

1 TEST CONDITIONS AND RESULTS

1.1 Conducted emissions

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

1.1.1 Description of the test location

Test location: Shielded Room S2

1.1.2 Photo documentation of the test set-up



1.2 26 dB emission bandwidth

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

1.2.1 Description of the test location

Test location: AREA4

1.2.2 Photo documentation of the test set-up



1.2.3 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 center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum of the modulated carrier.

1.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level by a specified ratio of -26 dB. The reference level is the level of the highest amplitude of the signal observed from the transmitter frequency. The spectrum analyser function "n-dB-down" is used to determine the bandwidth.

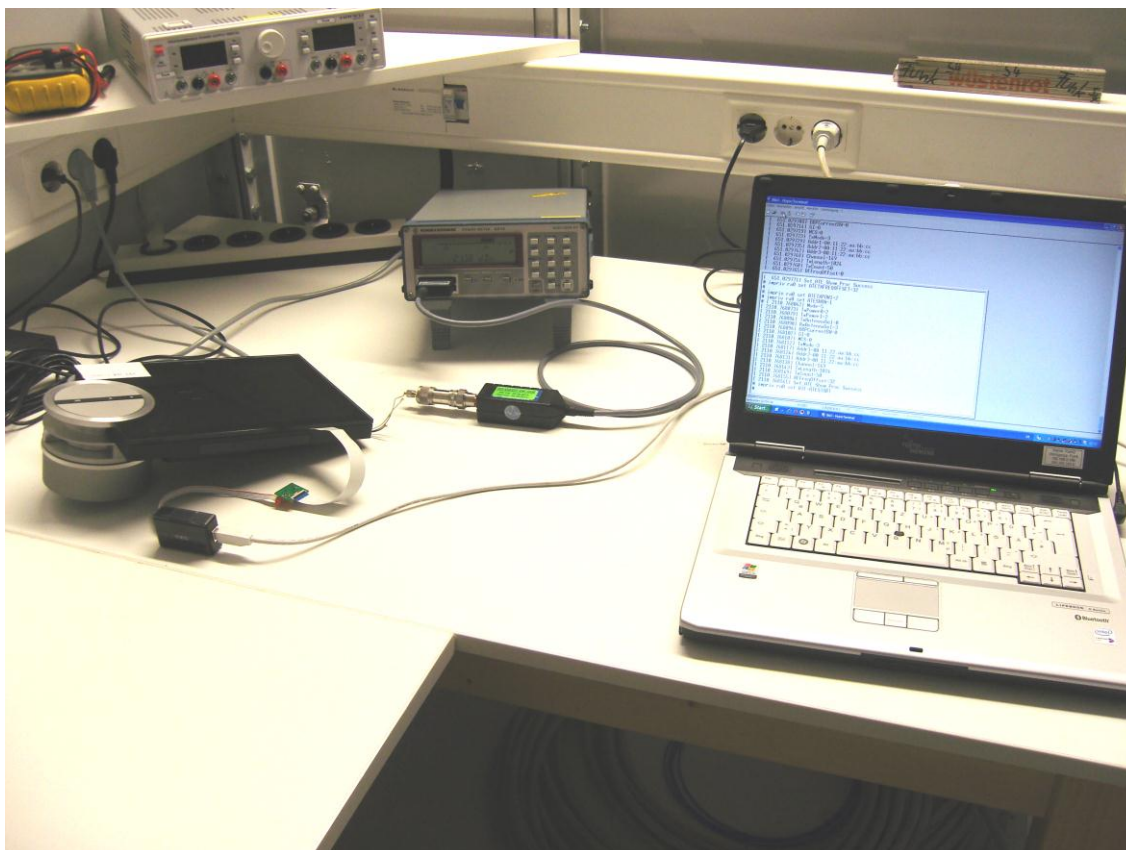
1.3 Maximum conducted output power

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

1.3.1 Description of the test location

Test location: AREA4

1.3.2 Photo documentation of the test set-up



1.3.3 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.

1.3.4 Description of Measurement

The output power is measured using the power meter method according ANSI C63.10, clause 6.10.2.2. The EUT is set while measuring in TX continuous mode with a duty cycle, $x = 1$. The total output power is summed over all antenna terminals of the multiple antenna system.

