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Test – Results

Order-No.: **T40451-00-00KJ**

Client	smaXtec animal care sales GmbH
Manufacturer	smaXtec animal care sales GmbH
Product Description	“smaXtec Sensor” and “smaXtec Sensor +pH”
Type / Model Name	US-1042 and TX-1442
Testing commenced on	2015-11-23
Testing concluded on	2015-11-24
Serial - No.	Prototype

Pretest
are made according to
FCC Part 15.249 (partly testing)

Type of test	Limits		Test Results		
Emission / Immunity	Margin (dB)	exceeded by (dB)	ok	not ok	meet criteria
Model: US-1042					
CPR2 Radiated emission of the fundamental wave	2.8		☒	☐	-
SER3 Spurious emissions radiated (1 GHz to 12 GHz)	> 15		☒	☐	-
DC Correction for pulse operation (duty cycle)	-		☒	☐	-
Model: TX-1442					
CPR2 Radiated emission of the fundamental wave	1.3		☒	☐	-
SER3 Spurious emissions radiated (1 GHz to 12 GHz)	> 15		☒	☐	-
DC Correction for pulse operation (duty cycle)	-		☒	☐	-

Remarks:

- The limits are met.
- For detailed information see the following pages.

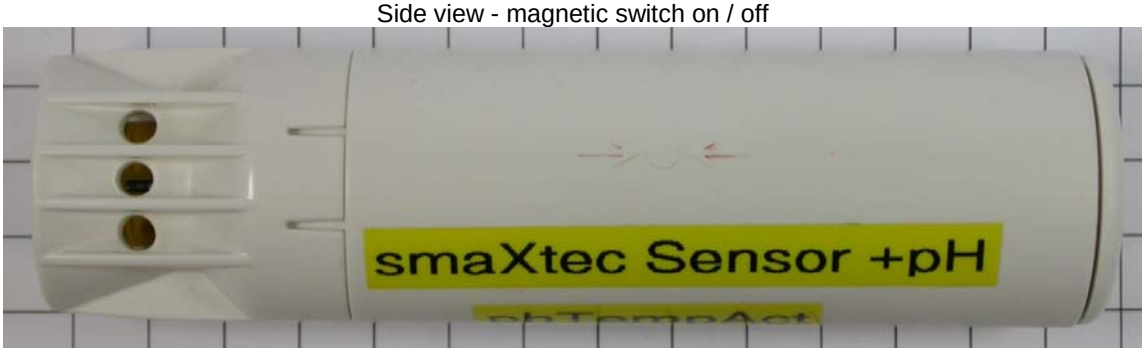
This test result consists of 18 page(s). The test result only corresponds to the tested sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Date	Checked by	Tested by	Result
2015-11-24	Klaus Gegenfurtner 2016.03.30 12:34:46 +02'00'	Tobias Kammerer 2016.03.30 11:28:44 +02'00'	☒ **passed**
			☐ **not passed**

