

DELTA Test Report



Emission tests to FCC requirements of Alpro System Activity Meter Receiver

Performed for DeLaval International AB

DANAK-198451

Project no.: A503781-2

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including 4 annexes

14 September 2006

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Title Emission tests to FCC requirements of
Alpro System Activity Meter Receiver

Test object Alpro System Activity Meter Receiver

Report no. DANAK-198451

Project no. A503781-2

Test period May 2006

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Specifications FCC:47 CFR Part 15, Subpart B Class B - Unintentional
Radiators (Receiver).

Results The equipment under test is in compliance with the re-
quirements.

Test personnel Henrik Egeberg Nielsen

Date 14 September 2006


Responsible 
Vagn Sylvest
Project Manager - EMC
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1. Summaries

1.1 Technical report summary

The tests reported in this document have been performed to demonstrate compliance with the requirements of Section 15 in general and with Section 15.109 Class B in particular.

This report contains measurement data from tests performed at DELTA, Hørsholm, Denmark. DELTA is a DANAK accredited test laboratory with reference number 19.

The laboratory is listed by Industry Canada under file IC 4187-5.

The laboratory is listed by FCC under the registration number 90529.

1.1.1 Applicable test methods

The methods and procedures have been applied as specified in:

ANSI C63.4:2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.2 Summary of test results

The results of the emission tests can be summarised as follows:

Tests of intentional radiator	Key references to requirement	Common FCC and IC status
Conducted emission, AC mains	FCC 15.109	Passed
Radiated emission limits, general requirements.	FCC15.109	Passed

Abbreviations

Passed	:	The requirements are met.
Failed	:	The requirements are not met.
Not done	:	No test was performed.
N/A	:	Not applicable.
Not relevant	:	The test was not relevant for the test object.

The given results are based on a shared risk principle with respect to the measurement uncertainty.

The test results relate only to the objects tested.

2. Test objects and auxiliary equipment

2.1 Test object - Receiver unit

Category	Part 15.101 receiver
Manufacturer	DeLaval International AB
Model / type	Alpro System Activity Meter Receiver
Part no.	-
Serial no.	Rx418 for 418 MHz receiver w. external antenna Rx433 for 433 MHz receiver w. external antenna
FCC ID (intended)	UCS906762V2
IC (intended)	6576A-906762V2
Supply voltage	120 VAC
Operational mode	Normal

2.2 Description of the test object

The unit is a receive-only device. It is installed in areas where cows wearing Alpro Activity Transmitters roam.

The receiver can be delivered from factory operating on either 418.0 MHz or 433.92 MHz. The receiver has an external antenna delivered as a part of the receiver.

