Submitted by Industry

Informal Document ACSF-22-13

Automated Lane Keeping Systems

Examples for system reaction on different driver input

Supporting presentation to document ACSF-22-07

Draft – final version will be available Tuesday 2019/04/09

Principles for the proposal for regulatory provisions in doc ACSF-22-07

- A driver override of an activated system shall be always possible using the conventional controls (pedals and steering wheel)

- The driver input to the conventional controls
  - may be suppressed or mitigated by the system if it could lead to a critical situation
  - shall be suppressed if it would result in a lower deceleration than that induced by the system or if it would prevent from meeting the requirements of this regulation.

- Any input of the driver to the conventional controls leads always to either automatic deactivation or a transition demand depending on if the driver has taken over manual control or not.

Definition of “Manual Control”

2.2.y. The driver is deemed to have “taken over manual control” if one or more of the following conditions are met:

- The driver manually deactivates the system.
- The driver maintains the vehicle stationary by any braking system.
- The driver provides an input to the brake or accelerator control and is holding the steering control.
- The driver provides a steering input which
  Option 1 = [led the vehicle to cross a lane marking]
  Option 2 = [alters the vehicle’s path].
- The driver follows a transition demand by grabbing the steering control.

ALKS examples – Definitions and Symbols

ACTIVATED	System is active and performing the driving task
DEACTIVATED	System is not active and not performing the driving task Driver is in manual control
OVERRIDE	The driver input forces the vehicle to a change of the lateral or longitudinal movement other than the system would do by performing the driving task
TRANSITION DEMAND	System is active but due to a driver Input (in these examples only the driver input is considered) the driver is requested to take over the manual driving task again

System with
no steering input detected

System with
steering input detected

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ALKS examples – list of scenarios

Steering override leads to deactivation upon lane departure [Option 1] “Led the vehicle to cross a lane marking” = Manual control

Steering override leads to deactivation upon lane departure [Option 1] “Steering in the lane” = Transition Demand

Steering override leads directly to deactivation [Option 2]
“Driver alters the vehicle’s path” = Manual control

Acceleration override not holding the steering wheel

Acceleration override suppressed by system while not holding the steering wheel

Acceleration while holding the steering wheel

Brake while holding the steering wheel

Brake while not holding the steering wheel

Two channel takeover to manual control

Automatic deactivation - “The driver follows a transition demand by grabbing the steering control.”

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Automated Lane Keeping Systems

Steering override leads to deactivation upon lane departure [Option 1]

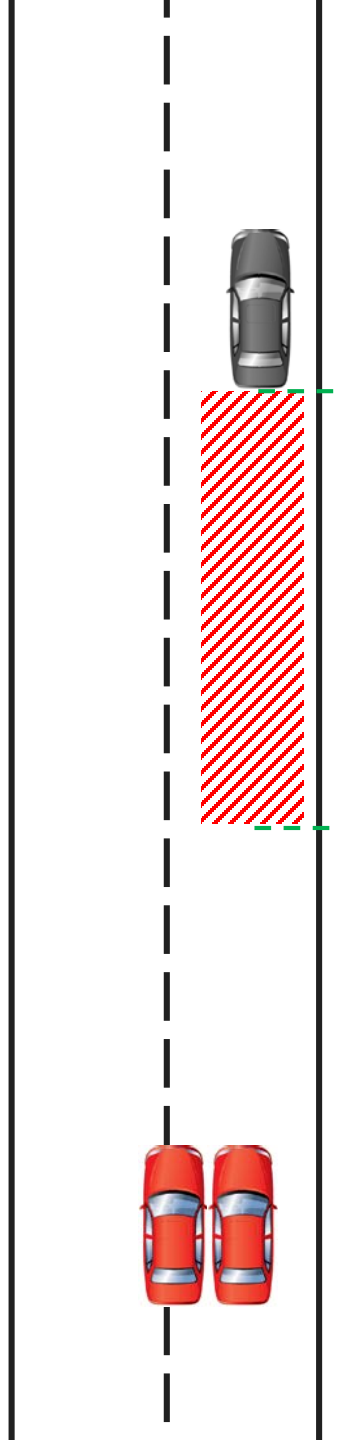
“Led the vehicle to cross a lane marking” = Manual control

Steering in the lane = Transition Demand

ALKS example to paragraph 2.4.10 option 1

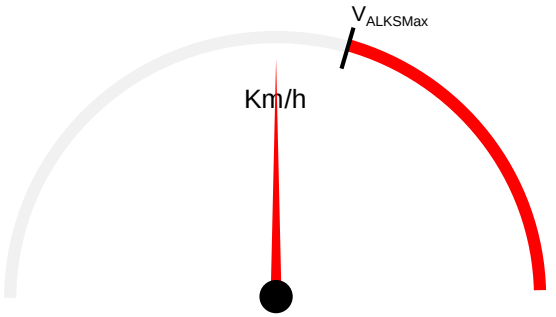
Steering override leads to deactivation upon lane departure

“Led the vehicle to cross a lane marking” = Manual control



Safety Zone

ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND

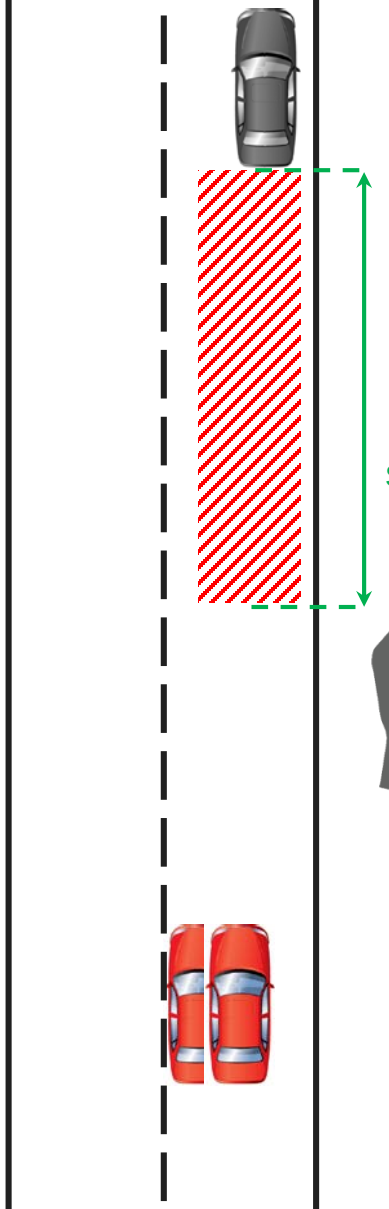


Repeat Example

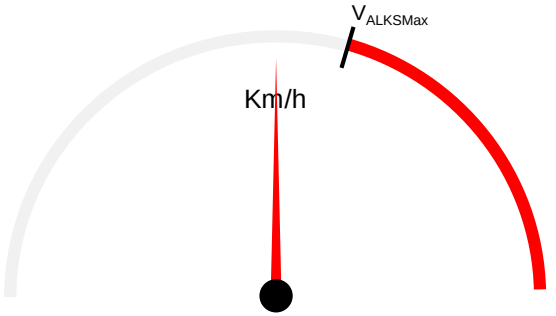
ALKS examples to paragraph 2.4.10 option 1

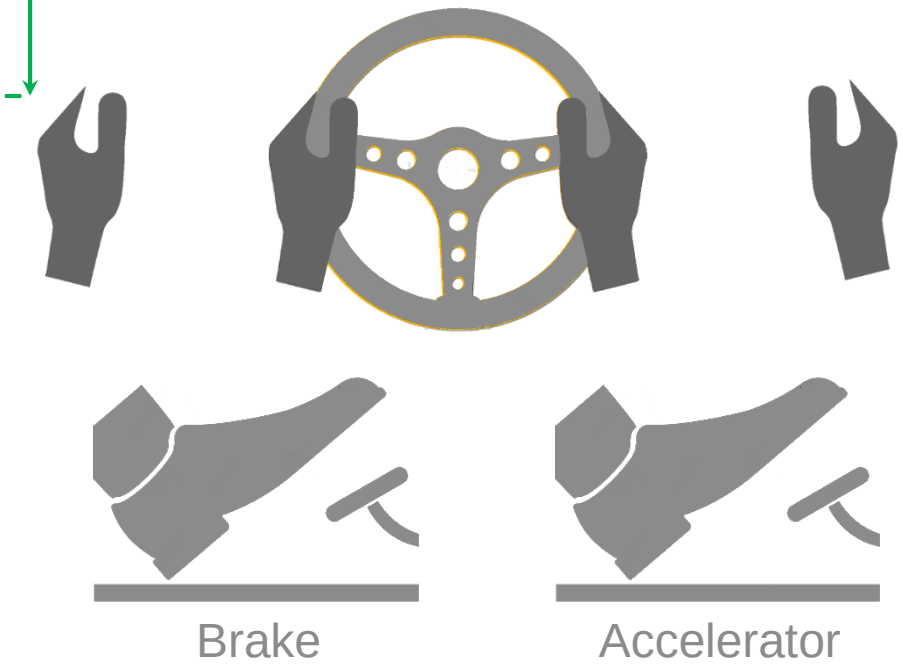
Steering override leads to deactivation upon lane departure

“Steering in the lane” = Transition Demand



ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND





Repeat Example

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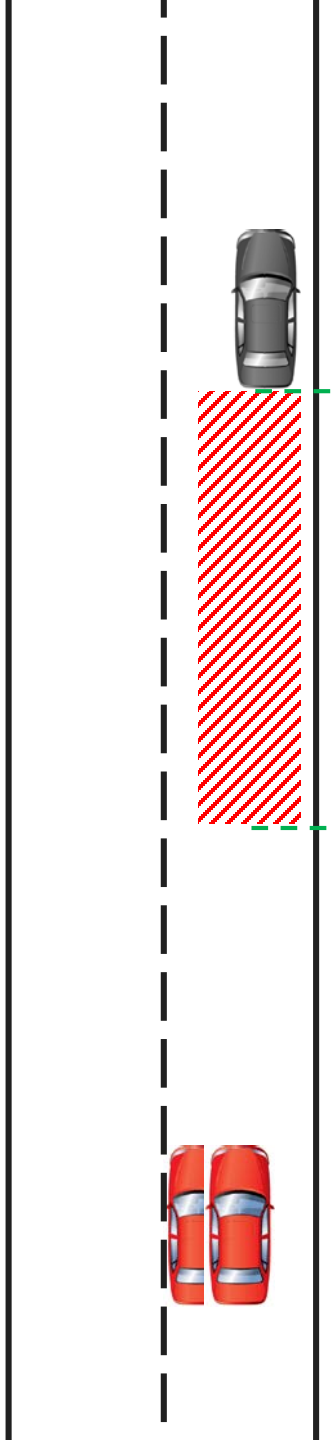
Steering override leads directly to deactivation [Option 2]

“Driver alters the vehicle’s path” = Manual control

ALKS example to paragraph 2.4.10 option 2

Steering override leads directly to deactivation

“Driver alters the vehicle’s path” = Manual control



ALKS Status	
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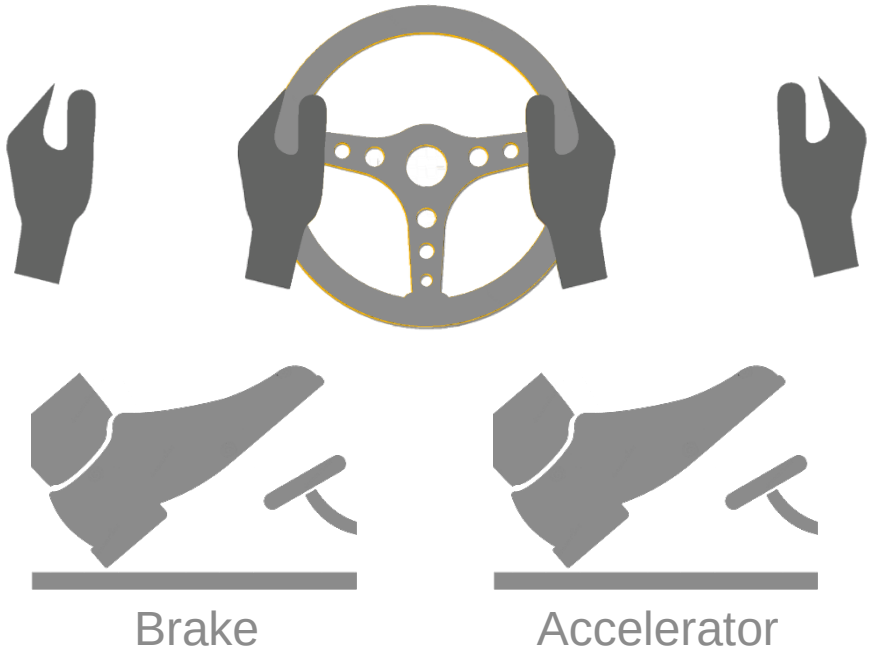
OVERRIDE	TRANSITION DEMAND



Repeat Example

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Acceleration override not holding the steering wheel

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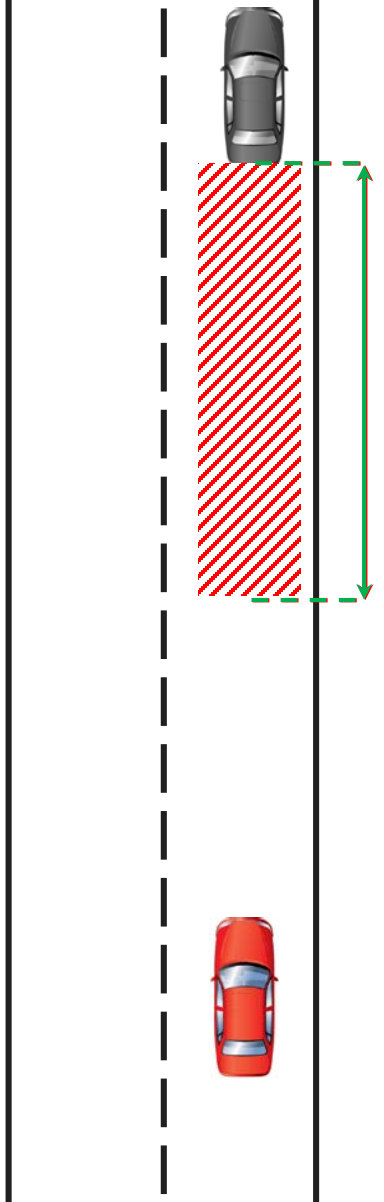
ALKS example to paragraph 2.4.12 + 2.4.13

Acceleration override not holding the steering wheel



ALKS Status	
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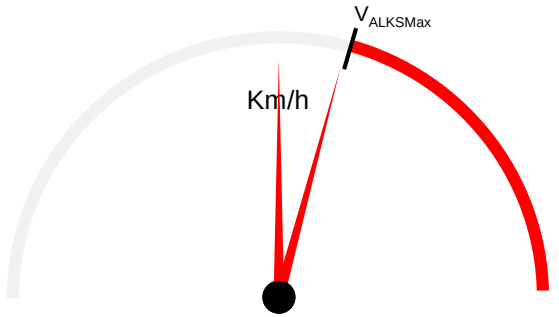
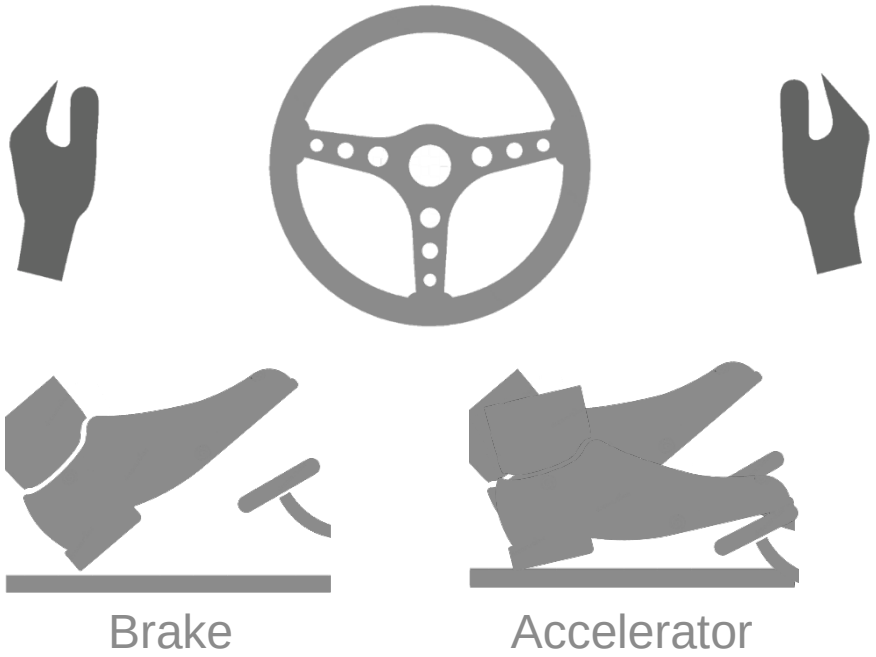
OVERRIDE	TRANSITION DEMAND





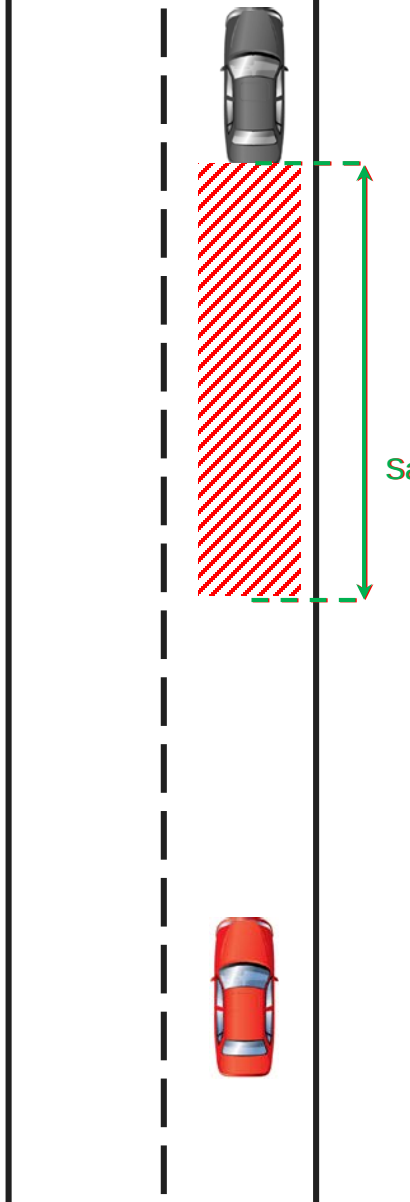
Repeat Example

Automated Lane Keeping Systems

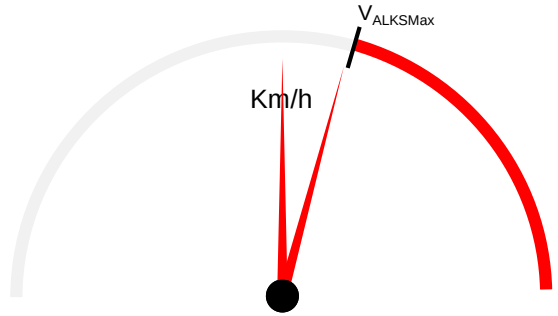
Acceleration override suppressed by system while not holding the steering wheel

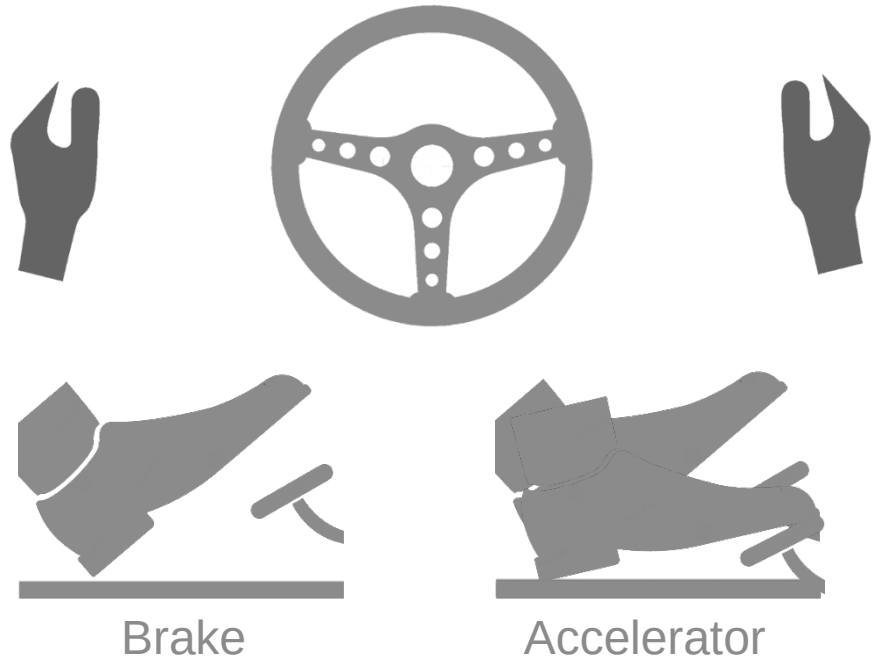
ALKS example to paragraph 2.4.12 + 2.4.13 without manual control

Acceleration override suppressed by system while not holding the steering wheel



ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND





Repeat Example

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Acceleration while holding the steering wheel

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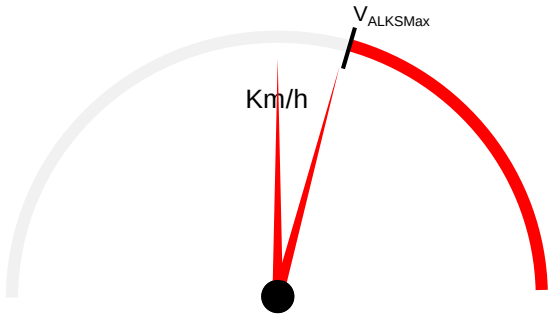
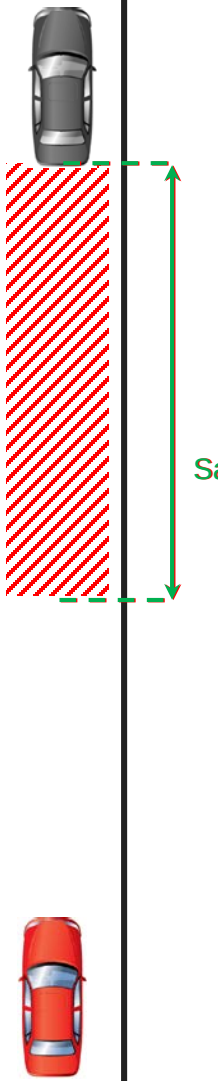
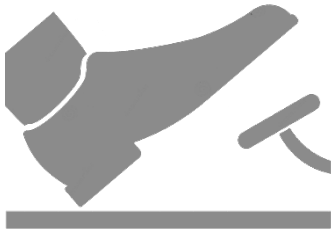
ALKS example to paragraph 2.4.12 + 2.4.13 with manual control

“The driver provides an input to the brake or accelerator control and is holding the steering control.”

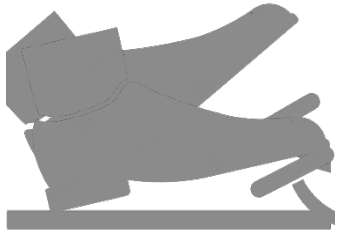




ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND



Brake



Accelerator

Repeat Example

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Brake while holding the steering wheel

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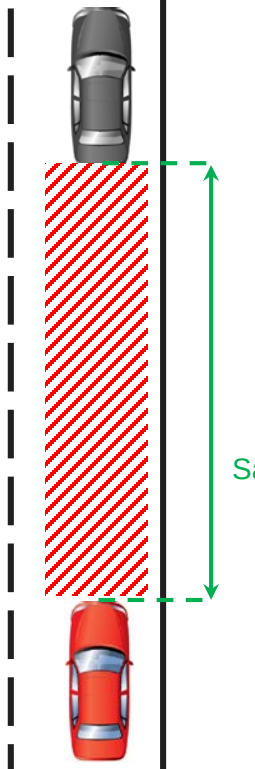
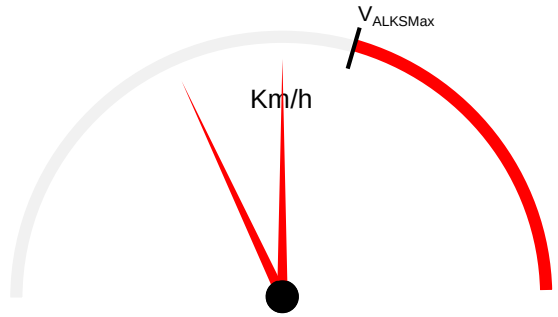
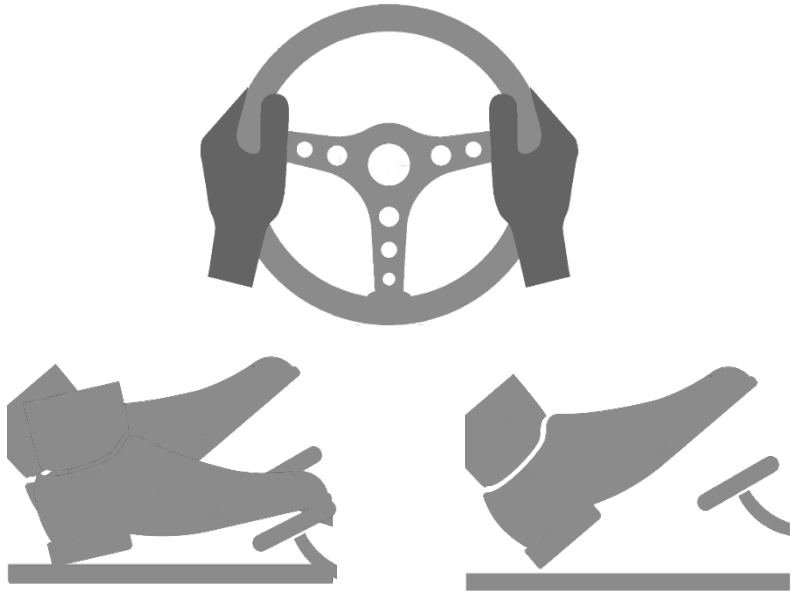
ALKS example to paragraph 2.4.11 + 2.4.13 with manual control

“The driver provides an input to the brake or accelerator control and is holding the steering control.”



ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND





Repeat Example

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Brake while not holding the steering wheel

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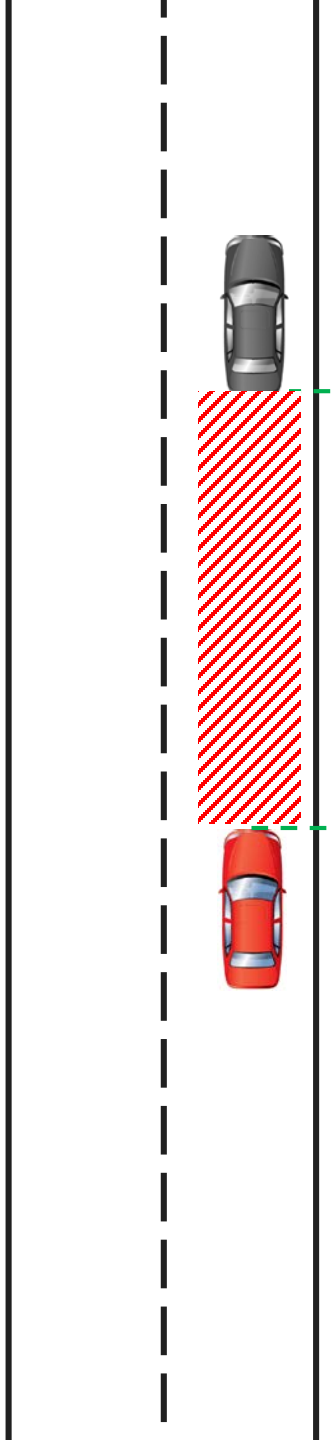
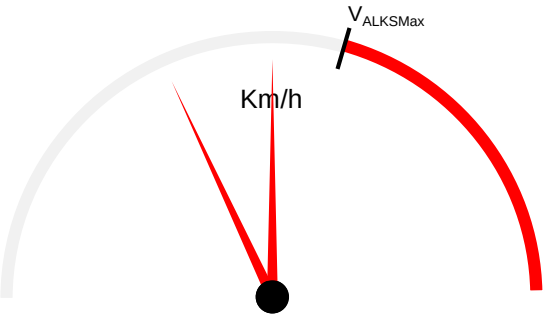
ALKS example to paragraph 2.4.11 + 2.4.13 without manual control

Brake while not holding the steering wheel



Safety Zone

ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND



Brake Accelerator

Repeat Example

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Two channel takeover to manual control

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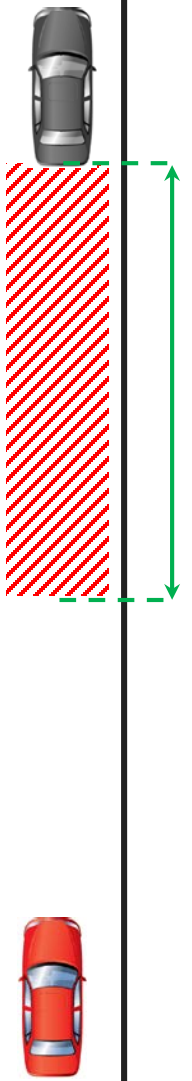
ALKS example

Two channel takeover to manual control



ALKS Status	
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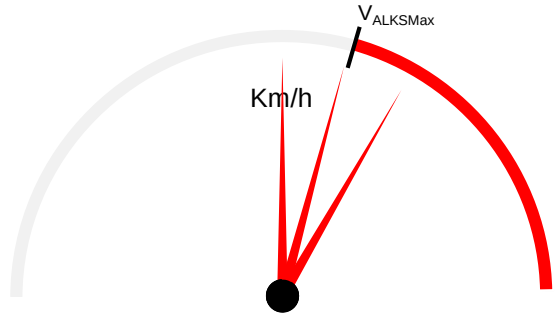
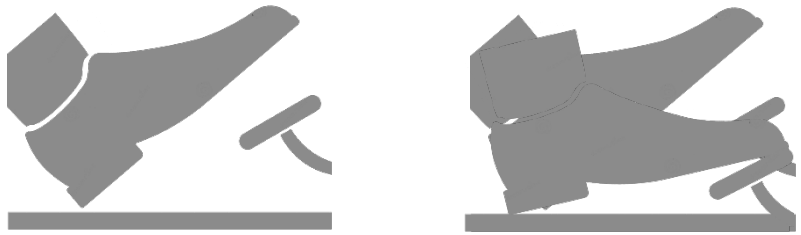
OVERRIDE	TRANSITION DEMAND





Repeat Example

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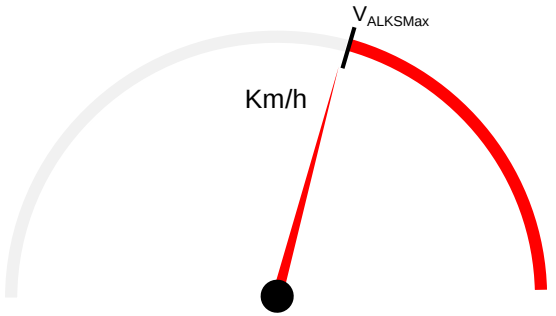
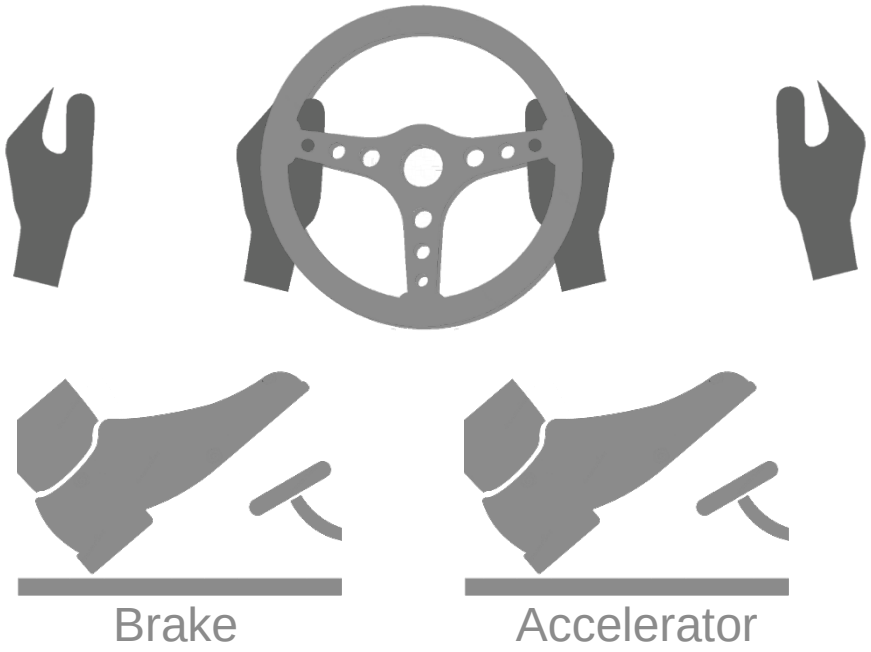
ALKS example: Automatic deactivation

“The driver follows a transition demand by grabbing the steering control.”



ALKS Status	
ACTIVATED	DEACTIVATED
OVERRIDE	TRANSITION DEMAND



Repeat Example

Thank you

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