

TEST REPORT

Test report no.: 1-3125-01-03/11-B



Testing laboratory

CETECOM ICT Services GmbH
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Accredited test laboratory:

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
DAkkS registration number: D-PL-12076-01-01

Area of Testing: Radio/Satellite Communications

Applicant

Phonak AG
Laubisrütistrasse 28
8712 Stäfa / SWITZERLAND
Phone:
Fax: +41 5 89 28 20 11
Contact: Valentina Shcherba
e-mail: valentina.shcherba@phonak.com
Phone: +41 5 89 28 01 01

Manufacturer

Phonak AG
Laubisrütistrasse 28
8712 Stäfa / SWITZERLAND

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS-210 Issue 8	Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

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

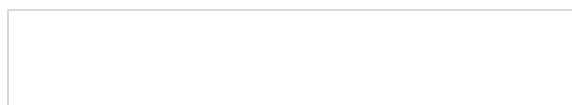
Test item

Kind of test item:	RC and streamer for hearing aids
Model name:	Phonak ComPilot
FCC ID:	KWC-COMPILOT1
IC:	2262A-COMPILOT1
Frequency:	10.6 MHz
Power supply:	3.70 V LiPo battery, charge via mini-USB, 5 V DC
Temperature range:	0 °C to +50 °C



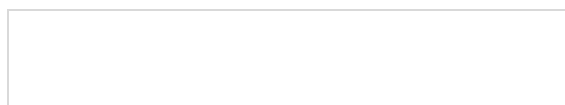
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test performed:



Andreas Keller

Test report authorised:



Stefan Bös

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2 General information

2.1 Notes

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 generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

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2.2 Application details

Date of receipt of order:	2011-03-18
Date of receipt of test item:	2011-08-01
Start of test:	2011-08-01
End of test:	2011-08-04
Person(s) present during the test:	Mr Matthias Müller -/-

3 Test standard/s

Test standard	Version	Test standard description
47 CFR Part 15	2009-10	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS-210 Issue 8	2010-12	Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+24 °C during room temperature tests
	T_{max}	+50 °C during high temperature tests
	T_{min}	0 °C during low temperature tests
Relative humidity content:		55 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.70 V LiPo battery, charge via mini-USB, 5 V DC
	V_{max}	V
	V_{min}	V

5 Test item

Kind of test item	:	RC and streamer for hearing aids
Type identification	:	Phonak ComPilot
S/N serial number	:	555, 549
HW hardware status	:	006-0051
SW software status	:	0.2.18.0
Frequency band [MHz]	:	10.2 MHz – 11.0 MHz (used frequency: 10.6 MHz)
Type of modulation	:	F1D (FSK)
Number of channels	:	1
Antenna	:	Integrated coil antenna OR neck loop antenna
Power supply	:	3.70 V LiPo battery, charge via mini-USB, 5 V DC
Temperature range	:	0 °C to +50 °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 210, Issue 8	Passed	2011-09-13	-/-

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	☒	☐	☐	☐	
§ 15.209 / RSS-210 Issue 8	Bandwidth of the modulated carrier	Nominal	Nominal	☒	☐	☐	☐	
§ 15.209 / RSS-210 Issue 8	Fieldstrength of fundamental	Nominal	Nominal	☒	☐	☐	☐	
§ 15.209 (a) / RSS-210 Issue 8	Fieldstrength of harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	
§ 15.109 / RSS-210 Issue 8	Receiver spurious emissions	Nominal	Nominal	☒	☐	☐	☐	
§ 15.109 / § 15.207	Conducted limits	Nominal	Nominal	☒	☐	☐	☐	

Note: NA = Not Applicable; NP = Not Performed

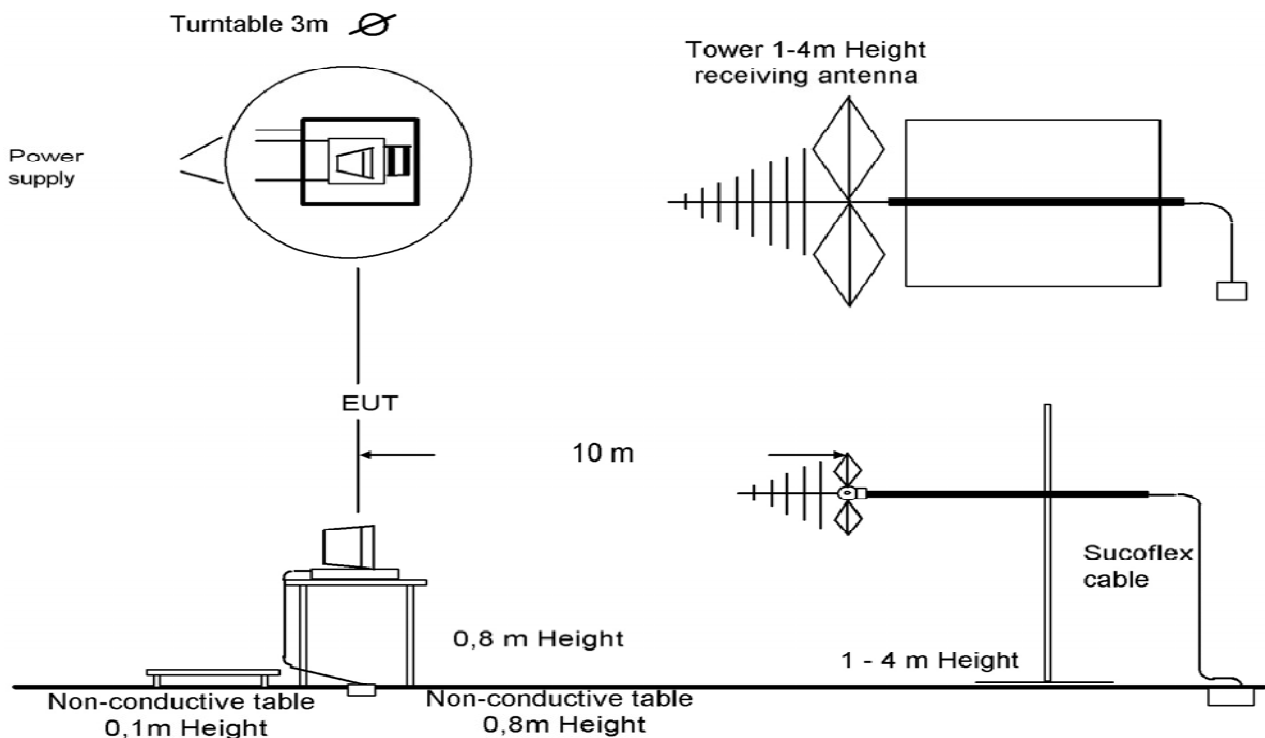
8 RF measurements

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



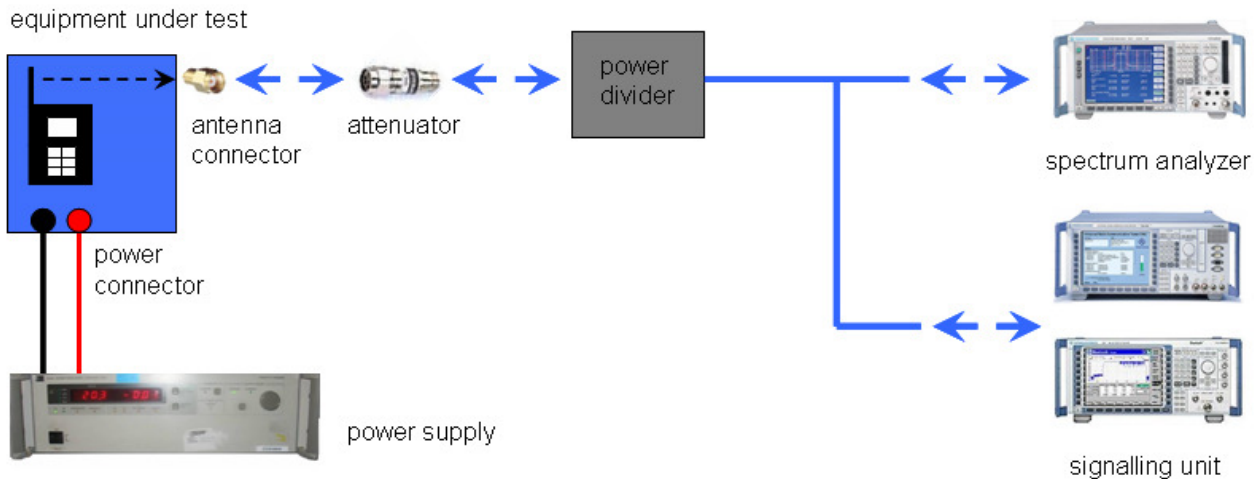
Picture 1: Diagram radiated measurements

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:

According to the demand of the customer -present during the tests- for the measurements of radiated spurious emissions the test configuration has to be as follows:

-when using the internal coil antenna, the microphone will not be used. The device is powered only by the internal battery and no power supply/charger is connected.

-when using the neck loop antenna the microphone and the power supply/charger has to be connected.

The manufacturer declared that the internal coil antenna and the neck loop antennas do not use the same signal processing chain.

Radiated measurements in chamber F were performed with sample labeled 555, all others labeled 549.

Configuration descriptions:

The samples were provided with special test mode software.

In random transmit mode the sample provides a duty cycle of 92% (declared by the manufacturer).

Two neck loop antennas are available: A short one with a length of 57cm and a long one with a length of 75cm.

8.3 RSP100 test report cover sheet / performance test data

Test Report Number	:	1-3125-01-03/11-B
Equipment Model Number	:	Phonak ComPilot
Certification Number	:	2262A-COMPILOT1
Manufacturer (complete Address)	:	Phonak AG Laubisrütistrasse 28 8712 Stäfa / SWITZERLAND
Tested to radio standards specification no.	:	RSS 210, Issue 8
Open Area Test Site IC No.	:	IC 3462C-1
Frequency Range or fixed frequency	:	10.2 MHz – 11.0 MHz (used frequency: 10.6 MHz)
Field Strength :		Internal coil antenna: 20.0 dB μ V/m at 30m Neck loop antenna (short): 1.0 dB μ V/m at 30m Neck loop antenna (long): 3.0 dB μ V/m at 30m
Occupied bandwidth (99%-BW)	:	Internal coil antenna: 570kHz Neck loop antenna: 588kHz
Type of modulation	:	F1D (FSK)
Emission Designator (TRC-43)	:	Internal coil antenna: 570KF2D Neck loop antenna: 588KF2D
Antenna Information	:	Integrated coil antenna OR neck loop antenna (57cm or 75cm)
Transmitter Spurious (worst case) [dBμV/m @ 10m]	:	Internal coil antenna: 28.0 at 342.2MHz Neck loop antenna: 26.6 at 725.9MHz
Receiver Spurious (worst case) [dBμV/m @ 10m]:		Internal coil antenna: 22.5 at 918.2MHz Neck loop antenna: 22.5 at 930.7MHz

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:

Andreas Keller
Signature

9 Measurement results

9.1 Timing of the transmitter

Measurement:

Measurement parameter	
Detector:	
Sweep time:	
Resolution bandwidth:	
Video bandwidth:	
Span:	
Trace-Mode:	

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.35 ©	RSS-GEN Issue 2 Section 4.5
Timing of the transmitter	
© 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.	

Duty cycle of the sample with test mode is 92% (declared by the manufacturer).

Result: The result is passed.

9.2 Bandwidth of the modulated carrier

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.209	RSS-210 Issue 8
Bandwidth of the modulated carrier	

Measured with the integrated OBW-function of the Rohde&Schwarz ESPI test receiver
(measurement criteria is the integrated power in %).

Result:

Integrated coil antenna

	Occupied Bandwidth (kHz)
6 dB (75%)	300
20 dB (99%)	570

Neck loop antenna (short)

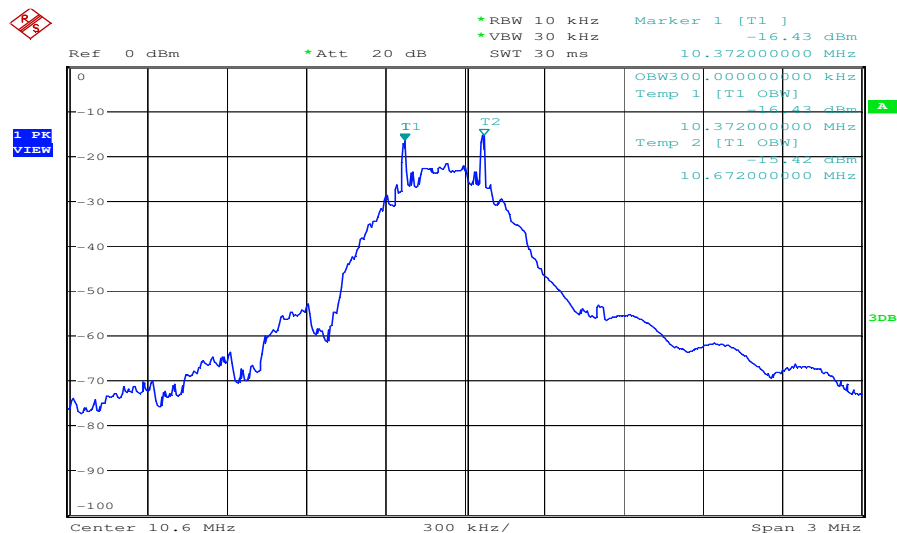
	Occupied Bandwidth (kHz)
6 dB (75%)	306
20 dB (99%)	588

Neck loop antenna (long)