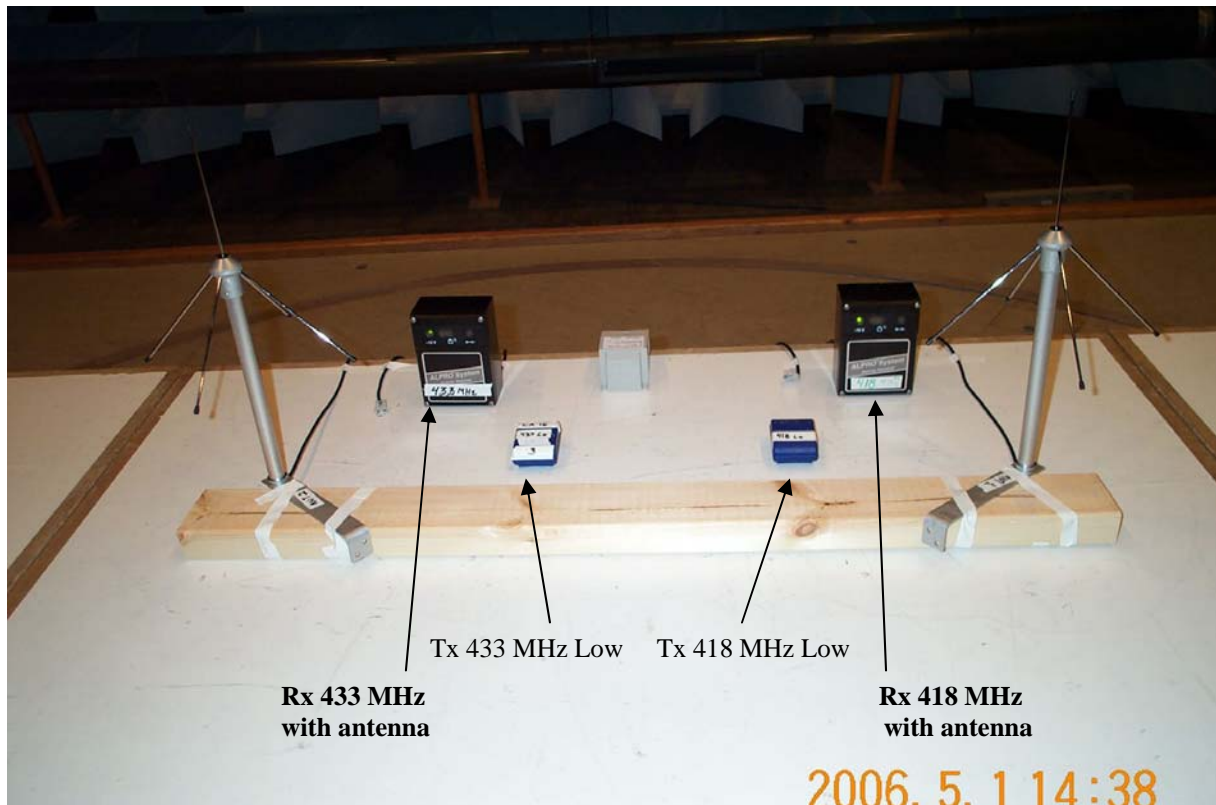
The unit is powered from 120 VAC.

2.2.1 Frequency determining components

The active receiver part consists of a hybrid receiver with build-in SAW filter. The receiver components are RX500 factory pre-tuned for 433.92 MHz and RX5002 factory pre-tuned for 418.00 MHz. A capacitor for antenna matching is 0 pF for 433 MHz and 5.6 pF for 418 MHz. The receiver is of type amplifier-sequenced hybrid (ASH), which does not use local oscillator.

3. General test conditions

3.1 Test setup



Units under test.

During the test, emission was measured simultaneously from 433 MHz Rx and 418 MHz Rx. During some tests 433 MHz Tx low power, 418 MHz Tx low power were also present.

If any signal is higher than the general spurious level Class B, its source is investigated and verified, if it is in accordance with specifications. The transmitter is reported separately.

4. Test and results

4.1 Radiated emission

	Requirements	
Specification	FCC Rules and Regulations Part 15, Subpart B Class B	
Test setup	ANSI C63.4:2003	
Measuring distance	3 m	
Frequency range	30-2000 MHz	
General limits as specified in 15.109(a)	30-88 MHz:	40 dB μ V/m
	88-216 MHz:	43.5 dB μ V/m
	216-960 MHz:	46 dB μ V/m
	Above 960 MHz:	54 dB μ V/m
Measurement uncertainty (2 σ) <1 GHz	2.6 dB	
Measurement uncertainty (2 σ) >1 GHz	4.9 dB	
Below 1 GHz the general limits apply to measurements performed using a quasi-peak detector.		
Above 1 GHz the limits apply to measurements performed using an average detector		
Photos of test setup	Annex 2	
Test record sheets	Annex 3	

Results

The emission was within the specified limits.

Climatic conditions

21°C and 38% R.H.

Note:

The test record sheets in Annex 3 states under operating condition Ant 1 m vertical or Ant 3 m horizontal. Those are the position of the measuring antenna during investigatory measurements.

4.2 Conducted emission, AC mains

	Requirements	
Specification	FCC Rules and Regulations, Part 15, Subpart B, Class B	
Test method	ANSI C63.4:2003	
Frequency range	0.15 - 30 MHz	
Test setup	ANSI C63.4:2003	
Limit: (quasi-peak)	0.15 - 0.50 MHz: (decreasing lin. with the logarithm of freq.)	66 - 56 dB μ V
	0.50 - 5 MHz:	56 dB μ V
	5 - 30 MHz:	60 dB μ V
Limit: (average)	0.15 - 0.50 MHz: (decreasing lin. with the logarithm of freq.)	56 - 46 dB μ V
	0.50 - 5 MHz:	46 dB μ V
	5 - 30 MHz:	50 dB μ V
Photos of test set-up	Annex 2	
Test record sheets	Annex 4	

Results

The AC mains conducted emission was within the specified limits.

