ECL-EMC Test Report No.: 02-042

Equipment under test: CS0171 RFBASECUE
FCC ID QHXCS0171-9

Type of test: FCC 47 CFR Part 15 Subpart C

Measurement Procedures: ANSI C63.4 (1992)

Test result: Passed

Date of issue:	20.11.02			Signature:
Issue-No.:	01	Author:	**Günter Weinfurtner** Test engineer	
Date of delivery:	10.10.02	Checked:	**Zapf** Operational manager	
Testdates:	10.10.02			
Pages:	33			

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Manufacturer:	**CUE** **spol. s r.o.** Na Dolinách **147 00 Praha 4** **Czech Republic**
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General:
The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.249 of the Code of Federal Regulations title 47.
This report informs about the results of the EMC tests, it only refers to the equipment under test. No part of this report may be reproduced in any form, without written permission.

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1 Test Results Summery

Summary of Test Results
CS0171 RFBASECUE

Requirement	CFR Section	Report Section	Test Result
Antenna requirement	15.203	4	Pass
Conducted emissions	15.207	6	Pass
Field Strength Limits (Fundamental and Harmonics)	15.249	5	Pass
Radiated Spurious Emissions	15.209, 15.249	5	Pass

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the “Correction Factor” documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4-1992 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report.
The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

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2 CS0171 rfbaseCUE

RX/TX mode description

The rf part of Cue Control System contains 3 units:

1) the stationary station **rfbaseCUE**, connected to the central unit (Assistant) via RS485 bus
2) the handheld battery powered remote control keyboard **rfCUE**
3) the handheld battery powered 6 inch LCD terminal with touch panel – **touchCUE-srf**

Each of these 3 units contains 1 pair of transmitter and receiver.

The data transmission and reception is provided in a half-duplex mode by rf modules TX3A-914-64 and RX3-914-64 or TX2-433-40-5V and RX2-433-40-5V produced by Radiometrix Ltd., England. The transmission and reception frequencies are the same. 914.5 MHz for using in the USA and 433.92 MHz for using in Europe. The data sheet for both modules is available.

The RX input and the TX output are connected to the permanently attached (non-removable) 1/4 wave whip antennas, both located on front panel of the rfbaseCUE.

After switching on the control system all receivers are activated, while transmitters are disconnect from power supply voltage (Vcc, +5V). After pushing on any button in the distant rf remote controller (rfCUE keyboard or touch panel on touchCUE-srf), the command is received in rfbaseCUE and via RS485 bus is sent to the central unit of the control system (Assistant). The RX module in rfbaseCUE is disconnect from the Vcc and the transmitter is connect to the Vcc. Acknowledge of received command is sent and transmitter is disconnect from the Vcc.
When the distant remote controller not receives the command acknowledge from rfbaseCUE, repeats transmitting of command up to five times. Time delay between command transmissions is approximately 50 milliseconds.

When the system central unit (Assistant) needs to send command to the remote controller (i.e. change of backlight colour in rfCUE or status of bar graphs, pushbuttons on LCD in touchCUE-srf), the RX module in rfbase is disconnect from the Vcc and the TX module is activated. The command is sent, the TX is switched off and the RX is activated. The processor in rfbaseCUE is waiting for acknowledge from the distant remote controller. When the acknowledge of command is not received, command transmission is repeated after several seconds. Delay between repeating of command is increasing from several seconds to several minutes until getting acknowledge.

The duration time of command or acknowledge transmission is 11 to 20 milliseconds. The exact time depends on length of the command and transmitter is frequency modulated by serial data from microprocessor. Bit rate does not exceed 30 kbit/sec.

Used frequencies:

14.7456 MHz	Microprocessor clock
14.289 MHz	Reference oscillator in PLL for TX3A
14.456 MHz	Reference oscillator in PLL for RX3

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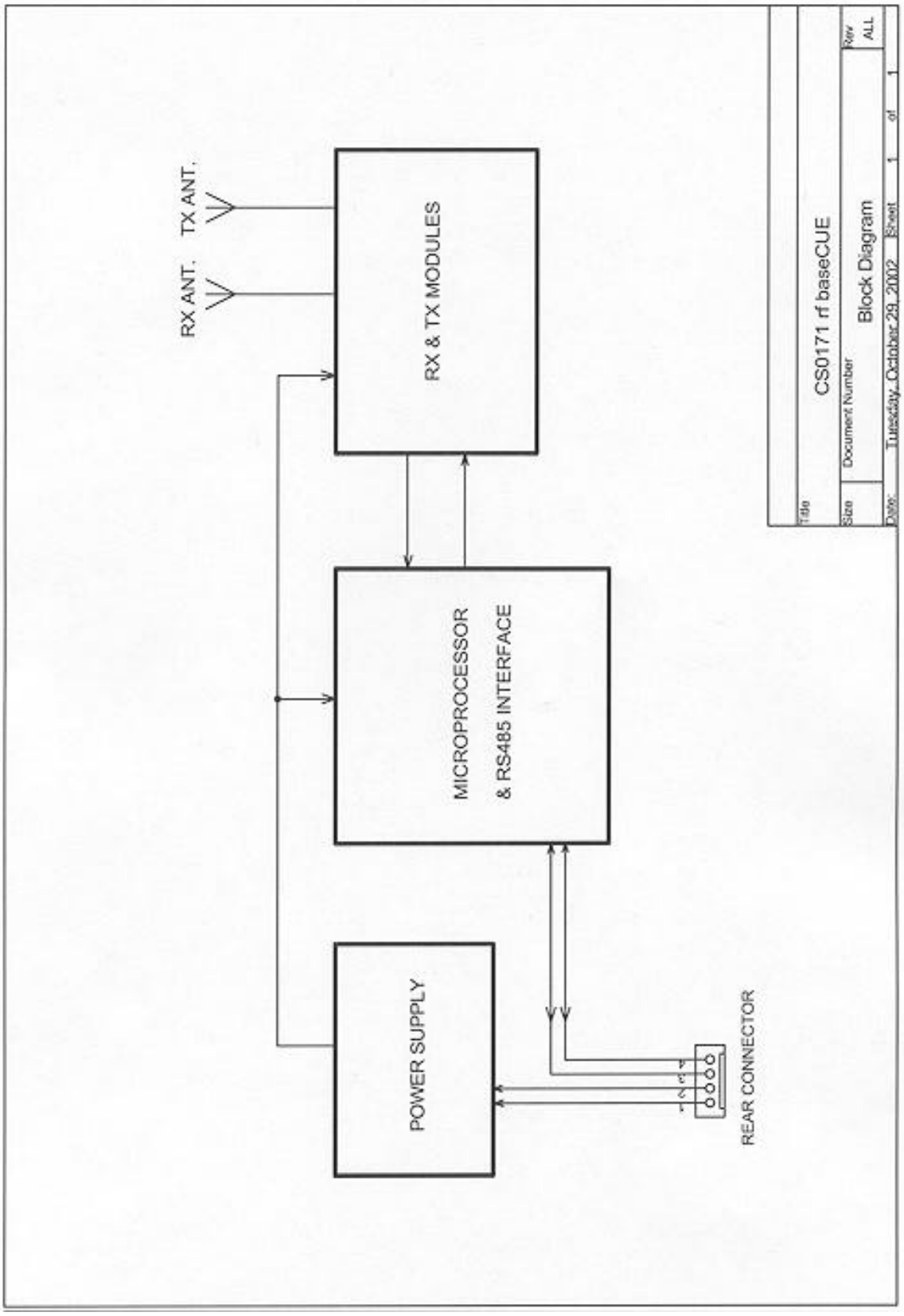

Block diagram

3 Description of EMC test centre

3.1 Registrations

Registration No.: TTI-P-G 004/92-03

Registration No.: 96997

Registration No. for conducted emission: C-1361

Registration No. for radiated emission: R-1293

Registered Manufacturer Test Facility (MTF) within Verizons ITL program.

