



## MEASUREMENT/TECHNICAL REPORT FCC Part 15 Subpart C

Issued: September 1, 2009

Name and Address of the Applicant:	Brother Industries, Ltd. 15-1, Naeshiro-cho, Mizuho-ku, Nagoya 467-8561, Japan
Test Item:	Mobile Printer
Identification:	MW-145BT
Serial No.:	F9A000041
FCC ID:	B3Q5V6103
Sample Receipt Date:	July 28, 2009
Test Specification:	FCC Part 15 Subpart C, 15.247
Date of Testing:	August 4, 6, and 10, 2009
Test Result:	PASS

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	O. Itogawa, Engineer	Date
Reviewed by:	<u>Y. Kawahara</u>	<u>September 1, 2009</u>
	Y. Kawahara, Deputy General Manager	Date

Notes:

1. This report should not be reproduced except in full, without the written approval of Cosmos Corporation.
2. All measurement data contained in this report may have uncertainty. A judgment for the limitation should be taken into the count.
3. The report in this report apply only to the sample tested.

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## 1. Description of Equipment Under Test

### 1.1 Product Description

Manufacturer : BROTHER INDUSTRISE, LTD.  
 Model (referred to as the EUT) : MW-145BT  
 Nominal Voltage : DC 10.5V  
 Type of Modulation : GFSK,  
 Mode of Operation :  duplex  1/2 duplex  simplex  other  
 The type of the equipment :  Stand-alone  Combined Equipment  
    Plug -In Card  Other (Module Unit)  
 The type of the antenna :  Integral  external  Other  
 The type of power source :  AC mains  Dedicated AC adapter (        V)  
    DC Voltage  Battery  
  
 The type of battery (if applicable) : Li-ion Battery  
 Type of Operation :  Continuous  Burst  Intermittent  
 Stand by Mode :  Available  N/A  
 Intended functions : Bluetooth 2.1+EDR  
 The bandwidth of the IF filters : N/A  
 Method of Communication Link :  
 The operating frequency band : 2.402 to 2.480 MHz  
 The thermal limitation : Not specified

### 1.2 Antenna Description

No.	Type Name	Gain	Antenna Type	Remarks
1	AF216M245001	+1dBi (min)	Helical antenna	

### 1.3 Accompanied Peripherals Description

No.	Equipment Name	Manufacturer	Type Name	Serial Number	Remarks
1	PC	DELL	PA-10	6081760005	DC 19.5 V
2	AC Adapter	DELL	PA-1650-05D	5U092	AC100-240 V, 50/60 Hz, 1.5 A
3	Jig	TAIYO YUDEN	TE7037-1	---	DC 5 V
4	AC Adapter	DVE	DSA-0151A-05A	3872A604	AC 100-120 V, 50/60 Hz, 0.4 A

## 2. General Information

### 2.1 Test Methodology

All measurement subject to the present report was carried out according to the procedures in ANSI C63.4: 2003.

### 2.2 Test Facility

All measurement was performed in the following facility;

#### **Cosmos Corporation EMC Lab. Ohnogi**

(2-3571 Ohaza-iwatachi, Ohnogi, Watarai-cho, Watarai-gun, Mie-ken 516-2102, Japan) The test firm has been filed since March 7, 2008 under CFR 47 Part.2.948.

### 2.3 Traceability

The calibration of measurement equipment used in the test subject to the present report is designed and operated to ensure that the measurement is traceable to national standards of measurement or equivalent abroad.

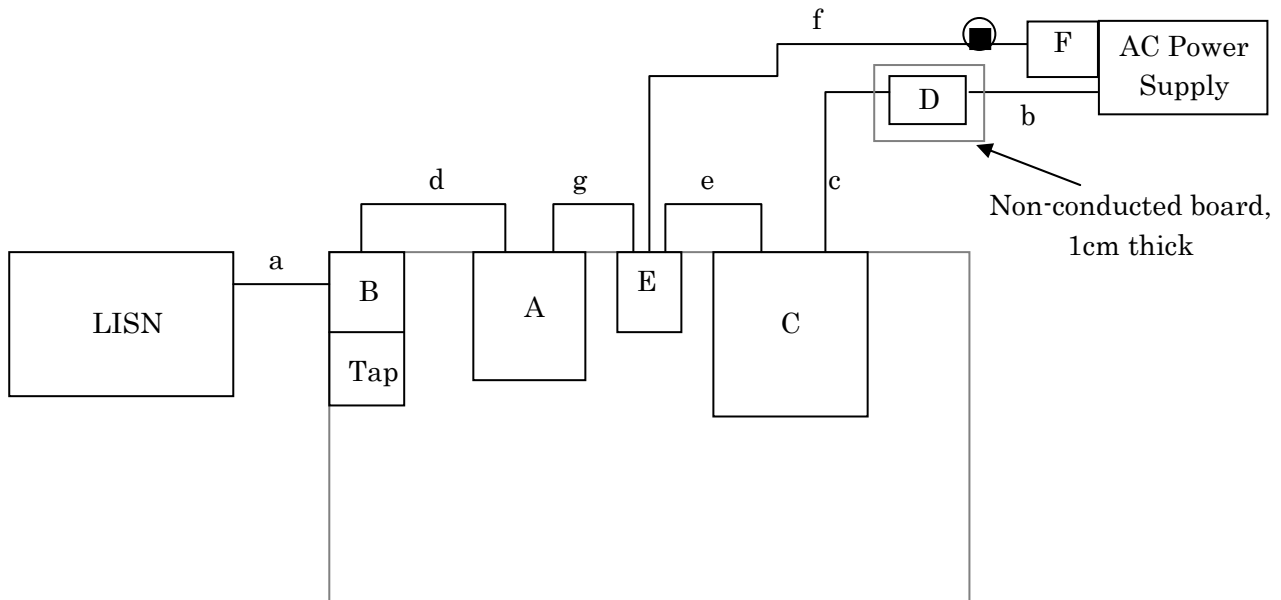
### 3. Summary of Test Results

Section	Test Item	Limit	Result
15. 207	AC Power Conducted Emission	See 5.1.2	Pass
15. 247(a)(1)	Spectrum Bandwidth of Frequency Hopping Spread Spectrum System	< 1MHz if using less than 15 non-overlapping channels	Pass
15. 247(a)(1)	Channel Separation	> 2/3 of 20dB BW for systems with output power < 125mW	Pass
15. 247(a)(1)	Number of Channels	> 15 channels	Pass
15. 247(a)(1)	Time of Occupancy	< 0.4 sec in 30 sec period	Pass
15. 247(a)(2)	Spectrum Bandwidth of Direct Sequence Spread Spectrum System	Min. 500kHz	Pass
15. 247(b)	Maximum Peak Output Power	Max. 1W (30dBm)	Pass
15. 247(d) 15. 209	Transmitter Radiated Emissions	See 5.4.2 See 5.5.2	Pass
15. 247(e)	Power Spectrum Density	Max. 8dBm	Pass
15. 247(d)	Band Edge Measurement	See 5.7.2	Pass

#### 4. Test Configuration

Instrument	Model	Cable	Length	Shield	
A	EUT 1 (Mobile Printer)	MW-145BT	2.0 m	×	
B	EUT 2 (AC Adapter)	AD-210JP	0.8 m	×	
C	PC	PA-10	1.6 m	×	
D	AC Adapter	PA-1650-05D	2.0 m	×	
E	Jig	TE7037-1	1.6 m		
F	AC Adapter	DSA-0151A-05A	2.0 m	×	
		g	Signal Cord	0.15 m	×

#### 4.1 15. 207 AC Power Conducted Emission in Shield Room



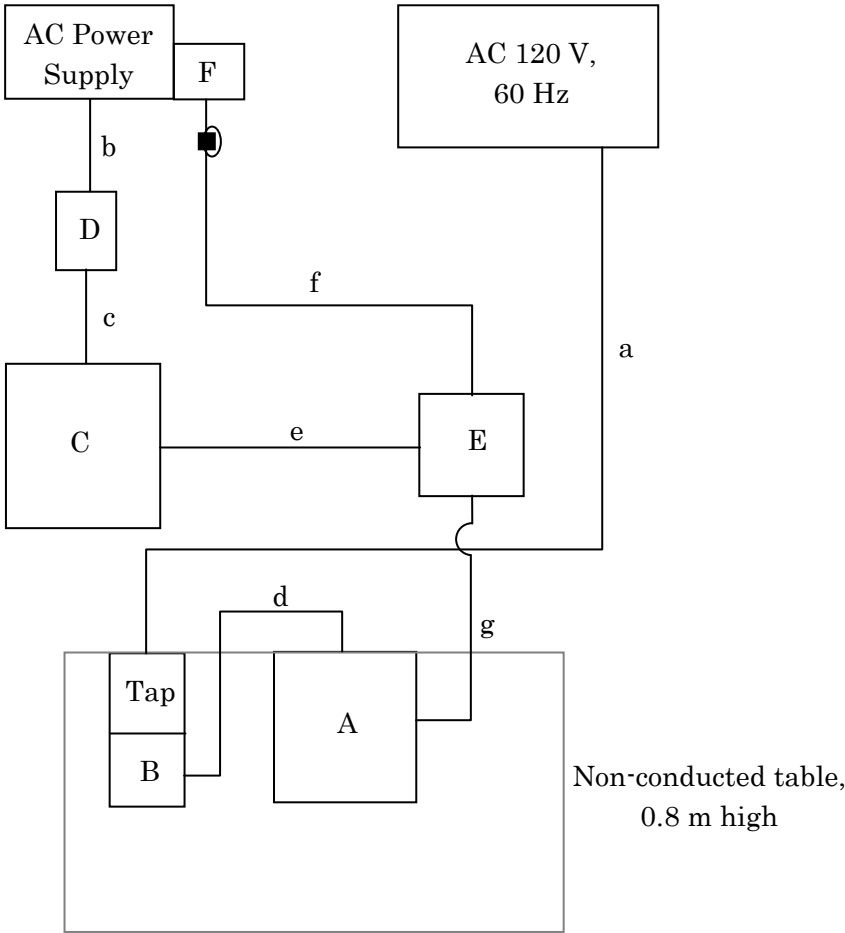
■ Ferrite Core (ZCAT2035-0930, TDK)

Note: Distance of instruments: 0.1 m

#### Excess cable arrangement

Sym.	Length or Diameter	Position	Setting
d	0.4 m	center	Bundle

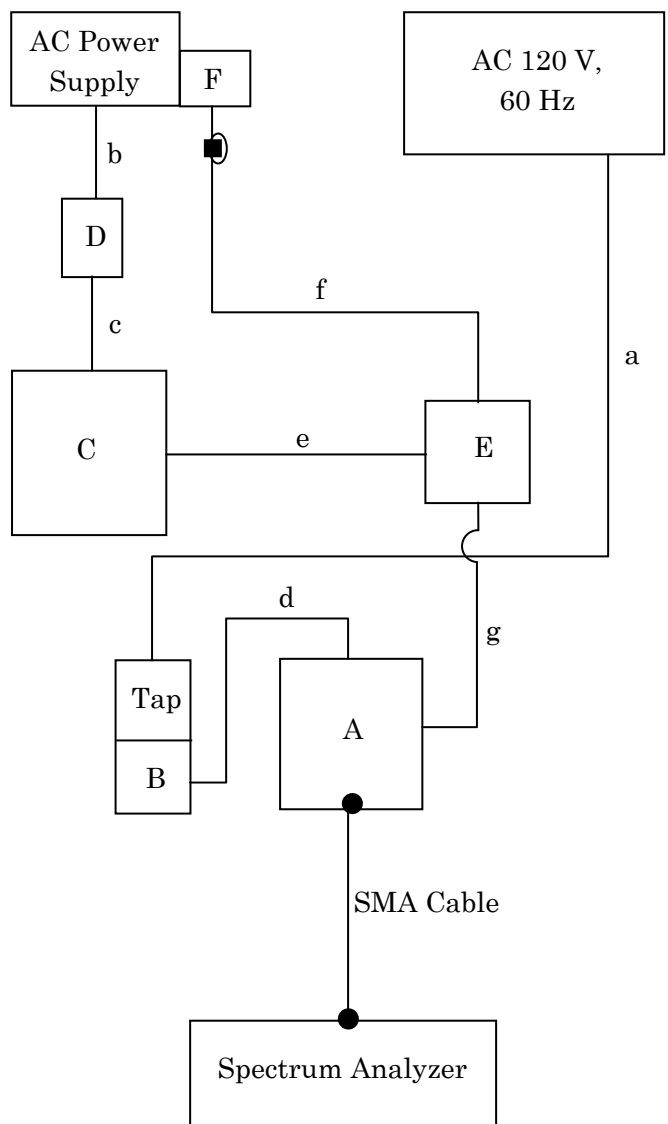
4.2 15.247(d), 15.209 Transmitter Radiated Emissions, 15.209 Band Edge (Radiated), and 15.215 (c) 20 dB Bandwidth in 3m Anechoic Chamber



■ Ferrite Core (ZCAT2035-0930, TDK)

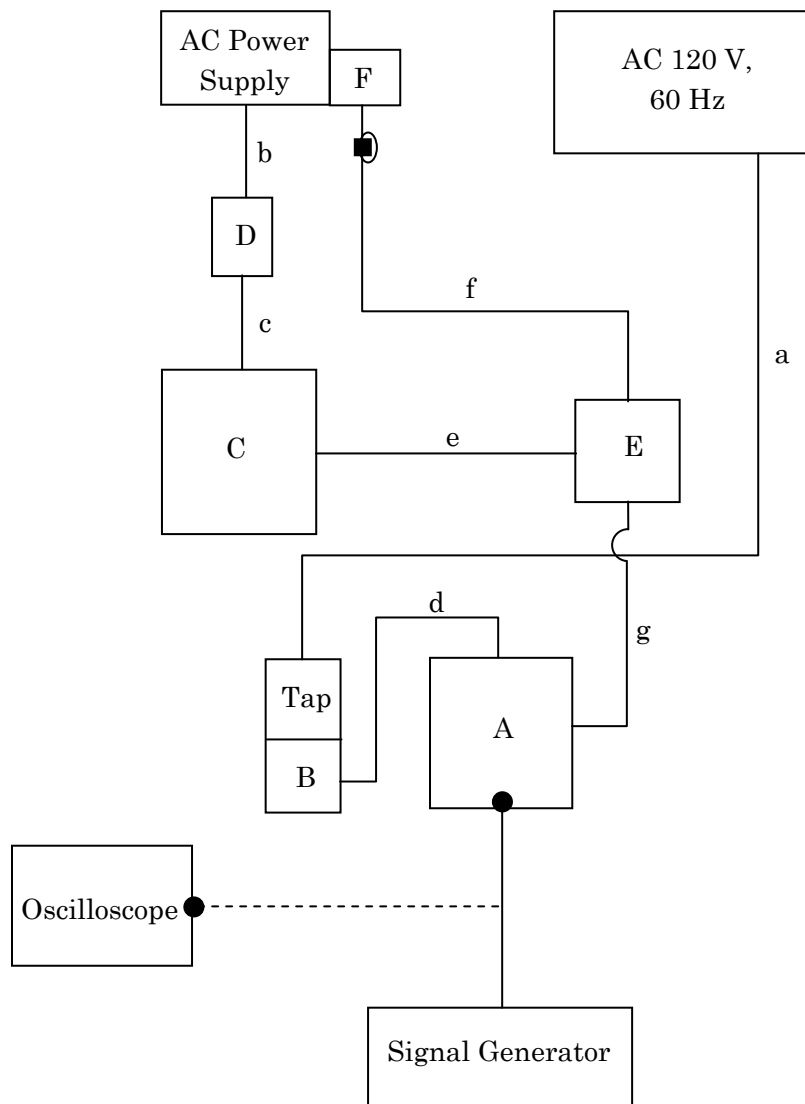


4.3 All Other Test Items (Except Maximum Peak Output Power)



■ Ferrite Core (ZCAT2035-0930, TDK)

#### 4.4 Maximum Peak Output Power



■ Ferrite Core (ZCAT2035-0930, TDK)

#### 4.5 Test Mode

In all test configurations above, EUT makes continuous RF transmitting with manufacturer's specified power.

