



Test Report EMC

FCC listed*) test laboratory

Test Laboratory:

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Equipment under Test:

Applicant:	N & W / Ewige Weide 7 / D-22926 Ahrensburg
Manufacturer:	Wittenborg A/S / Seebadsgade 1-3 / DK-5000 Odense C
File number:	586400-2240-0010/35397
EUT:	Radio equipment: Short range device in the frequency range 9 kHz to 25 MHz
Brand/model:	Cafitesse 700 CFT700
EUT received:	2003-04-14

Information concerning the Test Report:

Report No.:	Testreport-F43-1-35397.doc
Number of pages:	60
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 C63.4:1992 CISPR 16-1:1993
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 C63.4:1992 CISPR 16-1:1993

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 modification was made:
Insertion of a ferrite bead (WÜRTH 74270036) at connector P2

Result:	Passed
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Date of issue:	2003-09-10	
Tested by:	Gerald Gossmann	
	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:	Commercial coffee maker with digital control circuitry and incorporated radio equipment (short range device): The RF Identification system consists of a) Active transceiver with dedicated loop antenna, integrated into the main controller which is mounted behind the front panel of the commercial coffee CFT700 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>

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	Modified sample of the transceiver PCB, integrated in the front door assembly of the coffeemaker: - 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 Sample T2 was temporarily derived from the original sample T1. After completion of the measurements, T2 was rebuilt to sample T1.
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 100-120 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. 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 9,7 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				
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 border="1"> <thead> <tr> <th>Power Class</th><th>Radiated H-field or Power Level</th></tr> </thead> <tbody> <tr> <td>1</td><td>7 dBμA/m at 10 m</td></tr> </tbody> </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
Miscellaneous information	Antenna: Dedicated loop antenna with 2,6 cm diameter with 138 turns, integrated into the front door of the coffee maker

Disturbance sources/Components:

No.	Description	Manufacturer	Type designation	Remarks
1	User Interface	N & W	PCB01	Includes RF-ID chip
2	Module A	N & W	PCB02	
3	Module B	N & W	PCB03	
4	Module C	N & W	PCB04	
5	Module door open	N & W	PCB07	
6	Modul membrancontrol	N & W	PCB05/06	
7	Module trough in place	N & W	PCB08	
8	Module payment	N & W	PCB37	
9	Module hot water switch	N & W	PCB09	
10	Module fuse	N & W	PCB10	
11	Y-Filter board	N & W	47183100	
12	B2 coil	Binder	Type 5690	3x
13	Switching relay for heater	Siemens	Typ T92P7D32	3x
14	Heater	---	3.0 + 2.7 + 2.0 kW	one heater per phase
15	Water inlet valve	A + K Müller	Type 1.010.125	
16	Product water valve	A + K Müller	Type 40.012.191	4x
17	Mixer motor	Crouzet	Type 82.810.510	3x
18	Gear motor	Bühler	Type 61.013.118-9	2x
19	Fan	ADDA	--	24 VDC
20	Switching power supply	Mean Well	S-240-24	100-200VAC 50/60Hz 200-240VAC 50/60Hz
21	Peltierelement	Supercool	PE-127-14-25S	24VDC, 3.1A 2x
22	Empty detection	Telefunken	BPW 96/TSH 55	



EMC-measures for the reduction of emissions

No.	Location	Description	Specification	Manufacturer	Type designation
1	Y-Filter board	Y-capacitor	4 x 0.01 μ F	N & W	---
2	Harness to module fuse	Ferrite		Kitagawa	RI-18-28-10Y
3	Harness to relais control	Ferrite		Kitagawa	RI-14-28-6M
4	Harness to user interface	Ferrite		Kitagawa	RI-14-28-6M
5	Harness to port P2	Ferrite		Kitagawa	RI-26-28-13

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				

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	

3 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	18	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	18	Class B limits	passed
2.2	Radiated emissions (Electric field strength) § 15.109 (g)	30 MHz – 1 GHz	23	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 6.6 and 6.7 of this test report.

4 Measurement protocols from testing intentional radiators

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

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2003-04-23
Environmental conditions:	25° C, 37% 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 120 V, 60 Hz. The loop antenna was located in a distance of 3 m respectively 5 m from the EUT. 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 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. 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 3 m, employing a Quasi Peak detector. For 300 m test distance, the magnetic field strength was calculated to -25,5 dBµV/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): - 25,5 dBµV/m
Specified limit: + 25,8 dBµV/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.

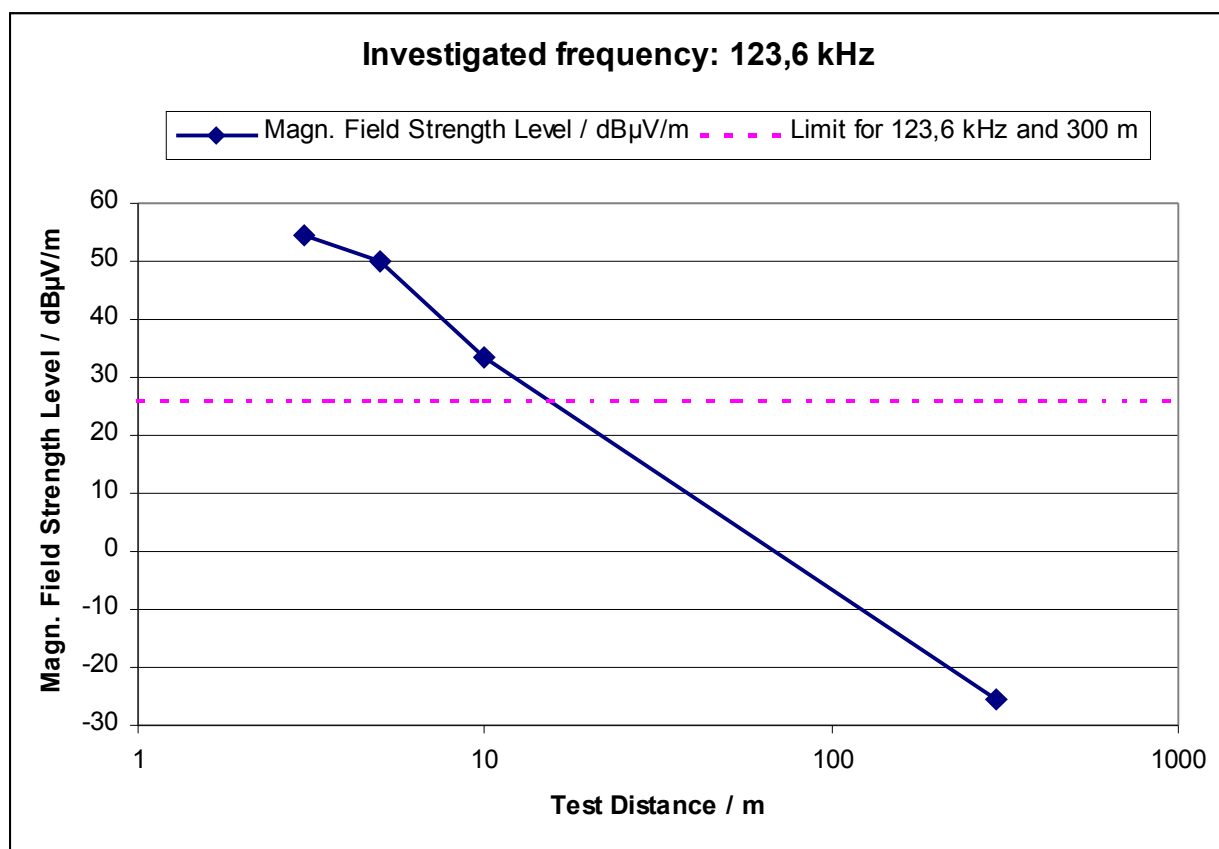
Protocol:

Results of the preliminary investigations in a shielded room:

- Maximum field strength measured 1 m distance: +6,8 dB μ A/m @ ca. 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
123,2	3	+54,5	Quasi Peak	Measured value Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
	5	+50	Quasi Peak	Measured value, including ambient noise (with the signal less than 6 dB over the noise floor)
	10	+33,6	Quasi Peak	Calculated value from the 3 m reading, using a correction factor of 40 dB per decade
	300	-25,5	Quasi Peak	Calculated value from the 3 m reading, using a correction factor of 40 dB per decade





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

4.2.1 Frequency range 9 kHz ... 30 MHz

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2003-04-23
Environmental conditions:	25° C, 37% 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 120 V, 60 Hz. The loop antenna was located in a distance of 3 m from the EUT. 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 10 m.

Operating modes investigated:

3. Standby / ready
4. 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:

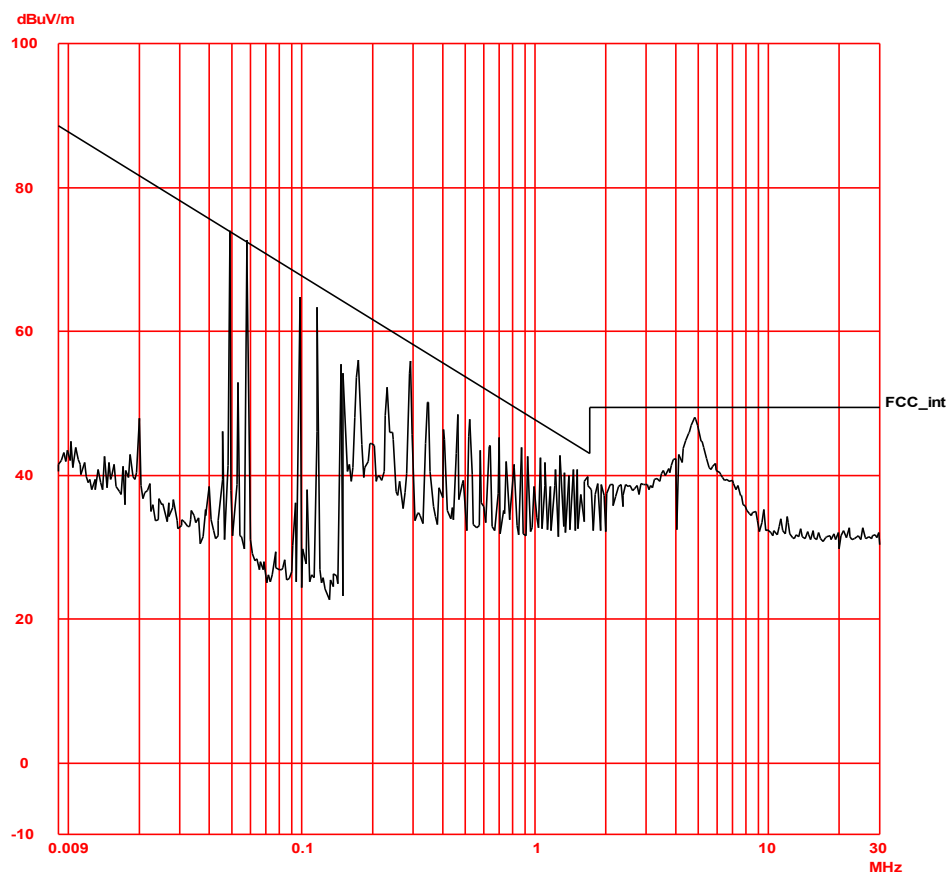
VDE Pruef- und Zertifizierungsinstitut
Magnetic field strength

22. Apr 03 16:51

EUT: Commercial Coffeemaker with RF ID-Tag
Manuf: N&W Global Vending Cafitesse CFT700
Op Cond: Standby
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B+C
Comment: 1 m, Front facing the loop antenna
Az: Grenzwert eingehalten.

