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DELTA Test Report

TEST Reg. no. 19

EMC test of ALTITRACK

Performed for Larsen & Brusgaard Aps

DANAK-1910464
Project no.: A506135-1

26 March 2009

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Title	EMC test of ALTITRACK
Test object	ALTITRACK
Report no.	DANAK-1910464
Project no.	A506135-1
Test period	16 to 18 March 2009
Client	Larsen & Brusgaard Aps Ledreborg Alle 28 4000 Roskilde Denmark Tel.: +45 4648 2480
Contact person	Mads Larsen E-mail: Mads@L-And-B.Dk
Manufacturer	Larsen & Brusgaard ApS
Specifications	EN/(IEC) 61326-1:2006, Class B emission and Industrial immunity
Results	The test objects were found to be in compliance with the specifications, as listed in Section 1
Test personnel	Claus Momme Thomsen Peter Wolf Frandsen

Date 26 March 2009

Project Manager

Peter Wolf Frandsen
Specialist, EMC
DELTA

Responsible

Michael Nielsen
Specialist, EMC
DELTA

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1. Summary of tests

Tests	Test methods	Results
Immunity to electrostatic discharges	EN/(IEC) 61000-4-2:1995+A1+A2	Passed
Immunity to radio frequency electromagnetic fields	EN/(IEC) 61000-4-3:2006	Passed
Immunity to fast transients	EN/(IEC) 61000-4-4:2004	Not relevant, see note 1
Immunity to surge transients	EN/(IEC) 61000-4-5:2006	Not relevant, see note 1
Immunity to conducted radio frequency disturbances	EN/(IEC) 61000-4-6:2007	Not relevant, see note 1
Immunity to power frequency magnetic field	EN/(IEC) 61000-4-8:1993+A1	Not relevant, see note 2
Immunity to AC mains voltage dips and interruptions	EN/(IEC) 61000-4-11:2004	Not relevant, see note 1
Measurement of radio frequency voltage on mains	EN/(CISPR) 55011:1998+A1+A2, Class B	Not relevant, see note 1
Measurement of radio frequency electromagnetic field	EN/(CISPR) 55011:1998+A1+A2, Class B	Passed
Measurement of mains harmonic currents	EN/(IEC) 61000-3-2:2006	Not relevant, see note 1
Measurement of mains voltage variations and flicker	EN/(IEC) 61000-3-3:1995+A1+A2	Not relevant, see note 1

Note:
1) The test object is powered from internal battery and has no cables attached.
2) The test object has no magnetic susceptible components

The given result is based on a shared risk principle with respect to the measurement uncertainty.

Conclusion

The test objects mentioned in this report meet the requirements of the standard stated below.

- EN/(IEC) 61326-1:2006, Class B emission and Industrial immunity.

The test results relate only to the objects tested.

2. Test objects and auxiliary equipment

2.1 Test objects

Test object 2.1.1

Name of test object	ALTITRACK
Model / type	Plastic
Part no.	205340
Serial no.	4
FCC ID	-
Manufacturer	Larsen & Brusgaard ApS
Supply voltage	3.6 V ½ AA
Software version	-
Cycle time	-
Comments	-

Test object 2.1.2

Name of test object	ALTITRACK
Model / type	Aluminium
Part no.	308210
Serial no.	P05308
FCC ID	-
Manufacturer	Larsen & Brusgaard ApS
Supply voltage	3.6 V ½ AA
Software version	-
Cycle time	-
Comments	-

Test object 2.1.3

Name of test object	ALTITRACK
Model / type	Plastic
Part no.	03627
Serial no.	3
FCC ID	-
Manufacturer	Larsen & Brusgaard ApS
Supply voltage	3.6 V ½ AA
Software version	-
Cycle time	-
Comments	-

3. General test conditions

3.1 Test setup during test

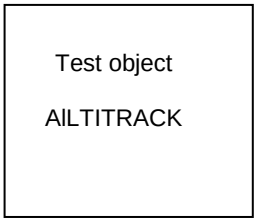


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

The test object was in operational mode prior, during and after test.

During immunity test, the display of the test object showing time, temperature, altitude and enable pictogram was observed.

3.2 Criteria for compliance during immunity test

Performance criteria according to corresponding standard were applied during immunity tests as follows:

General

The test object shall not become dangerous or unsafe as a result of the application of the tests.

Performance criterion A

The test object shall continue to operate as intended during the test.

