EMISSION TEST REPORT

Test Report No. : 18C0030-02-1
TAKAYA CORPORATION, Model: RP69W01
FCC Part 15 Subpart C

1. This test report shall not be reproduced except in full, without the written approval of A-Pex International Co., Ltd.

2. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

3. This equipment is in compliance with above regulation. We hereby certify that the data are contain a true representation of the emission profile.

4. The results in this report apply only to the sample tested.

5. This test report clearly shows that EUT, RP69W01, Wetness Sensor System (Transponder) is in compliance with FCC Part 15 Subpart C

Date of test: March 19, 1999 **Issued date:** March 31, 1999

Tested by: ______________________
Naoki Sakamoto
EMC section

Approved by: ______________________
Kazutoyo Nakanishi
Group Leader of EMC section

Form Version No. 1

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1 GENERAL INFORMATION

APPLICANT	: TAKAYA CORPORATION
ADDRESS	: 1-1 Momiji-cho, Fukuyama-city, Hiroshima 720-0811 Japan Tel: +81-849-27-5133 Fax: +81-849-27-5130
REGULATION(S)	: FCC Part 15 SubpartC
MODEL NUMBER	: RP69W01
SERIAL NUMBER	: -
KIND OF EQUIPMENT	: Wetness Sensor System (Transponder)
TESTED DATE	: March 19, 1999
RECEIPT DATE OF SAMPLE	: March 19, 1999
TEST REPORT NUMBER	: 18C0030-02-1
TEST SITE	: A-PEX Yokowa NO.3 Open Test Site

1.1 Tested Methodology

Both conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4(1992). Radiated testing was performed at a distance of 3 meters from the antenna to EUT .

1.2 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 108, Yokowa-cho, Ise-shi, Mie-ken, 516-1106 Japan.
This site has been fully described in a report dated Aug. 1, 1997 submitted to FCC office, and accepted in a letter dated Sep. 16, 1997 (31040/SIT 1300F2).

2 Product Description

TAKAYA CORPORATION, Model RP69W01 (referred to as the EUT in this report) is a Wetness Sensor System (Transponder).

Receive system	: Double-conversion superheterodyne
Receiving frequency 1	: 318.125M, 318.500M, 318.875M, 319.250MHz
Receiving frequency 2	: 314.500M□314.725MHz (25kHz step)
Sensitivity	: -113dBm for 12dB SINAD
Intermediate frequency	: 1st 21.7MHz
	: 2nd 450kHz
Transmitting frequency	: 314.500M□314.725MHz (25kHz step)
Frequency stability	: ±0.001%
Modulation system	: Variable reactance frequency modulation
Maximum deviation	: ±4kHz
Power source	: DC, AC 9V □0.1A AC adaptor
Battery life	: about 12 hours

3 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

Model	FCC ID	Description	Cable description	Backshell Material
(1) TAKAYA M/N: RP69W01 (EUT)	MK4RP69W01	Wetness Sensor System (Transponder)	Unshielded DC Power Cable	P.V.C.
(2) Radio Shack M/N: 273-1651D	N/A	AC Adaptor	—	—

4 SYSTEM TEST CONFIGURATION

4.1 Justification

The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

The sequence is used:

Operation: Transmitting mode

Measurement was performed by changing over the dip switches (1□10 channels) of transmitting frequency 314.500M□314.725MHz (25kHz step).

