

4.2 Restricted Band of Operation

4.2.1 Measurement procedure

[FCC 15.247(d), 15.205, 15.209, KDB 558074 D01 v05r02, Section 8.6]

Test was applied by following conditions.

Test method	:	ANSI C63.10
Test place	:	3m Semi-anechoic chamber
EUT was placed on	:	Styrofoam table / (W) 1.0 × (D) 1.0 × (H) 0.8 m (below 1 GHz) Styrofoam table / (W) 0.6 × (D) 0.6 × (H) 1.5 m (above 1 GHz)
Antenna distance	:	3m
Spectrum analyzer setting	:	
- Peak	:	RBW=1 MHz, VBW=3 MHz, Span=Arbitrary setting, Sweep=auto
- Average	:	RBW=1 MHz, VBW=1kHz,3kHz, Span=0 Hz, Sweep=auto Display mode=Linear

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	1/T _{on} (kHz)	Determined VBW Setting
IEEE802.11b	96.12	990	40	1.010	3kHz
IEEE802.11g	96.94	1392	44	0.718	1kHz
IEEE802.11n(HT20)	96.55	1286	46	0.778	1kHz

Although these tests were performed other than open area test site, adequate comparison measurements

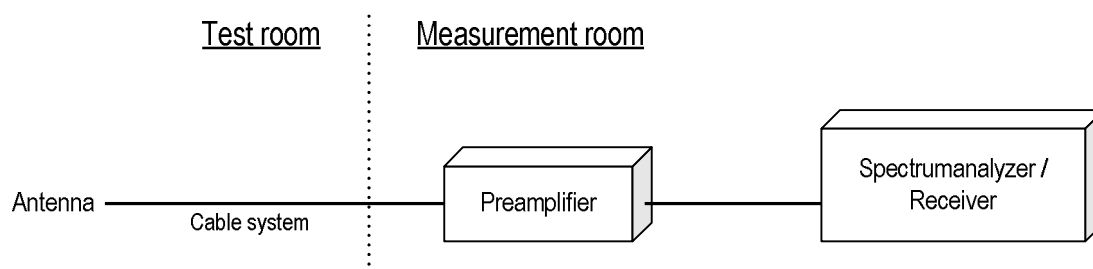
were confirmed against 30 m open area test site.

Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

Radiated emission measurements are performed at 3m distance with the broadband antenna (Double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission.

The EUT is Placed on a turntable, which is 0.8m/1.5m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

- Test configuration



4.2.2 Limit

Emission at the boundary of the restricted band provided by 15.205 shall be lower than 15.209 limit.

4.2.3 Measurement Result

[IEEE802.11b, IEEE802.11g, IEEE802.11n (HT20)]

Channel	Frequency [MHz]	Results Chart	Result
Low	2412	See the Trace Data	Pass
High	2462	See the Trace Data	Pass

4.2.4 Test data

Date : 14-April-2020
Temperature : 21.6 [°C]
Humidity : 35.6 [%]
Test place : 3m Semi-anechoic chamber

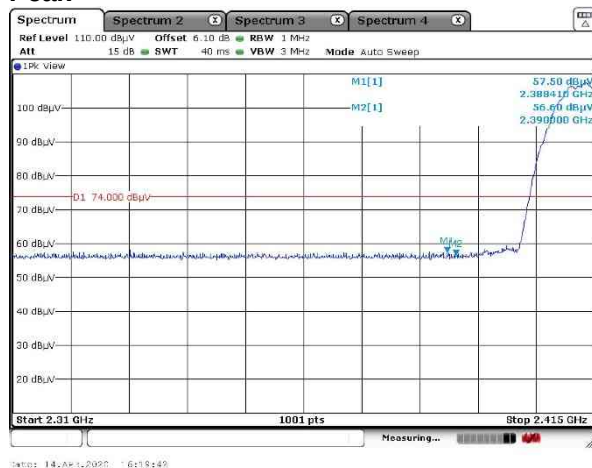
Test engineer : Taiki Watanabe

Date : 16-April-2020
Temperature : 25.3 [°C]
Humidity : 36.2 [%]
Test place : 3m Semi-anechoic chamber

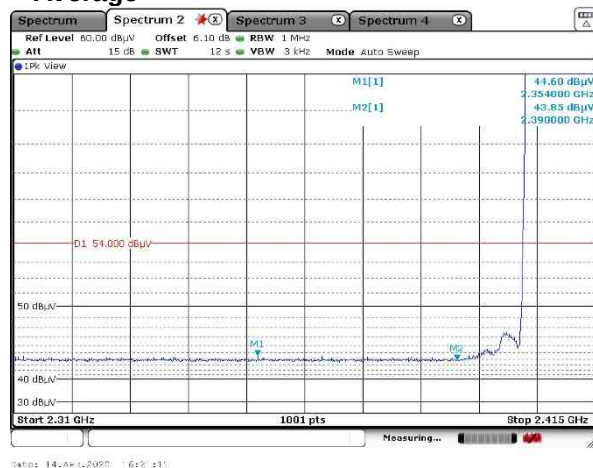
Test engineer : Taiki Watanabe

[IEEE802.11b]

