

TEST REPORT

Test report no.: 1-3449/11-01-02-B



Testing laboratory

CETECOM ICT Services GmbH
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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01
 Area of Testing: Radio/Satellite Communications

Applicant

m&h Inprocess Messtechnik GmbH
 Am Langholz 11
 88289 Waldburg / GERMANY
 Phone: +49 752 997-3338
 Fax: +49 752 997-3339
 Contact: Christoph Wiest
 e-mail: entwicklung@mh-inprocess.com
 Phone: +49 752 997-3338

Manufacturer

m&h Inprocess Messtechnik GmbH
 Am Langholz 11
 88289 Waldburg / GERMANY

Test standard/s

47 CFR Part 15 Title 47 of the Code of Federal Regulations; Chapter I
 Part 15 - Radio frequency devices
 RSS – GEN Issue 3 General Requirements and Information
 for the Certification of Radio Apparatus

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: Touch Trigger Probe
Model name: RWP38.41
FCC ID: MFFRWP3841
IC: 5782A-RWP3841
Frequency [MHz]: 433.075 MHz – 434.65 MHz
Technology tested: Proprietary
Antenna: Integrated antenna
Power Supply: 7.20 V DC by Battery (LI-110 / ER 14250)
Temperature Range: +22°C



This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

Stefan Bös
 Senior Testing Manager

Test performed:

Jakob Reschke
 Testing Manager

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

This test report replaces the test report with the number 1-3449/11-01-02-A and dated 2011-12-14

2.2 Application details

Date of receipt of order:	2011-05-27
Date of receipt of test item:	2011-11-21
Start of test:	2011-11-21
End of test:	2011-12-09
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS – GEN Issue 3	2010-12	General Requirements and Information for the Certification of Radio Apparatus

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	-/- °C during high temperature tests
	T_{min}	-/- °C during low temperature tests
Relative humidity content:		41 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	7.20 V DC by Battery (LI-110 / ER 14250)
	V_{max}	-/- V
	V_{min}	-/- V

5 Test item

Kind of test item	:	Touch Trigger Probe
Type identification	:	RWP38.41
S/N serial number	:	#1053 #1005
HW hardware status	:	HW01
SW software status	:	V01
Frequency band [MHz]	:	433.075 MHz – 434.65 MHz
Type of modulation	:	2FSK
Antenna	:	Integrated antenna
Power supply	:	7.20 V DC by Battery (LI-110 / ER 14250)
Temperature range	:	+22°C

6 Test laboratories sub-contracted

None

7 Summary of measurement results

- No deviations from the technical specifications were ascertained**
- There were deviations from the technical specifications ascertained

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS GEN, Issue 3	Passed	2012-01-18	-/-

Test Specification Clause	Test Case	Temperature Conditions	Power Source Voltages	Pass	Fail	NA	NP	Results
§ 15.35 (c) / RSS-GEN Issue 2 Section 4.5	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
RSS-GEN Issue 3 Item 4.6	Bandwidth of the modulated carrier	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209 / RSS-GEN Issue 3 Item 7.2.5	Fieldstrength of fundamental	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.209 / RSS-GEN Issue 3 Item 7.2.5	Fieldstrength of harmonics and spurious	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note: NA = Not Applicable; NP = Not Performed

