**3GPP TSG RAN Meeting #93-e RP-21xxxx**

**Electronic Meeting, September 13 - 17, 2021**

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**Source:** LG Electronics (moderator)

**Title:** Email discussion [93e-10-SL-Positioning-TR] on Study on scenarios and requirements of in-coverage, partial coverage, and out-of-coverage NR positioning use cases

**Document for:** Report

# **Introduction**

This contribution summarizes the email discussion [93e-10-SL-Positioning-TR] on “Study on scenarios and requirements of in-coverage, partial coverage, and out-of-coverage NR positioning use cases.” Input contributions covered: RP-211808, 2004, 2022, 2036, 2037, 2105, 2131, 2132, 2410, 2498, 2460, 2038, 2035.

# **Discussion: Initial round**

2.1. Changes for “5.1 Network coverage”

Q1: [RP-211808, OPPO] proposed to remove the TS 38.304 reference of in-coverage definition as this definition is made in a carrier specific manner.

Please provide your view on this.

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| Company | Comment |
| LGE | Okay with the proposal. |
| Xiaomi | ok |
| Futurewei | ok |
| Qualcomm | Fine with the proposal, as it is good to clarify the coverage terminology (which is different for communication vs. positioning). |
| CATT | Support |
| OPPO | Proponent |
| Intel | OK to remove reference |
| Apple | OK |
| Nokia | Not sure why we need to remove reference to 38.304 for a definition of “in-coverage”. Even with the quoted text from TS 23.287, this definition in 38.304 still holds true. We prefer not to re-open discussions on what is the definition of “in-coverage”. |
| ZTE, Sanechips | Yes |
| Samsung | OK |
| Lenovo, Motorola Mobility | Fine to support. |
| Ericsson | Agree with proposal. |
| NTT DOCOMO | OK |
| Huawei, HiSilicon | The text of 304 is still true when interpreted in the correct case. It is not preferable to have no definition of coverage, nor to develop a new one for this TR. |
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=> The moderator suggest adopting this proposal.

Q2: One FFS in the editor’s note is about “the need for transitions between coverage states.” [RP-212004, Intel] proposed to clarify that network coverage scenarios may change in time. Similarly, [RP-212131, Huawei] proposed to capture that there are operation scenarios in V2X and PS that need to support transitions between different coverage states.

Please provide your view on this.

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| Company | Comment |
| LGE | We support the wording proposed by Intel. |
| Xiaomi | Agree with the wording by intel |
| Futurewei | Support |
| Qualcomm | It is fine to capture that V2X and PubS have scenarios where the UE may change coverage states. However, there should be some clarification regarding the requirements derived from such scenarios, i.e. they need a positioning mechanism that works in all coverage states. |
| CATT | Okay to add “A UE may transition between in-coverage, partial coverage and out-of-coverage scenarios”, as proposed by Intel. |
| OPPO | We are generally fine with the wording proposed by Intel, yet wondering if the following update would be needed  “~~A~~ The at least two UEs may transit~~ion~~ between in-coverage, partial coverage and out-of-coverage scenarios.”  Since it is a bit misleading to talk about “partial coverage” for a single UE, considering partial coverage is defined as “Partial coverage means that one UE remains inside the network coverage but the other UE is outside the network coverage.” |
| Intel | OK with RP-212004 |
| Apple | Support |
| Nokia | Agree to capture the transition between coverage states but the actual text proposal needs further discussion. If Intel text proposal is considered, our suggestion is to reword “measurements” to make it “assistance” to make it more generic.  In the Intel text proposal, the deleted editor note covered solutions where one interface can assist another for the solution, but the proposed new text takes away this mention of “assistance”. The existing text only talks from the perspective of measurements. |
| ZTE, Sanechips | Can accept Intel's text |
| Samsung | Support of the wording proposed by Intel |
| Lenovo, Motorola Mobility | Ok with Intel’s wording that “A UE may transition between in-coverage, partial coverage and out-of-coverage scenarios.” |
| Ericsson | We can use intel’s wording and remove the FFS. |
| NTT DOCOMO | OK with Intel’s proposal |
| Huawei, HiSilicon | Agree to add the sentence on transitions proposed by Intel. |
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=> The moderator suggest adopting the proposal in RP-212004. On OPPO’s point, in moderator’s understanding, a UE can be in either of the three scenarios as a part of the two UEs illustrated in the figure.

Q3: [RP-212036, LGE], [RP-212410, ZTE], [RP-212460, Lenovo] proposed to add a figure illustrating the three coverage scenarios.

Please provide your view on this.

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| Company | Comment |
| LGE | Support. We prefer the figure in RP-212036 as the others used vehicles as UEs and thus may not be suitable in covering non-vehicle operation scenarios. |
| Xiaomi | Agree to add the figure in 212036 |
| Futurewei | Support |
| CATT | Support. We prefer the figure in RP-212036. |
| OPPO | We are fine with the figure in 2036, with the revision of “PC-5” to “PC5”. |
| Intel | Agree. Figures in RP-212036 are preferred. |
| Apple | Support |
| Nokia | Agree to add a figure illustrating the three coverage scenarios. Prefer the figure in RP-212036. |
| ZTE,Sanechips | Support |
| Samsung | Support to capture the 3 figures in x2036 to TR38.845 |
| Lenovo, Motorola Mobility | Fine to support Figure in RP-212036, for a more neutral depiction of a UE. The labelling of the PC-5 link should be corrected to “PC5”. |
| Ericsson | OK to use the rapporteur’s figure in RP-212036. |
| NTT DOCOMO | Basically fine with LGE’s proposal. BTW, now we consider only NR coverage? Or LTE coverage as well? The figure uses “gNB”, so some clarification might be better. (My intention is just to have same understanding among companies. No other intention.) |
| Huawei, HiSilicon | Support to add the figure referred to in RP-212036. |
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=> The moderator suggest adopting the figure in RP-212036. Regarding DOCOMO’s question, we may close this study with gNB as this is an NR study item. But whether to consider LTE coverage additionally can be discussed later, e.g., in the discussion for Rel-18 positioning item.

Q4: [RP-212131, Huawei] proposed to add that some V2X and public safety use cases require to be in network coverage while some other use cases are independent of the network coverage. It also proposed to add that there are scenarios operating with no network and GNSS coverage.

