3GPP TSG-RAN WG2 Meeting #119 electronic Draft R2-2208708

Online, August, 2022

Agenda: 9.8

Source: Session Chair (Intel)

Title: Report from IDC breakout session

Document for: Approval

 **Organizational:**

* [AT119-e][650][IDC] Organizational Yi – IDC (Intel)

 Scope:

* Share plans for the e-meetings and list/status of ongoing email discussions for the sessions.
* Share meeting notes and agreements for review and endorsement.

* [AT119-e][651][IDC] FDM solution enhancements (Huawei)

 Scope: based on companies’ contributions submitted in 8.10.2

 A) Identify the use cases or scenarios (e.g. serving/non-serving, E-UTRA frequency, NR frequency and MR-DC) for the FDM solution enhancements.

 B) Granularity of frequency indication for identified use case/scenarios

 Intended outcome: Report to Wednesday session in R2-2208951

 Deadline: Wednesday 2022-08-24 00:30 AM UTC.

* [AT119-e][652][IDC] TDM solution (Xiaomi)

 Scope: based on companies’ contributions submitted in 8.10.3

 A) Identify the use cases or scenarios (e.g. WLAN, BT multimedia, BT voice) for the TDM solution

 B) TDM solutions for identified use cases/scenarios

 Intended outcome: Report to Wednesday session in R2-2208952

 Deadline: Wednesday 2022-08-24 00:30 AM UTC.

## 8.10 IDC enhancements for NR and MR-DC

(NR\_IDC\_enh-Core; leading WG: RAN2; REL-18; WID: RP-221281)

Time budget: 1 TU

Tdoc Limitation: 2 tdocs

This WI expects to address interference between 3GPP (including various MR-DC architectures, i.e. NR-DC and EN-DC) and non-3GPP RAT (e.g. WiFi). Note: Enhancements to FDM solution is prioritized. LTE IDC solution should be considered as the baseline for the solutions developed in this WI.

### 8.10.1 Organizational

LS in. Rapporteur Input

[R2-2207803](file:///C%3A%5Cwork%5CRAN2%5CExtracts%5CR2-2207803%20Work%20Plan%20for%20Rel-18%20IDC.docx) Work Plan for Rel-18 IDC Xiaomi discussion Rel-18 NR\_IDC\_Enh-Core

* Noted

### 8.10.2 FDM solution enhancements

Enhancements to FDM solution, to allow more granular indication of affected frequencies (e.g. granularity of BWP or PRB level).

* [AT119-e][651][IDC] FDM solution enhancements (Huawei)

 Scope: based on companies’ contributions submitted in 8.10.2

 A) Identify the use cases or scenarios (e.g. serving/non-serving, E-UTRA frequency, NR frequency and MR-DC) for the FDM solution enhancements.

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 Intended outcome: Report to Wednesday session in R2-2208951

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[R2-2208951](file:///C%3A%5Cwork%5CRAN2%5CExtracts%5CR2-2208951%20Report%20of%20%5BAT119-e%5D%5B651%5D%5BIDC%5D%20FDM%20solution%20enhancements.doc) [AT119-e][651][IDC] FDM solution enhancements (Huawei) Huawei, HiSilicon discussion Rel-18 NR\_IDC\_Enh-Core

Proposals for agreement:

Proposal 1: [To agree] [14/14] RAN 2 agrees that the Adjacent channel interference between NR Stand Alone (SA) or MN of NR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.

* Samsung, consider sidelink is in the WI scope. The band of sidelink is near WiFi, and therefore it is possible to have interference between them. They also see the problem for Relay. LG, sidelink is out our scope. Xiaomi, FDM solution can be applicable for multiple use cases. It can also be applicable for sidelink. But we should focus on how to report for freq.
* VDF, why we separate two cases for P1 and p2? They think same solution can be applicable for both scenarios. Huawei clarified it is related whether the signaling should be carried via SRB1 or SRB3. Apple, if UL is only involve one leg, the UE can report UAI to SN directly. If the UL involves two legs, then it must be reported to MN. VDF, we can discuss this later. But for scenario, we should keep some level common. ZTE agree, signalling can be discussed in later stage. But wonder how to handle NE-DC? Huawei, it has been excluded from WI scope.
* ZTE, for EN-DC, do we have enhancements on E-UTRA freq? Chair, Huawei, we do not enhance E-UTRA freq.
* Samsung, we only focus on the interference between 3GPP and non-3GPP.
* QC, Does NE-DC not considered mean that we can't even report to NR MN? We can still report it as "other" victim system? Chair/LG, we will still work on NR freq as SA NR.
* Samsung, our focus is on interference between 3GPP frequency and non-3GPP freq.? Xiaomi, the interference within 3GPP freq is not in the WI scope. Apple agree. Huawei agree.

