

InterLab®

FCC Measurement/Technical Report on

Remote Control for USLT-USB and
SpotChecker

RC 24

FCC ID W9I-GEIT-RC24

Report Reference: MDE_GE_1501_FCCb_Rev_2

Test Laboratory:

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Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Authorization

Certification for an Intentional Radiator.

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-14 Edition) and 15 (10-1-14 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.205 Restricted bands of operation

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.249 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

Note:

ANSI C63.10–2013 is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.

0.2 Measurement Summary

FCC Part 15, Subpart C

§ 15.207

Conducted emissions (AC power line)

The measurement was performed according to ANSI C63.10

OP-Mode	Setup	Port	Final Result
-	-	-	N/A

FCC Part 15, Subpart C

§ 15.249 (a)

Field strength of Fundamental / Radiated power output

The measurement was performed according to ANSI C63.10

OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_01	Enclosure	passed

FCC Part 15, Subpart C

§ 15.249 (a), § 15.35 (b), § 15.209

Field Strength of Harmonics / Spurious radiated emissions

The measurement was performed according to ANSI C63.10

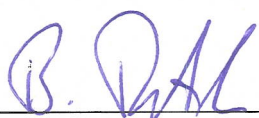
OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_01	Enclosure	passed

N/A not applicable (the EUT is powered by DC)

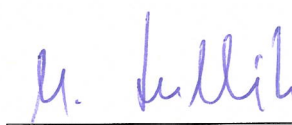
Revision History

Report version control			
Version	Release date	Change Description	Version validity
Initial	2015-11-05	--	invalid
Rev_1	2015-11-06	Op_mode and Setup numbers on page 15 are changed	invalid
Rev_2	2015-11-20	<ul style="list-style-type: none"> - Wrong FCC-ID corrected - FHHS removed in "Type of Authorisation" - Clarification of "spurious radiated emissions" test case - Changing wrong OP-Mode and Setup in chapter "Measurement Summary". 	valid

Responsible for
Accreditation Scope:



Responsible
for Test Report:



1 Administrative Data

1.1 Testing Laboratory

Company Name: 7Layers GmbH

Address Borsigstr. 11
40880 Ratingen
Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

The test facility is also accredited by the following accreditation organisation:
Laboratory accreditation no.: DAkkS D-PL-12140-01-01

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka
Dipl.-Ing. Robert Machulec
Dipl.-Ing. Thomas Hoell
Dipl.-Ing. Andreas Petz

Report Template Version: 2015-11-03

1.2 Project Data

Responsible for testing and report: Dipl.-Ing. Marco Kullik

Date of Test(s): 2015-10-22 to 2015-11-05

Date of Report: 2015-11-20

1.3 Applicant Data

Company Name: GE Sensing & Inspection Technologies GmbH

Address: Robert-Bosch-Str. 3
50354 Huerth
Germany

Contact Person: Mr. Jürgen Schmitt

1.4 Manufacturer Data

Company Name: Please see applicants data

Address:

Contact Person:

2 Test object Data

2.1 General EUT Description

Equipment under Test	Remote Control for USLT-USB and SpotChecker
Type Designation:	RC 24
Kind of Device: (optional)	2.4330 GHz Low Power Transmitter
Voltage Type:	DC
Voltage level:	3.0 V
Modulation Type:	ASK

General product description:

Remote Control for USLT-USB and SpotChecker is a radio transmitter intended to work at low output power only at a short distance of the device.

Specific product description for the EUT:

The EUT is part of a low power remote control system, designed to be used with Ultralog or USLT2000 Software. It is assembled using an integral antenna. The EUT is supplied by two 1.5 V, AAA size batteries and is not intended to be connected to AC Mains. It operates in the 2400-2483.5 MHz band.

The EUT provides the following ports:

Ports

Enclosure

The main components of the EUT are listed and described in Chapter 2.2.

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status
EUT A (Code: DE1061001_aa02)	Remote control (Transmitter)	RC 24 T	36818-01-1443	005WWCA0298	test SW Continuous Modulated (CM) Signal
Remark: EUT A is equipped with an integral antenna.					

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status
-	-	-	-	-	-

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it.

But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status
-	-	-	-	-	-

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup No.	Combination of EUTs	Description and Rationale
Setup_01	EUT A	setup for radiated measurements

2.6 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	The EUT transmits on 2.4330 GHz	transmitting Continuously Modulated signal

2.7 Special software used for testing

None (during the tests).

