

# TEST REPORT

For

## RFID Reader/Writer Unit

In conformity with

## FCC CFR 47 Part15 Subpart B

**Model : TR3X-SD01-24-CS141**

**FCC ID : MK4SD01-24-CS141**

**Test Item : RFID Reader/Writer Unit**

**Report No. : WE211110BB2-21**

**Issue Date : January 28, 2022**

### Prepared for

TAKAYA Corporation  
661-1, Ibara-cho, Ibara-city, Okayama, 715-8503 Japan

### Prepared by

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## History

Report No.	Date	Revisions	Issued By
WE211110BB2-21	January 28, 2022	Initial Issue	K. Onishi

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## 1 General information

### 1.1 Product description from applicant

Test item : RFID Reader/Writer Unit  
Manufacturer : TAKAYA Corporation  
Address : 661-1, Ibara-cho, Ibara-city, Okayama, 715-8503 Japan  
Model : TR3X-SD01-24-CS141  
FCC ID : MK4SD01-24-CS141  
Serial number : 21000010  
Highest operating frequency : 13.56 MHz  
Receipt date of EUT : December 29, 2021

### 1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47. Part 15 subpart B (01 Oct. 2021)  
Test method(s) : ANSI C63.4: 2014  
Test(s) started : January 18, 2022  
Test(s) completed : January 21, 2022

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.  
The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.  
Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.


Test engineer

: 

K. Onishi

C&P Connectivity Wireless RF Operation RF/EMC Lab.

Reviewer

: 

Y. Taki

Manager

C&P Connectivity Wireless RF Operation RF/EMC Lab.

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### 1.3 Test facility

**[Kitayamata laboratory]**

Address: 3-5-23, Kitayamata, Tsuzuki-ku, Yokohama, 224-0021, Japan  
TEL: +81-(0)50-3773-4513  
FAX: +81-(0)45-592-7506

Accredited by National Voluntary Laboratory Accreditation Program (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

Registered by Innovation, Science and Economic Development Canada (ISED):  
The registered CAB identifier is JP0009.

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI)  
Each registered facility number is as follows:  
Test site A-0212

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the US Government.



### 1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring UKAS Publication LAB34: 2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2: 2011 “Uncertainty in EMC Measurements”.

The uncertainty of the measurement results in the level of confidence of approximately 95% ( $k=2$ ) is as follows;

Conducted emission	: $\pm 3.3$ dB (150 kHz - 30 MHz)
Radiated emission	: $\pm 5.9$ dB (30 MHz - 1000 MHz)

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## 1.5 Summary of test results

Requirement	Section in FCC15B	Result	Section in this report
Radiated emissions (30 to 1000 MHz) (*)	15.109	Complied	2.1
AC power line conducted emissions	15.107	Complied	2.2

(\*) The highest internal operating frequency is below 108 MHz

## 1.6 Setup of equipment under test (EUT)

### 1.6.1 Test configuration of EUT

The test configuration of the EUT refers to following Tables.

Table: EUT

No.	Equipment	Model name	S/N	Note
A	RFID Reader/Writer Unit	TR3X-SD01-24-CS141	21000010	-
B	Antenna Unit 1	TR3-CA065 (12)	21000253~264	-
C	Antenna Unit 2	TR3-CA065 (12)	21000265~276	-

Table: Support equipment

No.	Item	Model Name	Manufacturer	S/N
D	PC	PP22L	DELL	JX189 A00
E	AC adapter	LA90PS0-00	DELL	CN-0DF266-71615-78V-B442
F	DC power supply	PMC35-2A	KUKUSUI	EF001839
G	USB dongle	BF07-1033R	pqi	P077023200464
H	Stereo earphone	-	apple	-

Table: Cable connected to the EUT

No.	Cable Name	From	To	Length [m]	Shielded	Ferrite
1	DC cable 1	A	F	3.0	No	Yes
2	Antenna cable 1 (12 cables)	A	B	0.6	No	No
3	Antenna cable 2 (12 cables)	A	C	0.6	No	No
4	Serial cable	A	D	3.2	No	Yes
5	USB - Serial cable	A	D	0.2	Yes	No
6	DC cable 2	D	E	1.8	No	No
7	AC cable 1	E	AC	0.9	No	No
8	AC cable 2	F	AC	2.0	No	No
9	earphone cable	D	H	1.2	No	No