Climatic conditions

21°C and 38% R.H.

Supply voltage

120 VAC.

4.2.1 Spurious emission 30 - 2000 MHz in tabular form for clock generated noise

For spectral plots see Annex 3.

Spurious freq. MHz	Polarization	QPeak dB μ V/m	dB below QP limit	Note
154.01	V	27.8	15.7	Microcontroller
168.01 (R)	V	30.8	12.7	Microcontroller

(R) means frequency in restricted band as defined in §15.205.

Other frequencies are more than 20 dB from the limit.

Note:

The plots in Annex 3 also show carrier and harmonics from transmitters. It has been verified that none are generated by the receivers.

Annex 1

List of instruments

Instru- ment no.	DESCRIPTION	MANUFACTURER	TYPE NO.	Date calibration expires
29461	ARTIFICIAL MAINS NETWORK	ROHDE & SCHWARZ	ESH2/Z5	2006-07-20
29499	BROADBAND RF PREAMPLIFIER	EC/MTS TELEMETER	TVV 711	2006-12-09
29797	BILOG ANTENNA, 30-2000 MHz	CHASE ELECTRICS LTD	CBL 6111A	2008-03-01
29861	EMI-SOFTWARE Ver. 1.60	ROHDE & SCHWARZ	ES-K1, PART: 1026.6790.02	ONLY CAL. IF RE- QUIRED
29876	RIDGED GUIDE HORN ANTENNA, 1-12.75 (18) GHz	EMCO	3115	2008-02-28
29916	AUTOMATIC TEST RECEIVER, 9 kHz - 2.75 GHz	ROHDE & SCHWARZ	ESCS 30 1102.4500.30	2007-01-02
49037	BROADBAND MICROWAVE PREAMPLIFIER, 1-12.8 GHz	MITEQ / DELTA	AMF-5D-001128-35-11P	2007-01-02
49086	REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 5	NeWeTec	REMI	ONLY CAL. IF RE- QUIRED
49321	SPECTRUM ANALYZER, 50GHz WITH OPTION 006	HEWLETT-PACKARD	8565E	2006-06-15
49421	IMPULSE VOLTAGE LIMITER	ROHDE & SCHWARZ	ESH3/Z2	2006-11-21

Annex 2

Photos



Photo A2.1 Units during emission tests (See Section 3.1 for details of setup).



Photo A2.2 Units during emission tests (See Section 3.1 for details of setup).

