Report on the RF Testing of:

KYOCERA Corporation
Mobile Phone, Model: DB05
FCC ID: JOYDB05

In accordance with FCC Part15 Subpart E (DFS)

TÜV SÜD Japan

Add value.
Inspire trust.

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Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Japan Ltd. document control rules.

EXECUTIVE SUMMARY
A sample(s) of this product was tested and found to be compliant with FCC Part15 Subpart E.

NVLAP TESTING
NVLAP LAB CODE 200306-0

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Japan

Contents

1 Summary of Test 3

1.1 Modification history of the test report 3
1.2 Standards 3
1.3 Test methods 3
1.4 Deviation from standards 3
1.5 List of applied test(s) of the EUT 3
1.6 Test information 3
1.7 Test set up 3
1.8 Test period 3

2 Equipment Under Test 4

2.1 EUT information 4
2.2 Modification to the EUT 5
2.3 Variation of family model(s) 5
2.4 Description of EUT 6
2.5 EUT Maximum Conducted Power 6
2.6 Transmit Power Control (TPC) 6
2.7 Statement of Maunfacturer 7
2.8 U-NII DFS Rule Requirements 7
2.9 Parameters of DFS Test Signals 9

3 Configuration of Equipment 10

3.1 EUT used 10
3.2 Support Unit used 10

4 Test Result 11

4.1 DFS Detection Threshold Levels 11
4.2 Channel Loading/Data Streaming 13
4.3 Channel Closing Transmission Time and Channel Move Time 15
4.4 Non-Occupancy Reriod 20

5 Measurement uncertainty 22

6 Laboratory Information 23

Appendix A. Test Equipment 24

Japan

1 Summary of Test

1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPD-TR-19160-0	First Issue	Refer to the cover page

1.2 Standards

CFR47 FCC Part 15 Subpart E
FCC 14-30

1.3 Test methods

ANSI C63.10-2013
KDB905462 D02 UNII DFS Compliance Procedures New Rules v02
KDB905462 D03 UNII Clients Without Radar Detection New Rules v01r02

1.4 Deviation from standards

None

1.5 List of applied test(s) of the EUT

Test item section	Test item	Condition	Result	Remark
KDB905462 D02 (8.2)	DFS Detection Threshold Levels	Radiated	N/A	-
KDB905462 D02 (7.7, 8.3)	Channel Loading/Data Streaming	Radiated	N/A	-
KDB905462 D02 (5.1, 5.2, 5.3, 6.1, 7.3.3, 7.6.1, 7.8.3)	Channel Closing Transmission Time and Channel Move Time	Radiated	PASS	-
KDB905462 D02 (5.1.2, 5.2, 5.3, 6.1, 7.3.3, 7.6.1, 7.8.3) KDB905462 D03	Non-Occupancy Reriod	Radiated	PASS	-

1.6 Test information

None

1.7 Test set up

Table-top

1.8 Test period

5-September-2019 - 20-September-2019

Japan

2 Equipment Under Test

2.1 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 (EUT)	Mobile Phone
Model number	DB05
Serial number	N/A
Trade name	Kyocera
Number of sample(s)	1
EUT condition	Pre-Production
Power rating	Battery: DC 3.85 V
Size	(W) 73.0 × (D) 153.0 × (H) 8.9 mm
Environment	Indoor and Outdoor use
Terminal limitation	-20˚C to 60˚C
Hardware version	DMT1
Software version	0.400BE
Firmware version	Not applicable
RF Specification	
Protocol	IEEE802.11a, IEEE802.11n (HT20), IEEE802.11n (HT40) IEEE802.11ac (HT20), IEEE802.11ac (HT40), EEE802.11ac (HT80)
Frequency range	IEEE802.11a/n/ac (HT20): 5180 MHz-5320 MHz, 5500 MHz-5700 MHz IEEE802.11n/ac (HT40): 5190 MHz-5310 MHz, 5510 MHz-5670 MHz IEEE802.11ac (HT80): 5210 MHz, 5290 MHz, 5530 MHz, 5610 MHz
Number of RF Channels	IEEE802.11a/n/ac (HT20): 19 Channels IEEE802.11n/ac (HT40): 9 Channels IEEE802.11ac (HT80): 4 Channels
Modulation type	IEEE802.11a/n/ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

Data rate	IEEE802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 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 IEEE802.11ac (HT20 LGI): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 86.5Mbps IEEE802.11ac (HT20 SGI): 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2, 86.6, 96.1Mbps 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 IEEE802.11ac (HT40 LGI): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 180Mbps IEEE802.11ac (HT40 SGI): 15, 30, 45, 60, 90, 120, 135, 150, 180, 200Mbps IEEE802.11ac (HT80 LGI): 29.3, 58.5, 87.8, 117, 175.5, 234, 263.3, 292.6, 351, 390Mbps IEEE802.11ac (HT80 SGI): 32.5, 65, 97.5, 130, 195, 260, 292.5, 325, 390, 433.3Mbps
Channel separation	IEEE802.11a/n/ac (HT20): 20 MHz IEEE802.11n/ac (HT40): 40 MHz IEEE802.11ac (HT80): 80 MHz
Output power	27.805 mW (IEEE802.11a) 26.683 mW (IEEE802.11n: HT20) 20.405 mW (IEEE802.11n: HT40) 20.423 mW (IEEE802.11ac: HT80)
DFS Function	Client (Without Radar Detection)
TPC Function	500mW not required
Antenna type	Internal antenna
Antenna gain	5.15-5.25 GHz band: -0.4 dBi 5.25-5.35 GHz band: -0.4 dBi 5.47-5.725 GHz band: -0.3 dBi

2.2 Modification to the EUT

The table below details modifications made to the EUT during the test project.

