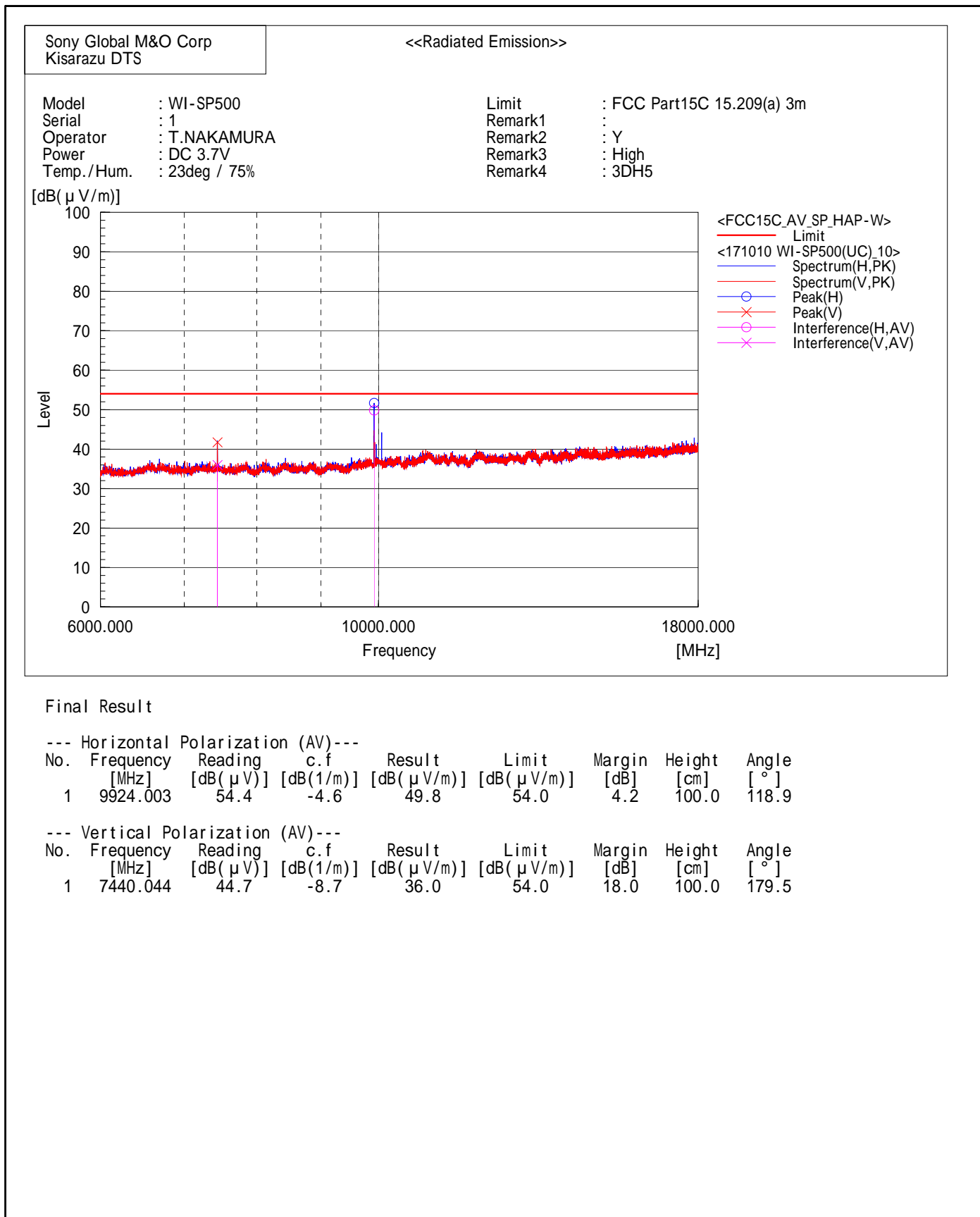
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9767.987	54.5	-4.8	49.7	54.0	4.3	100.0	127.8

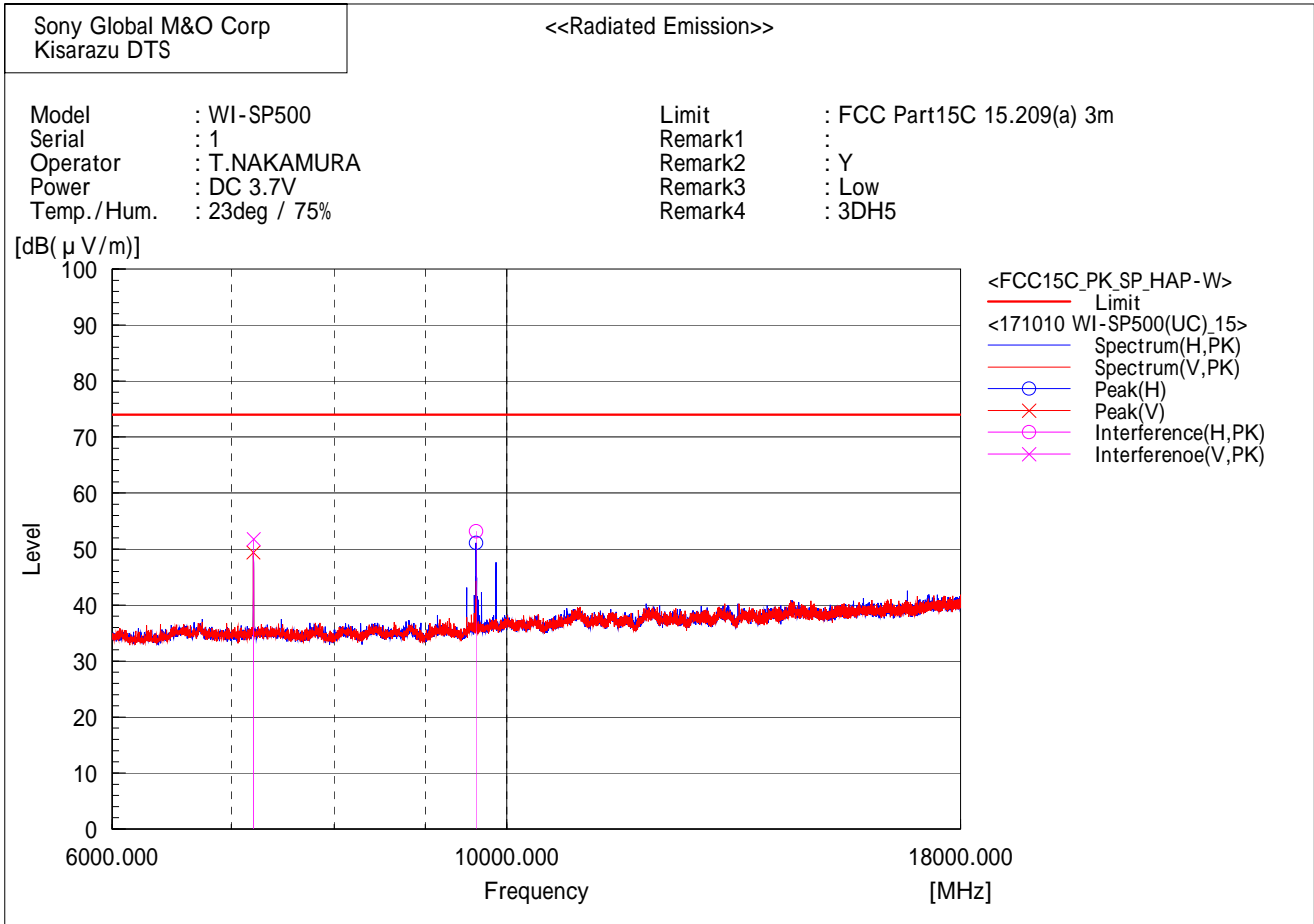
--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7323.136	46.8	-8.7	38.1	54.0	15.9	100.0	15.5

[EDR( 3DH5 )/2480MHz]



[EDR( 3DH5 )/2402MHz]



