TEST REPORT

Report number: DRTTEC1907-0040
Issue Date: 2019-07-02

Applicant	:	**Anam Electronics Co., Ltd.** **27, Digital-ro 27ga-gil, Guro-gu, Seoul, Korea**
Equipment under test	:	Integrated Amplifier
Model Name	:	PMA-600NE
Date of Test	:	2019.05.09 ~ 2019.05.13
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; Inhee Bae

Approval Person; Geunki Son

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1. Summary of Test

1. Purpose of test
Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment
2.4GHz Band wide band low power data communication System

2. Standards
Certification Ordinance Article 2 Clause 1 Item19

1) Test Methods
Ministry of Internal Affairs and Communications Notification Article 88 Appendix 43

2) Deviation from standards
None

3. List of applied test to the EUT

Article 88 Appendix 43	Classification of EUT	Condition	Result
1	Voltage fluctuation	Conducted	PASS
3	Frequency Tolerance	Conducted	PASS
4	Occupied Bandwidth	Conducted	PASS
4	Spread Bandwidth	Conducted	PASS
5	Unwanted (Spurious) Emission Strength	Conducted	PASS
6	RF Output Power Tolerance	Conducted	PASS
7	Secondary Emitted Radio Wave Strength	Conducted	PASS
8	Carrier Sensing Function (1)	Conducted	N/A
9	Carrier Sensing Function (2)	Conducted	N/A
10	Absoluto Gain of Transmission Antenna	Conducted	N/A
11	Angle Width of Principal Radiation from Transmission Antenna	Conducted	N/A
12	Interference Prevention Function	Conducted	PASS
13	Hopping frequency dwell time	Conducted	PASS

1) Test set up
Table-Top

2) Modification to the EUT by laboratory
None

2. Test Information

1. Applicant

Anam Electronics Co., Ltd.
27, Digital-ro 27ga-gil, Guro-gu, Seoul,
Korea

2. Equipment under test

Integrated Amplifier

3. Model number

PMA-600NE

4. Serial number

Identical prototype

5. Size

(W) 434 x (D) 307 x (H) 122 mm

6. Terminal limitation

-20˚C to 55˚C

7. RF Specification Frequency range

2402-2421MHz

8. Number of RF Channels

20 Channels

9. Modulation method

Method of GFSK, π/4-DQPSK, 8DPSK, FHSS
(Frequency equal to the transmission rate of the modulation signal: 1MHz)

10. Data rate

1Mbps(GFSK), 2Mbps(π/4-DQPSK), 3Mbps(8DPSK)

10. Variation of the family model(s)

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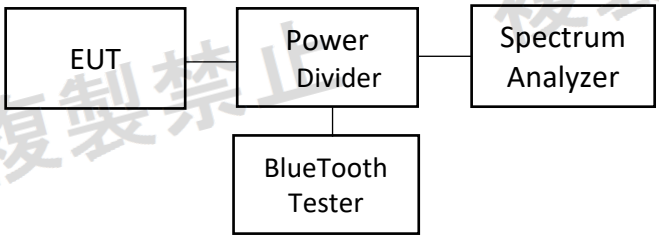
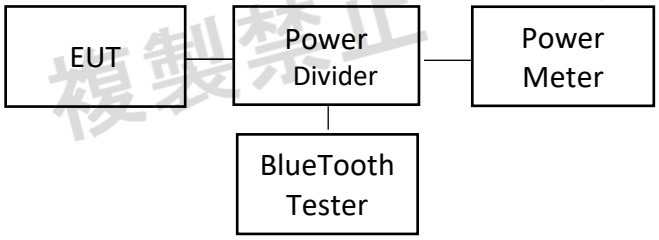
3. Configuration of equipment

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



2. RF output power tolerance



4. Test Results

Environment of Test Room	Test Date	2019.05.09 ~ 2019.05.13
	Temperature	21 ~ 25 ℃
	Humidity	45 ~ 46 %

Peak Antenna Gain	3.17	dBi
Declaration Output Power	0.105	mW/MHz
Declaration Output Power	-9.7881	dBm/MHz
E.I.R.P.	**-6.6181**	**dBm/ MHz**
Input Power Voltage	3.60	VDC

Tested Circit Insertion Loss		0	dB
Frequency eqal to the Transmission rate		1	MHz
Transmission Time	ON TIME	2.880	ms
	OFF TIME	0.870	ms
	Ratio	77%	
Packet Type (Mode)		2-DH5	mode
Transmit Speed		1	MHz

Note: The insertion loss was corrected during the test.

