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EMC TEST REPORT

for

TOYODA AUTOMATIC LOOM WORKS, LTD.

8, Cyaya, Kyouwa-cho,Obu-shi,
Aichi-ken,474-8601, JAPAN

Electric Vehicle Charger
TCG2000

Soshin Report No. : SAL 99125-1AT
Date of issue : 29/09/1999

Approved by

Susumu Okamura
Chief Engineer, Soshin Asama Testing Lab
SOSHIN ELECTRIC Co.,Ltd.

- 1 Applicant : TOYODA AUTOMATIC LOOM WORKS, LTD.
8, Cyaya, Kyouwa-cho, Obu-shi,
Aichi-ken, 474-8601, Japan
- 2 Manufacturer : TOYODA AUTOMATIC LOOM WORKS, LTD.
8, Cyaya, Kyouwa-cho, Obu-shi,
Aichi-ken, 474-8601, Japan
- 3 Description of Device
 - A) Kind of Equipment : Electric Vehicle Charger
 - B) Model Name : TCG2000
 - C) Serial No : 10
 - D) Type of Sample Tested : Pre- production
 - E) Clock Frequency Used : 16MHz
 - F) Carrier Frequency : 140kHz~360kHz
 - G) Tested Power Supply : AC240V, 1 ϕ , 60Hz, 30A
 - H) Date of Manufacture : July 1999
- 4 Date of Measurement : August 28~29, September 19/1999
- 5 Regulations Applied : FCC Rules & Regulation Part 15 Subpart B Class B
FCC Rules & Regulation Part 15 Subpart C
FCC Rules & Regulation Part 18 Subpart C
- 6 Measurement Procedure : ANSI C63.4 - 1992
- 7 Test Facility : Soshin Electric Co., Ltd. Soshin Asama Testing Lab.
Address : 800-38 Nagatoro, Saku-city, Nagano, 385-0021, Japan

8 Operating conditions of the EUT

No.	Operating conditions
1	No Output (Paddie in the holster)
2	No Output (Paddie in the Electric Vehicle)
3	Full Power
4	3 amp delivered to load (Electric Vehicle Battery)
5	RF Transmission (Paddie out of the holster)
6	RF Transmission (Paddie in the Charge Port)

Conducted Emissions 450kHz to 30MHz (about No.1, 2)

The conducted test for the floor standing EUT was performed on a ground plane.

The Electric Vehicle Charger model : TCG2000 was powered through the Impedance Stabilization Network bonded to the ground plane.

During this test, there were two operating conditions of the EUT.

The power transfer and RF communications were not active. (Paddie in the holster)

The RF communications were active and no output power. (Paddie in the Electric Vehicle)

Radiated Emissions 10kHz to 1GHz (about No.3, 4)

The Electric Vehicle Charger model : TCG2000 was connected to the Electric Vehicle.

During this test, the power transfer and RF communications were active.

The EUT was tested at 3 amp current at the load (Electric Vehicle Battery), and full power.

Radiated Emissions 1GHz to 10GHz (about No.5, 6)

The Paddle of the Electric Vehicle Charger model : TCG2000 was out of the holster (No.5) and was connected to the Charge Port (No.6).

During this test, the power transfer was Disabled, leaving only the RF transmission active.

