TEST REPORT

Report number: DRTTEC1804-0065(1)

Issue Date: Apr 18, 2018

Applicant	:	**Infomark Co., Ltd.** 3F Humaxvillage, 216 Hwangsaeul-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13598, Korea
Equipment under test(EUT)	:	Smart Speaker
Model Name	:	NL-S200JP
Date of Test	:	2018-03-16 ~ 2018-03-30
Test Place	:	**DT&C Co., Ltd.** 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935
Test Results	:	PASS (Refer to attachment)

The results in this reports are applicable only to the samples tested.
This report shall not be re-produced except in full without the written approval of DT&C Co., Ltd.

Tested Engineer; Hyunyong Seol

Approval Person; GeunKi Son

1. Summary of Test

1. Purpose of test

Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment
5.2GHz, 5.3GHz 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	PASS
12	Carrier Sensing Function	Conducted	PASS
14	Dynamic Frequency Selection Function(DFS)	Conducted	N/A

1) Test set up

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2) Modification to the EUT by laboratory

None

2. Test Information

1. Applicant
Infomark Co., Ltd.

3F Humaxvillage, 216 Hwangsaeul-ro, Bundang-gu,
Seongnam-si, Gyeonggi-do, 13598, Korea

2. Equipment under test
Smart Speaker

3. Model number
NL-S200JP

4. Serial number
Identical prototype

5. Size

(W) 36.00 × (D) 36.55 × (H) 56.91 mm

6. Terminal limitation
-20˚C to 50˚C

7. RF Specification Frequency range

802.11a/n(HT20) : 5260 MHz ~ 5320 MHz
802.11n(HT40) : 5270 MHz ~ 5310 MHz

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

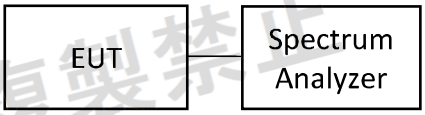
9. Modulation method & Data rate

802.11a: Orthogonal Frequency Division Multiplexing
(Up to 54Mbps)
802.11n(HT20): Orthogonal Frequency Division Multiplexing
(Up to 144.4Mbps)
802.11n(HT40): Orthogonal Frequency Division Multiplexing
(Up to 300Mbps)

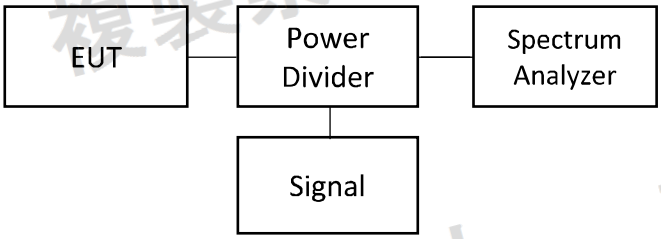
10. Variation of the family model(s)
NL-S210JP, NL-S220JP, NL-S230JP

3. Configuration of equipment

1. Frequency tolerance, RF output power tolerance, Spread bandwidth, Unwanted(Spurious) emission strength, Secondary emitted radio wave strength



2. Carrier Sensing Function



4. 試驗結果

Test results

Environment of test room	Date of test	2018-03-16 ~ 2018-03-30
	Temperature	20 ~ 23 °C
	Humidity	50 ~ 54 %

Peak Antenna Gain	3.034	dBi
Declaration Output Power	2.3	mW/MHz
	3.6173	dBm/MHz
E.I.R.P	**4.6252**	mW/MHz
	6.6513	**dBm/MHz**
Input Power Voltage	3.7	VDC

Tested Circit Insertion Loss	Tx1	0	dB
Transmission Time	ON TIME (1sec or less)	1.364	msec
	OFF TIME (0.1sec or more)	0.198	msec
	Ratio	87%	%
Packet Type (Mode)		OFDM	mode

Test category ;	5GHz Band Low-Power Data Communication System 802.11 a (HT 20)
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.	52	56	60	64		
Measurement Frequency	MHz	5260	5280	5300	5320	Result	Limit
Frequency Measurements(Tx1)	MHz	5259.963125		5299.973755	5319.967500	----	----
Frequency Toleranc(Tx1)	ppm	-7.01		-4.95	-6.11	**PASS**	±20×10-6(20ppm)
Occupied Bandwidth(Tx1)	MHz	16.900		16.890	16.942	**PASS**	19MHz or below
RF Output Power(Tx1)	mW/MHz	1.559074		1.686035	1.584407	**PASS**	10mW/MHz or below
RF Output Power (Tx1)or(Tx1+2)or(Tx1+2+3)or(Tx1+2+3+4)	mW/MHz	1.559074		1.686035	1.584407	**PASS**	10mW/MHz or below
RF Output Power Tolerance (Tx1)or(Tx1+2)or(Tx1+2+3)or(Tx1+2+3+4)	%	-32.21		-26.69	-31.11	**PASS**	+20% to -80%

