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TEST REPORT

Test Report Reference: R30422 Version 2 Edition 2

Equipment under Test: Model 24W (PRA5 Wedgereader)

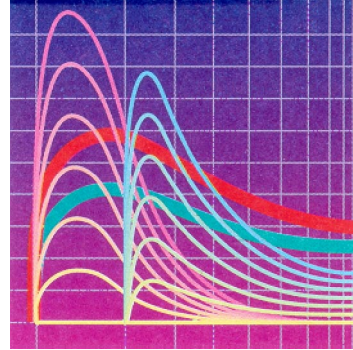
Serial Number: 002135

Applicant: deister electronic GmbH

Manufacturer: deister electronic GmbH

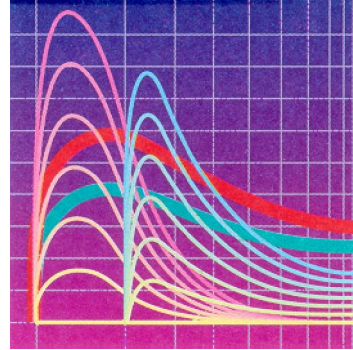
FCC ID: IXLMODEL24W

**Test Laboratory
(CAB)
accredited by
DATech e.V.
in compliance with DIN EN ISO/IEC 17025
under the
Reg. No. TTI-P-G071/94-11
and listed by
FCC 31040/SIT1300F2**



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

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1 IDENTIFICATION

1.1 APPLICANT

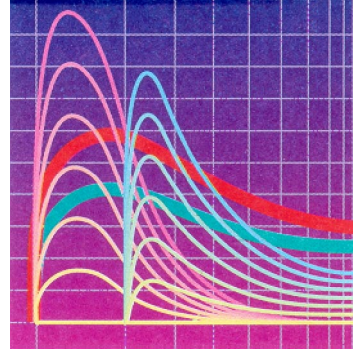
Name:	deister electronic GmbH
Address:	Hermann-Bahlsen-Straße 11 – 13 30890 Barsinghausen
Country:	Germany
Name for contact purposes:	Mr. Stefan Eichler
Phone:	+49 51 05 516-129
Fax:	+49 51 05 516-266
Mail address:	eichler@deister-gmbh.de
Applicant represented during the test by the following person:	-

1.2 MANUFACTURER

Name:	deister electronic GmbH
Address:	Hermann-Bahlsen-Straße 11 – 13 30890 Barsinghausen
Country:	Germany
Name for contact purposes:	Mr. Stefan Eichler
Phone:	+49 51 05 516-129
Fax:	+49 51 05 516-266
Mail address:	eichler@deister-gmbh.de
Manufacturer represented during the test by the following person:	-

1.3 DATES

Date of receipt of test sample:	05 June 2003
Start of test:	23 June 2003
End of test:	26 June 2003



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1.4 TEST LABORATORY

The tests were carried out at:

PHOENIX TEST-LAB GmbH
Königswinkel 10
D-32825 Blomberg
Germany

Phone: +49 (0) 52 35 / 95 00-0
Fax: +49 (0) 52 35 / 95 00-10

Test engineer:

Thomas KÜHN

Name

Signature

14 July 2003

Date

Test report checked:

Bernd STEINER

Name

Signature

14 July 2003

Date

Phoenix TEST-LAB GmbH
Königswinkel 10
32825 Blomberg
Tel. 0 52 35 / 95 00-0
Fax 0 52 35 / 95 00-10

Stamp

1.5 RESERVATION

This test report is only valid in its original form.

Any reproduction of its contents without written permission of the accredited test laboratory PHOENIX TEST-LAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TEST-LAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TEST-LAB Logo and the TEST REPORT REFERENCE.

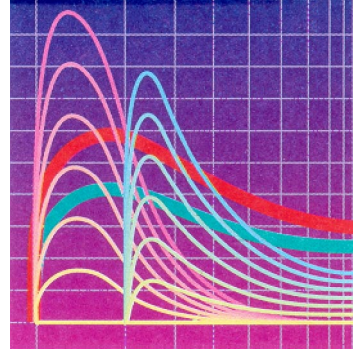
1.6 NORMATIVE REFERENCES

[1] **ANSI C63.4-1992** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

[2] **FCC 47 CFR Part 15 (March 2003)** Radio Frequency Devices

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.



2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment:	Short range inductive control card reader
Type designation:	Model 24W (PRA5 Wedgereader)
Serial No.:	002135
FCC-ID:	IXLMODEL24W
Antenna type:	Integral

The following external I/O cables were used:

Cable	Length	Shielding	Connector
DC input	2.0 m	No	Customised connector
PC-line	2.0 m	Yes	PS2-connector
Keyboard-line	0.5 m	Yes	PS2-connector
-	-	-	-
-	-	-	-

2.2 PEREPHERY DEVICES

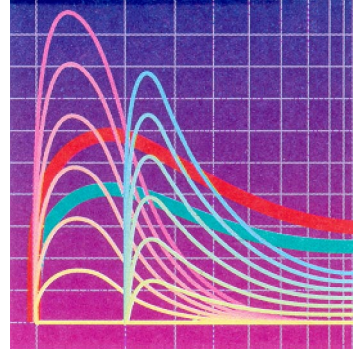
The following equipment was used as control unit and ancillary equipment:

The EUT was connected to an external 12 V DC power supply and a 5 V DC power supply at the PC line-connector.

2.3 SPECIAL EMC MEASURES

The following EMC measures were necessary to reach the documented results:

- The line between the reader module and the main PCB was passed through a ferrite core (H8FE-1142-NC CHOMERICS) with two turns.
- A common mode inductance (744 226 from Würth Elektronik GmbH) was set in the 12 V line.
- A 470 nF capacitor was set to the output of the common mode inductance (input of the circuit).



3 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

For all measurements the Model 24W (PRA5 Wedgereader) was tested in normal operation mode (transmit-mode without presence of TAG).

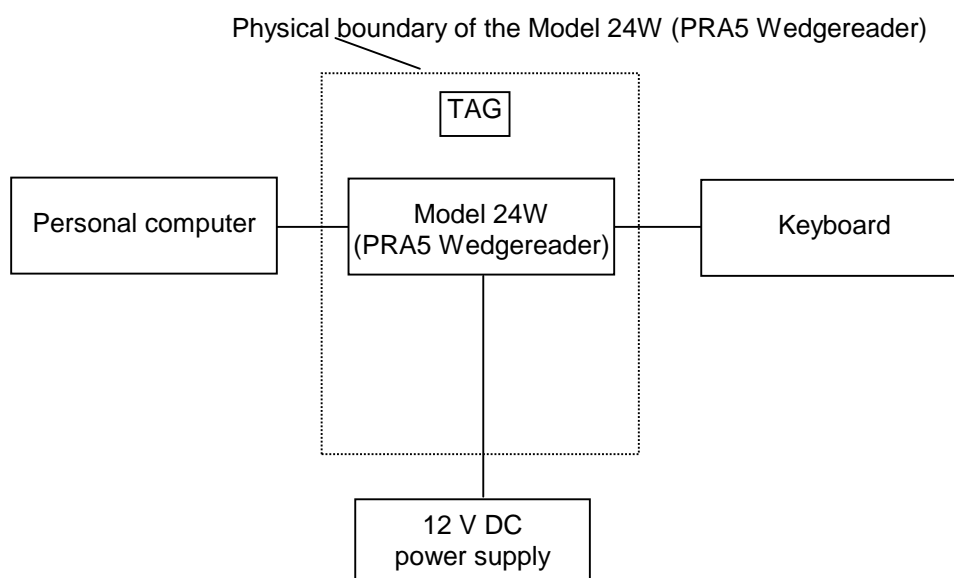
The Model 24W (PRA5 Wedgereader) can will be supplied with 12 V DC. Additionally it will be supplied with 5 V DC via the PC-line.