(For service / programming: Monitoring Software 5480 Porsche UDS.vi)

2.8 Product labelling

2.8.1 FCC ID label

Please refer to the documentation of the applicant.

2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

3 Test Results

3.1 Field strength of Fundamental / Radiated power output

Standard FCC Part 15, Subpart C

The test was performed according to: ANSI C63.10

3.1.1 Test Description

Please refer to the description at sub-clause 3.1.4, esp. item no. 3.

3.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50 (94.0 dB μ V/m)	500 (54.0 dB μ V/m)
2400-2483.5 MHz	50 (94.0 dB μ V/m)	500 (54.0 dB μ V/m)
5725-5875 MHz	50 (94.0 dB μ V/m)	500 (54.0 dB μ V/m)
24.0-24.25 GHz	250 (108.0 dB μ V/m)	2500 (68.0 dB μ V/m)

Used conversion factor: Limit (dB μ V/m) = 20 log (Limit (μ V/m)/1 μ V/m)

(c) Field strength limits are specified at a distance of 3 meters.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Protocol

Temperature: 25 °C
Air Pressure: 1013 hPa
Humidity: 36 %

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure

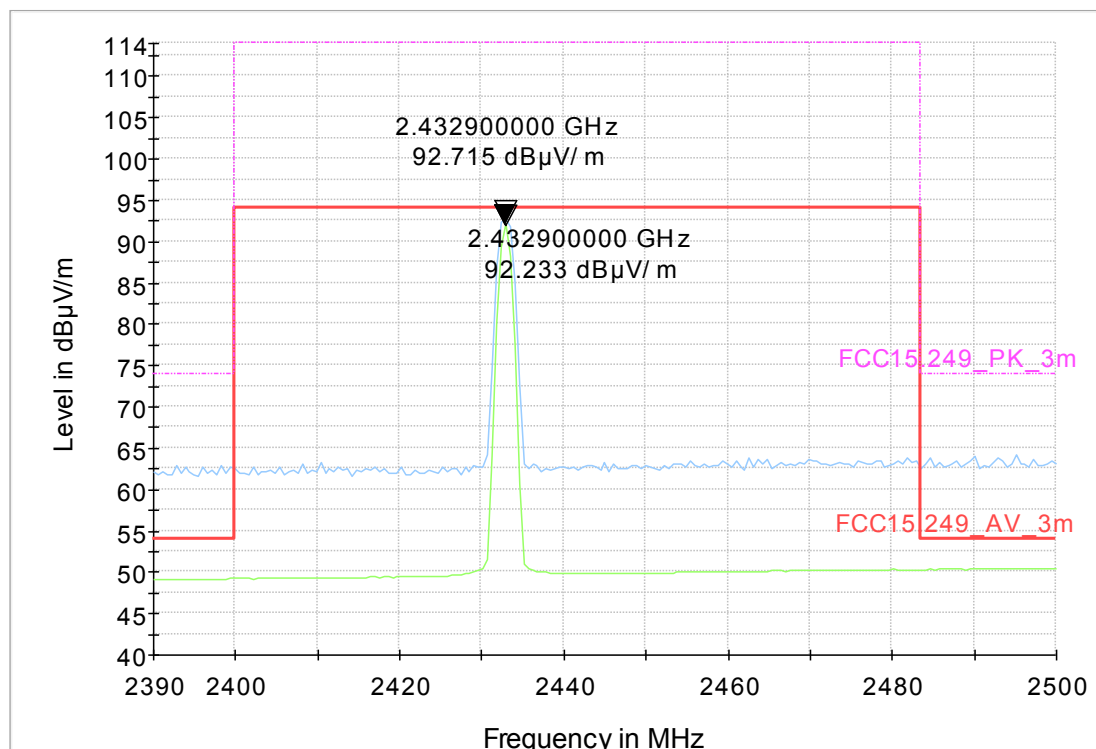
Radiated output power measured as field strength at a distance of 3 meters.

Polarisation	Frequency MHz	Field strenght of Fundamental dBµV/m		Limit dBµV/m		Margin to limit dB	
		Peak	AV	Peak	AV	Peak	AV
Vertical + horizontal	2433	92.7	92.2	114.0	94.0	21.3	1.8

Remark: Please see the measurement plot.

3.1.3 Test result: Peak power output

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed



Field Strength of Harmonics / Spurious radiated emissions

Standard FCC Part 15, Subpart C

The test was performed according to: ANSI C63.10

3.1.4 Test Description

The Equipment Under Test (EUT) was set up on a non-conductive table. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes.