Measurement Channel		Ch.	52	56	60	64		
Measurement Frequency		MHz	5260	5280	5300	5320	Result	Limit
Unwanted (Spurious) Emission Strength(Tx1)	30MHz to 5135MHz	uW/MHz	0.026		0.023	0.020	**PASS**	2.5uW/MHz or below
		MHz	5069.880		5104.120	5131.560	-----	----
	5365MHz to 26GHz	uW/MHz	0.062		0.042	0.069	**PASS**	2.5uW/MHz or below
		MHz	24869.295		24159.395	25405.135	-----	----
Adjacent Channel Leakage Power (Tx1)	cf	dB	13.242		13.621	13.539	**----**	----
	cf -20MHz	dB	-38.492		-38.131	-38.299	**PASS**	-25dBc or below
	cf +20MHz	dB	-38.972		-38.511	-38.669	**PASS**	-25dBc or below
	cf -40MHz	dB	-47.692		-47.761	-47.569	**PASS**	-40dBc or below
	cf +40MHz	dB	-47.162		-47.471	-47.439	**PASS**	-40dBc or below

Measurement Channel		Ch.	52	56	60	64		
Measurement Frequency		MHz	5260	5280	5300	5320	Result	Limit
Out-Band Leakage Power (Tx1)	5135 to 5233.3MHz	uW/MHz	0.694		0.022	0.003	**PASS**	2.5uW/MHz or below
		MHz	5230.0047		5160.3486	5135.3132	----	----
	5233.3 to 5240MHz	uW/MHz	6.537		0.018	0.004	**PASS**	$10^{1-(f-5)}$mW/MHz or below
		MHz	5239.914		5233.619	5235.287	----	----
	Limit	uW/MHz	15.4746		2.7181	4.3100	----	----
	5240 to 5249MHz	uW/MHz	1.218		0.088	0.004	**PASS**	$10^{1-(f(MHz)-11)}$mW/MHz or below
		MHz	5248.982		5247.685	5241.639	----	(Ch1)RBW, VBW: 30kHz
	Limit	uW/MHz	99.6261		76.4094	22.1656	----	+15.23dB
	5249 to 5250MHz	uW/MHz	4.207		0.037	0.003	**PASS**	$10^{1.1-(f/30)(f-20}$mW/MHz or below
		MHz	5249.990		5249.040	5249.701	----	(Ch1)RBW, VBW: 30kHz
	Limit	uW/MHz	978.1377		109.6226	502.1113	----	+15.23dB
	5350 to 5365MHz	uW/MHz	0.018		0.112	0.004	**PASS**	2.5uW/MHz or below
		MHz	5358.6448		5352.4321	5361.2797	----	----

Measurement Channel		Ch.	52	56	60	64		
Measurement Frequency		MHz	5260	5280	5300	5320	Result	Limit
Secondary Emitted Radio Wave Strength (Rx1)	30MHz to 1000MHz	nW	0.010		0.006	0.008	**PASS**	4nW or below
		MHz	951.940		952.520	951.800	**----**	----
	1GHz to 10GHz	nW	0.062		0.076	0.044	**PASS**	20nW or below
		MHz	5918.770		7338.090	5779.290	**----**	----
	10GHz to 26GHz	nW	2.432		2.767	2.393	**PASS**	20nW or below
		MHz	25439.090		24864.320	24867.090	**----**	----
Burst Length of Transmitted Signals			Good		Good	Good	**PASS**	4ms or below
Carrier Sensing Function			Good		Good	Good	**PASS**	100mV/m
Transmission Power Control Function			Good		Good	Good	**PASS**	3dB
Interference Prevention Function			Good				**PASS**	

5. 測定機器リスト

Measurement equipment list

USE	Equipment	Company	Model No.	Serial No.	Calibrated by	Cal. Method	Cal. Due	Cal. Date
X	Spectrum analyzer	Agilent Technologies	N9020A	MY48010133	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	SMF100A	102341	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 Splitter	Anritsu	K241B	1701042	MPC	ハ(c)	Sep. 6, 2018	Sep. 6, 2017

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: 校正方法 …
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., Keysight Technologies, Inc～.