Photo documentation of the EuT

Model: US-1042
Scale: 1 square = 1 cm

Side view - magnetic switch on / off

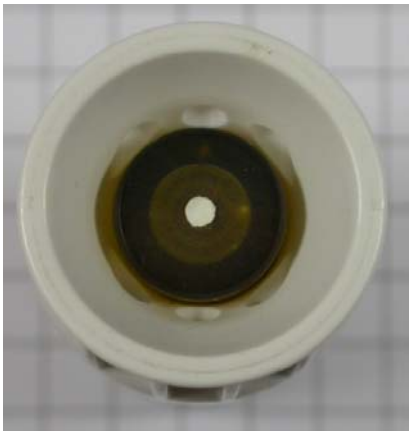


Side view - label

Label view

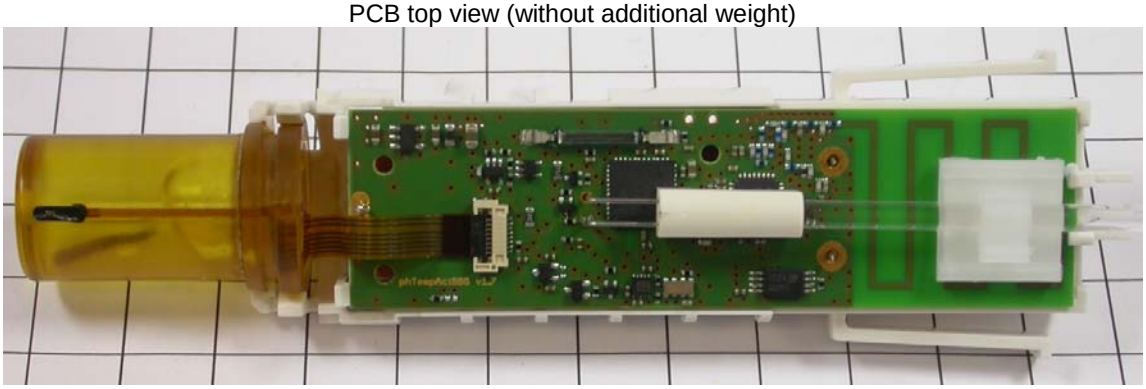
Top view

Bottom view

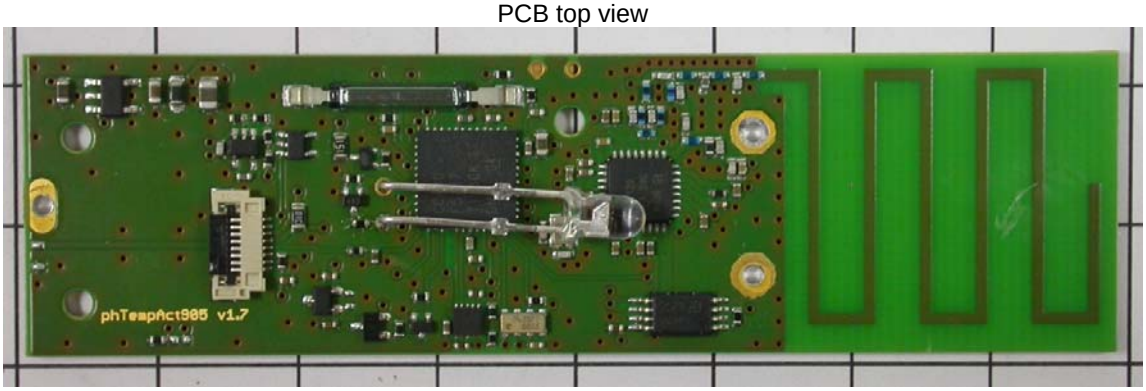


Internal view – removed electronic

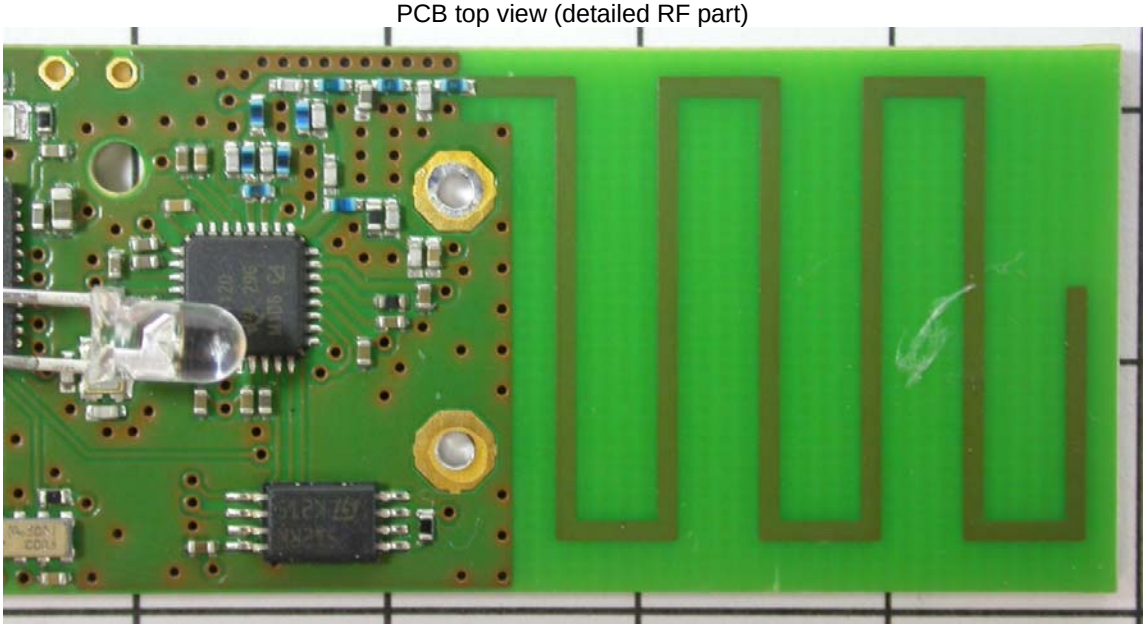
PCB top view (without additional weight)



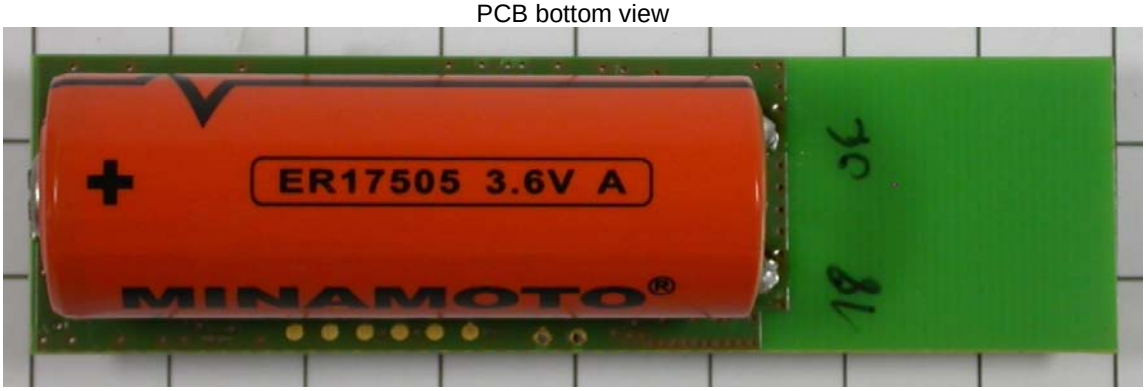
PCB top view



PCB top view (detailed RF part)



PCB bottom view



PCB bottom view (removed battery)

