3GPP TSG RAN Meeting #74
Dubrovnik, Croatia, March 6 - 9, 2017

Document for: Discussion
Agenda Item: 10.1.1

RP-170341

Motivation for new WI on Further Enhancements to Licensed-Assisted Access using LTE

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Motivation to introduce short TTI in LAA

- **Improve the UL LAA performance**
  - In the case of self-scheduling in unlicensed carrier, PUSCH is 4ms deferred from UL grant, which means that the UE has to give up 4ms transmission resource in the UL and thus limits the UL performance. eNB could transmit 4ms DL data channels before PUSCH starts to utilize the resource, however the padding may not be able to utilize the resource sufficiently in the case of light DL traffic.
- **Improve DL/UL radio resources utilization efficiency**
  - Due to uncertain transmission opportunity, only limited starting positions for both DL and UL transmission in a subframe are permitted, which would lead to either channel reservation overhead or potentially losing the channel if self deferral is used.
- **More efficient transmission between Wi-Fi and small packet LAA**
  - Small packet LAA can be transmitted e.g., 1 OFDM symbol or 2 OFDM symbols, instead of 1ms, and release channels for other LAA/Wi-Fi nodes

Motivation to introduce wide bandwidth in LAA

- Compared with the n*20MHz carrier aggregation, the wider bandwidth has
  - better PAPR
  - reduced UE power consumption to monitor multiple carriers
  - Reduced implementation complexity for both eNB and UE comparing with CA

- Wide bandwidth can also be combined with shorter TTI or further reduction of symbol duration and TTI with changing of sub-carrier spacing to speed up channel access and release procedure.

Motivation to introduce autonomous uplink transmission in LAA

- UL transmission autonomously by UE without eNB scheduling is to enhance the UL transmission efficiency on unlicensed spectrum
  - A successful uplink transmission need not depend on the eNB LBT result for transmitting uplink grant
  - The uplink transmission time is more flexible and not restricted by the scheduled time of eNB UL grant

Motivation to introduce unlicensed sidelink in LAA

- There is much interest to use LTE technology to connect and manage low cost MTC devices like wearables, where the wearables can be relayed by a nearby smartphone over sidelink to communicate with the network. However, with licensed sidelink, the transmissions from numerous wearable devices to UEs would consume the precious licensed spectrum resource, as well as introduce unnecessary interference to the access link in the network.

- It is worthy to consider transmitting the sidelink between wearable and UE over unlicensed band assisted by licensed Uu link.
  - It saves licensed spectrum from operators for better use and is beneficial to existing UEs.
  - The Uu link from the licensed spectrum can also be used for management of and backup to unlicensed sidelink for better QoS, coverage, and low power consumption.