**3GPP TSG-RAN WG4 Meeting # 112 R4-241xxxx**

**Maastricht, The Netherlands, 19 – 23 August, 2024**

**Agenda item:** 8.19.4

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Topic summary for [112][221] NR\_duplex\_evo

**Document for:** Information

# Introduction

This document provides summary for Tdocs submitted to AI 8.19.3.

Recommended issues for online discussion:

Sub-topic 1-1: Work plan

Issue 2-2-1: Scope of requirements for gNB-to-gNB CLI handling

Issue 2-1-1: Scope of requirements for UE-to-UE CLI handling

Issue 2-3-1: Requirements for legacy UE

Issue 2-3-2: Requirements for SSB based measurement

Issue 2-1-7: Side condition

Issue 2-1-8: Measurement period

# Topic #1: General issues

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2412534**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412534.zip) | Samsung, Huawei | Work plan for Rel-19 Duplex Evo WI (RRM part only) |

## Open issues summary

### Sub-topic 1-1: Work plan

* Proposals
	+ Proposal 1 (SS, HW):
		- Work plan for RRM part of Rel-19 Duplex Evo WI is provided in R4-2412534
* Recommended WF
	+ Approve the work plan in R4-2412534

# Topic #2: RRM requirements

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411344**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411344.zip) | CATT | **Observation 1: Aperiodic reporting of CLI measurements is supported by RAN1. Periodic and semi-persistent reporting can be considered.** **Proposal 1: More RAN1 progress on reporting design is needed for defining CLI reporting requirements.****Proposal 2: More RAN1 progress on resource configurations for CLI measurements is needed for defining CLI measurement period requirements.****Proposal 3: Legacy CLI requirements can be used as a baseline for defining CLI requirements for SBFD.****Proposal 4: Defining scheduling restrictions/interruptions needs more RAN1 progress.** **Proposal 5: No performance requirements need to be defined for RS index reporting.** **Proposal 6: For L1-SRS-RSRP and L1-CLI-RSSI reporting, more RAN1 progress on resource configurations is needed to decide if legacy CLI measurement accuracy requirements can be reused.**  |
| [**R4-2411406**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411406.zip) | Apple | ***Proposal 1: RAN4 is to focus the discussion on RRM requirement for L1-SRS-RSRP and L1-CLI-RSSI, pending further updates from RAN1 if other measure quantities will be specified.*** ***Proposal 2: RAN4 is to discuss and decide how many samples are needed for L1-SRS-RSRP.******Observation 1: RAN4 needs to wait for RAN1 decision on UE measurement timing before deciding the measurement accuracy requirement.*** |
| [**R4-2411571**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411571.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: The legacy UEs shall perform and operate according to the legacy RRM requirements, despite being served by a gNB operating with SBFD.*****Observation #1: From RAN1 point of view, SSB resources can be configured in both SBFD and DL-only symbols.*** ***Observation #2: For SSB resources on SBFD symbols, the SSB resources shall be contiguous and contained within the DL resource blocks. Puncturing of the SSB resources is not expected since SBFD operation is mainly used with large carrier bandwidths where up to 80% of the frequency resources are used for downlink direction.******Observation #3: For all the RAN1-agreed cases (incl. FFS), SSB is always prioritized and not expected to be impacted by SBFD operation.*** **Proposal 2: For SBFD-aware UE, the SSB-based measurement requirement will not be impacted due to SBFD configuration.** **Proposal 3: Existing RRM requirements for idle/inactive mode can still apply because SSB transmissions are not impacted by SBFD configuration.** **Proposal 4: In RAN4 RRM, we should at least specify the UE requirements for the L1 based UE-to-UE CLI measurement and reporting.*****Observation #4: In R16, the CLI measurements was introduced for dynamic TDD to mitigate the interference on DL reception due to UL transmission from aggressor UE.******Observation #5: In R19, the CLI measurements are being discussed in SBFD and may be configured over DL subbands and/or UL subband of the victim UE, which is different from legacy CLI measurements.*****Proposal 5: To start discussing the CLI measurements in SBFD without considering dynamic TDD in R19.*****Observation #6: For the different CLI measurements methods in SBFD, the CLI measurement requirements may be different in RAN4.*****Proposal 6: RAN4 to prioritize specifying the measurement requirements for the CLI measurements in SBFD on UL subbands of victim UEs i.e. Method#2 and #3.** ***Observation #7: The Rel-16 assumptions for Rx beam used for CLI measurement in FR2 may not be applicable provided the latest RAN1 discussion.*****Proposal 7: RAN4 to discuss the CLI measurement requirement considering the potential different Rx beams based on RAN1 conclusion.** ***Observation #8: In R16, the CLI measurement periods are defined for SRS-RSRP and CLI-RSSI in the way of L3 measurements for dynamic TDD.*** ***Observation #9: In R19 duplex discussion, new reporting quantities L1-SRS-RSRP and L1-CLI-RSSI are agreed for CLI measurements hence legacy CLI measurement requirements do not apply.*** **Proposal 8: RAN4 should specify the measurement periods for L1-SRS-RSRP and L1-CLI-RSSI measurements irrespective of different CLI measurement methods.****Proposal 9: The CLI measurement requirement can be specified following L1-RSRP measurement and same assumption can be applied.** **Proposal 10: At least the L1-RSRP measurement reporting requirement for aperiodic reporting can be reused for the L1 based CLI measurement reporting.****Proposal 11: RAN4 should define new requirements for the mini-band CLI-RSSI reporting if this feature is supported by RAN1.** **Proposal 12: RAN4 shall wait for RAN1 conclusion on the CLI measurement methods before discussing the measurement and scheduling restriction.** |