Final Result

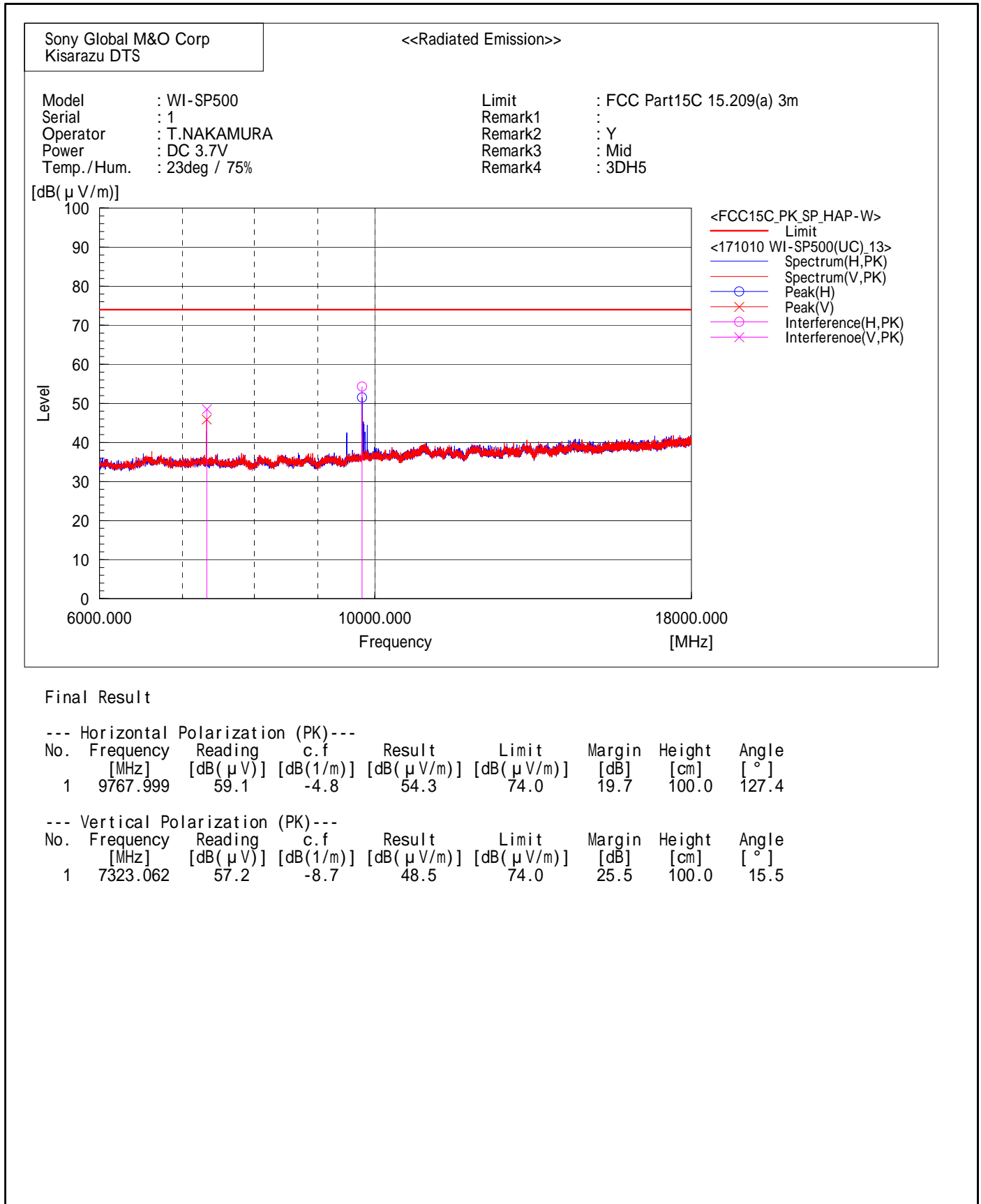
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9612.208	58.4	-5.2	53.2	74.0	20.8	100.0	55.9

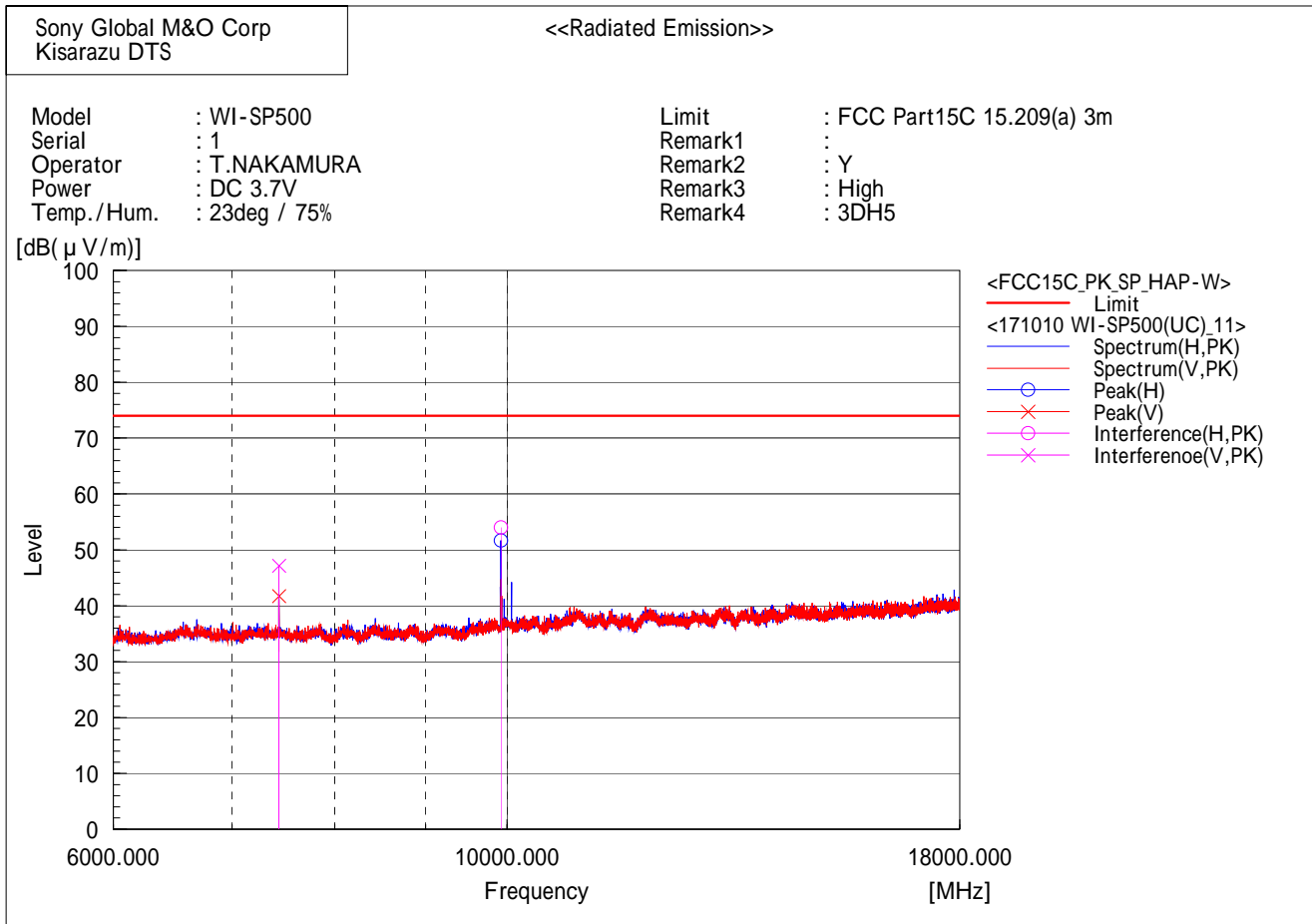
--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7206.205	60.7	-8.9	51.8	74.0	22.2	100.0	176.4

[EDR( 3DH5 )/2441MHz]



[EDR( 3DH5 )/2480MHz]



Final Result

--- Horizontal Polarization (PK)---

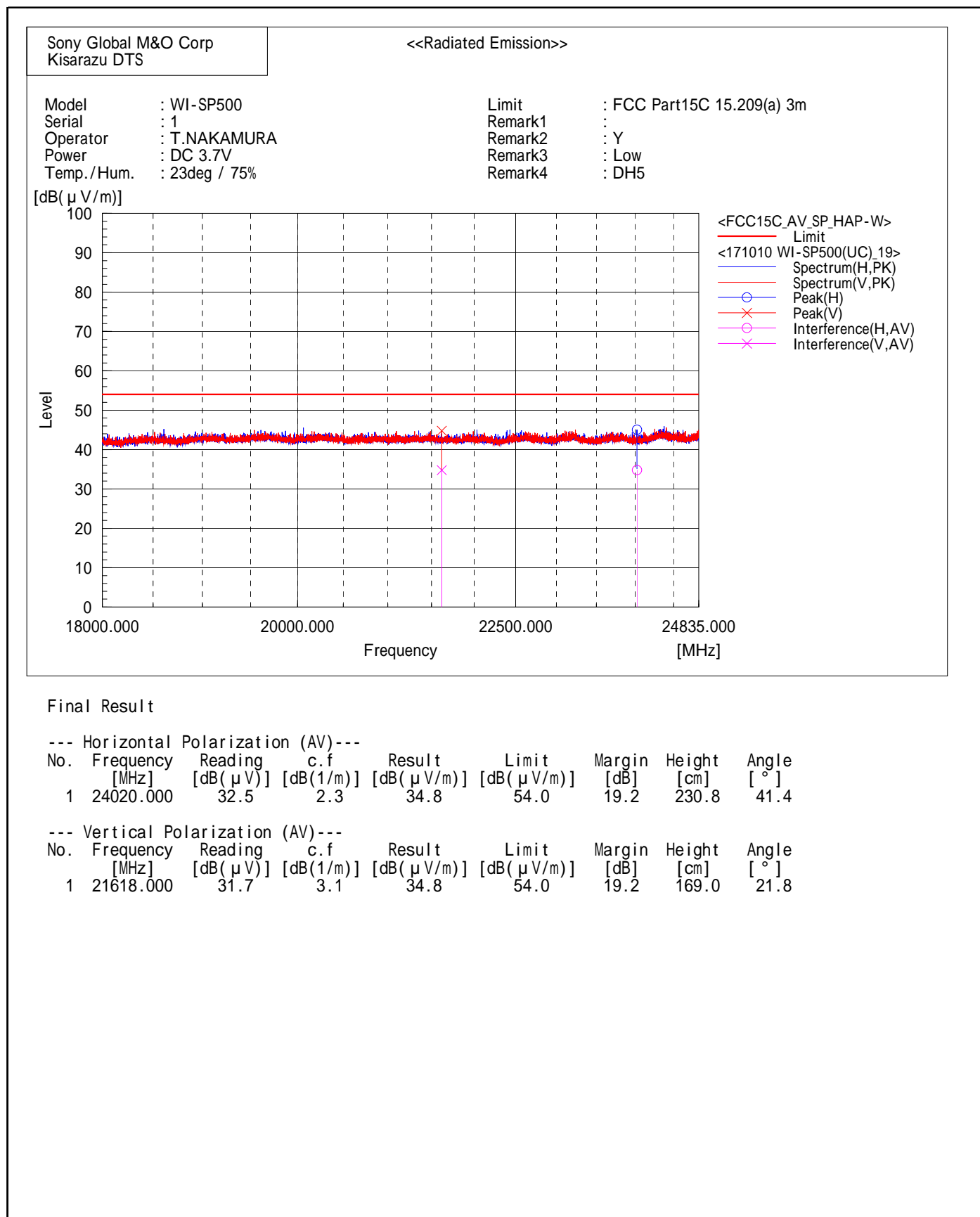
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	9924.211	58.6	-4.6	54.0	74.0	20.0	100.0	118.9

