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**Special Crash Investigations:
On-Site Air Bag Non-Deployment
Crash Investigation;
Vehicle: 2014 Chevrolet Traverse;
Location: New York;
Crash Date: November 2017**

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16. Abstract This report documents the on-site investigation of the non-deployment of the air bag systems in a 2014 Chevrolet Traverse and the fatality of its belted 56-year-old female driver. The Chevrolet was involved in a left side impact crash when it initiated a left turn across the southbound trajectory of a 2005 Mack three-axle dump truck and was struck by its front plane. The Chevrolet had front seat belt pretensioners, Certified-Advanced-Compliant frontal air bags, front seat-mounted side impact air bags, roof side rail-mounted inflatable curtain air bags, and a driver seat-mounted center air bag (intended to mitigate front row occupant-to-occupant interaction). None of the Chevrolet's supplemental restraint devices actuated or deployed in the crash. Through the course of this investigation, the SCI investigator was unable to identify the root cause of the Chevrolet's non-deployment. The focal crash event to the Chevrolet's left plane by the front plane of the Mack was recognized and recorded by the Chevrolet's sensing and diagnostic control module, but the module did not command the actuation/deployment of any of the vehicle's supplemental restraint devices. The SCI investigator noted that similar crashes of this type and magnitude would typically result in actuation and deployment commands. The absence of diagnostic trouble codes prior to the event as reported by the imaged EDR data indicated that all systems were functional and operational at the time of the crash.			
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Special Crash Investigations
On-Site Air Bag Non-Deployment Crash Investigation
Office of Defects Investigation
Case Number: CR17032
Vehicle: 2014 Chevrolet Traverse
Location: New York
Crash Date: November 2017

Background

This report documents the on-site investigation of the non-deployment of the air bag systems in a 2014 Chevrolet Traverse (Figure 1) and the fatality of its belted 56-year-old female driver. The Chevrolet was involved in a left-side-impact crash when it initiated a left turn across the southbound trajectory of a 2005 Mack three-axle dump truck and was struck by its front plane. The Chevrolet was equipped with front seat belt pretensioners, Certified Advanced Compliant (CAC) frontal air bags, front seat-mounted side impact air bags, roof side rail-mounted inflatable curtain (IC) air bags, and a driver seat-mounted center air bag (intended to mitigate front row occupant-to-occupant interaction). None of the Chevrolet's supplemental restraint devices actuated or deployed in the crash.



Figure 1. Oblique left side view of the Chevrolet Traverse

A law enforcement investigator reported the crash to the Special Crash Investigations (SCI) team at Crash Research & Analysis, Inc., in November 2017. The SCI team forwarded notification of the crash to the Crash Investigation Division of the National Highway Traffic Safety Administration. After consultation with the Office of Defects Investigation, further research was requested, and the crash was assigned for an on-site investigation. The SCI team established cooperation with the law enforcement investigator on the same day to inspect the Chevrolet. The on-site investigation, which took place in November 2017, included the documentation and measurement of the Chevrolet's exterior and interior damage and intrusion, identification of occupant contact, and the assessment and documentation of the manual and supplemental restraint systems. The Chevrolet had an air bag sensing and diagnostic control module (SDM) with Event Data Recorder (EDR) capabilities. The data were imaged during the inspection by the SCI team using the current version of the Bosch Crash Data Retrieval software/tool. Following

inspection of the Chevrolet, the crash site was inspected and documented using a combination of photographs and measurements from a total station mapping system. The police crash report (PCR) and on-scene images documenting physical evidence at the crash scene were obtained.

Through the course of this investigation, the SCI investigator was unable to identify the root cause of the Chevrolet's non-deployment. The focal crash event to the Chevrolet's left side by the front plane of the Mack was recognized and recorded by the Chevrolet's SDM, but the SDM did not command the actuation/deployment of any of the vehicle's supplemental restraint devices. The SCI investigator noted that similar crashes of this type and magnitude would typically result in actuation and deployment commands. The absence of diagnostic trouble codes prior to the event as reported by the imaged EDR data indicated that all systems were functional and operational at the time of the crash.

Summary

Crash Site

The crash occurred during the morning hours of November 2017 at a four-leg intersection in a suburban setting. Environmental conditions documented by the law enforcement agency were daylight, clear, and dry. According to data from the National Weather Service, conditions in the locale at the time of the crash included overcast skies, a temperature of -1.0 °C (30.2 °F), a 100-percent relative humidity, and east-northeast winds at 9.3 km/h (5.8 mph).

At the crash site, an east/west local road intersected a two-lane north/south State-maintained roadway. The local roadway measured 6.6 m (21.7 ft) in total width and had no painted lane markings. Stop signs controlled the traffic approaching the intersection (Figure 2) on the local roadway. A posted speed limit of 48 km/h (30 mph) regulated speed on the local roadway for the Chevrolet's approach to the intersection.



Figure 2. Eastbound trajectory view of the Chevrolet for the local roadway on approach to the intersection



Figure 3. Southbound trajectory view of the Mack on the approach to the intersection

The State-maintained north/south roadway consisted of two travel lanes that measured 3.7 m (12.1 ft) in width and were separated by a double solid yellow centerline (Figure 3). Both lane edges were defined by solid white fog lines and supported by 3.0 m (9.8 ft) wide shoulders. Speed for southbound traffic on the State roadway (the Mack's pre-crash travel trajectory) changed from 64 km/h (40 mph) to 56 km/h (35 mph) at the intersection.

All roadway surfaces were level and paved with asphalt. Commercial businesses with parking areas were located in the northwest and southwest quadrants of the intersection. The SCI investigator observed that there were no apparent obstructions that would have affected the visibility for either driver. A crash diagram is included at the end of this report.

Pre-Crash

The 56-year-old female was in the Chevrolet driver's seat. The seat adjustments included a middle track position and slightly reclined seat back, with the head restraint 8 cm (3.1 in) upward. The driver used the available 3-point lap and shoulder seat belt system for manual restraint and operated the vehicle east on the local roadway. She approached the intersection and

brought the vehicle to a controlled stop, adjacent to the stop sign, according to data imaged from the Chevrolet's EDR, which reported that the speed of the Chevrolet was 0 km/h (0 mph) during the 4.5 and 4.0 second intervals prior to algorithm enable (AE). Refer to the Event Data Recorder section of this report for further detail regarding the speed data of the Chevrolet. Documentation of the crash site by the SCI team and law enforcement indicated that the Chevrolet's driver's view of traffic on the north/south roadway was unobstructed. She should have had full visibility of traffic approaching the intersection from any direction. The driver accelerated the Chevrolet forward from its stopped position and entered the intersection to turn left to travel north.

Meanwhile, the Mack dump truck was traveling south on the state roadway, driven by a 70-year-old male. As the Mack approached the intersection, he saw the Chevrolet at the stop sign and then suddenly begin to enter the intersection into his travel path. The Mack driver initiated emergency braking as it approached the Chevrolet. The SCI investigator used post-impact skid marks documented from both vehicles to determine that the speed of the Mack at impact was 69 km/h (43 mph). These calculations are presented at the end of this report as Appendix A.

Crash

The SCI reconstruction of the crash determined that the Chevrolet was approximately 35 degrees into its left turn when the left plane of the Chevrolet was struck by the front plane of the Mack in a 10/12 o'clock impact configuration (Event 1). The impact was approximately centered in the area of the Chevrolet's left B-pillar. Tire marks from both vehicles (Figure 4) evidenced the location of the impact.



Figure 4. South-facing on-scene image depicting the vehicles' post-impact tire marks (on-scene law enforcement image)

The crash displaced the Chevrolet to the south, causing it to rotate 30 degrees clockwise and wrap entirely onto the front plane of the Mack. The engagement of the vehicles, combined with the speed and mass of the Mack, displaced the Chevrolet to the southeast. The Mack and Chevrolet continued southeast as a combined mass and began to cross the centerline of the roadway. The Mack decelerated by braking/skidding, and in doing so traveled on an arcing trajectory through the northbound lane and toward the east shoulder. The Chevrolet separated from the Mack with a counterclockwise rotation and slid to an uncontrolled stop facing north-northeast. Lateral skidding tire marks on the roadway surface showed the Chevrolet's post-

impact trajectory. At final rest, the Chevrolet straddled the east fog line with its center of mass approximately 28 m (91.9 ft) south of its initial impact location.

The front of the Mack departed the east edge of the roadway and struck a “No Parking” sign, shearing the non-breakaway post at ground level (Event 2). The Mack came to final rest facing southeast and straddling the east road edge, with its center of mass approximately 30.2 m (99.1 ft) southeast from its impact location. Figure 5 is an on-scene law enforcement image depicting the final rest positions of the vehicles.



Figure 5. East-facing view of the vehicles at final rest (on-scene law enforcement image)

Post-Crash

Law enforcement, fire department, and emergency medical services (EMS) personnel responded to the crash site. The 56-year-old driver of the Chevrolet was found unresponsive in the vehicle and absent of vital signs. She was pronounced deceased at the crash scene. Her body was removed from the Chevrolet and transferred to the medical examiner’s office. The 70-year-old male driver of the Mack complained of back pain and was transported by ambulance to a local hospital for evaluation. The Chevrolet was recovered from the scene by a tow service and transferred to a local garage, where it was held pending completion of the law enforcement investigation. The Mack was towed to its owner’s facility, released following inspection by the law enforcement agency, and transferred to an unknown regional facility for repair. It was not available for SCI inspection.

2014 Chevrolet Traverse

Description

The 2014 Chevrolet Traverse SUV was identified by the Vehicle Identification Number 1GNKVGKD7EJxxxxxx. It was manufactured in August 2013 and equipped with the LT-level trim package. Power came from a 3.6-liter gasoline engine linked to a 6-speed, automatic transmission with front-wheel-drive.



Figure 6. Left front oblique view of the 2014 Chevrolet Traverse at the time of the SCI vehicle inspection

The SUV (Figure 6) was configured on a 302 cm (118.9 in) wheelbase and had a curb weight of 2,197 kg (4,844 lb). The gross vehicle weight rating (GVWR) was 2,930 kg (6,459 lb), with gross axle weight ratings (GAWR) of 1,450 kg (3,196 lb) front and 1,600 kg (3,527 lb) rear. Standard features included electronic traction control, electronic stability control, electronic brakeforce distribution, a direct tire pressure monitoring system, and 4-wheel, power-assisted disc brakes with ABS. Additional exterior features included a full panoramic sun roof that consisted of two panels, one between the A- and B-pillar location and the other between the B- and C-pillar. Aftermarket step bars were mounted to the frame at the sill level. The vehicle manufacturer's recommended tire size was P255/65R18, with recommended cold tire pressures of 240 kPa (35 PSI). At the time of the crash, the Chevrolet was equipped with Goodyear Fortera all-season radial tires of the recommended size, mounted on OEM, 6-spoke, alloy wheels. Specific tire data at the time of the SCI inspection were as follows:

Position	Tire Identification Number (TIN)	Measured Tread Depth	Restricted	Damage
LF	4BXM AR0R 5016	7 mm (9/32/in)	No	None
LR	4BXM AR0R 3313	5 mm(6/32/in)	Yes	Outer sidewall cut
RR	4BXM AR0R 3313	4 mm(5/32 in)	No	None
RF	4BXM AR0R 5016	7 mm(9/32 in)	No	None

The Chevrolet had three rows for the seating of up to seven occupants (2/2/3). The front and second rows consisted of bucket seats with adjustable head restraints, while the third row was a 60/40 split bench seat. At SCI inspection the driver's seat was in mid-track position. Manual

restraint was provided by 3-point lap and shoulder seat belts for all seat positions. The front seat belts were equipped with retractor and lower anchor pretensioners. Supplemental restraints included CAC frontal, front seat-mounted side impact air bags, a driver seat-mounted center air bag, and IC air bags. None in the Chevrolet actuated or deployed.

Vehicle History

A commercially available vehicle history report obtained for the Chevrolet by the SCI investigator reported that the Chevrolet had two owners. The initial owner had purchased the vehicle new in September 2013 and drove it for 58,127 km (36,120 miles) over the course of three years and two months.

