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# DELTA Test Report



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## Test of USB Meter Reader according to FCC requirements

### Performed for Kamstrup A/S

DANAK-19/13064

Project no.: T204885

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including 1 annex

07 May 2013

Amendment to original report: DELTA project T203210, DANAK-19/12505 Rev. A, dated 30 October 2012, for the purpose of FCC Permissive Change Class 2.

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**Title** Test of USB Meter Reader according to FCC requirements

**Test object** USB Meter Reader

**Report no.** DANAK-19/13064

**Project no.** T204885

**Test period** 25 April 2013

**Client** Kamstrup A/S  
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**Contact person** Bjarne Lund Jensen  
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**Manufacturer** Kamstrup A/S

**Specifications** Selected parts from:  
47 CFR Part 15, Subpart C (Specific rule part §15.247)


**Results** The test objects were found to be in compliance with the specifications, as listed in Section 1

**Test personnel** Claus Momme Thomsen

**Test site(s)** DELTA, Venlighedsvej 4, 2970 Hørsholm, Denmark

**Date** 07 May 2013

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## 1. Summary of tests

The authorization procedures for the USB Meter Reader are:

Declaration of Conformity by FCC Part 15 B, Class B (residential use).

Certification by FCC Part 15 C.

The present report amends the original authorization report, DELTA project T203210, DANAK, 19/12505 Rev. A, dated 30 October 2012.

The USB Meter Reader has been hardware modified from “Rev. A” to “Rev B”. These modifications require a Permissive Change Class 2.

Tests performed after the hardware modifications, and the results, are:

Test case ID	Description	Specification	Test methods	Results
2.3	6 dB Bandwidth	47 CFR Part 15C Subpart 15.247(a)(2)	ANSI C63.10-2009	Passed
2.6	Antenna Conducted Emission	47 CFR Part 15C Subpart 15.247(b)(3)	ANSI C63.10-2009	Passed
2.7	Occupied Bandwidth & Band Edge Compliance	47 CFR Part 15C Subpart 15.247(c)	ANSI C63.10-2009	Passed

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

### Conclusion

The test object mentioned in this report meets the requirements of the rule parts stated below.

- Selected parts from:  
47 CFR Part 15, Subpart C (Specific rule part §15.247).

The test results relate only to the object tested.



## 2. Test object and auxiliary equipment



Photo 2.1.1 Exterior (front) and interior stack up of the test object.

## 2.1 Test object

### Test object 2.1.1

Name of test object	USB Meter Reader
Model / type	USB Meter Reader
Part no.	-
Serial no.	SN:US2
FCC ID	OUY-USBEXT
Manufacturer	Kamstrup A/S
Supply voltage	5.0 VDC (USB only)
Software version	Test software ver 001
Hardware version	5535-1267 B (old version: 5535-1267 A)
Cycle time	0.1 msec
Highest frequency generated or used	916.0 MHz
Comment	Used for all measurements

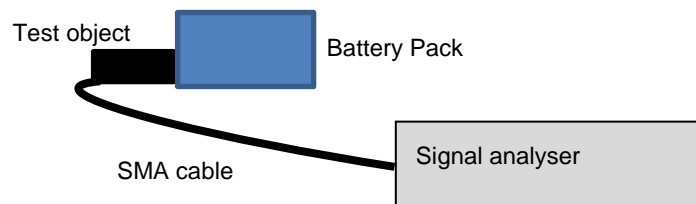
## 2.2 Auxiliary equipment

### Auxiliary equipment 2.2.1

Name of auxiliary equipment	External Lithium-polymer Battery Pack
Model / type	YL-F04
Part no.	-
Serial no.	-
FCC ID	-
Manufacturer	Kamstrup A/s
Supply voltage	-
Highest frequency generated or used	-
Comment	Used only for powering the test object

### 3. General test conditions

#### 3.1 Test setup during test



For conducted measurements, the test object's reverse polarity SMA connector is connected through an extension coax cable to a signal analyser.

Figure 3.1 Block diagram of test object with cable and auxiliary equipment.

The USB Meter Reader is powered by the Battery Pack and put into continuous Tx mode.

### 3.1.1 Description and intended use of test object

The USB Meter Reader is used for retrieving measurement data from Kamstrup wireless water flow meters and similar Kamstrup products. The USB Meter Reader is used in households as well as in industrial and commercial buildings.