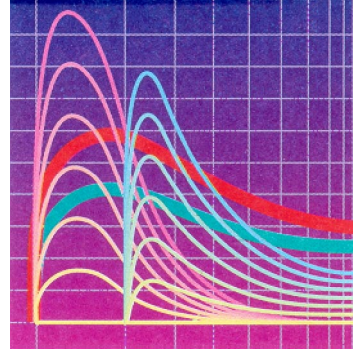
Because no peripheral devices (except the 5 V DC supply) were necessary to the function of the reader and these devices were not provided to the final customer from the applicant, it was decided to test it on a stand-alone base and not with a connected personal computer / keyboard.

At the start and the end of each test the function of the EUT was checked with the help of a TAG (Mifare card), which was submitted by the applicant. Pretests have shown that the emissions of the reader were higher in case of not reading a TAG. This was the reason for carrying out the tests in unmodulated state (transmit mode).

For the whole frequency range a preliminary measurement in a fully anechoic chamber with a measuring distance of 3 m was carried out to determine the frequencies, which were radiated by the EUT. The final measurements on the detected frequencies were carried out on an outdoor test site without ground plane (for the frequency range 9 kHz to 30 MHz) and on an open area test site with ground plane (for the frequency range 30 MHz to 1 GHz).

The physical boundaries of the Equipment Under Test are shown below.

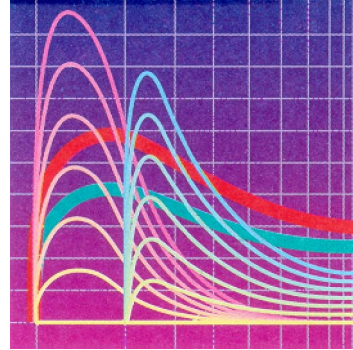




4 LIST OF TEST MODULES

4.1 EMISSION

Radiated emissions FCC 47 CFR Part 15 section 15.209 [2]						
No.	Application	Frequency range	Limits (microvolts/meter)	Reference standard	Remark	Status
1	Intentional radiator	0.009 to 0.49 MHz 0.490 to 1.705 MHz 1.705 to 30.0 MHz 30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz	2400/f(kHz) at 300 m 24000/f(kHz) at 30 m 30 dB μ V/m at 30 m 40.0 dB μ V/m at 3 m 43.5 dB μ V/m at 3 m 46.0 dB μ V/m at 3 m 54.0 dB μ V/m at 3 m	ANSI C63.4 (1992);	-	Passed
Radiated emissions FCC 47 CFR Part 15 section 15.225 (a)[2]						
No.	Application	Frequency range	Limits (microvolts/meter)	Reference standard	Remark	Status
2	Operation with in the band 13.553 – 13.567 MHz	13.553 to 13.567 MHz	10,000	ANSI C63.4 (1992);	-	Passed
Frequency tolerance over temperature and supply voltage FCC 47 CFR Part 15 section 15.225 (c)[2]						
No.	Application		Limits	Reference standard	Remark	Status
3	Temperature range -20°C to +50°C and supply voltage 85 to 115 % or new battery		0.01 %	ANSI C63.4 (1992);	-	Passed
Conducted emissions FCC 47 CFR Part 15 section 15.107 (a)[2]						
No.	Frequency range	Conducted limits [dB μ V]		Reference standard	Remark	Status
		Quasi-peak	Average			
4	0.15 MHz to 0.5 MHz	66 to 56 *	56 to 46 *	ANSI C63.4 (1992);	-	Passed
	0.5 MHz to 5 MHz	56	46			
	5 MHz to 30 MHz	60	50			
* Decreases with the logarithm of the frequency						



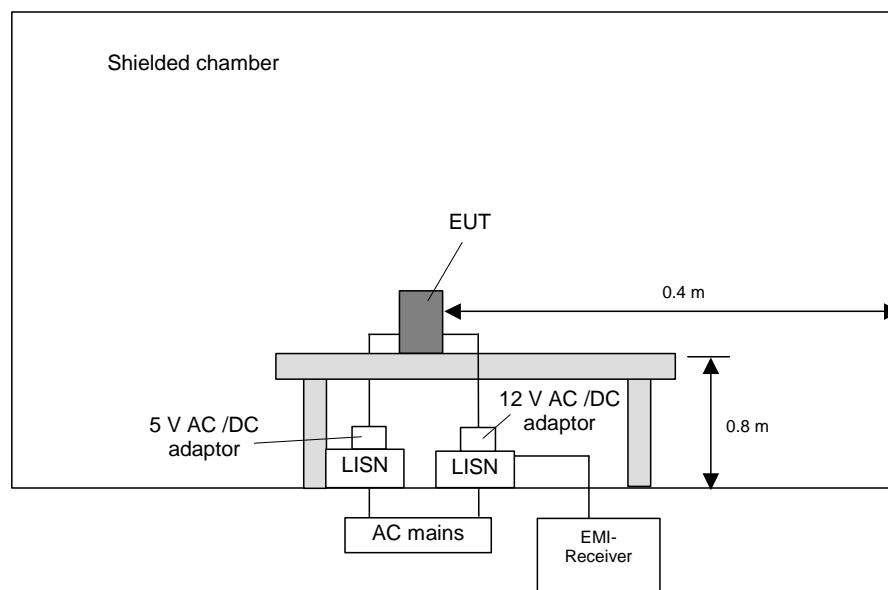
5 METHOD OF MEASUREMENT

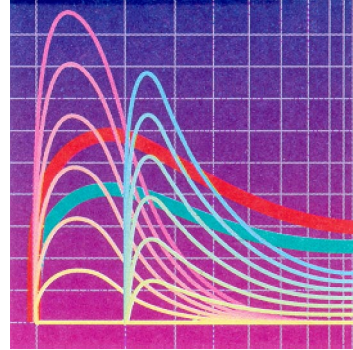
5.1 CONDUCTED EMISSIONS ON AC MAINS (150 kHz to 30 MHz)

This test will be carried out in a shielded chamber. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-1992 [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase of the AC mains network. If levels detected 10 dB below the appropriate limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz





5.2 RADIATED EMISSIONS 9 kHz to 30 MHz

The radiated emission measurement is divided into two stages.

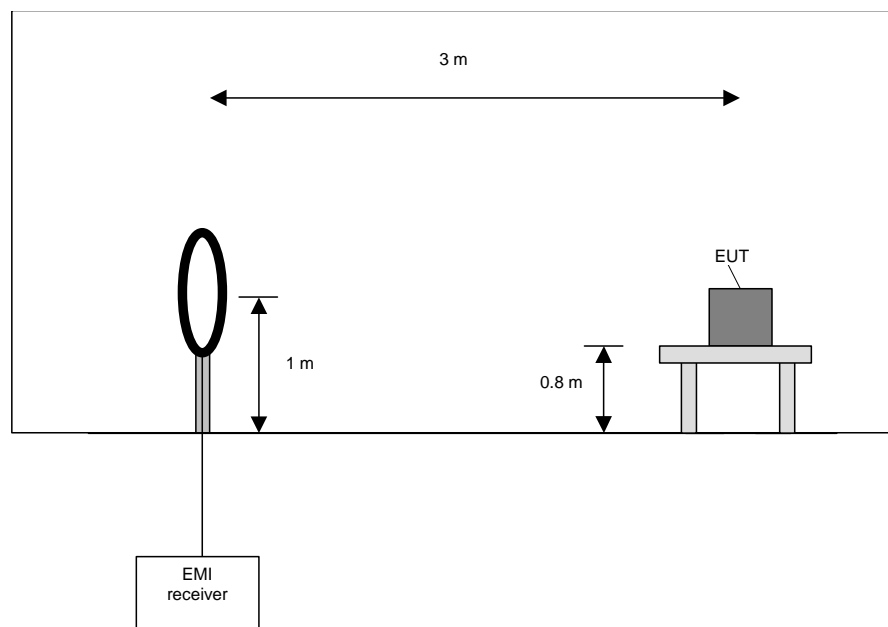
Preliminary measurement:

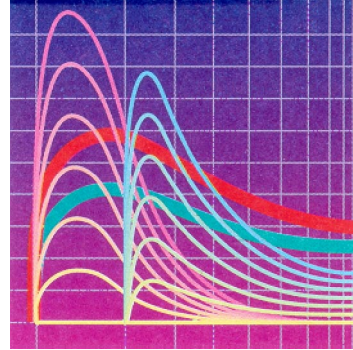
In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-1992 [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to found the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	10 kHz





Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
- 2) Manipulate the system cables within the range to produce the maximum level of emission.
- 3) Rotate the EUT by 360 ° to maximize the detected signals.
- 4) Make a hardcopy of the spectrum.
- 5) Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 6) Repeat steps 1) to 4) with the other orthogonal axes of the EUT.
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

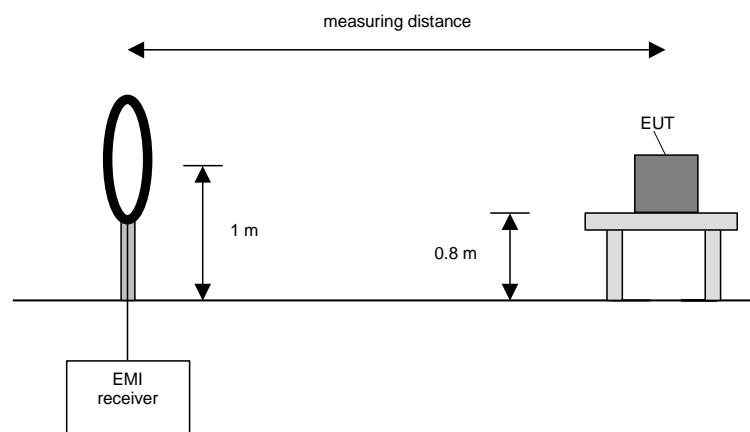
Final measurement:

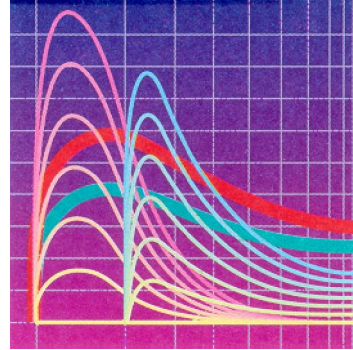
In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

On the during the preliminary measurement detected frequencies the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz





Final measurement procedure:

The following procedure will be used:

- 1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
- 3) Rotate the measuring antenna to find the maximum and note the value.
- 4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
- 5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT if applicable (handheld equipment).

5.3 RADIATED EMISSIONS 30 MHz to 1 GHz

The radiated emission measurement is divided into two stages.

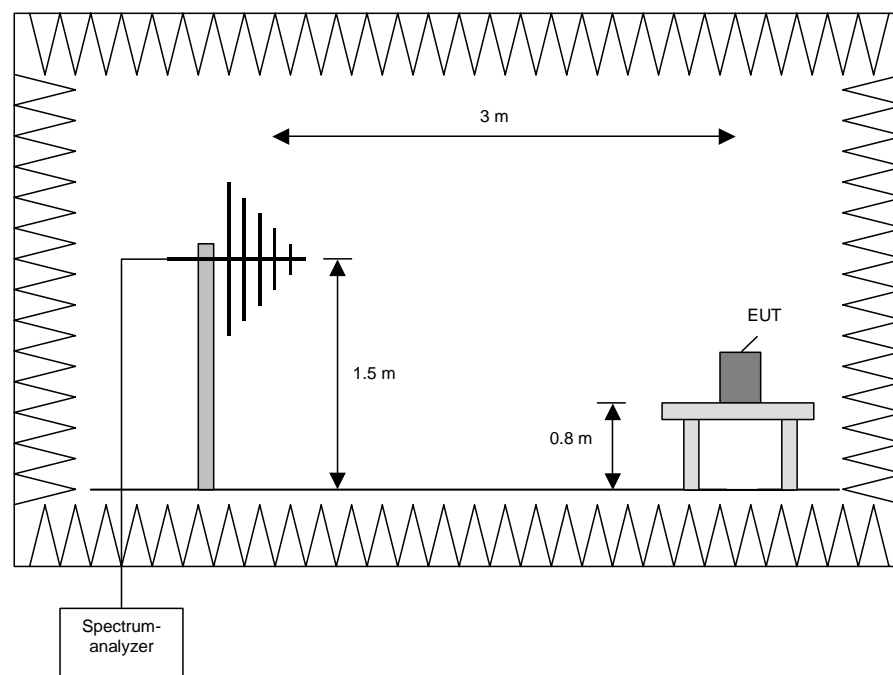
Preliminary measurement:

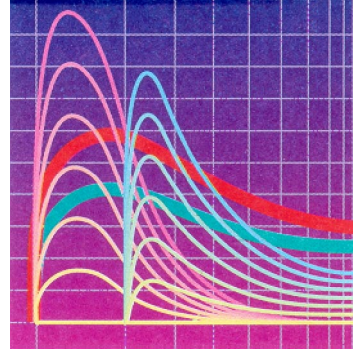
In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Tabletop devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-1992 [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 100 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	100 kHz





Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz. The following procedure will be used:

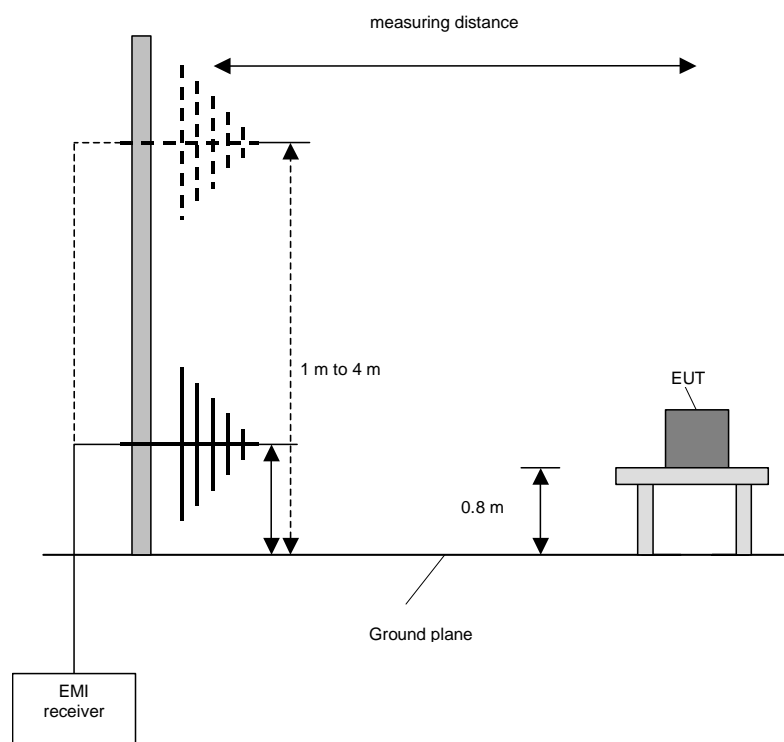
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of 3 highest detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat steps 1) to 4) with the other orthogonal axes of the EUT.
7. Repeat steps 1) to 5) with the vertical polarisation of the measuring antenna.

