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Agenda Item : 5  
Source : InterDigital, Inc.  
Title : Views on Duplex enhancements  
for Rel-19  
Document for : Discussion

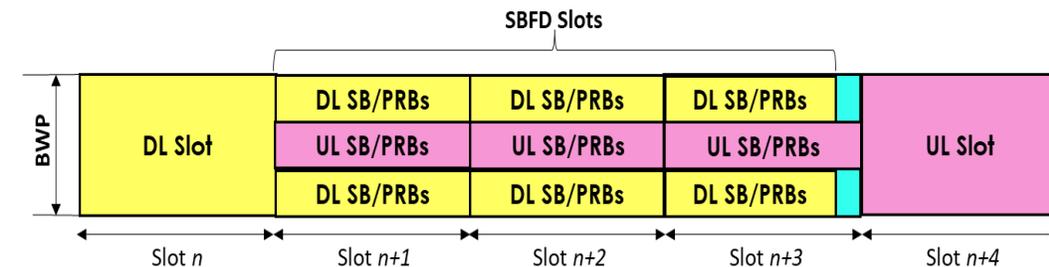
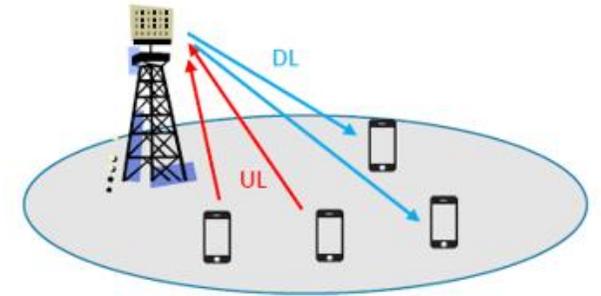
# Duplex enhancements

## Motivation

- Normative phase following completion of SI on Duplex enhancements
- Support **Subband non-overlapping Full Duplex** (SBFD) in unpaired spectrum
  - Enhanced UL coverage, reduced latency

## Proposed R19 WI scope

- SBFD configuration in frequency and time domains
- Collision handling between DL/UL signals across SBFD and non-SBFD symbols
- Cross-Link Interference (CLI) mitigation and avoidance
  - L1/L2-based CLI reporting for faster adaptation to interference
  - Uplink power control enhancements (see next slide)
  - Spatial-domain coordination among gNBs and UEs by information exchange
- Latency reduction by supporting HARQ-ACK/PRACH transmissions in SBFD symbols
- Handling of UL/DL timing misalignment due to non-zero TA of UL Tx



# Duplex enhancements

## Benefit of uplink power control enhancement for CLI mitigation

- R1-2211737 (IDC) showed impacts from UE-to-UE CLI on downlink performance degradation w.r.t RB gap between UL and DL signals.
- Due to the CLI power leakage on adjacent RBs, a certain level of RB gap (Figure 4) may be required
  - where the RB gap cannot be fixed, as it depends on various factors, e.g., inter-UE distance, beam, power.
- Specifying a fixed 'guard band' as the RB gap is not preferred, which degrades DL throughput
- Instead, RB gap dependent CLI handling techniques need to be investigated, assuming full flexibility at gNB to schedule both DL/UL with any RB gap, e.g.,
  - Separated UL power controls for SBFD/non-SBFD symbols can be considered
  - Conditions to apply the separated UL PC for SBFD need to be further studied.

