1. Concept & Outline

√ Increased visibility in Fog conditions

√ Keeping others on the road alert

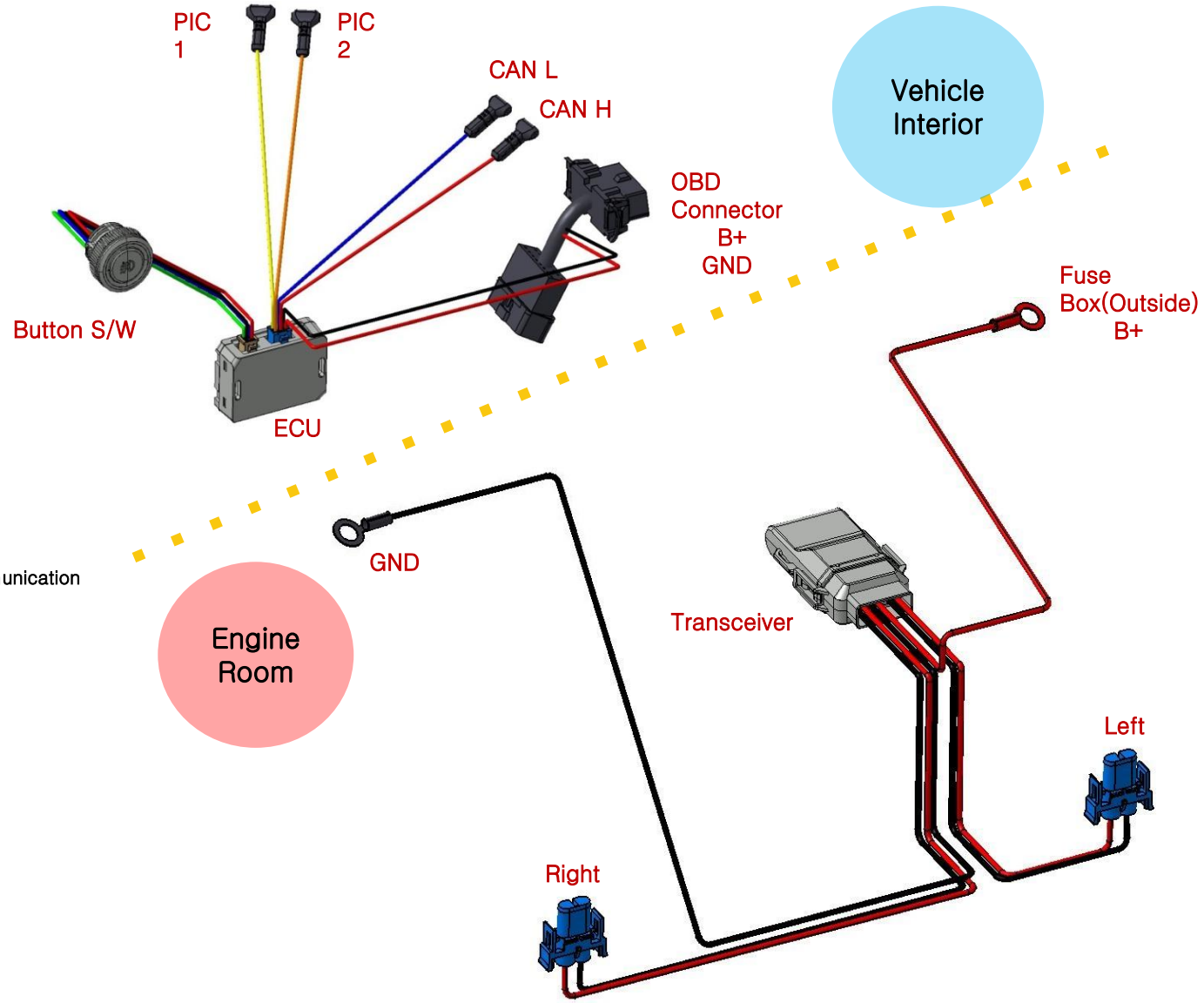
Easy installation design

√ Harness wire minimized using Wireless communication

√ Gained Reliability by minimized wire exposure

√ Car Protection / Additional sensing device

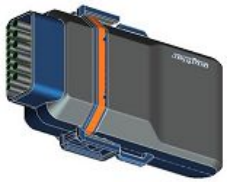
√ FOTA Support



2-1. Design Specification of System

Specifications	
Source Voltage	Vin 12V (Car Battery 12V)
Operating Temperature	-30 ~ 105℃ (ES95400-10) → Lamp Module -30 ~ 75℃ (ES95400-10) → ECU Module -30 ~ 85℃ (ES95400-10) → Button Module
Storage Temperature	-40 ~ 115℃ (ES95400-10) → Lamp Module -40 ~ 85℃ (ES95400-10) → ECU Module -40 ~ 95℃ (ES95400-10) → Button Module
Water proof	Applied (IP6K9K) → Lamp Module Not Applied → ECU Module Not Applied → Button Module
Communication Range	30m ~ 50m
Mounting Position	Perimeter of Head lamp→ Lamp Module Driver's lower dash Pannel→ ECU Module Driver's upper dash Pannel(Left,Right free space) Make a hole and Mounting→ Button Module

