Agreement on EVM in Rel.16

**Agreement**

Existing EVM (Table A.2.1-1 of TS38.802 or NR phase 2 EVM) can be a starting point with additional updates.

Proposal 2-0: Use the table 2-1 with the following additional updates

**Table 2-1**. SLS assumptions for CSI enhancement

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Duplex, Waveform | | FDD (TDD is not precluded), OFDM |
| Multiple access | | OFDMA |
| Scenario | | Dense Urban (Macro only) is a baseline.  Other scenarios (e.g. UMi@4GHz 2GHz, Urban Macro) are not precluded. |
| Frequency Range | | FR1 only, 4GHz. |
| Inter-BS distance | | 200m |
| Channel model | | According to the TR 38.901 |
| Antenna setup and port layouts at gNB | | Companies need to report which option(s) are used between   * 32 ports: (8,8,2,1,1,2,8), (dH,dV) = (0.5, 0.8)λ * 16 ports: (8,4,2,1,1,2,4), (dH,dV) = (0.5, 0.8)λ   Other configurations are not precluded. |
| Antenna setup and port layouts at UE | | 4RX: (1,2,2,1,1,1,2), (dH,dV) = (0.5, 0.5)λ for rank > 2  2RX: (1,1,2,1,1,1,1), (dH,dV) = (0.5, 0.5)λ for (rank 1,2) Type II overhead reduction  Other configuration is not precluded. |
| BS Tx power | | 41 dBm |
| BS antenna height | | 25m |
| UE antenna height & gain | | Follow TR36.873 |
| UE receiver noise figure | | 9dB |
| Modulation | | Up to 256QAM |
| Coding on PDSCH | | LDPC  Max code-block size=8448bit |
| Numerology | Slot/non-slot | 14 OFDM symbol slot |
| SCS | 15kHz |
| Number of RBs | | 52 for 15 kHz SCS |
| Simulation bandwidth | | 10 MHz for 15kHz as a baseline, and configurations which emulate larger BW, e.g., same sub-band size as 40/100 MHz with 30kHz, may be optionally considered. |
| Frame structure | | Slot Format 0 (all downlink) for all slots |
| MIMO scheme | | SU/MU-MIMO with rank adaptation is a baseline for overhead reduction.  For low RU, SU-MIMO or SU/MU-MIMO with rank adaptation are assumed for higher rank extension.  For medium/high RU, SU/MU-MIMO with rank adaptation is assumed for higher rank extension. |
| MIMO layers | | For all evaluation, companies to provide the assumption on the maximum MU layers (e.g. 8 or 12) |
| CSI feedback | | Feedback assumption at least for baseline scheme   * CSI feedback periodicity (full CSI feedback) :  5 ms, * Scheduling delay (from CSI feedback to time to apply in scheduling) :  4 ms |
| Overhead | | Companies shall provide the downlink overhead assumption |
| Traffic model | | FTP model 1 with packet size 0.5 Mbytes  Other FTP model is not precluded. |
| Traffic load (Resource utilization) | | * 50/70 % for CSI overhead reduction * 20/50 % for high rank extension   Companies are encouraged to report the MU-MIMO utilization. |
| UE distribution | | - 80% indoor (3km/h), 20% outdoor (30km/h) |
| UE receiver | | MMSE-IRC as the baseline receiver |
| Feedback assumption | | Realistic |
| Channel estimation | | Realistic |
| Evaluation Metric | | Throughput and CSI feedback overhead as baseline metrics.  Additional metrics, e.g., ratio between throughput and CSI feedback overhead, can be used.  Maximum overhead (payload size for CSI feedback)for each rank at one feedback instance is the baseline metric for CSI feedback overhead, and companies can provide other metrics. |
| Baseline for performance evaluation | | Rel-15 Type II Codebook is the baseline for performance and overhead evaluation for overhead reduction. (Type I Codebook can be considered at least for performance evaluation)   * Companies are encouraged to compare the proposed overhead reduction scheme with Rel-15 overhead reduction scheme,   Rel-15 Type I Codebook is the baseline for performance and overhead evaluation for higher rank codebook. |

**Agreement**

For multi-TRP/panel performance evaluation:

* + For eMBB in FR1, 10MHz BW and 15kHz SCS are baseline.
  + For eMBB in FR1, 20MHz BW and 30kHz SCS are optional.
  + For eMBB in FR2, 80MHz BW and 120kHz SCS are baseline.

