

EMC TEST REPORT

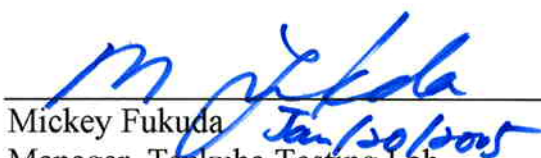
for

TADANO Ltd.

5405-3, Shido, Sanuki-city, Kagawa, 769-2101 Japan

Equipment Under Test: Remote Control Transmitter
Model Name: RCSFT1
FCC ID: SU6-RCSFT1
Category: FCC Part 15 Sub.part C Low Power Communications Device Transmitter
Token Report No.: T6Q04Z401
Date of Issue: January 17, 2005

Approved by


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

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NVLAP Lab. Code: 200221-0

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1 DESCRIPTION OF DEVICE

A) Kind of Equipment:	Remote Control Transmitter
B) FCC ID:	SU6-RCSFT1
C) Model Name:	RCSFT1
D) Serial No.:	0365465
E) Type of Sample Tested:	Pre-production
F) High Frequency Used:	12.5kHz step of 429.2500 to 429.7375MHz: 429.2625MHz, 429.4750MHz, 429.6625MHz, 429.4125MHz, 429.6125MHz (Carrier Frequency) 21.250MHz (PLL Basic Clock) 9.83MHz (MCU Clock)
G) Rating Power Supply:	DC4.0 ~ 7.0V, 50mA (Battery)
H) Tested Power Supply:	DC6V (Battery)
I) Date of Manufacture:	December 2004
J) Manufacturer:	Futaba Corporation 1080 Yabutsuka, Chosei-mura, Chosei-gun, Chiba, 299-4395 Japan
K) Description of Operating:	Transmission mode
L) Date of Sample Received:	December 15, 2004
M) Test Engineer:	Koji Takizawa

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Koji Takizawa, Engineer

2 TEST FACILITY

The open field test site is used for testing, where is located following address. This site's FCC Test firm registration number: 91021. This laboratory is accredited by NVLAP for NVLAP Lab. Code: 200221-0.

Tokin EMC Engineering Co., Ltd.
Tsukuba Testing Laboratory, Open Field Test Site No.6

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

3 SUMMARY OF RESULTS

3.1 Electromagnetic Emission

RFI Voltage Measurement **Not Applicable**
(Battery drive.)

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 : None

5 TECHNICAL COUNTERMEASURE: None

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6 TEST RESULTS

6.1 RFI Field Strength Measurement

6.1.1 Measurement Instrumentation Used

Semi anechoic Chamber:

(model/serial no./manufacturer/Tokin control no./last calibration/next calibration)

<30MHz to 1000MHz>

Field strength meter (FCVU1534/131/Schwarzbeck/RE046/26 Aug.'04/May'05)
 Biconical antenna (BBA9106/2099/Schwarzbeck/TB024/10 Sep.'04/Sep.'05)
 Logperiodic antenna (UHALP9108-A/0115/Schwarzbeck/TL021/10 Sep.'04/Sep.'05)
 Pre-amplifier (8447D/2727A05431/Hewlett Packard/AM006/28 Jan.'04/Jan.'05)
 Spectrum analyzer (R3261A/81720103/Advantest/SP006/20 Aug.'04/Jun.'05)
 Attenuator (8495B/3308A21794/Hewlett Packard/ME272/09 Nov.'04/Nov.'05)
 Coaxial switch unit..... (MP59B/6100226498/Anritsu/ME267/28 Jan.'04/Jan.'05)
 Site establishment cable..... (---/---/---/DKT07/28 Jan.'04/Jan.'05)
 Software..... (Software Data Calculation Software TEPTO 1.06/---/AES/---/---/---)
 Open field test site (Tsukuba No.6/---/Tokin/SA006/28 Jan.'04/Jan.'05)

