**3GPP TSG-RAN WG4 Meeting #99-e R4-210XXXX**

**Electronic Meeting, May 19-27, 2021**

**Agenda item:** 9.2.1

**Source:** Moderator (vivo)

**Title:** Email discussion summary for [99-e][335] FR1\_TRP\_TRS

**Document for:** Information

# Introduction

*In RAN#91e meeting, Work Item on FR1 TRP TRS was approved. An LS from GSMA on FR1 OTA test method is received, technical discussions are needed to provide timely feedback before the response deadline.*

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: Finalize Workplan, TR skeleton.
* 2nd round: Finalize the LSs and other items.

# Topic #1: General and Work plan

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2110792 | vivo, OPPO, CMCC | Workplan of FR1 TRP TRS WI  **Proposal: Approve the proposed work plan for Rel-17 FR1 TRP TRS WI.** |
| [R4-2110029](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110029.zip) | Xiaomi | On How to organize the TRP TRS project  **Proposal 2: Performance part can start early once the test methodology for NR FR1 TRP and TRS work finished with the rest core part work going parallel.** |
| [R4-2111459](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111459.zip) | Huawei,HiSilicon | This document provides our view on the workplan for this new work item |
| [R4-2110803](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110803.zip) | vivo | TR Skeleton for FR1 TRP TRS OTA test methods (TR 38.834) |
| [R4-2110793](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110793.zip) | vivo | General views on TRP TRS WI  **Observation 1**: The scope of test methods development includes SA and EC-DC which is greater than LTE, care needs to be taken to prioritize the work in order that timely progress is made towards the WI objectives within Rel-17.  **Observation 2**: From the latest 5G report of GSA, more than 431 commercially available devices are in the market, with smartphone accounting for the largest proportion.  **Proposal 1: Select smartphone as the first priority of the device type to finalize the work.**  **Observation 3**: The phantoms defined in 3GPP is not applicable for FR1 TRP TRS testing, new phantoms should be considered to cover >72mm wide devices and >3GHz frequency bands.  **Proposal 2: Sent an LS to CTIA to ask for the licence of body phantoms to be referenced in 3GPP FR1 TRP TRS spec.**  **Proposal 3: RAN5 is responsible for MU assessment as secondary responsibility working group. The agreements and text proposals on MU assessment in RAN5 can be sent to RAN4 via LSs with attachment to draft the TR MU Annex.**  **Proposal 4: An LS to RAN5 is needed to inform the work plan of TRP TRS WI, TR skeleton and MU work handling.** |

## Open issues summary

### Sub-topic 1-1 Workplan

Views on workplan of this WI have been shared in R4-2110792, [R4-2110029](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110029.zip), [R4-2111459](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111459.zip), the contribution from Rapporteurs R4-2110792 is selected as basis for discussion. Further discuss on whether we need to finetune the workplan or not.

**Issue 1-1: Workplan for FR1 TRP TRS WI**

* Proposals
  + Proposal: Approve the proposed workplan for FR1 TRP TRS WI in [R4-2110792]
* Recommended WF
  + Discuss on how to finetune the workplan, if needed.
  + Stabilize the workplan after 1st round discussion.

### Sub-topic 1-2 TR skeleton

**Issue 1-2: TR skeleton for FR1 TRP TRS test method**

* Proposals
  + Proposal: Approve the proposed skeleton for FR1 TRP TRS test method in [R4-2110803]
* Recommended WF
  + Stabilize the TR skeleton after 1st round discussion.

### Sub-topic 1-3 General part for TRP TRS WI

**Issue 1-3-1: UE type**

* Proposals
  + Proposal: Select smartphone as the first priority of the device type to finalize the work
* Recommended WF
  + TBA.

**Issue 1-3-2: Head&Hand phantoms**

* Proposals
  + Proposal: Sent an LS to CTIA to ask for the licence of head&hand phantoms to be referenced in 3GPP FR1 TRP TRS spec
* Recommended WF
  + TBA.

### Sub-topic 1-4 MU work in RAN4 and RAN5

**Issue 1-4: MU work**

* Proposals
  + Proposal 1: RAN5 is responsible for MU assessment as secondary responsibility working group. The agreements and text proposals on MU assessment in RAN5 can be sent to RAN4 via LSs with attachment to draft the TR MU Annex.
  + Proposal 2: An LS to RAN5 is needed to inform the work plan of TRP TRS WI, TR skeleton and MU work handling.
* Recommended WF
  + TBA.

