

TEST REPORT

Report number : JPD-TR-18033-0

Issue date : May 23, 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	: YKHA81
FCC ID	: JOYYKHA81

Date of test : April 26, 27, 28, 2018
May 2, 15, 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 Taiki Watanabe
Tadahiro Seino Taiki Watanabe

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



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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, KDB 558074 D01 DTS Meas Guidance v04

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)(2)	DTS Bandwidth / Occupied Bandwidth (99%)	Conducted	PASS
15.247(b)(3)	Maximum conducted (average) 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
15.247(e)	Transmitter Power Spectral Density	Conducted	PASS
15.207	AC Power Line Conducted Emissions	Conducted	PASS

1.3.1 Test set up

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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	: YKHA81
Serial number	: N/A
EUT condition	: Pre-Production
Power ratings	: Battery: DC 3.8V
Size	: (W) 71.0mm × (D) 9.7mm × (H) 147.3mm
Environment	: Indoor and Outdoor use
Operating environment	: Temperature: 5°C to 40°C Humidity: 35% to 90%
RF Specification Protocol	: IEEE802.11b, IEEE802.11g, IEEE802.11n (HT20) , IEEE802.11n (HT40)
Frequency range	: IEEE802.11b /11g/11n (HT20): 2412MHz-2462MHz IEEE802.11n (HT20): 2422MHz-2452MHz
Number of RF Channels	: 11 Channels
Modulation type	: IEEE802.11b: DSSS (DBPSK, DQPSK, CCK) IEEE802.11g /11n (HT20) / 11n (HT40) : OFDM (BPSK, QPSK, 16QAM, 64QAM)
Data rate	: IEEE802.11b: 1, 2, 5.5, 11Mbps IEEE802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps IEEE802.11n (HT20 LGI): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65Mbps IEEE802.11n (HT20 SGI): 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2Mbps IEEE802.11n (HT40 LGI): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135Mbps IEEE802.11n (HT40 SGI): 15, 30, 45, 60, 90, 120, 135, 150Mbps
Channel separation	: 5MHz
Output power	: 37.085mW (IEEE802.11b) 109.875mW (IEEE802.11g) 113.815mW (IEEE802.11n: HT20) 99.885mW (IEEE802.11n: HT40)
Antenna type	: Internal antenna
Antenna gain	: -1.4dBi

2.3 Variation of the family model(s)

Not applicable

2.4 Operating channels and frequencies

Channel	Frequency [MHz]
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

2.5 Operating mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

Tested Channel [11b, 11g, 11n(HT20)]	Frequency [MHz]
Low	2412
Middle	2437
High	2462

Tested Channel [11n(HT40)]	Frequency [MHz]
Low	2422
Middle	2437
High	2452

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

Tested Channel	Modulation Type	Data Rate
Low, Middle, High	IEEE802.11b: DSSS	1Mbps
Low, Middle, High	IEEE802.11g: OFDM	6Mbps
Low, Middle, High	IEEE802.11n (HT20 LGI): OFDM	MCS0 (6.5Mbps)
Low, Middle, High	IEEE802.11n (HT40 LGI): OFDM	MCS0 (13.5Mbps)

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 X axis and the worst case recorded.

2.6 Operating flow

[Tx mode]

i) Test program setup to the DM tool

ii) Select a Test mode

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

Operating frequency: Channel Low: 2412MHz, Channel Middle: 2437MHz, Channel High: 2462MHz

[IEEE802.11n (HT40)]

Operating frequency: Channel Low: 2422MHz, Channel Middle: 2437MHz, Channel High: 2452MHz

iii) Start test mode

[Rx mode]

i) Test program setup to the DM tool

ii) Select a Test mode

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

Operating frequency: Channel Low: 2412MHz, Channel Middle: 2437MHz, Channel High: 2462MHz

[IEEE802.11n (HT40)]

Operating frequency: Channel Low: 2422MHz, Channel Middle: 2437MHz, Channel High: 2452MHz

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	YKHA81	N/A	JOYYKHA81	EUT
2	AC Adapter	au	N/A	N/A	N/A	*

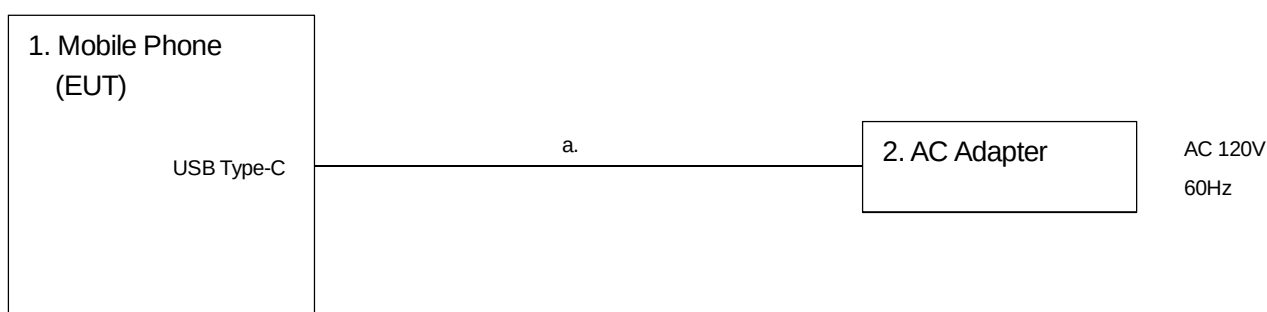
*: AC power line Conducted Emission Test.

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	USB cable (for AC Adapter)	0.8	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. DTS Bandwidth / Occupied Bandwidth (99%)

4.1 Measurement procedure

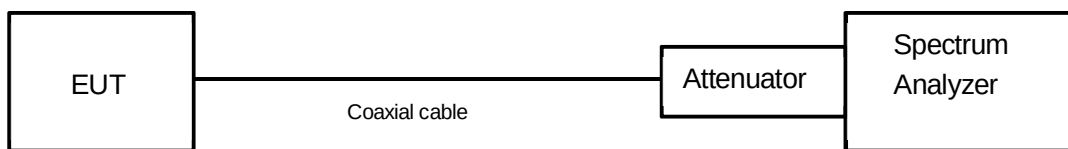
[FCC 15.247(a)(2), KDB 558074 D01 v04, Section 8.2]

The bandwidth at 6dB 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) RBW = 100kHz.
- b) VBW $\geq 3 \times$ RBW.
- c) Sweep time = auto-couple.
- d) Detector = peak.
- e) Trace mode = max hold.

- Test configuration



4.2 Limit

The minimum permissible 6dB bandwidth is 500kHz.

4.3 Measurement result

Date : May 15, 2018
 Temperature : 20.8 [°C]
 Humidity : 44.3 [%]
 Test place : Shielded room No.3

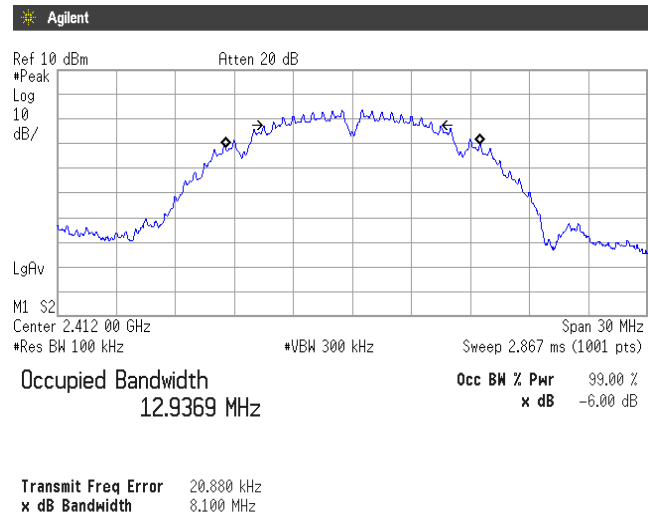
Test engineer :
 Tadahiro Seino

Channel	DTS Bandwidth [MHz]			
	IEEE802.11b	IEEE802.11g	IEEE802.11n (HT20)	IEEE802.11n (HT40)
Low	8.100	16.471	17.636	35.165
Middle	8.560	16.410	17.623	35.715
High	8.105	16.445	17.624	35.358

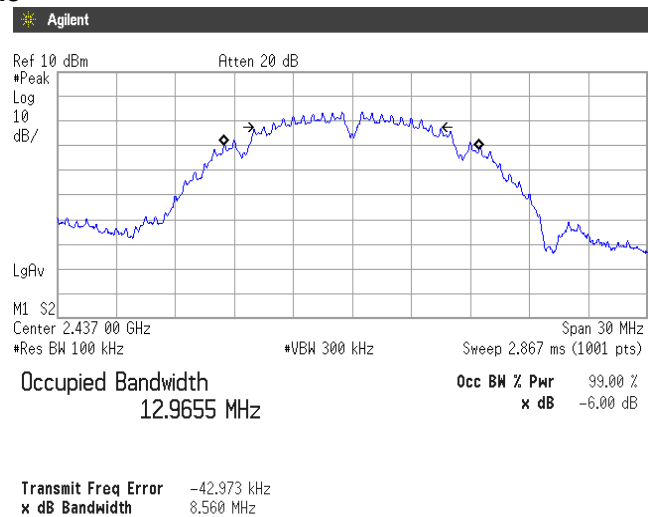
Channel	Occupied Bandwidth (99%) [MHz]			
	IEEE802.11b	IEEE802.11g	IEEE802.11n (HT20)	IEEE802.11n (HT40)
Low	12.937	16.556	17.688	35.775
Middle	12.966	16.617	17.735	35.982
High	12.953	16.558	17.693	35.988

4.4 Trace data
[IEEE802.11b]

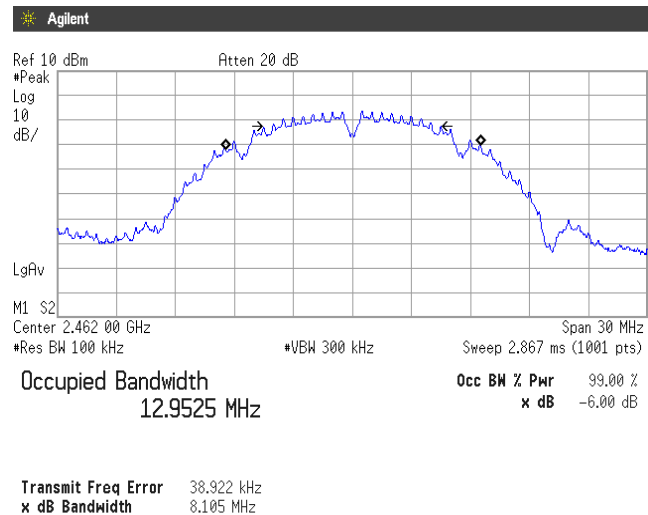
Channel Low



Channel Middle

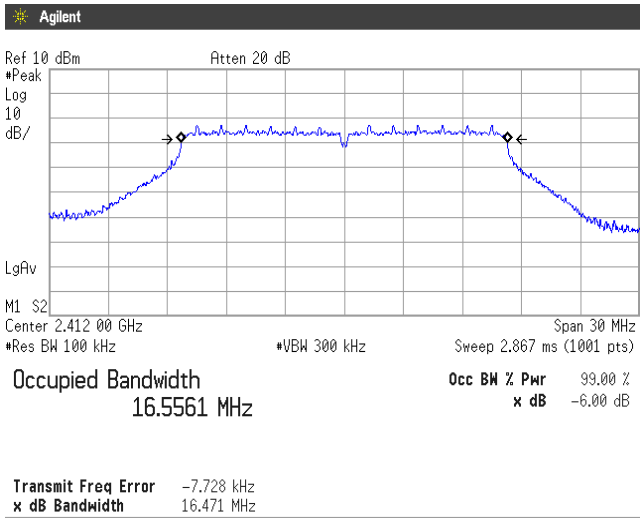


Channel High

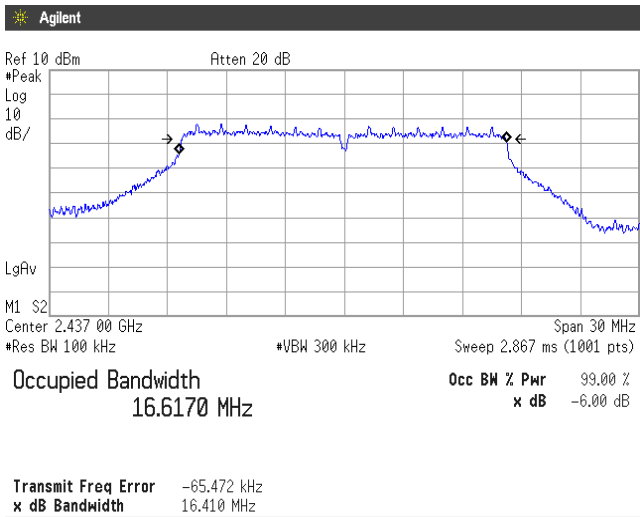


[IEEE802.11g]

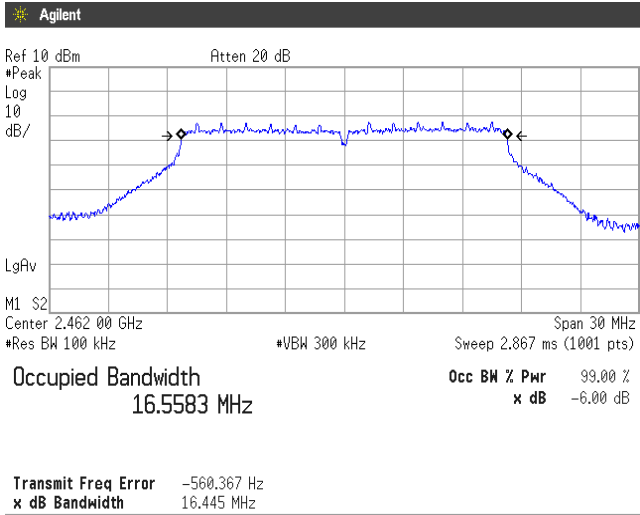
Channel Low



Channel Middle

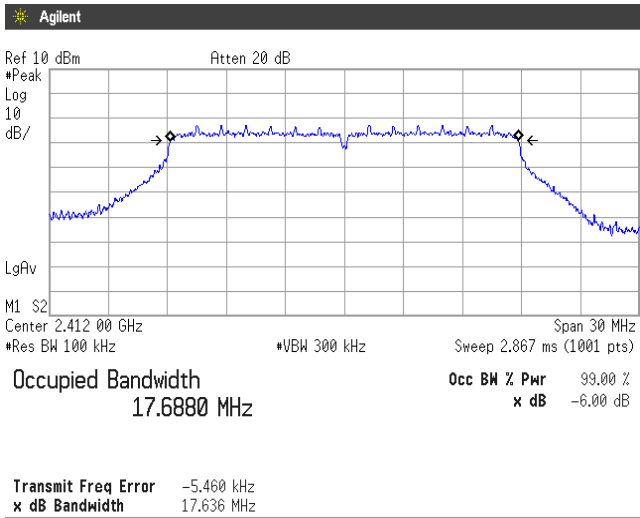


Channel High

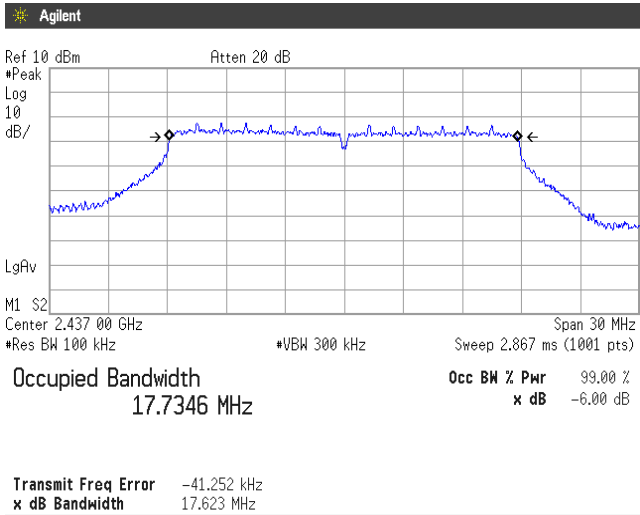


[IEEE802.11n (HT20)]

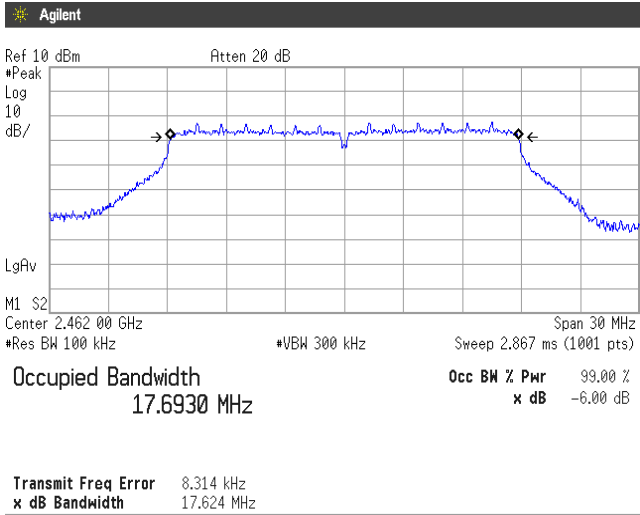
Channel Low



Channel Middle

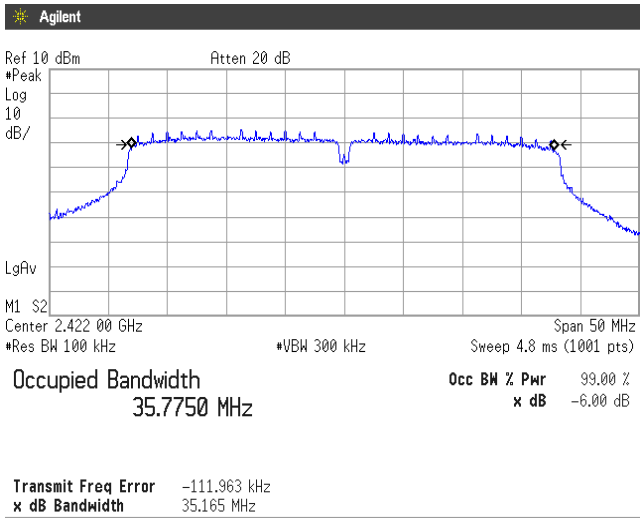


Channel High

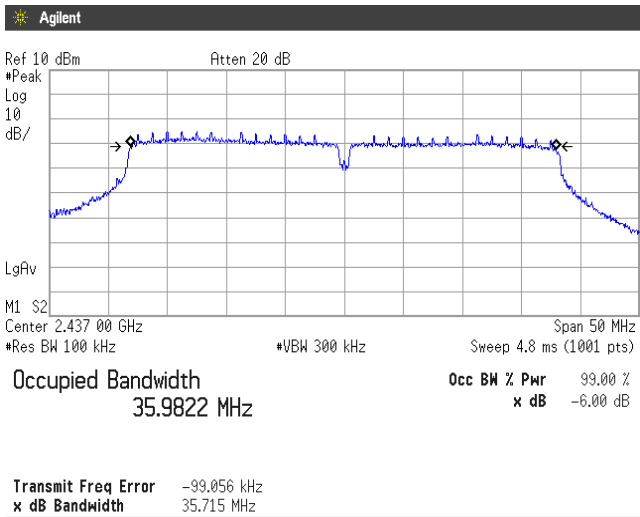


[IEEE802.11n (HT40)]

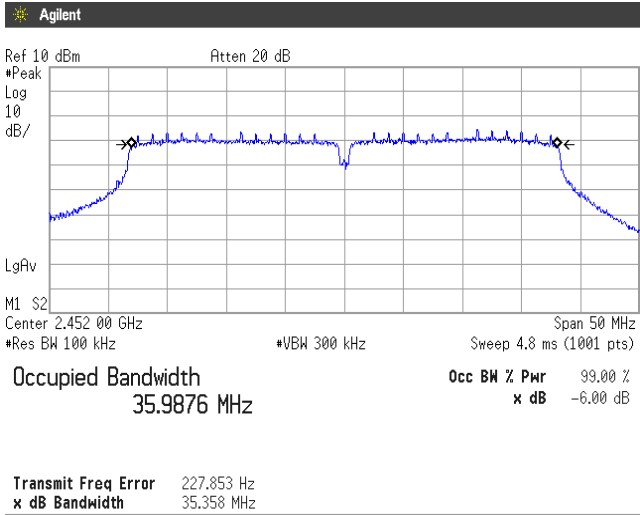
Channel Low



Channel Middle



Channel High



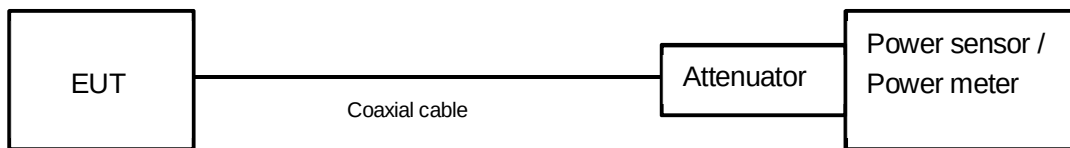
5. Maximum Conducted Output Power

5.1 Measurement procedure

[FCC 15.247(b)(3), KDB 558074 D01 v04, Section 9.1.3]

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



5.2 Limit

1W(1000mW) or less

5.3 Measurement result

Date : May 15, 2018
 Temperature : 20.8 [°C]
 Humidity : 44.3 [%]
 Test place : Shielded room No.3

Test engineer : Tadahiro Seino

[IEEE802.11b]
Battery Full

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Output Power (mW)	Limit (mW)	Result
Low	2412	4.27	11.18	15.45	35.059	≤ 1000	PASS
Middle	2437	4.28	11.18	15.46	35.132	≤ 1000	PASS
High	2462	4.51	11.18	15.69	37.085	≤ 1000	PASS

[IEEE802.11g]
Battery Full

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Output Power (mW)	Limit (mW)	Result
Low	2412	9.23	11.18	20.41	109.875	≤ 1000	PASS
Middle	2437	8.63	11.18	19.81	95.786	≤ 1000	PASS
High	2462	8.46	11.18	19.64	92.024	≤ 1000	PASS

[IEEE802.11n (HT20)]
Battery Full

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Output Power (mW)	Limit (mW)	Result
Low	2412	9.29	11.18	20.47	111.404	≤ 1000	PASS
Middle	2437	9.38	11.18	20.56	113.815	≤ 1000	PASS
High	2462	9.07	11.18	20.25	105.803	≤ 1000	PASS

[IEEE802.11n (HT40)]
Battery Full

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Output Power (mW)	Limit (mW)	Result
Low	2422	8.14	11.18	19.32	85.566	≤ 1000	PASS
Middle	2437	8.82	11.18	20.00	99.885	≤ 1000	PASS
High	2452	8.59	11.18	19.77	94.907	≤ 1000	PASS

Calculation;

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

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

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

6. Band Edge Compliance of RF Conducted Emissions

6.1 Measurement procedure

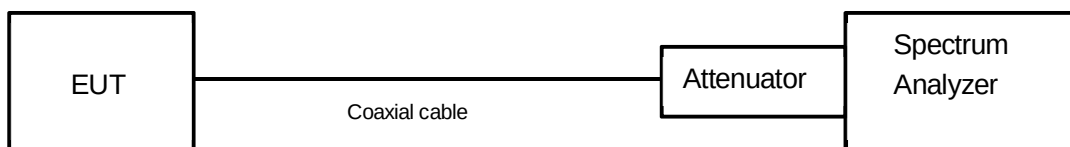
[FCC 15.247(d), KDB 558074 D01 v04, Section 11.0]

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 = 100kHz.
- c) VBW $\geq 3 \times$ RBW
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



6.2 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.

6.3 Measurement result

Date : May 15, 2018
 Temperature : 20.8 [°C]
 Humidity : 44.3 [%]
 Test place : Shielded room No.3

Test engineer : Tadahiro Seino

[IEEE802.11b]

Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
Low	2412.00	-6.88	2397.04	-53.59	46.71	At least 20dB below from peak of RF	PASS
High	2462.00	-6.82	2484.06	-67.31	60.49	At least 20dB below from peak of RF	PASS

[IEEE802.11g]

Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
Low	2412.00	-13.23	2399.76	-47.15	33.92	At least 20dB below from peak of RF	PASS
High	2462.00	-12.62	2485.10	-62.29	49.67	At least 20dB below from peak of RF	PASS

[IEEE802.11n (HT20)]

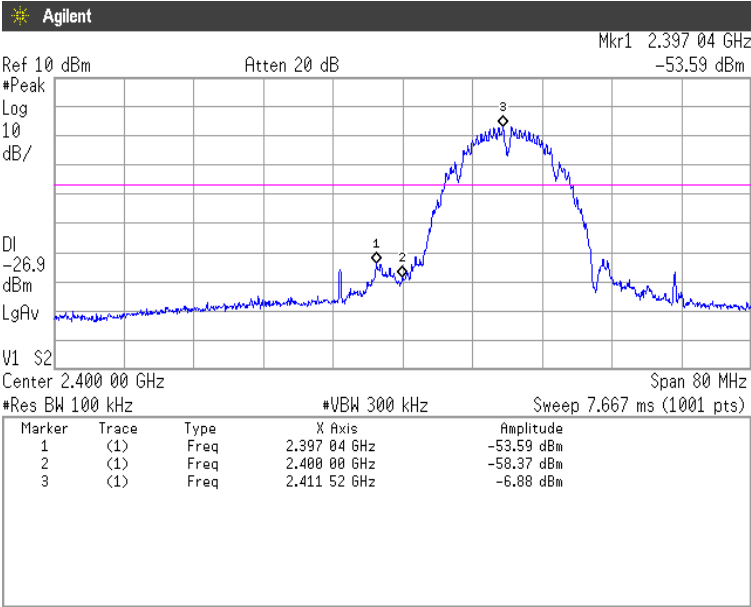
Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
Low	2412.00	-13.23	2399.76	-47.46	34.23	At least 20dB below from peak of RF	PASS
High	2462.00	-12.69	2485.10	-60.57	47.88	At least 20dB below from peak of RF	PASS

[IEEE802.11n (HT40)]

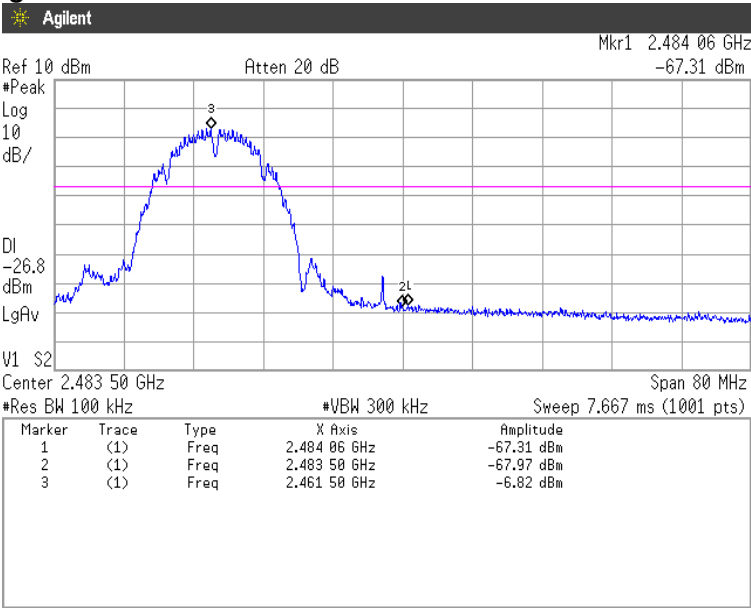
Channel	Frequency (MHz)	RF Power Level (dBm)	Band-edge Frequency (MHz)	Band-edge Level (dBm)	Difference Level (dBm)	Limit (dBm)	Result
Low	2422.00	-15.06	2399.84	-47.29	32.23	At least 20dB below from peak of RF	PASS
High	2452.00	-15.70	2483.98	-61.49	45.79	At least 20dB below from peak of RF	PASS

6.4 Trace data
[IEEE802.11b]

Channel Low

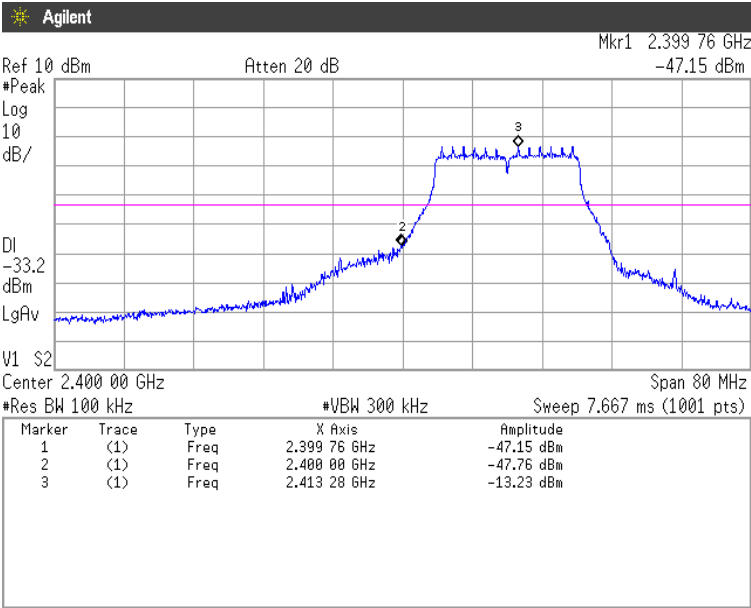


Channel High

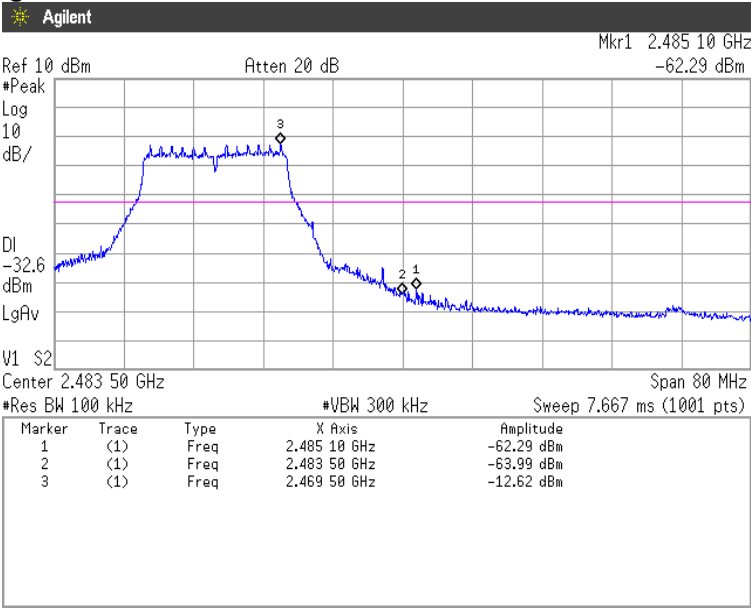


[IEEE802.11g]

Channel Low

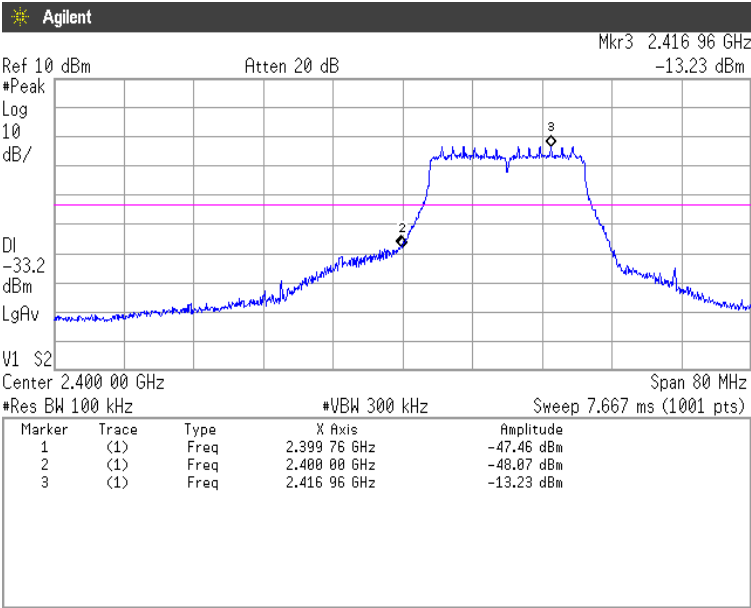


Channel High

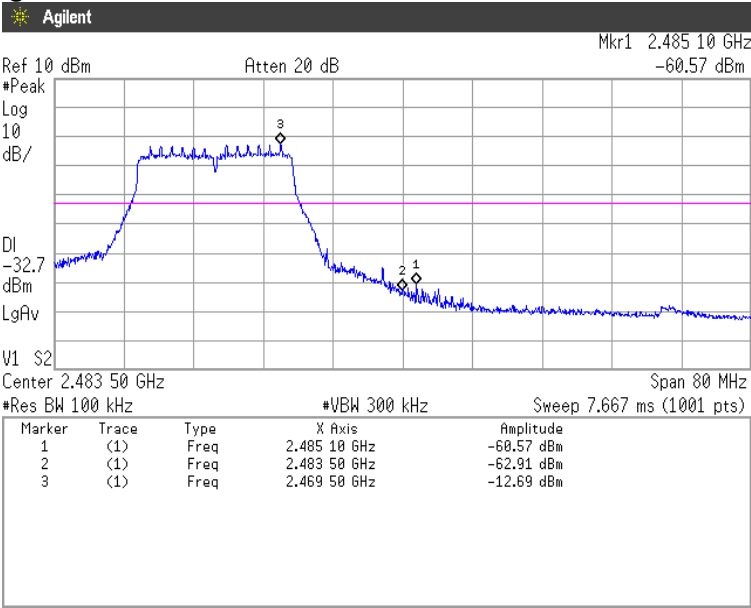


[IEEE802.11n (HT20)]

Channel Low

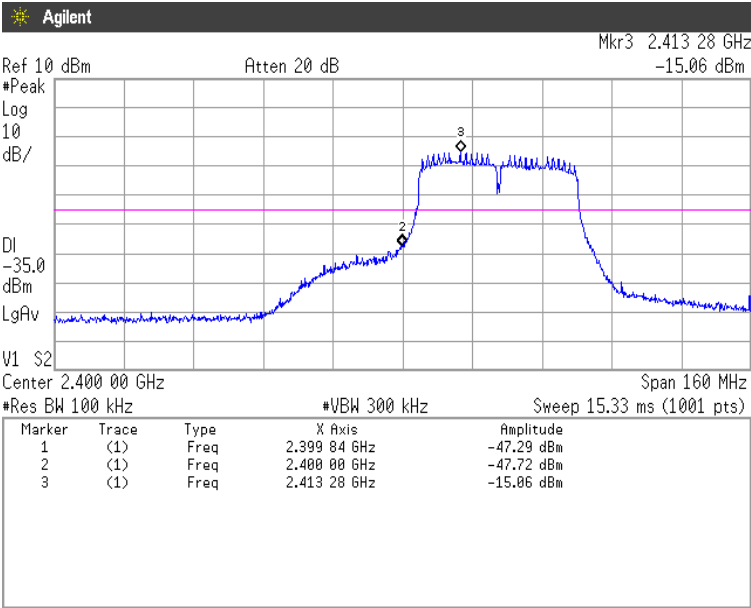


Channel High

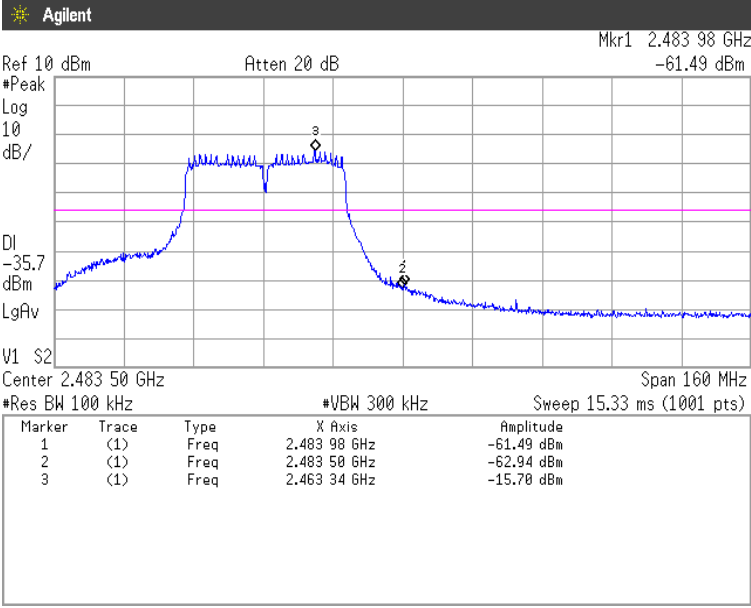


[IEEE802.11n (HT40)]

Channel Low



Channel High



7. Spurious emissions - Conducted -

7.1 Measurement procedure

[FCC 15.247(d), KDB 558074 D01 v04, Section 11.0]

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;

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

- Test configuration



7.2 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.

