

5 TEST CONDITIONS AND RESULTS

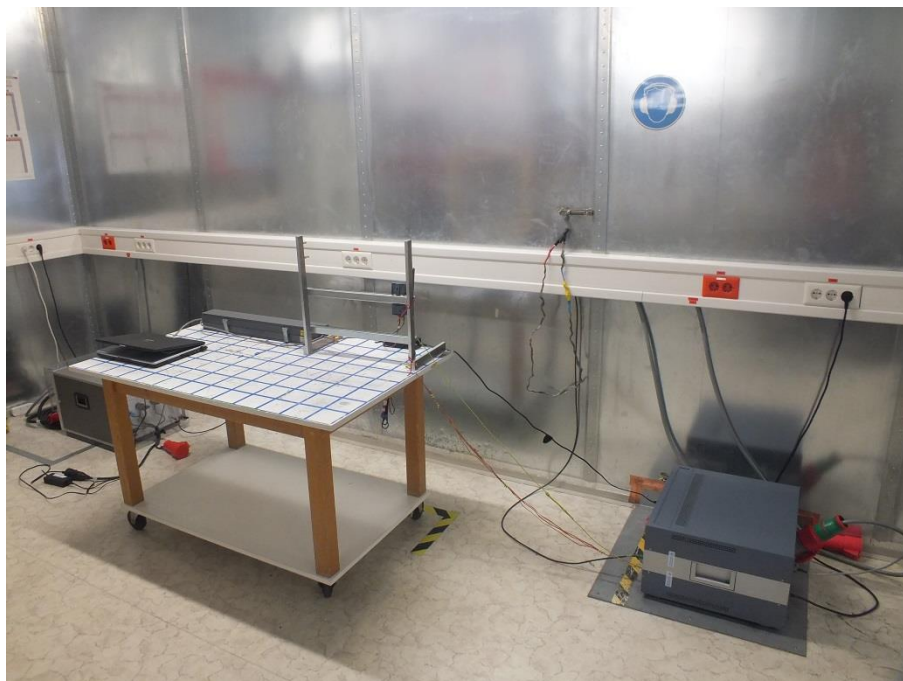
5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15C, Section 15.107(a) and Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

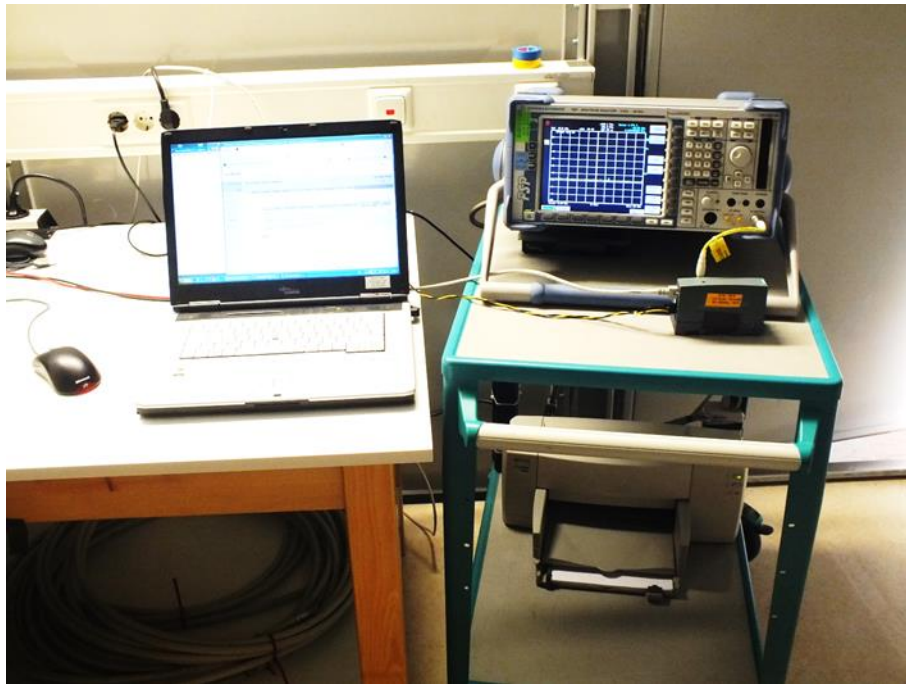
5.2 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

5.2.1 Description of the test location

Test location: AREA 4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15E, Section 15.407(i):

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency, that are 26 dB down relative to the maximum of the modulated carrier.