Peak power spectral density

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

1.3.5 Description of the test location

Test location: AREA 4

1.3.6 Photo documentation of the test set-up



1.3.7 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.

1.3.8 Description of Measurement

The measurement is performed using the procedure set out in DA 02-2138, PPSD Method 2. For this MIMO transmitter the antenna output 1 is measured and the output 2 is taken into account with the formula according OET 662911, $10 \log(N)$, where N is the number of outputs. The total sum is calculated to add a correction factor of 3 dB ($10 \log 2$) to the analyser reading of each antenna output.

Settings on the spectrum analyzer:

RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto, Detector: SA, Sweep count: 100

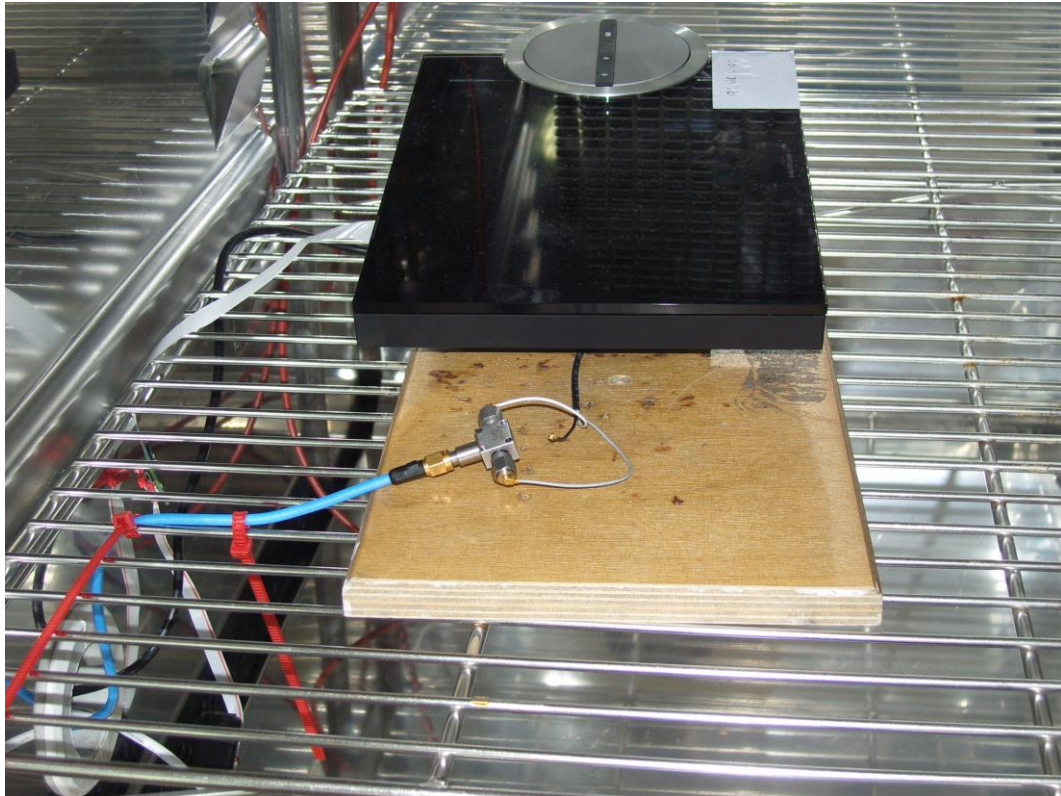
1.4 Peak excursion

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

1.4.1 Description of the test location

Test location: AREA 4

1.4.2 Photo documentation of the test set-up



1.4.3 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.

1.4.4 Description of Measurement

The transmitter output was connected to the spectrum analyzer. Using peak detector and "MAX HOLD" function for Trace 1 with 1 MHz RBW and 3 MHz VBW and Trace 2 with 1 MHz RBW and 300 kHz VBW both traces were recorded. The largest difference between Trace 1 and Trace 2 in any 1 MHz band was noted as maximum *Peak Excursion* value.

