3GPP TSG RAN Rel-19 Workshop
Taipei, Taiwan – June 15th – 16th, 2023

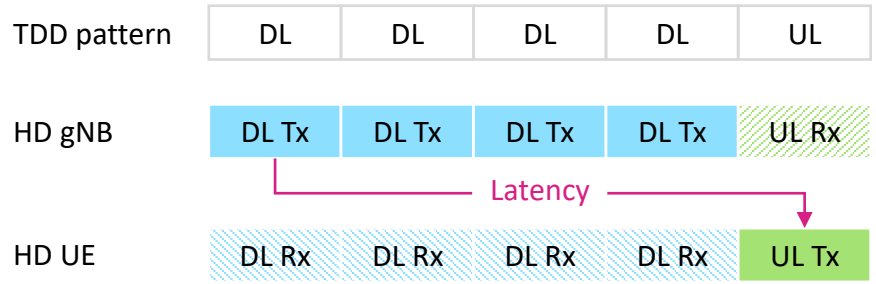
RWS-230112
Agenda Item 5

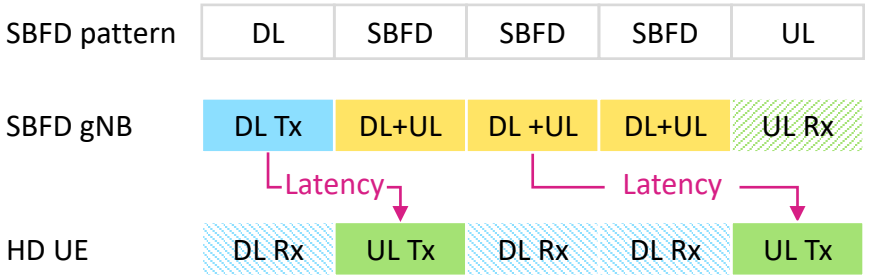
[RAN1 led] Study on UE Full-Duplex operation [SI]

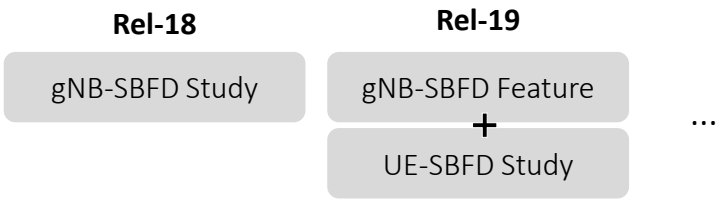
MediaTek Inc.

Motivation
Problem Statement

- **TDD** bands offer large bandwidth –**essential to achieve 5G/B5G service req.** i.e. high Tput and reliability
- However, fixed TDD UL/DL patterns result in **increased latency**, and **limited capacity and coverage**
  - Negatively impacts system capacity for latency-sensitive services.
- **SBFD-gNB** full duplex alleviates the issue to some extent, and WI expected R19.
  - However, **UE HD operation remains the latency bottleneck** due to non-simultaneous UL/DL UE operation
- **Performance objective:**
  - Enable FDD-like low-latency in TDD bands, to improve capacity for latency-sensitive services, particularly important for the successes of XR

