Appendix C

Barrier Crash Test, 2007 Toyota Corolla, December 10, 2010

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2007 Toyota Corolla

Toyota Consulting
0907698

December 10, 2010

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2007 Toyota Corolla

Toyota Consulting
0907698

December 10, 2010

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

December 2010

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/1210/R562

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Test Description

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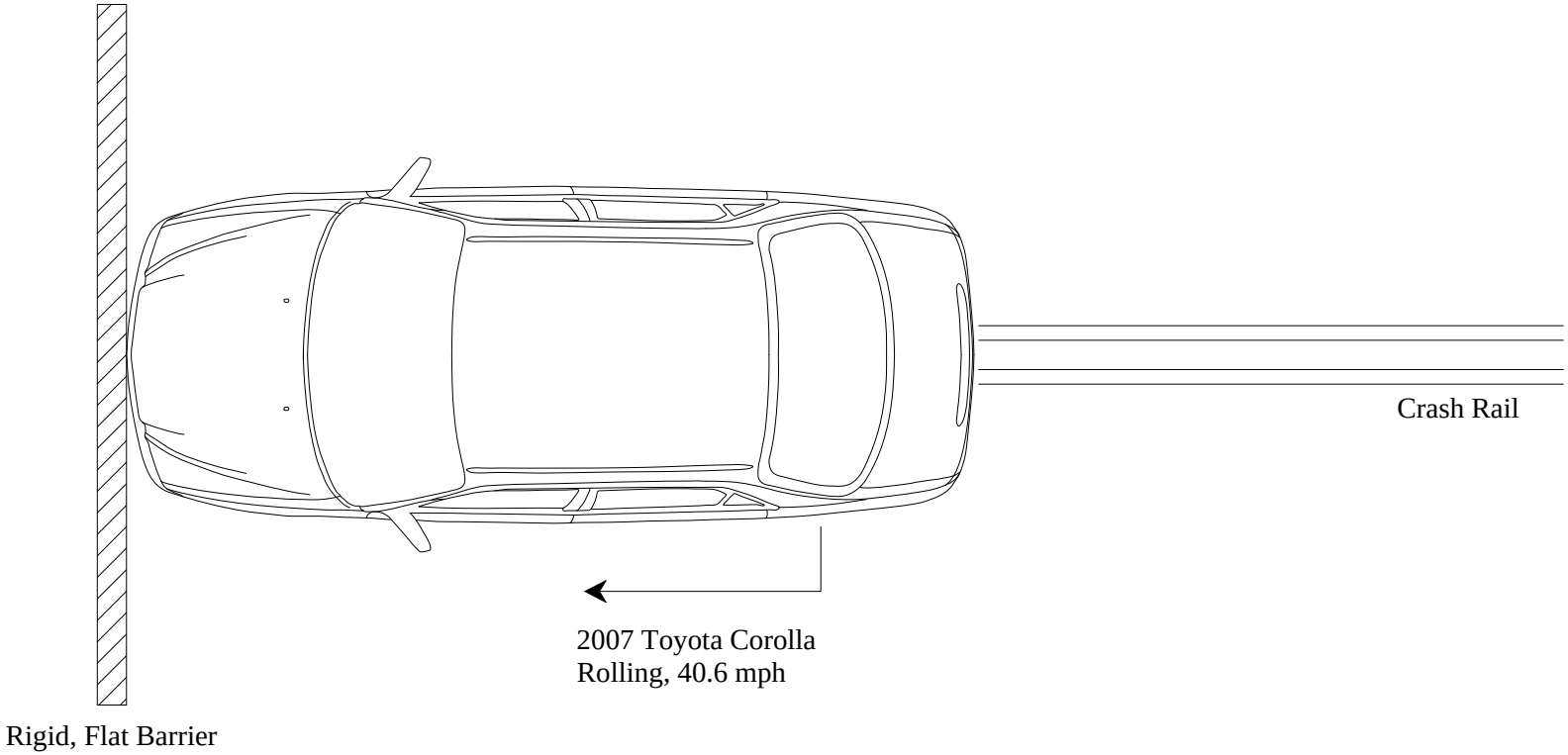
TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	December 10, 2010
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2007 Toyota Corolla
IMPACT SPEED:	40.6 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set in trunk
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. Two sandbags were added to the right front seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 40.6 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
December 10, 2010



Exponent®

2007 Toyota Corolla

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Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	6941			DATE RECEIVED:	12/9/2010
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	COROLLA
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	TEAL
VEHICLE IDENTIFICATION NUMBER:	1NXBR32EX7Z811764			DATE OF MANUFACTURE:	10/06
GVWR (lb):	3585	FRONT GAWR (lb):	1885	REAR GAWR (lb):	1720
RECOMMENDED TIRE SIZE - F/R:	P185/65R15	RECOMMENDED TIRE PRESSURE - F/R (psi):	30		
INSTALLED TIRE SIZE:	LF: P185/65R15	RF: P185/65R15	LR: P185/65R15	RR: P185/65R15	
ENGINE TYPE:	4-CYLINDER	ENGINE DISPLACEMENT:	1.8 LITER	ODOMETER (mi):	39,896
TRANSMISSION TYPE:	MANUAL	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	CENTER, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT REAR QUARTER PANEL		
DESIGNATED SEATING - FRONT: 2	MID: 0	REAR: 3	TOTAL: 5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	N
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	Y	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	N	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	N	ANTI-LOCK BRAKES F:	N
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	N	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	N
SUNROOF:	N	ROOF RACK:	N						

ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES: NONE

SIGNIFICANT BODY DAMAGE/CORROSION: NONE

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

LEFT FRONT:	763	RIGHT FRONT:	765	TOTAL FRONT:	1528	PERCENT FRONT:	60%
LEFT REAR:	509	RIGHT REAR:	500	TOTAL REAR:	1009	PERCENT REAR:	40%
				TOTAL WEIGHT:	2537		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

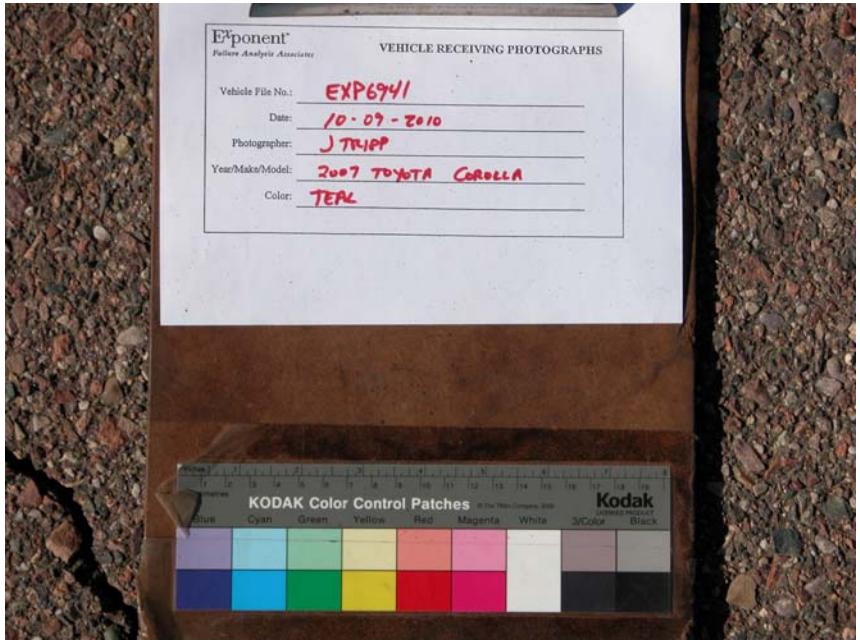
LEFT FRONT:	26.4	AT WHL WELL @ AXLE	RIGHT FRONT:	26.7	AT WHL WELL @ AXLE
LEFT REAR:	27.5	AT WHL WELL @ AXLE	RIGHT REAR:	27.5	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	178.3	OVERALL WIDTH:	66.8	OVERALL HEIGHT:	57.9
WHEELBASE:	102.7	FRONT TRACK:	58.2	REAR TRACK:	57.6
REAR OVERHANG:	38.6	FRONT BUMPER HEIGHT:	21.3	REAR BUMPER HEIGHT:	24.2

COMMENTS: NR = NOT RECORDED

EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	JT/KW	CHECKED BY:	DSP



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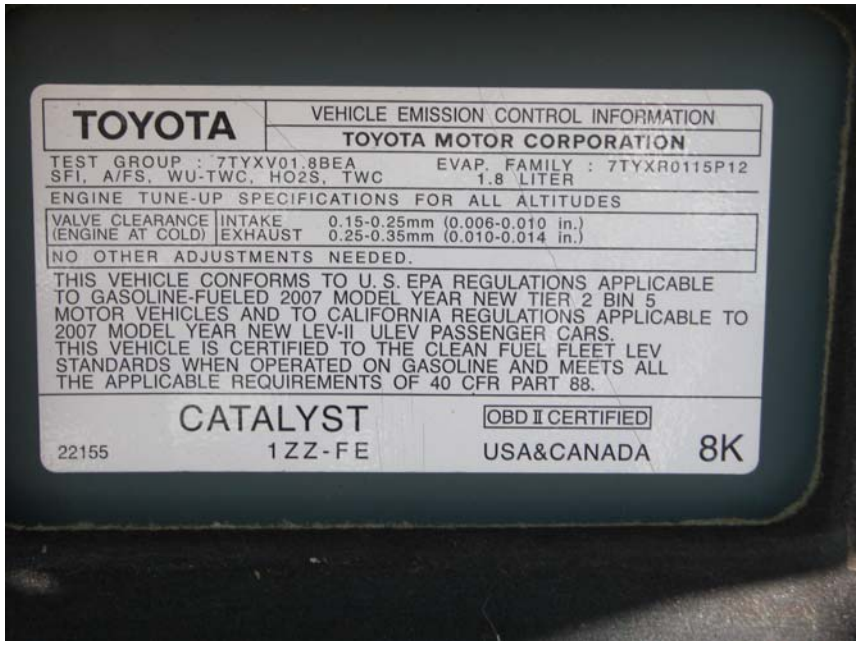

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Test Setup

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VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	COROLLA
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	TEAL
VEHICLE IDENTIFICATION NUMBER:	1NXBR32EX7Z811764			ODOMETER (mi):	39,897

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P185/65R15 | 30 PSI | 9/32"	P185/65R15 | 30 PSI | 9/32"
REAR:	P185/65R15 | 30 PSI | 9/32"	P185/65R15 | 30 PSI | 9/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	769	RIGHT FRONT:	804	TOTAL FRONT:	1573	PERCENT FRONT:	61%
LEFT REAR:	487	RIGHT REAR:	499	TOTAL REAR:	986	PERCENT REAR:	39%
				TOTAL WEIGHT:	2559		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	26.3	AT	WHL WELL @ AXLE	RIGHT FRONT:	26.4	AT	WHL WELL @ AXLE
LEFT REAR:	27.6	AT	WHL WELL @ AXLE	RIGHT REAR:	27.5	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRONT SUSPENSION CROSSMEMBER		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	TRUNK		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	--	RIGHT FRONT:	NONE*
LEFT MID:	--	CENTER MID:	--	RIGHT MID:	--
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	MIDDLE POSITION	MIDDLE POSITION
OTHER:	SEATBELT UNBUCKLED, D-RING FULL DOWN	SEATBELT BUCKLED, D-RING FULL DOWN

COMMENTS

*TWO SANDBAGS (103 LBS TOTAL) PLACED IN RIGHT FRONT SEAT

	FORM COMPLETED BY:	DSP	CHECKED BY: MLM

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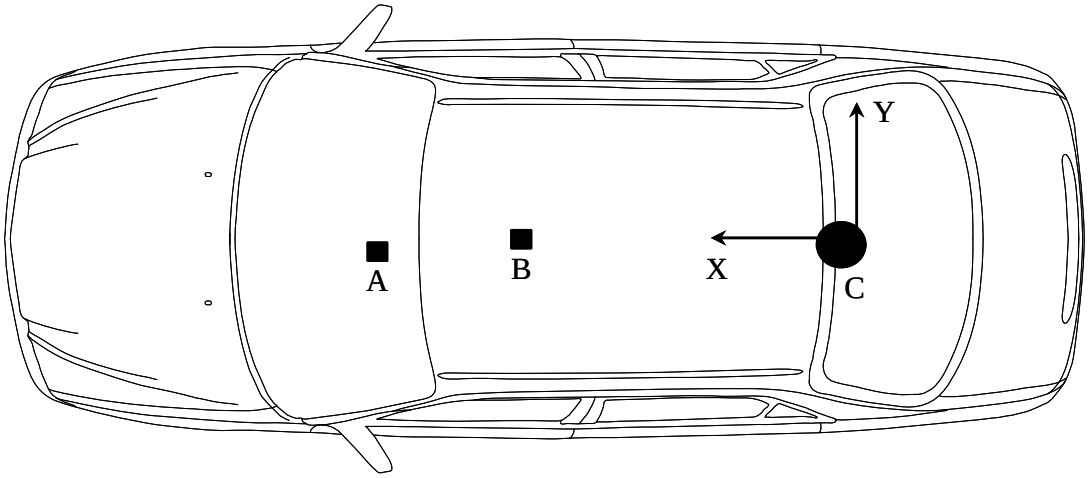
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	COROLLA
VEHICLE IDENTIFICATION NUMBER:	1NXBR32EX7Z811764				



NOTES: NOT TO SCALE, ORIGIN AT CENTER OF REAR AXLE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	82.7 in.	-1.9 in.	17.5 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	64.3 in.	0.0 in.	16.2 in.
C	TRIAXIAL ACCELEROMETER SET, TRUNK	2.1 in.	-2.0 in.	20.8 in.

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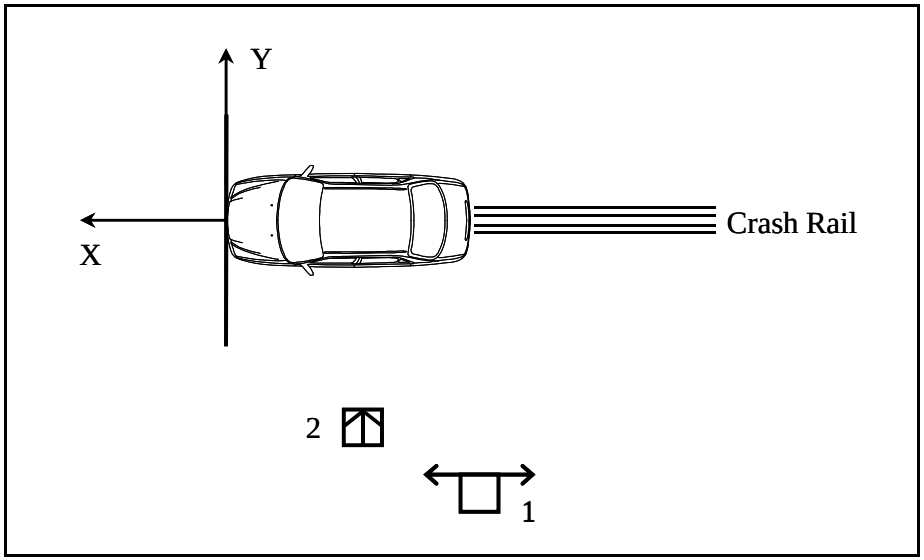
CAMERA SETUP RECORD

PROJECT NO:	0907698	TEST DATE:	12/10/2010
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2007 TOYOTA COROLLA		
TEST SPEED:	40.6 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-12.0	-37.0	4.0	RT	--

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PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA BARRIER CRASH TESTING
JOB NUMBER:	0907698
DATE:	12/10/2010
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2007 TOYOTA COROLLA

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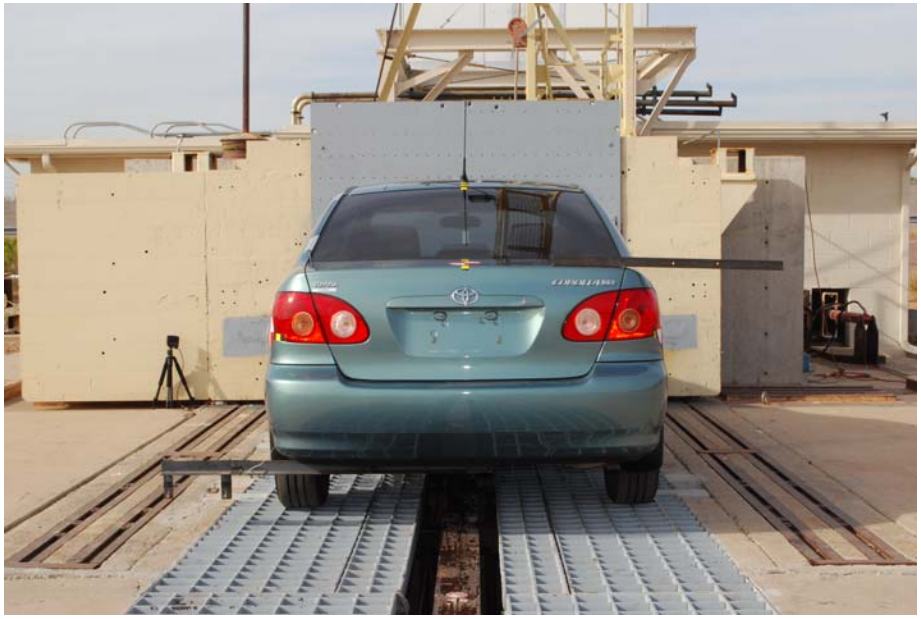

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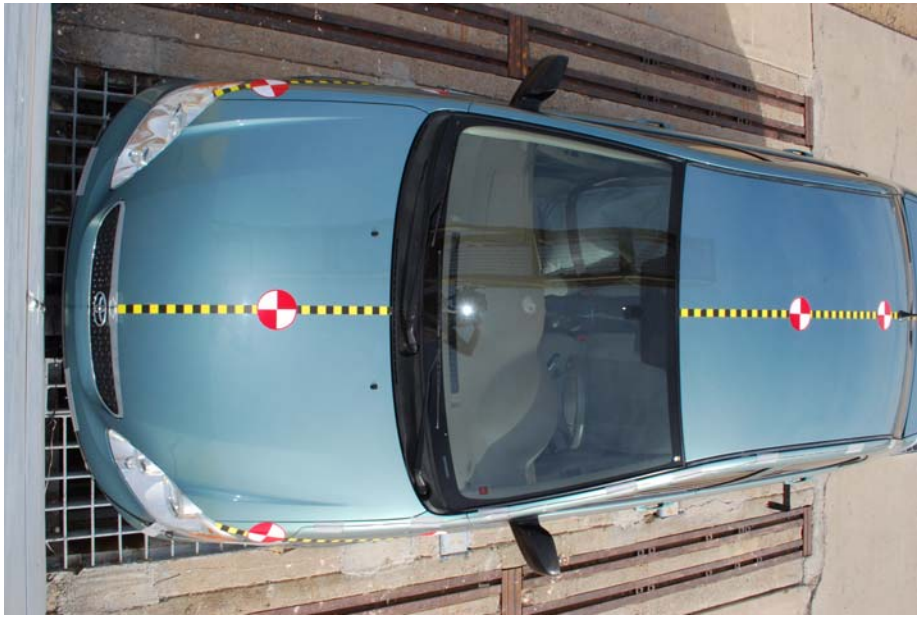

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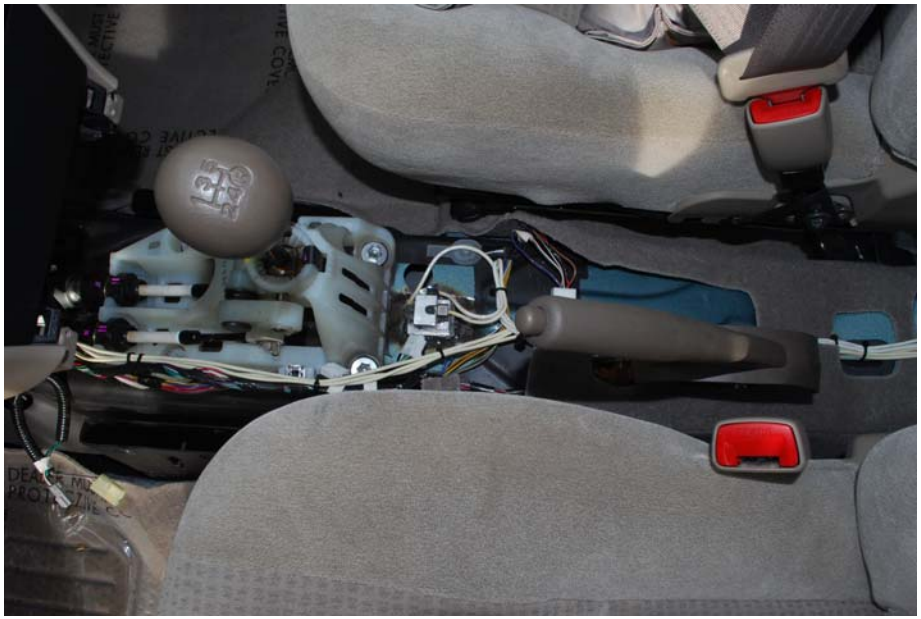

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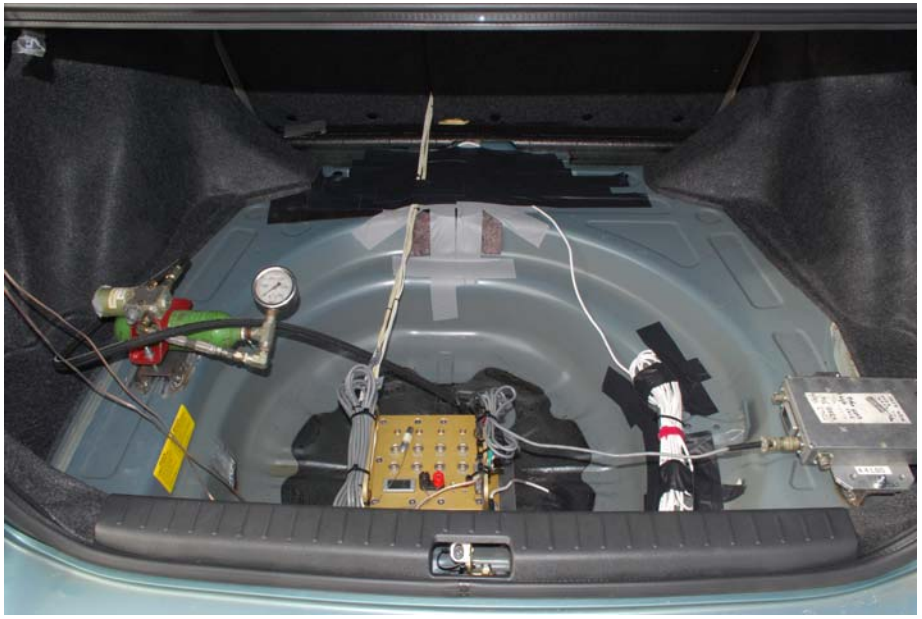

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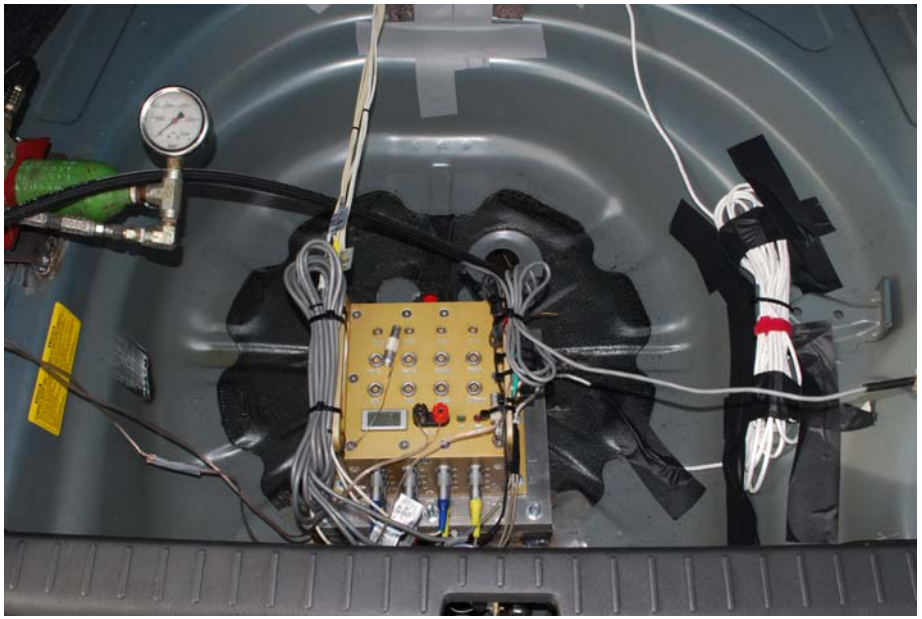

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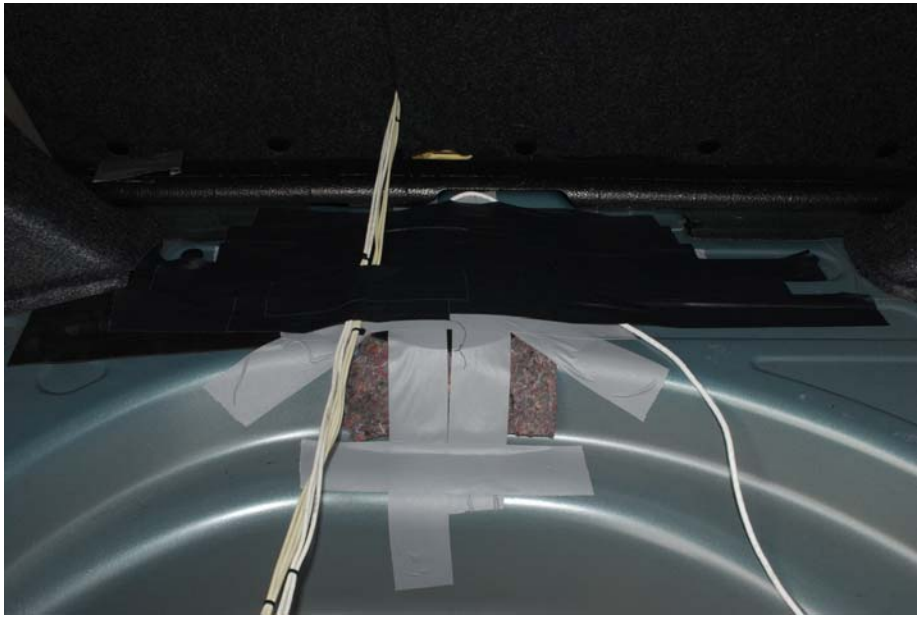

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Test Results

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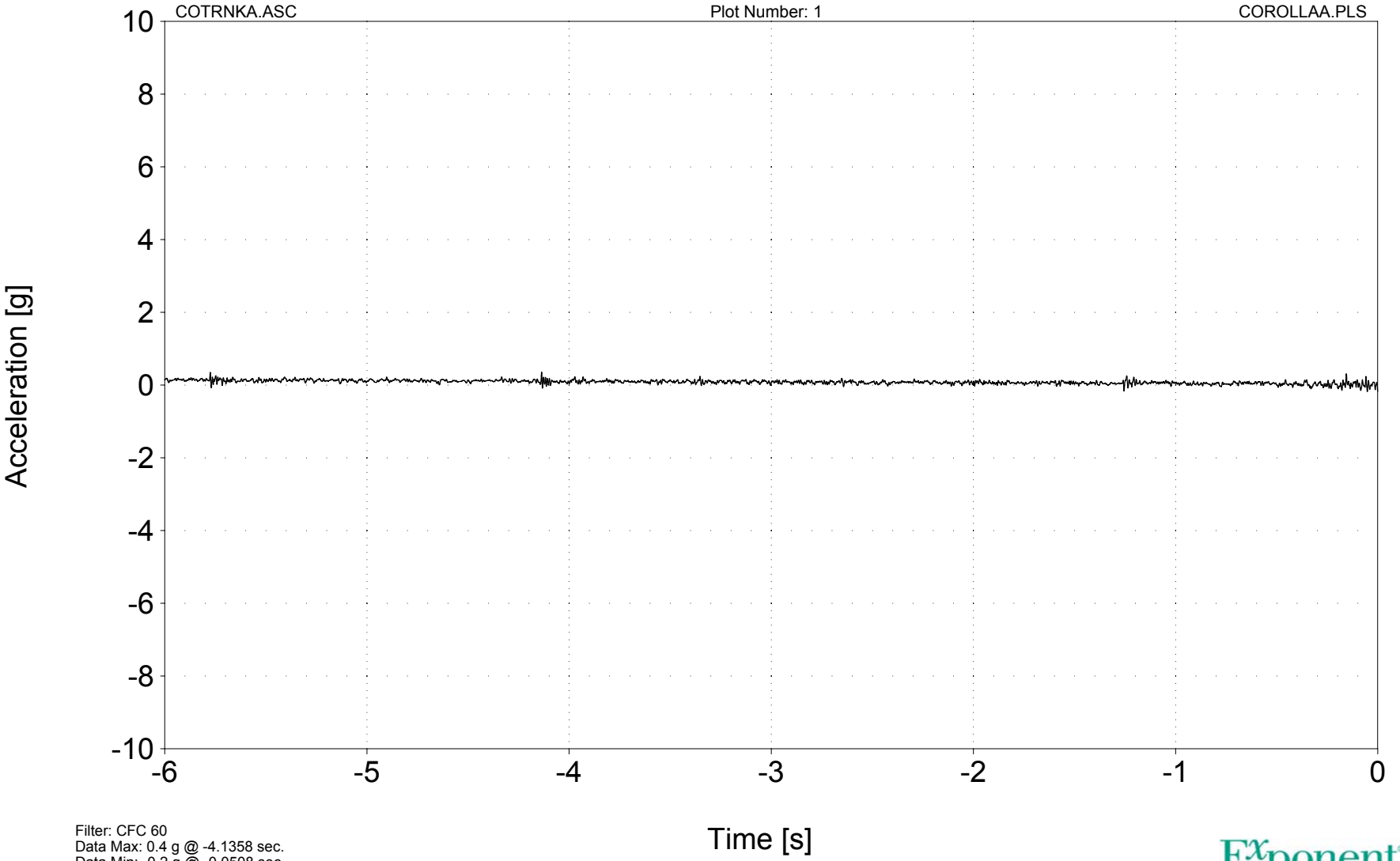
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
OPERATOR:	DSP	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	NONE				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
121010-COROLLA	Channel 1	--	40.6	59.5	JS
	Channel 2	--	40.6	59.5	
	Average	--	40.6	59.5	

Longitudinal Acceleration v Time

Trunk
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.4 g @ -4.1358 sec.
Data Min: -0.2 g @ -0.0508 sec.

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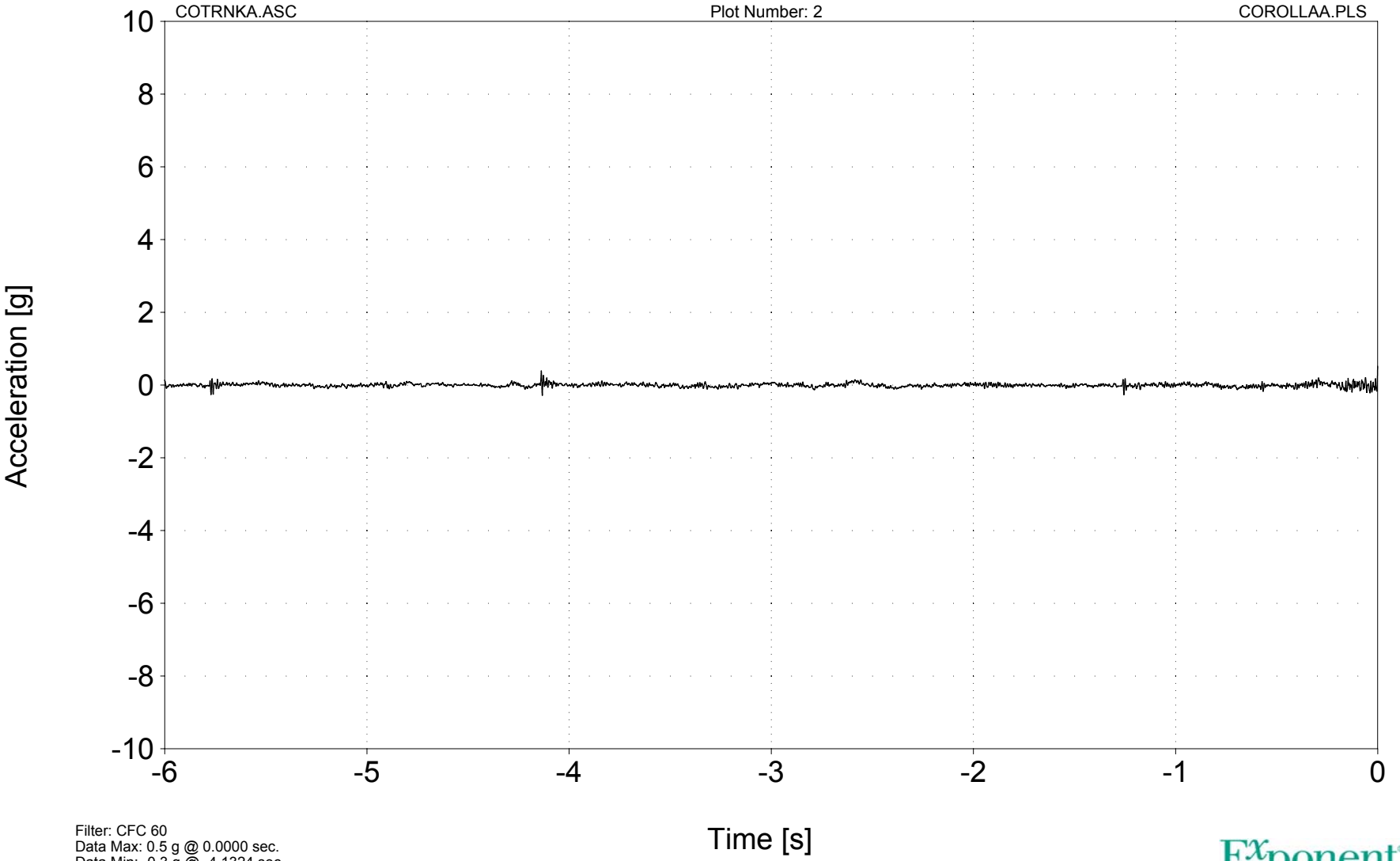
Lateral Acceleration v Time

Trunk
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.5 g @ 0.0000 sec.
Data Min: -0.3 g @ -4.1324 sec.

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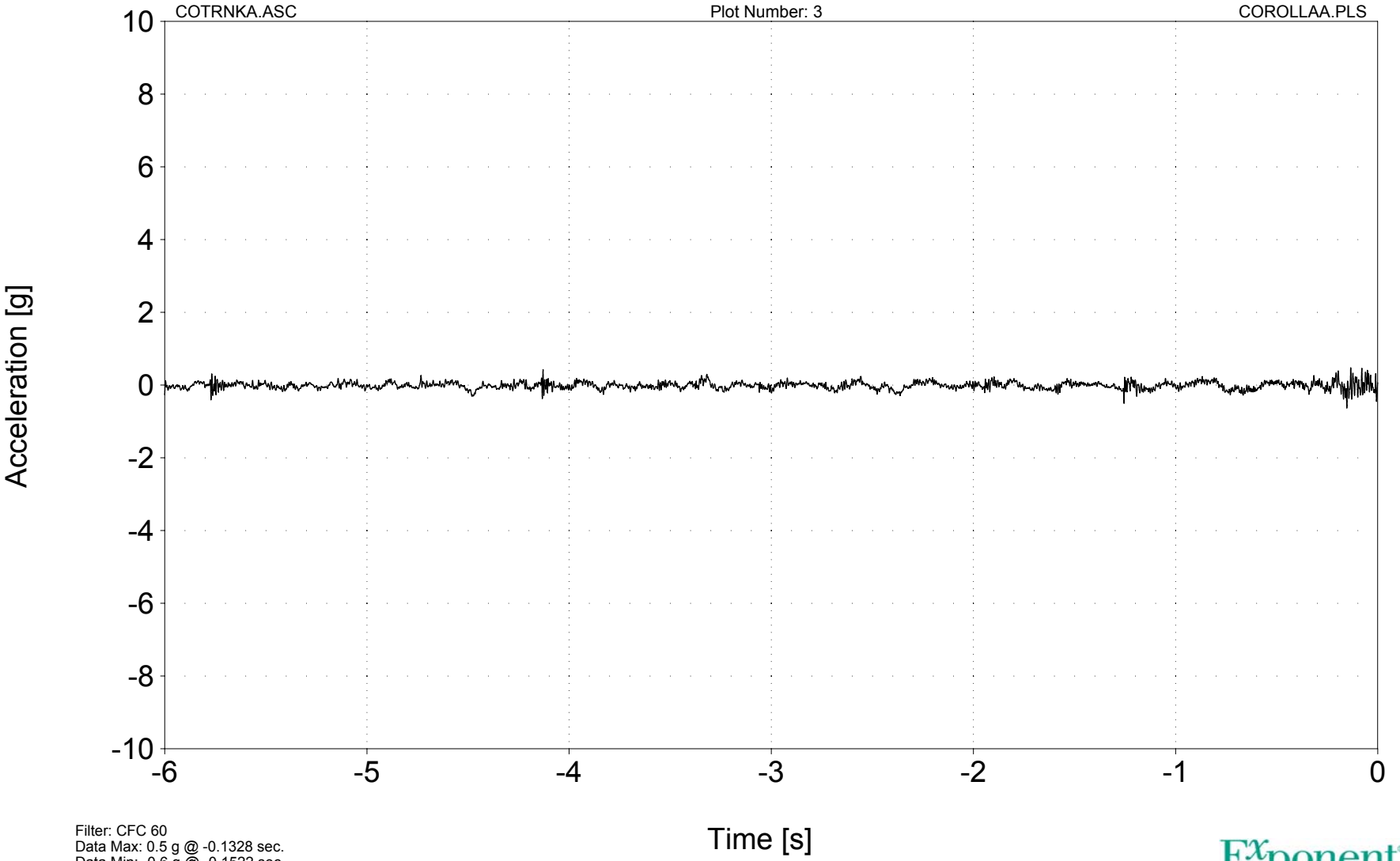
Vertical Acceleration v Time

Trunk
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.5 g @ -0.1328 sec.
Data Min: -0.6 g @ -0.1522 sec.

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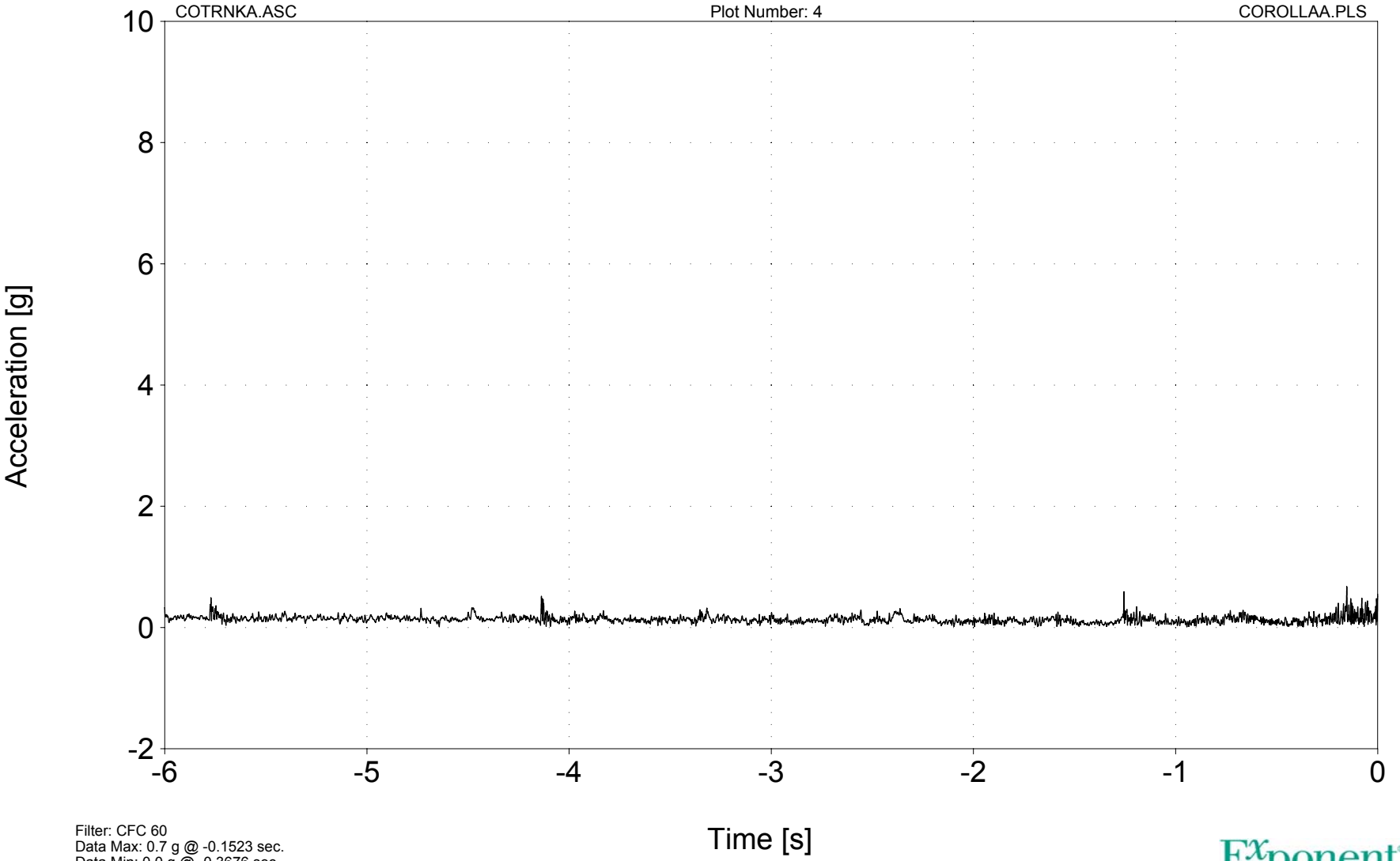
Resultant Acceleration v Time

Trunk
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.7 g @ -0.1523 sec.
Data Min: 0.0 g @ -0.3676 sec.

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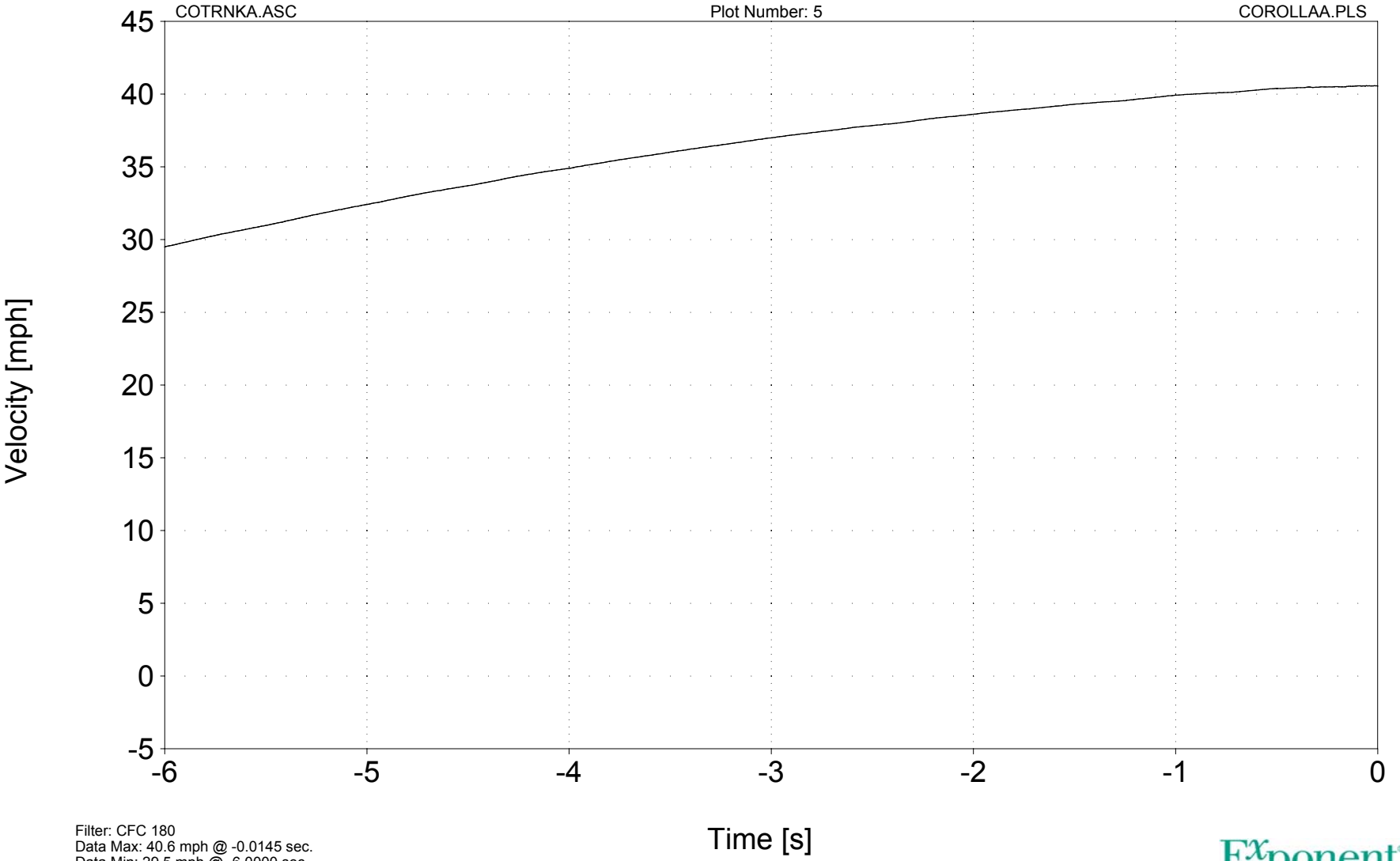
Longitudinal Velocity v Time

Trunk
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



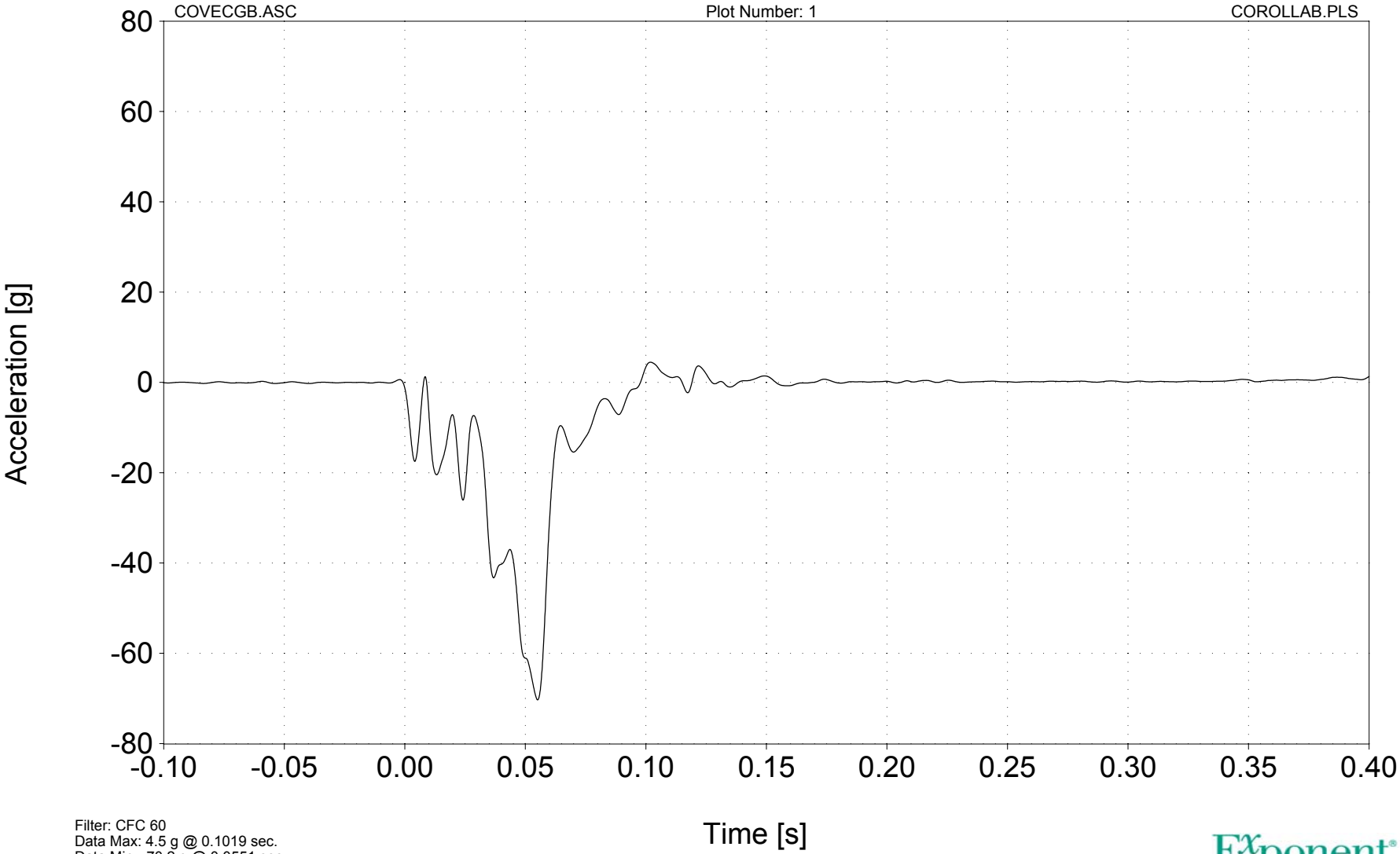
Filter: CFC 180
Data Max: 40.6 mph @ -0.0145 sec.
Data Min: 29.5 mph @ -6.0000 sec.

Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Longitudinal Acceleration v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 4.5 g @ 0.1019 sec.
Data Min: -70.2 g @ 0.0551 sec.

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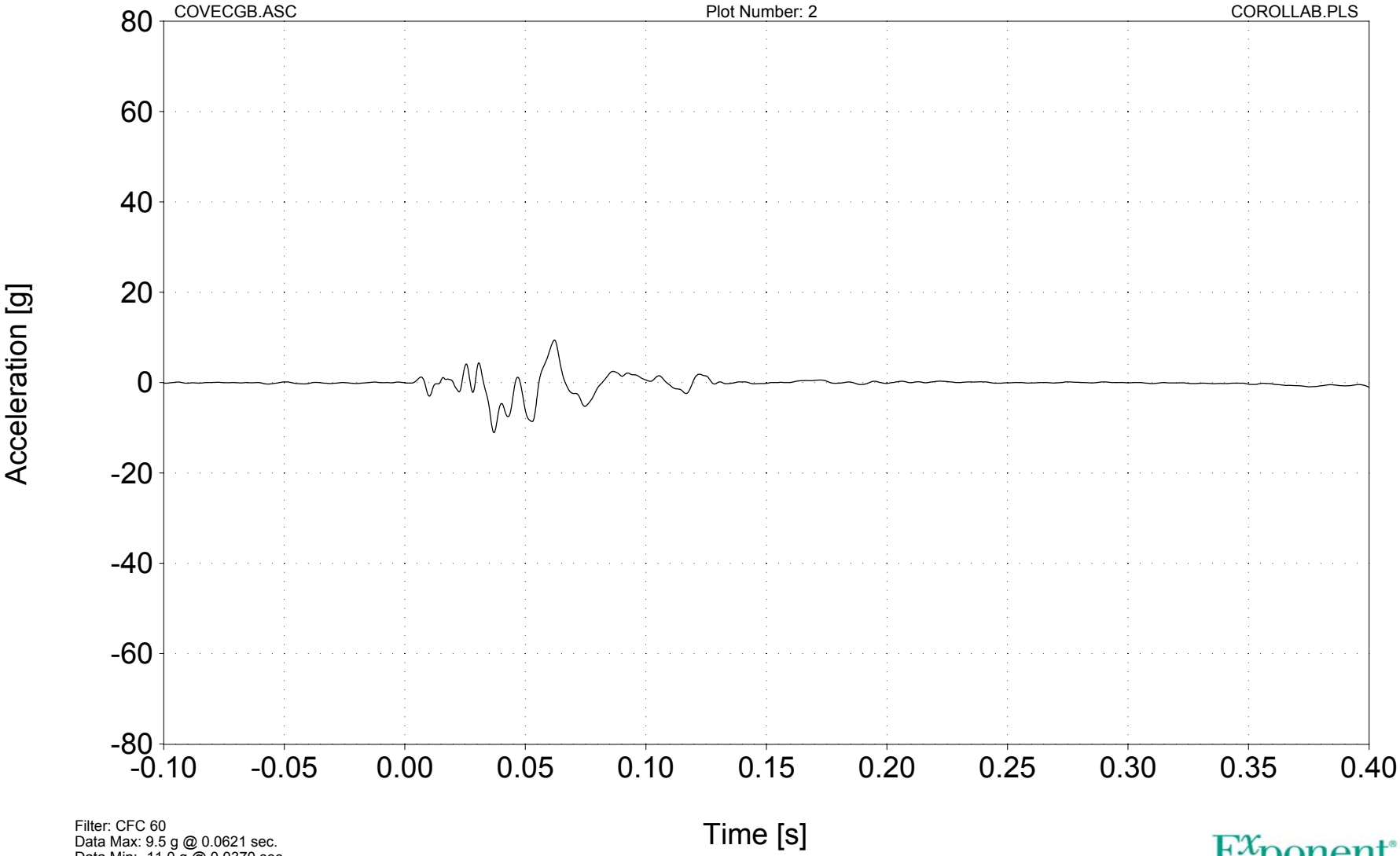
Lateral Acceleration v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 9.5 g @ 0.0621 sec.
Data Min: -11.0 g @ 0.0370 sec.

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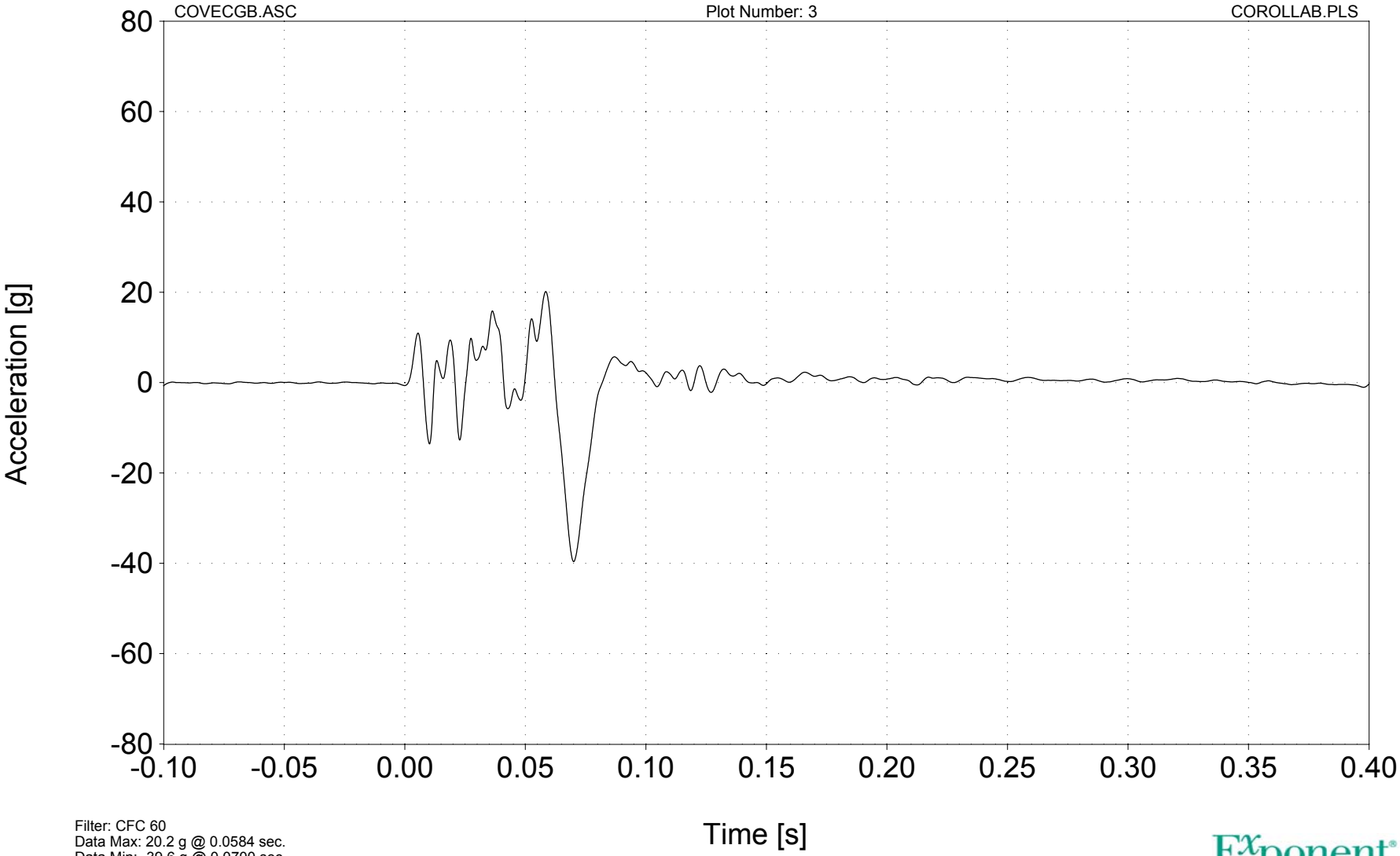
Vertical Acceleration v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 20.2 g @ 0.0584 sec.
Data Min: -39.6 g @ 0.0700 sec.

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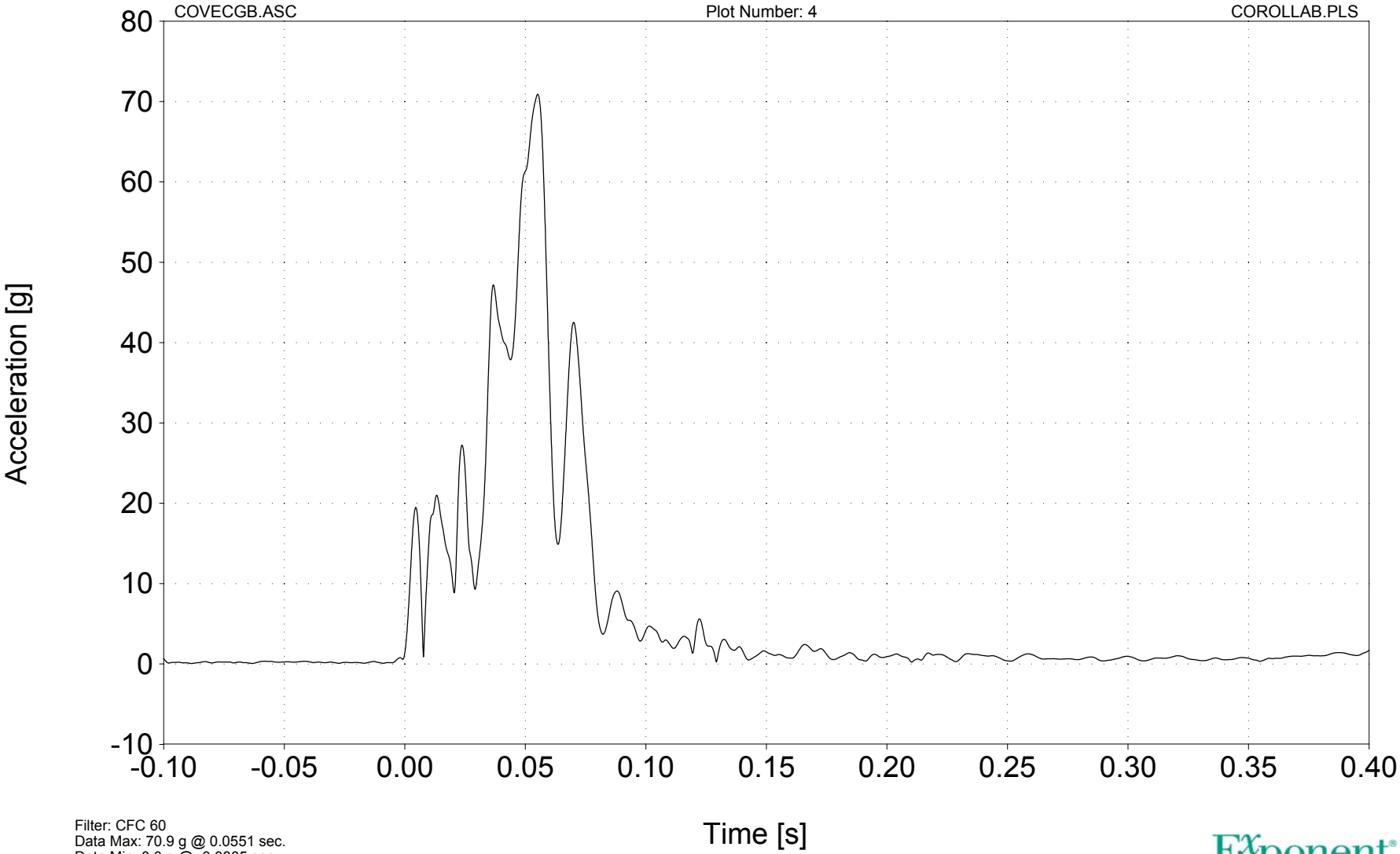
Resultant Acceleration v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 70.9 g @ 0.0551 sec.
Data Min: 0.0 g @ -0.0885 sec.

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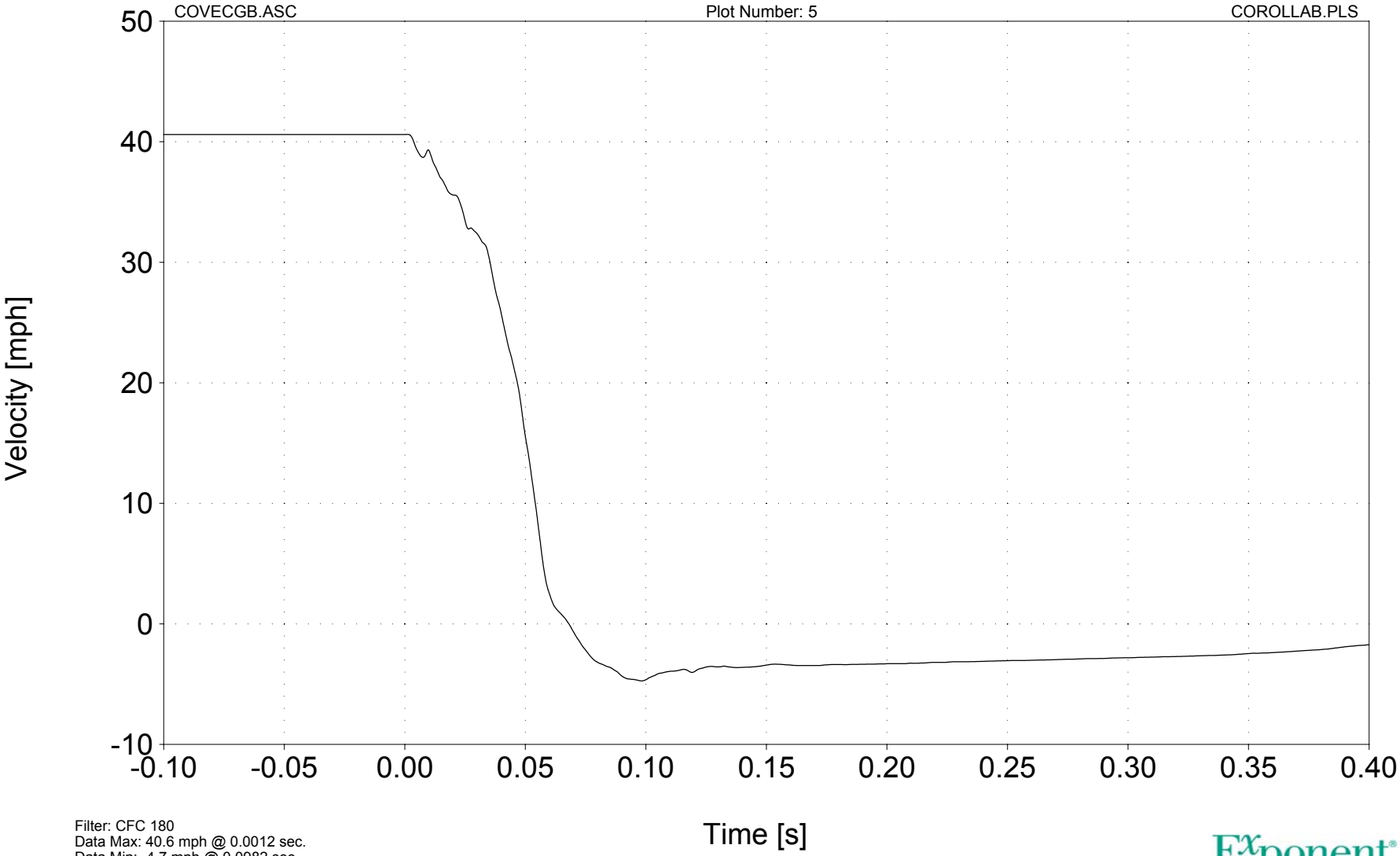
Longitudinal Velocity v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 40.6 mph @ 0.0012 sec.
Data Min: -4.7 mph @ 0.0982 sec.

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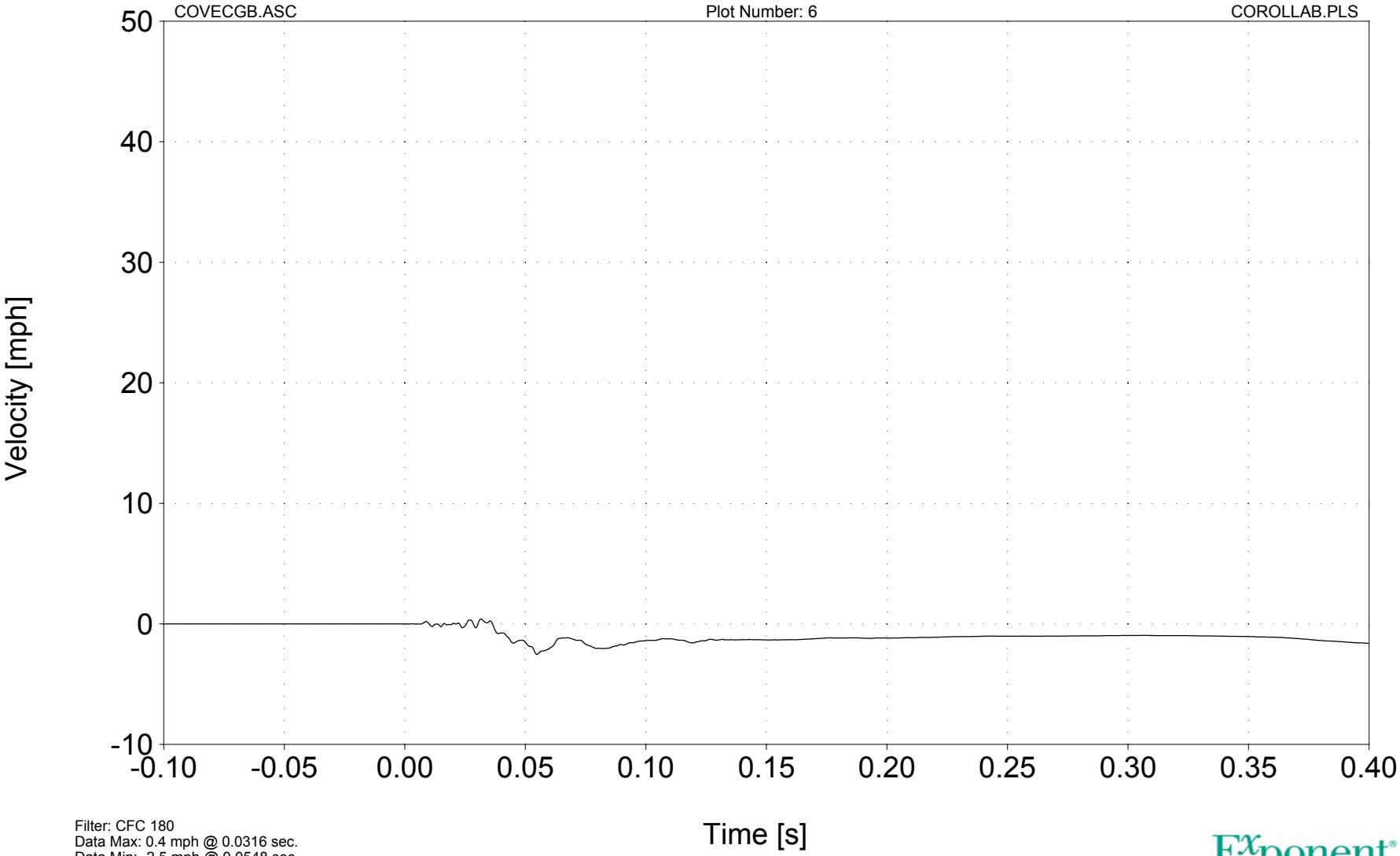
Lateral Velocity v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 0.4 mph @ 0.0316 sec.
Data Min: -2.5 mph @ 0.0548 sec.

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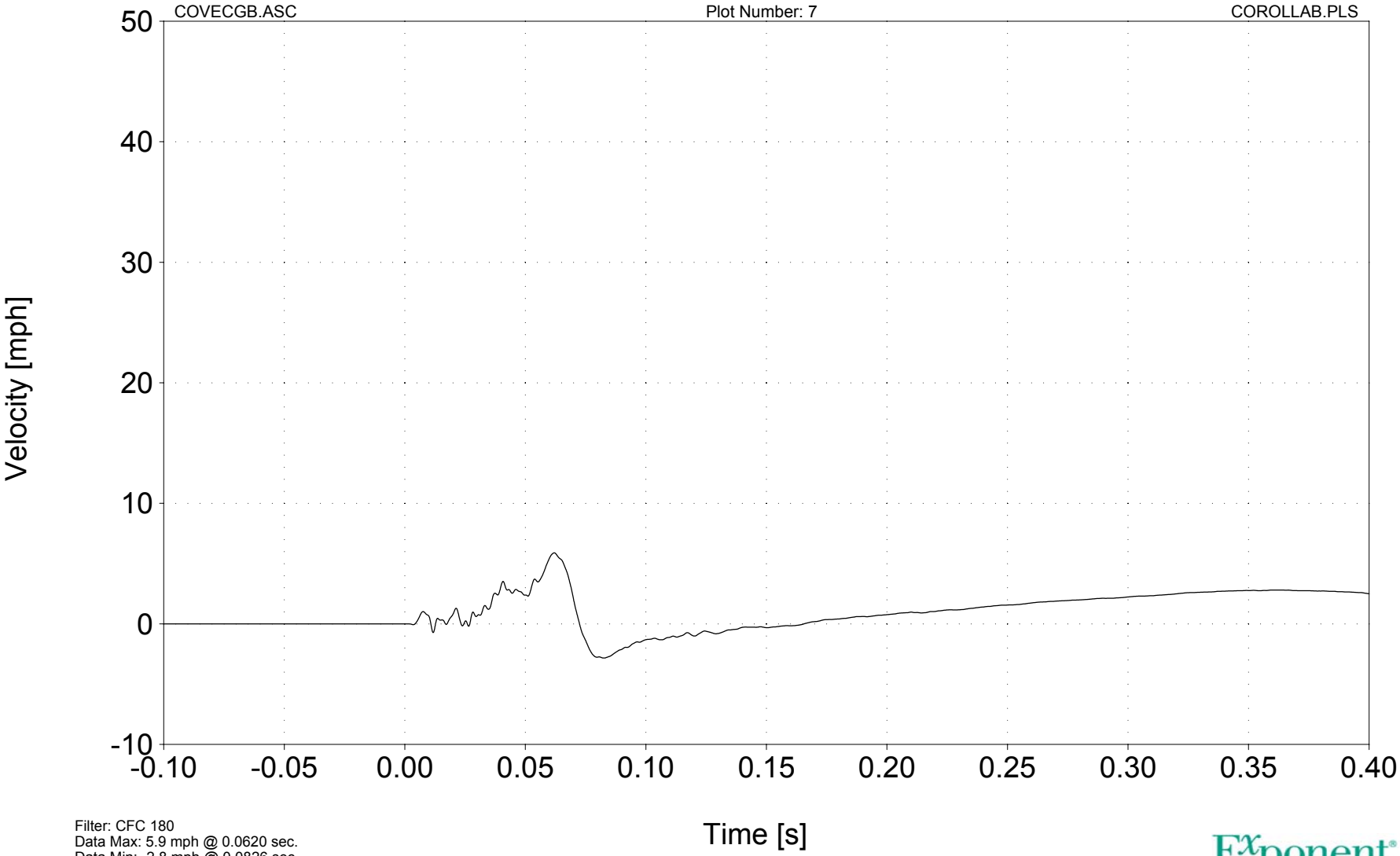
Vertical Velocity v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 5.9 mph @ 0.0620 sec.
Data Min: -2.8 mph @ 0.0826 sec.