## 5. Measurement Result

### 5.1 15. 207 AC Power Conducted Emission

#### 5.1.1 Setting Remarks

- Configure the EUT System in accordance with ANSI C63.4-2003.
- Non-conductive board (10mm thick) for EUT and non-conductive table (80cm high) for personal computer were used.
- Other power cord of support equipment is connected to another LISN to isolate its emission from the measured emission of EUT.
- The measuring port of LISN for support equipment was terminated by the 50Ω
- Activate the EUT System and run the software prepared for the test, if necessary.
- Refer to test configuration figure 4.1.

#### 5.1.2 Minimum Standard

15. 207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

#### 5.1.3 Result

**EUT complies with the requirement.**

Uncertainty of measurement : ± 2.26 dB  
 Temperature, Humidity : 27°C, 45 %

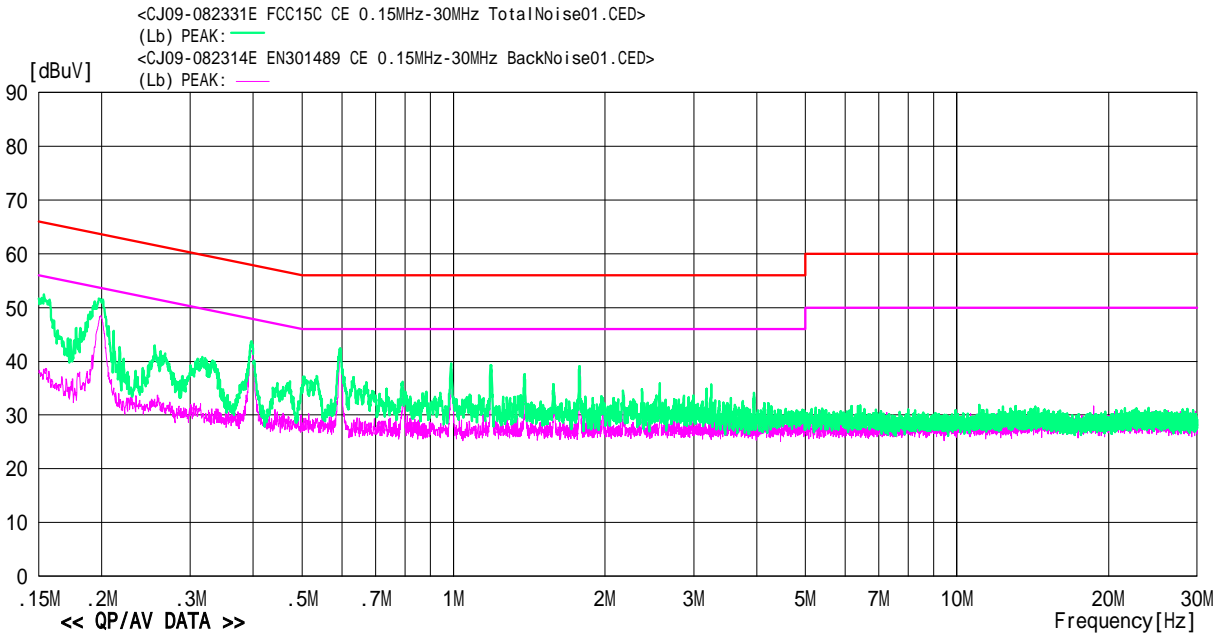
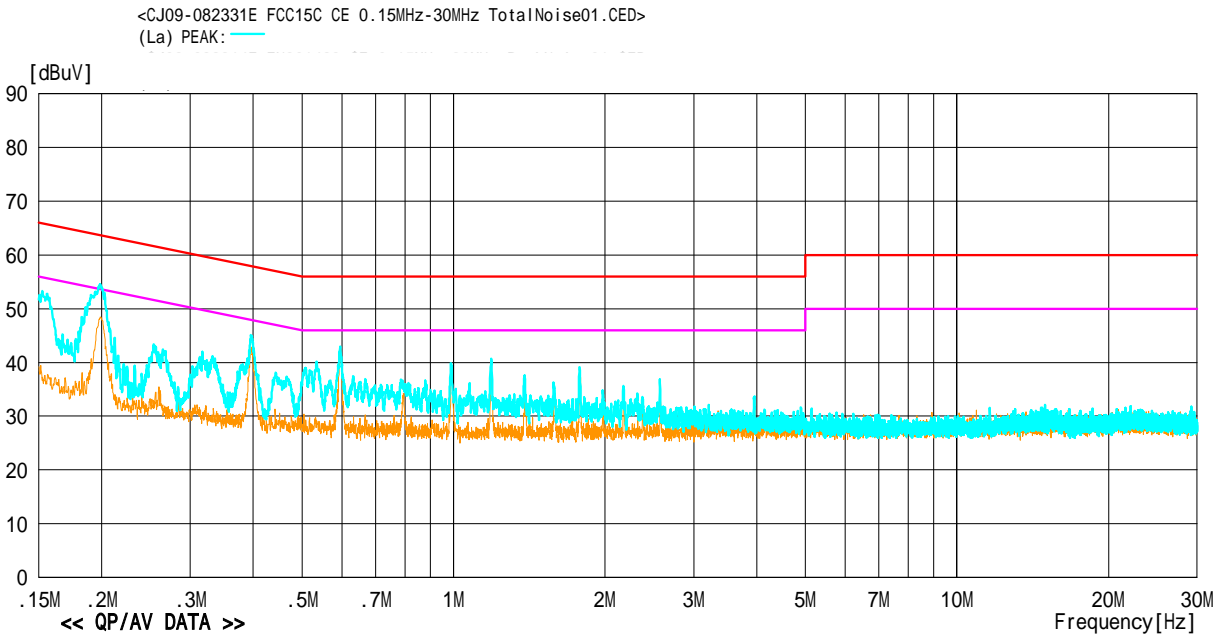
5.1.4 Measured Data

Measured Value Table

Model Name	: MW-145BT	Job No	: CJ09-082331E
Serial No.	: None	Temp/Humi	: 27 /45%
Operator	: O. Itogawa	Condition	: Operated
Power Supply	: AC120V,60Hz	Remark	:

Memo : RBW:9kHz(150k-30MHz)

LIMIT : FCC Part 15 SubpartC ClassB QP  
 FCC Part 15 SubpartC ClassB AV



Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 27 /45%  
 Condition : Operated  
 Remark :

Memo : RBW:9kHz(150k-30MHz)

LIMIT : FCC Part 15 SubpartC ClassB QP  
 FCC Part 15 SubpartC ClassB AV

<< QP/AV DATA >>

No	Freq. [MHz]	Reading Level		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		QP	AV		QP	AV	QP	AV	QP	AV		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dB]	[dB]	[dB]	[dB]		
1	0.15024	39.9	37.8	10.2	50.1	48.0	66.0	56.0	15.9	8.0	La	
2	0.19744	42.0	38.9	10.1	52.1	49.0	63.7	53.7	11.6	4.7	La	
3	0.25510	28.0	25.1	10.1	38.1	35.2	61.6	51.6	23.5	16.4	La	
4	0.51021	21.3	19.9	10.1	31.4	30.0	56.0	46.0	24.6	16.0	La	
5	2.56811	21.7	19.9	10.2	31.9	30.1	56.0	46.0	24.1	15.9	La	
6	3.31144	11.0	5.0	10.2	21.2	15.2	56.0	46.0	34.8	30.8	La	
7	0.15224	38.9	36.5	10.2	49.1	46.7	65.9	55.9	16.8	9.2	Lb	
8	0.19709	40.0	37.1	10.1	50.1	47.2	63.7	53.7	13.6	6.5	Lb	
9	0.26542	24.8	21.1	10.1	34.9	31.2	61.3	51.3	26.4	20.1	Lb	
10	0.53282	18.4	15.2	10.1	28.5	25.3	56.0	46.0	27.5	20.8	Lb	
11	2.56844	22.2	19.7	10.2	32.4	29.9	56.0	46.0	23.6	16.1	Lb	
12	3.11191	17.3	12.8	10.2	27.5	23.0	56.0	46.0	28.6	23.0	Lb	

## 5.2 15. 247(a)(1) Spectrum Bandwidth and Channel Separation of Frequency Hopping Spread Spectrum System

### 5.2.1 Setting Remarks

- The both side of 20dB down value from peak power are measured by using delta-maker function of the spectrum analyzer.
- The spectrum analyzer is set-up as following;

✓ Frequency Span	: 150 MHz
✓ Resolution bandwidth	: 100 kHz
✓ Video bandwidth	: 300 kHz
✓ Sweep	: Auto
✓ Detector function	: Peak
✓ Trace Mode	: Max Hold

- See test configuration figure 4.3.

### 5.2.2 Minimum Standard

The maximum permissible 20dB bandwidth is 1MHz, unless more than 15 non-overlapping channels are employed.

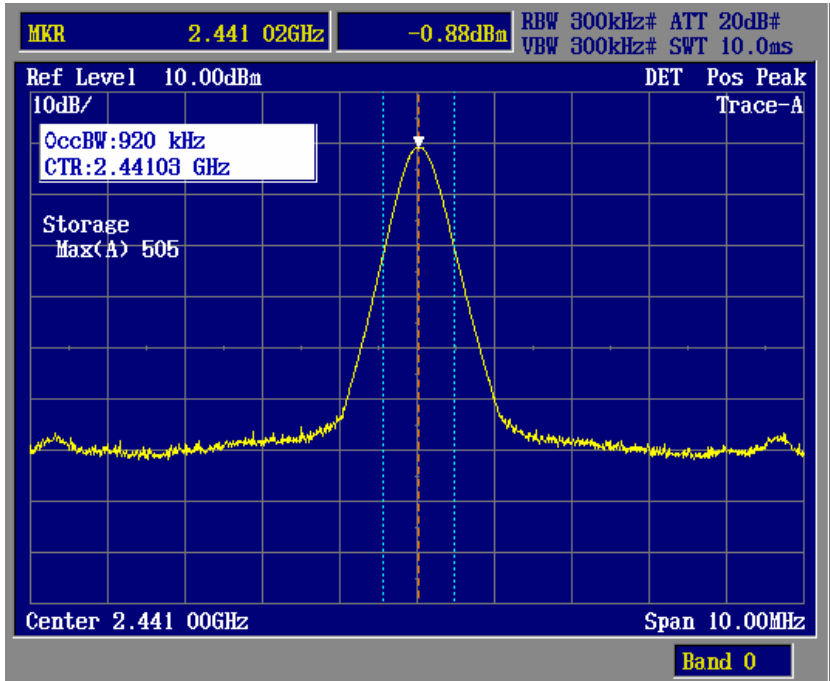
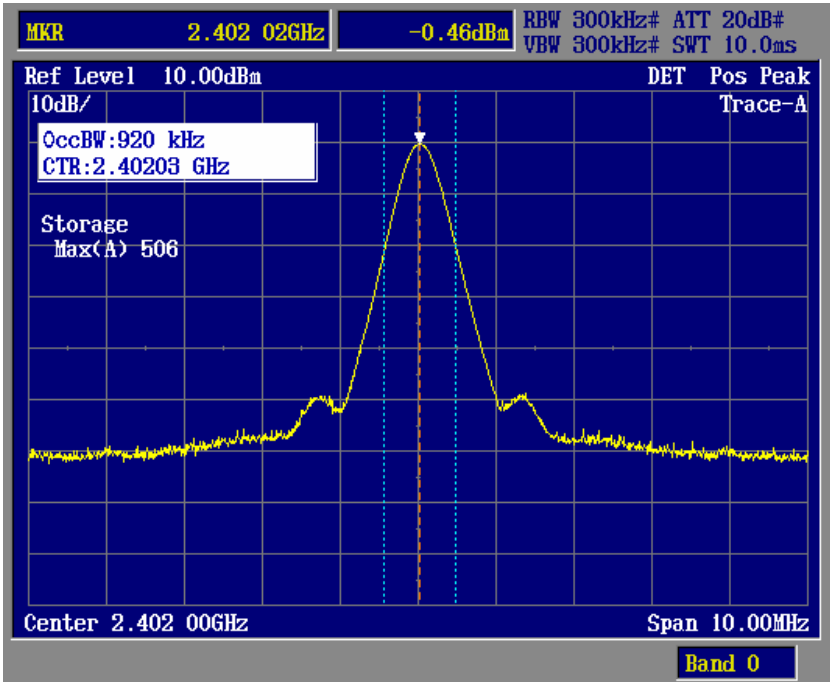
Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 5.2.3 Result