The history reported two crashes during the first ownership, one in July 2014 and one in December 2014. The December 2014 crash was accompanied by a structural vehicle damage indicator. The history reported the Chevrolet was repaired following both incidents. It was then traded and sold at auction in November 2016 to an auto sales dealership. The second (current) owner purchased the Chevrolet as a certified, pre-owned vehicle in January 2017 from the auto sales dealership. A title was issued to the current owner in February 2017. There were no further records of the vehicle in the history report following issuance of the new title leading up to the crash.



Figure 7. On-scene view of the left plane impact damage to the 2014 Chevrolet Traverse, prior to the removal of the left front door (image provided by the investigating law enforcement agency)

Exterior Damage

The Chevrolet sustained left plane damage consistent with the crash. Direct contact began 15 cm (5.9 in) aft of the left front axle and extended 282 cm (111.0 in) rearward. It ended 4 cm (1.6 in) aft of the left rear axle position. The left A-, B-, and C- pillars were directly involved in the impact damage. The left front door of the Chevrolet was removed from the vehicle during the law enforcement's vehicle inspection. On-scene images shown that the latch and striker had remained engaged during the crash; however, the hinges had separated at the A-pillar due to overload (Figure 7). A crush profile documented during the SCI inspection using a Nikon Nivo 5M+ Total Station produced the following resultant measurements: C1 = 8 cm (3.1 in), C2 = 48 cm (18.9 in), C3 = 66 cm (26.0 in), C4 = 52 cm (20.5 in), C5 = 33 cm (13.0 in), and C6 = 9 cm (3.5 in). Figure 8 shows an oblique view of the damage profile while Figure 9 shows the

overhead view of the damage profile. The Collision Deformation Classification (CDC) assigned to the left damage pattern was 10LDAW4.

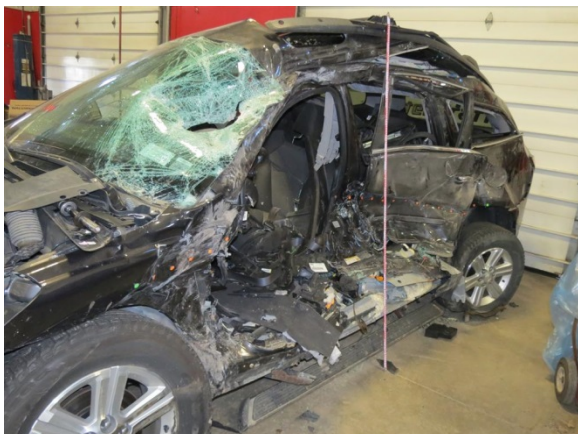


Figure 8. Oblique left view depicting the impact deformation of the Chevrolet



Figure 9. Overhead perspective view of the impact damage pattern to the left plane of the Chevrolet

Analysis of the crash using the barrier algorithm of the WinSMASH program for comparison purposes only calculated a total delta V for the Chevrolet of 65 km/h (40 mph). The longitudinal and lateral components of the calculated delta V were -32 km/h (-20 mph) and 56 km/h (35 mph), respectively. The calculated barrier equivalent speed was 65 km/h (40.4 mph). It was notable that the data recorded by the Chevrolet's EDR indicated a maximum longitudinal delta V of -31 km/h (-19 mph) and a maximum lateral delta V of 59 km/h (37 mph).

Event Data Recorder

The 2014 Chevrolet Traverse had an air bag sensing and diagnostic control module (SDM) that performed the diagnostic, sensing, and actuation/deployment command functions for the vehicle's supplemental restraint systems. The SDM also had EDR capabilities. It was fastened to the center tunnel beneath the center console, but it had been removed prior to the SCI inspection by the investigating law enforcement agency. At the time of the SCI inspection, the SDM was lying loose in the center console. Its EDR component was imaged by the SCI investigator using version 17.5 of the Bosch Crash Data Retrieval tool via a direct-to-module connection using an external 12-volt electrical power source. The imaged data, later reported using software version 21.2, are included at the end of this report as Appendix B.

Data limitations reported that the EDR was capable of recording two event types, designated as non-deployment or deployment, and it could store up to three recorded events. A non-deployment event required a minimum velocity change (delta V) of 8 km/h (5 mph) for qualification and recorded data, but it did not deploy air bags. Pretensioner-only actuation, battery cut-off, and head restraint actuation were all considered non-deployment event types. Although the oldest unlocked non-deployment event could be overwritten once all three memory locations were full, locked non-deployment events could not be overwritten. A locked non-deployment event was one that occurred within five seconds of a deployment event. By definition, deployment events deployed air bags. Data from a deployment event became locked

to memory and could not be overwritten. Recorded events were accompanied by a 5-second pre-crash data buffer, which described various vehicle performance parameters such as vehicle speed, accelerator pedal position, brake status, and engine performance. These parameters were recorded asynchronously in 0.5-second intervals.

Data were imaged from the Chevrolet’s SDM by the SCI investigator on ignition cycle 7,395. The imaged data indicated that the Chevrolet’s EDR had recognized and recorded two non-deployment events. Event counter data fields in the recording indicated that these were the only events recorded during the SDM’s active lifetime. All available data for each event had been completely recorded to memory.

EDR Event Record 1

This non-deployment event occurred and was recorded on ignition cycle 2,142. It was a historical event, unrelated to the crash under investigation.

EDR Event Record 2

This non-deployment event occurred and was recorded on ignition cycle 7,395. It was consistent with the dynamics of the side impact crash that was the subject of this investigation. At the time of event recording, the driver’s seat belt was buckled, and the air bag warning lamp was off. There were no active DTCs. The event was indicated as an OnStar Notification (post-collision emergency system) event.

The front, side, and rollover algorithms of the module were active for the event; however, there was no command issued by the SDM for either pretensioner actuation or air bag deployment. The maximum recorded longitudinal delta V was -31 km/h (-19 mph) at 162 milliseconds, and the maximum recorded lateral delta V was 59 km/h (37 mph) at 182 milliseconds. The reported pre-crash vehicle parameters associated with Event Record 2 were as follows:

Time (seconds)	Vehicle Speed km/h (mph)	Accelerator Pedal (% Full)	Engine Throttle (% Full)	Engine rpm	Brake Status
-5	1 (1)	0	12	704	On
-4.5	0 (0)	0	12	640	On
-4	0 (0)	13	26	768	Off
-3.5	1 (1)	12	27	1,408	Off
-3	3 (2)	23	30	1,472	Off
-2.5	7 (4)	30	33	1,856	Off
-2	10 (6)	33	34	1,984	Off
-1.5	15 (9)	43	40	2,112	Off
-1	19 (12)	0	40	2,432	Off
-0.5	21 (13)	0	19	2,112	On

Examination of the pre-crash data trends revealed that the driver approached the intersection with the engine idling, applied the brakes, and brought the Chevrolet to a complete stop. The speed of the Chevrolet was 0 km/h (0 mph) at the -4.5 second interval prior to AE. The Chevrolet then accelerated forward into the intersection from the -3.5 second interval, reaching a speed of 21 km/h (13 mph) at the -0.5 second interval. The data further indicated that the driver released

the accelerator pedal and applied the brakes immediately prior to AE. This data was deemed consistent with the circumstances of the crash.

The EDR-reported acceleration data indicated the Chevrolet moved forward 12 m (39.2 ft) during its pre-crash acceleration from its stopped position leading up to the final recorded pre-crash data interval (area of impact). This movement of the Chevrolet is shown in the crash diagram.

Interior Damage

The interior of the Chevrolet sustained moderate-to-severe intrusion at the driver’s position as a result of the impact. Spot welds along the left plane structure released from overload, which separated the floor pan and lower aspect of the B-pillar from the sill. Significant intrusion of the driver’s door, sill, and B-pillar displaced the floor, left instrument panel, steering wheel, and driver’s seat to the right. The intruded left plane components (Figure 10) deformed the driver’s seat and fractured the steering wheel adjustments. The instrument panel was compressed laterally at least 13 cm (5.1 in) by the intrusion (Figure 11), and the right displacement of the driver’s seat deformed the center console.



Figure 10. Left-facing view of the intruded driver’s door prior to its removal (image provided by the investigating law enforcement agency)



Figure 11. Forward-facing view of the deformed steering wheel and left A-pillar/left instrument panel deformation at the time of the SCI inspection

Law enforcement removal of the left front door hindered the SCI investigator’s ability to fully document the total intrusions into the Chevrolet. Measurements of intrusions documented during the SCI vehicle inspection were as follows:

Position	Component	Intrusion Range	Direction
Row 1 Left	Front door - rear upper quadrant	>=15cm (5.9 in), <30 cm (11.8 in)	Lateral
	Driver seat cushion	>=15cm (5.9 in), <30 cm (11.8 in)	Lateral
	Driver seat back	>=15cm (5.9 in), <30 cm (11.8 in)	Lateral
	B-pillar	>=30cm (11.8 in), <46 cm (18.1 in)	Lateral
	A-pillar	>=30cm (11.8 in), <46 cm (18.1 in)	Lateral
	Roof side rail	>=30cm (11.8 in), <46 cm (18.1 in)	Lateral

Position	Component	Intrusion Range	Direction
Row 1 Center	Center console	$\geq 8\text{cm}$ (3.1 in), $< 15\text{ cm}$ (5.9 in)	Lateral
Row 2 Left	Roof side rail	$\geq 30\text{cm}$ (11.8 in), $< 46\text{ cm}$ (18.1 in)	Lateral
	Driver seat back	$\geq 15\text{cm}$ (5.9 in), $< 30\text{ cm}$ (11.8 in)	Longitudinal

The severe intrusion of left side components resulted in direct contact with the driver and her displacement to the right during the impact engagement. Although completely fractured by the crash forces, the interior panel of the left door was directly contacted with the driver's left flank. The driver's left chest and left abdomen also contacted and loaded the interior fascia of the left B-pillar. This contact was highlighted and documented during the SCI vehicle inspection. Intrusion of left side components displaced the driver's seat cushion to the right, and also displaced the seat back rearward and to the right while rotating it counterclockwise. The driver's seat back also engaged and deformed the center console. Figure 12 shows the driver's contact to the left B-pillar, as well as the deformation and displacement of the driver's seat as observed during the SCI vehicle inspection.

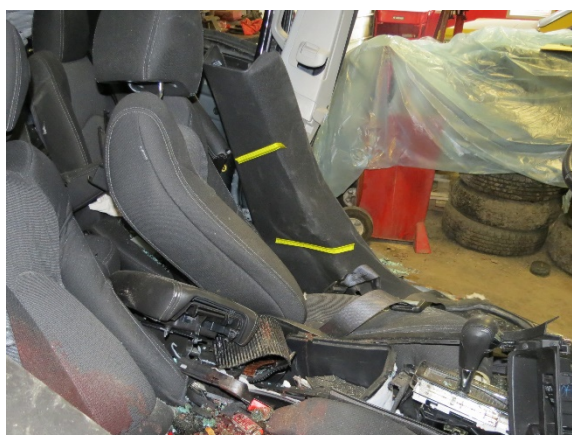


Figure 12. Interior image depicting the driver's seat belt in the Chevrolet

Manual Restraint Systems

The Chevrolet had 3-point lap and shoulder seat belt systems for all five seating positions. The front seat belt systems used continuous loop webbing with light-weight locking latch plates and adjustable D-rings. The driver's seat belt system retracted onto an emergency locking retractor (ELR), while the front right passenger's seat belt used an ELR/automatic locking retractor (ALR). Both front seat belts were equipped with both lower anchor and retractor pretensioners, none of which was actuated as a result of the crash. All second and third row seat belt systems featured continuous loop webbing with sliding latch plates. Only the driver's seat position was occupied at the time of the crash; therefore, none of the remaining systems were in use when the crash occurred.

At the time of the SCI inspection, the driver's seat belt was found cut into several pieces and lying loosely on the driver's seat. The latch plate remained engaged in the buckle stalk with a 48 cm (18.9 in) section of webbing through the belt path. Examination of the webbing remnants revealed striations and evidence of loading throughout its exposed length. A distinct area of

abrasions from the latch plate (Figure 13) was also observed. It was apparent the driver was belted at the time of the crash, based on the observations of the SCI inspection in conjunction with the data imaged from the vehicle's EDR and the on-scene images taken by the law enforcement agency during their documentation of the crash.



