**3GPP TSG-RAN WG2 Meeting #113 Electronic R2-2102446**

**25 January – 05 February 2021**

**Agenda item: 6.7.3 & 7.4.2**

**Source: Nokia**

**Title: Summary of [AT113-e][212][MOB] UE capability corrections for LTE and NR mobility (Nokia)**

**WID/SID: NR\_Mob\_enh-Core, LTE\_feMob-Core**

**Document for: Decision**

# 1 Introduction

This document is the summary of the following email discussion:

**Email discussions ([212])**

**[AT113-e][212][MOB] UE capability corrections for LTE and NR mobility (Nokia)**

Scope:

* + - Discuss which UE capability corrections (for LTE and NR) marked for this discussion are seen agreeable
    - Some (or even all) CRs may be merged together if seen needed

Intended outcome:

* + - Discussion summary in [R2-2101965](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101965.zip) (by email rapporteur).
    - Agreeable CRs (if any)

Deadline for providing comments, for rapporteur inputs, conclusions and CR finalization:

* + - Initial deadline (for companies' feedback): 1st week Thu, UTC 0900
    - Initial deadline (for rapporteur's summary): 1st week Fri, UTC 0900
    - Deadline for CR finalization: 2nd week Thu, UTC 1000

**Web Conf 2nd week (summary of [212])**

[R2-2101965](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101965.zip) Summary of [AT113-e][212][MOB] UE capability corrections for LTE and NR mobility (Nokia) Nokia discussion Rel-16 NR\_Mob\_enh-Core, LTE\_feMob-Core

By Email [212] (6)

UE capability aspects for DAPS:

[R2-2101025](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101025.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 38.331 16.3.1 2379 - F NR\_Mob\_enh-Core

[R2-2101026](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101026.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 38.306 16.3.0 0501 - F NR\_Mob\_enh-Core

[R2-2101027](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101027.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 36.331 16.3.0 4562 - F LTE\_feMob-Core

[R2-2101028](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101028.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 36.306 16.3.0 1803 - F LTE\_feMob-Core

[R2-2101360](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101360.zip) Clarification on DAPS HO Capability Apple discussion Rel-16 NR\_Mob\_enh-Core

[R2-2101710](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101710.zip) Understanding of DAPS in BWC-A band Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core

By email [212] (3)

*Capability coordination for DAPS:*

[R2-2100618](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100618.zip) DAPS capability coordination between source and target Intel Corporation discussion Rel-16 NR\_Mob\_enh-Core, LTE\_feMob-Core

[R2-2101712](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101712.zip) Discussion on inter-node signalling for DAPS UE capability coordination Huawei, HiSilicon, MediaTek Inc., Qualcomm Incorporated, China Telecom, China Unicom discussion Rel-16 NR\_Mob\_enh-Core

[R2-2100486](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100486.zip) Inter-node signalling for UE capability coordination in DAPS handover Ericsson discussion Rel-16 TEI16

*(moved from 6.7.3)*

## Contact person(s) for each participating company

|  |  |  |
| --- | --- | --- |
| Company | Name | Email address |
| Nokia | Amaanat | amaanat.ali@nokia.com |
| Intel | Yi | Yi.guo@intel.com |
| Huawei, HiSilicon | Tangxun | tangxun@huawei.com |
| ZTE | Mengjie Zhang | zhang.mengjie@zte.com.cn |
| Ericsson | Oscar | [oscar.ohlsson@ericsson.com](mailto:oscar.ohlsson@ericsson.com) |
| Futurewei | Jialin Zou | Jialinzou88@yahoo.com |
| OPPO | Haitao Li | lihaitao@oppo.com |
| MediaTek | Li-Chuan TSENG | li-chuan.tseng@mediatek.com |
| Apple | Fangli XU | fangli\_xu@apple.com |
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# 2 Discussion

## 2.1 Dummifying capabilities related to intra frequency multi UL transmission

[R2-2101025](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101025.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 38.331 16.3.1 2379 - F NR\_Mob\_enh-Core