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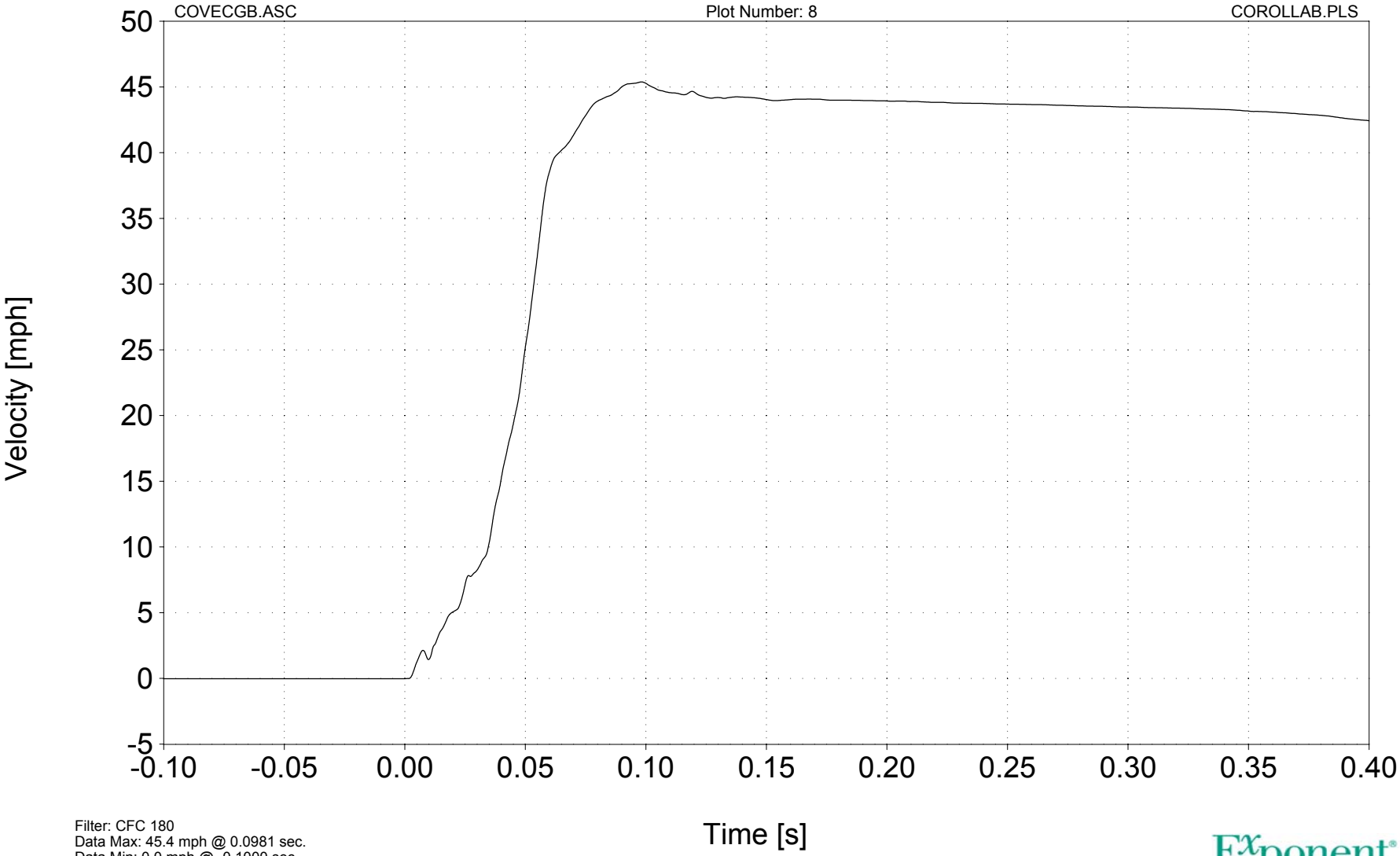
Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 45.4 mph @ 0.0981 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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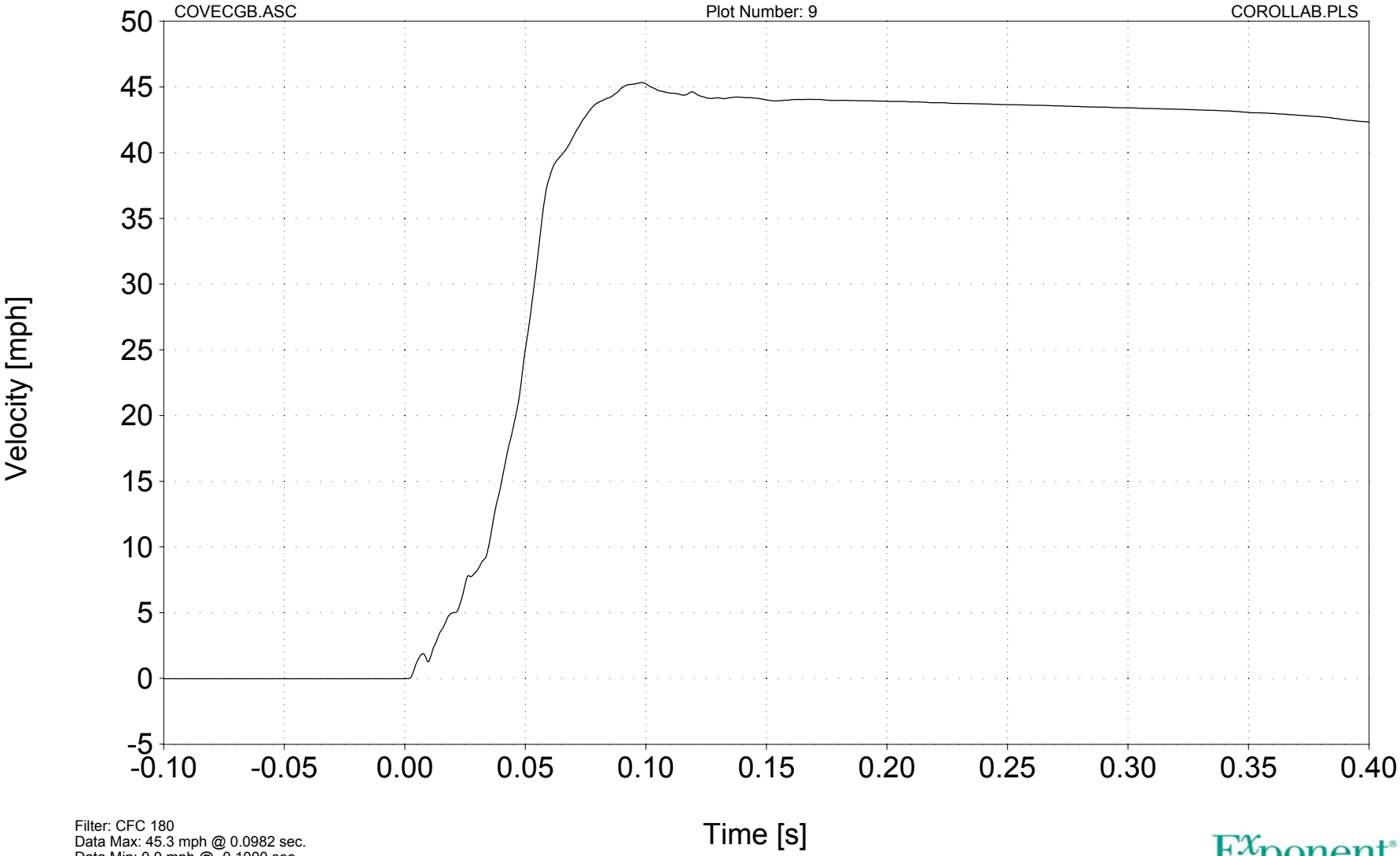
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 45.3 mph @ 0.0982 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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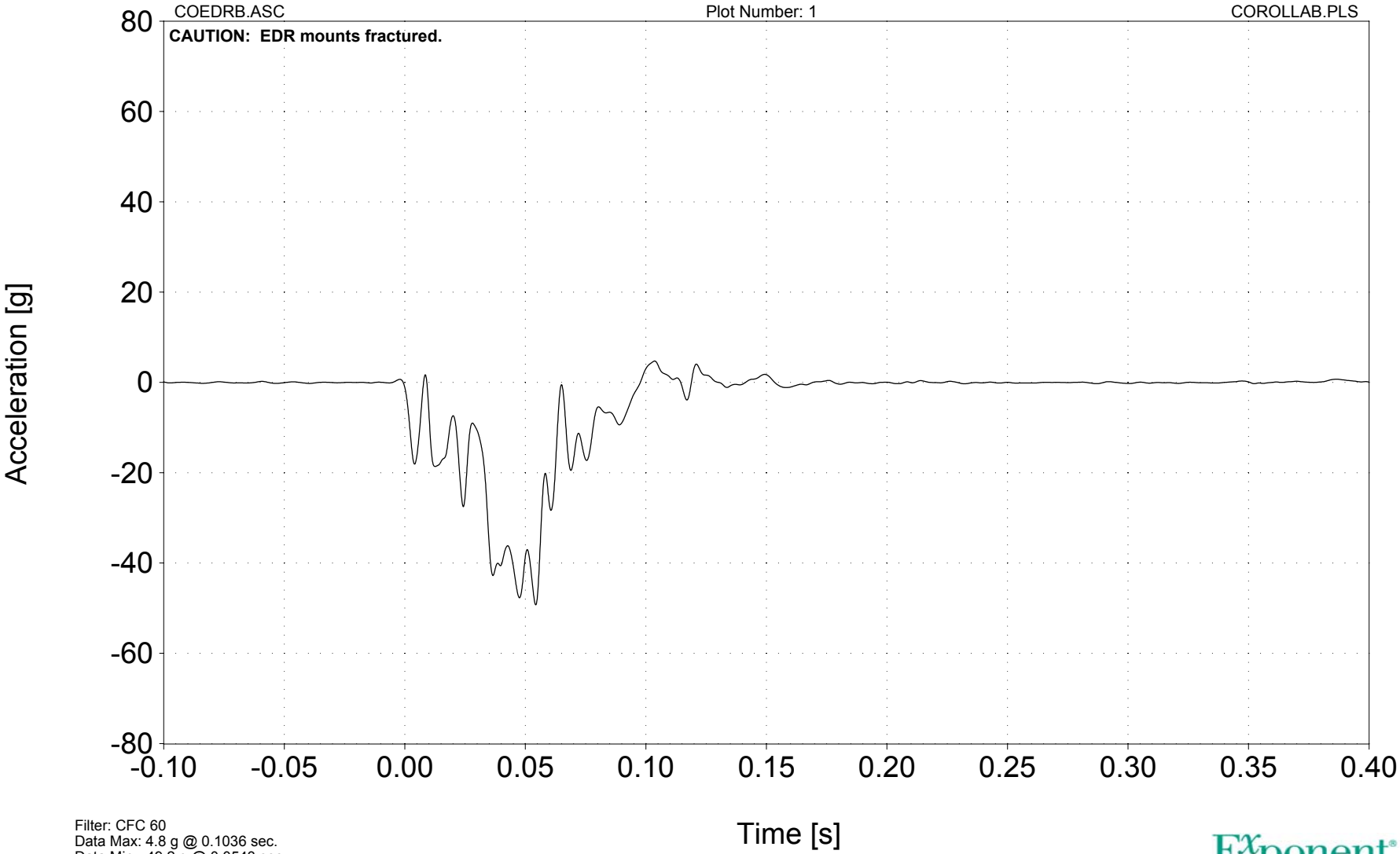
Longitudinal Acceleration v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 4.8 g @ 0.1036 sec.
Data Min: -49.2 g @ 0.0543 sec.

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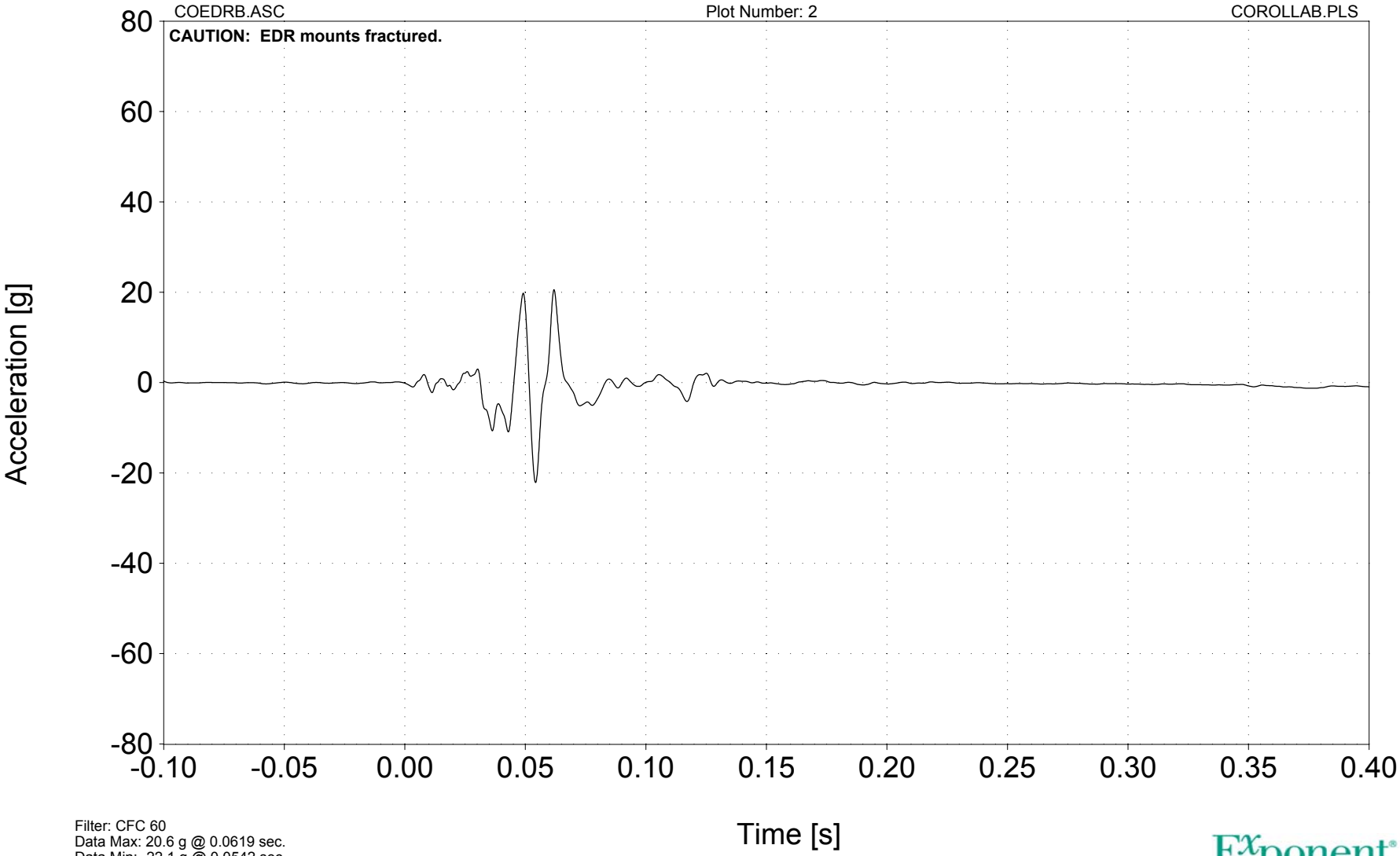
Lateral Acceleration v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 20.6 g @ 0.0619 sec.
Data Min: -22.1 g @ 0.0542 sec.

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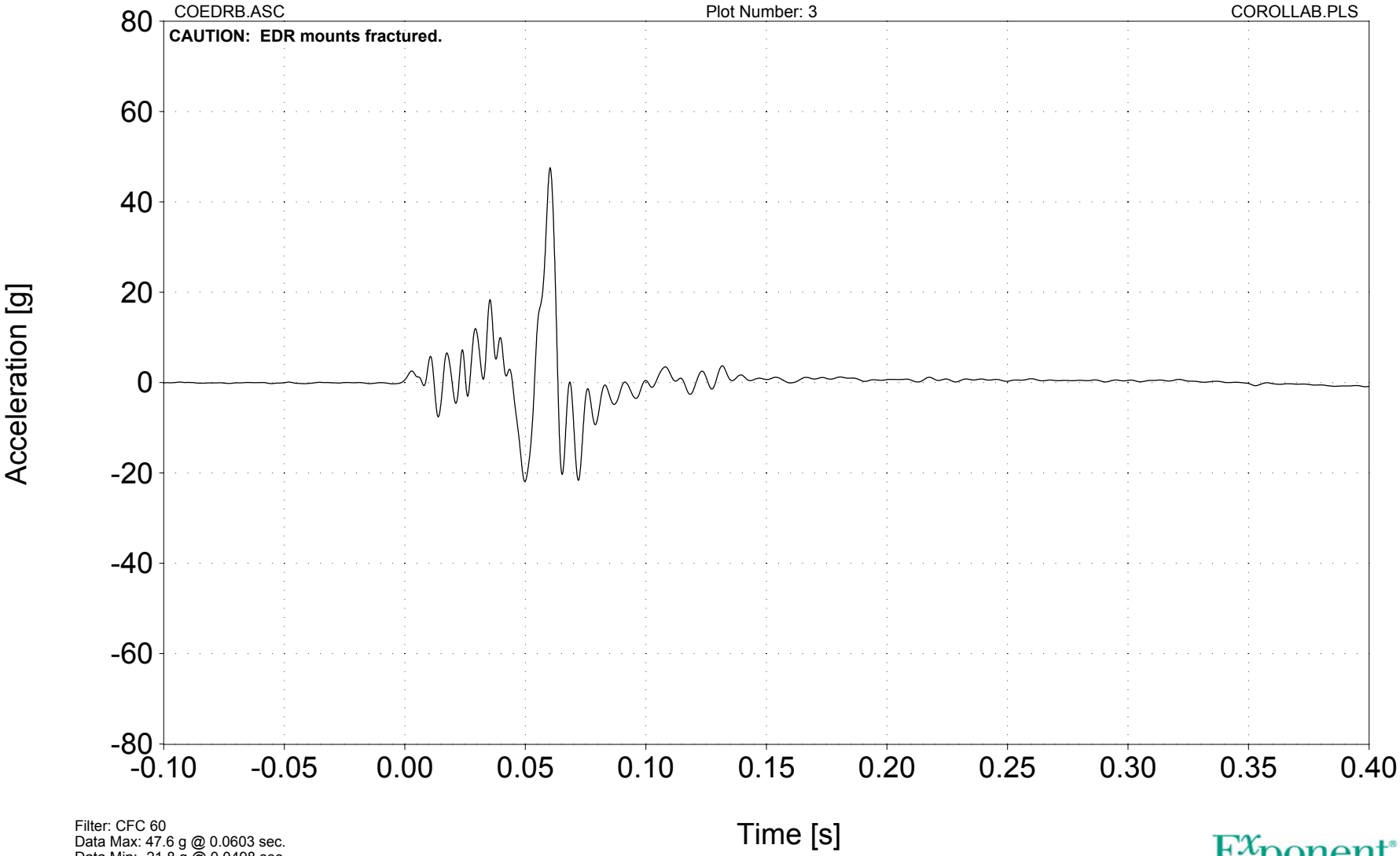
Vertical Acceleration v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 47.6 g @ 0.0603 sec.
Data Min: -21.8 g @ 0.0498 sec.

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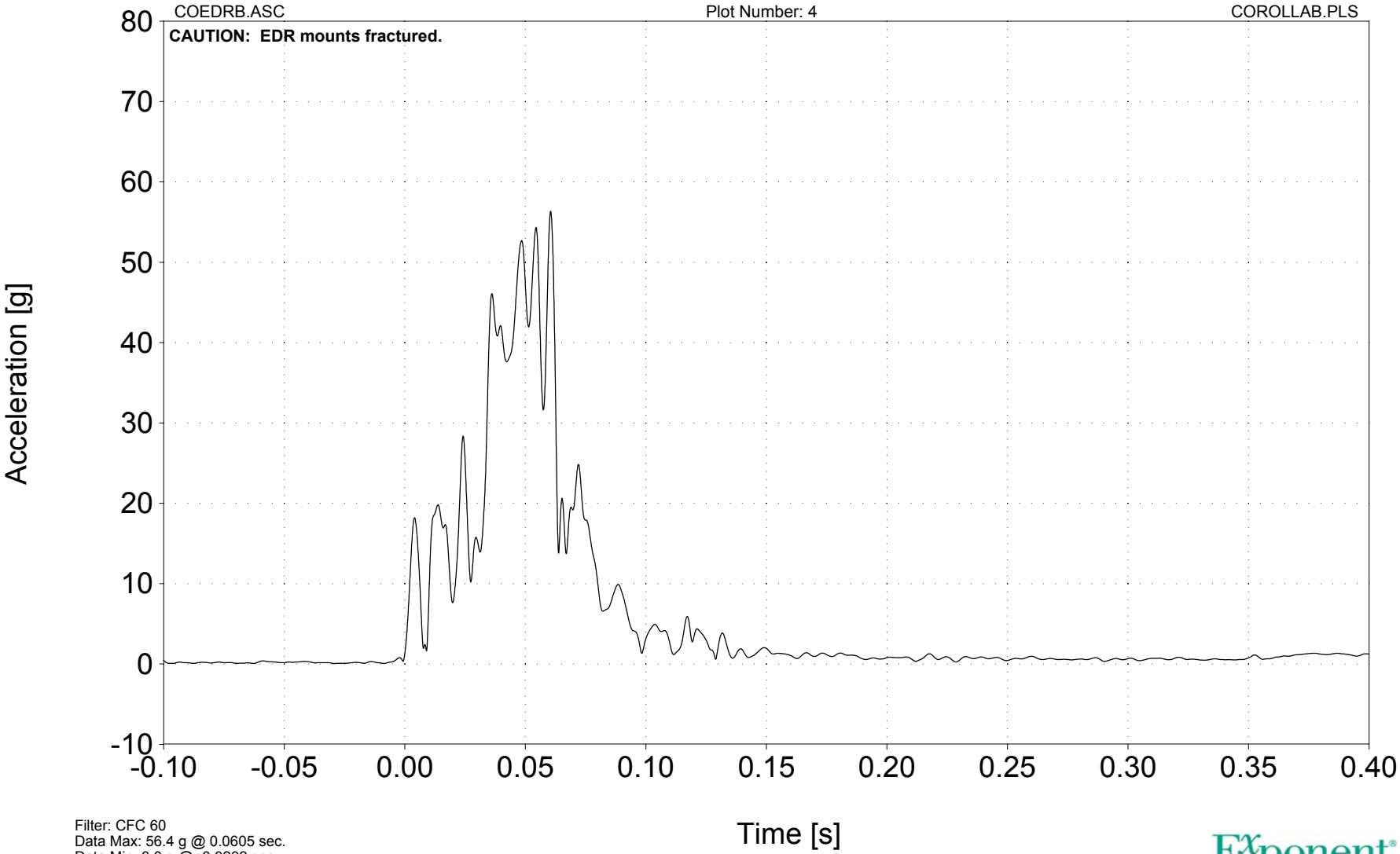
Resultant Acceleration v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 56.4 g @ 0.0605 sec.
Data Min: 0.0 g @ -0.0292 sec.

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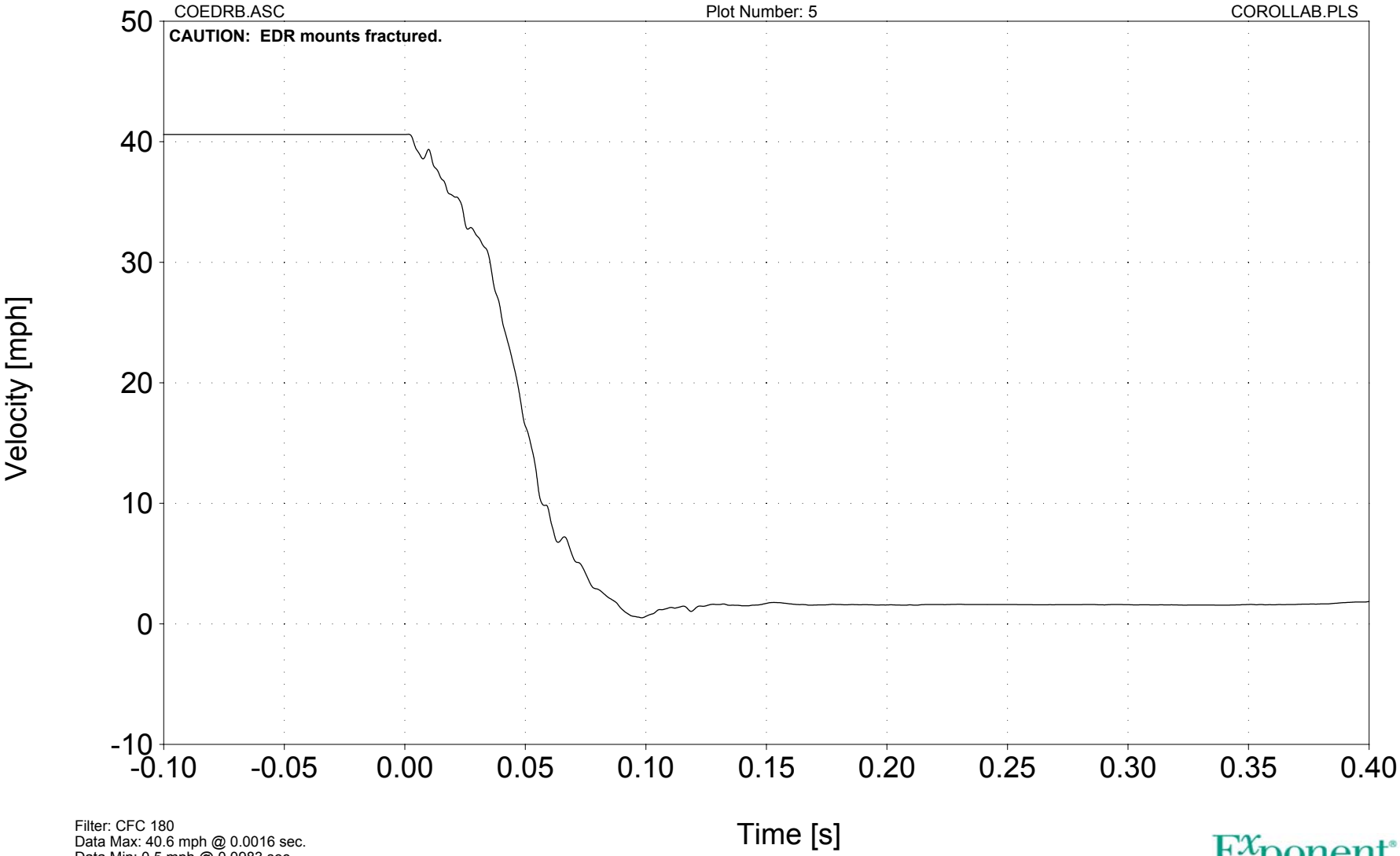
Longitudinal Velocity v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 40.6 mph @ 0.0016 sec.
Data Min: 0.5 mph @ 0.0983 sec.

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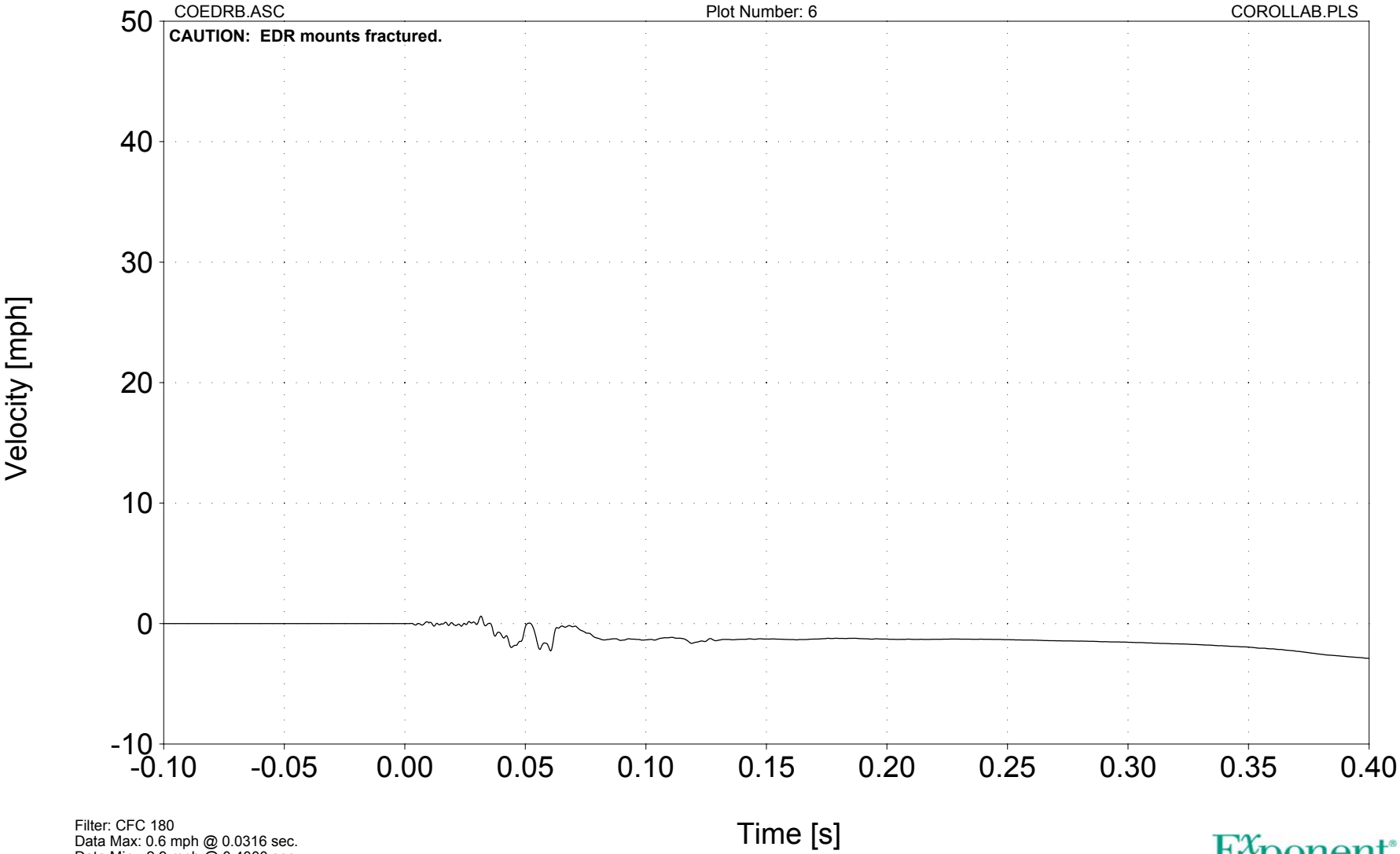
Lateral Velocity v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 0.6 mph @ 0.0316 sec.
Data Min: -2.9 mph @ 0.4000 sec.

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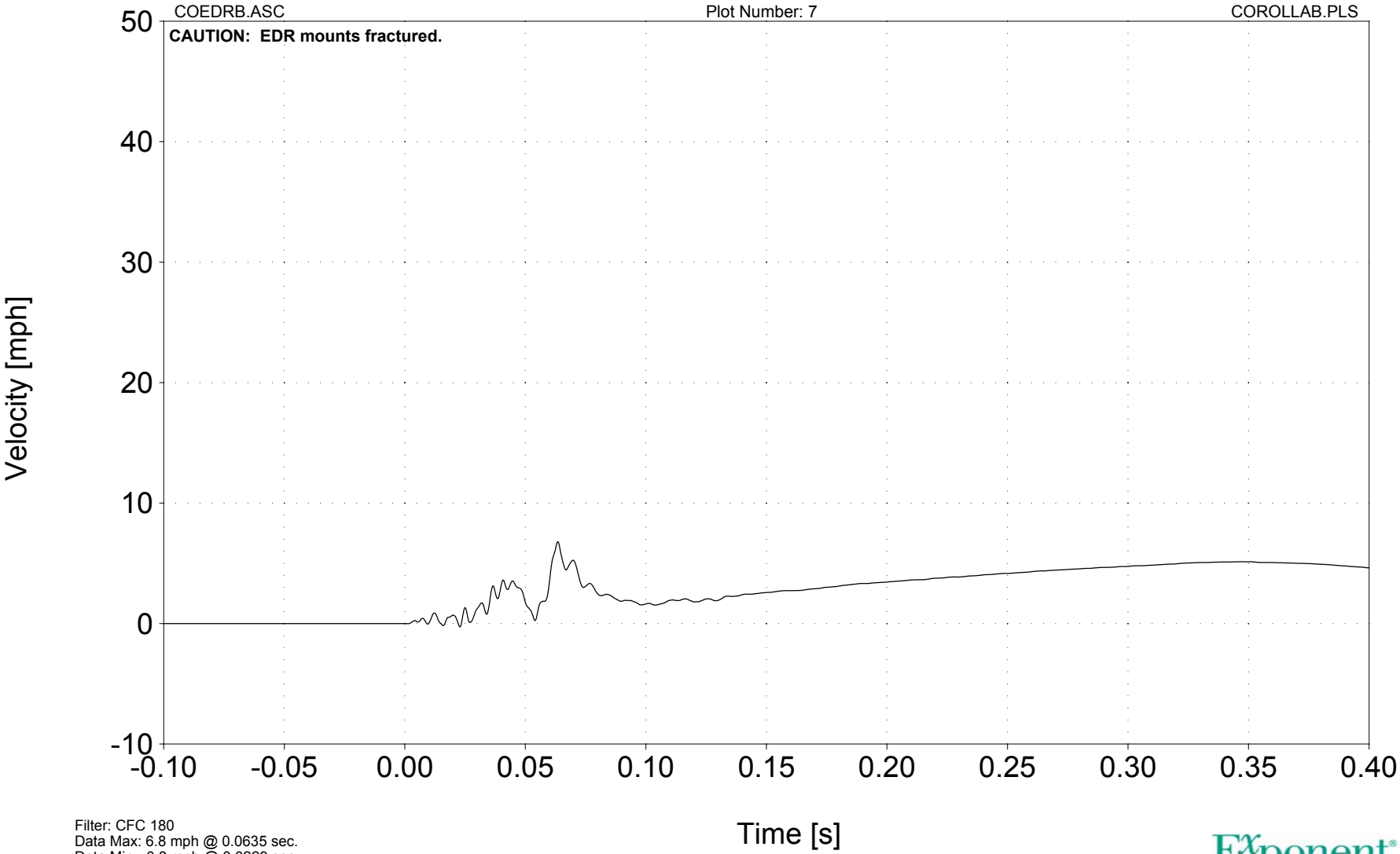
Vertical Velocity v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 6.8 mph @ 0.0635 sec.
Data Min: -0.3 mph @ 0.0229 sec.

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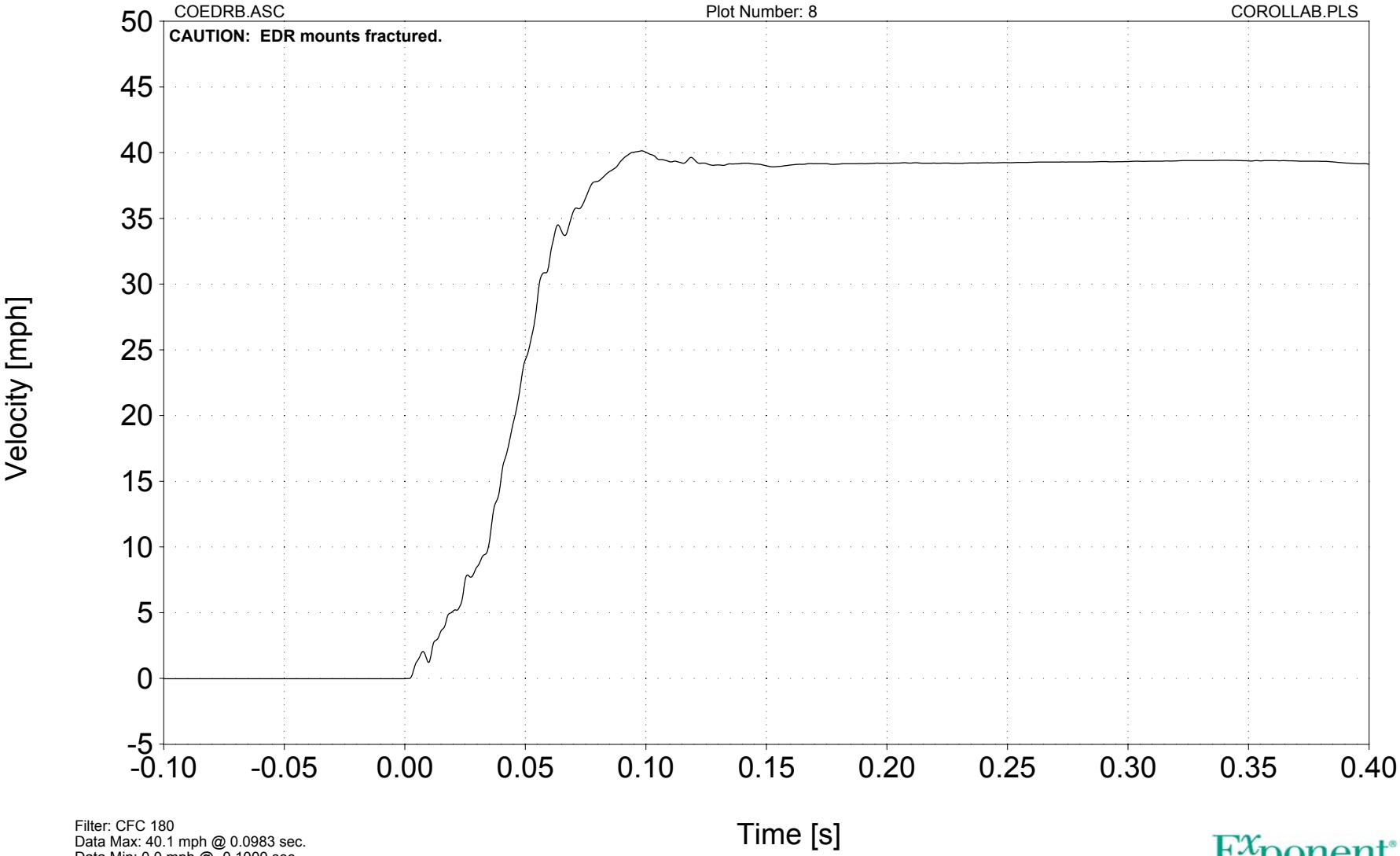
Delta Velocity v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 40.1 mph @ 0.0983 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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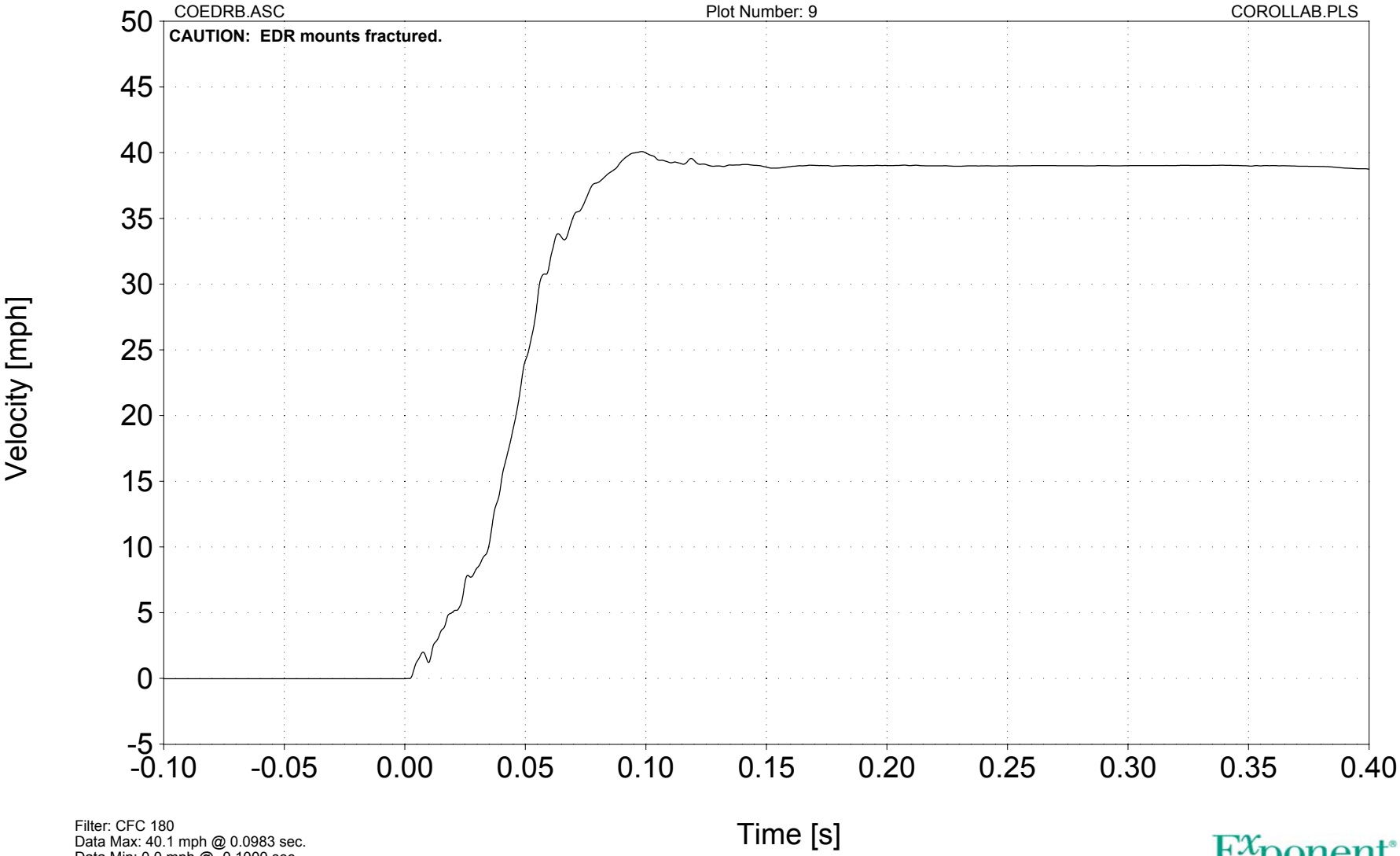
Longitudinal Delta Velocity v Time

EDR
2007 Toyota Corolla
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 40.1 mph @ 0.0983 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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Failure Analysis Associates

PHOTO DOCUMENTATION DATA SHEET

JOB NAME: TOYOTA BARRIER CRASH TESTING
JOB NUMBER: 0907698
DATE: 12/10/2010
LOCATION: TEC
PHOTOGRAPHER: DANIEL PETERSON
DIGITAL SEQUENCE: [A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT: 2007 TOYOTA COROLLA

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0907698 A0T0 - 06156PH_0123

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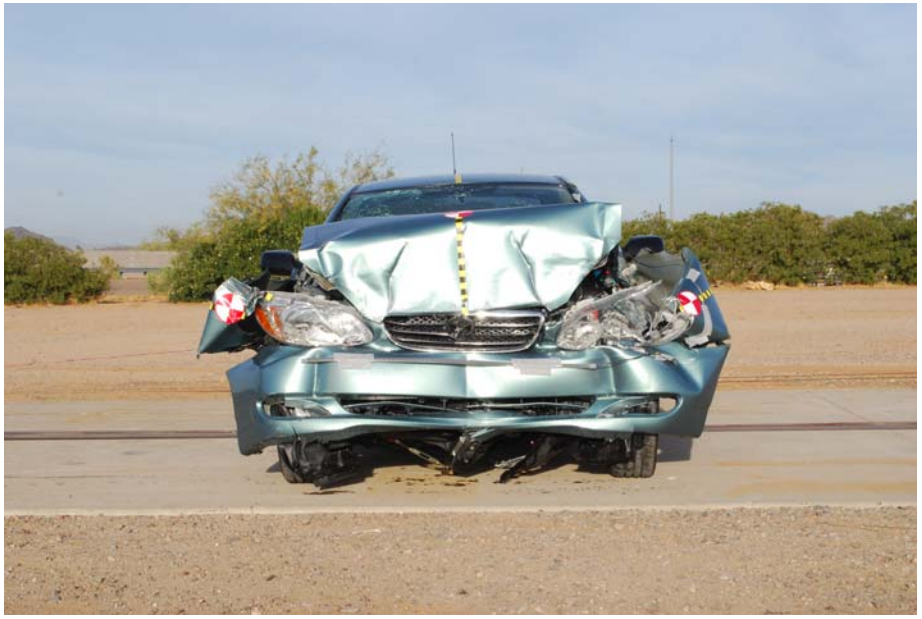

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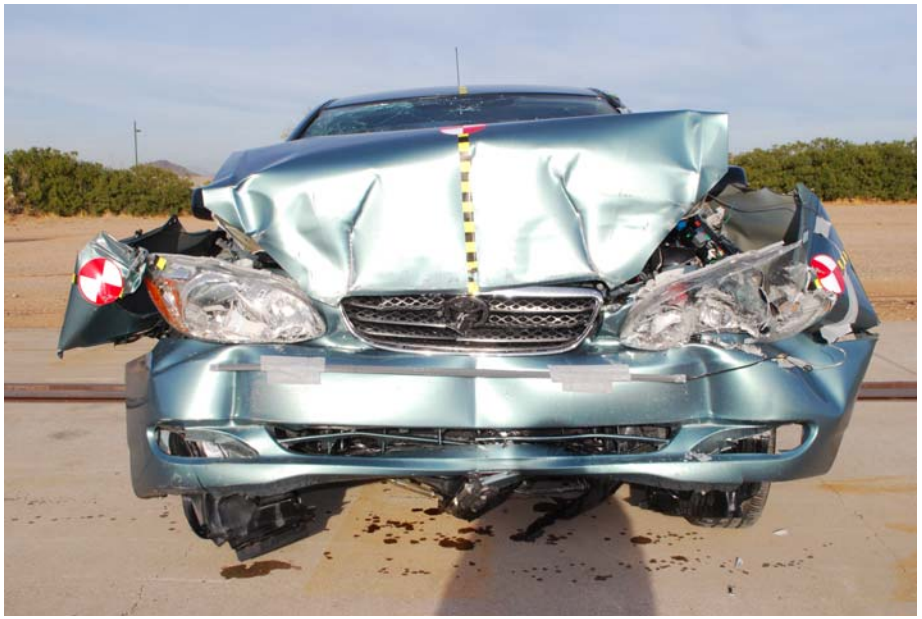

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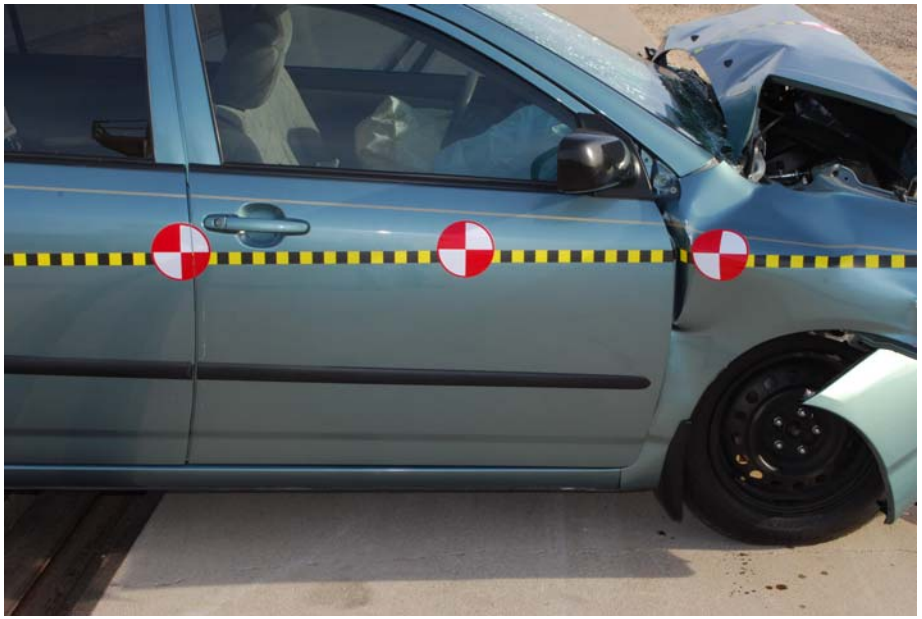

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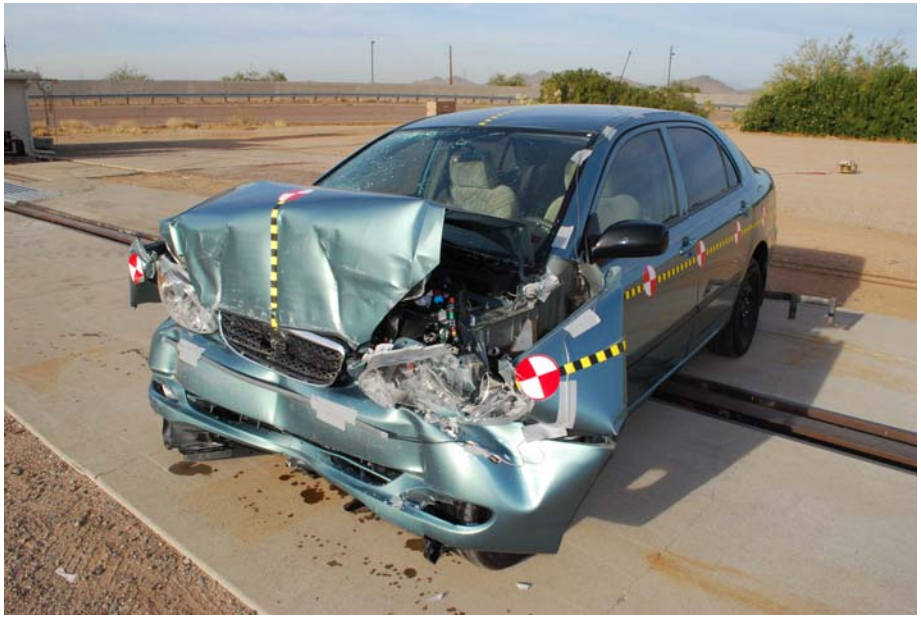

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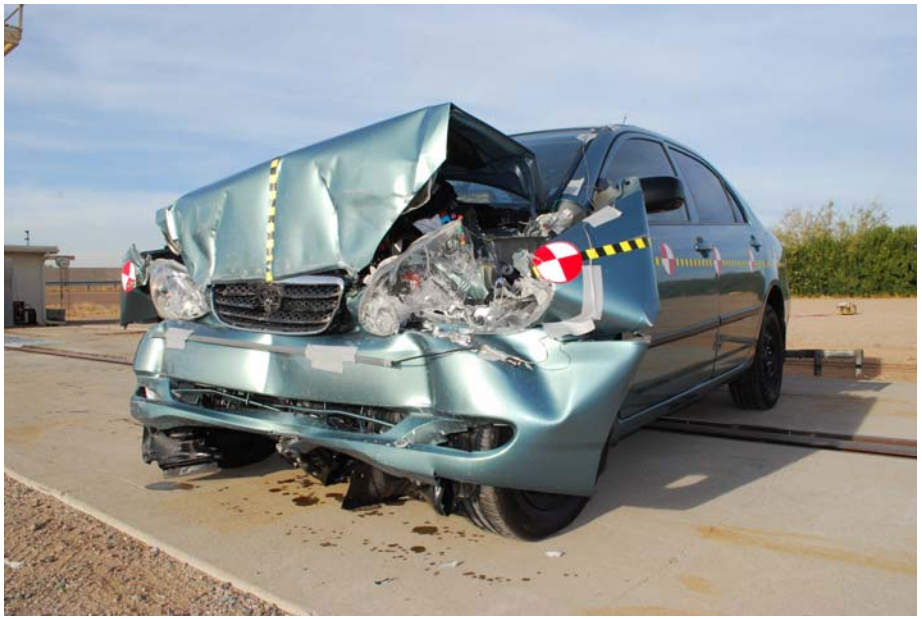

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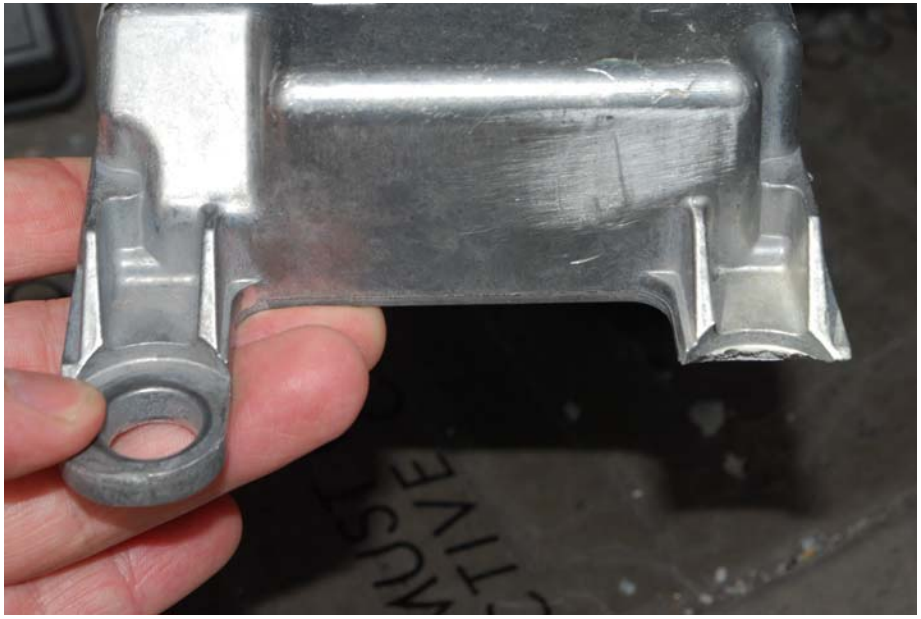

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0907698 A0T0 - 06156PH_0175

0907698 A0T0 - 06156PH_0176

0907698 A0T0 - 06156PH_0177

Appendix D

Barrier Crash Test, 2005 Toyota Camry, December 10, 2010

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2005 Toyota Camry

Toyota Consulting
0907698

December 10, 2010

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2005 Toyota Camry

Toyota Consulting
0907698

December 10, 2010

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

December 2010

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/1210/R561

Exponent®

Test Description

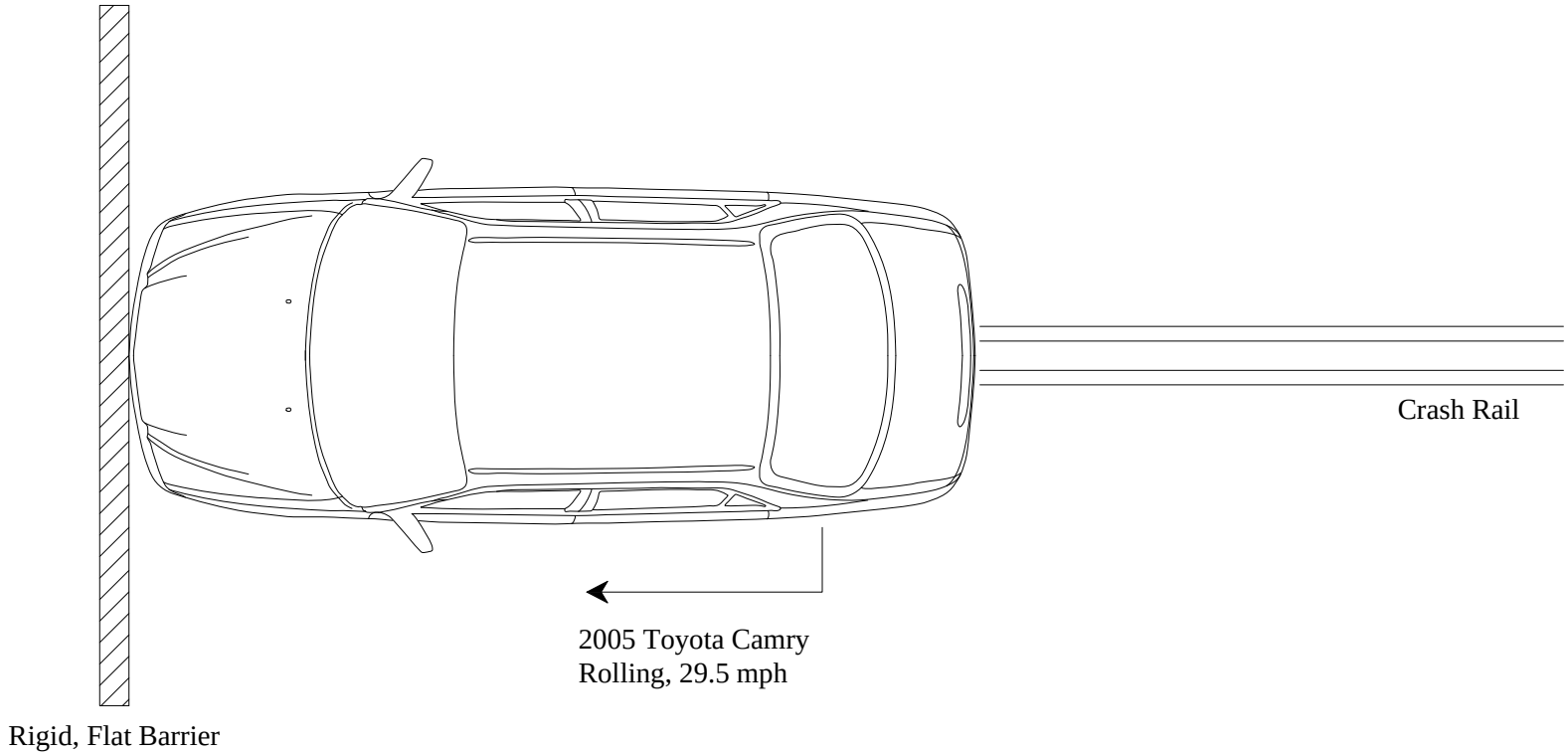
Exponent®
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	December 10, 2010
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2005 Toyota Camry
IMPACT SPEED:	29.5 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set on trunk floor
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. Two sandbags were added to the right front seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 29.5 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
December 10, 2010



Exponent®

2005 Toyota Camry

Exponent®
Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	6940			DATE RECEIVED:	12/9/2010
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2005	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	SILVER
VEHICLE IDENTIFICATION NUMBER:	4T1BE32KX5U557830			DATE OF MANUFACTURE:	02/05
GVWR (lb):	4200	FRONT GAWR (lb):	2668	REAR GAWR (lb):	2282
RECOMMENDED TIRE SIZE - F/R:	P205/65R15	RECOMMENDED TIRE PRESSURE - F/R (psi):	29		
INSTALLED TIRE SIZE:	LF: P205/65R15	RF: P205/65R15	LR: P205/65R15	RR: P205/65R15	
ENGINE TYPE:	4-CYLINDER	ENGINE DISPLACEMENT:	2.4 LITER	ODOMETER (mi):	20,937
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	CENTER, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT REAR QUARTER PANEL		
DESIGNATED SEATING - FRONT: 2	MID: 0	REAR: 3	TOTAL: 5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	Y
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	Y	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	N	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	N	ANTI-LOCK BRAKES F:	Y
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	N	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	Y
SUNROOF:	N	ROOF RACK:	N						
ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES:	NONE								
SIGNIFICANT BODY DAMAGE/CORROSION:	NONE								

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

LEFT FRONT:	962	RIGHT FRONT:	945	TOTAL FRONT:	1907	PERCENT FRONT:	59%
LEFT REAR:	664	RIGHT REAR:	653	TOTAL REAR:	1317	PERCENT REAR:	41%
				TOTAL WEIGHT:	3224		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

LEFT FRONT:	26.9	AT WHL WELL @ AXLE	RIGHT FRONT:	27.2	AT WHL WELL @ AXLE
LEFT REAR:	27.0	AT WHL WELL @ AXLE	RIGHT REAR:	27.2	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	189.3	OVERALL WIDTH:	71.0	OVERALL HEIGHT:	58.0
WHEELBASE:	107.0	FRONT TRACK:	61.2	REAR TRACK:	59.6
REAR OVERHANG:	45.3	FRONT BUMPER HEIGHT:	21.0	REAR BUMPER HEIGHT:	25.3
COMMENTS:	NR = NOT RECORDED				
EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	SL / KH	CHECKED BY:	DSP

0907698 A0T0 - 06155PH_0001

0907698 A0T0 - 06155PH_0002

0907698 A0T0 - 06155PH_0003

0907698 A0T0 - 06155PH_0004

0907698 A0T0 - 06155PH_0005

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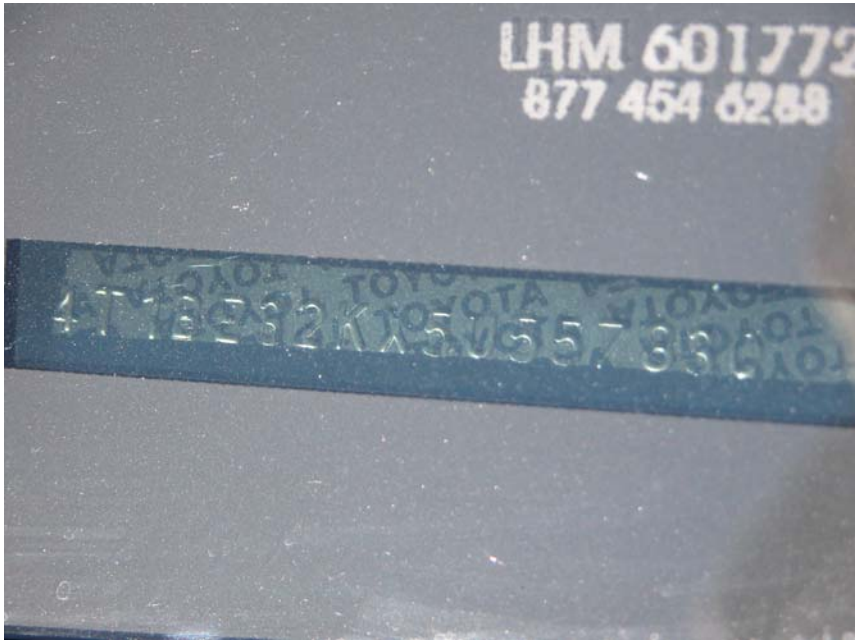

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0907698 A0T0 - 06155PH_0022

Exponent®

Test Setup

Exponent®
Failure Analysis Associates®

VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
VEHICLE YEAR:	2005	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	SILVER
VEHICLE IDENTIFICATION NUMBER:	4T1BE32KX5U557830			ODOMETER (mi):	20,938

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P205/65R15 | 29 PSI | 9/32"	P205/65R15 | 29 PSI | 9/32"
REAR:	P205/65R15 | 29 PSI | 8/32"	P205/65R15 | 29 PSI | 8/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	978	RIGHT FRONT:	988	TOTAL FRONT:	1966	PERCENT FRONT:	62%
LEFT REAR:	596	RIGHT REAR:	618	TOTAL REAR:	1214	PERCENT REAR:	38%
				TOTAL WEIGHT:	3180		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	26.8	AT	WHL WELL @ AXLE	RIGHT FRONT:	26.9	AT	WHL WELL @ AXLE
LEFT REAR:	27.7	AT	WHL WELL @ AXLE	RIGHT REAR:	27.6	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRAME RAILS, FORWARD OF FRONT AXLE		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	TRUNK		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	--	RIGHT FRONT:	NONE*
LEFT MID:	--	CENTER MID:	--	RIGHT MID:	--
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	FULL FORWARD	FULL FORWARD
OTHER:	SEATBELT BUCKLED, D-RING FULL DOWN	SEATBELT BUCKLED, D-RING FULL DOWN

COMMENTS

*TWO SANDBAGS (104 LBS TOTAL) PLACED IN RIGHT FRONT SEAT

	FORM COMPLETED BY:	DSP	CHECKED BY: MLM

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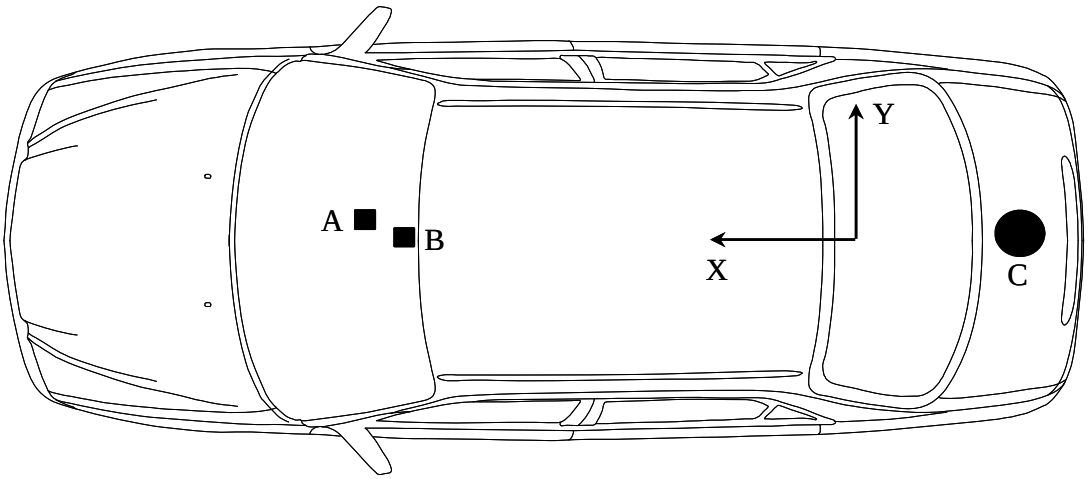
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
VEHICLE YEAR:	2005	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE IDENTIFICATION NUMBER:	4T1BE32KX5U557830				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	81.4 in.	1.5 in.	15.2 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	77.5 in.	0.0 in.	14.2 in.
C	TRIAXIAL ACCELEROMETER SET, BOTTOM OF TRUNK	-31.0 in.	1.0 in.	11.5 in.

