REPORT

issued by an Accredited Testing Laboratory

Date	Reference	Page
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EMC test of A-tau thermal image camera A35

(12 appendices)

Test object

A-tau thermal image camera A35

- A-tau thermal image camera, serial number: T197737
- AC/DC adapter, serial number: NT11281G00406

Summary

The functional specification was supplied by the client.
The functional tests were performed by representatives of the client.
The functional criteria can be found in Appendix 1.

Standard	Compliant	Appendix	Remarks
Emission: EN 61000-6-3:2007	**Yes**		
Radiated emission	Yes	2	Note 1, 2
Conducted emission	Yes	3	
EN 61000-3-2 Harmonics	Yes	4	
EN 61000-3-3 Voltage fluctuations and flicker	Yes	5	
Immunity: EN 61000-6-2:2005	Yes		
EN 61000-4-2 Electrostatic discharge	Yes	6	
EN 61000-4-3 RF electromagnetic field	Yes	7	
EN 61000-4-4 Fast transients	Yes	8	
EN 61000-4-5 Surges	Yes	9	
EN 61000-4-6 RF conducted disturbances	Yes	10	
EN 61000-4-8 Power frequency magnetic field	Yes	11	
EN 61000-4-11 Voltage dips and interruptions	Yes	12	

Note 1: During the test the EUT was powered by 120 V/60 Hz.
Note 2: The EUT was connected to a personal computer system inside the anechoic chamber.

SP Technical Research Institute of Sweden
Electronics - EMC

Performed by

Bengt Andersson

Examined by

Tomas Bodeklint

Test object

The A-Tau thermal image camera consists of optics, thermal image sensor, power circuitry and Ethernet connection in small aluminium housing. The camera is configured and streams pictures over Ethernet. A separate power supply is connected either through Ethernet or the separate optional power connector.

Performance test and requirements

Functional tests before, during and after the immunity tests were performed in order to verify compliance with the performance criteria as specified by the client.

Immunity test

Operation mode during immunity tests:

The camera was set up in normal working mode and connected to a monitoring PC outside the test chamber. The picture from the camera was streamed to and presented on the PC display. The PC display was visually monitored during test.

Performance criterion A: Normal operation
The EUT shall continue to operate as intended during and after the test.

Performance criterion B: Reduced performance 1
The EUT shall continue to operate as intended after the test, without any manual reset or reset command. No change of stored data or actual operation status is allowed.

Performance criterion C: Reduced performance 2
Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Emission measurement

During the emission measurements the functional mode was the same as above.

The EUT was powered by 120 V/60Hz during the radiated emission test.

Functional test equipment

LapTop Dell Latitude E6410	Client equipment
LapTop power supply Dell, LA90PE1-01	Client equipment

Uncertainties

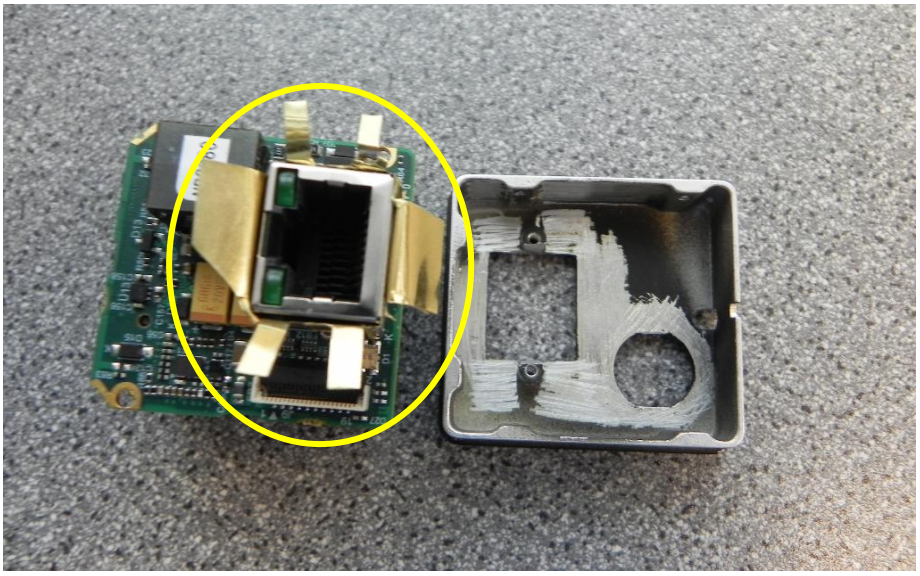
Measurement and test instrument uncertainties are described in the quality assurance documentation”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence). The measurement uncertainties can be found in the table below:

Standard	Method	Uncertainty
EN 61000-4-3	Radiated electromagnetic field	1.5 dB
EN 61000-4-6	Injected radio frequent disturbances	1.5 dB
EN 55011/22	Radiated emission, 30 – 1000 MHz	4.8/5.6 dB (V/H-pol)
	Radiated emission, 1 – 40GHz	2.6 dB
	Conducted emission, power port	3.5 dB
	Conducted emission, telecom port	3.3 dB
EN 61000-3-2	Harmonics	1 %
EN 61000-3-3	Flicker	6 %

Reservation

The test results in this report apply only to the particular test object as declared in the report.

To reduce the radiated emission level the following modification was performed by the client: A plate which contacts the Ethernet connector to the chassis. An overview of the modification is shown in the picture below.



Delivery of test object

The client delivered the test object on the dates of the test.

Test participant

Göran Skedung, FLIR Systems AB

Test engineers

Azhar Abbas, Bengt Andersson and Bengt Andersson, SP

Radiated emission measurements according to EN 61000-6-3:2007
Test method EN 55016-2-3:2010 (applicable parts)

Date	Temperature	Humidity
2012-04-23	22 °C ± 3 °C	35 % ± 5 %

Test set-up and procedure

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3 m.

The measurement procedure is as follows:

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the average detector above 1 GHz.

The test set-up during the test can be seen in the picture below:

Cable types and terminations can be found in the table below:

I/O port	Cable type	Cable length	Termination
AC/DC adaptor for A-tau thermal image camera	Unshielded	1 m	Connected to power outlet in chamber floor via an extension cable
Ethernet	Shielded USB	3 m	Connected to the computer type LapTop Dell Latitude E6410
General purpose port	Shielded cable	3m	No termination, bundled

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
EMI measurement computer	-
Software R&S EMC32, ver. 8.5.1	503 889
EMI test receiver R&S ESIB 26	503 885
Antenna Schaffner CBL 6143	504 079
Rosenberger antenna cable N-N	504 101
Temperature and humidity meter Testo 625	504 117

Remarks

During the test the EUT was powered with 120 V / 60 Hz.

