INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER
School of Public and Environmental Affairs
501 South Morton Street Suite 105
Bloomington, Indiana 47403-2452
(812) 855-3908 Fax: (812) 855-3537

ON-SITE ROLLOVER INVESTIGATION

CASE NUMBER - IN09003
LOCATION - MISSOURI
VEHICLE - 2008 CHEVROLET SILVERADO LS 4X4 K2500HD
CRASH DATE - January 2009

Submitted:

July 13, 2009

Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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15. *Supplementary Notes*
On-Site Rollover Investigation involving a 2008 Chevrolet Silverado LS 4x4 K2500HD.

16. *Abstract*

This report covers an On-Site Rollover Investigation that involved a 2008 Chevrolet Silverado LS 4x4 K2500HD, which departed the roadway and rolled over. This on-site investigation focused on the Chevrolet's rollover. The Chevrolet's restrained 51-year-old male driver was traveling south in the outside lane of a 4-lane, divided U.S. highway. The vehicle lost traction on the ice-covered roadway and departed the west (right) side of the roadway in a clockwise rotation. The vehicle continued to rotate clockwise as it traveled down a steep embankment where it tripped and rolled over, right side leading. The vehicle rolled over eight quarter turns. During the rollover, the roof sustained maximum vertical crush of 28 cm (11 in), which occurred at the top of the left A-pillar. The driver sustained a nonanatomic brain injury due to loading his head on the roof. He was transported by ambulance to a hospital and was pronounced deceased approximately 30 minutes after arrival in the emergency room.

17. *Key Words* Rollover Fatal Injury Motor Vehicle Traffic Crash Injury Severity		18. *Distribution Statement* General Public	
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This on-site investigation focused on the rollover of a 2008 Chevrolet Silverado LS 4x4 K2500HD pickup truck. This crash was brought to the National Highway Traffic Safety Administration's attention on February 6, 2009 by this contractor. This investigation was assigned on February 13, 2009. The crash involved a 2008 Chevrolet Silverado LS 4x4 K2500HD pickup truck (**Figure 1**), which departed the roadway and rolled over. The crash occurred in January, 2009 at 2128 hours, in Missouri and was investigated by the Missouri State Highway Patrol. This contractor inspected the crash scene and the vehicle on February 17-18, 2009. This report is based on the police crash report, crash scene and vehicle inspections, inspection of an exemplar vehicle, interview with the investigating police officer, driver autopsy report, occupant kinematic principles, and this contractor's evaluation of the evidence.

Figure 1: The damaged 2008 Chevrolet Silverado LS K2500HD

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which the Chevrolet was traveling was a 4-lane, divided, US highway that traversed in a north-south direction. The trafficway was straight with two travel lanes in each direction, a grass median, and was bordered by bituminous shoulders. Each travel lane was approximately 3.9 m (12.8 ft) in width and the median was 14.7 m (48.2 ft) in width. The outside and inside shoulders were 3 m (9.8 ft) and 1.8 m (5.9 ft) in width, respectively. The roadway was level and the grade along the off-road path of travel adjacent to the west shoulder was negative 4.4%. The grade down the embankment prior to the rollover was negative 25%. A horse pasture was located at the bottom of the embankment and the grade along the path of the rollover through the pasture was level. The posted speed limit was 113 km/h (70 mph). At the time of the crash the light condition was dark, the atmospheric condition was fog and mist, and the roadway was ice-covered bituminous. The traffic density was unknown and the site of the crash was rural. See the Crash Diagram on page 8 of this report.

Pre-Crash: The Chevrolet's restrained 51-year-old male driver was traveling south in the outside lane (**Figure 2**). The vehicle lost traction on the ice-covered roadway and began to rotate clockwise. It departed the right (west) side of the road where the rollover began.

Figure 2: Approach of the Chevrolet southbound in the outside lane, number on roadway shows meters to departure from shoulder (arrow)

Crash: The Chevrolet yawed clockwise 75 degrees relative to its original southerly travel direction as it departed the west (right) shoulder and entered the grass (**Figure 3**). The vehicle traveled across the negative 4.4% grass slope and

started down the embankment (**Figure 4**), which became increasingly steeper. As the vehicle traveled down the embankment, it continued to rotate clockwise and the right side tires furrowed into the ground (**Figure 5**) and it tripped right side leading (event 1). As the vehicle rolled over, it impacted and knocked down a 9 cm (3.5 in) diameter tree and a wire fence (**Figure 5**). The fence impact scratched the right side of the truck bed topper (event 2), but there was no visible damage due to the tree contact. The top plane of the vehicle sustained the primary damage (**Figures 6** and **7**) from the rollover. The vehicle came to final rest on its wheels in the horse pasture heading southwest (**Figure 8**).

