

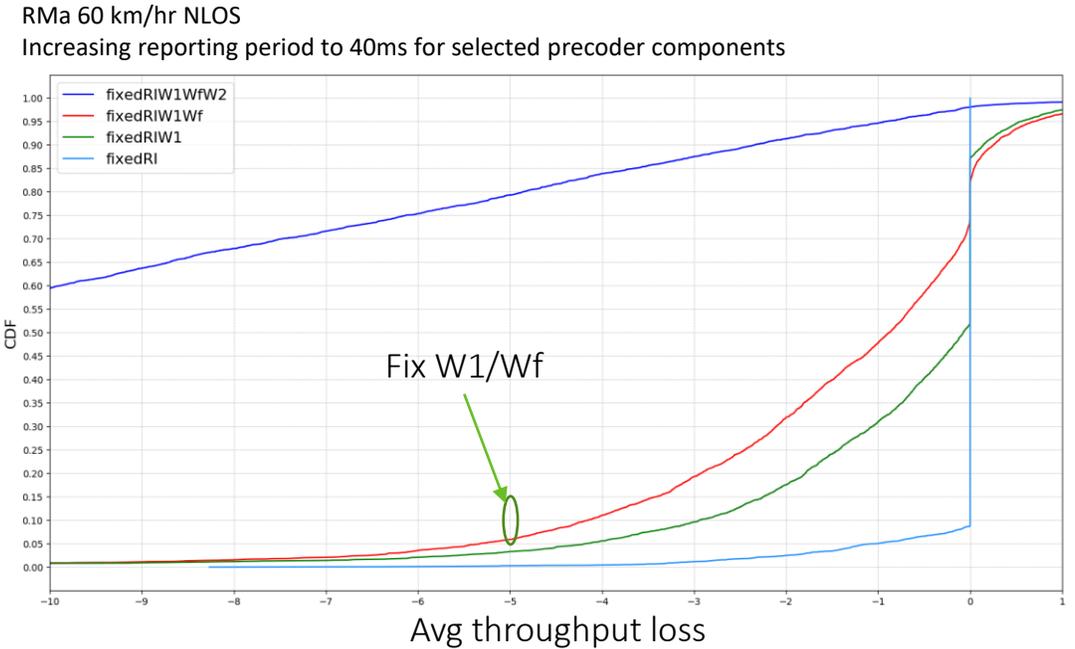
[RAN1-led] MIMO Enhancements

[WI]

Motivation

CSI framework

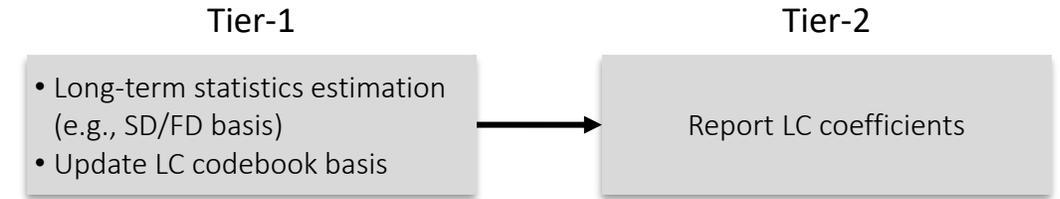
- [R18 enh. for high mobility] endeavors time-domain CSI compression as a means to allow reducing reporting overhead whilst maintaining MIMO performance
 - However, there are further potential enhancements possible by way of reducing CSI reporting overhead in such a scenario
 - Observed negligible performance loss from *reducing* reporting frequency of slow-varying basis (report the same W_1, W_f [R1-2204691]) while not reducing the reporting frequency of linear combination coefficients



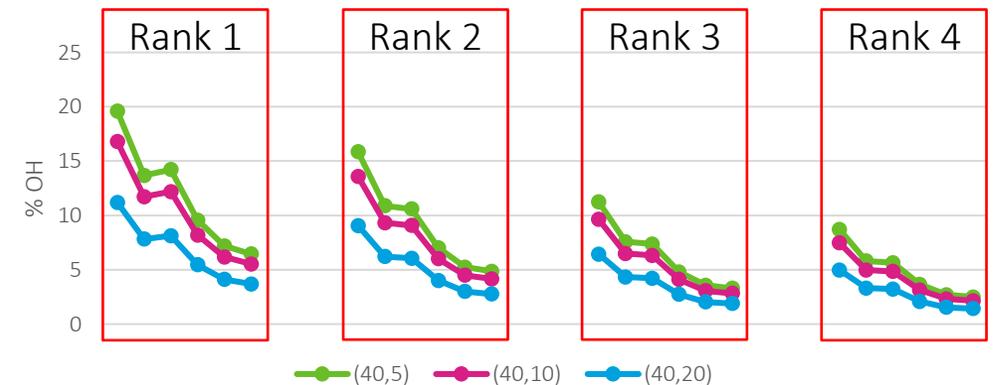
Proposal

Tiered CSI Feedback

- Tiered CSI feedback with variable rates
 - Tier-1: Less frequency report for slow-varying parameters, e.g. time-frequency-spatial basis
 - Tier-2: Frequent report of fast-changing parameters, e.g. linear combination coefficients
- Error propagation easily addressed by ACK design
- Benefit
 - Flexible overhead–perf. Tradeoff
 - OH reduction: up to 20% dependent on configuration
 - ~10% if report period is 1:4 for (W1/Wf): W2, and rank=2
 - 5% throughput degradation at 5-percentile
 - General framework for further evolution