Test Category；	2.4GHz Band Wideband Low-Power Data Communication System Bluetooth_π/4-DQPSK
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 Frequency		MHz	2402	2411	2421	Result	Limit	Note
Channel Number		Ch.	1	10	20	---	---	
Reading Frequency		MHz	2402.000225	2410.999775	2420.999700	---		
Frequency Tolerance		ppm	0.09367194	-0.093322273	-0.123915737	**PASS**	±50×10^{-6}(50ppm)	
Occupied Bandwidth		MHz	19.948			**PASS**	83.5MHz or below	
Spread Bandwidth		MHz	18.202			**PASS**	500kHz or more	
RF Output Power		mW/MHz	0.070879	0.074907	0.079163	**PASS**	3mW/MHz or below	
RF Output Power Tolerance		%	-32.495866	-28.660449	-24.607114	**PASS**	+20 to -80%	
Tx Spurious Emission Strength	30 to 2387MHz	uW/MHz	0.059156			**PASS**	2.5uW/MHz or below	
		MHz	2052.3			-----		
	2387 to 2400MHz	uW/MHz	0.897429			**PASS**	25uW/MHz or below	
		MHz	2399.909			-----		
	2483.5 to 2496.5MHz	uW/MHz	0.037757			**PASS**	25uW/MHz or below	
		MHz	2488.674			-----		
	2496.5 to 12500MHz	uW/MHz	0.111429			**PASS**	2.5uW/MHz or below	
		MHz	12360			-----		
Rx Spurious Emission Strength	10 to 1000MHz	nW	0.124738			**PASS**	4nW or below	
		MHz	873.28			-----		
	1000 to 5000MHz	nW	2.393316			**PASS**	20nW or below	
		MHz	1812			-----		
	5000 to 12500MHz	nW	1.261828			**PASS**	20nW or below	
		MHz	9837.5			-----		
Time of occupancy hopping frequency		sec	0.002880			**PASS**	0.4sec or below	
		sec	0.33696			**PASS**	0.4sec or below	0.4sec×Spread rate
Spreading Factor		---	18.202000			**PASS**	5 or more	
Interference Prevention Function		-----	Good	Good	Good	**PASS**		

5. List of Measuring Instruments

USE	Equipment	Company	Model No.	Serial No.	Calibrated by	Cal. Method	Cal. Due	Cal. Date
X	Spectrum analyzer	Agilent Technologies	N9020A	MY50410357	MPC	ハ(c)	Dec. 19, 2019	Dec. 19, 2018
X	Power Meter	Anritsu	ML2495A	1338003	MPC	ハ(c)	Jul. 4, 2019	Jul. 4, 2018
X	Wide Bandwidth Sensor	Anritsu	MA2490A	1249304	MPC	ハ(c)	Jul. 4, 2019	Jul. 4, 2018
X	Power Divider	Weinschel	WA1574	WA1574-4	MPC	ハ(c)	Jul. 5, 2019	Jul. 5, 2018
X	BlueTooth Tester	TESCOM	TC-3000C	3000C000563	MPC	ハ(c)	Jul. 6, 2019	Jul. 6, 2018
X	Digital Multimeter	FLUKE	17B+	36390701WS	MPC	ハ(c)	Dec. 18, 2019	Dec. 18, 2018
X	Signal Generator	Rohde Schwarz	SMF100A	102341	MPC	ハ(c)	Jun. 7, 2019	Jun. 7, 2018
X	Thermohygrometer	BODYCOM	BJ5478	120612-1	MPC	ハ(c)	Dec. 27, 2019	Dec. 27, 2018

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., Keysight Technologies, Inc〜.

