**3GPP TSG-RAN WG4 Meeting #100-e R4-210xxxx**

**Electronic Meeting, August 16-27, 2021**

**Agenda item:** 8.43

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

**Title:** Email discussion summary for [100-e][125] Simultaneous\_RxTx

**Document for:** Information

# Introduction

This email thread discuss Rel-17 PC2 HPUE for NR sidelink enhancements. The contributions are in agenda 8.43, which includes:

* Topic #1: Principles for simultaneous Rx/Tx capability
  1. Issue 1-1: Rules to decide simultaneous Rx/Tx capability for a band combination
  2. Issue 1-2: Simultaneous Rx/Tx capability and sync/async condition
* Topic #2: CR for simultaneous Rx/Tx

# Topic #1: Issues related to PC2 HPUE for SL enhancements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2112833](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112833.zip)** | CHTTL | **Proposal 1: For issue 1-2-1: Simultaneous Rx/Tx capability for FR1+FR1 FDD-TDD band combination**  **- At least the following condition #1 which was already agreed in the previous RAN4 meeting should be continually applied.**  **- Condition #1: *For TDD-FDD combinations, the capability shall be mandatory if low-band (below 1GHz) is aggregated with high (i.e. 2.69GHz and above) and mid-band (1GHz to 2.69GHz) TDD cells.***  **- For the band combinations that are not under the condition #1, RAN4 can further agree on other criteria (ex: frequency separation…) to determine whether simultaneous Rx/Tx capability can be mandatory supported without any discussion.**  (Note that if no further consensus can be reached, case-by-case discussion is applied for the band combinations that are not under the condition #1) |
| **[R4-2112913](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112913.zip)** | ZTE | FR1+FR1 FDD-TDD  **Proposal 1. Combining option 1 with option 2**  *FR1+FR2 TDD-TDD*  **Proposal 2. Mandatory simultaneous Rx/Tx capability should be supported for all of the FR1 (<7.125 GHz)+FR2 TDD-TDD CA band combination.**  *FR2+FR2 TDD-TDD*  **Proposal 3. case by case for FR2+FR2 TDD-TDD band combination.** |
| **[R4-2113304](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113304.zip)** | Xiaomi | **Proposal 1: for FR1+FR1 FDD-TDD band combination, option 3 is preferable on how to decide Simultaneous Rx/Tx capability.**  **Proposal 2: Simultaneous Rx/Tx capability for FR1+FR2 TDD-TDD band combination can be mandatory support in the case of current FR1 and FR2 frequency range.**  **Proposal 3: for FR2+FR2 TDD-TDD band combination, Simultaneous Rx/Tx capability shall be decided by case by case.** |
| **[R4-2113895](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113895.zip)** | OPPO | ***Observation 1: Supporting simultaneous RxTx means in any case this capability is supported and mainly represent the hardware capability in interference rejection.***  ***Observation 2: In current scheme, BS cannot schedule simultaneous RxTx in any case if UE doesn’t support Simultaneous RxTx.***  ***Observation 3: For UE without simultaneous RxTx capability, it is possible that NW can still schedule both bands working under simultaneous RxTx scenario if the capability applicable NW sync/async condition are provided.***  ***Proposal 1: It is proposed to evaluate the benefits of enable NW schedule UE without simultaneous RxTx capability working in simultaneous RxTx status, and study the possibility of reporting sync/async condition to NW to facilitate scheduling incapable UEs.*** |
| **[R4-2113896](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113896.zip)** | OPPO | ***Proposal 1: It is proposed to adopt following combined principle for FDD-TDD band combinations***   * + - Simultaneous RxTx is the default capability in FDD-TDD FR1 band combinations     - MSD will be defined for band combinations which potentially have problems like harmonics/IMD, etc. as usual     - For band combinations whose MSD is larger than a threshold (value FFS), further discuss whether simultaneous RxTx can be changed to optional   ***Proposal 2: It is proposed to adopt following principle for FR1+FR2 band combinations***   * + - Mandatory support simultaneous RxTx capability for FR1+FR2 band combinations with condition that FR1 is below 7.125GHz, and FR2 is above 24GHz.   ***Proposal 3: It is proposed to postpone the discussion for FR2+FR2 band combinations until deployment requests and also completion of FR2 CA requirements definition.*** |
| **[R4-2114515](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114515.zip)** | Huawei, HiSilicon | ***Proposal 1: For FR1+FR1 FDD-TDD band combinations, simultaneous Rx/Tx capability is mandatorily supported if the combination has no MSD issue or the MSD less than a certain value (to be discussed in RAN4). For the combination with MSD exceeding the threshold, whether the capability can be mandatorily supported should be checked under the WI.***  ***Proposal 2: For FR1+FR2 TDD-TDD band combinations, the simultaneous Rx/Tx capability shall be mandatory if FR1 TDD band does not exceed the frequency range of 7125MHz.***  ***Proposal 3: For FR2+FR2 TDD-TDD band combinations, the simultaneous Rx/Tx capability is studied case by case.*** |
| **[R4-2114516](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114516.zip)** | Huawei, HiSilicon | **TP for TR 38.839: Principles for simultaneous RxTx capability** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Issue 1-1: Rules to decide simultaneous Rx/Tx capability for a band combination

