



Test Report EMC

FCC listed^{*)} test laboratory

Test Laboratory:

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VDE Testing and Certification Institute
Laboratory for EMC measurements

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Equipment under Test:

Applicant:	N & W Global Technology; Ewige Weide 7, 22926 Ahrensburg
Manufacturer:	Wittenborg A/S; Seebadsgade 1-3, 5000 ODENSE C
File number:	586400-2240-0010/63455
EUT:	Coffee maker for commercial use
Brand/model:	Cafitesse 600 CFT600S
EUT received:	2005-08-16

Information concerning the Test Report:

Report No.:	Testreport-FG43-4-63455.doc	
Number of pages:	58	
Your contact:	Mr. Ott	Phone ext.: -413

Applied Standards:	
Main Standard	Basic Standards
Standards that have been applied to the radio equipment:	
47 CFR 15, Subpart C: Intentional Radiators §§ 15.201 through 15.209 (General requirements) Alternatives to the general radiated emission limits as provided in §§ 15.217 through 15.255 have not been applied.	ANSI C63.4:2003
Standards that are applicable to the non-radio equipment:	
47 CFR 15, Subpart B: Unintentional Radiators in conjunction with CISPR Pub.22: 1997 Limits for class B equipment	ANSI C63.4:2003

Remarks to the Standards:	The device under test, except for the external transponder, is built in a commercial coffeemaker which is also subject to the requirements of the EMC Directive 89/336/EEC and other Directives of the European Communities. This test report does not make a statement on the compliance with other directives that are relevant for the non-radio equipment.
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Information about modifications to the EUT at the test laboratory:

In order to achieve compliance with the regulations, the following modifications were made to the EUT:
Added ferrite (Würth, Part No. 74271142) to the wires of the RFID loop antennas

Result: **Passed**

Date of issue:	2005-09-05	
Tested by:	Hartmut Schmehl	
	Wolfgang Klos	
Reviewed:	Lothar Ott	

^{*)} FCC Information:

A description of the test site pursuant to 47 CFR 2.948 has been filed with the Federal Communications Commission.



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This test report contains only the results of a single investigation carried out on the product submitted. It is not a generally valid judgement by the VDE Testing and Certification Institute regarding the properties of similar products taken from current production. It does not apply to all VDE specifications applicable to the tested products. It does not entitle the applicant to use the VDE certification mark and the mark "GS = geprüfte Sicherheit (approved safety)".

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1 Description of the sample

1.1 General description of the EUT

Type of EUT:	Radio equipment (short range device): RF Identification system, consisting of a) Active transceiver with dedicated loop antenna, integrated into the main controller which is mounted behind the front panel of the commercial coffee maker CFT600S b) Handheld transponder chip (ID Tag)
Intended use, typical applications:	The radio equipment utilized in the coffee maker is designed to allow only authorized service personal the access to the service mode of the coffee maker for purposes of diagnostics and adjustments. It will be used indoor only. The purpose of the radio equipment is to detect the RF ID-Tag that authorized technicians carry with themselves.
Brand name:	N&W
Model/Type Designation:	The transceiver is integrated into the User Interface Board V2.0, see N&W Document No. 472816.00 (on file at the laboratory)
Product variants:	Not considered here

Equipment Type:	fix
Signal flow direction:	Duplex
Construction of the equipment:	Two units: One Transceiver built in the coffeemaker and one transponder built in a token <i>Note: "UNIT" means a physically separate item of the equipment. The equipment under test may consist of two separate units.</i>

Equipment class
according to EN 301 489-3:2001,
Subclause 6.1:

Note:

The relevant class for several applications is given in Annex B (normative) of EN 301 489-3

Class 3:

The result of a too low performance caused by the influence of electromagnetic disturbances would be inconvenient to persons, which can simply be overcome by other means (e.g. manual).

1.2 Samples submitted to the test laboratory

ID or Serial Number	Description, Type/Model Name	Characteristics, Information about modifications
Transceivers		
T1	Unmodified sample built in the coffee maker	For measurements of the magnetic field under normal conditions, for measurements of spurious emissions of the transmitter and also for immunity testing
T2	User interface board with integrated RF transceiver: - With integral (original) antenna and temporarily installed coupling circuit and - connectors for an artificial antenna and external power source, - with external trigger key switch, parallel installed to the 'STOP' key (SW16)	For measurements of several parameters under extreme conditions
ID Tag		
I1	Unmodified sample	For measurements of spurious emissions; also for immunity testing

1.3 Other items supplied to the test laboratory

Spare batteries, e.g. for portable equipment:	Not applicable
Battery charging device:	Not required
Special tools for dismantling equipment:	Not required
Encoder/Decoder:	Not required
Test fixture (if applicable):	Not applicable
Operating instructions/ User's Manual:	Yes
Circuit diagrams:	Yes
Drawings of the PCB layout, including component positioning:	No
Parts list:	No
Photographs:	No
Other (e.g. support equipment for testing):	No

1.4 Technical Specifications

1.4.1 Transmitter

1.4.1.1 Transmitter components

The transceiver is integrated into the user interface board.

The user interface board, the main processor board and a dedicated loop coil antenna with 138 turns and a diameter of 26 mm are mounted fix in the front door of the coffeemaker.

1.4.1.2 Ports of the transmitter (transceiver)

Power ports:	The transceiver is powered from DC 24 V which is supplied from an autoranging switch-mode power supply built in the coffee maker. For testing it was set to the the voltage range 200-240 V AC
Antenna ports:	Special connector, non user-accessible, for the dedicated loop antenna
Earth port:	The coffee maker is protection class I equipment. The power cable contains a PE wire.
Signal/control ports:	No external ports for regular use. The transceiver is controlled directly from the ancillary circuitry that can also be found on the main board of the coffee maker.
Telecommunication ports:	No external ports. The transceiver communicates with the ancillary circuitry on the main board of the coffee maker.

1.4.1.3 Transmitter (Transceiver) power supply

Type of power source:	The Main PCB with the transceiver section is powered from DC 24 V which is supplied from an autoranging switch-mode power supply built in the coffee maker.
Rated voltage:	DC 24 V +/- 5%
Lower extreme test source voltage:	21,6 V (= 24 V - 10%) in agreement with the applicant
Upper extreme test source voltage:	26,4 V (= 24 V + 10%) in agreement with the applicant
Automatic transmitter shut-off facility (of the final product):	The transmitter will be active for a duration of approx. 2 seconds, only after triggering by pushing the "STOP" button for 5 seconds on the front panel of the coffee maker.

Rated power consumption:	Coffee Maker: up to 8,5 kW	Rated current:	up to 32 A
Number of phases (if applicable):	1 or 3, depending on the settings on the power input module	Protection class:	I

1.4.1.4 RF characteristics of the transmitter

Operating frequency:	nominal 125 kHz +/- 6 kHz				
Channel separation (if applicable):	Not applicable				
Method of frequency generation:	Integrated PLL system to achieve self adaptive carrier frequency to antenna resonant frequency				
Type of modulation:	Amplitude shift keying (OOK, 100% AM), for details refer to the specification of the front end IC (on file at the test laboratory) On activation, bursts with 11 data bits are being transmitted. Pulse repetition frequency: As long as the transmitter is active (for energization of the ID Tag), the burst will be repeated continuously. Duty cycle: in practical use ca. 100 % while transmitting Total length of one active transmission period: approx. 2 s in presence of an ID Tag, otherwise transmissions are repeated for up to 27 seconds				
Modulation input signal characteristics:	The modulation signal is generated internally, depending on the transponder protocol. The operation of the transceiver chip is controlled by an 8 bit Configuration Register. This register is written via serial interface.				
Duty cycle of the transmitter:	< 1% based on number of operations in one hour Intermittent operation				
Intended temperature range:	Category III: For normal indoor use (20°C to +55°C)				
Class of power level acc. to CEPT/ERC Rec. 70-03:	Power class (conducted or radiated) <table> <tr> <th>Power Class</th><th>Radiated H-field or Power Level</th></tr> <tr> <td>1</td><td>7 dBμA/m at 10 m</td></tr> </table>	Power Class	Radiated H-field or Power Level	1	7 dBμA/m at 10 m
Power Class	Radiated H-field or Power Level				
1	7 dBμA/m at 10 m				
Maximum rated transmitter output power (as stated by the manufacturer):	Maximum generated fieldstrength: -17,5 dBμA/m +/- 6 dB, measured at 10 m horizontal distance				
Variable transmitter carrier output:	No, the output power of the transmitter is fixed.				
Product variants with alternate power levels:	None				



1.4.1.5 Other constructional details

Oscillators, generated frequencies:	Transceiver and Microcontroller: 3,6864 MHz and 7,3728 MHz clock oscillators (on the User Interface Board) Transmit Oscillator: ~ 125 kHz For details refer to the set of schematics that are on file at the test laboratory.. ID Tag: World TAG Titan Microcontroller: unknown Local oscillator: unknown
EMC measures:	Coffee maker with built-in transceiver: Refer to section 1 of VDE Test Report FG43-1-63455, page 4
Miscellaneous information	Antenna: Dedicated loop antenna with 2,6 cm diameter with 138 turns, integrated into the front door of the coffee maker

1.4.2 Receiver and ancillary components

1.4.2.1 Receiver classification

Receiver class according to EN 300 220-1:2001, Subclause 4.1.1:	Class 3: Inconvenience to persons, which can simply be overcome by other means (e.g. manual).
<i>Note:</i> <i>The relevant class for several applications is given in Annex B (normative) of EN 301 489-3</i>	The primary means of control of the coffee maker is manual. The remote control is for the convenience of the technician in case of service. In case of a failure of the RF ID, the service mode of the firmware can be accessed by pressing a specific key combination after opening the the front door of the coffeemaker with a special key.

1.4.2.2 Receiver components

The receiver function is part of the transceiver circuitry which is integrated into the user interface board of the coffee maker.

1.4.3 RF characteristics of the receiver

Operating frequency:	approx. 125 kHz
Channel separation (if applicable):	Not applicable
Receiver mute/squelch:	None
Antenna connectors:	Special connector, non user-accessible, for the dedicated loop antenna of the transceiver
Other ports:	refer to 1.4.1.2
Oscillators, generated frequencies:	refer to 1.4.1.4
EMC measures:	refer to 1.4.1.5
Miscellaneous information:	Demodulation method of the transceiver front end IC: Amplitude and phase demodulation, see specifications (on file at the test laboratory)



2 General conditions for testing

Number of samples used for testing:

Full tests of one type of equipment were carried out. The samples No. T1 and T2, as described in Subclause 1.1 of this test report, were used for testing.

Transmitter shut-off facility:

The final production version of the transmitter will be activated by the user who has to press the 'STOP' button on the front panel of the coffee maker for a transmission.

Receiver mute or squelch:

During testing, no receiver mute, squelch or battery-saving circuitry was enabled.

Operational modes investigated:

No.	Description
T1	Transmission of a signal command after pressing one button
T2	Transmission of signals after external triggering. The transceiver is supplied from an external adjustable power source.
R1	Receiver on, with no wanted command signal in the air
R2	Receiver on, receiving a command

Support Equipment:

Device	Identification/Short description
None	

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R2	Receiver on, receiving a command

Support Equipment:

Device	Identification/Short description
None	

4 Summary of measuring results:

Test		Frequency range	Page	Remarks	Result
1.1	Conducted emissions AC Power input terminals § 15.207 (a)	150 kHz - 30 MHz	19	This test was combined with the measurement acc. to § 15.107 (a)	Passed
1.2	Radiated emissions (Magnetic field strength) § 15.209 (a)	9 kHz - 30 MHz	12		Passed
1.3	Radiated emissions (Electric field strength) § 15.209 (a)	30 MHz – 1 GHz	---	The highest frequency to be investigated for this type of equipment is 30 MHz. ⁺⁾	---
1.4	Radiated emissions Electric fieldstrength § 15.209 (a)	> 1 GHz	---		---
2.1	Conducted emissions AC Power input terminals § 15.107 (a)	150 kHz - 30 MHz	19	Class B limits	Passed
2.2	Radiated emissions (Electric field strength) § 15.109 (g)	30 MHz – 1 GHz	28	Class B limits	Passed
2.3	Radiated emissions Electric fieldstrength § 15.109 (a)	> 1 GHz	---	Class B limits No measurement required. ⁺⁾	---
2.4	Conducted emissions Power at the antenna terminals	see § 15.33	---	This test is not applicable	---

⁺⁾ The upper value of the investigated frequency band was determined according to § 15.33 (b)(1).

Emission class
(for unintentional
radiators):

class B

Tables showing the six highest readings of each test relative to the limit can be found on the pages indicated in the table or on one of the following pages of them.

A rationale for the selection of tests that have been carried out (applicable test requirements) is given in the appendices, see sections 7.5 and 7.6 of this test report.

5 Measurement protocols from testing intentional radiators

5.1 Radiated H-Field (wanted signal and spurious radiation)

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2005-08-23
Environmental conditions:	26° C, 44% r.h.

Instruments:	Test Location: OATS without ground plane		
Inventory number	Description	Manufacturer	Type
1800027	MESSEMPFAENGER	R&S	ESH2
1810009	RAHMENANTENNE Z. ESH 2	R&S	HFH2-Z2

Test setup:

The coffee maker with the transceiver incorporated was placed on a non-conductive table of 0,8 m height. It was powered from mains with AC 240 V, 60 Hz. The loop antenna was located in distances of 1, 3, 5 and 10 m from the EUT on the open-area test site.

Operating modes investigated:

1. Standby / ready
2. Active communication between the transceiver and the transponder after pressing of the 'stop' button by the operator.