Modification State	Description of Modification	Modification fitted by	Date of Modification
Model: DB05, Serial Number: N/A			
0	As supplied by the applicant	Not Applicable	Not Applicable

2.3 Variation of family model(s)

2.3.1 List of family model(s)

Not applicable

2.3.2 Reason for selection of EUT

Not applicable

Japan

2.4 Description of EUT

Operational Mode	Operational Frequency Range	
	5250-5350MHz	5470-5725MHz
Client without radar detection and adhoc function	Applicable	Applicable

For FCC and IC the EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges excluding the 5600-5650 MHz range.

2.5 EUT Maximum Conducted Power

Mode	Frequency Band (MHz)	Maximum Conducted Output Power		Maximum EIRP	
		Test Result (dBm)	Test Result (mW)	Antenna Gain (dBi)	Result (mW)
802.11a	5250-5350	13.81	24.050	-0.4	21.934
	5470-5725	14.4	27.805	-0.3	25.949

Mode	Frequency Band (MHz)	Maximum Conducted Output Power		Maximum EIRP	
		Test Result (dBm)	Test Result (mW)	Antenna Gain (dBi)	Result (mW)
802.11n (20MHz)	5250-5350	13.65	23.187	-0.4	21.147
	5470-5725	14.3	26.683	-0.3	24.902

Mode	Frequency Band (MHz)	Maximum Conducted Output Power		Maximum EIRP	
		Test Result (dBm)	Test Result (mW)	Antenna Gain (dBi)	Result (mW)
802.11n (40MHz)	5250-5350	12.60	18.199	-0.4	16.598
	5470-5725	13.1	20.405	-0.3	19.043

Mode	Frequency Band (MHz)	Maximum Conducted Output Power		Maximum EIRP	
		Test Result (dBm)	Test Result (mW)	Antenna Gain (dBi)	Result (mW)
802.11ac (80MHz)	5250-5350	12.54	17.962	-0.4	16.381
	5470-5725	13.1	20.423	-0.3	19.060

2.6 Transmit Power Control (TPC)

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an E.I.R.P. of less than 500 mW.

Maximum EIRP of this device is 25.949 mW which less than 500mW, therefore it's not require TPC function.

2.7 Statement of Maunfacturer

Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user. And the device doesn't have Ad Hoc mode on DFS frequency band.

2.8 U-NII DFS Rule Requirements

The manufacturer shall state whether the UUT is capable of operating as a Master and/or a Client. If the UUT is capable of operating in more than one operating mode then each operating mode shall be tested separately.

DFS Requirements Prior to Use of a Channel

KDB905462 D02
Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

DFS requirements during normal operation

KDB905462 D02
Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
DFS Detection Threshold	Yes	Not required
Channel Closing Transmission Time	Yes	Yes
Channel Move Time	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other tests	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

DFS Detection Thresholds

KDB905462 D02
Table 3: DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

Response Requirements

KDB905462 D02
Table 4: provides the response requirements for Master and Client Devices incorporating DFS.

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

2.9 Parameters of DFS Test Signals

Short Pulse Radar Test Waveforms

KDB905462 D02
Table 5: Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup: {(1/360) x (19 x 10^6 PRI_{usec})}	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Long Pulse Radar Test Waveform

KDB905462 D02
Table 6: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Frequency Hopping Radar Test Waveform

KDB905462 D02
Table 7: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	PRI (µsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

3 Configuration of Equipment

3.1 EUT used

No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	Mobile Phone	KYOCERA	DB05	N/A	JOYDB05	EUT

3.2 Support Unit used

No.	Equipment	Company	Model No.	Serial No.	FCC ID	Comment
a	Access Point	Cisco	AIR-CAP3702E-A-K9	FJC1938F0NV	LDK102087	*1, *2

NOTE: 1. This device was functioned as a Master device during the DFS test.
NOTE: 2. The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is –64 + 1 = -63 dBm.

Japan

4 Test Result

4.1 DFS Detection Threshold Levels

4.1.1 Measurement procedure

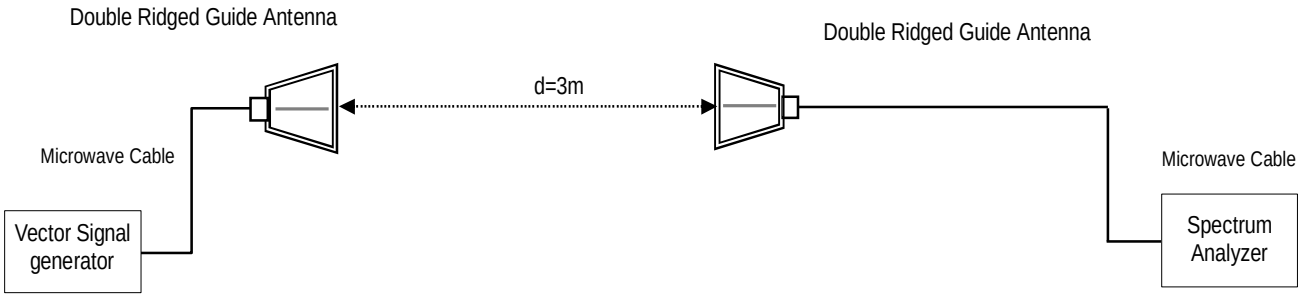
[KDB905462 D02(8.2)]

Spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain - coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of -63 dBm as measured on the spectrum analyzer.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is -64 + 1 = -63 dBm.

