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Report On

RF Exposure Assessment of the
SRT Marine Technology
em-trak B100 with Cobalt II Class B AIS Transponder (SOTDMA and
CSTDMA)

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SECTION 1

REPORT SUMMARY

RF Exposure Assessment of the
SRT Marine Technology
em-trak B100 with Cobalt II Class B AIS Transponder (SOTDMA and CSTDMA)



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the RF Exposure Assessment of the SRT Marine Technology em-trak B100 with Cobalt II Class B AIS Transponder (SOTDMA and CSTDMA) to the requirements of the applied test specifications.

Objective	To perform RF Exposure Assessment to determine the Equipment Under Test's (EUT's) compliance of the applied rules.
Applicant	SRT Marine Technology
Manufacturer	SRT Marine Technology
Manufacturing Description	Class B AIS Transponder (SOTDMA and CSTDMA)
Model Number(s)	em-trak B100 with Cobalt II
Test Specification/Issue/Date	EN 62311:2008 CFR 47 Pt1.1310 (2016) Health Canada Safety Code 6 ARPANSA Radiation Protection Series No.3



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1.2 REGIONAL REQUIREMENTS

The table below shows the regional requirements that are referenced in this test report. A full list of the requirements is shown in Annex A.

Report Reference	Regional Requirement
EU	EN 62311:2008
FCC	CFR 47 Pt1.1310 (2016)
IC	Health Canada Safety Code 6
AUS	ARPANSA Radiation Protection Series No.3



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1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment under test was a SRT Marine Technology em-trak B100 with Cobalt II Class B AIS Transponder (SOTDMA and CSTDMA). A full technical description can be found in the manufacturer's documentation.

All reported calculations were carried out on the relevant information supplied for the em-trak B100 with Cobalt II Class B AIS Transponder (SOTDMA and CSTDMA) to demonstrate compliance with the applied test specification(s). The sample assessed was found to comply with the requirements of the applied rules.

1.3.2 Supported Features

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	AIS (SOTDMA)
	AIS (CSTDMA)

Frequency Band	156.025 - 162.025
----------------	-------------------

1.3.3 Antennas

The following antennas are supported by the equipment under test.

No.	Model	Gain(dB)
1	AIS	3

1.3.4 EUT Configurations

The EUT is a SRT Marine Technology em-trak B100 with Cobalt II Class B AIS transponder (SOTDMA / CSTDMA); when active the AIS transmission occur on 156.025 – 162.025 MHz as per the Manufacturers transmission schedule.



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1.4 BRIEF SUMMARY OF RESULTS

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields for both General Public and Occupational. The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

Configuration	Required Compliance Boundary (m)	
	Occupational	General Population
SOTDMA	0.2	0.2
CSTDMA	0.2	0.2

Table 1 – Compliance Boundary Results



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1.4.1 Configuration 1 - SOTDMA

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m ²)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.1985	10.0000	8.6503	61.0000	0.0229	0.1620
FCC*	0.0198	1.0000	8.6503	61.4000	0.0229	0.1630
IC	0.1985	8.0629	8.6503	55.1345	0.0229	0.1462
AUS	0.1985	10.0000	8.6503	61.4000	0.0229	0.1630

* Requirement and Result in mW/cm²

Table 2 – Occupational Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m ²)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.1985	2.0000	8.6503	28.0000	0.0229	0.0730
FCC*	0.0198	0.2000	8.6503	27.5000	0.0229	0.0730
IC	0.1985	1.2910	8.6503	22.0600	0.0229	0.0585
AUS	0.1985	2.0000	8.6503	27.4000	0.0229	0.0729

* Requirement and Result in mW/cm²

Table 3 – General Population Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.



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1.4.2 Configuration 2 - CSTDMA

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m ²)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.0794	10.0000	5.4705	61.0000	0.0145	0.1620
FCC*	0.0079	1.0000	5.4705	61.4000	0.0145	0.1630
IC	0.0794	8.0629	5.4705	55.1345	0.0145	0.1462
AUS	0.0794	10.0000	5.4705	61.4000	0.0145	0.1630

* Requirement and Result in mW/cm²

Table 4 – Occupational Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m					
	S Field (W/m ²)		E Field (V/m)		H Field (A/m)	
	Result	Limit	Result	Limit	Result	Limit
EU	0.0794	2.0000	5.4705	28.0000	0.0145	0.0730
FCC*	0.0079	0.2000	5.4705	27.5000	0.0145	0.0730
IC	0.0794	1.2910	5.4705	22.0600	0.0145	0.0585
AUS	0.0794	2.0000	5.4705	27.4000	0.0145	0.0729

* Requirement and Result in mW/cm²

Table 5 – General Population Results

The calculations show that the EUT complies with the occupational exposure levels described in the EN 62311:2008, CFR 47 Pt1.1310 (2016), Health Canada Safety Code 6 and ARPANSA Radiation Protection Series No.3 at the point of investigation, 0.2 m.



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SECTION 2

TEST DETAILS

2.1 RATIONALE FOR ASSESSMENT OF THE RF EXPOSURE

The aim of the assessment report is to evaluate the compliance boundary for a set of given input power(s) according to the basic restrictions (directly or indirectly via compliance with reference levels) related to human exposure to radio frequency electromagnetic fields.

The chosen assessment method to establish the compliance boundary in the far-field region is the reference method as defined in the relevant specifications.