--- Vertical Polarization (PK)---

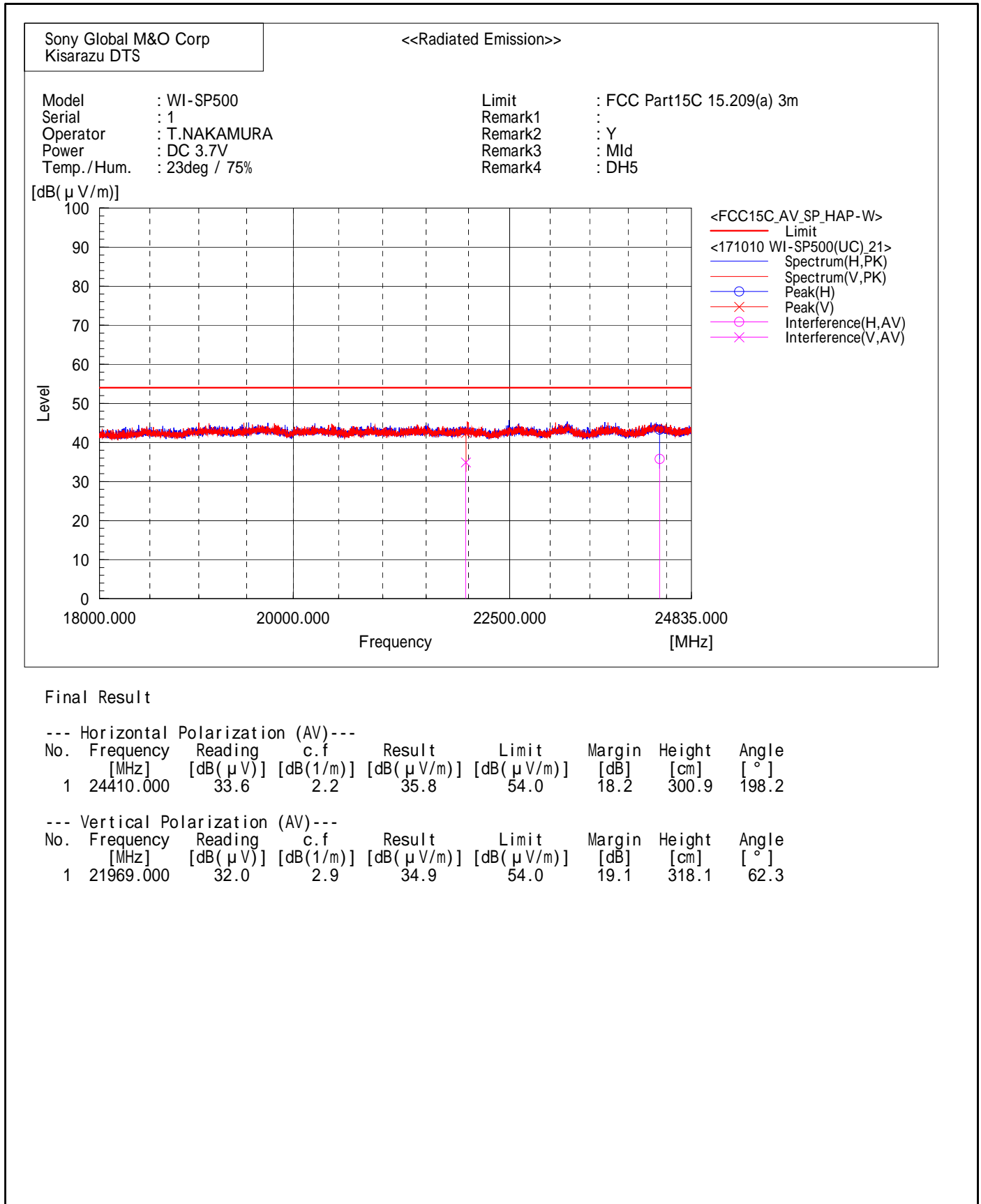
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	7439.794	55.9	-8.7	47.2	74.0	26.8	100.0	179.1

18 GHz - 24.835 GHz

[BDR( DH5 )/2402MHz]

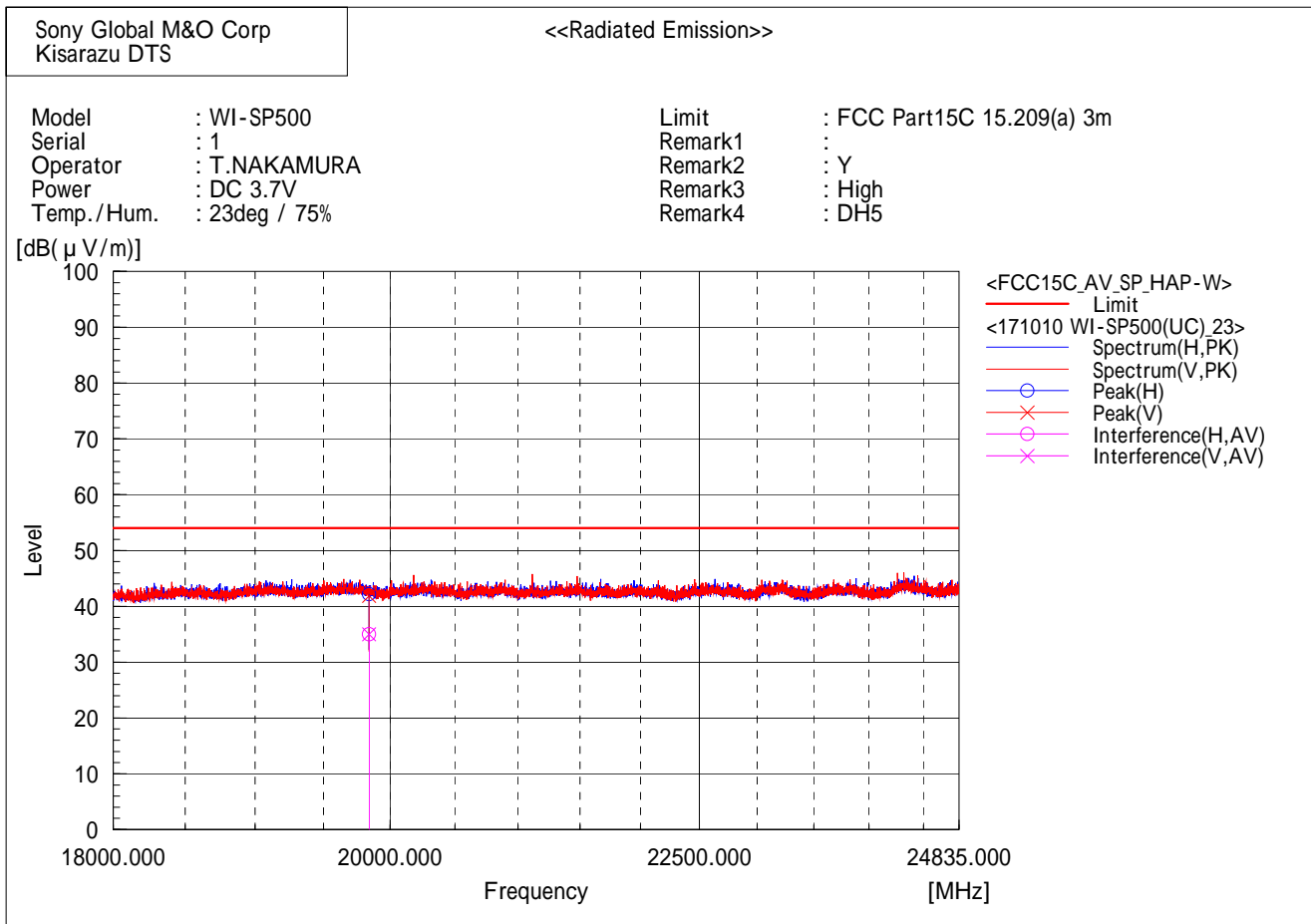


[BDR( DH5 )/2441MHz]





[BDR( DH5 )/2480MHz]



