



TEST REPORT

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1. Applicant ◦ Name : Samsung Electronics Co., Ltd. ◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea			
2. Use of Report : Certification			
3. Type of Equipment / Model : HASS Converter / MIM-S10UN			
4. FCC ID : A3LMIMS10UN			
5. IC Certificate No. : 649E-MIMS10UN			
6. Date of Test : 2025-02-25 to 2025-03-21 Date of Issuing : 2025-03-28			
7. Test Standard(method) used : 47 CRF Part 1.1310 RSS-102 Issue 6 December 2023			
8. Test Result : Refer to the test result in the test report			
Affirmation	Tested by Name : Hosung Lee (Signature)		Technical Manager Name : Harim Lee (Signature)
			
2025-03-28			
Eurofins KCTL Co.,Ltd.			
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REPORT REVISION HISTORY

Date	Revision	Page No
2025-03-28	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.
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 Manufacturer : Samsung Electronics Co., Ltd.
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
 Factory : SAMSUNG ELECTRONICS VIETNAM CO.,LTD.(SEV)
 Address : Khu Cong nghiep Yen Phong 1, Yen Trung, Yen Phong, Bac Ninh, Viet Nam
 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
 CAB Identifier: KR0040
 ISED Number: 8035A
 KOLAS No.: KT231

2. Device information

Equipment under test : HASS Converter
 Model : MIM-S10UN
 Derivative Model : VCTRL13P-1, MIM-S10N
 Modulation technique : Bluetooth Low Energy : GFSK
 WIFI(802.11a/b/g/n) : DSSS, OFDM
 Number of channels : Bluetooth Low Energy : 40 ch
 2.4GHz WIFI(802.11b/g/n) : 11 ch
 5GHz WIFI(802.11a/n)
 UNII-1 : 4 ch (20 MHz)
 UNII-2A : 4 ch (20 MHz)
 UNII-2C : 12 ch (20 MHz)
 UNII-3 : 5 ch (20 MHz)
 Power source : DC 12.0 V
 Antenna specification : PCB Antenna
 Antenna gain : Bluetooth Low Energy : 2.09 dBi
 2.4GHz WIFI(802.11b/g/n) : 2.09 dBi
 5GHz WIFI(802.11a/n)
 UNII-1 : 2.99 dBi
 UNII-2A : 2.99 dBi
 UNII-2C : 3.81 dBi
 UNII-3 : 3.81 dBi
 Frequency range : Bluetooth Low Energy : 2 402 MHz ~ 2 480 MHz
 2.4GHz WIFI(802.11b/g/n) : 2 412 MHz ~ 2 462 MHz
 5GHz WIFI(802.11a/n)
 UNII-1 : 5 180 MHz ~ 5 240 MHz
 UNII-2A : 5 260 MHz ~ 5 320 MHz
 UNII-2C : 5 500 MHz ~ 5 720 MHz
 UNII-3 : 5 745 MHz ~ 5 825 MHz
 Software version : DB92-00001A/18.05.16
 Hardware version : v0.5
 Test device serial No. : Conducted : 07DB8104692ADV NAXC90013
 : Radiated : 07DB8104692ADV NAXC90010
 Operation temperature : -10 °C ~ 50 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

Bluetooth Low Energy(1 Mbps, 2 Mbps),

WLAN 2.4 GHz_802.11b/g/n(HT20), WLAN 5 GHz_802.11a/n(HT20)

Ch.	Frequency (MHz)
00	2 402
.	.
19	2 440
.	.
39	2 480

Table 2.1-1. Bluetooth Low Energy

Ch.	Frequency (MHz)
01	2 412
.	.
06	2 437
.	.
11	2 462

Table 2.1.3. 802.11b/g/n HT20 mode

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5 180	52	5 260	100	5 500	149	5 745
.	.	.	.	.	.	.	.
40	5 200	56	5 280	120	5 580	157	5 785
.	.	.	.	.	.	.	.
48	5 240	64	5 320	144	5 720	165	5 825

Table 2.1.4. WLAN 5 GHz(802.11a/n HT20)

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 ²]	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 ²	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 ²	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

IC

RF Field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency Range (MHz)	Electric Field (V _{RMS} /m rms)	Magnetic Field (A _{RMS} /m)	Power Density (W/m ²)	Reference Period (minutes)
10-20	27.46	0.072 8	2	6
20-48	58.07 / $f^{0.25}$	0.154 0 / $f^{0.25}$	8.944 / $f^{0.5}$	6
48-300	22.06	0.058 52	1.291	6
300-6 000	3.142 $f^{0.341\ 7}$	0.008 335 $f^{0.341\ 7}$	0.026 19 $f^{0.683\ 4}$	6
6 000-15 000	61.4	0.163	10	6
15 000-150 000	61.4	0.163	10	616 000/ $f^{1.2}$
150 000-300 000	0.158 $f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	616 000/ $f^{1.2}$

Note: f is frequency in MHz.

