



Inter**Lab**[®]

FCC Measurement/Technical Report on

Bluetooth Handsfree Carkit
HCB-150 / DEA-0002006

Report Reference: MDE_SE_0804_FCCd

Test Laboratory:

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DAT-P-192/99-01

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 testing laboratory.

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Table of Contents

0	Summary	3
0.1	Technical Report Summary	3
0.2	Measurement Summary	4
1	Administrative Data	5
1.1	Testing Laboratory	5
1.2	Project Data	5
1.3	Applicant Data	5
1.4	Manufacturer Data	5
2	Product labelling	6
2.1	FCC ID label	6
2.2	Location of the label on the EUT	6
3	Test object Data	7
3.1	General EUT Description	7
3.2	EUT Main components	8
3.3	Ancillary Equipment	8
3.4	EUT Setups	8
3.5	Operating Modes	8
4	Test Results	9
4.1	Conducted emissions (AC power line)	9
4.2	Spurious radiated emissions	11
5	Test Equipment	14
6	Photo Report	17
7	Setup Drawings	21
8	Annex measurement plots	22
8.1	AC Mains conducted	22
8.2	Radiated Emissions	23



0 Summary

0.1 Technical Report Summary

Type of Authorization

Certification for an Unintentional Radiator (Class B digital device)

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-07 Edition) and 15 (10-1-07 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart A – General

§ 15.31 Measurement standards

§ 15.33 Frequency range of radiated measurements

Part 15, Subpart B – Unintentional Radiators

§ 15.101 Equipment authorization of unintentional radiators

§ 15.107 Conducted limits

§ 15.109 Radiated emission limits

Note:

None.

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 B		§ 15.107	
Conducted Emissions (AC power line)			
The measurement was performed according to ANSI C63.4			
OP-Mode	Setup	Port	2003 Final Result
op-mode 1	Setup_AA_02	AC Port	passed
FCC Part 15, Subpart B		§ 15.109	
Spurious Radiated Emissions			
The measurement was performed according to ANSI C63.4			
OP-Mode	Setup	Port	2003 Final Result
op-mode 2	Setup_AD_03	Enclosure	passed
op-mode 2	Setup_AC_03	Enclosure	passed
op-mode 3	Setup_AC_03	Enclosure	passed



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Responsible for
Accreditation Scope:

B. Roth

Responsible
for Test Report:

Ma Duler



1 Administrative Data

1.1 Testing Laboratory

Company Name: 7 Layers AG
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:
- Deutscher Akkreditierungs Rat DAR-Registration no. DAT-P-192/99-01

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

Report Template Version: 2007-07-16

1.2 Project Data

Responsible for testing and report: Dipl.-Ing. Robert Machulec
Date of Test(s): 2008-02-26 to 2008-03-31
Date of Report: 2007-04-01

1.3 Applicant Data

Company Name: Sony Ericsson Mobile Communications AB
Address: Torshamnsgatan 27,
Department: SEKI/BGLIK
SE-164 94 Kista
Sweden
Contact Person: Mr. Kenth Skoglund

1.4 Manufacturer Data

Company Name: Please see applicant data
Address:
Contact Person:



2 Product labelling

2.1 FCC ID label

At the time of the report there was no FCC label available.

2.2 Location of the label on the EUT

see above



3 Test object Data

3.1 General EUT Description

Equipment under Test	Bluetooth Handsfree Carkit
Type Designation:	HCB-150 / DEA-0002006
Kind of Device:	Mobile Phone Accessory
(optional)	
Voltage Type:	DC (via AC charger or via DC charger)
Voltage level:	115V (AC Charger), 12V (DC charger)

General product description:

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, the Bluetooth technology defines 79 RF channels spaced 1 MHz (2402 - 2480 MHz). The actual RF channel is chosen from a pseudo-random hopping sequence through the 79 channels.

The EUT provides the following ports:

Ports

Enclosure	
DC Port	of handsfree carkit (power line)
AC Port	of AC charger(power line)
DC Port	of DC charger(power line)

The main components of the EUT are listed and described in Chapter 3.2



3.2 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	Date of Receipt
EUT A (Code: 13200d01)	Bluetooth Handsfree Carkit	HCB-150 / DEA- 0002006	0804052210 0114C	ROA128258 2FP1	CAX103188 9P2D	2008-02-19
Remark: EUT A is equipped with an integral antenna (gain= -1.9 dBi).						
EUT B (Code: 13200f01)	Bluetooth Handsfree Carkit	HCB-150 / DEA- 0002006	0804052D1 0011D8	ROA128258 2FP1	CAX103188 9P2D	2008-02-21
Remark: EUT B is equipped with an integral antenna (gain= -1.9 dBi).						

