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Special Crash Investigations: On-Site Child Restraint System Crash Investigation; Vehicle: 2023 Hyundai Palisade; Location: Utah; Crash Date: November 2022

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16. Abstract This report documents the on-site investigation of a child restraint system (CRS) crash. A 2023 Hyundai Palisade with three children using CRSs was in a single-vehicle rollover crash on a north/south U.S. highway in Utah during daylight in November 2022. The driver was a belted 32-year-old female; the second-row left occupant was a 5-year-old male in a high-back booster seat and the vehicle's seat belt; the second-row right occupant was a 2-year-old male in a rear-facing CRS; the third-row left occupant was a 3-year-old female in a forward-facing CRS. The roadway ahead was congested with traffic and, according to police, the Hyundai driver steered right to avoid striking a vehicle ahead. According to the driver, she had a sudden loss of consciousness causing her to lose control. The Hyundai left the roadway on the right edge, overturned, and rolled one and three-quarter times and came to rest on its right side and facing east on the roadside. The driver sustained moderate to serious injuries and was transported to a hospital where she was admitted for 14 days. The 5-year-old male occupant sustained a minor injury and the other occupants were not injured. The three children were assessed for injuries on-scene by EMS responders; they were not transported. The Hyundai was towed due to disabling damage.			
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Special Crash Investigations
On-Site Child Restraint System Crash Investigation
Case No. DS23004
Vehicle: 2023 Hyundai Palisade
Location: Utah
Crash Date: November 2022

Background

This report documents the on-site investigation of a child restraint system (CRS) crash selected by the Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration. In January 2023, SCI headquarters notified the team of the crash and requested photos of the subject vehicle, a 2023 Hyundai Palisade (Figure 1). The team obtained the police report via the Police Accident Report Sampling Engine (PARSE) and obtained vehicle photos via an online auto auction. The police report said three children were using CRSs and auction photos showed a rear-facing CRS in the second row. The team submitted the photos to SCI and the case was assigned in January 2023. Permission to inspect the vehicle was obtained in January 2023 and the vehicle inspection was completed in February 2023. The Hyundai had an air bag control module with event data recorder capability supported by GIT Hyundai EDR tool and the crash data was imaged during the inspection. Police photos were obtained following the field inspections.

The crash occurred on a north/south U.S. highway in Utah during daylight in November 2022. The Hyundai driver was a belted 32-year-old female; the second-row left child was a 5-year-old male using a high-back booster seat in combination with the vehicle's lap and shoulder seat belt; the second-row right child was a 2-year-old male in a rear-facing CRS; and the third-row left child was a 3-year-old female in a forward-facing CRS.

The Hyundai was traveling northbound in the right lane. The roadway ahead was congested with traffic and, according to police, the Hyundai couldn't slow down to avoid colliding with the vehicle in front. According to the driver who was interviewed by SCI, she had a sudden loss of consciousness causing her to lose control. The Hyundai left the roadway on the right edge, rolled over one and three-quarter times and came to rest on its right side facing east on the roadside.

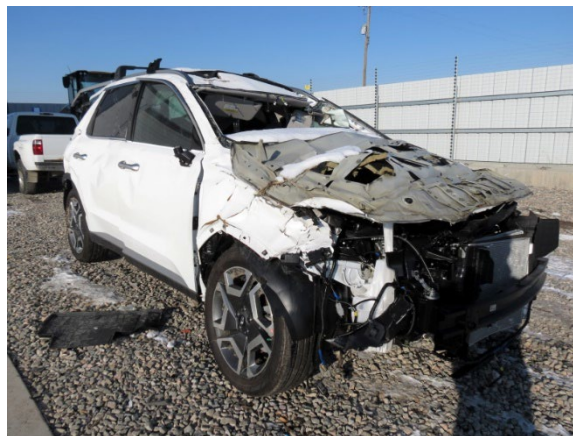


Figure 1. 2023 Hyundai Palisade

The Hyundai driver sustained moderate to serious injuries and was transported to a hospital where she was admitted for 14 days. The 5-year-old male sustained a minor injury and the other occupants were not injured. The three children were assessed for injuries on-scene by EMS responders; they were not transported or treated at a medical facility.¹ The Hyundai was towed due to disabling damage.

¹ The police report said the three children were transported to a hospital by their father. The interviewee stated the children were not transported or treated at a medical facility.

Summary

Crash Site

The crash occurred on a north/south U.S. highway in Utah in November 2022. The asphalt roadway had two lanes for each direction of travel and a center two-way turn lane (Figure 2). The lanes were separated by dashed white painted stripes. The roadway was bordered by raised concrete curbs and unpaved ground on the roadsides. It was straight and level and had a posted speed limit of 72 km/h (45 mph). The crash occurred during daylight under clear and dry conditions. A crash diagram is included at the end of this report.



Figure 2. Crash site looking north

Pre-Crash

The Hyundai was traveling northbound in the right lane at an EDR-reported vehicle speed of 66 km/h (41 mph) at time -5.0 seconds prior to algorithm enable (AE). The engine throttle was 100 percent full, accelerator pedal position was 99 percent full, the service brake was off, and steering input was 0°. Cruise control was off. According to the police report, traffic ahead became congested and the driver responded by steering right, causing a roadway departure. According to the Hyundai driver, she had a sudden loss of consciousness that caused her to lose control and leave the roadway on the right edge. Based on EDR data, the driver did not brake, and began steering right just prior to leaving the roadway on the right edge. EDR data is shown in table below.

Time (sec)	Speed	Throttle (percent)	Accelerator pedal position (percent)	Service Brake	Steering Input (deg)
-1	93 km/h (58 mph)	100	75	Off	10
0	90 km/h (56 mph)	54	91	Off	100

Crash

The crash included one event - the rollover. Following a clockwise rotation, the Hyundai's left side tires tripped on the ground, initiating a left-side-leading rollover. It rolled an estimated seven quarter-turns about its longitudinal axis before coming to rest on its right plane, facing east on the roadside (Figure 3). The estimated roll distance was 54 m (177 ft). It had combination roll-sensing/side-impact inflatable curtain (IC) air bags that deployed during the rollover, in addition to the driver's frontal and knee air bags, and the front and second-row seat-back mounted side-impact air bags. All occupants were belted or secured in CRSs and remained in their seated positions during the rollover.



Figure 3. 2023 Hyundai Palisade at final rest looking north (police photo)

Post-Crash

Law enforcement and EMS were called within one minute after the crash and arrived four minutes later. The husband and father of the Hyundai occupants worked across the street from the crash site and came to their aide immediately. The father and other responders removed the children from the vehicle. They were assessed for injuries on-scene by EMS responders and then taken home by their father. They were not transported or treated at a medical facility. The two CRSs were installed using LATCH and were left in the vehicle. The seat belt used by the 5-year-old male was cut by responders and the booster seat was discarded following the crash. The Hyundai driver was suspended by the seat belt webbing due to the vehicle's sideways orientation. A responder helped her unbuckle the belt and she remained in the front row of the vehicle while emergency responders cut open the roof over the front row to allow access. The driver was removed due to perceived serious injuries and transported by ambulance to a hospital. She was then transferred to a level 2 trauma center where she was admitted for 14 days. She then received home care for several weeks and continued with follow-up treatment as of August 2023. The Hyundai was towed due to disabling damage.

Per the driver's EMS medical records, following the crash she had an altered mental status and was combative, confused, and agitated. Her Glasgow coma scale score during transport was 13-14. The driver's hospital medical records said she had a history of chronic opiate use and dependence.

2023 Hyundai Palisade

Vehicle Description

The 2023 Hyundai Palisade was identified by the VIN KM8R4DGE2PUxxxxxx. The manufacture date was September 2022. The vehicle was purchased less than 3 weeks before that crash and the odometer reading was unknown. The EDR-reported ignition cycle at crash was 73. The Hyundai was a 5-door SUV with three rows of seats for eight passengers. It had a 6-cylinder, 3.8-liter gasoline engine and all-wheel drive. The vehicle manufacturer recommended size 245/50R20 tires with a cold tire pressure of 240 kPa (35 psi) for front and rear tires. It had Hankook Ventus S1 Noble 2 tires of the recommended size. The vehicle had a suite of driver safety features that included forward collision-avoidance assist, lane keeping assist, blind spot warning, driver attention warning, dynamic braking, and pedestrian automatic emergency braking. The driver did not recall any warnings or activations.

The vehicle had front bucket seats, second-row split bench seats with folding backs, and a third-row split bench seat with folding backs; all seats had adjustable head restraints. The driver's seat was between the forward-most and middle-track positions. The steering column had tilt and telescoping functionality; at the time of the inspection, it was full-up and full-forward.

Exterior Damage

The rollover caused direct and induced damage to all planes of the vehicle. The front bumper fascia, grille headlight assemblies, and trim were missing. The top layer sheet metal of the hood was missing and the bottom layer was crumpled. The fenders and quarter panels along with the hatch and roof panel were also crumpled. The OEM roof racks were fractured with pieces missing. The right front wheel was restricted and the right wheelbase was reduced by 8 cm (3.1 in). The left and right side view mirrors were fractured and missing. Emergency responders cut away part of the roof during extrication of the driver.

The greenhouse was crushed laterally and vertically. The right rear aspect of the greenhouse exhibited the most severe lateral and vertical crush (Figure 4). Maximum lateral crush to the greenhouse was located at the upper aspect of the right D-pillar and measured 15 cm (5.9 in). Maximum vertical crush was located at the right backlight header at 22 cm (8.7 in) aft of the right rear axle and measured 20 cm (7.9 in). The collision deformation classification (CDC) for the Hyundai in Event 1 was 00TDDO3.



Figure 4. Greenhouse crush damage 2023 Hyundai Palisade

Child Restraint Systems

Graco Booster Safety Seat

The police report said the second-row left position 5-year-old child was using a child restraint. Per the driver interview, this child was using a forward-facing Graco high-back belt positioning booster seat in combination with the vehicle's lap and shoulder seat belt. The model, specifications, and other data were unknown; it was disposed of following the crash. The seat belt for this seat position was cut by emergency responders, and the latch plate was found inserted into the buckle. An aftermarket Safe-Fit seat liner intended to be placed between a CRS and vehicle seat back and cushion was found in the vehicle; it had been installed at this seat position.

The driver said that, per the HBB labeling and instructions, the booster seat was appropriate for the occupant's age and weight. The child was a 5-year-old male who weighed 18 kg (40 lb); his height was unknown. Based on the parameters for Graco high-back booster seats,² the HBB appeared to be appropriate for this child.

Graco SlimFit 3-in-1

The second-row right position child was using a Graco SlimFit 3-in-1 convertible CRS with a 5-point harness system (Figure 5). It was model number 1999656JJ with a manufacture date of October 9, 2020. It was installed rear-facing using LowerAnchors and Tethers for Children (LATCH) lower anchors. There was no slack at the attachment points and the CRS was held firmly on the vehicle seat. The upper tether was stowed on the back side of the CRS shell. According to the labeling instructions, the upper tether is not required when the seat is used rear-facing. The recline adjustment setting was appropriate for a rear-facing installation. The adjustable headrest was set in the lower position. The harness shoulder straps were in the lower position and the crotch strap was in the forward-most slot. The CRS did not reveal any crash-related damage or evidence of occupant loading. Padded infant inserts were installed at the headrest and seating areas. An aftermarket Safe-Fit seat liner was installed between the CRS and the vehicle seat back and cushion.

