



CERTIFICATION TEST REPORT

Report Number. : 12216550-E4V3

Applicant : PEOPLENET COMMUNICATIONS CORPORATION
4400 BAKER ROAD,
MINNETONKA, MN, 55344, U.S.A.

Model : PLS8-US R3

FCC ID : NKS-DV423-LTE

EUT Description : GSM, WCDMA, LTE MODULE

Test Standard(s) : FCC 47 CFR PART 1 SUBPART I
FCC 47 CFR PART 1 SUBPART J

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	5/2/2018	Initial Issue	--
V2	5/14/2018	Updated report to address TCB's questions	Tina Chu
V3	5/17/2018	Updated report to address TCB's questions	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PEOPLENET COMMUNICATIONS CORPORATION
4400 BAKER ROAD,
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EUT DESCRIPTION: GSM, WCDMA, LTE MODULE

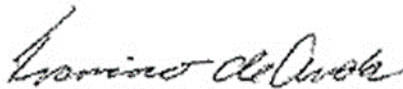
MODEL: PLS8-US R3

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Complies

UL Verification Services Inc. calculated the RF Exposure of the above equipment in accordance with the requirements set forth in the above standards, using test results reported in the test report documents referenced below and/or documentation furnished by the applicant. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations of these calculations. The results show that the equipment is capable of demonstrating compliance with the requirements as documented in this report.

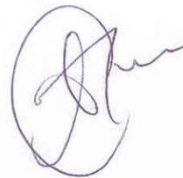
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Approved & Released For
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FRANCISCO DE ANDA
OPERATIONS LEAD
UL Verification Services Inc.

Prepared By:



TINA CHU
SENIOR PROJECT ENGINEER
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2. TEST METHODOLOGY

All calculations were made in accordance with FCC OET Bulletin 65 Edition 97-01.

3. REFERENCES

GSM 1900MHz Output power measurements were made as documented in test report UL Verification Services Inc. document 12216550-E3V1. All other Output power and Duty cycle data is excerpted from the original certification MPE test report No.: 6-0744-15-3-1b (FCC ID:QIPALS3-USR3).

Antenna gain data is excerpted from product documentation provided by the applicant.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

5. MAXIMUM PERMISSIBLE RF EXPOSURE

5.1. FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 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)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			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/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTES:

- (1) Occupational/controlled exposure 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 a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
- (2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

5.2. EQUATIONS

POWER DENSITY

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

Where

S = Power density in mW/cm²

EIRP = Equivalent Isotropic Radiated Power in mW

D = Separation distance in cm

Power density in units of mW/cm² is converted to units of W/m² by multiplying by 10.

DISTANCE

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

Where

D = Separation distance in cm

EIRP = Equivalent Isotropic Radiated Power in mW

S = Power density in mW/cm²

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in W

MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)

For multiple chain devices, and colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the EIRP (in linear units) of each transmitter.

$$\text{Total EIRP} = (\text{EIRP1}) + (\text{EIRP2}) + \dots + (\text{EIRPn})$$

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

MIMO AND COLOCATED TRANSMITTERS

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply:

The Power Density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as
(Power Density of chain or transmitter) / (Limit applicable to that chain or transmitter).

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

6. RF EXPOSURE RESULTS

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

Single Chain and non-colocated transmitters								
Band	Mode	FCC Limit (mW/cm ²)	Output AVG (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Duty Cycle (%)	EIRP (mW)	Separation Distance (cm)
850 MHz	GSM	0.55	33.50	4.04	37.54	50.0	2837.7	20.27
1900 MHz	GSM	1.00	28.58	2.64	31.22	50.0	662.2	7.26
850 MHz	WCDMA Band 5	0.55	24.50	4.04	28.54	100.0	714.5	10.17
1900 MHz	WCDMA Band 2	1.00	24.50	2.64	27.14	100.0	517.6	6.42
1700 MHz	WCDMA Band 4	1.00	24.50	1.54	26.04	100.0	401.8	5.66
700 MHz	LTE Band 17	0.47	23.50	3.44	26.94	100.0	494.3	9.14
850 MHz	LTE Band 5	0.55	23.50	4.04	27.54	100.0	567.5	9.06
1700 MHz	LTE Band 4	1.00	23.50	1.54	25.04	100.0	319.2	5.04
1900 MHz	LTE Band 2	1.00	23.50	2.64	26.14	100.0	411.1	5.72

Single Chain and non-colocated transmitters									
Band	Mode	Separation Distance (cm)	Output AVG (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC Power Density Limit (mW/cm ²)	FCC Power Density (mW/cm ²)	FCC Power Density Margin (mW/cm ²)
850 MHz	GSM	20.27	33.50	4.04	50.0	2837.7	0.55	0.55	0.00
1900 MHz	GSM	20.27	28.58	2.64	50.0	662.2	1.00	0.13	-0.87
850 MHz	WCDMA Band 5	20.27	24.50	4.04	100.0	714.5	0.55	0.14	-0.41
1900 MHz	WCDMA Band 2	20.27	24.50	2.64	100.0	517.6	1.00	0.10	-0.90
1700 MHz	WCDMA Band 4	20.27	24.50	1.54	100.0	401.8	1.00	0.08	-0.92
700 MHz	LTE Band 17	20.27	23.50	3.44	100.0	494.3	0.47	0.10	-0.38
850 MHz	LTE Band 5	20.27	23.50	4.04	100.0	567.5	0.55	0.11	-0.44
1700 MHz	LTE Band 4	20.27	23.50	1.54	100.0	319.2	1.00	0.06	-0.94
1900 MHz	LTE Band 2	20.27	23.50	2.64	100.0	411.1	1.00	0.08	-0.92

NOTES:

- 1) EUT should be installed at a minimum distance of 20.27cm away from end user.
- 2) A tolerance value of +0.5 dB was included in the output power values above to cover the output power tolerance of +/-0.5 dB under extreme conditions in the real filed as declared by the client.
- 3) Listed GSM output power on above table is peak output power.
- 4) The antenna gain in the tables above is the maximum antenna gain among various channels within the specified band when cable length of the Antenna Port 1 is at 3 meters. Antenna Port 2 is Rx only.

END OF REPORT