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ON-SITE CERTIFIED ADVANCED 208-COMPLIANT VEHICLE INVESTIGATION

CASE NUMBER - IN09005
LOCATION - MISSOURI
VEHICLE - 2008 CHEVROLET IMPALA LT
CRASH DATE - February 2009

Submitted:

July 1, 2009

Contract Number: DTNH22-07-C-00044

Prepared for:

U.S. Department of Transportation
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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 Certified Advanced 208-Compliant Vehicle investigation involving a 2008 Chevrolet Impala LT and a 1997 Oldsmobile Regency.			
16. *Abstract* This report covers an on-site investigation of a head-on crash that involved a 2008 Chevrolet Impala LT and a 1997 Oldsmobile Regency. The focus of this investigation was the Chevrolet, which was certified by the manufacturer to be compliant to the Advanced Air Bag portion of Federal Motor Vehicle Safety Standard (FMVSS) No. 208. The Chevrolet's unrestrained 64-year-old female driver was traveling south negotiating a left curve. The Oldsmobile's restrained 23-year-old male driver was traveling north. The Oldsmobile crossed the center line as the driver negotiated the curve and the front of the vehicle impacted the front of the Chevrolet. The Chevrolet's direction of force was within the 12 o'clock sector and the impact force was sufficient to trigger stage 1 and 2 deployments of the driver's frontal air bag. The Chevrolet's driver loaded through the air bag and deformed the steering wheel rim and steering column. She was pronounced deceased at the scene.			
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The focus of this on-site investigation was a 2008 Chevrolet Impala LT. The vehicle was equipped with frontal air bags, which were certified by the manufacturer to be compliant to the Advanced Air Bag portion of the Federal Motor Vehicle Safety Standard (FMVSS) No. 208. This crash was brought to the National Highway Traffic Safety Administration's attention on February 24, 2009 by Special Crash Investigation (SCI) Team 2. This investigation was assigned on March 16, 2009. The crash involved a 2008 Chevrolet Impala LT (**Figure 1**) and a 1997 Oldsmobile Regency that collided head-on on a state highway. The crash occurred in February 2009, at 0838 hours, in Missouri and was investigated by the Missouri State Highway Patrol. This contractor inspected the crash scene and Chevrolet on March 3 and 4, 2009. The Oldsmobile had been salvaged. This report is based on the police crash report, inspections of the crash scene, Chevrolet and exemplar vehicle, occupant medical records, occupant kinematic principles, and this contractor's evaluation of the evidence.

Figure 1: The damaged 2008 Chevrolet Impala LT

CRASH CIRCUMSTANCES

Crash Environment: The trafficway on which both vehicles were traveling was a 2-lane, undivided, state highway, traversing in a nominal north-south direction. The roadway had one travel lane in each direction and was bordered by grass shoulders. A shallow ditch was adjacent to the east shoulder and a short embankment with a negative 38.5% grade was adjacent to the west shoulder. The north and south lanes were 3.2 m (10.5 ft) and 3.3 m (10.8 ft) in width, respectively, and the shoulders were nominally 1 m (3.3 ft) in width. The roadway had a negative 1.1% grade for the Chevrolet and a positive 1.9% grade for the Oldsmobile. The roadway was also curved to the northeast/southeast and had a positive 4% superelevation for the Chevrolet and positive 7.1% for the Oldsmobile. The roadway pavement markings consisted of solid white edge lines and double yellow center lines. The speed limit was 89 km\h (55 mph). At the time of the crash the light condition was daylight, the atmospheric condition was clear, and the roadway pavement was dry bituminous. Traffic density was unknown and the site of the crash was rural agricultural. See the Crash Diagram on page 8 of this report.

Figure 2: Chevrolet's approach; number on pavement shows meters to impact

Pre-Crash: The Chevrolet's unrestrained 64-year-old female driver was traveling south and was negotiating a left curve (**Figure 2**). The Oldsmobile's restrained 23-year-old male driver was traveling north. As the Oldsmobile's driver

negotiated the curve, the vehicle crossed the centerline and entered the Chevrolet's travel lane where the crash occurred (**Figure 3**). The Chevrolet's Event Data Recorder (EDR) pre-crash data indicated that the driver applied the brakes prior to the crash. The EDR recorded the Chevrolet's brake switch as on from 2.5 seconds to 0.5 seconds prior to Algorithm Enable (AE). The vehicle's speed was recorded as 97 km\h (60 mph) at 2.5 seconds prior to AE decelerating to 77 km\h (48 mph) at 0.5 seconds prior to AE.