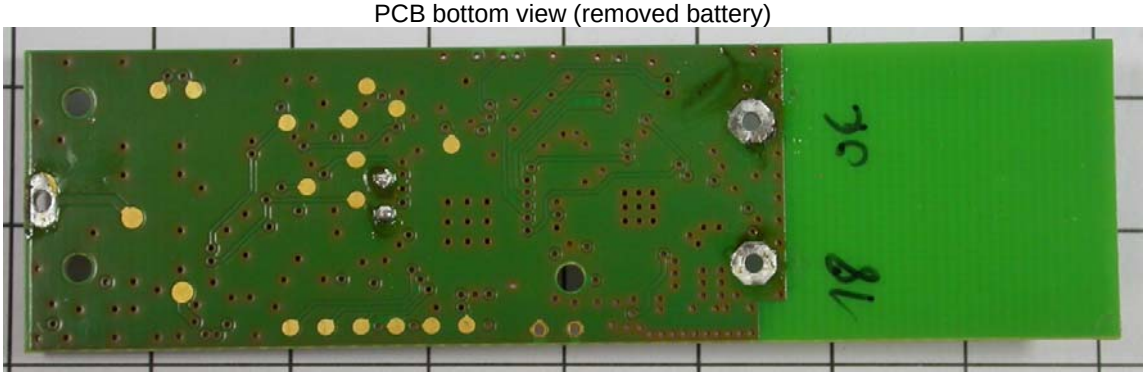
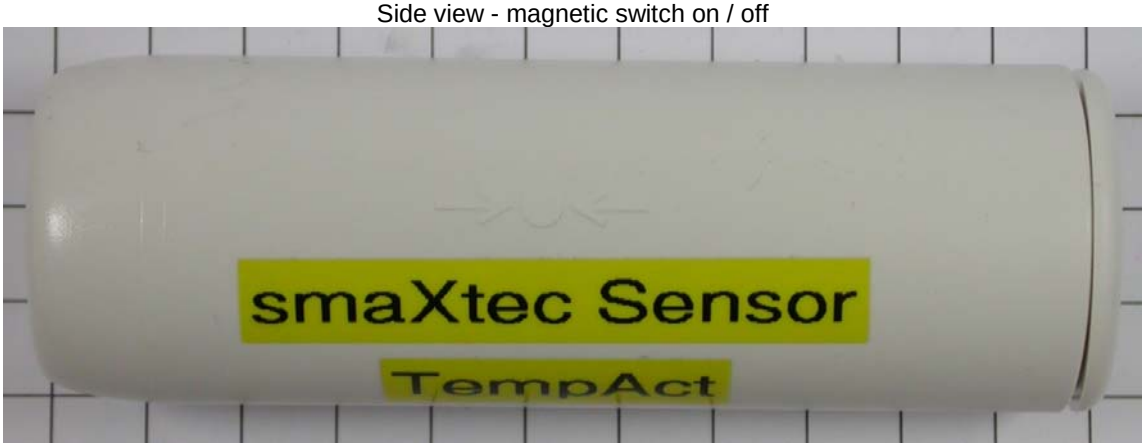


