

SARGENT MANUFACTURING CO. MPE CALCULATION REPORT

SCOPE OF WORK

MPE Calculation of NTB-Push Button & NTB-Touchscreen

REPORT NUMBER

105779861BOX-006mpe.1

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MPE CALCULATION REPORT

(FULL COMPLIANCE)

Report Number: 105779861BOX-006mpe.1

Project Number: G105779861

Report Issue Date: May 13, 2024

Report Revision Date: October 30, 2024

Model(s) Tested: NTB-Push Button & NTB-Touchscreen

Standards: FCC Part 1 Subpart I, May 2024

Procedures Implementing the National Environmental Policy Act of 1969
§1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

ISED RSS-102 Issue 5, March 19, 2015

Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus
(All Frequency Bands)

Tested by:
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70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Sargent Manufacturing Co.
110 Sargent Drive
New Haven, CT 6511
USA

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1 Introduction and Conclusion

This evaluation report covers for a mobile device subject to routine environmental evaluation for RF exposure. A mobile device is defined as a transmitting device designed to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

The evaluation indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining sections are the verbatim text from the actual evaluation during the investigation. These sections include the evaluation name, the specified Method, and Results. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product evaluated **complies** with the requirements of the standard(s) indicated. The results obtained in this report pertain only to the item(s) evaluated. Intertek does not make any claims of compliance for samples or variants which were not evaluated.

2 Evaluation Summary

Section	Test full name	Result
3	Client Information	-
4	Description of Equipment Under Evaluation and Variant Models	-
5	System Setup and Method	-
6	Power Density Calculation (FCC §1.1310; ISSED RSS-102 Issue 5)	Compliant
7	Revision History	-

3 Client Information

This EUT was tested at the request of:

Client: Sargent Manufacturing Company
100 Sargent Drive
New Haven, CT 6511
USA

Contact: Dave Debiase
Telephone: 203-821-5724
Email: dave.debiase@assaabloy.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Sargent Manufacturing Co.
110 Sargent Drive
New Haven, CT 6511
USA

Description of Equipment Under Test (provided by client)
Electronic access control system

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
6 V (4 x 1.5 V Batteries)	1.5 A	DC	N/A

Variant Models:

The following variant models have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

NTB613-ACC, NTB613-NR, NTB633-ACC, NTB633-NR
NTB623-ACC, NTB623-NR, NTB643-ACC, NTB643-NR

5 Power Density Calculation

5.1 Requirement(s)

FCC §1.1310 Radiofrequency radiation exposure limits

Table 1 below sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic field.

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	842/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

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Table 2 below sets forth limits for the RF field strength.

Table 2 – RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency range (MHz)	Electric field strength (V/m rms)	Magnetic field strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ f ^{0.5}	-	-	6**
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
15000-150000	61.4	0.163	10	616000/ f ^{1.2}
150000-300000	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 10 ⁻⁵ f	616000/f ^{1.2}

Note: f is frequency in MHz. *Based on nerve stimulation (NS)

**Based on specific absorption rate (SAR)

5.2 Method

An MPE evaluation was performed in order to show that the device was compliant with FCC §2.1091 and ISSED RSS-102. The maximum power density was calculated for each transmitter at a separation distance of 20 cm. The calculation was performed using the maximum gain from the internal and external antennas declared by the manufacturer.

The maximum permissible exposure (MPE) is predicted by using the following equation:

$$S = PG/4\pi R^2$$

where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

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 (appropriate units, e.g., cm)

5.3 Calculation:

EIRP [dBm] = E [dBμV/m] + 20*log [d(m)]-104.77, where d is the test distance

13.56 MHz RFID

NTB-Push Button: 39.99 dBuV/m at 3 meters

NTB-Touchscreen: 40.69 dBuV/m at 3 meters

Bluetooth Low Energy (BLE)