Please provide your view on this.

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| Company | Comment |
| LGE | Support in general. But we don’t want to specify which use cases require network coverage as this may lead to solution-level discussions not for the positioning but for the data communication. So we prefer simple clarification that there are V2X and public safety use cases that require positioning with no network and GNSS coverage. |
| Xiaomi | Ok to add this clarification |
| Futurewei | Ok with it |
| Qualcomm | Agree with LGE. |
| CATT | Partial agree. For the network coverage scenarios, we think it has already captured by the in-coverage, partial coverage and out-of-coverage and transition between coverage states (in Q2), no need to further clarify.  We support to include the clarification on operating with/without GNSS coverage. |
| OPPO | We are fine to add clarification like: There are V2X and public safety use cases that require positioning when there is no network coverage (and GNSS coverage). |
| Intel | Clarification is needed. Original proposal seems refer to communication use cases while TR is about positioning. Suggestion from LGE looks reasonable. |
| Apple | We share similar view as LGE |
| Nokia | Agree with LGE. Adding some text without example use cases is fine. Note that 22.872 is already referenced in TR 38.845 and so PS use case is already covered. So, is V2X use case. If any clarification about dependencies to network coverage is required, then it should be captured under the respective use case in Section 4.2 and 4.3. |
| ZTE,Sanechips | Agree with CATT |
| Samsung | We tend to agree with FL’s assessments and it is preferred to have a simple clarification rather than to describe details. |
| Lenovo, Motorola Mobility | Ok to indicate the different examples of use cases that can be considered in all coverage scenarios including no GNSS coverage. |
| Ericsson | We are OK to clarify that there are use cases requiring network coverage and other requiring to be independent of the network coverage (P1 and P2 in RP-212131). Regarding P3 for the scenario where there is neither network nor GNSS available, we think that in that case an autonomous deployment can be used to provide a local coverage. |
| NTT DOCOMO | Same view with LGE. |
| Huawei, HiSilicon | It is important to capture the network coverage requirements in the TR, i.e. that some use cases require network coverage for operation and some other use cases require to be independent of the network coverage. Note that 5GAA and SAE have identified in their LS that some advanced V2X applications need to be supported also in out of coverage scenarios, e.g. tunnels, underground parking lots.  The reason it would be good to mention as examples a couple of use cases is not related to solution-level details, but to use case level issues. For example, 5GAA state some use cases such as software updates and HD content delivery for which the network necessarily has to be present. |
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=> The moderator suggest adding a clarification that there are V2X and public safety use cases that require positioning with no network and GNSS coverage.

Q5: [RP-212498, Ericsson] proposed to capture that the description of the partial coverage scenario needs to include whether GNSS is available and whether autonomous network deployment or coverage extension is possible.

Please provide your view on this.

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| Company | Comment |
| LGE | Not support. The coverage extension mentioned in RP-212498 is considered as a part of network coverage so we understand the current network coverage description already covers the cases in the proposal. The text discussed in Q4 is enough to deal with the GNSS coverage. |
| Xiaomi | Not agree, covered by Q4 |
| Futurewei | Do not support. Same understanding as LGE. |
| Qualcomm | This is also related to the Q1 regarding the coverage definition. It should be clarified regarding the "coverage" is referring to communication or positioning.  Additionally, the autonomous network deployment or coverage extension does not necessarily provide positioning coverage.  Therefore, we do not support the proposal. |
| CATT | Our understanding is that use cases clearly cover different network coverage with/without GNSS coverage. We are fine to include the descriptions of the autonomous network deployment and Coverage extension scenarios. |
| OPPO | Same view as LGE, i.e., autonomous network deployment or coverage extension are in-coverage scenario. |
| Intel | OK to clarify that partial coverage scenario may or may not have GNSS available. |
| Apple | Do Not support |
| Nokia | The autonomous network deployment is about on-demand network coverage through private network deployment or base stations on wheels while the GNSS availability is about GNSS coverage as opposed to cellular network coverage. Both aspects are covered by “in-coverage” scenarios. We can consider some clarifications to these aspects as part of network coverage in the TR. |
| ZTE,Sanechips | Same view as LGE |
| Samsung | Not support. A simple description in Q4 seems good enough. |
| Lenovo, Motorola Mobility | We think this may not be needed since it will be addressed by the “no GNSS coverage” use case in 2.1-Q4. |
| Ericsson | Support. We also think the proposals in Q4 and Q5 can be considered together. |
| NTT DOCOMO | Our understanding is same as LGE, but some clarification is fine for us. |
| Huawei, HiSilicon | We do not support adding this, since the existence of GNSS will be separately mentioned, and autonomous networks are simply network coverage. |
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=> The moderator suggest not adding the proposed text.

Q6: If you think other changes are necessary for this sub-section, please specify them.

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2.2. Changes for “5.2 Radio link”

Q1: One FFS in the editor’s note is about “RAT independent positioning.”

[RP-212004, Intel], [RP-212036, LGE], [RP-212410, ZTE], [RP-212498, Ericsson] proposed to add RAT independent positioning (e.g., GNSS, sensors, etc.) which can complement RAT dependent positioning.

Please provide your view on this.

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| Company | Comment |
| LGE | We support the text proposal in RP-212004 or RP-212036. |
| Xiaomi | We are ok with intel’s proposal |
| Futurewei | Support |
| Qualcomm | It is fine to add the description. |
| CATT | We support the text proposal in RP-212004. |
| OPPO | We support the TP in 2036 (not quite sure if there is a need to describe hybrid RAT (in)dependent solution as in 2004) |
| Intel | Prefer TP in RP-212004 |
| Nokia | We are OK to capture the support for RAT-independent positioning. However, the use of hybrid RAT-dependent and RAT-independent has always been allowed for implementations and so there is nothing new that needs to be said about it. The TP in RP-212036 is preferred. |
| ZTE, Sanechips | Ok with the text proposed |
| Samsung | Support of the text proposal in RP-212004 |
| Lenovo, Motorola Mobility | Prefer Intel’s (RP-212004) wording as there is differentiation between hybrid positioning on a link basis, i.e. Uu and/or PC5 and on a RAT-dependent/RAT-independent positioning basis. Although, the latter reference to hybrid positioning in 3GPP tends to refer to the utilization of RAT-dependent and RAT-independent positioning solutions. |
| Ericsson | We support the text proposal from RP-212004, with the following small edit: RAT-dependent and**/or** RAT-independent solutions |
| NTT DOCOMO | We are fine with either x2004 or x2036. |
| Huawei, HiSilicon | If RAT-independent is mentioned, it needs to be properly qualified as to how useful it may be in the scenarios discussed in the TR. We are not convinced we need spend the time to do so at this final meeting of the SI, as this would be an effort requiring potentially rather detailed analyses beyond the scope of RAN. E.g. some sensors may not allow to identify the UEs involved in the measurements, and thus not allow positioning of those UEs.  The proposed text from Intel would unnecessarily change the already-agreed definition of hybrid solutions. |
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=> The moderator suggest adopting the proposal in RP-212004 with some rewording.

