**3GPP TSG-SA WG4 Meeting #131-bis-eS4-250426**

**Online, 11 – 17 April 2025**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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|  |
| ***Title:***  | Haptics media traffic characteristics |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
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| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** | Rel- |
|  | *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 canbe 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | In the conclusion of the Haptics Media study in TR 26.854, it is recommended to document the haptics media traffic characteristics in TR 26.925 |
|  |  |
| ***Summary of change:*** | Include the haptics media traffic characteristics and related KPIs in TR 26.925 |
|  |  |
| ***Consequences if not approved:*** | Haptics media traffic characteristics are not included. |
|  |  |
| ***Clauses affected:*** | 2, 4.7 (new), 5.7 (new), 7.4 (new) |
|  |  |
|  | **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:*** |  |

## Change 1

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 26.234: "Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs".

[3] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[4] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs ".

[5] 3GPP TS 26.116: "Television (TV) over 3GPP services; Video profiles".

[6] 3GPP TS 26.118: "3GPP Virtual reality profiles for streaming applications".

[7] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction".

[8] 3GPP TS 26.223: "Telepresence using the IP Multimedia Subsystem (IMS); Media handling and interaction ".

[9] Recommendation ITU-R BT.1872-3 (10-2019): " User requirements for broadcast auxiliary services including digital television outside broadcast, electronic/satellite news gathering and electronic field production".

[10] 3GPP TS 23.501: "System Architecture for the 5G System ".

[11] 3GPP TS 26.238: "Uplink streaming".

[12] ST 2110-10:2017 - SMPTE Standard - Professional Media Over Managed IP Networks: System Timing and Definitions.

[13] Video Services Forum (VSF) Technical Recommendation TR-05, Essential Formats and Descriptions for Interoperability of SMPTE ST 2110-20 Video Signals.

[14] Recommendation ITU-T H.264 (04/2017): "Advanced video coding for generic audiovisual services" | ISO/IEC 14496-10:2014: "Information technology - Coding of audio-visual objects - Part 10: Advanced Video Coding".

[15] Recommendation ITU-T H.265 (12/2016): "High efficiency video coding" | ISO/IEC 23008-2:2015: "High Efficiency Coding and Media Delivery in Heterogeneous Environments - Part 2: High Efficiency Video Coding".

[16] 3GPP TR 26.949: "Video formats for 3GPP services".

[17] IETF RFC 793: "TCP"

[18] https://www.ietf.org/id/draft-ietf-quic-transport-19.txt.

[19] DVB BlueBook A176: "Adaptive media streaming over IP multicast - reference architecture".

[20] CableLabs OC-TR-IP-MULTI-ARCH: "IP Multicast Adaptive Bit Rate Architecture Technical Report".

[21] "How youtube led to Google's cloud-gaming service", spectrum.ieee.org | SEP 2019 | 09.

[22] 3GPP TR 22.842: "Study on Network Controlled Interactive Services (Release 17)".

[23] "Cloud Gaming: Architecture and Performance", Ryan Shea and Jiangchuan Liu, Simon Fraser University; Edith C.-H. Ngai, Uppsala University; Yong Cui, Tsinghua University; IEEE Network-July/August 2013.

[24] Jens-Rainer Ohm, Gary J. Sullivan, Heiko Schwarz, Thiow Keng Tan, and Thomas Wiegand, "Comparison of the Coding Efficiency of Video Coding Standards—Including High Efficiency Video Coding (HEVC)" IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 22, NO. 12, DECEMBER 2012.

[25] T.K. Tan, M. Mrak, R. Weerakkody, N. Ramzan, V. Baroncini, G.J. Sullivan, J.-R. Ohm, K.D. McCann, "HEVC subjective video quality test results", IBC2014 Conference, 2014.

[26] Thiow Keng Tan ; Rajitha Weerakkody ; Marta Mrak ; Naeem Ramzan ; Vittorio Baroncini, Jens-Rainer Ohm, Gary J. Sullivan, "Video Quality Evaluation Methodology and Verification Testing of HEVC Compression Performance" IEEE Transactions on Circuits and Systems for Video Technology, Volume: 26, Issue: 1, Jan. 2016.

[27] Minhua Zhou, Jianle Chen, Kiho Choi and Dmytro Rusanovskyy, "Tool comparison between VVC (VTM3.0) and NVC", ISO/IEC JTC1/SC29/WG11 MPEG2019/ m46554, Marrakech, Morocco, January 2019.

[28] Frank Bossen, Xiang Li, Karsten Suehring, "AHG report: Test model software development (AHG3)", JVET-M0003, Joint Video Experts Team (JVET) of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11, 13th Meeting: Marrakech, MA, 9-18 Jan. 2019.