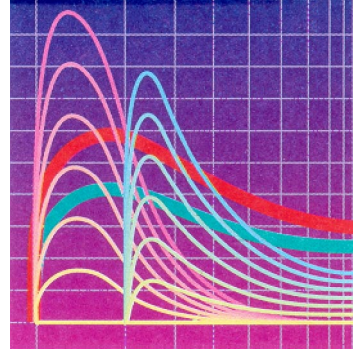
Final Measurement:

In the second stage a final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



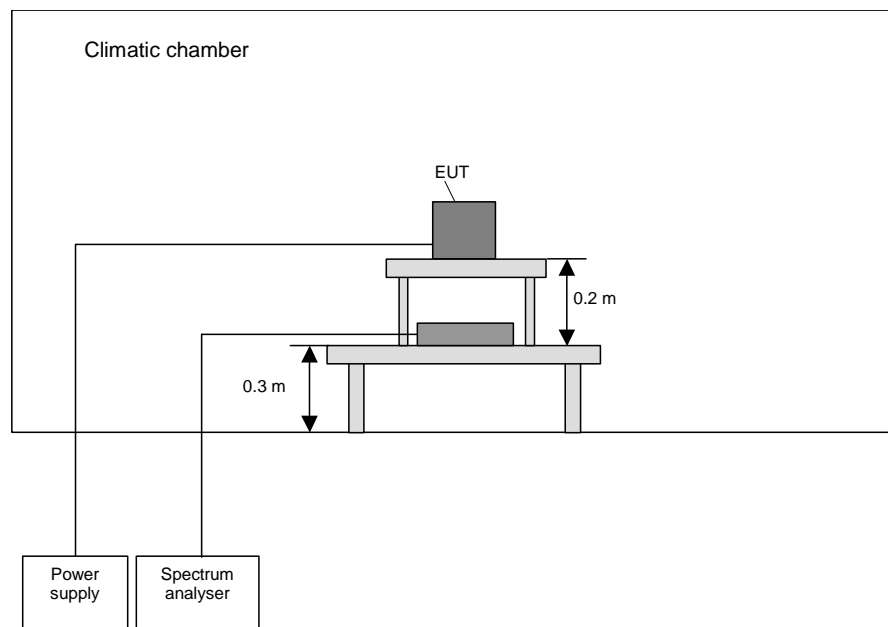


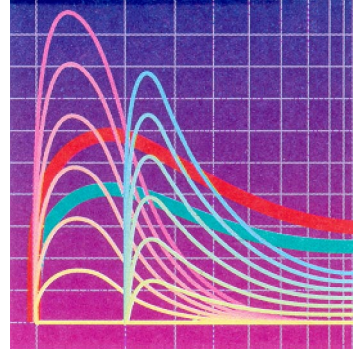
Procedure final measurement:

The following procedure will be used:

- 1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
- 2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
- 3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
- 4) Repeat 1) to 3) for the other orthogonal antenna polarization.
- 5) Move the antenna and the turntable to the position where the maximum value is detected.
- 6) Measure while moving the antenna slowly +/- 1 m.
- 7) Set the antenna to the position where the maximum value is found.
- 8) Measure while moving the turntable +/- 45 °.
- 9) Set the turntable to the azimuth where the maximum value is found.
- 10) Measure with Final detector (QP or AV) and note the value.
- 11) Repeat 5) to 10) for each frequency.
- 12) Repeat 1) to 11) for each orthogonal axes of the EUT if handheld equipment.

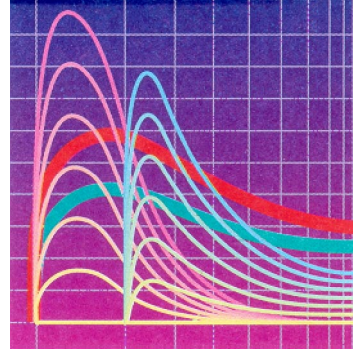
5.4 FREQUENCY STABILITY WITH RESPECT TO AMBIENT TEMPERATURE AND SUPPLY VOLTAGE





The following procedure will be used:

- 1) Place the EUT in the climatic chamber.
- 2) Switch on the EUT and check the correct function and the settings of the spectrum analyser.
- 3) Switch off the EUT and tune the climatic chamber to a temperature of 20 °C. Wait until the thermal balance is obtained.
- 4) Switch the EUT on and record the frequency at start-up and 2, 5 and 10 minutes after powering on.
- 5) Repeat 4) with 85 % and 115 % of the nominal supply voltage (AC only).
- 6) Switch off the EUT and tune the climatic chamber to a temperature of 50 °C. Wait until the thermal balance is obtained.
- 7) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 8) Repeat 7) with 85 % and 115 % of the nominal supply voltage (AC only).
- 9) Switch off the EUT and tune the climatic chamber to a temperature of -20 °C. Wait until the thermal balance is obtained.
- 10) Switch the EUT on and record the frequencies at start-up and 2, 5 and 10 minutes after powering on.
- 11) Repeat 10) with 85 % and 115 % of the nominal supply voltage (AC only).



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6 TEST RESULTS EMISSION TEST

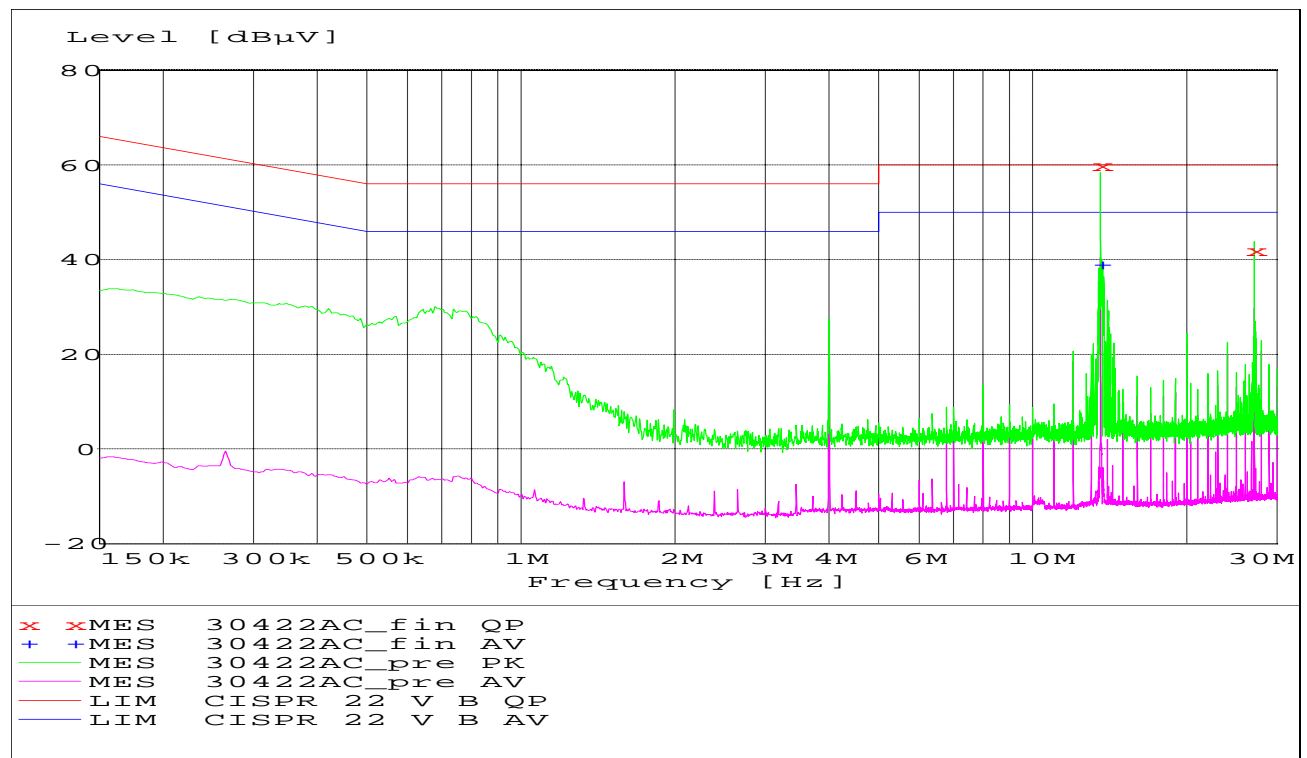
6.1 CONDUCTED EMISSION MEASUREMENT ON AC MAINS (150 kHz to 30 MHz)

