

Proposal for amendments for appendix 1 of annex 5

ECE/TRANS/WP.29/2020/81

Modifications to the existing text of JRC/EC proposal are marked in purple for new or ~~purple strikethrough~~ for deleted characters.

Paragraph 3.3.1., amend to read:

3.3.1. The approval authority shall define the approach to classify the difficulty level of the testing scenarios. Parameters of the traffic critical scenarios shall be chosen in order to ensure a certain difficulty level. In particular, for systems operating at speeds above 60km/h the approval authority shall include tests of traffic critical scenarios if any:

- in the “difficult” parameter range and;
- in the “unavoidable collision” parameter range for the given scenario.

Authorities may use the method(s) presented for guidance in Appendix 1 to determine the difficulty of the tests.

For scenarios in the “unavoidable collision” class, the manufacturer may demonstrate either by documentation or, if possible, by verification/testing that the system doesn’t unreasonably switch its control strategy.

Appendix 1

Guidance to determine the difficulty of the test

Following data sheets are pictorial examples of simulations, which determines conditions under which ALKS shall avoid a collision, taking into account the combination of every parameter in accordance to the Performance models of Annex 4 Appendix 3, at and below the maximum permitted ALKS vehicle speed.

1. In case of performance model 1 in annex 4

Where collision is deemed to be avoidable, three subsets are defined, to differentiate between the parameter sets based on their difficulty in accordance to the Performance model 1 laid down in paragraph 3.3 of Annex 4 Appendix 3:

- “Avoidable” conditions are highlighted by green colour,
- “Difficult” conditions are highlighted by blue colour, while
- “Unavoidable” is highlighted by red colour.

- 1.1. Cut in

Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to Performance model 1:

- “Avoidable” can be avoided by a braking demand with lower than 5 m/s².
- “Difficult” cannot be avoided by a braking demand with lower than 5 m/s².
- “Unavoidable” cannot be avoided by a braking demand with 7.6 m/s².

Based on these equations the classification may be done for any parameter set; to show some examples, a number of figures are presented below with different ego vehicle speeds.

Figure 1

For $V_{e0} = 130$ kph

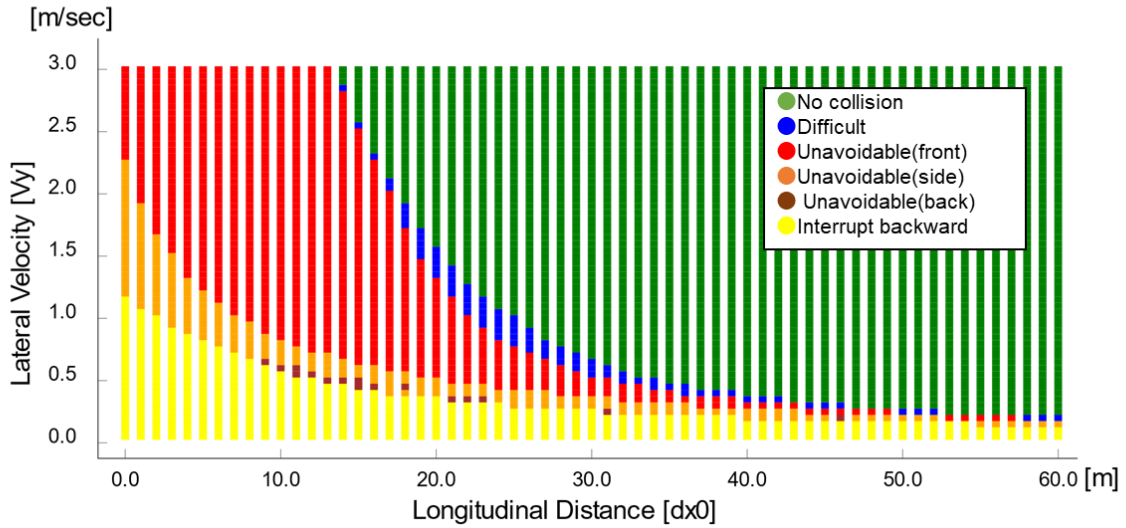
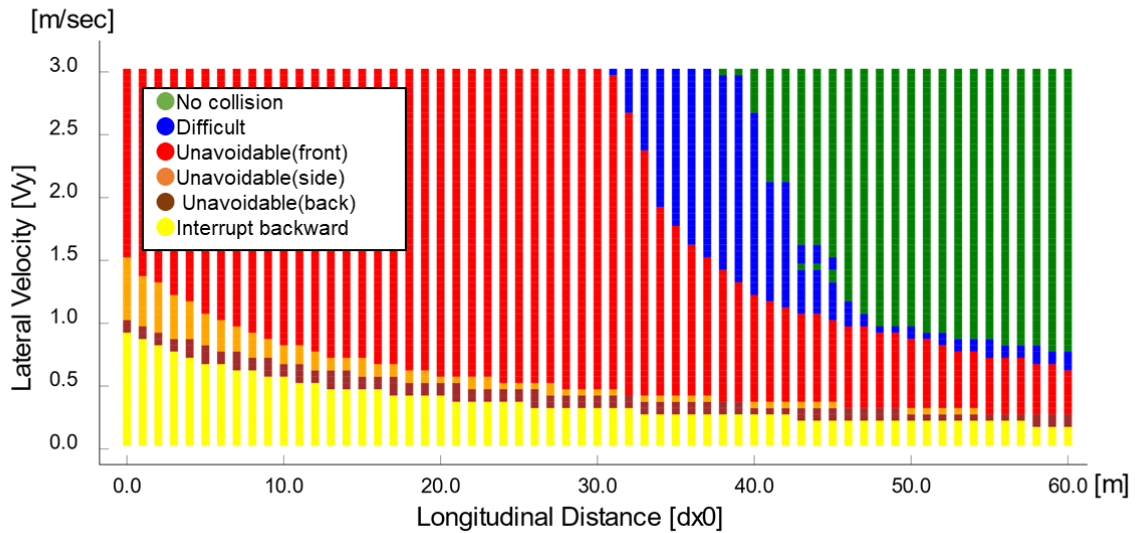


Figure 2

For $V_{e0} = 60$ kph



1.2. Cut out

Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to the Performance model 1:

- "Avoidable" can be avoided by a braking demand with lower than 5 m/s^2 .
- "Difficult" cannot be avoided by a braking demand with lower than 5 m/s^2 .

- “Unavoidable” cannot be avoided by a braking demand with 7.6 m/s^2 .

Based on these equations the classification may be done for any parameter set; to show some examples, a number of figures are presented below with different ego vehicle speeds.

