



Zacta

TEST REPORT

Report number : JPD-TR-17258-0

Issue date : January 16, 2018

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

FCC Part15 Subpart C

The test results are traceable to the international or national standards.

Applicant	: KYOCERA Corporation
Equipment under test (EUT)	: Mobile Phone
Model number	: HA43
FCC ID	: JOYHA43

Date of test : December 27, 28, 29, 2017
January 9, 10, 2018
Test place : TÜV SÜD Zacta Ltd. Yonezawa Testing Center
5-4149-7, Hachimanpara, Yonezawa-shi,
Yamagata, 992-1128 Japan
Phone: +81-238-28-2881 Fax: +81-238-28-2888
Test results : Complied

The results in this report are applicable only to the equipment tested.
This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.
This test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, ILAC-MRA, or any agency of the federal government.

Tested by : Tadahiro Seino Chiaki Kanno
Tadahiro Seino Chiaki Kanno

Tested by : Taiki Watanabe
Taiki Watanabe

Approved by : Hiroaki Suzuki
Hiroaki Suzuki
Lab Manager of RF Lab



Table of contents

	Page
1. Summary of Test	4
1.1 Purpose of test	4
1.2 Standards	4
1.3 List of applied test to the EUT	4
1.4 Modification to the EUT by laboratory	4
2. Equipment Under Test	5
2.1 General Description of equipment	5
2.2 EUT information	5
2.3 Variation of the family model(s)	6
2.4 Operating channels and frequencies	6
2.5 Operating mode	7
2.6 Operating flow	7
3. Configuration of equipment	8
3.1 Equipment(s) used	8
3.2 Cable(s) used	8
3.3 System configuration	8
4. 20dB Bandwidth	9
4.1 Measurement procedure	9
4.2 Limit	9
4.3 Measurement result	9
4.4 Trace data	10
5. Carrier Frequency Separation	11
5.1 Measurement procedure	11
5.2 Limit	11
5.3 Measurement result	11
5.4 Trace data	12
6. Number of Hopping Frequencies	13
6.1 Measurement procedure	13
6.2 Limit	13
6.3 Measurement result	13
6.4 Trace data	14
7. Time of Occupancy (Dwell Time)	16
7.1 Measurement procedure	16
7.2 Limit	16
7.3 Measurement result	17
7.4 Trace data	18
8. Maximum Peak Output Power	20
8.1 Measurement procedure	20
8.2 Limit	20
8.3 Measurement result	20
9. Band Edge Compliance of RF Conducted Emissions	21
9.1 Measurement procedure	21
9.2 Limit	21



Zacta

9.3 Measurement result.....	22
9.4 Trace data	23
10. Spurious emissions - Conducted -	25
10.1 Measurement procedure	25
10.2 Limit	25
10.3 Measurement result.....	25
10.4 Trace data	26
11. Spurious Emissions - Radiated -	32
11.1 Measurement procedure	32
11.2 Calculation method	33
11.3 Limit.....	33
11.4 Test data.....	34
12. Restricted Band of Operation	50
12.1 Measurement procedure	50
12.2 Limit	50
12.3 Measurement Result	51
12.4 Test data.....	51
13. AC Power Line Conducted Emissions.....	56
13.1 Measurement procedure	56
13.2 Calculation method	56
13.3 Limit	57
13.4 Test data.....	57
14. Antenna requirement.....	58
15. Uncertainty of measurement.....	59
16. Laboratory Information	60
Appendix A. Test equipment.....	61
Appendix B. Duty Cycle.....	62

1. Summary of Test

1.1 Purpose of test

It is the original test in order to verify conformance to FCC Part 15 Subpart C.

1.2 Standards

CFR47 FCC Part 15 Subpart C

1.2.1 Test Methods

ANSI C63.10-2013

1.2.2 Deviation from standards

None

1.3 List of applied test to the EUT

Test items Section	Test items	Condition	Result
15.247(a)(1)	20dB Bandwidth	Conducted	PASS
15.247(a)(1)	Carrier Frequency Separation	Conducted	PASS
15.247(a)(1)(iii)	Number of Hopping Frequencies	Conducted	PASS
15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Conducted	PASS
15.247(b)(1)	Maximum Peak Output Power	Conducted	PASS
15.247(d)	Band Edge Compliance of RF Conducted Emissions	Conducted	PASS
15.247(d) 15.205 15.209	Spurious Emissions	Conducted Radiated	PASS
15.247(d) 15.205 15.209	Restricted Bands of Operation	Radiated	PASS
15.207	AC Power Line Conducted Emissions	Conducted	PASS

1.3.1 Test set up

Table-Top

1.4 Modification to the EUT by laboratory

None

2. Equipment Under Test

2.1 General Description of equipment

EUT is the Mobile Phone.

2.2 EUT information

Applicant	: KYOCERA Corporation Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku Yokohama-shi, Kanagawa, Japan Phone: +81-45-943-6253 Fax: +81-45-943-6314
Equipment under test	: Mobile Phone
Trade name	: Kyocera
Model number	: HA43
Serial number	: N/A
EUT condition	: Pre-Production
Power ratings	: Battery: DC 3.8V
Size	: (W) 71.9mm × (D) 8.8mm × (H) 145.3mm
Environment	: Indoor and Outdoor use
Terminal limitation	: -20°C to 60°C
RF Specification Protocol	: Bluetooth 4.2 + EDR
Frequency range	: 2402MHz-2480MHz
Number of RF Channels	: 79 Channels
Modulation type/ Data rate	: FHSS: GFSK (1Mbps), $\pi/4$ -DQPSK (2Mbps), 8-DPSK (3Mbps)
Channel separation	: 1MHz
Conducted power	: 3.864mW (DH5) 4.295mW (3-DH5)
Antenna type	: Internal antenna
Antenna gain	: -0.8dBi

2.3 Variation of the family model(s)

Not applicable

2.4 Operating channels and frequencies

Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

2.5 Operating mode

The EUT had been tested under operating condition.

There are three channels have been tested as following:

Tested Channel	Frequency [MHz]
Low	2402
Middle	2441
High	2480

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Middle, High	FHSS	GFSK	DH5
Low, Middle, High	FHSS	8-DPSK	3-DH5

The field strength of spurious emissions was measured at each position of all three axis X, Y and Z to compare the level, and the maximum noise.

The worst emission was found in Z axis and the worst case recorded.

2.6 Operating flow

[Tx mode]

- i) Bluetooth test program setup to the DM tool
- ii) Select a test mode
 - Operating frequency:
 - No hopping (Channel Low: 2402MHz, Channel Middle: 2441MHz, Channel High: 2480MHz)
 - Hopping
 - Packet type: DH5, 3-DH5
- iii) Start test mode

[Rx mode]

- i) Bluetooth test program setup to the DM tool
- ii) Select a test mode
 - Operating frequency: Channel Low: 2402MHz, Channel Middle: 2441MHz, Channel High: 2480MHz
- iii) Start test mode

3. Configuration of equipment

3.1 Equipment(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	Mobile Phone	KYOCERA	HA43	N/A	JOYHA43	EUT
2	AC Adapter	au	N/A	N/A	N/A	*
3	USB conversion connector	ANKER	N/A	N/A	N/A	*

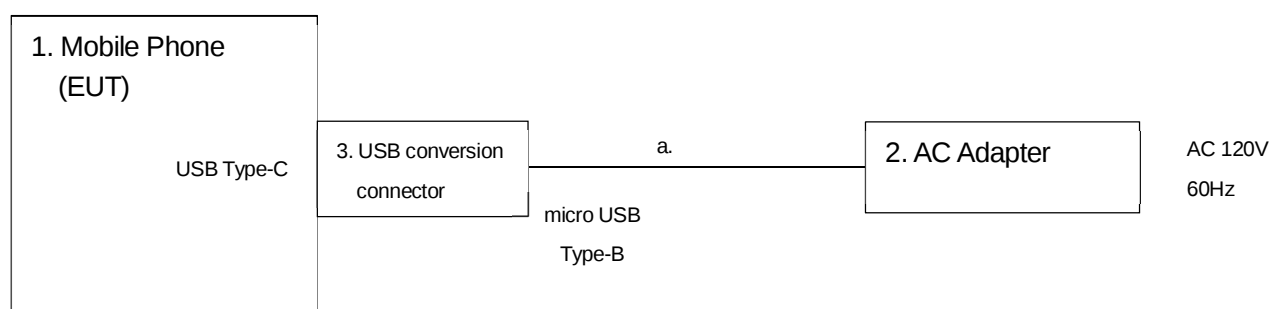
*: AC power line Conducted Emission Test.

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	Micro USB cable (for AC Adapter)	1.0	Yes	Metal	*

*: AC power line Conducted Emission Test.

3.3 System configuration



Note1: Numbers assigned to equipment or cables on this diagram correspond to the list in “3.1 Equipment(s) used” and “3.2 Cable(s) used”.

4. 20dB Bandwidth

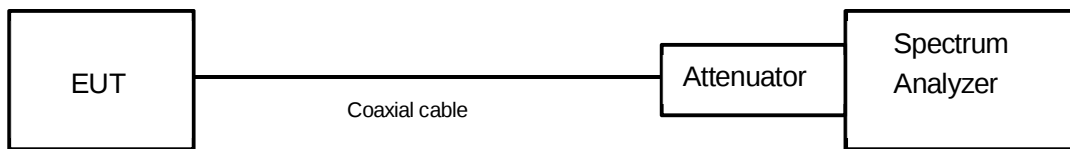
4.1 Measurement procedure [FCC 15.247(a)(1)]

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- a) Span = 2-3 times the 20 dB bandwidth.
- b) RBW $\geq$ 1% of the 20 dB bandwidth.
- c) VBW $\geq$ RBW.
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



4.2 Limit

None

4.3 Measurement result

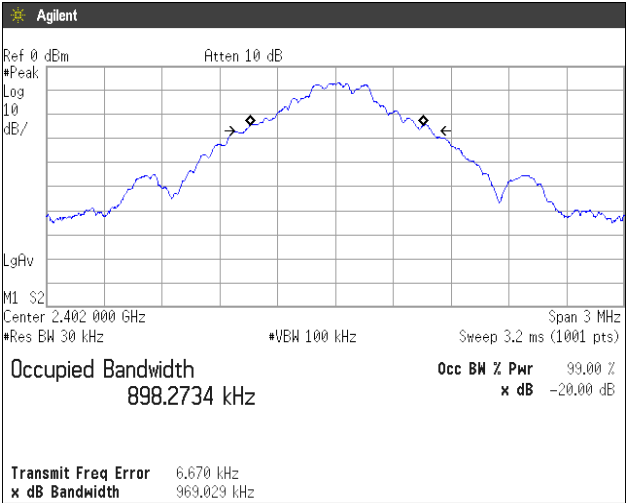
Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer :
 Chiaki Kanno

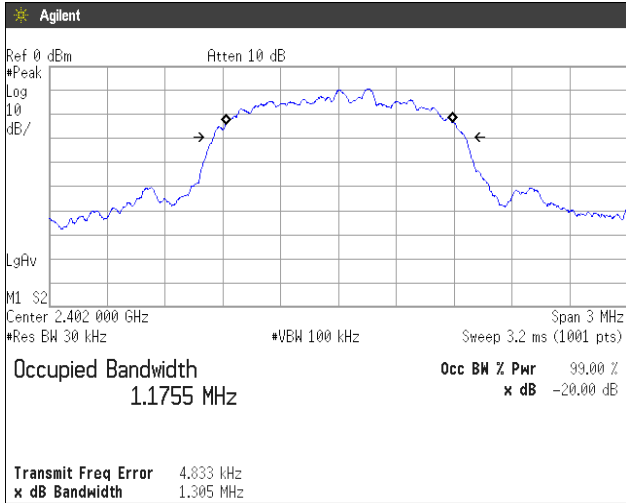
Channel	Frequency [MHz]	20dB bandwidth [MHz]	
		DH5	3-DH5
Low	2402	0.969	1.305
Middle	2441	0.968	1.304
High	2480	1.022	1.305

4.4 Trace data

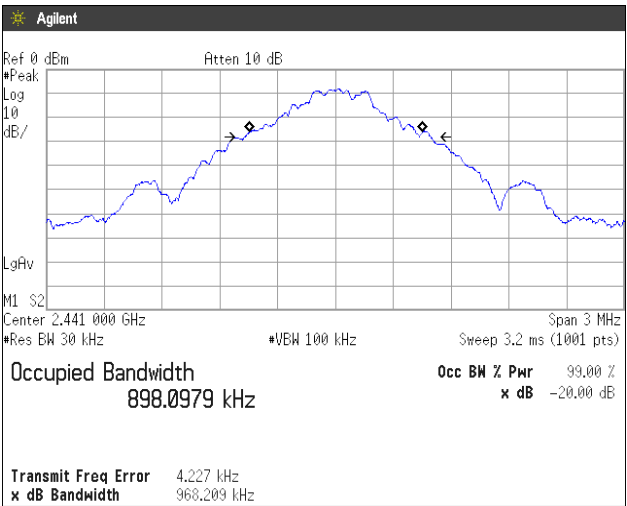
[DH5]
Channel Low



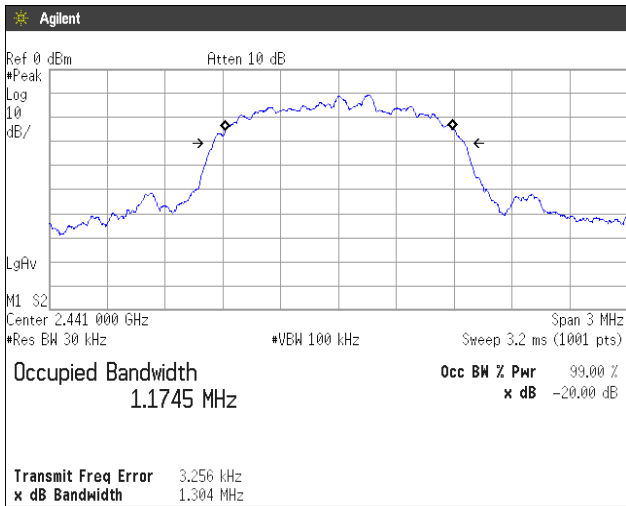
[3-DH5]



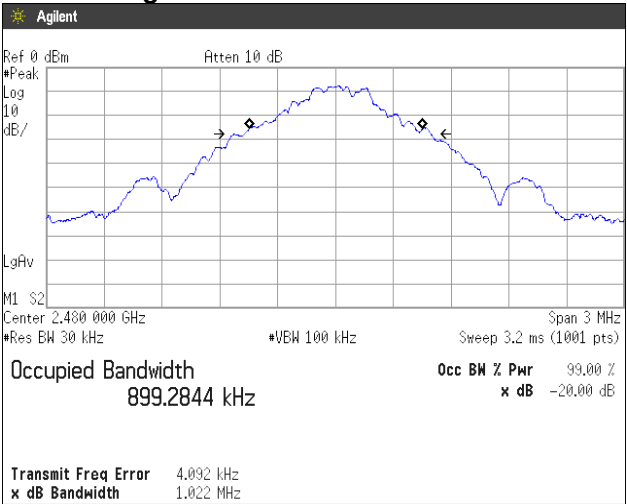
[DH5]
Channel Middle



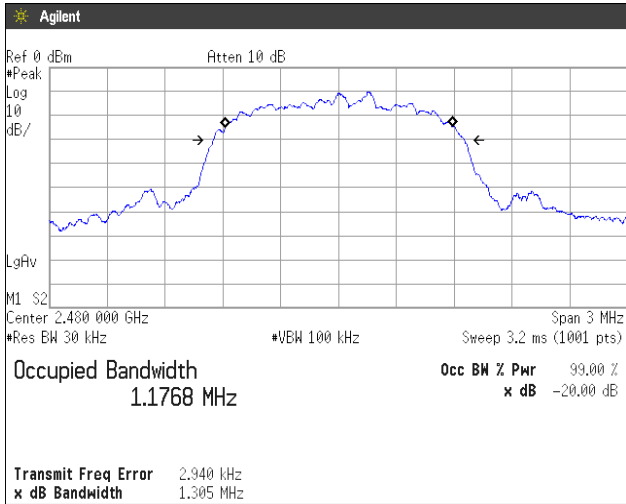
[3-DH5]



[DH5]
Channel High



[3-DH5]



5. Carrier Frequency Separation

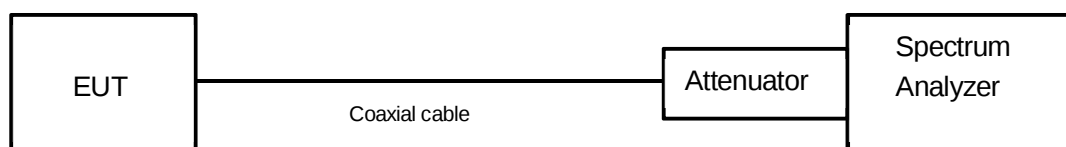
5.1 Measurement procedure [FCC 15.247(a)(1)]

The adjacent channel interval is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- Span = wide enough to capture the peaks of two adjacent channels.
- RBW $\geq 1\%$ of the span.
- VBW $\geq$ RBW.
- Sweep time = auto-couple.
- Detector = peak.
- Trace mode = max hold.

- Test configuration



5.2 Limit

System shall have hopping channel carrier frequencies separated by a minimum of, 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

5.3 Measurement result

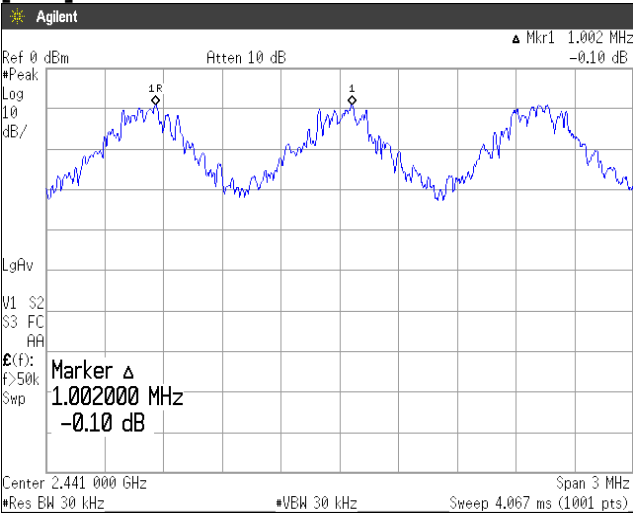
Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer :
 Chiaki Kanno

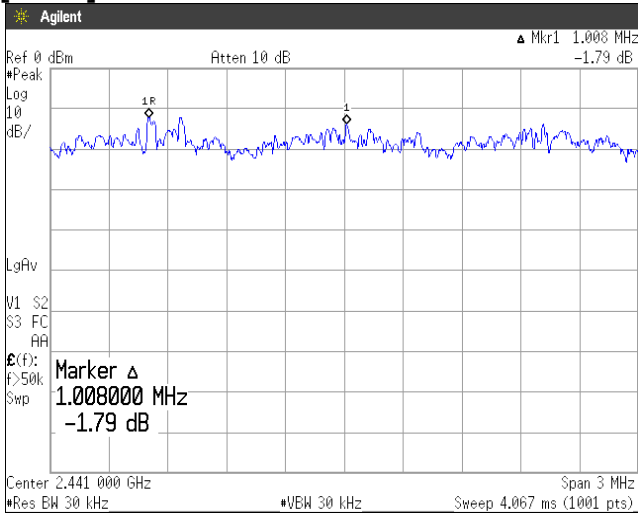
Packet type	Channel separation (MHz)	Limit (MHz)	Result
DH5	1.002	>two-thirds of the 20dB Bandwidth =681kHz	PASS
3-DH5	1.008	>two-thirds of the 20dB Bandwidth =870kHz	PASS
DH5(AFH)	1.005	>two-thirds of the 20dB Bandwidth =681kHz	PASS
3-DH5(AFH)	1.002	>two-thirds of the 20dB Bandwidth =870kHz	PASS

5.4 Trace data

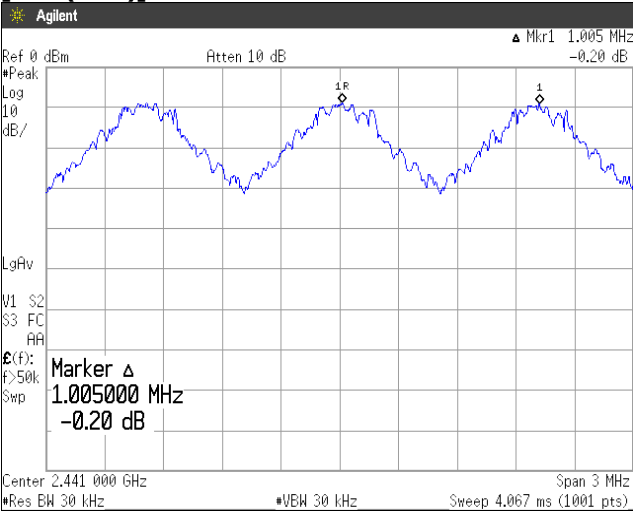
[DH5]



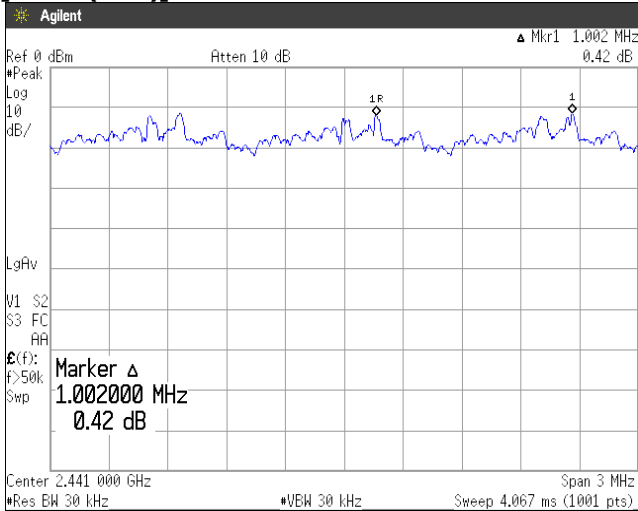
[3-DH5]



[DH5(AFH)]



[3-DH5(AFH)]



6. Number of Hopping Frequencies

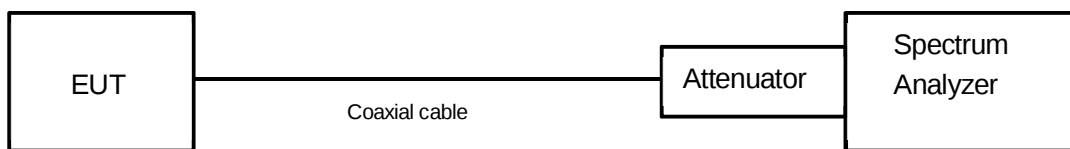
6.1 Measurement procedure [FCC 15.247(a)(1)(iii)]

The number of hopping channels is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- a) Span = the frequency band of operation.
- b) RBW $\geq$ 1% of the Span.
- c) VBW $\geq$ RBW.
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



6.2 Limit

Shall have more than 15 channels.