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.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial no.	FCC ID
AE1	Mobile Phone	Sony Ericsson P1i	-	-	CB5A0CELN Q	PY7FD02201 5
AE2 (13200AC02)	AC Travel Charger	CST-60 / CAA- 0002002-BV	-	-	458B 06W03	-
AE3 (13200DC02)	DC Vehicular Charger	CLA-60 / CAA- 0002003	-	-	558B 06W17	-
AE4	Lead-acid battery 12V 36Ah 300A (EN)	Bosch Silver 3D	-	-	G5B287182 0798	-
AE5 (13200HS01)	Portable Handsfree	HPM-61 / CCA- 0002005	-	-	-	-

3.4 EUT Setups

This chapter describes the combination of EUTs and ancillary equipment used for testing.

Setup No.	Combination of EUTs	Description
Setup_AA_02	EUT A + AE1 + AE2	setup for conducted measurements
Setup_AC_03	EUT B + AE2 + AE5	setup for radiated measurements with AC charger
Setup_AD_03	EUT B + AE3 + AE4 + AE5	setup for radiated measurements with DC charger

3.5 Operating Modes

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

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	BT hopping mode	BT Link to Mobile Phone P1i (GSM900)
op-mode 2	BT test mode	TX on 2441 MHz, DH1, max. output power
op-mode 3	BT test mode	Bluetooth scan mode, RX active, TX standby

4 Test Results

4.1 Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-07
Subpart B

The test was performed according to: ANSI C 63.4, 2003

4.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. 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 ES-K1 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
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- 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

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

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

4.1.3 Test Protocol

Temperature: 24 °C
 Air Pressure: 992 hPa
 Humidity: 30 %

Op. Mode	Setup	Port
op-mode 1	Setup_AA_02	AC Port (power line)

Power line	Frequency MHz	Measured value dBµV	Delta to limit dBµV	Remarks
-	-	-	-	-

Remark: Please see annex for the measurement plot.

An empty table means that no final measurement was performed because no relevant frequencies (peaks) were found during the preliminary scan.

4.1.4 Test result: Conducted emissions (AC power line)

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

4.2 Spurious radiated emissions

Standard FCC Part 15, 10-1-07
Subpart B

The test was performed according to: ANSI C 63.4, 2003

4.2.1 Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

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

Settings for step 1:

- 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°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

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:

A further measurement will be performed on the frequencies determined in step 1.

Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -180° to 180°
- 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 +/- 22.5° 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: 100ms
- Turntable angle range: -22.5° to + 22.5 ° around the determined value
- Height variation range: -0.25m to + 0.25m 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(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

4.2.2 Test Requirements / Limits

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits
Frequency Range (MHz): Class B Limit (dBµV/m)

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

§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: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

4.2.3 Test Protocol

Temperature: 24 °C
 Air Pressure: 1007 hPa
 Humidity: 39 %

Op. Mode	Setup	Port	Measurement range
op-mode 2	Setup_AD_03	Enclosure	30 MHz < f < 1 GHz

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Horizontal	280.08	34.70	-	-	46.00	-	-	11.30	-
Vertical	660.00	41.10	-	-	46.00	-	-	4.90	-

Remark: Please see annex for the measurement plot. The measurement was performed in a combined RX/TX mode (TXon/RXon = 1). Accordingly it is the worst case in comparison to a measurement in a pure RX mode.

Op. Mode	Setup	Port	Measurement range
op-mode 2	Setup_AC_03	Enclosure	30 MHz < f < 1 GHz

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Horizontal	600.00	36.00	-	-	46.00	-	-	10.00	-
Vertical	660.00	42.40	-	-	46.00	-	-	3.60	-

Remark: Please see annex for the measurement plot. The measurement was performed in a combined RX/TX mode (TXon/RXon = 1). Accordingly it is the worst case in comparison to a measurement in a pure RX mode.