Figure 3

For $V_{e0} = 130 \text{ kph}$

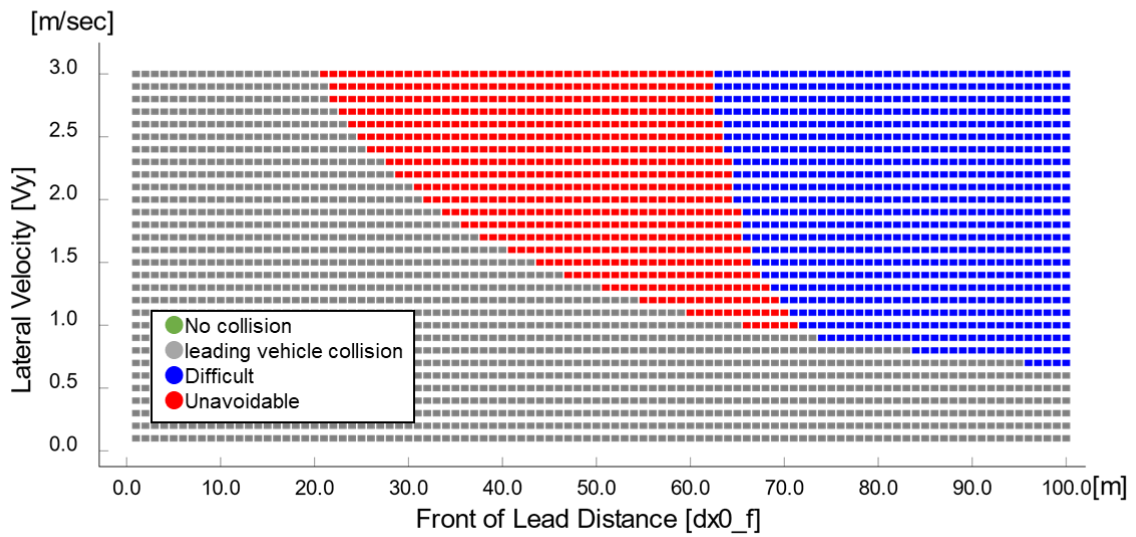


Figure 4

For $V_{e0} = 120 \text{ kph}$

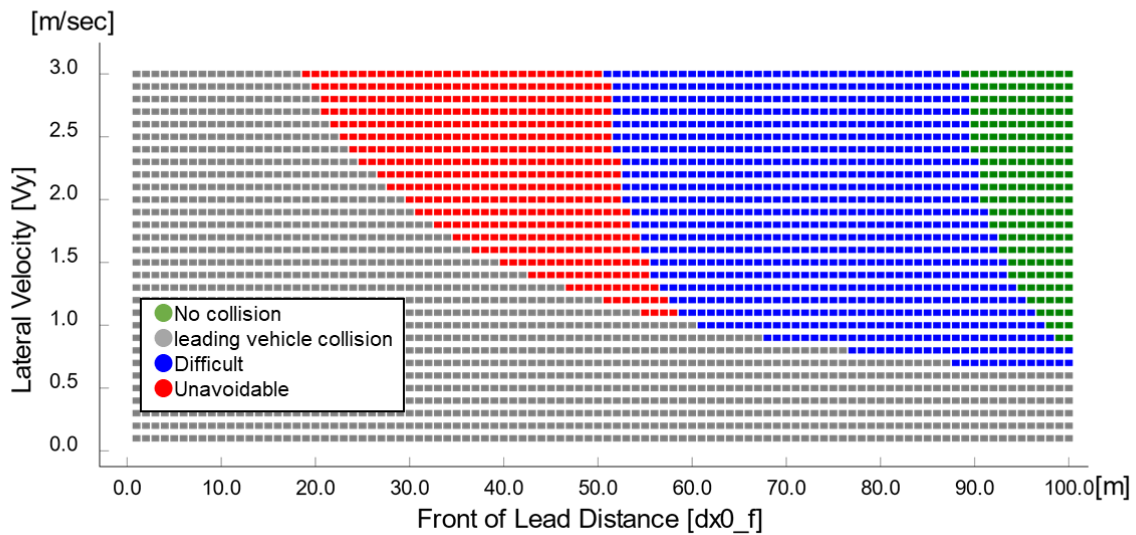


Figure 5

For $V_{e0} = 110 \text{ kph}$

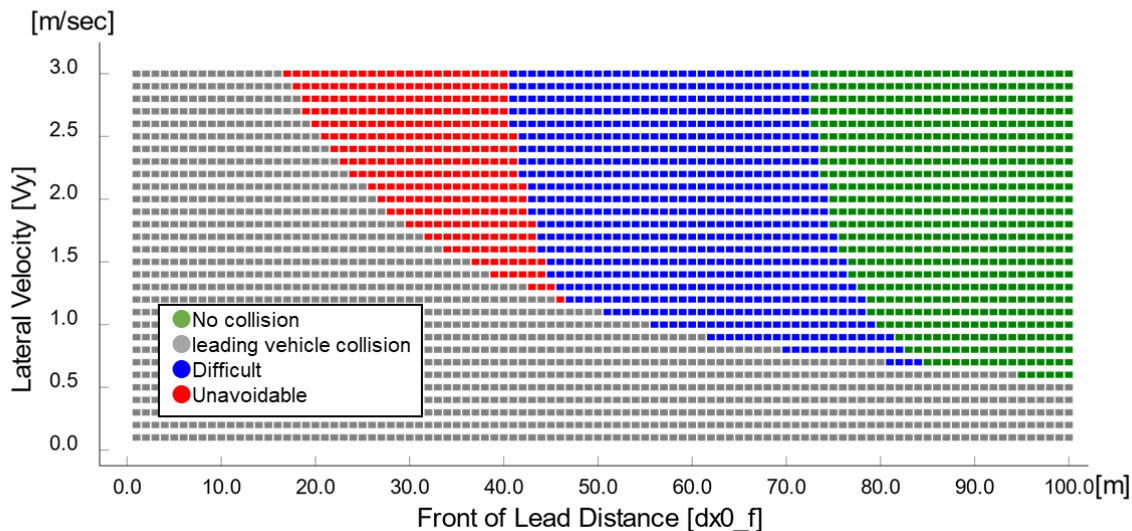


Figure 6
For $V_{e0} = 100$ kph

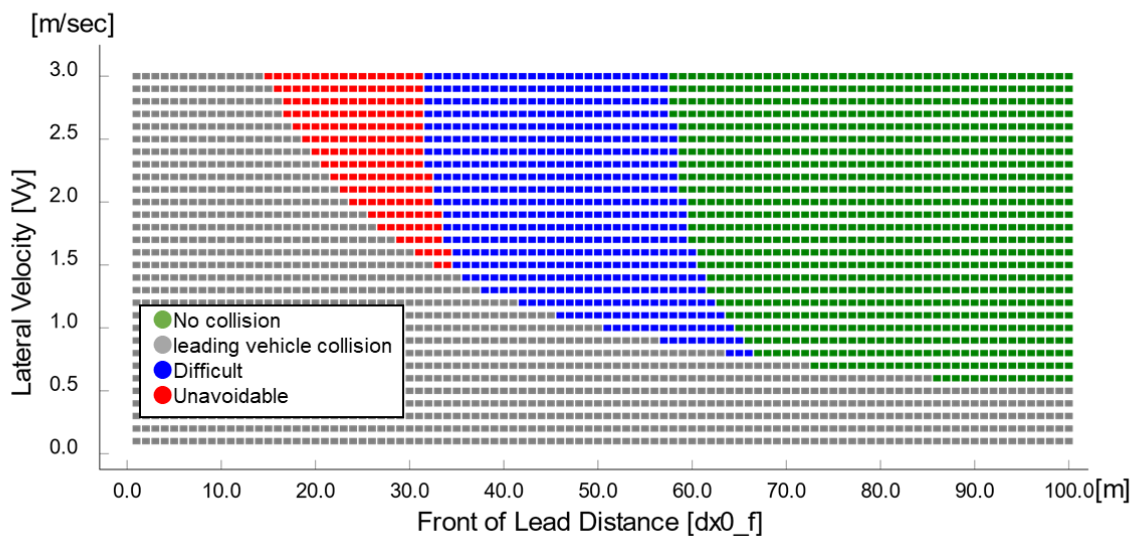


Figure 7
For $V_{e0} = 90$ kph

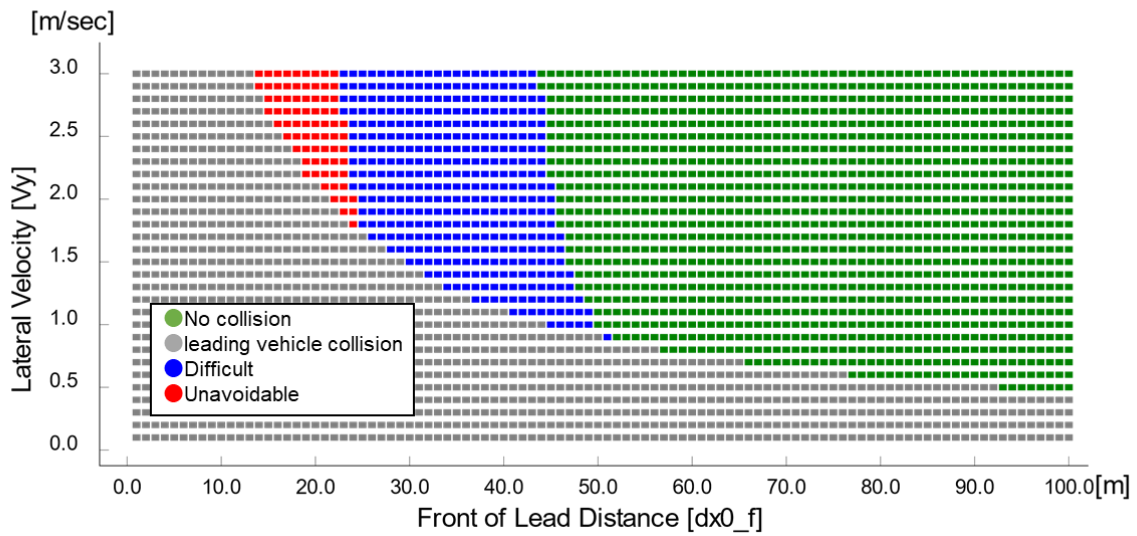
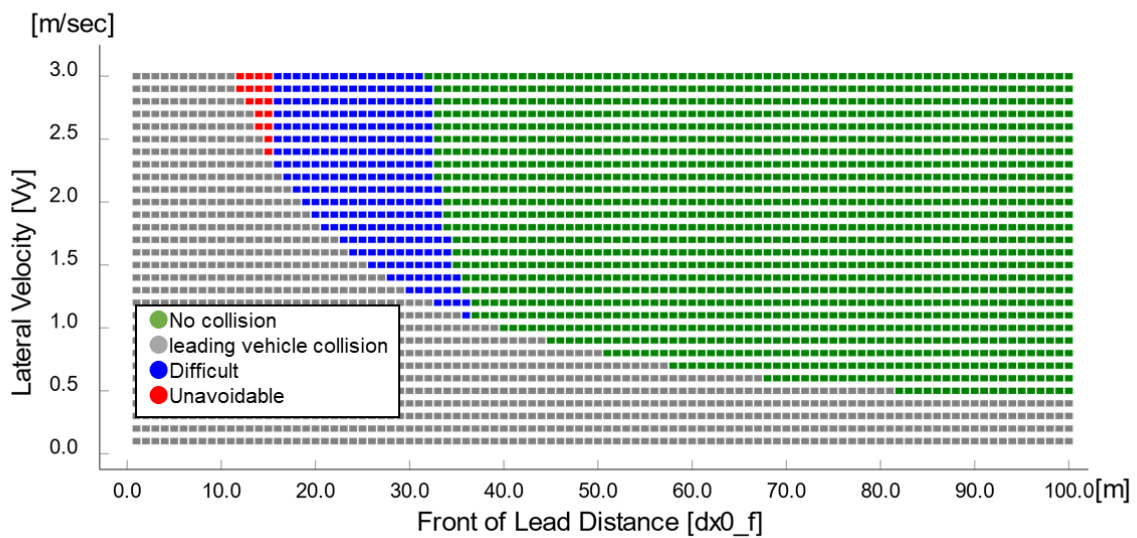


Figure 8
For $V_{e0} = 80$ kph



1.3. Deceleration

Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to the Performance model 1 :

