TÜV PRODUCT SERVICE

TEST RESULT SUMMARY

FCC PART 15 SUBPART C
Section 15.231

MANUFACTURER'S NAME	OMRON Corp
NAME OF EQUIPMENT	Transmitter, RF Keyless Entry System
MODEL NUMBER	**G8D-320A-A**
MANUFACTURER'S ADDRESS	1-1203, Yashirogaoka, Meito-Ku Nagoya-City, Aichi., 465-0051 Japan
TEST REPORT NUMBER	W8570
TEST DATE	14 December 1998

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15.

Date: 31 December 1998

Location: Taylors Falls MN
USA

J. C. Sausen
Test Engineer

J. T. Schneider
NVLAP Signatory

Not Transferable

TÜV PRODUCT SERVICE

EMC EMISSION - TEST REPORT

Test Report File No.	:	**W011857001**	Date of issue:	31 December 1998

Model / Serial No.	:	**G8D-320A-A /**
Product Type	:	Transmitter, RF Keyless Entry System
Applicant	:	OMRON Corp
Manufacturer	:	OMRON Corp
License holder	:	OMRON Corp
Address	:	1-1203, Yashirogaoka, Meito-Ku
	:	Nagoya-City, Aichi., 465-0051 Japan

Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**W8570**
Total pages including Appendices		22

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

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TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

TÜV PRODUCT SERVICE INC 19035 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

DIRECTORY - EMISSIONS

TÜV PRODUCT SERVICE INC 19035 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991		
☐ - EN 55011 / 1991	☐ - Group 1 ☐ - Class A	☐ - Group 2 ☐ - Class B
☐ - EN 55013 / 1990		
☐ - EN 55014 / 1987	☐ - Household appliances and similar ☐ - Portable tools ☐ - Semiconductor devices	
☐ - EN 55014 / A2:1990		
☐ - EN 55014 / 1993	☐ - Household appliances and similar ☐ - Portable tools ☐ - Semiconductor devices	
☐ - EN 55015 / 1987		
☐ - EN 55015 / A1:1990		
☐ - EN 55015 / 1993		
☐ - EN 55022 / 1987	☐ - Class A	☐ - Class B
☐ - EN 55022 / 1994	☐ - Class A	☐ - Class B
☐ - BS		
☐ - VCCI	☐ - Class A	☐ - Class B
■ - FCC Part 15 Subpart C Section 15.231		
☐ - AS 3548 (1992)	☐ - Class A	☐ - Class B
☐ - CISPR 11 (1990)	☐ - Group 1 ☐ - Class A	☐ - Group 2 ☐ - Class B
☐ - CISPR 22 (1993)	☐ - Class A	☐ - Class B

Environmental conditions in the lab:

	Actual
Temperature	: 22 °C
Relative Humidity	: 39 %
Atmospheric pressure	: 99.2 kPa
Power supply system	: 3 VDC

Sign Explanations:

☐ - not applicable
■ - applicable

Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

☐ - **Test not applicable**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

at a test distance of :

☐ - 3 meters
☐ - 30 meters

■ - **Test not applicable**

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :

☐ - Test not applicable

■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

at a test distance of :

■ - 3 meters
☐ - 10 meters
☐ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number	Cal Date
■ -	3146	Electro-Mechanics (EMCO)	Log Periodic Antenna	9103-3075	7-97
■ -	3108	Electro-Mechanics (EMCO)	Biconical Antenna	2118	7-97
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	4-98
■ -	85662A	Hewlett-Packard	Analyzer Display	2152A03640	4-98
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	4-98
■ -	ZHL-1042J	Mini-Circuits	Preamplifier	H072294-11	4-98

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: INTERFERENCE POWER

The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

■ - Test not applicable

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 100 GHz were performed in a horizontal and vertical polarization at the following test location :

■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room

at a test distance of:

☐ - 1 meters
■ - 3 meters
☐ - 10 meters

☐ **- Test not applicable**

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number	Cal Date
■ -	3115	Electro-Mechanics (EMCO)	Horn Antenna	9001-3275	9-98
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	4-98
■ -	85662A	Hewlett-Packard	Analyzer Display	2152A03640	4-98
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	4-98
■ -	ZHL-1042J	Mini-Circuits	Preamplifier	H072294-11	4-98
■ -	AFT-8434	Avantek	Preamplifier	9112 Z221	4-98

Use of the calibrated equipment on this list ensures traceability to national and international standards.

