**3GPP TSG RAN WG1 Meeting #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Source: Moderator (Intel Corporation)**

**Title: Discussion summary of [102-e-NR-Mob-Enh-02]**

**Agenda item: 7.2.9**

**Document for: Discussion**

# Introduction

In this contribution, we summarize the email reflector discussions for [102-e-NR-Mob-Enh-02]. Chairman has approved the following email discussion:

* [102-e-NR-Mob-Enh-02] Email discussion/approval on 1st and 2nd TPs of issue #1, and TPs contained in issues #3, #5 and #6 in R1-2005942 until 8/21; if necessary, endorse remaining TPs by 8/27 – Daewon (Intel)

# Recap of Issues from R1-2005942 [10]

## Issue #1) Overlapping UL transmission between source and target cells [1][6]

Two companies has discussed issues with overlapping uplink transmission between source and target cell. One issue was regarding use of the reference subcarrier spacing based on the active UL BWP of the source MCG. The other issue was regarding the handling of Msg 3 transmission. The following are proposed TPs from the contributions.

* Proposed TP from [1]:

### #TP2-1

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| --- |
| 15 Dual active protocol stack based handover<---------------------------Other parts are omitted ------------------------------->For DAPS operation in a same frequency band, a UE does not transmit PUSCH/PUCCH/SRS to the source MCG in a slot overlapping in time with a PRACH transmission to the target MCG or when a gap between a first or last symbol of a PRACH transmission to the target MCG in a first slot would be separated by less than $N$ symbols from a last or first symbol, respectively, of the PUSCH/PUCCH/SRS transmission to the source MCG in a second slot. For DAPS operation in a same frequency band, a UE does not transmit PRACH on the source MCG in a slot overlapping in time with a PUSCH/PUCCH/SRS transmission on the target MCG or when a gap between the first or last symbol of a PUSCH/PUCCH/SRS transmission on the target MCG is separated by less than $N$ symbols from a last or a first symbol, respectively, of a PRACH transmission on the source MCG. $N=2$ for $μ=0$ or $μ=1$, $N=4$ for $μ=2$ or $μ=3$, and $μ$ is the SCS configuration of the active UL BWP for the PUSCH/PUCCH/SRS transmission ~~to source MCG~~.<---------------------------Other parts are omitted -------------------------------> |

* Proposed TP from [6]:

### #TP2-2

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| **Text proposal #2 for section 15 in TS38.213**----omitted----If - the UE does not provide *UplinkPowerSharingDAPS-HO*, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell, and cancels the transmission to source cell if the first symbol of source cell transmission is after Tproc,2+d. The UE does not expect to cancel the transmission on the source cell with first symbol that occurs, relative to a last symbol of a CORESET where the UE detects a DCI format scheduling a transmission on the target cell, after a number of symbols that is smaller than Tproc,2+d. Tproc,2 is the PUSCH preparation time for the corresponding PUSCH processing capability [6, TS 38.214] assuming d2,1 = 1 after a last symbol of a CORESET where the UE detects a DCI format scheduling the transmission on the target cell, d is the time duration of 2 symbols with SCS based on SCS configuration μ, and μ corresponds to the smallest SCS configuration among the SCS configuration of the PDCCH carrying the DCI format and the SCS configuration of the UE transmission on the source cell. If the UE transmits PRACH using 1.25 kHz or 5 kHz SCS on the source cell, the UE determines Tproc,2 assuming SCS configuration μ=0. A UE does not expect to cancel a transmission on the source cell [in symbols from the set of symbols] that occur, relative to a last symbol of a PDSCH reception conveying a RAR message with a RAR UL grant on the target cell, after a number of symbols that is smaller than msec, where  is a time duration of  symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured,  is a time duration of  symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214] and the UE considers that  and  correspond to the smaller of the SCS configurations for the PDSCH on the target cell and the transmission on the source cell. For , the UE assumes  [6, TS 38.214].----omitted---- |

## Issue #3) PDCCH monitoring in DL DAPS-HO [1][4][5]

In RAN1 #101-e meeting, RAN1 agreed to in principle TP that corrected the UE assumption on overbooking configuration for source and target cell. However, the except TP was not captured into the latest CR due to issues with interpretation of the text and issues raised by the editor. In this meeting several companies has provided text proposal that resolve the concerns raised during the email discussion of the 38.213 CR.

