April 16th 2021

‘Environmental impact of mobile phones and tablets’ – Ecodesign and Energy Labelling.

Update meeting

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European Commission

House rules of the virtual meeting:

- Only audio connections, no video
- Everyone remains muted (unless speaking when invited by the Chair)
- Signal through chat only (in the chat), if you would like to speak, indicating **only the ORGANISATION, COMPANYT or MEMBER STATE THAT YOU REPRESENT**
- Concise intervention or question

NB: The chats will not be kept/copied. Please do not make comments in the chat area unless invited by the Chair.

Agenda

- *Tour de table (Commission & consultants)*

- *GROW/IZM presentation*
  - ✓ *Intro*
  - ✓ *Req. on reparability*
  - ✓ *Req. on disass & prep for reuse*
  - ✓ *Reliability req.*
  - ✓ *Req. on recyclability and env. impacts*
  - ✓ *Info req on battery + energy labelling*

Meeting objectives

- *Updating stakeholders on the process, planned activities and on the potential Ecodesign & Energy labelling requirements for mobile phones & tablets*

- *The objective of the meeting is NOT to discuss changes to the recently concluded Ecodesign preparatory study on smartphones & tablets*

Circular Economy Action Plan 2020 – Circular Electronics Initiative

- *regulatory measures for electronics and ICT including mobile phones, tablets and laptops under the Ecodesign Directive so that devices are designed for* ***energy efficiency and durability, reparability, upgradability, maintenance, reuse and recycling****.*

Procedural steps - update

- *Initiatives published on EU website* *
- *IIA published and comments period over*
- *Preparatory study: ended (March) and final report published*
- *Impact assessment phase: started*

* See at https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12797-Environmental-impact-of-mobile-phones-and-tablets-Ecodesign and at https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12798-Environmental-impact-of-mobile-phones-and-tablets-Energy-Labelling

Policy options under analysis

- *Option 1: "No action" (i.e. bau)*
- *Option 2: Self regulatory approach*
- *Option 3: Ecodesign requirements*
- *Option 4: Energy Labelling*
- *Option 5: Ecodesign + Energy Labelling.*

Product groups



ED+EL scenario – 2030 savings per product group

Smartphones	**11 TWh**
Feature phones	**0,5 TWh**
Cordless phones	**0,3 TWh**
Tablets	**2,1 TWh**

Declining market figures

focus on smartphones & tablets

Definitions

Scope

- ‘smartphone’ means a mobile phone* characterized by WiFi connectivity, mobile use of internet services, and the ability to accept original and third-party software applications. A smartphone has an integrated touch screen display with a diagonal size between 4 and 7 inches. Devices with more than one and/or foldable displays are characterized as smartphones if at least one of the displays falls into the size range in either opened or closed mode
- *‘mobile phone’ means a cordless handheld electronic device designed for long-range voice communication over either a cellular telecommunications network or a satellite based telecommunications network, requiring a SIM card, eSIM or similar means to identify the connected parties. It is designed for battery mode usage, and connection to mains via an external power supply is mainly for battery charging purposes

Definitions

Scope

> ‘tablet’ means a type of notebook computer designed for portability that includes an integrated touch-sensitive display with a diagonal size greater than 7 inches but does not have an integrated, physical attached keyboard in its as-shipped configuration. A tablet relies on a wireless network connection, which might or might not be a telecommunications network, and is primarily powered by an internal battery (with connection to the mains for battery charging, not primary powering of the device). A tablet is furthermore characterized by an operating system, mobile use of internet services, and the ability to accept original and third-party software applications

Questions?

task 7 – input to legislation

task 7 – Draft requirements for smartphones

5y Spare parts availability – draft req.

Professional repairers

battery;
back cover or back cover assembly;
front-facing camera assembly;
rear-facing camera assembly;
external connectors;
buttons;
microphone;
speaker(s);
hinge assembly;
mechanical display folding mechanism;
mechanical display rolling mechanism.

End users

battery; (*unless 'durable'*)
Display assembly;
Charger.

Repair & maint information – draft req.

