**3GPP TSG- Meeting #**

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**Source: Samsung**

**Title: Solution for energy saving based on throughout requirements**

**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 solution of the existing UC in TR.

# 4 Detailed proposal

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| **First Change** |

### 5.1.1 Use case 1: Energy Saving based on throughput requirements

#### 5.1.1.1 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). Each SSB associated with a beam is designed at different directions to cover the intended coverage area of a cell as depicted in Figure 5.1.1.1-1.

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| Figure 5.1.1.1-1: Illustration of SSB beams covering full cell coverage area. | Figure 5.1.1.1-2: 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 modified or deactivated. For example, as depicted in Figure 5.1.1.1-2, if the expected traffic (hotspot area) can be covered by 3 beams, then the remaining beams can be deactivated. 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.

This use case considers throughput as main criteria to define the traffic load. It is desirable to use MDA analytics to get throughput prediction for traffic load at the granular level of geographical coordinate. This information can be then used to reduce the coverage of the beam resulting in energy savings.

Editors Note: The realization of this use case depends on the definition of beam specific energy saving mechanism.

#### 5.1.1.2 Potential requirements

**REQ-TLM-FUN-01:** MDA capability for energy saving analysis shall include providing the predicted throughput requirements for the area which is the candidate for the energy saving mechanism.

#### 5.1.1.3 Potential solutions

The enabling data for MDAAssistedEnergySaving.EnergySavingAnalysis is defined in [13]. This solution proposes additional performance metrics into this table to enrich UE throughput and location information so that throughput metrics can be processed with UE location to generate throughput requirement, at the granular level of geographical coordinate, for more accurate energy saving decisions.

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| **Data category** | **Description** | **References** |
| MDT Reports | PDCP Data Volume per UE | PDCP SDU Data volume measurement separately for DL and UL, per DRB per UE by gNB of M4 measurements in TS 32.422 and TS 32.423. |
| Average UE throughput measurement | Average UE throughput measurement separately for DL and UL, per DRB per UE and per UE for the DL, per DRB per UE and per UE for the UL, by gNB of M5 measurements in TS 32.422 and TS 32.423 |
| Packet Delay measurement | Packet delay measurement, separately for DL and UL, per DRB per UE by gNB of M6 measurements in TS 32.422 and TS 32.423 |
| UE location reports | UE location information provided by the LMF services. | The UE location information provided by LMF via service-based interface (see TS 23.273). The mapping between the UE location and the SSB coverage need to be decided and up to the producer implementation. |

The analytics output for MDAAssistedEnergySaving.EnergySavingAnalysis is defined in [13]. This solution propose that throughput information at the granular level of geographical coordinate is added to the analytics output. Additionally the recommendation on the SSB to enter energy saving state is also provided based on the throughput requirements at the granular level of geographical coordinate.

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| **Information element** | **Definition** | **Support qualifier** | **Properties** |
| rANenergySavingRecommendationSSB | For ES on NR cell SSBs. It may contain a set of:  - Recommended NRCell SSB to enter energySaving state.  - Reason for energySavingState suggestion  - Recommended candidate cell SSBs with precedence for taking over the traffic of the ES-Cell.  - The time to enter and terminate the energy saving state.  - The load threshold to enter and terminate the energy saving state for the NR Cell SSB. | M | type: EsRecommendationOnNRcellSSB  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False  Editors Note: the <<datatype>> EsRecommendationOnNRcellSSB will be defined in the normative phase. |
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#### 5.1.1.4 Evaluation of solutions