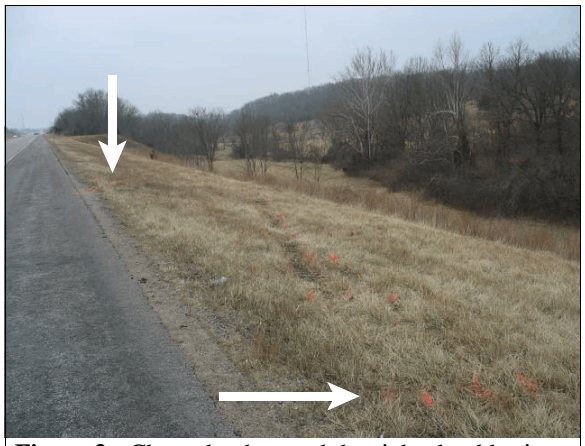


Figure 3: Chevrolet departed the right shoulder in a clockwise yaw, arrows show tire marks in grass

Figure 4: Path of the Chevrolet onto the embankment

Figure 5: Area where Chevrolet tripped and rolled over right side leading, arrow in foreground shows furrow from right front tire, arrow in background shows broken tree and wire fence

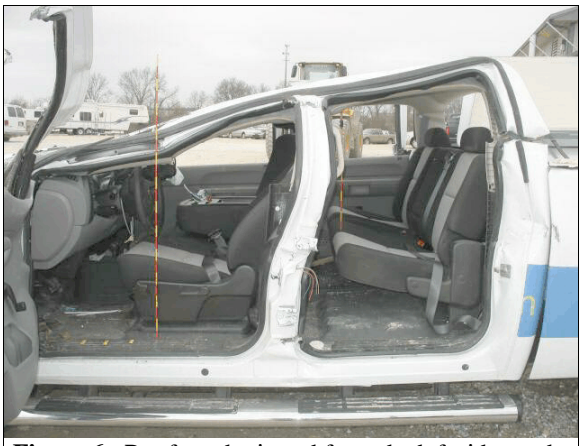


Figure 6: Roof crush viewed from the left side, each increment on measurement rod is 5 cm (2 in)

Figure 7: Front view of the top plane damage

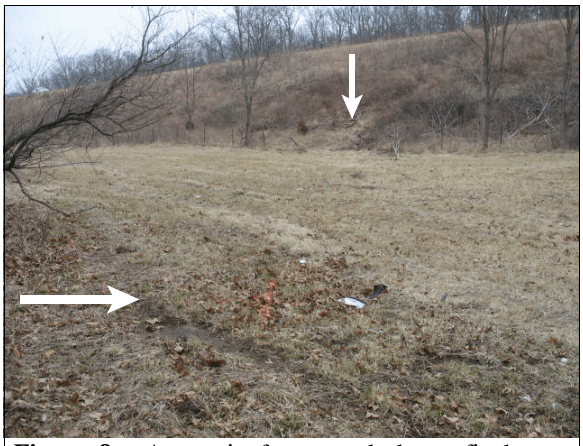


Figure 8: Arrow in foreground shows final rest location; arrow in background shows area of rollover initiation

Post-Crash: The police, emergency medical service, and rescue personnel responded to the crash scene. The police were notified of the crash at 2143 hours and arrived on scene at 2223 hours. Rescue personnel removed the vehicle's left rear door and pried open the left front door and removed the driver from the vehicle. He was transported by ambulance to a hospital were he was pronounced deceased.

ROLLOVER DISCUSSION

The Chevrolet was not equipped with Electronic Stability Control (ESC), a rollover sensor, or side curtain air bags. There was no rollover rating information for this Chevrolet model[1].