2-2. Design Specification of Each Module

	MAIN Controller	Engine Room Lamp Module	Button Module
Image			
RF	BLE4.2 / 2.4 ~ 2.48㎓ / 40CH	BLE4.2 / 2.4 ~ 2.48㎓ / 40CH	-
PCB	4Layer,FR4,1.2T,LF-HAL 32.5X47.3mm	4Layers, FR4, 1.6T	4Layer, FR4, 1.2T, LF-HAL, 32.5x47.3mm
F/W	BLE Protocol4.2 CAN Bus Protocol	BLE 4.2 Protocol	-
Communication encryption	AES128	AES128	-
Display	-	-	4EA (AMBER LED)
Button	-	-	1EA
UI	-	-	-
Voltage	Vehicle 12V	Vehicle 12V	3.3V (ECU Module)
Operation Temp.	-30℃ ~ +85℃	-30℃ ~ +105℃	-30℃ ~ +85℃
Antenna Type	Pattern	Pattern	-
Life time	-	-	-
Communication Range	50m (Max. Range)	50m (Max. Range)	-
Update solution	On-board Coding	On-board Coding	-
Surface treatment	부식+부분광택	TBD	부식+스프레이+레이져
Size/Weight	55.2 x 38.2 x 18.68T/ TBD	90.0 x 50.3 x 23T / TBD	Φ31.07X23.60 / 13g
Certification	FCC/IC	FCC/IC	-
Target sched.	2019’ May	2019’ May	2019’ May

3-1. Operating Principle [Strong Point]

Solution	Description	Advantage
Auto grade Wireless SoC	◆ Auto grade AEC-Q100 qualified (Grade 2 : -40 ~ 105℃) BLE SoC	**Reliability ↑**
Power Saving	◆ Minimal System IC applied ◆ Use of Bluetooth Low Energy Chipset for 2way communications	**Power Consumption ↓**
Connectivity	◆ Easy Connection to Smartphone w/o any additional device. - Device management - Diagnostic function - Upgrades	**Convenience ↑**
RF technology	◆ Reliable Wireless Communications with Bluetooth RF technology - Prevents frequency interference with Frequency hopping technique - Maintaining communication with auto reconnection solution	**Reliability ↑**
Security	◆ Secure communication of Bluetooth Low Energy (Based on AES128) ◆ Hard to physically scan channel due to Frequency Hopping Technique	**Security ↑**
Diagnostic	◆ Managing BLE Connection status and registration status ◆ Monitoring wireless transmitter-receiver operation in Engine room (Connection/Temperature, etc.) ◆ Monitoring Fog Lamp Relay status	**Reliability ↑**

3-2. Operating Principle [Button & UI]

