MPE TEST REPORT

Applicant	Nokia Shanghai Bell Co., Ltd.
FCC ID	2ADZRG240WJ
Product	7368 ISAM ONT
Model	G-240W-J
Report No.	R1905B0068-M1V3
Issue Date	October 21, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC 47 CFR Part 1 1.1310**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Yu Wang

Performed by: Yu Wang

Guangchang Fan

Approved by: Guangchang Fan

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
Country:	P. R. China
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Telephone:	+86-021-50791141/2/3
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Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Description of Equipment under Test

Client Information

Applicant	Nokia Shanghai Bell Co., Ltd.
Applicant address	No. 388, Ningqiao Rd. Pilot Free Trade Zone, Shanghai, China
Manufacturer 1	TAICANG T&W ELECTRONICS CO.,LTD
Manufacturer address 1	89# Jiang Nan RD, Lu Du, Taicang, Jiangsu, China
Manufacturer 2	SHENZHEN TWOWING TECHNOLOGIES CO., LTD
Manufacturer address 2	1st-12th Floor, Nangang Industrial Building, Tangtou Industrial Park, Shiyan, Baoan, Shenzhen, Guangdong 518108, China

General Technologies

Information of Configuration

No.	Name	Model/Code No.	Edition	Serial No. or Quantity
1.1	EMA-G-240W-J	3FE48009AA	PEM2	PEM
2.1	Power adapter	SUN-1200300	A/0	PEM
2.2	Power adapter	RD1203000-C55-20MG	A/0	PEM

	Kit Code	EMA	Part Description	Power Adaptor
G-240W-J	3FE48008AA	3FE48009AA	2 POTS, 4 GE, Dual band WIFI AC3000 802.11ac 4x4/802.11n 3x3 US Plug in, 2Pin, Wall Mounted, 12V	SUN-1200300 RD1203000-C55-20MG

Auxiliary equipment details

No.	Name	Brand name	Model	NSB code	Valid Until
1	Spirent	TestCenter	DE48E0	-	No Cal. Required
2	OLT	Alcatel-Lucent	N.A	-	No Cal. Required
3	PC	HP	N.A	-	No Cal. Required
4	Phone	N.A	N.A	-	No Cal. Required

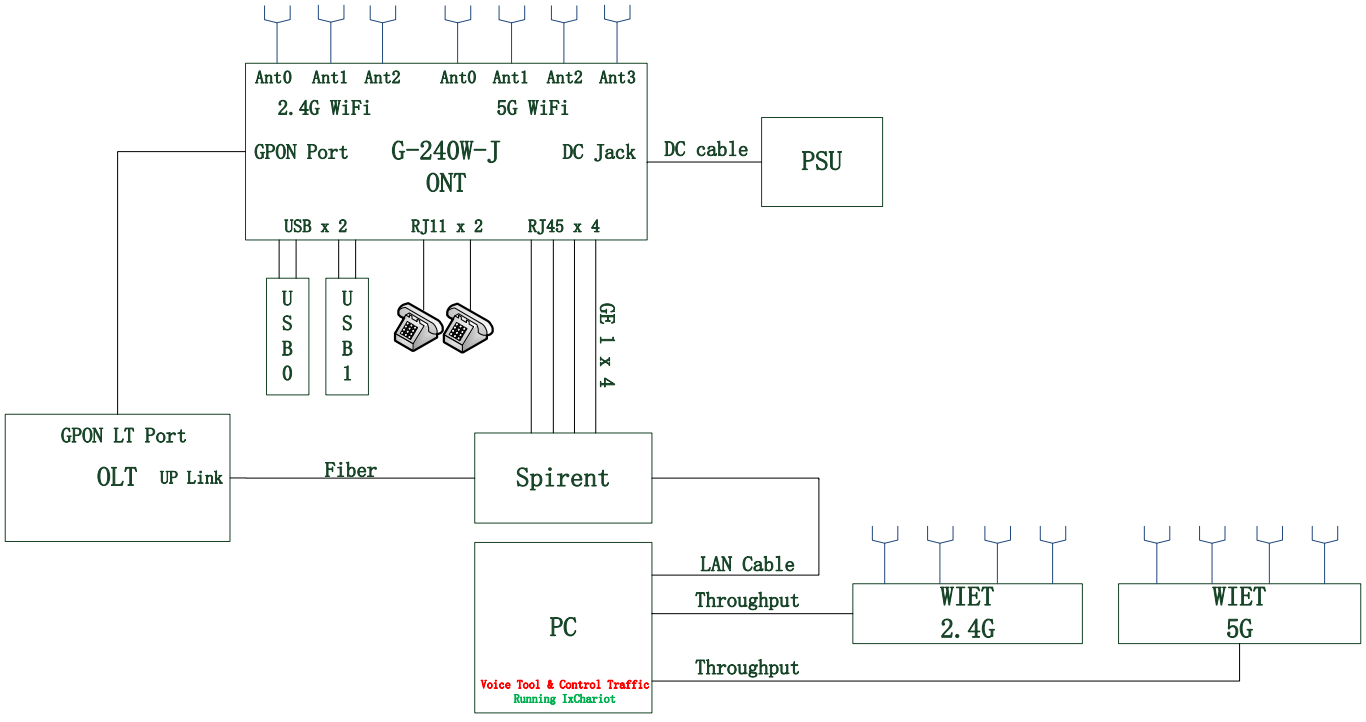
Information of Ports

No.	Port name	Number	Shielded or unshielded	Cable type (optic, twisted pair, etc.)	Max. Cable length
1	Power	1	unshielded	-	-
2	GE	4	unshielded	-	-
3	POTS	2	unshielded	-	-
4	USB	2	shielded	-	-