Op. Mode	Setup	Port	Measurement range
op-mode 2	Setup_AC_03	Enclosure	1 GHz < f < 12.7 GHz

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
-	-	-	-	-	-	-	-	-	-

Remark: No emissions found closer than 20 dB below the limit. Please see annex for the measurement plot. Due to the measurement results below 1 GHz for the AC and the DC charger, where the setup with the AC charger is the worst case, and due to the measurement results above 1 GHz with the AC charger it was found to be not necessary to perform the measurement above 1 GHz with the DC charger additionally.

4.2.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart B	Op. Mode	Result
	op-mode 2	passed
	op-mode 3	passed

5 Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	01.12.05	01.12.08
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	-
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	22.09.07	22.09.09

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Comparison Noise Emitter	CNE III	99/016	York	-	-
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	06.12.09
Signal Generator	SMR 20	846834/008	Rohde & Schwarz	05.12.07	05.12.09

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel	-	-
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	02.07.03	02.07.08
Broadband Amplifier 18MHz-26GHz	JS4- 18002600 -32	849785	Miteq	06.02.08	06.08.08
Broadband Amplifier 30MHz-18GHz	JS4- 00101800 -35	896037	Miteq	06.02.08	06.08.08
Broadband Amplifier 45MHz-27GHz	JS4- 00102600 -42	619368	Miteq	06.02.08	06.08.08
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	06.02.08	06.08.08
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger- Microcoax	06.02.08	06.08.08
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	12.05.08
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz	20.01.04	N/A – spare antenna
High Pass Filter	5HC3500/ 12750- 1.2-KK	200035008	Trilithic	06.02.08	06.08.08
High Pass Filter	5HC2700/ 12750- 1.5-KK	9942012	Trilithic	06.02.08	06.08.08
High Pass Filter	4HC1600/ 12750- 1.5-KK	9942011	Trilithic	06.02.08	06.08.08
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	17.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	19.08.02	N/A – only used for pre-testing
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	06.02.08	06.08.08

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	06.02.08	06.08.08
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	01.11.05	01.11.08
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-

Auxiliary Test Equipment – calibration not applicable; spare equipment

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel	-	-
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel	-	-
Digital Multimeter 01	Voltcraft M-3860M	IJ096055	Conrad	-	-
Digital Multimeter 02	Voltcraft M-3860M	IJ095955	Conrad	-	-
Digital Oscilloscope	TDS 784C	B021311	Tektronix	-	-
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis	-	-
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis	-	-
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz	-	-
Notch Filter ultra stable	WRCA800 /960-6E	24	Wainwright	-	-
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	-	-
Temperature Chamber	KWP 120/70	59226012190010	Weiss	-	-
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	-	-

Anechoic Chamber – calibration not applicable

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Air Compressor (pneumatic)			Atlas Copco	-	-
Controller	CO 2000	CO2000/328/12470406/L	Innco innovative constructions GmbH	-	-
EMC Camera	CE-CAM/1		CE-SYS	-	-
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi	-	-
Filter ISDN	B84312-C110-E1		Siemens & Matsushita	-	-
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita	-	-
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita	-	-
Fully/Semi AE Chamber	10.58x6.3 8x6		Frankonia	-	-
Turntable	DS 420S	420/573/99	HD GmbH, H.Deisel	-	-
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H.Deisel	-	-



*7 layers Bluetooth Full RF Test
Solution*

*Bluetooth RF Conformance
Test System TS8960*

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Power Meter 832025/059	NRVD	832025/059	Rohde & Schwarz	22.08.07	22.08.08
Power Sensor A 832279/013	NRV-Z1	832279/013	Rohde & Schwarz	23.08.07	23.08.08
Power Sensor B 832279/015	NRV-Z1	832279/015	Rohde & Schwarz	23.08.07	23.08.08
Power Supply	E3632A	MY40003776	Agilent	-	-
Power Supply	PS-2403D	-	Conrad	-	-
RF Step Attenuator 833695/001	RSP	833695/001	Rohde & Schwarz	09.08.06	09.08.08
Rubidium Frequency Normal	MFS	002	Efratom	24.08.07	24.08.08
Signal Analyzer FSIQ26 832695/007	FSIQ26	832695/007	Rohde & Schwarz	23.08.07	23.08.09
Signal Generator 833680/003	SMP 03	833680/003	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator A 834344/002	SMIQ03B	834344/002	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator B 832870/017	SMIQ03B	832870/017	Rohde & Schwarz	24.05.07	24.05.10
Signal Switching and Conditioning Unit	SSCU	338826/005	Rohde & Schwarz	-	-
Signalling Unit PTW60 838312/014	PTW60 for TS8960	838312/014	Rohde & Schwarz	-	-
System Controller 829323/008	PSM12	829323/008	Rohde & Schwarz	-	-