6.3 Measurement result

Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer :
 Chiaki Kanno

FHSS

Number of channels	Limit	Result
79	≥ 15 channel	PASS

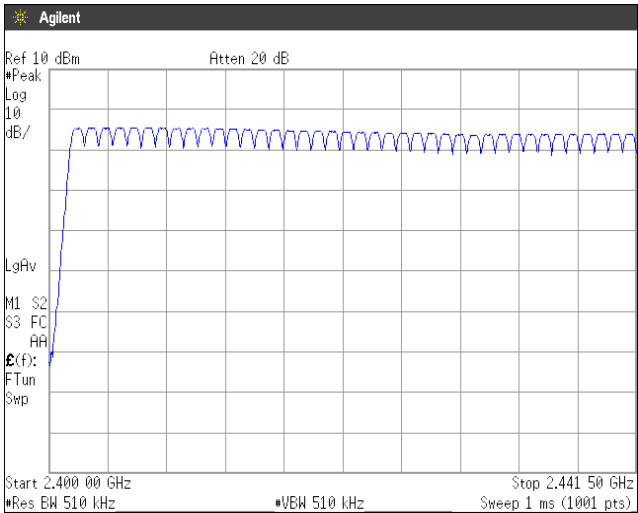
AFH

Channel	Number of channels	Limit	Result
Low	20	≥ 15 channel	PASS
Middle	20	≥ 15 channel	PASS
High	20	≥ 15 channel	PASS

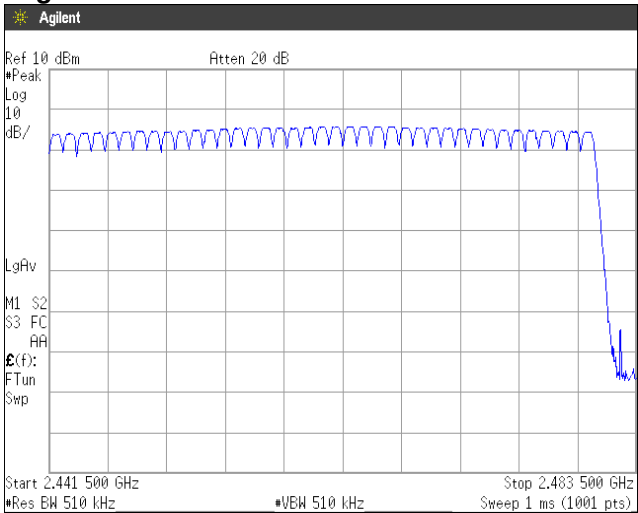
6.4 Trace data

[DH5]

Low

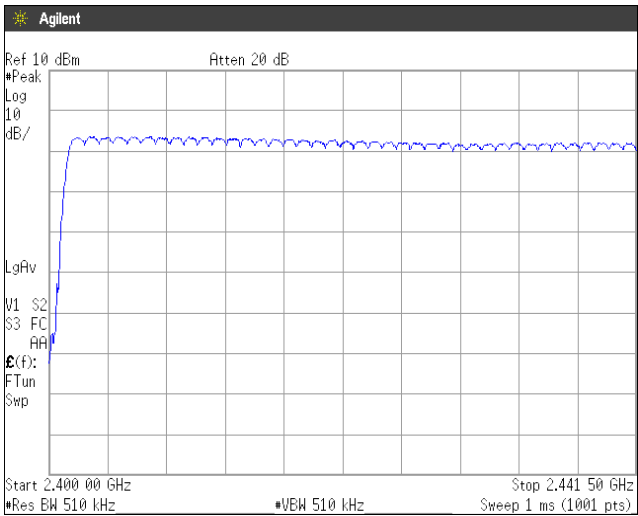


High

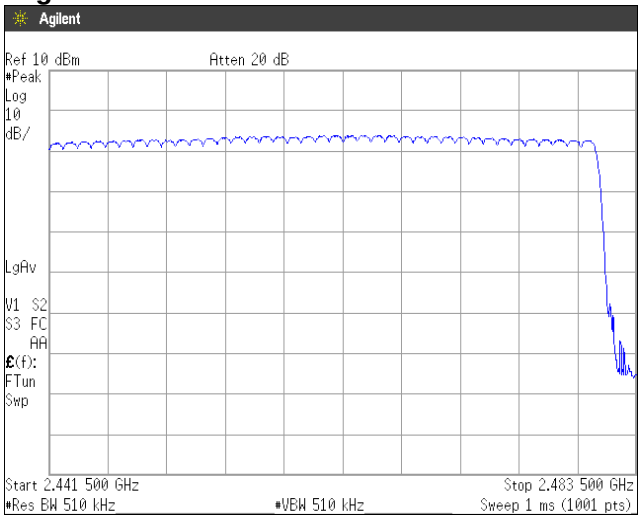


[3-DH5]

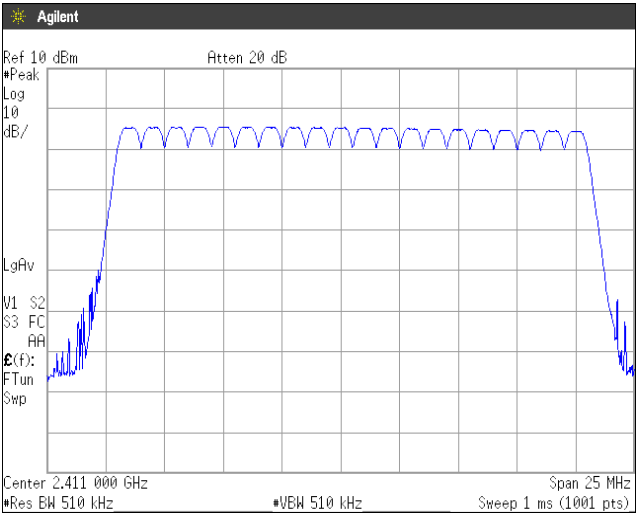
Low



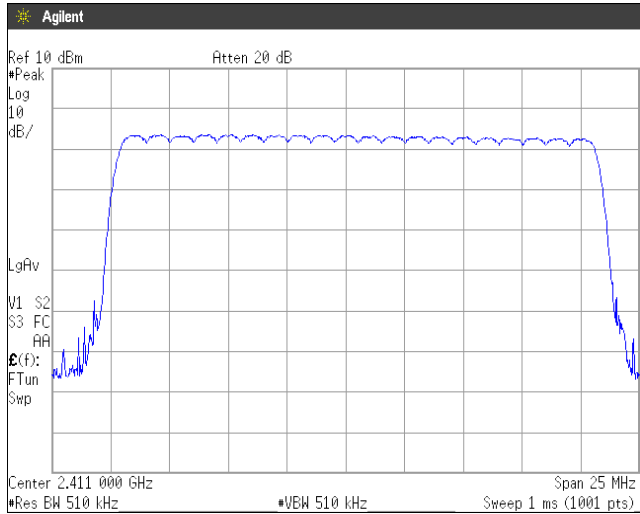
High



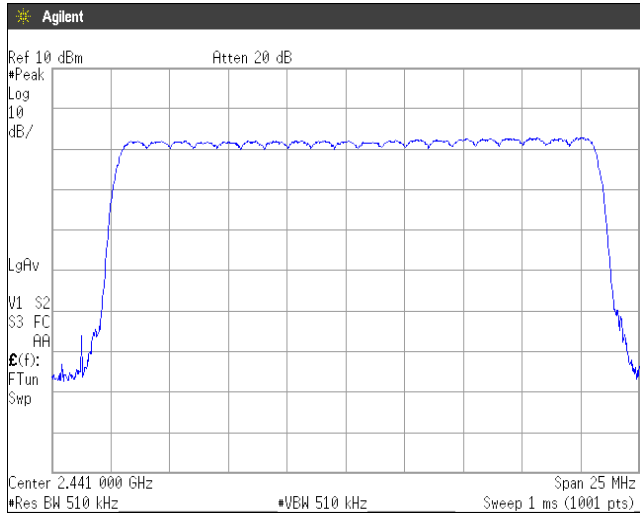
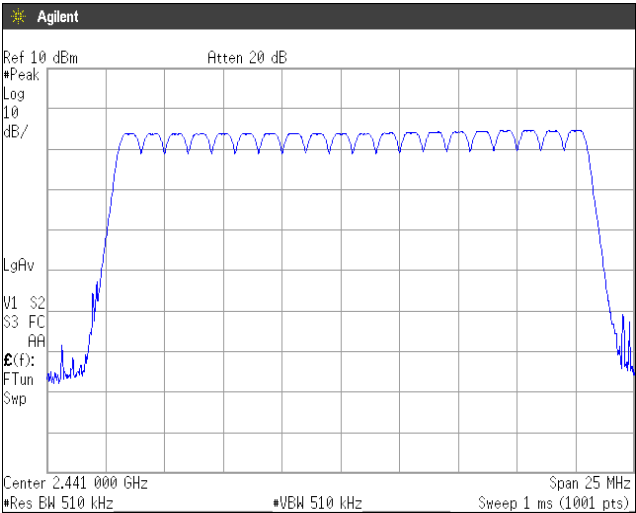
[DH5(AFH)]
Low



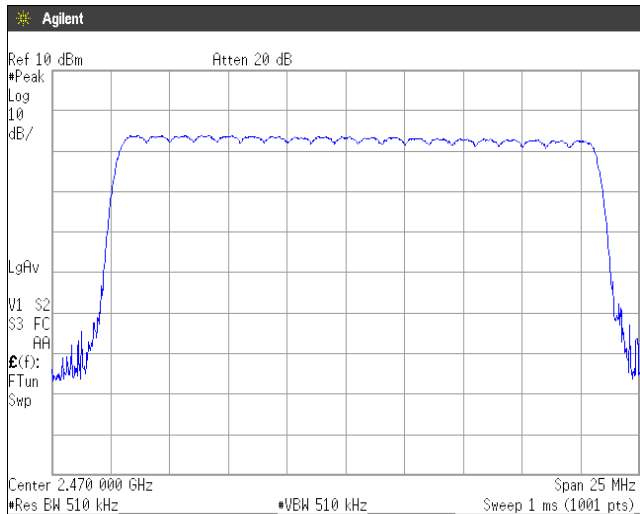
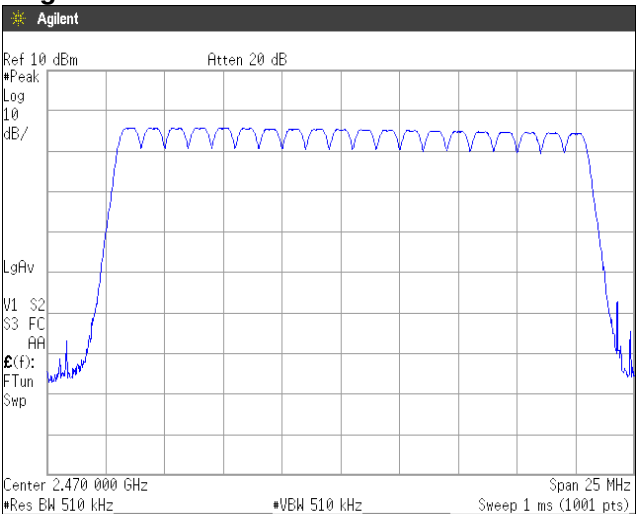
[3-DH5(AFH)]



Middle



High



7. Time of Occupancy (Dwell Time)

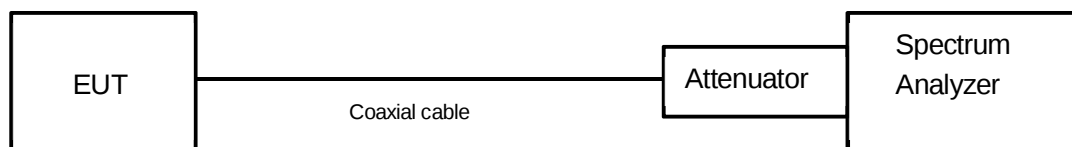
7.1 Measurement procedure [FCC 15.247(a)(1)(iii)]

The time occupancy of hopping channel is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- a) Span = Zero span, centered on a hopping channel.
- b) RBW $\geq$ 1MHz.
- c) VBW $\geq$ RBW.
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode=Single.

- Test configuration



7.2 Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

7.3 Measurement result

Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer : Chiaki Kanno

FHSS

Packet type	Channel	Frequency (MHz)	Dwell time (ms)	Occupancy time of 31.6 seconds (s)	Limit	Result
DH5	Low	2402.0	2.880	0.307	<0.4s	PASS
	Middle	2441.0	2.880	0.307	<0.4s	PASS
	High	2480.0	2.880	0.307	<0.4s	PASS
3-DH5	Low	2402.0	2.890	0.308	<0.4s	PASS
	Middle	2441.0	2.890	0.308	<0.4s	PASS
	High	2480.0	2.880	0.307	<0.4s	PASS

AFH

Packet type	Channel	Frequency (MHz)	Dwell time (ms)	Occupancy time of 8 seconds (s)	Limit	Result
DH5(AFH)	Low	2402.0	2.880	0.154	<0.4s	PASS
	Middle	2441.0	2.880	0.154	<0.4s	PASS
	High	2480.0	2.880	0.154	<0.4s	PASS
3-DH5(AFH)	Low	2402.0	2.890	0.154	<0.4s	PASS
	Middle	2441.0	2.890	0.154	<0.4s	PASS
	High	2480.0	2.880	0.154	<0.4s	PASS

FHSS

$DH5/3-DH5 = \text{Dwell time (ms)} \times 1600 / 6 / 79 \times 31.6$

AFH

$DH5/3-DH5 = \text{Dwell time (ms)} \times 1600 / 6 / 20 \times 8$

The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

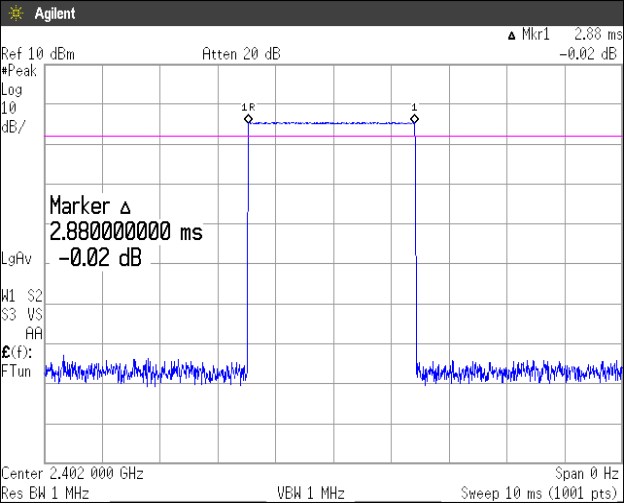
Calculation:

Occupancy time of 31.6 seconds* = time domain slot length x hop rate / number of hopper channel / 79 / x 31.6

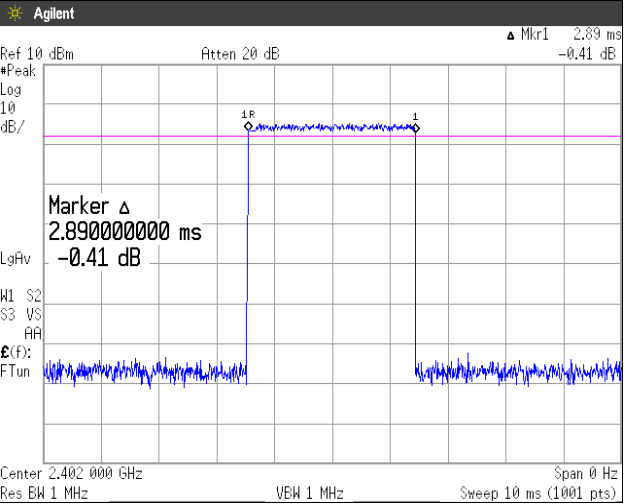
Ex.) for FHSS mode Channel Low, 3- DH5 = $2.880\text{ms} \times 1600 / 6 / 79 \times 31.6 = 307\text{ms}$

7.4 Trace data

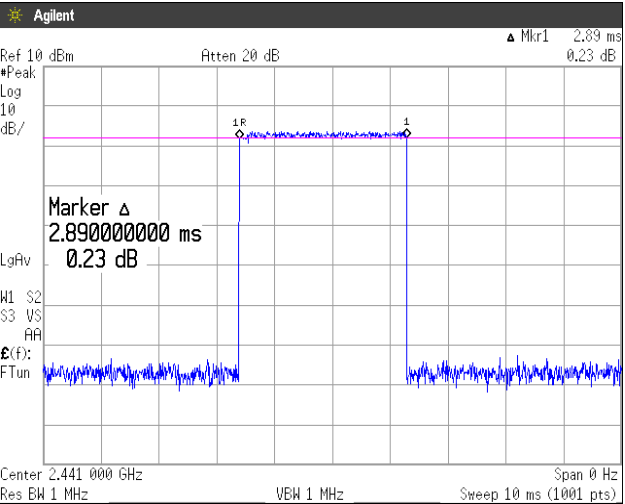
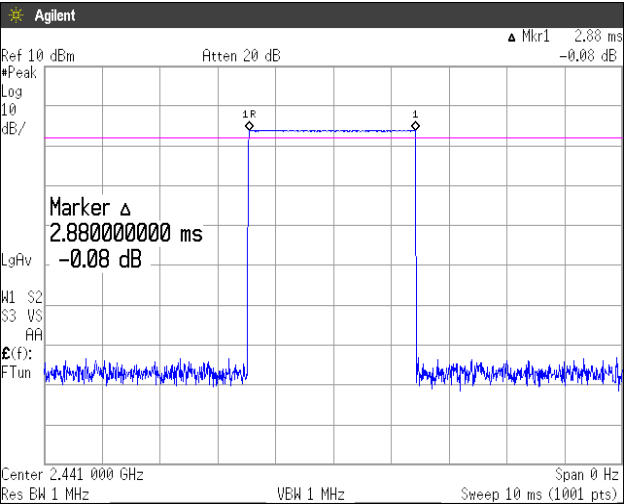
FHSS
[DH5]
Channel Low



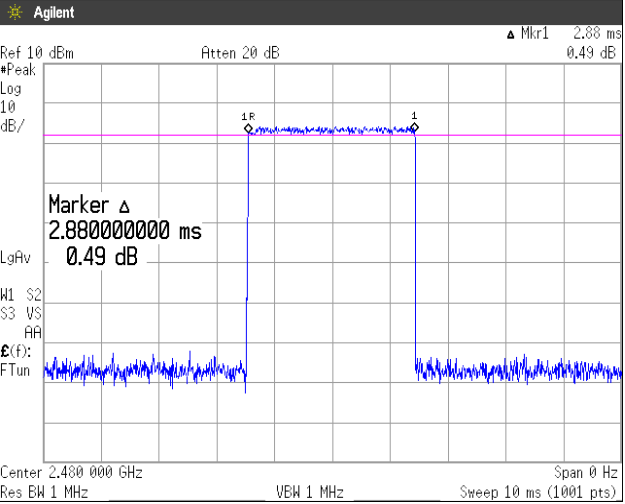
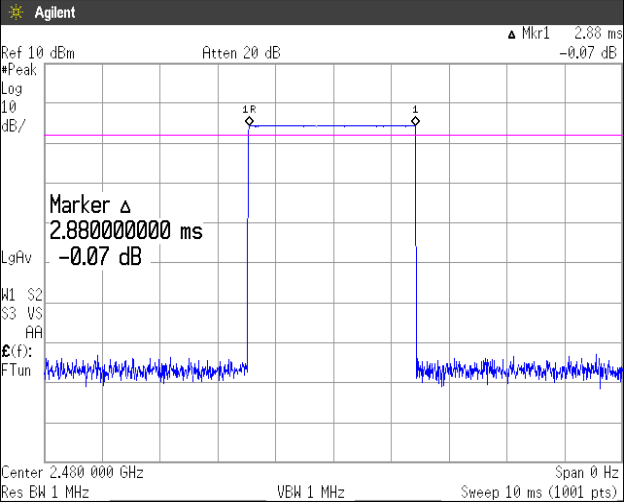
[3-DH5]



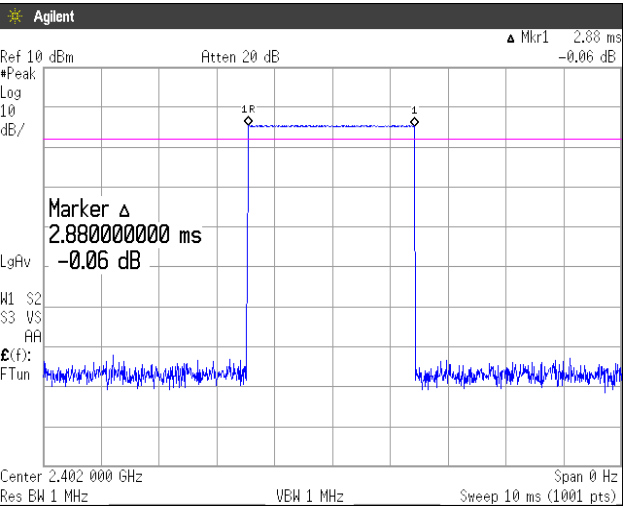
Channel Middle



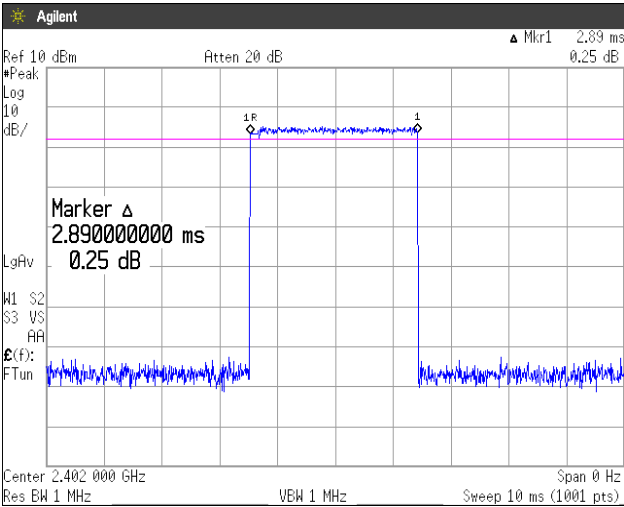
Channel High



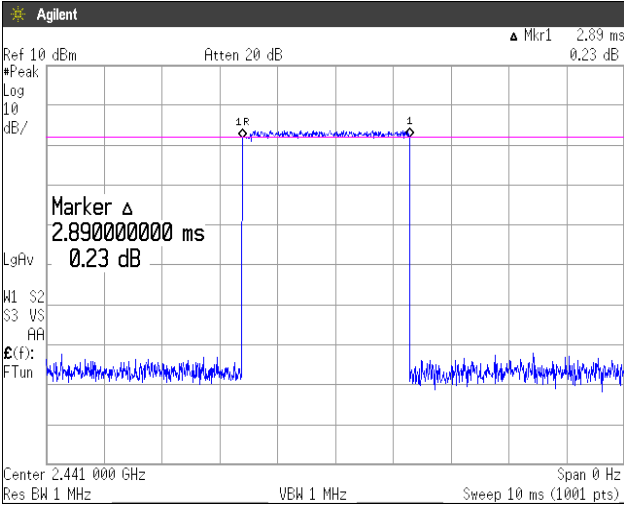
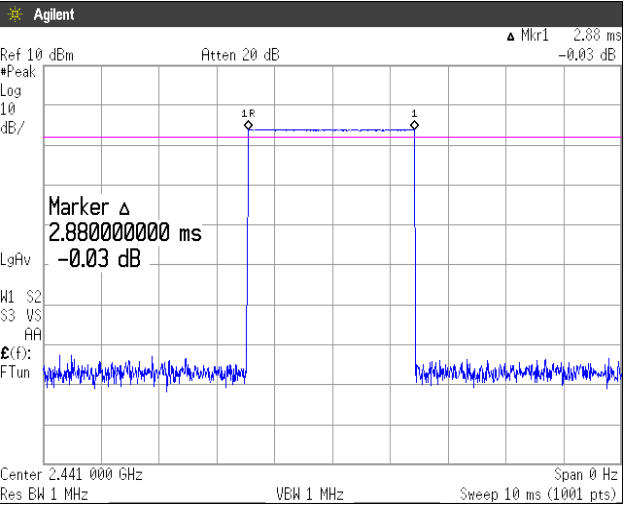
AFH
[DH5]
Channel Low