Labeling on the seat stated that a child weighing 5 to 40 lb (2.3 to 18 kg) can use this seat rear-facing, and a child weighing less than 22 lb (10 kg) and less than 1 year old must only use it rear-facing. The harness shoulder straps must be at or just below the child's shoulders and the top of the head must be at least 1 in (2.5 cm) below the red handle at the top of the headrest. The occupant using this CRS was a 2-year-old male who weighed 9 kg (20 lb); his height at the time of the crash was unknown. The child had a premature birth and his height and weight were below average. Based on the parameters for using this CRS rear-facing with LATCH installation, it appeared to be appropriate for the occupant.

² Graco TurboBooster, Graco AFFIX



Figure 5. Graco SlimFit 3-in-1 CRS

Maxi-Cosi Pria 3-in-1

The child in the third-row left position was using a Maxi-Cosi Pria 3-in-1 convertible CRS with a 5-point harness system (Figure 6). It was model number CC244-FGF with a manufacture date of 12/22/2020. It was installed in a forward-facing orientation using LATCH lower anchors. There was no slack at the attachment points and the CRS was held firmly in the vehicle seat. The upper tether was stowed on the back side of the CRS shell. According to the labeling instructions, the upper tether should be used when the seat is used forward-facing. A tether anchor was available on the vehicle seat back for this position. The adjustable headrest and harness shoulder straps were in a middle position and the crotch strap was in the forward-most slot. The CRS did not reveal any crash-related damage or evidence of occupant loading. An aftermarket Summer vehicle seat liner was installed between the CRS and the vehicle seat back and cushion.

Labeling on the seat stated a forward-facing installation was appropriate for children weighing 22 to 65 lb (10.1 to 29 kg), 29 to 49 in (73.6 to 125 cm) tall, and at least 1 year old. Labeling specified that a LATCH lower anchor installation was intended for children weighing up to 40 lb (18 kg), and a seat belt (lap or lap and shoulder) installation was intended for children weighing up to 65 lb (29 kg). The child using this CRS was a 3-years-old female who weighed 16 kg (35 lb); her height was unknown. Based on the parameters for using this CRS forward-facing with LATCH installation, it appeared to be appropriate for the occupant.



Figure 6. Maxi-Cosi Pria 3-in-1 CRS

Rollover Discussion

According to NHTSA's five-star rating system,³ the Hyundai had a NHTSA rollover rating of four stars (out of a possible five stars). A rollover resistance test was used to measure the risk of rollover in a single-vehicle, loss-of-control scenario; the results for this vehicle was a rollover risk of 14.3%.

The Insurance Institute for Highway Safety gave the 2022 Palisade (same body style as the 2023 model) a "good" (highest) rating for roof strength.⁴ During testing, the peak strength-to-weight ratio recorded at any time before the roof is crushed 5 inches is the key measurement of roof strength. A good rating requires a strength-to-weight ratio of at least 4. The roof must withstand a force of at least 4 times the vehicle's weight before the plate crushes the roof by 5 inches. The strength-to-weight ratio for this vehicle was 4.63.

The Hyundai had the following passenger restraint systems designed to deploy in rollover crashes.

- Front-row seat belt retractor pretensioners. The pretensioners actuated during the rollover event.
- IC air bags, with an inflation duration of 6 seconds. The left and right IC air bags deployed in the rollover.

The rollover followed a roadway departure. It appears the driver steered to the right to avoid striking a vehicle ahead. Based on EDR-reported data, no pre-rollover braking occurred. The vehicle appears to have tripped on unpaved ground after departing the roadway. It rolled in a left-side-leading, counterclockwise rotation along its longitudinal axis in a northeast trajectory. After rolling an estimated seven quarter-turns, it came to rest on its right side and facing eastbound. The estimated roll distance was 65 m (213 ft).

³ www.nhtsa.gov/vehicle/2023/HYUNDAI/PALISADE/SUV/AWD#safety-ratings-rollover

⁴ www.iihs.org/ratings/vehicle/hyundai/palisade-4-door-suv/2022#roof-strength

Event Data Recorder

The Hyundai had an air bag control module with EDR capability. Using the direct-to-module method with the GIT Hyundai EDR tool, the crash data was imaged during the vehicle inspection. The tool generated a PDF file. The report captured 1 deployment event record (Event 1). The EDR report included pre-crash, deployment, post-crash, and velocity change data; it reported lateral and longitudinal crash pulse data, and rollover and vertical crash pulse data. It said the vehicle's forward collision warning avoidance assist system was on, and its smart cruise control system was off. The last 2 seconds of the pre-crash data is shown in the following table. The complete EDR report is included in Appendix A of this report.

Time (sec)	Speed	Throttle (percent)	Accelerator pedal position (percent)	Service Brake	Steering Input (deg)
-1	93 km/h (58 mph)	100	75	Off	10
0	90 km/h (56 mph)	54	91	Off	100

Interior Damage

The Hyundai had interior damage caused by impact forces, integrity loss, air bag deployments, and post-crash extrication efforts. The windshield was fractured and missing, the rear hatch was jammed shut and the backlight was disintegrated, the left front window glazing was fractured and in place, the right rear window glazing, rear of the C-pillar, was disintegrated, and part of the roof was cut away by emergency responders while extricating the driver. The front-row seat belts were extended and locked in place by pretensioner actuation and the second-row left seat belt was cut by responders. Eight of nine available air bags deployed.

The front and third rows of the passenger compartment were reduced by vertical and lateral intrusions. The front row was reduced by vertical intrusion of the left (11 cm [4.3 in]) and middle (5 cm [2.0 in]) windshield header; it was reduced by lateral intrusion of the left A-pillar (5 cm [2.0 in]). There was also intrusion of the front-row left roof. The third row was reduced by vertical intrusion of the right (24 cm [9.4 in]) and middle (15 cm [5.9 in]) roof, and the right roof side rail (10 cm [3.9 in]); by longitudinal intrusion of the right (26 cm [10.2 in]) and middle (11 cm [4.3 in]) backlight header; and by lateral intrusion of the right side panel (15 cm [5.9 in]).

Manual Restraint Systems

The four Hyundai occupants were either belted or using CRSs at the time of the crash. The vehicle had lap and shoulder seat belts for all seat positions. The EDR report said the driver's belt was "on," and police report stated the driver was belted. The driver's belt was locked in the unspooled position by the actuated pretensioner. Seat belts with emergency locking retractor/automatic locking retractor (ELR/ALR) and LATCH (lower anchors and tethers for children) were installed for the second and third-row seat positions. The second-row left position seat belt was cut by responders and the latch plate was found inserted into the buckle. Per the driver interview, the occupant in this seat was using the lap and shoulder belt in combination with a Graco HBB. An unknown make/model aftermarket silicone buckle attachment was found installed on the buckle; it was intended to prevent a child from unbuckling the belt. The CRSs used by occupants in the second-row right and third-row left positions were installed using LATCH and the seat belts at those positions were not used.

Supplemental Restraint Systems

The Hyundai had frontal and seat-mounted side-impact air bags for the front row, a knee air bag for the driver, seat-mounted side-impact air bags for the second row, and combination side-impact/roll-sensing IC air bags for all three rows. The IC air bags were deployable in rollover crashes and had an inflation duration of six seconds. Eight of the nine available air bags deployed in this crash; only the front passenger's frontal air bag did not deploy. All four of the occupants were seated adjacent to a deployed IC air bag during the rollover, and the front and second-row occupants were seated adjacent to deployed seat-mounted side-impact air bags.

NHTSA Recalls and Investigations

A VIN-based NHTSA recall search queried in February 2023 revealed no unrepaired recalls for this vehicle. A search queried on September 2023 revealed one unrepaired recall issued in March 2023 regarding windshield wiper operation (NHTSA Recall Number 23V180000).

2023 Hyundai Palisade Occupants

Driver Demographics

Age/sex:	32 years/female
Height:	170 cm (67 in)
Weight:	85 kg (187 lb)
Eyewear:	None
Seat type:	Bucket with adjustable head restraint
Seat track position:	Between forward-most and middle
Manual restraint usage:	Lap and shoulder belt available, used
Usage source:	Vehicle inspection, EDR, police report, interview
Air bags:	Frontal, knee, seat-mounted side-impact, and IC air bags available; all deployed
Alcohol/drug data:	Positive for benzodiazepine, alpha-hydroxymidazolam, THC, hydromorphone, fentanyl
Egress from vehicle:	Removed due to perceived serious injuries and orientation of vehicle
Transport from scene:	Ambulance to hospital, then transferred to level 2 trauma center
Type of medical treatment:	Admitted for 14 days; home care for several weeks; follow-up treatment continued through August 2023

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Fracture, “burst,” T3 spine	650436.3	Seat cushion	Possible
2	Fracture, right pedicle extending to right foramen; right facet; posterior arch; posterior process; C5 spine	650217.2	Seat cushion	Possible
3	Fracture, complex, right transverse process, posterior process, foramen, right facet, C6 spine	650217.2	Seat cushion	Possible
4	Fracture C7 superior facet.	650204.2	Seat cushion	Possible
5	Fracture, compression, superior endplate, T2 spine	650432.2	Seat cushion	Possible

Source: medical records

Driver Kinematics

The belted driver was actively steering the vehicle prior to the roadway departure and rollover. During the rollover, four air bags at the driver's seat position deployed and her seat belt pretensioner actuated. She was displaced in several directions during the rollover and remained in her seated position. The driver sustained compression-related injuries to the cervical and thoracic spine, ranging in severity from moderate to severe. The sources for these injuries appears to be occupant interaction with the seat belt and seat cushion. The driver stated during the interview that due to her loss of consciousness she had no muscle control, which contributed to the severity of her injuries.

Second-Row Left Occupant Demographics

Age/sex:	5 years/male
Height:	Unknown
Weight:	18 kg (40 lb)
Eyewear:	None
Seat type:	Split bench with folding backs
Seat track position:	Not adjustable
Manual restraint usage:	Lap and shoulder belt available; used with Graco high-back booster
Usage source:	Vehicle inspection, police report, interview
Air bags:	IC and seat-mounted side-impact air bag available; both deployed
Egress from vehicle:	Removed by responders due to age
Transport from scene:	Taken home by father
Type of medical treatment:	Treated on scene, no transport

Second-Row Left Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Abrasion, face (right ear)	210202.1	Flying glass	Possible

Source: driver interview

Second-Row Left Occupant Kinematics

The second-row left occupant was using the lap and shoulder seat belt in combination with a forward-facing BSS. When the vehicle tripped, the occupant's left IC and seat-mounted side-impact air bags deployed. During the rollover, the occupant remained in his seated position but was displaced in multiple directions due to the rollover dynamics.

Second-Row Right Occupant Demographics

Age/sex:	2 years/male
Height:	Unknown
Weight:	9 kg (20 lb)
Eyewear:	None
Seat type:	Split bench with folding backs
Seat track position:	Not adjustable
Manual restraint usage:	CRS installed rear-facing using LATCH
Usage source:	Vehicle inspection, police report, interview
Air bags:	IC and seat-mounted side-impact air bag available; both deployed
Egress from vehicle:	Removed by responders due to age
Transport from scene:	Taken home by father
Type of medical treatment:	Treated on scene, no transport

Second-Row Right Occupant Injuries

The occupant was not injured in the crash.