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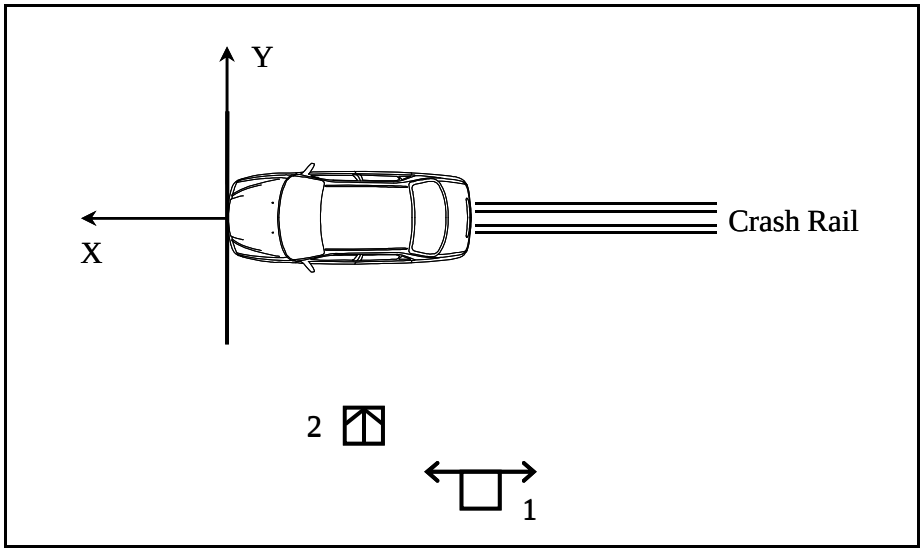
CAMERA SETUP RECORD

PROJECT NO:	0907698	TEST DATE:	12/10/2010
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2005 TOYOTA CAMRY		
TEST SPEED:	29.5 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-12.0	-37.0	4.0	RT	--

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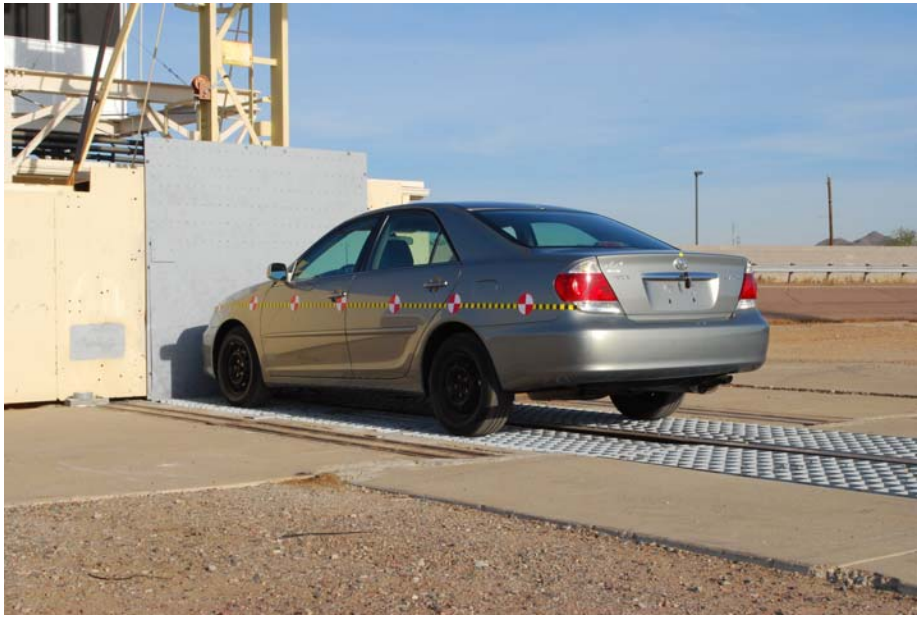
PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA BARRIER CRASH TESTING
JOB NUMBER:	0907698
DATE:	12/10/2010
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2005 TOYOTA CAMRY

0907698 A0T0 - 06155PH_0023

0907698 A0T0 - 06155PH_0024



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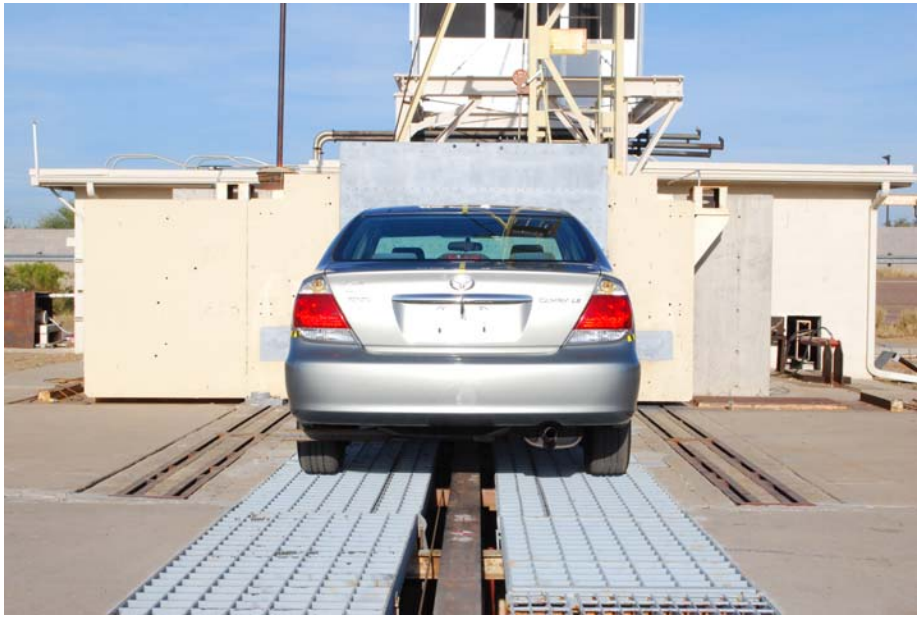

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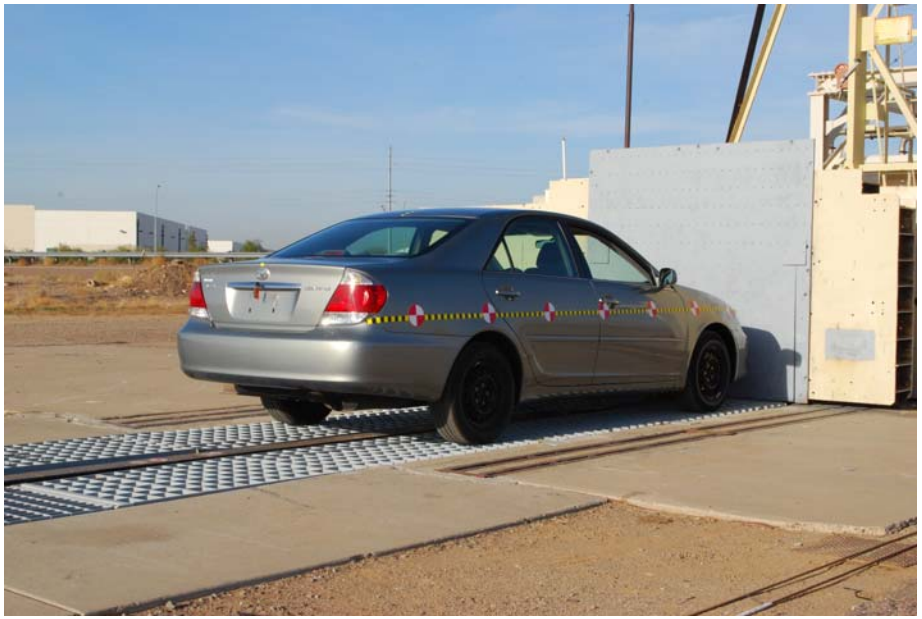

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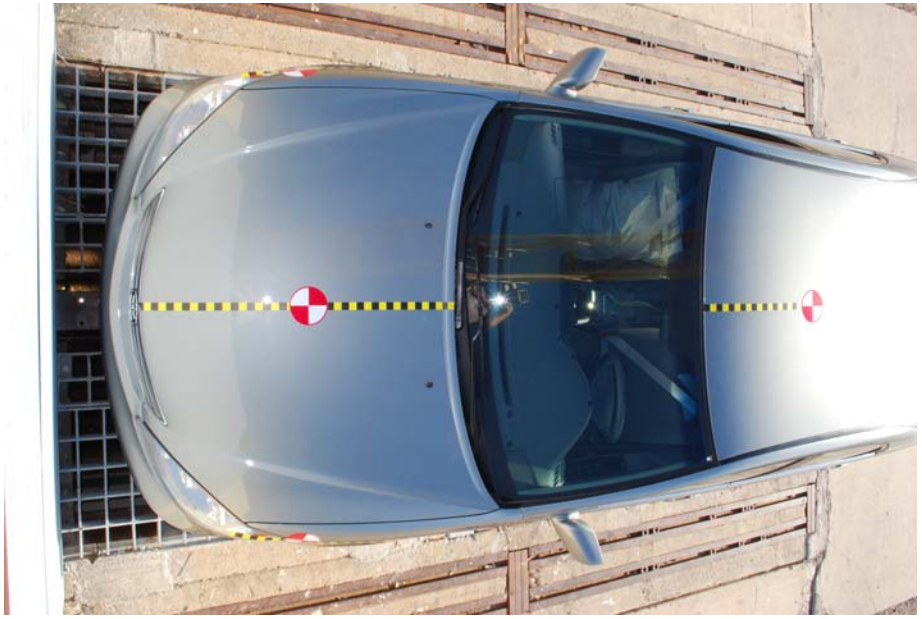
0907698 A0T0 - 06155PH_0028



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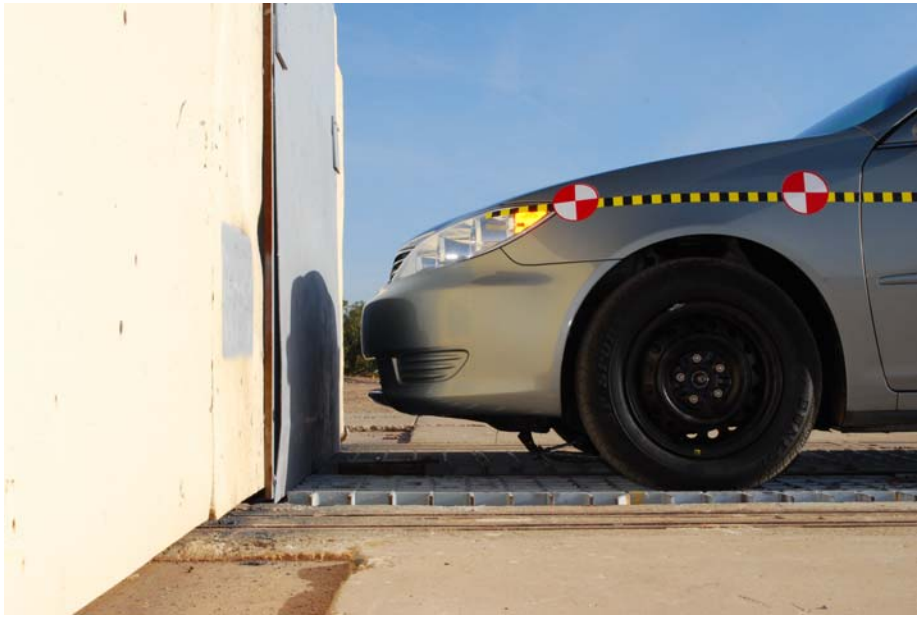

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0907698 A0T0 - 06155PH_0032

0907698 A0T0 - 06155PH_0033

0907698 A0T0 - 06155PH_0034

0907698 A0T0 - 06155PH_0035

0907698 A0T0 - 06155PH_0036

0907698 A0T0 - 06155PH_0037

0907698 A0T0 - 06155PH_0038

0907698 A0T0 - 06155PH_0039

0907698 A0T0 - 06155PH_0040

0907698 A0T0 - 06155PH_0041

0907698 A0T0 - 06155PH_0042

0907698 A0T0 - 06155PH_0043

0907698 A0T0 - 06155PH_0044

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0907698 A0T0 - 06155PH_0048

0907698 A0T0 - 06155PH_0049

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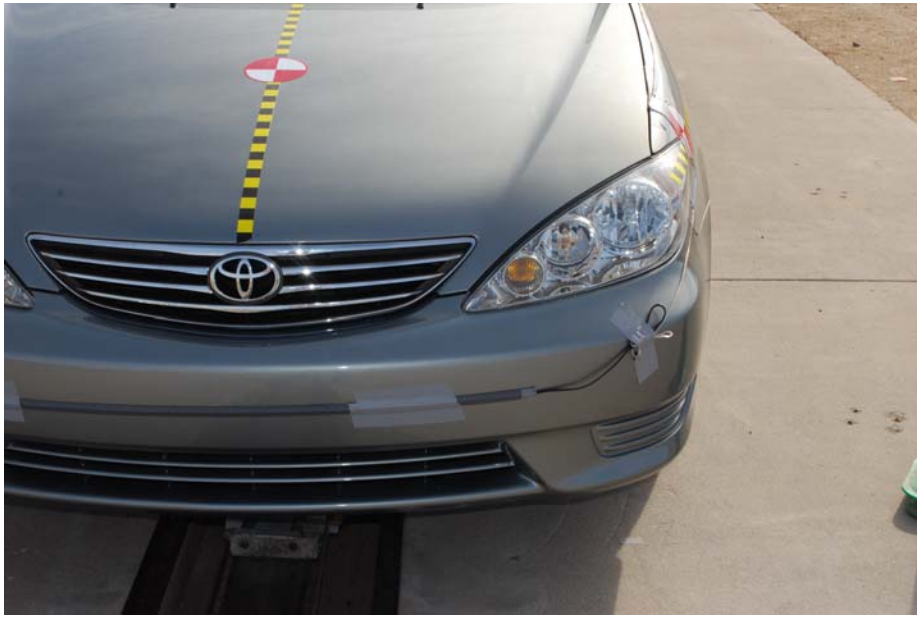
0907698 A0T0 - 06155PH_0061



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0907698 A0T0 - 06155PH_0068

0907698 A0T0 - 06155PH_0069

0907698 A0T0 - 06155PH_0070

0907698 A0T0 - 06155PH_0071

0907698 A0T0 - 06155PH_0072

0907698 A0T0 - 06155PH_0073

0907698 A0T0 - 06155PH_0074

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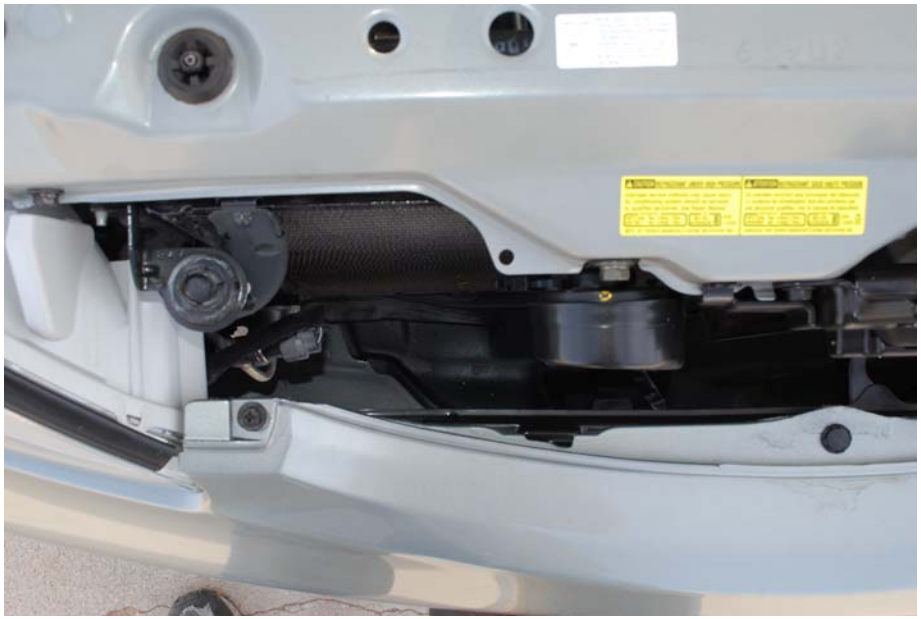

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0907698 A0T0 - 06155PH_0090

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0907698 A0T0 - 06155PH_0092

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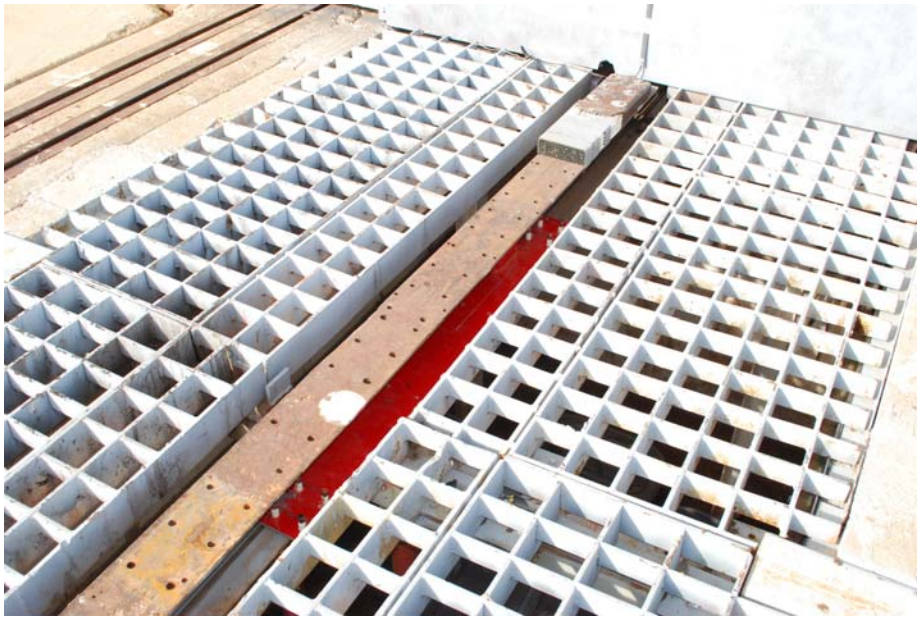

0907698 A0T0 - 06155PH_0112

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Test Results

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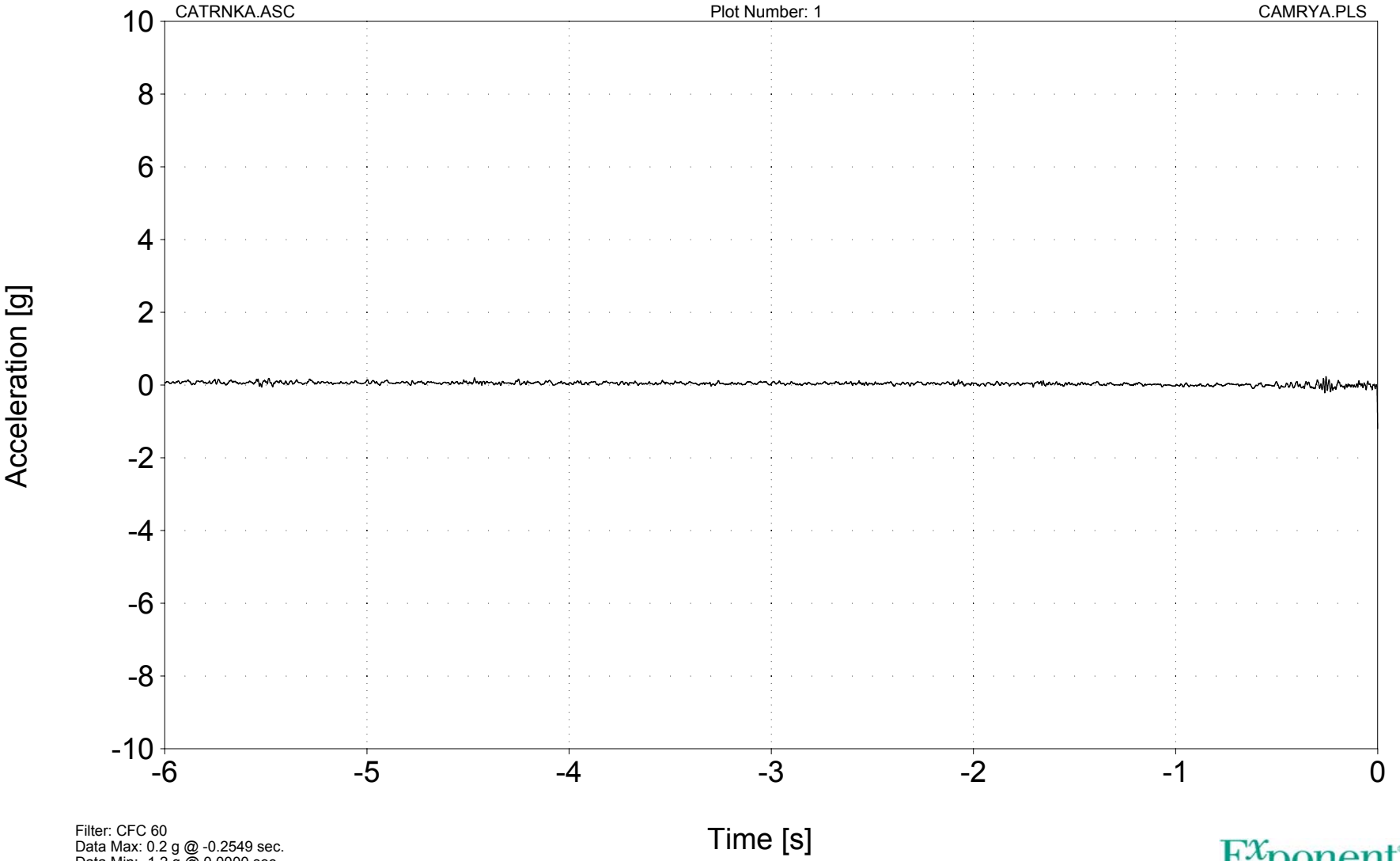
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/10/2010
OPERATOR:	DSP	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	NONE				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
121010-CAMRY	Channel 1	--	29.5	43.3	JS
	Channel 2	--	29.5	43.3	
	Average	--	29.5	43.3	

Longitudinal Acceleration v Time

Trunk
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.2 g @ -0.2549 sec.
Data Min: -1.2 g @ 0.0000 sec.

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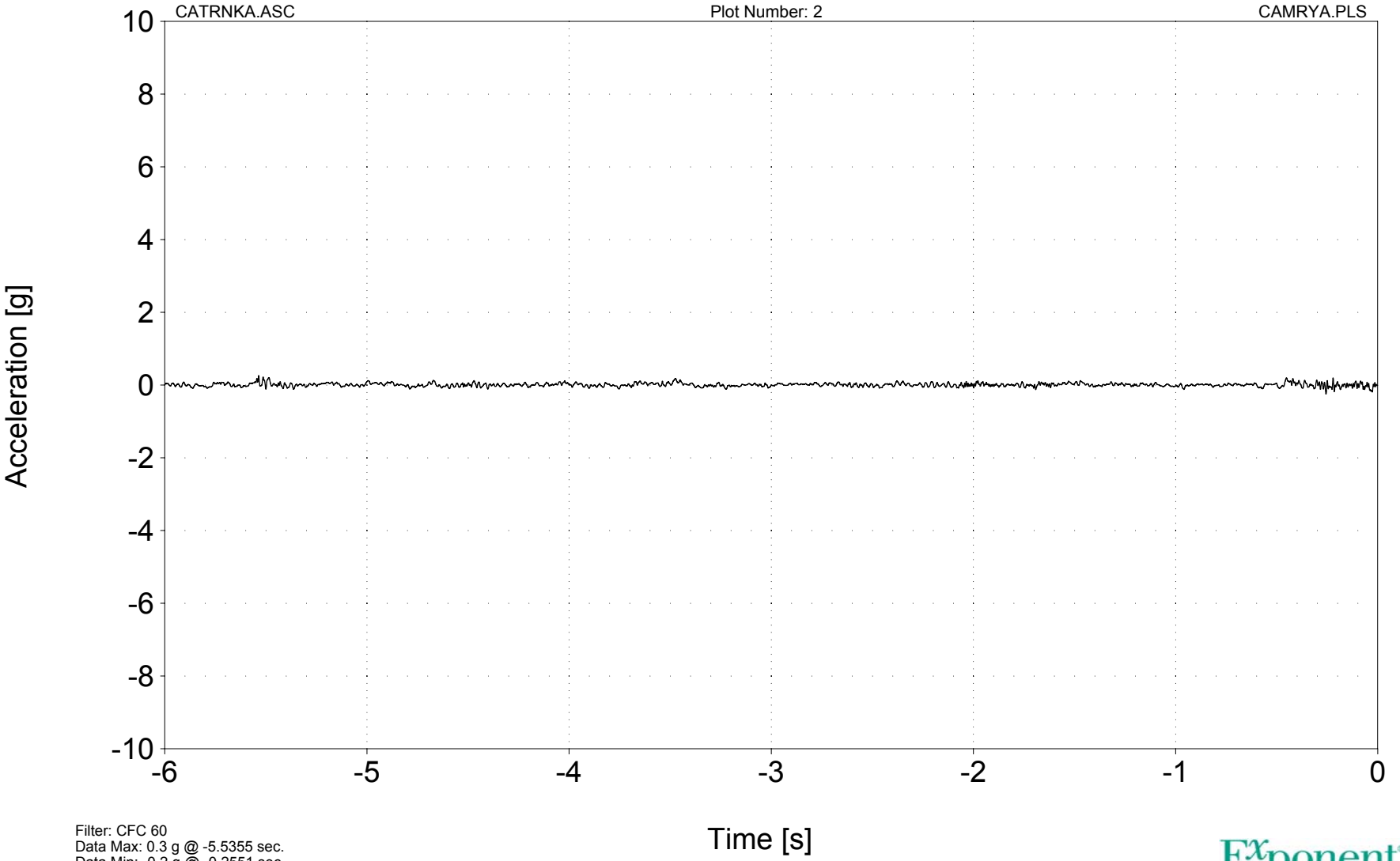
Lateral Acceleration v Time

Trunk
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.3 g @ -5.5355 sec.
Data Min: -0.2 g @ -0.2551 sec.

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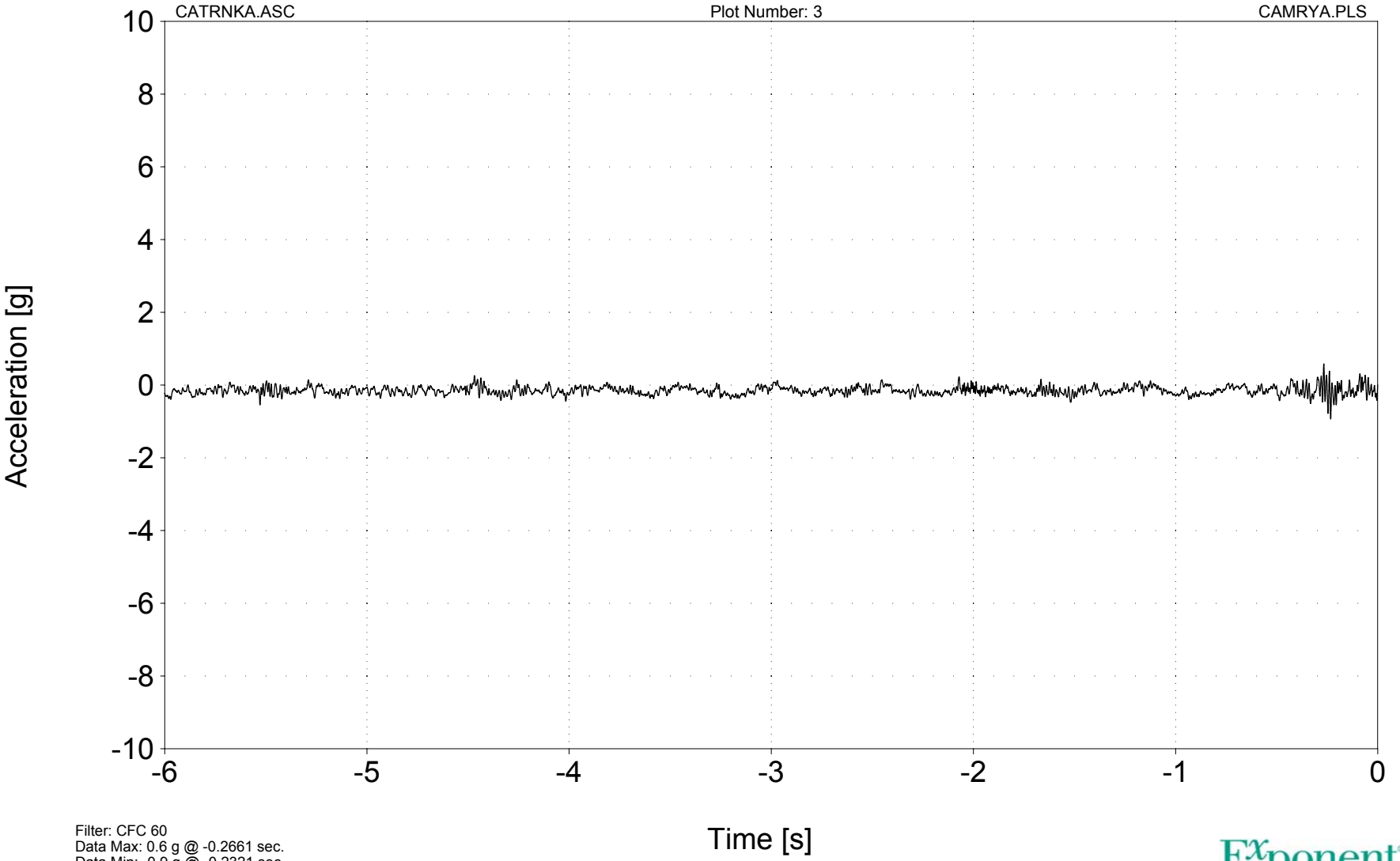
Vertical Acceleration v Time

Trunk
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 0.6 g @ -0.2661 sec.
Data Min: -0.9 g @ -0.2321 sec.

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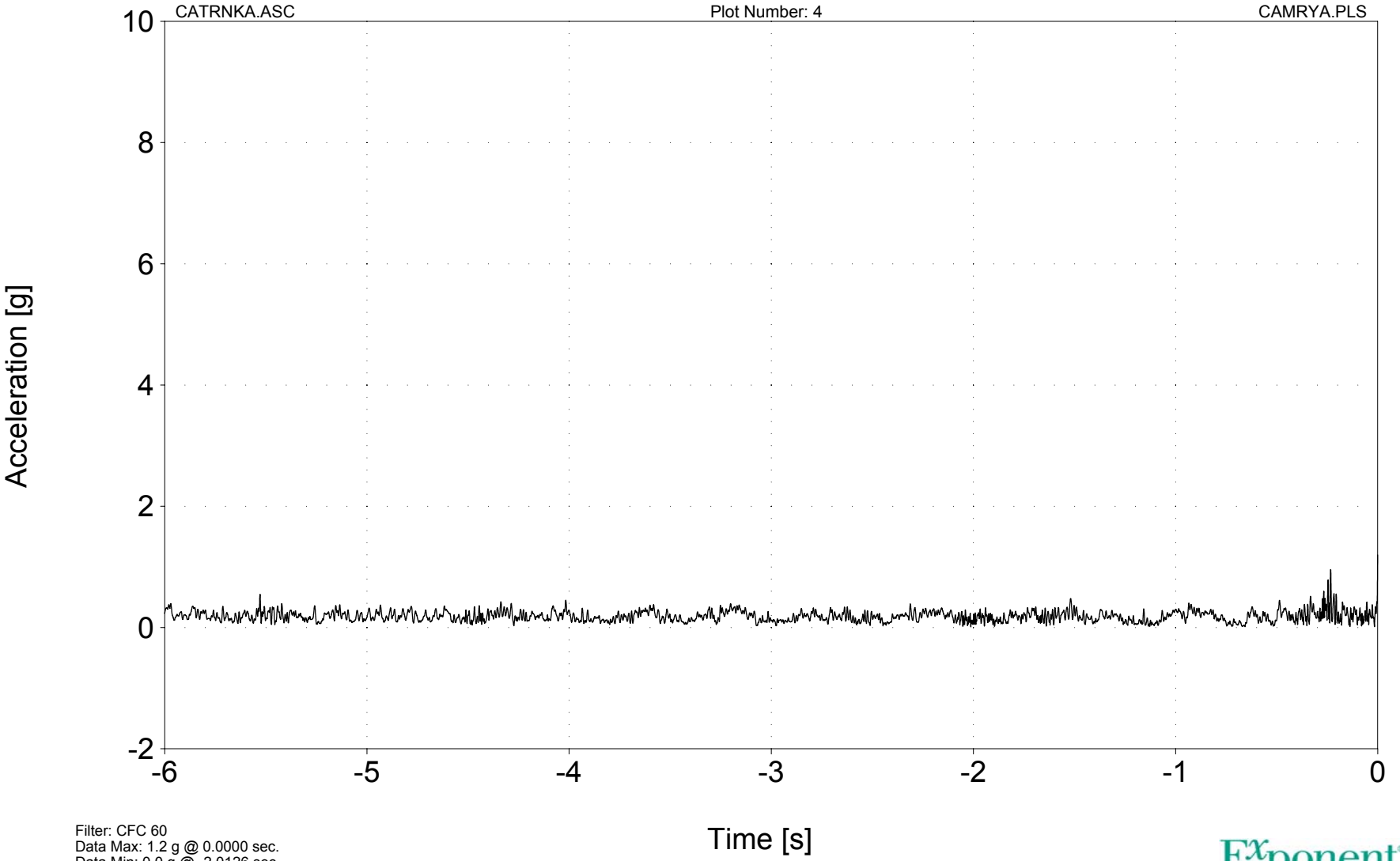
Resultant Acceleration v Time

Trunk
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 1.2 g @ 0.0000 sec.
Data Min: 0.0 g @ -2.0126 sec.

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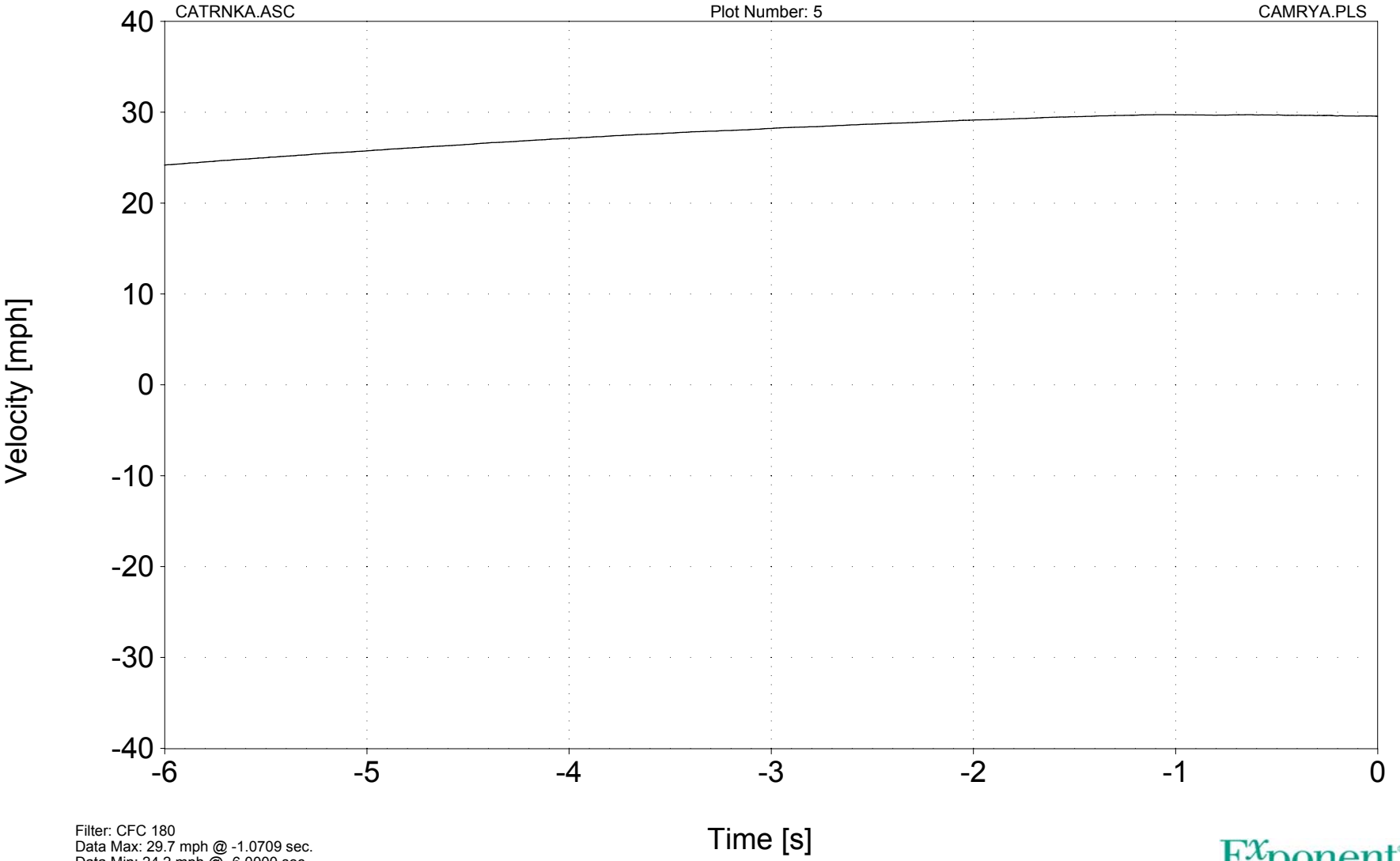
Failure Analysis Associates®

Longitudinal Velocity v Time

Trunk
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 29.7 mph @ -1.0709 sec.
Data Min: 24.2 mph @ -6.0000 sec.

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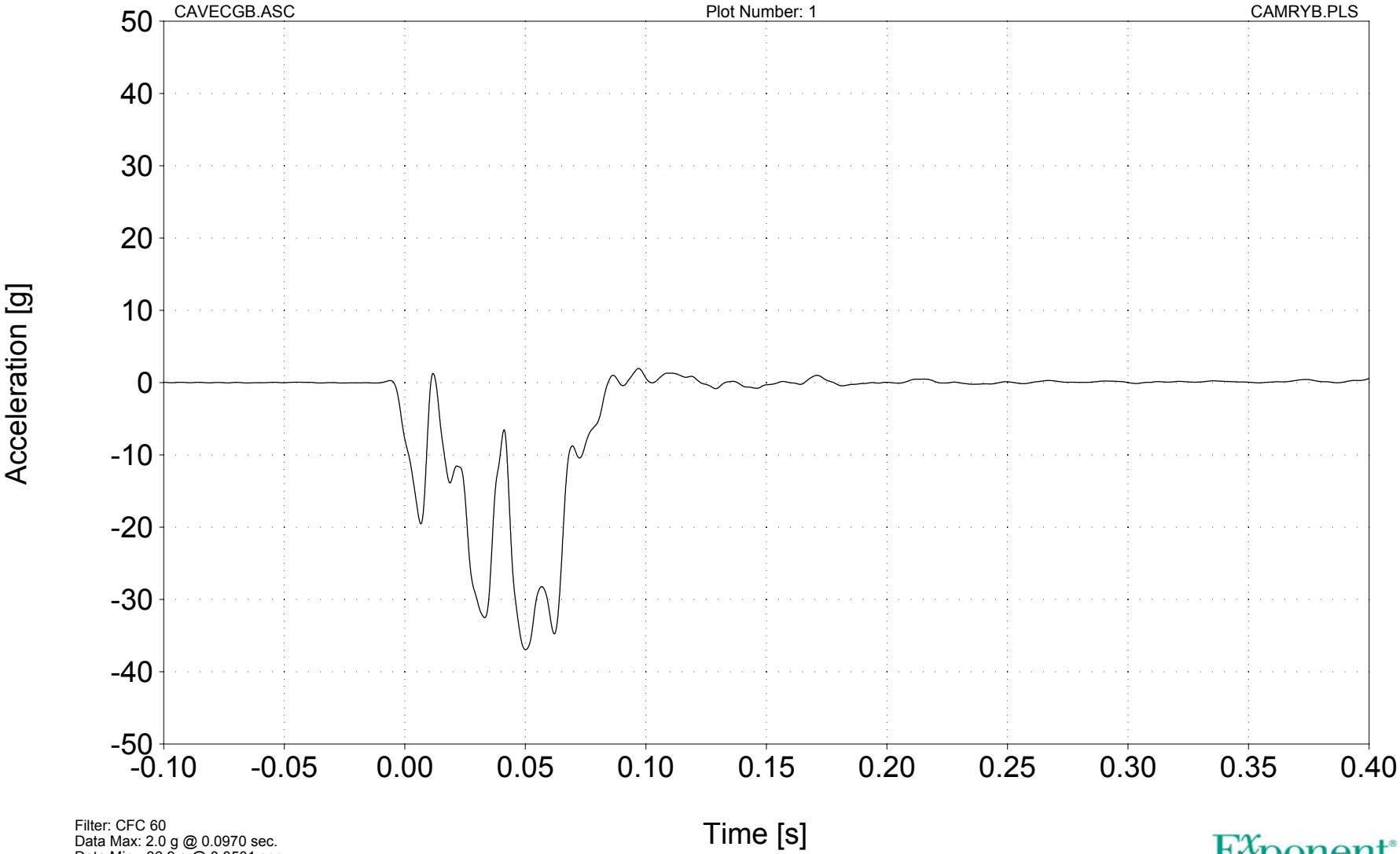
Longitudinal Acceleration v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 2.0 g @ 0.0970 sec.
Data Min: -36.9 g @ 0.0501 sec.

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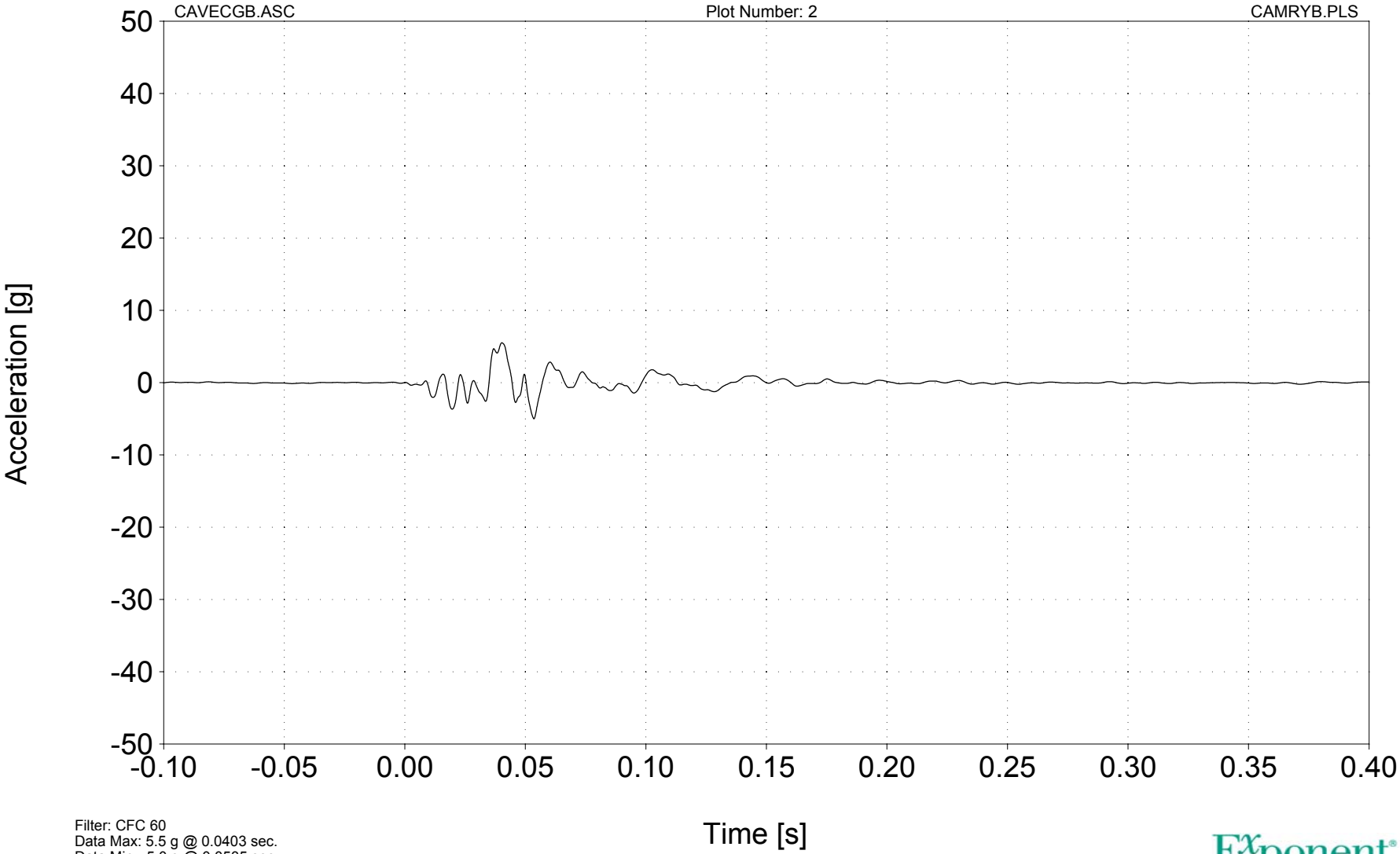
Lateral Acceleration v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 5.5 g @ 0.0403 sec.
Data Min: -5.0 g @ 0.0535 sec.

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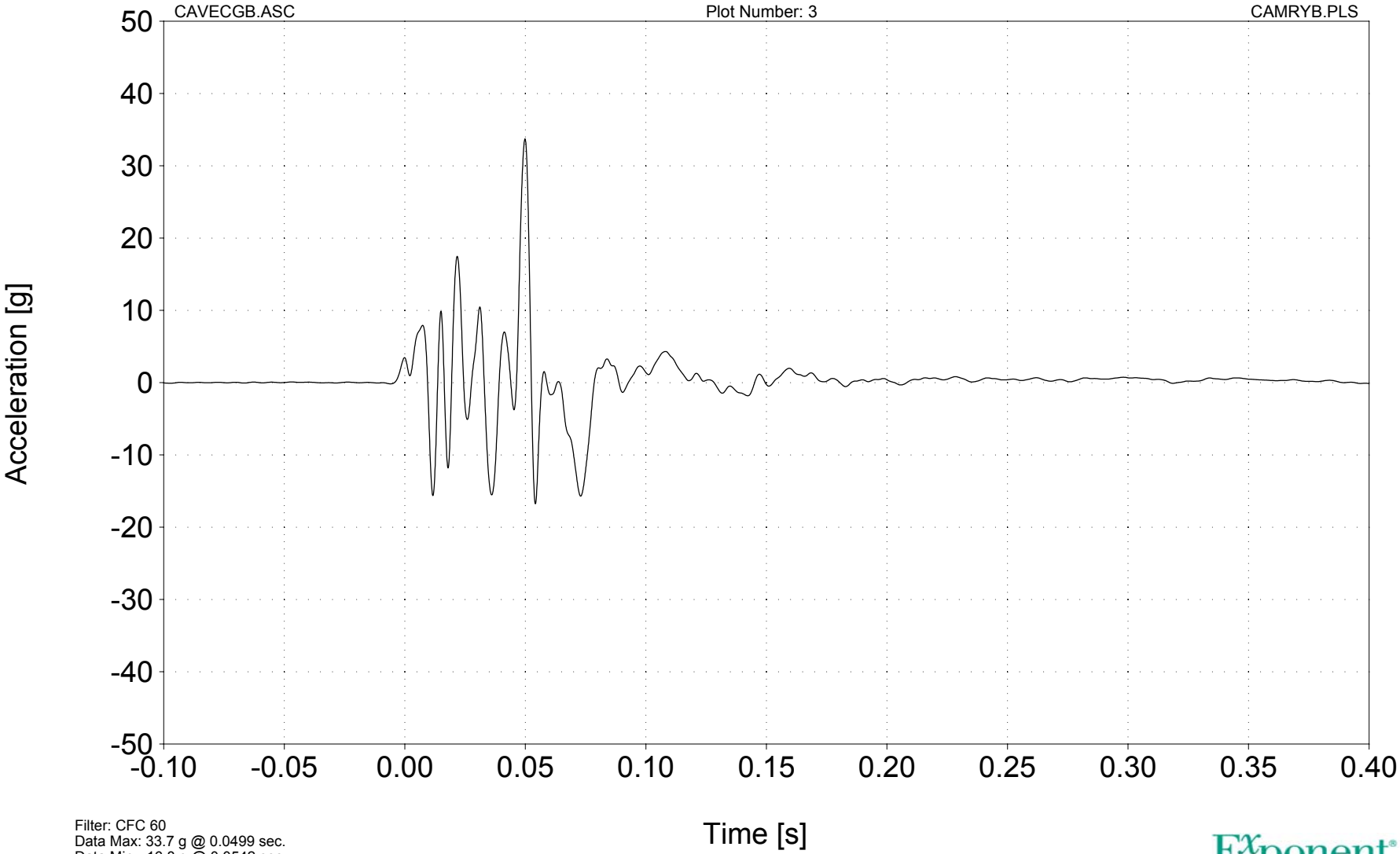
Vertical Acceleration v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 33.7 g @ 0.0499 sec.
Data Min: -16.8 g @ 0.0542 sec.

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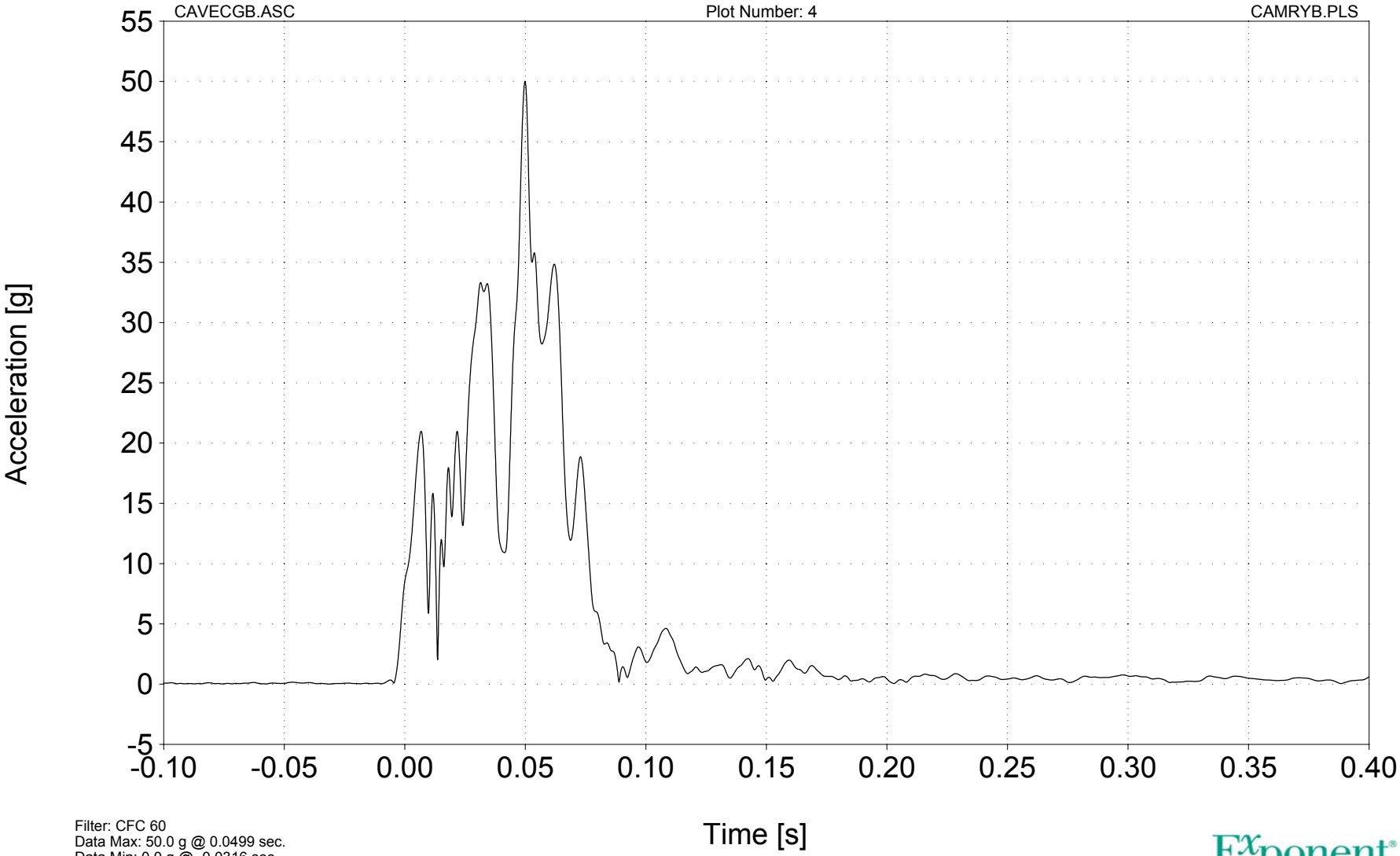
Resultant Acceleration v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 50.0 g @ 0.0499 sec.
Data Min: 0.0 g @ -0.0316 sec.

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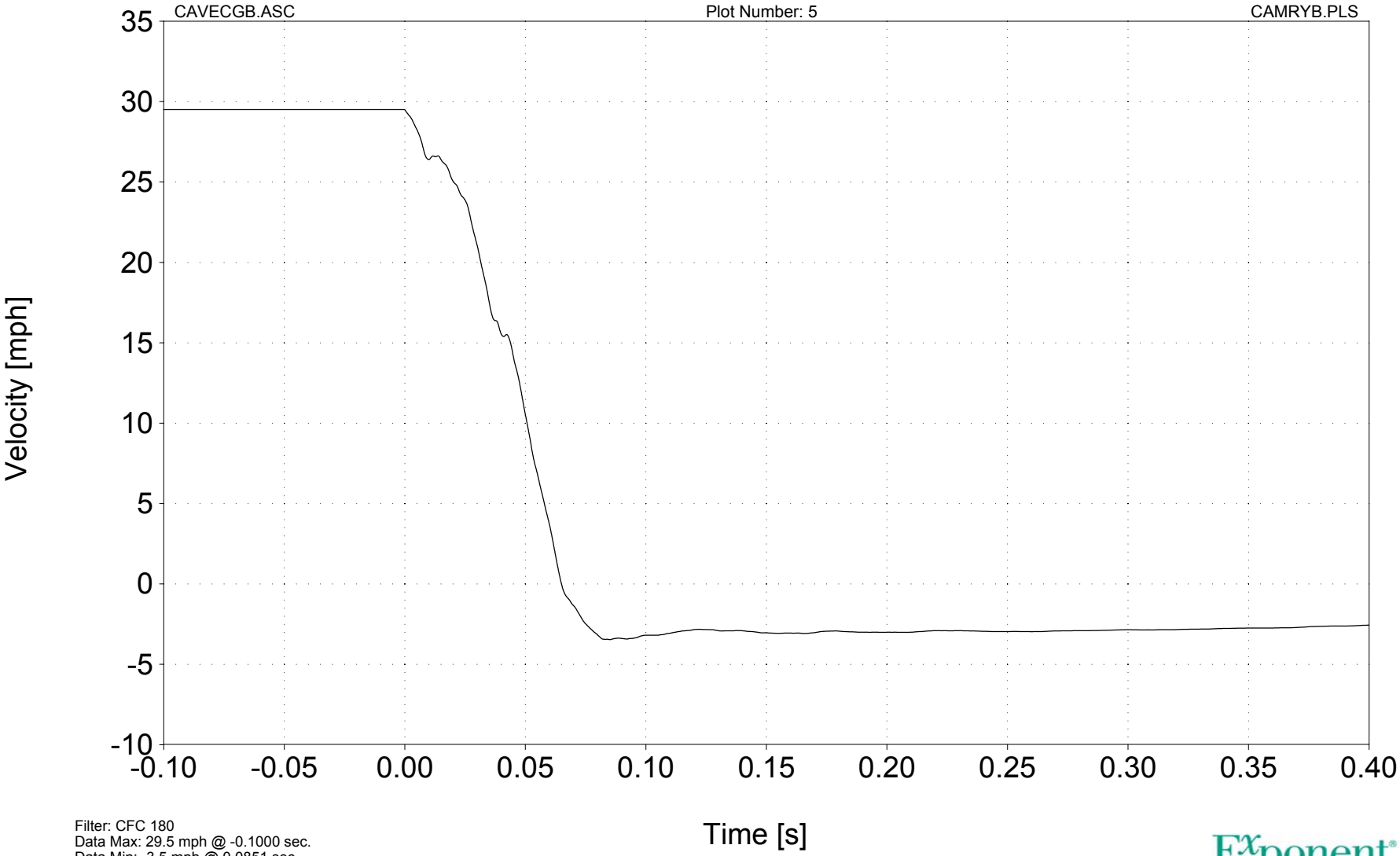
Longitudinal Velocity v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 29.5 mph @ -0.1000 sec.
Data Min: -3.5 mph @ 0.0851 sec.

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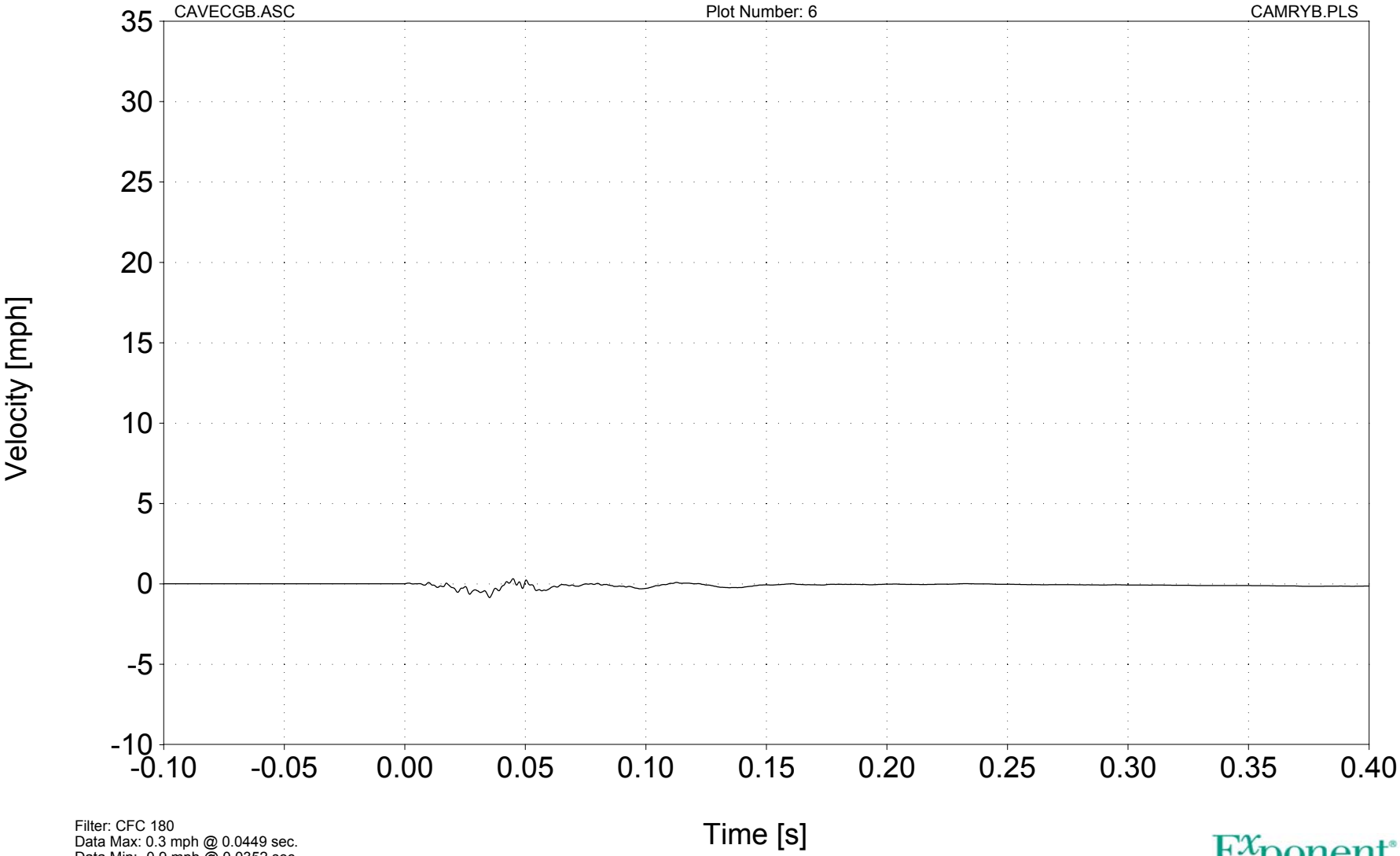
Lateral Velocity v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 0.3 mph @ 0.0449 sec.
Data Min: -0.9 mph @ 0.0352 sec.

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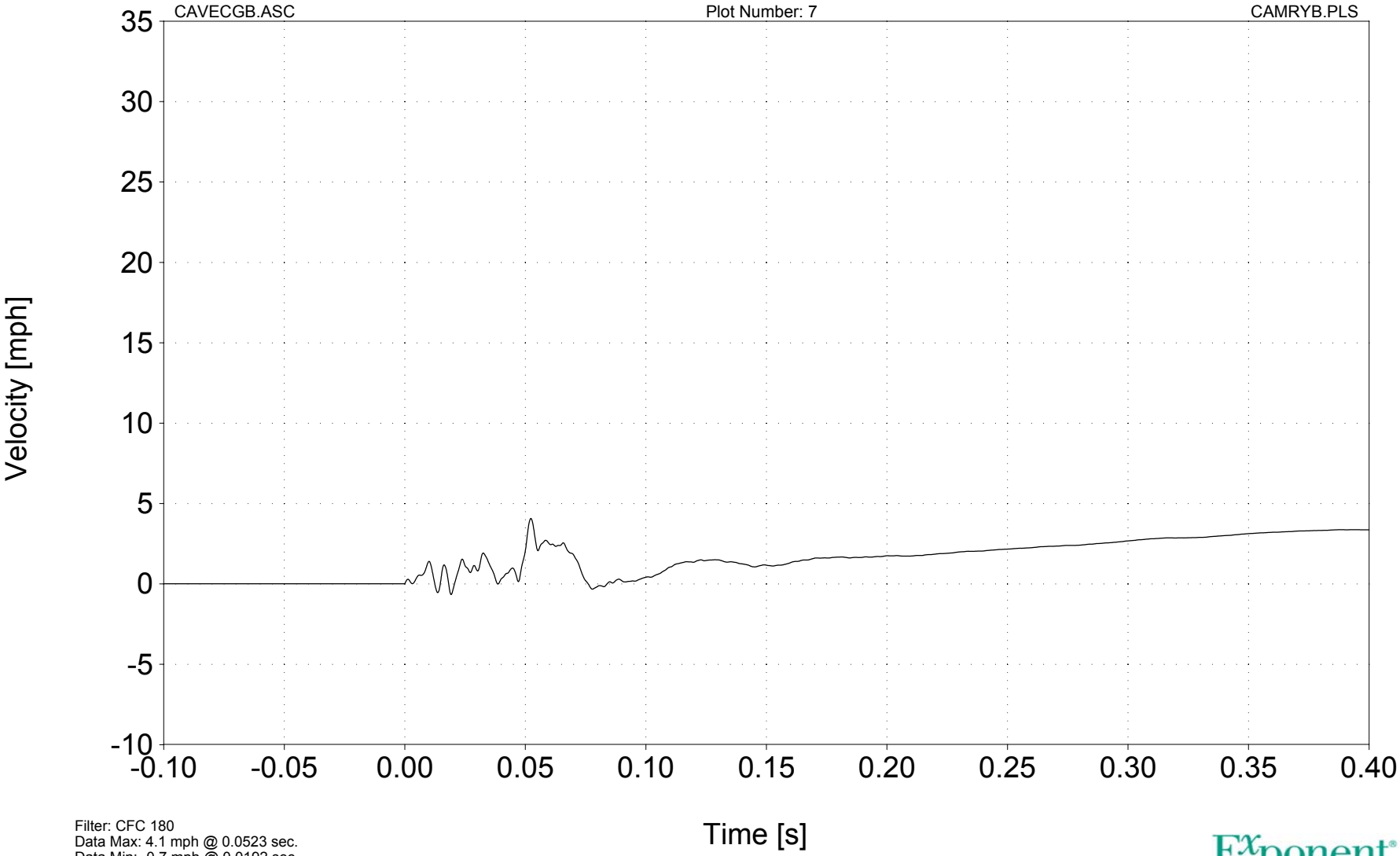
Vertical Velocity v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 4.1 mph @ 0.0523 sec.
Data Min: -0.7 mph @ 0.0192 sec.

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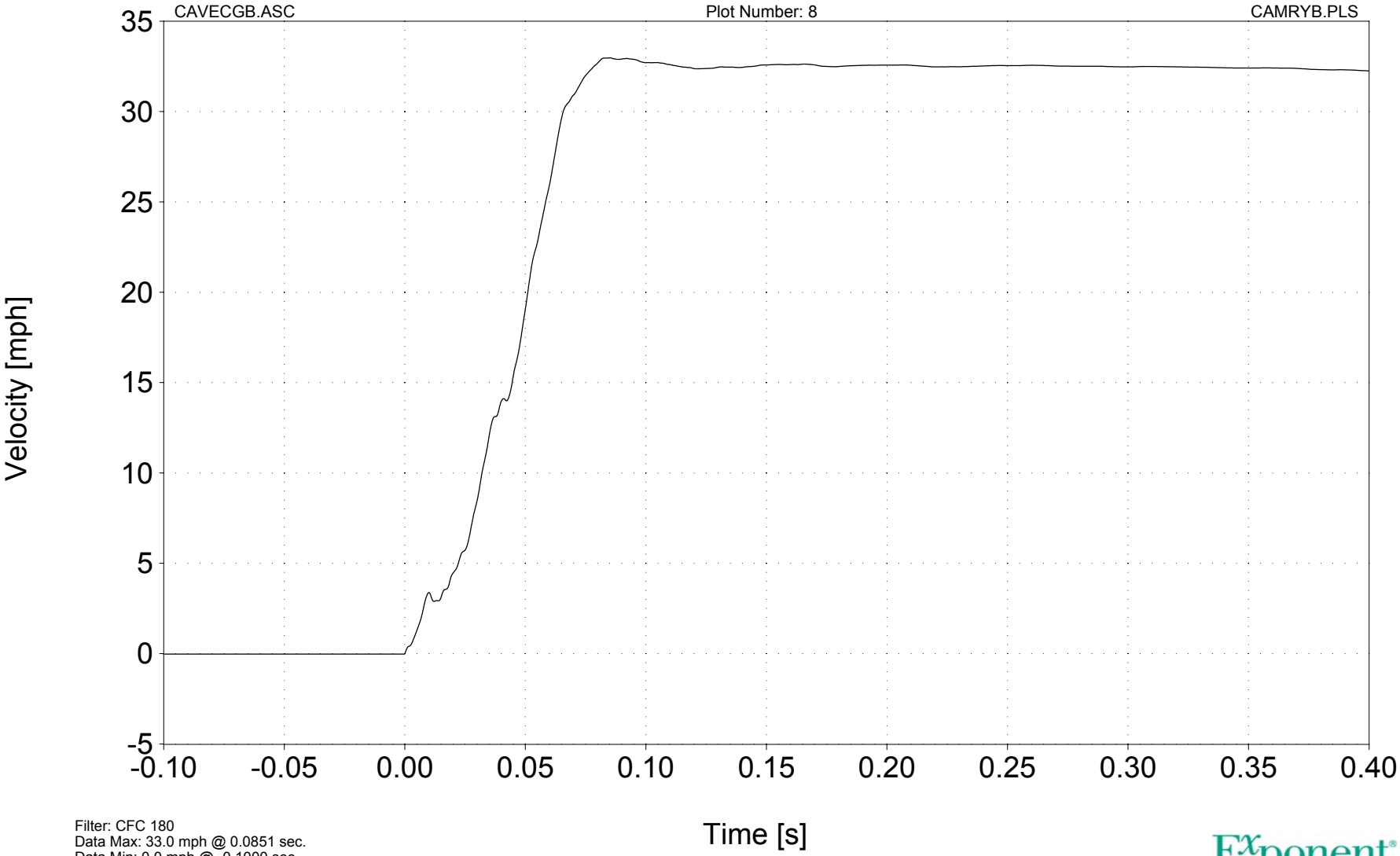
Failure Analysis Associates®

Delta Velocity v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 33.0 mph @ 0.0851 sec.
Data Min: 0.0 mph @ -0.1000 sec.

Toyota Consulting
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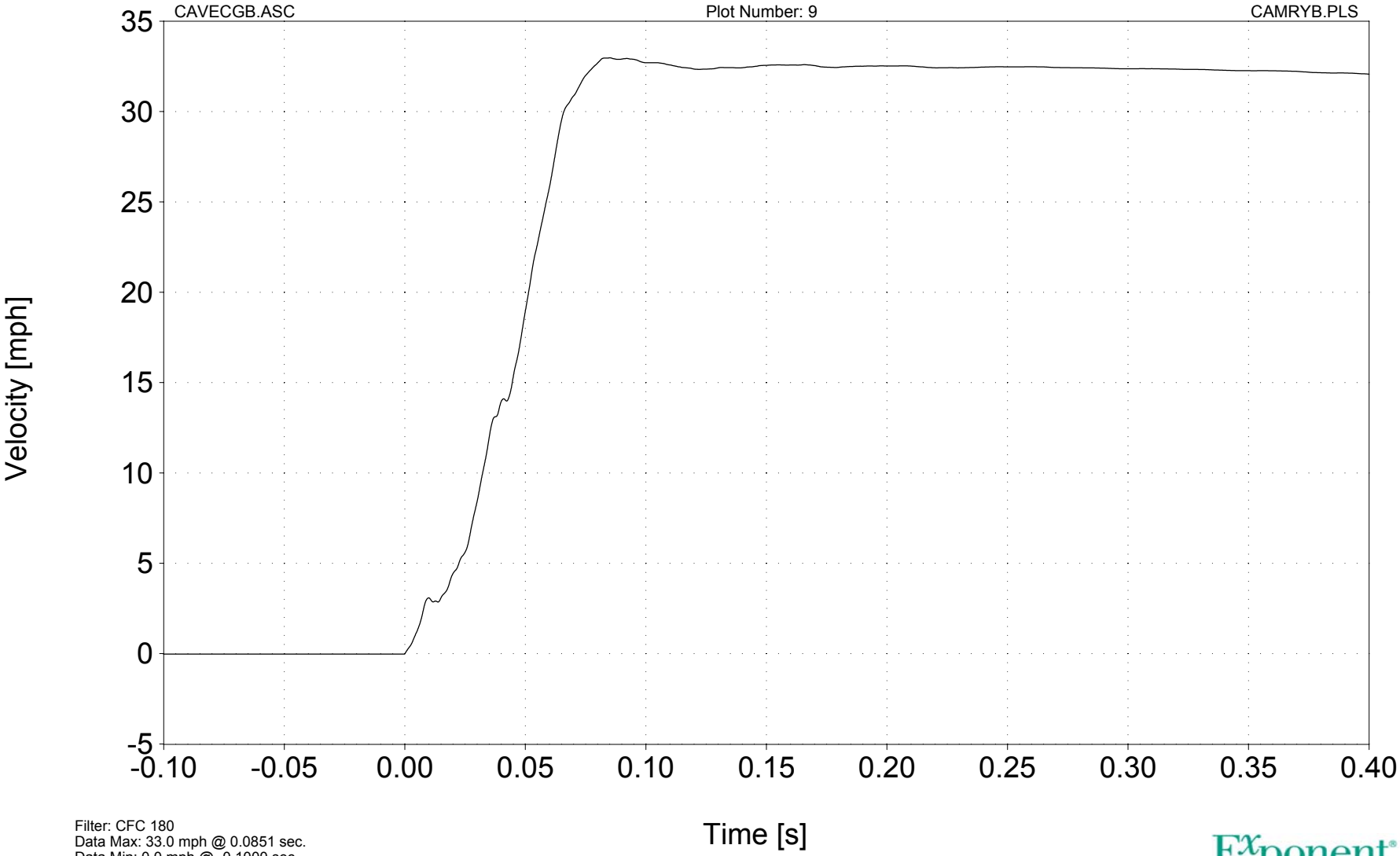
Exponent®
Failure Analysis Associates®

Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 33.0 mph @ 0.0851 sec.
Data Min: 0.0 mph @ -0.1000 sec.

Toyota Consulting
0907698

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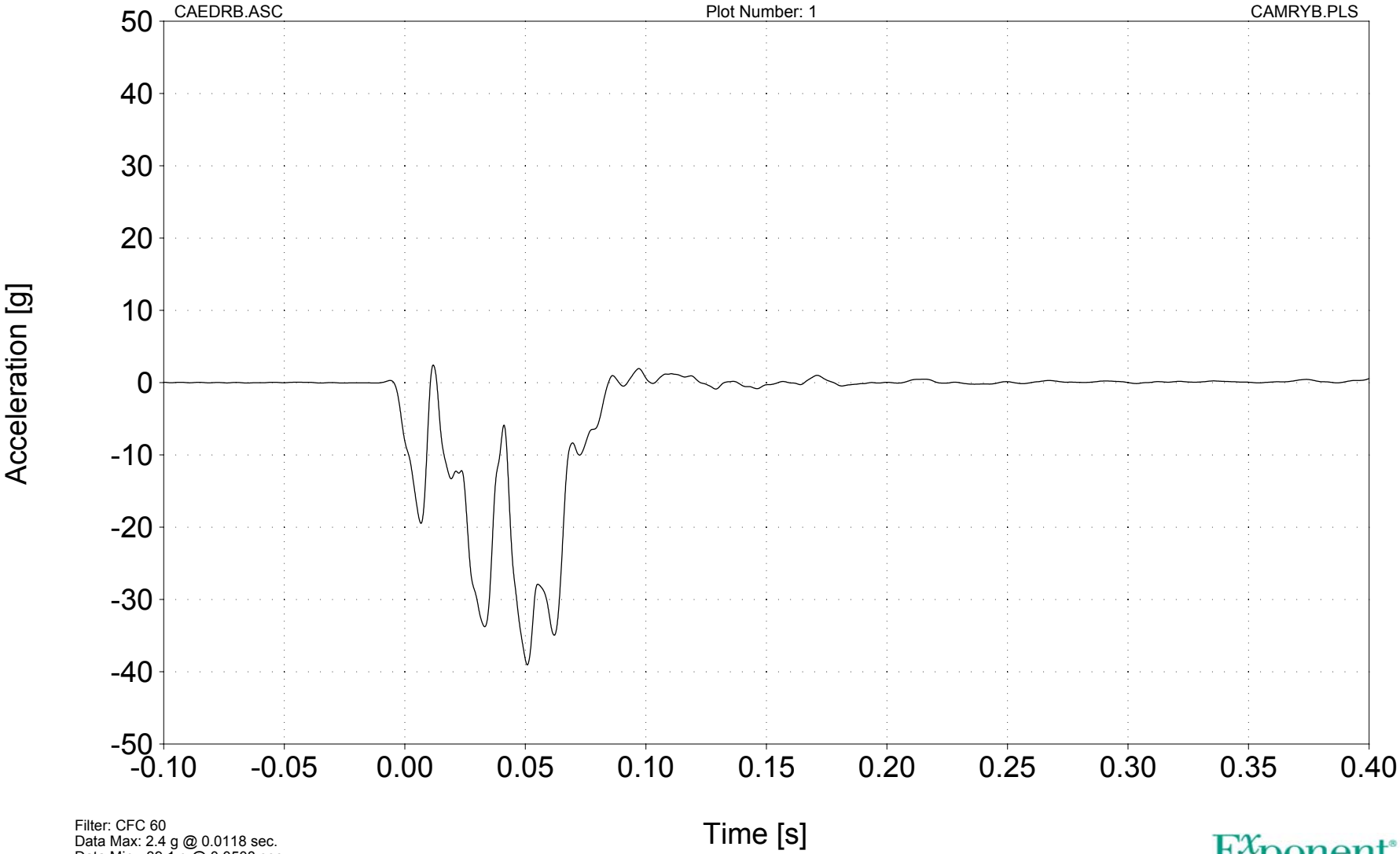
Failure Analysis Associates®

Longitudinal Acceleration v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 2.4 g @ 0.0118 sec.
Data Min: -39.1 g @ 0.0508 sec.

Toyota Consulting
0907698

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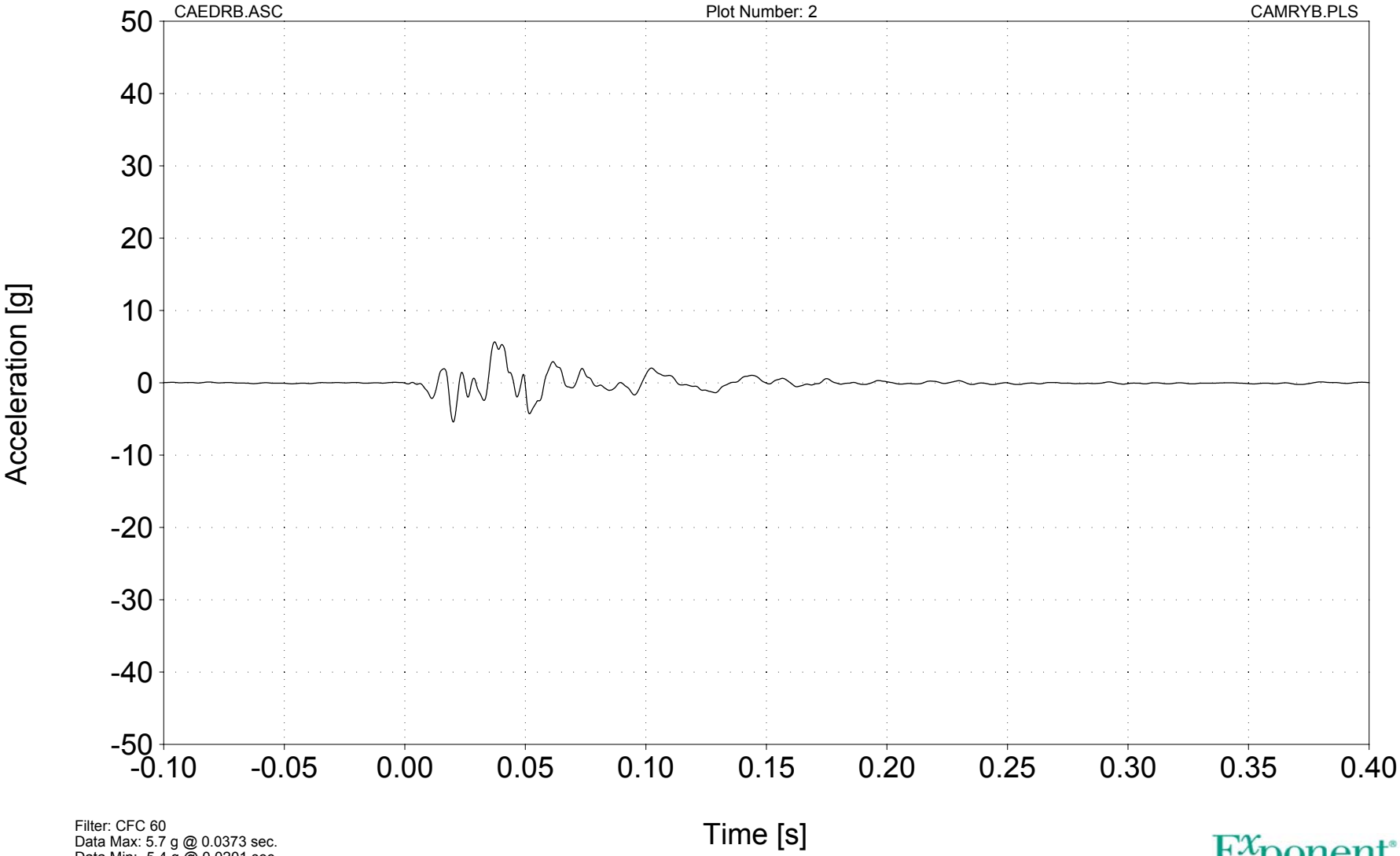
Failure Analysis Associates®

Lateral Acceleration v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 5.7 g @ 0.0373 sec.
Data Min: -5.4 g @ 0.0201 sec.