No data errors allowed.

No error or warning signals from the modules are allowed.

The test object is not allowed to change operating mode.

Performance criterion B

The test object shall continue to operate as intended after the test.

No change of operating state or stored data is allowed.

Performance criterion C

The test object is allowed to have temporary degradation or loss of function or performance, which requires operator intervention or systems reset.

During continuous radio frequency tests the ALTITRACK shall meet performance criterion A, and during transient tests at least criterion B shall be fulfilled.

3.3 Test Sequence

The tests described in this test report were performed in the following sequence:

1.	Measurement of radio frequency electromagnetic field
2.	Immunity to electrostatic discharges
3.	Immunity to radio frequency electromagnetic fields

4. Test results

4.1 Immunity to electrostatic discharges

Test object	ALTITRACK	Sheet	ESD-1
Type	Plastic	Project no.	A506135-1
Serial no.	4	Date	16 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	PWF
Specification	EN/(IEC) 61326-1:2006	Required Perf. criter.	B

Test method	EN/(IEC) 61000-4-2:1995+A1+A2	Temperature	22 °C
Characteristics	Discharge network: 150 pF, 330 Ω	Humidity	38 % RH
Test equipm.	Midilab Hørsholm 49562, Uncertainty 5 %		

Surface under test	Test standard's name of surface	Coupling of discharges	No of disch. each combin.	Amplitude [kV]	Re-sponse	Remarks
Enclosure	Enclosure	HCP contact	10	+/- 2 and 4	No	Ok
Enclosure	Enclosure	VCP contact	10	+/- 2 and 4	No	Ok
Enclosure	Metallic	Direct contact	10	+/- 2 and 4	No	Ok
Enclosure	Insulated	Direct air	10	+/- 2, 4, and 8	No	Ok

Note 1:

Criteria for compliance: See section 3.2

Test result: The discharges caused no malfunctions

Compliant: Yes

Comments: None

Photo 4.1.1 Test setup regarding immunity to electrostatic discharges.

Photo 4.1.2 Test setup regarding immunity to electrostatic discharges.

Photo 4.1.3 Test setup regarding immunity to electrostatic discharges.

Photo 4.1.4 Test setup regarding immunity to electrostatic discharges.

Test object	ALTITRACK	Sheet	ESD-2
Type	Aluminium	Project no.	A506135-1
Serial no.	P05308	Date	16 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	PWF
Specification	EN/(IEC) 61326-1:2006	Required Perf. criter.	B

Test method	EN/(IEC) 61000-4-2:1995+A1+A2	Temperature	22 °C
Characteristics	Discharge network: 150 pF, 330 Ω	Humidity	38 % RH
Test equipm.	Midilab Hørsholm 49562, Uncertainty 5 %		

Surface under test	Test standard's name of surface	Coupling of discharges	No of disch. each combin.	Amplitude [kV]	Re-sponse	Remarks
Enclosure	Enclosure	HCP contact	10	+/- 2 and 4	No	Ok
Enclosure	Enclosure	VCP contact	10	+/- 2 and 4	No	Ok
Enclosure	Metallic	Direct contact	10	+/- 2 and 4	No	Ok
Enclosure	Insulated	Direct air	10	+/- 2, 4, and 8	No	Ok

Note 1:

Criteria for compliance See section 3.2

Test result The discharges caused no malfunctions

Compliant Yes

Comments None

Photo 4.1.5 Test setup regarding immunity to electrostatic discharges.