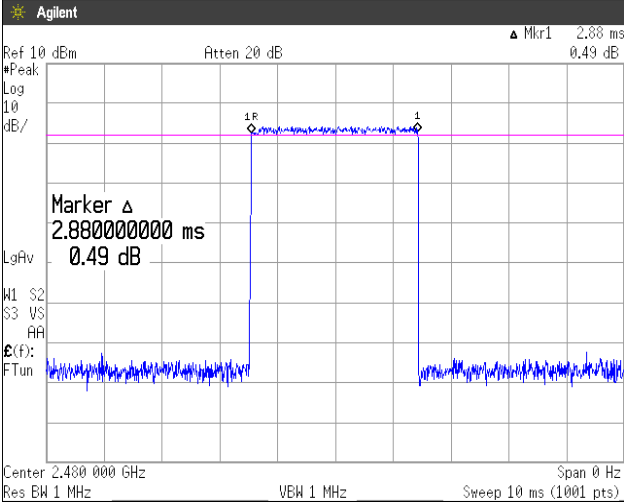
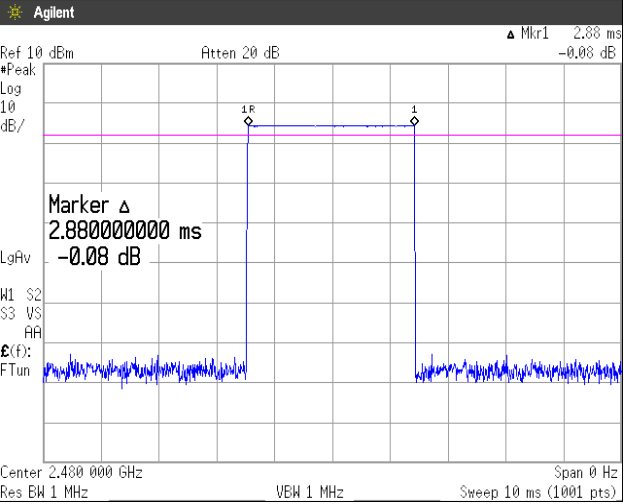
3-DH5]



Channel Middle



Channel High

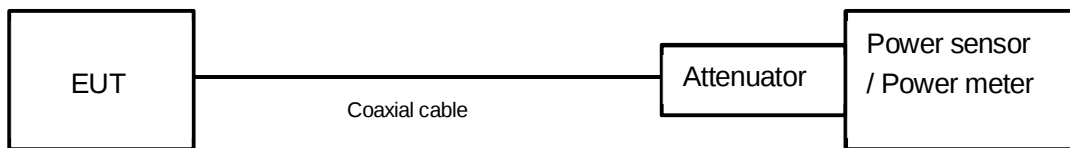


8. Maximum Peak Output Power

8.1 Measurement procedure [FCC 15.247(b)(1)]

The peak power is measured with a power sensor connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

- Test configuration



8.2 Limit

0.125W or less

8.3 Measurement result

Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer : Chiaki Kanno

Battery Full

Packet type	Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Peak Output Power (mW)	Limit (mW)	Result
DH5	Low	2402	-4.65	10.52	5.87	3.864	≤125	PASS
	Middle	2440	-6.03	10.52	4.49	2.812	≤125	PASS
	High	2480	-5.47	10.52	5.05	3.199	≤125	PASS
3-DH5	Low	2402	-4.19	10.52	6.33	4.295	≤125	PASS
	Middle	2440	-5.60	10.52	4.92	3.105	≤125	PASS
	High	2480	-5.03	10.52	5.49	3.540	≤125	PASS

Calculation;

$$\text{Reading (dBm)} + \text{Factor (dB)} = \text{Level (dBm)}$$

$$10\log P = \text{Level (dBm)}$$

$$P = 10^{(\text{Maximum Peak Output Power} / 10)} \text{ (mW)}$$

9. Band Edge Compliance of RF Conducted Emissions

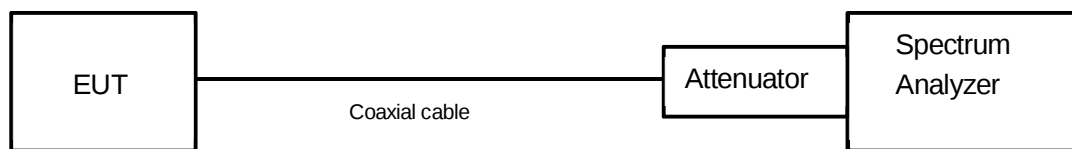
9.1 Measurement procedure [FCC 15.247(d)]

The Band Edge is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- a) Span = Arbitrary setting. (Setting suitable for measurement.)
- b) RBW $\geq 1\%$ of the span
- c) VBW $\geq$ RBW
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



9.2 Limit

In any 100kHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

9.3 Measurement result

Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer : Chiaki Kanno

[Hopping]

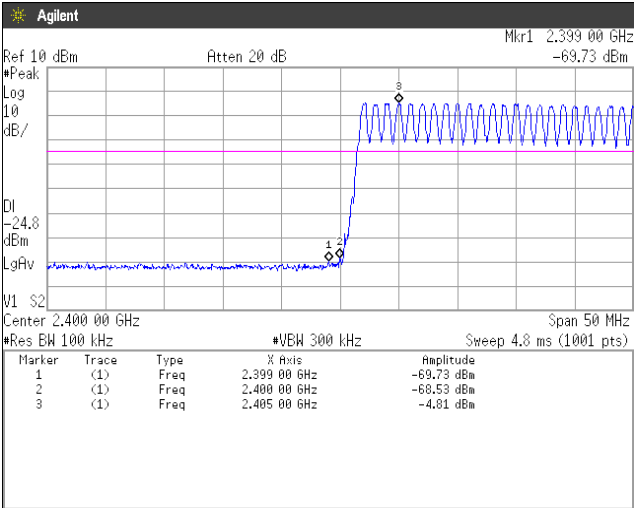
Packet Type	Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
DH5	Low	2402	-4.81	2400.00	-68.53	63.72	At least 20dB below from peak of RF	PASS
	High	2480	-4.63	2496.30	-70.27	65.64		PASS
3-DH5	Low	2402	-6.53	2399.95	-65.29	58.76		PASS
	High	2480	-6.24	2501.05	-70.21	63.97		PASS

[No hopping]

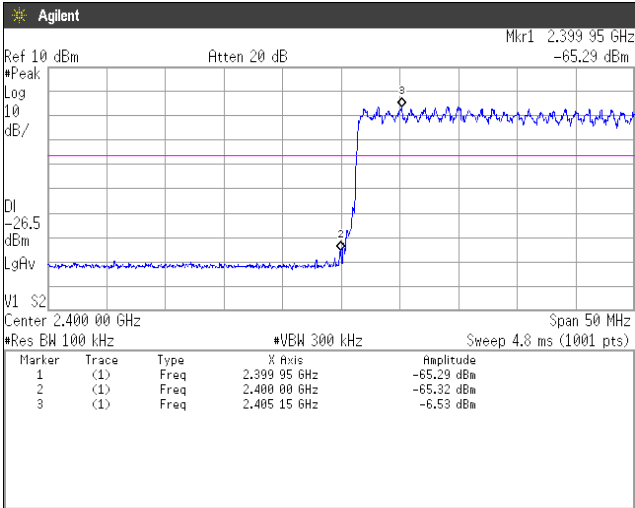
Packet Type	Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
DH5	Low	2402	-4.65	2400.00	-62.06	57.41	At least 20dB below from peak of RF	PASS
	High	2480	-5.59	2483.90	-69.98	64.39		PASS
3-DH5	Low	2402	-6.73	2400.00	-63.77	57.04		PASS
	High	2480	-7.56	2484.05	-69.67	62.11		PASS

9.4 Trace data

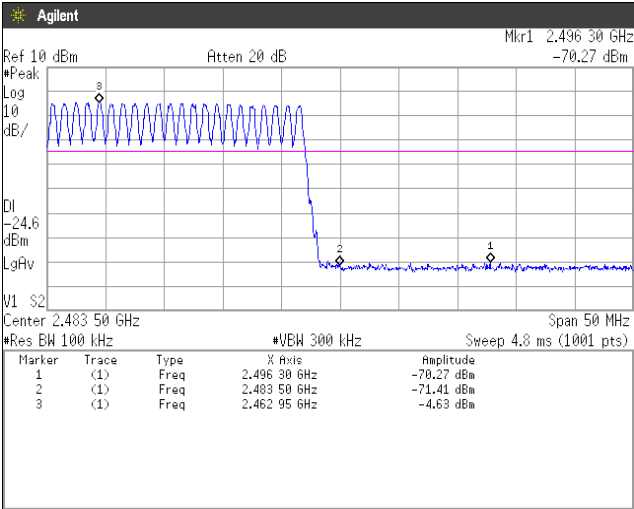
[Hopping]
Channel Low
DH5



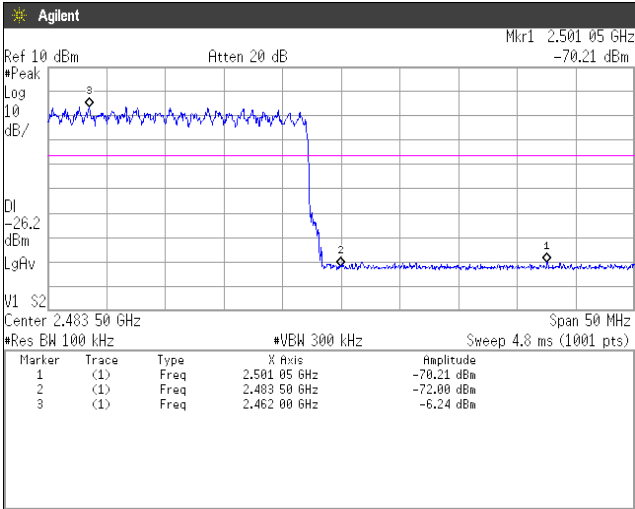
3-DH5



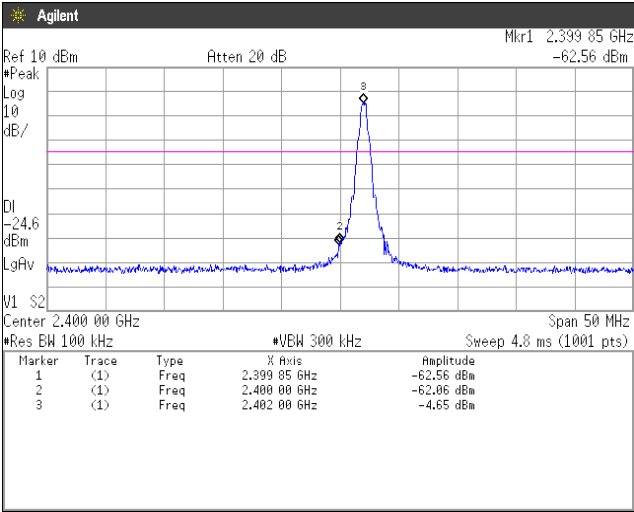
Channel High
DH5



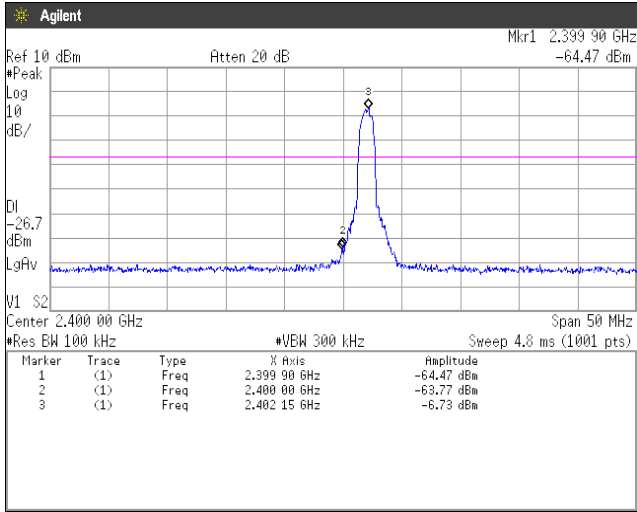
3-DH5



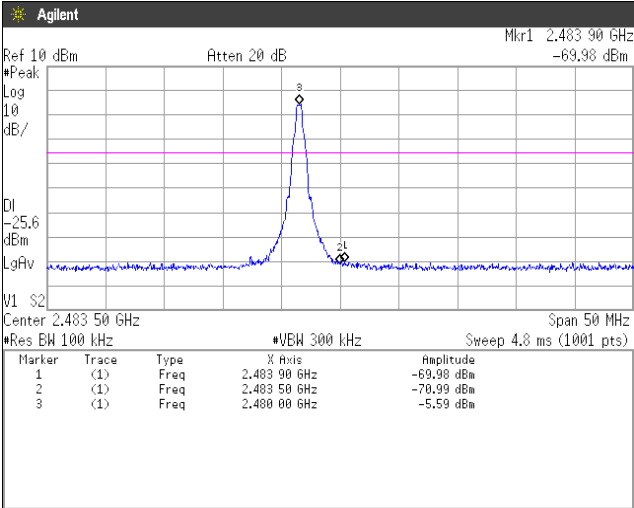
[No hopping]
Channel Low
DH5



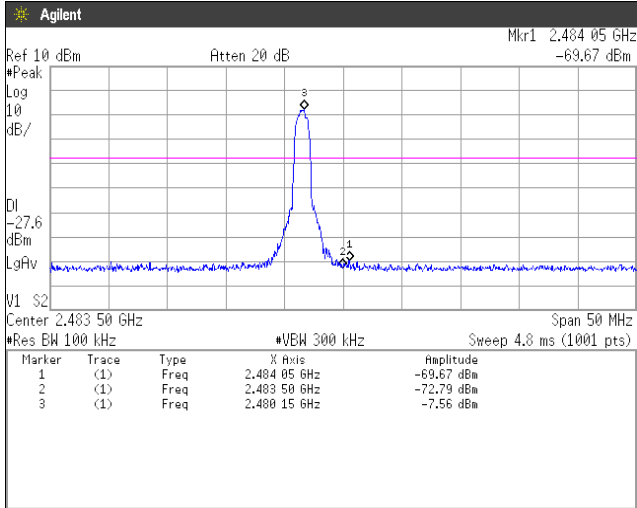
3-DH5



Channel High
DH5



3-DH5



10. Spurious emissions - Conducted -

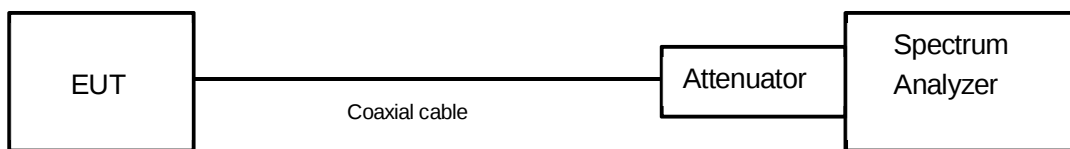
10.1 Measurement procedure [FCC 15.247(d)]

The spurious emissions (Conducted) are measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- a) Span = wide enough to fully capture the emission being measured.
- b) RBW = 100 kHz.
- c) VBW $\geq$ RBW.
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



10.2 Limit

In any 100kHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

10.3 Measurement result

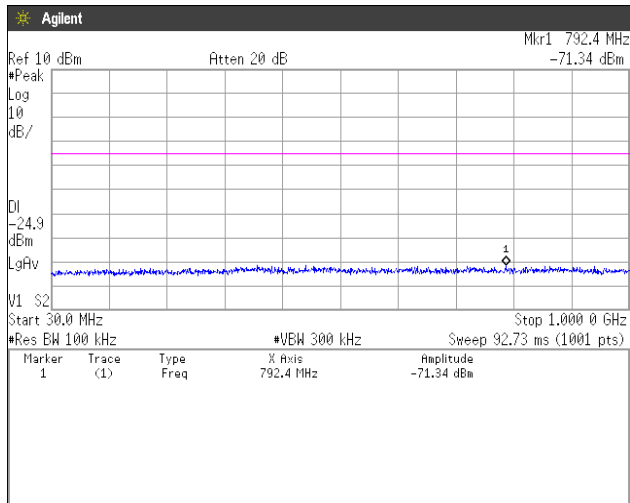
Date : December 29, 2017
 Temperature : 21.9 [°C]
 Humidity : 41.7 [%]
 Test place : Shielded room No.4

Test engineer :
 Chiaki Kanno

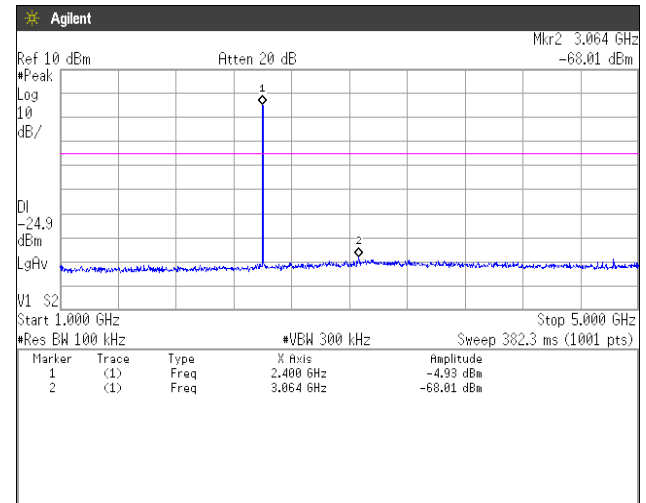
Channel	Frequency [MHz]	Limit [dB]	Results Chart	Result
Low	2402	At least 20dB below from peak of RF	See the trace Data	PASS
Middle	2441	At least 20dB below from peak of RF	See the trace Data	PASS
High	2480	At least 20dB below from peak of RF	See the trace Data	PASS

