**3GPP SA4 #128 S4-241110**

**Jeju, Korea, 20 May 2024**

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| *CR-Form-v12.0* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.822** | **CR** | pseudo | **rev** | **-** | **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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | **[FS\_5G\_RTP\_Ph2] Benefits of using AL-FEC for real-time communication in cellular networks** | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5G\_RTP\_Ph2 | | | | |  | ***Date:*** | | | 05/20/2024 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)*  *Rel-17 (Release 17)*  *Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | One aspect of Key issue #: Enhancements for application-layer FEC support  There are doubts on the benefit of using AL-FEC for real-time communication in cellur networks. We need to explain away or confirm the doubts. | | | | | | | | |
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| ***Summary of change:*** | | Explanations on the benefits of using AL-FEC | | | | | | | | |
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| ***Consequences if not approved:*** | | Whatever solutions out of Key Issue #3 will be based on a shaky foundation. | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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# Proposed changes

\* \* \* \* 1st change \* \* \* \*

## 6.3.x Benefits of using AL-FEC for real-time communication in cellular networks



There are inherent losses in the over-the-air transmission in cellular networks. To recover the error, retransmission in PDCP, RLC and MAC may be used. However, the low-latency requirement by XR applications puts a constraint on the use of PDCP and RLC layer retransmissions.

If retransmission is needed, MAC layer HARQ retransmssion is preferred. However, RAN implementations typically has an instaneous BLER (iBLER) of 10% for high spectral efficiency. That requires a large number of HARQ retransmissions, resulting in large delays. If AL-FEC is used, the need for HARQ retransmission is greatly reduced. This is illustrated in the simulation study below.

**Scenario:** TDD with subframe format DDDSU, 30kHz SCS, HARQ turnaround time about 5ms, 100MHz bandwidth, 60fps, average SNR 5dB, and MDS AL-FEC code.

Table 5.3-1 Delay without and with AL-FEC

|  |  |  |  |
| --- | --- | --- | --- |
| **Scheme** | **Redundancy ratio** | **Latency (ms)** | |
| **99.9 percentile** | **99 percentile** |
| No AL-FEC | 0 | 55 | 43.5 |
| With AL-FEC | 30% | 15 | 14 |

We see from the table that AL-FEC reduces the 99-percentile delay from 43.5ms to 14 ms and reduces the 99.9-percentile delay from 55ms to 15ms.

**Observation 1:** AL-FEC can reduce the delay for practical RAN implementations.

\* \* \* \* End of 1st change \* \* \* \*