Professional repairers

- a disassembly map or exploded view;
- wiring and connection diagrams, as required for failure anal.;
- electronic board diagrams, as required for failure analysis;
- list of necessary repair and test equipment;
- technical manual of instructions for repair;
- diagnostic fault and error codes (including manufacturer-specific codes, where applicable);
- component and diagnosis information (such as minimum and maximum theoretical values for measurements);
- instructions for software and firmware (including reset software);
- information on how to access data records of reported failure incidents stored on the device (where applicable);
- software tools, firmware and similar auxiliary means required for full functionality of the spare part and device after repair, such as remote authorisation of serial numbers.

Maximum price of spare parts – draft req.

- maximum price of spare parts
during the period mentioned under points 1(a), 1(b) and 1(c) the manufacturers, importers or authorised representatives shall indicate a maximum pre-tax price for spare parts listed in points 1(a), 1(b) and 1(c) disclosed on the free access website of the manufacturer, importer or authorised representative mentioned under points 1(d) and 1(e).

The stated maximum pre-tax price may not be increased after it has been published on the website.

Definitions

Key terms

> ‘spare part’ means a separate part that can replace a part with the same or similar function in a mobile phone, cordless phone or tablet. The part is considered necessary for use if the mobile phone, cordless phone or tablet cannot function as intended without that part. The functionality of the mobile phone, cordless phone or tablet is restored or is upgraded when the part is replaced by a spare part

- Is this definition specific enough? Which sub-assembly counts as “spare-part”?

Questions?

Disassembly requirements

(a) battery replacement (……..UNLESS DURABLE):

- **Fasteners and connectors: Reusable (Class A)**
- **Tools: Feasible with the use of no tool, or a tool or set of tools that is supplied with the product or spare part, or basic tools as listed in Table A.3 of EN 45554 (Class A)**
- **Working environment: Use environment (Class A)**
- **Skill level: Layman (Class A)**

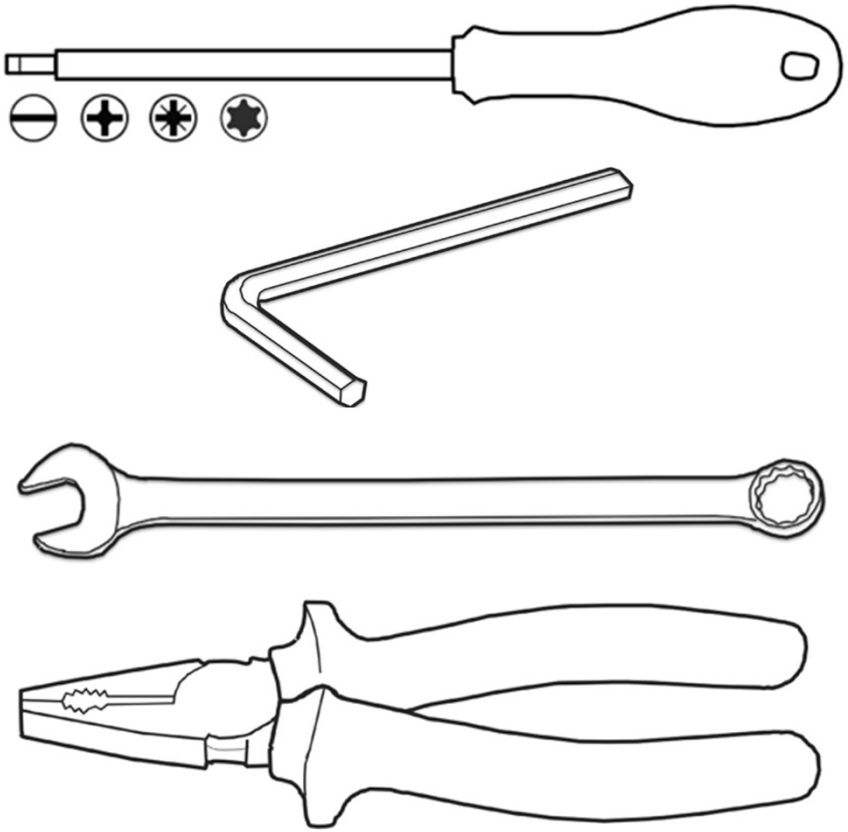
display assembly criteria:

- **Fasteners and connectors: Removable (Class B)**
- **Tools: Feasible with commercially available tools (Class C)**
- **Working environment: Workshop environment (Class B)**
- **Skill level: Generalist (Class B)**

Disassembly requirements

Basic tools

> basic tools as listed in Table A.3 of EN 45554, examples:



Preparation for reuse – draft req.

