# 試験報告書
*TEST REPORT*

***Report number* 報告書番号 : DRTTEC1809-0146(2)**

***Issue date* 発行日 : 2018-11-19**

| | | |
|---|---|---|
| 申請者<br>*Applicant* | : | **Infomark Co., Ltd.**<br>3F Humaxvillage, 216 Hwangsaeul-ro, Bundang-gu,<br>Seongnam-si, Gyeonggi-do, 13598, Korea |
| 供試装置<br>*Equipment under test* | : | AI Speaker |
| 型式又は名称<br>*Model name* | : | NL-V110JP |
| 測定日<br>*Date of test* | : | 2018-08-10 ~ 2018-10-25 |
| 試験設備名<br>*Name of facility* | : | **DT&C Co., Ltd.**<br>42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si,<br>Gyeonggi-do, Korea 449-935 |
| 試験結果 | : | 適合 |

この試験報告書における測定結果は試験された装置にのみ該当します。
また、完全な複製を除き、当試験所の文書による承認なしに、報告書の一部分だけを複製することを禁止します。

**測定者;**
***Tested by;***

Hyunyong Seol X

**承認者;**
***Authorized by;***

Geunki Son X

# 1. Summary of Test

1. Purpose of test

Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment
5.2GHz Band wide band low power data communication System

2. Standards
Certification Ordinance Article 2 Clause 1 Item19-3

1) Test Methods
Ministry of Internal Affairs and Communications Notification Article 88 Appendix 45

2) Deviation from standards
None

3. List of applied test to the EUT

| Article 88 Appendix 45 | Classification of EUT | Condition | Result |
|---|---|---|---|
| 1 | Voltage fluctuation | Conducted | PASS |
| 3 | Frequency Tolerance | Conducted | PASS |
| 4 | Occupied Bandwidth | Conducted | PASS |
| 5 | Unwanted (Spurious) Emission Strength | Conducted | PASS |
| 6 | RF Output Power Tolerance | Conducted | PASS |
| 7 | Adjacent Channel Leakage Power and Out-of-Band Leakage Power | Conducted | PASS |
| 8 | Secondary Emitted Radio Wave Strength | Conducted | PASS |
| 9 | Interference Prevention Function | Conducted | PASS |
| 10 | Transmission Burst Length | Conducted | PASS |
| 11 | Transmission Power Control Function (TPC) | Conducted | N/A |
| 12 | Carrier Sensing Function | Conducted | PASS |
| 14 | Dynamic Frequency Selection Function(DFS) | Conducted | N/A |

1) Test set up
Table-Top

2) Modification to the EUT by laboratory
None

# 2. Test Information

1. Applicant

Infomark Co., Ltd.

2. Equipment under test
AI Speaker

3. Model number
NL-V110JP

4. Serial number
Identical prototype

5. Size

(W) 181.0 x (D) 87.50 x (H) 181.0 mm

6. Terminal limitation
-20˚C to 50˚C

7. RF Specification Frequency range
802.11a/n/ac(HT20/VHT20) : 5180 MHz ~ 5240 MHz
802.11n/ac(HT40/VHT40) : 5190 MHz ~ 5230 MHz
802.11ac(VHT80) : 5210 MHz

8. Number of RF Channels
20 MHz interval 4 Channel, 40 MHz interval 2 Channel, 80 MHz interval 1 Channel

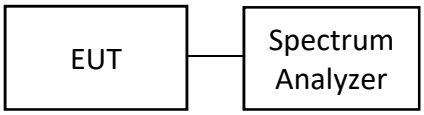
9. Modulation method & Data rate

802.11a: Orthogonal Frequency Division Multiplexing(Up to 54Mbps)
802.11n(HT20): Orthogonal Frequency Division Multiplexing(Up to 72.2Mbps)
802.11n(HT40): Orthogonal Frequency Division Multiplexing(Up to 150Mbps)
802.11ac(VHT20): Orthogonal Frequency Division Multiplexing(Up to 86.7Mbps)
802.11ac(VHT40): Orthogonal Frequency Division Multiplexing(Up to 200Mbps)
802.11ac(VHT80): Orthogonal Frequency Division Multiplexing(Up to 433.3Mbps)

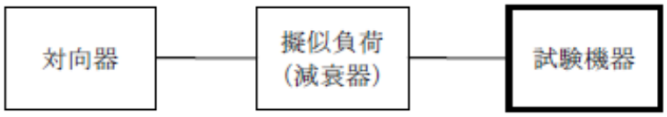
10. Variation of the family model(s)
-

# 3. Configuration of equipment

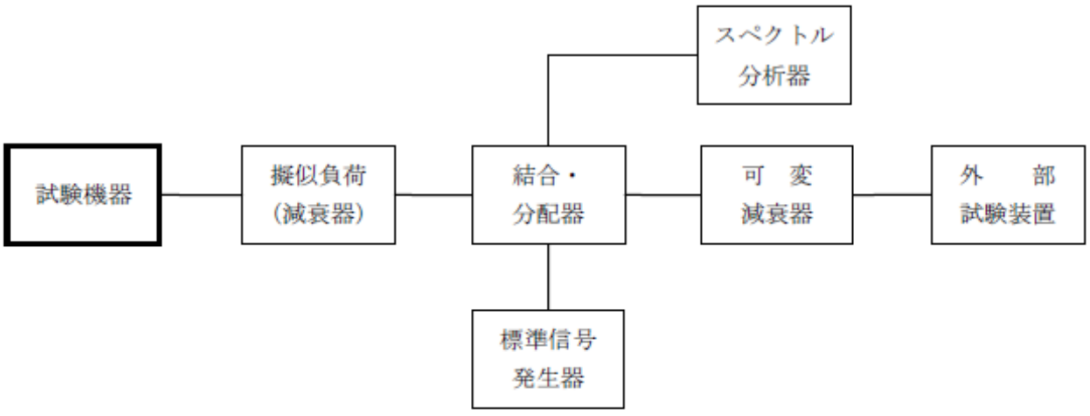
1. Frequency tolerance, Occupied bandwidth, Unwanted(Spurious) emission strength,
RF output Power Tolerance, Adjacent Channel Leakage Power and Out-of Band Leakage Power,
Secondary Emitted Radio Wave Strength, Burst Length of Transmitted Signals,