A test sample providing an unmodulated carrier was not available, therefore all measurements were carried with modulation. During all measurements, the transponder was located as close as possible to the loop antenna of the transceiver.

In advance to the final measurement, preliminary investigations had been carried out in a shielded room, with the loop antenna of the test instrumentation placed in a distance of 1 m to the front of the coffee maker. The final measurement was conducted on the open area test site.

Measurement values can be found on the following page.

The magnetic field strength was measured on an open-area test-site under normal operating conditions in a distance of 10 m, employing a Quasi Peak detector. For 300 m test distance, the magnetic field strength was calculated to -25,5 dB μ V/m by using a correction factor of 40 dB/decade.

Maximum H-field at a distance of 300 m:

Measured value (max. field strength level under normal or extreme test conditions):	- 23,1 dB μ V/m
Specified limit for 125,7 kHz:	+ 25,6 dB μ V/m

Result concerning the transmitter characteristics (H-Field of the wanted signal): **Passed**

The level of the wanted signal of the EUT was found below the specified limit.

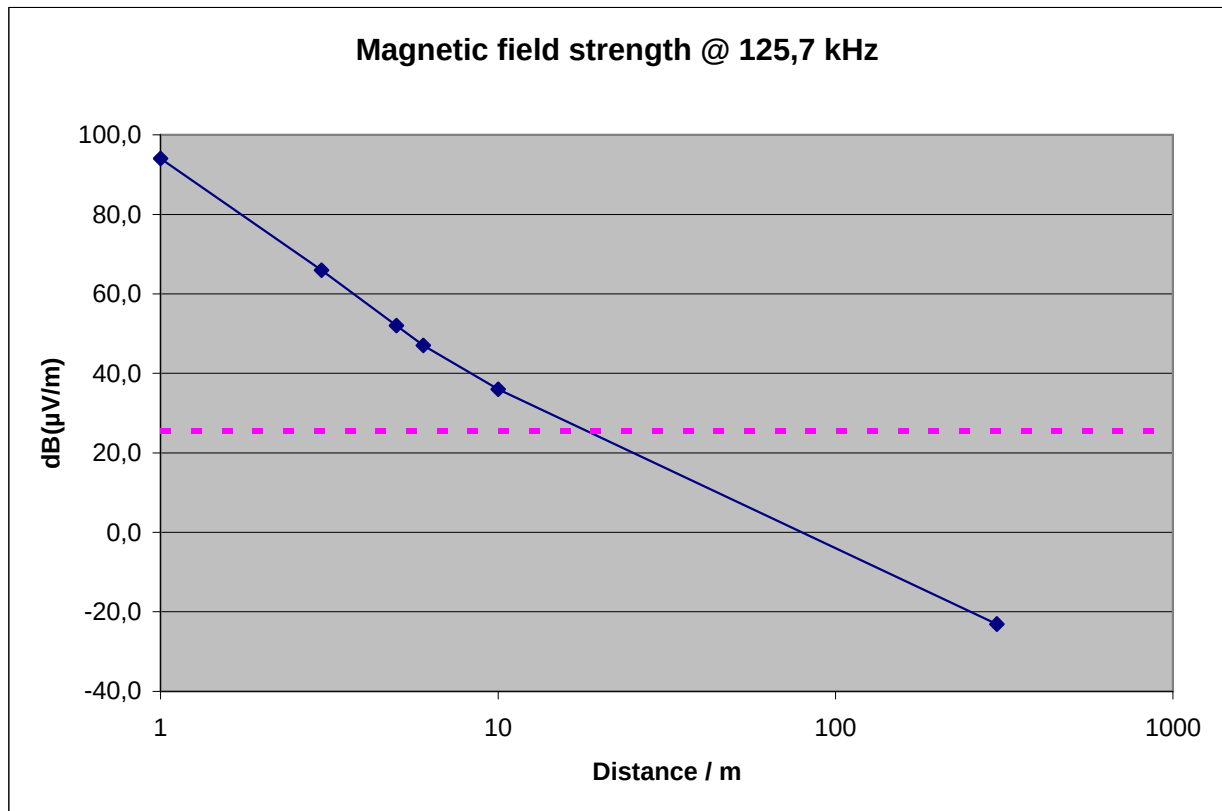
Protocol:

Results of the preliminary investigations in a shielded room:

- Maximum field strength measured 1 m distance: 91,8 dB μ V/m @ approx. 1 m
- The highest reading of the fundamental frequency was found when the front of the coffee maker was facing the loop antenna.
- Placing the transponder token at the transceiver coil did not have any influence on the signal level.

Results of the final measurements at the open area test site:

Frequency kHz	Test Distance m	Field Strength dB(μ V/m)	Detector Type	Remarks
125,7	1	94	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
125,7	3	66	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
125,7	5	52	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
125,7	6	47	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
125,7	10	36	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
125,7	300	-23,1	Quasi Peak	Calculated value from the 10 m reading, using a correction factor of 40 dB per decade





5.2 Spurious emissions (radiated) of the transmitter and the receiver

5.2.1 Frequency range 9 kHz ... 30 MHz

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2005-08-23
Environmental conditions:	28° C, 32% r.h.

Instruments:	Test Location: OATS without ground plane		
Inventory number	Description	Manufacturer	Type
1800027	MESSEMPFAENGER	R&S	ESH2
1810009	RAHMENANTENNE Z. ESH 2	R&S	HFH2-Z2
1800049	FUNKSTOERMESSEMPFAENGER	R&S	ESHS30

Test setup:

The coffee maker with the transceiver incorporated was placed on a non-conductive table of 0,8 m height. It was powered from mains with AC 240 V, 60 Hz. The loop antenna was located in a distance of 1 m from the EUT inside a shielded room. Due to ambient noise and the low emission level of the EUT it was not possible to detect any emissions of the EUT in a distance of 3 m or 10 m on the open-area test site.

Operating modes investigated:

1. Standby / ready
2. Active communication between the transceiver and the transponder after pressing of the 'stop' button by the operator.

A test sample providing an unmodulated carrier was not available, therefore all measurements were carried with modulation.

In advance to the final measurement, preliminary investigations had been carried out in a shielded room, with the loop antenna placed in a distance of 1 m to the front of the coffee maker.
The final measurement was conducted on the open area test site.

Measurement values can be found on the following page.

Evaluation:

Result concerning the emission characteristics of the transmitter (spurious): **passed**

The measured emissions (spurious) of the transmitter in the frequency range 9 kHz ... 30 MHz were found below the specified limits.

Result concerning the emission characteristics of the receiver (spurious): **passed**

The measured emissions (spurious) of the receiver in the frequency range 9 kHz ... 30 MHz were found below the specified limits.



Protocol:

PRESCAN:

Test results: Magnetic fieldstrength

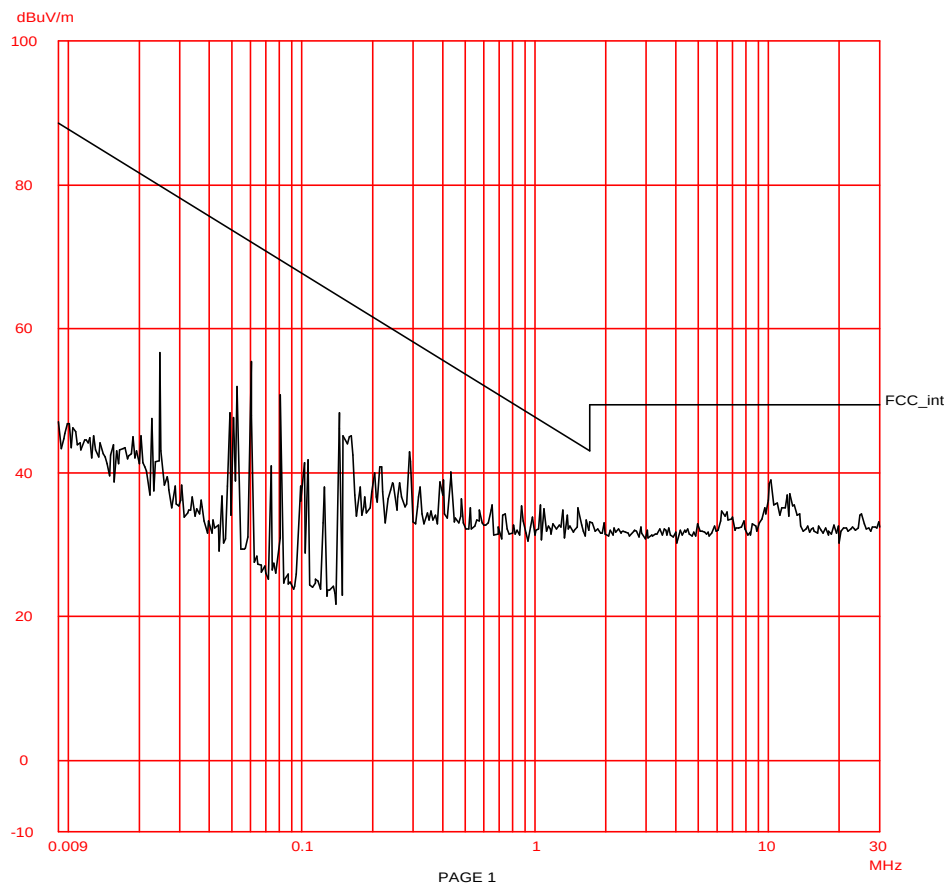
VDE Pruef- und Zertifizierungsinstitut
Magnetic field strength

23. Aug 05 11:21

EUT: Commercial Coffeemaker with RF ID-Tag
Manuf: N&W Global Vending Cafitesse CFT600
Op Cond: Ready (standby)
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B+C
Comment: 1 m, Front facing the loop antenna
File ref.: 5864.00-2240-0010/63455

Fast Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
9k	150k	60Hz	200Hz	PK	0.05ms	10dBLN	OFF	60dB
150k	30M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB



The prescan was run in standby mode with the Peak Detector employed. The test distance was 1 m.

No correction factors for the test distance were applied. The limit line shown in the diagram was extrapolated from the limits specified in § 15.209 (a) for 3 m test distance by using a conversion factor of 20 dB/decade.



FINAL:

The following table shows the field strength levels of the harmonics of the wanted signal. The test distance was also 1 m. For comparison with the limits, the measured values from 1 m test distance had been converted to values valid for 300 m respectively 30 m test distance using a correction factor of 40 dB per decade.

Frequency kHz	Measured field strength @ 1 m dBμV/m	Calculated field strength dBμV/m	Test Dist. m	Calculated limit dBμV/m	Test Dist. m	Result Comments
251,4	+49,5 QP	-2,3	300	+19,6	300	Passed
377,1	+55,0 QP	+4,2	300	+16,1	300	Passed
502,8	+40,0 QP	+9,7	30	+33,6	30	Passed
628,5	+45,5 QP	+14,7	30	+31,6	30	Passed
753,2	+38,0 QP	+14,7	30	+30,1	30	Passed
1128,8	+37,5 QP	+5,2	30	+26,6	30	Passed



5.2.2 Frequencies above 30 MHz

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2005-08-23

Report / Evaluation:

Measurements of the electric fieldstrength in the range 30 MHz to 1000 MHz or above 1 GHz have not been carried out, with reference to § 15.33 (b)(1).

The highest frequency used in the transmitter portion is approx. 126 kHz.

Result concerning the emission characteristics of the transmitter (spurious): **no result**

Result concerning the emission characteristics of the receiver (spurious): **no result**

A protocol from the electric field strength measurements of the unintentional radiators contained in the equipment can be found in section 6.2 of this report.

6 Measurement protocols from testing unintentional radiators

6.1 Terminal Disturbance Voltage

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2005-08-26

Instruments:	Test Location: Shielded Room #5		
Inventory number	Description	Manufacturer	Type
F43 05 Disturbance Voltage			
1800026	FUNKSTOERMESSEMPFAENGER	R&S	ESHS30
1820054	NETZNACHBILDUNG 4-DRAHT	R&S	ESH2-Z5

Test set-up:

The coffee maker with integrated transceiver was placed on a wooden table of 80 cm height with a distance of 40 cm to the wall of the shielded room. The coffee maker was powered from a LISN that was located on the floor of the shielded room. The cable connecting the EUT to the test LISN had a length of approx. 1 meter.

Operating modes investigated:

During preliminary measurements, all possible operating modes have been investigated. The final test was carried out with the operating mode showing the highest readings.

Protocol:

Measurement curves can be found on the following pages.

Result: Passed

**The measured emissions of the EUT were found to be below the specified limits.
The highest reading found was 2,3 dB below the limit.**

Terminal disturbance voltage, summarizing table of the 6 highest readings relative to the limit

Fre- quency	Reading	QP or AV	Correction	Measured Value	Limit	Margin	Result	Comments / Remarks
MHz	dB(μV)		dB	dB(μV)	dB(μV)	dB		
10,476	47,7	MW	0	47,7	50	2,3	PASS	Neutral
13,1	46,8	MW	0	46,8	50	3,2	PASS	Neutral
13,1	44,8	MW	0	44,8	50	5,2	PASS	Hot
10,476	43,4	MW	0	43,4	50	6,6	PASS	Hot
10,476	52,4	QP	0	52,4	60	7,6	PASS	Neutral
13,1	52,2	QP	0	52,2	60	7,8	PASS	Neutral



6.1.1 Terminal disturbance voltage, measured at the mains input of the coffee maker

6.1.1.1 Standby mode, with/without transmitter activated

Curves from preliminary measurements for the determination of the operating mode causing highest emissions (all prescan data was obtained with the coffee maker powered from 240 V, 60 Hz).