<1000MHz to 18000MHz>

Pre-amplifier (8449B/3008A00681/Hewlett Packard/AM034/29 Jun.'04/Jun.'05)
 Double ridge
 guide horn antenna (3115/ 90053420/EMCO/AN003/14 Jun'04/Jun'05)
 Spectrum analyzer (8563E/3450A02894/Hewlett Packard/SP036/04 Jun.'04/Jun.'05)
 Coaxial cable..... (SUCOFLEX 104/144326-4/SUCOFLEX/DK176/23 Sep.'04/Sep.'05)
 Coaxial cable..... (SUCOFLEX 104/147075-4/SUCOFLEX/DK177/23 Sep.'04/Sep.'05)
 Coaxial cable..... (SUCOFLEX 104/149621-4/SUCOFLEX/DK178/23 Sep.'04/Sep.'05)
 Software (Software Data Calculation Software TEPTO 1.06/---/AES/---/---/---)
 Open field test site (Tsukuba No.6/---/Tokin/SA006/28 Jan.'04/Jan.'05)

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 open field test site No.6. 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 $\pm 3.56\text{B}(k=2)$ and it had estimated for decision to PASS or FAIL.

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6.1.5 Test Data

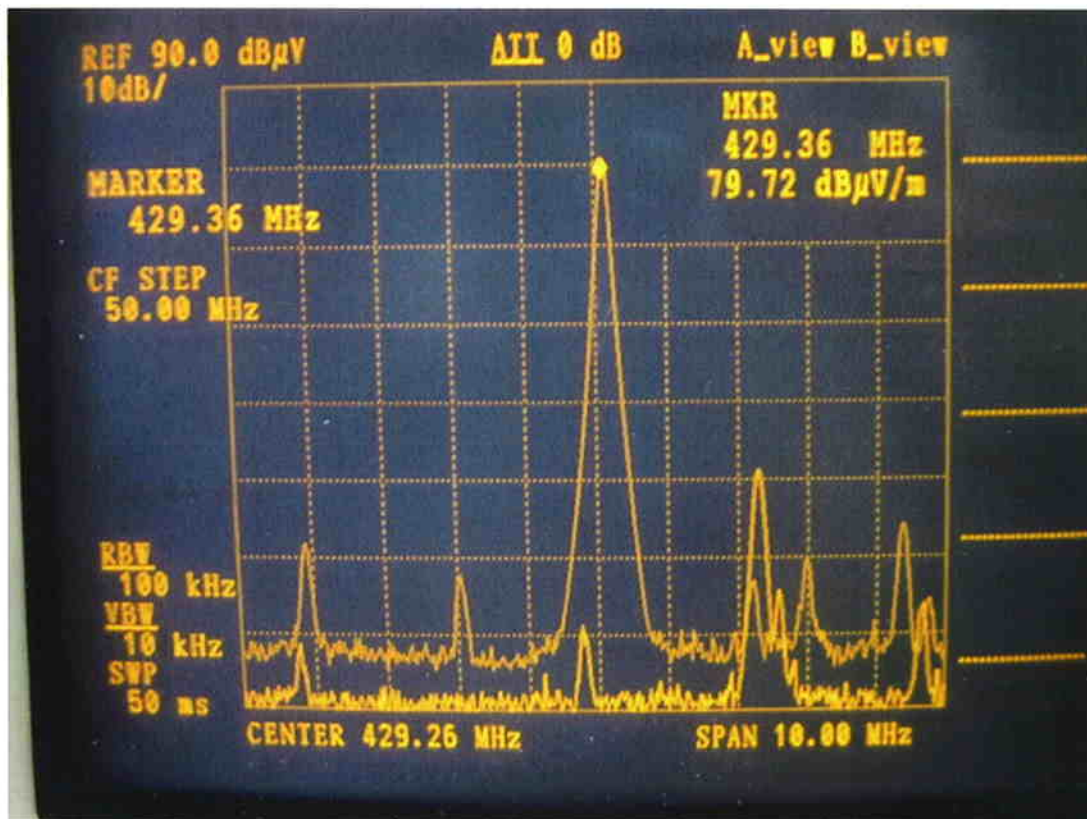


Figure 6.1a Fundamental Frequency Direct Input Waveform

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

<260MHz to 18000MHz>

Operating mode: Transmission Mode

Date of measurement: December 17, 2004

Test procedure: ANSI C63.4-2001

Temperature: 21 degree C

Test condition: DC6V (Battery)

