

ANNEX D RESULTS OF THE RECEIVER MEASUREMENTS

1 RADIATED EMISSIONS (RECEIVER)

1.1 Preliminary radiated emission measurement with external patch antenna

Ambient temperature	21 °C	Relative humidity	45 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

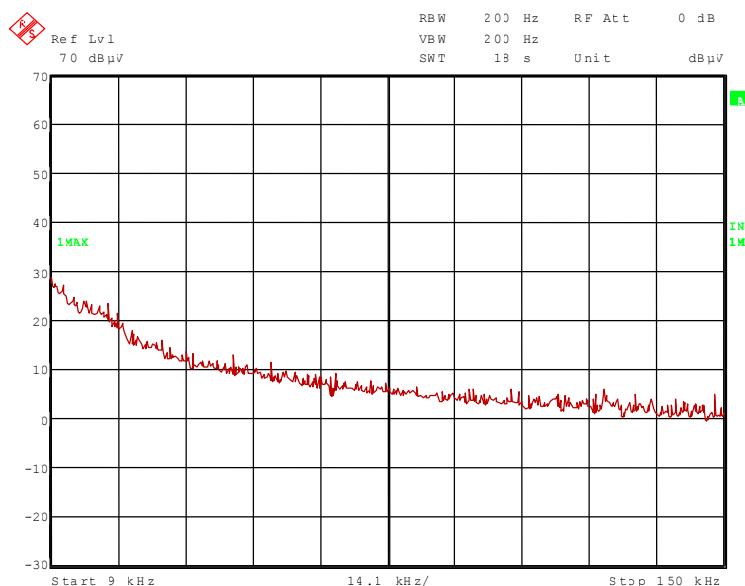
Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following. The test was carried out in test mode 5 of the EUT. The method of measurement is described in subclause 5.7.1 of the test report.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC via the carrier board.

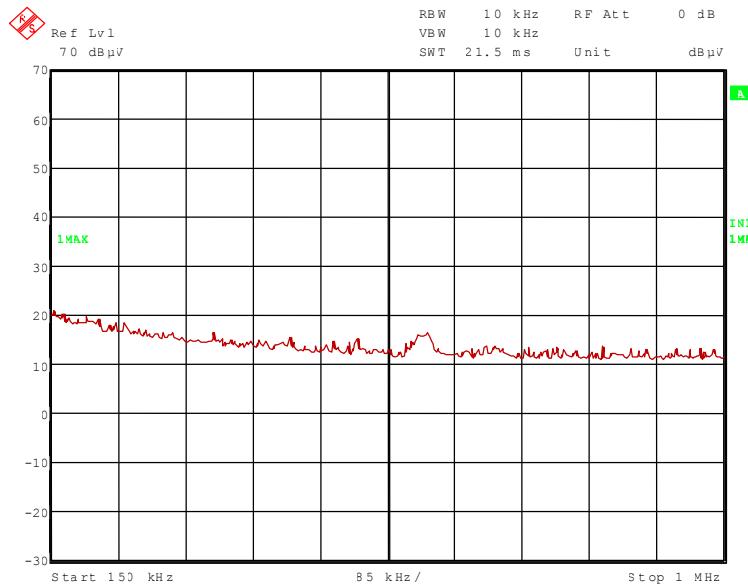
Remark: As pre-tests have shown, the emissions in the frequency range 9 kHz to 1 GHz are not depending on the receiver operation mode. The highest emissions in this frequency range were emitted if an external antenna is used. Therefore the emissions in this frequency range were measured only with the receiver operates in operation mode 5 and the external patch antenna type Huber+Suhner SPA 2400/70/9/0/RCP, because this antenna has the highest gain of all antennas in question. The results are shown below.