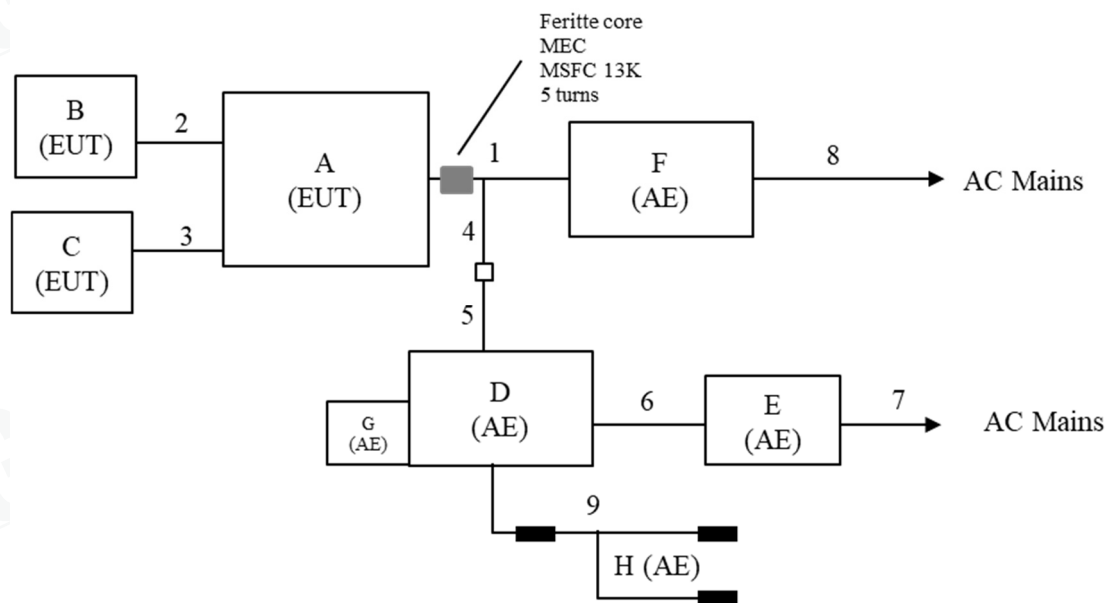
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## 1.6.2 Operating condition:

Software: TR3 R/W Mode Set Program 1.3.1.0  
Operating mode: PC Communication (RF OFF)

## 1.6.3 Setup diagram of tested system



## 1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

## 1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

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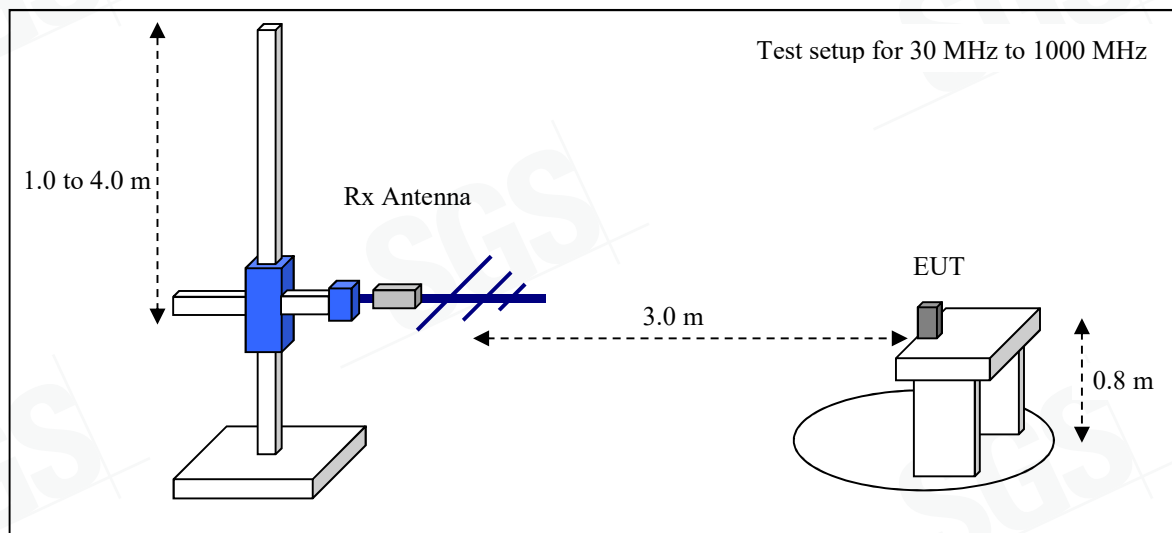
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## 2 Test procedure and test data

### 2.1 Radiated emissions

#### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2014 clause 6 “General requirements for EUT arrangements, configuration, and operation”, and clause 8 “Radiated emission measurements”.



#### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2014 clauses 8.3.

The EUT is placed on a non-conducted table which is 0.8 m high from a ground plane and the measurement antenna to EUT distance is 3 meters. The turn table is rotated for 360 degrees to determine the maximum emission level.