9 Test Results

9.1 Radiated Emission

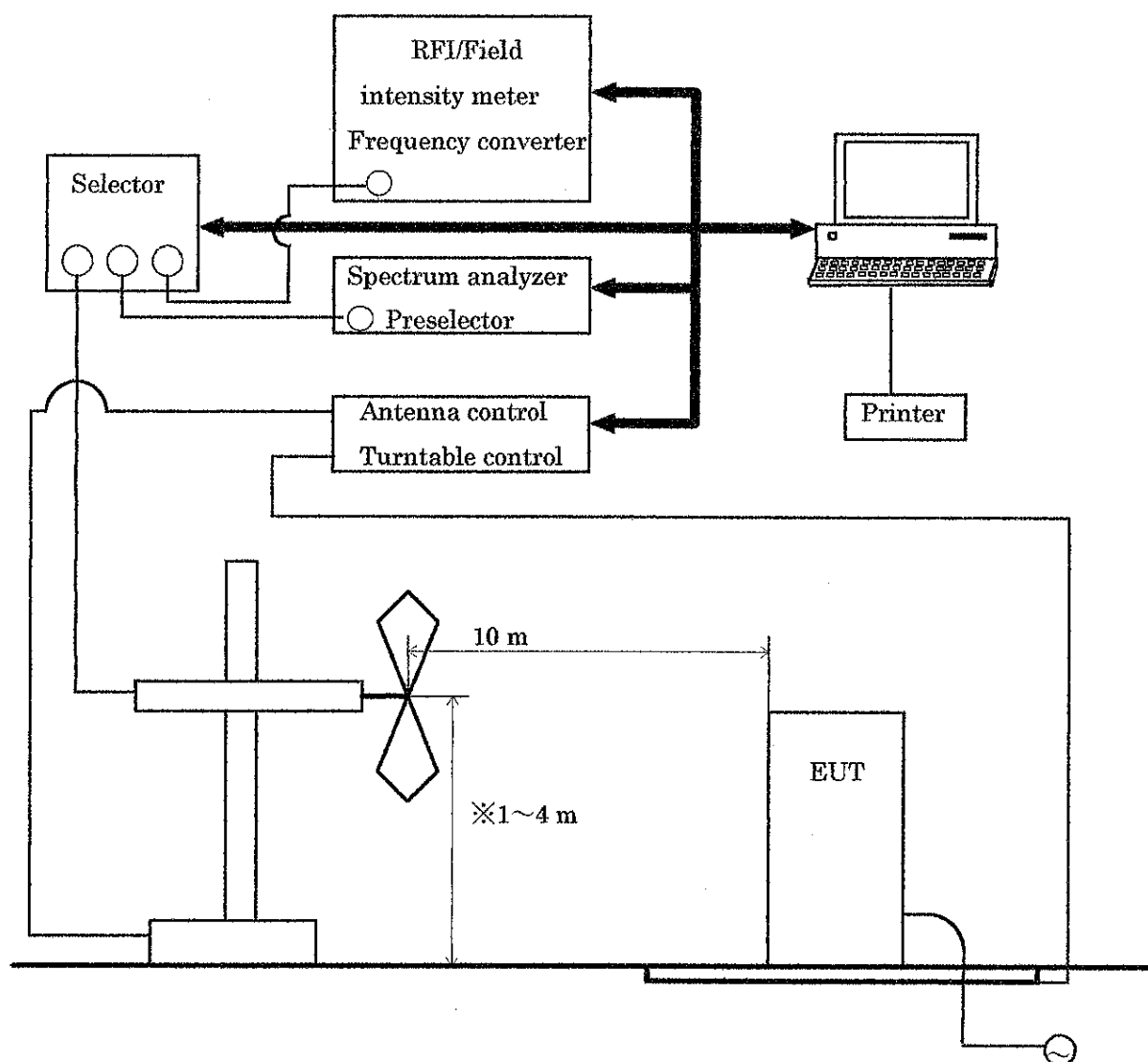
(1) Measurement Instrumentation Used

Description	Model	Serial No.	Manufacturer	Soshin control No.	Next calibration
Loop antenna	6502	8811-2248	EMCO	G-1AT-003	April 2000
Biconical antenna	BBA9106	—	SCHWARZBECK	G-1AT-014	April 2000
Log-per antenna	UHALP9107	1393/1395	SCHWARZBECK	G-1AT-008	April 2000
Double-Ridged Wave guide Horn antenna	3115	9906-5829	EMCO	G-1AT-022	July 2000
Spectrum analyzer	R3361A	11730287	ADVANTEST	G-1AZ-157	April 2000
Spectrum analyzer	R3271A	07019700	ADVANTEST	Rent from ORIX Rentec	March 2000
Preselector	R3551	12970022	ADVANTEST	G-1AZ-157-1	April 2000
RFI/Field intensity meter	ESS	844362/014	ROHDESCHWARZ	G-1NF-027	October 1999
Selector	PSU	843265/008	ROHDESCHWARZ	G-1NF-027-1	October 1999
Pre-amplifier	MH648A	M48993	Anritsu	G-1WP-008	March 2000
Microwave System Amplifier	83017A	3123A00530	HEWLETT PACKERD	G-1WP-014-1	March 2000