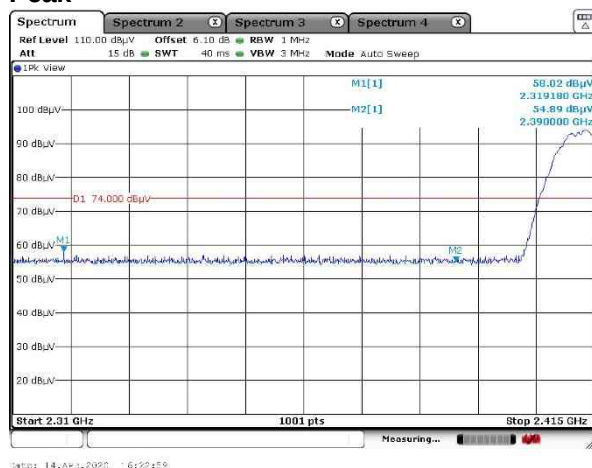
Channel Low Horizontal Peak



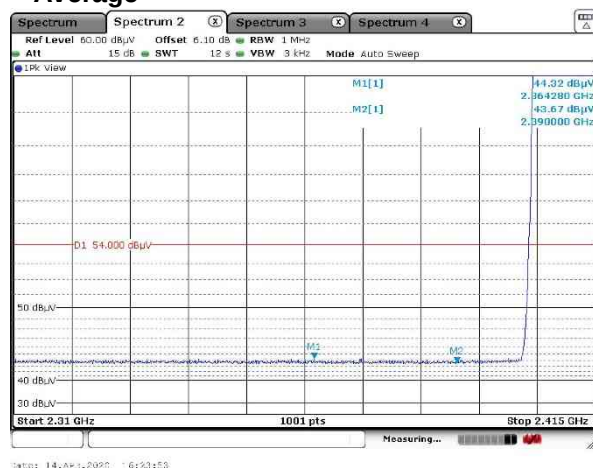
Average



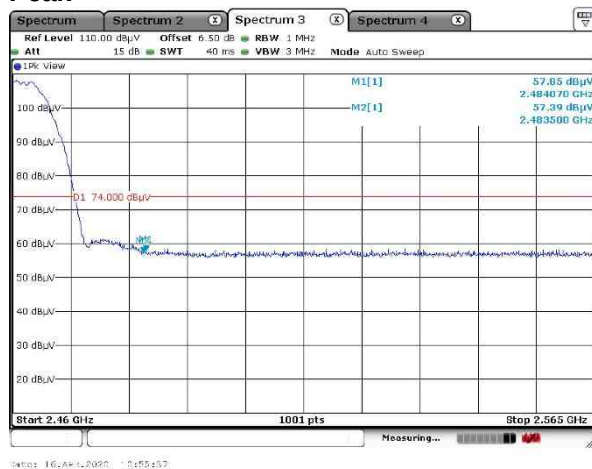
Vertical Peak



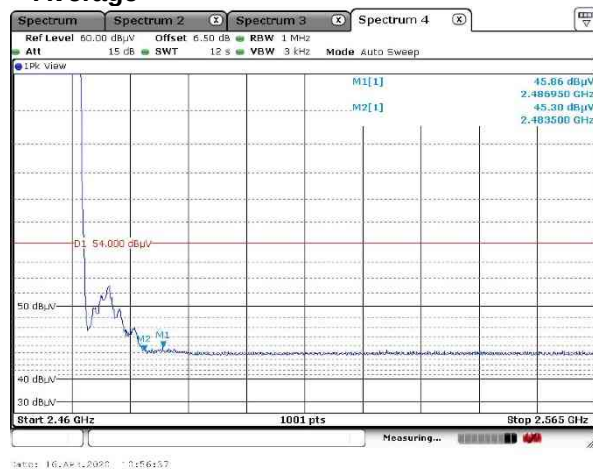
Average



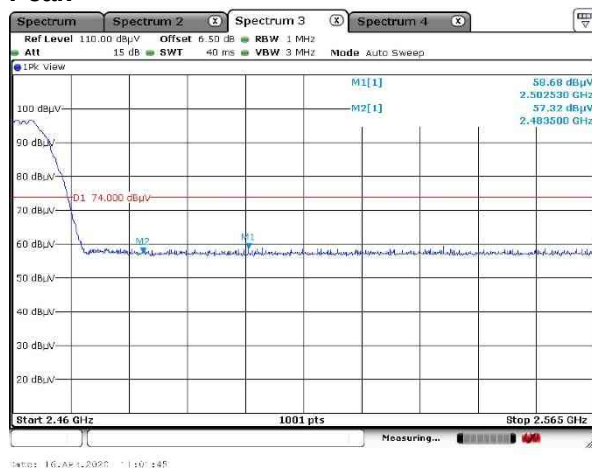
Channel High Horizontal Peak



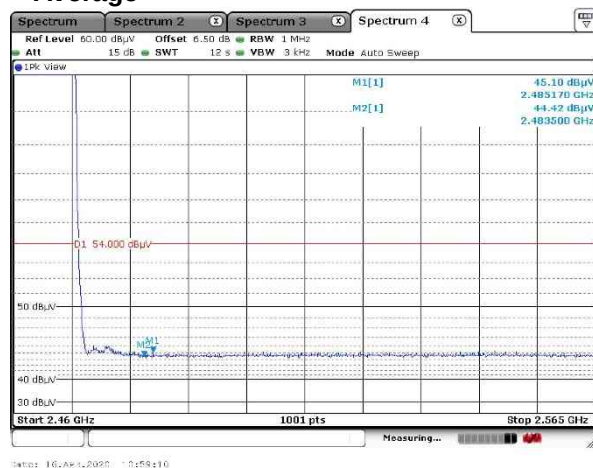
Average