Figure 3: Impact area; arrow shows Chevrolet's path of travel to impact

Crash: The front plane of the Oldsmobile impacted the front plane of the Chevrolet (**Figure 1**). The Chevrolet's direction of force was within the 12 o'clock sector and the impact force was sufficient to trigger stage 1 and 2 deployments of the driver's frontal air bag. As a result of the impact, the Chevrolet rotated counterclockwise 35 degrees and came to final rest on the northern lane heading southeast with the back end on the centerline (**Figure 4**). The Oldsmobile rotated clockwise 257 degrees and came to final rest partially off the roadway heading west (**Figure 5**).

Figure 4: Arrow indicates Chevrolet's final rest position and heading angle

Figure 5: Arrow indicates Oldsmobile's final rest position and heading angle

Post-Crash: The police were notified of the crash at 0842 hours and arrived on scene at 0847 hours. Emergency rescue and medical services also responded to the scene. The Chevrolet's driver was pronounced deceased at the crash scene at 0905 hours and was transported directly to a local funeral home. The Oldsmobile's driver sustained B-injuries and was transported by ambulance to a hospital. Both vehicles were towed from the crash scene due to damage.

CASE VEHICLE

Case Vehicle: The 2008 Chevrolet Impala LT was a front wheel drive, 4-door sedan (VIN: 2G1WT58K881------) that was manufactured in January 2008. It was equipped with a 3.5L, 6-cylinder engine, automatic transmission, a tire pressure monitoring system, and an EDR. The front row was equipped with bucket seats, adjustable head restraints, lap-and-shoulder belts, and dual stage driver and front right passenger frontal air bags. The second row was equipped with a split bench seat with folding backs, lap-and-

shoulder belts, adjustable head restraints, and Lower Anchors and Tethers for Children (LATCH) in the outboard seating positions. The vehicle's mileage at the time of inspection could not be determined because the vehicle was equipped with an electronic odometer and the vehicle was without power. The vehicle's specified wheelbase was 218 cm (110.5 in).

Figure 6: The Chevrolet's front plane damage

CASE VEHICLE DAMAGE

Exterior Damage: The Chevrolet's impact with the Oldsmobile involved the entire front plane. The front bumper, hood, grille, radiator, right fender, and right headlamp/turn signal assembly were directly damaged. The direct damage began at the front right bumper corner and extended 123 cm (48.4 in) across the bumper bar (**Figure 6**). The crush measurements were taken on the bumper bar and the maximum residual crush was 88 cm (34.6 in) occurring at C_4 (**Figure 7**). The table below shows the vehicle's front crush profile.

Units	Event	Direct Damage		Field L	C_1	C_2	C_3	C_4	C_5	C_6	Direct	Field L
		Width CDC	Max Crush								±D	±D
cm	1	123	88	123	50	62	77	88	81	79	15	0
in		48.4	34.6	48.4	19.7	24.4	30.3	34.6	31.9	31.1	5.9	0.0

The vehicle's left side wheelbase was reduced 10 cm (3.9 in) while the right side wheelbase was reduced 23 cm (9.1 in). The induced damage involved the hood, both fenders, the windshield, both front wheel assemblies, the right front and rear doors, and the left roof side rail.

Figure 7: Right side view of the Chevrolet's front crush profile; each stripe on the measurement rods is 5 cm (2 in)

Damage Classification: The Chevrolet's Collision Deformation Classification for the front impact was **12-FDEW-4** (**10** degrees). The Missing Vehicle algorithm of the WinSMASH program calculated the Chevrolet's total Delta V as 77.0 km/h (48 mph). The longitudinal and lateral velocity changes were -76 km/h (-47 mph) and -13 km/h (-8 mph), respectively. The vehicle's EDR recorded the maximum longitudinal velocity change as -75.72 km/h (-47.05 mph), which was recorded at 80 msec after the deployment criteria was met. The maximum lateral

velocity change was recorded as -14.92 km\h (-9.27 mph) occurring at 100 msec after the deployment criteria was met.