3.2 Semi anechoic chamber (SAC) with maximum 10m measurement distance

Dimensions (LxWxH):	22.28 m x 15.98 m x 9.00 m with ground plane
Shielding:	Chrome steel frame with steel panels in modular design, screwed, insulated design
Shielding attenuation:	> 85 dB at 10 kHz > 100 dB at 156 kHz > 120 dB at 1 MHz > 100 dB at 100 MHz up to 1 GHz > 80 dB at 10 GHz > 80 dB at 18 GHz
Absorber:	Franko$_{Sorb}$ P2400; length 2.4m; on sidewalls, endwalls and ceiling
Turntable:	5 m diameter; 3 t load-bearing capacity
EMC test system:	Rohde & Schwarz; ESH3; ESVS30; ESAI; ESI40
Antennas:	Loop antenna; biconical antennas, log. periodic antennas, horn antennas Emission frequency range: 10 kHz - 40 GHz Immunity frequency range: 10 kHz - 18 GHz
Chamber filters:	AC chamber filter max. 100A / 3 phase system DC chamber filter max. 100V / 100A 32 filters with 2 Mbit/s 20 filters with 64 kBit/s 20 filters with 3.4 kHz
Video:	Pontis
Power supplies:	DC: 100V / 100A (with chamber filter) or 70V / 500A (without chamber filter)

3.3 Fully anechoic chamber (FAC) with maximum 5m measurement distance

Dimensions (LxWxH):	12.01 m x 8.03 m x 6.00 m
Shielding:	Chrome steel frame with steel panels in modular design, screwed, insulated design
Shielding attenuation:	> 85 dB at 10 kHz > 100 dB at 156 kHz > 120 dB at 1 MHz > 100 dB at 100 MHz up to 1 GHz > 80 dB at 10 GHz > 80 dB at 18 GHz
Absorber:	Franko$_{Sorb}$ H600; length 0.6 m; on sidewalls, endwalls, ceiling and bottom

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Turntable:	3 m diameter; 1 t load-bearing capacity
EMC test system:	Rohde & Schwarz; ESH3; ESVS30; ESAI; ESI40
Antennas:	Loop antenna; biconical antennas, log. periodic antennas, horn antennas Emission frequency range: 10 kHz - 40 GHz Immunity frequency range: 10 kHz - 18 GHz
Chamber filters:	AC chamber filter max. 100A / 3 phase system DC chamber filter max. 100V / 100 A 32 filters with 2 Mbit/s 20 filters with 64 kBit/s 20 filters with 3.4 kHz
Video:	Pontis
Power supply:	DC: 100V / 100A

3.4 Shielded test cabins

Measurementroom for SAC (MRS):

Dimensions (LxWxH):	2.5 m x 2.4 m x 2.5 m
Use:	Isolation of auxiliary equipment from the equipment under test inside SAC

Measurementroom for FAC (MRF):

Dimensions (LxWxH):	3.5 m x 1.7 m x 2.5 m
Use:	Isolation of auxiliary equipment from the equipment under test inside FAC

Shielded cabin (EMI):

Dimensions (LxWxH):	4.31 m x 4.31 m x 2.8 m
Use:	ESD test cabin, RFI voltage measurement and conducted interference immunity tests.
Cabin filters:	AC chamber filter max. 25 A DC chamber filter max. 60 A 2 filters with cut-off frequency 3.4 kHz 5 filters (4-w) with cut-off frequency 500 kHz

Amplifier room (AR):

Dimensions (LxWxH):	3.5 m x 2.5 m x 2.5 m
Use:	Location for RF amplifiers

3.5 Instrument room

Dimensions (LxWxH):	12 m x 5.33 m x 3.3 m
Use:	Location for measurement equipment as like as spectrum analyzers, receivers and PCs with EMI software. There are also located: Control devices for antenna/turntable movement and audio/video.

3.6 Measurement Uncertainty

The table below shows the measurement uncertainties for each measurement method. The expanded uncertainty was calculated with worst case values over the complete frequency area.

Measurement method	Frequency area impulse duration time	Description	expanded Uncertainty (95% or k=2)
Radiated emission (EN 55022; ANSI C63.4 etc.)	30 MHz...1 GHz	Semi anechoic chamber	±4,7 dB
	1 GHz...18 GHz	Fully anechoic chamber	±3,9 dB
Conducted emission (EN 55022; ANSI C63.4 etc.)	9 kHz...150 kHz 150 kHz...30 MHz		±4,0 dB ±3,6 dB
Harmonics (EN 61000-3-2)	2...40 x $f_{N;}$ f_N = 50 Hz	Voltage Current	±1% ±1%
Flicker (EN 61000-3-3)	f_N = 50 Hz	P_{st}	±1,5%
ESD (EN 61000-4-2)	5/30ns	Rise time/ half life Voltage amplitude	±30% ±10%
Radiated Immunity (EN 61000-4-3)	80 MHz...1 GHz		±42,7%
BURST (EN 61000-4-4)	5/50 ns	Rise time/ half life Voltage amplitude	±20% ±4,1%
SURGE (EN 61000-4-5)	1,2/50 µs 8/20 µs	Voltage rise time/ half life Current rise time/ half life Charged voltage	±30%/±20% ±20%/±20% ±4,1%
HF-Injection (EN 61000-4-6)	150 kHz...80 MHz		±9%
Voltage Dips, Interruptions (EN 61000-4-11)		Voltage level time	±1% ±0,1%
Power induction	ITU-K.20	Frequency Amplitude	±0,1Hz ±1%

3.7 Ground plan

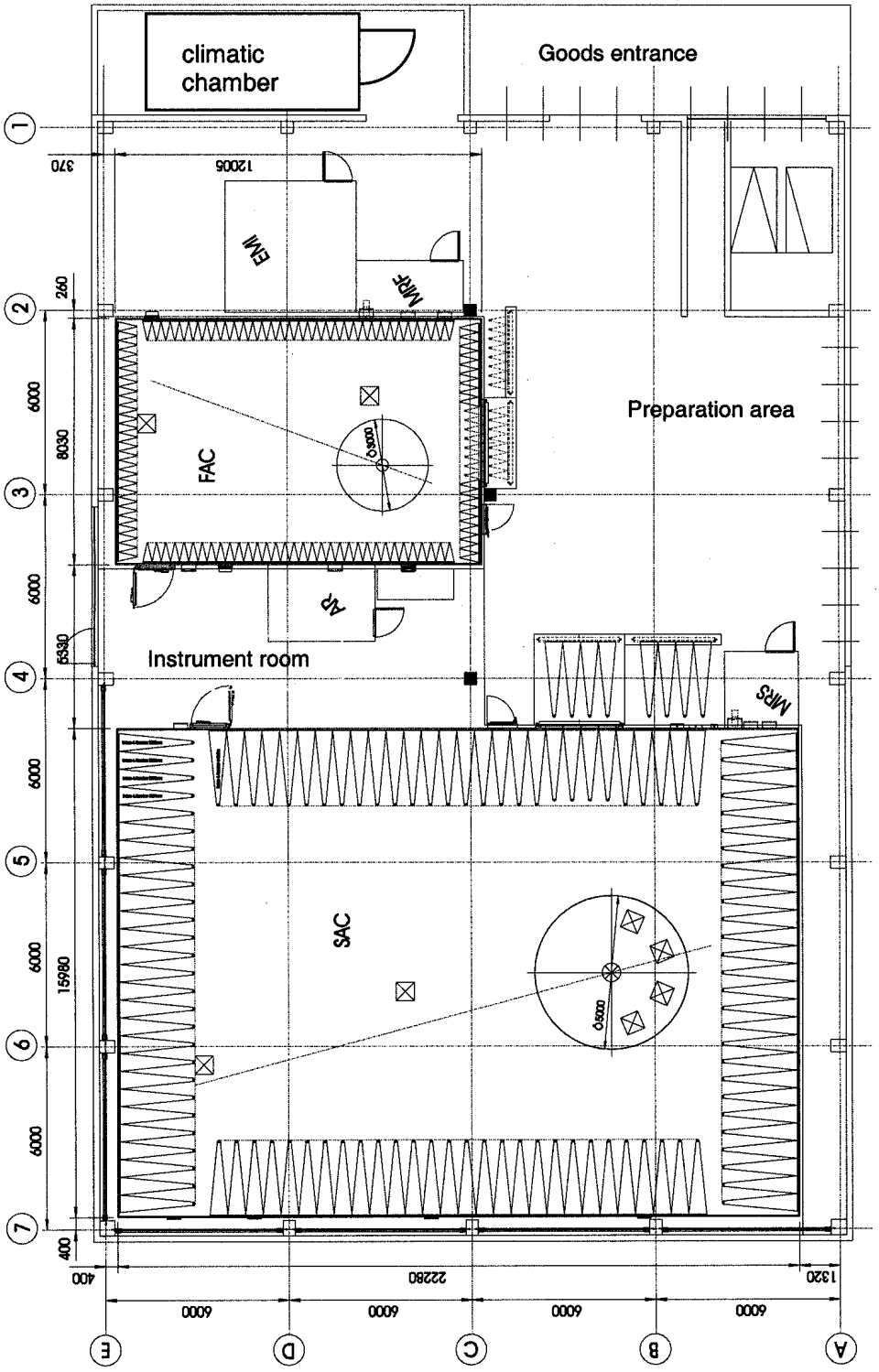

Fig. 3.7.1: Partition of the European Compliance Laboratory

4 Antenna Requirement

Test requirement: FCC CFR47, Part 15C

4.1 Regulation

15.203 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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, 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 Sections 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 Section 15.31(d), must be measured at the installation site. However, the installer shall responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

EUT: CS0171 RFBASECUE

The antenna is permanently attached.
The EUT meets the requirements of this section.

