

**INSTRUCTIONS:**

Fill out the hazard analysis and risk assessment below.

HA-001 should be for the lane departure warning function as discussed in t

HA-002 should be for the lane keeping assistance function as discussed in

Then come up with your own situations and hazards for the lane assistance

When finished, export your spreadsheet as a pdf file so that a reviewer can

Hazard ID			
	Operational Mode	Operational Scenario	Environmental Details
HA-001	Normal Driving	Highway	rain (slippery road)
HA-002	Normal Driving	Country roads	normal
HA-003	Normal Driving	Highway	Normal conditions
HA-004	Backward Driving	City Road	Normal conditions

discussed in the lecture.  
discussed in the lecture.  
the assistance system. Fill in the HA-003 and HA-004 rows.  
viewer can easily see your work.

Situational Analysis		
Situation Details	Other Details (optional)	Item Usage (function)
high speed		correctly used
high speed		incorrectly used
high speed	lane change	correctly used
low speed	parking	correctly used

Situation Description
The lane departure warning system malfunctions causing the steering wheel to vibrate erratically; the vehicle veers back and forth and the driver may lose control of the vehicle.
the driver is misusing the lane keeping assistance function as an autonomous function
The driver is trying to change lanes on a highway (normal activity). The lane departure warning system malfunctions and alerts the driver when no alert is necessary.
The driver is trying to park on the side of a city road. The LKA function applies steering torque that may prevent this

Function	Deviation
Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV04 - Actor effect is too much
Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 - Function always activated
Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV12 - Sensor sensitivity is too high
Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV19 - Sensor detection is wrong

Hazard Identification	
Deviation Details	Hazardous Event (resulting effect)
The LDW function applies an oscillating torque with very high torque (above limit)	Collision with other vehicle.
The driver was misusing the function by taking both hands off the wheel and incorrectly treating the car as a fully autonomous vehicle. the lane keeping assistance function is always activated	Collision with other vehicle.
The camera sybssystem should be able to differentiate between a hazardous situation (drifting out of the ego lane) and an intentional change (which is not hazardous)	Collision with other vehicle.
The camera sybssystem should no engage the LKA when the vehicle is travelling in reverse.	None

Event Details
High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure.
The LKA function may reduce driver engagement with the operation of the steering wheel which is not the intent of this driver assistance functionality
Haptic feedback from the LDW in a situation where there is no hazard may surprise the operator, possibly causing them to suddenly alter their steering input and loose control of the vehicle.
There is no immediate hazardous event, but the driver is unable to complete their intended behavior and may become an obstacle for another vehicle

Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)
The LDW function applies too high an oscillating torque to the steering wheel (above limit).	E3	Driving on wet roads occurs with medium probability
If the driver is not actively controlling the vehicle, the LKA may be unable to operate the vehicle safely in certain scenarios.	E2	Country road driving occurs less often
Driver loses control of the vehicle when LDW oscillates the steering wheel during a routine lane change	E4	Lane change is a normal, everyday occurrence for an average driver
If driver is unable to park the vehicle, they may become an obstacle for another vehicle travelling in the same lane.	E4	Parking is a regular occurrence for city driving

Hazardous Event Classification		
Severity (of potential harm)	Rationale (for severity)	Controllability (of hazardous event)
S3 - Fatal Injuries	High speed driving	C3 - Difficult to control
S3 - Fatal Injuries	High speed driving	C3 - Difficult to control
S3 - Fatal Injuries	High speed driving	C2 - Normally controllable
S0 - No injuries	Low speed and no immediate Hazard	C0 - Controllable in general



Rationale (for controllability)	ASIL Determination
If steering wheel vibrates wildly, most drivers would have difficulty controlling the vehicle	C
Vehicle would be difficult to control without drivers hands on the wheel	B
Most drivers should be able to complete a lane change even with incorrect feedback from the LDW system	C
Assuming the system can be manually disabled, it would be controllable for most drivers	QM

Determination of ASIL and Safety Goals
--

Safety Goal
-------------

The oscillating steering torque from the lane warning function shall be limited
---

The lane keeping assistance function shall be time limited and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving
--

Lane Departure Warning (LDW) function shall not apply an oscillating steering torque to provide the driver with haptic feedback when driver is intentionally changing lanes.
--

The Lane Keeping Assistance (LKA) should not engage when the vehicle is in reverse and the user should be able to manually disengage the system.
--