Final Result

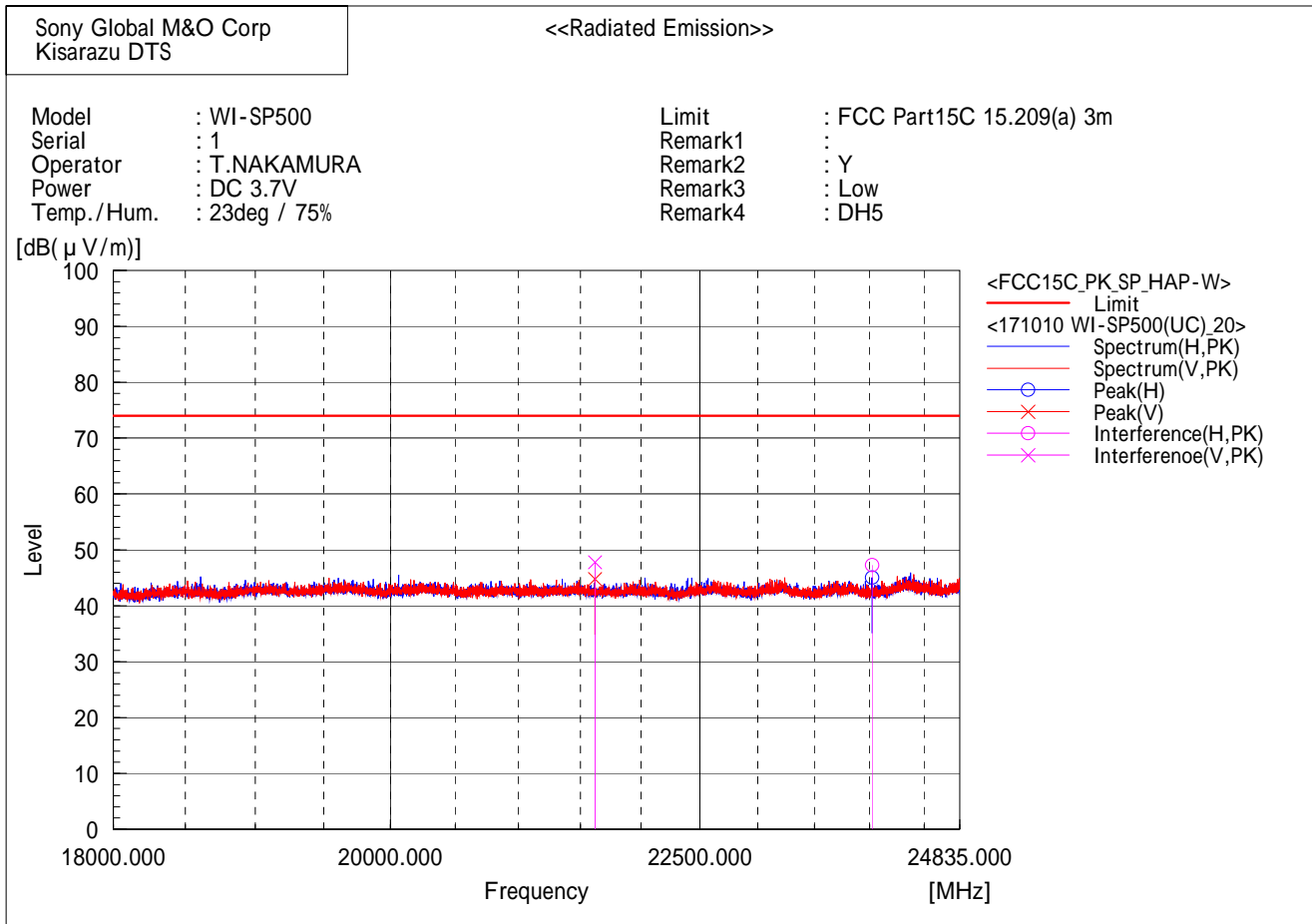
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	31.4	3.6	35.0	54.0	19.0	293.6	321.0

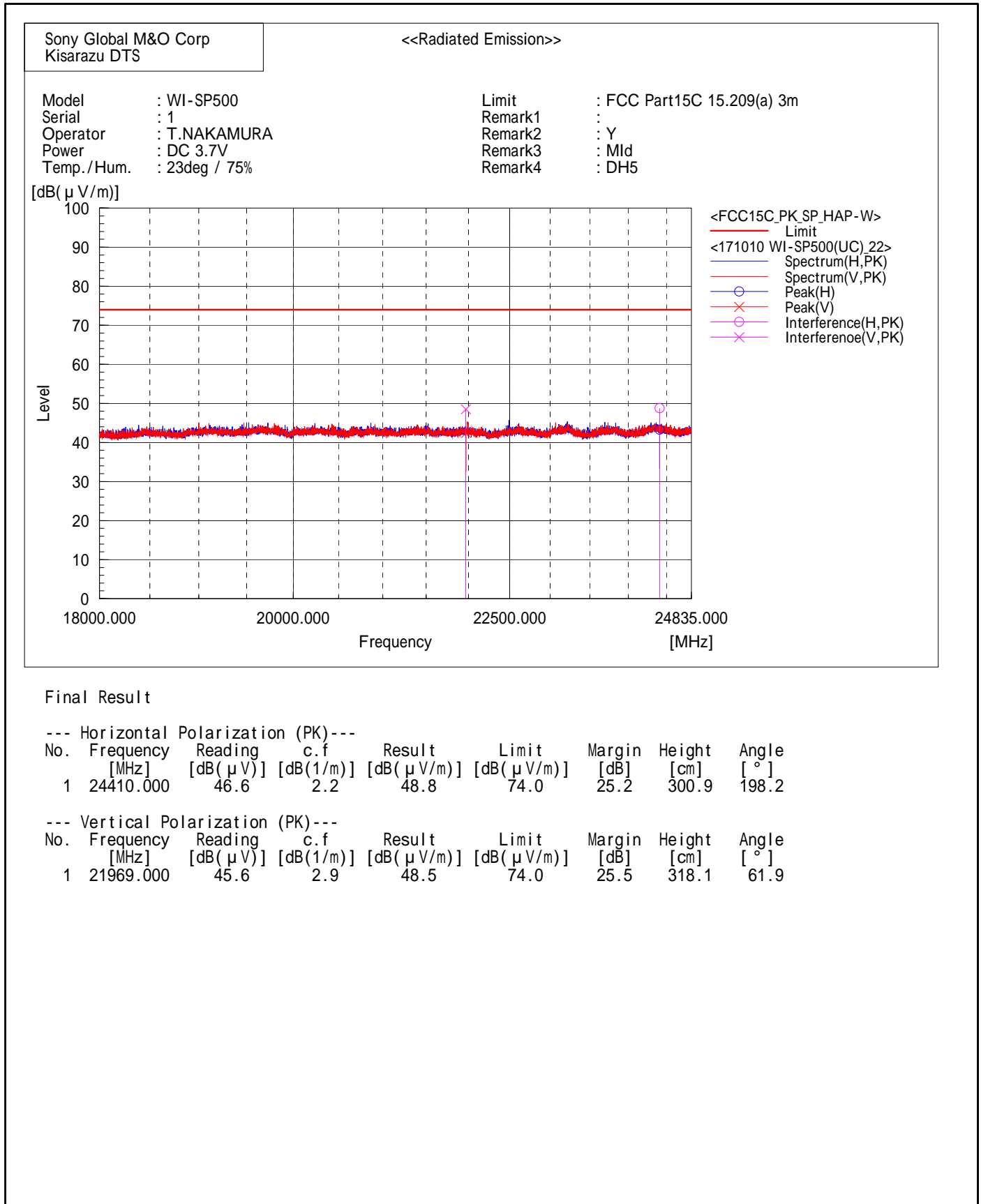
--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	31.4	3.6	35.0	54.0	19.0	100.0	232.3