[R2-2101026](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101026.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 38.306 16.3.0 0501 - F NR\_Mob\_enh-Core

[R2-2101027](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101027.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 36.331 16.3.0 4562 - F LTE\_feMob-Core

[R2-2101028](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101028.zip) Dummifying the field intraFreqMultiUL-TransmissionDAPS Nokia, Nokia Shanghai Bell, MediaTek, Intel Corporation CR Rel-16 36.306 16.3.0 1803 - F LTE\_feMob-Core

[R2-2101360](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101360.zip) Clarification on DAPS HO Capability Apple discussion Rel-16 NR\_Mob\_enh-Core

**Discussion:** It was probably clear from the RAN2#112-e meeting discussion that only the intraFreqMultiUL-TransmissionDAPS parameter was to be dummified but power sharing related ones would remain. Apple seems to have a bit different understanding of this. However, given that there may have been last minute rush due to limited time, something has been missed.

**Q1: What is the understanding from the companies about what was discussed related to the need and subsequent dummifying of *intraFreqMultiUL-TransmissionDAPS****?*

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| **Company** | **View** |
| Nokia, Nokia Shanghai Bell | [Proponent] We think only the intraFreqMultiUL-TransmissionDAPS needs to be dummified but we are open to understand the technical background from the company that thinks otherwise. |
| Intel | Ok to dummify intraFreqMultiUl-TransmissionDAPS since it has been deleted from RAN1 spec.  However below capabilities are still used in RAN1 spec. If we want to remove them, we have to check RAN1 first.   intraFreqSemiStaticPowerSharingDAPS-Mode1;   intraFreqSemiStaticPowerSharingDAPS-Mode2;   intraFreqDynamicPowerSharingDAPS. |
| Huawei, HiSilicon | OK to only dummify intraFreqMultiUl-TransmissionDAPS |
| ZTE | It’s fine to dummify intraFreqMultiUl-TransmissionDAPS. For power sharing related parameters, we may need to check with RAN1 first. |
| Ericsson | If there is no dual UL transmission then there should be no power sharing so what is the use of the power sharing capabilities? |
| Futurewei | Ok to dummify intraFreqMultiUl-TransmissionDAPS. See Ericsson raised a good question. |
| OPPO | Ok to dummify intraFreqMultiUl-TransmissionDAPS. Wait for RAN1’s input on other capabilities. |
| MediaTek | Agree with Ericsson that if no dual UL transmission is possible, there should be no power sharing. This is why we proposed to remove another three capabilities (see Intel’s comment) in R2-2009783. Our understanding is that these power sharing capabilities in RAN1 feature table do not apply to intra-frequent case. We can further confirm with RAN1. |
| Apple | Agree with Ericsson that no dual UL transmission means no need to have power sharing. So we need to dummify all the following capabilities.   * intraFreqMultiUL-TransmissionDAPS; * intraFreqSemiStaticPowerSharingDAPS-Mode1; * intraFreqSemiStaticPowerSharingDAPS-Mode2; * intraFreqDynamicPowerSharingDAPS. |
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By Email [212] (6)

UE capability aspects for DAPS:

**Summary:**

* Base for P1: Most companies agree to dummify *intraFreqMultiUl-TransmissionDAPS* capability.
* Base for P2: The power sharing capabilities are still used in RAN1 specifications and quite a few companies seem to think these are no longer needed. However, RAN2 cannot agree to remove them without checking (LS seems to be needed).

**Rapporteur's Proposal:**

- Proposal 1: Changes in R2-2101025/ R2-2101026/ R2-2101027/ R2-2101028 are agreeable

- Proposal 2: Send LS to RAN1 asking them if power sharing capabilities are still relevant to intra-freq DAPS handover (as *intraFreqMultiUl-TransmissionDAPS* capability no longer exists)

**Summary:**

**Rapporteur's Proposal:**

## 2.2 Understanding of DAPS in BWC-A band

The following CR was submitted:

[R2-2101710](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101710.zip) Understanding of DAPS in BWC-A band Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core

The contribution has observations but there are no concrete proposals. So we can discuss if companies can relate to the observations or have different view.