5 Radiated Emissions Test

Test requirement: FCC CFR47, Part 15C
Test procedure: ANSI C63.4: 1992

5.1 Regulation

15.249(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902 – 928 MHz	50	500
2400 – 2483.5 MHz	50	500
5725 – 5875 MHz	50	500
24.0 – 24.25 GHz	250	2500

(b) Field strength limits are specified at a distance of 3 meters.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(d) As shown in §15.35(b), for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Section 15.33 Frequency range of radiated measurements:
(a) Unless otherwise noted in the specific rule section under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

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5.2 Radiated Emissions Test, 9 kHz to 10 GHz

5.2.1 Test equipment used:

Designation	Equipment	Manufacturer	Frequency range	used
EMI test receiver	ESVS30	Rohde & Schwarz	20 MHz – 1 GHz	
EMI test receiver	ESAI	Rohde & Schwarz	20 Hz – 1,8 GHz	
EMI test receiver	ESI40	Rohde & Schwarz	20 Hz – 40 GHz	X
EMI test receiver	ESH3	Rohde & Schwarz	9 kHz – 30 MHz	X
Antenna	CBL 6111	Chase	30 MHz – 1 GHz	
Antenna	HFH2-Z2	Rohde & Schwarz	9 kHz – 30 MHz	X
Antenna	3141	EMCO	26 MHz – 2 GHz	X
Antenna	HL025	Rohde & Schwarz	1 GHz - 18 GHz	X

5.2.2 Test Procedures

For tabletop equipment, the EUT is placed on a 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.
Preview tests are performed. Emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions. All tests performed with the antenna placed in two polarizations: horizontal and vertical.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 10 GHz
Test distance	3 m *
Test instrumentation resolution bandwidth	200 Hz (9 kHz – 150 kHz) 9 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1 GHz) 1 MHz (1 GHz – 10 GHz
Receive antenna scan height	1 m – 4 m (above 30 MHz)
Receive antenna polarization	Vertical/Horizontal

* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. (...) When performing measurements at a distance other than specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

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5.2.3 Calculation of Field Strength Limits

Fundamental field strength limit for the band 902 to 928 MHz:
50 mV/m at 3 meters; 50 mV/m corresponds with 94.0 dB(µV/m).

Harmonics field strength limit for the band 902 to 928 MHz:
500 µV/m at 3 meters; 500 µV/m corresponds with 54.0 dB(µV/m).

The above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Emissions radiated outside the frequency band 902 to 928 MHz, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Calculation: microvolts/meter to dB(µV/m)

Frequency	Field Strength Limits according to §15.209		Measurement distance
[MHz]	[µV/m]	[dB(µV/m)]	[m]
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

The emission limits shown in the above table are based on measurements employing a CISPR quasipeak detector except for frequencies above 1000 MHz. Radiated emission limits above 1000 MHz are based on measurements employing an average detector.

5.2.4 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the “worst case” on time in any 100 ms time period and using the formula:

Correction Factor (dB) = 20*log (worst case on time/100 ms)

Analysis of the transmitter worst case on time in any 100 ms time period is an on time of 40 ms.
Therefore the correction factor is 20 log (40/100) = - 8 dB

5.2.5 Field Strength Calculation

The field Strength is calculated by adding the Antenna Factor and the Cable Factor. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF
where
FS = Field Strength in dB((µV/m)
RA = Receiver Amplitude in dB(µV)
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB

Assume a receiver reading of 23.5 dB(µV) is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dB(µV/m). The 32 dB(µV/m) value can be mathematically converted to its corresponding level in µV/m.

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FS = 23.5 dB(µV) + 7.4 dB (1/m) + 1.1 dB = 32 dB(µ/m)

FS = $10^{(32/20)}$µV/m = 39.8 µV/m

For test distances other than what is specified, but fufilling the requirements of Section 15.31 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements). The basic equation with a sample calculation is as follows:

FS = RA + AF + CF + DF
where
FS = Field Strength in dB(µV/m)
RA = Receiver Amplitude in dB(µV)
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
DF = Distance Extrapolation Factor in dB
where DF = 20log(D_{test}/D_{spec}) where D_{test} = test distance and D_{spec} = specified distance

Assume the test performed at a reduced test distance of 1.5 m instead of the specified distance of 3 m giving a Distance Extrapolation of DF = 20log(1.5m/3m) = - 6 dB.
Assuming a receiver reading of 23.5 dB(µV) is obtained. The Antenna Factor of 7.4 dB(1/m), the Cable Factor of 1.1 dB and the Distance Factor of –6 dB are added, giving a field strength of 26 dB(µV/m). The 26 dB(µV/m) value can be mathematically converted to its corresponding level in µV/m.

FS = 23.5 dB(µV) + 7.4 dB(1/m) + 1.1 dB – 6 dB = 26 dB(µV/m)

FS = $10^{(26/20)}$µV/m = 20.0 µV/m

5.2.6 Test Results

Product Emissions Data, Fundamental and Harmonics											
No	Emission Frequency [MHz]	Receiver Bandwidth and Mode [kHz]	Test Dist-ance [m]	Receiver Reading RA [dB(µV)]	Correction Factor AF + CF [dB(1/m)]	Distance Extrapol. Factor DF [dB]	Average Correction Factor [dB]	Result = Corrected Reading FS [dB(µV/m)]	Spec. Limit [dB(µV/m)]	Polari-zation Ant.	Margin [dB]
1	914,5	120, PK	3	65.7	28	0	-10.9	82.8	94	v	11.2
2	1829	1000, PK	3	17.6	28.4	0	-10.9	35.1	54	v	18.9
3	2743.5	1000, PK	3	9.4	32.6	0	-10.9	31.1	54	v	22.9
4											
5											

Product Emissions Data above 30 MHz (except fundamental and harmonics)											
No	Emission Frequency [MHz]	Receiver Bandwidth and Mode [kHz]	Test Dist-ance [m]	Receiver Reading RA [dB(µV)]	Correction Factor AF + CF [dB(1/m)]	Distance Extrapol. Factor DF [dB]	Average Correction Factor [dB]	Result = Corrected Reading FS [dB(µV/m)]	Spec. Limit [dB(µV/m)]	Polari-zation Ant.	Margin [dB]
1	0.0533	0.2, PK	3	68	0.2	-20		48.2	53.07	Rect.	4.87
2	0.1066	0.2, PK	3	49.5	0.3	-20		29.8	47.05	Rect.	17.25
3	0.1333	0.2, PK	3	48.6	0.4	-20		29	45.1	Rect.	16.1
4	0.1581	9, PK	3	45.4	0.5	-20		25.9	43.6	Rect.	17.7
5	0.2134	9, PK	3	41.9	0.5	-20		22.4	41	Rect.	18.6
6	0.5396	9, PK	3	40.1	0.6	-20		20.7	33	Rect.	12.3

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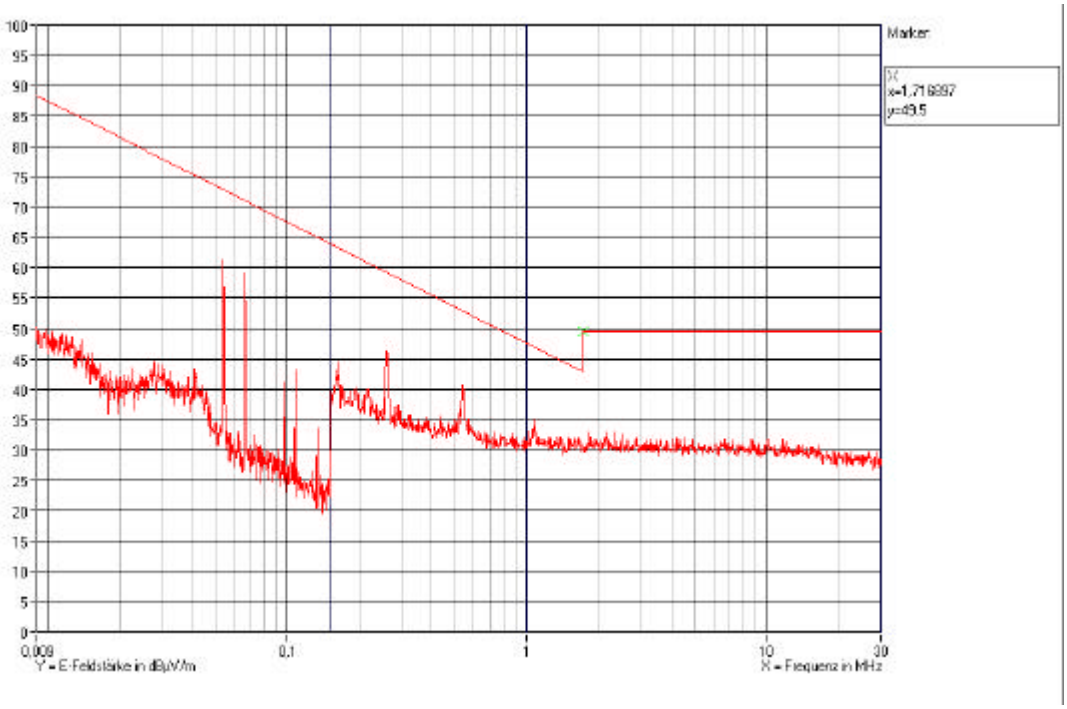
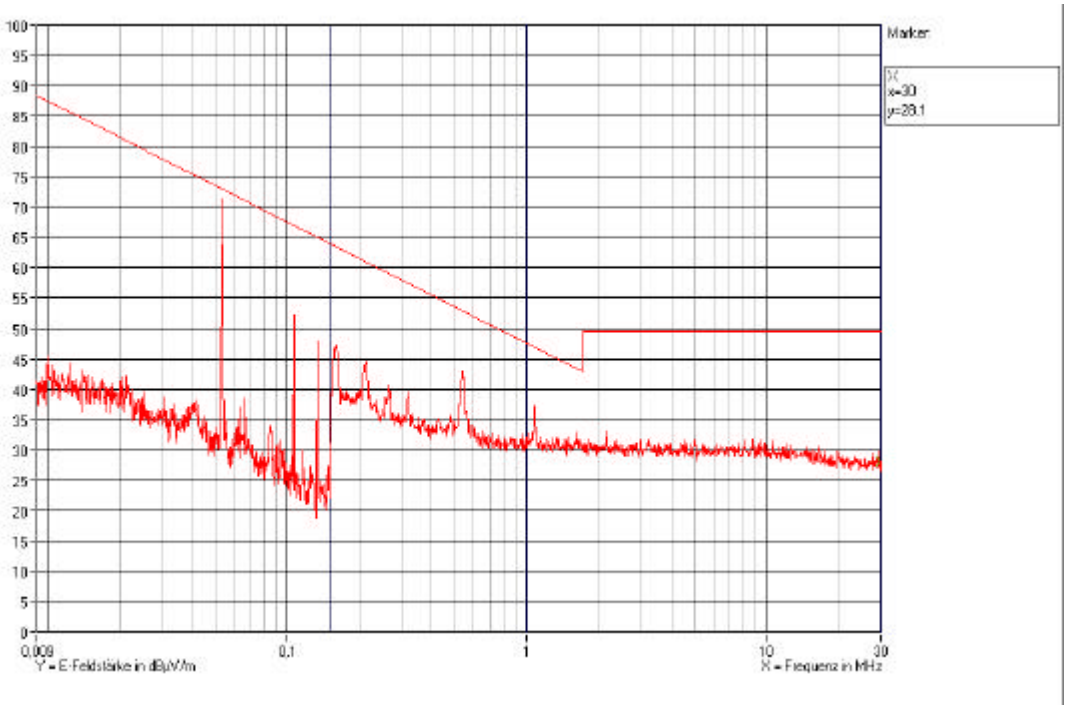