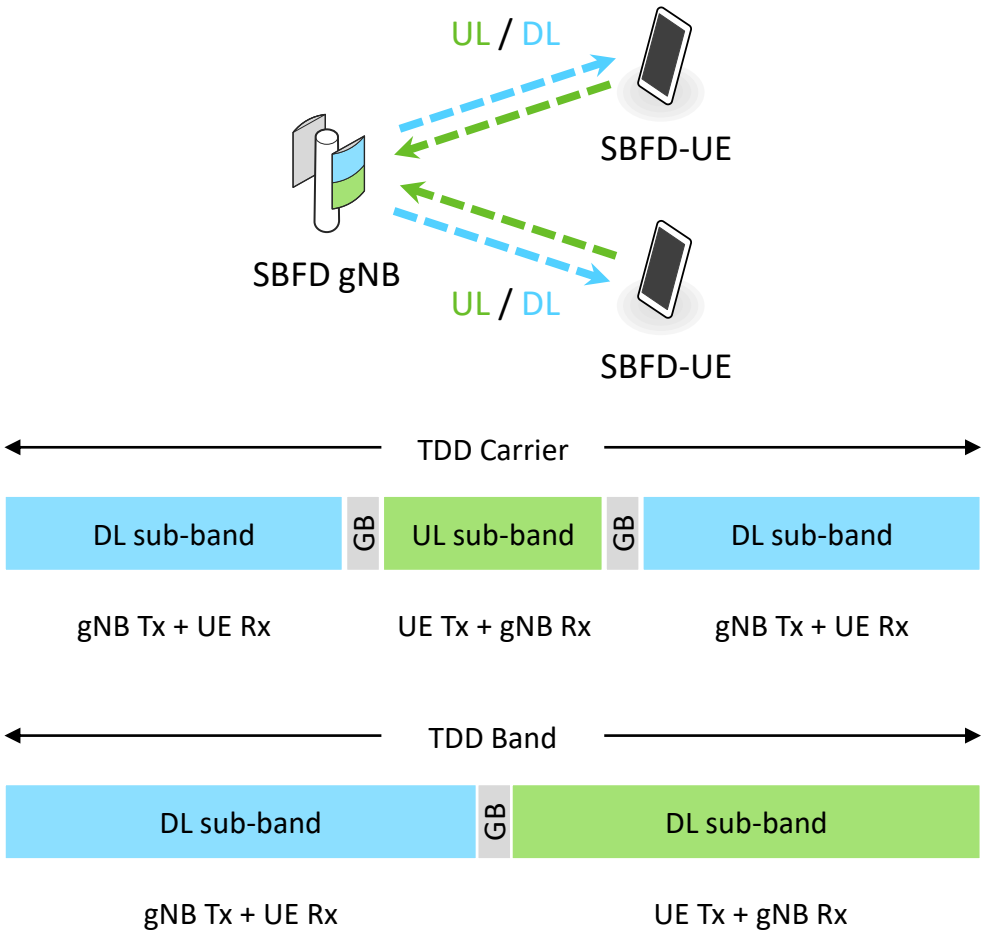






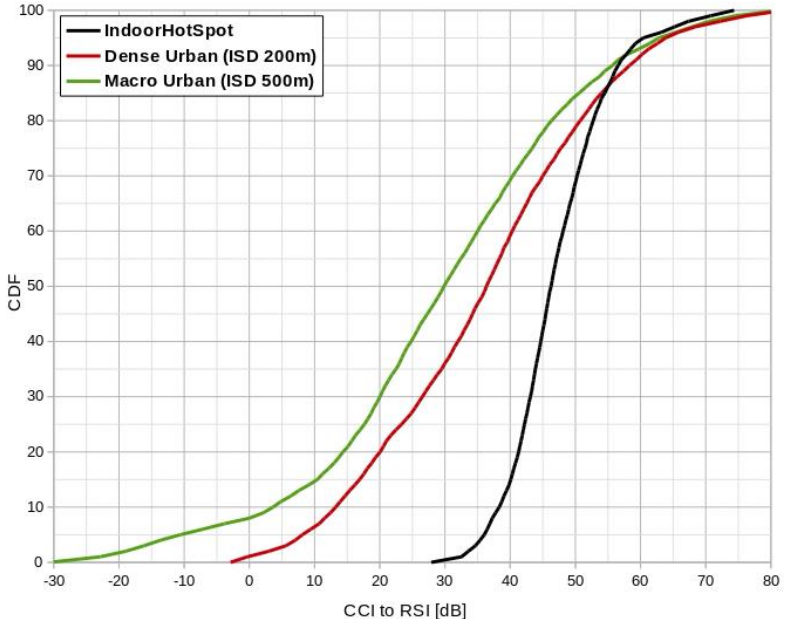
Proposal
Study Full-Duplex operation at UE

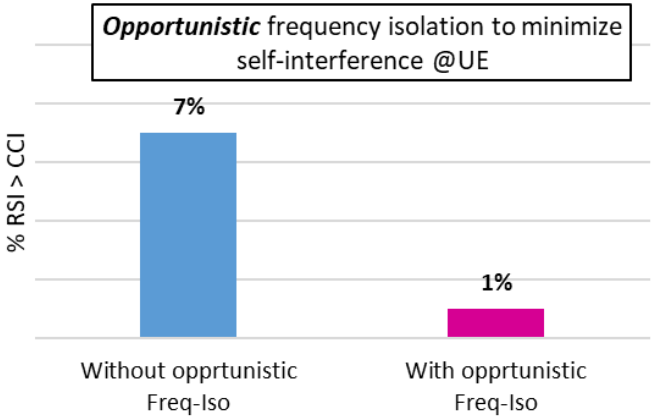
- Study full-duplex operation at UE
  - Non-overlapped simultaneous transmission and reception
  - Within a carrier or across different carriers (in intra-band CA)
- Investigate aspects to allow constraining UE complexity, such as
  - Level of frequency separation (if needed) between Rx and Tx sub-bands
  - Opportunistic operating conditions (e.g., UE Tx power level, inter-cell-interference level, UE Tx allocation, etc.)
  - Different device types