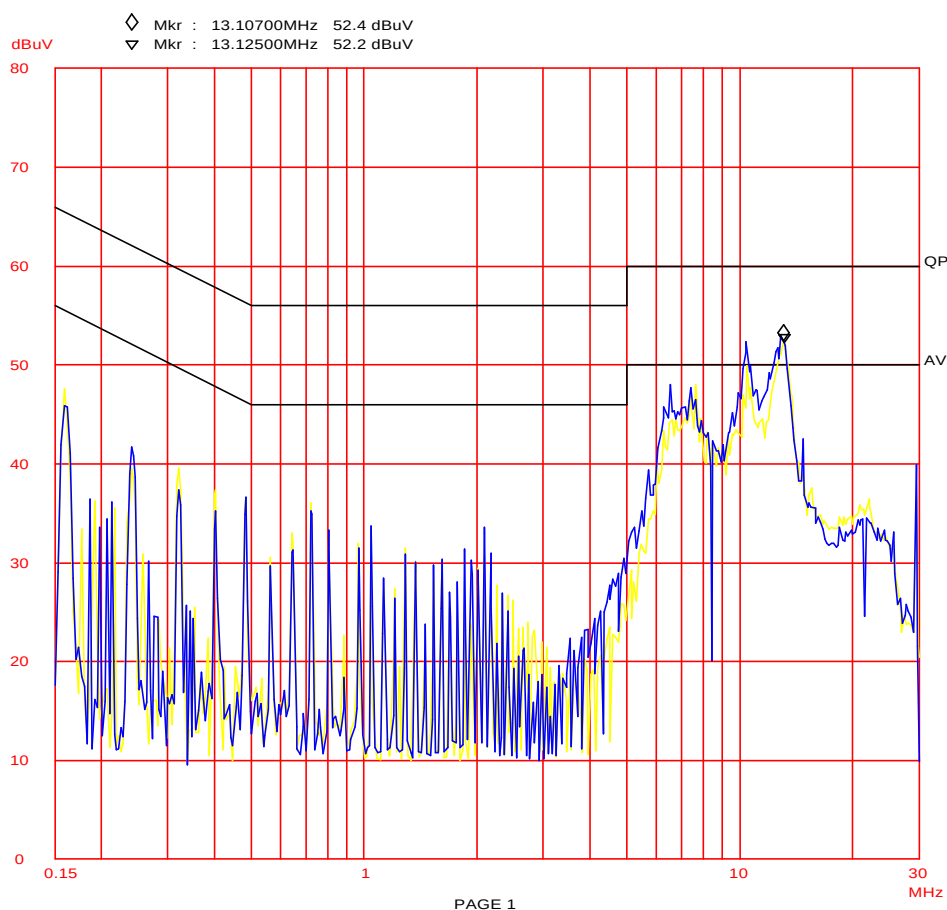
VDE Testing and Certification Institute Conducted emissions at the mains input

26. Aug 05 14:10

EUT: Commercial Coffee Maker with RFID
Manuf: N&W Global Vending, CFT600S
Op Cond: Ready, AC 240 V, 60 Hz
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 240 V, 3.5 kW, single phase
File ref.: 586400-2240-0010/93455 Trace 1: N, Trace 2: Hot

Fast Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamplifier	OpRge
150k	30M	3k	10k	PK	0.05ms	10dBLN	OFF	60dB



Operating mode: Activating service mode / Detection of the RF ID-Tag
No higher readings detected than in standby mode.



Final measurements (manually taken)

Average

Measurement of the disturbance voltage

Fre- quency	Reading	QP or AV	Correction	Measured Value	Limit	Margin	Result	Comments / Remarks
MHz	dB(μV)		dB	dB(μV)	dB(μV)	dB		
0,161	43,4	AV	0	43,4	55,41	12,01	PASS	Hot
0,161	45,1	AV	0	45,1	55,41	10,31	PASS	Neutral
0,241	40,8	AV	0	40,8	52,06	11,26	PASS	Neutral
0,241	38,1	AV	0	38,1	52,06	13,96	PASS	Hot
0,321	38,3	AV	0	38,3	49,68	11,38	PASS	Hot
0,321	37	AV	0	37	49,68	12,68	PASS	Neutral
0,481	36,3	AV	0	36,3	46,32	10,02	PASS	Hot
0,481	35,7	AV	0	35,7	46,32	10,62	PASS	Neutral
0,725	34	AV	0	34	46	12	PASS	Hot
0,725	34	AV	0	34	46	12	PASS	Neutral
4,942	20,2	AV	0	20,2	46	25,8	PASS	Hot
4,942	26,3	AV	0	26,3	46	19,7	PASS	Neutral
6,551	38,6	AV	0	38,6	50	11,4	PASS	Hot
6,551	40,5	AV	0	40,5	50	9,5	PASS	Neutral
10,476	47,7	AV	0	47,7	50	2,3	PASS	Neutral
10,476	43,4	AV	0	43,4	50	6,6	PASS	Hot
13,1	44,8	AV	0	44,8	50	5,2	PASS	Hot
13,1	46,8	AV	0	46,8	50	3,2	PASS	Neutral



Quasi-peak

Measurement of the disturbance voltage

Fre- quency	Reading	QP or AV	Correction	Measured Value	Limit	Margin	Result	Comments / Remarks
MHz	dB(μV)		dB	dB(μV)	dB(μV)	dB		
0,161	45	QP	0	45	65,41	20,41	PASS	Hot
0,161	46,3	QP	0	46,3	65,41	19,11	PASS	Neutral
0,241	41,7	QP	0	41,7	62,06	20,36	PASS	Neutral
0,241	39,3	QP	0	39,3	62,06	22,76	PASS	Hot
0,321	39,5	QP	0	39,5	59,68	20,18	PASS	Hot
0,321	37,9	QP	0	37,9	59,68	21,78	PASS	Neutral
0,481	37,3	QP	0	37,3	56,32	19,02	PASS	Hot
0,481	36,7	QP	0	36,7	56,32	19,62	PASS	Neutral
0,725	35,1	QP	0	35,1	56	20,9	PASS	Hot
0,725	35	QP	0	35	56	21	PASS	Neutral
4,942	24,7	QP	0	24,7	56	31,3	PASS	Hot
4,942	29,2	QP	0	29,2	56	26,8	PASS	Neutral
6,551	44	QP	0	44	60	16	PASS	Hot
6,551	46,2	QP	0	46,2	60	13,8	PASS	Neutral
10,476	52,4	QP	0	52,4	60	7,6	PASS	Neutral
10,476	50,3	QP	0	50,3	60	9,7	PASS	Hot
13,1	50,3	QP	0	50,3	60	9,7	PASS	Hot
13,1	52,2	QP	0	52,2	60	7,8	PASS	Neutral

6.1.1.2 Spending "cappuccino"

VDE Testing and Certification Institute Terminal disturbance voltage, mains line

16. Aug 05 06:27

EUT: Coffee machine
Manuf: N & W
Op Cond: Spending "cappuccino" continuously
Operator: H. Schmehl shielded room 3
Test Spec: DIN EN 55014-1, household appliance
Comment: CFT600S
586400-2240-0010/63455

Scan Settings (1 Range)

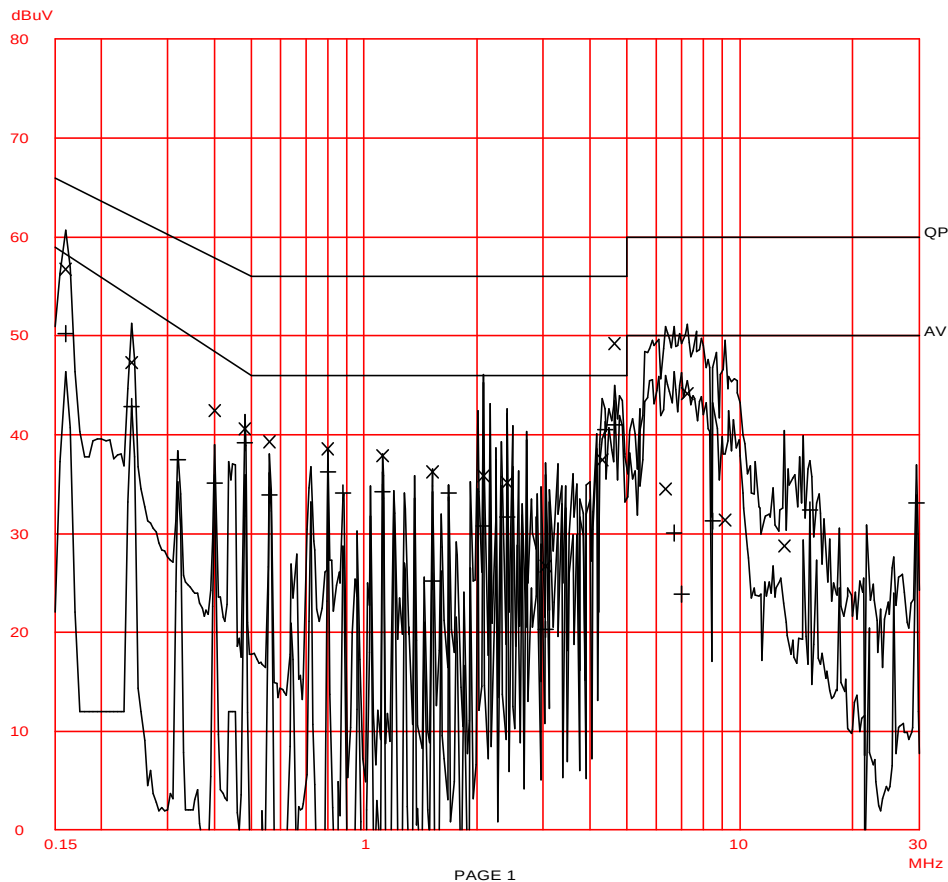
Frequencies				Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	30M	5k	10k	PK+AV	50ms	AUTO	LN OFF	30dB

Final Measurement: x QP / + AV

Meas Time: 2 s

Subranges: 25

Acc Margin: 20dB





VDE Testing and Certification Institute
Terminal disturbance voltage, mains line

16. Aug 05 06:27

EUT: Coffee machine
Manuf: N & W
Op Cond: Spending"capuccino" continuously
Operator: H. Schmehl shielded room 3
Test Spec: DIN EN 55014-1, household appliance
Comment: CFT600S
586400-2240-0010/63455

Scan Settings (1 Range)

[----- Frequencies -----][----- Receiver Settings -----]
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 5k 10k PK+AV 50ms AUTO LN OFF 30dB

Final Measurement Results:

Indicated Phase/PE shows Configuration of max. Emission

Frequency MHz	QP Level dBuV	QP Limit dBuV	Phase -	PE -
0.16000	56.6	65.5	L1	gnd
0.24000	47.3	62.1	N	gnd
0.40000	42.4	57.8	N	gnd
0.48000	40.5	56.4	L1	gnd
0.56000	39.2	56.0	L1	gnd
0.80000	38.5	56.0	L1	gnd
1.12000	37.8	56.0	L1	gnd
1.52000	36.2	56.0	L1	gnd
2.08000	35.8	56.0	L1	gnd
2.40000	35.1	56.0	N	gnd
3.04000	26.6	56.0	L1	gnd
4.32000	37.4	56.0	N	gnd
4.63500	49.2	56.0	N	gnd
6.34500	34.5	60.0	L1	gnd
7.25500	44.1	60.0	L1	gnd
9.11500	31.3	60.0	N	gnd
13.16000	28.7	60.0	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	Phase -	PE -
0.16000	50.2	58.4	N	gnd
0.24000	42.8	54.0	L1	gnd
0.32000	37.4	50.8	N	gnd
0.40000	35.1	48.4	L1	gnd
0.48000	39.1	46.5	L1	gnd
0.56000	33.8	46.0	N	gnd
0.80000	36.2	46.0	L1	gnd
0.88000	34.1	46.0	L1	gnd
1.12000	34.2	46.0	L1	gnd
1.52000	25.2	46.0	N	gnd
1.68000	34.1	46.0	L1	gnd
2.08000	30.8	46.0	L1	gnd
2.40000	31.7	46.0	N	gnd
3.04000	20.2	46.0	L1	gnd
4.39500	40.5	46.0	N	gnd
4.63500	41.0	46.0	L1	gnd
6.67500	30.0	50.0	N	gnd
7.01000	23.8	50.0	N	gnd
8.48000	31.2	50.0	N	gnd
15.36000	32.4	50.0	N	gnd
29.49000	33.1	50.0	L1	gnd