10.4 Trace data

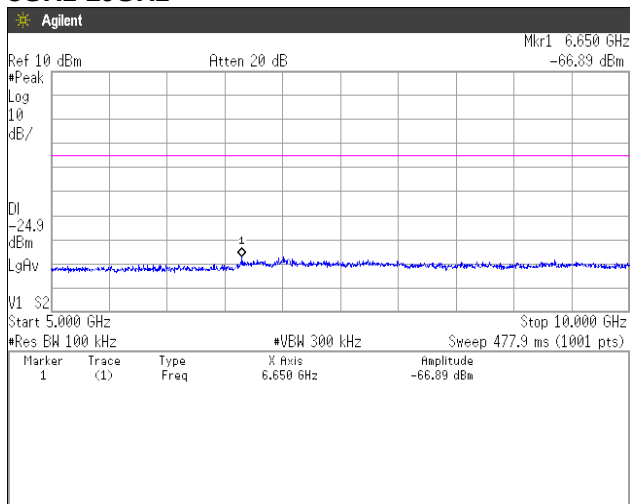
[DH5] Channel Low 30MHz-1GHz



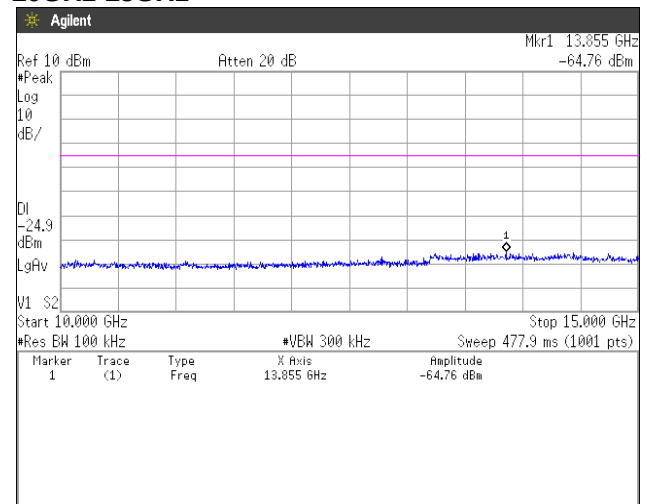
1GHz-5GHz



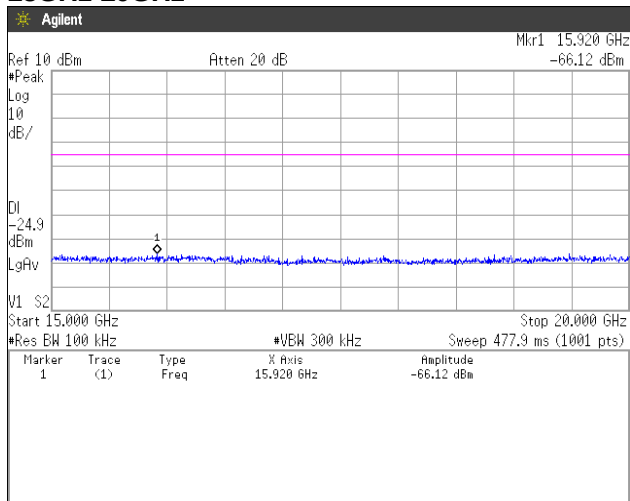
5GHz-10GHz



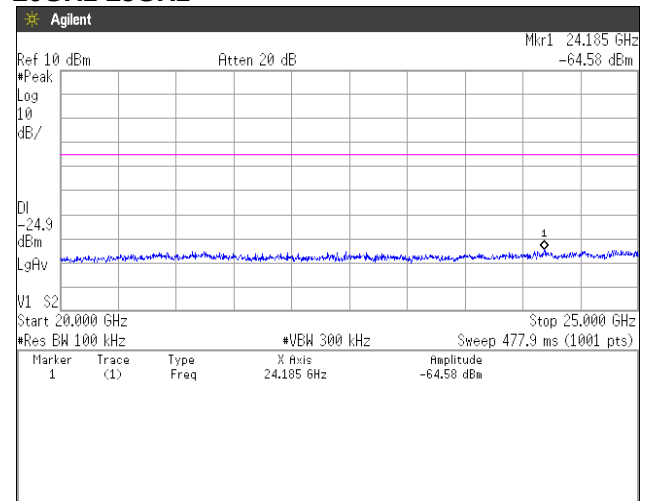
10GHz-15GHz



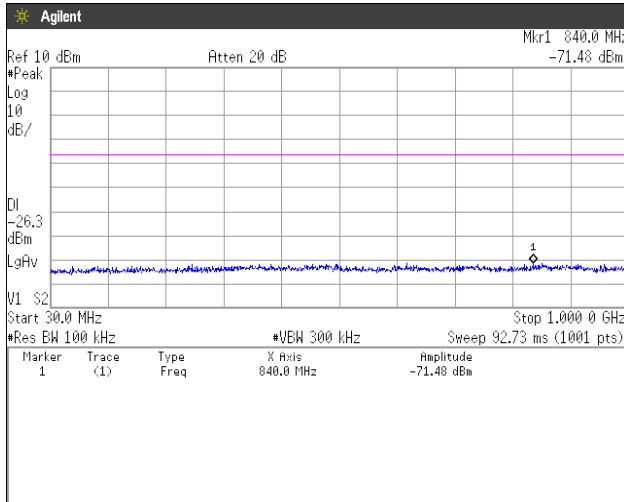
15GHz-20GHz



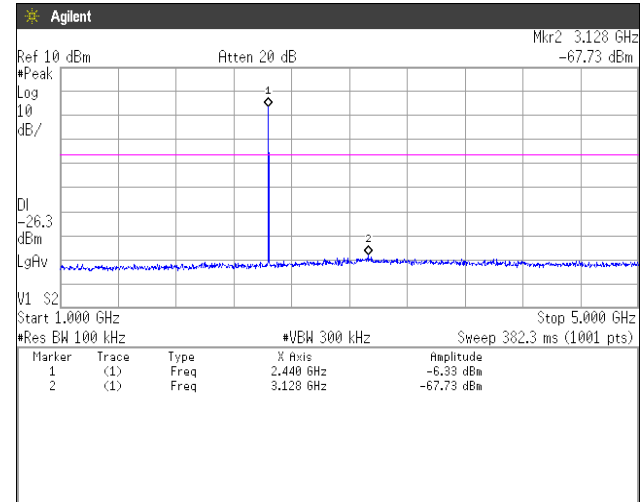
20GHz-25GHz



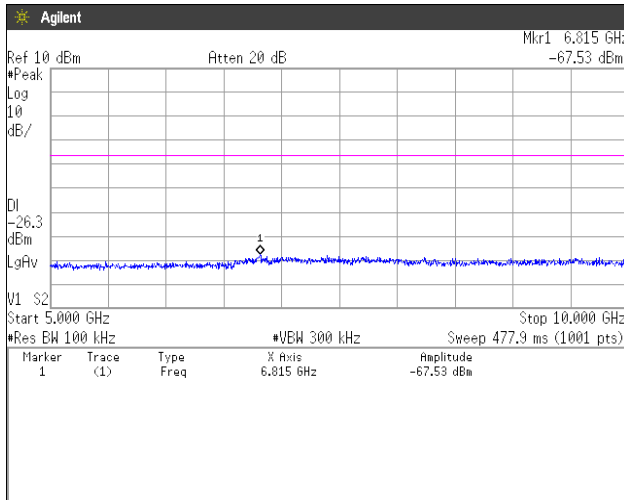
Channel Middle 30MHz-1GHz



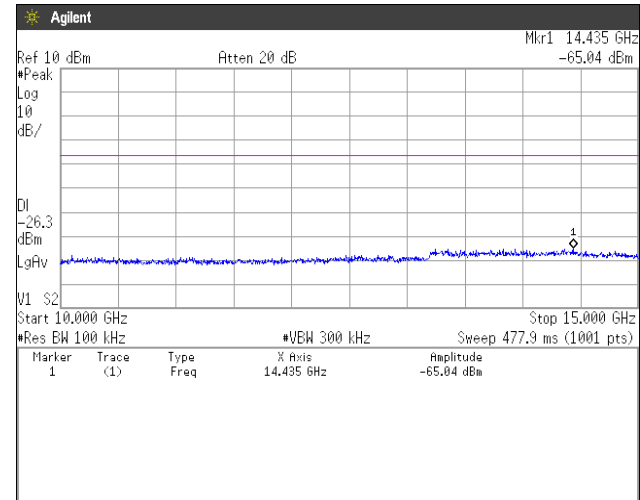
1GHz-5GHz



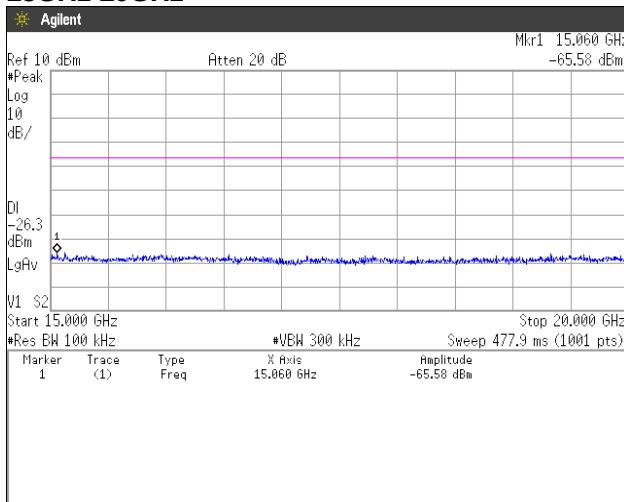
5GHz-10GHz



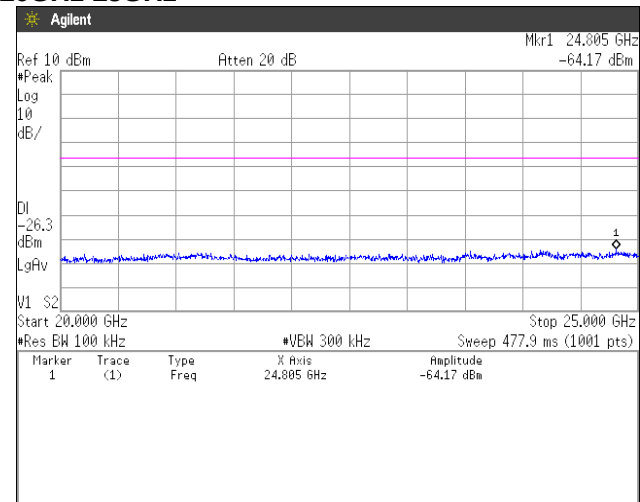
10GHz-15GHz



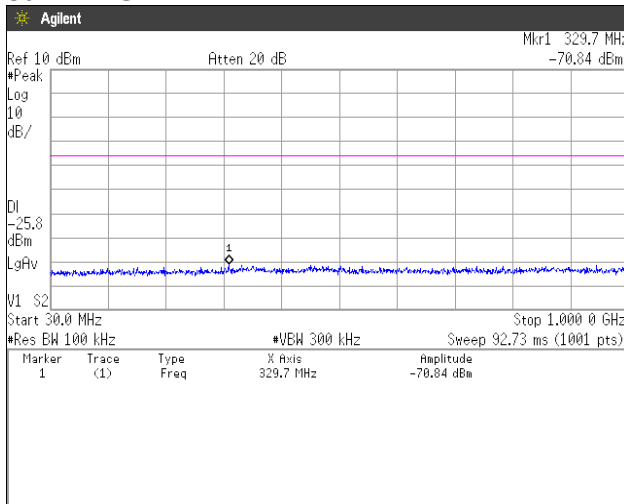
15GHz-20GHz



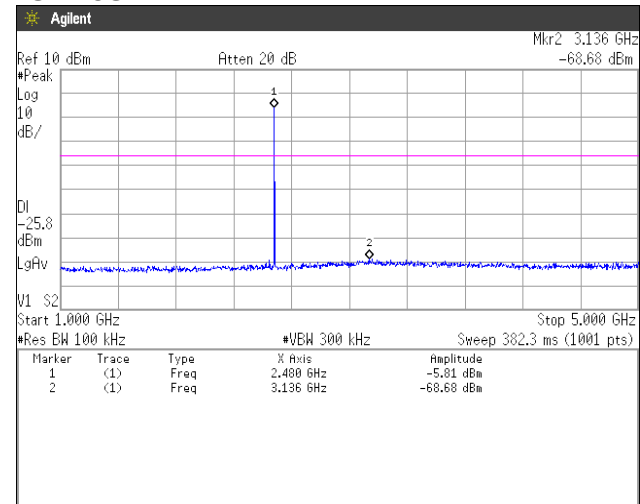
20GHz-25GHz



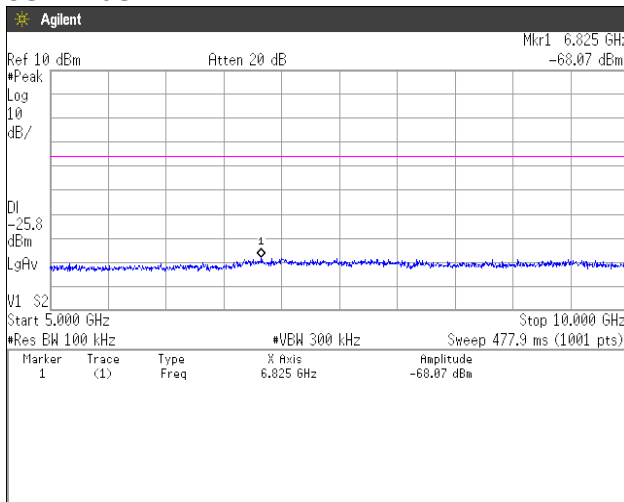
Channel High 30MHz-1GHz



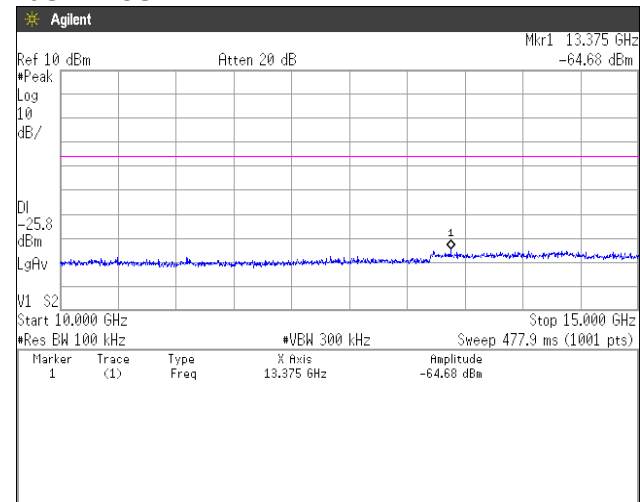
1GHz-5GHz



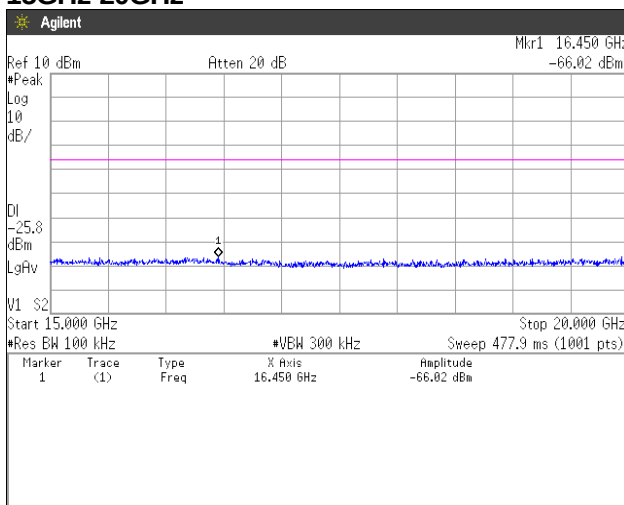
5GHz-10GHz



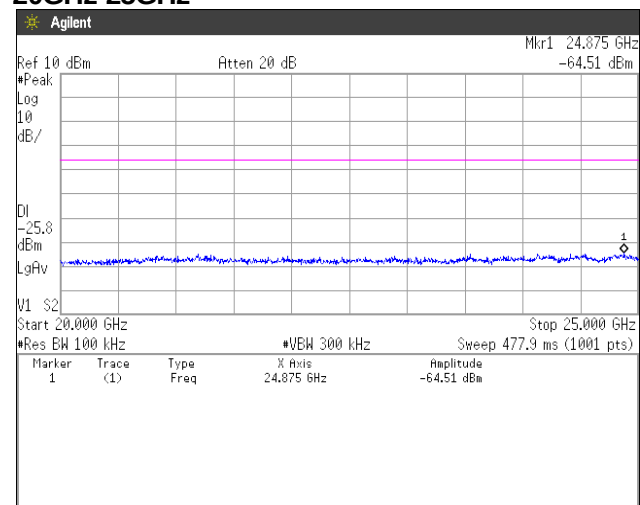
10GHz-15GHz



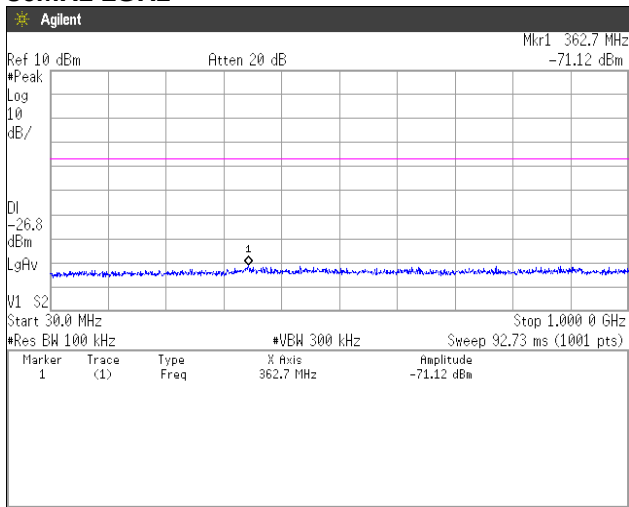
15GHz-20GHz



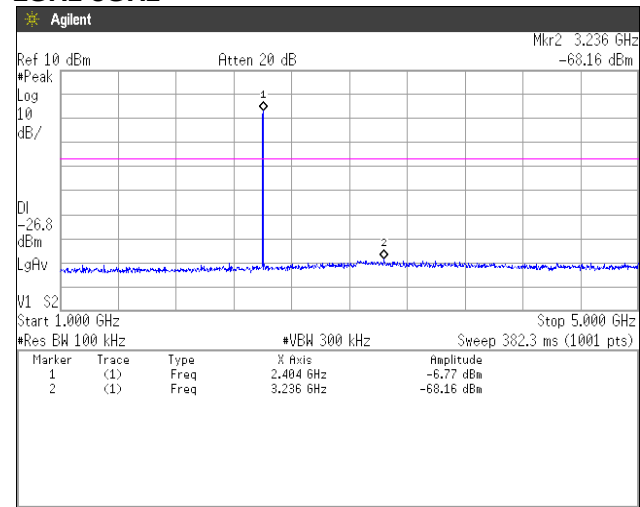
20GHz-25GHz



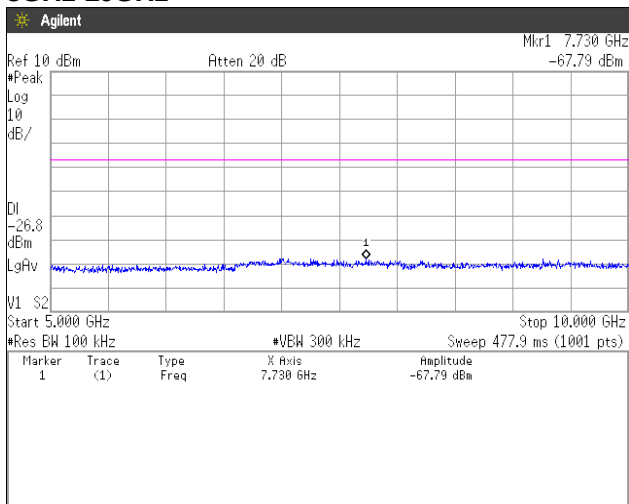
[3-DH5] Channel Low 30MHz-1GHz



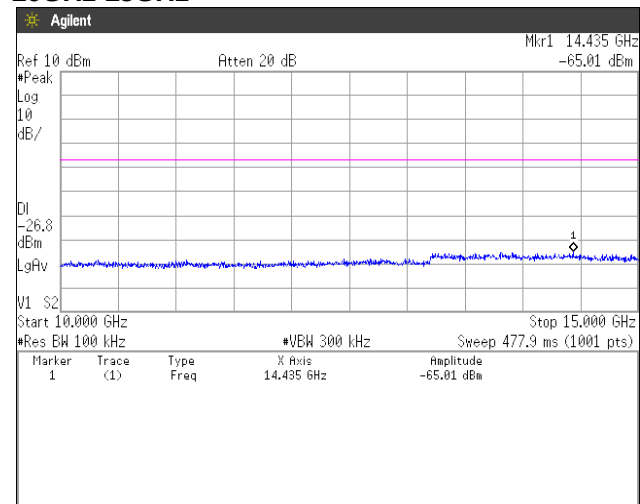
1GHz-5GHz



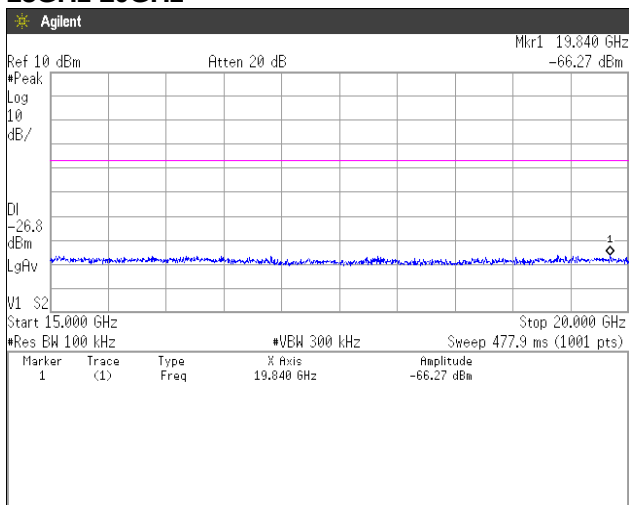
5GHz-10GHz



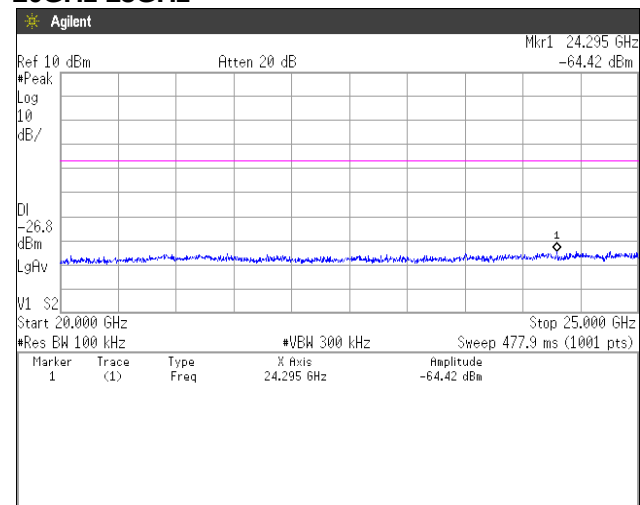
10GHz-15GHz



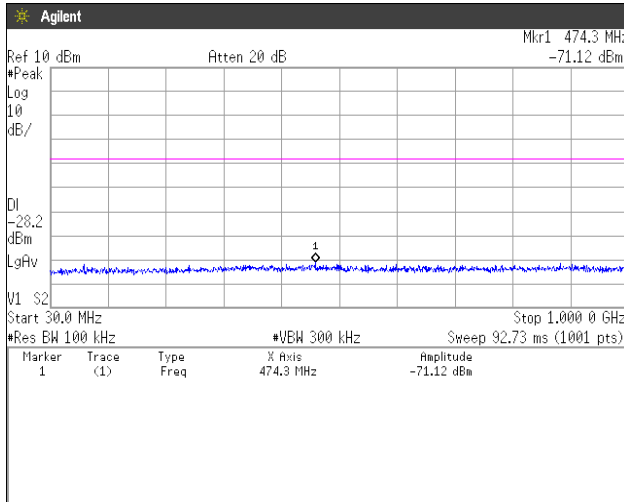
15GHz-20GHz



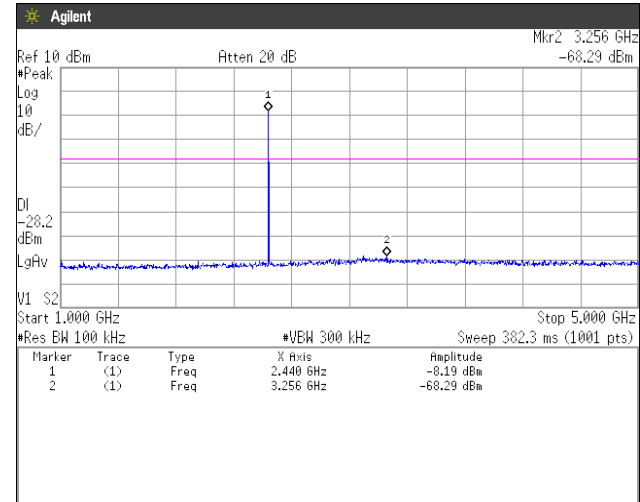
20GHz-25GHz



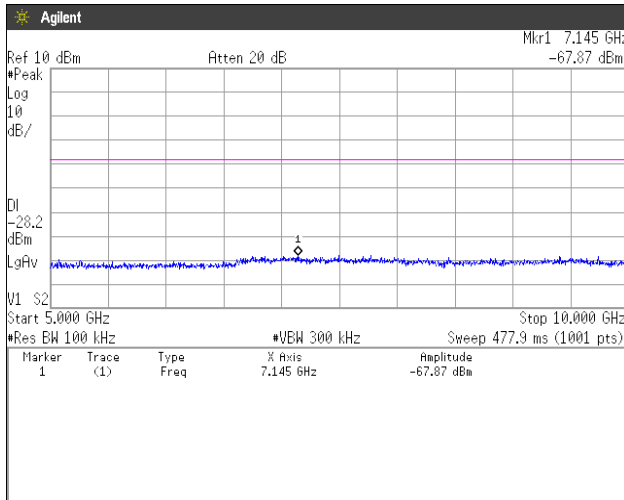
Channel Middle 30MHz-1GHz



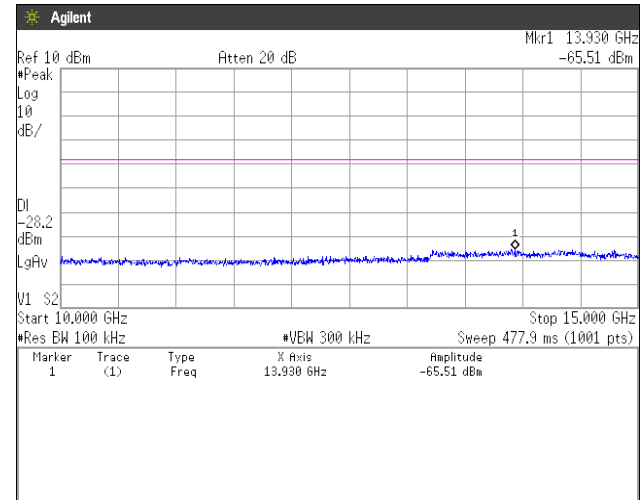
1GHz-5GHz



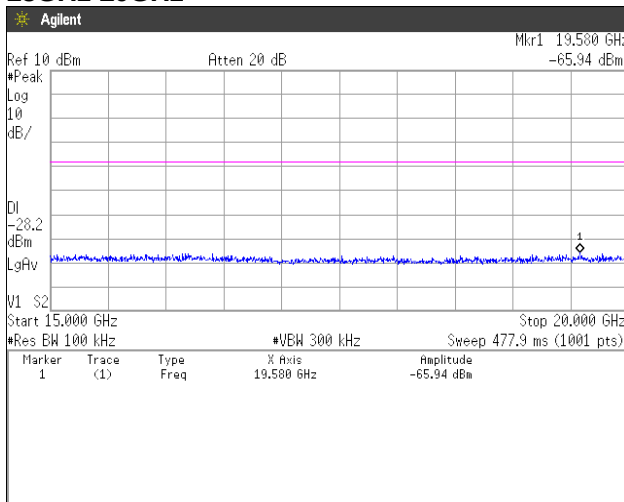
5GHz-10GHz



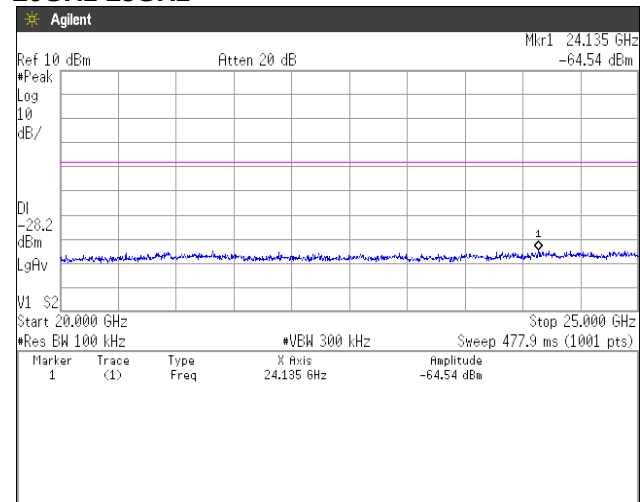
10GHz-15GHz



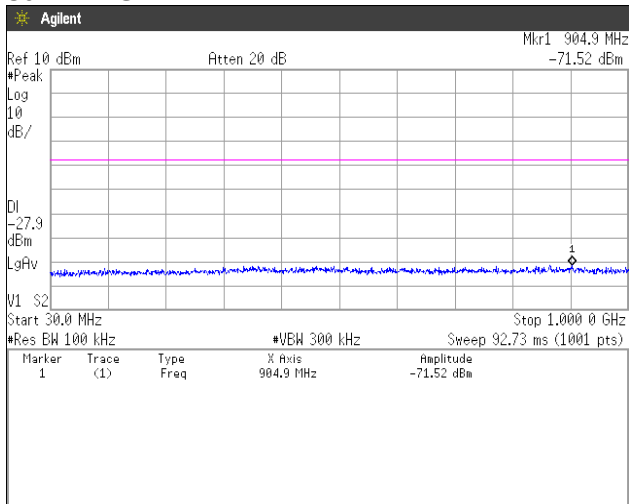
15GHz-20GHz



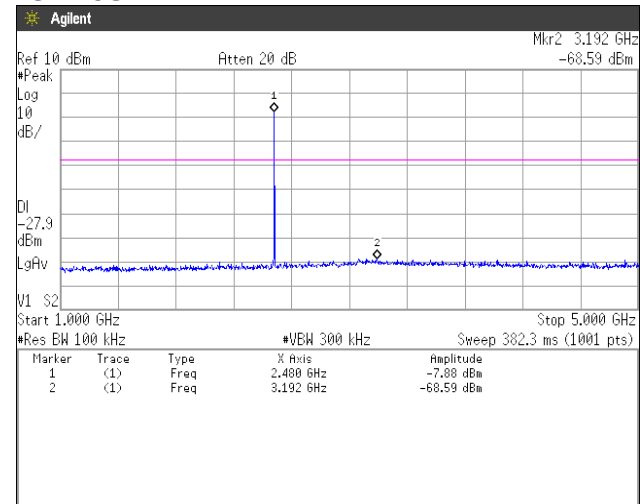
20GHz-25GHz



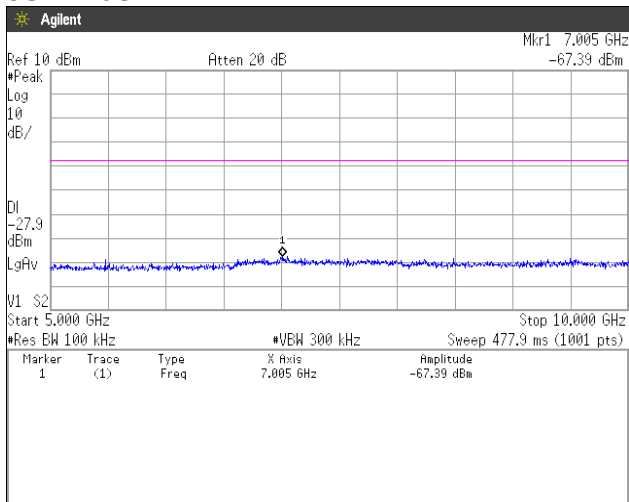
Channel High 30MHz-1GHz



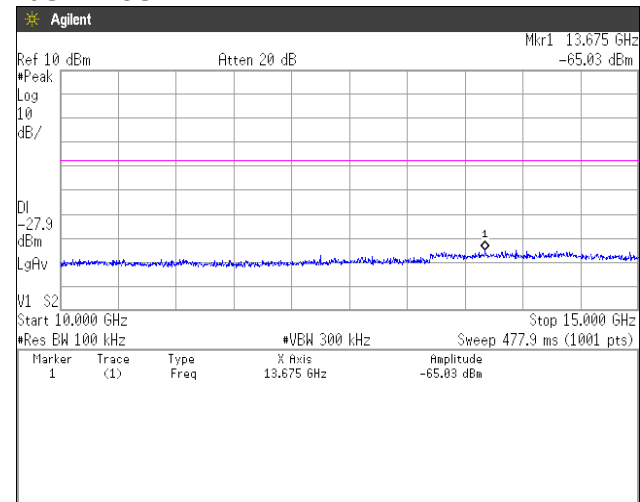
1GHz-5GHz



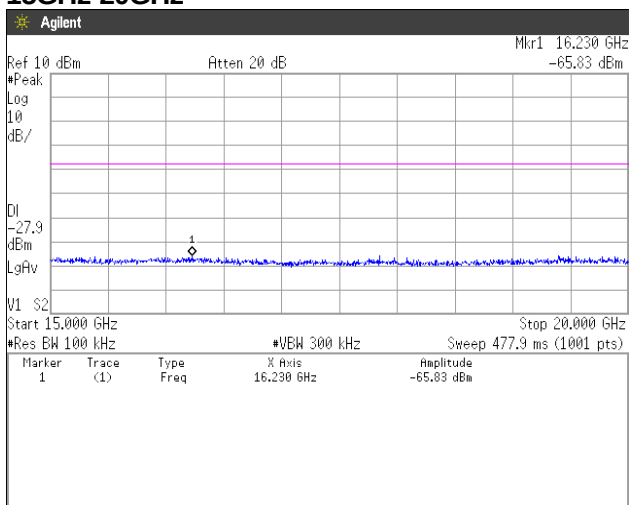
5GHz-10GHz



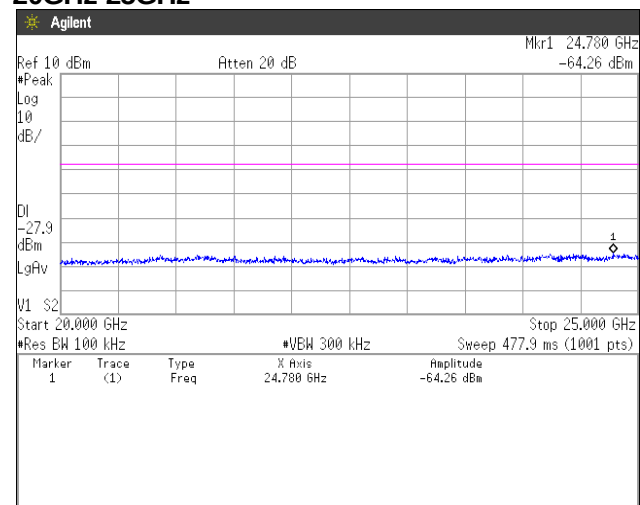
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



11. Spurious Emissions - Radiated -

11.1 Measurement procedure

[FCC 15.247(d), 15.205, 15.209]

Test was applied by following conditions.

Test method	: ANSI C63.10
Frequency range	: 9kHz to 25GHz
Test place	: 3m Semi-anechoic chamber
EUT was placed on	: Styrofoam table / (W)1.0m × (D)1.0m × (H)0.8m (below 1GHz) Styrofoam table / (W)0.6m × (D)0.6m × (H)1.5m (above 1GHz)