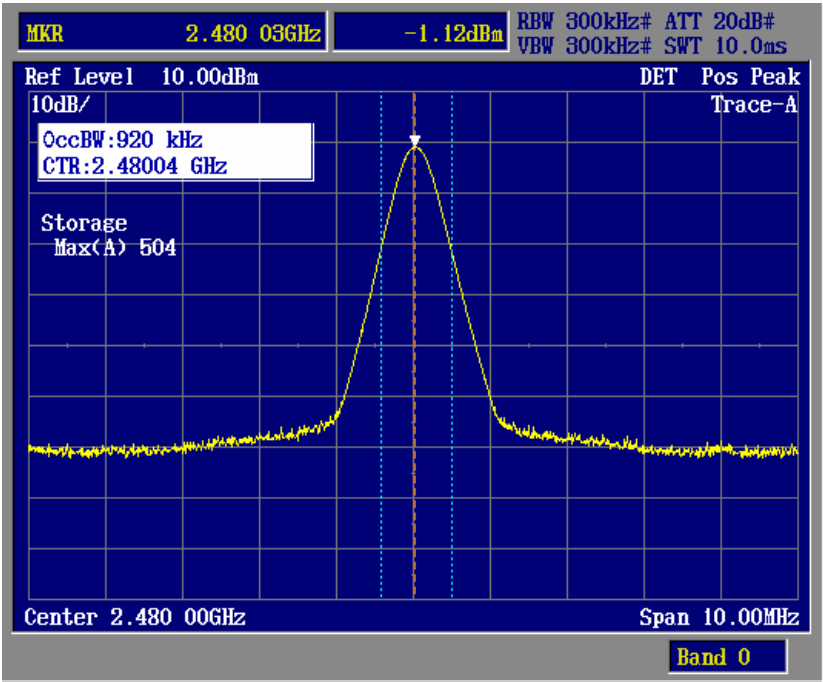
**EUT complies with the requirement.**

Uncertainty of measurement	: ± 1.2 dB
Temperature, Humidity	: 26 °C, 47%

5.2.4 Measured Data



5.2.4 Measured Data (Continued)





5.2.4 Measured Data (Continued)

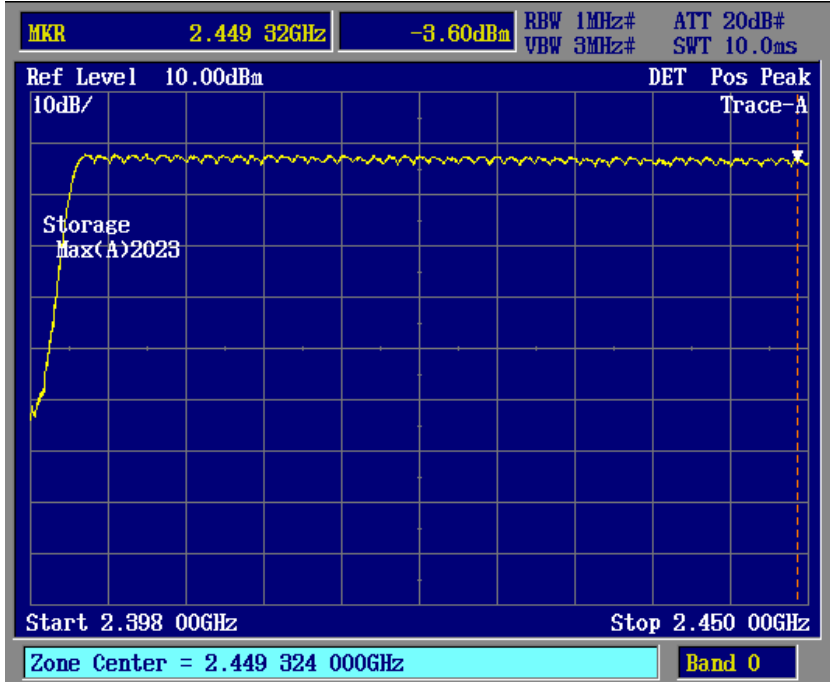
Channel Separation



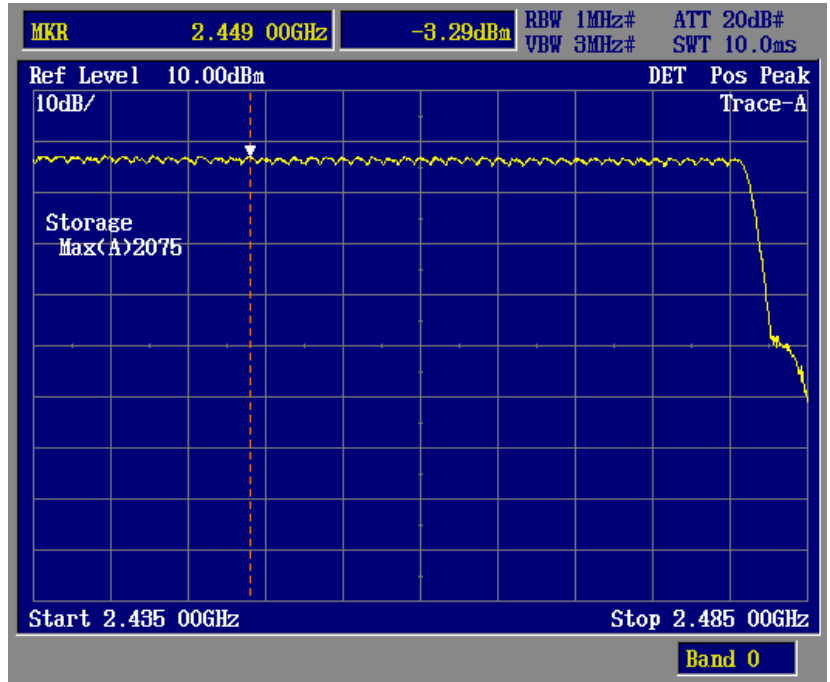
5.2.4 Measured Data (Continued)

Number of Channels

79 CH



79 CH



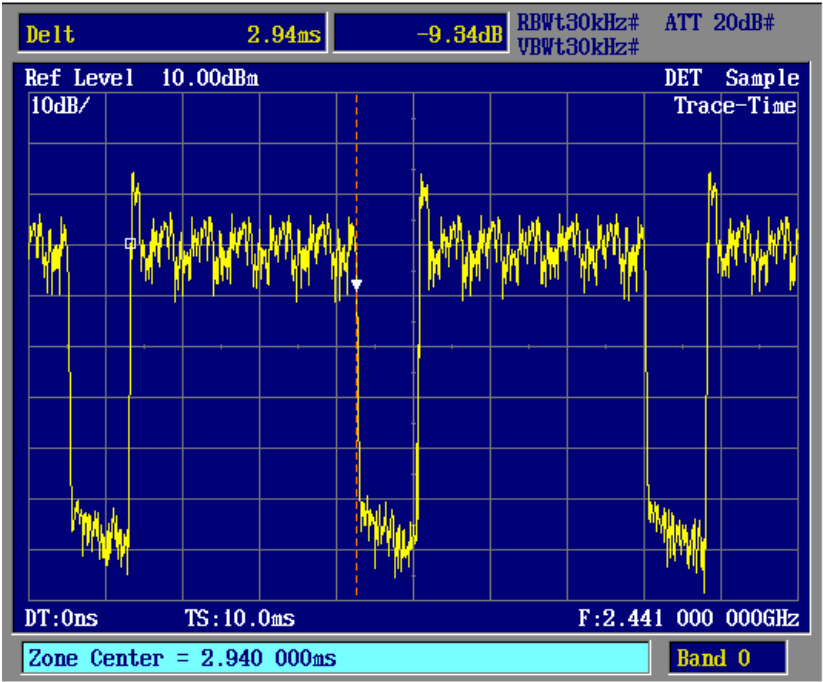
5.2.4 Measured Data (Continued)

Time of Occupancy

Frequency [MHz]	Power Supply Voltage [V]	Cycle [ms]	ON Time [ms]	Duty cycle	Dwell Time [s]	Limit [S]	Margin [S]
2441(39ch)	7.50	3.75	2.94	0.784	0.314	0.400	0.086
	6.75	3.75	2.94	0.784	0.314	0.400	0.086
	8.25	3.75	2.94	0.784	0.314	0.400	0.086

$(0.4*79)/(79*3.75)*2.94=0.314\text{seconds}$

5.2.4 Measured Data (Continued)



### 5.3 15. 247(a)(2) Spectrum Bandwidth of Direct Sequence Spread Spectrum System

#### 5.3.1 Setting Remarks

- The both side of 6dB down value from peak power are measured by using delta-maker function of the spectrum analyzer.
- The spectrum analyzer is set-up as following;

✓ Frequency Span	: 150 MHz
✓ Resolution bandwidth	: 100 kHz
✓ Video bandwidth	: 300 kHz
✓ Sweep	: 45 ms
✓ Detector function	: Peak
✓ Trace Mode	: Max Hold

- See test configuration figure 4.3.

#### 5.3.2 Minimum Standard

15.247 (a) (2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 5.3.3 Result

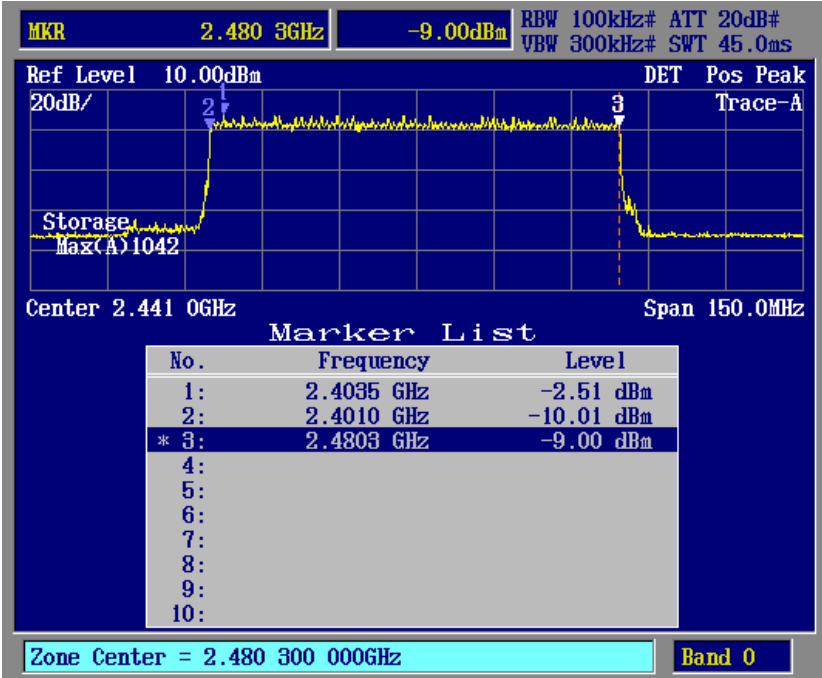
**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 0.8$  dB  
Temperature, Humidity : 25°C, 45 %

#### 5.3.4 Measured Data

Frequency (MHz)	Frequency Bandwidth (MHz)	Limit (MHz)	Margin (dB)
2441(39ch)	79.3	0.5	78.8

Bluetooth EDR 2-DH5



## 5.4 15. 247(b) Maximum Peak Output Power

### 5.4.1 Setting Remarks

- See test configuration figure 4.4.
- The maximum peak output power is measured as following;
  1. The diode detector is inserted between EUT and the oscilloscope.
  2. The oscilloscope is used to read the peak response of the detector.
  3. Replaced EUT by the signal generator (SG).
  4. Adjusted the frequency of SG to the fundamental frequency.
  5. Adjusted the amplitude of SG to be the same peak recorded in 2.
- The oscilloscope is set-up as following;
  - ✓ Voltage level range : 10 mV / Div
  - ✓ Sampling time : 1.00GS / s
  - ✓ Function : Peak search

### 5.4.2 Minimum Standard

The maximum peak output power shall not exceed 1 watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 5.4.3 Result

**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 0.5$  dB  
Temperature, Humidity : 25°C, 45%

5.4.4 Measured Data

Bluetooth (G1D) EDR 2-DH5, Modulated

Frequency (MHz)	Power Supply Voltage (V)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
2441(39ch)	7.50	-4.3	30	34.3
	6.38	-4.4	30	34.4
	8.63	-4.3	30	34.3

Bluetooth (G1D) EDR 2-DH5, Unmodulated

Frequency (MHz)	Power Supply Voltage (V)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
2402(1ch)	7.50	0.1	30	29.9
	6.38	0.1	30	29.9
	8.63	0.0	30	30
2441(39ch)	7.50	-0.2	30	30.2
	6.38	-0.2	30	30.2
	8.63	-0.2	30	30.2
2480(79ch)	7.50	-0.7	30	30.7
	6.38	-0.7	30	30.7
	8.63	-0.7	30	30.7



## 5.5 15. 247(d) Transmitter Spurious Emissions (Conducted)

### 5.5.1 Setting Remarks

- EUT directly connects to the spectrum analyzer via calibrated coaxial cable and 10 dB attenuator.
- The Spectrums are scanned from the lowest generated frequency of EUT up to the 10th harmonics by using the spectrum analyzer.
- The spectrum analyzer is set-up as following;
  - ✓ Resolution bandwidth : 100 kHz
  - ✓ Video bandwidth : 100 kHz
  - ✓ Sweep : Auto
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold
- See test configuration figure 4.3.

### 5.5.2 Minimum Standard

15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

### 5.5.3 Result

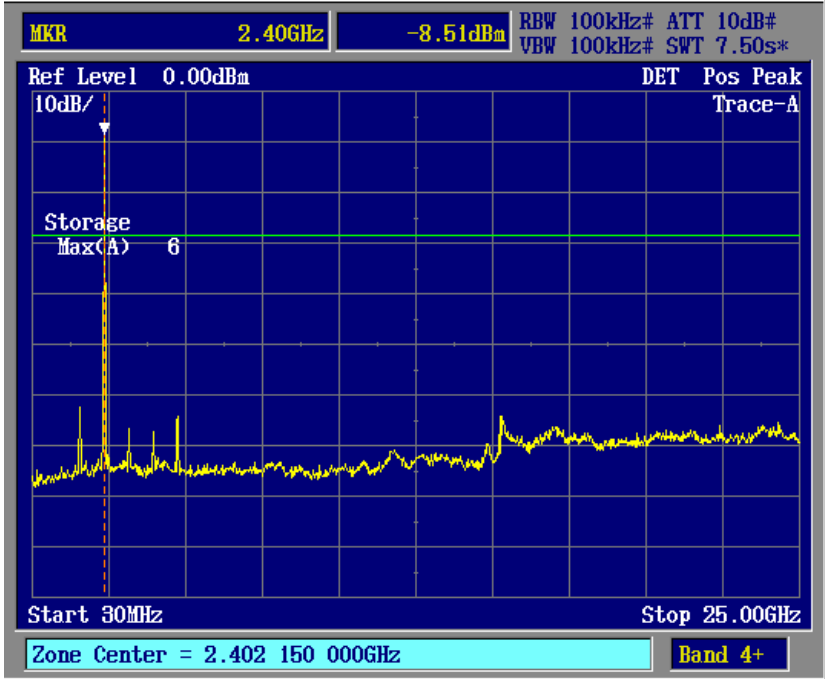
**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 0.8$  dB  
Temperature, Humidity : 25°C, 45%

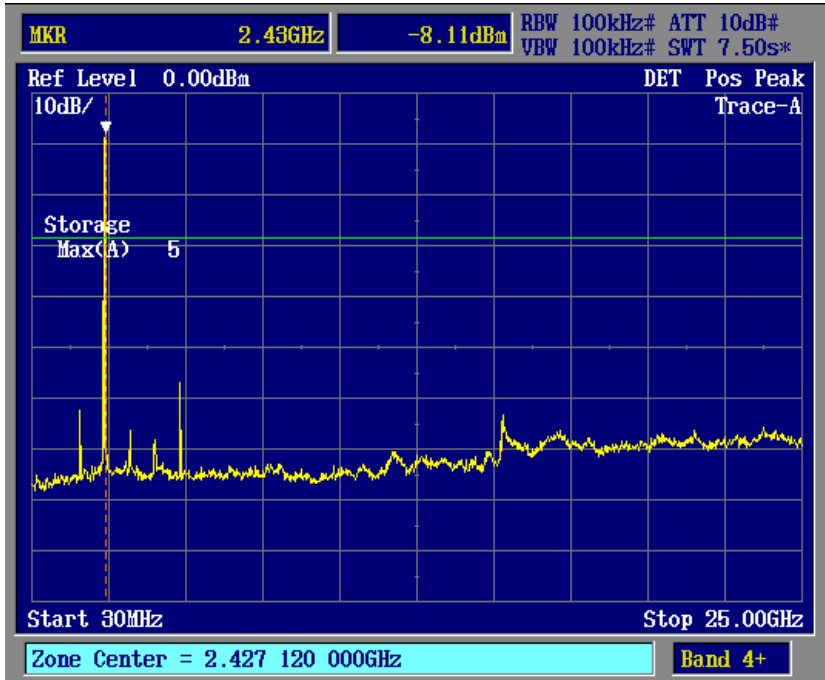
5.5.4 Measured Data

(No emission exceeding the 20dB limit was found)