Feasibility and Performance results

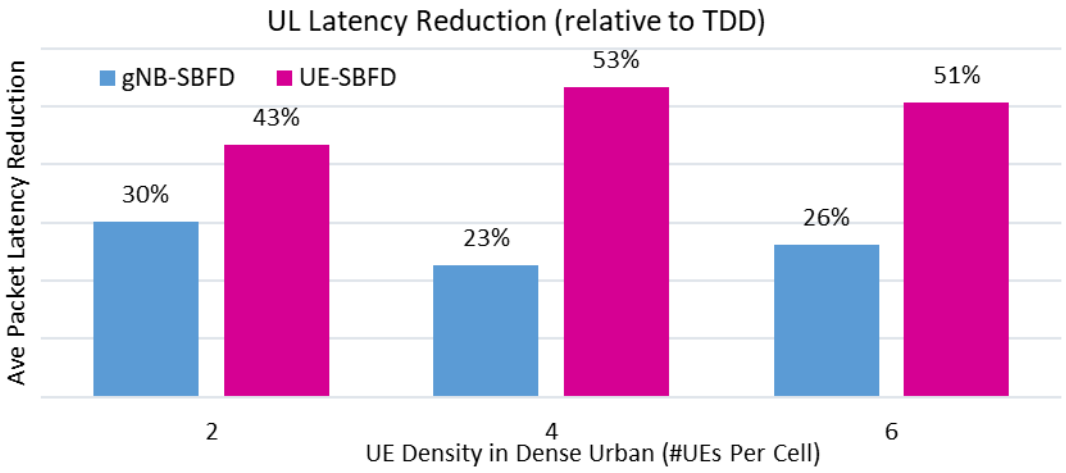
UE-SBFD feasibility

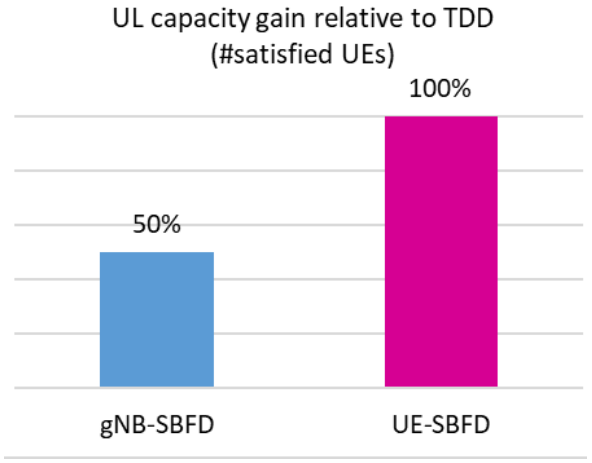




CCI: inter-cell interference
RSI: Residual self-interference

System performance gain





- Dense Urban (200m ISD)
- XR Traffic (10Mbps data-rate, 30ms PDB)

Proposal

SA/CT Dependency: No

Study non-overlapping full-duplex at the UE

Objective I: Identify possible schemes for non-overlapping full-duplex UE and evaluate their feasibility and performance for the following (RAN1, RAN4);

- UE baseband and RF aspects.
- Different types of devices; smartphones, compact devices for XR, CPE, etc.
- The following types of UE configuration:
    - non-overlapped full-duplex on different subbands within a carrier.
    - non-overlapped full-duplex on different carriers (intra-band).
- Different deployment scenarios.

Objective II: Identify potential functionality to mitigate self-interference and enable acceptable SBFD-UE complexity (RAN1, RAN4)

- Frequency isolation between Rx and Tx sub-bands to minimize self-interference
- Opportunistic activation of full-duplex-UE mode in favourable conditions (e.g., UE Tx power level, inter-cell-interference level, UE Tx allocation, etc.)
- Procedures and signals for self-interference cancellation training

Note: Coexistence and CLI handling mechanisms to be addressed in the WI on gNB-SBFD.

Expected TU

	2024												2025 [Calendar TBC at the time of writing]												2026		
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
RAN			**103**			**104**			**105**			**106**			**107**			**108**			**109**			**110**			**111**
R1	115b	116		116b	117			118		118b	119		119b	120		120b	121			122		122b	123		123b	124	
R2	124b	125		125b	126			127		127b	128		128b	129		129b	130			131		131b	132				
R3	122b	123		123b	124			125		125b	126		126b	127		127b	128			129		129b	130				
R4	109b	110		110b	111			112		112b	113		113b	114		114b	115			116		116b	117		117b	118	
R1		0.5		0.5	0.5			1		0.5	0.5			1		0.5	1										
R2				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R3				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R4 RD				N/A	N/A			N/A		N/A	N/A			N/A		N/A	N/A			N/A							
R4 RF				0.25	0.25			0.5		0.25	0.25			0.5		0.25	0.25			0.5							

RAN4 Core

RAN4 Perf

Study TU

Feature TU

RAN1: 6 TUs
RAN4/RF: 3 TUs

Thank you!