

EMC TEST REPORT

for

Futaba Corporation

629 Oshiba Mobara, Chiba-Prefecture 297-8588, Japan

Equipment Under Test: Communication System
Model Name: FDK01TU

Category: FCC Part 15 Sub.part C Low Power Communications Device Transmitter

FCC ID: AZP-FDK01TU

Tokin Report No.: TXV045245

Date of Issue: July 22, 2004

Approved by


Mickey Fukuda
Manager, Tsukuba Testing Lab.
Tokin EMC Engineering Co., Ltd.

-- ATTENTION --

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NVLAP Lab. Code: 200221-0

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1 DESCRIPTION OF DEVICE

A) Kind of Equipment: Communication System

B) FCC ID: AZP-FDK01TU

C) Model Name: FDK01TU

D) Serial No.: None

E) Type of Sample Tested: Pre-production

F) High Frequency Used: 232.5MHz (Transmission)
16.8MHz, 21.7MHz (System)
24MHz (CPU)

G) Rating Power Supply: DC24V

H) Tested Power Supply: DC24V

I) Date of Manufacture: February 2004

J) Manufacturer: Futaba Corporation
1080 Yabutsuka, Chosei-mura, Chosei-gun, Chiba,
299-4395 Japan

K) Description of Operating: Modulation Continuous Transmission Mode

L) Date of Sample Received: March 2, 2004

M) Test Engineer: Yutaka Takeuchi

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Hiroko Nakamura
22/Jul./2004

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Yutaka Takeuchi, Engineer

2 TEST FACILITY

The semi anechoic chamber is used for testing, where is located following address. This chamber was fully described in a report dated Nov.13,2003, that was submitted to the FCC. And we had accepted in a letter dated Nov.14,2003 (31040/SIT). This laboratory is accredited by NVLAP for NVLAP Lab. Code: 200221-0.

Tokin EMC Engineering Co., Ltd.
Tsukuba Testing Laboratory, Semi Anechoic Chamber

Address ; 28-1, Kitahara-aza, Hanashimashinden-ohaza, Tsukuba-city, Ibaraki 305-0875, Japan

3 SUMMARY OF RESULTS

3.1 Electromagnetic Emission

RFI Voltage Measurement **Not Applicable**
(Because this EUT is DC main power supply.)

RFI Field Strength Measurement **PASS**

Although the measured emissions indicate that the EUT complies with the required limits, some measurements are close to these limits. When the uncertainty of measurement is considered, there is some possibility that the EUT may not be compliant.

Test results are traceable to JQA and NML/CSIRO.

3.2 Modifications to The EUT : None

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4 TESTED SYSTEM DETAILS

4.1 Peripherals and Others : None

4.2 Type of Used Cables :

Description	Length	Type of shield	Model name	Manufacturer
DC Cable (EUT ~ Battery)	1.0m	Non-shielded	---	---
Coaxial Cable (EUT ~ EUT)	0.5m	Non-shielded	---	---
Feeder Cable (EUT ~ EUT)	2.0m	Non-shielded	---	---

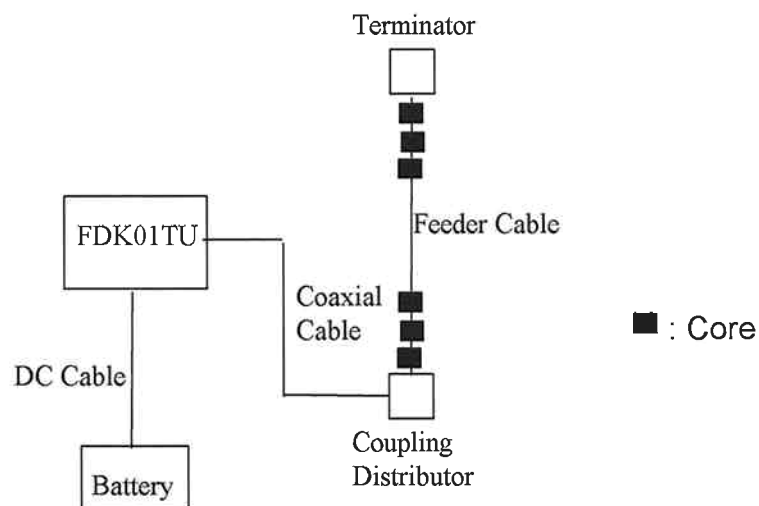


Figure 4-1 System Configuration Diagram

5 TECHNICAL COUNTERMEASURE: None

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Yutaka Takeuchi, Engineer

6 TEST RESULTS

6.1 RFI Field Strength Measurement

6.1.1 Measurement Instrumentation Used

(model/serial no./manufacturer/Tokin control no./last calibration/next calibration)
<30MHz to 1000MHz>