	Occupied Bandwidth (kHz)
6 dB (75%)	300
20 dB (99%)	576

Plots of the measurement

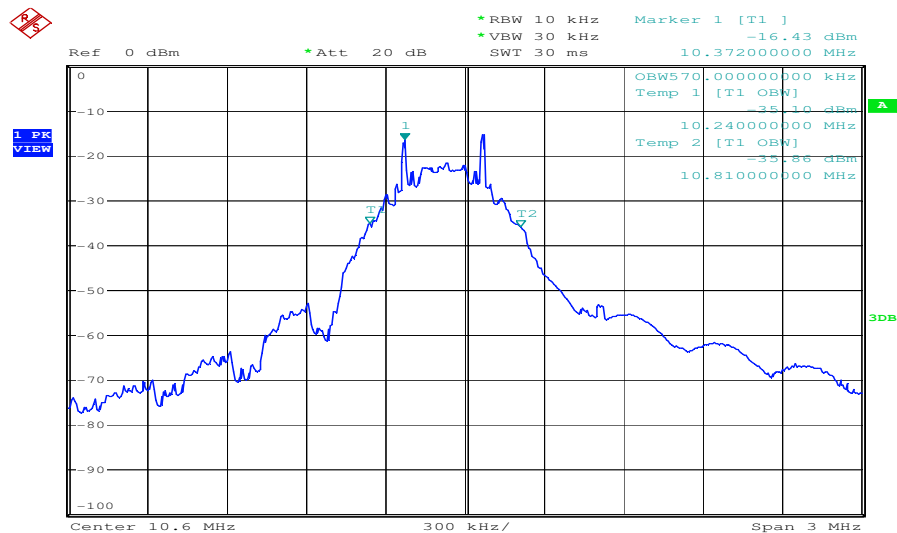
Plot 1: 6dB (75%) – bandwidth, integrated coil antenna



min

Date: 3.AUG.2011 17:22:22

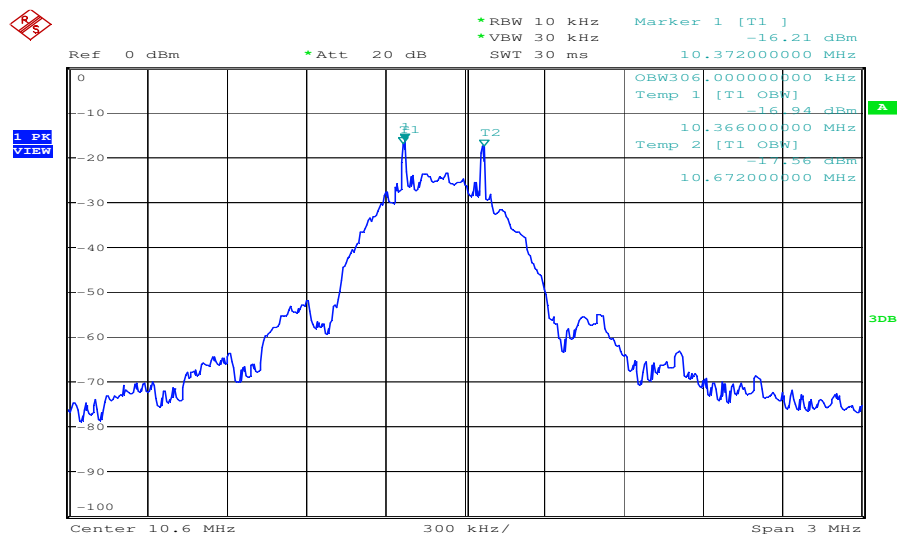
Plot 2: 20dB (99%) – bandwidth, integrated coil antenna



min

Date: 3.AUG.2011 17:21:58

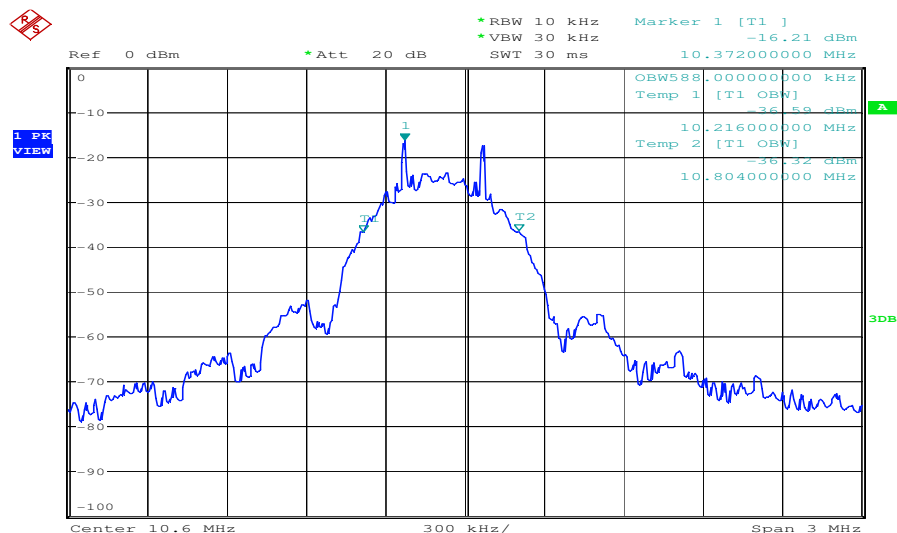
Plot 3: 6dB (75%) – bandwidth, neck loop antenna (short)



min

Date: 3.AUG.2011 17:18:31

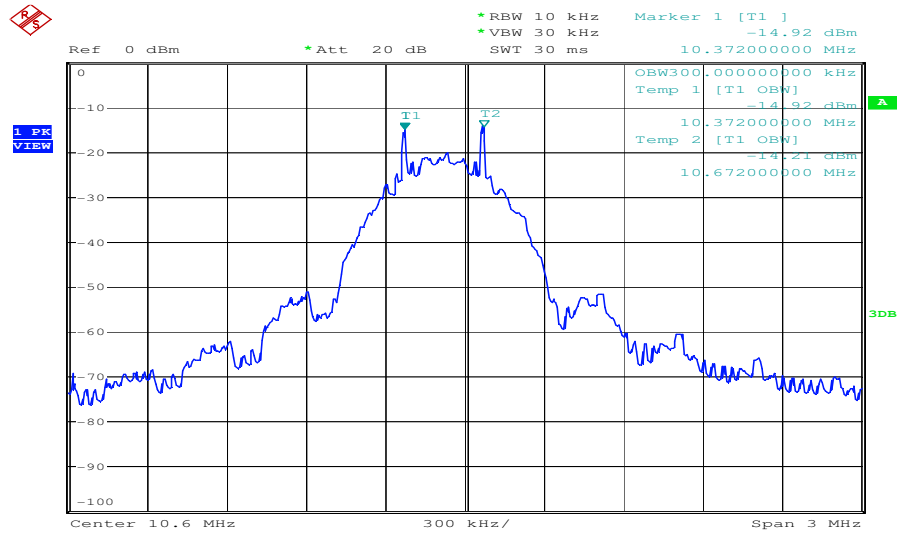
Plot 4: 20dB (99%) – bandwidth, neck loop antenna (short)



min

Date: 3.AUG.2011 17:18:07

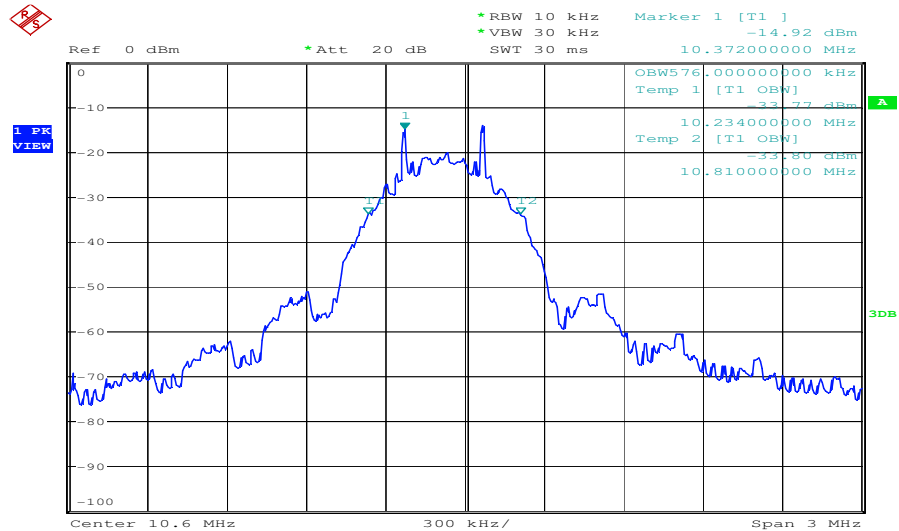
Plot 5: 6dB (75%) – bandwidth, neck loop antenna (long)



min

Date: 3.AUG.2011 17:12:57

Plot 6: 20dB (99%) – bandwidth, neck loop antenna (long)



min

Date: 3.AUG.2011 17:12:30

9.3 Field strength of the fundamental

Measurement:

Measurement parameter	
Detector:	Quasi Peak (CISPR)
Resolution bandwidth:	10kHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
CFR Part SUBCLAUSE § 15.209		RSS-210 Issue 8
Fundamental Frequency (MHz)	Field strength of Fundamental (µV/m)	Measurement distance (m)
1.705 – 30.0	30	30

Result:

Internal coil antenna

TEST CONDITIONS		MAXIMUM POWER (dB μ V/m)	
Frequency		10.6 MHz	10.6 MHz
Mode		at 10 m distance	at 30 m distance*
T _{nom}	V _{nom}	40.0	20.0
Measurement uncertainty		±3dB	

Short neck loop antenna

TEST CONDITIONS		MAXIMUM POWER (dB μ V/m)	
Frequency		10.6 MHz	10.6 MHz
Mode		at 3 m distance	at 30 m distance*
T _{nom}	V _{nom}	41.0	1.0
Measurement uncertainty		±3dB	

Long neck loop antenna

TEST CONDITIONS		MAXIMUM POWER (dB μ V/m)	
Frequency		10.6 MHz	10.6 MHz
Mode		at 3 m distance	at 30 m distance*
T _{nom}	V _{nom}	43.0	3.0
Measurement uncertainty		±3dB	

* Recalculation to a measurement distance of 30m with a correction of 40 dB/decade.

Result: The result of the measurement is passed.

9.4 Field strength of the harmonics and spurious

Limits:

FCC		IC
SUBCLAUSE § 15.209 (a)		RSS-210 Issue 8
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:

Internal coil antenna

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB $\mu\text{V/m}$]	Amplitude of emission [dB $\mu\text{V/m}$]	Results
No critical peaks detected				

Short neck loop antenna

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB $\mu\text{V/m}$]	Amplitude of emission [dB $\mu\text{V/m}$]	Results
No critical peaks detected				

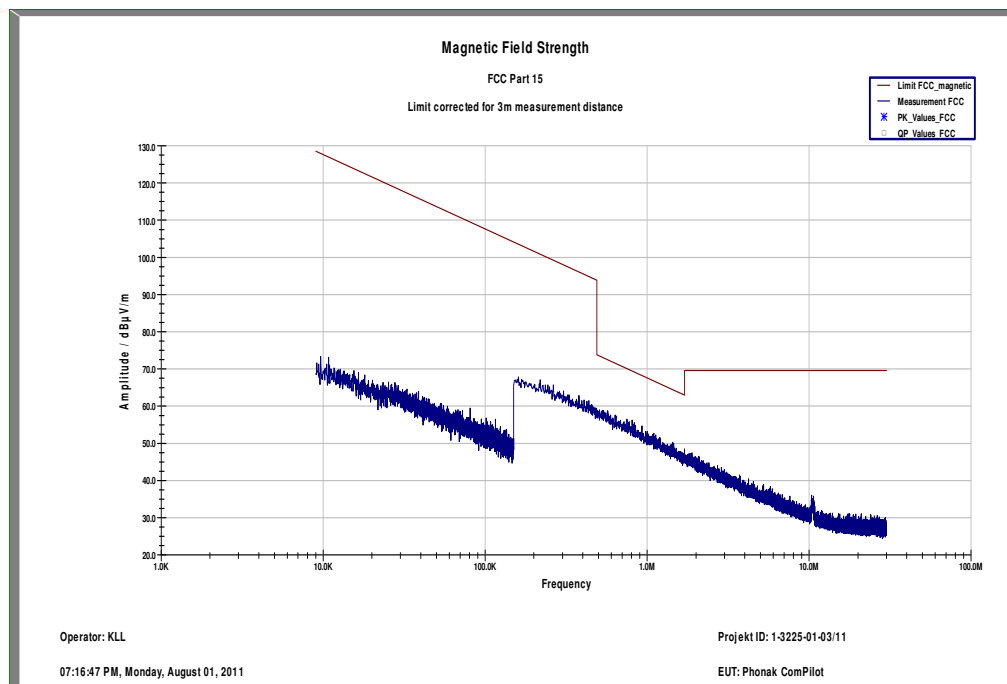
Long neck loop antenna

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB μ V/m]	Amplitude of emission [dB μ V/m]	Results
No critical peaks detected				

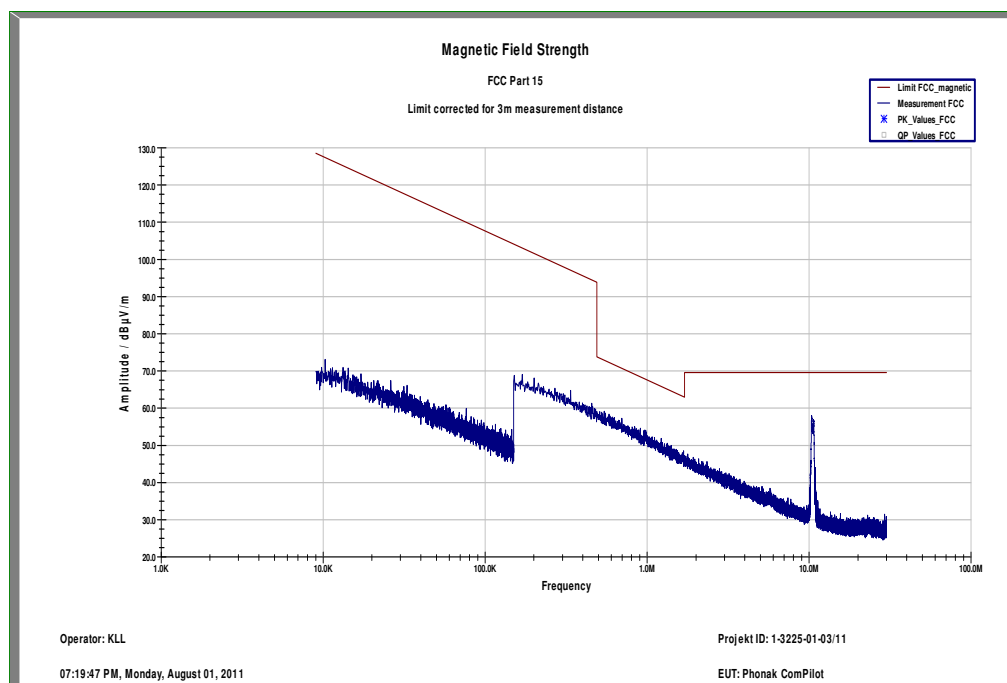
Result: The result of the measurement is passed.