6 Photo Report



Photo 1: Test setup for conducted measurements on AC mains (setup AA_02)



Photo 2: Test setup for radiated measurements below 1GHz (setup AD_03)

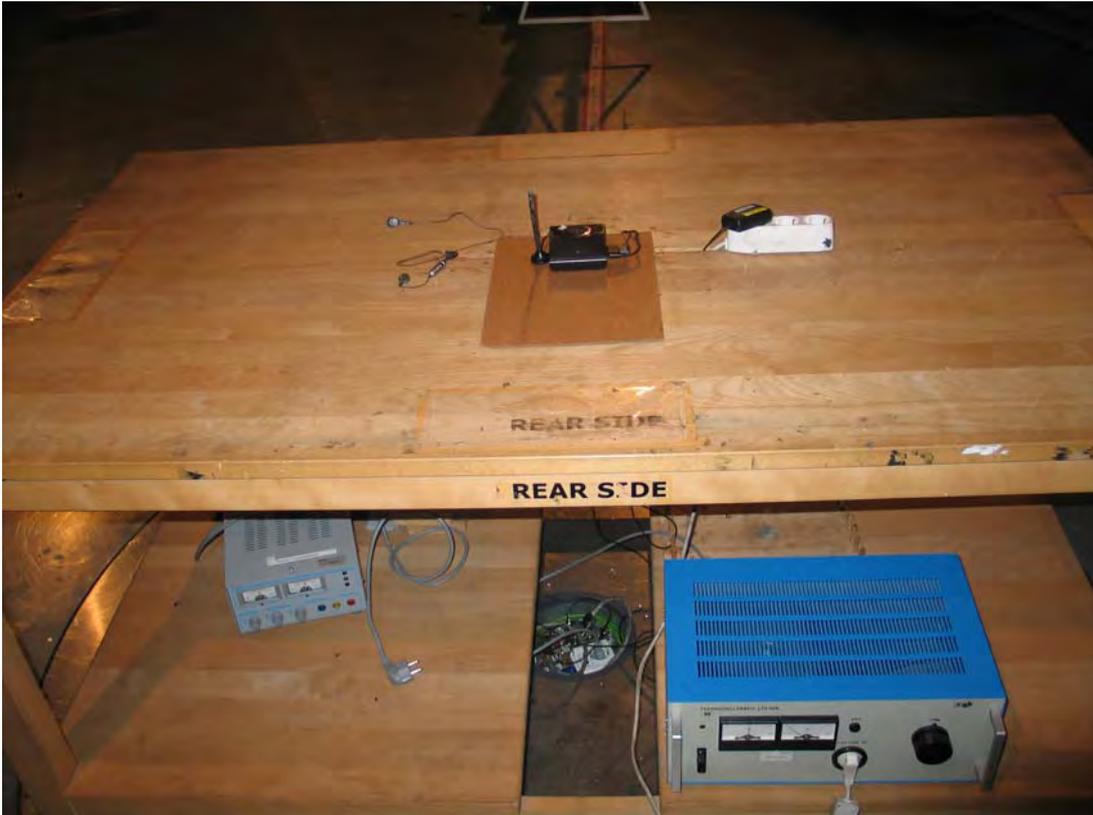


Photo 3: Test setup for radiated measurements below 1GHz (setup AC_03)