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



PAGE 1

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 lines shown in the diagram were extrapolated from the limits specified in § 15.209 (a) for 3 m test distance by using a conversion factor of 20 dB/decade.

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	Remarks
246,6	+29,2	-69,9	300	+19,8	300	
369,8	+29,6	-69,5	300	+16,3	300	
493,2	+18,1	-81	30	+33,7	30	
616,56	+20,2	-38,9	30	+31,8	30	
739,76	+9,8	-49,3	30	+30,2	30	
863,32	+23,2	-35,9	30	+28,9	30	main source is not the transmitter
1109,96	+10,8	-48,3	30	+26,7	30	
1356,36	+8,0	-51,1	30	+25,0	30	
1603	+6,6	-52,5	30	+23,5	30	
2096	+6,3	-52,8	30	+29,5	30	
2342	+6,9	-52,2	30	+29,5	30	

FINAL:

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

Frequency kHz	Test Distance m	Field Strength dBµV/m	Detector Type	Remarks
369,8	3	+33,0	Quasi Peak	Measured value, including ambient noise (with the signal less than 6 dB over the noise floor) Receive antenna of the test instrumentation oriented in parallel to the front of the coffee maker
	5	below the noise floor	Quasi Peak	Measured value, including ambient noise (with the signal less than 6 dB over the noise floor)
	300	-47,0	Quasi Peak	Calculated value from the 300 m reading, using a correction factor of 40 dB per decade Limit: approx. + 16,24 dBµV/m



4.2.2 Frequencies above 30 MHz

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2003-04-23

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 125 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 5.2 of this report.

5 Measurement protocols from testing unintentional radiators

5.1 Terminal Disturbance Voltage

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2003-04-16

Instruments:	Test Location: Shielded Room #5		
Inventory number	Description	Manufacturer	Type
1800049	FUNKSTOERMESSEMPFÄNGER	R&S	ESHS30
1820023	NETZNACHBILDUNG	SCHWARZBECK	NSLK8126

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 page.

Result: Passed

**The measured emissions of the EUT were found to be below the specified limits.
The highest reading found was 5,6 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		
0,232	46,8	MW	0	46,8	52,38	5,58	PASS	Line
0,232	46,2	MW	0	46,2	52,38	6,18	PASS	Neutral
0,29	44	MW	0	44	50,52	6,52	PASS	Line
0,29	43	MW	0	43	50,52	7,52	PASS	Neutral
0,1746	47	MW	0	47	54,74	7,74	PASS	Neutral
0,1746	46,5	MW	0	46,5	54,74	8,24	PASS	Line



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

5.1.1.1 Preliminary measurements

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 120 V, 60 Hz).

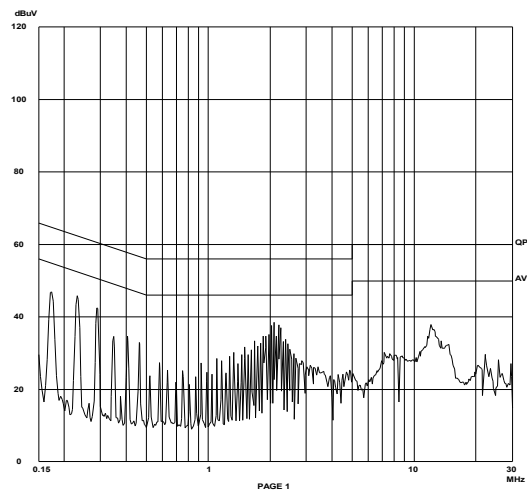
Operating mode: Standby

VDE Testing and Certification Institute Conducted emissions at the mains input

16. Apr 03 11:05

EUT: Commercial Coffee Maker with RFID
Manuf: NAW Global Vending, CFT70553, SN 231341
Op Cond: Ready, AC 120 V, 60 Hz
Operator: W. Klein, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref: 586400-2240-0010/27567 Line tested: Neutral

Fast Scan Settings (1 Range)
Frequencies Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB

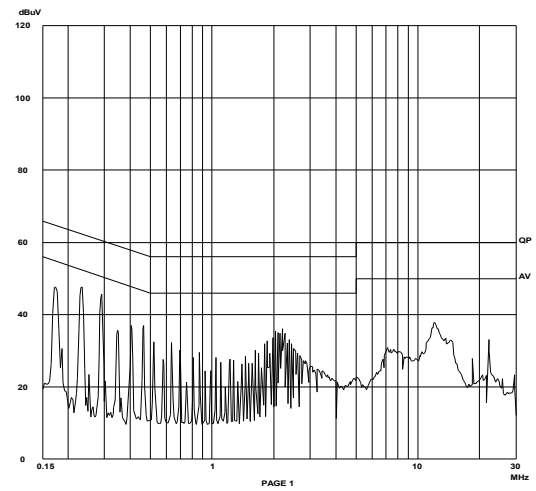


VDE Testing and Certification Institute Conducted emissions at the mains input

16. Apr 03 11:19

EUT: Commercial Coffee Maker with RFID
Manuf: NAW Global Vending, CFT70553, SN 231341
Op Cond: Ready, AC 120 V, 60 Hz
Operator: W. Klein, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref: 586400-2240-0010/27567 Line tested: Hot

Fast Scan Settings (1 Range)
Frequencies Receiver Settings
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB





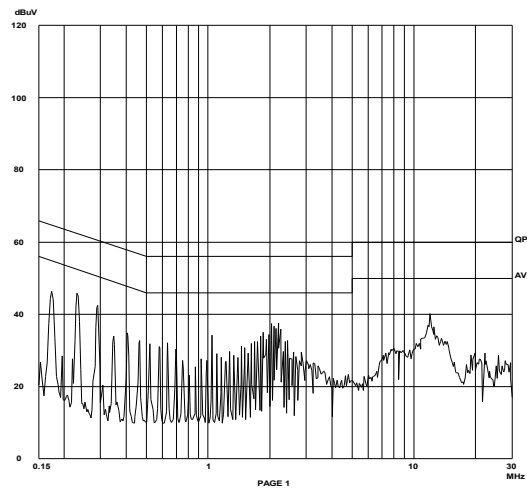
Operating mode: Vending

VDE Testing and Certification Institute
Conducted emissions at the mains input

16. Apr 03 11:30

EUT: Commercial Coffee Maker with RFID
Manuf: N&W Global Vending, CFT70053, SN 231341
Op Cond: Vending small Cappuccino, 120 V, 60 Hz
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref.: 586400-2240-0010/27567 Line tested: Neutral

Fast Scan Settings (1 Range)
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB

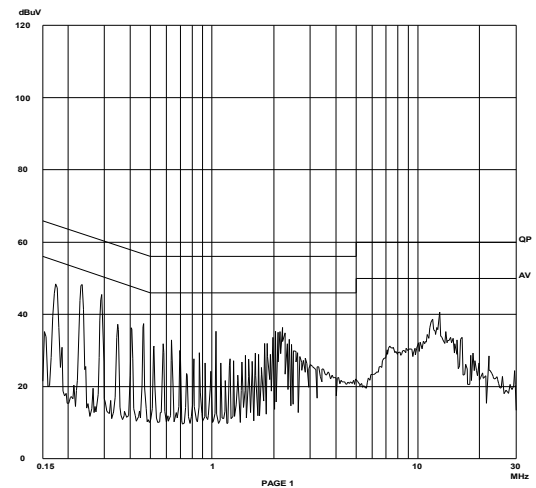


VDE Testing and Certification Institute
Conducted emissions at the mains input

16. Apr 03 11:34

EUT: Commercial Coffee Maker with RFID
Manuf: N&W Global Vending, CFT70053, SN 231341
Op Cond: Vending small Cappuccino, 120 V, 60 Hz
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref.: 586400-2240-0010/27567 Line tested: Hot

Fast Scan Settings (1 Range)
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB



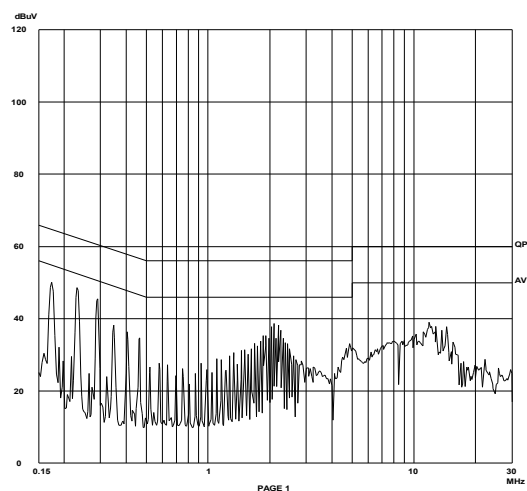
Operating mode: Activating service mode / Detection of the RF ID-Tag

VDE Testing and Certification Institute
Conducted emissions at the mains input

16. Apr 03 11:42

EUT: Commercial Coffee Maker with RFID
Manuf: N&W Global Vending, CFT70053, SN 231341
Op Cond: Activating service mode (RFID in use)
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref.: 586400-2240-0010/27567 Line tested: Neutral

Fast Scan Settings (1 Range)
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB

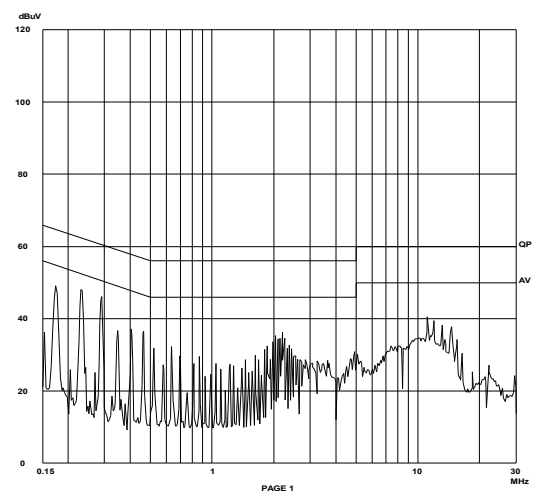


VDE Testing and Certification Institute
Conducted emissions at the mains input

16. Apr 03 11:39

EUT: Commercial Coffee Maker with RFID
Manuf: N&W Global Vending, CFT70053, SN 231341
Op Cond: Activating service mode (RFID in use)
Operator: W. Klos, Shielded room #5
Test Spec: FCC Part 15, Subparts B and C
Comment: Protection class I, wired for 120 V, 1.6 kW, single phase
File ref.: 586400-2240-0010/27567 Line tested: Hot

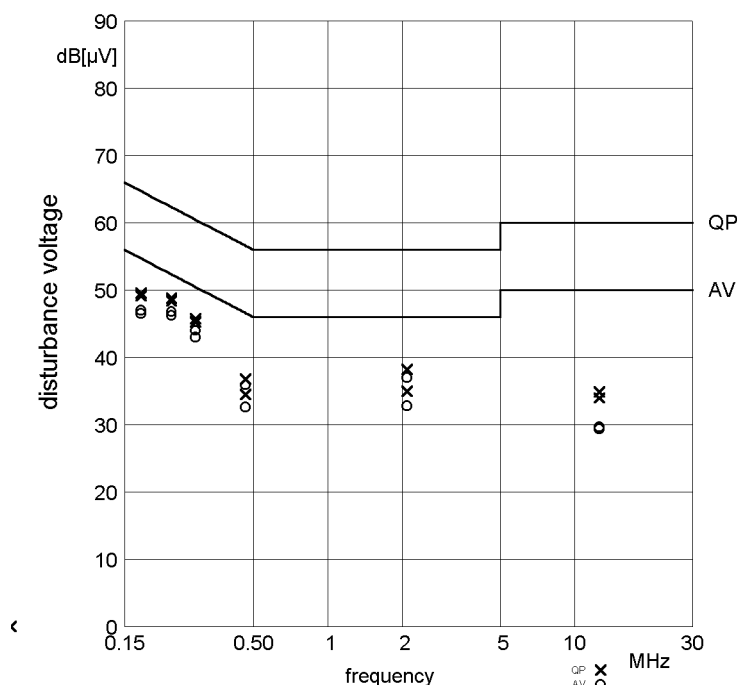
Fast Scan Settings (1 Range)
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 3k 10k PK 0.05ms 10dB LN OFF 60dB



The curves do not show a significant change of the maximum disturbance voltage with different operating modes.