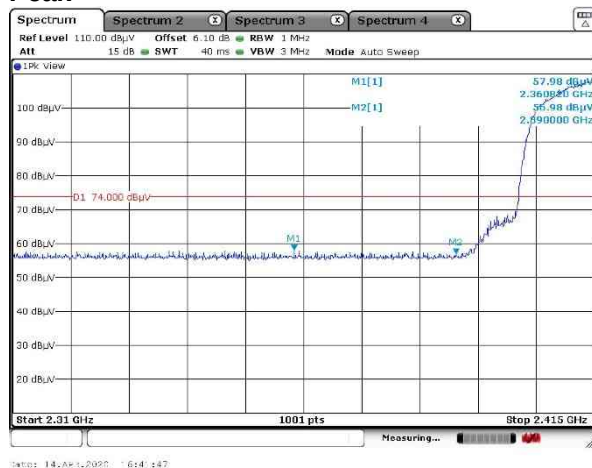
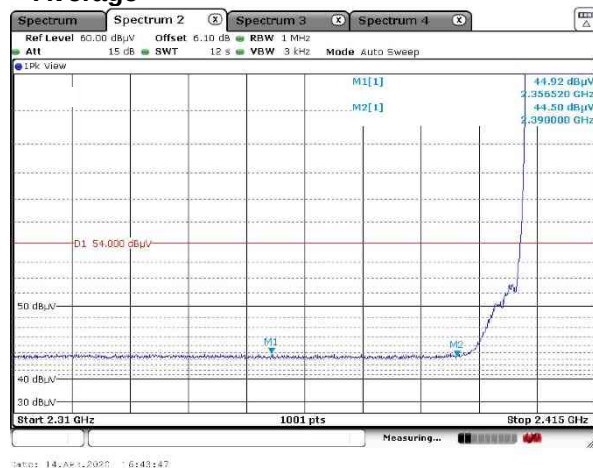
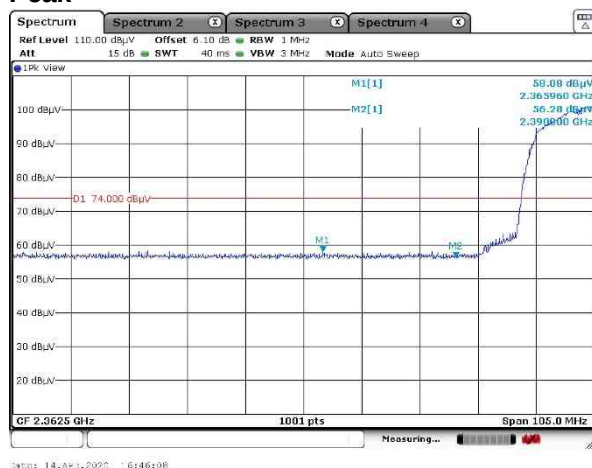
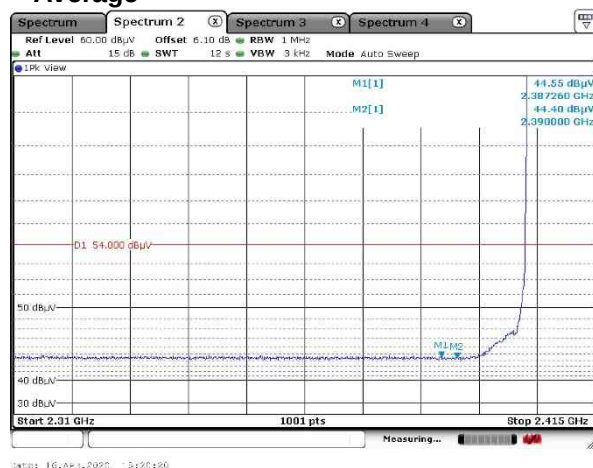
Vertical Peak



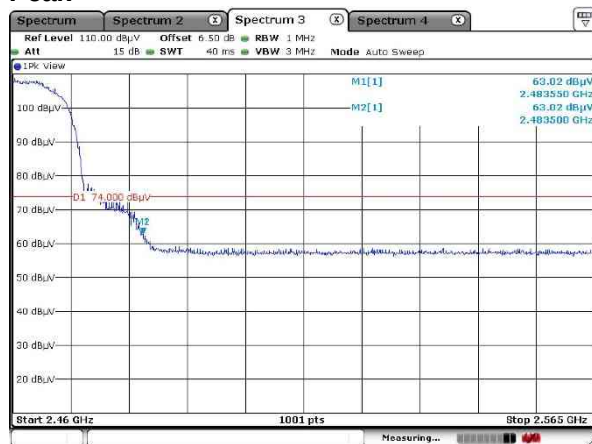
Average



[IEEE802.11g]

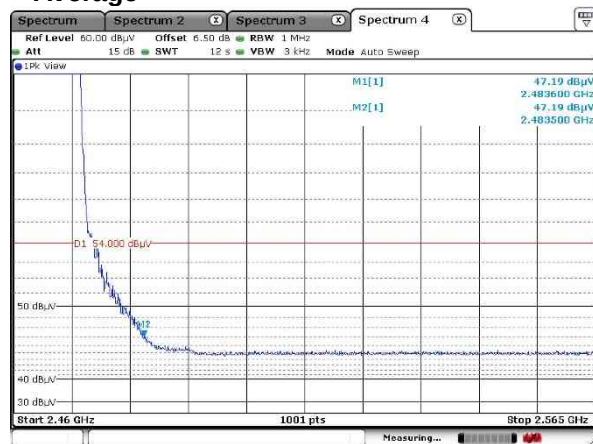
**Channel Low
Horizontal
Peak****Average****Vertical
Peak****Average**