2. Interference Prevention Fuction




3. Carrier Sensing Function



# 1. 試験結果

***Test results***

| | | |
|---|---|---|
| Environment of test room | Date of test | 2018-08-10 ~ 2018-10-25 |
| | Temperature | 20 ~ 23 °C |
| | Humidity | 50 ~ 54 % |

| | | |
|---|---|---|
| Peak Antenna Gain | 3.725 | dBi |
| Declaration Output Power | 0.3 | mW/MHz |
| | -5.2288 | dBm/MHz |
| **E.I.R.P** | **0.7073** | mW/MHz |
| | **-1.5038** | **dBm/MHz** |
| Input Power Voltage | 3.7 | VDC |

| | | | |
|---|---|---|---|
| Tested Circit Insertion Loss | Tx1 | 0 | dB |
| Transmission Time | ON TIME (1sec or less) | 0.248 | msec |
| | OFF TIME (0.1sec or more) | 0.200 | msec |
| | Ratio | 55 | % |
| Packet Type (Mode) | | OFDM | mode |

| | |
|---|---|
| Test category ; | 5GHz Band Low-Power Data Communication System 802.11 ac (VHT 80) |
| The reason why the tests are performed only at rated voltage : | When the input voltage to receiver RF circuit varies below ± 1% as the input voltage from the external power supply to the receiver varies ± 10% (excluding power supply). |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Measurement Channel | Ch. | 42 | ---- | ---- | ---- | | |
| Measurement Frequency | MHz | 5210 | ---- | ---- | ---- | Result | Limit |
| Frequency Measurements(Tx1) | MHz | 5210.001593 | ---- | ---- | ---- | **----** | ---- |
| Frequency Toleranc(Tx1) | ppm | 0.3 | ---- | ---- | ---- | **PASS** | ±20×10-6(20ppm) |
| Occupied Bandwidth(Tx1) | MHz | 74.595 | ---- | ---- | ---- | **PASS** | 78MHz or below |
| RF Output Power(Tx1) | mW/MHz | 0.193565 | ---- | ---- | ---- | **PASS** | 2.5mW/MHz or below |
| RF Output Power Tolerance (Tx1)or(Tx1+2)or(Tx1+2+3)or(Tx1+2+3+4) | % | -35.5 | ---- | ---- | ---- | **PASS** | +20% to -80% |

| Measurement Channel | | Ch. | 42 | ---- | ---- | ---- | | |
|---|---|---|---|---|---|---|---|---|
| Measurement Frequency | | MHz | 5210 | ---- | ---- | ---- | Result | Limit |
| Unwanted (Spurious) Emission Strength(Tx1) | 30MHz to 5020MHz | uW/MHz | 0.002 | ---- | ---- | ---- | **PASS** | 2.5uW/MHz or below |
| | | MHz | 3163.710 | ---- | ---- | ---- | ----- | ---- |
| | 5480MHz to 26GHz | uW/MHz | 0.056 | ---- | ---- | ---- | **PASS** | 2.5uW/MHz or below |
| | | MHz | 25158.22 | ---- | ---- | ---- | ----- | ---- |
| Adjacent Channel Leakage Power (Tx1) | cf | dB | 7.990 | ---- | ---- | ---- | **----** | ---- |
| | cf -80MHz | dB | -35.990 | ---- | ---- | ---- | **PASS** | -25dBc or below |
| | cf +80MHz | dB | -35.470 | ---- | ---- | ---- | **PASS** | -25dBc or below |

| Measurement Channel | | Ch. | 42 | ---- | ---- | ---- | | |
|---|---|---|---|---|---|---|---|---|
| Measurement Frequency | | MHz | 5210 | ---- | ---- | ---- | Result | Limit |
| Out-Band Leakage Power (Tx1) | 5020 to 5123.2MHz | uW/MHz | 0.163 | ---- | ---- | ---- | **PASS** | 2.5uW/MHz or below |
| | | MHz | 5121.1030 | ---- | ---- | ---- | ---- | ---- |
| | 5123.2 to 5150MHz | uW/MHz | 0.260 | ---- | ---- | ---- | **PASS** | 15uW/MHz or below |
| | | MHz | 5137.7961 | ---- | ---- | ---- | ---- | ---- |
| | 5250 to 5251MHz | uW/MHz | 25.498 | ---- | ---- | ---- | **PASS** | $10^{-((f-40)+\log(1/4)}$mW/MHz or below |
| | | MHz | 5250.0063 | ---- | ---- | ---- | ---- | ---- |
| | Limit | uW/MHz | 246.400 | ---- | ---- | ---- | ---- | ---- |
| | 5251 to 5290MHz | uW/MHz | 14.174 | ---- | ---- | ---- | **PASS** | $10^{-(8/390)(f-41)-1+\log(1/4)}$mW/MHz or below |
| | | MHz | 5251.0621 | ---- | ---- | ---- | ---- | ---- |
| | Limit | uW/MHz | 24.927 | ---- | ---- | ---- | ---- | ---- |
| | 5290 to 5296.7MHz | uW/MHz | 0.026 | ---- | ---- | ---- | **PASS** | $10^{-(3/100)(f-80)-1.8+\log(1/4)}$mW/MHz or below |
| | | MHz | 5291.9881 | ---- | ---- | ---- | ---- | ---- |
| | Limit | uW/MHz | 3.454 | ---- | ---- | ---- | ---- | ---- |
| | 5296.7 to 5480MHz | uW/MHz | 0.022 | ---- | ---- | ---- | **PASS** | 2.5uW/MHz or below |
| | | MHz | 5297.7119 | ---- | ---- | ---- | ---- | ---- |

| Measurement Channel | | Ch. | 42 | ---- | ---- | ---- | | |
|---|---|---|---|---|---|---|---|---|
| Measurement Frequency | | MHz | 5210 | ---- | ---- | ---- | Result | Limit |
| Secondary Emitted Radio Wave Strength (Rx1) | 30MHz to 1000MHz | nW | 0.003 | ---- | ---- | ---- | **PASS** | 4nW or below |
| | | MHz | 917.98 | ---- | ---- | ---- | **----** | ---- |
| | 1GHz to 10GHz | nW | 0.092 | ---- | ---- | ---- | **PASS** | 20nW or below |
| | | MHz | 7892.80 | ---- | ---- | ---- | **----** | ---- |
| | 10GHz to 26GHz | nW | 2.489 | ---- | ---- | ---- | **PASS** | 20nW or below |
| | | MHz | 25708.37 | ---- | ---- | ---- | **----** | ---- |
| Burst Length of Transmitted Signals | | | Good | ---- | ---- | ---- | **PASS** | 4ms or below |
| Carrier Sensing Function | | | Good | ---- | ---- | ---- | **PASS** | 100mV/m |
| Transmission Power Control Function | | | N/A | ---- | ---- | ---- | **N/A** | 3dB |
| Interference Prevention Function | | | Good | | | | **PASS** | |