Ambient temperature	22 °C	Relative humidity	54 %
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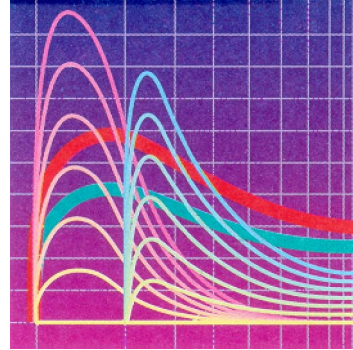
Position of EUT: The EUT was set-up on a wooden table of a height of 0.8 m.

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

Test record: The test was carried out in normal operation mode of the EUT (transmit mode without reading a TAG). All results are shown in the following.



Data record name: 30422AC



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

Result measured with the quasi-peak detector:

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

Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Phase	PE
13.559910	59.90	1.8	60.0	0.1	N	GND
27.119760	41.90	3.0	60.0	18.1	L1	GND

Data record name: 30422AC_fin QP

Result measured with the average detector:

(These values are marked in the above diagram by +)

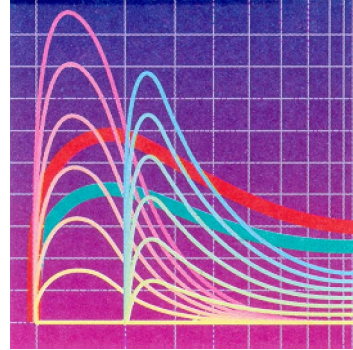
Frequency MHz	Level dB μ V	Transducer dB	Limit dB μ V	Margin dB	Phase	PE
13.559280	38.90	1.8	50.0	11.1	N	GND

Data record name: 30422AC_fin AV

Test: Passed

TEST EQUIPMENT USED:

1, 2, 5, 6, 45 – 47



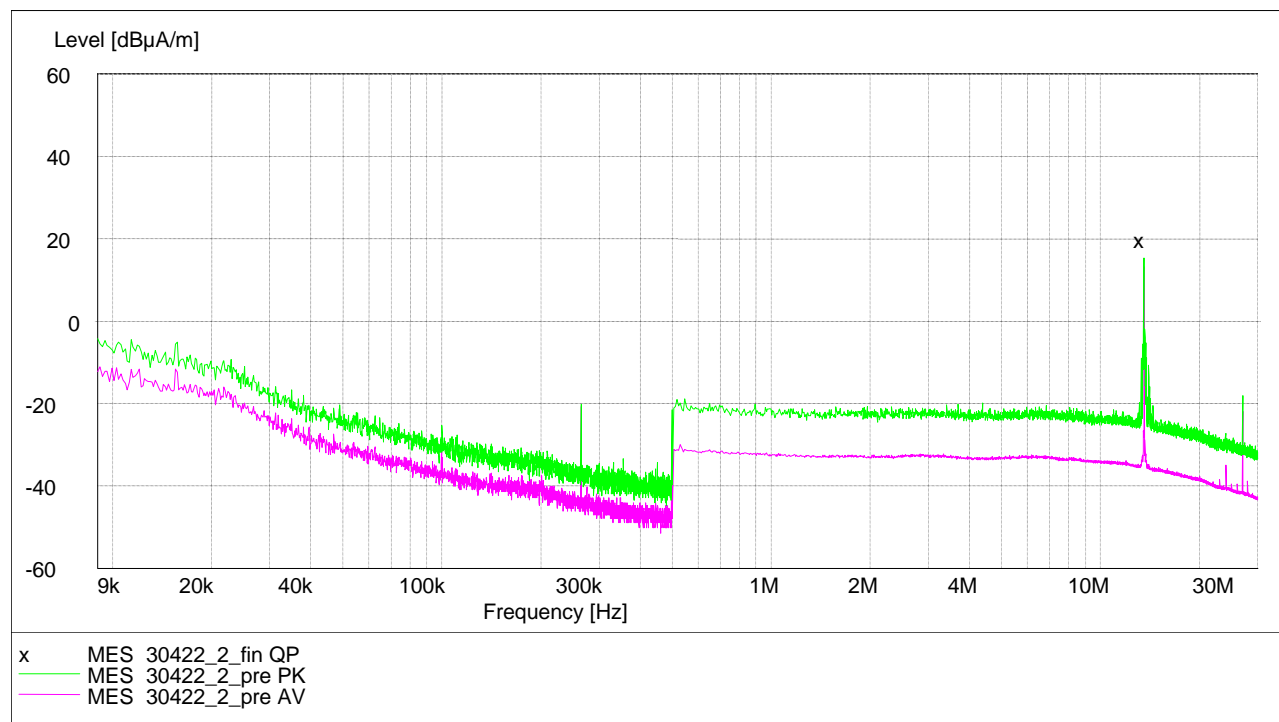
6.2 PRELIMINARY RADIATED EMISSION TEST (9 kHz to 30 MHz)

Ambient temperature	21 °C	Relative humidity	52 %
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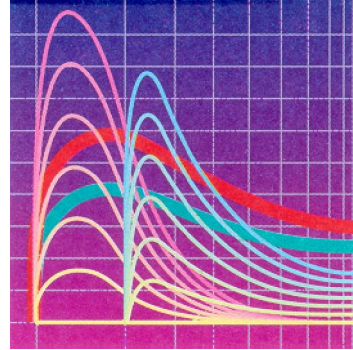
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

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: The test was carried out in normal operation mode of the EUT (transmit mode without reading a TAG). All results are shown in the following.



Data record name: 30422_2



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

No critical frequency was found outside the restricted bands.

No frequency was found inside the restricted bands according to FFC 47 CFR Part 15 section 15.205 [2].

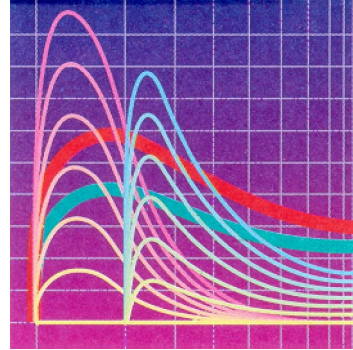
The following frequency was found inside the 13.533 to 13.567 MHz band according to FFC 47 CFR Part 15 section 15.225 [2].

- 13.5596 MHz

This frequency has to be measured on the outdoor test site. The result of this final measurement is shown in subclause 6.3 of this test report.