| [**R4-2412039**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412039.zip) | LG Electronics Inc. | ***Proposal 1***: No additional RRM requirements would be required for UL resource muting for PUSCH feature.***Proposal 2***: RAN4 need to discuss how to measure the UL CLI leakage by UL sub-band aggressor UE at DL sub-band at the UL sub-band UE as aggressor and DL sub-band UE as victim in same DL BWP scenario. ***Proposal 3***: RAN4 need to consider SRS-RSRP and CLI-RSSI measurement within UL sub-band, and Rel-16 CLI principle can be applied as baseline. |
| [**R4-2412122**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412122.zip) | China Telecom | **Proposal 1: Rel-16 CLI measurement requirements can be the starting point for the discussion on Rel-19 L1 CLI measurement requirements.****Proposal 2: Rel-19 L1 CLI measurement requirements including measurement reporting, measurement period, measurement accuracy, side conditions, scheduling restrictions** **need to be specified.****Proposal 3: It’s proposed to define better measurement requirements for Rel-19 L1 CLI measurement compared to Rel-16 L3 CLI measurement.** |
| [**R4-2412279**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412279.zip) | Ericsson | [**Observation 1: Current RAN1 agreed CLI measurement methods may result in different measurement requirement.**](#_Toc174090617)[**Observation 2: The SBFD UE-to-UE CLI resources configuration is different compare with legacy CLI measurement. Legacy CLI-RSSI resource is configured periodically while SBFD CLI resource support Periodic, semi-persistent, or aperiodic measurement resource configuration.**](#_Toc174090618)[**Observation 3: CLI-RSSI and SRS-RSRP serve different purposes and have different dependency factor for measurement performance.**](#_Toc174090619)[**Observation 4: SBFD aware UE Random Access configuration, RO validation still has many open issues within RAN1 and RAN2 discussion, certain configurations and priority rules will have impact on RAN4 to specify the correct UE behavior for Random Access procedure.**](#_Toc174090620)[**Observation 5: SBFD aware UE only can operate in half duplex mode within the SBFD symbol which is different in compare with the legacy NR UE.**](#_Toc174090621)[**Observation 6: Current RAN1 agreement has not clearly defined which SSB is being considered for the priority rules, only current serving cell SSB or any SSB within the SBFD symbol.**](#_Toc174090622)[**Observation 7: Typically, RAN4 specified scheduling restriction for handling collision between SSB and other transmissions, however the RAN4 entire symbol-based restriction is not optimized if RAN1 agree to use the PRBs that is not occupied by SSBs in frequency domain.**](#_Toc174090623)[**Proposal 1: The measurement capability for L1-CLI measurement and report shall wait and follow the RAN1 specific agreement and RAN4 can start the discussion of what type of requirements shall be specify and the capability can be based on the maximum configured resource.**](#_Toc174090624)[**Proposal 2: Measurement resources configuration for SBFD UE for both SRS-RSRP and CLI-RSSI will upon network configuration based on RAN1 and RAN2 agreement, RAN4 will define the measurement requirement based on future agreement of exact number of PRBs to be used and exact number of symbols to be used within one set of requirement.**](#_Toc174090625)[**Proposal 3: RAN4 shall specify L1- CLI-RSSI and L1-SRS-RSRP measurement requirement. RAN4 shall start the initial discussion for simulation assumption for setting up the requirements. The Legacy Rel-16 CLI-RSSI requirement can be used as L1-CLI-RSSI baseline and legacy L1-RSRP requirement can be used as L1-SRS-RSRP baseline.**](#_Toc174090626)[**Proposal 4: RAN4 can wait for RAN1 and RAN2 agreement for Random Access procedure stable then define the correct UE behavior based on the agreements. Certain side conditions may need to be specified on top of the UE behavior due to the SBFD UE only support HD mode.**](#_Toc174090627)[**Proposal 5: For collision case RAN 4 need clarification from RAN1 which SSB is being agreed, only current serving cell or any SSBs collide with the SBFD symbol. RAN4 shall wait for RAN1 final agreement for the frequency domain usage of that SBFD symbol to decide how to address the collision case with RRM requirement.**](#_Toc174090628) |
| [**R4-2412292**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412292.zip) | vivo | **Proposal 1: For CLI handling, focus on UE-to-UE CLI handling, particularly on L1 CLI measurement requirements.** **Proposal 2: For CLI handling, RAN4 discuss aspects on measurement delay, side conditions and accuracy, scheduling and/or measurement restrictions, etc.** **Proposal 3: For SBFD operating, RAN4 discuss the impact on the CSI-RS requirements.** |
| [**R4-2412533**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412533.zip) | Samsung | **Proposal 1: No new RRM requirement required for objective “Semi-static indication of time/frequency location of SBFD-sub band”** **Proposal 2: For objective “UE transmission, reception and measurement behavior and procedures”, following potential RRM impact foreseen:*** L1 RRM measurement may need to be updated to following RAN1 update on CSI report configuration between SBFD slots and non-SBFD slots
* FFS on RAN4 RRM impact for UL PC and or spatial relation update e.g., unified TCI state framework and /or UL spatial info related framework.