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～

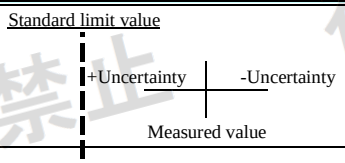
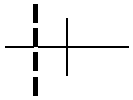
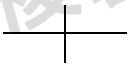
ハ)：外国において行う較正であつて、機構又は第百二条の十八第一項の指定較正機関（TELEC,インターテックジャパン、キーサイト）が行う較正に相当するもの
c)：Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)～ TELECOM Engineering Center, Intertek Japan 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

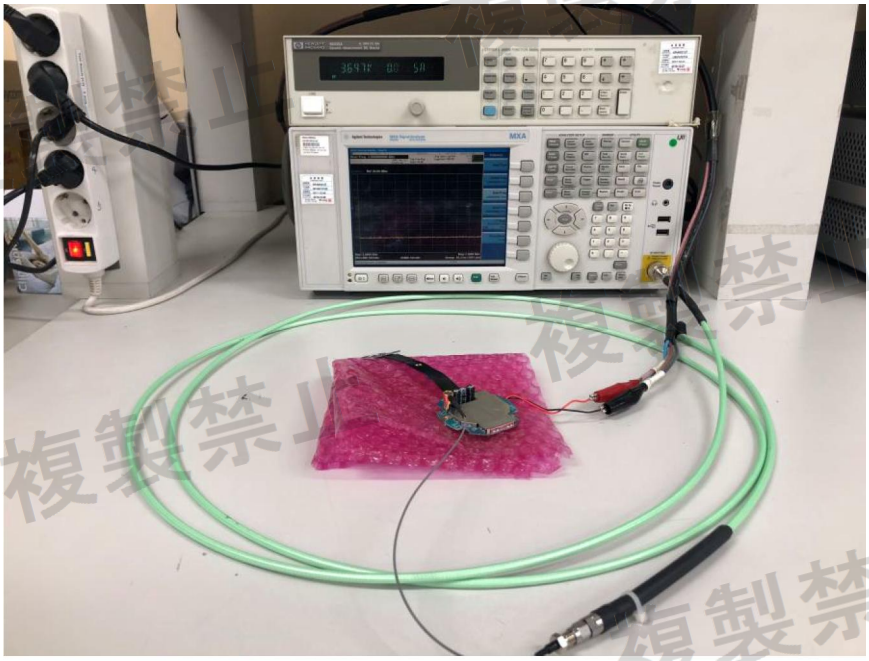
Parameter	Uncertainty
Total RF power conducted	1.5dB
Spurious emissions conducted	1.18dB
Temperature	0.4℃
Humidity	2%

Judge	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.