Level of overhead reduction with lower periodicity of W1, Wf



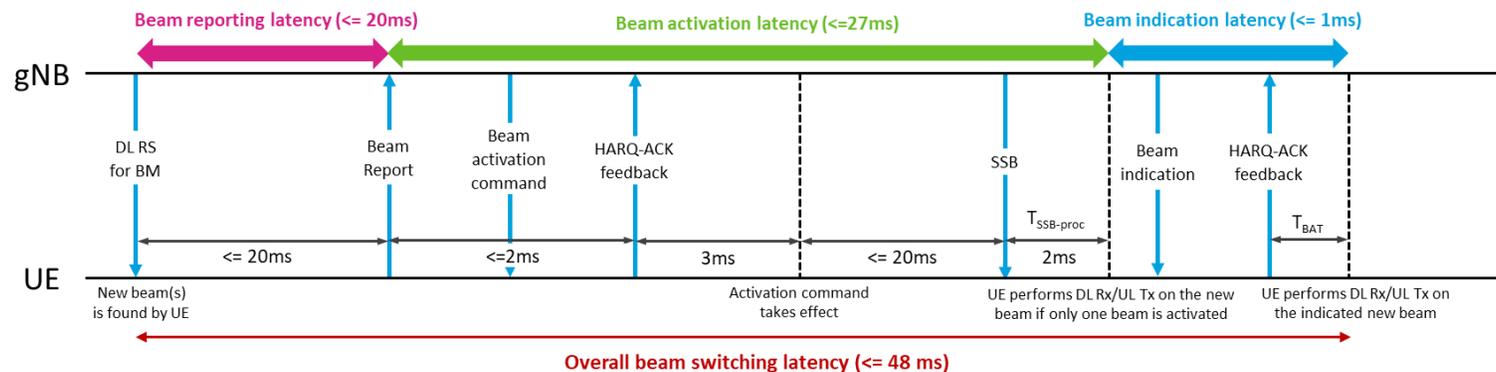
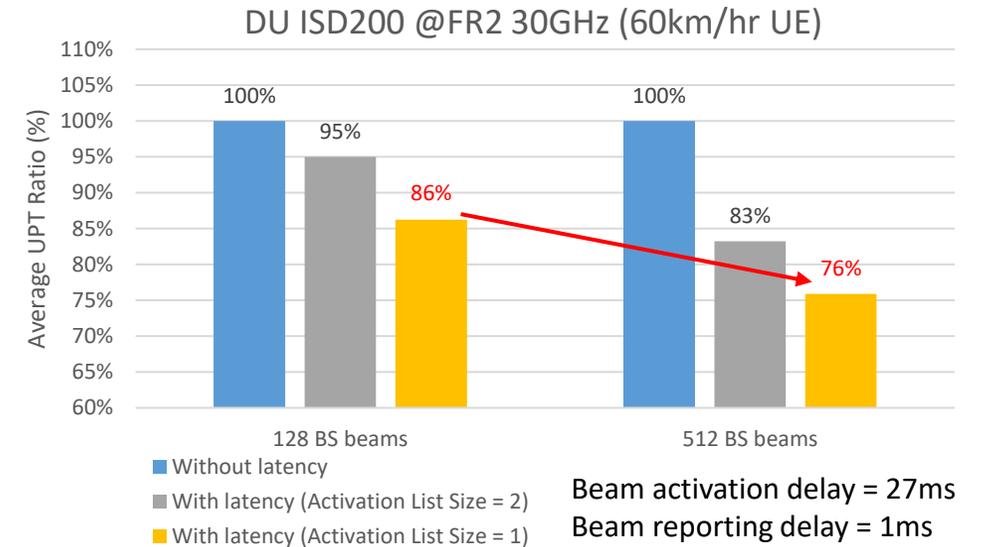
Assumption

1. Fixed rank for the duration of 40msec.
2. SB size of 4 RBs and no. of subbands as 13.
3. For each curve (40,x),
 1. 6 points correspond to 6 parameter combination of eType1
 2. Baseline: W1/W2/Wf period = x ms
 3. Tiered CSI feedback: W1/Wf period = 40ms, W2 period = x ms

