**3GPP TSG RAN WG1 #120bis R1-250xxxx**

**Wuhan, China, April 7th – 11th, 2025**

**Agenda item: 9.7.2**

**Source: Moderator (Xiaomi)**

**Title: Email summary on [Post-120bis-ISAC-02]**

**Document for:** **Discussion/Decision**

# Introduction

In RAN1 #120bis, the values of the parameters generating background channel for monostatic sensing were proposed. Further, two new parameters, i.e., a factor to revise d3D and a ZOA threshold to drop certain rays were additionally agreed in the discussion of detailed procedure generating the background channel for monostatic sensing, which motivates the email discussion.

Further, there are two tables for the parameter values of monostatic RCS for UAV with large size and AGV with single scattering point, which are included in the email discussion.

[Post-120bis-ISAC-02] – Yingyang (Xiaomi)

Email discussion for agreement on parameter values for monostatic background channel, and values of parameters for monostatic RCS of UAV with large size and AGV, from April 21 to April 25.

# Background channel for monostatic sensing

In RAN1 #120bis, the values of the parameters generating background channel for monostatic sensing were proposed. Further, two new parameters, i.e., a factor to revise d3D and a ZOA threshold to drop certain rays were additionally agreed. Consequently, the parameter values generating background channel for monostatic sensing needs to be re-evaluated. The values in the table in the agreement for email discussion is the starting point.

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| For email discussionProposalThe values of the parameters to generate background channel for TRP monostatic and UE monostatic sensing for each sensing scenario are provided in the following table * FFS parameter values for other scenarios (e.g. indoor factory)
* Email discussion/approval checking the values after April meeting, including validation for newly agreed parameters
	+ The email discussion includes all scenarios, TRP monostatic and UE monostatic
	+ The email discussion includes how to merge results provided by companies

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| --- | --- | --- | --- | --- | --- |
| Scenario | Uma /Urban grid /Highway (FR2) /HST(FR2), (TRP monostatic) | UMi, (TRP monostatic) | Rma /Highway (FR1) /HST(FR1). (TRP monostatic) | Indoor office (TRP monostatic) | Indoor office (UE monostatic) |
| Distribution of 2D distance between Tx and reference points$d\_{rp\\_2D\\_n}\~Γ\left(α1, β1\right)+c$1 | $$α\_{1}$$ | 10.3370 | 6.1996 | 6.2025 | 4.236 | 4.3733 |
| $$β\_{1}$$ | 0.1317 | 0.1558 | 0.0391 | 0.19255 | 0.4457 |
| $$c\_{1}$$ | 68.7778 | 15.2697 | 1.2940 | 4.99 | 4.6302 |
| Distribution of height of reference points$$h\_{rp\\_n}\~Γ\left(α2, β2\right)+c2$$ | $$α\_{2}$$ | 16.2253 | 12.0487 | 0.0007 | 1.3293 | 0.2974 |
| $$β\_{2}$$ | 1.9218 | 2.3261 | 5.0146 | 0.1442 | 0.4103 |
| $$c\_{2}$$ | 2.6142 | 0.0157 | 0.0522 | 13.19 | 2.9711 |

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To avoid a quite big tables for inputs, let’s separately collect parameter values for TRP monostatic and UE monostatic.

Note: I put “if validated” for the parameter of scaling factor d\_s to d3D, if you prefer such scaling factor, please add value in the table.

## Parameter values for TRP monostatic sensing

Please each interested company provide the values of parameters generating background channel for TRP monostatic sensing using the format of following table.

|  |  |
| --- | --- |
| Scenario | TRP monostatic sensing |
| Uma /Urban grid /Highway(FR2) /HST(FR2) | UMi | Rma /Highway(FR1) /HST(FR1) | Indoor office | Indoor Factory |
| Distribution of 2D distance between Tx and reference points | $$α\_{1}$$ |  |  |  |  |  |
| $$β\_{1}$$ |  |  |  |  |  |
| $$c\_{1}$$ |  |  |  |  |  |
| Distribution of height of reference points | $$α\_{2}$$ |  |  |  |  |  |
| $$β\_{2}$$ |  |  |  |  |  |
| $$c\_{2}$$ |  |  |  |  |  |
| scaling factor d\_s to d3D (if validated) |  |  |  |  |  |
| Threshold D for ZOA |  |  |  | N/A | N/A |

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| **Company** | **Comments** |
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## Parameter values for UE monostatic sensing