Second-Row Right Occupant Kinematics

The second-row right occupant was using a rear-facing CRS with a 5-point harness system. When the vehicle tripped, the occupant's right IC and seat-mounted side-impact air bags deployed. During the rollover, the occupant remained in his seated position but was displaced in multiple directions due to the rollover dynamics. The vehicle completed an estimated seven quarter-turns and came to rest on its right side. The occupant was removed from the vehicle by his father and other responders. He was assessed on-scene by EMS responders and then driven home by his father. The occupant was not transported or treated at a medical facility.

Third-Row Left Occupant Demographics

Age/sex:	3 years/female
Height:	Unknown
Weight:	16 kg (35 lb)
Eyewear:	None
Seat type:	Split bench with folding backs
Seat track position:	Not adjustable
Manual restraint usage:	CRS installed forward-facing using LATCH
Usage source:	Vehicle inspection, police report, interview
Air bags:	IC air bag available, deployed
Egress from vehicle:	Removed by responders due to age
Transport from scene:	Taken home by father
Type of medical treatment:	None

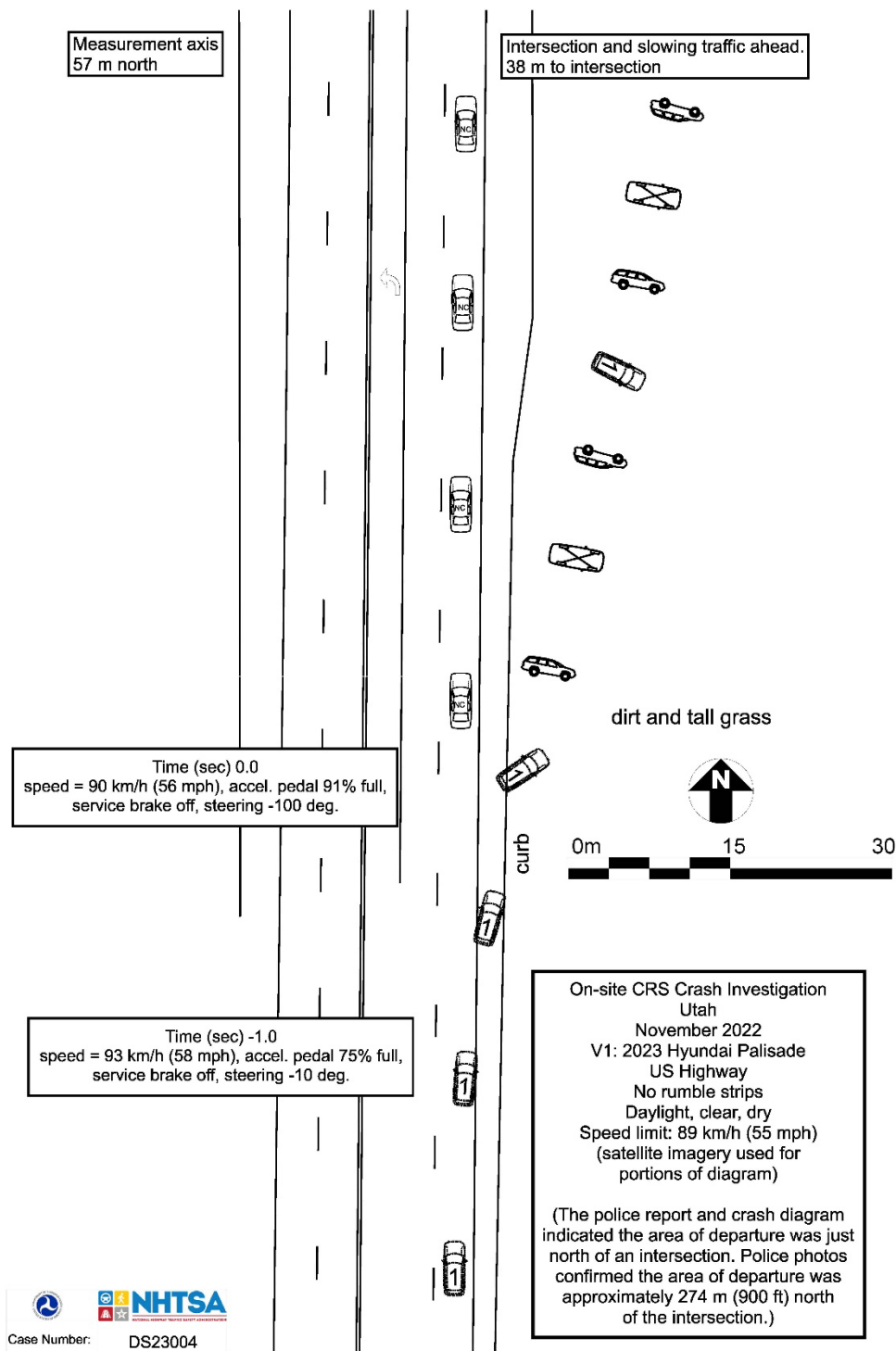
Third-Row Left Occupant Injuries

The occupant was not injured in the crash.

Third-Row Left Occupant Kinematics

The third-row left child was using a forward-facing CRS with a 5-point harness system. When the vehicle tripped, her left IC air bag deployed. During the rollover, she remained in her seated position but was displaced in several directions due to the rollover dynamics. The vehicle completed an estimated seven quarter-turns and came to rest on its right side. She was removed from the vehicle by her father and other responders. She was assessed on-scene by EMS responders and then driven home by her father. The child was not transported or treated at a medical facility.

Crash Diagram



Appendix A: Event Data Recorder Report – 2023 Hyundai Palisade⁵

⁵ The EDR report in this report was imaged using the current version of the Hyundai GIT EDR software at the time of the vehicle inspection.



▣ Vehicle Information

HYUNDAI PALISADE(LX2) 2023 AIR BAG SYSTEM	
VIN as Programmed into EMS	

▣ Additional Information

User-entered VIN	KM8R4DGE2PUxxxxxx
User Name	
Case Number	
Crash Date	
Saved-on Date	2023-02-02 15:56
EDR Tool Version	E-P-H-01-00-0054
EDR Report Version	EDR002-R01
Tire Size(s)	
Memo	

■ Data Limitation

General Information:

Tools for downloading and interpreting the EDRs in Hyundai vehicles have been developed for vehicles produced after September 1, 2012. Currently, there is no tool for downloading and accurate interpreting data from the EDRs in Hyundai vehicles produced prior to this date.

The EDR Report requires Adobe Reader Version 9.00 or higher to open.

EDR(Event Data Recorder):

- The EDR function is part of the Air bag Control Unit(ACU).
- ACU can store up to two events.
- Event means a crash or other physical occurrence that causes the trigger threshold to be met or exceeded, or any non-reversible deployable restraint to be deployed, whichever occurs first:
 1. Deployment Event:
 - 1) the event which is recorded if an air bag is commanded to deploy.
 - 2) the event is locked and cannot be overwritten.
 2. Non-deployment Event:
 - 1) the event which is recorded, but in which an air bag is not commanded to deploy
 - 2) the event is not locked and can be overwritten by a subsequent event (Deployment or Non-deployment event), for example, Pretensioner(s) only deployment
 - 3) An example of a non-deployment event is a pretensioner-only deployment with no air bag deployments
- Ignition cycle count will increment by 1 in the following cases
 1. the power mode change from OFF/Accessory to IGN ON/RUN
 2. EDR data download by tools
- The ACU can record data for all or some of the following events. But, depending on the vehicle's configurations, data for side crash and/or rollover crash(event) may not be recorded.
- If power supply to the ACU is lost during an event, all or part of the data may not be recorded.

Data Limitation

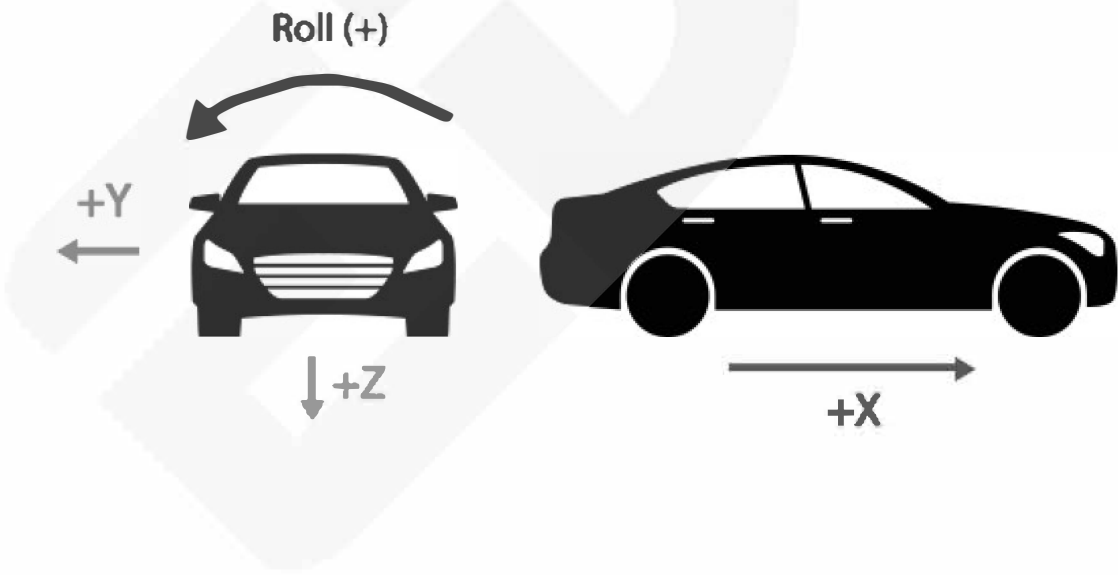
Data Element Sign Convention:

The following table provides an explanation of the sign notation for data elements that may be included in the EDR report. Directional references to sign convention are from the point of view of the driver.

Data element name	Positive sign	Note
* Longitudinal acceleration	Forward direction	+X at the figure 1
Delta V, longitudinal	Forward direction	+X at the figure 1
Lateral acceleration	Left to Right direction	+Y at the figure 1
Delta V, lateral	Left to Right direction	+Y at the figure 1
Normal(vertical) acceleration	Downward direction	+Z at the figure 1
Vehicle roll angle	Clockwise about the longitudinal axis	Roll(+) at the figure 1
Steering input	Counterclockwise rotation	-

* The forward direction of longitudinal acceleration for front side impact sensor may be different for each vehicle

Figure 1. Sign Conventions



Data Limitation

Data Sources:

Many EDR data elements are sourced from other control modules in the vehicle.