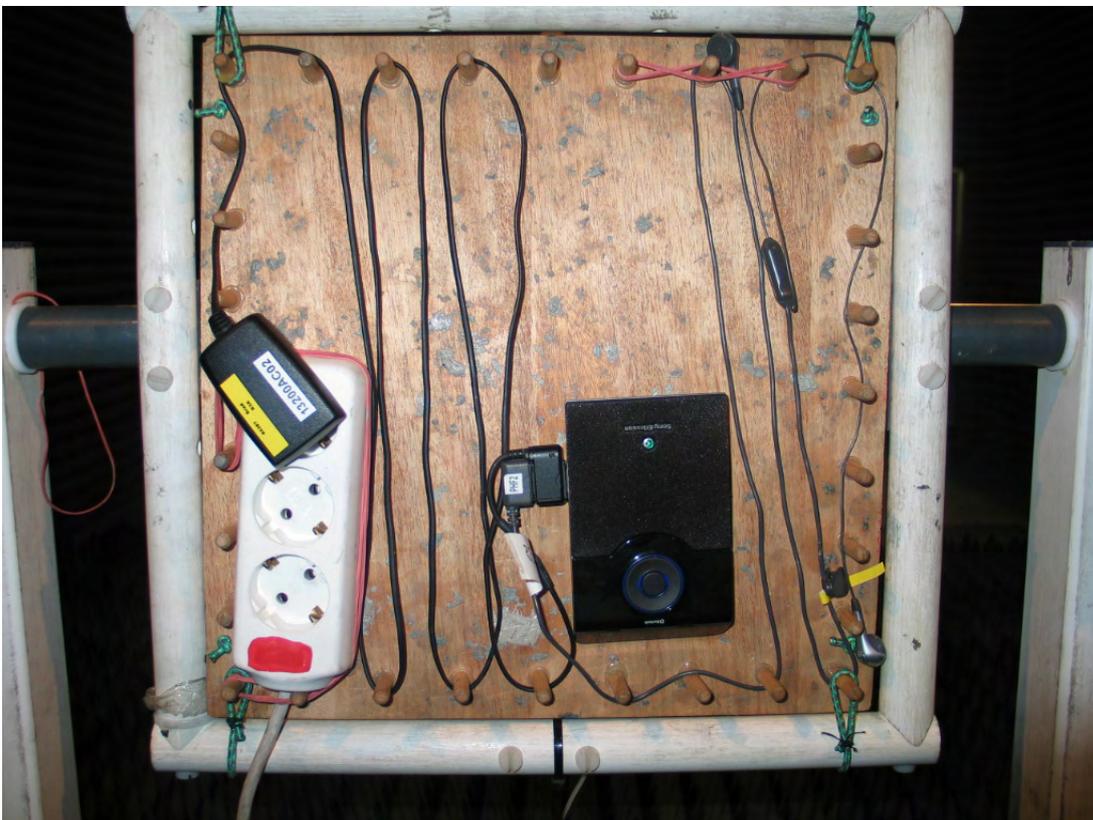


Photo 4: Test setup for radiated measurements above 1GHz (setup AC_03)



Photo 5: EUT (side 1)



Photo 6: EUT (side 2)

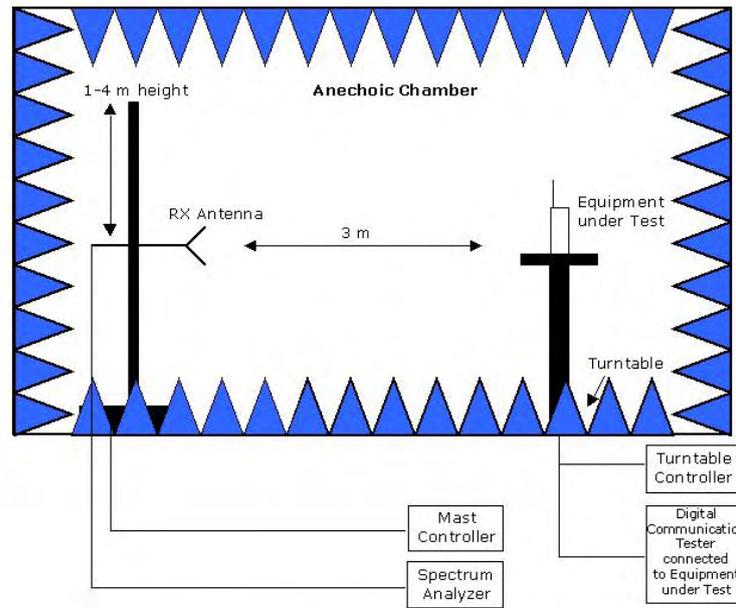


Photo 7: Ancillary Equipment (AC travel charger 13200AC02, DC vehicular charger 13200DC02)



Photo 8: Ancillary Equipment (portable handsfree 13200HS01)