**Agreement**

For URLLC multi-TRP/panel performance evaluation, choose a subset of evaluation scenarios/assumptions agreed in the URLLC agenda item

**Agreement**

For eMBB multi-TRP/panel performance evaluation, FTP traffic model 1 with packet size 0.5Mbytes as a baseline, and other traffic model is not precluded. RU=20/40/60% are baseline, and optional low RU (e.g. 5/10) can be considered.

**Agreement**

For eMBB multi-TRP/panel performance evaluation, MMSE IRC is the baseline, and advanced receiver is not precluded. Practical channel estimation and feedback model are used.

**Agreement**

* For eMBB multi-TRP performance evaluation, ideal and non-ideal backhaul are considered, the following delay values are assumed:
  + Ideal backhaul: 0ms
  + Non-ideal backhaul: 2ms, 5ms, 50ms(optional)
* For URLLC multi-TRP performance evaluation, ideal and non-ideal backhaul are considered, the following delay values are assumed:
  + Ideal backhaul: 0ms
  + Non-ideal backhaul: 2ms, 5ms(FFS, optional)
* Companies to provide the delay values used in their evaluations

Agreement: Table 1 SLS assumption for eMBB multi-TRP/panel enhancement

|  |  |  |
| --- | --- | --- |
| Parameters | Dense urban (Macro Only) | Indoor hotspot |
| Carrier frequency | 2GHz/4GHz is baseline (each company to choose 1 or more)  30GHz is optional | 4GHz is baseline,  30GHz is optional |
| Channel model | TR38.901 | |
| TP antenna configuration | 4 ports: (M, N, P, Mg, Ng, Mp, Np) = (8,2,2,1,1,1,2)  16 ports: (M, N, P, Mg, Ng Mp, Np) = (8,4,2,1,1,2,4)  (dH, dV) = (0.5, 0.8)λ for FR1  2 ports (8,8,2,1,1) and 8 ports (4,8,2,2,2) for 30GHz  Other antenna configurations is not precluded (such as 32 ports) | 2 ports: (M, N, P, Mg, Ng) = (1,1,2,1,1)  for 4GHz  2 ports: (4,4,2,1,1) for 30GHz  Other antenna configurations is not precluded. |
| UE antenna configuration | 4Rx Port: (Baseline)  (M,N,P,Mg,Ng,Mp,Np) = =(1,2,2,1,1,1,2), (dH,dV) = (0.5, 0.5)λ for FR1  For 30 GHz: (M, N, P, Mg, Ng) = (2, 4, 2, 1, 2); (dV, dH) = (0.5, 0.5)λ. (dg,V, dg,H) = (0, 0)λ. \* Θmg,ng=90°; Ω0,1=Ω0,0+180 | 4Rx Port: (Baseline)  (M,N,P,Mg,Ng,Mp,Np) = =(1,2,2,1,1,1,2), (dH,dV) = (0.5, 0.5)λ for 4GHz  For 30 GHz: (M, N, P, Mg, Ng) = (2, 4, 2, 1, 2); (dV, dH) = (0.5, 0.5)λ. (dg,V, dg,H) = (0, 0)λ. \* Θmg,ng=90°; Ω0,1=Ω0,0+180 |
| Coordination assumptions | Each company to provide details on cluster size, coordination scheme, etc | |

**Agreement**

Baseline scheme to evaluate eMBB multi-TRP enhancements is DPS or single TRP

* Each company to provide the details on backhaul delay, CSI reporting, transmission scheme, scheduling, etc

**Agreement**

The LLS/SLS simulation assumptions list in the following 2 tables below are agreed except for the red entries which will be discussed over email

Table 2. Simulation assumptions for beam management. (LLS)