(a) encrypt user data by default;

(b) include a software function, that resets the device to its factory settings and erases by default the encryption key;

(c) record the following data from the battery management system in the system settings or another location accessible for end-users:

- Date of manufacturing of the battery;
- Date of first use of the battery;
- Number of full charge/discharge cycles (reference: rated capacity);
- Estimated state of health (full charge capacity relative to the rated capacity in %).

Definitions

Key terms

- ‘failure analysis’ means a process of collecting and analysing data to identify the component, which causes a malfunction
- ‘encryption' means a (reversible) transformation of data by an encryption algorithm to produce ciphertext, i.e. to hide the information content of the data [source: ISO/IEC DIS 18033-1]
- ‘key’ means a sequence of symbols that controls the operation of a cryptographic transformation (e.g., encipherment, decipherment)

Questions?

Design for reliability – draft req.

(a) resistance to accidental drops

(b) scratch resistance

(c) protection from dust and water

(d) battery endurance in cycles (performance degradation)

(e) battery management and fast charging

Design for reliability SW/FW – draft req.

(a) availability of security updates for at least 5 years and the availability of operating system version upgrades for at least 3 years, at no costs

(b) the user shall have the option to de-install an operating system version upgrade and to re-install the operating system version running on the device prior to the upgrade.

(c) updates mentioned under (a) need to be available to the user latest 2 months after the public release of the source code of an update of the underlying operating system or, if the source code is not publicly released, after an update of the same operating system is released by the operating system provider or on any other product of the same brand

Definitions

Key terms

- ‘security updates’ means operating system updates with the main purpose to provide enhanced security for the device;
- ‘operating system version upgrade’ means a change-over to an operating system version with new functionalities, corresponding to the latest version of this operating system available in the market [much more specific than EN 45550 definition of “upgrade”]

Reliability requirements

Withstanding accidental drops

Parameter	Source	Reference Test Method / Title	Notes
Free fall tests	IEC	IEC 60068- 2-31, Free fall repeated – Procedure 2	1. Mobile phones shall be tested for resistance to accidental drops, fall height 1 meter; the test has to be performed with 5 units consecutively and is passed, if at least 3 units pass the test. 2. Tablets shall be tested for resistance to accidental drops, fall height 1 meter; the test has to be performed with 5 units consecutively. The free fall test shall be interrupted after 50, 100, 150 falls and terminated after 200 falls to verify, if full functionality of the device is still given. The number of falls passed by at least 3 out of 5 units is the value to be stated in user instructions as set out in Annex II.

Reliability requirements

Scratch resistance - Test settings

- ASTM C1895 – 20: Standard Test Method for Determination of Mohs Scratch Hardness

- Requirement Mohs hardness ≥4
  - (copper: 3, ordinary steel: 4 – 4.5, quartz: 7)

Reliability requirements

Ingress protection - Test settings (1/3)

> IEC 60529 “Degrees of protection provided by enclosures (IP Code)”

- IP codes for the entry of foreign solid objects

Level	Object size	Description of the protection
0	-	No specific protection against contact and ingress of objects.
1	>50 mm	Protection ensured from contact with larger surfaces of the body (e.g. back of a hand), but no protection from deliberate contact with a smaller body part (e.g. finger).
2	>12.5 mm	Protection ensured from smaller body parts (e.g. finger) and other objects.
3	>2.5 mm	Protection from tools, thick wires, etc.
4	**>1 mm**	**Protection from most wires, slender screws, large ants, etc.**
5	Dust protected	Partial protection from harmful dust. Ingress is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment.
6	Dust tight	Complete protection from contact with harmful dust.