Motivation

Beam Management

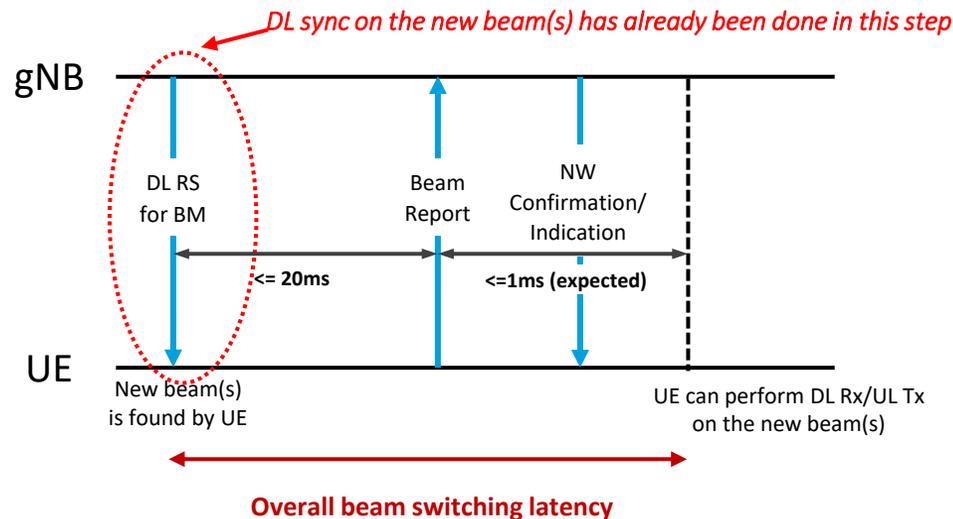
- Larger antenna array is a key technique to enable cost-effective mmWave, but suffer from mobility issue
 - Smaller beam dwell time when increasing array size
 - NR mmWave performance degrades under larger antenna array due to large beam switching latency
 - Previous enhancements have been focused on beam indication latency reduction



Proposal

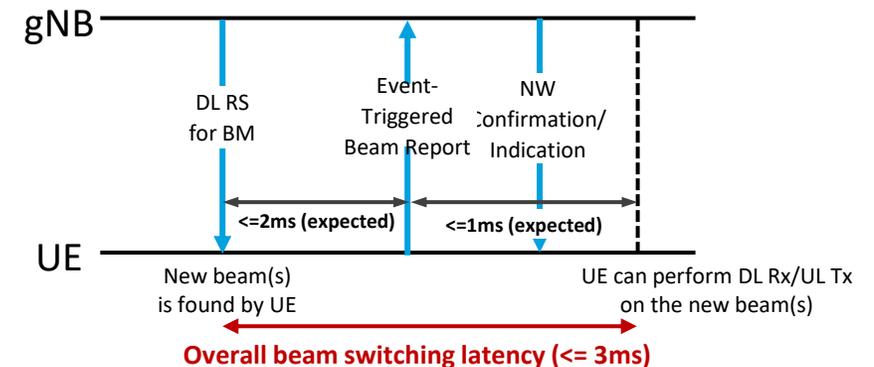
UE-initiated Beam Operation

- UE-initiated beam switching: Define (configurable) systematic adoption of UE-reported beam(s) by the network to avoid beam activation latency
 - SSB measurement for beam activation is not necessary (save at most 20ms+2ms)
 - Signaling/procedure can be further simplified



UE-initiated beam switching

- UE-initiated beam reporting: Beam reporting according to pre-defined event(s) instead of a certain periodicity to reduce beam reporting latency
 - A good trade-off between latency reduction and UL resource overhead
 - Considered together with UE-initiated beam switching to make the most of it
 - Less attractive if beam switching is still initiated by NW



UE-initiated beam switching + beam reporting

Proposal

SA/CT Dependency: No

CSI overhead-performance tradeoff for various MIMO scenario.
Completing last piece in beam management latency reduction

Objective I: Specify procedural support to enable tiered CSI feedback for reducing feedback overhead without harmful throughput impact [RAN1]

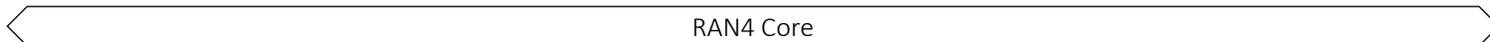
Objective II: Evaluate and specify UE-initiated beam operation to reduce latency from beam activation and beam reporting [RAN1, RAN4]

Necessary RAN2 alignment work to support the above

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			0.5		0.5	0.5			0.5		0.5	0.5										
R2				0	0			0	0	0	0			0		0.5	0.5			0.5							
R3				N/A	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			N/A							
R4 RF				N/A	N/A			N/A	N/A	N/A	N/A			N/A		N/A	N/A			N/A							

Study TU
Feature TU



Thank you!