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| **Observation 1: UE can include two or more FSperCCs in BWC-A band to support DAPS handover.**  **Observation 2: it can be left for network implementation to configure DAPS in a BWC-A band, i.e. for intra-freq DAPS, network can configure source cell and target cell based on two FSperCCs within one BWC-A band; for inter-freq DAPS, network only configures source cell or target cell based on one FSperCC in one BWC-A band.**  **Observation 3: for BWC-A band, UE can indicate intra and inter freq DAPS UE capabilities in different BCs to enable different featuresets for these two cases, e.g. UE indicates intra-freq DAPS UE capability in a single-band BC, and indicates inter-freq DAPS UE capability in a multiple-band BC.** |

**Q2: Do companies support the observations in** [R2-2101710](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101710.zip)?

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| **Company** | **Agree/Disagree** |
| Nokia, Nokia Shanghai Bell | In our understanding, current specification restricts UE to report more than 1 CC FSPCC if it indicates BW class A. But we think we understand the intention of O1-O2 but think this is optimization over Rel-16 functionality and not so important.  About O3, we think there is a point we would like to clarify. It is our understanding from the network perspective that When this intra or inter frequency DAPS capability is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the network may configure intra/inter-frequency DAPS to the UE as long as the UE supports CA in any single band or in any band combination. For this meeting we had prepared CR drafts but did not submit them as we thought this was general understanding of the companies. We are also fine to clarify this formally in TS 38.306. |
| Intel | The simple way is, the DAPS UE shall not indicate bandwidth class A since so far we already allow the UE to indicate the support of DAPS without supporting CA.  Therefore the UE can indicate BW-B with 2 CCs for DAPS, and not support CA. DO not see the meaning why the UE needs to indicate BW-A. |
| Huawei, HiSilicon | The observations above are based on current specification. And no further spec impact is foreseen. And our understanding is that UE can indicate intra-freq DAPS UE capability in a band combination with a single BWC-A band including more than one FSperCCs. |
| ZTE | Agree with the observations. |
| Futurewei | Support the observations listed above. |
| OPPO | Agree with the observations. |
| MediaTek | Agree with the observation.   * In our understanding, current spec allows UE to two or more FSperCCs in BWC-A band, one for source and another for target in intra-frequency DAPS. * The problem is what network should do if UE supporting intra-frequency DAPS with BWC-A indicates only one FSperCC. We suggest intra-frequency DAPS is not configured in this case. FFS whether we need any related descriptions in our spec.   We do not want to bring back the “BWC-B” restriction. UE should be able to operate intra-frequency DAPS HO with BWC-A band, and this should not be indicated as BWC-B |
| Apple | Agree with all the observations. |
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By Email [212] (6)

UE capability aspects for DAPS:

**Summary:**  Base for P3: 2 companies think there is no real need for allowing the flexibility that UE can signal BW Class A with more than 1 CC as UE can use BW Class B or higher. 1 company think the current specifications already allow that. Overall, 5 companies are supportive of the changes.

**Rapporteur's Proposal:**

- Proposal 3A: Confirm in Chairman notes that for intra-frequency DAPS, for a given band with BWC-A signalled, UE can signal more than 1 FSpCC (e.g. if 2 then one of them is for source and other for target).

~~- Proposal 3B: Continue discussion if for given band with BWC-A with single FSpCC, if intra-frequency DAPS should be supported.~~

~~- Proposal 3C: For inter-frequency DAPS it is clear that there must be at least two FSpCC’s signalled.~~

## 2.3 Capability coordination for DAPS

The following was submitted:

*Capability coordination for DAPS:*

[R2-2100618](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100618.zip) DAPS capability coordination between source and target Intel Corporation discussion Rel-16 NR\_Mob\_enh-Core, LTE\_feMob-Core

[R2-2101712](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101712.zip) Discussion on inter-node signalling for DAPS UE capability coordination Huawei, HiSilicon, MediaTek Inc., Qualcomm Incorporated, China Telecom, China Unicom discussion Rel-16 NR\_Mob\_enh-Core

[R2-2100486](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100486.zip) Inter-node signalling for UE capability coordination in DAPS handover Ericsson discussion Rel-16 TEI16

*(moved from 6.7.3)*

**Discussion:**

**Option 1:** Support proposal in [R2-2100618](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100618.zip) i.e. No changes are needed. The target can know what capability has been used in source based on source configuration and can use the rest of capability based on any of the UE supported DAPS combinations.