5.2.4 Description of Measurement

The bandwidth is measured conducted using a spectrum analyser and following the procedures according the OET 789033, item C. The spectrum analyser function "n-dB-down" is used to determine the 26 dB EBW. For the OBW the analyser function "OBW" is used to determine the bandwidth. The procedures according the OET 789033, item D are followed in this case. The measurement is done at the highest power setting P20.

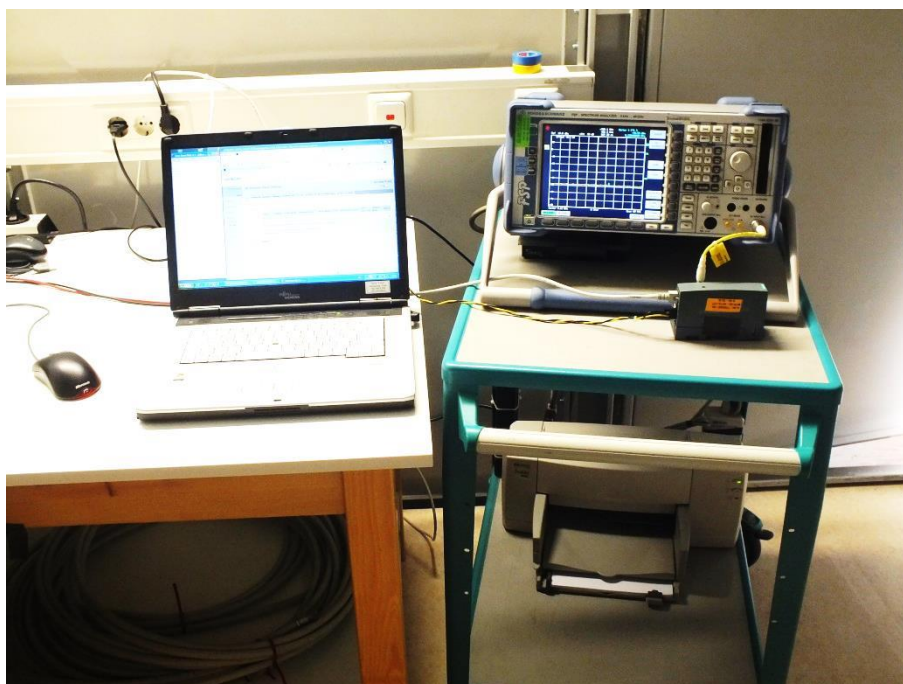
5.3 Maximum conducted output power

For test instruments and accessories used see section 6 Part **CPC 3**.

5.3.1 Description of the test location

Test location: AREA 4

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

The maximum conducted output power over the frequency band of operation shall not exceed the effective values. If transmitting antennas of directional gain are greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.4 Description of Measurement

The output power is measured conducted using a spectrum analyser. The EUT has no constant duty cycle and may be smaller than 98% therefore the procedure according the OET 789033; item E g) Method SA-3 Alternative is followed. The EUT is set while measuring in TX continuous mode with a maximum duty cycle. The insertion loss of the measurement cable is taken into account with amplitude offset while measuring. The output power is integrated across the OBW 99 alternatively.

Determination of the min VBW for AV-Measurement:

Transmission duration			
Standard	min puls in TX continuous mode	1/T	min VBW
	(ms)	(Hz)	
801.11a	2.000	500	1 kHz
801.11n, HT20	1.850	541	1 kHz
801.11n, HT40	0.455	2198	3 kHz