**Proposal 3: No RAN4 RRM requirements impact foreseen on “SBFD random access operation”, some update on RAN4 PRACH configuration maybe required pending on detailed RAN1 specification update.** **Proposal 4: There is no RRM impact on gNB to gNB CLI handing.** **Proposal 5: RAN4 need to specify L1 based CLI measurement requirements** * Leverage existing Rel-16 L3 CLI measurement requirements framework as much as possible with necessary update.

**Observation 1: Time difference and residual timing error can be optimized for Rel-19 CLI SRS-RSRP measurement:*** **No cell phase error for intra-cell L1 CLI measurement (target scenario for SBFD operation)**
* **Cell phase error can be optimized for inter-cell LI CLI measurement (if considered in Rel-19) e.g., co-located scenario**

**Proposal 6: For Rel-19 L1 CLI SRS-RSRP measurement, the time difference between UE’s DL reference timing in the serving cell and SRS arrival time shall be further discussed.****Proposal 7: Reusing Rel 16 L3 CLI SRS-RSRP measurement assumption as starting point for following side conditions:*** **SRS port: 1**
* **SRS bandwidth: 48 RBs**
* **SRS symbol: 1**
* **No SRS repetitions**
* **Frequency hopping, sequence group hopping or sequence hopping is disabled**
* **SNR side condition: 1 dB**

**Proposal 8: RAN4 can evaluate L1 SRS-RSRP measurement performance considering both single shot and multiple shots measurements if different side condition identified e.g. residual timing error** * For intra-cell L1 CLI SRS-RSRP measurement: Tother = 1.67usec for FR1 and 0.67usec for FR2 can be considered.
* For inter-cell L1 CLI SRS-RSRP measurement: Reduced values compared R16 CLI assumption can be considered.

**Proposal 9: Focus on Aperiodic CSI reporting mode for Rel-19 CLI measurement, for other reporting modes hold on the discussion pending on further progress in RAN1.****Proposal 10: UE measurement behaviour and corresponding measurement restriction and/or scheduling availability is pending on further progress from RAN1.** |
| [**R4-2412671**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412671.zip) | Huawei, HiSilicon | **Proposal 1: RAN4 not to define RRM requirements for gNB-to-gNB CLI handling.****Proposal 2: RAN4 to define requirements for L1 based UE-to-UE CLI measurement, e.g. L1-SRS-RSRP and/or L1-CLI-RSSI.****Proposal 3: RAN4 to discuss following aspects for L1 based UE-to-UE CLI measurement.** * **Measurement delay**
* **Side conditions and measurement accuracy**
* **Scheduling and measurement restriction**
* **Report mapping**