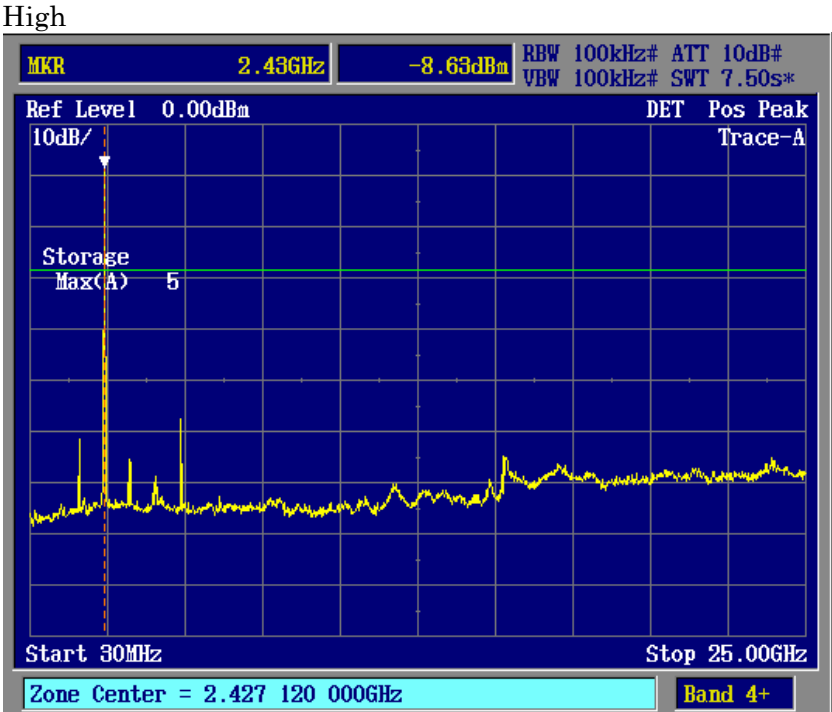
Low



Middle



5.5.4 Measured Data (Continued)



## 5.6 15. 247(d) Transmitter Radiated Emissions (Radiated)

### 5.6.1 Setting Remarks

- The data lists in “5.5.4 Measured Data “ list the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.
- In the frequency range between 30MHz to 25 GHz (as 10<sup>th</sup> harmonics), the Electric Field Strength is measured in accordance with ANSI C63.4: 2003 and CISPR22: 1997.
- The test setup is made in accordance with ANSI C63.4: 2003.
- The antenna is measured at 1-4m height.
- The EUT is placed on the non-conductive table in the center of turntable. The height of this table is 0.8m.
- The measurement is carried out with both horizontal and vertical antenna polarization.
- The highest radiation from the equipment is recorded.
- By varying the configuration of the test sample and the cable routing, it is attempted to maximize the emission.
- The test receiver with Quasi Peak and Average detector is in compliance with CISPR 16-1:1993.
- The spectrum analyzer is set-up as following;

(Frequency range : 30 - 1000 MHz)

- ✓ Resolution bandwidth : 100 kHz
- ✓ Video bandwidth : 300 kHz
- ✓ Detector function : Peak
- ✓ Trace Mode : Max Hold

(Frequency range : Above 1000 MHz)

- ✓ Resolution bandwidth : 1 MHz
- ✓ Video bandwidth : 1 MHz
- ✓ Detector function : Peak
- ✓ Trace Mode : Max Hold

- EMI Test Receiver analyzer is set-up as following;
  - ✓ IF bandwidth : 120 kHz (Quasi-Peak Detector)
  - ✓ IF bandwidth : 1 MHz (Average Detector)
- See test configuration figure 4.2.

### 5.6.2 Minimum Standard

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., § § 15.231 and 15.241.

### 5.6.3 Result

**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 3.28$  dB

Temperature, Humidity : Refer to each data table

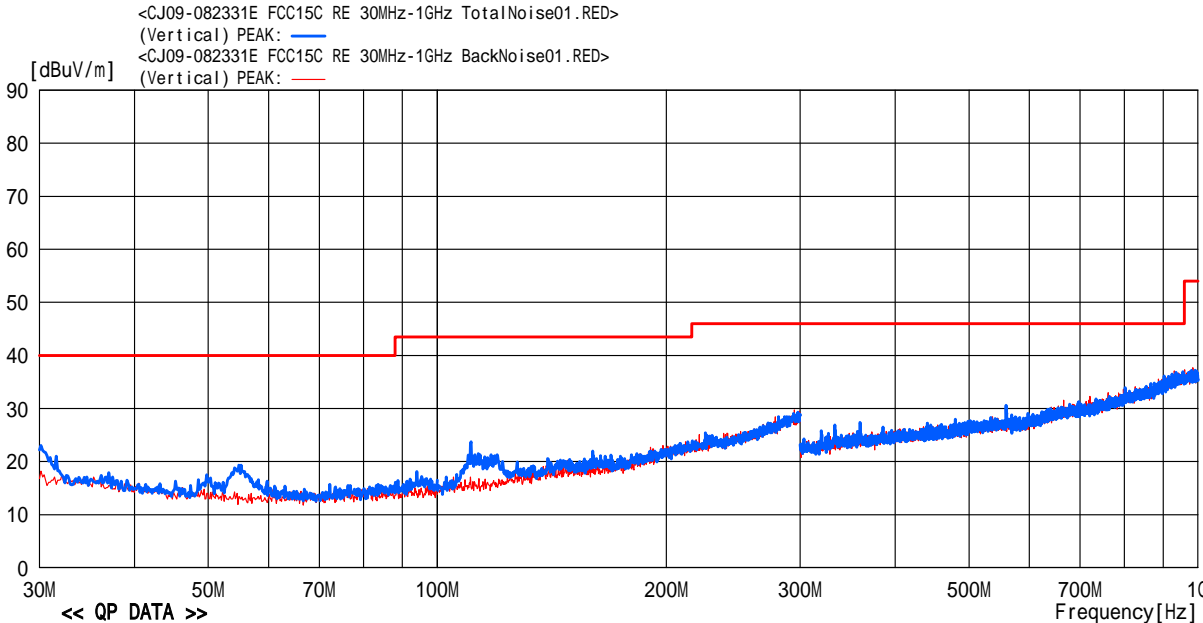
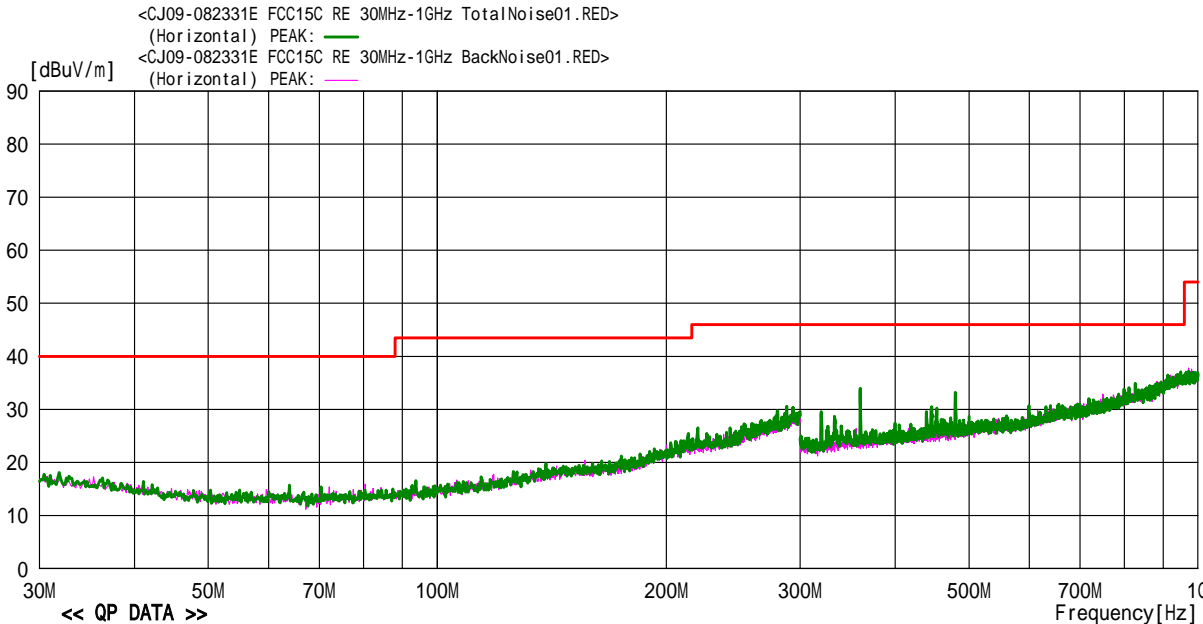
5.6.4 Measured Data

30MHz to 1GHz

Model Name	: MW-145BT	Job No	: CJ09-082331E
Serial No.	: None	Temp./Humi.	: 24 /44%
Operator	: O. Itogawa	Condition	: Tx
Power Supply	: AC 120V,60Hz	Remark	:

Memo : RBW:30M ~ 1GHz(120kHz)

LIMIT : Fcc15C 15\_209 (3m) 30MHz-1000MHz



30MHz to 1GHz

Model Name : MW-I45BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp./Humi. : 24 /44%  
 Condition : Tx  
 Remark :

Memo : RBW:30M ~ 1GHz(120kHz)

LIMIT : Fcc15C 15\_209 (3m) 30MHz-1000MHz

<< QP DATA >>

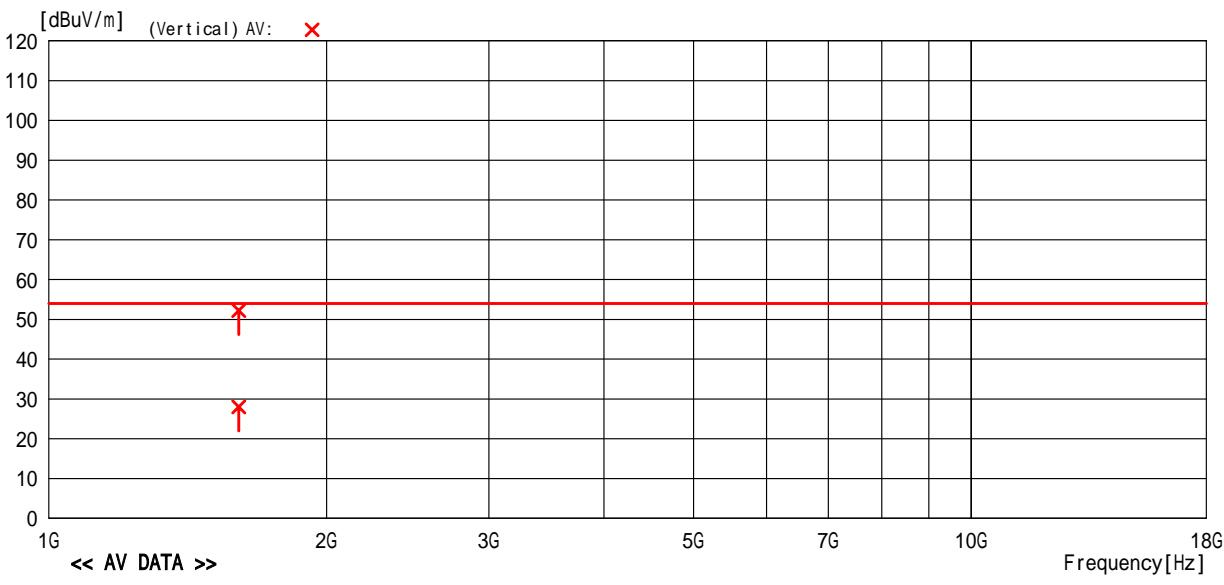
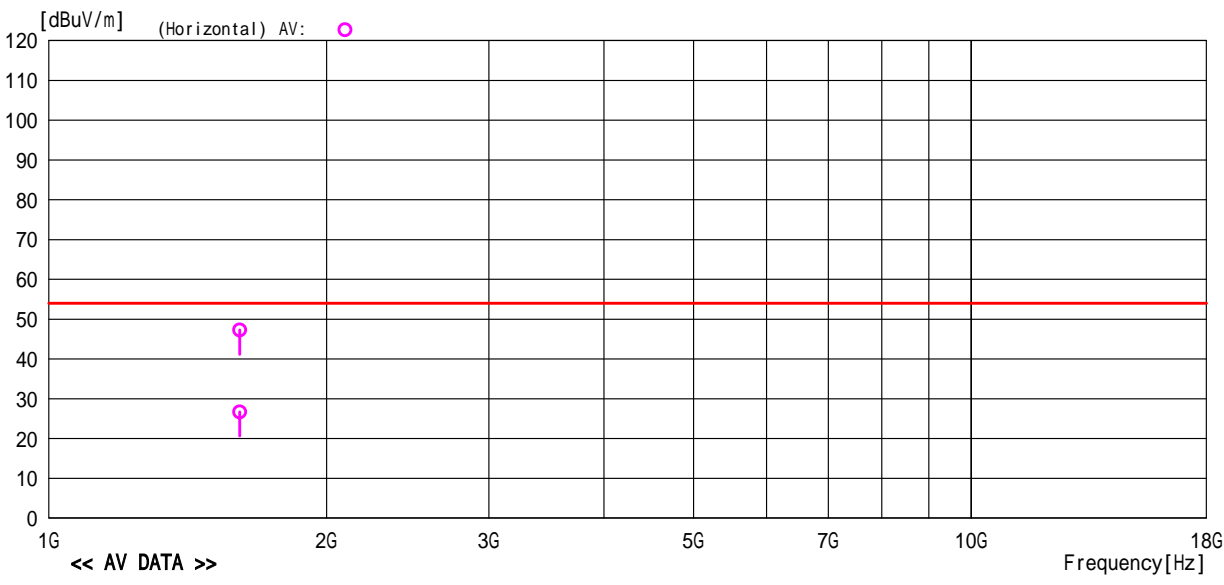
No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	319.584	37.1	14.9	6.8	27.6	31.2	46.0	14.8	Hori.	100	196	LP	PK
2	319.584	34.8	14.9	6.8	27.6	28.9	46.0	17.1	Hori.	100	196	LP	QP
3	359.584	39.0	15.7	7.1	28.0	33.8	46.0	12.2	Hori.	100	269	LP	PK
4	359.584	36.8	15.7	7.1	28.0	31.6	46.0	14.4	Hori.	100	269	LP	QP
5	446.438	36.0	16.9	7.6	28.4	32.1	46.0	13.9	Hori.	100	274	LP	PK
6	446.438	30.9	16.9	7.6	28.4	27.0	46.0	19.0	Hori.	100	274	LP	QP
7	479.524	39.5	17.2	7.8	28.5	36.0	46.0	10.0	Hori.	199	96	LP	PK
8	479.524	37.4	17.2	7.8	28.5	33.9	46.0	12.1	Hori.	199	96	LP	QP
9	30.135	30.0	13.7	3.9	28.3	19.3	40.0	20.7	Vert.	100	256	BC	QP
10	30.135	35.6	13.7	3.9	28.3	24.9	40.0	15.1	Vert.	100	256	BC	PK
11	54.147	29.7	9.6	4.4	28.3	15.4	40.0	24.6	Vert.	100	196	BC	QP
12	54.147	35.0	9.6	4.4	28.3	20.7	40.0	19.3	Vert.	100	196	BC	PK
13	112.410	30.7	9.9	5.1	28.1	17.6	43.5	25.9	Vert.	100	106	BC	QP
14	112.410	38.6	9.9	5.1	28.1	25.5	43.5	18.0	Vert.	100	106	BC	PK

1GHz to 18GHz

Model Name	: MW-145BT	Job No.	: CJ09-082331E
Serial No.	: None	Temp/Humi	: 24 /44%
Operator	: O. Itogawa	Condition	: Tx
Power Supply	: AC 120V,60Hz	Remark	:

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)



-TEPTO-DV/RE Ver1.80.0020

Note: Except for measured point, AV was within a limit.