RF field strength and power density limits for controlled-use devices (controlled environment)

Frequency Range (MHz)	Electric Field (V _{RMS} /m rms)	Magnetic Field (A _{RMS} /m)	Power Density (W/m ²)	Reference Period (minutes)
10-20	61.4	0.163	10	6
20-48	129.8 / $f^{0.25}$	0.344 4 / $f^{0.25}$	44.72 / $f^{0.5}$	6
48-100	49.33	0.130 9	6.455	6
100-6 000	15.60 $f^{0.25}$	0.041 38 $f^{0.25}$	0.645 5 $f^{0.5}$	6
6 000-15 000	137	0.364	50	6
15 000-150 000	137	0.364	50	616 000/ $f^{1.2}$
150 000-300 000	0.354 $f^{0.5}$	$9.40 \times 10^{-4} f^{0.5}$	$3.33 \times 10^{-4} f$	616 000/ $f^{1.2}$

Note: f is frequency in MHz.

For both table 7 and table 8, refer to Health Canada's Safety Code 6 for relevant notes and additional information.

Field reference level exposure exemption limits

Field reference level (FRL) 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 (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP of the device is equal to or less than 1 W (adjusted for tune-up tolerance)
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum EIRP 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 EIRP 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 EIRP 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 EIRP 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 EIRP was derived.

3.1. Test results

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

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

S = power density [mW/cm^2]

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 Exposure evaluation

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;

Calculation Result of RF exposure (FCC)

Maximum tune-up tolerance (Worst Case)

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Ant Gain [dBi]	Power density at 20 cm [mW/cm ²]	Limit [mW/cm ²]
Bluetooth Low Energy	2 440	7.00	2.09	0.001 61	1.00
2.4G_802.11b	2 462	18.00	2.09	0.020 31	1.00
5G_U-NII-1_802.11a	5 240	18.00	2.99	0.024 99	1.00
5G_U-NII-2A_802.11a	5 280	20.00	2.99	0.039 60	1.00
5G_U-NII-2C_802.11a	5 500	18.00	3.81	0.030 18	1.00
5G_U-NII-3_802.11a	5 745	19.00	3.81	0.038 00	1.00

Simultaneous Transmission (Worst configuration)

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Ant Gain [dBi]	Sum of the MPE ratios	Limit
Bluetooth Low Energy + WLAN 2.4 GHz(802.11b) + WLAN 5 GHz(802.11a)				0.061 53	1.0

Note.

1. Simultaneous Transmission scenario : Bluetooth Low Energy + 2.4G WLAN + 5G WLAN
2. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission
Formula is far below the limit of 1 mW/cm².
3. Simultaneous transmission of RF Exposure test exclusion for worst case configuration.
 - Bluetooth Low Energy : the ratio is 0.001 61 / 1
 - 2.4G WLAN: the ratio is 0.020 31 / 1
 - 5G WLAN : the ratio is 0.039 60 / 1
 - Bluetooth Low Energy + 2.4G WLAN + 5G WLAN :
((0.001 61 / 1) + (0.020 31 / 1) + (0.039 60 / 1))

Calculation Results of RF exposure (IC)

Maximum tune-up tolerance (Worst Case)

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Ant Gain [dBi]	E.I.R.P.		Limit [mW]
				[dBm]	[mW]	
Bluetooth Low Energy	2 440	7.00	2.09	9.1	8.11	2 705.29
2.4G_802.11b	2 462	18.00	2.09	20.1	102.09	2 721.93
5G_U-NII-1_802.11a	5 240	18.00	2.99	21.0	125.60	4 561.02
5G_U-NII-2A_802.11a	5 280	20.00	2.99	23.0	199.07	4 584.79
5G_U-NII-2C_802.11a	5 500	18.00	3.81	21.8	151.71	4 714.49
5G_U-NII-3_802.11a	5 745	19.00	3.81	22.8	190.99	4 857.02

Simultaneous Transmission (Worst configuration)

Mode	Frequency [MHz]	Max Tune-up Power [dBm]	Ant Gain [dBi]	Sum of the MPE ratios	Limit
Bluetooth Low Energy + WLAN 2.4 GHz(802.11b) + WLAN 5 GHz(802.11a)				0.083 92	1.0

Note.

1. Simultaneous Transmission scenario : Bluetooth Low Energy + 2.4G WLAN + 5G WLAN
2. The power density Pd (5th column) at a distance of 20 cm calculated from the friis transmission
 Formula is far below the limit of 1 mW/cm².
3. Simultaneous transmission of RF Exposure test exclusion for worst case configuration.
 - Bluetooth Low Energy : the ratio is 8.11 / 2 705.29
 - 2.4G WLAN: the ratio is 102.09 / 2 721.93
 - 5G WLAN : the ratio is 199.07 / 4 584.79
 - Bluetooth Low Energy + 2.4G WLAN + 5G WLAN :
 ((8.11 / 2 705.29) + (102.09 / 2 721.93) + (199.07 / 4 584.79))

4. Measurement Equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV3044	101421	25.07.26
DC Power Supply	AGILENT	E3632A	MY40000265	25.04.24
Attenuator	Weinschel ENGINEERING	56-10	51395	26.01.21
Power Sensor	R&S	NRP-Z81	1137.9009.02- 106223-bB	25.04.24
Attenuator	HP	8491A	29738	25.10.10

End of test report

