

FCC Measurement/Technical Report on Bluetooth Headset Jabra BTE6

FCC ID: BCE-BTE6A

Test Report Reference: MDE_GNNET_1601_FCCb

Test Laboratory:

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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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1 Applied Standards and Test Summary

1.1 Applied Standards

Applicable FCC Rules

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

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart B – Unintentional Radiators

§ 15.107 Conducted limits

§ 15.109 Radiated emission limits; general requirements

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 1.3 Measurement Summary / Signatures.

1.2 FCC-IC Correlation Table

**Correlation of measurement requirements for
Information Technology Equipment (ITE)
from
FCC and IC**

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-003 Issue 6: 6.1
Radiated Spurious Emissions	§15.109	ICES-003 Issue 6: 6.2

Remarks:

1. FCC Part 15 subpart B, ICES 003 and CISPR 22 contain different definitions of Class A and Class B limits, i.e. which class is applicable to which kind of EUT. ICES 003 and CISPR 22 distinguish between the location where the EUT is intended to operate whilst FCC refers to the method of commercial distribution (distributive trades).
2. The correct assignment of the appropriate class to the concrete EUT is not scope of this test report!
3. A radio apparatus that is specifically subject to an Industry Canada Radio Standard Specification (RSS) and which contains an ITE is not subject to ICES-003 provided the ITE is used only to enable operation of the radio apparatus and the ITE does not control additional functions or capabilities.
4. ISM (Industrial, Scientific or Medical) radio frequency generators, though they may contain ITE, are excluded from the definition of ITE and are not subject to ICES-003. They are instead subject to the Interference-Causing Equipment Standard ICES-001, which specifically addresses ISM radio frequency generators.

1.3 Measurement Summary / Signatures

47 CFR CHAPTER I FCC PART 15 Subpart B § 15.107

Conducted Emissions at AC mains

The measurement was performed according to ANSI C63.4-2014

Final Result

OP-Mode

AC mains connection, Test setup

Setup

FCC

IC

via auxilliary equipment, stand-alone

Setup_AB01

Passed
Class B

Passed
Class B

via connected computer device, computer peripheric

Setup_AB02

Passed
Class B

Passed
Class B

47 CFR CHAPTER I FCC PART 15 Subpart B § 15.109

Radiated Emissions

The measurement was performed according to ANSI C63.4-2014

Final Result

OP-Mode

AC mains connection, Measurement range, Test setup

Setup

FCC

IC

via auxilliary equipment, 30 MHz - 1 GHz, stand-alone

Setup_AB01

Passed
Class B

Passed
Class B

via connected computer device, 30 MHz - 1 GHz, computer peripheric

Setup_AB02

Passed
Class B

Passed
Class B

N/A: Not applicable

N/P: Not performed

(responsible for accreditation scope)
Dipl.-Ing. Marco Kullik

(responsible for testing and report)
Dipl.-Ing. Daniel Gall

2 Administrative Data

2.1 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.

This facility has been fully described in a report submitted to the IC and accepted under the registration number: Site# 3699A-1.

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. Marco Kullik
Report Template Version: 2016-02-29

2.2 Project Data

Responsible for testing and report: Dipl.-Ing. Daniel Gall
Employees who performed the tests: documented internally at 7Layers
Date of Report: 2016-04-14
Testing Period: 2016-03-31 to 2016-04-08

2.3 Applicant Data

Company Name: GN Netcom A/S
Address: Lautrupbjerg 7
DK-2750 Ballerup
Denmark

Contact Person:

2.4 Manufacturer Data

Company Name: Please see at applicant data
Address:

Contact Person:

3 Test object Data

3.1 General EUT Description

Kind of Device product description	Bluetooth Transceiver operating in the 2.4 GHz ISM band using frequency hopping spread spectrum (FHSS) modulation
Product name	Bluetooth Headset
Type	Jabra BTE6
Declared EUT data by the supplier	
Power Supply Type	DC
Comment	-
Nominal Voltage / Frequency	5 V
Test Voltage / Frequency	5 V
General Description	The EUT is an Bluetooth headset.
Highest internal frequency	26 MHz
Ports	Enclosure, USB, USB cable Linoya AWM 2725 E315619 1m

The main components of the EUT are listed and described in chapter 3.2 EUT Main components.