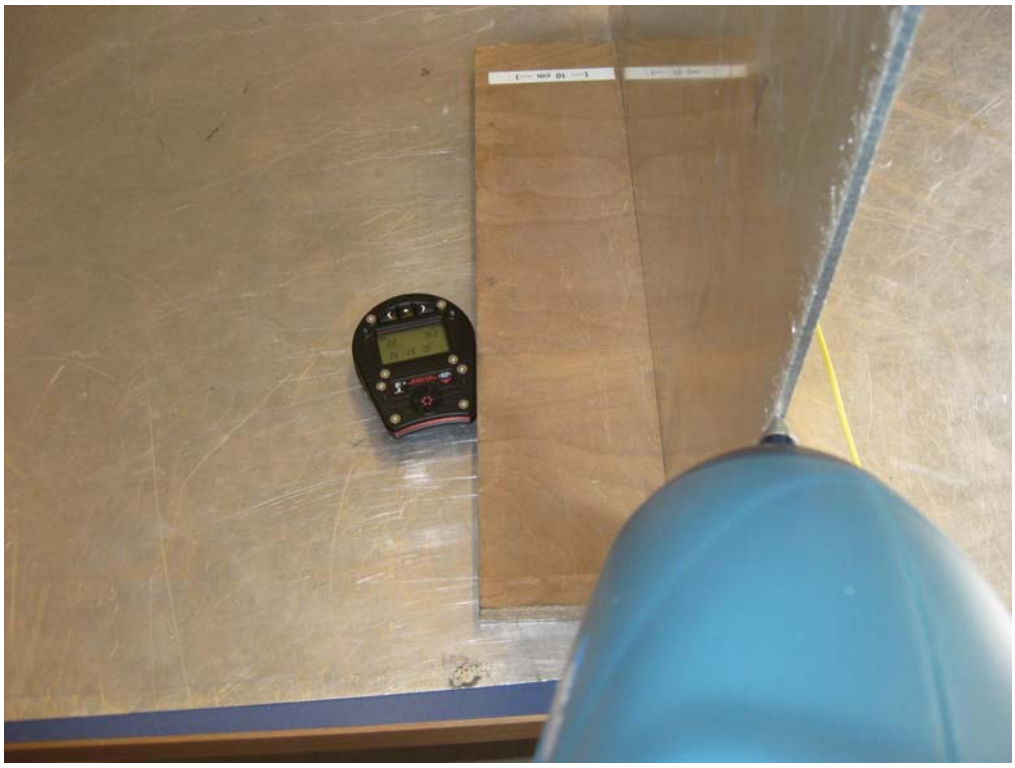


Photo 4.1.6 Test setup regarding immunity to electrostatic discharges.

Photo 4.1.7 Test setup regarding immunity to electrostatic discharges.

Photo 4.1.8 Test setup regarding immunity to electrostatic discharges.

4.2 Immunity to radio frequency electromagnetic field

Test object	Combination of 2.1. 2: ALTITRACK 2. 1.3: ALTITRACK	Sheet	RF Field-1
Type	Aluminium, plastic	Project no.	A506135-1
Serial no.	P05308, 3	Date	18 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	CMT
Specification	EN/(IEC) 61326-1:2006	Required Perf. criter.	A

Test method	EN/(IEC) 61000-4-3:2006	Temperature	19 °C
Characteristics	16 point pre-Calibration	Humidity	36 % RH
Test equipm.	EMC room 1 Hørsholm 29846 49353 29744 29776 29777 29985 29691 29984 29342 49000 49001 29694, Uncertainty: +/-1.7dB		

Frequency range	Modulation	Field direction	Amplitude [V/m]	Response	Remarks
80-1000 MHz	80 % AM 1 kHz	Vertical	10	No	Ok, Note 1
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	No	Ok, Note 1
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	No	Ok, Note 2
80-1000 MHz	80 % AM 1 kHz	Vertical	10	No	Ok, Note 2
1-2.7 GHz	80 % AM 1 kHz	Vertical	3	No	Ok, Note 2
1-2.7 GHz	80 % AM 1 kHz	Horizontal	3	No	Ok, Note 2
1-2.7 GHz	80 % AM 1 kHz	Horizontal	3	No	Ok, Note 1
1-2.7 GHz	80 % AM 1 kHz	Vertical	3	No	Ok, Note 1

Note 1: Front of the test object is facing the antenna
Note 2: Side of the test object is facing the antenna