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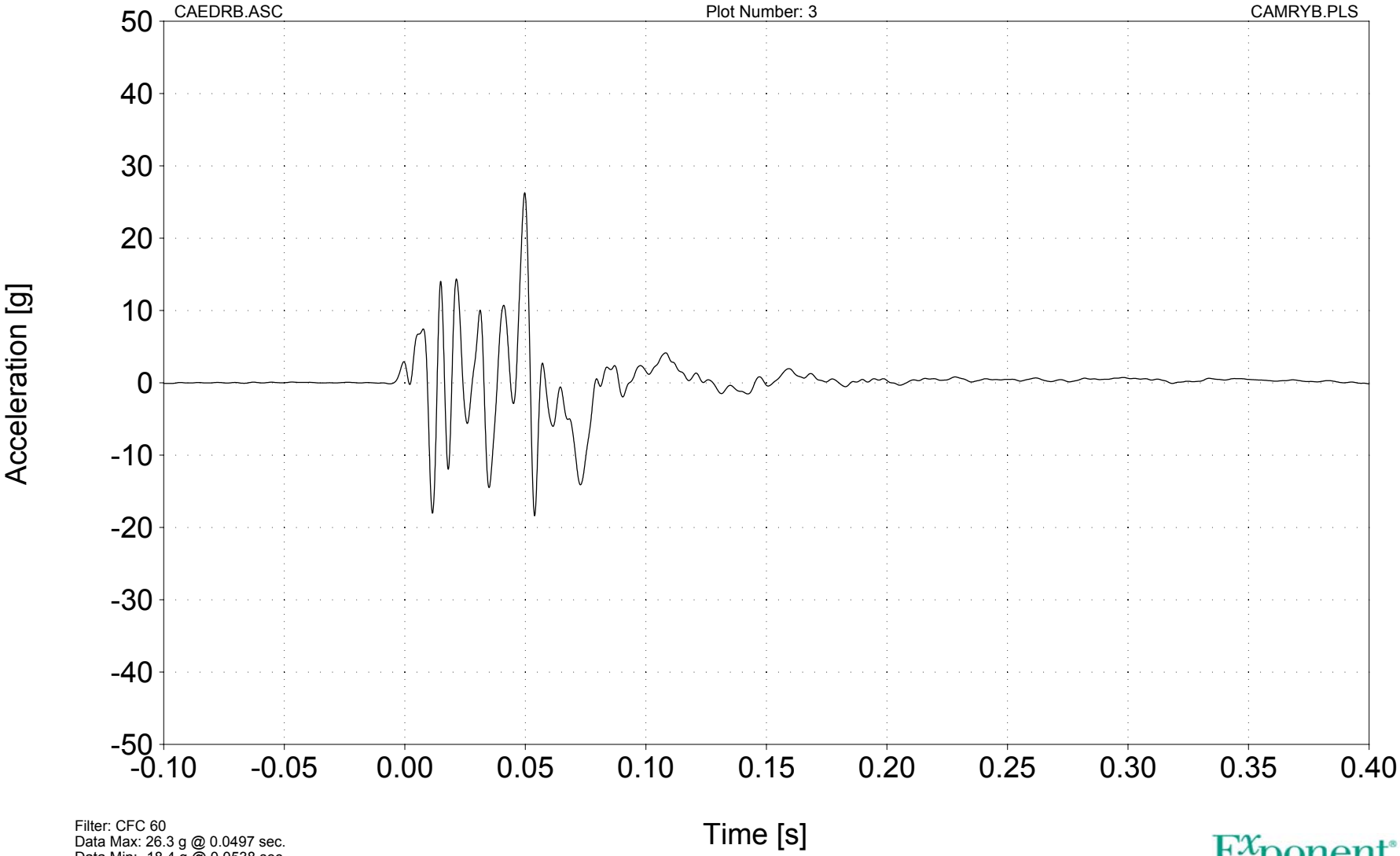
Vertical Acceleration v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 26.3 g @ 0.0497 sec.
Data Min: -18.4 g @ 0.0538 sec.

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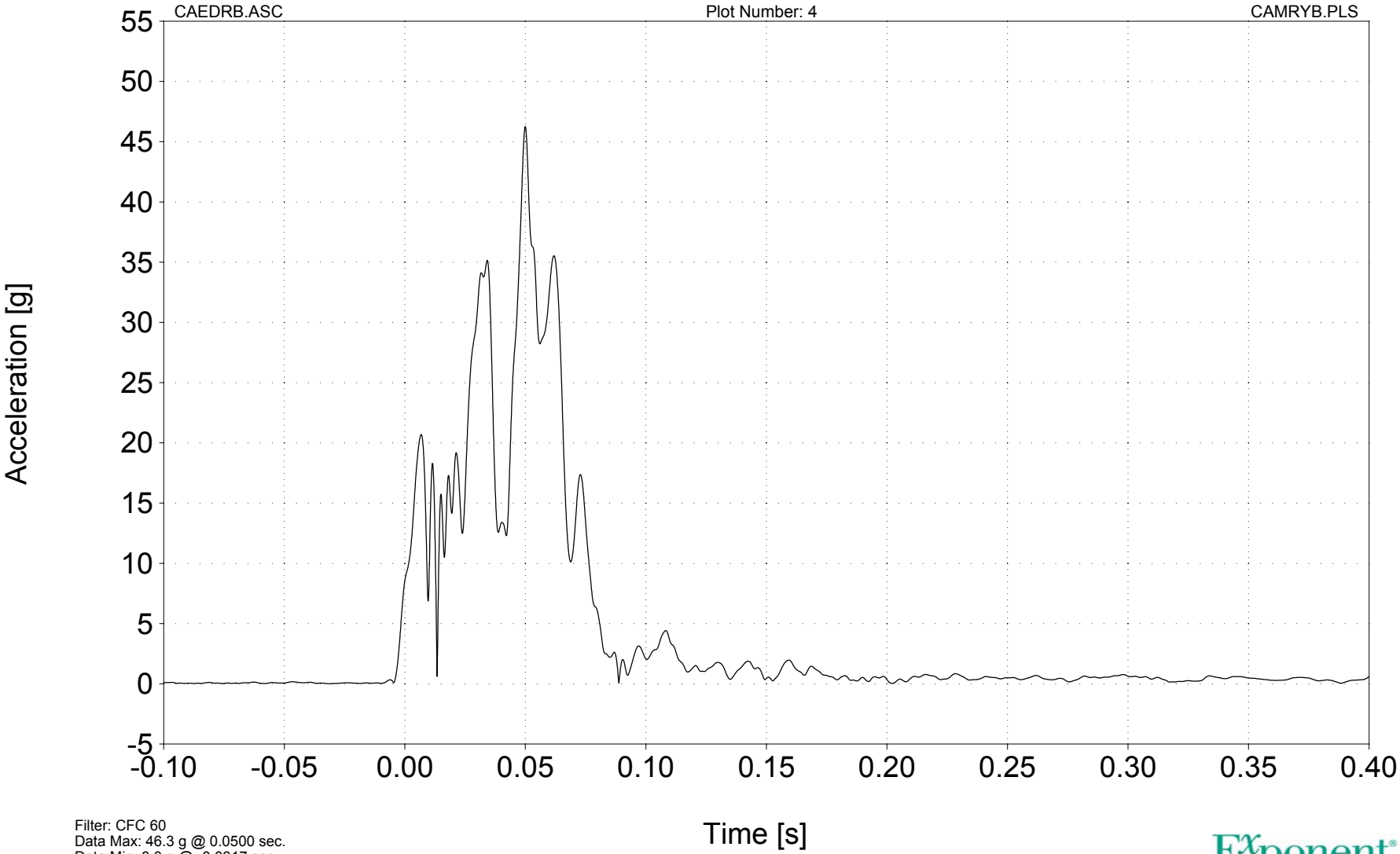
Resultant Acceleration v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 60
Data Max: 46.3 g @ 0.0500 sec.
Data Min: 0.0 g @ -0.0317 sec.

Toyota Consulting
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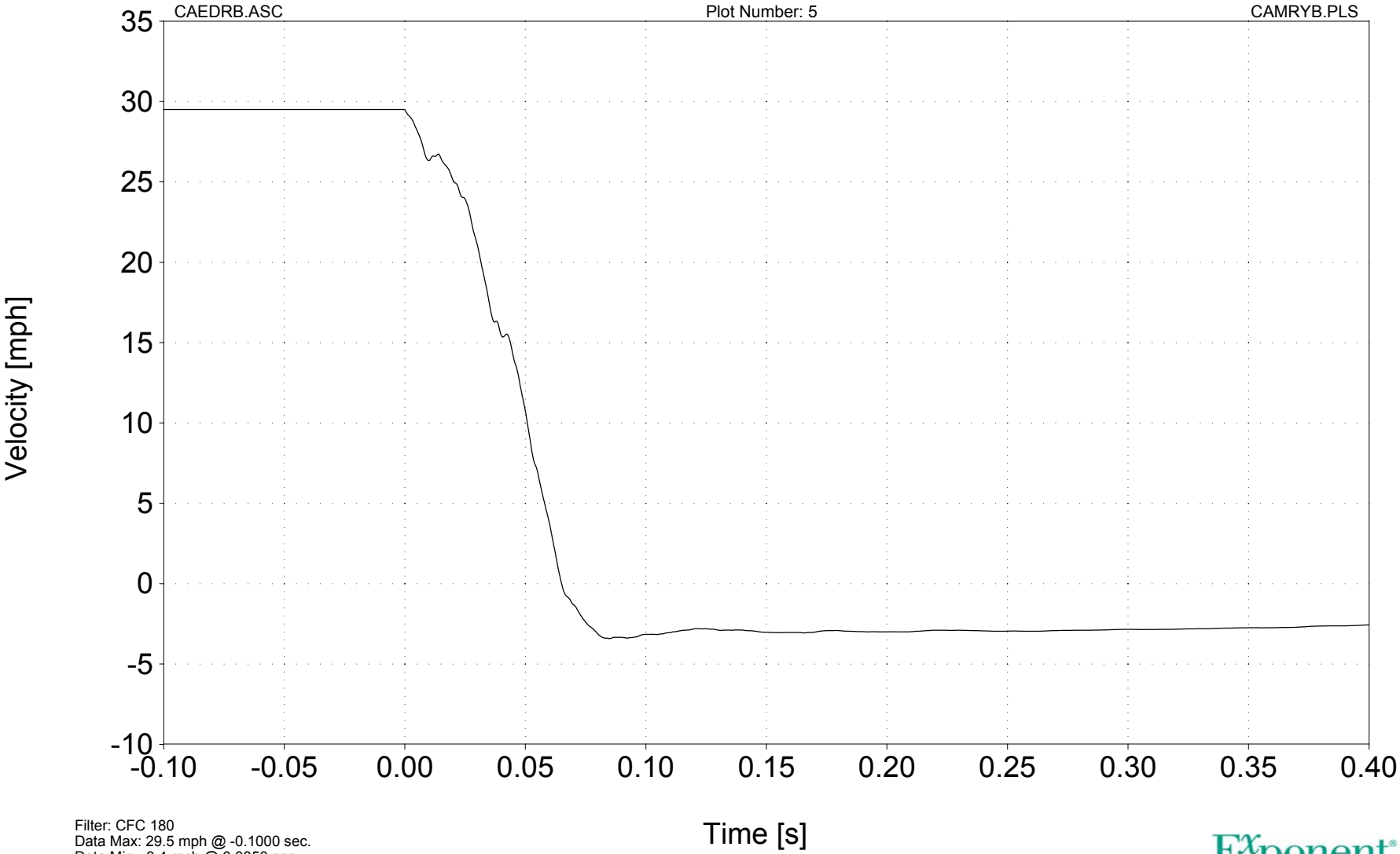
Longitudinal Velocity v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 29.5 mph @ -0.1000 sec.
Data Min: -3.4 mph @ 0.0850 sec.

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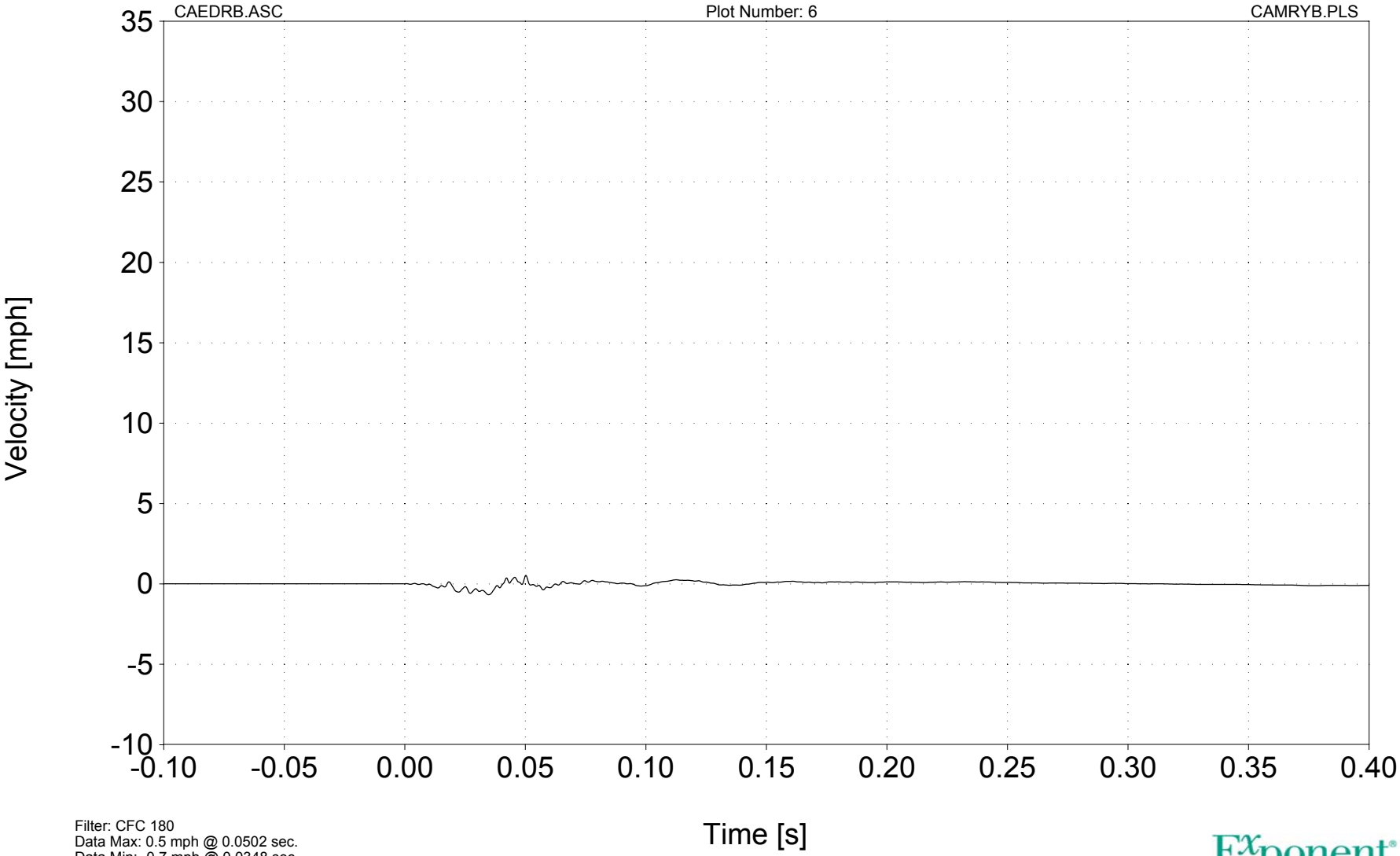
Lateral Velocity v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 0.5 mph @ 0.0502 sec.
Data Min: -0.7 mph @ 0.0348 sec.

Toyota Consulting
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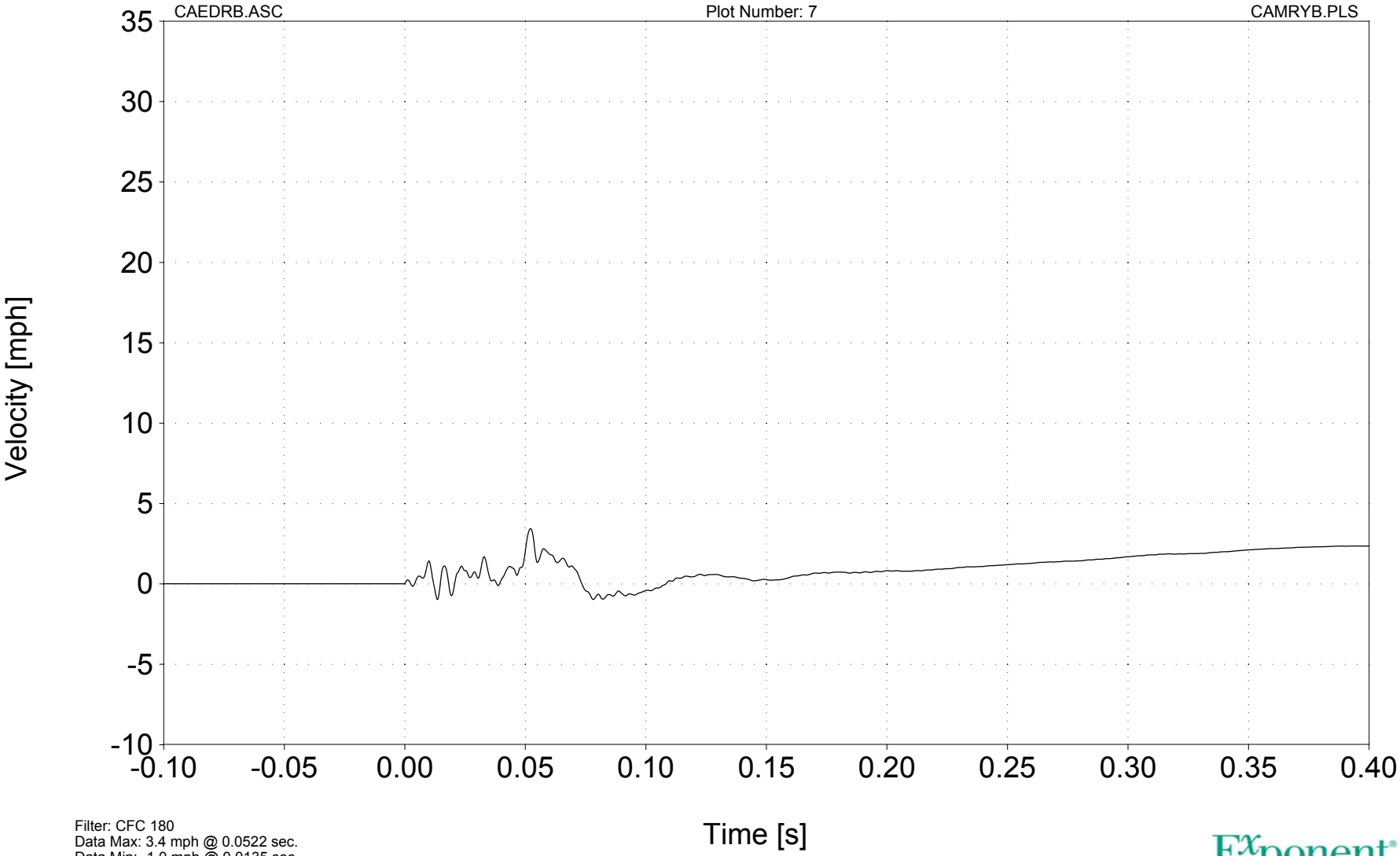
Vertical Velocity v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 3.4 mph @ 0.0522 sec.
Data Min: -1.0 mph @ 0.0135 sec.

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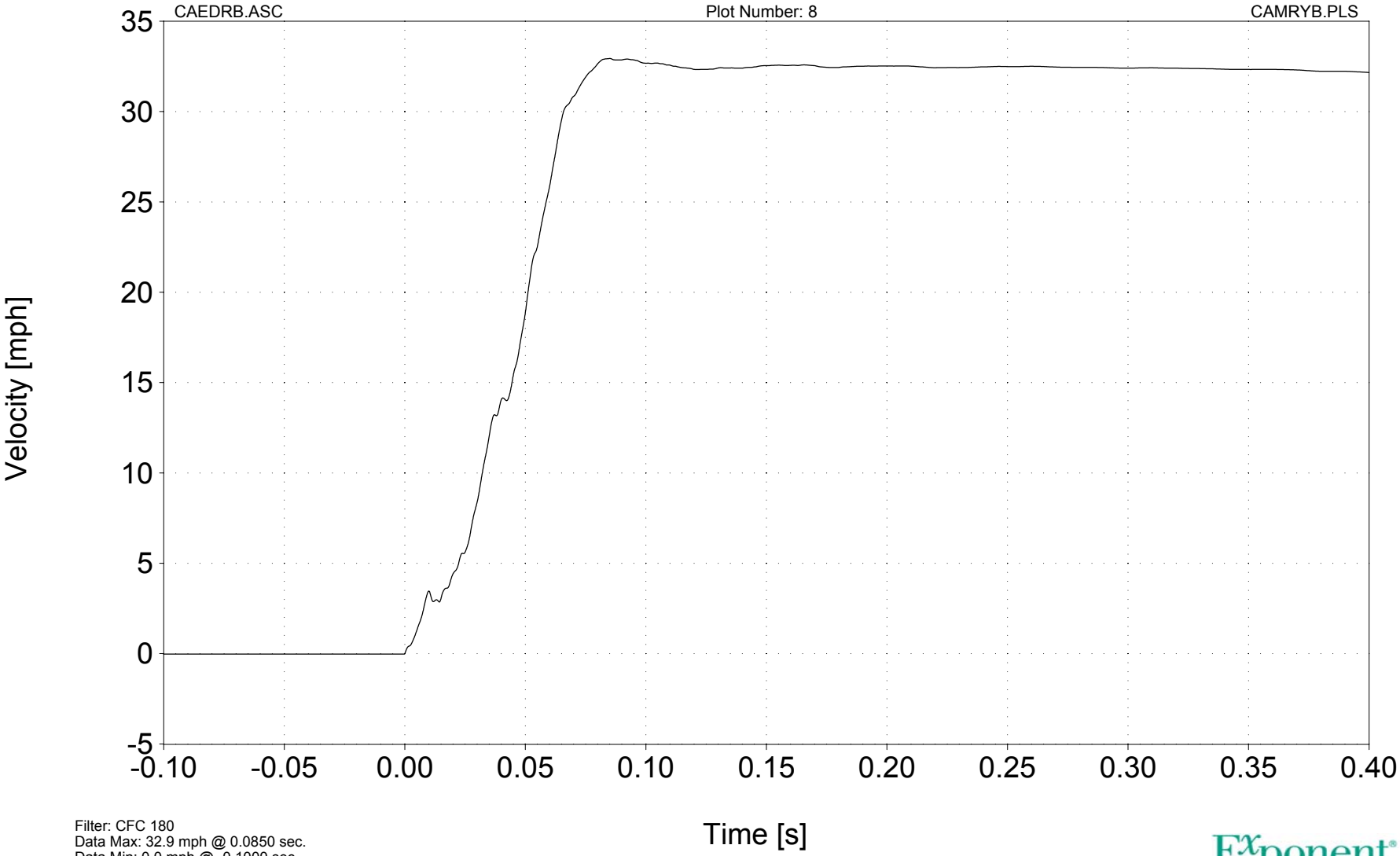
Delta Velocity v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 32.9 mph @ 0.0850 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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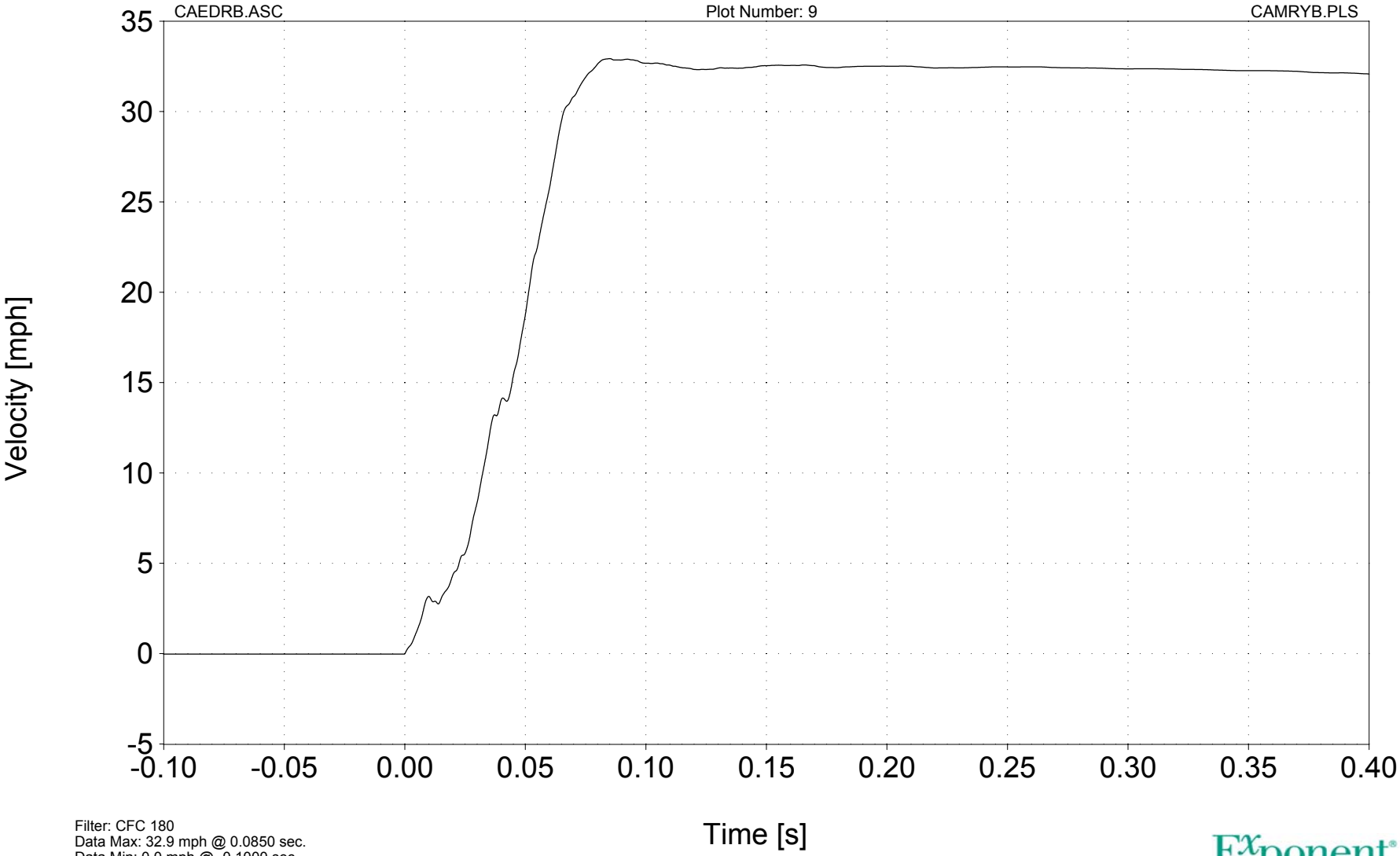
Longitudinal Delta Velocity v Time

EDR
2005 Toyota Camry
Barrier Crash Test - 12/10/10



Filter: CFC 180
Data Max: 32.9 mph @ 0.0850 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA BARRIER CRASH TESTING
JOB NUMBER:	0907698
DATE:	12/10/2010
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2005 TOYOTA CAMRY

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0907698 A0T0 - 06155PH_0114

0907698 A0T0 - 06155PH_0115

0907698 A0T0 - 06155PH_0116

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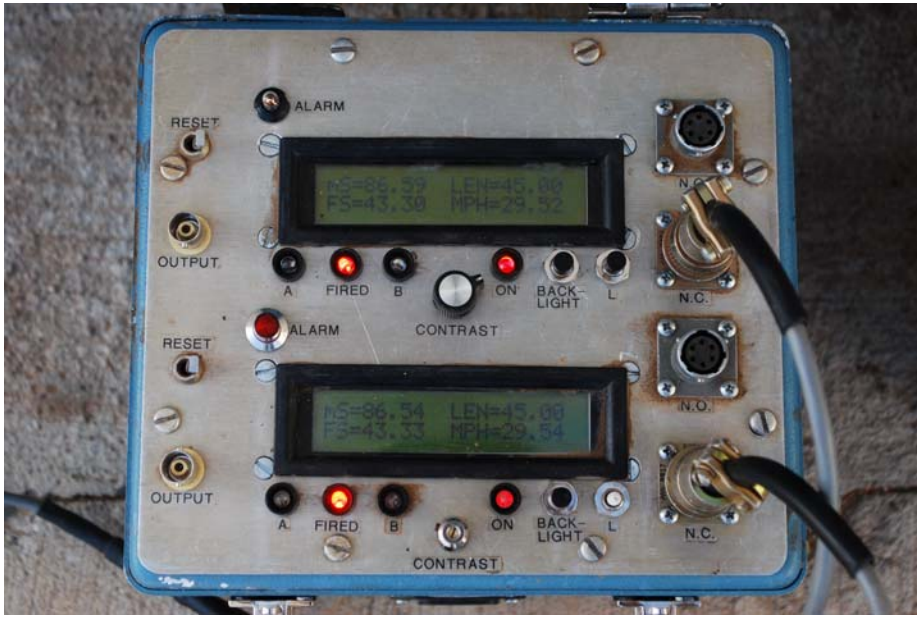

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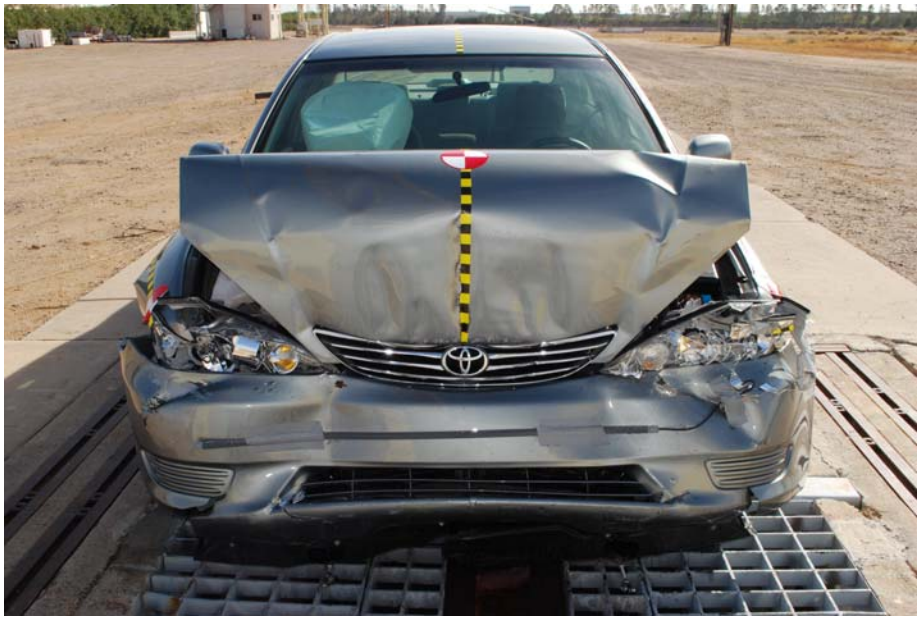

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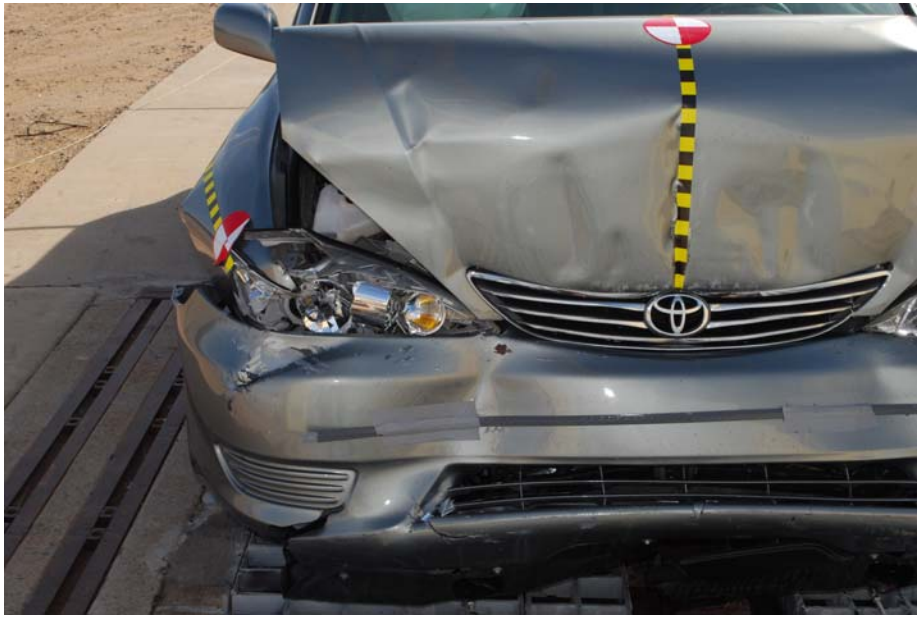

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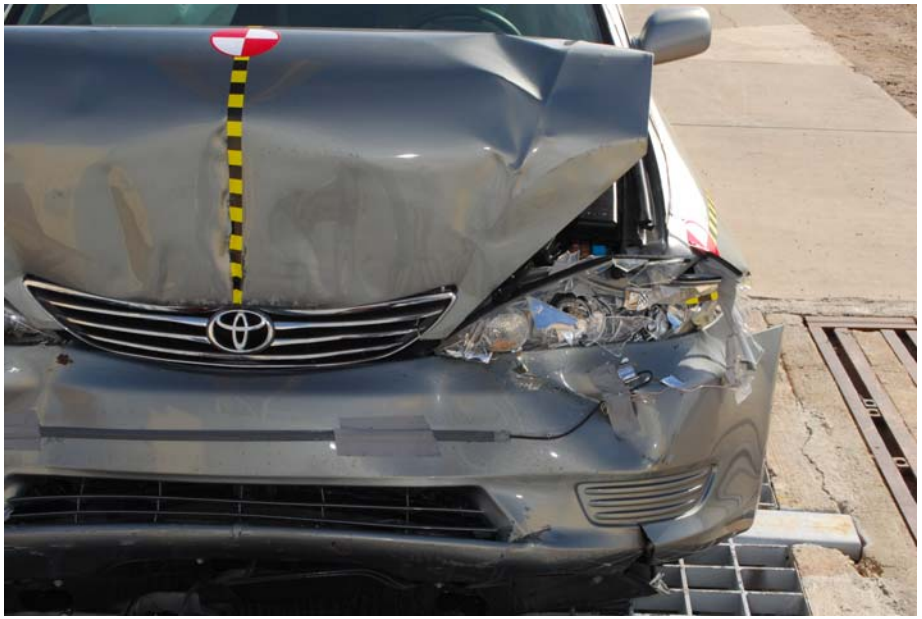

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0907698 A0T0 - 06155PH_0133

0907698 A0T0 - 06155PH_0134

0907698 A0T0 - 06155PH_0135

0907698 A0T0 - 06155PH_0136

0907698 A0T0 - 06155PH_0137

0907698 A0T0 - 06155PH_0138

0907698 A0T0 - 06155PH_0139

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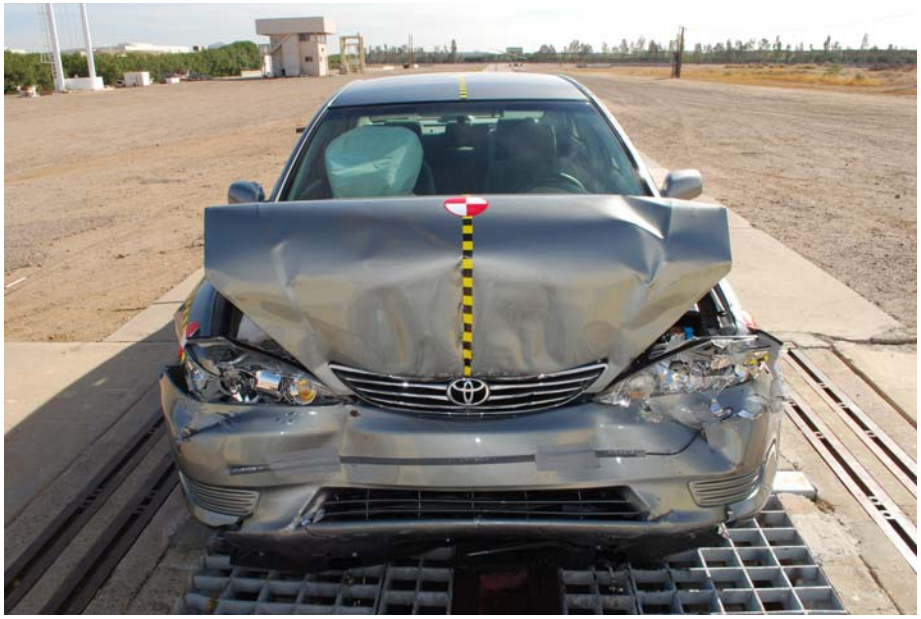

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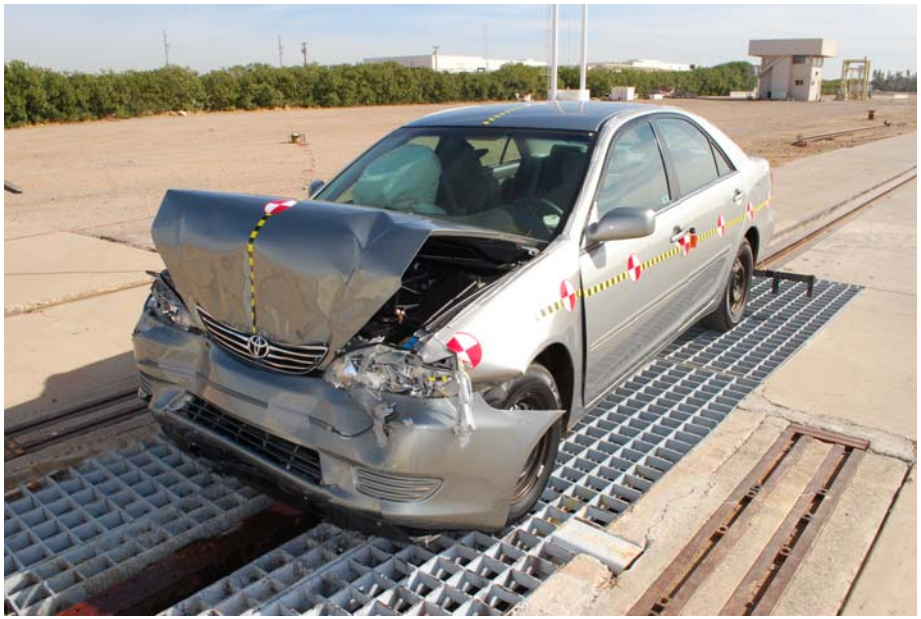

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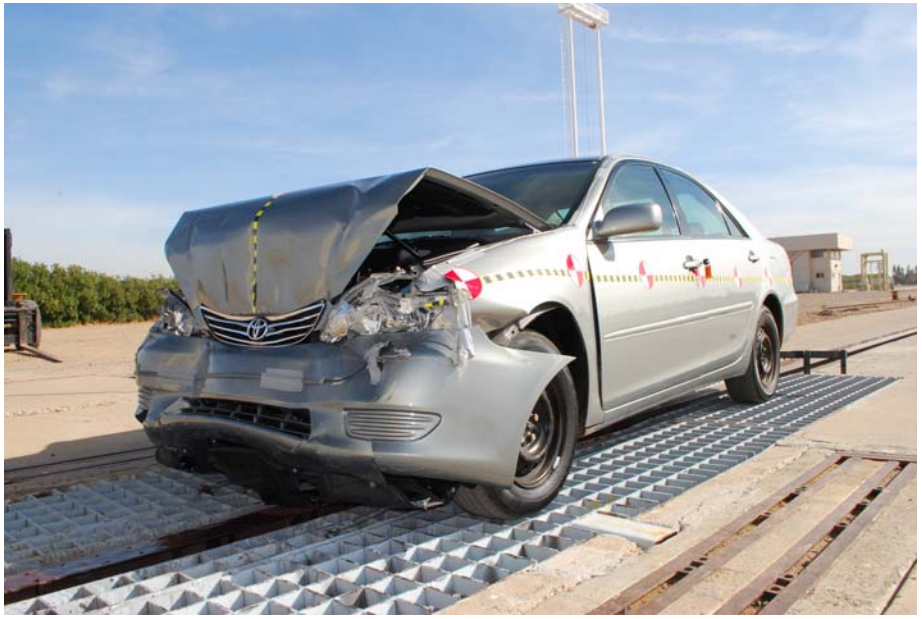

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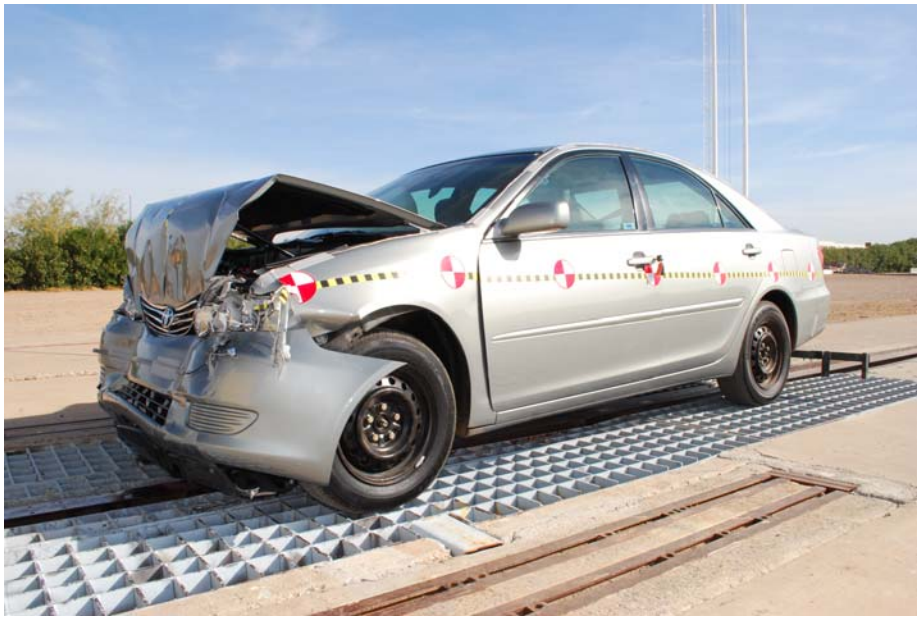

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0907698 A0T0 - 06155PH_0154

0907698 A0T0 - 06155PH_0155

0907698 A0T0 - 06155PH_0156

0907698 A0T0 - 06155PH_0157

0907698 A0T0 - 06155PH_0158

0907698 A0T0 - 06155PH_0159

0907698 A0T0 - 06155PH_0160

0907698 A0T0 - 06155PH_0161

0907698 A0T0 - 06155PH_0162

0907698 A0T0 - 06155PH_0163

Failure Analysis Associates

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Appendix E

Barrier Crash Test, 2007 Toyota RAV4, December 13, 2010

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2007 Toyota RAV4

Toyota Consulting
0907698

December 13, 2010

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2007 Toyota RAV4

Toyota Consulting
0907698

December 13, 2010

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

December 2010

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/1210/R563

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Test Description

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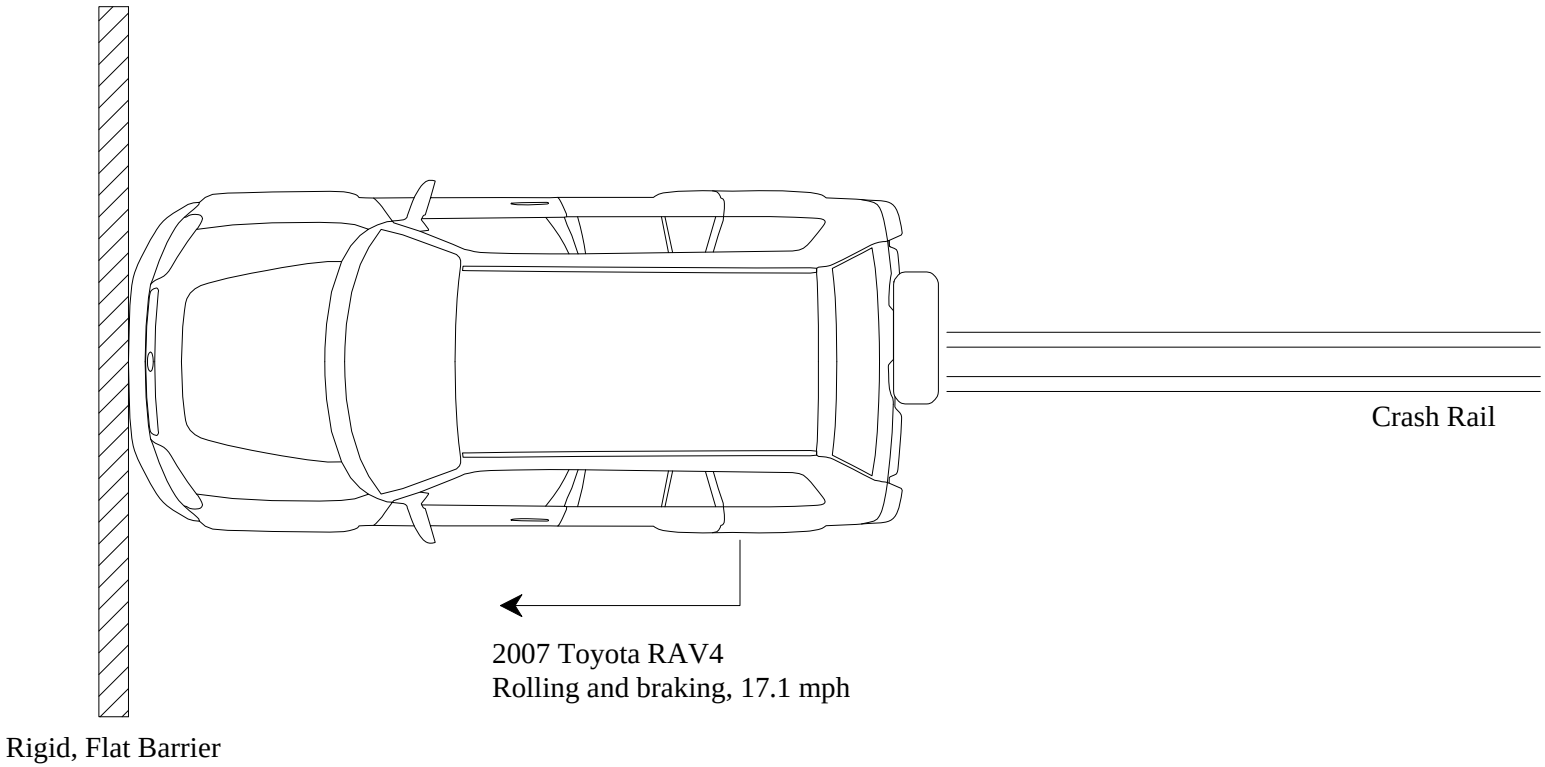
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	December 13, 2010
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2007 Toyota RAV4
IMPACT SPEED:	17.1 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set on cargo area floor
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. A pneumatic brake application system that used a cylinder to press on the brake pedal was also installed in the vehicle. Two sandbags were added to the right front seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 30.5 mph and released from tow. At the moment of release, the brake application system was triggered. The vehicle decelerated over approximately 2.0 seconds until it impacted Exponent's rigid, flat barrier at a speed of 17.1 mph. Reference the *Impact Configuration* diagram on the following page.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
December 13, 2010



Exponent®

2007 Toyota RAV4

Exponent®
Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	6939			DATE RECEIVED:	12/9/2010
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	RAV4
VEHICLE BODY STYLE:	4-DOOR SPORT UTILITY VEHICLE			VEHICLE COLOR:	BLUE
VEHICLE IDENTIFICATION NUMBER:	JTMZD33V675073813			DATE OF MANUFACTURE:	06/07
GVWR (lb):	4430	FRONT GAWR (lb):	2535	REAR GAWR (lb):	2435
RECOMMENDED TIRE SIZE - F/R:	P225/65R17	RECOMMENDED TIRE PRESSURE - F/R (psi):	32		
INSTALLED TIRE SIZE:	LF: P225/65R17	RF: P225/65R17	LR: P225/65R17	RR: P225/65R17	
ENGINE TYPE:	4-CYLINDER	ENGINE DISPLACEMENT:	2.4 LITER	ODOMETER (mi):	24,236
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	LEFT SIDE, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT REAR QUARTER PANEL		
DESIGNATED SEATING - FRONT: 2	MID: 0	REAR: 3	TOTAL: 5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	N
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	N	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	Y	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	Y	ANTI-LOCK BRAKES F:	Y
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	Y	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	Y
SUNROOF:	N	ROOF RACK:	Y						
ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES:	NONE								
SIGNIFICANT BODY DAMAGE/CORROSION:	NONE								

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

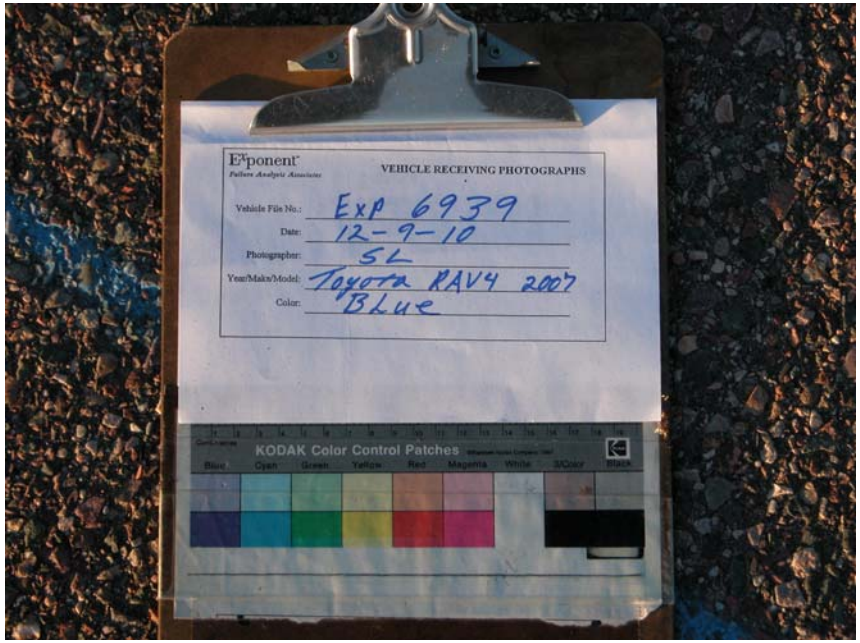
LEFT FRONT:	998	RIGHT FRONT:	930	TOTAL FRONT:	1928	PERCENT FRONT:	57%
LEFT REAR:	721	RIGHT REAR:	706	TOTAL REAR:	1427	PERCENT REAR:	43%
				TOTAL WEIGHT:	3355		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

LEFT FRONT:	31.6	AT WHL WELL @ AXLE	RIGHT FRONT:	31.9	AT WHL WELL @ AXLE
LEFT REAR:	32.1	AT WHL WELL @ AXLE	RIGHT REAR:	32.2	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	180.7	OVERALL WIDTH:	71.5	OVERALL HEIGHT:	68.0 *
WHEELBASE:	105.0	FRONT TRACK:	61.4	REAR TRACK:	61.0
REAR OVERHANG:	42.0	FRONT BUMPER HEIGHT:	26.0	REAR BUMPER HEIGHT:	20.9
COMMENTS:	*INCLUDING ROOF RACK; NR = NOT RECORDED				
EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	SL / KH	CHECKED BY:	DSP



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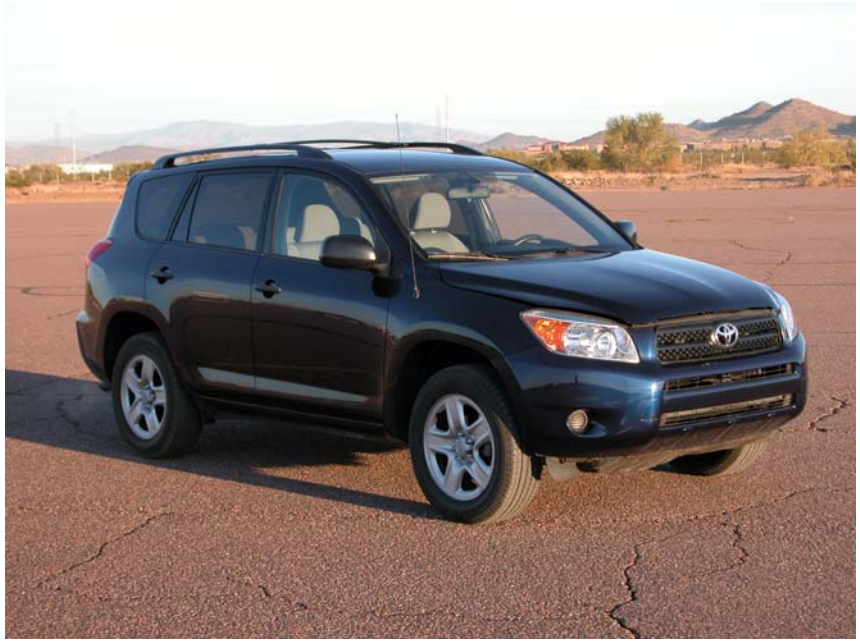

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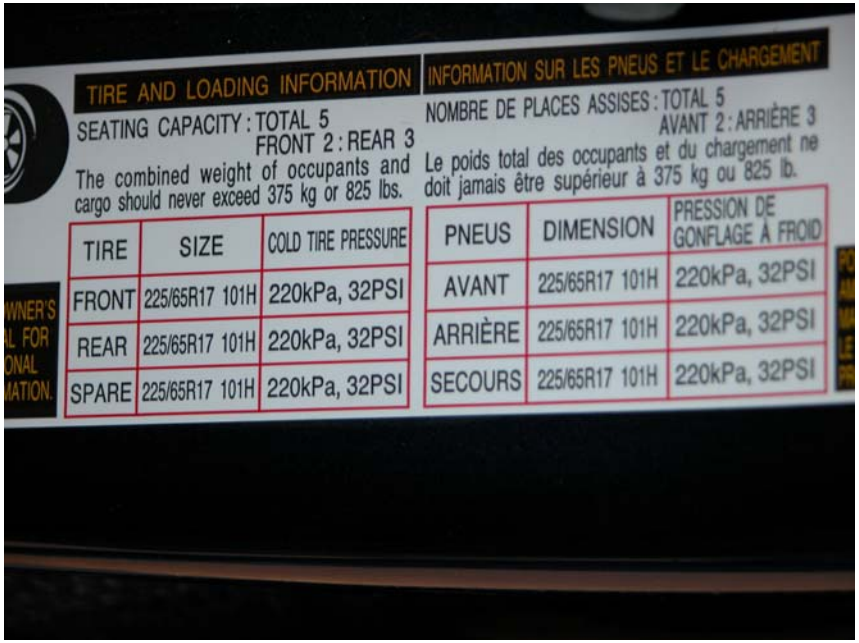

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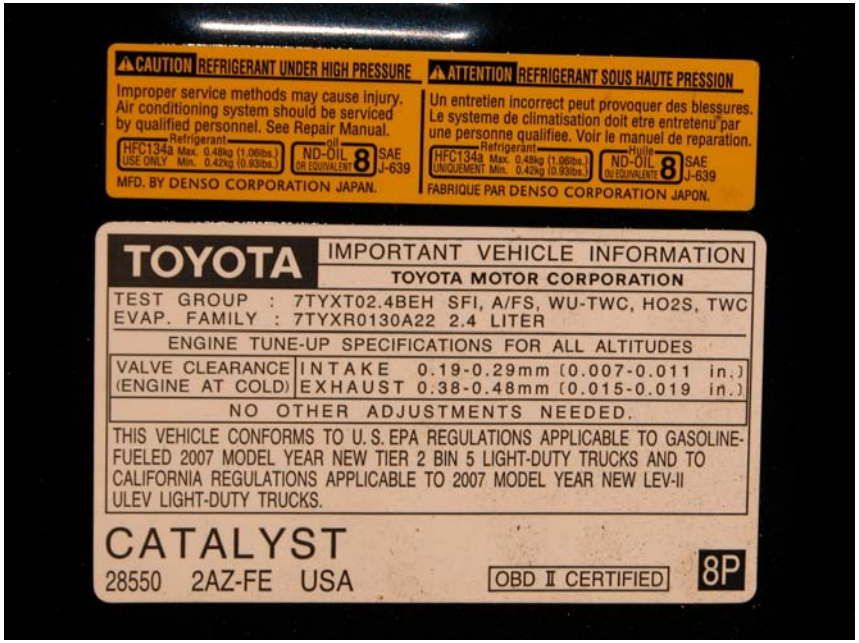

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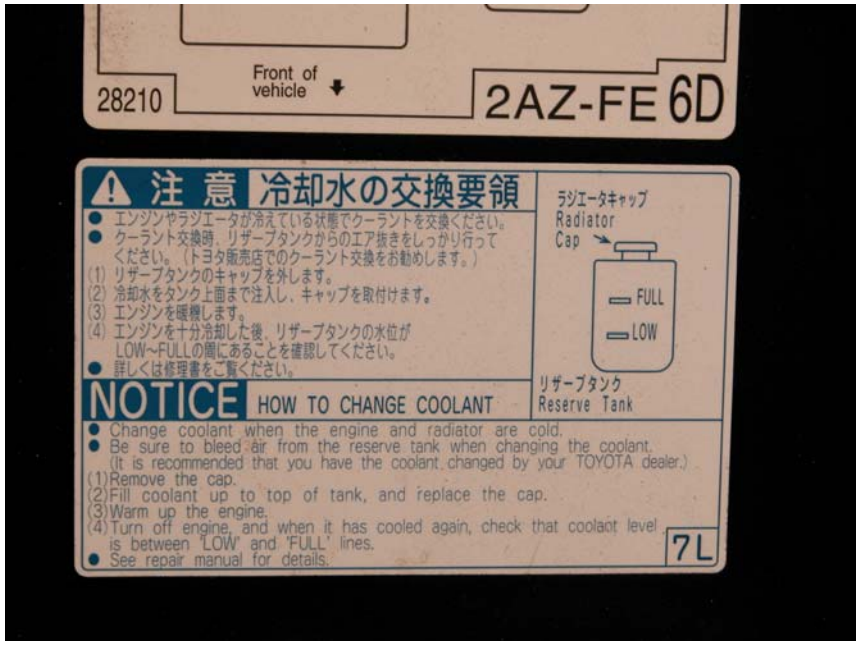

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0907698 A0T0 - 06157PH_0024

0907698 A0T0 - 06157PH_0025

0907698 A0T0 - 06157PH_0026

Exponent®

Test Setup

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VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/13/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	RAV4
VEHICLE BODY STYLE:	4-DOOR SPORT UTILITY VEHICLE			VEHICLE COLOR:	BLUE
VEHICLE IDENTIFICATION NUMBER:	JTMZD33V675073813			ODOMETER (mi):	24,244

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P225/65R17 | 32 PSI | 7/32"	P225/65R17 | 32 PSI | 9/32"
REAR:	P225/65R17 | 32 PSI | 5/32"	P225/65R17 | 32 PSI | 5/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	991	RIGHT FRONT:	969	TOTAL FRONT:	1960	PERCENT FRONT:	57%
LEFT REAR:	721	RIGHT REAR:	741	TOTAL REAR:	1462	PERCENT REAR:	43%
				TOTAL WEIGHT:	3422		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	31.7	AT	WHL WELL @ AXLE	RIGHT FRONT:	31.8	AT	WHL WELL @ AXLE
LEFT REAR:	32.0	AT	WHL WELL @ AXLE	RIGHT REAR:	31.9	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRONT SUSPENSION CROSSMEMBER		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	CARGO AREA		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION; PRESSURE REGULATOR (CARGO AREA) AND PNEUMATIC CYLINDER (DRIVER FOOTWELL) INSTALLED FOR PRE-IMPACT BRAKE APPLICATION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	--	RIGHT FRONT:	NONE*
LEFT MID:	--	CENTER MID:	--	RIGHT MID:	--
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	FULL AFT	FULL AFT
OTHER:	SEATBELT BUCKLED, D-RING FULL DOWN	SEATBELT UNBUCKLED, D-RING FULL DOWN

COMMENTS

*TWO SANDBAGS (103 LBS TOTAL) PLACED IN RIGHT FRONT SEAT

	FORM COMPLETED BY:	DSP	CHECKED BY: MLM

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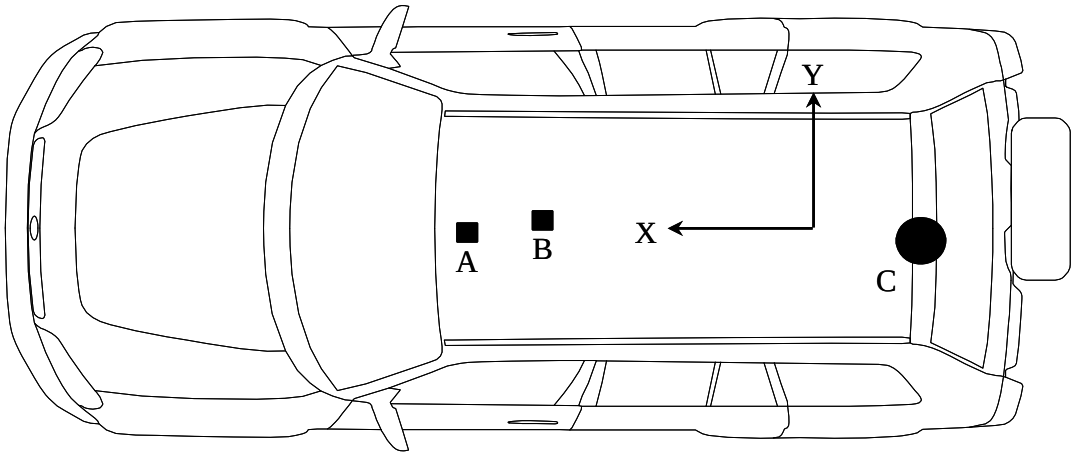
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/13/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	RAV4
VEHICLE IDENTIFICATION NUMBER:	JTMZD33V675073813				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	59.6 in.	0.0 in.	21.7 in.
B	TRIAXIAL ACCELEROMETER SET, EDR MODULE	50.1 in.	1.8 in.	23.0 in.
C	LONGITUDINAL ACCELEROMETER, BOTTOM OF CARGO AREA	-24.0 in.	-2.7 in.	13.4 in.