**Proposal 4: RAN4 to discuss the impacts of SBFD operation for at least following requirements:*** **SSB based L1 measurement**
* **CSI-RS based L1 and L3 measurement**
* **MG**
* **BWP switch**

**Other impacts of SBFD operation are not precluded.** |
| [**R4-2413081**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413081.zip) | ZTE Corporation, Sanechips | **Observation 1: Some high level key points of the applicable scenario of R19 SBFD are listed as below:*** **The frequency and time resource of SBFD subband is semi-statically indicated to SBFD aware UE in CONNECTED mode, i.e. dynamic SBFD/TDD operation is not considered**
* **SBFD at gNB side, and half duplex operation at UE side**
* **Consider FR1 and FR2-1**
* **Coexistence between non-SBFD aware UEs and SBFD aware UEs in a cell at gNB side**
* **SBFD scheme within a single configured DL and UL BWP pair with aligned center frequencies**
* **The SBFD subband applicable to UL operation only locates in D or F symbol**
* **Includes both single-operator and two-operator applications**
* **Both macro and micro are considered, i.e. the homogeneous and heterogeneous network are considered**

**Observation 2: The R19 UE-to-UE CLI measurement is determined as L1 measurement, both SRS-RSRP measurement and CLI-RSSI measurement are allowed, the resource can be configured as periodic, semi-persistent, or aperiodic resource. At least aperiodic reporting supported.** **Observation 3: How to determine the QCL typeD assumption of the CLI resource, still FFS.****Observation 4: Four types of UE-to-UE CLI measurements are on the table, including both direct measurement on DL subband and indirect measurement on UL subband/guard band.****Proposal 1: The measurement period requirements for the four candidate UE-to-UE CLI measurements should be discussed one by one.****Proposal 2: The R19 UE-to-UE CLI is L1 measurement, instead of L3 measurement, so the legacy UE-to-UE CLI accuracy requirements can not be reused directly. Some adaptation to facilitate L1 measurement should be considered.****Proposal 3: The side condition for Method#2 should be considered from the following aspects:*** **Side condition of time offset between UE’s DL reference timing in the serving cell and SRS arrival time**
* **Side condition of SINR**
* **Side condition of maximum/minimum RSRP**

**Observation 5: One main motivation of gNB-to-gNB CLI measurement is to help the victim gNB to derive the interference leakage to the UL subband since the aggressor gNB Tx at the DL subband. Besides, some spatial domain scheme could reduce or eliminate the interference.****Observation 6: Based on all candidate schemes of gNB-to-gNB CLI, four types of measurements could be considered with different measurement purpose:*** **Type 1：Victim gNB measures the CLI resource to derive the channel info from aggressor gNB to victim gNB**
* **Type 2：Aggressor gNB measures the CLI resource and based on the reciprocity to derive the channel info from aggressor gNB to victim gNB**
* **Type 3：Victim gNB measures the CLI resource to obtain the RSRP/RSSI/SINR of the link from aggressor gNB to victim gNB**
* **Type 4：Victim gNB measures the CLI resource to obtain the strongest/poorest beam of the link from aggressor gNB to victim gNB**

**Proposal 4: L1 based gNB-to-gNB CLI measurement is preferred due to the relatively stable interference circumstance. If channel matrix measurement allowed, need to discuss how to define the measurement type.****Observation 7: One victim gNB may interfered by multiple aggressors. So who undertakes the gNB-to-gNB CLI resource configuration task should be considered. Whether allow the interaction between gNBs should be determined, so wait for RAN3 conclusions.****Observation 8: Within all four types of measurement for gNB-to-gNB CLI, the Type 3 is not sensitive to single aggressor or multiple aggressors. While Type 1, 2, 4 are sensitive to single aggressor or multiple aggressors due to non-overlapping CLI resource are needed for multiple aggressors case.** |
| [**R4-2413454**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413454.zip) | Qualcomm Incorporated | **Proposal 1: RAN4 to start discussing L1 UE-to-UE CLI measurement requirements for RRM.****Proposal 2: RAN4 to discuss the measurement bandwidth for L1 CLI measurements, e.g., DL subband.****Proposal 3: When more than one DL sub-bands are configured, RAN4 to discuss whether the measurement quantities can be filtered/combined across DL subbands.****Proposal 4: RAN4 to start identifying impact of SBFD operation to RRM requirements such as CSI-RS based measurements.****Proposal 5:** **RAN4 to consider putting limits on the maximum number of DL/UL switching during SBFD slots within the SBFD periodicity** |
| **[R4-2413209](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413209.zip)** | MediaTek inc. | **Observation 1: The measurement delay for the new measurement quantities, such as L1-SRS-RSRP, L1-CLI-RSSI, should be faster compared to the existing measurement delay for SRS-RSRP.****Observation 2: The measurement framework for the new measurement quantities should be defined by RAN1 while the measurement accuracy and delay are specified by RAN4.** **Proposal 1: RAN4 RRM should wait for RAN1 WG to define the new measurement quantities and framework before defining the new RRM requirements.****Proposal 2: RAN4 should study and define requirements for: (1) CSI-RS based RLM and BFD, (2) CSI-RS based L1-RSRP.** |