Figure 13. Interior image depicting the driver's seat belt in the Chevrolet

Supplemental Restraint Systems

The Chevrolet air bags gave supplemental restraint in the event of a crash including CAC driver's and passenger's frontal air bags, seat-mounted side impact air bags in the outboard aspects of the front row seats, dual-sensing (side impact and rollover) IC air bags mounted in the roof side rails, and a center air bag mounted in the right aspect of the driver's seat. The center air bag was designed to deploy from the inboard aspect of the driver's seat back to mitigate occupant-to-occupant interaction of front row occupants in lateral crash events. There was no actuation of the seat belt pretensioners or deployment of any air bags in the Chevrolet as a result of the crash.

NHTSA Recalls and Investigations

A VIN-based query of NHTSA's recall database (www.nhtsa.gov/recalls) for the 2014 Chevrolet Traverse as of the date of this report indicated no open (unrepaired) recalls and no investigations pertaining to this specific vehicle.

Air Bag Non-Deployment Discussion

Crashes with dynamics similar to this crash involving the Chevrolet routinely result in seat belt pretensioner actuation and supplemental side impact air bag deployment. In similar late model vehicles, frontal air bag deployment has also been observed in crashes with similar dynamics and circumstances. The impact acceleration measured by the Chevrolet's SDM and recorded to memory (in terms of velocity change) for this crash were of comparative magnitude and severity to deployment events observed in similar vehicles that were involved in crashes with similar impact dynamics. Specifically, a crash test of a 2012 Chevrolet Traverse conducted by TRC of

Ohio in March 2013¹ involving a moving barrier impact to the test vehicle's left plane produced deployment commands for the side impact protection devices, including the driver's seat-mounted and both IC air bags. The test vehicle experienced an impact closing speed of 61.84 km/h (38.4 mph). Comparatively, the calculated barrier equivalent speed of the Chevrolet for this crash was 65 km/h (40.4 mph).

Data imaged from the Chevrolet indicated that the air bag warning light was not on, nor were there any DTCs recorded that would have prevented the actuation or deployment of the supplemental devices. The Chevrolet's SDM recognized and recorded a pair of non-deployment events associated with this crash, the second of which included lateral acceleration data points within the first 30 milliseconds that exceeded 20 g. The Chevrolet's EDR did not command air bag deployment, but the recorded events did meet the OnStar notification threshold.

Specifics concerning the lack of deployment commands and OnStar notification qualification remain unknown due to the proprietary nature of the Chevrolet Traverse's algorithms. However, testing and field experience suggest that the magnitude of the impact should have exceeded threshold for deployment. It was notable that the involved Chevrolet was involved in two prior crash events, though neither was indicated or correlated to the actuation or deployment of the Chevrolet's supplemental restraint devices. The vehicle history report indicated that the Chevrolet's supplemental restraint systems were original manufacturer installed equipment and had not been modified or replaced. The root cause of the Chevrolet's air bag non-deployment could not be identified.

¹ National Highway Traffic Safety Administration. (2013, March 26). Vehicle Database Query Results - Test Detail Information [test #8354]. www-nrd.nhtsa.dot.gov/database/VSR/veh/TestDetail.aspx?LJC=83541

2014 Chevrolet Occupant

Driver Demographics

Age /sex: 56 years/female
 Height: Unknown (not reported)
 Weight: Unknown (not reported)
 Eyewear: Unknown
 Seat type: Forward-facing bucket seat with adjustable head restraint
 Seat track position: Middle
 Manual restraint usage: 3-point lap and shoulder seat belt
 Usage source: SCI vehicle inspection, EDR data, PCR
 Air bags: Frontal, seat-mounted side impact, center seat-mounted, and IC air bags available; none deployed
 Alcohol/drug data: Buprenorphine and norbuprenorphin²
 Egress from vehicle: Occupant fatal in vehicle
 Transport from scene: None
 Medical treatment: None, pronounced deceased at the crash site

Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Pericardial and epicardial petechial hemorrhage	441603.3	Intruded left door, rear upper quadrant (indirect)	Probable
2	Mid-thoracic bilateral rib fractures with associated hemorrhage of soft tissue	450210.2	Intruded left door, rear upper quadrant	Probable
3	Blunt force trauma to head, NFS	100099.9	Exterior surface of other vehicle (Specify: front plane of Mack)	Probable
4	Blunt force trauma to neck, NFS	300099.9	Intruded left door, rear upper quadrant	Probable
5	Blunt force trauma to thorax, NFS	400099.9	Intruded left door, rear upper quadrant	Probable
6	Soft tissue hemorrhage with vaginal bleeding, suprapubic and low anterior pelvis	500099.9	Intruded left door, rear upper quadrant (indirect)	Probable
7	Small contusions to anterior surface of heart	441004.1	Intruded left door, rear upper quadrant (indirect)	Probable
8	Contusions of soft tissue anterior to thoracic spine	410402.1	Intruded left door, rear upper quadrant (indirect)	Probable
9	Abrasions to right hand, NFS	710202.1	Steering wheel	Possible

² According to the coroner's report, buprenorphine and norbuprenorphin were detected in the driver's cardiac blood sample. These two drugs, classified as a Schedule III narcotic by the Drug Enforcement Agency, can be used to treat opioid dependency and are often accompanied by side effects such as drowsiness, dizziness, headache, memory loss, and cognitive and/or neural inhibition.

10	Abrasions to left hand, NFS	710202.1	Intruded left door, forward upper quadrant	Probable
11	Abrasions to left lower extremity, NFS	810202.1	Intruded left door, forward lower quadrant	Probable

Source: coroner's report.

Driver Kinematics

The 56-year-old female driver was in the Chevrolet's driver's seat, positioned mid-track, with the seat back slightly reclined. She used the available 3-point lap and shoulder seat belt system for manual restraint, as determined by the observed post-crash condition of the system during the SCI vehicle inspection, the data imaged from the Chevrolet's EDR, and a review of the on-scene images provided by the investigating law enforcement agency. As she approached the intersection, she released the accelerator and applied the brake. She brought the Chevrolet to a controlled stop, recorded by the vehicle at 4.5- seconds prior to AE. The Chevrolet was then stationary for approximately 1 second before the driver released the brake and applied the accelerator. The Chevrolet then entered into the intersection, directly into the path of the Mack truck.

At impact she responded to the 10 o'clock direction of the impact force by initiating a left and forward trajectory. As the Chevrolet rotated clockwise during the initial engagement, the driver's trajectory became purely lateral with respect to the vehicle's orientation. She maintained her trajectory response toward the impact force and struck the intruding left door and left B-pillar with her left flank.

Impact forces and the corresponding deformation to the Chevrolet's left plane disintegrated the left front window. Absent the integrity, and with the surrounding left plane objects deforming to the right, the driver's head was subjected to partial ejection from the vehicle through the left front glazing opening. It is highly likely that the left aspect of her head contacted the exposed exterior front plane of the Mack during maximum impact engagement. The severe intrusion displaced the driver and exacerbated her left loading of the intruded components.

Impact forces and the corresponding deformation to the Chevrolet's left plane disintegrated the left front window. The severe intrusion displaced the driver and exacerbated her left loading of the intruded components.

The combination of the driver's left flank loading of the door and the door's severe lateral intrusion produced numerous internal injuries. She was displaced to the right by the intrusion, such that her upper torso was positioned over the center console as the vehicle came to final rest. Injuries to the driver included head and facial bleeding. On-scene medical personnel pronounced the driver deceased at the crash site. Her body was subsequently removed and transferred to the Medical Examiner's office for post-mortem examination.

2005 Mack CL700 Truck

Description

The 2005 Mack CL700 was a tri-axle, single-unit truck equipped with a dump body and identified by the VIN 1M2AG11C85Mxxxxxx. The Mack (Figure 14) had a 12-liter, inline 6-cylinder diesel engine. It was a Class-8 truck with a 29,932 kg (66,000 lb) GVWR. Following the crash, the Mack was towed to its owner's facility. After being inspected by the law enforcement agency, it was released to its owner. The SCI team attempted to locate the Mack for inspection, but it had been transferred to a regional repair facility and was not available for inspection. Post-crash images of the truck were provided by its owner.

Exterior Damage

On-scene law enforcement images showed damage across the full width of the Mack's front bumper, extending vertically onto the hood. The left aspect of the hood, left headlamp assembly, and center grill were fractured, with visible deformation to the front bumper beam (Figure 15). The left front axle was displaced rearward an estimated 10 cm (4 in). Based on a review of the images of the Mack, the CDC assigned to the damage pattern was 12FDEW1.



Figure 14. Left front oblique view of the Mack at final rest (on-scene law enforcement image)



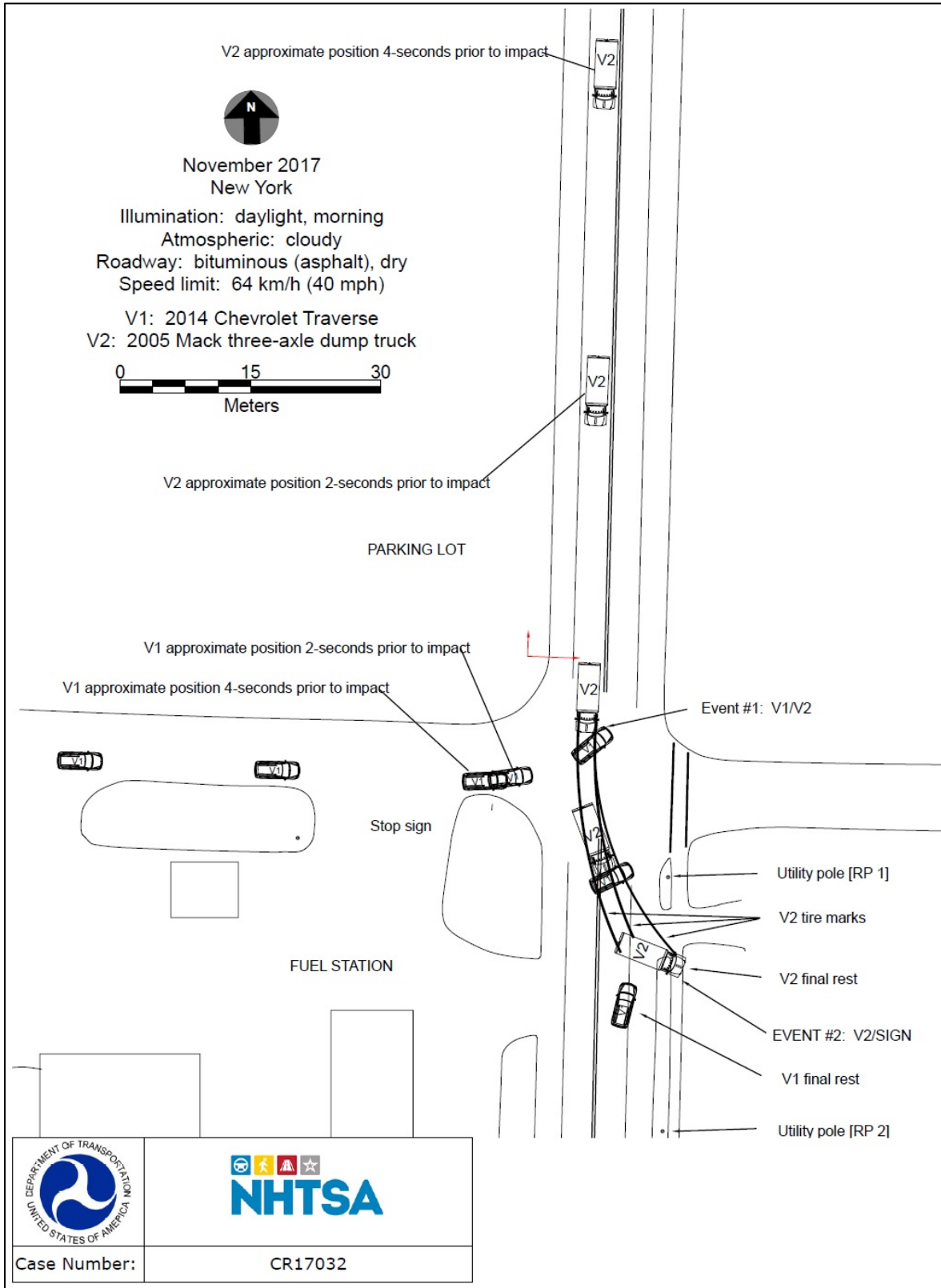
Figure 15. View of the Mack's front plane damage pattern (on-scene law enforcement image)

Occupant Data

The police report stated that the 70-year-old driver of the Mack was belted. He was operating the vehicle during the course of his employment. He complained of back pain but denied injury and was transported by ambulance to a local hospital for evaluation and toxicology examination.

