



Test Report EMC

FCC listed*) test laboratory

Test Laboratory:

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Equipment under Test

Applicant:	N & W Global Technology; Ewige Weide 7, 22926 Ahrensburg
Manufacturer:	Wittenborg A/S / Seebadsgade 1-3 / DK-5000 Odense C
File number:	586400-2240-0010/79979
EUT:	Coffee maker for commercial use
Brand/model:	Cafitesse 700 CFT700
EUT received:	2006-09-27

Applied standards

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

Remarks:	The object of this report has been derived from previous versions of the commercial coffee maker CFT700. These devices are objects of the VDE Test Reports F43-3-27567 and F43-1-35397. The tested product is similar to the coffee maker described in Test Report F43-1-35397, but is equipped with new control circuitry and a different power supply unit. However, the type of the user interface board with integrated RFID transceiver is identical with the type of the user interface board used in the previously tested Model CFT600, see VDE Test Report FG43-4-63455. Therefore, only conducted emissions in the frequency range from 150 kHz to 30 MHz and radiated emissions in the frequency range from 30 MHz to 1 GHz were measured. This report does not contain any measurement data about the radiated H-field in the frequency range from 9 kHz to 30 MHz.
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Information about modifications to the EUT at the test laboratory:

In order to achieve compliance with the regulations, no modifications were made to the EUT in the course of the tests.

Result: Pass

Date of issue:	2006-11-03	
Tested by:	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)".

This test report may only be passed to a third party in its complete wording including this preamble and the date of issue. Any publication or reproduction require the prior written approval of the VDE Testing and Certification Institute.

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 device 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 V2.1, see N&W Document No. 472816.00/01 (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 Technical Specifications

1.2.1 Transmitter

1.2.1.1 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.

1.2.1.2 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.

1.2.1.3 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

1.2.1.4 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> <tr> <th>Power Class</th><th>Radiated H-field or Power Level</th></tr> <tr> <td>1</td><td>7 dBμA/m at 10 m</td></tr> </table>	Power Class	Radiated H-field or Power Level	1	7 dBμA/m at 10 m
Power Class	Radiated H-field or Power Level				
1	7 dBμA/m at 10 m				
Maximum rated transmitter output power (as stated by the manufacturer):	Maximum generated fieldstrength: -17,5 dBμA/m +/- 6 dB, measured at 10 m horizontal distance				
Variable transmitter carrier output:	No, the output power of the transmitter is fixed.				
Product variants with alternate power levels:	None				

1.2.1.5 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 diametre 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	PCB 01 Drawing No. 47181600	Includes RF-ID transceiver
2	C700 I/O UL	N & W	PCB 02 Drawing No. 47188430	New board
3	C700 Extension Board	N & W	PCB03 Drawing No. 47183800	New board
4	Modul membrancontrol	N & W	PCB05/06 Drawing No. 47182200	
5	Module trough in place	N & W	PCB08 Drawing No. 47181700	
6	Module payment	N & W	PCB37 Drawing No. 47182400	
7	Module hot water switch	N & W	PCB09 Drawing No. 47182100	
8	Y-Filter board	N & W	PCB11 Drawing No. 47183100	4 x 0,01 µF
9	B2 coil	Binder	Type 5690	3x
10	Switching relay for heater	Siemens	Typ T92P7D32	3x
11	Heater	---	3.0 + 2.7 + 2.0 kW	one heater per phase
12	Water inlet valve	A + K Müller	Type 1.010.125	
13	Product water valve	A + K Müller	Type 40.012.191	4x
14	Mixer motor	Crouzet	Type 82.810.510	3x
15	Gear motor	Bühler	Type 61.013.118-9	2x
16	Fan	ADDA	--	24 VDC
17	Switching power supply	Total	TPSF 220-3-A	AC Input 100-120VAC;50/60Hz; 200 - 240VAC; 50/60Hz; Output 3x 24V
18	Peltierelement	Supercool	PE-127-14-25S	24VDC, 3.1A 2x
19	Sensor TX/RX	Telefunken	BPW 96/TSH 55 XX	