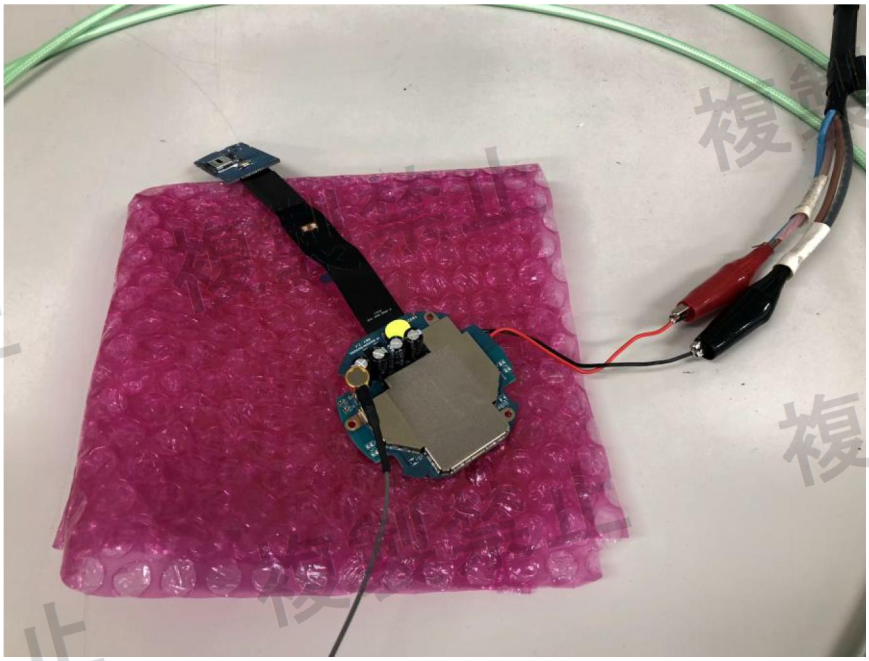
7. 測定写真

Photographs

Conducted Measurement Photo



Conducted Measurement Photo



8. 測定チャート

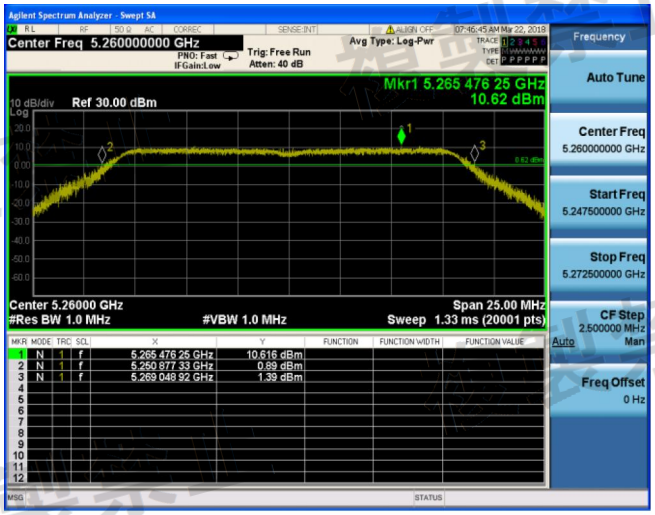
Test chart

8.1 周波数偏差

Frequency tolerance

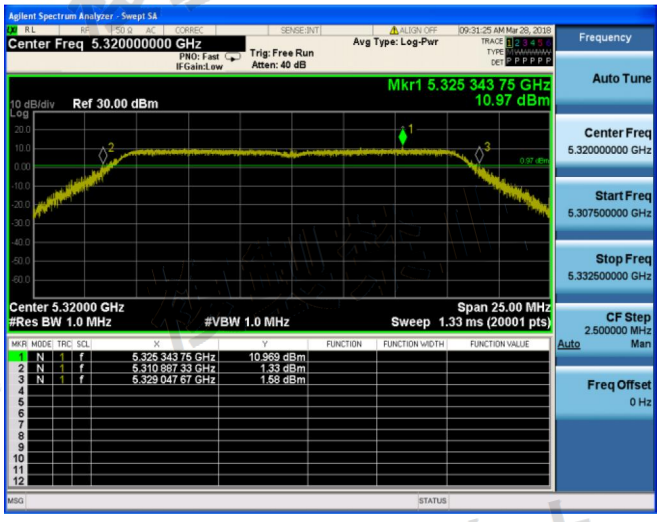
Tx1

Ch.52: 5260MHz



Ch.60: 5300MHz