Field strength meter.....(FCVU 1534/130/Schwarzbeck/RE047/25 May'04/Aug.'04)
Bi-Log Antenna.....(CBL6111/1154/Chase/TB018/19 Jun.'04/Jun.'05)
Pre-amplifier.....(8447D/2648A04832/Hewlett Packard/AM007/29 Jan.'04/Jan.'05)
Spectrum analyzer(8566B/2139A01073/Hewlett Packard/SP00A/04 Jun.'04/Sep.'04)
Coaxial switch unit.....(MP59B/6100175602/Anritsu/ME265/08 May'04/May'05)
Site establishment cable(---/---/---/DKT11/08 May'04/May'05)
Software(Software Data Calculation Software TEPTO 1.06/---/AES/---/---/---)
Semi anechoic chamber(Tsukuba AC/---/Tokin/SA012/08 May '04/Aug.'04)

<1000MHz to 2000MHz>

Pre-amplifier(8449B/3008A00681/Hewlett Packard/AM034/29 Jun.'04/Sep.'04)
Double ridge
guide horn antenna(3115/ 90053420/EMCO/AN003/14 Jun'04/Jun'05)
Spectrum analyzer(8563E/3450A02894/Hewlett Packard/SP036/04 Jun.'04/Sep.'04)
Coaxial cable.....(SUCOFLEX 104/144326-4/SUCOFLEX/DK176/29 Jun.'04/Sep.'04)
Coaxial cable.....(SUCOFLEX 104/147075-4/SUCOFLEX/DK177/29 Jun.'04/Sep.'04)
Coaxial cable.....(SUCOFLEX 104/149621-4/SUCOFLEX/DK178/29 Jun.'04/Sep.'04)
Software(Software Data Calculation Software TEPTO 1.06/---/AES/---/---/---)
Semi anechoic chamber(Tsukuba AC/---/Tokin/SA012/08 May '04/Aug.'04)

The measurement instrumentation used, are calibrated according to Quality Manual.

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6.1.2 Measurement Procedure

Final test was performed according to ANSI C63.4-2001 at the semi anechoic chamber. There are no deviations from the standard.

The EUT was placed in a 0.8m high table along with the peripherals. The turn table was separated from the antenna distance 3meters. Cables were placed in a position to produce maximum emissions as determined by experimentation, and operation mode was selected for maximum.

The frequencies and amplitudes of maximum emission were measured at varying azimuths, antenna heights and antenna polarities. Reported are maximized emission levels.

These tests were performed at 120kHz of 6dB bandwidth.

The measurement above 1GHz was tested at RBW 1MHz, at VBW 10Hz.

Test results had obtained from following equation.

$$\text{Result (dB}\mu\text{V/m)} = \text{Level (dB}\mu\text{V)} + \text{Ant. Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Amp. Gain (dB)}$$

<Decision to Pass or Fail>

To judge pass or fail of the test result, it was added "Uncertainty" to the obtained data and then subtracted it from the limit value. If all the values are +(plus), it will be passed and if there is -(minus), it will be failed.

6.1.3 Deviation from the specification: None

6.1.4 Measurement Uncertainty

The data was tested are including uncertainty.

Measurement uncertainty of 30MHz to 300MHz is $\pm 3.58\text{dB}(k=2)$, 300MHz to 1000MHz is $\pm 3.56\text{dB}(k=2)$ and it had estimated for decision to PASS or FAIL.