EMC-measures

No.	Location	Description	Specification	Manufacturer	Type designation
1	Y-Filter board	Y-capacitor	4 x 0.01µF	N & W	---
2	User interface board L16, L17, L18, L19	Ferrite beads	---	Murata	BLM21BD

Description of shield- and contacting measures for emc

No.	Description of the measure
1	None

1.2.2 Receiver and ancillary components

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

1.2.3 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 1.2.1.2
Oscillators, generated frequencies:	refer to 1.2.1.4
EMC measures:	refer to 1.2.1.5
Miscellaneous information:	Demodulation method of the transceiver front end IC: Amplitude and phase demodulation, see specifications (on file at the test laboratory)

2 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	10	This test was combined with the measurement acc. to § 15.107 (a)	Pass
1.2	Radiated emissions (Magnetic field strength) § 15.209 (a)	9 kHz - 30 MHz	---	see VDE Test Report FG43-4-63455	Pass (lately not tested)
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	10	Class B limits	Pass
2.2	Radiated emissions (Electric field strength) § 15.109 (g)	30 MHz – 1 GHz	13	Class B limits	Pass
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.



3 Measurement protocols from testing intentional radiators

see VDE Test Report FG43-4-63455

4 Measurement protocols from testing unintentional radiators

4.1 Terminal Disturbance Voltage

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2006-09-27

Instruments:	Test Location: Shielded Room #5		
Inventory number	Description	Manufacturer	Type
1800049	FUNKSTOERMESSEMPFAENGER	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 investigations it was found that the level of emissions in stand-by mode can be considered as worst case. Therefore the final measurements were carried out in stand-by mode.

Protocol:

Measurement curves can be found on the following page.

Result: Pass

**The measured emissions of the EUT were found to be below the specified limits.
The highest reading found was 4,1 dB below the limit.**

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

Fre- quency	Reading	Detector type	Correction	Measured Value	Limit	Margin	Result	Comments / Remarks
MHz	dB(μV)		dB	dB(μV)	dB(μV)	dB		
0,245	47,8	AV	incl.	47,8	61,9	14,1	Pass	
0,195	48,2	AV	incl.	48,2	63,9	15,7	Pass	
0,390	38,3	AV	incl.	38,3	58,0	19,7	Pass	

The margin of all other readings with the average detector to the limit was 20 dB or higher.

0,245	47,8	QP	incl.	47,8	51,9	4,1	Pass	
0,195	46,0	QP	incl.	46,0	53,9	7,9	Pass	
0,390	36,7	QP	incl.	36,7	48,0	11,3	Pass	
0,290	39,0	QP	incl.	39,0	50,6	11,6	Pass	
0,440	34,6	QP	incl.	34,6	47,0	12,4	Pass	
0,585	33,2	QP	incl.	33,2	46,0	12,8	Pass	