Measurement configuration to next page

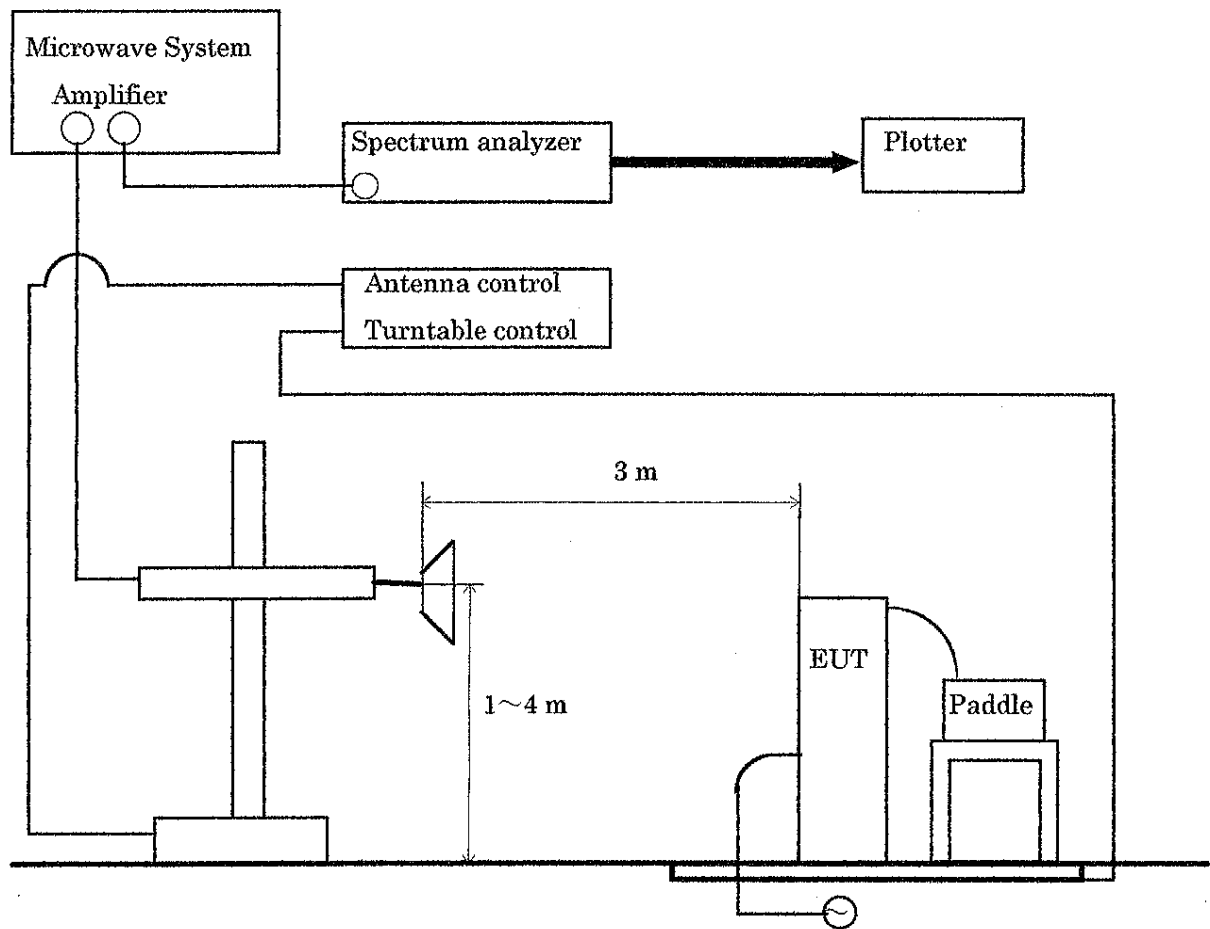
(2) Measurement configuration

9kHz~1GHz ※ 9kHz~30MHz : Antenna height is 1m



EUT = A : System configuration

1GHz~10GHz



EUT = A : System configuration

(3-1) Measurement data

Operation mode : 3A delivered to load (Electric Vehicle Battery)

The spectrum was scanned from 9kHz to 30MHz

Detector function : CISPR Quasi-peak

IF band width : 9kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 18 Subpart C

Antenna Height : 1m

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
0.0809	12.4	27.7	101.2	450
0.2189	11.6	38.2	309.0	450
0.4526	11.3	31.9	144.5	450
0.9780	11.1	25.8	70.0	450
1.1857	11.1	38.5	302.0	450
1.4519	11.1	36.6	242.7	450
4.4398	11.1	22.7	49.0	450

※1 The cable loss is included in the antenna factor.

[Sample Calculation]

[Limit]

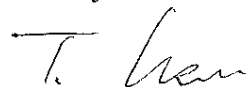
0.0809MHz, Horizontal Polarization

9kHz to 30MHz : 450 μ V/m

[12.4+27.7] /20

10 =101.2[μ V/m]

Tested by



Engineer

(3-2) Measurement data

Operation mode : Full Power

The spectrum was scanned from 9kHz to 30MHz.

Detector function : CISPR Quasi-peak

IF band width : 9kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 18 Subpart C

Antenna Height : 1m

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
0.0808	12.4	27.6	100.0	450
0.1407	11.9	23.3	57.5	450
0.2219	11.6	38.0	302.0	450
0.3368	11.4	34.6	199.5	450
0.4219	11.1	32.6	156.7	450
1.0007	11.1	29.4	105.9	450
1.4388	11.1	35.4	211.3	450
1.9834	11.0	18.9	31.3	450

※1 The cable loss is included in the antenna factor.

[Sample Calculation]

[Limit]

0.0808MHz, Horizontal Polarization

9kHz to 30MHz : 450 μ V/m

[12.4+27.6] /20

10 = 100.0 [μ V/m]

Tested by



Engineer

(3-3) Measurement data

Operation mode : 3A delivered to load (Electric Vehicle Battery)

The spectrum was scanned from 30MHz to 1GHz

Detector function : CISPR Quasi-peak

IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C Class B
Horizontal Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
30.200	-9.7	27.9	8.1	30
30.473	-9.8	28.0	8.1	30
33.915	-11.0	24.2	4.6	30
34.874	-11.5	23.7	4.1	30
79.380	-20.3	44.1	15.5	30
285.140	-7.0	24.5	7.5	60
856.820	-0.9	26.6	19.3	60

※1 The cable loss and the amplifier gain are included in the antenna factor.


[Sample Calculation]

30.200MHz, Horizontal Polarization
 $[(-9.7)+27.9] / 20$
 10 = 8.1 [μ V/m]

[Limit]

30MHz to 88MHz : 30 μ V/m
 88MHz to 216MHz : 45 μ V/m
 216MHz to 960MHz : 60 μ V/m
 960MHz to 1000MHz : 150 μ V/m

Tested by



Engineer

(3-4) Measurement data

Operation mode : 3A delivered to load (Electric Vehicle Battery)

The spectrum was scanned from 30MHz to 1GHz.