1. Most of them can be measured and calculated by the ACU. For example, Delta-V and Rollover angle can be calculated from internal sensors in the ACU (if applicable).
2. The following pre-crash data can be transmitted to the ACU via the vehicle's communication network.
 - Speed, Vehicle indicated
 - Engine rpm
 - Engine Throttle, % full
 - Acceleration Pedal
 - Master cylinder pressure
 - Service Brake, on/off
 - Anti-lock braking system activity
 - Stability Control
 - Steering Input
 - Gear shift selector display
 - Smart Cruise Control information (Set Speed)
 - Smart Cruise Control information (SPEED UNIT)
 - Smart Cruise Control information (Mode status)
 - Smart Cruise Control information (Fail info)
 - Forward Collision-Avoidance Assist (Function status)
 - Forward Collision-Avoidance Assist (Warning Level)
 - Forward Collision-Avoidance Assist (Fail info)
 - Forward Collision-Avoidance Assist-JC (Function status)

*Note) Depending on the vehicle's configuration and the conditions described above, some items may not be recorded.
3. Pre-crash data is recorded in discrete intervals. Due to different refresh rates within the vehicle's electronics, the data recorded may be asynchronous to each other.

Data Limitation

Data Definitions:

- Data recorded by the ACU and imaged by the EDR tool is displayed relative to Time zero(T0). Time zero(T0) is not typically the time at which the vehicle made contact with another vehicle or object.
- Time zero (T0) means whichever of the following occurs first
 1. For systems with “wake-up” air bag control systems, the time at which the occupant restraint control algorithm is activated; or
 2. For continuously running algorithms,
 - 1) The first point in the interval where a longitudinal cumulative delta-V of over 0.8 km/h (0.5 mph) is reached within a 20msec time period; or
 - 2) For vehicles that record “delta-V, lateral,” the first point in the interval where a lateral cumulative delta-V of over 0.8 km/h (0.5 mph) is reached within a 5msec time period; or
 3. Deployment of a non-reversible deployable restraint.
- Multi-event crash means the occurrence of 2 events, the first and last of which begin not more than 5 seconds apart. If an event is not part of a multi-event crash, the value of this data element will be “1”.
- Service brake, on or off means the status of the device that is installed in or connected to the brake pedal system to detect whether the pedal was pressed. The device can include the brake pedal switch or other driver-operated service brake control,
- Engine RPM means
 1. For vehicles powered by internal combustion engines, the number of revolutions per minute of the main crankshaft of the vehicle's engine, and
 2. For vehicles not entirely powered by internal combustion engines, the number of revolutions per minute of the motor shaft at the point at which it enters the vehicle transmission gearbox.
- Engine Throttle is a measure of the throttle position.
- Accelerator Pedal is a measure of the accelerator pedal value.
- Seat belt status is determined by whether the buckle switch is open or closed.
- Delta-V means the cumulative change in velocity, and is calculated from internal sensors in the ACU
- 'Invalid data' means
 1. The data sources sent invalid data
 2. The data sources did not send data
 3. The data does not be recorded depending on design standard
 4. The data could not be recorded in some conditions such as the loss of power in vehicle
- 'Not supported' means : The system is not applied in that vehicle
- Master Cylinder Pressure means a measure of how deeply the brake pedal value was pressed.
- Gear Shift Selector Display means selected gear information.
- Smart Cruise Control system information means its set speed/speed unit/mode status/fail information.
- Forward Collision-avoidance Assist system information means its function status/warning level/fail information.
- Forward Collision-avoidance Assist-Junction system information means its function status.

■ EDR Information

Part No. (EOL Code) as programmed into ACU	95910S8520 (S856)
ECU SW Version as programmed into ACU	1.01
EDR Version as programmed into ACU	0422

< Event 1 >

Event Status at Event

Multi-event crash, number of Event	1 event
Time from event 1 to 2 [ms]	0
Completed File Recorded (Yes or No)	YES
Ignition cycle, crash [cycle]	73
Ignition cycle, download [cycle]	74

Pre-Crash Information 1(-5 ~ 0 sec)

Time (sec)	Speed, Vehicle indicated [km/h]	Engine rpm [rpm]	Engine Throttle, % full [%]	Acceleration Pedal, % full [%]	Master cylinder pressure [bar]	Service Brake, on/off	Anti-lock braking system activity	Stability Control	Steering Input [deg]
-5.0	66	5100	100	99	0.0	OFF	OFF	ON	0
-4.5	72	5500	100	99	0.0	OFF	OFF	ON	0
-4.0	76	5900	46	49	0.0	OFF	OFF	ON	0
-3.5	80	6100	42	52	0.0	OFF	OFF	ON	0
-3.0	82	5800	50	53	0.0	OFF	OFF	ON	0
-2.5	85	4200	45	59	0.0	OFF	OFF	ON	0
-2.0	89	4400	100	70	0.0	OFF	OFF	ON	-5
-1.5	93	4600	100	69	0.0	OFF	OFF	ON	0
-1.0	93	4100	100	75	0.0	OFF	OFF	ON	-10
-0.5	101	3800	100	92	0.0	OFF	OFF	ON	20
0.0	90	4200	54	91	0.0	OFF	OFF	ON	-100

Pre-Crash Information 2 (-5 ~ 0 sec)

Time (sec)	Gear shift selector display	Smart Cruise Control information (Main switch status)	Smart Cruise Control information (Set Speed)	Smart Cruise Control information (SPEED UNIT)	Smart Cruise Control information (Mode status)	Smart Cruise Control information (Fail info)
-5.0	D	OFF	0	MPH	Ready	System without Error
-4.5	D	OFF	0	MPH	Ready	System without Error
-4.0	D	OFF	0	MPH	Ready	System without Error
-3.5	D	OFF	0	MPH	Ready	System without Error
-3.0	D	OFF	0	MPH	Ready	System without Error
-2.5	D	OFF	0	MPH	Ready	System without Error
-2.0	D	OFF	0	MPH	Ready	System without Error
-1.5	D	OFF	0	MPH	Ready	System without Error
-1.0	D	OFF	0	MPH	Ready	System without Error
-0.5	D	OFF	0	MPH	Ready	System without Error
0.0	D	OFF	0	MPH	Ready	System without Error

Pre-Crash Information 3 (-5 ~ 0 sec)

Time (sec)	Forward Collision-Avoidance Assist (Function status)	Forward Collision-Avoidance Assist (Warning Level)	Forward Collision-Avoidance Assist (Fail info)	Time (sec)	Forward Collision-Avoidance Assist (Function status)	Forward Collision-Avoidance Assist (Warning Level)	Forward Collision-Avoidance Assist (Fail info)
-5.0	ON	No Warning / Invalid or Not supported	Normal	-2.5	ON	No Warning / Invalid or Not supported	Normal
-4.9	ON	No Warning / Invalid or Not supported	Normal	-2.4	ON	No Warning / Invalid or Not supported	Normal
-4.8	ON	No Warning / Invalid or Not supported	Normal	-2.3	ON	No Warning / Invalid or Not supported	Normal
-4.7	ON	No Warning / Invalid or Not supported	Normal	-2.2	ON	No Warning / Invalid or Not supported	Normal
-4.6	ON	No Warning / Invalid or Not supported	Normal	-2.1	ON	No Warning / Invalid or Not supported	Normal
-4.5	ON	No Warning / Invalid or Not supported	Normal	-2.0	ON	No Warning / Invalid or Not supported	Normal
-4.4	ON	No Warning / Invalid or Not supported	Normal	-1.9	ON	No Warning / Invalid or Not supported	Normal
-4.3	ON	No Warning / Invalid or Not supported	Normal	-1.8	ON	No Warning / Invalid or Not supported	Normal
-4.2	ON	No Warning / Invalid or Not supported	Normal	-1.7	ON	No Warning / Invalid or Not supported	Normal
-4.1	ON	No Warning / Invalid or Not supported	Normal	-1.6	ON	No Warning / Invalid or Not supported	Normal
-4.0	ON	No Warning / Invalid or Not supported	Normal	-1.5	ON	No Warning / Invalid or Not supported	Normal
-3.9	ON	No Warning / Invalid or Not supported	Normal	-1.4	ON	No Warning / Invalid or Not supported	Normal
-3.8	ON	No Warning / Invalid or Not supported	Normal	-1.3	ON	No Warning / Invalid or Not supported	Normal
-3.7	ON	No Warning / Invalid or Not supported	Normal	-1.2	ON	No Warning / Invalid or Not supported	Normal
-3.6	ON	No Warning / Invalid or Not supported	Normal	-1.1	ON	No Warning / Invalid or Not supported	Normal
-3.5	ON	No Warning / Invalid or Not supported	Normal	-1.0	ON	No Warning / Invalid or Not supported	Normal
-3.4	ON	No Warning / Invalid or Not supported	Normal	-0.9	ON	No Warning / Invalid or Not supported	Normal
-3.3	ON	No Warning / Invalid or Not supported	Normal	-0.8	ON	No Warning / Invalid or Not supported	Normal
-3.2	ON	No Warning / Invalid or Not supported	Normal	-0.7	ON	No Warning / Invalid or Not supported	Normal
-3.1	ON	No Warning / Invalid or Not supported	Normal	-0.6	ON	No Warning / Invalid or Not supported	Normal
-3.0	ON	No Warning / Invalid or Not supported	Normal	-0.5	ON	No Warning / Invalid or Not supported	Normal
-2.9	ON	No Warning / Invalid or Not supported	Normal	-0.4	ON	No Warning / Invalid or Not supported	Normal
-2.8	ON	No Warning / Invalid or Not supported	Normal	-0.3	ON	No Warning / Invalid or Not supported	Normal
-2.7	ON	No Warning / Invalid or Not supported	Normal	-0.2	ON	No Warning / Invalid or Not supported	Normal
-2.6	ON	No Warning / Invalid or Not supported	Normal	-0.1	ON	No Warning / Invalid or Not supported	Normal
-2.5	ON	No Warning / Invalid or Not supported	Normal	0.0	ON	No Warning / Invalid or Not supported	Normal

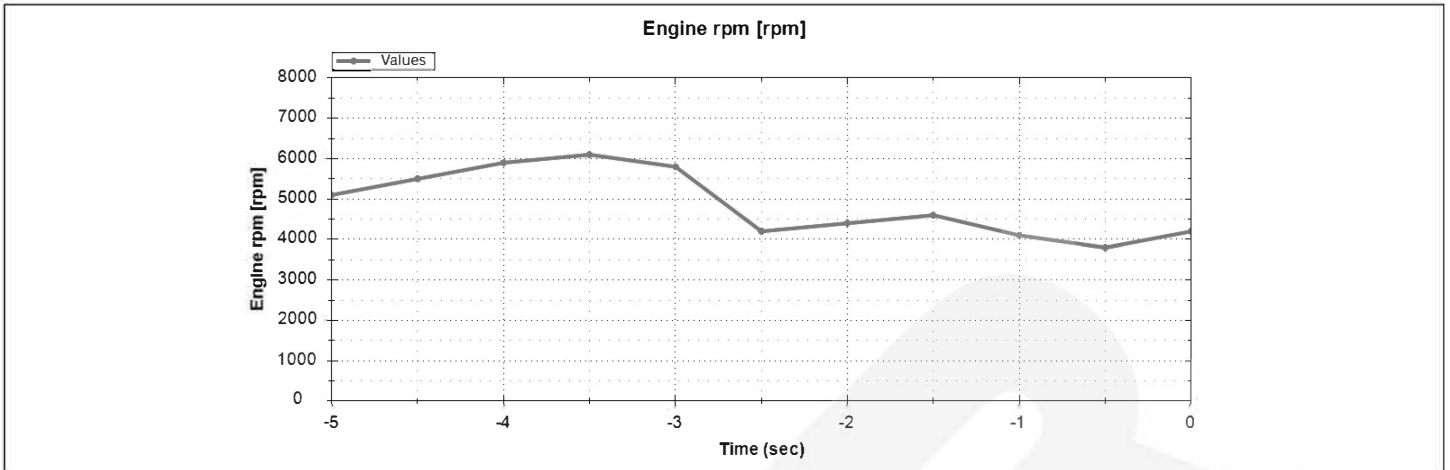
< Event 1 >

Speed, Vehicle indicated



Time (sec)	Speed, Vehicle indicated [km/h]
-5.0	66
-4.5	72
-4.0	76
-3.5	80
-3.0	82
-2.5	85
-2.0	89
-1.5	93
-1.0	93
-0.5	101
0.0	90