The manufacturer's recommended tire size was P225/60R16 and the vehicle was equipped with tires of this size. The Hyundai'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	262	38	207	30	7	9	None	No	No
LR	262	38	207	30	7	9	None	No	No
RR	234	34	207	30	7	9	None	No	No
RF	Flat	Flat	207	30	7	9	Sidewall/tread cuts	Yes	Yes

Vehicle Interior: Inspection of the Chevrolet's interior revealed scuffs and deformation on the left lower instrument panel (**Figure 8**) immediately to the right of the steering column, which was due to loading by the driver's right knee. The driver loaded the air bag and her chest, abdomen, and thighs loaded the steering column, displacing it forward 9 cm (3.5 in). The steering column was also displaced upward, but its original tilt position could not be determined and the extent of vertical displacement was unknown. The steering wheel rim sustained significant deformation with the most severe displacement of 10 cm (3.9 in) occurring on the lower half section (**Figure 9**). The seat back was undamaged and found reclined approximately 40 degrees. It was probably repositioned by rescue personnel during the removal of the driver from the vehicle, or at some time during the handling of the vehicle by salvage personnel.

Figure 8: Occupant contact to knee bolster of Chevrolet

Figure 9: Damage to the Chevrolet's steering wheel due to loading by the driver

All of the vehicle's doors remained closed and operational and all of the window glazing was either closed or fixed. The right rear window glazing was disintegrated and the windshield glazing was in place and cracked from impact

forces. There was no discernable evidence that the driver contacted the windshield. The remaining window glazing was undamaged and sustained no occupant contact.

The Chevrolet sustained six passenger compartment intrusions. The intrusions that occurred within the driver's occupant space involved the left toe pan and instrument panel. The toe pan intruded longitudinally 18 cm (7.1 in) while the instrument panel was displaced upward (**Figure 10**) 10 cm (3.9 in) as a result of loading by the driver.

Figure 10: Left side view of the vertical displacement of the instrument panel and steering assembly

EVENT DATA RECORDER

The Chevrolet's EDR was imaged during the vehicle inspection with version 3.1 of the Bosch Crash Data Retrieval tool and subsequently read with version 3.2. The EDR recorded a deployment event. The System Status at Deployment record indicated the recording of the data was complete. The SIR warning lamp was recorded as off and the driver's seat belt switch circuit was recorded as unbuckled. The time from AE to the first stage deployment command criteria being met for the driver's air bag was 12 msec and 14 msec for stage two. The driver and front right seat belt pretensioners were commanded to actuate. The maximum longitudinal velocity change was recorded as -75.71 km/h (-47.05 mph) and was recorded at 80 msec after deployment criteria was met. The maximum lateral velocity change was recorded as -14.92 km/h (-9.27 mph) and was recorded at 100 msec after deployment criteria was met. The pre-crash data is discussed in the pre-crash section on page 1 of this report. The EDR report is attached at the end of this report[1].

AUTOMATIC RESTRAINT SYSTEM

The Chevrolet was equipped with a manufacturer Certified Advanced 208-Compliant (CAC) frontal air bag system that consisted of dual stage driver and front right passenger air bags, driver seat position sensor, seat belt usage sensors, retractor-mounted pretensioners and a front right passenger weight sensor.

The driver's frontal air bag was located within the steering wheel hub and the module cover (**Figure 11**) was a two flap configuration constructed of pliable vinyl. Each cover flap was

Figure 11: The driver's air bag module cover flaps

[1] Please note that pages 7-10 of the EDR report have been omitted for confidentiality reasons.

5 cm (2 in) in width and 13.5 cm (5.3 in) in height. The cover flaps opened at the designated tear points. The deployed air bag (**Figure 12**) was 63 cm (24.8 in) in diameter and was designed with two vent ports and three tethers. The vent ports were located at the 11 and 1 o'clock positions. Inspection of the air bag revealed no damage and no discernable occupant contact evidence.

Figure 12: The driver's deployed frontal air bag

The front right passenger frontal air bag was located within the top of the instrument panel. The deployment of this air bag was suppressed because the front right passenger seat was unoccupied at the time of the crash.

