3GPP TSG RAN#102
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RP-233491

Views on Rel-19 RAN4-led RF

LG Electronics

Candidate Topics on RF Enhancement

- **Further RF enhancement for sidelink**
  - PC3 SL-U
  - SL CA
    - SL intra-band contiguous CA
    - SL intra-band non-contiguous CA
    - SL inter-band CA
  - Intra-band con-current operation of NR-U and SL-U @ Un-licensed band
  - 3Tx for inter-band con-current operation w/ sidelink
  - 4Tx for sidelink

- **FR2 RF enhancement**
  - UL256QAM for frequency > 39GHz FR2-1

- **New frequency range**
  - Study feasibility on the upper-mid band (e.g., 7-24GHz frequency range)

Further RF enhancement for sidelink

- **Motivation**
  - PC3 SL-U
    - In Rel-18, due to lack of time, only power class 5 was specified in SL-U.
    - PC3 SL-U was agreed to be specified in future release.
  - SL CA
    - In Rel-18, due to lack of time, only PC3 SL intra-band contiguous CA was specified.
    - PC2 SL intra-band contiguous CA, PC3 & PC2 SL intra-band non-contiguous CA, and inter-band CA (n47+n46/n96/n102) need to be specified by considering CAR OEM interest.
  - Intra-band con-current operation of NR-U and SL-U @ Un-licensed band
    - In Rel-18, NR-U and SL-U were specified in un-licensed band (n46, n96, n102)
      - NR-U : PC3(Rel-18), Power class 5(Rel-17)
      - SL-U : Power class 5
    - In Rel-17, NR V2X intra-band con-current operation on a licensed band was specified.
    - On a un-licensed band, SL-U con-current operation with NR-U needs to be specified.
    - This could be discussed under spectrum work item.

Further RF enhancement for sidelink

- **Motivation**
  - 3Tx for inter-band SL con-current operation
    - In Rel-18, 3Tx with two bands for inter-band UL CA or EN-DC was specified for high power UE, such as power class 2 and 1.5
      - PC3 FDD(1Tx) + PC3/PC2 TDD(2Tx)
      - PC3 TDD(1Tx) + PC2 TDD(2Tx)
      - PC3 FDD(1Tx) + PC1.5 TDD(2Tx)
    - The existing requirements of inter-band SL con-current operation were specified as follows with limitation of PC3 on Uu.
      - PC3 FDD/TDD NR (1Tx) + PC3 TDD NR SL(1Tx)
    - 3Tx with two band for inter-band SL con-current operation needs to be specified
  - 4Tx for SL
    - In Rel-18, 4Tx RF requirements were specified for high power UE, i.e, power class 1.5
    - The existing SL requirements were specified with power class 3 and power class 2.
      - To enhance SL communication range, the higher power class is required.
    - Power class 1.5 can be implemented by 4Tx (4x23dBm)

Further RF enhancement for sidelink

- **Objective**
  - PC3 SL-U
    - Specify UE RF requirements for PC3 SL-U considering 1Tx and 2Tx
  - SL CA
    - Specify UE RF requirements for SL intra-band contiguous CA (PC2)
    - Specify UE RF requirements for SL intra-band non-contiguous CA (PC3 & PC2)
    - Specify UE RF requirements for SL inter-band CA, PC3 SL@n47 + Power class 5 SL@unlicensed band(n46/n96/n102)
  - Intra-band con-current operation of NR-U and SL-U @ Un-licensed band
    - Specify UE RF requirements for SL-U intra-band con-current operation with NR-U on un-licensed band (n46, n96, n102)
      - Power class 5 NR-U + Power class 5 SL-U
      - PC3 NR-U + Power class 5 SL-U
      - Power class 5 NR-U + PC3 SL-U
      - PC3 NR-U + PC3 SL-U
  - 3Tx for inter-band SL con-current operation
    - Study and specify UE RF requirements for inter-band SL con-current operation with 3Tx for two band as follows
      - PC3 TDD NR (2Tx, UL MIMO) + PC3 NR SL(1Tx)
      - PC2 TDD NR (2Tx, UL MIMO and TxD) + PC3 NR SL(1Tx)
      - PC3 TDD NR (1Tx) + PC2 NR SL(2Tx, SL-MIMO)
      - PC3 FDD NR (1Tx) + PC3 NR SL(2Tx, SL-MIMO)
      - PC3 FDD NR (1Tx) + PC2 NR SL(2Tx, SL-MIMO and TxD)
  - 4Tx for SL
    - Study and specify UE RF requirements for 4Tx SL in n47
    - Target power class is PC1.5

FR2 RF enhancement

- **Motivation**
  - Frequency range of 24.25GHz~52.6GHz is defined in FR2-1, however, UL 256QAM is specified up to 39GHz in Rel-18.
  - FR2-1 device, e.g., FWA is expected to be deployed in the near future.
  - Therefore, UL256QAM for frequency > 39GHz in FR2-1 needs to be specified.

- **Objective**
  - UL256QAM for frequency > 39GHz in FR2-1
    - Specify UL256QAM requirement for frequency > 39GHz in FR2-1 based on the result of feasibility study

New frequency range : upper-mid band

- **Motivation**
  - In Rel-16, study item for 7.125 – 24.250 GHz frequency range was performed
    - The study did not reveal any blocking points for introducing the NR technologies to the frequency range between 7.125-24.250GHz
    - Work item that develop the requirements for selected band(s) within the range can be started based on industry needs and proposals
  - RAN4 should update the earlier study with focus on changes in regulative landscape and improvements in RF technology

- **Objective (SID)**
  - Update the regulatory landscape in 7-24GHz frequency range in 6 months starting from Q3 2024
  - Co-existence study if needed
  - Update RF technology considerations
    - BS aspects
    - UE aspects