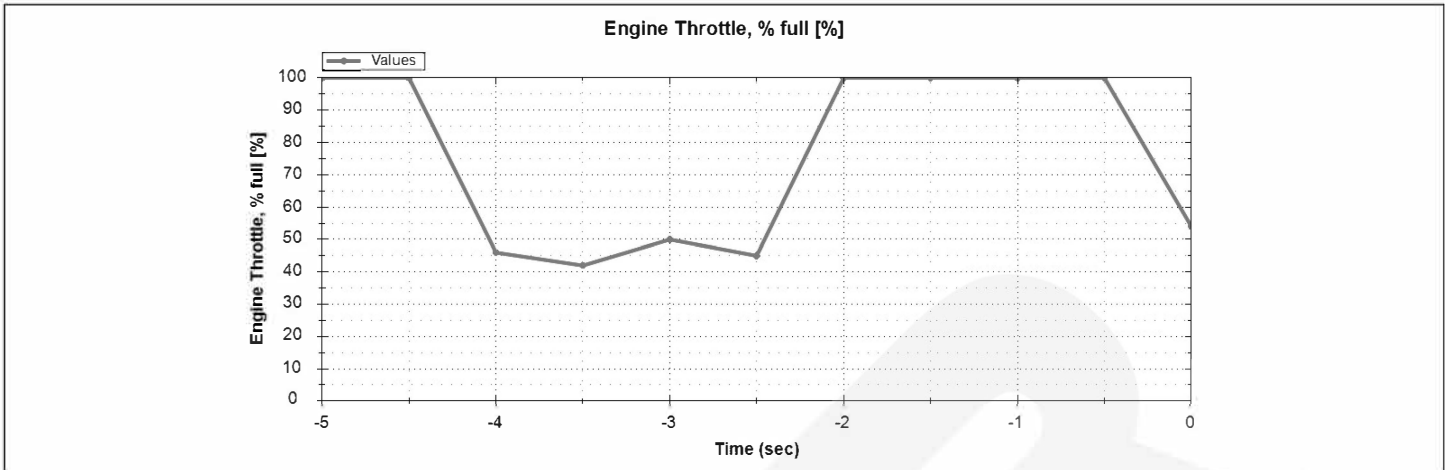
< Event 1 > Engine rpm



Time (sec)	Engine rpm [rpm]
-5.0	5100
-4.5	5500
-4.0	5900
-3.5	6100
-3.0	5800
-2.5	4200
-2.0	4400
-1.5	4600
-1.0	4100
-0.5	3800
0.0	4200

< Event 1 >

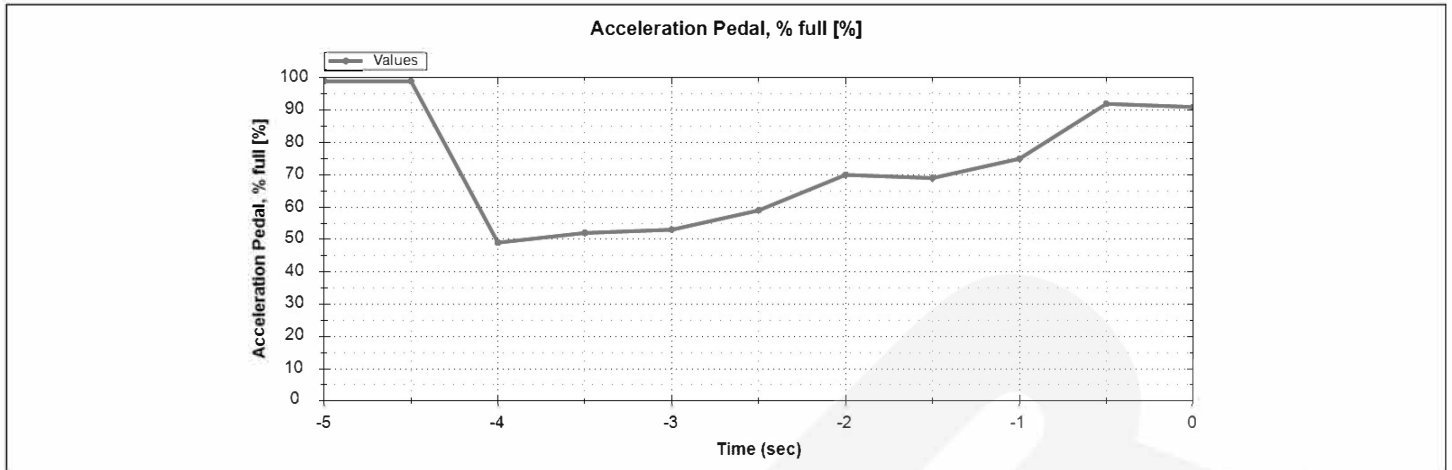
Engine Throttle, % full



Time (sec)	Engine Throttle, % full [%]
-5.0	100
-4.5	100
-4.0	46
-3.5	42
-3.0	50
-2.5	45
-2.0	100
-1.5	100
-1.0	100
-0.5	100
0.0	54

< Event 1 >

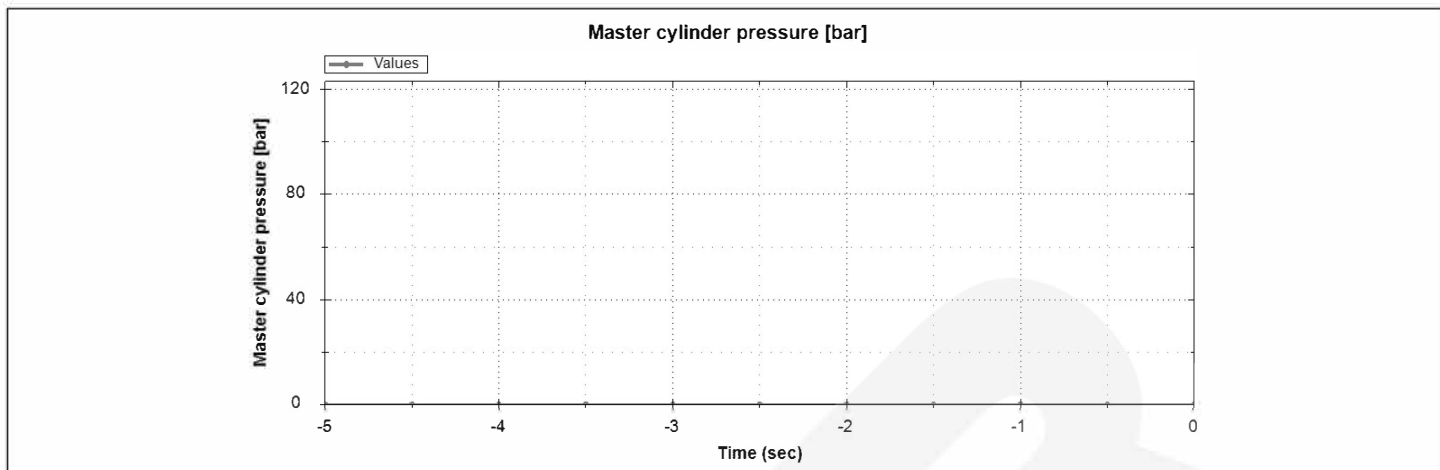
Acceleration Pedal, % full



Time (sec)	Acceleration Pedal, % full [%]
-5.0	99
-4.5	99
-4.0	49
-3.5	52
-3.0	53
-2.5	59
-2.0	70
-1.5	69
-1.0	75
-0.5	92
0.0	91

< Event 1 >

Master cylinder pressure



Time (sec)	Master cylinder pressure [bar]
-5.0	0.0
-4.5	0.0
-4.0	0.0
-3.5	0.0
-3.0	0.0
-2.5	0.0
-2.0	0.0
-1.5	0.0
-1.0	0.0
-0.5	0.0
0.0	0.0

< Event 1 >

Service Brake, on/off

Time (sec)	Service Brake, on/off
-5.0	OFF
-4.5	OFF
-4.0	OFF
-3.5	OFF
-3.0	OFF
-2.5	OFF
-2.0	OFF
-1.5	OFF
-1.0	OFF
-0.5	OFF
0.0	OFF

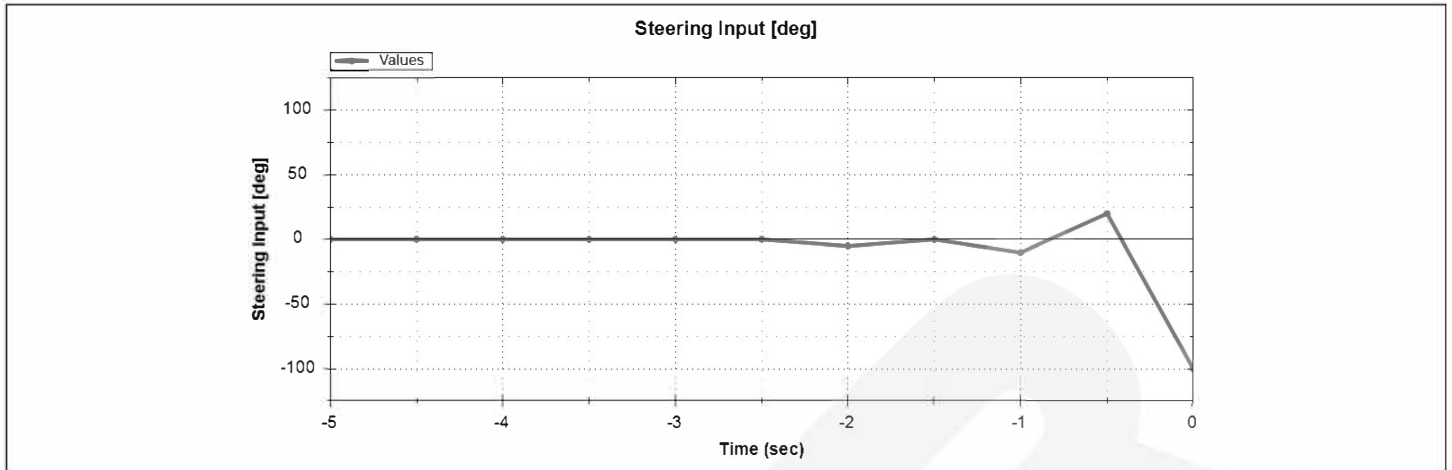
Anti-lock braking system activity

Time (sec)	Anti-lock braking system activity
-5.0	OFF
-4.5	OFF
-4.0	OFF
-3.5	OFF
-3.0	OFF
-2.5	OFF
-2.0	OFF
-1.5	OFF
-1.0	OFF
-0.5	OFF
0.0	OFF