Antenna distance	: 3m
Test receiver setting	Below 1GHz
- Detector	: Average (9kHz-90kHz, 110kHz-490kHz), Quasi-peak
- Bandwidth	: 200Hz, 120kHz
Spectrum analyzer setting	Above 1GHz
- Peak	: RBW=1MHz, VBW=3MHz, Span=0Hz, Sweep time = auto-couple
- Average	: RBW=1MHz, VBW=1kHz, Span=0Hz, Sweep time = auto-couple Display mode=Linear

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	1/T _{on} (kHz)	Determined VBW Setting
Bluetooth 4.2 EDR	76.93	2885	865	0.347	1kHz

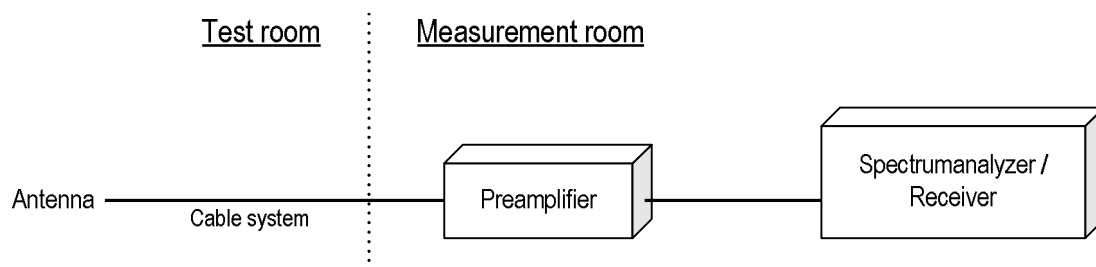
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.

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 (Loop antenna, Biconical antenna, Log periodic antenna, Double ridged guide antenna and Broad-band horn 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. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop antenna is 1m above the ground plane.

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



11.2 Calculation method

[9kHz to 150kHz]

Emission level = Reading + (Ant factor + Cable system loss)

Margin = Limit – Emission level

[150kHz to 25GHz]

Emission level = Reading + (Ant factor + Cable system loss - Amp. Gain)

Margin = Limit – Emission level

Example:

Limit @ 4804.0MHz : 74.0dBuV/m (Peak Limit)

S.A Reading = 49.0dBuV Cable system loss = 8.3dB

Result = 49.0 + 8.3 = 57.3dBuV/m

Margin = 74.0 - 57.3 = 16.7dB

11.3 Limit

Frequency [MHz]	Field strength		Distance [m]
	[uV/m]	[dBuV/m]	
0.009-0.490	2400 / F [kHz]	20logE [uV/m]	300
0.490-1.705	24000 / F [kHz]	20logE [uV/m]	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition modulation.

11.4 Test data

Date : December 27~28, 2017
Temperature : 20.5 [°C]
Humidity : 25.3 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Taiki Watanabe

Date : January 9, 2018
Temperature : 20.1 [°C]
Humidity : 23.7 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Tadahiro Seino

Date : January 10, 2018
Temperature : 20.3 [°C]
Humidity : 24.9 [%]
Test place : 3m Semi-anechoic chamber

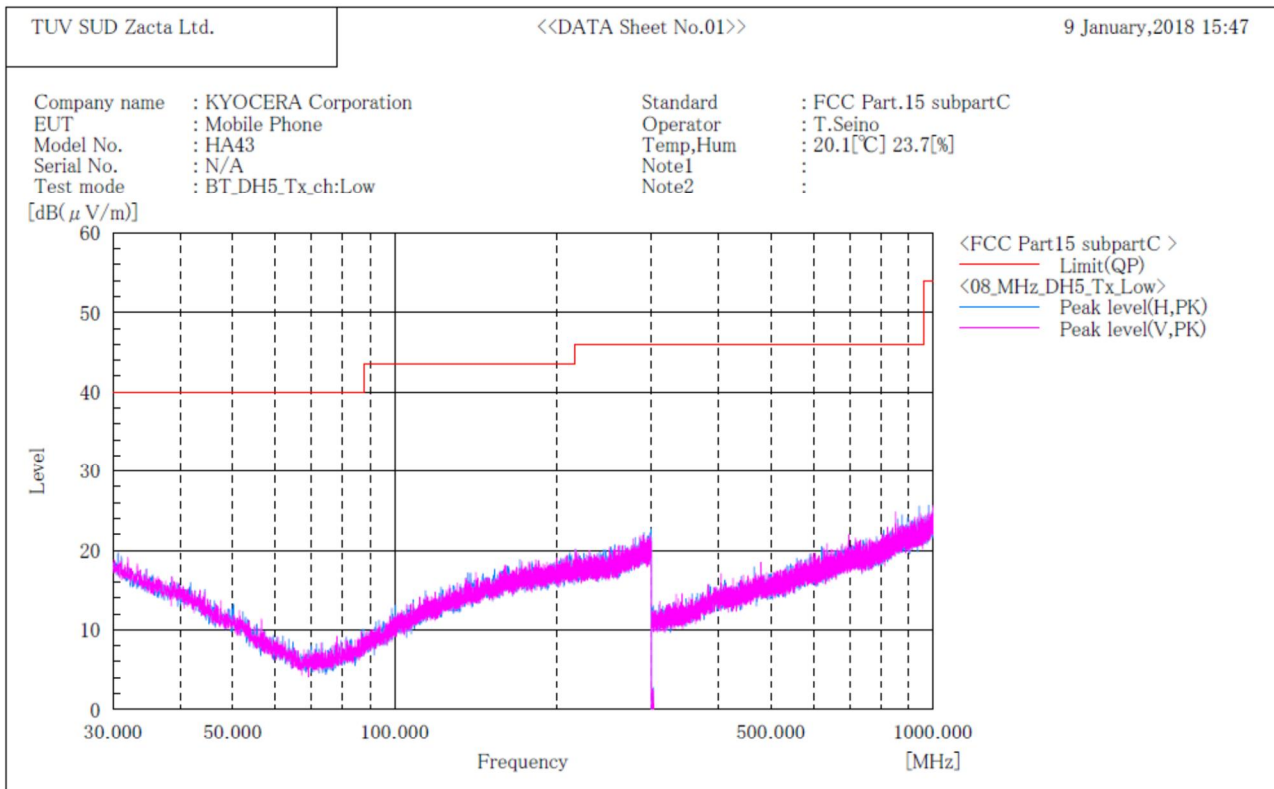
Test engineer : Tadahiro Seino

11.4.1 Transmission mode

[DH5]

Channel Low
BELOW 1GHz

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

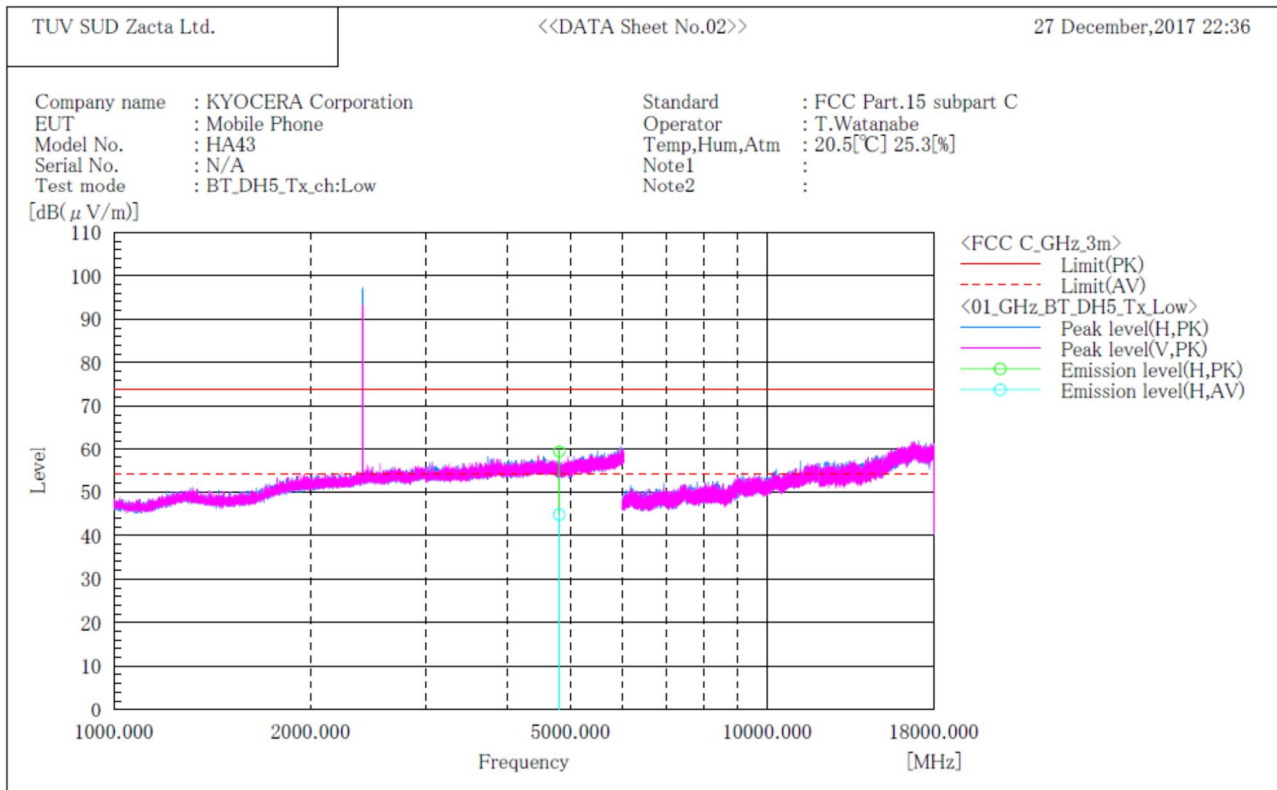
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.