The Mack's driver was released within hours of the crash without injury. Law enforcement confirmed that the Mack's driver was not under the influence of alcohol or drugs when the crash occurred.

Crash Diagram



Appendix A: Truck Impact Speed Calculation

Truck Impact Speed Calculations

Minimum Skid Speed Formula: $S = \sqrt{30 * D * f * n}$

S = Minimum speed

30 = Constant

Where, in Imperial Units:

D = Skid distance

f = Frictional coefficient

n = Braking efficiency (percent)

Average Value:

$$A = \left(\frac{x_1 + x_2 + x_3 \dots x_n}{n} \right)$$

A = Average value

x_1 = First value

Where:

x_2 = Second value

x_3 = Third value

n = Number of values

Both involved vehicles produced significant post-impact skidding tire marks. Although not fully visible at the time of the SCI investigation, the skidding tire marks had been completely documented by the investigating law enforcement agency at the time of the crash. Their values were reported to the SCI investigator as follows:

2005 Mack CL700			
<i>Tire Position</i>	<i>Distance</i>	<i>Tire Position</i>	<i>Distance</i>
LF	27.5 m (90.3 ft)	RF	None Visible
LR1 (outer)	24.5 m (80.5 ft)	RR1 (outer)	27.2 m (89.3 ft)
LR1 (inner)	24.9 m (81.7 ft)	RR1 (inner)	27.2 m (89.2 ft)
LR2 (outer)	25.2 m (82.7 ft)	RR2 (outer)	24.9 m (81.6 ft)
LR2 (inner)	16.6 m (54.5 ft)	RR2 (inner)	24.5 m (80.7 ft)

2014 Chevrolet Traverse	
<i>Tire Position</i>	<i>Distance</i>
LF	16.9 m (55.4 ft)
LR	None Visible
RR	23.9 m (78.5 ft)
RF	26.0 m (85.4 ft)

A calculation of the truck's speed was performed using its average skidding tire distance. Due to the apparent discrepancy of the LR2 inner position, its value was not included in the average (*note that inclusion of lower skid distance values only reduces the calculated speed value*).

Therefore:

$$x_1 = 90.3, x_2 = 80.5, x_3 = 81.7, x_4 = 82.7, x_5 = 89.3, x_6 = 89.2, x_7 = 81.6, x_8 = 80.7, \text{ and } n = 8$$

$$\text{Substituting and solving: } A = \left(\frac{90.3+80.5+81.7+82.7+89.3+89.2+81.6+80.7}{8} \right) = \frac{676}{8} = 84.5$$

Environmental conditions at the time of the crash were daylight, clear, and dry. The asphalt surface of the roadway therefore likely had a frictional coefficient of approximately 0.75. As all axle positions had at least one tire in contact with the roadway surface and were locked, the assumed braking efficiency percentage is equivalent to 1.0. Therefore:

$$\text{Minimum speed: } S = \sqrt{30 * D * f * n} = \sqrt{30 * 84.5 * 0.75 * 1.0} = \mathbf{43.6 \text{ mph}}$$

For comparison, a calculation of the truck's speed was performed using the average skidding tire distance for the Chevrolet. Only the values of the right-side tires were used for this calculation, due to the location of the impact on the left side of the vehicle. The forces of the crash would have elevated the left side tires during the impact engagement and displacement of the Chevrolet from impact, such that the left tires likely were not in contact with the roadway surface for the entire distance from impact to final rest. Therefore:

$$x_1 = 78.5, x_2 = 85.4, \text{ and } n = 2$$

$$\text{Substituting and solving: } A = \left(\frac{78.5+85.4}{2} \right) = \frac{163.9}{2} = 81.95$$

The same asphalt surface coefficient of 0.75 applies. As both right side tire positions were in contact with the roadway surface and were locked, the assumed braking efficiency percentage is equivalent to 1.0. Therefore:

$$\text{Minimum speed: } S = \sqrt{30 * D * f * n} = \sqrt{30 * 81.95 * 0.75 * 1.0} = \mathbf{42.9 \text{ mph}}$$

Based on these calculations, the SCI investigator confidently concluded that the estimated speed of the Mack truck at impact was 69 km/h (43 mph).

Appendix B: Event Data Recorder Report for 2014 Chevrolet Traverse³

³ The EDR Report contained in this technical report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	1GNKVGKD7EJ*****
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	CR17032_V1_ACM.CDRX
Saved on	
Imaged with CDR version	Crash Data Retrieval Tool 17.5
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 21.2
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	Non-Deployment, Non-Deployment

Comments

No comments entered.

Data Limitations

Recorded Crash Events:

There are two types of recorded crash events for Front, Side, and Rear (FSR) Events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH [8 km/h]. A Non-Deployment Event contains Pre-Crash and Crash data. The oldest Non-Deployment event can be overwritten by a Deployment Event, if all three records are full and the Non-Deployment Event is not locked. A Non-Deployment Event can be overwritten by a more recent Non-Deployment Event if all three records are full and the Non-Deployment is older than approximately 250 ignition cycles. Also, a Non-Deployment event can be recorded if one of the following occurs without the Deployment of any of the frontal air bags, side air bags, or roll bars:

- Pretensioner(s) only Deployment
- Head Rest Deployment
- Battery Cut-Off Deployment

The second type of SDM recorded crash event for FSR Events is the Deployment Event. It also contains Pre-Crash and Crash data. Deployment Events cannot be overwritten or cleared by the SDM.

Rollover Events contains Pre-Crash and Crash data. Rollover event follow the same rules as FSR Deployment events. The SDM can store up to three Events.

Data:

For FSR Events, SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment and Non-Deployment Events, the SDM will record up to 300 milliseconds of data after time zero. The SDM will also record up to 300 milliseconds of Vehicle Acceleration data after time zero.

For Rollover Events, the SDM may record Lateral Acceleration, Vertical Acceleration, and Roll Rate data, if the SDM is rollover capable. This data reflects what the sensing system experienced during the recorded portion of the event. For Rollover Deployment Events, the SDM will record up to 700 milliseconds of data before the Deployment criteria is met and 290 milliseconds after the Deployment criteria is met.

-Deployment loops may be displayed as being deployed in a Non-Deployment event record, if a Deployment event is qualified during the Non-Deployment event. That is, if two or more events are occurring at the same time and one is a Non-Deployment event and one of the others is a Deployment event, and the Deployment event is qualified while the Non-Deployment is still active, the deployed loops may be recorded in the Non-Deployment event record.

-Time between events is recorded in 10 msec intervals and is displayed in seconds for a maximum time of 655.33 seconds.

-The Maximum SDM Recorded Vehicle Velocity Change may occur between the recorded 10 millisecond sample points of the SDM Recorded Vehicle Velocity Change.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has

been interrupted and not fully written.

- SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
 - Significant changes in the tire's rolling radius
 - Final drive axle ratio changes
 - Wheel lockup and wheel slip
- Brake Switch Circuit Status indicates the open/closed state of the brake switch circuit.
- Pre-Crash data is recorded asynchronously. The 0.5 second Pre-crash data value (most recent recorded data point) is the data point last sampled before Time Zero. That is to say, the last data point may have been captured just before Time Zero but no more than 0.5 second before Time Zero. All subsequent Pre-crash data values are referenced from this data point.
- Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:
 - The SDM receives a message with an "invalid" flag from the module sending the pre-crash data
- Pre-Crash Electronic Data Validity Check Status indicates "Data Not Available" if:
 - No data is received from the module sending the pre-crash data
- For diesel powered vehicles, the data displayed as Throttle Position (%) is actually the data for the Air Inlet Flap Position. This is not the same as the throttle position for a gasoline powered engines.
- Belt Switch Circuit Status indicates the status of the seat belt switch circuit.
- The ignition cycle counter will increment when the power mode cycles from OFF/Accessory to RUN. Applying and removing of battery power to the module will not increment the ignition cycle counter.
- Ignition Cycles Since DTCs Were Last Cleared can record a maximum value of 253 cycles and can only be reset by a scan tool.
- Dynamic Deployment Event Counter tracks the number of Deployment events that have occurred during the SDM's lifetime.
- Dynamic Event Counter tracks the number of qualified events (either Deployments, Non-deploy, or Rollover events) that have occurred during the SDM's lifetime.
- For Deployment Events, DTC B0052 (Deployment commanded) shall be recorded with the remainder of the data for this event even though it occurred after Event Enable.
- Once a firing loop has been commanded to be deployed, it will not be commanded to be deployed again during the same ignition cycle. Firing loop times for subsequent deployment type events, during the same ignition cycle, will record the deployment times as N/A.
- The GM parameter name is displayed in parentheses after the NHTSA Part 563 parameter name.
- The reported range of the longitudinal and lateral acceleration values is approximately ± 50 g.
- All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

Data Source:

- All SDM recorded data is measured, calculated, and stored internally, except for the following:
- Vehicle Status Data (Pre-Crash) is transmitted by the Body Control Module, via the vehicle's communication network.
 - The Belt Switch Circuit is wired directly to the SDM.

Data Element Sign Convention:

The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. Directional references to sign notation are all from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Acceleration	Forward
Longitudinal Velocity Change	Forward
Lateral Acceleration	Left to Right
Lateral Velocity Change	Left to Right
Vertical Acceleration	Downward
Roll Rate	Clockwise Rotation

Hexadecimal Data:

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR tool.

01048_SDM11P-autoliv_r013

System Status at Time of Retrieval

Dynamic Deployment Event Counter	0
Multi-Event, Number of Events (Dynamic Event Counter)	2
Dynamic OnStar Notification Event Counter	1
Ignition Cycle, Download (Ignition Cycles at Investigation)	7395
End Model Part Number	00CF45AC
System Type	Autoliv
Software Module Identifier 1	00CF53F0
Software Module Identifier 2	0160D377
Manufacturing Traceability Data, Component Identifier	AS
Manufacturing Traceability Data, Part Number/Broadcast Code	3788
Manufacturing Traceability Data, Supplier Code	E
Manufacturing Traceability Data, Traceability Number	05*****3
ESS # 1 Traceability Data, Component Identifier	AU
ESS # 1 Traceability Data, Part Number/Broadcast Code	0000
ESS # 1 Traceability Data, Supplier Code	E
ESS # 1 Traceability Data, Traceability Number	000000000
ESS # 2 Traceability Data, Component Identifier	AT
ESS # 2 Traceability Data, Part Number/Broadcast Code	0000
ESS # 2 Traceability Data, Supplier Code	E
ESS # 2 Traceability Data, Traceability Number	000000000
ESS # 3 Traceability Data, Component Identifier	AH
ESS # 3 Traceability Data, Part Number/Broadcast Code	0000
ESS # 3 Traceability Data, Supplier Code	E
ESS # 3 Traceability Data, Traceability Number	000000000
ESS # 4 Traceability Data, Component Identifier	AJ
ESS # 4 Traceability Data, Part Number/Broadcast Code	0000
ESS # 4 Traceability Data, Supplier Code	E
ESS # 4 Traceability Data, Traceability Number	000000000
ESS # 5 Traceability Data, Component Identifier	DA
ESS # 5 Traceability Data, Part Number/Broadcast Code	0000
ESS # 5 Traceability Data, Supplier Code	E
ESS # 5 Traceability Data, Traceability Number	000000000
ESS # 6 Traceability Data, Component Identifier	DB
ESS # 6 Traceability Data, Part Number/Broadcast Code	0000
ESS # 6 Traceability Data, Supplier Code	E
ESS # 6 Traceability Data, Traceability Number	000000000
ESS # 7 Traceability Data, Component Identifier	00
ESS # 7 Traceability Data, Part Number/Broadcast Code	0000
ESS # 7 Traceability Data, Supplier Code	E
ESS # 7 Traceability Data, Traceability Number	000000000
ESS # 8 Traceability Data, Component Identifier	00
ESS # 8 Traceability Data, Part Number/Broadcast Code	0000
ESS # 8 Traceability Data, Supplier Code	E
ESS # 8 Traceability Data, Traceability Number	000000000