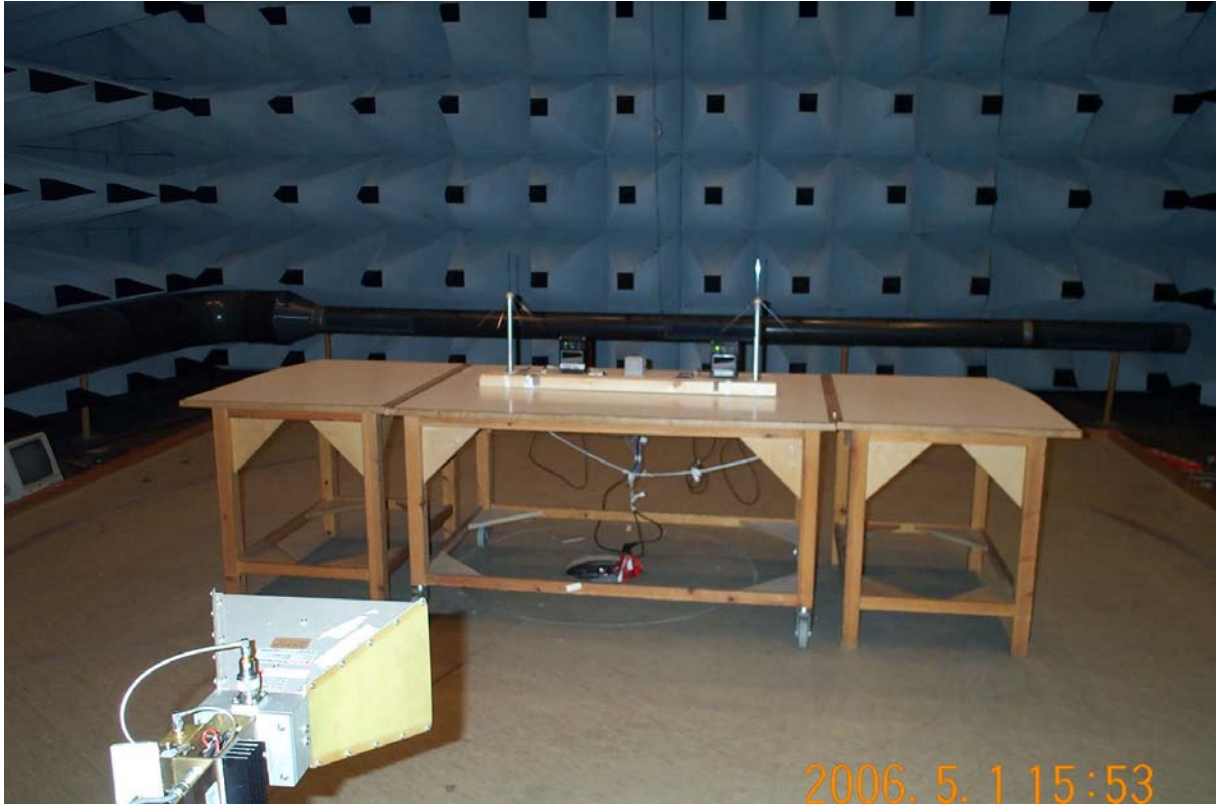


Photo A2.3 Test setup (See Section 3.1 for details of setup).