5.1.1.2 Final measurements

Test results: Terminal disturbance voltage measurement on mains line



Disturbance voltage measurement

Average

Measurement of disturbance voltage

Fre- quency MHz	Reading dB(μV)	QP or AV	Correction dB	Measured Value dB(μV)	Limit dB(μV)	Margin dB	Result	Comments / Remarks
0,1746	46,5	MW	0	46,5	54,74	8,24	PASS	Line
0,1746	47	MW	0	47	54,74	7,74	PASS	Neutral
0,232	46,8	MW	0	46,8	52,38	5,58	PASS	Line
0,232	46,2	MW	0	46,2	52,38	6,18	PASS	Neutral
0,29	44	MW	0	44	50,52	6,52	PASS	Line
0,29	43	MW	0	43	50,52	7,52	PASS	Neutral
0,463	35,9	MW	0	35,9	46,64	10,74	PASS	Line
0,463	32,6	MW	0	32,6	46,64	14,04	PASS	Neutral
2,087	32,8	MW	0	32,8	46	13,2	PASS	Line
2,087	37	MW	0	37	46	9	PASS	Neutral
12,58	29,7	MW	0	29,7	50	20,3	PASS	Line
12,58	29,4	MW	0	29,4	50	20,6	PASS	Neutral



Quasi-peak

Measurement of disturbance voltage

Fre- quency MHz	Reading dB(μV)	QP or AV	Correction dB	Measured Value dB(μV)	Limit dB(μV)	Margin dB	Result	Comments / Remarks
0,1746	49,2	QP	0	49,2	64,74	15,54	PASS	Line
0,1746	49,6	QP	0	49,6	64,74	15,14	PASS	Neutral
0,232	48,8	QP	0	48,8	62,38	13,58	PASS	Line
0,232	48,4	QP	0	48,4	62,38	13,98	PASS	Neutral
0,29	45,8	QP	0	45,8	60,52	14,72	PASS	Line
0,29	45,3	QP	0	45,3	60,52	15,22	PASS	Neutral
0,463	36,8	QP	0	36,8	56,64	19,84	PASS	Line
0,463	34,5	QP	0	34,5	56,64	22,14	PASS	Neutral
2,087	35	QP	0	35	56	21	PASS	Line
2,087	38,2	QP	0	38,2	56	17,8	PASS	Neutral
12,58	34	QP	0	34	60	26	PASS	Line
12,58	34,9	QP	0	34,9	60	25,1	PASS	Neutral



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

General information about the test:

Tested by:	Gossmann, Gerald
Test date:	2003-09-10

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 tabel of 0.8 m heighth. 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.

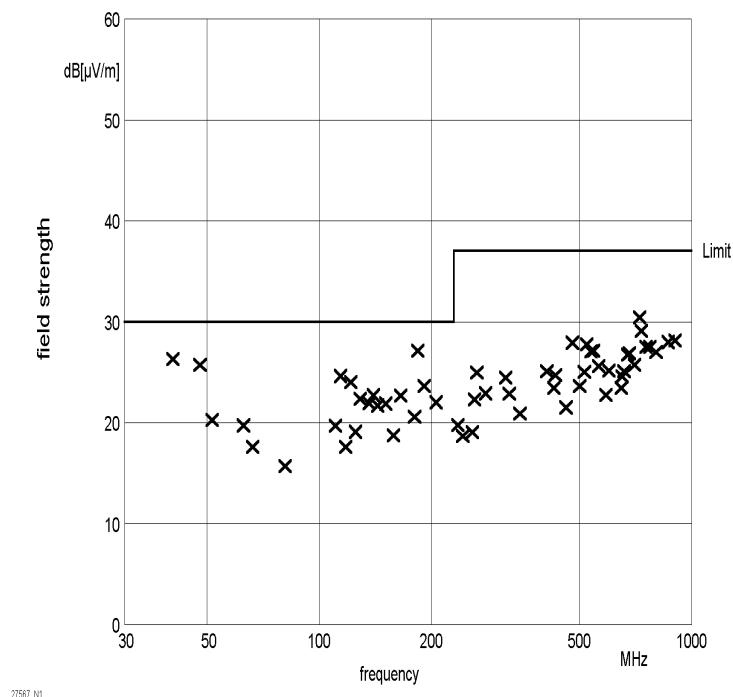
The minimum margin of the highest reading relative to the limit was 2,87 dB.



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(μ V)	dB/m	dB(μ V/m)	dB(μ V/m)	dB		
184,3	10	1	Ver.	0	15,4	11,73	27,13	30	2,87	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
40,5	10	1,5	Ver.	0	12,3	14	26,3	30	3,7	PASS	
47,9	10	1,2	Ver.	90	11,8	13,91	25,71	30	4,29	PASS	
114,2	10	1,3	Ver.	0	12,2	12,4	24,6	30	5,4	PASS	
121,7	10	1	Ver.	30	16,9	7,12	24,02	30	5,98	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
191,7	10	1	Ver.	30	12,1	11,53	23,63	30	6,37	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2

Test results: Electric Fieldstrength



Electric Fieldstrength: Table of measured data

Quasi-peak

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		
40,5	10	1,5	Ver.	0	12,3	14	26,3	30	3,7	PASS	
47,9	10	1,2	Ver.	90	11,8	13,91	25,71	30	4,29	PASS	
51,6	10	1,1	Ver.	240	6,5	13,74	20,24	30	9,76	PASS	
62,7	10	1	Ver.	270	7,5	12,22	19,72	30	10,28	PASS	
66,3	10	1	Ver.	150	6,8	10,78	17,58	30	12,42	PASS	
81,1	10	1	Ver.	150	6	9,7	15,7	30	14,3	PASS	
110,6	10	1,3	Ver.	180	6,6	13,09	19,69	30	10,31	PASS	
114,2	10	1,3	Ver.	0	12,2	12,4	24,6	30	5,4	PASS	
117,9	10	1	Ver.	240	5,9	11,7	17,6	30	12,4	PASS	
121,7	10	1	Ver.	30	16,9	7,12	24,02	30	5,98	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
125,3	10	1	Ver.	220	11,7	7,37	19,07	30	10,93	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
129	10	1	Ver.	60	14,7	7,63	22,33	30	7,67	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2



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		
136,4	10	1	Ver.	240	13,8	8,08	21,88	30	8,12	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
140	10	1	Ver.	220	14,4	8,3	22,7	30	7,3	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
143,7	10	1	Ver.	230	13,2	8,48	21,68	30	8,32	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
151,1	10	1	Ver.	200	13	8,87	21,87	30	8,13	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
158,5	10	1	Ver.	150	9,4	9,31	18,71	30	11,29	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
165,9	10	1	Ver.	300	12,8	9,87	22,67	30	7,33	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
180,6	10	1	Ver.	220	8,7	11,88	20,58	30	9,42	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
184,3	10	1	Ver.	0	15,4	11,73	27,13	30	2,87	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
191,7	10	1	Ver.	30	12,1	11,53	23,63	30	6,37	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
206,4	10	1	Ver.	30	10,3	11,7	22	30	8	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
235,9	10	1	Ver.	330	8,4	11,33	19,73	37	17,27	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
243,3	10	1	Ver.	330	7,1	11,56	18,66	37	18,34	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
258	10	1	Ver.	90	6,2	12,86	19,06	37	17,94	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
261,7	10	1	Ver.	0	9	13,26	22,26	37	14,74	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
265,4	10	1	Ver.	30	10,9	14,03	24,93	37	12,07	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
280,2	10	1	Ver.	30	7	15,89	22,89	37	14,11	PASS	With ferrite KITAGAWA



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		
											RI-26-28-13 at connector P2
317	10	1	Ver.	30	8,6	15,86	24,45	37	12,55	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
324,4	10	1	Ver.	300	7,1	15,75	22,85	37	14,15	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
346,5	10	1	Ver.	330	5,2	15,69	20,89	37	16,11	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
409,2	10	2,6	Ver.	180	7,2	17,87	25,07	37	11,93	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
427,6	10	2,6	Ver.	180	5,4	18,02	23,42	37	13,58	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
431,3	10	2,6	Ver.	180	6,5	18,22	24,72	37	12,28	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
460,8	10	2,4	Ver.	180	2,2	19,29	21,49	37	15,51	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
479,2	10	2,6	Ver.	180	8,8	19,11	27,91	37	9,09	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
501,4	10	2,9	Ver.	180	4,1	19,53	23,63	37	13,37	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
516,1	10	2,2	Ver.	120	5,1	19,89	24,99	37	12,01	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
523,5	10	2,2	Ver.	150	7,7	20,06	27,76	37	9,24	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
538,2	10	2,5	Ver.	180	6,7	20,36	27,06	37	9,94	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
545,6	10	2,7	Ver.	180	6,6	20,51	27,11	37	9,89	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
564	10	3,2	Ver.	160	4,8	20,77	25,57	37	11,43	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
589,8	10	2,9	Ver.	150	2	20,72	22,72	37	14,28	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2



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(μ V)	dB/m	dB(μ V/m)	dB(μ V/m)	dB		
600,9	10	1,9	Ver.	150	4,5	20,66	25,16	37	11,84	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
648,8	10	1,9	Ver.	150	0,3	23,15	23,45	37	13,55	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
652,5	10	2,2	Ver.	180	1,4	23,15	24,55	37	12,45	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
659,9	10	2,3	Ver.	180	2,1	23	25,1	37	11,9	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
674,6	10	1,5	Ver.	180	4	22,71	26,71	37	10,29	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
682	10	1,7	Ver.	180	3,9	22,95	26,85	37	10,15	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
704,1	10	1,7	Ver.	210	2	23,73	25,73	37	11,27	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
726,2	10	1,6	Ver.	180	6	24,39	30,39	37	6,61	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
733,6	10	1,6	Ver.	180	4,8	24,3	29,1	37	7,9	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
755,7	10	1,6	Ver.	180	3,2	24,28	27,48	37	9,52	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
774,2	10	1,6	Ver.	180	2,6	24,87	27,47	37	9,53	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
803,6	10	1,4	Ver.	165	1,7	25,27	26,97	37	10,03	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
866,3	10	1,4	Ver.	150	2,2	25,77	27,97	37	9,03	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2
903,2	10	1,6	Ver.	130	1,4	26,74	28,14	37	8,86	PASS	With ferrite KITAGAWA RI-26-28-13 at connector P2