PAGE 2

6.1.1.3 Mixer motor active

VDE Testing and Certification Institute Terminal disturbance voltage, mains line

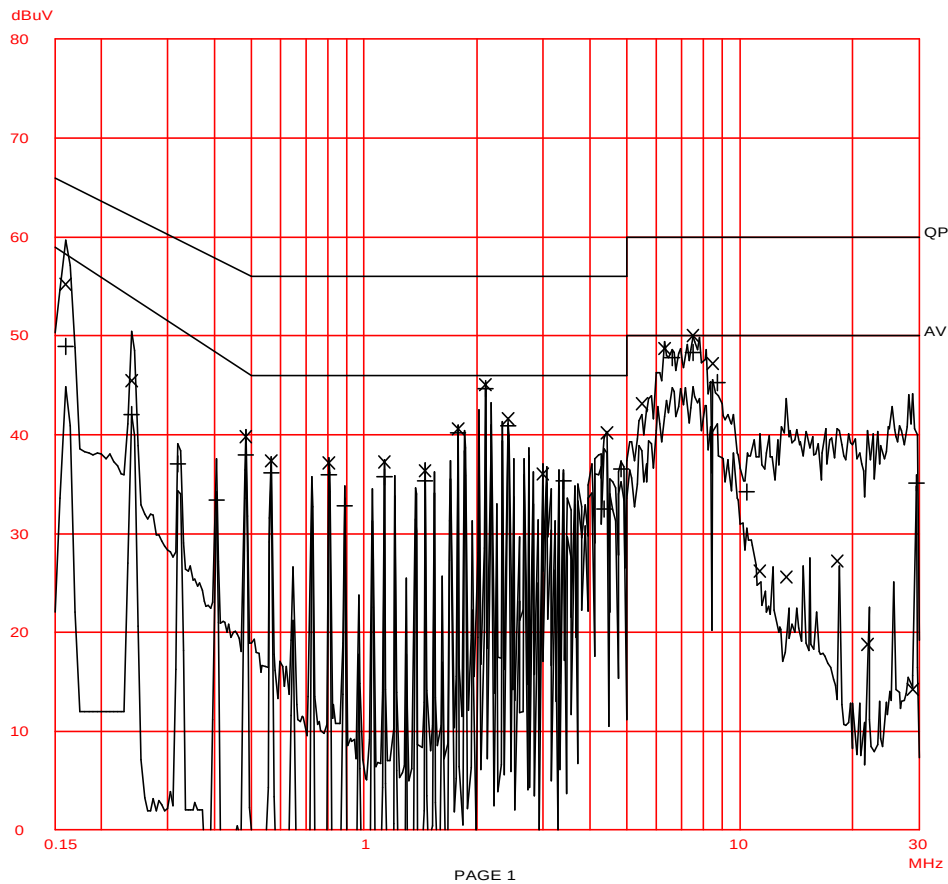
16. Aug 05 06:50

EUT: Coffee machine
Manuf: N & W
Op Cond: Coin return motor active
Operator: H. Schmehl shielded room 3
Test Spec: DIN EN 55014-1, household appliance
Comment: CFT600S
586400-2240-0010/63455

Scan Settings (1 Range)

Frequencies				Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp OpRge
150k	30M	5k	10k	PK+AV	50ms	AUTO	LN OFF 30dB

Final Measurement: x QP / + AV
Meas Time: 2 s
Subranges: 25
Acc Margin: 20dB





VDE Testing and Certification Institute
Terminal disturbance voltage, mains line

16. Aug 05 06:50

EUT: Coffee machine
Manuf: N & W
Op Cond: Coin return motor active
Operator: H. Schmehl shielded room 3
Test Spec: DIN EN 55014-1, household appliance
Comment: CFT600S
586400-2240-0010/63455

Scan Settings (1 Range)

|----- Frequencies -----||----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 5k 10k PK+AV 50ms AUTO LN OFF 30dB

Final Measurement Results:

Indicated Phase/PE shows Configuration of max. Emission

Frequency MHz	QP Level dBuV	QP Limit dBuV	Phase -	PE -
0.16000	55.2	65.5	N	gnd
0.24000	45.4	62.1	L1	gnd
0.48500	39.8	56.3	L1	gnd
0.56500	37.3	56.0	L1	gnd
0.80500	37.1	56.0	L1	gnd
1.13000	37.2	56.0	L1	gnd
1.45500	36.3	56.0	L1	gnd
1.77500	40.6	56.0	L1	gnd
2.10000	45.1	56.0	L1	gnd
2.42000	41.6	56.0	N	gnd
2.98500	36.0	56.0	L1	gnd
4.44000	40.1	56.0	N	gnd
5.49000	43.1	60.0	N	gnd
6.29500	48.6	60.0	N	gnd
7.50500	50.0	60.0	N	gnd
8.48000	47.1	60.0	N	gnd
11.31500	26.2	60.0	N	gnd
13.28500	25.5	60.0	L1	gnd
18.17000	27.1	60.0	L1	gnd
21.85500	18.8	60.0	L1	gnd
28.84500	14.2	60.0	L1	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	Phase -	PE -
0.16000	48.9	58.4	N	gnd
0.24000	42.0	54.0	L1	gnd
0.32000	37.0	50.8	N	gnd
0.40500	33.4	48.4	L1	gnd
0.48500	37.9	46.4	L1	gnd
0.56500	36.1	46.0	L1	gnd
0.80500	35.9	46.0	L1	gnd
0.89000	32.7	46.0	L1	gnd
1.13000	35.7	46.0	L1	gnd
1.45500	35.3	46.0	L1	gnd
1.77500	40.2	46.0	L1	gnd
2.10000	44.6	46.0	L1	gnd
2.42000	40.9	46.0	N	gnd
3.39000	35.3	46.0	L1	gnd
4.36000	32.5	46.0	L1	gnd
4.84500	36.5	46.0	N	gnd
6.62000	47.8	50.0	N	gnd
7.51000	48.3	50.0	N	gnd

PAGE 2



8.72000	45.2	50.0	N	gnd
10.41500	34.1	50.0	N	gnd
29.49000	35.0	50.0	L1	gnd

16. Aug 05 06:

* limit exceeded



6.2 Radiated emissions (electric fieldstrength) acc. to EN 55022

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2005-08-26

Instruments:	Test Location: 10 m OATS (Building N)		
Inventory number	Description	Manufacturer	Type
1150007	FUNKSTOERMESSEMPFAENGER	R&S	ESVS30
1810061	ANTENNE	SCHWARZBECK	VULB9163

Test setup:

The coffee maker was operated on a non-conductive table of 0.8 m height. The power cable was routed vertically to the turntable where the power outlet was located. For details refer to the photographs in the appendix.

Operating modes investigated:

Standby

During preliminary investigations in a shielded room it was determined that the emission level changes only marginal with the operating mode. Especially the level of the narrowband disturbances did not change significantly when the RF identification was activated.

Protocol:

During preliminary investigations in a shielded room it was determined that the emission level changes only marginal with the operating mode. Especially the level of the narrowband disturbances did not change significantly when the RF identification was activated.

Therefore, and also for practical reasons, the final measurement of the electric fieldstrength was carried out with the coffee maker in standby mode.

Measurement data can be found on the following page.

Result: Passed

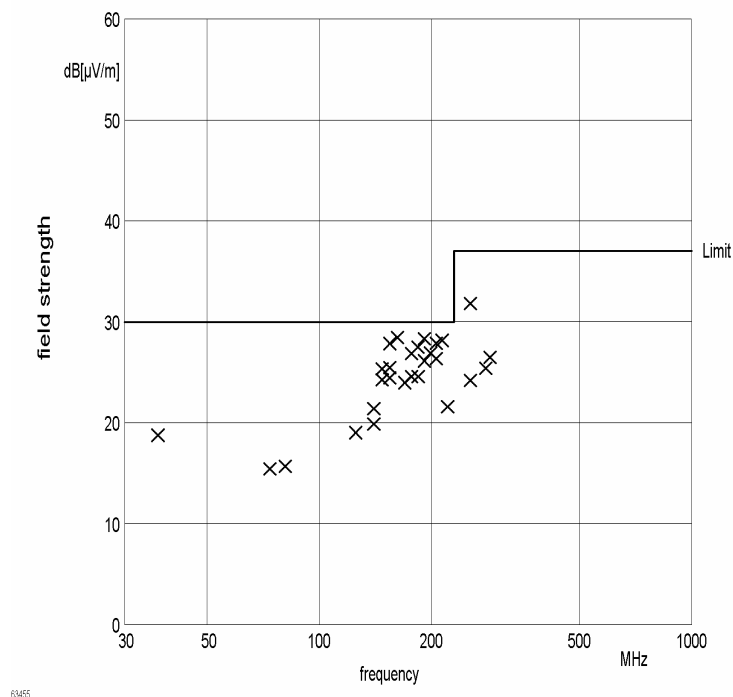
The emissions of the EUT were found to be below the specified limits.

The minimum margin of the highest reading relative to the limit was 1,57 dB.

Electric field strength, summarizing table of the 6 highest readings relative to the limit

Fre- quency	Distance	Height of An- tenna	Polari- zation	EUT Angle	Reading	An- tenna- factor	Σ	Limit	Margin	Result	Remarks
MHz	m	m		1°	dB(μV)	dB/m	dB(μV/m)	dB(μV/m)	dB		
162,19	10	1,2	Ver.	0	18,2	10,23	28,43	30	1,57	PASS	
191,69	10	3,9	Hor.	40	15,9	12,42	28,32	30	1,68	PASS	
213,8	10	3,4	Hor.	60	15,1	13,05	28,15	30	1,85	PASS	incl. ambient noise
206,44	10	1,1	Ver.	0	15,1	12,76	27,86	30	2,14	PASS	
154,83	10	4	Hor.	30	18	9,84	27,84	30	2,16	PASS	
184,31	10	3,8	Hor.	30	15,6	11,89	27,49	30	2,51	PASS	

Test results: Electrical Fieldstrength



Electrical Fieldstrength: Table of measured data

Quasi-peak

Fre- quency MHz	Distance m	Height of An- tenna m	Polari- zation	EUT Angle 1°	Reading dB(μV)	An- tenna- factor dB/m	Σ dB(μV/m)	Limit dB(μV/m)	Margin dB	Result	Remarks
36,87	10	2	Ver.	0	5,5	13,26	18,76	30	11,24	PASS	
73,73	10	2	Ver.	0	6,8	8,65	15,45	30	14,55	PASS	
81,1	10	2	Ver.	270	6	9,7	15,7	30	14,3	PASS	
125,33	10	1,2	Ver.	330	8,4	10,61	19,01	30	10,99	PASS	
140,08	10	1,2	Ver.	330	12	9,4	21,4	30	8,6	PASS	
140,08	10	4	Hor.	30	10,5	9,4	19,9	30	10,1	PASS	
147,46	10	1,2	Ver.	0	14,7	9,55	24,25	30	5,75	PASS	
147,46	10	4	Hor.	0	15,8	9,55	25,35	30	4,65	PASS	
154,83	10	4	Hor.	15	14,6	9,84	24,44	30	5,56	PASS	
154,83	10	4	Hor.	30	18	9,84	27,84	30	2,16	PASS	
154,83	10	1,2	Ver.	0	15,6	9,84	25,44	30	4,56	PASS	
162,19	10	1,2	Ver.	0	18,2	10,23	28,43	30	1,57	PASS	
169,57	10	4	Hor.	0	13,3	10,67	23,97	30	6,03	PASS	
176,93	10	1,1	Ver.	0	15,6	11,25	26,85	30	3,15	PASS	
176,94	10	4	Hor.	0	13,3	11,26	24,56	30	5,44	PASS	
184,31	10	3,8	Hor.	30	15,6	11,89	27,49	30	2,51	PASS	



Fre- quency MHz	Distance m	Height of An- tenna m	Polari- zation	EUT Angle 1°	Reading dB(μV)	An- tenna- factor dB/m	Σ dB(μV/m)	Limit dB(μV/m)	Margin dB	Result	Remarks
184,32	10	1,1	Ver.	300	12,7	11,89	24,59	30	5,41	PASS	
191,69	10	1,1	Ver.	330	13,7	12,42	26,12	30	3,88	PASS	
191,69	10	3,9	Hor.	40	15,9	12,42	28,32	30	1,68	PASS	
199,06	10	3,9	Hor.	30	14,4	12,49	26,89	30	3,11	PASS	
206,44	10	3,5	Hor.	60	13,6	12,76	26,36	30	3,64	PASS	
206,44	10	1,1	Ver.	0	15,1	12,76	27,86	30	2,14	PASS	
213,8	10	3,4	Hor.	60	15,1	13,05	28,15	30	1,85	PASS	incl. ambient noise
221,19	10	3,8	Hor.	170	8,2	13,37	21,57	30	8,43	PASS	
254,5	10	2,1	Hor.	0	17,3	14,5	31,8	37	5,2	PASS	
254,5	10	1,1	Ver.	30	9,7	14,5	24,2	37	12,8	PASS	
280,16	10	1,1	Ver.	330	10,1	15,31	25,41	37	11,59	PASS	
287,53	10	4	Ver.	340	10,9	15,6	26,5	37	10,5	PASS	