The USB Meter Reader is power supplied solely by the USB port of the auxiliary PC or a battery pack, to which it is connected during use.

All measurements, references, readings, events and calculations are stored in a data logger for billing and analysis.

The remote data communication is handled in either of two ways:

- By broadband wireless communication in the 902-928 MHz band with output power of approximately 0.2 mW.
- By standard USB communication to a PC.

The USB Meter Reader has a reverse polarity SMA antenna connector, intended to be connected to one of the two possible antenna types described in Section 2. Both antennas were tested.

### 3.1.2 Test modes during emission tests

The test object was running special test software.

Tests were performed at the following fundamental frequency of the radio transmitter: 916.0 MHz.

For all the emission tests, all relevant functions are activated in order to maximize emissions and to monitor that the radio is active. The presence of an active radio is checked both prior to and after each test.

The test object is put into constant, modulated Tx operating mode with a modulation cycle no higher than 0.1 msec, so that each measurement sample completely covers a cycle.





### 3.2 Radio specification

Radio	Proprietary 916 MHz radio
Fundamental operating frequency (f_center)	916.0 MHz
Maximum measured field strength @ 3 m	90.0 dBuV/m
Antenna type	External antenna (2 types)
Equipment Type	I: Transfer of messages (digital or analogue signals)
Equipment intended for fixed use?	No
Equipment intended for vehicular or mobile use?	Yes
Equipment intended for portable use? (<20 cm from user)	Yes
Transmit mode available	Yes
Receive mode available	Yes
Environment	General population
User proximity by FCC definition	Portable and Mobile use (may be less than 20 cm from user during normal operation)
Frequency band	902-928 MHz
Maximum permissible output power in the band	1 W from ant connector (127.38 dBuV/m @ 3m)
Number of power levels	1
Number of channels	1
Modulation forms	FSK (digital modulation)
Maximum data rate [kbps]	250
Manufacturer stated band width (20 dB) [kHz]	1000
Manufacturer stated band width (6 dB) [kHz]	520
Channel spacing	One channel only
Maximum duty cycle during normal use	1 %



## 4. Test results

### 4.1 Test ID 2.6: Antenna conducted emission

Test object	USB Meter Reader	Sheet	RE_Con-1
Type	See section 2	Project no.	T204885
Serial no.	See section 2	Date	25 Apr. 2013
Client	Kamstrup A/S	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	916 MHz

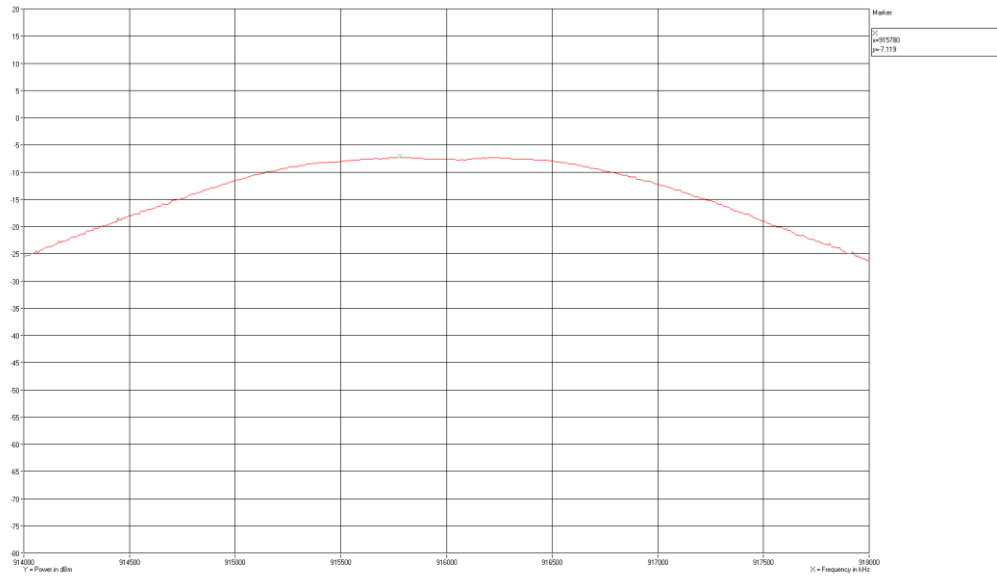
Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Conducted measurement @ antenna port	Humidity	35 % RH
Span	3 MHz	RBW	1 MHz
Sweep	Auto	VBW	3 MHz
Detector	Peak	Trace	Max hold
Test equipm.	Outside EMC room Hørsholm 49086 49321	Uncertainty	1.1 dB