Photo documentation of the EuT

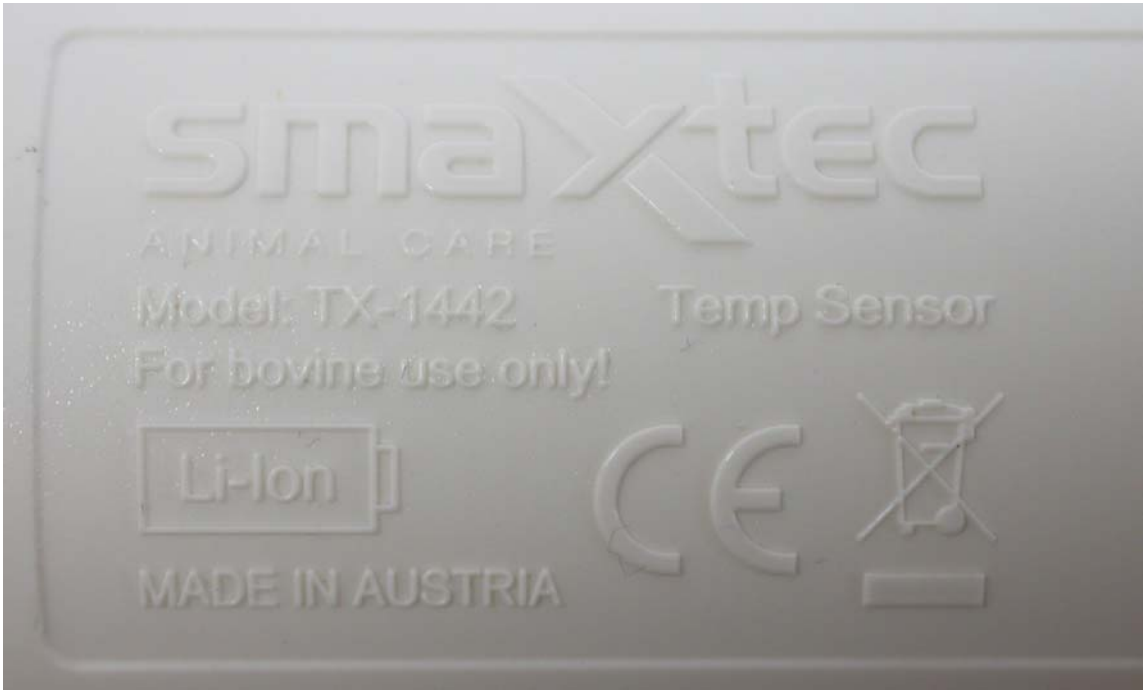
Model: TX-1442
Scale: 1 square = 1 cm

Side view - magnetic switch on / off



Side view - label

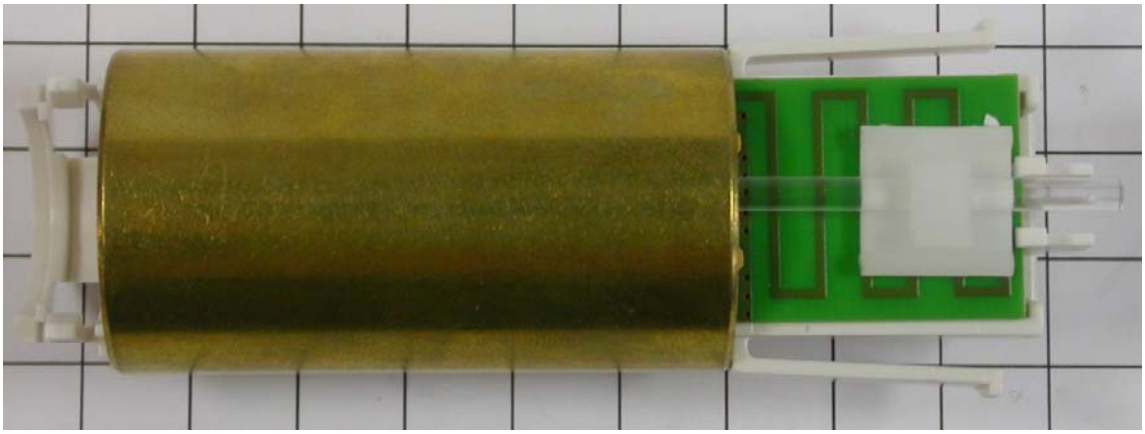
Label view



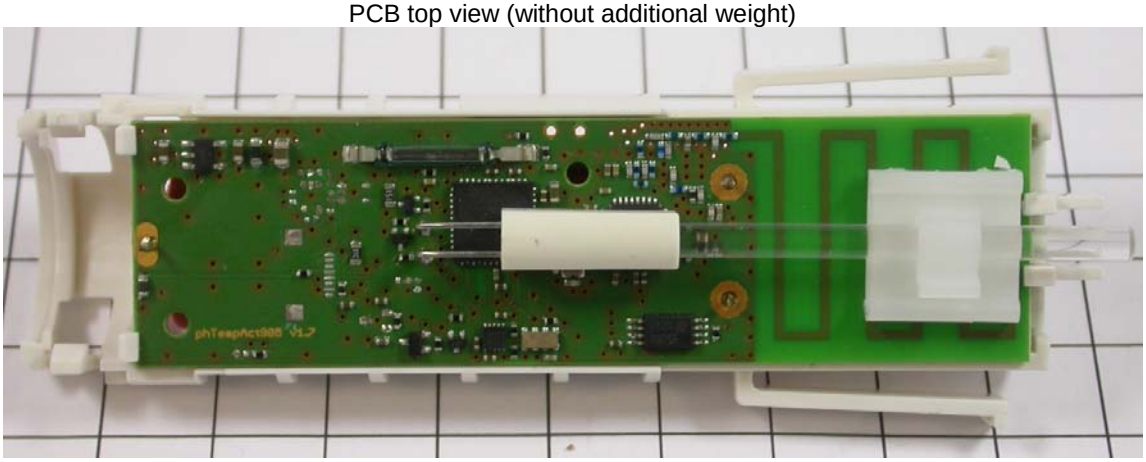
Top view

Bottom view

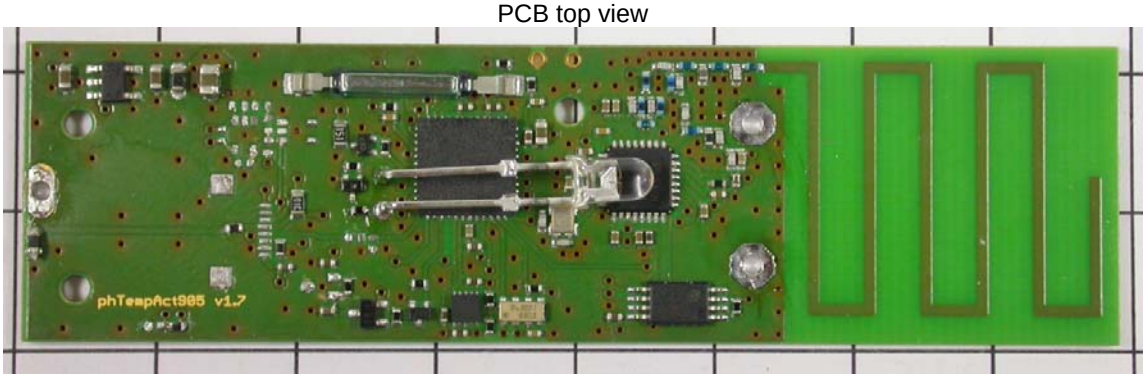
Internal view – removed electronic



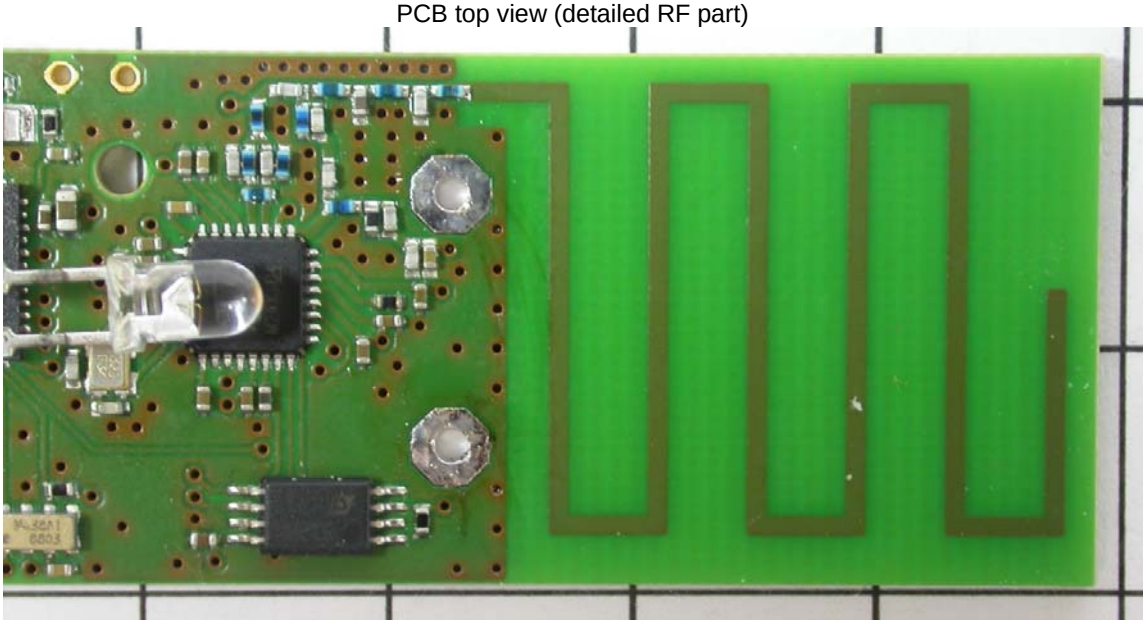
PCB top view (without additional weight)