Measurement report 1: parallel; h=1m, 0 degree
9 kHz – 30 MHz



Measurement report 2: rectangular; h=1m, -25 degree
9 kHz – 30 MHz

Measurement report 1 and 2 were carried out with the whole system. The CS0171 rfbaseCUE was one part of the system.

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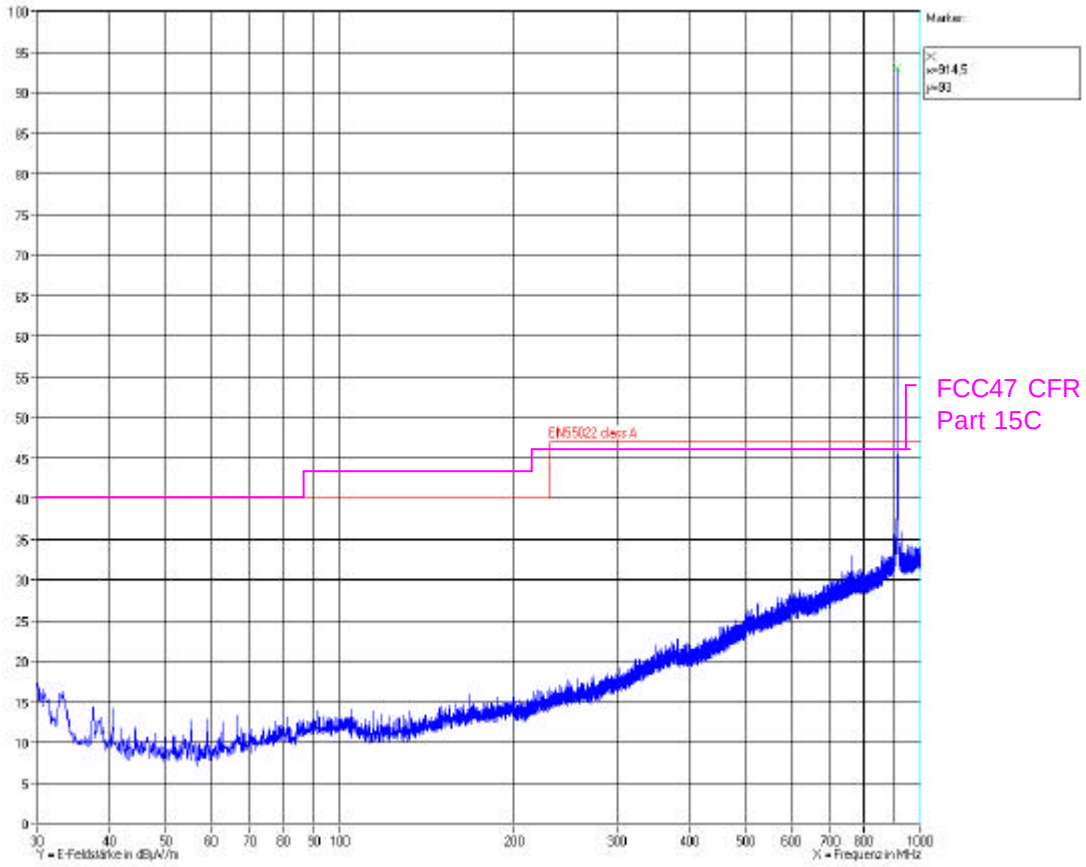
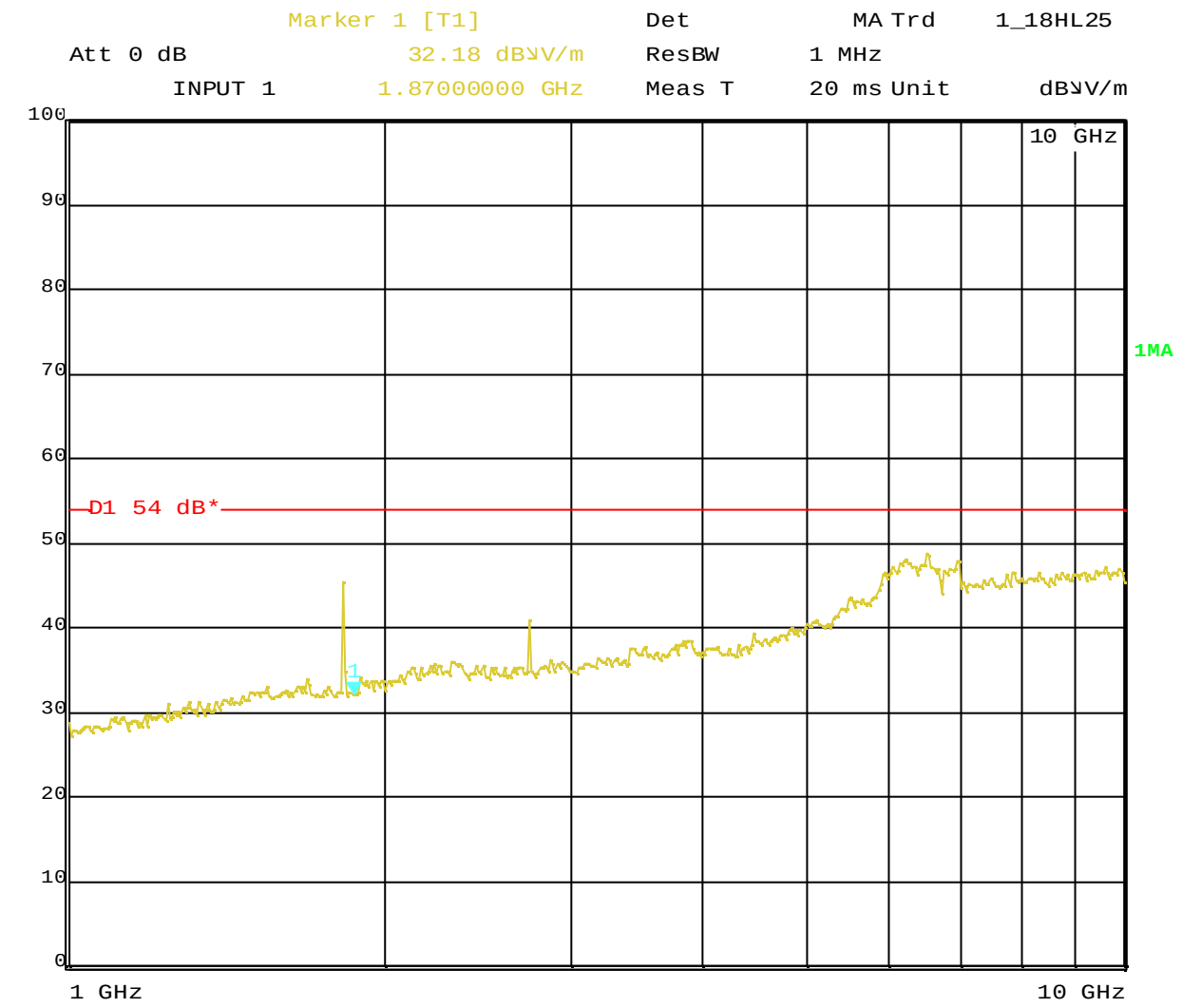