7 Appendix

7.1 Photos of the test setup (radiated emissions)



Figure 1



Figure 2



Figure 3

7.2 Photos of the test setup (conducted emissions)



Figure 4



Figure 5

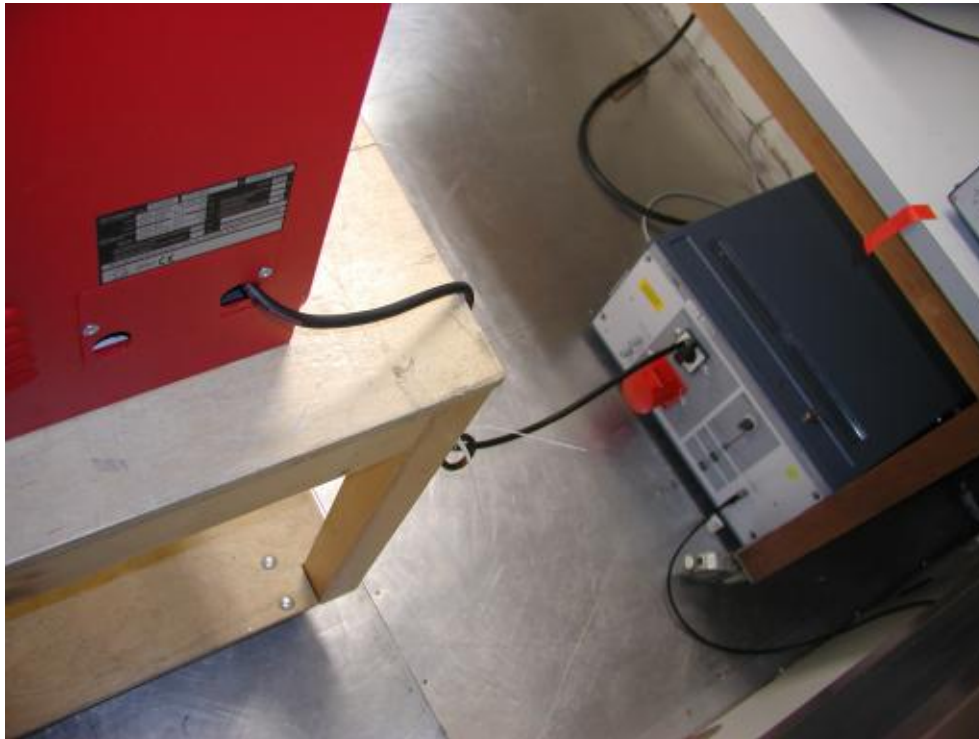


Figure 6

7.3 Photos of the EUT



Figure 7 View of the front



Figure 8 Name plate for Europe

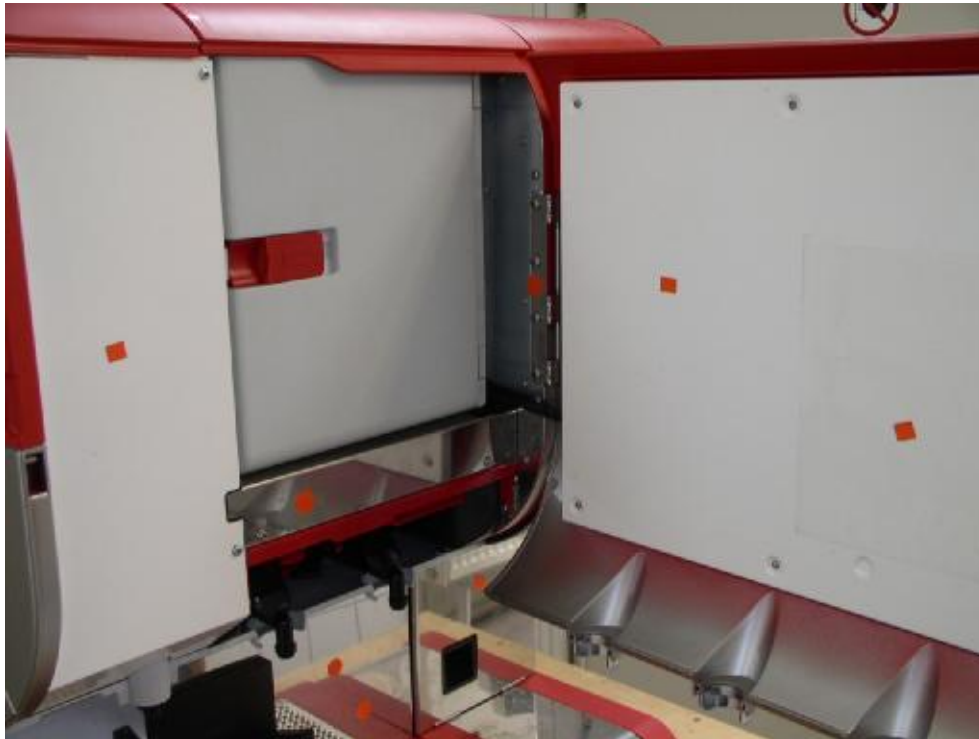


Figure 9 View into the service compartment; the transceiver is built into the front door

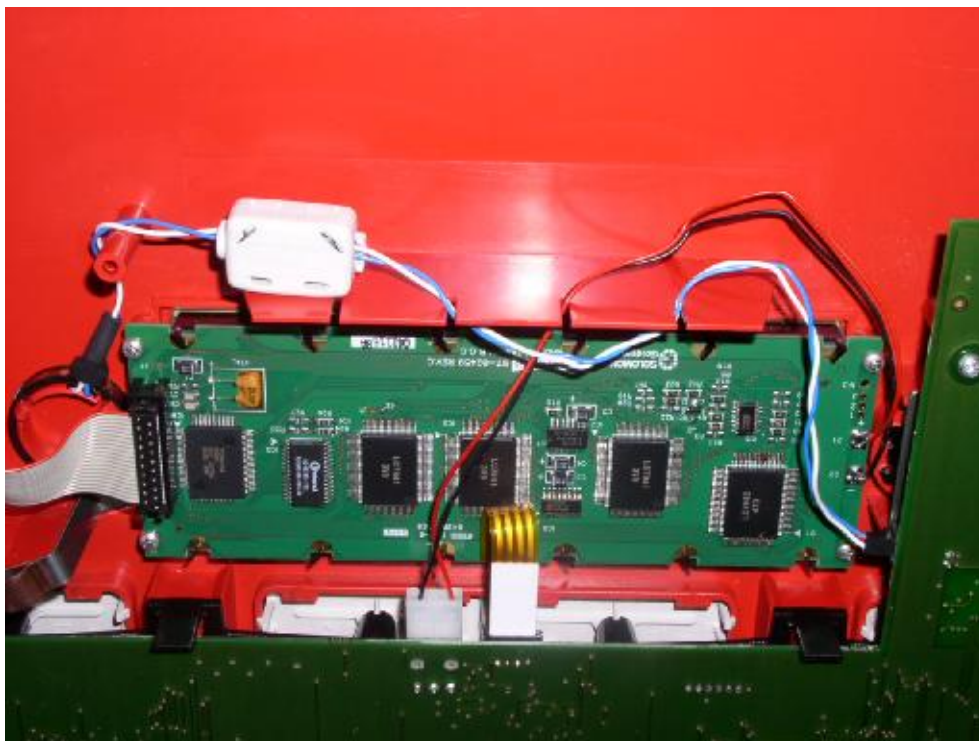


Figure 10 Ferrite on the lines to the RFID antenna

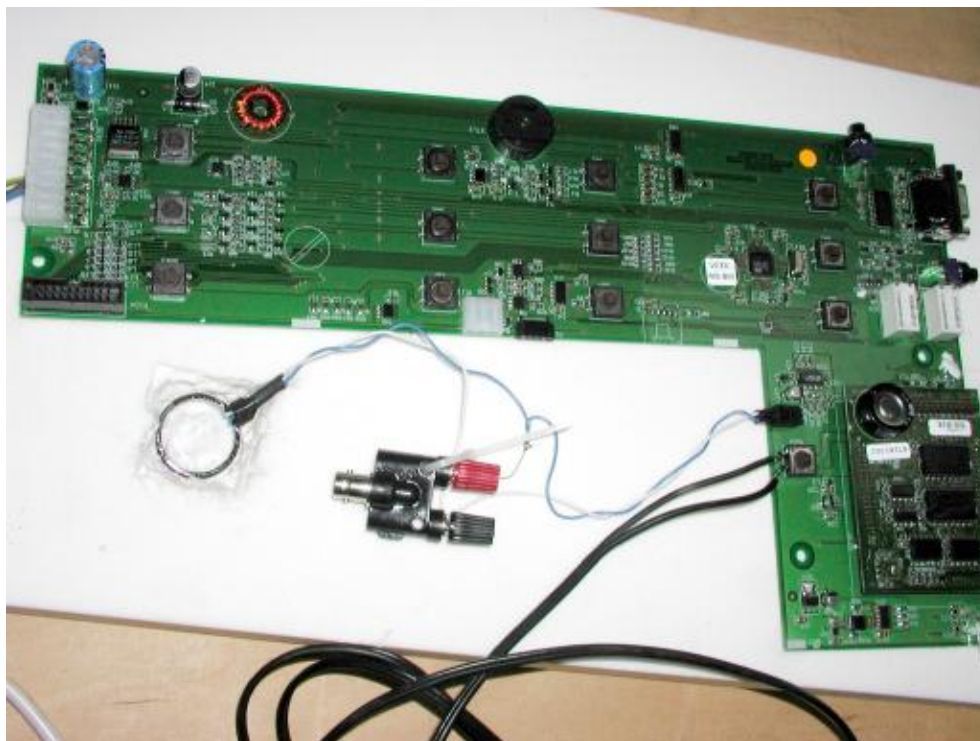


Figure 11 User interface board with RFID antenna

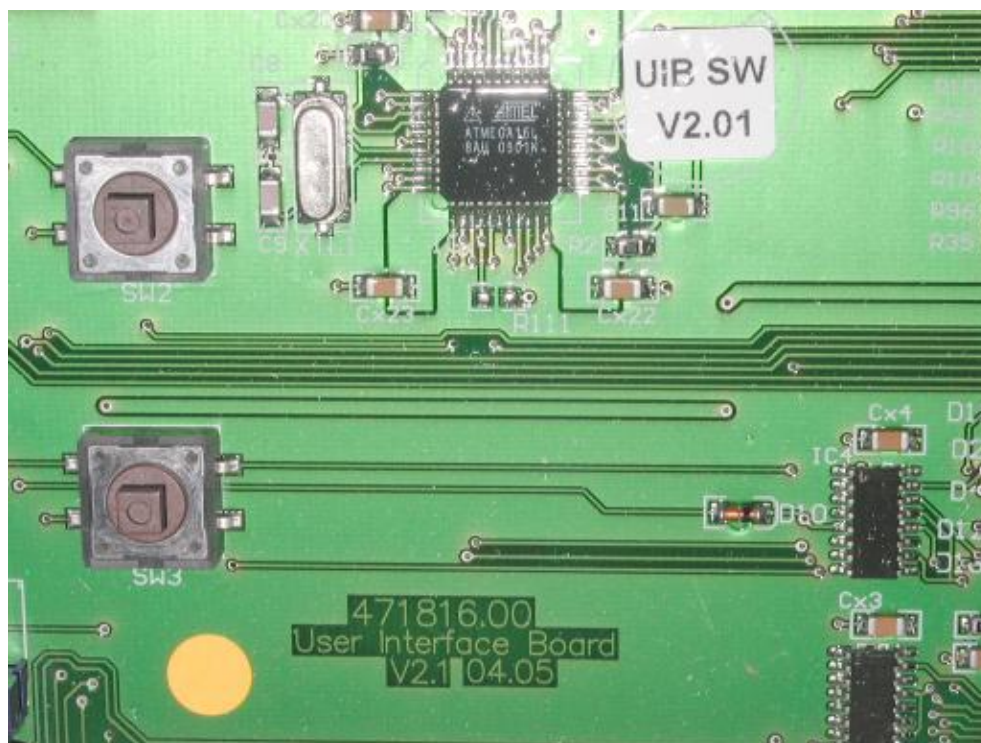
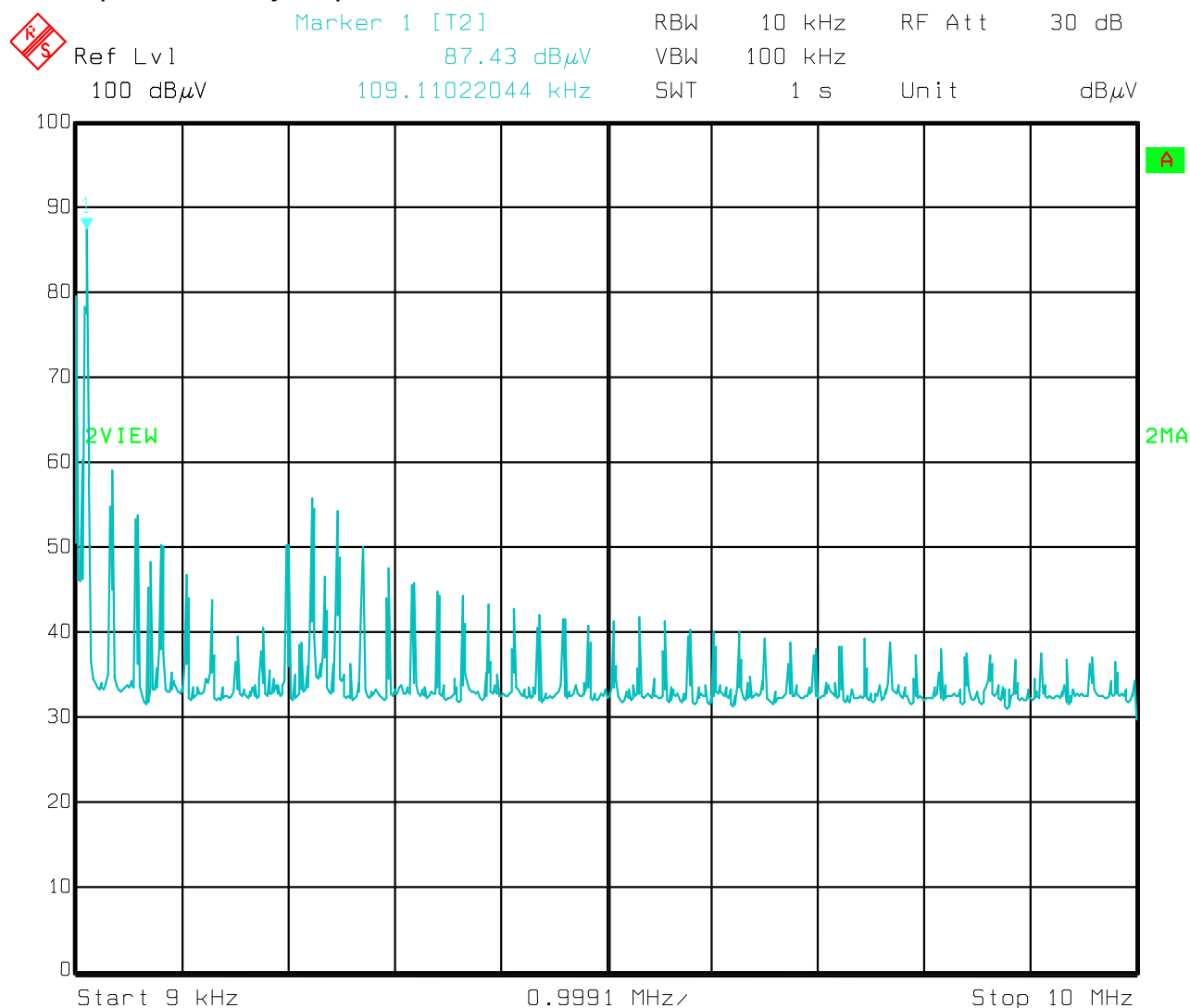