Criteria for compliance: See section 3.2

Test result: The radio frequency electromagnetic field caused no malfunctions

Compliant: Yes

Setup comments: Frequency step: 1 %, dwell time: 1 second

Comments: None

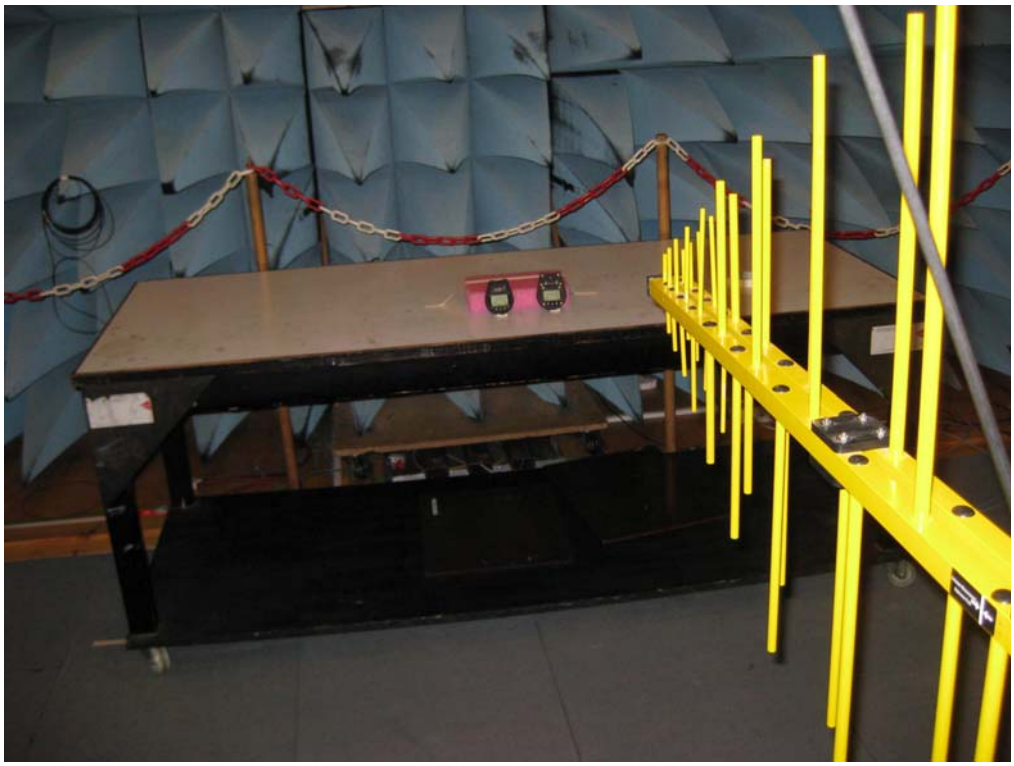


Photo 4.2.1 Test setup regarding immunity to radio frequency electromagnetic field.