## Open issues summary

### Sub-topic 2-1: RRM impacts of UE-to-UE CLI handling

#### Issue 2-1-1: Scope of requirements for UE-to-UE CLI handling

* Proposals
	+ Proposal 1 (CATT, Apple, Nokia, LGE, CTC, E///, vivo, SS, HW, ZTE, QC, MTK):
		- RAN4 to define RRM requirements for L1 based UE-to-UE CLI measurement and reporting.
* Recommended WF
	+ Agree on P1

#### Issue 2-1-2: Measurement quantities

* Proposals
	+ Proposal 1 (Apple, HW, E//):
		- RAN4 to first focus on L1-SRS-RSRP and L1-CLI-RSSI, and FFS if other measurement quantities to be considered pending on further RAN1 conclusion
	+ Proposal 2 (MTK):
		- RAN4 RRM should wait for RAN1 WG to define the new measurement quantities and framework before defining the new RRM requirements.
* Recommended WF
	+ RAN4 to define core requirements for L1-SRS-RSRP and L1-CLI-RSSI measurements. This can be revisited based on further RAN1 agreement
	+ FFS if other measurement quantities to be considered in the core requirements based on further RAN1 agreement

#### Issue 2-1-3: Baseline for defining requirements

* Proposals
	+ Proposal 1 (CATT, LGE, CTC, E///, SS):
		- R16 CLI requirements can be used as a baseline for defining CLI requirements for SBFD.
	+ Proposal 2 (Nokia):
		- The CLI measurement requirement can be specified following L1-RSRP measurement and same assumption can be applied
* Recommended WF
	+ Both R16 CLI measurement requirements and L1-RSRP measurement requirements are to be considered for defining requirements for L1 based UE-to-UE CLI measurement.
	+ RAN4 can directly discuss the requirements for L1 based UE-to-UE CLI measurement in next meeting.

#### Issue 2-1-4: Measurement methods

* Background

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| AgreementFor SBFD aware UEs, CLI measurements is performed within the active DL BWP and the following can be considered* Method#1: UE measures RSSI within DL subband
* Method#2: UE measures RSRP of aggressor UE within UL subband
* Method#3: UE measures RSSI within UL subband
* Method#4: UE measures RSSI within guard band, if guard band exists

Note: If DL subband, UL subband or guard band is outside the active DL BWP, the above methods does not apply.Note: Method#4 does not imply that guard band is explicitly configured. |

* Proposals
	+ Proposal 1 (Nokia):
		- RAN4 to prioritize specifying the measurement requirements for the CLI measurements in SBFD on UL subbands of victim UEs i.e. Method#2 and #3
	+ Proposal 2 (LGE):
		- RAN4 need to discuss how to measure the UL CLI leakage by UL sub-band aggressor UE at DL sub-band at the UL sub-band UE as aggressor and DL sub-band UE as victim in same DL BWP scenario.
	+ Proposal 3 (E///, ZTE):
		- The measurement period requirements for the four candidate UE-to-UE CLI measurements should be discussed one by one.
	+ Proposal 4 (QC):
		- RAN4 to discuss the measurement bandwidth for L1 CLI measurements, e.g., DL subband.
		- When more than one DL sub-bands are configured, RAN4 to discuss whether the measurement quantities can be filtered/combined across DL subbands.
* Recommended WF
	+ RAN4 to wait for RAN1 conclusion on the supported methods of L1 based UE-to-UE CLI measurement.
	+ Meanwhile, RAN4 to discuss the impacts of different measurement methods on the requirements.