Reliability requirements

Ingress protection - Test settings (2/3)

> IEC 60529 “Degrees of protection provided by enclosures (IP Code)”

- IP codes for the entry of moisture

Level	Protection against	Effective against	Details
1	Dripping water	Dripping water (vertically falling drops) shall have no harmful effect on the specimen when mounted in an upright position onto a turntable and rotated at 1 RPM.	Test duration: 10 min. Water equivalent to 1 mm rainfall per min.
2	Dripping water when tilted at 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle of 15° from its normal position. Four positions are tested within two axes.	Test duration: 2.5 min. for every direction of tilt (10 min. total). Water equivalent to 3 mm rainfall per minute.
3	Spraying water	Protection against direct sprays of water when device is tilted at an angle up to 60°. It is possible to use either a) an oscillating fixture or b) a spray nozzle with a counterbalanced shield. Test a) is conducted for 5 min., and then repeated with the specimen rotated horizontally by 90° for the second 5-min. test. Test b) is conducted (with shield in place) for 5 min. minimum.	Oscillating tube (a): Test duration: 10 min. Water Vol.: 0.07 l/min per hole. Spray nozzle (b): Test duration: 1 min. per m2 for at least 5 min. Water volume: 10 litres/min. Pressure: 50–150 kPa.
4	**Splashing of water**	**Protection from sprays and splashing of water in all directions. It is possible to use either a) an oscillating fixture, or b) a spray nozzle with no shield. Test a) is conducted for 10 minutes. Test b) is conducted for 5 min. minimum (without shield).**	**Oscillating tube (a): Test duration: 10 min. Spray nozzle (b): same as IPX3 spray nozzle with the shield removed.**
5	Water jets	Protection from low-pressure water projected from a nozzle (6.3 mm diameter opening) against the enclosure from any direction.	Test duration: 1 min. per m2 for at least 3 min. Water volume: 12.5 litres/min. Pressure: 30 kPa at distance of 3 m.
6	Powerful water jets	Protection from water projected in powerful jets from a nozzle (12.5 mm diameter opening) in any direction.	Test duration: 1 min. per m2 for at least 3 min. Water volume: 100 litres/min Pressure: 100 kPa at distance of 3 m.

Reliability requirements

Ingress protection - Test settings (3/3)

> **IEC 60529 “Degrees of protection provided by enclosures (IP Code)”**

- **IP codes for the entry of moisture**

Level	Protection against	Effective against	Details
6K	Powerful water jets with increased pressure	Water projected in powerful jets (6.3 mm nozzle) against the enclosure from any direction, under elevated pressure, shall have no harmful effects. Found in DIN 40050, and not IEC 60529.	Test duration: at least 3 min. Water volume: 75 litres/min. Pressure: 1000 kPa at distance of 3 m.
7	Immersion, up to 1 m depth	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion).	Test duration: 30 min. (ref IEC 60529, table 8). Tested with the lowest point of the enclosure 1000 mm below the water surface, or the highest point 150 mm below the surface, whichever is deeper.
8	Immersion, 1 m or more depth	Protected from immersion in water with a depth of more than 1 m. The equipment is suitable for continuous immersion in water under conditions that shall be specified by the manufacturer. However, with certain types of equipment, the classification can mean that water can enter as long as it is not producing harmful effects. The test depth and duration is expected to be greater than the requirements for IPx7, and other environmental effects may be added, such as temperature cycling before immersion.	Test duration: Agreement with Manufacturer Depth specified by manufacturer, generally up to 3 m.
9K	Powerful high temperature water jets	Protected against close-range high pressure, high temperature spray downs. Smaller specimens rotate slowly on a turntable, from 4 specific angles. Larger specimens are mounted upright, no turntable required, and are tested freehand for at least 3 minutes at distance of 0.15– 0.2 m. There are specific requirements for the nozzle used for the testing. This test is identified as IPx9 in IEC 60529.	Test duration: 30 seconds in each of 4 angles (2 min. total) Water volume: 14–16 litres/min. Pressure: 8–10 MPa at distance of 0.10–0.15 m Water temperature: 80°C

Reliability requirements

Battery endurance in cycles - Test settings

- Mobile phones and tablets shall be tested for battery endurance in cycles, according to EN 61960-3:2017, until the battery's usable electrical capacity has reached 80% of its rated capacity; the battery shall be tested
  - according to the default charging algorithms implemented by the manufacturer, and
  - with fast charging enabled (if applicable)
- The resulting number of cycles shall be rounded down to full hundreds and stated as "≥ x00".

Reliability requirements

Battery charging and battery management

- by default the charging rate shall not exceed 0,7C at any point during the charging process;
- fast charging may be available as an option, but needs to be activated by the user

Definitions

- ‘C (h^{-1})’ is a measure of the rate at which a battery is charged relative to its capacity, defined as the charge current divided by the capacity, expressed in 1/h;
- ‘fast charging’ means charging a battery at a charging rate of above 0,7C for at least part of the charging cycle

Questions?