7.3 Measurement result

Date : May 15, 2018

Temperature : 20.8 [°C]

Humidity : 44.3 [%]

Test place : Shielded room No.3

Test engineer :

Tadahiro Seino

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

Channel	Frequency [MHz]	Limit [dB]	Results Chart	Result
Low	2412	At least 20dB below from peak of RF	See the trace Data	PASS
Middle	2437	At least 20dB below from peak of RF	See the trace Data	PASS
High	2462	At least 20dB below from peak of RF	See the trace Data	PASS

[IEEE802.11n (HT40)]

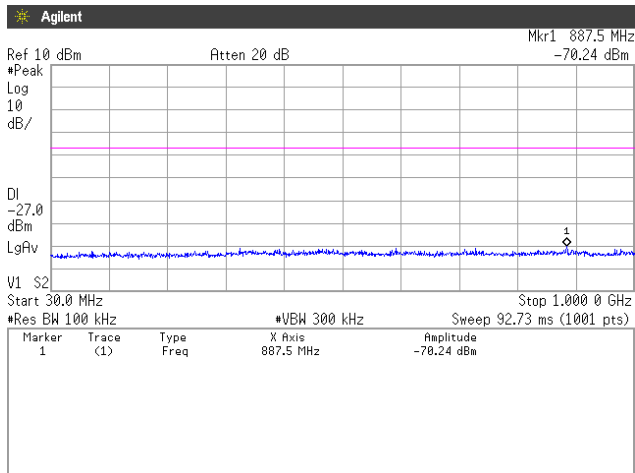
Channel	Frequency [MHz]	Limit [dB]	Results Chart	Result
Low	2422	At least 20dB below from peak of RF	See the trace Data	PASS
Middle	2437	At least 20dB below from peak of RF	See the trace Data	PASS
High	2452	At least 20dB below from peak of RF	See the trace Data	PASS

7.4 Trace data

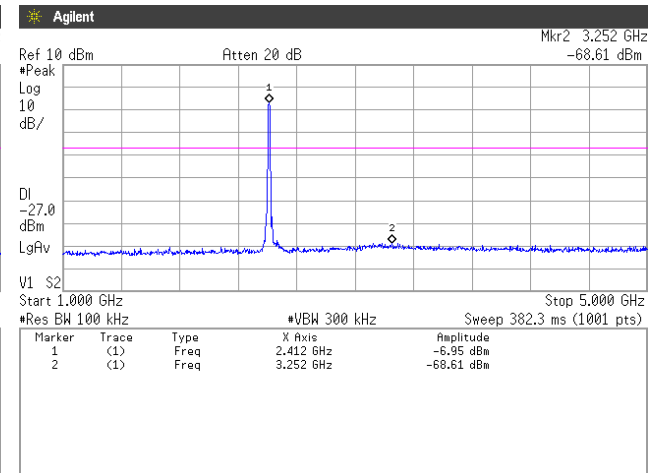
[IEEE802.11b]