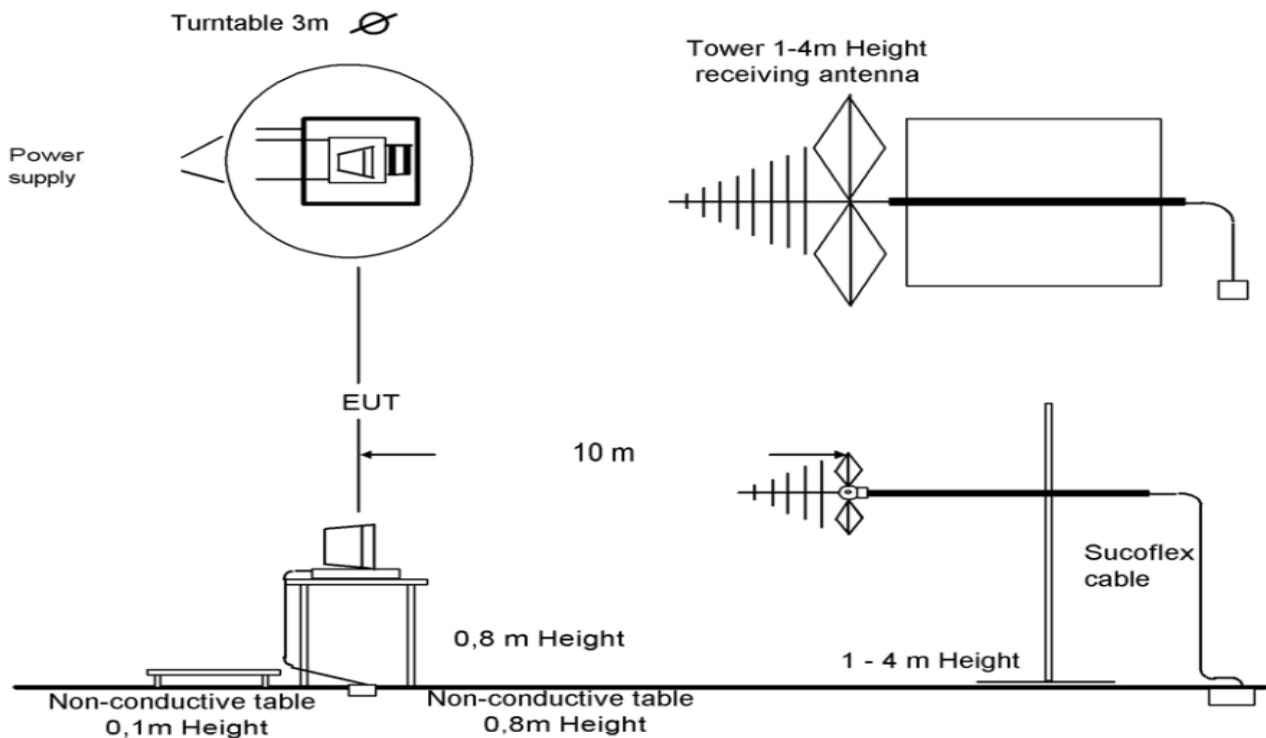
8 RF measurements

8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.2-1996 and ANSI C63.4-2009. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-2009. Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



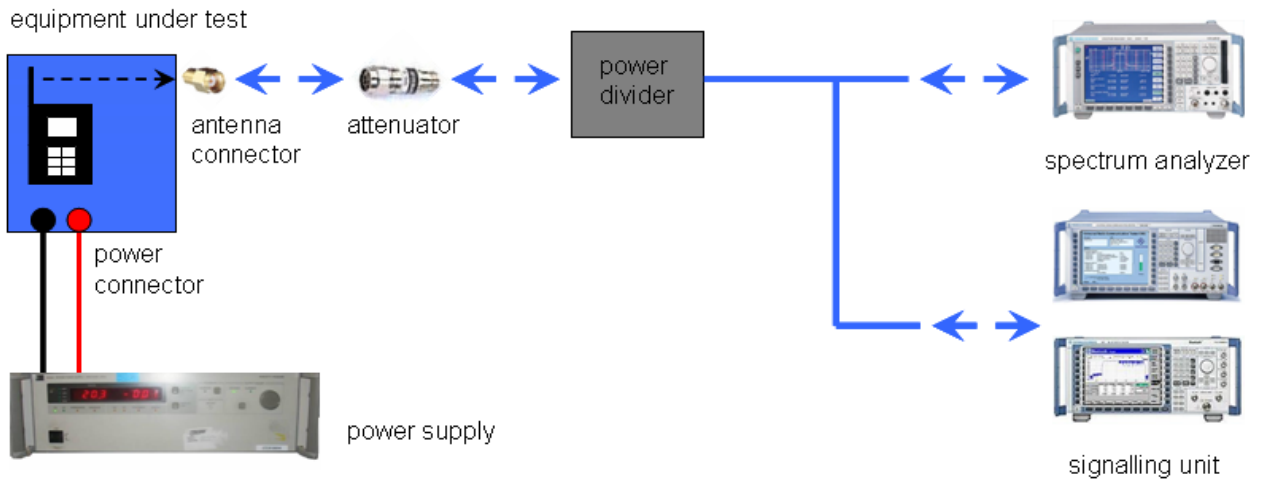
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

The EUT is powered by an external power supply with nominal voltage. The signalling (if needed) is performed from outside the chamber with a signalling unit by air link using signalling antenna.

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: The tests were performed on the lowest, middle and highest channel. Only the middle channel is reported in the test report. No differences were found between the three channels.