Detector function : CISPR Quasi-peak

IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C Class B
Vertical Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
30.200	-9.7	33.5	15.5	30
30.473	-9.8	32.7	14.0	30
33.915	-11.0	33.8	13.8	30
46.295	-14.9	38.9	15.8	30
49.306	-16.0	38.8	13.8	30
79.380	-20.3	46.4	20.2	30
264.003	-8.1	30.9	13.8	60
856.820	-0.9	30.3	29.5	60

※1 The cable loss and the amplifier gain are included in the antenna factor.

[Sample Calculation]

30.200MHz, Horizontal Polarization
 $[(-9.7)+33.5] / 20$
 10 $= 15.5 [\mu \text{ V/m }]$

[Limit]

30MHz to 88MHz : 30 μ V/m
 88MHz to 216MHz : 45 μ V/m
 216MHz to 960MHz : 60 μ V/m
 960MHz to 1000MHz : 150 μ V/m

Tested by



Engineer

(3-5) Measurement data

Operation mode : Full Power
 The spectrum was scanned from 30MHz to 1GHz
 Detector function : CISPR Quasi-peak
 IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999
 Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C Class B
 Horizontal Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
30.157	-9.7	28.5	8.71	30
30.279	-9.7	27.0	7.33	30
33.945	-11.0	22.4	3.72	30
49.268	-16.0	28.5	4.22	30
56.090	-18.5	25.0	2.11	30
78.995	-20.3	41.0	10.84	30
94.421	-18.2	21.3	1.43	45
181.957	-10.5	21.4	3.51	45

※1 The cable loss is included in the antenna factor.

[Sample Calculation]

30.157MHz, Horizontal Polarization
 $[(-9.7)+28.5] / 20$
 10 = 8.71[μ V/m]

[Limit]

$\left\{ \begin{array}{ll} 30\text{MHz to } 88\text{MHz} : 30 \mu \text{ V/m} \\ 88\text{MHz to } 216\text{MHz} : 45 \mu \text{ V/m} \\ 216\text{MHz to } 960\text{MHz} : 60 \mu \text{ V/m} \\ 960\text{MHz to } 1000\text{MHz} : 150 \mu \text{ V/m} \end{array} \right.$

Tested by

T. Kumi

Engineer

(3-6) Measurement data

Operation mode : Full Power
 The spectrum was scanned from 30MHz to 1GHz
 Detector function : CISPR Quasi-peak
 IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C Class B
 Vertical Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
30.157	-9.7	33.9	19.2	30
30.279	-9.7	33.7	15.8	30
33.658	-10.9	28.8	7.9	30
47.001	-15.2	32.9	7.7	30
49.268	-16.0	35.9	9.9	30
51.084	-16.6	34.3	7.7	30
78.995	-20.3	44.5	16.2	30
258.514	-8.4	32.5	16.0	60

※1 The cable loss is included in the antenna factor.

[Sample Calculation]

30.157MHz, Horizontal Polarization
 $[(-9.7)+33.9] / 20$
 10 = 19.2[μ V/m]

[Limit]

$\left\{ \begin{array}{ll} 30\text{MHz to } 88\text{MHz} : 30 \mu \text{ V/m} \\ 88\text{MHz to } 216\text{MHz} : 45 \mu \text{ V/m} \\ 216\text{MHz to } 960\text{MHz} : 60 \mu \text{ V/m} \\ 960\text{MHz to } 1000\text{MHz} : 150 \mu \text{ V/m} \end{array} \right.$

Tested by

T. Kuri

Engineer

(3-14) Measurement data
Transmitter test (Harmonics & Spurious)

Operation mode : RF Transmission (Paddle in the Charge Port)

The spectrum was scanned from 1GHz to 10GHz

Detector function : Peak

IF band width : 1MHz

Measuring distance was 3 meter.

Date : 19, September, 1999

Temp. : 25 °C Humi. : 55 %

FCC Rules & Regulation Part 15 Subpart C
Vertical Polarization

Emission Frequency [GHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
3.6640	6.6	40.3	221.3	500

Above 3.6640GHz was not founded.

※1 The cable loss and the amplifier gain are included in the antenna factor.

[Sample Calculation]

[Limit] : 500 μ V/m

3.6640GHz, Vertical Polarization

902MHz to 918MHz : 500 μ V/m

[6.6+40.3] /20

10 =221.3 [μ V/m]

Tested by

T. Sone

Engineer

(3-13) Measurement data

Transmitter test (Harmonics & Spurious)

Operation mode : RF Transmission (Paddle in the Charge Port)

The spectrum was scanned from 1GHz to 10GHz

Detector function : Peak

IF band width : 1MHz

Measuring distance was 3 meter.

Date : 19, September, 1999

Temp. : 25 °C Humi. : 55 %

FCC Rules & Regulation Part 15 Subpart C

Horizontal Polarization

Emission Frequency [GHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
2.7677	2.7	42.7	186.2	500
5.4686	10.1	39.7	309.0	500

Above 5.4686GHz was not founded.