MANUAL RESTRAINT SYSTEM

The Chevrolet was equipped with lap-and-shoulder belts for all 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 full-down 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 full-up position. The front row seat belts were equipped with retractor-mounted pretensioners, both of which actuated in this crash. The second row seat belts consisted of continuous loop belt webbing, switchable ELR/ALRs, sliding latch plates, and fixed upper anchors.

Inspection of the driver's seat belt assembly revealed that the seat belt was retracted tightly along the B-pillar consistent with actuation of the pretensioner. The condition of the seat belt indicated that the driver was not restrained during the crash. This was supported by the EDR data, which recorded the driver's seat belt switch circuit status as unbuckled. The remaining seat positions were unoccupied

CASE VEHICLE DRIVER KINEMATICS

The Chevrolet's driver [64-year-old, female (unknown height and weight)] was seated in an unknown posture. At the time of the inspection, the driver's seat track was located between the middle and rear most positions. The seat back recline position could not be determined.

The Chevrolet's impact with the Oldsmobile displaced the driver forward, opposite the Chevrolet's 12 o'clock direction of force. Since the driver was unrestrained she loaded through the air bag and her chest and lower abdomen contacted the steering wheel, and her knees contacted the left lower instrument panel. The driver sustained multiple unspecified fractures of both legs from the lower instrument panel and multiple unspecified fractures of both arms from the instrument panel. The driver also sustained a compound fracture of the right ankle, probably due to contacting the brake pedal.

The driver was pronounced deceased at the crash scene at 0905 hours and was transported directly to a local funeral home. No autopsy was performed. The table below shows the driver's injuries and injury sources.

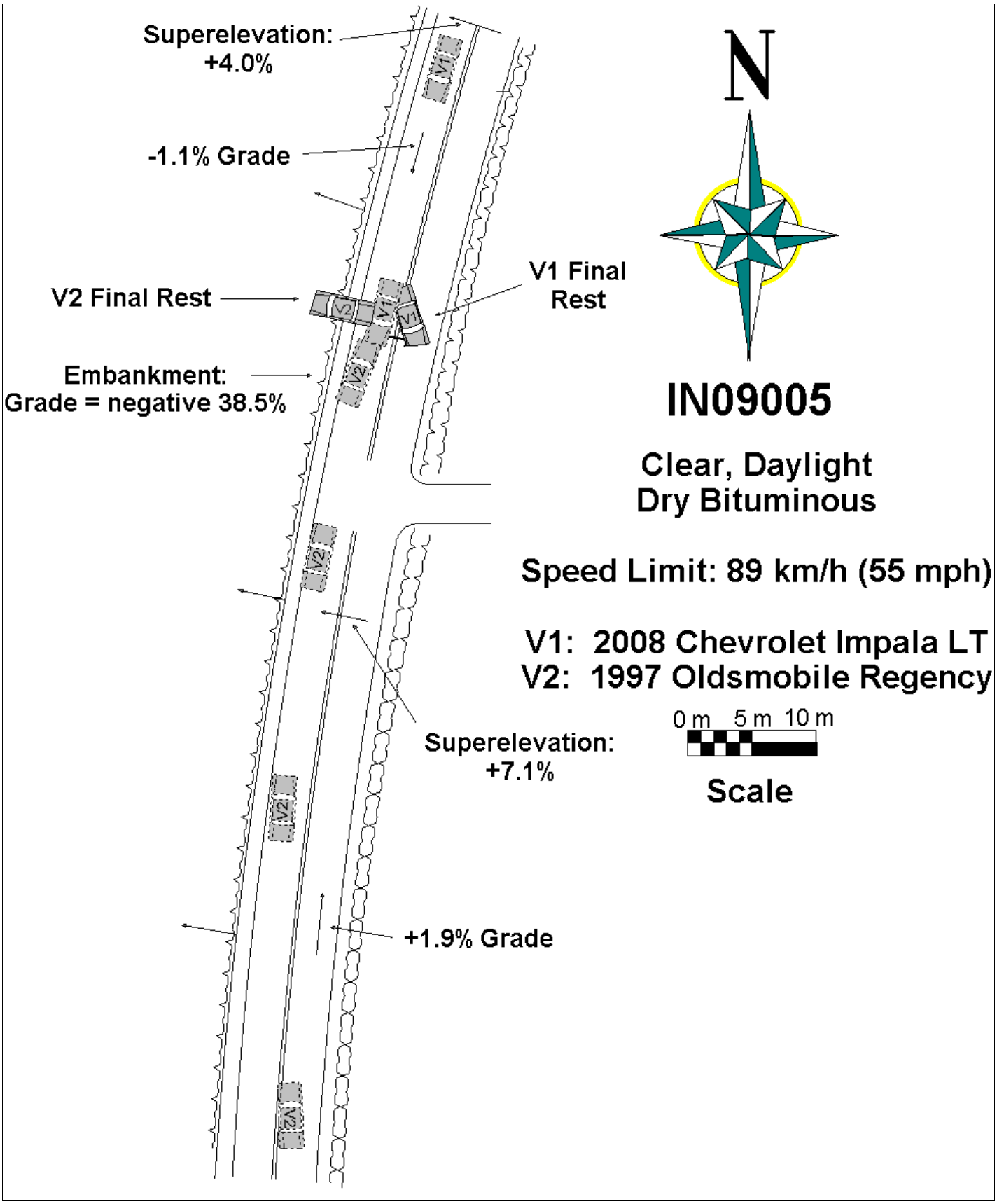
Injury Number	Injury Description (including Aspect)	NASS Injury Code & AIS 90	Injury Source	Source Confidence	Source of Injury Data
1	Fracture, compound, right ankle	moderate 852002.2,1	Floor, foot controls	Certain	Coroner's record
2 3	Fracture, multiple {many}, arms, not further specified	moderate 751800.2,1 751800.2,2	Center instrument panel (right arm) and left instrument panel (left arm)	Probable	Coroner's record
4 5	Fracture, multiple {many}, legs, not further specified	moderate 852002.2,1 852002.2,2	Left lower instrument panel	Probable	Coroner's record
	Ribs very soft, not further specified	not coded	Steering wheel hub and/or spokes and rim	Probable	Coroner's record
6	Abrasion noted on bottom lip, not further specified	minor 290202.1,8	Air bag, driver's	Probable	Coroner's record
7	Abrasions on lower abdomen; no abrasions that appeared to be seat belt-related	minor 590202.1,8	Steering wheel rim	Certain	Coroner's record

