Informal Document: ACSF-16-04

ACSF-C2
2-actions system

Industry input to ACSF IG
16th meeting
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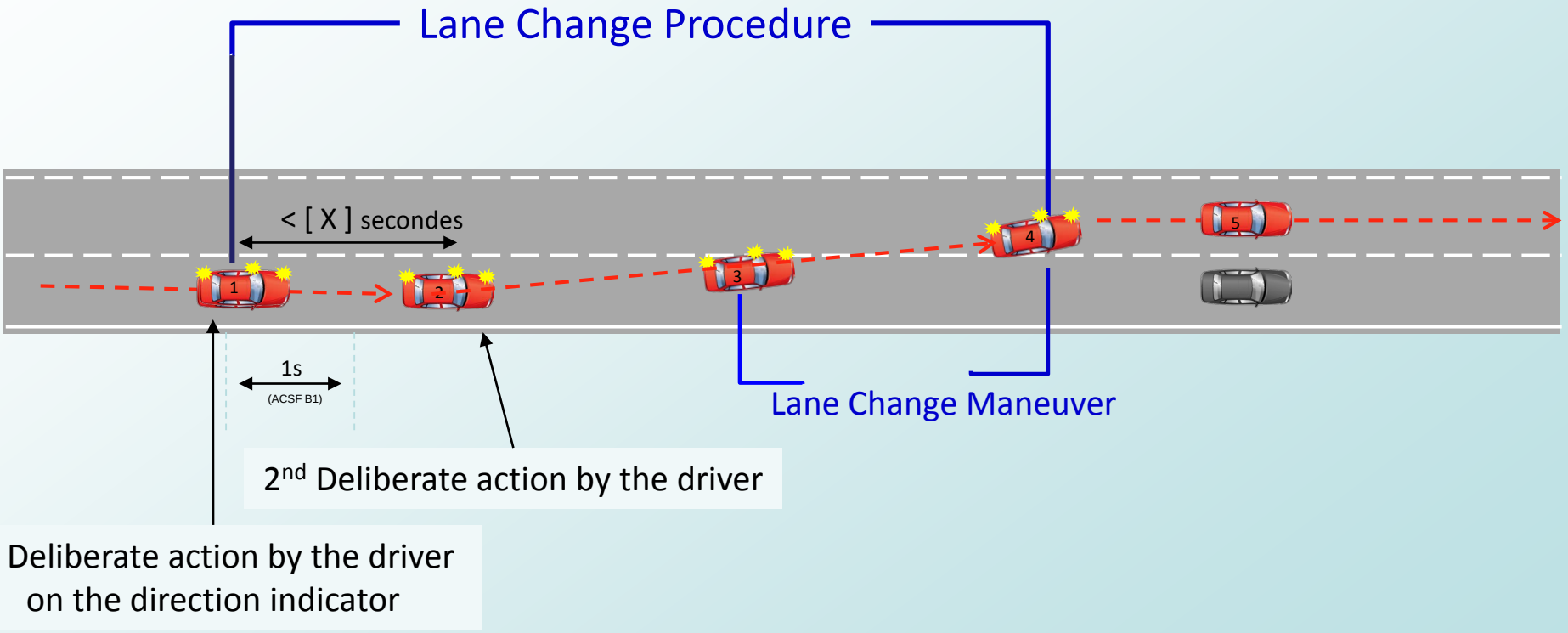
Industry interest

- At GRRF-85 of December, the text of ACSF-C (former ACSF-C1) was adopted.

