**3GPP TSG-RAN WG2 Meeting #109bis-e R2-2004172**

**E-meeting, April 20 – April 30, 2020**

**Agenda item:**6.0.3 (TEI16)

**Source:** LG Electronics Inc., MediaTek

**Title:** Report of [AT109bis-e][060][NR16] MAC eLCID and RACH stopping

**Document for:** Discussion and Decision

# 1. Introduction

This document is to report the result of the following email discussion in RAN2#109bis-e Meeting.

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| * [AT109bis-e][060][NR16] MAC eLCID and RACH stopping (LG, Mediatek)   Scope: treat [R2-2003024](file:///C:\Users\mtk04448\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\docs\R2-2003024.zip) and [R2-2002931](file:///C:\Users\mtk04448\AppData\Local\Microsoft\Windows\INetCache\Content.Outlook\docs\R2-2002931.zip)  Wanted outcome: if agreement can be reached, one or two in-principle-agreed CRs.  Deadline: April 29 0700 UTC |

# 2. Discussions

## 2.1 eLCID

In R2-2003024, it is proposed that the LCID values indicated by one-byte eLCID field is only used to identify MAC CE, rather than used to identity the logical channel of a MAC SDU (for SRB/DRB) or padding, with following observations and proposal.

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| **Observation 1: According to RAN2 agreement, Set1 LCID (LCID values below 64) should be used for more frequent and high priority MAC CE.**  **Observation 2: LCID values associated with logical channels of SRB/DRB should be put in Set1 LCID because they are frequently used to deliver MAC SDU.**  **Observation 3: Set2 LCID values is only used to identify MAC CE, rather than used to identify logical channel of SRB/DRB or padding.**  **Proposal 1: Set2 LCID (LCID values above 64 identified via one-byte eLCID field) is only used to identify MAC CE, rather than used to identity the logical channel of a MAC SDU or padding.** |

Companies are asked to provide their views whether it is ok to restrict the 1-byte eLCID field to MAC CE.

**Question 1. Do you agree to restrict the 1-byte eLCID field to MAC CE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | No | Although we tend to share the view on the spirit (i.e., SDU should prioritize set1 over set2):  On the one hand, the current MAC spec is correct since no MAC CE has been implemented in the 1-byte eLCID field yet.  On the other hand, when MAC CEs are implemented in this 1-byte field (after conclusion from different WI:s), we can rely on the Table 6.2.1-1/2 to know the associated LCID allocation to SDU and/or MAC CE.  So no need for the specification change. |
| Ericsson | No | We think we can treat the 1-byte eLCID space as the regular LCID space, some values are reserved, no need to decide now what they cannot be in future releases. |
| CATT | No | We think the previously agreed principle is sufficient and the rest can be left to each WI to decide. For example, IAB just made some agreement that R16 MAC CEs introduced by the IAB WI shall have their identifiers selected from set2 of the one-byte eLCID space. So things seem to work without further restriction. |
| MediaTek | Yes | We propose this proposal with reasons below:   * Our intention is just to clarify the usage of eLCID   In our view, MAC SDU and padding should be put in set1 since they are frequently used. Therefore, it is quite straightforward that set 2 would only be used for MAC CE.   * Timing for clarification   Although current MAC spec has not implemented any MAC CEs in the 1-byte eLCID field yet, we have seen discussion in eMIMO, and some Tdoc in IAB, 2-step RACH and NR positioning also discuss what MAC CEs should be moved from legacy LCID space to LCID space indicated by 1-byte eLCID. So, we think it’s worthwhile to discuss the usage of eLCID field now.   * Even in future release, we do not see any need to put the LCID of MAC SDU or padding into eLCID space.   + As long as future releases does not extend the maximum number of supported SRB/DRB for NR Uu (kept as 32), the proposed change is still valid.     - If for a new WI, the supported number of SRB/DRB is more than 32 in R15 NR, then we can follow current IAB approach, i.e. assign IAB a specific LCID value and dedicated eLCID space. .   + If in the future, the supported number of SRB/DRB for NR-Uu is extended from 32 to 64 or beyond, then we may consider to assign another LCID value to indicate a separate eLCID space dedicated for identifying the logical channels of MAC SDU for SRB/DRB.     - If Set2 LCID is shared to both MAC SDU and MAC CE, then when the number of supported SRB/DRB is increased, the available LCID values for MAC CEs are decreased.     - So, in our proposal, we suggest that Set2 LCID is dedicated for MAC CE. If in the future we have the need, we can create a separate LCID space (e.g. Set3 LCID) dedicated for MAC SDU.   Based on our analysis above, we think this proposal is acceptable and will not restrict the extensibility for future release. |
| LG | Yes | We agree with the intention |
| HW | No | Logical channel identity is actually configured by NW, and the value range is explicitly clear in the RRC spec, so we don’t see a need to have any additional restriction in MAC spec. |
| Nokia, Nokia Shanghai Bell | No | Agree with Ericsson. |
| Futurewei | No | There is no need of explicitly specifying this kind of limitation of eLCID use – the intended optimization can be realized implicitly when setting LCID values in Tables 6.2.1-1 and 6.2.1-2 in MAC specs. |
| ASUSTeK | Yes | We share the same view with MediaTek. |
| Qualcomm Incorporated | Yes | This is a reasonable working assumption for release-16. |
| vivo | No | Agree with Ericsson. |
| Lenovo | No | Same view as Ericsson |
| ZTE | No | Same view as Ericsson |