[29] K. Choi et al., "Description of video coding technology proposal by Samsung, Huawei, and Qualcomm for New Video Coding Standard", MPEG-M46354, Marrakech, Morocco, January 209.

[30] 3GPP TR 26.928: "Extended Reality over 5G".

[31] ST 297:2006 - SMPTE Standard - For Television — Serial Digital Fiber Transmission System for SMPTE 259M, SMPTE 344M, SMPTE 292 and SMPTE 424M Signals.

[32] ST 2081-10:2018 - SMPTE Standard - 2160-line and 1080-line Source Image and Ancillary Data Mapping for 6G-SDI.

[33] ST 2082-1:2015 - SMPTE Standard - 12 Gb/s Signal/Data Serial Interface — Electrical ST 2082-1:2015.

[34] SMPTE ST-2083, 24G-SDI, In development.

[35] 3GPP TR 22.827: "Study on Audio-Visual Service Production".

[36] ST 2042-1:2017 - SMPTE Standard - VC-2 Video Compression

[37] ITU-T/T.802 | ISO/IEC 15444-3 "Information technology - JPEG 2000 image coding system - Part 3: Motion JPEG 2000

[38] ITU-T G.1032 "Influence factors on gaming quality of experience" (<https://www.itu.int/rec/T-REC-G.1032-201710-I/en>)

[39] ITU-T P.809 "Subjective evaluation methods for gaming quality" (<https://www.itu.int/rec/T-REC-P.809/en>)

[40] M. Mathis, J. Semke, J. Mahdavi, The macroscopic behavior of the TCP congestion avoidance algorithm. Comput. Commun. Rev. (ACM SIGCOMM) **27**(3), 67–82 (1997)

[41] Yusuke Miki, Tsuyoshi Sakiyama, Kenichiro Ichikawa, Mayumi Abe, Seiji Mitsuhashi, Masayuki Miyazaki , "Ready for 8K UHDTV broadcasting in Japan", IBC 2015 Conference.

[42] Hirokazu Kamoda, "NHK Launched World’s First 8K Broadcasting in Japan", NAB Pilot guest blog post ([*https://nabpilot.org/nhk-launch-worlds-first-8k-broadcasting/*](https://nabpilot.org/nhk-launch-worlds-first-8k-broadcasting/))

[43] Thierry Fautier, Eric Mazieres, France Television Lab blog post "8K EXPERIMENT AT ROLAND GARROS 2019" (https://www.francetelevisions.fr/lab/projets/8K-Experiment-at-Roland-Garros-2019)

[44] M. Aracena, T. Fautier, O. Oyman, "Live VR end-to-end workflows: real-life deployments and advances in VR and network technology", SMPTE 2020 Annual Technical Conference & Exhibition, November 2020, <https://www.vr-if.org/wp-content/uploads/vrif2020.115.01.pdf>.

[45] 3GPP TS 26.511, "5G Media Streaming (5GMS); Profiles, codecs and formats".

[46] 3GPP TR 26.955, " Video codec characteristics for 5G-based services and applications".

[47] 3GPP TR 26.926, "Traffic Models and Quality Evaluation Methods for Media and XR Services in 5G Systems".

[48] 3GPP TR 26.854, "*Study on Haptics in 5G Media Services".*

## Change 2

## 4.7 Haptics Media enhanced services

For details on haptics media enhanced services, refer to 3GPP TR 26.854 [48]. Identified scenarios are:

- Haptics-enhanced media distribution, clause 5.2

- Haptics-enhanced Communication, clause 5.3

- Immersive entertainment, clause 5.4

- Immersive multi-modal XR and metaverse, clause 5.5

## Change 3

## 5.7 Haptics media traffic Characteristics

Two types of haptics media transmission formats are considered: parametric and PCM.

In general, haptics media PCM coded bitstreams require substantially more bandwidth than parametric coded bitstreams, this is due to the capability of having silent units in a parametric bitstream.

When coding repetitive haptics media effect, a key difference between a parametric coded bitstream and a PCM coded bitstream on the traffic characteristic is the following:

- In a parametric coded bitstreams, identical or similar effects can be coded and sent a single time and then referenced, rather than coding multiple time the same or similar haptics media effect.

- In a PCM coded bitstream, similarly to audio and video, coding performance improves for these repeated consecutive effects but provide a much higher overhead compared to the parametric coded bitstream.

Table 5.7-1 summarises the expected characteristics and average bitrates per channel applicable for the use cases of section 5. In this table, density represents the quantity of haptics effects over the duration of the sequence, it is not related to the intensity of the haptics effect. Three parameters impact the bitrate requirements: the number of channels, the media format and the density.