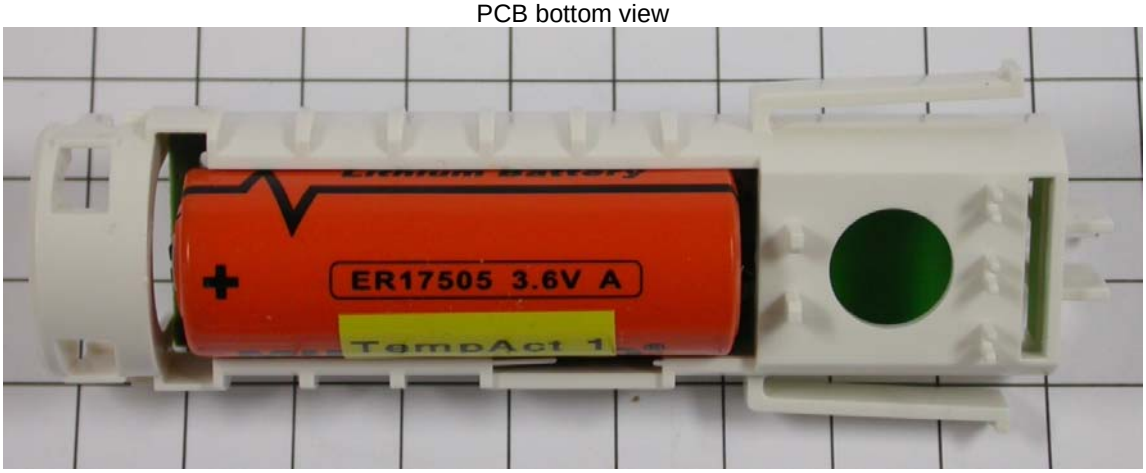
PCB top view



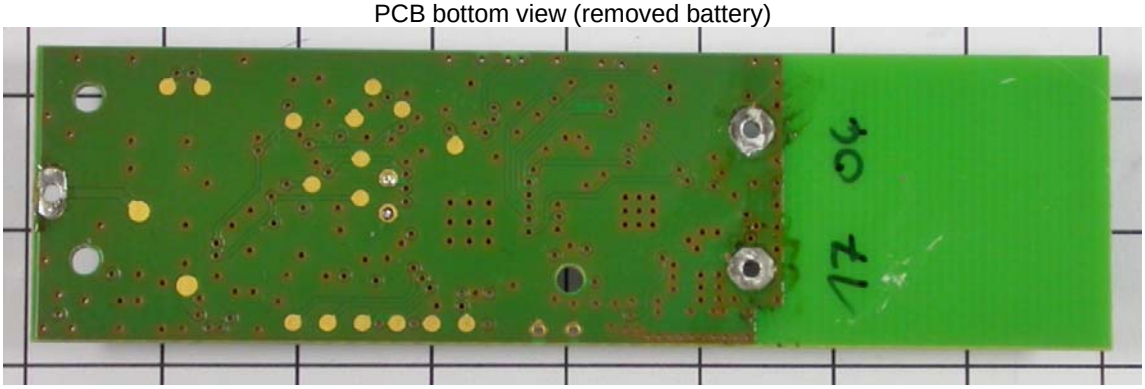
PCB top view (detailed RF part)



PCB bottom view



PCB bottom view (removed battery)



Test conditions and results

Radiated emission of the fundamental wave

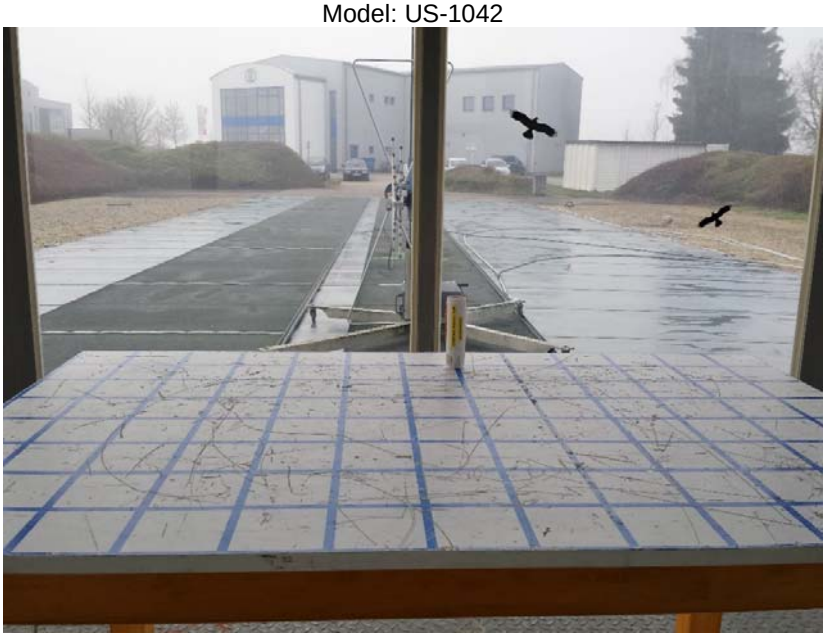
For test instruments and accessories used see section 6 Part **CPR 2**.

Description of the test location

Test location: OATS 1
Test distance: 3 m

Photo documentation of the test set-up

Model: US-1042



Model: TX-1442

Applicable standard

According to FCC Part 15C, Section 15.249(a):
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

Description of Measurement

The radiated field strength of the fundamental wave from the EUT is measured using a tuned EMI-receiver. The set up of the EUT and the measurement procedure is in accordance to ANSI C63.4, Item 8.3. The EUT is measured in TX continuous mode modulated under normal conditions.