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6.1.5 Test Data

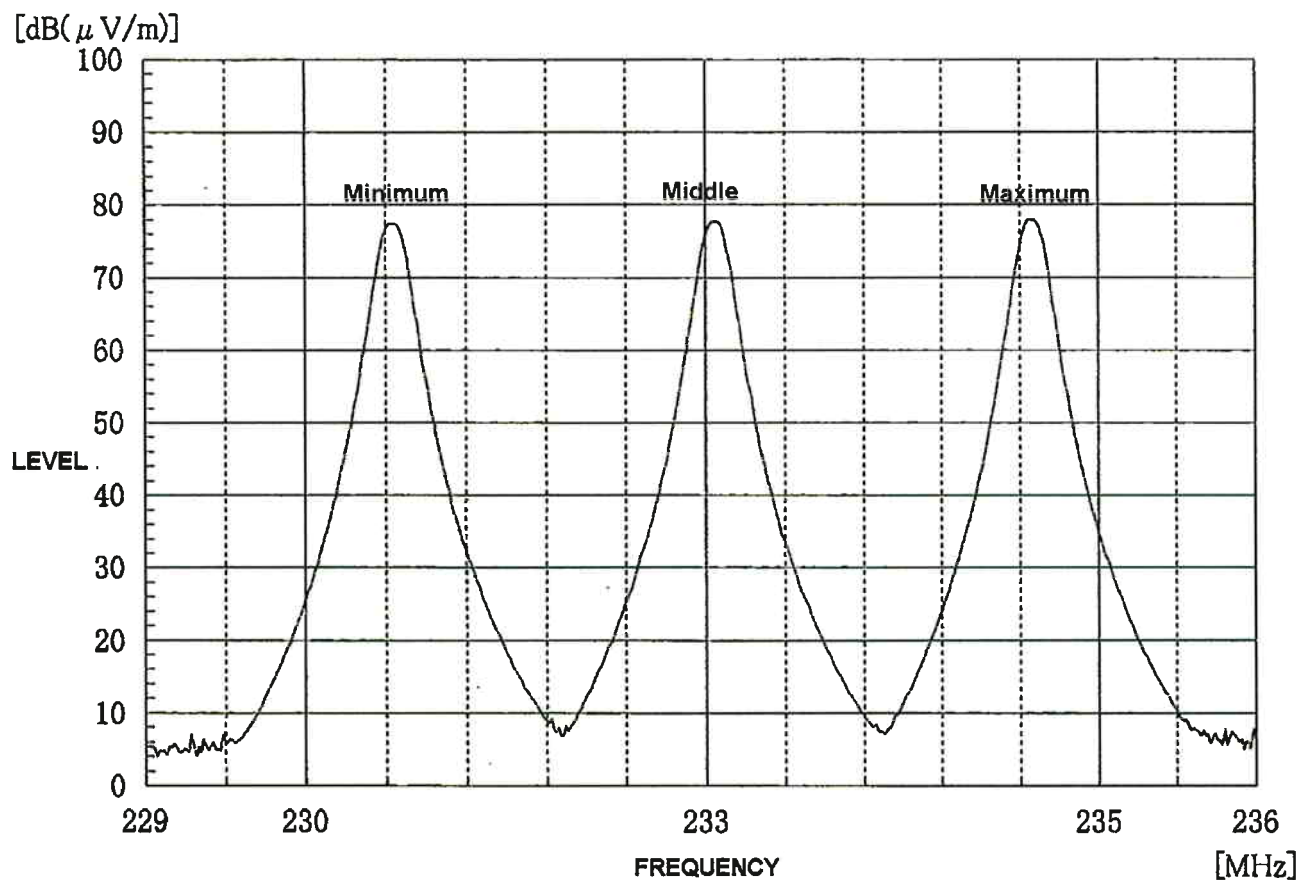


Figure 6.1 Fundamental Frequency Direct Input Waveform

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6.1.5 Test Data

Table 6.1-1 RFI Field Strength Measurement Results (Q-Peak Measurement)

Operating mode: Modulation Continuous Transmission Mode Date of measurement: July 21, 2004
Test procedure: ANSI C63.4-2001 Temperature: 23 degree C
<30MHz to 1000MHz> Humidity: 54 %

Frequency (MHz)	Level (dBμV)		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result (dBμV/m)		Result (μV/m)		3 Meter Limit (μV/m)	Margin (dB)	
	Ver.	Hor.				Ver.	Hor.	Ver.	Hor.		Ver.	Hor.
48.00	25.0	22.0	1.6	-29.3	9.4	6.7	3.7	2.16	1.53	100	33.3	36.3
174.40	40.5	41.0	3.5	-28.7	8.6	23.9	24.4	15.67	16.60	150	19.6	19.1
232.50	54.0	56.5	4.3	-28.4	11.2	41.0	43.5	112.20	149.62	200	5.0	2.5
465.00	21.0	20.5	6.8	-29.2	17.5	16.1	15.6	6.38	6.03	200	29.9	30.4
697.50	22.0	21.5	8.5	-29.3	21.8	23.0	22.5	14.13	13.34	200	23.0	23.5
930.00	20.5	20.5	9.9	-28.7	25.3	27.0	27.0	22.39	22.39	200	19.0	19.0