# 5. 試験機器リスト

***Measurement equipment list***

| USE | Equipment | Company | Model No. | Serial No. | Calibrated by | Cal. Method | Cal. Due | Cal. Date |
|---|---|---|---|---|---|---|---|---|
| X | Spectrum analyzer | Agilent Technologies | N9020A | MY46471445 | MPC | ハ(c) | Dec. 28, 2018 | Dec. 28, 2017 |
| X | Power Supply | Agilent Technologies | 66332A | US37472772 | MPC | ハ(c) | Dec. 27, 2018 | Dec. 27, 2017 |
| X | Signal generator | ROHDE&SCHWARZ | SMBV100A | 255571 | MPC | ハ(c) | Dec. 27, 2018 | Dec. 27, 2017 |
| X | Multimeter | FLUKE | 17B | 26030065WS | MPC | ハ(c) | Dec. 26, 2018 | Dec. 26, 2017 |
| X | Thermohygrometer | BODYCOM | BJ5478 | 1209 | MPC | ハ(c) | Jan. 3, 2019 | Jan. 3, 2018 |
| X | Power Divider | Weinschel | WA1574 | WA1574-1 | MPC | ハ(c) | Jul. 6, 2019 | Jul. 6, 2018 |
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Note1: "X" は使用した測定機器です。
"X" used equipment.

Note2: 較正期限は、較正を行った日の翌月から起算して1年以内です。
The validity of measurement equipment is one year from the first day of the following month of the calibration date.

Note3: 較正方法 ...
Cal.Method ...

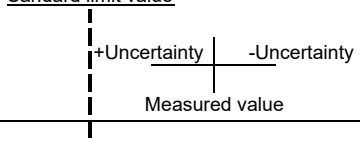
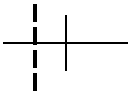
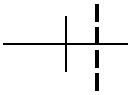
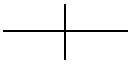
イ)：国立研究開発法人情報通信研究機構（NICT）（以下「機構」という。）又は第百二条の十八第一項の指定較正機関
（TELEC,インターテックジャパン、キーサイト）が行う較正
a)： Calibration conducted by the National Institute of Information and Communications Technology〜NICT〜 or a designated calibration agency under Article 102-18 paragraph (1)〜 Telecom Engineering Center, Intertek Japan K.K.,
ロ)：計量法 （平成四年法律第五十一号）第百三十五条 又は第百四十四条 の規定に基づく校正
（JCSS校正）
b)： Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)〜Japan Calibration Service System〜
ハ)：外国において行う較正であつて、機構又は第百二条の十八第一項の指定較正機関
（TELEC,インターテックジャパン、キーサイト）が行う較正に相当するもの
c)： Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)〜 Telecom Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc〜.

ニ)：イからハまでのいずれかに掲げる較正等を受けたものを用いて行う較正等
d)： Calibration conducted by using other equipment that listed above from a) to c)

# 6. 測定の不確かさ

***About uncertainty of measured value***

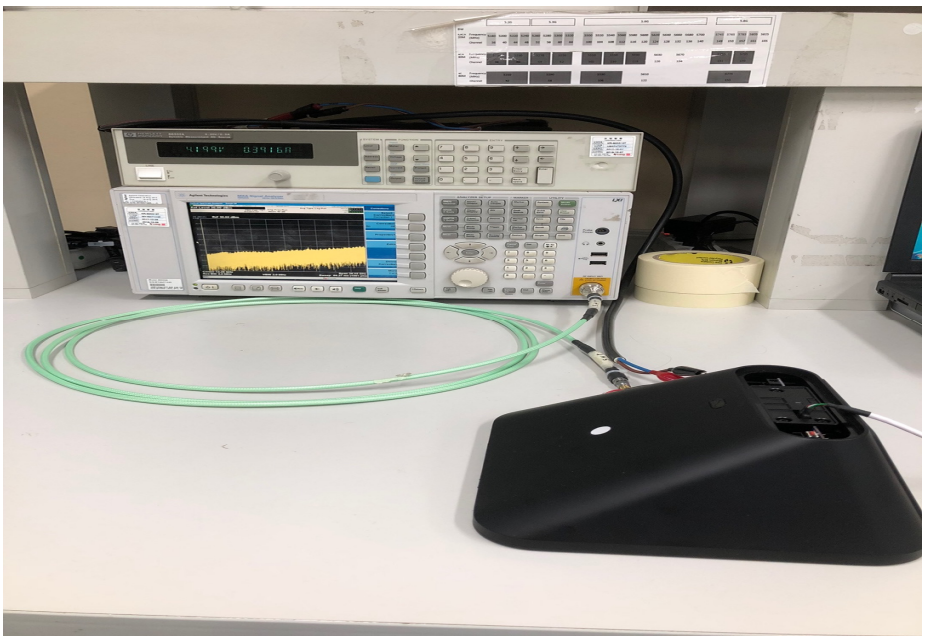
| Parameter | Uncertainty |
|---|---|
| Total RF power conducted | 1.4 dB |
| Spurious emissions conducted | 1.0 dB |
| Temperature | 0.4℃ |
| Humidity | 2% |