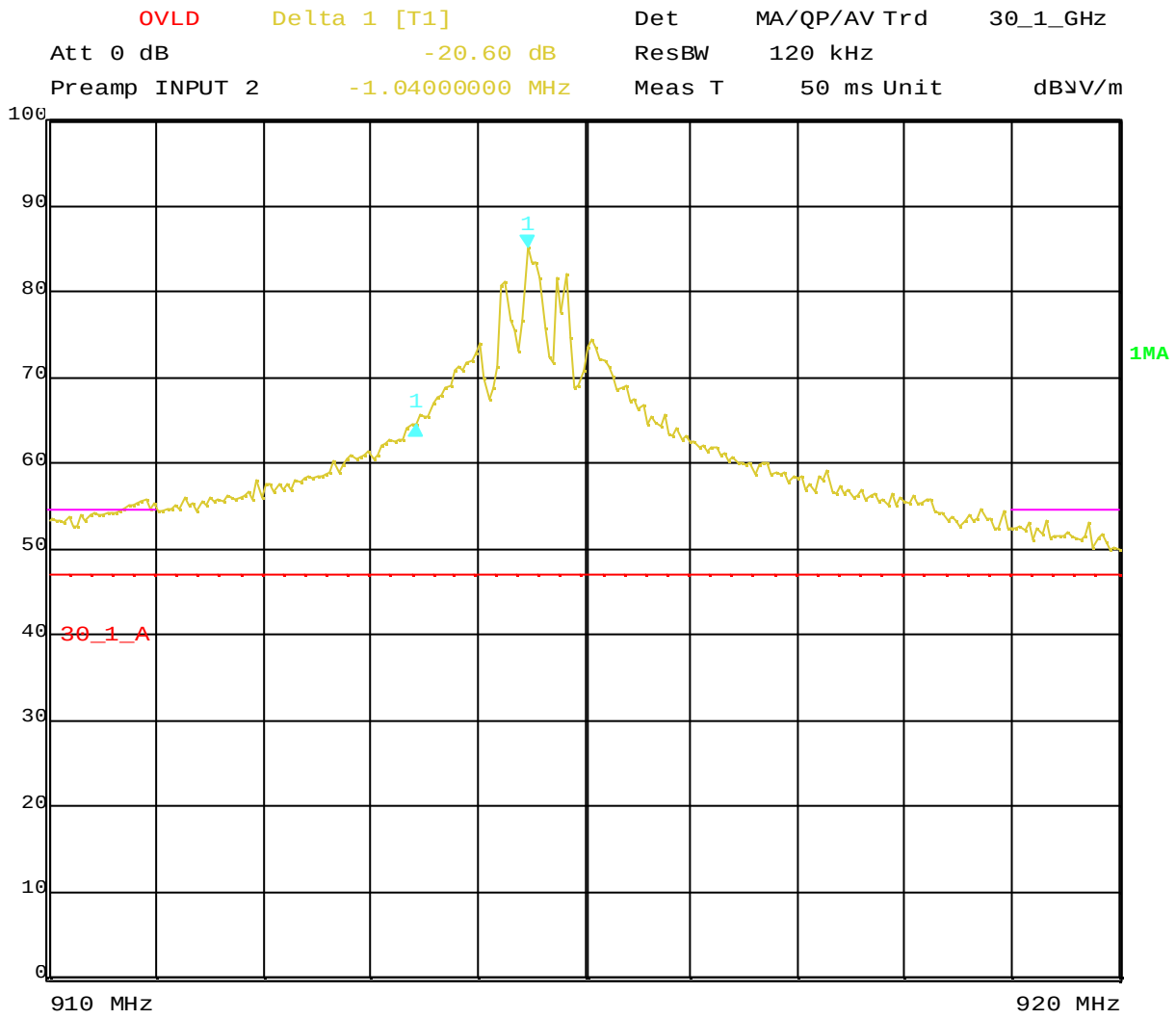
Measurement report 3: vertical; h=1m, -5 degree
30 MHz – 1 GHz

Remark: The peak at 914,5 MHz is the intended frequency and therefore not relevant for the limits.



Measurement report 4: vertical; h=0,8, -5 degree, peak
> 1 GHz

Spurious emissions



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The spurious emissions within the band 902 to 928 MHz were less than 54 dBµV/m measured with a resolution bandwidth of 10 kHz.

All plots show the results with the peak detectors. It is the worst case condition.

EUT: CS0171 RFBASECUE

The EUT meets the requirements of this section.

6 Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C
Test Procedure: ANSI C63.4: 1992

6.1 Regulation

Section 15.207 (a) For an intentional radiator which 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. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

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

* Decreases with the logarithm of the frequency.

Section 15.207 (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 charger 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.

6.2 Test Equipment

Designation	Equipment	Manufacturer	Frequency range	used
EMI test receiver	ESAI	Rohde & Schwarz	20 Hz – 1,8 GHz	
EMI test receiver	ESI40	Rohde & Schwarz	20 Hz – 40 GHz	
EMI test receiver	ESH-3	Rohde & Schwarz	9 kHz – 30 MHz	X
Transient Limiter	ESH3-Z2	Rohde & Schwarz	9 kHz – 30 MHz	X
Transient Limiter	11947A	Agilent Technologies	DC – 200 MHz	
LISN (4x25 A)	LISN4-25/32	Bajog	9 kHz – 30 MHz	X
LISN (2x100 A)	LISN2-100/200	Bajog	9 kHz – 30 MHz	
LISN (4x100 A)	LISN4-100/200	Bajog	9 kHz – 30 MHz	

6.3 Test Procedures

The supply voltage for the EUT was provided via a Line impedance stabilizing network (LISN). The LISNs were under the turntable and connected to the chamber ground.

The EUT, when intended for table-top use, was placed 0,4m from a vertical metal reference plane of at least 2m by 2m, and was kept at least 0,8m from any other metal surface or other ground plane was not part of the EUT. If the measurement was made in a screened enclosure, the distance of 0,4m was referred to one of the walls of the enclosure. If the measurement was made in a screened enclosure, the distance of 0,4m was referred to the horizontal metal ground plane.

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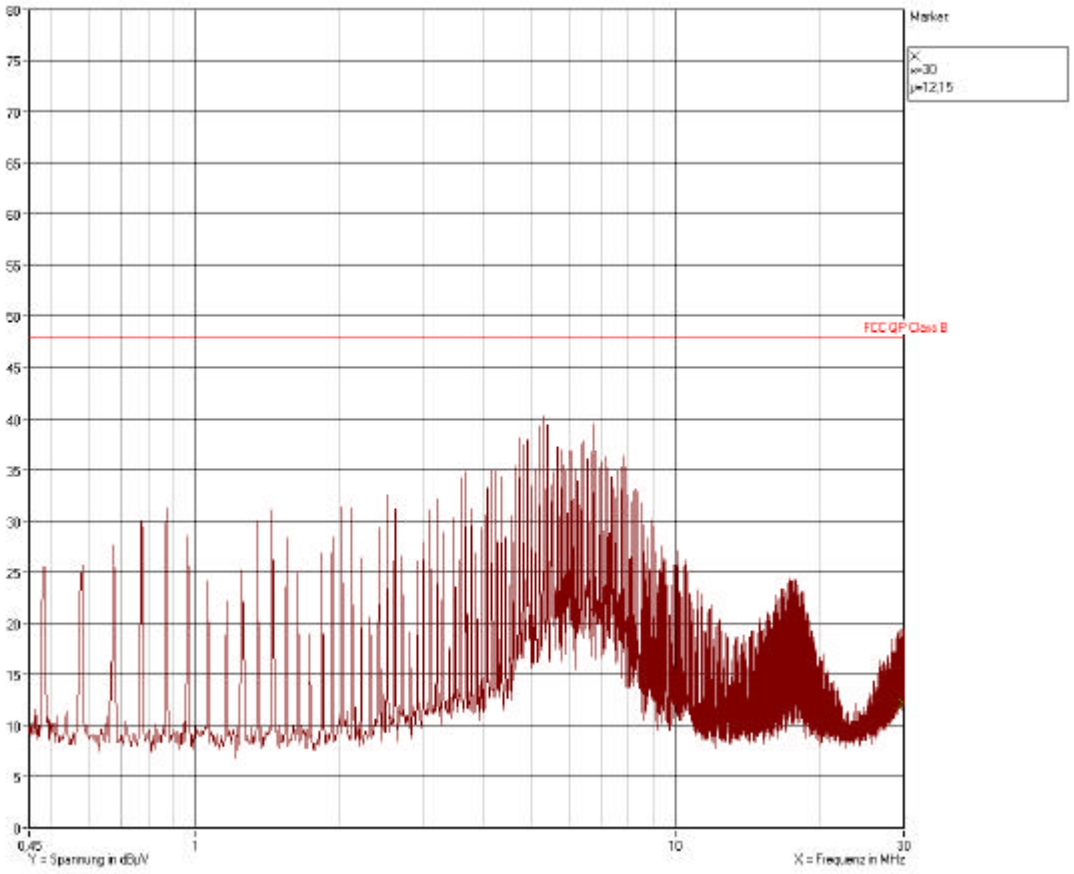
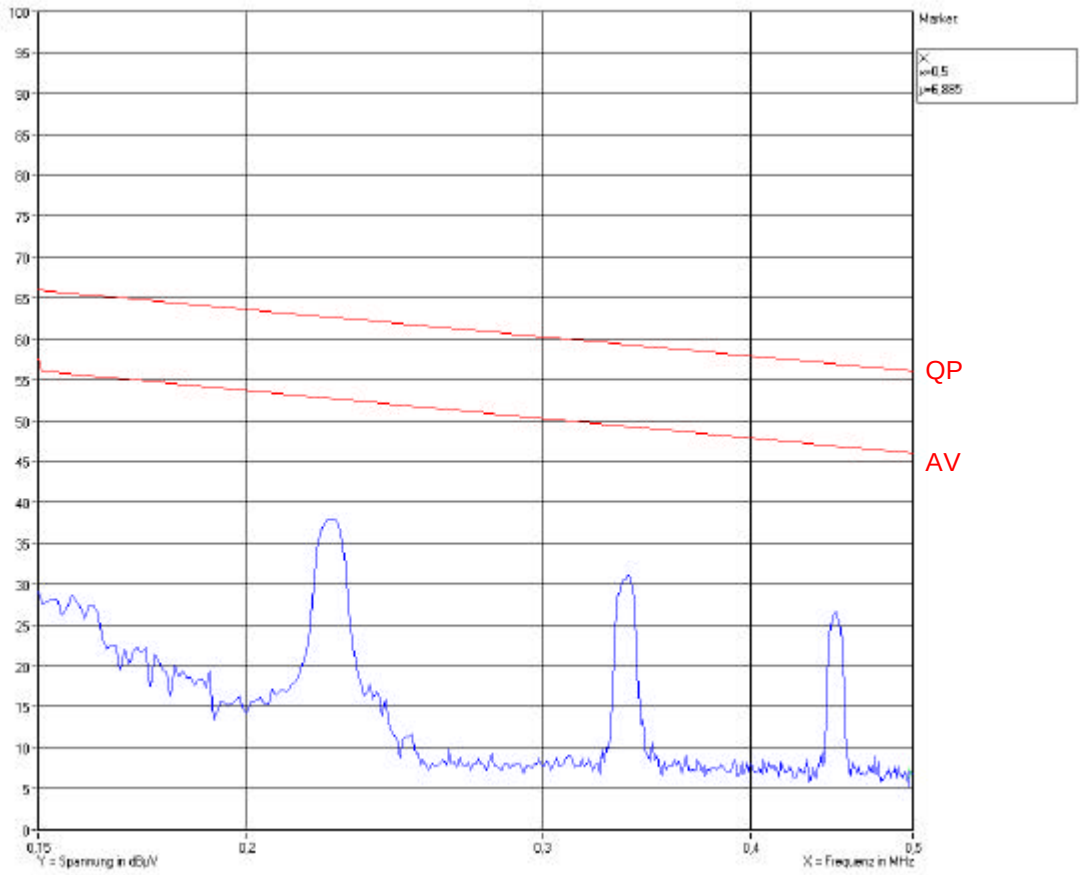
A floor-standing EUT was placed on a horizontal metal ground plane, the points of contact were consistent with normal use, but not in metallic contact with the ground plane. The reference ground plane was at least 0,5m beyond the boundaries of the EUT, and had minimum dimensions of 2m by 2m.

