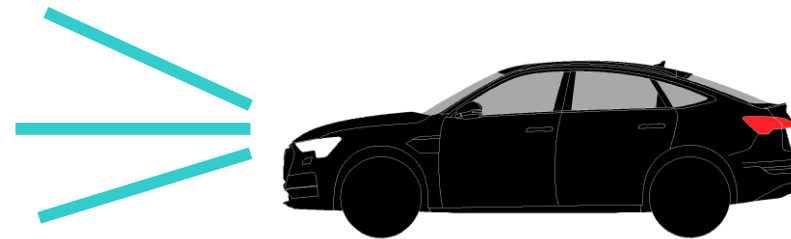


Discussion on automated driving indication

Ingolstadt, 15.07.2024

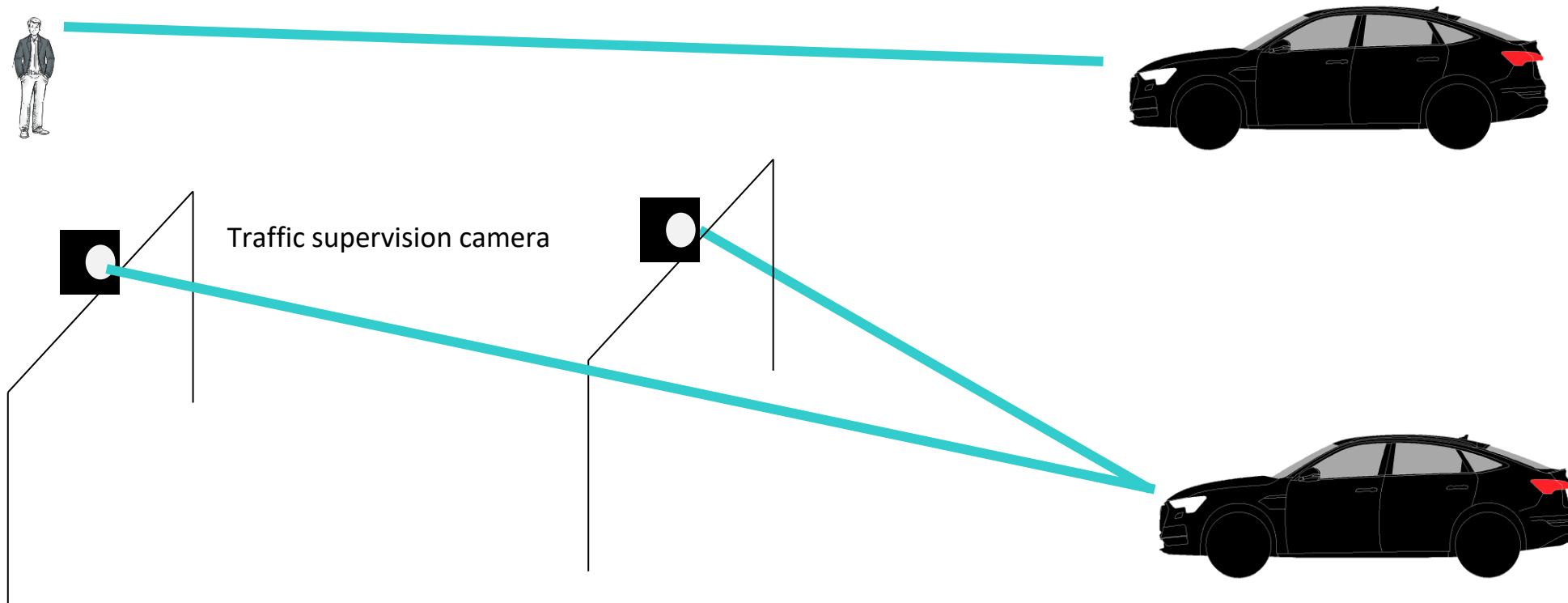
discussion on automated driving indication

- › How does the motivation influence the definition of the performance of an ADS marker lamp:
- › The distance to a dedicated observer identifies the intensity of the ADS marker lamp.



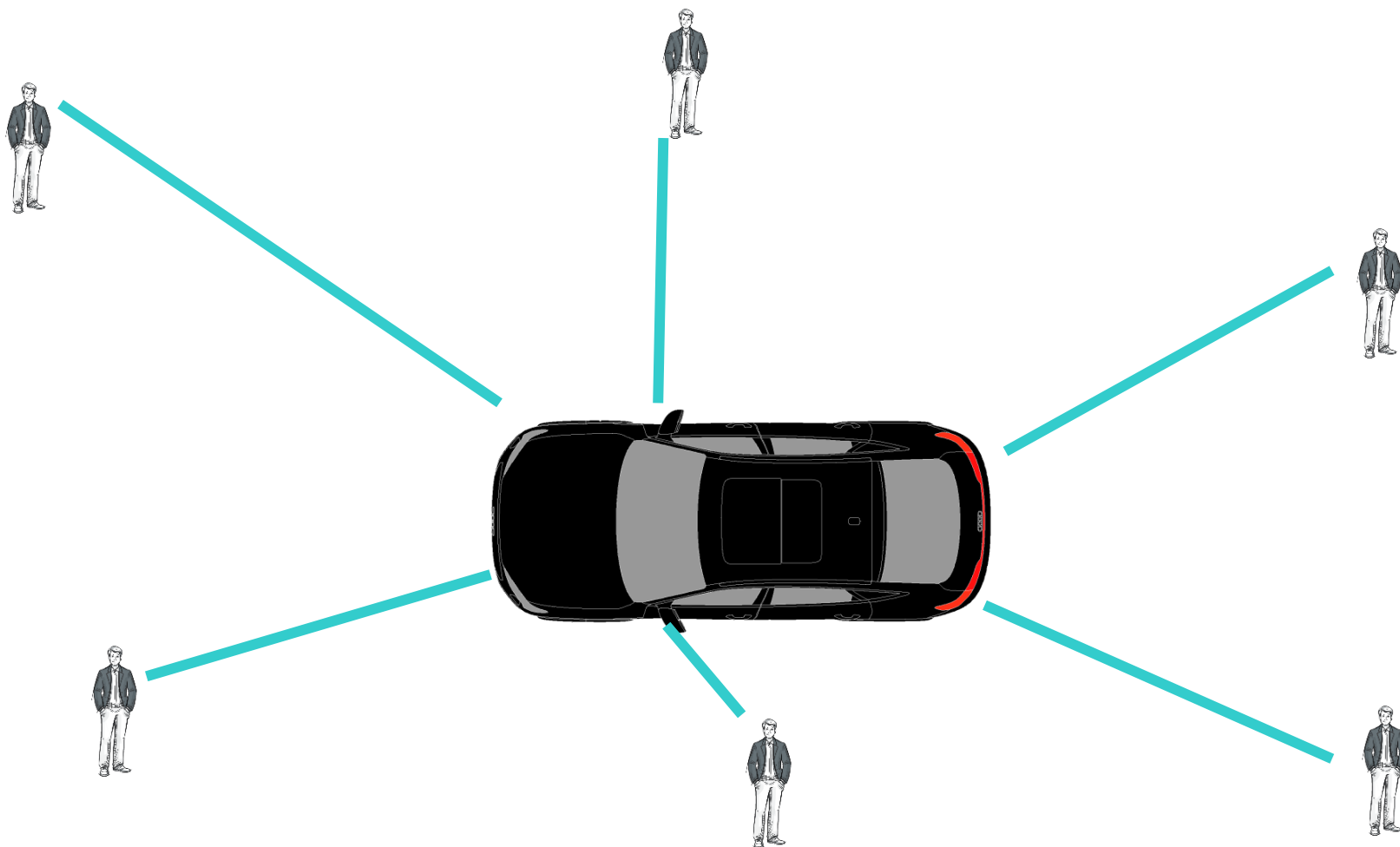
discussion on automated driving indication

- › The position and distance of a dedicated observer identifies the vertical angle of geometric visibility



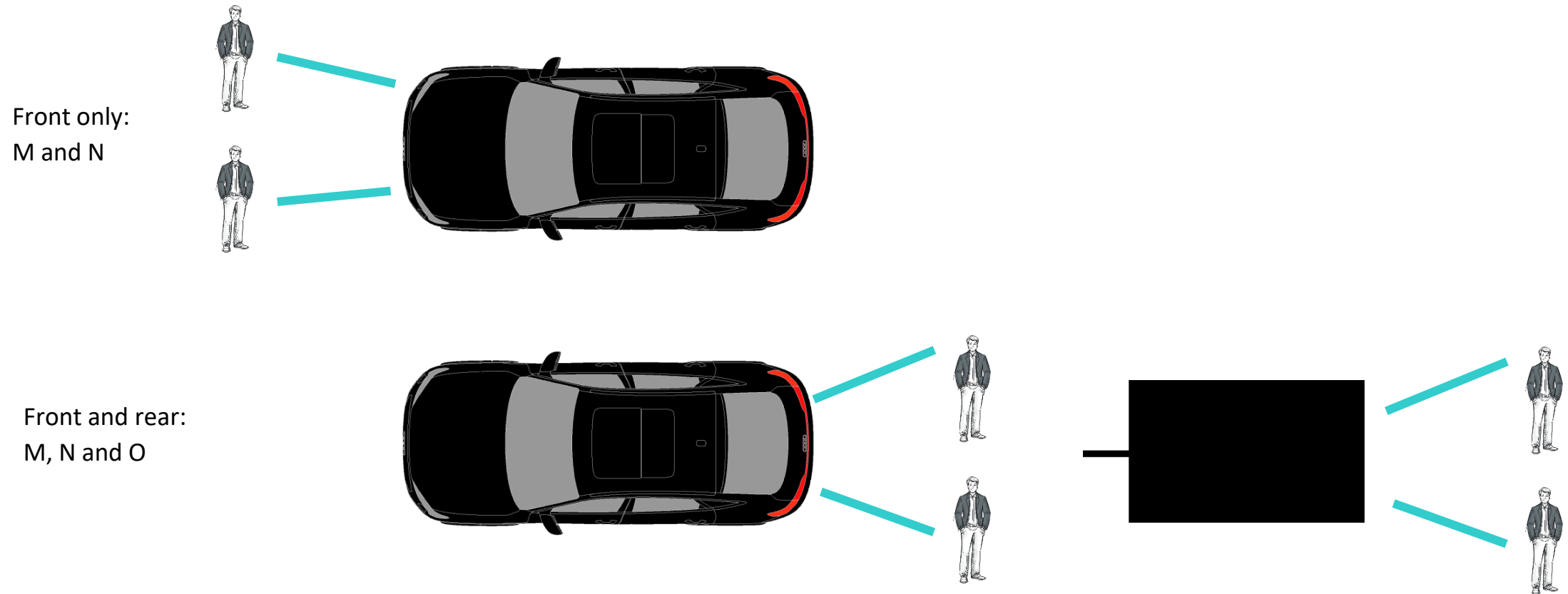
discussion on automated driving indication

- › The position of dedicated observers identifies the position, number and geometric visibility of the ADS marker lamp




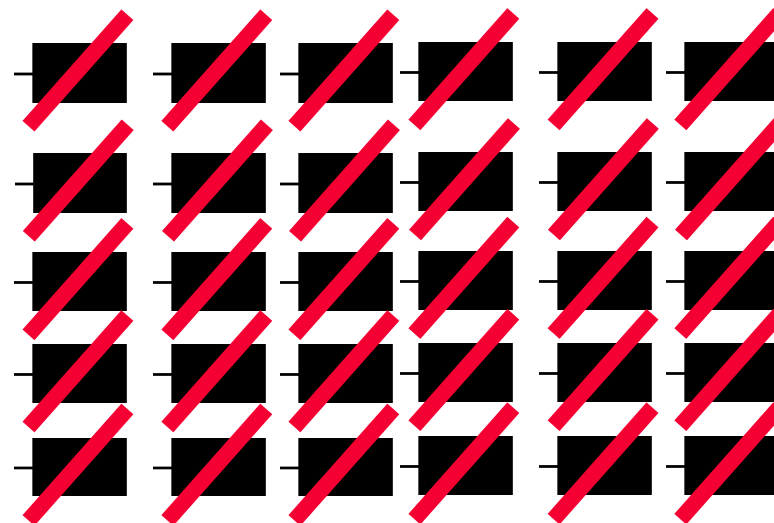
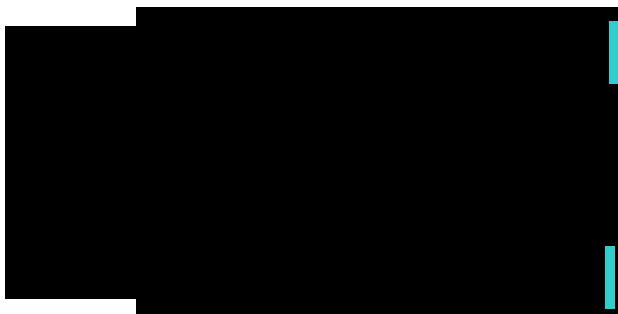
discussion on automated driving indication

- › The relative position of dedicated observers influences the addressed vehicle classes



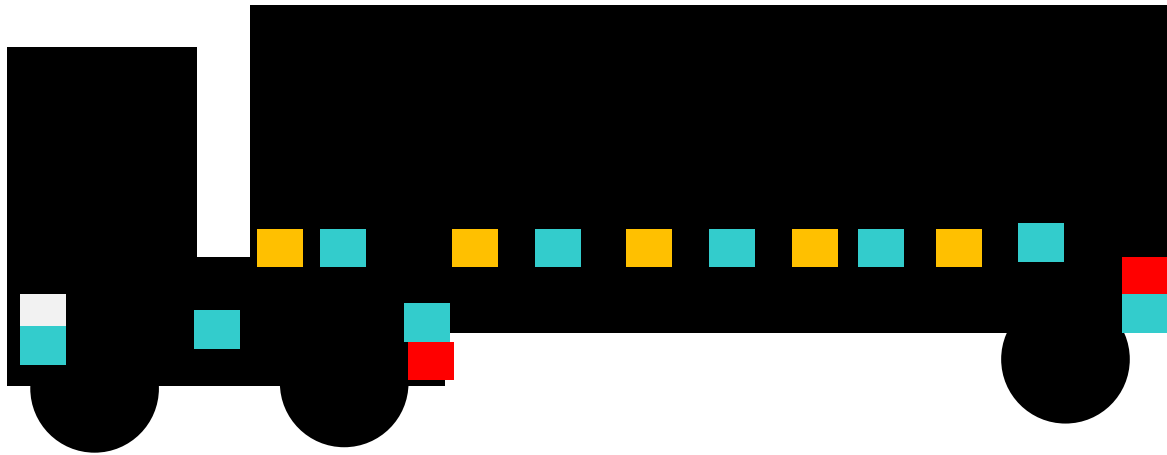
discussion on automated driving indication

- › The motivation identifies the level of possible compromises between equipment and market penetration/use:
- › To equip trailers with ADS marker lamps, the connector between vehicle and trailer must transfer the ADS activation signal.
- › Then, a new standard for the connector must be developed.
- › Such connector should be backward compatible with older connectors  ADS ready trailers can be towed by older vehicles and non-ADS ready trailers can be towed by ADS vehicles.
- › A towing vehicle needed to identify if the trailer is equipped with ADS marker lamps and if not ban ADS control.
- › If the motivation leads to a need for rear indication, fully autonomous vehicles like trucks would be restricted to tow an initially very low number of newest trailers equipped with ADS marker lamps older trailers cannot be towed.
- › This would severely hamper the market penetration of automated trucks.



discussion on automated driving indication

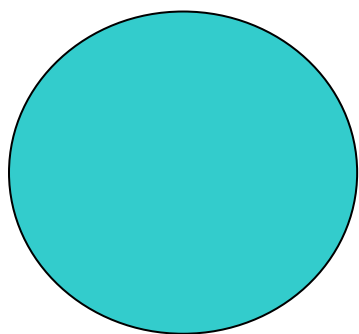
- › The motivation may influence the level of compromises for distraction:
- › Recently, GRE limited the maximum number of side lights to indicate the presence of a vehicle based on arguments on “excessive” number of lamps on the side that may distract.
- › The number of lamps on the side of trucks is increased if side facing ADS marker lamps are mandated.
- › When the GRE impression is correct, the additional lamps may distract.
- › However, if the motivation identifies a great benefit of ADS information to observers on the side of ADS controlled vehicles, this could justify the compromises by a potential distraction.



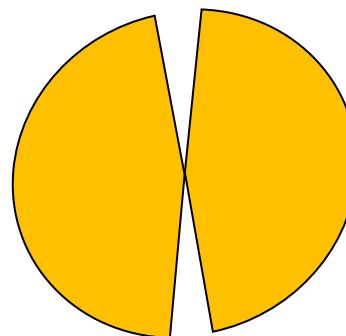
discussion on automated driving indication

- › The motivation influences the importance of ADS indication in comparison to other lamps:

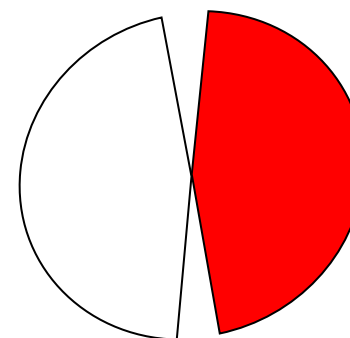
ADS marker GRE feedback and former China GB draft 360°



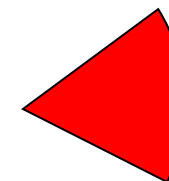
Direction indicator 320°



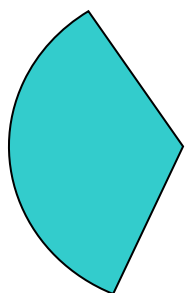
Position lamp 320°



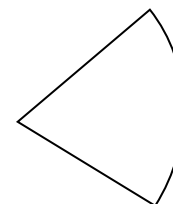
Fog rear 45°



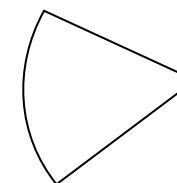
ADS marker SAE 120°



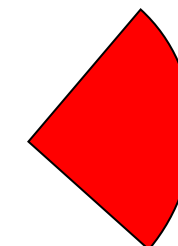
Registration plate 60° (EU example)



Daytime running lamp 40°

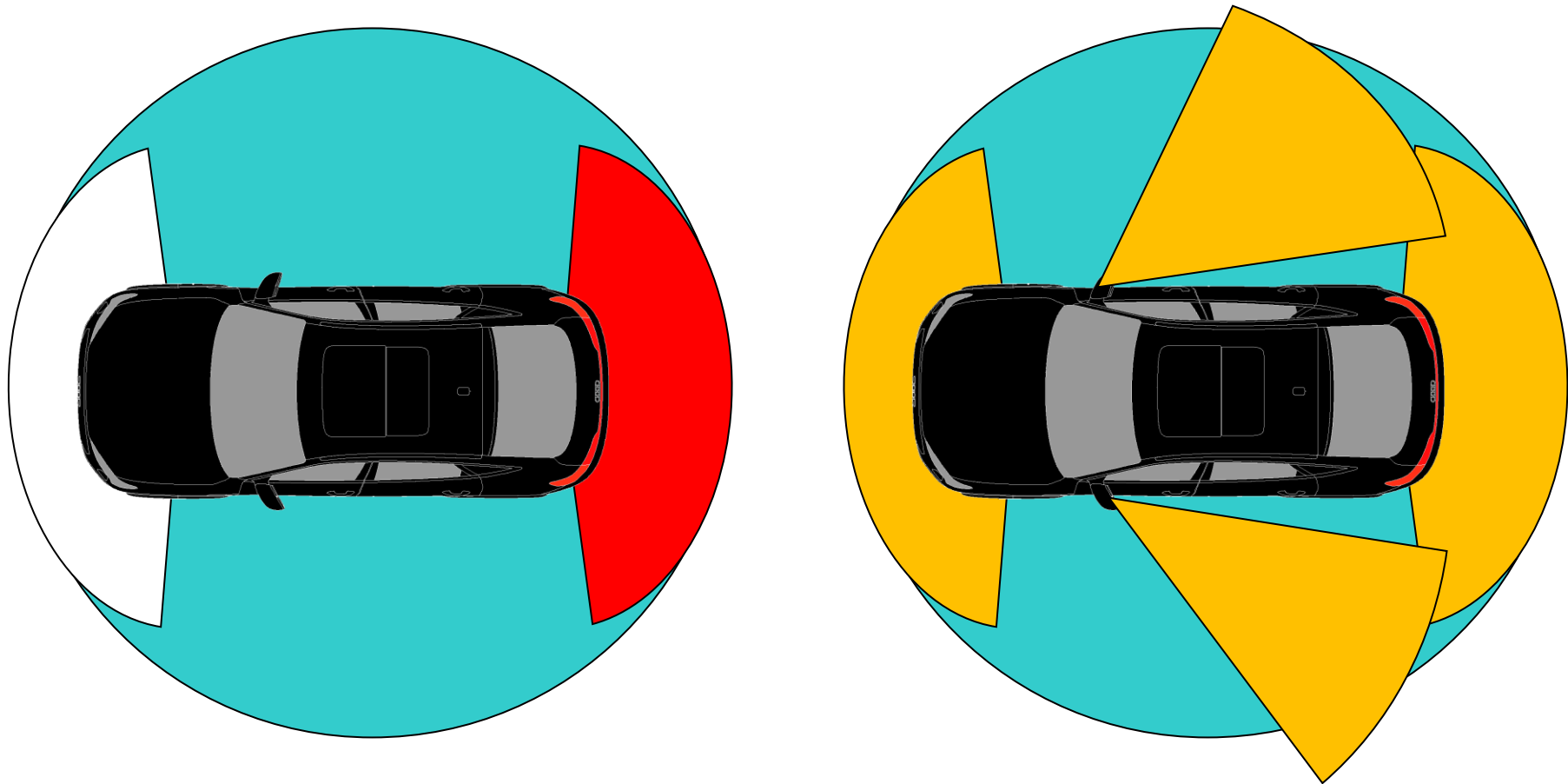


Stop 60°



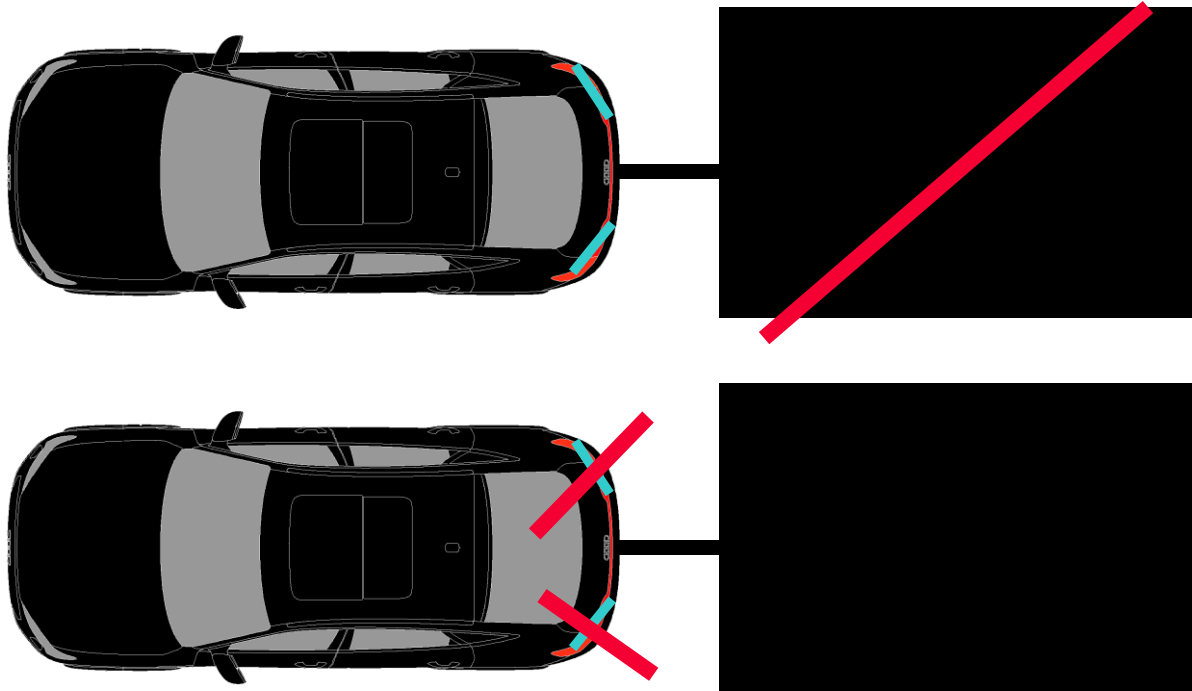
discussion on automated driving indication

- › How important is knowledge about the ADS status compared to information about the presence or direction of the vehicle?



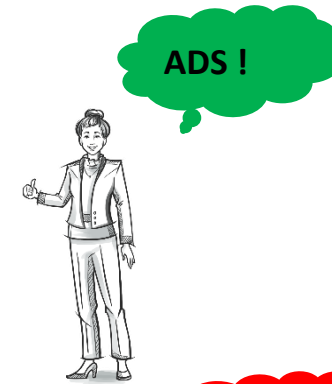
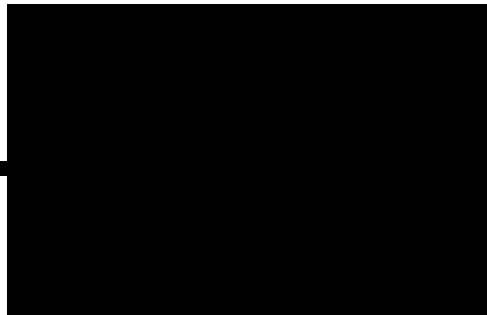
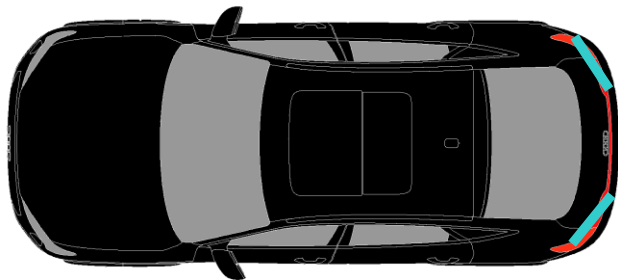
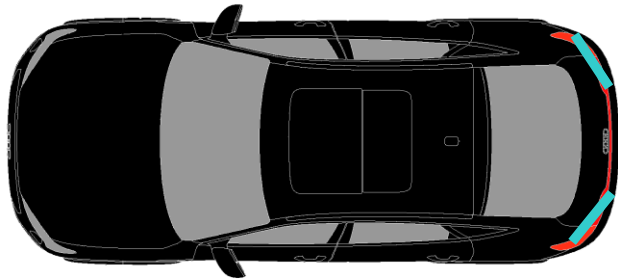
discussion on automated driving indication

- › Rear indication:
- › A trailer will block the view on vehicle ADS marker lamps.
- › To overcome this, automated vehicles must not carry trailers not equipped with ADS marker lamps.
- › Alternatively, when trailers without ADS marker lamps are attached, the vehicle must not enter an automated mode.
- › External termination of ADS may raise safety concerns for defects or misuse (functional safety).



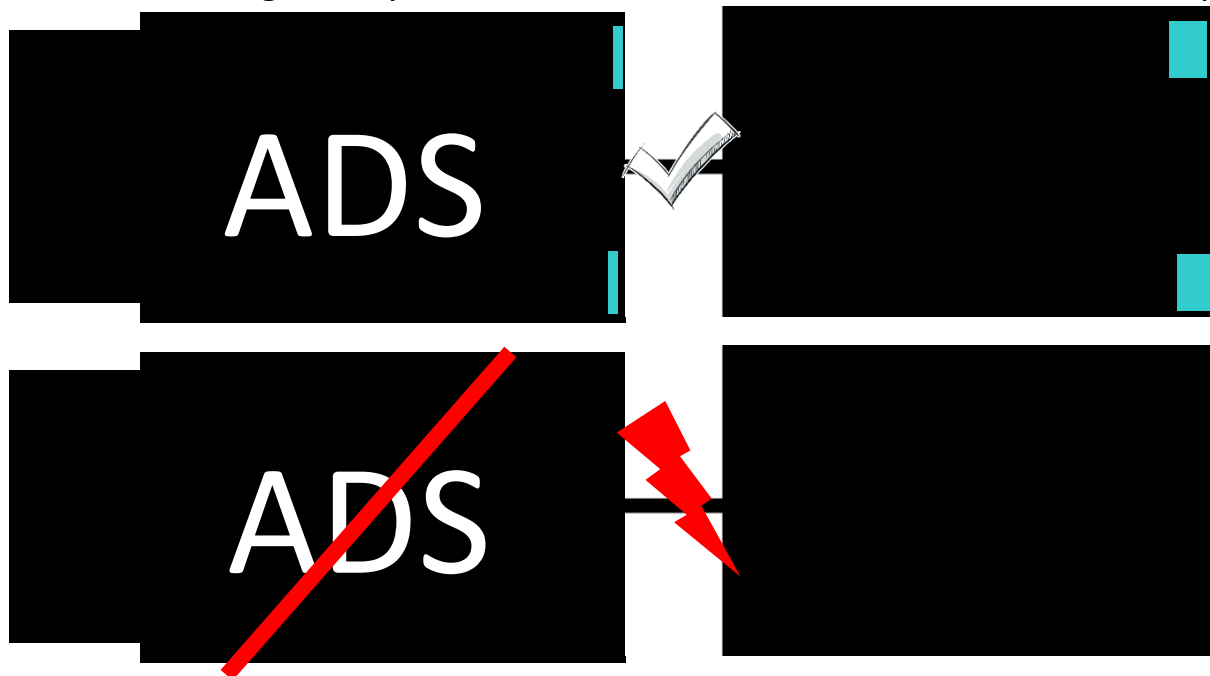
discussion on automated driving indication

- › Problems with rear indication:
- › If no arrangement applies to the equipment of trailers with ADS marker lamps, question is why a vehicle must show rear indication without trailer but when a combination applies, there is no need for indication



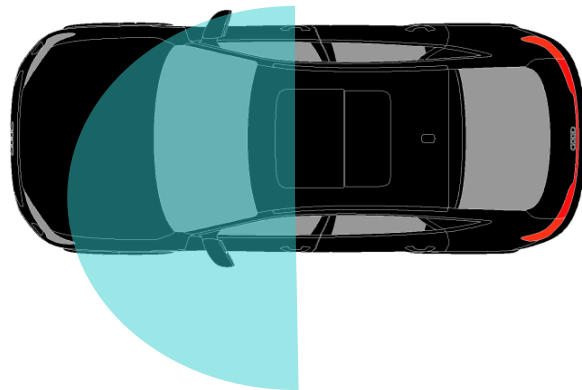
discussion on automated driving indication

- › Problems with rear indication:
- › When equipped to tow trailers, the capabilities of autonomous driving depended on the equipment level of the trailer with ADS marker lamps.
- › If the combination must provide ADS indication to the rear, the towing vehicle must be informed of the status of ADS equipment of the trailer.
- › Risk is, that if such information is lost e.g. by a failure connector, the vehicle must leave the ADS mode.
- › Then, a fully automated vehicle will most likely be brought to a stop which might raise safety concerns.
- › The functioning of a hybrid automated vehicle and the transfer of responsibility to a driver need to be defined.



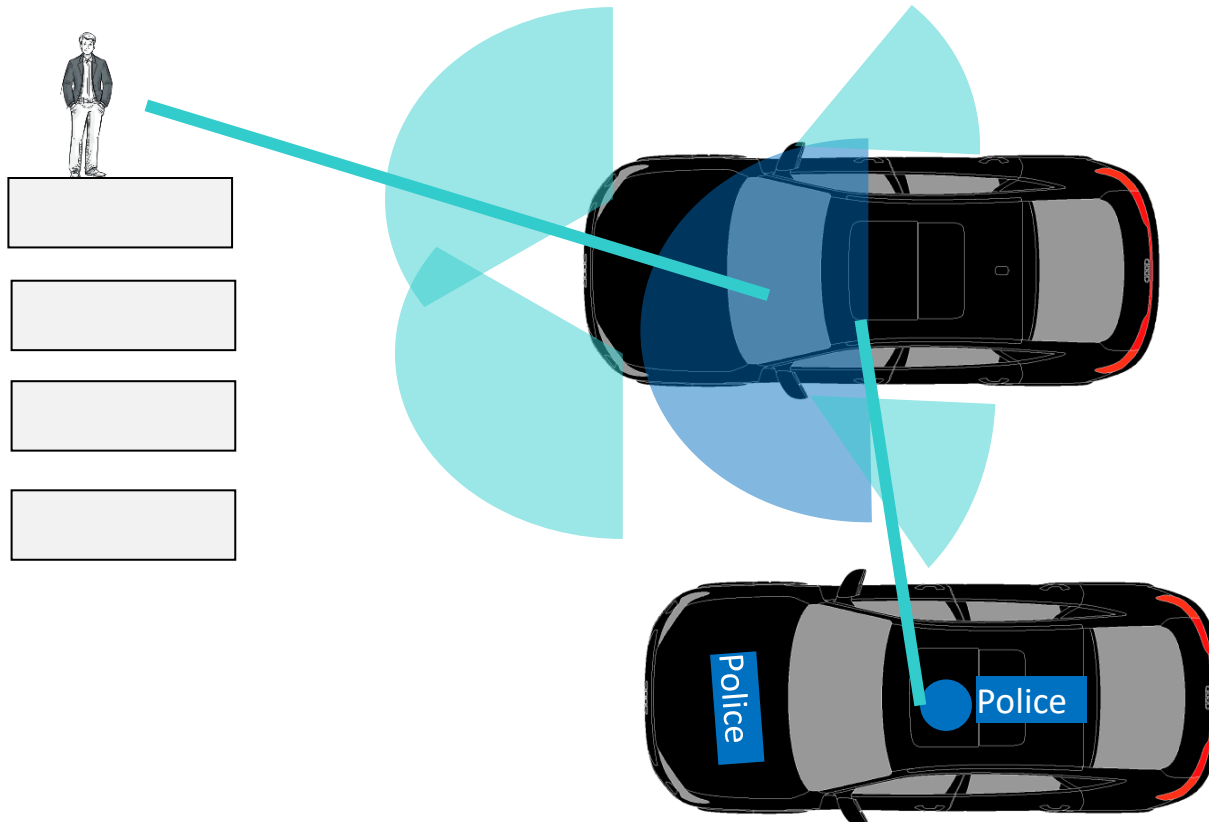
discussion on automated driving indication

- › suggestions?
- › The SAE standard provides justification for signals to other road users interested in information about the ADS status when a driver is not available for communication.
- › The traffic supervision authorities want to identify the status of an ADS mainly to identify if the human driver is in control or not and if the human driver may or may not perform tasks that distract from the dynamic driving task.
- › *Both needs have their merit. Both logics relate to situations when the driver is visible to other road users or traffic supervision authorities.*
- › *This means, that the status display need not be provided in directions where a driver typically cannot be observed.*
- › *The regulation for glazing and drivers' field of vision may be indicative of where drivers can be monitored and this is to the front of the vehicle up to 180° from the drivers eye point location.*



discussion on automated driving indication

- > suggestions?
- > Both needs identify a comparatively low distance of observation, because communication with and information about the driver cannot be observed from a long distance.



discussion on automated driving indication

- > suggestions?
- > ADS marker may substitute lamps that identify about the presence or width of a vehicle when indication is only defined for the front if their intensity is similar to or higher than the minimum requirements of such lamp and if the geometric visibility angle is identical or bigger.