Channel Low

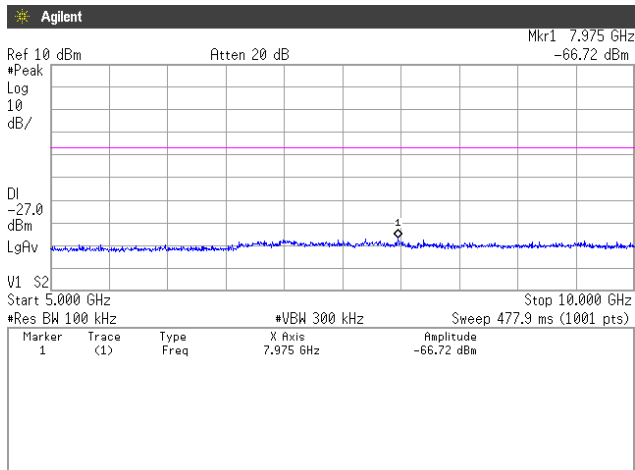
30MHz-1GHz



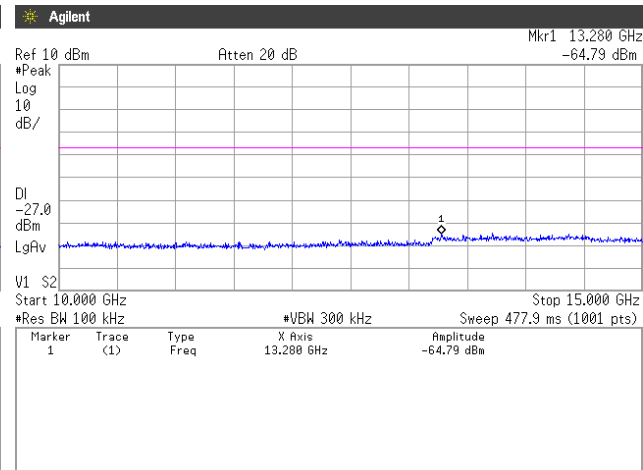
1GHz-5GHz



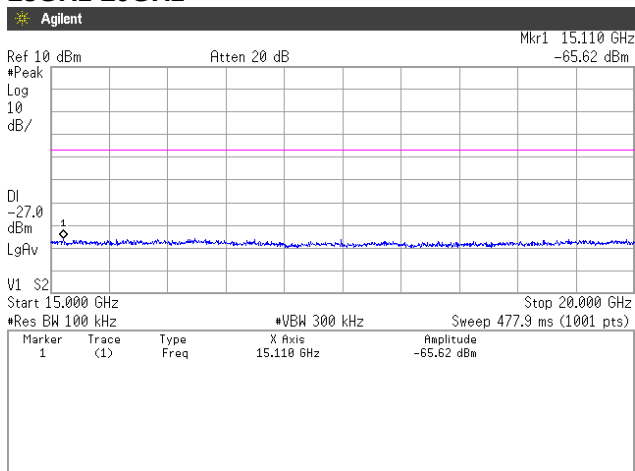
5GHz-10GHz



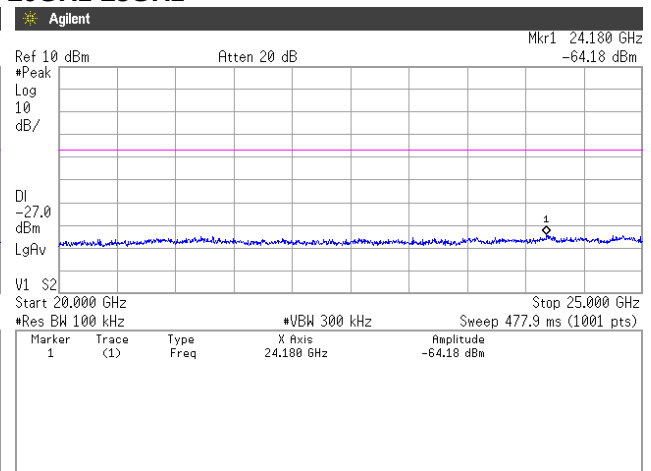
10GHz-15GHz



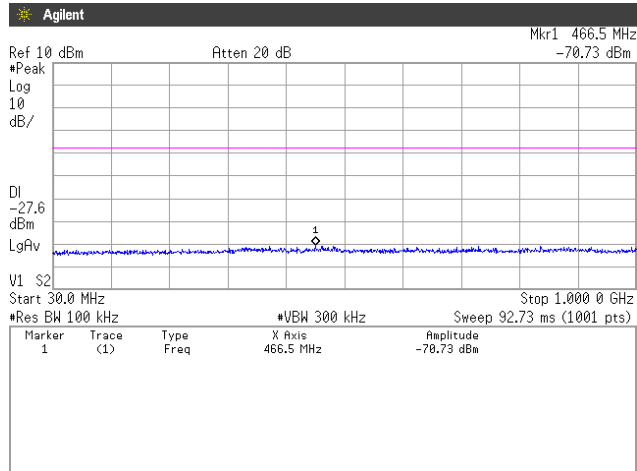
15GHz-20GHz



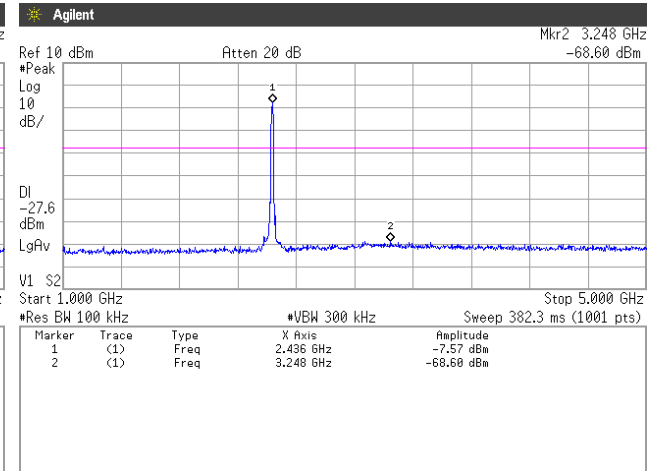
20GHz-25GHz



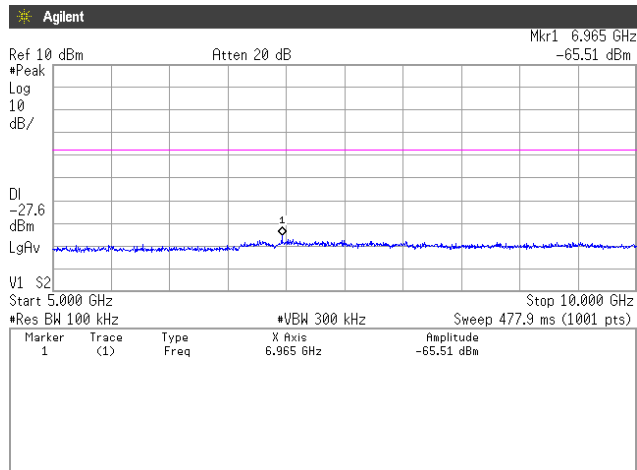
Channel Middle 30MHz-1GHz



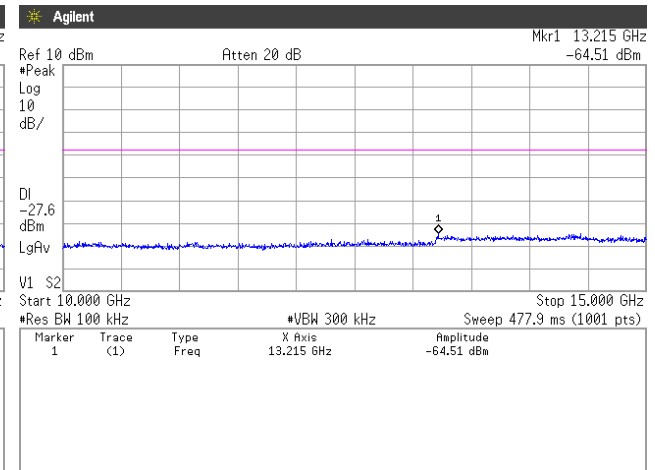
1GHz-5GHz



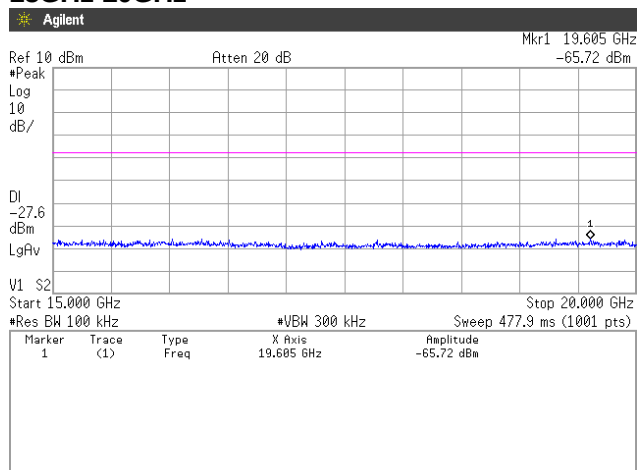
5GHz-10GHz



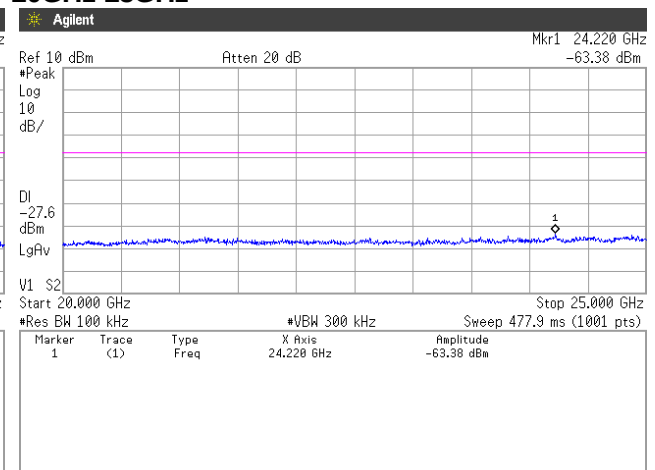
10GHz-15GHz



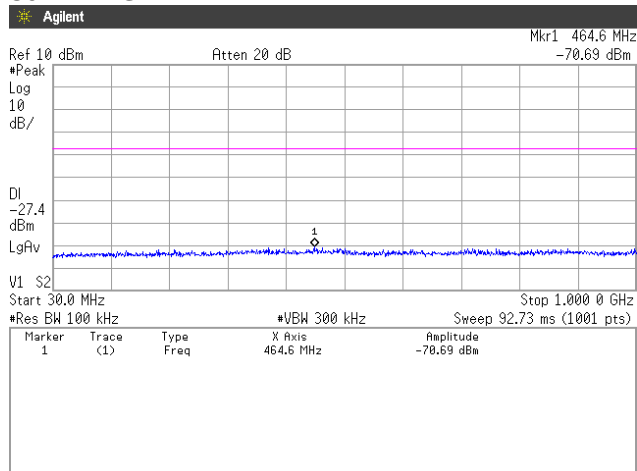
15GHz-20GHz



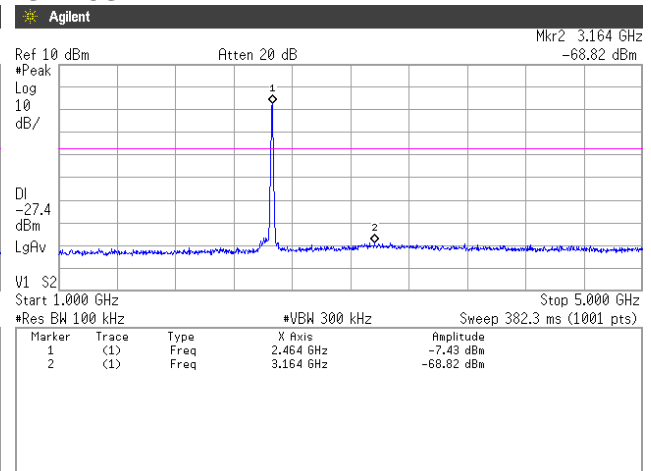
20GHz-25GHz



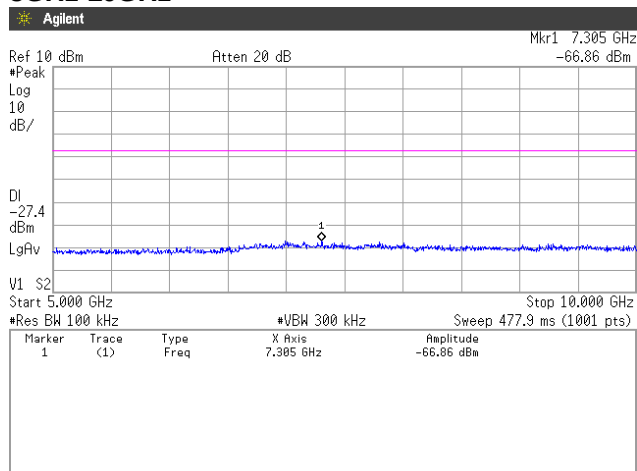
Channel High 30MHz-1GHz



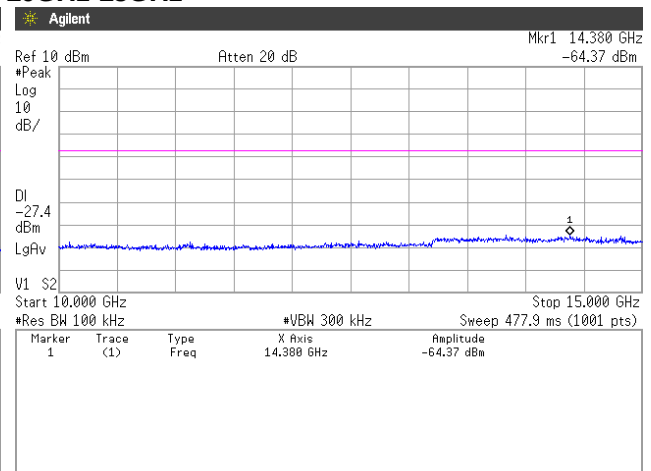
1GHz-5GHz



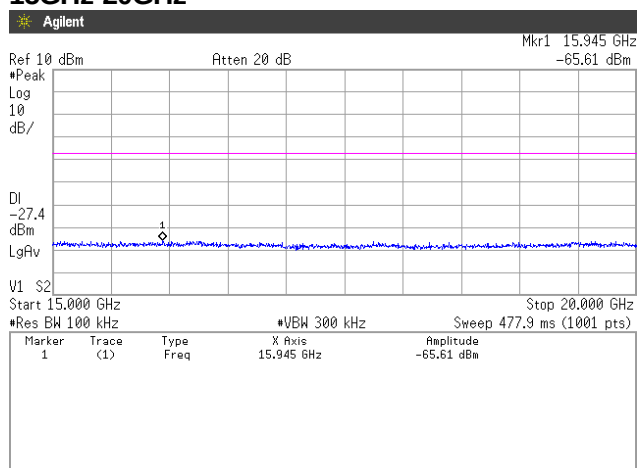
5GHz-10GHz



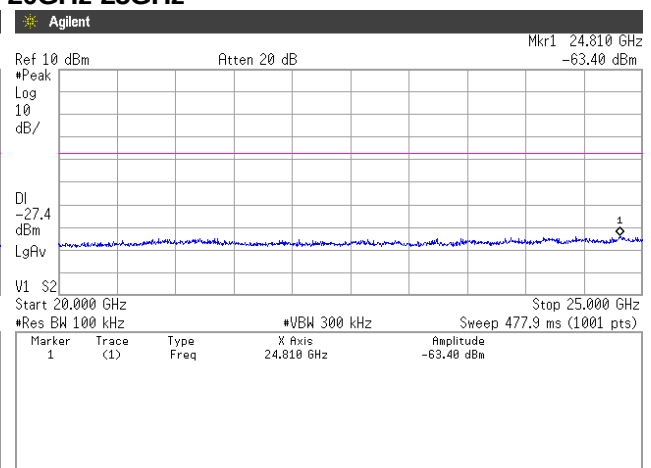
10GHz-15GHz



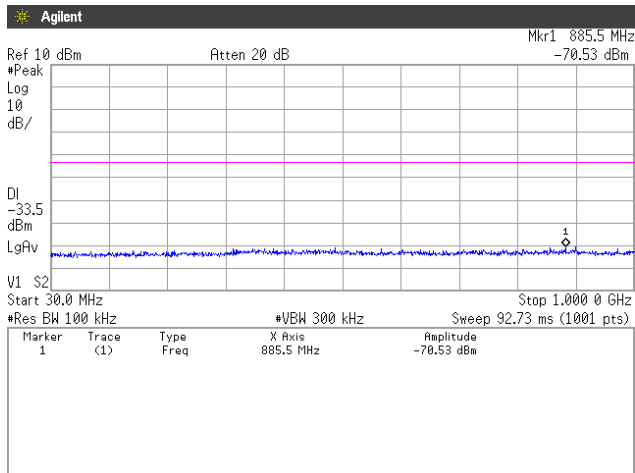
15GHz-20GHz



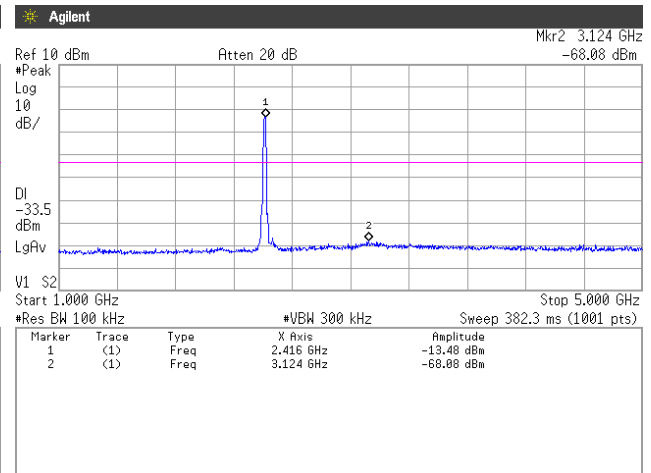
20GHz-25GHz



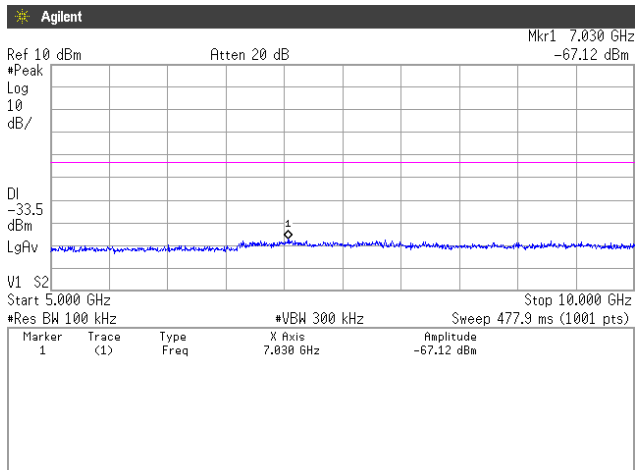
[IEEE802.11g] Channel Low 30MHz-1GHz



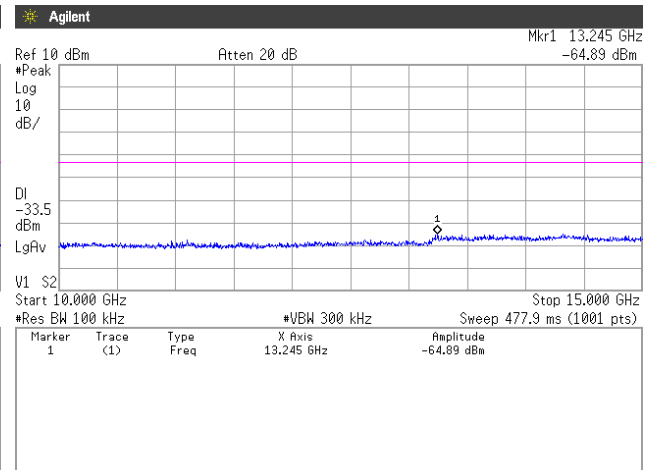
1GHz-5GHz



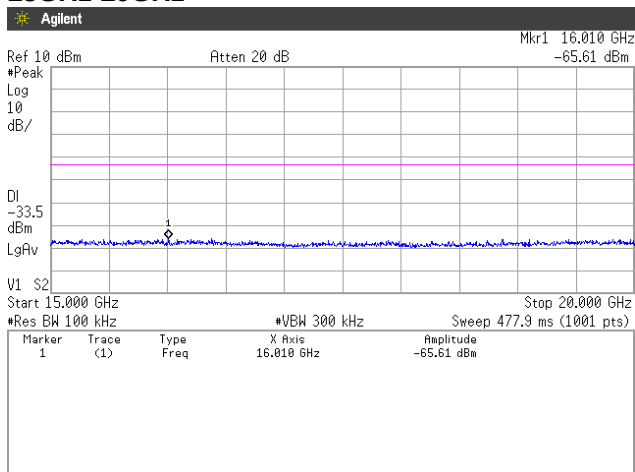
5GHz-10GHz



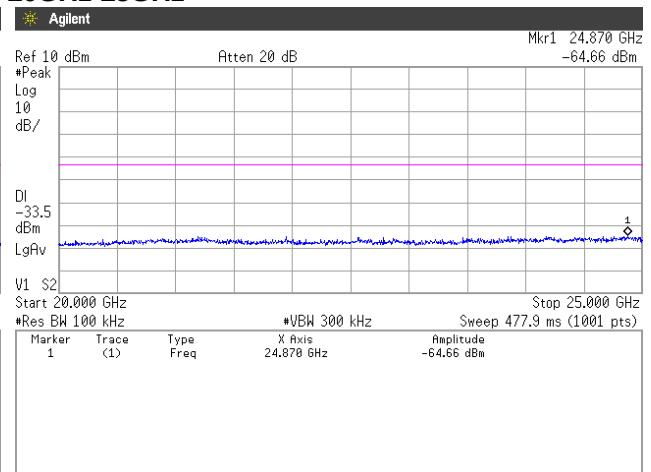
10GHz-15GHz



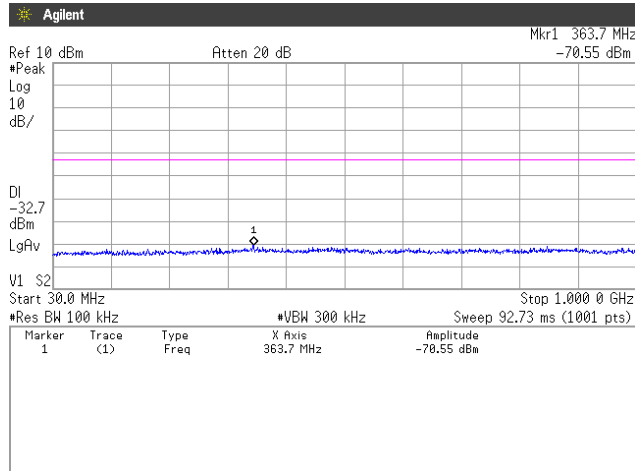
15GHz-20GHz



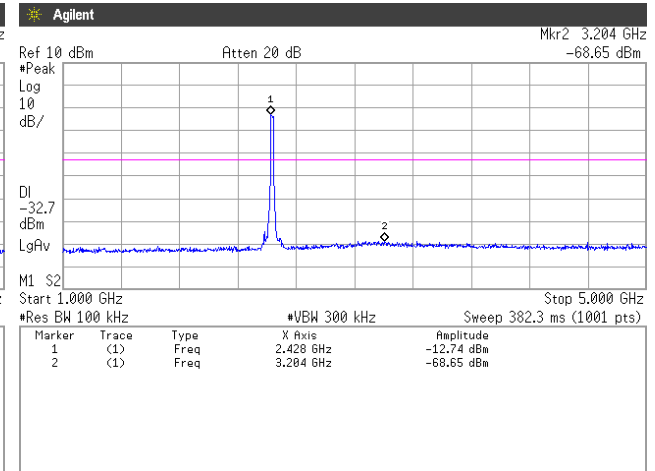
20GHz-25GHz



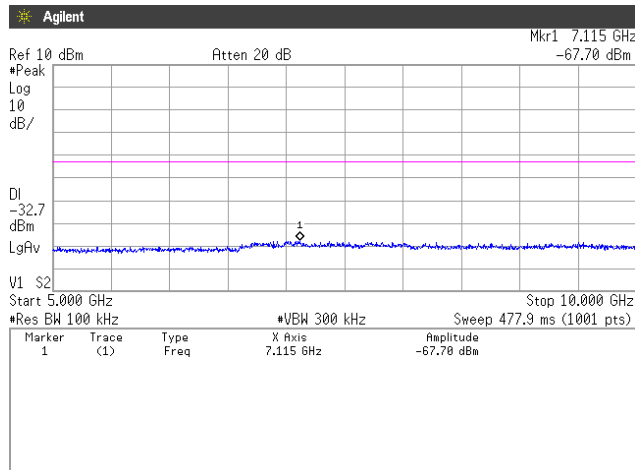
Channel Middle 30MHz-1GHz



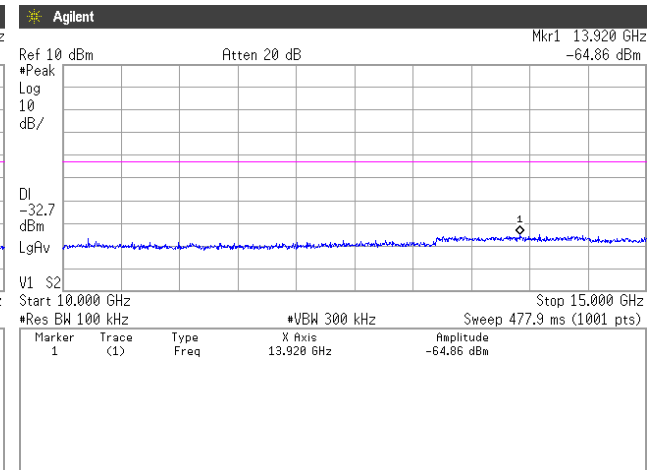
1GHz-5GHz



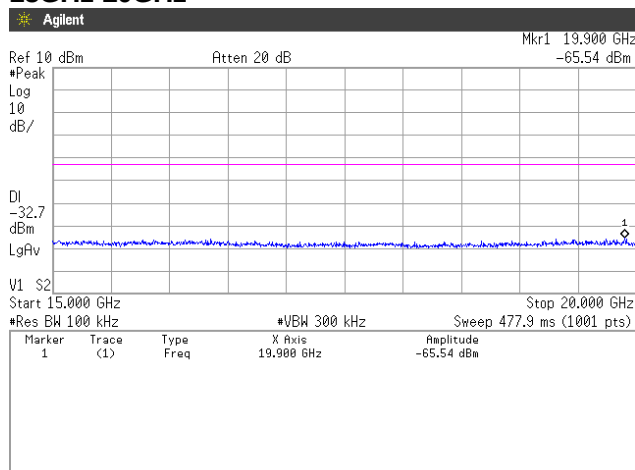
5GHz-10GHz



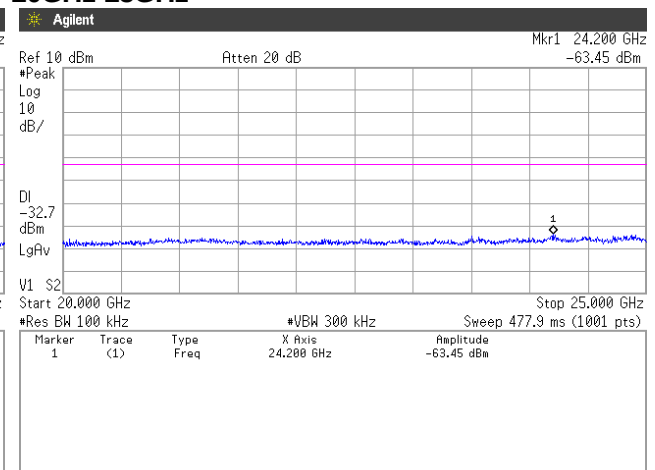
10GHz-15GHz



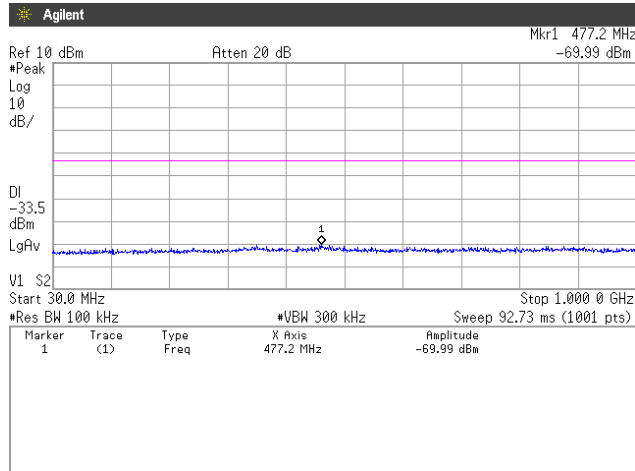
15GHz-20GHz



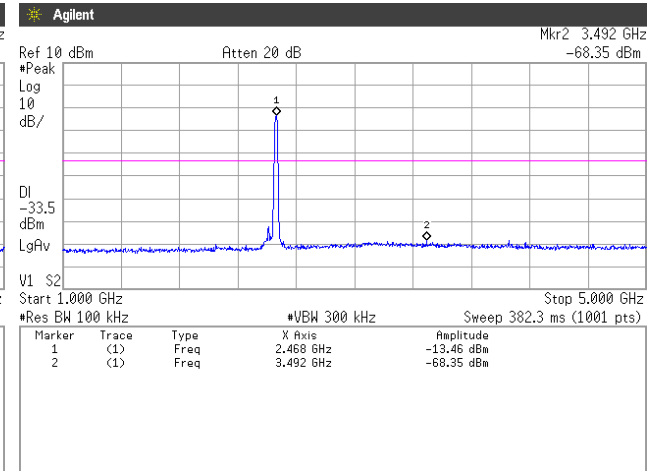
20GHz-25GHz



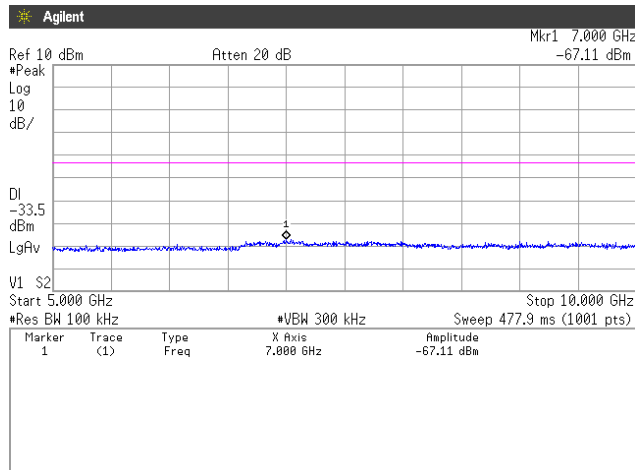
Channel High 30MHz-1GHz



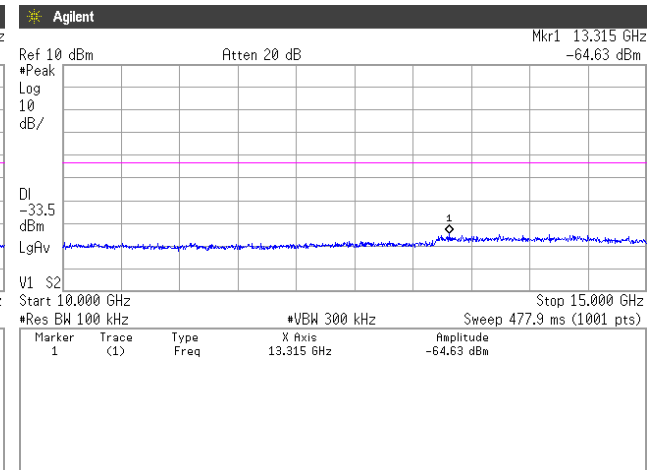
1GHz-5GHz



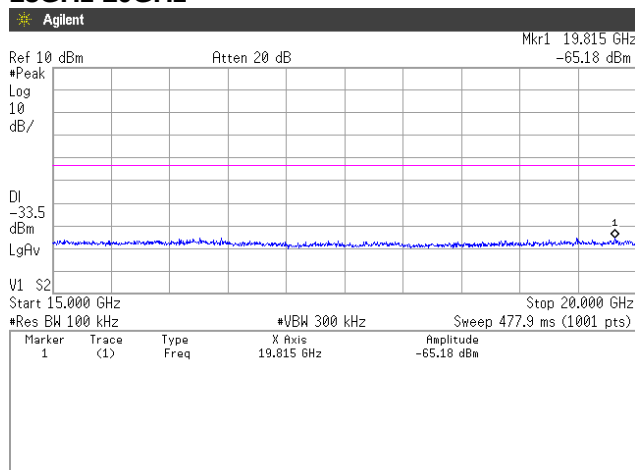
5GHz-10GHz



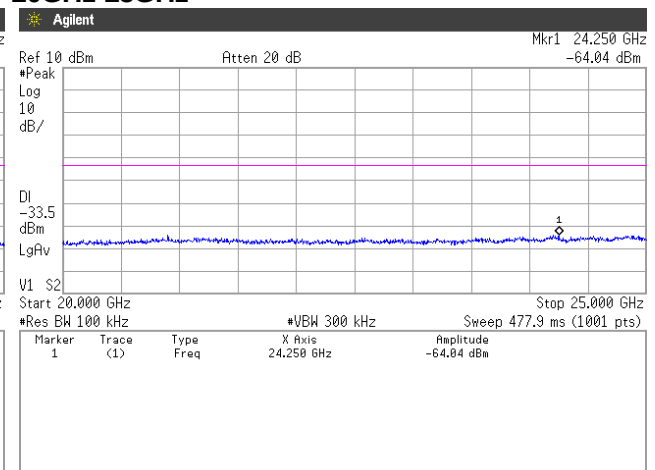
10GHz-15GHz



15GHz-20GHz



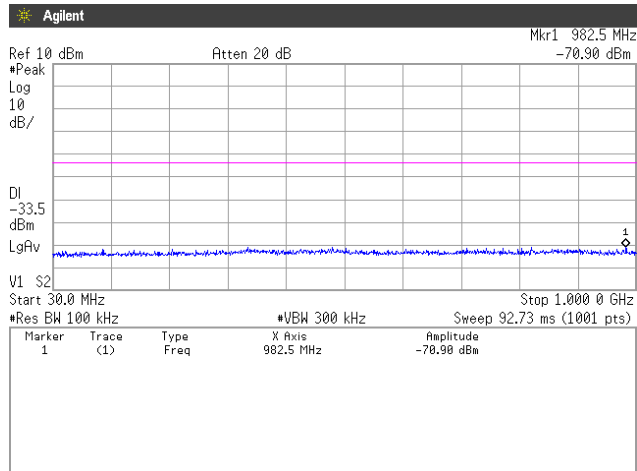
20GHz-25GHz



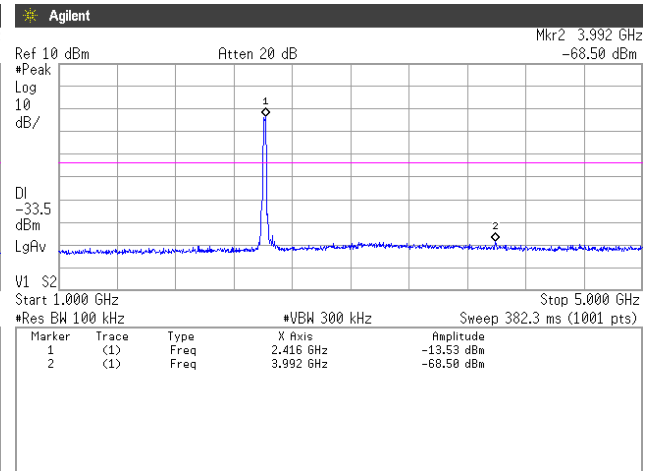
[IEEE802.11n (HT20)]

Channel Low

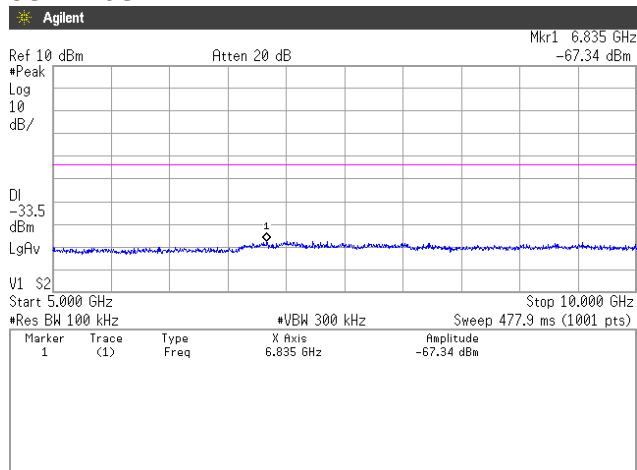
30MHz-1GHz



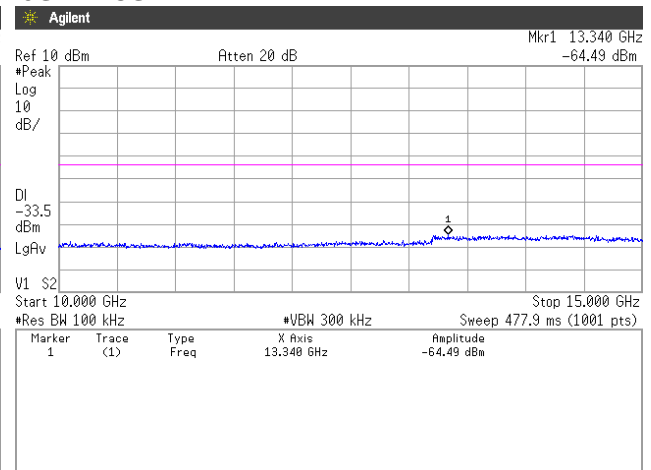
1GHz-5GHz



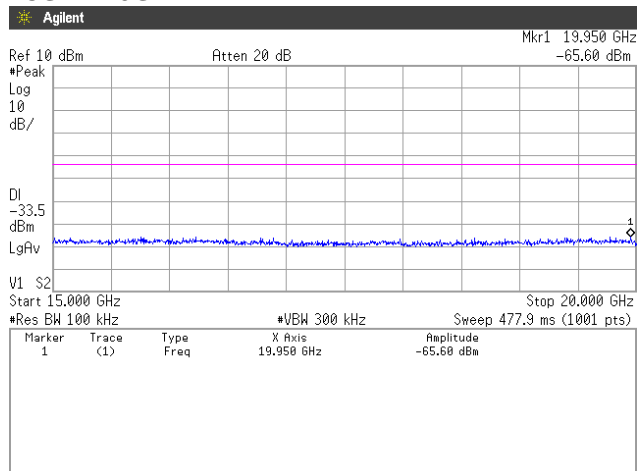
5GHz-10GHz



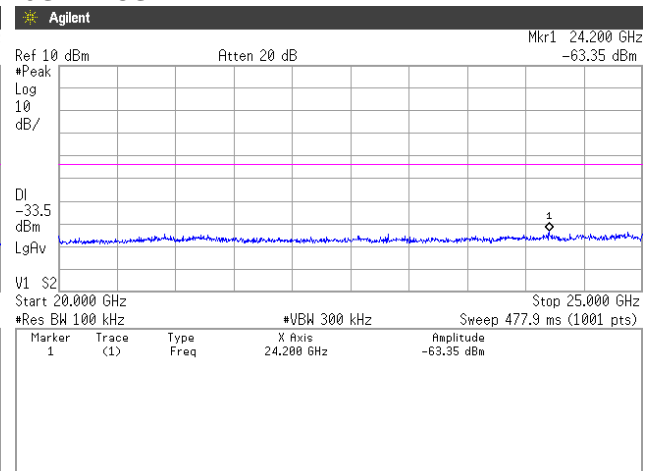
10GHz-15GHz



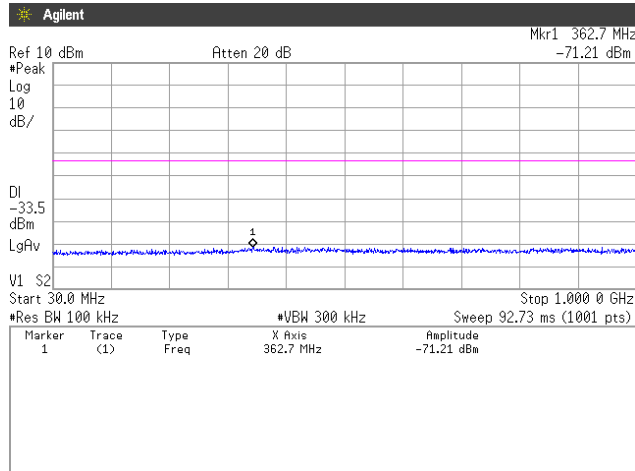
15GHz-20GHz



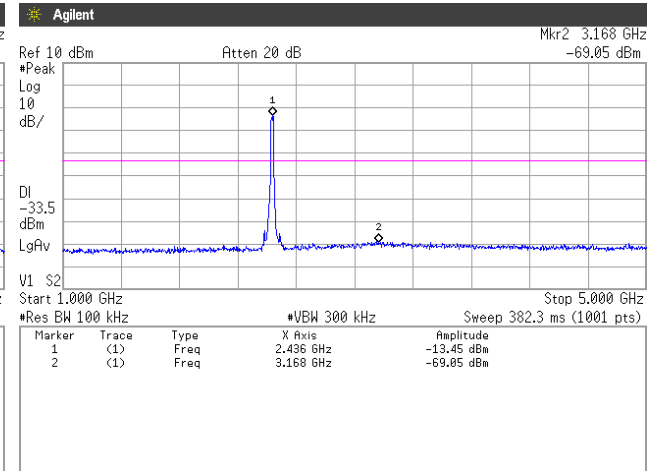
20GHz-25GHz



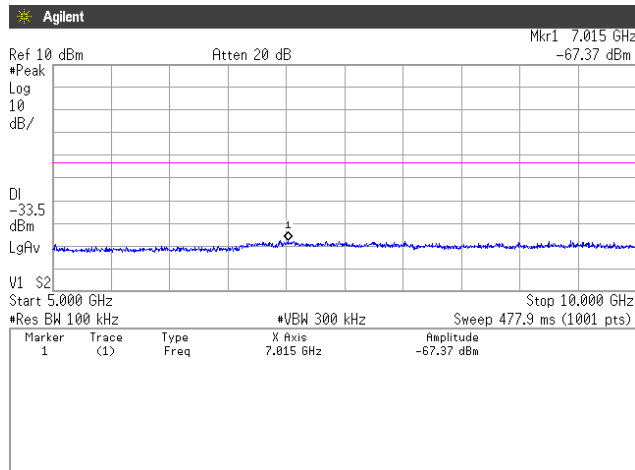
Channel Middle 30MHz-1GHz



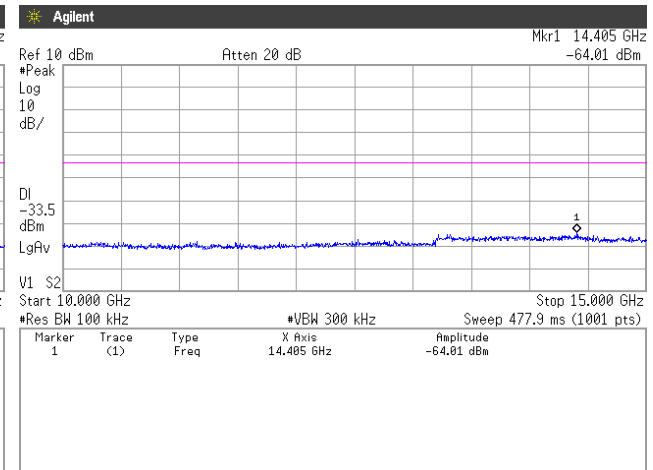
1GHz-5GHz



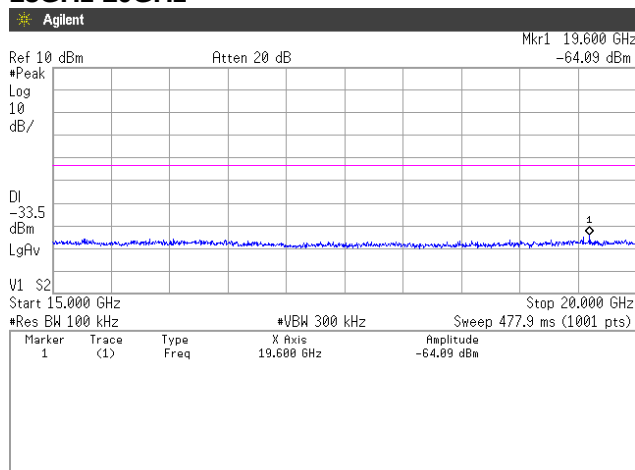
5GHz-10GHz



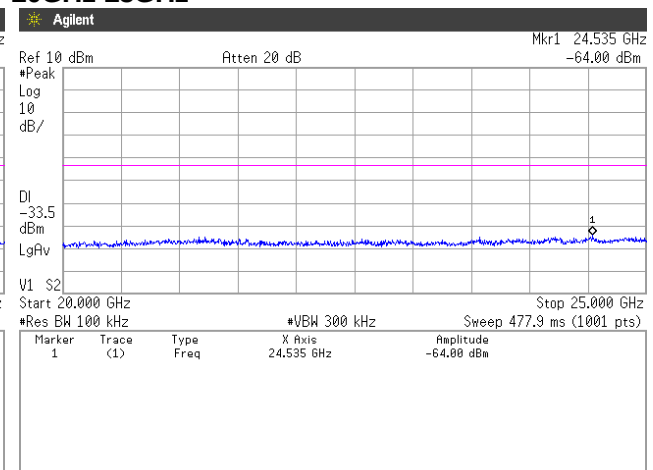
10GHz-15GHz



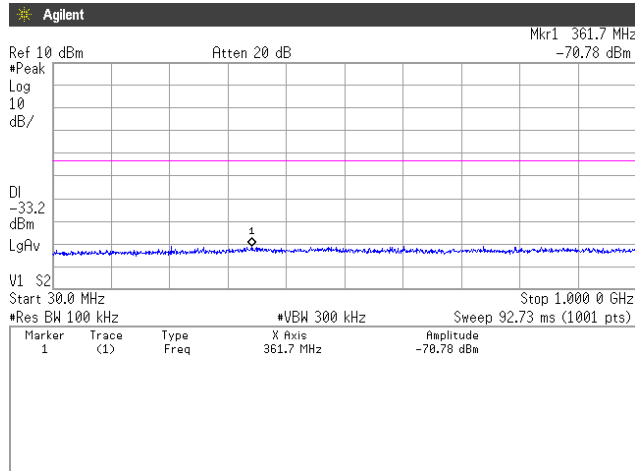
15GHz-20GHz



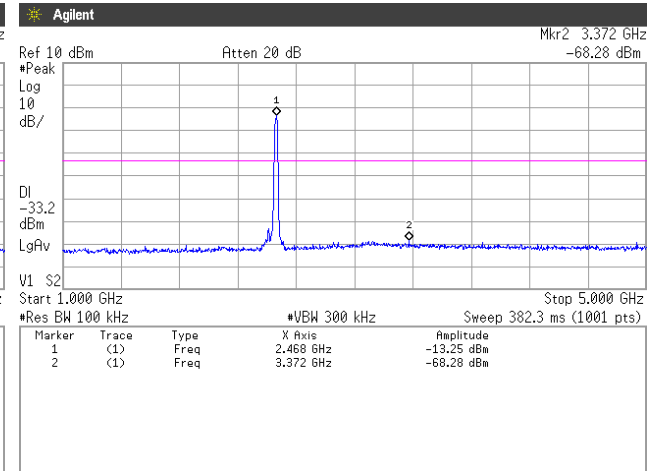
20GHz-25GHz



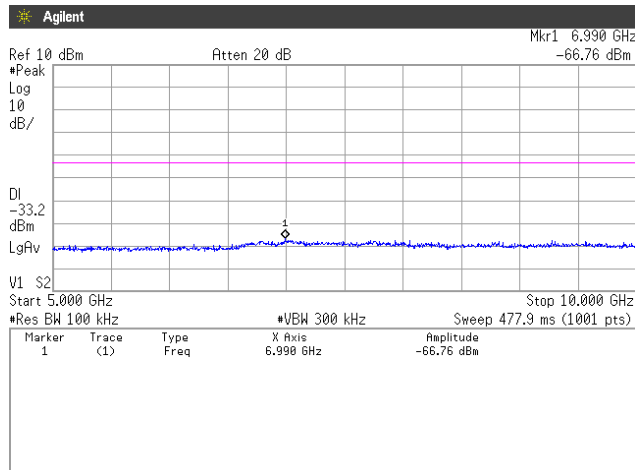
Channel High 30MHz-1GHz



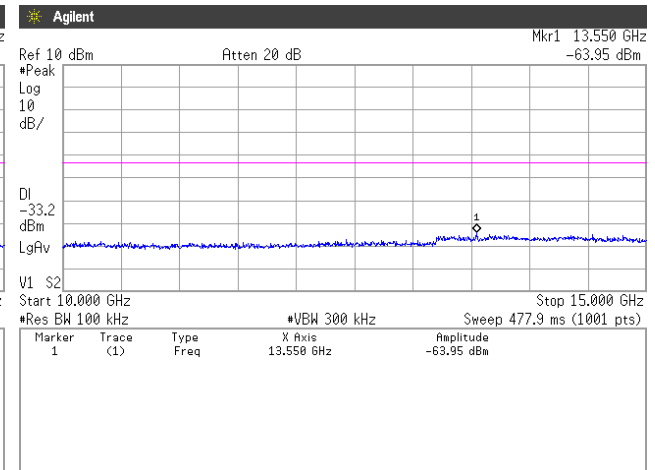
1GHz-5GHz



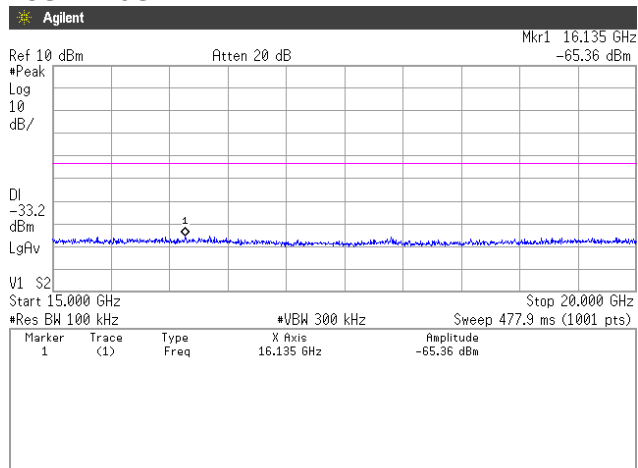
5GHz-10GHz



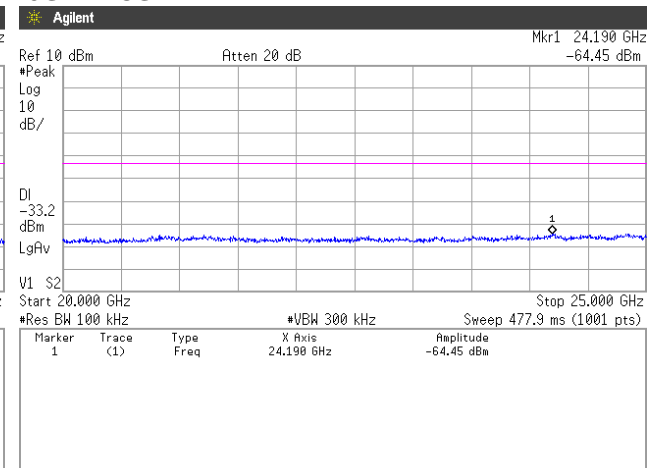
10GHz-15GHz



15GHz-20GHz



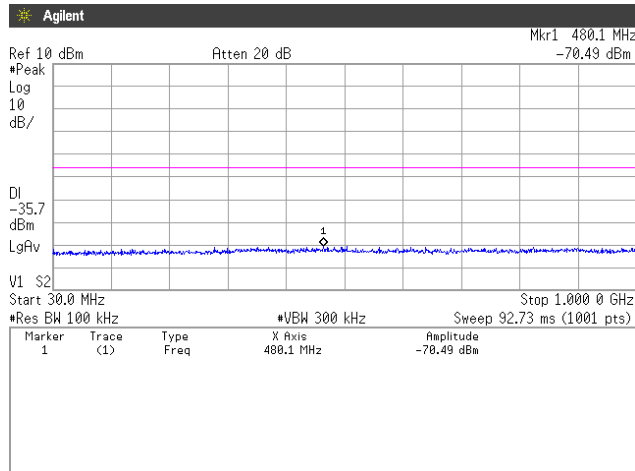
20GHz-25GHz



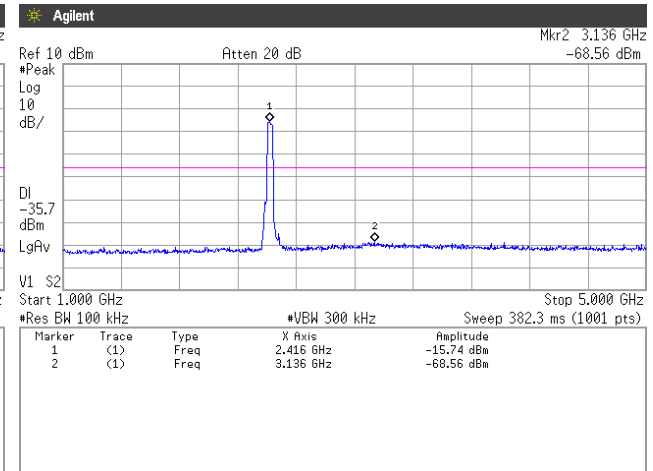
[IEEE802.11n (HT40)]