Proposal 2: [To agree] [14/14] RAN 2 agrees that the Adjacent channel interference between SN (NR) of MR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.

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| Agreements:1 The Adjacent channel interference between NR Stand Alone (SA) or MN of NR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.2 The Adjacent channel interference between SN (NR) of MR-DC and non-3GPP should be considered for the FDM enhancement in Rel.18.3 NE-DC is not considered; We will work on NR freq as SA NR case. 4 We will not consider the enhancements on E-UTRA freq for EN-DC scenario. FFS, on signalling details; |

Proposal 3: [To agree] [12/14] RAN 2 agrees that the IMD interference from simultaneous Tx in EN-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.

* Ericsson, we can discuss adjacent first, and then consider the BC issue. Nokia agree. Xiaomi, all solutions are applicable for IMD. They think most of interference came from IMD based on LTE discussion. And these two proposals are ok from most companies. Huawei, agree with xiaomi. Intel, Samsung, also agree. Apple, the only difference is MR-DC case. How the network coordinate with each other. They agree with xiaomi, other aspects are same. VDF, we can capture same solution from adjacent is used for IMD. Nokia, we did not discuss the solution details. It is difficult to predict. Vivo would like to deprioritize the IMD.
* Nokia is ok with the note.

Proposal 4: [To agree] [12/14] RAN 2 agrees that the IMD interference from simultaneous Tx in NR-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.

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| Agreements:1 The IMD interference from simultaneous Tx in EN-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.2 The IMD interference from simultaneous Tx in NR-DC to non-3GPP should be considered for the FDM enhancement in Rel.18.Note: the solution (on freq granularity) for adjacent can be reused for IMD, we will not invent new solution on freq granularity for IMD. FFS on signalling details.  |

Proposal 5: [To agree] [10/14] RAN 2 agrees that granular indications of the affected NR frequency reported for IDC issue needs to consider both serving and non-serving frequency as in the legacy FDM solution.

* LG, P5 is contradict with P7 solution 3.1. VDF, support P5. They see the benefit to have more information in gNB. Ericsson, Nokia, xiaomi, Intel, CATT, agree. ZTE, they have no strong opinion but can follow majority.
* Huawei, if P5 is agreed, we have additional metric to be considered in P7.

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| Agreements:1 Granular indications of the affected NR frequency reported for IDC issue needs to consider both serving and non-serving frequency as in the legacy FDM solution. |

Proposals need further online discussion:

Proposal 6: [To discuss] [7/14] RAN 2 to discuss whether we should have unified FDM solution enhancements with granular indications for both serving and non-serving frequency as the starting point.

* Apple, how we can have unified FDM since there is BWP in serving freq, but not the case for non-serving cell. QC, ZTE, agree with Apple. Do not see the point to agree it for now. Ericsson, we have candidate freqs in LTE, we can have candidate BWP. VDF, Huawei support unified solution.

Proposal 7: [To discuss] RAN 2 to first have conclusions on P5 and P6, and based on the conclusions, RAN2 to further discuss the solutions with the following direction that is aligning with the conclusions:

- Direction 1: Have a unified solution for both serving frequency and non-serving frequency

o Option 1.1: Frequency range based reporting (original Option 1, 2, 2a series) – UE reports actual affected frequency range in terms of Central/Start frequency + Bandwidth or Start and End frequency among the configured candidate frequency ranges

o Option 1.2: BWP based reporting (original Option 3 series) – UE reports affected BWP among the configured candidate BWP

- Direction 2: Separate solutions for serving frequency and non-serving frequency:

o Option 2.1: BWP based reporting (original Option 3 series) – UE reports affected BWP among the configured candidate BWP for serving frequency, and Frequency range based reporting (original Option 1, 2, 2a series) – UE reports actual affected frequency range in terms of Central/Start frequency + Bandwidth or Start and End frequency among the configured candidate frequency ranges for non-serving frequency

- Direction 3: Only have solution for serving frequency, no enhancement for non-serving frequency

o Option 3.1: BWP based reporting (original Option 3 series) – UE reports affected BWP among the configured candidate BWP for serving frequency

- QC we can skip P6, and discuss P7 directly.