Q2: [RP-212131, Huawei] proposed to include that a Uu-based solution consists of UL and/or DL positioning and a PC5-based solution consists of SL positioning.

Please provide your view on this.

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| Company | Comment |
| LGE | Support in general. We prefer a simple general clarification that Uu interface uses UL and/or DL and PC5 interface uses sidelink. |
| Xiaomi | No need for this clarification |
| Futurewei | Prefer not to add wording wrt ‘solution’. So, LGE proposal is ok. |
| Qualcomm | Agree with LGE. |
| CATT | Support. A hybrid solution consists of SL positioning and UL and/or DL positioning. |
| OPPO | The only point to add seems to be that Uu-positioning includes both UL and DL (we do not think there is any ambiguity on PC5/SL), which is fine for us, although it seems clear enough already. |
| Intel | No strong preference. Details can be discussed during design framework; we do not see the strong motivation behind proposal at this stage. |
| Apple | Not needed |
| Nokia | The current text in Section 5.2 about the definition of Uu-based solution and PC5-based solution already allows the possibilities covered by the proposal in RP-212131. We think the currently level of details in the TR is sufficient and such details about UL and/or DL and SL positioning can be addressed in the solution discussion phase. |
| ZTE, Sanechips | OK |
| Samsung | To keep the consistency with other descriptions, a simple clarification seems good enough. |
| Lenovo, Motorola Mobility | Okay with general clarification on Uu and PC5 interfaces, but existing text may already be self-explanatory. |
| Ericsson | Ok with the clarification. |
| NTT DOCOMO | LGE’s suggestion would be better. |
| Huawei, HiSilicon | This clarification is required to define SL positioning in a similar way as UL and DL positioning are defined. Sending measurements over the SL cannot be referred to SL positioning, similarly as UL positioning does not consist of a UE sending measurements in the UL. |
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=> The moderator suggest adding a clarification on which “link” is measured in each solution.

Q3: [RP-212410, ZTE] proposed to capture that, in the context of “Uu based solution with assistance of PC5 interface and PC5 based solution with assistance of Uu interface,” PC5 interface can forward the Uu based positioning measurement and vice versa.

Please provide your view on this.

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| Company | Comment |
| LGE | We don’t think the wording “Uu based solution with assistance of PC5 interface and PC5 based solution with assistance of Uu interface” is necessary. We can clarify that the measurement can be sent to the positioning calculation entity using Uu or PC5 interface. This wording can be merged to the text to be discussed Q1 for 5.3 Positioning calculation entity. |
| Xiaomi | Unclear to us |
| Futurewei | Same comment as Q2 above. |
| Qualcomm | The intention of the proposal is unclear.  If this is trying to clarify the which entity makes the positioning calculation, it should be placed into the corresponding clauses, and describe what are the possible interfaces used for the information transfer.  If this is trying to clarify which radio interface is used for positioning signal measurements, the above description seems to create more confusion. It should rather just simply clarify that Uu and/or PC5 may be used for positioning measurements, and that can be independent from the measurements results transfer. |
| CATT | It seems we may need to consider whether to use the terms of “Uu-based solution” and “PC5-based solution”. We have already defined UE-based and network-based solutions, where ‘UE’ and ‘network’ refer to the network entities where the position is calculated, but Uu and PC5 are not network entities, but interfaces. |
| OPPO | Same view as LGE. |
| Intel | Prefer to discuss based on concrete TP. The ‘assistance’ wording is confusing. It seems the intention is to clarify that sidelink measurements can be sent over Uu air-interface and DL/UL measurements over PC5 interface, which is OK in principle. |
| Apple | Not needed |
| Nokia | We support it. See our comments to Q2. We prefer to make the text generic by changing “measurements” to “assistance”. |
| ZTE, Sanechips | OK with LGE's suggestion and it should be clarified that the measurement can be sent to the positioning calculation entity using Uu or PC5 interface. |
| Samsung | Agree with FL’s suggestion. |
| Lenovo, Motorola Mobility | We think Uu and PC5 assistance information can be useful for both Uu and PC5 based positioning solution, but overall we do not see a need to explicitly capture it in the TR. |
| Ericsson | Agree with the moderator’s assessment. |
| NTT DOCOMO | The intention should be clarified further. We have question similar to QC. |
| Huawei, HiSilicon | The wording “YY based solution with assistance of XX interface” is not necessary. |
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=> The moderator suggest adding a text that Uu or PC5 interface can be used to transfer the measurement.

Q4: If you think other changes are necessary for this sub-section, please specify them.

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2.3. Changes for “5.3 Positioning Calculation Entity”

Q1: [RP-212131, Huawei] proposed to mention that, for UE based positioning, the UE may receive necessary information from another UE or the network for the positioning calculation at the UE, at least for SL positioning.

Please provide your view on this.