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Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - Transmitter on.

Configuration of the device under test:

☐ - See Constructional Data Form in Appendix B - Page B2

■ - See Product Information Form in Appendix B - beginning on Page B3

The following peripheral devices and interface cables were connected during the measurement:

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - unshielded power cable

☐ - unshielded cables

☐ - shielded cables MPS.No.: _____

☐ - customer specific cables

☐ - _____

☐ - _____

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Emission Test Results:

Conducted emissions 10/150 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ■ - MET ☐ - NOT MET

Minimum limit margin for fundamental 3 dB at 313.8 MHz

Minimum limit margin for spurious 9 dB at 627.7 MHz

Remarks: The fundamental was measured to be 71.8 dBuV/m in quasi-peak mode (3890 uV/m) compared to an average limit of 75.5 dBuV/m (5956 uV/m). The second harmonic was measured to be 45.6 dBuV/m (190.5 uV/m) in quasi-peak mode, compared to an average limit of 55.5 dBuV/m (595.6 uV/m).

Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent Radiated emissions 1 GHz - 3.14 GHz

The requirements are ■ - MET ☐ - NOT MET

Minimum limit margin 12 dB at 1255.2 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: Peak analyzer reading of 43.4 dBuV/m (147.9 uV/m), compared to an average limit of 55.5 dBuV/m (595.6 uV/m).

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DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

The bandwidth of the fundamental must be less than 0.25% of the center frequency, or 785 kHz. Page A5 of A5 shows the bandwidth to be less than 90 kHz.

SUMMARY:

The requirements according to the technical regulations are

■ - met

☐ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 14 December 1998

Testing End Date: 14 December 1998

- TÜV PRODUCT SERVICE INC -

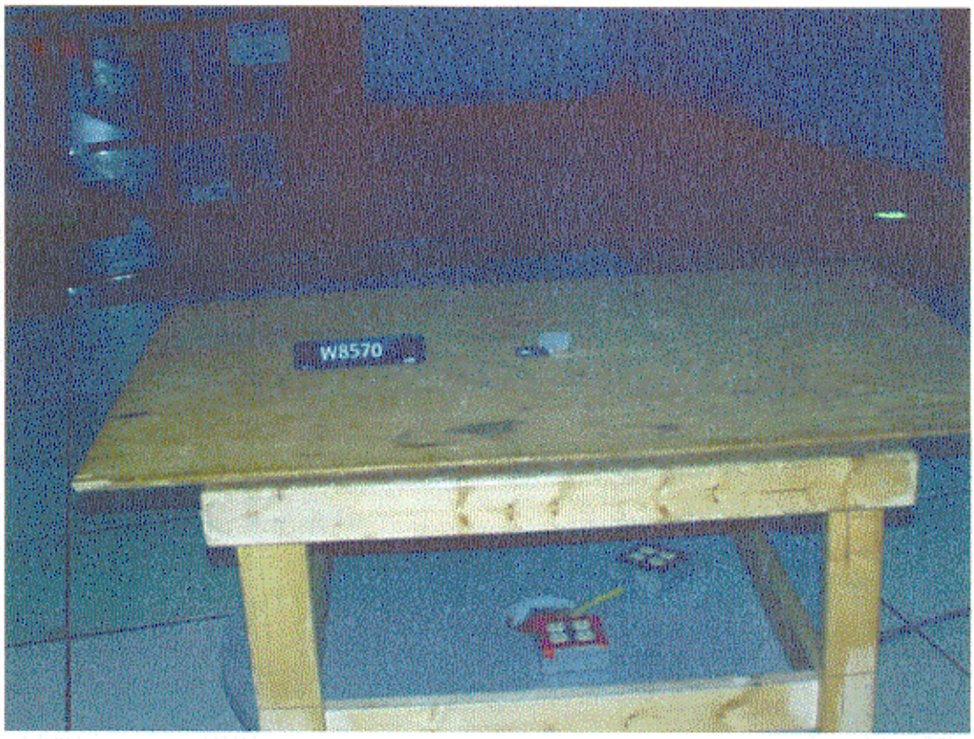
J. C. Sausen
Test Engineer

Tested By:
J. T. Schneider

Test-setup photo(s):
Conducted emission 10/150 kHz - 30 MHz

Not Applicable

Test-setup photo(s):
Radiated emission 30 MHz - 3.14 GHz



Appendix A

Test Data Sheets

and

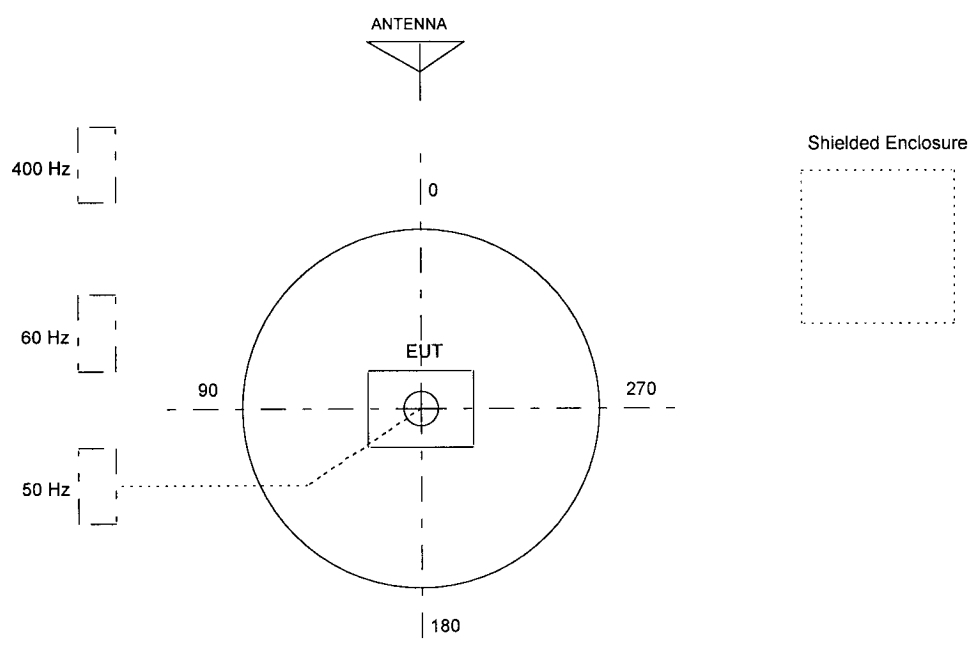
Test Setup Drawing(s)

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.
3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.
4. The circle is a 6.7 meter diameter turntable.
5. A ground plane is in the plane of this sheet.
6. The test sample is shown in the azimuthal position representing zero degrees.