Zacta

**[DH5]
Channel Low
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

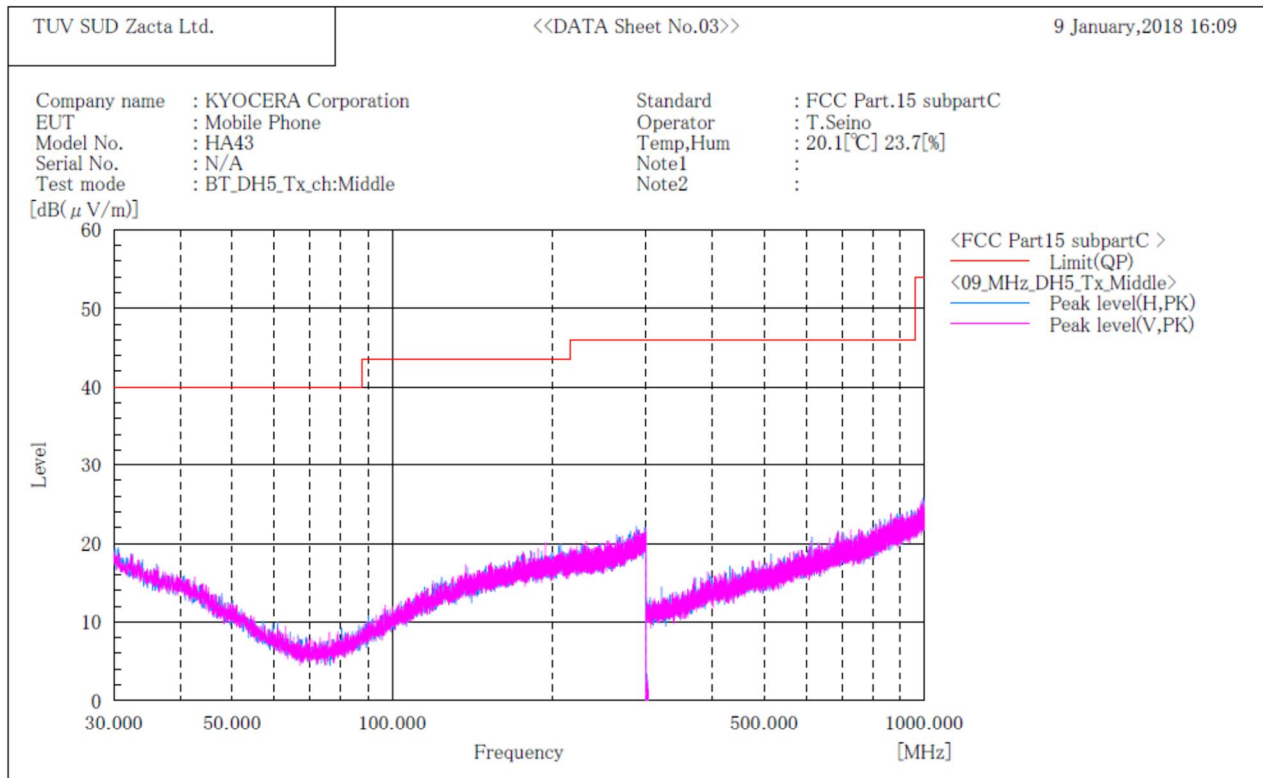
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4804.000	H	50.2	35.6	9.2	59.4	44.8	74.0	54.0	14.6	9.2	128.0	133.0	

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

**[DH5]
Channel Middle
BELOW 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

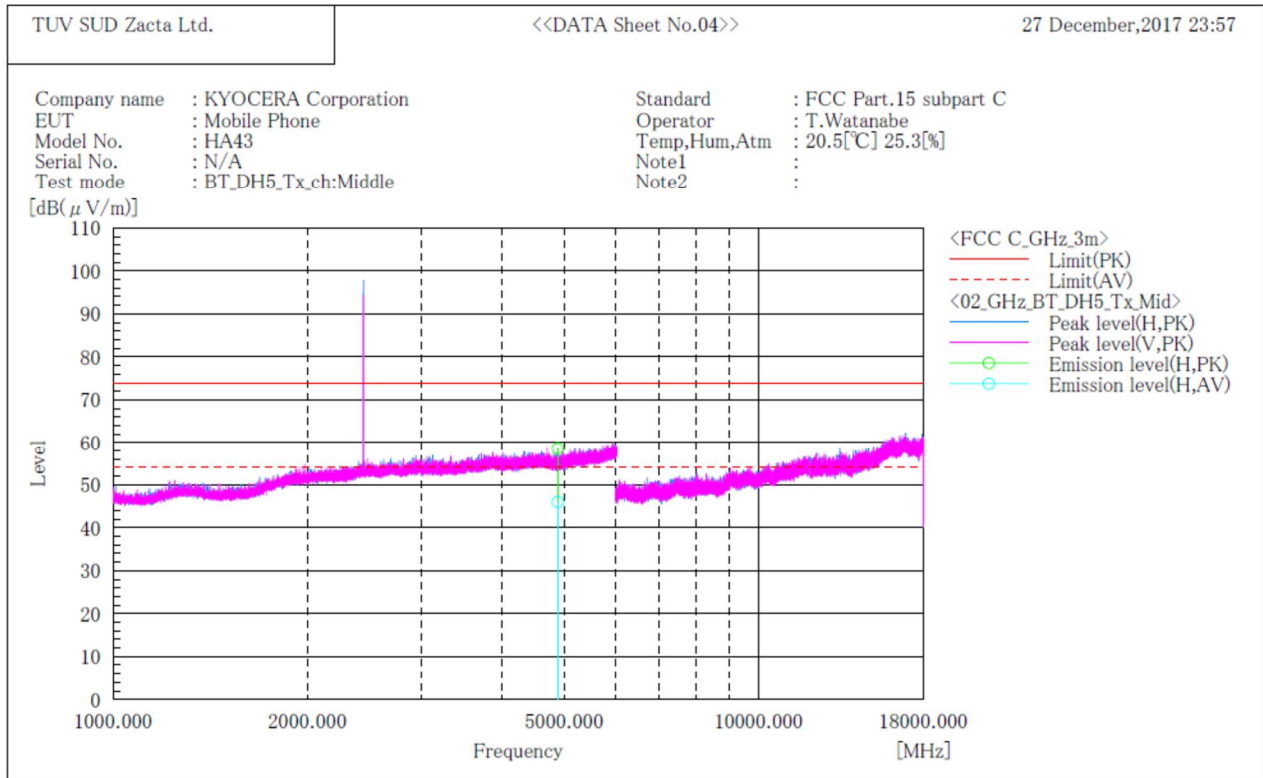
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.

**[DH5]
Channel Middle
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

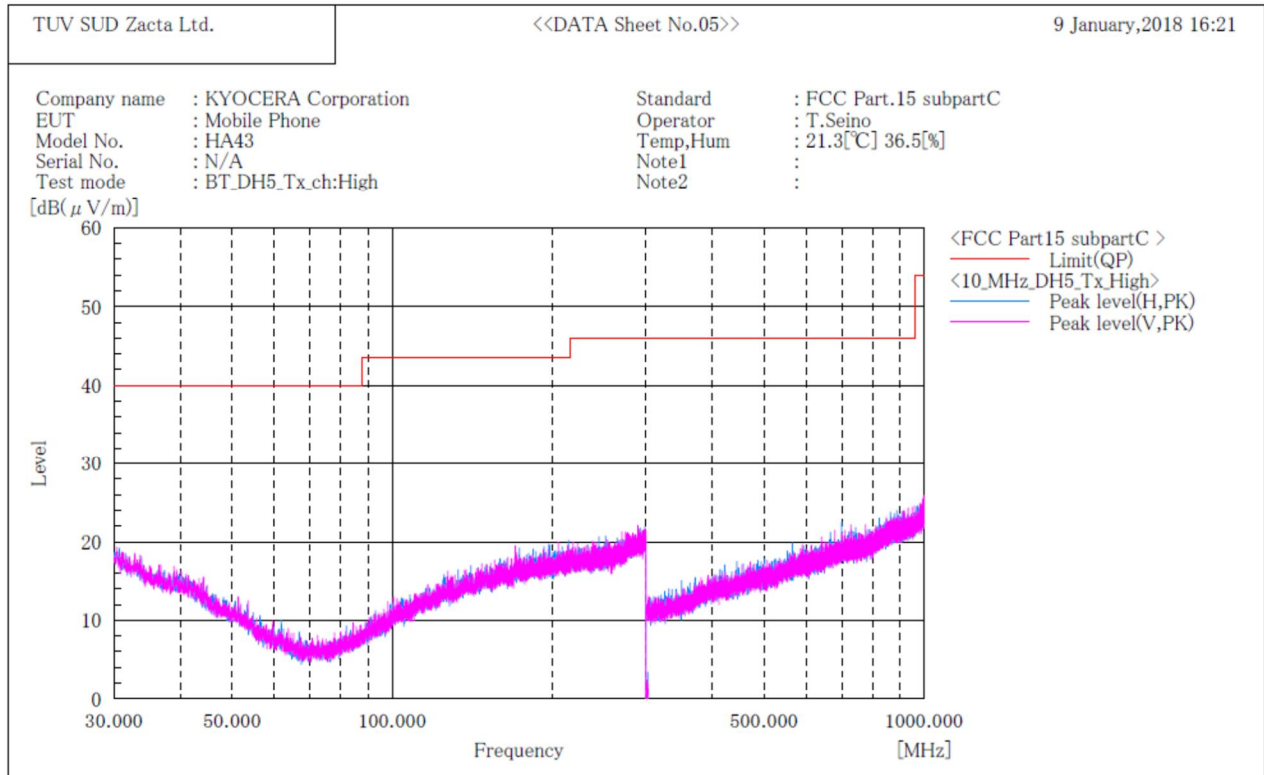
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c. f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4882.000	H	49.2	36.6	9.4	58.6	46.0	74.0	54.0	15.4	8.0	134.0	165.0	

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

**[DH5]
Channel High
BELOW 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

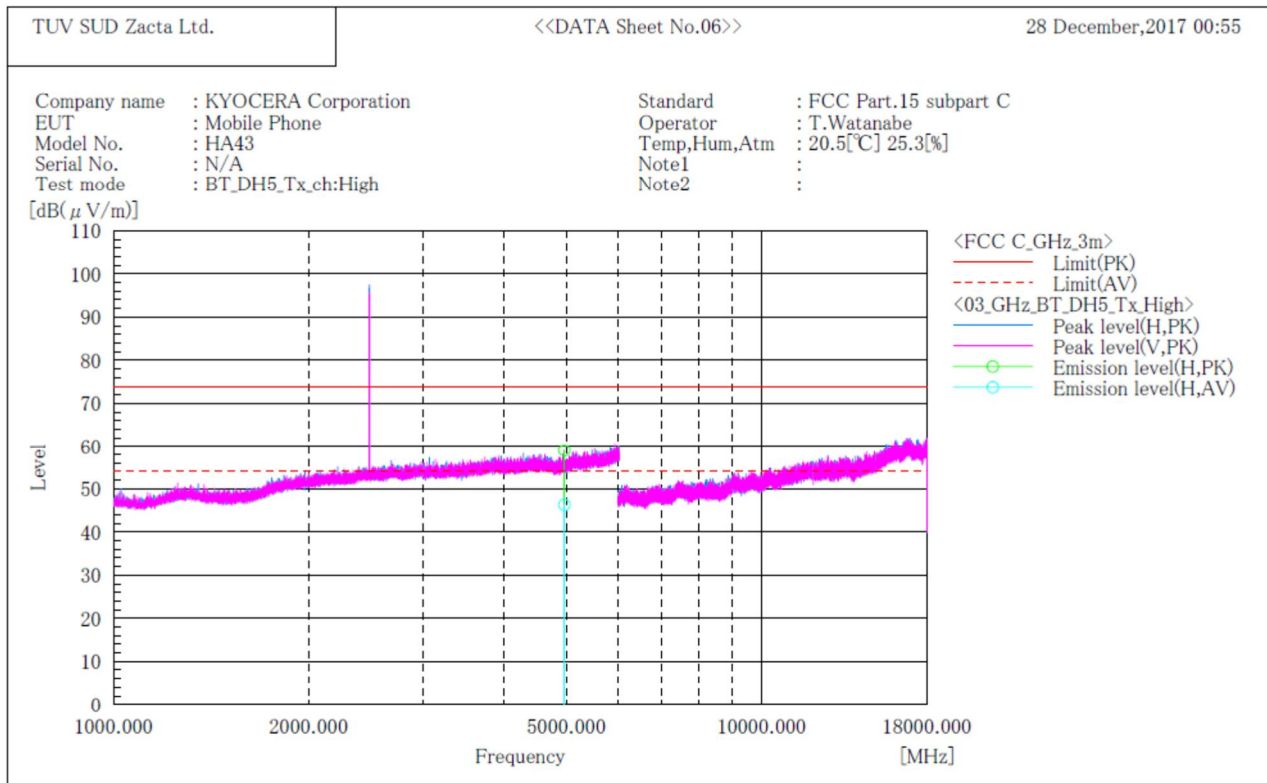
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.

**[DH5]
Channel High
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

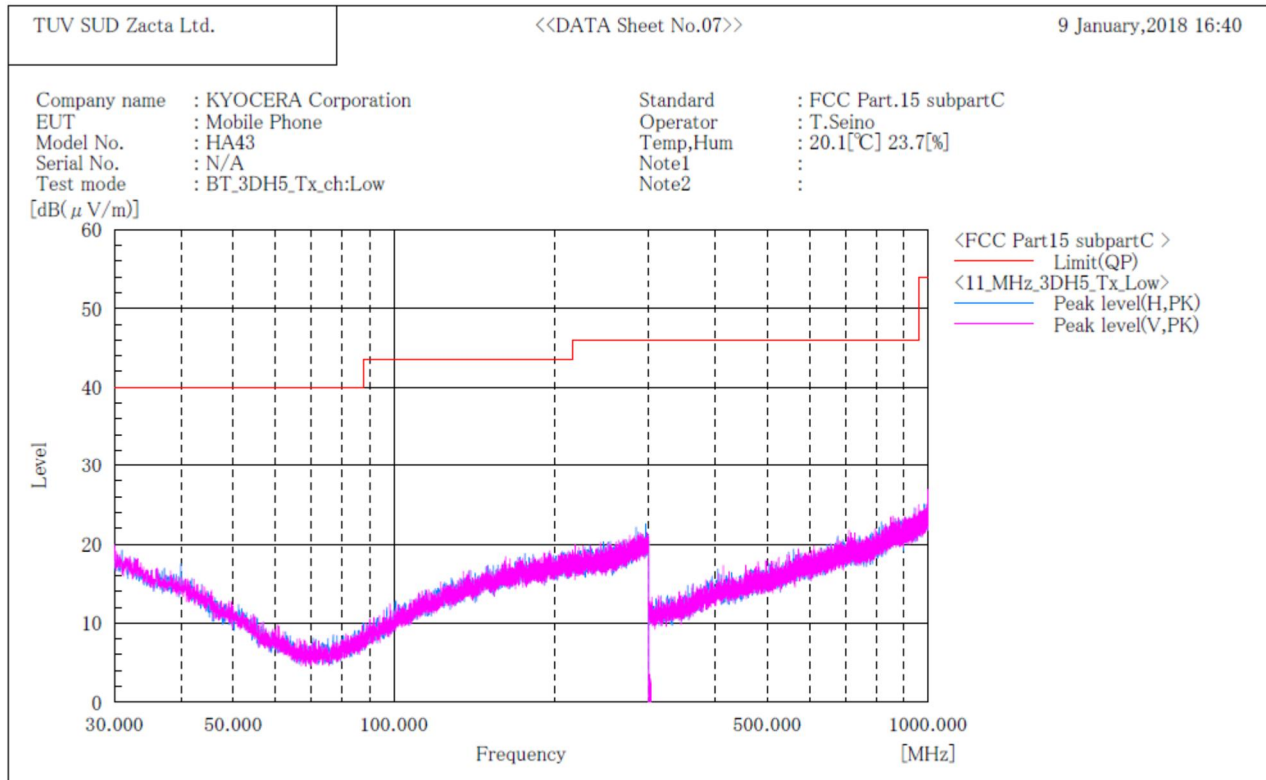
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4960.000	H	49.3	36.6	9.7	59.0	46.3	74.0	54.0	15.0	7.7	158.0	218.0	

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

**[3-DH5]
Channel Low
BELOW 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

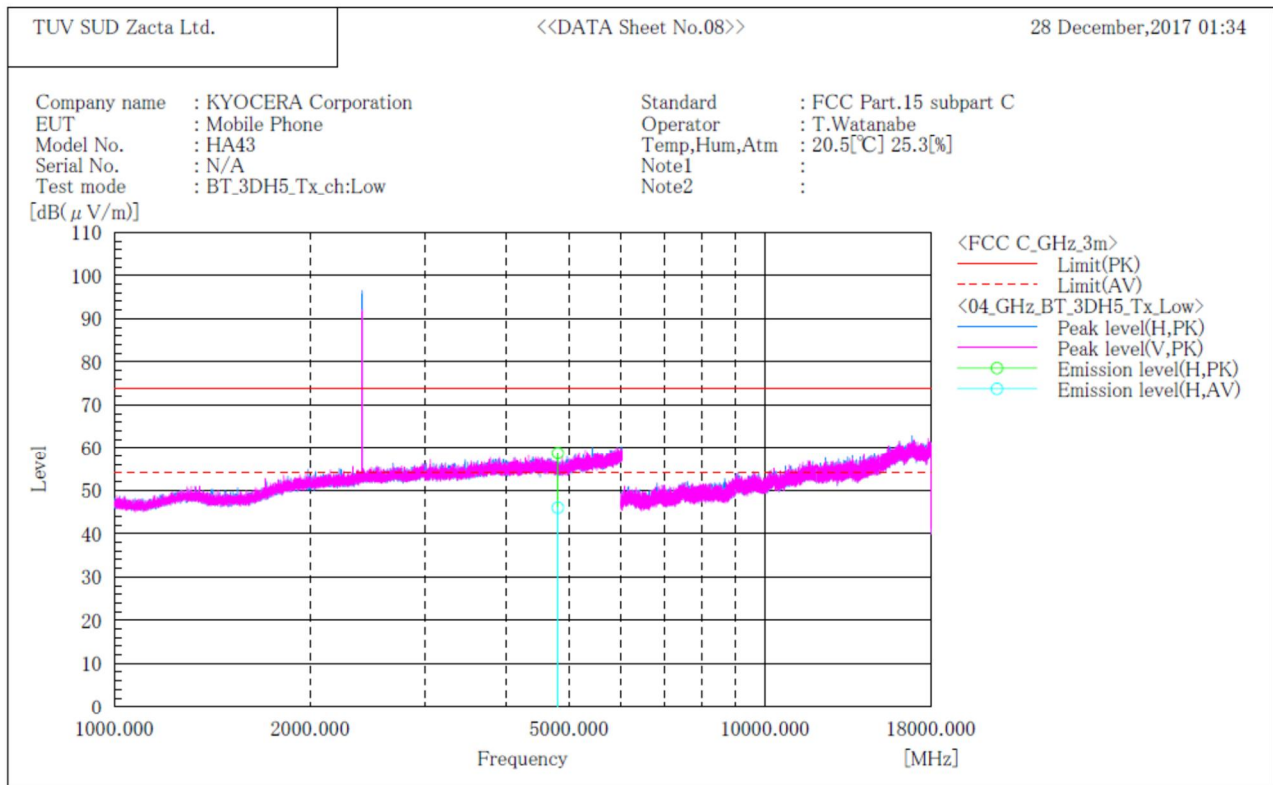
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.

**[3-DH5]
Channel Low
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

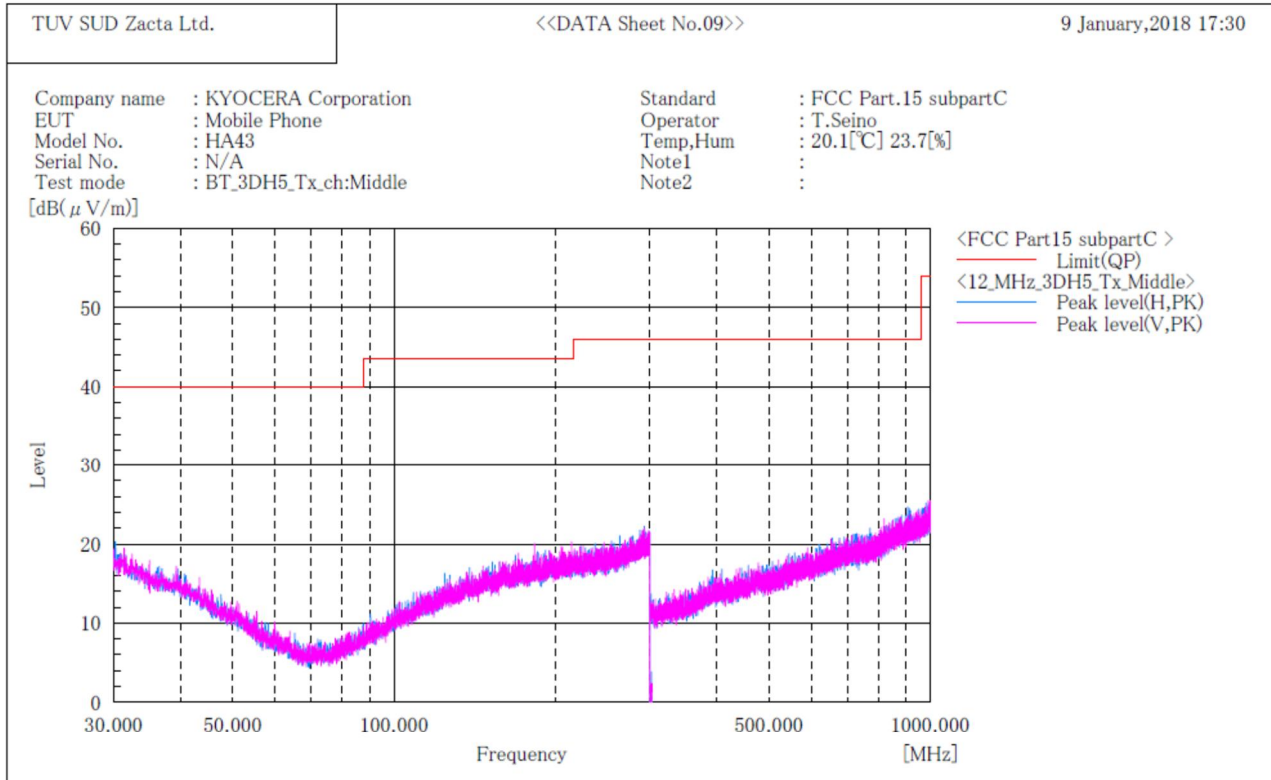
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4804.000	H	49.5	36.8	9.2	58.7	46.0	74.0	54.0	15.3	8.0	135.0	203.0	

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

**[3-DH5]
Channel Middle
BELOW 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

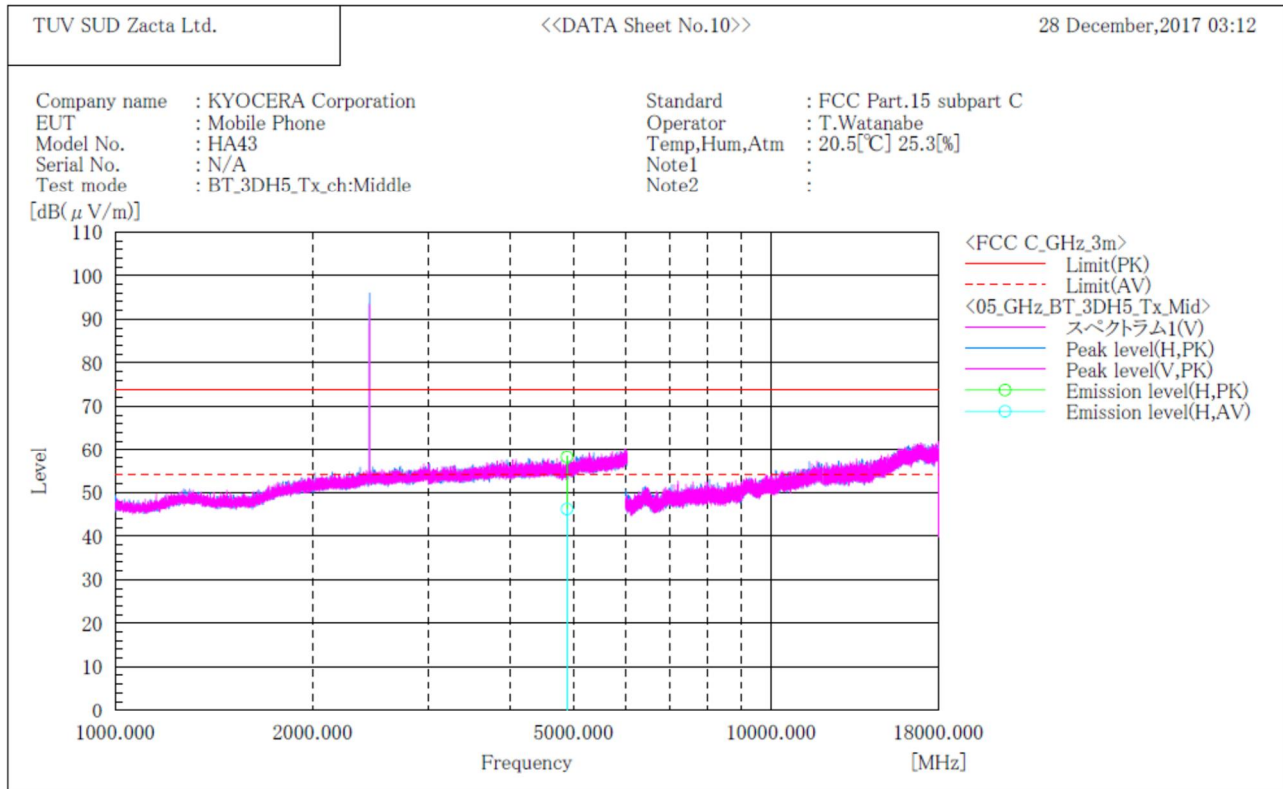
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.