111592_154.wmf: Receiver emissions from 9 kHz to 150 kHz (operation mode 5):

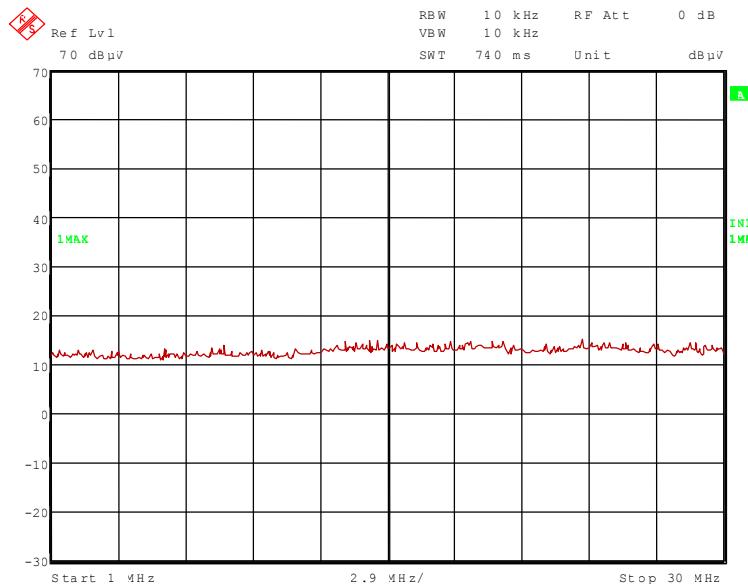


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111592_155.wmf: Receiver emissions from 150 kHz to 1 MHz (operation mode 5):



111592_156.wmf: Receiver emissions from 1 MHz to 30 MHz (operation mode 5):



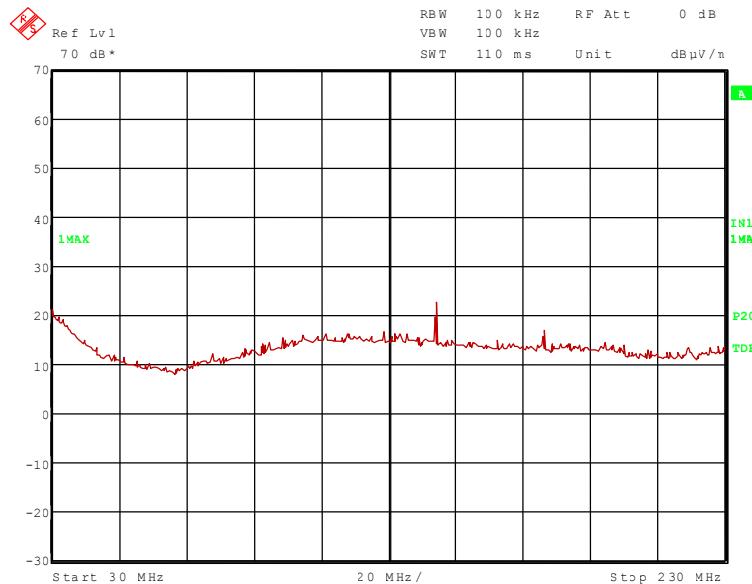
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no measurements were carried out on the outdoor test site.

TEST EQUIPMENT USED FOR THE TEST:

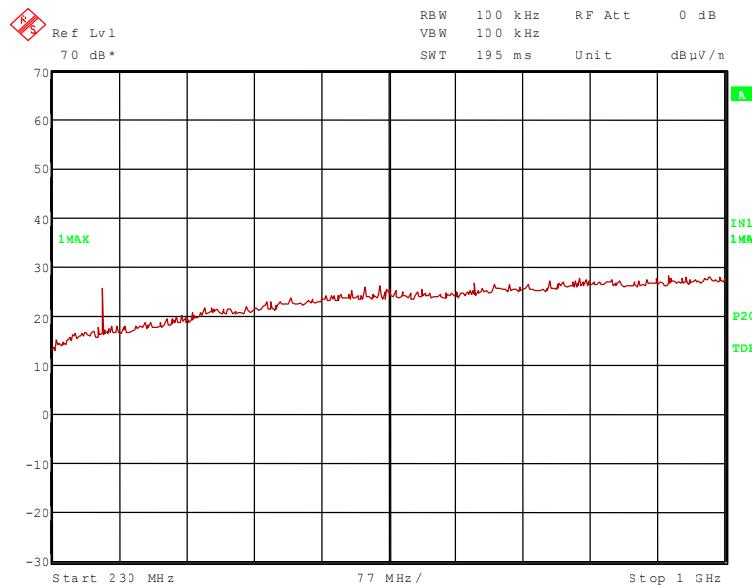
29, 31 – 36, 43, 44, 49, 55

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111592_60.wmf: Receiver emissions from 30 MHz to 230 MHz (operation mode 5):



