**3GPP TSG RAN WG1 #109-e R1-220xxxx**

**e-Meeting, May 9th – 20th, 2022**

**Agenda Item: 8.2.5**

**Source: Moderator (InterDigital, Inc.)**

**Title: Discussion Summary #1 of Beam Management for new SCSs**

**Document for: Discussion and Decision**

# **Introduction**

In this contribution, we summarize all issues discussed on beam management and timings associated with beam-based operation for new SCSs to support NR from 52.6 GHz to 71 GHz for the following email discussion in RAN#109-e.

[109-e-R17-FR2-2-07] Email discussion for maintenance on beam management for new SCSs, for issue 7-1 (introduction of beam switching gap) in R1-2205124, until May 13 – Youngwoo (InterDigital)

# **Remaining issues**

## Introduction of beam switching gap and scheduling restrictions

### Observations and Proposals from Contributions

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| **Company** | **Observations and Proposals from Contributions** |
| [ZTE/Sanechips, 1] | **Proposal 3: It is proposed to introduce a UE capability for supporting the UE reporting the beam switching time.** |
| [NTT Docomo, 5] | **Proposal 1:**   * *Support a UE capability for Rx and Tx beam switching time between adjacent DL signals/channels and adjacent UL signals/channels, respectively.*   + *Number of symbols for the beam switching time is up to UE feature discussion, and possibly RAN4 progress.*   + *The beam switching time should be considered for two adjacent signals/channels with different QCL Type-D assumptions.* |
| [LGE, 6] | **Proposal #1: Support a UE capability for Rx and Tx beam switching time between adjacent DL signals/channels and adjacent UL signals/channels, respectively.** |
| [Huawei/HiSi, 7] | **Proposal 2: Regarding beam switch time, support the following for 960k Hz and 480 kHz SCSs**   * **UE is not expected to be scheduled/configured with a signal/channel on one symbol before to and one symbol after of another signal/channel if the signals/channels have two different QCL-D assumptions.** |

### Summary of views

In [LGE, 6], it is pointed out that UE may require beam switching time which is longer than gNB beam switching time 59 ns which is tentatively agreed in RAN4.

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| Different from Rel-15/16 beam management operation, beam switching time (i.e., required time to change phase shifters) should be considered at least for 960 kHz SCS, and in addition, for 480 kHz SCS when applicable. Even though RAN4 tentatively agreed on 59 ns beam switching time at gNB side [1], UE may require beam switching time longer than gNB or have different beam switching time capabilities depending on how to implement. Therefore, it should be discussed how to handle beam switching time or how to allocate symbol-level gap between DL/UL signals/channels. One possible approach could be to define UE capabilities for beam switching time and corresponding UE behaviour when receiving adjacent DL signals/channels (or transmitting adjacent UL signals/channels) considering the reported beam switching time. |

In addition, [ZTE/Sanechips, 1], [NTT Docomo, 5] and [Huawei/HiSi, 7] also proposed to support UE capability signaling to report beam switching time and corresponding scheduling restrctions.

### Discussion

Given the support from multiple companies, the proposal from [LGE, 6] is copied in the below for further discussion.

#### Proposal 2.1-a

Support a UE capability for Rx and Tx beam switching time between adjacent DL signals/channels and adjacent UL signals/channels, respectively.

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| **Company** | **Input** |
| Ericsson | RAN1 has still not received feedback from RAN4 on UE beam switching time. In our view it is premature for RAN1 to make agreements related to beam switching gaps and associated capabilities. If there is a need for beam switching gaps, it places quite heavy scheduling restrictions on the gNB, and we do not want to make agreements on this without knowledge of concrete numbers. Hence, we do not support Proposal 2.1-a and prefer to wait until RAN4 provides feedback. |
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# **References**

1. R1-2203294, Remaining issues on beam management for 52.6 to 71GHz, ZTE, Sanechips,
2. R1-2203373, Remaining issues for beam management for new SCSs, InterDigital, Inc.,
3. R1-2203512, Maintenance on beam management, vivo,
4. R1-2204114, Remaining issues for beam management, Ericsson,
5. R1-2204342, Remaining issues on beam based operation for new SCSs for NR from 52.6 to 71 GHz, NTT DOCOMO, INC.,
6. R1-2204603, Supported values for SSSG switching delay for 480 kHz and 960 kHz SCS, Nokia, Nokia Shanghai Bell,
7. R1-2204615, Remaining issues of beam management to support NR above 52.6 GHz, LG Electronics,
8. R1-2204896, Remaining issues of PUCCH enhancement and beam management enhancement for 52-71GHz spectrum, Huawei, HiSilicon.