Moderator notes that many of the TP are similar and expect the issue to be resolved quickly.

* Text Proposal from [1]
	+ PDCCH overbooking is not allowed for source cell and target cell in a slot where a UE needs to monitor PDCCH from both source and target cell

### #TP2-3

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| --- |
| 15 Dual active protocol stack based handover<---------------------------Other parts are omitted ------------------------------->For intra-frequency DAPS HO operation, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively.If the UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have in any slot from both the source cell and the target cell a USS set that results to corresponding total numbers of monitored PDCCH candidates and non-overlapped CCEs per slot that exceed the corresponding maximum numbers per slot on the target MCG or the source MCG.<---------------------------Other parts are omitted -------------------------------> |

* Text Proposal from [4]:

### #TP2-4

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| --- |
| **15 Dual active protocol stack based handover**< Unchanged parts are omitted >If the UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have in any slot - a USS set on the target MCG that results in that the total number of monitored PDCCH candidates and non-overlapped CCEs per slot exceeds the maximum number per slot for the target MCG, and- a USS set on the source MCG that results in that the total number of monitored PDCCH candidates and non-overlapped CCEs per slot exceeds the maximum number per slot for the source MCG. |

* Text Proposal from [5]:

### #TP2-5

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| **15   Dual active protocol stack based handover***<unchanged text omitted>*For intra-frequency DAPS HO operation, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively. If a UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have in any slot USS sets that result to corresponding total numbers of monitored PDCCH candidates and non-overlapped CCEs per slot or per span for a cell that exceed the corresponding maximum numbers per slot or per span for a cell, respectively, on both the target MCG and the source MCG. |

* Text Proposal from [7]:

### #TP2-6

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| **15   Dual active protocol stack based handover**……..For intra-frequency DAPS HO operation, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively.If a UE is provided search space sets on both the target MCG and the source MCG, in any slot the UE does not expect to have USS sets on both the target MCG and the source MCG that result to the number of monitored PDCCH candidates and non-overlapped CCEs in each cell that exceed the corresponding maximum numbers per slot. |

* Proposal from [9]:
	+ It appeared in RAN1#101e that overbooking could be allowed in semistatic manner in one of the MCGs, source or target.
	+ Confirm the understanding of the intent of the the agreement made in RAN1 meeting #99 and allow overbooking in one of the MCGs, source or target at a time, during the DAPS HO.
	+ Adopt following TP to Section 15 of 38.213:

### #TP2-7

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| If the UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have simultaneously in both target MCG and source MCG any USS set without allocated PDCCH candidates. |

## Issue #5) Clarification of frequency range applicable for DAPS HO [5]

Two companies mentioned that FR2-to-FR2 DAPS HO was agreed not be supported. However, the current specification text is bit ambiguous on whether this is supported or not and suggests an correction.

* Proposal from [3]
	+ Fix the source and target cell maximum power configurations
	+ The following is the proposed TP:

### #TP2-8

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| **15 Dual active protocol stack based handover**< Unchanged parts are omitted >If a UE is configured with ~~a target MCG and a source MCG using NR radio access in FR1 and/or in FR2,~~:* a target MCG using NR radio access in FR1 and a source MCG using NR radio access in FR1, or
* a target MCG using NR radio access in FR1 and a source MCG using NR radio access in FR2, or
* a target MCG using NR radio access in FR2 and a source MCG using NR radio access in FR1,

the UE is configured a maximum power $P\_{MCG}$ for transmissions on the target MCG ~~by~~ *~~p-DAPS-FR1~~* ~~and/or by~~ *~~p-DAPS-FR2~~*and a maximum power $P\_{SCG}$ for transmissions on the source MCG ~~by~~ *~~p-DAPS-FR1~~* ~~and/or by~~ *~~p-DAPS-FR2~~*: * by *p-DAPS-FR1* for the target MCG using NR radio access in FR1 and by *p-DAPS-FR1* for the source MCG using NR radio access in FR1, or
* by *p-DAPS-FR1* for the target MCG using NR radio access in FR1 and by *p-DAPS-FR2* for the source MCG using NR radio access in FR2, or
* by *p-DAPS-FR2* for the target MCG using NR radio access in FR2 and by *p-DAPS-FR1* for the source MCG using NR radio access in FR1,

and with an inter-CG power sharing mode by *UplinkPowerSharingDAPS-HO-mode* ~~for FR1 and/or by~~ *~~UplinkPowerSharingDAPS-HO-mode~~* ~~for FR2~~ for the frequency range combination used by the source and target MCGs. The UE determines a transmission power on the target MCG and a transmission power on the source MCG per frequency range. |