System Status at Event (Event Record 1)

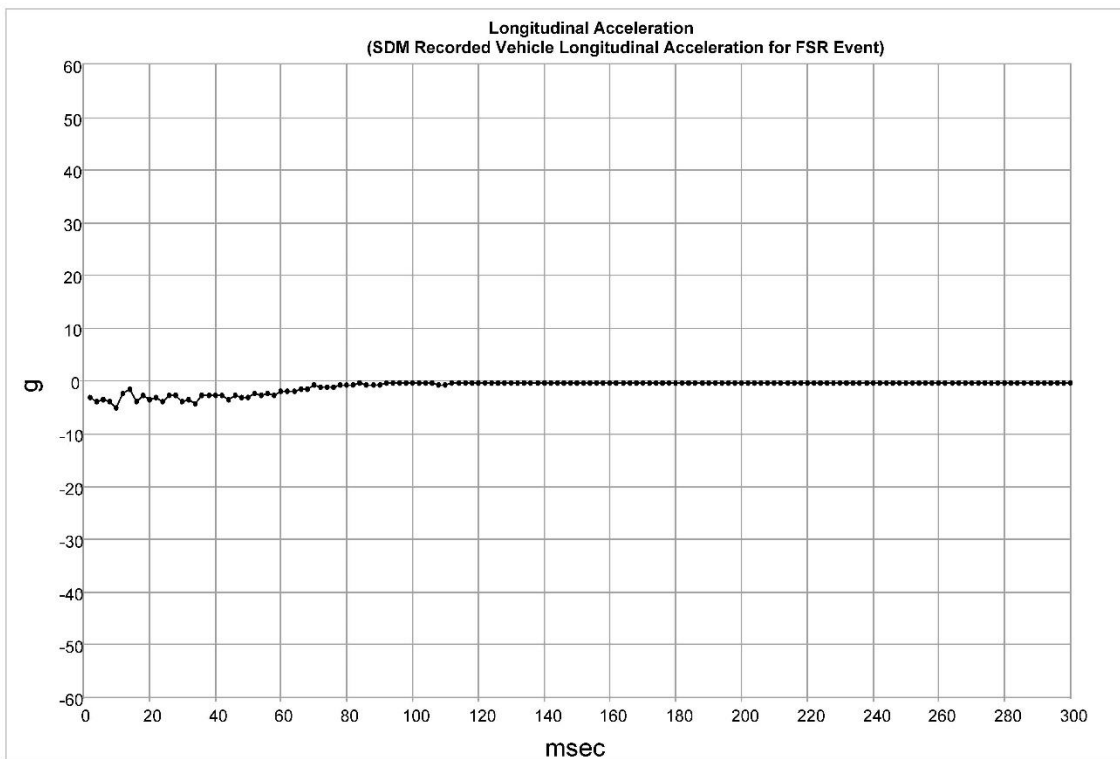
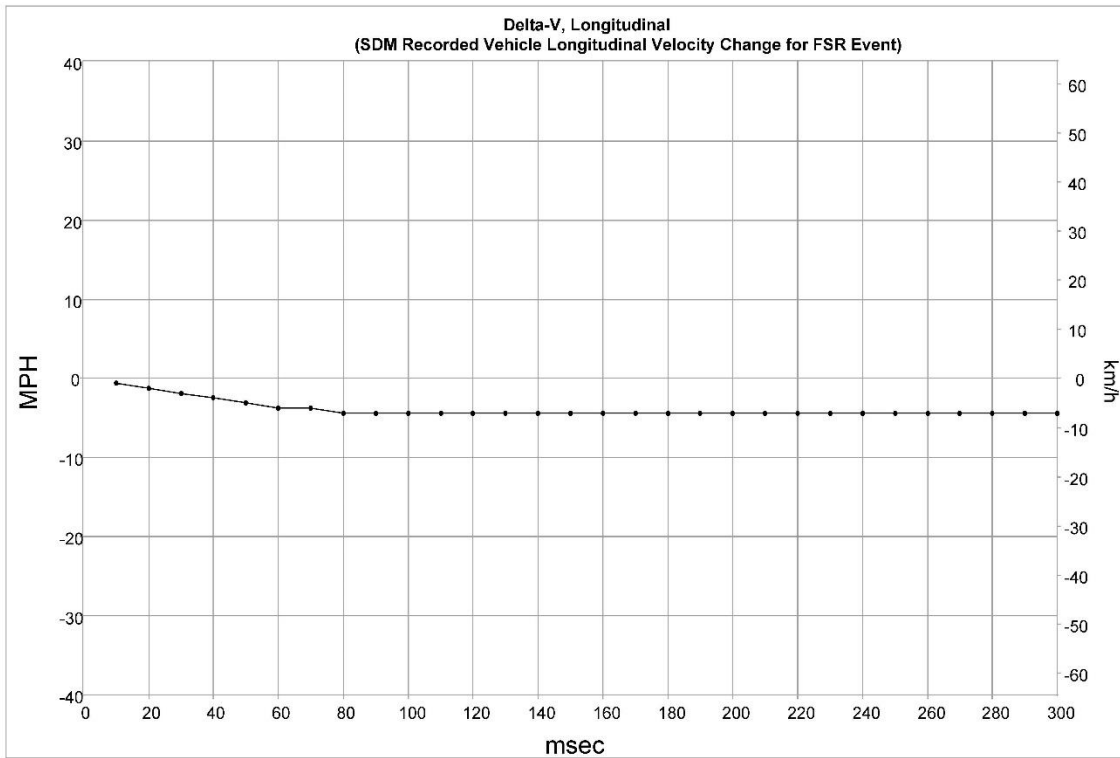
Event Record Type	Non-Deployment
OnStar Deployment Status Data Sent	No
Complete file recorded (Event Recording Complete)	Yes
Crash Record Locked	No
OnStar SDM Recorded Vehicle Velocity Change Data Sent	No
Deployment Event Counter	0
Multi-Event, Number of Events (Event Counter)	1
OnStar Notification Event Counter	0
Time From Event 1 to 2 (Time Between Events) (seconds)	Data Not Available
Ignition Cycle, Crash (Ignition Cycles at Event)	2142
Algorithm Active: Frontal	Yes
Algorithm Active: Side	No
Algorithm Active: Rollover	No
Algorithm Active: Rear	No
Concurrent Event Flag Set	No
Event Severity Status: Frontal Pretensioner	No
Event Severity Status: Frontal Stage 1	No
Event Severity Status: Frontal Stage 2	No
Event Severity Status: Left Side	No
Event Severity Status: Right Side	No
Event Severity Status: Rear	No
Event Severity Status: Rollover	No
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Not Buckled
Safety Belt Status, Right Front Passenger (Passenger Belt Switch Circuit Status)	Not Buckled
Center Front Row Belt Switch Circuit Status (If Equipped)	Data Not Available
Left Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Center Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Right Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Passenger Seat Occupancy Status	Occupied
Occupant Size Right Front Passenger Child (Passenger Classification Status)	No (Adult)
Passenger Air Bag ON Indicator Status	On
Passenger Air Bag OFF Indicator Status	Off
Low Tire Pressure Warning Lamp Status 0.5 Seconds Prior to Time Zero	On
Frontal Air Bag Warning Lamp (SIR Warning Lamp Status 0.5 Seconds Prior to Time Zero)	Off
SIR Warning Lamp ON/OFF Time Continuously (seconds)	128830
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	138
Ignition Cycles Since DTCs Were Last Cleared 0.5 Seconds Prior to Time Zero	253
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	-4 [-7]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change)(msec)	110
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	5 [8]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change)(msec)	110

DTCs Present at Time of Event (Event Record 1)
No Diagnostic Trouble Codes

Event Data (Event Record 1)

Driver 1st Stage Deployment Loop Commanded	No
Passenger 1st Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded	No
Driver Pretensioner Deployment Loop #1 Commanded	No
Passenger Pretensioner Deployment Loop #1 Commanded	No
Driver Pretensioner Deployment Loop #2 Commanded	No
Passenger Pretensioner Deployment Loop #2 Commanded	No
Driver Thorax Loop Commanded	No
Passenger Thorax Loop Commanded	No
Left Row 1 Roof Rail/Head Curtain Loop Commanded	No
Right Row 1 Roof Rail/Head Curtain Loop Commanded	No
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Driver (Driver 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (Driver 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Right Front Passenger (Passenger 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (Passenger 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Side air bag deployment, time to deploy, driver (Driver Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Side air bag deployment, time to deploy, right front passenger (Passenger Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Pretensioner Deployment, Time to Fire, Driver (Driver Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	Data Not Available
Pretensioner Deployment, Time to Fire, Right Front Passenger (Passenger Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	Data Not Available

Longitudinal Crash Pulse (Event Record 1)



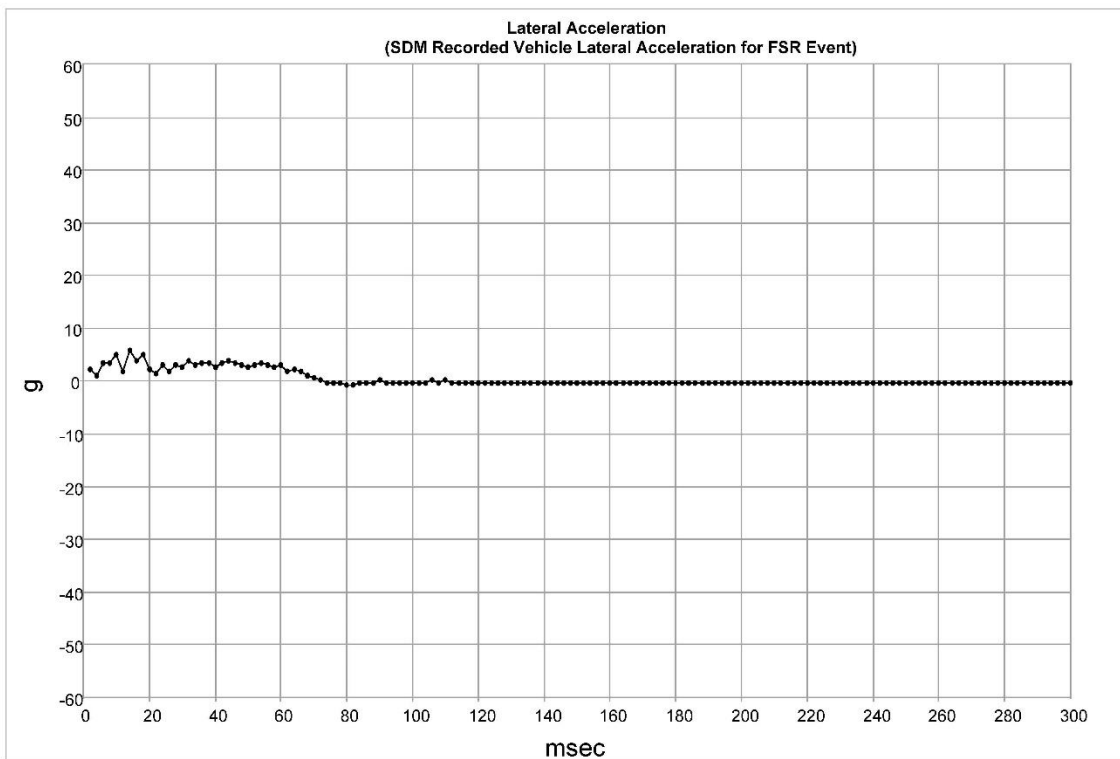
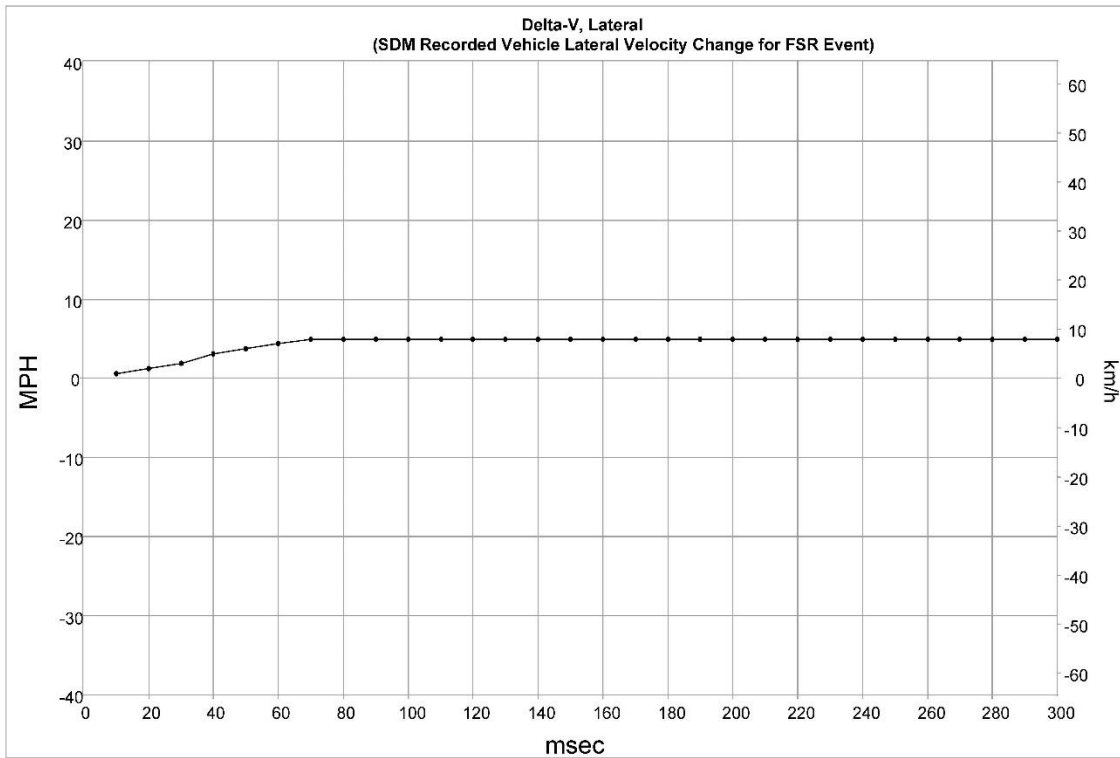
Longitudinal Crash Pulse (Event Record 1)

Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (km/h)
10	-0.6	-1.0
20	-1.2	-2.0
30	-1.9	-3.0
40	-2.5	-4.0
50	-3.1	-5.0
60	-3.7	-6.0
70	-3.7	-6.0
80	-4.3	-7.0
90	-4.3	-7.0
100	-4.3	-7.0
110	-4.3	-7.0
120	-4.3	-7.0
130	-4.3	-7.0
140	-4.3	-7.0
150	-4.3	-7.0
160	-4.3	-7.0
170	-4.3	-7.0
180	-4.3	-7.0
190	-4.3	-7.0
200	-4.3	-7.0
210	-4.3	-7.0
220	-4.3	-7.0
230	-4.3	-7.0
240	-4.3	-7.0
250	-4.3	-7.0
260	-4.3	-7.0
270	-4.3	-7.0
280	-4.3	-7.0
290	-4.3	-7.0
300	-4.3	-7.0

Longitudinal Crash Pulse (Event Record 1)

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
2	-3.0	102	-0.2	202	-0.2
4	-3.8	104	-0.2	204	-0.2
6	-3.4	106	-0.2	206	-0.2
8	-3.8	108	-0.6	208	-0.2
10	-5.0	110	-0.6	210	-0.2
12	-2.2	112	-0.2	212	-0.2
14	-1.4	114	-0.2	214	-0.2
16	-3.8	116	-0.2	216	-0.2
18	-2.6	118	-0.2	218	-0.2
20	-3.4	120	-0.2	220	-0.2
22	-3.0	122	-0.2	222	-0.2
24	-3.8	124	-0.2	224	-0.2
26	-2.6	126	-0.2	226	-0.2
28	-2.6	128	-0.2	228	-0.2
30	-3.8	130	-0.2	230	-0.2
32	-3.4	132	-0.2	232	-0.2
34	-4.2	134	-0.2	234	-0.2
36	-2.6	136	-0.2	236	-0.2
38	-2.6	138	-0.2	238	-0.2
40	-2.6	140	-0.2	240	-0.2
42	-2.6	142	-0.2	242	-0.2
44	-3.4	144	-0.2	244	-0.2
46	-2.6	146	-0.2	246	-0.2
48	-3.0	148	-0.2	248	-0.2
50	-3.0	150	-0.2	250	-0.2
52	-2.2	152	-0.2	252	-0.2
54	-2.6	154	-0.2	254	-0.2
56	-2.2	156	-0.2	256	-0.2
58	-2.6	158	-0.2	258	-0.2
60	-1.8	160	-0.2	260	-0.2
62	-1.8	162	-0.2	262	-0.2
64	-1.8	164	-0.2	264	-0.2
66	-1.4	166	-0.2	266	-0.2
68	-1.4	168	-0.2	268	-0.2
70	-0.6	170	-0.2	270	-0.2
72	-1.0	172	-0.2	272	-0.2
74	-1.0	174	-0.2	274	-0.2
76	-1.0	176	-0.2	276	-0.2
78	-0.6	178	-0.2	278	-0.2
80	-0.6	180	-0.2	280	-0.2
82	-0.6	182	-0.2	282	-0.2
84	-0.2	184	-0.2	284	-0.2
86	-0.6	186	-0.2	286	-0.2
88	-0.6	188	-0.2	288	-0.2
90	-0.6	190	-0.2	290	-0.2
92	-0.2	192	-0.2	292	-0.2
94	-0.2	194	-0.2	294	-0.2
96	-0.2	196	-0.2	296	-0.2
98	-0.2	198	-0.2	298	-0.2
100	-0.2	200	-0.2	300	-0.2

Lateral Crash Pulse (Event Record 1)



Lateral Crash Pulse (Event Record 1)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (km/h)
10	0.6	1.0
20	1.2	2.0
30	1.9	3.0
40	3.1	5.0
50	3.7	6.0
60	4.3	7.0
70	5.0	8.0
80	5.0	8.0
90	5.0	8.0
100	5.0	8.0
110	5.0	8.0
120	5.0	8.0
130	5.0	8.0
140	5.0	8.0
150	5.0	8.0
160	5.0	8.0
170	5.0	8.0
180	5.0	8.0
190	5.0	8.0
200	5.0	8.0
210	5.0	8.0
220	5.0	8.0
230	5.0	8.0
240	5.0	8.0
250	5.0	8.0
260	5.0	8.0
270	5.0	8.0
280	5.0	8.0
290	5.0	8.0
300	5.0	8.0

Lateral Crash Pulse (Event Record 1)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
2	2.2	102	-0.2	202	-0.2
4	1.0	104	-0.2	204	-0.2
6	3.4	106	0.2	206	-0.2
8	3.4	108	-0.2	208	-0.2
10	5.0	110	0.2	210	-0.2
12	1.8	112	-0.2	212	-0.2
14	5.8	114	-0.2	214	-0.2
16	3.8	116	-0.2	216	-0.2
18	5.0	118	-0.2	218	-0.2
20	2.2	120	-0.2	220	-0.2
22	1.4	122	-0.2	222	-0.2
24	3.0	124	-0.2	224	-0.2
26	1.8	126	-0.2	226	-0.2
28	3.0	128	-0.2	228	-0.2
30	2.6	130	-0.2	230	-0.2
32	3.8	132	-0.2	232	-0.2
34	3.0	134	-0.2	234	-0.2
36	3.4	136	-0.2	236	-0.2
38	3.4	138	-0.2	238	-0.2
40	2.6	140	-0.2	240	-0.2
42	3.4	142	-0.2	242	-0.2
44	3.8	144	-0.2	244	-0.2
46	3.4	146	-0.2	246	-0.2
48	3.0	148	-0.2	248	-0.2
50	2.6	150	-0.2	250	-0.2
52	3.0	152	-0.2	252	-0.2
54	3.4	154	-0.2	254	-0.2
56	3.0	156	-0.2	256	-0.2
58	2.6	158	-0.2	258	-0.2
60	3.0	160	-0.2	260	-0.2
62	1.8	162	-0.2	262	-0.2
64	2.2	164	-0.2	264	-0.2
66	1.8	166	-0.2	266	-0.2
68	1.0	168	-0.2	268	-0.2
70	0.6	170	-0.2	270	-0.2
72	0.2	172	-0.2	272	-0.2
74	-0.2	174	-0.2	274	-0.2
76	-0.2	176	-0.2	276	-0.2
78	-0.2	178	-0.2	278	-0.2
80	-0.6	180	-0.2	280	-0.2
82	-0.6	182	-0.2	282	-0.2
84	-0.2	184	-0.2	284	-0.2
86	-0.2	186	-0.2	286	-0.2
88	-0.2	188	-0.2	288	-0.2
90	0.2	190	-0.2	290	-0.2
92	-0.2	192	-0.2	292	-0.2
94	-0.2	194	-0.2	294	-0.2
96	-0.2	196	-0.2	296	-0.2
98	-0.2	198	-0.2	298	-0.2
100	-0.2	200	-0.2	300	-0.2

**Rollover Crash Pulse (Event Record 1)
SDM Recorded Vehicle Roll Rate**

Contains No Recorded Data

**Rollover Crash Pulse (Event Record 1)
Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for
Rollover Event)**

Contains No Recorded Data

**Vertical Crash Pulse (Event Record 1)
Normal Acceleration (SDM Recorded Vehicle Vertical Acceleration for
Rollover Event)**

Contains No Recorded Data

Pre-Crash Data -5.0 to -0.5 sec (Event Record 1)

Times (sec)	Accelerator Pedal, % Full (Accelerator Pedal Position)	Service Brake (Brake Switch Circuit State)	Engine RPM (Engine Speed)	Engine Throttle, % Full (Throttle Position)	Speed, Vehicle Indicated (Vehicle Speed) (MPH [km/h])
-5.0	0	On	576	6	0 [0]
-4.5	0	On	576	6	0 [0]
-4.0	0	Off	576	6	0 [0]
-3.5	28	Off	960	44	0 [0]
-3.0	0	Off	1728	21	2 [3]
-2.5	0	On	960	15	3 [5]
-2.0	0	Off	896	14	3 [5]
-1.5	26	Off	1344	32	4 [6]
-1.0	28	Off	2048	33	5 [8]
-0.5	0	Off	1792	30	7 [12]

Pre-Crash Data -2.0 to -0.5 sec (Event Record 1)

Times (sec)	Cruise Control Active	Cruise Control Resume Switch Active	Cruise Control Set Switch Active	Engine Torque (lb-ft [N-m])	Reduced Engine Power Mode Indicator
-2.0	No	No	No	25 [34]	Off
-1.5	No	No	No	127 [172]	Off
-1.0	No	No	No	134 [181]	Off
-0.5	No	No	No	100 [136]	Off

System Status at Event (Event Record 2)