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| Company | Comment |
| LGE | We can simply say that necessary information for positioning, including the measurement, can be sent using Uu or PC5 interface. |
| Xiaomi | Ok with the proposal |
| Qualcomm | Given that this clause is about "calculation entity", the following should be captured:  "The UE can be the calculation entity for SL positioning, with information received from other UEs or network via PC5 or Uu interface." |
| CATT | Huawei’s proposal is fine to us. |
| OPPO | The simplified wording suggested by LGE is fine for us. In general, this clarification seems to go into detailed solution level rather than requirement, would be good to rely on further WG work to down-select between the options. |
| Intel | OK in principle |
| Apple | We share similar view as LGE |
| Nokia | The definitions of network-based and UE-based in Section 5.3 is clear. The additional involvement of SL in positioning and how it impacts the existing terminologies of network-based and UE-based positioning can be discussed in the solutions phase. However, through generalization of text under Radio Link section, this involvement of SL involvement can be covered. |
| ZTE, Sanechips | Ok with LGE's suggestion |
| Samsung | Support of FL’s suggestion |
| Lenovo, Motorola Mobility | Share LGE’s view to keep the description more general. |
| Ericsson | We think this is already going into to much details, which should be discussed by working groups. |
| NTT DOCOMO | It seems that LGE’s suggestion is better. Detailed solution will be discussed in later phase, so simple text is preferred. |
| Huawei, HiSilicon | The current description in the TR mentions the report of necessary information from the UE to the network for network based positioning, but does not discuss the report of necessary information for UE based positioning. It should be captured in the TR that for UE based positioning, the recipient is a UE, and the source reporting necessary information can be another UE or the network. |
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=> The moderator suggest adding a text that Uu or PC5 interface can be used to transfer necessary information. The moderator understands that this is about which interface to use in delivering the necessary information (other than the measurements) so it can be added to the section of radio link.

Q2: [RP-212131, Huawei] proposed to capture that positioning with SL measurements can be done at the network or at a UE.

Please provide your view on this.

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| Company | Comment | |
| LGE | We don’t think this is strictly necessary because there is no limitation in using PC5-based solution under the architecture of network-based and UE-based positioning. The same understanding applies to Uu-based solution. | |
| Xiaomi | Not need for the clarification | |
| Futurewei | Not seeing this as important clarification at this time | |
| Qualcomm | It should be clarified that for the calculation at the network option, it only applies to cases where UEs are in network (communication) coverage. | |
| CATT | We are fine to clarify that both network based SL positioning and UE based SL positioning are supported with SL measurements as suggested by Huawei. We also agree with QC’s comments. | |
| OPPO | We do not see the need of this clarification, due to similar reason as replied to Q1 above. | |
| Intel | In general case, all DL/UL/SL measurements can be used for UE or NW based positioning. Whether to enable this and which measurements can be transferred over Uu and PC5 interface is a solution space that can discussed at a later stage. | |
| Apple | Not needed, it should be already the common understanding | |
| Nokia | This level of solution details can be addressed during the solutions phase. These are not precluded in our understanding. | |
| ZTE, Sanechips | We think this can be discussed together with Q3 under 2.3. Our preference is to capture the text in Q3, alternatively Huawei's text is acceptable. |
| Samsung | Further clarification seems not necessary. FL’s suggestion seems good enough | |
| Lenovo, Motorola Mobility | This would also apply to Uu as well so we do not see a strong need to mention it for SL as it is applicable for both Uu and SL network-based and UE-based positioning. | |
| Ericsson | Agree with moderator’s assessment. | |
| NTT DOCOMO | Why this text is needed is unclear for us. | |
| Huawei, HiSilicon | We believe it is important to point out that the use of SL measurements does not imply computation at a UE. As mentioned in the reply to the next question, all options (without preference) should be available for discussion in a WG-level study. | |
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=> The moderator suggest not adding the proposed text. The moderator understands that any positioning solution (Uu-based and PC-based) can be combined with any position calculation entity (network-based and UE-based).

Q3: [RP-212410, ZTE] proposed to add that the network based architecture is preferred for in-coverage scenario and UE based architecture is suitable for out-coverage scenario.

Please provide your view on this.

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| Company | Comment |
| LGE | Not support. The issue of which solution is better needs to be discussed in a WG-level study. |
| Xiaomi | Can be discussed in WG level study |
| Futurewei | Cant agree with such conclusive wordings. |
| Qualcomm | This is not acceptable.  Similarly, the definition of "in-coverage" is unclear here.  Even if this means that the UE is in communication coverage, it does not always be beneficial to use network-based architecture, as it depends on the solution and use cases.  Agree with LGE that such discussion should happen when the exact positioning solution is designed and reviewed at WG level. |
| CATT | We assume which architecture is preferred is implementation dependent. |
| OPPO | We do not see the need of this clarification, due to similar reason as replied to Q1 above. |
| Intel | Both options are possible. There is no objective to discuss/conclude on which option is more suitable. |
| Apple | Same view as LGE |
| Nokia | Agree with LGE and Xiaomi |
| ZTE. Sanechips | Support |
| Samsung | No need to restrict scenarios at this stage |
| Lenovo, Motorola Mobility | Can be discussed in detail at a later stage. |
| Ericsson | Do not support. This sort of conclusion is typically the outcome of an SI. |
| NTT DOCOMO | Agree with LGE. |
| Huawei, HiSilicon | Not support, since this would be expressing a technical detail preference at a too-early stage. |
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=> The moderator suggest not adding the proposed text.

Q4: If you think other changes are necessary for this sub-section, please specify them.

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2.4. Changes for “5.4 UE types”

Q1: Several contributions made proposals on the power consumption aspect.

* [RP-212004, Intel], [RP- 212022, vivo], [RP-212036, LGE], [RP-212460, Lenovo] proposed to add that a UE installed in a device of VRU may have more limited battery capacity. In addition, [RP- 212022, vivo] proposed to add a requirement that sidelink positioning for VRU type of devices should not impact the duration of VRU type of device by more than [5]%.
* [RP- 212022, vivo], [RP-212460, Lenovo] proposed to add that UEs in public safety use case are battery limited.

Please provide your view on this.