Plots of the measurements

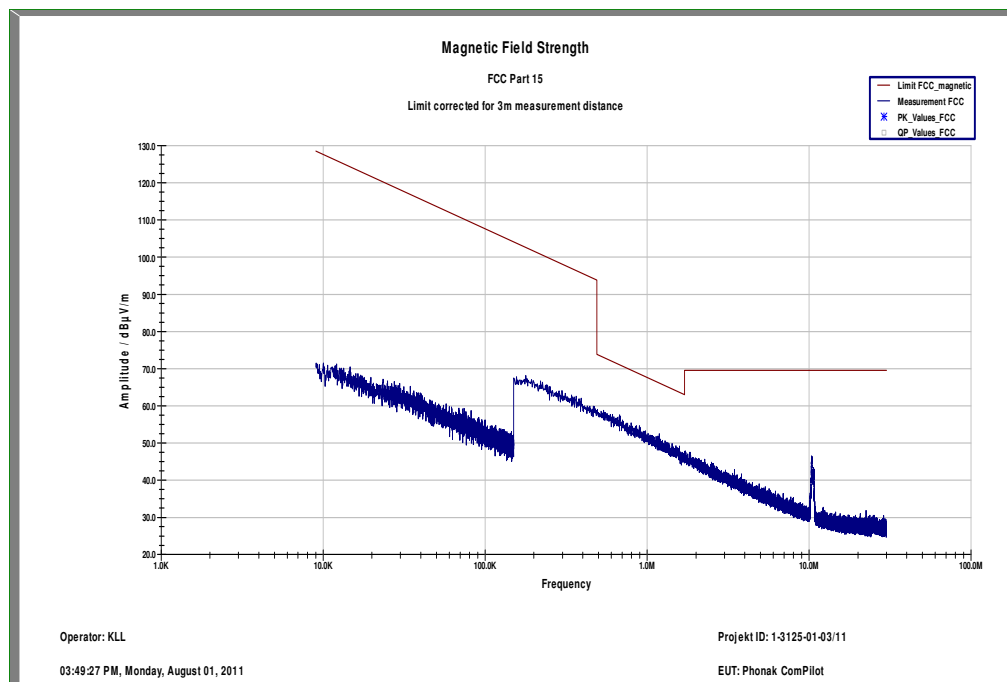
Plot 1: 9 kHz – 30 MHz, antenna 0°, internal coil antenna



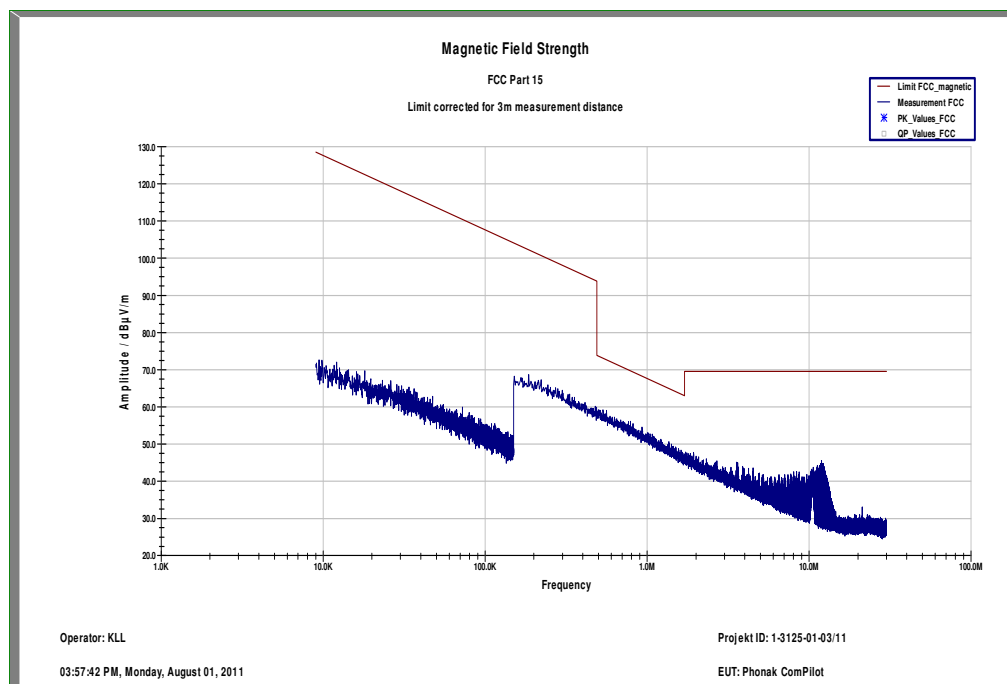
Plot 2: 9 kHz – 30 MHz, antenna 90°, internal coil antenna



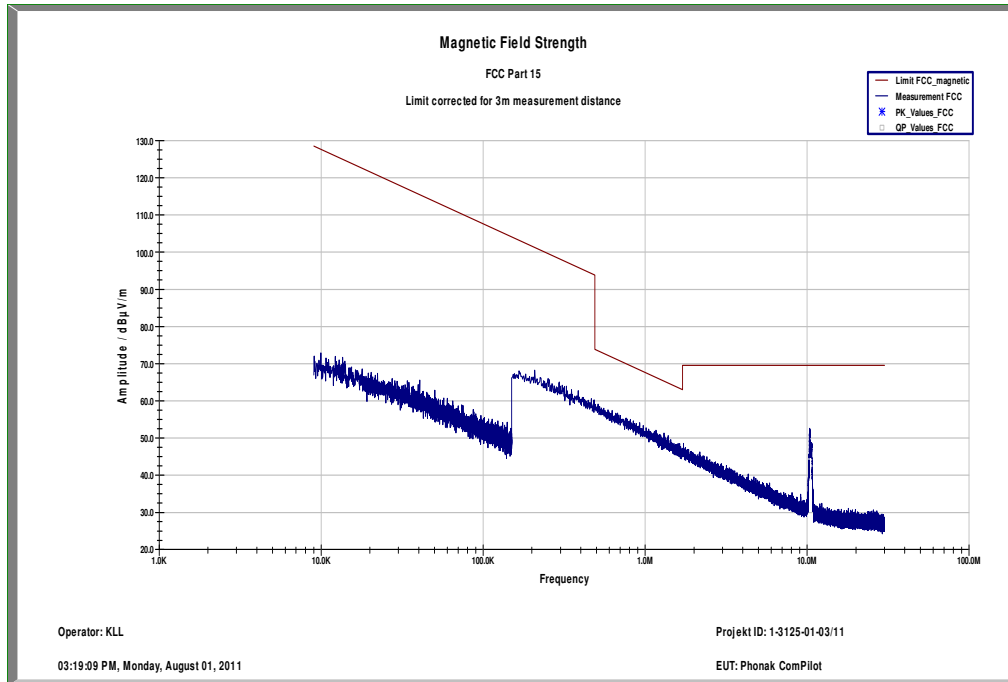
Plot 3: 9 kHz – 30 MHz, antenna 0°, short neck loop antenna



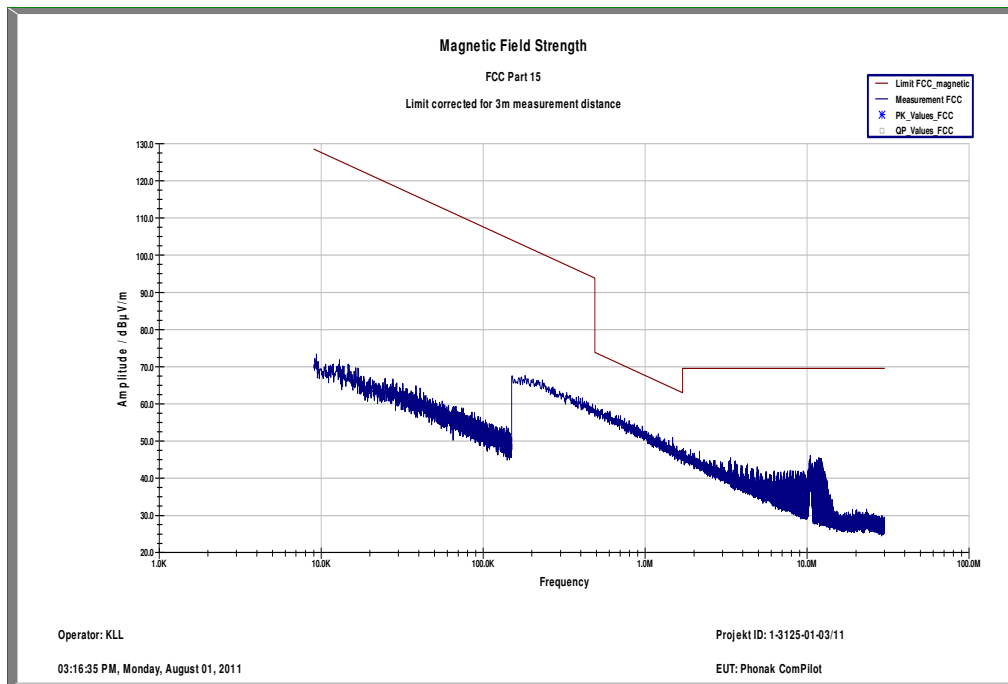
Plot 4: 9 kHz – 30 MHz, antenna 90°, short neck loop antenna



Plot 5: 9 kHz – 30 MHz, antenna 0°, long neck loop antenna



Plot 6: 9 kHz – 30 MHz, antenna 90°, long neck loop antenna

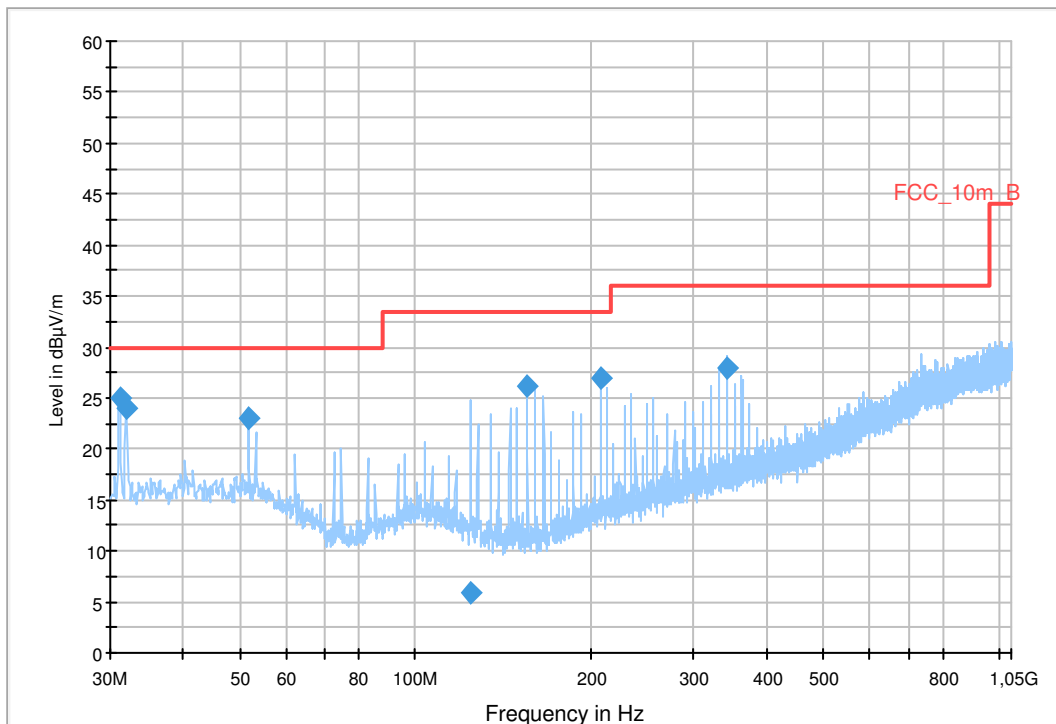


Plot 7: 30 MHz – 1000 MHz, internal coil antenna

EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: 10,6 MHz tx
 Operator Name: wld
 Comment: battery powered; internal antenna

Scan Setup: STAN_Fin EMI radiated]

Hardware Setup: Electric Field (NOS)
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz – 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB
 FCC_10m(B)



Final Result 1

frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
31.109250	25.0	1000.0	120.000	113.0	V	171.0	12.6	5.0	30.0	
31.983300	24.0	1000.0	120.000	98.0	V	-4.0	12.7	6.0	30.0	
51.844950	23.0	1000.0	120.000	98.0	V	180.0	13.2	7.0	30.0	
124.447350	5.9	1000.0	120.000	105.0	V	4.0	9.9	27.6	33.5	
155.551950	26.2	1000.0	120.000	98.0	V	-4.0	9.1	7.3	33.5	
207.406800	26.9	1000.0	120.000	98.0	V	61.0	12.0	6.6	33.5	
342.205950	28.0	1000.0	120.000	98.0	V	110.0	15.8	8.0	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range:	30 MHz – 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical) : Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

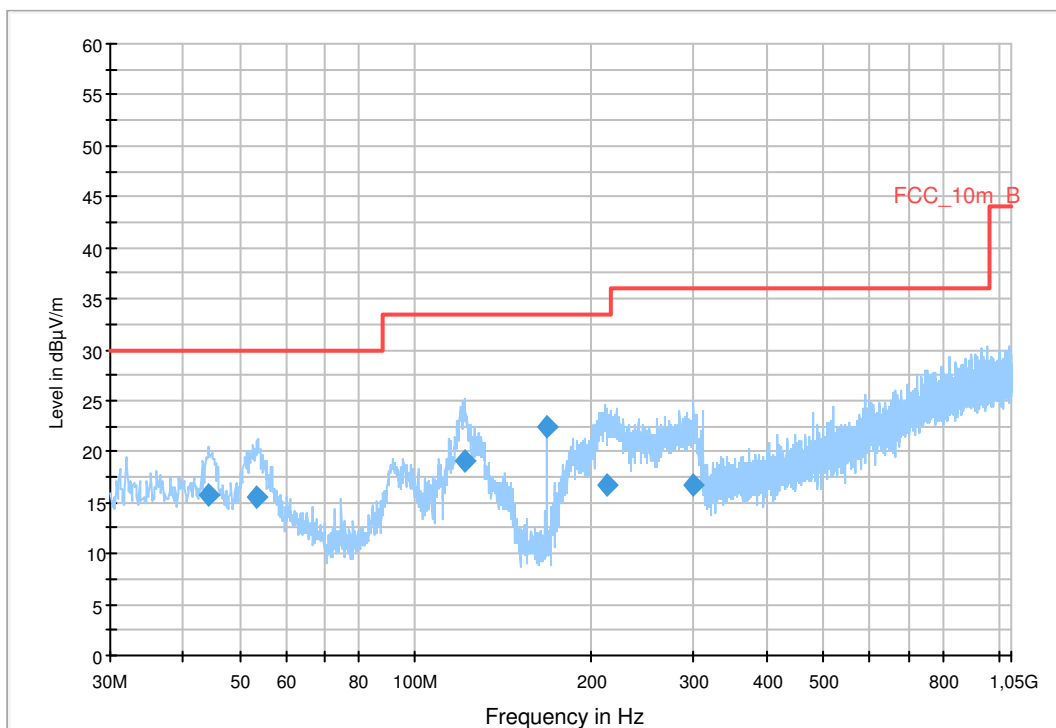
EMC 32 Version 8.10.00

Plot 8: 30 MHz – 1000 MHz, short neck loop antenna

EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: 10,6MHz tx + charging
 Operator Name: wld
 Comment: AC: 115 V / 60 Hz + neckloop antenna short

