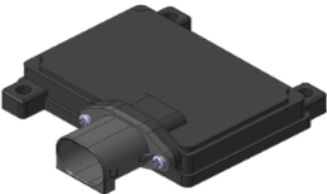


MAR120_77GHz Radar User Manual

1. Specifications for Designing and Developing

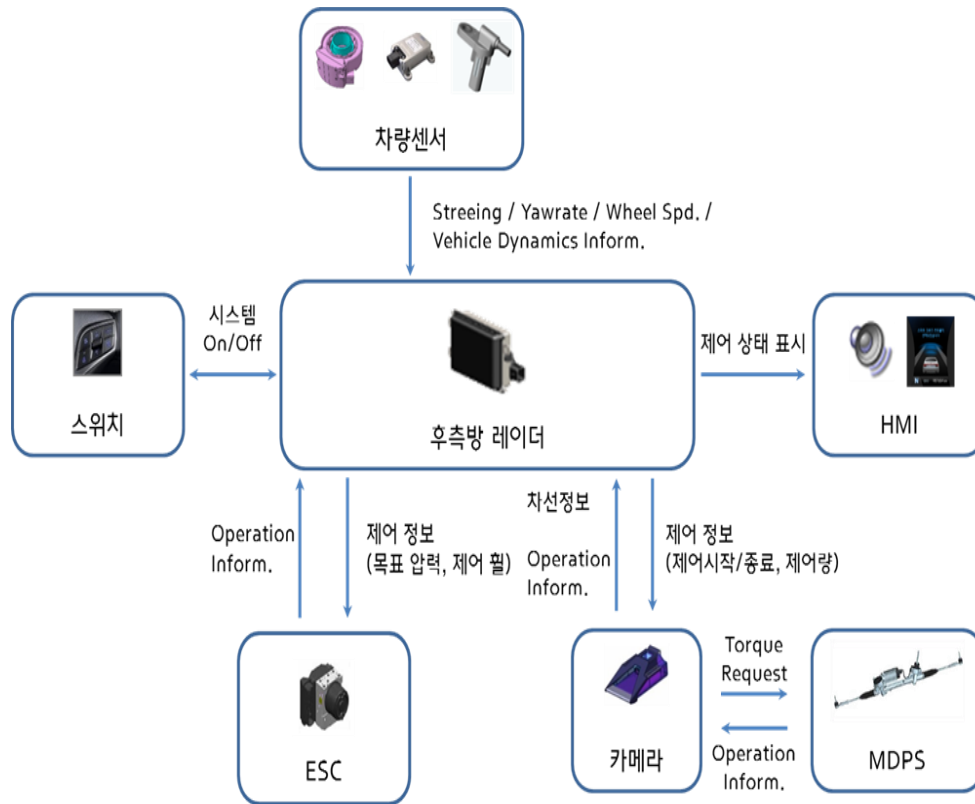
1-1. Features and Main Specifications

Vehicle Type		Rear Lateral Radar
Shape		 Rear Lateral Radar
Main Specifications	Assy	• Solo SRR + Bracket
	Sensor	• Solo SRR
	S/W	• Radar signal processor DSP SW • Warning Logic (BCW/RCCW) SW • Additional function [BCA-R(Braking or Steering), RCCA, SEA, (BCA-R)+] SW
	Accessory	• Bracket applied (Except Extension Wire and Absorber)
Special note		• New sensor (Solo SRR) applied

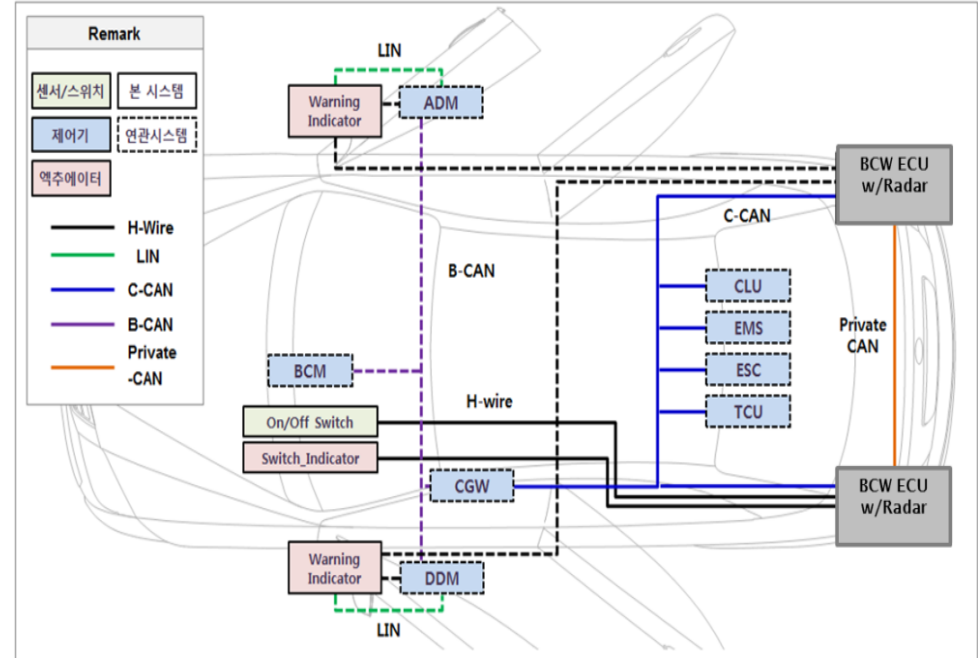
1. Specification of Design Development

1-2. System Composition

Outline of System Composition



System Architecture Composition



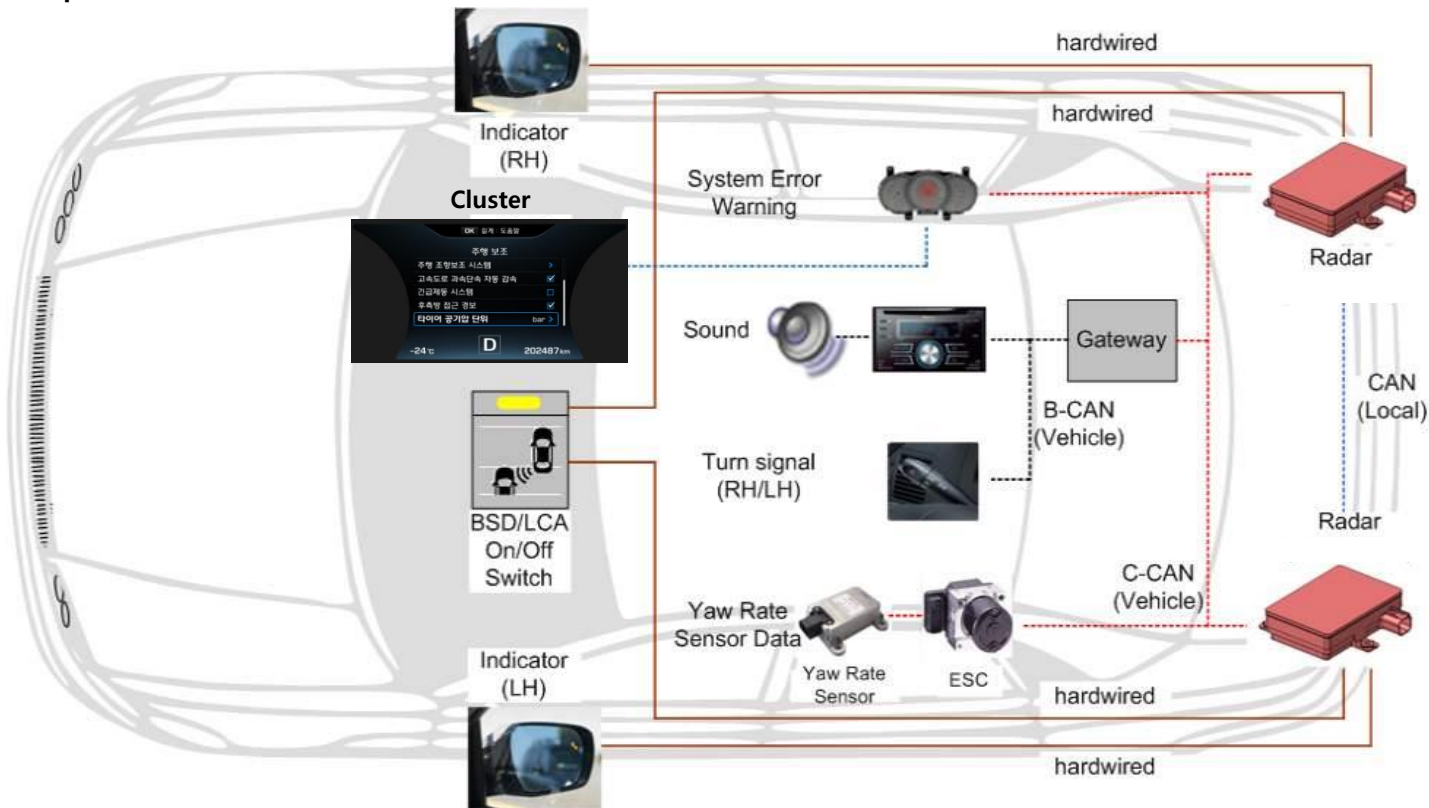
No	Item	Description	제어방식
1	BCW ECU w/RADAR (LH/RH)		
2	Warning Indicator	BCW 시스템 경보 기능 수행 (아웃사이드 미러 LED)	직접 제어
3	BCW On/Off Switch	BCW 기능 On/Off 스위치 (C/PAD LWR)	
4	Switch Indicator	BCW 기능 On/Off 스위치 Indicator (C/PAD LWR)	
5	CGW / CLU / EMS / ESC / TCU	시스템 작동 관련 차량 상태 정보 송신	

2. Rear Lateral Radar Detail of Function

1. Outline

- Blind-Spot Collision Warning (BCW) and Blind-Spot Collision Avoidance Assist-Rear) (BCA-R)
- Rear Cross-Traffic Collision Warning (RCCW) and Rear Cross-Traffic Collision Avoidance Assist (RCCA)
- Safe Exit Assist(SEA)

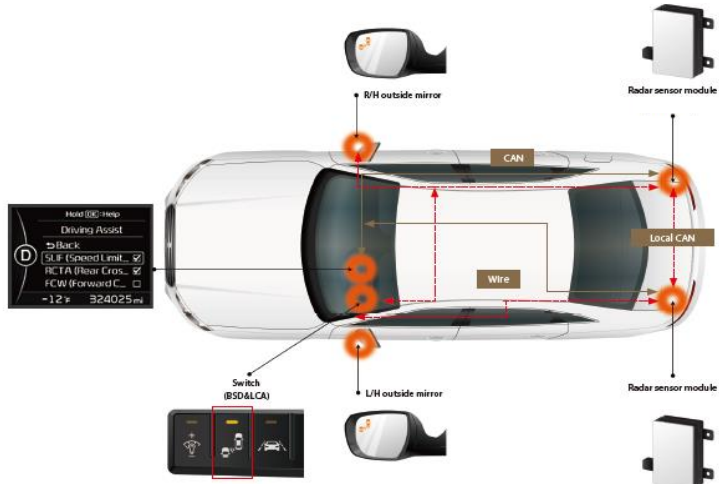
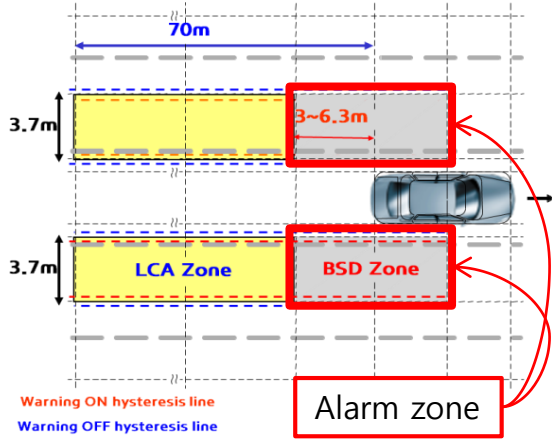
2. System Composition



2. Rear Radar Function Description

2-1. BCW (Blind Spot)

- Radar detects blind spot of vehicles to alert drivers
- Warning method : Primary -LED lighting, Secondary - LED blinking + alert sound

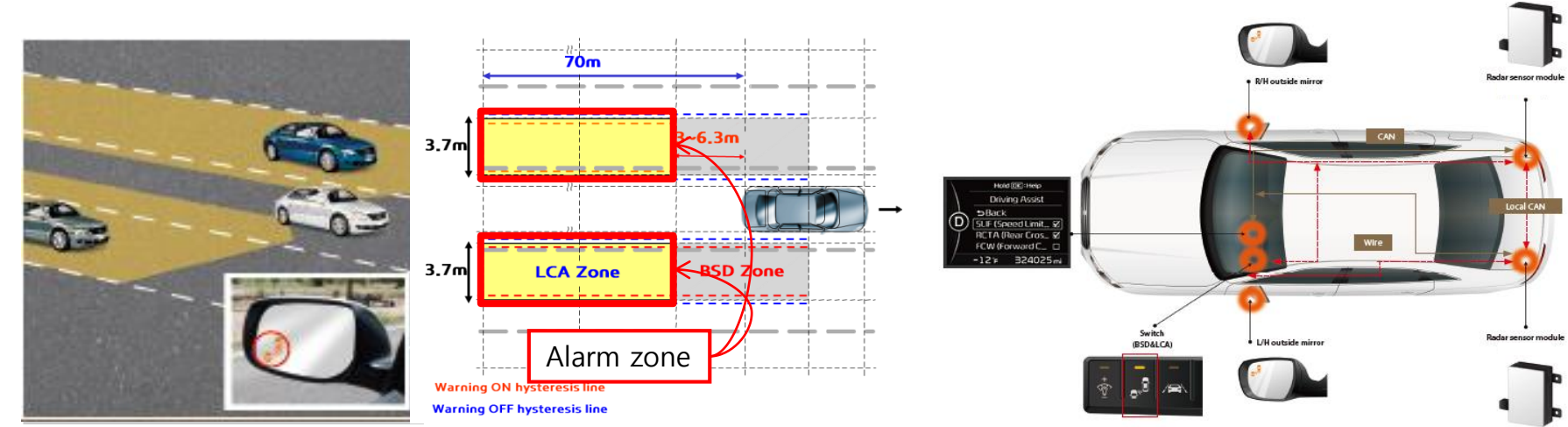


Activation condition	• Own speed above 20 kph • The radius of curvature above 125m
Alarm zone	• Transverse : {3m + (width/2)} ~ {3.4m + (width/2)} within (reversible depending on own speed) • longitudinal : 3.8m from B pillar to rear side ~ 6.3m (Rear area is reversible depending on own speed)
Alarm condition	• Entered target car in warning area • Relative velocity of target car within -10 ~ 255kph

3. Rear Radar Function Description

2-2. BCW (High speed approach)

- Radar detects fast approaching vehicles to alert drivers
 - Warning method : Primary -LED lighting, Secondary - LED blinking + alert sound

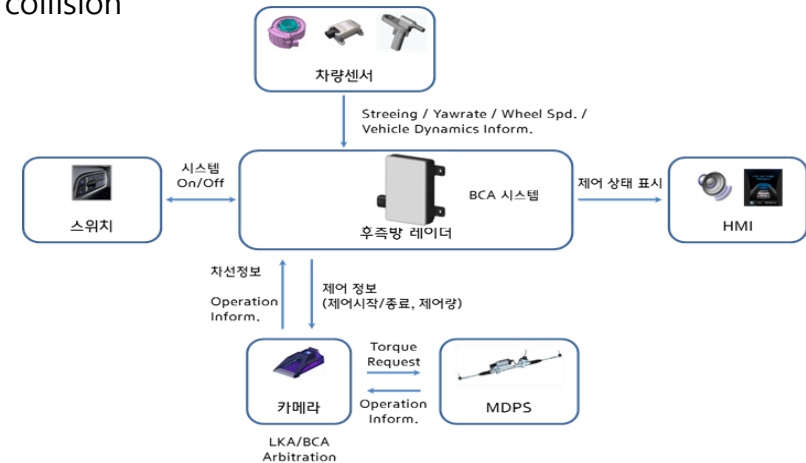
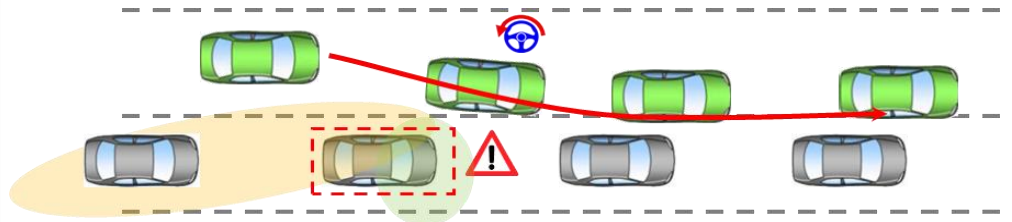


- | | |
|----------------------|--|
| Activation condition | <ul style="list-style-type: none">• Own speed above 20 kph• The radius of curvature above 125m |
| Alarm zone | <ul style="list-style-type: none">• Transverse : {3m + (width/2)} ~ {3.4m + (width/2)} within (reversible depending on own speed)• longitudinal : {BCW End of blind spot alarm zone} ~ {rear side 70m} (reversible depending on own speed) |
| Alarm condition | <ul style="list-style-type: none">• Entered target car in warning area• Relative velocity of target car within -10 ~ 255kph• Estimated collision time of target car (TTC) within 4.5sec(3.8sec)
(※ TTC can be set by the driver) |

2. Rear Radar Function Description

2-3. BCA (Driving)

- Anti-collision assist function through control of braking in case of collision with adjacent vehicle during lane departure
 - Warning meth : LED lighting, alert sound
 - Control method : Braking Control via ESC



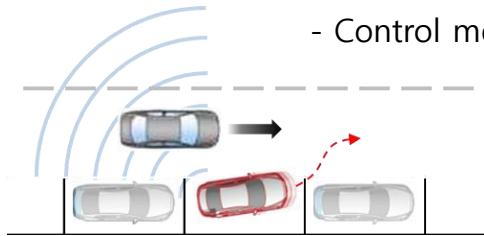
Activation condition	• Activated BCW, Own speed within 60kph ~ 180kph. • MFC Normal operated.
Alarm zone	• Transverse : $0.4\text{m} + (\text{width}/2) \sim 2.2\text{m} + (\text{width}/2)$ • longitudinal : Position of driver's eye ~ 1.5 m rearward from rear bumper end.
Alarm and breaking condition	• Entered target car in warning area. • When own vehicle attempts lane departure.

2. Rear Radar Function Description

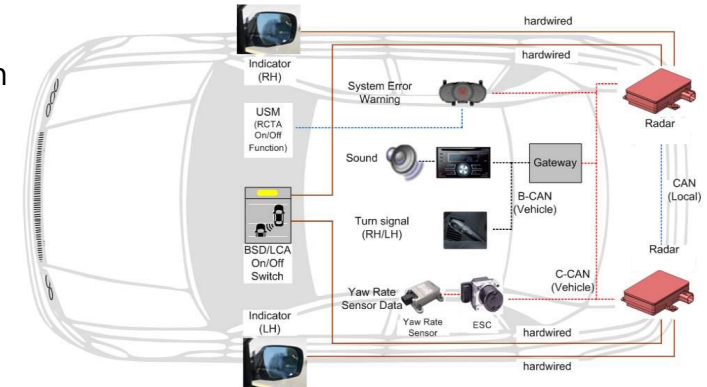
2-4. BCA (Departure)

- Warning (sound/on screen) and control (Braking) system that If there is a rear approaching object(Other vehicles, pedestrians and etc.) when vehicle is moving forward.

- Warning meth : LED lighting, alert sound
- Control method : Braking Control via ESC



<Scenario of posterolateral BCA(Departure)>



Activation condition

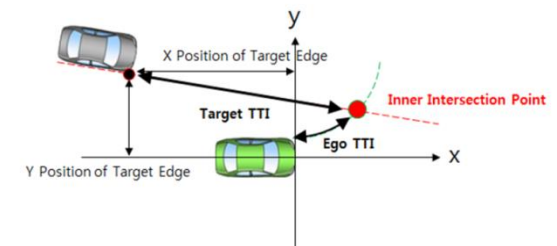
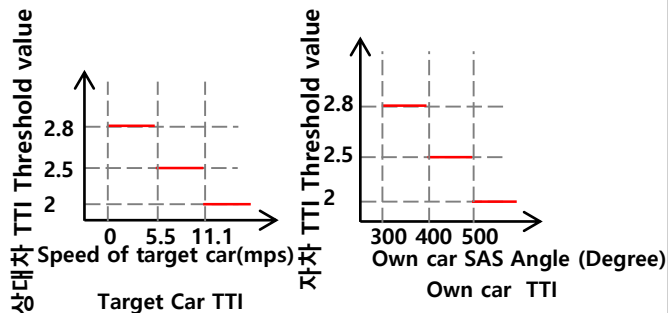
- Activated BCW, Own speed within 3kph.
- ESC normal operating.

Alarm zone

- Transverse : 2.5m from the center of own vehicle.
- longitudinal : 60m rearward from the front bumper.

Alarm and breaking condition

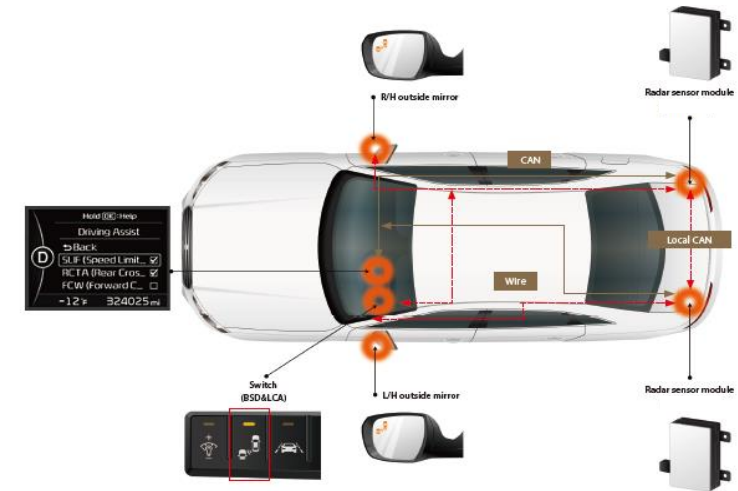
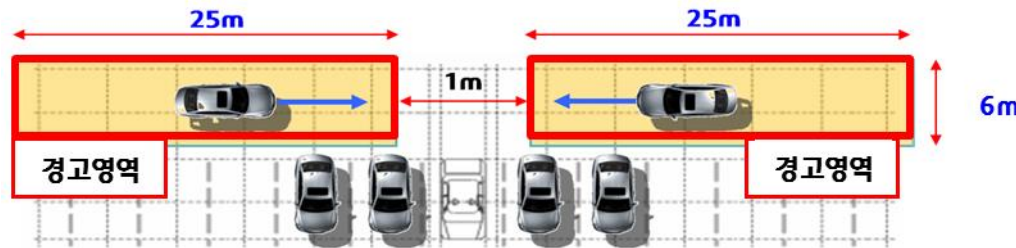
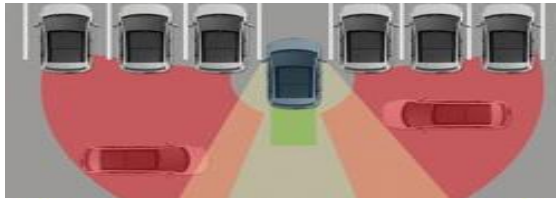
- Entered target car in warning area.
- Target TTI < Threshold value
- Ego TTI < Threshold value



2. Rear Radar Function Description

2-5. RCCW

- Providing warning to driver via detecting side approach vehicles when reversing
 - Warning meth : LED lighting, Cluster is on screen, alert sound



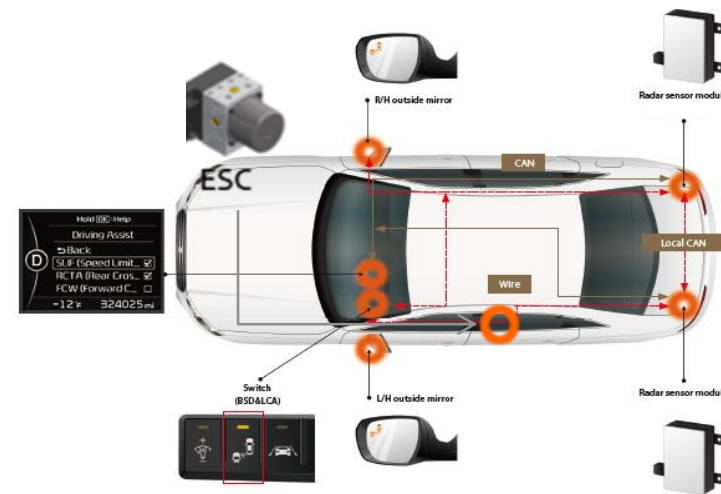
Function	■ Providing warning to driver via detecting side approach vehicles when reversing - Warning meth : LED lighting, Cluster is on screen, alert sound
Activation condition	• Gear is on Reverse, Own speed within 0kph ~ -10kph.
Alarm zone	• Transverse : 25m • longitudinal : 6m
Alarm condition	• Entered target car in warning area. • Relative velocity of target car within 4 ~ 60kph. • Estimated collision time with in 2.1~3.5sec (reversible depending on relative velocity of target car)

2. Rear Radar Function Description

2-6. RCCA

Function

- A system that detects side approach vehicles when reversing and warns and controls them to prevent accidents
- Warning meth : LED lighting, Cluster is on screen, alert sound
- Control method : Control method : Braking Control via ESC



Activation condition

- Reverse gear (Maintain operation at gear shift of N stage after RCCA operation at stage R)
- Not signed parking Brake.
- Own speed within 0kph ~ -10kph.
- ESC is normal operated and RCCA Brake is available to operate.

Alarm zone

- Transverse : Within 10m from the center of own car.
- longitudinal : From rear bumper end (0m) to within 6m.
- Driving angle difference with own car : within 55deg.

Alarm condition

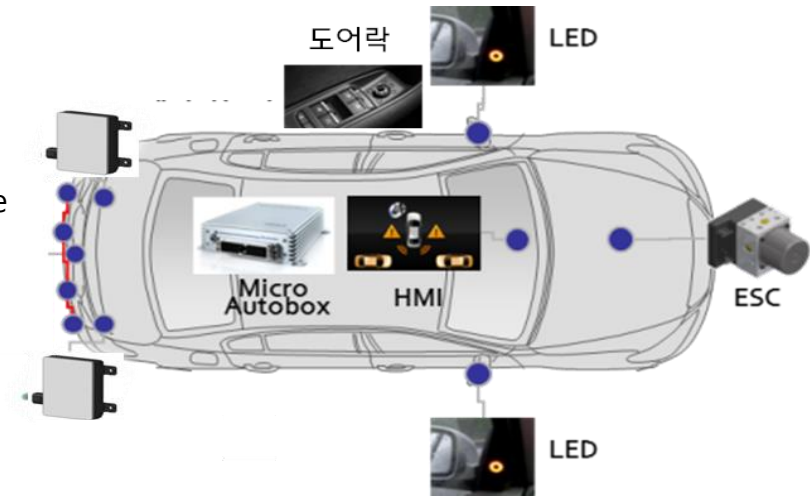
- Entered target car in warning area.
- Relative velocity of target car is above 5kph.
- Own vehicle intersection area arrival time 1sec and target car intersection area arrival time is below 2sec.

2. Rear Radar Function Description

2-7. SEA

Function

- Warning and control system to prevent accidents when passengers get off after the vehicle stops
 - Warning meth : LED lighting, alert sound
 - Control method : When passenger attempt to get off, locked the door-lock



Activation condition

- Within 10 minutes and 30 seconds from engine start.
- Own speed is below 3kph.

Alarm zone

- Transverse : Within 0.5 ~ 3+ (width / 2) m from the center line of own vehicle
- longitudinal : Vehicle satisfying TTC from rear end of rear bumper.
- Driving angle difference with own vehicle: Within ± 25 deg from the own vehicle center line

Alarm condition

- When the target vehicle reaches the end of the rear bumper of the vehicle for 3 seconds or less (within 3 seconds of TTC)

USA

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. CAUTION TO USERS Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Statement (MPE)

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Canada

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) L'appareil ne doit pas produire de brouillage; 2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure Statement (MPE)

The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times. This device must not be co-located or operating in conjunction with any other antenna or transmitter.