In this crash, the vehicle was rotated clockwise 75 degrees relative to its original southerly travel direction as it departed the west (south) shoulder. The vehicle traversed 18 m (59 ft) across a negative 4.4% grass slope and entered a negative 15.5% grade as it started down the embankment. As the it traveled down the embankment, it continued to rotate clockwise and the grade became negative 25%. The vehicle traversed a distance of 52 m (171 ft) across the embankment and had rotated clockwise a total of approximately 315 degrees relative to its original southerly heading on the roadway when the right side tires furrowed into the ground, which tripped the vehicle and it rolled over, right side leading. During the rollover the roof impacted the ground and sustained maximum vertical and lateral crush on the left A-pillar of 28 cm (11 in) and 1 cm (0.4 in), respectively. Based on the damage to the vehicle and the crash scene evidence, it was estimated that the vehicle rolled over eight quarter turns across a distance of approximately 30 m (98.4 ft). The vehicle traveled a total distance of 38 m (124.6 ft) from the point of rollover initiation to the final rest position in the horse pasture, where it was on its wheels heading southwest. The heading of the vehicle at the final rest position and the distance from the last ground divot to the final rest position suggested that the vehicle rolled on its wheels the final 8 m (26.2 ft) to the final rest position.

[1] www.safercar.gov, 6/26/09

The 2008 Chevrolet Silverado LS 4x4 K2500HD was a heavy duty, 4-wheel drive, 4-door, crew cab pickup truck (VIN: 1GCHK23618F------), equipped with a 6.6L V8 engine, automatic transmission, 4-wheel anti-lock brakes with dynamic rear proportioning, and a tire pressure monitoring system. The front row was equipped with a split bench seat (40/20/40) with separate back cushions, adjustable head restraints in the outboard positions, dual stage driver and front right passenger frontal air bags, lap-and-shoulder belts in the outboard positions, and a center lap belt. The second row was equipped with a split bench (70/30) with flip-up seat cushions, adjustable head restraints in the outboard seating positions, and lap-and-shoulder belts. The vehicle was also equipped with Lower Anchors and Tethers for Children (LATCH) in the second row outboard seating positions. The vehicle was not equipped with front seat back-mounted side impact air bags or side curtain air bags.

CASE VEHICLE DAMAGE

Exterior Damage: The damage from the rollover involved the top plane and both side planes of the vehicle. The direct damage on the top plane began at the front of the hood and extended rearward 601 cm (236.6 in). The direct damage also involved the full width of the top, 134 cm (52.8 in). The maximum vertical and lateral crush occurred at the top of the left A-pillar and were 28 cm (11 in) and 1 cm (0.4 in), respectively. The direct damage on the right side plane began 60 cm (23.6 in) forward of the right front axle and extended 345 cm (135.8 in) rearward. Intermittent scratches from the wire fence were located along the right side of the truck bed topper. The direct damage on the left side plane began 61 cm (24 in) forward of the left front axle and extended 346 cm (136.2 in) rearward. The direct damage on the side planes involved only the cab of the truck and did not extend below the top of the front wheel wells or below the beltline on the side of cab.

Damage Classification: The Collision Deformation Classification was **00-TDDO-4** for the rollover (event 1). The CDC for the wire fence impact (event 2) was **00-RBGW-2**. The severity of the rollover damage was severe based on the extent of the roof crush.

The vehicle manufacturer's recommended tire size was LT245/75R16. The Chevrolet was equipped with tires of the recommended size. The vehicle's tire data are shown in the table below.

Tire	*Measured Pressure*		*Vehicle Manufacturer's Recommended Cold Tire Pressure*		*Tread Depth*		*Damage*	*Restricted*	*Deflated*
	kPa	psi	kPa	psi	milli-meters	32nd of an inch			
LF	393	57	414	60	4	5	None	No	No
LR	496	72	552	80	7	9	None	No	No
RR	496	72	552	80	7	9	None	No	No
RF	Flat	Flat	414	60	5	6	None	No	Yes

Vehicle Interior: The inspection of the Chevrolet's interior revealed a scuff mark and impression on the left roof side rail adjacent to the driver's seat back and a slight impression with a few small black hairs or fibers on the roof directly above the driver's seat (**Figure 9**). These marks were probably the result of loading by the driver's left shoulder and head, respectively. A mark was also present on the roof directly above the head restraint, which was due to roof contact. It is possible that the roof contact displaced the seat back rearward during the rollover. The recline position of the seat back was 50 degrees.