Result

The radiated emission spectra can be found in the diagrams below:

Diagram 1:	Ambient
Diagram 2:	Radiated emission, 30-1000 MHz
Diagram 3:	Radiated emission, 1-2GHz

Emission below limit?	Yes

Diagram 1: Ambient

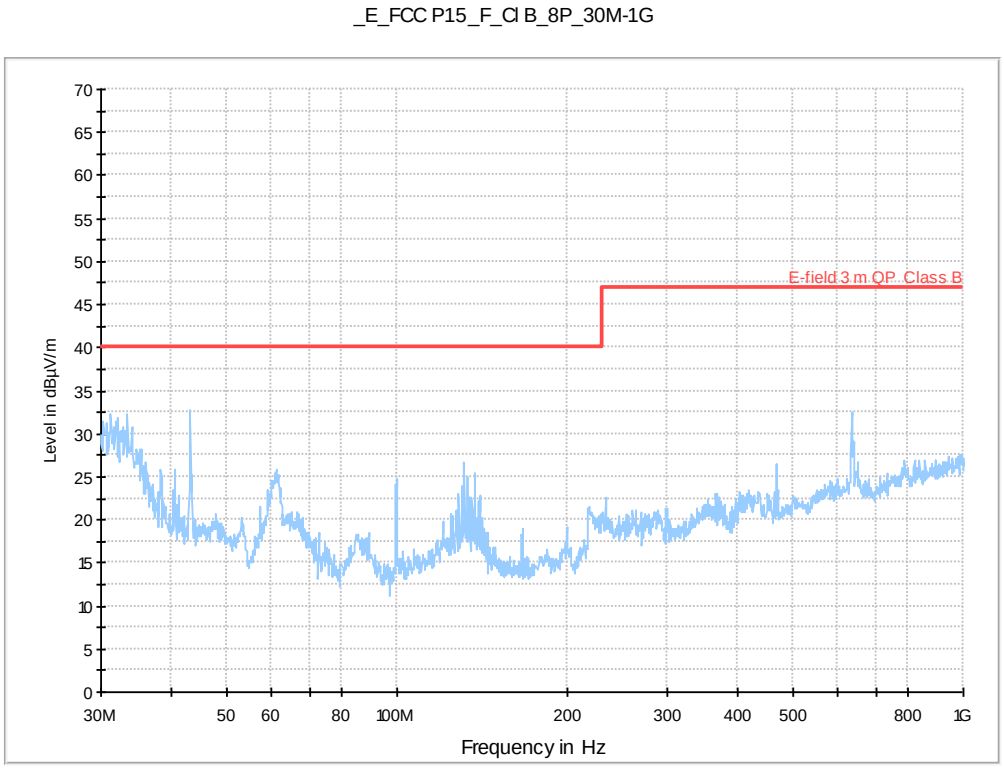
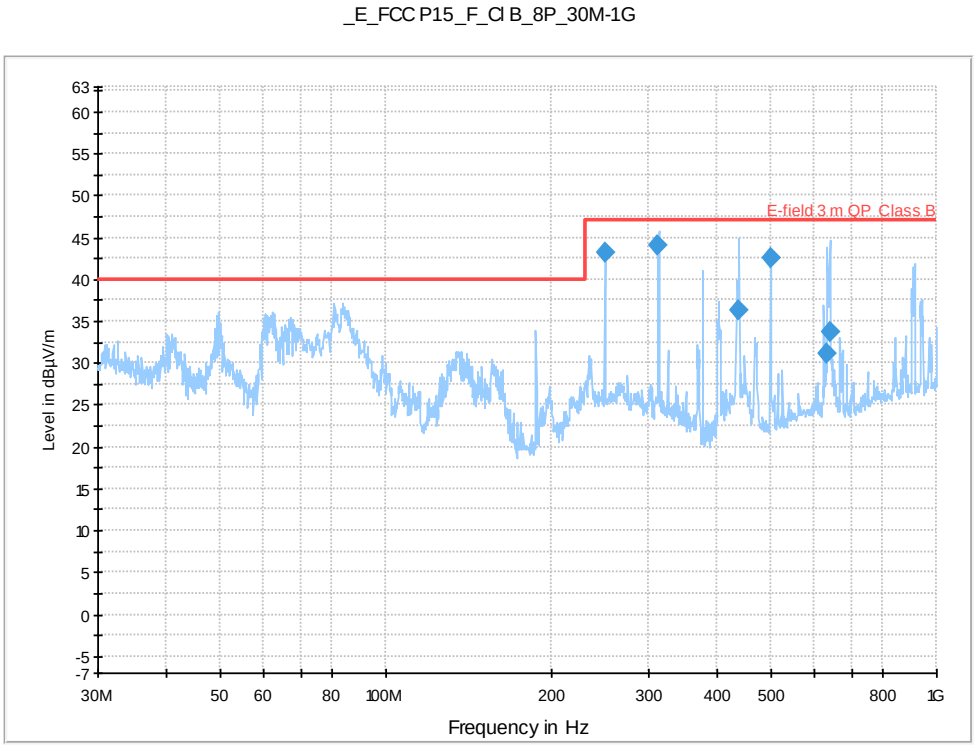