**[3-DH5]
Channel Middle
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

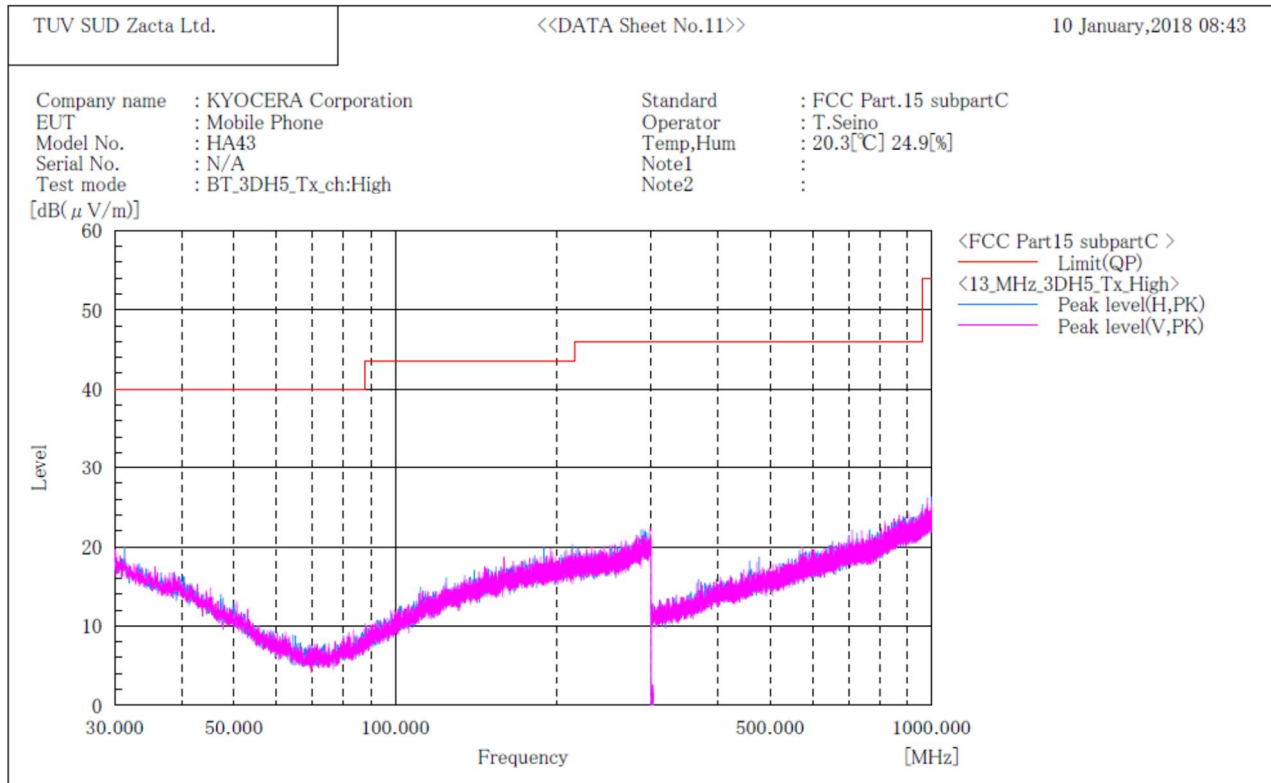
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4882.000	H	48.8	36.8	9.4	58.2	46.2	74.0	54.0	15.8	7.8	124.0	239.0	

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

**[3-DH5]
Channel High
BELOW 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

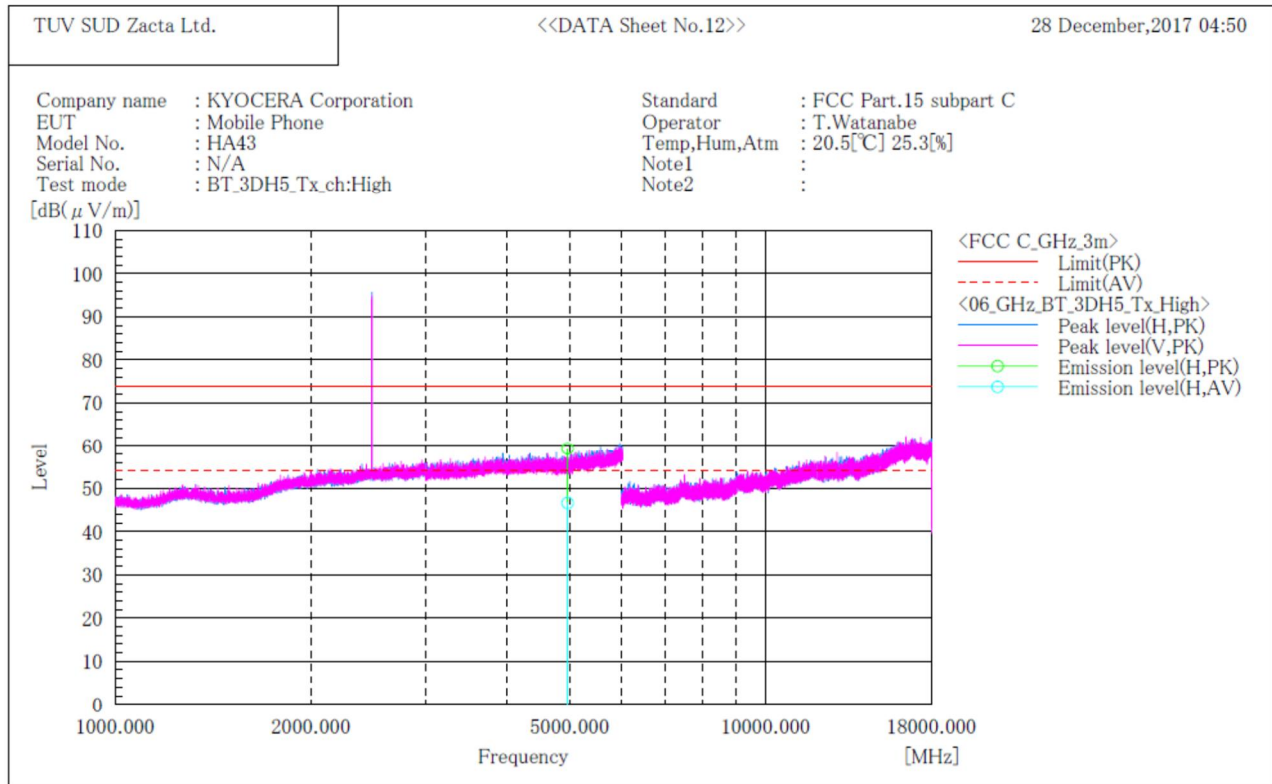
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.

**[3-DH5]
Channel High
ABOVE 1GHz**

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4960.000	H	49.6	36.9	9.7	59.3	46.6	74.0	54.0	14.7	7.4	133.0	246.0	

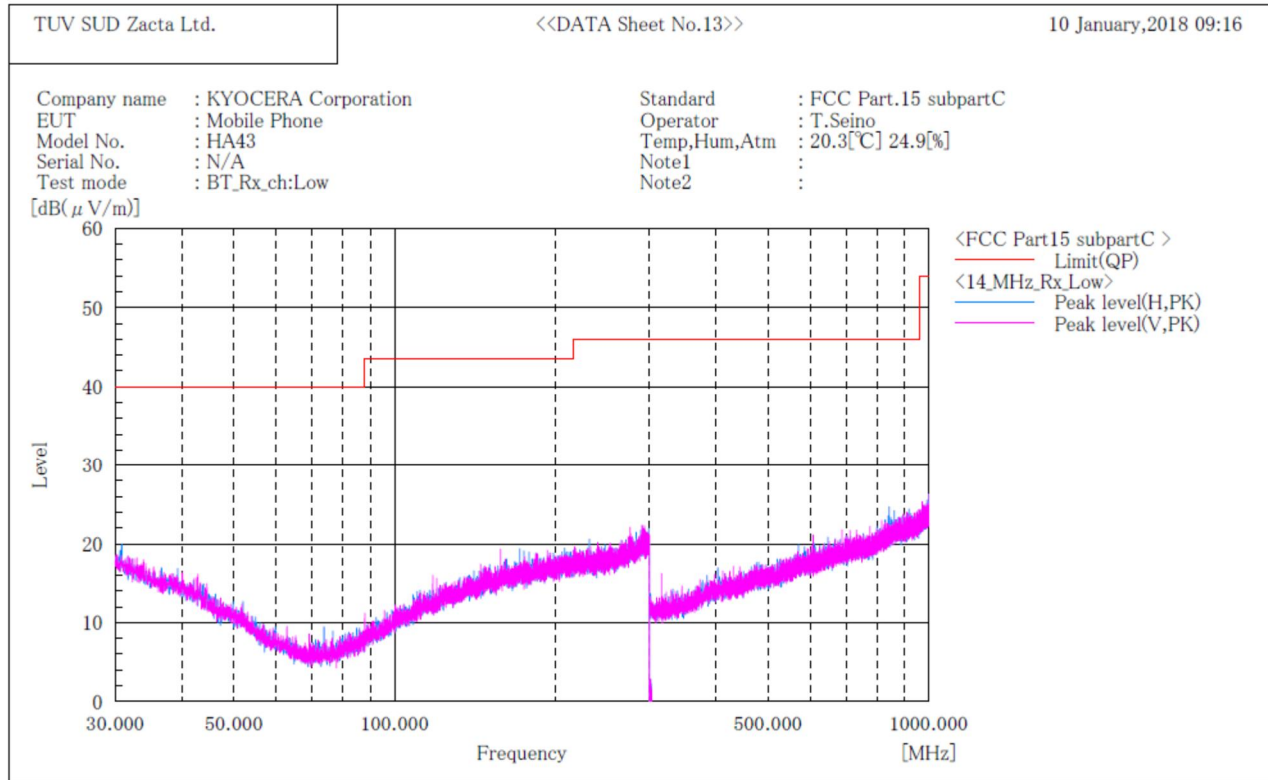
Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

11.4.2 Receive mode

Channel Low BELOW 1GHz

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

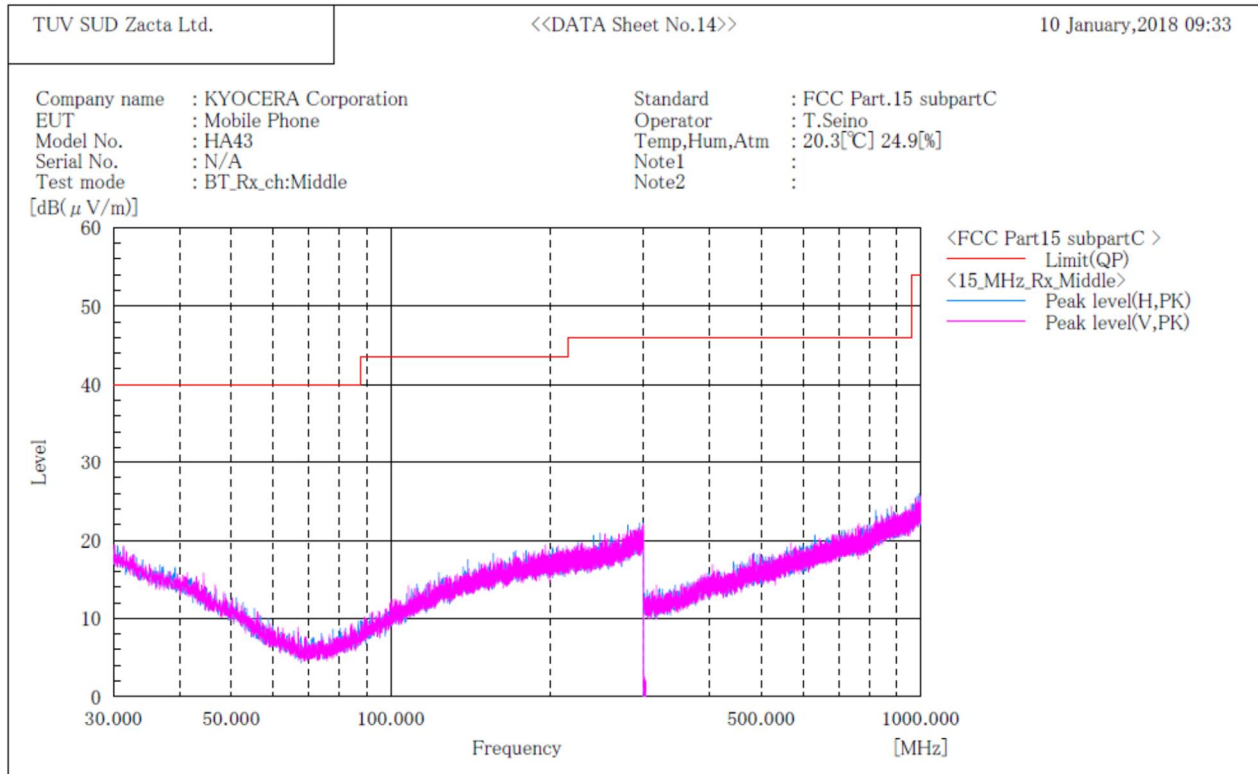
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz and 1GHz to 25GHz at the 3 meters distance.

Channel Middle BELOW 1GHz

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

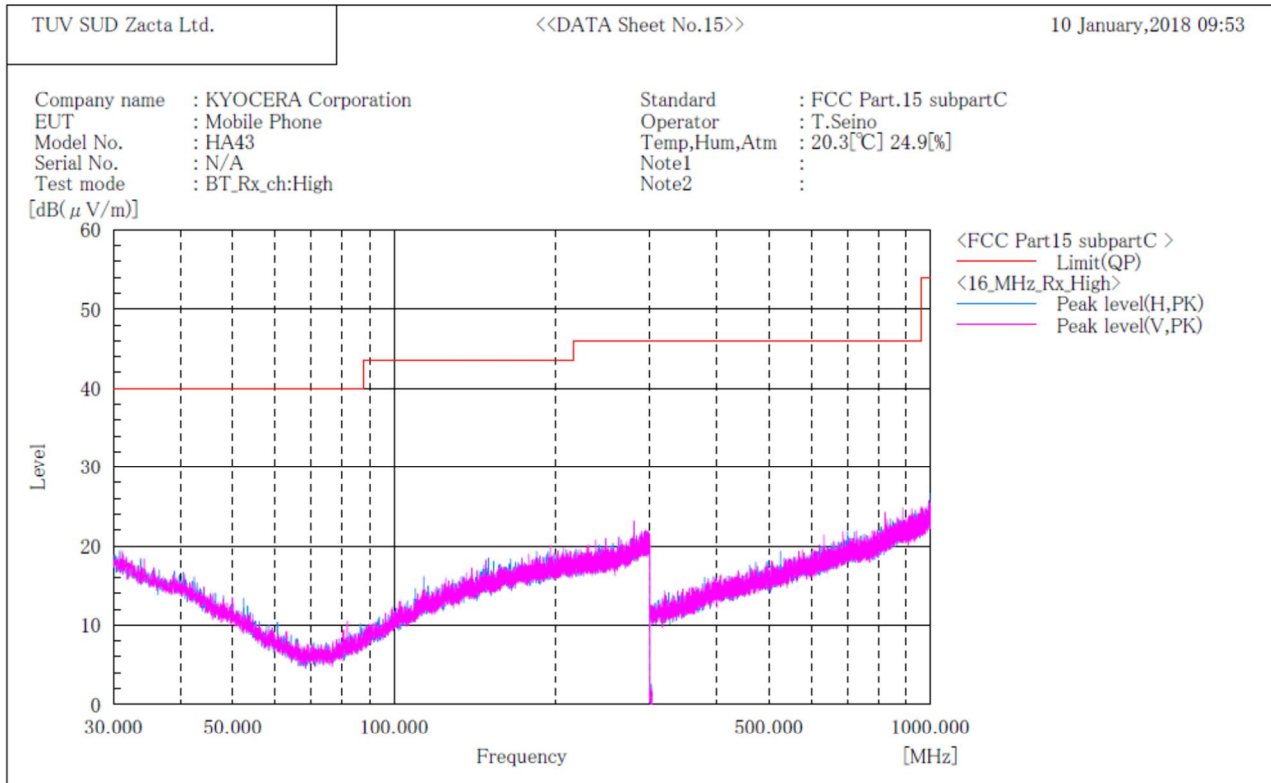
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz and 1GHz to 25GHz at the 3 meters distance.

Channel High BELOW 1GHz

***** RADIATED EMISSION *****
[3m Semi-anechoic chamber]



Final Result

No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz and 1GHz to 25GHz at the 3 meters distance.

12. Restricted Band of Operation

12.1 Measurement procedure

[FCC 15.247(d), 15.205, 15.209]

Test was applied by following conditions.

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

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	1/T _{on} (kHz)	Determined VBW Setting
Bluetooth 4.2 EDR	76.93	2885	865	0.347	1kHz

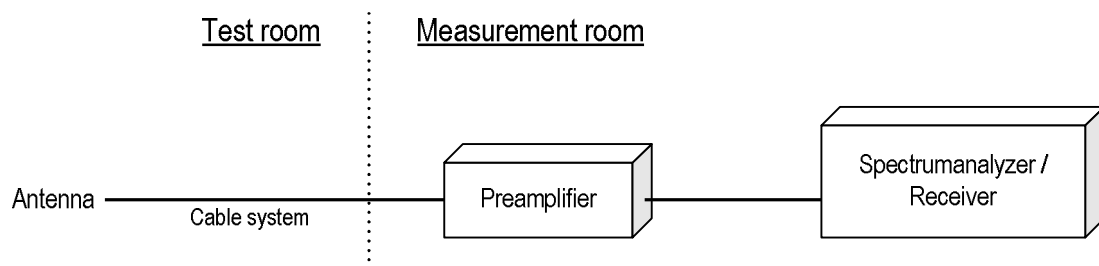
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.

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



12.2 Limit

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

12.3 Measurement Result

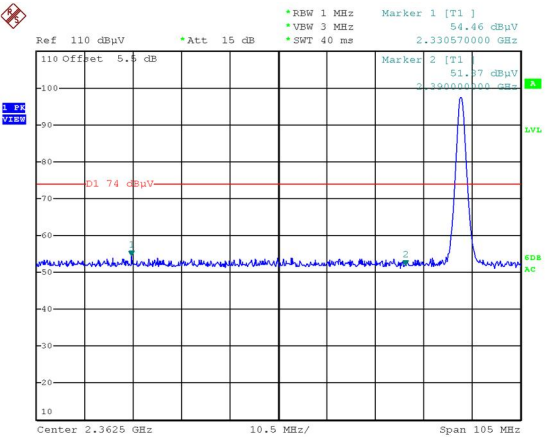
Channel	Frequency [MHz]	Results Chart	Result
Low	2402	See the Trace Data	Pass
High	2480	See the Trace Data	Pass

12.4 Test data

Date : December 29, 2017
Temperature : 20.3 [°C]
Humidity : 26.1 [%]
Test place : 3m Semi-anechoic chamber