The spectrum analyzer is set to;
- RBW=3 MHz, VBW=3 MHz, Span=Zero span
  Sweep=10ms, Detector=Peak, Trace mode=Clear / write

- Test configuration



4.1.2 Limit

None

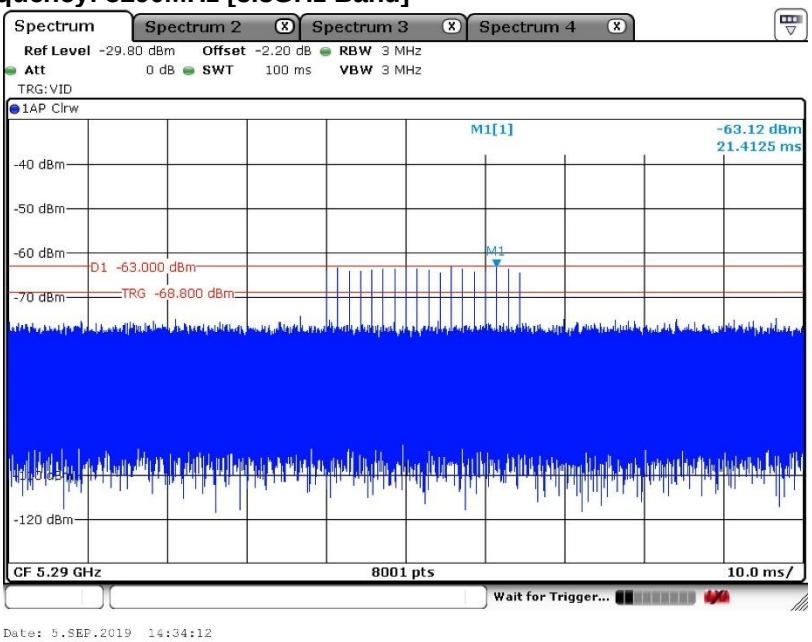
Japan

4.1.3 Radar Waveform

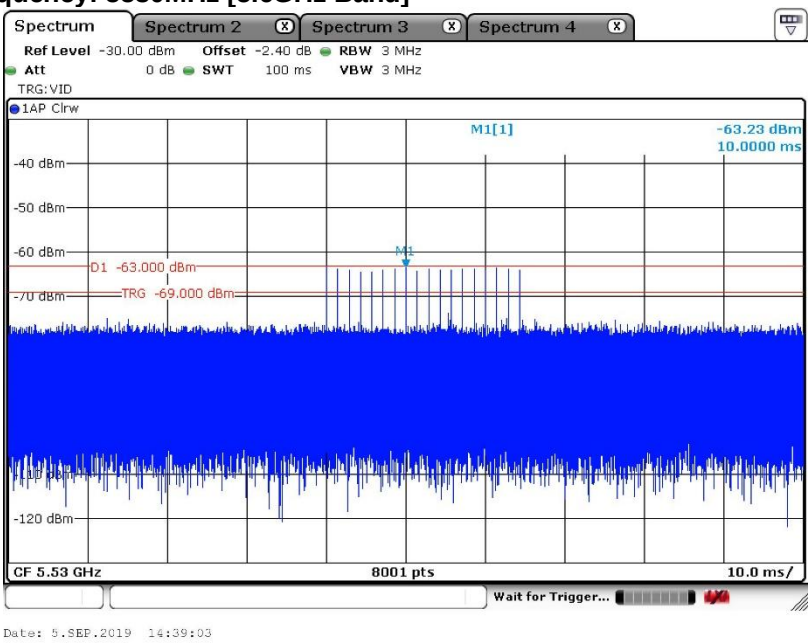
Date : 5-September-2019
Temperature : 20.6 [˚C]
Humidity : 54.1 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

Radar Type 0 Calibration Plot

Frequency: 5290MHz [5.3GHz Band]



Frequency: 5530MHz [5.6GHz Band]



4.2 Channel Loading/Data Streaming

4.2.1 Measurement procedure

[KDB905462 D02(7.7, 8.3)]

