RF EXPOSURE REPORT

Report No. : 15U21863-E2V2

Applicant : GOOGLE
1600 AMPHITEATRE PARKWAY
MOUNTAIN VIEW, CA 94043, U.S.A

Model : GFRG250

FCC ID : A4RGFRG250

EUT Description : STORAGE NETWORK BOX II, 2TB HD, WIFI AP

Test Standard(s) : FCC Part 1 Subpart I
FCC Part 2 Subpart J

Date of Issue:
October 7, 2016

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	6/16/2016	Initial Issue	---
V2	10/7/16	Updates: sections 5.3	10/7/2016

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UL VERIFICATION SERVICES INC.   FORM NO: CCSUP4701I
47173 BENICIA STREET, FREMONT, CA 94538, USA   TEL: (510) 771-1000   FAX: (510) 661-0888
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOOGLE
1600 AMPHITEATRE PARKWAY
MOUNTAIN VIEW, CA 94043, U.S.A

EUT DESCRIPTION: STORAGE NETWORK BOX II, 2TB HD, WIFI AP

MODEL: GFRG250

SERIAL NUMBER: BFAFSJ1538E0015

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Pass
INDUSTRY CANADA RSS 102 ISSUE 3	Pass

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, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Verification Services Inc. By:

Calculated By:

FRANCISCO DE ANDA
CONSUMER TECHNOLOGY DIVISION
PROJECT MANAGER
UL Verification Services Inc.

CLIFFORD SUSA
CONSUMER TECHNOLOGY DIVISION
TEST ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

All calculations were made in accordance with FCC OET Bulletin 65 Edition 97-01 and IC Safety Code 6 and KDB 447498 D01 General RF Exposure Guidance.

3. REFERENCES

All measurements were made as documented in test report from International Certification Corp. document number FA421101-07 Version 01 for operation in the 2.4 GHz band and UL Verification Services Inc. document number 15U21863-E1V1 for operation in the 5 GHz bands.

5GHz bands Output power and Duty cycle data is excerpted from the applicable test reports.

2.4GHz data was excerpted from International Certification Corp. RF exposure report number FA421101-07 Version 01.

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/cm²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
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
NOTE 1 TO TABLE 1: 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.
NOTE 2 TO TABLE 1: 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.

5.2.   EQUATIONS

POWER DENSITY

Power density is given by:

S = EIRP / (4 * Pi * D^2)

Where

S = Power density in mW/cm^2
EIRP = Equivalent Isotropic Radiated Power in mW
D = Separation distance in cm

Power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by 10.

DISTANCE

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

Where

D = Separation distance in cm
EIRP = Equivalent Isotropic Radiated Power in mW
S = Power density in mW/cm^2

SOURCE-BASED DUTY CYCLE

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

Source-based time-averaged EIRP = (DC / 100) * 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.

Total EIRP = (EIRP1) + (EIRP2) + ... + (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.

5.3. LIMITS AND IC EXEMPTION

FIXED LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2
From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

•below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;

•at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

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.

Power levels include tolerance of 1.5 dB for 2.4 GHz band and 0.75 dB for 5 GHz Bands.

(MIMO and/or Colocated transmitters all with same Power Density limit, MPE distance > 20 cm)

Distance calculations -based on highest average conducted power plus manufacturing tolerance

Multiple chain or colocated transmitters									
Band	Mode	Chain for MIMO	FCC Limit (mW/cm^2)	IC Limit (W/m^2)	Output AVG Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	Separation Distance (cm)
2.4Ghz*	WLAN	3TX			29.57	5.69	98.4	3302.0	
5 GHz**	WLAN	4TX			29.73	6.03	82.9	3122.9	
Combined			1.00	10.0				6424.9	22.62

Power Density calculations -based on minimum distance separation

Multiple chain or colocated transmitters									
Band	Mode	Chain for MIMO	Separation Distance (cm)	Output AVG Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	EIRP (mW)	FCC Power Density (mW/cm^2)	IC Density (W/m^2)
2.4Ghz*	WLAN	3TX		29.57	5.69	98.4	3302.0		
5 GHz**	WLAN	4TX		29.73	6.03	82.9	3122.9		
Combined			23				6424.9	1.000	10.00

*Worst case data for 2.4GHz band. Data from International Certification Corp. RF report number FR421101 Version 01.
** Worse case data for all 5GHz bands. Data from UL Verification Services Inc. report number 15U21863-E1V1

Notes:

1) For MPE the new KDB 447498 requires the calculations to use the maximum rated power; that power should be declared by the manufacturer, and should not be lower than the measured power.

2) The manufacturer configures output power so that the maximum power, after accounting for manufacturing tolerances, will never exceed the maximum power level measured.

3) The output power in the tables above is the maximum power various channels and various modes within the specific bands.

4) The antenna gain in the tables above is the maximum antenna gain among various channels within the specified band and modes that yielded highest power.

END OF REPORT