**#3GPP TSG RAN WG1 #102-e R1-20xxxxx**

**e-Meeting, August 17th – 28th, 2020**

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**Source:** Moderator (LG Electronics)

**Title:** FL summary#1 for AI 8.11.1 SL evaluation methodology update for power saving

**Document for:** Discussion and decision

1. **Email discussion**

As per Chairman’s guideline, the following email discussion was allocated for AI 8.11.1. Please provide your view on the questions in Section 1.1/1.2/1.3/1.4 **by 8/19 (Wednesday)**. Based on the collected view, I’ll make a set of proposals that will be discussed and finalized **by 8/21**. Note that other remaining assumptions, if any, will be discussed/finalized in the second phase of email discussion.

* + - * **[102-e-NR-SL\_enh-01] Email discussion/approval using the summary as a starting point, focusing on simulation assumptions – Seungmin (LGE)**
* **By 8/21 – Simulation assumptions, critical ones**
* **By 8/27 – Remaining simulation assumptions**

**1.1 Reference configuration for power consumption model**

* + - * Q1: Do you agree that the number of SL symbols in a slot is 14 (including AGC and TX-RX switching period)?

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* + - * Q2: Do you agree that the SCS for FR1 is 30kHz and the SCS for FR2 is 120kHz?

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* + - * Q3: Do you agree that the system BW for power consumption model is 100MHz as in TR38.840?

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* + - * Q4: Do you agree that the number of OFDM symbols for PSCCH (excluding AGC symbol) is 2?

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* + - * Q5: Do you agree that the modulation order for power consumption model is 256QAM as in TR38.840?

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* + - * Q6: Do you agree that the number of TX APs for power consumption model is 1 as in TR38.840?

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* + - * Q7: Do you agree that the number of RX APs for power consumption model is 4 for FR1 or 2 for FR2 as in TR38.840?

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* + - * Q8: Do you agree that TX power for power consumption model is {0dBm, 23dBm} for FR1 as in TR38.840? Do you agree that TX power for power consumption model is 0dBm for FR2?

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**1.2 Power consumption scaling for adaptation**

* + - * Q1: Do you agree to support that X MHz power for RX is (0.4 +0.6\*(X-20)/80)\*100MHz power for RX?

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* + - * Q2: Do you agree that no scaling is supported for SL BWP adaptation in TX perspective?

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* + - * Q3: For antenna scaling in RX perspective, do you agree that 2Rx power is 0.7\*4Rx power for FR1 and 1Rx power is 0.7\*2Rx power for FR2?

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* + - * Q4: For antenna scaling in TX perspective for FR1, do you agree that 2Tx power is 1.4\*1Tx power at 0dBm and 1.2\*1Tx power at 23dBm? Is the antenna scaling in TX perspective necessary for FR2?

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* + - * Q5: Other power consumption scaling for adaptation (please specify)

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**1.3 Power consumption level**

* + - * Q1: Do you agree to reuse three states of “Sleep” specified in TR38.840 including transition time and energy consumption?

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* + - * Q2: In “1st SCI/2nd SCI RX” state, a UE tries to decode 1st SCI on PSCCH and 2nd SCI on PSSCH, but the UE does not decode SL-SCH on PSSCH. In this case, what is the UE power consumption level?
* Q2-1: For power consumption level of “1st SCI/2nd SCI RX” in non-PSFCH-slot, which option is used?
  + Option 1: Same as power consumption level of “PDCCH-only” for same-slot scheduling
  + Option 2: Scaling factor Y \* power consumption level of “PDCCH-only” for same-slot scheduling
    - Option 2-1: Y = 1.45
    - Option 2-2: Y= 2
  + Option 3: Scaling factor Y \* power consumption level of “PSCCH/PSSCH RX”
    - Y is selected from [0.6 0.7 0.8 0.9]

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* Q2-2: For power consumption level of “1st SCI/2nd SCI RX” in PSFCH-slot, which option is used?
  + Option 1: Same as power consumption level of “PDCCH-only” for same-slot scheduling
  + Option 2: Scaling factor Y \* power consumption level of “PDCCH-only” for same-slot scheduling
    - Y = 0.85
  + Option 3: Scaling factor Y \* power consumption level of “PSCCH/PSSCH RX”
    - Y is selected from [0.6 0.7 0.8 0.9]

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* + - * Q3: In “PSCCH/PSSCH RX” state, a UE tries to decode 1st SCI on PSCCH and 2nd SCI on PSSCH, and SL-SCH on PSSCH. In this case, what is the UE power consumption level?
* Q3-1: For power consumption level of “PSCCH/PSSCH RX” in non-PSFCH-slot, do you agree that the power consumption level is the same as that of “PDCCH+PDSCH”?

