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RADIO TEST REPORT – APFWL

Type of assessment:

MPE Calculation report

Manufacturer:

StrongBo Agritech Canada Ltd.

Product Marketing Name (PMN):

StrongBo WP Electrical Box

Hardware Version Identification Number (HVIN):

SB-WCTSC4R00

FCC ID:

2BE3T-WP01

ISED certification number:

32066-WP01

Contains FCC ID:

2AEMI-B404X

Contains ISED certification number:

20127-B404X

2AVE9-M138

25817-M138

Specification:

- ◆ FCC 47 CFR Part 1 Subpart I, §§1.1307, 1.1310
- ◆ FCC 47 CFR Part 2 Subpart J, §2.1091
- ◆ FCC KDB 447498 D01 General RF Exposure Guidance v06
- ◆ ISED Canada RSS-102 Issue 5 Amendment 1, (February 2021)

RSS-102 Annex B - Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in Annex A is correct; that the Technical Brief was prepared and the information contained therein is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed; and that the device meets the SAR and/or RF field strength limits of RSS-102.

Date of issue: **March 19, 2024**

Andrey Adelberg, Senior EMC/RF Specialist

Prepared by

Signature

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ANAB File Number: AT-3195 (Ottawa/Almonte); AT-3193 (Pointe-Claire); AT-3194 (Cambridge)



Lab locations

Company name	Nemko Canada Inc.			
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Test site identifier	Organization	Ottawa/Almonte	Montreal	Cambridge
	FCC:	CA2040	CA2041	CA0101
	ISED:	2040A-4	2040G-5	24676
Website	www.nemko.com			

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1 Evaluation summary

1.1 MPE calculation for simultaneous transmission

1.1.1 References, definitions and limits

FCC §2.1091(d)

- (2) (2) For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b) of this part, except for portable devices as defined in §2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in §2.1093.

Table 1.1-1: Table 1 to §1.1310(e)(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)
(i) 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
300–1500			f / 300	<6
1500–100000			5	<6
(ii) 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
1500–100000			1.0	<30

Notes: f = frequency in MHz. * = Plane-wave equivalent power density.

RSS-102, Section 4

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6:

Table 1.1-2: Table 4 to RSS-102— RF Field Strength Limits

Frequency range (MHz)	Electric field strength (V/m rms)	Magnetic field strength (A/m rms)	Power density (W/m ²)	Reference Period (minutes)
Limits for Controlled Environment				
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
Limits for Uncontrolled Environment				
10–20	27.46	0.0728	2	6
20–48	58.07 / f ^{0.25}	0.1540 / f ^{0.25}	8.944 / f ^{0.5}	6
48–300	22.06	0.05852	1.291	6
300–6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	0.02619 f ^{0.6834}	6
6000–15000	61.4	0.163	10	6

Notes: f = frequency in MHz.

References, definitions and limits, continued

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)
P = power input to the antenna (mW or W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna (cm or m)

1.1.2 EUT technical information

	Transmitter 1 (BLE)	Transmitter 2 (Cellular)	Transmitter 2 (Satellite)
Prediction frequency	2402 MHz	699 MHz	150 MHz
Antenna gain	2 dBi	12 dBi	2 dBi
Maximum transmitter conducted power	6.3 dBm	25 dBm	21.02 dBm
Prediction distance (declared)	50 cm	50 cm	50 cm

