SAMSUNG

Test report for Energy Efficiency Index

(as per requirements of EU Regulation No 2023/1669)

Issued date : 2025-05-14
Test date : 02/05/2025 ~ 08/05/2025

Applicant details

Name : Samsung Electronics Co., Ltd.
Address : 129 Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 16677 Korea

Product details

Product : Tablet
Brand : Samsung
Model : SM-X356B
Type : Non-foldable

Manufactured by Samsung Electronics Co., Ltd
129, Samsung-Ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, 16677 Korea

Test Procedure to

Regulation (EU) No 2023/1669 Annex II, IV and Annex IVa, Transitional Methods,
EEI test specifications

The equipment under test has found to be compliant with the requirements of (EU) No 2023/1669

Contents

Tested by : Hojin Bang

Reviewed by : Jiyoung Lim

1. General

1.1 Battery parameters

Parameters	Rating	Unit
Rated battery capacity	9800	mAh
Nominal voltage	3.85	V

1.2 Instrumentation

Test instruments which were used in the test are as follows;

Test instrumentation	Model name	Manufacturer	Serial or Firmware	Calibration Date
Network simulator	MD8475B	Anritsu		
Shield box	TC-5910D	TESCOM		

WiFi AP	RT-AX88U	Asus		
Illuminance meter	CA-310	Konica Minolta		
Sound meter	TES-53S	TES CORT		

2. Test Condition

2.1 Measurement tool used

Pursuant to Regulation (EU) 2023/1669, EEI labelling will become mandatory for smartphones and slate tablets sold within the European Union starting June 20, 2025. In response, SmartViser and the European Commission collaborated to develop a conformity assessment testing solution that supports the EEI (Energy Efficiency Index) labeling requirements for smartphones and slate tablets sold in the EU. This solution is used to conduct the required tests.

The apps used to measure the usage time of the sample are "viSerNeoEei_1.3.5.apk" and "device_settings-release.apk", which are installed on the sample to determine the usage time and energy efficiency rating.

2.2 General device settings and configuration

– An application was installed on the sample to embed the test scenario and the content required for use during the test
– All applications were closed (except required system applications)
– No specific user account (e.g. Google ID) was used to perform the test
– The web browser used during the testing was the native OS browser of the device
– Power saving features were disabled before starting the testing
– No accessory was connected to the device
– For Dual-SIM devices, only one SIM card was inserted; for Dual-SIM devices with eSIM, eSIM was switched off; for devices with eSIM only, eSIM was used
– Screen brightness was set at 200cd/m² measured using external equipment
– Auto brightness was switched off and the refresh rate was set at the default value
– Darkmode was disabled
– All audio volumes (call and media) were set to 75 dBa when measured at 20 cm from the front (screen) of the sample
– Speaker used during the video was the one set in the default setting of the device
– During the call, the application ensured that the screen was off, no specific simulation of the proximity sensor was required

2.3 EEI test specifications

2.3(a) Network (EEI_ns_specs_v3.9)

Parameter	Value
Technology	FDD LTE
LTE Category	CAT 3
RF Band	Band 3 FDD
DL EARFCN	1575
UL EARFCN	19575
RSRP	-90 dBm
RSRQ	-10 dB
Tx Power	10 dB
DL modulation	64 QAM
UL modulation	16 QAM
Bandwidth	20 Mhz
MIMO	2 x 2
Audio codec	AMR WB - 12.2
Audio mode	Loopback
Tx Power	10 dBm
Connected DRX	On
Connected DRX On Duration timer	psf6
DRX inactivity timer	psf1920
DRX retransmission timer	psf16
Long DRX Cycle	sf1280
Long DRX Cycle StartOffset	0
Short DRX	Disabled
UL Dynamic scheduling	Disabled
Neighbour cells	band1 / EARFCN 500 / - 110 dBm
	band3 / EARFCN 1700 / - 110 dBm
	band7 / EARFCN 3200 / - 110 dBm

	band20 / EARFCN 6300 / - 110 dBm
Paging Cycle	1280
Idle DRX	Disabled
RRC Status Change	Enabledtimeout = 30s
CDRX On Duration timer	psf4

2.3(b) Device

Parameter	Value	Verification	Tolerance
Screen brightness	200 cd/m²	Use completely white screen with RGB value 255,255,255 Use Lux Meter targeting the centre of the screen. Adjust brightness level until Lux meter reads required value.	+/- 2 cd/m²
Automatic brightness	Off	Visual	
Screen refresh rate	Default, adaptive refresh rates on if enabled by default.	Visual	
Screen off timeout	30 seconds	Visual	
Other display settings (tap to wake or other gestures)	off		
Auto rotate	- Off - Smartphones: start test in portrait mode - Tablets: start test in landscape mode	Visual	
Media Volume	75 dBa at 20 cm	Media volume set at 75 dBa at 20 cm away from the device. To measure 75 dB, users shall play a specified tone (file can be downloaded at:). The sound probe measuring the sound shall be placed flat on the table on the same level as the phone, 20 cm from the bottom edge of the device if speaker is present on bottom else choose a speaker side The device volume shall be adjusted in any increments allowable by the device and set at the lowest setting at which a value of at least 75 dB is recorded on the sound meter while playing the specified tone.	+/- 1 dBa
Call Volume	Call should be set to maximum call volume	Visual	
Other sound & vibration seetings	default	Visual	
Bluetooth	Off	Visual	
Dark Mode	Off	Visual	
NFC	Off	Visual	
Localisation / Location	Off	Visual	
Accounts	No account should be set on the device	Visual	
Applications	- Only default application should be installed - Only EEI app started, all applications in background should be closed - all applications must be closed before beginning the test, except the test app. - app update Off - background app refresh Off	- disable app store application auto - update - disable system application update - disable firmware update - disable security mechanisms like play protect	
Accessories (i.e. keyboard, headphones)	No accessory should be connected	Visual	
Wifi	- 802.11n - The device shall be pre-set to connect automatically to the desired Wifi network and all other saved wifi networks should be deleted/forgotten	Visual	