Channel High Horizontal Peak



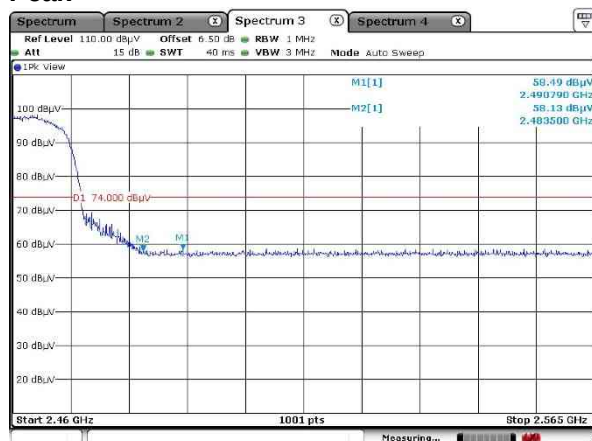
Date: 16-Apr-2020 11:52:50

Average



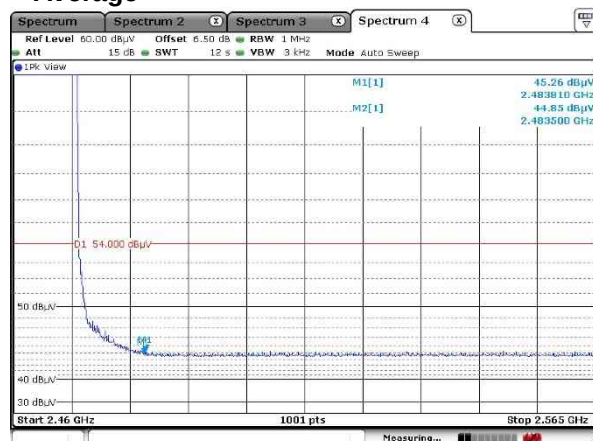
Date: 16-Apr-2020 11:53:03

Vertical Peak



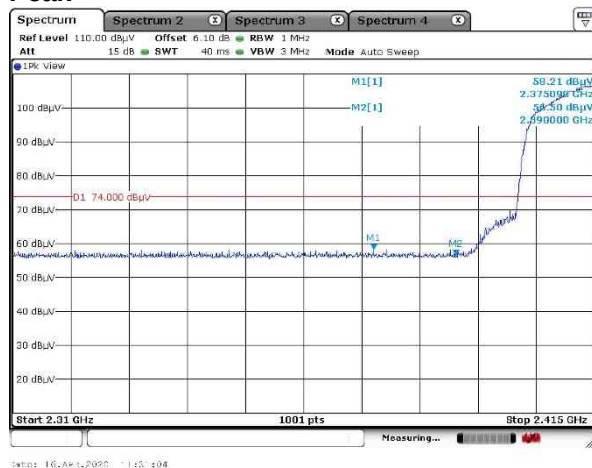
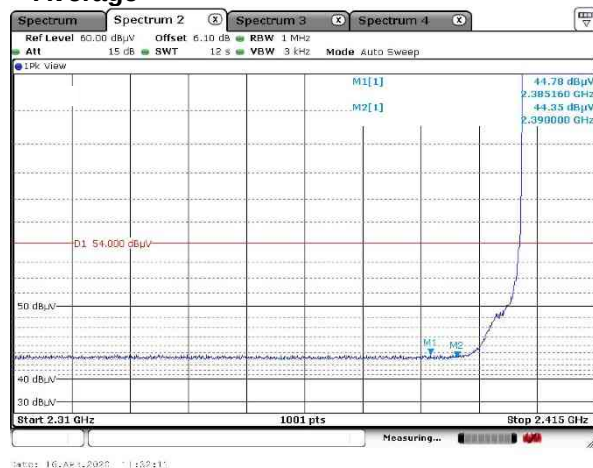
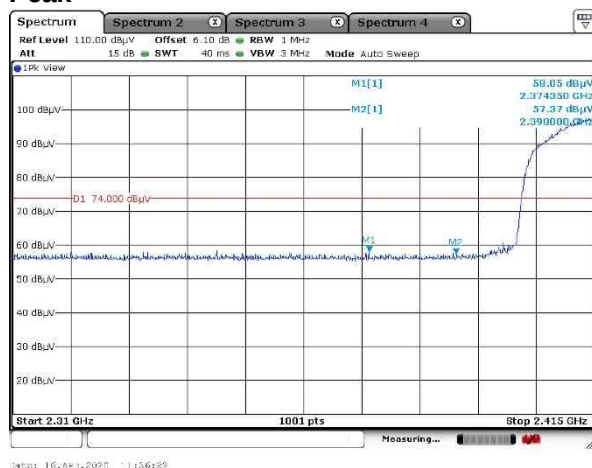
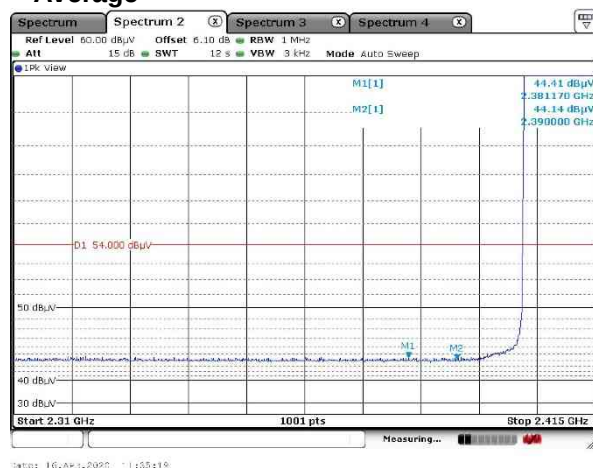
Date: 16-Apr-2020 11:56:55