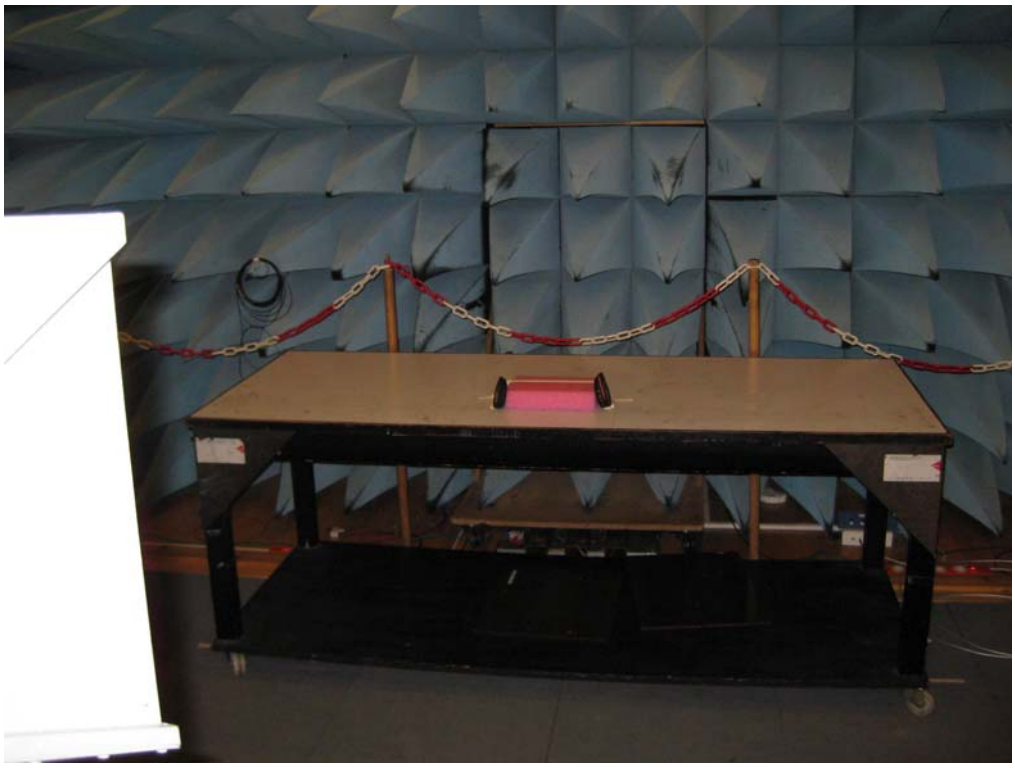
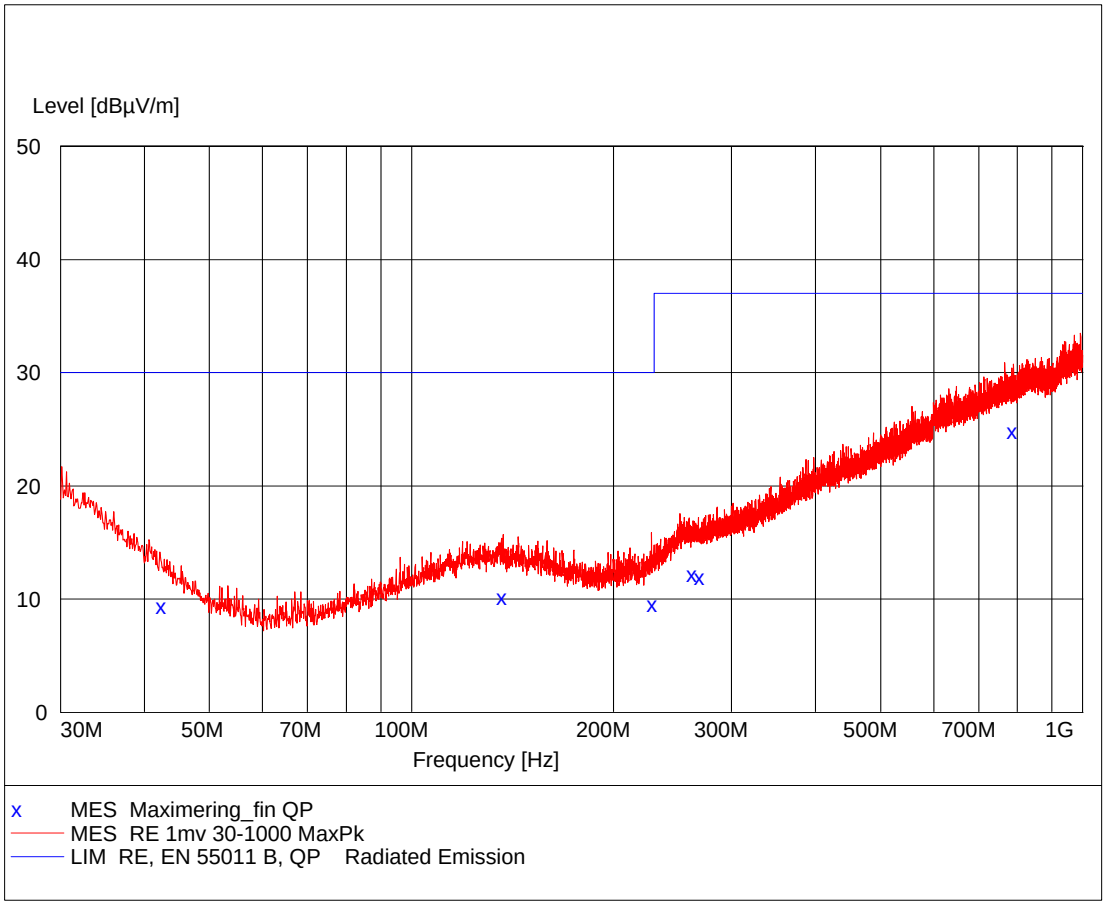


Photo 4.2.2 Test setup regarding immunity to radio frequency electromagnetic field.

4.3 Measurement of radio frequency electromagnetic field

Test object	Combination of 2.1.1: ALTITRACK 2.1.2: ALTITRACK	Sheet	RE-1
Type	Plactic, aluminium	Project no.	A506135-1
Serial no.	4, P05308	Date	16 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	PWF
Specification	EN/(IEC) 61326-1:2006	Frequency	30-1000 MHz