Humidity: 58 %

Frequency (MHz)	Level		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result		Result Ver. (μV/m)	Result Hor. (μV/m)	3 Meter Limit (μV/m)	Margin	
	Ver.	Hor.				Ver.	Hor.				Ver.	Hor.
	(dBμV)					(dBμV/m)					(dB)	
429.26	83.0	78.0	5.3	-27.7	18.5	79.1	74.1	9015.71	5069.91	10350	1.2	6.2

Sub.part C limit

Radiated Emission – 3 meter distance

Fundamental Frequency (MHz)	Field Strength of Fundamental (μV/m) / (dBμV/m)	Field Strength pf Spurious Emissions (μV/m) / (dBμV/m)
260 - 470	3750 - 12500 ** / 71.5 - 82.0**	375 - 1250 ** / 51.5 - 62.0 **
Above 470	12500 / 82.0	1250 / 62.0

** Linear interpolations

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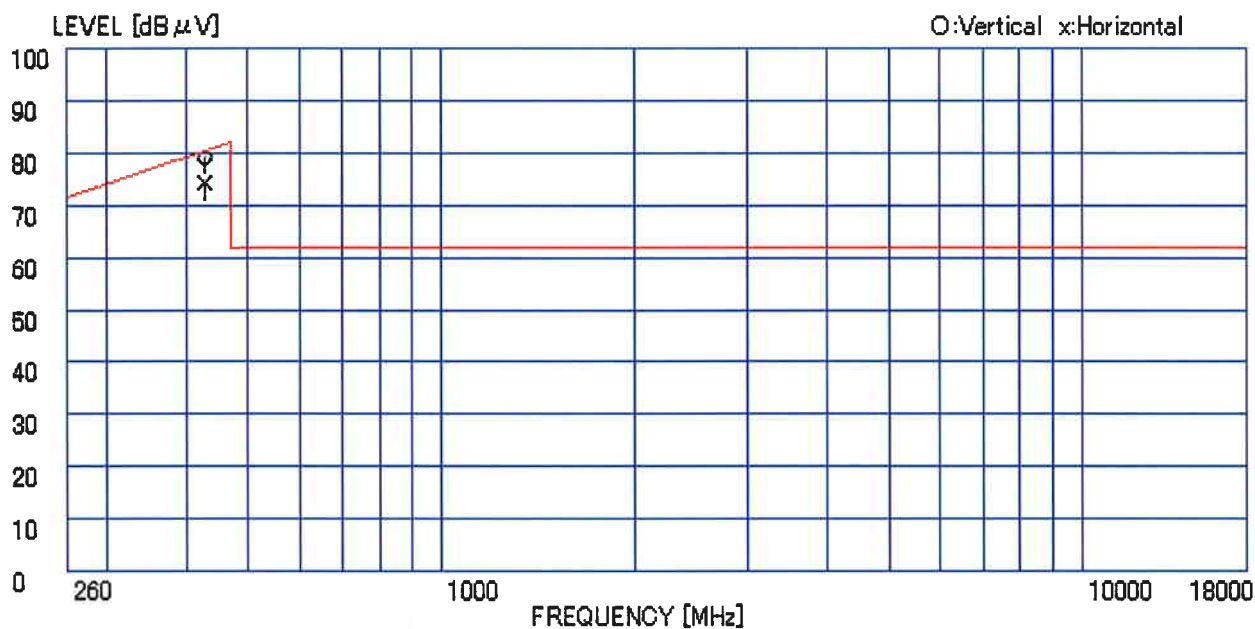


Figure 6.1-1 RFI Field Strength Measurement Results

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

<30MHz to 1000MHz>

Operating mode: Transmission mode

Date of measurement: December 17, 2004

Test procedure: ANSI C63.4-2001

Temperature: 17 degree C

Test condition: DC6V (Battery)

Humidity: 51 %

Frequency (MHz)	Level		Cable Loss (dB)	Amp. Gain (dB)	Ant. Factor (dB/m)	Result		Result		3 Meter Limit (μV/m)	Margin	
	Ver.	Hor.				Ver.	Hor.	Ver.	Hor.		Ver.	Hor.
	(dBμV)					(dBμV/m)		(μV/m)			(dB)	
50.00	28.0	27.0	1.3	-27.5	11.2	13.0	12.0	4.47	3.98	100	27.0	28.0
160.00	23.0	23.0	2.7	-27.1	14.8	13.4	13.4	4.68	4.68	150	30.1	30.1
250.00	22.0	22.0	3.8	-26.9	17.5	16.4	16.4	6.61	6.61	200	29.6	29.6
400.00	22.0	21.0	5.0	-27.4	19.4	19.0	18.0	8.91	7.94	200	27.0	28.0
600.00	21.0	20.0	6.3	-28.2	19.9	19.0	18.0	8.91	7.94	200	27.0	28.0
800.00	20.0	20.0	7.4	-28.2	22.2	21.4	21.4	11.75	11.75	200	24.6	24.6