Configuration descriptions: None

8.3 RSP100 test report cover sheet / performance test data

Test Report Number	:	1-3449/11-01-02-B
Equipment Model Number	:	RWP38.41
Certification Number	:	5782A-RWP3841
Manufacturer (complete Address)	:	m&h Inprocess Messtechnik GmbH Am Langholz 11 88289 Waldburg / GERMANY
Tested to radio standards specification no.	:	RSS GEN, Issue 3
Open Area Test Site IC No.	:	IC 3462C-1
Frequency Range or fixed frequency	:	433.075 MHz – 434.65 MHz channel step size: 25 kHz
Field Strength [dB μ V/m] (at which distance)	:	52.53 Peak @ 10m 33.20 Average @ 10m
Occupied bandwidth (99%-BW) [kHz]	:	14.33
Type of modulation	:	2FSK
Emission Designator (TRC-43)	:	14K3F1D
Antenna Information	:	Integrated antenna
Transmitter Spurious (worst case) [dB μ V/m @ 3m]:		47.62 @ 2170 MHz 4.91 dB below carrier
Receiver Spurious (worst case) [dB μ V/m @ 3m]:		Not applicable

ATTESTATION:
DECLARATION OF COMPLIANCE:

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory Manager:


Signature

2012-01-18

9 Measurement results

9.1 Timing of the transmitter

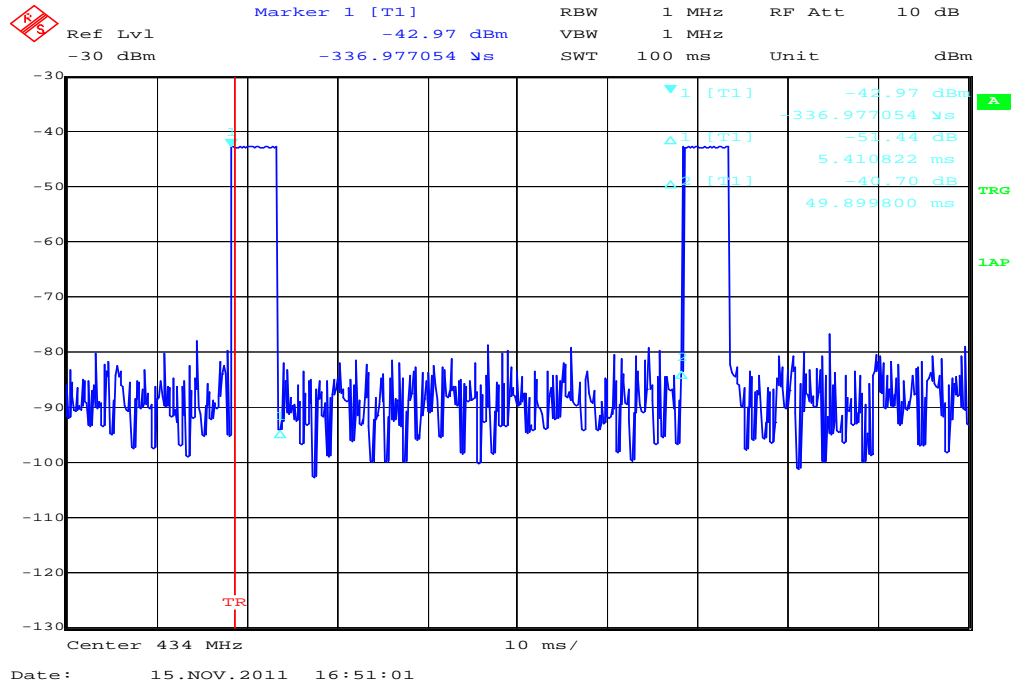
Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	100ms
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	Zero Span
Trace-Mode:	Max View with Trigger

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.35 (c)	RSS-GEN Issue 2 Section 4.5
Timing of the transmitter	
<p>(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.</p>	

Plot 1: Duty Cycle



Tx on: 5.4ms x 2
 Duty Cycle correction factor is -19.33dB

Result: The result of the measurement is passed.

9.2 Bandwidth of the modulated carrier

Limits:

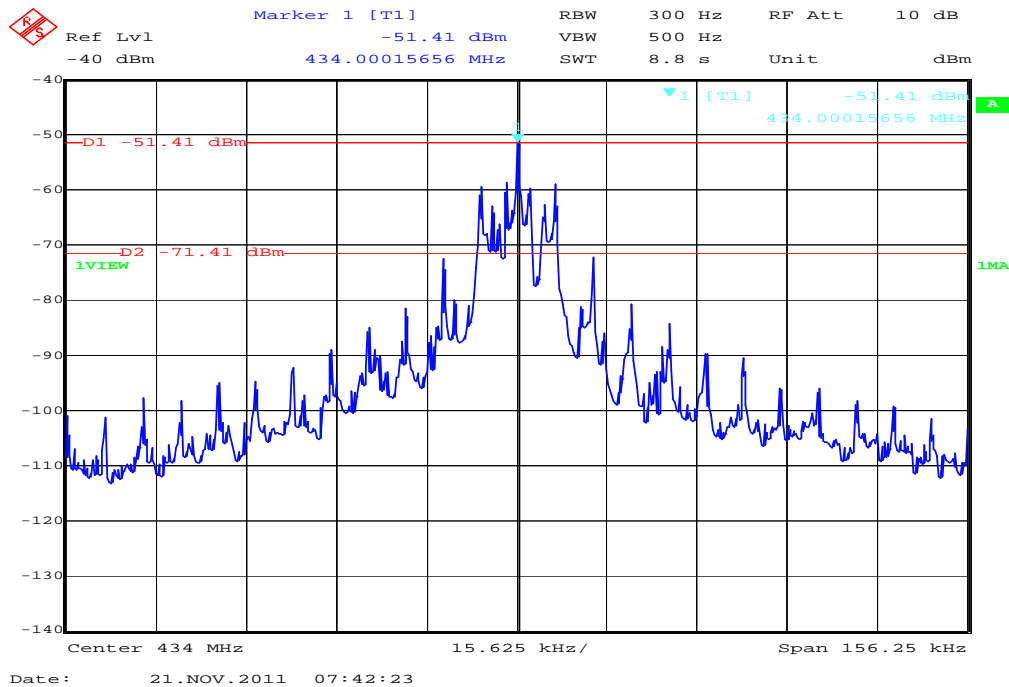
IC
RSS-GEN Issue 3
Bandwidth of the modulated carrier