Sub.part C limit

Radiated Emission – 3 meter distance

Frequency (MHz)	dBμV/m	μV/m
30 - 88	40.0	100
88 - 216	43.5	150
216 - 960	46.0	200
> 960	54.0	500

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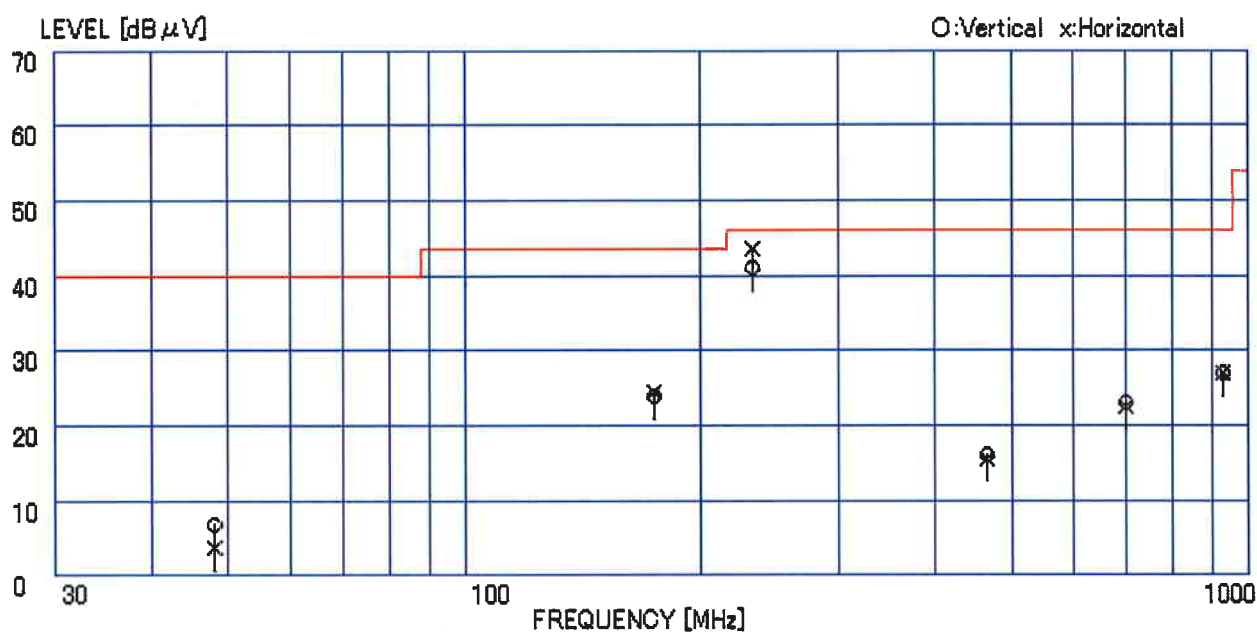


Figure 6.1-1 RFI Field Strength Measurement Results

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Table 6.1-2 RFI Field Strength Measurement Results (Q-Peak Measurement)

Operating mode: Modulation Continuous Transmission Mode Date of measurement: July 21, 2004
Test procedure: ANSI C63.4-2001 Temperature: 23 degree C
<1000MHz to 2000MHz> Humidity: 54 %

Frequency (MHz)	Level (dBμV)		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result (dBμV/m)		Result (μV/m)		3 Meter Limit (μV/m)	Margin (dB)	
	Ver.	Hor.				Ver.	Hor.	Ver.	Hor.		Ver.	Hor.
1162.50	35.5	36.0	7.0	-35.3	25.5	32.5	33.0	42.17	44.67	500	21.5	21.0
1627.50	33.0	33.0	8.4	-35.2	26.1	32.4	32.4	41.69	41.69	500	21.6	21.6