#### Issue 2-1-5: Rx beam

* Proposals
	+ Proposal 1 (Nokia):
		- RAN4 to discuss the CLI measurement requirement considering the potential different Rx beams based on RAN1 conclusion.
* Recommended WF
	+ RAN4 to wait for RAN1 conclusion on the Rx beam for L1 based UE-to-UE CLI measurement.
	+ Meanwhile, RAN4 to discuss the impacts of Rx beam configuration/determination on the requirements.

#### Issue 2-1-6: Measurement resources

* Proposals
	+ Proposal 1 (Nokia):
		- RAN4 should define new requirements for the mini-band CLI-RSSI reporting if this feature is supported by RAN1
	+ Proposal 2 (E///):
		- RAN4 will define the measurement requirement based on future agreement of exact number of PRBs to be used and exact number of symbols to be used within one set of requirements
* Recommended WF
	+ RAN4 to wait for RAN1 conclusion on measurement resources to discuss whether is an impact on the requirements.

#### Issue 2-1-7: Side condition

* Proposals
	+ Proposal 1 (CATT, CTC, E///, vivo, SS, HW, ZTE, QC):
		- RAN4 to discuss side conditions for L1 based UE-to-UE CLI measurement requirements.
	+ Proposal 2 (SS):
		- For Rel-19 L1 CLI SRS-RSRP measurement, the time difference between UE’s DL reference timing in the serving cell and SRS arrival time shall be further discussed, e.g. the residual timing error can be
			* For intra-cell L1 CLI SRS-RSRP measurement: Tother = 1.67usec for FR1 and 0.67usec for FR2 can be considered (i.e. without 3us cell phase error).
			* For inter-cell L1 CLI SRS-RSRP measurement: Reduced values compared R16 CLI assumption can be considered.
	+ Proposal 3 (SS):
		- Reuse R16 L3 CLI SRS-RSRP measurement assumption on SRS configuration and SINR condition as starting point
	+ Proposal 4 (ZTE):
		- The side condition for Method#2 should be considered from the following aspects:
			* Side condition of time offset between UE’s DL reference timing in the serving cell and SRS arrival time
			* Side condition of SINR
			* Side condition of maximum/minimum RSRP
* Recommended WF
	+ RAN4 to define side conditions for L1 based UE-to-UE CLI measurement requirements.
	+ RAN4 to discuss at least time offset between DL timing and SRS arrival timing, SRS Es/Iot, SRS configuration and maximum/minimum SRS-RSRP.

#### Issue 2-1-8: Measurement period

* Proposals
	+ Proposal 1 (CATT, Apple, Nokia, LGE, CTC, E///, vivo, SS, HW, ZTE, QC):
		- RAN4 to discuss measurement period requirements for L1 based UE-to-UE CLI measurement
	+ Proposal 2 (CATT):
		- More RAN1 progress on resource configurations for CLI measurements is needed for defining CLI measurement period requirements.
	+ Proposal 3 (Apple, SS, HW):
		- RAN4 to discuss number of samples for the L1-SRS-RSRP measurement including single shot and multiple shots
	+ Proposal 4 (Nokia):
		- RAN4 should specify the measurement periods for L1-SRS-RSRP and L1-CLI-RSSI measurements irrespective of different CLI measurement methods.
	+ Proposal 5 (CTC):
		- Define better measurement requirements for Rel-19 L1 CLI measurement compared to Rel-16 L3 CLI measurement
* Recommended WF
	+ RAN4 to define measurement periods for L1 based UE-to-UE CLI measurement requirements,
	+ RAN4 to discuss whether the measurement is based on single shot or multiple shots (e.g. 3 samples as R16 SRS-RSRP measurement).

#### Issue 2-1-9: Measurement reporting

* Proposals
	+ Proposal 1 (CATT, Nokia, CTC, SS):
		- RAN4 to discuss measurement reporting requirements for L1 based UE-to-UE CLI measurement
	+ Proposal 2 (CATT):
		- More RAN1 progress on reporting design is needed for defining CLI reporting requirements
	+ Proposal 3 (Nokia):
		- At least the L1-RSRP measurement reporting requirement for aperiodic reporting can be reused for the L1 based CLI measurement reporting
	+ Proposal 4 (SS):
		- Focus on Aperiodic CSI reporting mode for Rel-19 CLI measurement, for other reporting modes hold on the discussion pending on further progress in RAN1.
* Recommended WF
	+ RAN4 to define measurement reporting requirements for L1 based UE-to-UE CLI measurement at least for aperiodic reporting
	+ FFS on reporting requirements for periodic and semi-persistent reporting pending on RAN1 agreement
	+ FFS whether L1-RSRP measurement reporting requirement can be re-used.