Final max (Peak) :

Frequency MHz	Level dBm	Level mW	Limit dBm @ 3m	Limit mW	Margin dB	(Max ant gain) ( dBi )
915.78000	-7.12	0.19	30.00	1000.0	37.12	(5.15)

Test result	The measured power was below the limit
Test Port	Antenna connector
Test frequency	915.78 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	The limit of 1000.0 mW applies to transmitters with antenna gain up to 6 dBi. The test object incorporates an external antenna with a maximum gain of 5.15 dBi.  Measurements are corrected for cable losses.





Polarization

Not applicable

Comments

Conducted measurement of antenna emission



## 4.2 Test ID 2.3: 6 dB bandwidth

Test object	USB Meter Reader	Sheet	RE_Con-2
Type	See section 2	Project no.	T204885
Serial no.	See section 2	Date	25 Apr 2013
Client	Kamstrup A/S	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	916 MHz

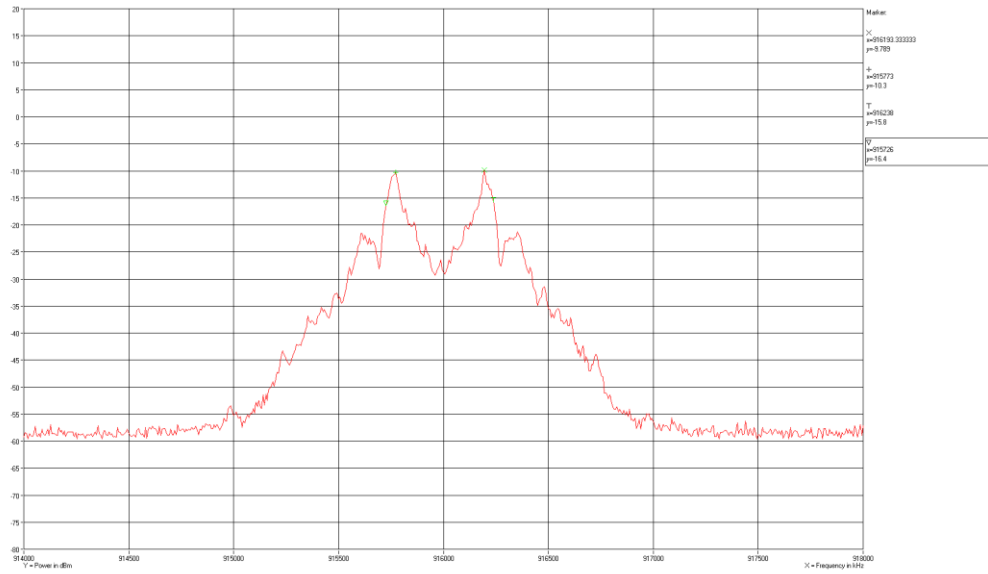
Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Conducted measurement @ antenna port	Humidity	35 % RH
Span	2 MHz	RBW	10 kHz
Sweep	Auto	VBW	30 kHz
Detector	Peak	Trace	Max hold
Test equipm.	Outside EMC room Hørsholm 49086 49321	Uncertainty	1.1 dB

Final max (Peak) :

Frequency Peak 1 MHz	Frequency 6 dB Delta 1 MHz	Frequency Peak 2 MHz	Frequency 6 dB Delta 2 MHz	6 dB BW Delta 2 - Delta 1 MHz
915.773	915.726	916.193	916.238	000.512

Test result	The measured bandwidth is within the limit
Test Port	Antenna connector
Test frequency	Fundamental frequency is set at 916 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	The 6 dB BW lower limit was 500 kHz. The test object has a 6 dB BW of 512 kHz. Measurements are corrected for cable losses.





