

3GPP TSG RAN Meeting #70

Sitges, Spain, 7 -10 December 2015

Document for: Discussion

Agenda Item: 14.1.1

RP-151882

Motivation for new WI on Downlink Multiuser Superposition Transmission for LTE

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- **MuST Study status**
- **Proposal**

Overview of MUST Study

- The 3GPP study item on MuST (Downlink Multiuser Superposition Transmission) was approved at RAN#66 in December 2014. Version 1.0.0 of the MUST Technical Report 36.859 was endorsed in RAN1#83 November 2015.
- It has been identified that the use of MuST can serve as a useful additional tool by operators to increase system capacity as well as improve user experience in certain scenarios at least for 2Tx case

Candidate schemes of MUST Study

Classification of MUST schemes and their key characteristics

Categories	Power ratio	Gray mapping	Label-bit assignment
MUST Category 1	adaptive, on component constellations	N	on component constellations
MUST Category 2	adaptive, on component constellations	Y	on the composite constellation
MUST Category 3	N/A	Y	on the composite constellation

Observations for MUST Study (1/3)

Wideband scheduling for FTP traffic, assuming Rel 12 EVM requirements for 64QAM

Resource Utilization	User Perceived Throughput	Gains	Comments
70% ~ 80%	Average	3.71% ~ 20.2%	
	5%-ile	10.7% ~ 30.7%	
60% ~ 70%	Average	-4% ~ 7.6%	
	5%-ile	-7% ~ 14.2%	
< 60%	Average	0.85% ~ 8%	
	5%-ile	4.54% ~ 14.9%	

Observations for MuST Study (2/3)

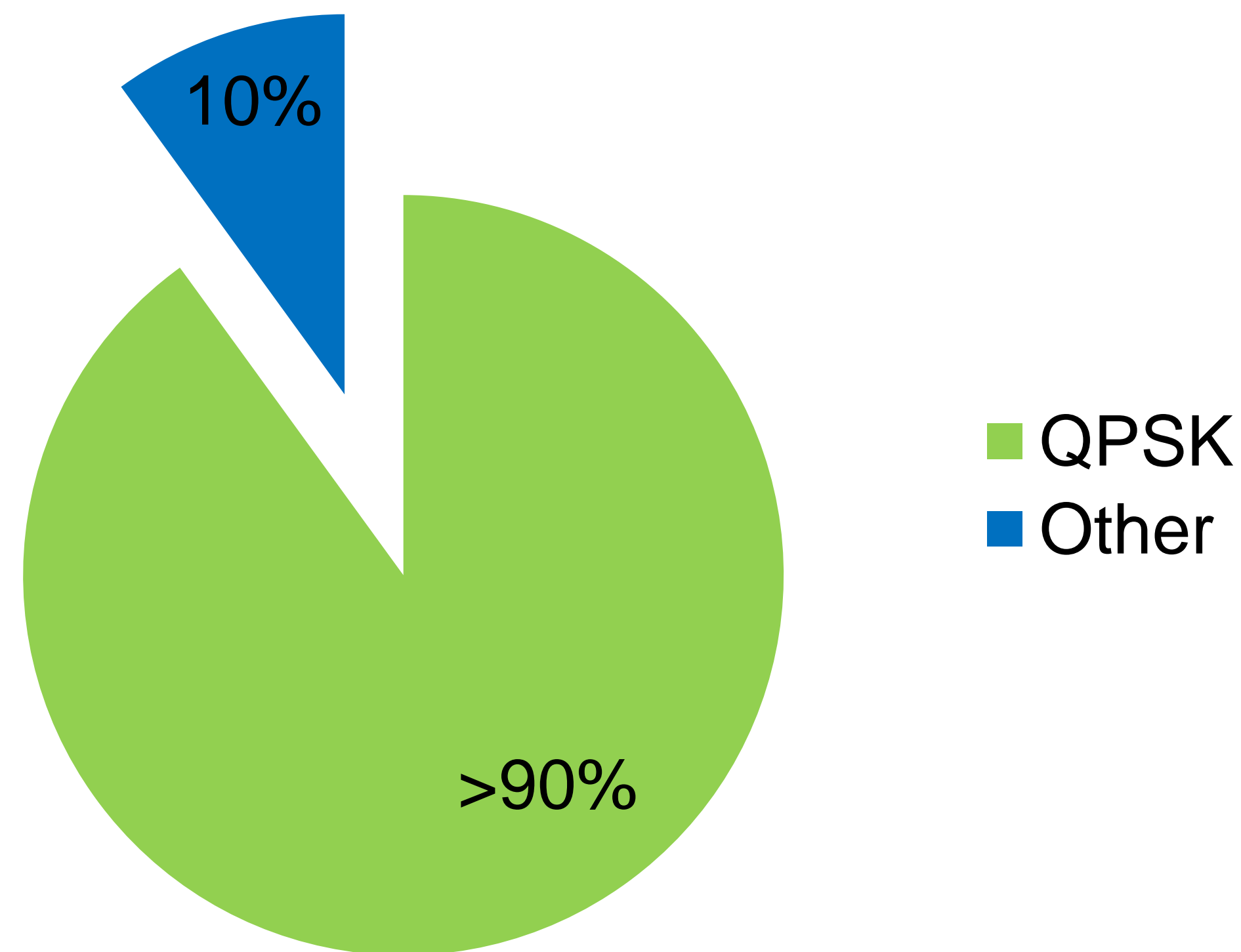
Subband scheduling for FTP traffic, assuming Rel 12 EVM requirements for 64QAM