#### Issue 2-1-10: Measurement accuracy

* Proposals
	+ Proposal 1 (CATT, CTC, E///, vivo, SS, HW, ZTE, QC):
		- RAN4 to discuss measurement accuracy requirements for L1 based UE-to-UE CLI measurement
	+ Proposal 2 (CATT):
		- No performance requirements need to be defined for RS index reporting
		- More RAN1 progress on resource configurations is needed to decide if legacy CLI measurement accuracy requirements can be reused.
	+ Proposal 3 (CTC):
		- Define better measurement requirements for Rel-19 L1 CLI measurement compared to Rel-16 L3 CLI measurement
	+ Proposal 4 (ZTE):
		- The legacy UE-to-UE CLI accuracy requirements can not be reused directly. Some adaptation to facilitate L1 measurement should be considered.
* Recommended WF
	+ RAN4 to define measurement accuracy requirements for L1 based UE-to-UE CLI measurement based on the agreed side condition and measurement period.

#### Issue 2-1-11: Scheduling and measurement restriction

* Proposals
	+ Proposal 1 (CATT, Nokia, CTC, vivo, SS, HW, QC):
		- RAN4 to discuss scheduling and measurement restriction for L1 based UE-to-UE CLI measurement
	+ Proposal 2a (Nokia):
		- RAN4 to start discussing the CLI measurements in SBFD without considering dynamic TDD in R19
		- RAN4 shall wait for RAN1 conclusion on the CLI measurement methods before discussing the measurement and scheduling restriction.
	+ Proposal 2b (SS):
		- UE measurement behaviour and corresponding measurement restriction and/or scheduling availability pending on further progress from RAN1, e.g. measurement methods and Rx beam assumption
* Recommended WF
	+ RAN4 to define scheduling and measurement restriction for L1 based UE-to-UE CLI measurement.
	+ FFS the impact of measurement methods and Rx beam assumption

#### Issue 2-1-12: Measurement capability

* Proposals
	+ Proposal 1 (E///):
		- The measurement capability for L1-CLI measurement and report shall wait and follow the RAN1 specific agreement and RAN4 can start the discussion of what type of requirements shall be specify and the capability can be based on the maximum configured resource.
* Recommended WF
	+ FFS whether RAN4 needs to discuss measurement capability for L1 based UE-to-UE CLI measurement in terms of number of resources UE shall be able to monitor.

#### Issue 2-1-13: Report mapping

* Proposals
	+ Proposal 1 (HW):
		- RAN4 to discuss report mapping for L1 based UE-to-UE CLI measurement
* Recommended WF
	+ FFS whether RAN4 needs to discuss measurement capability for L1 based UE-to-UE CLI measurement.
	+ FFS whether R16 report mapping can be re-used.

#### Issue 2-1-14: Link level simulations

* Proposals
	+ Proposal 1 (E///, HW):
		- RAN4 shall start the initial discussion for simulation assumption for setting up the requirements.
* Recommended WF
	+ RAN4 to discuss link level simulation assumptions for evaluating the performance of L1 UE-to-UE CLI measurement e.g. based on the possible new side condition and/or sample number.

### Sub-topic 2-2: RRM impacts of gNB-to-gNB CLI handling

#### Issue 2-2-1: Scope of requirements for gNB-to-gNB CLI handling

* Proposals
	+ Proposal 1 (SS, HW):
		- There is no RRM impact on gNB to gNB CLI handing.
	+ Proposal 2 (ZTE):
		- L1 based gNB-to-gNB CLI measurement is preferred due to the relatively stable interference circumstance. If channel matrix measurement allowed, need to discuss how to define the measurement type.
* Recommended WF
	+ RAN4 not to define RRM requirements for gNB to gNB CLI handing.

### Sub-topic 2-3: RRM impacts of SBFD operation

#### Issue 2-3-1: Requirements for legacy UE

* Proposals
	+ Proposal 1 (Nokia):
		- The legacy UEs shall perform and operate according to the legacy RRM requirements, despite being served by a gNB operating with SBFD.
* Recommended WF
	+ Agree on P1

#### Issue 2-3-2: Requirements for SSB based measurement

* Proposals
	+ Proposal 1 (Nokia, HW, QC, MTK):
		- For SBFD-aware UE, the SSB-based measurement, including RRM requirements for idle/inactive mode, requirement will not be impacted due to SBFD configuration.
	+ Proposal 2 (E///):
		- RAN4 need clarification from RAN1 which SSB is being agreed, only current serving cell or any SSBs collide with the SBFD symbol.
* Recommended WF
	+ For SBFD-aware UE, existing requirements apply for SSB-based serving cell measurement. FFS for SSB based neighbour cell measurement.

