**3GPP TSG-SA5 Meeting #154 *S5-241278***

Changsa, China, 15 April - 19 April 2024

**Source: Samsung**

**Title: Throughput and latency map for EE**

**Document for: Approval**

**Agenda Item: 6.19.2**

# 1 Decision/action requested

***In this box give a very clear / short /concise statement of what is wanted.***

# 2 References

None

# 3 Rationale

This provides the new use case of MDAS.

# 4 Detailed proposal

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| **First Change** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[x] 3GPP TR 38.864, “Study on network energy savings for NR”.

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| **Next Change** |

# 5. Use Cases

5.1 Energy Saving based on Throughput and Latency requirements.

5.1.1 Description

Directional beams are formed using multiple antenna elements and directional beams are used in both common channels for initial access and in RRC\_CONNECTED state. Common signals/channels used for UE initial access are transmitted in synchronization signal block (SSB) which contains the primary synchronization channel (PSS), secondary synchronization channel (SSS) and physical broadcast channel (PBCH) in a block. An SSB burst set contains a number of SSB which are transmitted several times in time domain. Each SSB is associated with a beam is designed at different directions to cover the intended coverage area of a cell as depicted in Figure 1.

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| Figure 1: Illustration of SSB beams covering full cell coverage area. | Figure 2: Illustration of reduced number of SSB beams covering only hotspot area. |

To reduce energy consumption, SSB beams which are not required based on traffic demand can be deactivated. For example, as depicted in Figure 2, if the expected traffic (hotspot area) can be covered by 3 beams, then the remaining beams can be deactivated. Furthermore, if the expected traffic is low, periodicity of each SSB burst can be reduced for energy efficiency. Both techniques i.e. reduction of number of SSBs (A-1-2 technique in [x]) and periodicity change of SSB bursts (A-1-3 technique in [x]) are identified as key energy saving solutions in 3GPP RAN1 R18 study item “Study on network energy savings for NR”[x]. This energy saving techniques depend on the accuracy of where the expected traffic demand comes from geographically so that it can be correlated with SSB beam coverage areas.

In an another case where coverage layer is provided by the macro cells and capacity layer consists of small cells typically deployed closer to expected hotspot areas. A simple version of this scenario with one macro cell and a number of small cells within the coverage area of the macro cell is illustrated in Figure 3.



Figure 3: Illustration of network deployment with macro and small cells.

Small cells provide the required capacity to the network when traffic demand is higher, and they are switched off when traffic demand is lower. Macro cell provides the overall coverage in the whole area and offer required services during the time when the traffic demand is low. In low-traffic scenarios (e.g. during the night) all small cells are switched off. The default procedure is that when macro cell load increases, all of the small cells within the macro cell area need to be switched on. However, if an energy saving agent in the network (MDAS consumer) can find the relevant small cells which provide coverage to where majority of the traffic is (i.e. hotspot area) and switch on only those small cells it will lead to energy savings. In this case, an inaccurate decision can lead to the incorrect small cells being switched on, i.e. not providing coverage to the hotspot area and consuming additional energy, or all small cells within the macro cell need to be switched on and leading to unnecessary higher energy consumption. This energy saving techniques depend on the accuracy of where the expected traffic demand comes from geographically so that it can be correlated with cell coverage area.

This use case considers throughput and latency as main criteria to define the traffic load. It is desirable to use MDA analytics to get throughput and latency prediction for traffic load at the granular level of geographical coordinate. This will enable consumer to create throughout map of the network. Similarly, the latency map can also be provided which will further enhance the EE decisions.



**Figure 4: Throughput/Latency Map**

* + 1. Potential Requirements

REQ-TLM-FUN-01: MDA capability for energy saving analysis shall include providing the throughput and latency map for the area where the energy efficiency issue exists.

5.1.2 Potential Solutions

5.1.2.1 Solution-x

5.1.2.2 Solution-y

5.1.3 Evaluation of solutions

5.1 Use case B