Figure 12 Inscriptions on the User Interface Board

7.4 Spectrum analyzer plots



Title: N&W, 55C, 24.0 V
 Date: 24.AUG.2005 17:10:26

Figure 13: Spectrum overview from 9 kHz to 10 MHz

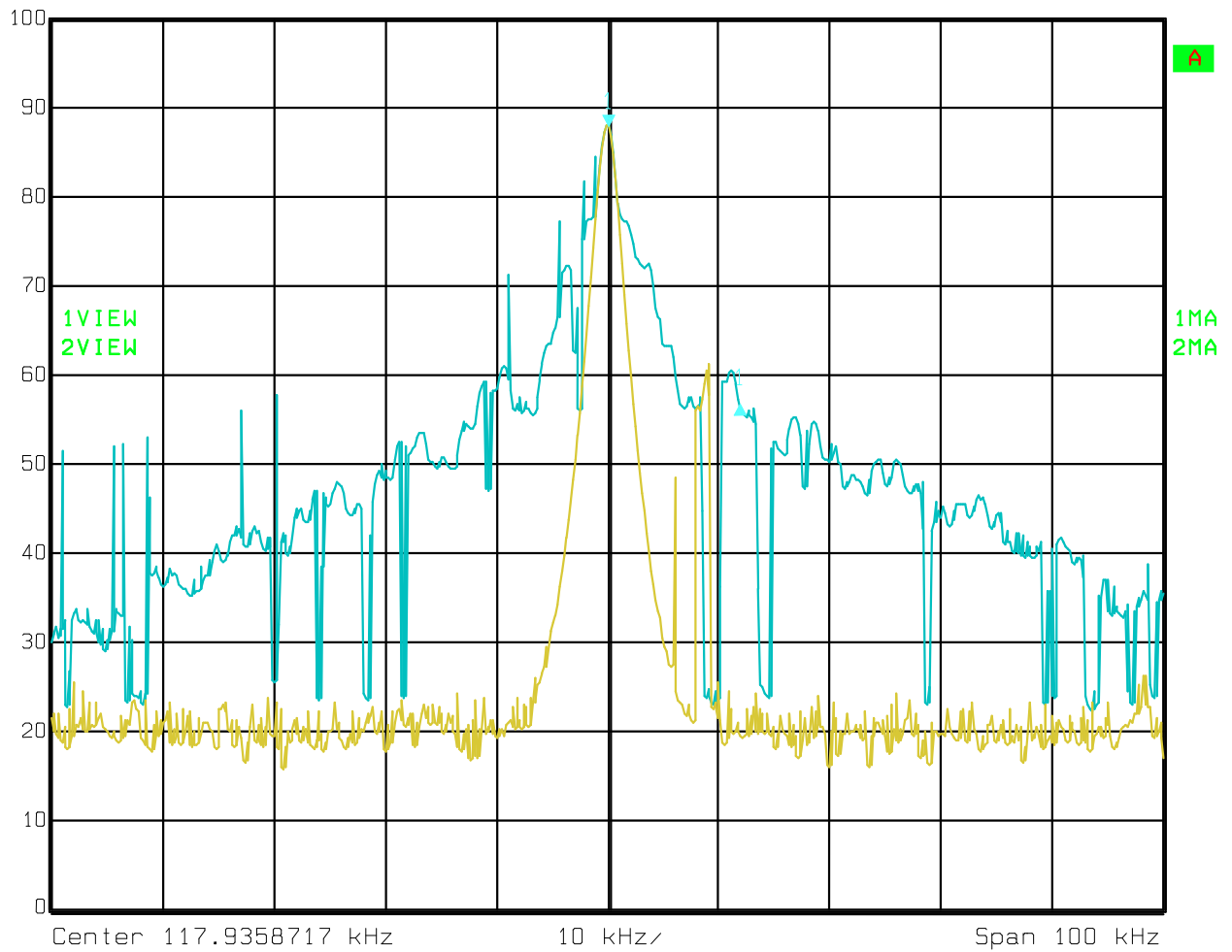
The disturbances appearing between the harmonics are caused by transient effects after inilisation of the transmitter.



Ref Lvl
100 dB μ V

Delta 1 [T2]
-30.96 dB
11.82364729 kHz

RBW 1 kHz RF Att 30 dB
VBW 10 kHz
SWT 2 s Unit dB μ V



Title: N&W, 24C, 21.6 V
Date: 24.AUG.2005 11:14:18

Figure 14: Envelope of the spectrum of the wanted signal,
recorded with 24°C ambient temperature and 21.6 V supply voltage

7.5 Identification of the requirements to intentional radiators acc. to FCC Part 15, Subpart C

7.5.1 General Requirements

Table of requirements and applicable test suites to transmitters

Reference	Requirement	Applicability	Remarks
§ 15.201	Equipment authorization requirement		
	(a) (a) Intentional radiators operated as carrier current systems, devices operated under the provisions of §§15.211, 15.213, and 15.221, and devices operating below 490 kHz in which all emissions are at least 40 dB below the limits in §15.209 shall be verified pursuant to the procedures in Subpart J of Part 2 of this chapter prior to marketing.	not applicable	The fundamental frequency of the wanted signal is more than 40 dB the limit of §15.209, but the harmonics might have less than 40 dB margin.
	(b) Except as otherwise exempted in paragraph (c) of this section and in §15.23 of this part, all intentional radiators operating under the provisions of this part shall be certificated by the Commission pursuant to the procedures in Subpart J of Part 2 of this chapter prior to marketing.	applicable	The EUT must be certificated prior to marketing.
	(c) For devices such as perimeter protection systems which, in accordance with §15.31(d), are required to be measured at the installation site, each application for certification must be accompanied by a statement indicating that the system has been tested at three installations and found to comply at each installation. Until such time as certification is granted, a given installation of a system that was measured for the submission for certification will be considered to be in compliance with the provisions of this chapter, including the marketing regulations in Subpart I of Part 2 of this chapter, if tests at that installation show the system to be in compliance with the relevant technical requirements. Similarly, where measurements must be performed on site for equipment subject to verification, a given installation that has been verified to demonstrate compliance with the applicable standards will be considered to be in compliance with the provisions of this chapter, including the marketing regulations in Subpart I of Part 2 of this chapter.	not applicable	
	(d) For perimeter protection systems operating in the frequency bands allocated to television broadcast stations operating under Part 73 of this chapter, the holder of the grant of certification must test each installation prior to initiation of normal operation to verify compliance with the technical standards and must maintain a list of all installations and records of measurements. For perimeter protection systems operating outside of the frequency bands allocated to television broadcast stations, upon receipt of a grant of certification, further testing of the same or similar type of system or installation is not required.	not applicable	
§ 15.202	Certified operation frequency range		
	Client devices that operate in a master/client network may be certified if they have the capability of operating outside permissible Part 15 frequency bands, provided they operate on only permissible Part 15 frequencies under the control of the master device with which they communicate. Master devices marketed within the United States must be limited to operation on permissible Part 15 frequencies. Client devices that can also act as master device is defined as a device operating in a mode in which it has the capability to transmit without receiving an enabling signal. In this mode it is able to select a channel and initiate a network by sending enabling signals to other devices. A network always has at least one device operating in master mode. A client device is defined as a device operating in a mode in which the transmissions of the device are under control of the master. A device in client mode is not able to initiate a network.	not applicable	



Reference	Requirement	Applicability	Remarks
§ 15.203	Antenna requirement		
	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	applicable	The dedicated loop antenna is located behind the front panel of the coffee maker and cannot be accessed or replaced by the user.
§ 15.204	External radio frequency power amplifiers and antenna modifications		
	(a) Except as otherwise described in paragraphs (b) and (d) of this section, no person shall use, manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease), or import, ship, or distribute for the purpose of selling or leasing, any external radio frequency power amplifier or amplifier kit intended for use with a Part 15 intentional radiator.	not applicable	The EUT does not provide any possibility for connecting to an external power amplifier.
	(b) A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized.	not applicable	It is not intended to market the product as a transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna.
	(c) An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types. (1) The antenna type, as used in this paragraph, refers to antennas that have similar in-band and out-of-band radiation patterns. (2) Compliance testing shall be performed using the highest gain antenna for each type of antenna to be certified with the intentional radiator. During this testing, the intentional radiator shall be operated at its maximum available output power level. (3) Manufacturers shall supply a list of acceptable antenna types with the application for equipment authorization of the intentional radiator. (4) Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator. No retesting of this system configuration is required. The marketing or use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the antenna authorized with the intentional radiator is not permitted unless the procedures specified in §2.1043 of this chapter are followed.	applicable	The dedicated loop antenna is located behind the front panel of the coffee maker and cannot be accessed or replaced by the user.



Reference	Requirement	Applicability	Remarks																																																																								
§15.204 (cont.)	(d) Except as described in this paragraph, an external radio frequency power amplifier or amplifier kit shall be marketed only with the system configuration with which it was approved and not as a separate product. (1) An external radio frequency power amplifier may be marketed for individual sale provided it is intended for use in conjunction with a transmitter that operates in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands pursuant to §15.247 of this part or a transmitter that operates in the 5.725-5.825 GHz band pursuant to §15.407 of this part. The amplifier must be of a design such that it can only be connected as part of a system in which it has been previously authorized. (The use of a non-standard connector or a form of electronic system identification is acceptable.) The output power of such an amplifier must not exceed the maximum permitted output power of its associated transmitter. (2) The outside packaging and user manual for external radio frequency power amplifiers sold in accordance with paragraph (d)(1) of this section must include notification that the amplifier can be used only in a system which it has obtained authorization. Such a notice must identify the authorized system by FCC Identifier.	not applicable																																																																									
§ 15.205	Restricted bands of operation																																																																										
	(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below: <table><thead><tr><th>MHz</th><th>MHz</th><th>MHz</th><th>GHz</th></tr></thead><tbody><tr><td>0.090-0.110</td><td>16.42-16.423</td><td>399.9-410</td><td>4.5-5.15</td></tr><tr><td>0.495-0.505 1</td><td>16.69475-16.69525</td><td>608-614</td><td>5.35-5.46</td></tr><tr><td>2.1735-2.1905</td><td>16.80425-16.80475</td><td>960-1240</td><td>7.25-7.75</td></tr><tr><td>4.125-4.128</td><td>25.5-25.67</td><td>1300-1427</td><td>8.025-8.5</td></tr><tr><td>4.17725-4.17775</td><td>37.5-38.25</td><td>1435-1626.5</td><td>9.0-9.2</td></tr><tr><td>4.20725-4.20775</td><td>73-74.6</td><td>1645.5-1646.5</td><td>9.3-9.5</td></tr><tr><td>6.215-6.218</td><td>74.8-75.2</td><td>1660-1710</td><td>10.6-12.7</td></tr><tr><td>6.26775-6.26825</td><td>108-121.94</td><td>1718.8-1722.2</td><td>13.25-13.4</td></tr><tr><td>6.31175-6.31225</td><td>123-138</td><td>2200-2300</td><td>14.47-14.5</td></tr><tr><td>8.291-8.294</td><td>149.9-150.05</td><td>2310-2390</td><td>15.35-16.2</td></tr><tr><td>8.362-8.366</td><td>156.52475-156.52525</td><td>2483.5-2500</td><td>17.7-21.4</td></tr><tr><td>8.37625-8.38675</td><td>156.7-156.9</td><td>2655-2900</td><td>22.01-23.12</td></tr><tr><td>8.41425-8.41475</td><td>162.0125-167.17</td><td>3260-3267</td><td>23.6-24.0</td></tr><tr><td>12.29-12.293</td><td>167.72-173.2</td><td>3332-3339</td><td>31.2-31.8</td></tr><tr><td>12.51975-12.52025</td><td>240-285</td><td>3345.8-3358</td><td>36.43-36.5</td></tr><tr><td>12.57675-12.57725</td><td>322-335.4</td><td>3600-4400</td><td>Above 38.6</td></tr><tr><td>13.36-13.41</td><td></td><td></td><td></td></tr></tbody></table>	MHz	MHz	MHz	GHz	0.090-0.110	16.42-16.423	399.9-410	4.5-5.15	0.495-0.505 1	16.69475-16.69525	608-614	5.35-5.46	2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75	4.125-4.128	25.5-25.67	1300-1427	8.025-8.5	4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2	4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5	6.215-6.218	74.8-75.2	1660-1710	10.6-12.7	6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4	6.31175-6.31225	123-138	2200-2300	14.47-14.5	8.291-8.294	149.9-150.05	2310-2390	15.35-16.2	8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4	8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12	8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0	12.29-12.293	167.72-173.2	3332-3339	31.2-31.8	12.51975-12.52025	240-285	3345.8-3358	36.43-36.5	12.57675-12.57725	322-335.4	3600-4400	Above 38.6	13.36-13.41				applicable	The fundamental frequency of the transmitter is approx. 125 kHz and therefore out of the restricted frequency bands.
MHz	MHz	MHz	GHz																																																																								
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15																																																																								
0.495-0.505 1	16.69475-16.69525	608-614	5.35-5.46																																																																								
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13.36-13.41																																																																											
	(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.	applicable	Measurements in accordance with § 15.209 are required.																																																																								
	(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.	applicable																																																																									
	(d) The following devices are exempt from the requirements of this section: (1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle. (2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies. (3) Cable locating equipment operated pursuant to §15.213. (4) Any equipment operated under the provisions of §15.253 or	not applicable																																																																									



	§15.255. (5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands. (6) Transmitters operating under the provisions of Subparts D or F of this part. (7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only. (8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b). (9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a). (e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).		
	(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).	not applicable	

Reference	Requirement	Applicability	Remarks															
§ 15.207	Conducted limits																	
	(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, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges. <table><tr><td>Frequency of emission (MHz)</td><td colspan="2">Conducted limit (dBµV)</td></tr><tr><td></td><td>Quasi-peak</td><td>Average</td></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.	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	applicable	The EUT was found to be in compliance with the specified 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																
	(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards: (1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions. (2) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN. (3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as provided in §15.205 and §§15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.	not applicable	The EUT is not a carrier current system.															
	(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.	applicable	The transmitter obtains power from a power supply unit that supplies the control circuitry (an unintentional radiator) of the coffee maker as well.															