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 Workplan

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2 TR skeleton

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| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-3 General part for TRP TRS WI

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Issue 1-3-1: UE type:  Issue 1-3-2: Head&Hand phantoms:  In addition to the wide device, would RAN4 specify the requirements for narrow device, i.e., width<72mm, in this WI? |
|  |  |

Sub topic 1-4 MU work in RAN4 and RAN5

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | RAN4 to send an LS to RAN5 indicating RAN5 should contribute the same TR. The TR number and skeleton which includes the clause that RAN5 should contribute should be included. The LS should also include the RAN4 agreed workplan so that RAN5 can plan for the contributions and create a WP. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | 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 assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

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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)

# Topic #2: Reply LS to GSMA

*Given the response deadline is 30 June 2021, reply LS should be sent out in this meeting.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2108729 | GSMA | **2 Request to 3GPP**  Can you define an OTA test method for 5G NR for frequency range FR1 please?  Following use scenarios are required:  - Talk mode using head & hand phantom for narrow devices between 56 mm and 72 mm and for wide devices with a width >72 mm.  - Browsing mode using hand phantom for narrow and wide phones  - Free Space for devices not used in talk or browsing mode  If 3GPP has already started a WI on this, can you provide details of the scope of the work and your estimated schedule for completion.  It would be appreciated if the following items could be included in the 3GPP work:  - Measure TRP for both LTE and NR with a 50%-50% equal power sharing between LTE and NR (simultaneous or one by one)  **3 Technical Questions**  - Will Dynamic Power Sharing (DPS) be used for the 3GPP OTA testing and will there be a special test method for that?  Will self-interference be considered for TRS testing? |
| R4-2110804 | vivo | Discussion and reply LS to GSMA  **Proposal 1: Approve the reply LS to GSMA to ensure the timely feedback.** |
| R4-2110179 | CAICT | **Proposal 1:** **the p-MAX configuration of FR1 EN-DC TRP and TRS need to be discussed. The preference is using 50% power split between NR and LTE.** |
| R4-2110802 | vivo | **Observation 1**: The study of EN-DC test method is limited to 1CC LTE with 1CC NR, as agreed in the WID.  **Observation 2**: For EN-DC mode, only specify NR requirements.  **Observation 3**: For TRS testing, using a 50% uplink output power split between LTE and NR is an aligned configuration among different SDOs.  **Proposal 1: For TRS testing in EN-DC mode, 50% uplink output power split between LTE and NR should be configured.**  **Observation 4**: For TRP testing, how to configure the LTE and NR power is different in CTIA and CCSA.  **Proposal 2: For TRP testing in EN-DC mode, RAN4 needs further study on how to configure the UE power splitting between LTE and NR.**  **Proposal 3: For EN-DC mode, no additional LTE requirements will be introduced, RAN4 should make decision whether LTE path need to be measured or not.**  **Proposal 4: To reduce the total measurement time of EN-DC combinations, mechanism on testing time reduction should be defined in RAN4.** |
| R4-2110842 | OPPO | **Proposal: the power configuration for EN-DC is setting Pmax of LTE as half of maximum output power for EN-DC defined in TS 38.101-3 Table 6.2B.1.3-1.** |

## Open issues summary

### Sub-topic 2-1 Use scenarios

**Issue 2-1: Phantom use scenarios for FR1 TRP TRS testing**

* Proposals
  + Option1 (from GSMA): Following use scenarios are required
    - Talk mode using head & hand phantom for narrow devices between 56 mm and 72 mm and for wide devices with a width >72 mm.
    - Browsing mode using hand phantom for narrow and wide phones
    - Free Space for devices not used in talk or browsing mode
  + Option 2: others?
* Recommended WF
  + TBA

### Sub-topic 2-2 EN-DC power configuration

**Issue 2-2-1: Dynamic Power Sharing (DPS) for EN-DC OTA testing**

* Proposals
  + Option 1: Fixed power splitting
  + Option 2: Dynamic power sharing
* Recommended WF
  + TBA

**Issue 2-2-2: EN-DC Tx Power Splitting for TRS** **(if fixed power splitting is selected)**

* Proposals
  + Option 1: LTE and NR with a 50%-50% equal power sharing between LTE and NR
  + Option 2: others?
* Recommended WF
  + TBA.