3.2 EUT Main components

Sample Name	Sample Code	Description
DE1021015ab01	ab01	radiated sample
Sample Parameter	Value	
Serial No.	TA-2	
HW Version	28-04732	
SW Version	1.0.3	
Comment	-	

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

3.3 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.

Device	Details (Manufacturer, Type Model, OUT Code)	Description
-	-	-

3.4 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.

Device	Details (Manufacturer, HW, SW, S/N)	Description
Lifebook Eseries E781	Fujitsu, -, -, DSCK013817	Laptop RE
PJW1942NA	Fujitsu Ltd., -, -, 13300281B	AC Adapter 3 Laptop RE
TC E250	HTC, -, -, 2RSA119F022294	AC adapter

3.5 EUT Setups

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	Combination of EUTs	Description and Rationale
Setup_AB01	DE1021015ab01, TC E250,	
Setup_AB02	DE1021015ab01, PJW1942NA, Lifebook Eseries E781,	

3.6 Operating Modes

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

The test setup with AC / DC charger was tested in Bluetooth test mode, loopback on 2441 MHz while charging using the AC / DC charger.

For the test setup as computer peripheral, Bluetooth was set to local RX mode while the BER rate was send to the laptop using the USB port.

3.7 Product labelling

3.7.1 FCC ID label

Please refer to the documentation of the applicant.

3.7.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

4 Test Results

4.1 Conducted Emissions at AC mains

Standard **47 CFR CHAPTER I FCC PART 15 Subpart B**

The test was performed according to: ANSI C63.4-2014

4.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4. The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software EMC-32 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak – Maxhold & Average
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 2.5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

4.1.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.107

Class B:

Frequency (MHz)	QP Limits (dB μ V)	AV Limits (dB μ V)
0.15 – 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

Class A:

Frequency (MHz)	QP Limits (dB μ V)	AV Limits (dB μ V)
0.15 – 0.5	79	66
0.5 - 30	73	60

4.1.3 Test Protocol

Temperature: 23 °C
 Air Pressure: 1001 hPa
 Humidity: 34 %
 AC/DC adapter

Power line	Frequency [kHz]	Level [dB μ V]	Detector	Limit [dB μ V]	Margin [dB]
N	269.3	41.0	QP	61.1	20.2

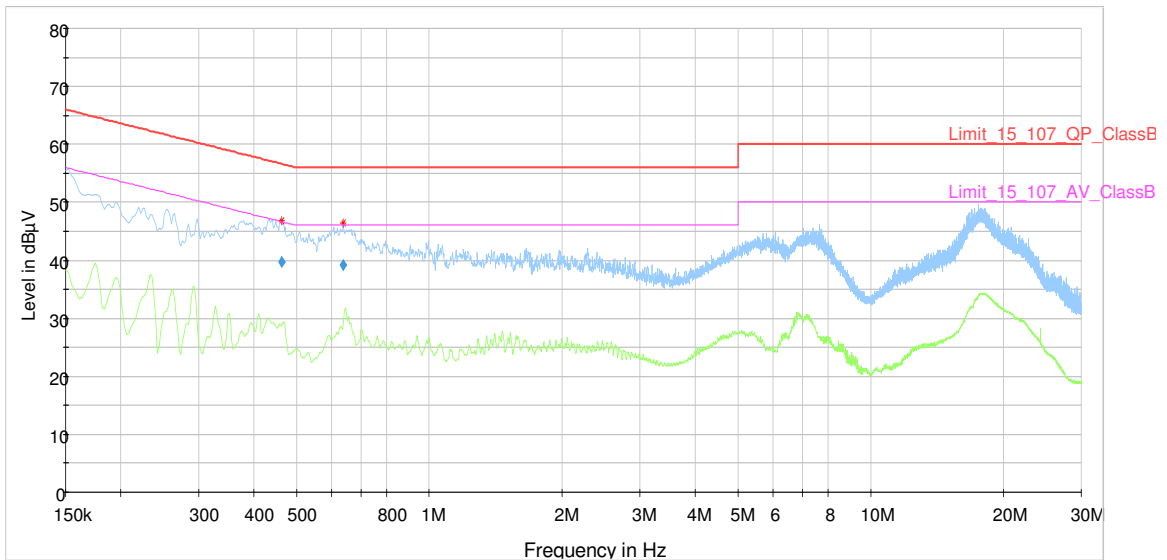
Temperature: 24 °C
 Air Pressure: 1004 hPa
 Humidity: 34 %
 Computer Peripheral