- Industry still have a strong interest for ACSF-C2, e.g. regarding:
  - C2 is a more natural HMI, closer to manual lane change: the driver has full control on the timing of the 2 steps of a LC. This permits to increase the maximum time between the LCP and the LCM.
  - Automatic deactivation of direction indicator causes unnecessary technical problems that can be corrected with ACSF-C2.
  - Current ACSF-C requirements are design restrictive regarding HMI
  - HCVs have a particular interest for ACSF-C2

- **Industry expectations from ACSF IG is to start the drafting phase to cover C2.**

Description of ACSF C2



Comparison of concepts

	Manual driving	ACSF C1	ACSF C2
1st action	Activation of the direction indicator to inform the other users	Activation of the direction indicator to inform the other users and initiate the lane change procedure	Activation of the direction indicator to inform the other users and initiate the lane change procedure
2nd action	Action on the steering control to change lane	Automatic start of the lane change manoeuver, 3 to 5s after the driver action.	Second deliberate action to initiate the lane change manoeuver.

Given the LCM starts automatically up to 5s (i.e. 180m at 130km/h) after the driver deliberate action…

backward looking sensors have been judged necessary

Given the LCM only starts after a 2nd deliberate action of the driver, no backward looking sensors are necessary…

there are other ways to ensure same level of safety, see next slides

Philosophy of ACSF-C2
Safety measures

- ACSF C2 is Level-2 system: the driver is hands-on and drives, the system only assists
- The driver is expected to get quickly used to an HMI which is quite similar to that of the manual driving
- The driver masters the exact time when the vehicle starts moving towards the lane, and consequently when the manoeuver starts, depending the surrounding traffic, similarly to the manual driving
- The lane change assistance does not start automatically, thus "no surprise"
- Unintentional activation is prevented thanks to:
  - ON/OFF switch
  - 2-action activation
- The overriding force remains low (< 50 N)
- Blind zone detection sensors ensure safety regarding the area not covered by the mirrors (and minimize over-reliance risks)

→ *see next slides*

Philosophy of ACSF-C2

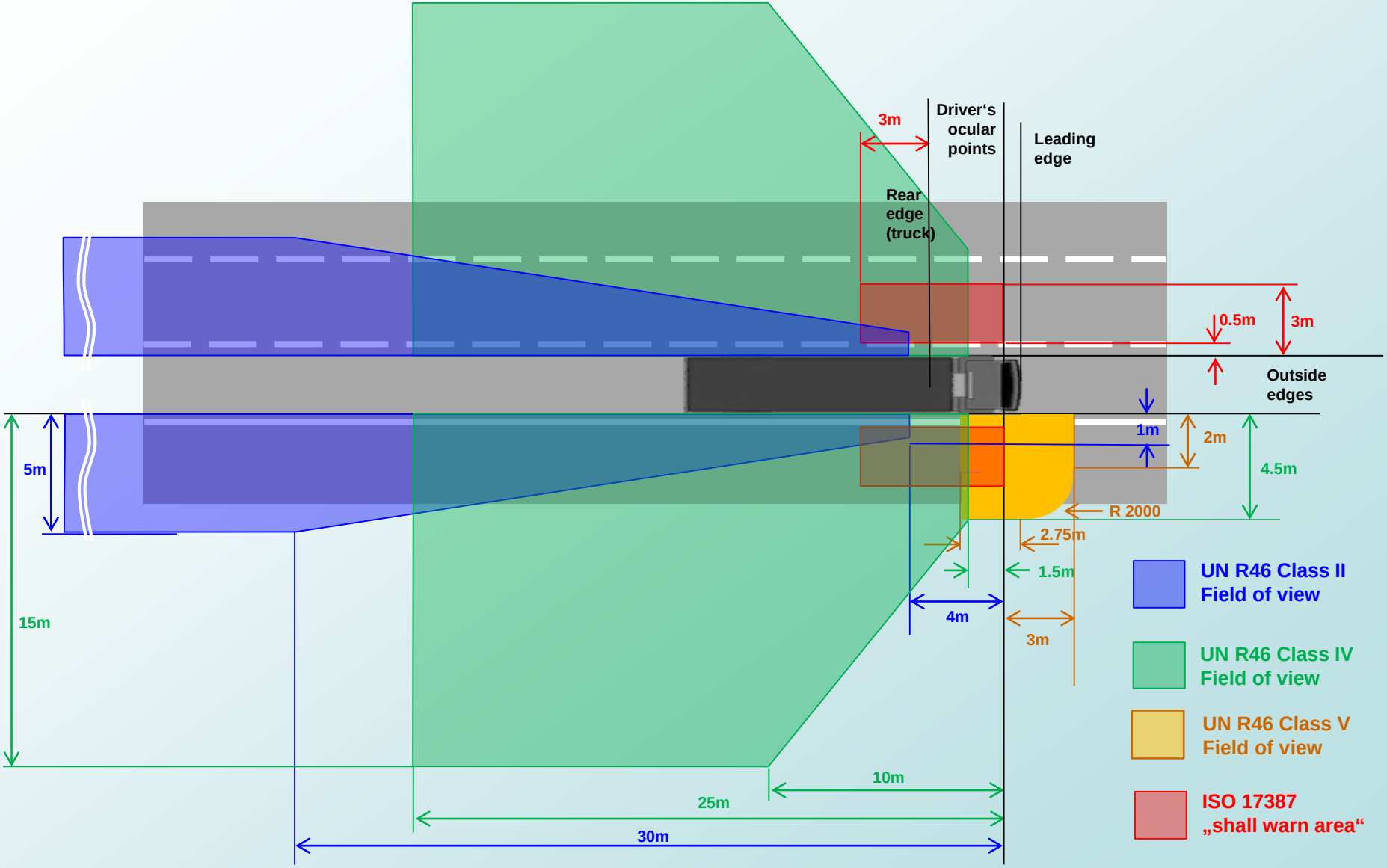
Why only short range sensors are needed ?