NTB-Push Button: 82.50 dBuV/m at 3 meters

NTB-Touchscreen: 78.58 dBuV/m at 3 meters

Enclosure	Frequency	Field Strength	Distance	Max. EIRP	Max. EIRP	Power Density at	Power Density at	mit at 20 c	mit at 20 c	Result
			(m)	(dBm)	(mW)	20 cm (mW/cm ²)	20 cm (W/m ²)	(V/m)	(W/m ²)	
13.56 MHz RFID										
Push Button	13.56 MHz	39.99dBuV/m	3	--	--	--	--	--	--	--
		9.99E-05V/m	3	--	--	--	--	62.09	--	Compliant
Touchscreen	13.56 MHz	40.69 dBuV/m	3	--	--	--	--	--	--	Compliant
		0.000108 V/m	3	--	--	--	--	62.09	--	Compliant
2.4 GHz Bluetooth Low Energy (BLE)										
Push Button	2.402 GHz	82.50	3	-12.700	0.053703	1.06839E-05	0.000106839	--	1.00	Compliant
Touchscreen	2.402 GHz	78.58	3	-16.620	0.021777	4.33242E-06	4.33242E-05	--	1.00	Compliant

Notes: Data for power density calculation was taken from Intertek test report number: 105779861BOX-006.

5.4 Results:

The sample tested was found to Comply. The maximum calculated power density at 20 cm distance is less than the limits for general population / uncontrolled exposure of 1 mW/cm^2 for BLE. And the maximum calculated electric field strength at 20 cm distance is less than 62.09 V/m for 13.56 MHz RFID.

6 ISED RSS-102 Issue 5 §2.5.2 Exemption**6.1 Requirement(s)**

Power Density Limit: $0.02619 f^{0.6834} \text{ W/m}^2$ ($300 \text{ MHz} \leq f < 6 \text{ GHz}$), f is in MHz.

Power Density Limit: $0.02619 * (2405^{0.6834}) = 5.355 \text{ W/m}^2$

Power Density Limit: $0.02619 * (2402^{0.6834}) = 5.351 \text{ W/m}^2$

6.2 Calculation

Enclosure	Frequency	Field Strength	Distance	Max. EIRP	Max. EIRP	Power Density at	Power Density at	mit at 20 c	mit at 20 c	Result
			(m)	(dBm)	(mW)	20 cm (mW/cm^2)	20 cm (W/m^2)	(V/m)	(W/m^2)	
13.56 MHz RFID										
Push Button	13.56 MHz	39.99dBuV/m	3	--	--	--	--	--	--	--
		9.99E-05V/m	3	--	--	--	--	27.46	--	Compliant
Touchscreen	13.56 MHz	40.69 dBuV/m	3	--	--	--	--	--	--	Compliant
		0.000108 V/m	3	--	--	--	--	27.46	--	Compliant
2.4 GHz Bluetooth Low Energy (BLE)										
Push Button	2.402 GHz	82.50	3	-12.700	0.053703	1.06839E-05	0.000106839	--	5.35	Compliant
Touchscreen	2.402 GHz	78.58	3	-16.620	0.021777	4.33242E-06	4.33242E-05	--	5.35	Compliant

Notes: Data for power density calculation was taken from Intertek test report number: 105779861BOX-006.

6.3 Results:

The sample tested was found to Comply. The maximum calculated power density at 20 cm distance is less than the limits for general population / uncontrolled exposure of 5.351 W/m² BLE. And the maximum calculated electric field strength at 20 cm distance is less than 27.46 V/m for 13.56 MHz RFID.

7 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	05/13/2024	105779861BOX-006mpe	KPS <i>KPS</i>	VFV <i>VFV</i>	Original Issue
1	10/30/2024	105779861BOX-006mpe.1	KPS <i>KPS</i>	VFV <i>VFV</i>	See Note # 1 below

Note # 1:

- 1) Updated model on pages 1 & 2 to NTB-Push Button & NTB-Touchscreen.
- 2) Removed FCC & IC # in Section 4 on Page 5.
- 3) Corrected the Rated Voltage to 6 V (4 x 1.5 V Batteries) in Section 4 on Page 5.
- 4) Added the variant models in Section 4 on Page 5