- Huawei clarified, based on this proposal, option 4-6 have been excluded. Nokia would like to keep option 6 for now.

- Apple, would like to have different solution for serving freq and non-Serving freq. We could have benefit for both cases. LG, QC agree with Apple.

- QC, is ok to have freq range for non-serving.

- LG, BWP is sufficient for most of cases for serving freq. For non-serving freq, they are fine no any enhancements.

- VDF, if we use BWP solution, TDM will be more complicated. TDM pattern needs to be changed if BWP is changed. Huawei, we do not need to link BWP and TDM. Vivo agree with Huawei.

- Intel, we need to discuss signalling and granularity separately so far, the solution direction mixed them together.

- Xiaomi, the granularity does not need to be aligned among frequencies, e.g. EN-DC, we have different way for LTE and NR freq.

- Nokia, prefer to have unified solution. But fine not take decision in this meeting. Ericsson, hope we can have single granularity.

- vivo, we may only list different options in this meeting, and compare them next meeting.

The following documents will not be individually treated

[R2-2207162](file:///C%3A%5Cwork%5CRAN2%5CExtracts%5CR2-2207162.docx) Consideration on the FDM enhancement ZTE Corporation, Sanechips discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207469 Discussion on FDM solution enhancements for IDC OPPO discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207539 Discussion on FDM solution enhancements Sharp discussion

R2-2207556 Assistance information for FDM Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207804 Discussion on the IDC FDM solutions Xiaomi discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207844 Discussion on FDM solution for in-device co-existence interference avoidance Samsung discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207936 Discussion on FDM solution in IDC Apple discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207968 Enhanced FDM solution for IDC Intel Corporation discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208116 FDM Solutions in IDC Qualcomm Incorporated discussion Rel-18

R2-2208135 FDM solution for IDC Ericsson discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208230 Discussion on FDM enhancement Huawei, HiSilicon discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208396 Discussion on FDM solution for R18 IDC vivo discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208524 IDC FDM solution LG Electronics discussion Rel-18

moved here from 8.10.1

R2-2207161 Clarification on the IDC scope ZTE Corporation, Sanechips discussion Rel-18 NR\_IDC\_Enh-Core

### 8.10.3 TDM solution

Introduction of TDM solution (e.g. indication of UE preferred TDM pattern for UL/DL).
Note: The TDM solution is considered complementary to the FDM solution.

* [AT119-e][652][IDC] TDM solution (Xiaomi)

 Scope: based on companies’ contributions submitted in 8.10.3

 A) Identify the use cases or scenarios (e.g. WLAN, BT multimedia, BT voice) for the TDM solution

 B) TDM solutions for identified use cases/scenarios

 Intended outcome: Report to Wednesday session in R2-2208952

 Deadline: Wednesday 2022-08-24 00:30 AM UTC.

[R2-2208952](file:///C%3A%5Cwork%5CRAN2%5CExtracts%5CR2-2208952_Summary%20of%20%5BAT119-e%5D%5B652%5D%5BIDC%5D%20TDM%20solution%20%28Xiaomi%29.docx) [AT119-e][652][IDC] TDM solution (Xiaomi) Xiaomi discussion Rel-18 NR\_IDC\_Enh-Core

Observation: The Rel-18 IDC TDM solution should be discussed case-by-case.

Potential easy agreements:

Proposal 1 (14/14): The use cases (e.g. BT voice, BT eSCO and WLAN beacon) as described in 3GPP TR 36.816 for LTE TDM solutions are considered for developing the Rel-18 IDC TDM solution in RAN2.

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| Agreements:1 The use cases (e.g. BT voice, BT eSCO and WLAN beacon) as described in 3GPP TR 36.816 for LTE TDM solutions are considered for developing the Rel-18 IDC TDM solution in RAN2.2 Rel-18 IDC TDM solution(s) targets at resolving the adjacent channel interference issue and the intermodulation distortion interference issue, as LTE. |

Proposal 2 (12/14): Rel-18 IDC TDM solution(s) targets at resolving the adjacent channel interference issue and the intermodulation distortion interference issue, as LTE.