6.4 Test Results

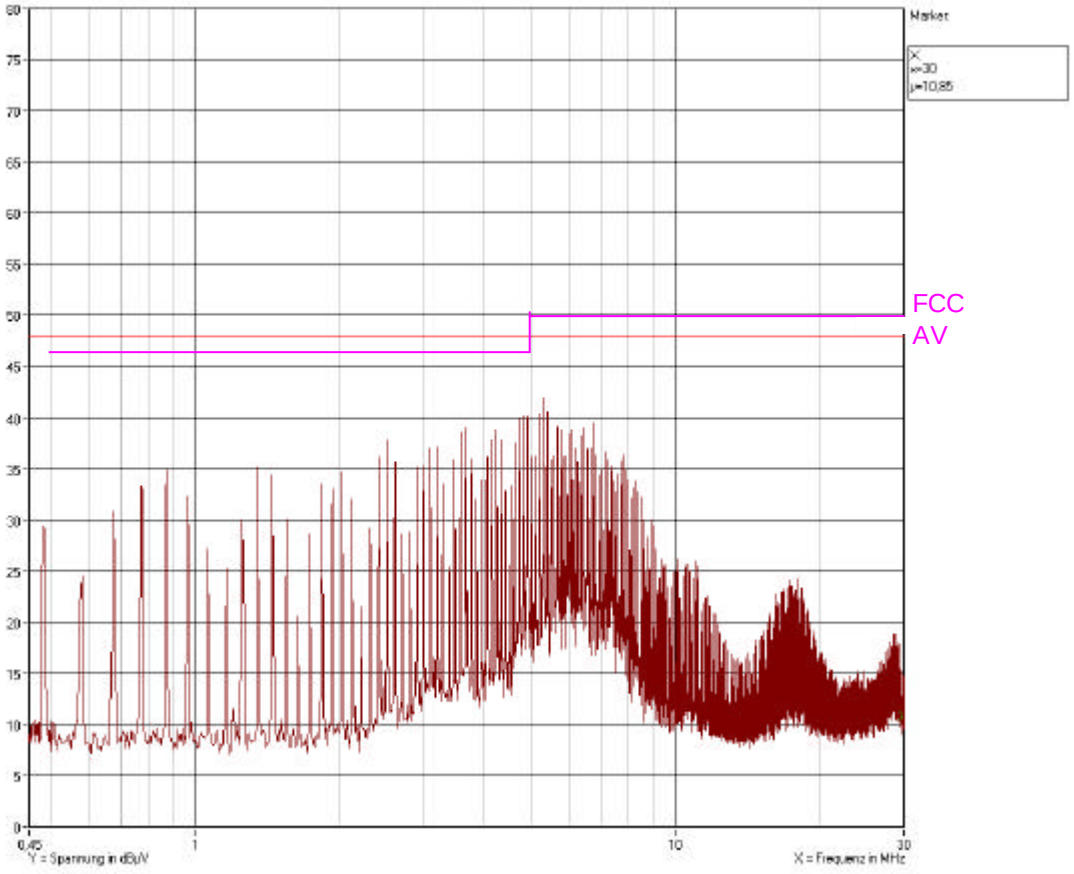
A functional test of the test equipment was carried out before and after the measurements.