**Summary on Question 1**

9 companies think there should be no restriction, and 4 companies think such restriction is useful. The rapporteur suggests to go for majority.

**Proposal 1: There is no restriction that 1-byte eLCID is only used for MAC CE.**

If companies agree to restrict the 1-byte eLCID field to MAC CE, further discussion is needed whether to explicitly specify this restriction in the MAC specification.

**Question 2. If you agree to restrict the 1-byte eLCID field to MAC CE, do you agree to specify the restriction in the MAC specification?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | No | As replied to Q1 above. |
| Ericsson | No | No need to specify this restriction. |
| CATT | No | See our comments to Q1. |
| MediaTek | Yes | As replied to Q1 above. |
| LG | No | Although we agree with the intention, we think the restriction does not need to be specified. |
| HW | No | See Q1 |
| Nokia, Nokia Shanghai Bell | No |  |
| Futurewei | No | There is no need of explicitly specifying this kind of limitation of eLCID use – the intended optimization can be realized implicitly when setting LCID values in Tables 6.2.1-1 and 6.2.1-2 in MAC specs. |
| ASUSTek | Yes | It’s better to specify the principle and prevent specification uncertainty. |
| Qualcomm Incorporated | No | It is not clear to us how long such restriction is sustainable. It is probably better no to change the standard. |
| vivo | No |  |
| Lenovo | No |  |
| ZTE | No |  |

**Summary on Question 2**

11 companies oppose to specify the restriction in the MAC specification, and 2 companies support. The rapporteur suggests to go for majority.

**Proposal 2: Do not specify the restriction (i.e. 1-byte eLCID is used only for MAC CE) to the MAC specification.**

A text proposal is also provided in R2-2003024. If companies agree to specify the restriction in the MAC specification, it is further asked whether the text proposal provided in R2-2003024 is agreeable.

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| 6.2.1 MAC subheader for DL-SCH and UL-SCH The MAC subheader consists of the following fields:  - LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding as described in Tables 6.2.1-1 and 6.2.1-2 for the DL-SCH and UL-SCH respectively. There is one LCID field per MAC subheader. The LCID field size is 6 bits. If the LCID field is set to 34, one additional octet is present in the MAC subheader containing the eLCID field and follow the octet containing LCID field. If the LCID field is set to 33, two additional octets are present in the MAC subheader containing the eLCID field and these two additional octets follow the octet containing LCID field;  - eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits. If the size of the eLCID field is 8 bits, it is only used to identify the type of the correpsonding MAC CE. |