* ZTE, the solution here mentioned LTE, but we do not have BC for LTE. Xiaomi, clarify autonomous denial can be applied for IMD.

Proposal 3 (13/14): As the baseline, the UE reports the TDM assistance information for IDC affected frequency list (i.e. not for the frequency combination list of UL CA), as LTE. The frequency granularity relys on the FDM solution.

* Apple, seems TDM is on top of FDM solution in the proposal. Xiaomi, yes. For LTE, TDM is also on top of FDM. Intel, do not see why we link them together. We do not need to optimize TDM for IMD, but if the reporting can be reused, why should we exclude it. Xiaomi, For DRX, UE will drop all UL transmission during Inactive period. It is overkill.
* Ericsson, would like to mention clear, TDM is complementary of FDM. We should make it simple. Nokia, agree with Erisson, to make TDM simple. VDF agree with Ericsson and Nokia. We should make it as agreements. LG also agree. Huawei agree. And think DRX could be a possible solution.
* Apple, UE needs to report problematic band first, complementary does not mean the UE to try FDM first. Intel, in LTE, the UE can send FDM and TDM in the same message. If LTE is baseline we do not need to debate on this. QC agree with Intel. But do not see the need to capture it.
* Vivo, combine FDM information to TDM solution is beneficial, they support this proposal.
* Huawei, for some scenarios, gNB may not need TDM. We need the configuration from network.

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| Agreements:1 As the baseline, the UE reports the TDM assistance information for IDC affected frequency list , as LTE. Note, this does not exclude MUSIM gap like solution.  |

Proposal 4 (10/14): The UE can report its preferred DRX pattern (including DRX cycle, DRX starting offset and DRX active time), as LTE.

* LG, DRX cannot work well for very dynamic issue. But they prefer to select simple one. It is premature to take one solution as baseline. Nokia, Agree with LG, we need to compare solutions first.
* Apple, DRX is quite complicated, UE needs to maintain many timers. They think MUSIM gap is simpler. Vivo, agree with Apple. VDF, there is Rel-18 WI on MUSIM, not sure whether there will be impact. We should leave it open.
* Xiaomi, we may choose one from DRX/Gap solution.
* Samsung, we cannot do down selection, and suggest to do same as FDM, i.e. list candidate solution first, do down selection in next meeting. VDF, agree. ZTE agree with Samsung. Intel agree. Huawei agree.
* Huawei/Intel has concern on MUSIM gap solution.
* Vivo clarify we can discuss TDM based on R17 MUSIM gap. Rel-18 MUSIM is for capability coordination, and unrelated to TDM.

Candidate solution TDM:

* DRX solution;
* MUSIM gap like solution;
* UL and/or DL transmission occasion(s);
* Autonomous denial solution;
* We will have separate post meeting discussions on candidate solutions (FDM/TDM), and try to do down selection in next meeting.

Proposal 8 (11/14): Hardware sharing indication is not included in the Rel-18 IDC work.

* RAN2 consider “hardware sharing indication” is out of scope. Company should bring this to RANP if want to support it.

Solutions need more discussion:

Proposal 5 (5(Yes)/8(No)): FFS on whether the UE can report its preferred UL and/or DL transmission occasion(s), as LTE.

Proposal 6 (5(Yes)/5(No)/4(No strong view)): FFS on whether the UE can be configured to autonomously deny the NR UL transmission, as LTE.

Proposal 7 (4(Yes/7(No)/3(FFS))): FFS on whether MUSIM gap-like solution is included in Rel-18 IDC work.

The following documents will not be individually treated

R2-2207379 TDM Assistance Information for IDC Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207718 TDM solution for IDC problem Lenovo discussion Rel-18

R2-2207805 Candidate TDM solutions for IDC Xiaomi discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207845 Discussion on TDM solution for in-device co-existence interference avoidance Samsung discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207937 Discussion on TDM solution in IDC Apple discussion Rel-18 NR\_IDC\_Enh-Core

R2-2207969 TDM solution for IDC Intel Corporation discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208113 TDM Solution for NR IDC Ericsson discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208118 TDM Solutions in IDC Qualcomm Incorporated discussion Rel-18

R2-2208231 Discussion on TDM solution for NR IDC Huawei, HiSilicon discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208397 Discussion on TDM solution for IDC vivo discussion Rel-18 NR\_IDC\_Enh-Core

R2-2208525 IDC TDM solution LG Electronics discussion Rel-18