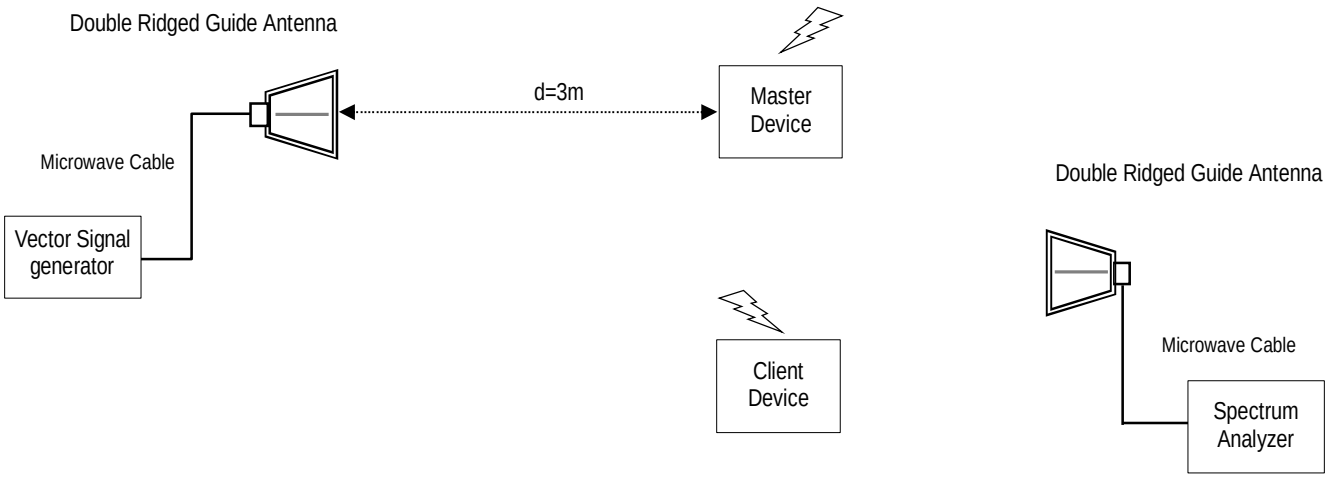
System testing will be performed with channel-loading using means appropriate to the data types that are used by the unlicensed device. The following requirements apply:

-The data file must be of a type that is typical for the device (i.e., MPEG-2, MPEG-4, WAV, MP3, MP4, AVI, etc.) and must generally be transmitting in a streaming mode.

-Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater.

The spectrum analyzer is set to;
- RBW=3 MHz, VBW=3 MHz, Span=Zero span
  Sweep=10ms, Detector=Peak, Trace mode=Clear / write

- Test configuration



4.2.2 Limit

Timing plot duty cycle greater than 17%

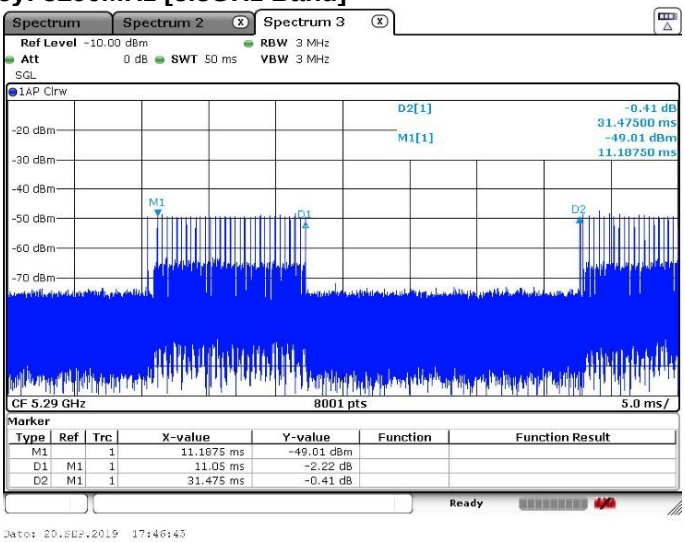
Japan

4.2.3 Measurement result

Date : 20-September-2019
Temperature : 21.6 [˚C]
Humidity : 56.1 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

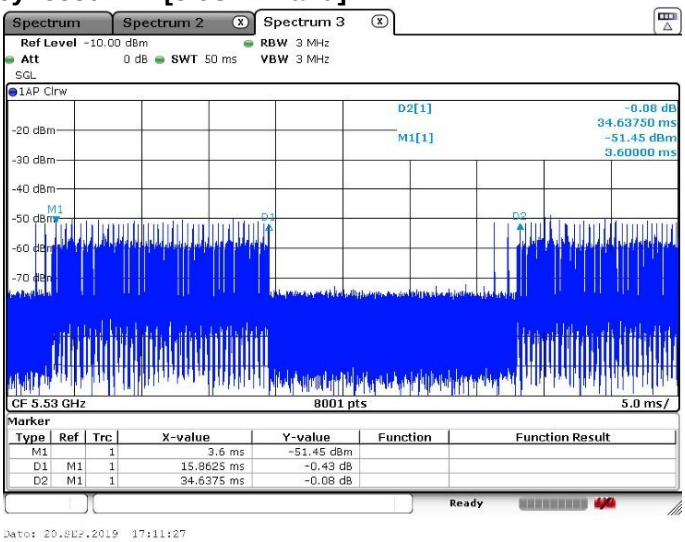
Client device Data Traffic Plot

Frequency: 5290MHz [5.3GHz Band]



ON Time [ms]	ON+OFF Time [ms]	Duty Cycle [%]
11.05	31.475	35.11

Frequency: 5530MHz [5.6GHz Band]