Stability Control

Time (sec)	Stability Control
-5.0	ON
-4.5	ON
-4.0	ON
-3.5	ON
-3.0	ON
-2.5	ON
-2.0	ON
-1.5	ON
-1.0	ON
-0.5	ON
0.0	ON

< Event 1 > Steering Input



Time (sec)	Steering Input [deg]
-5.0	0
-4.5	0
-4.0	0
-3.5	0
-3.0	0
-2.5	0
-2.0	-5
-1.5	0
-1.0	-10
-0.5	20
0.0	-100

Note) Positive value(CCW), Negative value(CW)

< Event 1 >

System Status at Event

Air bag warning lamp [on/off]	OFF
Safety belt status, driver	ON
Safety belt status, front passenger	OFF
Seat track position switch, foremost, status, driver	Not Supported
Seat track position switch, foremost, status, front passenger	Not Supported
Occupant size classification, driver (5% female or larger)	Not Supported
Occupant size classification, front passenger (child)	YES

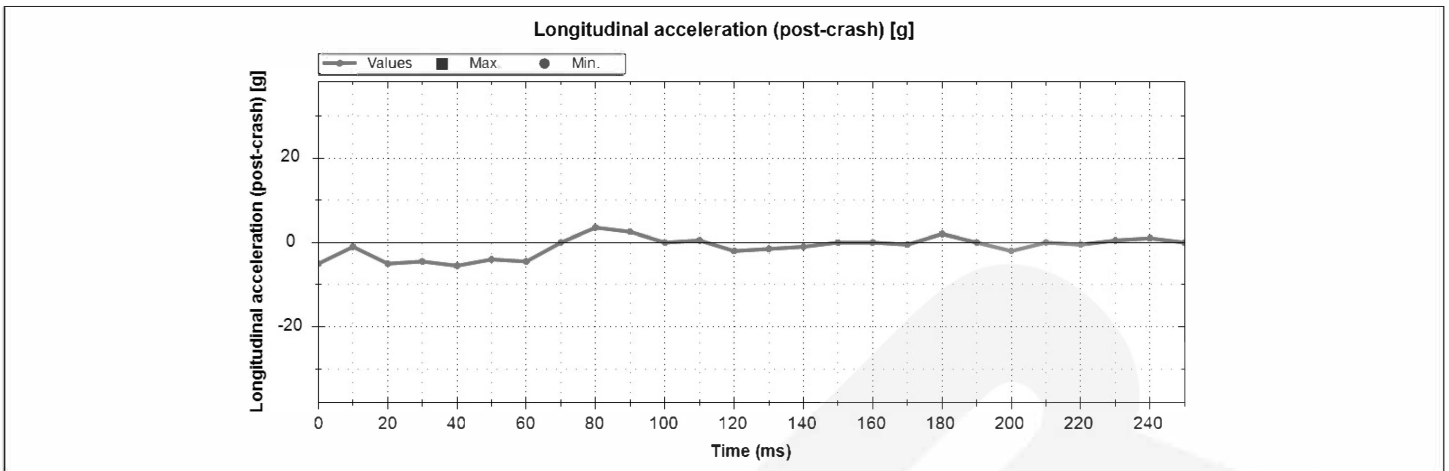
Deployment Command Data at Event

Frontal air bag deployment, time to single or 1st stage, driver [ms]	102
Frontal air bag deployment, time to single or 1st stage, front passenger	No deployment
Frontal air bag deployment, time to 2nd stage, driver [ms]	222
Frontal air bag deployment, time to 2nd stage, front passenger [ms]	No deployment
Frontal air bag deployment, time to 3rd stage, driver [ms]	Not supported
Frontal air bag deployment, time to 3rd stage, front passenger [ms]	Not supported
Frontal air bag deployment, time to 4th stage, front passenger [ms]	Not supported
Frontal air bag deployment, 2nd stage disposal, driver, Y/N	YES
Frontal air bag deployment, 2nd stage disposal, front passenger, Y/N	NO
Frontal air bag deployment, 3rd stage disposal, driver, Y/N	NO
Frontal air bag deployment, 3rd stage disposal, front passenger, Y/N	NO
Frontal air bag deployment, 4th stage disposal, front passenger, Y/N	NO
Knee air bag deployment, time to deploy, driver [ms]	102
Knee air bag deployment, time to deploy, front passenger [ms]	Not supported
Side air bag deployment, time to deploy, driver [ms]	728
Side air bag deployment, time to deploy, front passenger [ms]	728
Side air bag deployment, time to deploy, driver side, rear [ms]	728
Side air bag deployment, time to deploy, passenger side, rear [ms]	728
Side curtain air bag deployment, time to deploy, driver side [ms]	728
Side curtain air bag deployment, time to deploy, passenger side [ms]	728
Side curtain air bag deployment, time to deploy, driver side, rear [ms]	Not supported
Side curtain air bag deployment, time to deploy, passenger side, rear [ms]	Not supported
Pretensioner deployment, time to fire, driver [ms]	102
Pretensioner deployment, time to fire, front passenger [ms]	102
Pretensioner deployment, time to fire, driver side, rear [ms]	Not supported

Pretensioner deployment, time to fire, passenger side, rear [ms]	Not supported
Anchor pretensioner deployment time to fire, driver [ms]	Not supported
Anchor pretensioner deployment time to fire, front passenger [ms]	Not supported
Adaptive load limiter deployment, time to fire, driver [ms]	Not supported
Adaptive load limiter deployment, time to fire, front passenger [ms]	Not supported
Far-side impact center air bag deployment time to deploy, front [ms]	Not supported

< Event 1 >

Longitudinal crash pulse_acceleration (g, 0 ~ 250msec)

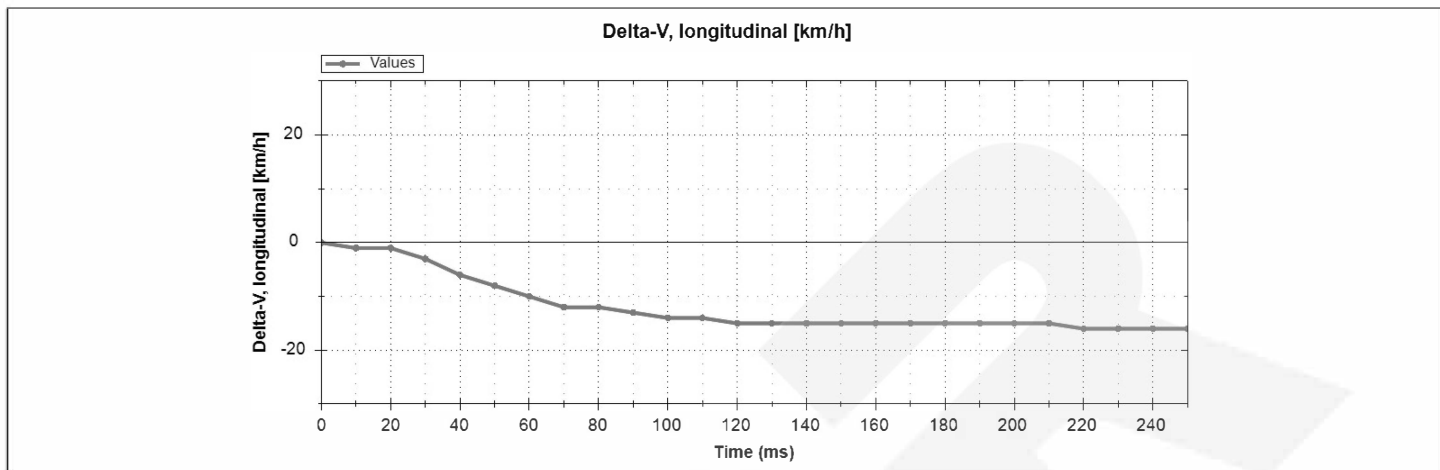


Time (ms)	Longitudinal acceleration (post-crash) [g]
0.0	-5.0
10.0	-1.0
20.0	-5.0
30.0	-4.5
40.0	-5.5
50.0	-4.0
60.0	-4.5
70.0	0.0
80.0	3.5
90.0	2.5
100.0	0.0
110.0	0.5
120.0	-2.0
130.0	-1.5
140.0	-1.0
150.0	0.0
160.0	0.0
170.0	-0.5
180.0	2.0
190.0	0.0
200.0	-2.0
210.0	0.0
220.0	-0.5
230.0	0.5
240.0	1.0
250.0	0.0

< Event 1 >

Longitudinal crash pulse_delta-v (kph, 0 ~ 250msec)

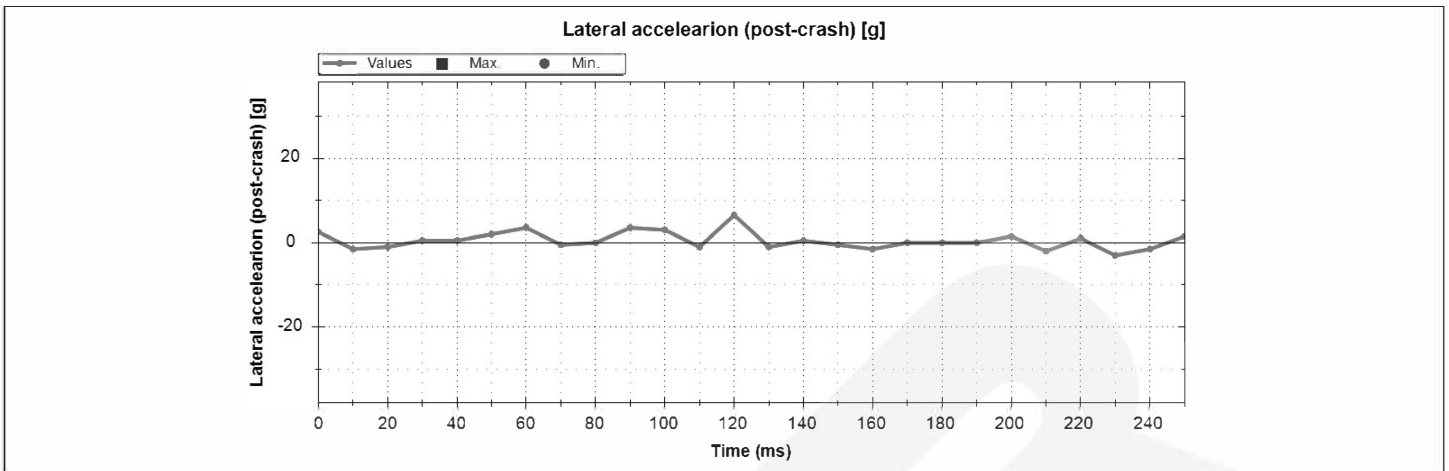
Maximum Delta-V, longitudinal [km/h]	-16
Time, maximum Delta-V, longitudinal [ms]	297.5



Time (ms)	Delta-V, longitudinal [km/h]
0.0	0
10.0	-1
20.0	-1
30.0	-3
40.0	-6
50.0	-8
60.0	-10
70.0	-12
80.0	-12
90.0	-13
100.0	-14
110.0	-14
120.0	-15
130.0	-15
140.0	-15
150.0	-15
160.0	-15
170.0	-15
180.0	-15
190.0	-15
200.0	-15
210.0	-15
220.0	-16
230.0	-16
240.0	-16
250.0	-16