Sub.part C limit

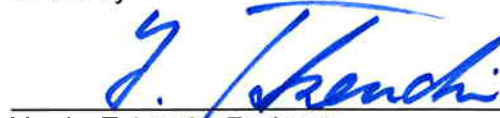
Radiated Emission – 3 meter distance

Frequency (MHz)	dBμV/m	μV/m
30 - 88	40.0	100
88 - 216	43.5	150
216 - 960	46.0	200
> 960	54.0	500

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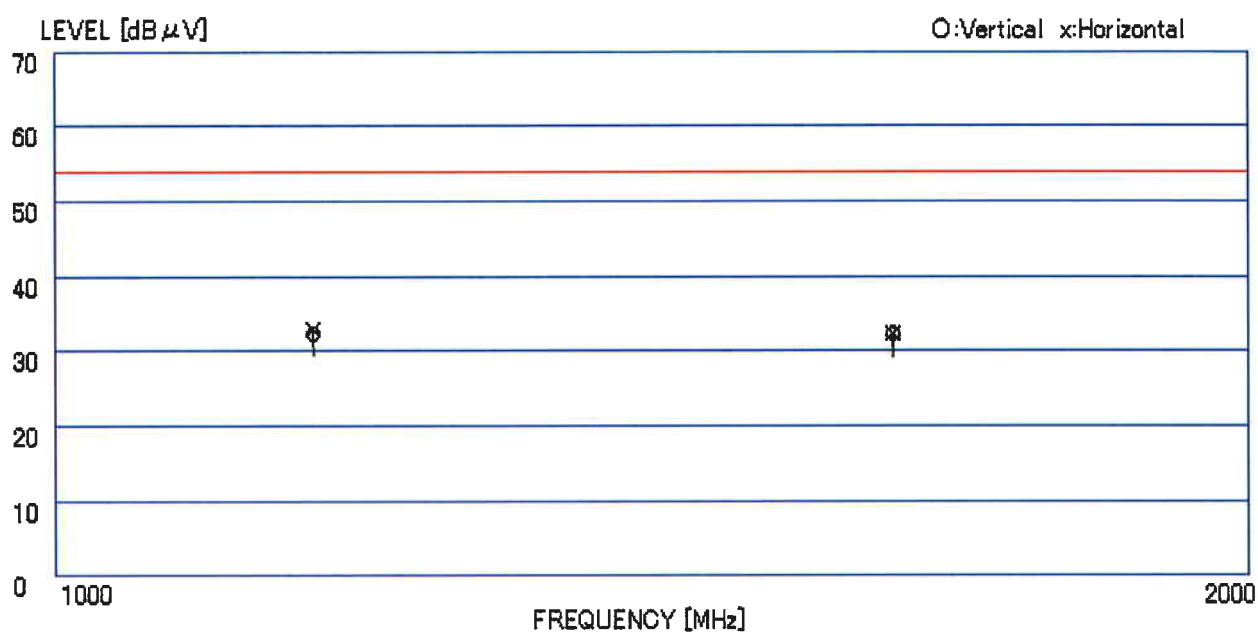


Figure 6.1-2 RFI Field Strength Measurement Results

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6.3 Minimum Margin

Table 6.3-1 Minimum Margin

<u>Radiated emission</u> <i>Modulation Continuous Transmission</i>	operation mode	<i>232.50</i> MHz,	<i>2.5</i> dB
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6.4 Sample Calculation

Table 6.4-1 Sample Calculation

The maximum radiating emission can be obtained at the frequency of *232.50* MHz,
Horizontal polarization on *Modulation Continuous Transmission* operation mode.

Height of Antenna: *1.9* m, Angle of Turn table: *250°*

Each value at frequency is as follows;

R :	Field strength meter reading	=	<i>56.5</i>	(dBμV)
A :	Antenna factor	=	<i>11.2</i>	(dB/m)
C :	Cable loss	=	<i>4.3</i>	(dB)
G :	Amplifier gain	=	<i>28.4</i>	(dB)

Then radiated emission E(dBμV/m) is ;

$$E = R + A + C - G$$

Therefore, the maximum radiated emission is ;

43.5 (dBμV/m)

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7 MEASUREMENT PHOTOS

Photo 7.1a Setup with the Maximized RFI Field Strength Emission Level



Photo 7.1b Setup with the Maximized RFI Field Strength Emission Level