1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /44%  
 Condition : Tx  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< AV DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1609.967	33.0	25.2	-31.5	0.0	26.7	54.0	27.3	Hori.	100	134	HRN	AV
2	1609.967	53.5	25.2	-31.5	0.0	47.2	54.0	6.8	Hori.	100	134	HRN	PK
3	1606.741	34.3	25.2	-31.5	0.0	28.0	54.0	26.0	Vert.	100	183	HRN	AV
4	1606.741	58.5	25.2	-31.5	0.0	52.2	54.0	1.8	Vert.	100	183	HRN	PK

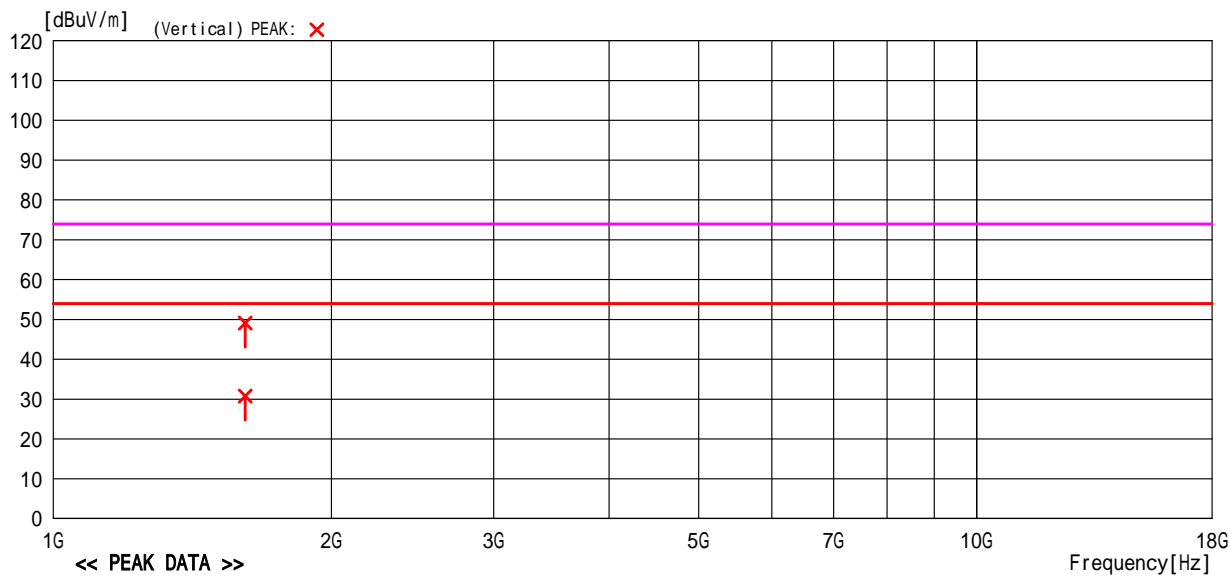
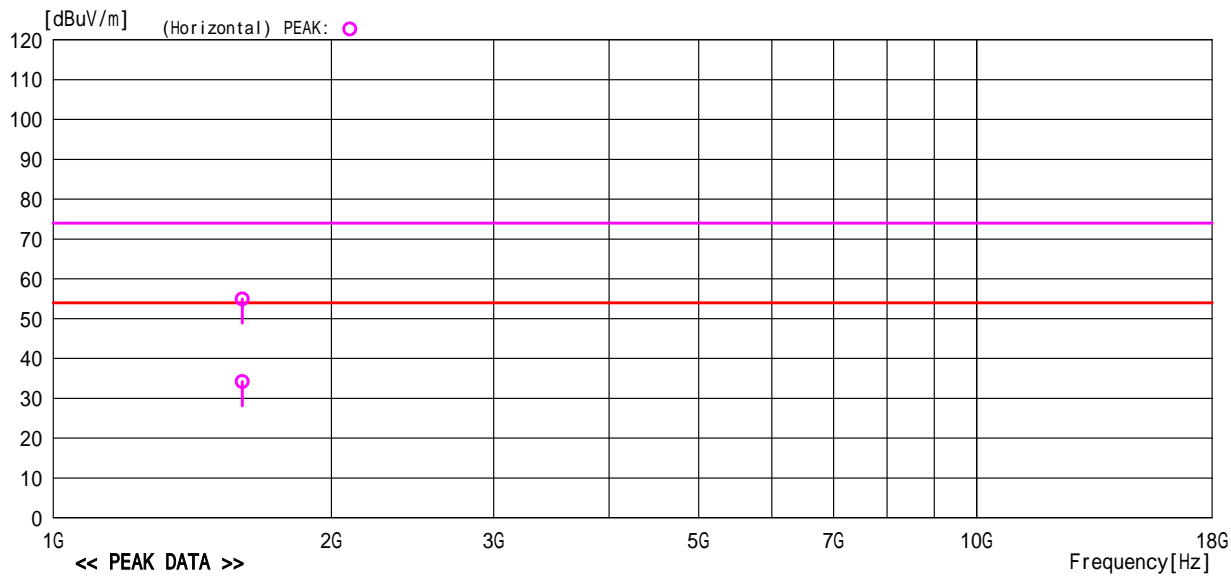
-TEPT0-DV/RE Ver1.80.0020

Note: Except for measured point, AV was within a limit.

1GHz to 18GHz

Model Name	: MW-145BT	Job No.	: CJ09-082331E
Serial No.	: None	Temp/Humi	: 24 /40%
Operator	: O. Itogawa	Condition	: Low
Power Supply	: AC 120V,60Hz	Remark	:
Memo	: RBW:1GHz ~ (1MHz)		

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : Low  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1602.052	61.2	25.2	-31.5	0.0	54.9	74.0	19.1	Hori.	100	70	HRN	PK
2	1613.374	55.4	25.2	-31.5	0.0	49.1	74.0	24.9	Vert.	100	231	HRN	PK

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : Low  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1602.052	40.4	25.2	-31.5	0.0	34.1	54.0	19.9	Hori.	100	70	HRN	AV
2	1613.374	37.1	25.2	-31.5	0.0	30.8	54.0	23.3	Vert.	100	231	HRN	AV

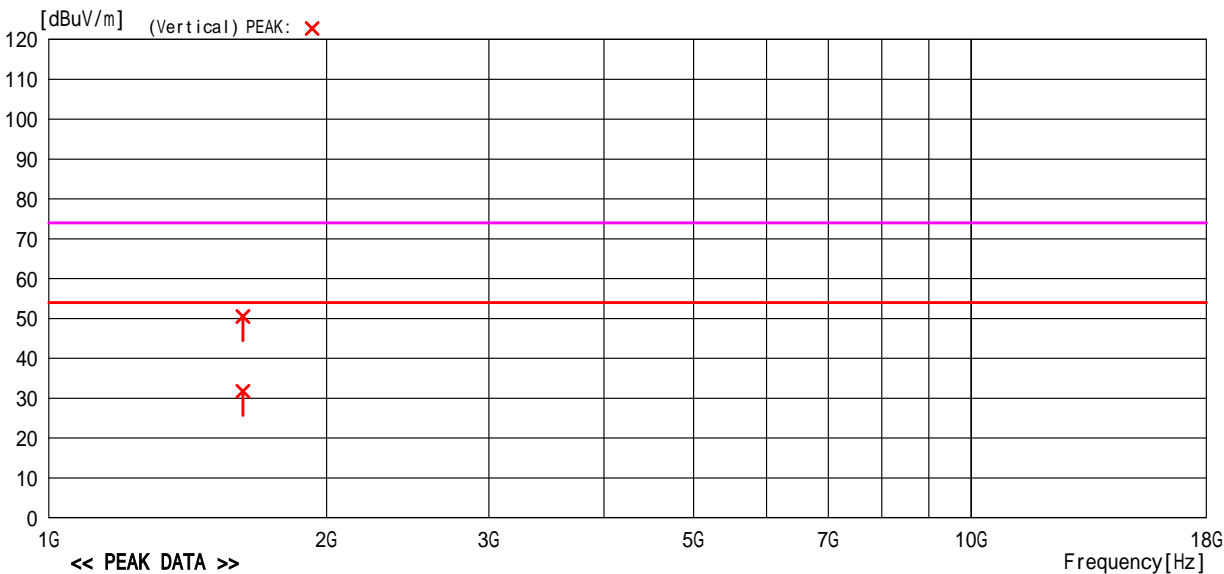
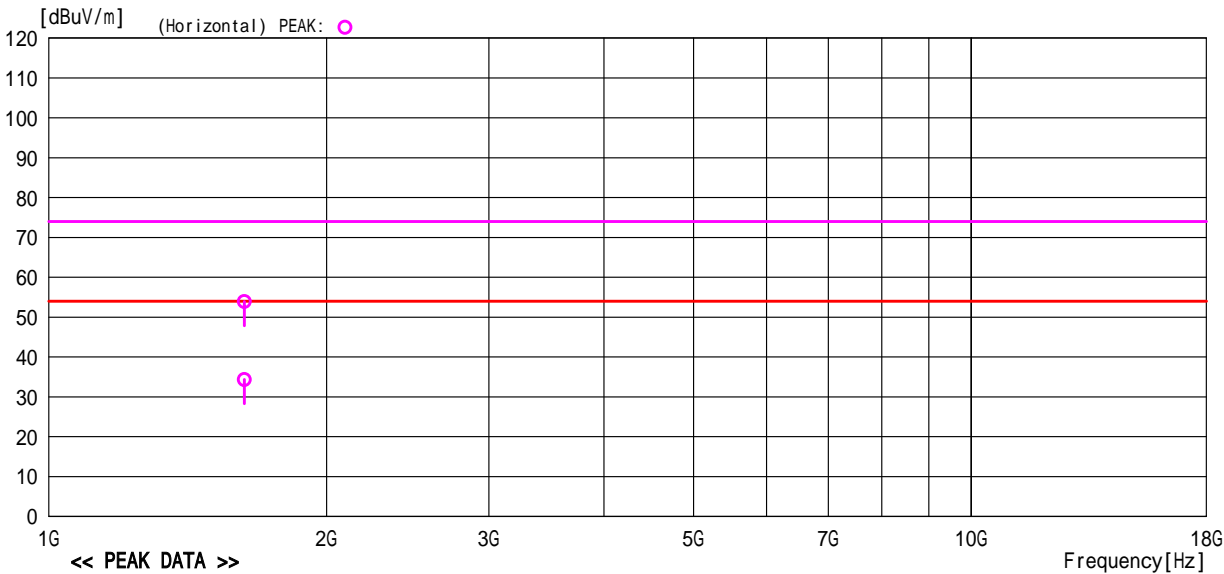
1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 / 40%  
 Condition : Middle  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz  
 Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : Middle  
 Remark :  
 Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1628.705	60.1	25.2	-31.4	0.0	53.9	74.0	20.1	Hori.	100	74	HRN	PK
	1622.693	56.8	25.2	-31.5	0.0	50.5	74.0	23.5	Vert.	100	231	HRN	PK

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz  
 Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : Middle  
 Remark :  
 Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1628.705	40.5	25.2	-31.4	0.0	34.3	54.0	19.7	Hori.	100	74	HRN	AV
2	1622.693	38.1	25.2	-31.5	0.0	31.8	54.0	22.2	Vert.	100	231	HRN	AV