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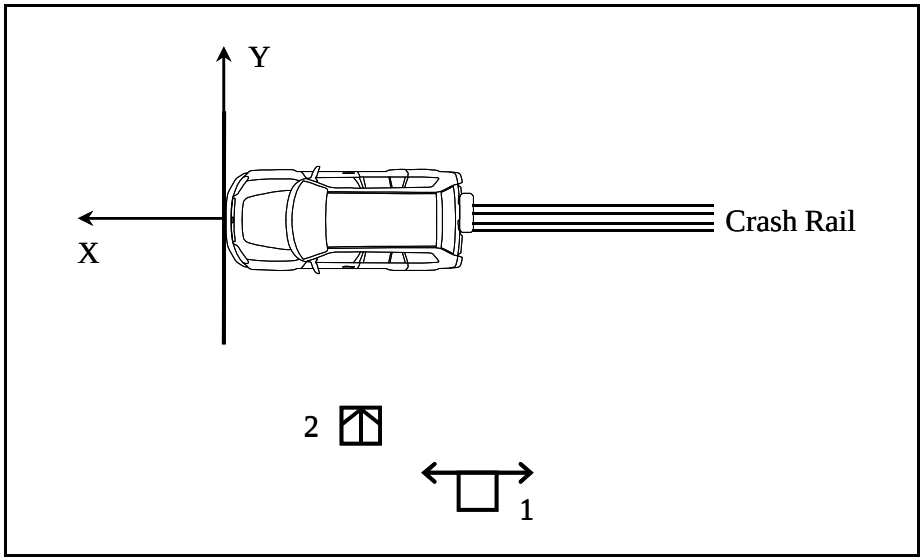
CAMERA SETUP RECORD

PROJECT NO:	0907698	TEST DATE:	12/13/2010
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2007 TOYOTA RAV4		
TEST SPEED:	17.1 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-11.0	-37.7	3.8	RT	--

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Failure Analysis Associates®

PHOTO DOCUMENTATION DATA SHEET

JOB NAME: TOYOTA BARRIER CRASH TESTING
JOB NUMBER: 0907698
DATE: 12/13/2010
LOCATION: TEC
PHOTOGRAPHER: DANIEL PETERSON
DIGITAL SEQUENCE: [A] [B] [C] [D] [E] [F] [G] [H] [I] [J]
[K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT: 2007 TOYOTA RAV4

0907698 A0T0 - 06157PH_0027

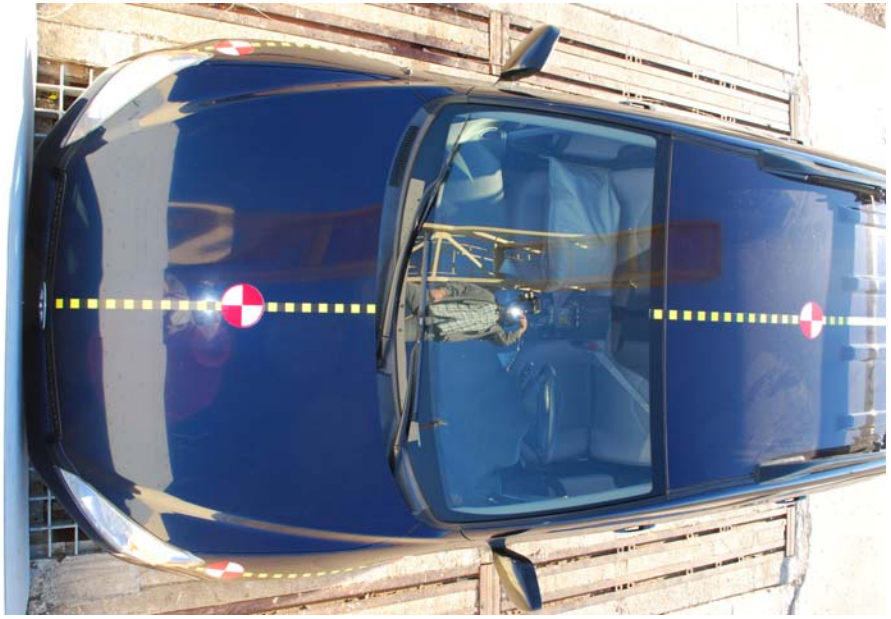
0907698 A0T0 - 06157PH_0028

0907698 A0T0 - 06157PH_0029

0907698 A0T0 - 06157PH_0030

0907698 A0T0 - 06157PH_0031

0907698 A0T0 - 06157PH_0032



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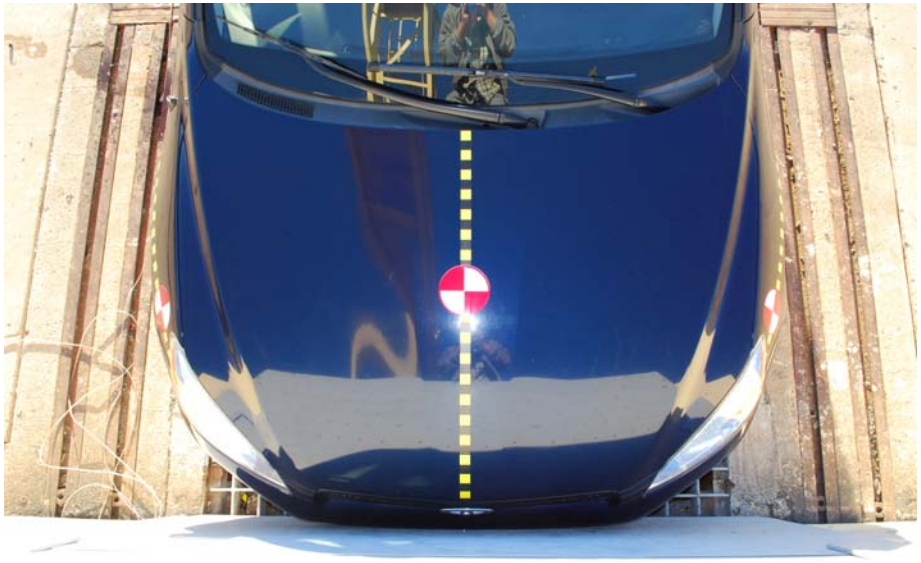

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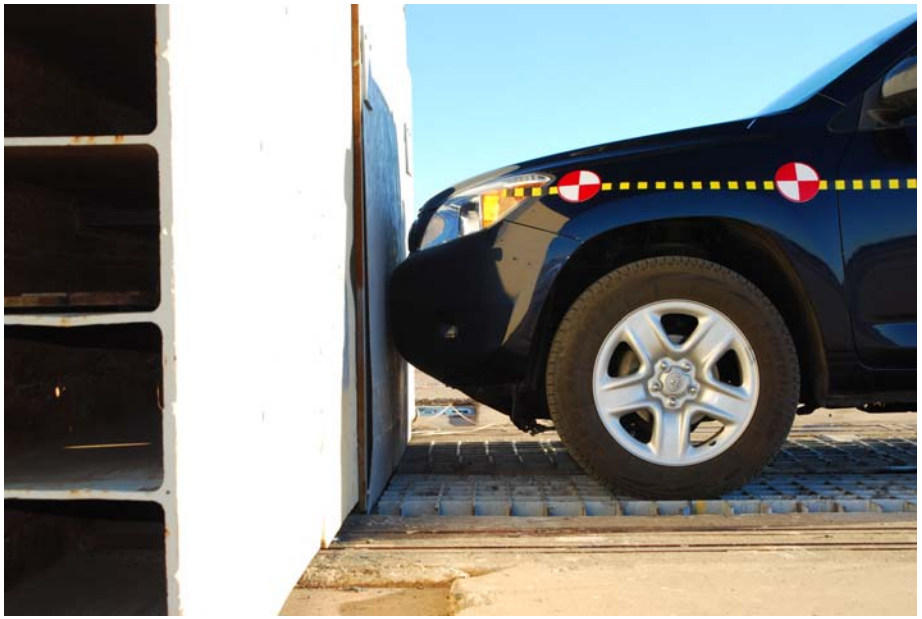

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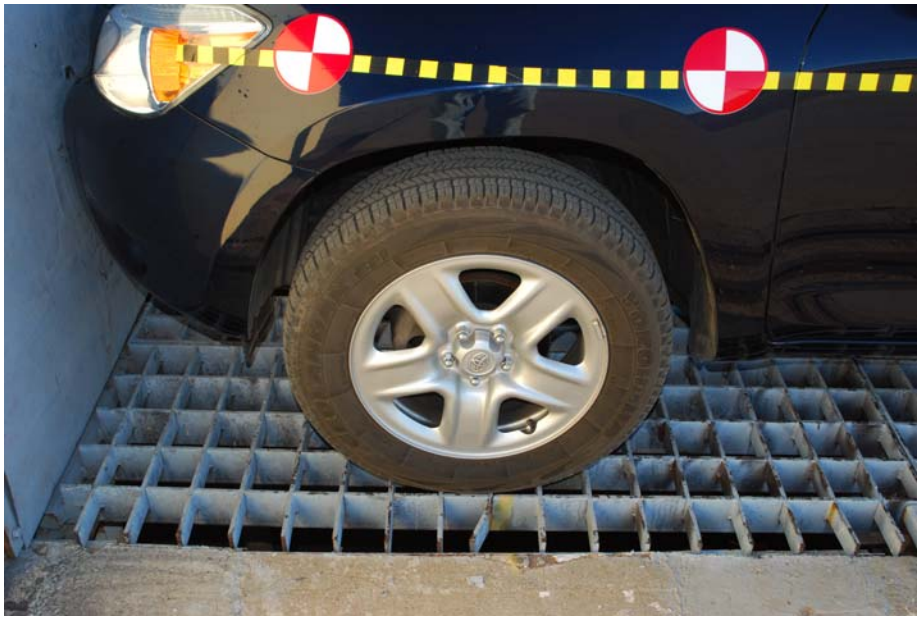

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0907698 A0T0 - 06157PH_0038

0907698 A0T0 - 06157PH_0039

0907698 A0T0 - 06157PH_0040

0907698 A0T0 - 06157PH_0041

0907698 A0T0 - 06157PH_0042

0907698 A0T0 - 06157PH_0043

0907698 A0T0 - 06157PH_0044

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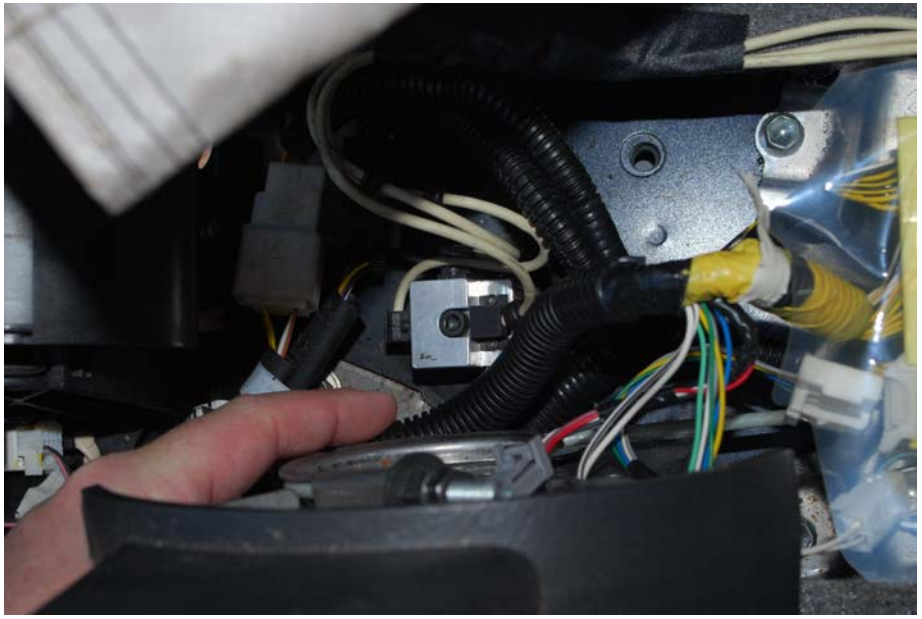
0907698 A0T0 - 06157PH_0048



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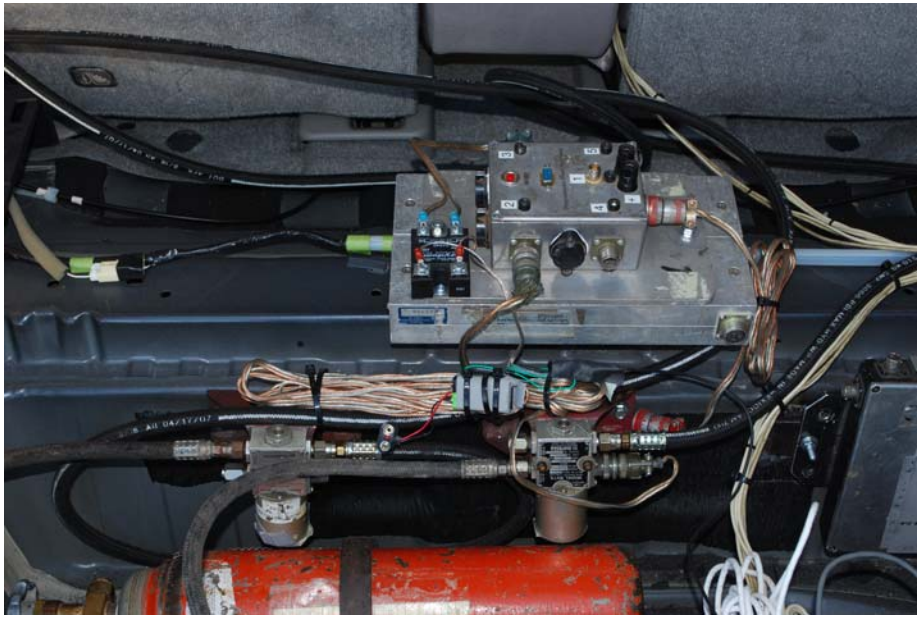
0907698 A0T0 - 06157PH_0052

0907698 A0T0 - 06157PH_0053



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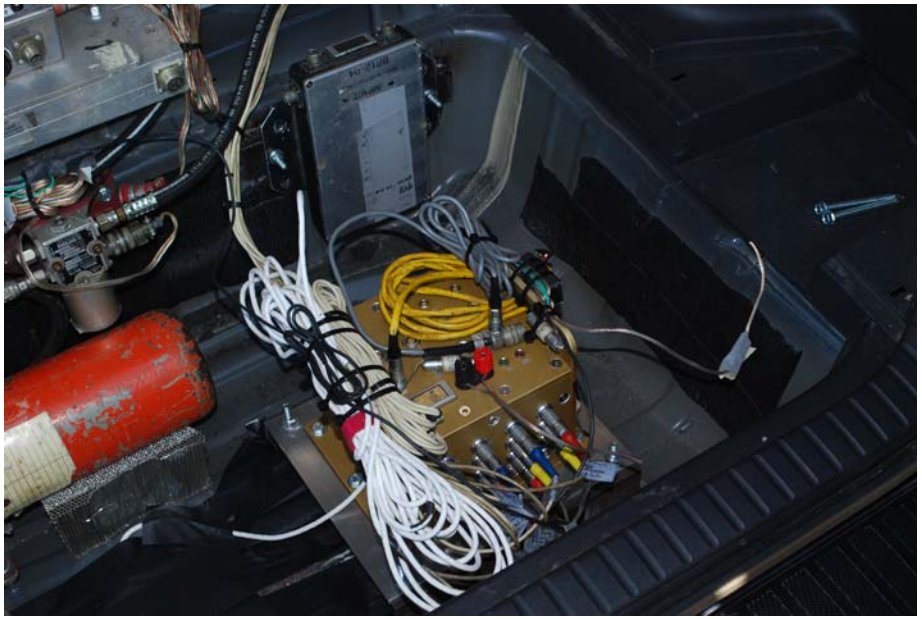

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0907698 A0T0 - 06157PH_0059

0907698 A0T0 - 06157PH_0060

0907698 A0T0 - 06157PH_0061

0907698 A0T0 - 06157PH_0062

0907698 A0T0 - 06157PH_0063

0907698 A0T0 - 06157PH_0064

0907698 A0T0 - 06157PH_0065

0907698 A0T0 - 06157PH_0066

0907698 A0T0 - 06157PH_0067

0907698 A0T0 - 06157PH_0068

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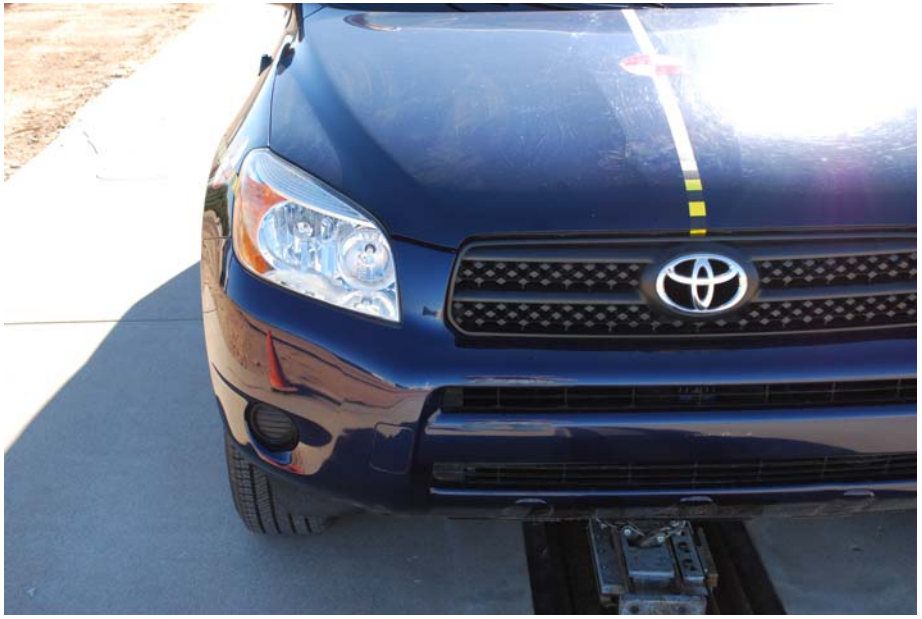
0907698 A0T0 - 06157PH_0072



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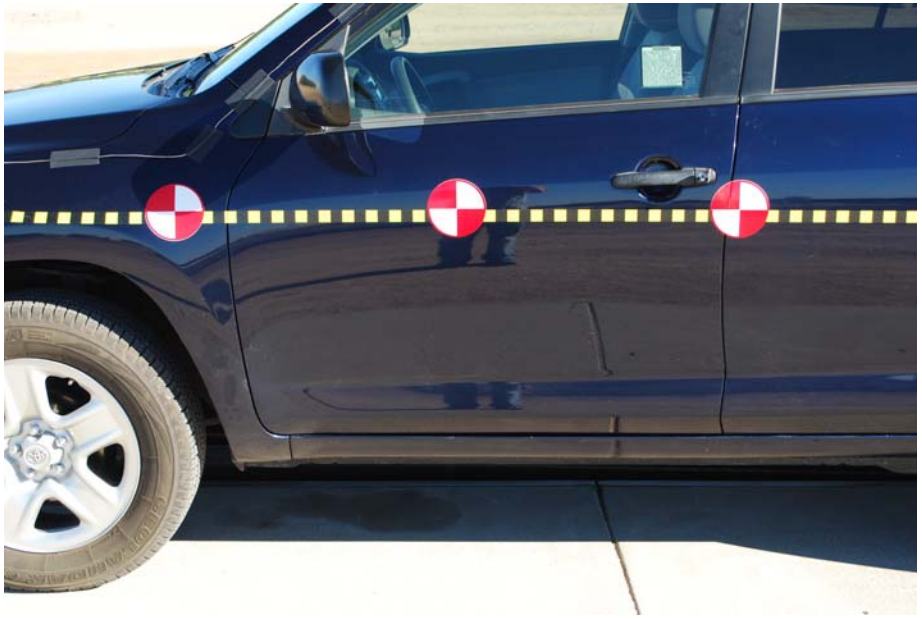
0907698 A0T0 - 06157PH_0076



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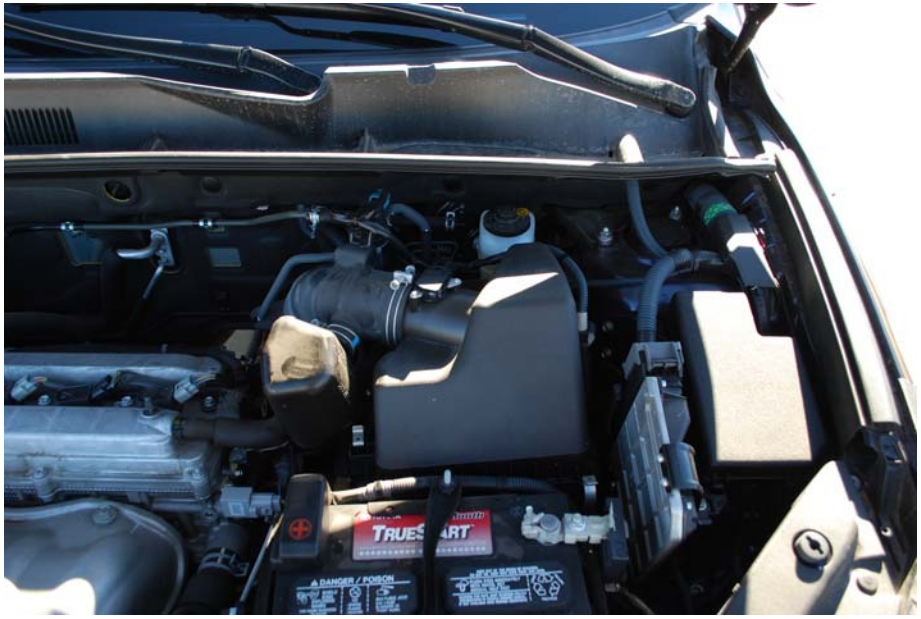
0907698 A0T0 - 06157PH_0081



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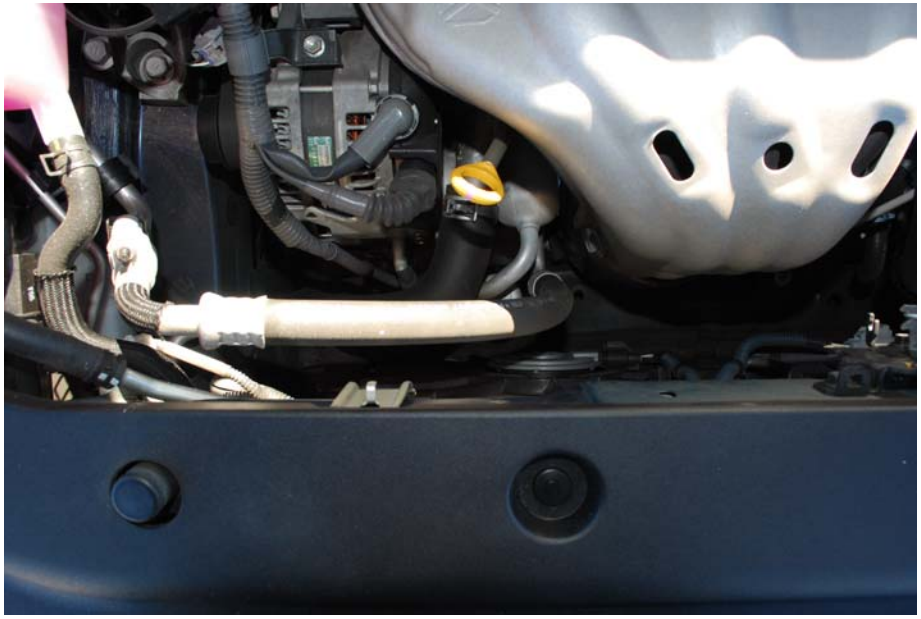
0907698 A0T0 - 06157PH_0085



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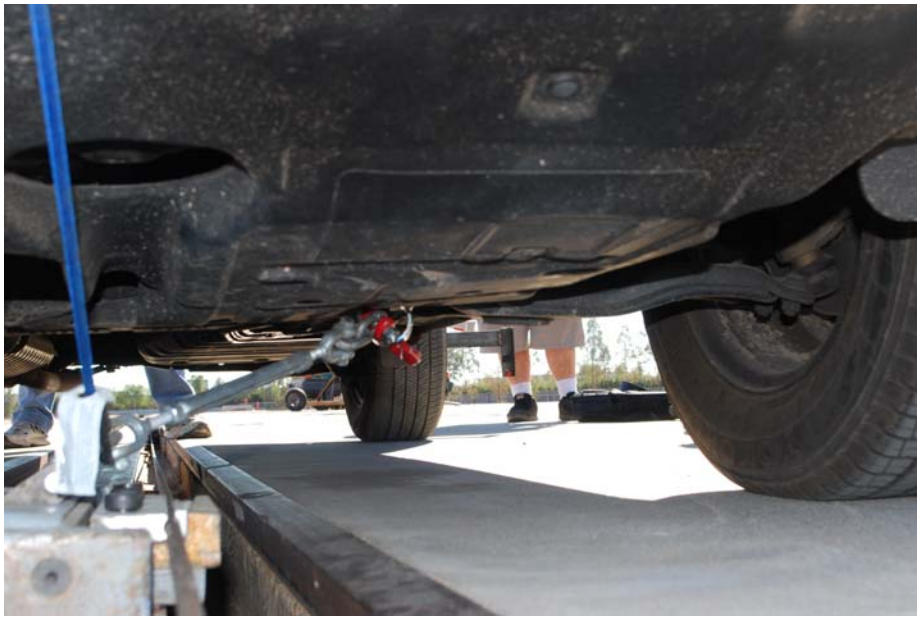
0907698 A0T0 - 06157PH_0090



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0907698 A0T0 - 06157PH_0095

0907698 A0T0 - 06157PH_0096

0907698 A0T0 - 06157PH_0097

0907698 A0T0 - 06157PH_0098

0907698 A0T0 - 06157PH_0099

0907698 A0T0 - 06157PH_0100

0907698 A0T0 - 06157PH_0101

0907698 A0T0 - 06157PH_0102

0907698 A0T0 - 06157PH_0103

0907698 A0T0 - 06157PH_0104

0907698 A0T0 - 06157PH_0105

0907698 A0T0 - 06157PH_0106

0907698 A0T0 - 06157PH_0107

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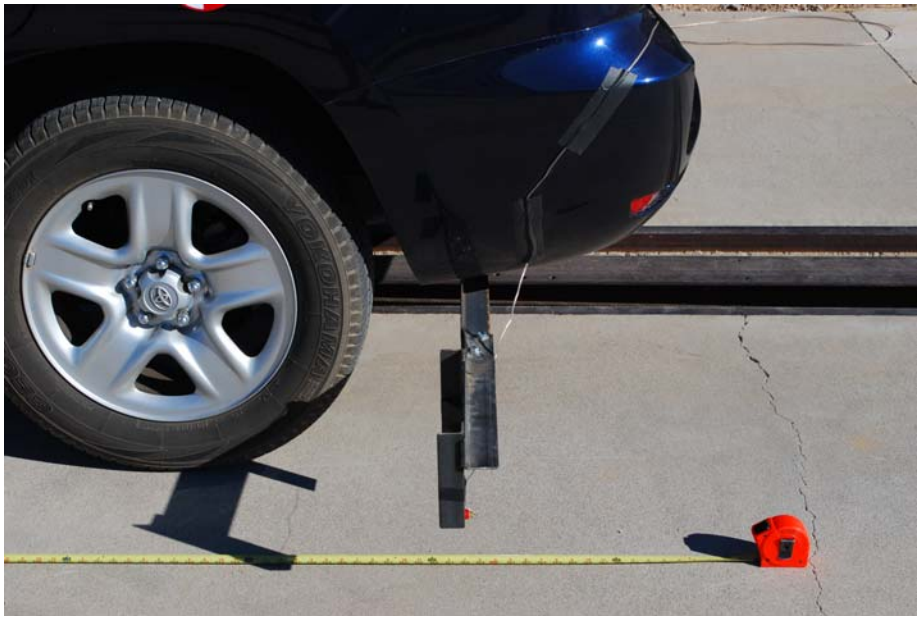

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0907698 A0T0 - 06157PH_0118

0907698 A0T0 - 06157PH_0119

0907698 A0T0 - 06157PH_0120

0907698 A0T0 - 06157PH_0121

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Test Results

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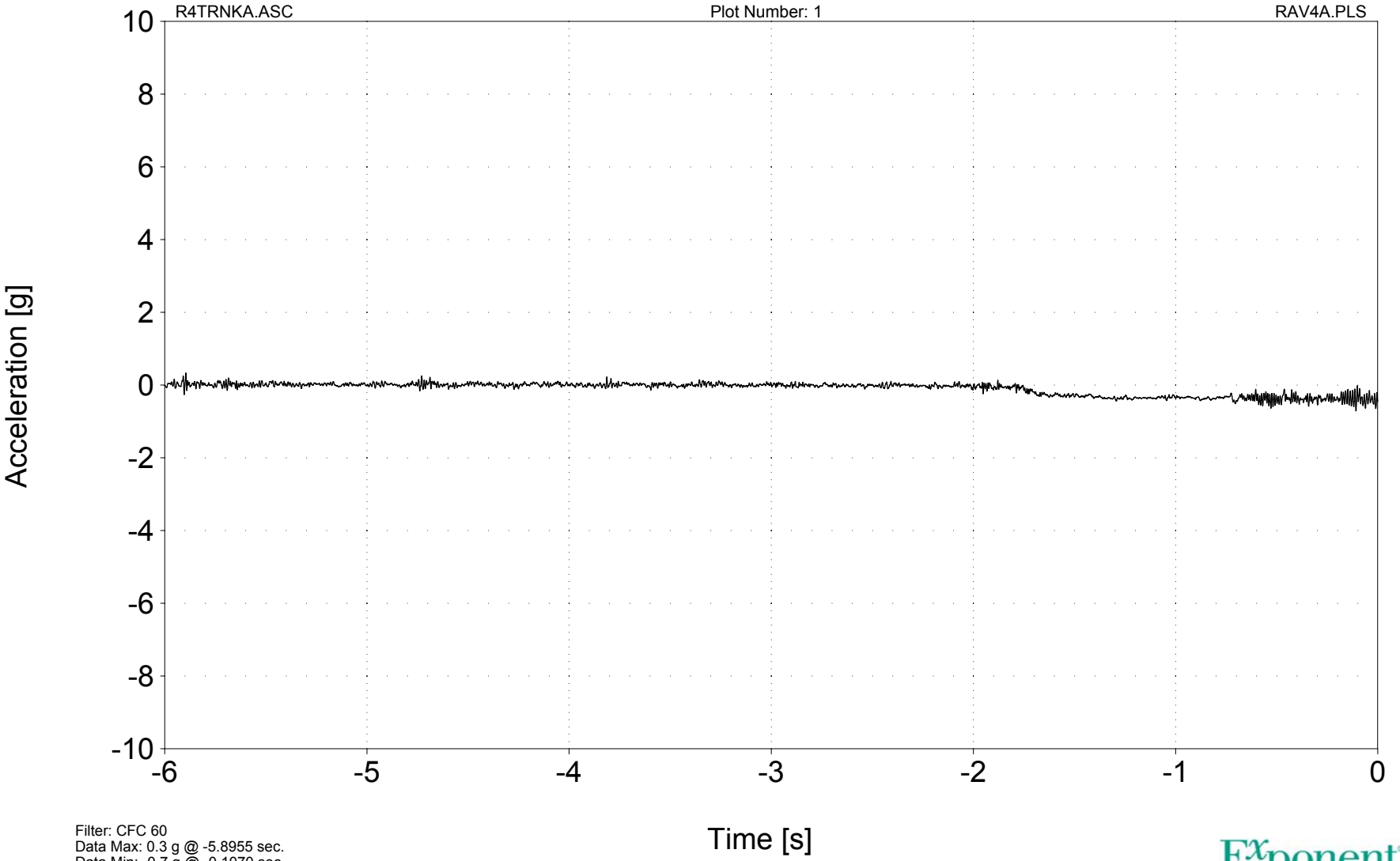
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/13/2010
OPERATOR:	DSP	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	SPEED RECORDED AT POINT OF RELEASE FROM TOW				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
121310	Channel 1	--	30.5	44.7	JS
	Channel 2	--	30.5	44.7	
	Average	--	30.5	44.7	

Longitudinal Acceleration v Time

Cargo Area
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 0.3 g @ -5.8955 sec.
Data Min: -0.7 g @ -0.1070 sec.

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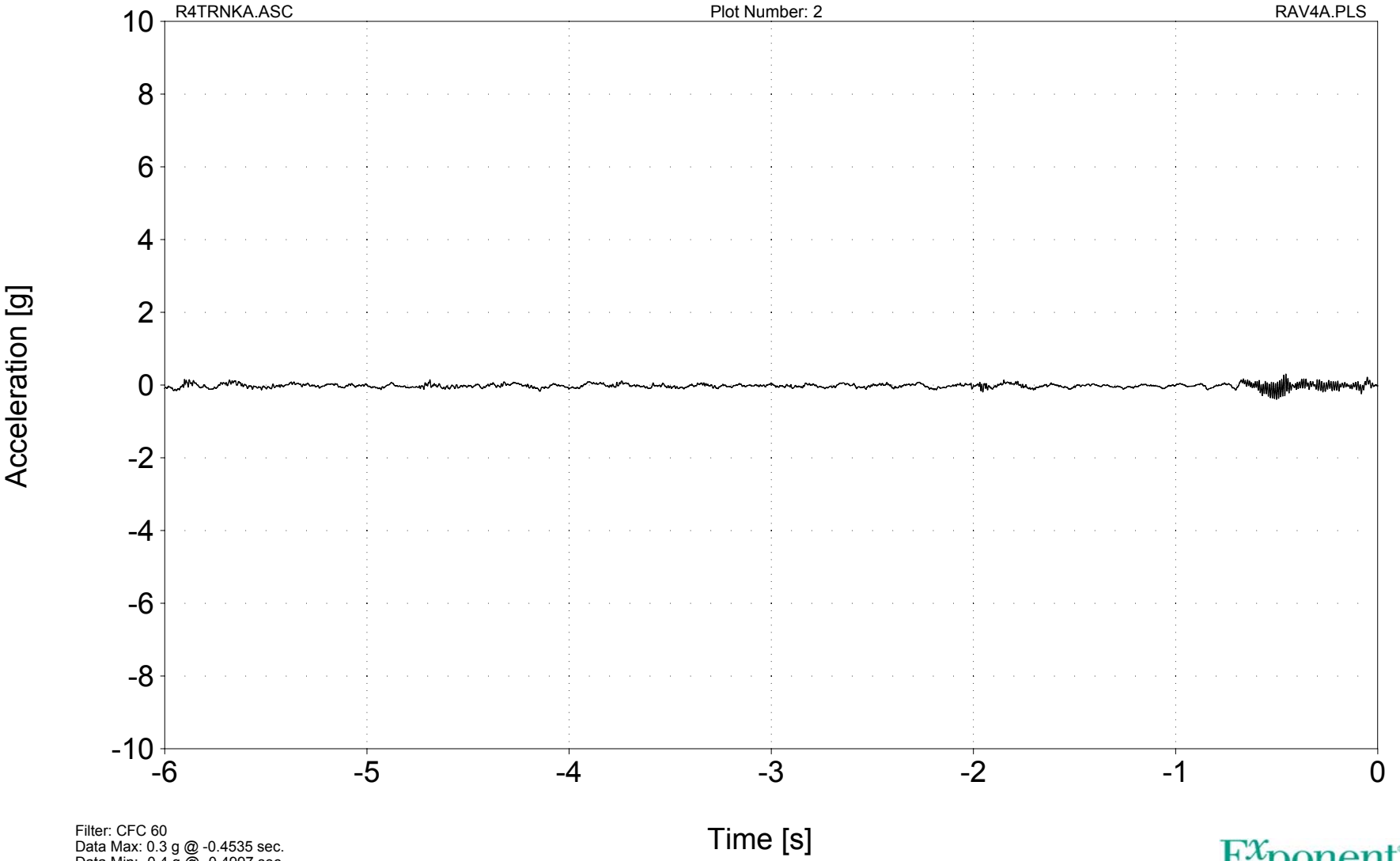
Lateral Acceleration v Time

Cargo Area
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 0.3 g @ -0.4535 sec.
Data Min: -0.4 g @ -0.4997 sec.

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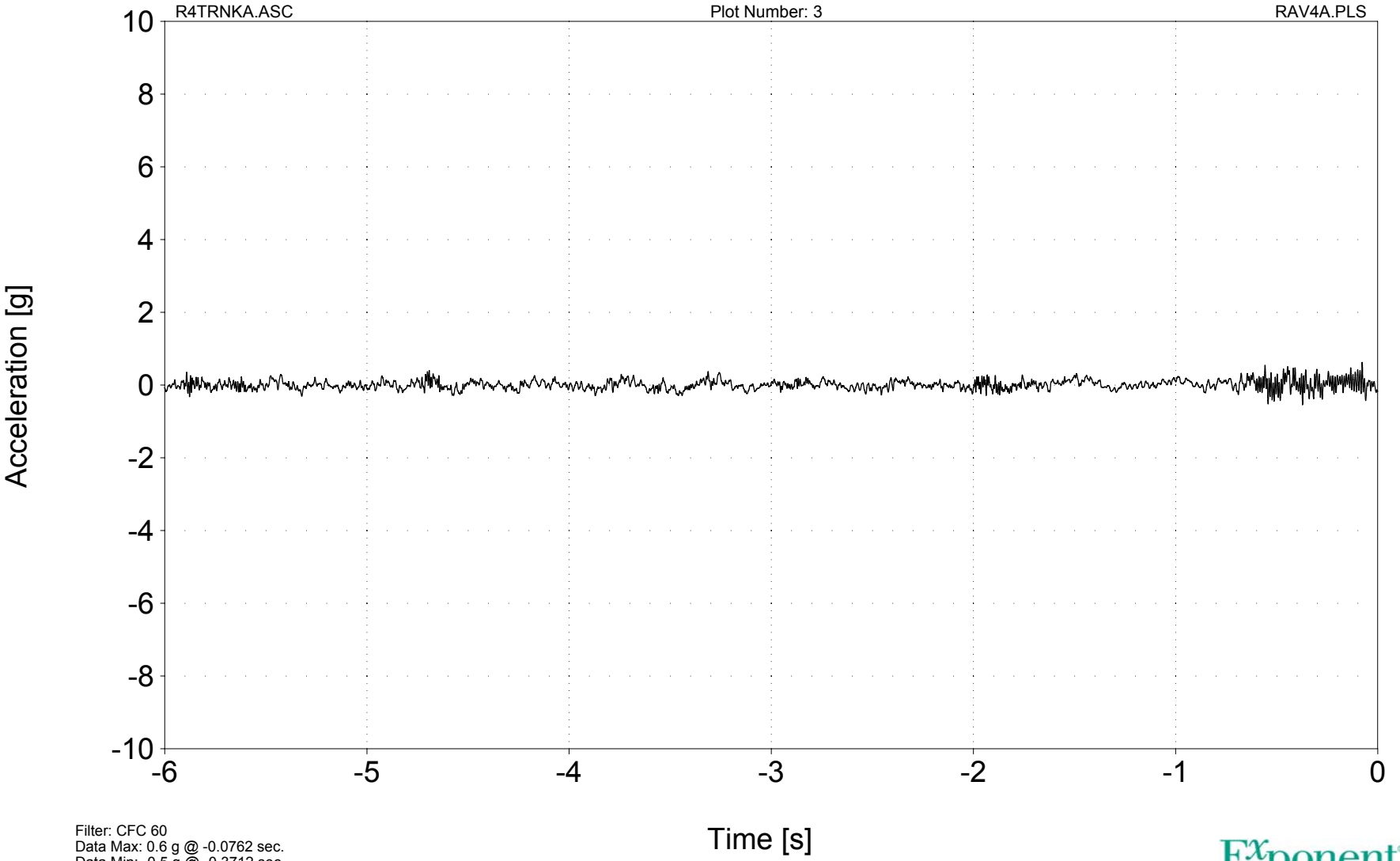
Failure Analysis Associates®

Vertical Acceleration v Time

Cargo Area
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 0.6 g @ -0.0762 sec.
Data Min: -0.5 g @ -0.3712 sec.

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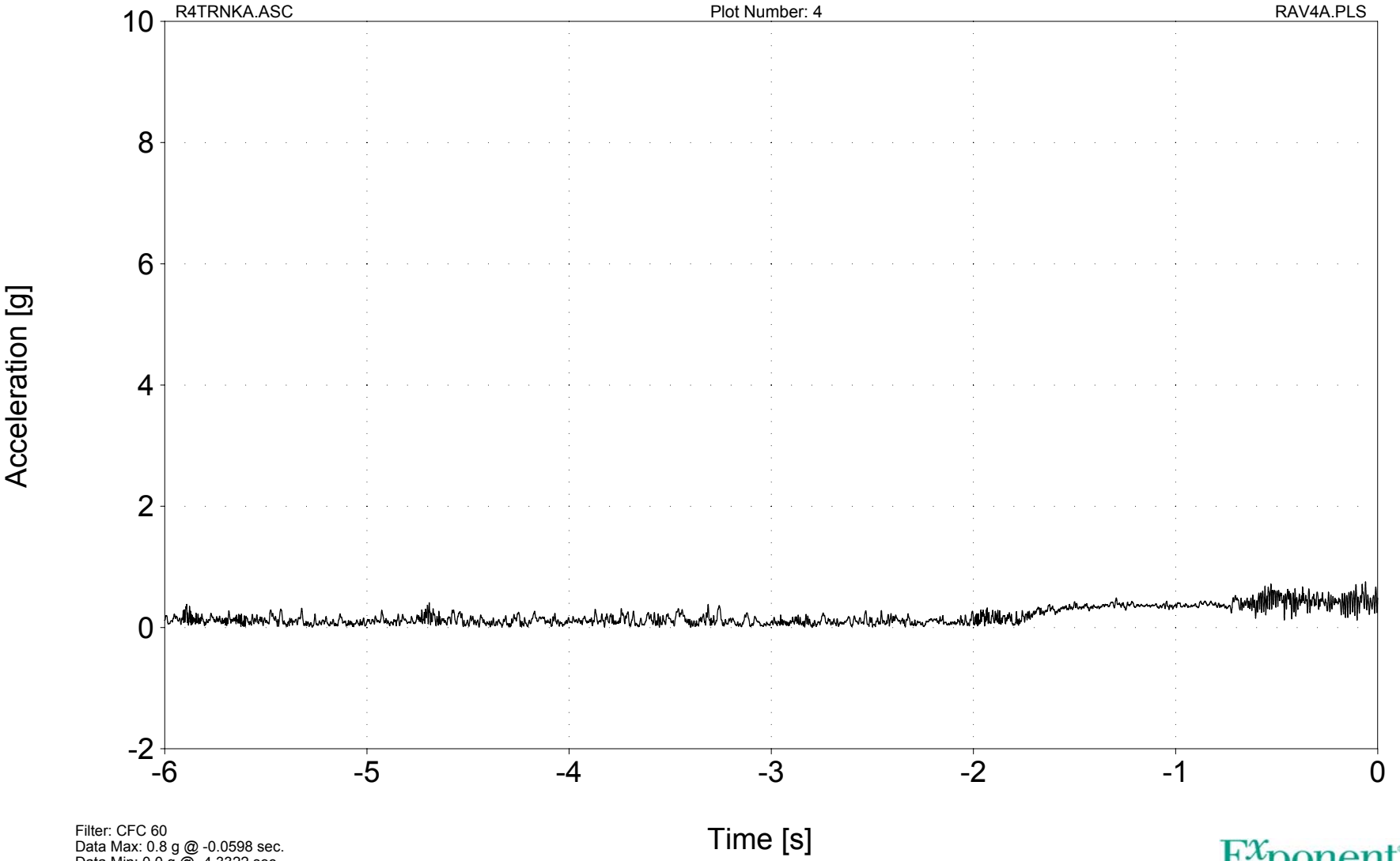
Resultant Acceleration v Time

Cargo Area
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 0.8 g @ -0.0598 sec.
Data Min: 0.0 g @ -4.3322 sec.

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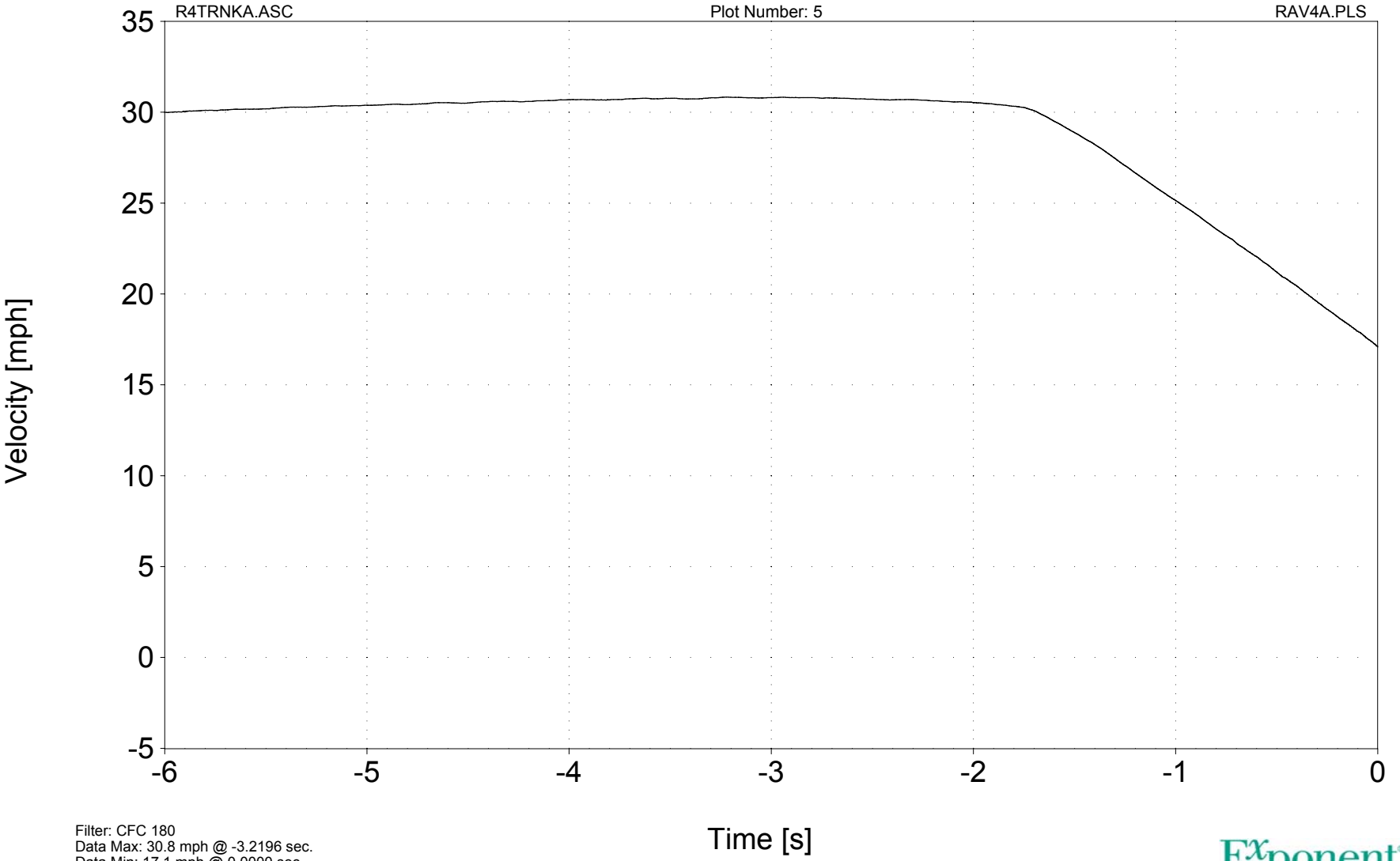
Failure Analysis Associates®

Longitudinal Velocity v Time

Cargo Area
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 30.8 mph @ -3.2196 sec.
Data Min: 17.1 mph @ 0.0000 sec.

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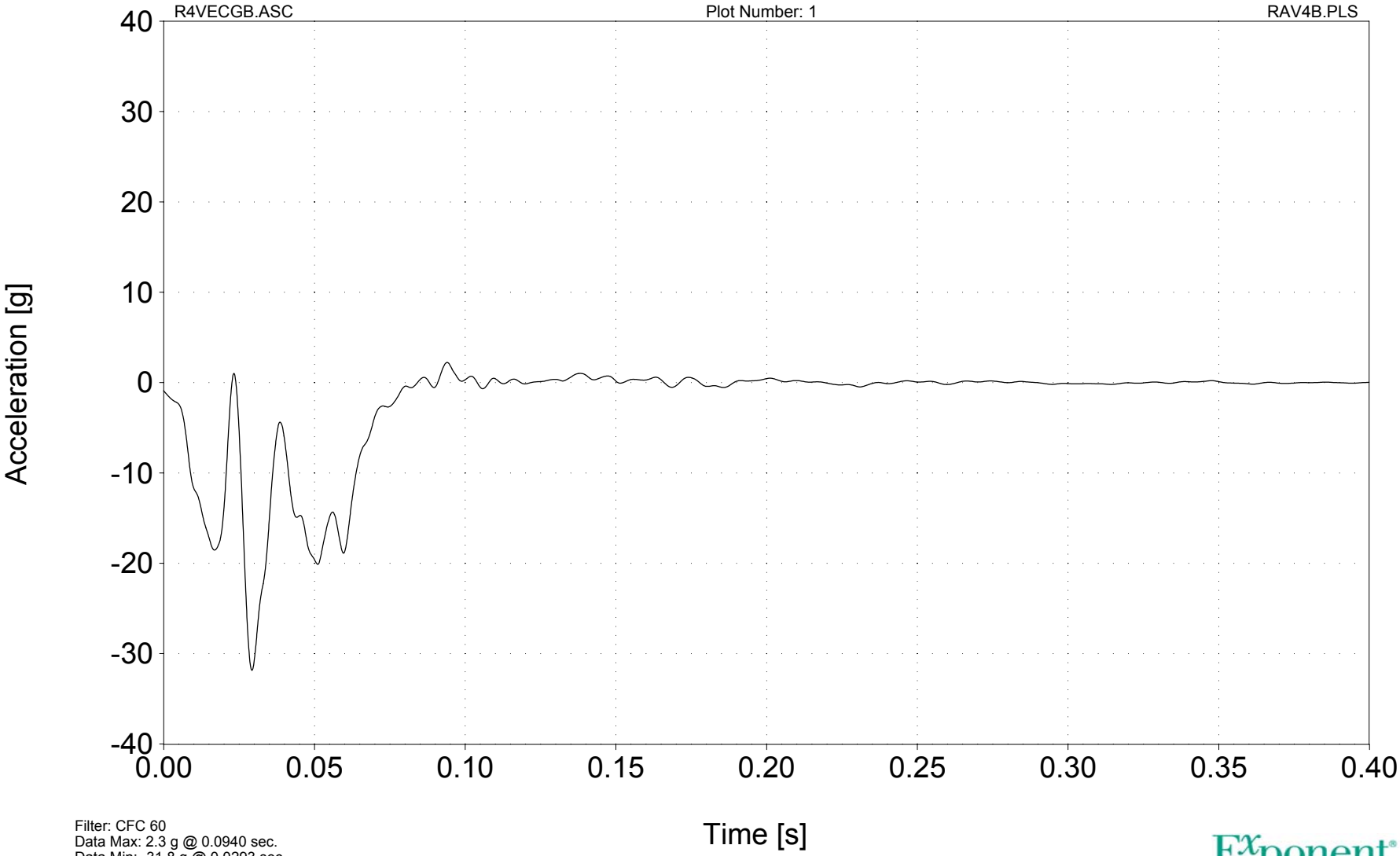
Longitudinal Acceleration v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 2.3 g @ 0.0940 sec.
Data Min: -31.8 g @ 0.0293 sec.

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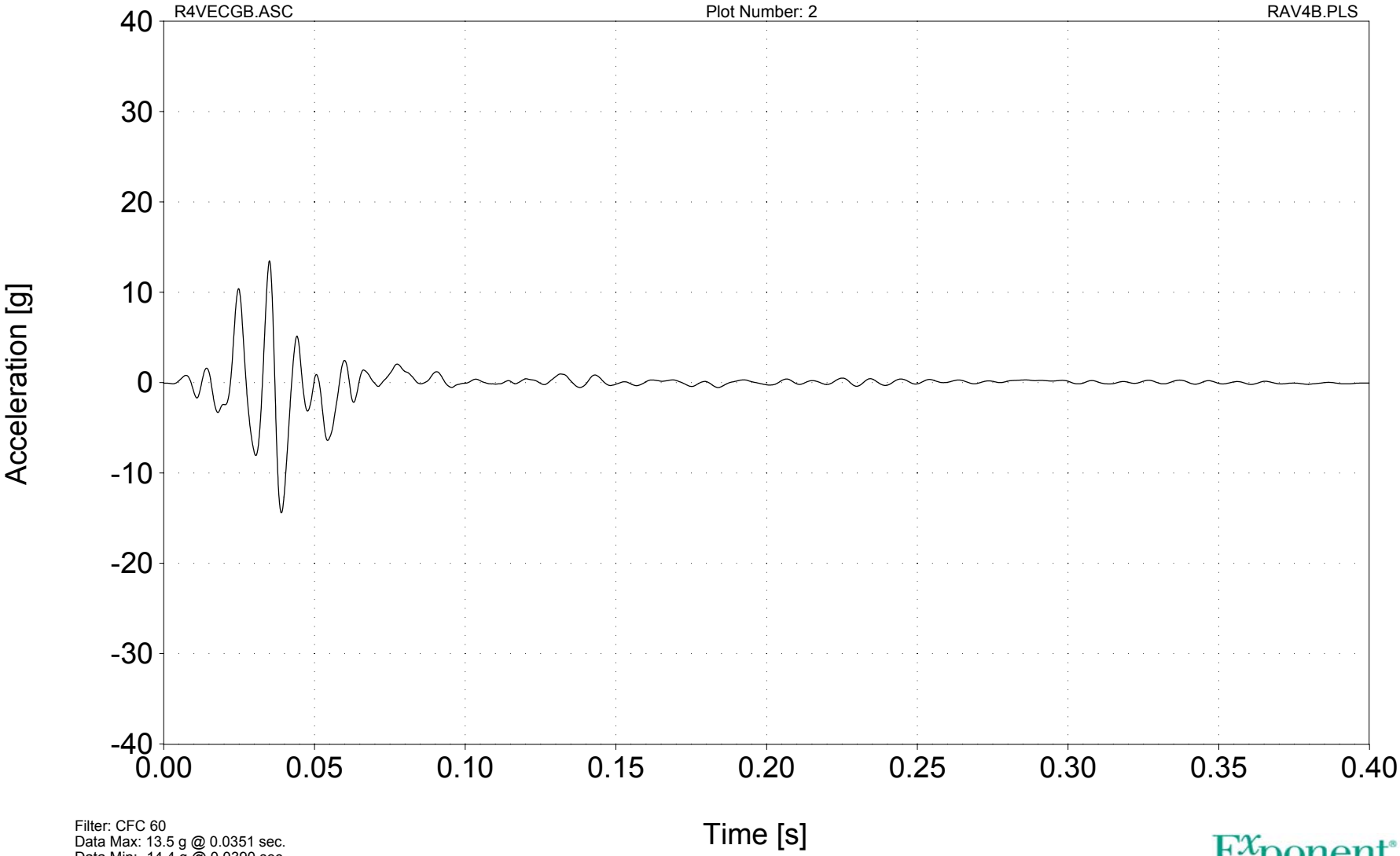
Lateral Acceleration v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 13.5 g @ 0.0351 sec.
Data Min: -14.4 g @ 0.0390 sec.

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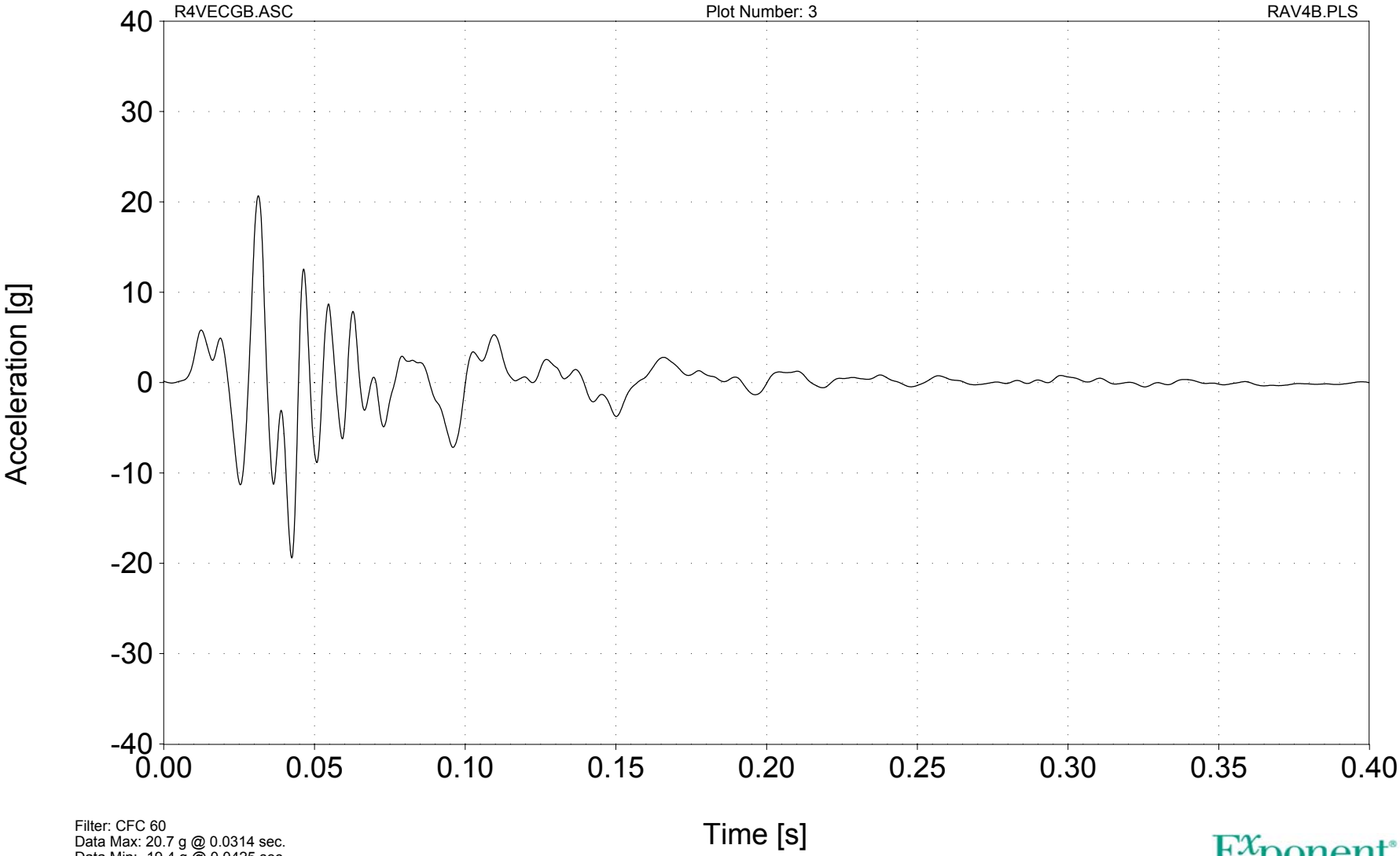
Vertical Acceleration v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 20.7 g @ 0.0314 sec.
Data Min: -19.4 g @ 0.0425 sec.

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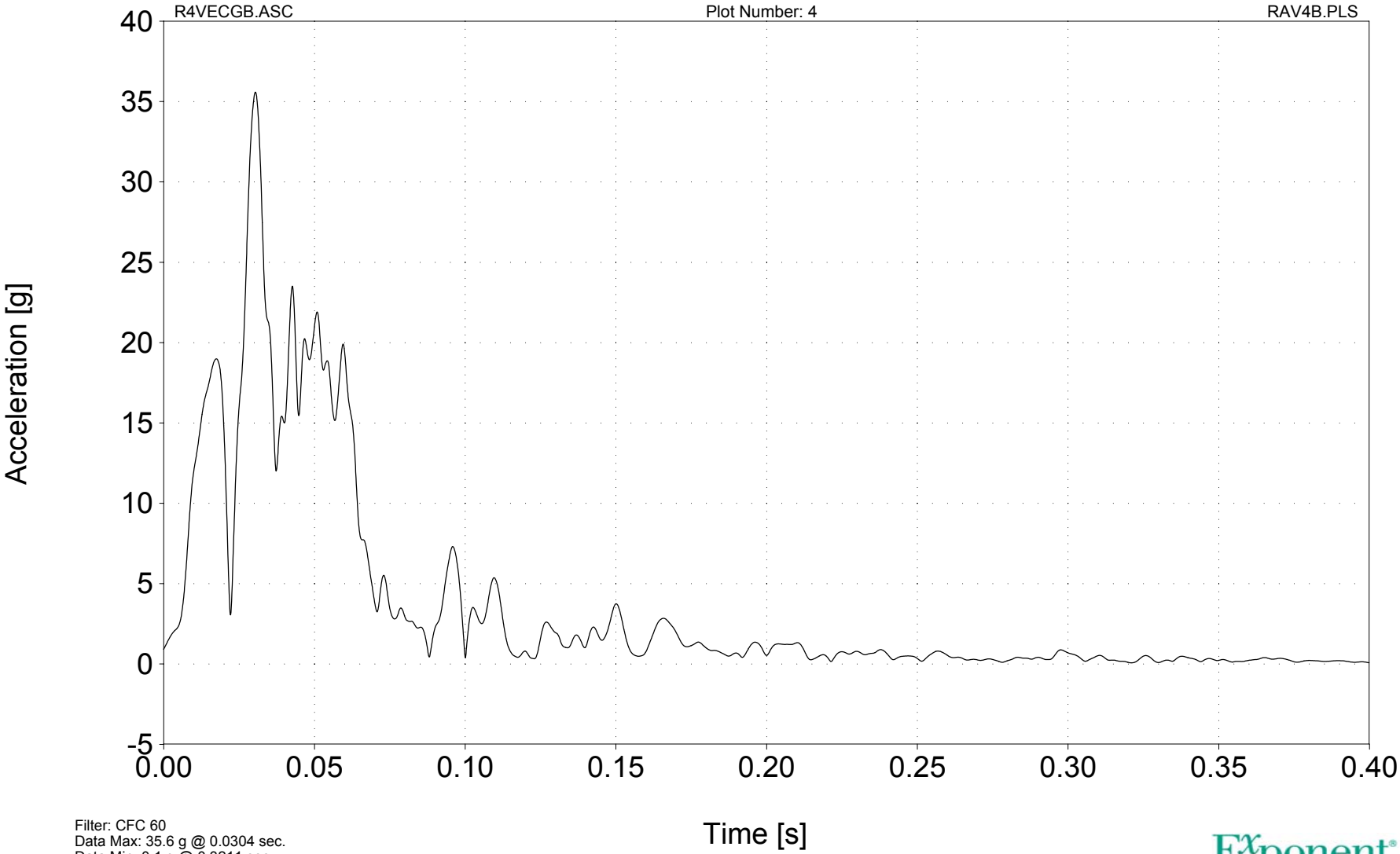
Resultant Acceleration v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 35.6 g @ 0.0304 sec.
Data Min: 0.1 g @ 0.3211 sec.

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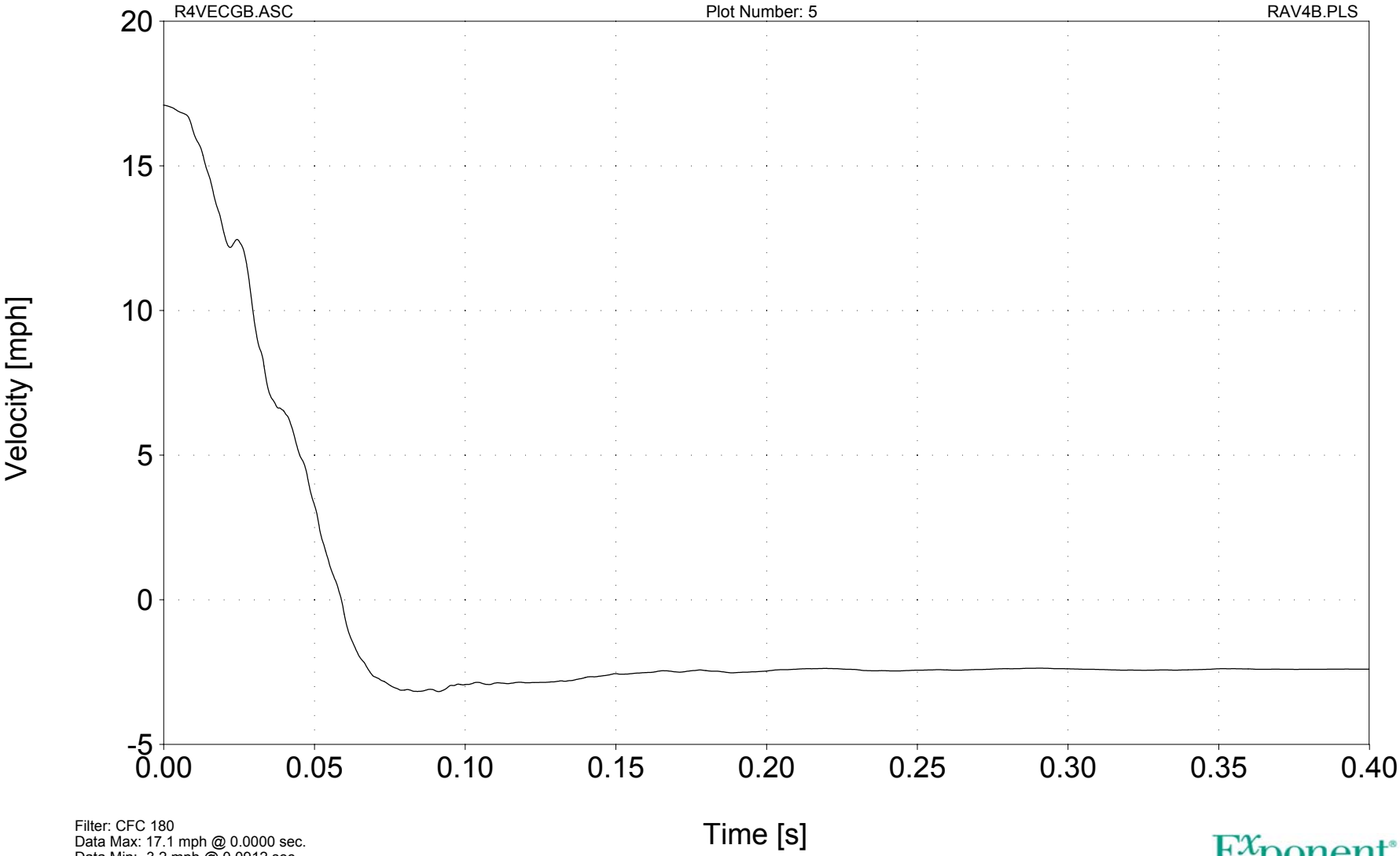
Longitudinal Velocity v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 17.1 mph @ 0.0000 sec.
Data Min: -3.2 mph @ 0.0912 sec.

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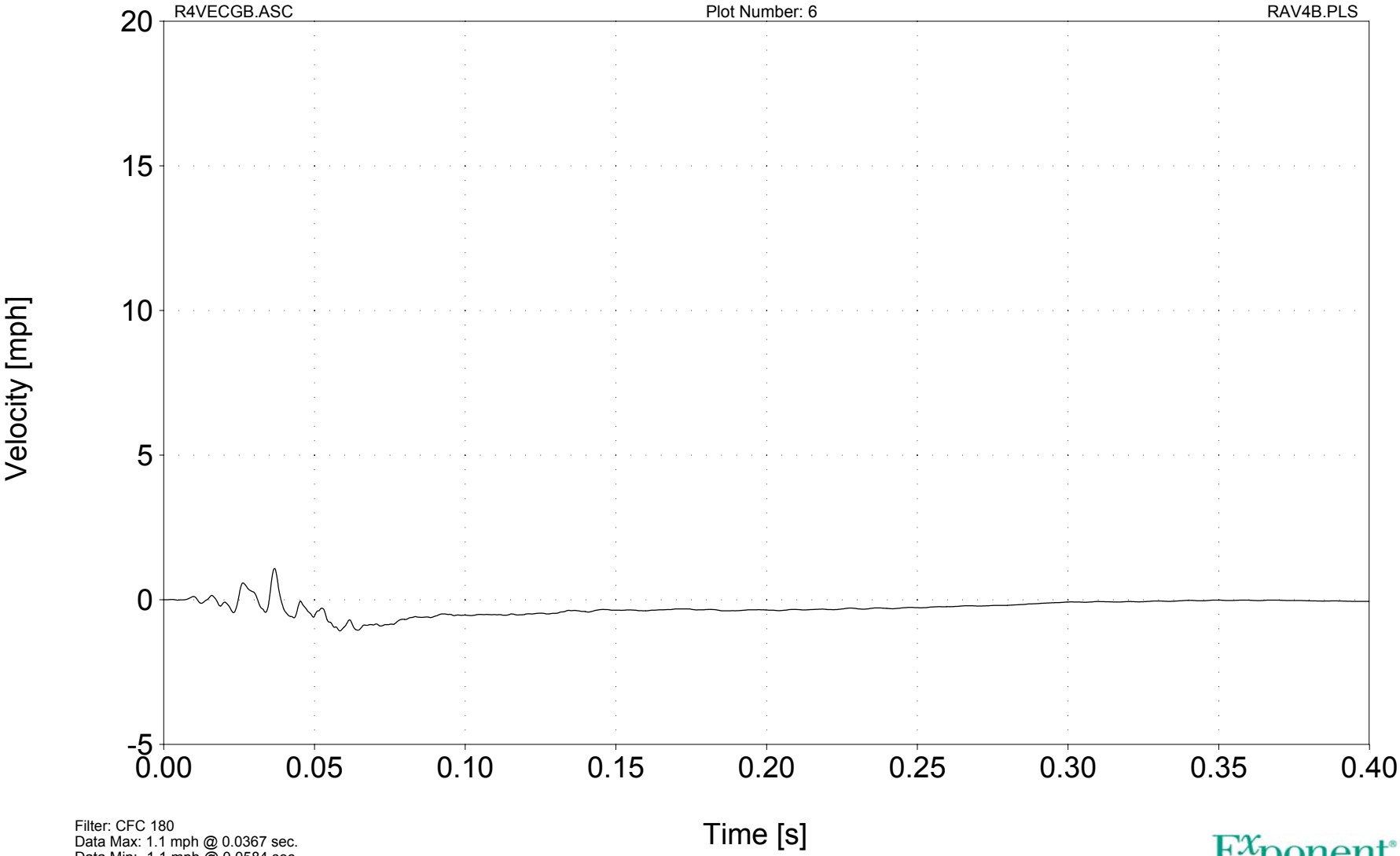
Lateral Velocity v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 1.1 mph @ 0.0367 sec.
Data Min: -1.1 mph @ 0.0584 sec.

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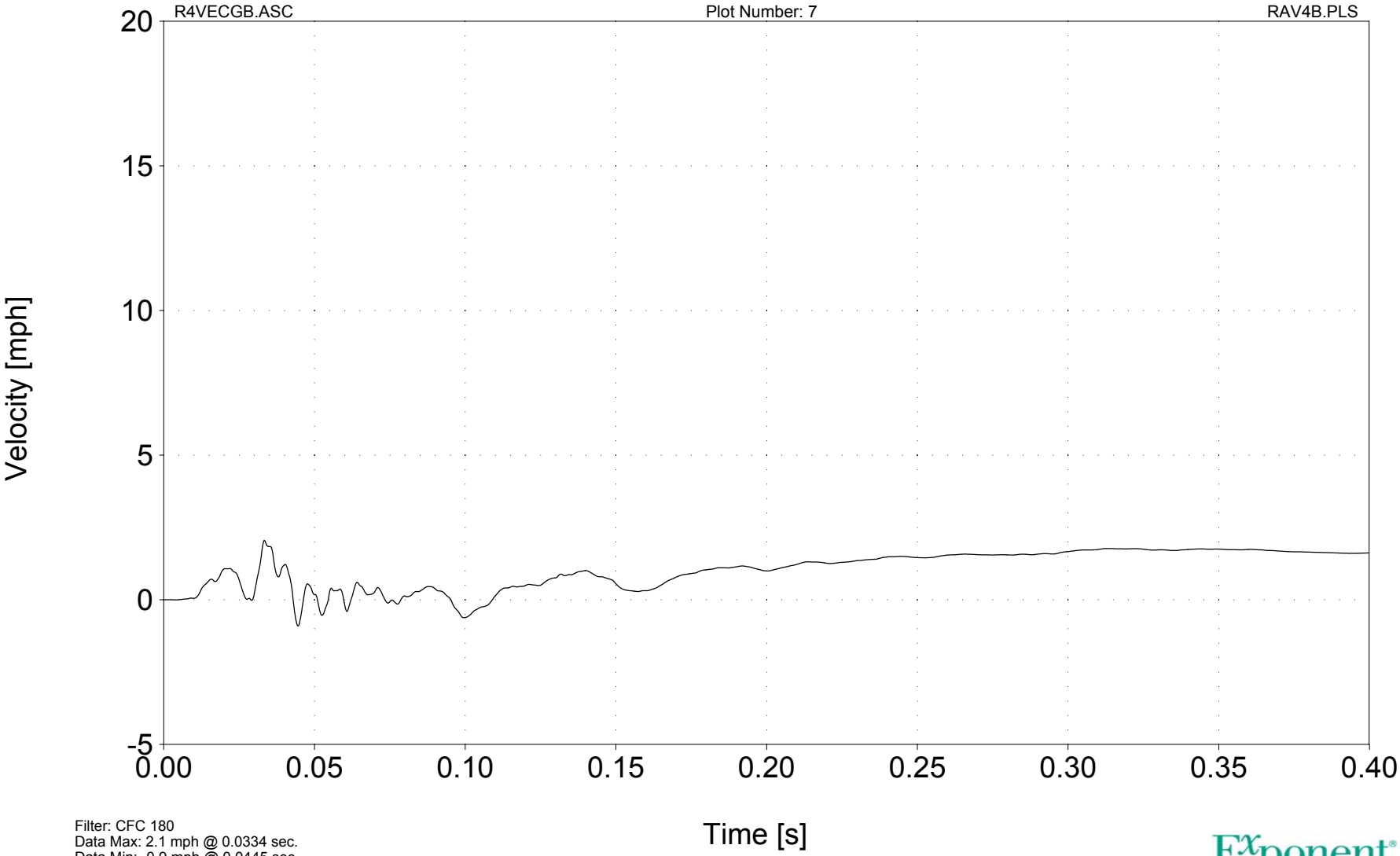
Vertical Velocity v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 2.1 mph @ 0.0334 sec.
Data Min: -0.9 mph @ 0.0445 sec.

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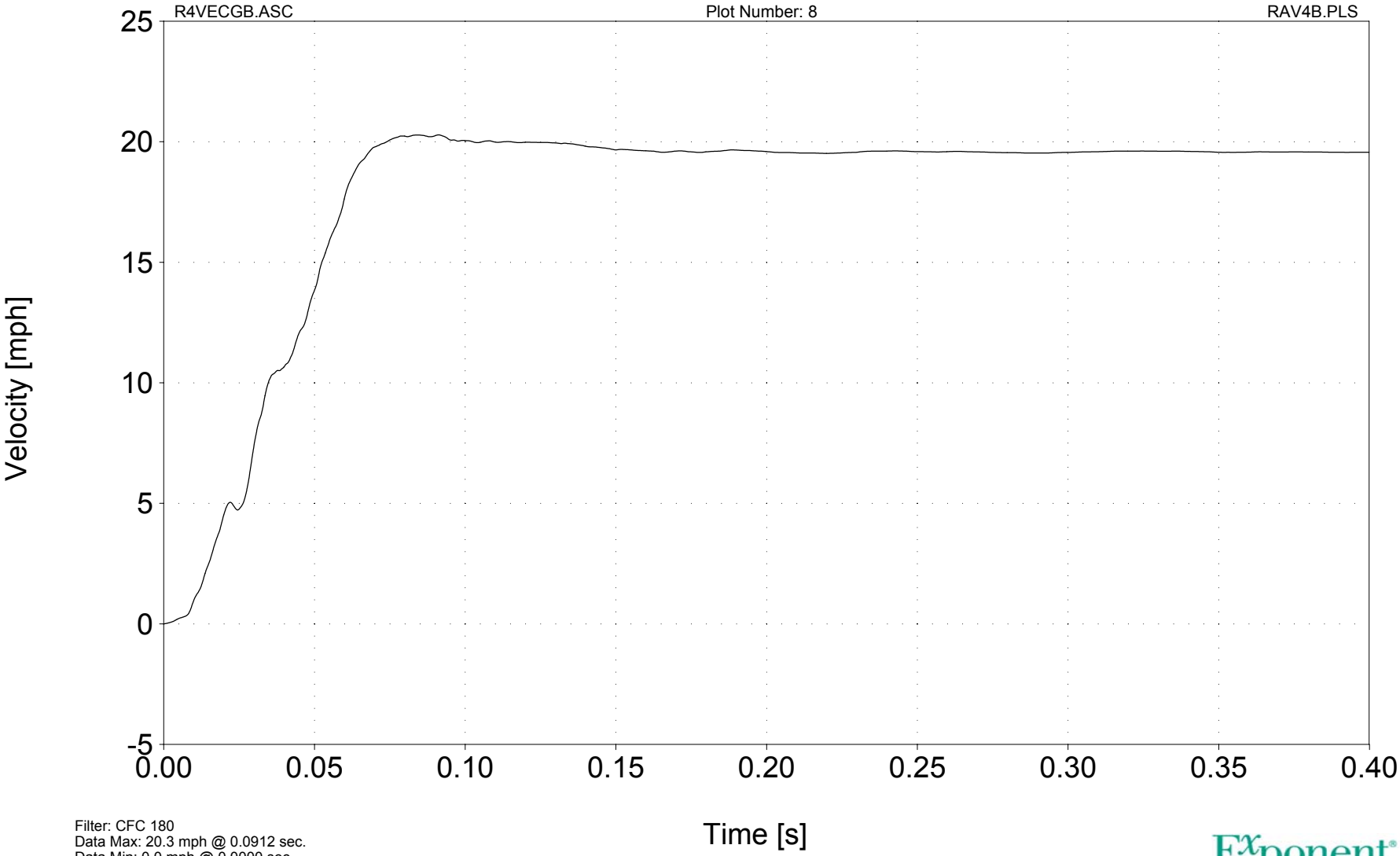
Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 20.3 mph @ 0.0912 sec.
Data Min: 0.0 mph @ 0.0000 sec.

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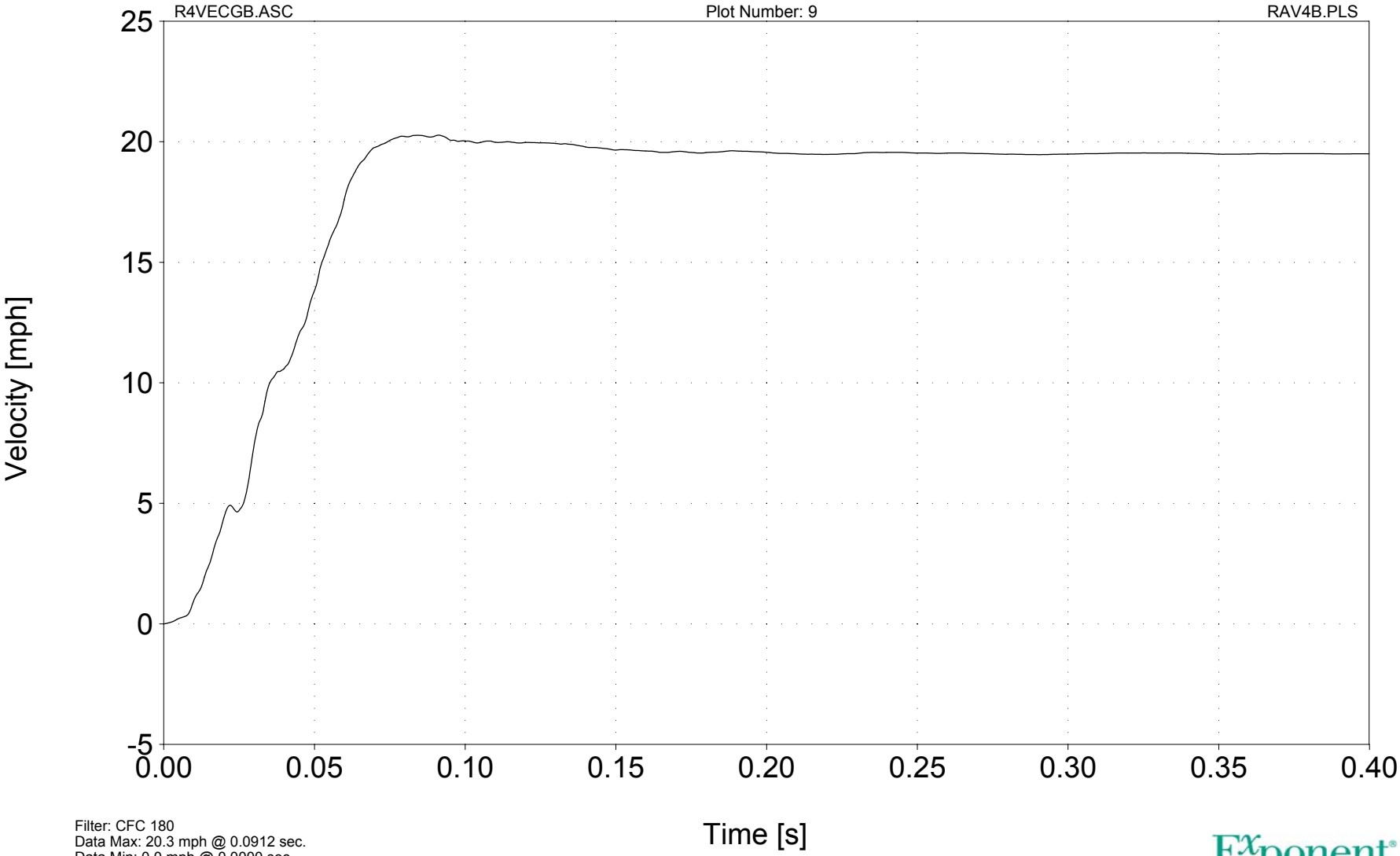
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 20.3 mph @ 0.0912 sec.
Data Min: 0.0 mph @ 0.0000 sec.