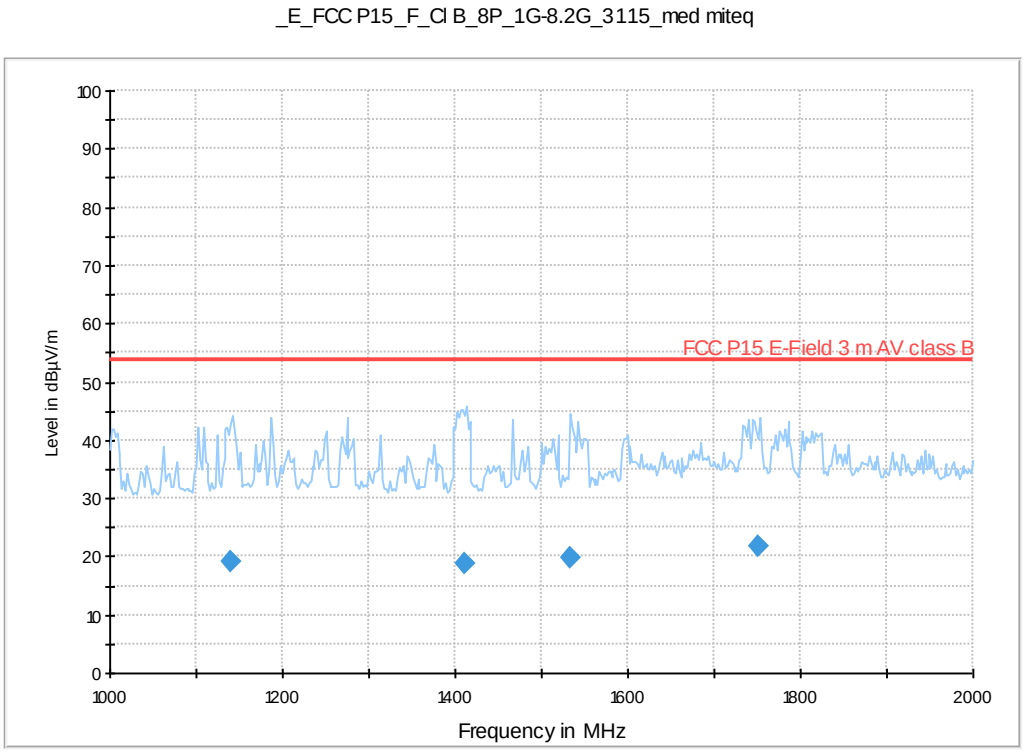
Diagram 2: Radiated emission, 30-1000 MHz



Final test, quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
249.986974	43.2	5000.0	120.000	108.0	H	291.0	13.9	3.8	47.0
312.481964	44.1	5000.0	120.000	100.0	H	45.0	15.4	3.9	47.0
438.522044	36.2	5000.0	120.000	100.0	H	266.0	17.8	10.8	47.0
499.998998	42.6	5000.0	120.000	144.0	V	235.0	19.2	4.4	47.0
633.668337	31.2	5000.0	120.000	108.0	V	243.0	20.9	15.8	47.0
640.920842	33.7	5000.0	120.000	100.0	V	255.0	21.2	13.3	47.0

Diagram 3: Radiated emission, 1 – 2 Hz



Final measurement: Average

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1139.709419	19.3	5000.0	1000.000	151.0	V	222.0	-19.9	34.6	53.9
1410.951904	19.0	5000.0	1000.000	194.0	H	131.0	-20.2	34.9	53.9
1534.418837	19.7	5000.0	1000.000	121.0	H	217.0	-19.8	34.2	53.9
1752.054108	21.8	5000.0	1000.000	100.0	H	69.0	-17.5	32.1	53.9

Conducted emission measurements according to EN 61000-6-3:2007
Test method EN 55016-2-1:2009 (applicable parts)
EN 55022:2006, /A1:2007 class B (telecom port)

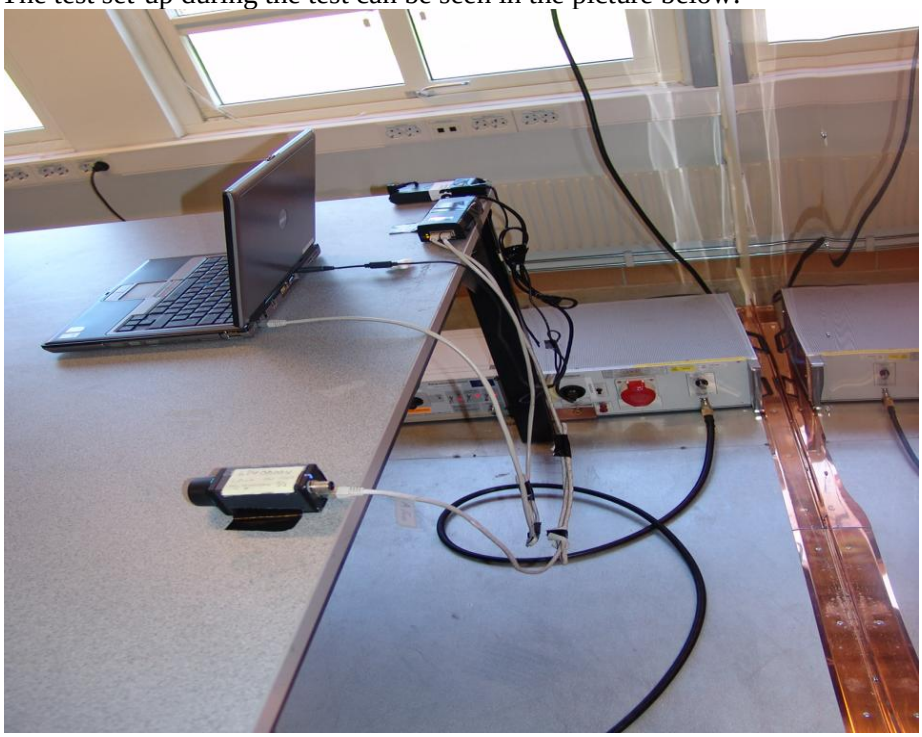
Date	Temperature	Humidity
2011-11-30(Note 1)	22°C ± 3 °C	35 % ± 5 %
2012-05-07(Note 2)	23°C ± 3 °C	16 % ± 5 %

Note 1: Test on the Ethernet
Note 2: Test on the AC/DC adaptor with SN:1206802G00035Z

Test set-up and procedure

Measurements were performed on the 230 V AC/50 Hz, phase and neutral.

The test set-up during the test can be seen in the picture below:



Cable types and terminations can be found in the table below:

I/O port	Cable type	Cable length	Termination
AC/DC adaptor for A-tau thermal image camera	Unshielded	1 m	Connected to power outlet in chamber floor via an extension cable
Ethernet	Shielded USB	3 m	Connected to the computer type LapTop Dell Latitude E6410
General purpose port	Shielded cable	3m	No termination, bundled

Measurement equipment	SP number
Test site, Hertz	15:116
Control computer Fujitsu Siemens	-
Software R&S EMC32, ver. 8.20.1	503 899
Spectrum analyser R&S ESI 40	503 125
LISN Schwarzbeck NSLK 8126	503 114
ISN Teseq ST08, shielded Ethernet	900 121
Temperature and humidity meter Testo 615	503 498

Result

The conducted emission spectra can be found in the diagrams below:

Diagram 1:	Ambient
Diagram 2:	Phase
Diagram 3:	Neutral
Diagram 4:	Ethernet

Emission below limit?	Yes

Diagram 1: Ambient

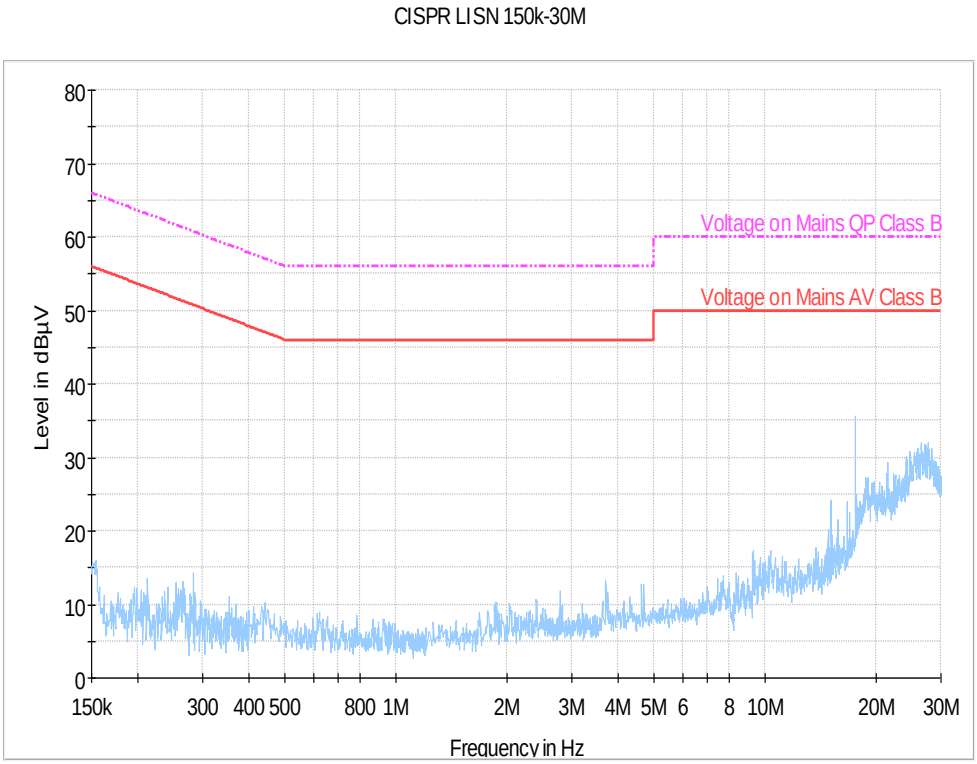
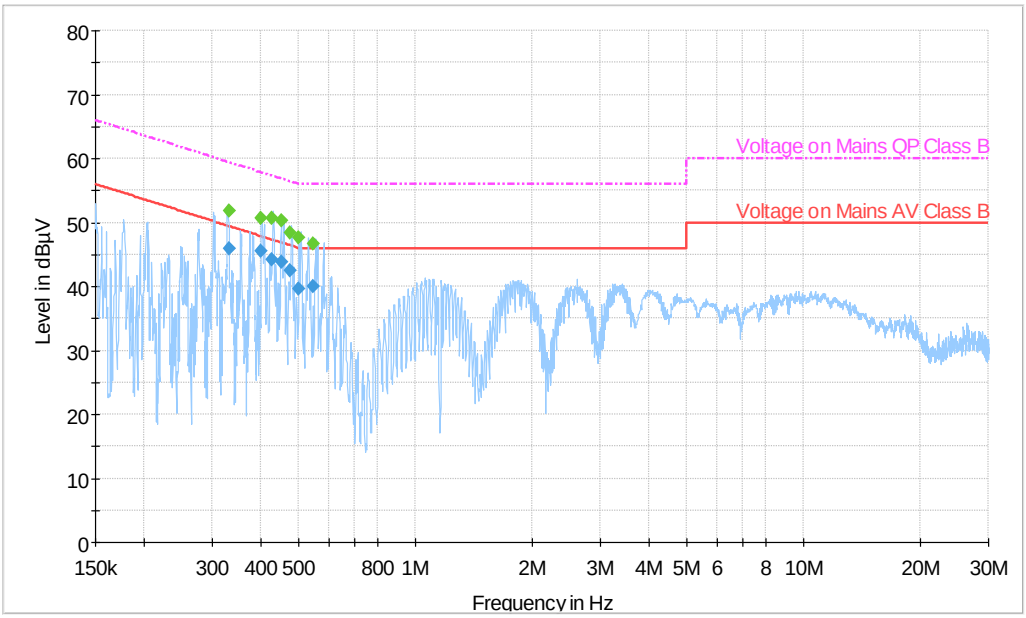


Diagram 2: Conducted emission, phase

CISPR LISN 150k-30M



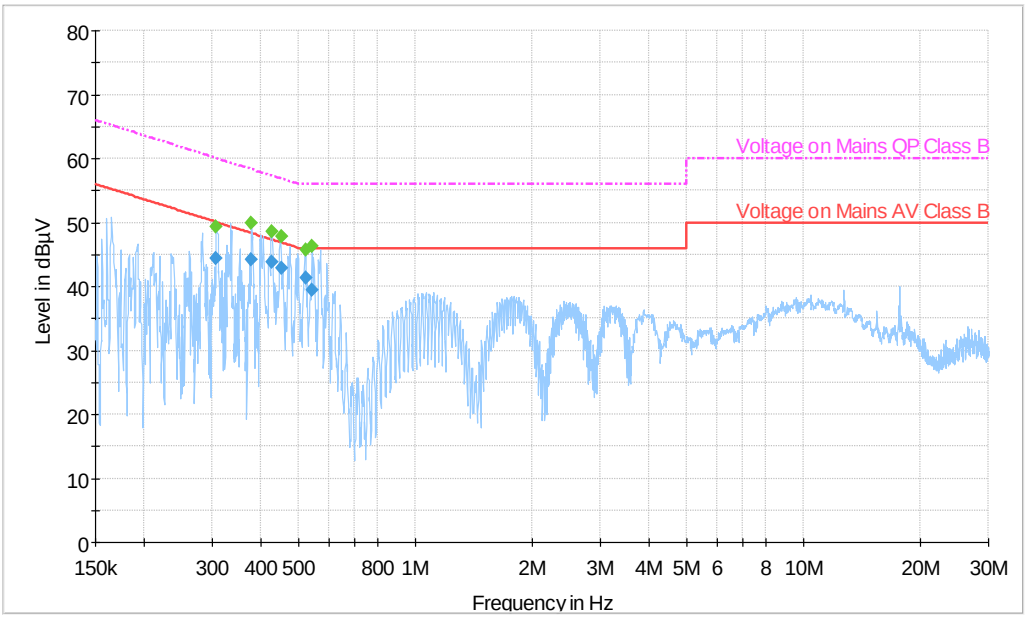
Final measurement: CAverage

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.332200	45.8	5000.0	9.000	GN	0.1	3.6	49.4
0.401630	45.5	5000.0	9.000	GN	0.1	2.3	47.8
0.427999	44.1	5000.0	9.000	GN	0.1	3.2	47.3
0.451629	43.8	5000.0	9.000	GN	0.1	3.0	46.8
0.476724	42.5	5000.0	9.000	GN	0.1	3.9	46.4
0.499705	39.7	5000.0	9.000	GN	0.1	6.3	46.0
0.544260	39.9	5000.0	9.000	GN	0.1	6.1	46.0