Reference	Requirement	Applicability	Remarks																								
§ 15.209	Radiated emission limits, general requirements																										
	(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: <table><tr><th>Frequency (MHz)</th><th>Field Strength (microvolts/meter)</th><th>Measurement Distance (meters)</th></tr><tr><td>0.009-0.490</td><td>2400/F (kHz)</td><td>300</td></tr><tr><td>0.490-1.705</td><td>24000/F (kHz)</td><td>30</td></tr><tr><td>1.705-30.0</td><td>30</td><td>30</td></tr><tr><td>30-88</td><td>100 ¹</td><td>3</td></tr><tr><td>88-216</td><td>150 ¹</td><td>3</td></tr><tr><td>216-960</td><td>200 ¹</td><td>3</td></tr><tr><td>Above 960</td><td>500</td><td>3</td></tr></table> ¹ Except as provided in paragraph (g) of this section, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.	Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)	0.009-0.490	2400/F (kHz)	300	0.490-1.705	24000/F (kHz)	30	1.705-30.0	30	30	30-88	100 ¹	3	88-216	150 ¹	3	216-960	200 ¹	3	Above 960	500	3	applicable	
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)																									
0.009-0.490	2400/F (kHz)	300																									
0.490-1.705	24000/F (kHz)	30																									
1.705-30.0	30	30																									
30-88	100 ¹	3																									
88-216	150 ¹	3																									
216-960	200 ¹	3																									
Above 960	500	3																									
	(b) In the emission table above, the tighter limit applies at the band edges.																										
	(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.																										
	(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.																										
	(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.																										
	(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.	applicable	A digital device is incorporated. For frequencies up to 30 MHz, measurements against the limits of § 15.209 (a) are required. In addition, measurements against the limits shown in §15.109 are required in the frequency range from 30 MHz to 1000 MHz.																								
	(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.	not applicable	The EUT is not a perimeter protection system.																								



Reference	Requirement	Applicability	Remarks
§ 15.211	Tunnel radio systems		
	An intentional radiator utilized as part of a tunnel radio system may operate on any frequency provided it meets all of the following conditions:	not applicable	
	(a) Operation of a tunnel radio system (intentional radiator and all connecting wires) shall be contained solely within a tunnel, mine or other structure that provides attenuation to the radiated signal due to the presence of naturally surrounding earth and/or water.		
	(b) Any intentional or unintentional radiator external to the tunnel, mine or other structure, as described in paragraph (a) of this section, shall be subject to the other applicable regulations contained within this part.		
	(c) The total electromagnetic field from a tunnel radio system on any frequency or frequencies appearing outside of the tunnel, mine or other structure described in paragraph (a) of this section shall not exceed the limits shown in §15.209 when measured at the specified distance from the surrounding structure, including openings. Particular attention shall be paid to the emissions from any opening in the structure to the outside environment. When measurements are made from the openings, the distances shown in §15.209 refer to the distance from the plane of reference which fits the entire perimeter of each above ground opening.		
	(d) The conducted limits in §15.207 apply to the radio frequency voltage on the public utility power lines outside of the tunnel.		
§ 15.213	Cable locating equipment		
	An intentional radiator used as cable locating equipment, as defined in §15.3(d), may be operated on any frequency within the band 9-490 kHz, subject to the following limits: within the frequency band 9 kHz, up to, but not including, 45 kHz, the peak output power from the cable locating equipment shall not exceed 10 watts; and, within the frequency band 45 kHz to 490 kHz, the peak output power from the cable locating equipment shall not exceed one watt. If provisions are made for connection of the cable locating equipment to the AC power lines, the conducted limits in §15.207 also apply to this equipment.	not applicable	
§ 15.214	Cordless telephones		
	(a) through (d)	not applicable	

7.5.2 Radiated emission limits, additional provisions

Reference	Requirement	Applicability	Remarks
§ 15.215	Additional provisions to the general radiated emission limitations		
	(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.	not applicable	The fundamental frequency of the transmitter does not fall into one of the frequency bands for which alternative limits are specified.
	(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.		
	(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.		



7.6 Identification of requirements to unintentional radiators acc. to FCC Part 15, Subpart B

7.6.1 General Requirements

Table of requirements and applicable test suites to receivers, digital equipment and other unintentional radiators

Reference	Requirement	Applicability	Remarks																																				
§ 15.101	Equipment authorization of unintentional radiators																																						
	(a) Except as otherwise exempted in §15.23, 15.103, and 15.113, unintentional radiators shall be authorized prior to the initiation of marketing, as follows: <table><tr><td>Type of device</td><td>Equipment authorization required</td></tr><tr><td>TV broadcast receiver</td><td>Verification</td></tr><tr><td>FM broadcast receiver</td><td>Verification</td></tr><tr><td>CB receiver</td><td>DoC or Certification</td></tr><tr><td>Superregenerative receiver</td><td>DoC or Certification</td></tr><tr><td>Scanning receiver</td><td>Certification</td></tr><tr><td>Radar detector</td><td>Certification</td></tr><tr><td>All other receivers subject to part 15</td><td>DoC or Certification</td></tr><tr><td>TV interface device</td><td>DoC or Certification</td></tr><tr><td>Cable system terminal device</td><td>DoC</td></tr><tr><td>Stand-alone cable input selector switch</td><td>Verification</td></tr><tr><td>Class B personal computers and</td><td>DoC or peripherals Certification¹</td></tr><tr><td>CPU boards and internal power supplies used with Class B personal computers</td><td>DoC or Certification¹</td></tr><tr><td>Class B personal computers assembled using authorized CPU boards or power supplies</td><td>DoC</td></tr><tr><td>Class B external switching power supplies</td><td>Verification</td></tr><tr><td>Other Class B digital devices and peripherals</td><td>Verification</td></tr><tr><td>Class A digital devices, peripherals and external switching power supplies</td><td>Verification</td></tr><tr><td>All other devices</td><td>Verification</td></tr></table> NOTE to table: Where the above table indicates more than one category of authorization for a device, the party responsible for compliance has the option to select the type of authorization. ¹ Applications for this equipment will no longer be accepted by the Commission once domestic Telecommunication Certification Bodies are available to certificate the equipment. See §2.960 of this chapter.	Type of device	Equipment authorization required	TV broadcast receiver	Verification	FM broadcast receiver	Verification	CB receiver	DoC or Certification	Superregenerative receiver	DoC or Certification	Scanning receiver	Certification	Radar detector	Certification	All other receivers subject to part 15	DoC or Certification	TV interface device	DoC or Certification	Cable system terminal device	DoC	Stand-alone cable input selector switch	Verification	Class B personal computers and	DoC or peripherals Certification ¹	CPU boards and internal power supplies used with Class B personal computers	DoC or Certification ¹	Class B personal computers assembled using authorized CPU boards or power supplies	DoC	Class B external switching power supplies	Verification	Other Class B digital devices and peripherals	Verification	Class A digital devices, peripherals and external switching power supplies	Verification	All other devices	Verification	applicable	Certification required, see §15.201 (a) The measurements according to subpart B are required in particular for the digital circuitry that is incorporated into the transceiver.
Type of device	Equipment authorization required																																						
TV broadcast receiver	Verification																																						
FM broadcast receiver	Verification																																						
CB receiver	DoC or Certification																																						
Superregenerative receiver	DoC or Certification																																						
Scanning receiver	Certification																																						
Radar detector	Certification																																						
All other receivers subject to part 15	DoC or Certification																																						
TV interface device	DoC or Certification																																						
Cable system terminal device	DoC																																						
Stand-alone cable input selector switch	Verification																																						
Class B personal computers and	DoC or peripherals Certification ¹																																						
CPU boards and internal power supplies used with Class B personal computers	DoC or Certification ¹																																						
Class B personal computers assembled using authorized CPU boards or power supplies	DoC																																						
Class B external switching power supplies	Verification																																						
Other Class B digital devices and peripherals	Verification																																						
Class A digital devices, peripherals and external switching power supplies	Verification																																						
All other devices	Verification																																						
	(b) Only those receivers that operate (tune) within the frequency range of 30-960 MHz, CB receivers and radar detectors are subject to the authorizations shown in paragraph (a) of this section. However, receivers indicated as being subject to Declaration of Conformity that are contained within a transceiver, the transmitter portion of which is subject to certification, shall be authorized under the verification procedure. Receivers operating above 960 MHz or below 30 MHz, except for radar detectors and CB receivers, are exempt from complying with the technical provisions of this part but are subject to §15.5.	not applicable	The receiver portion, operating at 125 kHz, is exempt from complying with the technical provisions of this part.																																				



	(c) Personal computers shall be authorized in accordance with one of the following methods: (1) The specific combination of CPU board, power supply and enclosure is tested together and authorized under a Declaration of Conformity or a grant of certification; (2) The personal computer is authorized under a Declaration of Conformity or a grant of certification, and the CPU board or power supply in that computer is replaced with a CPU board or power supply that has been separately authorized under a Declaration of Conformity or a grant of certification; or (3) The CPU board and power supply used in the assembly of a personal computer have been separately authorized under a Declaration of Conformity or a grant of certification; and (4) Personal computers assembled using either of the methods specified in paragraphs (c)(2) or (c)(3) of this section must, by themselves, also be authorized under a Declaration of Conformity if they are marketed. However, additional testing is not required for this Declaration of Conformity, provided the procedures in §15.102(b) are followed.	not applicable	
	(d) Peripheral devices, as defined in §15.3(r), shall be authorized under a Declaration of Conformity, or a grant of certification, or verified, as appropriate, prior to marketing. Regardless of the provisions of paragraphs (a) or (c) of this section, if a CPU board, power supply, or peripheral device will always be marketed with a specific personal computer, it is not necessary to obtain a separate authorization for that product provided the specific combination of personal computer, peripheral device, CPU board and power supply has been authorized under a Declaration of Conformity or a grant of certification as a personal computer. (1) No authorization is required for a peripheral device or a subassembly that is sold to an equipment manufacturer for further fabrication; that manufacturer is responsible for obtaining the necessary authorization prior to further marketing to a vendor or to a user. (2) Power supplies and CPU boards that have not been separately authorized and are designed for use with personal computers may be imported and marketed only to a personal computer equipment manufacturer that has indicated, in writing, to the seller or importer that they will obtain a Declaration of Conformity or a grant of certification for the personal computer employing these components.	not applicable	
	(e) Subassemblies to digital devices are not subject to the technical standards in this part unless they are marketed as part of a system in which case the resulting system must comply with the applicable regulations. Subassemblies include: (1) Devices that are enclosed solely within the enclosure housing the digital device, except for: power supplies used in personal computers; devices included under the definition of a peripheral device in §15.3(r); and personal computer CPU boards, as defined in §15.3(bb); (2) CPU boards, as defined in §15.3(bb), other than those used in personal computers, that are marketed without an enclosure or power supply; and (3) Switching power supplies that are separately marketed and are solely for use internal to a device other than a personal computer.		Measurements required, refer to § 15.209 (f)
	(f) The procedures for obtaining a grant of certification or notification and for verification and a Declaration of Conformity are contained in Subpart J of Part 2 of this chapter.	applicable	



Reference	Requirement	Applicability	Remarks
§ 15.102	CPU boards and power supplies used in personal computers.		
	(a) Authorized CPU boards and power supplies that are sold as separate components shall be supplied with complete installation instructions. These instructions shall specify all of the installation procedures that must be followed to ensure compliance with the standards, including, if necessary, the type of enclosure, e.g., a metal enclosure, proper grounding techniques, the use of shielded cables, the addition of any needed components, and any necessary modifications to additional components. (1) Any additional parts needed to ensure compliance with the standards, except for the enclosure, are considered to be special accessories and, in accordance with §15.27, must be marketed with the CPU board or power supply. (2) Any modifications that must be made to a personal computer, peripheral device, CPU board or power supply during installation of a CPU board or power supply must be simple enough that they can be performed by the average consumer. Parts requiring soldering, disassembly of circuitry or other similar modifications are not permitted.	not applicable	
	(b) Assemblers of personal computer systems employing modular CPU boards and/or power supplies are not required to test the resulting system provided the following conditions are met: (1) Each device used in the system has been authorized as required under this part (according to §15.101(e), some subassemblies used in a personal computer system may not require an authorization); (2) The original label and identification on each piece of equipment remain unchanged; (3) Each responsible party's instructions to ensure compliance (including, if necessary, the use of shielded cables or other accessories or modifications) are followed when the system is assembled; (4) If the system is marketed, the resulting equipment combination is authorized under a Declaration of Conformity pursuant to §15.101(c)(4) and a compliance information statement, as described in §2.1077(b), is supplied with the system. Marketed systems shall also comply with the labelling requirements in §15.19 and must be supplied with the information required under §§15.21, 15.27 and 15.105; and (5) The assembler of a personal computer system may be required to test the system and/or make necessary modifications if a system is found to cause harmful interference or to be noncompliant with the appropriate standards in the configuration in which it is marketed (see §§2.909, 15.1, 15.27(d) and 15.101(e)).		