1. Measurement up to 30 MHz

The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The Loop antenna HFH2-Z2 is used.

Step 1: pre-measurement

- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 – 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF-Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: final measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.

- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF-Bandwidth: 200 Hz – 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

Test was provided in semi-anechoic chamber using ES-K1 EMI test software.

Preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance 3 m
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 μ s
- Turntable angle range: -180 to $+180^\circ$
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -180 to $+180^\circ$
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved.

This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by $\pm 22.5^\circ$ around this value.

During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by ± 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -22.5° to $+22.5^\circ$ around the determined value

- Height variation range: -0.25 m to +0.25 m around the determined value

Step 4: final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz and up to 25.0 GHz:

Step one is performed with 45 ° step size of the turn table and 45° step size of the tilt device.

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1.5 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). All steps are performed with Peak and Average detector and with one height of the receiving antenna only.

With the turn table and the tilt device the pre- and final measurement was performed a maximum search over the complete sphere.

EMI receiver settings:

- Detector: Peak, Average
- IF Bandwidth = 1 MHz

3.1.5 Test Requirements / Limits

FCC Part 15, Subpart C, §15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50 (94.0 dBμV/m)	500 (54.0 dBμV/m)
2400-2483.5 MHz	50 (94.0 dBμV/m)	500 (54.0 dBμV/m)
5725-5875 MHz	50 (94.0 dBμV/m)	500 (54.0 dBμV/m)
24.0-24.25 GHz	250 (108.0 dBμV/m)	2500 (68.0 dBμV/m)

Used conversion factor: Limit (dBμV/m) = 20 log (Limit (μV/m)/1μV/m)

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency (MHz)	Limit (μV/m)	Measurement distance (m)	Calculate Limit(dBμV/m @10m)	Limit (dBμV/m) @10m
0.009 – 0.49	2400/F (kHz)	300	(48.5 – 13.8) + 59.1 dB	107.6 – 72.9
0.49 – 1.705	24000/F (kHz)	30	(33.8 – 23.0) + 19.1 dB	52.9 – 42.1
1.705 – 30	30	30	29.5 + 19.1 dB	39.5

Frequency in MHz	Limit (μV/m)	Measurement distance (m)	Limit (dBμV/m)
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
above 960	500	3	54.0

Used conversion factor: Limit (dBμV/m) = 20 log (Limit (μV/m)/1μV/m)

§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

3.1.6 Test Protocol

Temperature: 25–26 °C
Air Pressure: 1013–1018 hPa
Humidity: 26–33 %

Measurement up to 30 MHz

Op. Mode	Setup	Port							
op-mode 1	Setup_01	Enclosure							
Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
0°	-	-	-	-	-	-	-	-	-
90°	-	-	-	-	-	-	-	-	-

Remark: No spurious emissions in the range 20 dB below the limit found therefore step 2 was not performed.

Measurement above 30 MHz

Op. Mode	Setup	Port							
op-mode 1	Setup_01	Enclosure							
Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Margin to limit dB	Margin to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Vertical + horizontal	-	-	-	-	-	-	-	-	-

Remarks: No spurious emissions in the range 20 dB below the limit found.

Test result: Spurious radiated emissions

FCC Part 15, Subpart C			Op. Mode	Result
			op-mode 1	passed

4 Measurement uncertainty

Test Case	Parameter	Uncertainty
Field strength of Fundamental / Radiated power output	Power	± 4.5 dB
Field Strength of Harmonics / Spurious radiated emissions	Power Frequency: 0.009 to 30 MHz 30 MHz - 1 GHz 1 GHz - 18 GHz 18 GHz - 25 GHz	± 5.5 dB $\pm 11.2 - 50.5$ kHz $\pm 50.5 - 52.5$ kHz $\pm 52.5 - 55.0$ kHz ± 55.0 kHz

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	Lab 1
Manufacturer:	Frankonia
Description:	Anechoic Chamber for radiated testing
Type:	10.58x6.38x6 m ³

Single Devices for Anechoic Chamber

Single Device Name	Type	Serial Number	Manufacturer
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	FCC listing 96716 3m Part15/18		2011/01/11 2014/01/10
	IC listing 3699A-1 3m		2011/02/07 2014/02/06
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	Lab 1
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer
Antenna mast	AS 620 P	620/37	HD GmbH
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2008/10/27 2013/10/26
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2011/05/11 2011/11/10
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2011/05/11 2011/11/10
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2011/05/11 2011/11/10
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Path Calibration		2011/05/11 2011/11/10

