(NOTE: Track changes relative to v010\_Mod)

Based on the above observation the following moderator **proposals** are made:

|  |
| --- |
| * [Issue 1] For Rel.17 NR FeMIMO, on the unified TCI framework
	1. Support joint TCI for DL and UL based on and analogous to Rel.15/16 DL TCI framework
		+ The term “TCI” at least comprises a TCI state that includes at least one source RS to provide a reference (UE assumption) for determining QCL and/or spatial filter
		+ The source reference signal(s) in one TCI or >1 TCIs provide common QCL information at least for UE-dedicated reception on PDSCH and all CORESETs in a CC
		+ The source reference signal(s) in one TCI or >1 TCIs provide a reference for determining common UL TX spatial filter(s) at least for dynamic-grant/configured-grant based PUSCH, all dedicated PUCCH resources in a CC,
			- Optionally, this UL TX spatial filter can also apply to all SRS resources in resource set(s) configured for antenna switching/codebook-based/non-codebook-based UL transmissions
			- FFS: applicability of this UL TX spatial filter to SRS configured for beam management (BM)
			- FFS: PUSCH port determination based on the TCI, e.g., to be mapped with SRS ports analogous to Rel.15/16
		+ When used for the purpose of joint beam indication for UL and DL, joint TCI pool for DL and UL is used
		+ FFS (RAN1#103-e): Details on extension to intra- and inter-band CA
		+ FFS (RAN1#103-e): Extended use case of unified TCI framework beyond facilitating common beam updates
		+ FFS (RAN1#103-e): The supported number of active TCI states considering factors such as multi-TRP and issue 6
	2. In RAN1#103-e, investigate, for the purpose of down selection, the following alternatives for accommodating the case of separate beam indication for UL and DL
		+ Alt1. Utilize the joint TCI to include references for both DL and UL beams
		+ Alt2. Utilize two separate TCI states, one for DL and one for UL. The TCI state for the DL is the same as agreed in 1a
			- Alt 2-1: The UL TCI state is taken from the same pool of TCI states as the DL TCI state
			- Alt 2-2: The UL TCI state is taken from another pool of TCI states than the DL TCI state
		+ FFS (RAN1#103-e): Details on extension to intra- and inter-band CA
		+ Note: This may be related to issue 5 as well as other reasons for different TCIs such as network flexibility/scheduling
	3. Support the use of SSB/CSI-RS for BM and/or SRS for BM as source RS to determine a UL TX spatial filter in the unified TCI framework
		+ Whether the UL TX spatial filter corresponds to UL TCI (separate from DL TCI) depends on the outcome of 1b) above
	4. In RAN1#103-e, decide if SRS for BM can be configured as a source RS to represent a DL RX spatial filter in the unified TCI framework
	5. In RAN1#103-e, decide/finalize all other parameters included in or concurrent with (but not included in) the TCI, e.g. UL-PC-related parameters (involving P0/alpha, PL RS, and/or closed loop index), UL-timing-related parameters
	6. In RAN1#103-e, identify issues pertaining to alignment between DL and UL default beam assumptions using the unified TCI framework, including the applicability to CSI-RS reception
* [Issue 2] For Rel.17 NR FeMIMO, on L1/L2-centric inter-cell mobility:
	1. In RAN1#103-e, finalize scope and use cases for L1/L2-centric inter-cell mobility, including:
		+ Applicability in various CA setups such as intra-band and inter-band CA
		+ Use cases in comparison to Rel.15 L3-based handover (HO) taking into account potential extension of DAPS-based Rel.16 mobility enhancement to FR2-FR2 HO
		+ The extent of RAN2 impact (MAC CE, RRC, user plane protocols)
		+ Network architecture, e.g. NSA vs. SA, inter-RAT scenarios
	2. In RAN1#103-e, depending on the outcome of 2a), further identify additional components –along with the associated alternatives –required for supporting inter-cell mobility based on the same unified TCI framework as that for intra-cell mobility (including dynamic TCI state update signaling), including
		+ Method(s) for incorporating non-serving cell information associated with TCI
		+ Method(s) for DL measurements and UE reporting (e.g. L1-RSRP) associated with non-serving cell(s)
		+ UE behavior for reception of signals and non-UE-specific control and data channels associated with non-serving cell(s)
		+ UL-related enhancements, e.g. related to RA procedure including TA
		+ Event-driven mechanism for L1/L2-centric inter-cell mobility
* [Issue 3] For Rel.17 NR FeMIMO, on dynamic TCI state update signaling medium:
	1. In RAN1#103-e, investigate, for the purpose of down selection, the following alternatives:
		+ Alt1. DCI
		+ Alt2. MAC CE
		+ Note: Combination between DCI and MAC CE for, e.g. different use cases or control information partitioning can also be considered
		+ Note: The study should consider factors such as feasibility for pertinent use cases, performance (based on at least the agreed EVM), overhead, latency, flexibility. reliability including the support of retransmission
		+ Note: This may be related to outcome of issue 1a), 1b), and 6a)
	2. In RAN1#103-e, depending on the outcome of 3a), identify candidates for more detailed design issues for the dynamic TCI state update such as
		+ Exact content
		+ Signaling format,
		+ Reliability aspects including the support of retransmission
		+ Extensions, including the support of UE-group (in contrast to UE-dedicated) signaling
* [Issue 4] For Rel.17 NR FeMIMO, on MP-UE assumption to facilitate fast UL panel selection:
	1. The following assumptions are used:
		+ In terms of RF functionality, a UE panel comprises a collection of TXRUs that is able to generate one analog beam (one beam may correspond to two antenna ports if dual-polarized array is used)
		+ UE panels can constitute the same as well as different number of antenna ports, number of beams, and EIRP
		+ For each UE panel, it can comprise an independent unit of PC and/or TA.
		+ No beam correspondence across different UE panels
		+ Same or different sets of UE panels can be used for DL reception and UL transmission, respectively
	2. In RAN1#103-e, identify candidate use cases including MPE, and consider remaining aspects if use cases are identified
	3. In RAN1#103-e, identify candidate signaling schemes for the following:
		+ NW to MP-UE (taking into account potential extension of the unified TCI framework in issue 1)
		+ MP-UE to NW
* [Issue 5] For Rel.17 NR FeMIMO, on MPE mitigation (that is, minimizing the UL coverage loss due to the UE having to meet the MPE regulation), in RAN1#103-e:
	1. If needed, identify candidate solutions to be down-selected in future meeting(s). The following sub-categories can be used:
		+ CAT0. The need for specification support for MPE event detection and, if needed, candidate solutions
		+ CAT1. The need for UE reporting associated with an MPE and/or a potential/anticipated MPE event if the UE selects a certain UL spatial resource, e.g., corresponding to DL or UL RS
		+ CAT2. The need for NW signaling in response to the reported MPE event (taking into account issue 1) and UE behavior after receiving the NW signaling
		+ Note: RAN4 has agreed to specify P-MPR reporting (cf. CRs for TS 38.101/102/133) which can be used as a baseline scheme for further enhancement
		+ Note: This may be related to outcome of issue 4b)
	2. Companies are encouraged to submit evaluation results based on the agreed EVM to justify the benefits of the candidate solutions
* [Issue 6] For Rel.17 NR FeMIMO,
	1. add another category on performing study and, if needed, specifying feature(s) for beam acquisition (including beam tracking and refinement) latency reduction, especially for scenarios with high-speed UEs and large number of configured TCI states
	2. Partial BFR will be handled in ITEM 2c (BM enhancement for mTRP)
 |

[Example proposals for issue 6a: further sub-categorization is to be done in RAN1#102-e to facilitate more structured discussion in RAN1#103-e:

* + - Joint DL TX/RX beam refinement (P2/P3) and beam sweeping using ‘UE-group TCI’
			* Note: The relation with existing features such as beam-group reporting should be considered
		- Joint DL TX/RX beam refinement (P2/P3) and beam sweeping by using CSI-RS resources with partial repetition within a CSI-RS resource set across DL spatial domain TX filters.
		- Joint UL TX/DL RX beam refinement (joint P2/U3) based on CSI-RS with repetition across DL spatial domain TX filters and aperiodic SRS transmission
		- Predictive TCI state update (including potential MPE event indication)
		- Enabling DL TX/RX beam refinement (P2/P3) via additional QCL with A-TRS
		- SSB-based beam indication to facilitate beam refinement and selection, e.g. via MSG3 on PRACH during initial access
		- Dynamic TCI for periodic and/or aperiodic RS
		- Intra-symbol beam sweeping based on 1-port CSI-RS for BM
		- Dynamic TCI state/QCL source update directly from L1-RSRP measurement report with gNB control/confirmation
		- Simultaneous PL RS update across CCs
		- Simultaneous spatial relation update for multiple SRS resource sets]