The RF exposure assessment is based upon the following criteria:

The em-trak B100 with Cobalt II Class B AIS transponder operates with the following transmitters active on the antenna ports shown in Section 1.3.3. For each transmitter, the Radio Access Technology (RAT), EIRP inclusive of antenna gain and duty cycle, gain of the antenna and lowest frequency of operation are shown as they contribute to the calculation of S Field, E field and H field values according to the following formulas.

The power flux (S Field):

$$S = \frac{PG_{(\theta, \phi)}}{4\pi r^2}$$

The electric field strength (E Field):

$$E = \frac{\sqrt{30PG_{(\theta, \phi)}}}{r}$$

The magnetic field strength (H Field):

$$H = \frac{E}{\eta_0}$$

Where:

P = Average Power (W)

G = Antenna Gain (dBi)

r = Distance (cm) or (m)

$\eta_0 = 377$



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2.2 TEST RESULT DETAILS

The frequencies shown in the tables below have been chosen based on the lowest possible frequency that the EUT can transmit.

2.2.1 Configuration 1 - SOTDMA

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m ²)	E Field (V/m)	H Field (A/m)
1	1	1	AIS (SOTDMA)	0.100	1	3	156.025	0.1985	8.6503	0.0229

Table 6 – Occupational Transmitter Summary

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m ²)	E Field (V/m)	H Field (A/m)
1	1	1	AIS (SOTDMA)	0.100	1	3	156.025	0.1985	8.6503	0.0229

Table 7 – General Population Transmitter Summary



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2.2.2 Configuration 2 - CSTDMA

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m ²)	E Field (V/m)	H Field (A/m)
1	1	1	AIS (CSTDMA)	0.040	1	3	156.025	0.0794	5.4705	0.0145

Table 8 – Occupational Transmitter Summary

Antenna Port	Tx No.	Ant No.	RAT	EIRP (W)	Duty Cycle (%)	Gain (dBi)	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m		
								S Field (W/m ²)	E Field (V/m)	H Field (A/m)
1	1	1	AIS (CSTDMA)	0.040	1	3	156.025	0.0794	5.4705	0.0145

Table 9 – General Population Transmitter Summary



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SECTION 3

DISCLAIMERS AND COPYRIGHT



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3.1 DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

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ANNEX A

REGIONAL REQUIREMENTS



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Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.065 - 1	-	610	1.6/f
1 - 10	-	610/f	1.6/f
10 - 400	10	61	0.162
400 - 2000	f/40	3*f ^{0.5}	0.008*f ^{0.5}
2000 - 300000	50	137	0.36

Table A.1 – EN 62311:2008 Occupational Limits

Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.003 - 0.15	-	87	5
0.15 - 1	-	87	0.73/f
1 - 10	-	87/f ^{0.5}	0.73/f
10 - 400	2	28	0.073
400 - 2000	f/200	1.375*f ^{0.5}	0.0037*f ^{0.5}
2000 - 300000	10	61	0.16

Table A.2 – EN 62311:2008 General Population Limits

Frequency Range (MHz)	Power Density (mW/cm ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	900/f ²	1842/f	4.89/f
30 - 300	1	61.4	0.163
300 - 1500	f/300	-	-
1500 - 100000	5	-	-

Table A.3 – CFR 47 Pt1.1310 (2016) Occupational Limits

Frequency Range (MHz)	Power Density (mW/cm ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	180/f ²	824/f	2.19/f
30 - 300	0.2	27.5	0.073
300 - 1500	f/1500	-	-
1500 - 100000	1	-	-

Table A.4 – CFR 47 Pt1.1310 (2016) General Population Limits



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Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 - 20	10	61.4	0.163
20 - 48	$44.72/f^{0.5}$	$129.8/f^{0.25}$	$0.3444/f^{0.25}$
48 - 100	6.455	49.33	0.1309
100 - 6000	$0.6455*f^{0.5}$	$15.60*f^{0.25}$	$0.04138*f^{0.25}$
6000 - 150000	50	137	0.364

Table A.5 – Health Canada Safety Code 6 Occupational Limits

Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 - 20	2	27.46	0.0728
20 - 48	$8.944/f^{0.5}$	$58.07/f^{0.25}$	$0.1540/f^{0.25}$
48 - 300	1.291	22.06	0.05852
300 - 6000	$0.02619*f^{0.6834}$	$3.142*f^{0.3417}$	$0.008335*f^{0.3417}$
6000 - 15000	10	61.4	0.163

Table A.6 – Health Canada Safety Code 6 General Population Limits

Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 1	-	614	$1.63/f$
1 - 10	$1000/f^2$	614	$1.63/f$
10 - 400	10	61.4	0.163
400 - 2000	$f/40$	$3.07*f^{0.5}$	$0.00814*f^{0.5}$
2000 - 300000	50	137	0.364

Table A.7 – ARPANSA Radiation Protection Series No.3 Occupational Limits

Frequency Range (MHz)	Power Density (W/m ²)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 0.15	-	86.8	4.86
0.15 - 1	-	86.8	$0.729/f$
1 - 10	-	$86.8/f^{0.5}$	$0.729/f$
10 - 400	2	27.4	0.0729
400 - 2000	$f/200$	$1.37*f^{0.5}$	$0.00364*f^{0.5}$
2000 - 300000	10	61.4	0.163

Table A.8 – ARPANSA Radiation Protection Series No.3 General Population Limits