※1 The cable loss and the amplifier gain are included in the antenna factor.

[Sample Calculation]

[Limit] : 500 μ V/m

2.7677GHz, Horizontal Polarization

902MHz to 918MHz : 500 μ V/m

[2.7+42.7] /20

10 = 186.2 [μ V/m]

Tested by



Engineer

(3-12) Measurement data

Transmitter test (Harmonics & Spurious)

Operation mode : RF Transmission (Paddle out of the holster)

The spectrum was scanned from 1GHz to 10GHz

Detector function : Peak

IF band width : 1MHz

Measuring distance was 3 meter.

Date : 19, September, 1999

Temp. : 25 °C Humi. : 55 %

FCC Rules & Regulation Part 15 Subpart C

Vertical Polarization

Emission Frequency [GHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
1.8054	-3.7	55.8	402.7	500
2.7459	2.5	48.3	346.7	500

Above 2.7459GHz was not founded.

※1 The cable loss and the amplifier gain are included in the antenna factor.

[Sample Calculation]

[Limit] : 500 μ V/m

1.8054GHz, Vertical Polarization

902MHz to 918MHz : 500 μ V/m

[(-3.7)+55.8] /20

10 = 402.7 [μ V/m]

Tested by



Engineer

(3-11) Measurement data

Transmitter test (Harmonics & Spurious)

Operation mode : RF Transmission (Paddle out of the holster)

The spectrum was scanned from 1GHz to 10GHz

Detector function : Peak

IF band width : 1MHz

Measuring distance was 3 meter.

Date : 19, September, 1999

Temp. : 25 °C Humi. : 55 %

FCC Rules & Regulation Part 15 Subpart C

Horizontal Polarization

Emission Frequency [GHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m]
2.7597	2.6	42.5	180.0	500

Above 2.7597GHz was not founded.

※1 The cable loss and the amplifier gain are included in the antenna factor.

[Sample Calculation]

[Limit] : 500 μ V/m

2.7597GHz, Horizontal Polarization

902MHz to 918MHz : 500 μ V/m

[2.6+42.5] /20

10 =180 [μ V/m]

Tested by

T. Sone

Engineer

(3-10) Measurement data
Transmitter test (Fundamental)

Operation mode : Full Power
The spectrum was scanned from 300MHz to 1GHz
Detector function : Peak
IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999
Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C
Vertical Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m] ※2
915.260	1.9	50.4	412.1	15000

※1 The cable loss and the amplifier gain are included in the antenna factor.

※2 The limit value of radiated emission changed the limit value of the 3m method into the value of the 10m method by the distance converting method.

In this case

Limit (3m) = 50000 μ V/m

Limit (10m) = 50000 μ V/m \times 3m/10m = 15000 μ V/m

[Sample Calculation]

[Limit]

915.260MHz, Vertical Polarization
[1.9+50.3] /20
10 = 412.1 [μ V/m]

902MHz to 918MHz : 15000 μ V/m

Tested by

T. hen

Engineer

(3-9) Measurement data
Transmitter test (Fundamental)

Operation mode : Full Power
The spectrum was scanned from 300MHz to 1GHz
Detector function : Peak
IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999
Temp. : 23°C Humi : 56%

FCC Rules & Regulation Part 15 Subpart C
Horizontal Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m] ※2
915.260	1.9	50.8	431.5	15000

- ※1 The cable loss and the amplifier gain are included in the antenna factor.
※2 The limit value of radiated emission changed the limit value of the 3m method into the value of the 10m method by the distance converting method.

In this case

Limit (3m) = 50000 μ V/m

Limit (10m) = 50000 μ V/m \times 3m/10m = 15000 μ V/m

[Sample Calculation]

[Limit]

915.260MHz, Horizontal Polarization
[1.9+50.8] /20
10 = 431.5 [μ V/m]

902MHz to 918MHz : 15000 μ V/m

Tested by



Engineer

(3-8) Measurement data
Transmitter test (Fundamental)

Operation mode : 3A delivered to load (Electric Vehicle Battery)

The spectrum was scanned from 300MHz to 1GHz

Detector function : Peak

IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C
Vertical Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit [μ V/m] ※2
915.260	1.9	55.1	707.9	15000

※1 The cable loss and the amplifier gain are included in the antenna factor.

※2 The limit value of radiated emission changed the limit value of the 3m method into the value of the 10m method by the distance converting method.

In this case

Limit (3m) = 50000 μ V/m

Limit (10m) = 50000 μ V/m \times 3m/10m = 15000 μ V/m

[Sample Calculation]

[Limit]


915.260MHz, Vertical Polarization

902MHz to 918MHz : 15000 μ V/m

[1.9+55.1] /20

10 = 707.9 [μ V/m]

Tested by



Engineer

(3-7) Measurement data
Transmitter test (Fundamental)

Operation mode : 3A delivered to load (Electric Vehicle Battery)

The spectrum was scanned from 300MHz to 1GHz

Detector function : Peak

IF band width : 120kHz

Measuring distance was 10 meter.