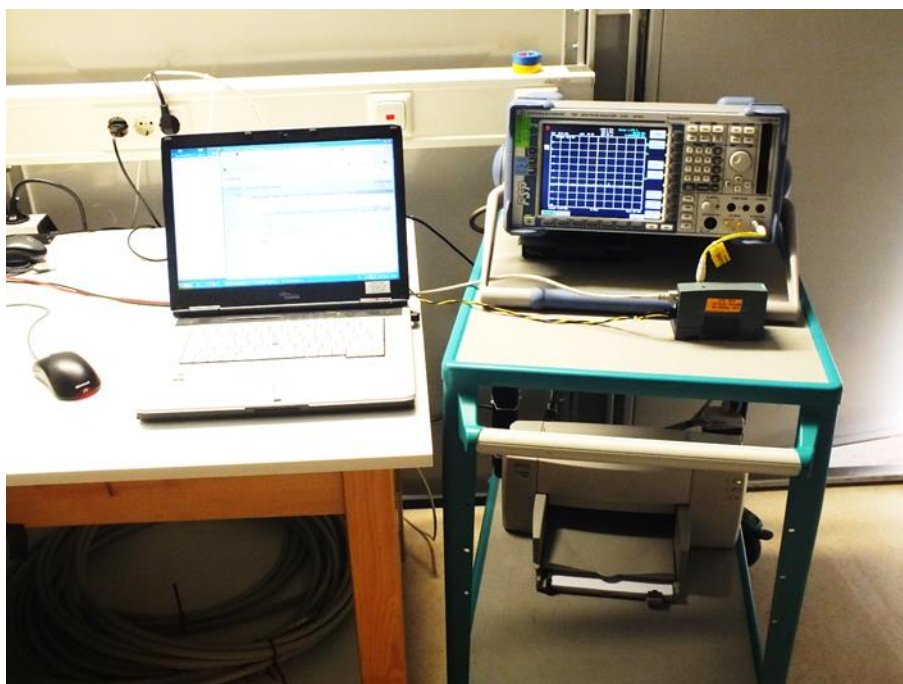
5.4 Peak power spectral density

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: AREA 4

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15E, Section 15.407(a):

For the defined operating bands the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than the appropriate limit in any 1 MHz band during any time interval of continuous transmission.

5.4.4 Description of Measurement

The bandwidth is measured conducted using a spectrum analyser and following the procedures according the OET 789033, item F. Since the method SA-3 alternative was used for channel power the spectrum analyser settings are the same as under item F)g). The marker function "Marker to max" is used to set at peak power spectral density. For this MIMO transmitter the antenna chain 1 and chain 2 is measured and summed in linear terms over all antenna terminals of the multiple antenna system. The insertion loss of the measurement cable and switch is taken into account with a amplitude offset while measuring.

Spectrum analyser settings:

Channel power measurement function, TX channel bandwidth equal to OBW;

RBW: 1 MHz, VBW: 1 kHz, Sweep time: auto, Detector: PK, Trace: max hold;

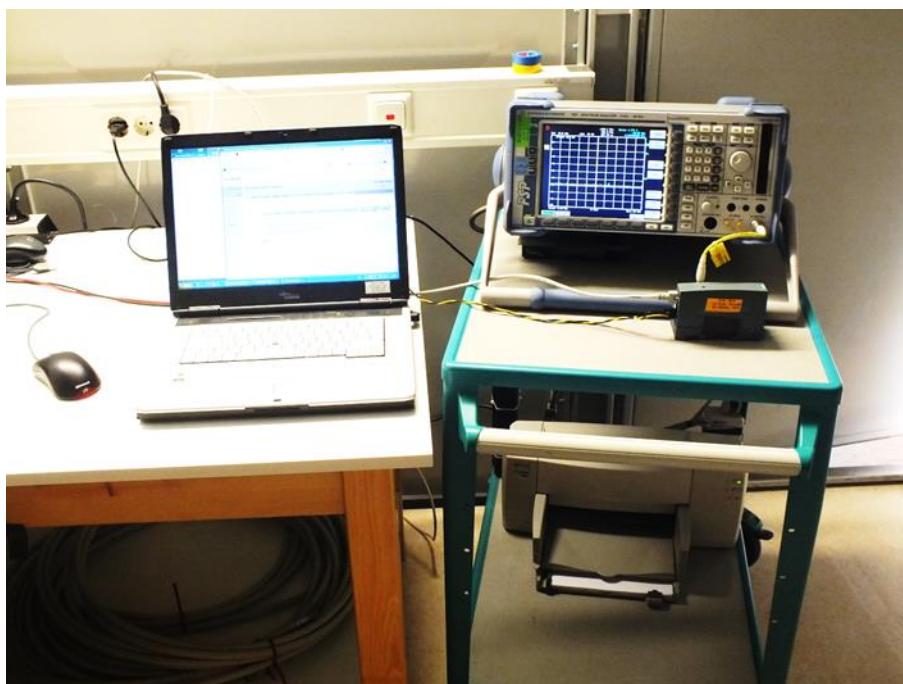
5.5 Peak excursion

For test instruments and accessories used see section 6 Part **MB**.