OTHER VEHICLE

The 1997 Oldsmobile Regency was a front wheel drive, 4-door sedan (VIN: 1G3HC52K1V4------) equipped with a 3.8L, V6 engine, automatic transmission, driver and front right passenger frontal air bags, and 4-wheel anti-lock brakes. The Oldsmobile could not be located for an inspection.

The Missing Vehicle algorithm of the WinSMASH program calculated the Oldsmobile's total Delta V for the frontal impact as 71 km/h (44.1 mph). The longitudinal and lateral velocity changes were -71 km/h (-44.1 mph) and 0 km/h, respectively. The results were considered borderline since they were based only the Chevrolet's crush profile.

Other Vehicle's Driver: The police crash report indicated that the Oldsmobile's driver (23-year-old, male) was restrained by his seat belt. The driver's frontal air bag also deployed in this crash.


Superelevation:
+4.0%
-1.1% Grade
V2 Final Rest
V1 Final
Rest
Embankment:
Grade = negative 38.5%
Superelevation:
+7.1%
+1.9% Grade
N
IN09005
Clear, Daylight
Dry Bituminous
Speed Limit: 89 km/h (55 mph)
V1: 2008 Chevrolet Impala LT
V2: 1997 Oldsmobile Regency
0 m 5 m 10 m
Scale

CDR File Information

User Entered VIN	2G1WT58K881******
User	
Case Number	
EDR Data Imaging Date	
Crash Date	
Filename	IN09005.CDR
Saved on	Wednesday, March 4 2009 at 11:22:03 AM
Collected with CDR version	Crash Data Retrieval Tool 3.1
Reported with CDR version	Crash Data Retrieval Tool 3.2
EDR Device Type	airbag control module
Event(s) recovered	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 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. A locked Non Deployment Event cannot be overwritten 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 can 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 status 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 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	0
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)	No
The Event(s) Not Recorded was a Deployment Event(s)	No
The Event(s) Not Recorded was a Non-Deployment Event(s)	No