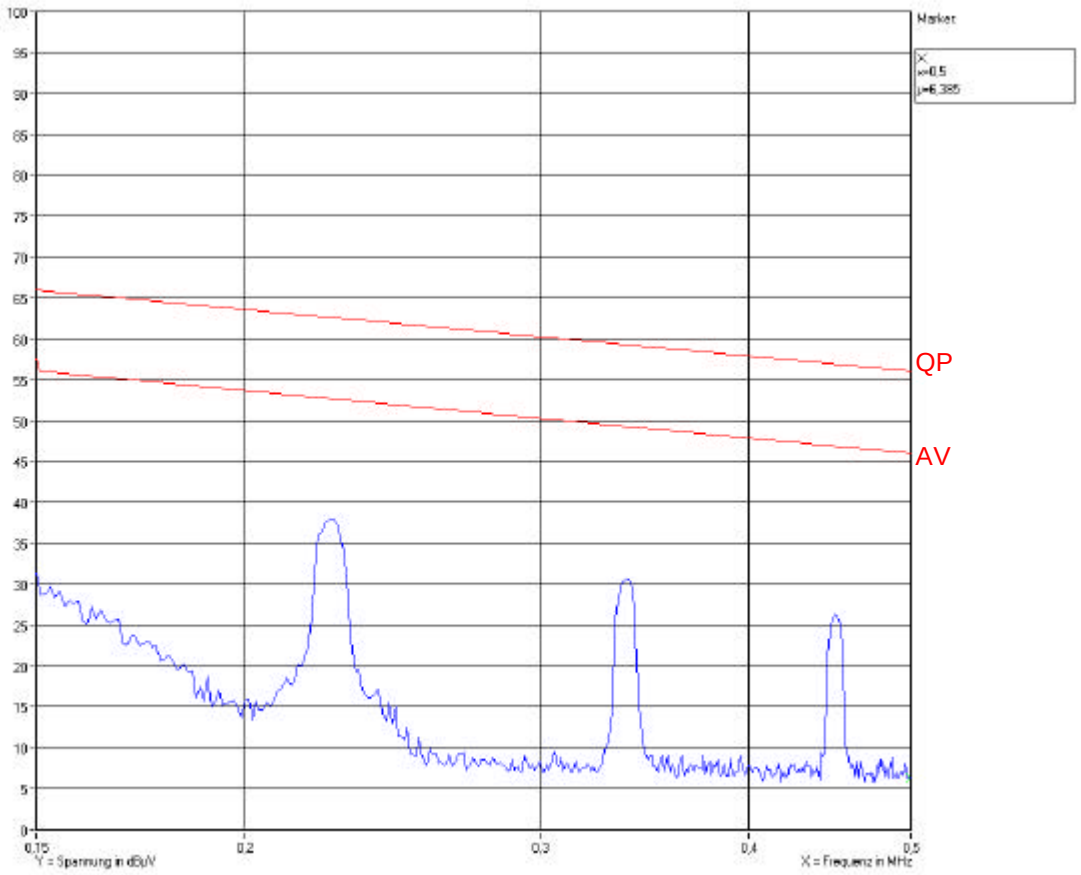
Measurement report 1: Neutral



Measurement report 2: Neutral 150 kHz to 500 kHz



Measurement report 3: Line L1 450 kHz to 30 MHz



Measurement report 4: Line L1 150 kHz to 500 kHz

7 Calibration list

Asset no.	Serial no.	Model	Manufacturer	Designation	Cal. date
B415	LO-123364	PM 6303	Philips	RCL Bridge	07/11/2002
D2157	611462	CTR 2	EM Test	Calibration shunt	01/07/2002
D382	300 161 10	RBD	Rohde&Schwarz	Attenuator	08/03/2003
D523	300618/61	RBU	Rohde&Schwarz	Resistor	07/03/2003
D665	GF557	40-20-34	Weinschel	Attenuator	07/03/2003
D669	2200	769-3	Narda	Attenuator	14/05/2002
D670	D 32240	53 16 21	Spinner	Attenuator	14/05/2002
D672	D39951	74 53 93	Spinner	Attenuator	13/11/2002
D683	D41796	53 16 21	Spinner	Attenuator	14/05/2002
D707	IX 077	Modell 49	Kontron	Attenuator	16/08/2002
D710	---	765-3	Transtech	Attenuator	14/05/2002
D789	300160/10	RBU	Rohde&Schwarz	Resistor	01/03/2002
D790	K 6226311	50 Ohm	Kathrein	Termination 50 Ohm	07/03/2003
D898	---	2N150W-6DB	Tactron	Attenuator	20/09/2001
D899	---	2N150W-6DB	Tactron	Attenuator	07/12/2000
E1057	81510070	R 4131	Advantest	Spectrum-Analyzer	12/03/2003
E1194	3033A01486	85650 A	Agilent Technologies	Peak-Adapter	14/03/2003
E1229	894702/027	ESAI	Rohde&Schwarz	Receiver	05/02/2003
E1416	60908	HI-4400-01	Pötschke	Field strength meter	10/12/2001
E1455	353701902	ESV-Z1	Rohde&Schwarz	HF Current converter	15/11/2002
E1482	C-0009	EFA-2	WUG	Field strength meter	26/11/2003
E1607	829909/005	ESI-40	Rohde&Schwarz	Receiver	06/11/2002
E1626	830516/009	ESVS30	Rohde&Schwarz	Receiver	19/03/2003
E1687	837808/003	ESI-40	Rohde&Schwarz	Receiver	13/02/2003
E1742	US39440167	E7405A	Agilent Technologies	Spectrum-Analyzer	18/12/2002
E426	514633 E	SPM-11	WUG	Voltmeter	29/10/2002
E678	872317/025	ESH 3	Rohde&Schwarz	Receiver	13/11/2002
E716	1750A02940	3585 A	Agilent Technologies	Spectrum-Analyzer	06/12/2002
E816	880111/34	ESH2-Z1	Rohde&Schwarz	HF Current converter	08/08/2002
E871	2627A03145	8566 B	Agilent Technologies	Spectrum-Analyzer	14/03/2003
E881	881363/13	ESH2-Z1	Rohde&Schwarz	HF Current converter	15/11/2002
E924	881388/24	ESV-Z1	Rohde&Schwarz	HF Current converter	15/11/2002
F1574	3531A00126	6843 A	Agilent Technologies	Harmonic/Flicker Test Sytem	08/11/2002
F1781	US38432025	8753 E	Agilent Technologies	Network-Analyzer	28/08/2003
G1021	2520G04678	8116 A	Agilent Technologies	Signalgenerator	15/11/2002
G1029	879856/038	SMPC	Rohde&Schwarz	Signalgenerator	05/06/2003
G1060	080723-08-85	P 6 T	Haefely	Transient generator	29/05/2003
G1068	881209/002	SMPC	Rohde&Schwarz	Signalgenerator	08/10/2002
G1106	080865-23-86	PC6-288	Haefely	Transient generator	29/05/2003
G1228	0390-01	ESD 30	EM-Test	ESD-Generator	31/10/2002
G1234	0390-02	ESD 30	EM-Test	ESD-Generator	31/10/2002
G1267	1290-05	EFT 5	EM-Test	Transient generator	19/02/2002
G1325	3145A0455	83623 A	Agilent Technologies	Signalgenerator	26/11/2002
G1552	835537/014	SMR-40	Rohde&Schwarz	Signalgenerator	06/09/2002
G1632	0201-02	EFT 800-16 A	EM Test	Burst-Generator	15/01/2003
G1633	0301-04	VCS 500 M/8	EM Test	Surge-Generator	16/01/2003
G1634	1201-14	DITO	EM Test	ESD-Generator	01/12/2002
G1637	0102-01	TSS 500 M10	EM Test	Surge-Generator	01/01/2003
G1641	1201-01	TSS 500 M6B	EM Test	Surge-Generator	02/05/2003
K1013	22538	200T8G18	EMV GmbH	Amplifier	27/05/2003
K1014	21287	200T4G8	EMV GmbH	Amplifier	27/05/2003
K1017	24901	DC 7350	EMV GmbH	Directional coupler	20/11/2003
K1019	9911001C	CDN-M5/100A	EM Test	LISN/CDN/ISN	05/11/2002
K1020	699-01	CNI 503-8/100	EM-Test	LISN/CDN/ISN	29/05/2003

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Asset no.	Serial no.	Model	Manufacturer	Designation	Cal. date
K1025	620180	EM-6871	Electro Metrics	Antenna	04/06/2003
K1026	2624	CBL 6111 C	Chase	Antenna	17/06/2003
K1029	99-40004	LISN 4-100/200	Bajog	LISN/CDN/ISN	22/05/2003
K1030	99-40006	LISN 2-100/200	Bajog	LISN/CDN/ISN	22/05/2003
K1031	99-40005	LISN 4-25/32	Bajog	LISN/CDN/ISN	22/05/2003
K1033	0002-50935	95236-1	EMCO	Current Clamp	23/05/2003
K1034	0003-50963	95241-1	EMCO	Calibration Jig	23/05/2003
K1042	1041	MWH-1826/B	ARA Inc.	Antenna	29/05/2003
K1043	1021	MWH-2640/B	ARA Inc.	Antenna	29/05/2003
K1045	---	RTK 106-km-km-4m	NeWe-Tec	HF cable	22/05/2003
K1049	---	S1	Lucent	LISN/CDN/ISN	20/09/2003
K1050	---	S1	Lucent	LISN/CDN/ISN	20/09/2003
K1068	996	VHAP	Schwarzbeck	Antenna	01/01/2004
K1069	997	VHAP	Schwarzbeck	Antenna	01/01/2002
K1099	16910	CDNT 400	MEB	LISN/CDN/ISN	01/05/2002
K1100	15994	CDNT 246	MEB	LISN/CDN/ISN	01/05/2002
K1102	100040	ENY-22	Rohde&Schwarz	LISN/CDN/ISN	01/07/2002
K1103	100042	ENY-41	Rohde&Schwarz	LISN/CDN/ISN	01/07/2002
K1105	99-4-0005	LISN 4-100/200	Bajog	LISN/CDN/ISN	25/10/2002
K1108	---	FAP1	Frankonia	Filterboard	05/12/2004
K1109	---	FAP2	Frankonia	Filterboard	05/12/2004
K1110	---	FAP3	Frankonia	Filterboard	05/12/2004
K1111	---	SAP1	Frankonia	Filterboard	05/12/2004
K1112	---	SAP2	Frankonia	Filterboard	05/12/2004
K1113	---	SAP3	Frankonia	Filterboard	05/12/2004
K1114	100109	HL 025	Rohde&Schwarz	Antenna	10/01/2003
K1118	2023	CDN-M2/75A	EM Test	LISN/CDN/ISN	01/03/2003
K1120	16097	CDN ST08S	Schaffner	LISN/CDN/ISN	20/09/2003
K1121	---	SAC-Antenne	Frankonia	HF cable	06/06/2003
K1122	---	SAC	Frankonia	HF cable	06/06/2003
K1123	---	SAC	Frankonia	HF cable	06/06/2003
K1125	---	SAC Kabel	Frankonia	HF cable	06/06/2003
K1126	---	SAC Kabel	Frankonia	HF cable	06/06/2003
K1127	---	SAC Kabel	Frankonia	HF cable	06/06/2003
K1128	---	SAC Kabel	Frankonia	HF cable	06/06/2003
K1129	---	---	Lucent	Helmholtz Coil	06/06/2003
K1130	1740	91550-1B	Ailtech	Current probe	18/06/2003
K1155	---	---	---	HF cable	18/06/2003
K1156	---	---	---	HF cable	18/06/2003
K1157	---	---	---	HF cable	18/06/2003
K1158	---	---	---	HF cable	18/06/2003
K1161	---	---	---	HF cable	19/06/2003
K1162	356592/001	HB 525	Rohde & Schwarz	Antenna	01/01/2003
k1163	---	3 und 99 Wdg.	Lucent	Helmholtz Coil	06/06/2003
K298	B 032576	AM 503	Tektronix	Amplifier for current	25/04/2002
K548	880563/17	HFH2-Z1	Rohde&Schwarz	Antenna	18/04/2003
K549	880458/47	HFH2-Z2	Rohde&Schwarz	Antenna	18/04/2003
K569	2602A00226	85685 A	Agilent Technologies	Preselektor	14/03/2003
K593	32551	3020 A	Narda	Directional coupler	14/11/2002
K617	986	C 1460	Werlatone	Directional coupler	14/11/2002
K628	---	NTFM 8132	SCHWARZBEC	LISN/CDN/ISN	10/03/2000
K629	---	NTFM 8132	SCHWARZBEC	LISN/CDN/ISN	10/03/2000
K630	---	NTFM 8132	SCHWARZBEC	LISN/CDN/ISN	10/03/2000
K639	1088	C 1460	Werlatone	Directional coupler	12/11/2002
K661	44279	110	Pearson	Current clamp	15/11/2002
K675	983	9411-1	Ailtech	Current clamp	23/04/2002
K678	890604/019	ESH3-Z5	Rohde&Schwarz	LISN/CDN/ISN	05/12/2002