Table 5.7-1: summary of typical haptics media traffic characteristic.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Use case | Nb of channels | Media Format | Density | Average bitrate per channel |
| Haptic enhanced media distribution (clause 5.2 of [48]) | 1 to 32 | Parametric |  LightMediumHigh | 0.25 to 0.75 kbps0. 5 to 1.5 kbps1 to 5 kbps |
| 1 to 32 | Time sampled | LightMediumHigh | From 6 to 64kbps depending on the density and the quality of the desired signal.8-16 kbps for good quality at medium and high density.32-64 kbps for very high quality at medium and high density. |
| Haptic enhanced communication (clause 5.3 of [48])) | 1 to 4 | Parametric | LightMedium | 0.25 to 0.75 kbps0.5 to 2 kbps |
| Immersive Entertainment (clause 5.4 of [48])) | 1 to 32 | Parametric | LightMediumHigh | 0.25 to 0.75 kbps0. 5 to 1.5 kbps1 to 5 kbps |
| 1 to 32 | Time sampled | LightMediumHigh | From 6 to 64kbps depending on the density and the quality of the desired signal.8-16 kbps for good quality at medium and high density32-64 kbps for very high quality at medium and high density |
| Immersive multi-modal XR and metaverse (clause 5.5 of [48])) | 6 to 32 | Parametric | LightMediumHigh | 0.25 to 0.75 kbps0. 5 to 1.5 kbps1 to 5 kbps |
| 6 to 32 | Time sampled | LightMediumHigh | From 6 to 64kbps depending on the density and the quality of the desired signal.8-16 kbps for good quality at medium and high density32-64 kbps for very high quality at medium and high density |

## Change 4

## 7.4 Summary of Characteristics for haptics media

### 7.4.1 Bitrate Characteristics

See clause 5.7

### 7.4.2 Other KPIs

#### 7.4.2.1 Introduction

The QoS factors influencing the QoE for haptics media enhanced services as described in the use-cases of section 5 are mostly similar to those used for traditional AV and immersive AV services (jitter, delay, packet loss, etc). The asynchronicity between haptics and other media is a prevalent parameter to be considered when using haptics along with other media. Another characteristic of parametric haptics media is the presence of silent units alongside temporal and spatial units; which can be taken into account when setting PDU Set Importance.

#### 7.4.2.2 Asynchronicity between haptics and other media

TR 26.854 [48] reports that that haptics effects perceived prior to visual cues is less detrimental to the user experience than the reverse and that asynchronicity is more tolerable in scenarios involving passive user involvement than active user involvement.

The suitable threshold for asynchronicity is listed in table 7.4.2.2-1

Table 7.4.2.2-1: Tolerable asynchronicity thresholds per use-cases

|  |  |  |
| --- | --- | --- |
| Use case | Media | Tolerable asynchronicity threshold (note 1) |
| Haptic enhanced media distribution  | audio-haptics | audio delay:100ms | haptic delay:50ms |
| visual-haptics | visual delay:80ms | Haptic delay:60ms |
| Haptic enhanced communication  | audio-haptics | audio delay:3 frames (25ms) | haptic delay:1 frame (12ms) |
| Visual-haptics | Visual delay: 20ms | Haptic delay:30ms |
| Immersive games and Immersive multimodal XR and metaverse  | audio-haptics | audio delay:50 ms | haptic delay:25 ms 1 frame for gaming |
| visual-haptics | visual delay:15 ms | Haptic delay:50 ms |
| Immersive entertainment  | audio-haptics | audio delay:25 ms | haptic delay:12 ms |
| visual-haptics | visual delay:20 ms | Haptic delay:30ms |
| NOTE: For each media component, “delay” refers to the case where that media component is delayed compared to the other. |

#### 7.4.2.3 QoS requirements for haptic media enhanced services

The following from [48] is reported in Table 7.4.2.3-1 and depicts the typical QoS requirements that need be fulfilled for the users’ QoE to be satisfactory.

Table 7.4.2.3-1 Typical QoS requirements for haptic media enhanced services

|  |  |  |  |
| --- | --- | --- | --- |
|  | Haptics | Video | Audio |
| Jitter (ms) | ≤ 2 | ≤ 30 | ≤ 30 |
| Delay (ms) | ≤ 50 | ≤ 400 | ≤ 150 |
| Packet loss (%) | ≤ 10 | ≤ 1 | ≤ 1 |
| Update rate (Hz) | ≥ 2000 | ≥ 24 | ≥ 20k |
| Packet size (bytes) per channel | 60-350 compressed parametric50-1500 time sampled | ≤ MTU | 160-320 |
| Throughput (kbit/s) per channel | n\*(fe\*16)1 bits/s time sampled16-32kbps for compressed parametric2  | 2500 - 40000 | 64-128 |
|  |

#### 7.4.2.4 Potential mapping to 5QIs

Whether the 5QIs defined in [10] for media streaming and communication services are sufficient to enable haptics media enhanced services may need to be studied further.