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* Q3-2: For power consumption level of “PSCCH/PSSCH RX” in PSFCH-slot, do you agree that the power consumption level is 0.9\*power consumption level of “PDCCH+PDSCH”?

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* + - * Q4: In “PSCCH/PSSCH TX” state, a UE transmits PSCCH and PSSCH. In this case, what is the UE power consumption level?
* Q4-1: For power consumption level of “PSCCH/PSSCH TX” in non-PSFCH-slot, do you agree that the power consumption level is the same as that of “UL” for long PUCCH or PUSCH?

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* Q4-2: For power consumption level of “PSCCH/PSSCH TX” in PSFCH-slot, do you agree that the power consumption level is 0.8\*power consumption level of “UL” for long PUCCH or PUSCH?

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* + - * Q5: In “PSFCH TX” or “PSFCH RX” state, a UE transmits or receives PSFCH only in a slot, respectively. In this case, what is the UE power consumption level?
* Q5-1: For power consumption level of “PSFCH TX”, which option is used?
  + Option 1: Same as power consumption level of “UL” for short PUCCH
  + Option 2: Scaling factor Y\*power consumption level of “UL” for long PUCCH or PUSCH
    - Option 2-1: Y=0.36
    - Option 2-2: Y= 0.2
  + Option 3: 72

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* Q5-2: For power consumption level of “PSFCH RX”, which option is used?
  + Option 1: Same as power consumption level of “PDCCH-only” for same-slot scheduling
  + Option 2: Same as power consumption level of “PDCCH-only” for cross-slot scheduling
  + Option 3: 5 for FR1, 30 for FR2

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* + - * Q6: In PSFCH-slot, a UE can (1) SCI decoding only, (2) SCI decoding and PSFCH RX, (3) SCI decoding and PSFCH TX, (4) PSCCH/PSSCH decoding, (5) PSSCH/PSSCH decoding and PSFCH RX, (6) PSCCH/PSSCH decoding and PSFCH TX, (7) PSCCH/PSSCH TX and PSFCH RX, or (8) PSSCH/PSSCH TX and PSFCH TX. What is the power consumption level of a combination of PSCCH/PSSCH/PSFCH operation?
* Q6-1: For power consumption level of a combination of “1st SCI/2nd SCI RX” and “PSFCH RX”, do you agree that the power consumption level is the same as that of “1st SCI+2nd SCI RX” in non-PSFCH-slot?

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* Q6-2: For power consumption level of a combination of “PSCCH/PSSCH RX” and “PSFCH RX”, do you agree that the power consumption level is the same as that of “PSCCH/PSSCH RX” in non-PSFCH-slot?

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* Q6-3: For power consumption level of a combination of “PSCCH/PSSCH TX” and “PSFCH TX”, do you agree that the power consumption level is the same as that of “UL (long PUCCH or PUSCH)”?

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* Q6-4: For power consumption level of a combination of “1st SCI/2nd SCI RX” and “PSFCH TX”, do you agree that the power consumption level is a sum of power consumption level of “1st SCI/2nd SCI RX” in PSFCH-slot and power consumption level of “PSFCH TX”?

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* Q6-5: For power consumption level of a combination of “PSCCH/PSSCH RX” and “PSFCH TX”, do you agree that the power consumption level is a sum of power consumption level of “PSCCH/PSSCH RX” in PSFCH-slot and power consumption level of “PSFCH TX”?

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* Q6-6: For power consumption level of a combination of “PSCCH/PSSCH TX” and “PSFCH RX”, do you agree that the power consumption level is a sum of power consumption level of “PSCCH/PSSCH TX” in PSFCH-slot and power consumption level of “PSFCH RX”?

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* + - * Q7: In “S-SSB RX”, a UE tries to detect S-SSB and decode PSBCH. In “S-SSB TX”, a UE transmits S-SSB in a slot. What is the power consumption level?
* Q7-1: For power consumption level of “S-SSB RX”, which option is used?
  + Option 1: Same as power consumption level of “SSB processing” with 1 SSB in a slot
  + Option 2: Same as power consumption level of “SSB processing” with 2 SSB in a slot
  + Option 3: Same as that of “1st SCI/2nd SCI RX” in non-PSFCH-slot
  + Option 4: 150
  + Option 5: 0.3
  + Option 6: 5

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* Q7-2: For power consumption level of “S-SSB TX”, do you agree that the power consumption level is the same as power consumption level of “UL” for (long PUCCH or PUSCH)?