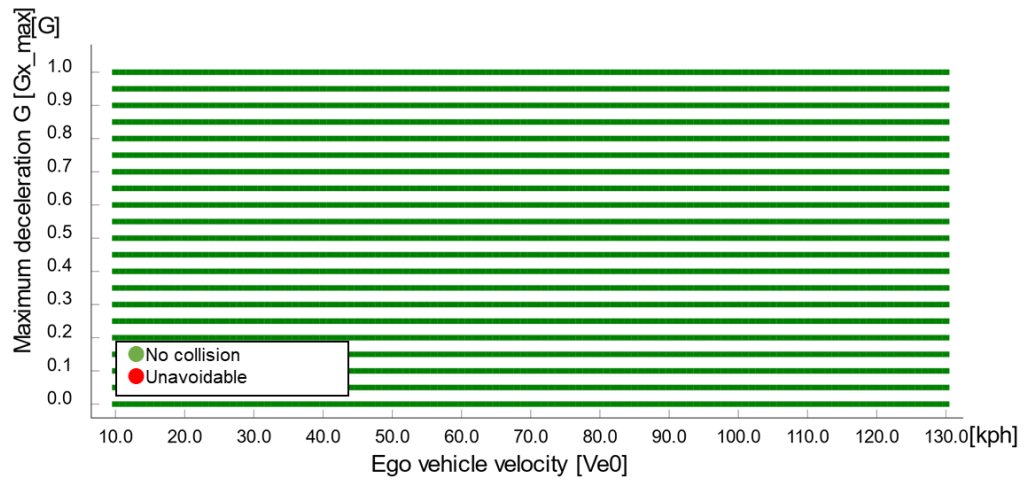
- “Avoidable” can be avoided by a braking demand with lower than 5 m/s^2 .
- "Difficult" cannot be avoided by a braking demand with lower than 5 m/s^2 .
- “Unavoidable” cannot be avoided by a braking demand with 7.6 m/s^2 .

Based on these equations the classification may be done for any parameter set; to show some examples, a number of figures are presented below with different ego vehicle speeds.

Figure 9

Deceleration

Difficult area and Unavoidable area are not found.