4.3 Test Procedure

4.3.1 Tabletop Equipment Conducted Emissions

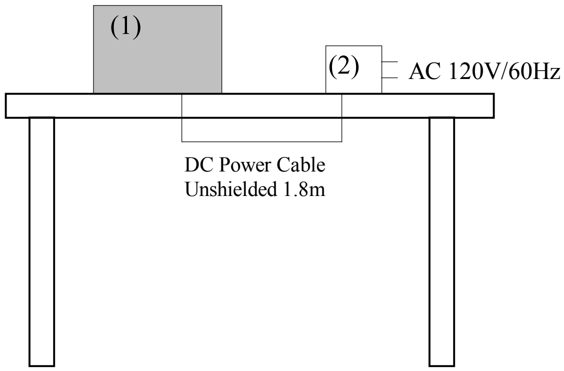
EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
The rear of tabletop was located 40cm to the vertical conducting plane.
The rear of EUT, including peripherals aligned and flush with rear of tabletop.
All other surfaces of tabletop was at least 80cm from any other grounded conducting surface.
DC power cables was bundled in center.
They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.
Each EUT current-carrying power lead, except the ground (safety) lead, were individually connected through a LISN to the input power source.
All unused 50Ω connectors of the LISN were resistively terminated in 50Ω when not connected to the measuring equipment.

4.3.2 Tabletop Equipment Radiated Emissions

EUT was placed on a center of table of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.
The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
The measurement distance was 3m.

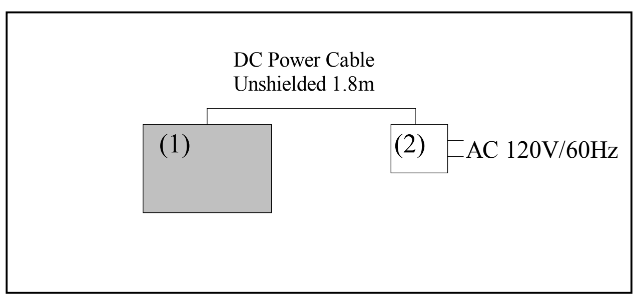
Figure4.1 Configuration of Tested System

Front View



* Cabling was taken into consideration and test data was taken under worst case conditions.

Top View



* Cabling was taken into consideration and test data was taken under worst case conditions.

5 CONDUCTED AND RADIATED MEASUREMENT PHOTOS

Figure 5.1 Conducted Measurement Photos

Figure 5.2 Radiated Measurement Photos

5.1 Measurement Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±3.3dB.

□ The data listed in this test report may exceed the test limit because it does not have enough margin (more than 3.3dB).

■ The data listed in this test report has enough margin, more than 3.3dB.

Conducted Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was ±2.0dB.

□ The data listed in this test report may exceed the test limit because it does not have enough margin (more than 2.0dB).

■ The data listed in this test report has enough margin, more than 2.0dB.

6 CONDUCTED EMISSION DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range(450kHz-30MHz).
The final data represents worst-case emissions. (Transmitting mode)
The minimum margin to the limit is as follows :

Frequency (MHz)	Line (N/L)	Measured (dBμV)	LISN Factor(dB)	Result (dBμV)	Limit (dBμV)	Margin (dBμV)
0.4500	N	28.4	-4.0	24.4	48.0	23.6

* All readings are quasi-peak detect.

7 RADIATED EMISSION DATA

The initial step in collecting radiated data was a spectrum analyzer peak scan of the measurement range (314.500MHz-3147.250MHz).
The final data was reported in the worst-case emissions.
The minimum margin to the limit is as follows :

Regarding measurement above 1000MHz, the measurement was performed on following conditions:
□ Resolution bandwidth: 1MHz
□ Video bandwidth: 1MHz

*** 314.500MHz 1000MHz (Quasi-Peak detect)**

ch 7: Transmitter frequency 314.650MHz type.

Frequency (MHz)	Receiver Reading (dBμV)	Correction Factor (dBμV)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dBμV)
314.65	60.0	0	60.0	67.6	7.6

*** 1000MHz 3147.250MHz (Peak detect)**

ch 1: Transmitter frequency 314.500MHz type.
ch 8: Transmitter frequency 314.675MHz type.