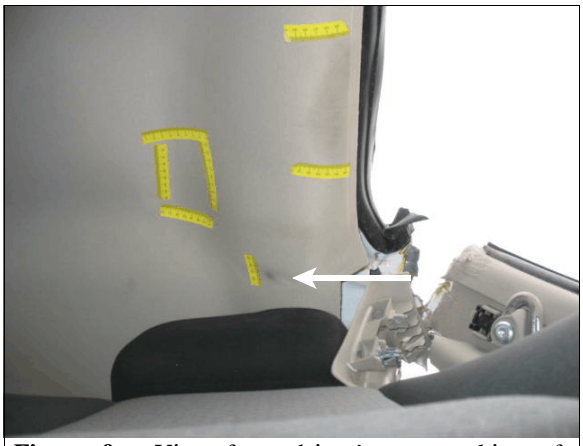


Figure 9: View from driver's seat cushion of occupant contact marks on the roof and left roof side rail, arrow shows mark on roof from contact with head restraint

All the vehicle's doors were jammed shut. The pre-crash condition of all of the window glazing was either fixed or closed. All of the side window glazing and the backlight glazing were disintegrated due to impact forces. The windshield was cracked from impact forces and approximately 50% of the windshield was out of place due to bond separation. There was no deformation to the steering wheel or compression of the energy absorbing column.

The vehicle sustained numerous passenger compartment intrusions during the rollover. The most severe intrusions into the driver's occupant space involved the left A-pillar, left roof side rail, windshield header, and roof. The vertical intrusion values of these components was 28 cm (11 in), 28 cm (11 in), 27 cm (10.6 in), and 25 cm (9.8 in), respectively.

EVENT DATA RECORDER

The Chevrolet's EDR was imaged using version 3.1 of the Bosch Crash Data Retrieval tool and the EDR recorded a non-deployment event. The data indicated that the SIR warning lamp was recorded as off and the driver's seat belt buckle circuit switch was recorded as buckled. The maximum recorded velocity change was 18.7 km/h (11.65 mph), which occurred 120 ms after Algorithm Enable (AE). The data also indicated that an event followed the recorded event. The EDR report is attached at the end of this report.

AUTOMATIC RESTRAINT SYSTEM

The Chevrolet was equipped with frontal air bags that were certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The driver air bag was located within the steering wheel hub and the front right passenger air bag was located within the middle of the instrument panel. Neither of these air bags deployed in this crash. The frontal air bag system is not designed to deploy in a rollover crash.

The Chevrolet was equipped with lap-and-shoulder belts for the driver and front right seating positions and a lap belt in the front center seating position. The second row was equipped with lap-and-shoulder belts in all three seating positions. The driver's seat belt consisted of continuous loop belt webbing, an Emergency Locking Retractor (ELR), sliding latch plate, and an adjustable upper anchor that was in the middle position. The front right seat belt was equipped with a switchable ELR/Automatic Locking Retractor (ALR), sliding latch plate, and adjustable upper anchor that was located in the middle position. The lap belt was equipped with a locking latch plate. The second row outboard seat belts were equipped with continuous loop belt webbing, switchable ELR/ALRs and fixed upper anchors. The second row center seat belt was similarly equipped except that the latch plate was locking. The driver and front right passenger seat belts were equipped with buckle-mounted pretensioners and load limiters. The pretensioner's did not actuate during the crash consistent with the non-deployment of the frontal air bags.

The driver's latch plate was found latched in the buckle and the seat belt had been cut by rescue personnel (**Figure 10**). Inspection of the latch plate belt guide revealed slight abrading due to belt loading (**Figure 11**). The evidence supported by the EDR data indicated that the driver was restrained by the lap-and shoulder belt at the time of the crash. The remaining seat positions were unoccupied.