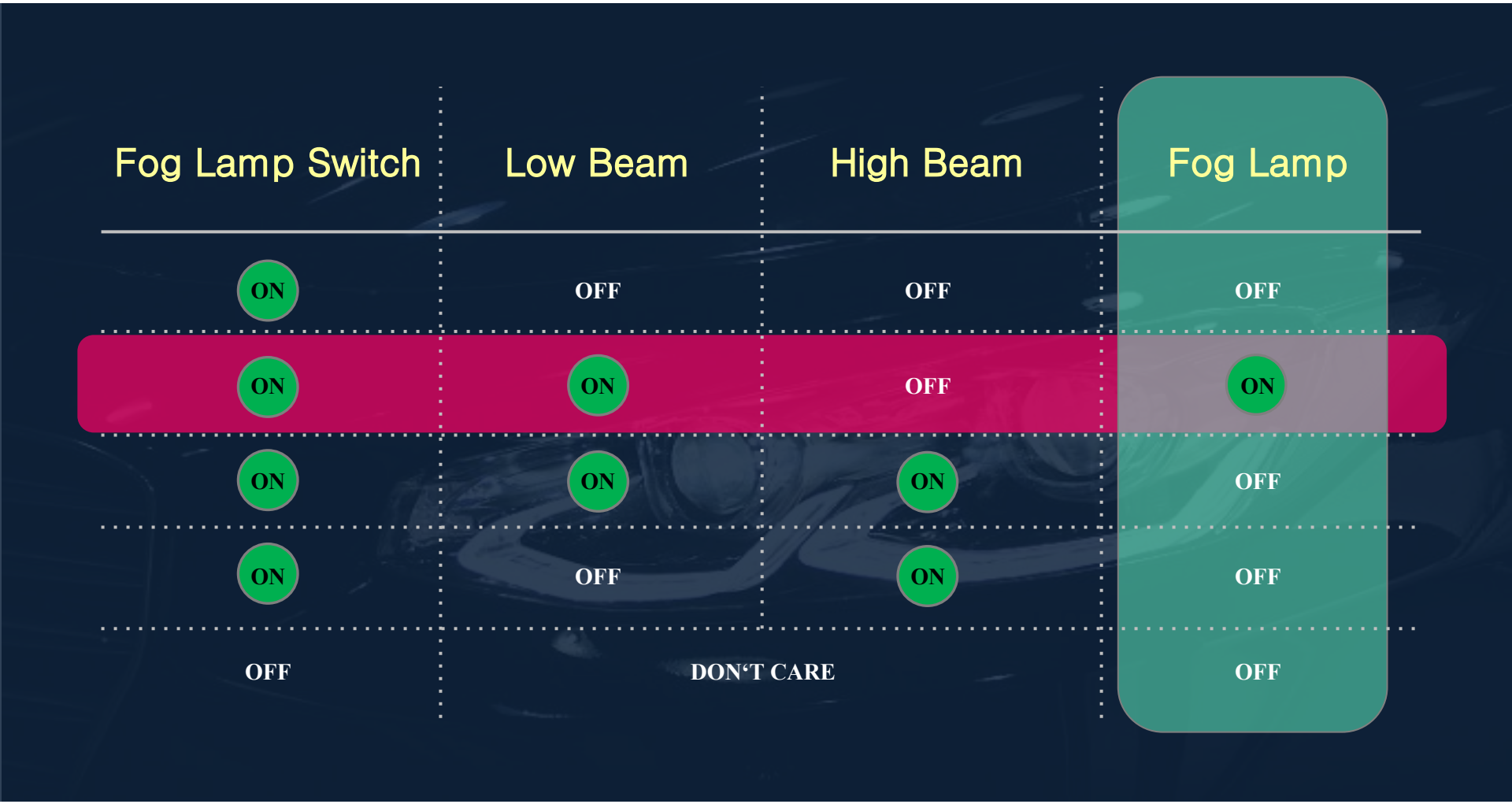
Button Functions

Short Tap	Long Tap(3sec)+Short Tap(5Times)
Fog Lamp On/Off	Bluetooth Paring

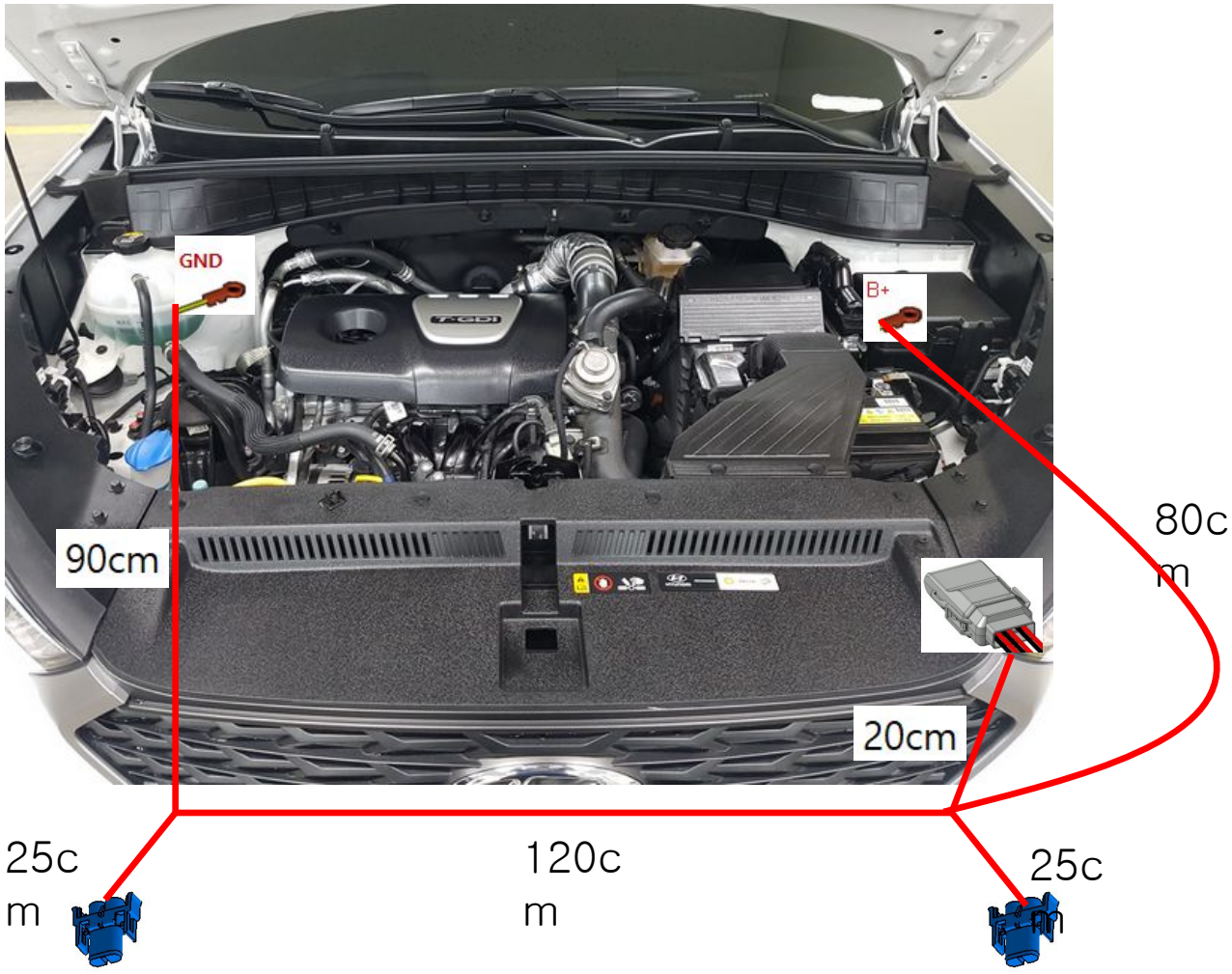
LED Functions

LED 표시 방식	ACC → IGN	Fog Lamp Switch ON	Error Code	ID Pairing
Fog Lamp	Dark AMBER	Strong AMBER	BLINK AMBER (500ms) On time Off time 500ms 500ms	BLINK AMBER (250ms) On time Off time 250ms 250ms

3-3. Operating Principle [Vehicle Lamp Condition]

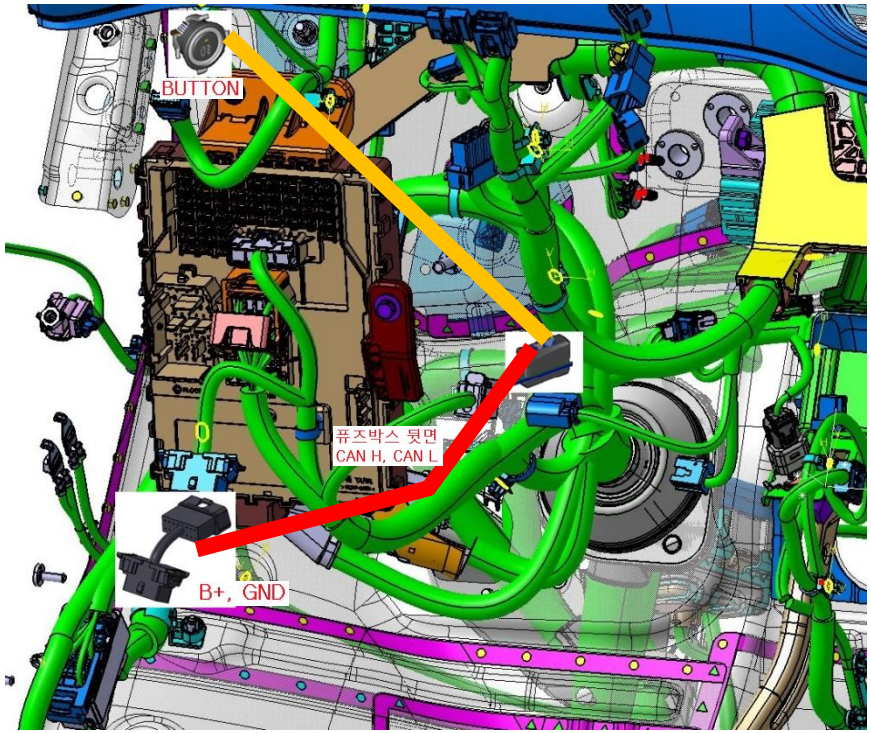


4-1. [Mounting Position of Lamp Module]