* + **Note from Feature Lead:**
		- The TP is based on old version of TS38.213.
* Proposal from [6]
	+ RAN1 spec is missing for inter-FR (FR1-FR2/FR2-FR1) DAPS HO scenarios whereas RAN4 spec already supports.
	+ The following is the proposed TP:

### #TP2-9

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| --- |
| 15 Dual active protocol stack based handoverIf a UE indicates a capability for dual active protocol stack based handover (DAPS HO), the UE can be provided with a source MCG and a target MCG. If a UE is configured with an target MCG using NR radio access in FR1 or in FR2 and with a source MCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5. |

## Issue #6) Correcting RRC parameter names [5][6]

RAN2 has updated the RRC parameter names related to DAPS and currently the RAN1 specification does not match what is defined in TS38.331.

* Proposed TP from [5]:

### #TP2-10

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| 15 Dual active protocol stack based handoverIf a UE indicates a capability for dual active protocol stack based handover (DAPS HO), the UE can be provided with a source MCG and a target MCG. If a UE is configured with a target MCG and a source MCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power $P\_{MCG}$ for transmissions on the target MCG by *p-DAPS-Target-r16* and a maximum power $P\_{SCG}$ for transmissions on the source MCG by *p-DAPS-Source-r16* and with an inter-CG power sharing mode by *uplinkPowerSharingDAPS-Mode-r16* for FR1 and/or by *uplinkPowerSharingDAPS-Mode-r16* for FR2. The UE determines a transmission power on the target MCG and a transmission power on the source MCG per frequency range.If the UE indicates support for semi-static power sharing mode1and is provided *uplinkPowerSharingDAPS-Mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates support for semi-static power sharing mode2 and is provided *uplinkPowerSharingDAPS-Mode-r16* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG. The UE expects to be provided *uplinkPowerSharingDAPS-Mode-r16* = *Semi-static-mode2* only for synchronous DAPS HO operation [10, TS 38.133].If the UE indicates support for dynamic power sharingand is provided *uplinkPowerSharingDAPS-Mode-r16* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.*<unchanged text omitted>* |

* Proposed TP from [6]:
	+ Update the higher layer parameter name “NR-DC-PC-mode” to “nrdc-PCmode-FR1-r16”.
	+ Also update TP as follows:

### #TP2-11

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| --- |
| **Text proposal #5 for Section 15 of TS38.213**…If - the UE does not ~~provide~~ *~~UplinkPowerSharingDAPS-HO~~* indicate a capability for power sharing between source and target MCG in DAPS handover, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell and cancels the transmission on the source cell if the first symbol of the transmission on the source cell is after $T\_{proc,2}+d$. The UE does not expect to cancel a transmission on the source cell if a first symbol of the transmission on the source cell is less than $T\_{proc,2}+d$after a last symbol of a CORESET where the UE receives a PDCCH providing a DCI format scheduling a transmission on the target cell. $T\_{proc,2}$ is the PUSCH preparation time for the corresponding PUSCH processing capability [6, TS 38.214] assuming $d\_{2,1}=1$, $d$ is a time duration corresponding to 2 symbols for SCS configuration $μ$, and $μ$ is the smallest SCS configuration between the SCS configuration of the PDCCH providing the DCI format and the SCS configuration for the transmission on the source cell. If the UE transmits PRACH using 1.25 kHz or 5 kHz SCS on the source cell, the UE determines $T\_{proc,2}$ assuming SCS configuration $μ=0$.… |

# Discussions

***Issue #1)***

The issue brought up are either straight forward or already discussed to some extent in the previous meeting. Therefore, moderator has formulated questions on the adoption for the TP directly.