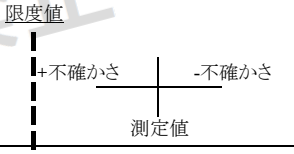
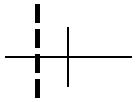
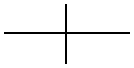
ロ): 計量法（ 平成四年法律第五十一号） 第百三十五条 又は第百四十四条 の規定に基づく 校正（ JCSS校正）
b): Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)〜Japan Calibration Service System〜

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. Uncertainty

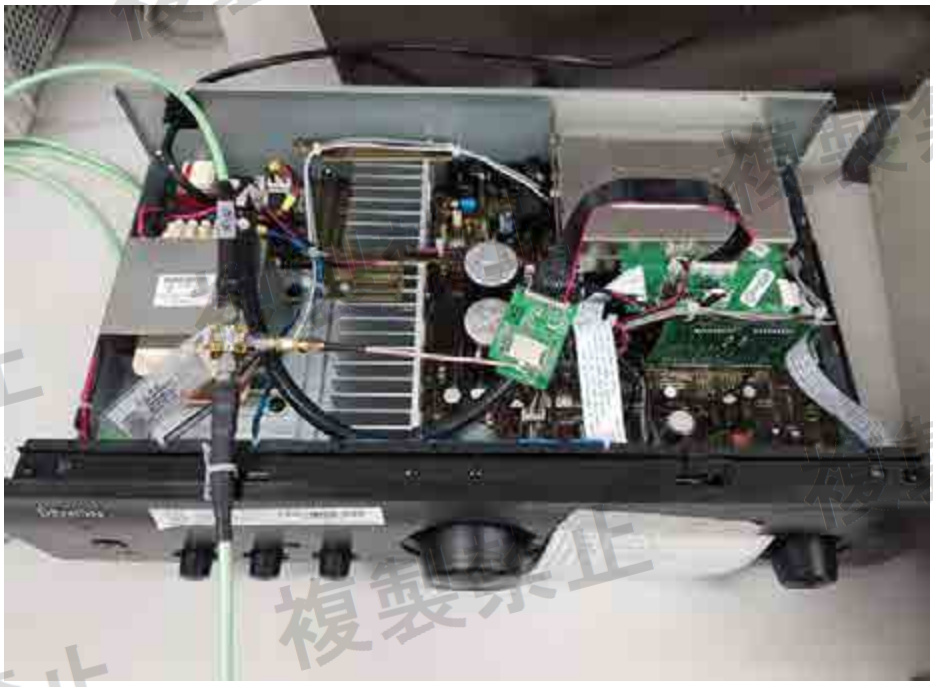
Parameter	Uncertainty
Total RF power conducted	0.7 dB
Spurious emissions conducted	0.9 dB
Temperature	0.4 ℃
Humidity	2.0 %

判定	測定データにおける不確かさの判断とその範囲
適合	**例 A**  測定結果と不確かさは与えられた限度値内に入っています。 これを『適合』と呼びます。
	例 B  完全には、限度値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。
不適合	**例 C**  完全には、限度値内でも限度値外でもありません。 この場合の適合性については、確実な結論を出すことは出来ません。
	例 D  測定結果も不確かさも与えられた限度値内に入っていません。 これは『不適合』と呼びます。

7. Configuration Photographs

Conducted Measurement Photo(1)

Conducted Measurement Photo(2)