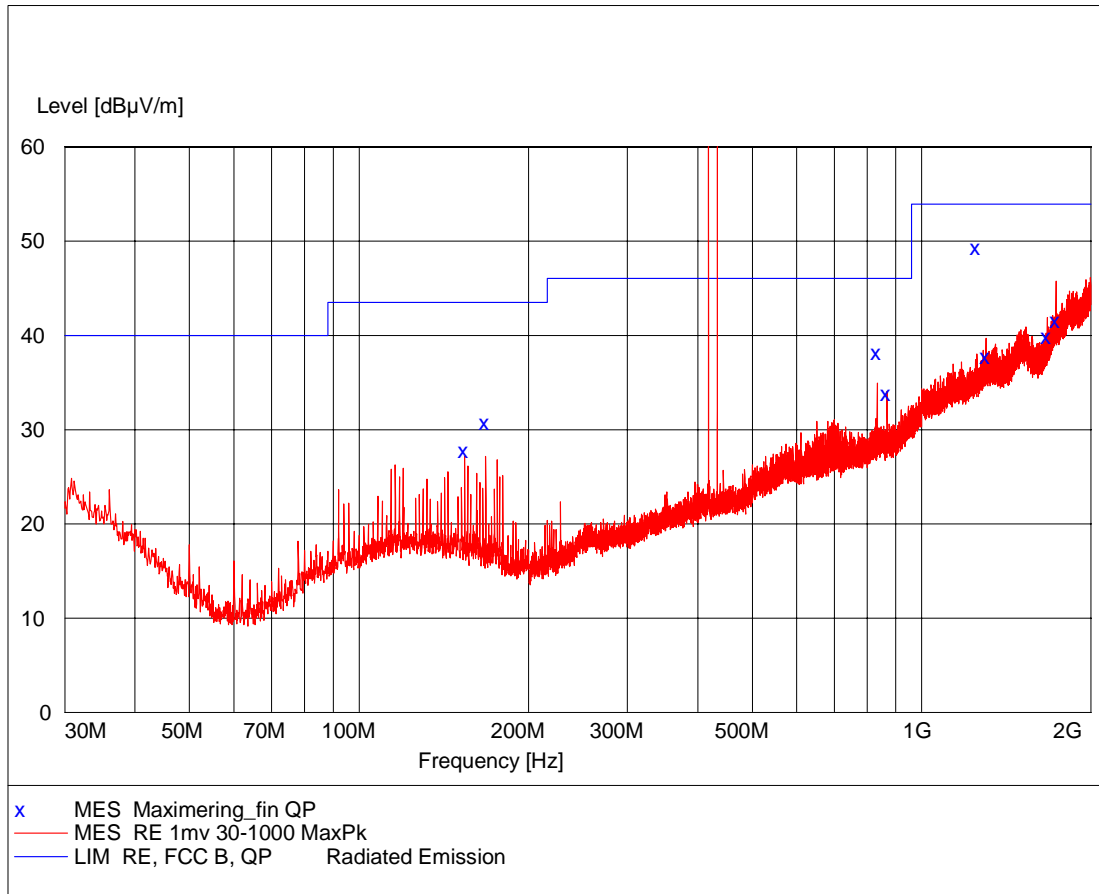


Photo A2.4 Test setup for conducted emission.

Annex 3

Plots of spurious emission

EUT: Activity RX, TX LA16 433 MHz. Activity RX, TX LA10 418 MHz
 Manufacturer: DeLaval International AB
 Operating Condition: Ant 1 m vertical
 Test Site: EMC-5
 Operator: HEN - A503781
 Test Specification: FCC
 Comment: Sheet 3
 Start of Test: 2006-05-01

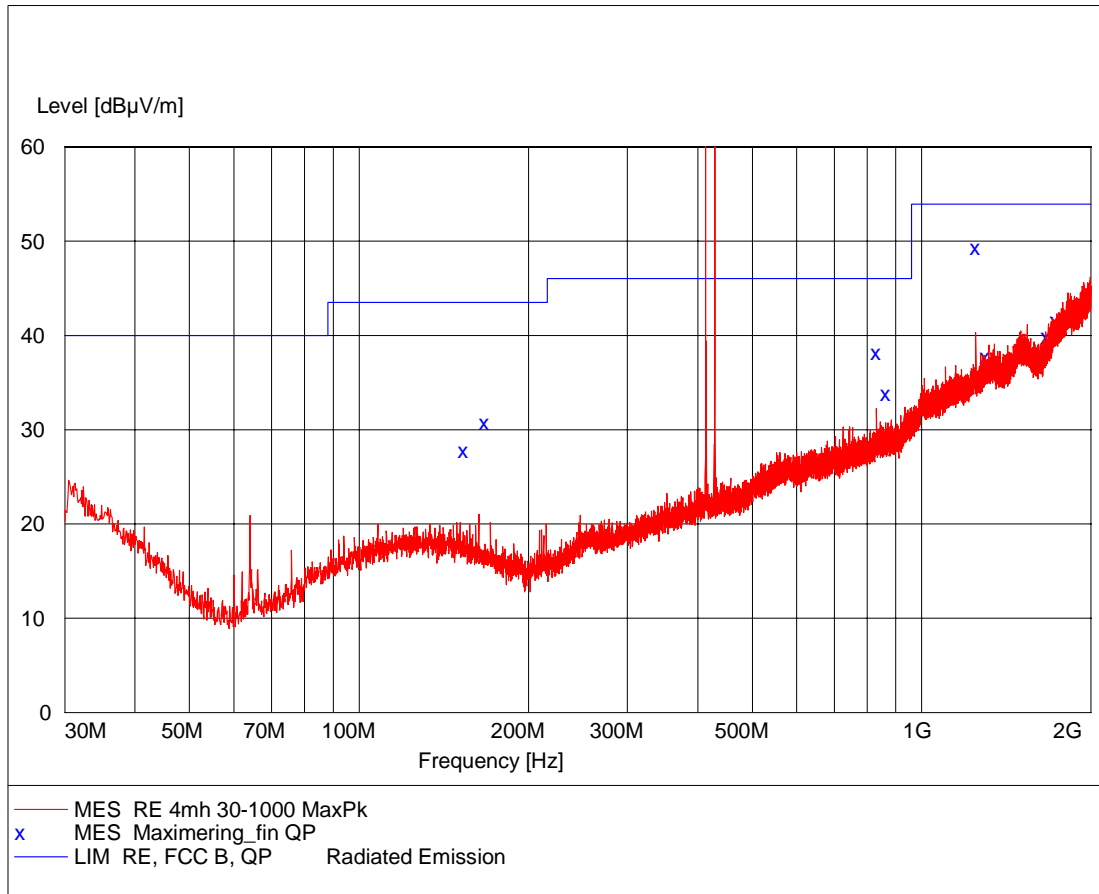


MEASUREMENT RESULT: "Maximering_fin QP"