**Q1)** Is TP#2-1 agreeable? If not, please provide comments or alternative TP.

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| --- | --- | --- |
|  **Company** | **TP#2-1 agreeable? (Yes/No)** | **Comments for Q1** |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Nokia | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| MTK | Yes |  |

**Q2)** Is TP#2-2 agreeable? If not, please provide comments or alternative TP.

|  |  |  |
| --- | --- | --- |
|  **Company** | **TP#2-2 agreeable? (Yes/No)** | **Comments for Q2** |
| Ericsson | No | Unnecessary |
| ZTE | No | Since transmission based cancellation is supported, there is no need to define an additional timeline.  |
| Qualcomm | No | Not clear whether the TP is needed. |
| Samsung | Yes | We view msg3 is an important component during handover so it is better to be specified. Due to the different mechanism the dynamic grant is conveyed for msg3, it is hard to combine it with the timeline for other uplink transmission based on dynamic grant. So we suggest a separated timeline as TP#2-2. |
| MTK | Yes | It seems the proposed TP is intended to tackle the issue of msg 3, which seems reasonable to us. |

***Issue #3)***

This issue has been discussed in the previous meeting. The TP in question was omitted from the last CR update by the editor due to conflicts in understanding of the last RAN1 agreements. Most of the TP provided are based on the text provided by the editor during the CR discussion. However, there are some subtle differences between TP#2-3/4/5/6/7. Moderator suggests picking one of them for approval.

**Q3)** Which TP is agreeable among TP#2-3/4/5/6/7? If none of them are agreeable, please provide a suggested TP.

|  |  |  |
| --- | --- | --- |
|  **Company** | **Which TP is/are agreeable (TP#2-3/4/5/6/7 or None)** | **Comments for Q3** |
| Ericsson | 2-3, 2-4, 2-6 | 2-5 talks about “span” – unclear. 2-7 uses the expression “any USS set without allocated PDCCH candidates” which is less clear |
| ZTE | 2-3, 2-4, 2-6 | PDCCH overbooking in a span is not involved in the discussion in this WI. So 2-5 needs more discussion. For 2-7, there may be misunderstanding as discussed in last meeting.  |
| Intel | 2-4, 2-5 | 2-4 address the ambiguity that Qualcomm had concerns about regarding whether the limits is referring to the pool of BD/CCE limits across cells or not. So we would prefer 2-4 over 2-3.2-5 is aligning with the additions added as part of Rel-16 features. We are ok to further discuss this. |
| Nokia | 2-4 | We could consider shorten the TP a bit e.g. “If the UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have in any slot a USS set on both the target MCG and on the source MCG that results in that the total number of monitored PDCCH candidates and non-overlapped CCEs per slot exceeds the maximum number per slot for the target MCG and source MCG, respectively.” |
| Qualcomm | 2-4 with some update | The number of monitored PDCCH candidates and the number of non-overlapped CCEs per slot are separate with separate max numbers. Hence, we propose the following updates to 2-4:“If the UE is provided search space sets on both the target MCG and the source MCG, the UE does not expect to have in any slot - a USS set on the target MCG that results in that the total number of monitored PDCCH candidates and the total number of non-overlapped CCEs per slot exceed~~s~~ the maximum numbers per slot defined in Table 10.1-2 and Table 10.1-3 respectively for the target MCG, and- a USS set on the source MCG that results in that the total number of monitored PDCCH candidates and the total number of non-overlapped CCEs per slot exceed~~s~~ the maximum numbers per slot defined in Table 10.1-2 and Table 10.1-3 respectively for the source MCG.” |
| Samsung | 2-3, 2-4 and may be 2-5. | All TPs want to achieve the same goal. Among them, we prefer TP2-3/2-4. We also think “per span” in TP2-5 is not discussed in this WI. |
| MTK | 2-3, 2-4 | Same view as Samsung. Modification from Nokia and QC are also acceptable to us. |

***Issue #5)***

This seems to be editorial correction that might be essential. Moderator suggest taking TP#2-9 as baseline since TP#2-8 is based on an old version of the specifications. Moderator has formulated question on the adoption for the TP directly.