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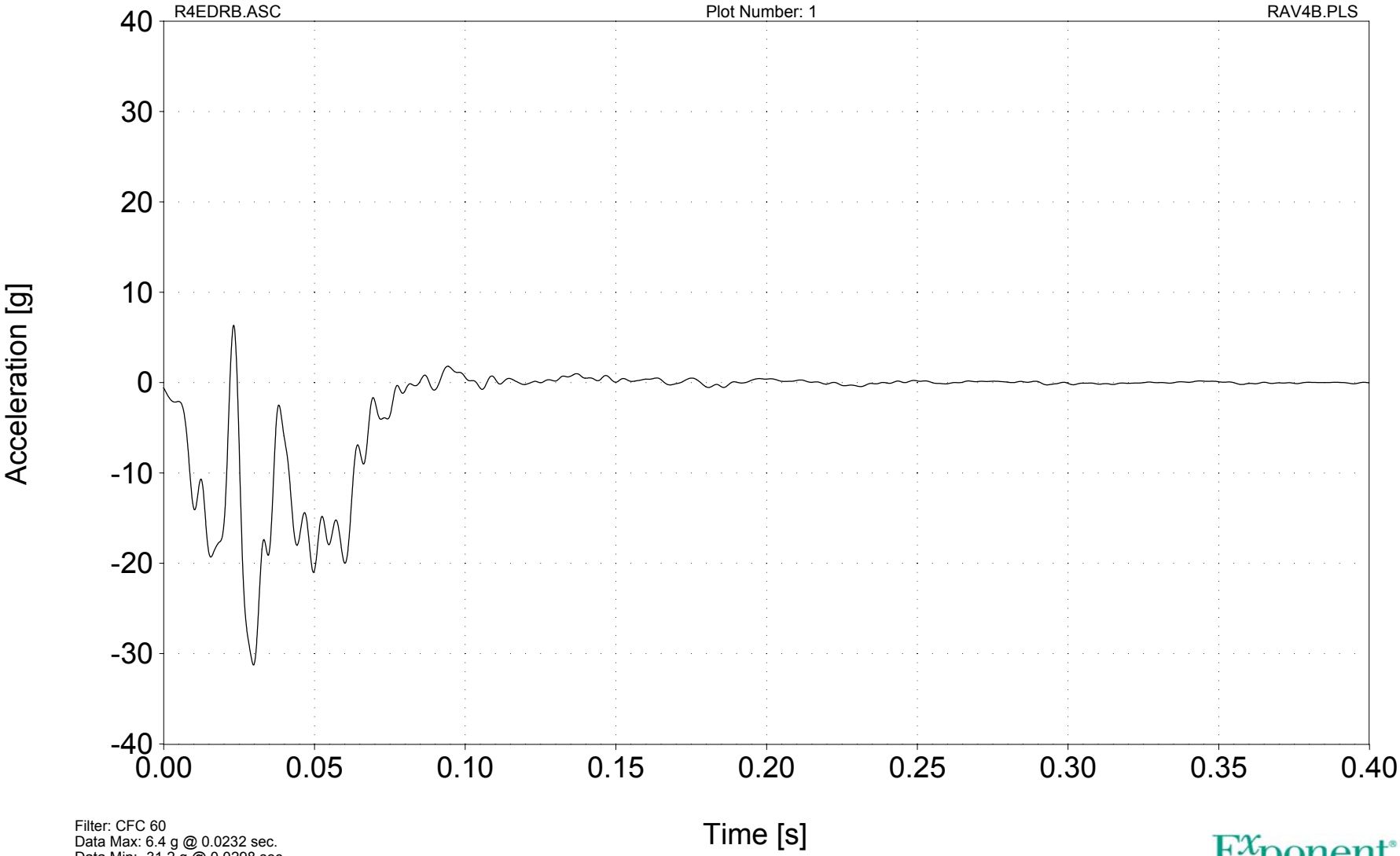
Longitudinal Acceleration v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 6.4 g @ 0.0232 sec.
Data Min: -31.2 g @ 0.0298 sec.

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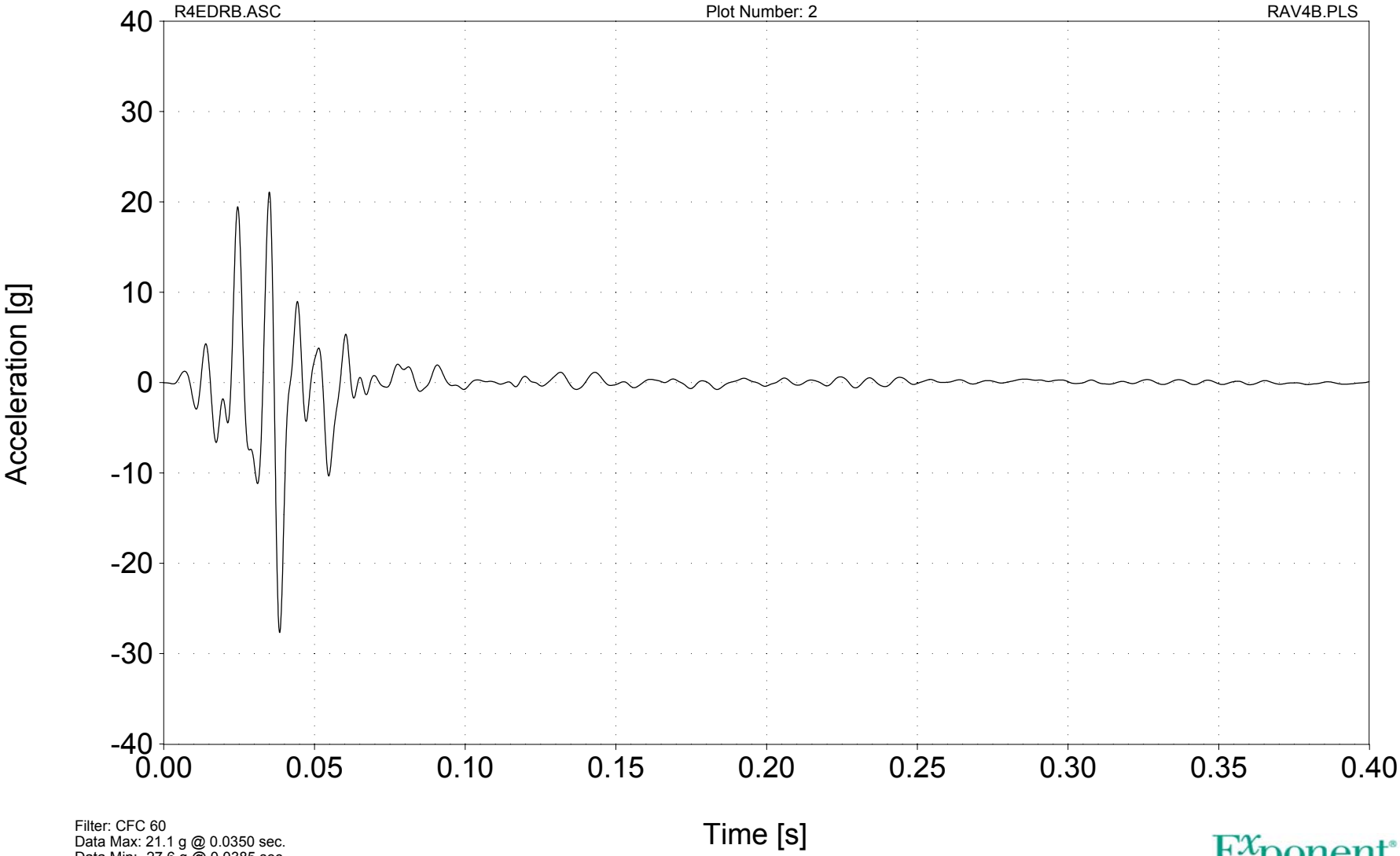
Lateral Acceleration v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 21.1 g @ 0.0350 sec.
Data Min: -27.6 g @ 0.0385 sec.

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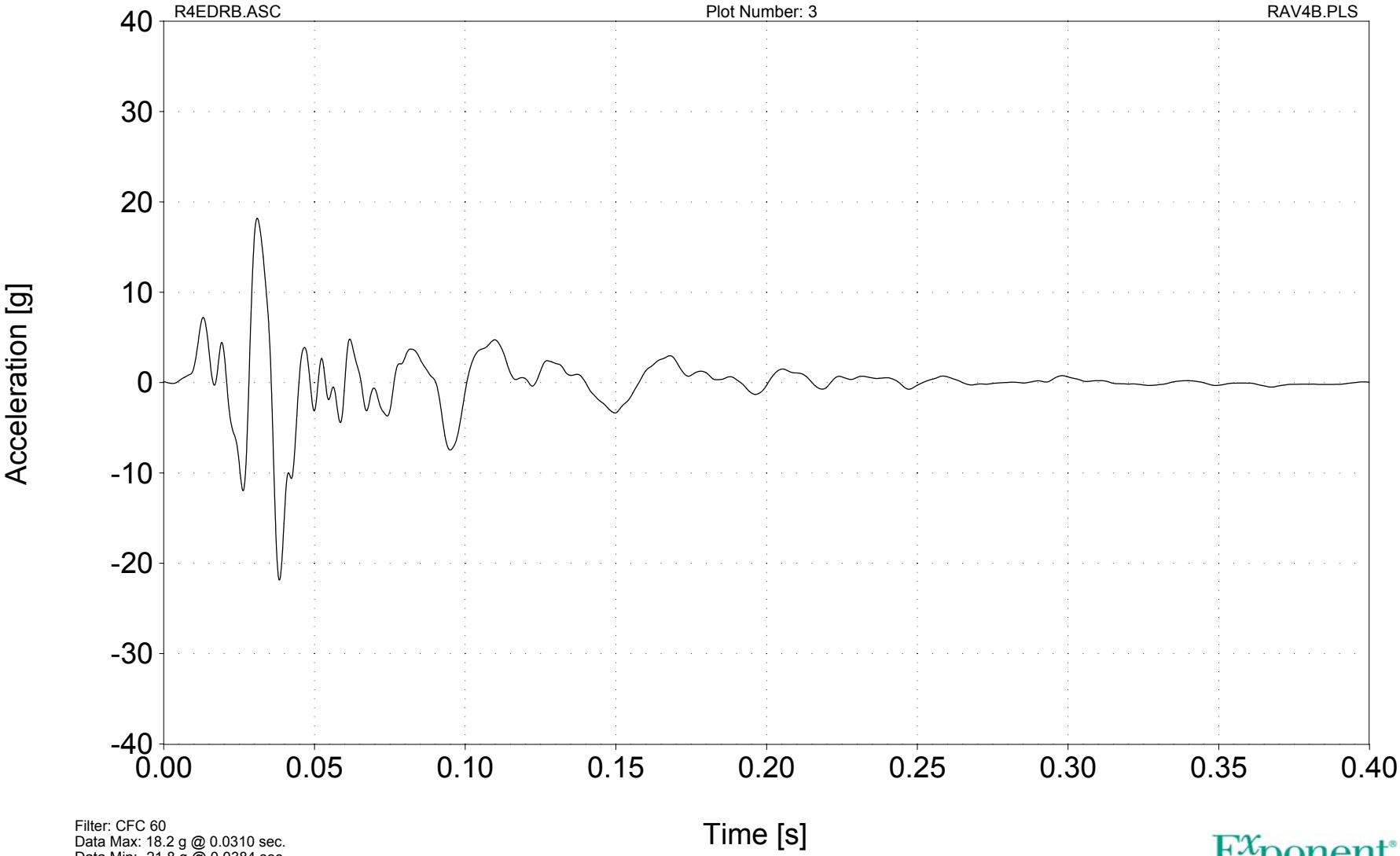
Vertical Acceleration v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 18.2 g @ 0.0310 sec.
Data Min: -21.8 g @ 0.0384 sec.

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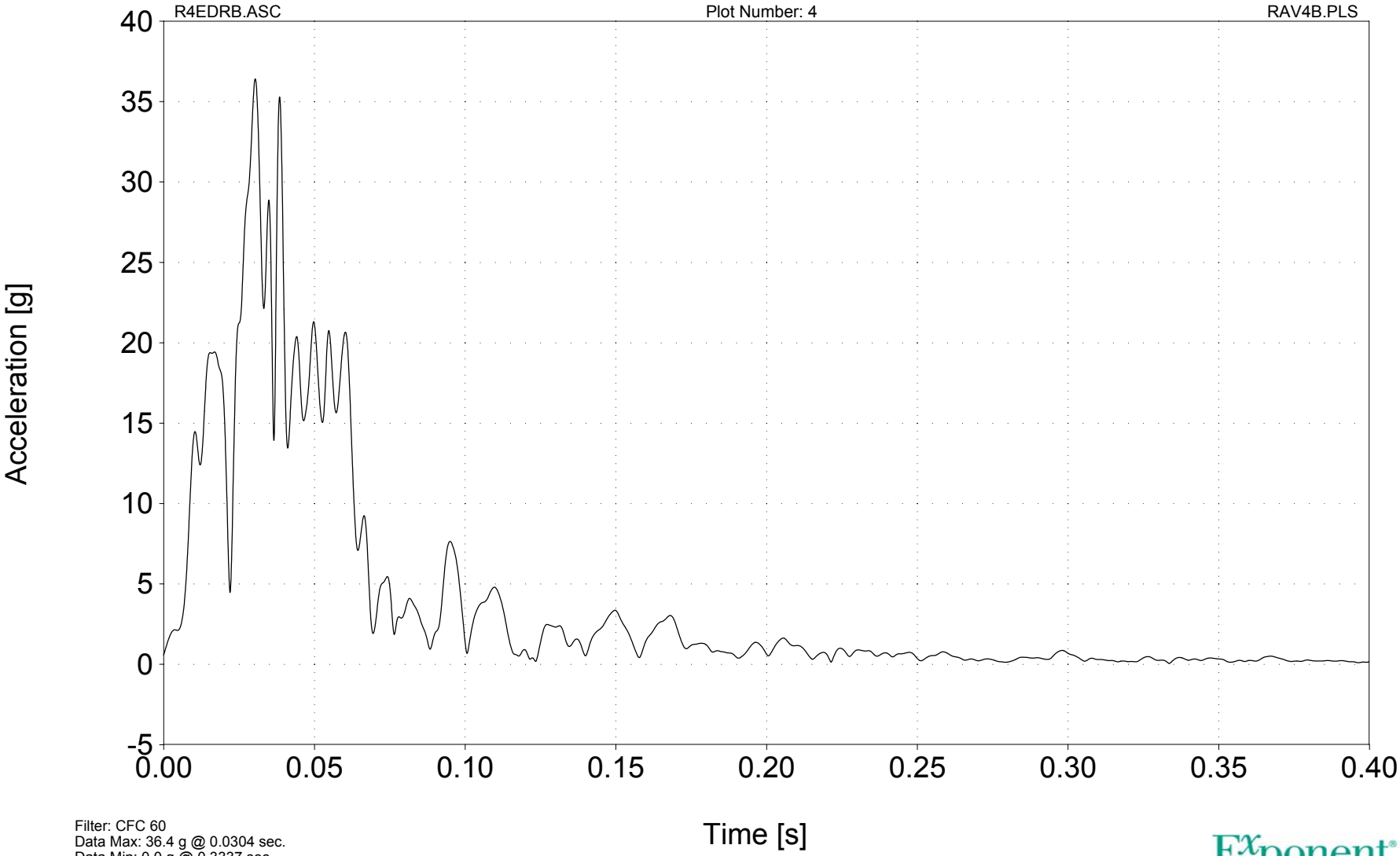
Resultant Acceleration v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 60
Data Max: 36.4 g @ 0.0304 sec.
Data Min: 0.0 g @ 0.3337 sec.

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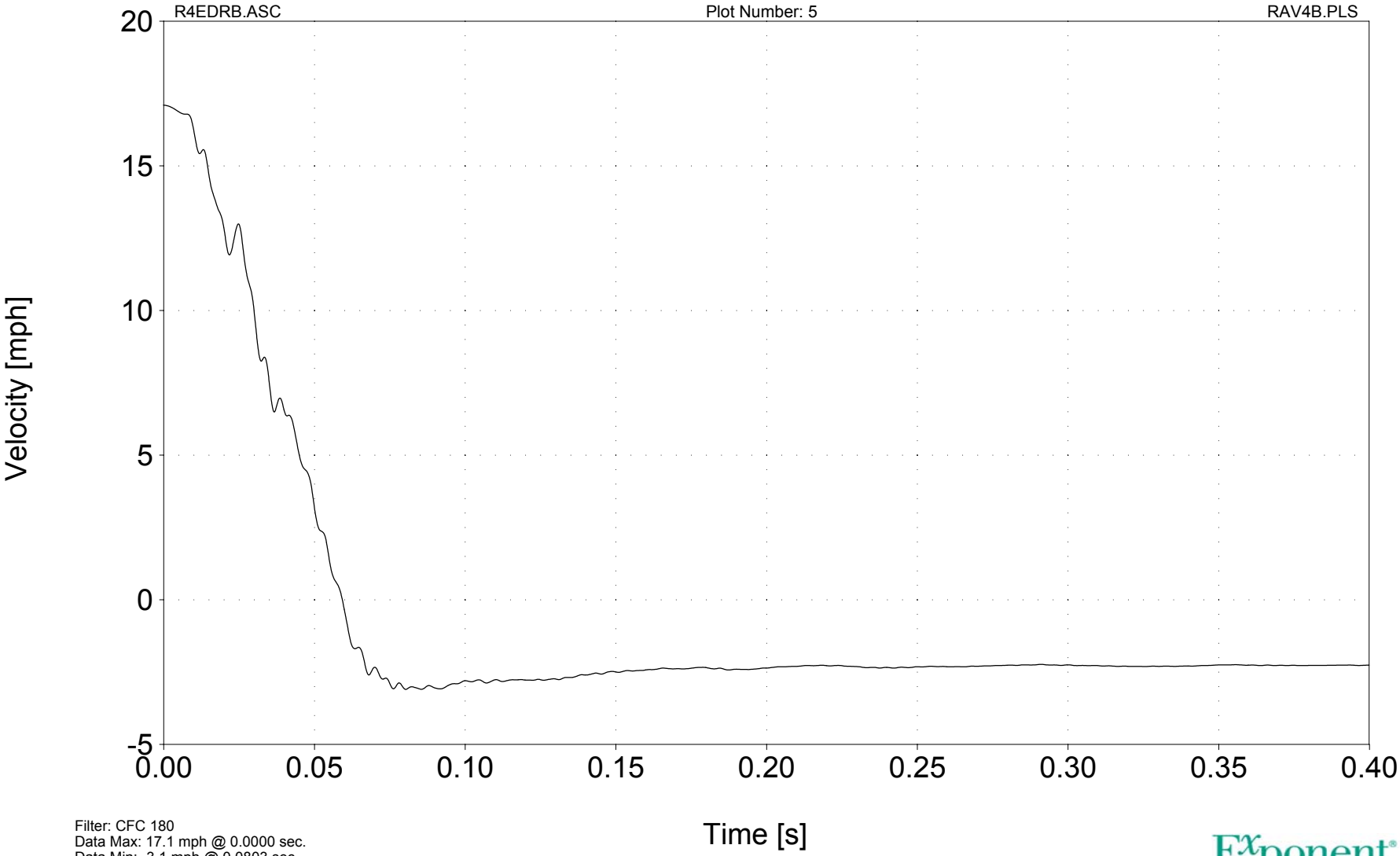
Longitudinal Velocity v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 17.1 mph @ 0.0000 sec.
Data Min: -3.1 mph @ 0.0803 sec.

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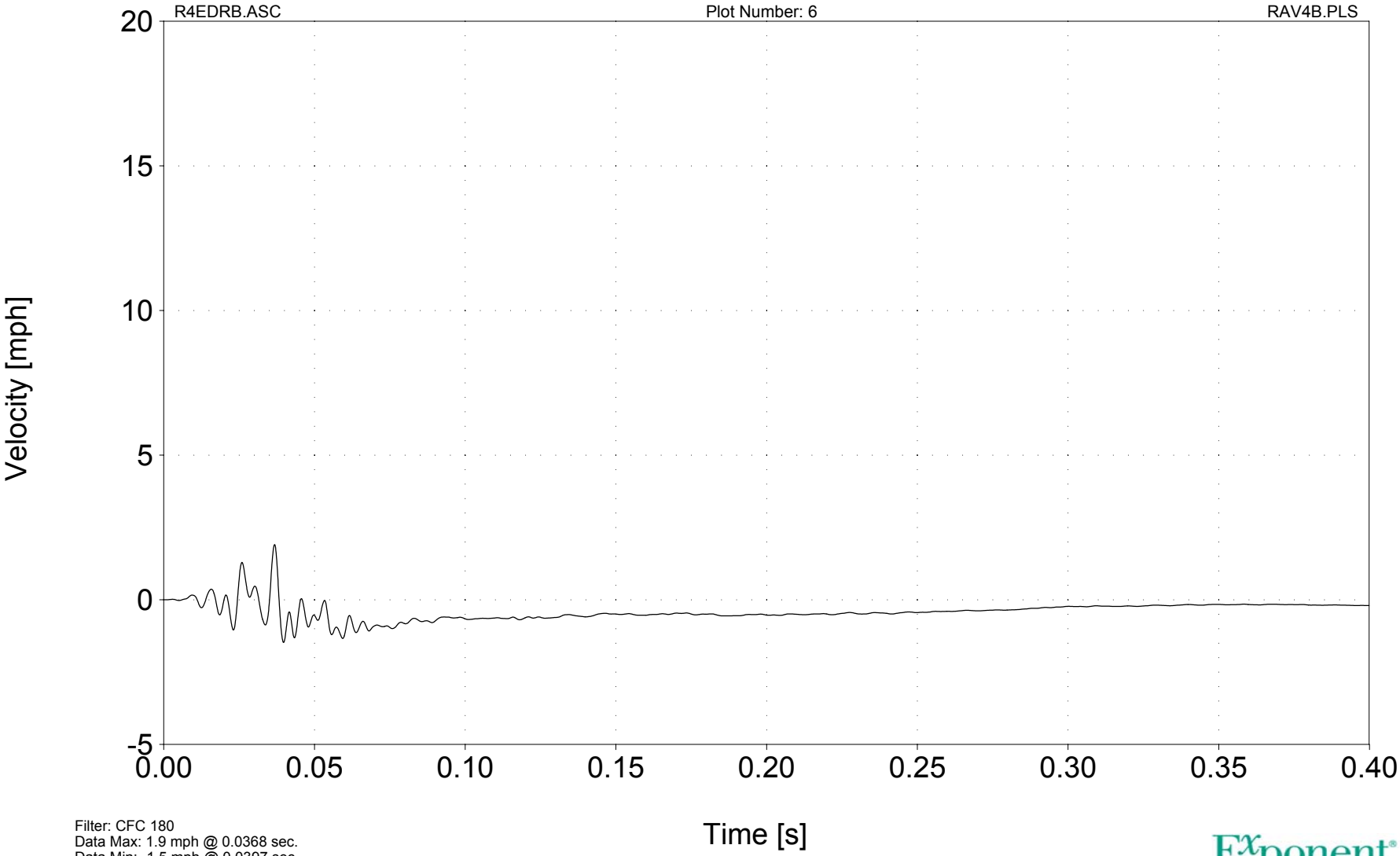
Lateral Velocity v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 1.9 mph @ 0.0368 sec.
Data Min: -1.5 mph @ 0.0397 sec.

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0907698

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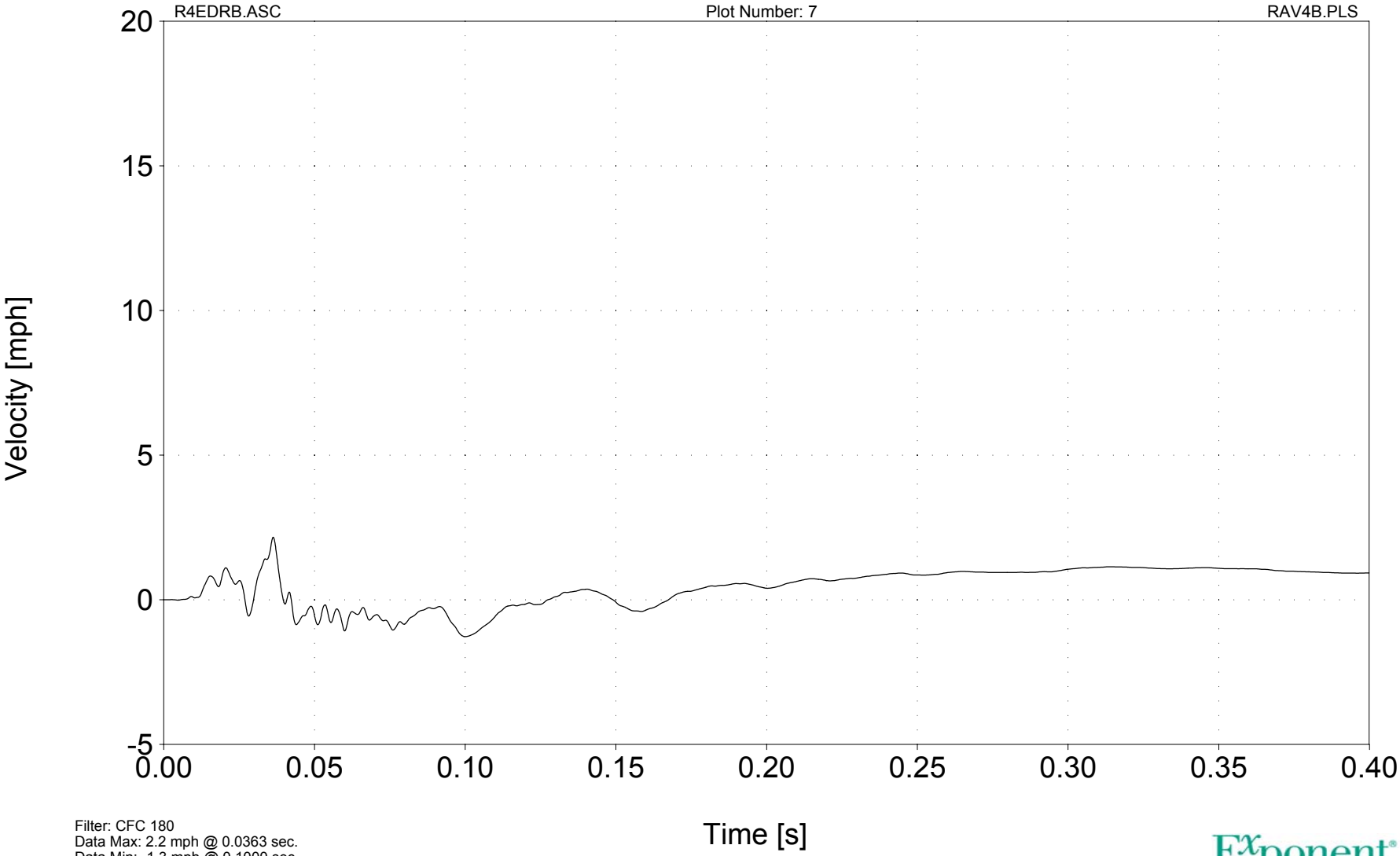
Vertical Velocity v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 2.2 mph @ 0.0363 sec.
Data Min: -1.3 mph @ 0.1000 sec.

Toyota Consulting
0907698

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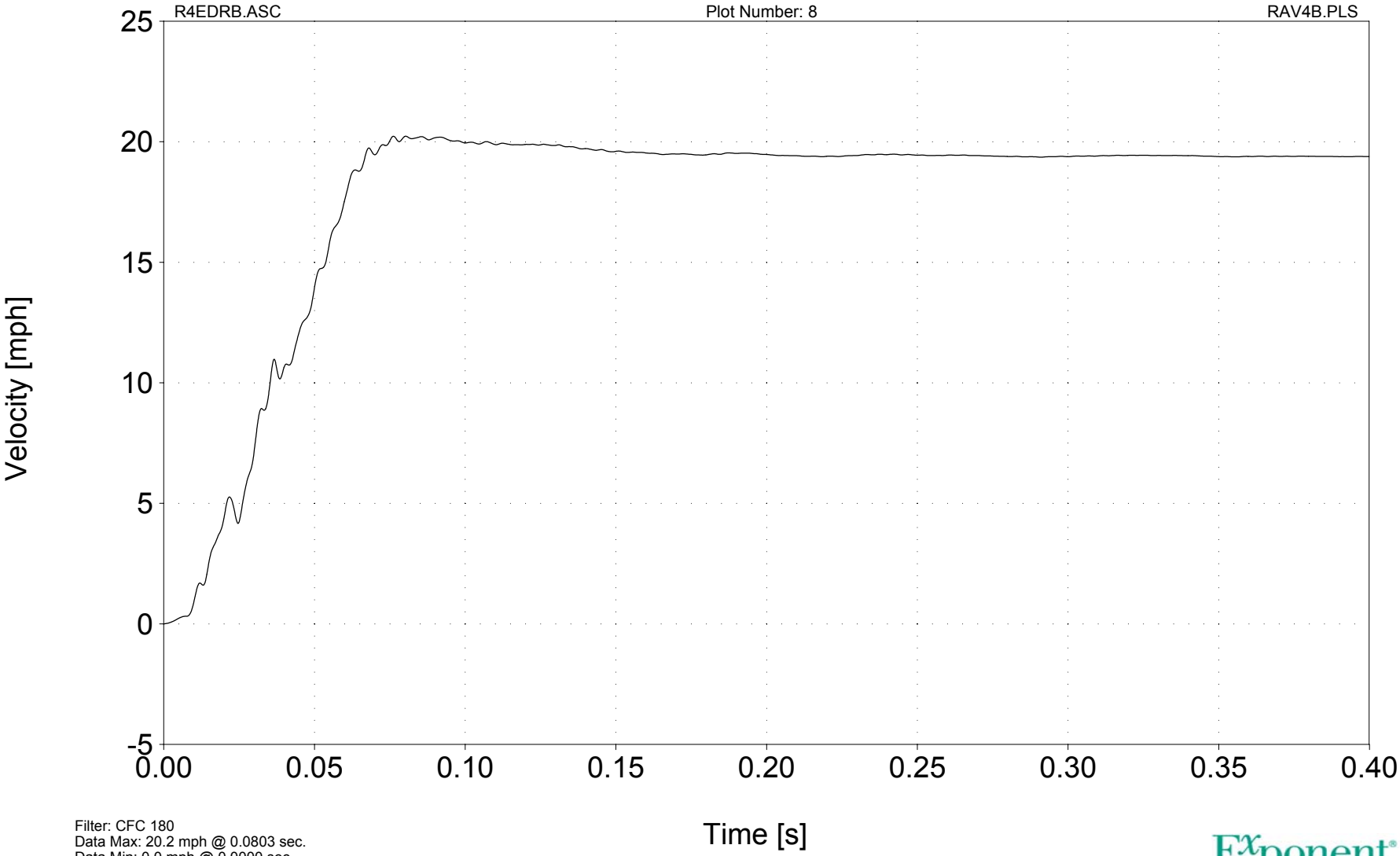
Delta Velocity v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 20.2 mph @ 0.0803 sec.
Data Min: 0.0 mph @ 0.0000 sec.

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0907698

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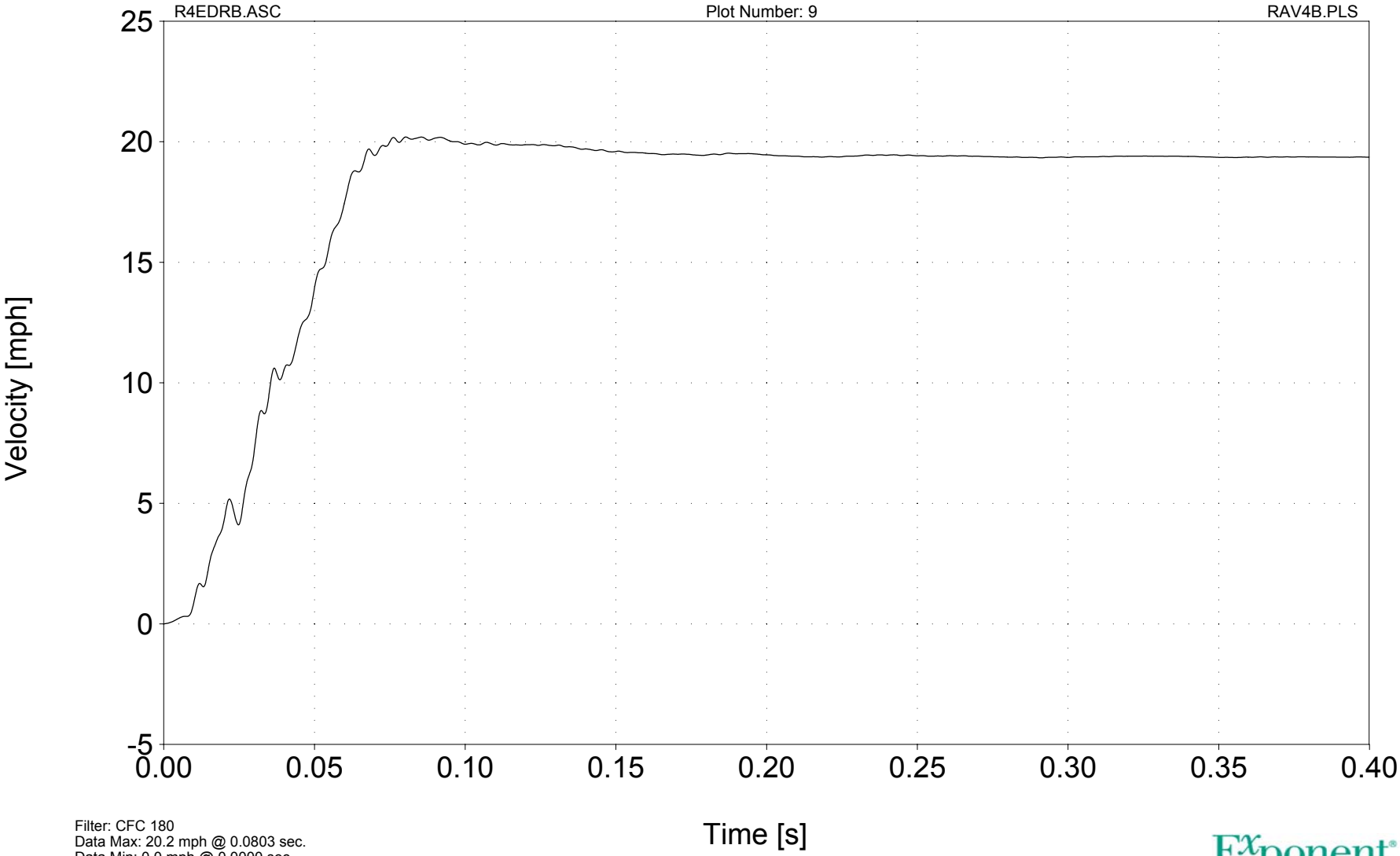
Failure Analysis Associates®

Longitudinal Delta Velocity v Time

EDR
2007 Toyota RAV4
Barrier Crash Test - 12/13/10



Filter: CFC 180
Data Max: 20.2 mph @ 0.0803 sec.
Data Min: 0.0 mph @ 0.0000 sec.

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0907698

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Failure Analysis Associates®

PHOTO DOCUMENTATION DATA SHEET

JOB NAME: TOYOTA BARRIER CRASH TESTING
JOB NUMBER: 0907698
DATE: 12/13/2010
LOCATION: TEC
PHOTOGRAPHER: DANIEL PETERSON
DIGITAL SEQUENCE: [A] [B] [C] [D] [E] [F] [G] [H] [I] [J]
[K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT: 2007 TOYOTA RAV4

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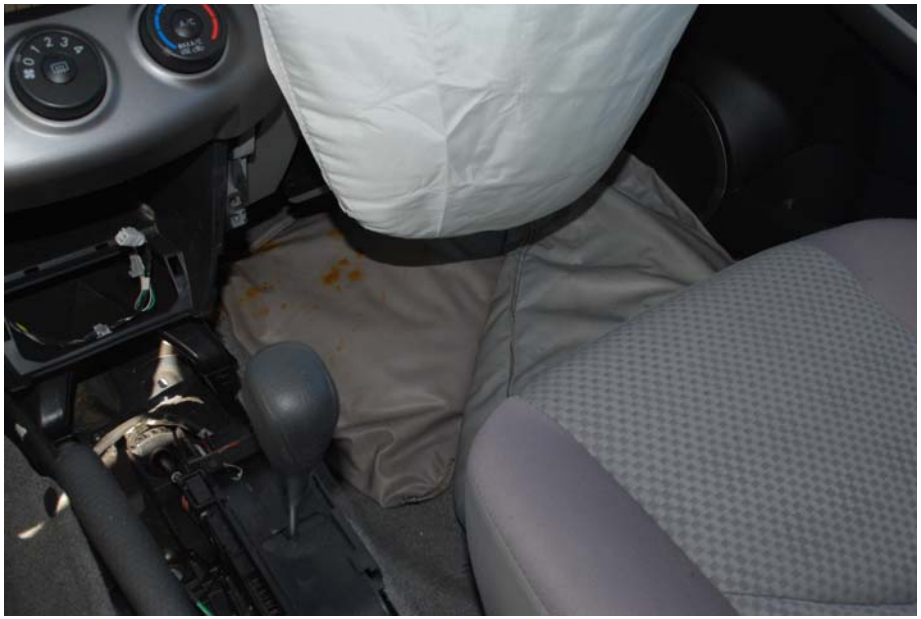

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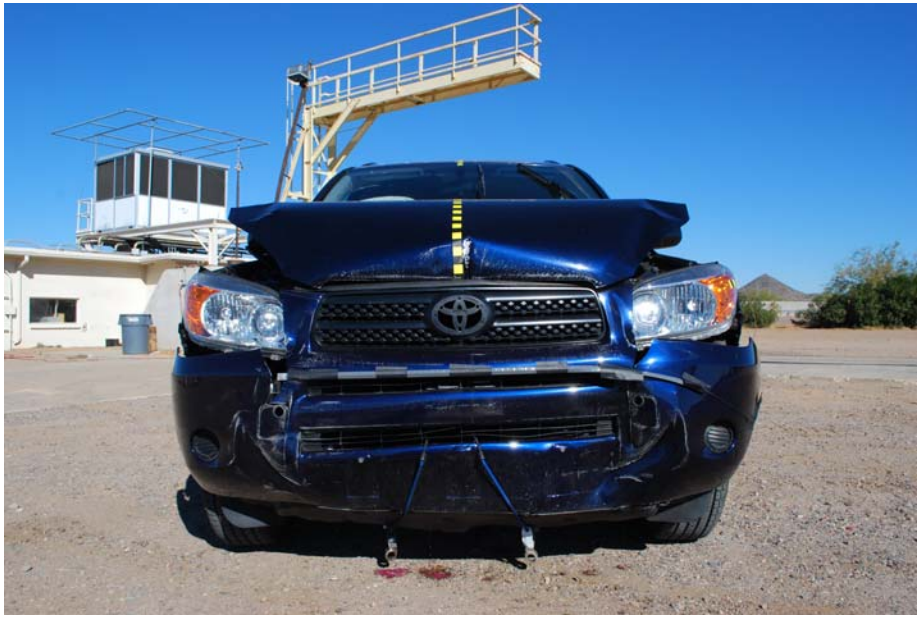

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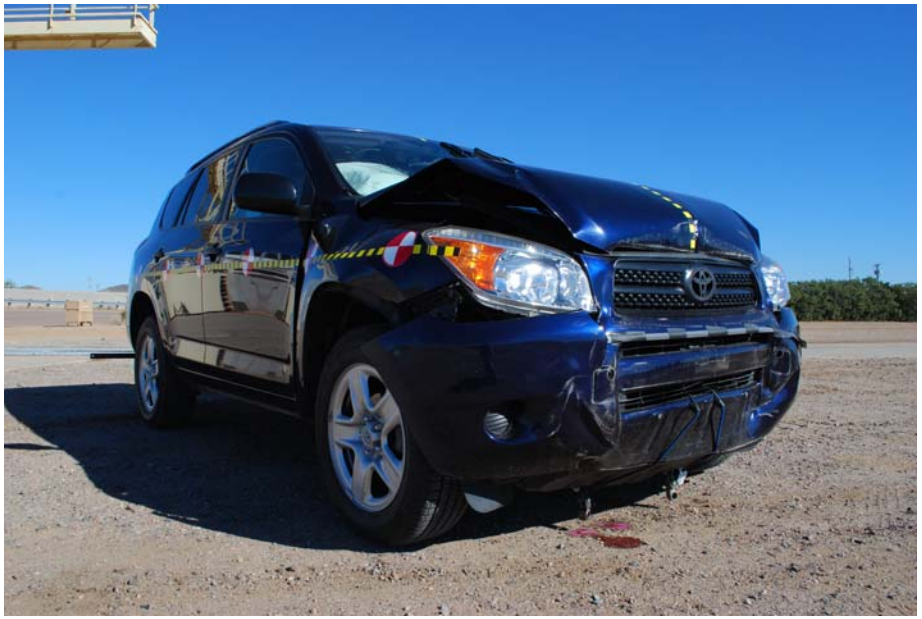

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Failure Analysis Associates

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Appendix F

Barrier Crash Test, 2007 Toyota Tundra, December 14, 2010

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2007 Toyota Tundra

Toyota Consulting
0907698

December 14, 2010

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2007 Toyota Tundra

Toyota Consulting
0907698

December 14, 2010

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

December 2010

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/1210/R564

Exponent®

Test Description

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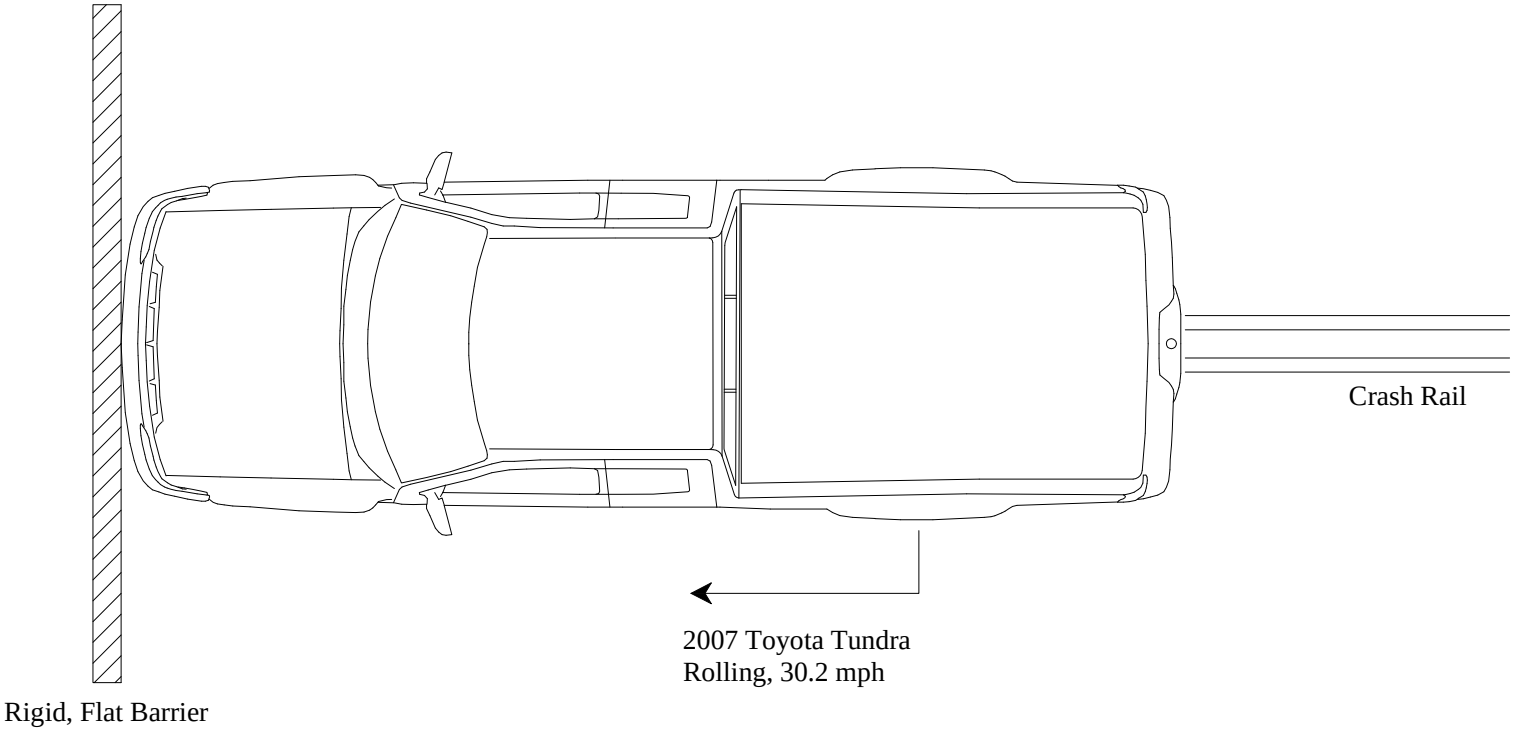
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	December 14, 2010
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2007 Toyota Tundra
IMPACT SPEED:	30.2 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set near center of bed
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 2 gallons, and instrumentation equipment and a tow system were installed. Two sandbags were added to the right front seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 30.2 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
December 14, 2010



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2007 Toyota Tundra

Exponent®
Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	6944			DATE RECEIVED:	12/14/2010
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	TUNDRA
VEHICLE BODY STYLE:	4-DOOR CREW CAB PICKUP			VEHICLE COLOR:	WHITE
VEHICLE IDENTIFICATION NUMBER:	5TFRV54147X014817			DATE OF MANUFACTURE:	05/07
GVWR (lb):	6900	FRONT GAWR (lb):	3900	REAR GAWR (lb):	4100
RECOMMENDED TIRE SIZE - F/R:	P255/70R18			RECOMMENDED TIRE PRESSURE - F/R (psi):	30 / 33

INSTALLED TIRE SIZE:	LF:	P255/70R18	RF:	P255/70R18	LR:	P255/70R18	RR: P255/70R18

ENGINE TYPE:	8-CYLINDER	ENGINE DISPLACEMENT:	5.7 LITER	ODOMETER (mi):	27,775
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	COLUMN	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	INSIDE LEFT FRAME RAIL, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT SIDE OF BED		
DESIGNATED SEATING - FRONT: 3	MID: 0	REAR: 3	TOTAL: 6	FRONT SEAT TYPE:	BUCKET WITH FOLDING CENTER

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	3-PT ACTIVE BELT	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	N
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	N	FRONT WHEEL DRIVE:	N	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	N	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	Y	ANTI-LOCK BRAKES F:	Y
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	Y	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	Y
SUNROOF:	N	ROOF RACK:	N						
ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES:	NONE								
SIGNIFICANT BODY DAMAGE/CORROSION:	NONE								

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

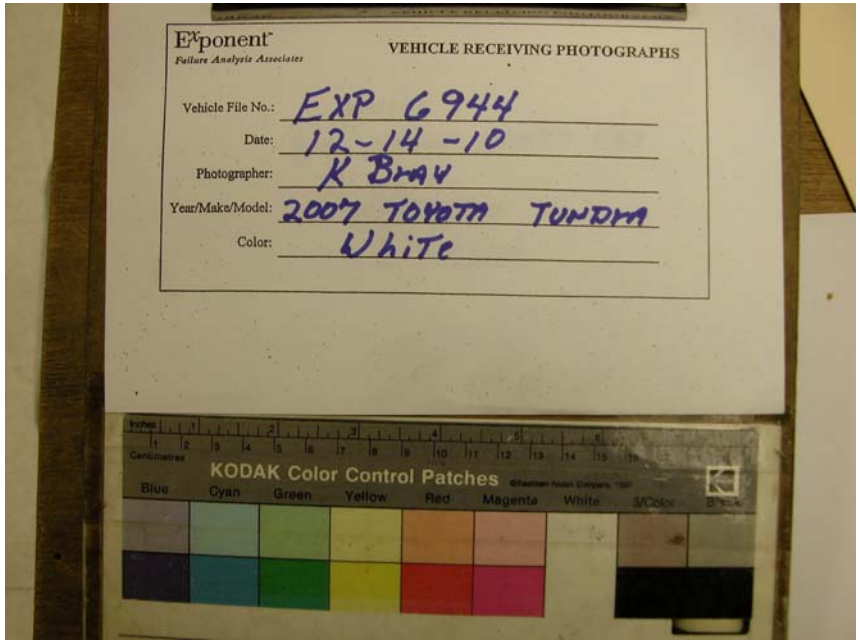
LEFT FRONT:	1571	RIGHT FRONT:	1446	TOTAL FRONT:	3017	PERCENT FRONT:	57%
LEFT REAR:	1144	RIGHT REAR:	1128	TOTAL REAR:	2272	PERCENT REAR:	43%
				TOTAL WEIGHT:	5289		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

LEFT FRONT:	35.8	AT WHL WELL @ AXLE	RIGHT FRONT:	35.9	AT WHL WELL @ AXLE
LEFT REAR:	39.4	AT WHL WELL @ AXLE	RIGHT REAR:	39.5	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	229.5	OVERALL WIDTH:	80.2	OVERALL HEIGHT:	75.9
WHEELBASE:	146.1	FRONT TRACK:	68.1	REAR TRACK:	68.1
REAR OVERHANG:	48.5	FRONT BUMPER HEIGHT:	29.5	REAR BUMPER HEIGHT:	30.4
COMMENTS:	NR = NOT RECORDED				
EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	KB	CHECKED BY:	DSP



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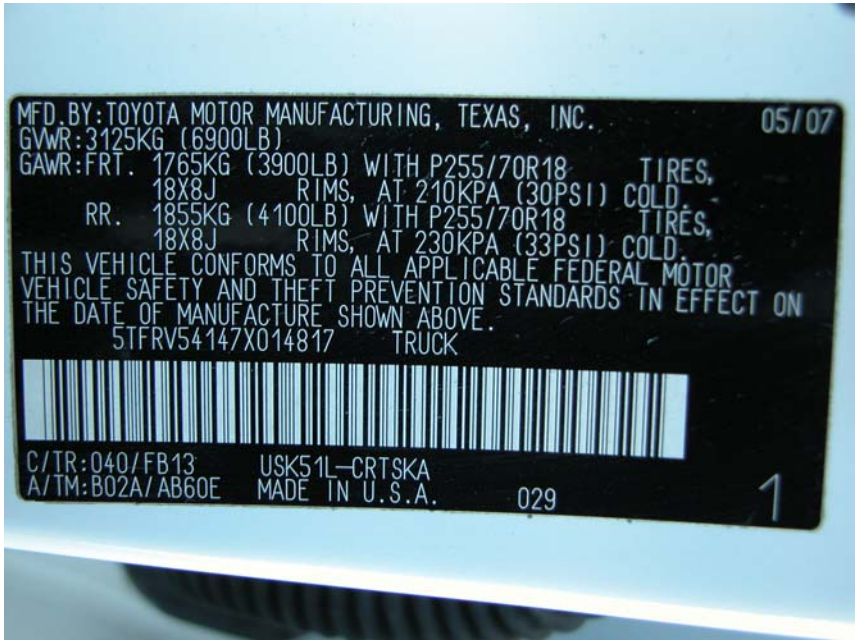

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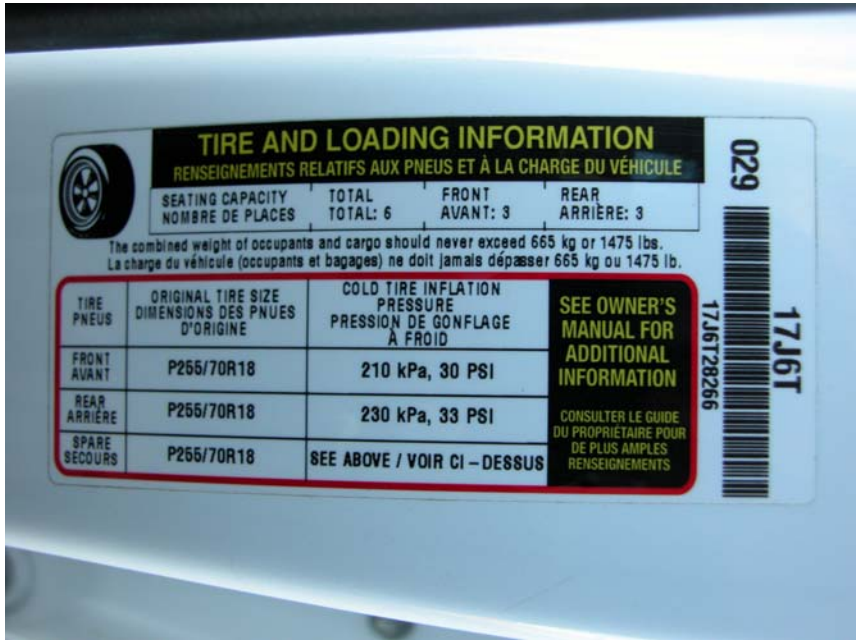

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0907698 A0T0 - 06158PH_0025

Exponent®

Test Setup

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Failure Analysis Associates®

VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/14/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	TUNDRA
VEHICLE BODY STYLE:	4-DOOR CREW CAB PICKUP			VEHICLE COLOR:	WHITE
VEHICLE IDENTIFICATION NUMBER:	5TFRV54147X014817			ODOMETER (mi):	27,775

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P255/70R18 | 30 PSI | 9/32"	P255/70R18 | 30 PSI | 8/32"
REAR:	P255/70R18 | 33 PSI | 9/32"	P255/70R18 | 33 PSI | 8/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	1542	RIGHT FRONT:	1502	TOTAL FRONT:	3044	PERCENT FRONT:	57%
LEFT REAR:	1144	RIGHT REAR:	1139	TOTAL REAR:	2283	PERCENT REAR:	43%
				TOTAL WEIGHT:	5327		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	36.1	AT	WHL WELL @ AXLE	RIGHT FRONT:	35.7	AT	WHL WELL @ AXLE
LEFT REAR:	39.6	AT	WHL WELL @ AXLE	RIGHT REAR:	39.4	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRAME CROSSMEMBER AT CONTROL ARM REAR MOUNT		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	BED NEAR CAB REAR WALL		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 2 GALLONS	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	NONE	RIGHT FRONT:	NONE*
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	FULL FORWARD	FULL FORWARD
OTHER:	SEATBELT UNBUCKLED, D-RING FULL DOWN	SEATBELT UNBUCKLED, D-RING FULL DOWN

COMMENTS

*TWO SANDBAGS (103 LBS TOTAL) PLACED IN RIGHT FRONT SEAT

	FORM COMPLETED BY:	DSP	CHECKED BY: MLM

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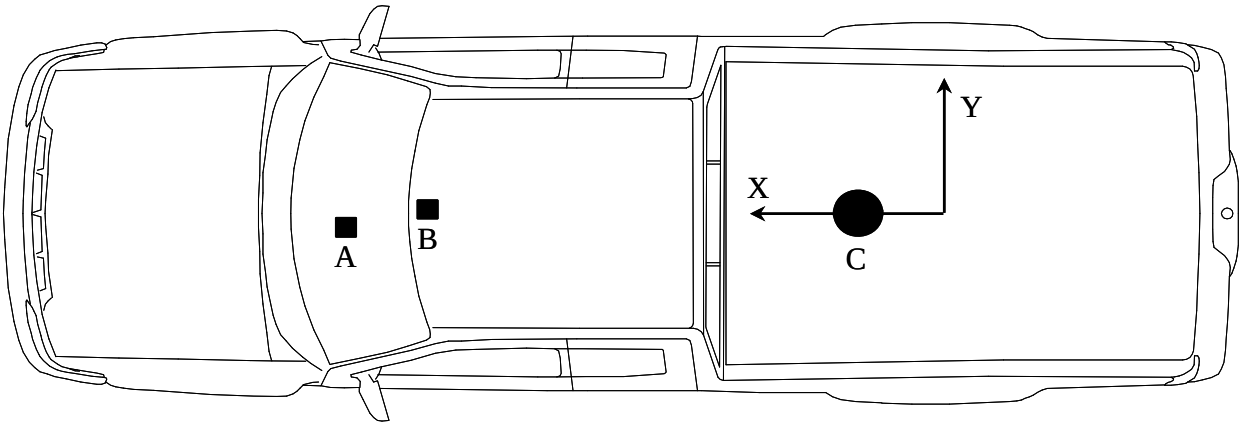
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/14/2010
VEHICLE YEAR:	2007	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	TUNDRA
VEHICLE IDENTIFICATION NUMBER:	5TFRV54147X014817				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	121.3 in.	-1.6 in.	30.3 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	112.5 in.	0.4 in.	30.0 in.
C	TRIAXIAL ACCELEROMETER SET, NEAR CENTER OF BED	13.0 in.	0.0 in.	32.6 in.

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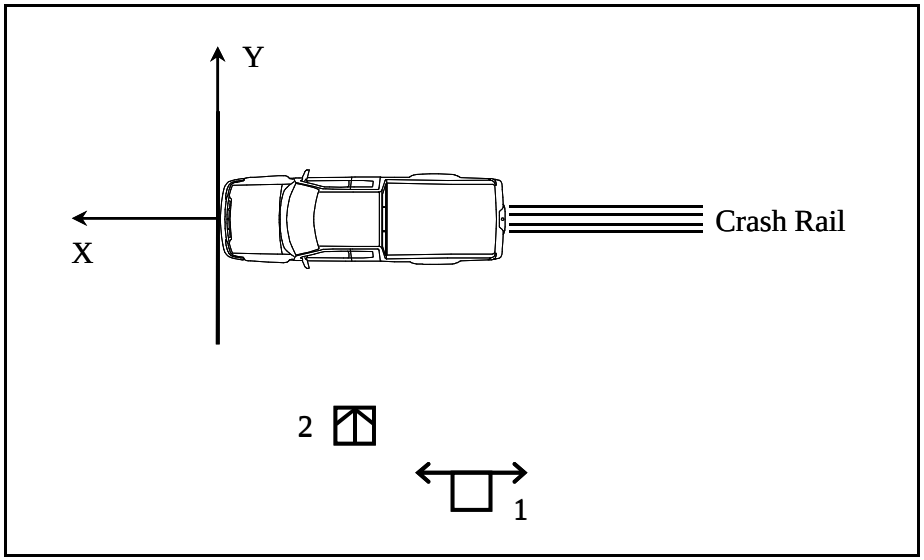
CAMERA SETUP RECORD

PROJECT NO:	0907698	TEST DATE:	12/14/2010
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2007 TOYOTA TUNDRA		
TEST SPEED:	30.2 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.7	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-10.2	-35.8	3.8	RT	--

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PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA BARRIER CRASH TESTING
JOB NUMBER:	0907698
DATE:	12/14/2010
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2007 TOYOTA TUNDRA

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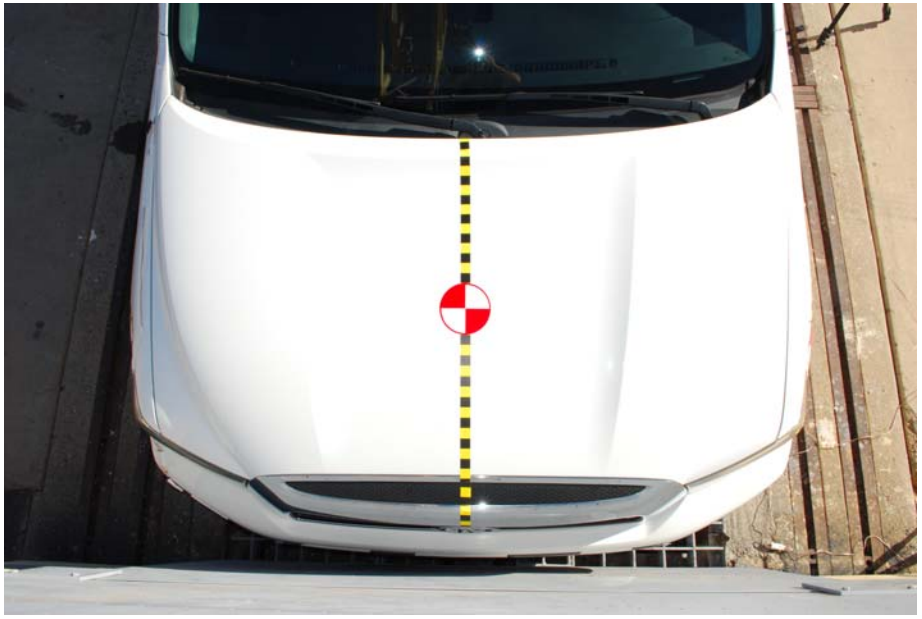

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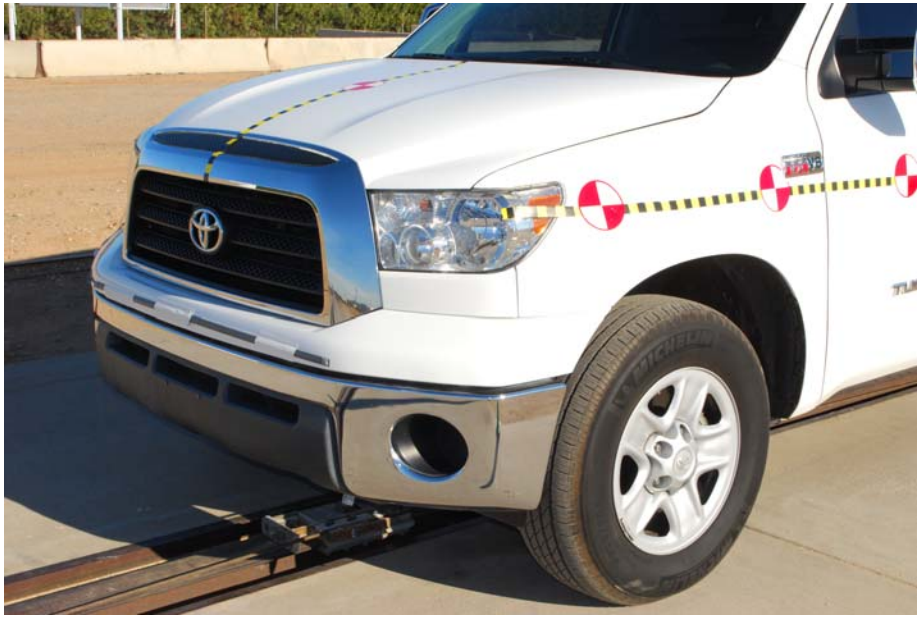

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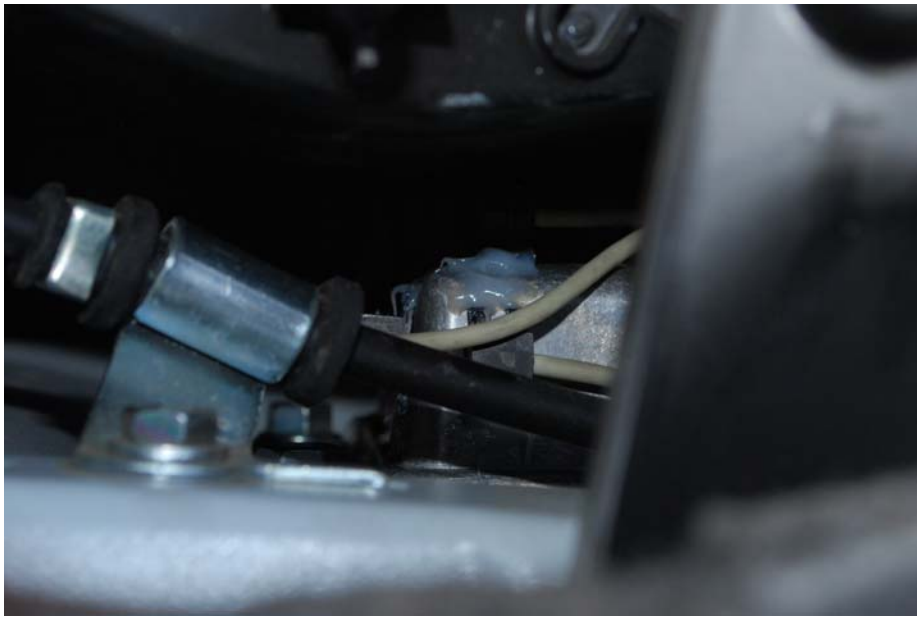

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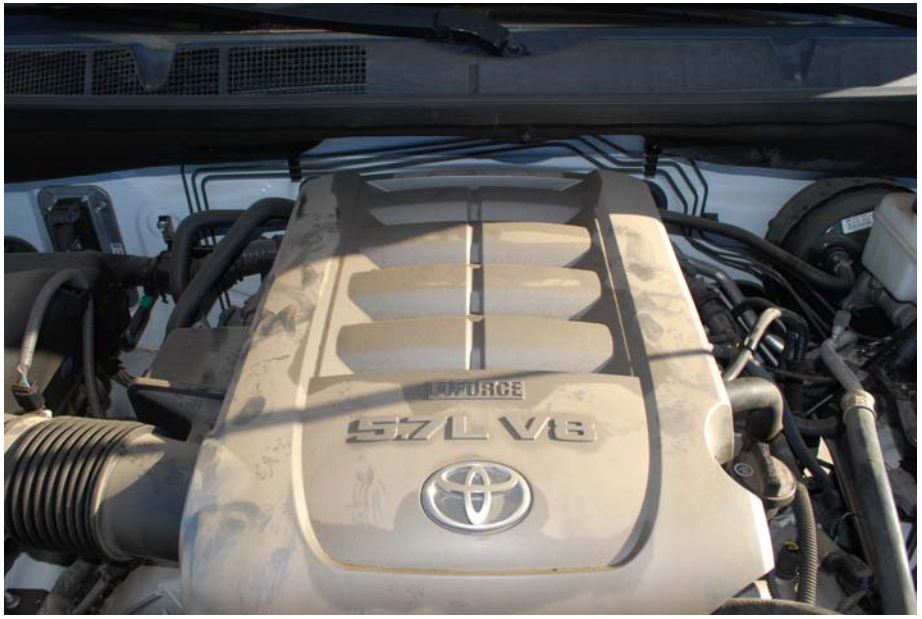

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0907698 A0T0 - 06158PH_0084

0907698 A0T0 - 06158PH_0085

0907698 A0T0 - 06158PH_0086

0907698 A0T0 - 06158PH_0087

0907698 A0T0 - 06158PH_0088

0907698 A0T0 - 06158PH_0089

0907698 A0T0 - 06158PH_0090

0907698 A0T0 - 06158PH_0091

0907698 A0T0 - 06158PH_0092

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0907698 A0T0 - 06158PH_0094

0907698 A0T0 - 06158PH_0095

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0907698 A0T0 - 06158PH_0097

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0907698 A0T0 - 06158PH_0100

0907698 A0T0 - 06158PH_0101

0907698 A0T0 - 06158PH_0102

0907698 A0T0 - 06158PH_0103

0907698 A0T0 - 06158PH_0104

0907698 A0T0 - 06158PH_0105

0907698 A0T0 - 06158PH_0106

0907698 A0T0 - 06158PH_0107

0907698 A0T0 - 06158PH_0108

0907698 A0T0 - 06158PH_0109

0907698 A0T0 - 06158PH_0110

0907698 A0T0 - 06158PH_0111

0907698 A0T0 - 06158PH_0112

0907698 A0T0 - 06158PH_0113

Exponent®

Test Results

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Failure Analysis Associates®

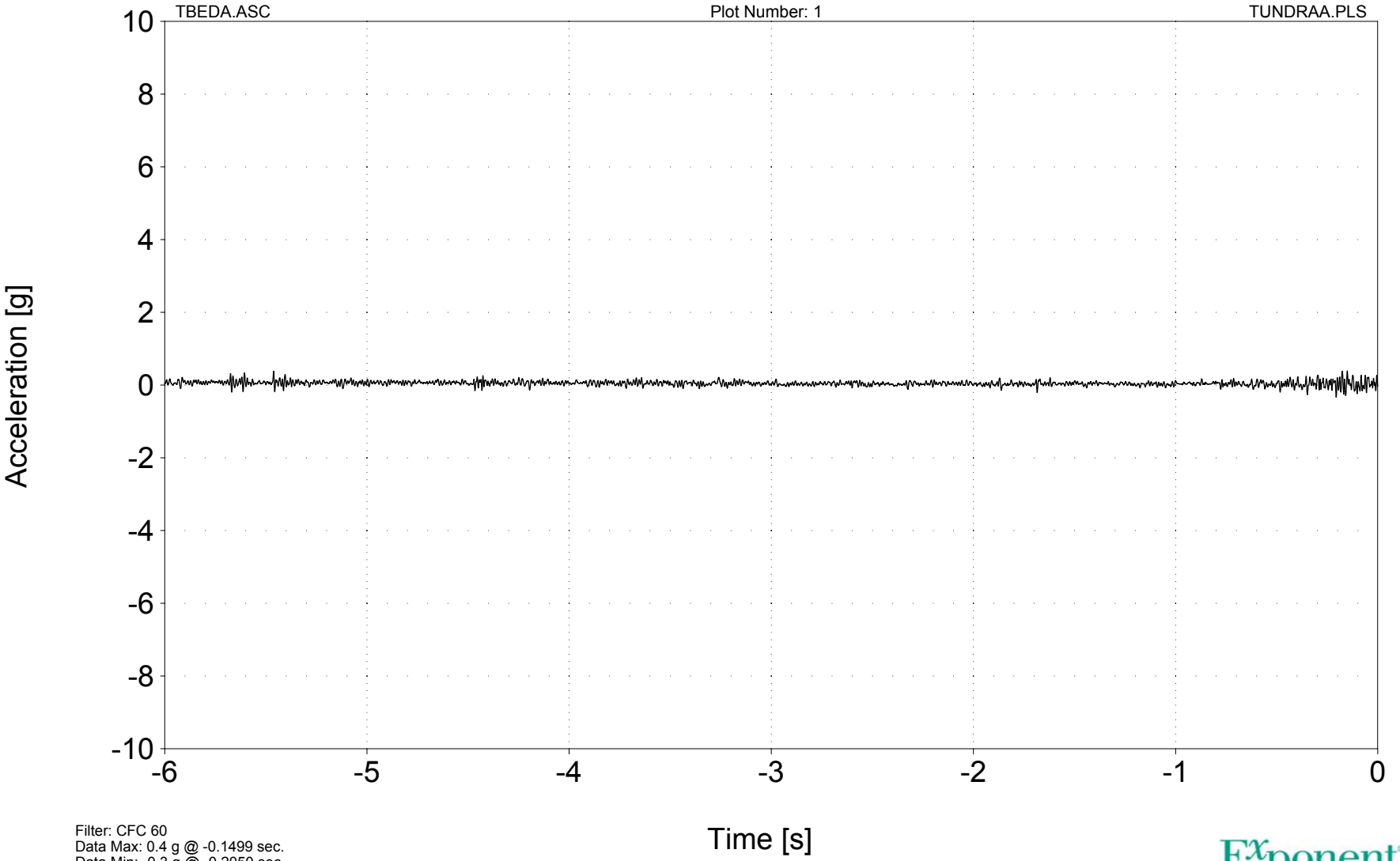
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	12/14/2010
OPERATOR:	DSP	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	NONE				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
121410	Channel 1	--	30.2	44.3	JS
	Channel 2	--	30.2	44.3	
	Average	--	30.2	44.3	

Longitudinal Acceleration v Time

Bed
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 0.4 g @ -0.1499 sec.
Data Min: -0.3 g @ -0.2050 sec.

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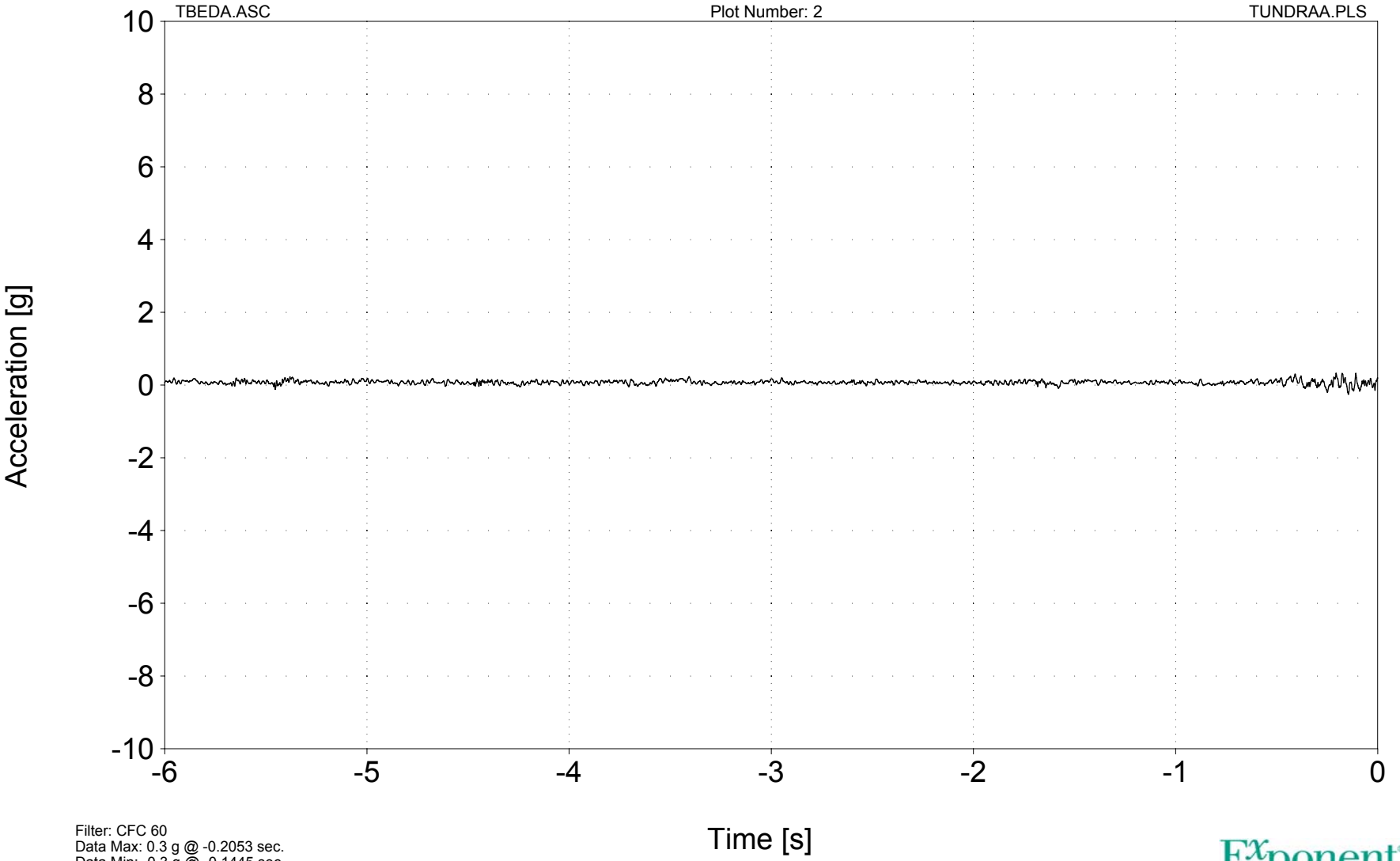
Lateral Acceleration v Time

Bed
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 0.3 g @ -0.2053 sec.
Data Min: -0.3 g @ -0.1445 sec.

