

INSTRUCTIONS:

Fill out the hazard analysis and risk assessment below.

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

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

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	Situational Analysis		
	Operational Mode	Operational Scenario	Environmental Details
HA-001	OM03 - Normal Driving	OS04 - Highway	EN06 - rain(slippery)
HA-002	OM03 - Normal Driving	OS03 - Country road	EN01 - normal
HA-003	OM03 - Normal Driving	OS04 - Highway	EN08 - glaze(slippery)
HA-004	OM03 - Normal Driving	OS02 - City road	EN01 - normal

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Situation Details	
SD02 - high speed	
SD02 - high speed	
SD04 - high acceleration	
SD01 - low speed	

» HA-003 and HA-004 rows.
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Other Details (optional)
Driver has no hands on the wheel
Driver is accelerating when entering the highway, but does not use their blinker to signal lane change
a biker passes along the right side of the vehicle in traffic

Item Usage (function)
IU01 - proper usage
IU02 - improper usage
IU02 - improper usage
IU02 - improper usage

Situation Description
Normal driving on the highway at high speed in rain(slippery) conditions with proper usage
Normal driving on country roads at high speed in normal conditions while the driver misuses lane keeping by taking
Normal driving on the highway with high acceleration in glace(slippery) conditions while driver improperly uses
Normal driving on city roads with low speed while driver properly uses system, but a biker passes on the right side

Hazard Identification

Function

Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic
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Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane

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Deviation	
Deviation	Deviation Details
DV04 - Actor effect is too much	Torque applied during oscillation is too much
DV03 - Function always active	Lane keeping is always expected to keep vehicle in lane
DV20 - NA	Driver error not using signal to deactivate LKA
DV12 - Sensor sensitivity is too high	sensor does not understand biker passing over lane line

Hazardous Event (resulting effect)	
EV00 - collision with other vehicle	
EV00 - collision with other vehicle	
EV03 - car spins out of control	
EV-01 - side collision with obstacle	

Event Details
Oscillation is too great causing driver to lose control and collide with another vehicle or barrier
vehicle will collide with another vehicle when lane keeping fails and driver loses control
vehicle lane keeping will attempt to maintain course, while driver attempts to change lanes causing wheel to
vehicle attempts to maintain lane but swerves right and injures a bicyclist

	Hazardous Event C
Hazardous Event Description	Exposure (of situation)
the lane departure warning	E3 - medium
total dependence on lane keeping	E2 - low probability
driver misues of lane keeping	E1 - very low
lane keeping sensor malfunction	E2 - very low

Classification
Rationale (for exposure)
highway driving in the rain is likely to be within 1% and 10% of operation
country roads are likely to be less than 1% of operation
drivers are not expected to drive on frozen roads more than once a year
driver may often be in cities in traffic at low speed, but bikers may not pass often

Severity (of potential harm)
S3 - life-threatening or fatal injuries
S3 - life-threatening or fatal injuries
S2 - severe and life-threatening injuries
S1 - light and moderate injuries

Rationale (for severity)	
If driver collides at high speed they are almost definitely going to suffer contusions or death	
If driver collides at high speed they are almost definitely going to suffer contusions or death	
if driver collides at relatively high speed during high acceleration in icy conditions they will likely suffer severe	
if driver collides with a bicyclist at low speed, the cyclist may sustain moderate injuries (car at 25-35 mph and bike	

Controllability (of hazardous event)
C3 - difficult or impossible
C3 - difficult or impossible
C3 - difficult or impossible
C1 - simply controllable

Rationale (for controllability)
when the wheel is oscillating rapidly drivers will have difficulty maintaining control of the vehicle
at high speed the majority of drivers will not be able to regain control of vehicle when their hands are completely off
in icy conditions, the driver has little to no chance of regaining control of the vehicle
if the driver is paying attention they will see the biker coming in the side view mirror, and when the car begins to

Determination of

**ASIL
Determination**

ASIL C

ASIL B

QM

QM

ASIL and Safety Goals
Safety Goal
the oscillating steering torque shall be limited
The lane keeping system shall be time limited and apply torque for a given time interval so that the driver cannot
the lane departure system shall try only once to counter driver action, but this case is rare
Sensors shall not treat moving obstacles interrupting the lane line as key factors to lane keeping