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Asset no.	Serial no.	Model	Manufacturer	Designation	Cal. date
K689	08057-19-86	FP 20/3-3	Haefely	Coupling device	29/05/2003
K757	0189-3535	M 404 E	Pötschke	HF-Amplifier	27/05/2003
K759	8812-3085	3115	Kontron	Antenna	27/05/2003
K776	2936A00886	85047 A	Agilent Technologies	S-Parameter	28/08/2003
K809	320891/013	HL 025	Rohde&Schwarz	Antenna	15/06/2002
K817	217554	Miteq	Parzich	Amplifier	11/02/2003
K827	825333/010	ESH3-Z6	Rohde&Schwarz	LISN/CDN/ISN	26/04/2002
K831	73721	3022	Transtech	Directional coupler	20/09/2001
K835	825867-022	ESH3-Z4	Rohde&Schwarz	LISN/CDN/ISN	08/08/2001
K838	656297	Miteq	Parzich	Amplifier	25/10/2002
K841	---	8 G/ 2 M	Telemeter	HF cable	18/06/2003
K845	827904003	EZ-10	Rohde&Schwarz	LISN/CDN/ISN	08/08/2001
K856	12349	AT 5000	EMV	Antenna	27/05/2003
K859	---	LN-40/50	Heine	LISN/CDN/ISN	10/10/1999
K874	---	T 1 V/P 4D	PKI/EMV	LISN/CDN/ISN	10/03/2000
K876	---	T 2 V/P 4D	PKI/EMV	LISN/CDN/ISN	10/03/2000
K877	357.8810.52	ESH3-Z2	Rohde&Schwarz	Limiter	23/10/2002
K879	---	RG-214-U	F+G	HF cable	18/06/2003
K880	---	AF-2	MEB	LISN/CDN/ISN	20/09/2003
K881	---	AF-4	MEB	LISN/CDN/ISN	27/04/2001
K882	---	S4	MEB	LISN/CDN/ISN	20/09/2003
K896	---	M1	MEB	LISN/CDN/ISN	20/09/2003
K899	------	Transmission	PKI/EMV	HF cable	28/07/2000
K900	------	1000-4-6	PKI/EMV	HF cable	31/08/2000
K901	---	S1	MEB	LISN/CDN/ISN	20/09/2003
K910	9124-0211	BBA 9106	Schwarzbeck	Antenna	02/05/2003
K911	9124-0214	BBA 9106	Schwarzbeck	Antenna	02/05/2003
K912	312/93	UBA 9116	Schwarzbeck	Antenna	02/05/2003
K913	311/93	UBA 9116	Schwarzbeck	Antenna	02/05/2003
K920	816121502	EZ-10	Rohde&Schwarz	LISN/CDN/ISN	08/08/2001
K933	11158	M2	MEB	LISN/CDN/ISN	16/07/2002
K934	11503	IKEN SO	MEB	LISN/CDN/ISN	11/03/2002
K935	12200	KEN M3-1-801	MEB	LISN/CDN/ISN	20/09/2003
K936	11298	S15	MEB	LISN/CDN/ISN	20/09/2003
K937	11328	S25	MEB	LISN/CDN/ISN	20/09/2003
K938	13001	AT 1080	EMV GmbH	Antenna	27/05/2003
K939	12446	KEN T2-801	MEB	LISN/CDN/ISN	20/09/2003
K940	11422	KEN T4-801	MEB	LISN/CDN/ISN	20/09/2003
K972	9803-1089	3141	EMCO	Antenna	01/04/2003
K976	23623	50 S1G 4	EMV	Amplifier	27/05/2003
K978	----	Transmission	Frankonia	HF cable	18/06/2003
K979	9856	FCC-801-S9	FCC	LISN/CDN/ISN	26/09/2003
K980	9844	FCC-801-T8	FCC	LISN/CDN/ISN	26/09/2003
M1765	304267	7150	Solartron	Multimeter	10/10/2002
M1923	881375/102	URV 5	Rohde&Schwarz	Power meter	18/04/2003
M1925	881096/062	URV5-Z2	Rohde&Schwarz	HF probe	12/11/2002
M1926	880572/46	URV5-Z4	Rohde&Schwarz	HF probe	25/03/2003
M2145	DY0104017	PM 2718 X	Philips	Multimeter	22/10/2002
M2191	DY0102352	PM 2534	Philips	Multimeter	22/10/2002
M2214	DY0103745	PM 2718 X	Philips	Multimeter	08/10/2002
M2292	44930413	77	Fluke	Multimeter	08/10/2002
M2407	892948/44	URV5-Z4	Rohde&Schwarz	HF probe	25/03/2003
M2541	49750325	87	Philips	Multimeter	18/10/2002
M2573	860617/029	URV 5	Rohde&Schwarz	Power meter	05/02/2003
M2659	862.806/010	URV5-Z2	Rohde&Schwarz	HF probe	29/08/2003
M2660	894823/34	URV5-Z4	Rohde&Schwarz	HF probe	25/03/2003
M2758	DM529010	PM 2525	Philips	Multimeter	18/07/2003

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Asset no.	Serial no.	Model	Manufacturer	Designation	Cal. date
M2816	53120431	87	Philips	Multimeter	22/09/2000
M2892	3125U05034	437 B	Agilent Technologies	HF power meter	10/10/2002
M2893	2702A07178	8481 B	Agilent Technologies	HF probe	10/10/2002
N2112	1543	33K7EU5	Gossen	Multi power supply	04/09/2002
N2329	396-01	PFS 500	EM-Test	Simulator for voltage dips	28/11/2002
N2423	A251507/00500	EMV D 15000/PAS	Spitzenberger+Spieß	Test system	26/11/2002
O2152	B010166	TDS 694 C	Tektronix	Oscilloscope	01/02/2003
O2177	B 011016	P 5210	Tektronix	High Voltage Probe	01/01/2001
O2197	B016080	TDS 3012	Tektronix	Oscilloscope	05/02/2003
O2303	B040166	TDS 714 L	Tektronix	Oscilloscope	20/11/2002
V255	RX/169163	U 2233	Siemens	Noise meter	27/08/2003
V288	883792/007	UPA	Rohde&Schwarz	Audio-Analyzer	12/03/2003
V303	860339/011	UPA	Rohde&Schwarz	Audio-Analyzer	08/10/2002
X257	20	---	Conrad	Thermometer	23/07/2002
X314	---	SAC	Frankonia	Shielded door	15/03/2003
X315	---	SAC/FAC	Frankonia	Preparation for new registration	15/08/2003
X316	---	SAC/FAC	Frankonia	Shielded door	15/03/2005
X317	---	FAC	Frankonia	Shielded door	15/03/2002
X318	---	SAC	Frankonia	Shielded door	10/12/2001
X319	---	FAC	Frankonia	Shielded door	10/12/2001
X415	---	---	Conrad	Thermometer	13/12/2002
Y1329	US38461347	86120 B	Agilent Technologies	Wavelength meter	09/04/2003
Y514	73916701	AQ 1338 P	ANDO	optical Transmitter	30/03/2000
Y580	2843G01745	8158 B	Agilent Technologies	Optical attenuator	21/02/2003

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8 Accreditation certificate

Translation

Deutsche Akkreditierungsstelle Technik (DATech) e.V.

represented in the

Deutschen AkkreditierungsRat

Akkreditierung

The **German Accreditation Body Technology (DATech) e.V.** certifies that the Testing Laboratories of the

Lucent Technologies Network Systems GmbH
European Compliance Laboratory (ECL)
Thurn-und-Taxis-Straße 10
90411 Nürnberg

is competent under the terms of DIN EN ISO/IEC 17025 to carry out testing in the fields

Safety of electrical equipment,
Electromagnetic Compatibility (EMC) and
Mobil Communications; Air Interface; Telecommunications Interface

The accreditation is valid until: **February 7th, 2007**

The annex is deemed part of this certificate and comprises: **12** pages

DAR-Registration No.: **TTI-P-G 004/92-03**

Frankfurt/Main, April 19th, 2002

i.V. Dipl.-Ing. (FH) Ralf Egner
Head of Accreditation Body

Accreditation Body in the TGA - Trägergemeinschaft für Akkreditierung GmbH

9 List of Annexes

Following annexes are separated parts to this test report.

Description	Pages
Annex 1: Photographs of test set-ups	5

******** End of test report *******