Power line	Frequency [kHz]	Level [dB μ V]	Detector	Limit [dB μ V]	Margin [dB]
L	462.8	39.8	QP	56.6	16.9
L	638.3	39.2	QP	56.0	16.9

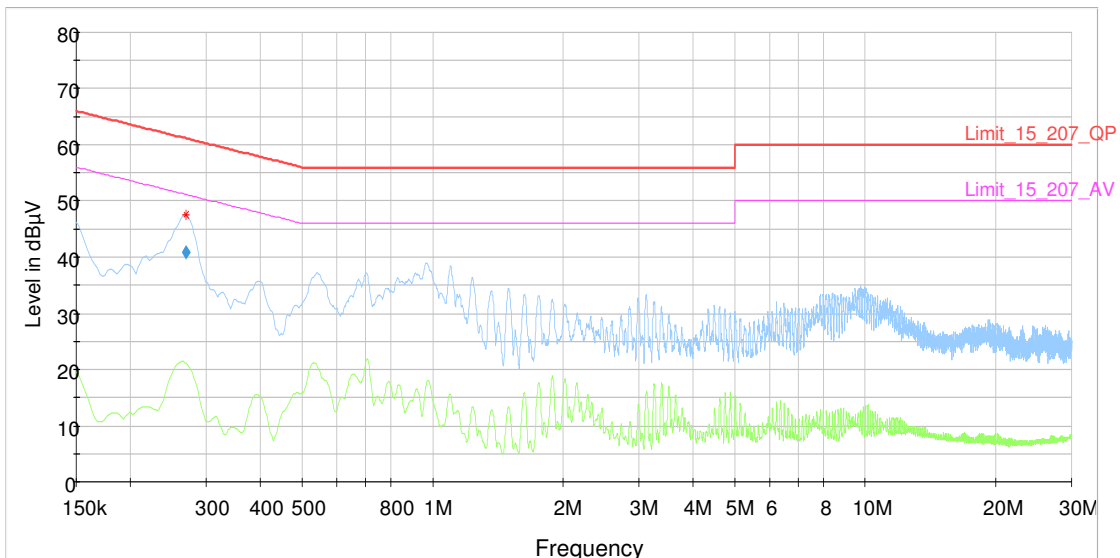
Remark: Please see next sub-clause for the measurement plot.

4.1.4 Measurement Plot (showing the highest value, "worst case")

AC mains connection = via connected computer device, Test setup = computer peripheric



AC mains connection = via auxilliary equipment, Test setup = stand-alone



4.1.5 Test Equipment used

Conducted Emissions

4.2 Radiated Emissions

Standard **47 CFR CHAPTER I FCC PART 15 Subpart B**

The test was performed according to: ANSI C63.4-2014

4.2.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The measurement procedure is implemented into the EMI test software EMC32 from R&S. 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 also performed at 3 axes. A pre-check is performed while the EUT is powered from a DC power source.

1. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

This is a preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: -180° to 90°
- 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: Adjustment 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 slowly vary by $\pm 45^\circ$ 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 will also slowly vary by ± 100 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: $\pm 45^\circ$ around the determined value
- Height variation range: ± 100 cm around the determined value
- Antenna Polarisation: max. value determined in step 1

Step 3: 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 (< 1 GHz)
- 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:

Step 1:

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.

All steps were performed with one height (1.5 m) of the receiving antenna only.

The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.

The turn table step size (azimuth angle) for the preliminary measurement is 45 °.