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| Company | Comment |
| LGE | Support. The TR needs to capture that some UEs in VRU and public safety may have limited battery and/or processing capability. But we don’t think there is a concrete numerical requirement on the power saving aspect, so capturing some quantitative requirement is not preferred. |
| Xiaomi | Agree to add battery limited UEs |
| Qualcomm | It is potentially useful to identify the different types of UEs that may make use of positioning service. However, it is impossible to place any definite requirements based on that.  Therefore, we cannot agree with the proposal in RP- 212022.  In general, there can be high level descriptions on the UE types, and clarify that while some UEs, and the positioning mechanisms need to take these into account and accommodate the differences. |
| CATT | We are in general fine to add that a UE of a VRU may be more limited battery capacity comparing to UE installed in a vehicle or a road side unit. |
| vivo | Support to differentiate the UE types. |
| OPPO | Same view as LGE that a generalized sentence like, a UE installed in a device of VRU or a UE in public safety use are battery limited. |
| Intel | Support w/o mentioning any explicit requirement |
| Apple | A general statement like some UEs in VRU or public safety are power limited is sufficient. Details on numbers are not supported. |
| Nokia | OK to capture that different UE types may have different power profiles i.e. different battery capacity. Any specific requirements and bands assumed will need further discussion. |
| ZTE, Sanechips | Some clarification is needed. |
| Samsung | Support of FL’s suggestion |
| Lenovo, Motorola Mobility | Support to capture the inclusion of limited battery/capability UEs for VRUs and public safety use cases. |
| Ericsson | We can agree that power saving considerations should be listed in relevant scenarios. But we should not aim at capturing a requirement if it is not already available. |
| NTT DOCOMO | Support FL’s suggestion. |
| Huawei, HiSilicon | Due to the absence of concrete requirements relating to power consumption, battery life, batter capacity, etc. for positioning use cases for V2X and PS (as per objective #1 of the SID), it is not necessary to capture UE power constraints in the TR. The power consumption aspect can be discussed in a later phase, e.g. at WG-level study, as a potential comparative metric. In addition, we would like to point out that a battery limitation may not necessarily imply a limited computational processing capability.  On the one hand, it has been mentioned there are UEs with battery limitations in PS. On the other hand, it has also been mentioned that for PS there are UEs with a capability of a high power transmission, without being clear whether such UEs also have a power limitation. |
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=> The moderator suggest adding a text that some UEs are battery limited.

Q2: [RP- 212022, vivo], [RP-212036, LGE], [RP-212131, Huawei] proposed to reference the antenna configuration and panel distribution in TR 37.885 as an example of a distributed antenna system.

Please provide your view on this.

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| Company | Comment |
| LGE | Support. We can simply give a reference to 37.885 as in RP-212036 since this is for the evaluation purpose and the detailed information can be found there. |
| Xiaomi | Agree to simply add a reference to 37.885 |
| CATT | Support. |
| vivo | Support. |
| OPPO | Agree to simply add a reference to 37.885 |
| Intel | In our view this is a part of evaluation methodology assumption and discussion. It is OK to add reference. |
| Nokia | This level of details about reference antenna configuration can be discussed during the solutions evaluation phase. |
| ZTE, Sanechips | OK |
| Samsung | Support of FL’s suggestion |
| Lenovo, Motorola Mobility | Ok with referencing 37.885 for directing the reader towards the applicable antenna evaluation models. Suggest a editorial addition to the text in RP-210036 “An The relevant antenna models for evaluation can be found in [10].” |
| Ericsson | No strong opinion, but such details may be more relevant for a WG level study |
| NTT DOCOMO | Same view with Nokia. |
| Huawei, HiSilicon | A reference to 37.885 can be added with a very brief statement that different vehicle types with two panels (i.e. one panel at the front bumper/rooftop and one panel at the rear bumper/rooftop) are defined for evaluation in one of the options of vehicle UE antenna element pattern and array configuration. |
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=> The moderator suggest adding a reference to 37.885.

Q3: [RP- 212022, vivo] proposed to reference the UE antenna configurations for 700MHz in TR38.802 as an example of UE antenna in public safety use cases.

Please provide your view on this.

|  |  |
| --- | --- |
| Company | Comment |
| LGE | No strong view but we think such detailed antenna configuration can be discussed in WGs, e.g., as a part of evaluation methodology. |
| Xiaomi | Agree to add the referece of 38.802 |
| Qualcomm | Agree with LGE and this level of details should not be added now with WG level discussions. |
| CATT | We share the similar view as LGE that detailed antenna configuration can be discussed in WGs. |
| vivo | Support to clarify this in the deployment scenarios. |
| OPPO | Agree to simply add a reference to 38.802 |
| Intel | In our view this is a part of evaluation methodology assumption and discussion.  It is OK to add reference. |
| Nokia | This level of details about reference antenna configuration can be discussed during the solutions evaluation phase. |
| ZTE, Sanechips | OK |
| Samsung | Support of FL’s suggestion, i.e., it can be discussed later. |
| Lenovo, Motorola Mobility | Similar to 2.4-Q2, we can simply reference the relevant antenna models in TR38.802 |
| Ericsson | No strong opinion, but such details may be more relevant for a WG level study |
| NTT DOCOMO | Same view with Nokia. |
| Huawei, HiSilicon | A reference to TR 38.802 can be added. We are open to include the antenna details or not. |
|  |  |

=> The moderator suggest adding a reference to 38.802.

Q4: [RP-212036, LGE] proposed to add that some UEs may be capable of transmissions with higher power such as Power class 1 in public safety use cases.

Please provide your view on this.

|  |  |
| --- | --- |
| Company | Comment |
| LGE | Support. |
| Xiaomi | Agree |
| CATT | We stick to the existing UE Power Class definition for public safety scenario, i.e. The UE power class 1 requirements for Band n14 are applicable for public safety scenario only (please see Table 6.2.1-1: UE Power Class in 38.101-1). If more bands are expected for power class 1, RAN4 study work should be involved at first. |
| OPPO | We are not quite sure if this needs to be captured as requirement or maybe better to leave it as a factor to be considered during solution discussion in WG level. |
| Apple | Not needed |
| Nokia | See comments to Q1 under Section 2.4 above. For now it is sufficient to capture that different UE types may have different power profiles i.e. different battery capacity. Any specific requirements and bands assumed will need further discussion. |
| ZTE, Sanechips | Prefer to merge this with Q1 as an example to the general text. |
| Samsung | Support |
| Lenovo, Motorola Mobility | Ok with indicating power class 1 as an example but may lead to a discussion on including other power class examples. It could be better considered later on during the WG-level study. |
| Ericsson | OK |
| NTT DOCOMO | We do not think that this aspect should be captured in this stage. |
| Huawei, HiSilicon | This would seem to be only a statement of a UE power class specified for Uu and not necessarily for sidelink (where PC1 is not currently defined). In that sense it only re-states certain parts of 3GPP TSs, which is not itself a scenario nor requirement. It does not seem suitable to include in the TR. |
|  |  |

=> The moderator suggest not adding this proposal.