Average

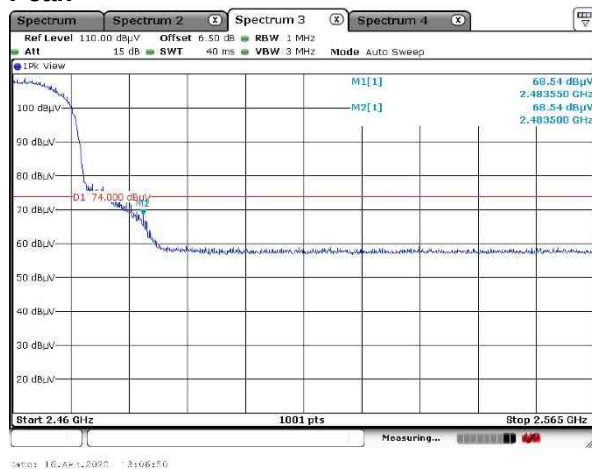


Date: 16-Apr-2020 11:58:04

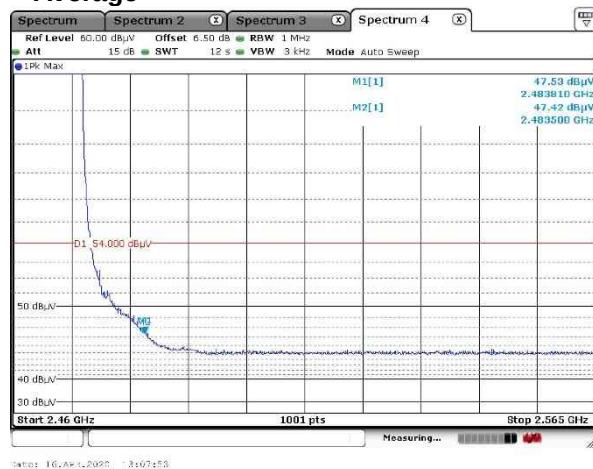
[IEEE802.11n (HT20)]

**Channel Low
Horizontal
Peak****Average****Vertical
Peak****Average**

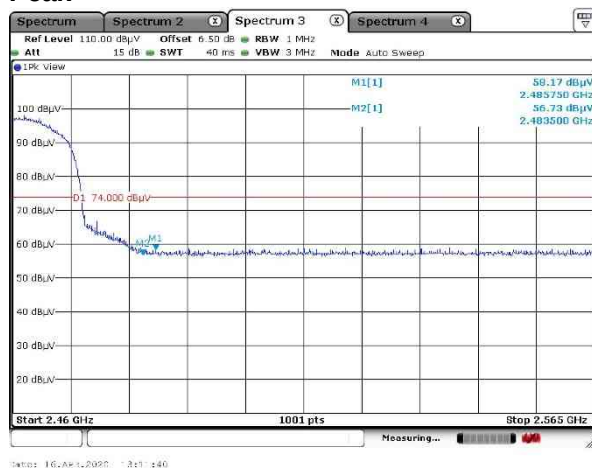
Channel High Horizontal Peak



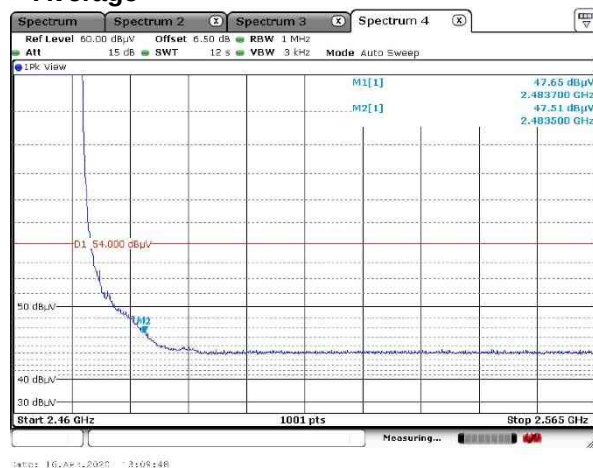
Average



Vertical Peak



Average



4.3 AC Power Line Conducted Emissions

4.3.1 Measurement procedure

[FCC 15.207]

Test was applied by following conditions.

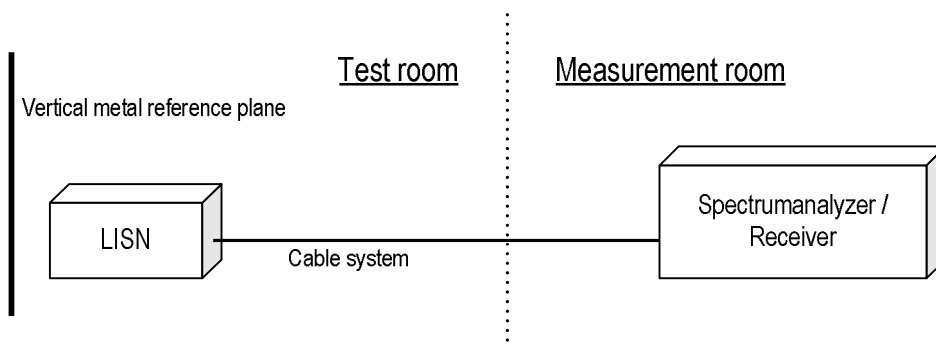
Test method	: ANSI C63.10
Frequency range	: 0.15 MHz to 30 MHz
Test place	: 3m Semi-anechoic chamber
EUT was placed on	: FRP table / (W) 2.0 × (D) 1.0 × (H) 0.8 m
Vertical Metal Reference Plane	: (W) 2.0 × (H) 2.0 m, 0.4 m away from EUT
Test receiver setting	
- Detector	: Quasi-peak, Average
- Bandwidth	: 9 kHz