System Status At AE

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

Pre-crash data

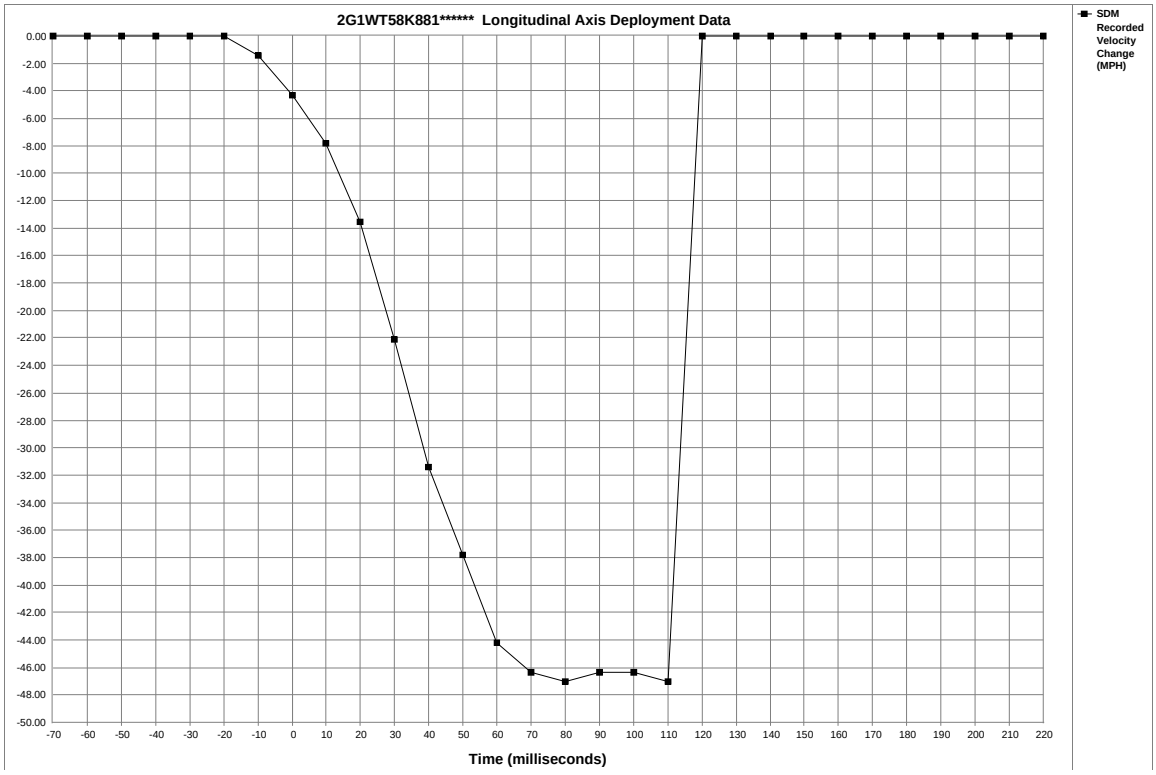
Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	-14.75	-12.54