EMI test receiver settings:
30 MHz – 1000 MHz: RBW: 120 kHz

Test result

Model: US-1042

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
905.5	75.2	-14.9	60.3	30.9	106.1	91.2	114.0	94.0	-2.8

*) Average values were calculated from the subtraction of peak values minus correction duty cycle factor.

Model: TX-1442

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
905.5	76.7	-14.9	61.8	30.9	107.6	92.7	114.0	94.0	-1.3

*) Average values were calculated from the subtraction of peak values minus correction duty cycle factor.
Note: The correction factor includes cable loss and antenna factor.

Average-Limit according to FCC Part 15C, Section 15.249(a):

Frequency	Field strength of fundamental	
(MHz)	(mV/m)	dB(µV/m)
902 - 928	**50**	**94**
2400 - 2483.5	50	94
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):
However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED.**

Remarks: The alternative measurement method accd. to FCC Part 15.35(a) where used.

Spurious emissions radiated

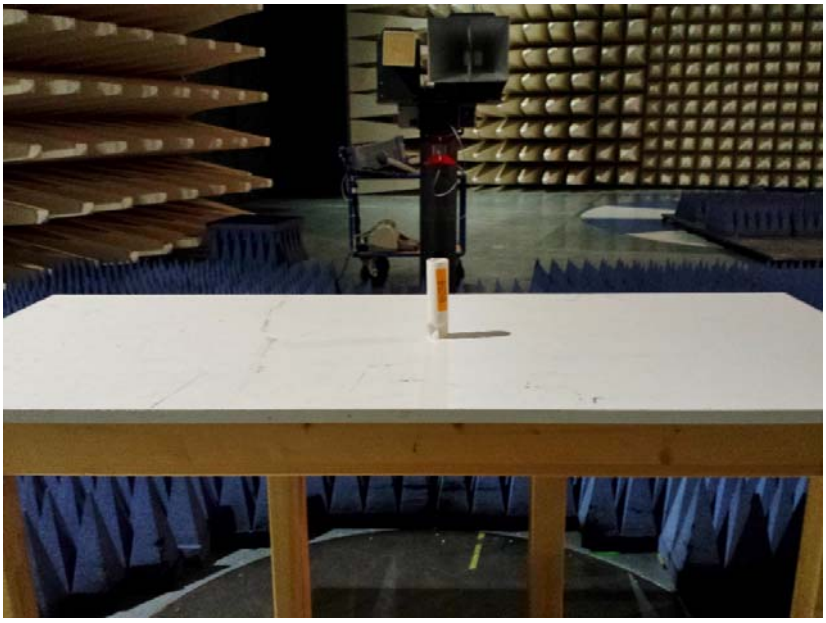
For test instruments and accessories used see section 6 Part **SER 3**.

Description of the test location

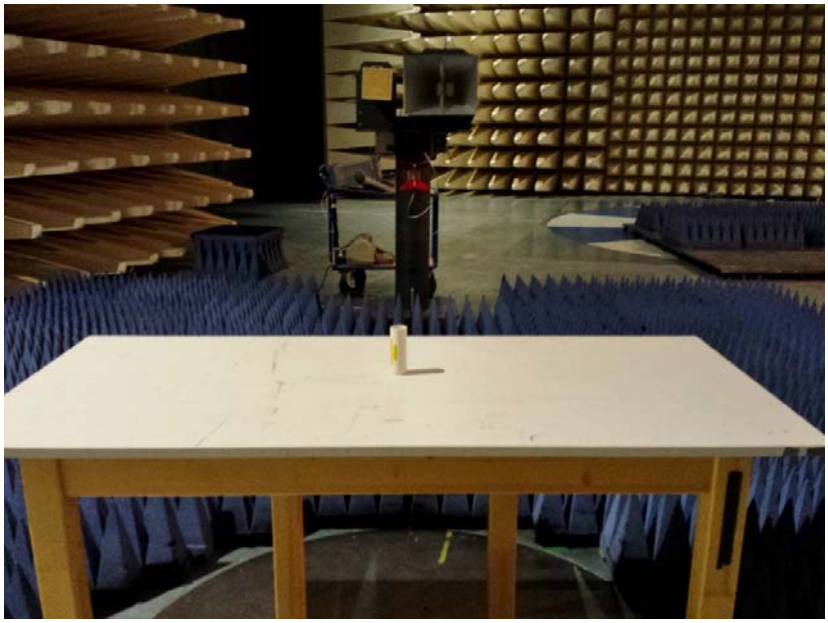
Test location: Anechoic chamber 1
Test distance: 3 m

Photo documentation of the test set-up

Model: US-1042



Model: TX-1442



Applicable standard

According to FCC Part 15C, Section 15.249 (d):
Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4, Item 8.3.
The EUT is measured in TX continuous mode modulated under normal conditions.

Spectrum analyser settings:
1000 MHz – 40 GHz RBW: 1 MHz

Test result

Model: US-1042

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1811.1	66.2	-14.9	51.3	-17.9	48.3	33.4	74.0	54.0	-20.6
2716.4	65.7	-14.9	50.8	-13.6	52.1	37.2	74.0	54.0	-16.8
3622.4	67.1	-14.9	52.2	-13.1	54.0	39.1	74.0	54.0	-14.9
4512.0	42.5	-14.9	27.6	1.8	44.3	29.4	74.0	54.0	-24.6
6399.0	40.4	-14.9	25.5	6.6	47.0	32.1	74.0	54.0	-21.9

*) Average values were calculated from the subtraction of peak values minus correction duty cycle factor.