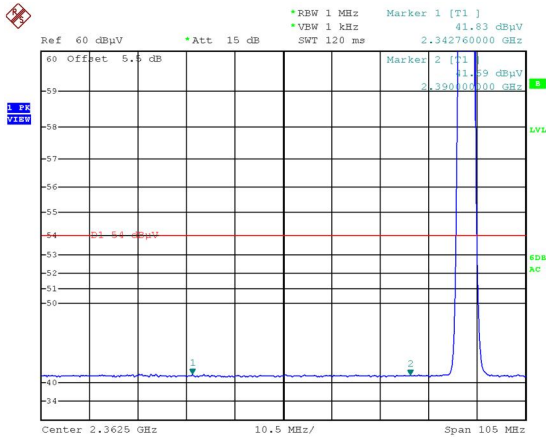
Test engineer : Taiki Watanabe

[DH5]
Channel Low
Horizontal
Peak



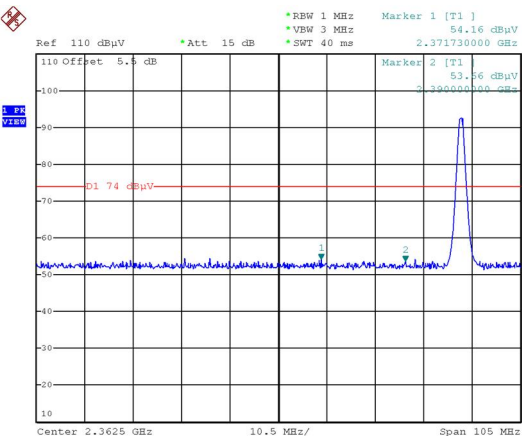
Date: 29.DEC.2017 03:53:56

Average



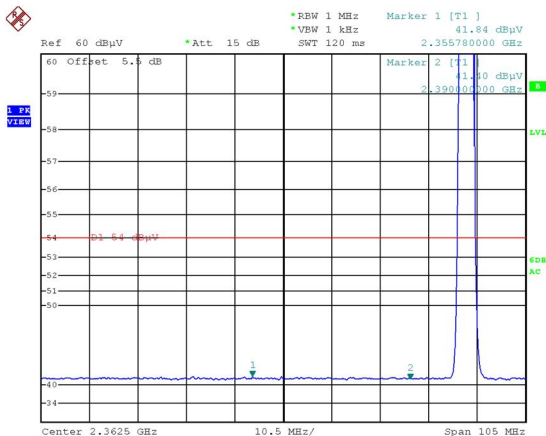
Date: 29.DEC.2017 03:55:15

Vertical
Peak



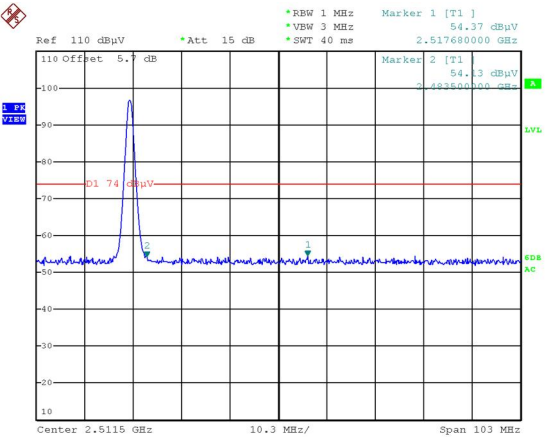
Date: 29.DEC.2017 03:58:24

Average



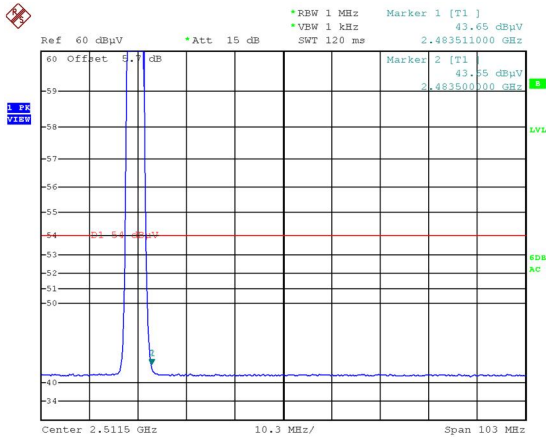
Date: 29.DEC.2017 03:59:04

[DH5]
Channel High
Horizontal
Peak



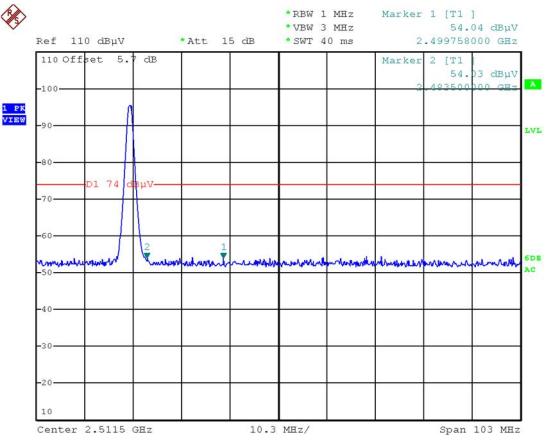
Date: 29.DEC.2017 04:07:18

Average



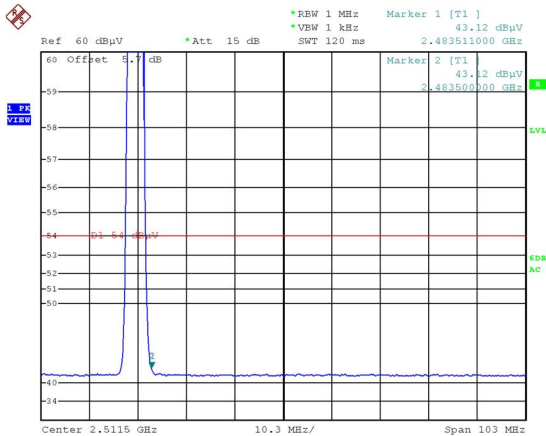
Date: 29.DEC.2017 04:08:07

Vertical
Peak



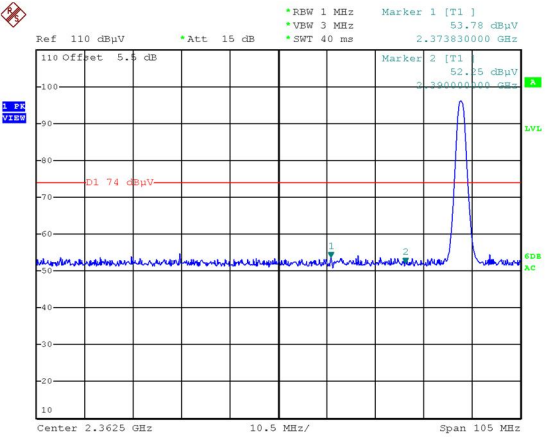
Date: 29.DEC.2017 04:11:45

Average



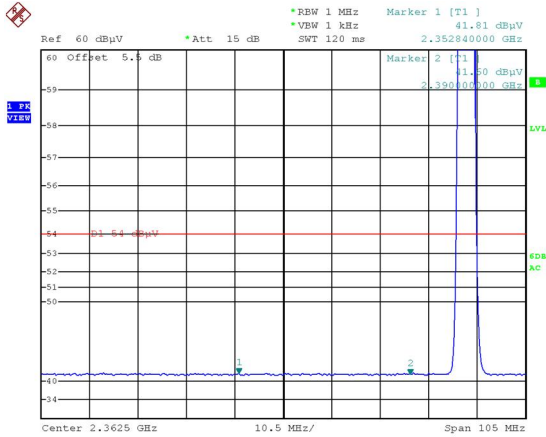
Date: 29.DEC.2017 04:12:19

**[3-DH5]
Channel Low
Horizontal
Peak**



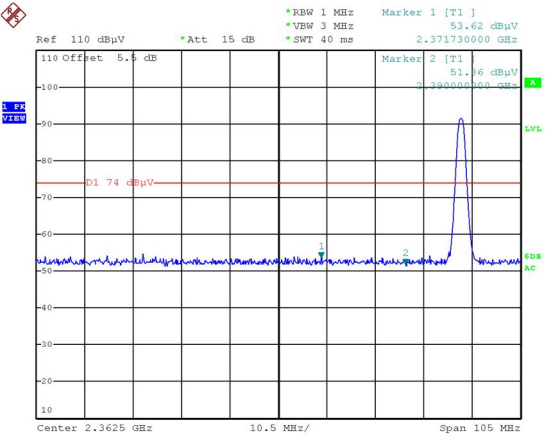
Date: 29.DEC.2017 04:39:59

Average



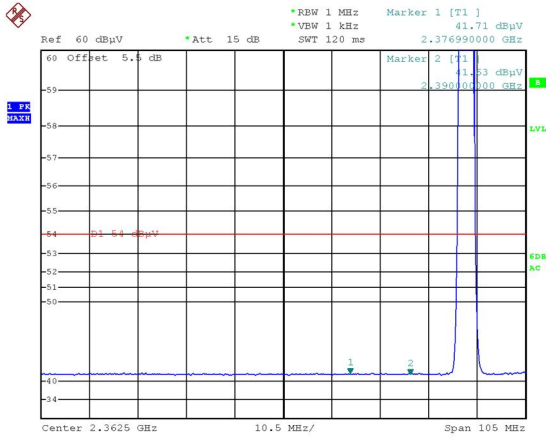
Date: 29.DEC.2017 04:41:26

**Vertical
Peak**



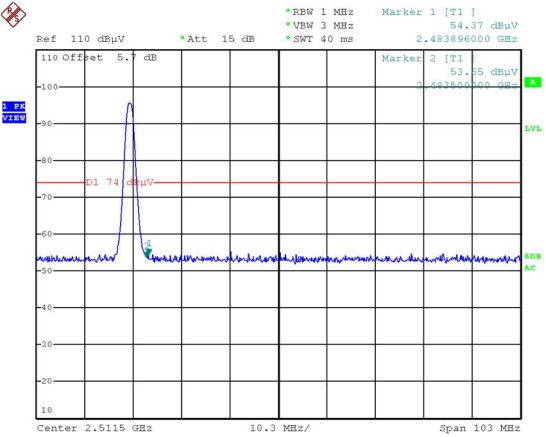
Date: 29.DEC.2017 04:45:37

Average



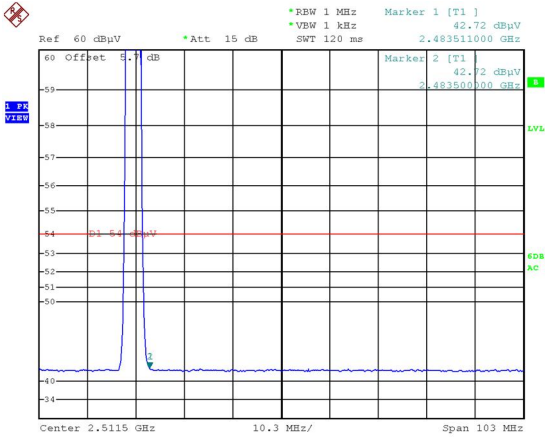
Date: 29.DEC.2017 04:47:00

[3-DH5]
Channel High
Horizontal
Peak



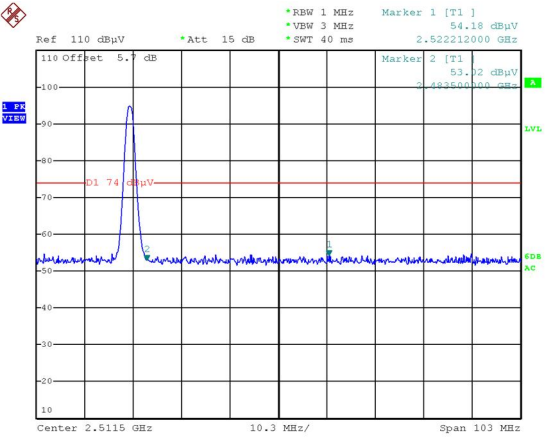
Date: 29.DEC.2017 05:09:19

Average



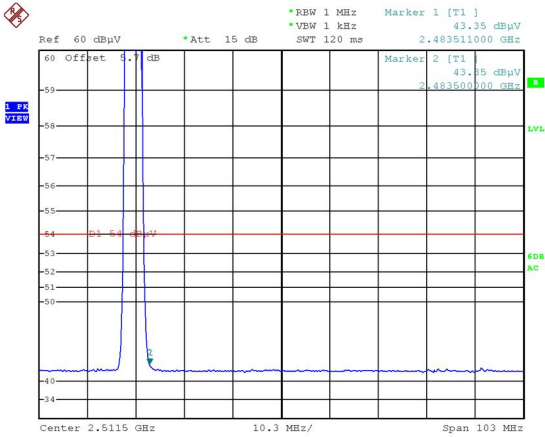
Date: 29.DEC.2017 05:20:25

Vertical
Peak



Date: 29.DEC.2017 05:12:53

Average



Date: 29.DEC.2017 05:18:49

13. AC Power Line Conducted Emissions

13.1 Measurement procedure [FCC 15.207]

Test was applied by following conditions.

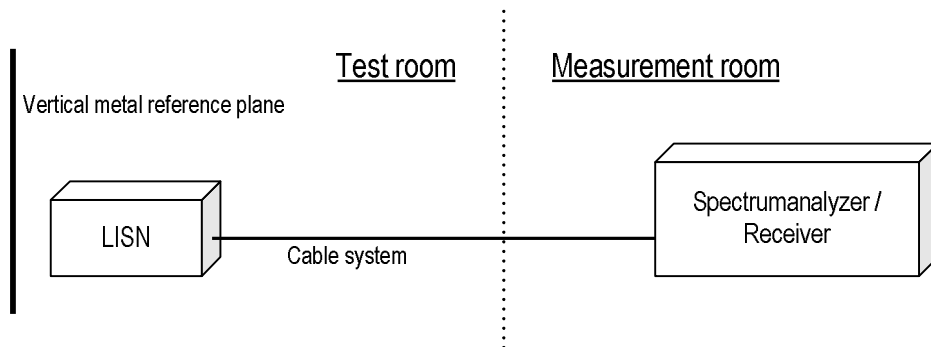
Test method	: ANSI C63.10
Frequency range	: 0.15MHz to 30MHz
Test place	: 3m Semi-anechoic chamber
EUT was placed on	: FRP table / (W)2.0m × (D)1.0m × (H)0.8m
Vertical Metal Reference Plane	: (W)2.0m × (H)2.0m 0.4m away from EUT
Test receiver setting	
- Detector	: Quasi-peak, Average
- Bandwidth	: 9kHz

EUT and peripherals are connected to 50Ω/50μH 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



13.2 Calculation method

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

Margin = Limit – Emission level

Example:

Limit @ 0.400MHz : 57.9dBμV(Quasi-peak)
: 47.9dBμV(Average)

(Quasi peak) Reading = 22.7dBμV c.f = 10.4dB
Emission level = 22.7 + 10.4 = 33.1dBμV
Margin = 57.9 – 33.1 = 8.5dB

(Average) Reading = 6.3dBμV c.f = 10.4dB
Emission level = 6.3 + 10.4 = 16.7dBμV
Margin = 47.9 – 16.7 = 4.7dB

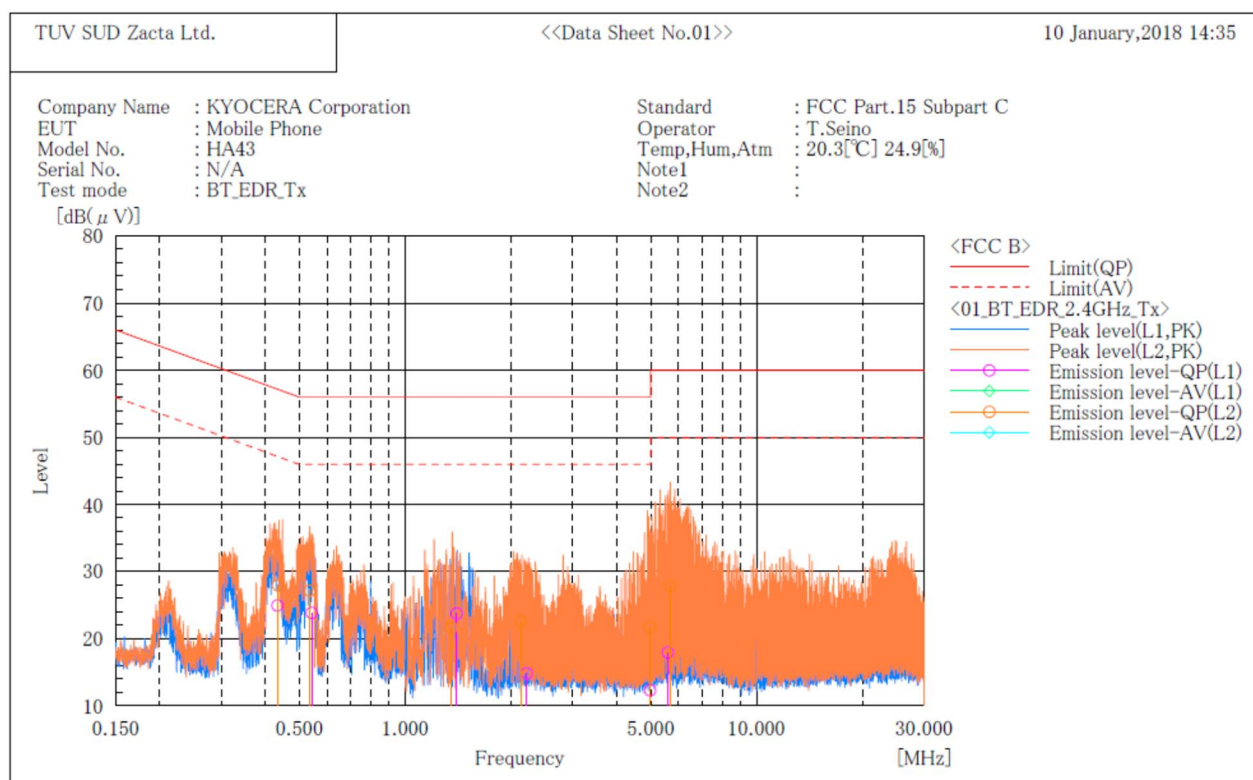
13.3 Limit

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.

13.4 Test data

***** CONDUCTED EMISSION at MAINS PORT *****
[3m Semi-anechoic chamber]



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	0.433	14.5	-2.2	10.4	24.9	8.2	57.2	47.2	32.3	39.0
2	0.542	13.4	-2.9	10.4	23.8	7.5	56.0	46.0	32.2	38.5
3	1.401	13.3	-3.2	10.4	23.7	7.2	56.0	46.0	32.3	38.8
4	2.218	4.3	-4.6	10.5	14.8	5.9	56.0	46.0	41.2	40.1
5	4.978	1.6	-5.1	10.7	12.3	5.6	56.0	46.0	43.7	40.4
6	5.595	7.2	-4.6	10.7	17.9	6.1	60.0	50.0	42.1	43.9

--- 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	0.434	17.5	-1.5	10.4	27.9	8.9	57.2	47.2	29.3	38.3
2	0.535	16.7	-2.0	10.4	27.1	8.4	56.0	46.0	28.9	37.6
3	1.350	11.2	-3.5	10.4	21.6	6.9	56.0	46.0	34.4	39.1
4	2.135	12.0	-3.7	10.5	22.5	6.8	56.0	46.0	33.5	39.2
5	4.962	11.0	-4.4	10.7	21.7	6.3	56.0	46.0	34.3	39.7
6	5.676	17.1	-3.1	10.7	27.8	7.6	60.0	50.0	32.2	42.4

14. 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.

15. Uncertainty of measurement

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 100 028-0011 determining compliance or non-compliance with test result

Test item	Measurement uncertainty
Conducted emission, AMN (9kHz – 150kHz)	$\pm 3.8\text{dB}$
Conducted emission, AMN (150kHz – 30MHz)	$\pm 3.3\text{dB}$
Radiated emission (9kHz – 30MHz)	$\pm 3.0\text{dB}$
Radiated emission (30MHz – 1000MHz)	$\pm 4.7\text{dB}$
Radiated emission (1GHz – 6GHz)	$\pm 4.9\text{dB}$
Radiated emission (6GHz – 18GHz)	$\pm 5.2\text{dB}$
Radiated emission (18GHz – 40GHz)	$\pm 5.8\text{dB}$

16. Laboratory Information

1. Location

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

2. Accreditation and Registration

- 1) VLAC
Accreditation No.: VLAC-013
- 2) NVLAP
LAB CODE: 200306-0
- 3) BSMI
Laboratory Code: SL2-IN-E-6018, SL2-A1-E-6018

4) Industry Canada

Site number	Facility	Expiration date
4224A-4	3m Semi-anechoic chamber	2020-11-27
4224A-5	10m Semi-anechoic chamber No.1	2020-11-27
4224A-6	10m Semi-anechoic chamber No.2	2019-12-14

5) VCCI Council

Registration number	Expiration date
A-0166	2019-07-03

Appendix A. Test equipment

Antenna port conducted test

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	Jun. 30, 2018	Jun. 28, 2017
Attenuator	HUBER+SUHNER	6810.19.A	N/A(S450)	Jan. 31, 2018	Jan. 20, 2017
Power meter	ROHDE&SCHWARZ	NRP2	103269	Jul. 31, 2018	Jul. 11, 2017
Power sensor	ROHDE&SCHWARZ	NRP-Z81	102459	Jul. 31, 2018	Jul. 11, 2017

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	Sep. 30, 2018	Sep. 13, 2017
Spectrum analyzer	Agilent Technologies	E4447A	MY46180188	Mar. 31, 2018	Mar. 15, 2017
Spectrum analyzer	Agilent Technologies	E4440A	US40420937	Oct. 31, 2018	Oct. 19, 2017
Preamplifier	ANRITSU	MH648A	M96057	Feb. 28, 2018	Feb. 1, 2017
Preamplifier	SONOMA	310	372170	Sep. 30, 2018	Sep. 12, 2017
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	100515	Feb. 28, 2018	Feb. 17, 2017
Attenuator	TDC	TAT-43B-06	N/A(S209)	May 31, 2018	May 23, 2017
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	2155	Jul. 31, 2018	Jul. 18, 2017
Log periodic antenna	Schwarzbeck	UHALP9108A	0560	Jul. 31, 2018	Jul. 18, 2017
Attenuator	TME	CFA-01NPJ-6	N/A(S275)	Feb. 28, 2018	Feb. 3, 2017
Attenuator	TME	CFA-01NPJ-3	N/A(S272)	Feb. 28, 2018	Feb. 2, 2017
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	Feb. 28, 2018	Feb. 3, 2017
Attenuator	AEROFLEX	26A-10	081217-08	May 31, 2018	May 24, 2017
Double ridged guide antenna	ETS LINDGREN	3117	00052315	Feb. 28, 2018	Feb. 23, 2017
Attenuator	Agilent Technologies	8491B	MY39268633	Feb. 28, 2018	Feb. 2, 2017
Double ridged guide antenna	A.H.Systems Inc.	SAS-574	469	Aug. 31, 2018	Aug. 8, 2017
Preamplifier	TSJ	MLA-1840-B03-35	1240332	Aug. 31, 2018	Aug. 8, 2017
Notch filter	Micro-Tronics	BRM50702	045	Apr. 30, 2018	Apr. 26, 2017
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY30037/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/1m	my24610/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/8m	SN MY30031/4	Feb. 28, 2018	Feb. 2, 2017
		SUCOFLEX104/1.5m	MY32976/4	Feb. 28, 2018	Feb. 2, 2017
		SUCOFLEX104/1.5m	MY19309/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/7m	41625/6	Feb. 28, 2018	Feb. 3, 2017
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)	May 31, 2018	May 30, 2017
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-SVSWR)	May 31, 2018	May 31, 2017

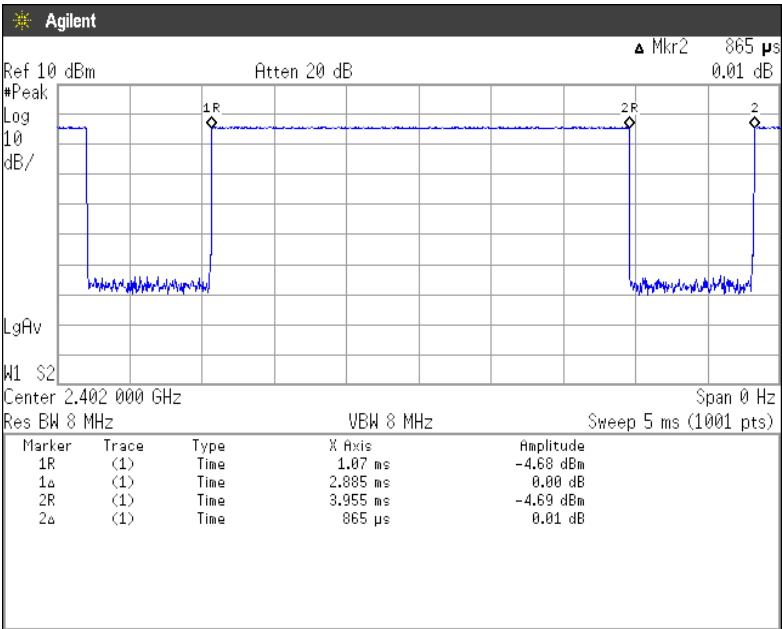
Conducted emission at mains port

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	Sep. 30, 2018	Sep. 13, 2017
Attenuator	HUBER+SUHNER	6810.01.A	N/A(S411)	Feb. 28, 2018	Feb. 2, 2017
Line impedance stabilization network for EUT	Kyoritsu Electrical Works, Ltd.	KNW-407F2	12-17-110-2	Apr. 30, 2018	Apr. 25, 2017
Coaxial cable	FUJIKURA	5D-2W/4m	N/A(S350)	Feb. 28, 2018	Feb. 2, 2017
Coaxial cable	FUJIKURA	5D-2W/1m	N/A(S193)	Feb. 28, 2018	Feb. 3, 2017
Coaxial cable	HUBER+SUHNER	RG214/U/10m	N/A(S194)	Feb. 28, 2018	Feb. 3, 2017
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]



Duty Cycle = Ton / (Ton + Toff) = 2885[μs] / (2885[μs] + 865[us]) = 76.93[%]