#### Issue 2-3-3: Requirements for CSI-RS based measurement

* Proposals
	+ Proposal 1 (vivo, SS, HW, QC, MTK):
		- For SBFD operating, RAN4 discuss the impact on the CSI-RS measurement requirements.
	+ Proposal 2 (SS):
		- L1 CSI-RS measurement requirements may need to be updated to following RAN1 update on CSI report configuration between SBFD slots and non-SBFD slots
	+ Proposal 3 (HW):
		- L1 and L3 CSI-RS measurement requirements may need to be updated due to collision between CSI-RS measurement and dynamic UL transmission on SBFD symbols
	+ Proposal 4 (HW, QC, MTK):
		- CSI-RS measurement requirements may need to be updated due to CSI-RS resources not mapped outside DL usable PRBs in frequency domain
* Recommended WF
	+ RAN4 to discuss the impact of SBFD operation on the CSI-RS measurement requirements.

#### Issue 2-3-4: Requirements for scheduling restriction

* Proposals
	+ Proposal 1 (E///):
		- RAN4 shall wait for RAN1 final agreement for the frequency domain usage of that SBFD symbol to decide how to address the collision case with RRM requirement.
	+ Proposal 2 (HW):
		- RAN4 to discuss scheduling restriction for SSB based L1 measurement due to SBFD operation
* Recommended WF
	+ RAN4 to discuss the impact of SBFD operation on the scheduling restriction requirements.

#### Issue 2-3-5: Requirements for RACH requirements

* Proposals
	+ Proposal 1 (E///):
		- RAN4 can wait for RAN1 and RAN2 agreement for Random Access procedure stable then define the correct UE behavior based on the agreements. Certain side conditions may need to be specified on top of the UE behavior due to the SBFD UE only support HD mode.
	+ Proposal 2 (SS, HW):
		- No RAN4 RRM requirements impact foreseen on “SBFD random access operation”, some update on RAN4 PRACH configuration maybe required pending on detailed RAN1 specification update.
* Recommended WF
	+ RAN4 to discuss whether RACH requirements are impacted due to SBFD operation based on RAN1 agreements.

#### Issue 2-3-6: Requirements for UL PC and or spatial relation update

* Proposals
	+ Proposal 1 (SS):
		- FFS on RAN4 RRM impact for UL PC and or spatial relation update e.g., unified TCI state framework and /or UL spatial info related framework.
* Recommended WF
	+ RAN4 to discuss whether requirements for UL PC and or spatial relation switch are impacted due to SBFD operation based on RAN1 agreements.

#### Issue 2-3-7: Requirements for MG and BWP switch

* Proposals
	+ Proposal 1 (HW):
		- RAN4 to clarify the term “UL slot” in MG and BWP switch requirements when SBFD operation is enabled.
* Recommended WF
	+ RAN4 to discuss whether to clarify the term “UL slot” in MG and BWP switch requirements when SBFD operation is enabled.

#### Issue 2-3-8: Requirements for UL resource muting

* Proposals
	+ Proposal 1 (LGE):
		- No additional RRM requirements would be required for UL resource muting for PUSCH feature.
* Recommended WF
	+ Agree on P1

#### Issue 2-3-9: Requirements for generic SBFD operation

* Proposals
	+ Proposal 1 (CATT):
		- Defining scheduling restrictions/interruptions needs more RAN1 progress, e.g. in CA scenario where SBFD operation is enabled in one CC
	+ Proposal 2 (SS):
		- No new RRM requirement required for objective “Semi-static indication of time/frequency location of SBFD-sub band”
* Recommended WF
	+ RAN4 to discuss whether there is any RRM impact e.g. to scheduling restrictions/interruptions requirements due to SBFD operation.

#### Issue 2-3-10: Limits on the maximum number of DL/UL switching

* Proposals
	+ Proposal 1 (QC):
		- RAN4 to consider putting limits on the maximum number of DL/UL switching during SBFD slots within the SBFD periodicity
* Recommended WF
	+ RAN4 to discuss whether to put limits on the maximum number of DL/UL switching during SBFD slots within the SBFD periodicity.