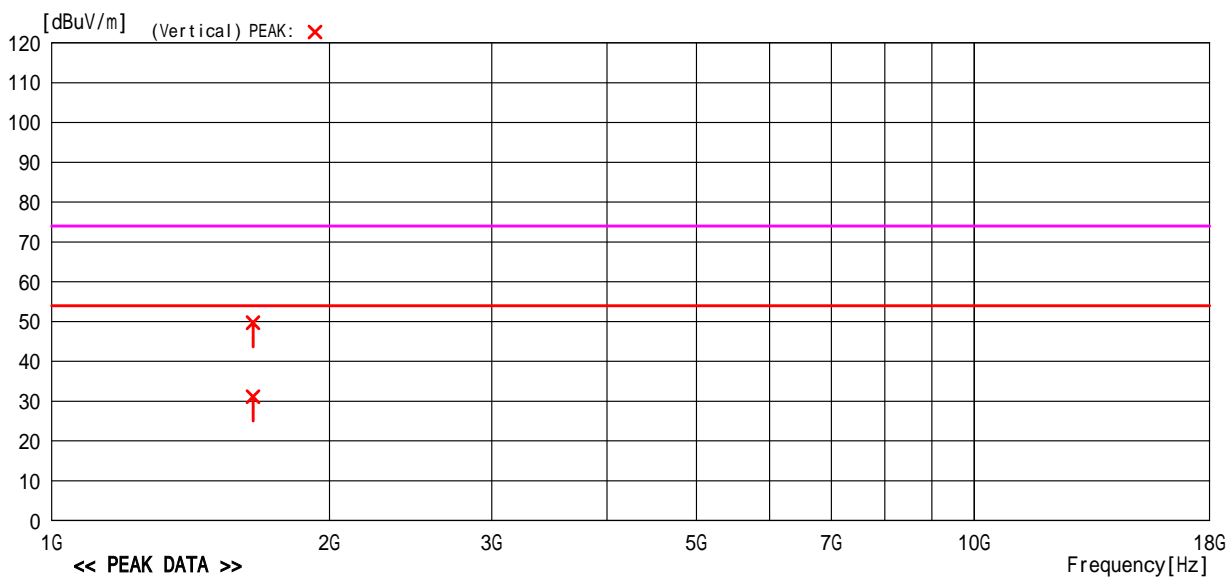
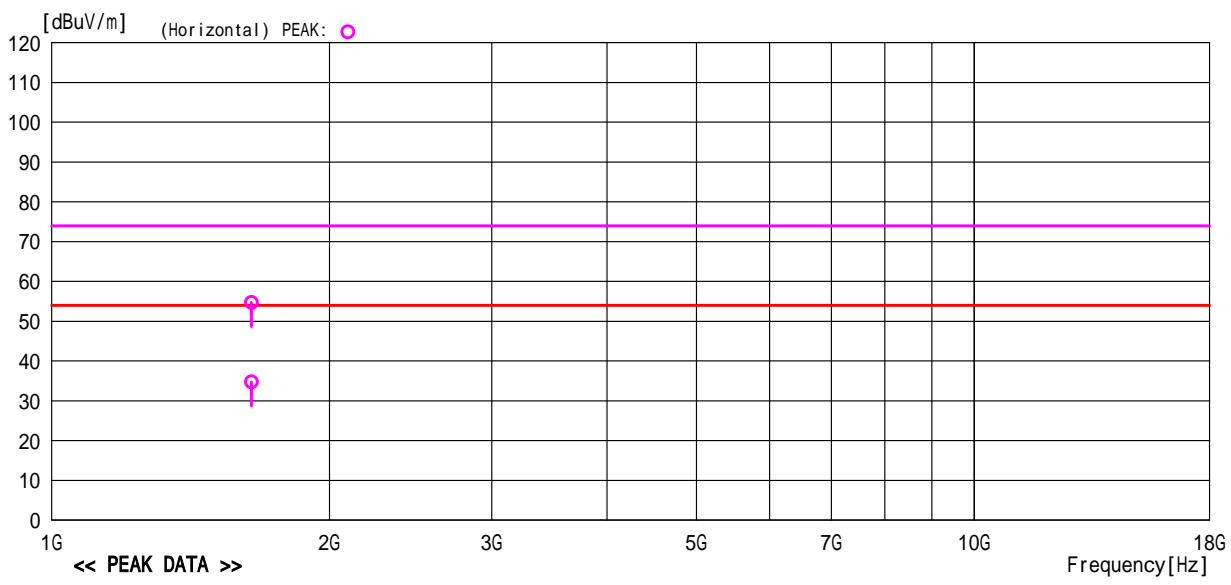
1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : High  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



1GHz to 18GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : High  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1646.741	60.8	25.3	-31.4	0.0	54.7	74.0	19.3	Hori.	100	182	HRN	PK
2	1653.354	55.8	25.3	-31.4	0.0	49.7	74.0	24.3	Vert.	100	235	HRN	PK

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No. : CJ09-082331E  
 Temp/Humi : 24 /40%  
 Condition : High  
 Remark :

Memo : RBW:1GHz ~ (1MHz)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1646.741	40.9	25.3	-31.4	0.0	34.8	54.0	19.2	Hori.	100	182	HRN	AV
2	1653.354	37.2	25.3	-31.4	0.0	31.1	54.0	22.9	Vert.	100	235	HRN	AV

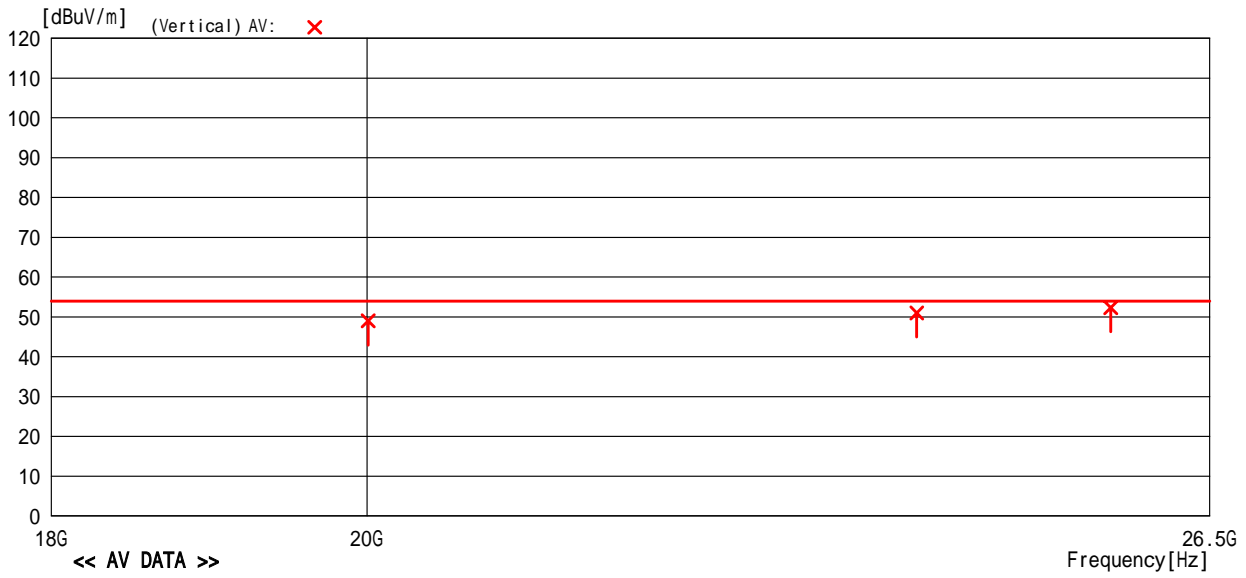
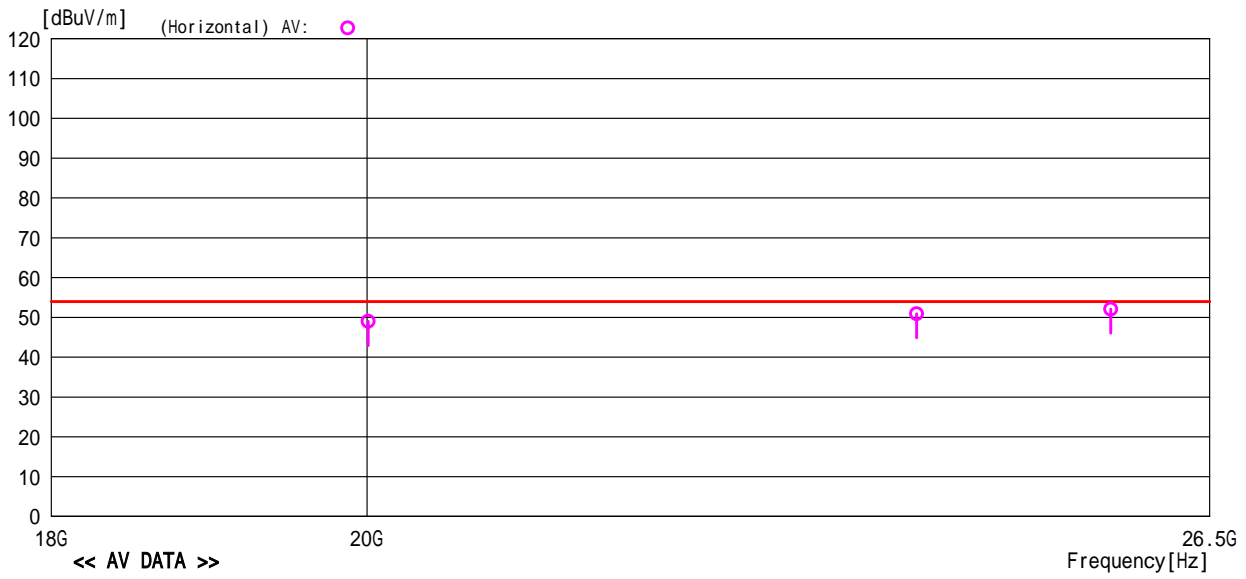
18GHz to 26.5GHz

Model Name : MW-145BT  
Serial No. : None  
Operator : O. Itogawa  
Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
Temp/Humi : 24 /44%  
Condition : Tx  
Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)



-TEPT0-DV/Ver 1.80.0020

Note: Except for measured point, AV was within a limit.



18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /44%  
 Condition : Tx  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< AV DATA >>

No	Freq.	Reading	Ant. Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	.0008.020	28.7	40.1	16.2	36.0	49.0	54.0	5.0	Hori.	100	0	HRN	Freq:20008.020MHz
2	.4030.060	30.2	39.9	18.1	37.3	50.9	54.0	3.1	Hori.	100	0	HRN	Freq:24030.060MHz
3	.5638.270	30.2	40.2	18.9	37.2	52.1	54.0	1.9	Hori.	100	0	HRN	Freq:25638.270MHz
4	.0008.020	28.7	40.1	16.2	36.0	49.0	54.0	5.0	Vert.	100	0	HRN	Freq:20008.020MHz
5	.4030.060	30.3	39.9	18.1	37.3	51.0	54.0	3.0	Vert.	100	0	HRN	Freq:24030.060MHz
6	.5638.270	30.4	40.2	18.9	37.2	52.3	54.0	1.7	Vert.	100	0	HRN	Freq:25638.270MHz

-TEPT0-DV/Ver 1.80.0020

Note: Except for measured point, AV was within a limit.

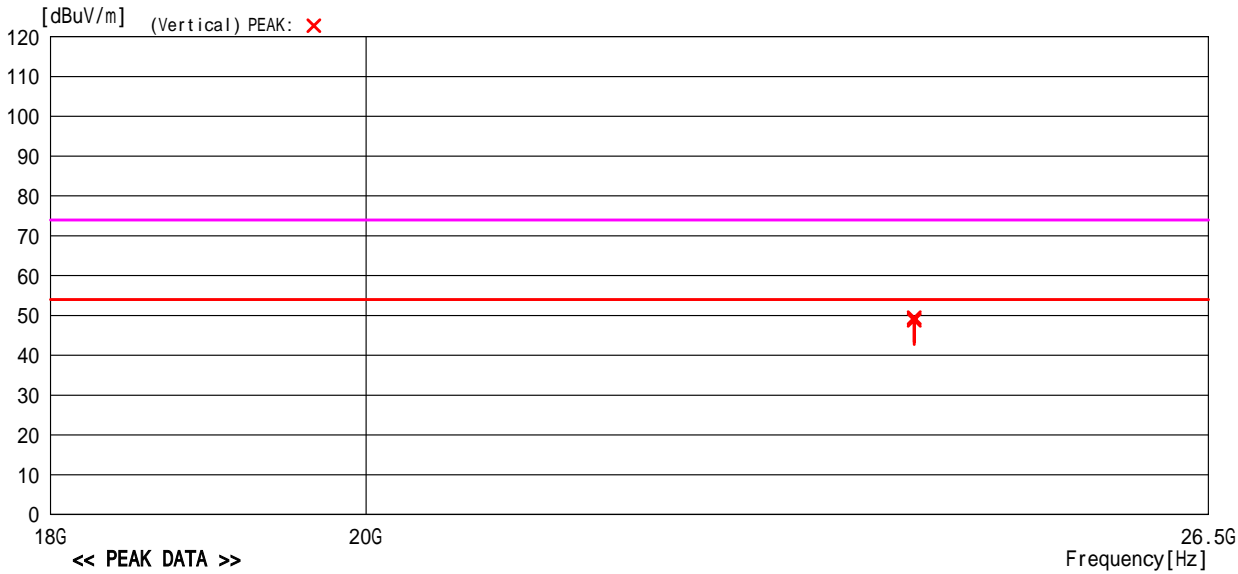
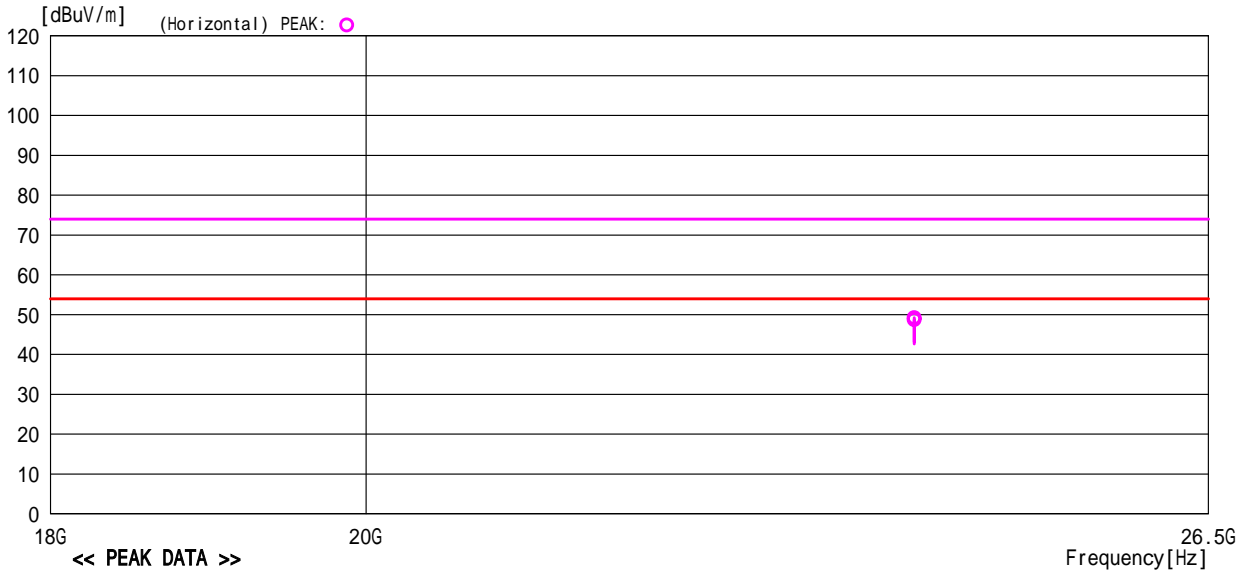
18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : Low  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : Low  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4020.040	28.5	39.9	18.1	37.3	49.2	74.0	24.8	Hori.	100	0	HRN	PK 24020.040MHz
2	4020.040	28.7	39.9	18.1	37.3	49.4	74.0	24.6	Vert.	100	0	HRN	PK 24020.040MHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : Low  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< AV DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4020.040	28.0	39.9	18.1	37.3	48.7	54.0	5.3	Hori.	100	0	HRN	AV 24020.040MHz
2	4020.040	28.1	39.9	18.1	37.3	48.8	54.0	5.2	Vert.	100	0	HRN	AV 24020.040MHz