TEST EQUIPMENT USED THE TEST:

29, 31 - 33, 41, 47



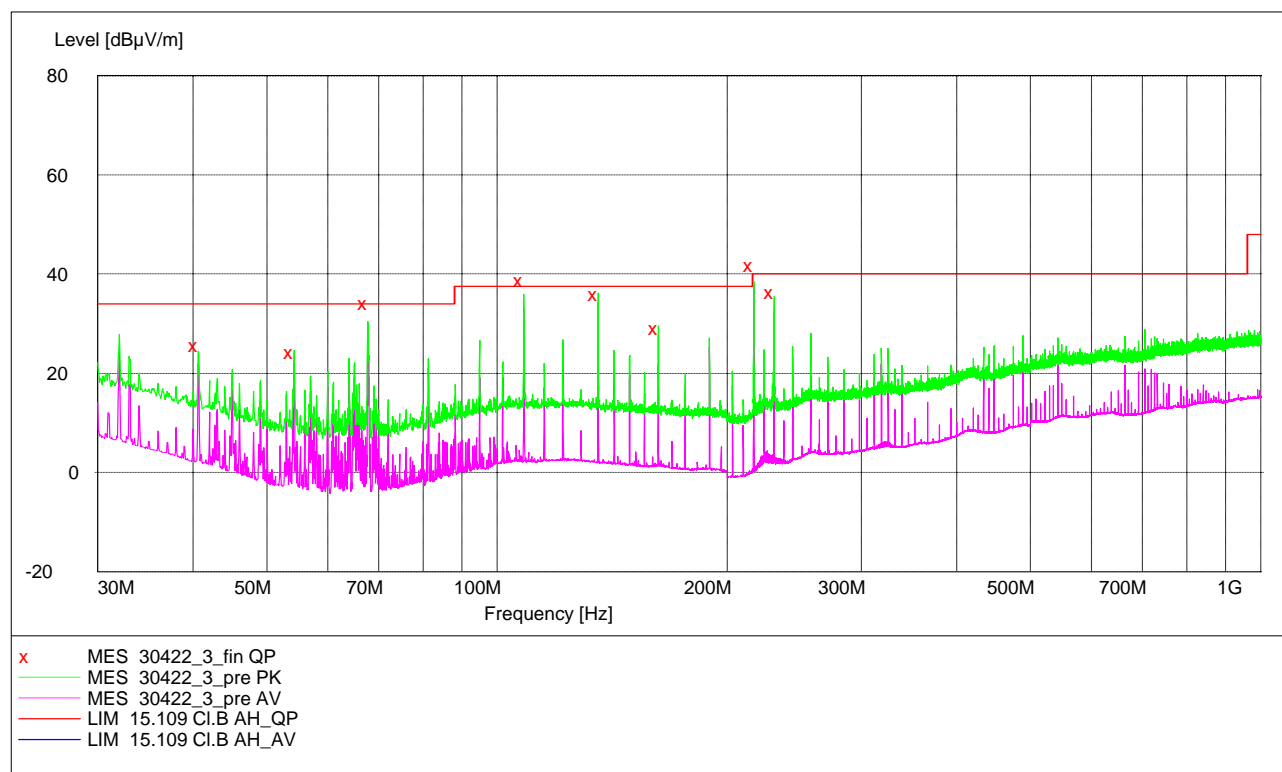
6.3 PRELIMINARY RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature	21 °C	Relative humidity	52 %
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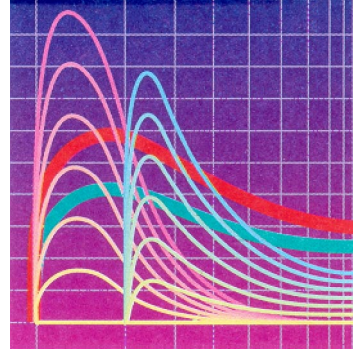
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.

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: The test was carried out in normal operation mode of the EUT (transmit mode without reading a TAG). All results are shown in the following.



Data record name: 30422_3



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

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

- 32.004000 MHz,
- 40.668000 MHz,
- 54.240000 MHz,
- 67.788000 MHz,
- 162.708000 MHz,
- 216.948000 MHz,
- 230.508000 MHz.

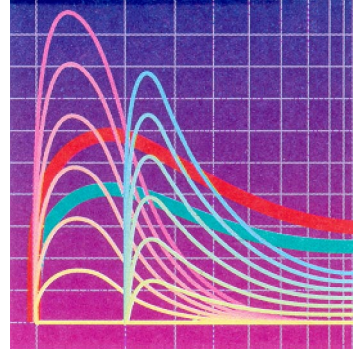
The following frequencies were found inside the restricted bands according to FCC 47 CFR Part 15 section 15.205 [2].

- 108.468000 MHz,
- 135.588000 MHz.

These frequencies have to be measured on the open area test site. The results of this final measurement are shown in subclause 6.4 of this test report.

TEST EQUIPMENT USED FOR THE TEST:

29, 31 – 35, 37, 47



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

6.4 FINAL RADIATED EMISSION TEST (9 kHz to 30 MHz)

Ambient temperature	16 °C	Relative humidity	51 %
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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 30 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: The test was carried out in normal operation mode of the EUT (transmit mode without reading a TAG). All results are shown in the following.
- Supply voltage: The EUT was supplied with 12 V DC and 5 V DC via suitable AC/DC adaptors.
- Test results: The test results were calculated with the following formula:

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

Measuring results (distance 30 m):

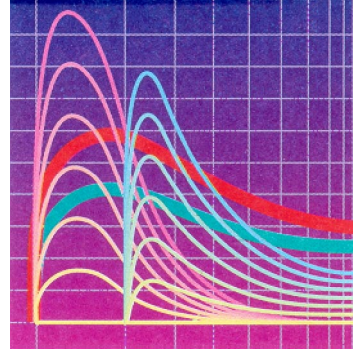
Fundamental frequency						
Frequency MHz	Result dB μ V/m	Limit dB μ V/m	Margin dB	Detector	Readings dB μ V	Antenna factor * dB/m
13.55960	35.5	80	54.5	QP	15.5	20

*: Cable loss included

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

30, 40, 41, 47



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

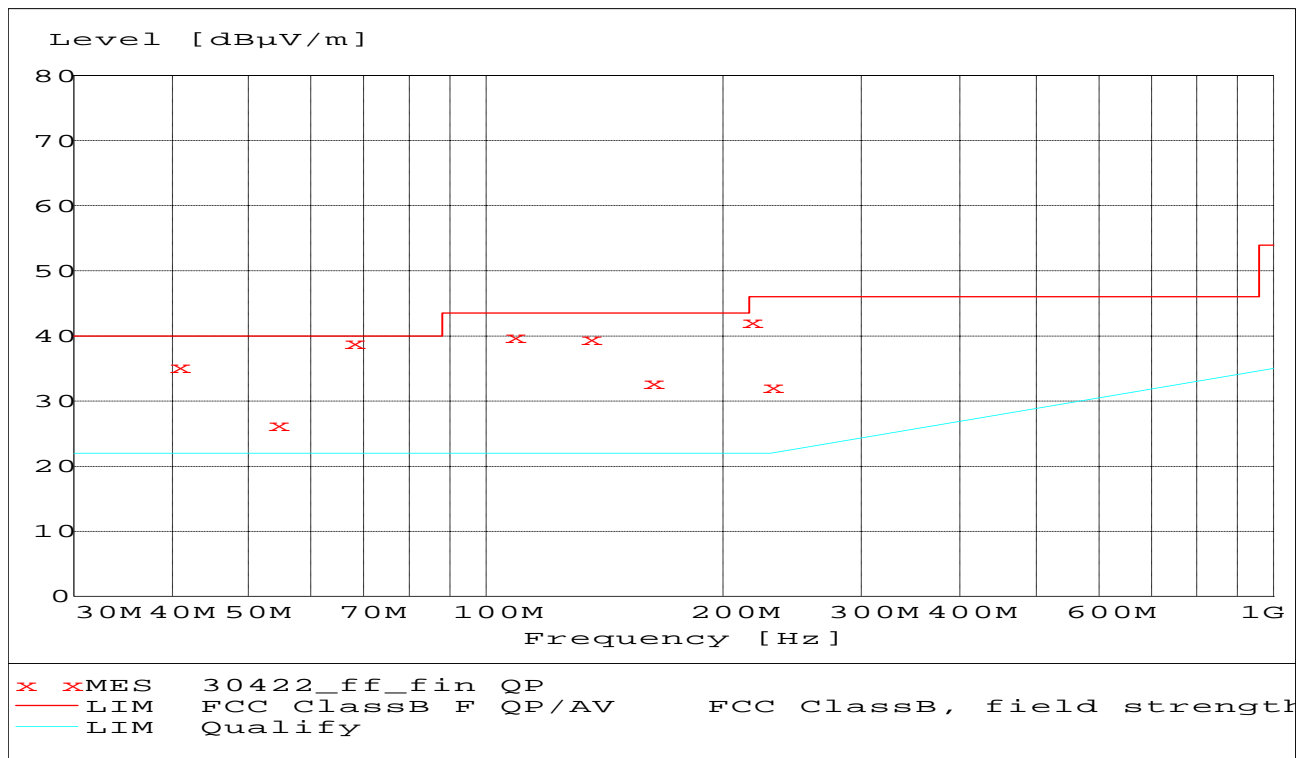
6.5 FINAL RADIATED EMISSION TEST (30 MHz to 1 GHz)