Final measurement: QP detector

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.332200	51.8	5000.0	9.000	GN	0.1	7.6	59.4
0.401630	50.6	5000.0	9.000	GN	0.1	7.2	57.8
0.427999	50.7	5000.0	9.000	GN	0.1	6.6	57.3
0.451629	50.3	5000.0	9.000	GN	0.1	6.5	56.8
0.476724	48.3	5000.0	9.000	GN	0.1	8.1	56.4
0.499705	47.7	5000.0	9.000	GN	0.1	8.3	56.0
0.544260	46.6	5000.0	9.000	GN	0.1	9.4	56.0

Diagram 3: Conducted emission, neutral



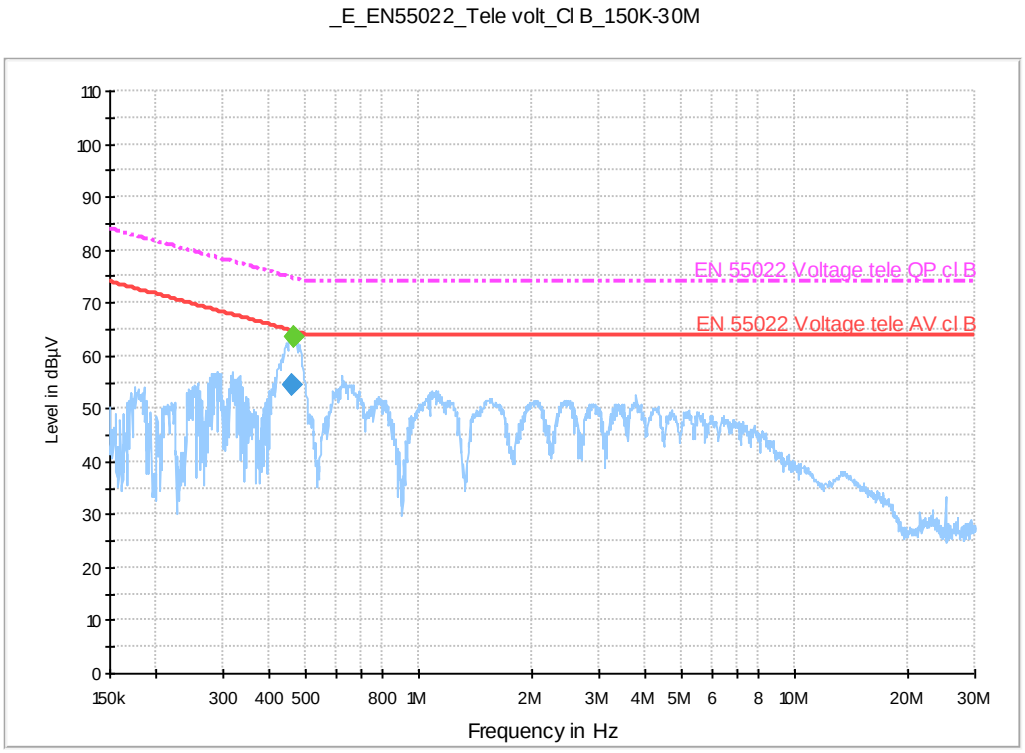
Final measurement: Average

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.306410	44.3	5000.0	9.000	GN	0.1	5.7	50.1
0.377510	44.2	5000.0	9.000	GN	0.1	4.1	48.3
0.427985	43.8	5000.0	9.000	GN	0.1	3.5	47.3
0.451674	42.8	5000.0	9.000	GN	0.1	4.0	46.8
0.522899	41.4	5000.0	9.000	GN	0.1	4.6	46.0
0.542117	39.4	5000.0	9.000	GN	0.1	6.6	46.0

Final measurement: QP detector

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.306410	49.4	5000.0	9.000	GN	0.1	10.7	60.1
0.377510	49.9	5000.0	9.000	GN	0.1	8.4	58.3
0.427985	48.5	5000.0	9.000	GN	0.1	8.8	57.3
0.451674	47.8	5000.0	9.000	GN	0.1	9.1	56.8
0.522899	45.7	5000.0	9.000	GN	0.1	10.3	56.0
0.542117	46.3	5000.0	9.000	GN	0.1	9.7	56.0

Diagram 4: Conducted emission, Ethernet



Final measurement: Average

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.459335	54.3	5000.0	9.000	9.7	10.4	64.7
0.460064	54.3	5000.0	9.000	9.7	10.4	64.7

Final measurement: QP detector

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.461335	63.6	5000.0	9.000	9.7	11.1	74.7
0.464064	63.4	5000.0	9.000	9.7	11.2	74.6

Harmonic current emissions measurement according to EN 61000-3-2:2006. A1:2009, A2:2009

Date	Temperature	Humidity
2011-12-01	23°C ±3 °C	27 % ±5 %

Test conditions and procedure

According to the manufacturer's information, the test object does not include techniques that are not allowed according to clause 6.1 in EN 61000-3-2.

The harmonic measurement was started 10 seconds after the power to the EUT was turned on.
Test voltage and frequency: 230 V AC/ 50 Hz
Equipment classification: class A
Observation period: 2.5 minutes.

Number of tests: 1 (Note 1).

Note 1: A repeated test, to verify repeatability according to EN 61000-3-2 clause 6.2.3.1, was judged not to be necessary due to the large margins.