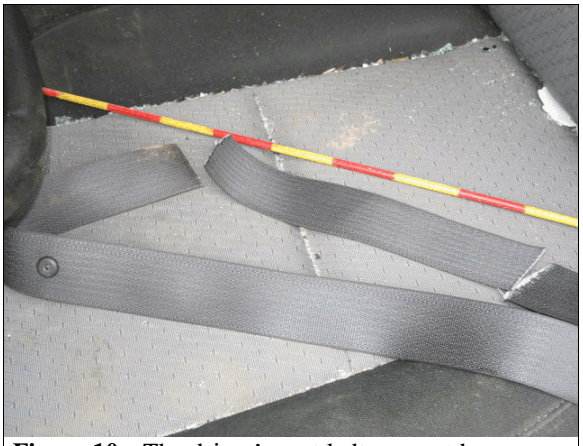


Figure 10: The driver's seat belt was cut by rescue personnel

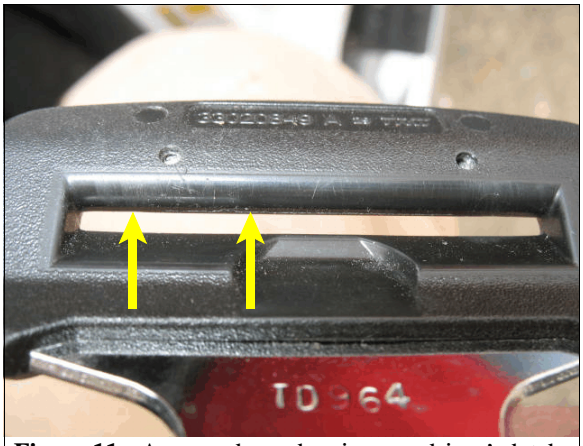


Figure 11: Arrows show abrasions on driver's latch plate belt guide

CASE VEHICLE DRIVER KINEMATICS

The Chevrolet's driver (51-year-old, male; unknown height and weight) was seated in an unknown posture. At the time of the inspection, the seat track was adjusted to the middle track position, 11 cm (4.3 in) rear of full forward and 11 cm (4.3 in) forward of full rear. The recline position of the seat back at the time of the crash is not known. The tilt steering column was located in the full-down position.

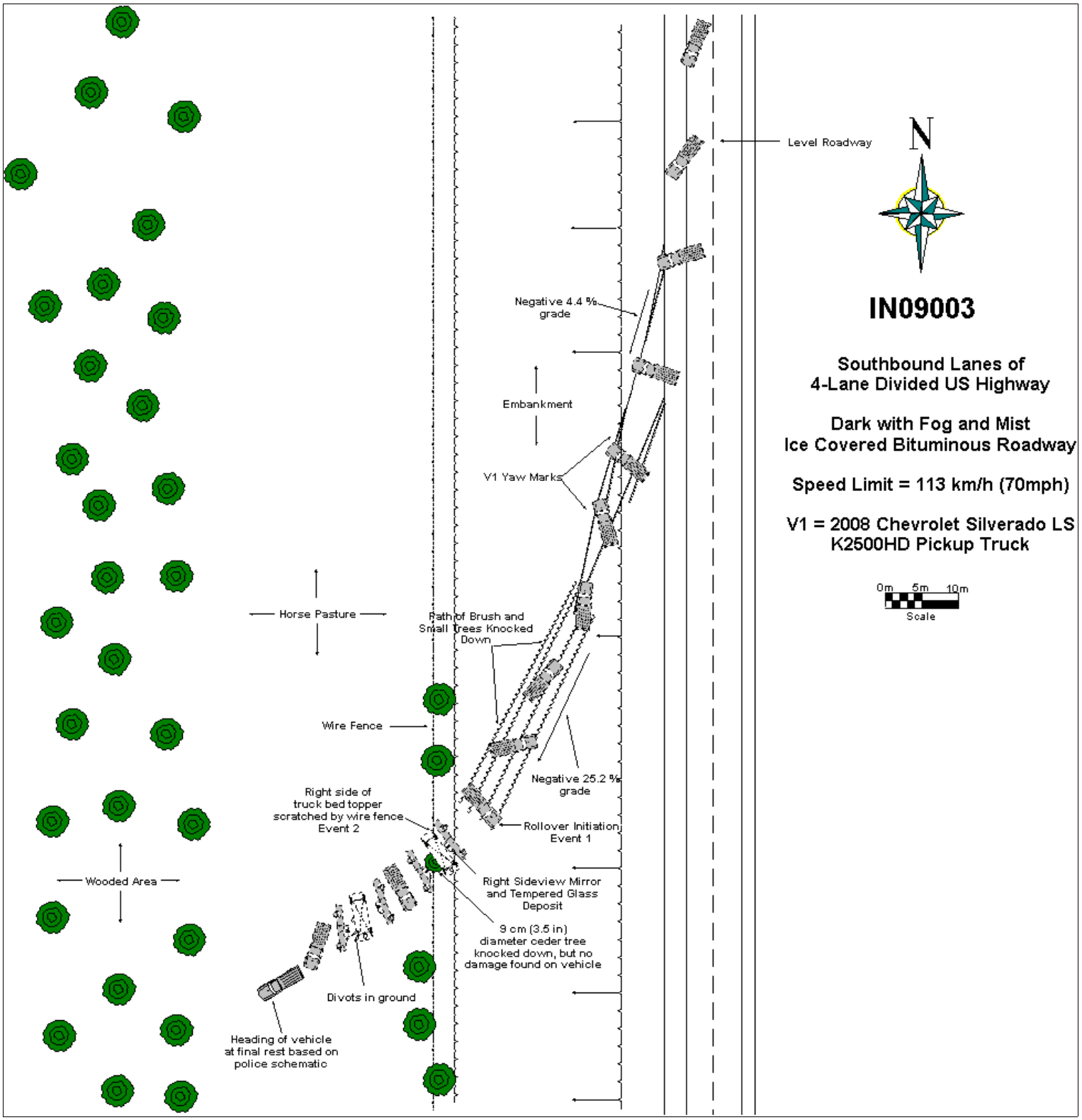
The occupant contact evidence observed within the vehicle indicated that as the roof was crushed during the rollover, the driver loaded his head on the roof which resulted in a nonanatomic brain injury and an abrasion on the left forehead. The driver also probably loaded his left shoulder on the left roof side rail; although, no injury was documented. He remained restrained in his seat throughout the rollover sequence and rescue personnel cut the seat belt off of him in order to remove him from the vehicle.