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

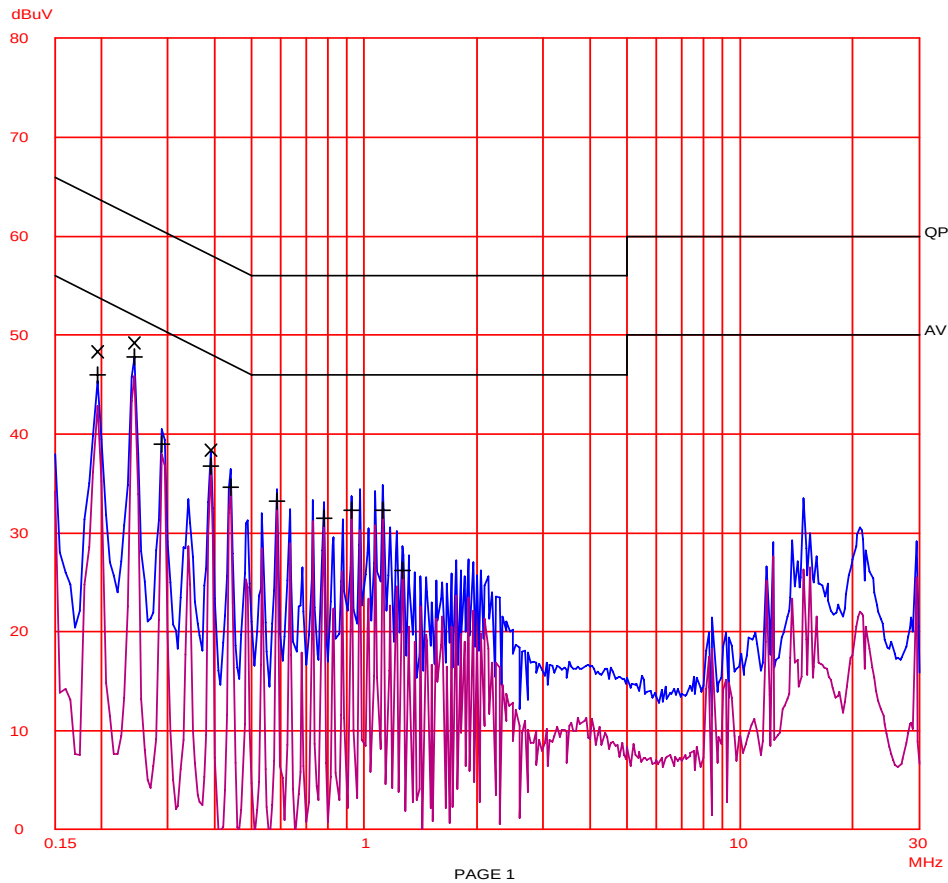
VDE Testing and Certification Institute Terminal disturbance voltage, mains line

27. Sep 06 14:12

EUT: Commercial coffee maker
Manuf: N&W Global Vending, Type CFT700
Op Cond: Stand-by, heating up
Operator: W. Klos shielded room 3
Test Spec: FCC Part 15, Subpart B (CISPR 22 B)
Comment: 240 V, 60 Hz, 3.4 kW, Class I
5864.00-2240-0010/79979

Scan Settings (1 Range)
|----- Frequencies -----|----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 5k 10k PK+AV 20ms AUTO LN OFF 30dB

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





VDE Testing and Certification Institute
Terminal disturbance voltage, mains line

27. Sep 06 14:12

EUT: Commercial coffee maker
Manuf: N&W Global Vending, Type CFT700
Op Cond: Stand-by, heating up
Operator: W. Klos shielded room 3
Test Spec: FCC Part 15, Subpart B (CISPR 22 B)
Comment: 240 V, 60 Hz, 3.4 kW, Class I
5864.00-2240-0010/79979

Scan Settings (1 Range)

|----- Frequencies -----||----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
150k 30M 5k 10k PK+AV 20ms AUTO LN OFF 30dB

Final Measurement Results:

Indicated Phase/PE shows Configuration of max. Emission

Frequency MHz	QP Level dBuV	QP Limit dBuV	Phase -	PE -
0.19500	48.2	63.9	N	gnd
0.24500	49.1	61.9	N	gnd
0.39000	38.3	58.0	N	gnd

Frequency MHz	AV Level dBuV	AV Limit dBuV	Phase -	PE -
0.19500	46.0	53.9	N	gnd
0.24500	47.8	51.9	N	gnd
0.29000	39.0	50.6	N	gnd
0.39000	36.7	48.0	N	gnd
0.44000	34.6	47.0	L1	gnd
0.58500	33.2	46.0	L1	gnd
0.78000	31.4	46.0	L1	gnd
0.92500	32.3	46.0	L1	gnd
1.12000	32.3	46.0	L1	gnd
1.26500	26.1	46.0	L1	gnd

* limit exceeded

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

General information about the test:

Tested by:	Klos, Wolfgang
Test date:	2006-09-28

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

Test setup:

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

Operating modes investigated:

Standby

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

Protocol:

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

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

Measurement data can be found on the following page.