Step 2:

Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size $\pm 45^\circ$ for the elevation axis is performed.

The turn table azimuth will slowly vary by $\pm 22.5^\circ$.

The elevation angle will slowly vary by $\pm 45^\circ$

EMI receiver settings (for all steps):

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

Step 3:

Spectrum analyser settings for step 3:

- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

4.2.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Class B:

Frequency (MHz)	Limit ($\mu\text{V}/\text{m}$)	Measurement distance (m)	Limits ($\text{dB}\mu\text{V}/\text{m}$)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 - 26000	500@3m	3	54.0@3m
26000 - 40000	500@3m	1	54.0@3m

Class A:

Frequency (MHz)	Limit ($\mu\text{V}/\text{m}$)	Measurement distance (m)	Limits ($\text{dB}\mu\text{V}/\text{m}$)
30 – 88	90@10m	3	39.1@10m
88 – 216	150@10m	3	43.5@10m
216 – 960	210@10m	3	46.4@10m
960 - 26000	300@10m	3	49.5@10m
26000 - 40000	300@10m	1	49.5@10m

The measured values for Class A and for Class B (> 26 GHz) measurements are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§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....

Used conversion factor: $\text{Limit (dB}\mu\text{V}/\text{m)} = 20 \log (\text{Limit } (\mu\text{V}/\text{m})/1\mu\text{V}/\text{m})$

4.2.3 Test Protocol

Ambient temperature: 23 °C
 Air Pressure: 1001 hPa
 Humidity: 34 %
 AC/DC adapter

Spurious Freq. [MHz]	Spurious Level [dB μ V/m]	Detector	RBW [kHz]	Limit [dB μ V/m]	Margin to Limit [dB]
30.4	22.5	QP	120.0	40.0	17.5

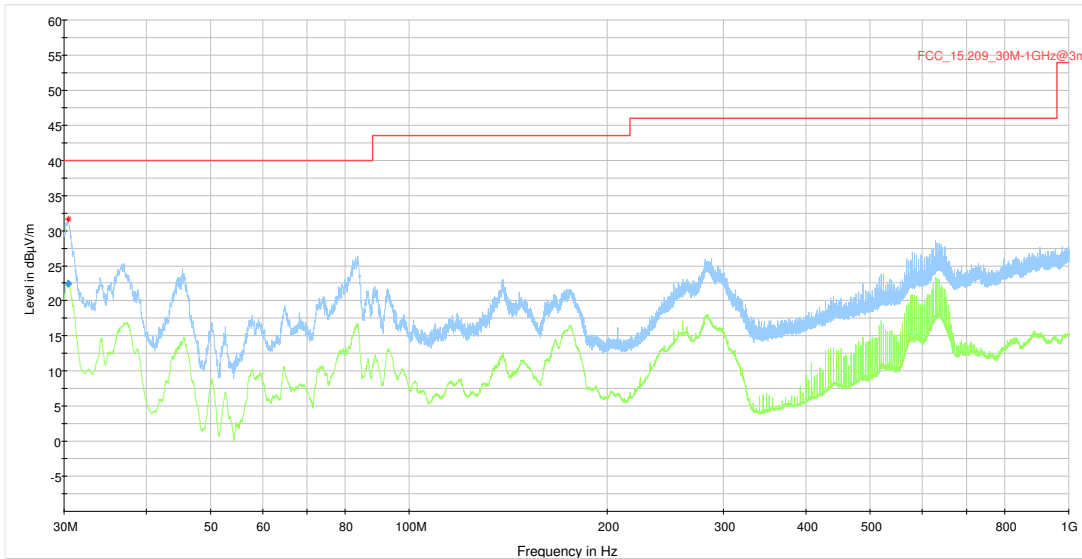
Ambient temperature: 24 °C
 Air Pressure: 1004 hPa
 Humidity: 34 %
 Computer Peripheral Setup