Ch.64: 5320MHz

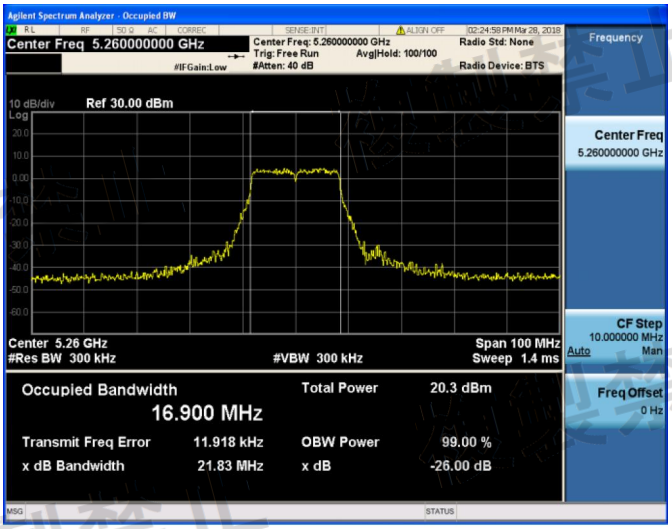


8.2 占有周波数帯幅

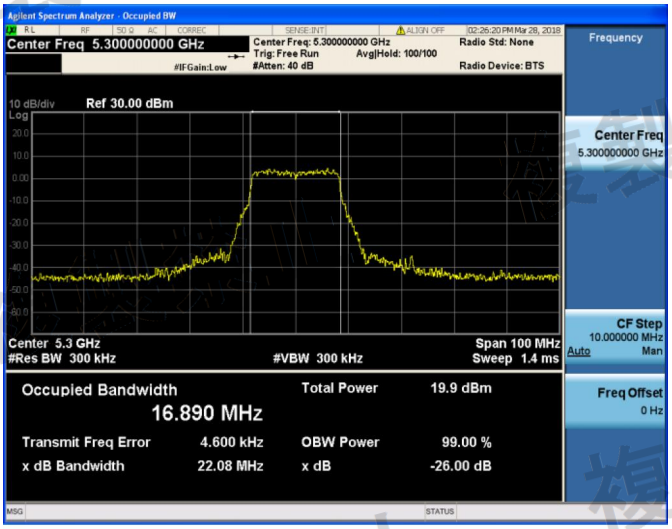
Occupied bandwidth

Tx1

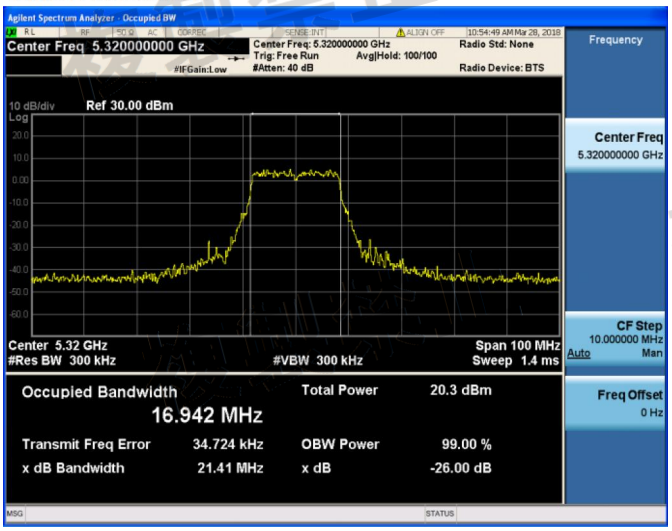
Ch.52: 5260MHz



Ch.60: 5300MHz



Ch.64: 5320MHz

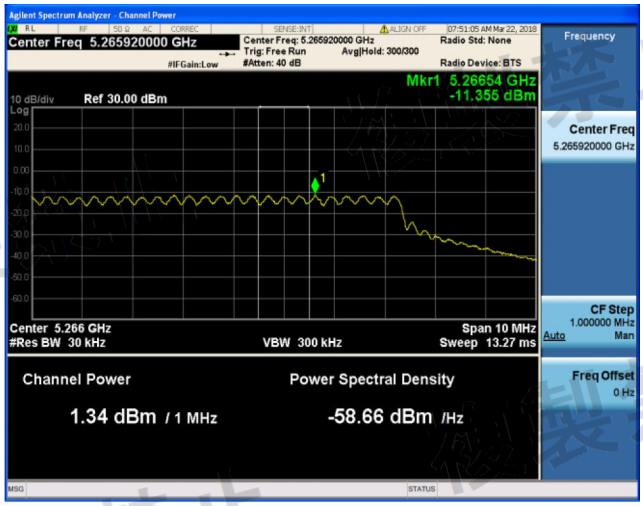


8.3 空中線電力の偏差