Date : 29, August, 1999

Temp. : 23°C Humi. : 56%

FCC Rules & Regulation Part 15 Subpart C
Horizontal Polarization

Emission Frequency [MHz]	Antenna factor [dB] ※1	Meter Reading [dB μ V/m]	Field Strength [μ V/m]	Limit (10m) [μ V/m] ※2
915.260	1.9	53.4	582.1	15000

※1 The cable loss and the amplifier gain are included in the antenna factor.

※2 The limit value of radiated emission changed the limit value of the 3m method into the value of the 10m method by the distance converting method.

In this case

Limit (3m) = 50000 μ V/m

Limit (10m) = 50000 μ V/m \times 3m/10m = 15000 μ V/m

[Sample Calculation]

[Limit]

915.260MHz, Horizontal Polarization

902MHz to 918MHz : 15000 μ V/m

[1.9+53.4] /20

10 =582.1[μ V/m]

Tested by

T. Usui

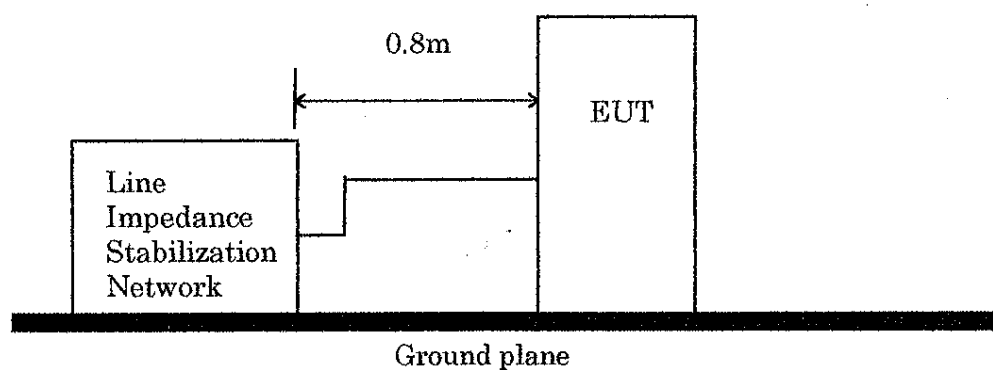
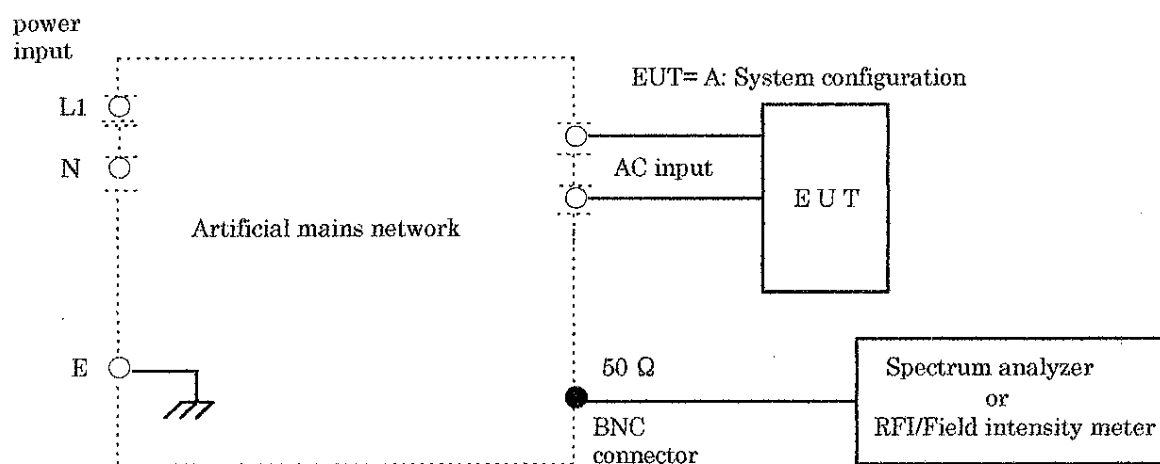
Engineer

9.2 Conducted Emission

(1) Measurement Instrumentation Used

Description	Model	Serial No.	Manufacturer	Soshin control No.	Next calibration
Artificial mains network	ESH2-Z5	842966/013	ROHDESCHWARZ	G-1NA-005	February 2000
Spectrum analyzer	R3361A	71720647	ADVANTEST	G-1AZ-234	April 2000
Preselector	R3551	72970020	ADVANTEST	G-1AZ-234-1	April 2000
RFI/Field intensity meter	KNM2402	4N-164-3	Kyoritsu	G-1NF-005	April 2000
Selector	MP59B	M59385	Amitsu	G-1VR-146	April 2000
UHF Variable attenuator	URA-0330Y	27233	Tamagawa	G-1VA-041	March 2000

(2) Measurement configuration



(3-1) Measurement data

Operation mode : No Output (Paddle in the holster)
 The spectrum was scanned from 450kHz to 30MHz

Detector function : CISPR Quasi-peak
 IF band width : 9kHz
 Line : L1

Date : 28, August, 1999
 Temp. : 21°C Humi. : 41%

FCC Rules & Regulation Part 15 Class B

Emission Frequency [MHz]	Line	LISN correction factor[dB] ※	Meter Reading [dB μ V]	RF Voltage [μ V]	Limit [μ V]
0.524	L1	0.2	- 12.3	0.24	250
12.539	L1	0.7	4.1	1.74	250
13.903	L1	0.8	5.4	2.04	250
14.557	L1	0.8	11.7	4.22	250
24.861	L1	1.6	5.3	2.21	250
28.405	L1	2.0	4.3	2.07	250

※ The cable loss is included in the LISN correction factor.