Result: Pass

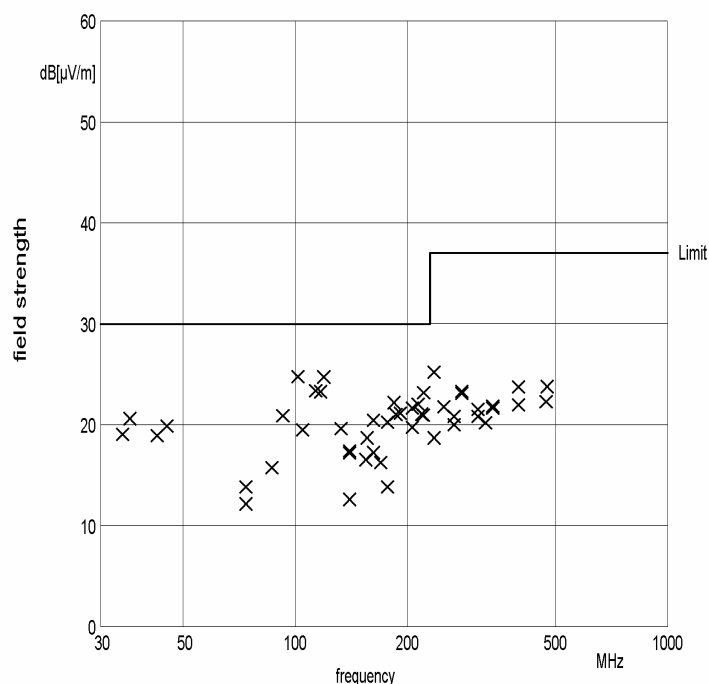
The emissions of the EUT were found to be below the specified limits.

The minimum margin of the highest reading relative to the limit was 5,2 dB.

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

Fre- quency MHz	Distance m	Height of An- tenna m	Polari- zation	EUT Angle 1°	Reading dB(μV)	An- tenna- factor dB/m	Σ dB(μV/m)	Limit dB(μV/m)	Margin dB	Result	Remarks
101,69	10	1,2	Ver.	330	11	13,78	24,78	30	5,22	PASS	
119,3	10	1	Ver.	0	13,3	11,43	24,73	30	5,27	PASS	
113,5	10	1,2	Ver.	0	10,8	12,54	23,34	30	6,66	PASS	
117	10	1,2	Ver.	0	11,4	11,87	23,27	30	6,73	PASS	
221,2	10	1	Ver.	0	9,8	13,37	23,17	30	6,83	PASS	
184,31	10	1	Ver.	350	10,3	11,89	22,19	30	7,81	PASS	

Test results: Electrical Fieldstrength



79979 7

Electrical Fieldstrength: Table of measured data

Quasi-peak

Fre- quency MHz	Distance m	Height of An- tenna m	Polari- zation	EUT Angle 1°	Reading dB(μV)	An- tenna- factor dB/m	Σ dB(μV/m)	Limit dB(μV/m)	Margin dB	Result	Remarks
34,4	10	1,6	Ver.	0	6,3	12,74	19,04	30	10,96	PASS	240 V/60 Hz
36	10	1,6	Ver.	0	7,6	13	20,6	30	9,4	PASS	
42,56	10	1,6	Ver.	0	4,9	14	18,9	30	11,1	PASS	
45,22	10	1,6	Ver.	0	5,8	14,08	19,88	30	10,12	PASS	
73,7255	10	1,6	Ver.	300	5,2	8,65	13,85	30	16,15	PASS	
73,727	10	4	Hor.	270	3,5	8,65	12,15	30	17,85	PASS	
86,52	10	1,2	Ver.	0	4,2	11,53	15,73	30	14,27	PASS	
92,59	10	1,2	Ver.	330	7,8	13,07	20,87	30	9,13	PASS	Narrowband disturbance, measured with Peak, 10 kHz incl. ambient disturbance (QP reading: 9,4 dBμV + Factor = 22,47 dBμV/m)
101,69	10	1,2	Ver.	330	11	13,78	24,78	30	5,22	PASS	
104,73	10	1,2	Ver.	330	5,9	13,57	19,47	30	10,53	PASS	Narrowband disturbance, measured with Peak, 10 kHz incl. ambient disturbance (QP reading: 16,6 dBμV + Factor = 30,17 dBμV/m)
113,5	10	1,2	Ver.	0	10,8	12,54	23,34	30	6,66	PASS	
117	10	1,2	Ver.	0	11,4	11,87	23,27	30	6,73	PASS	