Result:

	Occupied Bandwidth (kHz)
20 dB (99%)	14.33

Plots of the measurement

Plot 1: Signal overview



Plot 2: 20dB (99%) - bandwidth



9.3 Field strength of the fundamental

Measurement:

Measurement parameter	
Detector:	Peak / Average
Resolution bandwidth:	100 kHz
Trace-Mode:	Max Hold

Limits:

FCC		IC	
CFR Part SUBCLAUSE § 15.209		RSS-GEN Issue 3	
Fundamental Frequency (MHz)	Field strength of Fundamental (µV/m)	Measurement distance (m)	
216-960	200 µV/m 46 dBµV/m	3	
216-960	36 dBµV/m*	10	

*calculated acc. 15.31(f1) with 20dB/decade

Result:

TEST CONDITIONS		MAXIMUM POWER (dBµV/m)	
Frequency		434 MHz	434 MHz
Mode		at 10 m distance	at 10 m distance
T _{nom}	V _{nom}	52.53 Peak	33.20 AV*
Measurement uncertainty		±3dB	

*calculated

Result: The result of the measurement is passed.

9.4 Fieldstrength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Average / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Video bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Span:	100 MHz Steps
Trace-Mode:	Max Hold

Limits:

FCC	IC	
SUBCLAUSE § 15.209 (a)	RSS-Gen Issue 3	
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30 (29.5 dB $\mu\text{V/m}$)	30
30 – 88	100 (40 dB $\mu\text{V/m}$)	3
88 – 216	150 (43.5 dB $\mu\text{V/m}$)	3
216 – 960	200 (46 dB $\mu\text{V/m}$)	3

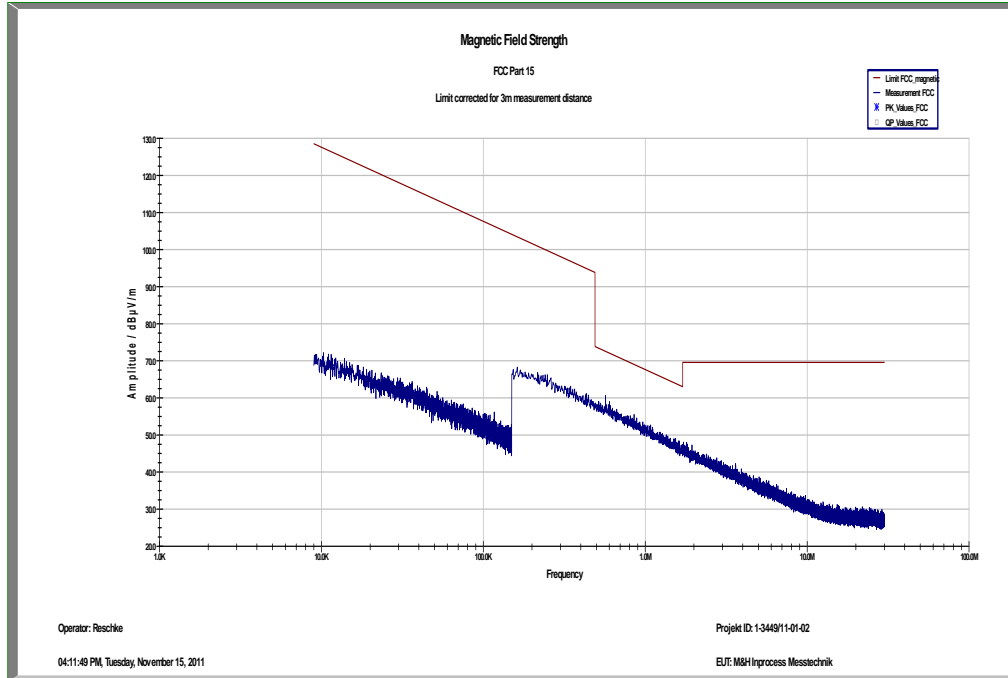
Result:

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB $\mu\text{V/m}$]	Amplitude of emission [dB $\mu\text{V/m}$]	Results
2170	Peak	54	47.62 4.91 dB below carrier	Pass

Result: The result of the measurement is passed.