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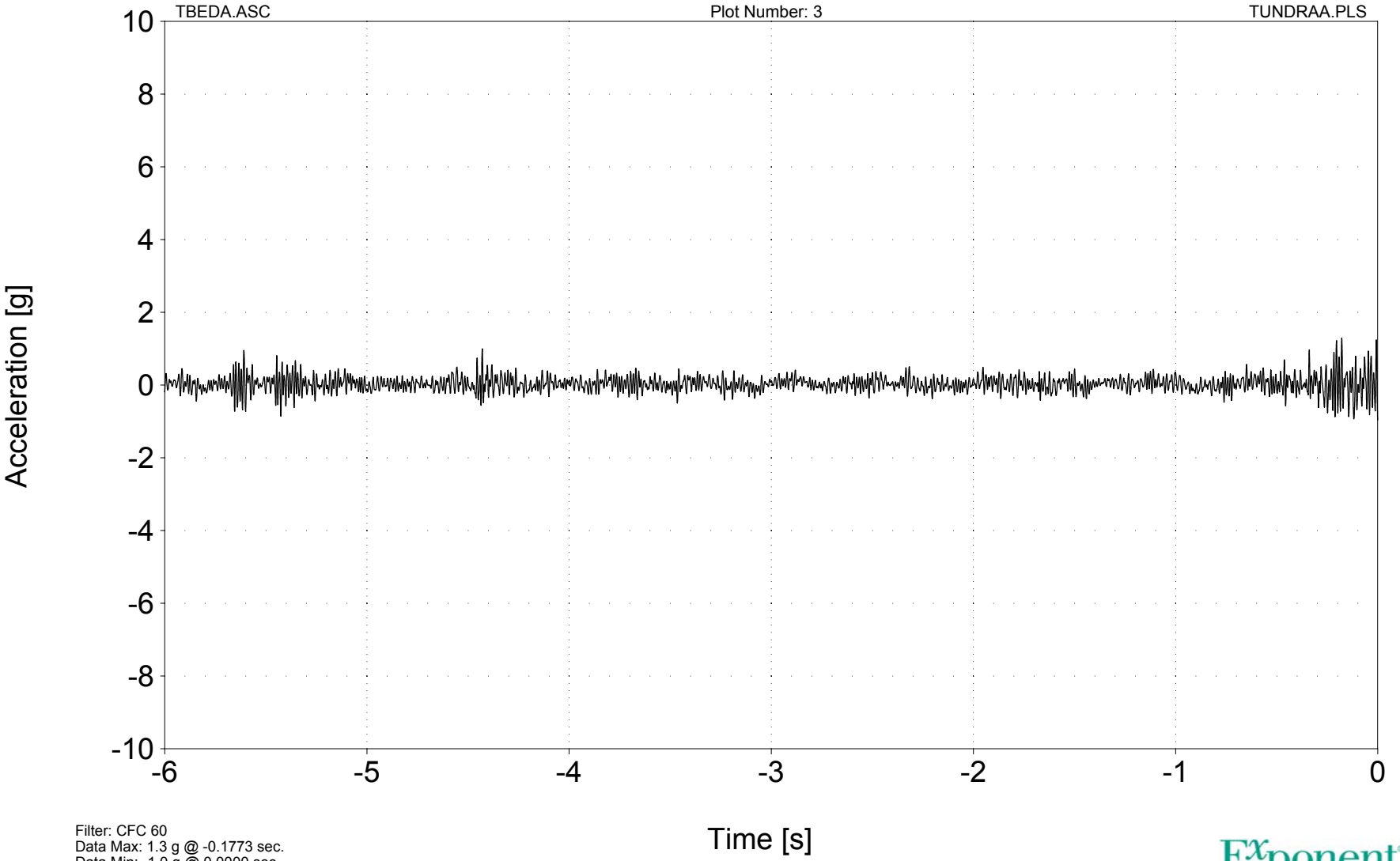
Failure Analysis Associates®

Vertical Acceleration v Time

Bed
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 1.3 g @ -0.1773 sec.
Data Min: -1.0 g @ 0.0000 sec.

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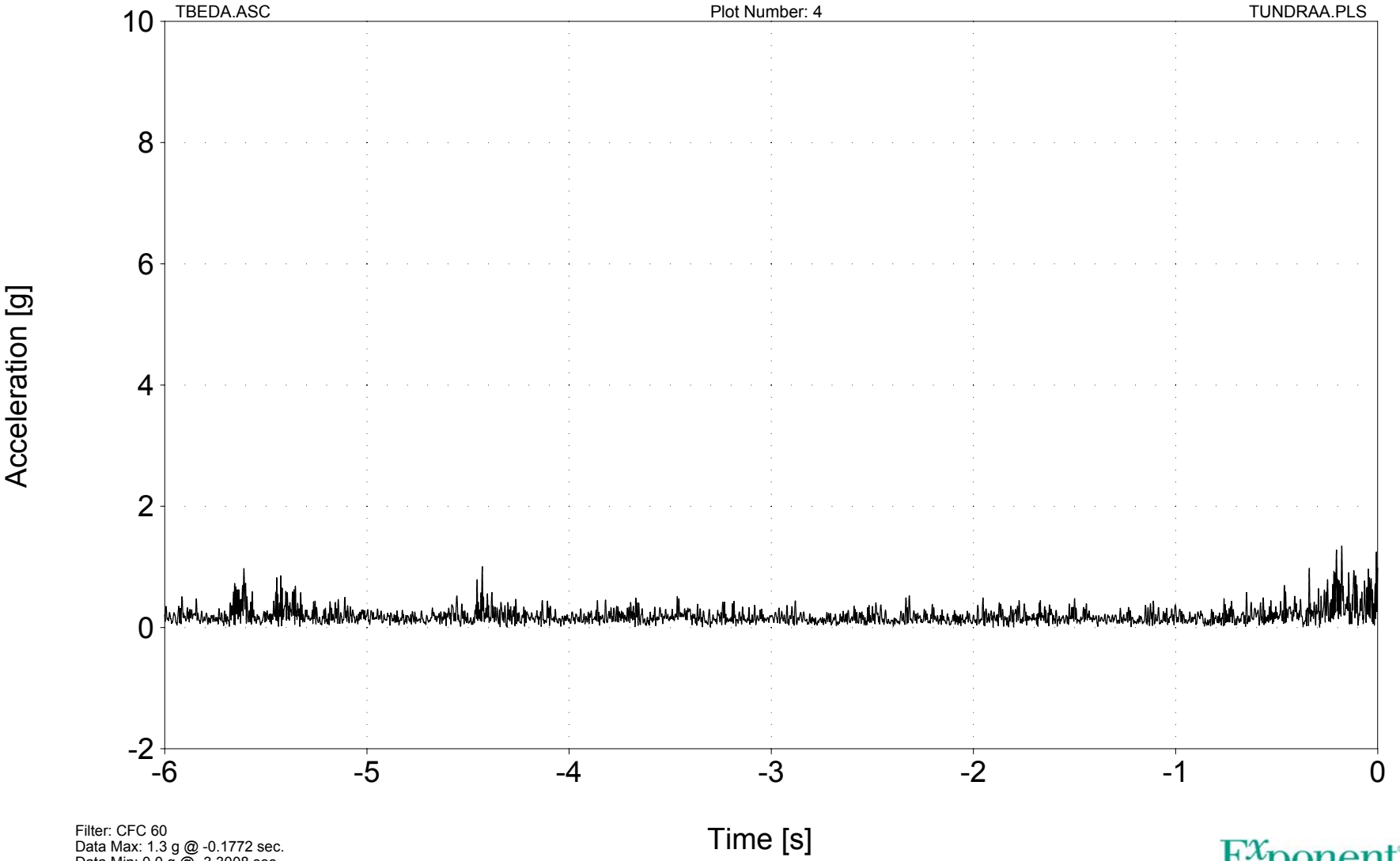
Failure Analysis Associates®

Resultant Acceleration v Time

Bed
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 1.3 g @ -0.1772 sec.
Data Min: 0.0 g @ -3.3008 sec.

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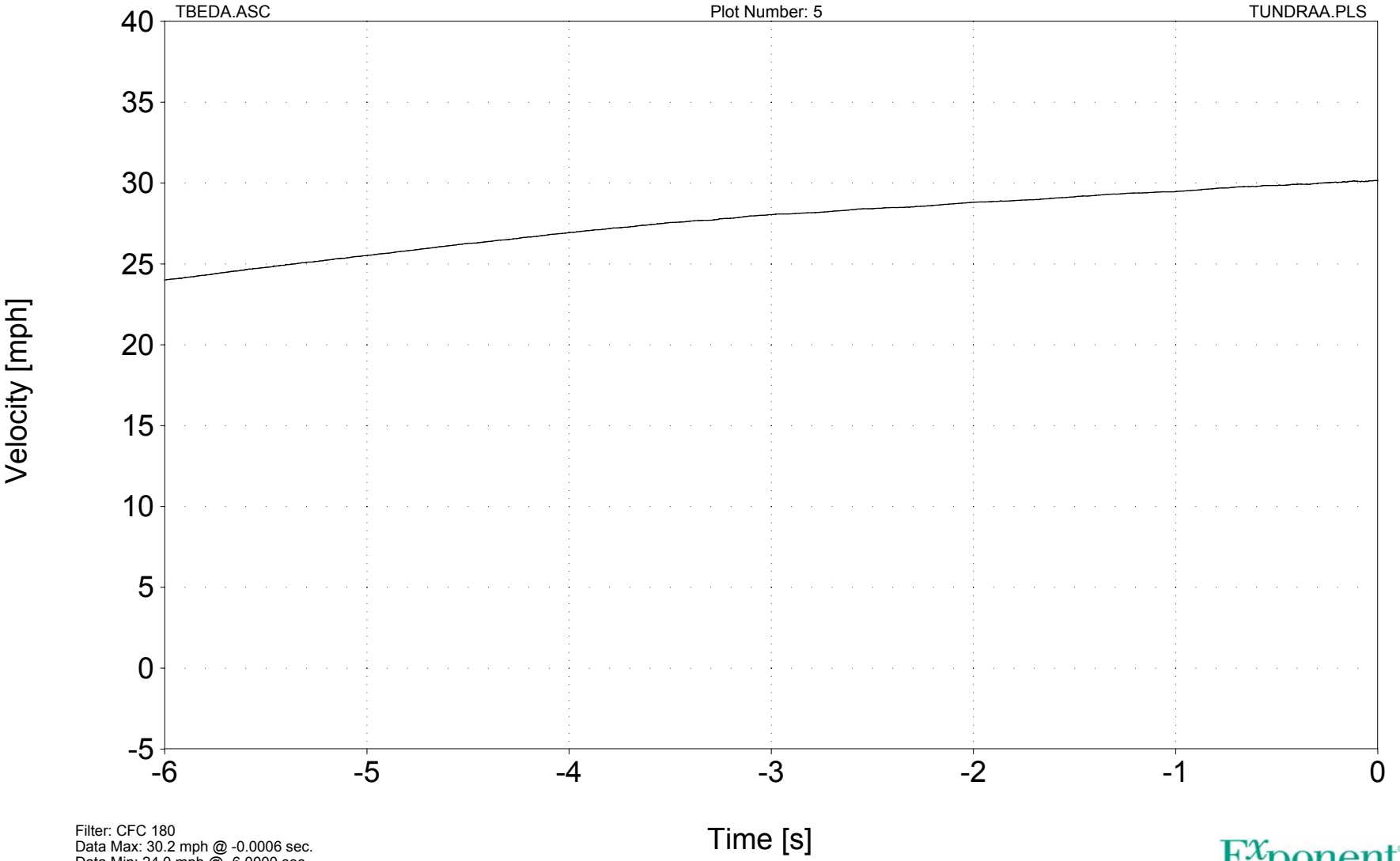
Longitudinal Velocity v Time

Bed
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 30.2 mph @ -0.0006 sec.
Data Min: 24.0 mph @ -6.0000 sec.

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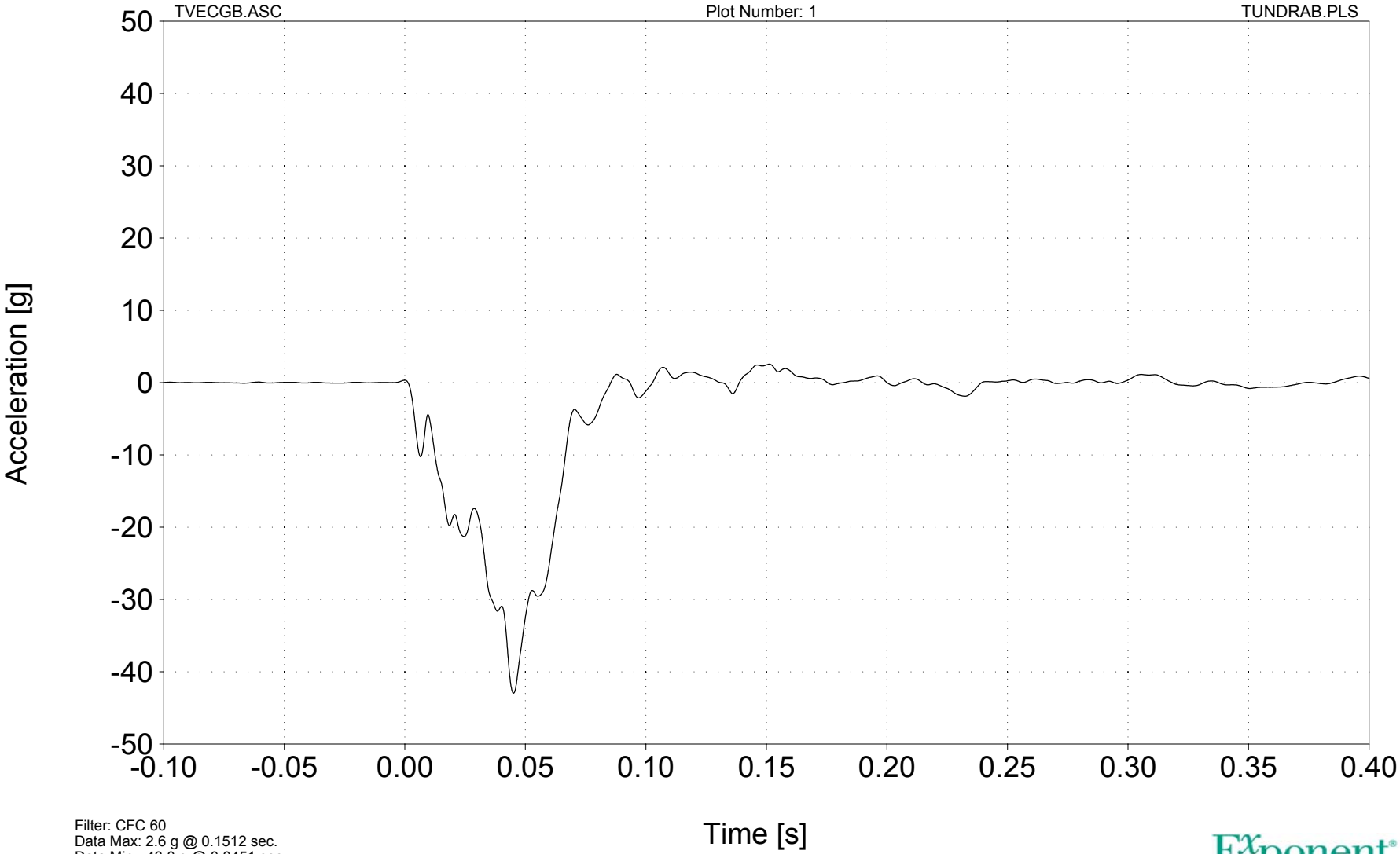
Longitudinal Acceleration v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 2.6 g @ 0.1512 sec.
Data Min: -43.0 g @ 0.0451 sec.

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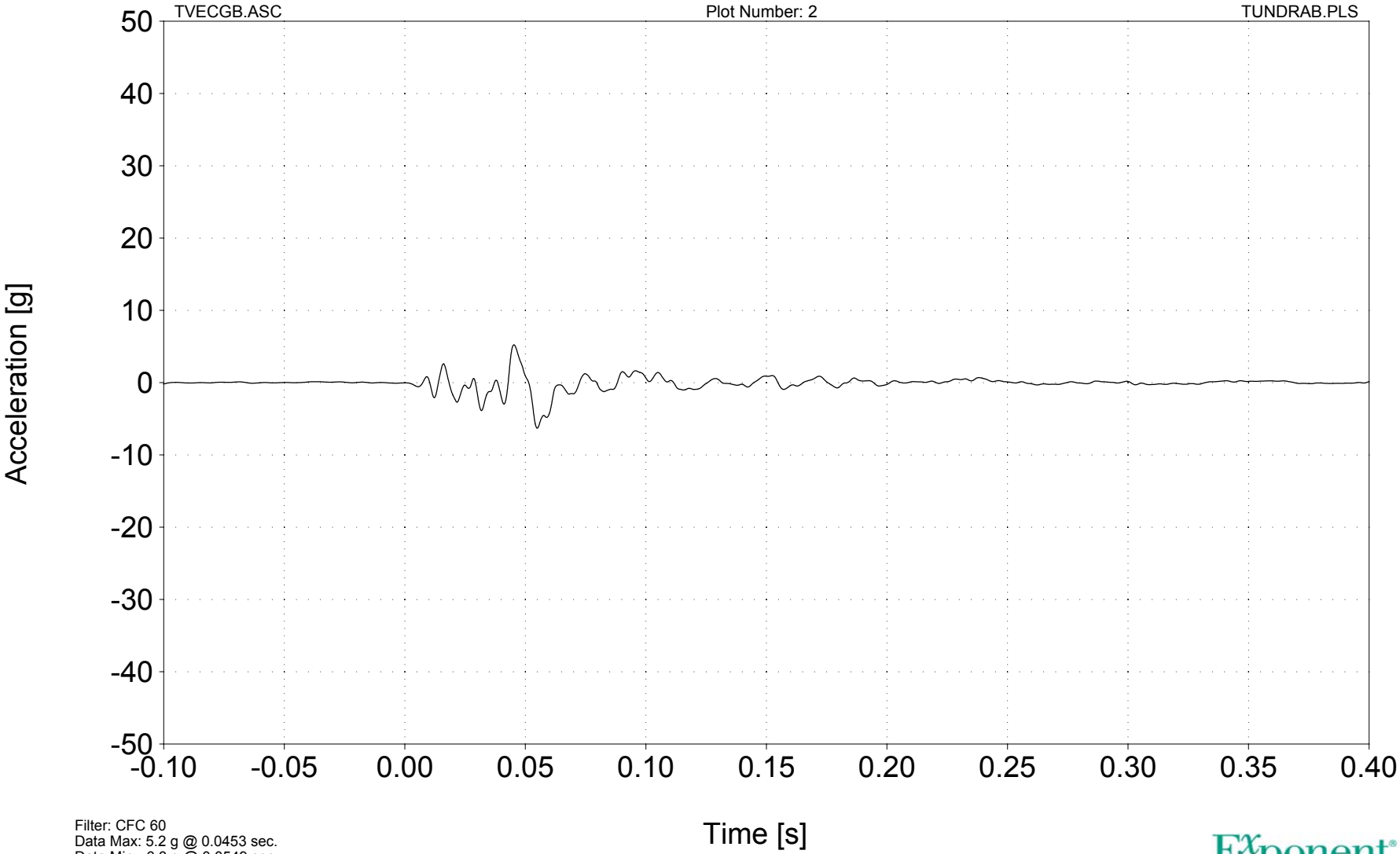
Lateral Acceleration v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 5.2 g @ 0.0453 sec.
Data Min: -6.3 g @ 0.0549 sec.

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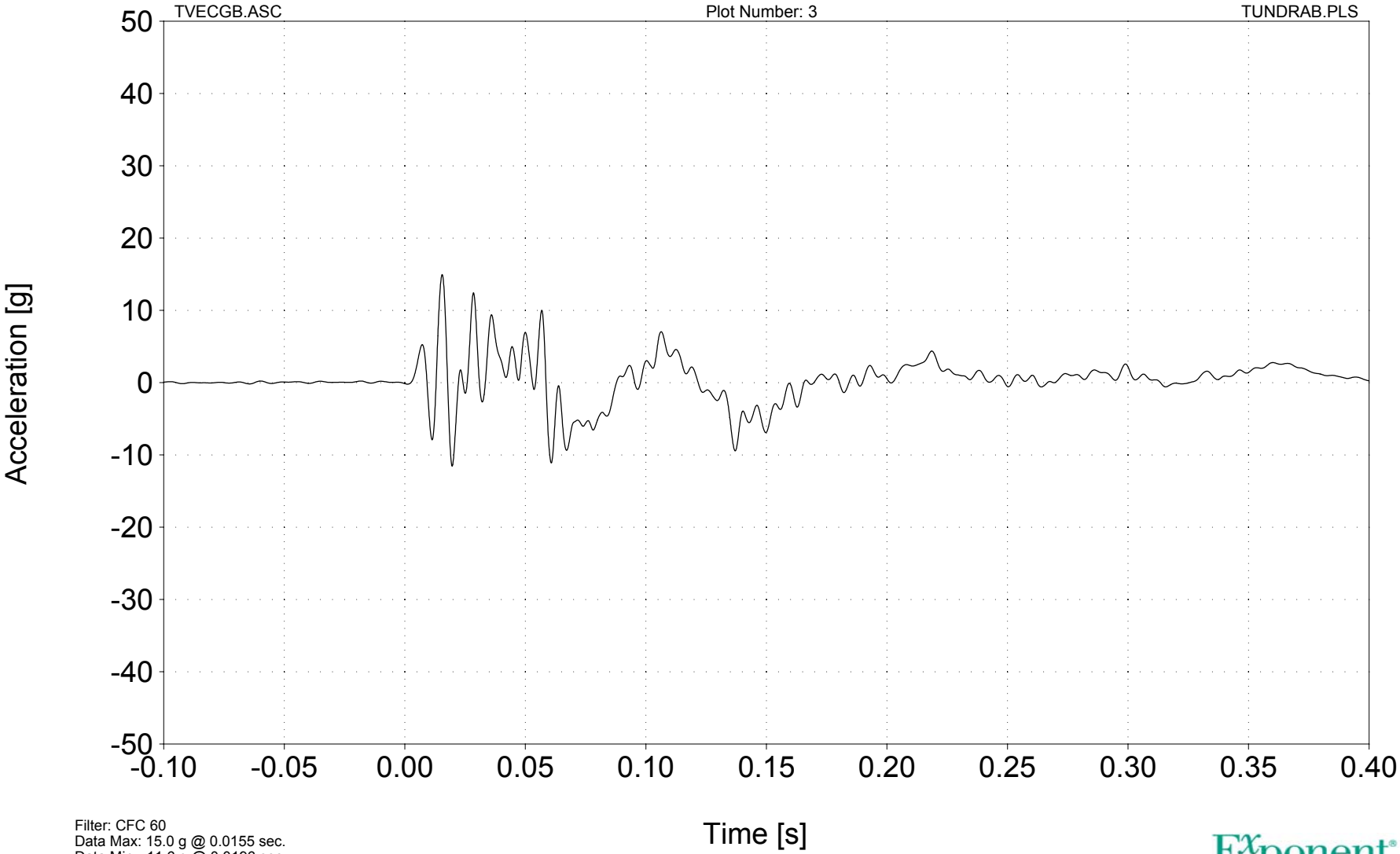
Vertical Acceleration v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 15.0 g @ 0.0155 sec.
Data Min: -11.6 g @ 0.0196 sec.

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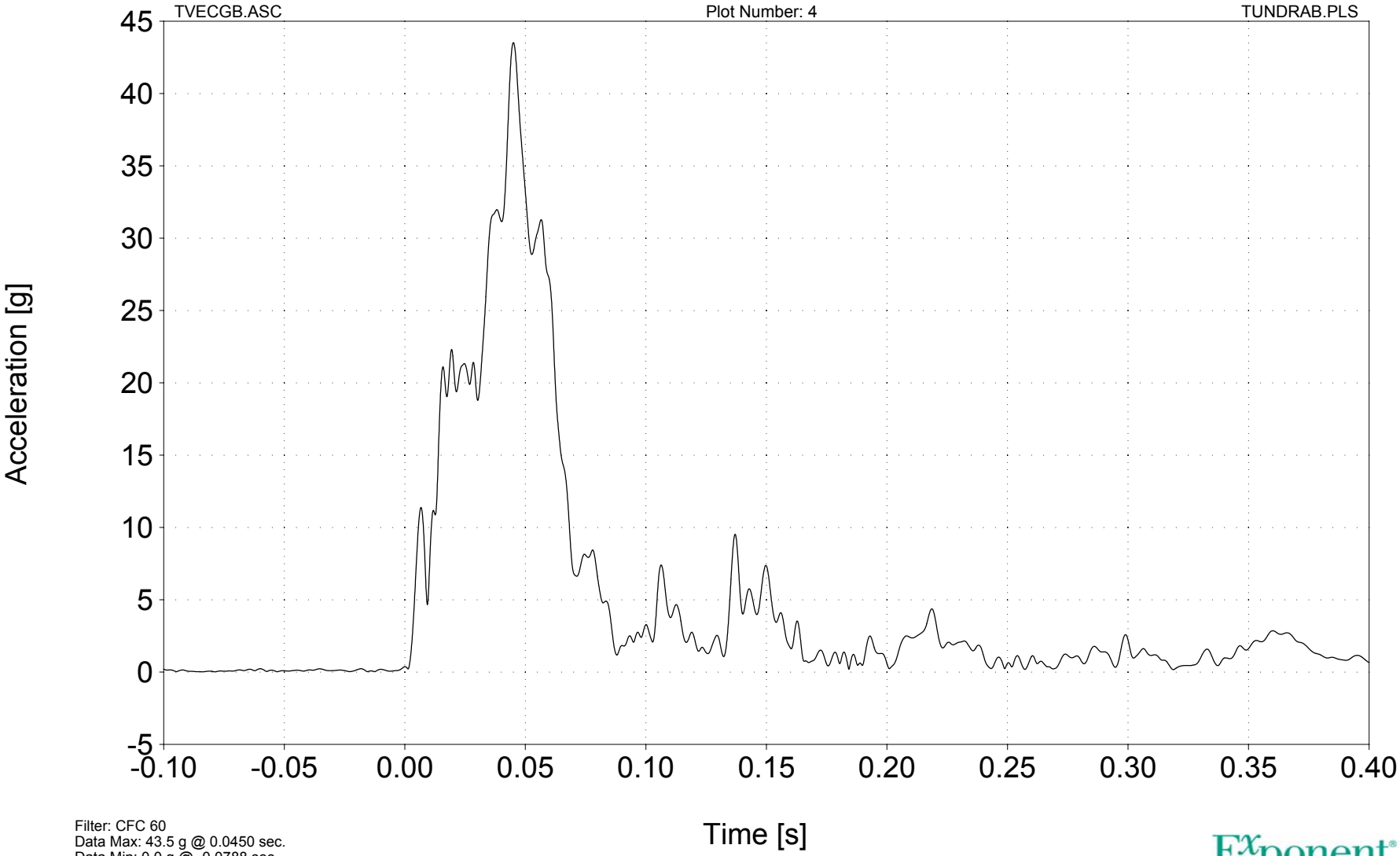
Resultant Acceleration v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 43.5 g @ 0.0450 sec.
Data Min: 0.0 g @ -0.0788 sec.

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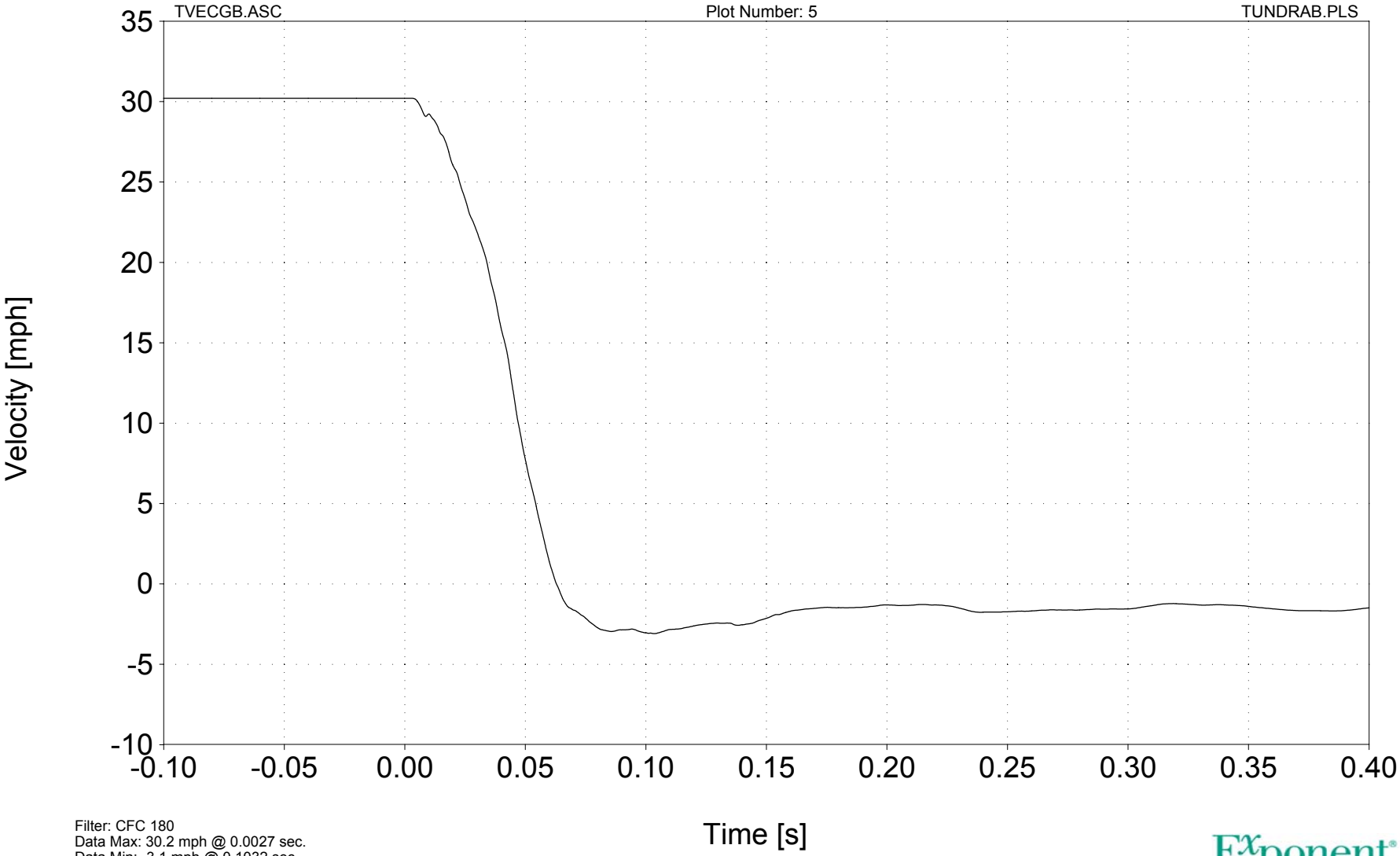
Longitudinal Velocity v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 30.2 mph @ 0.0027 sec.
Data Min: -3.1 mph @ 0.1032 sec.

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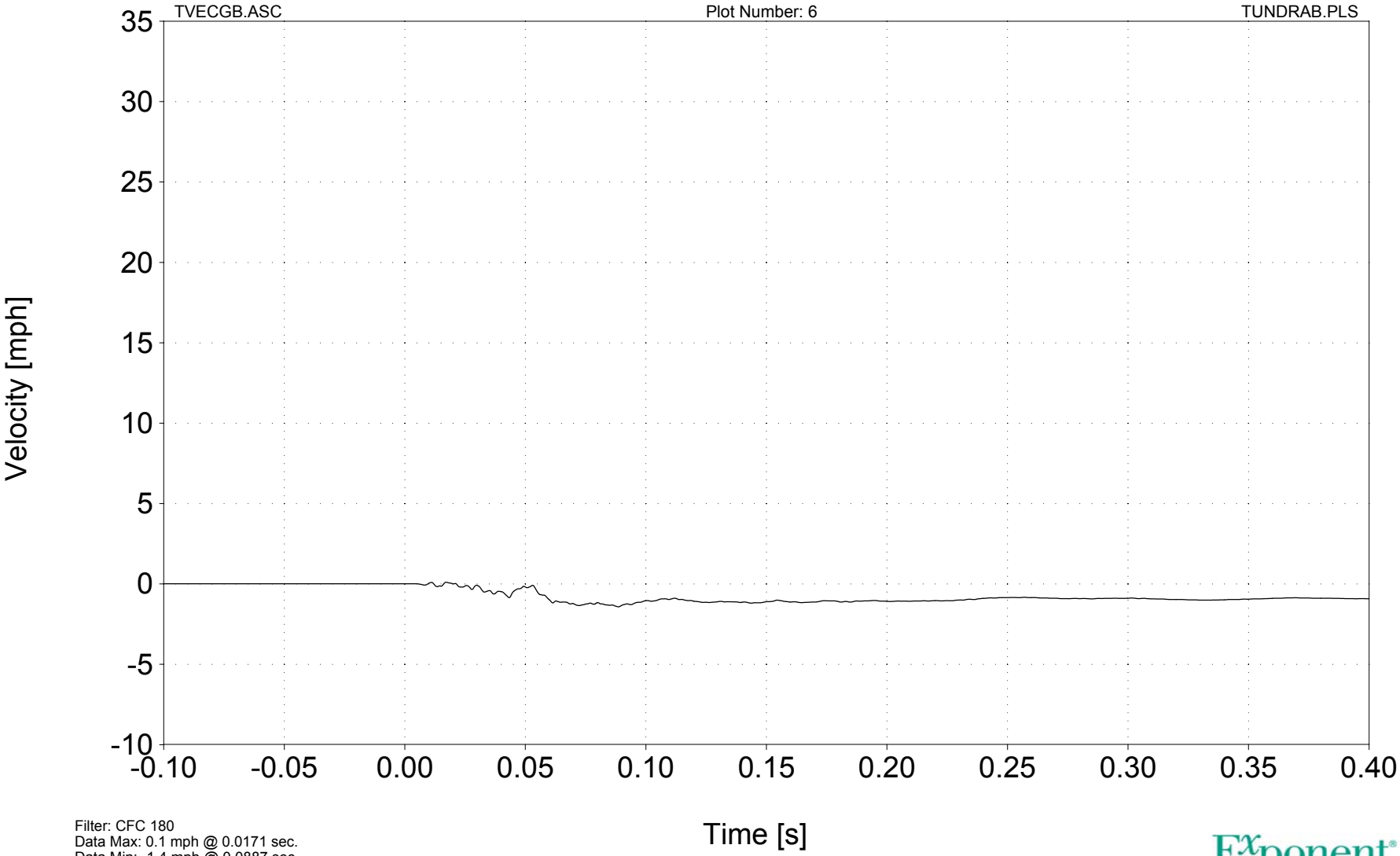
Lateral Velocity v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 0.1 mph @ 0.0171 sec.
Data Min: -1.4 mph @ 0.0887 sec.

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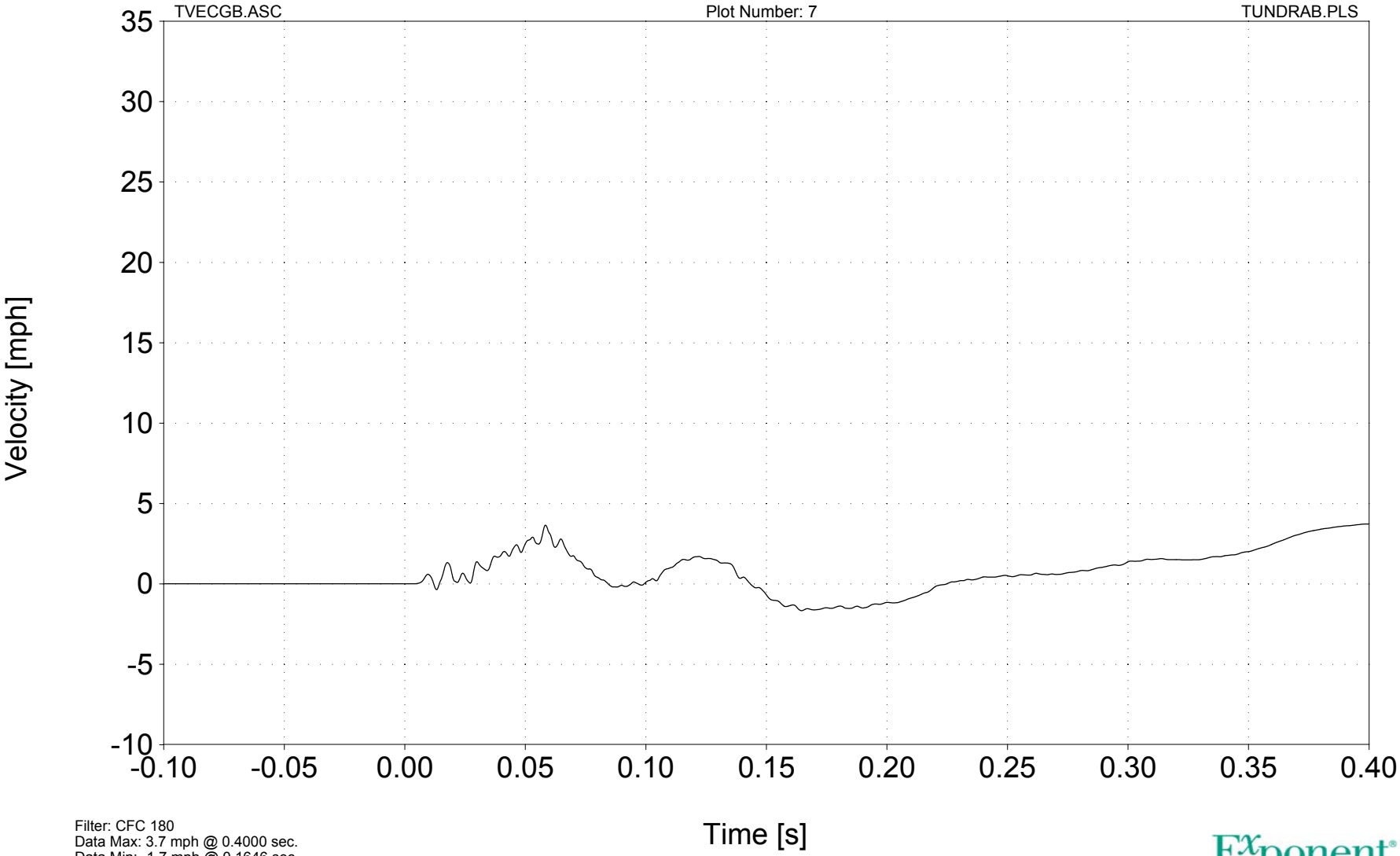
Vertical Velocity v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 3.7 mph @ 0.4000 sec.
Data Min: -1.7 mph @ 0.1646 sec.

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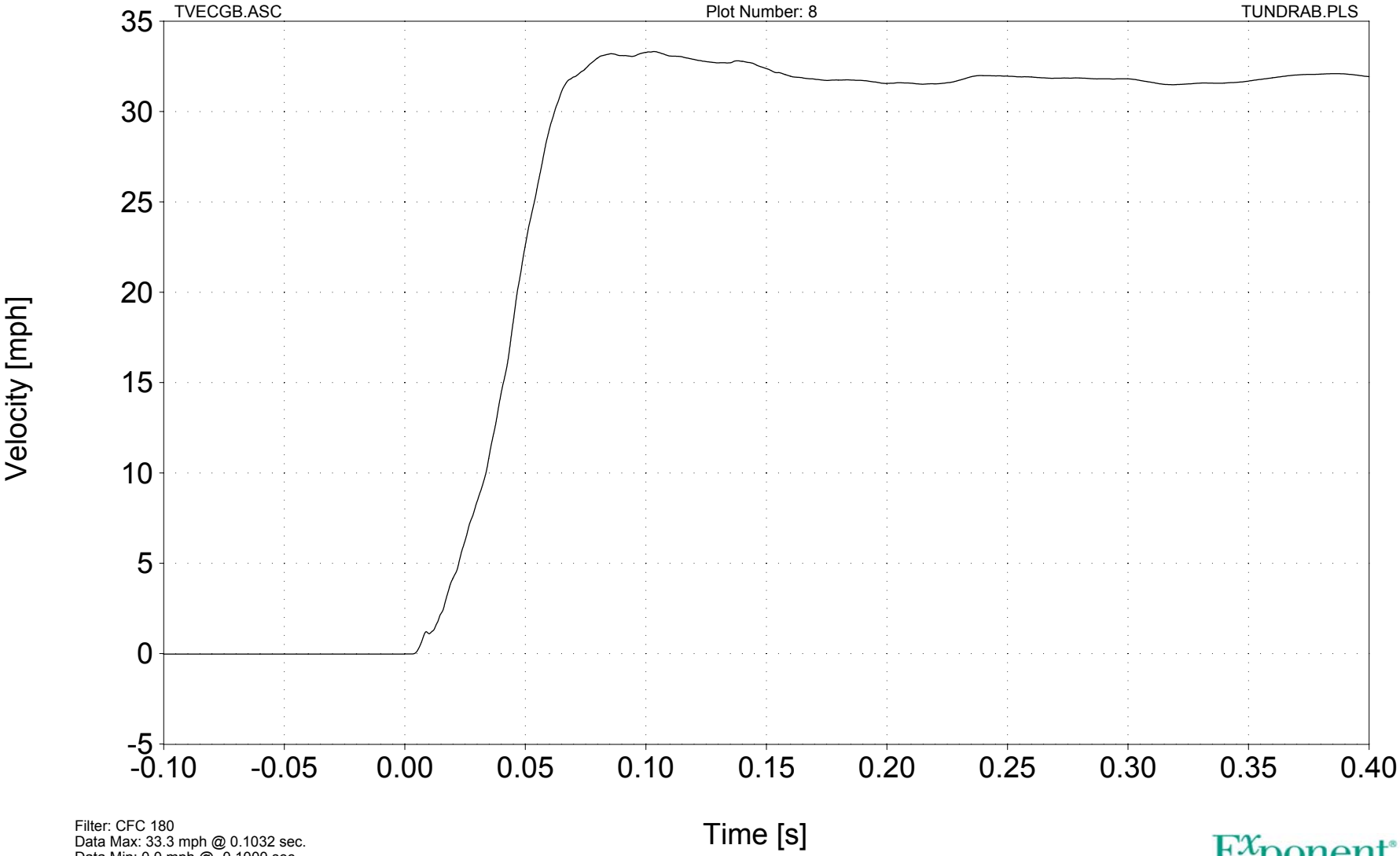
Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 33.3 mph @ 0.1032 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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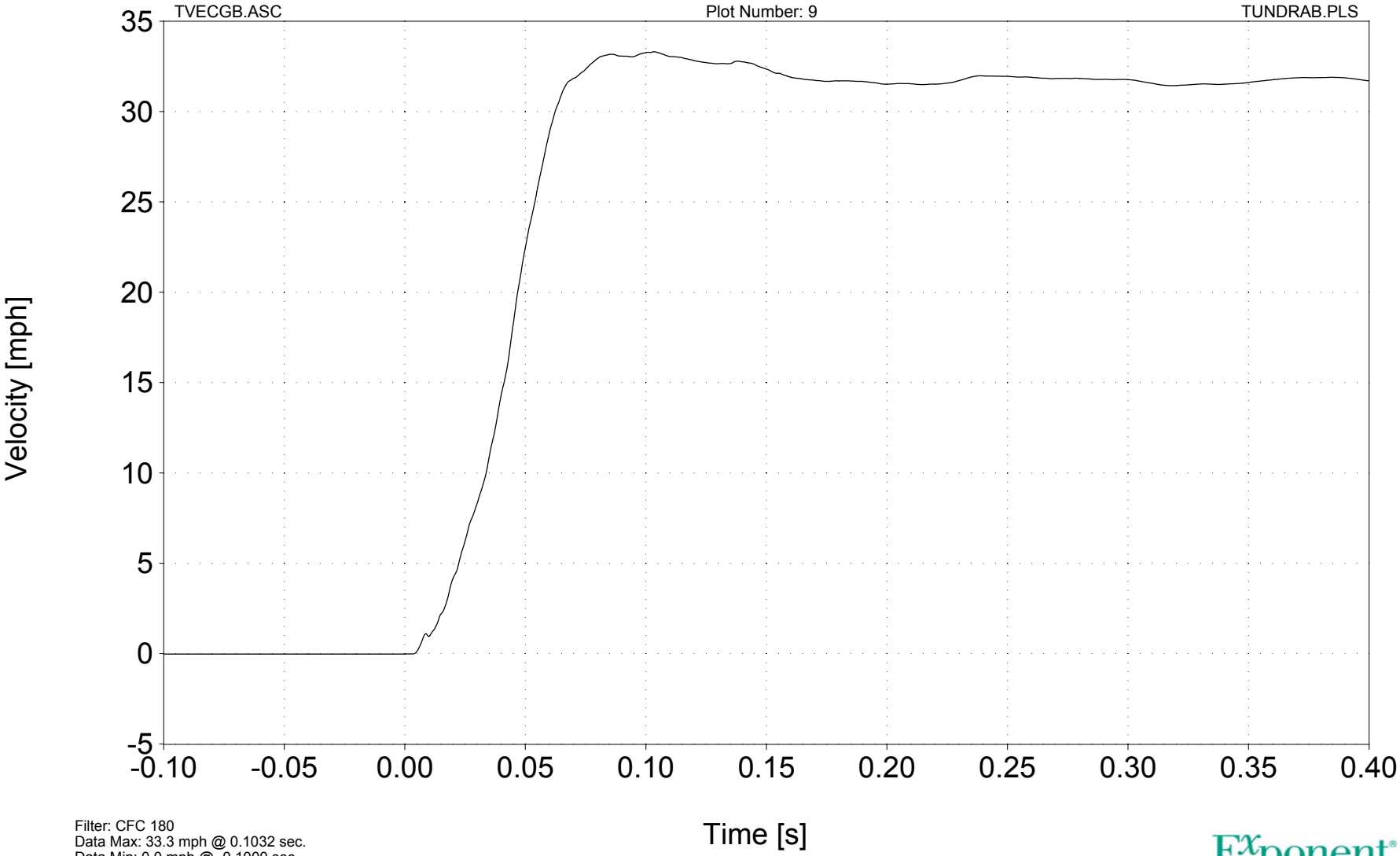
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
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Data Min: 0.0 mph @ -0.1000 sec.

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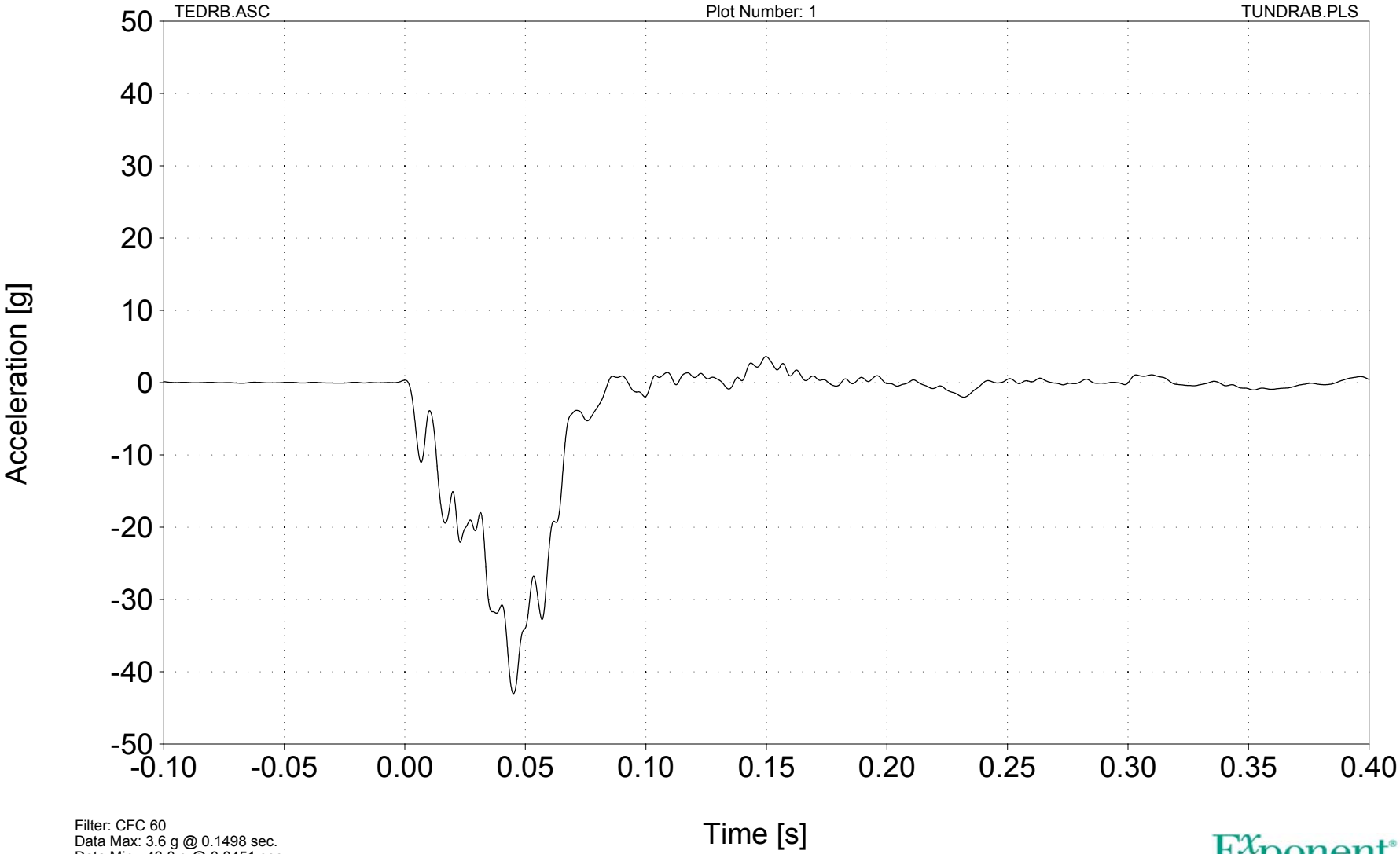
Longitudinal Acceleration v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 3.6 g @ 0.1498 sec.
Data Min: -43.0 g @ 0.0451 sec.

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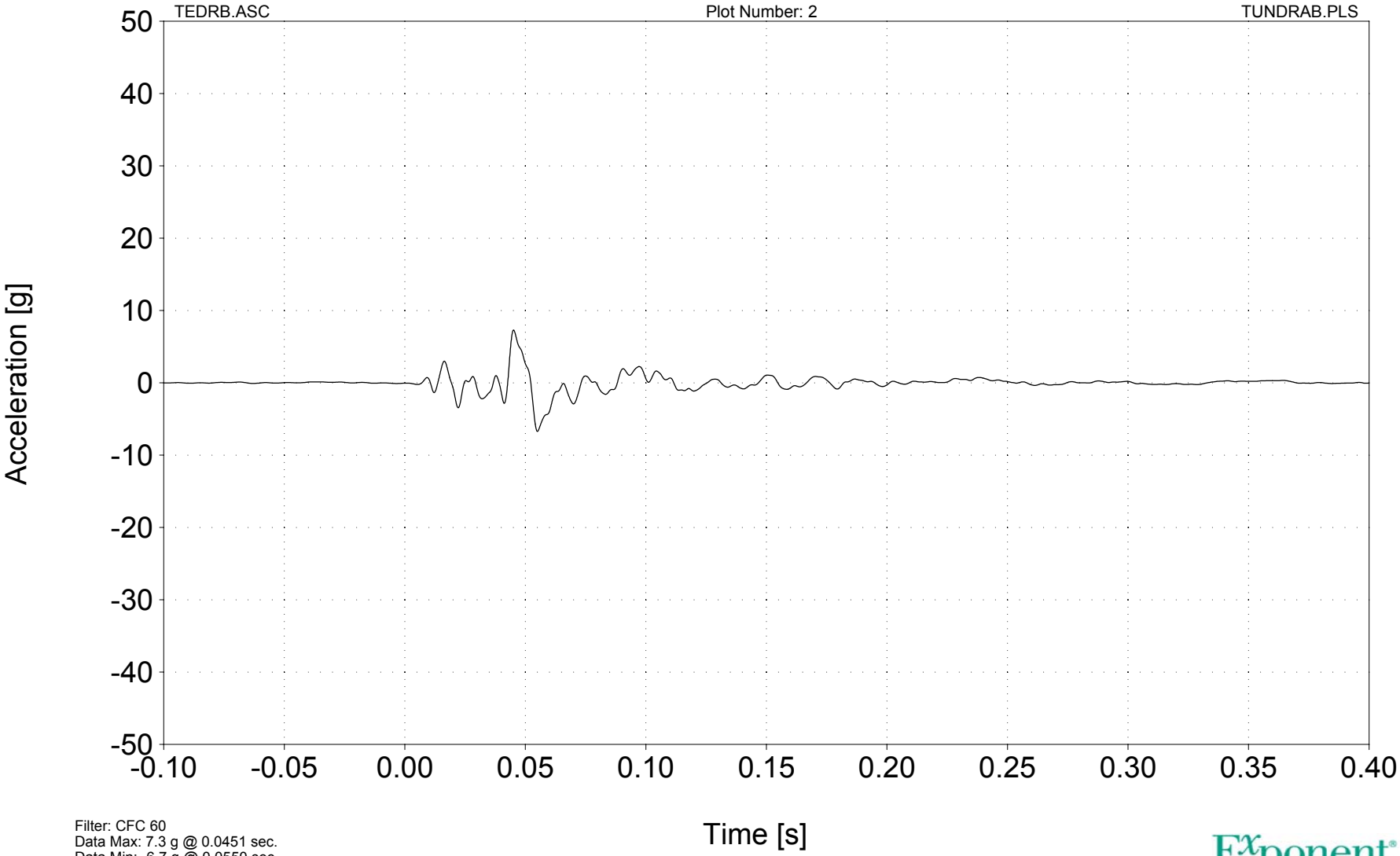
Lateral Acceleration v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 7.3 g @ 0.0451 sec.
Data Min: -6.7 g @ 0.0550 sec.

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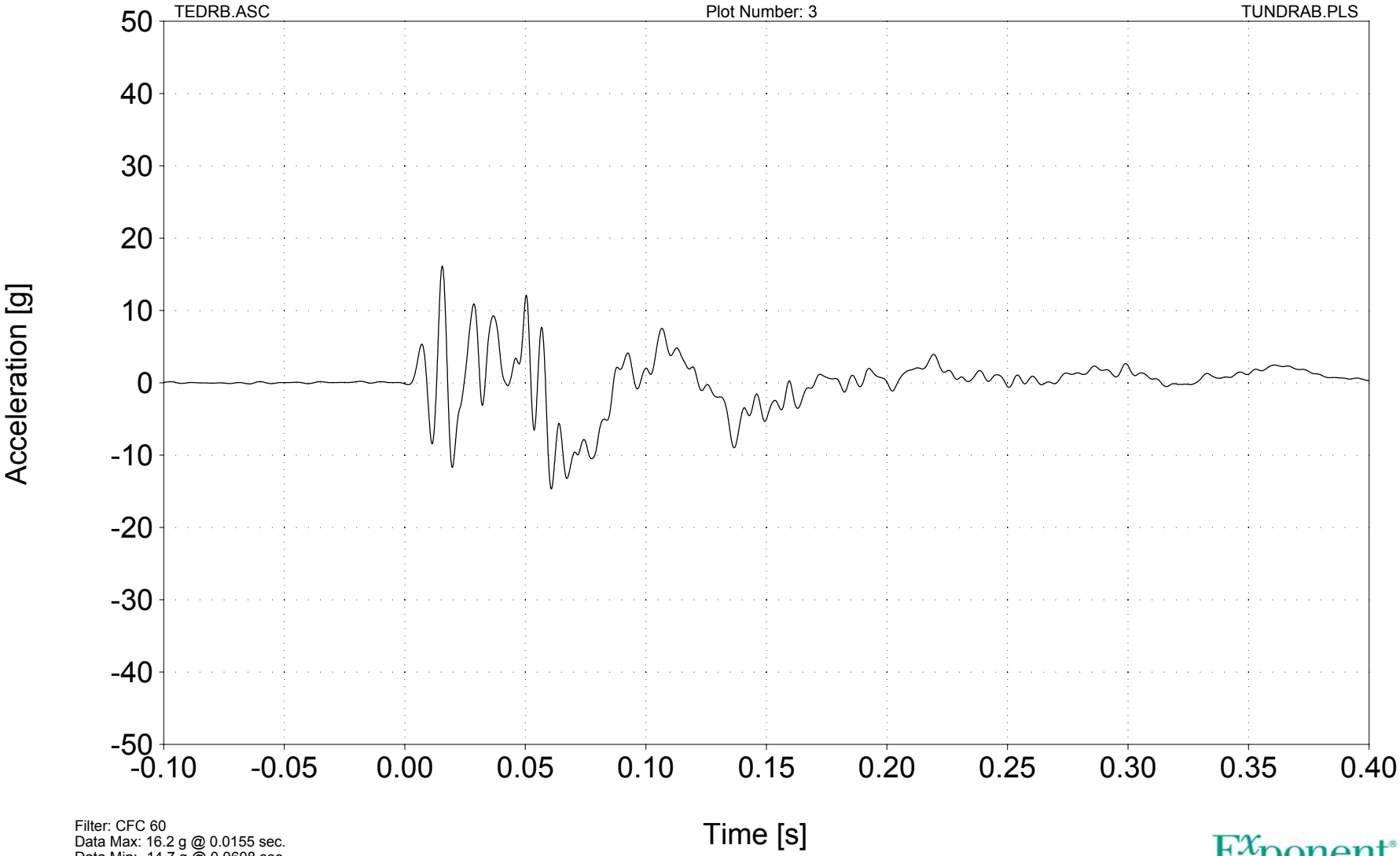
Vertical Acceleration v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 16.2 g @ 0.0155 sec.
Data Min: -14.7 g @ 0.0608 sec.

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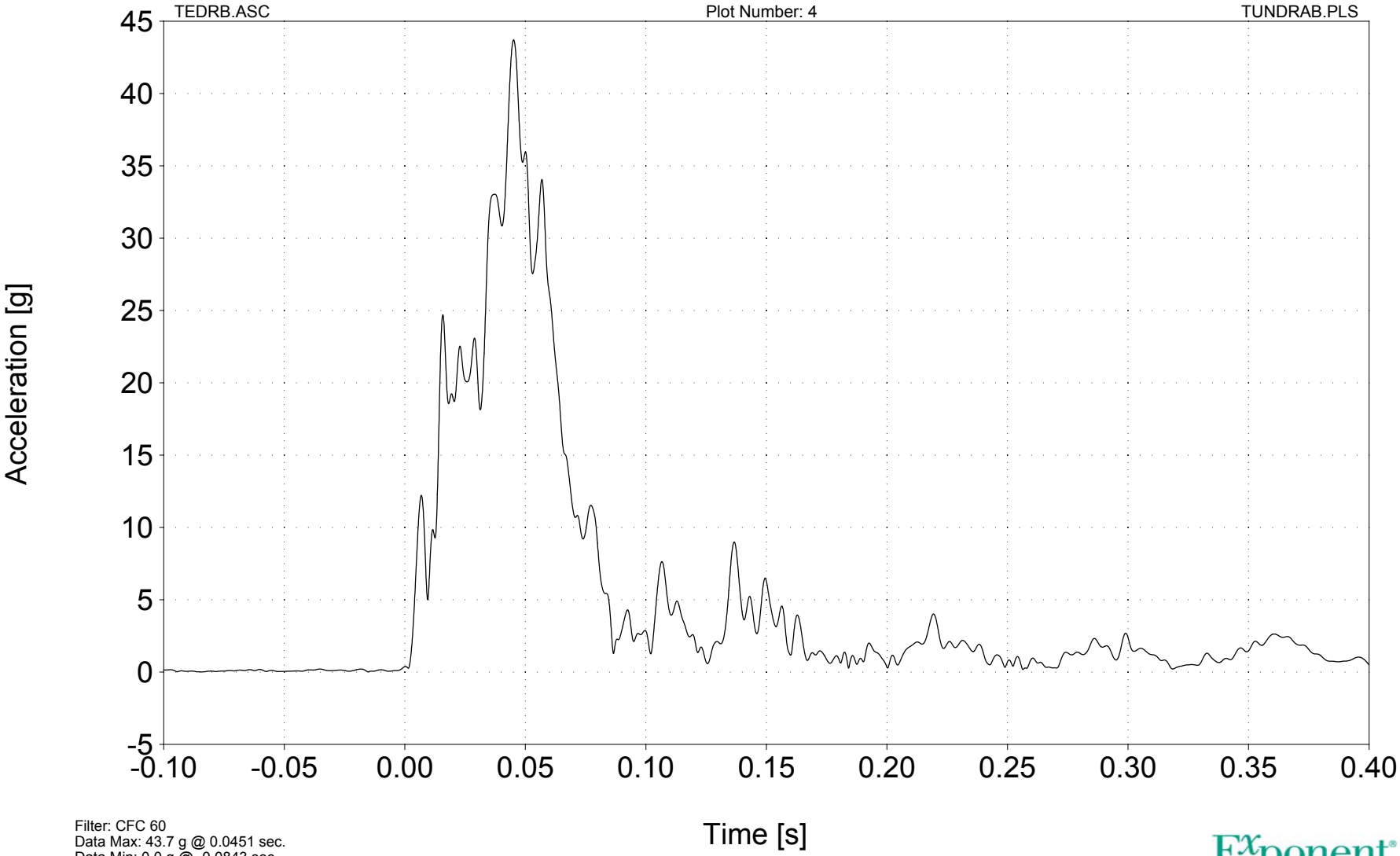
Resultant Acceleration v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 60
Data Max: 43.7 g @ 0.0451 sec.
Data Min: 0.0 g @ -0.0843 sec.

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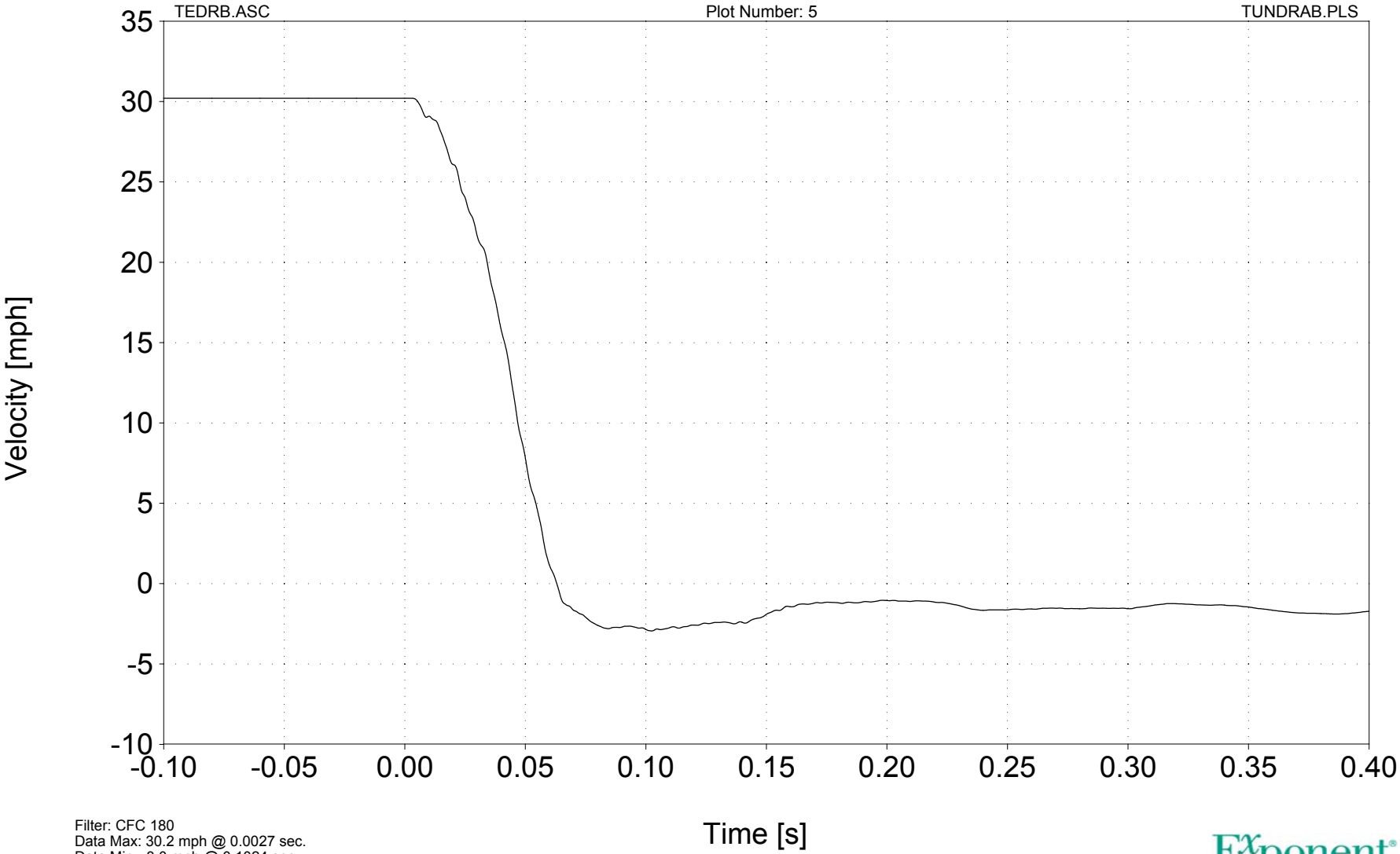
Failure Analysis Associates®

Longitudinal Velocity v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 30.2 mph @ 0.0027 sec.
Data Min: -3.0 mph @ 0.1024 sec.

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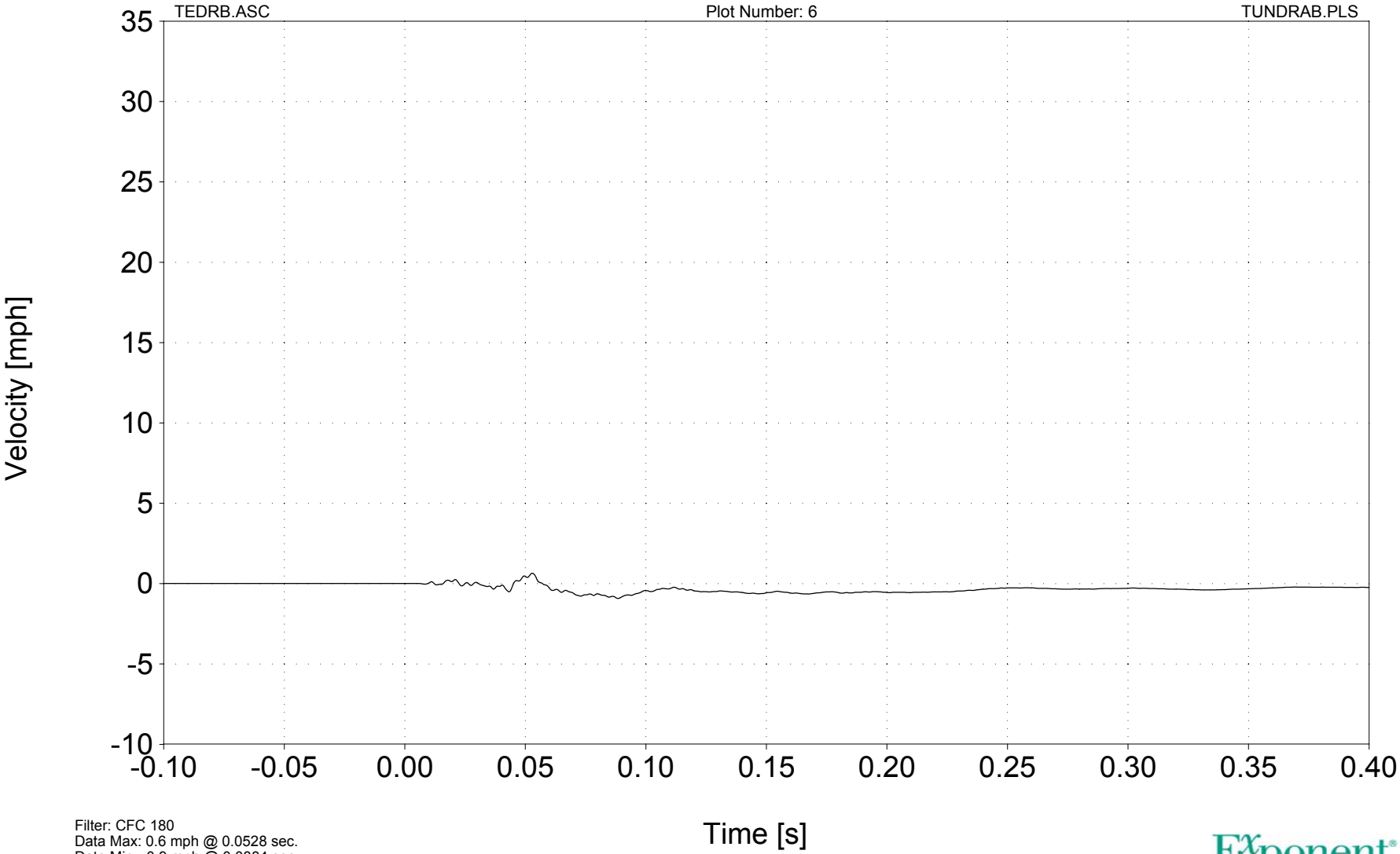
Lateral Velocity v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 0.6 mph @ 0.0528 sec.
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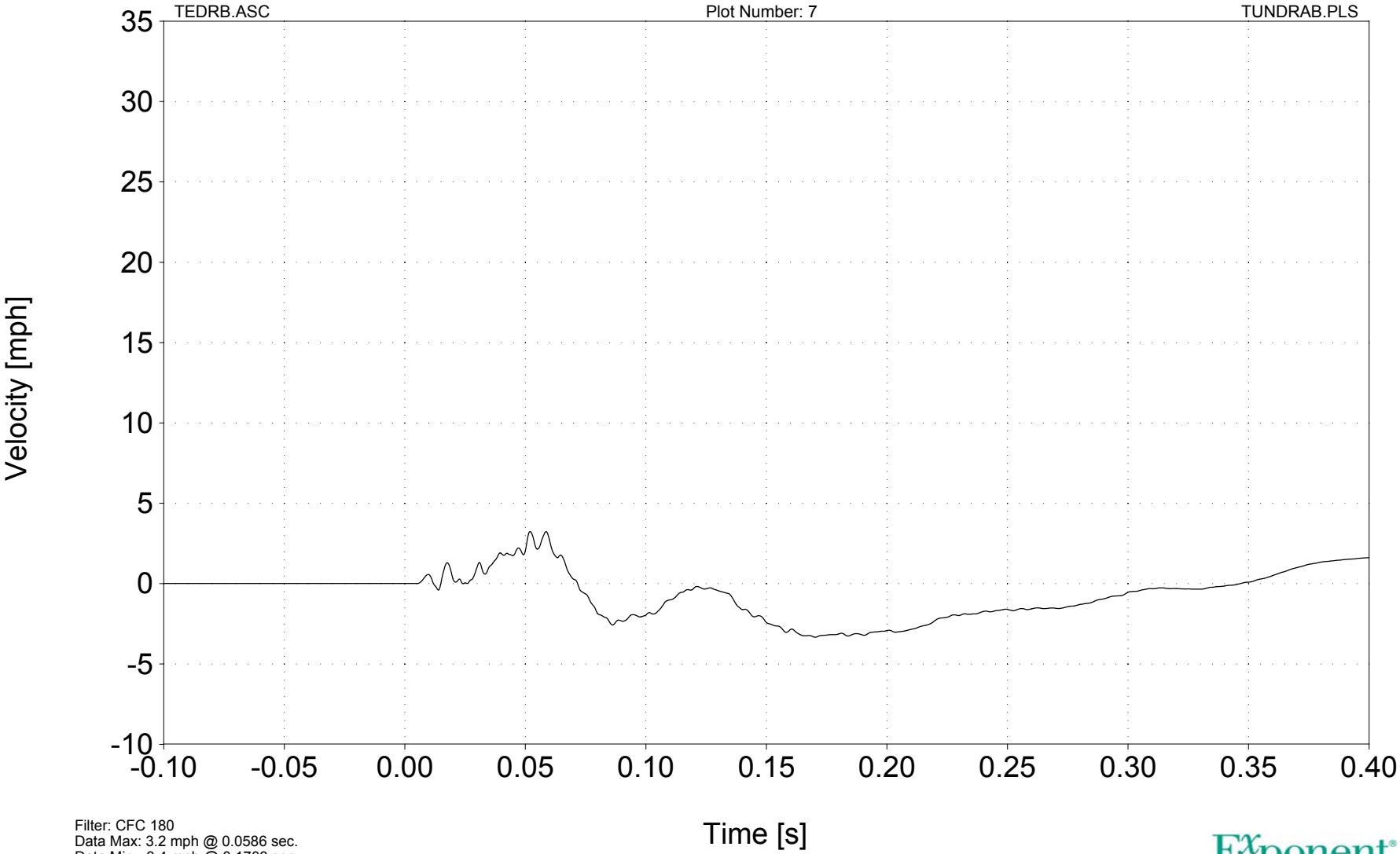
Vertical Velocity v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 3.2 mph @ 0.0586 sec.
Data Min: -3.4 mph @ 0.1703 sec.