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange 30 MHz – 2 GHz
Step Size 60 kHz
Detectors QPK
IF BW 120 kHz
Meas. Time 1 s
Preamp 20 dB
 FCC_10m(B)_3



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
44.117100	15.7	1000.0	120.000	98.0	V	94.0	13.3	14.3	30.0	
53.523900	15.6	1000.0	120.000	113.0	V	9.0	13.0	14.4	30.0	
121.156350	19.1	1000.0	120.000	98.0	V	9.0	10.1	14.4	33.5	
168.013950	22.3	1000.0	120.000	98.0	V	283.0	9.7	11.2	33.5	
212.471100	16.7	1000.0	120.000	123.0	V	258.0	12.1	16.8	33.5	
299.752200	16.7	1000.0	120.000	98.0	V	274.0	14.5	19.3	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range:	30 MHz – 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical) : Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

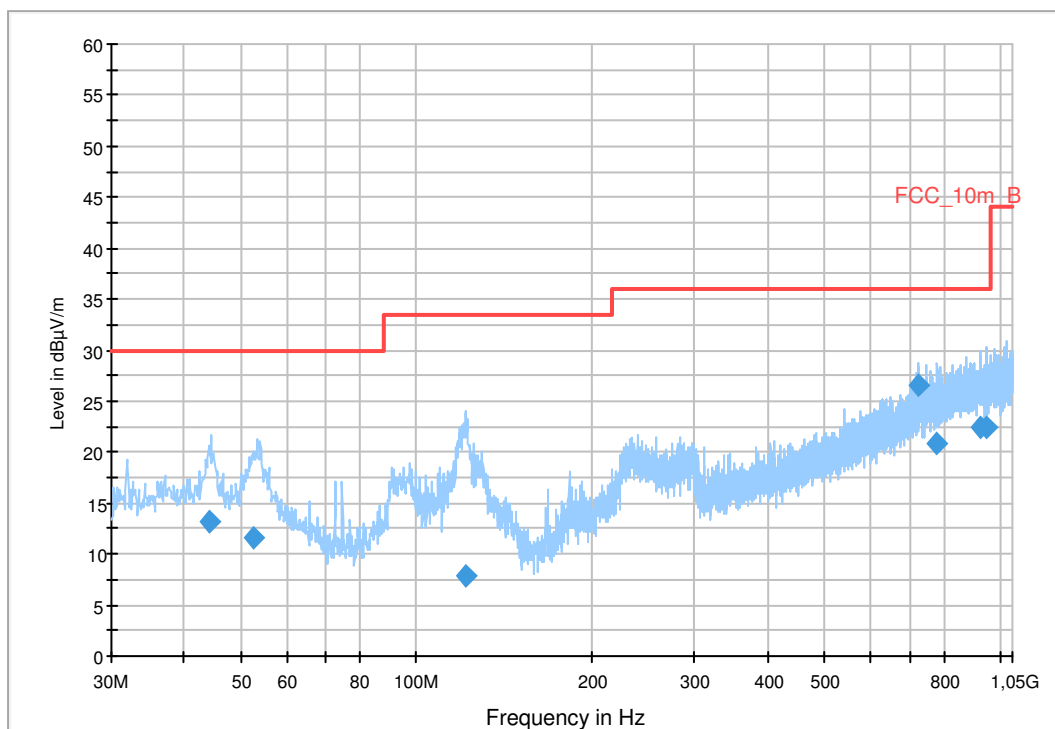
Plot 9: 30 MHz – 1000 MHz, long neck loop antenna

EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: 10,6 MHz tx + charging
 Operator Name: wld
 Comment: AC: 115 V / 60 Hz + neckloop antenna long

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz – 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
44.236650	13.2	1000.0	120.000	98.0	V	95.0	13.3	16.8	30.0	
52.770300	11.6	1000.0	120.000	144.0	V	-6.0	13.1	18.4	30.0	
121.651950	7.9	1000.0	120.000	170.0	V	196.0	10.1	25.6	33.5	
725.916750	26.6	1000.0	120.000	98.0	H	170.0	23.1	9.4	36.0	
780.717000	20.9	1000.0	120.000	104.0	H	285.0	23.7	15.1	36.0	
925.819950	22.3	1000.0	120.000	170.0	H	-6.0	25.3	13.7	36.0	
948.003450	22.5	1000.0	120.000	170.0	H	95.0	25.3	13.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range: 30 MHz – 2 GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 4.42

Signal Path: without Notch
FW 1.0

Antenna: VULB 9163
SN 9163-295, FW ---
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table (vertical): Cable_EN_1GHz (1005)
Correction Table (horizontal): Cable_EN_1GHz (1005)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

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9.5 Receiver spurious emissions

Limits:

FCC		IC
SUBCLAUSE § 15.109		RSS-210 Issue 8
Field strength of the harmonics and spurious.		
Frequency (MHz)	Field strength (µV/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 dBµV/m)	30
30 – 88	100 (40 dBµV/m)	3
88 – 216	150 (43.5 dBµV/m)	3
216 – 960	200 (46 dBµV/m)	3

Result:

Internal coil antenna (idle)

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
No critical peaks detected				

Short neck loop antenna (idle)

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dBµV/m]	Amplitude of emission [dBµV/m]	Results
No critical peaks detected				

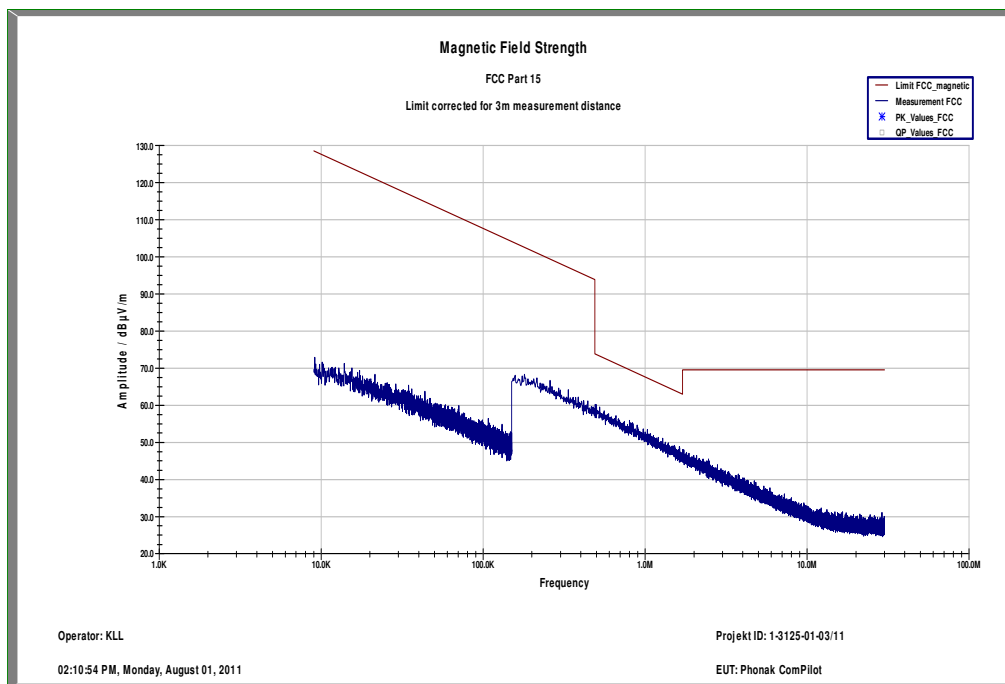
Long neck loop antenna (idle)

EMISSION LIMITATIONS				
f [MHz]	Detector	Limit max. allowed [dB μ V/m]	Amplitude of emission [dB μ V/m]	Results
No critical peaks detected				

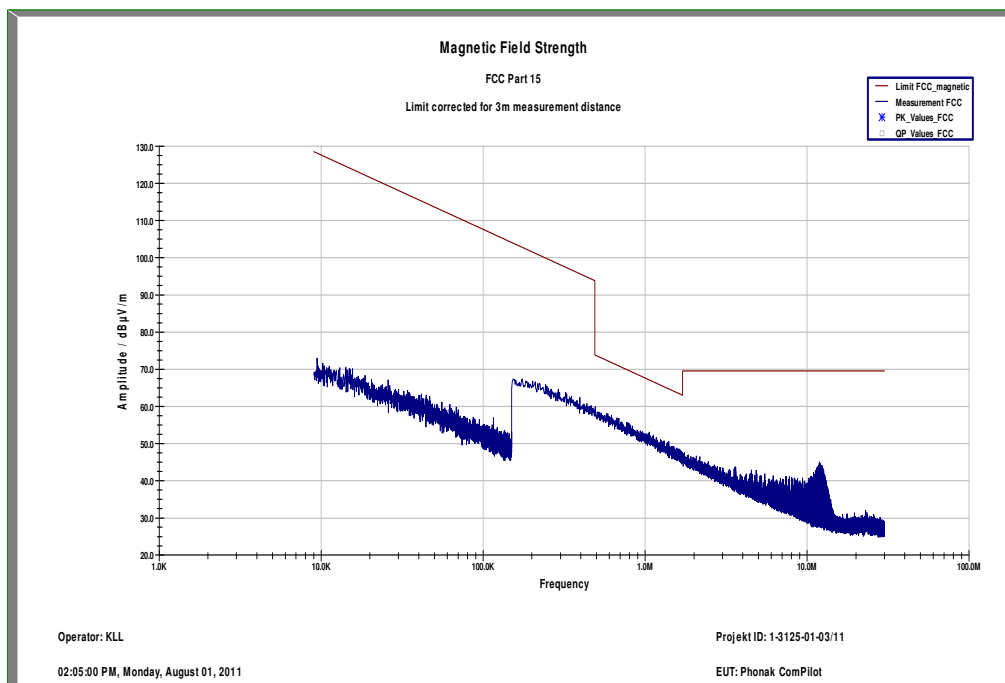
Result: The result of the measurement is passed.

Plots of the measurements

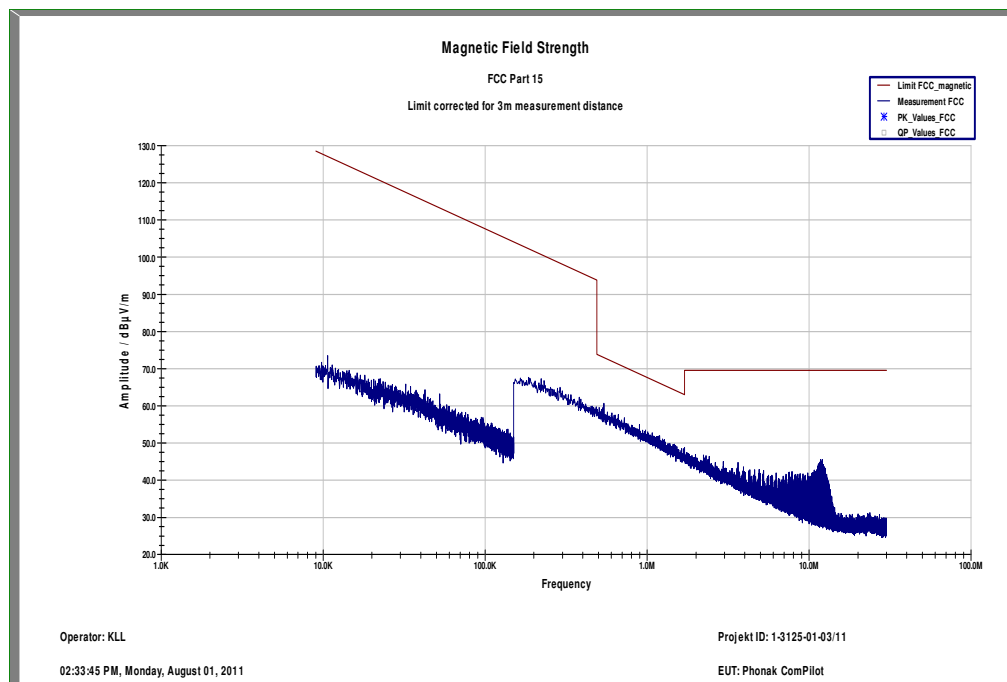
Plot 1: 9 kHz – 30 MHz, antenna 0°, internal coil antenna



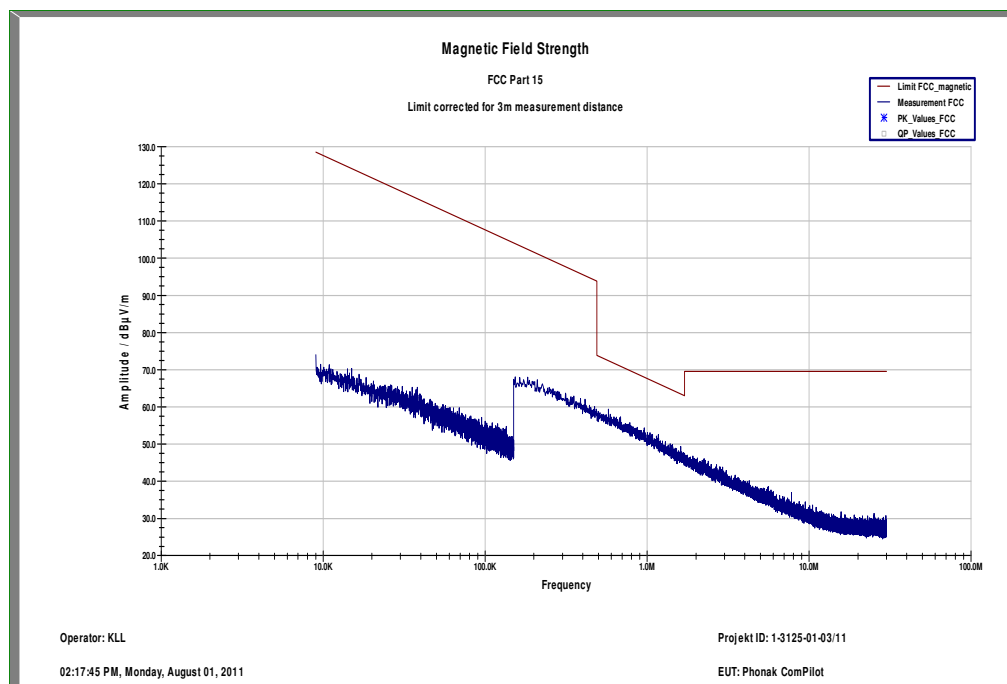
Plot 2: 9 kHz – 30 MHz, antenna 90°, internal coil antenna