< Event 1 >

Lateral crash pulse_acceleration (g, 0 ~ 250msec)

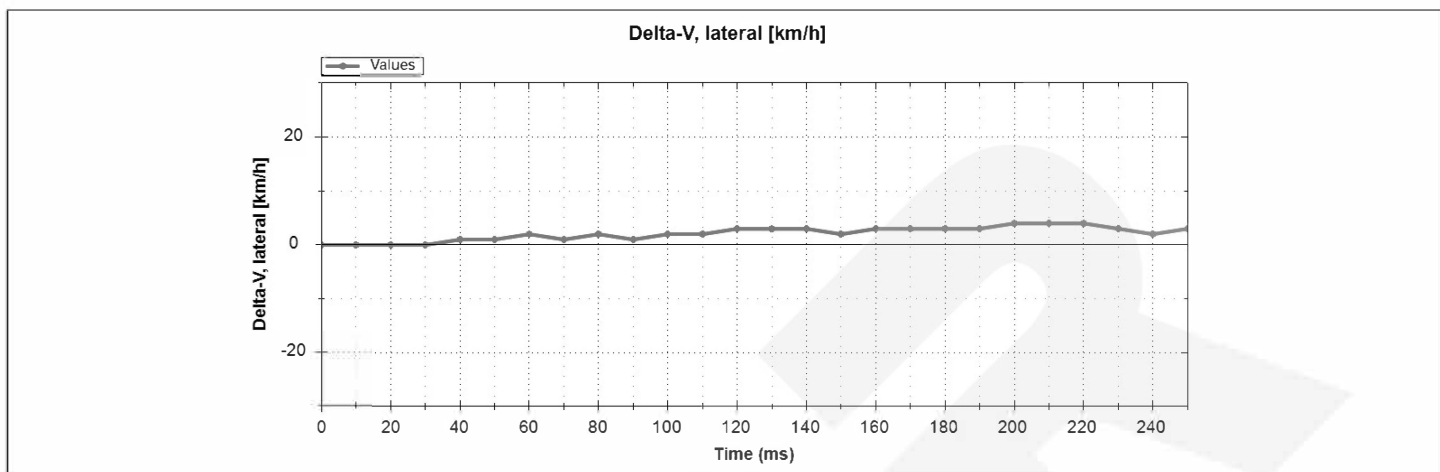


Time (ms)	Lateral acceleration (post-crash) [g]
0.0	2.5
10.0	-1.5
20.0	-1.0
30.0	0.5
40.0	0.5
50.0	2.0
60.0	3.5
70.0	-0.5
80.0	0.0
90.0	3.5
100.0	3.0
110.0	-1.0
120.0	6.5
130.0	-1.0
140.0	0.5
150.0	-0.5
160.0	-1.5
170.0	0.0
180.0	0.0
190.0	0.0
200.0	1.5
210.0	-2.0
220.0	1.0
230.0	-3.0
240.0	-1.5
250.0	1.5

< Event 1 >

Lateral crash pulse_delta-v (kph, 0 ~ 250msec)

Maximum Delta-V, lateral [km/h]	4
Time, maximum Delta-V, lateral [ms]	225.0



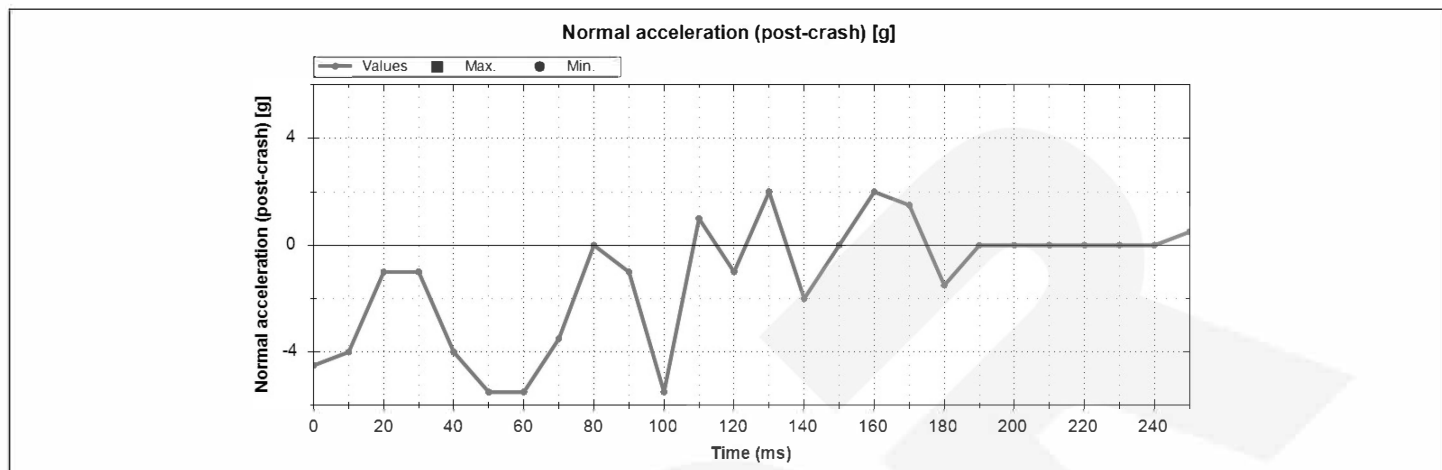
Time (ms)	Delta-V, lateral [km/h]
0.0	0
10.0	0
20.0	0
30.0	0
40.0	1
50.0	1
60.0	2
70.0	1
80.0	2
90.0	1
100.0	2
110.0	2
120.0	3
130.0	3
140.0	3
150.0	2
160.0	3
170.0	3
180.0	3
190.0	3
200.0	4
210.0	4
220.0	4
230.0	3
240.0	2
250.0	3

< Event 1 >

Crash pulse Resultant, Time_Max. delta-V resultant (0 ~ 300 msec)

Time, maximum Delta-V, resultant [ms]	297.5
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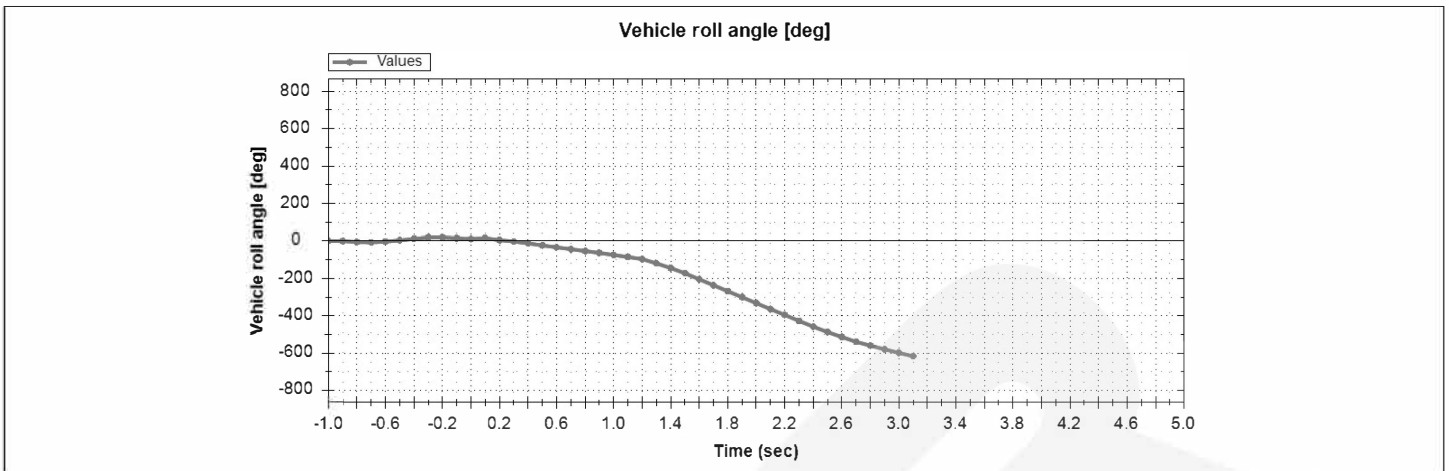
Normal acceleration (g, 1 ~ 5sec)



Time (ms)	Normal acceleration (post-crash) [g]
0.0	-4.5
10.0	-4.0
20.0	-1.0
30.0	-1.0
40.0	-4.0
50.0	-5.5
60.0	-5.5
70.0	-3.5
80.0	0.0
90.0	-1.0
100.0	-5.5
110.0	1.0
120.0	-1.0
130.0	2.0
140.0	-2.0
150.0	0.0
160.0	2.0
170.0	1.5
180.0	-1.5
190.0	0.0
200.0	0.0
210.0	0.0
220.0	0.0
230.0	0.0
240.0	0.0
250.0	0.5

< Event 1 >

Roll angle (degree, -1 ~ 5sec)

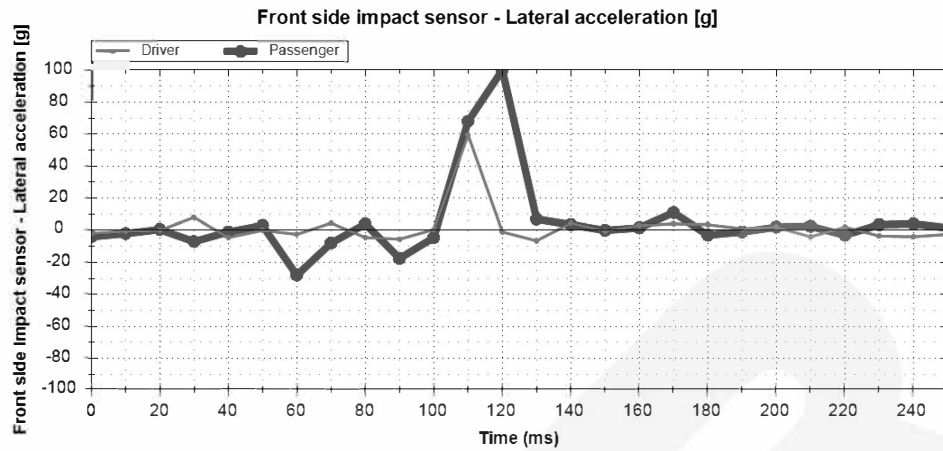


Time (sec)	Vehicle roll angle [deg]
-1.0	1
-0.9	0
-0.8	-5
-0.7	-7
-0.6	-3
-0.5	4
-0.4	12
-0.3	19
-0.2	19
-0.1	15
0.0	11
0.1	16
0.2	5
0.3	-2
0.4	-12
0.5	-23
0.6	-33
0.7	-43
0.8	-53
0.9	-63
1.0	-74
1.1	-85
1.2	-96
1.3	-119
1.4	-144
1.5	-172
1.6	-204
1.7	-236
1.8	-268
1.9	-300
2.0	-332

2.1	-364
2.2	-395
2.3	-427
2.4	-458
2.5	-487
2.6	-513
2.7	-539
2.8	-559
2.9	-579
3.0	-598
3.1	-616
3.2	Invalid data
3.3	Invalid data
3.4	Invalid data
3.5	Invalid data
3.6	Invalid data
3.7	Invalid data
3.8	Invalid data
3.9	Invalid data
4.0	Invalid data
4.1	Invalid data
4.2	Invalid data
4.3	Invalid data
4.4	Invalid data
4.5	Invalid data
4.6	Invalid data
4.7	Invalid data
4.8	Invalid data
4.9	Invalid data
5.0	Invalid data