Q5: If you think other changes are necessary for this sub-section, please specify them.

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| Company | Comment |
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2.5. Changes for “5.5 Spectrum”

Q1: [RP-212004, Intel] proposed to clarify that the spectrum currently captured for V2X use case can be considered for both Uu and PC5 interfaces.

Please provide your view on this.

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| --- | --- |
| Company | Comment |
| LGE | Okay. |
| Xiaomi | agree |
| Futurewei | Support |
| Qualcomm | Support to capture these. |
| CATT | We would like to understand what it means by “spectrum currently captured for V2X use case can be considered for both Uu and PC5 interfaces.” We assume the spectrum for Uu interface is independent of the spectrum of V2X or PC5 interfaces. |
| vivo | Support to capture these. |
| OPPO | The addition is confusing, it reads like ITS-dedicated spectrum can be considered also for Uu interface. |
| Intel | Support |
| Nokia | Should be driven by regulatory requirements and can be studied further in RAN4 during solutions phase. |
| ZTE. Sanechips | Support |
| Samsung | Support |
| Lenovo, Motorola Mobility | Support |
| Ericsson | OK |
| NTT DOCOMO | Similar view with OPPO. |
| Huawei, HiSilicon | The proposed text by Intel is incorrect as the ITS band cannot be considered for the Uu interface. A further issue is that there is no sidelink or PC5 interface defined in unlicensed spectrum, so the technology cannot, in fact, be considered in such spectrum in the release of this TR. |
|  |  |

=> The moderator suggest revising the proposal so that only PC5 is mentioned for ITS spectrum. The moderator reminds that there is already a note saying that the current NR sidelink is not defined in unlicensed spectrum and 5GAA TR also mentioned unlicensed spectrum.

Q2: Several contributions made proposals on the spectrum for public safety use case.

* [RP-212004, Intel] proposed to add that licensed and unlicensed spectrum can be considered for public safety use cases.
* [RP- 212022, vivo] proposed to add that licensed spectrum can be considered for public safety use cases.

Please provide your view on this.

|  |  |
| --- | --- |
| Company | Comment |
| LGE | We think licensed spectrum can be mentioned for public safety and would like to get feedback from the public safety players about the potential usage of unlicensed spectrum. |
| Xiaomi | Agree with intel’s proposal |
| Futurewei | Support |
| Qualcomm | We support the proposal to include licensed and unlicensed spectrum for public safety use cases (if the positioning mechanism supports unlicensed operation, there is no reason to not use it for Public Safety cases) |
| CATT | Share a similar view as LGE. We like to understand from public safety players on which spectrum should be considered. |
| OPPO | Same view as LGE, the usage of unlicensed spectrum for PS use case needs to be evaluated. |
| Intel | Support proposed changes in RP-212004 |
| Nokia | Should be driven by regulatory requirements and can be studied further in RAN4 during solutions phase. |
| ZTE, Sanechips | Support the suggestion from LGE |
| Samsung | Agree with FL’s suggestion. We need to wait for input from PS community regarding whether unlicensed spectrum can be utilized for public safety. |
| Lenovo, Motorola Mobility | Both licensed and unlicensed band operation can be considered for public safety use cases. |
| Ericsson | Regarding unlicensed spectrum, we can agree that it could be considered for positioning, but it is not yet known whether it is suitable to fulfill the requirements. |
| NTT DOCOMO | Support LGE’s suggestion. |
| Huawei, HiSilicon | Agree with vivo’s proposal that licensed spectrum can be considered for PS, as it is not clear why PS, which requires performance guarantees, would use unlicensed spectrum when dedicated spectrum can be obtained for that purpose. Such statements in this TR would speculate beyond what has been submitted to 3GPP by external organizations and our own TRs/TSs. |
|  |  |

=> The moderator suggest mentioning only licensed spectrum for public safety and continue more discussion on the unlicensed spectrum.

Q3: [RP-212036, LGE] proposed to add possible bandwidth and frequency locations of ITS-dedicated, licensed, and unlicensed spectrum.

Please provide your view on this.

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| --- | --- |
| Company | Comment |
| LGE | Support. |
| Xiaomi | Agree |
| Futurewei | Support |
| Qualcomm | Fine to capture these, but the final text proposal requires review. |
| CATT | Partial agree. We think it is too early to add possible bandwidth and frequency locations of unlicensed spectrum. The support of unlicensed spectrum for SL positioning should be supported after the sidelink in unlicensed spectrum is supported. |
| vivo | Not sure how bandwidth/frequency location could be determined at RANP level. |
| OPPO | Do not see the need since this is quite detailed solution level description that may be mainly useful for stage-4 RAN4 spec.. so prefer not to add these uncertain information, as possible bandwidth and frequency location may not facilitate the following work. |
| Intel | OK in principle. Is there intention to add text from 5GAA LS or just give some examples for selected country/region or refer to RAN4 specs? |
| Nokia | Should be driven by regulatory requirements and can be studied further in RAN4 during solutions phase. |
| ZTE, Sanechips | Similar view as CATT. |
| Samsung | Not support  For unlicensed spectrum, it is still under discussion as part of Rel-18 sidelink. Also, this text was captured in the 5GAA TR without thorough discussion on available frequency bands. So, we don’t see any justification to capture this text at this point. |
| Lenovo, Motorola Mobility | Support |
| NTT DOCOMO | Same view with CATT/OPPO/Samsung. This kind of text is unnecessary in this study phase. |
| Huawei, HiSilicon | Agree to capture this with simply a reference to the 5GAA TR. Proposed reference [11] is not an external input to 3GPP, nor a TS/TR. It should not be included, as it is simply a survey of companies views back in 2018. Ref [11]’s contents cannot be reinterpreted as applying to sidelink which was not considered in the survey. Regulations may also have changed since 2018. |

=> The moderator suggest not adding this proposal.

Q4: [RP-212131, Huawei] proposed to add that the use of unlicensed bands for SL positioning would only be efficient to introduce after there is support for sidelink in unlicensed spectrum in general.

Please provide your view on this.