Measurement equipment	SP number
Test site Hertz	15:116
Computer	—
IEC 61000 Software for PM6000 1.12.05 RC1	—
Voltech PM 6000 A, Power Analyser	504 201
HP 6813B, Universal power supply	503 091
Temperature and humidity meter Testo 615	503 498

Result

Measured power, camera, normal operation: 18.2 W

Appendix 4

The requirements and the measured harmonics during normal operation are shown in the tables below:

Harmonic	Limit 1	Limit 2	Average Reading	<L1	<L2	Max Reading	<L2	Pass/FAIL
2	1.0800A	1.6200A	1.071mA	✓	✓	1.210mA	✓	N/A
3	2.3000A	3.4500A	83.10mA	✓	✓	84.00mA	✓	N/A
4	430.0mA	645.0mA	1.019mA	✓	✓	1.150mA	✓	N/A
5	1.1400A	1.7100A	79.77mA	✓	✓	80.57mA	✓	N/A
6	300.0mA	450.0mA	0.944mA	✓	✓	1.078mA	✓	N/A
7	770.0mA	1.1550A	74.97mA	✓	✓	75.66mA	✓	N/A
8	230.0mA	345.0mA	0.855mA	✓	✓	0.993mA	✓	N/A
9	400.0mA	600.0mA	68.95mA	✓	✓	69.52mA	✓	N/A
10	184.0mA	276.0mA	0.768mA	✓	✓	0.894mA	✓	N/A
11	330.0mA	495.0mA	62.01mA	✓	✓	62.50mA	✓	N/A
12	153.3mA	230.0mA	0.705mA	✓	✓	0.833mA	✓	N/A
13	210.0mA	315.0mA	54.51mA	✓	✓	54.93mA	✓	N/A
14	131.4mA	197.1mA	0.658mA	✓	✓	0.774mA	✓	N/A
15	150.0mA	225.0mA	46.84mA	✓	✓	47.18mA	✓	N/A
16	115.0mA	172.5mA	0.651mA	✓	✓	0.769mA	✓	N/A
17	132.3mA	198.5mA	39.42mA	✓	✓	39.69mA	✓	N/A
18	102.2mA	153.3mA	0.666mA	✓	✓	0.784mA	✓	N/A
19	118.4mA	177.6mA	32.65mA	✓	✓	32.90mA	✓	N/A
20	92.00mA	138.0mA	0.687mA	✓	✓	0.795mA	✓	N/A
21	107.1mA	160.7mA	26.94mA	✓	✓	27.19mA	✓	N/A
22	83.63mA	125.4mA	0.704mA	✓	✓	0.808mA	✓	N/A
23	97.82mA	146.7mA	22.59mA	✓	✓	22.87mA	✓	N/A
24	76.66mA	115.0mA	0.697mA	✓	✓	0.801mA	✓	N/A
25	90.00mA	135.0mA	19.72mA	✓	✓	20.03mA	✓	N/A
26	70.76mA	106.1mA	0.682mA	✓	✓	0.792mA	✓	N/A
27	83.33mA	125.0mA	18.11mA	✓	✓	18.46mA	✓	N/A
28	65.71mA	98.57mA	0.648mA	✓	✓	0.748mA	✓	N/A
29	77.58mA	116.3mA	17.25mA	✓	✓	17.62mA	✓	N/A
30	61.33mA	92.00mA	0.617mA	✓	✓	0.724mA	✓	N/A
31	72.58mA	108.8mA	16.65mA	✓	✓	17.00mA	✓	N/A
32	57.50mA	86.25mA	0.591mA	✓	✓	0.695mA	✓	N/A
33	68.18mA	102.2mA	15.89mA	✓	✓	16.21mA	✓	N/A
34	54.11mA	81.17mA	0.567mA	✓	✓	0.676mA	✓	N/A
35	64.28mA	96.42mA	14.83mA	✓	✓	15.11mA	✓	N/A
36	51.11mA	76.66mA	0.570mA	✓	✓	0.671mA	✓	N/A
37	60.81mA	91.21mA	13.45mA	✓	✓	13.68mA	✓	N/A
38	48.42mA	72.63mA	0.578mA	✓	✓	0.678mA	✓	N/A
39	57.69mA	86.53mA	11.83mA	✓	✓	12.05mA	✓	N/A
40	46.00mA	69.00mA	0.591mA	✓	✓	0.693mA	✓	N/A

Emission below limit?	Yes

Voltage fluctuations and flicker measurement according to EN 61000-3-3:2008

Date	Temperature	Humidity
2011-12-01	23 °C ±3 °C	27 % ±5 %

Test set-up and procedure

Observation time, during normal operation: 10 minutes.

Limits

Short term flicker Pst=1
Long term flicker Plt=0.65
The value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms.
The relative steady state voltage change, dc, shall not exceed 3.3 %.
The maximum relative voltage change dmax, shall not exceed

- 4 % without additional requirements.
- 6 % for equipment which is switched manually or switched on automatically, with delayed restart after power interruption.
- 7 % for equipment which is attended while in use or switched on manually or automatically with a delayed restart after a power supply interruption no more often than twice a day.

Measurement equipment	SP number
Test site Hertz	15:116
Computer	—
IEC 61000 Software for PM6000 1.12.05 RC1	—
Voltech PM 6000 A, Power Analyser	504 201
HP 6813B, Universal power supply	503 091
Temperature and humidity meter Testo 615	503 498

Result

Normal operation:

	Pst	Plt	dc	dmax	d(t) >3.3 % ms
Limit	1	0.65	3.3 %	4 %	500
Measured value	0.071	0.071 (Note 1)	0.017	0.040	0
Result	Pass	Pass	Pass	Pass	Pass

Note 1: As the Pst value is below the Plt limit, a Plt test was not performed. The Plt-value in the table is based on the measured Pst value.

Voltage changes caused by manual switching/Voltage changes caused by automatically switching:

Average dmax	limit	Result	Remarks
0.811	4	Pass	Note 1

Note 1: The measured average value is based on 12 tests. Due to the low level, 24 tests with manual switching, as stated in the standard, was judged not to be necessary.