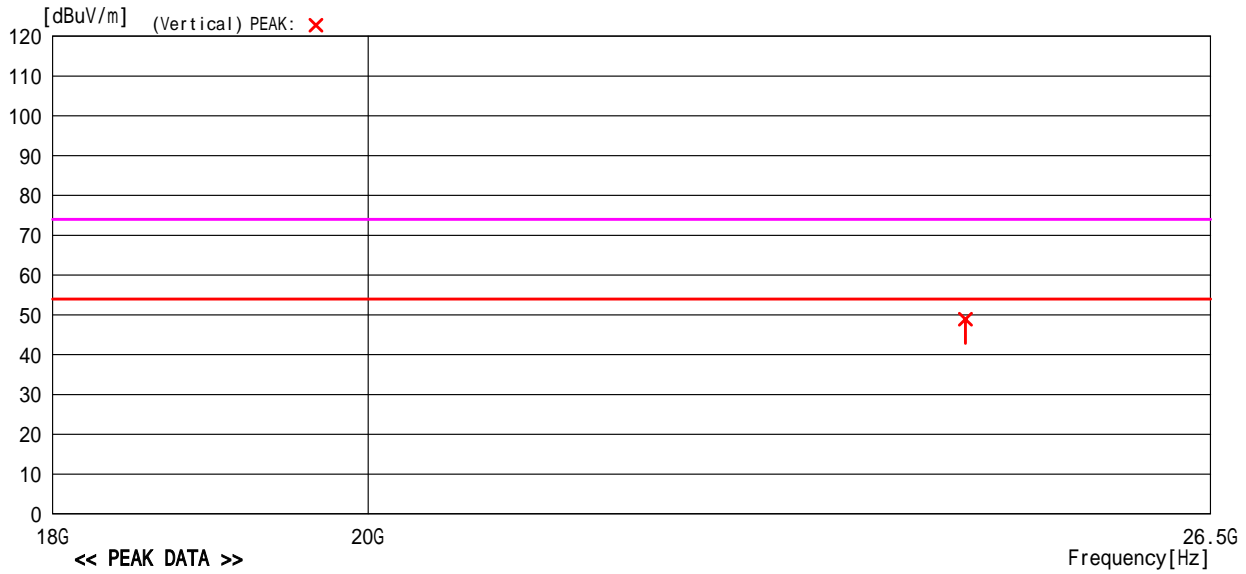
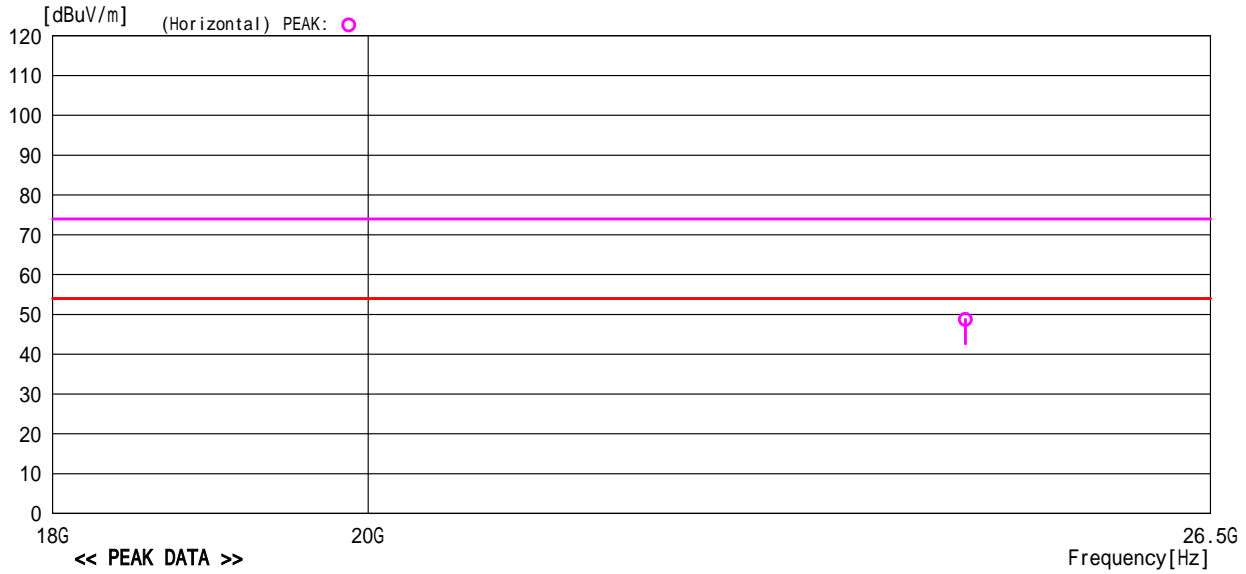
18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V, 60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 / 41%  
 Condition : Middle  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : Middle  
 Remark :

Memo : RBW:1MHz(1G~)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4415.830	26.7	39.9	18.2	37.5	47.3	74.0	26.7	Hori.	100	0	HRN	PK 24415.830MHz
2	4415.830	28.8	39.9	18.2	37.5	49.4	74.0	24.6	Vert.	100	0	HRN	PK 24415.830MHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : Middle  
 Remark :

Memo : RBW:1MHz(1G~)

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< AV DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pol.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4415.830	28.1	39.9	18.2	37.5	48.7	54.0	5.3	Hori.	100	0	HRN	AV 24415.830MHz
2	4415.830	28.3	39.9	18.2	37.5	48.9	54.0	5.1	Vert.	100	0	HRN	AV 24415.830MHz

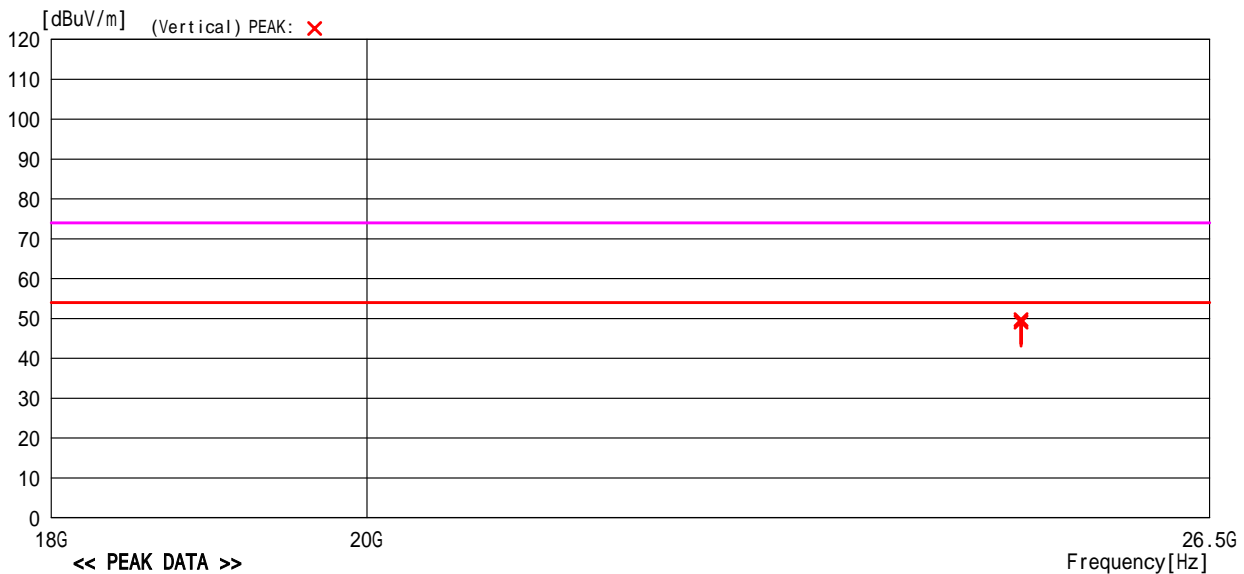
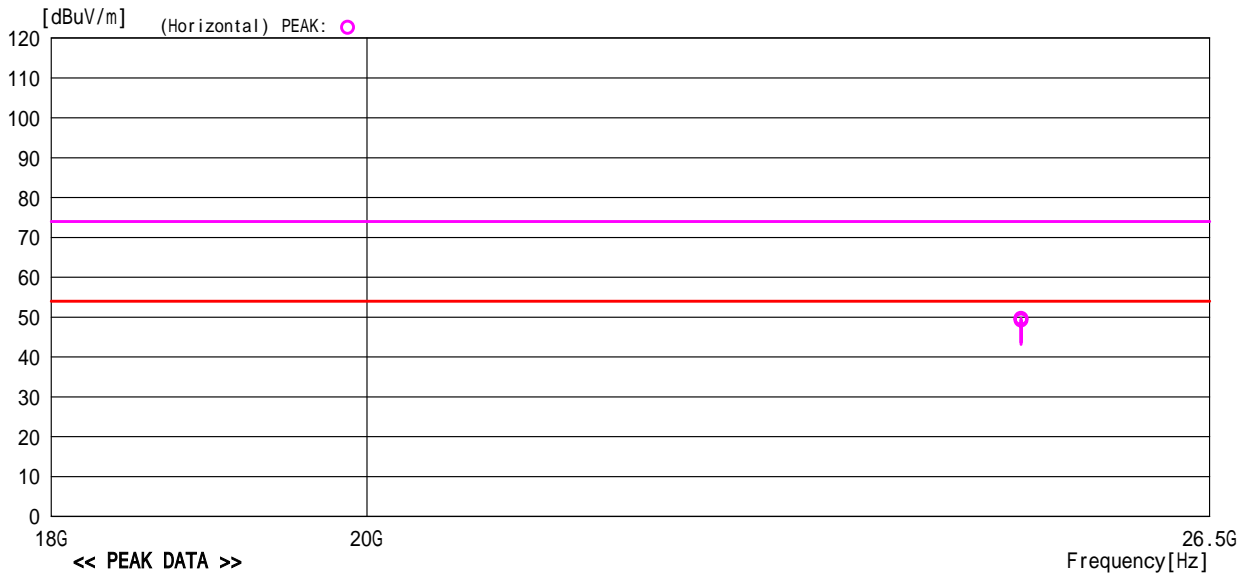
18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : High  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)  
 FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)



18GHz to 26.5GHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : High  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(PK)

<< PEAK DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4881.760	28.8	39.8	18.5	37.4	49.7	74.0	24.3	Hori.	100	0	HRN	PK 24881.760MHz
2	4881.760	28.8	39.8	18.5	37.4	49.7	74.0	24.3	Vert.	100	0	HRN	PK 24881.760MHz

Model Name : MW-145BT  
 Serial No. : None  
 Operator : O. Itogawa  
 Power Supply : AC 120V,60Hz

Job No : CJ09-082331E  
 Temp/Humi : 24 /41%  
 Condition : High  
 Remark :

Memo : RBW:1MHz(1G ~ )

LIMIT : FCC Subpart C 15.209 (3m) 1G-26.5GHz(AV)

<< AV DATA >>

No	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margin	Pola.	Height	Angle	Ant	Comment
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg]	Type	
1	4881.760	28.3	39.8	18.5	37.4	49.2	54.0	4.8	Hori.	100	0	HRN	AV 24881.760MHz
2	4881.760	28.2	39.8	18.5	37.4	49.1	54.0	4.9	Vert.	100	0	HRN	AV 24881.760MHz

## 5.7 15. 247(e) Power Spectrum Density

### 5.7.1 Setting Remarks

- EUT directly connects to the spectrum analyzer via calibrated coaxial cable and 10 dB attenuator.
- The loss of the coaxial cable is maximum 1 dB.
- The peak output power is determined by using the marker-data function of spectrum analyzer.
- The spectrum analyzer is set-up as following;
  - ✓ Frequency Span : 1.5 MHz
  - ✓ Resolution bandwidth : 3 kHz
  - ✓ Video bandwidth : 3 MHz
  - ✓ Sweep : 500sec
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold
- See test configuration figure 4.3.

### 5.7.2 Minimum Standard

15.247 (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 5.7.3 Result

**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 0.8$  dB  
Temperature, Humidity : 25°C, 45%

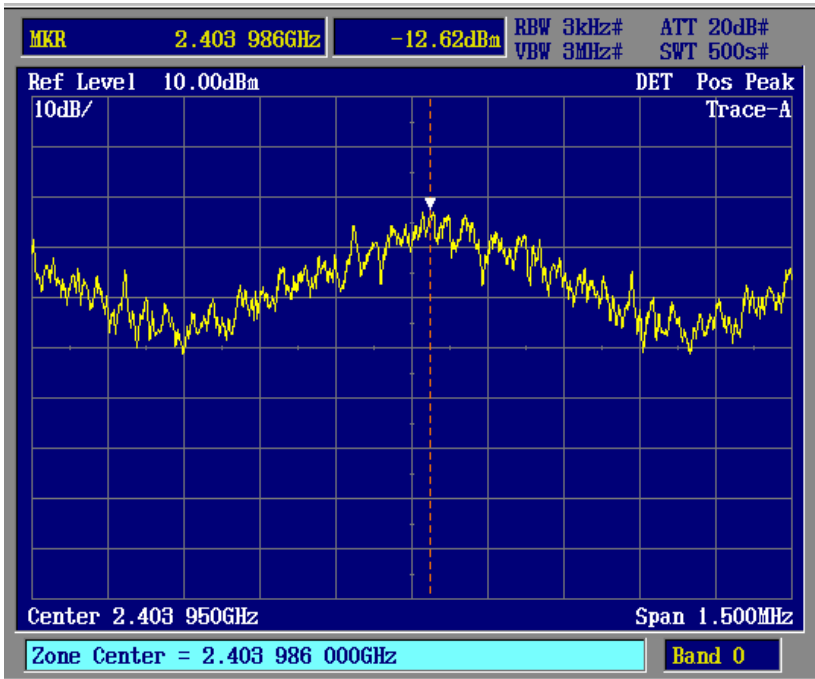


5.7.4 Measured Data

Frequency (MHz)	Correction Factor (dB)	Reading (dBm)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
2441(39ch)	0.70	-12.62	-11.92	8	19.92

\* Correction Factor = Cable Loss (dB) + External Attenuator (dB)

Bluetooth EDR 2-DH5



## 5.8 15. 247(d) Band Edge Measurement

### 5.8.1 Setting Remarks

- EUT directly connects to the spectrum analyzer via calibrated coaxial cable and 10 dB attenuator.
- The loss of the coaxial cable is maximum 1 dB.
- The emission at the band edge is measured by using the marker function of spectrum analyzer.
- The peak of the in-band emission is measured by using the marker to peak function of spectrum analyzer.
- This measurement is repeated in both side of the spectrum.
- The spectrum analyzer is set-up as following;
  - ✓ Frequency Span : 30MHz
  - ✓ Resolution bandwidth : 300kHz (1% of frequency span)
  - ✓ Video bandwidth : > RBW
  - ✓ Sweep : Auto
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold
- Where band edge spectrum is too rough to find precise edge point, larger RBW i.e. 1MHz, 3MHz shall be applied as severer condition.
- See test configuration figure 4.2.

