

## OICA/CLEPA Input

to the

### Special interest group on UN-R 157

with regard to

# **Explanation of proposed Lane Change parameters**

# LC parameters – 3 different scenarios

5.2.6.9.1. When there is an approaching vehicle “how strong can a vehicle approaching from the rear be forced to decelerate?”

...

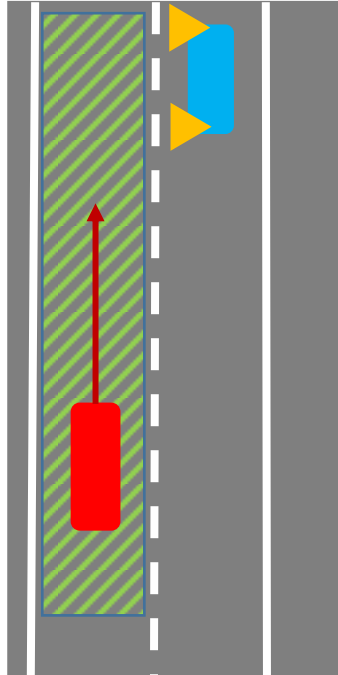
5.2.6.9.3. When there is no vehicle detected “how much freespace is needed if we assume a certain speed of a potentially approaching vehicle?”

...

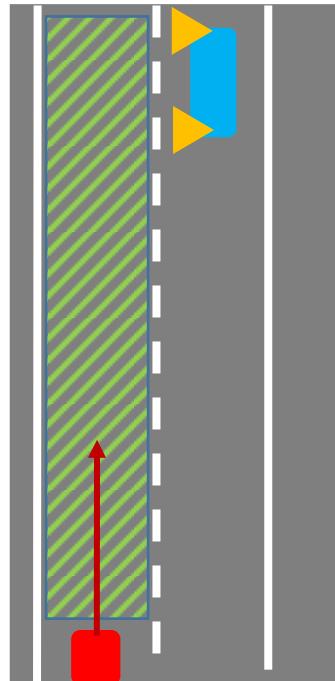
5.2.6.9.4. When there is an equally fast or slower moving vehicle “what’s the minimum distance between two vehicles at the start of the LCM?”

...

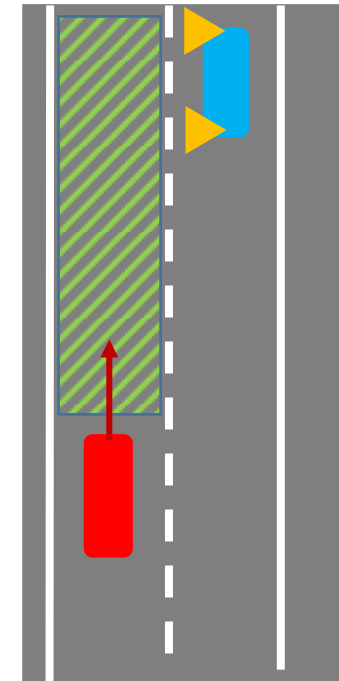
5.2.6.9.1.



5.2.6.9.3.



5.2.6.9.4.



## 5.2.6.9.1. When there is an approaching vehicle

An approaching vehicle in the target lane should not have to decelerate at a higher level than **A** m/s<sup>2</sup>, **B** seconds after the ALKS vehicle starts crossing a lane marking, to ensure the distance between the two vehicles is never less than that which the lane change vehicle travels in **C** seconds.

- |          |  |   |
|----------|--|---|
| <b>A</b> | ... 3m/s <sup>2</sup><br>... 3,7m/s <sup>2</sup> | Deceleration of the vehicle approaching from the rear. For MRM maneuvers, we should not leave an additional comfort margin and use the available 3,7m/s <sup>2</sup> .  |
| <b>B</b> | ... 0s<br>... 0,4s<br>... 1,4s                   | Assumption on reaction time of the vehicle approaching from the rear. If the driver had already been warned by activated Hazard warning lights, the reaction can be assumed to be faster. Note: This is starting at the lane marking, so there was reaction time when the ALKS vehicle moves inside the lane already. |
| <b>C</b> | ... 0,5s<br>... 1s                               | This describes the remaining safety distance at the end of the braking maneuver of the approaching vehicle. For MRM maneuvers, a smaller value should be acceptable, to make these LC possible.   |