Emission below limit?	Yes

Immunity to electrostatic discharge according to EN 61000-4-2:2009

Date	Temperature	Humidity
2012-12-01	23 °C ± 3 °C	27 % ± 5 %

Severity level

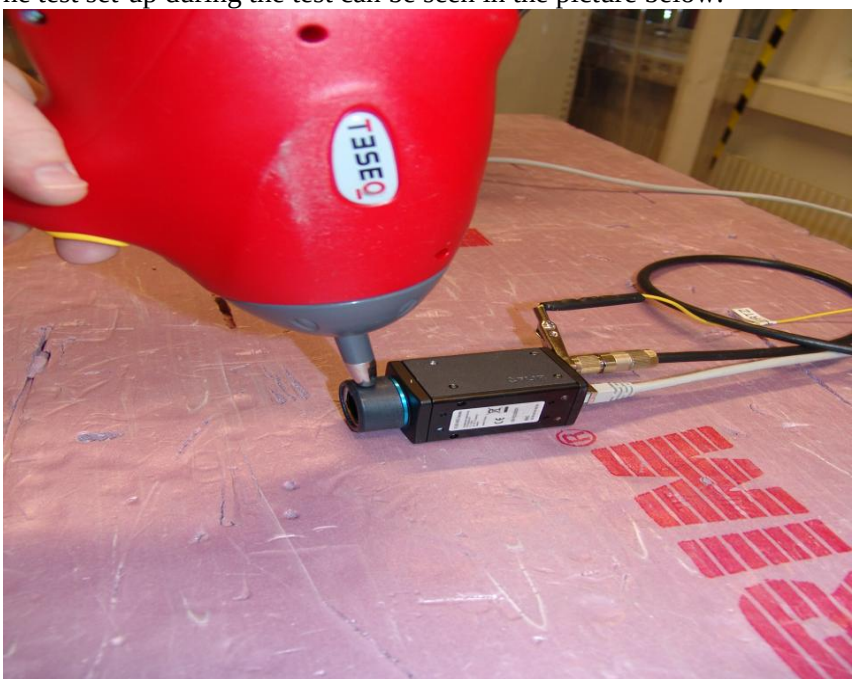
Air discharges: ±2, ±4 and ±8 kV
Contact discharges: ±4 kV

Test set-up and procedure

Test set-up: The test object was placed on a horizontal coupling plane and insulated from it by a 0.5 mm thick insulator.

The housing of the EUT was scanned with a carbon fibre brush with 2x470 kΩ connected to ground to secure discharge of EUT between each exposure. A 2x470 kΩ bleeder resistor was connected to the ground of the camera

The test set-up during the test can be seen in the picture below:



Performance criterion, EN 61000-6-2: B

Test equipment	SP number
Test site, Tesla	503 881
TESEQ NSG 437	504 437
Temperature and humidity meter, Testo 625	504 188

Result

Test points	Discharge type	Result
Scan over EUT's cabinet	Air	Pass
Optical lens	Air	Pass
Ring of metal around lens	Air	Pass
AC power connection	Contact	Pass
Right side	Contact	Pass
Left side	Contact	Pass
Hole for screw on top of camera	Contact	Pass
Ethernet shield	Contact	Pass
Indirect discharge, vertical coupling plane	Contact	Pass
Indirect discharge, horizontal coupling plane	Contact	Pass

Performance requirements fulfilled?	Yes

Immunity to RF electromagnetic field according to EN 61000-4-3:2006, /A1:2008

Date	Temperature	Humidity
2011-11-30	22 °C ± 3 °C	35 % ± 5 %

Note 1: The frequency range 80 – 1000 MHz was tested 2012-01-17 and the frequency range 1.4 – 2.7 GHz was tested 2012-02-22.

Severity

Amplitude: 10 V/m

Test set-up and procedure

The tests were performed in a semi anechoic chamber.

The antenna distance during the test was 3 m for frequencies below 1 GHz and 4.5 m for frequencies above 1 GHz.

Cable types and terminations can be found in the table below:

I/O port	Cable type	Cable length	Termination
AC/DC adaptor for A-tau thermal image camera	Unshielded	1 m	Connected to power outlet in chamber floor via an extension cable
Ethernet	Shielded USB	3 m	Connected to the computer type LapTop Dell Latitude E6410
General purpose port	Shielded cable	3m	No termination, bundled

Performance criterion: A

Test equipment	SP number
Anechoic chamber, Hertz (2012-01-17)	15:116
Computer Chieftec	- -
Control Program SPIMM 4.0.97	503 420
Signal generator R&S SME06	502 755
RF Power Meter Boonton 4232A	504 018
Power Sensor Boonton	504 019
Power Sensor Boonton	504 020
Amplifier AR 250W1000A	503 858
Directional coupler	502 188
Bilog antenna Chase 6121A	502 460
Electric Field Probe Holaday HI-6005	503 978
Signal generator R&S SMR40	503 254
Amplifier AR100S1G4 100W	503 118
Horn antenna AR AT4002A	503 190
RF Power Meter Boonton 4532	503 675
Peak Power Sensor Boonton 57518	503 676
Peak Power Sensor Boonton 57518	503 677
Electric Field Probe Holaday HI-6005	503 978
Temperature and humidity meter Testo 615	503 498

Result

Amplitude modulation 80 %, 1 kHz sine wave, step size 1 %, dwell time 1 s					
Frequency MHz	EUT side facing antenna	Horizontal		Vertical	
		V/m	Result	V/m	Result
80-1000	0 °	10	Pass	10	Pass
80-1000	90 °	10	Pass	10	Pass
80-1000	180 °	10	Pass	10	Pass
80-1000	270 °	10	Pass	10	Pass
1400-2700*	0 °	10	Pass	10	Pass
1400-2700*	90 °	10	Pass	10	Pass
1400-2700*	180 °	10	Pass	10	Pass
1400-2700*	270 °	10	Pass	10	Pass

*The test level specified in the used standard is 3 V/m (1.4 – 2 GHz) and 1 V/m (2 – 2.7 GHz).

No interference was noted during or after the test.

Performance requirements fulfilled?	Yes

Immunity to fast transients/burst according to EN 61000-4-4:2004, A1:2010

Date	Temperature	Humidity
2011-12-01 (Note 1)	23 °C ± 3 °C	27 % ± 5 %
2012-01-17 (Note 2)	22 °C ± 3 °C	24 % ± 5 %

Note 1: Test on the Ethernet cable and signal ports
Note 2: Test on the AC supply port

Severity

AC supply: 2 kV
Signal: 1kV

Test set-up and procedure

Test set-up: The test object was placed on a ground plane and insulated from it by a 0.1 m thick insulator.

Test procedure: The test was performed with both positive and negative polarity for 1 minute each.

The test set-up during the test can be seen in the picture below:

Test equipment	SP number
Test site, Hertz (2012-01-19)	15:116
Transient 2000	504 415
Test site Edison (2012-02-22)	15:130
Transient 1000	503 094
Capacitive clamp Schaffner SL400-07	502 772
Temperature and humidity meter Testo 625	504 117

Result

The tested cables were according to the following table:

Cable	Dir / Cap	Result
230 VAC, in i AC/DC-adapter	Dir	Pass
Ethernet	Cap	Pass
General purpose port	Cap	Pass

Dir = Tested by direct injection.
Cap = Tested with the capacitive coupling clamp.

No interference was noted during or after the test.

Performance requirements fulfilled?	Yes

Immunity to surges according to EN 61000-4-5:2006

Date	Temperature	Humidity
2011-12-01 (Note 1)	23 °C ± 3 °C	27 % ± 5 %
2012-01-17 (Note 2)	22 °C ± 3 °C	24 % ± 5 %

Note 1: Test on Ethernet cable and general purpose port
Note 2: Test on the AC supply port

Severity

Amplitude:	AC mains:	Line to line	0.5, and 1.0 kV
		Line to ground	0.5, 1.0 and 2.0 kV
	Ethernet cable:	Line to ground	0.5 and 1.0 kV
	General purpose port:	Line to ground	0.5 and 1.0 kV

Test set-up and procedure

Test set-up: The mains were connected to the test object through a decoupling network and general purpose cable.
The surge injection on the shielded Ethernet cable and the shielded general purpose cable were performed with the EUT connected to ground and the test pulses were applied at the far end of a 20 m Ethernet cable.

Test procedure: The test was performed at the positive and the negative peak of the AC voltage, and at the zero-crossings. The pulse was applied 5 times in each polarity, each severity level and each phase angle, ≤ 60 s between each maximum voltage pulse.

Performance criterion : B

Test equipment	SP number
Test site, Hertz (2012-01-19)	15:116
Transient 1000	504 094
Software SPEX 1.3	504 136
Test site Edison (2012-02-22)	15:130
Transient 1000	503 094
Capacitive clamp Schaffner SL400-07	502 772
Temperature and humidity meter Testo 625	504 117

Result

The tested cables were according to the following table:

Cable	Mode	Result
230 V AC mains supply to the power adapter	Line to line	Pass
230 V AC mains supply to the power adapter	Line to ground	Pass
Ethernet	Line to ground	Pass (Note 1)

Note 1: The external computer was disconnected during the test to avoid damage of that unit. Normal operation was verified by reconnecting the computer after the test.

No interference was noted during or after the test.

Performance requirements fulfilled?	Yes

Immunity to RF conducted disturbances according to EN 61000-4-6:2009

Date	Temperature	Humidity
2011-12-01	23 °C ± 3 °C	27 % ± 5 %

Severity

Amplitude: 10 V

Test set-up and procedure

Test set-up: The test object was placed on a ground plane and insulated from it by a 0.1 m thick insulator. The 230 V AC mains power port of the AC/DC adapter was tested. The Ethernet cable was connected to a test computer.
The ground of the test object was terminated with 150 Ω connected to the shield of the general purpose cable.

The test set-up during the test can be seen in the picture below:

Performance criterion: A

Test equipment	SP number
Test site, Hertz	15:116
Computer Chieftec	- -
Control Program SPIMM 4.1.30	503 420
Signal generator R&S SME06	502 755
RF Power Meter Boonton 4232A	504 018
Power Sensor Boonton	504 019
Power Sensor Boonton	504 020
Directional coupler AR DC2600	503 639
Amplifier AR 500A100A	503 441
CDN 801 M2/M3	503 513
Lüthi EM101	503 515
Lüthi FTC101	503 514
Current probe Fischer F-35	504 092
Temperature and humidity meter Testo 615	503 498

Cable types and terminations can be found in the table below:

I/O port	Cable type	Cable length	Termination
AC/DC adaptor for A-tau thermal image camera	Unshielded	1 m	Connected to power outlet in chamber floor via an extension cable
Ethernet	Shielded USB	3 m	Connected to the computer type LapTop Dell Latitude E6410
General purpose port	Shielded cable	3m	No termination, bundled

Result

The tested cables were according to the following tables:

Amplitude modulation 80 %, 1 kHz sine wave, step size 1 %, dwell time 1 s				
Frequency (MHz)	CDN	Cable	Amplitude (V)	Result
0.15-80	M3	230 V AC mains supply to power adapter	10	Pass
0.15-80	Clamp	Ethernet	10	Pass
0.15-80	Clamp	General purpose port	10	Pass

No interference was noted during or after the test.

Performance requirements fulfilled?	Yes

Immunity to power frequency magnetic field according to EN 61000-4-8:2010

Date	Temperature	Humidity
2012-01-17	22 °C ± 3 °C	24 % ± 5 %

Severity

Amplitude: 100 A/m, 50 Hz (the severity level according to EN 61000-6-2 is 30 A/m).

Test set-up and procedure

Test set-up: The test object was subjected to the test magnetic field by using a square formed coil with 1 meter sides. The test was performed within a non shielded enclosure.

Test procedure: The magnetic field was applied in three perpendicular directions, 1 minute in each direction.

Performance criterion: A

Test equipment	SP number
Test site, Hertz	15:116
Current coil, 1 meter square, 8 turns	503 288
Adjustable transformer	S4-086
Transformer C11652	- -
FLUKE 336 True RMS clamp meter	503 877
Temperature and humidity meter Testo 615	503 498

Result

No interference was noted during or after the test.

Performance requirements fulfilled?	Yes

Immunity to voltage dips and interruptions according to EN 61000-4-11:2004

Date	Temperature	Humidity
2012-01-17	22 °C ± 3 °C	24 % ± 5 %

Severity

Residual voltage:
a) 0 % during 10 ms.
b) 0 % during 20 ms.
c) 40 % during 200 ms.
d) 70 % during 500 ms.
e) 0 % during 5000 ms.

Performance criterion: B for test a)and b)
C for test c), d) and e)

Test equipment	SP number
Test site Edison	15:130
Transient 1000	503 094
Software SPEX 1.3	504 136
Temperature and humidity meter Testo 625	504 117

Result

The tested cables were according to the following table:

Cable	Test	Result
230 V AC power supply	a)	Pass (Note 1)
230 V AC power supply	b)	Pass (Note 1)
230 V AC power supply	c)	Pass (Note 1)
230 V AC power supply	d)	Pass (Note 1)
230 V AC power supply	e)	Pass (Note 2)

Note 1: No interference was noted during or after the test.
Note 2: Normal restart after the power switch on.

Performance requirements fulfilled?	Yes