Please each interested company provide the values of parameters generating background channel for UE monostatic sensing using the format of following table.

|  |  |
| --- | --- |
| Scenario | UE monostatic sensing |
| Uma /Urban grid /Highway(FR2) /HST(FR2) | UMi | Rma /Highway(FR1) /HST(FR1) | Indoor office | Indoor Factory |
| Distribution of 2D distance between Tx and reference points | $$α\_{1}$$ |  |  |  |  |  |
| $$β\_{1}$$ |  |  |  |  |  |
| $$c\_{1}$$ |  |  |  |  |  |
| Distribution of height of reference points | $$α\_{2}$$ |  |  |  |  |  |
| $$β\_{2}$$ |  |  |  |  |  |
| $$c\_{2}$$ |  |  |  |  |  |
| scaling factor d\_s to d3D (if validated) |  |  |  |  |  |
| Threshold D for ZOA |  |  |  | N/A | N/A |

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| **Company** | **Comments** |
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## Options on the factor to revise d3D

Related to the evaluation on values of parameters generating background channel for monostatic sensing, please directly comment on which Option is preferred to revise d3D. It is appreciated if you could provide analysis/comparison on 3 options considering the evaluation results

|  |
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| * The absolute delay model d3D and $Δτ$ as agreed for bistatic sensing for the same sensing scenario applies. Down-select one option from the following:
* Option 0: no scaling factor is applied to d3D
* Option 1: An offset is applied to d3D, i.e., d3D-c1
* Option 2: A scaling factor d\_s is multiplied to d3D, i.e., d3D\*d\_s. d\_s is a value within range [0, 1].
* Note: The adjustment of absolute delay doesn’t impact the generation of NLOS clusters between the Tx and each reference point
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| **Company** | **Option 0/1/2** | **Comments** |
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## How to merge results provided by companies?

As agreed in last meeting, please also comment on how to merge results provided by companies

To all: If there is a question/answer, please try to resolve it early and avoid last minute discussion on some high level principle. Thanks

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| **Company** | **Comments** |
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# Monostatic RCS for UAV with large size

In RAN1 #120bis, the values of parameters to generate monostatic RCS for UAV with large size were proposed by merging the inputs from the companies (NIST, BUPT, Xiaomi, SS, LGE). The method for merging is the same as that we used to derive the parameter values for vehicle. Therefore, it is believed that the proposed values are rather stable.

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| For email approval[FL3] Proposal 4.2.1-1 On the monostatic RCS of UAV of large size,* The values/pattern of component A\*B1 are generated by the following parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | $$φ\_{center}$$ | $$φ\_{3dB, n}$$ | $$θ\_{center}$$ | $$θ\_{3dB,n}$$ | $$G\_{max}$$ | $$σ\_{max}$$ | *Applicable Range of* $θ$ | *Applicable Range of* $φ$ |
| *Left* | *90°* | *7.13°* | *90°* | *8.68°* | *7.43* | *14.30* | *[45°,135°]* | *[45°,135°]* |
| *Back* | *180°* | *10.09°* | *90°* | *11.43°* | *3.99* | *10.86* | *[45°,135°]* | *[135°,225°]* |
| *Right* | *270°* | *7.13°* | *90°* | *8.68°* | *7.43* | *14.30* | *[45°,135°]* | *[225°,315°]* |
| *Front* | *0°* | *14.19°* | *90°* | *16.53°* | *1.02* | *7.89* | *[45°,135°]* | *[-45°,45°]* |
| *Bottom* | */* | */* | *180°* | *4.93°* | *13.55* | *20.42* | *[135°,180°]* | *[0°,360°]* |
| *Roof* | */* | */* | *0°* | *4.93°* | *13.55* | *20.42* | *[0°,45°]* | *[0°,360°]* |

* + When $θ$ is in the range [0°,45° ] or [135°,180°], $σ^{H}\_{dB}\left( φ\right)=0$
* The standard deviation of component B2 is 2.50 dB
 |