6 Appendix

6.1 Photos of the test setup (radiated emissions)



Picture 1



Picture 2

6.2 Photos of the test setup (conducted emissions)



Picture 3

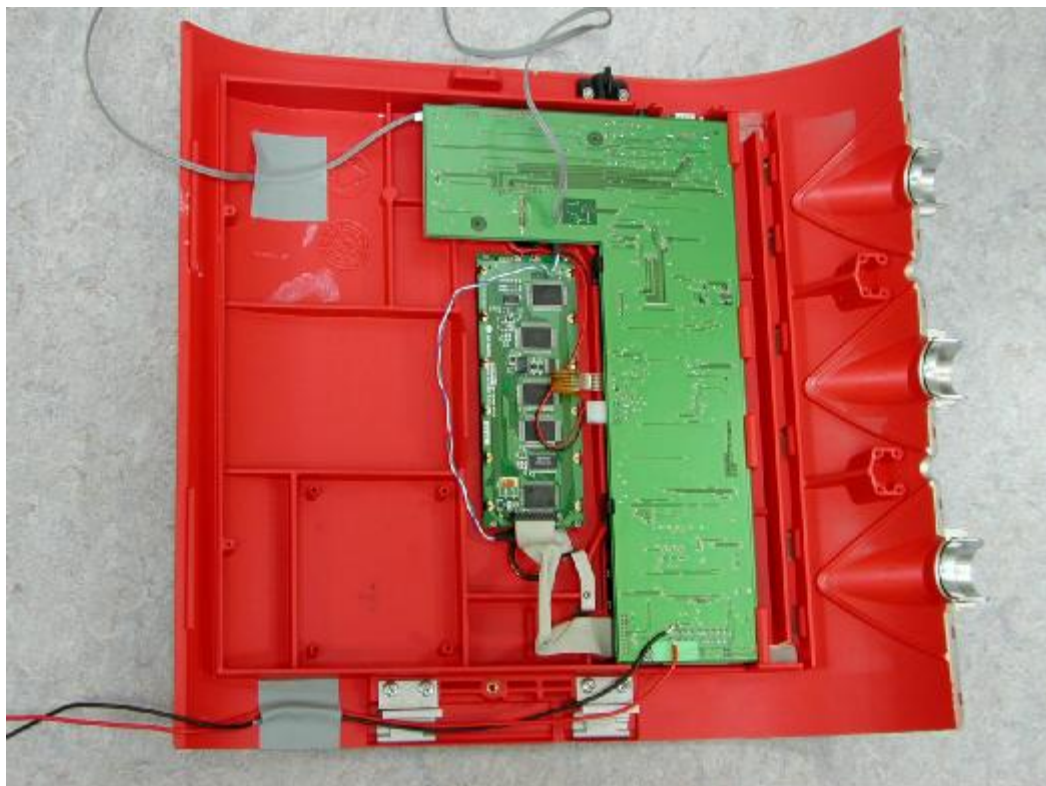


Picture 4

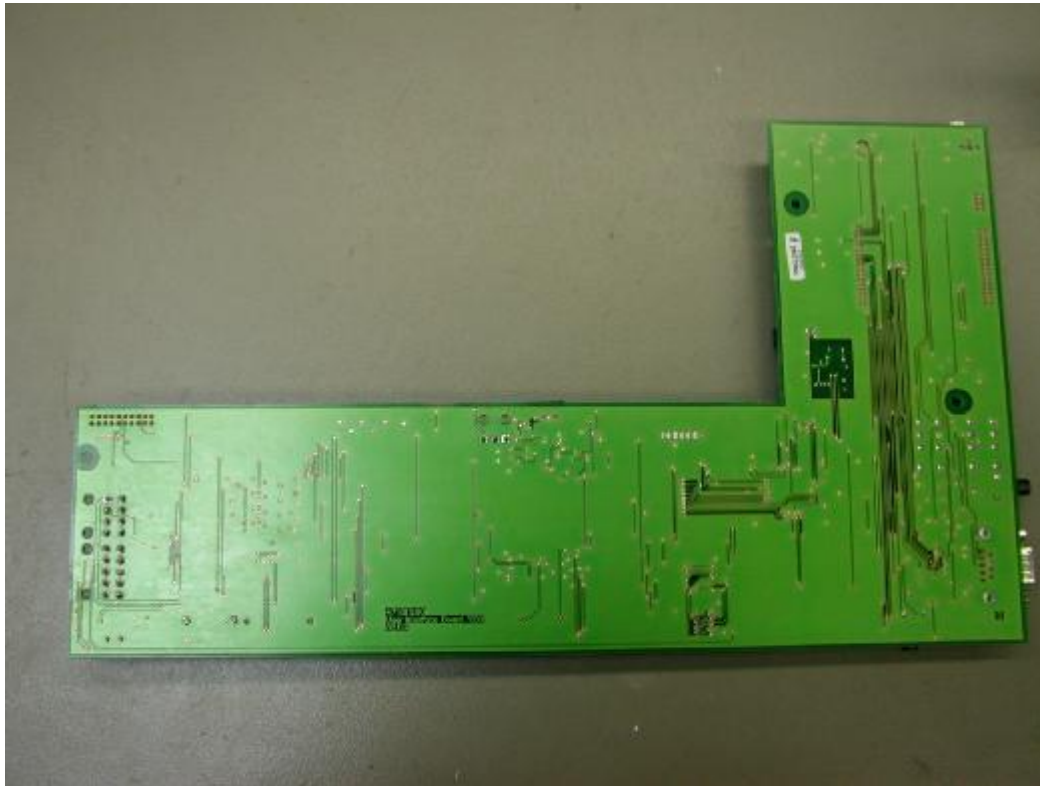
6.3 Photos of the assembly with the transceiver integrated



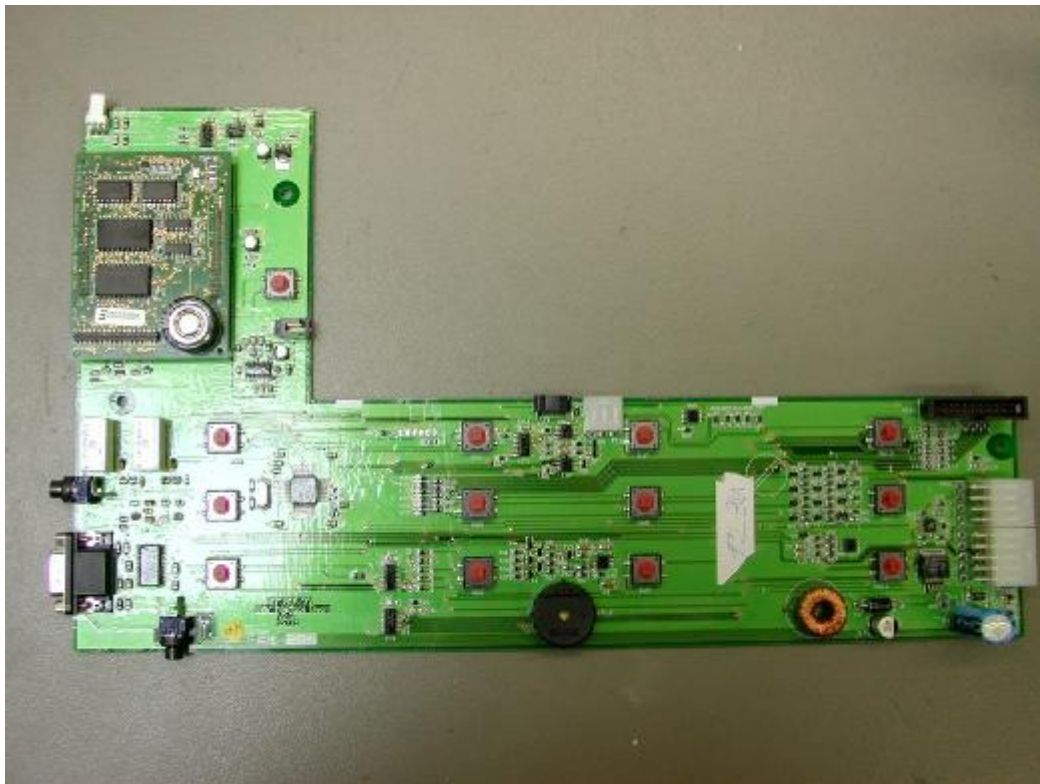
Picture 5: Coffee maker with open front door