Design for recyclability – draft req.

(a) Plastic components heavier than 50 g shall be marked by specifying the type of polymer with the appropriate standard symbols or abbreviated terms set between the punctuation marks '>' and '<' as specified in available standards. The marking shall be legible.

(with some exceptions)

Design for recyclability – draft req. CRM

(a) indicative weight range of the following critical raw materials and environmentally relevant materials:

- Cobalt in the battery (weight range: less than 2 g, between 2 g and 10 g, above 10 g)

- Tantalum in capacitors (weight range: less than 0,05 g, between 0,05 g and 0,2 g, above 0,2 g)

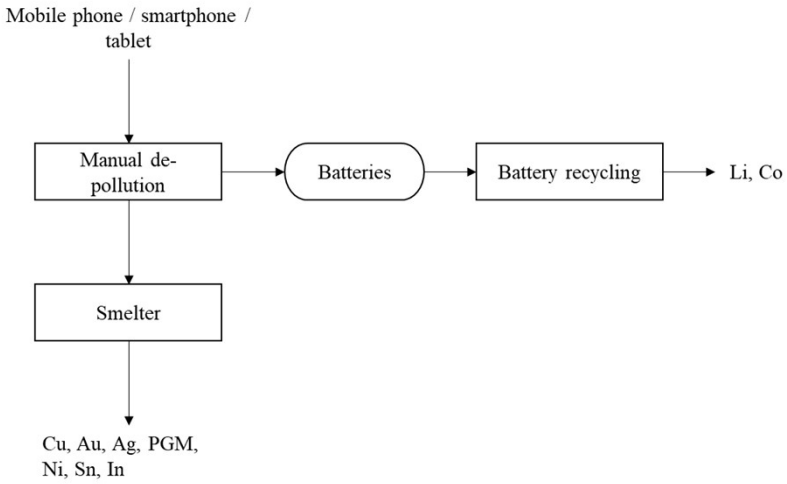
- Neodymium in loud speakers, vibration motors, and other magnets (weight range: less than 0,05 g, between 0,05 g and 0,2 g, above 0,2 g)

- Gold in all components (weight range: less than 0,02 g, between 0,02 g and 0,05 g, above 0,05 g)

Recyclability requirements

Technical aspects of a recyclability rate (not covered by prep study, to be discussed)

- EN 45555:2019 requires the definition of a product-group specific reference end-of-life treatment scenario, which is supposed to reflect typical end-of-life processes. Would look like this:



- Current recyclability rate with this approach: Roughly 15%
- Modular product approach with 4 instead of 2 resulting fractions: 30-40% feasible (but the hypothetical dismantling step is not in line with EN 45555:2019)
- With typical eol treatment > 20% feasible
- Not a broad range of recyclability rates in the market, generic information requirement only for better transparency?

Recyclability requirements

Technical aspects of a recyclability rate (not covered by prep study, to be discussed)

Parameter	Source	Reference Test Method / Title	Notes
R_{cyc}		EN 45555:2019	To be calculated as mass based recyclability rate, with the following reference end-of-life scenario: • Battery: Co, Li ($R_{cyc,Li}$ 90%) masses count towards recyclability rate • Mono-material parts removed when extracting the battery: Steel, Al, Mg, plastics or copper masses count towards recyclability rate • All other parts: Cu, Co, Sn ($R_{cyc,Sn}$ 50%), Ni ($R_{cyc,Ni}$ 85%), In ($R_{cyc,In}$ 50%), Au, Ag, PGM ($R_{cyc,PGM}$ 95%) masses count towards recyclability rate

Info req. on env. impact aspects

(a) results of a Life Cycle Assessment following the method set out in 11.2.3, including the assessed environmental impact indicators and the results of the calculation, over the product life cycle from cradle to the location, where the product is put on the market in the European Union;

(b) whether the semiconductor chips are produced in a fab with a high reduction rate for fluorinated greenhouse gas emissions, separately for SoC/CPU, RAM, Storage;

(c) whether the display is produced in a fab with a high reduction rate for fluorinated greenhouse gas emissions;

(d) whether air cargo is involved in shipping the device from final assembly to the location, where the product is put on the market in the European Union;