Wifi signal strength	-70 dBm	Visual	+/- 5 dBm
Wifi Band	- 5 Ghz. - 2.4 Ghz permitted if 5Ghz is not available.	Visual	

Battery Power saving mode	User-controllable power saving features should be off during the test and not triggered at specific level. Power management features not controllable by the user may be enabled if not intended to specifically improve EEI Disable adaptative battery behaviour	Visual	
Battery Optimisation mechanisms	Off	Visual	
Software Update	Any system OS and Software update should be deferred until after testing is complete	Visual	
Automatic Software update	Off	Visual	
SIM configuration	- Phones: Single Physical SIM Card unless phone only uses ESIMs. - ESim Off unless required. - Tablets: No data card.	Visual	
SIM Pin Code	Disabled	Visual	
Screen Lock (FaceID, TouchID, Passcodes)	Disabled (no swipe, no password, no face, no fingerprint)	Visual	
Cellular Preferred network type	- Smartphone: should ensure that setting will enable the device to camp on 4G/LTE - Tablets: Not applicable as no SIM should be inserted. Cellular signal Off	Visual	
Always on display	Off	Visual	
All notifications	Off	Visual	
Government/Earthquakes... Alerts	Off	Visual	
Background App Refresh	Off	- android: Data saver enabled and only viSerNeo allowed to use background data or disable for each app. - ios: general/app refresh in background off	
News Feed	Off	Discover on android for instance	
Airdrop / Nearby sharing or other peer & sharing settings	Off	Visual	
Analytics / tracking	Off	Visual	
“Find my” or other Emergency Locating Services	Off	Visual	
True Tone / Color adjustement / adaptive color tone…	Off	use natural tone instead of vivid colors	
Automatic time & time zone	Off	Visual	

2.3(c) Use case

Use Case	Item	Spec
Idle	Screen	Off after screen off timeout.
Call	Screen	Off after screen off timeout
Call	Audio out	handset mode (no loud speaker)
Call	Type	VoLTE
Call	Audio	Loopback
Web	Data bearer	Wifi
Web	Browsing speed	refresh every 20 seconds
Web	Scrolling speed	every 5 seconds
Web	Cache management	Clear before each refresh
Web	Browser	Native OS browser or native embedded in app browser.
Web	Orientation	Portrait for Phones, Landscape for Tablets
Video Playback	Clip Duration	1 minute video clip
Video playback	Orientation	Fullscreen Landscape or 16:9 fit if screen mismatches video aspect ratio
Video playback	Data bearer	None. Local video
Video playback	Resolution	1280*720
Video playback	Codec	H264
Video playback	Frame rate	30 FPS
Video playback	Audio	MPEG/AAC/44.1 KHz/93 kb/s / 32 bits/Stereo
Video streaming	Orientation	Fullscreen Landscape or 16:9 fit if screen mismatches video aspect ratio
Video streaming	Data bearer	Cellular for phones / WiFi for tablets
Video streaming	Data bearer	Cellular
Video streaming	Resolution	1280*720
Video streaming	Codec	H264
Video streaming	Frame rate	30 FPS
Video streaming	Audio	MPEG/AAC/44.1 KHz/93 kb/s / 32 bits/Stereo
File Transfer	Behavior when completed	Idle with screen displaying "100%" upload or download for remaining time
File Transfer	Screen display	Screen On - Mostly white screen using RGB Value 256.256.256 Black text indicating progress permitted whith size 12 Font RGB value 0.0.0.
File Transfer	Orientation	Portrait for Phones, Landscape for Tablets
File Transfer	Time	15s for each transfer (uplad and download)
File Transfer	Data bearer	Cellular for phones / WiFi for tablets
File Transfer	Protocol	http
File Transfer	Files size	5 MB
Gaming	Data bearer	Wifi
Gaming	Content	WebGl page / Aquarium open source / Default settings

3. Test Method

3.1 Test Sequence

– The sample was operated according to the scenario below by running the viSerNeoEei_1.3.5.apk described in section 2.1 until the battery reaches 0%.