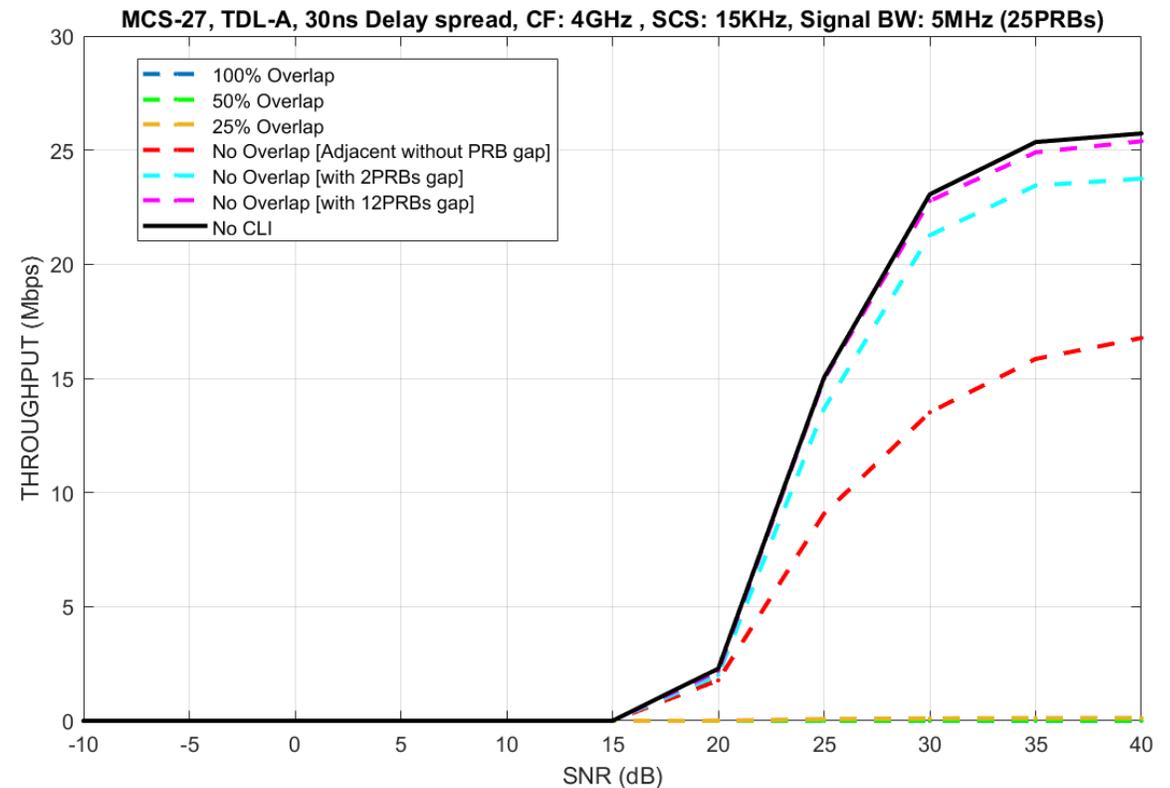
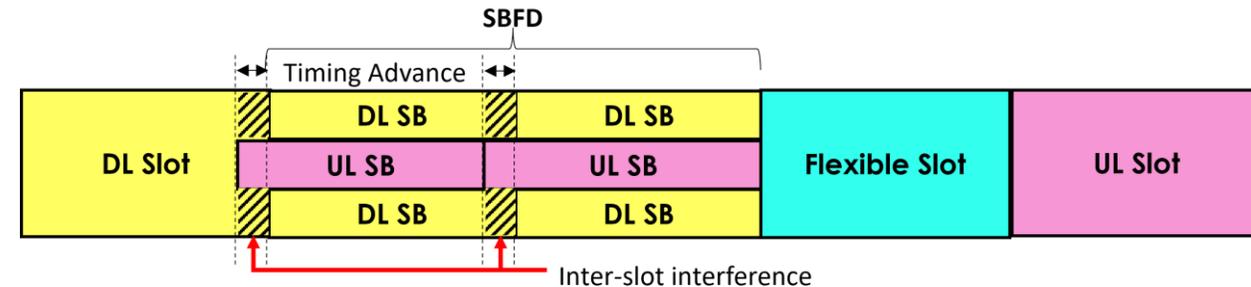


Figure 4. Throughput vs SNR: CLI power 18dB below DL signal

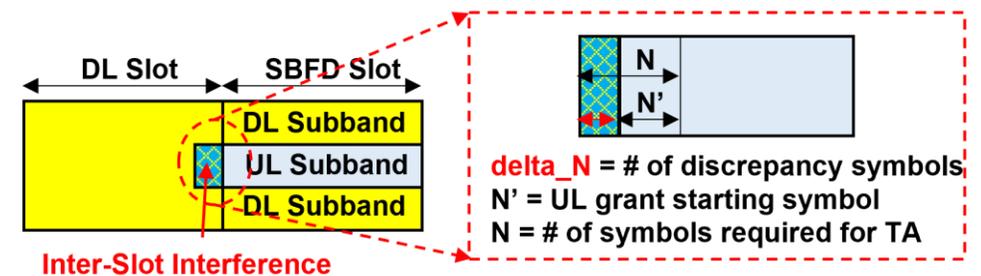
# Duplex enhancements

## Necessity of handling UL/DL timing misalignment

- R1-2304789 (IDC) discussed issues on UL/DL timing misalignment, due to non-zero timing advance (TA) that an SBFDD-aware UE applies for an UL transmission.
  - Since such UL Tx may occur in a UL SB of a 'D' slot (as shown in the figure) for SBFDD operation, there may be a prior another 'D' slot back-to-back, contrary to the current NR system where a 'Special' slot is always present prior to 'U' slot.
  - This can cause inter-slot interference across any adjacent two 'D' slots when an SBFDD operation is performed in a later 'D' slot.
  - The interference is more severe for the legacy UEs scheduled in the previous slot for Rx of a DL signal, e.g., SSBs, CORESET, DMRS, etc., on the symbols close to the end of the DL slot.
- Solutions to handle the UL/DL timing misalignment at the UE with non-zero TA need to be studied, when N for the TA exceeds the starting symbol N' of a UL grant
  - UE reporting on the overlapped number of symbols to aid gNB's scheduling on N'
  - UE behaviors on the overlapped symbols, e.g., dropping, rate-matching, etc.



< Inter-slot interference due to timing advance in SBFDD UL SBs >



< Interference caused due to timing misalignment in UL Tx in UL SB >