Info req. on env. impact asp. (*ctd*)

(a) list of up to ten components, where electricity consumption is based on 100% renewable energy in the manufacturing stage with the highest electricity consumption of this particular supply chain;

Life cycle impact indicators

Fluorinated Greenhouse Gas Emissions

Parameter	Source	Reference Test Method / Title	Notes
high reduction rate for fluorinated greenhouse gas emissions	IEEE	IEEE 1680.1	a. for displays, deviating from IEEE 1680.1, demonstrating that F-GHG emissions have been reduced by at least 90% by all fabs* b. deviating from IEEE 1680.1, for CPU/SoC, RAM, flash memory each ≥ 70% F-GHG emission reduction if F-HTF emissions are included in the reduction assessment and ≥ 75% if F-HTF emissions are excluded from the assessment, for all fabs manufacturing one of the covered semiconductor components**

IEEE 1680.1 wording:

- *shall be achieved by at least 75% of flat panel display suppliers by annual spend (fiscal or calendar) that produce flat panel displays in products declared to conform to this standard
- **shall include all 300 mm process semiconductor manufacturing facilities (fabs) that produce semiconductor components (e.g., CPUs, DRAM, accelerators) in products declared to conform to this standard for the manufacturer, from 75% (by annual fiscal or calendar spend) of all the manufacturer's semiconductor component suppliers for those products.

Questions?

Info req. on battery

(a) how to access on the device information from the battery management system on:

- Date of manufacturing of the battery;
- Date of first use of the battery;
- Number of full charge/discharge cycles (reference: rated capacity);
- Estimated state of health (full charge capacity relative to the rated capacity in %).

Energy Labelling index

(a) The energy efficiency index (EEI) of a mobile phone or tablet shall be calculated using the following equation:

$$EEI = END\_Device/C\_rated$$

Where:

C_rated is the rated battery capacity in mAh

Overall battery endurance (END_{device}) in hours is calculated as follows:

(a) smartphones:

$$END_{device} = \frac{24}{\left(\frac{1}{END_{talk}} + \frac{1}{END_{web}} + \frac{1}{END_{video}} + \frac{21}{END_{standby}}\right)}$$

Energy Labelling index - 2

(a) Phone call (ENDtalk)

(b) Browsing the web (ENDweb)

(c) Playing the video (ENDvideo)

(d) Stand-by (ENDstandby)

Battery endurance per cycle

Test settings

Phone call (mobile phones only)

- all applications closed (except required system applications), all radios switched off except cellular network,
- for Dual-SIM devices only 1 SIM card inserted; for Dual-SIM devices with eSIM, eSIM to be switched off; for devices with eSIM only, eSIM to be used,
- initiate 3G call, or 4G in case of no 3G capability; test setting with a base station simulator, sending constant “power up command” to the terminal, i.e. the phone is commanded to transmit at full power,
- audio at 80% volume,
- measure talk time (END_{talk}) until phone shuts off (screens may shut off during a call, if this is the default setting)

Battery endurance per cycle

Test settings

Browsing the web (smartphones and tablets only)

- display brightness set to 200 candela per square meter (cd/m2); automatic screen brightness adjustment disabled
- 802.11n access point in short distance for full connectivity
- running an automated script which reloads a webpage every ten seconds; no flash elements on the web pages
- measure web browsing time (END_{web}) until phone shuts off

Battery endurance per cycle

Test settings

Playing a video (smartphones and tablets only)

- display brightness set to 200 candela per square meter (cd/m2); automatic screen brightness adjustment disabled
- radios on the device switched off (airplane mode)
- looping a standard-definition video
- end-point: battery state of charge at 10% (END_{video})

Standby (mobile phones and tablets)

- all applications closed (except required system applications), all radios switched off except cellular network,
- measure standby time ($END_{standby}$) until phone shuts off

Battery endurance per cycle

Under discussion

Input appreciated on

- (further) details on appropriate test settings / test conditions
  - E.g., test video (settings), test suite of websites to be browsed
- Alternatives:
  - potential use of an app triggering the various events or
  - robot based activity cycle

- Simplifications will be required for a test procedure, which can be applied across a broader spectrum of devices, but which simplifications lead to misleading results?