Channel Low

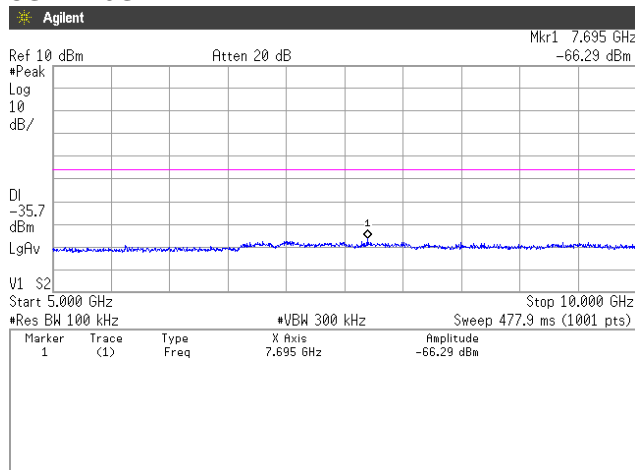
30MHz-1GHz



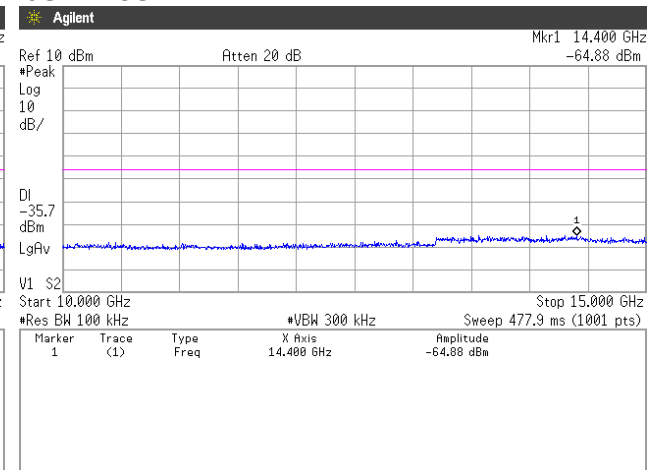
1GHz-5GHz



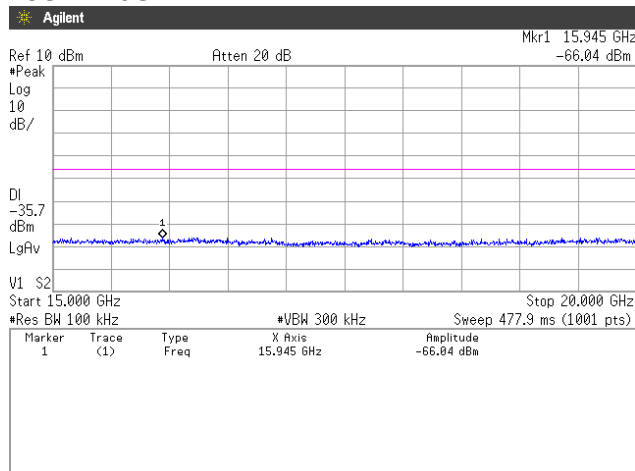
5GHz-10GHz



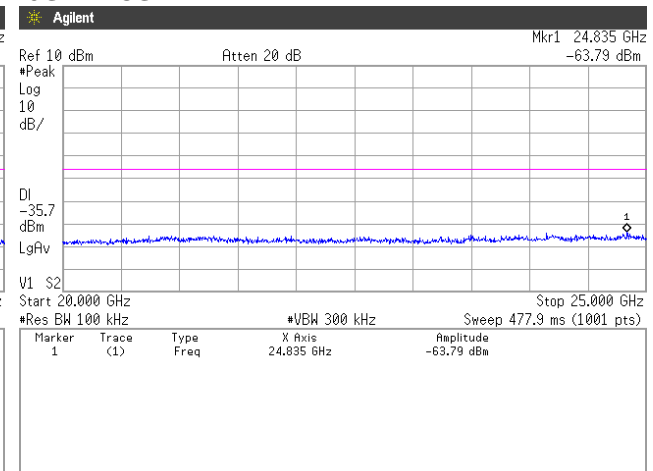
10GHz-15GHz



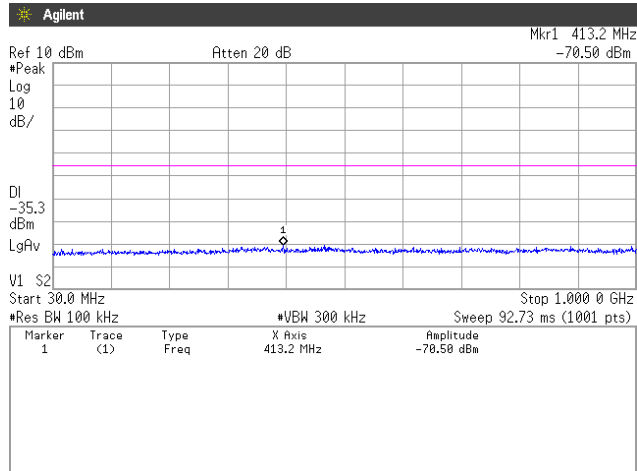
15GHz-20GHz



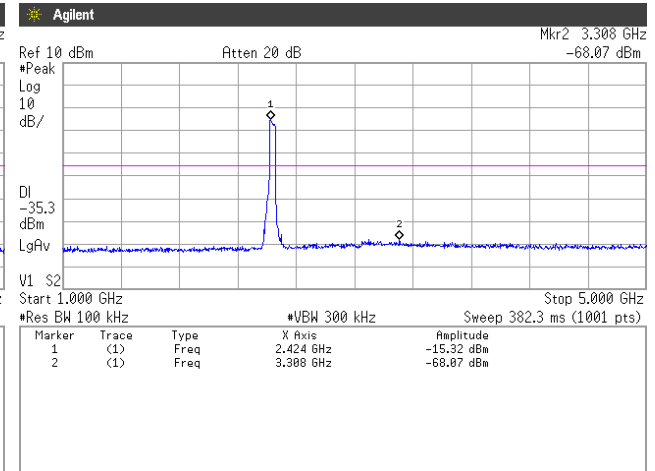
20GHz-25GHz



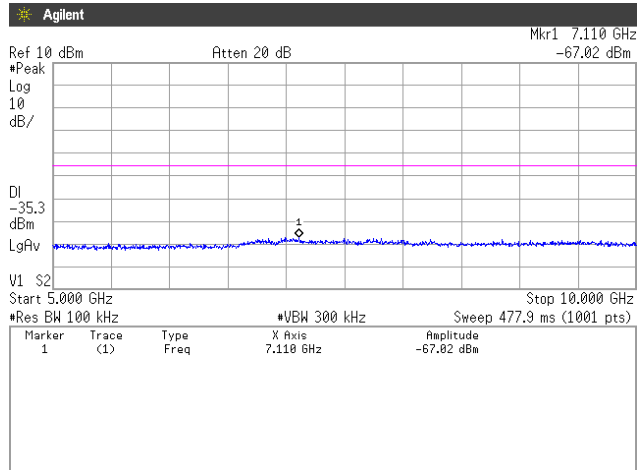
Channel Middle 30MHz-1GHz



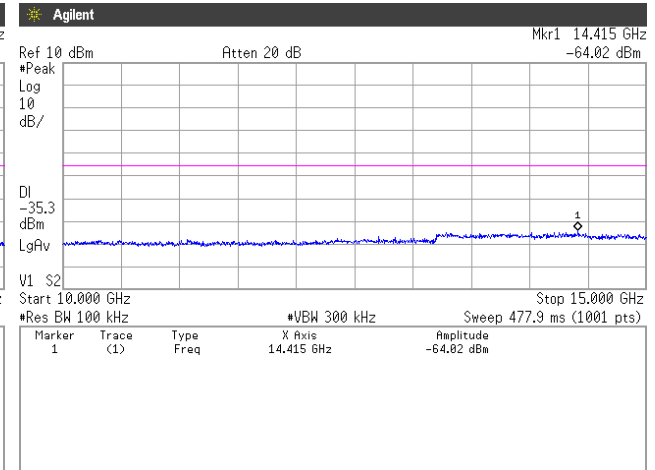
1GHz-5GHz



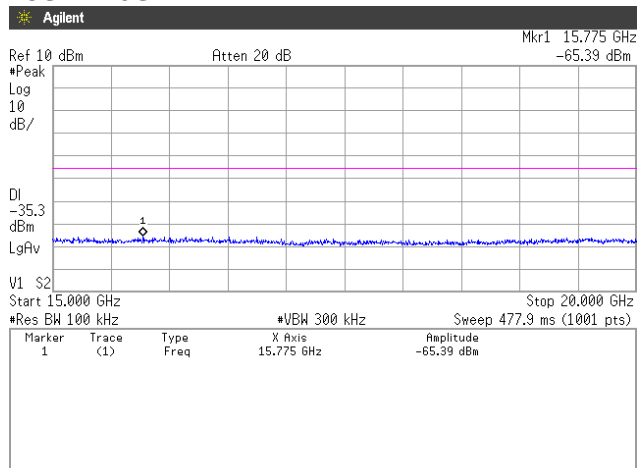
5GHz-10GHz



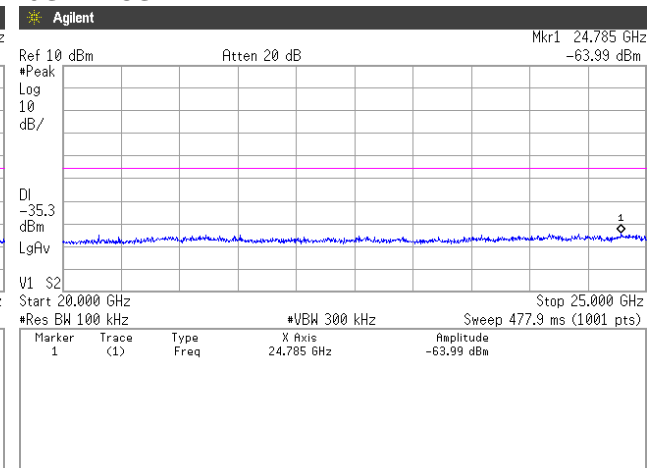
10GHz-15GHz



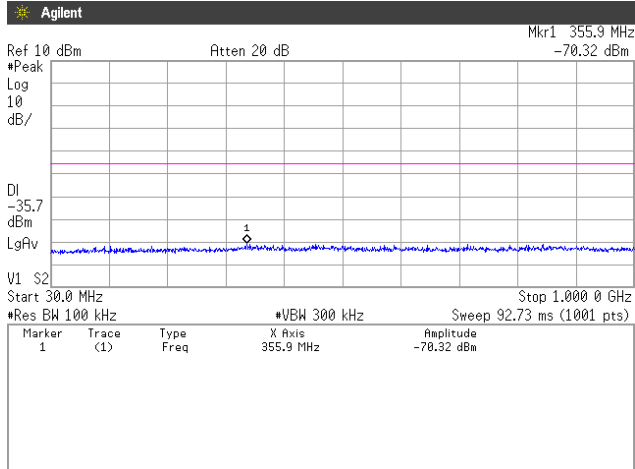
15GHz-20GHz



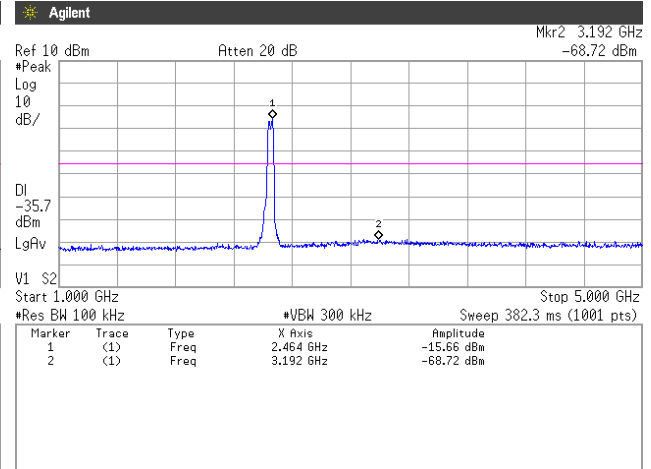
20GHz-25GHz



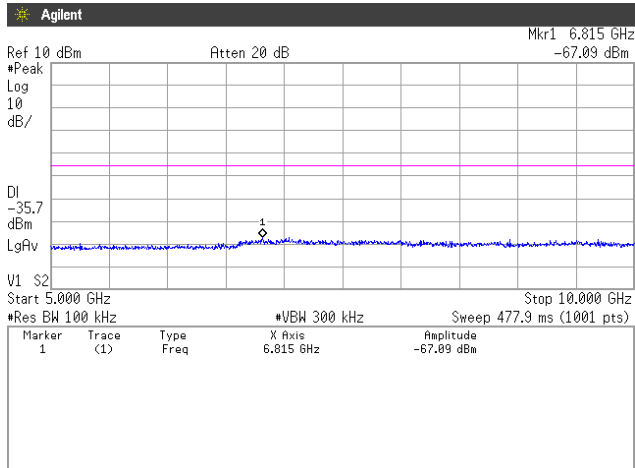
Channel High 30MHz-1GHz



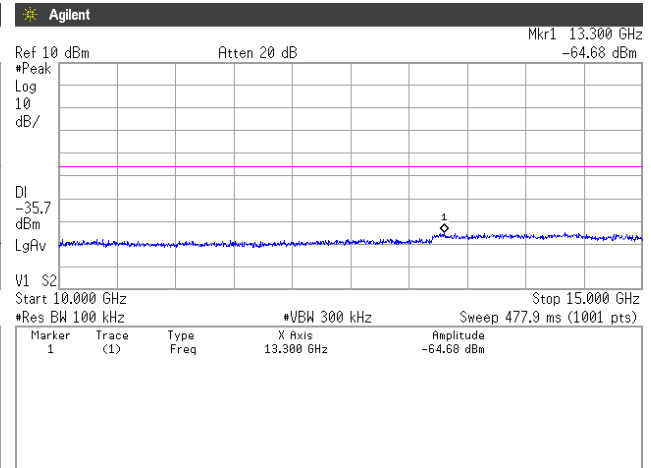
1GHz-5GHz



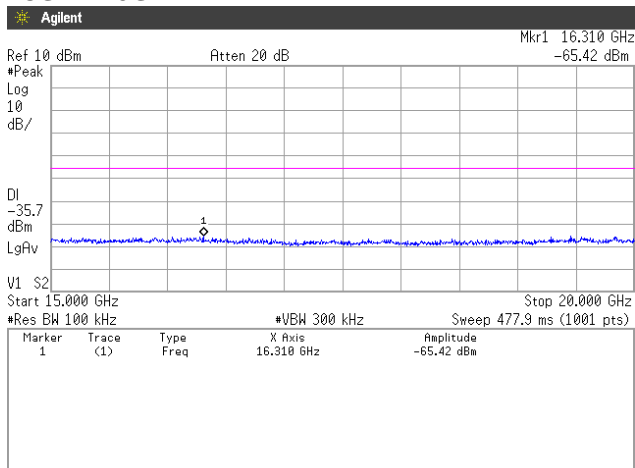
5GHz-10GHz



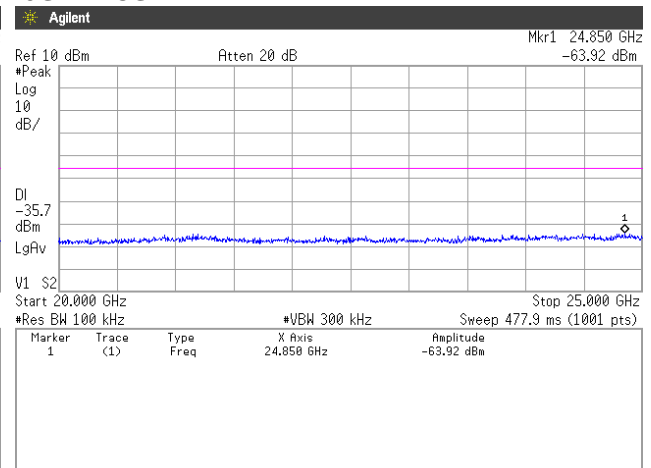
10GHz-15GHz



15GHz-20GHz



20GHz-25GHz



8. Spurious Emissions - Radiated -

8.1 Measurement procedure

[FCC 15.247(d), 15.205, 15.209, KDB 558074 D01 v04, Section 12.1]

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=auto
- Average	: RBW=1MHz, VBW=10Hz, Span=0Hz, Sweep=auto Display mode=Linear

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	Determined VBW Setting
IEEE802.11b	99.22	1024	8	10Hz (Duty Cycle ≥ 98%)
IEEE802.11g	99.27	1362	10	10Hz (Duty Cycle ≥ 98%)
IEEE802.11n(HT20)	99.38	1276	8	10Hz (Duty Cycle ≥ 98%)
IEEE802.11n(HT40)	98.45	635	10	10Hz (Duty Cycle ≥ 98%)

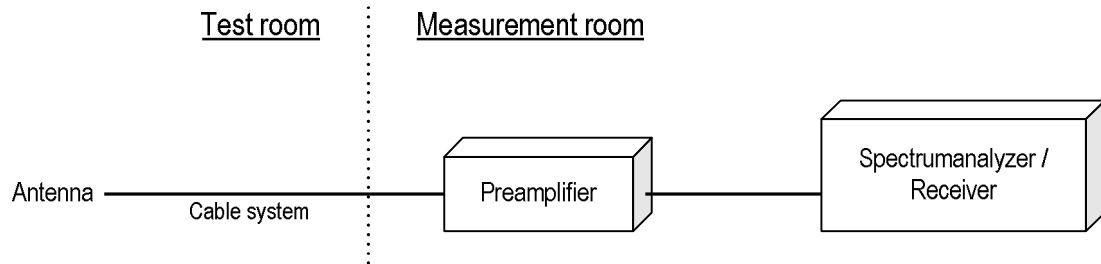
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.

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 and 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. 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



8.2 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 @ 4824.0MHz : 74.0dBuV/m (Peak Limit)

S.A Reading = 49.5dBuV Cable system loss = 8.4dB

Result = 49.5 + 8.4 = 45.1dBuV/m

Margin = 74.0 - 45.1 = 16.1dB

8.3 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.

8.4 Test data

Date : April 27, 2018
Temperature : 20.1 [°C]
Humidity : 38.6 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Taiki Watanabe

Date : April 27, 2018
Temperature : 20.1 [°C]
Humidity : 38.6 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Tadahiro Seino

Date : April 28, 2018
Temperature : 21.9 [°C]
Humidity : 35.6 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Tadahiro Seino

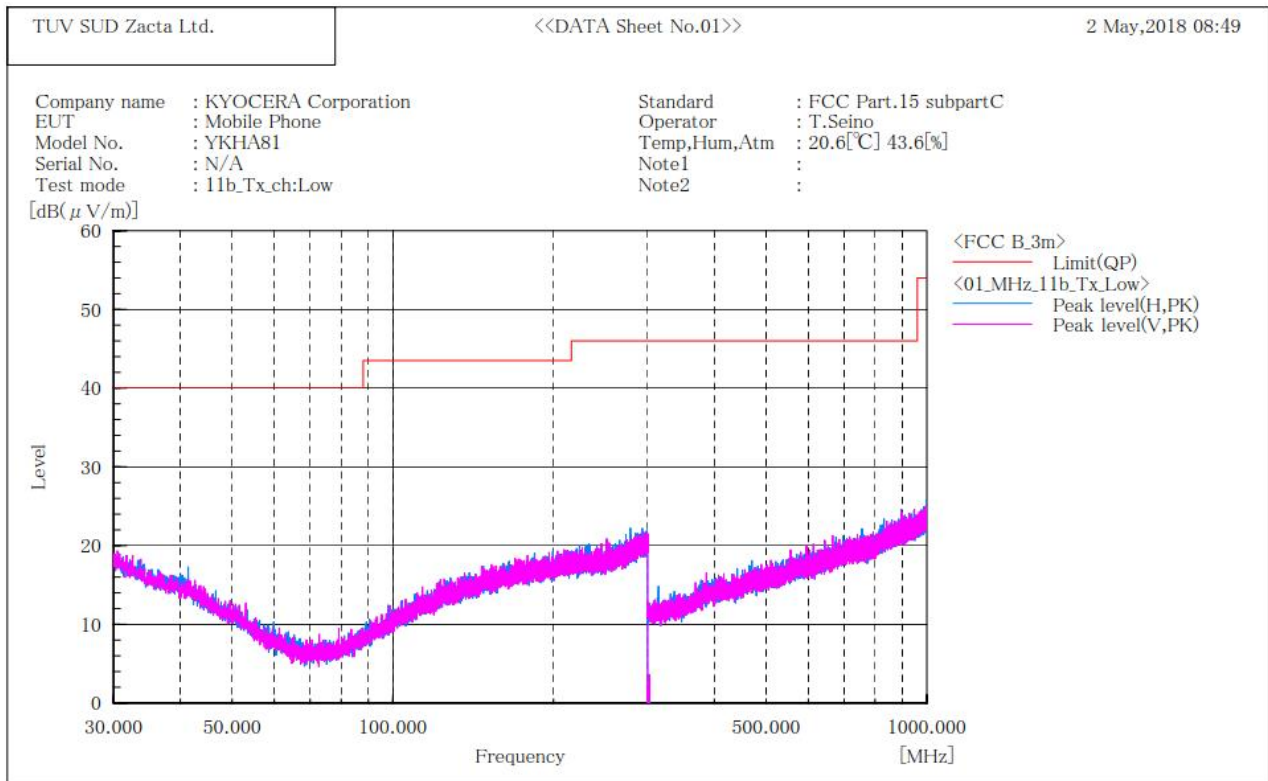
Date : May 2, 2018
Temperature : 20.6 [°C]
Humidity : 43.6 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Tadahiro Seino

8.4.1 Transmission mode

[11b] Channel Low BELOW 1GHz

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



Final Result

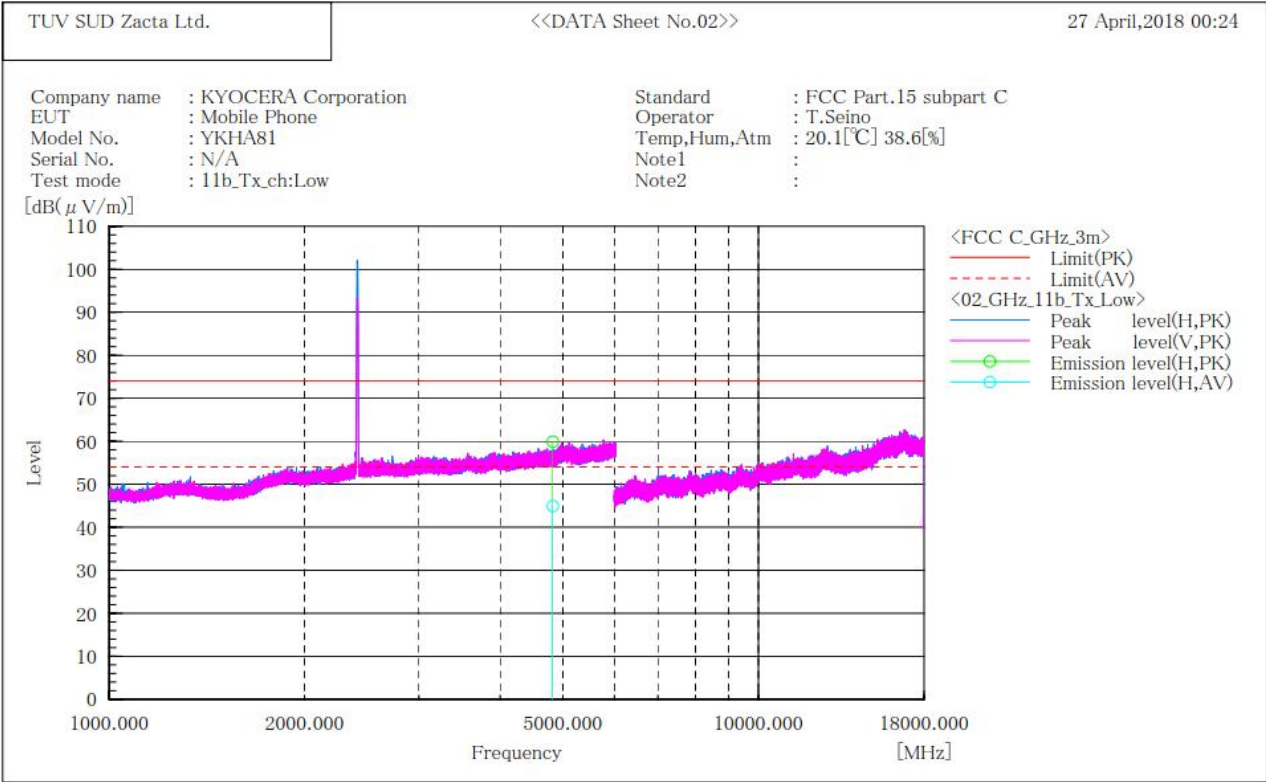
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11b]
Channel Low
ABOVE 1GHz

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



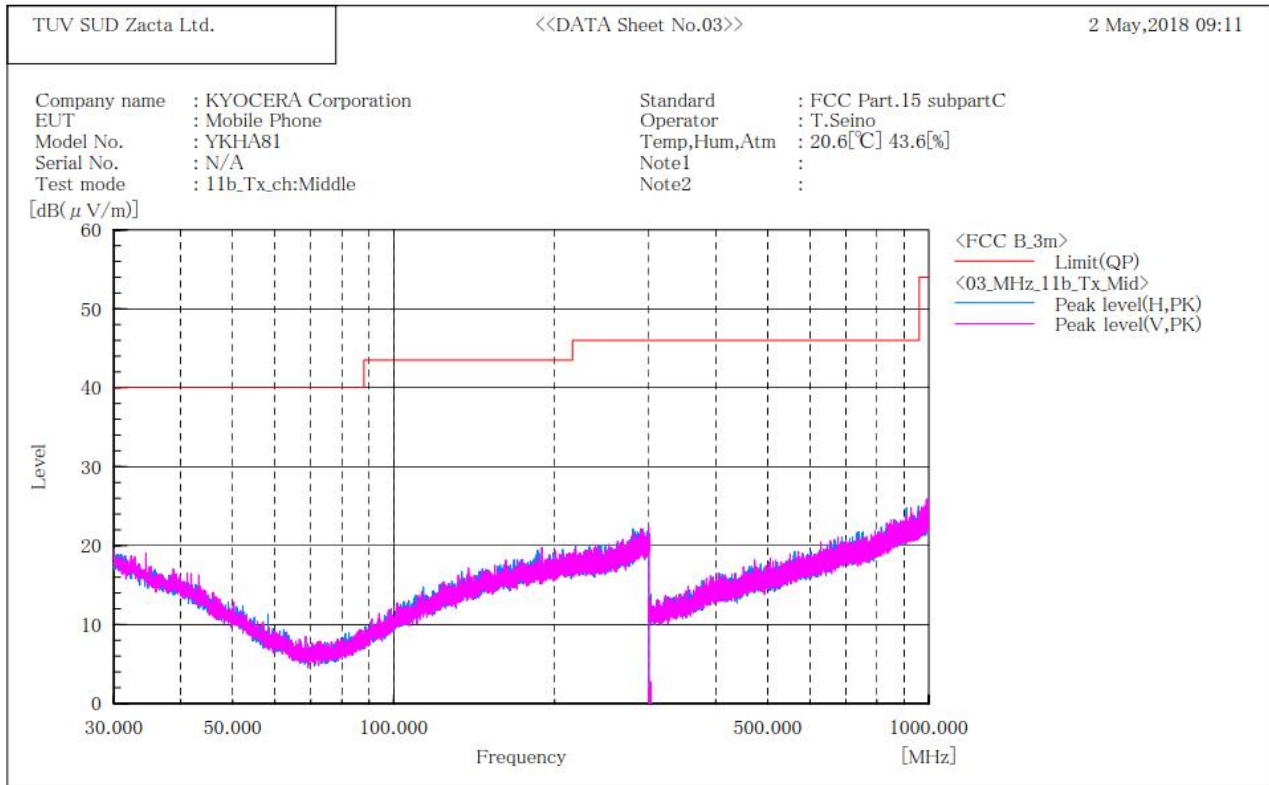
Final Result

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	4824.000	H	50.9	35.9	9.0	59.9	44.9	74.0	54.0	14.1	9.1	167.0	227.0	

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

[11b]
Channel Middle
BELOW 1GHz

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



Final Result

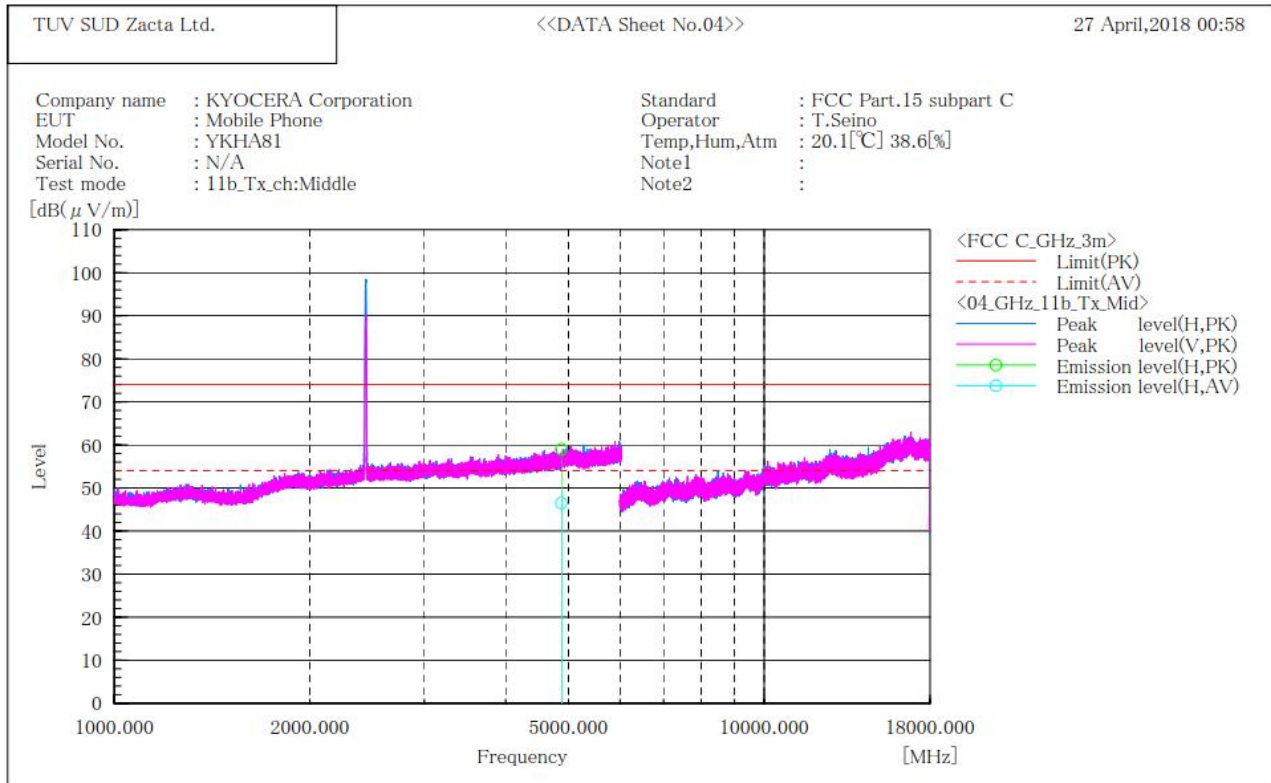
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11b]
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	4874.000	H	49.8	37.3	9.2	59.0	46.5	74.0	54.0	15.0	7.5	161.0	47.0	

Note:

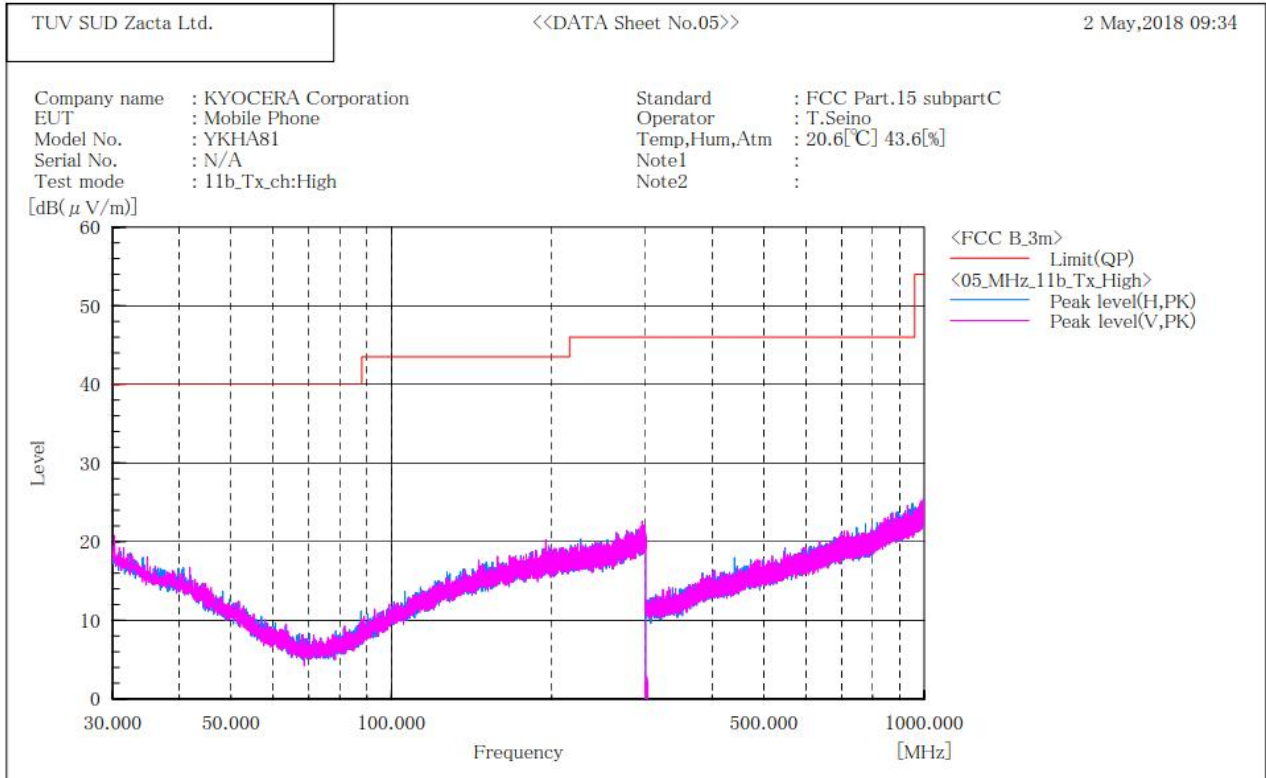
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.