5.5.1 Description of the test location

Test location: AREA 4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15E, Section 15.407(a)(6):

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured like before) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

5.5.4 Description of Measurement

Peak excursion is measured using a spectrum analyser and following the procedures according the OET 789033, item G. The peak max spectrum is determined with the analyser setting mentioned below. The ratio between peak-max-hold spectrum and average spectrum is calculated and listed as PEX in the tables below.

Spectrum analyser settings:

RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto, Detector: PK, Trace: max hold;

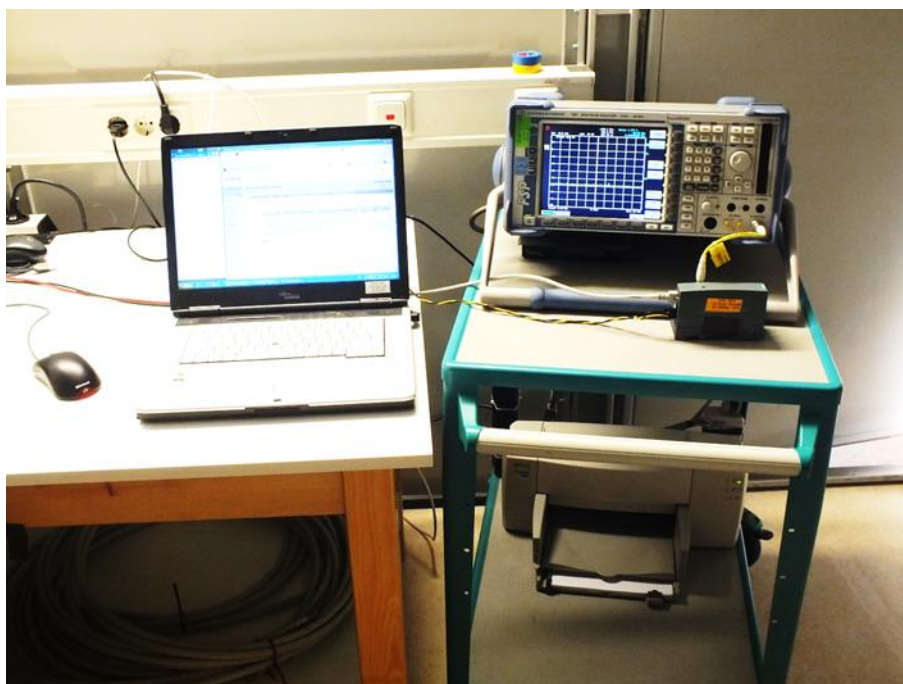
5.6 Undesirable emissions conducted

For test instruments and accessories used see section 6 Part **SEC 1, SEC 2 and SEC 3.**

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):

For transmitters operating in the defined bands shall not exceed the appropriate emission limit outside of the operating bands.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.6.4 Description of Measurement

Undesirable emissions are measured using a spectrum analyser and following the procedures according to the OET 789033, item H. If the emission level of the EUT in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. Up from 8 GHz a HP filter is used.

Spectrum analyser settings:

Peak-measurement:

9 - 150 kHz:	RBW: 300 Hz,	VBW: 1 kHz,	Detector: Max peak,	Trace Mode: Max hold;
0.15 - 30 MHz:	RBW: 10 kHz,	VBW: 30 kHz,	Detector: Max peak,	Trace Mode: Max hold;
30 - 1000 MHz:	RBW: 100 kHz,	VBW: 300 kHz,	Detector: Max peak,	Trace Mode: Max hold;
1 - 40 GHz:	RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace Mode: Max hold;

AV-measurement according KDB 789033, Item H)6d) Method VB:

RBW: 1 MHz, VBW: $\geq 1/T$, Detector: Max peak, Trace Mode: Max hold, Sweep time: auto;
For 801.11a, n HT20: VBW = 1 kHz, for 802.11 n, HT40: VBW = 3 kHz;