Undesirable emissions

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

1.4.5 Description of the test location

Test location: Anechoic Chamber A2
Test location: OATS 1
Test distance: 3 metres

1.4.6 Photo documentation of the test set-up

Open area test site (Test setup for 9 kHz – 30 MHz)



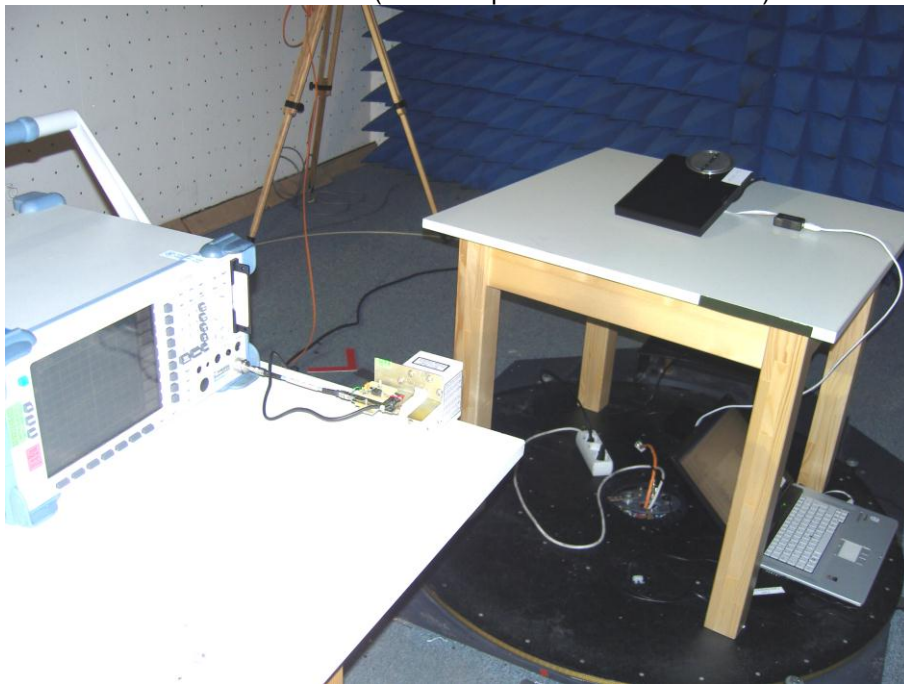
Open area test site (Test setup for 30 MHz – 1000 MHz)



Anechoic chamber (Test setup for field strength measurement)



Anechoic chamber (Test setup for 18 GHz – 30 GHz)



Anechoic chamber (Test setup for 30 GHz – 40 GHz)



1.4.7 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)).

Frequency stability

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

1.4.8 Description of the test location

Test location: AREA 4

1.4.9 Photo documentation of the test setup



1.4.10 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.

1.4.11 Description of Measurement

This test have been performed over variations in temperature and voltage. The lowest and the highest channel in the operating frequency bands is 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.

Maximum permissible exposure (MPE)

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

1.4.12 Description of the test location

Test location: AREA 4

1.4.13 Photo documentation of the test set-up



1.4.14 Applicable standard

According to FCC Part 15, Section 15.407(f):

U-NII devices are subject to the radio frequency radiation exposure requirements specified in Section 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment. The test methods used comply with ANSI/IEEE C95.1-2005, “IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”.

1.4.15 Description of Measurement

The maximum total power input to the antenna has been measured and conducted as described in clause 5.3 of this document. Through the Friis transmission formula, which is a far field assumption and the known maximum gain of the antenna, the maximum MPE at a defined distance away from the product, can be calculated.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

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

1.4.16 Description of the test location

Test location: Anechoic Chamber A2
Test location: OATS 1
Test distance: 3 metres

1.4.17 Photo documentation of the test set-up

Anechoic chamber (Test setup for field strength measurement)



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



1.5 99% bandwidth

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

1.5.1 Description of the test location

Test location: AREA 4

1.5.2 Photo documentation of the test set-up



1.5.3 Applicable standard

According to RSS-Gen Issue 2, 4.6.1:

When an occupied bandwidth is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth.

1.5.4 Description of Measurement

The bandwidth was measured with the function “bandwidth measurement” of the spectrum analyser. The EUT is connected via suitable attenuator at the spectrum analyser. The measurement is repeated for every different modulation standard of the EUT and recorded.

Spectrum analyzer settings:

RBW 1% of the selected span
Detector Peak

VBW 3 times RBW
Trace: No max hold