Picture 6: Front Door Assembly



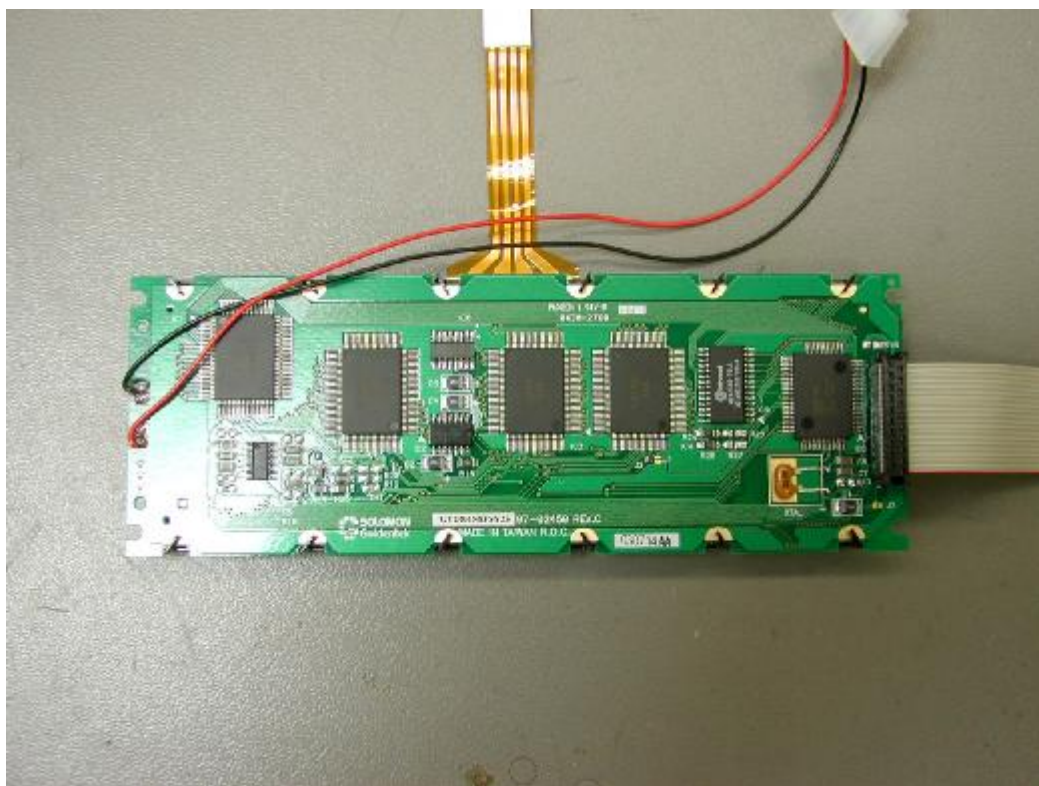
Picture 7: User Interface Board



Picture 8: User Interface Board



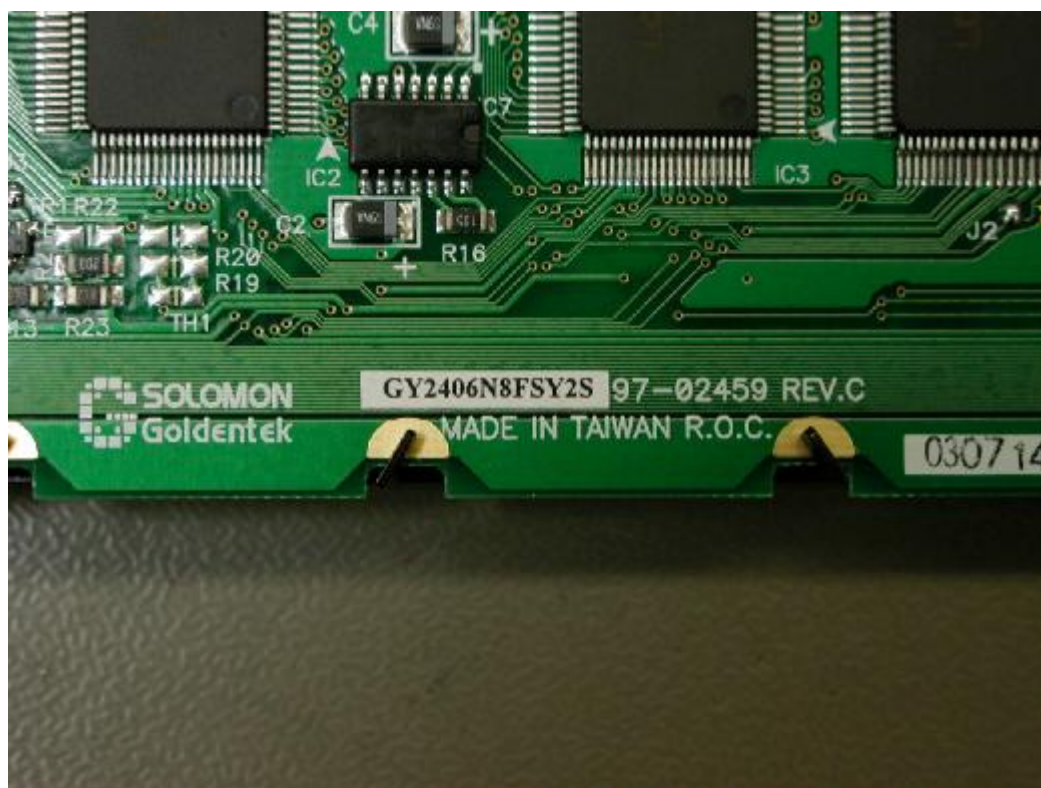
Picture 9: User Interface Board



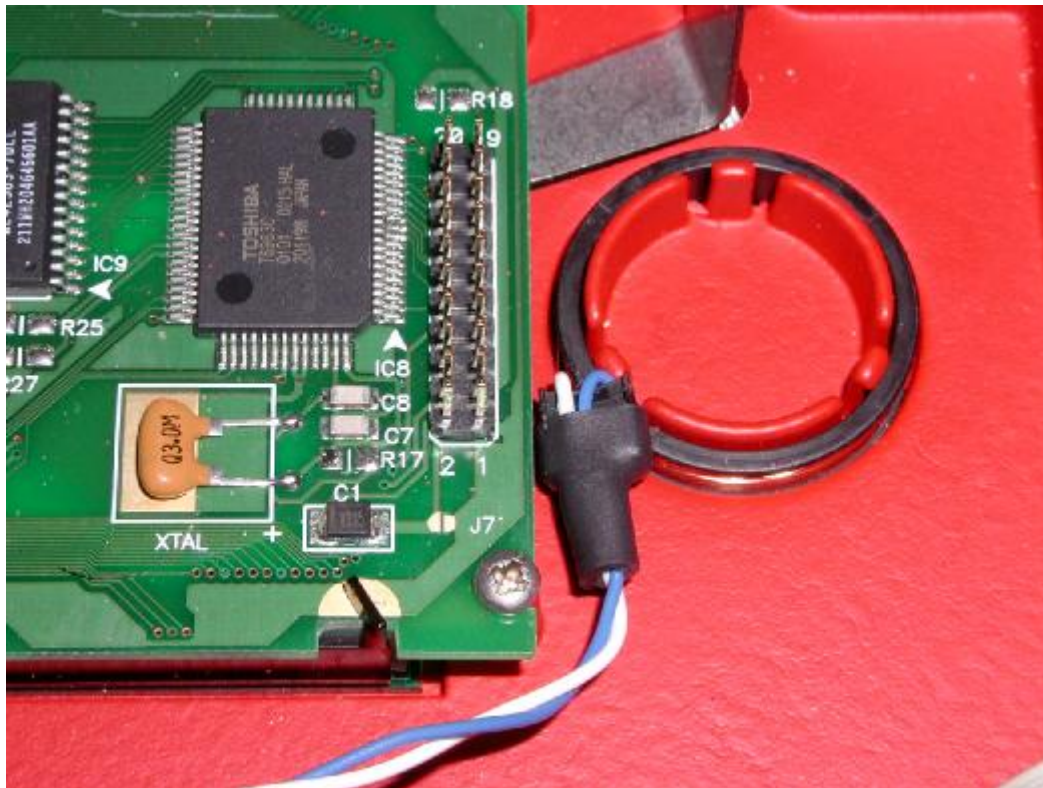
Picture 10: Display PCB



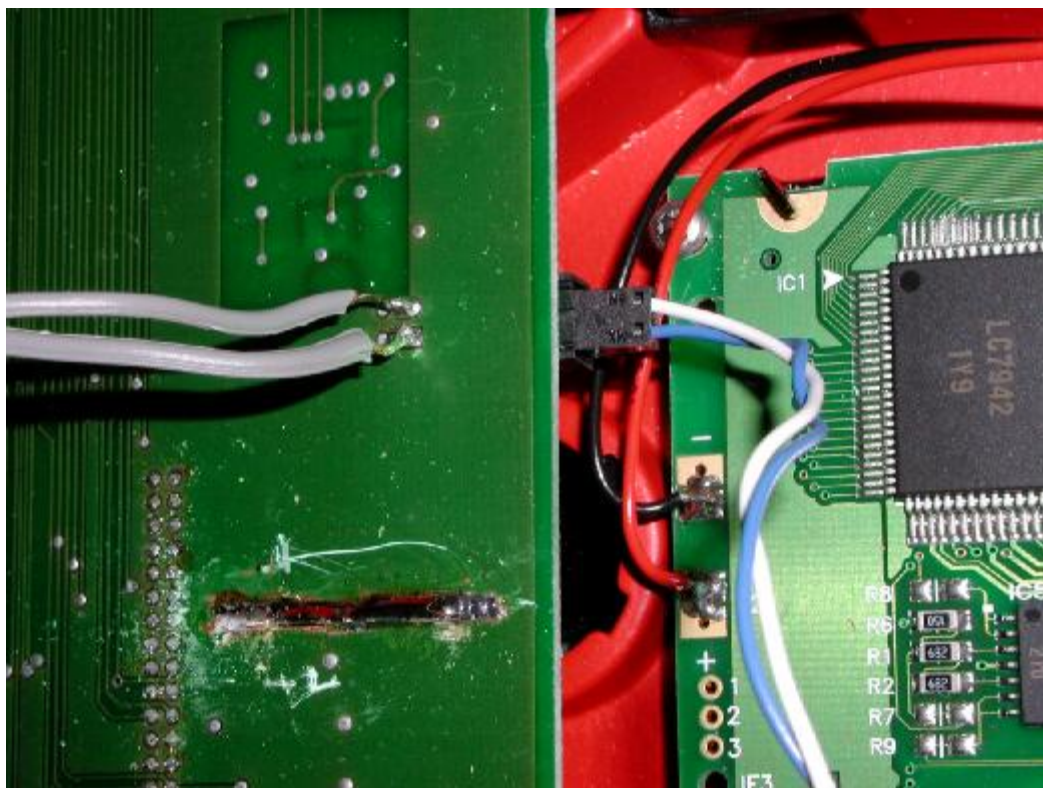
Picture 11: Display PCB



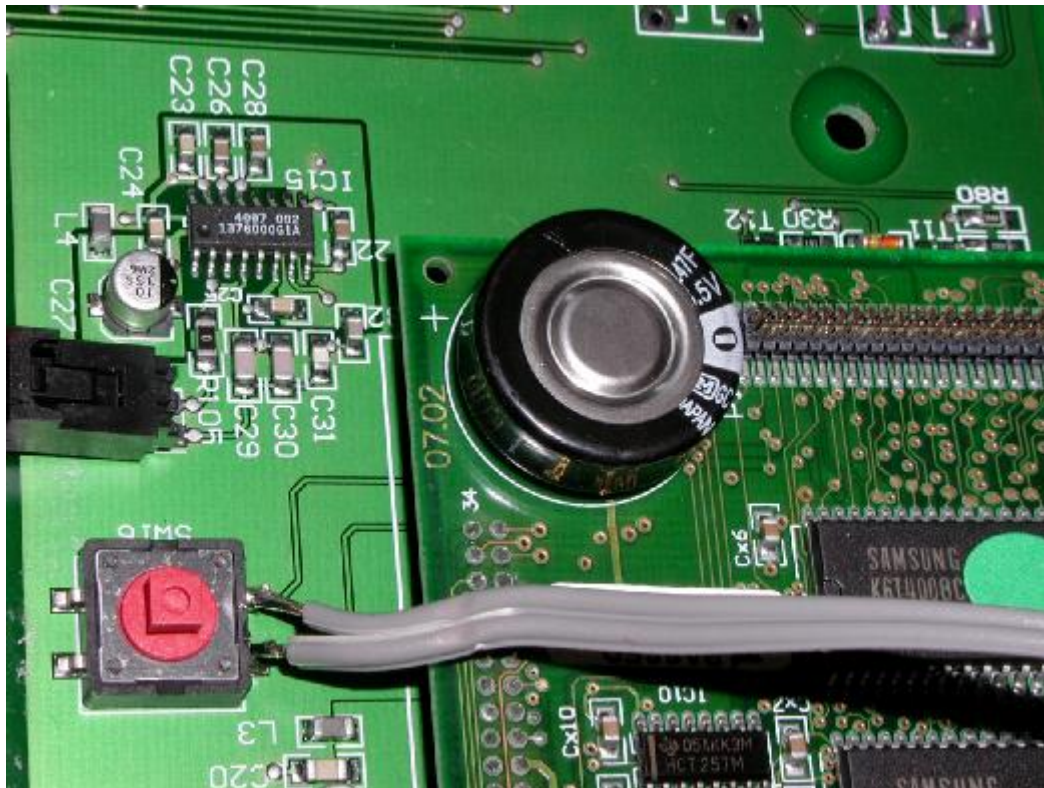
Picture 12: Inscriptions on the Display PCB



Picture 13: Loop antenna next to the Display PCB

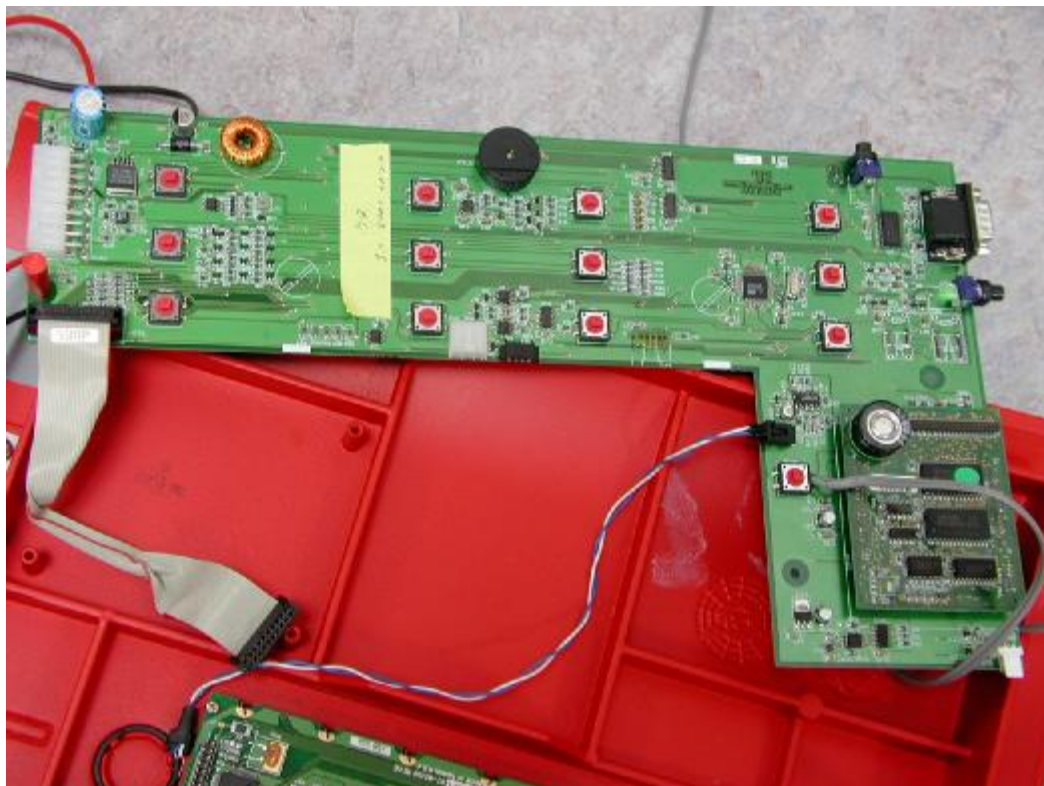


Picture 14: Loop antenna terminals
(The grey cables were temporarily soldered to the pins for taking the oscillographs.)