EUT and peripherals are connected to 50Ω/50 μH Line Impedance Stabilization Network (LISN) which are connected to reference ground plane, and are placed 80cm away from EUT. Excess of AC power cable is bundled in center.

LISN for peripheral is terminated in 50Ω.

EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Maximum emission configuration is determined by manipulating the EUT, peripherals, interconnecting cables. Then, emission measurements are performed with test receiver in above setting to each current-carrying conductor of the mains port. Sufficient time for EUT, peripherals and test equipment is provided in order for them to warm up to their normal operating condition. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits.

- Test configuration



4.3.2 Calculation method

Emission level = Reading + (LISN. Factor + Cable system loss)

Margin = Limit – Emission level

Example:

Limit @ 0.403 MHz: 57.8 dBμV(Quasi-peak)
: 47.8 dBμV(Average)

(Quasi peak) Reading = 22.7 dBμV c.f. = 10.4 dB

Emission level = 22.7 + 10.4 = 33.1 dBμV

Margin = 57.8 – 33.1 = 24.7 dB

(Average) Reading = 6.5 dBμV c.f. = 10.4 dB

Emission level = 6.5 + 10.4 = 16.9 dBμV

Margin = 47.8 – 16.9 = 30.9 dB

4.3.3 Limit

Frequency [MHz]	Limit	
	QP [dBuV]	AV [dBuV]
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

*: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

4.3.4 Test data

Date : 20-April-2020

Temperature : 20.7 [°C]

Humidity : 25.2 [%]

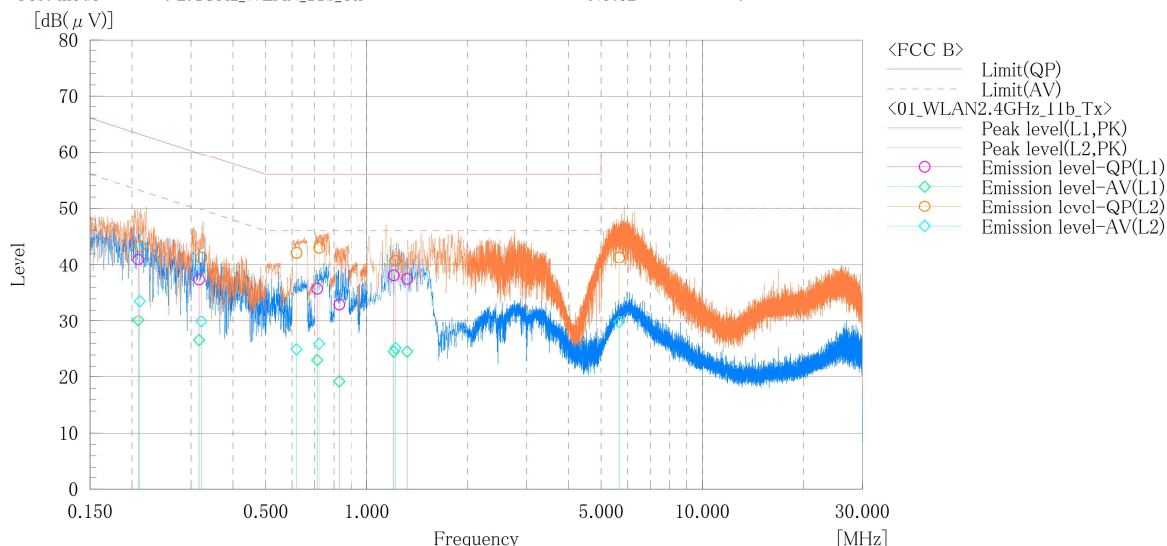
Test place : 3m Semi-anechoic chamber

Test engineer :

Kazunori Saito

Company Name : KYOCERA Corporation
EUT : Mobile Phone
Model No. : EB1035
Serial No. : N/A
Test mode : 2.4GHz_WLAN_11b_Tx

Standard : FCC Part.15 Class C
Operator : K.Saito
Temp,Hum,Atm : 20.7[°C] 25.2[%]
Note1 :
Note2 :



Final Result

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.209	30.6	19.7	10.4	41.0	30.1	63.2	53.2	22.2	23.1
2	0.317	27.0	16.2	10.4	37.4	26.6	59.8	49.8	22.4	23.2
3	0.712	25.4	12.7	10.4	35.8	23.1	56.0	46.0	20.2	22.9
4	0.829	22.6	8.8	10.4	33.0	19.2	56.0	46.0	23.0	26.8
5	1.206	27.7	14.2	10.4	38.1	24.6	56.0	46.0	17.9	21.4
6	1.320	27.1	14.2	10.4	37.5	24.6	56.0	46.0	18.5	21.4

--- L2 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.211	32.9	23.2	10.4	43.3	33.6	63.2	53.2	19.9	19.6
2	0.322	31.0	19.5	10.4	41.4	29.9	59.7	49.7	18.3	19.8
3	0.619	31.8	14.6	10.4	42.2	25.0	56.0	46.0	13.8	21.0
4	0.722	32.7	15.6	10.4	43.1	26.0	56.0	46.0	12.9	20.0
5	1.219	30.4	14.8	10.4	40.8	25.2	56.0	46.0	15.2	20.8
6	5.659	30.7	19.1	10.7	41.4	29.8	60.0	50.0	18.6	20.2



Japan

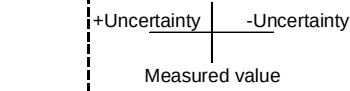
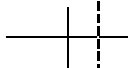
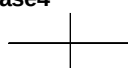
5 Antenna requirement

According to FCC section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The antenna is a special antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.