111592_61.wmf: Receiver emissions from 230 MHz to 1 GHz (operation mode 5):



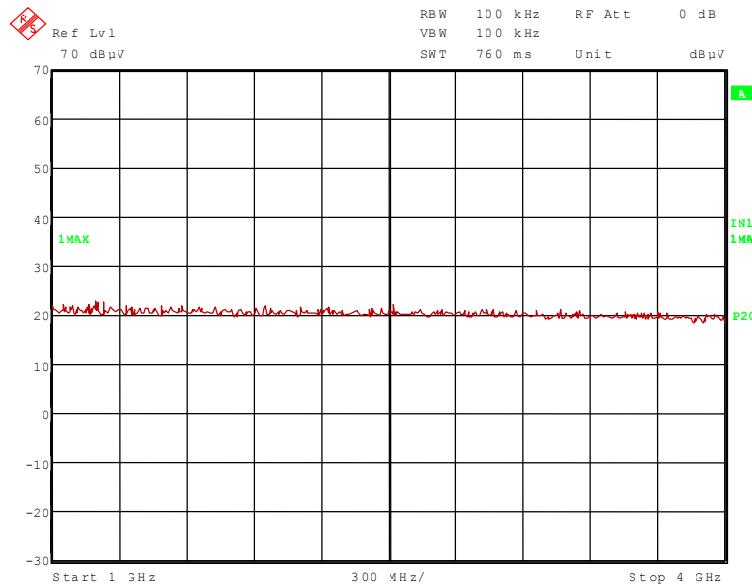
The following frequencies were found during the preliminary radiated emission test:

- 144.000 MHz and 176.000 MHz, 288.000 MHz,

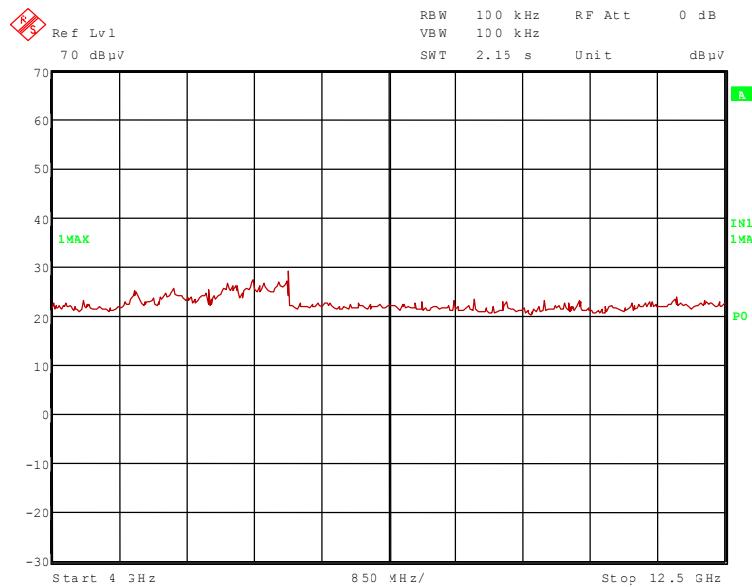
These frequencies have to be measured on the open area test site. The results were presented in the following

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111592_57.wmf: Receiver emissions from 1 GHz to 4 GHz (operation mode 5):



111592_56.wmf: Receiver emissions from 4 GHz to 12.5 GHz (operation mode 5):



No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no final measurements were carried out inside the fully anechoic chamber.