**Issue 2-2-3: EN-DC Tx Power Splitting for TRP (if fixed power splitting is selected)**

* Proposals
  + Option 1: LTE and NR with a 50%-50% equal power sharing between LTE and NR
  + Option 2: others?
* Recommended WF
  + TBA.

**Issue 2-2-4: EN-DC measurement**

* Proposals
  + Option 1 (from GSMA): Measure TRP for both LTE and NR simultaneous or one by one
  + Option 2: Only measure NR, given only NR requirement will be defined
  + Option 3: others?
* Recommended WF
  + TBA.

**Issue 2-2-5: Special test methodology for Dynamic Power Sharing (DPS) (if fixed power splitting is selected for EN-DC)**

* Should RAN4 develop an additional special test methodology to test DPS function?
  + Yes
  + No

### Sub-topic 2-3 EN-DC testing time reduction

**Issue 2-3-1: Reduce testing time of EN-DC combinations**

* Proposal:
  + RAN4 should define a mechanism on testing time reduction of EN-DC combinations
* Recommended WF
  + TBA.

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 use scenarios

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Option 1 |

Sub topic 2-2 EN-DC power configuration

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-2-1: Dynamic Power Sharing (DPS) for EN-DC OTA testing:  Issue 2-2-2: EN-DC Tx Power Splitting for TRS:  Issue 2-2-3: EN-DC Tx Power Splitting for TRP:  Issue 2-2-4: EN-DC measurement:  Issue 2-2-5: Special test methodology for Dynamic Power Sharing (DPS): |
| Qualcomm | Issue 2-2-1: Dynamic Power Sharing (DPS) for EN-DC OTA testing:  Option 1  Issue 2-2-2: EN-DC Tx Power Splitting for TRS:  RAN4 needs to further discuss the test method for EN-DC with DPS. By now, two options will be considered: Option 1: 50%-50% power split for LTE and NR. Option 2: Set a relative power for LTE.  Issue 2-2-3: EN-DC Tx Power Splitting for TRP:  RAN4 needs to further discuss the test method for EN-DC with DPS. By now, two options will be considered: Option 1: 50%-50% power split for LTE and NR. Option 2: Set a relative power for LTE.  Issue 2-2-4: EN-DC measurement:  It depends on the power splitting for EN-DC. For example, 50%-50% is used, then both LTE and NR should be measured.  Issue 2-2-5: Special test methodology for Dynamic Power Sharing (DPS):  RAN4 needs to further discuss on this. |

Sub topic 2-3 EN-DC testing time reduction

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*For the suggested wording of reply LS, please share comments in the table below.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Reply LS  R4-2110804 | Qualcomm: The GSMA LS is sending to 3GPP RAN4 and RAN5, and RAN5 is the secondary WG for this WI, it would be good if we can also include the information regarding RAN5 timeline in the reply LS. For example, RAN5 will work together with RAN4 to contribute the MU and a new WI on conformance test will be started in RAN5 when the completion level in RAN4 is [80%]. The TR and TS number should be captured if any in the reply LS that would be the helpful info. for GSMA to follow the status. |
| 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 assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### 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”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #3: SA test method