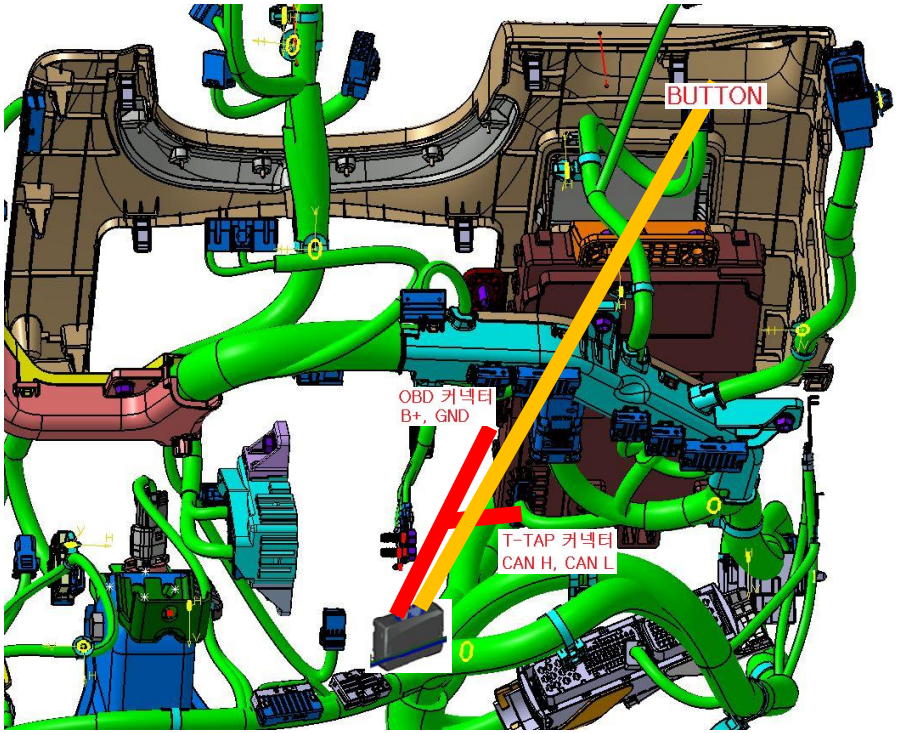


4-2. [Mounting Position of ECU Module]

[FRONT VIEW]

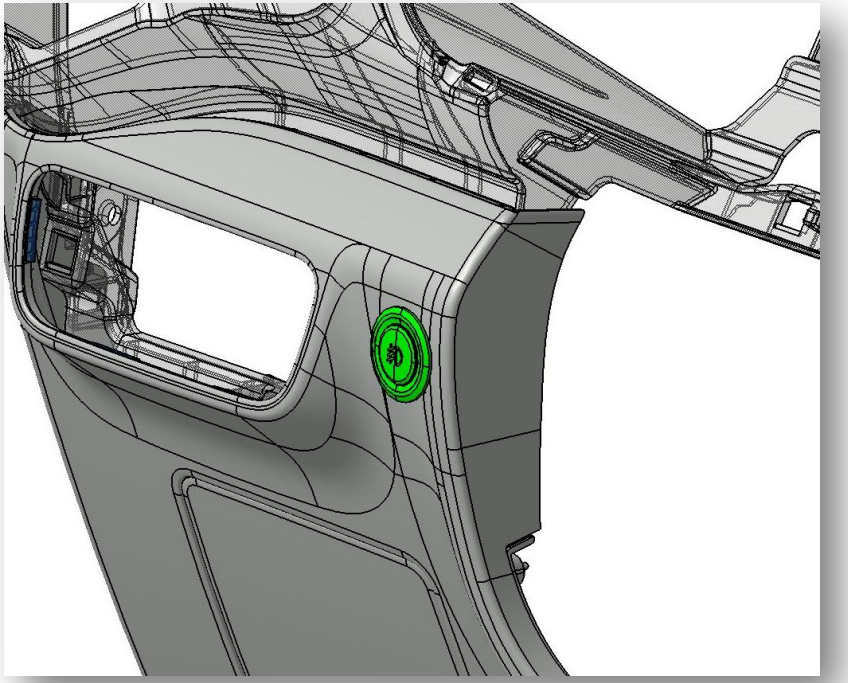


[BACK VIEW]



4-3. [Mounting Position of Button Module]

[FRONT VIEW]



[SIDE VIEW]