RF EXPOSURE REPORT

OF

Applicant:	MARS TOHKEN SOLUTION CO.LTD 1-10-7 Shinjuku, Shinjuku-ku, Tokyo 160-0022, Japan
Product Name:	UHF RFID READER/WRITER MODULE
Brand Name:	MARS
Model No.:	FRU-4100Q
Model Difference:	N/A
Report Number:	E2/2020/50002
FCC ID:	WK4FRU4100Q
FCC Rule Part	Part 2.1091
Issue Date:	May 22, 2020

We hereby certify that:

The above equipment was verified by SGS Taiwan Ltd. The evaluation in this report is in compliance with the above rule(s).

The results of this report relate only to the sample identified in this report.

Approved By: _____

Yeh John / Asst. Manager

Revision History				
Report Number	**Revision**	**Description**	**Issue Date**	**Remark**
E2/2020/50002	Rev.00	Original.	May 22, 2020	Revised By: Yuri Tsai

Note:

Disclaimer:

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 General:

Product Name:	UHF RFID READER/WRITER
Brand Name:	MaRS
Model No. of Host:	MRU-F5100US
Model Difference:	N/A
Hardware Version:	N/A
Software Version:	N/A
Model No. of RFID Module:	FRU-4100Q
Module FCC ID:	WK4FRU4100Q
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.
Class II Permissive change:	UHF RFID READER/WRITER MODULE INSTALLED IN UHF RFID READER/WRITER
Power Supply:	DC 12V / 24V

Radio Technology:	RFID
Frequency Range:	902.75 – 927.25MHz
Channel number:	50 channels
Modulation type:	PR-ASK, ASK
Transmit Power:	28.99dBm (Peak)
Dwell Time:	<= 0.4s
Operating Mode:	Point-to-Point
Antenna Designation:	1. Patch Antenna , Gain: 4.75dBi, Model No.: UAT-002 2. Patch Antenna , Gain: -1.5dBi, Model No.: UAT-006 3. Patch Antenna , Gain: 4.12dBi, Model No.: A6034_70809 4. Patch Antenna , Gain: 5.7dBi, Model No.: RAF2031

1.2 Maximum Output power

The Max. output power value is derived from test report.

RFID	Report Number:	E2/2020/40028
	Test Lab:	SGS Taiwan Ltd.

2 FCC MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 FCC Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-15000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

2.2 Power Density Calculation (Worst Case)

RFID					
CH	**Freq. (MHz)**	**Peak Output Power (dBm)**	**Peak Output Power (mW)**	**Limit**	**RESULT**
1	902.75	28.90	776.25	1 Watt = 30.00 dBm	PASS
25	914.75	**28.99**	**792.50**	1 Watt = 30.00 dBm	PASS
50	927.25	28.85	767.36	1 Watt = 30.00 dBm	PASS
RFID					
CH	**Freq. (MHz)**	**Avg. Output Power (dBm)**	**Avg. Output Power (mW)**	**Limit**	**RESULT**
1	902.75	26.91	490.91	1 Watt = 30.00 dBm	PASS
25	914.75	**26.93**	**493.17**	1 Watt = 30.00 dBm	PASS
50	927.25	26.86	485.29	1 Watt = 30.00 dBm	PASS

FCC Standalone MPE

Operation Mode	Evaluation Frequency (MHz)	Operation Distance (cm)	Max. output Power (dBm)	Antenna Gain (dBi)	Max. output Power EIRP (mW)	Power Density (PD) (mW/cm^2)	Limit (mW/cm^2)	Pass / Fail	Power Density / Limit
RFID	914.75	20	26.93	5.70	1832.31	0.365	0.610	Pass	0.598

Note: For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band.

~ End of Report ~