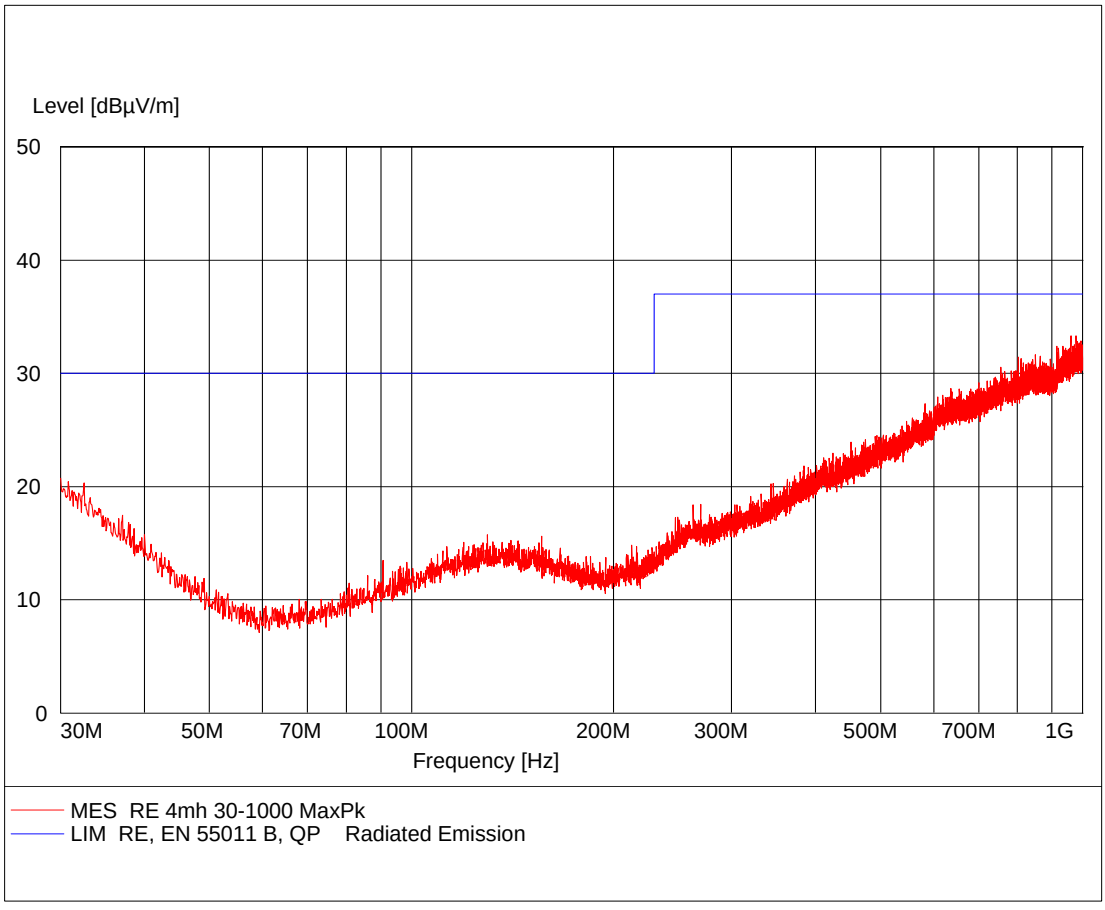
Test method	EN/(CISPR) 55011:1998+A1+A2, Class B	Temperature	22 °C
Characteristics	Pre-scan, Antenna at 10 m, 1 m height, vert. pol.	Humidity	34 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29461 49555 29861 29797	Uncertainty	4 dB



Comments None

Test object	Combination of 2.1.1: ALTITRACK 2.1.2: ALTITRACK	Sheet	RE-2
Type	Plactic, aluminium	Project no.	A506135-1
Serial no.	4, P05308	Date	16 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	PWF
Specification	EN/(IEC) 61326-1:2006	Frequency	30-1000 MHz

Test method Characteristics	EN/(CISPR) 55011:1998+A1+A2, Class B Pre-scan, Antenna at 10 m, 4 m height, hor. pol.	Temperature Humidity	22 °C 34 % RH
Detector	Peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29461 49555 29861 29797	Uncertainty	4 dB



Comments None

Test object	Combination of 2.1.1: ALTITRACK 2.1.2: ALTITRACK	Sheet	RE-3
Type	Plactic, aluminium	Project no.	A506135-1
Serial no.	4, P05308	Date	16 Mar. 2009
Client	Larsen & Brusgaard Aps	Initials	PWF
Specification	EN/(IEC) 61326-1:2006	Frequency	30-1000 MHz