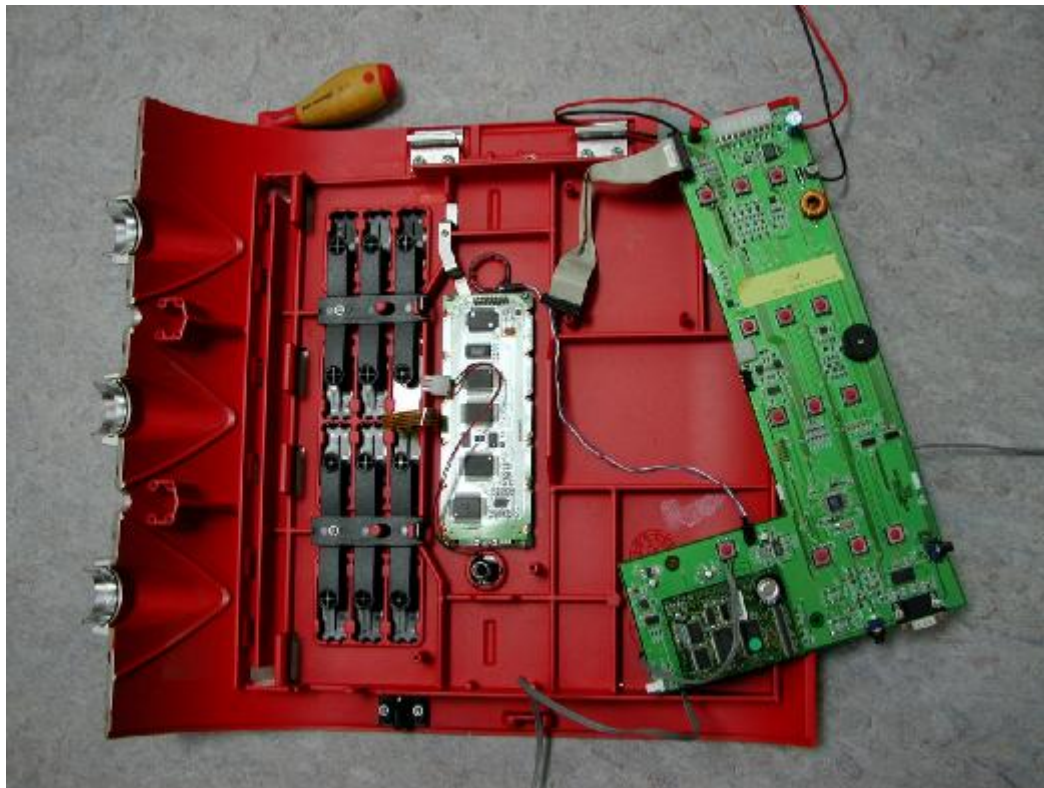


Picture 15: Trigger key on the PCB

(The grey cables were temporarily soldered to the pins for doing the measurements in the environmental chamber.)



Picture 16: User Interface Board with components



Picture 17: Front Door Assembly

6.4 Oscillographs of the RF signal

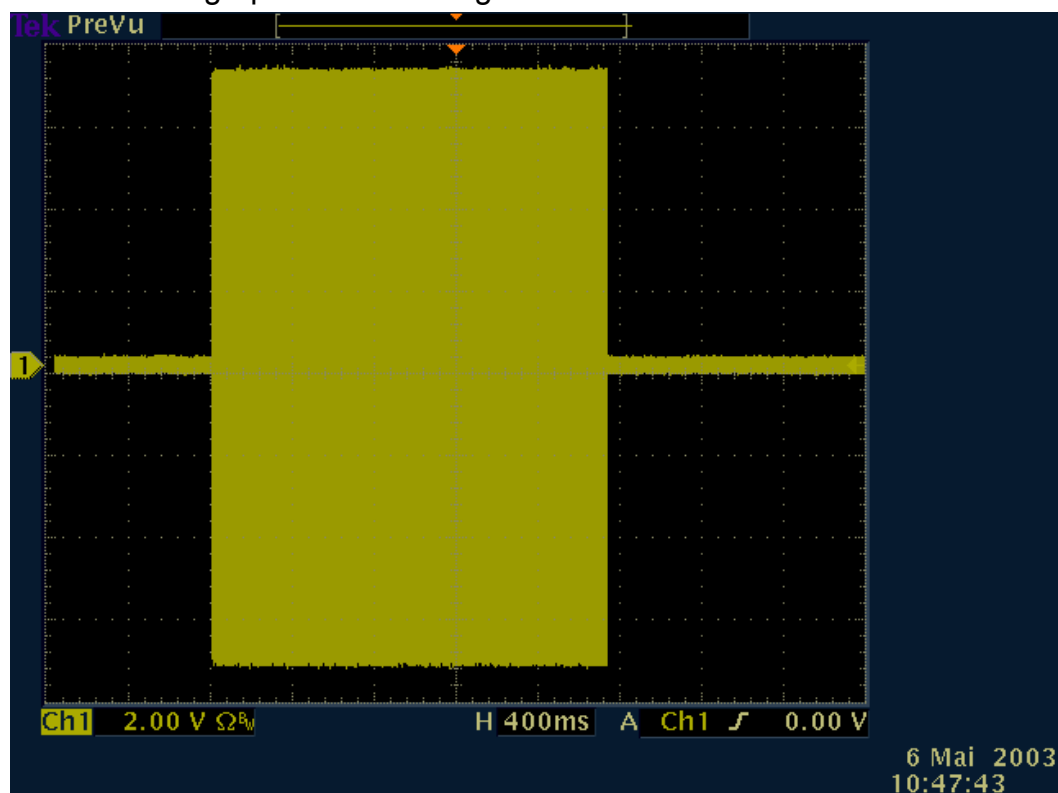


Figure 1: Envelope

After activation, the transmitter is active for nearly 2 seconds.

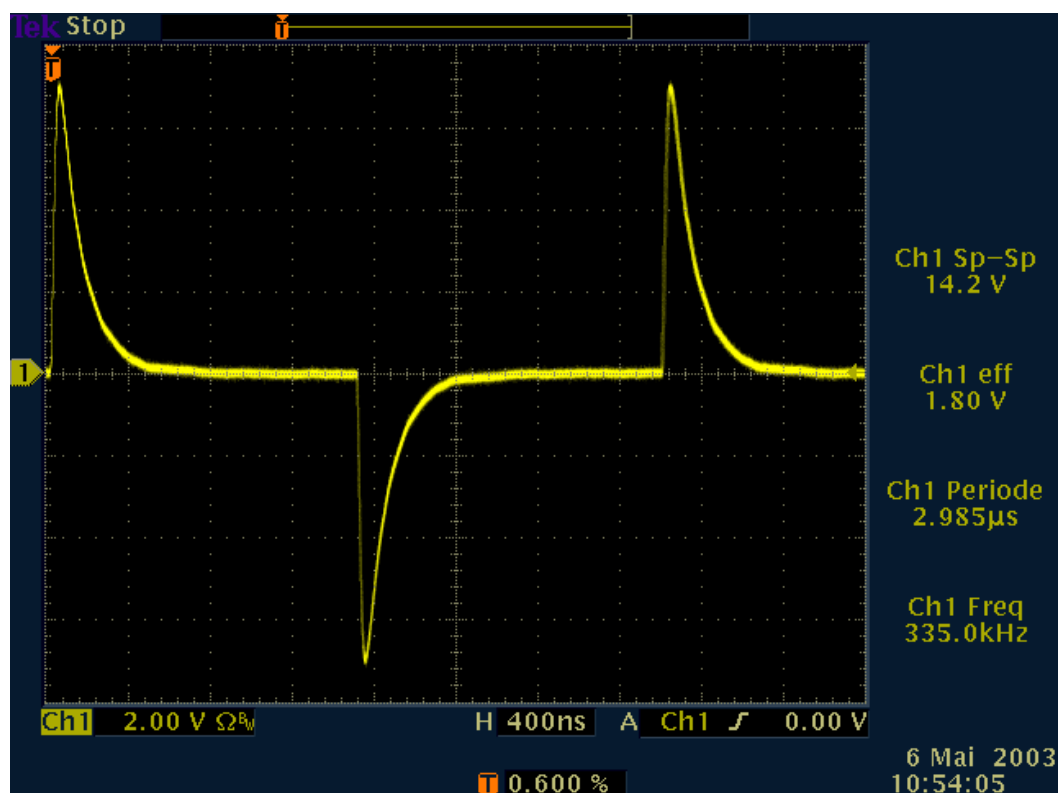


Figure 2: One period of the transmitter output signal (fed into an artificial load of 50 Ohm)