ON Time [ms]	ON+OFF Time [ms]	Duty Cycle [%]
15.8625	34.6375	45.80

4.3 Channel Closing Transmission Time and Channel Move Time

4.3.1 Measurement procedure

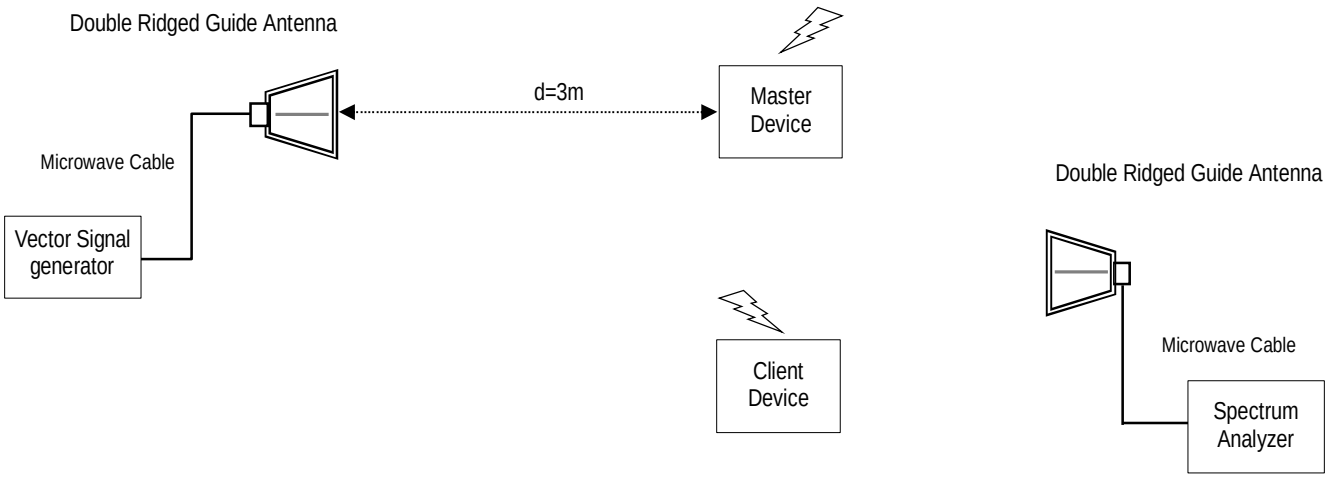
[KDB905462 D02(5.1, 5.2, 5.3, 6.1, 7.3.3, 7.6.1, 7.8.3)]

Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

The spectrum analyzer is set to;
- RBW=3 MHz, VBW=3 MHz, Span=Zero span
  Sweep=30 s, Detector=Peak, Trace mode=Clear / write

- Test configuration



4.3.2 Limit

(1) Channel Closing Transmission Time: The Aggregate Transmission Time is within 60ms within the Channel Move Time range excluding 200ms after the radar waveform is detected.

(2) Channel Move Time: The time to stop all transmissions on the current channel within 10 seconds when a radar waveform above the DFS detection threshold is detected.

Japan

4.3.3 Calculation method

Measurement of the aggregate duration of the Channel Closing Transmission Time method.

Dwell[ms]= S[ms] / B[points]

- Dwell is the dwell time per spectrum analyzer sampling bin.
- S is the sweep time.
- B is the number of spectrum analyzer sampling bins.

An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by:

C[ms]= N[bins] x Dwell[ms]

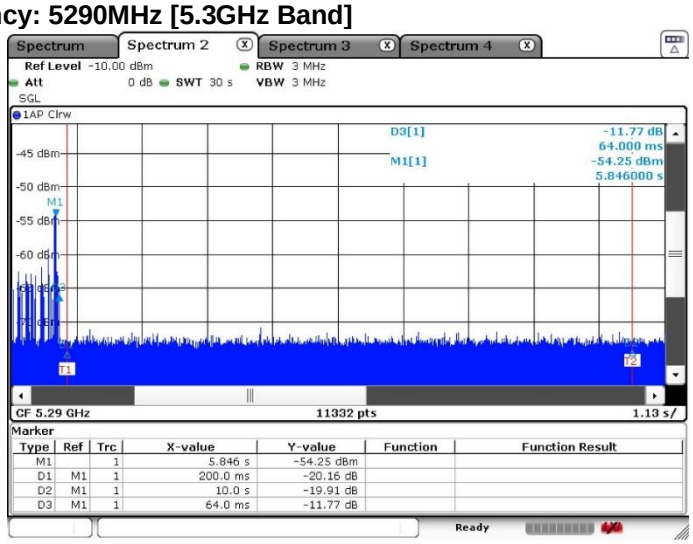
- C is the Closing Time.
- N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

4.3.4 Measurement result

Date : 20-September-2019
Temperature : 21.6 [˚C]
Humidity : 56.1 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

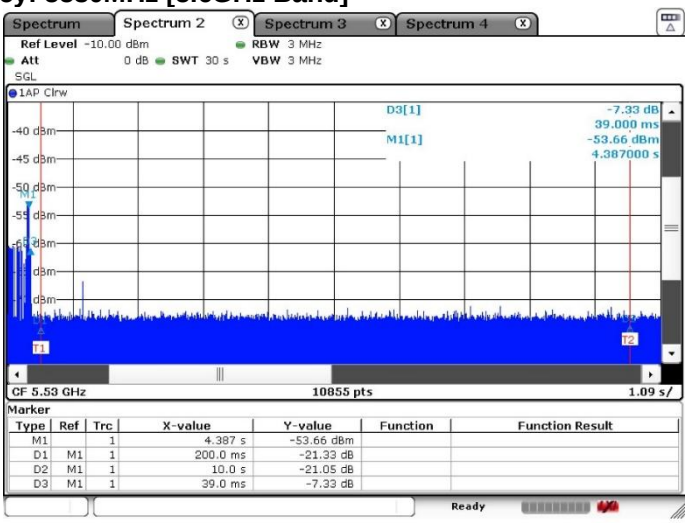
Channel Closing Transmission Time Plot

Frequency: 5290MHz [5.3GHz Band]