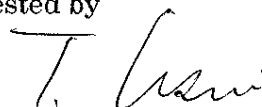
[Sample Calculation]

[Limit]

$$\begin{aligned}
 &0.524\text{MHz, L1} \\
 &\quad [0.7 + (-12.3)] / 20 \\
 &10 \quad \quad \quad = 0.24 [\mu \text{ V}]
 \end{aligned}$$

$$450\text{kHz to } 30\text{MHz} : 250 \mu \text{ V}$$

Tested by



Engineer

(3-2) Measurement data

Operation mode : No Output (Paddle in the holster)
 The spectrum was scanned from 450kHz to 30MHz

Detector function : CISPR Quasi-peak
 IF band width : 9kHz
 Line : L2

Date : 28, August, 1999
 Temp. : 21°C Humi. : 41%

FCC Rules & Regulation Part 15 Class B

Emission Frequency [MHz]	Line	LISN correction factor[dB] ※	Meter Reading [dB μ V]	RF Voltage [μ V]	Limit [μ V]
0.524	L2	0.2	- 12.3	0.25	250
12.540	L2	0.7	7.3	2.51	250
13.901	L2	0.8	6.6	2.34	250
14.337	L2	0.8	7.0	2.45	250
14.556	L2	0.8	12.6	4.68	250
24.860	L2	1.6	3.8	1.86	250
28.404	L2	2.0	2.7	1.72	250

※ The cable loss is included in the LISN correction factor.

[Sample Calculation]

[Limit]

$$\begin{aligned} &0.489\text{MHz, L1} \\ &\quad [0.2 + (-12.3)] / 20 \\ &10 \quad \quad \quad = 0.46 [\mu \text{ V}] \end{aligned}$$

450kHz to 30MHz : 250 μ V

Tested by



Engineer

(3-3) Measurement data

Operation mode : No Output (Paddle in the Electric Vehicle)
 The spectrum was scanned from 450kHz to 30MHz

Detector function : CISPR Quasi-peak
 IF band width : 9kHz
 Line : L1

Date : 28, August, 1999
 Temp. : 21°C Humi. : 41%

FCC Rules & Regulation Part 15 Class B

Emission Frequency [MHz]	Line	LISN correction factor[dB] ※	Meter Reading [dB μ V]	RF Voltage [μ V]	Limit [μ V]
0.489	L1	0.2	- 6.4	0.49	250
5.728	L1	0.5	7.6	2.54	250
6.164	L1	0.5	8.8	2.92	250
6.545	L1	0.5	7.2	2.43	250
6.872	L1	0.5	1.8	1.30	250
12.489	L1	0.7	- 3.2	0.75	250
26.548	L1	1.8	-15.1	0.22	250

※ The cable loss is included in the LISN correction factor.

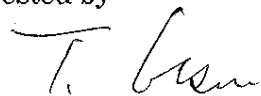
[Sample Calculation]

[Limit]

$$\begin{aligned}
 &0.489\text{MHz, L1} \\
 &\quad [0.2 + (-6.4)] / 20 \\
 &10 \quad \quad \quad = 0.49 [\mu \text{ V}]
 \end{aligned}$$

$$450\text{kHz to } 30\text{MHz} : 250 \mu \text{ V}$$

Tested by



Engineer

(3-4) Measurement data

Operation mode : No Output (Paddle in the Electric Vehicle)
 The spectrum was scanned from 450kHz to 30MHz

Detector function : CISPR Quasi-peak
 IF band width : 9kHz
 Line : L2

Date : 28, August, 1999
 Temp. : 21°C Humi. : 41%

FCC Rules & Regulation Part 15 Class B

Emission Frequency [MHz]	Line	LISN correction factor[dB] ※	Meter Reading [dB μ V]	RF Voltage [μ V]	Limit [μ V]
0.490	L2	0.2	-6.9	0.46	250
5.726	L2	0.5	8.2	2.72	250
6.162	L2	0.5	10.5	3.55	250
6.543	L2	0.5	8.8	2.92	250
6.871	L2	0.5	3.4	1.57	250
12.598	L2	0.7	3.4	1.60	250
26.548	L2	1.8	-13.6	0.26	250

※ The cable loss is included in the LISN correction factor.