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

# 7. 測定写真

***Photographs***

**Conducted Measurement Photo(1)**



**Conducted Measurement Photo(2)**

# 5. 測定チャート

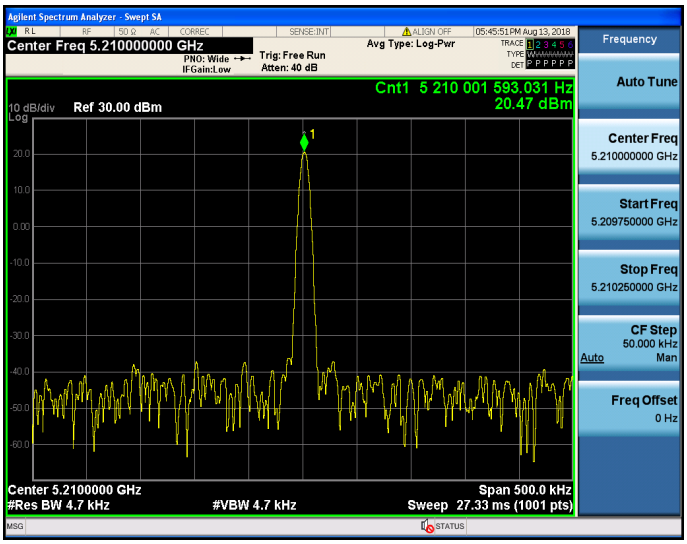
***Test chart***

## 5.1 周波数偏差

***Frequency tolerance***

Tx1

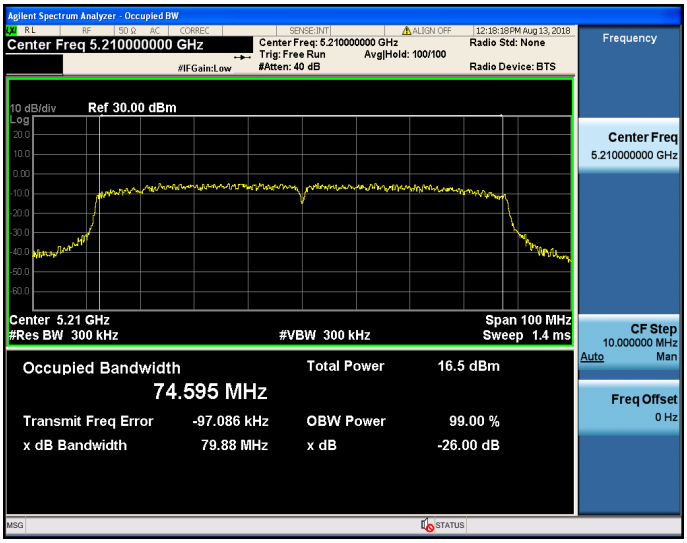
Ch.42: 5210MHz



## 5.2 占有周波数帯幅
## Occupied bandwidth

Tx1

Ch.42: 5210MHz

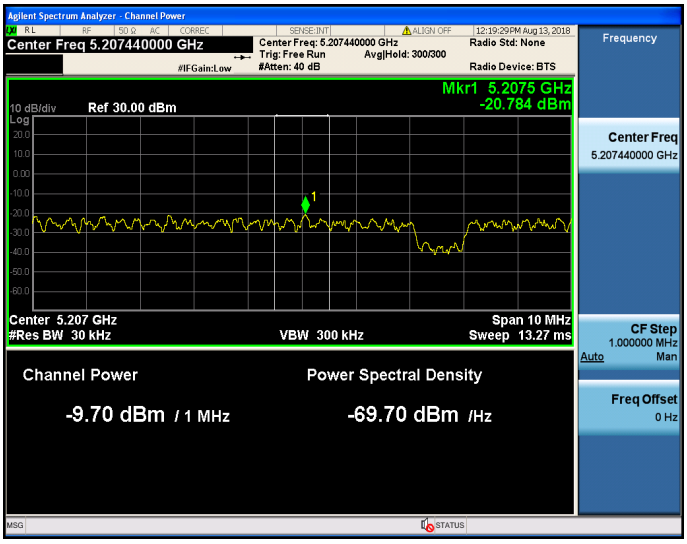


## 5.3 空中線電力の偏差

### *RF output power tolerance*

Tx1

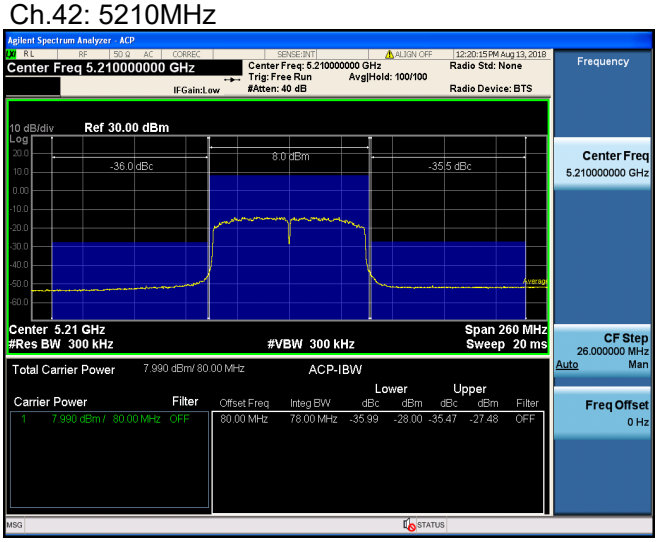
Ch.42: 5210MHz



## 5.4 隣接チャネル漏洩電力
## *Adjacent Channel Leakage Power*

Tx1

Ch.42: 5210MHz

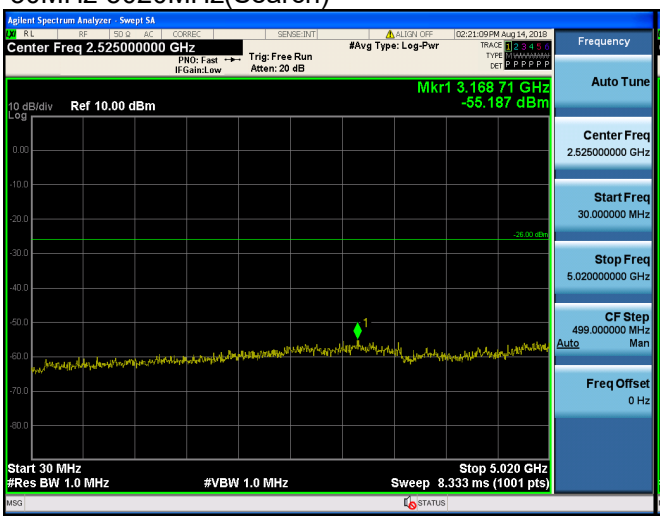


## 5.5 スプリアス発射又は不要発射の強度
## *Unwanted(Spurious) emission strength*

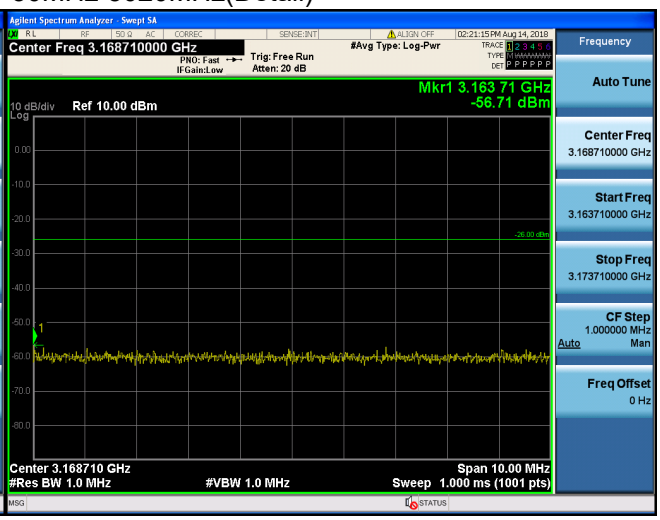
1x1

Ch.42: 5210MHz

30MHz-5020MHz(Search)

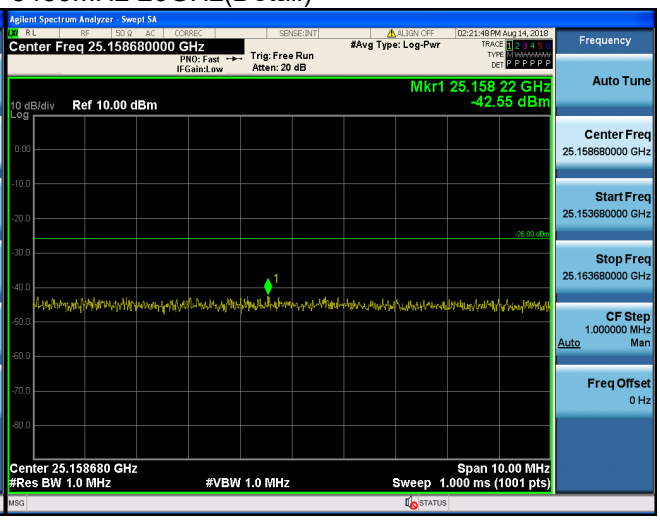



30MHz-5020MHz(Detail)




5480MHz-26GHz(Search)


5480MHz-26GHz(Detail)

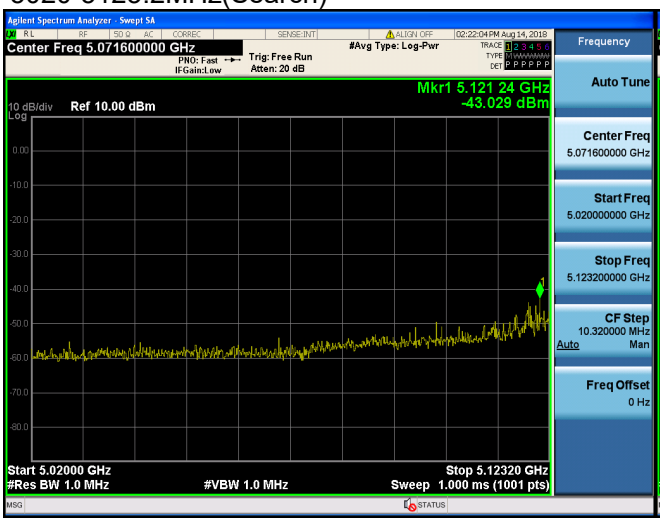


## 5.6 帶域外漏洩電力
## Out-band leakage power

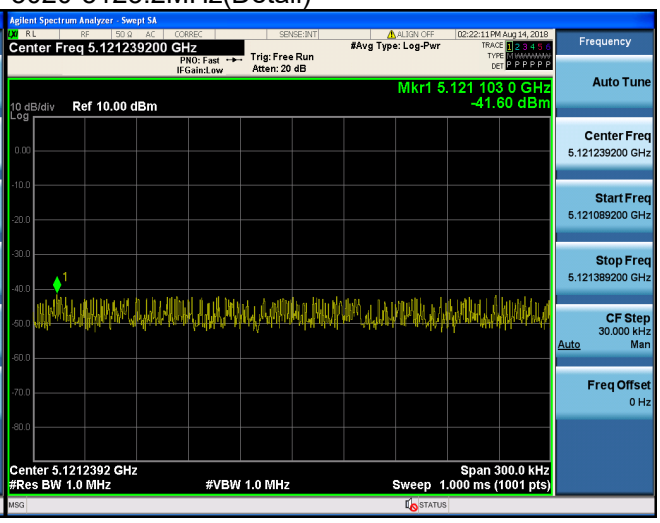
Tx1

Ch.42: 5210MHz

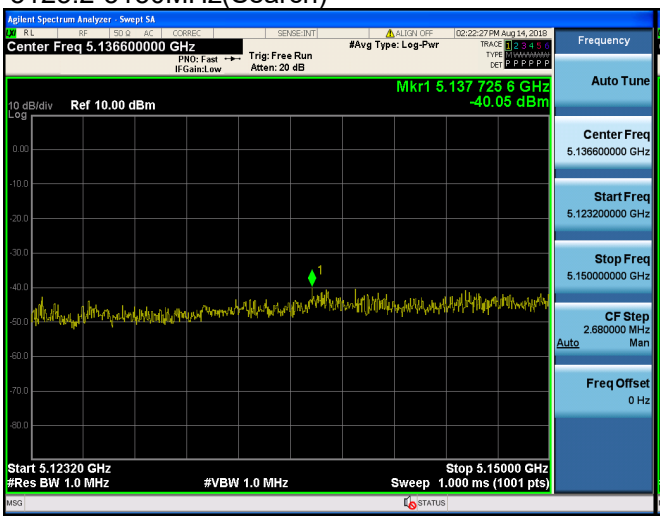
5020-5123.2MHz(Search)



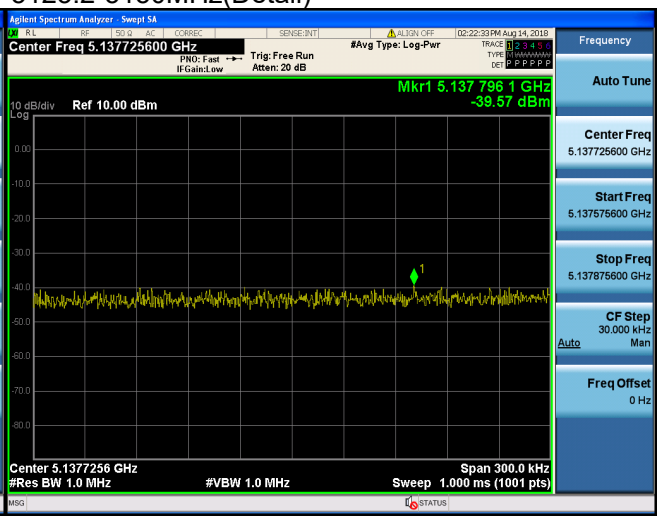

5020-5123.2MHz(Detail)



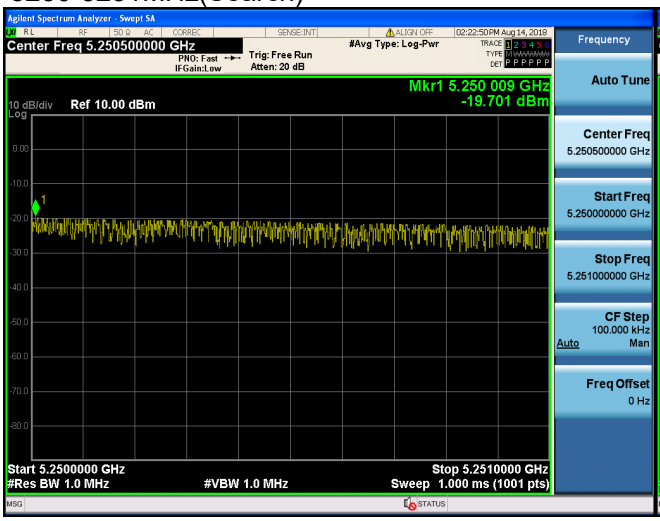

5123.2-5150MHz(Search)



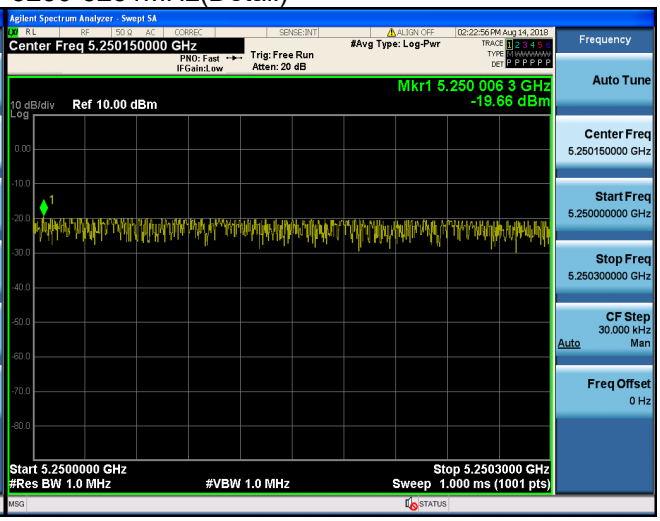

5123.2-5150MHz(Detail)



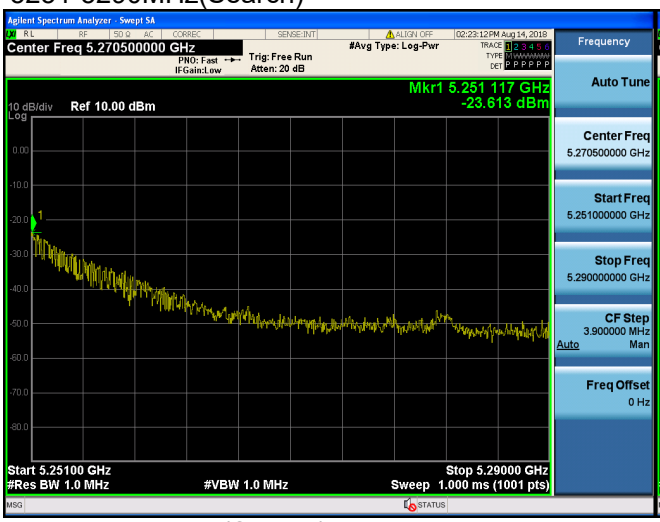

5250-5251MHz(Search)



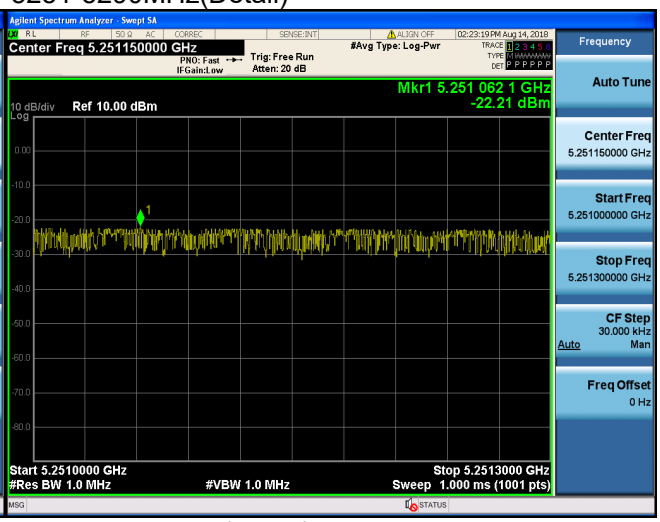

5250-5251MHz(Detail)