**Question 3. If you agree to restrict the 1-byte eLCID field to MAC CE, and if you agree to specify the restriction in the MAC specification, do you agree to the text proposal provided above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Ericsson | No | We may add the “or the type of the corresponding MAC CE” part, but not the rest. The second change is not necessary as the mapping of eLCID and LCID values are described in the tables. |
| CATT |  | Agree with Ericssion. |
| MediaTek | Yes | The first change is required since some WI will move their new MAC CE from legacy LCID space into the eLCID space.  The second change is acceptable for R16. And as we explained in Q1, it will not restrict the forward compatibility in future releases. |
| LG | No | The first change is needed as Ericsson pointed out. The second change is not needed. |
| HW | Yes | Only the first change can be agreeable. |
| Nokia, Nokia Shanghai Bell |  | Agree with Ericsson. |
| Futurewei | No | Agree with Ericsson. |
| ASUSTeK | Yes | We agree with the text proposal. |

**Summary on Question 3**

7 companies think that the first change is needed.

**Proposal 3: Agree on the following change.**

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| --- |
| eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits. |

## 2.2 RACH stopping

In R2-2002931, it is proposed to simplify the text about UE optional behavior on stopping ongoing RA procedure by specifying only the general principle, with following reasons.

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| The main point of this text is that the UE is allowed to stop the ongoing RA procedure if the ongoing RA procedure is no more needed. There may be various reasons that the ongoing RA procedure is no more needed, e.g. due to cancelling the SR that triggered the RA procedure, but specifying all the reasons is worthless. As long as this principle is kept, the UE implementation can this into consideration, and may stop the ongoing RA procedure if needed. Anyway, this is an optional UE behavior, and the implementation would not be impacted by specifying only the general principle. Moreover, if only general principle is specified, we don’t have to worry about future update even if a new SR trigger is introduced. |

Companies are asked to provide their views whether it is ok to simplify the text on stopping ongoing RA procedure by specifying only the general principle.

**Question 4. Do you agree to simplify the text on stopping ongoing RA procedure** **by specifying only the general principle?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | Yes..but | We have the sympathy on the intention to simplify the text, there are currently several cases which can trigger SR besides regular BSR:   * Consistent LBT failure * SCell BFR   The spec captures the cases when SR is triggerd by BSR and SCell MAC CE, however, the consistent LBT failure case is missing and the related discussion is on-going in the NR-U session. Looking at the latest version g00, it makes difficulty to read when SCell BFR case is added, let alone the consistent LBT failure case is coming with several new cases being discussed.  In general, we agree the intention to simplify the text and try to capture the principle, e.g., UE may stop on-going RACH if it’s not needed any more.  However, we do think some examples are good to have, and also these examples should be added without impacting the legacy behavior, i.e., R15 behavior. The reason is that, we do need those scenarios specified otherwise UE would not know in which cases the RACH can be stopped, it would even stop RACH based on its own judgment on the specified principle, and the judgment can be different from UE by UE thus makes the system un-predictable.  Thus, one way is to leave the R15 text there so that the legacy behavior is not touched, meanwhile, we specify the principle with the examples for consistent LBT failure and SCell BFR. |
| Ericsson | Yes | If not acceptable to change for legacy, we may only change the Rel-16 additions of BFR and LBT failure triggered RA due to SR. |
| CATT | Yes | We appreciate the effort of this proposed change. As the texts have been complete for R15, we’d prefer to start such optimization of spec from later than R15. |
| MediaTek | Yes, but | We agree with the intention, but we also share view from OPPO that some description/examples for how to determine whether an ongoing RACH procedure is still needed or not should be kept. Otherwise, UE may implement the decision with different ways from what is specified in legacy spec text. |
| LG | Yes | Stopping ongoing RA procedure is an optional UE behavior, and does not have to be updated each time a new feature is introduced. Specifying only the general principle is more robust and future proof. |
| HW | Yes | We share the intention and agree the current text is a bit messy. We prefer to take this chance to have a general but simpler description to cover all the relevant events that may cancel the SR that triggered the RA. A general note instead seems a right direction that is consistent with other similar cases. |
| Nokia, Nokia Shanghai Bell | Intention is OK, however | First of all, we would not like to touch the Rel-15 behavior as that is clear and works with BSR. The generalization as proposed in below TP is clearly too vague to be a normative text.  For the Rel-16 cases, we need to be very careful about the formulation of the text: RA procedure may be triggered multiple times by multiple triggers (e.g., multiple SCells fail at different times) whereas only one RA procedure will be initiated/maintained for all of these triggers. Hence, it will NOT be OK to cancel the RA procedure if, for instance, one SCell gets deactivated. Indeed, when there is no trigger left that would benefit from completing the RA procedure, the UE can be allowed to stop the RA procedure, not otherwise. Furthermore, it is NOT OK to cancel the RA if the MAC CE is included in RAR UL grant since the contention resolution may fail. |
| Futurewei | Yes | We agree with the intention of simplifying the text on stopping ongoing RA procedure, as it is anyway up to UE implementation.  We are also fine to make the change only for R16, to avoid the impact on R15. |
| ASUSTek | No | We also agree the simplification is nice to have. However, as all the concerns shown above, it seems not easy to have a simple sentence to overcome these concerns. So, we prefer to keep it as it is. |
| Qualcomm Incorporated | Yes | We agree the current specification text is getting overly complex.  Agree to Ericsson’s comment that we could only change the Rel-16 additions if it is not acceptable to change the legacy text. |
| vivo | Yes | We agree with the intension of simplifying the text. And we also agree with Ericsson that the change could start from Rel-16. |
| Lenovo | Yes | But change should be done only for Rel-16 |
| ZTE | Yes | We think it is nice to have some simplification, if suitable text can be found. But such simplification shall not result in change to normative UE behaviour according to existing rules. |