## 5.2.6.9.3. When there is no vehicle detected

If no approaching vehicle is detected by the system in the target lane, the minimal minimum gap to the rear shall be calculated under the assumption that:

- a) the approaching vehicle in the target lane is at a distance from the ALKS vehicle equal to rearward detection distance and

**Explanation:** The required detection distance to the rear is derived from the estimation at which distance another vehicle would need to be detected in order to not be forced to unreasonably decelerate

- b) the approaching vehicle in the target lane is travelling with the allowed or the advised maximum speed whichever is higher

**Explanation:** In order to achieve a reasonable distance (if using any speed then the distance becomes infinitely high) reasonable assumptions about the speed of another vehicle need to be made -> therefore “whichever is higher” does not work, as this would require to use 400km/h on German motorways.

- c) An approaching vehicle on a hard shoulder is travelling at a maximum speed of 80 km/h and a maximum speed difference to the ALKS vehicle at the start of the LCM of 40 km/h.

**Explanation:** Hard shoulders are commonly used when e.g. there is slow moving traffic before a highway exit. Then the speed of a vehicle on the hard shoulder is not tremendously faster than that of the vehicles in the adjacent lane, as hard shoulders are usually very narrow.

## 5.2.6.9.4. When there is an equally fast or slower moving vehicle

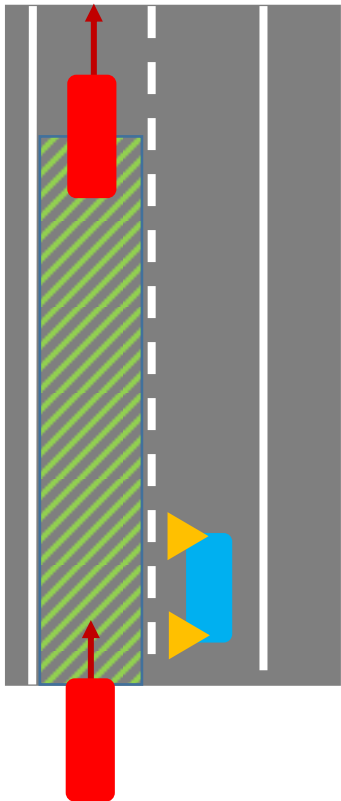
**At the beginning of the LCM, the distance between the rear of the ALKS vehicle and the front of a vehicle following behind in the target lane at equal or lower longitudinal speed shall never be less than the speed which the following vehicle in target lane travels in:**

- (a) 0.7s for a lane change during a minimal risk manoeuvre**
- (b) 1.0s for a regular lane change.**

**Explanation: This describes the permitted minimum distances between these two vehicles at the beginning of the LCM, when there was never a risk of collision (as the following vehicle travels equally fast or slower). For MRM LC this value should be decreased compared to a comfort LC, as we aim to make these lane changes possible, even in dense traffic and there is no direct risk related to this lower value.**

**5.2.6.10. For the duration of the lane change manoeuvre, the lane change vehicle shall observe the minimum following distance requirements in accordance with 5.2.3.3 for any lead vehicle(s) or road user(s) in the target lane of travel or the initial lane of travel.**

**The strategy shall be clearly documented to ensure that this requirement is met, whilst ensuring that all lane changes can be completed and forward collisions avoided.**



**Explanation:** This would require a free are to the next vehicle ahead at all times during the LCM („for the duration of the LCM“), so a deceleration of the lead vehicle would require a deceleration of the ALKS vehicle, just to maintain that distance. This could have a negative effect on following vehicles.

**Additionally it goes against real traffic behavior, where you start changing lanes once another faster vehicle has passed. If the vehicle ahead is driving off, then there is no imminent risk of collision, even from a temporarily smaller distance.**

**The provisions should permit for a temporarily smaller distance, as long as the collision avoidance requirements can still be met.**