~~A suggested approach for traffic critical scenario difficulty classification~~

2. In case of performance model 2 of annex 4

Following data sheets are pictorial examples of simulations which determines conditions under which ALKS shall avoid a collision, taking into account the combination of every parameter, *at and below* the maximum permitted ALKS vehicle speed.

Where collision is deemed to be avoidable, three subsets are defined, to differentiate between the parameter sets based on their difficulty in accordance to the performance model 2 laid down in paragraph 3.4 of Annex 4 Appendix 3:

- “Easy” conditions are highlighted by green colour,
- “Medium” conditions are highlighted by yellow colour,
- “Difficult” conditions are highlighted by red colour, while
- “Unavoidable collision” is highlighted by red colour with black “X”.

2.1. Cut in

Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to the performance model 2 laid down in paragraph 3.4 of Annex 4 Appendix 3:

- Easy: $PFS \leq 0.85$;
- Medium: $PFS > 0.85$ and $CFS < 0.9$;
- Difficult: $CFS \Rightarrow 0.9$.

Based on these equations the classification may be done for any parameter set; to show some examples, a number of figures are presented below with different ego vehicle speeds.

Alternatively the authority may also find the appropriate way to use the performance model laid down in paragraph 2 of Annex 4 Appendix 3 for the classification of the scenario difficulty.

Figure 10
For $V_{e0} = 130$ kph



Figure 11
For $V_{e0} = 110$ kph

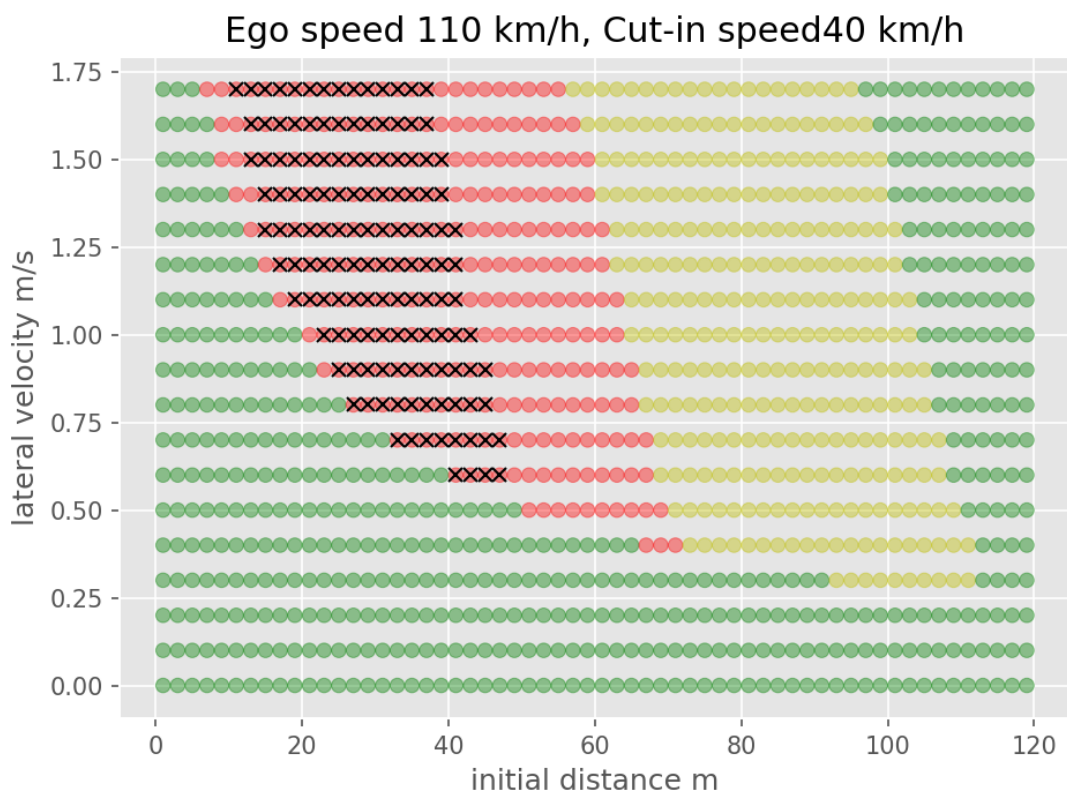


Figure 12
For $V_{e0} = 90$ kph

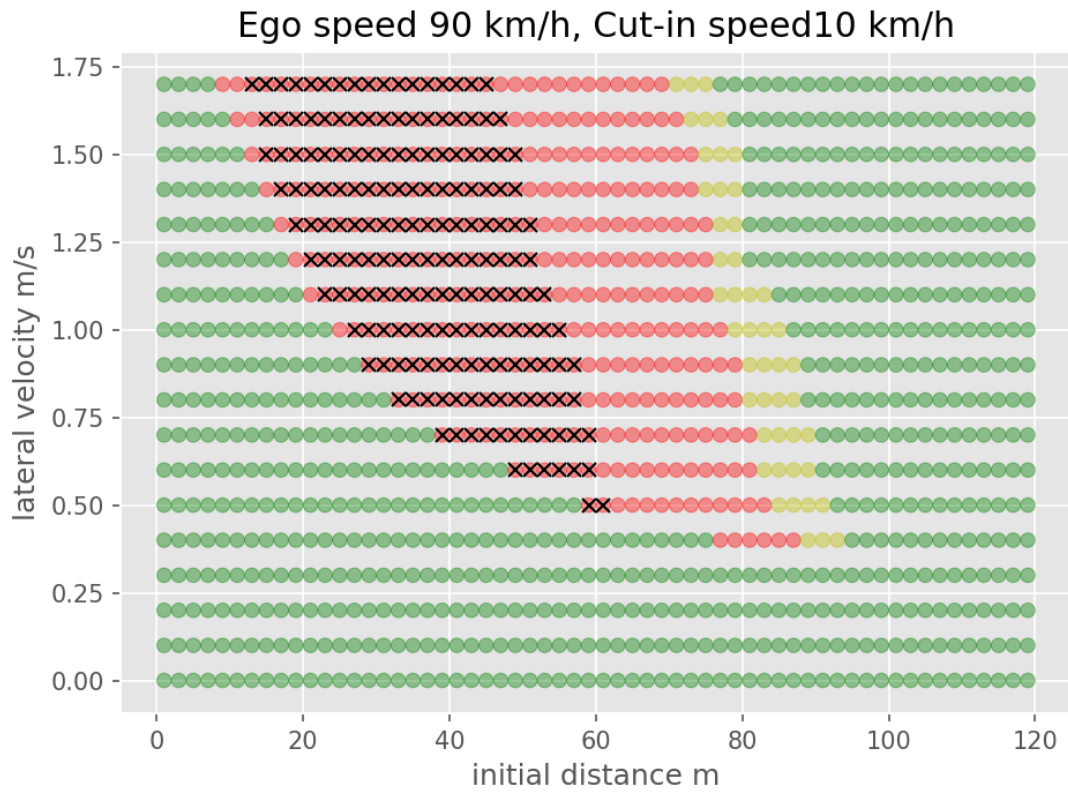
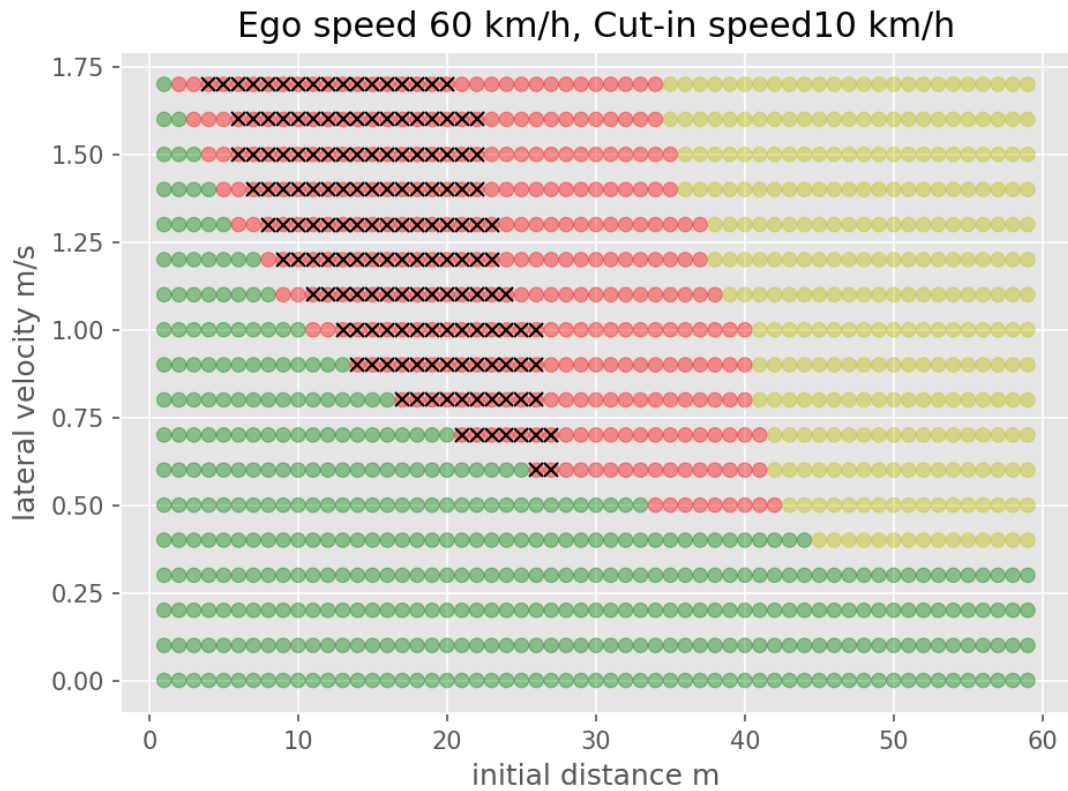