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T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
OMRON
G8D-320A-A TRANSMITTER
Notes:

Report W8570 Run 4
Date 12-14-98 Page 1
Engineer _____
Tech: JTS _____
Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Peak dBuV/m	Ave dBuV/m	Polar\ Height		Limit dBuV/m	Delta
ALL READINGS MAXIMIZED									
313.82	53	14.2	1.6	68.7	--	H	--	75.5	
627.74	23.3	20.1	2.3	45.6	--	H	--	55.5	
941.63	5.4	23.4	2.9	31.7	--	H	--	55.5	
941.47	9.8	23.4	2.9	36	--	V	--	55.5	
1255.2	12.9	25.6	3.4	41.8	--	H	--	55.5	
1569.1	-1.1	27.1	3.8	29.8	--	H	--	54	
1882.9	-2.4	28.8	4.8	31.1	--	H	--	55.5	
2196.7	-1.4	29.7	11.6	39.9	--	H	--	55.5	
1255.2	14.5	25.6	3.4	43.4	--	V	--	55.5	
2196.7	.3	29.7	11.6	41.6	--	V	--	55.5	
CHECKED 2ND TRANSMITTER									
313.82	56.1	14.2	1.6	71.8	--	H	--	75.5	

Joel T. Schneider

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T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site Figure____ Report W8570 Run 4
3 Meter Antenna Distance Date 12-14-98 Page 2
Equipment Under Test: Engineer _____
OMRON Tech: JTS_____
G8D-320A-A TRANSMITTER Requester_____
Notes:

Measurement Summary

Frequency MHz	Final dBuV/m	Final uV/m	Azimuth deg	Polar\ Height		Delta FCC 15.231	Delta
313.82	71.8	3890.4	--	H	--	-3.7	
627.74	45.6	190.54	--	H	--	-9.9	
941.47	36	63.095	--	V	--	-19.5	
941.63	31.7	38.459	--	H	--	-23.8	
1255.2	43.4	147.91	--	V	--	-12.1	
1569.1	29.8	30.902	--	H	--	-24.2	
1882.9	31.1	35.892	--	H	--	-24.4	
2196.7	41.6	120.22	--	V	--	-13.9	

