시 험 성 적 서
TEST REPORT

성적서 번호 Report No.		ICRT-TR-E230864-0A
신청자 Client	기관명 Name	Samsung Electronics Co., Ltd.
	주 소 Address	1, Samsung-ro, Giheung-gu, Yongin-si Gyeonggi-do, South Korea
시험대상품목 Sample description		IoT Module
모델명 Type designation		ITM-Gen3
정 격 Ratings		DC 3.3 V
시험장소 Place of test		■ 고정시험(Inside test) □ 현장시험(Field test) 주소지(Address): 112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
시험기간 Date of test		13. Apr. 2023 ~ 18. Apr. 2023
시험방법/항목 Test Method/Item		FCC rule §1.1310
시험결과 Test Results		Refer to 3. Maximum Permissible Exposure
확 인 Affirmation	작성자 Tested by 성 명 Name	Eun-Hye, Gwak (Signature)
	기술책임자 Technical Manager 성 명 Name	Tae Yang, Yoon (Signature)

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The above test report is certified that the above mentioned products have been tested for the sample.

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2023. 04. 18

주식회사 아이씨알 대표이사

The head of INTERNATIONAL CERTIFICATION REGISTRAR

Contents

Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
ICRT-TR-E230864-0A	2023.04.18	Initial Issue	All

1. Applicant & Manufacturer & Test Laboratory Information

1.1 Applicant information

Applicant	Samsung Electronics Co., Ltd.
Address	1, Samsung-ro, Giheung-gu, Yongin-si Gyeonggi-do, South Korea
Contact Person	Moungjin Jang
Telephone No.	+82-70-7142-1361
Fax No.	+82-31-8000-8000
E-mail	ethan.jang@samsung.com

1.2 Manufacturer Information

Manufacturer	Samsung Electronics Co., Ltd.
Address	1, Samsung-ro, Giheung-gu, Yongin-si Gyeonggi-do, South Korea

1.3 Test Laboratory Information

Conducted tests were performed at	
Laboratory	ICR Co., Ltd.
Address	112, Hwanggeum 3-ro 7beon-gil, Hagun-ri, Yangchon-eup, Gimpo-si, Gyeonggi-do, Korea
Telephone No.	+82-2-6351-9002
Fax No.	+82-2-6351-9007
RRA No.	KR0165
KOLAS No.	KT652

2. Equipment under Test(EUT) Information

2.1 General Information

Product Name	IoT Module
Brand Name	-
Model Name	ITM-Gen3
Additional Model Name	-
FCC ID	2AR3A-ITM-G3
Power Supply	DC 3.3 V

2.2 Additional Information

Equipment Class	DTS-Digital Transmission System	
Device Type	Stand-alone	
Operating Frequency	Bluetooth LE (1/2 Mbps)	2 402 ㎒ ~ 2 480 ㎒
	Zigbee	2 405 ㎒ ~ 2 480 ㎒
RF Output Power	Bluetooth LE 1 Mbps	7.63 ㏈m
	Bluetooth LE 2 Mbps	7.66 ㏈m
	Zigbee	6.28 ㏈m
Number of Channel	Bluetooth LE (1/2 Mbps)	40
	Zigbee	16
Modulation Type	Bluetooth LE (1/2 Mbps)	GFSK
	Zigbee	O-QPSK
Antenna Type	PCB Antenna	
Antenna Gain	-1.98 ㏈i	
Antenna Operating Mode	Single antenna exists for each mode	

2.3 Mode of operation during the test

- The EUT is continuous transmission mode during the test with set at Low Channel, Middle Channel, and High Channel.
To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, YZ, XZ planes.

2.4 Modifications of EUT

- None

3. Maximum Permissible Exposure

3.1 RF Exposure calculation

According to the FCC rule §1.1310 the limit for General Population/Uncontrolled exposure is 1 ㎽/㎠ for the device operating 1 500 ㎒ ~ 100 000 ㎒.

The electric field generated for a 1 ㎽/㎠ exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / D$, and $S = E^2 / Z = E^2 / 377$, because 1 ㎽/㎠ = 10 W/m²

S = Power density in ㎽/㎠, Z = Impedance of free space, 377 Ω

P = Power input to the external antenna

(Output power from the EUT antenna port (㏈m) – cable loss (㏈)),

E = Electric filed strength in V/m, G = Numeric antenna gain, and D = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$D = \sqrt{(30 * P * G) / (377 * 10 S)}$

Changing to units of ㎽ and cm, using P (㎽) = P (W) / 1 000, d (㎝) = 0.01 * d (m)

$D = 0.282 * \sqrt{(P * G) / S}$

3.2 Result

According to above equation, the following result was obtained.

Operating Mode	Target Power W / tolerance	Max tune up power		Antenna Gain		Safe Distance (㎝)	Power Density (㎽/㎠) @ 20 ㎝ Separation	Limit (㎽/㎠)
		(dBm)	(㎽)	Log	Linear			
Zigbee	6.28. ± 1.0	7.28	5.35	-1.98	0.63	0.52	0.000 67	1.00
Blutooth LE 1 Mbps	7.63. ± 1.0	8.63	7.29			0.61	0.000 92	
Blutooth LE 2 Mbps	7.66 ± 1.0	8.66	7.35			0.61	0.000 93	

According to above table, for Band(Zigbee), safe distance,

$D = 0.282 * \sqrt{(7.35 * 0.63)/1.00} = 0.61$ ㎝.

For getting power density at 20 ㎝ separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = (7.35 * 0.63 / (4 * \pi * 20^2) = 0.000\ 93$

3.3 Conclusion of Simultaneous Transmitter

Operating Freq. Band	Operating Mode	Max tune up power		Antenna Gain		Power Density (㎽/㎠) @ 20 ㎝ Separation	Conclusion MPE	Limit
		(dBm)	(㎽)	Log	Linear			
Zigbee + Bluetooth	Zigbee	7.28	5.35	-1.98	0.63	0.000 67	0.001 6	1.00
	Blutooth LE 1M	8.66	7.35			0.000 93		

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