CASE VEHICLE DRIVER INJURIES

The Chevrolet's driver was transported by ambulance to a hospital emergency room where he was pronounced deceased 1 hour and 41 minutes following the crash. He was transported directly from the hospital to a local funeral home. No autopsy was performed. The table below shows the driver's injuries and injury sources.

Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Nonanatomic brain injury with unconsciousness, flaccid, no reflexes, asystole[2], GCS = 3	critical 160824.5,0	Roof above driver's seat	Certain	Emergency room records
	Blood right ear, not further specified	Not coded			Emergency room records
2	Abrasions left forehead, not further specified	minor 290202.1,7	Roof above driver's seat	Certain	Emergency room records

[2] The following term is defined in DORLAND'S ILLUSTRATED MEDICAL DICTIONARY as follows:
asystole (a-sis'to-le): cardiac standstill or arrest; absence of a heartbeat.


Level Roadway
N
IN09003
Southbound Lanes of
4-Lane Divided US Highway
Dark with Fog and Mist
Ice Covered Bituminous Roadway
Speed Limit = 113 km/h (70mph)
V1 = 2008 Chevrolet Silverado LS
K2500HD Pickup Truck
0m 5m 10m
Scale
Negative 4.4 % grade
Embankment
V1 Yaw Marks
Horse Pasture
Path of Brush and Small Trees Knocked Down
Wire Fence
Negative 25.2 % grade
Right side of truck bed topper scratched by wire fence Event 2
Rollover Initiation Event 1
Wooded Area
Right Sideview Mirror and Tempered Glass Deposit
9 cm (3.5 in) diameter ceder tree knocked down, but no damage found on vehicle
Divots in ground
Heading of vehicle at final rest based on police schematic

CDR File Information

User Entered VIN	1GCHK23618F******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN09003.CDR
Saved on	Thursday, February 19 2009 at 07:54:32 AM
Collected with CDR version	Crash Data Retrieval Tool 3.1
Reported with CDR version	Crash Data Retrieval Tool 3.1
EDR Device Type	airbag control module
Event(s) recovered	Non-Deployment

IMPORTANT NOTICE: Robert Bosch LLC recommends that the latest production release of Crash Data Retrieval software be utilized when viewing, printing or exporting any retrieved data from within the CDR program. This ensures that the retrieved data has been translated using the most recent information including but not limited to that which was provided by the manufacturers of the vehicles supported in this product.

Data Limitations

Recorded Crash Events:
There are two types of recorded crash 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. A Non-Deployment Event contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM.
The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

Data:
-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 Events, the SDM will record 220 milliseconds of data after deployment criteria is met and up to 70 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.
-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity.
-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.
-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
  -no data is received from the module sending the pre-crash data
  -no module is present to send the pre-crash data
-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit.

-The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, "N/A" is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition cycle counter.
-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 to the SDM, by various vehicle control modules, via the vehicle's communication network.
-The Belt Switch Circuit is wired directly to the SDM.

