




# TEST REPORT

<b>Eurofins KCTL Co.,Ltd.</b> 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 <a href="http://www.kctl.co.kr">www.kctl.co.kr</a>	Report No.: KR22-SRF0142 Page (1) of (9)	   <b>KCTL</b>
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## 1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2022-09-26

**2. Use of Report** : Certification

**3. Name of Product / Model** : IoT module / WIC211S

**4. Manufacturer / Country of Origin** : Samsung Electronics Co., Ltd. / China

**5. FCC ID** : A3LWIC211S

**6. IC Certificate No.** : 649E-WIC211S

**7. Date of Test** : 2022-09-26 to 2022-10-04

**8. Location of Test** :  Permanent Testing Lab  On Site Testing  
 (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

**9. Test method used** : Part 1.1310  
 RSS-102 Issue 5 Mar 2015

**10. Test Result** : Refer to the test result in the test report  
 This laboratory is not accredited for the test results marked. \*

Affirmation	Tested by  Name : Taeyoung Kim (Signature)	Technical Manager  Name : Seungyong Kim (Signature)
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2022-10-05

**Eurofins KCTL Co.,Ltd.**

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.

**REPORT REVISION HISTORY**

Date	Revision	Page No
2022-10-05	Originally issued	-

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**General remarks for test reports**

**Statement concerning the uncertainty of the measurement systems used for the tests**

(may be required by the product standard or client)

**Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

**Procedure number, issue date and title:**


Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

**Statement not required by the standard or client used for type testing**

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## 1. General information

Client	: Samsung Electronics Co., Ltd.
Address	: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	: Samsung Electronics Co., Ltd.
Address	: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory1	: PT Samjin
Address	: Bekasi International Industrial Estate JL. Inti Raya. Blok C2 No. 10, Kel. Sukaresmi, Kec. Cikarang Selatan, Kab. Bekasi, Provinsi Jawa Barat, 17530 Indonesia
Factory2	: SEONG JI SAI GON COMPANY LIMITED
Address	: No.02, St.3A, Bien Hoa II industrial Zone, Long Binh Tan Ward, Bien Hoa City, Dong Nai Province, VietNam
Factory3	: SEONG JI SAI GON COMPANY LIMITED
Address	: Nha xuong C, D, Lo.X2, Khu Cong Nghiep Ho Nai, Xa Ho Nai3, Huyen Trang Bom, Tinh Dong Nai, VietNam
Factory4	: Qingdao Samjin Electronics Co., Ltd.
Address	: NO.27 TONGKANG ROAD, TONGHE TOWN, PINGDU CITY, QINGDAO, CHINA
Factory5	: Samjin Thai Co., Ltd.
Address	: 180/4 Moo 3, T.Bueng, A.Sriracha, Chonburi 20230
Laboratory	: Eurofins KCTL Co.,Ltd.
Address	: 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	: FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 Industry Canada Registration No. : 8035A KOLAS No.: KT231

## 2. Device information

Equipment under test	: IoT module
Model	: WIC211S
Modulation technique	: DSSS_O-QPSK
Number of channels	: 16 ch
Power source	: DC 5 V
Antenna specification	: PIFA Antenna
Antenna gain	: 1.34 dBi
Frequency range	: 2 405 MHz ~ 2 480 MHz
Software version	: 6.0.1
Hardware version	: 1.0
Test device serial No.	: N/A
Operation temperature	: -10 °C ~ 50 °C

## 2.1. Frequency/channel operations

This device contains the following capabilities:

Zigbee

Ch.	Frequency (MHz)
11	2 405
⋮	⋮
18	2 440
⋮	⋮
25	2 475
26	2 480

Table 2.1.1. Zigbee mode



### 3. RF Exposure

#### FCC

#### Regulation

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC rules and Regulations.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Table 1 – Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm <sup>2</sup> ]	Averaging Time [minute]
(A) Limits for Occupational / Controlled Exposure				
0.3 ~ 3.0	614	1.63	*100	6
3.0 ~ 30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30 ~ 300	61.4	0.163	1.0	6
300 ~ 1 500	/	/	f/300	6
1 500 ~ 15 000	/	/	5	6
(B) 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 <sup>2</sup>	30
30 ~ 300	27.5	0.073	0.2	30
300 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

f=frequency in MHz, \*= plane-wave equivalent power density

Per the guidance of KDB 680106, the E-field and H-field limits shown in the table above are extended down to 100 kHz

#### [FCC]

#### MPE (Maximum Permissible Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad (\Rightarrow R = \sqrt{PG / 4\pi S})$$

S = power density [mW/cm<sup>2</sup>]

P = Power input to antenna [mW]

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 [cm]

**IC**

**RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)**

According to RSS-102 Issue 5, Paragraph “4. Exposure Limits”, Industry of Canada has adopted the RF field strength limits established in Healths Canada’s RF exposure guideline, Safety code 6:

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> <sup>0.5</sup>	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> <sup>0.25</sup>	0.1540/ <i>f</i> <sup>0.25</sup>	8.944/ <i>f</i> <sup>0.5</sup>	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> <sup>0.3417</sup>	0.008335 <i>f</i> <sup>0.3417</sup>	0.02619 <i>f</i> <sup>0.6834</sup>	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> <sup>1.2</sup>
150000-300000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616000/ <i>f</i> <sup>1.2</sup>
<p><b>Note:</b> <i>f</i> is frequency in MHz.            *Based on nerve stimulation (NS).            ** Based on specific absorption rate (SAR).</p>				

### **Exemption Limits for Routine Evaluation – RF Exposure Evaluation**

According to RSS-102 Issue 5 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- Below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1W (adjusted for tune-up tolerance);
- At or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- At or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834}$  W (adjusted for tune-up tolerance), where  $f$  is in MHz;
- At or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance.)

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.



### 3.1. Test results

#### Calculation Result of RF exposure (FCC)

Maximum tune-up tolerance

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Max Tune-up Power [mW]	Ant Gain [dBi]	Ant Gain [mW]	Power density at 20 cm [mW/cm <sup>2</sup> ]	Limit [mW/cm <sup>2</sup> ]
Zigbee	2 440	22	158.49	1.34	1.36	0.042 93	1.000 00

**Note.**

- The power density  $P_d$  at a distance of 20 cm calculated from the friis transmission Formula is far below the limit of 1 mW/cm<sup>2</sup>.

#### Calculation Results of RF exposure (IC)

Maximum tune-up tolerance

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Ant Gain [dBi]	E.I.R.P		Limit [mW]
				[dBm]	[mW]	
Zigbee	2 440	22	1.34	23.34	215.77	2 705.29

**End of test report**