Resource Utilization	User Perceived Throughput	Gains	Comments
70% ~ 80%	Average	0.6% ~ 10.8%	
	5%-ile	1.0% ~ 14.4%	
60% ~ 70%	Average	2.5% ~ 4.3%	
	5%-ile	2.16% ~ 4.94%	
< 60%	Average	-1.9% ~ 3.84%	
	5%-ile	-0.69% ~ 8.95%	

Observations for MUST Study (3/3)

- QPSK accounts for most (i.e., about 90% or more) of MUST-far UE's modulation order, assuming Release 12 EVM requirements for 64QAM
- MUST with QPSK restriction for MUST-far UE can achieve similar performance to MUST without the restriction, assuming Release 12 EVM requirements for 64QAM.

MUST-far UE's modulation order



Conclusion for MUST Study

For multiuser superposition of PDSCH and PDSCH:

- MUST can increase system capacity as well as improve user experience in certain scenarios at least for 2Tx case
 - MUST is generally more beneficial when the network experiences higher traffic load
 - MUST is generally more beneficial in user perceived throughput for wideband scheduling case, compared to subband scheduling case
 - MUST is generally more beneficial in user perceived throughput for cell-edge UEs, compared to other UEs
- MUST-far UEs can be legacy UEs when QPSK is applied to MUST-far UEs or the most two significant bits in the modulation symbol are assigned to far UE

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Proposed Work Item Scope

- (Aligned with MediaTek's proposed WID)
- specify necessary mechanisms to enable MUST transmission for PDSCH using the same spatial precoding vector or the same transmit diversity scheme for the co-scheduled users. The detailed objectives include:
 - (RAN1) Specify downlink multiuser superposition transmission scheme(s), starting from the candidate MUST transmission schemes identified in TR 36.859.
 - (RAN1) Specify necessary mechanisms to enable efficient MUST operation.
 - The configuration of downlink multiuser superposition transmission.
 - The mechanism to provide MUST assistance information to a UE, which may include blind detection, signaling (e.g. higher layer signaling which is not supported in NAICS or new physical-layer signaling), tied to the UE's scheduling information, or tied to specific UE assumptions (e.g. UE assumes aligned resource allocation), starting from the candidate parameters of assistance information identified in TR 36.859.
 - (RAN4) Identify potential parameter(s) for MUST assistance information blind detection, if any.
 - (RAN1) Investigate potential CSI enhancements for MUST; specify the identified enhancements if needed.
 - (RAN2) Specify necessary higher-layer signaling to support the items listed above.

Proposal

- **Meeting scheduling for MUST**
 - Start Work Item at RAN#70
 - Parallel session required for RAN1/RAN2/RAN4
 - For each session in regular meetings: at least 2 RAN1 TUs are allocated to MUST
 - Finish Work Item before RAN#72

THANK YOU