Polarization Not applicable

Comments Conducted measurement of 6 dB BW



### 4.3 Test ID 2.7: Occupied bandwidth & band edge compliance

Test object	USB Meter Reader	Sheet	RE_Con-3
Type	See section 2	Project no.	T204885
Serial no.	See section 2	Date	25 Apr 2013
Client	Kamstrup A/S	Initials	CMT
Specification	See Section 1, Summary of tests	Frequency	916 MHz

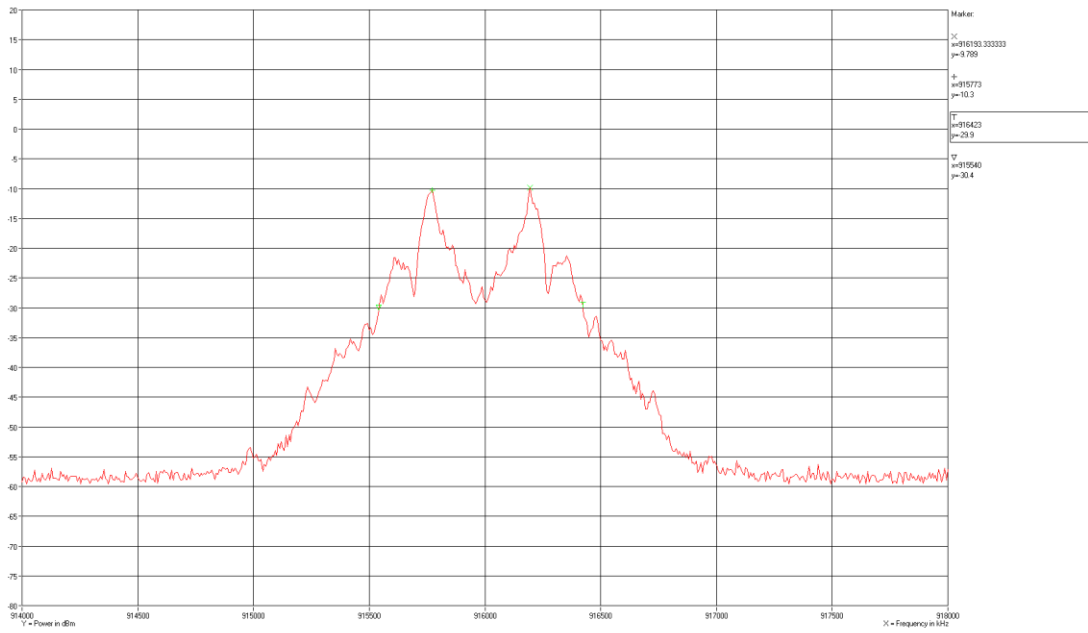
Test method	ANSI C63.10:2009	Temperature	23 °C
Characteristics	Conducted measurement @ antenna port	Humidity	35 % RH
Span	3 MHz	RBW	10 kHz
Sweep	Auto	VBW	30 kHz
Detector	Peak	Trace	Max hold
Test equipm.	Outside EMC room Hørsholm 49086 49321	Uncertainty	1.1 dB

Final max (Peak):

Frequency Peak 1 MHz	20 dB Delta 1 MHz	Frequency Peak 2 MHz	20 dB Delta 2 MHz	20 dB OBW Delta 2 - Delta 1 MHz
915.773	915.540	916.193	916.423	000.883
Band Edge MHz	20 dB OBW frequency MHz	Margin MHz		
902.000	915.540	13.540		
928.000	916.423	11.577		

Test result	The measured occupied bandwidth is within the limit. Band edges are respected.
Test Port	Antenna connector
Test frequency	Fundamental frequency was set at 916 MHz
Test mode	Continuous Tx - normal modulation
Condition	Normal
Compliant	Yes
Comments	The measured 20 dB OBW was 883 kHz. The 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated (15.247).





Polarization

Not applicable

Comments

Conducted measurement of 20 dB Occupied BW



## 5. National registrations and accreditations

### 5.1 DANAK Accreditation

**Organization:** Danish Accreditation and Metrology Fund - DANAK, see [www.danak.dk](http://www.danak.dk) and [www.ilac.org](http://www.ilac.org)

**Registration Number:** 19

**Area Number:** C

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 22:2008 is equivalent to CAN/CSA CISPR 22-10 specified in ICES-003:2012, and therefore this report can be used for approval in Canada for IT equipment, when this test has been passed.