Figure 13
For $V_{e0} = 60$ kph



2.2. Cut out

Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to the performance model 2 laid down in paragraph 3 of Annex 4 Appendix 3~~Classification of difficulty of the scenarios based on the initial parameters is done the following way:~~

- Easy: PFS = 0;
- Medium: PFS > 0 and CFS < 0.5;
- Difficult: CFS => 0.5.

Based on these equations the classification may be done for any parameter set; to show some examples, a number of figures are presented below with different ego vehicle speeds.

Alternatively the authority may also find the appropriate way to use the performance model laid down in paragraph 2 of Annex 4 Appendix 3 for the classification of the scenario difficulty.

Figure 14
For $V_{e0} = 130$ kph

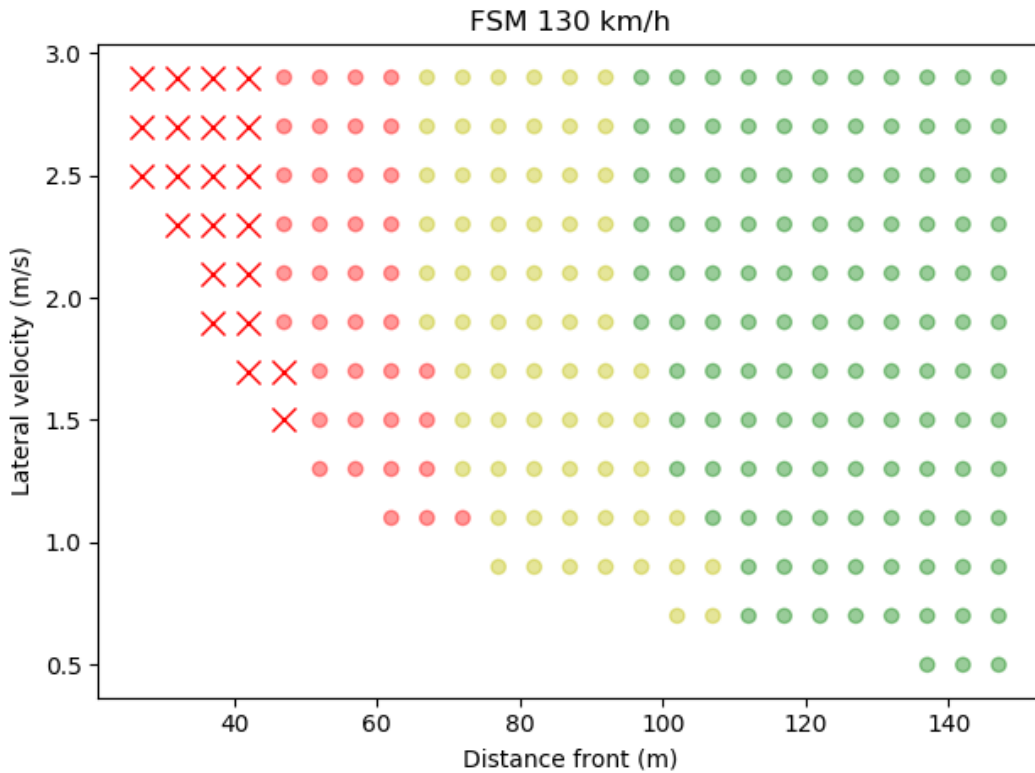


Figure 15
For $V_{e0} = 120$ kph

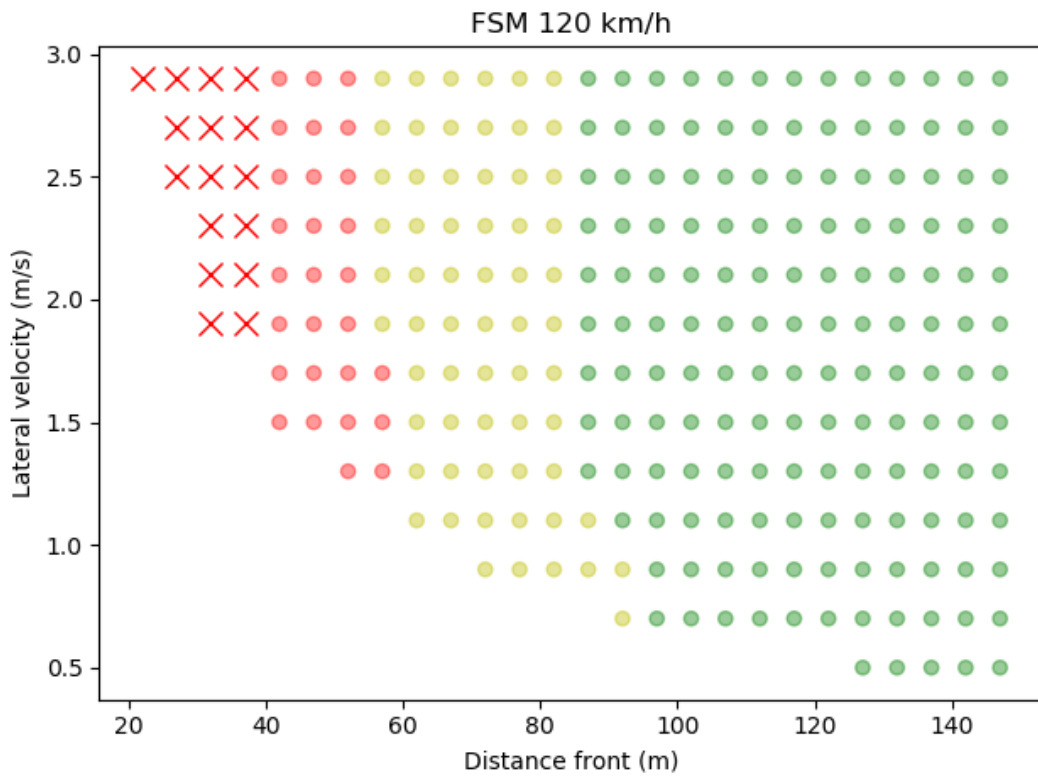


Figure 16
For $V_{e0} = 110$ kph

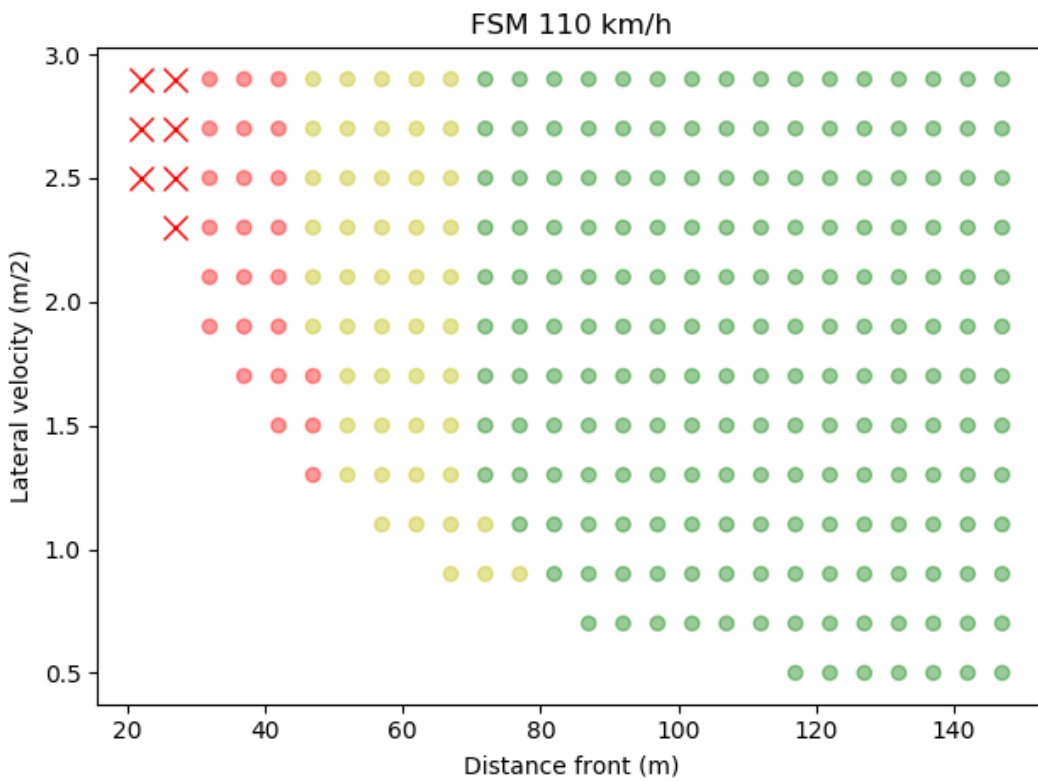


Figure 17
For $V_{e0} = 100$ kph

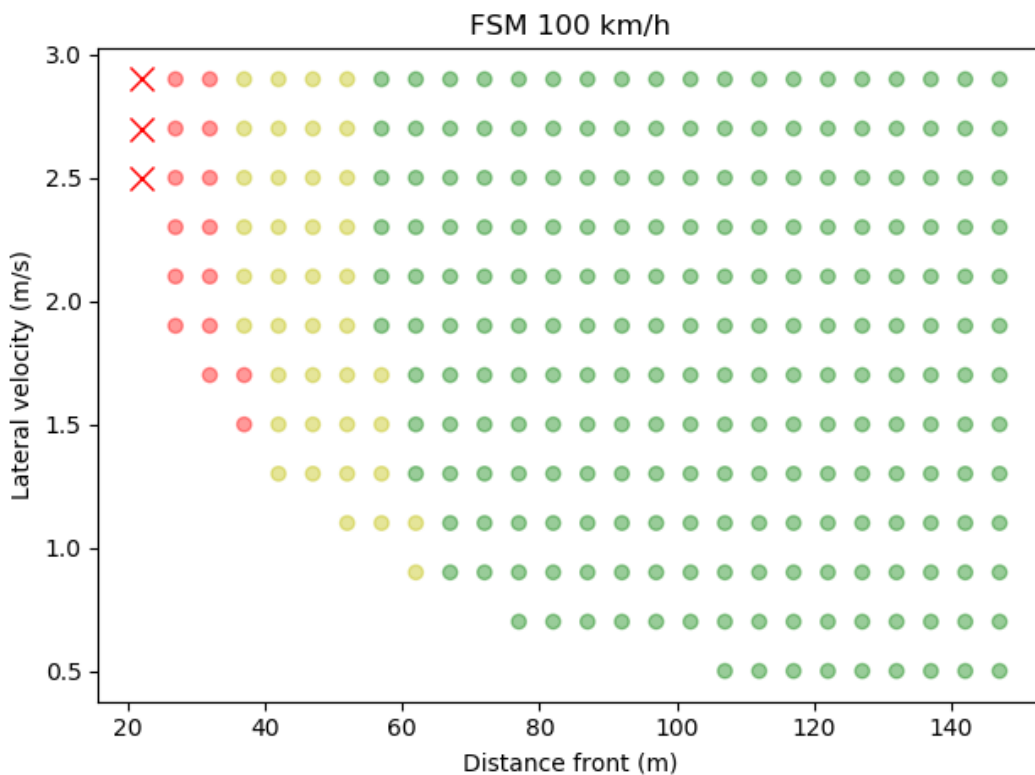


Figure 18
For $V_{e0} = 90$ kph

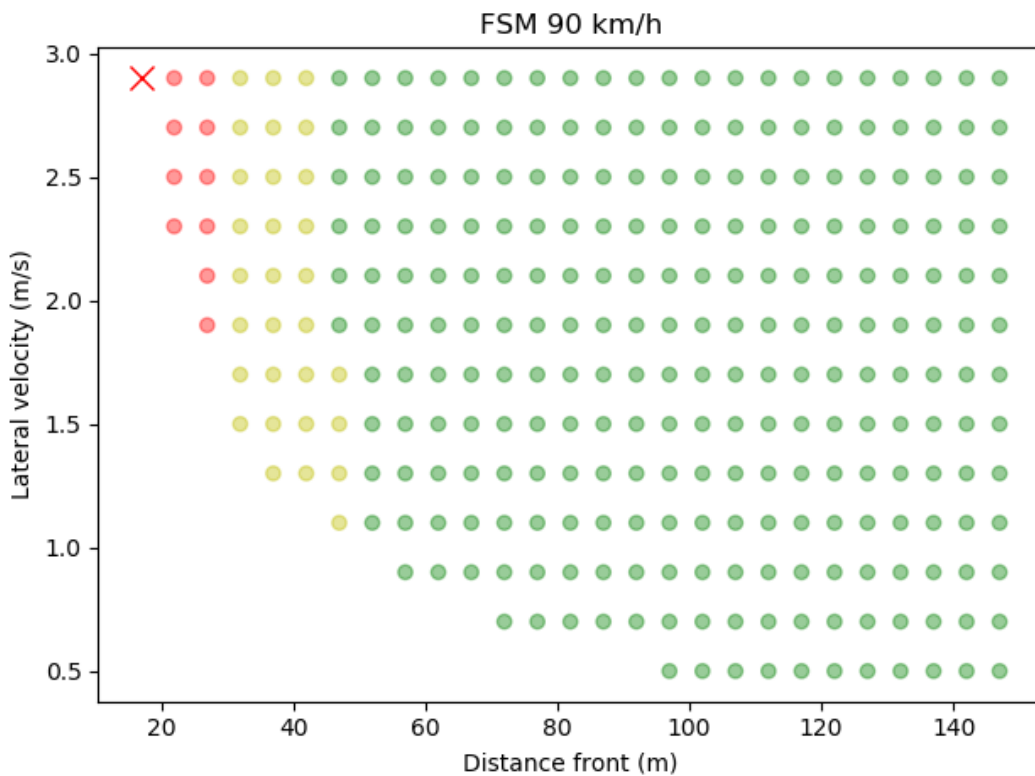


Figure 19
For $V_{e0} = 80$ kph

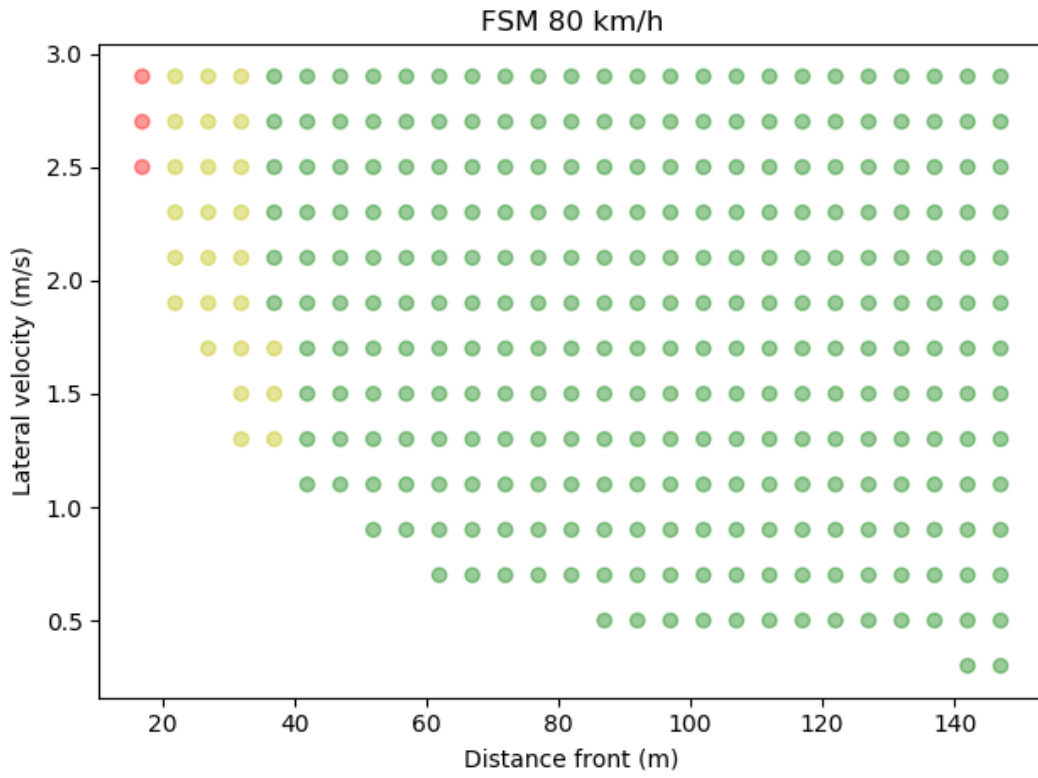


Figure 20
For $V_{e0} = 70$ kph