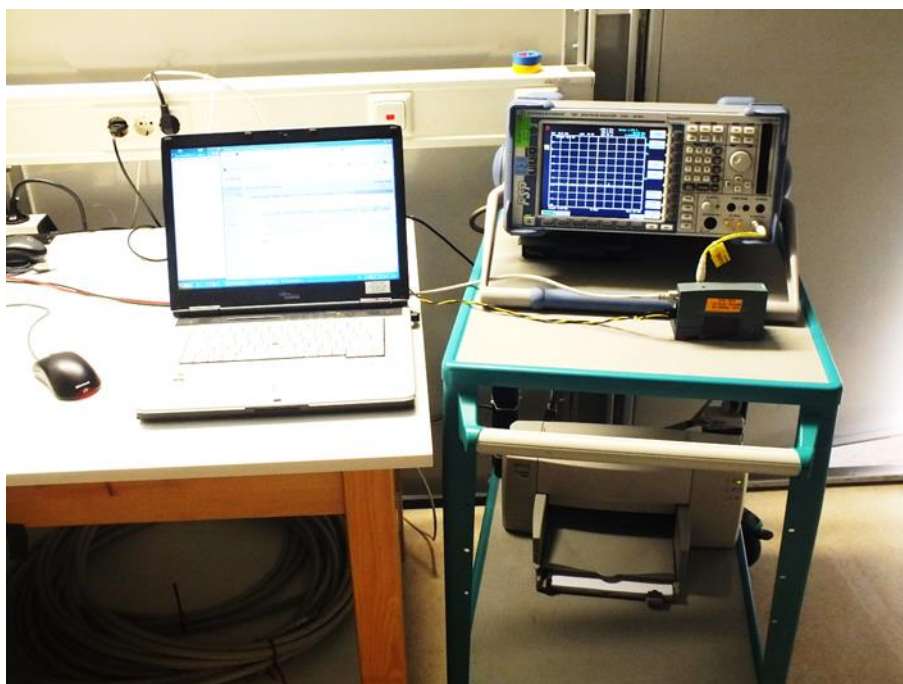
5.7 Undesirable emissions in restricted bands, conducted

For test instruments and accessories used see section 6 Part **SEC 1, SEC 2 and SEC 3.**

5.7.1 Description of the test location

Test location: AREA4

5.7.2 Photo documentation of the test set-up



5.7.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):

For transmitters operating in the defined bands shall not exceed the appropriate emission limit outside of the operating bands.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.7.4 Description of Measurement

Undesirable emissions are measured using a spectrum analyser and following the procedures according to the OET 789033, item H. If the emission level of the EUT in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. Up from 8 GHz a HP filter is used.

Spectrum analyser setting:

Peak-measurement:

9 - 150 kHz:	RBW: 300 Hz,	VBW: 1 kHz,	Detector: Max peak,	Trace Mode: Max hold;
0.15 - 30 MHz:	RBW: 10 kHz,	VBW: 30 kHz,	Detector: Max peak,	Trace Mode: Max hold;
30 - 1000 MHz:	RBW: 100 kHz,	VBW: 300 kHz,	Detector: Max peak,	Trace Mode: Max hold;
1 - 40 GHz:	RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace Mode: Max hold;

AV-measurement according KDB 789033, Item H)6)d) Method VB:

RBW: 1 MHz, VBW: $\geq 1/T$, Detector: Max peak, Trace Mode: Max hold, Sweep time: auto;
For 801.11b: VBW = 100 Hz, for 801.11g, n HT20: VBW = 1 kHz, for 801.11g, n HT40: VBW = 3 kHz;