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110794**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110794.zip) | vivo | **Observation 1**: For FR1 SA test method, UE configuration with 1Tx is the first priority.  **Observation 2**: For FR1 SA, the test system and test procedure are nearly the same as traditional SISO OTA test method, conclusions from LTE SISO OTA can be reused as much as possible.  **Proposal 1: for FR1 SA, the test system and test procedure for LTE can be reused as much as possible.**  **Proposal 2: The effective antenna approach defined in TR 38.827 for RTS method should be adopted for FR1 TRP TRS testing, the minimum range length is suggested to be 1.2m.**  **Proposal 3: A MU element related to frequency flatness needs to be considered for FR1 TRP TRS test system.**  **proposal 4: RAN4 need to study how to configure the UE with Tx switching function.** |
| [**R4-2110166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110166.zip) | Apple | **Observation 1: Compared to test methodologies necessary to verify LTE TRP/TRS requirements in TS37.144, an extension in frequency range down to 700 MHz (from 830 MHz) and up to 5000 MHz (up from 2690 MHz) can be prioritized.**  **Observation 2: RAN4 should discuss how to ensure consistent TRP test results can be achieved for UEs which implement Tx antenna selection.**  **Observation 3: Test time reduction techniques are desired to avoid measuring full TRP scans of a device which supports PC2 using a single port for each power class, PC2 and PC3.**  **Observation 4: Further study is needed to determine how to test TRP of devices which implement PC3 or PC2 with the TxD feature, and this study should not start until the TxD feature is fully defined by RAN4.**  **Observation 5: Further study is needed to ensure consistent TRS test results can be achieved for UEs which support 4 Rx ports in bands above 2.5 GHz.**  **Proposal 1: RAN4 should define the TRP/TRS requirements for NR FR1 UEs in stand-alone mode as a priority, although effort to define EN-DC test methodology can proceed in parallel with the SA work.** |
| [**R4-2110029**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110029.zip) | Xiaomi | On prioritize TRP TRS test method  **Observation 1: Further prioritization is needed for the core part work.**  **Proposal 1: To prioritize the test methodology for NR FR1 TRP and TRS.** |
| [**R4-2110793**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110793.zip) | vivo | views on SA test method  **Observation 4**: The signalling and RF requirements related to FR1 TxD feature has not been concluded. RAN4 should be very careful on starting this part of work before finalizing the general test methodology for SA and EN-DC to avoid the delay of the whole progress.  **Proposal 5: UL Tx switching is a function widely used in smartphone, RAN4 should discuss how the treat this function properly during TRP TRS measurement.**  **Proposal 6: RAN4 should define a proper way to reduce the TRP TRS OTA testing time for SA and EN-DC bands and band combinations.** |

## Open issues summary

### Sub-topic 3-1 Prioritization of SA test methodology development

**Issue 3-1: Priority of SA test methodology development**

* Proposals
  + Proposa1: RAN4 should define the TRP/TRS requirements for NR FR1 UEs in stand-alone mode as a priority, although effort to define EN-DC test methodology can proceed in parallel with the SA work
* Recommended WF
  + TBA

### Sub-topic 3-2 SA test system

**Issue 3-2-1: Test setup**

* Proposals
  + For FR1 SA, the test system and test procedure for LTE can be reused as much as possible
* Recommended WF

**Issue 3-2-2: Measurement distance**

* Proposals
  + The effective antenna approach defined in TR 38.827 for RTS method should be adopted for FR1 TRP TRS testing, the minimum range length is suggested to be 1.2m.
* Recommended WF

**Issue 3-2-3: Impact of large bandwidth**

* Proposals
  + Option 1: A MU element related to frequency flatness needs to be considered for FR1 TRP TRS test system
  + Option 2: others?
* Recommended WF

### Sub-topic 3-3 Tx/Rx antenna selection

**Issue 3-3-1: How to configure UE with Tx switching**

* Proposals
  + Option 1: Function Off. (i.e. Fixed-antenna is selected for each band declared by manufacturer. How to lock the antenna should be provided by manufacturer to test lab.)
  + Option 2: Function on. How to test the TRP is FFS.
  + Option 3: Further study in RAN4 on how to treat Tx switching.
* Recommended WF
  + TBA.

**Issue 3-3-2: How to configure UE with Rx antenna selection**

* Proposals
  + Further study is needed to ensure consistent TRS test results can be achieved for UEs which support 4 Rx ports in bands above 2.5 GHz.
* Recommended WF
  + TBA.

### Sub-topic 3-4 Test time reduction for SA UEs

**Issue 3-4: SA test time reduction**

* Proposals
  + Test time reduction techniques are desired to avoid measuring full TRP scans of a device which supports PC2 using a single port for each power class, PC2 and PC3
* Recommended WF
  + TBA.

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1 Prioritization of SA test methodology development

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Should not deprioritize EN-DC. SA and NSA should be equally treated in this WI. |

Sub topic 3-2 SA test system

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| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 3-2-1 Test setup:  Issue 3-2-2 Measurement distance:  Issue 3-2-3 Impact of large bandwidth: |
| Qualcomm | Issue 3-2-1 Test setup:  OK with proposal. |

Sub topic 3-3 Tx/Rx antenna selection

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 3-3-1 How to configure UE with Tx switching:  Issue 3-3-2 How to configure UE with Rx selection: |
| Qualcomm | Issue 3-3-1 How to configure UE with Tx switching:  Need further discussion.  Issue 3-3-2 How to configure UE with Rx selection:  Need further discussion. |

Sub topic 3-4 Test time reduction for SA UEs

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | OK with proposal. |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### 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”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

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

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