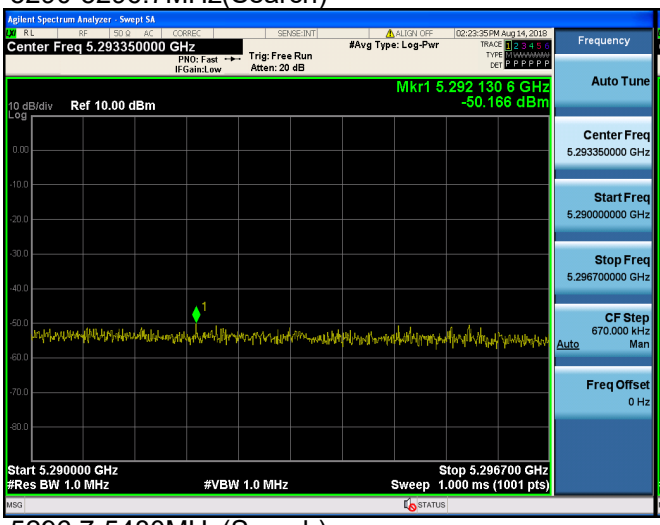
5251-5290MHz(Search)



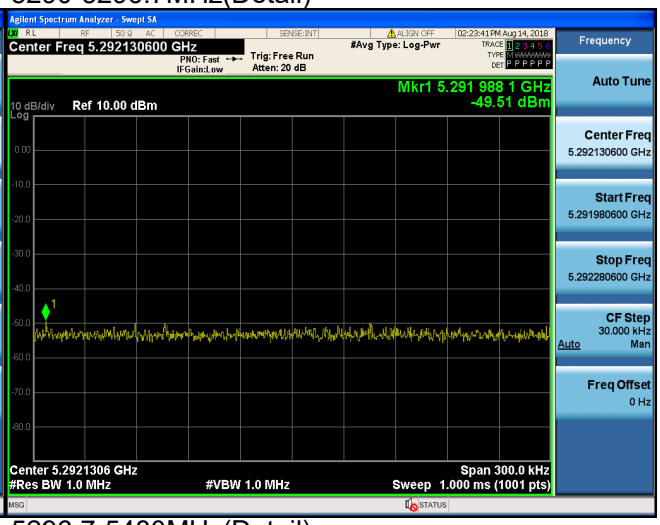

5251-5290MHz(Detail)



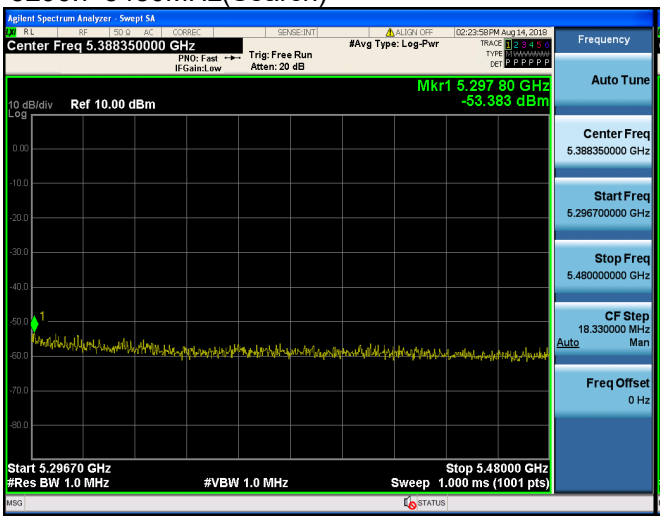

5290-5296.7MHz(Search)



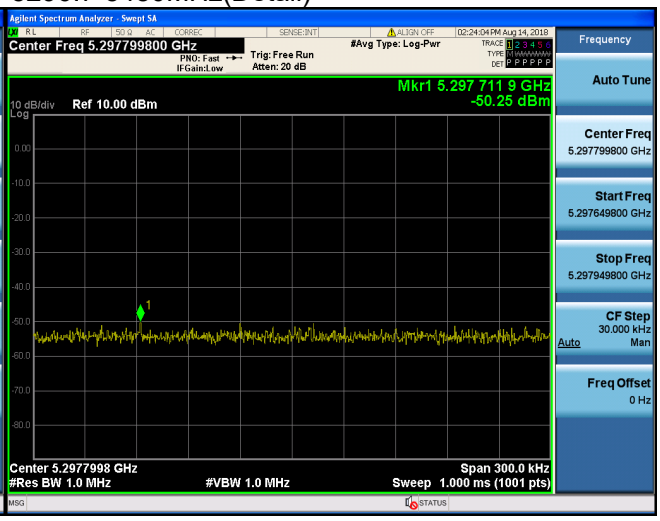

5290-5296.7MHz(Detail)




5296.7-5480MHz(Search)




5296.7-5480MHz(Detail)



