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

e-Meeting, May 9th – 20th , 2022

Source: Moderator (ZTE)

Title: [109-e-R18-Repeater-01] Email discussion and approval of TR skeleton

Agenda Item: 9.8

**Document for: Discussion and Decision**

# **Introduction**

In RAN1#109e meeting, the SI on NCR is initialized [1]. The original draft TR skeleton can be found in [R1-2203235](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2203235.zip)

For completion of the approval, the following email discussion is assigned.

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| [109-e-R18-Repeater-01] Email discussion and approval of TR skeleton for Rel-18 SI on NR network-controlled repeaters by May 13 – Nan (ZTE) |

# **Comments and discussion**

The main content/structure of current TR is listed in appendix. Companies are encouraged to provide the comments and suggestions on the main content/structure of current TR.

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| Company | Comment |
| **Ericsson** | As mentioned in the online session, cost is an essential parameter in specifying repeaters. Although not necessarily a RAN1 topic in itself, we expect the cost parameter to be included when discussing different alternatives for a certain topic in the TR.  We interpret Sec. 8 to concern how to make the repeater access and attach to the controlling gNB, e.g., initial access procedure, authentication and authorization etc. |
| Apple | We support the draft TR skeleton overall with following details:   * We support the current formulation of section 6. In our opinion, it is necessary to include all candidate side control information (SCI), simply because TR is for a study item and all candidates approved in SID should be studied and reported in TR as usual business in 3GPP. The section 9 is typically used to down select or recommend a subset of candidates for WI phase. * On the evaluation results, our view is that it is hard to find a common simulation assumption for all SCI types. For some SCI, the gain can be proven by some analysis e.g., beamforming information and on-off. Therefore, it is reasonable, for each SCI in section 6, to add the evaluation results and the corresponding evaluation assumption if provided by some companies. * Regarding the ‘cost’, it is reasonable to take it into account and capture it as part of feature study in the corresponding sub-section of section 6. On the other hand, cost is just one of metrics to evaluate and should not be overestimated when comparing with other metrics (e.g., performance benefit, deployment flexibility, power saving). |
| CATT | 1 we prefer to have one objective section after ‘introduction’ to list the objectives of the study   1. Regarding ‘cost’, companies can provide their analysis , however, no specific section is needed in the TR since it is not required in the WID |
| NEC | The NCR-MT for receiving the side control information is treated as a terminal device. Due to there is no service data transmission between it and gNB, so we think it can be seen as a simple terminal. Then its capability is much different with that of a normal terminal. Maybe a section to capture its capability is needed. |
| CMCC | We share the similar idea that the cost should be considered during the study. But it may not be necessary to set up a separate session for it.  For the evaluation results, we think it is clear enough to insert the evaluations results under the specific sections. Due to the limited time of SI, we may not have a 100% aligned simulation assumptions. But the general descriptions about the using scenarios and key simulation assumptions, such as O2I or O2O, FR1 or FR2, the power assumptions, could be presented along with the results. Detailed assumptions could be refer to the original contributions. |
| Sony | We are okay in general with the TR skeleton. One topic that is not mentioned but that is important is the allocation of SS/PBCH indices for use at the NCR. In the FR2 band, associating several NCRs to the same BS may lead to SS/PBCH index depletion; see, e.g., Sec. 5 in our contribution R1-2203741 for further details. This topic does not seem to fit any of the sections in the TR skeleton. Perhaps, a new section addressing this issue is needed. |
| ZTE | We are fine with this skeleton.  Regarding the cost part, it’s not necessary to capture the content if any in separately session since it’s only a reminder for the group.  For the evaluation, if there are some results associated with the discussion on certain side control information, in general, based on the consensus, we are open to include it under the section for each feature instead of dedicated one. The details of simulation can directly refer to the original contribution as citation.  For the scope of objective, it’s already included in the section 1 as scope. For others technical aspects, it can be included in the corresponding section, e.g., signalling design or as part of details for side control information, e.g., beam related procedure for beam information. |
| CEWiT | For NCR, the content of the channels like PDCCH, PUCCH, etc., will be different from the channels of the conventional UE. For e.g., NCR specific feedback for side control information in PUCCH. Please clarify in which section of the TR such information will be captured. |
| Huawei, HiSilicon | On cost, we think the analysis and evaluation results from different companies should be captured into the TR given that it is clearly stated as in SID that “NOTE1: Cost efficiency is a key consideration point for network-controlled repeaters.”. This is a clear reminder for all the designs as well as the comparison for other coverage extension solutions. We don’t understand the concern to capture such analysis.  In addition, on the performance evaluations, our understanding is that it may not fit into one subsection in section 6 since some performance evaluations are related to two side control information instead of one. Hence one cleaner way is to capture it in a separate section.  Considering the two above aspects, one possible way is to have a separate section capturing both performance evaluations and cost analysis. Then section 6 and section 7 can focus on the technical details and signaling design possibilities. |

# **Reference**

1. RP-213700, SID on NR Network-controlled Repeaters, RAN#94-e

# **Appendix**

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| 4 Introduction [Editor’s Note: This clause reuses the text from the Justification parts in SID.]  Coverage is a fundamental aspect of cellular network deployments. Mobile operators rely on different types of network nodes to offer blanket coverage in their deployments. Deployment of regular full-stack cells is one option but it may not be always possible (e.g., no availability of backhaul) or economically viable.  As a result, new types of network nodes have been considered to increase mobile operators’ flexibility for their network deployments. For example, Integrated Access and Backhaul (IAB) was introduced in Rel-16 and enhanced in Rel-17 as a new type of network node not requiring a wired backhaul. Another type of network node is the RF repeater which simply amplify-and-forward any signal that they receive. RF repeaters have seen a wide range of deployments in 2G, 3G and 4G to supplement the coverage provided by regular full-stack cells. In Rel-17, RAN4 specified RF and EMC requirements for such RF repeaters for NR targeting both FR1 and FR2.  While an RF repeater presents a cost effective means of extending network coverage, it has its limitations. An RF repeater simply does an amplify-and-forward operation without being able to take into account various factors that could improve performance. Such factors may include information on semi-static and/or dynamic downlink/uplink configuration, adaptive transmitter/receiver spatial beamforming, ON-OFF status, etc.  A network-controlled repeater is an enhancement over conventional RF repeaters with the capability to receive and process side control information from the network. Side control information could allow a network-controlled repeater to perform its amplify-and-forward operation in a more efficient manner. Potential benefits could include mitigation of unnecessary noise amplification, transmissions and receptions with better spatial directivity, and simplified network integration. 5 Modelling of Network-controlled repeater [Editor’s Note: This clause intent to capture the conceptual model of network-controlled repeater.] 6 Side control information [Editor’s Note: This clause includes the progress for each side control information, which will be captured in sub-clause.] 6.1 Beam information6.2 Timing information6.3 Information on UL-DL TDD configuration6.4 ON-OFF information6.5 Power control information7 L1/L2 signalling for side control information7.1 Signalling for side control information [Editor’s Note: This clause includes the candidate signalling for each side control information, which will be captured in sub-clause.] 7.2 Configuration of signalling8 Repeater management8.1 Solution on Repeater management8.2 Specification impacts [Editor’s Note: This clause includes the identified specification impacts for each solution based on the inputs from RAN2 and RAN3, it will be captured in sub-clause.] 9 Conclusion |