Pre-Crash Data

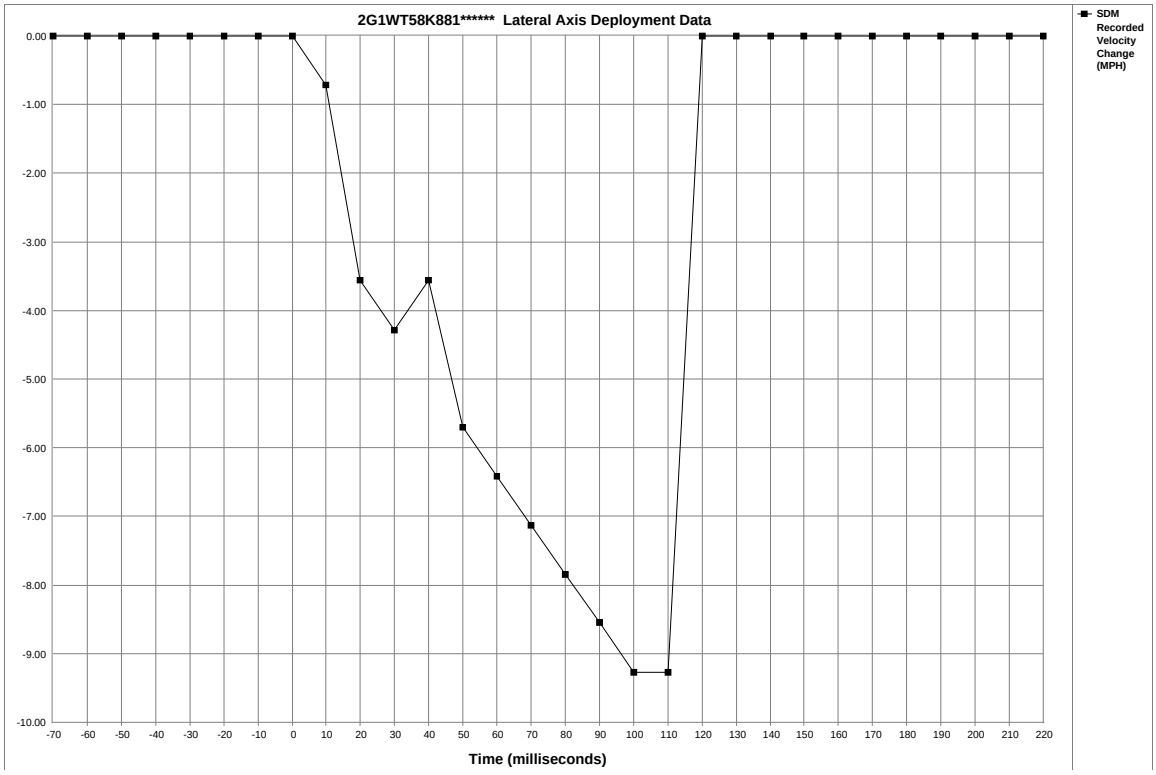
Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Accelerator Pedal Position (percent)	0	0	0	0	0
Vehicle Speed (MPH)	60	59	55	53	48
Engine Speed (RPM)	1408	1344	1152	1024	1024
Percent Throttle	7	7	7	6	5
Brake Switch Circuit Status	ON	ON	ON	ON	ON

System Status At Deployment

Ignition Cycles At Investigation	777
SIR Warning Lamp Status	OFF
SIR Warning Lamp ON Time Continuously (seconds)	0
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	766
Ignition Cycles At Event	777
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Classification Status at Event Enable	Passenger Seat Empty
Current Passenger Position Status at Event Enable	Position Not Applicable
Previous Passenger Position Status at Event Enable	Unknown
Passenger Air Bag Indicator Status at Event Enable	OFF
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
Driver 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	12
Driver 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	14
Passenger 1st Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	Suppressed
Passenger 2nd Stage Time From Algorithm Enable to Deployment Command Criteria Met (msec)	Suppressed
Driver Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Passenger Side or Roof Rail/Head Curtain Time From Algorithm Enable to Deployment Command Criteria Met (msec)	N/A
Time Between Events (sec)	0
Crash Record Locked	Yes
Vehicle Event Data (Pre-Crash) Associated With This Event	Yes
SDM Synchronization Counter	776
Event Recording Complete	Yes
Driver First Stage Deployment Loop Commanded	Yes
Passenger First Stage Deployment Loop Commanded	No
Driver Second Stage Deployment Loop Commanded	Yes
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	Yes
Passenger Pretensioner Deployment Loop Commanded	Yes
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)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Longitudinal Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	-1.43	-4.28	-7.84	-13.54	-22.10	-31.37	-37.78	-44.20	-46.34
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Longitudinal Axis Recorded Velocity Change (MPH)	-47.05	-46.34	-46.34	-47.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Time (milliseconds)	-70	-60	-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70
SDM Lateral Axis Recorded Velocity Change (MPH)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.71	-3.56	-4.28	-3.56	-5.70	-6.42	-7.13
Time (milliseconds)	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220
SDM Lateral Axis Recorded Velocity Change (MPH)	-7.84	-8.55	-9.27	-9.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00