***Issue 1-1-1: Simultaneous Rx/Tx capability for FR1+FR1 FDD-TDD band combination***

* ***Option 1:***

*Mandatory support by default* *unless the specific problem is identified when specifying the specific combinations in the basket WID. To make sure the potential problem will not be missed check, case-by-case study can be applied if the frequency separation between the FDD band and the TDD band of the combination is smaller than a threshold. Otherwise, the mandatory simultaneous Rx/Tx capability is applied without additional discussion. MSD requirements shall be defined for the combinations which have REFSENS degradation caused by IMD or harmonics (combination of OP1 and OP2 in last meeting)*

* ***Option 2:***

*Using MSD as a basic guideline for defining simultaneous RxTx capability, while order of IMD and harmonics may serve as certain criteria (OP3 in last meeting)*

* ***Option 3:***

*At least the following condition #1 which was already agreed in the previous RAN4 meeting should be continually applied.*

*- Condition #1: For TDD-FDD combinations, the capability shall be mandatory if low-band (below 1GHz) is aggregated with high (i.e. 2.69GHz and above) and mid-band (1GHz to 2.69GHz) TDD cells.*

*- For the band combinations that are not under the condition #1, RAN4 can further agree on other criteria (ex: frequency separation…) to determine whether simultaneous Rx/Tx capability can be mandatory supported without any discussion.*

*(Note that if no further consensus can be reached, case-by-case discussion is applied for the band combinations that are not under the condition #1)*

* ***Option 4:***
* *Simultaneous RxTx is the default capability in FDD-TDD FR1 band combinations*
* *MSD will be defined for band combinations which potentially have problems like harmonics/IMD, etc. as usual*
* *For band combinations whose MSD is larger than a threshold (value FFS), further discuss whether simultaneous RxTx can be changed to optional*
* ***Option 5****:*
* *Mandatory support if the combination has no MSD issue or the MSD less than a certain value (to be discussed in RAN4).*
* *For the combination with MSD exceeding the threshold, whether the capability can be mandatorily supported should be checked under the WI.*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

***Issue 1-1-2: Simultaneous Rx/Tx capability for FR1+FR2 TDD-TDD band combination***

* ***Option 1****: Mandatory support for all of the FR1 (<7.125 GHz)+FR2 TDD-TDD CA band combination (R4-2112913 ZTE)*
* ***Option 2****: Mandatory support in the case of current FR1 and FR2 frequency range (R4-2113304 Xiaomi)*
* ***Option 3****: Mandatory support if FR1 is below 7.125GHz, and FR2 is above 24GHz (R4-2113896 OPPO)*
* ***Option 4****: Mandatory support if FR1 TDD band does not exceed the frequency range of 7125MHz (R4-2114515 Huawei)*

***Moderator’s recommendation:***

* Recommended WF
  + All options proposed in this meeting are similar. It is suggested to check option 3 in 1st round discussion.