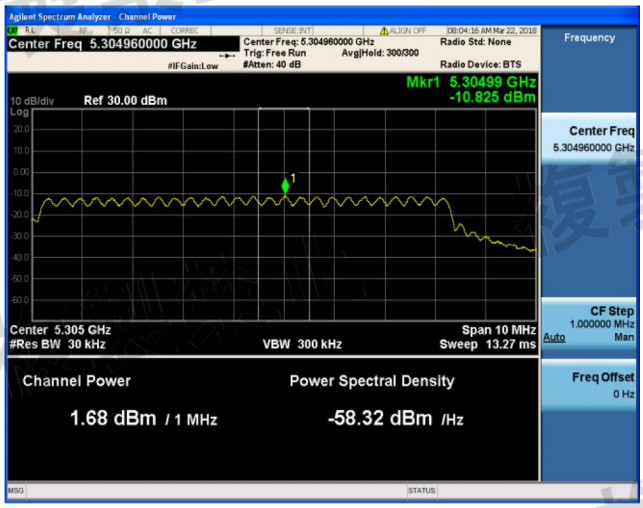
RF output power tolerance

Tx1

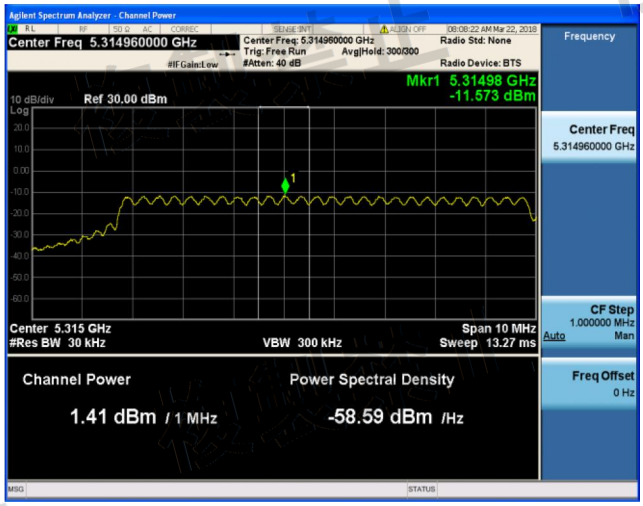
Ch.52: 5260MHz



Ch.60: 5300MHz



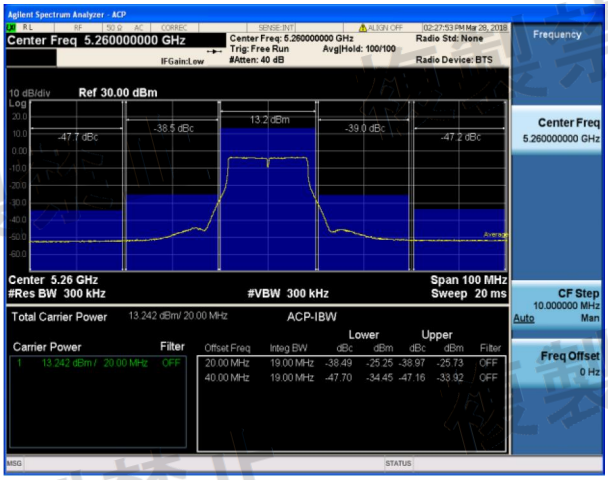
Ch.64: 5320MHz



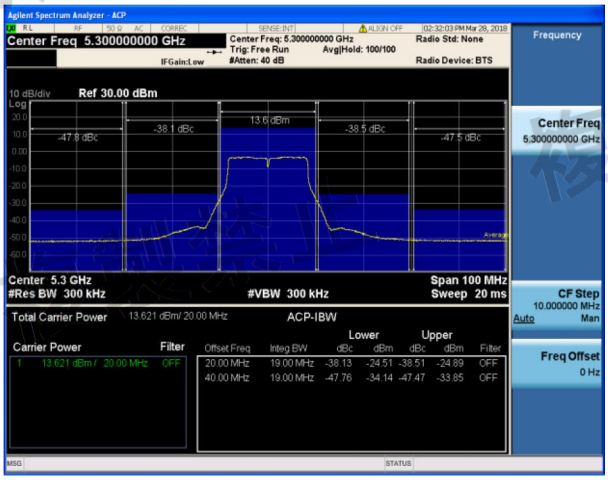
8.4 隣接チャネル漏洩電力
Adjacent Channel Leakage Power

Tx1

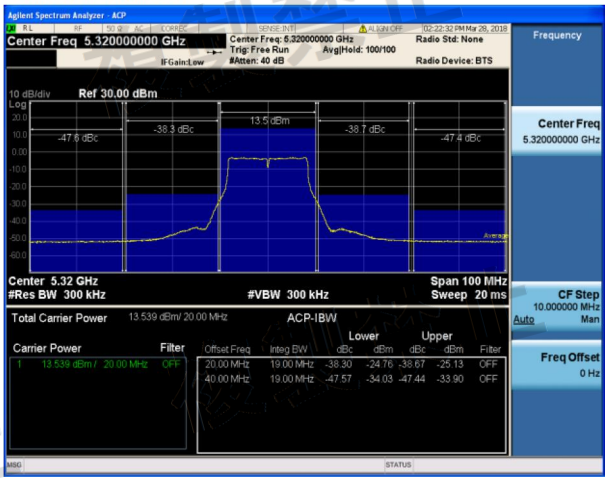
Ch.52: 5260MHz



Ch.60: 5300MHz



Ch.64: 5320MHz



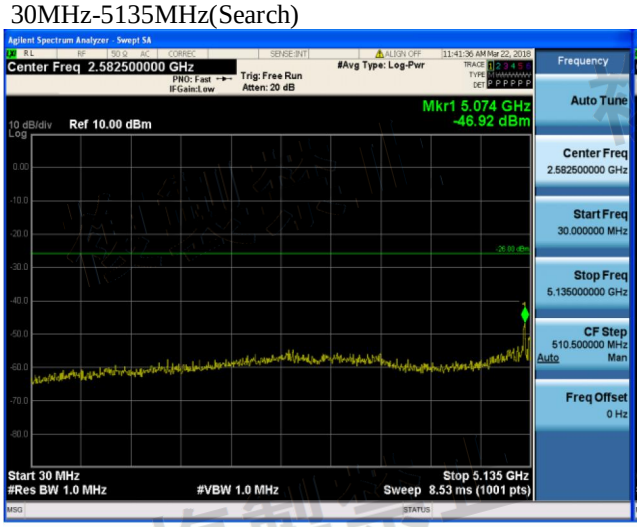
8.5 スプリアス発射又は不要発射の強度

Unwanted(Spurious) emission strength

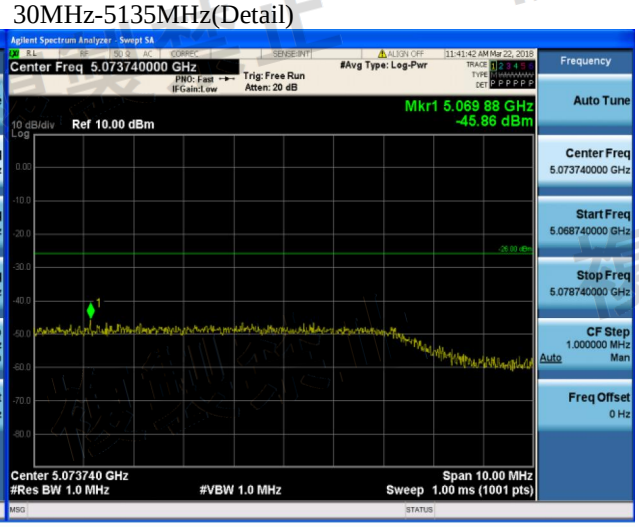
1x1

Ch.52: 5260MHz

30MHz-5135MHz(Search)

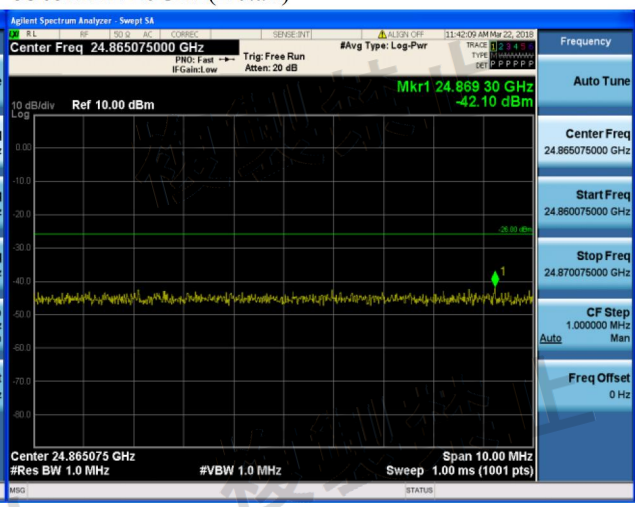


30MHz-5135MHz(Detail)



5365MHz-26GHz(Search)