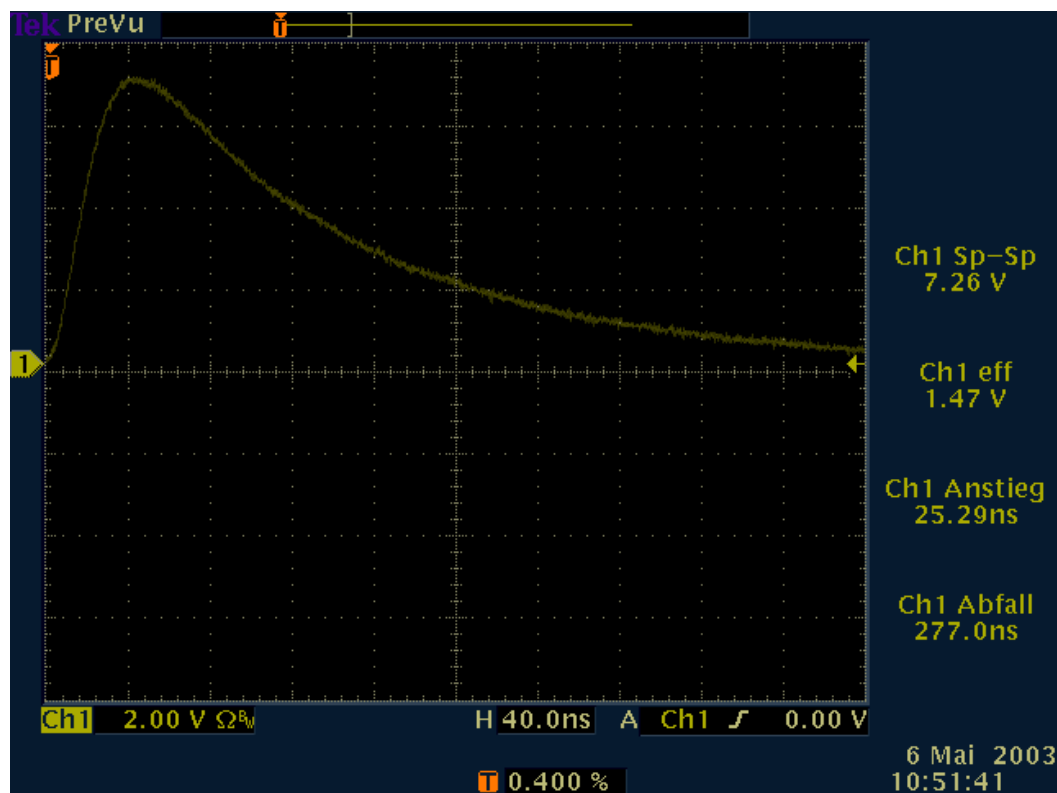


Figure 3: Positive half-wave of the pulse

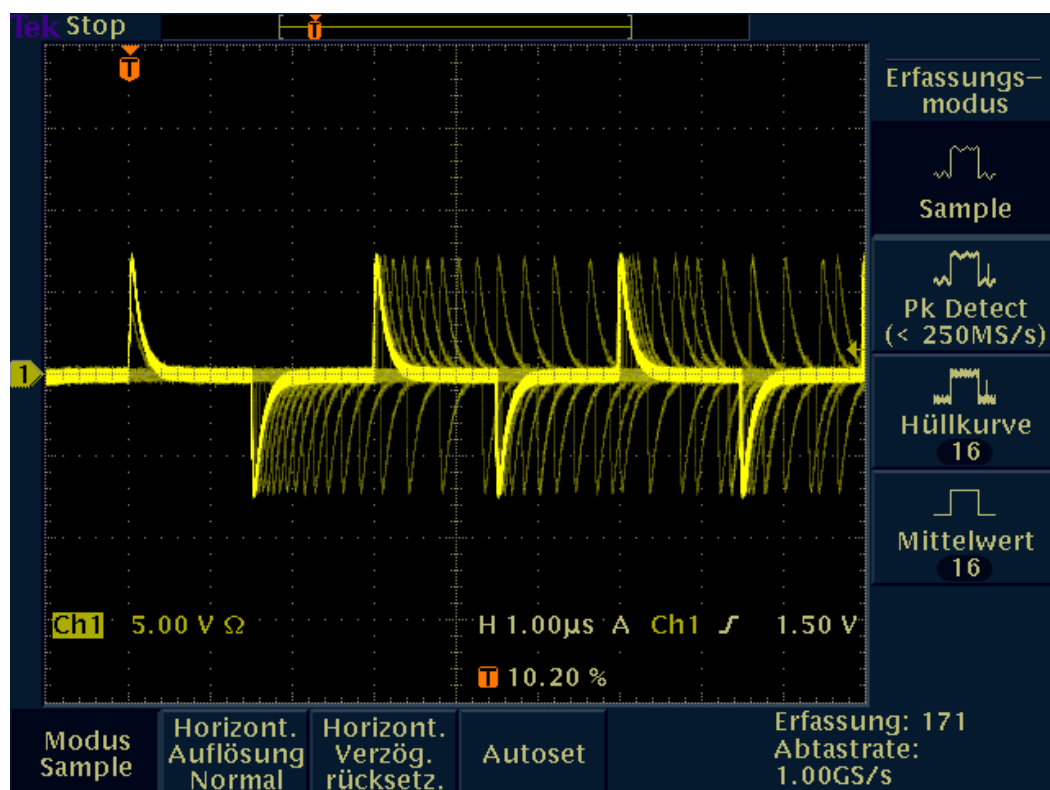
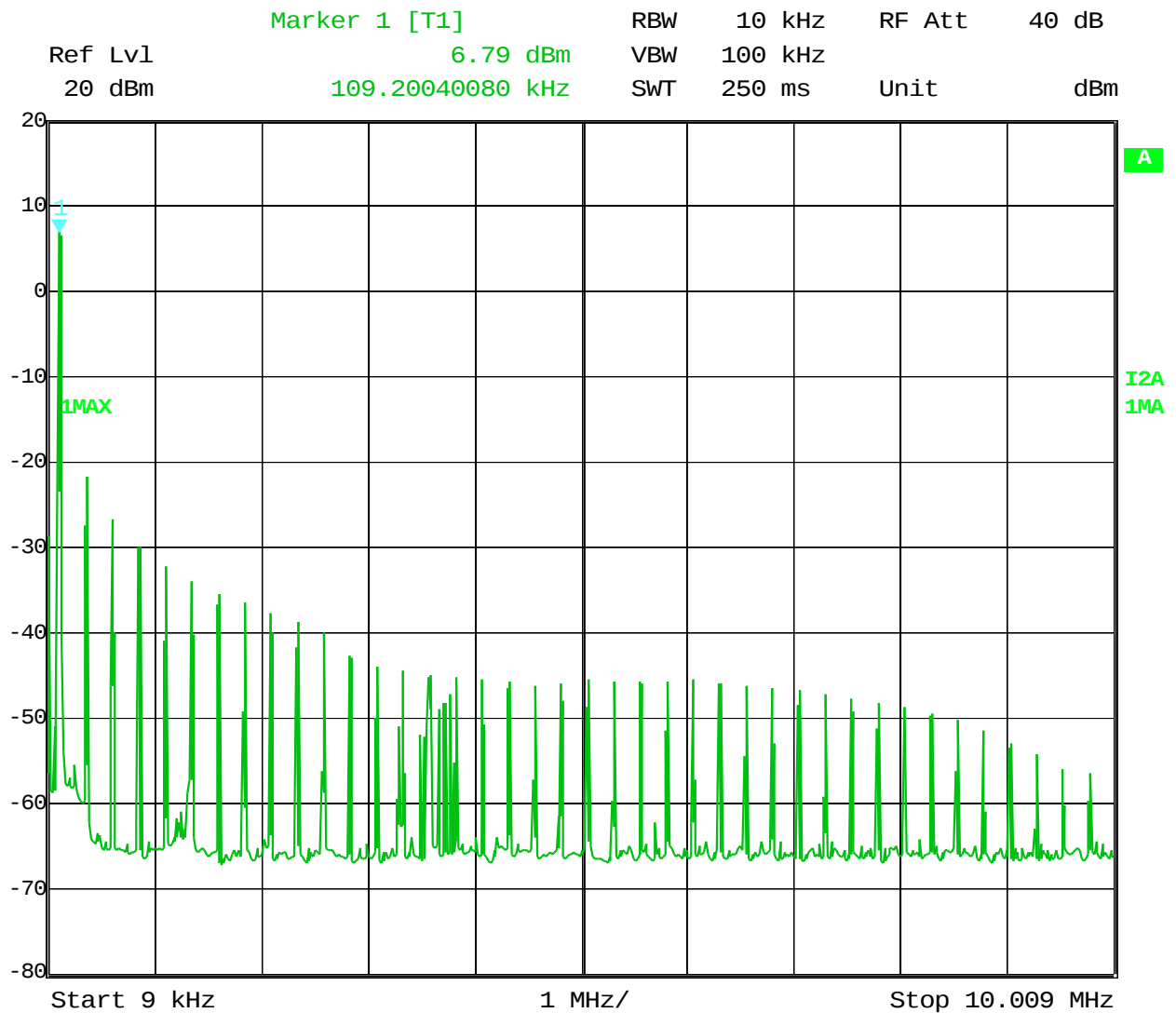