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Type	Serial Number	Manufacturer
	Standard Calibration		2015/06/23 2018/06/22
Double-ridged horn	HF 907	102444	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2015/05/11 2018/05/10
Double-ridged horn-duplicated 2015-07-15 10:47:55	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
High Pass Filter	5HC3500/18000-1.2-KK	200035008	Trilithic
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright
Horn Antenna Schwarzbeck 15-26.5 GHz BBHA 9170	BBHA 9170	BBHA9170262	Schwarzbeck Mess-Elektronik OHG
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2012/12/18 2015/12/17
Log.-per. Antenna (upgraded)	HL 562 Ultralog new biconicals	830547/003	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2015/06/30 2018/06/29
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	DKD Calibration		2014/11/27 2017/11/27
Standard Gain / Pyramidal Horn Antenna 26.5 GHz	3160-09	00083069	EMCO Elektronik GmbH
Standard Gain / Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH

Test Equipment Auxiliary Test Equipment

Lab ID:	Lab 2, Lab 3
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates	
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	<i>Calibration Details</i> Customized calibration		<i>Last Execution</i> 2013/12/04	<i>Next Exec.</i> 2015/12/03
Digital Multimeter 13 (Clamp Meter)	Fluke 325	31270091WS	FLUKE	
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis	
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis	
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorwerke GmbH	
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright	
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i> Standard		<i>Last Execution</i> 2014/02/10	<i>Next Exec.</i> 2016/02/09
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG	
Spectrum Analyzer	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	DKD calibration		2015/06/23	2018/06/22
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG	

Test Equipment Digital Signalling Devices

Lab ID:

Lab 2, Lab 3

Description:

Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	Type	Serial Number	Manufacturer	
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG	
	Standart calibration		2015/01/21	2018/01/19
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG	
	Standard calibration		2014/01/27	2016/01/26
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	DKD calibration		2014/12/02	2017/12/01
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	HW/SW Status		Date of Start	Date of End
	Hardware:		2007/07/16	
	B11, B21V14, B21-2, B41, B52V14, B52-2,			
	B53-2, B56V14, B68 3v04, PCMCIA, U65V04			
	Software:			
	K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21,			
	K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22,			
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG	
	DKD calibration		2014/12/03	2017/12/02
	HW/SW Status		Date of Start	Date of End
	HW options:		2007/01/02	
	B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2,			
	B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02			
	SW options:			
	K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10,			
	SW:		2008/11/03	
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG	

Test Equipment Emission measurement devices

Lab ID:	Lab 2
<i>Description:</i>	Equipment for emission measurements
<i>Serial Number:</i>	see single devices

Single Devices for Emission measurement devices

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>		
EMI Receiver / Spectrum ESR 7 Analyzer		101424	Rohde & Schwarz		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Initial Factory Calibration			2014/11/13	2016/11/12
Personal Computer	Dell	30304832059	Dell		
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG		
	Standard calibration			2015/05/11	2016/05/10
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG		
	Standard calibration			2015/05/11	2016/05/10
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG		
	Standard Calibration			2014/06/24	2017/06/23
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG		
	Standard Calibration			2014/01/07	2016/01/31
	<i>HW/SW Status</i>			<i>Date of Start</i>	<i>Date of End</i>
	Firmware-Update 4.34.4 from 3.45 during calibration			2009/12/03	
Spectrum Analyzer	FSW 43	103779	Rohde & Schwarz		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Initial Factory Calibration			2014/11/17	2016/11/16

Test Equipment Multimeter 03

Lab ID:	Lab 2, Lab 3
<i>Description:</i>	Fluke 177
<i>Serial Number:</i>	86670383

Single Devices for Multimeter 03

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>		
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Customized calibration			2013/12/04	2015/12/03