Spurious Freq. [MHz]	Spurious Level [dB μ V/m]	Detector	RBW [kHz]	Limit [dB μ V/m]	Margin to Limit [dB]
30.7	27.6	QP	120.0	40.0	12.4
38.8	27.6	QP	120.0	40.0	12.5
48.0	23.5	QP	120.0	40.0	16.6
78.8	29.4	QP	120.0	40.0	10.6
95.8	27.1	QP	120.0	43.5	16.4
133.4	31.8	QP	120.0	43.5	11.7
149.3	26.7	QP	120.0	43.5	16.8
179.3	27.6	QP	120.0	43.5	15.9
193.7	29.5	QP	120.0	43.5	14.0
369.0	35.2	QP	120.0	46.0	10.8
423.2	20.7	QP	120.0	46.0	25.3
760.7	23.4	QP	120.0	46.0	22.6
819.6	24.4	QP	120.0	46.0	21.6
904.1	21.3	QP	120.0	46.0	24.7

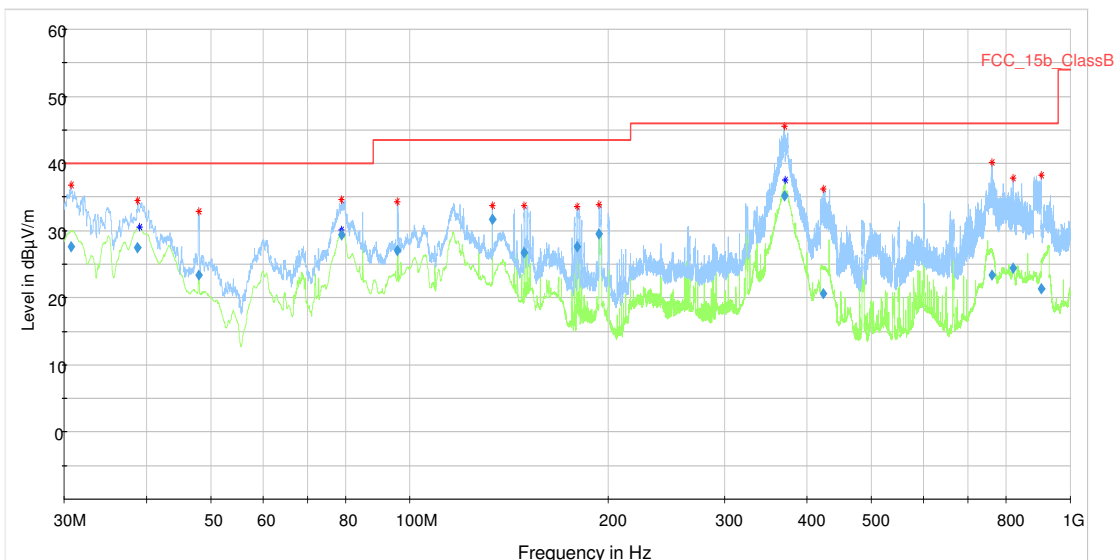
Remark: Please see next sub-clause for the measurement plot.

4.2.4 Measurement Plot (showing the highest value, "worst case")

AC mains connection = via auxilliary equipment, Measurement range = 30 MHz - 1 GHz,
 Test setup = stand-alone



AC mains connection = via connected computer device, Measurement range = 30 MHz - 1 GHz,
 Test setup = computer peripheric



4.2.5 Test Equipment used

Radiated Emissions

5 Test Equipment

1 Radiated Emissions

Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Calibration Due
1.1	AM 4.0	Antenna mast	Maturo GmbH	AM4.0/180/119 20513	
1.2	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11-13
1.3	Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	Frankonia	none	2017-01-09
1.4	ESIB 26	Spectrum Analyzer	Rohde & Schwarz	830482/004	2017-12-08
1.5	HL 562	Ultralog new biconicals	Rohde & Schwarz GmbH & Co. KG	830547/003	2018-06-30
1.6	Opus10 THI (8152.00)	ThermoHygro Datalogger 12 (Environ)	Lufft Mess- und Regeltechnik GmbH	12482	2017-03-10
1.7	Opus10 TPR (8253.00)	ThermoAirpres sure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-02-27
1.8	EP 1200/B, NA/B1	Amplifier with integrated variable Oscillator	Spitzenberger & Spieß	B6278	2018-07-23

