RF Exposure Report

Report No.:	SABGSN-WTW-P20080589-2 R1
FCC ID:	NKS-MA1BA1TE1
Test Model:	Trimble Gateway-MA1, Trimble Gateway-BA1, Trimble Gateway-TE1 (refer to item 2 for more details)
Received Date:	Aug. 29, 2020
Date of Evaluation:	Nov. 20, 2020
Issued Date:	Dec. 01, 2020
Applicant:	PeopleNet Communications Corporation
Address:	4400 Baker Road, Minnetonka Minnesota 55343-8684 United States
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
SABGSN-WTW-P20080589-2	Original Release	Nov. 23, 2020
SABGSN-WTW-P20080589-2 R1	Revise model on section 2 Note 1 & 2	Dec. 01, 2020

1 Certificate of Conformity

Product:	Trimble Gateway NA
Brand:	Trimble
Test Model:	Trimble Gateway-MA1, Trimble Gateway-BA1, Trimble Gateway-TE1 (refer to item 2 for more details)
Sample Status:	Engineering Sample
Applicant:	PeopleNet Communications Corporation
Date of Evaluation:	Nov. 20, 2020
Standards:	FCC Part 2 (Section 2.1091)
References Test Guidance :	KDB 447498 D01 General RF Exposure Guidance v06 IEEE C95.3 -2002

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Vera Huang , **Date:** Dec. 01, 2020

Vera Huang / Specialist

Approved by : , **Date:** Dec. 01, 2020

Dylan Chiou / Senior Project Engineer

2 General Information

1. The information of module collocated in this EUT is listed as below.

Module	Brand	Model	EUT Model		
			Trimble Gateway-MA1	Trimble Gateway-BA1	Trimble Gateway-TE1
BT/WLAN Module	msi	BM25	V	V	V
WWAN Module	Quectel	EC25-A	V	V	V

2. The difference between all models are listed as below.

Ant.	Brand	Model	Ant. Type	Remark	EUT Model		
					EUT 1	EUT 2	EUT 3
					Trimble Gateway-MA1	Trimble Gateway-BA1	Trimble Gateway-TE1
WWAN Antenna 1	TAOGLAS	PCS.06.A	SMD Antenna	Internal, Main Antenna	V		V
WWAN Antenna 2	TAOGLAS	PCS.06.B	SMD Antenna	Internal, Aux. Antenna	V	V	V
WWAN Antenna 3	TAOGLAS	MA240.LBI.001	Adhesive Mount Combination Antenna	External, Main Antenna	V		
WWAN Antenna 4	TAOGLAS	MA240.LBI.001	Adhesive Mount Combination Antenna	External, Aux. Antenna	V		
WWAN Antenna 5	PACCAR	PP407031	Exterior-mount Antenna	External, Main Antenna		V	
WLAN Antenna	TAOGLAS	FXP826.07.0120C	FPC Antenna	--	V	V	V

EUT Model	Connector
Trimble Gateway-MA1	a. 1 44-pin Sinbon connector b. 3 Fakra connectors for external antennas c. 1 M13 connector for ethernet
Trimble Gateway-BA1	a. 1 44-pin Sinbon connector b. 2 Fakra connectors for external antennas c. 1 M13 connector for ethernet
Trimble Gateway-TE1	1 44-pin Sinbon connector

3. The antenna gain is listed as below.

WWAN Antenna					
Band		WCDMA V	WCDMA II / LTE 2	WCDMA 4 / LTE 4	LTE 12
Gain (dBi)	Antenna 1	0.53	3.58	3.82	-0.03
	Antenna 2	0.75	**3.81**	**4.04**	0.06
	Antenna 3	0.94	2.51	1.93	1.6
	Antenna 4	1	1.77	1.2	1.2
	Antenna 5	**3**	3	3	**3**

*the maximum antenna gain is chosen for final test.

WLAN Antenna						
Brand	Model	Antenna Type	Antenna Gain (dBi)			
			BT/WLAN 2.4 GHz	WLAN 5.15~5.35 GHz	WLAN 5.47~5.725 GHz	WLAN 5.725~5.85 GHz
TAOGLAS	FXP826.07.0120C	FPC Antenna	0.75	1.22	3.58	3.52

4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3 RF Exposure

3.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	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

3.2 MPE Calculation Formula

$Pd = (Pout*G) / (4*pi*r^2)$

where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

pi = 3.1416

r = distance between observation point and center of the radiator in cm

3.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

3.4 Calculation Result of Maximum Conducted Power

Band	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
WCDMA II	1850-1910	22.66	3.81	20	0.088	1.00
WCDMA IV	1710-1755	22.57	4.04	20	0.091	1.00
WCDMA V	824-849	23.11	3	20	0.081	0.55
LTE 2	1850-1910	22.37	3.81	20	0.083	1.00
LTE 4	1710-1755	22.62	4.04	20	0.092	1.00
LTE 12	699-716	22.56	3	20	0.072	0.47
WLAN	2412-2462	18.45	0.75	20	0.017	1.00
	5180-5240	17.72	1.22	20	0.016	1.00
	5260-5320	17.83	1.22	20	0.016	1.00
	5500-5700	17.65	3.58	20	0.026	1.00
	5745-5825	17.56	3.52	20	0.026	1.00
BT	2402-2480	4.64	0.75	20	0.001	1.00

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz + BT + WWAN = 0.017/1 + 0.026/1 + 0.001/1 + 0.072/0.47 = 0.197

Therefore the maximum calculations of above situations are less than the "1" limit.

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