ANNEX D RESULTS OF THE RECEIVER MEASUREMENTS

1.2 Final radiated emission measurement (30 MHz to 1 GHz) with external patch antenna

Ambient temperature	21 °C	Relative humidity	66 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

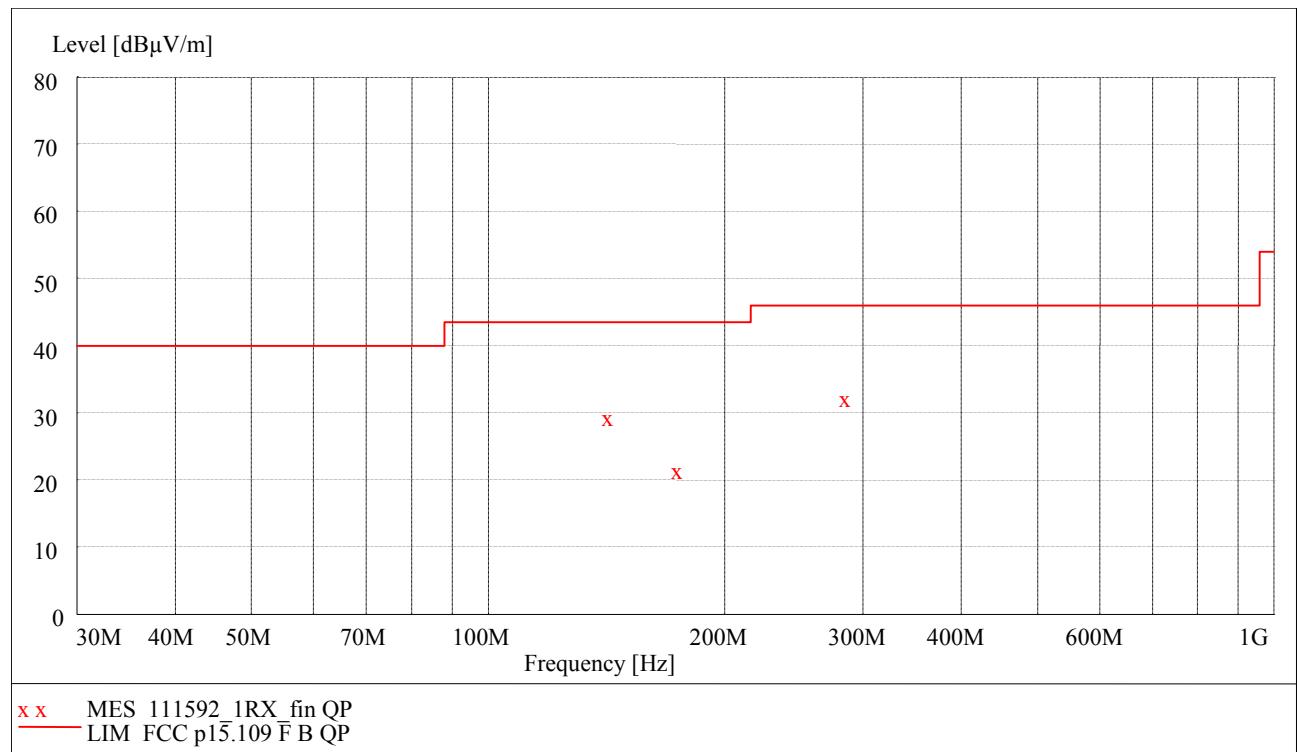
Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following. The test was carried out in test mode 5 of the EUT.

Supply voltage: During all measurements the EUT was supplied with 5.0 V DC via the carrier board.

Test method: Refer clause 5.7 of the test report F111592E1.

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above mentioned standard. The measured points marked by an x are the measured results of the standard subsequent measurement on the open area test site.



Data record name: 111592_1RX

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The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the quasi-peak measuring detector is 1 second.

