

RF Exposure Evaluation Declaration

Product Name : Connectivity Module
Trade Name : Husqvarna
Model No. : HCM500
FCC ID : ZASHCM500

Applicant : HUSQVARNA AB
Address : 561 82 HUSKVARNA Sweden

Date of Receipt : Dec. 22, 2020
Date of Declaration : Jun. 29, 2021
Report No. : 20C0830R-E3032410101
Report Version : V1.0



The declaration results relate only to the samples calculated.

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Issued Date : Jun. 29, 2021

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Product Name : Connectivity Module

Applicant : HUSQVARNA AB

Address : 561 82 HUSKVARNA Sweden

Manufacturer : HUSQVARNA AB

Address : 561 82 HUSKVARNA Sweden

Trade Name : Husqvarna

Model No. : HCM500

FCC ID : ZASHCM500

EUT Voltage : DC 6-58V

Testing Voltage : DC 48V

Applicable Standard : FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

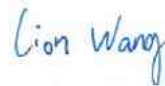
Test Lab : Hsin Chu Laboratory

Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958

Test Result : Complied

Tested By

:



(Lion Wang / Senior Engineer)

Approved By

:



(Louis Hsu / Deputy Manager)

Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Jun. 29, 2021

1.1. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Test Site
Temperature (°C)	Peak Output Power	15 - 35	1
Humidity (%RH)		25 - 75	

Note: Test site information refers to Laboratory Information.

USA : FCC Registration Number: TW3024
Canada : IC Registration Number: 22397-1 / 22397-2 / 22397-3

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
Email address	info.tw@dekra.com
Website	http://www.dekra.com.tw

1.2. List of Test Equipment

Peak Output Power / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2020/11/30	2021/11/29
Pulse Power Sensor	Anritsu	MA2411B	1531043	2020/11/30	2021/11/29
Pulse Power Sensor	Anritsu	MA2411B	1531044	2020/11/30	2021/11/29
Power Meter	Keysight	8990B	MY51000248	2020/05/20	2021/05/19
Power Sensor	Keysight	N1923A	MY57240005	2020/05/20	2021/05/19

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

1.3. Uncertainty

Test item	Uncertainty
Peak Output Power	± 2.26 dB

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

2. RF Exposure Evaluation

2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-1023	170	180	-	Instantaneous*
0.1-10	-	1.6/ f	-	6**
1.29-10	193/ f 0.5	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ f 0.25	0.3444/ f 0.25	44.72/ f 0.5	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 f 0.25	0.04138 f 0.25	0.6455 f 0.5	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ f 1.2
150000-300000	0.354 f 0.5	9.40 x 10 ⁻⁴ f 0.5	3.33 x 10 ⁻⁴ f	616000/ f 1.2
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Friis Formula

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d is the limit of MPE, $1 mW/cm^2$. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

2.3. Test Result of RF Exposure Evaluation

Product	Connectivity Module		
Test Mode	Transmit		
Test Condition	RF Exposure Evaluation		
Date of Test	2021/01/11~2021/01/12	Test Site	SR12-H
Temperature(°C)	18.0°C	Test Humidity	58.0%

(Internal Antenna) BT5.0 1M

Frequency (MHz)	Maximum Conducted Output Power		Maximum Power Density at R = 0.2 m (W/m ²)	Limit (mW/cm ²)
	(dBm)	(mW)		
2402	-1.240	0.75162	0.00025	1.000
2440	-1.220	0.75509	0.00025	1.000
2480	-1.110	0.77446	0.00026	1.000

(Internal Antenna) BT5.0 2M

Frequency (MHz)	Maximum Conducted Output Power		Maximum Power Density at R = 0.2 m (W/m ²)	Limit (mW/cm ²)
	(dBm)	(mW)		
2402	3.640	2.31206	0.00077	1.000
2440	3.540	2.25944	0.00075	1.000
2480	3.450	2.21309	0.00074	1.000

(External Antenna) BT5.0 1M

Frequency (MHz)	Maximum Conducted Output Power		Maximum Power Density at R = 0.2 m (W/m ²)	Limit (mW/cm ²)
	(dBm)	(mW)		
2402	-4.230	0.37757	0.00012	1.000
2440	-4.520	0.35318	0.00011	1.000
2480	-0.890	0.81470	0.00026	1.000

(External Antenna) BT5.0 2M

Frequency (MHz)	Maximum Conducted Output Power		Maximum Power Density at R = 0.2 m (W/m ²)	Limit (mW/cm ²)
	(dBm)	(mW)		
2402	0.420	1.10154	0.00035	1.000
2440	0.300	1.07152	0.00034	1.000
2480	0.410	1.09901	0.00035	1.000

Product	Connectivity Module			
Test Mode	Transmit			
Test Condition	RF Exposure Evaluation			
Date of Test	2021/01/12	Test Site	SR12-H	
Temperature(°C)	18.0°C	Test Humidity	58.0%	

Band	Frequency (MHz) (Lowest Frequency)	Maximum conducted output power (per tune-up) (dBm)	Maximum conducted output power (per tune-up) (mW)	Power Density (mW/cm ²)	Antenna Gain (dBi)	Antenna Gain (linear)	Duty cycle (%)	FCC MPE limit (mW/cm ²)	FCC EIRP /ERP limit (W)	Evaluation distance for compliance with MPE limits (cm)
GSM 850	824.2	34.5	2818.383	0.070	0	1.000	12.5	0.549	7	20
DCS 1900	1850.2	30.5	1122.018	0.044	2	1.585	12.5	1.000	2	20
LTE Band 2	1860	24	251.189	0.079	2	1.585	100	1.000	2	20
LTE Band 4	1715	24	251.189	0.079	2	1.585	100	1.000	1	20
LTE Band 5	826.5	24	251.189	0.050	0	1.000	100	0.551	7	20
LTE Band 12	704	24	251.189	0.050	0	1.000	100	0.469	3	20
LTE Band 13	779.5	24	251.189	0.050	0	1.000	100	0.520	3	20
LTE Band 26	816.5	24 (Part90)	251.189	0.050	0	1.000	100	0.544	100	20
LTE Band 26	831.5	24 (Part22)	251.189	0.050	0	1.000	100	0.554	7	20

The conducted power using GPRS class 8 (1 up and 1 down), duty cycle is 12.5%

Conclusion:

The formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

BT5.0 (Internal Antenna) + 2G GSM = $0.00077 + 0.128 = 0.12877$,

BT5.0 (Internal Antenna) + 4G LTE = $0.00077 + 0.106 = 0.10677$,

BT5.0 (External Antenna) + 2G GSM = $0.00035 + 0.128 = 0.12835$,

BT5.0 (External Antenna) + 4G LTE = $0.00035 + 0.106 = 0.10635$,

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