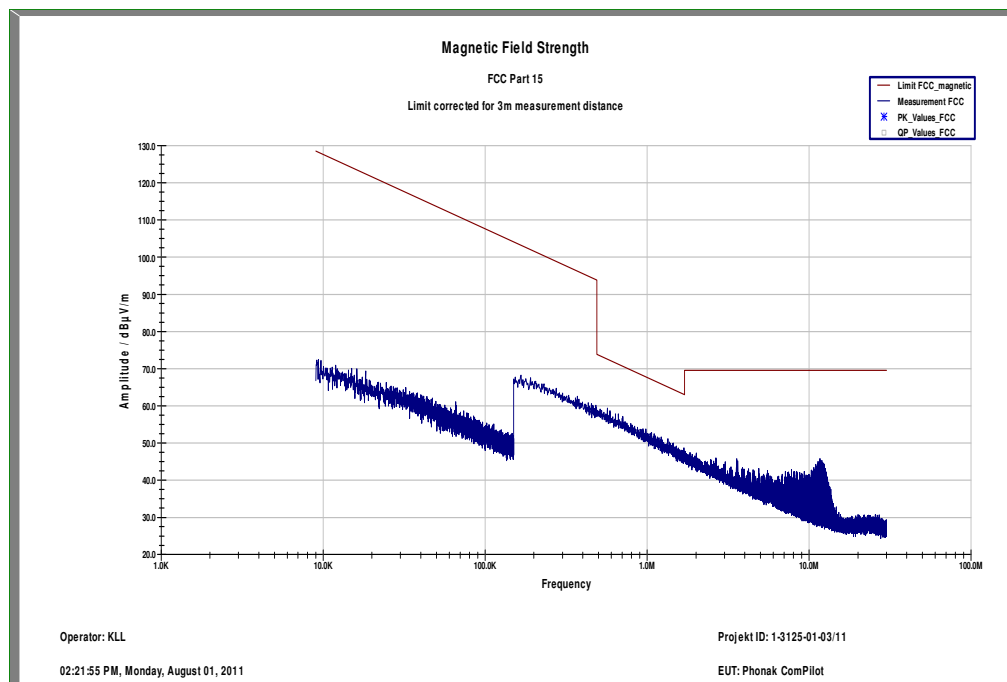
Plot 3: 9 kHz – 30 MHz, antenna 90° (worst case), short neck loop antenna



Plot 4: 9 kHz – 30 MHz, antenna 0°, long neck loop antenna



Plot 5: 9 kHz – 30 MHz, antenna 90°, long neck loop antenna



Plot 6: 30 MHz – 1000 MHz, internal coil antenna

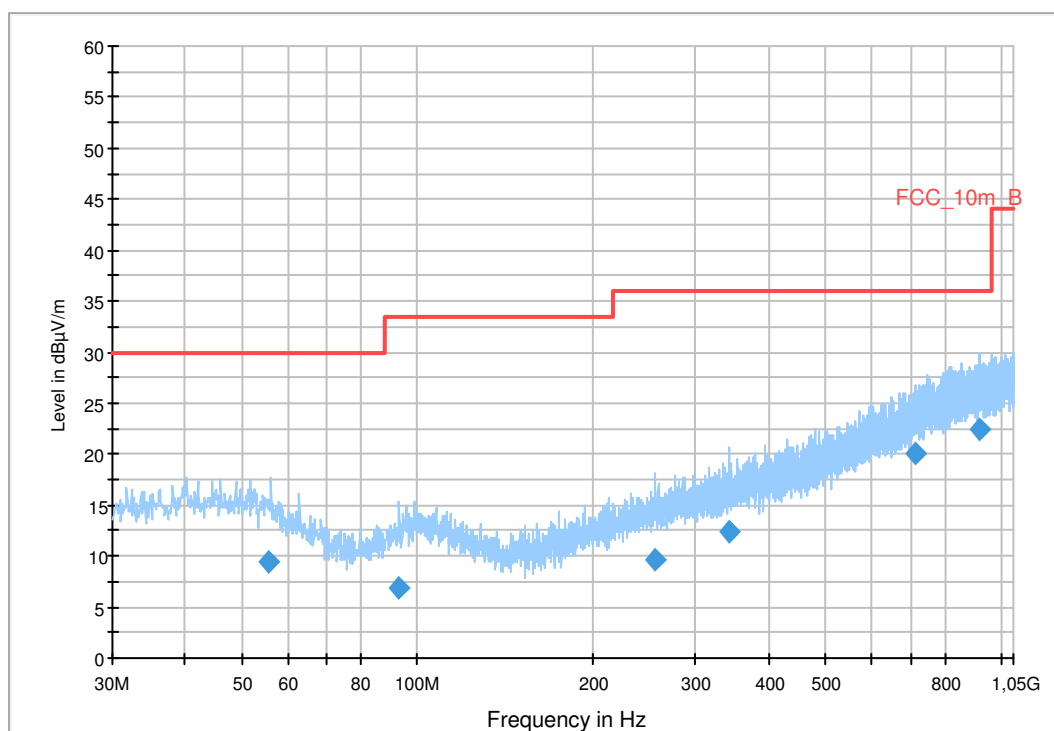
EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: rx
 Operator Name: wld
 Comment: internal antenna

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz – 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

FCC_10m(B)_3



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
55.674750	9.5	1000.0	120.000	156.0	H	260.0	12.7	20.5	30.0	
92.854050	6.8	1000.0	120.000	170.0	H	82.0	10.9	26.7	33.5	
255.219150	9.6	1000.0	120.000	170.0	V	283.0	13.4	26.4	36.0	
342.952050	12.4	1000.0	120.000	170.0	V	268.0	15.9	23.6	36.0	
713.750850	20.1	1000.0	120.000	170.0	H	269.0	22.8	15.9	36.0	
918.150300	22.5	1000.0	120.000	170.0	V	260.0	25.3	13.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range:	30 MHz – 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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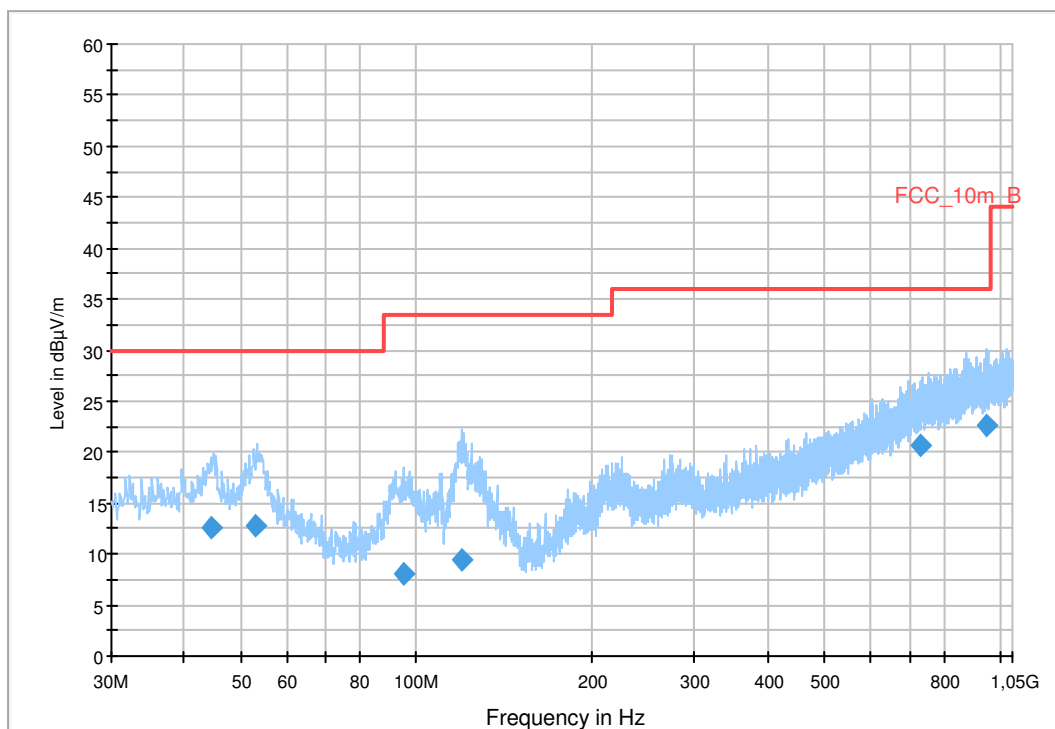
Plot 7: 30 MHz – 1000 MHz, short neck loop antenna

EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: rx + charging
 Operator Name: wld
 Comment: AC: 115 V / 60 Hz + neckloop antenna short

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz – 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
44.614950	12.7	1000.0	120.000	106.0	V	178.0	13.3	17.3	30.0	
52.783500	12.8	1000.0	120.000	98.0	V	88.0	13.1	17.2	30.0	
95.161350	8.1	1000.0	120.000	170.0	V	185.0	11.3	25.4	33.5	
119.365950	9.4	1000.0	120.000	170.0	V	185.0	10.3	24.1	33.5	
731.152650	20.6	1000.0	120.000	98.0	V	258.0	23.2	15.4	36.0	
950.847900	22.5	1000.0	120.000	124.0	H	260.0	25.4	13.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range:	30 MHz – 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

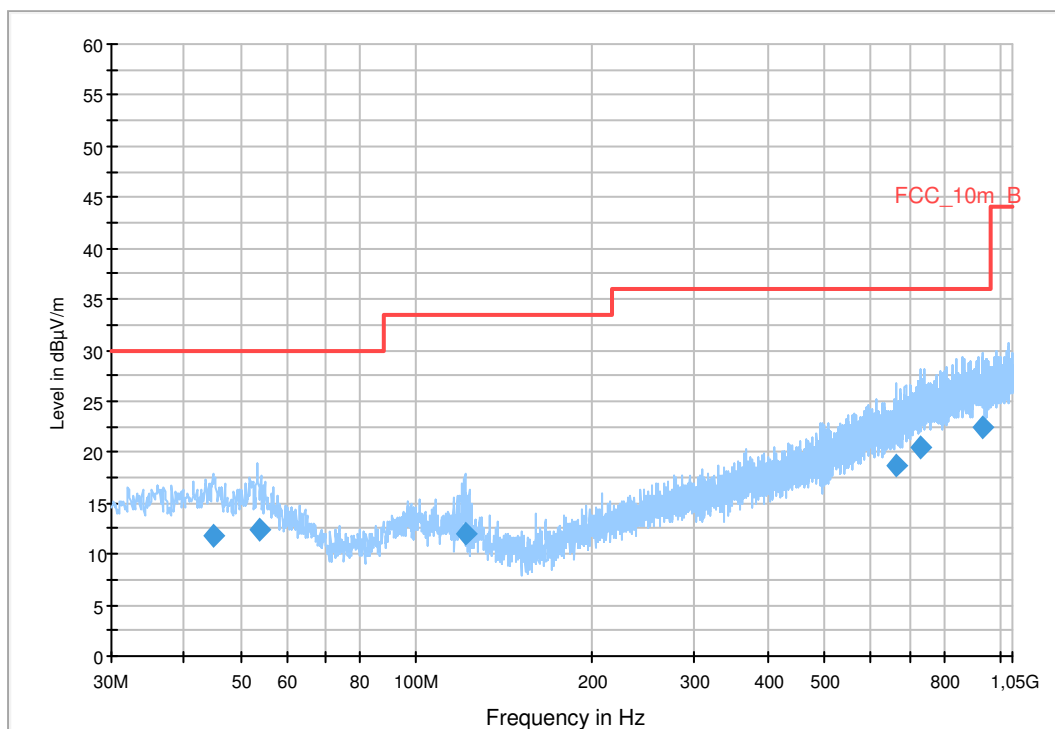
Plot 8: 30 MHz – 1000 MHz, long neck loop antenna

EUT: Phonak ComPilot
 Serial Number: prototype
 Test Description: FCC Part 15 @ 10m
 Operating Conditions: rx + charging
 Operator Name: wld
 Comment: AC: 115 V / 60 Hz + neckloop antenna long

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz – 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
44.964750	11.8	1000.0	120.000	170.0	V	268.0	13.3	18.2	30.0	
53.862300	12.4	1000.0	120.000	170.0	V	181.0	13.0	17.6	30.0	
121.366650	12.0	1000.0	120.000	120.0	V	170.0	10.1	21.5	33.5	
662.356200	18.7	1000.0	120.000	170.0	H	283.0	21.5	17.3	36.0	
729.497700	20.4	1000.0	120.000	170.0	H	270.0	23.2	15.6	36.0	
930.703350	22.5	1000.0	120.000	123.0	H	12.0	25.3	13.5	36.0	

Hardware Setup: EMI radiated\Electric Field (NOS) – [EMI radiated]

Subrange 1

Frequency Range:	30 MHz – 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

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9.6 Conducted limits

When the internal coil antenna for transmit mode is used, the DUT can be powered by the internal battery only.