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* + - * Q8: Depending on the Synch reference source, a UE performs synchronization process based on GNSS, SSB from gNB, or S-SSB from another UE. What is the power consumption level?
* Q8-1: For power consumption level of “GNSS-processing”, which option is used?
  + Option 1: 5
  + Option 2: 8
  + Option 3: 15
  + Option 4: 0.08\*Power consumption level of PSCCH/PSSCH RX

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* Q8-2: For power consumption level of “SSB-processing”, which option is used?
  + Option 1: Same as power consumption level of “SSB processing”
  + Option 2: 10

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* + - * Q9: For power consumption level of “CSI-RS processing”, which option is used?
* Option 1: Same as that of “CSI-RS processing”
* Option 2: 150
* Option 3: 0.4 for FR1, 300 for FR2
* Option 4: No need to specify it

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**1.4 Other remaining assumptions (to be discussed/finalized by 8/27)**

* + - * Q1: What additional assumptions (other than those in Section 1.1/1/2/1/3) are needed to discussed/finalized during the second phase of email discussion?

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1. **Appendix A -** Summary of contributions
   * + - Power consumption model for Rel-17 NR sidelink

* Reference configuration for power consumption model
  + FR1
    - Number of SL symbols in a slot (including AGC and TX-RX switching periods)
      * 7: [1]
      * 14: [1], [9]
    - SCS
      * 30kHz: [1], [2], [3], [5], [9], [11], [12], [15], [16], [20]
    - System BW
      * 20MHz: [5], [11], [12], [16], [20]
      * 40MHz: [1], [3], [12], [15], [20]
      * 100MHz: [2], [9]
    - PSCCH
      * 2 symbols: [1], [3], [9], [11], [15]
      * 3 symbols: [2], [15], [20]
    - PSSCH
      * Modulation order:
        + 64QAM: [1], [3], [5], [11], [15], [20]
        + 256QAM: [2], [9], [15]
    - Number of TX APs
      * 1: [1], [2], [5], [9], [15], [20]
      * 2: [11], [12]
    - Number of RX APs
      * 2: [1], [5], [9], [15], [20]
      * 4: [11]
    - TX power
      * 0 dBm: [1], [3], [5], [9], [11]
      * 23 dBm: [1], [3], [5], [9], [11], [12], [20]
      * 26 dBm: [12]
  + FR2
    - Number of SL symbols in a slot (including AGC and TX-RX switching periods)
      * 7: [1]
      * 14: [1], [9]
    - SCS
      * 120kHz: [1], [9], [11], [16]
    - System BW
      * 100MHz: [1], [9], [16]
      * 200MHz: [11]
    - PSCCH
      * 2 symbols: [1], [9], [11]
    - PSSCH
      * Modulation order:
        + 64QAM: [1], [11]
        + 256QAM: [9]
    - Number of TX APs
      * 1: [1], [9]
      * 2: [11]
    - Number of RX APs
      * 2: [1], [9], [11]
    - TX power
      * 0 dBm: [1], [9]
      * 23 dBm: [1], [11]
* Power consumption scaling for adaptation
  + SL BWP size adaption
    - For reception: Scaling of X MHz = 0.4 +0.6\*(X-20)/80 compared to 100MHz
      * Support: [1], [2], [5], [9], [11]
    - For transmission: No scaling
      * Support: [1], [2], [5], [9]
    - Antenna scaling in RX perspective
      * 2Rx power is 0.7x 4Rx power
        + Support: [1], [9], [11]
      * 1Rx power is 0.7x 2Rx power
        + Support: [1], [5], [9], [11]
    - Antenna scaling in TX perspective
      * 2Tx power is 1.4x 1Tx power at 0dBm. 1.2x at 23dBm FR1 only
        + Support: [5], [9], [11]
    - Additional scaling for adaptation
      * Scaling based on symbol duration
        + 0.6x 14-symbol case for 7-symbol case: [1]
        + Linear interpolation for various symbol duration: [5], [13]
      * Linear interpolation for other TX power: [2], [7]
      * Scaling based on the number of BD: [11]
      * Scaling based on the number of allocated PRBs: [11], [13], [17]