Class B 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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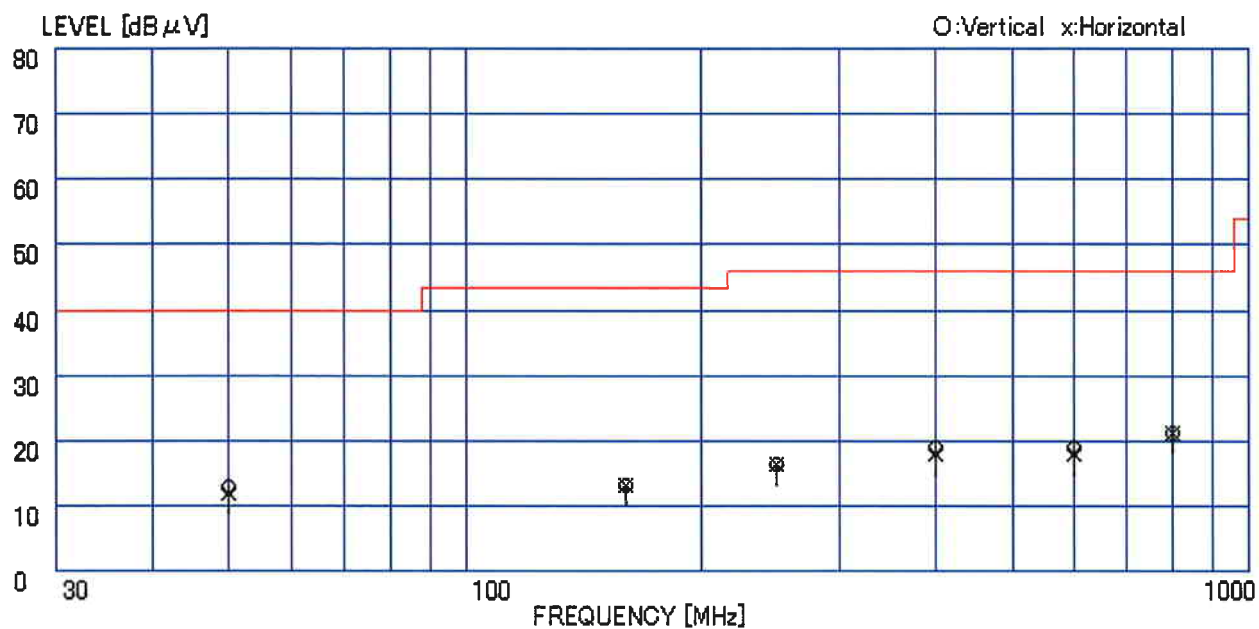


Figure 6.1-2 RFI Field Strength Measurement Results

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6.2 Minimum Margin

Table 6.2-1 Minimum Margin

<u>Radiated emission</u>	
<u>Transmission</u> operation mode	429.26 MHz, 1.2 dB
Antenna height / Turntable Degrees	1.58 m / 104 deg

6.3 Sample Calculation

Table 6.3-1 Sample Calculation

The maximum radiating emission can be obtained at the frequency of 429.26 MHz,	
<u>Vertical</u> polarization on <u>Transmission</u>	operation mode.

Each value at frequency is as follows;

R :	Field strength meter reading	=	83.0	(dBμV)
A :	Antenna factor	=	18.5	(dB/m)
C :	Cable loss	=	6.3	(dB)
G :	Amplifier gain	=	27.7	(dB)

Then radiated emission E(dBμV/m) is ;

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

Therefore, the maximum radiated emission is ;

$$79.1 \text{ (dBμV/m)}$$

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7 MEASUREMENT PHOTOS

Photo 7.1 Setup with the Maximized RFI Field Strength Emission Level