< Event 1 >

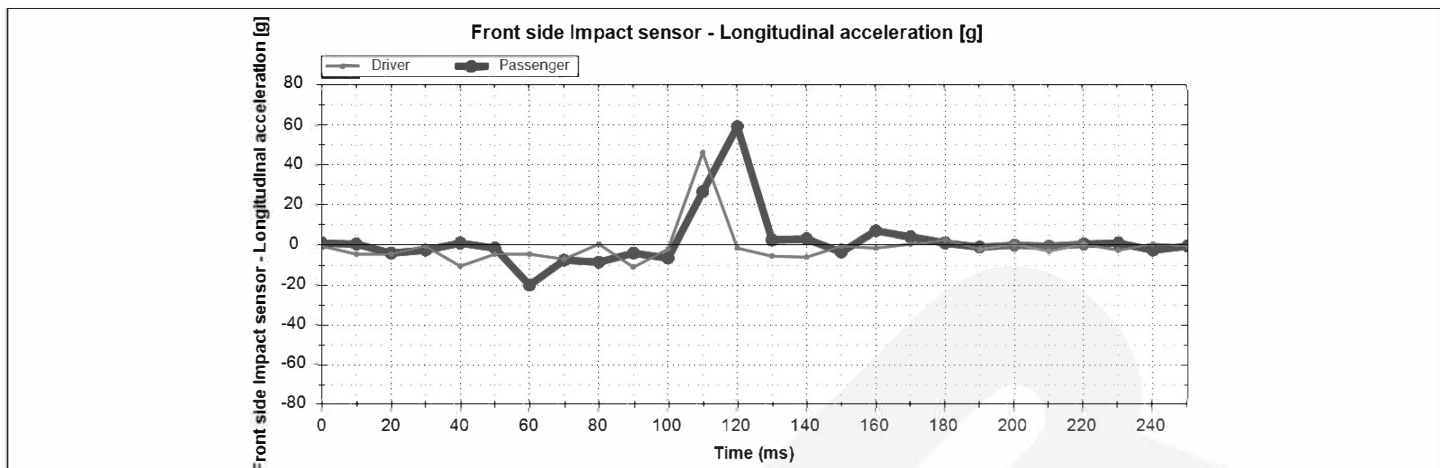
Front side impact sensor – Lateral acceleration (g, 0 ~ 250msec)



Time (ms)	Front driver side impact sensor - Lateral acceleration [g]	Front passenger side impact sensor - Lateral acceleration [g]
0.0	-2.0	-4.0
10.0	-0.5	-2.0
20.0	0.0	0.5
30.0	8.0	-7.0
40.0	-4.5	-1.0
50.0	0.0	3.0
60.0	-2.5	-28.0
70.0	4.5	-8.0
80.0	-4.5	4.0
90.0	-5.5	-17.5
100.0	0.5	-4.5
110.0	59.5	68.0
120.0	-1.0	100.0
130.0	-6.5	7.0
140.0	4.5	3.5
150.0	-0.5	0.0
160.0	3.0	1.5
170.0	4.0	11.0
180.0	3.5	-3.0
190.0	1.0	-1.0
200.0	2.0	2.0
210.0	-4.0	2.5
220.0	2.0	-3.0
230.0	-3.5	3.5
240.0	-4.0	4.0
250.0	-2.5	1.5

< Event 1 >

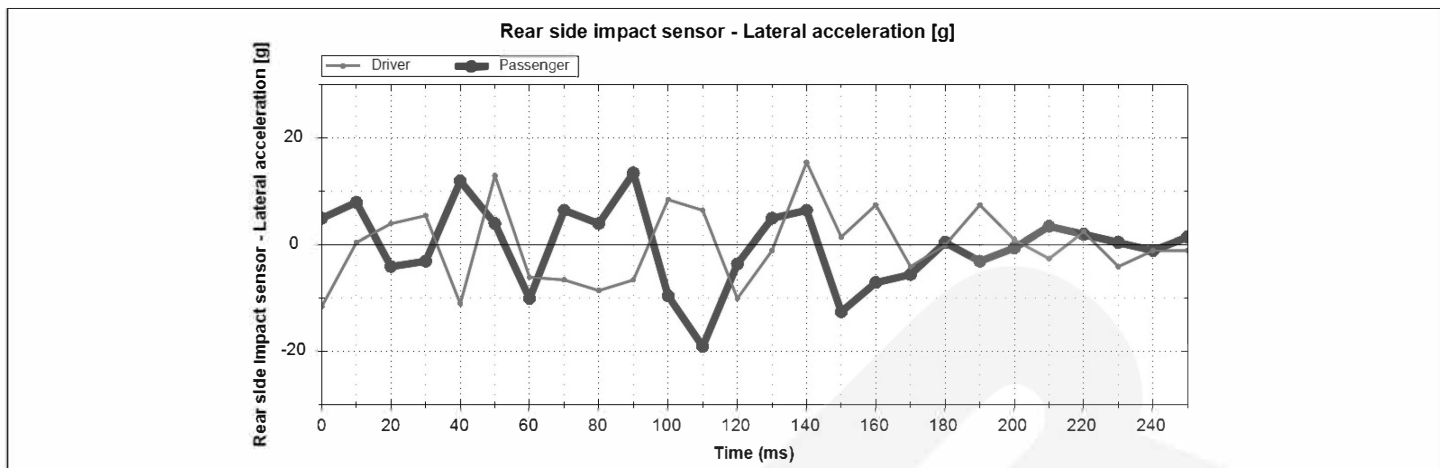
Front side Impact sensor – Longitudinal acceleration (g, 0 ~ 250msec)



Time (ms)	Front driver side Impact sensor - Longitudinal acceleration [g]	Front passenger side Impact sensor - Longitudinal acceleration [g]
0.0	-0.5	1.0
10.0	-4.5	0.5
20.0	-4.5	-4.0
30.0	-0.5	-2.5
40.0	-10.5	1.0
50.0	-4.5	-1.5
60.0	-4.5	-20.0
70.0	-7.0	-7.5
80.0	0.5	-8.5
90.0	-11.0	-4.0
100.0	-2.0	-6.5
110.0	46.0	26.5
120.0	-1.5	59.0
130.0	-5.5	2.5
140.0	-6.0	3.0
150.0	-0.5	-3.5
160.0	-1.5	7.0
170.0	0.5	4.0
180.0	2.5	1.0
190.0	-2.0	-1.0
200.0	0.5	0.0
210.0	-3.0	-0.5
220.0	0.5	0.5
230.0	-2.5	1.0
240.0	0.5	-2.5
250.0	-0.5	-0.5

< Event 1 >

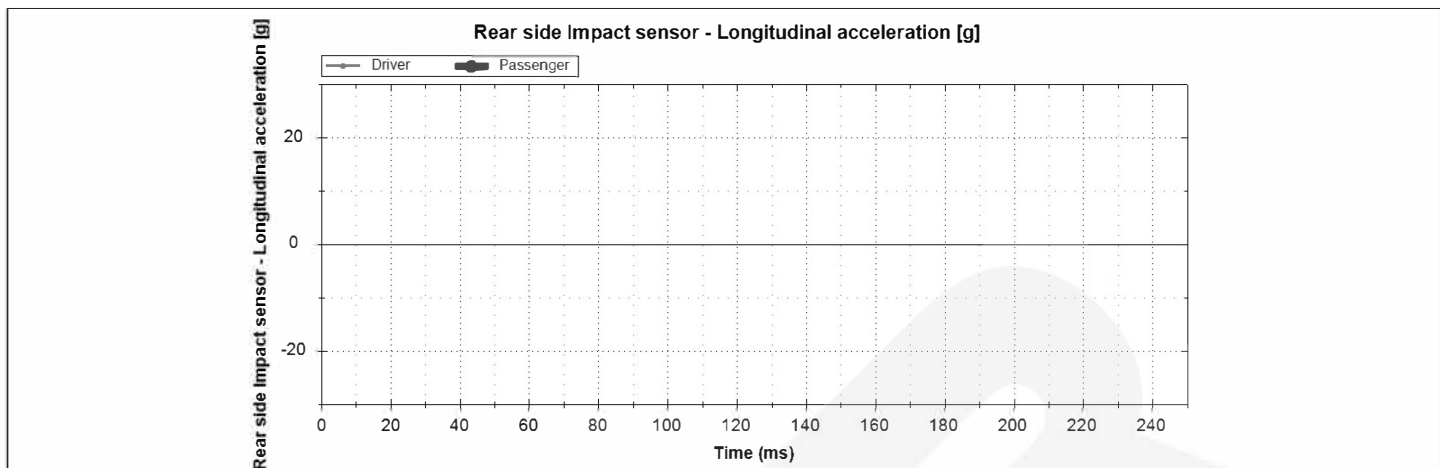
Rear side impact sensor – Lateral acceleration (g, 0 ~ 250msec)



Time (ms)	Rear driver side impact sensor - Lateral acceleration [g]	Rear passenger side impact sensor - Lateral acceleration [g]
0.0	-11.5	5.0
10.0	0.5	8.0
20.0	4.0	-4.0
30.0	5.5	-3.0
40.0	-11.0	12.0
50.0	13.0	4.0
60.0	-6.0	-10.0
70.0	-6.5	6.5
80.0	-8.5	4.0
90.0	-6.5	13.5
100.0	8.5	-9.5
110.0	6.5	-19.0
120.0	-10.0	-3.5
130.0	-1.0	5.0
140.0	15.5	6.5
150.0	1.5	-12.5
160.0	7.5	-7.0
170.0	-4.0	-5.5
180.0	0.0	0.5
190.0	7.5	-3.0
200.0	1.0	-0.5
210.0	-2.5	3.5
220.0	2.5	2.0
230.0	-4.0	0.5
240.0	-1.0	-1.0
250.0	-1.0	1.5

< Event 1 >

Rear side Impact sensor – Longitudinal acceleration (g, 0 ~ 250msec)



Time (ms)	Rear driver side Impact sensor - Longitudinal acceleration [g]	Rear passenger side Impact sensor - Longitudinal acceleration [g]
0.0	Not supported	Not supported
10.0	Not supported	Not supported
20.0	Not supported	Not supported
30.0	Not supported	Not supported
40.0	Not supported	Not supported
50.0	Not supported	Not supported
60.0	Not supported	Not supported
70.0	Not supported	Not supported
80.0	Not supported	Not supported
90.0	Not supported	Not supported
100.0	Not supported	Not supported
110.0	Not supported	Not supported
120.0	Not supported	Not supported
130.0	Not supported	Not supported
140.0	Not supported	Not supported
150.0	Not supported	Not supported
160.0	Not supported	Not supported
170.0	Not supported	Not supported
180.0	Not supported	Not supported
190.0	Not supported	Not supported
200.0	Not supported	Not supported
210.0	Not supported	Not supported
220.0	Not supported	Not supported
230.0	Not supported	Not supported
240.0	Not supported	Not supported
250.0	Not supported	Not supported

< Event 2 >

There is no recorded event.



DOT HS 813 850
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U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**



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