* Power consumption level
  + Reuse three states of “Sleep” specified in TR38.840 including transition time and energy consumption.
    - Support: [1], [2], [3], [5], [7], [9], [11], [15], [16], [17], [20]
  + 1st SCI+2nd SCI RX
    - In non-PSFCH-slot:
      * [0.6 0.7 0.8 0.9] \* power consumption level of “PSCCH/PSSCH RX”: [3]
      * Same as that of “PDCCH-only” with same-slot scheduling: [5], [7], [11]
      * Larger than that of “PDCCH-only” with same-slot scheduling: [9]
        + 1.45 \* Power consumption level of “PDCCH-only” with same-slot scheduling: [9]
        + 2 \* Power consumption level of “PDCCH-only” with same-slot scheduling: [15]
    - In PSFCH-slot:
      * 0.85 \* power consumption level of “1st SCI+2nd SCI RX” in non-PSFCH-slot: [9]
  + PSCCH/PSSCH RX
    - In non-PSFCH-slot:
      * Same as that of “PDCCH+PDSCH: [1], [2], [3], [5], [7], [9], [11], [15]
    - In PSFCH-slot:
      * 0.9 \* power consumption level of “PSCCH/PSSCH RX” in non-PSFCH-slot: [9]
  + PSCCH/PSSCH TX
    - In non-PSFCH-slot:
      * Same as that of “UL (long PUCCH or PUSCH)”: [1], [2], [3], [5], [7], [9], [11]
      * 300 for FR1, 350 for FR2: [16]
      * 400: [17]
    - In PSFCH-slot:
      * 0.8 \* power consumption level of “PSCCH/PSSCH TX” in non-PSFCH-slot: [9]
  + S-SSB RX:
    - Same as that of “SSB processing” with 1 SSB in a slot: [1]
    - Same as that of “SSB processing” with 2 SSBs in a slot: [3], [5], [16]
    - Same as that of “1st SCI+2nd SCI RX” in non-PSFCH-slot: [9]
    - 150: [7]
    - 0.3: [13]
  + S-SSB TX:
    - Same as that of “UL (long PUCCH or PUSCH)”: [1], [3], [5], [9], [11]
  + GNSS-operation:
    - 5: [7]
    - 8: [1]
    - 15: [11]
    - 0.08\*Power consumption level of PSCCH/PSSCH RX: [3], [9]
  + Synch gNB
    - 10: [11]
  + Synch SLSS
    - 5: [11]
  + CSI-RS RX
    - Same as that of “CSI-RS processing”: [2]
    - 150: [7]
    - 0.4 for FR1, 300 for FR2: [11]
    - Not necessary to specify it: [9]
  + PSFCH TX
    - Same as that of “UL (short PUCCH)”: [1], [2], [3], [7], [15]
    - Different value compared to “UL (short PUCCH)”: [9], [11]
      * 0.36 for scaling factor: [9]
      * 0.2 for scaling factor: [11]
      * 62: [17]
  + PSFCH RX
    - Same as that of “PDCCH only” for same-slot scheduling: [1], [3], [15], [16]
    - Same as that of “PDCCH only” for cross-slot scheduling: [9]
    - 5 for FR1, 30 for FR2: [11]
  + 1st SCI+2nd SCI RX and PSFCH RX
    - Same as that of “1st SCI+2nd SCI RX” in non-PSFCH-slot: [9]
  + PSCCH/PSSCH RX and PSFCH RX
    - Same as that of “PSCCH/PSSCH RX” in non-PSFCH-slot: [9]
  + PSCCH/PSSCH TX and PSFCH TX
    - Same as that of “UL (long PUCCH or PUSCH)”: [9]
  + 1st SCI+2nd SCI RX and PSFCH TX
    - Sum of power consumption level of “1st SCI+2nd SCI RX” in PSFCH-slot and power consumption level of “PSFCH TX”: [9]
  + PSCCH/PSSCH RX and PSFCH TX
    - Sum of power consumption level of “PSCCH/PSSCH RX” in PSFCH-slot and power consumption level of “PSFCH TX”: [9]
  + PSCCH/PSSCH TX and PSFCH RX
    - Sum of power consumption level of “PSCCH/PSSCH TX” in PSFCH-slot and power consumption level of “PSFCH RX”: [9]
* Performance metric
  + PRR reduction ratio compared to the baseline scheme
    - Support: [1], [11], [12], [13]
  + Power consumption reduction ratio compared to Rel-16 NR sidelink operation
    - Support: [1], [11], [12], [13]
      * Further consideration on evaluation methodology for pedestrian UE: [14], [2], [3], [8], [10], [11], [16], [20]
      * Further consideration on evaluation for other Use cases: [16], [2], [6], [10], [11], [18]
* Public safety scenario: [16], [2], [6]
* Commercial scenario: [2], [3], [11], [18]
* Dynamic ride sharing and tethering via Vehicle: [10]

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