Model: TX-1442

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1810.8	59.0	-14.9	44.1	-17.9	41.1	26.2	74.0	54.0	-27.8
2716.4	65.1	-14.9	50.2	-13.6	51.5	36.6	74.0	54.0	-17.4
3622.4	64.0	-14.9	49.1	-13.1	50.9	36.0	74.0	54.0	-18.0
4527.0	42.7	-14.9	27.8	2.0	44.7	29.8	74.0	54.0	-24.2
6398.0	40.9	-14.9	26.0	6.6	47.5	32.6	74.0	54.0	-21.4

*) Average values were calculated from the subtraction of peak values minus correction duty cycle factor.

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits dB(µV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30-88	40	3
88-216	43.5	3
216-960	46	3
Above 960	54	3

Average limit according to FCC Part 15C, Section 15.249(a):

Fundamental frequency	Field strength of harmonics	
(MHz)	(µV/m)	dB(µV/m)
902 - 928	**500**	**54**
2400 - 2483.5	500	54
5725-5875	500	54
24000 - 24250	2500	68

Peak-Limit according to FCC Part 15C, Section 15.249(e):
However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED.**

Remarks: The measurement was performed up to the 10th harmonic (12000 MHz).

Correction for pulse operation (duty cycle)

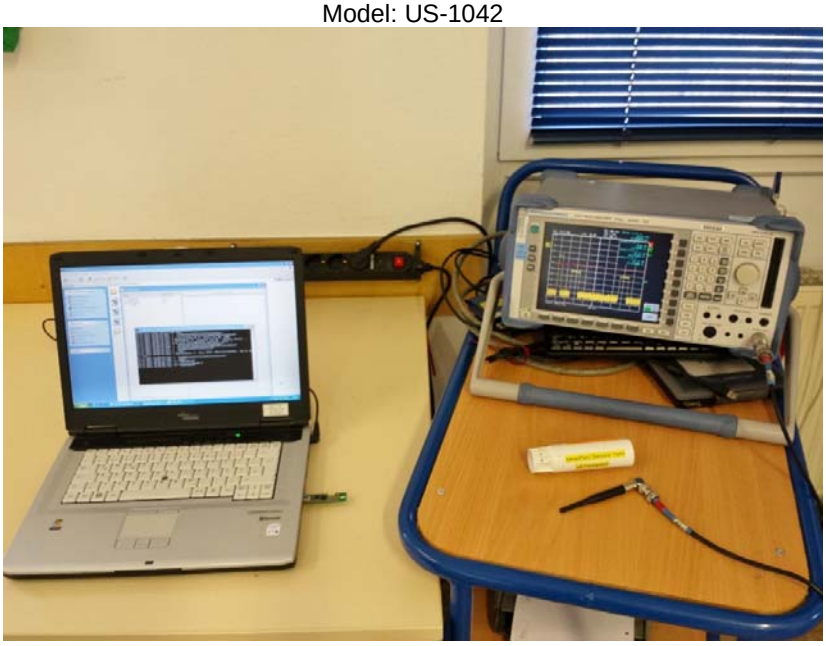
For test instruments and accessories used see section 6 Part **DC**.

Description of the test location

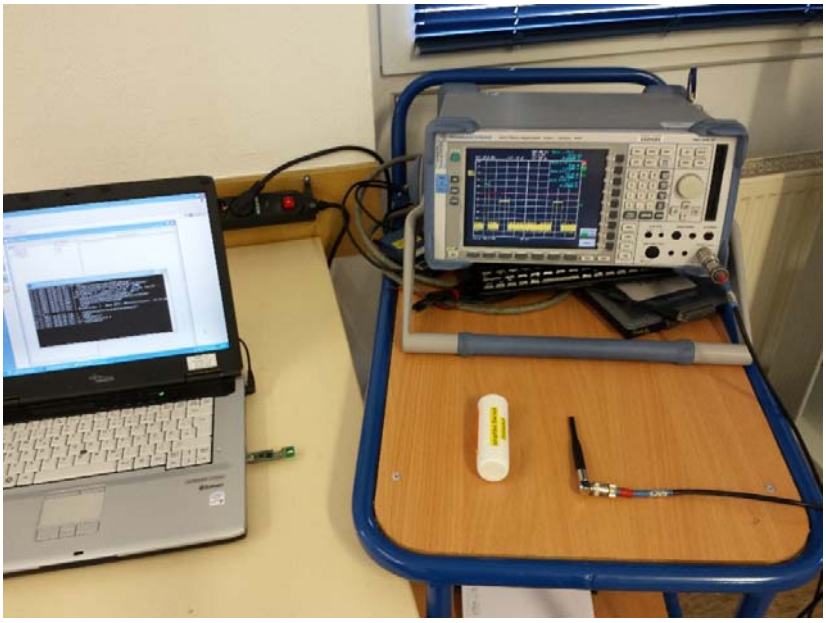
Test location: AREA4

Photo documentation of the test set-up

Model: US-1042



Model: TX-1442



Applicable standard

According to FCC Part 15A, Section 15.35(c):
When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

Description of Measurement

The duty cycle factor (dB) is calculated applying the following formula:

$$K_E = 20\ log\ \frac{T_{ON}}{T_{PT}}$$

$$\mathbf{-14.9dB = 20\ log\ \frac{18ms}{100ms}}$$

K_E: pulse operation correction factor (dB)
T_{ON} complete on time (ms)
T_{PT} complete pulse train (ms)

Spectrum analyser settings:

RBW:	300 kHz	VBW:	1MHz	Span:	zero span
Sweep time:	Manual	Detector:	Max. peak	Trace Mode:	single sweep

Test result

T_{ON} (ms)	T_{PT} (ms)	K_E (dB)
18	100	-14.9

Remarks: The pulse train (*Tw*) exceeds 100 ms, therefore the duty cycle have been calculated by averaging the sum of the pulse widths over the 100 ms width with the highest average value.

For detailed results, please see the test protocol below.