Plots of the measurements

Plot 1: 9 kHz – 30 MHz

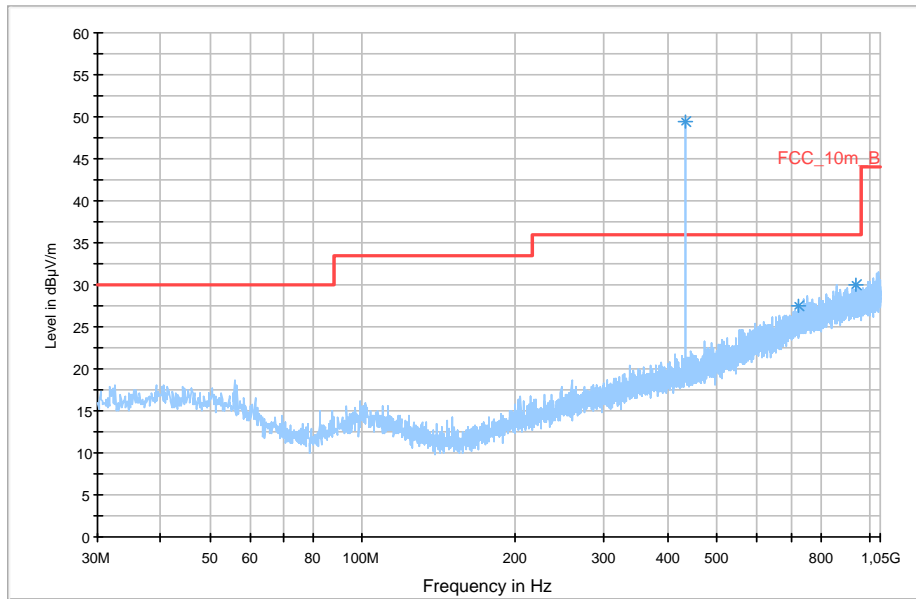


Plot 2: 30 MHz – 1000 MHz

Common Information

EUT:	Messtaster
Serial Number:	
Test Description:	FCC part 15 class B
Operating Conditions:	cont. tx
Operator Name:	Kraus
Comment:	battery powered

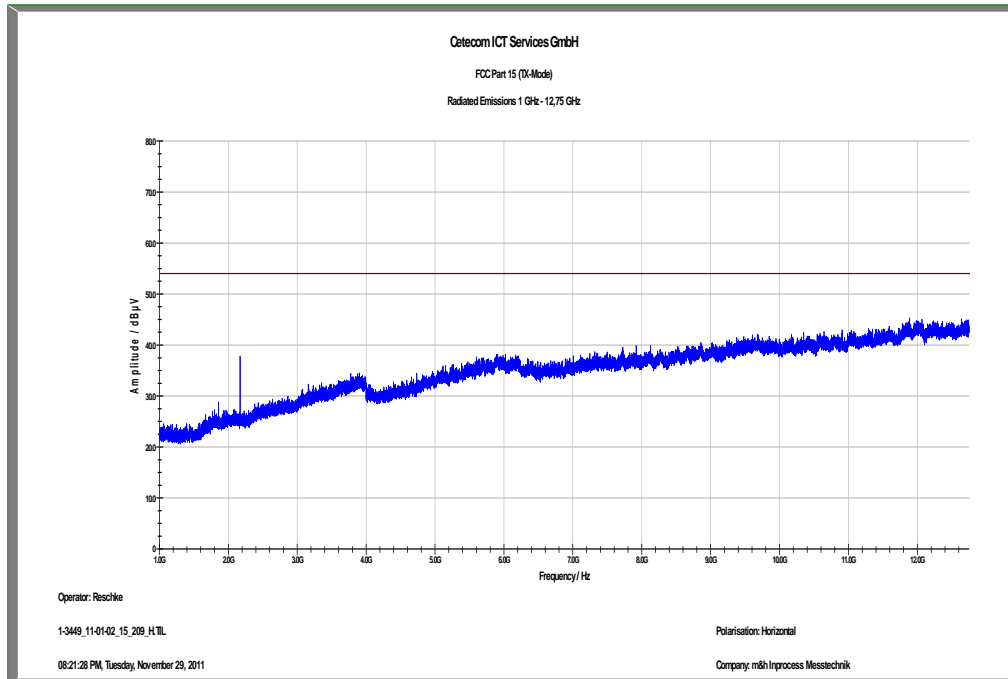
FCC_10m(B)