Result measured with the quasipeak detector:

(These values are marked in the diagram by an x)

Spurious emissions outside restricted bands										
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor dB/m	Cable loss dB	Height cm	Azimuth deg	Pol.	Pos.
144.000	29.8	43.5	13.7	16.7	11.8	1.3	100.0	82.0	Vert.	1
176.000	22.1	43.5	21.4	10.8	9.8	1.5	100.0	160.0	Vert.	1
288.000	32.6	46.0	13.4	17.8	12.9	1.9	106.0	90.0	Hor.	1
Measurement uncertainty				+2.2 dB / -3.6 dB						

The test results were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{cable loss [dB]} + \text{antenna factor [dB/m]}$$

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
14 – 20

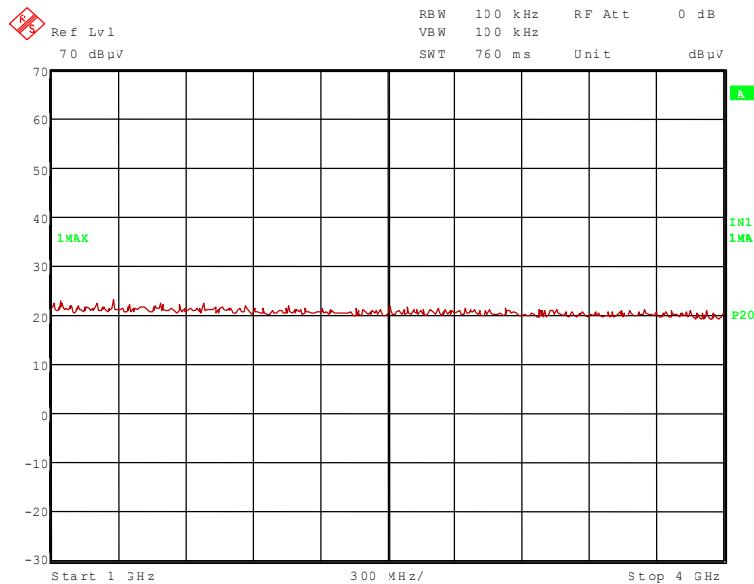
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1.3 Preliminary radiated emission measurement with internal antenna

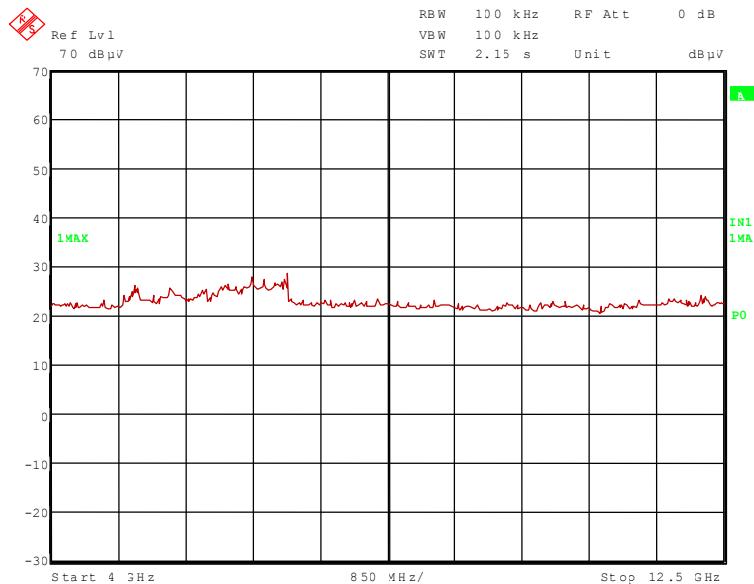
Remark:

This measurement was carried out by using internal antenna type Fractus FR05-S1-N-0-102, because pre-tests have shown that this antenna causes the highest emissions of internal antennas in question.