- From previous slide:
  - The driver masters the exact time when the vehicle starts moving towards the lane.
  - With two actions HMI, the system requires two decisions from the driver, which are assumed to be based on the monitoring of the rear traffic.
- The driver is aware of the vehicle environment thanks to direct Field Of Vision (FOV) and indirect FOV (R46 mirrors):

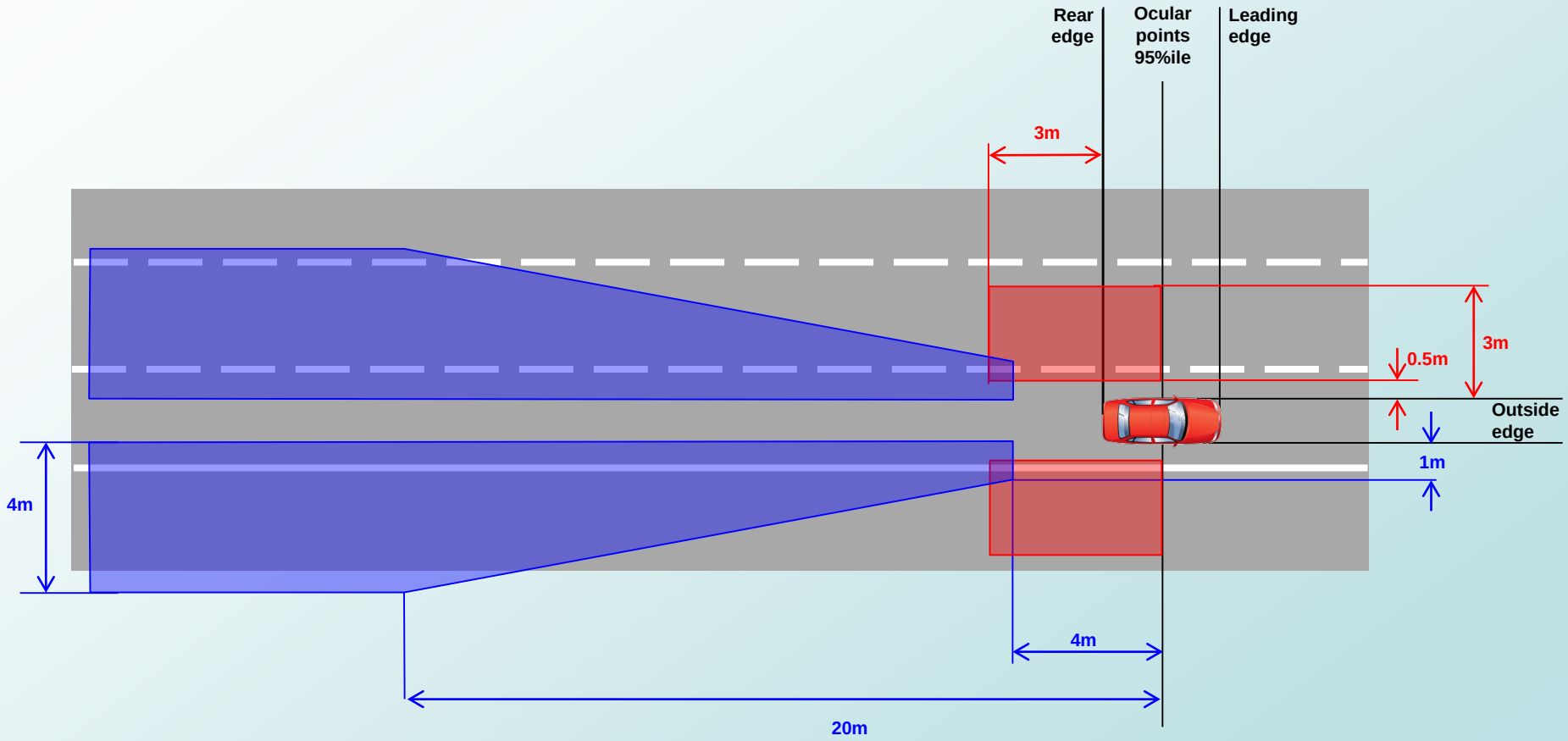
The system must only monitor the zones out of mirror coverage:

- M1/N1: Class I and III FOV
- M2/M3 : Class II FOV
- N2/N3: Class II, IV and V FOV

Proposed blind zone detection example of N3 vehicles



Proposed blind zone detection M1/N1



UN R46 Class III Field of view
Calculated at ground level

ISO 17387 „shall warn“ area
Improve safety compared to manual driving

Mode confusion issue

What happens if the driver has wrong perception of the system installed in the vehicle?

The driver believes to have

The vehicle is equipped with 	C1	C2
C1	OK	B
C2	A	OK

Mode confusion issue

Scenario A : The driver believes to be in a C1 while being in a **C2 equipped vehicle**.

The driver uses the command to initiate the procedure and nothing happens (the system waits for a second action).

→ No safety issue

Scenario B : The driver believes to be in a C2 while being in a **C1 equipped vehicle**.

The driver uses the direction indicator to initiate the procedure and the system starts a manoeuver only if the situation is deemed not critical.

→ No safety issue

Technical Proposal

- “3m x 3m” blind spot detection area (ISO17387 – see sketches) for M1/N1

- “3m x 3m” blind spot detection area *inspired* from ISO17387 – see sketches) for M2M3/N2N3 *

- If approaching vehicle detected in blind spot, then
  - Warn the driver
  - Lane change procedure suppressed automatically.

* For vehicles fitted with class IV mirrors, no Blind Spot sensor is needed since mirrors cover the whole zone

ANNEX

Radar vs. US sensors

Ultra-sonic sensor capabilities

- Range: 0-5 m
- Sensor-to-target relative speed: < 10km/h
- Angle of detection: ~ 120°
- Target movement: stationary and moving
- Target nature: any solid, no distinction
- HMI: ON/OFF detection
- Sensitivity to wheather conditions: low

Radar sensor capabilities

- Range: 55m (motorbikes)
- Sensor-to-target relative speed: 0-max speed
- Angle of detection: 150°
- Target movement: stationary and moving
- Target nature: any solid, no distinction
- HMI: can transmit distance and speed
- Sensitivity to weather conditions: low