5.9 Undesirable emissions, cabinet radiation

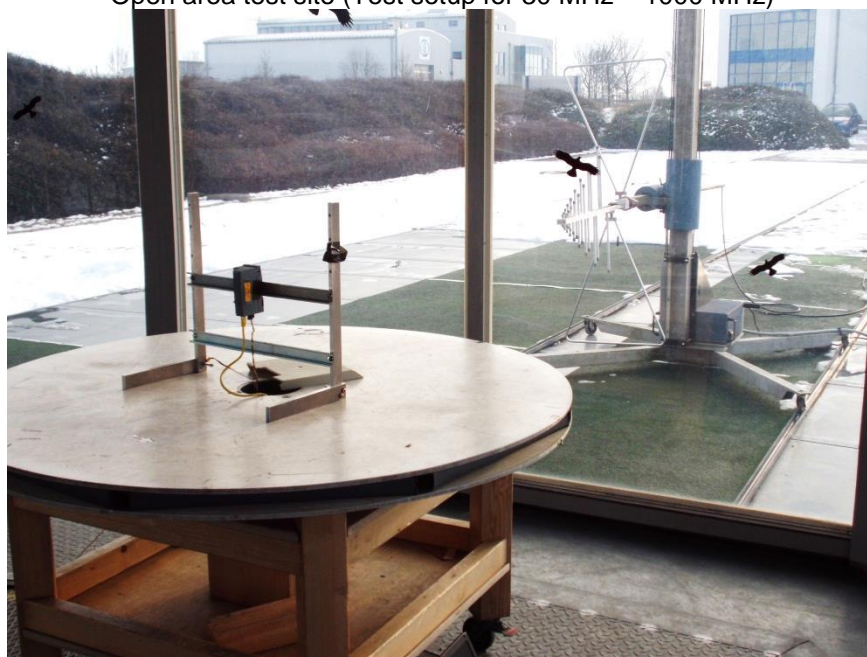
For test instruments and accessories used see section 6 Part **SER 2**, **SER 3**.

5.9.1 Description of the test location

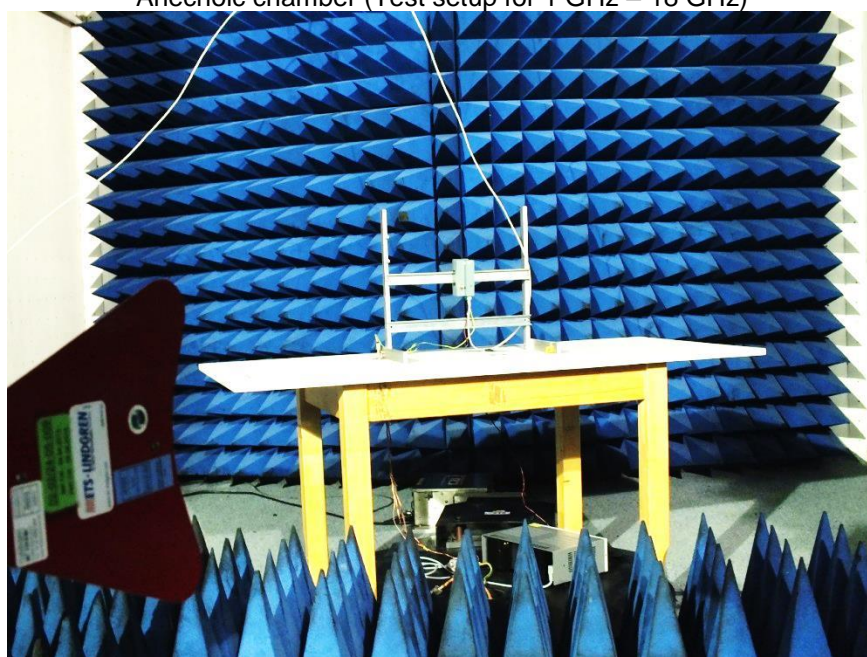
Test location: OATS 1
Test location: Anechoic chamber 2
Test distance: 3 m

5.9.2 Photo documentation of the test set-up

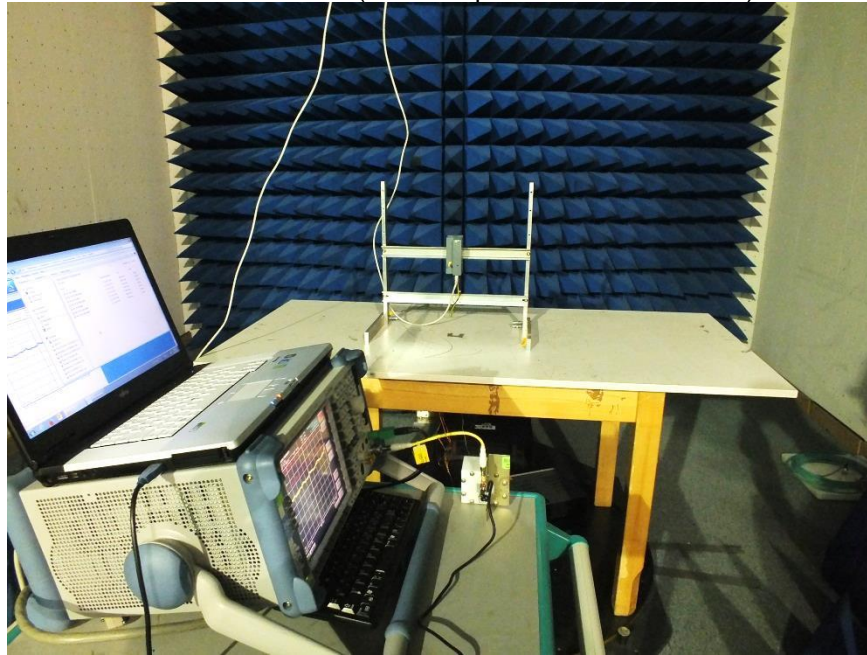
Open area test site (Test setup for 30 MHz – 1000 MHz)