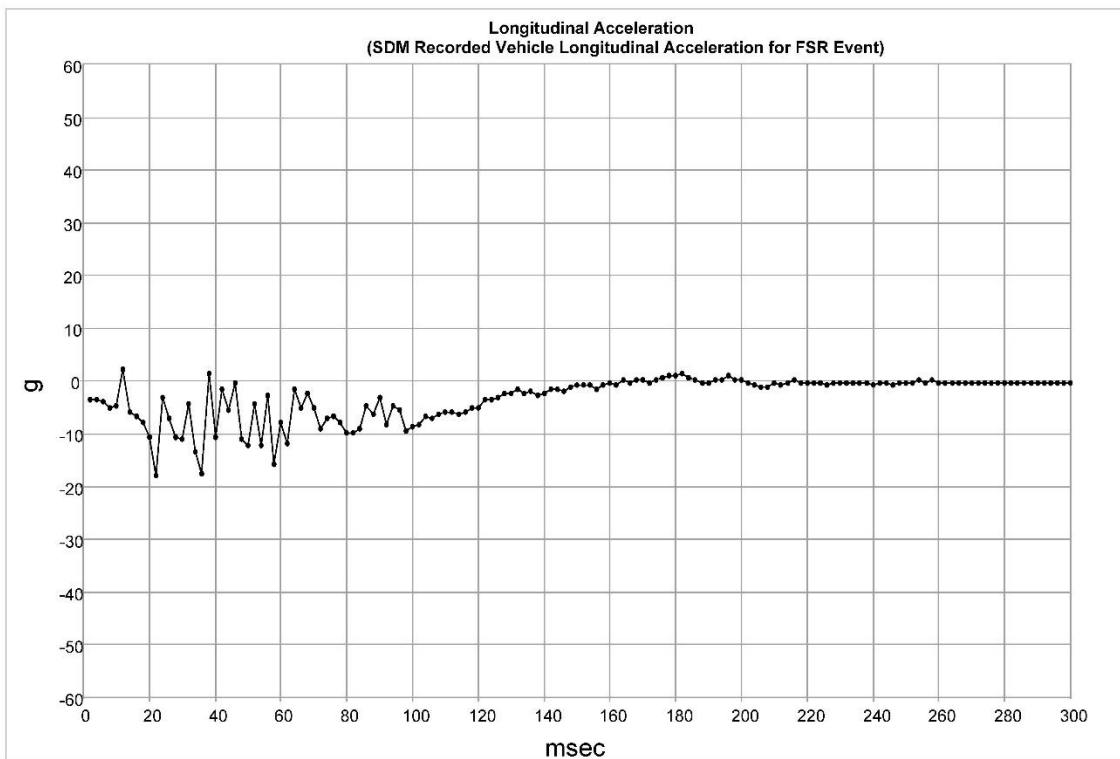
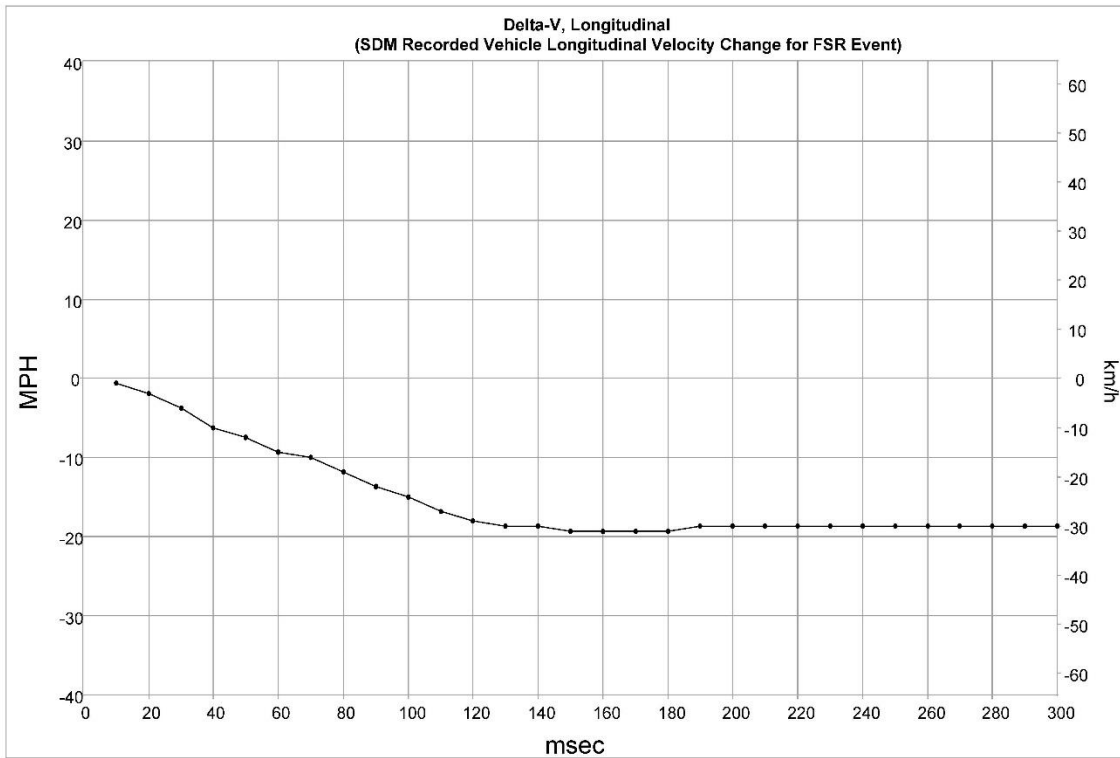
Event Record Type	Non-Deployment
OnStar Deployment Status Data Sent	Yes
Complete file recorded (Event Recording Complete)	Yes
Crash Record Locked	No
OnStar SDM Recorded Vehicle Velocity Change Data Sent	Yes
Deployment Event Counter	0
Multi-Event, Number of Events (Event Counter)	2
OnStar Notification Event Counter	1
Time From Event 1 to 2 (Time Between Events) (seconds)	Data Not Available
Ignition Cycle, Crash (Ignition Cycles at Event)	7395
Algorithm Active: Frontal	Yes
Algorithm Active: Side	Yes
Algorithm Active: Rollover	Yes
Algorithm Active: Rear	No
Concurrent Event Flag Set	No
Event Severity Status: Frontal Pretensioner	No
Event Severity Status: Frontal Stage 1	No
Event Severity Status: Frontal Stage 2	No
Event Severity Status: Left Side	No
Event Severity Status: Right Side	No
Event Severity Status: Rear	No
Event Severity Status: Rollover	No
Safety Belt Status, Driver (Driver Belt Switch Circuit Status)	Buckled
Safety Belt Status, Right Front Passenger (Passenger Belt Switch Circuit Status)	Not Buckled
Center Front Row Belt Switch Circuit Status (If Equipped)	Data Not Available
Left Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Center Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Right Row 3 Belt Switch Circuit Status (If Equipped)	Data Not Available
Passenger Seat Occupancy Status	Empty
Occupant Size Right Front Passenger Child (Passenger Classification Status)	No (Not Applicable)
Passenger Air Bag ON Indicator Status	Off
Passenger Air Bag OFF Indicator Status	On
Low Tire Pressure Warning Lamp Status 0.5 Seconds Prior to Time Zero	Off
Frontal Air Bag Warning Lamp (SIR Warning Lamp Status 0.5 Seconds Prior to Time Zero)	Off
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655330
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	1000
Ignition Cycles Since DTCs Were Last Cleared 0.5 Seconds Prior to Time Zero	253
Maximum Delta-V, Longitudinal (Maximum Longitudinal SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	-19 [-31]
Time, Maximum Delta-V (Time From FSR Time Zero to Maximum Longitudinal SDM Recorded Vehicle Velocity Change)(msec)	162
Maximum Delta-V, Lateral (Maximum Lateral SDM Recorded Vehicle Velocity Change for FSR Event) MPH [km/h]	37 [59]
Time Maximum Delta-V, Lateral (Time From FSR Time Zero to Maximum Lateral SDM Recorded Vehicle Velocity Change)(msec)	182

DTCs Present at Time of Event (Event Record 2)
No Diagnostic Trouble Codes

Event Data (Event Record 2)

Driver 1st Stage Deployment Loop Commanded	No
Passenger 1st Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded	No
Driver Pretensioner Deployment Loop #1 Commanded	No
Passenger Pretensioner Deployment Loop #1 Commanded	No
Driver Pretensioner Deployment Loop #2 Commanded	No
Passenger Pretensioner Deployment Loop #2 Commanded	No
Driver Thorax Loop Commanded	No
Passenger Thorax Loop Commanded	No
Left Row 1 Roof Rail/Head Curtain Loop Commanded	No
Right Row 1 Roof Rail/Head Curtain Loop Commanded	No
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Driver (Driver 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 2nd Stage, Driver (Driver 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 1st Stage Deployment, Right Front Passenger (Passenger 1st Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (Passenger 2nd Stage Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Side air bag deployment, time to deploy, driver (Driver Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Side air bag deployment, time to deploy, right front passenger (Passenger Thorax/Curtain Time From Time Zero to Deployment Command Criteria Met) (msec)	Data Not Available
Pretensioner Deployment, Time to Fire, Driver (Driver Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	Data Not Available
Pretensioner Deployment, Time to Fire, Right Front Passenger (Passenger Pretensioner Time From Time Zero to Deployment Loop #1 or Loop #2 Command Criteria Met) (msec)	Data Not Available

Longitudinal Crash Pulse (Event Record 2)



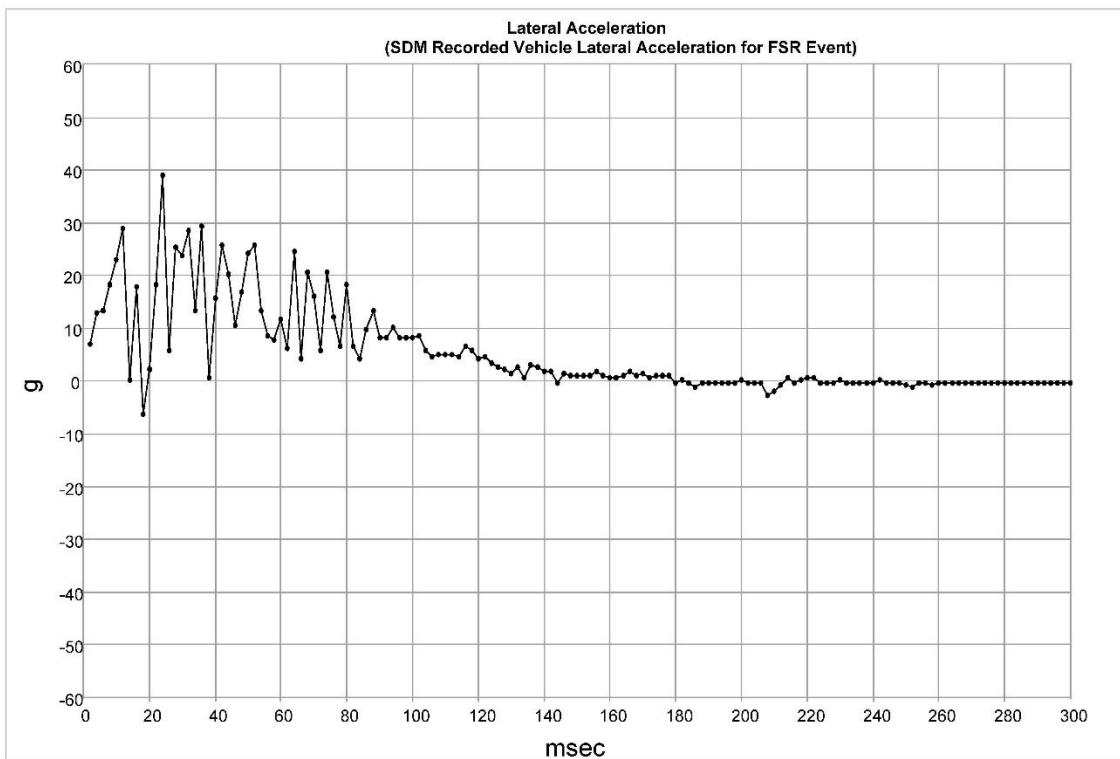
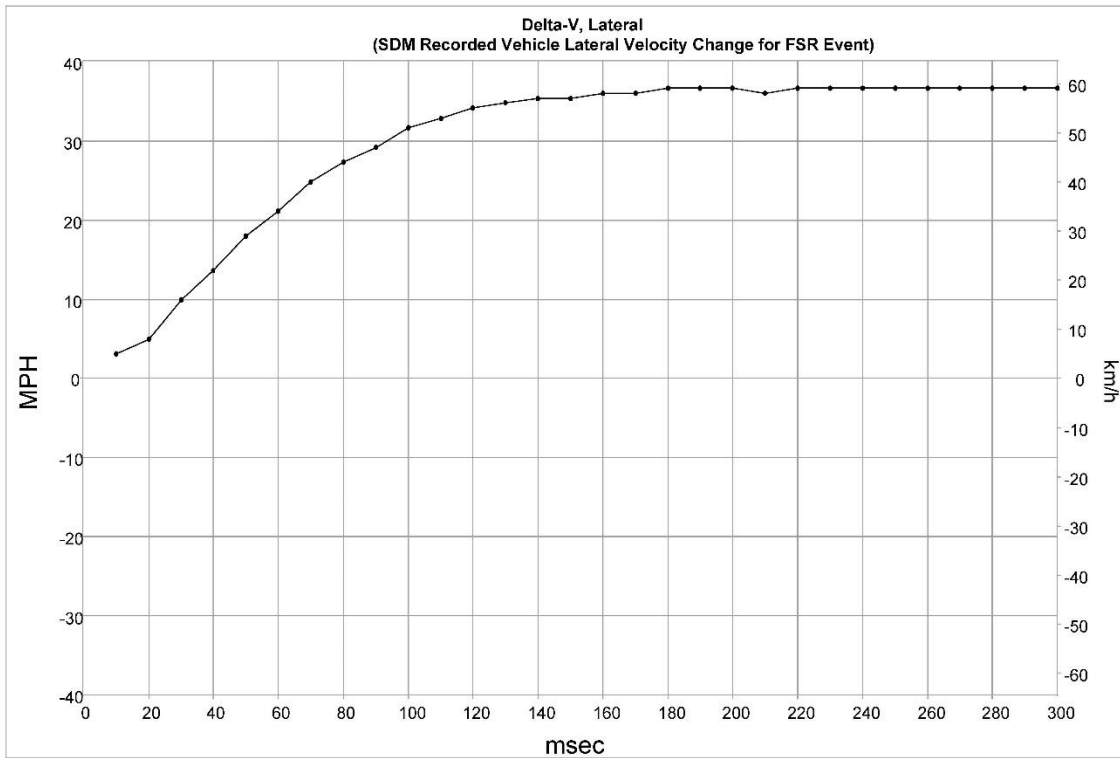
Longitudinal Crash Pulse (Event Record 2)