Energy Label

Depicted performance criteria (to be discussed)

- (energy) efficiency class

$$EEI = \frac{END_{Device}}{C_{rated}}$$ **-> A - G**

- battery endurance per cycle, active use only ($END_{device,active}$) in h per full battery charge, rounded to full hours

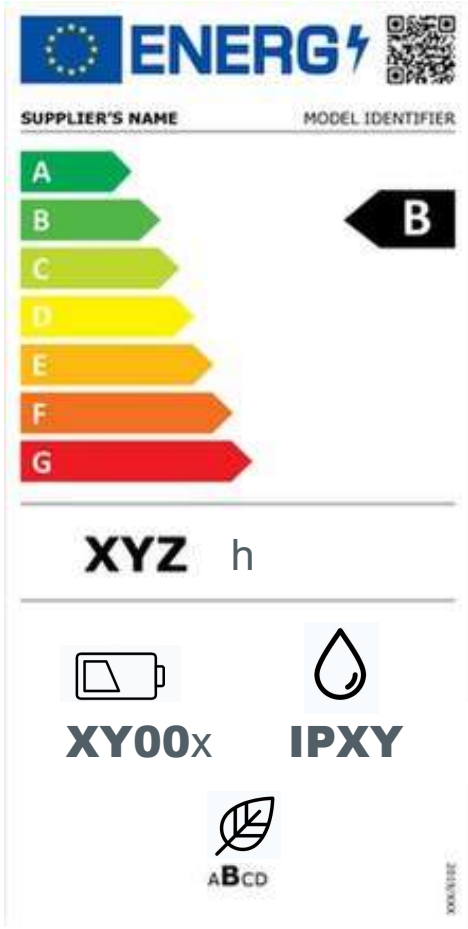
smartphones:

$$END_{device,active} = \frac{3}{\left(\frac{1}{END_{talk}} + \frac{1}{END_{web}} + \frac{1}{END_{video}}\right)}$$

tablets:

$$END_{device,active} = \frac{2}{\left(\frac{1}{END_{web}} + \frac{1}{END_{video}}\right)}$$

- battery endurance in cycles, in cycles, in ranges ≥500, ≥600, ≥700, ≥800, ≥900, ≥1000, ≥1100, ≥1200, ≥1300, ≥1400
- ingress protection rating
- environmental impact score

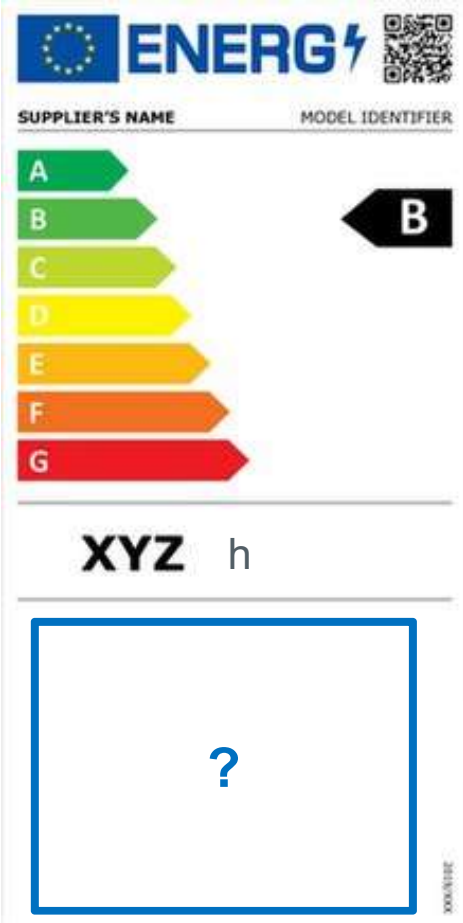


draft label design using resources from Flaticon.com

Energy Label

Depicted performance criteria (to be discussed)

- Alternatives:
  - minimum battery endurance in cycles under conditions of fast charging (if applicable) in numbers of cycles
  - passed falls according to IEC 60068-2-31 [tablets only]
  - High reduction rate for fluorinated greenhouse gas emissions for major semiconductors and display



draft label design using resources from Flaticon.com

Questions?

Next steps

- *16 April 2021: stakeholder meeting*
- *May 2021: opc publication*
- *28 June 2021 (date to be confirmed): consultation Forum meeting*

Thank you for your attention!

Contact points

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