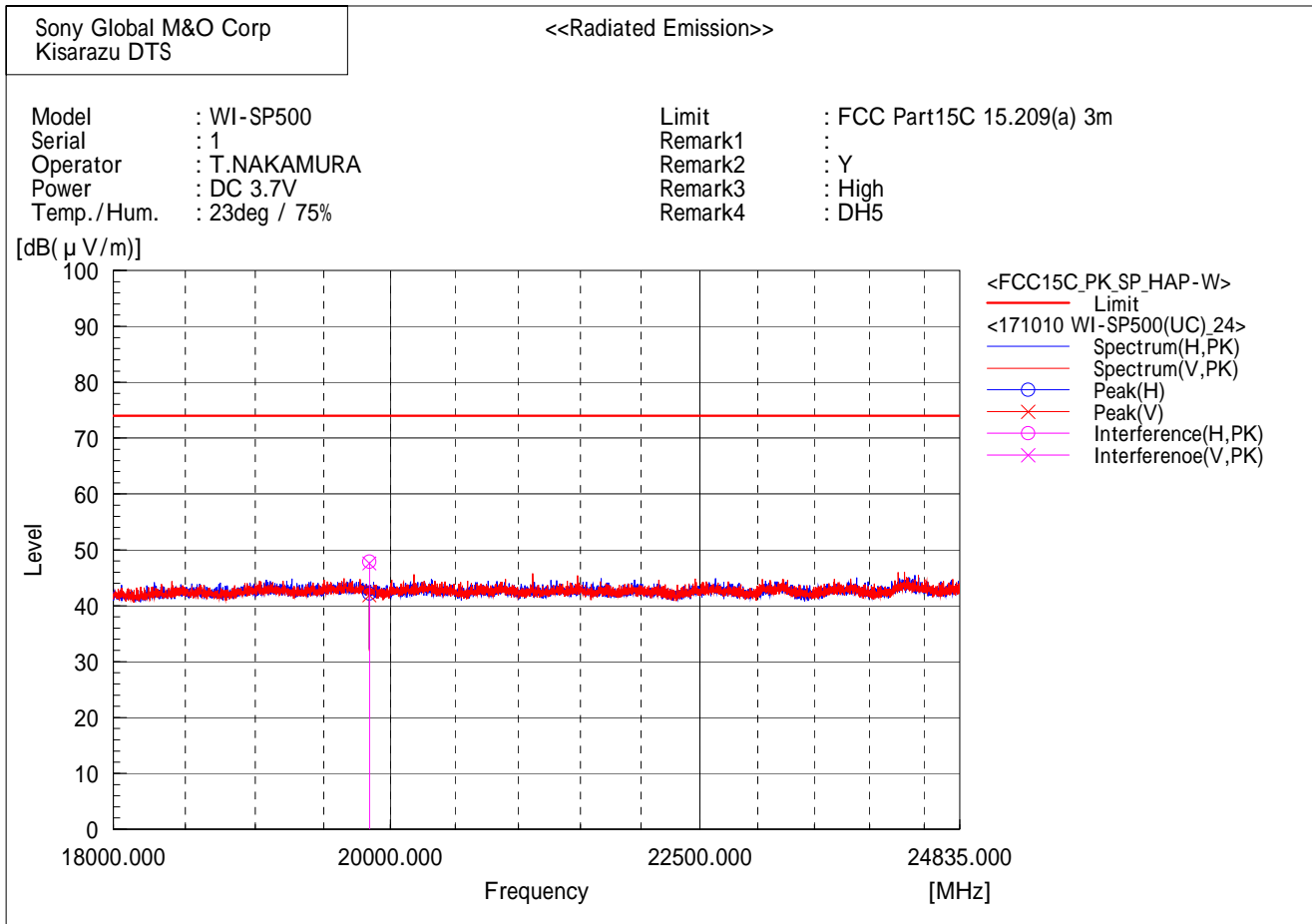
[BDR( DH5 )/2402MHz]



[BDR( DH5 )/2441MHz]



[BDR( DH5 )/2480MHz]



Final Result

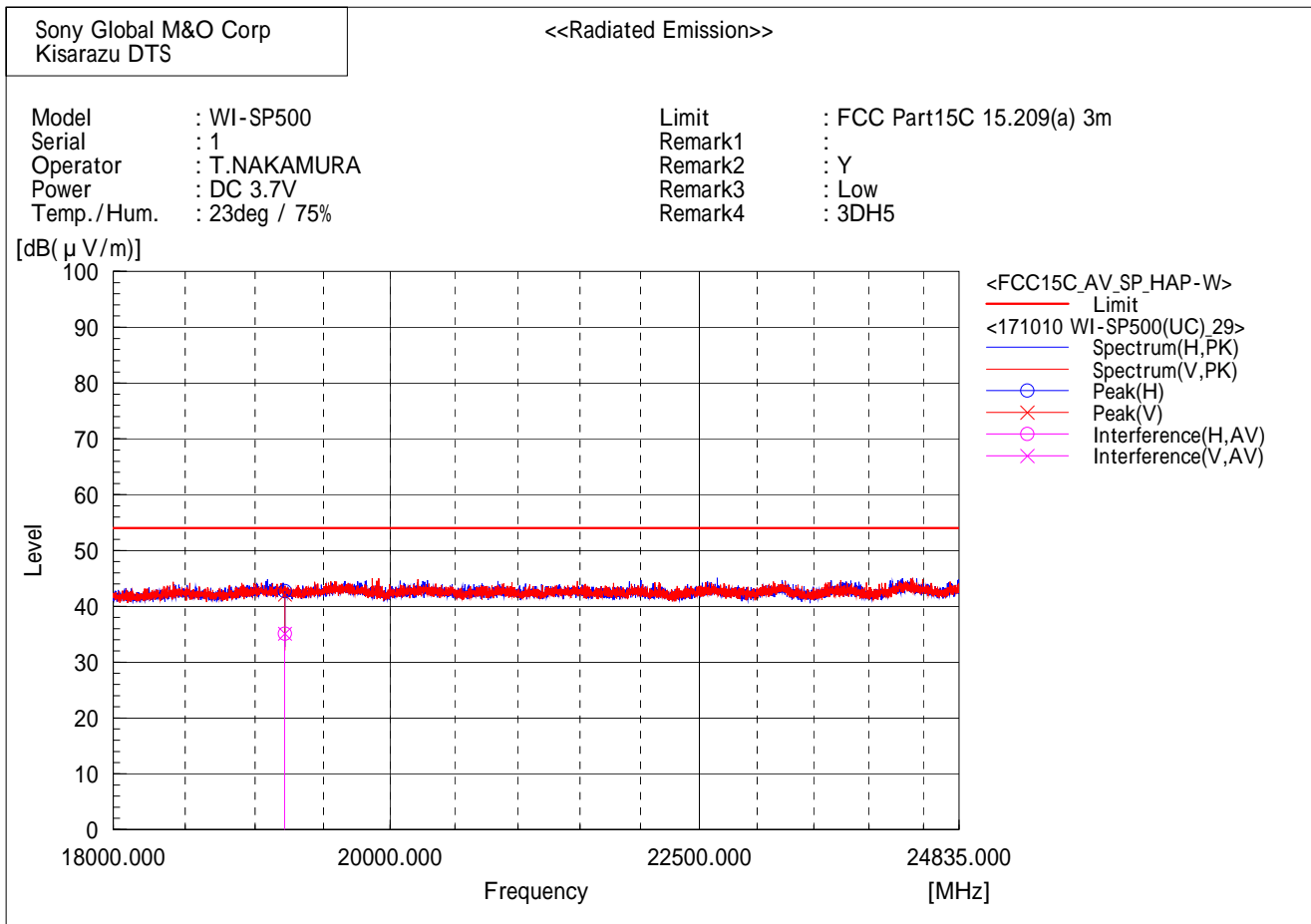
--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	44.3	3.6	47.9	74.0	26.1	293.6	320.6

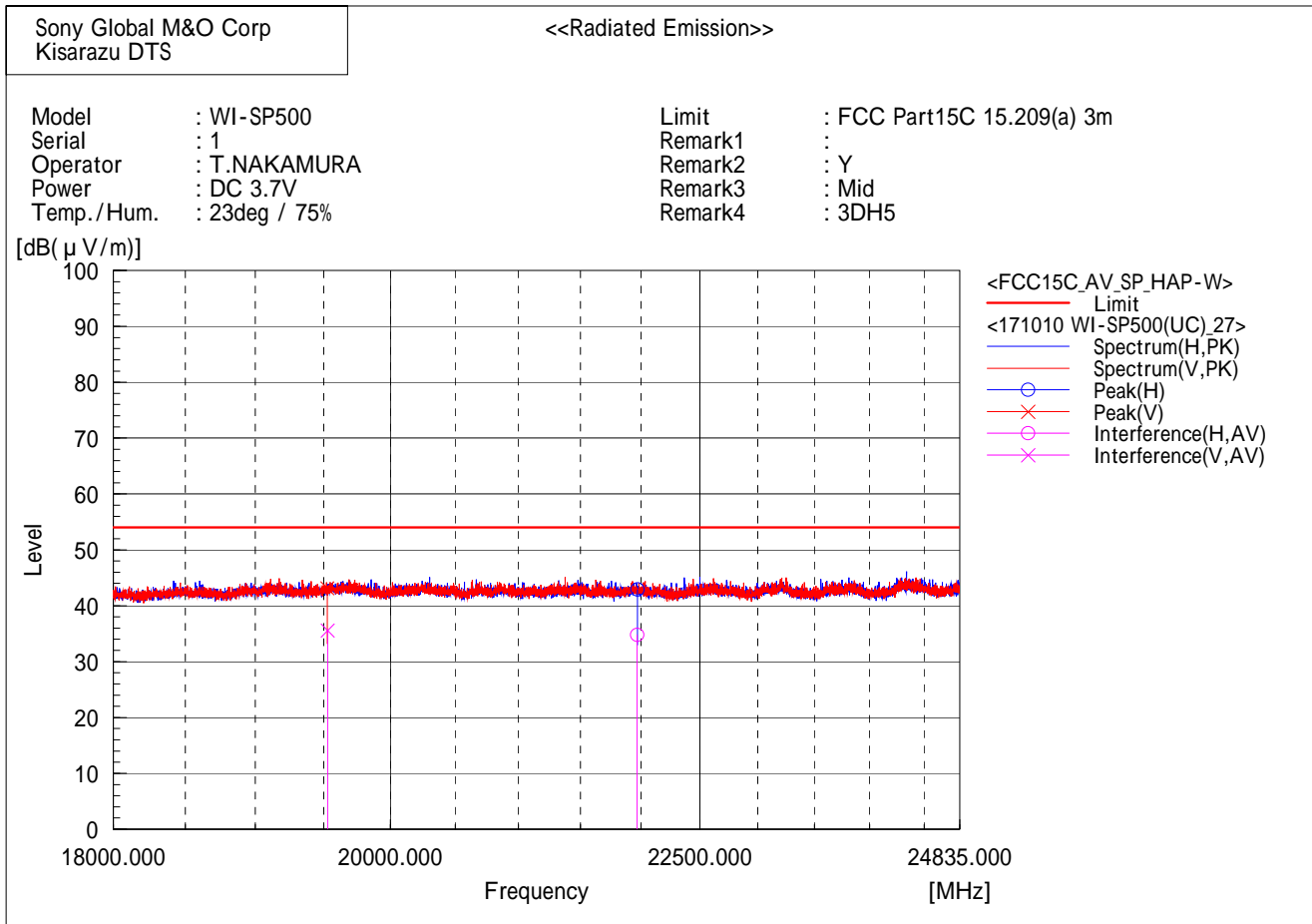
--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19840.000	44.0	3.6	47.6	74.0	26.4	100.0	232.3