***Issue 1-1-3: Simultaneous Rx/Tx capability for FR2+FR2 TDD-TDD band combination***

* ***Option 1****: study case by case (R4-2112913 ZTE, R4-2113304 Xiaomi, R4-2114515 Huawei)*
* ***Option 2****: postpone the discussion for FR2+FR2 band combinations until deployment requests and also completion of FR2 CA requirements definition (R4-2113896 OPPO)*

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

### Issue 1-2: simultaneous Rx/Tx capability and sync/async condition

***Issue 1-2-1: evaluate the benefits of enabling NW schedule UE without simultaneous RxTx capability working in simultaneous RxTx status, and study the possibility of reporting sync/async condition to NW to facilitate scheduling incapable UEs*** *(R4-2113895, OPPO)*

* ***Option 1: Yes***
* ***Option 2: No***

***Moderator’s recommendation:***

* Recommended WF
  + TBA based on 1st round discussion

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
| 1-1: Rules to decide simultaneous Rx/Tx capability for a band combination | ***Issue 1-1-1: Simultaneous Rx/Tx capability for FR1+FR1 FDD-TDD band combination***   * ***Option 1:*** *Mandatory support by default* *unless the specific problem is identified when specifying the specific combinations in the basket WID. To make sure the potential problem will not be missed check, case-by-case study can be applied if the frequency separation between the FDD band and the TDD band of the combination is smaller than a threshold. Otherwise, the mandatory simultaneous Rx/Tx capability is applied without additional discussion. MSD requirements shall be defined for the combinations which have REFSENS degradation caused by IMD or harmonics (combination of OP1 and OP2 in last meeting )* * ***Option 2:*** *Using MSD as a basic guideline for defining simultaneous RxTx capability, while order of IMD and harmonics may serve as certain criteria (OP3 in last meeting)* * ***Option 3:*** *At least the following condition #1 which was already agreed in the previous RAN4 meeting should be continually applied.*   *- Condition #1: For TDD-FDD combinations, the capability shall be mandatory if low-band (below 1GHz) is aggregated with high (i.e. 2.69GHz and above) and mid-band (1GHz to 2.69GHz) TDD cells.*  *- For the band combinations that are not under the condition #1, RAN4 can further agree on other criteria (ex: frequency separation…) to determine whether simultaneous Rx/Tx capability can be mandatory supported without any discussion.*  *(Note that if no further consensus can be reached, case-by-case discussion is applied for the band combinations that are not under the condition #1)*   * ***Option 4:*** * *Simultaneous RxTx is the default capability in FDD-TDD FR1 band combinations* * *MSD will be defined for band combinations which potentially have problems like harmonics/IMD, etc. as usual* * *For band combinations whose MSD is larger than a threshold (value FFS), further discuss whether simultaneous RxTx can be changed to optional*   *•* ***Option 5****: For FR1+FR1 FDD-TDD band combinations, simultaneous Rx/Tx capability is mandatorily supported if the combination has no MSD issue or the MSD less than a certain value (to be discussed in RAN4). For the combination with MSD exceeding the threshold, whether the capability can be mandatorily supported should be checked under the WI.*  Verizon: We support Option 3 and suggest the high band range is extended above 4.2GHz.  SoftBank: Support Option 3. For the band combinations that are not under the condition #1, support Option 4 or Option 5.  Xiaomi: Option 2. As mention in R4-2113304, even option 1 is adopted, in order to check the potential problem band combination, the criteria in option 2 still needs to be determined and studied.  ZTE： Option 1, also we can live with Option 4 or 5. (Seems they are more or less similar, maybe can consider together)  For almost all the FDD-TDD band combination, it should check the co-existance study first, then define MSD values if necessary (for some cases, MSD may not be defined due to MSD is negligible or no appropriated test point). However, In addition, there are few exceptions for some combs where frequency range are very close or even immediately close to each other, in this case, more study may be needed.  For option 3, it seems *Condition #1* is a slightly different with the agreements in last WF R4-2107841, where:  •The capability shall be mandatory if FR1 FDD band (<4GHz) is aggregated with FR2 TDD bands |
| ***Issue 1-1-2: Simultaneous Rx/Tx capability for FR1+FR2 TDD-TDD band combination***   * ***Option 1****: Mandatory support for all of the FR1 (<7.125 GHz)+FR2 TDD-TDD CA band combination (**R4-2112913 ZTE)* * ***Option 2****: Mandatory support in the case of current FR1 and FR2 frequency range (R4-2113304 Xiaomi)* * ***Option 3****: Mandatory support if FR1 is below 7.125GHz, and FR2 is above 24GHz (R4-2113896 OPPO)* * ***Option 4****: Mandatory support if FR1 TDD band does not exceed the frequency range of 7125MHz (R4-2114515 Huawei)*   ***Recommendation:*** *check option 3 in 1st round discussion.*  Verizon: we support options above. RAN4 should define the criteria requirements for further.  SoftBank: Support recommended WF and option 3.  Xiaomi: we think all options share the similar view. Option 3 is acceptable for us  ZTE: All the options are very close. Ok with Option 3. |
| ***Issue 1-1-3: Simultaneous Rx/Tx capability for FR2+FR2 TDD-TDD band combination***   * *Option 1:* *study case by case (R4-2112913 ZTE, R4-2113304 Xiaomi, )* * *Option 2: postpone the discussion for FR2+FR2 band combinations until deployment requests and also completion of FR2 CA requirements definition (R4-2113896 OPPO)*   Verizon: Option 1  Xiaomi: either option is OK.  ZTE: Option 1. |
| 1-2: simultaneous Rx/Tx capability and sync/async condition | ***Issue 1-2-1: evaluate the benefits of enabling NW schedule UE without simultaneous RxTx capability working in simultaneous RxTx status, and study the possibility of reporting sync/async condition to NW to facilitate scheduling incapable UEs***   * *Option 1: Yes* * *Option 2: No*   Verizon: Yes! |
| Others |  |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| **[R4-2114516](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114516.zip)**  TP for TR 38.839: Principles for simultaneous RxTx capability | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF ahe ssignment.*