Multiple Event Data

Associated Events Not Recorded	1
An Event(s) Preceded the Recorded Event(s)	No
An Event(s) was in Between the Recorded Event(s)	No
An Event(s) Followed the Recorded Event(s)	Yes
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	Yes

System Status At AE

Low Tire Pressure Warning Lamp (If Equipped)	OFF
Vehicle Power Mode Status	Run
Remote Start Status (If Equipped)	Inactive
Run/Crank Ignition Switch Logic Level	Active

Pre-crash data

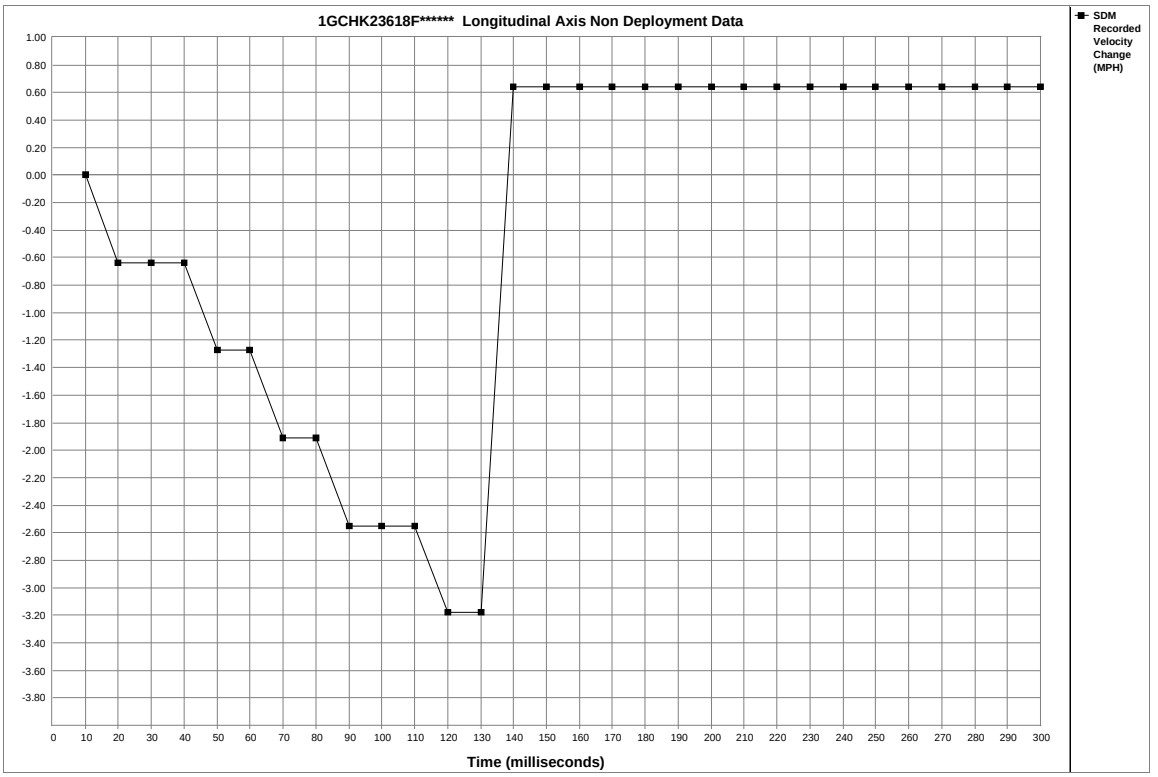
Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	380.23	347.78