[EDR( 3DH5 )/2402MHz]



[EDR( 3DH5 )/2441MHz]



Final Result

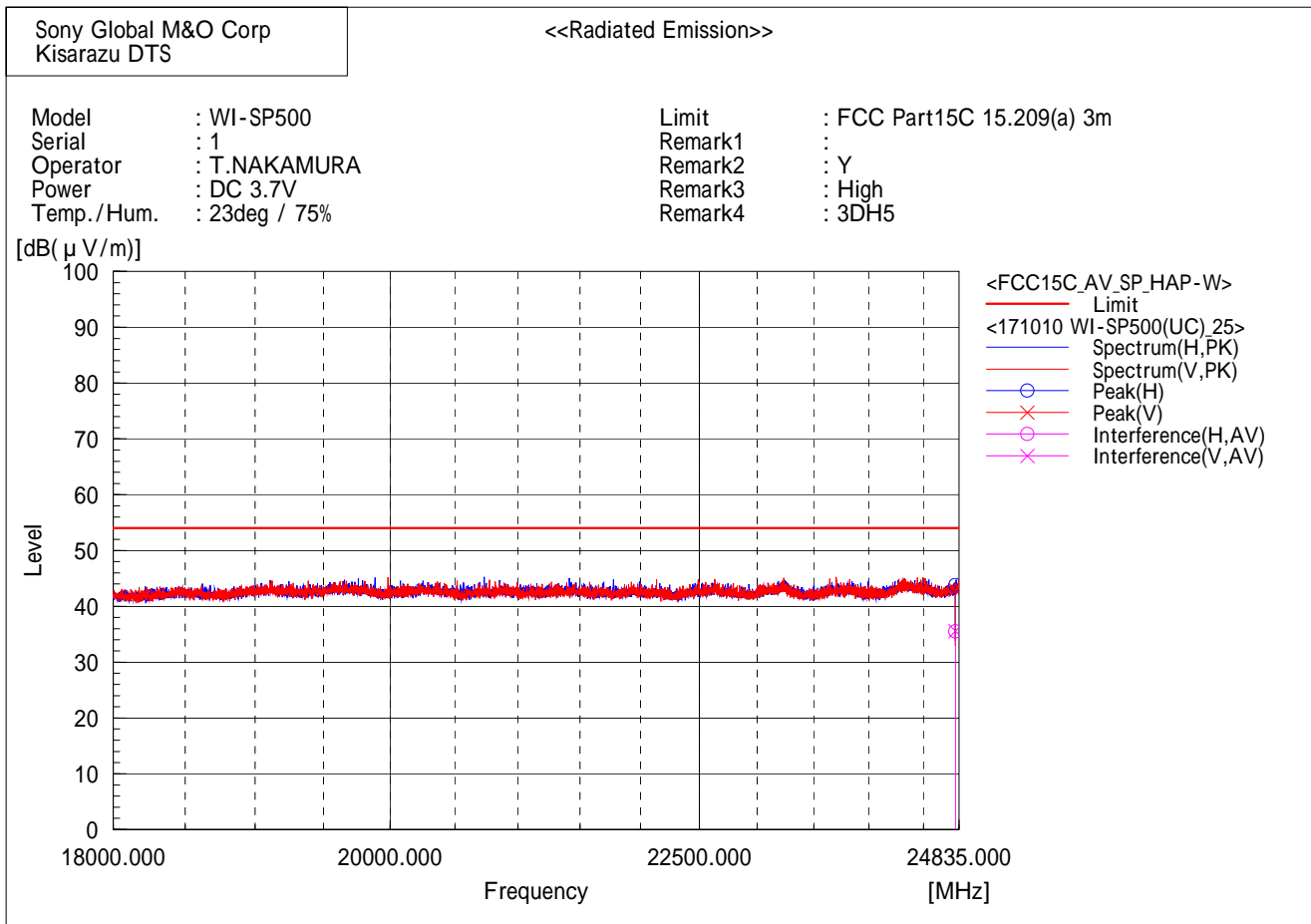
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	21969.000	31.9	2.9	34.8	54.0	19.2	204.0	151.3

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	19528.000	32.0	3.6	35.6	54.0	18.4	360.1	342.2

[EDR( 3DH5 )/2480MHz]



Final Result

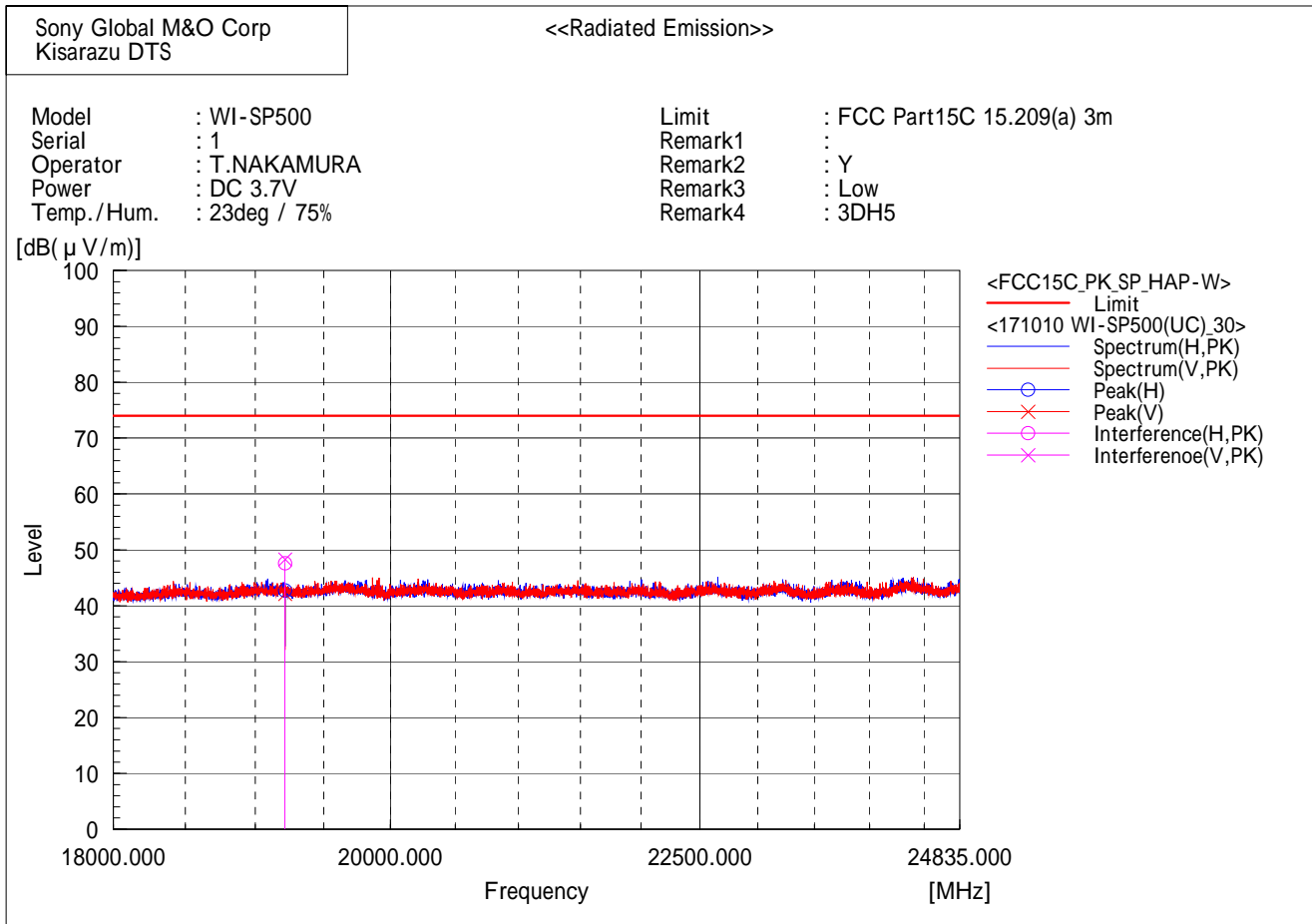
--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	33.3	2.2	35.5	54.0	18.5	419.7	172.6