6 Measurement Uncertainty

Expanded uncertainties stated are calculated with a coverage Factor $k=2$.
Please note that these results are not taken into account when measurement uncertainty considerations contained in ETSI TR 100 028 Parts 1 and 2 determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission, AMN (9 kHz – 150 kHz)	± 3.8 dB
Conducted emission, AMN (150 kHz – 30 MHz)	± 3.4 dB
Radiated emission (9kHz – 30 MHz)	± 3.9 dB
Radiated emission (30 MHz – 1000 MHz)	± 4.9 dB
Radiated emission (1 GHz – 6 GHz)	± 4.6 dB
Radiated emission (6 GHz – 18 GHz)	± 4.9 dB
Radiated emission (18 GHz – 40 GHz)	± 5.8 dB
Radio Frequency	$\pm 1.4 \cdot 10^{-8}$
RF power, conducted	± 0.6 dB
Temperature	± 0.6 °C
Humidity	± 1.2 %
Voltage (DC)	± 0.4 %
Voltage (AC, <10kHz)	± 0.2 %

Judge	Measured value and standard limit value	
PASS	Standard limit value +Uncertainty -Uncertainty Measured value Case1  Even if it takes uncertainty into consideration, a standard limit value is fulfilled.	
	Standard limit value +Uncertainty -Uncertainty Measured value Case2  Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.	
FAIL	Standard limit value +Uncertainty -Uncertainty Measured value Case3  Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.	
	Standard limit value +Uncertainty -Uncertainty Measured value Case4  Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.	



Japan

7 Laboratory Information

Testing was performed and the report was issued at:

TÜV SÜD Japan Ltd. Yonezawa Testing Center

Address: 5-4149-7 Hachimanpara, Yonezawa-shi, Yamagata, 992-1128 Japan
Phone: +81-238-28-2881
Fax: +81-238-28-2888

Accreditation and Registration

A2LA

Certificate #3686.03

VLAC

Accreditation No.: VLAC-013

BSMI

Laboratory Code: SL2-IN-E-6018, SL2-A1-E-6018

Innovation, Science and Economic Development Canada

ISED#: 4224A

VCCI Council

Registration number	Expiration date
A-0166	03-July-2021

Appendix A. Test Equipment

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	30-Sep-2020	25-Sep-2019
Spectrum analyzer	Agilent Technologies	E4447A	MY46180188	31-Mar-2021	27-Mar-2020
Spectrum analyzer	Agilent Technologies	E4440A	US40420937	30-Sep-2020	26-Sep-2019
Preamplifier	SONOMA	310	372170	30-Sep-2020	26-Sep-2019
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010	31-May-2020	21-May-2019
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	100515	30-Apr-2021	15-Apr-2020
Biconical antenna	Schwarzbeck	VHBB9124/BBA9106	1344	31-Dec-2020	04-Dec-2019
Log periodic antenna	Schwarzbeck	VUSLP9111B	345	31-Aug-2020	27-Aug-2019
Attenuator	TAMAGAWA.ELEC	CFA-01/6dB	N/A(S465)	31-May-2020	17-May-2019
Attenuator	TAMAGAWA.ELEC	CFA-10/3dB	N/A(S503)	31-Jul-2020	17-Jul-2019
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	31-Jan-2021	08-Jan-2020
Attenuator	AEROFLEX	26A-10	081217-08	31-Jan-2021	10-Jan-2020
Double ridged guide antenna	ETS LINDGREN	3117	00209352	31-Dec-2020	16-Dec-2019
Double ridged guide antenna	ETS LINDGREN	3117	00052315	30-Apr-2021	08-Apr-2020
Attenuator	HUBER+SUHNER	6803.17.B	N/A(2341)	31-Dec-2020	18-Dec-2019
Double ridged guide antenna	A.H.Systems Inc.	SAS-574	469	31-Aug-2020	28-Aug-2019
Preamplifier	TSJ	MLA-1840-B03-35	1240332	31-Aug-2020	28-Aug-2019
High Pass Filter	Wainwright	WHKX2.8/18G-6SS	1	31-Jul-2020	18-Jul-2019
Band rejection filter	Micro-Tronics	BRC50720	014	31-Dec-2020	18-Dec-2019
Signal generator	ROHDE&SCHWARZ	SMB100A	177525	31-Jul-2020	18-Jul-2019
RF power amplifier	R&K	CGA020M602-2633R	B40240	31-May-2020	16-May-2019
Microwave cable	HUBER+SUHNER	SUCOFLEX102/2m	31648	31-Mar-2021	26-Mar-2020
Dipole antenna	Schwarzbeck	VHAP	1021	31-Aug-2020	15-Aug-2019
Dipole antenna	Schwarzbeck	UHAP	993	31-Aug-2020	15-Aug-2019
Double ridged guide antenna	ETS LINDGREN	3117	00218815	31-Dec-2020	16-Dec-2019
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	126079	30-Nov-2020	14-Nov-2019
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	116338	31-Aug-2020	27-Aug-2019
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY30037/4	31-Jan-2021	08-Jan-2020
		SUCOFLEX104/1m	my24610/4	31-Jan-2021	08-Jan-2020
		SUCOFLEX104/8m	SN MY30031/4	31-Jan-2021	09-Jan-2020
		SUCOFLEX104	MY32976/4	31-Jan-2021	08-Jan-2020
		SUCOFLEX104/1.5m	MY19309/4	31-Jan-2021	08-Jan-2020
		SUCOFLEX104/7m	41625/6	31-Jan-2021	08-Jan-2020
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.6.0	N/A	N/A
Absorber	RIKEN	PFP30	N/A	N/A	N/A
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-NSA)	31-May-2020	14-May-2019
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-SVSWR)	31-May-2020	13-May-2019

