



# **RADIO TEST REPORT**

**Test Report No.: 31EE0216-SH-01-A**

**Applicant** : SMK Corporation  
**Type of Equipment** : Half-Mini Card size TransferJet module  
**Model No.** : TJ101  
**FCC ID** : GT3FC012  
**Test regulation** : FCC Part15 Subpart F: 2010  
**Test result** : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.

**Date of test:**

February 14 – 27, 2011

**Representative  
test engineer:**

Tatsuya Arai  
Engineer of WiSE Japan, UL Verification Service

**Approved by:**

Ichiro Isozaki  
Leader of WiSE Japan, UL Verification Service

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## 1 Applicant information

Company Name : SMK Corporation  
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Contact Person : Mitsuhiro Goto

## 2 Equipment under test (E.U.T.)

### 2.1 Identification of E.U.T.

Type of Equipment : Half-Mini Card size TransferJet module  
Model No. : TJ101  
Serial No. : Transmitter Time Out: 167  
Other Test: 030  
Rating : DC3.3V  
Country of Mass-production : Japan  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.  
Receipt Date of Sample : February 14, 2011

### 2.2 Product description

Model: TJ101 (referred to as the EUT in this report) is a Half-Mini Card size TransferJet module.

Equipment type : Transceiver  
Frequency of operation : 4480MHz  
Clock frequency : 20MHz: Crystal, 4.4kHz: LC, 3000kHz: DC/DC Converter  
Effective Bandwidth : 560MHz  
(not 10dB Bandwidth)  
Type of modulation : DSSS  
Antenna type : TransferJet Coupler  
Antenna connector type : U-FL  
Antenna gain@4.48GHz : Antenna gain (without cable loss)  
Type A (WHA9400-1501E): -4.72dBi  
Type B (WHA9400-1631F): -6.50dBi  
Type C (WHA9400-1626F): -7.82dBi  
Antenna cable loss  
Type A: 0.68dB, Type B: 1.37dB, Type C: 0.98dB  
ITU code : Q7D  
Operation temperature range : -20 ~ +75 deg.C.

FCC 15.31 (e)

The RF Module is provided with stable power supply DC 3.3V from the host device and has power supply regulator which provides DC1.2V and DC 1.8 V, therefore, the equipment complies power supply regulation.

FCC Part 15.203

The EUT has a unique coupling/antenna connector U-FL. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3 Test specification, procedures and results

#### 3.1 Test specification

Test specification : FCC Part 15 Subpart F: 2010, final revised on December 6, 2010 and effective January 5, 2011.  
Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart F Ultra-Wideband Operation  
Section 15.519 Technical requirements for hand held UWB systems

\* The EUT complies with FCC Part 15 Subpart B: 2010, final revised on December 6, 2010 and effective January 5, 2011.

#### 3.2 Procedures & Results (Hand held UWB systems)

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted Emission	ANSI C63.4:2003	FCC 15.505(a) FCC 15.207	-	N/A	20.4dB 0.30321MHz, N, QP	Complied
UWB Bandwidth	ANSI C63.4:2003 FCC 15.503 (a)	FCC 15.503 (d) FCC 15.519 (b)	Conducted	N/A	-	Complied
Radiated Emission	ANSI C63.4:2003 FCC 15.521 (d)	15.519 (c) (d)	Radiated	N/A	1.5dB 1560.00MHz, Horizontal	Complied
Peak level of the Emission	ANSI C63.4:2003 FCC 15.521 (e) (g)	FCC 15.209 FCC 15.519 (e)	Radiated	N/A	35.5dB 4480.00MHz, Horizontal	Complied
Transmitter Timeout	ANSI C63.4:2003	FCC 15.519 (a) (1)	Conducted	N/A	-	Complied

Note: UL Japan's EMI Work Procedures No.QPM05.

#### 3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2003 RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	-	N/A

\* Other than above, no addition, exclusion nor deviation has been made from the standard.

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### 3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Item	Frequency range	No.1 SAC*1/SR*2 (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) AMN/LISN	150kHz-30MHz	3.0 dB	2.7 dB	3.1 dB
Radiated emission	30MHz-300MHz	4.7 dB	4.5 dB	4.7 dB
	300MHz-1GHz	4.5 dB	4.6 dB	4.6 dB
	1GHz-18GHz	4.8 dB	4.8 dB	4.8 dB
	18GHz-40GHz	4.4 dB	4.2 dB	4.2 dB

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

\*3: Value of Antenna Terminal Voltage measurement is also applies to the No.5 and No.6 Shielded Room.

#### Conducted emission test

The data listed in this test report has enough margin, more than site margin.

#### Radiated emission test

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

### 3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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No.1/ No.2/ No.3 anechoic chamber has been fully described in a report submitted to FCC office, and accepted on April 17, 2009 (Registration No.: 697847).

IC Registration No. : 2973D-1 (No1 anechoic chamber)

2973D-2 (No2 anechoic chamber)

2973D-3 (No3 anechoic chamber)

Test room	Width x Depth x Height (m)	Test room	Width x Depth x Height (m)
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.1 Shielded room	6.8 x 4.1 x 2.7
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65 Maximum measurement distance: 10m	No.2 Shielded room	6.8 x 4.1 x 2.7
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35 Maximum measurement distance: 5m	No.3 Shielded room	6.3 x 4.7 x 2.7
No.4 Semi-anechoic chamber	8.1 x 5.1 x 3.55	No.4 Shielded room	4.4 x 4.7 x 2.7
		No.5 Shielded room	7.8 x 6.4 x 2.7
		No.6 Shielded room	7.8 x 6.4 x 2.7

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## 4 System test configuration

### 4.1 Justification

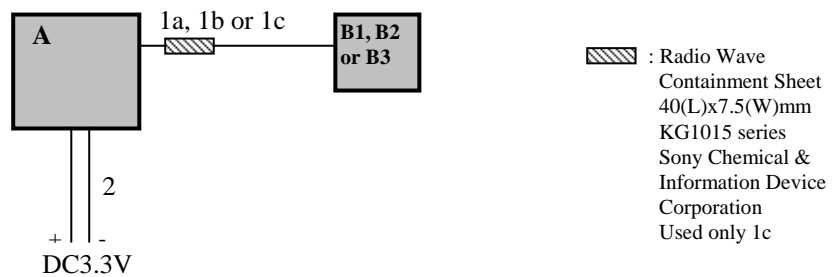
The system was configured in typical fashion (as a customer would normally use it) for testing.