Test Configuration

Description: The G-240W-J is a GPON ONT which has 2 POTs, 4 GE ports, 2 USB ports, 2.4G wi-fi and 5G wi-fi.

The basic functional test in normal room conditions consists of the traffic test and POTs connection test. G-240W-J runs 4 traffics on each line with DE48E0, the each upstream of 3 GE is 250Mbps, and downstream is 750Mbps. The POTs keep connecting though OFLT program.



3 Maximum conducted output power (measured) and antenna Gain

The numeric gain (G) of the antenna with a gain specified in dB is determined by
Numeric gain (G)=10^(antenna gain/10)

Without Beamforming

Band	Maximum Conducted Output Power (dBm)		Antenna Gain (dBi)	Numeric gain
	(dBm)	(mW)		
Wi-Fi 2.4G	25.830	382.825	3.000	1.995
Wi-Fi 5G	29.810	957.194	3.000	1.995

With Beamforming

Band	Maximum Conducted Output Power (dBm)		Beamforming Gain (dBi)	Numeric gain
	(dBm)	(mW)		
Wi-Fi 2.4G	25.770	377.572	7.77	5.984
Wi-Fi 5G	26.920	492.040	9.02	7.980
Directional gain $_{\text{Wi-Fi 2.4G}}$ = GANT + 10 log(NANT/NSS)= 3+10log（3/1）=7.77 dBi Directional gain $_{\text{Wi-Fi 5G}}$ = GANT + 10 log(NANT/NSS)= 3+10log（4/1）=9.02 dBi				

4 Test Result

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following

TABLE 1 – LIMITS FOR MAXIMUN PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3-30	1842/f	4.89/f	*(900/f2)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Note1. Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

Note2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

The maximum permissible exposure for 1500~100,000MHz is 1.0.So

Band	The maximum permissible exposure
Wi-Fi 2.4G	1.0mW/cm^2
Wi-Fi 5G	1.0mW/cm^2

RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the conducted power, considering maximum power and antenna gain. The formula shown in KDB 447498 D01 is used in the calculation.

Equation from KDB 447498 D01 General RF Exposure Guidance v06 (10/23/2015) is:

$$S = PG / 4\prod R^2$$

Where: S = power density (in appropriate units, e.g. mW/cm^2)

P = Time-average maximum tune up procedure (in appropriate units, e.g., mW)

G = the numeric gain of the antenna

R = distance to the center of radiation of the antenna

Without Beamforming

Band		PG (mW)	Test Result (mW/cm2)	Limit Value (mW/cm^2)	The MPE ratio (mW/cm2)	Limit R (cm)
Without Beamforming	Wi-Fi 2.4G	763.836	0.152	1.000	0.152	7.796408
	Wi-Fi 5G	1909.853	0.380	1.000	0.380	12.32805
	Wi-Fi 2.4G+ Wi-Fi 5G	2673.689	0.532	1.000	0.532	14.58646
With Beamforming	Wi-Fi 2.4G	2259.436	0.449	1.000	0.449	13.40894
	Wi-Fi 5G	3926.449	0.781	1.000	0.781	17.67643
	Wi-Fi 2.4G+ Wi-Fi 5G	6185.885	1.231	1.000	1.231	22.18684
Note: ∏= 3.1416 The MPE ratio = Mac Test Result÷Limit Value						

So, when R = 23cm

Band		PG (mW)	Test Result (mW/cm^2)	Limit Value (mW/cm^2)	The MPE ratio	Conclusion
Without Beamforming	Wi-Fi 2.4G	763.836	0.115	1.000	0.115	Pass
	Wi-Fi 5G	1909.853	0.287	1.000	0.287	Pass
With Beamforming	Wi-Fi 2.4G	2259.436	0.340	1.000	0.340	Pass
	Wi-Fi 5G	3926.449	0.591	1.000	0.591	Pass
Note: **R** = 23cm ∏= 3.1416 The MPE ratio = Mac Test Result÷Limit Value						

So the simultaneous transmitting antenna pairs as below:

∑of MPE ratios=WiFi 2.4G + WiFi 5G =0.340 +0.591=0.931 <1

Note: Refer to justification in op.des, for transmitters, minimum separation distance is 23cm.

ANNEX A： The EUT Appearance

A.1 EUT Appearance

Front Side

Back Side

a: EUT

Picture 1 EUT