111592_54.wmf: Receiver emissions from 1 GHz to 4 GHz (operation mode 5):



111592_55.wmf: Receiver emissions from 4 GHz to 12.5 GHz (operation mode 5):



No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no final measurements were carried out inside the fully anechoic chamber.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44, 49

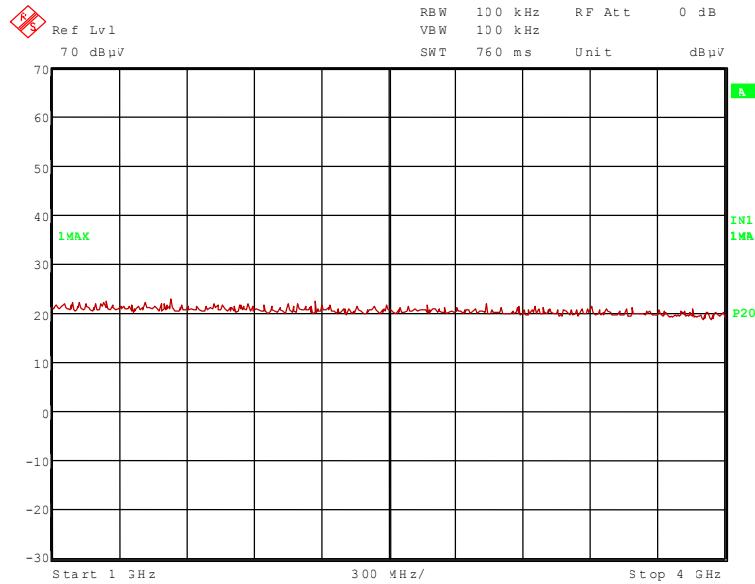
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1.4 Preliminary radiated emission measurement with external monopole antenna

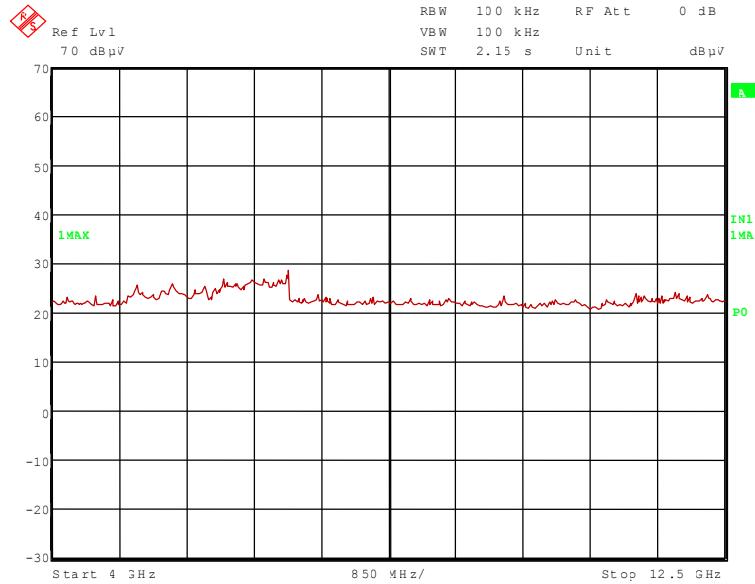
Remark:

As pre-tests have shown, the highest emissions in this frequency range were emitted if the external monopole antenna type Huber+Suhner SOA 2400/360/6/0/V is used. The results were shown below.

111592_58.wmf: Receiver emissions from 1 GHz to 4 GHz (operation mode 5):



111592_59.wmf: Receiver emissions from 4 GHz to 12.5 GHz (operation mode 5):