Test item	Operating mode	Tested frequency
Except Trasmitter Time Out	Transmitting (Data system: M18)	4480MHz
Trasmitter Time Out	Communication	4480MHz

Firmware Version: 12501027

Above setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting.

### 4.2 Configuration of tested system



\* Test data was taken under worse case conditions.

#### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID (Remarks)
A	Half-Mini Card Size TransferJet module	TJ101	*1	SMK Corporation	GT3FC012
B1	TransferJet coupler (Antenna Type A)	WHA9400-1501E	-	SMK Corporation	-
B2	TransferJet coupler (Antenna Type B)	WHA9400-1631F	-	SMK Corporation	-
B3	TransferJet coupler (Antenna Type C)	WHA9400-1626F	-	SMK Corporation	-

\*1) Transmitter Time Out: 167, Other Test: 030

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1a	U-FL Cable (Type A)	0.100	Shielded	Shielded	-
1b	U-FL Cable (Type B)	0.200	Shielded	Shielded	-
1c	U-FL Cable (Type C)	0.134	Shielded	Shielded	-
2	DC Cable	2.1	Unshielded	Unshielded	-

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## 5 Conducted emissions

### 5.1 Operating environment

The test was carried out in No.3 Shield Room.

### 5.2 Test configuration

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT was aligned and was flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface.

EUT was located 80cm from LISN and excess AC cable was bundled in center.

Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source.

Photographs of the set up are shown in Appendix 1.

### 5.3 Test conditions

Frequency range : 0.15 - 30MHz

EUT position : Table top

EUT operation mode: Transmitting

### 5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a screened room.

The AC adapter of the PC was connected to a Line Impedance Stabilization Network (LISN).

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver.

Detector Type : Quasi-Peak/ Average

IF Bandwidth : 9kHz

### 5.5 Results

Summary of the test results : Pass

Date : March 1, 2011

Test engineer : Hikaru Shirasawa

## 6 UWB bandwidth & Occupied bandwidth (99%)

### Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Date : February 16, 2011

Test engineer : Tatsuya Arai

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## 7 Radiated Emission and Peak level of the Emission

### 7.1 Operating environment

The test was carried out in No.3 anechoic chamber.

### 7.2 Test configuration

EUT was placed on a urethane platform of nominal size, 0.15m by 0.05m, raised 0.8m(below 960MHz) and 1.0m (above 960MHz) above the conducting ground plane. Photographs of the set up are shown in Appendix 1.

### 7.3 Test conditions

Frequency range : 30MHz - 40GHz  
 Test distance : 3m (30-960MHz), 0.5m (960MHz-10.6GHz), 0.3m (10.6-17GHz),  
 0.1m (17-40GHz)

### 7.4 Test procedure

The Radiated Emission has been measured with a ground plane and at a distance of 3m, 0.5m, 0.3m and 0.1m. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization. Measurements were performed with QP, RMS and Peak detector.

The radiated emission measurements were made with the following detector function of the test receiver.

Frequency	:	30-960MHz	960MHz-40GHz
Detector Type	:	Quasi-Peak	RMS Peak
IF Bandwidth	:	120kHz	RBW:1MHz/VBW:1MHz RBW:3MHz/VBW:3MHz RBW:1kHz/VBW:1kHz (15.519(d))

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst position

Model	Worst position		
	Below 1GHz	Above 1GHz	Fundamental
Module	Horizontal: Z, Vertical: Y	Horizontal: Y, Vertical: Y	Horizontal: X, Vertical: Y
Antenna	Horizontal: Y, Vertical: Y	Horizontal: Z, Vertical: Z	Horizontal: Z, Vertical: Y

The carrier level and noise levels were confirmed at each case of Antenna Type A, Type B and TypeC, Cable Type A, Type B and Type C of EUT to see the case of maximum noise, and the test was made at the case that has the maximum noise.

Combinations of the worst case

Model	Worst case
Antenna	Type A
Cable	Type A

### 7.6 Results

Summary of the test results : Pass \*No noise was detected above the 5<sup>th</sup> order harmonics.

Date : February 14 - 27, 2011

Test engineer : Tatsuya Arai

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## 8 Transmitter Timeout

### Test procedure

The Transmitter Timeout was measured with a spectrum analyzer connected to the antenna port.

Summary of the test results: Pass

Date : February 16, 2011

Test engineer : Tatsuya Arai

### **APPENDIX 1: Photographs of test setup**

Page 11	:	Conducted emission
Page 12-13	:	Radiated emission
Page 14-17	:	Pre-check of the worst position and case

### **APPENDIX 2: Test data**

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Page 19	:	USB bandwidth and Occupied Bandwidth (99%)
Page 20 - 22	:	Radiated Emission
Page 23	:	Peak level of the Emission
Page 24	:	Transmitter Timeout
Page 25	:	Pre-check worst case

### **APPENDIX 3: Test instruments**

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