### Proposal 3-1

On the monostatic RCS of UAV of large size,

* The values/pattern of component A\*B1 are generated by the following parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | $$φ\_{center}$$ | $$φ\_{3dB, n}$$ | $$θ\_{center}$$ | $$θ\_{3dB,n}$$ | $$G\_{max}$$ | $$σ\_{max}$$ | *Applicable Range of* $θ$ | *Applicable Range of* $φ$ |
| *Left* | *90°* | *7.13°* | *90°* | *8.68°* | *7.43* | *14.30* | *[45°,135°]* | *[45°,135°]* |
| *Back* | *180°* | *10.09°* | *90°* | *11.43°* | *3.99* | *10.86* | *[45°,135°]* | *[135°,225°]* |
| *Right* | *270°* | *7.13°* | *90°* | *8.68°* | *7.43* | *14.30* | *[45°,135°]* | *[225°,315°]* |
| *Front* | *0°* | *14.19°* | *90°* | *16.53°* | *1.02* | *7.89* | *[45°,135°]* | *[-45°,45°]* |
| *Bottom* | */* | */* | *180°* | *4.93°* | *13.55* | *20.42* | *[135°,180°]* | *[0°,360°]* |
| *Roof* | */* | */* | *0°* | *4.93°* | *13.55* | *20.42* | *[0°,45°]* | *[0°,360°]* |

* + When $θ$ is in the range [0°,45° ] or [135°,180°], $σ^{H}\_{dB}\left( φ\right)=0$
* The standard deviation of component B2 is 2.50 dB

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| **Company** | **Yes/No** | **Comments** |
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# Monostatic RCS for AGV with single scattering point

In RAN1 #120bis, the values of parameters to generate monostatic RCS for AGV were proposed by merging the inputs from the companies (Huawei, BUPT). The method for merging is the same as that we used to derive the parameter values for vehicle. Therefore, it is believed that the proposed values are rather stable.

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| For email approval[FL3] Proposal 4.2.3-1 On the monostatic RCS of AGV with single scattering point,* The values/pattern of component A\*B1 are generated by the following parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | $$φ\_{center}$$ | $$φ\_{3dB, n}$$ | $$θ\_{center}$$ | $$θ\_{3dB,n}$$ | $$G\_{max}$$ | $$σ\_{max}$$ | *Applicable Range of* $θ$ | *Applicable Range of* $φ$ |
| *Left* | *90°* | *19.45°* | *75°* | *19.45°* | *7.33* | *17.59* | *[30°,180°]* | *[45°,135°]* |
| *Back* | *180°* | *13.68°* | *90°* | *13.68°* | *11.01* | *21.27* | *[30°,180°]* | *[135°,225°]* |
| *Right* | *270°* | *19.45°* | *75°* | *19.45°* | *7.33* | *17.59* | *[30°,180°]* | *[225°,315°]* |
| *Front* | *0°* | *13.68°* | *90°* | *13.68°* | *13.02* | *23.29* | *[30°,180°]* | *[-45°,45°]* |
| *Roof* | */* | */* | *0°* | *16.57°* | *11.79* | *22.05* | *[0°,30°]* | *[0°,360°]* |

* + When $θ$ is in the range [0°,30° ), $σ^{H}\_{dB}\left( φ\right)=0$
* The standard deviation of component B2 is 2.51 dB
 |

### Proposal 4-1

On the monostatic RCS of AGV with single scattering point,

* The values/pattern of component A\*B1 are generated by the following parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | $$φ\_{center}$$ | $$φ\_{3dB, n}$$ | $$θ\_{center}$$ | $$θ\_{3dB,n}$$ | $$G\_{max}$$ | $$σ\_{max}$$ | *Applicable Range of* $θ$ | *Applicable Range of* $φ$ |
| *Left* | *90°* | *19.45°* | *75°* | *19.45°* | *7.33* | *17.59* | *[30°,180°]* | *[45°,135°]* |
| *Back* | *180°* | *13.68°* | *90°* | *13.68°* | *11.01* | *21.27* | *[30°,180°]* | *[135°,225°]* |
| *Right* | *270°* | *19.45°* | *75°* | *19.45°* | *7.33* | *17.59* | *[30°,180°]* | *[225°,315°]* |
| *Front* | *0°* | *13.68°* | *90°* | *13.68°* | *13.02* | *23.29* | *[30°,180°]* | *[-45°,45°]* |
| *Roof* | */* | */* | *0°* | *16.57°* | *11.79* | *22.05* | *[0°,30°]* | *[0°,360°]* |

* + When $θ$ is in the range [0°,30° ), $σ^{H}\_{dB}\left( φ\right)=0$
* The standard deviation of component B2 is 2.51 dB

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| **Company** | **Yes/No** | **Comments** |
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# Conclusion

# Reference

1. Chair’ notes for RAN1 #120bis
2. R1-2503146, “Summary #5 on ISAC channel modelling”