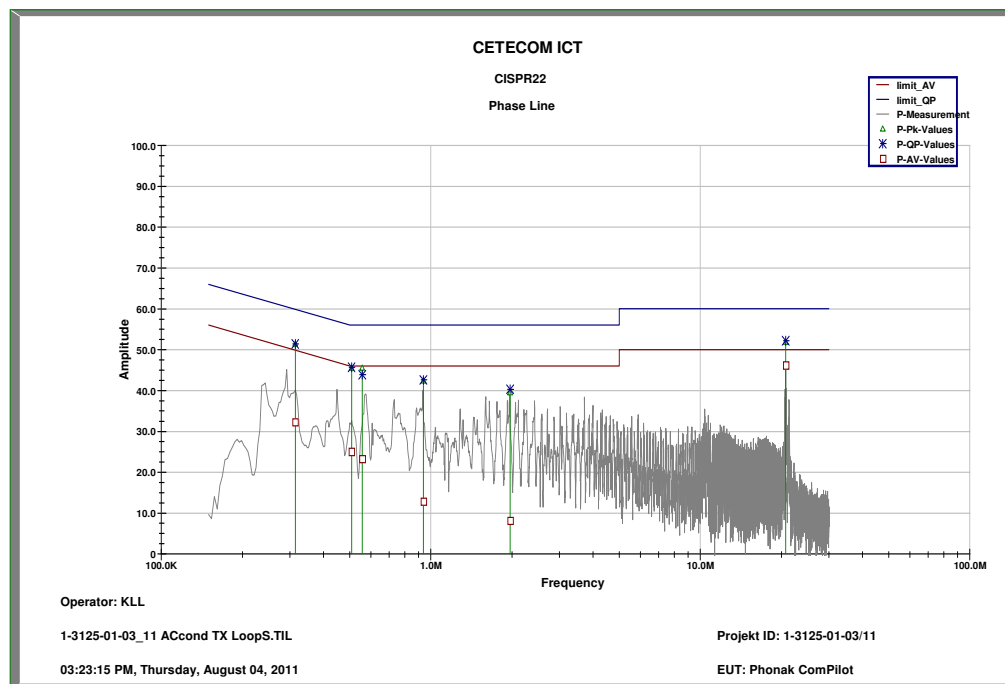
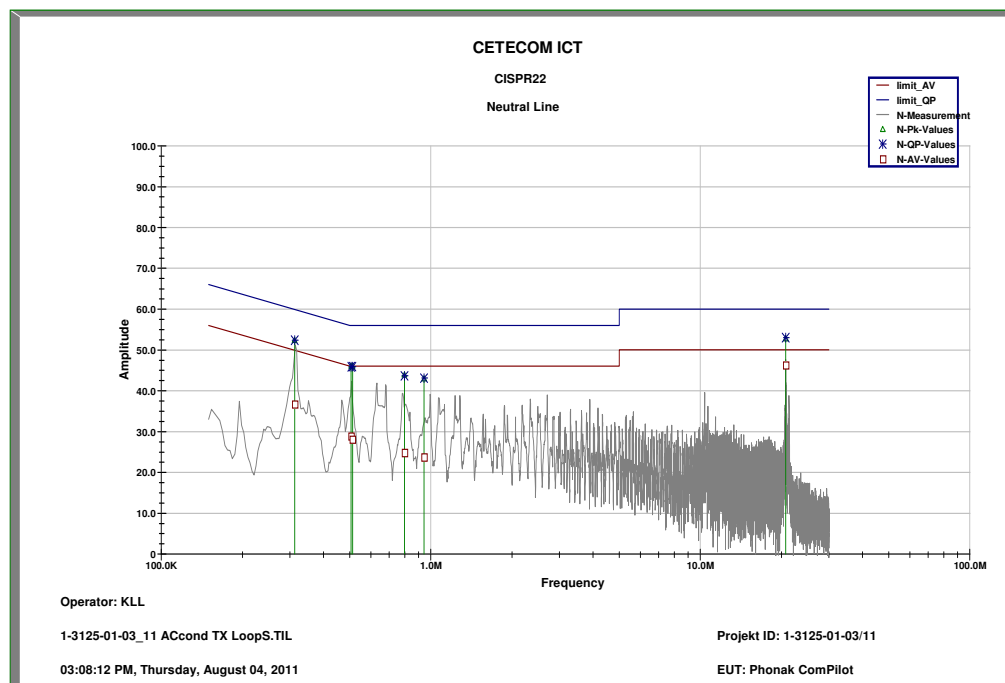
Measurements with neck loop antenna transmit mode were performed with the provided charger/switching power supply (Model: GPE060A-050100Z / APPROVAL NO: A/12297EA).

Limits:

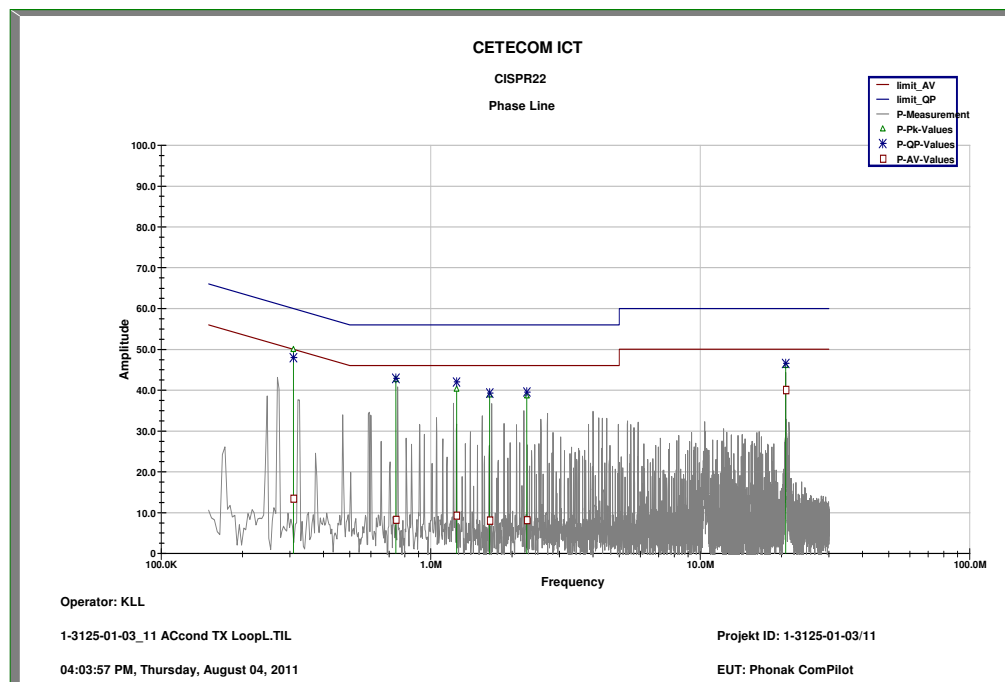
FCC		IC	
SUBCLAUSE § 15.107 / 15.207		-/-	
Conducted limits			
Frequency of Emission (MHz)	Conducted Limit (dBµV)		
	Quasi-peak	Average	
0.15 – 0.5	66 to 56 *	56 to 46 *	
0.5 – 5	56	46	
5 – 30	60	50	

*Decreases with the logarithm of the frequency

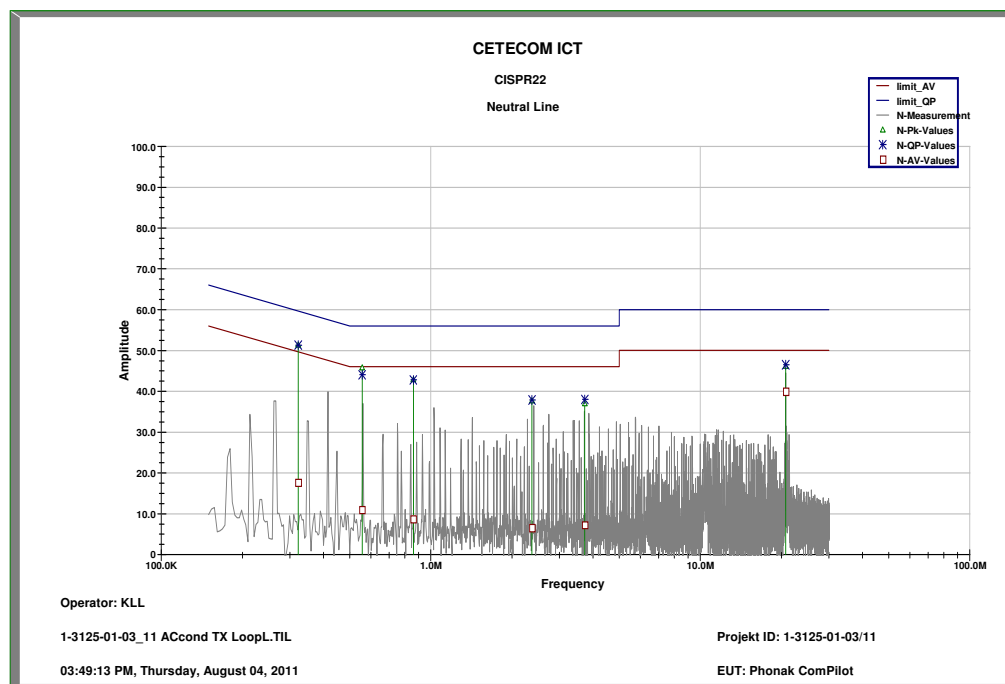
Result: The result of the measurement is passed.

Plots of the measurements**Plot 1:** Transmit mode, short neck loop antenna, 9 kHz to 30 MHz, phase line**Plot 2:** Transmit mode, short neck loop antenna, 9 kHz to 30 MHz, neutral line

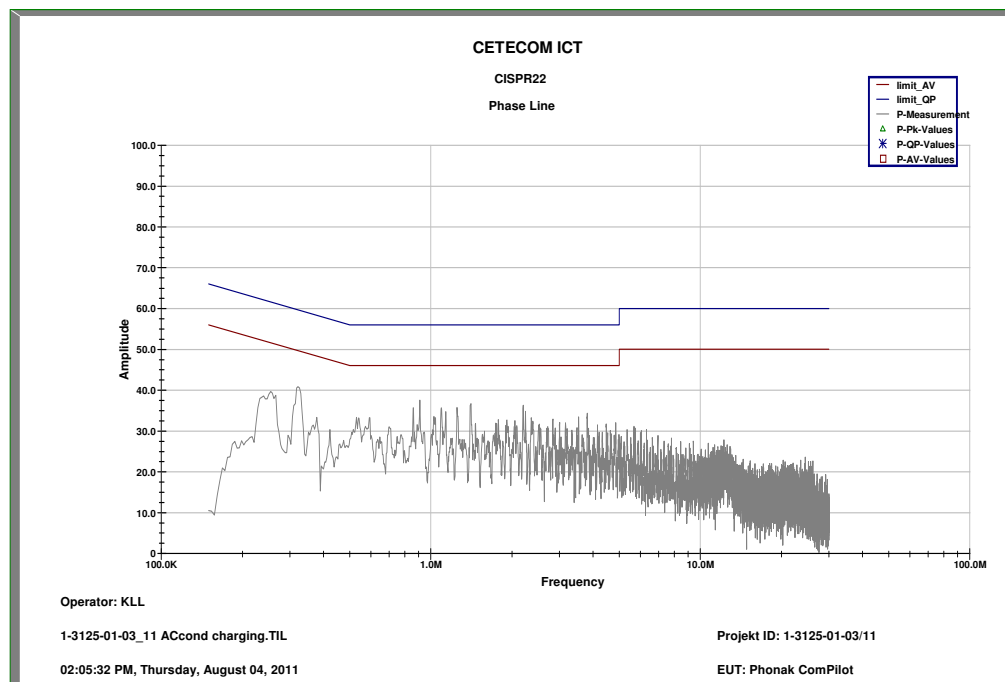
Plot 3: Transmit mode, long neck loop antenna, 9 kHz to 30 MHz, phase line



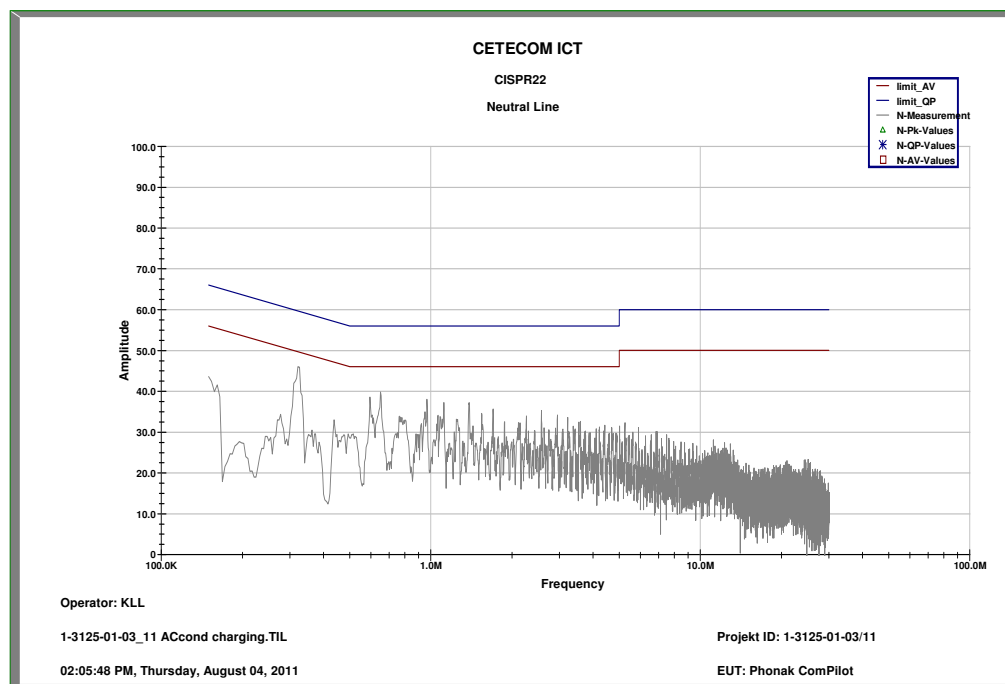
Plot 4: Transmit mode, long neck loop antenna, 9 kHz to 30 MHz, neutral line



Plot 5: Idle/charging mode, 9 kHz to 30 MHz, phase line



Plot 6: Idle/charging mode, 9 kHz to 30 MHz, neutral line



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	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
3	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
4	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	11.05.2011	11.05.2013
5	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
6	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
7	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
8	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
9	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
10	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
11	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
12	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
13	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
14	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
15	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
16	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
17	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
18	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
19	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
20	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
21	n. a.	PSA Spectrum Analyzer 3 Hz – 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
22	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
23	n. a.	RF Filter Section 9kHz – 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKI!	08.09.2010	08.09.2012
24	n. a.	TRILOG Broadband	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2011