Zacta

**[11b]
Channel High
BELOW 1GHz**

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



Final Result

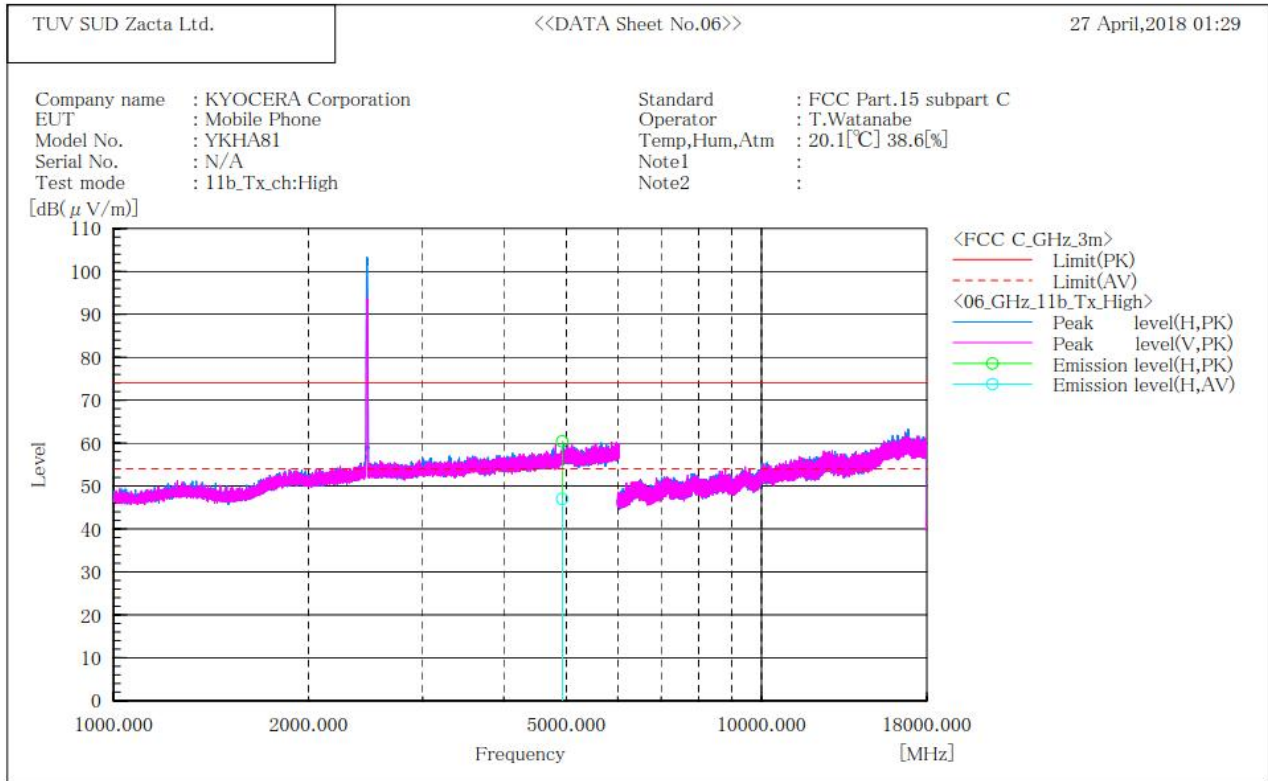
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

**[11b]
Channel High
ABOVE 1GHz**

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



Final Result

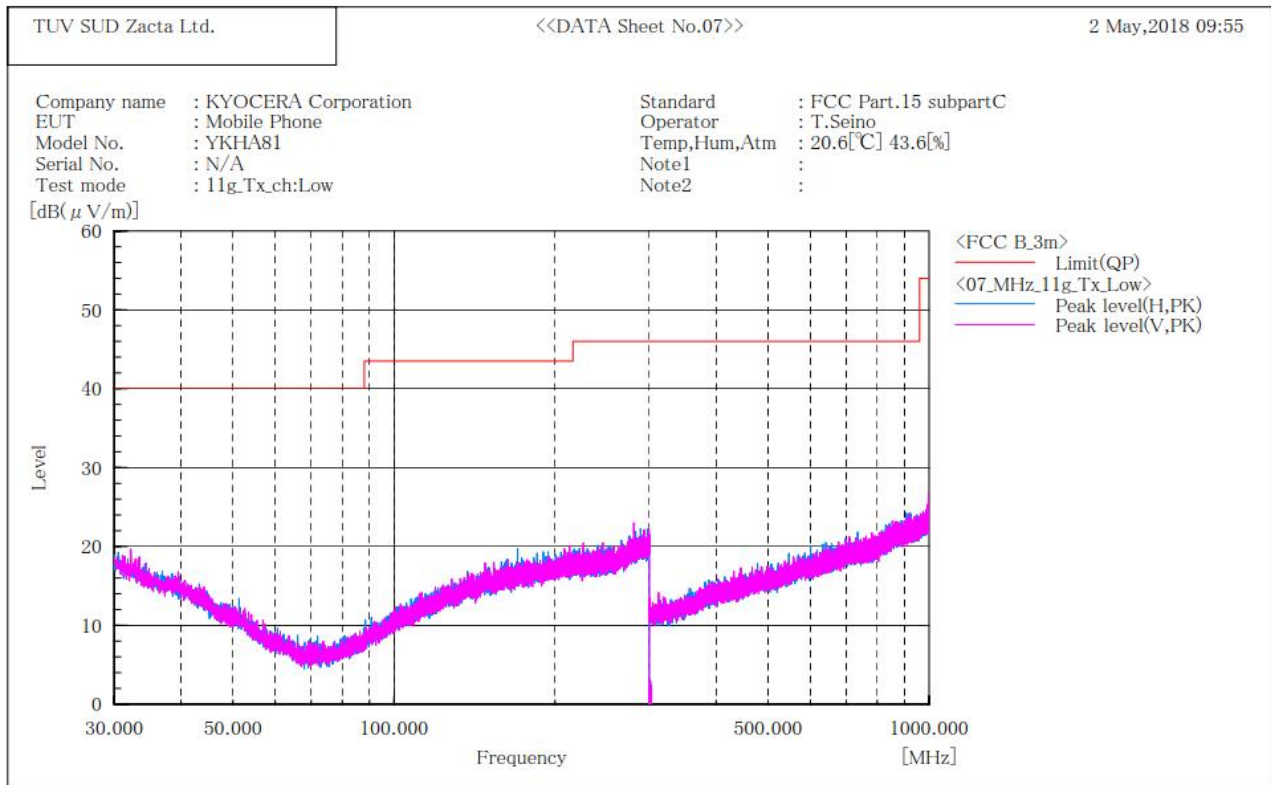
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4924.000	H	50.8	37.4	9.6	60.4	47.0	74.0	54.0	13.6	7.0	147.0	46.0	

Note:

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

**[11g]
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:

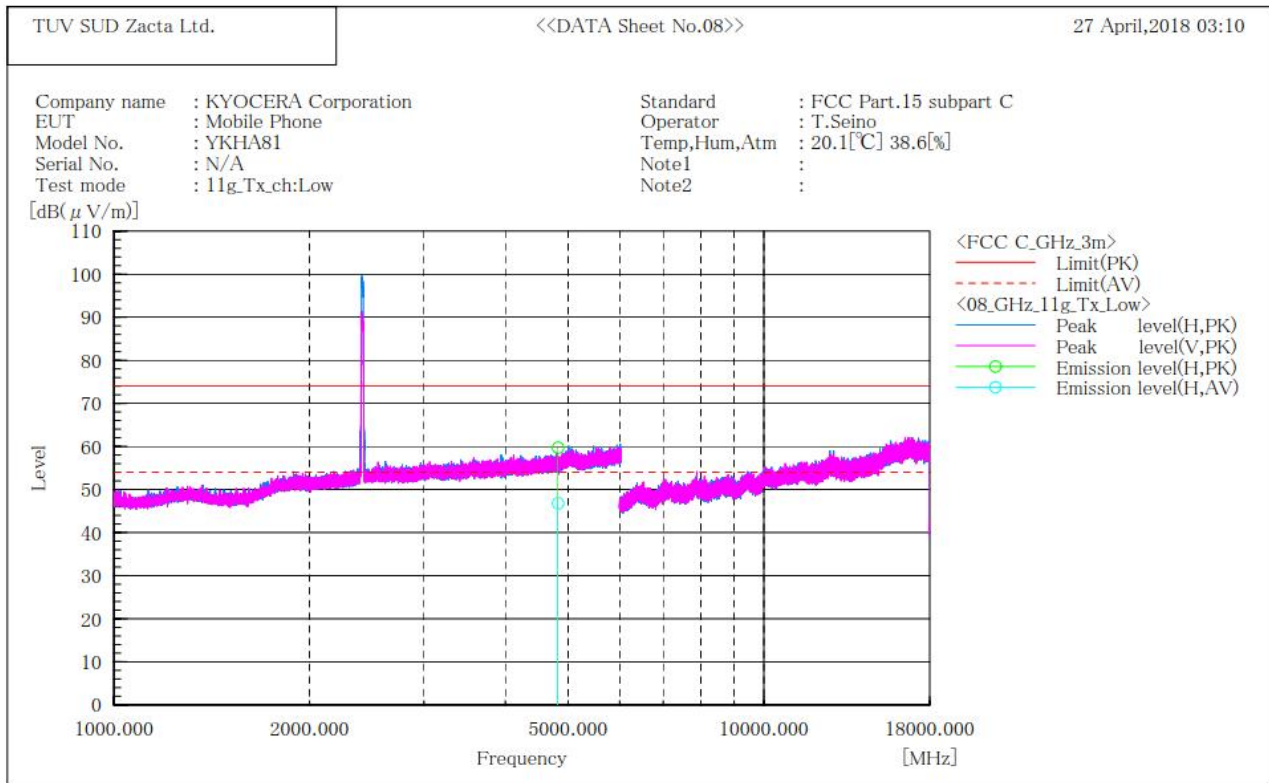
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.



Zacta

**[11g]
Channel Low
ABOVE 1GHz**

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



Final Result

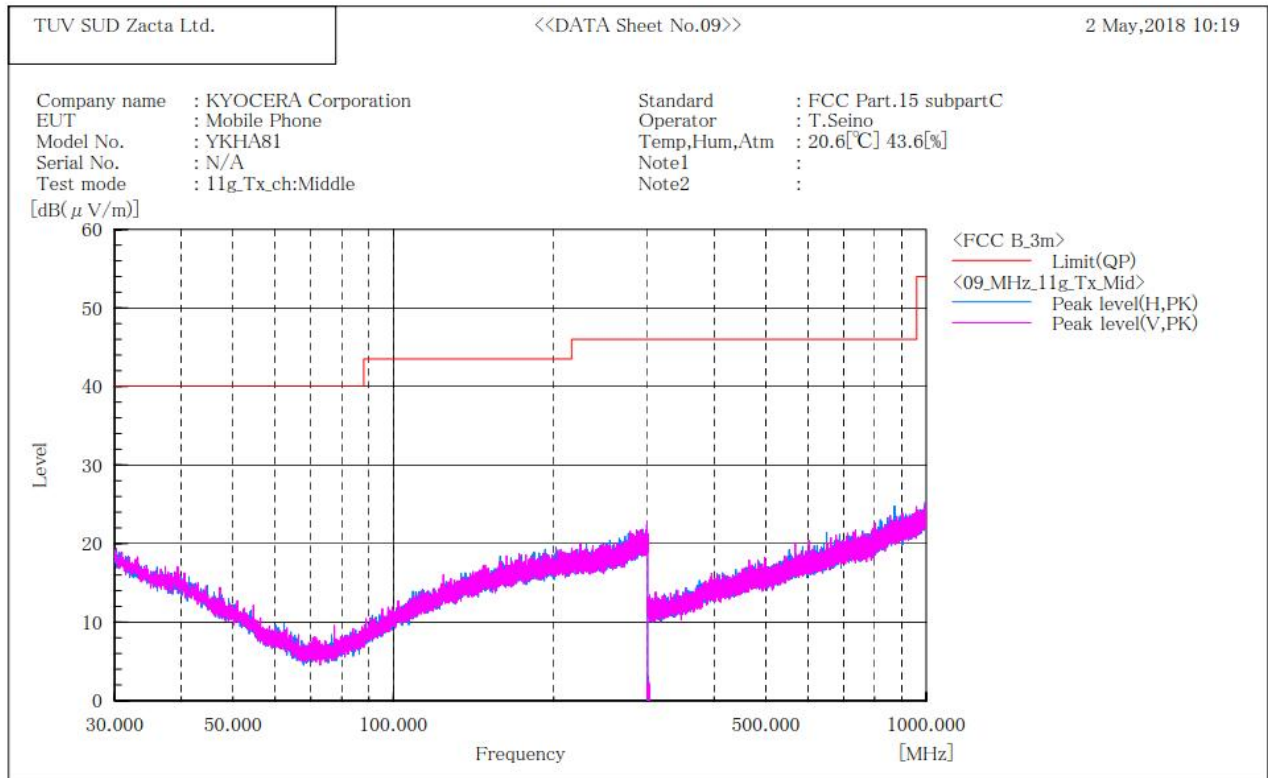
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4824.000	H	50.7	37.8	9.0	59.7	46.8	74.0	54.0	14.3	7.2	162.0	28.0	

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.

**[11g]
Channel Middle
BELOW 1GHz**

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



Final Result

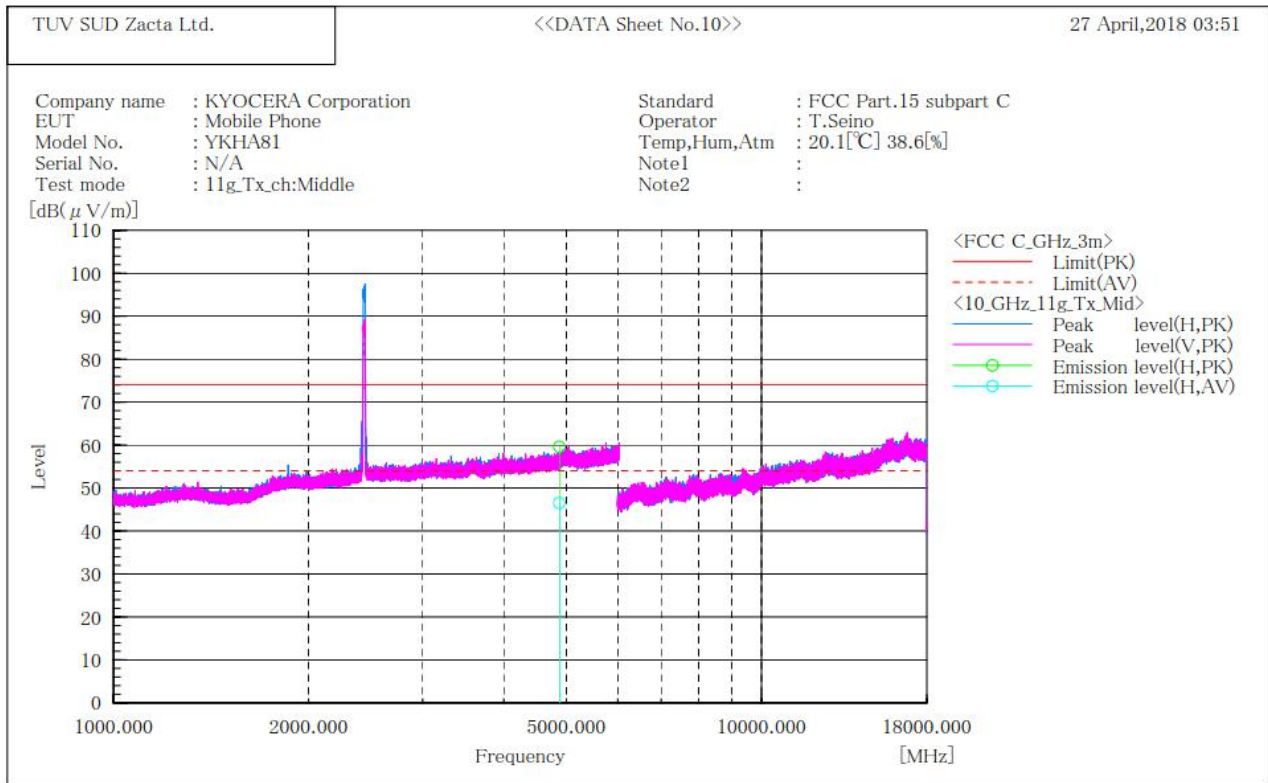
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

**[11g]
Channel Middle
ABOVE 1GHz**

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



Final Result

No.	Frequency (P)	Reading PK	Reading AV	c.f	Result PK	Result AV	Limit PK	Limit AV	Margin PK	Margin AV	Height	Angle	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[dB]	[cm]	[°]	
1	4874.000	H	50.4	37.3	9.2	59.6	46.5	74.0	54.0	14.4	7.5	145.0	58.0

Note:

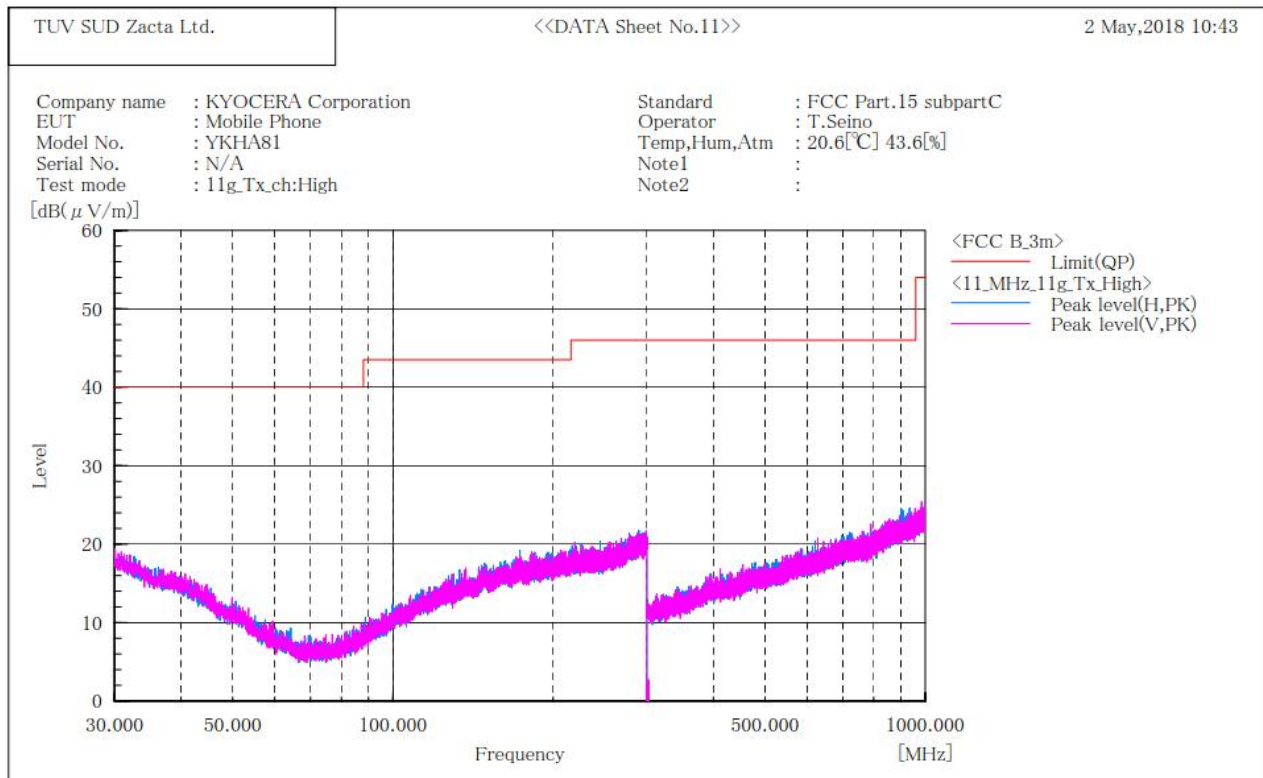
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.



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**[11g]
Channel High
BELOW 1GHz**

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



Final Result

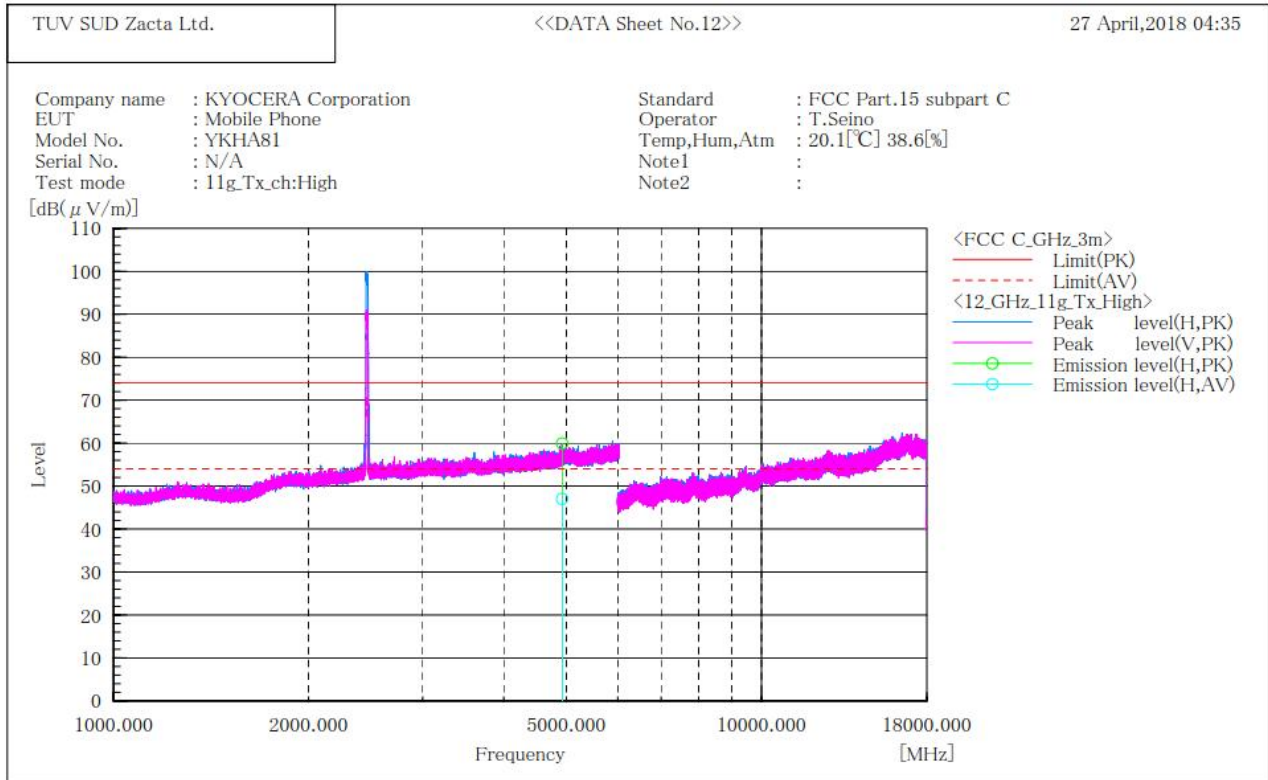
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

**[11g]
Channel High
ABOVE 1GHz**

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



Final Result

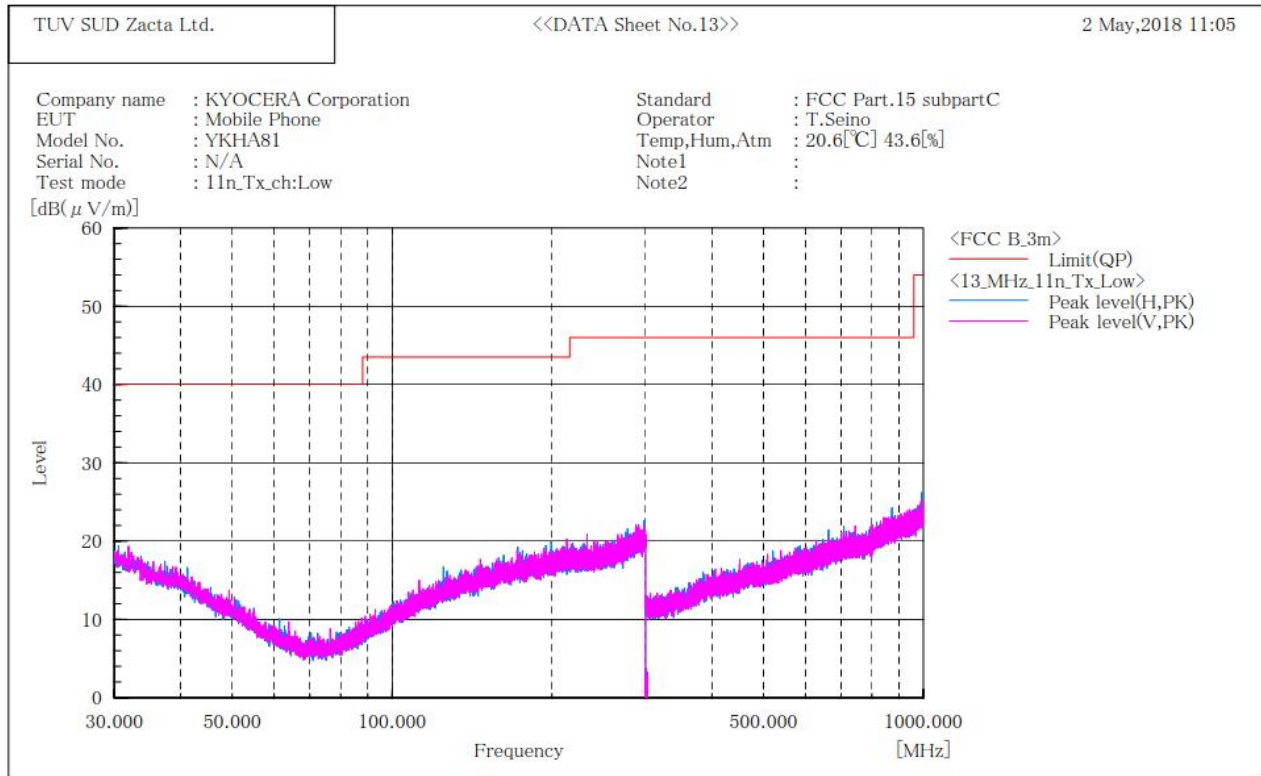
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4924.000	H	50.3	37.4	9.6	59.9	47.0	74.0	54.0	14.1	7.0	163.0	68.0	

Note:

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

[11n(HT20)]
Channel Low
BELOW 1GHz

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



Final Result

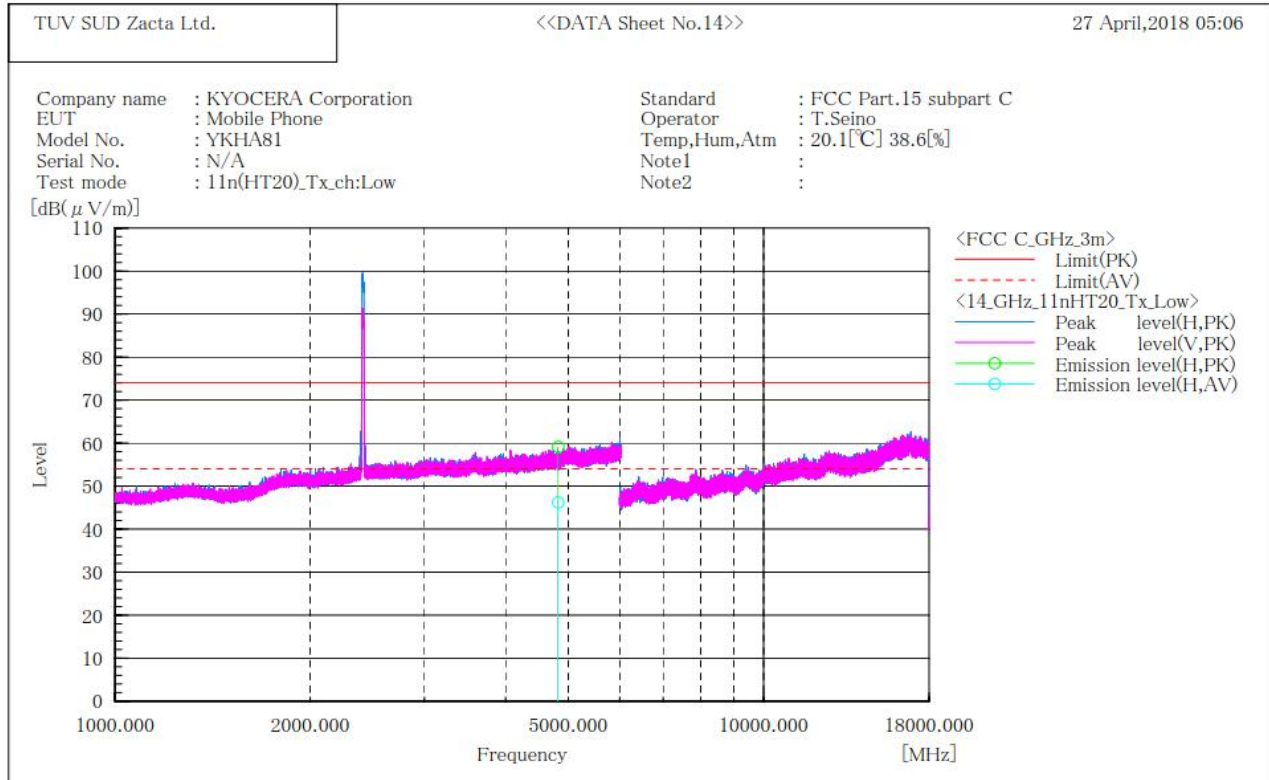
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11n(HT20)]
Channel Low
ABOVE 1GHz

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



Final Result

No.	Frequency (P)	Reading PK	Reading AV	c.f	Result PK	Result AV	Limit PK	Limit AV	Margin PK	Margin AV	Height	Angle	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[dB]	[cm]	[°]	
1	4824.000	H	50.1	37.2	9.0	59.1	46.2	74.0	54.0	14.9	7.8	148.0	43.0

Note:

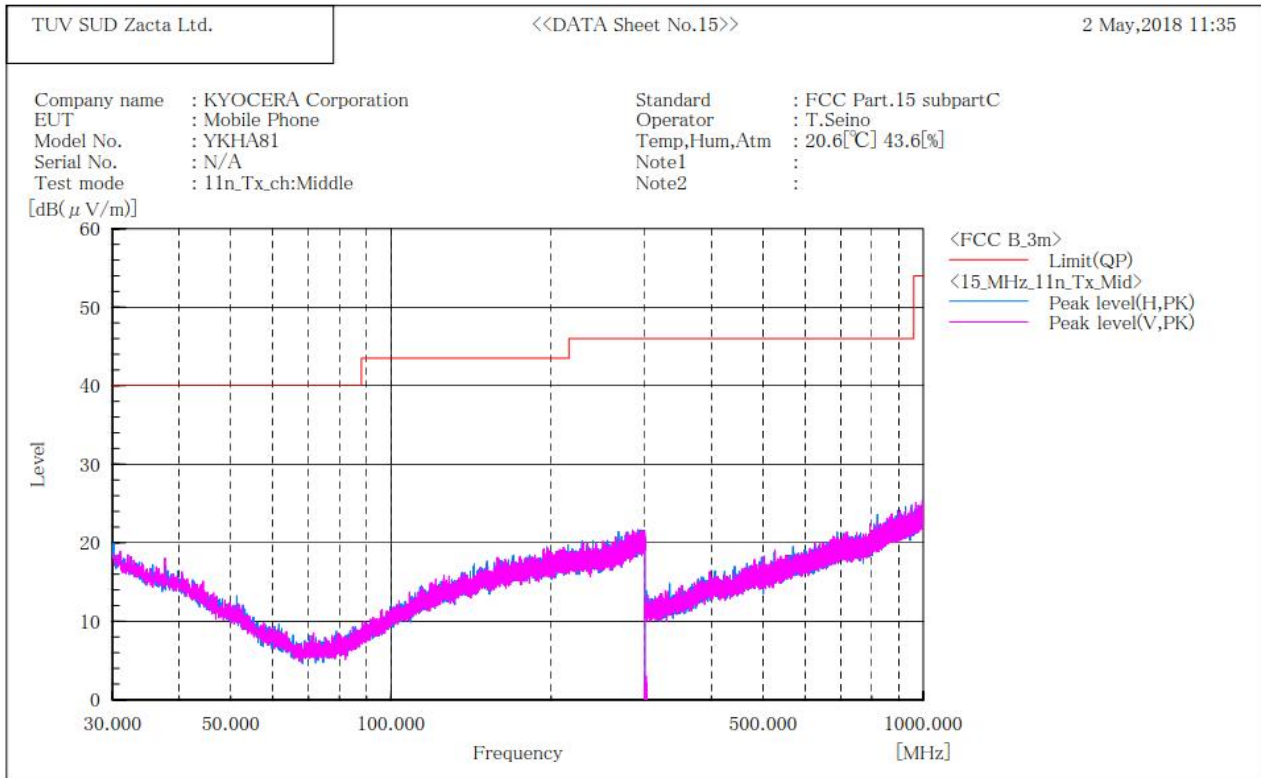
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.



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[11n(HT20)]
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:

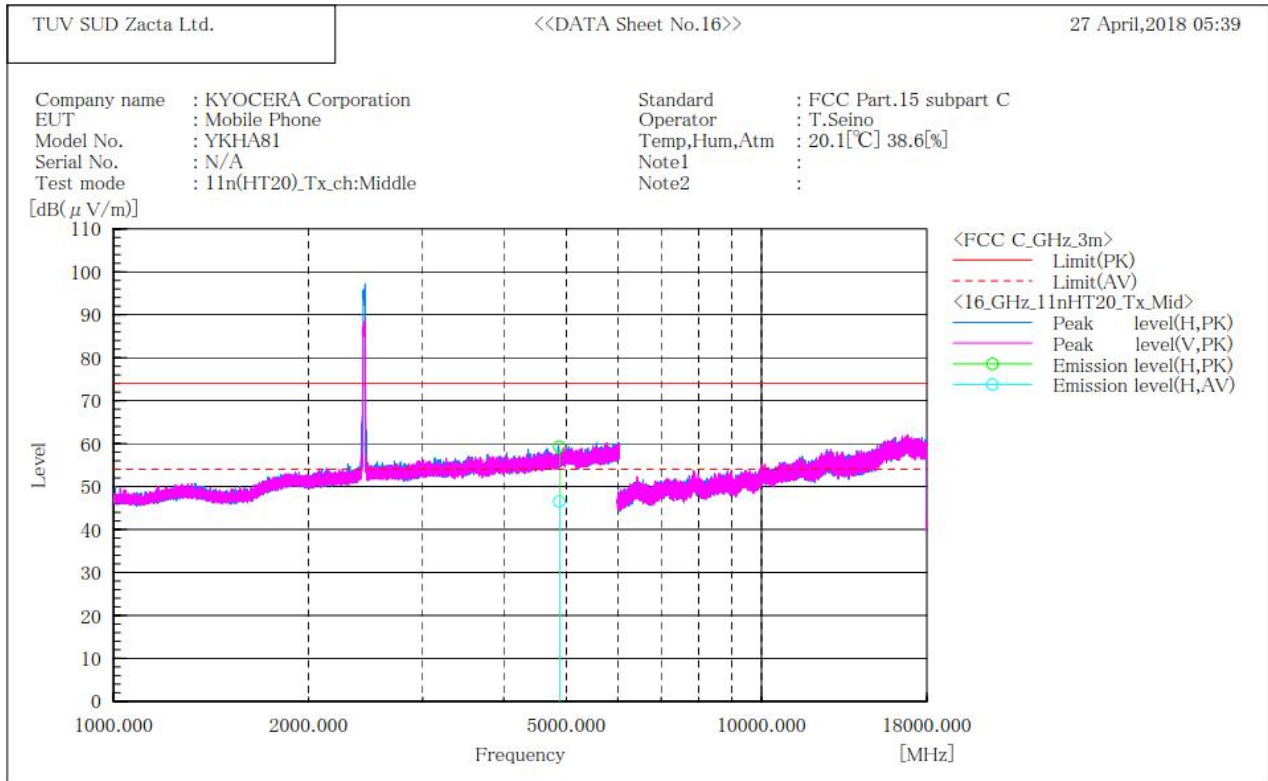
1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 1000MHz at the 3 meters distance.