The antenna height is scanned between 1 m and 4 m, and the antenna is rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

The spectrum analyzer and receiver are set to the followings;

Between 30 - 1000 MHz: RBW=100 kHz, VBW= 300 kHz (Final measurement: RBW=120 kHz (QP))

Above 1000 MHz: RBW=1 MHz, VBW= 1 MHz (Final measurement: RBW=1 MHz (PK/AV))

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**Applicable rule and limitation**

## §15.109 (b) Radiated emission limits

Frequency [MHz]	Field Strength [μV/m]	Measurement Distance [m]	Field Strength [dBμV/m] @3m
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
Above 960	500	3	53.9

In the emission table above, the tighter limit applies at the band edges

**Test results - Complied with requirement****Test equipment used (refer to List of utilized test equipment)**

AC01	BA10	CL71	PR15	TR10	-	-	-
-	-	-	-	-	-	-	-

**Test software used**

EMI1 Ver. 6.1

**Calculation method**

The Correction Factor and Result are calculated as followings.

Correction Factor [dB/m] = Ant. Factor [dB/m] + Loss [dB] – Gain [dB]

Result [dBμV/m] = Reading [dBμV] + Correction Factor [dB/m]

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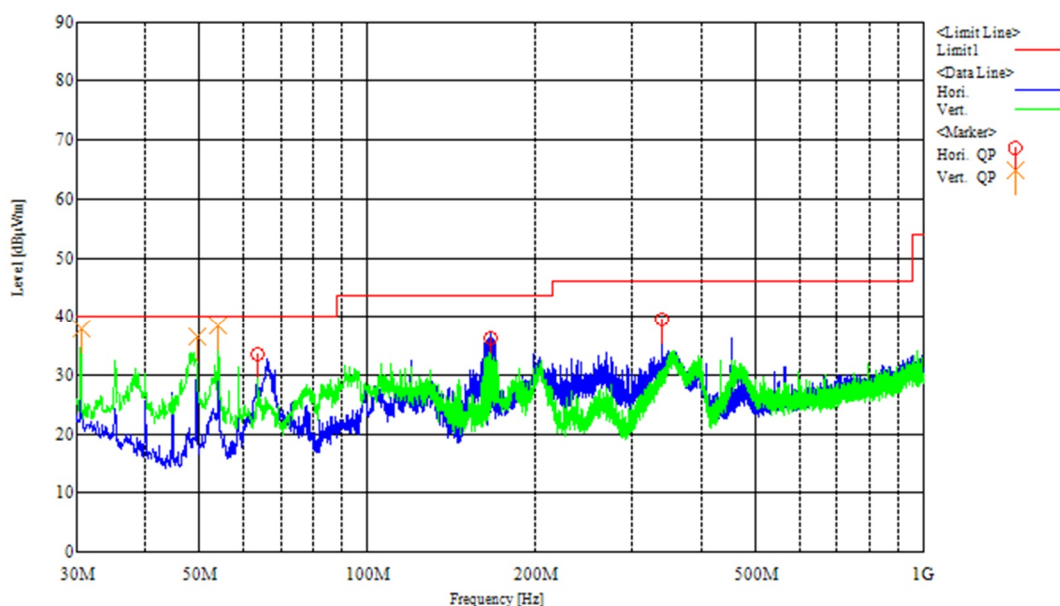
## Test Data

Frequency range: 30 - 1000MHz (Max internal frequency is below 108MHz (13.56MHz))

Measurement distance: 3 m

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	63.503	50.9	6.1	6.6	30.2	33.4	40.0	6.6	Hori.
2	167.366	49.3	9.9	7.1	30.0	36.3	43.5	7.2	Hori.
3	338.679	47.5	14.1	7.8	29.9	39.5	46.0	6.5	Hori.
4	30.575	43.4	18.6	6.3	30.3	38.0	40.0	2.0	Vert.
5	49.391	51.9	8.4	6.5	30.2	36.6	40.0	3.4	Vert.
6	54.094	55.6	6.4	6.5	30.2	38.3	40.0	1.7	Vert.

[Chart]



[Test condition]

Tested Date: January 21, 2022  
Humidity: 26 %

Temperature: 15 deg. C  
Atmos. Press: 1015 hPa

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## 2.2 AC power line conducted emissions

### Test setup

Test setup was implemented according to the method of ANSI C63.4: 2014 clause 6 “General requirements for EUT arrangements, configuration and operation” and clause 7 “AC power-line conducted emission measurements”.

### Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4: 2014 clauses 7.3. Exploratory measurements were used the spectrum analyzer to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement. Final ac power line conducted emission measurements were performed based on the exploratory tests. The EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit are selected for the final measurement. When the measurement value is greater than average limitation the average detection measurements were performed.