Anechoic chamber (Test setup for 1 GHz – 18 GHz)



Anechoic chamber (Test setup for 18 GHz – 40 GHz)



5.9.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):

For transmitters operating in the defined bands shall not exceed the appropriate emission limit outside of the operating bands.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.9.4 Description of Measurement

Radiated spurious emissions are measured with the setup set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported. Up from 8 GHz a HP filter is used. A conversion EIRP to Field strength is done with the formula $FS = EIRP + 95.2$, FS (dBμV/m), EIRP (dBm).

Spectrum analyser settings for peak values:

RBW: 1 MHz VBW: 3 MHz Sweep: Auto

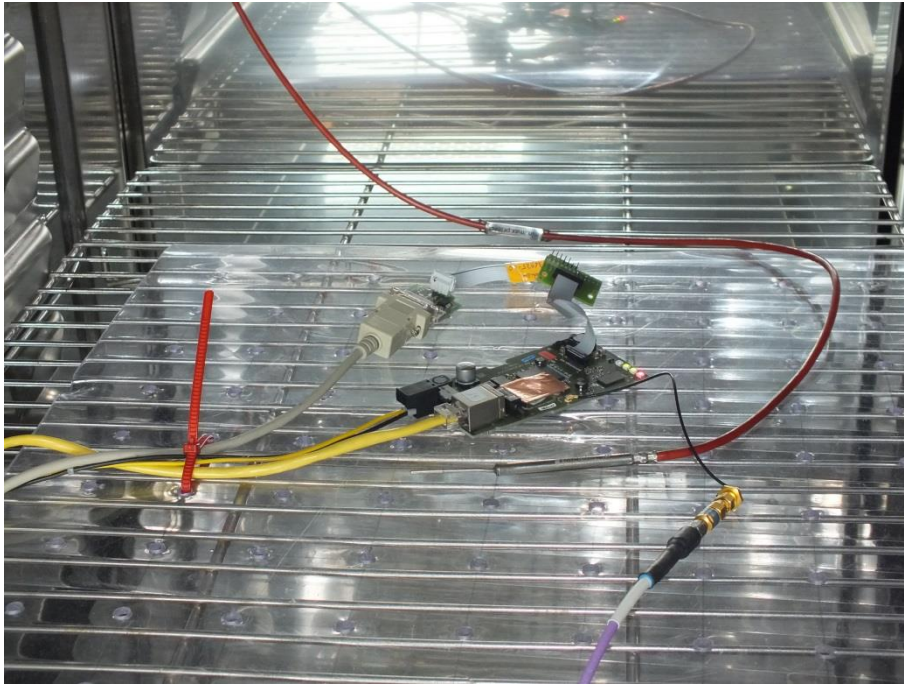
5.10 Frequency stability

For test instruments and accessories used see section 6 Part **MB**.

5.10.1 Description of the test location

Test location: AREA4

5.10.2 Photo documentation of the test setup



5.10.3 Applicable standard

According to FCC Part 15, Subpart E, Section 15.407 (g):

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.10.4 Description of Measurement

This test has been performed over variations in temperature and voltage. The lowest and the highest channel in the operating frequency bands are measured at the 20 dB bandwidth under following conditions:

1. Supply voltage from 100 VAC to 120 VAC at normal temperature
2. Extreme temperature from 0 °C to 40 °C at nominal voltage.