Pre-Crash Data

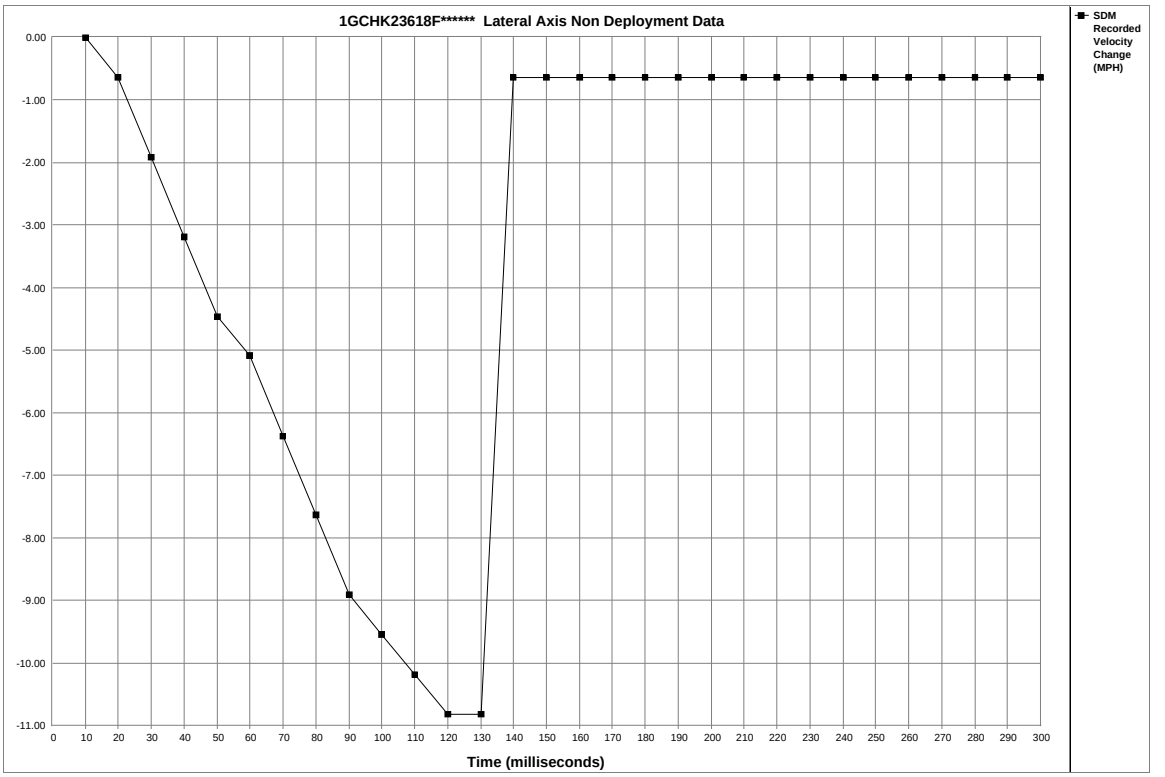
Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	37	59	100	100	100
Vehicle Speed (MPH)	75	73	71	79	94
Engine Speed (RPM)	1600	1856	2176	2624	3264
Percent Throttle	6	0	100	100	0
Brake Switch Circuit Status	OFF	OFF	OFF	OFF	OFF

System Status At Non-Deployment

Ignition Cycles At Investigation	5688
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON/OFF Time Continuously (seconds)	655350
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	5679
Ignition Cycles At Event	5684
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Diagnostic Trouble Codes at Event, fault number: 1	N/A
Diagnostic Trouble Codes at Event, fault number: 2	N/A
Diagnostic Trouble Codes at Event, fault number: 3	N/A
Diagnostic Trouble Codes at Event, fault number: 4	N/A
Diagnostic Trouble Codes at Event, fault number: 5	N/A
Diagnostic Trouble Codes at Event, fault number: 6	N/A
Diagnostic Trouble Codes at Event, fault number: 7	N/A
Diagnostic Trouble Codes at Event, fault number: 8	N/A
Diagnostic Trouble Codes at Event, fault number: 9	N/A
Maximum SDM Recorded Velocity Change (MPH)	11.65
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	120
Crash Record Locked	No
Deployment Event Recorded in the Non-Deployment Record	No
Vehicle Event Data (Pre-Crash) Associated With This Event	No
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	No
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	No
Driver 2nd Stage Deployment Loop Commanded for Disposal	No
Passenger Second Stage Deployment Loop Commanded	No
Passenger 2nd Stage Deployment Loop Commanded for Disposal	No
Driver Pretensioner Deployment Loop Commanded	No
Passenger Pretensioner Deployment Loop Commanded	No
Driver Side Deployment Loop Commanded	No
Passenger Side Deployment Loop Commanded	No
Second Row Left Side Deployment Loop Commanded	No
Second Row Right Side Deployment Loop Commanded	No
Driver (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 1) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 2) Roof Rail/Head Curtain Loop Commanded	No
Driver (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Passenger (Initiator 3) Roof Rail/Head Curtain Loop Commanded	No
Driver Knee Deployment Loop Commanded	No
Passenger Knee Deployment Loop Commanded	No
Second Row Left Pretensioner Deployment Loop Commanded	No
Second Row Right Pretensioner Deployment Loop Commanded	No
Second Row Center Pretensioner Deployment Loop Commanded	No



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	-0.64	-0.64	-0.64	-1.27	-1.27	-1.91	-1.91	-2.55	-2.55	-2.55	-3.18	-3.18	0.64	0.64
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	-0.64	-1.91	-3.18	-4.46	-5.09	-6.37	-7.64	-8.91	-9.55	-10.19	-10.82	-10.82	-0.64	-0.64
Time (milliseconds)	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300
SDM Lateral Axis Recorded Velocity Change (MPH)	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64	-0.64