	Frequency (MHz)	Receiver Reading (dBμV)	Correction Factor (dBμV)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dBμV)
ch 1:	3145.0	44.7	-3.8	40.9	47.6	6.7
ch 8:	3146.7	44.7	-3.8	40.9	47.6	6.7

The Fandamental Frequencies of this equipment are 314.5□314.725MHz(25kHz step).
The peak of output level of fandamental frequencies were confirmed by perfarming the meaurement.
It was corroborated that equipment was within of the tolerance which is prescribed
in the FCC regulation Part 15 Subpart C sec. 15.231 (c).
Since the fandamental frequencies are 314.5□314.725MHz(25kHz step), we selected most severe conditions, the limits were ±393.1kHz at 314.5MHz.
The measurement result was 174kHz (ch 2, upper) and 181.5kHz (ch 6, lower).

7.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

*** 314.500MHz 1000MHz**
FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Reading
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 60.0 dBμV is obtained. The antenna Factor of 16.5 dB, Cable Factor of 4.7 dB is added The Antenna Pad of 6.0 dB and Amplifier Gain of 27.2 dB is subtracted, giving a field strength of 60.0 dBμV/m.

FS = 60.0 + 16.5 + 4.7 + 6.0 - 27.2 = 60.0 dBμV/m

*** 1000MHz 3147.25MHz**
FS = RA + AF + CF - AG

where FS = Field Strength
RA = Spectrum Analyzer Reading
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a rspectrum analyzer reading of 44.7 dBμV is obtained. The antenna Factor of 30.4, the Cable Factor of 2.0 dB is added. The Amplifier Gain of 36.2 dB is subtracted, giving a field strength of 40.9 dBμV/m.

FS = 44.7 + 30.4+ 2.0 – 36.2 = 40.9 dBμV/m

8 TEST EQUIPMENT USED

	INSTRUMENTS	Mfr.	MODEL	C/N	Calibrated Until
■	Pre Amplifier	Hewlett Packard	8447D	AF1	June 10, 1999
■	Pre Amplifier	Hewlett Packard	8449B	AF4	January 31, 2000
□	Biconical Antenna	Schwarzbeck	BBA9106	BA1	May 3, 1999
□	Biconical Antenna	Schwarzbeck	BBA9106	BA2	July 6, 1999
■	Biconical Antenna	Schwarzbeck	BBA9106	BA5	July 6, 1999
□	Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA5	July 6, 1999
□	Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA6	February 14, 2000
■	Logperiodic Antenna	Schwarzbeck	UKLP9104-A	LA8	August 8, 1999
■	Horn Antenna	AH System, Inc	SAS-200/571	HA1	February 5, 2000
□	LISN	Rohde & Schwarz	ESH2-Z5	LS1	November 24, 1999
□	LISN	Rohde & Schwarz	ESH3-Z5	LS2	November 24, 1999
□	LISN	Schwarzbeck	NSLK8127	LS3	November 24, 1999
□	LISN	Rohde & Schwarz	ESH3-Z5	LS4	November 24, 1999
□	LISN	Schwarzbeck	NNLK8121	LS5	November 24, 1999
□	LISN	Rolf Heine	NNB-4/200	LS6	November 24, 1999
□	LISN	Schwarzbeck	NNLK8126	LS7	November 24, 1999
□	Spectrum Analyzer	Hewlett Packard	8567A	SA1	May 31, 1999
■	Spectrum Analyzer	Hewlett Packard	8567A	SA4	June 12, 1999
■	Spectrum Analyzer	Advantest	R3271	SA5	May 17, 1999
□	Test Receiver	Rohde & Schwarz	ESHS-20	TR1	April 3, 1999
□	Test Receiver	Rohde & Schwarz	ESVS-30	TR2	July 5, 1999
□	Test Receiver	Rohde & Schwarz	ESHS-30	TR3	July 14, 1999
□	Test Receiver	Rohde & Schwarz	ESVS-10	TR4	July 14, 1999
□	Test Receiver	Rohde & Schwarz	ESHS-10	TR5	March 23, 1999
■	Test Receiver	Rohde & Schwarz	ESVS-10	TR6	March 23, 1999

■ indicates EMI Test Equipment used.

*All measurement equipment is traceable to national standard.

APPENDIX

Test Data

Conducted emissions	A1 – A4
Radiated emissions	A5 – A44