Ambient temperature	18 °C	Relative humidity	46 %
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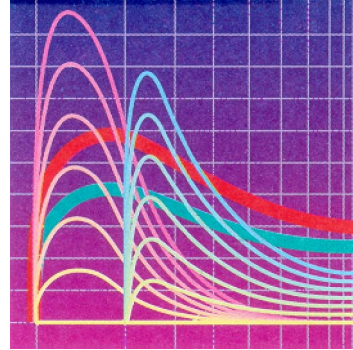
- Position of EUT:** The EUT was set-up on a non-conducting table of a height of 0.8 m. The distance between EUT and antenna was 3 m.
- Cable guide:** The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.
- Test record:** The test was carried out in normal operation mode of the EUT (transmit mode without reading a TAG). All results are shown in the following.
- Supply voltage:** During all measurements the EUT was supplied with 12 V DC.
- Test results:** The test results were calculated with the following formula:

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

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 with x are the measured results of the standard final measurement on the open area test site.



Data record name: 30422_ff



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

The results of the standard final 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.

Three highest 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.
40.668000	35.30	40.0	4.7	20.3	14.6	0.4	105.0	112.00	VERT.
67.788000	38.90	40.0	1.1	31.7	6.7	0.5	115.0	120.00	VERT.
216.948000	42.10	46.0	3.9	30.9	10.3	0.9	376.0	16.00	HOR.
Three highest spurious emissions in 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.
108.468000	39.80	43.5	3.7	27.1	12.1	0.6	98.0	325.00	HOR.
135.588000	39.50	43.5	4.0	26.3	12.3	0.7	100.0	203.00	VERT.
Other 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.
54.240000	26.40	40.0	13.6	18.4	7.5	0.5	339.0	231.00	HOR.
162.708000	32.80	43.5	10.7	20.4	11.6	0.8	225.0	227.00	HOR.
230.508000	32.20	46.0	13.8	20.2	11.1	0.9	176.0	206.00	VERT.
Other spurious emissions inside 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.
-	-	-	-	-	-	-	-	-	-

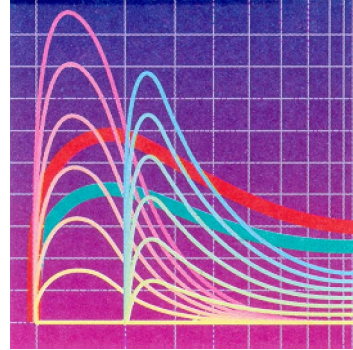
The test results were calculated with the following formula:

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

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

14 – 20, 47

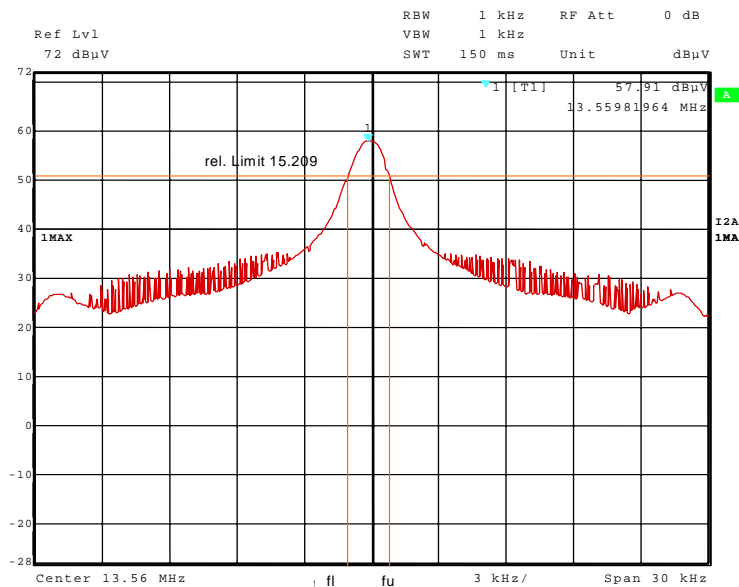


TEST REPORT REFERENCE: R30422 Version 2 Edition 2

6.6 EMISSION APPEARING OUTSIDE OF THE BAND

Ambient temperature:	20 °C	Relative humidity:	50 %
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- Test set-up: For this test the test set-up from the preliminary emission measurement test set-up was used.
- Cable guide: The cable of the EUT was fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.
- Supply voltage: The EUT was supplied with 12 V DC and 5 V DC.
- Test record: The test was carried out in continuous transmission mode in the presence of a TAG in front of the EUT.

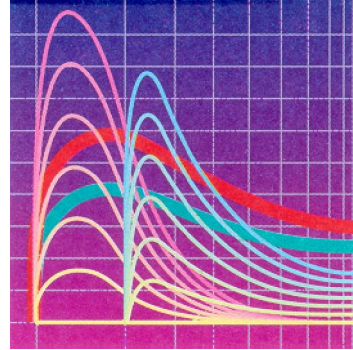


30422obw.wmf

$f_l > 13.553 \text{ MHz}$	$f_u < 13.567 \text{ MHz}$
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TEST EQUIPMENT USED THE TEST:

29, 31 - 33, 41, 44, 47, 49



6.7 FREQUENCY TOLLERANCE

Ambient temperature	22 °C	Relative humidity	45 %
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Supply voltage: 9 V DC / 3.75 V DC

Temperature:	Minutes after switch on	Frequency:	Allowed tolerance:	Measured tolerance:	Result:
20 ° C	10	13.55987 MHz	-	-	Reference
50 ° C	0	13.55983 MHz	± 1.35 kHz	-40 Hz	Passed
	2	13.55982 MHz	± 1.35 kHz	-50 Hz	Passed
	5	13.55981 MHz	± 1.35 kHz	-60 Hz	Passed
	10	13.55978 MHz	± 1.35 kHz	-90 Hz	Passed
- 20 ° C	0	13.55992 MHz	± 1.35 kHz	+50 Hz	Passed
	2	13.55991 MHz	± 1.35 kHz	+40 Hz	Passed
	5	13.55990 MHz	± 1.35 kHz	+30 Hz	Passed
	10	13.55990 MHz	± 1.35 kHz	+30 Hz	Passed