		Test-Antenna 30 MHz – 3 GHz							
25	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
26	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
27	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
28	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
29	n. a.	Analyzer- Reference- System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
30	n. a.	Amplifier	JS42-00502650- 28-5A	MITEQ	1084532	300003379	ev		
31	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
32	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
33	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
34	n. a.	TRILOG Broadband Test-Antenna 30 MHz – 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
35	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013
36	n. a.	Spectrum Analyzer 9kHz to 30GHz - 140...+30dBm	FSP30	R&S	100886	300003575	k	07.09.2010	07.09.2012
37	n. a.	DC Power Supply 0 – 32V	1108-32	Heiden	001802	300001383	Ve	23.06.2010	23.06.2013
38	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/83761	300002326	Ve	28.05.2009	28.08.2011
39	n. a.	Test Receiver	ESH2	R&S	871921/095	300002505	Ve	12.02.2010	12.02.2012
40	n. a.	Loop Antenna 9 KHz – 30 MHz	HFH2-Z2	R&S	872096/61	300001824	vlKI!	18.11.2008	18.11.2011
41	n. a.	EMI Test Receiver 9 kHz – 3 GHz incl. Preselector	ESPI3	R&S	101713	300004059	k	07.09.2010	07.09.2011

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
 vlKI! 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

Annex A Photographs of the test setup

Photo documentation:

Photo 1: Transmit mode / internal coil antenna



Photo 2: Transmit mode / internal coil antenna



Photo 3: Transmit mode / neck loop antenna



Photo 4: Transmit mode / neck loop antenna

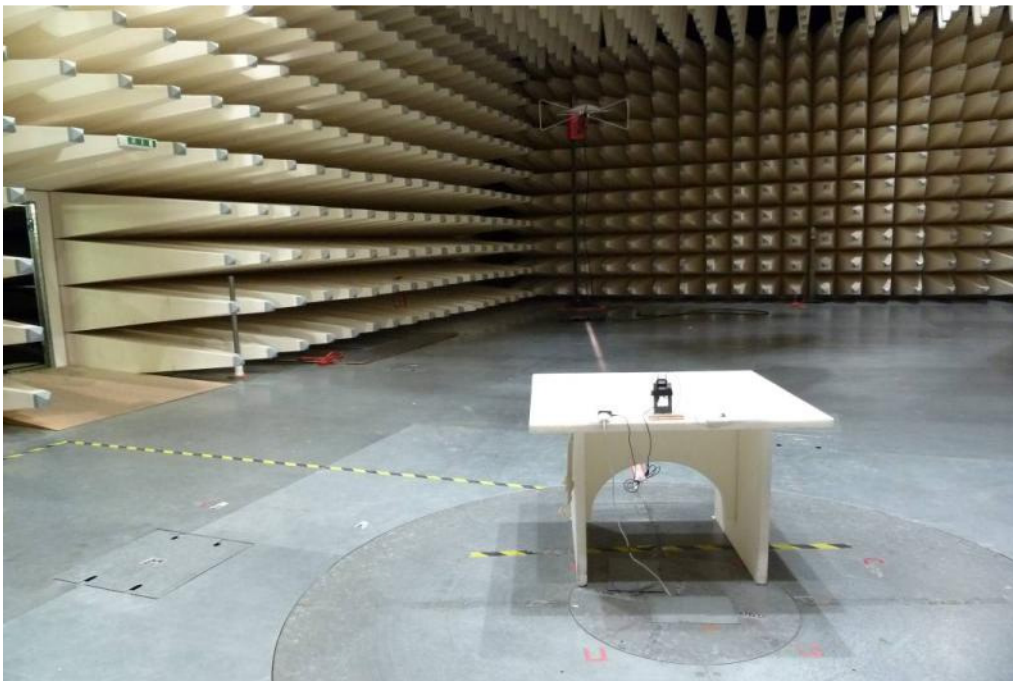


Photo 5:



Photo 6



Annex B External photographs of the EUT

Photo documentation :

Photo 1 :



Photo 2 :



Photo 3 :



Photo 4 :



Photo 5: Ports for neck loop antennas



Photo 6 :



Photo 7 :



Photo 8 :



Photo 9 : Long neck loop antenna

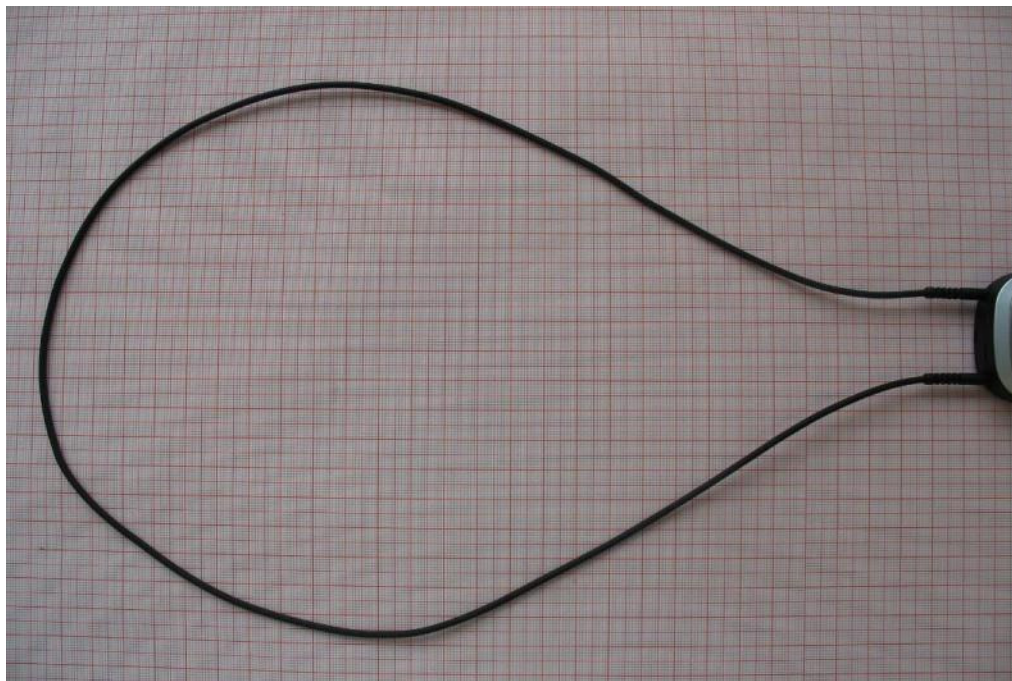


Photo 10: Short neck loop antenna

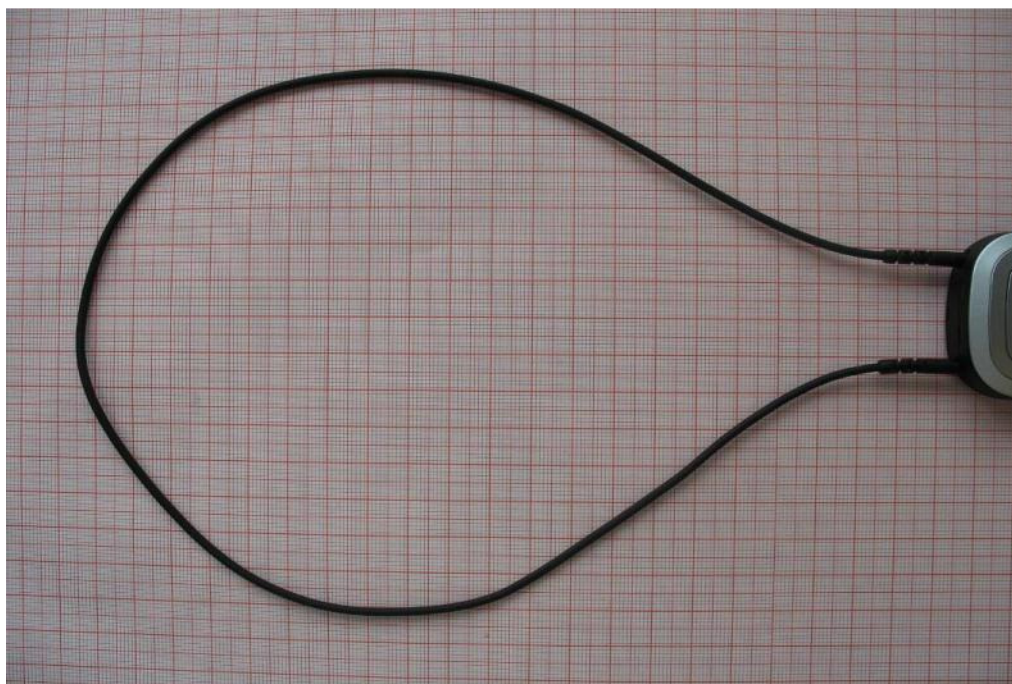
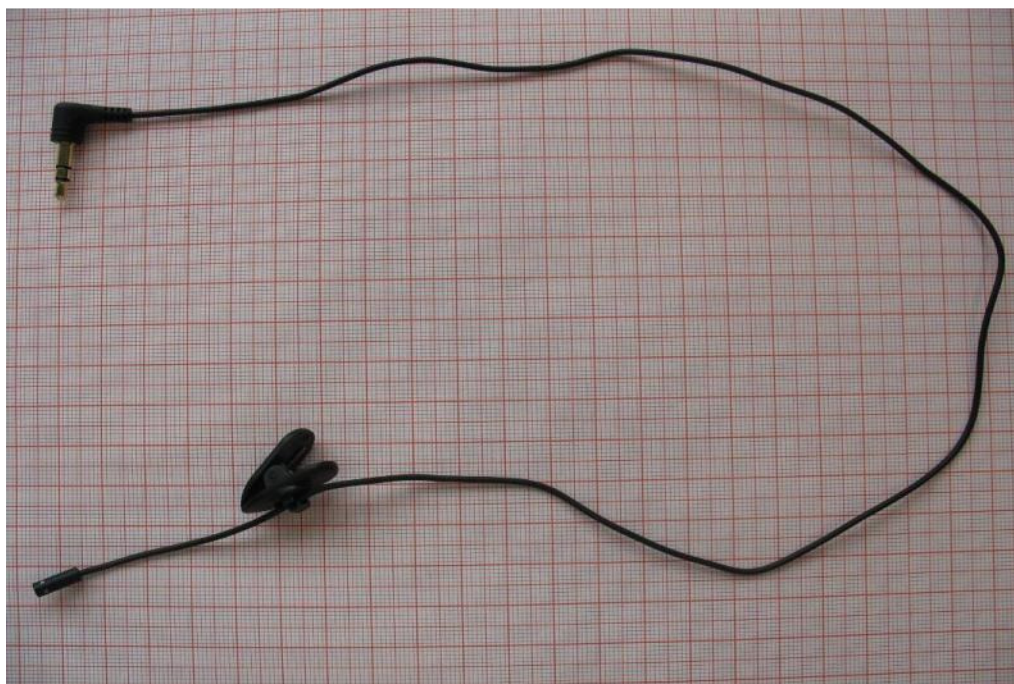


Photo 11 : Power supply



Photo 12: Microphone



Annex C Internal photographs of the EUT

Photo documentation :

Photo 1 :



Photo 2 :

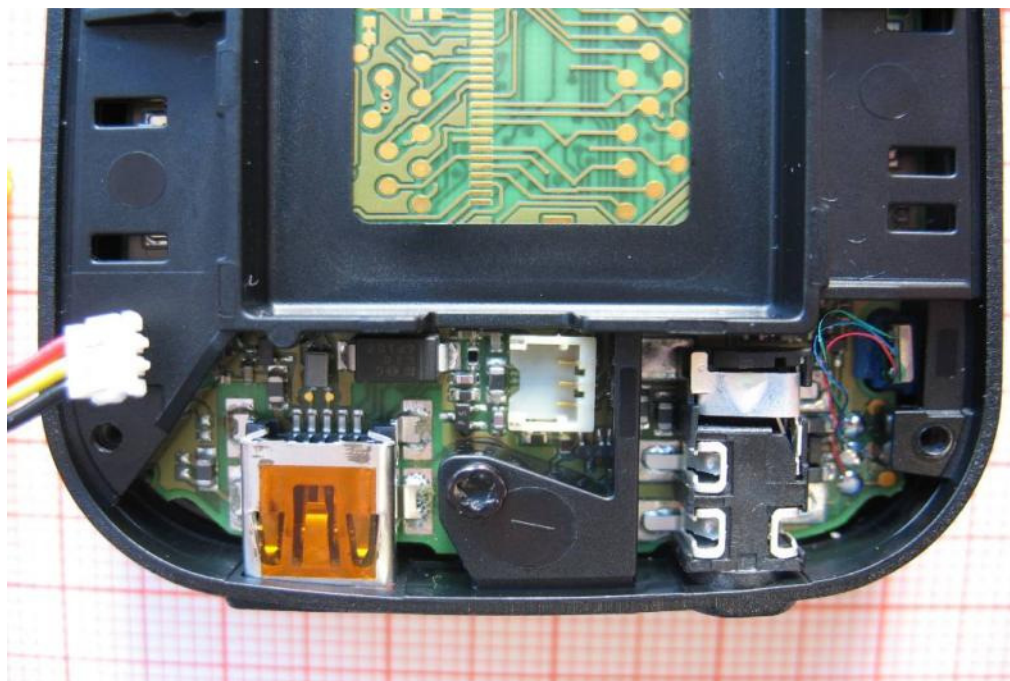


Photo 3 :

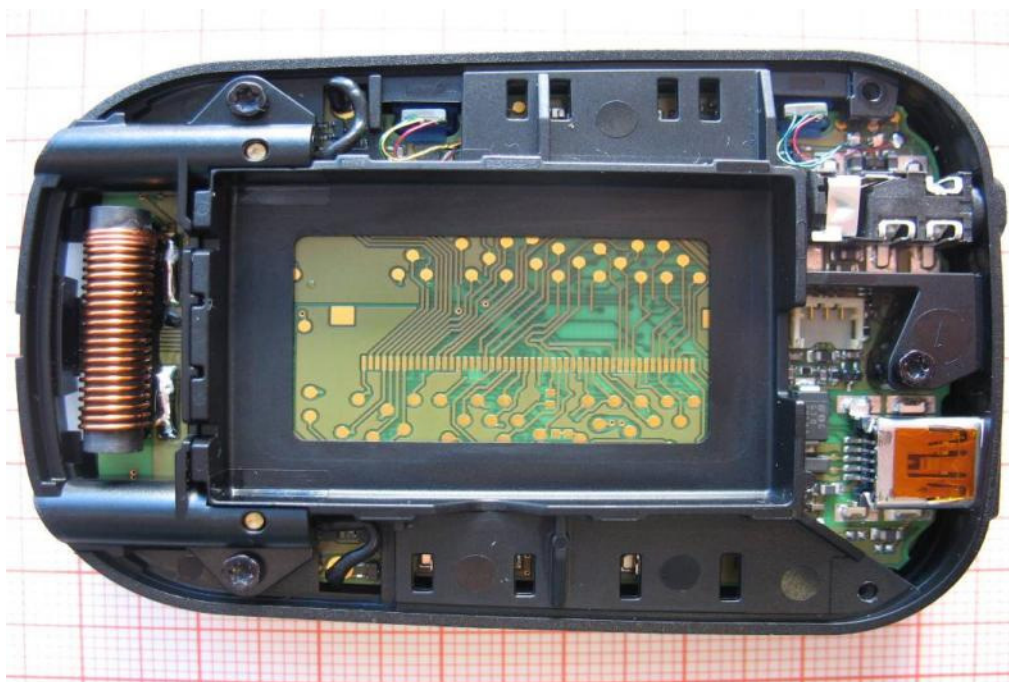


Photo 4 :