**Q4)** Is the following merged TP#2-9 agreeable?

|  |  |  |
| --- | --- | --- |
|  **Company** | **TP#2-9 agreeable? (Yes/No)** | **Comments for Q4** |
| Ericsson | Yes |  |
| ZTE | No | It has been clarified to use power control scheme in section 7.6.2 for DAPS. In section 7.6.2, it has been clarified that if a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5. It has been reflected what this TP means. Therefore, we don’t think this TP is needed. But we can accept it if majority of companies support it.  |
| Intel | No | Clarifying that FR2 – FR2 DAPS is not supported in specification doesn’t seem to be most essential correction as RAN4 would not provide any requirements for this. Similarly with ZTE, if other companies feel this is something needed we would not be against it. |
| Nokia | Yes | We are fine to clarify this if companies feel that it is needed. |
| Qualcomm | Yes |  |
| Samsung | Yes | On Intel’s comment, TP#2-9 attempts to clarify power control aspect for FR1-FR2/FR2-FR1 DAPS HO similar with NR-DC operation. In DAPS HO, power sharing is limited to same FR (as per UE feature). And we agree that not supporting FR2-FR2 DAPS HO is clear from RAN4 spec. |
| MTK | Yes | Fine for us to clarify this. However, it does not seem harm for us to also specify “not supporting FR2-FR2 DAPS HO” in RAN1 spec. |

***Issue #6)***

This seems to be editorial correction that might be essential. Moderator has merged the suggestion made by Intel and Samsung. TP#2-11 from Samsung might need to be discussed together with issue #2. Moderator will move copy the TP#2-11 to issue #2 being discussed in email discussion 01.

### #TP2-12

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| 15 Dual active protocol stack based handoverIf a UE indicates a capability for dual active protocol stack based handover (DAPS HO), the UE can be provided with a source MCG and a target MCG. If a UE is configured with a target MCG and a source MCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power $P\_{MCG}$ for transmissions on the target MCG by *p-DAPS-Target-r16* and a maximum power $P\_{SCG}$ for transmissions on the source MCG by *p-DAPS-Source-r16* and with an inter-CG power sharing mode by *uplinkPowerSharingDAPS-Mode-r16* for FR1 and/or by *uplinkPowerSharingDAPS-Mode-r16* for FR2. The UE determines a transmission power on the target MCG and a transmission power on the source MCG per frequency range.If the UE indicates support for semi-static power sharing mode1and is provided *uplinkPowerSharingDAPS-Mode-r16* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode-r16* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates support for semi-static power sharing mode2 and is provided *uplinkPowerSharingDAPS-Mode-r16* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *NR-DC-PC-mode-r16* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG. The UE expects to be provided *uplinkPowerSharingDAPS-Mode-r16* = *Semi-static-mode2* only for synchronous DAPS HO operation [10, TS 38.133].If the UE indicates support for dynamic power sharingand is provided *uplinkPowerSharingDAPS-Mode-r16* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode-r16* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.*<unchanged text omitted>* |

Q5) Is the following merged TP#2-12 agreeable?

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| --- | --- | --- |
|  **Company** | **TP#2-X agreeable? (Yes/No)** | **Comments for Q5** |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Nokia  | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes with additional modification | Update “*NR-DC-PC-mode*” to “*nrdc-PCmode-FR1-r16*”Note: “*NR-DC-PC-mode*” is no longer existed in section 7.6.2 and it becomes “*nrdc-PCmode-FR1-r16*“ and “*nrdc-PCmode-FR2-r16”. “nrdc-PCmode-FR2-r16”* is not applicable for DAPS HO since FR2-FR2 DAPS HO is not supported (yet) |
| MTK | Yes with additional modification | Agree with Samsung |

# Reference

1. R1-2005422, “Remaining issues on NR mobility enhancements in physical layer,” ZTE
2. R1-2005627, “Remaining issues on Rel-16 mobility enhancement,” MediaTek Inc.
3. R1-2005794, “Remaining issues on DAPS-HO,” Huawei, HiSilicon
4. R1-2005843, “Remaining issues on mobility enhancements,” Ericsson
5. R1-2005855, “corrections to NR mobility enhancements,” Intel Corporation
6. R1-2006121, “Remaining issues on NR Mobility Enhancements,” Samsung
7. R1-2006498, “Remaining issue on NR mobility enhancements,” Apple
8. R1-2006785, “Maintenance on NR mobility enhancements,” Qualcomm Incorporated
9. R1-2006895, “Remaining physical layer aspects of dual active protocol stack based HO,” Nokia, Nokia Shanghai Bell
10. R1-2005942, “Issue Summary for NR Mobility Enhancements,” Moderator (Intel Corporation)