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| Observation 1: Based on the source configuration in indicated in handover preparation message the target knows which capability is used in source;  Observation 2: The target cannot know the exactly which bandcombination FeatureSetCombinationDAPS the source is using if the same source capability match multiple bandcombination FeatureSetCombinationDAPS.  Observation 3: The target needs to select the combination which not exceed the UE DAPS capability taking into the account the configuration used in the source.  Proposal: No changes are needed. The target can know what capability has been used in source based on source configuration and can use the rest of capability based on any of the UE supported DAPS combinations. |

**Option 2:** Support INM change based on [R2-2101712](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101712.zip) & [R2-2100486](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100486.zip).

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| Set of proposals from [R2-2101712](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101712.zip)  Proposal 1: inter-node signalling is introduced for DAPS UE capability coordination.  Proposal 2: source gNB indicates the following elements to target gNB:   1. Allowed BC list; 2. Source band in every BC; 3. Allowed FS list in every BC; 4. Downlink FSperCC selected in source cell; 5. Uplink FSperCC selected in source cell.   Set of proposals from [R2-2100486](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2100486.zip)  Proposal 1 Adopt option B (inter-node signalling is added for UE capability coordination between source and target during DAPS handover).  Proposal 2 The source indicates the allowed BCs selected band entry and selected FSpCC to target.  Proposal 3 The inter-node signalling in proposal 2 is introduced for both NR and LTE. |

**Q3: Do companies agree with Option 1 or Option 2.**

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| **Company** | **Views** |
| Nokia, Nokia Shanghai Bell | We think Option 1 would work i.e. target has the knowledge of the source configuration especially the PCell configuration and also has the corresponding UE capability.  One could think of Option 2 when the target would want to quickly know which FSPCC was used and what is the source band information so that the target can find a band combination that contains the {Source Band, Source FSPCC used for PCell}. It seems enough that the source mentions the band that it proposes the allocation of the single CC with the FeatureSetperCC property it wants to select. The target knows which band it wants to pick from and it can consult the BC list to see if there is at least one BC that has both these bands listed.  Furthermore, there seems to be a logical error in the CR proposed by Huawei.  FeatureSetPerCCEntryIndex ::= INTEGER (1.. maxNrofServingCells)  The index of per CC seems restricted from 1..32? whereas the list of CC's could have upto 1024 so ideally one should be able to indicate the correct index?  So, even if Option 1 would work Option 2 would be more efficient. Or do the proponent companies think Option 1 cannot work at all? |
| Intel | As option 1 proponent, would like to understand what problem will be. |
| Huawei, HiSilicon | As we mentioned in the observation 5 as below,  Observation 5: without proper inter-node signalling, the DAPS configuration combination may exceeds UE capability or UE has to experience unnecessarily low data rate as current configuration combination doesn’t make full use of UE capability.  The inter-node signalling is aimed to guarantee that UE can experience less loss of data rate during DAPS, and it can also ease the NW implementation.  As for the CR problem pointed out by Nokia, in current spec one FS can only have up to 32 FSperCC.  featureSetListPerUplinkCC SEQUENCE (SIZE (1.. maxNrofServingCells)) OF FeatureSetUplinkPerCC-Id  featureSetListPerDownlinkCC SEQUENCE (SIZE (1..maxNrofServingCells)) OF FeatureSetDownlinkPerCC-Id  maxNrofServingCells INTEGER ::= 32  so the index of FSperCC is within (1..32). |
| ZTE | We also think option 1 would work but slightly prefer option 2 to help the target know which BC/FSpCC can be used more efficiently. However, considering no CA and DC are configured during DAPS HO, we share the same view with Nokia that the indication of the source band and source FSpCC may be enough for the target node to easily deduce which BC can be selected and which FSpCC can be used in the target PCell. |
| Ericsson | We are proponent of option 2. The problem with option 1 is that there are capabilities in FSpCC that are not reflected in the source RRC reconfiguration, for example maximum modulation order and maximum number of MIMO layers. This means that for intra-frequency DAPS handover and intra-band inter-frequency handover the target may not be able to determine which FSpCC the source has selected and hence which FSpCC that is left for the target to select. Signaling the selected band etc removes all these ambiguities.. |
| Futurewei | Support option 2 to allow more efficient resource usage at the target. |
| OPPO | We think option 1 can work although it is not optimal. DAPS HO is short, it is ok if UE capabilities are not fully utilized during handover. We prefer not to optimize after Rel-16 freeze. |
| MediaTek | Although this has no UE impact, we support Option 2 if any network vendors see potential problems that need to be resolved with inter-node message. |
| Apple | Option 2 is better than Option 1. |
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By email [212] (3)