**Summary on Question 4**

11 companies support to simplify the text, and 1 company prefer to keep it as it is. Thus, the rapporteur proposes that RAN2 work further on simplifying the text on RACH stopping. How to simplify the text needs further discussion, and described in Proposal 5.

**Proposal 4: Simplify the text on RACH stopping.**

A text proposal is also provided in R2-2002931. If companies agree to simplify the text on stopping ongoing RA procedure by specifying only the general principle, it is further asked whether the text proposal provided in R2-2002931 is agreeable.

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| 5.4.4 Scheduling Request The MAC entity may stop, if any, ongoing Random Access procedure if the ongoing Random Access procedure is no more needed due to e.g. cancelling the pending SR that triggered the Random Access procedure. |

**Question 5. If you agree to simplify the text on stopping ongoing RA procedure** **by specifying only the general principle, do you agree to the text proposal provided above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| OPPO | No | See Q4 |
| Ericsson | Yes | Should probably be something like:  The MAC entity may stop an ongoing Random Access procedure if the ongoing Random Access procedure is no more needed due to e.g. cancelling of the reason for the pending SR that triggered the Random Access procedure.  Alternatively:  The MAC entity may stop, if any, ongoing Random Access procedure due to a pending SR for BSR which has no valid PUCCH resources configured, which was initiated by MAC entity prior to the MAC PDU assembly. The ongoing Random Access procedure may be stopped when the MAC PDU is transmitted, regardless of LBT failure indication from lower layers, using a UL grant other than a UL grant provided by Random Access Response or a UL grant determined as specified in clause 5.1.2a for the transmission of the MSGA payload, and this PDU includes a BSR MAC CE which contains buffer status up to (and including) the last event that triggered a BSR (see clause 5.4.5) prior to the MAC PDU assembly, or when the UL grant(s) can accommodate all pending data available for transmission.  The MAC entity may stop an ongoing Random Access procedure due to a pending SR not for BSR if the ongoing Random Access procedure is no more needed due to e.g. cancelling of the reason for pending SR that triggered the Random Access procedure. |
| CATT | Yes | We do not have strong concern on the wording as long as it is still MAY and the example is clear. |
| MediaTek | No | See Q4 |
| LG | Yes | When to cancel the pending SR is well specified in the SR cancellation part, and the text here (i.e. stopping ongoing RA procedure) seems to be duplicated. |
| HW | Yes | It seems okay and can be put into a Note. |
| Nokia, Nokia Shanghai Bell | No | We want to keep the legacy text for BSR.  As this is to be normative text, we need to be very specific on when the RA procedure is “no more needed” which is a very vague statement and should be avoided in normative text. Regardless of the UE “may stop”, the UE shall not stop the RA procedure when it is not allowed and that cannot be avoided with the proposed text. Hence, we are quite reluctant to simplify too much, but we can attempt to do that to a certain level – e.g., not list all the cancelling conditions explicitly as they are defined in the TS elsewhere.  The important thing that needs to be visible is that:   * **all SR triggers** need to be cancelled before the RA procedure **may be** cancelled following the BSR procedure; * **the UL grant other than RAR UL grant** needs to be explicitly spelled out since otherwise the SR would be cancelled by inputting MAC CE into MsgA/Msg3 which is not correct. |