--- Vertical Polarization (AV)---

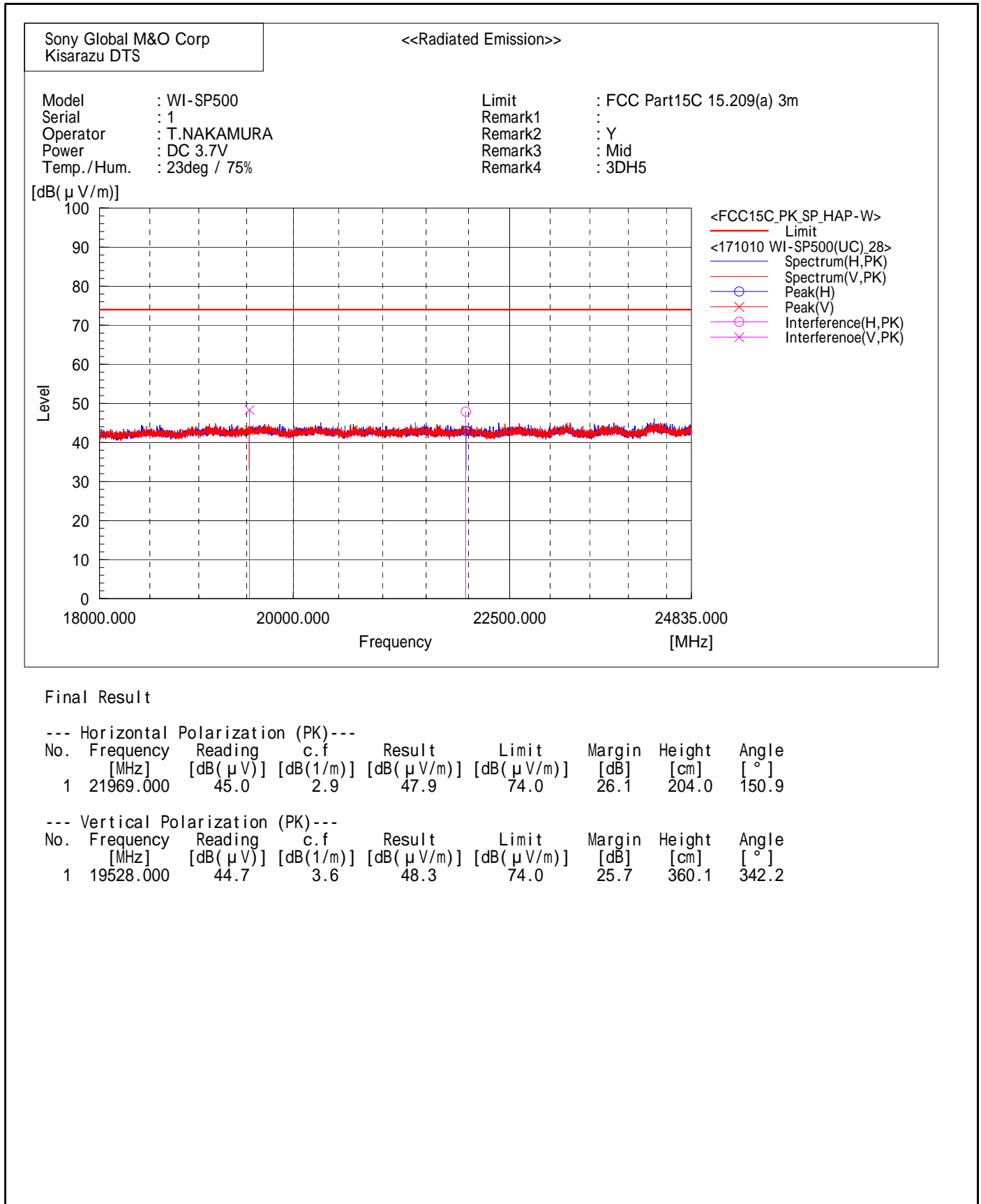
No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	33.4	2.2	35.6	54.0	18.4	204.8	184.3

[EDR( 3DH5 )/2402MHz]

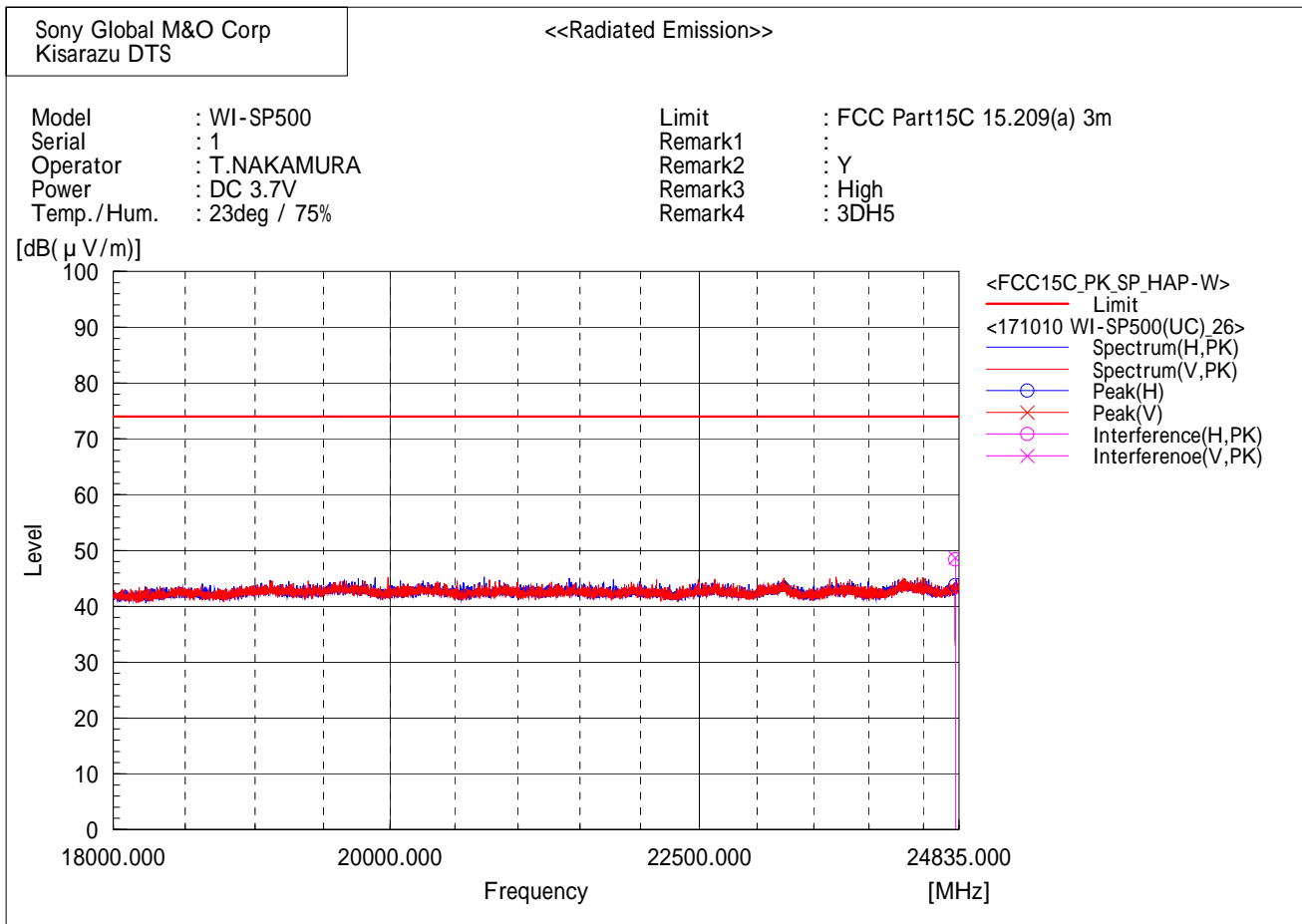




[EDR( 3DH5 )/2441MHz]



[EDR( 3DH5 )/2480MHz]



Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	46.2	2.2	48.4	74.0	25.6	419.7	172.6

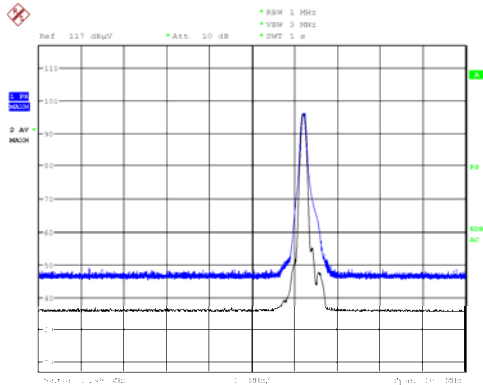
--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(µV)]	c.f [dB(1/m)]	Result [dB(µV/m)]	Limit [dB(µV/m)]	Margin [dB]	Height [cm]	Angle [°]
1	24800.000	46.5	2.2	48.7	74.0	25.3	419.7	172.6

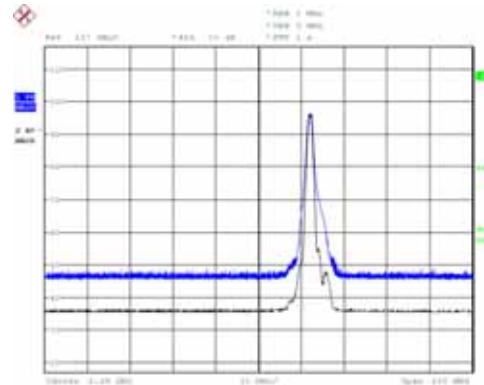
2.4GHz Restricted-Band Edge (Plot data)

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.