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8. Trece Data

8.1 Frequency Tolerance

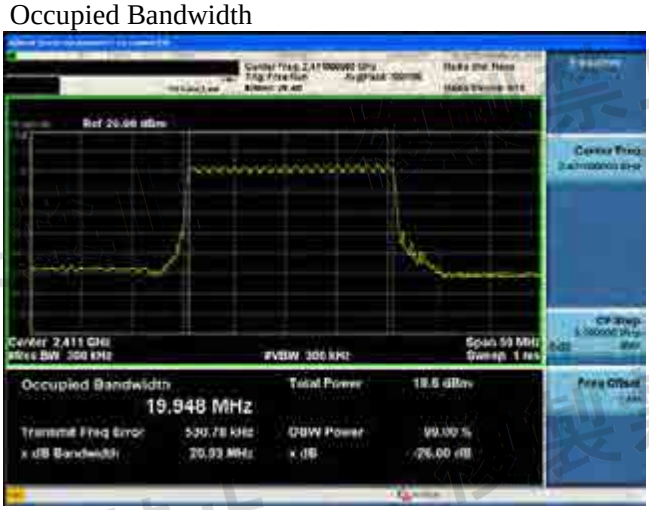
Ch.1: 2402MHz

Ch.10: 2411MHz

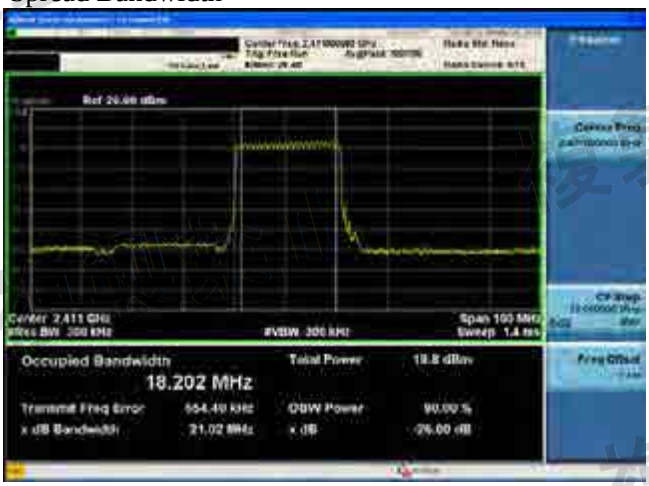
Ch.20: 2421MHz

8.2 Occupied and Spread Bandwidth

Occupied Bandwidth



Spread Bandwidth



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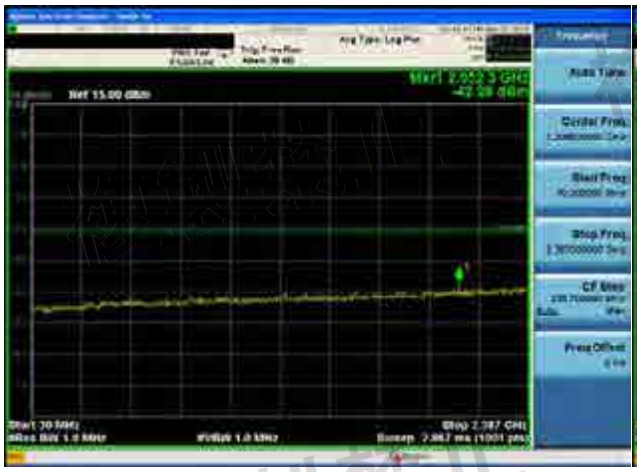
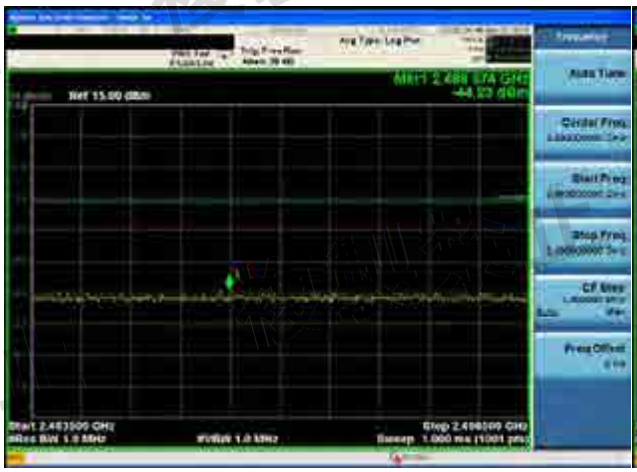
8.3 Tx Spurious Emission Strength