Test method Characteristics	EN/(CISPR) 55011:1998+A1+A2, Class B Peak search ant. at 10 m, height: 1-4 m, v/h pol.	Temperature Humidity	22 °C 34 % RH
Detector	Quasi peak	Bandwidth	120 kHz
Test equipm.	EMI room Hørsholm 29461 49555 29861 29797	Uncertainty	4 dB

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
42.596000	9.40	11.8	30.0	20.6	139.0	100.00	VERTICAL
136.900000	10.20	12.4	30.0	19.8	101.0	168.00	HORIZONTAL
229.450000	9.50	11.6	30.0	20.5	120.0	358.00	VERTICAL
262.700000	12.20	14.2	37.0	24.8	237.0	91.00	VERTICAL
269.600000	11.90	14.0	37.0	25.1	227.0	206.00	VERTICAL
788.890000	24.80	24.8	37.0	12.2	298.0	327.00	HORIZONTAL

Test result — The measured field strengths are below the limit

Compliant — Yes

Comments — Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation

Photo 4.3.1 Test setup regarding measurement of radio frequency electromagnetic field.

Photo 4.3.2 Test setup regarding measurement of radio frequency electromagnetic field.

5. National registrations and accreditations

5.1 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 90529

Facilities:
OATS Hørsholm (EMC-0)
EMC room 2 Hørsholm (EMC-2)
EMC room 3 Hørsholm (EMC-3)
EMC room 4 Hørsholm (EMC-4)
EMI room Hørsholm (EMC-5)

5.2 VCCI Registrations

Organization: Voluntary Control Council for Interference by Information Technology, Japan

Member Number: 910

Facilities:

OATS Hørsholm (EMC-0):	R-691
EMC room 2 Hørsholm (EMC-2):	C-707 and T-246
EMC room 3 Hørsholm (EMC-3):	C-2532 and T-247
EMC room 4 Hørsholm (EMC-4):	C-2533 and T-248
EMI room Hørsholm (EMC-5):	R-1180, C-706 and T-249

5.3 IC Registrations

Organization: Industry Canada, Certification and Engineering Bureau

Registration Number: IC4187-5

Facilities: EMI room Hørsholm (EMC-5)

5.4 DANAK Accreditation

Organization: Danish Accreditation and Metrology Fund - DANAK, see www.danak.dk and www.ilac.org

Registration Number: 19C

DANAK is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement). The MRA includes the Australian NATA and Canadian SCC.

CISPR 22 is equivalent to AS/NZS CISPR 22, and therefore this report can be used for applying the **Australian C-Tick mark** for IT equipment, when this test has been passed.

CISPR 22:2002 is equivalent to ICES-003:2004, and therefore this report can be used for approval in Canada for IT equipment, when this test has been passed.

6. List of instruments

NO.	DESCRIPTION	MANUFACTURER	TYPE NO.
29691	0.01 - 20 GHz SYNTH. SWEEPER	HEWLETT-PACKARD	83620A
29461	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2-Z5
29984	RF POWER AMPLIFIER, 0.8-2.2 GHz, 200 W	MILMEGA	AS0822-200
49000	SINGLE CHANNEL POWER METER DISPLAY UNIT	ROHDE & SCHWARZ	NRVS
49001	THERMAL POWER SENSOR, DC-18 GHz	ROHDE & SCHWARZ	NRV-Z51
29985	BILOG ANTENNA 26-2000 MHz	SCHAFFNER/CHASE	6140A
29846	RF GENERATOR, 9 kHz - 2.4 GHz	MARCONI	2024
29342	REFLECTOMETER COUPLER, 600-4200 MHz	ROHDE & SCHWARZ	ZPD
29694	1-12 GHz HORN ANTENNA.	LOGIMETRICS	AN 8200 F
29777	RF POWER METER, ROOM 1	HEWLETT-PACKARD	437B, OPT. 002
29776	RF POWER SENSOR, 100 kHz - 4.2 GHz, ROOM 1	HEWLETT-PACKARD	8482A
29744	RF DIRECTIONAL COUPLER, 26-1000 MHz, ROOM 1	SPINNER	BN 52 76 76
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A
49562	ESD GENERATOR, AIR AND CONTACT DISCHARGE	SHAFFNER	NSG438
29861	EMI-SOFTWARE VER. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02
49353	HIGH POWER RF AMPLIFIER, 80-1000 MHz, 500 W	AMPLIFIER RESEARCH	500W1000M7