Data Reduction Result 1 [1]

Frequency (MHz)	MaxPeak-MaxHold (dBµV/m)	Height (cm)	Polarization	Azimuth	Corr. (dB)	Comment
434.047500	49.3	300.0	H	88.0	17.4	
724.365000	27.6	300.0	H	268.0	23.1	
939.967500	30.1	300.0	V	317.0	25.3	

Plot 3: 1 GHz – 12.75 GHz



10 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
2	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
3	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
4	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
5	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
6	n. a.	Amplifier	JS42-00502650-28-5A	MITEQ	1084532	300003379	ev		
7	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
8	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
9	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
10	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
11	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013
12	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
13	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
14	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
15	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	11.05.2011	11.05.2013
16	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
17	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
18	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
19	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
20	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
21	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
22	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
23	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
24	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		

25	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
26	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
27	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
28	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
29	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
30	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
31	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
32	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
33	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
34	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vkI!	08.09.2010	08.09.2012
35	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vkI!	14.10.2011	14.10.2014
36	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSIQ26	R&S	835111/0004	300002678	Ve	04.11.2010	04.11.2012

Agenda: Kind of Calibration

k calibration / calibrated
 ne not required (k, ev, izw, zw not required)
 ev periodic self verification
 Ve long-term stability recognized
 vkI! Attention: extended calibration interval
 NK! Attention: not calibrated

EK limited calibration
 zw cyclical maintenance (external cyclical maintenance)
 izw internal cyclical maintenance
 g blocked for accredited testing
 *) next calibration ordered / currently in progress

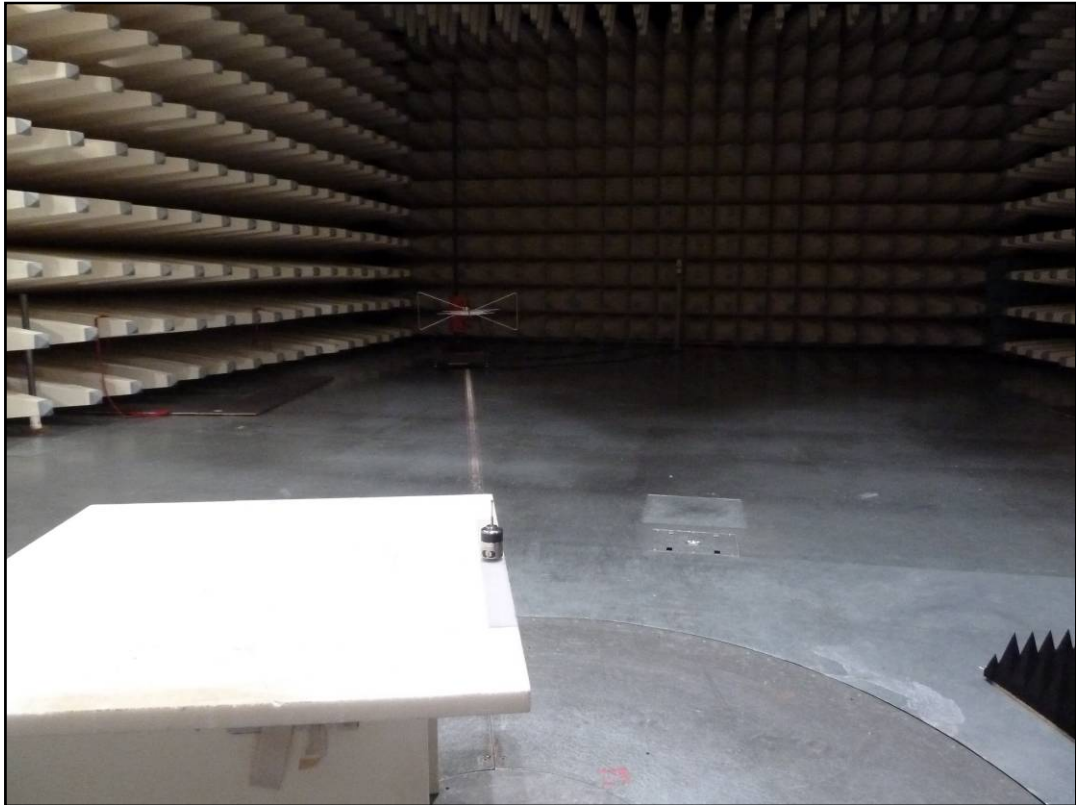
11 Observations

No observations exceeding those reported with the single test cases have been made.