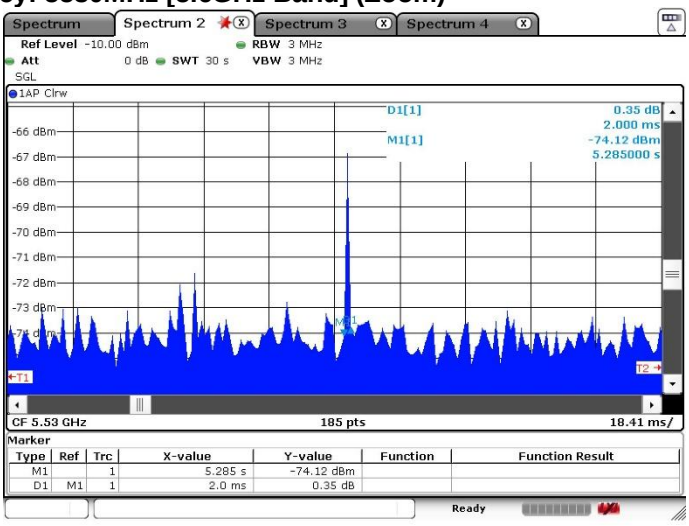


S [ms]	B [points]	Dwell [ms]	N [bins]	Aggregate Channel Closing Transmission Time [ms]	Limit [ms]
11300	11332	1.00	0	0.00	60

Frequency: 5530MHz [5.6GHz Band]



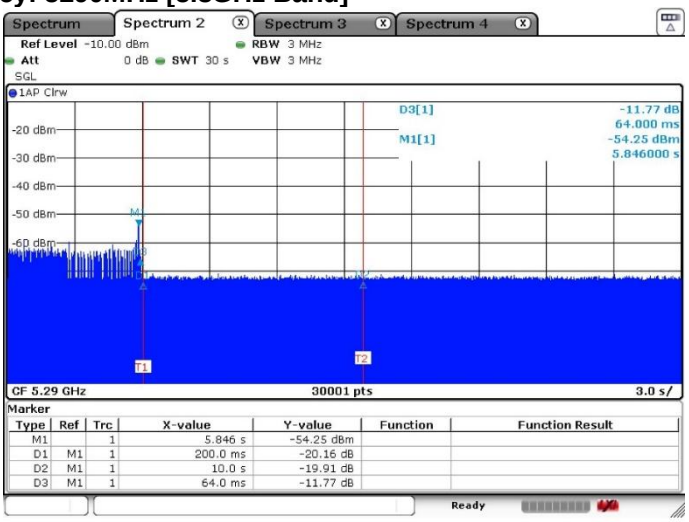
Frequency: 5530MHz [5.6GHz Band] (Zoom)



S [ms]	B [points]	Dwell [ms]	N [bins]	Aggregate Channel Closing Transmission Time [ms]	Limit [ms]
10900	10855	1.00	1	1.00	60

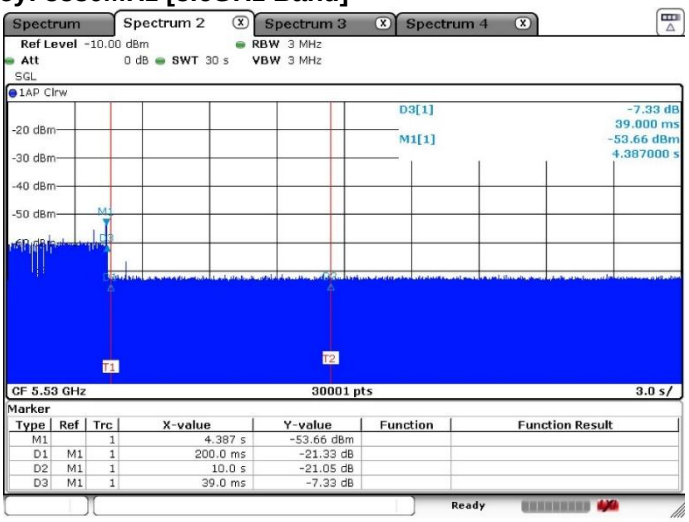
Channel Move Time Plot

Frequency: 5290MHz [5.3GHz Band]



Channel Move Time [s]	Limit [s]
0.064	10

Frequency: 5530MHz [5.6GHz Band]



Channel Move Time [s]	Limit [s]
0.039	10

Japan

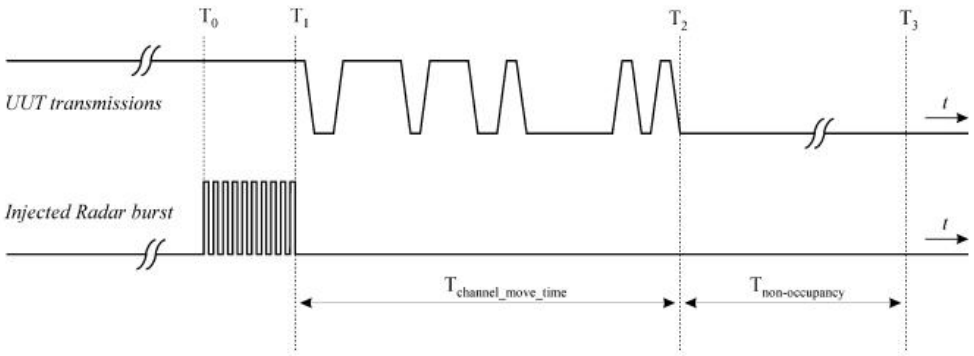
4.4 Non-Occupancy Reriod

4.4.1 Measurement procedure

[KDB905462 D02(5.1.2, 5.2, 5.3, 6.1, 7.3.3, 7.6.1, 7.8.3), KDB905462 D03]

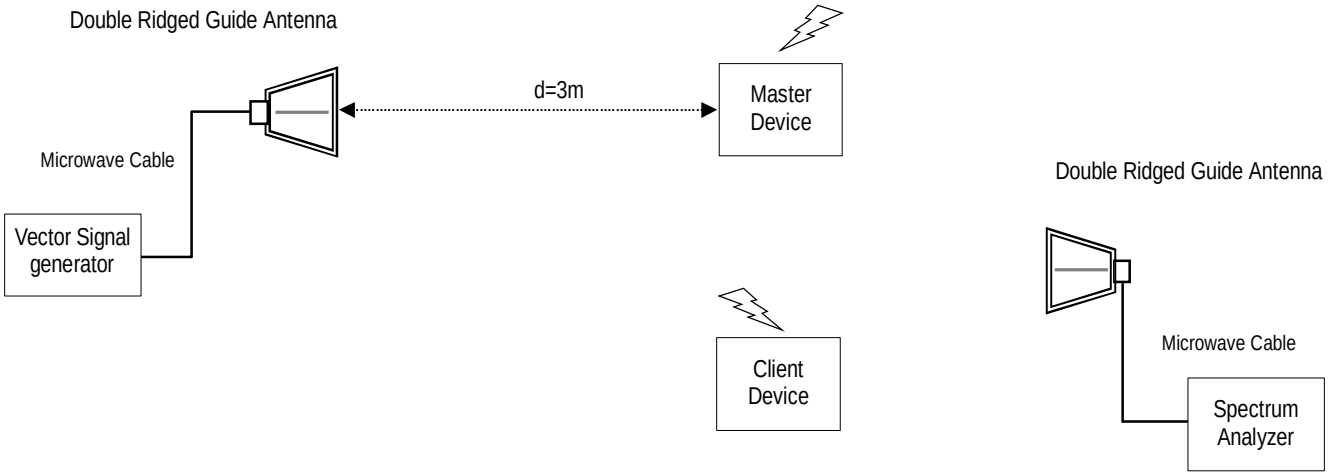
The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes.

If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.



The spectrum analyzer is set to;
- RBW=3 MHz, VBW=3 MHz, Span=Zero span
  Sweep=2000 s, Detector=Peak, Trace mode=Clear / write

- Test configuration



4.4.2 Limit

The client has vacated the Channel in the specified time (Channel Closing Transmission Time and Channel Move Time) and does not transmit on a Channel for 30 minutes after the detection and Channel move (Non-Occupancy Period).

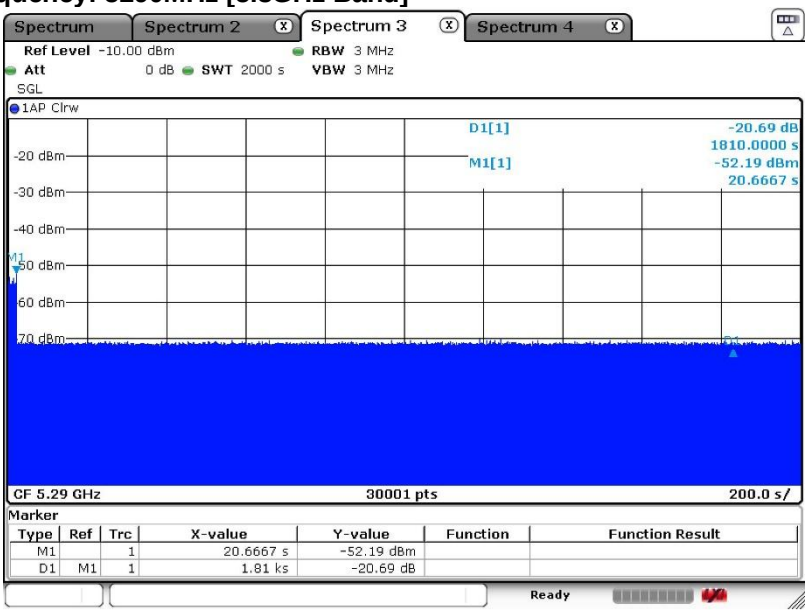
Japan

4.4.3 Measurement result

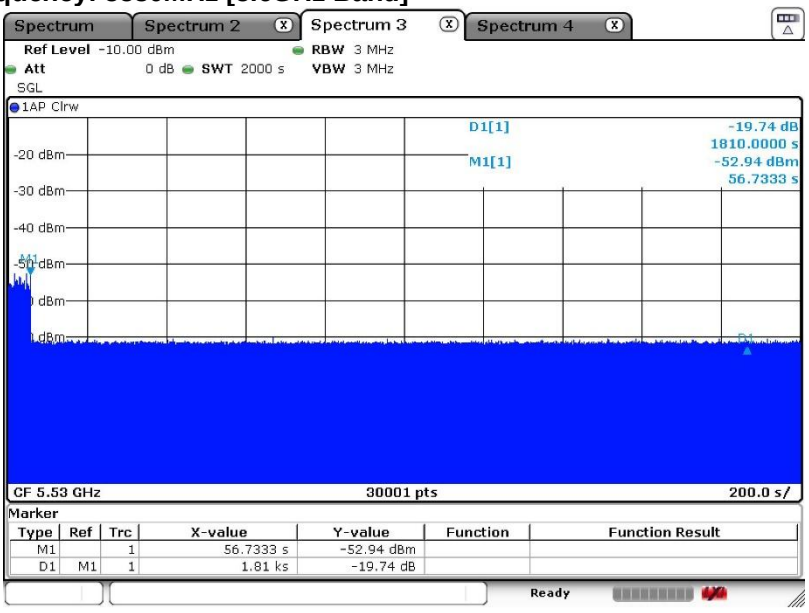
Date : 20-September-2019
Temperature : 21.6 [˚C]
Humidity : 56.1 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

