

RF EXPOSURE REPORT

Applicant: Taiyo Yuden Co., Ltd.
8-1 Sakae-cyou Takasaki-shi Gunma, Japan

Product Name: CatM1 Module

Brand Name: TAIYO YUDEN

Model No.: CL5ADAH2Z

Model Difference: N/A

Report Number: ER/2020/70060

FCC ID: RYYCL5AD

IC: 4389B-CL5AD

FCC Rule Part Part 2.1091

IC Rule: RSS-102 issue 5 Mar. 19, 2015

Issue Date: Nov. 11, 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.

John Teh

Approved By: _____
John Yeh / Asst. Manager



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/70060	Rev.00	Original.	Nov. 11, 2020	Revised By: Tiffany Kao

Note:

1、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:	CatM1 Module
Brand Name:	TAIYO YUDEN
Model No.:	CL5ADAH2Z
Model Difference:	N/A
Hardware Version:	V_2_0
Software Version:	CM_02_01_02_92
Power Supply:	3.6Vdc

1.2 Maximum Output power

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

WWAN	Report Number:	ER/2020/70059
	Test Lab:	SGS Taiwan Ltd. Central RF Lab

1.3 Antenna Information:

Antenna Type	Supplier	Main / Aux	Frequency (MHz)	Main Antenna Par No.	Main Peak Antenna Gain (dBi)
Monopole	N/A	Main	M1 Band 2: 1850.1MHz ~ 1909.9MHz	FMM800W-SMAP-L-A	2.63
			M1 Band 4: 1710.1MHz ~ 1754.9MHz	T17-058-1070	3
			M1 Band 12: 699.7MHz ~ 715.9MHz		3
			M1 Band 26: 824.1MHz ~ 848.9MHz	FMM800W-SMAP-L-A	1.9
			M1 Band 26 Part 90: 814.1MHz ~ 823.9MHz		1.83

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2 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 Permissible 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

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2.2 ISED Standard Applicable

This submittal(s) (test report) is intended to comply with RSS-102 issue 5 Radio frequency Radiation Exposure requirement.

This is a Mobile device, the MPE is required.

Limits for Maximum Permissible Exposure (MPE)

RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)				
Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field Strength (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

F = frequency in MHz

* = Based on nerve stimulation (NS).

** = Based on specific absorption rate (SAR)

Maximum Permissible Exposure (MPE) Evaluation

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

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2.3 RF Exposure & Maximum Allowable Antenna Gain

FCC

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Max. output Power include tolerance (dBm)	Max. Allowable Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (mW/cm ²)	PD Limit (mW/cm ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)
Cat. M1-Band 2	1850.7	20	25.00	8.00	33.00	1995.26	0.397	1.000	8.00	12.01
Cat. M1-Band 4	1710.7	20	25.00	5.00	30.00	1000.00	0.199	1.000	5.00	12.01
Cat. M1-Band 12	699.7	20	25.00	8.70	34.77	2343.53	0.466	0.466	9.77	8.70
Cat. M1-Band 26	824.7	20	25.00	9.41	38.45	2762.20	0.550	0.550	13.45	9.41
Cat. M1-Band 26 Part 90	814.7	20	25.00	9.36	50.00	2728.70	0.543	0.543	25.00	9.36

ISED

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Max. output Power include tolerance (dBm)	Max. Allowable Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (W/m ²)	Limit (W/m ²)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)
Cat. M1-Band 2	1850.7	20	25.00	8.00	33.00	1995.26	3.971	4.477	8.00	8.52
Cat. M1-Band 4	1710.7	20	25.00	5.00	30.00	1000.00	1.990	4.243	5.00	8.29
Cat. M1-Band 12	699.7	20	25.00	5.63	34.77	1157.17	2.303	2.303	9.77	5.63
Cat. M1-Band 26	824.7	20	25.00	6.12	38.45	1294.74	2.577	2.577	13.45	6.12

~ End of Report ~

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