*Capability coordination for DAPS:*

**Summary:**  Base on P4: Overall 9 companies participated in the discussion. 2 companies think the target can look at source configuration and make the necessary deduction. 6 companies think the INM design solves the problem that the capabilities in the FSpCC are not clearly reflected in the source RRC configuration (e.g. MIMO order and modulation) and 1 company has slight preference for INM though different approach. On the solution itself, 2 companies think indication of source band and source FSpCC is enough and the changes proposed in the current CRs by the proponent companies are more complex than required.

Given the topic is impacting only network side (at least two UE vendors prefer INM impact) and the view across network vendors is balanced i.e. 50-50, there seems to be balanced view.

**Rapporteur's Proposal:**

- Proposal 4: Down-select between these two options:

Option 1: Not pursue the topic.

Option 2: Consider simplify the signalling to share the source band and source FSpCC.

Option 3: The source indicates the allowed BCs, selected band entry and selected FSpCC to target

# 3 Conclusions

Web Conf 2nd week (summary of [212])

[R2-2101965](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_113-e\R2-2101965.zip) Summary of [AT113-e][212][MOB] UE capability corrections for LTE and NR mobility (Nokia) Nokia discussion Rel-16 NR\_Mob\_enh-Core, LTE\_feMob-Core

**Bulk agreements**

1 Intent of changes in [R2-2101025](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_113-e\R2-2101025.zip)/ [R2-2101026](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_113-e\R2-2101026.zip)/ [R2-2101027](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_113-e\R2-2101027.zip)/ [R2-2101028](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_113-e\R2-2101028.zip) are agreeable

3 Confirm in Chairman notes that for intra-frequency DAPS, for a given band with BWC-A signalled, UE can signal more than 1 FSpCC (e.g. if 2 then one of them is for source and other for target).

**[212] Update to Proposal 1: CR in R2-2101027 is revised to R2-2102361**

*Proposal 2: Send LS to RAN1 asking them if power sharing capabilities are still relevant to intra-freq DAPS handover (asintraFreqMultiUl-TransmissionDAPS capability no longer exists)*

- Nokia clarifies that RAN1 had already reached an agreement so no LS is needed. Could include other changes in these as well. Huawei wonders if we should have a separate CR? Chair clarifies that 38.306 rapporteur preferred to have seprate CRs and not handle those in 6.1.2.

* If RAN1 LS is received, discuss via [212] whether we merge the required changes to the RAN2 CRs.
* For P4, continue discussion via email [212] (Nokia)
* [212] Based on the Phase 2 discussions Option 2 seems acceptable compromise.

*Proposal 4: Down-select between these options:*

*Option 1: Not pursue the topic.*

*Option 2: Consider simplify the signalling to share the source band and source FSpCC.*

*Option 3: The source indicates the allowed BCs, selected band entry and selected FSpCC to target*