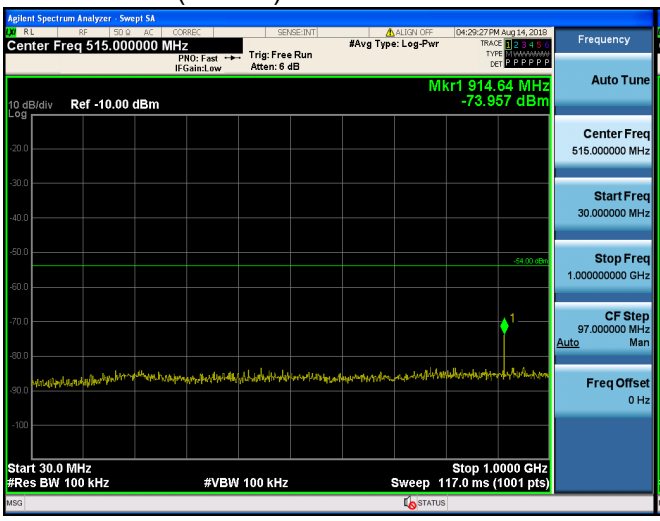
## *5.7 副次的に発する電波等の限度*

***Secondary emitted radio wave strength***

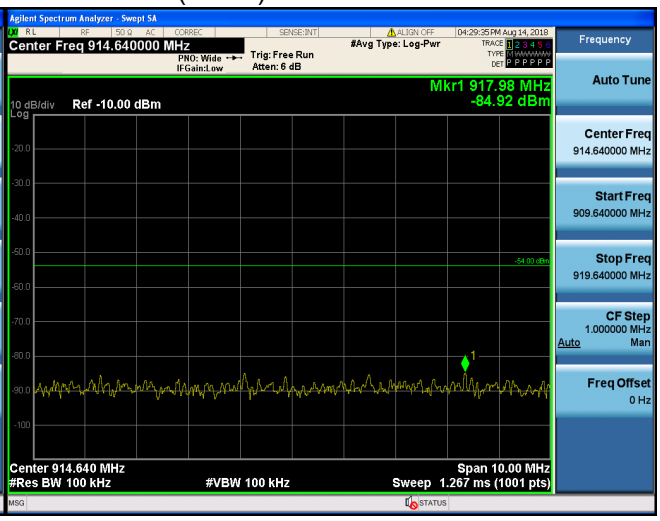
Rx1

Ch.42: 5210MHz

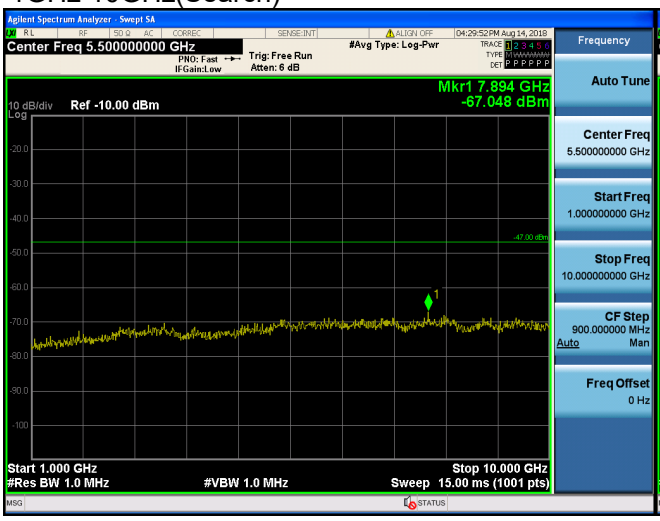
30MHz-1GHz(Search)



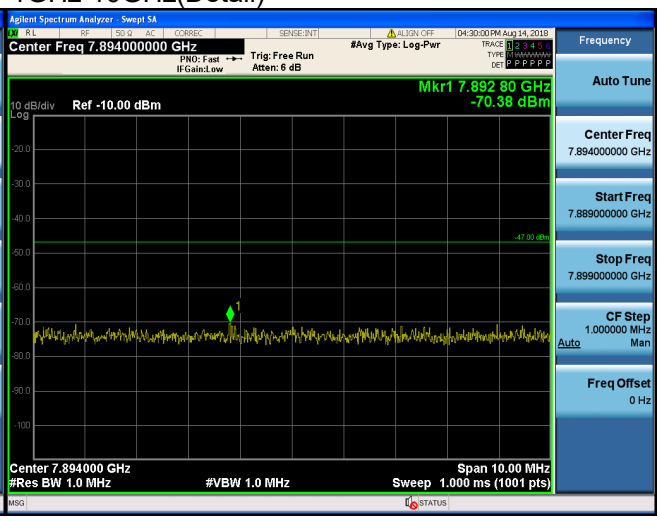

30MHz-1GHz(Detail)




1GHz-10GHz(Search)

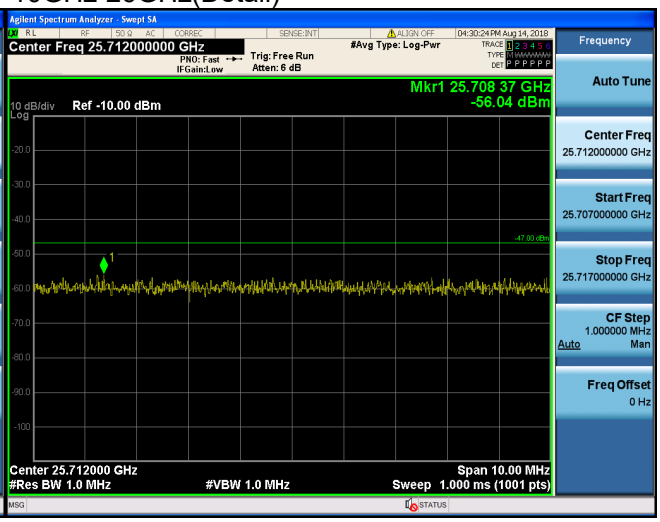



1GHz-10GHz(Detail)




10GHz-26GHz(Search)


10GHz-26GHz(Detail)

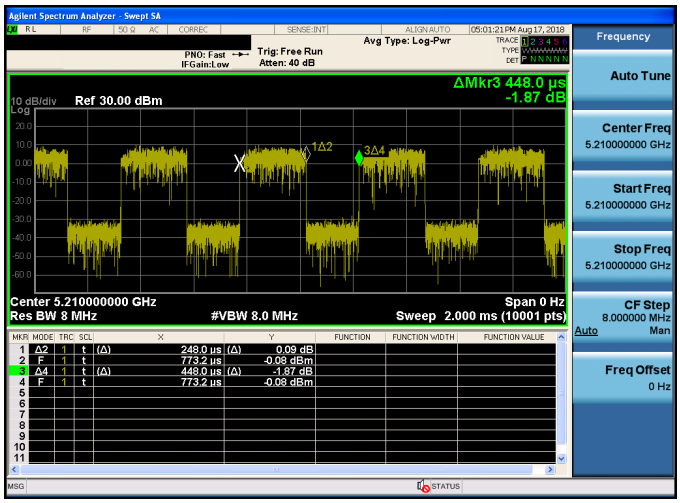


## 5.8 送信バースト長

***Burst length of transmitted signals***

Tx1

Ch.42: 5210MHz



# 9. Laboratory description

1. Location

Name: DT&C Co., Ltd.
Address: 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935s
Fax: +81-031-321-2855

2. Accreditation and Registration

1) VLAC
Accreditation No.: N/A

2) NVLAP
LAB CODE: N/A

3) BSMI
Laboratory Code: N/A

4) Industry Canada

| Site number | Facility | Expiration date |
|---|---|---|
| 5740A-4 | DT&C Co., Ltd. | 2020-10-16 |
| - | - | - |
| - | - | - |

5) VCCI Council

| Registration number | Expiration date |
|---|---|
| - | - |

6) KOLAS

| Registration number | Expiration date |
|---|---|
| KT393 | 2021-01-13 |