2006-05-01 14:53

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
154.010000	27.80	13.2	43.5	15.7	111.0	169.00	VERTICAL
168.010000	30.80	12.4	43.5	12.7	101.0	160.00	VERTICAL
835.960000	38.20	26.8	46.0	7.8	122.0	21.00	VERTICAL
867.780000	33.80	26.8	46.0	12.2	117.0	4.00	VERTICAL
1253.940000	49.30	31.4	53.9	4.6	101.0	290.00	HORIZONTAL
1301.670000	37.70	32.4	53.9	16.2	112.0	358.00	VERTICAL
1671.920000	39.90	34.8	53.9	14.0	111.0	19.00	VERTICAL
1735.560000	41.60	36.8	53.9	12.3	111.0	4.00	VERTICAL

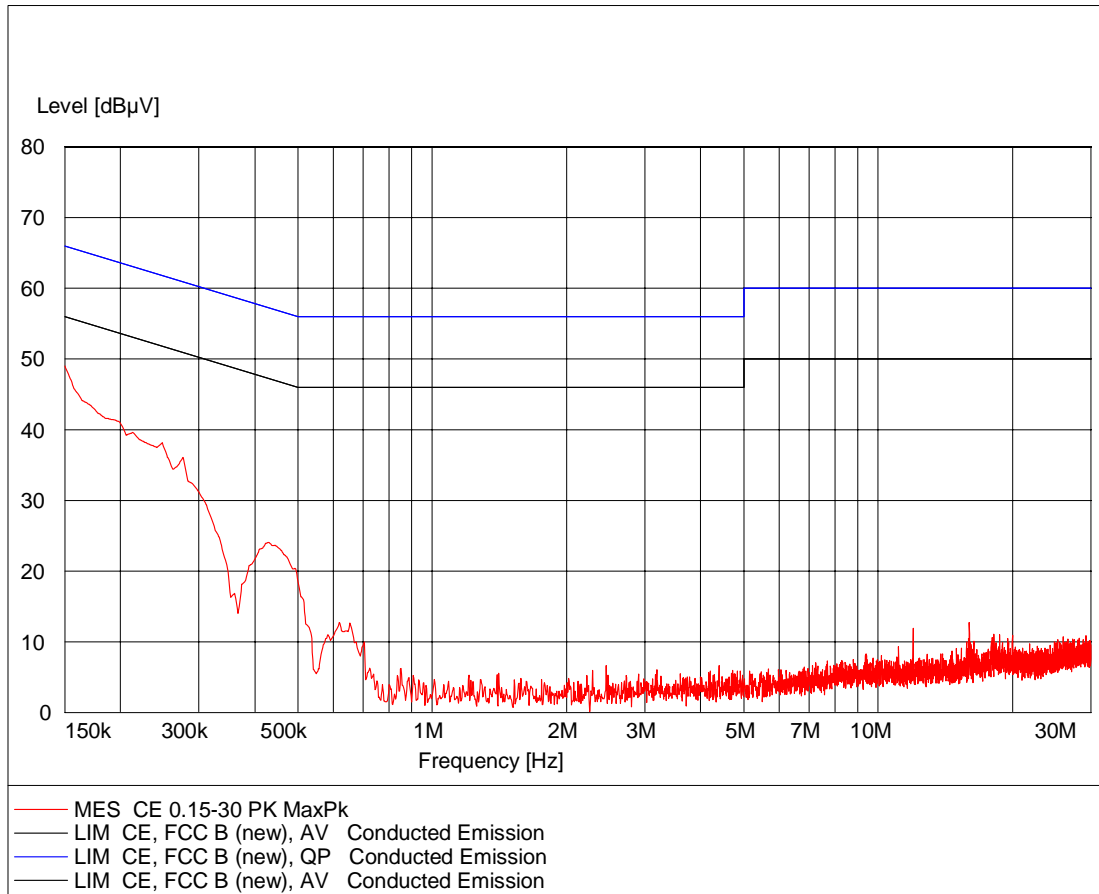
EUT: Activity RX, TX LA16 433 MHz. Activity RX, TX LA10 418 MHz
Manufacturer: DeLaval International AB
Operating Condition: Ant 3 m horizontal
Test Site: EMC-5
Operator: HEN - A503781
Test Specification: FCC
Comment: Sheet 4
Start of Test: 2006-05-01