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| --- | --- |
|  | **Status summary** |
| **Topic#1** | ***Issue 1-1-1: Simultaneous Rx/Tx capability for FR1+FR1 FDD-TDD band combination***  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  ***Issue 1-1-2: Simultaneous Rx/Tx capability for FR1+FR2 TDD-TDD band combination***  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:*  ***Issue 1-1-3: Simultaneous Rx/Tx capability for FR2+FR2 TDD-TDD band combination***  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |
| **Topic#2** | ***Issue 1-2-1: evaluate the benefits of enabling NW schedule UE without simultaneous RxTx capability working in simultaneous RxTx status, and study the possibility of reporting sync/async condition to NW to facilitate scheduling incapable UEs***  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |
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*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |
| #2 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

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| **T-doc number** | **Company** | **Proposals / Observations** |
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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
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# Topic #2: CR for simultaneous Rx/Tx

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2112960](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112960.zip)** | CHTTL, SoftBank Corp., NTT DOCOMO, INC. | *draft CR for updating the note of mandatory simultaneous Rx/Tx capability for Rel.17 FR1 NR-CA combinations* |
| **[R4-2112962](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112962.zip)** | SoftBank Corp., NTT DOCOMO, INC., CHTTL | *draft CR for updating the note of mandatory simultaneous Rx/Tx capability for Rel.17 FR1 EN-DC combinations* |
| **[R4-2112964](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112964.zip)** | CHTTL, SoftBank Corp., NTT DOCOMO, INC. | *draft CR for updating the note of mandatory simultaneous Rx/Tx capability for Rel.17 FR1+FR2 NR CA and EN-DC combinations* |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Issues** | **Company Comments** |
|  | Company A |
| Others |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| **[R4-2112960](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112960.zip)** | Company A |
| Company B |
|  |
| **[R4-2112962](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112962.zip)** | Company A |
| Company B |
|  |
| **[R4-2112964](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112964.zip)** | Company A |
| Company B |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
| **Topic#3** | **Issue 3-1:**  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
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## Discussion on 2nd round (if applicable)

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
|  |  |  |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
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# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
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|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents