



---

# TECHNICAL REPORT

---

## JOTRON ELECTRONICS AS

EMC TESTING OF BATTERY-CHARGER  
MODEL RCH-20

REPORT No. 2003-3235  
REVISION No. 01

DET NORSKE VERITAS



# TECHNICAL REPORT

Date of first issue: 2003-06-12	Project No.: 42010639
Approved by: Per Ove Øyberg Head of Section <i>Per Ove Øyberg</i>	Organisational unit: Testing, Product & Pers. Certification
Client: Jotron Electronics AS	Client ref.: Eirik Storjordet

DET NORSKE VERITAS  
CERTIFICATION AS

Testing, Product & Pers.  
Certification

Veritasveien 1  
N-1322 HØVIK Norway  
Tel: +47 67 57 99 00  
Fax: +47 67 57 89 60  
http://www.dnv.com  
Org. No: NO 959 627 606 MVA

**Summary:**  
A battery charger model RCH-20 manufactured by Jotron Electronics AS has been EMC tested according to:

- Paragraphs 8.2, 9.3 and 9.4 of EN 300 828, 1998

The tests were carried out in the Environmental Laboratory at Det Norske Veritas, Høvik, Norway 12<sup>th</sup> June and 24<sup>th</sup> June 2003. The purpose of the testing was to qualify the charger for wheel marking in accordance with the EU's Marine Equipment Directive.

**Note:**  
RCH-20 is intended for use together with the handheld VHF radio model TRON TR20 GMDSS manufactured by Jotron Electronics AS.

**Results:**  
With the modification described in Chapter 4.3, the EUT passed all the tests.

Report No.: 2003-3235	Subject Group:
Report title:  <b>EMC Testing of Battery-Charger Model RCH-20</b>	
Work carried out by: Per Gulbrandsen <i>Per Gulbrandsen</i>	
Work verified by: Steinar Andersen <i>Steinar Andersen</i>	
Date of this revision:	Rev. No.: 01
	Number of pages: 5

**Indexing terms**

Key words -CONDUCTED EMISSION -FAST TRANSIENTS -CONDUCTED DISTURBANCES	Service Area
	Market Sector
<input checked="" type="checkbox"/> No distribution without permission from the client or responsible organisational unit (however, free distribution for internal use within DNV after 3 years) <input checked="" type="checkbox"/> No distribution without permission from the client or responsible organisational unit. <input type="checkbox"/> Strictly confidential <input type="checkbox"/> Unrestricted distribution	



<i>Table of Content</i>		<i>Page</i>
1	SCOPE OF WORK.....	1
2	TEST LABORATORY.....	1
3	TEST PERIOD.....	1
4	EQUIPMENT UNDER TEST .....	2
4.1	Equipment submitted for tests	2
4.2	Modes of operation	2
4.3	Modifications during testing	2
5	EVALUATION OF PERFORMANCE DURING THE TESTS.....	2
5.1	Function testing and performance monitoring	2
5.2	Criteria of acceptance	2
6	TESTS.....	3
6.1	Conducted emission	3
6.2	Fast transients	4
6.3	Conducted disturbances induced by RF-fields in the frequency range 150 kHz – 80 MHz	4
7	SUMMARY OF TEST RESULTS.....	5
8	TEST FACILITIES AND INSTRUMENTS .....	5



## 1 SCOPE OF WORK

A battery-charger model RCH-20 manufactured by Jotron Electronics AS has been EMC tested according to the specifications listed below.

The purpose of the testing was to qualify for wheel marking in accordance with the EU's Marine Equipment Directive.

Test specifications:

Paragraph 8.2, 9.3 and 9.4 of EN 300 828, 1998      *Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) for radiotelephone transmitters and receivers for the maritime mobile service operating in the VHF bands*

For each test, reference is made to the relevant section or paragraph in the specifications.

## 2 TEST LABORATORY

Testing was carried out in the Environmental Laboratory at Det Norske Veritas, Høvik, Norway.

Ambient conditions in the laboratory:

Parameter	Required (IEC 60068-1)	Actual
Temperature	15 – 35 °C	23.2 - 23.8 °C
Humidity	25 – 75 % RH	37 - 45% RH
Barometric pressure	860 – 1060 mbar	997 - 1009 mbar

For details about the test facilities and instruments used, see Chapter 8.

## 3 TEST PERIOD

The charger was received for test on 10<sup>th</sup> June 2003. The tests were carried out 12<sup>th</sup> June and 24<sup>th</sup> June 2003.



## 4 EQUIPMENT UNDER TEST

### 4.1 Equipment submitted for tests

Unit	Description	Make	Type	S/N
1	Battery charger	Jotron Electronics	RCH-20	110AB01464 *) 110AC1566 **)
2	Batteries, 2off	-	NiMH 80059	-

\*) Tested on the 12<sup>th</sup> June

\*\*\*) Tested on the 24<sup>th</sup> June, modified.

The charger will from now on be referred to as **EUT (Equipment Under Test)**.

### 4.2 Modes of operation

All testing was carried out with the EUT connected to a 24VDC power supply and in battery-charging mode.

### 4.3 Modifications during testing

The conducted emissions, ref. Chapter 6.1, were initially above the limit at harmonics of 25,15kHz. A new Battery charger with the following modification was tested for conducted emissions on the 24<sup>th</sup> June 2003:

- A filter was inserted at the 24VDC input to the battery-charger. The filter components were L3 with a value of 100 $\mu$ H, and C5 with a value of 330 $\mu$ F.

The modification was assessed not to have any influence on the result of other tests.

## 5 EVALUATION OF PERFORMANCE DURING THE TESTS

### 5.1 Function testing and performance monitoring

During the testing, the EUT was connected to a DC power supply and in battery-charging mode. Flashing red or continuous red signal LED on the EUT showed that it was in charging mode.

### 5.2 Criteria of acceptance

In order to pass each test, the EUT had to meet the following criterion:

Performance criterion	Applies to
- No change in red signal LED	EUT



TECHNICAL REPORT

## 6 TESTS

All the EMC tests were carried out with the EUT in battery-charging mode.

### 6.1 Conducted emission

Test specification:

- EN 300 828, paragraph 8.2

Referenced standard:

- EN 60945; 10 kHz – 30 MHz

Test particulars:

Frequency range	Limits, quasi-peak
10 kHz – 150 kHz	96 – 50 dB $\mu$ V
150 kHz – 350 kHz	60 – 50 dB $\mu$ V
350 kHz – 30 MHz	50 dB $\mu$ V

The EUT was placed directly on the floor (ground plane) in the shielded room.

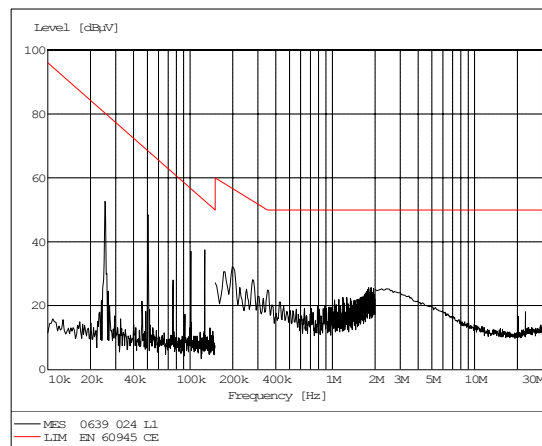


Fig.1 Conducted emissions, + wire

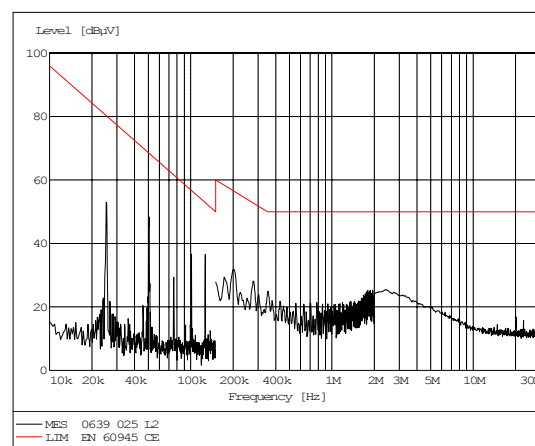


Fig.2 Conducted emissions, - wire

**Result:** The EUT passed the test.

The total uncertainty for this test is as follows:

- Uncertainty in measured values :  $\pm 2.3$  dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.



## 6.2 Fast transients

Test specification:

- EN 300 828, paragraph 9.3

Referenced standard:

- EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test

Test characteristics for power lines:

Parameters	Severity levels
Amplitude	$\pm 2$ kV
Repetition frequency	5 kHz
Duration	3 min per polarity

The EUT was placed on a wooden support, 0.8 m above the ground plane.

**Result:** The EUT passed the test

The total uncertainty for this test is as follows:

- |  |                |
|--|----------------|
| • Uncertainty in rise time (10%/90%) in of the pulse:  | $< \pm 30\%$   |
| • Uncertainty in half width (50%/50%) in of the pulse: | $< \pm 30\%$   |
| • Uncertainty in pulse repetition:                     | $< \pm 20\%$   |
| • Uncertainty in the amplitude of the pulse:           | $< \pm 10.8\%$ |

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

## 6.3 Conducted disturbances induced by RF-fields in the frequency range 150 kHz – 80 MHz

Test specification:

- EN 300 828, paragraph 9.4

Referenced standard:

- EN 61000-4-6: Electromagnetic compatibility (EMC); Part 4: Testing and measurement techniques; Section 6: Immunity to conducted disturbances, induced by radio-frequency fields



## TECHNICAL REPORT

Test characteristics:

Parameters	Severity levels
Frequency	150 kHz - 80 MHz
Amplitude	3 Vrms
Modulation	80% AM, 400 Hz
Sweep rate	$\leq 1.5 \times 10^{-3}$ dec./s
No. of sweeps	1

As the equipment may be installed on bridge or open deck area, the EUT was tested at the following spot frequencies at 10 Vrms, 80 % AM / 400 Hz: 2 – 3 – 4 – 6.2 – 8.2 – 12.6 – 16.5 – 18.8 – 22 and 25 MHz.

**Result:** The EUT passed the test

The total uncertainty for this test is as follows:

- Uncertainty in applied voltage:  $\pm 2.55$  dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

## 7 SUMMARY OF TEST RESULTS

With the modification described in Chapter 4.3, the EUT passed all the tests.

## 8 TEST FACILITIES AND INSTRUMENTS

The following test facilities and instruments were used during the testing:

Instrument description	Make	Model	Serial number
Power Amplifier	Amplifier Research	100A250	20028
Personal Computer	Compac	Deskpro	8711BMY3007
DC Power Supply	Delta Elektronik	SM7020-D	014606000048
Line Impedance Stabilization Network	EMCO	3825/2	1656
Advanced EMC Immunity Test System	KeyTek	EMCPro	0108204
SW for EMCPro	KeyTek	CEWare	P/N 95-000-925-00
Coupling/Decoupling Network	Lüthi	CDN 801-M2/M3	9450196
Signal Generator	Marconi	2030	119486-091
Semi-anechoic Chamber	Ray Proof	Series 81	NA
Spectrum Analyser	Rohde & Schwarz	FSEM30	845986-001
SW for emission testing	Rohde & Schwarz	ES-K1	1026.6790.02

- o0o -