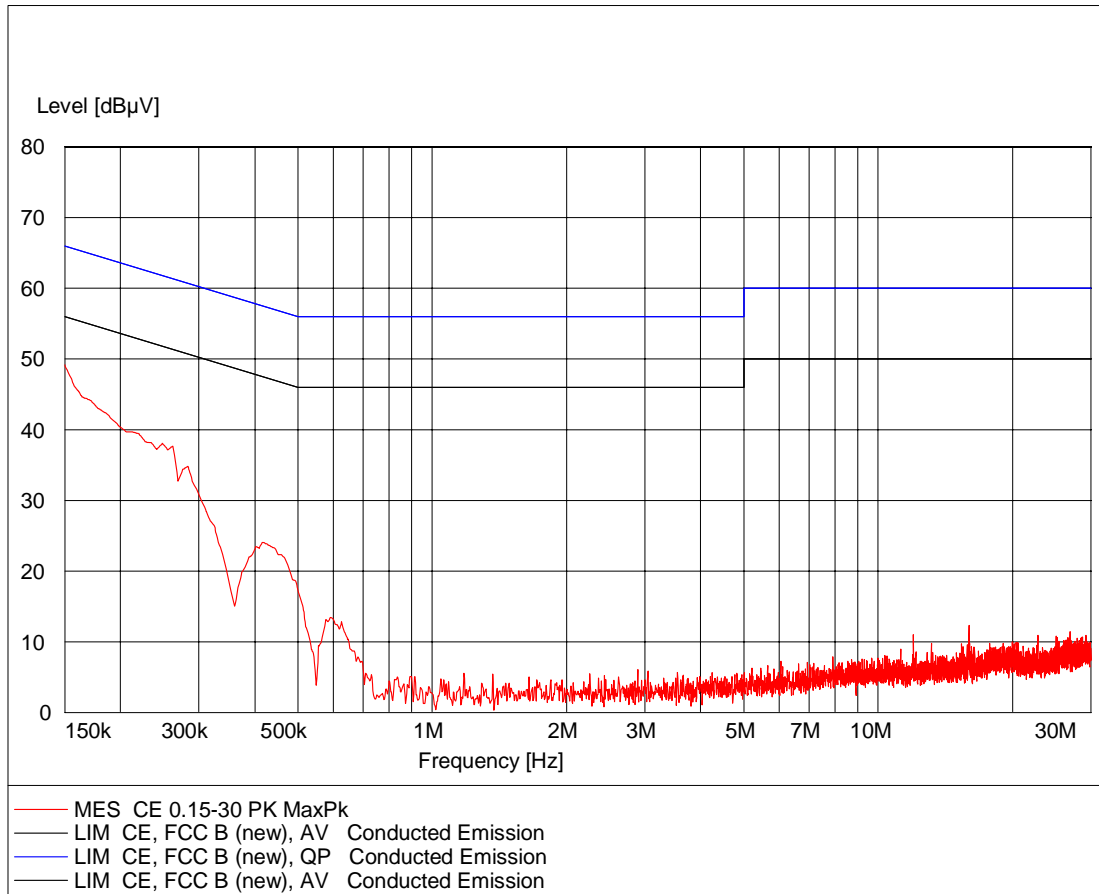
Annex 4

Plots of conducted emission

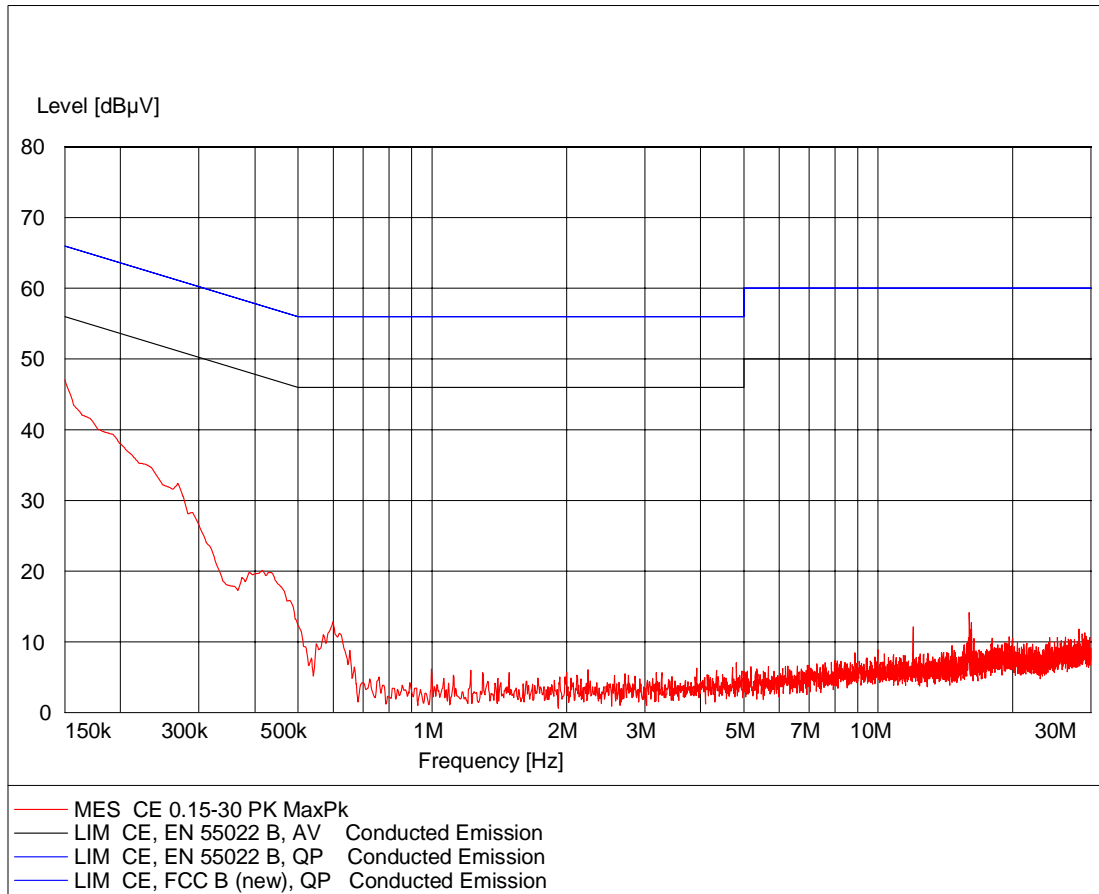
EUT: Activity RX 433 MHz
Manufacturer: DeLaval International AB
Operating Condition: Line no.: Neutral 120 VAC
Test Site: EMC-5
Operator: HEN - A503781
Test Specification: FCC Class B
Comment: Sheet 16
Start of Test: 2006-05-03



EUT: Activity RX 433 MHz
Manufacturer: DeLaval International AB
Operating Condition: Line no.: Line 1 120 VAC
Test Site: EMC-5
Operator: HEN - A503781
Test Specification: FCC Class B
Comment: Sheet 17
Start of Test: 2006-05-03



EUT: Activity RX 418 MHz
Manufacturer: DeLaval International AB
Operating Condition: Line no.: Neutral. 120 VAC
Test Site: EMC-5
Operator: HEN - A503781
Test Specification: FCC class B
Comment: Sheet 20
Start of Test: 2006-05-03



EUT: Activity RX 418 MHz
Manufacturer: DeLaval International AB
Operating Condition: Line no.: Line 1. 120 VAC
Test Site: EMC-5
Operator: HEN - A503781
Test Specification: FCC class B
Comment: Sheet 21
Start of Test: 2006-05-03