Non-Occupancy Reriod Plot

Frequency: 5290MHz [5.3GHz Band]



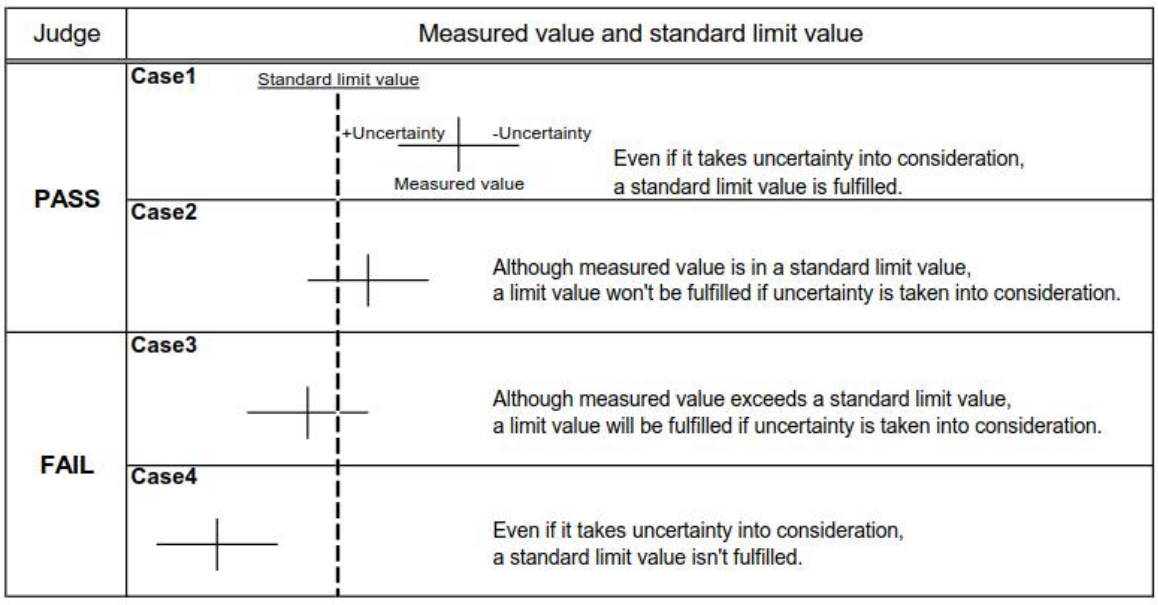
Frequency: 5530MHz [5.6GHz Band]



5 Measurement uncertainty

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

Test item	Measurement uncertainty
Conducted emission, AMN (9 kHz – 150 kHz)	±3.8 dB
Conducted emission, AMN (150 kHz – 30 MHz)	±3.3 dB
Radiated emission (9kHz – 30 MHz)	±3.1 dB
Radiated emission (30 MHz – 1000 MHz)	±4.9 dB
Radiated emission (1 GHz – 6 GHz)	±4.8 dB
Radiated emission (6 GHz – 18 GHz)	±5.1 dB
Radiated emission (18 GHz – 40 GHz)	±5.8 dB
Radio Frequency	$\pm 1.4 * 10^{-8}$
RF power, conducted	±0.6 dB
Temperature	±0.6 °C
Humidity	±1.2 %
Voltage (DC)	±0.4 %
Voltage (AC, <10kHz)	±0.2 %



Japan

6 Laboratory Information

Testing was performed and the report was issued at:

TÜV SÜD Japan Ltd. Yonezawa Testing Center

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

Accreditation and Registration
NVLAP
LAB CODE: 200306-0

VLAC
Accreditation No.: VLAC-013

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

Innovation, Science and Economic Development Canada

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

VCCI Council

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

Japan

Appendix A. Test Equipment

Radiated

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
Spectrum analyzer	ROHDE&SCHWARZ	FSV40	101731	31-Dec-2019	07-Dec-2018
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	257406	31-Jul-2020	17-Jul-2019
Double ridged guide antenna	ETS LINDGREN	3117	00224193	31-Jan-2020	23-Jan-2019
Attenuator	Agilent Technologies	8491B	MY39268633	31-Mar-2020	08-Mar-2019
Double ridged guide antenna	ETS LINDGREN	3117	00209352	30-Nov-2019	06-Nov-2018
Micro wave cable	HUBER+SUHNER	Sucoflex 102/2m	MY3385/2	31-Mar-2020	08-Mar-2019
Micro wave cable	HUBER+SUHNER	SUCOFLEX104/8m	SN MY30031/4	31-Jan-2020	16-Jan-2019
PC	HP	HP ProBook 450 G2	JPA524M85J	N/A	N/A
Software	ROHDE&SCHWARZ	R&S Pulse Sequencer DFS	V1.4 Build:6130	N/A	N/A
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-NSA)	31-May-2020	14-May-2019
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-SVSWR)	31-May-2020	13-May-2019

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