30-2387MHz



2387-2400MHz

2483.5-2496.5MHz



2496.5-12500MHz

8.4 RF Output Power

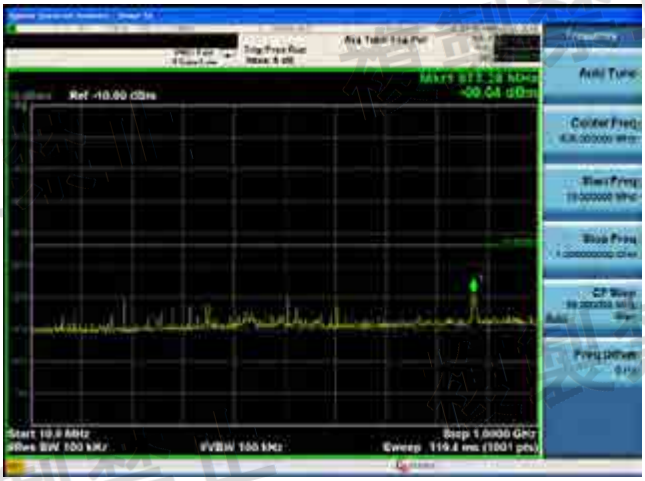
Ch.1: 2402MHz

Ch.10: 2411MHz

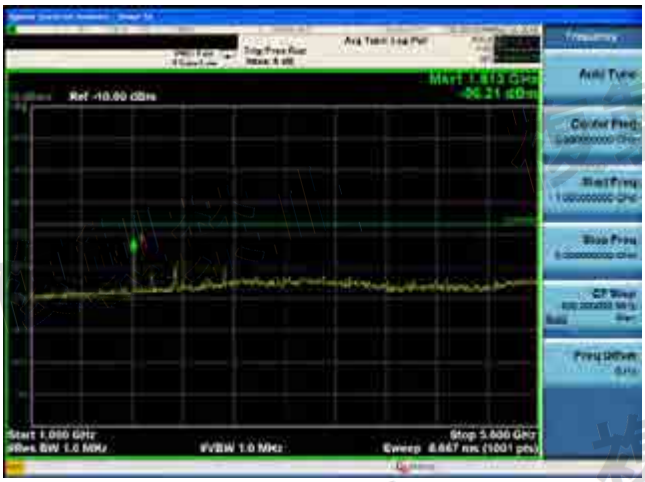
Ch.20: 2421MHz

8.5 Rx Spurious Emission Strength

10MHz-1GHz



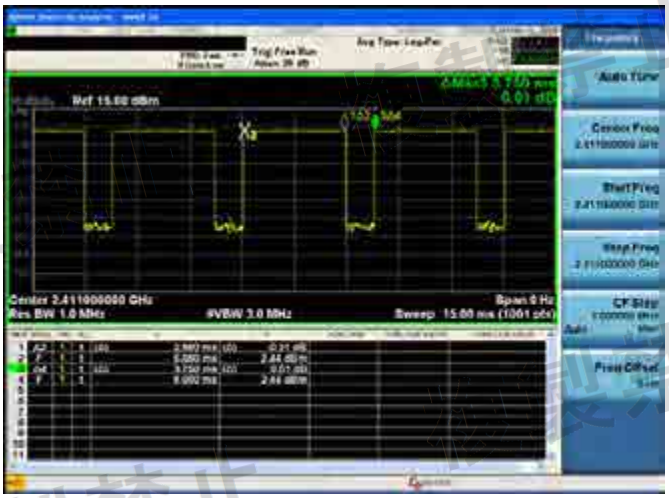
1-5GHz

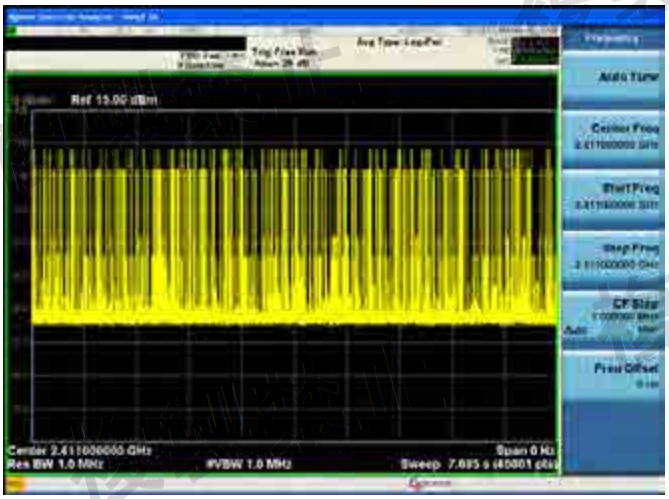


5-12.5GHz

8.6 Hopping Frequency Dwell Time

ON/OFF





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

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