### Applicable rule and limitation

§15.107 (b) AC power line conducted limits

Frequency of Emission [MHz]	Conducted emissions Limit [dBμV]	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

\* Decreases with the logarithm of the frequency. The lower limit applies at the band edges.

### Test equipment used (refer to List of utilized test equipment)

CL72	LN13	TR09	-
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### Test software used

EMI1 Ver. 6.1

### Calculation method

The Correction Factor and Result are calculated as followings.

$$\begin{aligned}\text{Correction Factor [dB]} &= \text{LISN Factor [dB]} + \text{Loss [dB]} \\ \text{Result [dB}\mu\text{V]} &= \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB]}\end{aligned}$$

### Test results - Complied with requirement

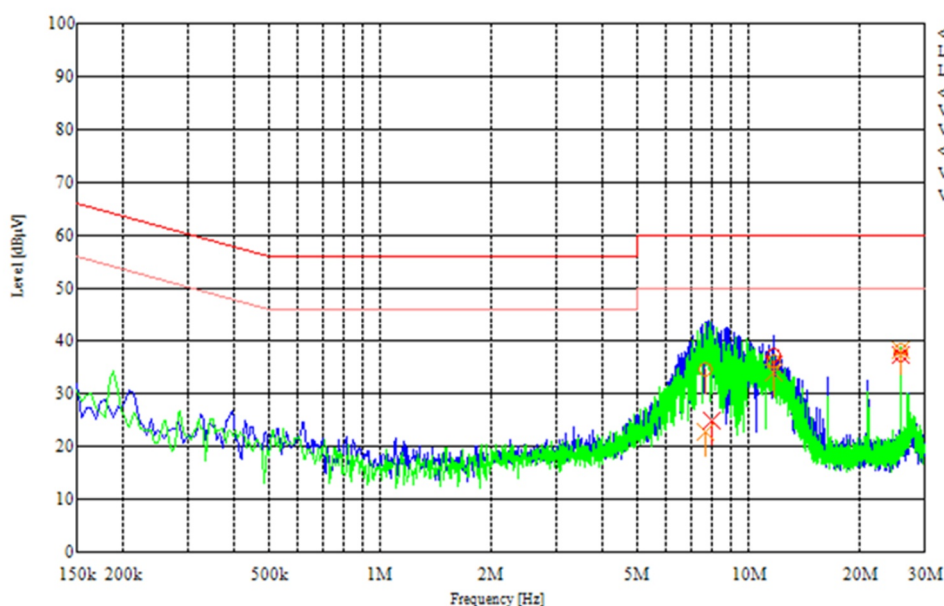
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## Test Data

No.	Frequency [MHz]	Reading		C.F. [dB]	Result		Limit		Margin		Phase
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
1	7.99472	26.9	14.6	10.2	37.1	24.8	60.0	50.0	22.9	25.2	Va
2	11.75989	27.0	25.2	10.3	37.3	35.5	60.0	50.0	22.7	14.5	Va
3	25.87128	26.8	26.7	10.5	37.3	37.2	60.0	50.0	22.7	12.8	Va
4	7.62496	24.2	12.5	10.2	34.4	22.7	60.0	50.0	25.6	27.3	Vb
5	11.75926	25.6	23.6	10.3	35.9	33.9	60.0	50.0	24.1	16.1	Vb
6	25.87137	27.7	27.7	10.5	38.2	38.2	60.0	50.0	21.8	11.8	Vb

[Chart]



[Test condition]

Tested Date: January 18, 2022  
Humidity: 36 %

Temperature: 25 deg. C  
Atmos. Press: 1006 hPa

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#### 4 List of utilized test equipment / calibration

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibrated until
AC11(EM)	Anechoic Chamber	TDK	-	-	2021/08/10	2022/08/31
BA10	Biological Antenna	TESEQ	CBL6111D	32342	2021/06/15	2022/06/30
CL71	RF Cable for RE	RFT	-	-	2022/01/14	2023/01/31
CL72	RF Cable for CE	RFT	-	-	2022/01/11	2023/01/31
LN13	LISN	Kyoritsu	KNW-407F	8-2003-3	2021/08/02	2022/08/31
PR15	Pre. Amplifier	Anritsu	MH648A	6201156141	2021/06/15	2022/06/30
TR09	Test Receiver (F/W: 4.43 SP3)	Rohde & Schwarz	ESU8	100386	2021/07/08	2022/07/31
TR10	Test Receiver (F/W: 2.26)	Rohde & Schwarz	ESR26	101313	2021/03/22	2022/03/31

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

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