**3GPP T****SG-RAN WG4 Meeting # 97-e R4-2016927**

**Electronic Meeting, 2-13 Nov., 2020**

**Source: Nokia, Nokia Shanghai Bell**

**Title: WF on timing text proposal to TR**

**Agenda item: 13.2.1.2**

**Document for: Approval**

1. Background

At RAN4#97-e, a way forward for timing issues on the FS\_NR\_52\_to\_71GHz was created based on the discussion in R4-2016981. This WF addresses the text proposal to TR 38.808 incorporating elements of R4-2016036 and R4-2016000.

Moderator recommendation after the first round:

* Continue to discuss the text proposals in R4-2016036 and R4-2016000 to see if an acceptable single TP can be agreed

In the WF section a single text proposal has been generated taking into account feedback received during first round discussion. All specific numbers have been left out and only guidance is provided on which areas need further work during the work item. Specifically, it has been taken into account that requirement work is to be done in WI. As the input contributions included proposals, the text proposal is formulated to also take into account those proposals.

1. Way forward

A text proposal shall be drafted capturing the following content into TR 38.808

<Start of TP>

4.2.x Timing aspects

During the study item timing aspects were evaluated with to goal of providing observations and guidance on which technical topics need to be considered in the work item phase when timing related requirements are agreed. The evaluated topics were cell phase synchronization, base station timing alignment error, analog beam switching delay, UE timing advance operation and transient periods.

It was observed that high SCSs may limit the available time budget left for e.g. delay spread. A higher UL SCS puts tighter requirements on UE UL timing and thus it is essential that the SCS selection and UE UL timing requirements are discussed jointly. the issue can be mitigated by adopting correct network configuration based on deployment scenario and use case. TDD pattern can be adjusted according to the propagation environment, and higher SCS provides more opportunities to achieve optimal configuration for with minimal overhead when compared to lower SCS.

Currently transient times for UE is 5 us in FR2. For base stations it is 3 us for FR2. It was concluded during the SI, that possible improvements for transient times should be evaluated and the final agreement for transient time requirements shall be made during the work item. It should be noted that extremely low latencies are not required in all use cases, e.g. if the optimization target is achieving high throughput. High throughput made possible by extremely wide available bandwidths appears as an attractive and feasible design target to be prioritized over improved latency.

Guard period is also related to cell phase synchronization as for overlapping cells, synchronization error needs to be taken into account as it contributes to the possibility of BS-to-BS and UE-to-UE interference. Due to smaller cell sizes in this frequency cells compared to lower frequencies and therefore shorter propagation delays possibility of such interference is reduced. As network has control over guard period, motivation to re-visit cell-phase synchronization was not found during the SI.

OTA TAE requirements in clause for FR2 base stations specify 65 ns for MIMO transmission. This requirement has been in place since UMTS and is derived to align with quarter of the time of a single UMTS chip. Technology has evolved, and therefore possible updates to TAE requirements can be studied and considered during the work item.

All requirements analysed in Work Item phase should preferably start from a total time budget, use case and feature, rather than working on single requirements separately. This is valid for requirements already mentioned above and other requirements like beam switching.

The PHY-layer specifications for UE timing advance are defined to be scalable with SCS, i.e. the update granularity becomes more accurate when SCS increases. Similar behaviour exists in timing advance requirements. Overall, it is necessary to consider UE timing advance requirements, including UE initial access timing error limit, BS controlled timing advance and UE autonomous timing adjustment requirements during work item. Adjustments to timing advance requirements should be studied in detail together with the parameters of the signals present during initial access phase are known, it is essential that the SCS selection and UE UL timing requirements are discussed jointly, for them to be compatible.

Overall, it was concluded that from timing perspective subcarrier spacings up to at least 960 kHz are feasible taking into account the considerations in this section.

<End of TP>