File W8541 Run 3

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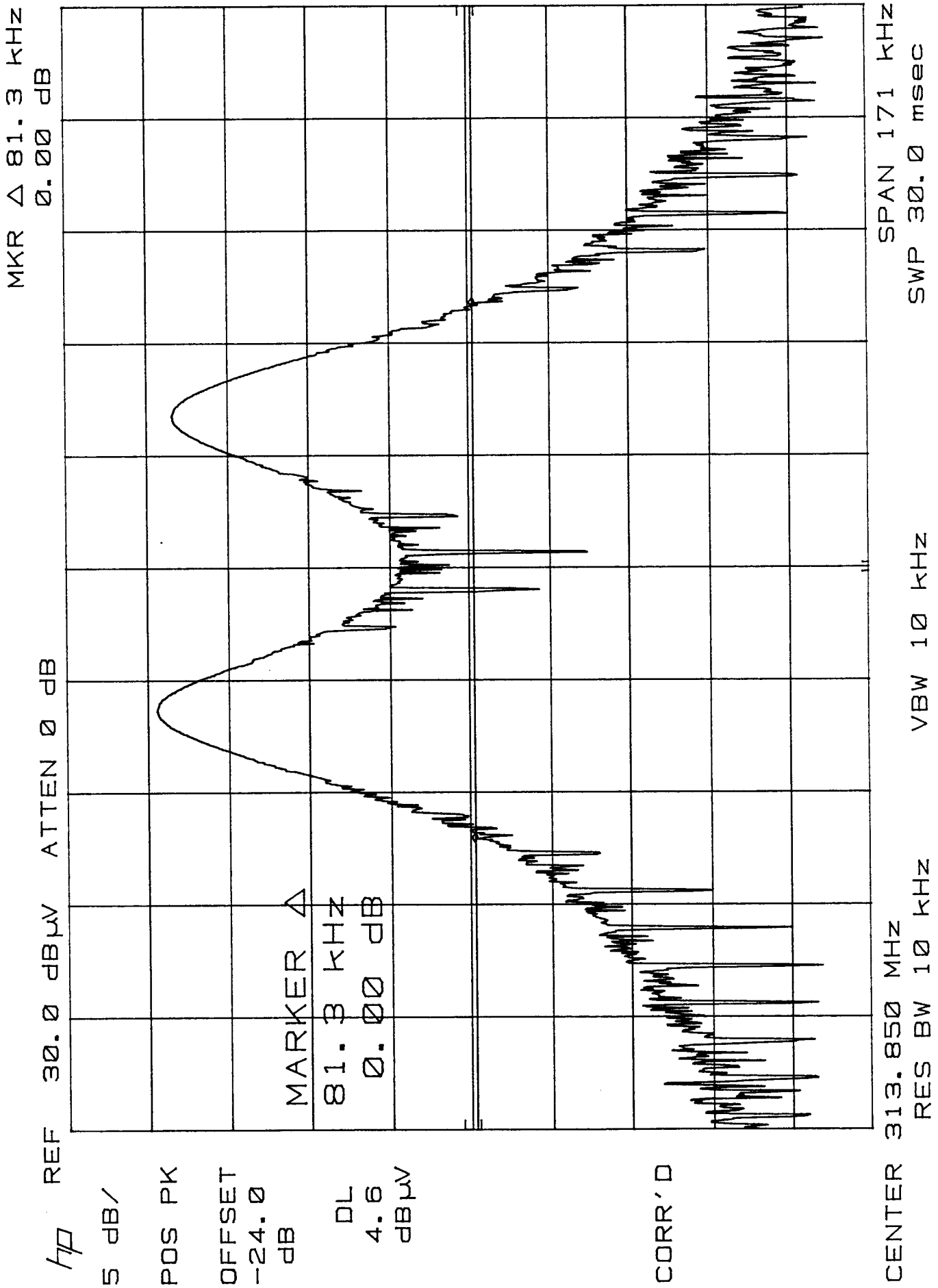
MKR Δ 81.3 kHz
0.00 dB
SPAN 171 kHz
SWP 30.0 msec
REF 30.0 dBµV
ATTEN 0 dB
VBW 10 kHz
5 dB/
POS PK
OFFSET
-24.0
dB
MARKER Δ
81.3 kHz
0.00 dB
DL
4.6
dBµV
CORR'D
CENTER 313.850 MHz
RES BW 10 kHz

TÜV PRODUCT SERVICE

Appendix B

Constructional Data Form

and

Product Information Form(s)

TÜV PRODUCT SERVICE INC 19035 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Constructional Data Form

Not Applicable

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Technical Description of the system

CPU

- TYPE	:uPD754244GS-xxx-BA9 (4bit) - NEC Corporation
- ROM	:4K BYTES
- RAM	:128 BYTES
- EEPROM	:16 BYTES
- CLOCK FREQUENCY	:4.19 MHZ
- CLOCK FREQUENCY GENERATION	:CERAMIC RESONATOR
- PACKAGE	:20pin SOP

RF BLOCK

- Carrier frequency	:313.85 MHz
- Frequency generation	:SAW resonator
- Modulation	:FSK
- Bit transmission rate	:1000 bps or 500 bps
- Bandwidth	:120 kHz
- RF output power (field strength)	:2000 uV/m at 3 meters

OTHERS

- Dimension	:58.2 mm X 30.7 mm X 12.6 mm
- Weight	:20 g
- Battery	:Lithium cell (CR2025) - Toshiba
- Operation voltage	:3 VDC, 20 mA
- Operation temperature	:-20 to +60 degrees C

Appendix C

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ±4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)

μV = Inverse log(dBμV/20)

RADIATED EMISSIONS

The final level, expressed in dBμV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBμV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

Frequency (MHz)	Level (dBμV)	+	Factor & Cable (dB)	=	Final (dBμV/m)	-	FCC B Limit (dBμV/m)	=	Delta FCC B (dB)
32.21	13.9	+	16.3	=	30.2	-	40.0	=	-9.8

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DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

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