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RF Exposure Evaluation Report

Application No.:	SZEM2103002421CR
Applicant:	Uniden America Corporation
Address of Applicant:	6225 N. State Highway 161 Suite 300, Irving, Texas 75038 United States
Manufacturer:	Uniden Holding Corporation
Address of Manufacturer:	2-12-7, Hacchobori, Chuo-ku, Tokyo, Japan, 104-8512
Factory:	Uniden Vietnam Limited
Address of Factory:	Lot 5. 1, Tan Truong Industrial Zone, Cam Giang District, Hai Duong Province, Vietnam

Equipment Under Test (EUT):

Product Name:	VHF Marine Radio with GPS and Bluetooth
Model No.:	UM725GBT
Trade Mark:	Uniden
FCC ID:	AMWUT662
Standards:	47 CFR Part 1.1307
	47 CFR Part 1.1310
Date of Receipt:	2021-03-05
Date of Test:	2021-03-08 to 2021-04-03
Date of Issue:	2021-04-06
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2021-04-06		Original

Authorized for issue by:				
		Edison Li		
		Edison Li/Project Engineer		
		Eric Fu		
		Eric Fu/Reviewer		

3 Contents

4 General Information

4.1 General Description of EUT

Power supply:	DC 13.8V
Cable(s):	DC Cable: 150cm Unshielded; NMEA0183+Ext Speaker Cable: 100cm Unshielded;
Sample Type:	Mobile device
Internal Source:	More than 108MHz
For VHF/DSC	
Transceiver frequency Range:	156.025MHz-161.60MHz(TX) 156.050MHz-163.275MHz(RX, includes WX band)
DSC Transmitter Frequency Range:	156.525MHz(CH70), Meets Global DSC Class D standards.
Modulation Type:	VHF:FM for Analog DSC:FSK
Frequency Spacing:	VHF: 25KHz
Emission Type:	16K0G3E for VHF 16K0G2B for DSC
Rated Output Power:	25W/1W for VHF/DSC;
VHF/DSC Antenna Connectors:	SO-239(50 ohm, External Antenna)
VHF/DSC Antenna Gain:	3dBi
Type of Equipment:	Ship stations
For Bluetooth*	
Bluetooth Model:	MDBT42Q
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	V5.0
Modulation Type:	GFSK
Number of Channels:	40
Antenna Type:	Chip Antenna
Antenna Gain:	-1.6dBi

*: The Bluetooth single module approval by TCB(FCC ID:SH6MDBT42Q), Grant at 01/02/2018.

4.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.

5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

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 Exposures				
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
300–1500	.....	.....	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/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

Friis Formula

Friis transmission 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

For Uncontrolled Environment, the MPE limit of VHF is 0.2 mW/cm^2, the MPE limit of Bluetooth is 1.0 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.

5.1.2 Test Procedure

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

5.1.3 EUT RF Exposure Evaluation

The best case gain of the antenna is 3dBi. 3dB logarithmic terms convert to numeric result is nearly 2.0.

Test Frequency (MHz)	Maximun Antenna Gain (dBi)	Maximum Antenna Gain (Numeric)	Output Power (dBm)	Max Tune-up tolerance power (dBm)	Max Tune-up tolerance power*50% [a] (mW)	Power density (mW/cm^2)	Minimum Distance to Human body (cm)
156.025	3	2.00	43.63	43.98	12501.73	0.2	**99.65**
156.025	3	2.00	28.98	30.00	500.00	0.2	19.95
156.300	3	2.00	43.64	43.98	12501.73	0.2	99.65
156.300	3	2.00	28.96	30.00	500.00	0.2	19.95
156.650	3	2.00	43.63	43.98	12501.73	0.2	99.65
156.650	3	2.00	28.95	30.00	500.00	0.2	19.95
156.800	3	2.00	43.63	43.98	12501.73	0.2	99.65
156.800	3	2.00	28.95	30.00	500.00	0.2	19.95
157.425	3	2.00	43.6	43.98	12501.73	0.2	99.65
157.425	3	2.00	28.92	30.00	500.00	0.2	19.95
156.525	3	2.00	43.86	43.98	12501.73	0.2	99.65
156.525	3	2.00	29.36	30.00	500.00	0.2	19.95
161.600	3	2.00	43.88	43.98	12501.73	0.2	99.65
161.600	3	2.00	29.47	30.00	500.00	0.2	19.95

Note [a]: These channels may be operated as half-duplex frequency channels.

For VHF Transmitter:

The maximum rated power of duplex is 25W, the low rated power of duplex is 1W which declared by manufacturer.

Then the maximum rated power of half-duplex is 12.5W, the low rated power of half-duplex is 0.5W.
To satisfy RF exposure requirements, a separation distance of 99.65cm or more should be maintained between this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.
The minimum distance between this device and persons during device operation is 130 cm which declared by manufacturer. Through the calculation, the maximum power density at 130cm is:
$Pd = (Pout*G)/(4* Pi * R^2) =(12501.73*2.00)/(4*3.1416*130*130) = 0.1177\ mW/cm^2$

For Bluetooth LE:

The best case gain of the antenna is -1.6dBi. -1.6dB logarithmic terms convert to numeric result is nearly 0.69

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Channel	Frequency (MHz)	Max tune-up tolerance power(dBm)	Max tune-up Tolerance Power to Antenna(mW)	Power Density at R = 130 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratio	Result
Low	2402MHz	3.57	2.28	0.00001	1	0.00001	PASS

The simultaneous transmission result between of Bluetooth and VHF/DSC:

The SAR Exclusion Threshold Level:

=CPD1/LPD1 + CPD2/LPD2 (CPD = Calculation power density, LPD = Limit of power density)

= (0.1177/0.2) +(0.00001/1) = 0.58851 < 1

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

- End of the Report -