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		
119,3	10	1	Ver.	0	13,3	11,43	24,73	30	5,27	PASS	
132,7	10	1	Ver.	250	9,8	9,84	19,64	30	10,36	PASS	
140,07	10	4	Hor.	270	3,2	9,4	12,6	30	17,4	PASS	
140,07	10	4	Hor.	30	8	9,4	17,4	30	12,6	PASS	
140,07	10	1	Ver.	60	7,8	9,4	17,2	30	12,8	PASS	
154,82	10	4	Hor.	210	6,7	9,84	16,54	30	13,46	PASS	
156,08	10	1	Ver.	345	8,8	9,9	18,7	30	11,3	PASS	
162,19	10	1	Ver.	345	10,2	10,23	20,43	30	9,57	PASS	
162,19	10	4	Hor.	225	7	10,23	17,23	30	12,77	PASS	
169,56	10	4	Hor.	90	5,6	10,67	16,27	30	13,73	PASS	
176,94	10	4	Hor.	90	2,6	11,26	13,86	30	16,14	PASS	
176,94	10	1	Ver.	30	9	11,26	20,26	30	9,74	PASS	
184,31	10	1	Ver.	350	10,3	11,89	22,19	30	7,81	PASS	
186,6	10	1	Ver.	0	8,9	12,09	20,99	30	9,01	PASS	
191,68	10	4	Hor.	100	8,7	12,42	21,12	30	8,88	PASS	
206,425	10	1	Ver.	30	8,9	12,76	21,66	30	8,34	PASS	
206,43	10	3,2	Hor.	270	7	12,76	19,76	30	10,24	PASS	
213,8	10	3,2	Hor.	270	9	13,05	22,05	30	7,95	PASS	Narrowband disturbance, measured with Peak, 10 kHz (QP Reading 11,2 + Factor = 24,25 dB(μV/m))
218,8	10	1	Ver.	30	7,8	13,25	21,05	30	8,95	PASS	
221,17	10	3,2	Hor.	240	7,6	13,37	20,97	30	9,03	PASS	
221,2	10	1	Ver.	0	9,8	13,37	23,17	30	6,83	PASS	
235,92	10	2,5	Hor.	20	4,5	14,2	18,7	37	18,3	PASS	
235,92	10	1	Ver.	0	11	14,2	25,2	37	11,8	PASS	
250,66	10	1	Ver.	300	7,3	14,5	21,8	37	15,2	PASS	
266,94	10	1,6	Hor.	190	5,9	14,92	20,82	37	16,18	PASS	
266,94	10	1	Ver.	0	5,1	14,92	20,02	37	16,98	PASS	
280,15	10	1	Ver.	210	7,8	15,31	23,11	37	13,89	PASS	
280,15	10	1,7	Hor.	180	8	15,31	23,31	37	13,69	PASS	
309,64	10	4	Ver.	45	4,7	16,14	20,84	37	16,16	PASS	
309,64	10	1,8	Hor.	150	5,4	16,14	21,54	37	15,46	PASS	
324,39	10	4	Ver.	330	3,7	16,5	20,2	37	16,8	PASS	



Fre- quency MHz	Distance m	Height of An- tenna m	Polari- zation	EUT Angle 1°	Reading dB(μV)	An- tenna- factor dB/m	Σ dB(μV/m)	Limit dB(μV/m)	Margin dB	Result	Remarks
339,13	10	4	Ver.	10	4,7	17,16	21,86	37	15,14	PASS	
339,13	10	3	Hor.	150	4,5	17,16	21,66	37	15,34	PASS	
398,11	10	4	Ver.	10	3,4	18,55	21,95	37	15,05	PASS	
398,11	10	1,8	Hor.	210	5,2	18,55	23,75	37	13,25	PASS	
471,84	10	1,3	Hor.	180	2,5	19,8	22,3	37	14,7	PASS	
475,09	10	1,4	Hor.	180	3,9	19,88	23,78	37	13,22	PASS	

5 Appendix

5.1 Photographs



Picture 1



Picture 2



Picture 3



Picture 4



Picture 5 Name plate of the EUT



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