1.1.3 MPE calculation

	Transmitter 1	Transmitter 2	Transmitter 3
Fundamental transmit (prediction) frequency:	2402 MHz	699 MHz	150 MHz
Maximum measured conducted peak output power:	6.3 dBm	25 dBm	21.02 dBm
Cable and/or jumper loss:	0 dB	0 dB	0 dB
Maximum peak power at antenna input terminal:	6.3 dBm	25 dBm	21.02 dBm
Duty cycle:	100 %	100 %	100 %
Maximum calculated average power at antenna input terminal:	4.2657952 mW	316.22777 mW	126.47363 mW
Single Antenna gain (typical):	2 dBi	12 dBi	2 dBi
Number of antennae:	1	1	1
Total system gain:	2.00 dBi	12.00 dBi	2.00 dBi
MPE limit for <u>uncontrolled</u> exposure at prediction frequency:	ISED limit 0.53508 mW/cm ² 5.350805 W/m ²	FCC limit 1.00000 mW/cm ² 10.00000 W/m ²	ISED limit 0.23017 mW/cm ² 2.301713 W/m ²
MPE limit for <u>controlled</u> exposure at prediction frequency:	FCC limit 0.46600 mW/cm ² 4.66000 W/m ²	ISED limit 0.12910 mW/cm ² 1.291000 W/m ²	FCC limit 0.20000 mW/cm ² 2.00000 W/m ²
Minimum calculated prediction distance for compliance:	31.6361 mW/cm ² 31.63609 W/m ²	5.00000 mW/cm ² 50.00000 W/m ²	1.70661 mW/cm ² 17.06612 W/m ²
Typical (declared) distance:	20 cm	20 cm	20 cm
Average power density at prediction frequency:	42 cm	29 cm	50 cm
MPE compliance for simultaneous operation:	50 cm	50 cm	50 cm
Margin of Compliance for <u>uncontrolled</u> environment:	0.000215 mW/cm ² 0.002152 W/m ²	0.000215 mW/cm ² 0.002152 W/m ²	0.159533 mW/cm ² 1.595329 W/m ²
Margin of Compliance for <u>controlled</u> environment:	0.159533 mW/cm ² 1.595329 W/m ²	0.159533 mW/cm ² 1.595329 W/m ²	0.006380 mW/cm ² 0.063804 W/m ²
with Maximum permitted antenna gain:	41.67 dB	43.66 dB	11.65 dB
Margin of Compliance for <u>uncontrolled</u> environment:	43.67 dBi	45.66 dBi	23.65 dBi
with Maximum permitted antenna gain:	33.96 dB	36.67 dB	4.66 dB
Average power density to MPE limit ratio (<u>uncontrolled</u>):	35.96 dBi	36.67 dBi	13.59 dBi
Average power density to MPE limit ratio (<u>controlled</u>):	0.000	0.000	0.693
Total sum of ratios for FCC (uncontrolled):	0.000	0.000	0.093
Total sum of ratios for FCC (controlled):	0.374 <1	0.743 <1	0.075 <1
Total sum of ratios for ISED (uncontrolled):	0.000	0.000	0.008
Total sum of ratios for ISED (controlled):	0.000	0.000	0.102 <1
Maximum allowed sum of ratios:	1	1	1
Total RF value for ISED:			1.6613 W/m ²

1.1.4 Verdict

The calculation is below the limit; therefore, the product is passing the RF Exposure requirements for the declared distance.

1.1.5 RSS-102, Annex A - RF technical brief cover sheet

ISED certification number	32066-WP01		
Product marketing name (PMN)	StrongBo WP Electrical Box		
Hardware version identification number (HVIN)	SB-WCTSC4R00		
Firmware version identification number (FVIN)	N/A		
Host marketing name (HMN)	N/A		
Applicant name	StrongBo Agritech Canada Ltd.		
SAR/RF exposure test laboratory	2040G-5 (3 m semi anechoic chamber - Montréal)		
Type of evaluation	☐ SAR Evaluation: Device Used in the Vicinity of the Human Head ☐ SAR Evaluation: Body-Worn Device and Body-Supported Device ☐ SAR Evaluation: Limb-Worn Device ☒ RF Exposure Evaluation ☐ Nerve Stimulation Exposure Evaluation (SPR-002)		
SAR evaluation	Multiple transmitters: ☐ Yes ☐ No		
	Evaluated against exposure limits: ☐ General Public Use ☐ Controlled Use		
	Duty cycle used in evaluation: N/A %		
	Separation distance: N/A mm		
	Standard used for evaluation: N/A		
	SAR value: N/A W/kg		
☐ Measured ☐ Computed ☐ Calculated			
Nerve Stimulation Evaluation (SPR-002)	Evaluated against exposure limits: ☐ General Public Use ☐ Controlled Use		
	Measurement distance: N/A m		
	Field Strength: N/A ☐ V/m (electric) ☐ A/m (magnetic) ☐ Measured ☐ Computed ☐ Calculated		
	Exposure condition: ☐ Whole body/Torso/Head ☐ Leg ☐ Arm ☐ Hand/Foot		
RF exposure evaluation	Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use		
	Duty cycle used in evaluation: 100 %		
	Operational frequency: 2400, 699, 150 MHz		
	Standard used for evaluation: Safety Code 6		
	Measurement distance: 0.5 m		
	RF value: 1.66 ☒ W/m ² ☐ V/m ☐ A/m ☐ Measured ☐ Computed ☒ Calculated		

End of the test report