### 5.8.2 Minimum Standard

In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency of Emission (MHz)	Limit of the band edge spurious emission (dB $\mu$ V)	
	Peak	Average
Below 2,390.0		
Above 2,483.5	74	54

### 5.8.3 Result

**EUT complies with the requirement.**

Uncertainty of measurement result:  $\pm 2.6$  dB

Temperature, Humidity : 25°C, 33%

#### 5.8.4 Measured Data

The band edge emissions are calculated as following;

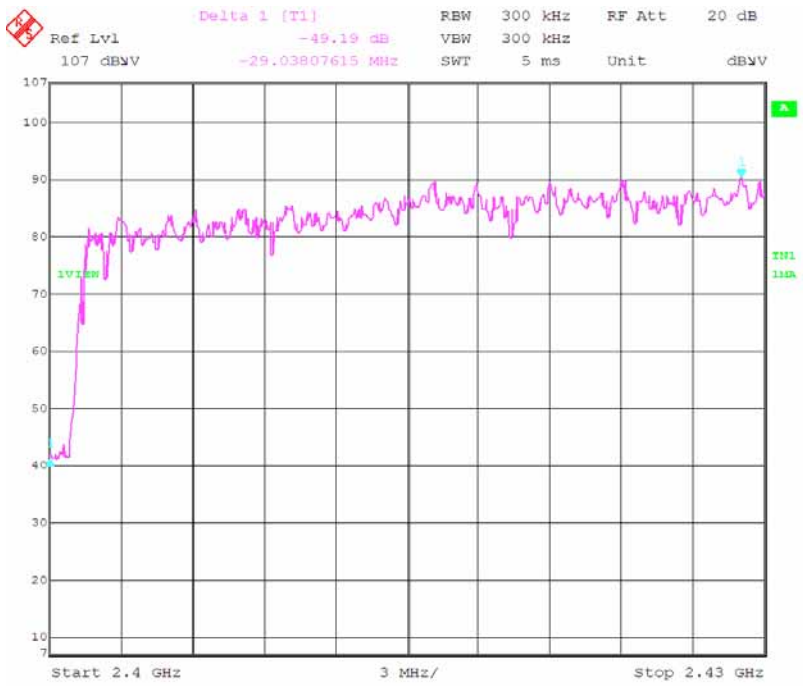
(Vertical)

CH	P <sub>max</sub>	P <sub>av</sub>	P <sub>dev</sub>	c.f.	E <sub>be</sub>	E <sub>av</sub>	Limit(E <sub>be</sub> )	Limit(E <sub>av</sub> )	Margin(E <sub>be</sub> )	Margin(E <sub>av</sub> )
1	86.70	86.40	49.19	-3.2	34.3	34.0	74.0	54.0	39.7	20.0
79	98.58	98.45	45.42	-3.2	50.0	49.8	74.0	54.0	24.0	4.2

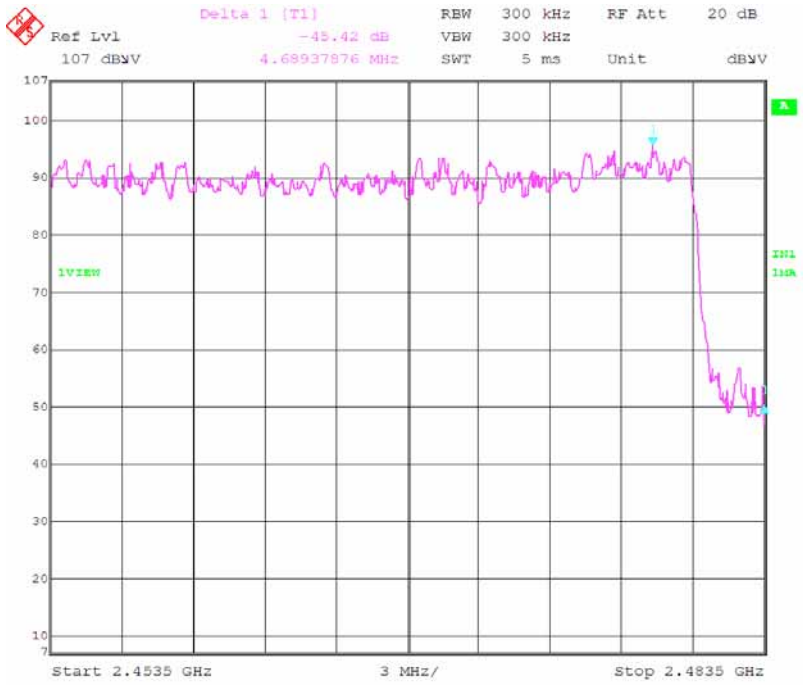
NOTE Vertical and Horizontal were measured and Vertical was confirmed as the worst.

- P<sub>max</sub> : Maximum peak power of the fundamental.
- P<sub>av</sub> : Average of the fundamental.
- P<sub>dev</sub> : The amplitude delta between the peak power and the band edge emission.
- E<sub>be</sub> : Band edge emission.
- E<sub>av</sub> : Average of the band edge emission.

Lower frequency of the band edge



Higher frequency of the band edge

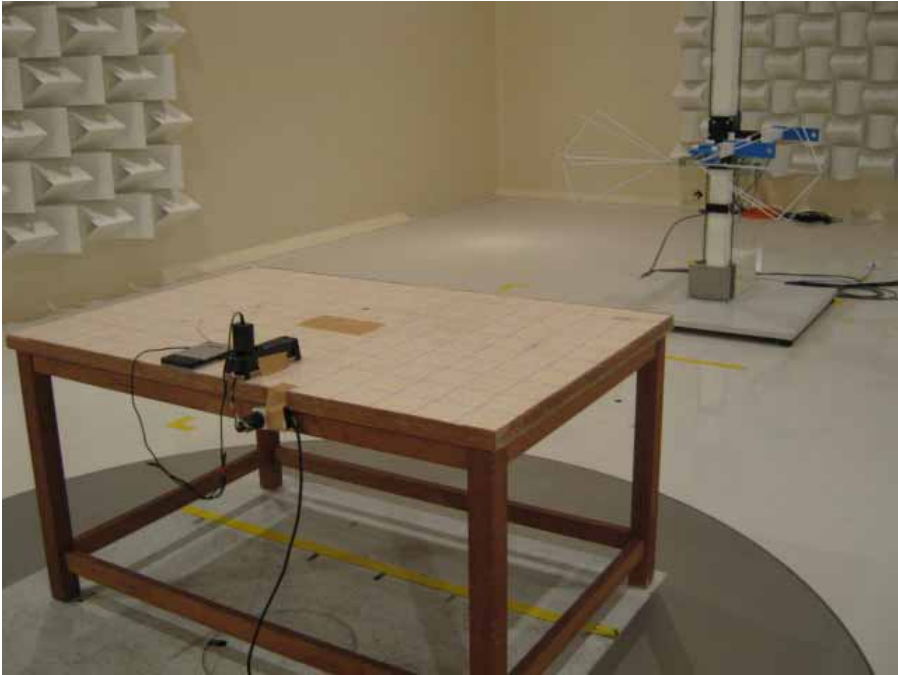


## 6. Photos

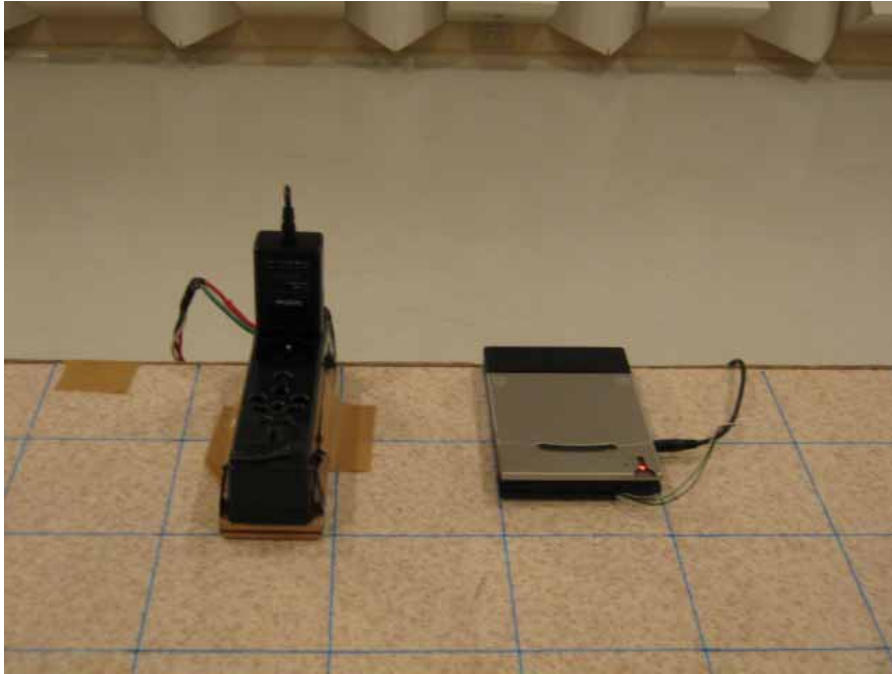
### 6.1 Setup Photo (Conducted Emission)



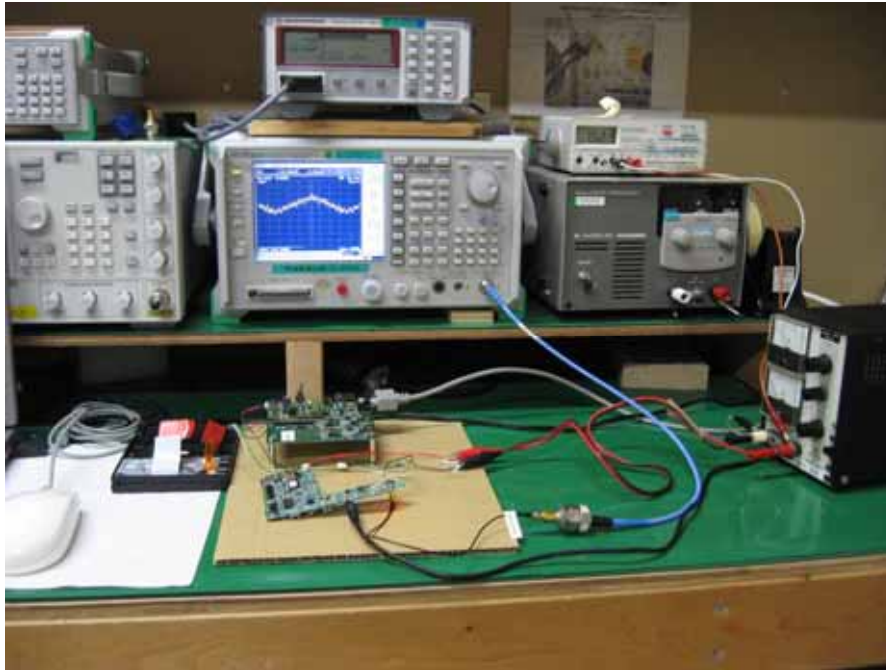
6.2 Setup Photo (Radiated Emission)



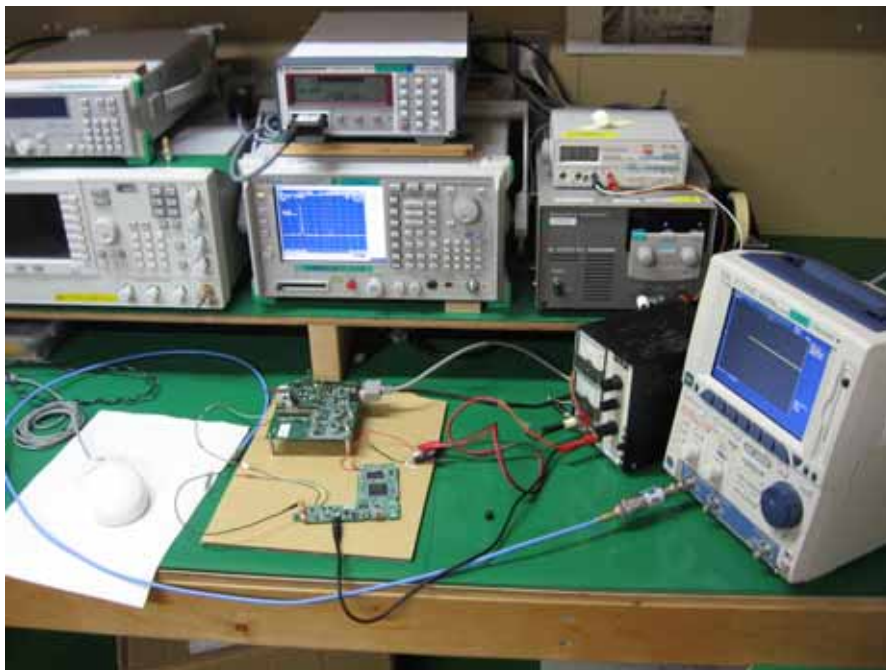
## 6.2 Setup Photo (Radiated Emission)



6.3 Setup Photo (All Other Test Items)



6.4 Setup Photo (Maximum Peak Output Power)





## 7. List of Test Measurement Instruments

### 7.1 AC Conducted Emission

Instruments	Manufacturer	Model / Type	Serial No.	Calibration Date Next Calibration
Spectrum Analyzer	ADVANTEST CORPORATION	R3132	140501174	July, 2008 July, 2010
EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100335	August, 2009 August, 2010
Artificial-Mains Network	KYORITSU CORPORATION	KNW-341C (for EUT)	8-1659-1	July, 2009 July, 2010
Transient Limiter	AGILENT TECHNOLOGIES	11947A	3107A03745	October, 2008 October, 2009
RF Selector	Techno Science Japan Corp.	RFM-E221	3148	Confirmed before Test

### 7.2 Radiated Emission Measurement

Instruments	Manufacturer	Model / Type	Serial No.	Calibration Date Next Calibration
Programmable AC/DC Power Source	NF Corporation	ES18000W	425779	Confirmed before Test
EMI Test Receiver	ROHDE & SCHWARZ	ESIB40	100211	February, 2009 February, 2010
Biconical Antenna (30 to 300MHz)	SCHWARZBECK	VHBB9124(Balun) BBA9106(Elements)	9124-311	September, 2008 September, 2009
Log.-Periodic Antenna (300 MHz to 1 GHz)	SCHWARZBECK	UHALP 9108 A	645	September, 2008 September, 2009
Horn Antenna	SCHWARZBECK	BBHA 9120 D	443	September, 2008 September, 2009
Horn Antenna	ETS LINDGREN	3160-08	00033782	September, 2008 September, 2009
Horn Antenna	ETS LINDGREN	3160-09	00034723	September, 2008 September, 2009

### 7.3 Conducted Radio Measurement

<b>Instruments</b>	<b>Manufacturer</b>	<b>Model / Type</b>	<b>Serial No.</b>	<b>Calibration Date Next Calibration</b>
DC Power Source	KIKUSUI	PAN60-6A	JK002503	---
Spectrum Analyzer	Anritsu	MS2687B	6200162706	April, 2009 April, 2010
Signal Generator	Agilent Technology	E8254A	US41140186	June, 2009 June, 2010
Oscilloscope	Tektronix	TDS794D	B031832	June, 2009 June, 2010
Diode Detector	Agilent Technology	423B	MY42241836	March, 2009 March, 2010