### 5.2 FCC Registrations

**Organization:** Federal Communications Commission, USA

**Registration Number:** 90529

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

### 5.3 VCCI Registrations

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

**Member Number:** 910

**Facilities:** EMC room 2 Hørsholm (EMC-2): C-707, T-246 and T-1547  
EMC room 3 Hørsholm (EMC-3): C-2532, T-247 and T-1548  
EMC room 4 Hørsholm (EMC-4): C-2533, T-248 and T1549  
EMI room Hørsholm (EMC-5): R-1180, C-706 and  
T-1550, G-470

### 5.4 IC Registrations

**Organization:** Industry Canada, Certification and Engineering Bureau

**Registration Number:** IC4187A-5

**Facilities:** EMI room Hørsholm (EMC-5)



## 6. List of instruments

No.	Description	Manufacturer	Type No.	Cal date	Cal exp
49086	REMI EMISSION SOFTWARE PACKAGE v. 2.133, ROOM 5	NeWeTec	REMI	-	-
49321	SPECTRUM ANALYZER, 50 GHZ WIH OPTION 006	HEWLETT-PACKARD	8565E	2012-06-20	2013-06-20



## **Annex 1**

### **Test setup photo**



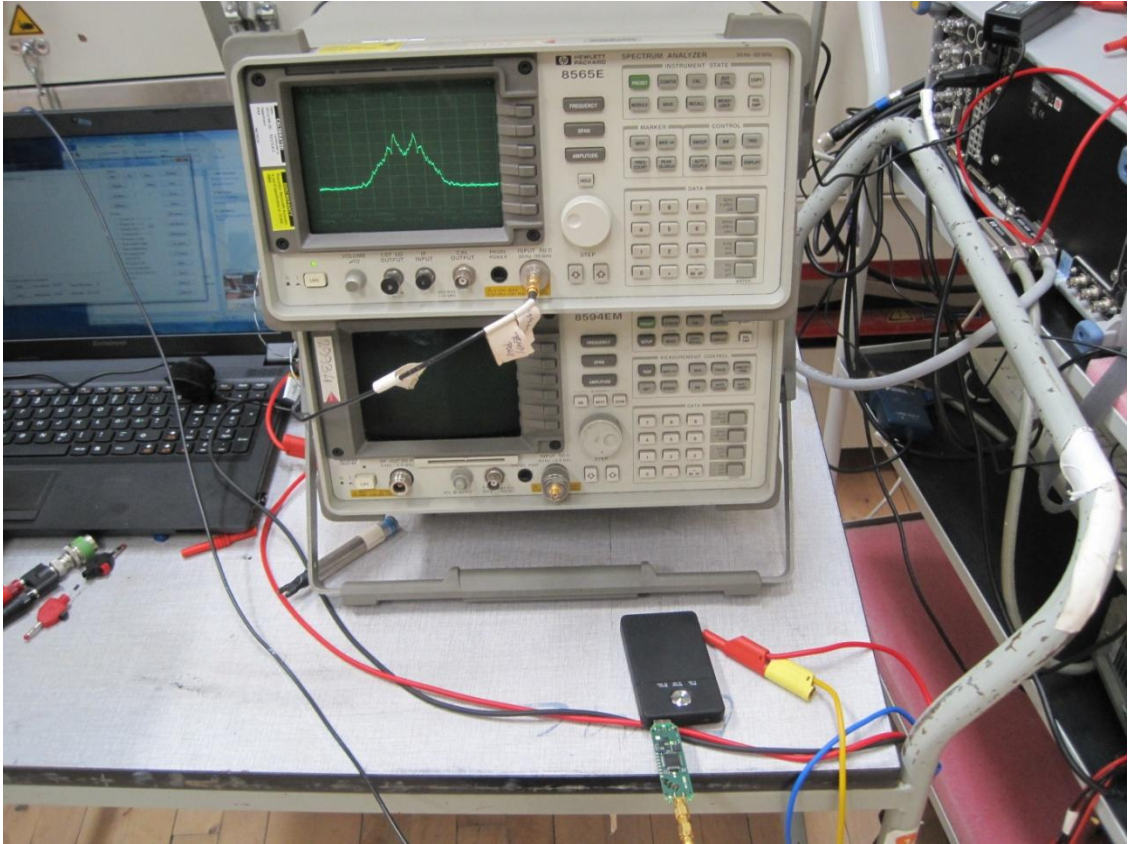


Photo A1.1: Test setup showing all conducted measurements, test ID 2.3, 2.6, and 2.7.