Conducted emission at mains port

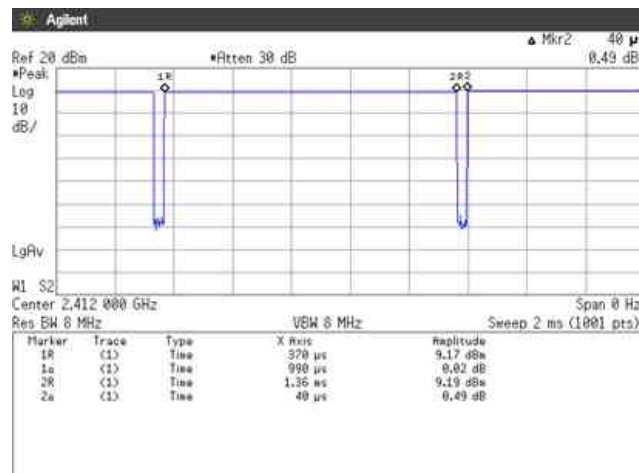
Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	30-Sep-2020	25-Sep-2019
Attenuator	HUBER+SUHNER	6810.01.A	N/A (S411)	31-Jan-2021	08-Jan-2020
Line impedance stabilization network	Kyoritsu Electrical Works, Ltd.	TNW-407F2	12-17-110-2	31-May-2020	16-May-2019
Coaxial cable	FUJIKURA	5D-2W/4m	N/A (S350)	31-Jan-2021	08-Jan-2020
Coaxial cable	FUJIKURA	5D-2W/1m	N/A (S193)	31-Jan-2021	08-Jan-2020
Coaxial cable	HUBER+SUHNER	RG214/U/10m	N/A (S194)	31-Jan-2021	08-Jan-2020
PC	DELL	DIMENSION	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/CE-AJ	0611193/V5.4.11	N/A	N/A

*: The calibrations of the above equipment are traceable to NIST or equivalent standards of the reference organizations.

Appendix B. Duty Cycle

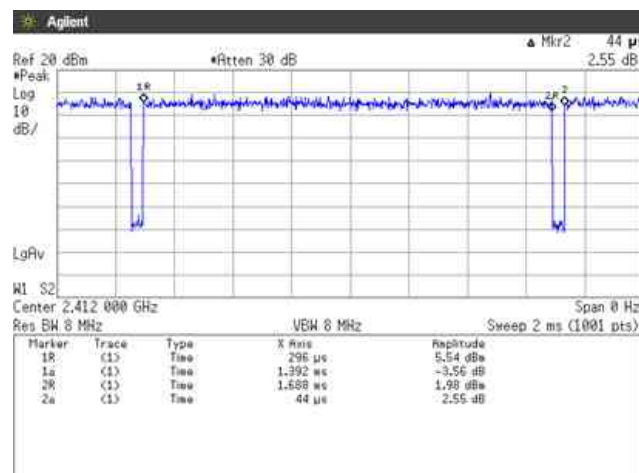
[Plot & Calculation]

11b



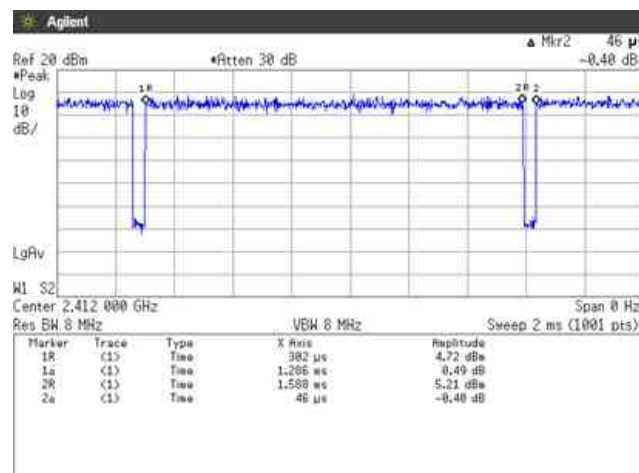
$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 990[\mu\text{s}] / (990[\mu\text{s}] + 40[\mu\text{s}]) = 96.12[\%]$$

11g



$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 1392[\mu\text{s}] / (1392[\mu\text{s}] + 44[\mu\text{s}]) = 96.94[\%]$$

11n (HT20)



$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 1286[\mu\text{s}] / (1286[\mu\text{s}] + 46[\mu\text{s}]) = 96.55[\%]$$