Annex A Photographs of the test setup

Photo documentation

Photo 1:



Annex B External photographs of the EUT

Photo documentation

Photo 2:



Photo 3:



Photo 4:



Photo 5:



Photo 6:



Photo 7:



Photo 8:



Photo 9:



Annex C Internal photographs of the EUT

Photo documentation

Internal Photos provided by customer
The laboratory does not have the special tool to open the EUT

Photo 10:

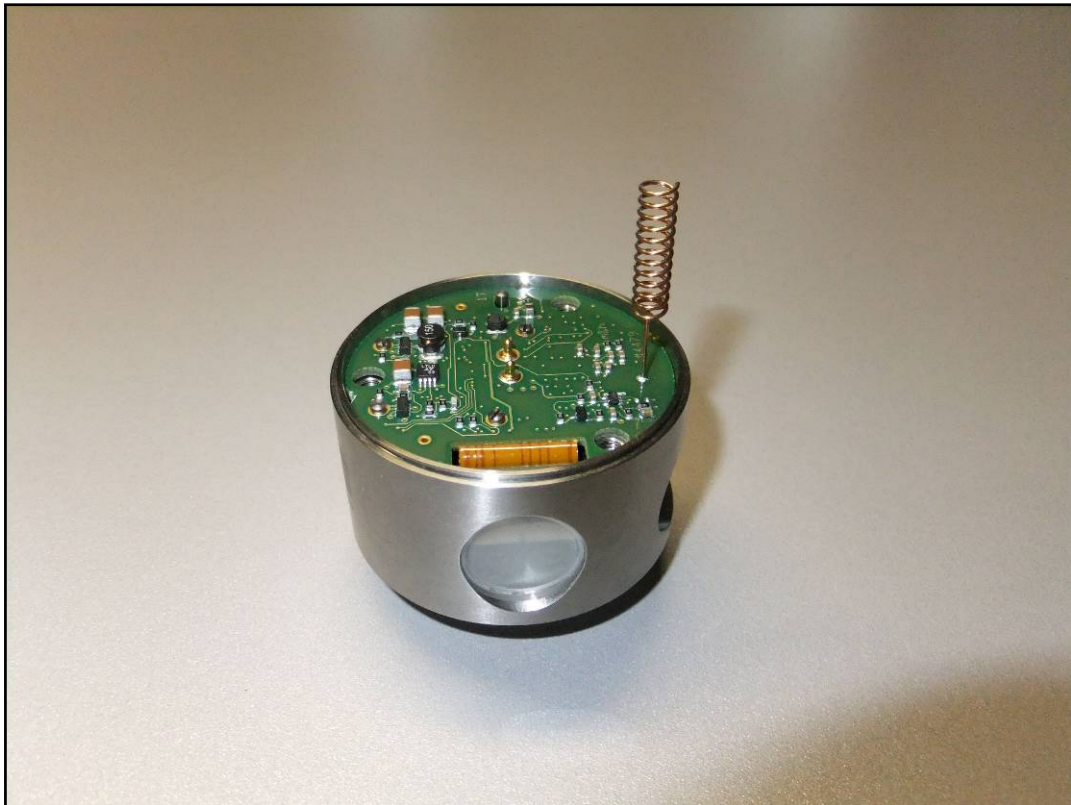


Photo 11:

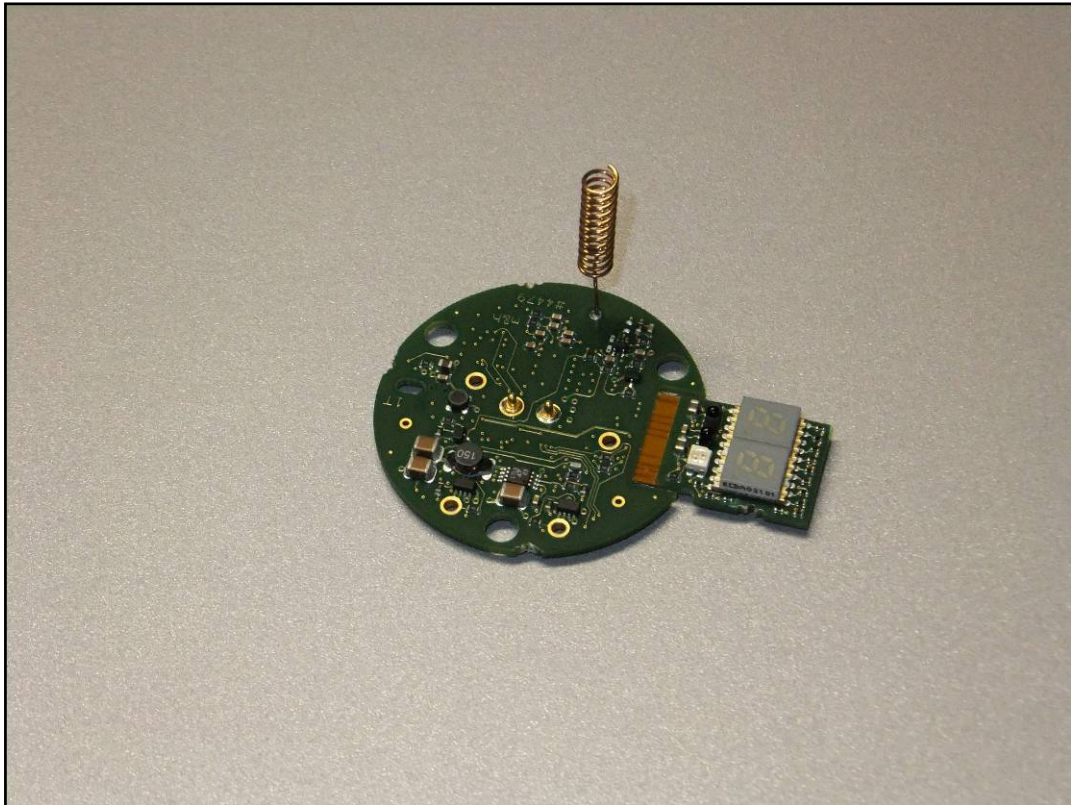
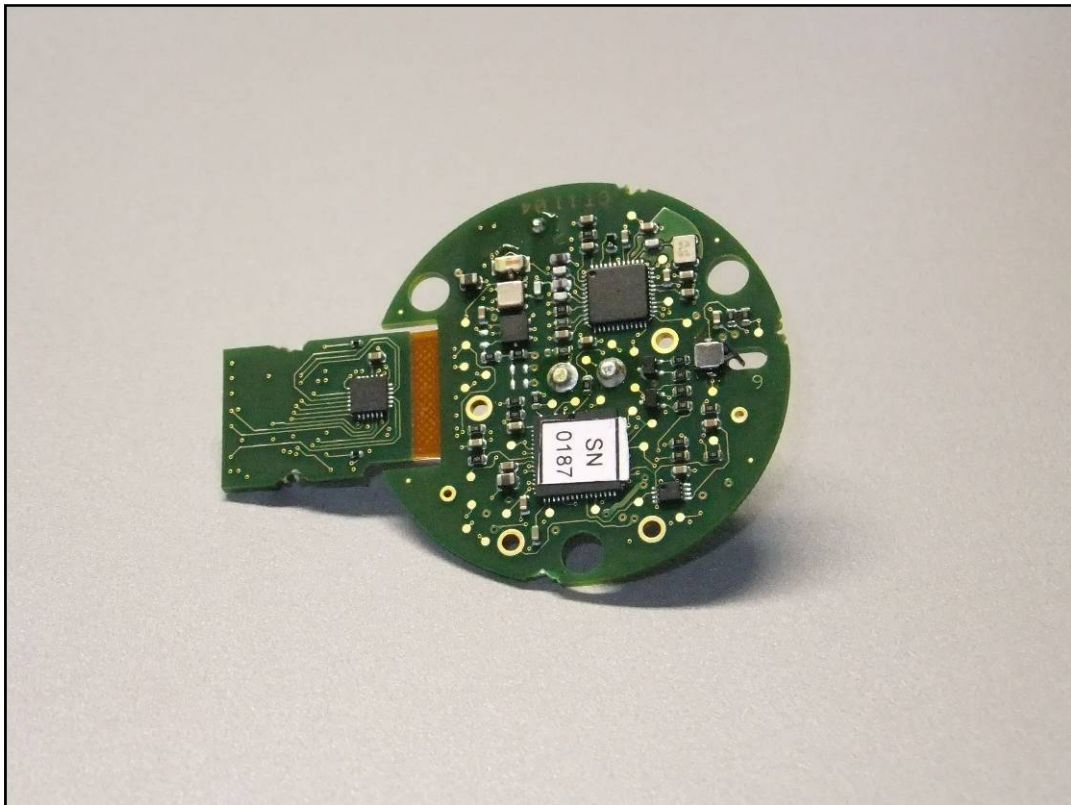


Photo 12:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-12-12
-A	Typos corrected This test report replaces the test report with the number 1-3449/11-01-02 and dated 2011-12-12	2011-12-14
-B	Frequency range corrected from 433.85 – 434.650 MHz to 433.075 – 434.650 MHz This test report replaces the test report with the number 1-3449/11-01-02-A and dated 2011-12-14	2012-01-18

Annex E Further information

Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software

Annex F Accreditation Certificate



Front side of the certificate



Back side of the certificate

Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

http://www.cetecom.com/fileadmin/de/CETECOM_D_Saarbruecken/accreditations_Jan_2010/DAKKS_Akkredi_Urk_EN17025-En_incl_Annex.pdf