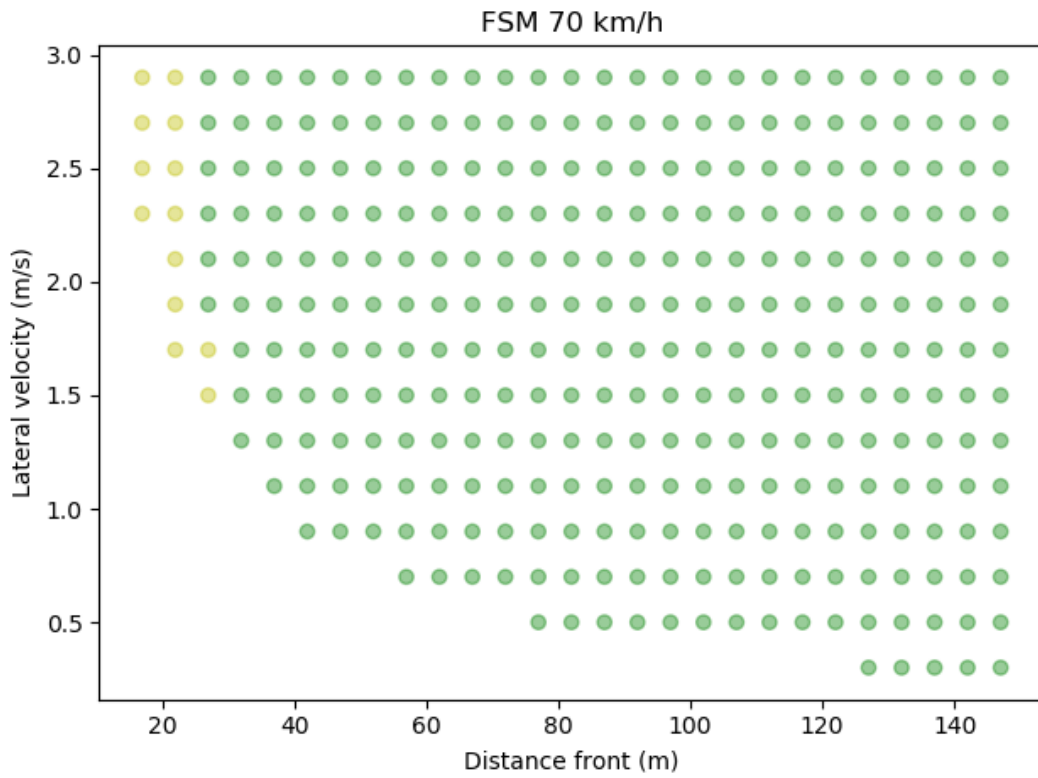
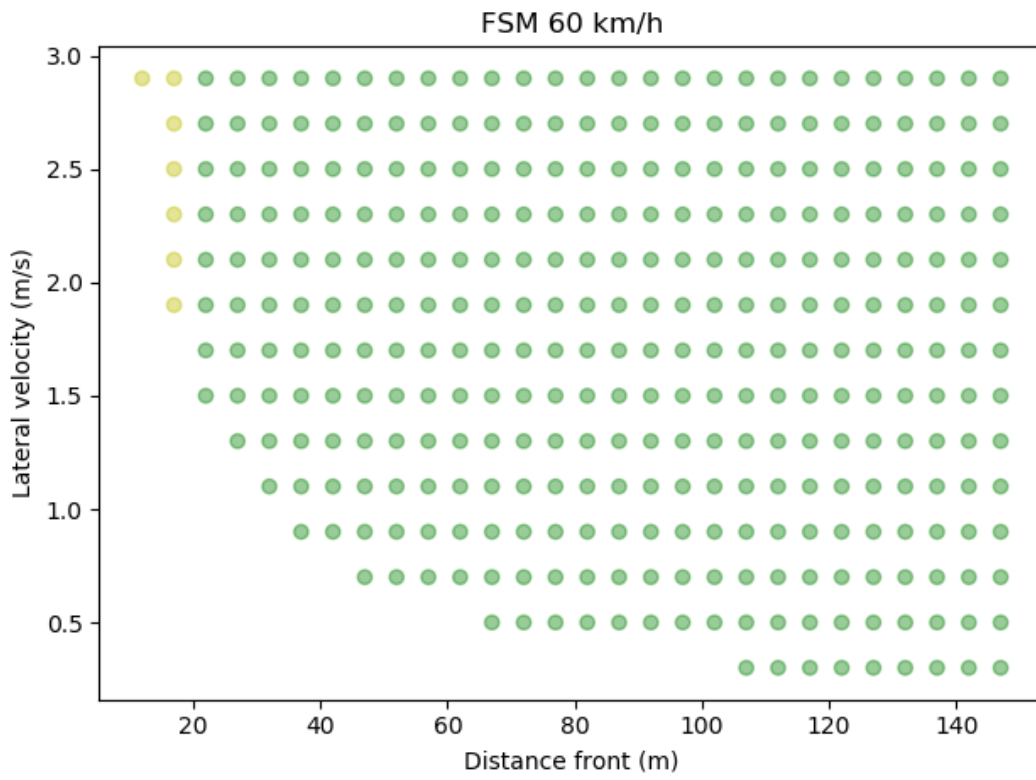


Figure 21
For $V_{e0} = 60$ kph



2.3. Deceleration

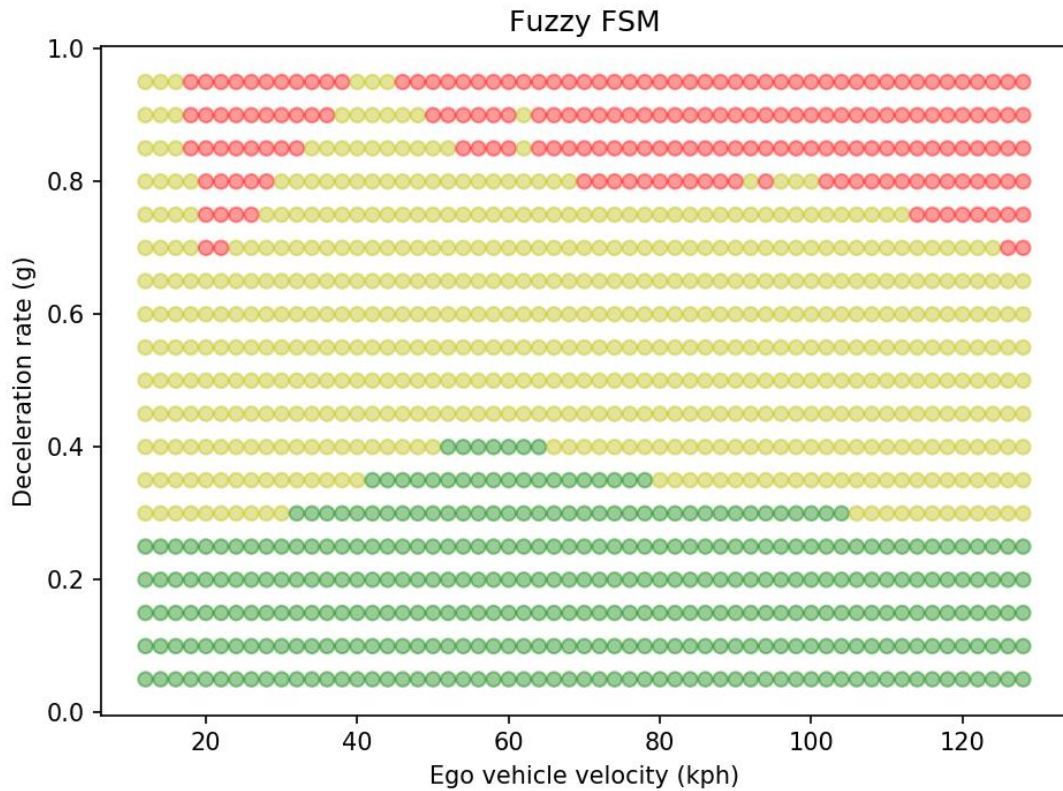
Classification of difficulty of the scenarios based on the initial parameters is done the following way in accordance to the performance model 2 laid down in paragraph 3 of Annex 4 Appendix 3Classification of difficulty of the scenarios based on the initial parameters is done the following way:

- Easy: PFS = 0;
- Medium: PFS > 0 and CFS < 0.5;
- Difficult: CFS => 0.5.

Based on these equations the classification may be done for any parameter set. The classification matrix for the different cases is presented below in Fig. 13.

Alternatively the authority may also find the appropriate way to use the performance model 2 laid down in paragraph 2 of Annex 4 Appendix 3 for the classification of the scenario difficulty.

Figure 22
Deceleration



II. Proposal – Annex 4

Paragraph 4., insert to read:

4.2.1 The Type Approval Authorities may verify the accuracy of simulation tools used by means of results from track and/or public road test performed under Annex 5 and/or Annex 6, and/or by performing additional tests where needed.