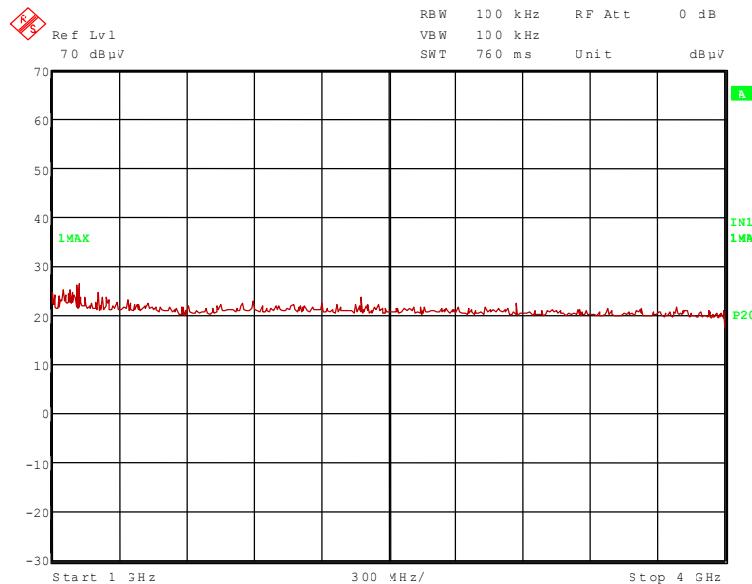
No significant frequencies above the noise floor of the system were found during the preliminary radiated emission test, so no final measurements were carried out inside the fully anechoic chamber.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44, 49

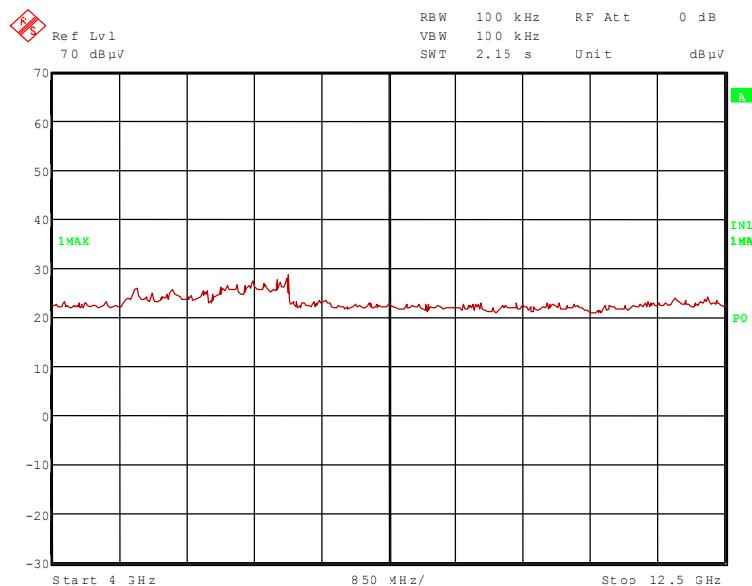
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1.5 Preliminary radiated emission measurement with EPA antenna

111592_153.wmf: Receiver emissions from 1 GHz to 4 GHz (operation mode 5):



111592_152.wmf: Receiver emissions from 4 GHz to 12.5 GHz (operation mode 5):



The following frequency was found during the preliminary radiated emission test:

- 1.125 GHz.

This frequency has to be measured in a final measurement. The results were presented in the following.

TEST EQUIPMENT USED FOR THE TEST:
29, 31 - 34, 36, 44, 49

ANNEX D RESULTS OF THE RECEIVER MEASUREMENTS

1.6 Final radiated emission measurement (1 GHz to 25 GHz) with EPA antenna

Ambient temperature	21 °C	Relative humidity	38 %
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Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

Cable guide: The cable of the EUT is running vertically to the false floor. For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 3.3 V DC by the carrier board.

Resolution bandwidth: For all measurements a resolution bandwidth of 1 MHz was used.

Result measured with the peak detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp. dB	Cable loss dB	Height cm	Pol.	Pos.
1.125	33.0	74.0	41.0	32.4	24.6	26.5	2.5	150	Hor.	1
Measurement uncertainty						+2.2 dB / -3.6 dB				

Result measured with the average detector:

Frequency GHz	Corr. value dB μ V/m	Limit dB μ V/m	Margin dB	Readings dB μ V	Antenna factor 1/m	Preamp. dB	Cable loss dB	Height cm	Pol.	Pos.
1.125	20.2	54.0	33.8	19.6	24.6	26.5	2.5	150	Hor.	1
Measurement uncertainty						+2.2 dB / -3.6 dB				

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

29, 31 - 34, 36, 44, 49