Time (msec)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (MPH)	Delta-V, Longitudinal (SDM Recorded Vehicle Longitudinal Velocity Change for FSR Event) (km/h)
10	-0.6	-1.0
20	-1.9	-3.0
30	-3.7	-6.0
40	-6.2	-10.0
50	-7.5	-12.0
60	-9.3	-15.0
70	-9.9	-16.0
80	-11.8	-19.0
90	-13.7	-22.0
100	-14.9	-24.0
110	-16.8	-27.0
120	-18.0	-29.0
130	-18.6	-30.0
140	-18.6	-30.0
150	-19.3	-31.0
160	-19.3	-31.0
170	-19.3	-31.0
180	-19.3	-31.0
190	-18.6	-30.0
200	-18.6	-30.0
210	-18.6	-30.0
220	-18.6	-30.0
230	-18.6	-30.0
240	-18.6	-30.0
250	-18.6	-30.0
260	-18.6	-30.0
270	-18.6	-30.0
280	-18.6	-30.0
290	-18.6	-30.0
300	-18.6	-30.0

Longitudinal Crash Pulse (Event Record 2)

Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)	Time (msec)	Longitudinal Acceleration (SDM Recorded Vehicle Longitudinal Acceleration for FSR Event) (g)
2	-3.4	102	-8.2	202	-0.2
4	-3.4	104	-6.6	204	-0.6
6	-3.8	106	-7.0	206	-1.0
8	-5.0	108	-6.2	208	-1.0
10	-4.6	110	-5.8	210	-0.2
12	2.2	112	-5.8	212	-0.6
14	-5.8	114	-6.2	214	-0.2
16	-6.6	116	-5.8	216	0.2
18	-7.8	118	-5.0	218	-0.2
20	-10.6	120	-5.0	220	-0.2
22	-17.8	122	-3.4	222	-0.2
24	-3.0	124	-3.4	224	-0.2
26	-7.0	126	-3.0	226	-0.6
28	-10.6	128	-2.2	228	-0.2
30	-11.0	130	-2.2	230	-0.2
32	-4.2	132	-1.4	232	-0.2
34	-13.4	134	-2.2	234	-0.2
36	-17.4	136	-1.8	236	-0.2
38	1.4	138	-2.6	238	-0.2
40	-10.6	140	-2.2	240	-0.6
42	-1.4	142	-1.4	242	-0.2
44	-5.4	144	-1.4	244	-0.2
46	-0.2	146	-1.8	246	-0.6
48	-11.0	148	-1.0	248	-0.2
50	-12.2	150	-0.6	250	-0.2
52	-4.2	152	-0.6	252	-0.2
54	-12.2	154	-0.6	254	0.2
56	-2.6	156	-1.4	256	-0.2
58	-15.8	158	-0.6	258	0.2
60	-7.8	160	-0.2	260	-0.2
62	-11.8	162	-0.6	262	-0.2
64	-1.4	164	0.2	264	-0.2
66	-5.0	166	-0.2	266	-0.2
68	-2.2	168	0.2	268	-0.2
70	-5.0	170	0.2	270	-0.2
72	-9.0	172	-0.2	272	-0.2
74	-7.0	174	0.2	274	-0.2
76	-6.6	176	0.6	276	-0.2
78	-7.8	178	1.0	278	-0.2
80	-9.8	180	1.0	280	-0.2
82	-9.8	182	1.4	282	-0.2
84	-9.0	184	0.6	284	-0.2
86	-4.6	186	0.2	286	-0.2
88	-6.2	188	-0.2	288	-0.2
90	-3.0	190	-0.2	290	-0.2
92	-8.2	192	0.2	292	-0.2
94	-4.6	194	0.2	294	-0.2
96	-5.4	196	1.0	296	-0.2
98	-9.4	198	0.2	298	-0.2
100	-8.6	200	0.2	300	-0.2

Lateral Crash Pulse (Event Record 2)



Lateral Crash Pulse (Event Record 2)

Time (msec)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (MPH)	Delta-V, Lateral (SDM Recorded Vehicle Lateral Velocity Change for FSR Event) (km/h)
10	3.1	5.0
20	5.0	8.0
30	9.9	16.0
40	13.7	22.0
50	18.0	29.0
60	21.1	34.0
70	24.9	40.0
80	27.3	44.0
90	29.2	47.0
100	31.7	51.0
110	32.9	53.0
120	34.2	55.0
130	34.8	56.0
140	35.4	57.0
150	35.4	57.0
160	36.0	58.0
170	36.0	58.0
180	36.7	59.0
190	36.7	59.0
200	36.7	59.0
210	36.0	58.0
220	36.7	59.0
230	36.7	59.0
240	36.7	59.0
250	36.7	59.0
260	36.7	59.0
270	36.7	59.0
280	36.7	59.0
290	36.7	59.0
300	36.7	59.0

Lateral Crash Pulse (Event Record 2)

Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)	Time (msec)	Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for FSR Event) (g)
2	7.0	102	8.6	202	-0.2
4	13.0	104	5.8	204	-0.2
6	13.4	106	4.6	206	-0.2
8	18.2	108	5.0	208	-2.6
10	23.0	110	5.0	210	-1.8
12	29.0	112	5.0	212	-0.6
14	0.2	114	4.6	214	0.6
16	17.8	116	6.6	216	-0.2
18	-6.2	118	5.8	218	0.2
20	2.2	120	4.2	220	0.6
22	18.2	122	4.6	222	0.6
24	39.0	124	3.4	224	-0.2
26	5.8	126	2.6	226	-0.2
28	25.4	128	2.2	228	-0.2
30	23.8	130	1.4	230	0.2
32	28.6	132	2.6	232	-0.2
34	13.4	134	0.6	234	-0.2
36	29.4	136	3.0	236	-0.2
38	0.6	138	2.6	238	-0.2
40	15.8	140	1.8	240	-0.2
42	25.8	142	1.8	242	0.2
44	20.2	144	-0.2	244	-0.2
46	10.6	146	1.4	246	-0.2
48	17.0	148	1.0	248	-0.2
50	24.2	150	1.0	250	-0.6
52	25.8	152	1.0	252	-1.0
54	13.4	154	1.0	254	-0.2
56	8.6	156	1.8	256	-0.2
58	7.8	158	1.0	258	-0.6
60	11.8	160	0.6	260	-0.2
62	6.2	162	0.6	262	-0.2
64	24.6	164	1.0	264	-0.2
66	4.2	166	1.8	266	-0.2
68	20.6	168	1.0	268	-0.2
70	16.2	170	1.4	270	-0.2
72	5.8	172	0.6	272	-0.2
74	20.6	174	1.0	274	-0.2
76	12.2	176	1.0	276	-0.2
78	6.6	178	1.0	278	-0.2
80	18.2	180	-0.2	280	-0.2
82	6.6	182	0.2	282	-0.2
84	4.2	184	-0.2	284	-0.2
86	9.8	186	-1.0	286	-0.2
88	13.4	188	-0.2	288	-0.2
90	8.2	190	-0.2	290	-0.2
92	8.2	192	-0.2	292	-0.2
94	10.2	194	-0.2	294	-0.2
96	8.2	196	-0.2	296	-0.2
98	8.2	198	-0.2	298	-0.2
100	8.2	200	0.2	300	-0.2

**Rollover Crash Pulse (Event Record 2)
SDM Recorded Vehicle Roll Rate**

Contains No Recorded Data

**Rollover Crash Pulse (Event Record 2)
Lateral Acceleration (SDM Recorded Vehicle Lateral Acceleration for
Rollover Event)**

Contains No Recorded Data

**Vertical Crash Pulse (Event Record 2)
Normal Acceleration (SDM Recorded Vehicle Vertical Acceleration for
Rollover Event)**

Contains No Recorded Data

Pre-Crash Data -5.0 to -0.5 sec (Event Record 2)

Times (sec)	Accelerator Pedal, % Full (Accelerator Pedal Position)	Service Brake (Brake Switch Circuit State)	Engine RPM (Engine Speed)	Engine Throttle, % Full (Throttle Position)	Speed, Vehicle Indicated (Vehicle Speed) (MPH [km/h])
-5.0	0	On	704	12	1 [1]
-4.5	0	On	640	12	0 [0]
-4.0	13	Off	768	26	0 [0]
-3.5	12	Off	1408	27	1 [1]
-3.0	23	Off	1472	30	2 [3]
-2.5	30	Off	1856	33	4 [7]
-2.0	33	Off	1984	34	6 [10]
-1.5	43	Off	2112	40	9 [15]
-1.0	0	Off	2432	40	12 [19]
-0.5	0	On	2112	19	13 [21]

Pre-Crash Data -2.0 to -0.5 sec (Event Record 2)

Times (sec)	Cruise Control Active	Cruise Control Resume Switch Active	Cruise Control Set Switch Active	Engine Torque (lb-ft [N-m])	Reduced Engine Power Mode Indicator
-2.0	No	No	No	143 [194]	Off
-1.5	No	No	No	172 [234]	Off
-1.0	No	No	No	158 [214]	Off
-0.5	No	No	No	18 [24]	Off

Hexadecimal Data

DPID \$11
FF F1 00 FC C0 7C 00

DPID \$15
01 02 03 04 07 08 05

DPID \$16
06 09 0A 0D 0E 00 00

DPID \$17
00 22 00 00 00 00 00

DPID \$32
00 FD 1C E3 00 00 00

DPID \$35
78 00 00 00 00 00 00

DID \$01
41 55 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$03
41 54 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$05
41 48 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$07
41 4A 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$09
44 41 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$0B
44 42 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$0D
30 30 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$0F
30 30 30 30 30 30 45 30 30 30 30 30 30 30 30

DID \$30
00 00 02 01

DID \$9A
04 01

DID \$B4
41 53 33 37 38 38 45 30 35 2A 2A 2A 2A 2A 2A 33

DID \$C1
00 CF 53 F0

DID \$C2
01 60 D3 77

DID \$CB
00 CF 45 AC

DID \$31

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0000 A5 00 00 00 01 00 01 08 5E FF
0010 FF 00 00 00 00 00 00 00 00 00
0020 0C FC FC F0 20 60 C0 40 00 1C
0030 1A 00 00 00 1C 00 00 00 00 40
0040 50 00 00 00 00 1C 20 15 0E 0F
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DOT HS 813 215
December 2021



U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