Reference	Requirement	Applicability	Remarks
§ 15.103	Exempted devices		
	The following devices are subject only to the general conditions of operation in §§15.5 and 15.29 and are exempt from the specific technical standards and other requirements contained in this part. The operator of the exempted device shall be required to stop operating the device upon a finding by the Commission or its representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected. Although not mandatory, it is strongly recommended that the manufacturer of an exempted device endeavor to have the device meet the specific technical standards in this part.	not applicable	The measurements according to subpart B are required for the digital circuitry that is incorporated into the transceiver. See § 15.209 (f)
	(a) A digital device utilized exclusively in any transportation vehicle including motor vehicles and aircraft.		
	(b) A digital device used exclusively as an electronic control or power system utilized by a public utility or in an industrial plant. The term public utility includes equipment only to the extent that it is in a dedicated building or large room owned or leased by the utility and does not extend to equipment installed in a subscriber's facility.		
	(c) A digital device used exclusively as industrial, commercial, or medical test equipment.		
	(d) A digital device utilized exclusively in an appliance, e.g., microwave oven, dishwasher, clothes dryer, air conditioner (central or window), etc.		
	(e) Specialized medical digital devices (generally used at the direction of or under the supervision of a licensed health care practitioner) whether used in a patient's home or a health care facility. Non-specialized medical devices, i.e., devices marketed through retail channels for use by the general public, are not exempted. This exemption also does not apply to digital devices used for record keeping or any purpose not directly connected with medical treatment.		
	(f) Digital devices that have a power consumption not exceeding 6 nW.		
	(g) Joystick controllers or similar devices, such as a mouse, used with digital devices but which contain only non-digital circuitry or a simple circuit to convert the signal to the format required (e.g., an integrated circuit for analog to digital conversion) are viewed as passive add-on devices, not themselves directly subject to the technical standards or the equipment authorization requirements.		
	(h) Digital devices in which both the highest frequency generated and the highest frequency used are less than 1.705 MHz and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Digital devices that include, or make provision for the use of, battery eliminators, AC adaptors or battery chargers which permit operation while charging or that connect to the AC power lines indirectly obtaining their power through another device which is connected to the AC power lines, do not fall under this exemption.		
	(i) Responsible parties should note that equipment containing more than one device is not exempt from the technical standards in this part unless all of the devices in the equipment meet the criteria for exemption. If only one of the included devices qualifies for exemption, the remainder of the equipment must comply with any applicable regulations. If a device performs more than one function and all of those functions do not meet the criteria for exemption, the device does not qualify for inclusion under the exemptions.		

Reference	Requirement	Applicability	Remarks
§ 15.105	Information to the user		
	(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.	not applicable	
	(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual: <i>This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:</i> -- Reorient or relocate the receiving antenna. -- Increase the separation between the equipment and receiver. -- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. -- Consult the dealer or an experienced radio/TV technician for help.	applicable	This text has to be incorporated into the user's manual.
	(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of §15.103.		
	(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.	applicable	
	(e) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.		

Reference	Requirement	Applicability	Remarks														
§ 15.107	Conducted limits																
	(d) Except for Class A digital devices, for equipment 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, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges. <table><tr><th rowspan="2">Frequency of emission (MHz)</th><th colspan="2">Conducted limit (dBmV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.	Frequency of emission (MHz)	Conducted limit (dBmV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50	applicable	
Frequency of emission (MHz)	Conducted limit (dBmV)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															
	(d) For a Class A digital device 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, as measured using a 50 mH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges. <table><tr><th rowspan="2">Frequency of emission (MHz)</th><th colspan="2">Conducted limit (dBmV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>79</td><td>66</td></tr><tr><td>0.5-30</td><td>73</td><td>60</td></tr></table>	Frequency of emission (MHz)	Conducted limit (dBmV)		Quasi-peak	Average	0.15-0.5	79	66	0.5-30	73	60	not applicable				
Frequency of emission (MHz)	Conducted limit (dBmV)																
	Quasi-peak	Average															
0.15-0.5	79	66															
0.5-30	73	60															
	(d) ©The limits shown in paragraphs (a) and (b) of this section shall not apply to carrier current systems operating as unintentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards: (d) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions. (d) For all other carrier current systems: 1000 mV within the frequency band 535-1705 kHz, as measured using a 50 mH/50 ohms LISN. (3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.109(e).	not applicable															
	(d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery charges which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.	not applicable															



Reference	Requirement	Applicability	Remarks										
§ 15.109	Radiated emission limits												
	(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values: <table><tr><td>Frequency of Emission (MHz)</td><td>Field Strength (microvolts/meter)</td></tr><tr><td>30 - 88</td><td>100</td></tr><tr><td>88 - 216</td><td>150</td></tr><tr><td>216 - 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>	Frequency of Emission (MHz)	Field Strength (microvolts/meter)	30 - 88	100	88 - 216	150	216 - 960	200	Above 960	500	applicable	see also §15.209 (f) Instead of the limits acc. to § 15.109 (a) the alternate limits acc. to § 15.109 (g) shall be applied.
Frequency of Emission (MHz)	Field Strength (microvolts/meter)												
30 - 88	100												
88 - 216	150												
216 - 960	200												
Above 960	500												
	(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following: <table><tr><td>Frequency of Emission (MHz)</td><td>Field Strength (microvolts/meter)</td></tr><tr><td>30 - 88</td><td>90</td></tr><tr><td>88 - 216</td><td>150</td></tr><tr><td>216 - 960</td><td>210</td></tr><tr><td>Above 960</td><td>300</td></tr></table>	Frequency of Emission (MHz)	Field Strength (microvolts/meter)	30 - 88	90	88 - 216	150	216 - 960	210	Above 960	300	not applicable	
Frequency of Emission (MHz)	Field Strength (microvolts/meter)												
30 - 88	90												
88 - 216	150												
216 - 960	210												
Above 960	300												
	(c) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.	applicable											
	(d) For CB receivers, the field strength of radiated emissions within the frequency range of 25 - 30 MHz shall not exceed 40 microvolts/meter at a distance of 3 meters. The field strength of radiated emissions above 30 MHz from such devices shall comply with the limits in paragraph (a) of this section.	not applicable											
	(e) Carrier current systems used as unintentional radiators or other unintentional radiators that are designed to conduct their radio frequency emissions via connecting wires or cables and that operate in the frequency range of 9 kHz to 30 MHz, including devices that deliver the radio frequency energy to transducers, such as ultrasonic devices not covered under Part 18 of this chapter, shall comply with the radiated emission limits for intentional radiators provided in §15.209 for the frequency range of 9 kHz to 30 MHz. As an alternative, carrier current systems used as unintentional radiators and operating in the frequency range of 525 kHz to 1705 kHz may comply with the radiated emission limits provided in §15.221(a). At frequencies above 30 MHz, the limits in paragraphs (a), (b) or (g) of this section, as appropriate, continue to apply.	not applicable											
	(f) For a receiver which employs terminals for the connection of an external receiving antenna, the receiver shall be tested to demonstrate compliance with the provisions of this section with an antenna connected to the antenna terminals unless the antenna conducted power is measured as specified in §15.111(a). If a permanently attached receiving antenna is used, the receiver shall be tested to demonstrate compliance with the provisions of this section.	not applicable	Testing of the receiver is not required, see § 15.101 (b)										



	(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, "Information Technology Equipment--Radio Disturbance Characteristics--Limits and Methods of Measurement" (incorporated by reference, see §15.38). In addition: (1) The test procedure and other requirements specified in this Part shall continue to apply to digital devices. (2) If, in accordance with §15.33 of this part, measurements must be performed above 1000 MHz, compliance above 1000 MHz shall be demonstrated with the emission limit in paragraph (a) or (b) of this section, as appropriate. Measurements above 1000 MHz may be performed at the distance specified in the CISPR 22 publication for measurements below 1000 MHz provided the limits in paragraphs (a) and (b) of this section are extrapolated to the new measurement distance using an inverse linear distance extrapolation factor (20 dB/decade), e.g., the radiated limit above 1000 MHz for a Class B digital device is 150 uV/m, as measured at a distance of 10 meters. (3) The measurement distances shown in CISPR Pub. 22, including measurements made in accordance with this paragraph above 1000 MHz, are considered, for the purpose of §15.31(f)(4) of this part, to be the measurement distances specified in the regulations. (4) If the radiated emissions are measured to demonstrate compliance with the alternative standards in this paragraph, compliance must also be demonstrated with the conducted limits shown in §15.107(e) of this Part.	applicable	The alternative limits of CISPR 22 shall be applied.
	(h) Radar detectors shall comply with the emission limits in paragraph (a) of this section over the frequency range of 11.7-12.2 GHz.	not applicable	

7.6.2 Additional requirements for special tapes of apparatus

Table of requirements and applicable test suites

Reference	Requirement	Applicability	Remarks
§ 15.111	Antenna power conduction limits for receivers		
	(a) In addition to the radiated emission limits, receivers that operate (tune) in the frequency range 30 to 960 MHz and CB receivers that provide terminals for the connection of an external receiving antenna may be tested to demonstrate compliance with the provisions of §15.109 with the antenna terminals shielded and terminated with a resistive termination equal to the impedance specified for the antenna, provided these receivers also comply with the following: with the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in §15.33 shall not exceed 2.0 nanowatts.	not applicable	
	(b) CB receivers and receivers that operate (tune) in the frequency range 30 to 960 MHz that are provided only with a permanently attached antenna shall comply with the radiated emission limitations in this part, as measured with the antenna attached.	not applicable	
§ 15.113	Power line carrier systems	not applicable	
§ 15.115	TV interface devices, including cable system terminal devices	not applicable	
§ 15.117	TV broadcast receivers	not applicable	
§ 15.118	Cable ready consumer electronics equipment	not applicable	
§ 15.119	Closed caption decoder requirements for analog television receivers	not applicable	
§ 15.120	Program blocking technology requirements for television receivers	not applicable	
§ 15.121	Scanning receivers and frequency converters used with scanning receivers	not applicable	
§ 15.122	Closed caption decoder requirements for digital television receivers and converter boxes	not applicable	
§15.123	Labeling of digital cable ready products	not applicable	

7.7 Information about sources of disturbance, generated frequencies and EMC measures

Generated frequencies:

ISM-Frequency	None
Operational frequencies:	7.3728 MHz (User Interface), 3.6864 MHz (MCM and Module Payment), 14.7456 (I/O-Board 600), 125 KHz (RFID)

Disturbance sources:

No.	Description	Manufacturer	Type designation	Remarks
1	User Interface	N & W	47181600	Includes RF-ID chip
2	MCM	N & W	47181300	
3	I/O Board 600	N & W	47183300	Rev 2.11
4	Module membrane control	N & W	PCB05/06	
5	Module payment	N & W	47182400	Included into payment module C7001
6	Module fuse	N & W	47182300	
7	Y-Filter board	N & W	47183100	
8	B2 coil	Binder	Type 5690	2x
9	Switching relay for heater	Potter&Brumfield	Type T92P7D32-24	2x
10	Heater	---	3.547 kW / 240 V	
11	Water inlet valve	A + K Müller	Type 1.010.125	
12	Product water valve	A + K Müller	Type 46.008.114	3x
13	Mixer motor	Crouzet	Type 82.810.508	2x
14	Gear motor	Bühler	Type 61.013.118-9	1x
15	Fan	ADDA	Type AD0924HB-A70GL	24 VDC 1x
16	Switching power supply	Mean Well	S-240-24	100-200VAC 50/60Hz 200-240VAC 50/60Hz
17	Peltierelement	Super cool	PE-127-14-25S	24VDC, 3.1A 2x
18	Power pack	N & W	Y1 Europa	AC 230-240 V / 15 A
19	Payment module	Karl Vogel, Schaltanlage	C7001	---

EMC-measures for the reduction of emissions

No.	Location	Description	Specification	Manufacturer	Type designation
1	Y-Filter board	Y-capacitor	4 x 0.01µF	N & W	---
2	RFID Antenna	Ferrite	---	Würth	Art. Nr. 74271142
3	Power pack; safety relay and heater relay	R/C-combination	0.1µF + 100Ω (2x)	---	Type F 1776
4	Coin return motor	RFI-capacitor	56pF	---	---

Description of shield- and contacting measures for emc

No.	Description of the measure
1	---

EMC measure for the improvement of immunity

No.	Location	Description	Specifications	Manufacturer	Type designation
1	See EMC-measures for the reduction of emissions				

Further measures

Description



(intentionally left blank)