|  |  |
| --- | --- |
| Parameters | Values |
| Carrier Frequency | 30 GHz |
| Subcarrier Spacing for data | For 30 GHz: 120kHz |
| Data allocation | 8 RBs (baseline), Larger # of PRB (e.g. 32) can be considered.  First 2 OFDM symbols for PDCCH, and following 12 OFDM symbols for data channel |
| Channel Model | CDL-A model  -               delay spread =30ns  -               UE speed=3km/h. (baseline) 30, 60km/h (optional)  -               The angles of BS, i.e., AoD, ZoD, are uniformly distributed within [-60, 60] degrees in azimuth domain and [90, 135] degrees in zenith domain, and those of UE, i.e., AoA, ZoA, are uniformly distributed within [-180, 180] degrees in azimuth domain and [45, 90] in zenith domain, via applying uniform-distribution desired mean angle in subclause 7.7.5.1 in TR 38.901 accordingly. |
| TXRU mapping to antenna elements | Companies explain details of the using TXRU mapping to antenna elements.  Notes:  2D DFT based beam per polarization as a baseline; |
| TXRU mapping weights | Companies to provide details on TXRU mapping weights. |
| Procedure of beam sweeping | Companies to provide details on procedure of beam sweeping. |
| Criteria for beam selection | Companies to provide details on criteria for beam selection. |
| UE reporting | Companies to provide details on criteria for UE reporting. |
| BS antenna configurations | For 30 GHz: (M, N, P, Mg, Ng) = (4, 8, 2, 2, 2). (dV, dH) = (0.5, 0.5)λ. (dg,V, dg,H) = (2.0, 4.0)λ  or (M, N, P, Mg, Ng) = (4, 8, 2, 1, 1). (dV, dH) = (0.5, 0.5)λ. (dg,V, dg,H) = (2.0, 4.0)λ  Other Antenna configuration is not precluded. |
| BS antenna element radiation pattern | For 30 GHz: According to TR38.802 |
| UE antenna configurations | For 30 GHz: (M, N, P, Mg, Ng) = (2, 4, 2, 1, 2) or (M, N, P, Mg, Ng) = (2, 4, 2, 1, 1)  (dV, dH) = (0.5, 0.5)λ. (dg,V, dg,H) = (0, 0)λ. \* Θmg,ng=90°; Ω0,1=Ω0,0+180°;  Other Antenna configuration is not precluded. |
| BS array orientation | azimuth 0 degree; mechanic downtilt: 0 degree |
| UE array orientation | ΩUT,a uniformly distributed on [0, 360] degree, ΩUT,b = 0°, ΩUT,g = 0° (baseline) |
| UE antenna element radiation pattern | See Table A.2.1-8 in TR 38.802 |
| Transmission scheme | Multi-antenna port transmission schemes  Note: Companies explain details of the using transmission scheme. |
| MIMO mode | SU-MIMO |
| UE receiver type | MMSE-IRC as baseline; other advanced receiver is not precluded. |
| Link adaptation | Based on CSI-RS |

Table 3. Evaluation assumptions for beam management (SLS)

|  |  |
| --- | --- |
| Parameters | Values |
| Scenarios | Indoor hotspot  Dense Urban Micro layer only |
| Mode | DL SU-MIMO/ MU-MIMO |
| Simulation bandwidth | 80MHz (DL+UL), TDD |
| Subcarrier Spacing for data | 120kHz,  (Other subcarrier spacings can be considered) |
| Channel Model | Following related assumption in TR 38.802/38.901 |
| TXRU mapping to antenna elements | Companies explain the details of TXRU mapping to antenna elements.  Notes:  2D DFT based beam per polarization as a baseline; |
| TXRU mapping weights | Companies explain the details of TXRU mapping weights. |
| Criteria for selection for serving TRP | Companies explain the details of criteria for selection for serving TRP. |
| Criteria for beam selection for serving TRP | Companies explain the details of criteria for beam selection for serving TRP. |
| Constraints for the range of selective beams per TRP sector | Companies explain what scheme is used |
| Scheduling algorithm | Companies explain what scheme is used |
| Link adaptation | Based on CSI-RS. |
| Traffic Model | FTP model 3 with packet size 0.5Mbytes (other value is not precluded).  Other traffic models including the full buffer are not precluded. |
| BS antenna configurations | (M, N, P, Mg, Ng) = (4, 8, 2, 2, 2). (dV, dH) = (0.5, 0.5) λ. (dg,V, dg,H) = (2.0, 4.0) λ  Note: important to consider also other antenna configurations to maintain flexibility |
| BS antenna element radiation pattern | According to TR38.802 |
| UE antenna configurations | (M, N, P, Mg,Ng) = (2, 4, 2, 1, 2); (dV, dH) = (0.5, 0.5) λ. (dg,V, dg,H) = (0, 0) λ. \*Θmg,ng=90°; Ω0,1=Ω0,0+180°;  Note: important to consider also other antenna configurations to maintain flexibility |
| UE antenna element radiation pattern | See Table A.2.1-8 in TR 38.802 |
| Inter-panel calibration for UE | Ideal, non-ideal following 38.802 (optional) |
| Beam correspondence | Companies report details of the assumptions |
| Control and RS overhead | Companies report details of the assumptions |
| Control channel decoding | Ideal or Non-ideal (Companies explain how is modeled) |
| UE receiver type | MMSE-IRC as the baseline, other advanced receiver is not precluded |
| BF scheme | Companies explain what scheme is used |
| Transmission scheme | Multi-antenna port transmission schemes  Note: Companies explain details of the using transmission scheme. |
| UE mobility feature | Companies to provide details on add-on features including UE mobility, rotation, blockage, etc. |