| Futurewei | Yes | With some revisions from Ericsson and Nokia. |
| ASUSTek | No | It is more desirable to keep legacy examples. |
| Qualcomm Incorporated | Yes | Alternative suggested by Ericsson also looks fine to us. |
| vivo | Yes but | We think that RACH after the transmission of Msg3/MsgA including the corresponding MAC CEs (e.g. BSR/BFR/UL LBT failure) should not be cancelled. Otherwise those MAC CEs would be lost. |
| Lenovo | Yes, but | With the restrictions brought up by Nokia (**the UL grant other than RAR UL grant** needs to be explicitly spelled out) |
| ZTE | Yes, but | In general, we agree that the current text is a bit long and convoluted. We first should attempt to simplify it by a general clean-up. It should be noted that such simplification should not result in any existing requirements for the procedure to be relaxed.  Then, in addition to the comments made by Ericsson and Nokia, we also note that the MAC CE, the MAC SDU from LCH can be included in the MAC PDU of Msg3/MsgA as well, and once we cancel the RACH procedure, the MAC SDU will be lost and we can only rely on the RLC retransmission, if the MAC SDU is from AM RLC. So, we are wondering whether the existence of MAC SDU shall be taken into account as well, and the UE shall not cancel the RACH procedure if any MAC SDU is included in the Msg3/MsgA buffer.  Based on the above, we think we can attempt to replace the existing paragraph with normative text like below (text in gray is meant to be replication of existing conditions – but of course this needs further review and seems can be made even cleaner. Text in yellow is a new condition according to the above comment):  When a Random Access procedure is ongoing, the MAC entity may:   1. if the ongoing Random Access procedure is initiated due to a pending SR for BSR which has no valid PUCCH resources configured   2> if a MAC PDU is assembled after the initiation of the Random Access procedure, and the MAC PDU includes a BSR MAC CE which contains buffer status up to (and including) the last event that triggered a BSR (see clause 5.4.5) prior to the MAC PDU assembly, and the MAC PDU is transmitted, regardless of LBT failure indication from lower layers, using a UL grant other than a UL grant provided by Random Access Response or a UL grant determined as specified in clause 5.1.2a for the transmission of the MSGA payload; or  2> if the UL grant(s) can accommodate all pending data available for transmission.  3> if no MAC SDU is included in the MAC PDU stored in MSG3/MSGA buffer:  4> cancel the ongoing Random Access procedure.  1> if the ongoing Random Access procedure is initiated due to a pending SR for BFR of an SCell; and  1> if a MAC PDU is transmitted using a UL grant other than a UL grant provided by Random Access Response or a UL grant determined as specified in clause 5.1.2a for the transmission of the MSGA payload and this PDU contains an SCell BFR MAC CE or truncated SCell BFR MAC CE which includes beam failure recovery information of that SCell  2> if no MAC SDU is included in the MAC PDU stored in MSG3/MSGA buffer:  3> cancel the ongoing Random Access procedure.  Note: by the way, the red part above seems to be missing in the original text and should have been added by the 2-step RACH CR… ?? |

**Summary on Question 5**

Most companies agree to simplify the text on RACH stopping, but there are different flavors on how to simplify the text. The rapporteur summarizes possible options on the table.