3.1(a) Test sequence for smartphones

From 100 % battery charge level to power off, this cycle was repeated:

a) Phone call (4 min)
b) Idle (30 min)
c) Web browsing (9 min)
d) Idle (30 min)
e) Video streaming (4 min)
f) Gaming (1 min)
g) Idle (30 min)
h) Data transfer: http upload and download (8 min)
i) Idle (30 min)
j) Video playback (4 min)

3.1(b) Test sequence for slate tablets

From 100 % battery charge level to power off, this cycle was repeated:

a) Gaming (5 min)
b) Idle (66 min)
c) Web browsing (11 min)
d) Idle (66 min)
e) Video streaming (6 min)
f) Idle (66 min)
g) Data transfer: http upload and download (2 min)
h) Idle (66 min)
i) Video playback (6 min)
j) Idle (66 min)

3.1(c) Measurement method used

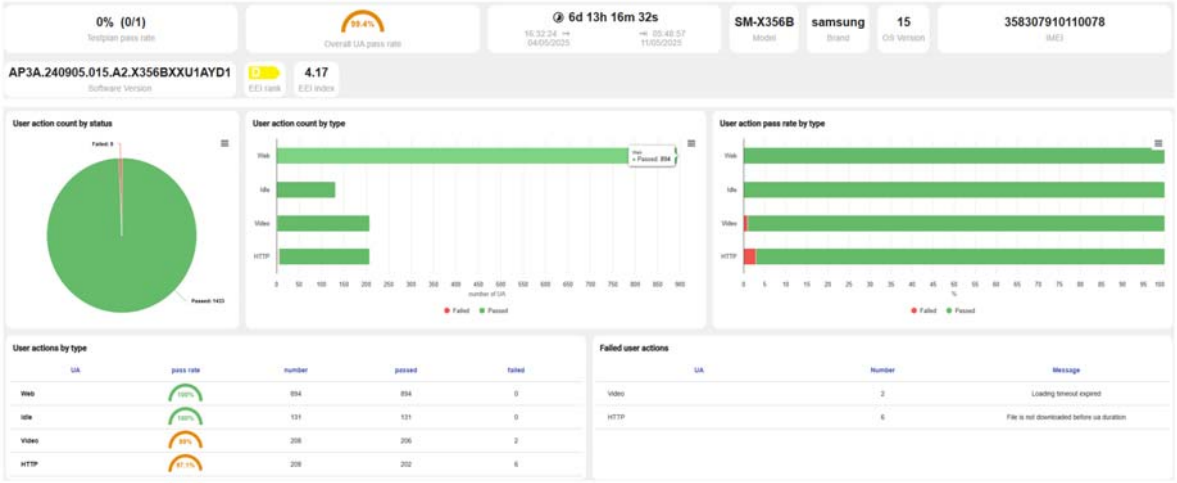
Based on the details outlined in section 2.3, the test was conducted in the following order with the sample settings and the parameter configuration of the NW equipment in place:

Step 1: "viSerNeoEei_1.3.5.apk" and "device_settings-release.apk" apps installed on the DUT.
Step 2: Sample placed in the Shield box to be tested and connected to the NS. Network and Wi-Fi connections verified.
Step 3: viSerNeo accessed, "Test Plan" at the bottom left selected, "EEISmart_md84_1.3.5"(smartphones), EEITab_generic_v1.3.5"(Tablets) chosen in the list. The play button for the "Loop" was pressed to start the test.
Step 4: Shield box closed and the test in the sequence (as per 3.1 Test Sequence) was repeated until the power went off.

4. Test Result

4.1 Summary

Energy Efficiency Class[2)]	Measured[2)]	D	
	Declared	E	
Energy Efficiency Index (EEI)[1)]	Measured[1)]	4.17	
	Declared	3.79	
Battery endurance per cycle (ENDdevice)	Measured	157 h	16 min
	Declared	142 h	50 min



4.2 Energy efficiency Index (EEI)

– The energy efficiency index (EEI) of a smartphone or slate tablet was calculated using the following equation and rounded to two decimal places:

$$EEI = \frac{END_{Device}}{U_{nom} \times C_{rated}} \times 1000$$

a) EEI is the Energy Efficiency Index in 1/W
b) END_{device} is the run-time of the test in hours, rounded to two decimal places.
c) U_{nom} is the nominal voltage in V
d) C_{rated} is the rated battery capacity in mAh

4.3 Energy efficiency Class

Table 1: Energy efficiency classes of smartphones

Energy Efficiency Class	Energy Efficiency Index (EEI)
A (most efficient)	EEI > 2.70
B	2.30 < EEI ≤ 2.70
C	1.95 < EEI ≤ 2.30
D	1.66 < EEI ≤ 1.95
E	1.41 < EEI ≤ 1.66
F	1.20 < EEI ≤ 1.41
G (least efficient)	EEI ≤ 1.20

Table 2: Energy efficiency classes of slate tablets

Energy Efficiency Class	Energy Efficiency Index (EEI)
A (most efficient)	EEI > 7.90
B	6.32 < EEI ≤ 7.90
C	5.06 < EEI ≤ 6.32
D	4.04 < EEI ≤ 5.06
E	3.24 < EEI ≤ 4.04
F	2.59 < EEI ≤ 3.24
G (least efficient)	EEI ≤ 2.59