RWS-140024

KDDI Proposals on Technology Requirement Clarification

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KDDI Corporation

KDDI Position on LTE-U

- **KDDI understandings on LTE-U (2014/6)**
  - Motivation: further boost LTE performance to meet the increasing mobile traffic demands in a efficient way
  - Main deployment assumption: in a licensed-LTE-assisted manner (via carrier aggregation)
  - LTE-U features: seems to include listen-before-talk

However, from our points of view, it is desirable to further clarify technology requirements as a prerequisite for leading "the LTE-U" to be an attractive option

KDDI proposal:
Clarify technology requirements on "the LTE-U", then start studying on it in Rel.13

Two key points for leading "the LTE-U" to success

- **"Fair" co-existence between "the LTE-U" and other radio access technology**
  - Currently, the most possible scenario is to share the same un-licensed spectrum with WLAN
  - Co-existence between "the LTE-U" and WLAN should be focused on

- **"Efficient" co-existence among "the LTE-Us"**
  - Co-existence among intra-operator "the LTE-Us"
  - Co-existence among inter-operator "the LTE-Us"

KDDI proposal: Clarify different technology requirements on
□ co-existence between "the LTE-U" and WLAN
□ co-existence among "the LTE-Us"

Requirements on co-existence between "the LTE-U" and WLAN

- **Co-existence with WLAN shall have no impacts on WLAN specifications**
- **Requirements on concepts of "listen-before-talk"**
  - **Both CSMA/CA and CCA should be included for fairness**
    - CSMA/CA is used to realize carrier sense multiple access and avoid collision
      - CSMA/CA in WLAN can be considered as a starting point (e.g., formula of back-off time, etc.)
    - CCA is used to detect/confirm the wireless channel assessment
  - **more details on requirements on CCA**
    - Firstly, study whether or not energy-detection CCA is sufficient for detecting WLAN channel assessment
    - If the energy-detection CCA is demonstrated to be not sufficient, signal-detection CCA should be applied to detect WLAN channel assessment

Requirements on Co-existence between "the LTE-U" and WLAN (cont.)

- **Requirements on designing of maximum transmission period**
  - WLAN has limitations on the maximum transmission period
    - e.g., aPPDUMaxTime 5.484 ms (IEEE Std 802.11ac™-2013)
  - In order to co-exist fairly with WLAN, it is reasonable to design a WLAN-similar maximum transmission period for "the LTE-U"

Requirements on Co-existence among "the LTE-Us"

- **For both intra-operator and inter-operator scenarios**
  - A partner of "the LTE-U", an LTE in licensed spectrum is always there
  - there are two scenarios for co-existence among "the LTE-Us"
    - coordination scenario: LTE in licensed spectrum coupled with "the LTE-U", can coordinate on time sharing, spectrum sharing etc.
      - LTE in licensed spectrum assisted co-existence is expected to optimize "the LTE-U" performance
    - non-coordination scenario: no coordination among LTE in licensed spectrum coupled with "the LTE-U"
      - similar to co-existence between "the LTE-U" and WLAN

KDDI proposal: Rel.13 "the LTE-U" study primarily focuses on coordination scenario (i.e., LTE in licensed spectrum assisted co-existence among "the LTE-Us")

Summary

- **Clarify technology requirements on "the LTE-U", then start studying on it in Rel.13**
- **Clarify different technology requirements on**
  - "Fair" co-existence between "the LTE-U" and WLAN
    - Co-existence with WLAN shall have no impacts on WLAN specifications
    - listen-before-talk shall include both CSMA/CA and CCA
      - firstly study whether or not energy-detection CCA is sufficient for detecting WLAN channel assessment
      - then consider to apply signal-detection CCA to detect WLAN channel assessment depending on study results
    - design a maximum transmission period
  - "Efficient" co-existence among "the LTE-Us"
    - primarily focuses on coordination scenario (i.e., LTE in licensed spectrum assisted co-existence among "the LTE-Us")
      - assuming either time sharing or spectrum sharing