**Option 1**: Specify only the general principle (Note that the text could be moved to NOTE). Example is below:

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| --- |
| The MAC entity may stop, if any, ongoing Random Access procedure if the ongoing Random Access procedure is no more needed due to e.g. cancelling the pending SR that triggered the Random Access procedure. |

**Option 2**: Keep the BSR related text, and simplify only for other reasons (Note that the BSR related text may be updated by other ongoing discussions, e.g. NR-U(#502) or eMIMO(#101)). Example is below:

|  |
| --- |
| The MAC entity may stop, if any, ongoing Random Access procedure due to a pending SR for BSR which has no valid PUCCH resources configured, which was initiated by MAC entity prior to the MAC PDU assembly. The ongoing Random Access procedure may be stopped when the MAC PDU is transmitted, regardless of LBT failure indication from lower layers, using a UL grant other than a UL grant provided by Random Access Response or a UL grant determined as specified in clause 5.1.2a for the transmission of the MSGA payload, and this PDU includes a BSR MAC CE which contains buffer status up to (and including) the last event that triggered a BSR (see clause 5.4.5) prior to the MAC PDU assembly, or when the UL grant(s) can accommodate all pending data available for transmission.  The MAC entity may stop an ongoing Random Access procedure due to a pending SR not for BSR if the ongoing Random Access procedure is no more needed due to e.g. cancelling of the reason for pending SR that triggered the Random Access procedure. |

**Option 3**: Other options (please provide an example of the text proposal)

Companies are further asked to provide there preferences among different options

**Question 5-1: If you agree to simplify the text on stopping ongoing RA procedure, which option do you prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option** | **Suggested text proposal** |
| LG | 1 |  |
| OPPO | 2 | As commented, we prefer to keep the current text as it is, and try to have a note as the principle for R16 new features. We’re also ok to let companies have more time to polish the wording if we can not converge in this meeting. |
| HW | 1 | We think we should first decide whether to have a general description/note or a separate one for R16 only.  Having a general description for all the cases is more robust and can avoid painful revisit across WIs (even the current text lacks the adaptation of 2-step RA to SCell BFR). We understand “no more needed” is sufficient for UE implementation guidance and can cover the intetion of “UL grant other than RAR/MSGA”. If majority thinks it is not crystal clear, we can have more time for checking the wording. |

**Summary on Question 5-1**

2 companies support to specifying only the principle, and 1 company prefer to keep the BSR related text, and simplify the text for other reasons. As not many companies expressed their views and actual texts need more discussion, the rapporteur proposed to invite actual texts for the next meeting and discuss this issue again in the next meeting.

**Proposal 5: Invite company proposals for the simplified text on RACH stopping for the next meeting.**

# 3. Summary

For the eLCID issue, companies views are quite aligend, and the proposals 1-3 could be easily agreed.

**Proposal 1: There is no restriction that 1-byte eLCID is only used for MAC CE.**

**Proposal 2: Do not specify the restriction (i.e. 1-byte eLCID is used only for MAC CE) to the MAC specification.**

**Proposal 3: Agree on the following change.**

|  |
| --- |
| eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits. |

The CR for Proposal 3 is available in R2-2004216.

For the RACH stopping issue, most companies support to simplify the text. However, companies have different views on how to simplify the text. Thus, the rapporteur suggest to discuss this again in the next meeting.

**Proposal 4: Simplify the text on RACH stopping.**

**Proposal 5: Invite company proposals for the simplified text on RACH stopping for the next meeting.**