Figure 4: Transient effect after initialisation of the oscillation

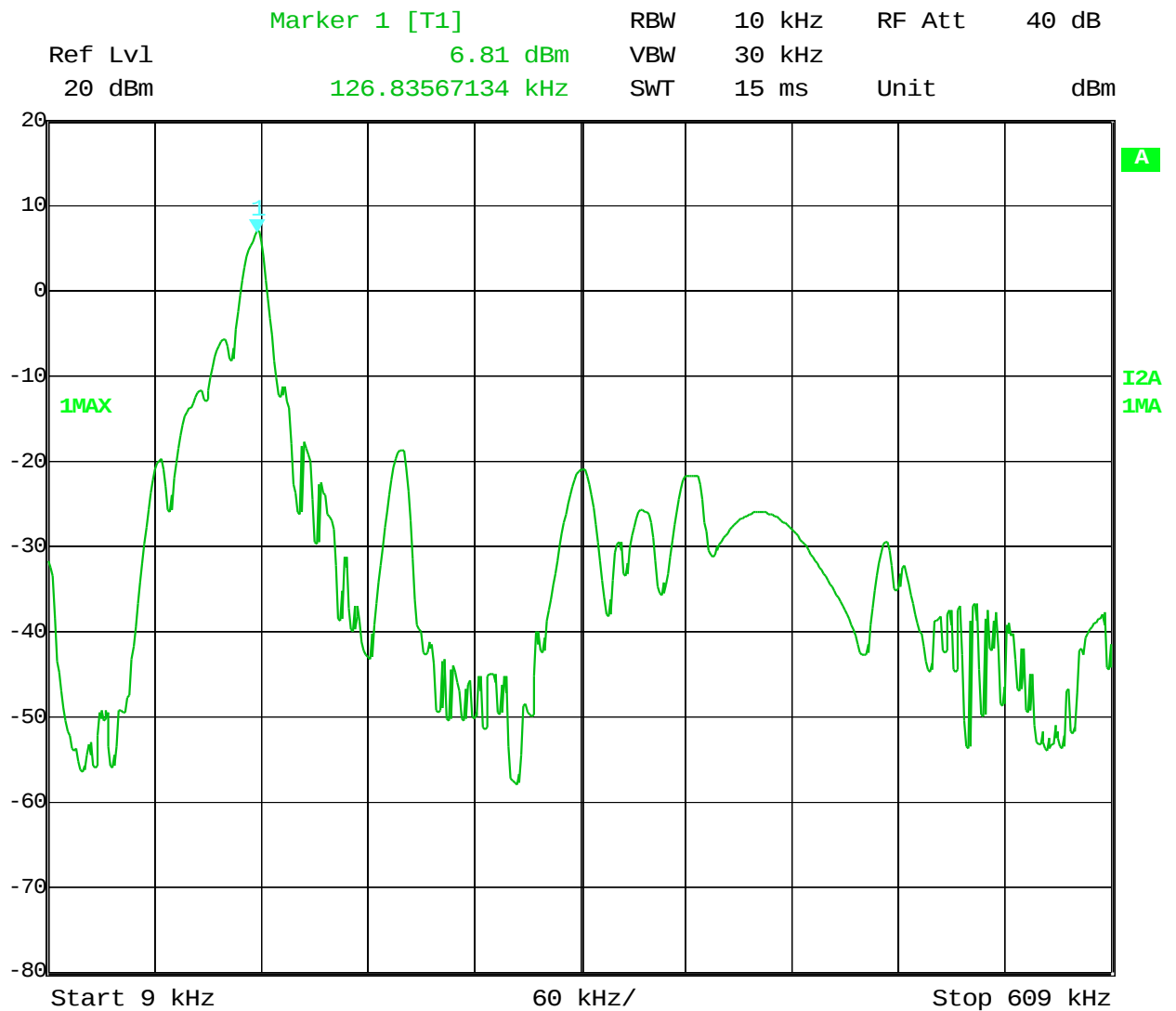
6.5 Spectrum analyzer plots



Date: 28.APR.2003 09:19:55

Figure 5: Spectrum overview from 9 kHz to 10 MHz

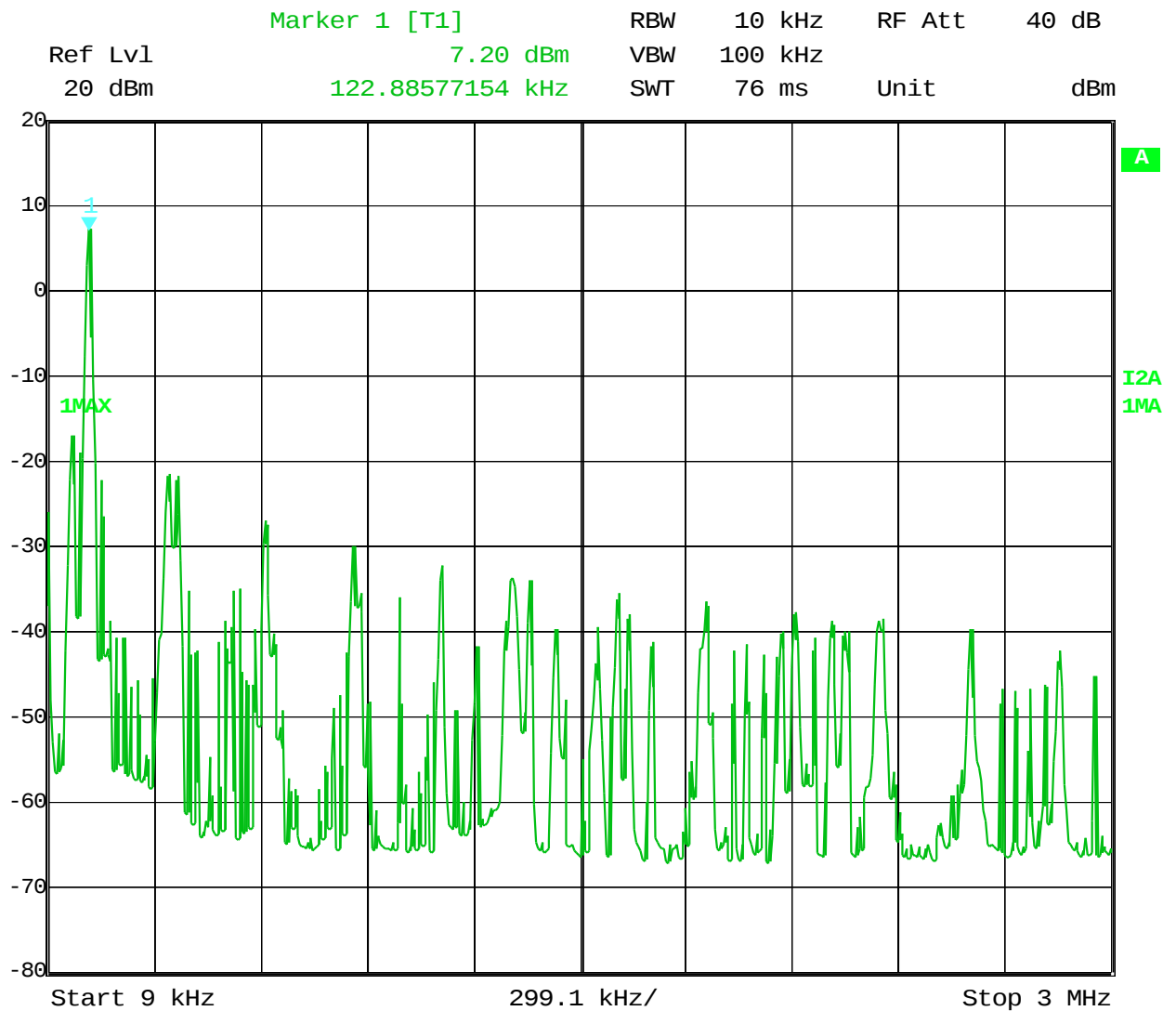
The disturbances appearing between the harmonics are caused by transient effects after inilisation of the transmitter.



Date: 28.APR.2003 09:24:09

Figure 6: Spectrum from 9 kHz to 600 kHz recorded over 12 transmitter activations

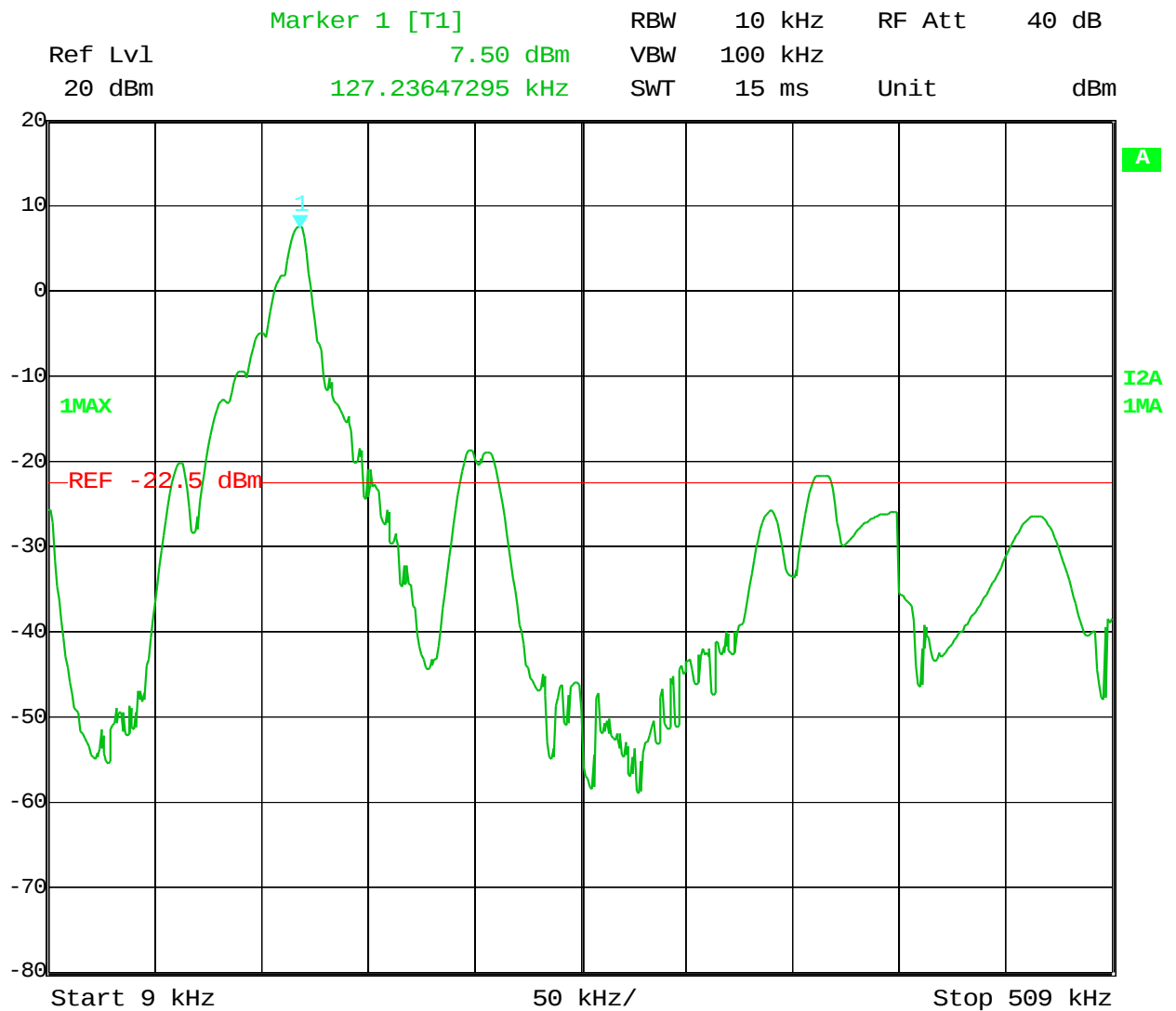
Due to transient effects, many frequencies are generated temporarily.
 Even the level of the fundamental of the wanted signal is far below the relevant limit for transmitter spurious emissions.



Date: 28.APR.2003 14:05:03

Figure 7: Spectrum from 9 kHz to 3 MHz recorded over 12 transmitter activations

Due to transient effects, many frequencies are generated temporarily.
Even the level of the fundamental of the wanted signal is far below the relevant limit for transmitter spurious emissions.



Date: 28.APR.2003 16:19:27

Figure 8: Spectrum from 9 kHz to 500 kHz recorded over 12 transmitter activations

Due to transient effects, many frequencies are generated temporarily. Even the level of the fundamental of the wanted signal is far below the relevant limit for transmitter spurious emissions.

This measurement was taken with 0° C ambient temperature and 24,0 V supply voltage. Referenced to -30 dB below the maximum level of the wanted signal, the range of modulation bandwidth would be from ca. 66 kHz to 380 kHz. However, all emissions are far below the limit for transmitter spurious emissions.

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

6.6.1 General Requirements

Table of requirements and applicable test suites to transmitters

Reference	Requirement	Applicability	Remarks
§ 15.201	Equipment authorization requirement		
	(a) Intentional radiators operated as carrier current systems and devices operated under the provisions of §§15.211, 15.213 and 15.221 shall be verified pursuant to the procedures in Subpart J of Part 2 of this chapter prior to marketing.	not applicable	
	(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	
§ 15.203	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.



Reference	Requirement	Applicability	Remarks
§ 15.204	External radio frequency power amplifiers and antenna modifications		
	(a) Except as otherwise described in paragraph (b) 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. However, 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. An external radio frequency power amplifier shall be marketed only in the system configuration with which the amplifier is authorized and shall not be marketed as a separate product.	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) Only the antenna with which an intentional radiator is authorized may be used with the intentional radiator.	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																																																																								
§ 15.205	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																																																																								
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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 §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.	not applicable																																																																									
	(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><th>Frequency of emission (MHz)</th><th colspan="2">Conducted limit (dBµV)</th></tr><tr><td></td><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 (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	

6.6.2 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 15.255 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 15.255 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB 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.		



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

6.7.1 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 peripherals</td><td>DoC or Certification ¹</td></tr><tr><td>CPU boards and internal power supplies used with Class B personal computers</td><td>DoC or Certification ¹</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 peripherals	DoC or 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 peripherals	DoC or 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	

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: Frequency of Emission (MHz) Field Strength (microvolts/meter) 30 - 88		



	(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 the Third Edition of International Electrotechnical Commission ("IEC"), International Special Committee on Radio Interference (CISPR) Pub. 22 (1997), "Information Technology Equipment--Radio Disturbance Characteristics--Limits and Methods of Measurement." This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 USC 552(a) and 1 CFR Part 51. Copies of CISPR publications may be purchased from the Global Engineering Documents, P.O. Box 8500 (S-4485), Philadelphia, PA 19178-4485, (303) 792-2181 or (800) 624-3974. Copies also may be inspected, but not reproduced, during normal business hours at the following locations: Federal Communications Commission, Reference Information Center, Room CY-A257, 445 12th Street, SW., Washington, DC, and Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC. 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	

6.7.2 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	



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