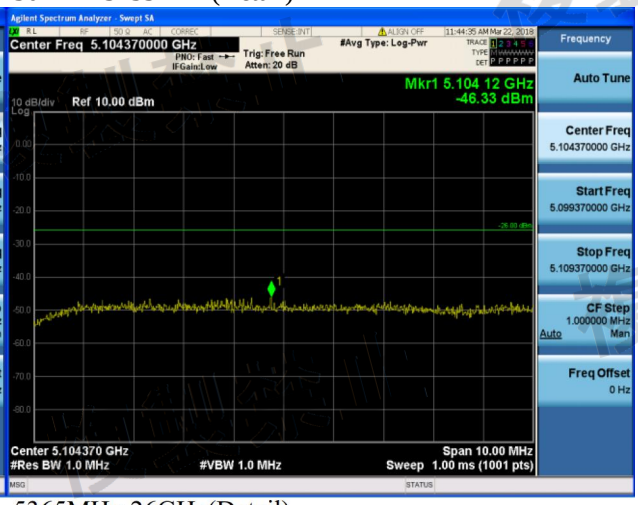
5365MHz-26GHz(Detail)



Ch.60: 5300MHz

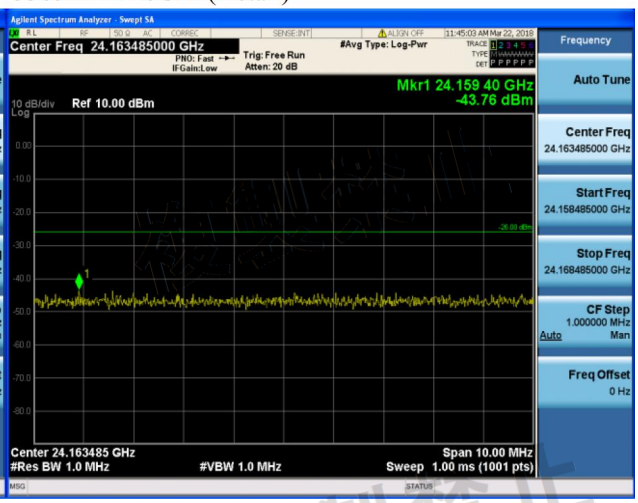
30MHz-5135MHz(Search)

30MHz-5135MHz(Detail)



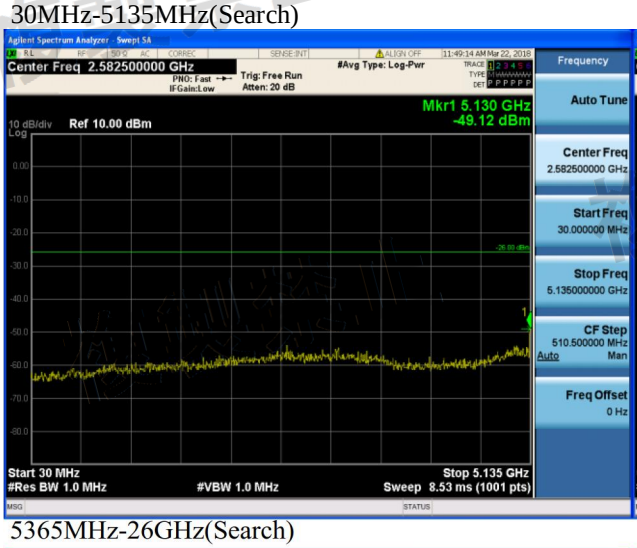
5365MHz-26GHz(Search)

5365MHz-26GHz(Detail)

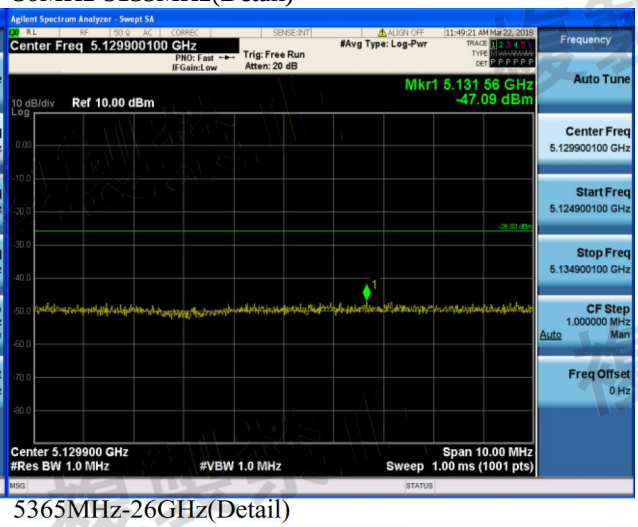


Ch.64: 5320MHz

30MHz-5135MHz(Search)



30MHz-5135MHz(Detail)



5365MHz-26GHz(Search)

5365MHz-26GHz(Detail)