**3GPP TSG-**SA4 **Meeting SA4#127-bis-e *S4-240652r03***

**online,** 8-4-2024 **–** 12-4-2024

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | 26.942 | **pCR** |  | **rev** | 3 | **Current version:** | 0.0.1 |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | FS\_MediaGREEN related work | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | InterDigital | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_MediaGREEN | | | | |  | ***Date:*** | | | 2-4-2024 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | D |  | | | | | ***Release:*** | | | Rel-19 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Proposed addition of introductory text | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Addition of background information regarding relevant standards activities of other SDOs. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

|  |
| --- |
| 1st Change |

# 2 References

[7] International Telecommunication Union, Recommendation ITU-T L.1210, “Sustainable power-feeding solutions for 5G networks”, 12/2019

[8] International Telecommunication Union, Recommendation ITU-T L.1220, “Innovative energy storage technology for stationary use – Part 1: Overview of energy storage”, 8/2017

[9] International Telecommunication Union, Recommendation ITU-T L.1221, “Innovative energy storage technology for stationary use – Part 2: Battery”, 11/2018

[10] International Telecommunication Union, Recommendation ITU-T L.1222, “Innovative energy storage technology for stationary use – Part 3: Supercapacitor technology”, 5/2018

[11] International Telecommunication Union, Recommendation ITU-T L.1331, “Assessment of mobile network energy efficiency”, 1/2022

[12] International Telecommunication Union, Recommendation ITU-T L.1350, “Energy efficiency metrics of a base station site”, 10 /2016

[13] International Telecommunication Union, Recommendation ITU-T L.1351, “Energy efficiency measurement methodology for base station sites”, 8/2018

[14] International Telecommunication Union, Recommendation ITU-T L.1380, “Smart energy solution for telecom sites”, 11/2019

[15] International Telecommunication Union, Recommendation ITU-T L.1381, “Smart energy solutions for data centres”, 6/2020

[16] International Telecommunication Union, Recommendation ITU-T L.1382, “Smart energy solution for telecommunication rooms”, 6/2020

[17] International Telecommunication Union, Recommendation ITU-T L.1383, “Smart energy solutions for city and home applications”, 10/2021

[18] International Telecommunication Union, Series L Supplement 36, “ITU-T L.1310 – Study on methods and metrics to evaluate energy efficiency for future 5G systems”, 11/2017

[19] International Telecommunication Union, Series L Supplement 43, “Smart energy saving of 5G base stations: Traffic forecasting and strategy optimization of 5G wireless network energy consumption based on artificial intelligence and other emerging technologies”, 5/2021

[20] International Telecommunication Union, Recommendation ITU-T L.1450, “Methodologies for the assessment of the environmental impact of the information and communication technology sector”, 9/2018

[21] Jens Malmodin, Nina Lövehagen, Pernilla Bergmark, and Dag Lundén. "[ICT sector electricity consumption and greenhouse gas emissions–2020 outcome.](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4424264)" Telecommunications Policy (2024): 102701

[22] International Telecommunication Union, Report ITU-R BT.2385-1, “Reducing the environmental impact of terrestrial broadcasting systems”, 03/2022

[23] International Telecommunication Union, Opinion ITU-R OP.104, “Advice for sustainability strategies incorporating carbon offsetting policies”, 2022

[24] International Telecommunication Union, Report ITU-R BT.2521-0, “Practical examples of actions to realize energy aware broadcasting”, 3/2023

[25] ISO/IEC 23001-11:2023 Information technology, MPEG systems technologies, Part 11: Energy-efficient media consumption (green metadata)

[26] DVB, “Study Mission report on Energy Aware service Delivery and Consumption”, DVB Document S100, 11/2023

[27] Greening of Streaming, <https://www.greeningofstreaming.org/>

[28] DIMPACT, <https://dimpact.org/>

[29] DIMPACT, “Methodology: Estimating the carbon impacts of serving digital media and entertainment products”, version 1.0, October 2022

[30] DIMPACT, Draft paper “Literature review and policy principles for streaming and digital media carbon footprinting”, March 2023

|  |
| --- |
| 2nd Change |

## 4.2 Related work

### 4.2.1 Introduction

Several standards setting organisations broadly active in the areas of broadcasting and telecommunications are considering energy efficiency and the reduction of climate impact. Likewise, several industry fora are active in this area. This section documents some of the efforts underway, and references standards and reports currently available.

### 4.2.2 3GPP

### 4.2.3 Other Standards Development Organisations

#### 4.2.3.1 ITU-T

Within the International Telecommunications Union, the T-sector includes Study Group 5 “Environment and Circular Economy” (SG5). Part of its mandate is to define and develop “methodologies for evaluating ICT effects on climate change and publishing guidelines for using ICTs in an eco-friendly way. Under its environmental mandate SG5 is also responsible for studying design methodologies to reduce ICT’s and e-waste’s adverse environmental effects, for example, through recycling of ICT facilities and equipment.”

Among its activities, ITU-T Study Group 5 is developing technical reports, supplements and international standards for the environmental requirements of 5G [7-19]. Further, the L.1400 series of reports and recommendations present methodologies and guidelines for the assessment of the greenhouse gas emissions and energy consumption of the ICT sector. For example, ITU-T L.1450 presents a methodology for the assessment of the impact of telecommunications systems [20]. It was used in an assessment of the electricity usage and greenhouse gas emissions of the ICT sector [21].

#### 4.2.3.2 ITU-R

The remit of ITU-R Study Group 6 (SG6) is programme production and interchange. Its Working Party 6A (WP 6A) has published ITU-R Report BT.2385 “Reducing the environmental impact of terrestrial broadcasting systems” [22]. Working Party 6C (WP 6C) has a rapporteur group which has produced the following documents:

- ITU-R Opinion 104, *Advice for sustainability strategies incorporating carbon offsetting policies* [23]

- ITU-R Report BT.2521, *Practical examples of actions to realize energy aware broadcasti*ng [24]. This report is based on a webinar held in March 2022.

#### 4.2.3.3 MPEG

The ISO/IEC JTC 1/SC 29 committee *Coding of audio, picture, multimedia and hypermedia information* has published the ISO/IEC 23001-11:2023 (Green MPEG) standard [25]. The various components of the standard define methods for the reduction of the power consumption of decoders and of displays. A further component defines a method for the selection of energy-efficient media. A final method allows for quality recovery after low-power encoding. The standard is currently in revision, and it is to be extended to enable the carriage of metadata to more efficiently reduce the power requirements of display devices receiving the content with the metadata.

#### 4.2.3.4 DVB

DVB has carried out a study mission to assess the potential for developing energy-efficient video transmission systems. This work has resulted in the creation of a new CM-EE (Energy Efficiency) working group in its Commercial Module. It has also published a report on the topic available as Blue Book S100 *Study Mission report on Energy Aware service Delivery and Consumption* [26].

#### 4.2.3.5 ATSC

Planning Team 9 of the ATSC is currently studying the implications of energy efficient technologies and practices on its broadcast and broadband distribution systems. The purpose of PT9 is to advise the board on whether standards or recommended practices could benefit the broadcast industry in its pursuit of reducing carbon footprint.

### 4.2.4 Industry Fora

#### 4.2.4.1 Greening of Streaming

Greening of Streaming is a member association investigating energy efficiency in the context of media streaming applications [27]. One of the challenges the group is aiming to address is that of accurately measuring the energy expenditure of streaming services, given that currently the available data is sparse and not very precise. It further intends to define best practices.

#### 4.2.4.2 DIMPACT

“DIMPACT is a collaborative initiative between leading media, entertainment and technology companies and world-class researchers [28].” The group is convened by Carnstone Partners Ltd, and research and technical expertise is provided by researchers from the University of Bristol. It has currently over 20 members. The group has developed a tool to measure the emissions of serving digital media and entertainment products. This tool is available as a web application and is able to estimate emissions originating from video streaming, online banner advertising, digital publishing, and audio streaming. The DIMPACT website makes available several publications explaining their methodology [29] and defining principles for streaming and digital media carbon footprinting [30].

#### 4.2.4.3 Ultra HD Forum

The Sustainability Working Group of the Ultra HD Forum is investigating energy efficiency opportunities throughout content distribution, from content encoding through distribution and display. While sustainability guidelines could result, the more immediate result has been a regular series of public demonstrations directed to sustainability at major broadcast conferences (specifically IBC and NAB) where the Ultra HD Forum regularly has a booth. Some of these demonstrate the degree of influence the consumer can have on the energy consumption by the display.

|  |
| --- |
| End of change |