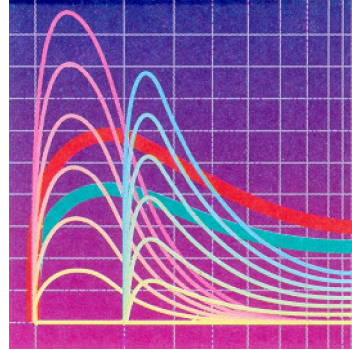
Supply voltage: 15 V DC / 6.25 V DC

Temperature:	Minutes after switch on	Frequency:	Allowed tolerance:	Measured tolerance:	Result:
20 ° C	10	13.55988 MHz	-	-	Reference
50 ° C	0	13.55983 MHz	± 1.35 kHz	-50 Hz	Passed
	2	13.55982 MHz	± 1.35 kHz	-60 Hz	Passed
	5	13.55981 MHz	± 1.35 kHz	-70 Hz	Passed
	10	13.55979 MHz	± 1.35 kHz	-90 Hz	Passed
- 20 ° C	0	13.55992 MHz	± 1.35 kHz	+40 Hz	Passed
	2	13.55990 MHz	± 1.35 kHz	+20 Hz	Passed
	5	13.55990 MHz	± 1.35 kHz	+20 Hz	Passed
	10	13.55990 MHz	± 1.35 kHz	+20 Hz	Passed

Test result: Passed

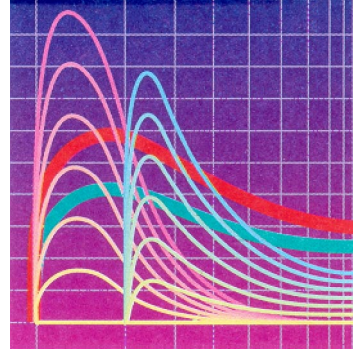
TEST EQUIPMENT USED FOR THE TEST:

30, 42, 48, 49, 50



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

7 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

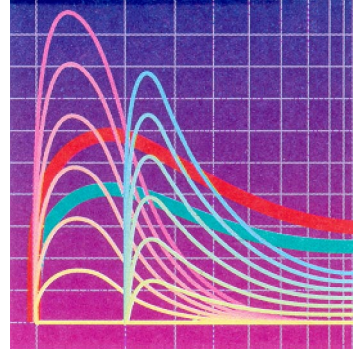


TEST REPORT REFERENCE: R30422 Version 2 Edition 2

Emission measurement at AC mains and DC in / out ports at M4					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
1	Shielded chamber M4	-	Siemens	B83117S1-X158	480088
2	Measuring receiver	ESAI	Rohde & Schwarz	831953/001 833181/018	480025 480026
3	LISN	NSLK8128	Schwarzbeck	8128155	480058
4	DC-filter	B84266-A21-E13	Siemens	940164525	480099
5	AC-filter	B84299-D87-E3	Siemens	930262292	480097
6	EMI-Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M5					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
7	Fully anechoic chamber M5	-	Siemens	B83177-S1-X156	480073
8	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
9	Controller	HD100	Deisel	100/324	480067
10	Antenna support	MA240	Deisel	228/314	480069
11	Turntable	DS412	Deisel	412/317	480070
12	Antenna	CBL6112C	Chase	2689	480327
13	EMI Software	ES-K1	Rohde & Schwarz	-	480111

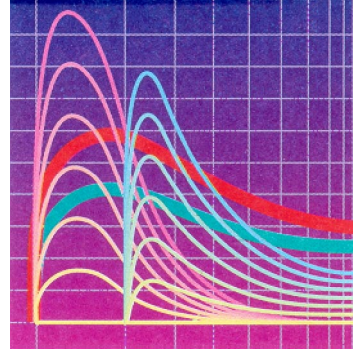
Radiated emission measurement at M6					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
14	Open area test site	-	Phoenix Test-Lab	-	480085
15	Measuring receiver	ESVS30	Rohde & Schwarz	829673/012	480024
16	Controller	HD100	Deisel	100/670	480139
17	Turntable	DS420HE	Deisel	420/620/80	480087
18	Antenna support	AS615P	Deisel	615/310	480086
19	Antenna	CBL6111 A	Chase	1643	480147
20	EMI Software	ES-K1	Rohde & Schwarz	-	480111



Radiated emission measurement at M8					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
21	Fully anechoic chamber M8	-	Siemens	B83117-E7019-T231	480190
22	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
23	Measuring receiver	ESCS 30	Rohde & Schwarz	828985/014	480270
24	Controller	HD100	Deisel	100/427	480181
25	Turntable	DS420	Deisel	420/435/97	480186
26	Antenna support	AS615P	Deisel	615/310	480187
27	Antenna	CBL6112 A	Chase	2034	480185
28	EMI Software	ES-K1	Rohde & Schwarz	-	480111

Radiated emission measurement at M20					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
29	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303
30	Measuring receiver	ESMI	Rohde & Schwarz	843977/001 843530/018	480179 480180
31	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355
32	Controller	HD100	Deisel	100/670	480326
33	Turntable	DS420HE	Deisel	420/620/80	480315
34	Antenna support	AS615P	Deisel	615/310	480187
35	Antenna	CBL6112 B	Chase	2688	480328
36	Antenna	3115 A	EMCO	9609-4918	480183
37	RF-cable No. 30	RTK 081	Rosenberger	-	410141
38	EMI Software	ES-K1	Rohde & Schwarz	-	480111
39	RF-cable No. 5	RTK 081	Rosenberger	-	410097

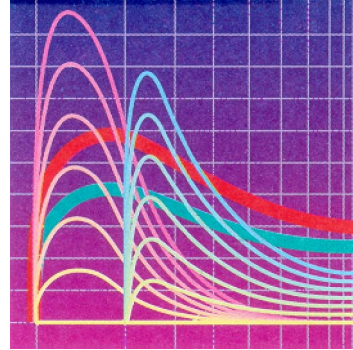
Ancillary equipment used for testing					
No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
40	Outdoor test site	-	Phoenix Test-Lab	-	480293
41	Loop antenna	HFH2-Z2	Rohde & Schwarz	832609/014	480059



TEST REPORT REFERENCE: R30422 Version 2 Edition 2

No.	Test equipment	Type	Manufacturer	Serial No.	PM-No
42	Power supply	TOE 8852	Toellner	51712	480233
43	EMI test receiver	ESPC	Rohde & Schwarz	843756/006	480150
44	Signal generator	SMHU	Rohde & Schwarz	844170/017	480266
45	LISN	NSLK 8128-	Schwarzbeck	8128161	480138
46	LISN / Mains Network	MN2050B	Chase	1153	480146
47	AC power source / analyser	6813A	Hewlett Packard	3524A-00484	480155
48	Climatic chamber	GTS500.40	GTS	1660	490073
49	RF-cable No. 11	RG223	Phoenix-Test-Lab	-	410103
50	Loop Antenna $\varnothing = 225$ mm	-	Phoenix Test-Lab	-	410085
-	-	-	-	-	-
-	-	-	-	-	-

All used measurement equipment was calibrated (if necessary). The calibration intervals and the calibration history will be given out on request.



8 LIST OF ANNEXES

ANNEX A	PHOTOGRAPHS OF THE TEST SET-UPS:	6 pages
	Model 24W test set-up preliminary emission measurement (9 kHz to 1 GHz)	30422_a.jpg
	Model 24W test set-up preliminary emission measurement (9 kHz to 1 GHz)	30422_b.jpg
	Model 24W test set-up final emission measurement (9 kHz to 30 MHz)	30422_c.jpg
	Model 24W test set-up final emission measurement (30 MHz to 1 GHz)	30422_e.jpg
	Model 24W test set-up conducted emission measurement (150 kHz to 30 MHz)	30422_j.jpg
	Model 24W test set-up climatic chamber	30422_i.jpg
ANNEX B	EXTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	4 pages
	Model 24W top view	30422_1.jpg
	Model 24W bottom view	30422_2.jpg
	Model 24W left-hand side	30422_4.jpg
	Model 24W type plate AC/DC adaptor	30422_3.jpg
ANNEX C	INTERNAL PHOTOGRAPHS OF THE TEST SAMPLE:	4 pages
	Model 24W internal view	30422_5.jpg
	Model 24W PCB, top view	30422_7.jpg
	Model 24W PCB, bottom view	30422_6.jpg
	Model 24W bottom view of reader module	30422_8.jpg