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| --- | --- |
| Company | Comment |
| LGE | Not support. We cannot preclude at this moment a scenario where only positioning measurement is done in the unlicensed band and all the necessary communications take place in ITS/licensed spectrum. |
| Xiaomi | Not agree. TR already captures that “with a note that there is no mechanism corresponding to regulatory requirements to use unlicensed spectrum in Rel-17 NR sidelink”. No need for further mis-leading interpretation. |
| Qualcomm | Do not support.  Sidelink PRS operation has no dependence on sidelink communication in the same band. Sidelink unlicensed operation is not a prerequisite for transmitting SL-PRS over unlicensed.  It is highly possible to have Sidelink communication in licensed and ITS bands, and the SL-PRS in unlicensed bands.  Therefore, it is technically not correct to claim that SL positioning in unlicensed band requires SL communication also in unlicensed. |
| CATT | Support. Our preference is that the support of unlicensed spectrum for SL positioning is supported after the sidelink in unlicensed spectrum is supported. |
| OPPO | Support the proposal, sidelink transmission on unlicensed spectrum has not been support yet, the working load may not be acceptable if unlicensed spectrum is considered in this item, and it is also unclear how to design sidelink PRS as the structure of other sidelink channels/signals are unkonwn. |
| Intel | Do not support. It is premature to draw such conclusions in TR as the design framework is not defined yet. |
| Apple | Do not support |
| Nokia | Should be driven by regulatory requirements and can be studied further in RAN4 during solutions phase. |
| ZTE, Sanechips | Support Huawei's text |
| Samsung | Support. Agree with CATT |
| Lenovo, Motorola Mobility | Prefer to keep it open at this stage, without suggesting any WG-level guidance for the purposes of this TR. |
| NTT DOCOMO | Support. Agree with CATT. |
| Huawei, HiSilicon | The current version of the TR has an FFS on discussing the pros and cons of the different bands. We believe that the use of unlicensed band for SL positioning has the disadvantage that its progress may be impacted by the work of Rel. 18 SL enhancements in unlicensed bands. |

=> The moderator suggest not adding this proposal based on the understanding that no clear assessment can be made on the efficiency of SL positioning in unlicensed band in this study.

Q5: If you think other changes are necessary for this sub-section, please specify them.

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| Company | Comment |
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2.6. Changes for “6 Conclusion”

Q1: Several contributions proposed text for the conclusion section: [RP-212004, Intel], [RP-212036, LGE], [RP-212105, Qualcomm], [RP-212132, Huawei]

Please provide your view on how to prepare the conclusion text.

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| --- | --- |
| Company | Comment |
| LGE | We think the conclusion should simply summarize what has been considered in identifying the requirements and operation scenarios instead of recommending future works. In this sense, we prefer the wording in RP-212004 or RP-212036. |
| Xiaomi | We prefer intel’s proposal. It is much clearer. |
| Futurewei | Agree with LGE suggestion |
| Qualcomm | Fine to capture the conclusions.  However, it is preferrable to also recommend the next step. |
| CATT | For spectrum part, we think it would be better to add a note “NOTE: The support of unlicensed spectrum for SL positioning can be supported after the sidelink in unlicensed spectrum is supported.” |
| OPPO | Also prefer Intel proposal in 2004, after some revision based on the questionnaire output above. |
| Intel | TP in RP-212004 is preferred. |
| Apple | Agree with LGE on not recommending future works |
| Nokia | Too early to discuss in the initial phase of this discussion. We should first settle down on other changes proposed to the TR before reviewing the conclusions. |
| ZTE, Sanechips | OK with LGE's suggestion |
| Samsung | We prefer the wording in RP-212004 except spectrum part. 1) We are not sure at this point whether unlicensed spectrum can be utilized for public safety as discussed in Q2 of Section 2.5, 2) As commented by some companies in Q3 of Section 2.5, we also think that the support of unlicensed spectrum for sidelink positioning needs to be discussed after the sidelink operation over unlicensed spectrum is specified. |
| Lenovo, Motorola Mobility | Share LGE’s view, that the conclusion should simply summarize the identified use cases, requirement and deployment scenarios. |
| Ericsson | We can discuss a conclusion during the meeting with Intel’s input as initial draft. |
| NTT DOCOMO | We have same view with CATT/Samsung. Unlicensed spectrum cannot simply be included in the conclusion part. |
| Huawei, HiSilicon | The conclusions should go beyond merely being a summary. They should also include recommendations on what to study/specify further as we have proposed in RP-212132. This can provide useful input to the Rel-18 scoping processes, wherein it was recently observed that waiting for outcomes from this SI was worthwhile. Also agree with the comments on unlicensed spectrum. |
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=> The moderator suggest adding RP-212004 as the first draft and continue more discussion. The moderator agrees with CATT that a note on the unlicensed band needs to be copied.

2.7. Other aspects

Q1: [RP-212036, LGE] proposed to send the final version of the TR to 5GAA and SAE Advanced Applications Technical Committee.

Please provide your view on this.

|  |  |
| --- | --- |
| Company | Comment |
| LGE | Support. |
| Xiaomi | Ok |
| CATT | Ok. |
| OPPO | Agree |
| Intel | OK |
| Nokia | Too early to discuss in the initial phase of this discussion. We should first settle down on other changes proposed to the TR before reviewing the conclusions. |
| ZTE,Sanechips | Ok |
| Samsung | OK |
| Lenovo, Motorola Mobility | Support |
| Ericsson | Agree |
| NTT DOCOMO | OK |
| Huawei, HiSilicon | Agree – preferably, we send v17.0.0 (i.e. after elevation by MCC), rather than v2.0.0. |
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=> The moderator suggest preparing an LS.

Q2: If you think any other aspects need to be discussed, please specify them.

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| Company | Comment |
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# **Discussion: Intermediate round**

The moderator uploaded a draft pCR uploaded in the following link:

<https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_93e/Inbox/Drafts/%5B93e-10-SL-Positioning-TR%5D/Intermediate%20round/Draft%20RP-21xxxx%20pCR%20for%20positioning%20scenarios%20and%20requirement%20v001.docx>

Companies are invited to check the draft pCR and provide comments on each sub-section.