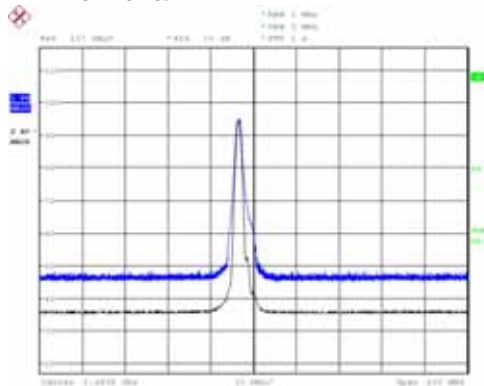
[BDR / 2402MHz]  
Horizontal



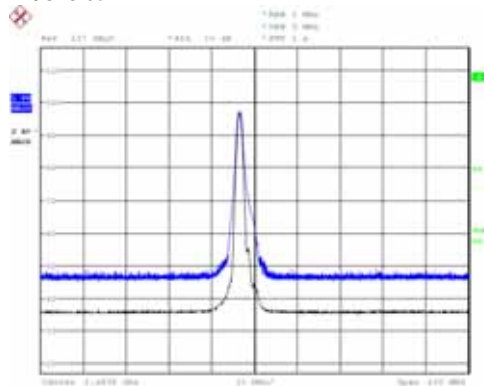
Vertical



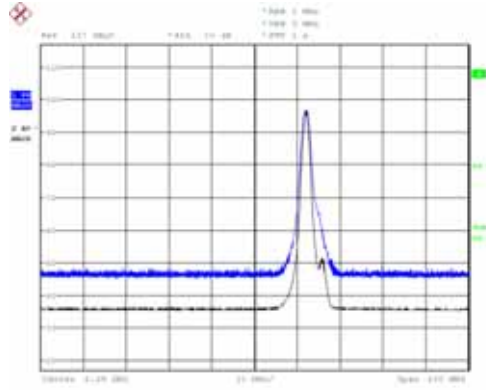
[BDR / 2480MHz]  
Horizontal



Vertical

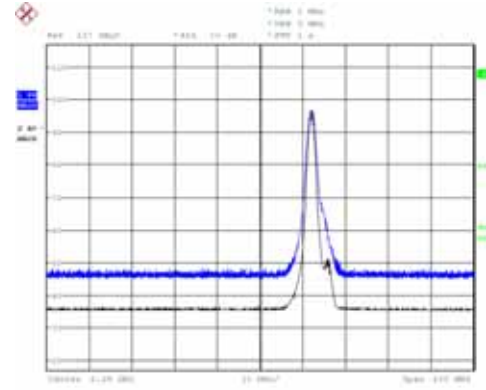


[EDR / 2402MHz]  
Horizontal



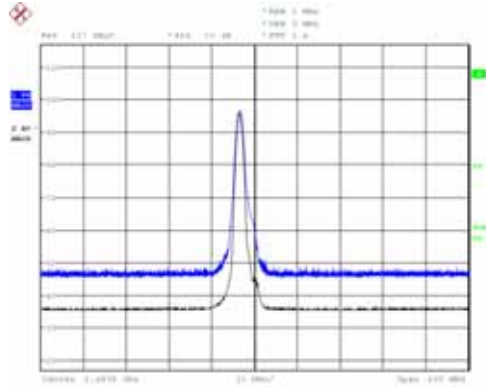
Date: 8/27/2021 11:58:19

Vertical



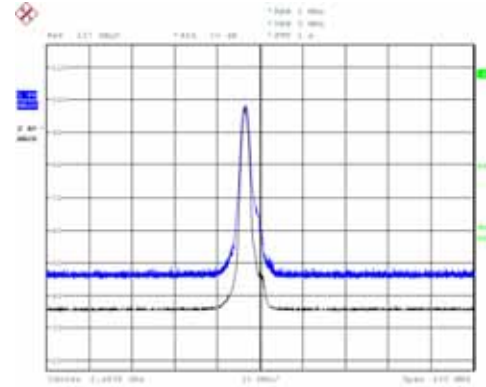
Date: 8/27/2021 14:03:13

[EDR / 2480MHz]  
Horizontal



Date: 8/27/2021 14:17:08

Vertical

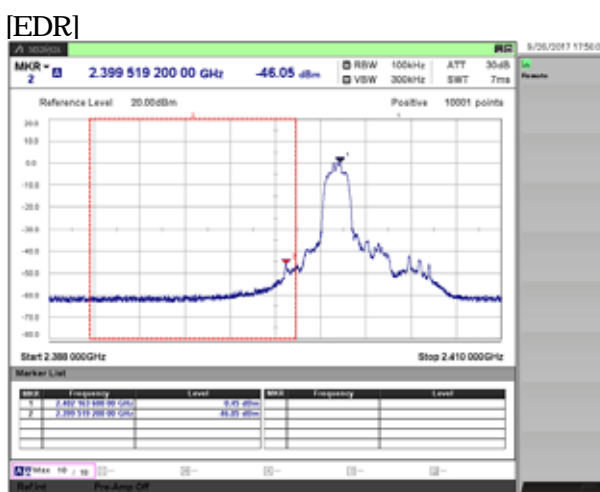
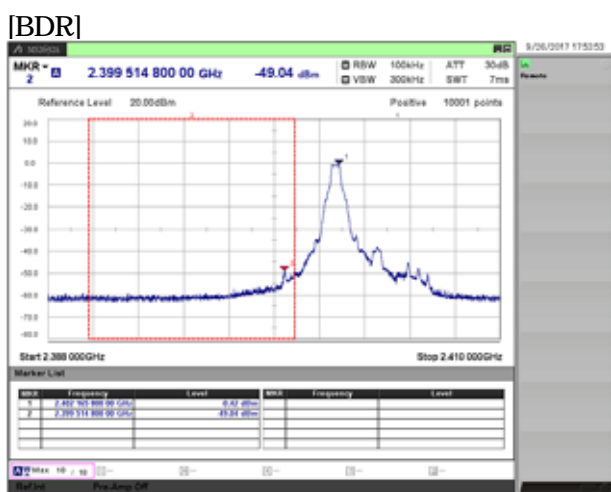


Date: 8/27/2021 14:19:41

3.7. Conducted Spurious Emissions for Band Edge

- 1) Ambient temperature : 22.0 deg.C
- 2) Relative humidity : 63.3 %
- 3) Date of measurement : September 26, 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	2399.51	-49.04	1.26	-47.78	-19.2	28.63
			2402.17	-0.42	1.26	0.84	-	-
EDR	3DH5	2402	2399.52	-46.05	1.26	-44.79	-18.3	26.49
			2402.16	0.45	1.26	1.71	-	-



## 4. Method of Calculation

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

Method of calculation : Software  
 The Software for Calculation Name : SW-308  
 Version : Ver.3.1

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

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.

### 4.2. Maximum Peak Conducted Output Power Measurement

Method of calculation : Software  
 The Software for Calculation Name : SW-308  
 Version : Ver.3.1

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

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

Notes :

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

#### 4.3. 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)

#### 4.4. Conducted Spurious Emission for Band Edge Measurement

Method of calculation : Software  
The Software for Calculation Name : SW-308  
Version : Ver.3.1

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. Antenna-port Conducted Measurements

#### 4th Site Shielded Room

	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	17.08.03
x	WC05	RF Cable	SUCOFLEX 102	34287	HUBER + SUHNER	12	16.11.04
x	M719	Thermometer	TH-321	140053	AS ONE	12	17.04.28

### 5.2. Radiated Spurious Emissions

#### 4th Site 10m Semi-Anechoic Chamber:

	Ctrl.#	Equipment	Model No.	Serial No.	Manufacturer	Cal.Int.	Last Cal.
x	M506	EMC Chamber	10m	-	TDK Corp.	12	17.05.17
x	M575	EMI Receiver	ESCI	100161	Rohde & Schwarz	12	16.12.01
x	M486	EMI Receiver	ESU40	100050	Rohde & Schwarz	12	17.05.15
x	A043	Biconical Antenna	BBA9106	VHA91032598 (V5)	Schwarzbeck	12	17.04.30
x	A046	Log-periodic Antenna	UHALP9108A1	0830	Schwarzbeck	12	17.04.30
x	A056	Horn Antenna (1-6 GHz)	BBHA9120D	670	Schwarzbeck	12	17.04.30
x	A057	Horn Antenna (6-18 GHz)	HAP06-18W	00000037	TOYO Corp.	12	17.04.30
x	A058	Horn Antenna (18-26.5 GHz)	HAP18-26W	00000016	TOYO Corp.	12	17.02.13
x	A073	Loop Antenna	HFH2-Z2	100171	Rohde & Schwarz	12	16.10.04
x	CS039	Fourth Site RE Cable System 3	-	-	Internal Manufacturing	12	17.01.16
x	CS064	Fourth Site RE Cable System 8	-	-	Internal Manufacturing	12	17.01.16
x	CS065	Fourth Site RE Cable System 8	-	-	Internal Manufacturing	12	17.01.16
x	CS066	Fourth Site RE Cable System 9	-	-	Internal Manufacturing	12	17.01.16
x	M510	RF Selector	NS4900	0802-226	Toyo Corporation	12	17.01.16
x	M706	3dB Attenuator	8491A	MY39267782	Keysight Technologies	12	17.01.16
x	M620	RF Pre-Amp	8447D	2944A10720	Keysight Technologies	12	17.01.16
x	M831	GHz Filter Box	FB-G1	2	Sony Global M&O	12	17.01.16
x	WC01	Coaxial Cable	SUCOFLEX102	34234/2	Huber + Suhner	12	17.05.31
x	W029	10dB Attenuator	8493C	76549	Agilent Technologies	12	17.08.03
x	M689	Thermo Meter	AD-5640A	201303	A&D	12	16.11.07

About calibration interval

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