2 Conducted Emissions

Shielded Room 02

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Calibration Due
2.1	ESH 3-Z5	Two-Line V- Network	Rohde & Schwarz	828304/029	
2.2	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2016-11-13
2.3	EP 1200/B, NA/B1	Amplifier with integrated variable Oscillator	Spitzenberger & Spieß	B6278	2018-07-23
2.4	ESIB 26	Spectrum Analyzer	Rohde & Schwarz	830482/004	2017-12-08
2.5	Opus10 THI (8152.00)	ThermoHygro Datalogger 02 (Environ)	Lufft Mess- und Regeltechnik GmbH	7489	2017-02-27
2.6	ESH 3-Z5	Two-Line V- Network	Rohde & Schwarz	829996/002	
2.7	Opus10 TPR (8253.00)	ThermoAirpres sure Datalogger 13 (Environ)	Lufft Mess- und Regeltechnik GmbH	13936	2017-02-27

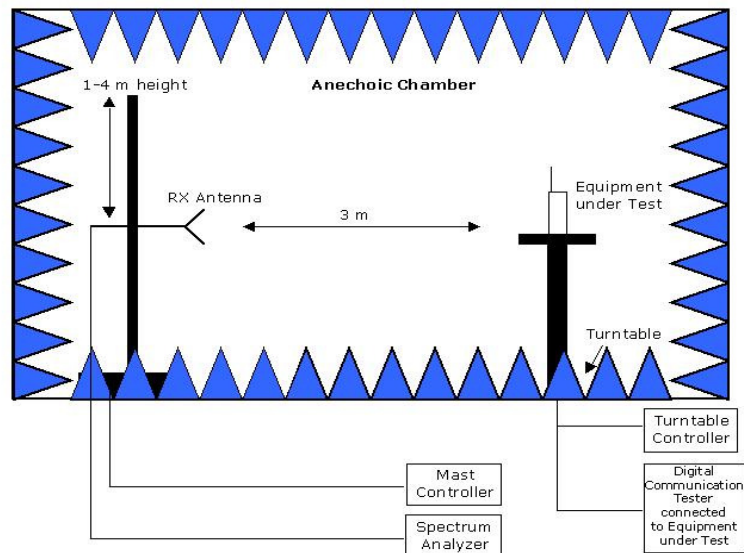


6 Photo Report

Please see separate photo report.

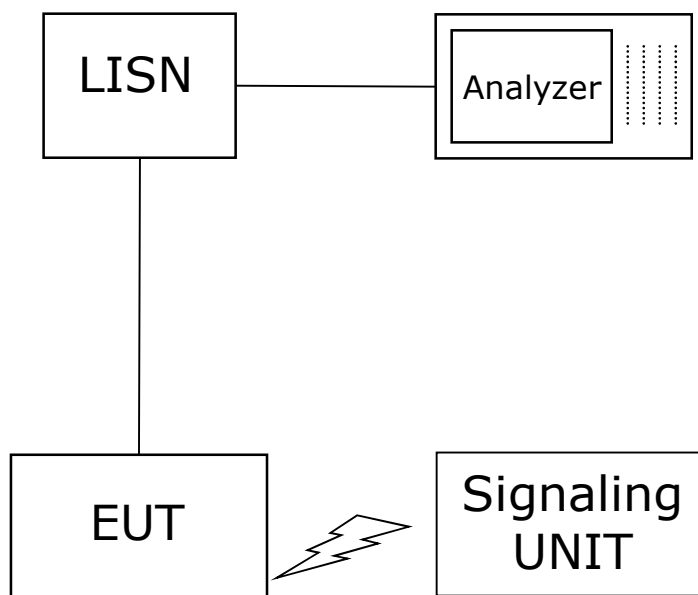
7 Setup Drawings

Setup Drawings



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

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



Setup in the shielded room for conducted measurements at AC mains port

8 Measurement Uncertainties

Test Case	Parameter	Uncertainty
Conducted Emissions at AC mains	Voltage	± 3.4 dB
Radiated Emissions	Field Strength	± 5.5 dB