7 Setup Drawings



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

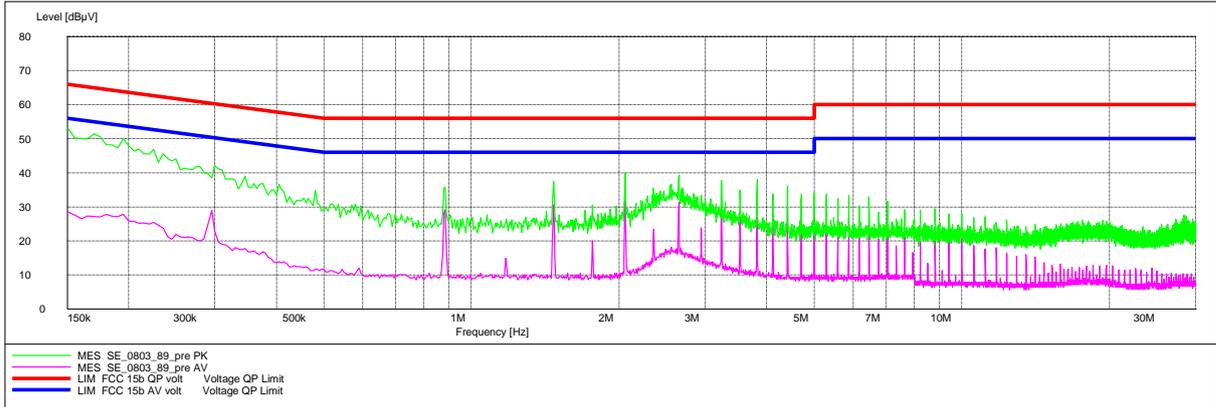
Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