Test Equipment Radio Lab Test Equipment

Lab ID: Lab 3
Description: Radio Lab Test Equipment

Single Devices for Radio Lab Test Equipment

Single Device Name	Type	Serial Number	Manufacturer
Broadband Power Divider SMA	WA1515	A856	Weinschel Associates
Coax Attenuator 10dB SMA 2W	4T-10	F9401	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3702	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3711	Weinschel Associates
Coax Cable Huber&Suhner	Sucotest 2,0m		Huber&Suhner
Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m	FA210A0010003030	54491-2	Rosenberger Micro-Coax
Power Meter	NRVD Standard calibration	828110/016	Rohde & Schwarz GmbH & Co.KG 2015/05/11 2016/05/10
RF Step Attenuator RSP	RSP	833695/001	Rohde & Schwarz GmbH & Co.KG
Rubidium Frequency Standard	Datum, Model: MFS Standard calibration	5489/001	Datum-Beverly 2015/06/25 2016/06/24
Sensor Head A	NRV-Z1 Standard calibration	827753/005	Rohde & Schwarz GmbH & Co.KG 2015/05/11 2016/05/10
Signal Generator SME	SME03 Calibration Details Standard calibration	827460/016	Rohde & Schwarz GmbH & Co.KG Last Execution Next Exec. 2014/12/02 2017/12/01
Signal Generator SMP	SMP02 Calibration Details Standard calibration	836402/008	Rohde & Schwarz GmbH & Co. KG Last Execution Next Exec. 2013/05/06 2016/05/05
Spectrum Analyzer	FSIQ26 Calibration after reparation	840061/005	Rohde & Schwarz GmbH & Co. KG 2015/04/02 2017/04/01

Test Equipment T/A Logger 13

Lab ID: Lab 2, Lab 3
Description: Lufft Opus10 TPR
Type: Opus10 TPR
Serial Number: 13936

Single Devices for T/A Logger 13

Single Device Name	Type	Serial Number	Manufacturer
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH
	Customized calibration		2015/02/27 2017/02/26

Test Equipment T/H Logger 03

Lab ID: Lab 3
Description: Lufft Opus10
Serial Number: 7482

Single Devices for T/H Logger 03

Single Device Name	Type	Serial Number	Manufacturer
ThermoHygro DataloggerOpus10 THI (8152.00) 03 (Environ)		7482	Lufft Mess- und Regeltechnik GmbH
	Customized calibration		2015/02/27 2017/02/26

Test Equipment T/H Logger 12

Lab ID: Lab 2
Description: Lufft Opus10
Serial Number: 12482

Single Devices for T/H Logger 12

Single Device Name	Type	Serial Number	Manufacturer
ThermoHygro DataloggerOpus10 THI (8152.00) 12 (Environ)		12482	Lufft Mess- und Regeltechnik GmbH
	Customized calibration		2015/03/10 2017/03/09

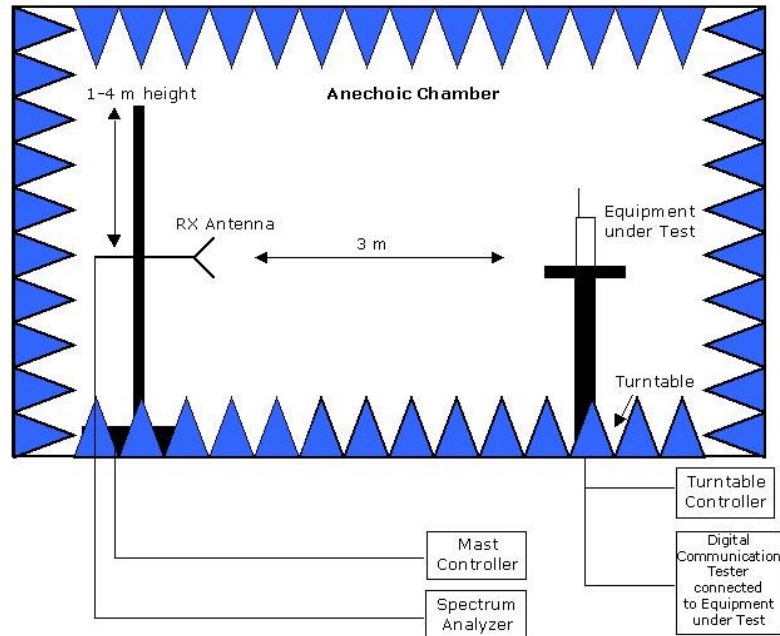
Test Equipment Temperature Chamber 05

Lab ID: Lab 3
Manufacturer: see single devices
Description: Temperature Chamber VT4002
Type: Vötsch
Serial Number: see single devices

Single Devices for Temperature Chamber 05

Single Device Name	Type	Serial Number	Manufacturer
Temperature Chamber Vötsch 05	VT 4002	58566080550010	Vötsch
	Customized calibration		2014/03/11 2016/03/10

6 Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Drawing 1: Setup in the Anechoic chamber:
Measurements below 1 GHz: Semi-anechoic, conducting ground plane.
Measurements above 1 GHz: Fully-anechoic, absorbers on all surface

7 Photo Report

Photos are included in an external report.