[Sample Calculation]

[Limit]

$$\begin{aligned}
 &0.489\text{MHz, L1} \\
 &\frac{[0.2 + (-6.9)]}{20} \\
 &10 \quad = 0.49 [\mu \text{ V}]
 \end{aligned}$$

450kHz to 30MHz : 250 μ V

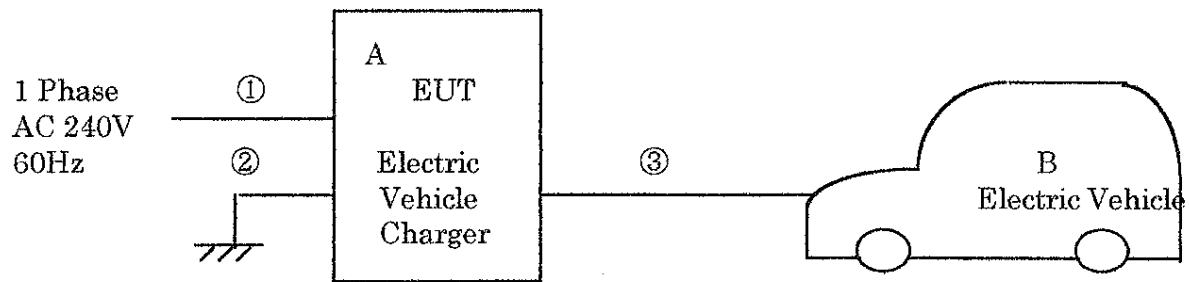
Tested by

T. Ise

Engineer

10 Tested System Details

(1) System configuration



(2) List of tested device

No.	Product name	Model No.	Manufacture	Remarks
		Serial No.		
A	Electric Vehicle Charger	TCG2000	TOYODA AUTOMATIC LOOM WORKS, LTD.	EUT
		10		
B	Electric Vehicle	RAV4EV	TOYOTA	—
		—		

(3) Type of used cables

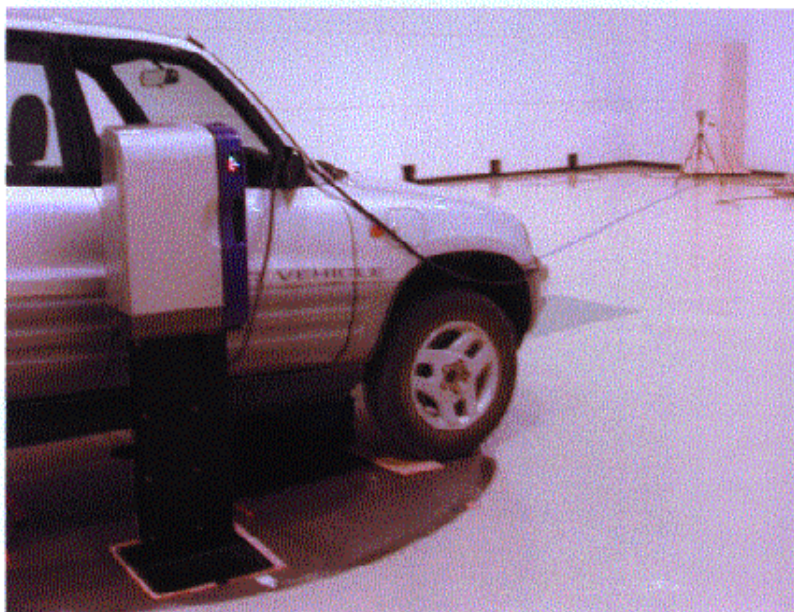
No.	Cable of Description	Length (m)	Shield	Grounding Point of shield	Remarks
①	AC Input Cable	1.0	—	—	
②	Earth Cable	1.0	—	—	
③	Charger Cable	3.0	○	EUT Side	

○ : Single Shielding

11 Measurement Photos

Photo 10.1 Radiated Emission

9kHz to 30MHz



30MHz to 1GHz



1GHz to 10GHz

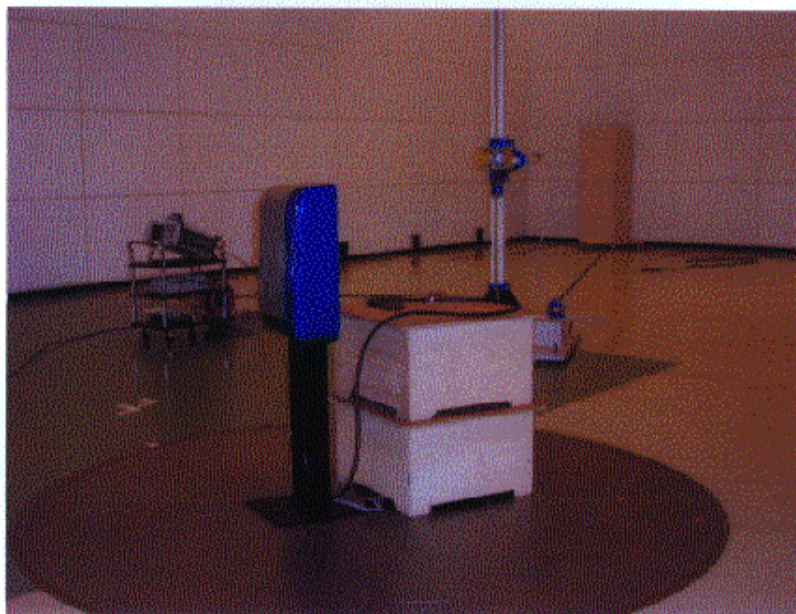


Photo 11.2 Conducted Emission