8 Annex measurement plots

8.1 AC Mains conducted

Op. Mode

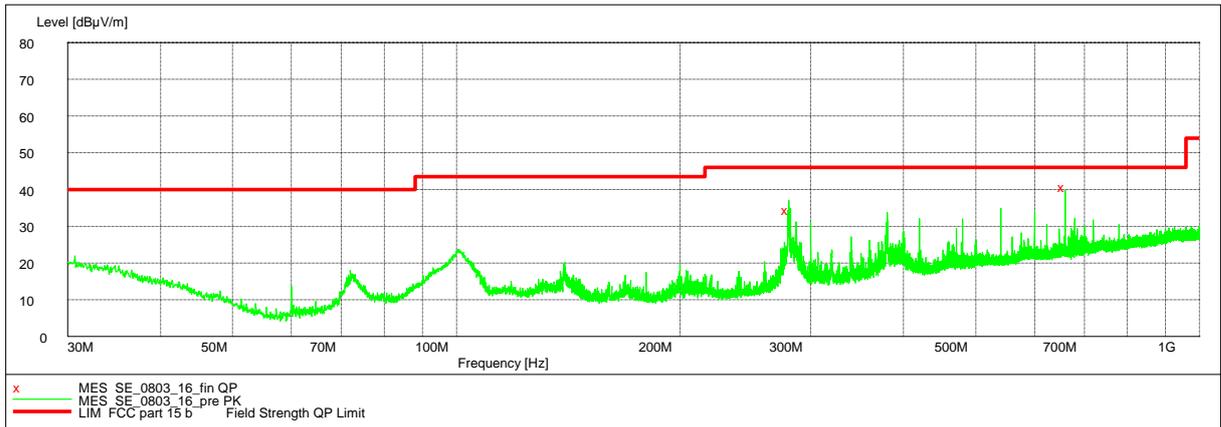
op-mode 1 Setup AA_02



8.2 Radiated Emissions

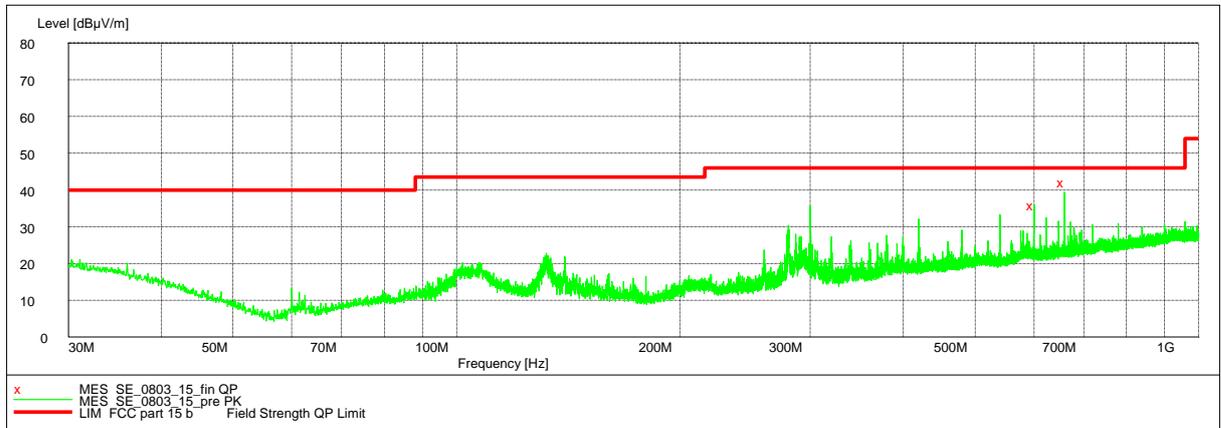
Op. Mode

op-mode 2 Setup AD_03 measurements below 1GHz



Op. Mode

op-mode 2 Setup AC_03 measurements below 1GHz

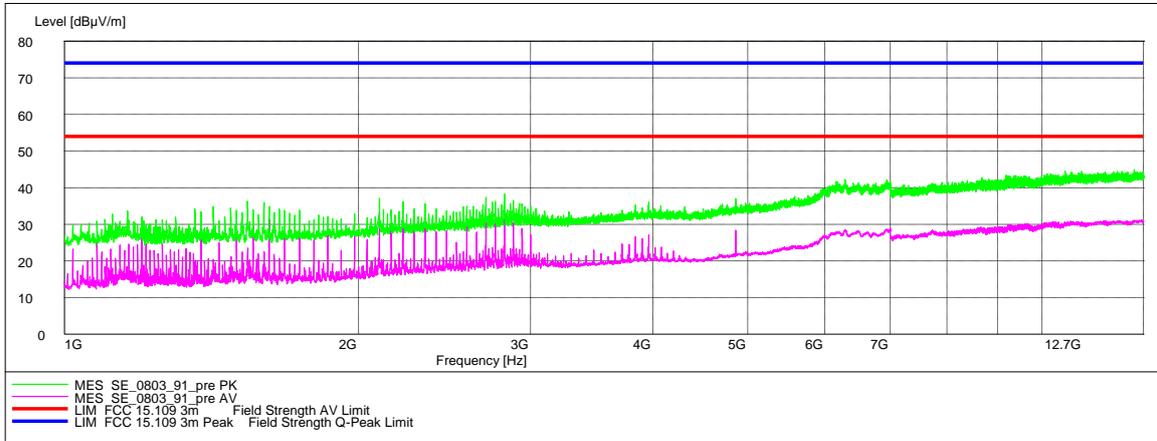


Op. Mode

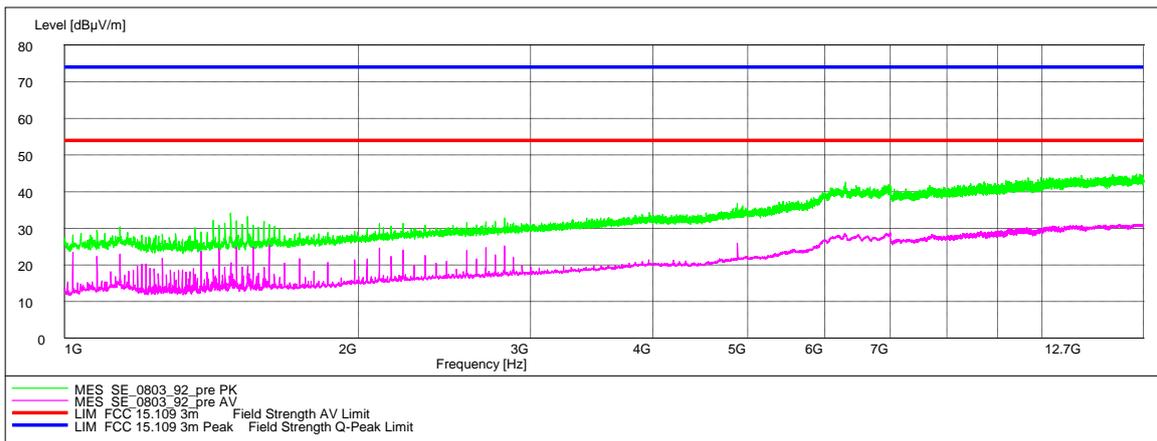
op-mode 3

Setup AC_03

measurements above 1GHz



vertical + horizontal antenna polarization; vertical EUT position



vertical + horizontal antenna polarization; horizontal EUT position