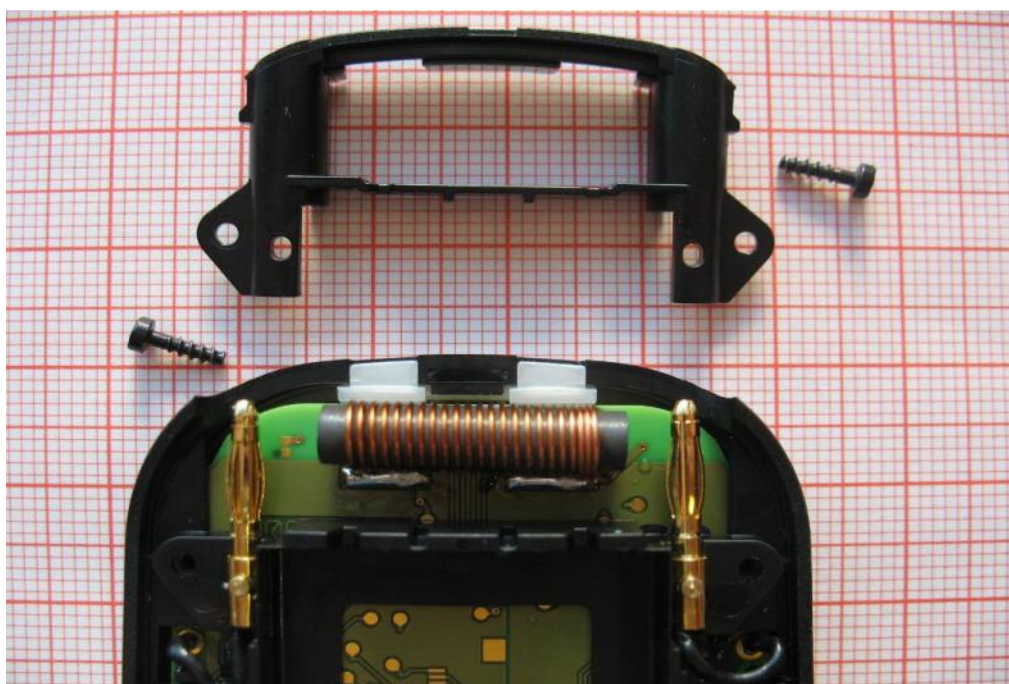


Photo 5 :

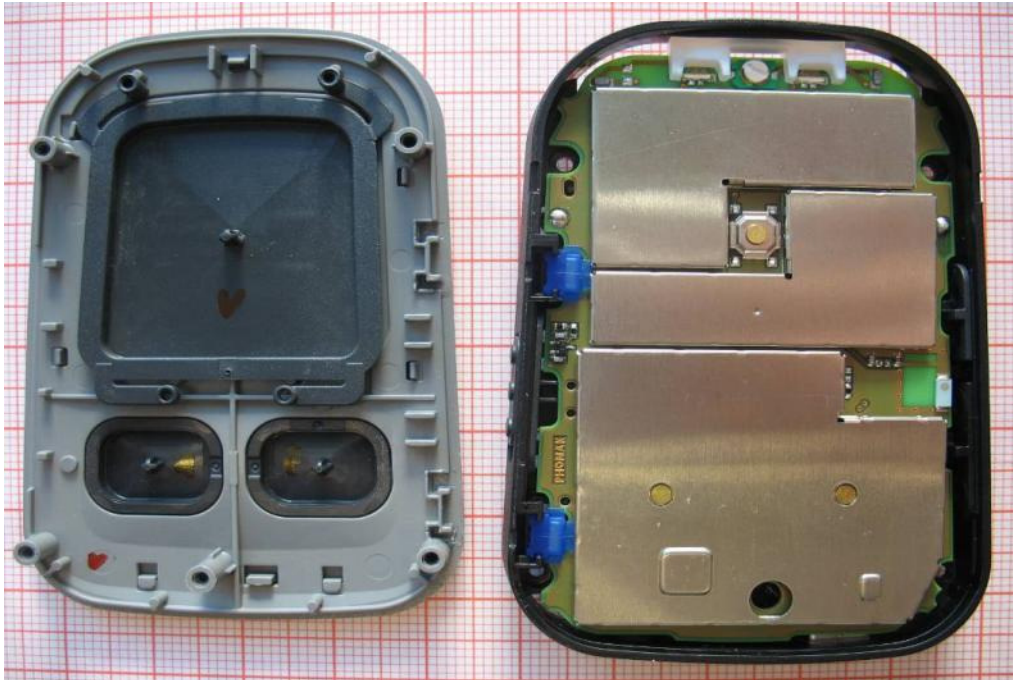


Photo 6 :



Photo 7 :

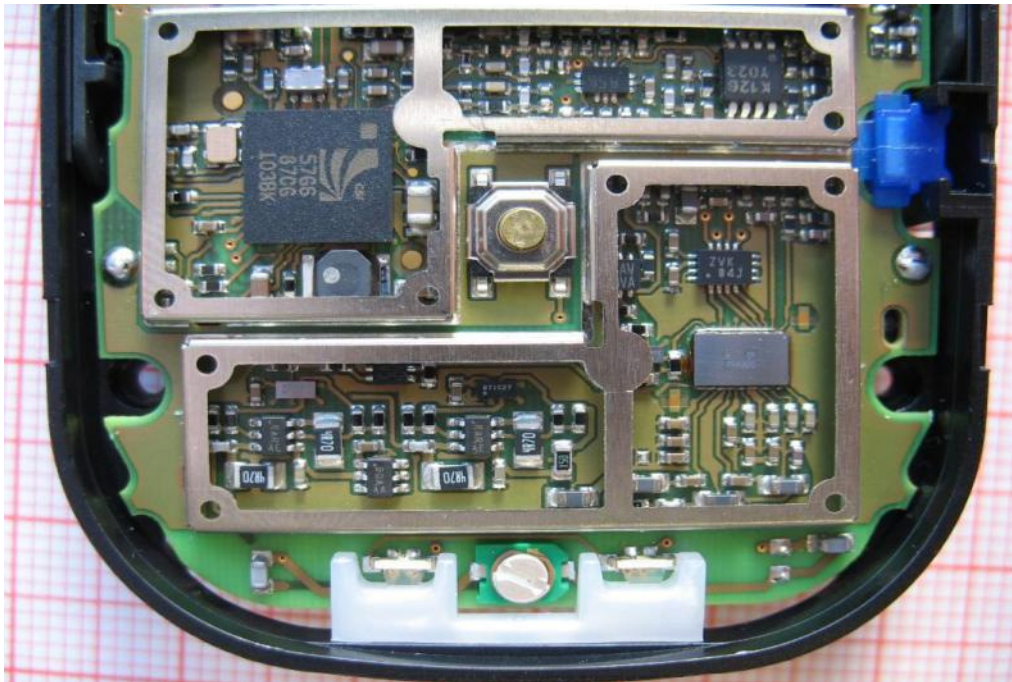


Photo 8 :

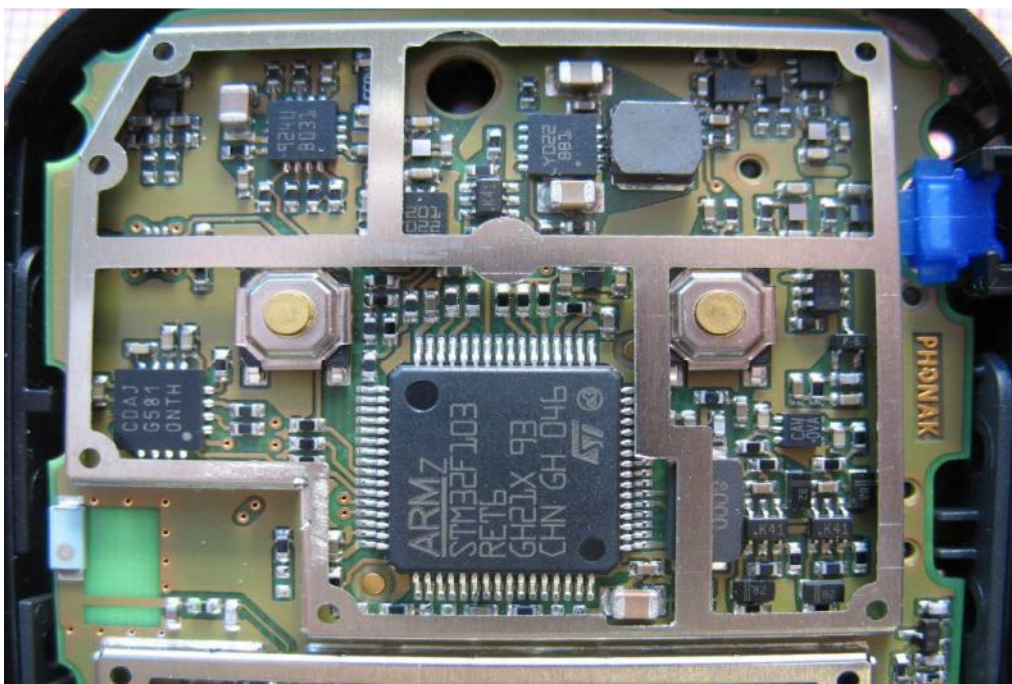


Photo 9 :

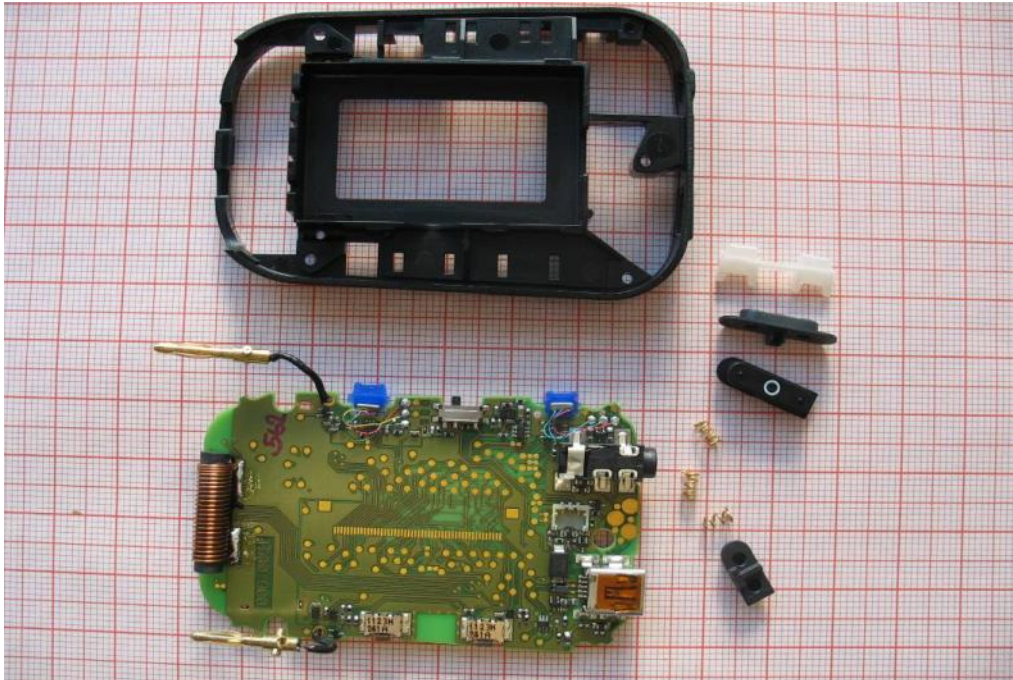
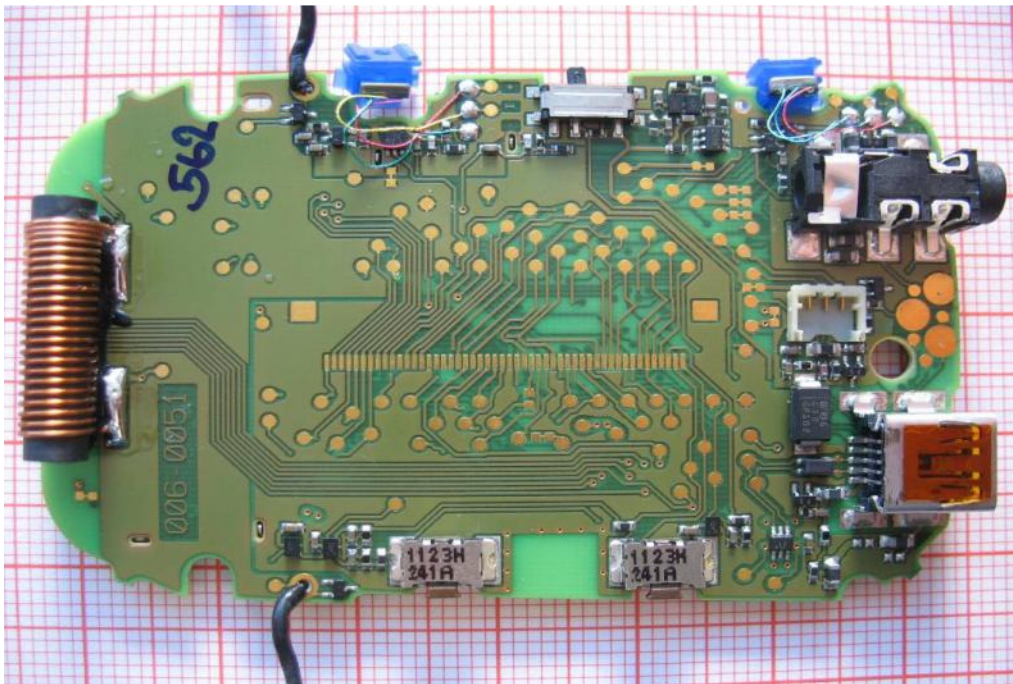


Photo 10 :



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-08-31
-A	Test specification clause (FCC) at p. 5, 10, 14 corrected	2011-09-07
-B	Type of modulation changed (p. 4, 8)	2011-09-13

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