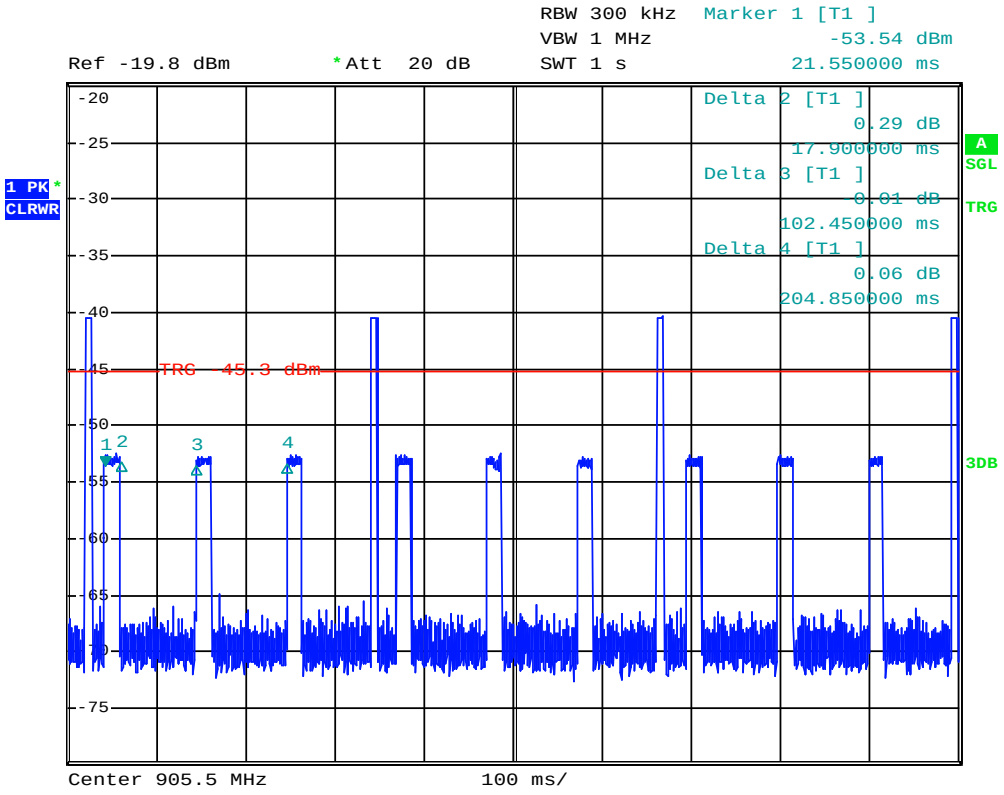
The higher transmission packakes are from the remote station (USB antenna).

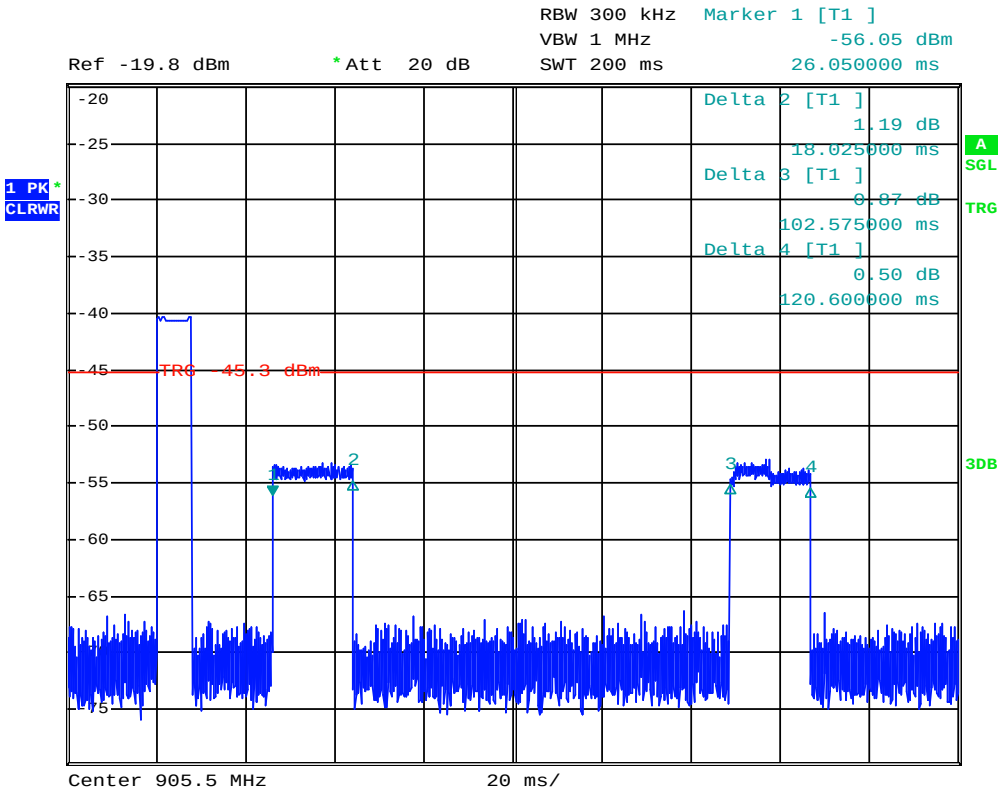
There are no differences between the US-1042 and TX-1442 variant.

Test protocol

Correction for Pulse Operation (Duty Cycle)

FCC Part 15A, Section 15.35(c)





USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 2	ESVS 30	02-02/03-05-003	09/07/2016	09/07/2015		
	VULB 9168	02-02/24-05-005	17/04/2016	17/04/2015	29/02/2016	31/08/2015
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
DC	FSP 30	02-02/11-05-001	01/10/2016	01/10/2015		
	RF Antenna	02-02/24-05-032				
SER 3	FSP 30	02-02/11-05-001	01/10/2016	01/10/2015		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	12/05/2016	12/05/2015		
	WHJS 1000-10EE	02-02/50-05-070				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				