Comments on 5.1 Network coverage

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | The removal of the agreed text about TS 38.304 is a bit unfortunate as we explained. If it is removed, it would then help to reference instead the newly-inserted figures in its place (they are currently not mentioned in the TR). Then, at least the TR is internally consistent.  The other additions are fine, but clearer to add “…when there is no network and no GNSS coverage”. |
| Qualcomm | We are fine with the proposed change. |
| Samsung | We are supportive of the proposed change from Huawei. |
|  |  |

Comments on 5.2 Radio link

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | The mention of RAT-independent needs to be properly qualified, with “where it is available and applicable”. For example, GNSS cannot always be used, and then the device may have no RAT-independent solution.  On the association between interface and node, see our updated suggestion for section 5.3. |
| Qualcomm | We are fine with the proposed change. |
| Samsung | We are supportive of the proposed change from Huawei. |
|  |  |

Comments on 5.3 Position calculation entity

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We still think there needs to be a way to understand what relationships can exist between the radio interfaces and the calculation nodes. If it is not convenient in section 5.2, we suggest something like this in section 5.3 instead:  5.3  …  Which node is the position calculation entity does not limit which interface(s) can be used for the radio link(s) in Section 5.2. |
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Comments on 5.4 UE types

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We don’t agree with isolating each UE type to a power limitation, since this is statements asserted largely without substantive input from external fora or 3GPP work to justify it for the use of sidelink positioning. We doubt that power limitation is a scenario or use case, and regard it as primarily a metric that might be used in evaluating suitability of a detailed solution.  Instead of what is currently proposed, we can compromise to a simplified statement at a level similar to the rest of the TR: *“Different UE types may have different power supply limitations*”.  For the sake of progress, we can live with the insubstantive mention of antenna types, but we think the quality of this TR would be enhanced by copying a few words from other TRs describing them. After all, those words are already agreed. |
| Qualcomm | We are ok with the proposal but suggest some rewording in the following sentence:  "A UE ~~installed in a device of~~ used by a vulnerable road user may be more battery limited comparing to a UE installed in a vehicle or a road side unit." |
| Samsung | We are supportive of the proposed change from Qualcomm. |
|  |  |

Comments on 5.5 Spectrum

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| --- | --- |
| Company | Comment |
| FirstNet | Please re-write the sentence “For public safety use case, the spectrum licensed to mobile network operators (including FR2) [,and the unlicensed spectrum] can be considered for both Uu and PC5 interfaces.” as follows: “For public safety use case, the spectrum licensed to mobile network operators (including FR2) ~~[,and the unlicensed spectrum] can be~~ is considered for both Uu and PC5 interfaces.” |
| Huawei, HiSilicon | We don’t agree to the inclusion of unlicensed spectrum for public safety. It is speculation beyond what is justified in the SID statements for inputs to the TR. |
| Qualcomm | Given clause 5 is about the potential deployment and operation scenarios, all the potential spectrum for positioning should be listed, including unlicensed.  There is no reason to preclude such operation scenarios. |
| Samsung | We support the revision from FirstNet |
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Comments on 6 Conclusions

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We have to object to the current conclusions for the following reasons and with suggestions:   1. The conclusions do not have sufficient reflection of the requirements in Section 4. It is not correct to call sections 4.2 and 4.3 merely a summary of external inputs – in fact, Section 4 is the work of one entire objective of the SI. The TR and SI is equally about deployment/operation scenarios as it is about requirements. The conclusions at least need to summarize that there are 3 sets of requirements, the applicability of absolute and relative positioning, use-case based requirement for in-coverage and out of coverage requirements satisfaction, and the existence of other metrics (for V2X); and similar summary of the points for PS. 2. Network coverage may alternatively be a place to mention the need to meet requirements for in-coverage and out-of-coverage. Otherwise, the linkage present in the body of the TR is lost in the conclusions. This is relevant to the “operation scenarios” part of the SI objectives, which don’t seem reflected in the current proposal. 3. The UE types should not be directly linked to a power supply limitation in the conclusions, and there is no mention of “power saving” elsewhere in the TR due to no existence of a requirement for it for sidelink positioning. In our view, this does not warrant any mention in the conclusions. 4. Additionally in UE types, the different antenna types should be mentioned. Antenna type is a material point which affects positioning for V2X especially.   In spectrum, it is not a conclusion of the TR that unlicensed spectrum for SL positioning “can be supported”, as that prejudges any feasibility studies in WGs. It would be correct to re-use the sentence from the body of the TR: “…however, there is no mechanism corresponding to regulatory requirements to use unlicensed spectrum in Rel-17”. And unlicensed needs to be removed from PS, as it is speculation. |
| Qualcomm | On the "spectrum" aspect, the following NOTE needs to be removed:  NOTE: The support of unlicensed spectrum for SL positioning can be supported after the sidelink in unlicensed spectrum is supported.  It has been clarified multiple times that the Sidelink Positioning requires only SL-PRS transmission over unlicensed spectrum. Sidelink over unlicensed operation is not a prerequisite for Sidelink positioning. Given that there is no SL-PRS operation defined over ITS bands or licensed band, the work scope is the same for any band, ITS bands or licensed bands, as well as for unlicensed bands.  Therefore, it is suggested that this NOTE to be removed.  Note that for Uu positioning design, the PRS design is always band agnostic and its frequency assignment is not tied to the Uu operating band. |
| Samsung | For spectrum part, we agree with Huawei.  In principle, we agree with Qualcomm’s assessment that the PRS design is band-agnostic. However, we think that sidelink UE procedure in licensed band or ITS band can be different from sidelink UE procedure in unlicensed band due to a regulatory issue, e.g., LBT operation. Then, we are not sure at this point whether SL-PRS designed for unlicensed band can be directly reused for licensed band or ITS band, or vice versa. So, we need to see sidelink UE procedure in unlicensed band first and then can design SL-PRS. |
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Comments on any other parts of the TR

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| Company | Comment |
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The moderator uploaded a draft LS to send the approved TR to relevant organizations in the following link:

<https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_93e/Inbox/Drafts/%5B93e-10-SL-Positioning-TR%5D/Intermediate%20round/Draft%20RP-21xxxx%20LS%20on%20positioning%20v001.doc>

Companies are invited to check the draft LS and provide comments on each sub-section.

Comments on the draft LS

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | The LS is fine. Not sure if a v17.0.0 TR will exist as an RP-xxxx number. Joern could advise what is best (maybe the hyperlink to the TR’s webpage and the notification of v17.0.0?).  <https://www.3gpp.org/DynaReport/38845.htm> |
| Samsung | No comment on the draft LS. It is fine for us. |
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|  |  |