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[11n(HT20)]
Channel Middle
ABOVE 1GHz

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



Final Result

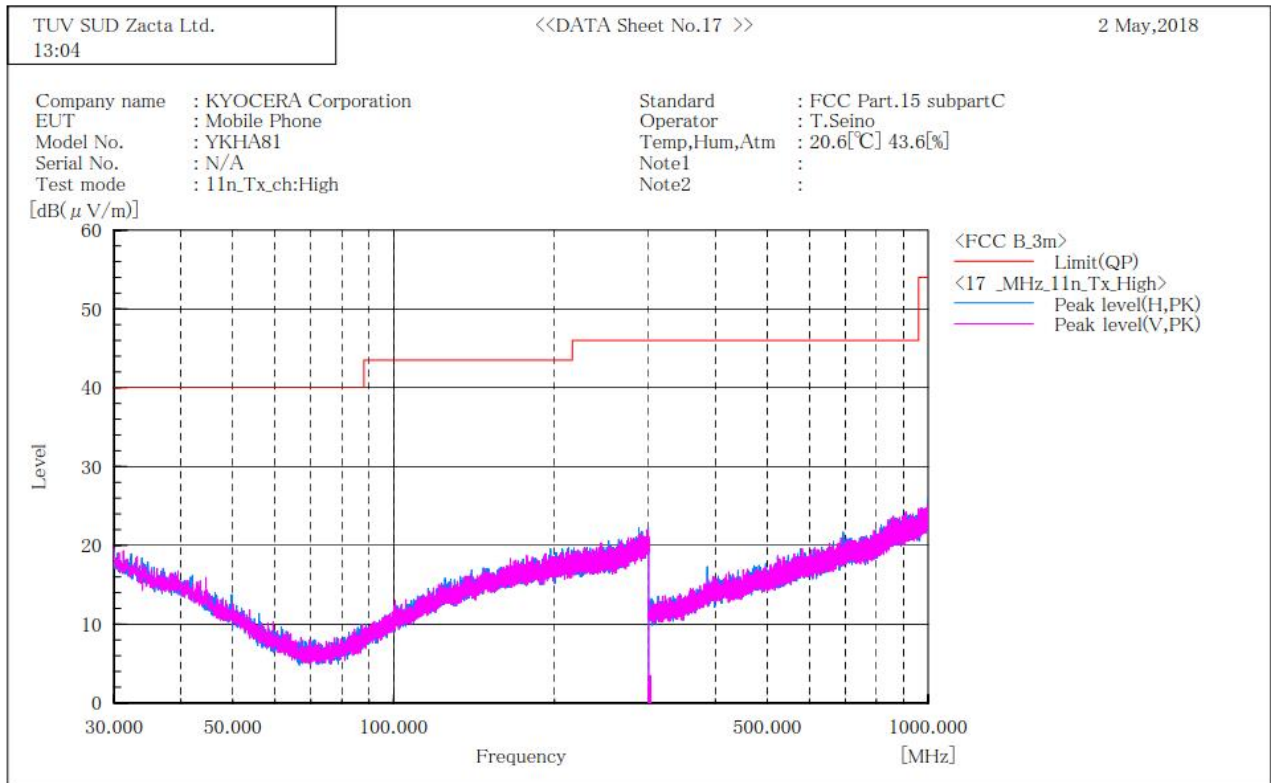
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4874.000	H	50.1	37.3	9.2	59.3	46.5	74.0	54.0	14.7	7.5	167.0	71.0	

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.

[11n(HT20)]
Channel High
BELOW 1GHz

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



Final Result

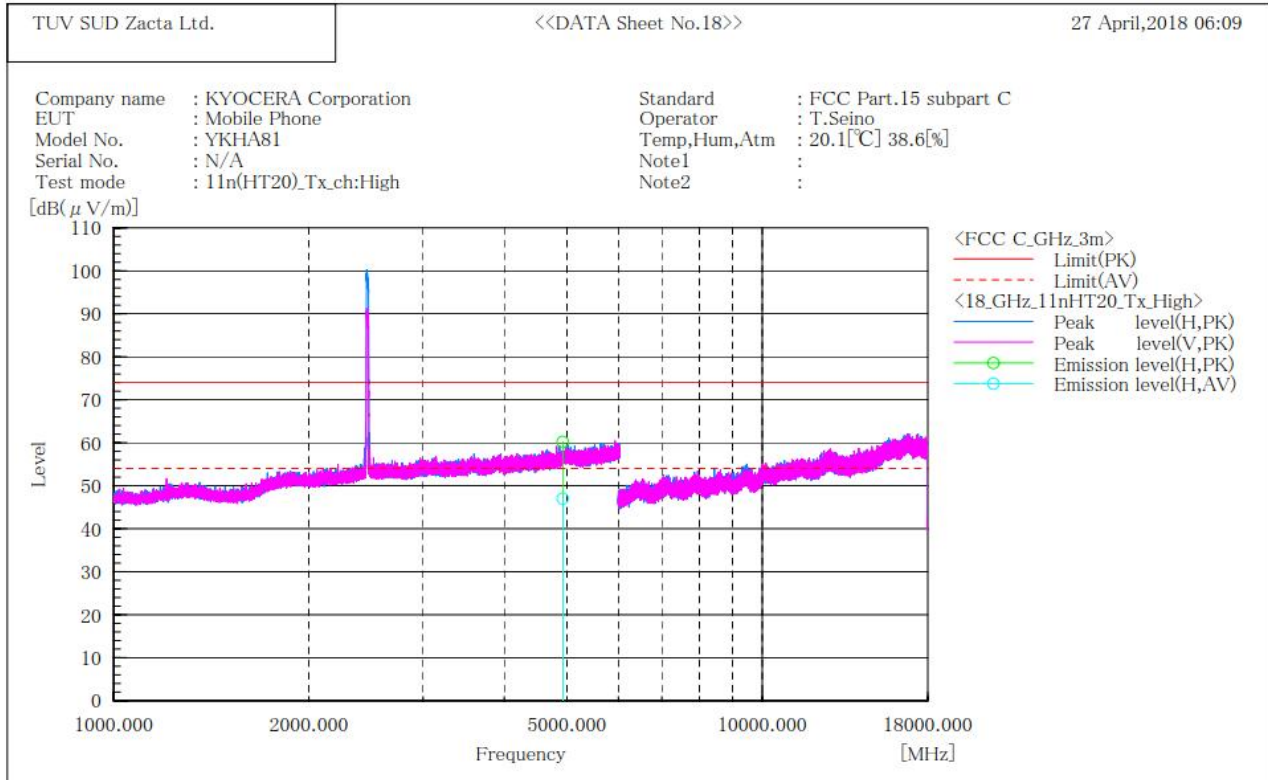
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11n(HT20)]
Channel High
ABOVE 1GHz

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



Final Result

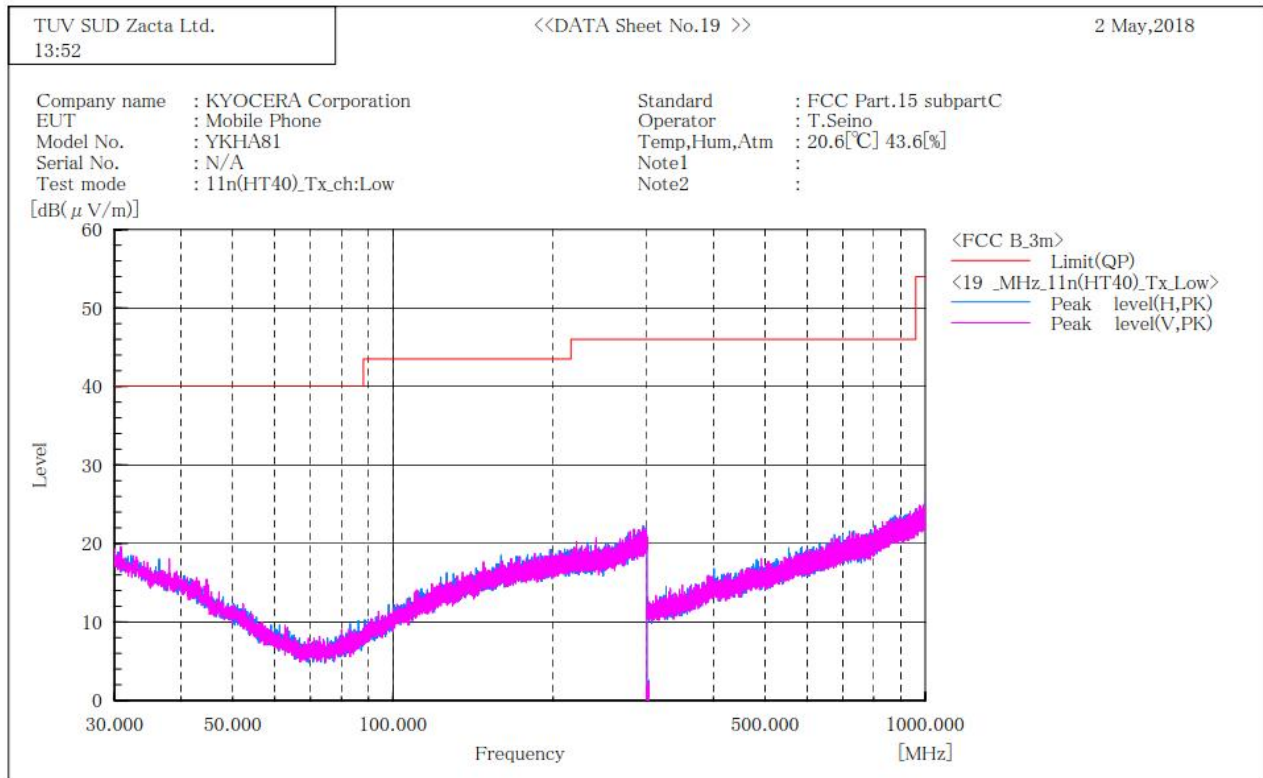
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]	Remark
1	4924.000	H	50.6	37.4	9.6	60.2	47.0	74.0	54.0	13.8	7.0	161.0	67.0	

Note:

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

[11n(HT40)]
Channel Low
BELOW 1GHz

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



Final Result

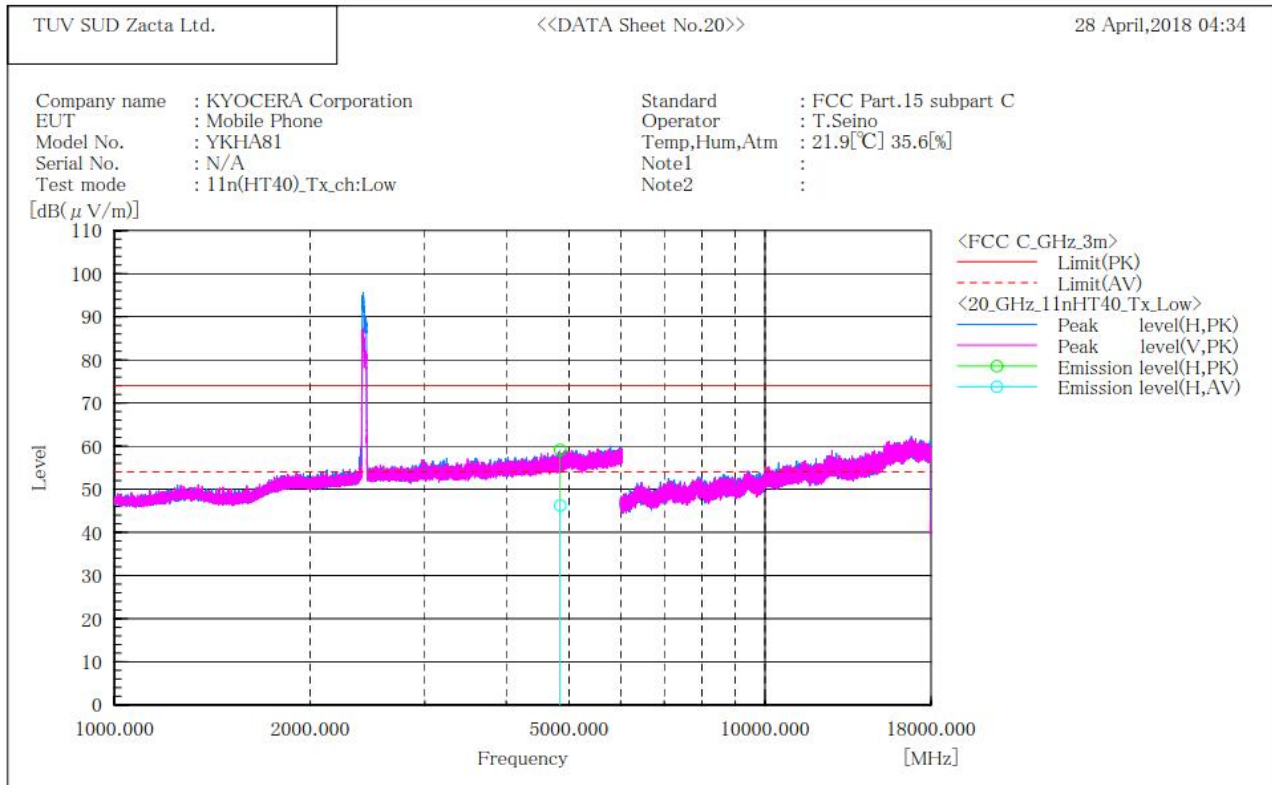
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11n(HT40)]
Channel Low
ABOVE 1GHz

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



Final Result

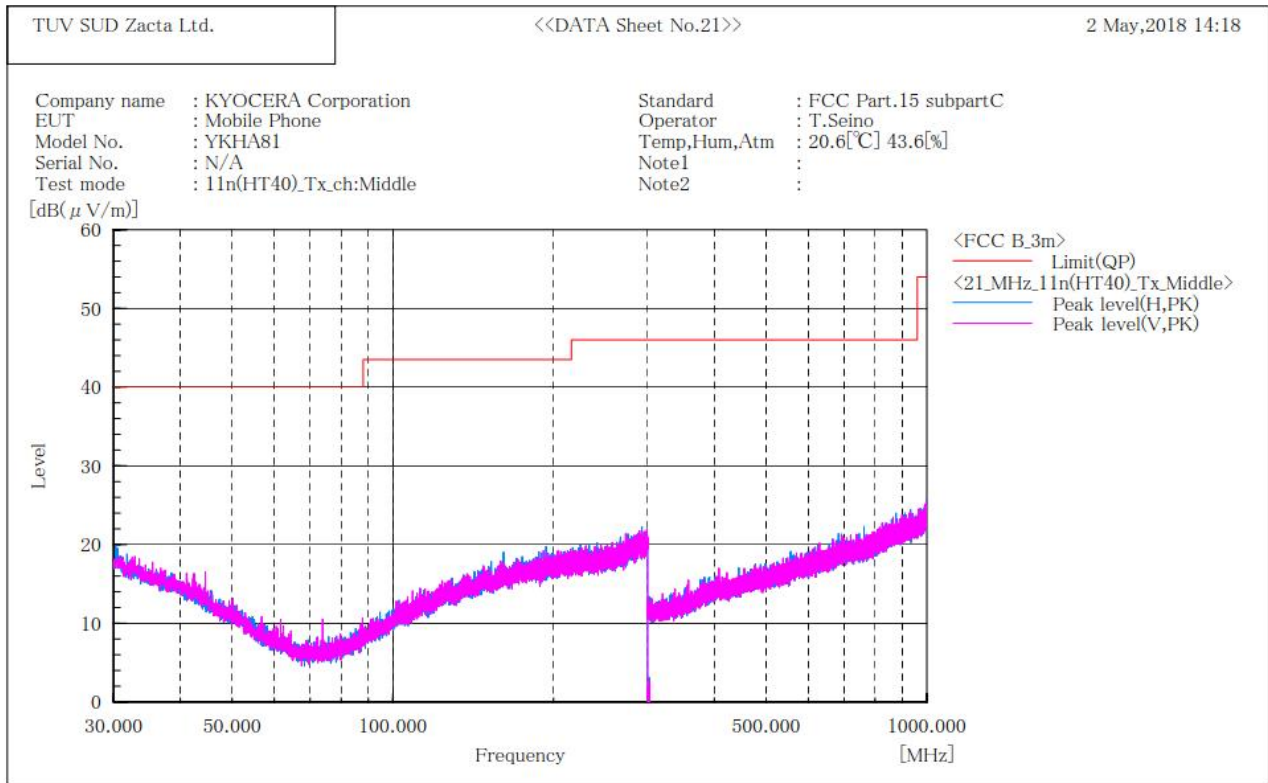
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c. f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]
1	4844.000	H	50.1	37.2	9.0	59.1	46.2	74.0	54.0	14.9	7.8	168.0	47.0

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.

[11n(HT40)]
Channel Middle
BELOW 1GHz

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



Final Result

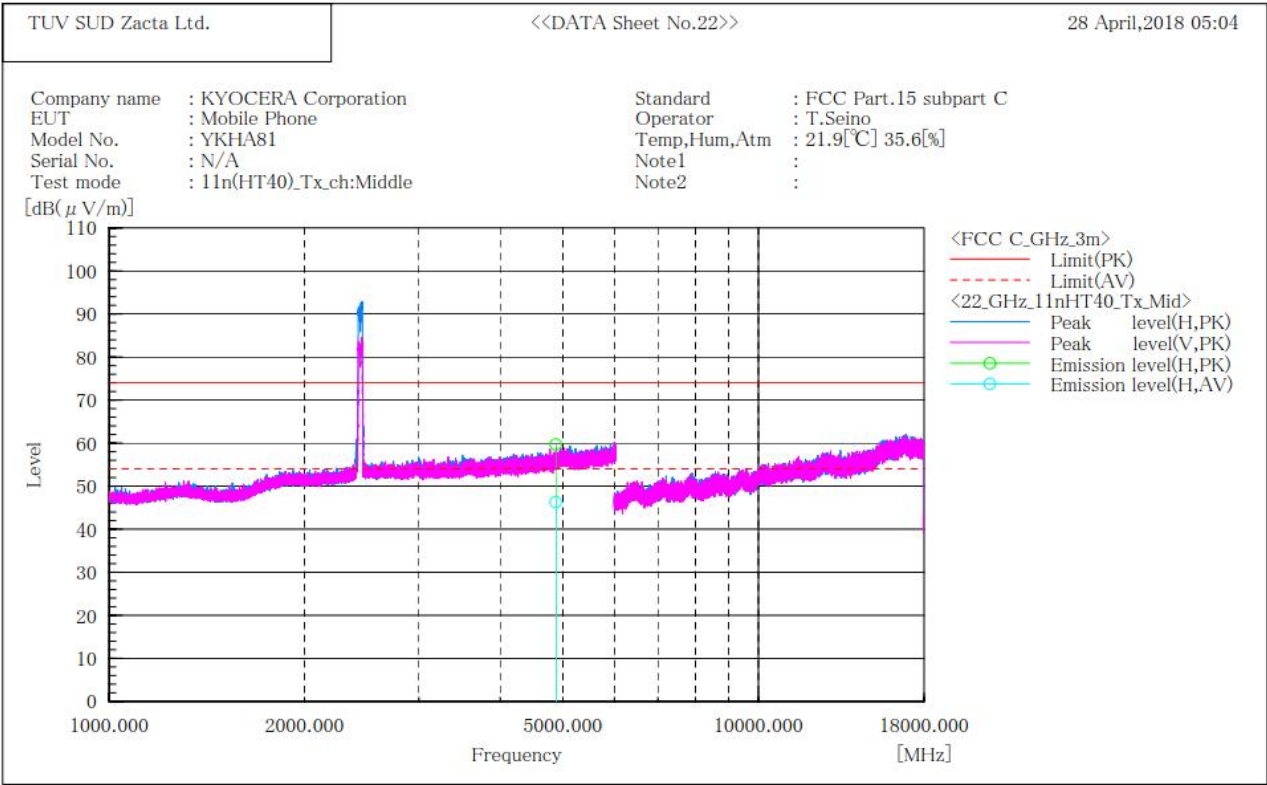
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11n(HT40)]
Channel Middle
ABOVE 1GHz

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



Final Result

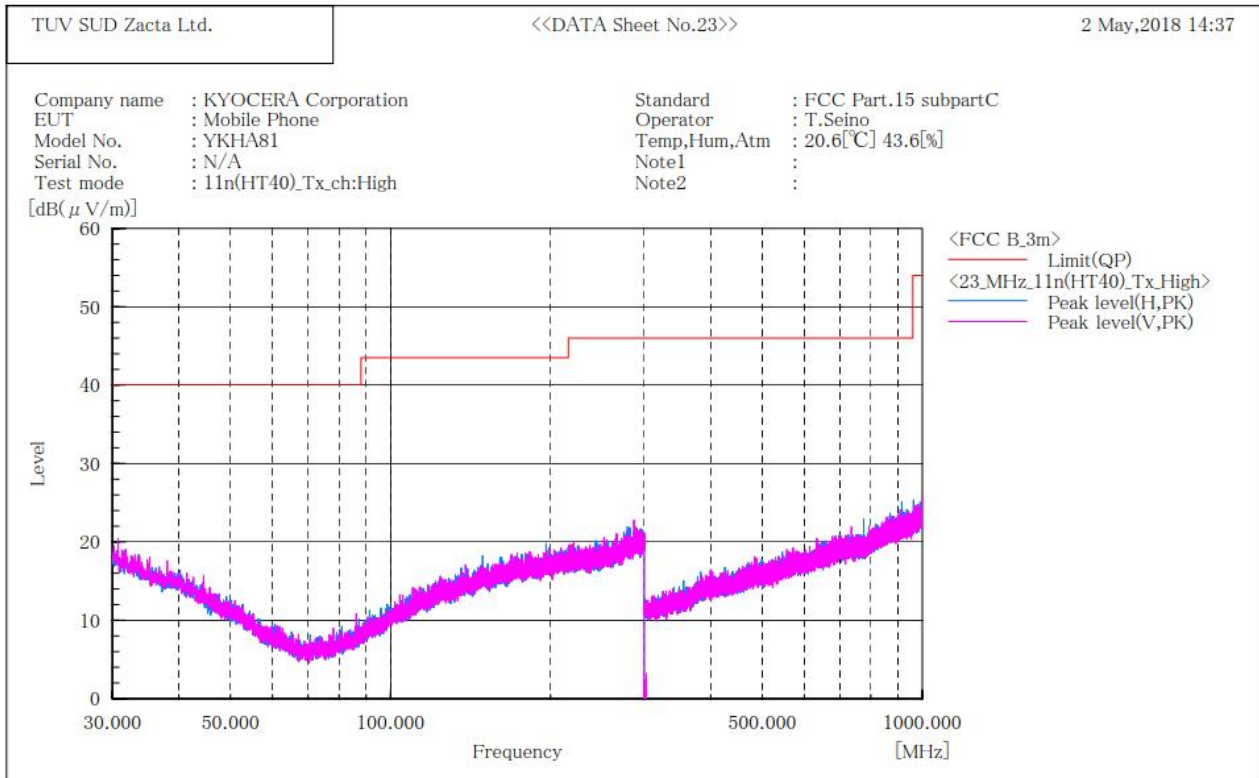
No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin AV [dB]	Height [cm]	Angle [°]
1	4874.000	H	50.5	37.1	9.2	59.7	46.3	74.0	54.0	14.3	7.7	160.0	54.0

Note:

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

[11n(HT40)]
Channel High
BELOW 1GHz

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



Final Result

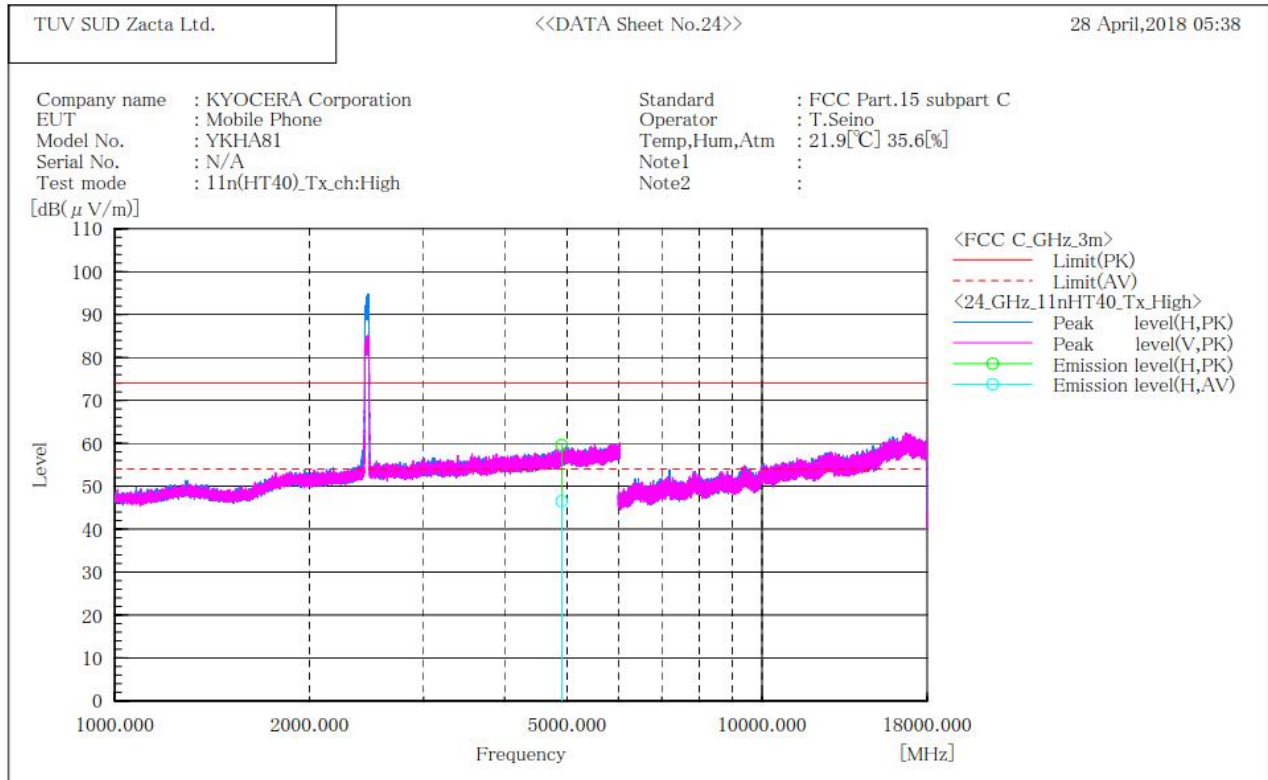
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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.

[11n(HT40)]
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 [°]
1	4904.000	H	50.2	37.1	9.4	59.6	46.5	74.0	54.0	14.4	7.5	135.0	45.0

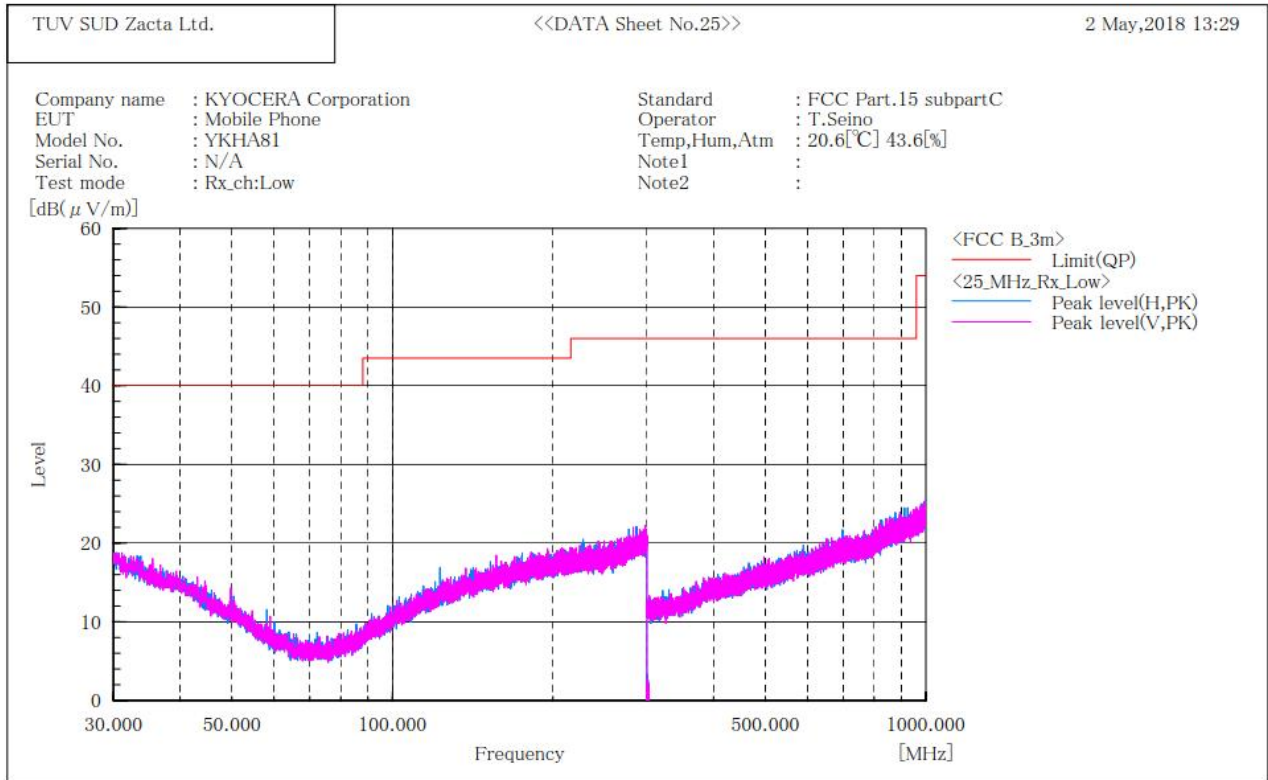
Note:

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.

8.4.2 Receive mode

Channel Low [11b, 11g, 11n(HT20)] BELOW 1GHz

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



Final Result

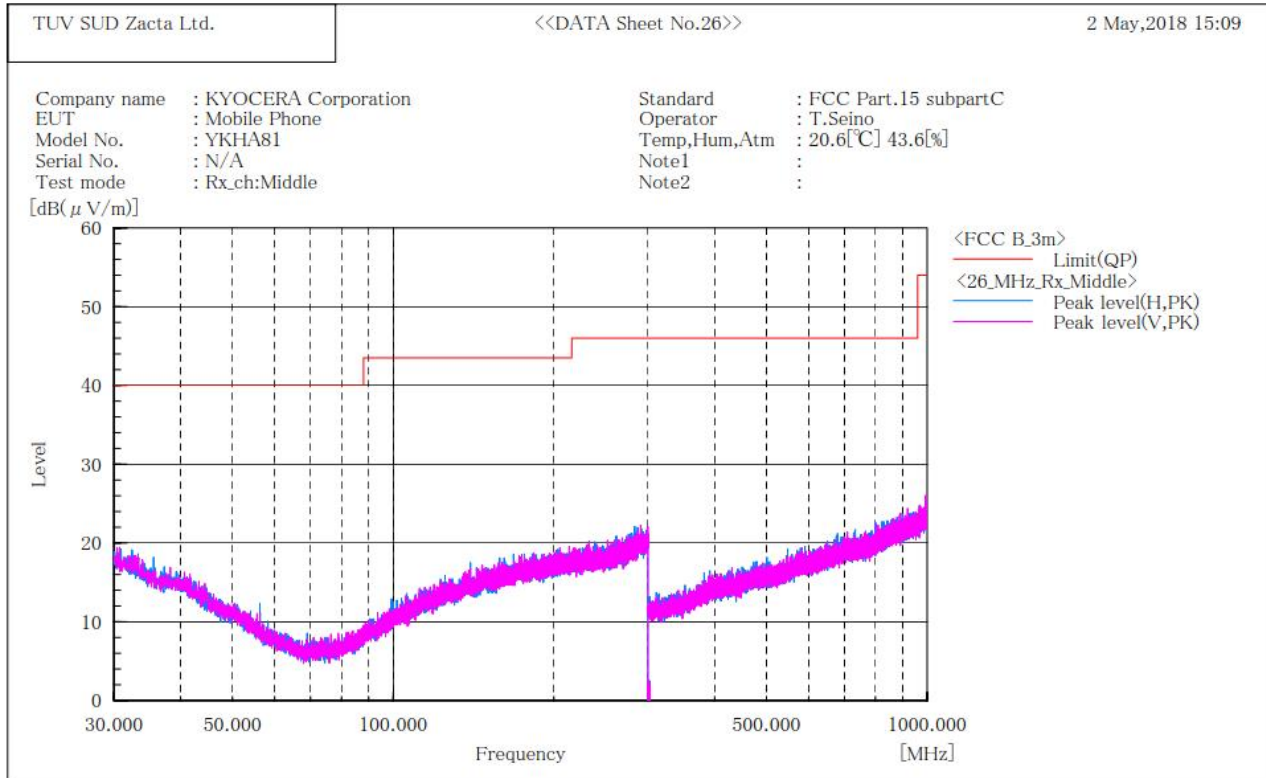
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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 [11b, 11g, 11n(HT20)] BELOW 1GHz

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



Final Result

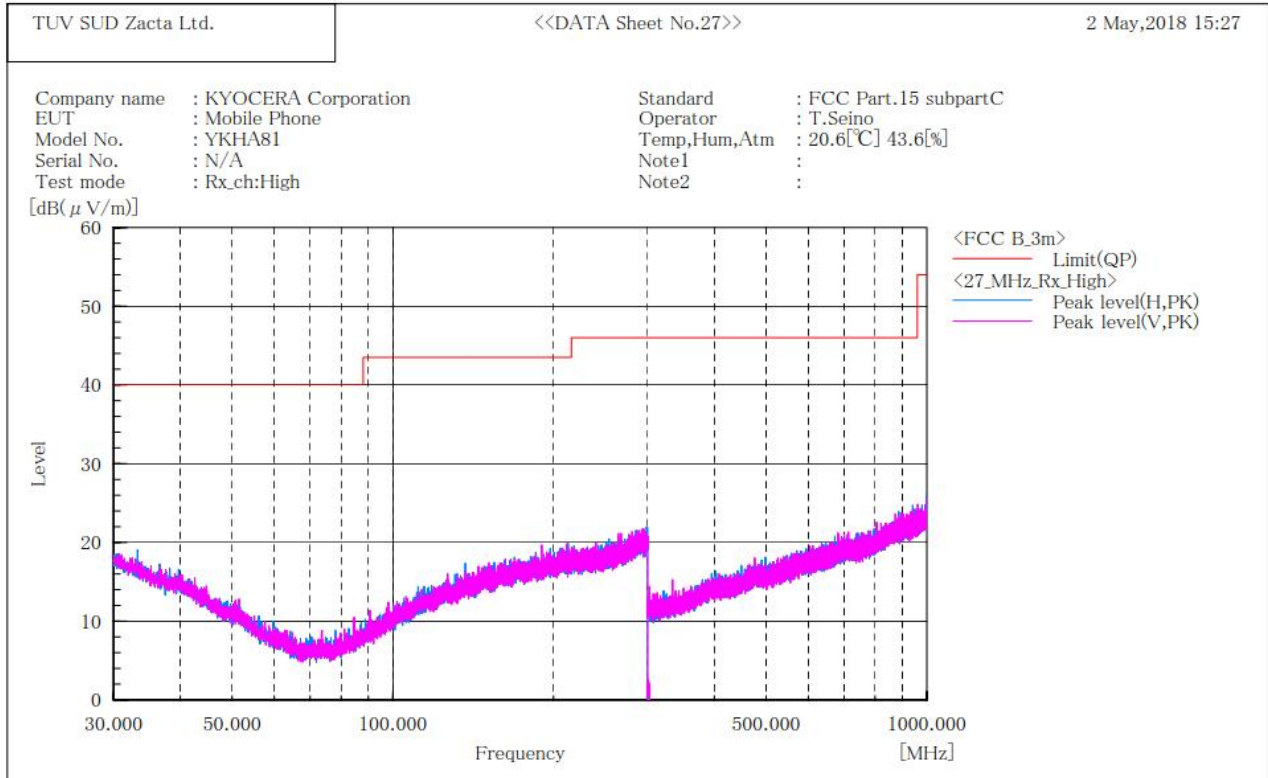
No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

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

Channel High [11b, 11g, 11n(HT20)] BELOW 1GHz

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



Final Result

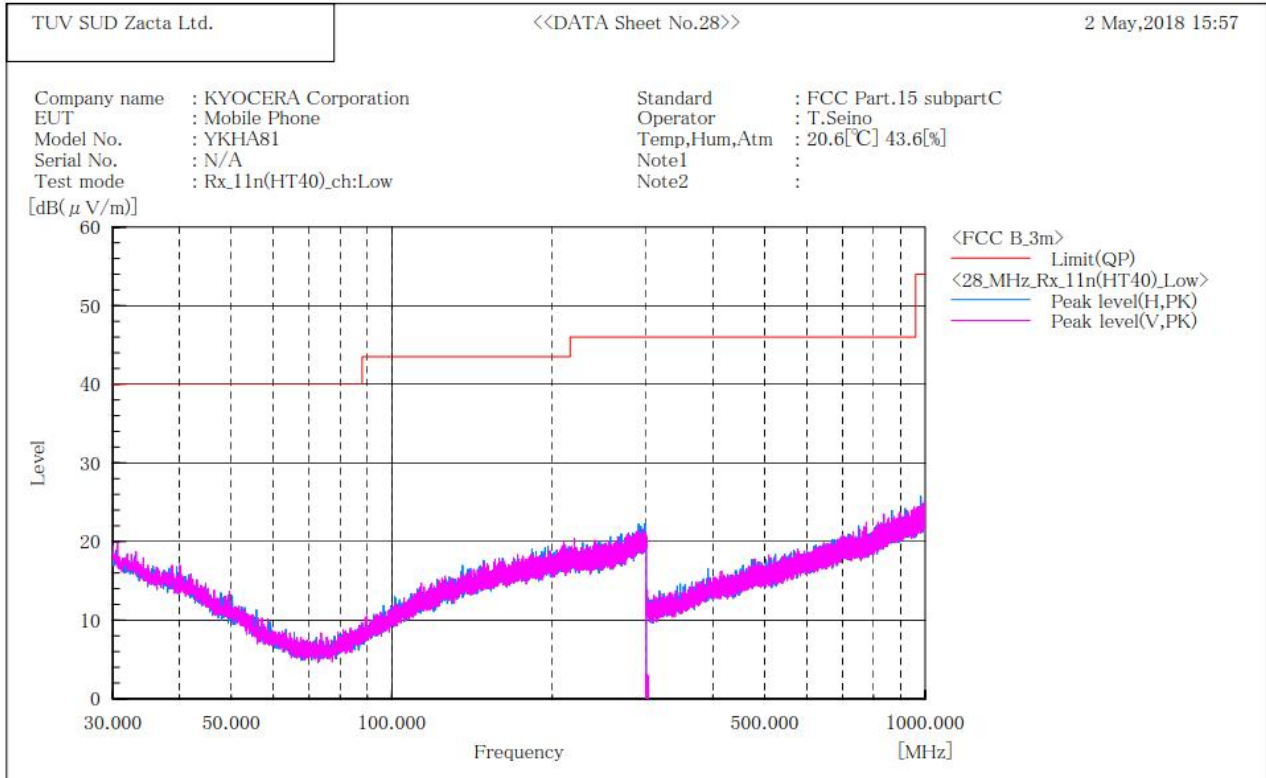
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

Note:

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

Channel Low [11n(HT40)] BELOW 1GHz

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



Final Result

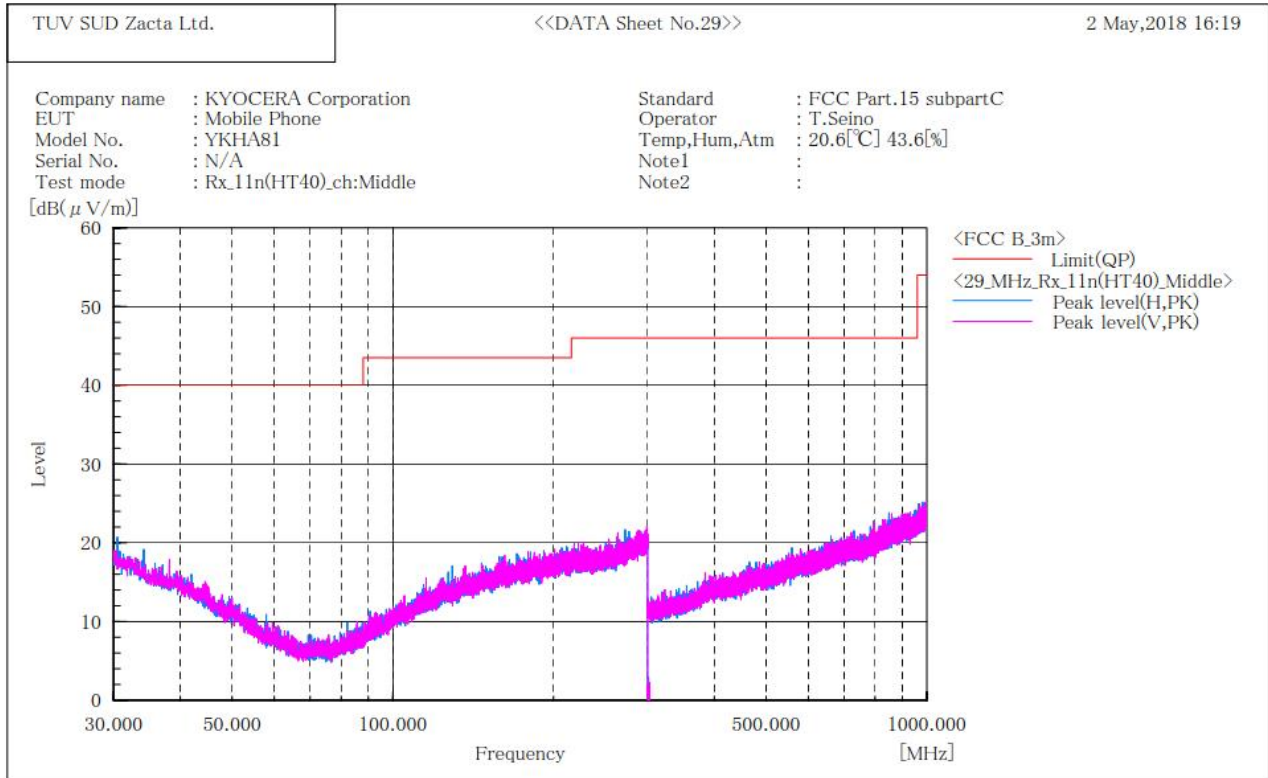
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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 [11n(HT40)] BELOW 1GHz

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



Final Result

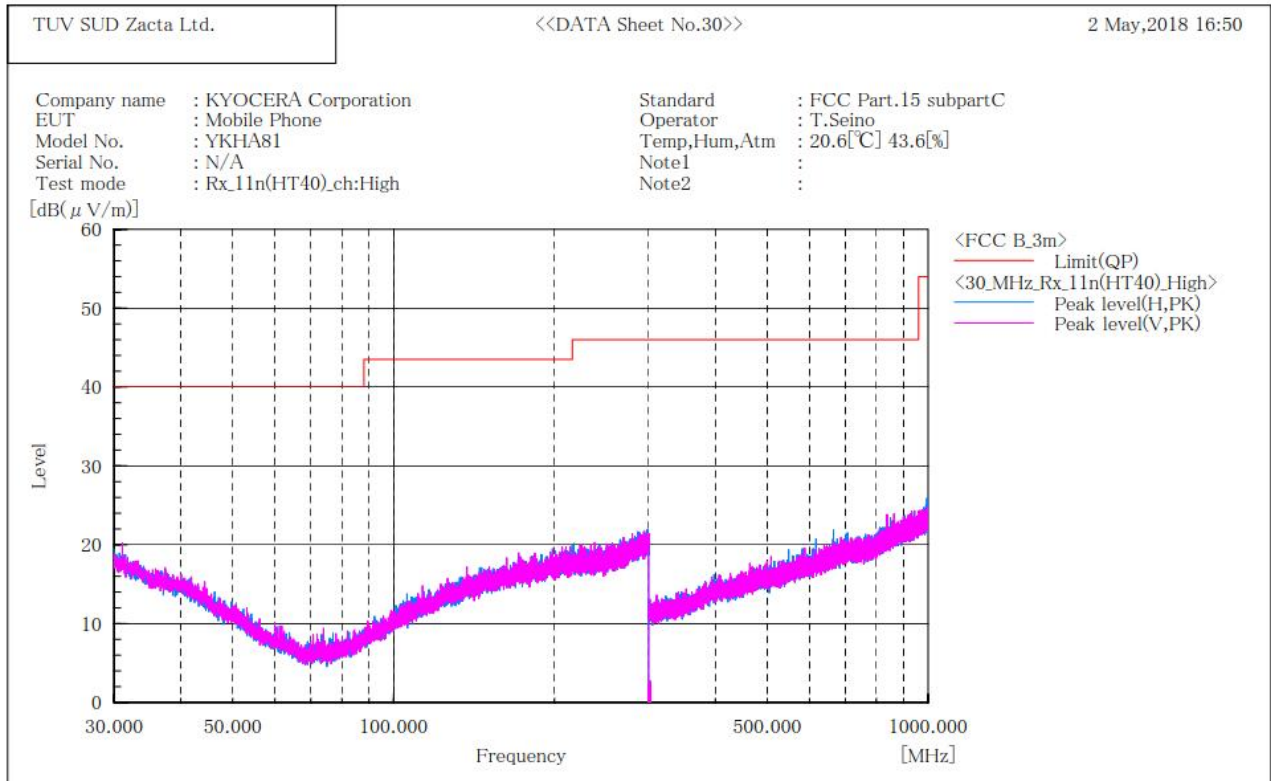
No.	Frequency (P)	c. f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[°]

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 [11n(HT40)] 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.

9. Restricted Band of Operation

9.1 Measurement procedure

[FCC 15.247(d), 15.205, 15.209, KDB 558074 D01 v04, Section 12.0]

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=auto
- Average	: RBW=1MHz, VBW=10Hz, Span=Arbitrary setting, Sweep=auto Display mode=Linear

Average Measurement Setting [VBW]

Mode	Duty Cycle (%)	T _{on} (us)	T _{off} (us)	Determined VBW Setting
IEEE802.11b	99.22	1024	8	10Hz (Duty Cycle ≥ 98%)
IEEE802.11g	99.27	1362	10	10Hz (Duty Cycle ≥ 98%)
IEEE802.11n(HT20)	99.38	1276	8	10Hz (Duty Cycle ≥ 98%)
IEEE802.11n(HT40)	98.45	635	10	10Hz (Duty Cycle ≥ 98%)

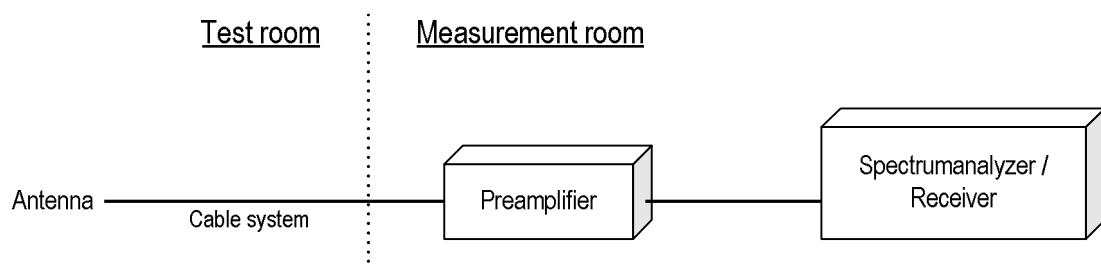
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open area test site.

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



9.2 Limit

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

9.3 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

[IEEE802.11n (HT40)]

Channel	Frequency [MHz]	Results Chart	Result
Low	2422	See the Trace Data	Pass
High	2452	See the Trace Data	Pass

9.4 Test data

Date : April 27, 2018

Temperature : 20.1 [°C]

Humidity : 38.6 [%]

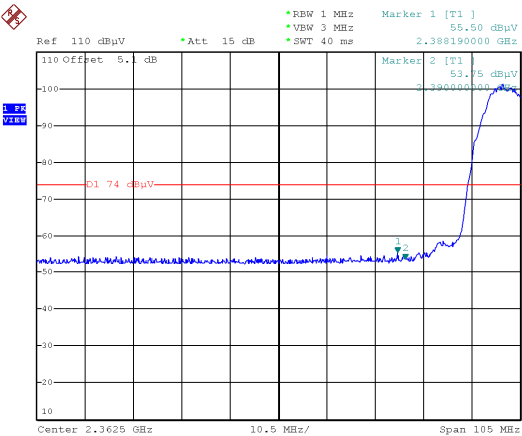
Test place : 3m Semi-anechoic chamber

Test engineer :

Tadahiro Seino

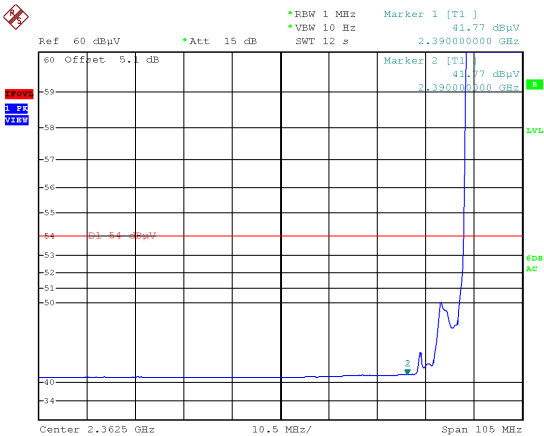
[IEEE802.11b]

Channel Low
Horizontal
Peak



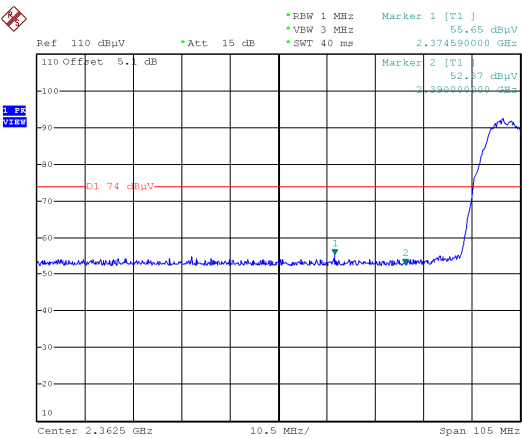
Date: 27.APR.2018 22:33:12

Average



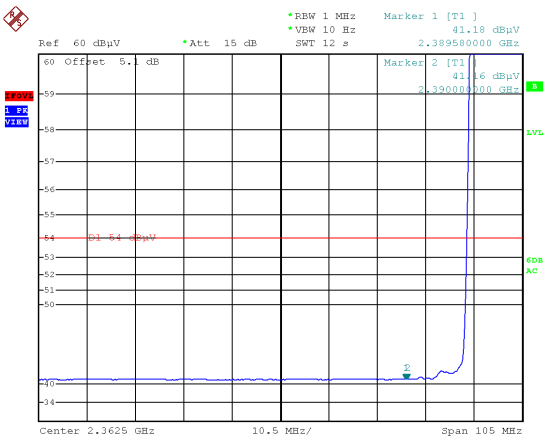
Date: 27.APR.2018 22:35:02

Vertical
Peak

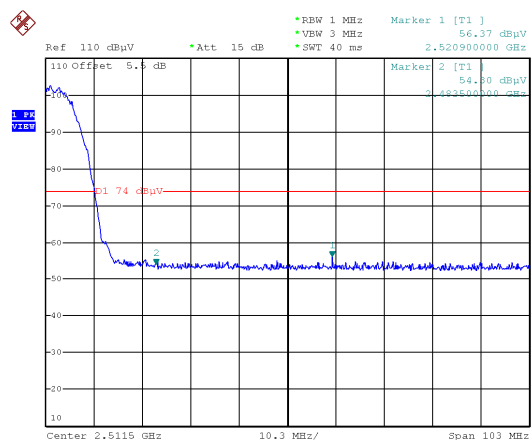


Date: 27.APR.2018 22:40:09

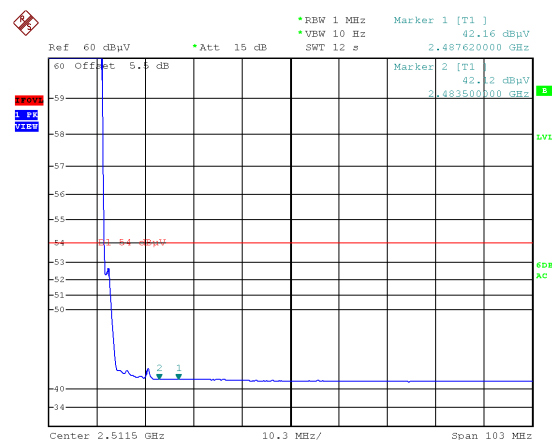
Average



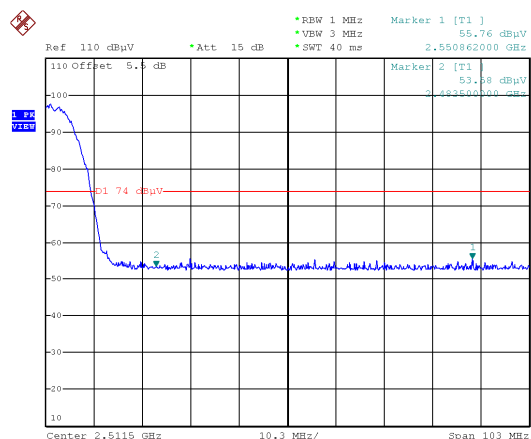
Date: 27.APR.2018 22:41:44



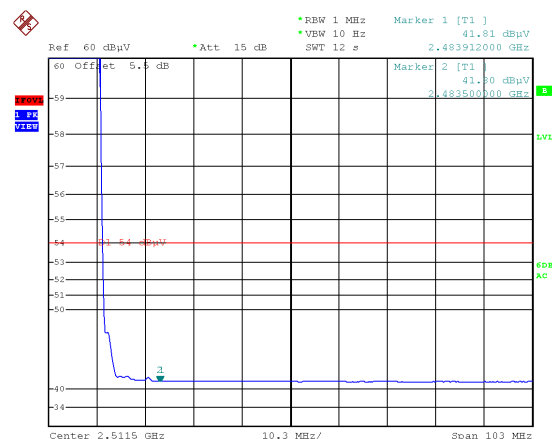
Date: 27.APR.2018 23:29:28



Date: 27.APR.2018 23:30:20



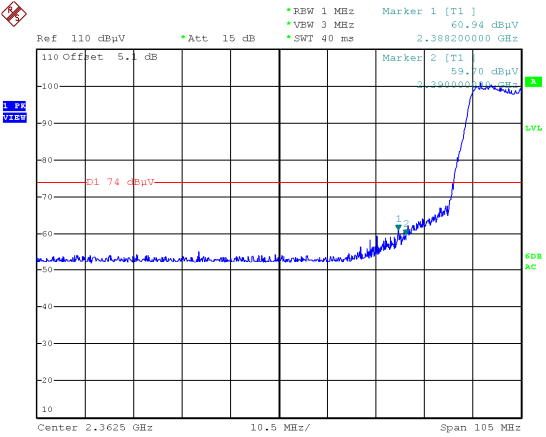
Date: 27.APR.2018 23:34:02



Date: 27.APR.2018 23:35:17

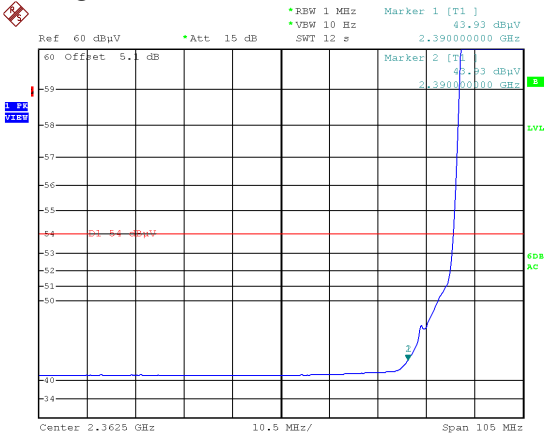
[IEEE802.11g]

Channel Low
Horizontal
Peak



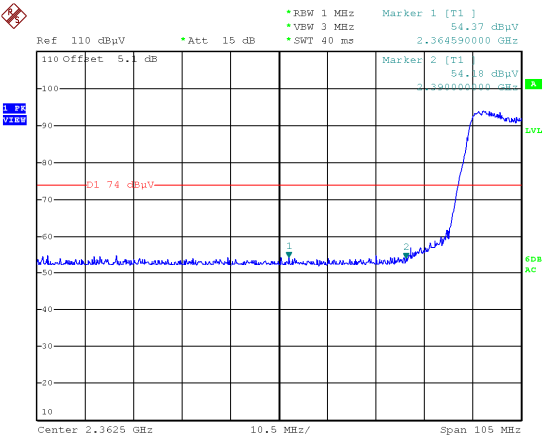
Date: 27.APR.2018 23:45:38

Average



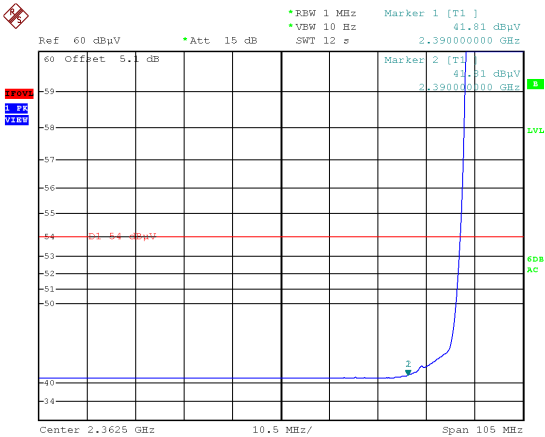
Date: 27.APR.2018 23:46:16

Vertical
Peak



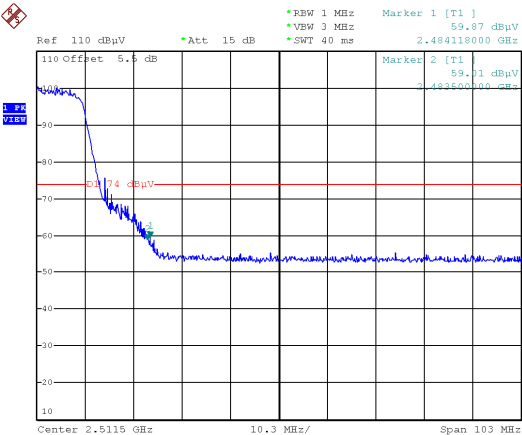
Date: 27.APR.2018 23:50:05

Average



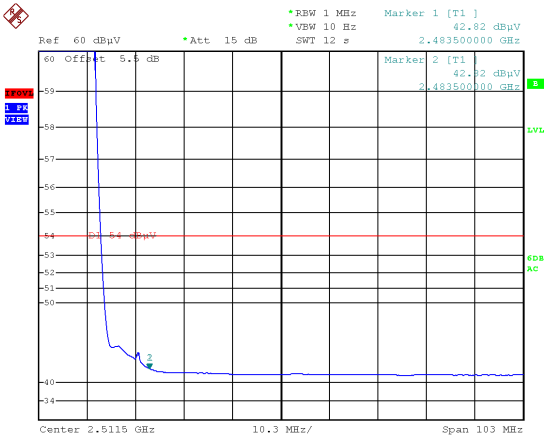
Date: 27.APR.2018 23:51:03

Channel High
Horizontal
Peak



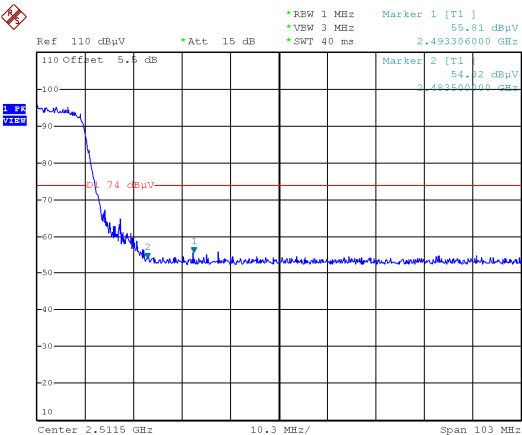
Date: 27.APR.2018 23:56:35

Average



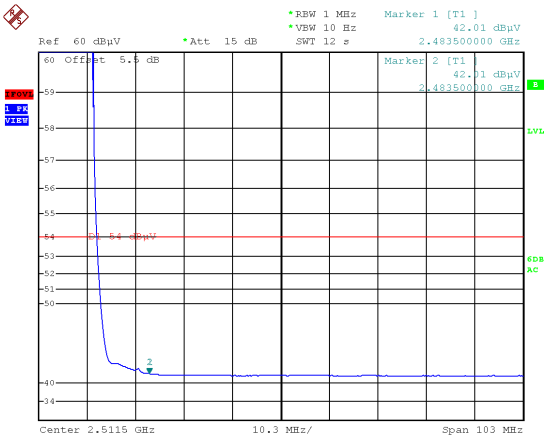
Date: 27.APR.2018 23:57:13

Vertical
Peak



Date: 28.APR.2018 00:00:03

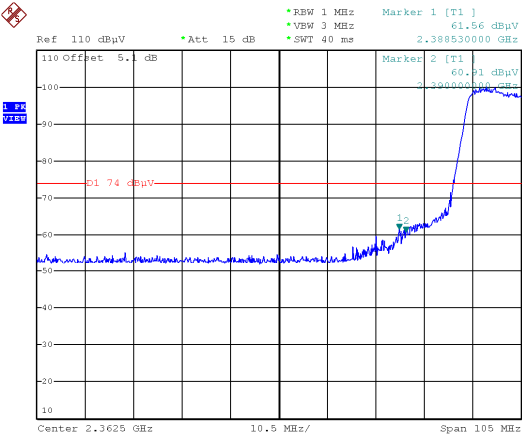
Average



Date: 28.APR.2018 00:00:39

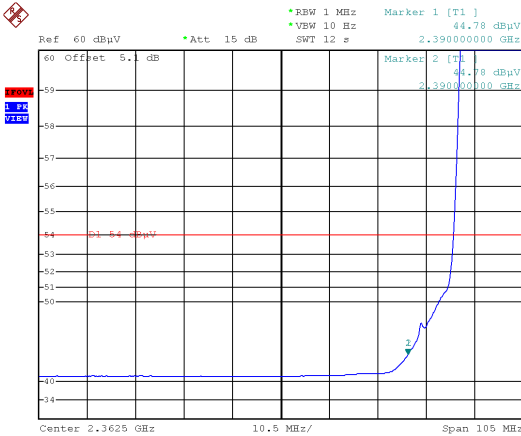
[IEEE802.11n (HT20)]

Channel Low
Horizontal
Peak



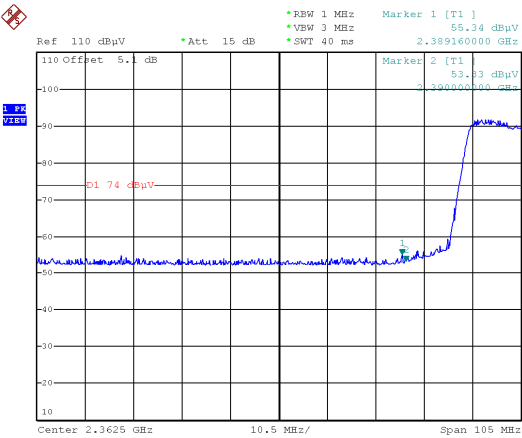
Date: 28.APR.2018 00:11:35

Average



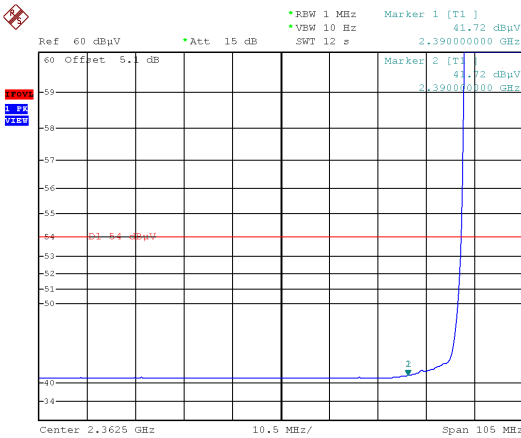
Date: 28.APR.2018 00:12:22

Vertical
Peak



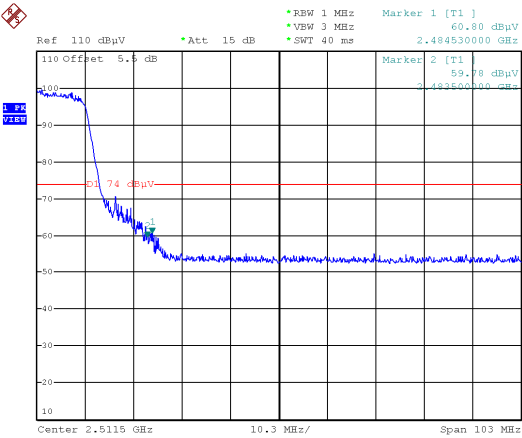
Date: 28.APR.2018 00:16:37

Average



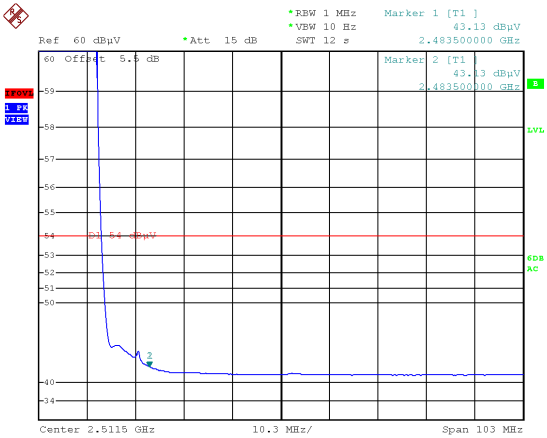
Date: 28.APR.2018 00:17:19

Channel High
Horizontal
Peak



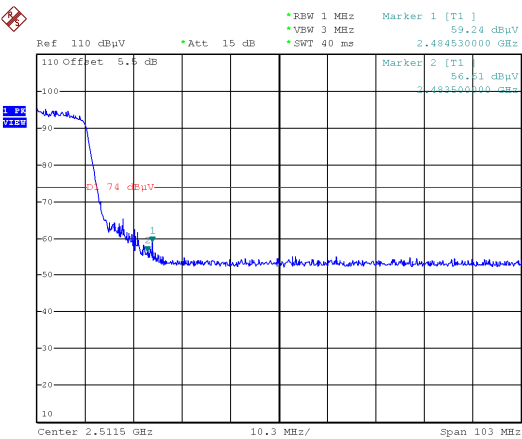
Date: 28.APR.2018 00:22:28

Average



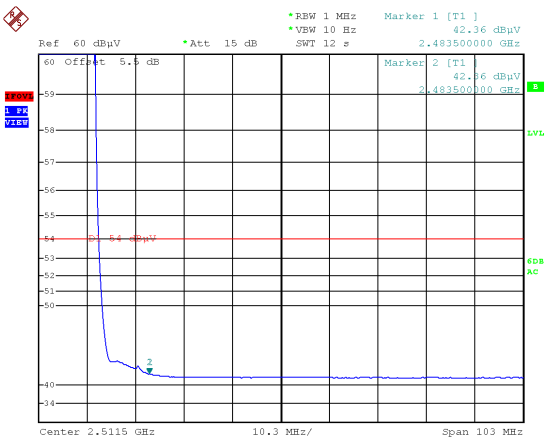
Date: 28.APR.2018 00:23:07

Vertical
Peak



Date: 28.APR.2018 00:28:17

Average



Date: 28.APR.2018 00:28:55

Channel Low Horizontal Peak

[illegible]

Date: 28.APR.2018 00:48:07

[illegible]

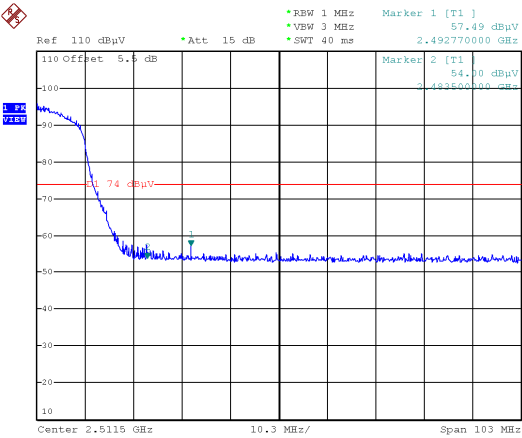
Date: 28.APR.2018 00:55:05

The screenshot shows a Spectrum Analyzer interface with the following details:

- Top Bar:**
 - Ref: 60 dBuV
 - Att: 15 dB
 - *RBW 1 MHz
 - *VIEW 10 Hz
 - SWT 12 s
 - Marker 1 [T1] 41.68 dBuV
 - 2.390000000 GHz
- Left Panel:**
 - Offset 5.1 dB
 - 1.0K View
- Grid and Trace:**
 - A blue trace shows a signal rising sharply from -40 dBuV to -34 dBuV at 2.3625 GHz.
 - A red horizontal line is at -54 dBuV.
 - A red horizontal line is at -40 dBuV.
- Right Panel:**
 - Marker 2 [T1] 41.59 dBuV
 - 2.390000000 GHz
 - 100 MHz
 - 60 dB AC
- Bottom Bar:**
 - Center 2.3625 GHz
 - 10.5 MHz/
 - Span 105 MHz

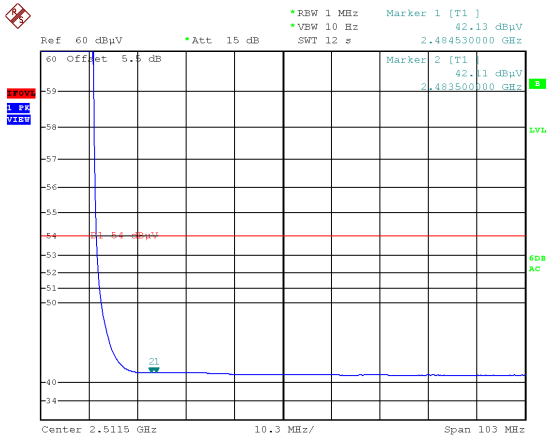
Date: 28.APR.2018 00:57:38

Channel High
Horizontal
Peak



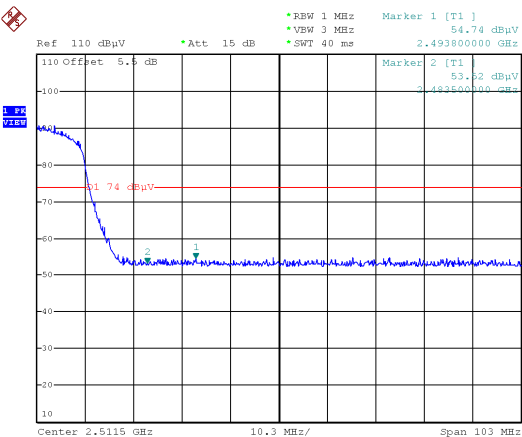
Date: 28.APR.2018 01:03:51

Average



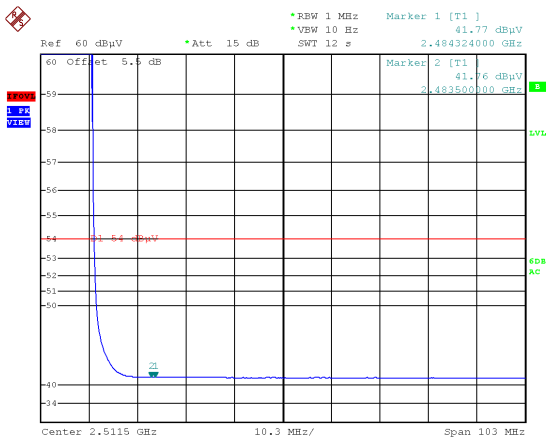
Date: 28.APR.2018 01:05:36

Vertical
Peak



Date: 28.APR.2018 01:20:23

Average



Date: 28.APR.2018 01:21:08

10. Transmitter Power Spectral Density

10.1 Measurement procedure

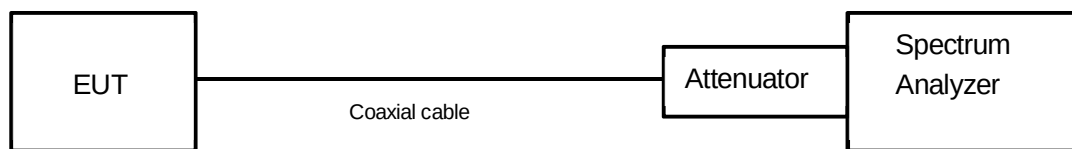
[FCC 15.247(e), KDB 558074 D01 v04, Section 10.2]

The peak power 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 = 1.5 times the 6 dB bandwidth.
- b) RBW = 3kHz - 100kHz.
- c) VBW $\geq 3 \times$ RBW.
- d) Sweep time = auto-couple.
- e) Detector = peak.
- f) Trace mode = max hold.

- Test configuration



10.2 Limit

The peak power spectral density shall not be greater than 8dBm in any 3kHz band.

10.3 Measurement result

Date : May 15, 2018
 Temperature : 20.8 [°C]
 Humidity : 44.3 [%]
 Test place : Shielded room No.3

Test engineer : Tadahiro Seino

[IEEE802.11b]

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Result
Low	2412	-20.35	11.18	-9.17	8.00	17.17	PASS
Middle	2437	-20.60	11.18	-9.42	8.00	17.42	PASS
High	2462	-20.40	11.18	-9.22	8.00	17.22	PASS

Calculation;

$$\text{Transmitter Power Spectral Density Level (Margin)} = \text{Limit} - (\text{Reading} + \text{Factor})$$

[IEEE802.11g]

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Result
Low	2412	-25.95	11.18	-14.77	8.00	22.77	PASS
Middle	2437	-25.44	11.18	-14.26	8.00	22.26	PASS
High	2462	-24.60	11.18	-13.42	8.00	21.42	PASS

Calculation;

$$\text{Transmitter Power Spectral Density Level (Margin)} = \text{Limit} - (\text{Reading} + \text{Factor})$$

[IEEE802.11n (HT20)]

Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Result
Low	2412	-26.12	11.18	-14.94	8.00	22.94	PASS
Middle	2437	-25.96	11.18	-14.78	8.00	22.78	PASS
High	2462	-25.75	11.18	-14.57	8.00	22.57	PASS

Calculation;

$$\text{Transmitter Power Spectral Density Level (Margin)} = \text{Limit} - (\text{Reading} + \text{Factor})$$

[IEEE802.11n (HT40)]

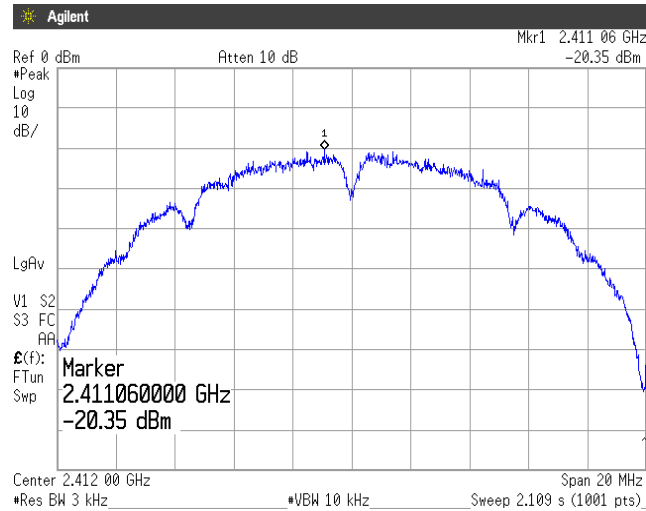
Channel	Center Frequency (MHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Margin (dBm)	Result
Low	2422	-29.34	11.18	-18.16	8.00	26.16	PASS
Middle	2437	-28.12	11.18	-16.94	8.00	24.94	PASS
High	2452	-28.49	11.18	-17.31	8.00	25.31	PASS

Calculation;

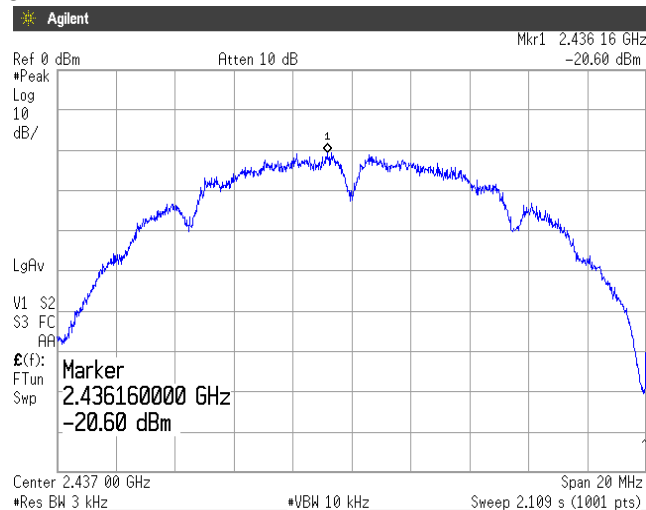
$$\text{Transmitter Power Spectral Density Level (Margin)} = \text{Limit} - (\text{Reading} + \text{Factor})$$

10.4 Trace data [IEEE802.11b]

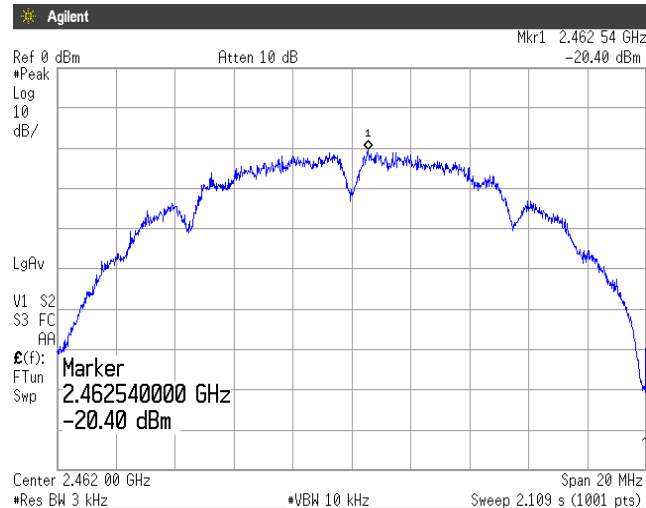
Channel Low



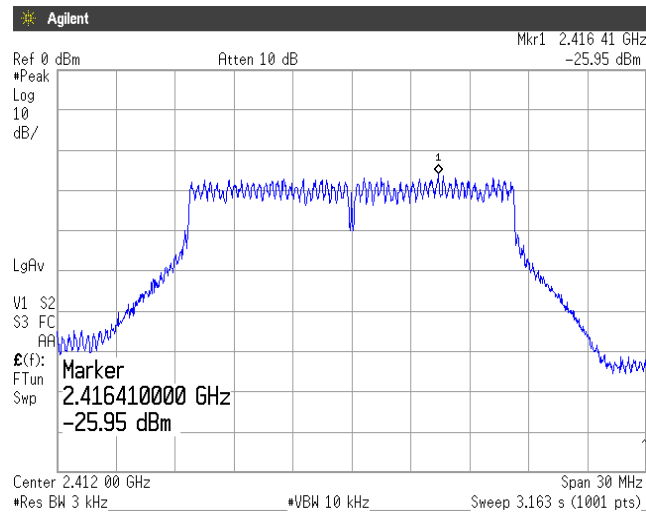
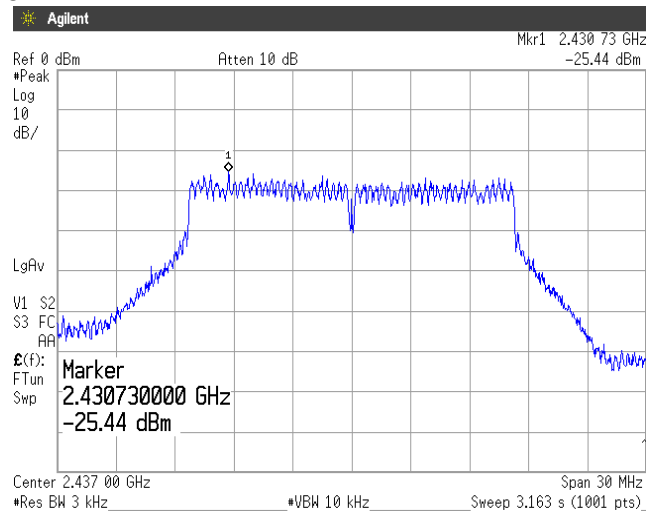
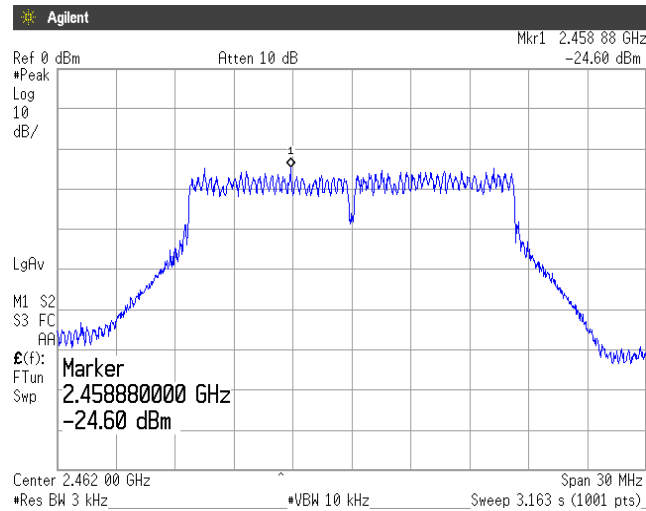
Channel Middle



Channel High

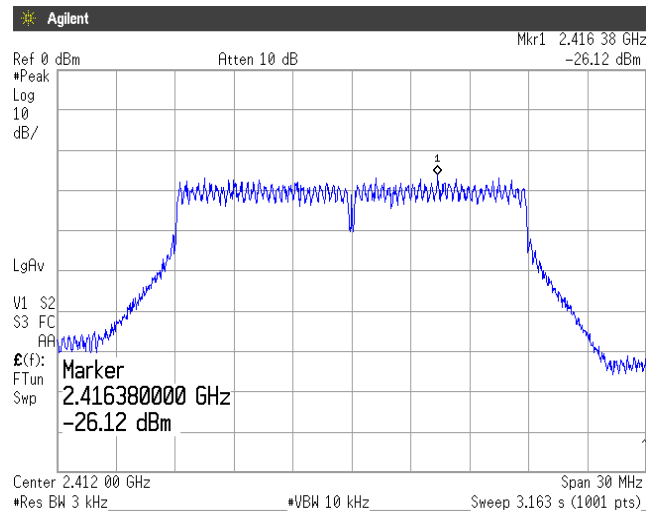


[IEEE802.11g]

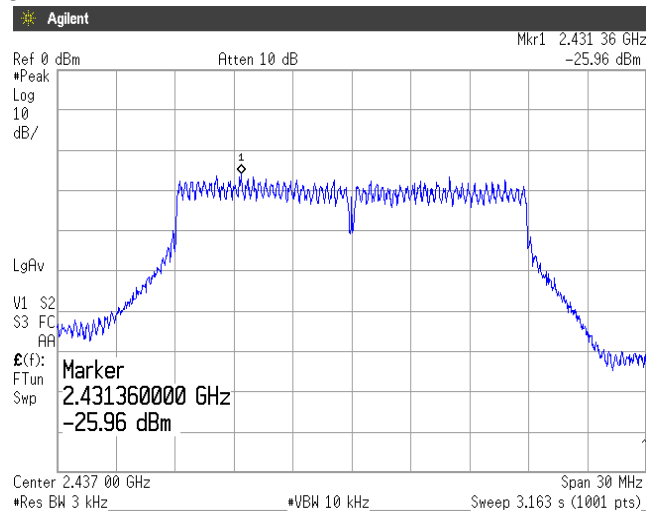
Channel Low**Channel Middle****Channel High**

[IEEE802.11n (HT20)]

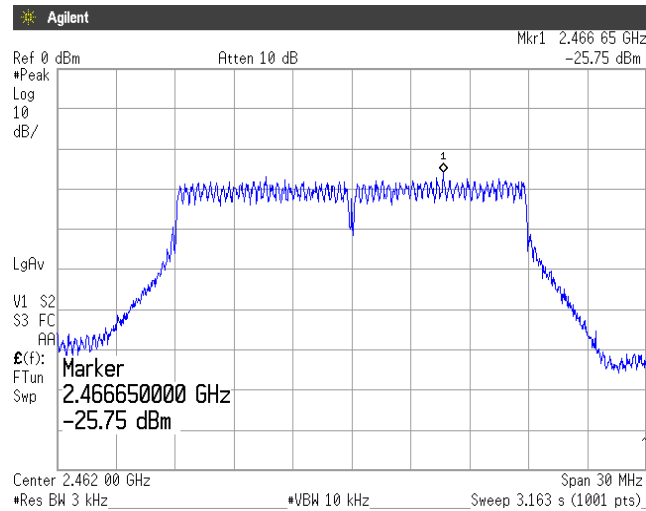
Channel Low



Channel Middle

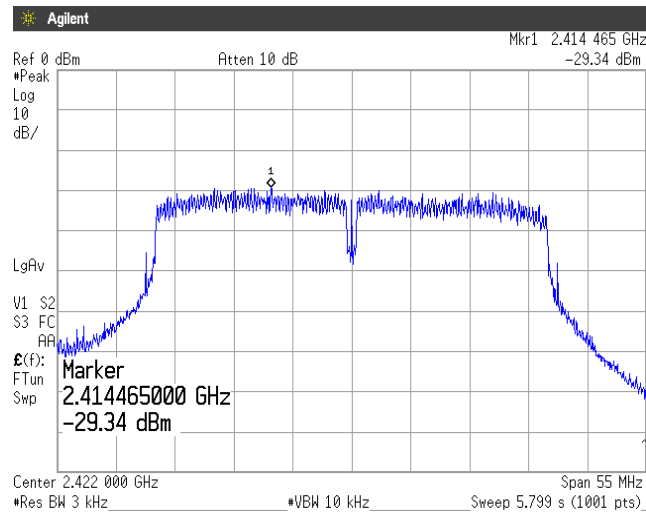


Channel High

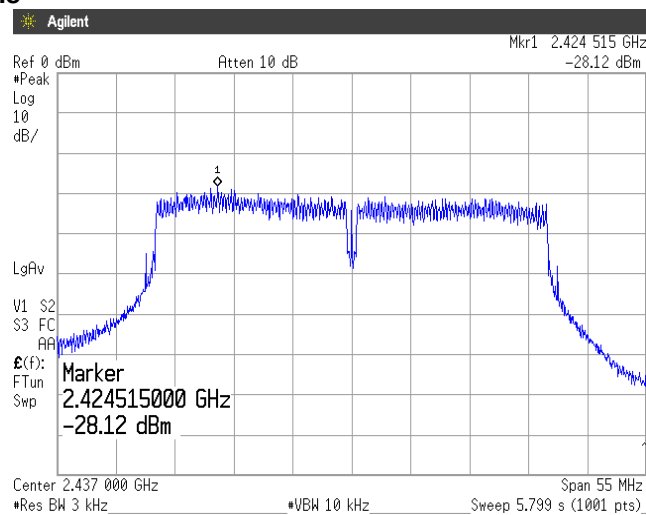


[IEEE802.11n (HT40)]

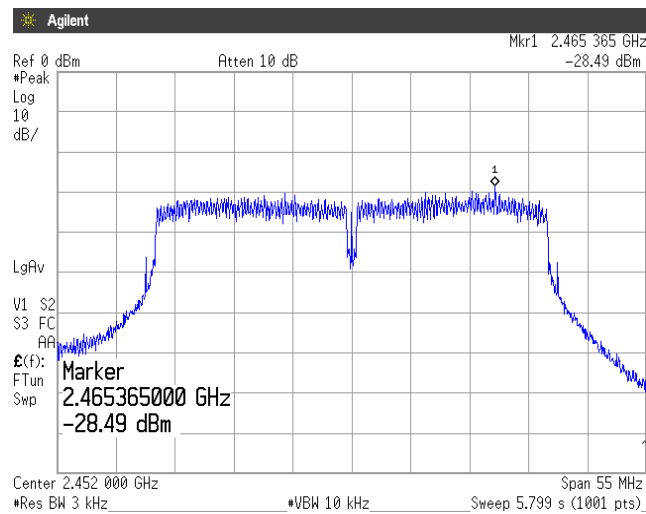
Channel Low



Channel Middle



Channel High



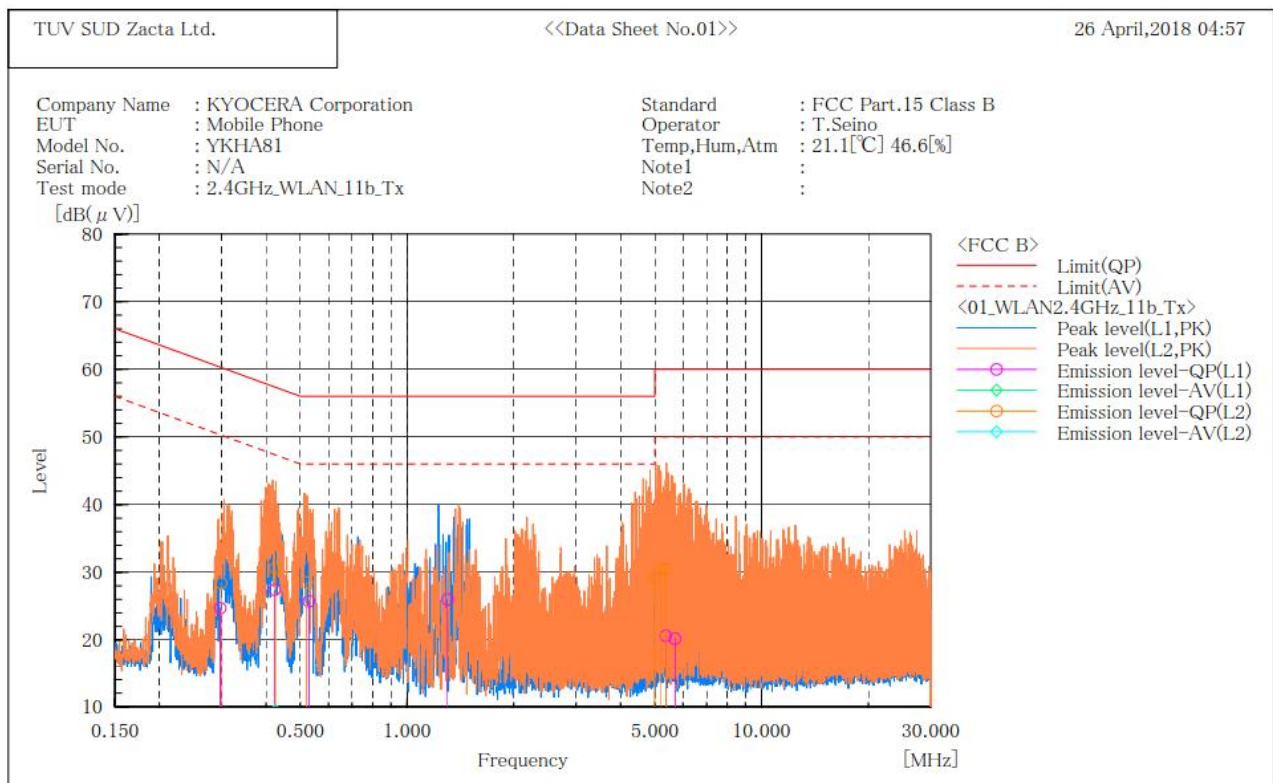
11.3 Limit

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.

11.4 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	0.297	14.3	-2.5	10.4	24.7	7.9	60.3	50.3	35.6	42.4
2	0.423	17.0	-1.8	10.4	27.4	8.6	57.4	47.4	30.0	38.8
3	0.529	15.3	-2.5	10.4	25.7	7.9	56.0	46.0	30.3	38.1
4	1.301	15.6	-2.7	10.4	26.0	7.7	56.0	46.0	30.0	38.3
5	5.365	9.9	-4.2	10.7	20.6	6.5	60.0	50.0	39.4	43.5
6	5.698	9.5	-4.3	10.7	20.2	6.4	60.0	50.0	39.8	43.6

--- 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	0.299	18.0	-1.5	10.4	28.4	8.9	60.3	50.3	31.9	41.4
2	0.425	20.2	-0.9	10.4	30.6	9.5	57.3	47.3	26.7	37.8
3	0.521	18.1	-1.8	10.4	28.5	8.6	56.0	46.0	27.5	37.4
4	4.990	18.5	-2.9	10.7	29.2	7.8	56.0	46.0	26.8	38.2
5	5.176	19.7	-2.6	10.7	30.4	8.1	60.0	50.0	29.6	41.9
6	5.368	19.7	-2.7	10.7	30.4	8.0	60.0	50.0	29.6	42.0



Zacta

12. 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.

13. 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)	$\pm 5.8\text{dB}$

14. 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, 2019	Jan. 18, 2018
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	E4440A	US40420937	Oct. 31, 2018	Oct. 19, 2017
Preamplifier	SONOMA	310	372170	Sep. 30, 2018	Sep. 12, 2017
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	100515	Feb. 28, 2019	Feb. 20, 2018
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)	Jan. 31, 2019	Jan. 18, 2018
Attenuator	TME	CFA-01NPJ-3	N/A(S272)	Jan. 31, 2019	Jan. 18, 2018
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	Jan. 31, 2019	Jan. 18, 2018
Attenuator	AEROFLEX	26A-10	081217-08	Jan. 31, 2019	Jan. 18, 2018
Double ridged guide antenna	ETS LINDGREN	3117	00052315	Mar. 31, 2019	Mar. 14, 2018
Attenuator	Agilent Technologies	8491B	MY39268633	Mar. 31, 2019	Mar. 14, 2018
DRGH 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
Notch filter	Micro-Tronics	BRM50702	045	Apr. 30, 2019	Apr. 16, 2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY30037/4	Jan. 31, 2019	Jan. 18, 2018
		SUCOFLEX104/1m	my24610/4	Jan. 31, 2019	Jan. 18, 2018
		SUCOFLEX104/8m	SN MY30031/4	Jan. 31, 2019	Jan. 18, 2018
		SUCOFLEX104/1.5m	MY32976/4	Jan. 31, 2019	Jan. 18, 2018
		SUCOFLEX104/1.5m	MY19309/4	Jan. 31, 2019	Jan. 19, 2018
		SUCOFLEX104/7m	41625/6	Jan. 31, 2019	Jan. 19, 2018
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

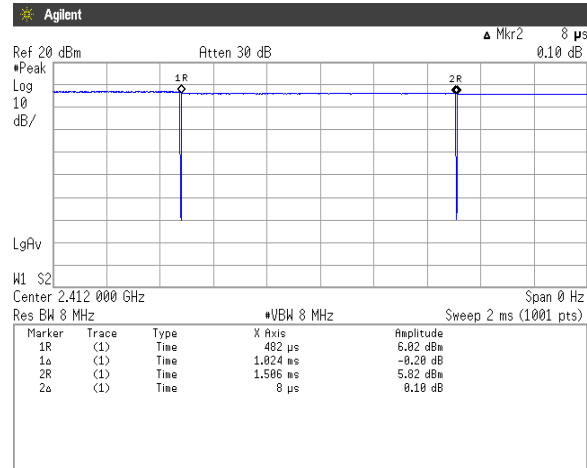
Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	Sep. 30, 2018	Sep. 13, 2017
Attenuator	HUBER+SUHNER	6810.01.A	N/A (S411)	Jan. 31, 2019	Jan. 18, 2018
Line impedance stabilization network	Kyoritsu Electrical Works, Ltd.	KNW-407F	8-2003-1	Feb. 28, 2019	Feb. 28, 2018
Coaxial cable	FUJIKURA	5D-2W/4m	N/A (S350)	Jan. 31, 2019	Jan. 18, 2018
Coaxial cable	FUJIKURA	5D-2W/1m	N/A (S193)	Jan. 31, 2019	Jan. 18, 2018
Coaxial cable	HUBER+SUHNER	RG214/U/10m	N/A (S194)	Jan. 31, 2019	Jan. 18, 2018
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

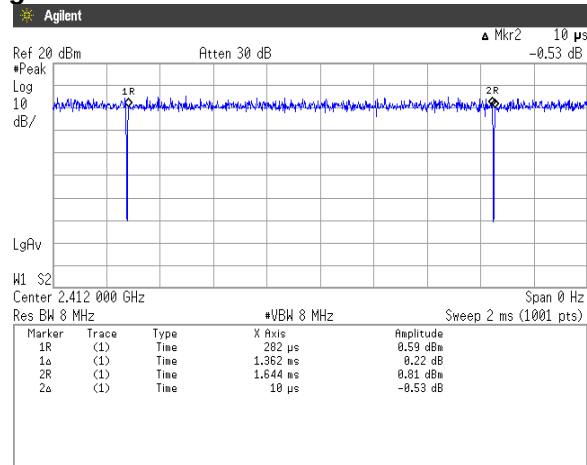
[Plot & Calculation]

11b



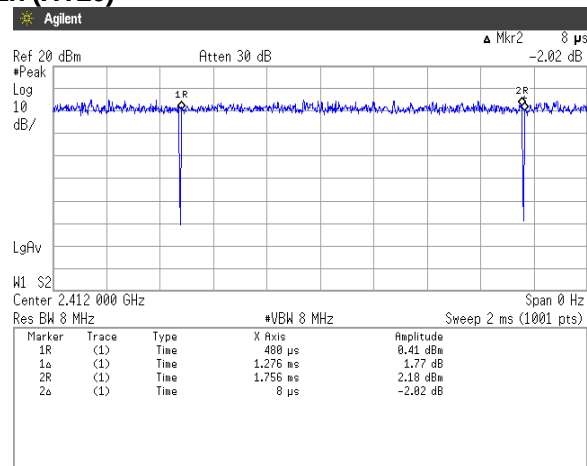
$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 1024[\mu\text{s}] / (1024[\mu\text{s}] + 8[\mu\text{s}]) = 99.22\%$$

11g



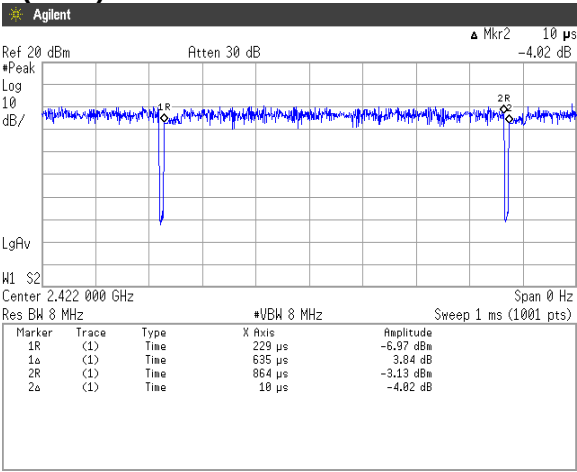
$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 1362[\mu\text{s}] / (1362[\mu\text{s}] + 10[\mu\text{s}]) = 99.27\%$$

11n (HT20)



$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff}) = 1276[\mu\text{s}] / (1276[\mu\text{s}] + 8[\mu\text{s}]) = 99.38\%$$

11n (HT40)



Duty Cycle = Ton / (Ton + Toff) = 635[μs] / (635[μs] + 10[μs]) =98.45[%]