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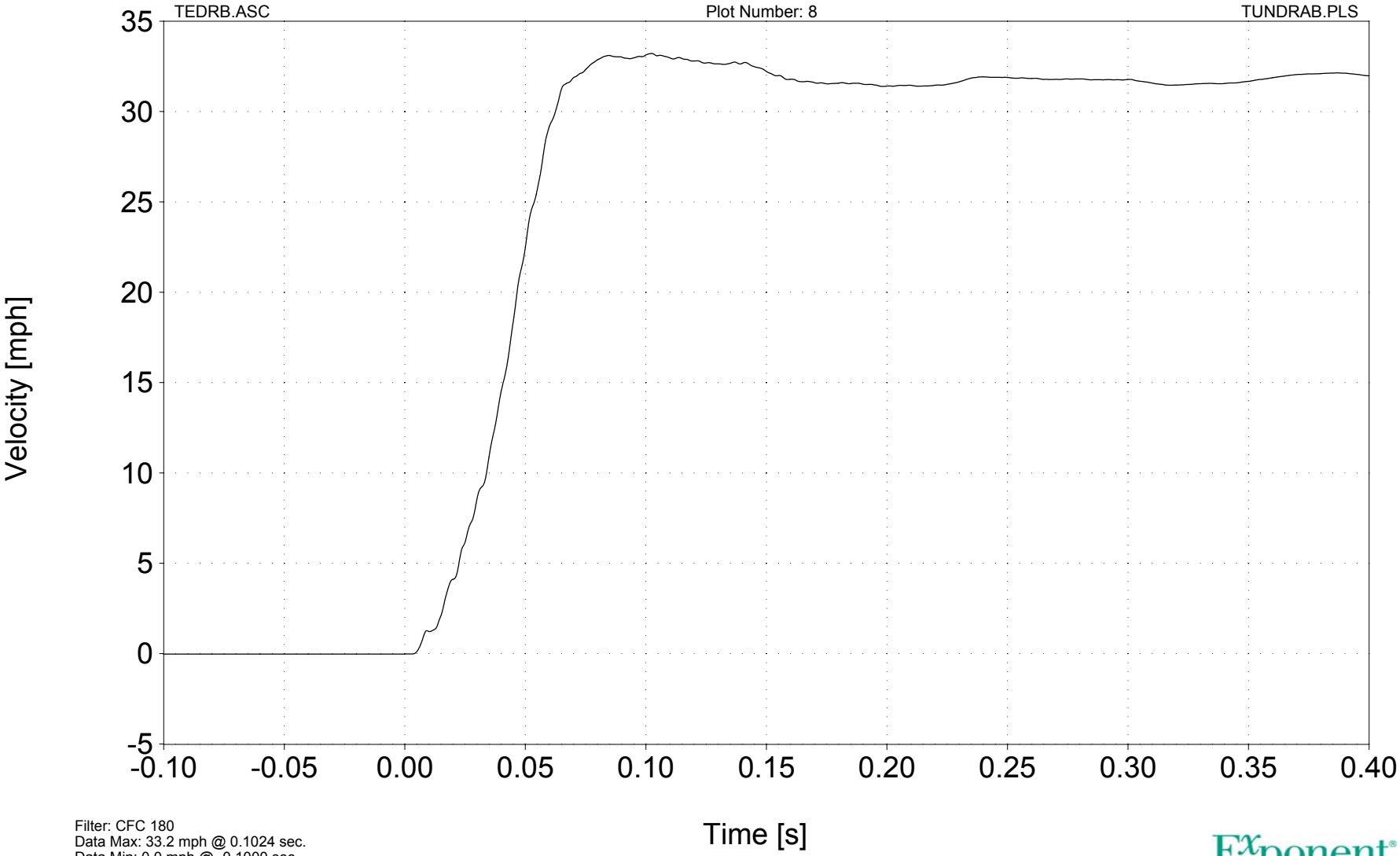
Delta Velocity v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



Filter: CFC 180
Data Max: 33.2 mph @ 0.1024 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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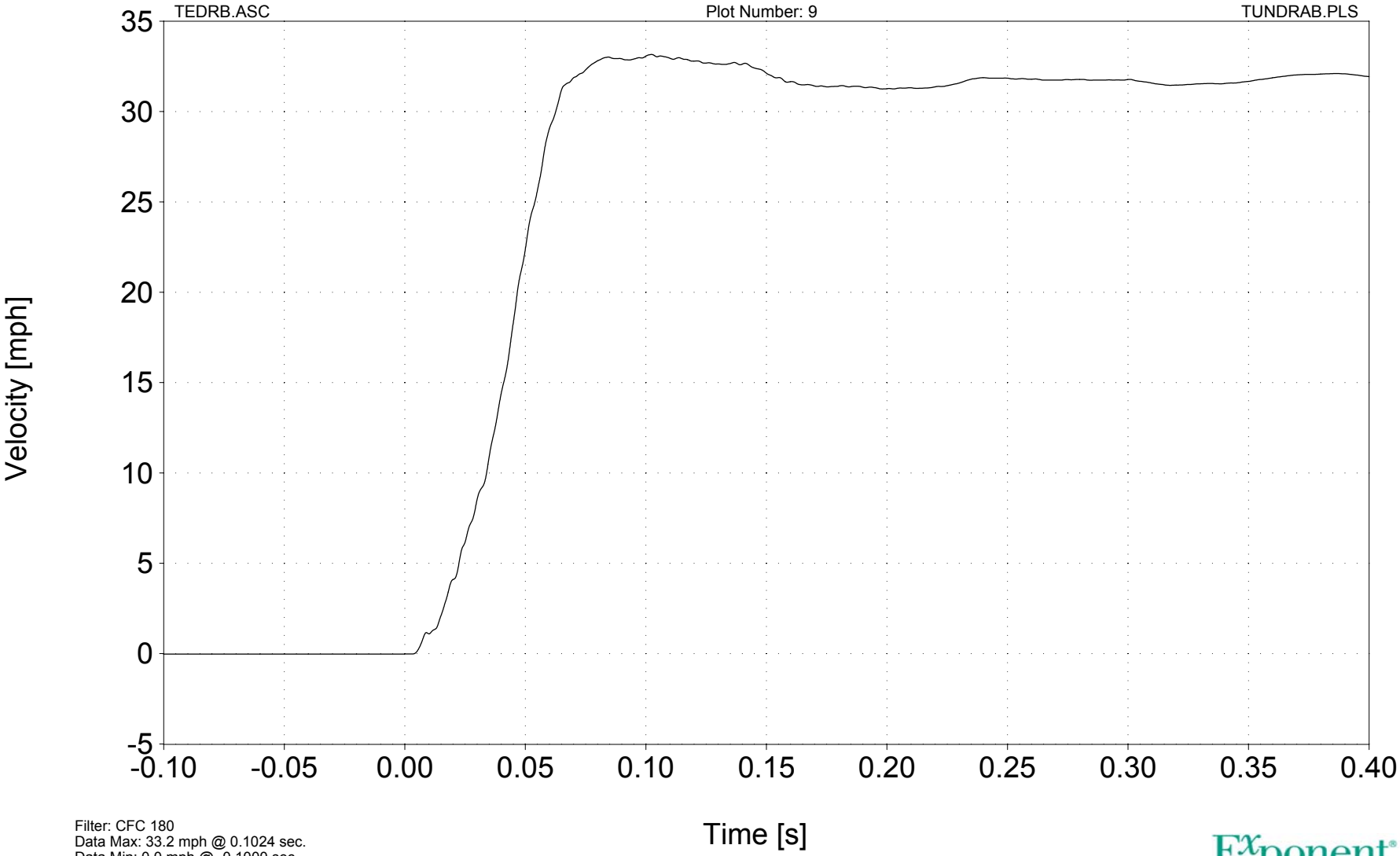
Failure Analysis Associates®

Longitudinal Delta Velocity v Time

EDR
2007 Toyota Tundra
Barrier Crash Test - 12/14/10



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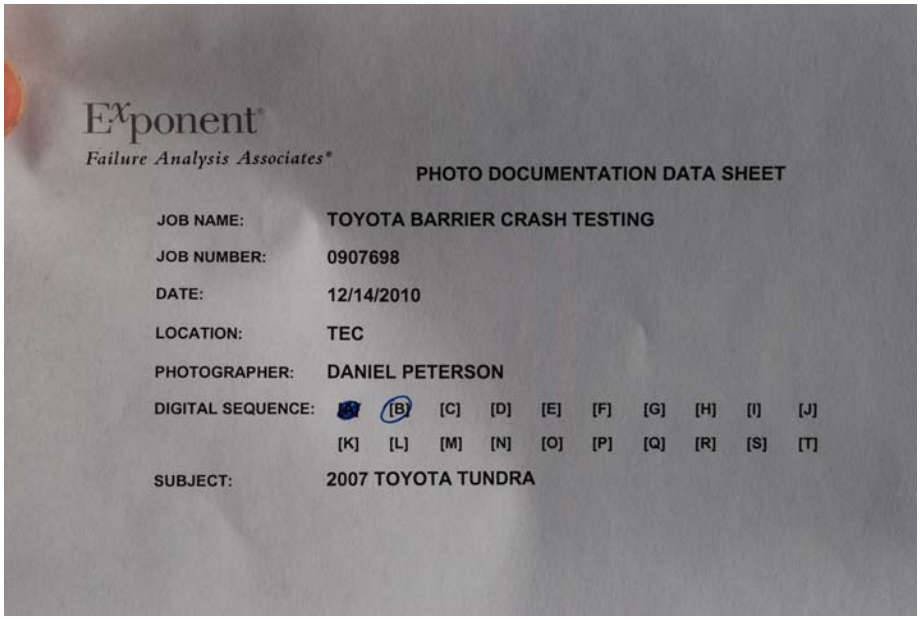

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Failure Analysis Associates®

PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA BARRIER CRASH TESTING
JOB NUMBER:	0907698
DATE:	12/14/2010
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2007 TOYOTA TUNDRA

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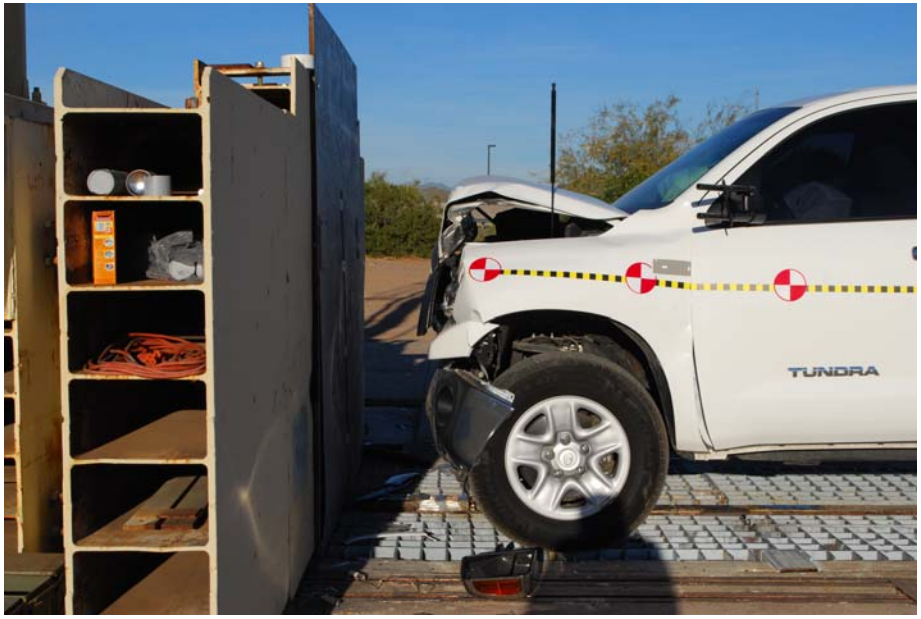

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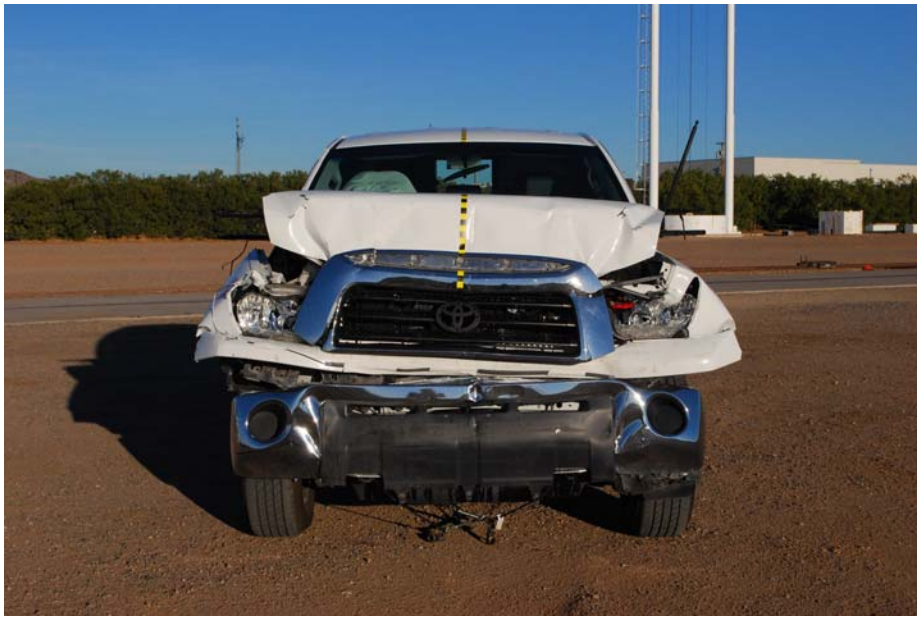

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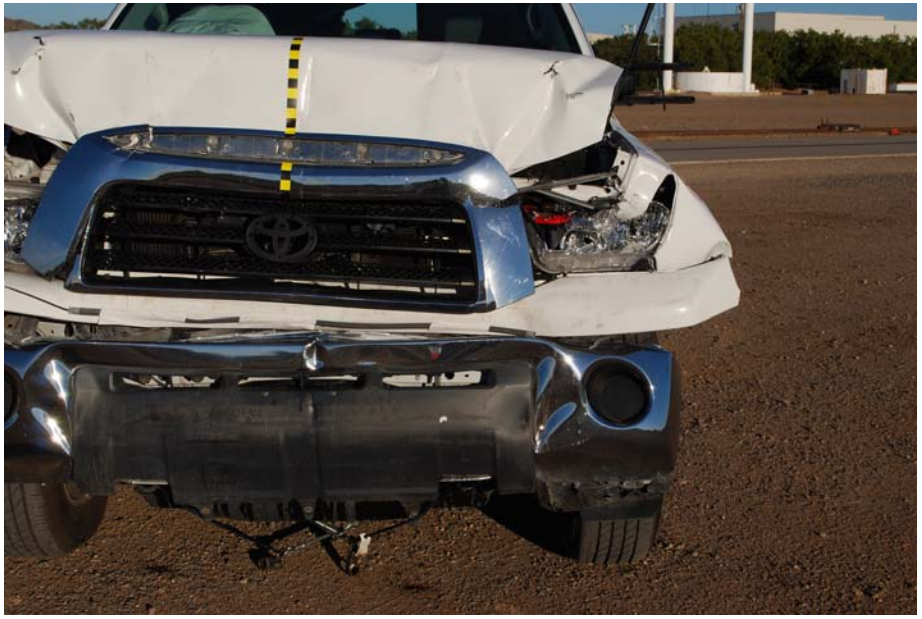

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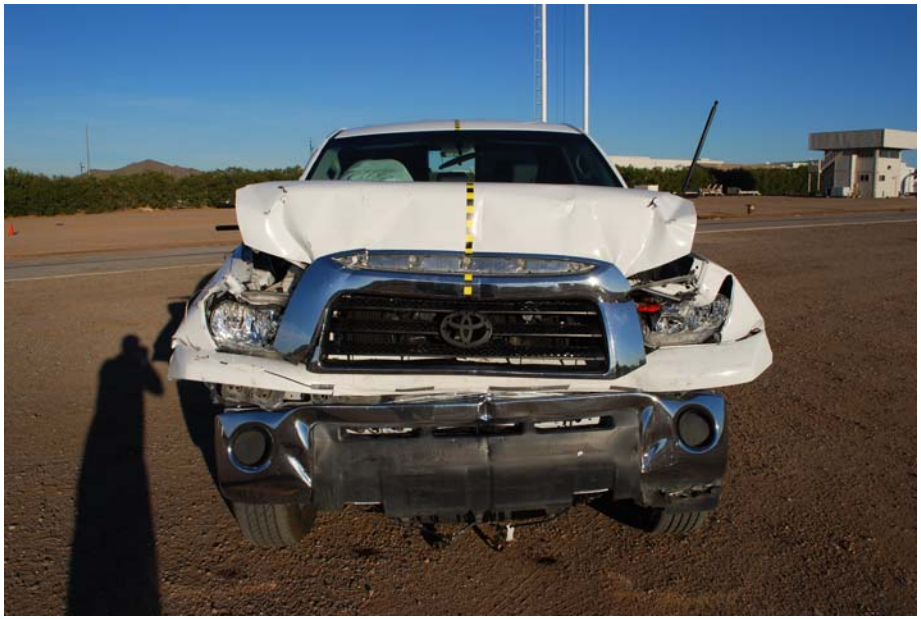

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0907698 A0T0 - 06158PH_0164

0907698 A0T0 - 06158PH_0165

0907698 A0T0 - 06158PH_0166

Appendix G

Barrier Crash Test, 2007 Lexus ES350, February 15, 2011

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2007 Lexus ES 350

Toyota Consulting
0907698

February 15, 2011

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2007 Lexus ES 350

Toyota Consulting
0907698

February 15, 2011

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

February 2011

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/0211/R076

Exponent®

Test Description

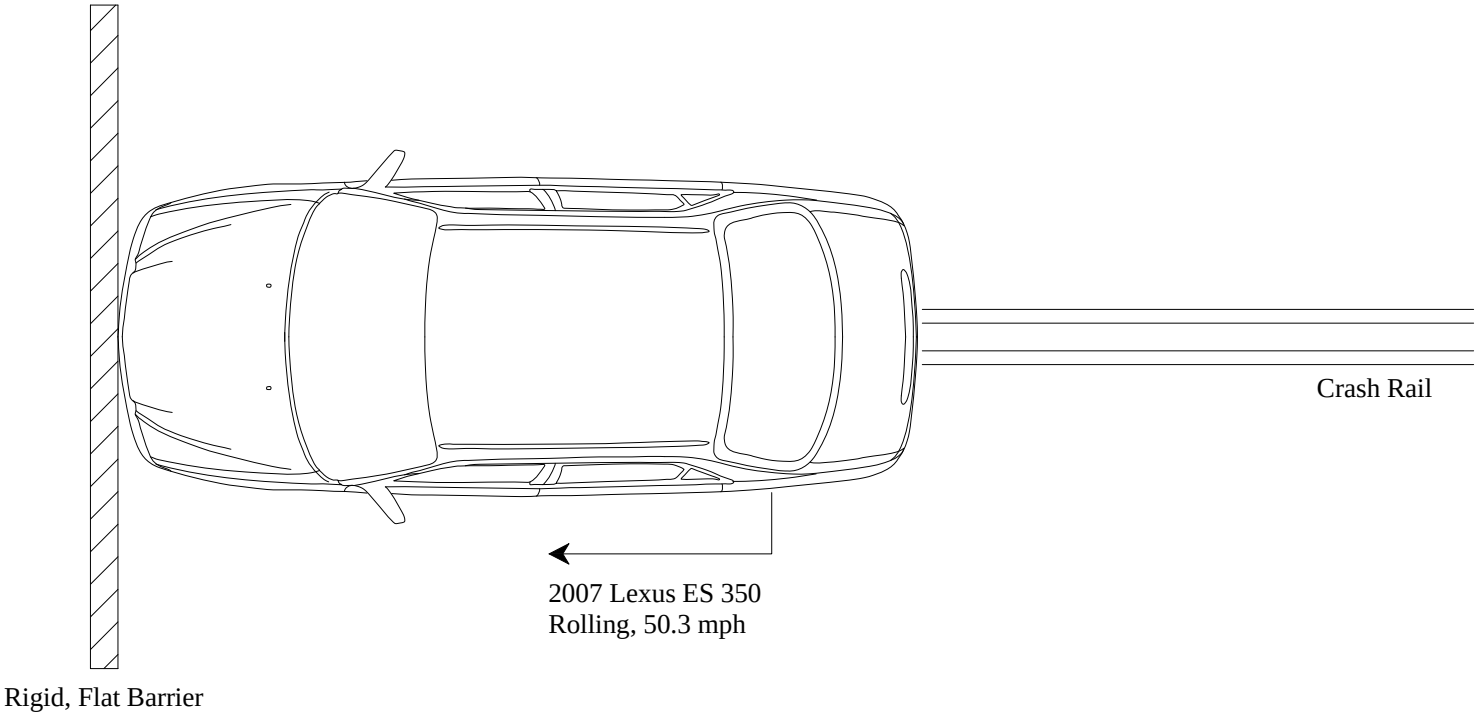
Exponent®
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	February 15, 2011
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2007 Lexus ES 350
IMPACT SPEED:	50.3 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set on trunk floor
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. Two sandbags were added to the right front seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 50.3 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.
NOTE:	During the event, the EDR mounting tabs broke and the accelerometers detached from the EDR.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
February 15, 2011



Exponent®

2007 Lexus ES 350

Exponent®
Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	6965			DATE RECEIVED:	2/10/2011
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2007	VEHICLE MAKE:	LEXUS	VEHICLE MODEL:	ES 350
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	SILVER
VEHICLE IDENTIFICATION NUMBER:	JTHBJ46G972080879			DATE OF MANUFACTURE:	12/06
GVWR (lb):	4680	FRONT GAWR (lb):	2668	REAR GAWR (lb):	2359
RECOMMENDED TIRE SIZE - F/R:	P215/55R17	RECOMMENDED TIRE PRESSURE - F/R (psi):	30		
INSTALLED TIRE SIZE:	LF: P215/55R17	RF: P215/55R17	LR: P215/55R17	RR: P215/55R17	
ENGINE TYPE:	6-CYLINDER	ENGINE DISPLACEMENT:	3.5 LITER	ODOMETER (mi):	38,852
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	18.5
FUEL TANK LOC:	CENTER, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT REAR QUARTER PANEL		
DESIGNATED SEATING - FRONT: 2	MID: 0	REAR: 3	TOTAL: 5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	Y
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	N	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	Y	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	Y	ANTI-LOCK BRAKES F:	Y
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	Y	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	Y
SUNROOF:	Y	ROOF RACK:	N						
ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES:	NONE								
SIGNIFICANT BODY DAMAGE/CORROSION:	NONE								

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

LEFT FRONT:	1096	RIGHT FRONT:	1078	TOTAL FRONT:	2174	PERCENT FRONT:	60%
LEFT REAR:	698	RIGHT REAR:	723	TOTAL REAR:	1421	PERCENT REAR:	40%
				TOTAL WEIGHT:	3595		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

LEFT FRONT:	27.4	AT WHL WELL @ AXLE	RIGHT FRONT:	27.4	AT WHL WELL @ AXLE
LEFT REAR:	28.1	AT WHL WELL @ AXLE	RIGHT REAR:	28.0	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	191.4	OVERALL WIDTH:	71.5	OVERALL HEIGHT:	57.0
WHEELBASE:	109.0	FRONT TRACK:	62.3	REAR TRACK:	61.5
REAR OVERHANG:	44.0	FRONT BUMPER HEIGHT:	20.1	REAR BUMPER HEIGHT:	24.5
COMMENTS:	NONE				
EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	KB	CHECKED BY:	DSP

0907698 A0T0 - 06263PH_0001

0907698 A0T0 - 06263PH_0002

0907698 A0T0 - 06263PH_0003

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0907698 A0T0 - 06263PH_0005

0907698 A0T0 - 06263PH_0006

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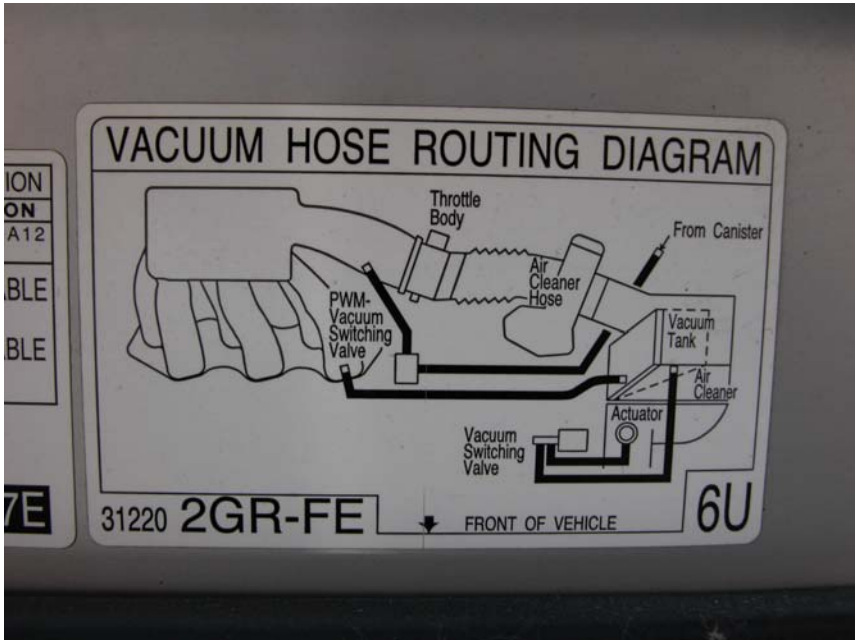

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Exponent®

Test Setup

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VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	2/15/2011
VEHICLE YEAR:	2007	VEHICLE MAKE:	LEXUS	VEHICLE MODEL:	ES 350
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	SILVER
VEHICLE IDENTIFICATION NUMBER:	JTHBJ46G972080879			ODOMETER (mi):	38,856

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P215/55R17 | 30 PSI | 5/32"	P215/55R17 | 30 PSI | 4/32"
REAR:	P215/55R17 | 30 PSI | 5/32"	P215/55R17 | 30 PSI | 4/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	1107	RIGHT FRONT:	1115	TOTAL FRONT:	2222	PERCENT FRONT:	62%
LEFT REAR:	648	RIGHT REAR:	700	TOTAL REAR:	1348	PERCENT REAR:	38%
				TOTAL WEIGHT:	3570		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	27.4	AT	WHL WELL @ AXLE	RIGHT FRONT:	27.4	AT	WHL WELL @ AXLE
LEFT REAR:	28.5	AT	WHL WELL @ AXLE	RIGHT REAR:	28.3	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRONT SUB-FRAME		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	TRUNK		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	N/A	RIGHT FRONT:	NONE*
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	MID-POSITION	MID-POSITION
OTHER:	SEATBELT BUCKLED, D-RING FULL DOWN, STEERING WHEEL AT MID TILT/TELESCOPE	SEATBELT BUCKLED, D-RING FULL DOWN

COMMENTS

*TWO SANDBAGS (104 LBS TOTAL) PLACED IN RIGHT FRONT SEAT; ECU WIRING HARNESS CONNECTOR LOCK BROKEN - WIRING HARNESS SECURED TO ECU WITH A PLASTIC TIE

FORM COMPLETED BY:	DSP	CHECKED BY:	JS

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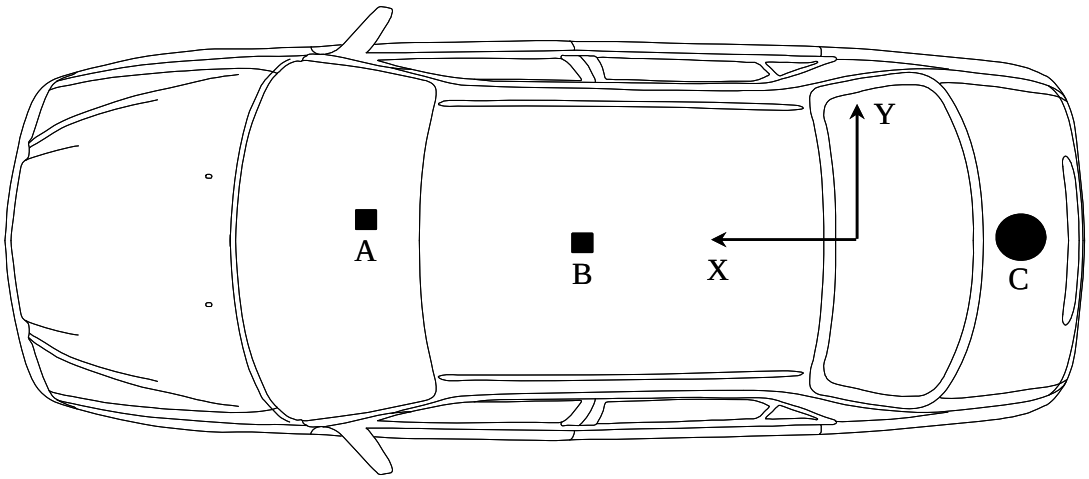
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	2/15/2011
VEHICLE YEAR:	2007	VEHICLE MAKE:	LEXUS	VEHICLE MODEL:	ES 350
VEHICLE IDENTIFICATION NUMBER:	JTHBJ46G972080879				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	83.9 in.	2.1 in.	16.7 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	52.5 in.	0.0 in.	14.0 in.
C	TRIAXIAL ACCELEROMETER SET, BOTTOM OF TRUNK	-30.8 in.	0.0 in.	12.0 in.

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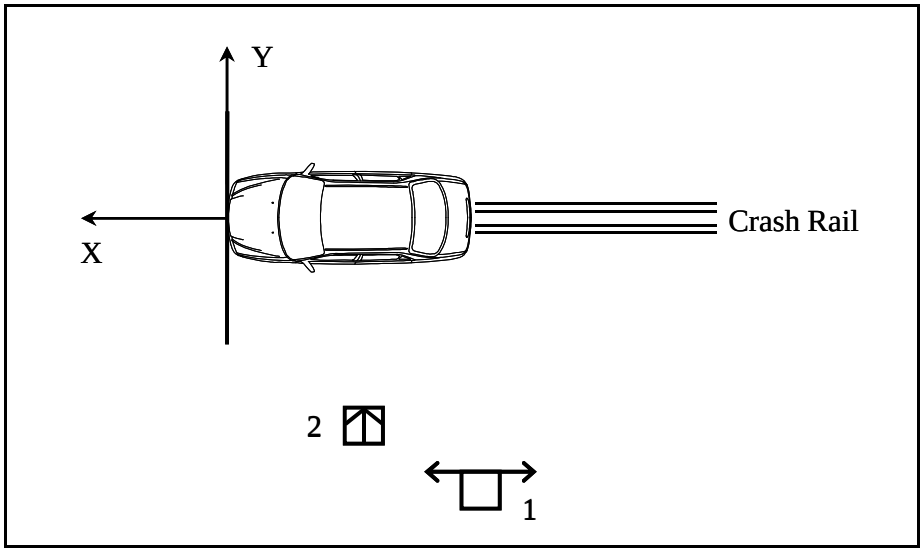
CAMERA SETUP RECORD

PROJECT NO:	0907698	TEST DATE:	2/15/2011
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2007 LEXUS ES 350		
TEST SPEED:	50.3 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-12.0	-37.0	4.0	RT	--

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PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA CONSULTING
JOB NUMBER:	0907698
DATE:	2/15/2011
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2007 LEXUS ES350

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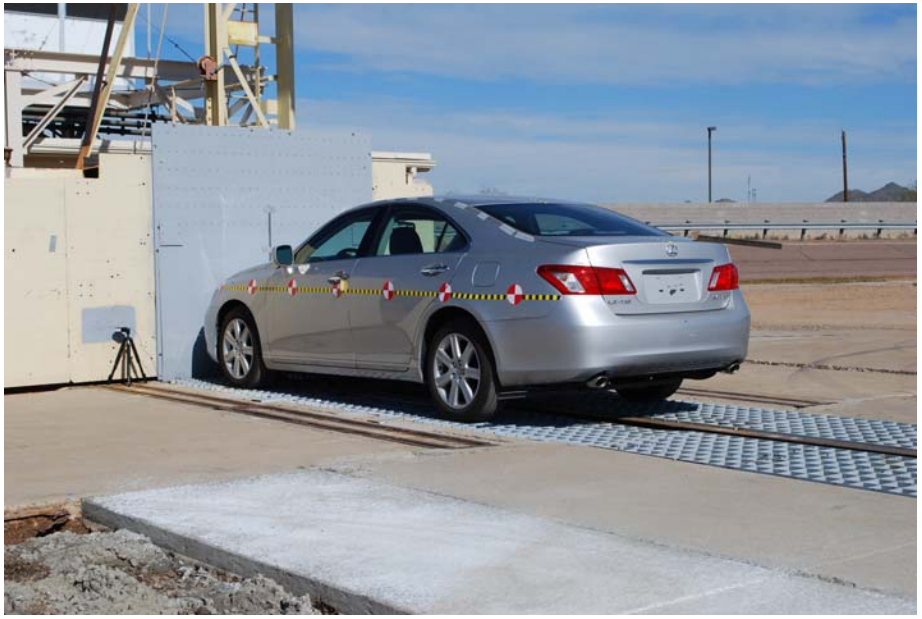

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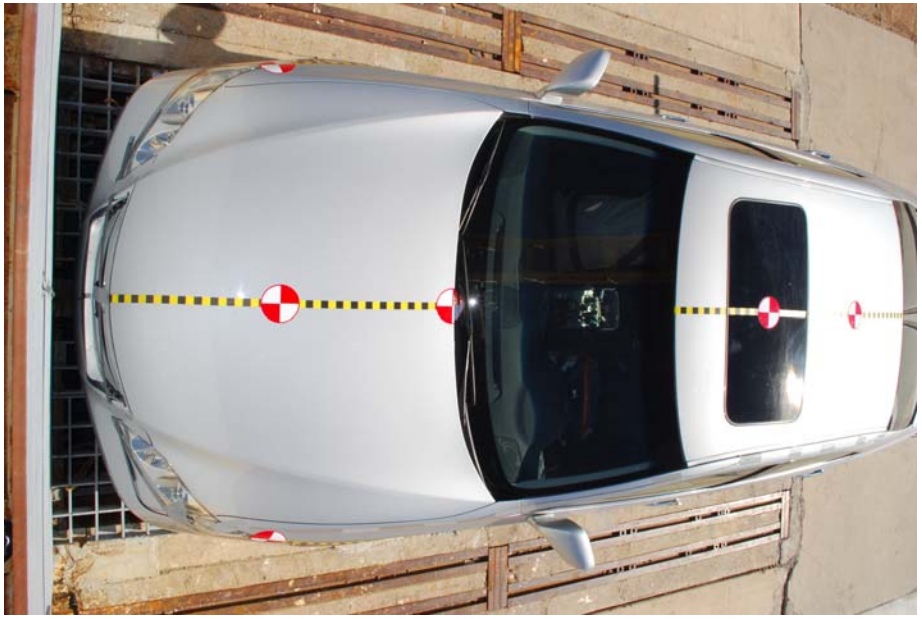

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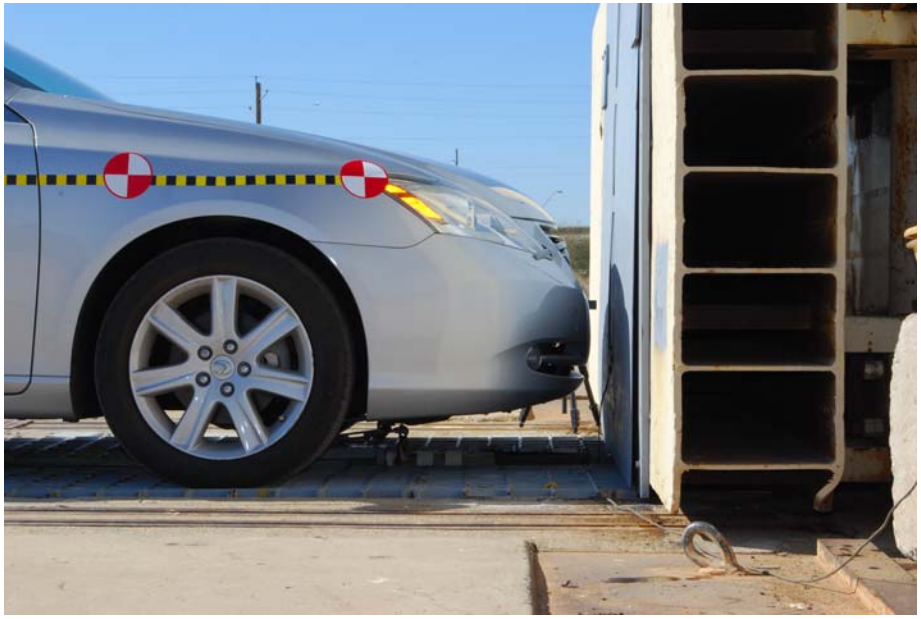

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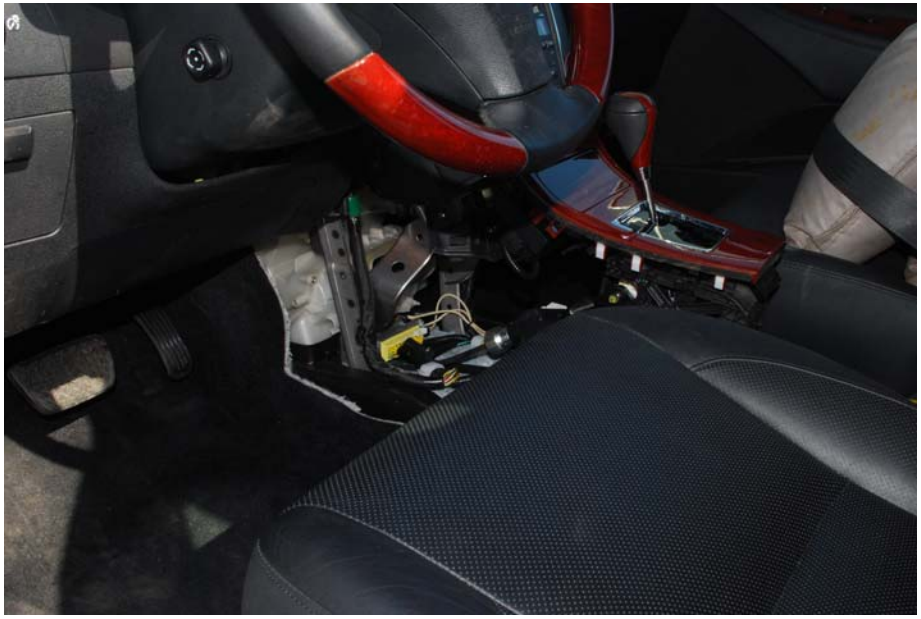

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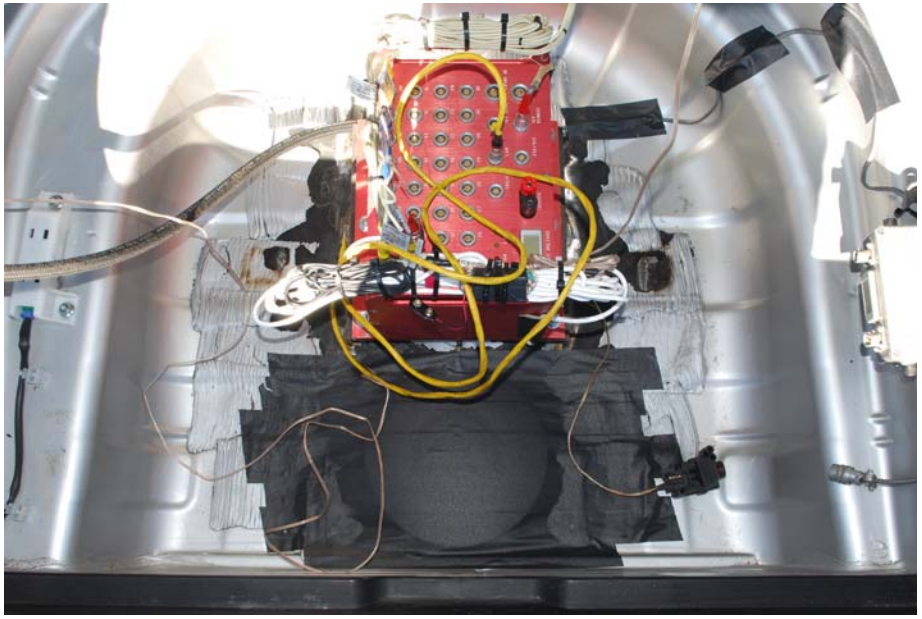

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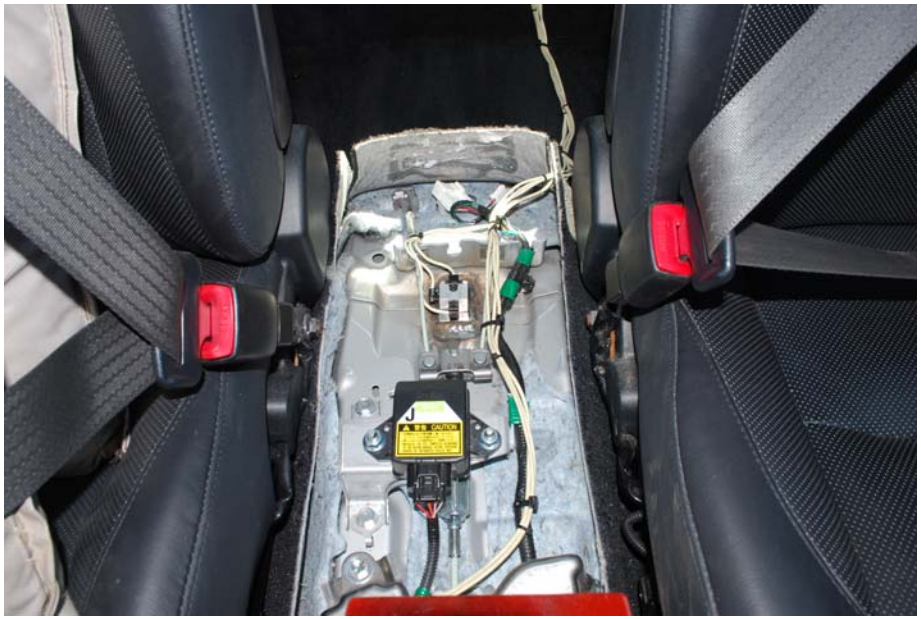

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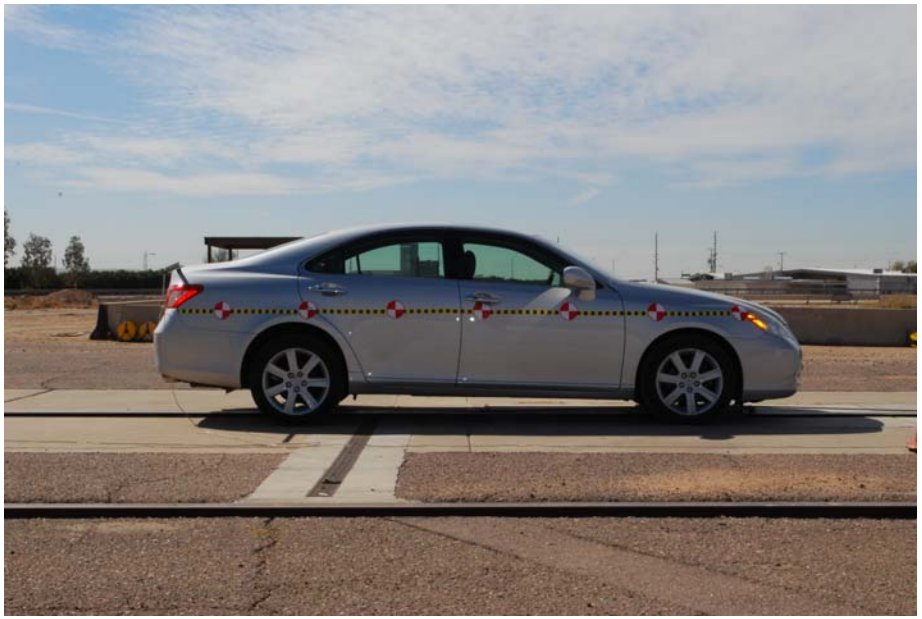

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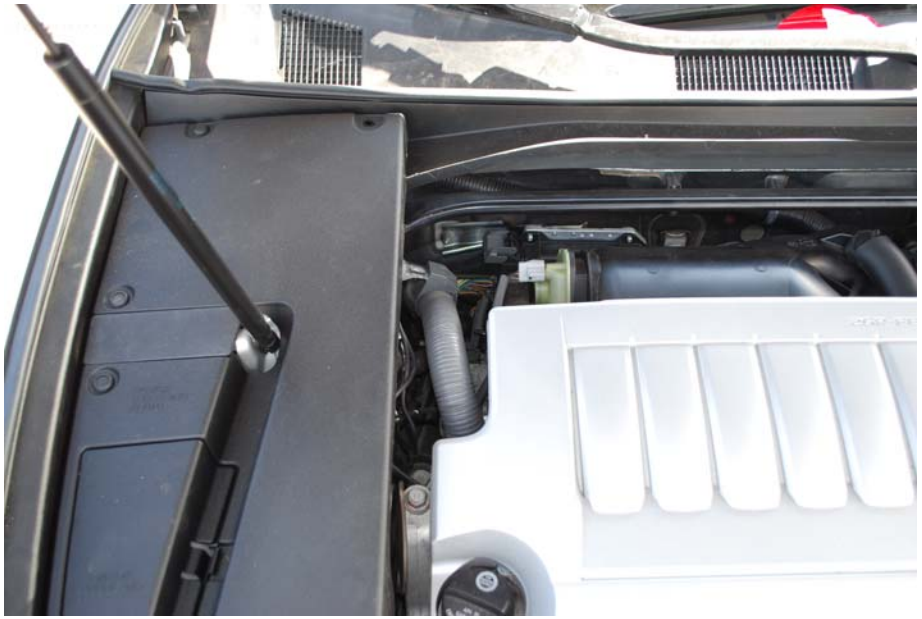

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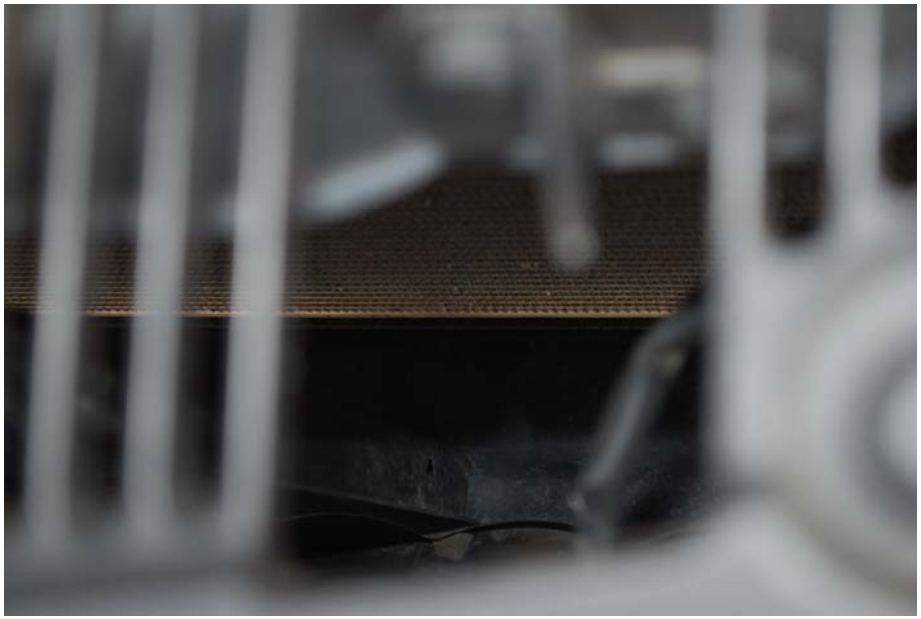

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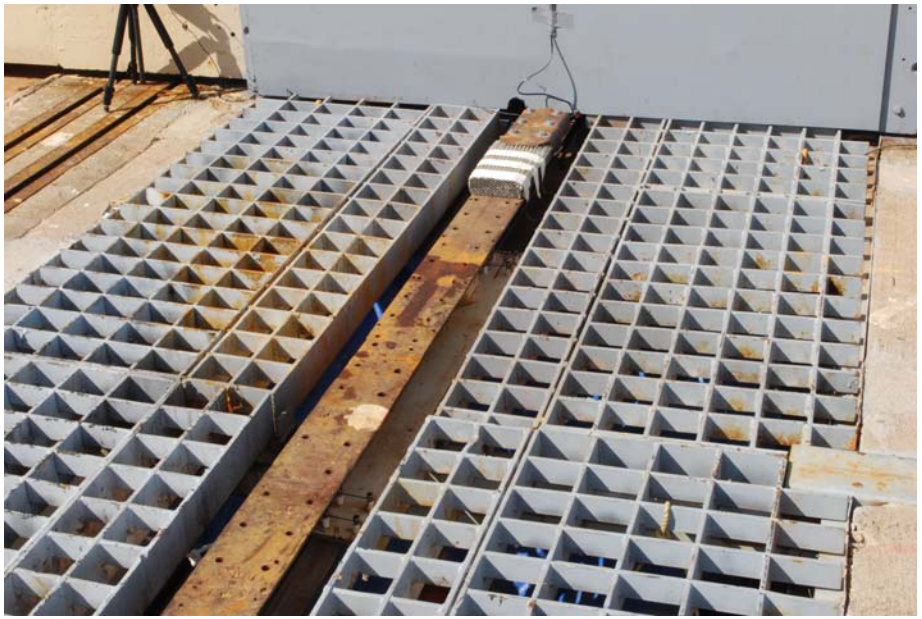

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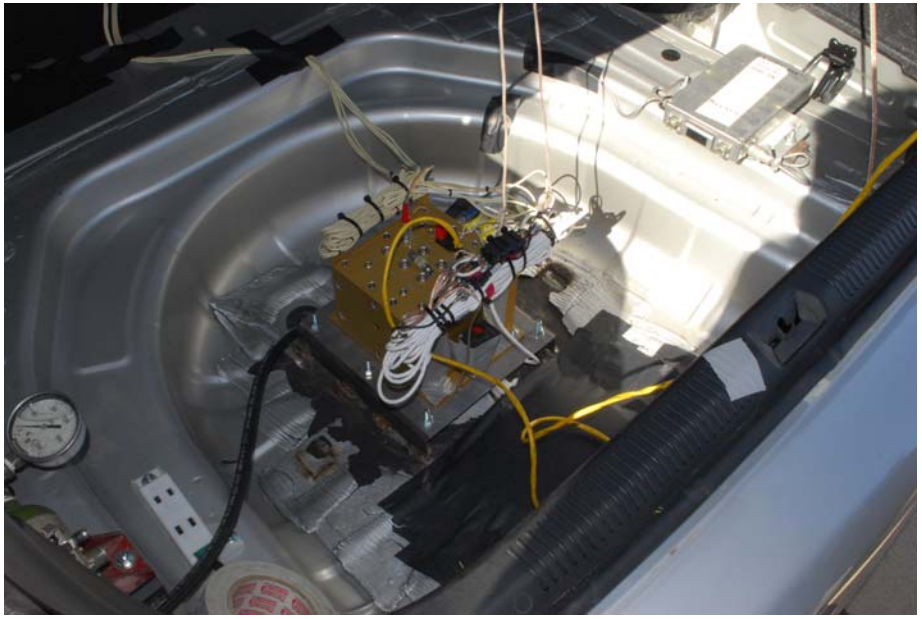

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0907698 A0T0 - 06263PH_0137

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Test Results

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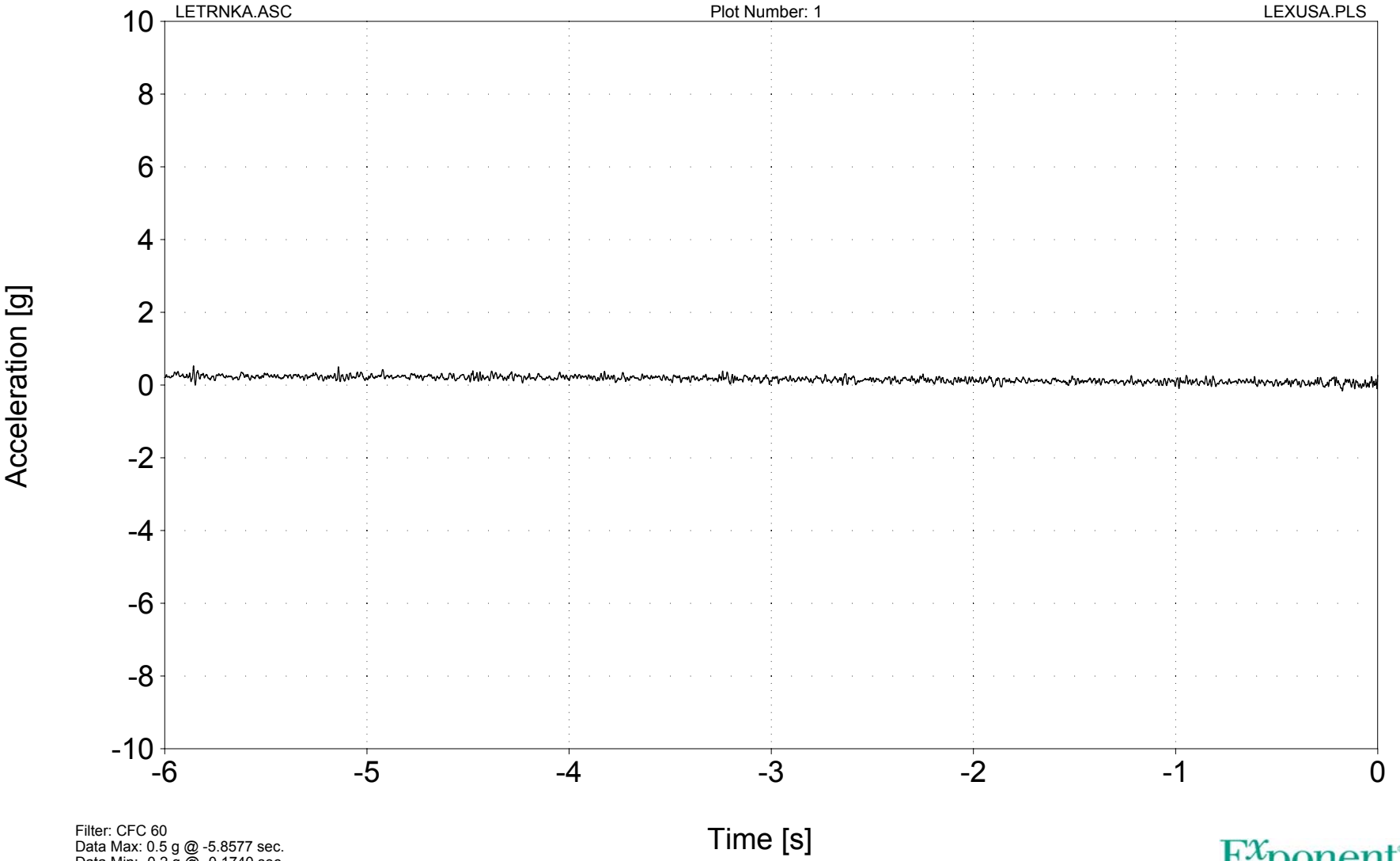
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	2/15/2011
OPERATOR:	DSP	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	TESTED VEHICLE: 2007 LEXUS ES 350; CHANNEL 1 FAILED				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
021511	Channel 1	--	--	--	JS
	Channel 2	--	50.3	73.8	
	Average	--	50.3	73.8	

Longitudinal Acceleration v Time

Trunk
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 0.5 g @ -5.8577 sec.
Data Min: -0.2 g @ -0.1740 sec.

Toyota Consulting
0907698

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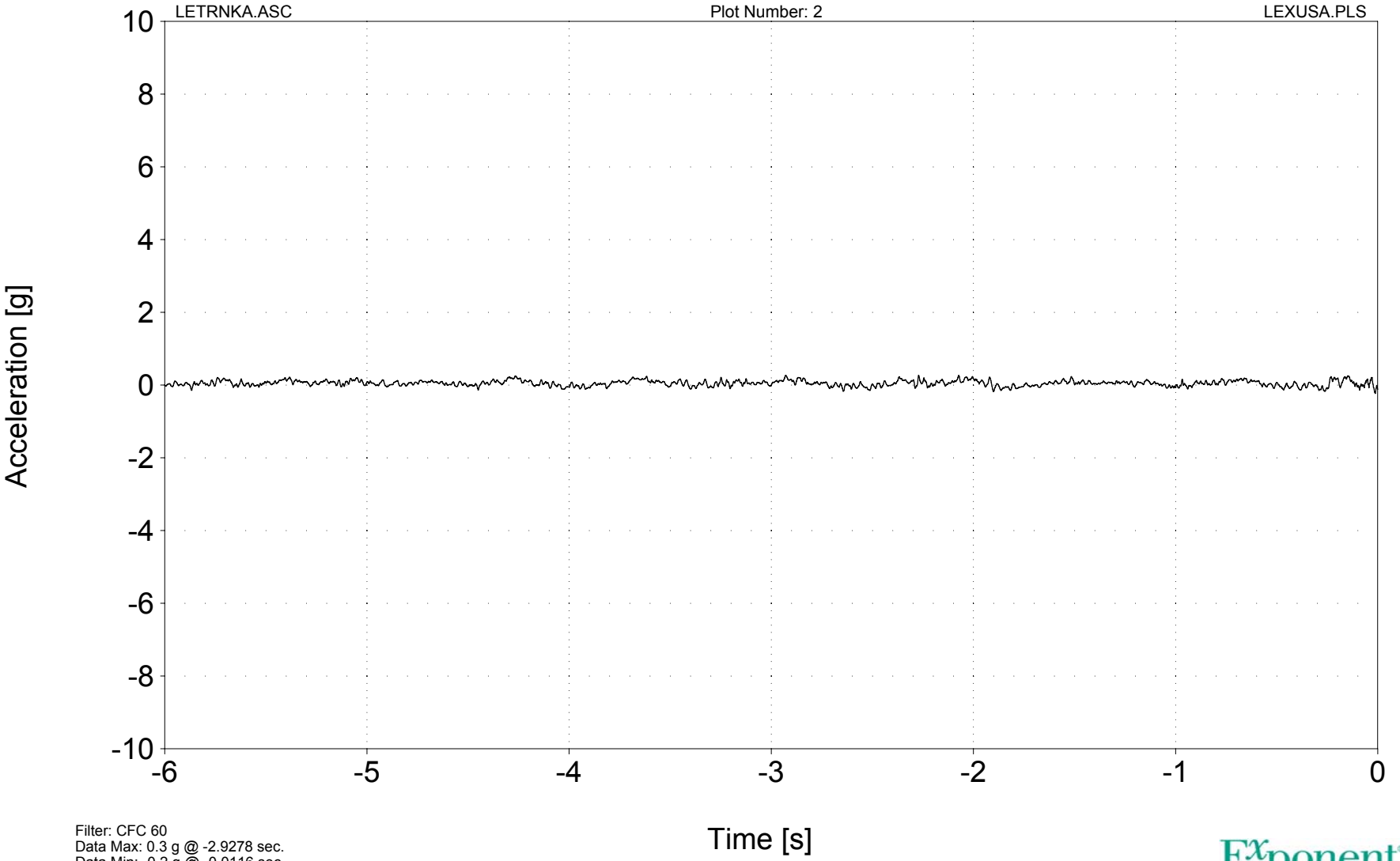
Lateral Acceleration v Time

Trunk
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



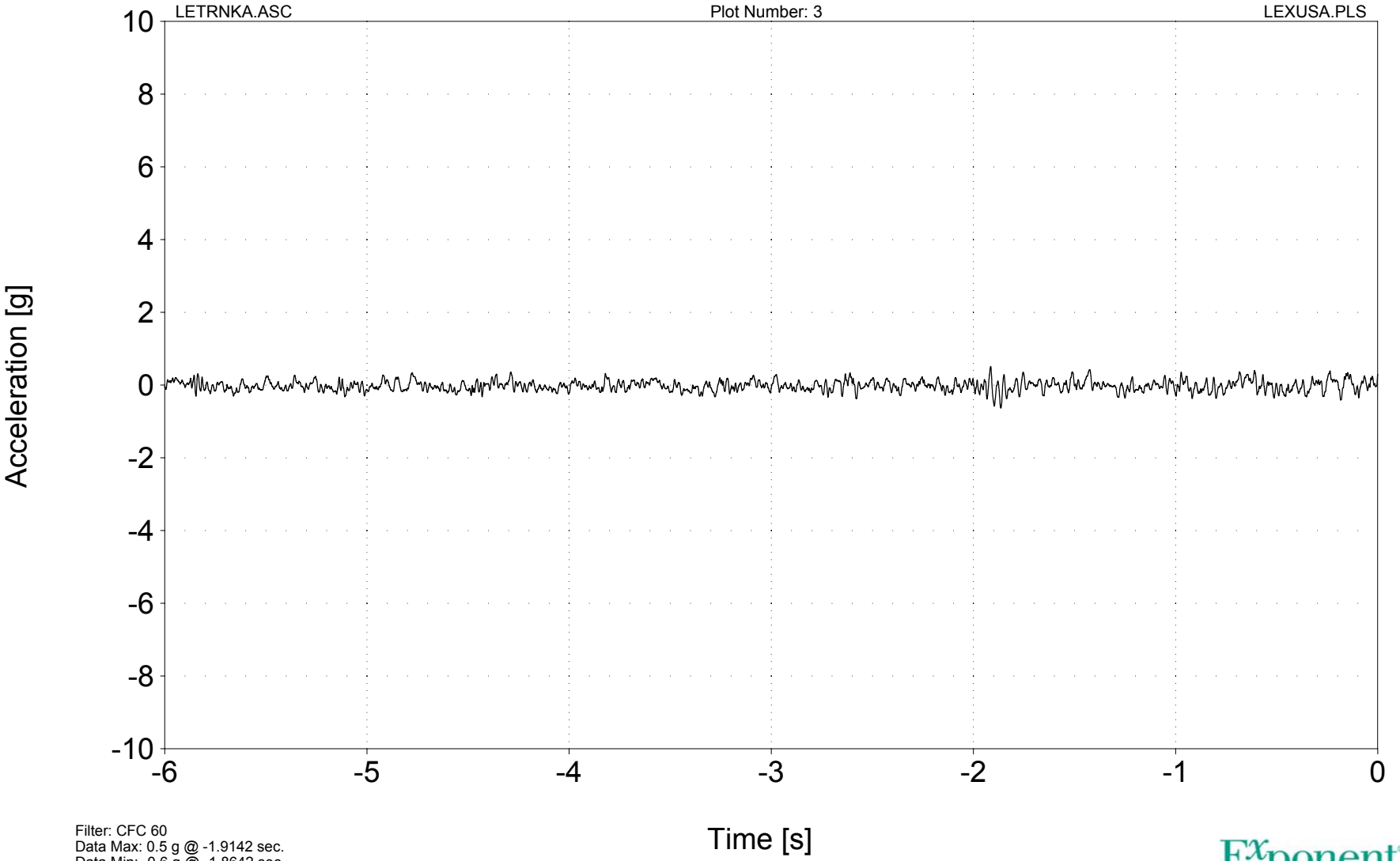
Filter: CFC 60
Data Max: 0.3 g @ -2.9278 sec.
Data Min: -0.2 g @ -0.0116 sec.

Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Vertical Acceleration v Time

Trunk
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



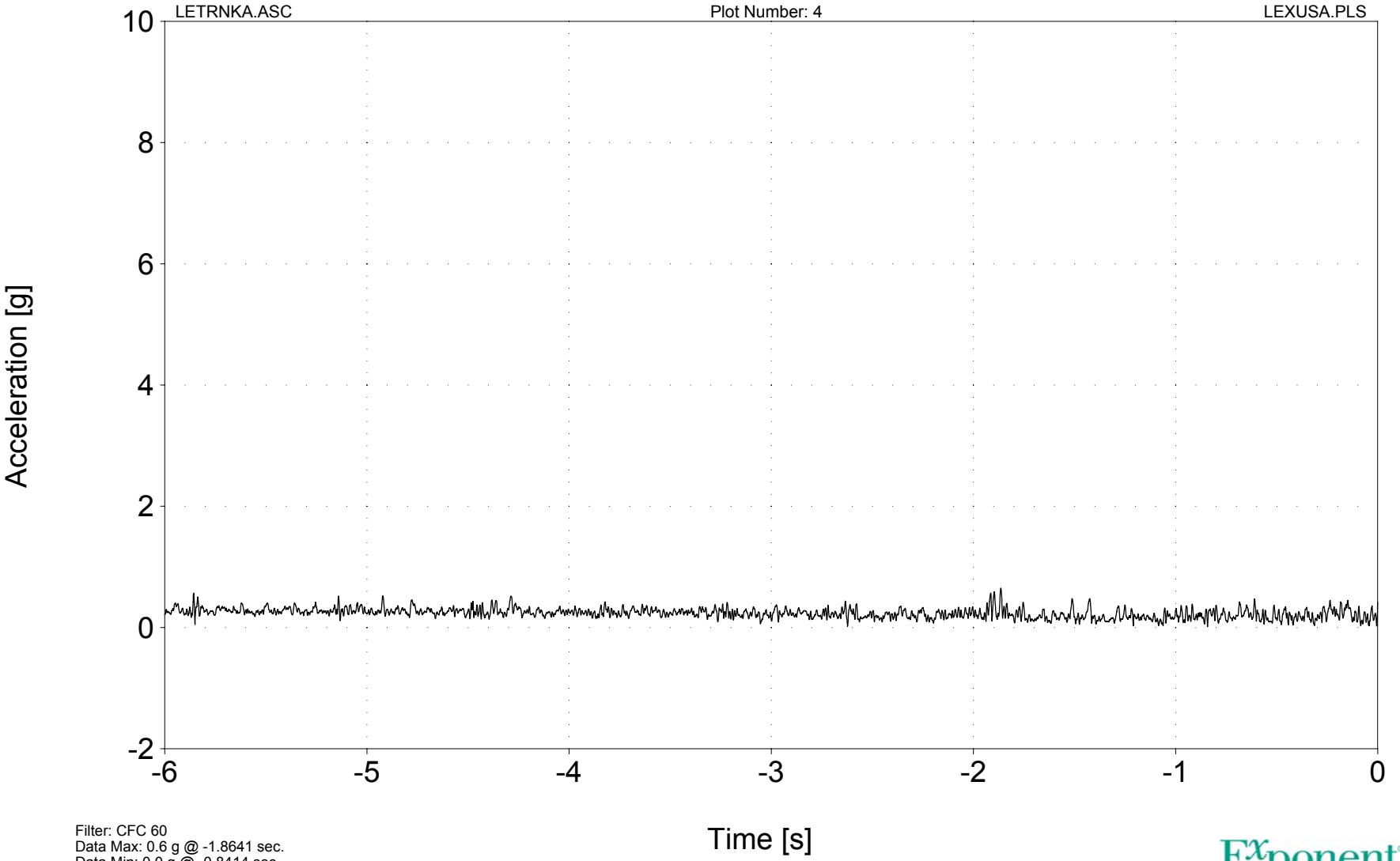
Filter: CFC 60
Data Max: 0.5 g @ -1.9142 sec.
Data Min: -0.6 g @ -1.8642 sec.

Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Resultant Acceleration v Time

Trunk
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 0.6 g @ -1.8641 sec.
Data Min: 0.0 g @ -0.8414 sec.

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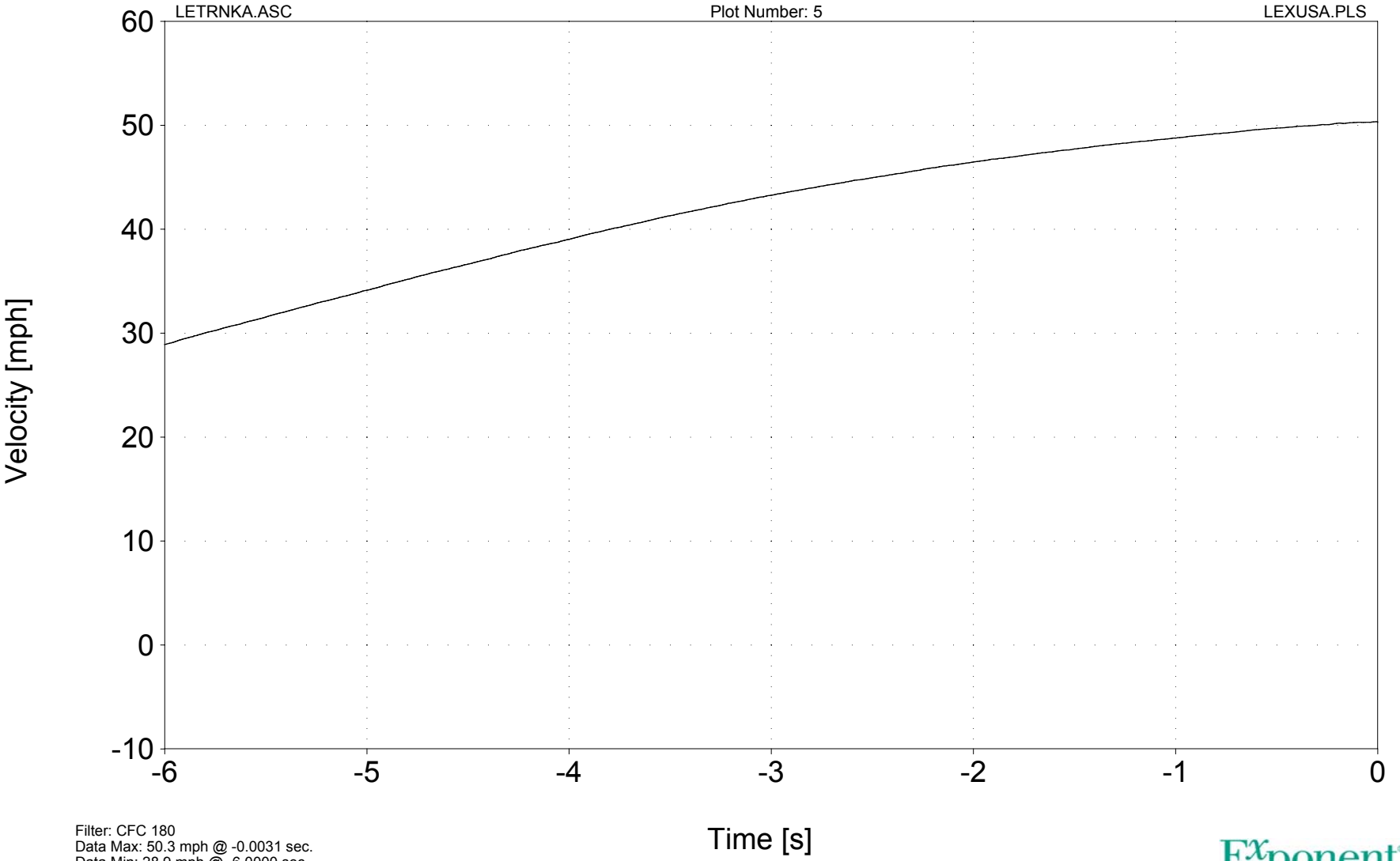
Longitudinal Velocity v Time

Trunk
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 50.3 mph @ -0.0031 sec.
Data Min: 28.9 mph @ -6.0000 sec.

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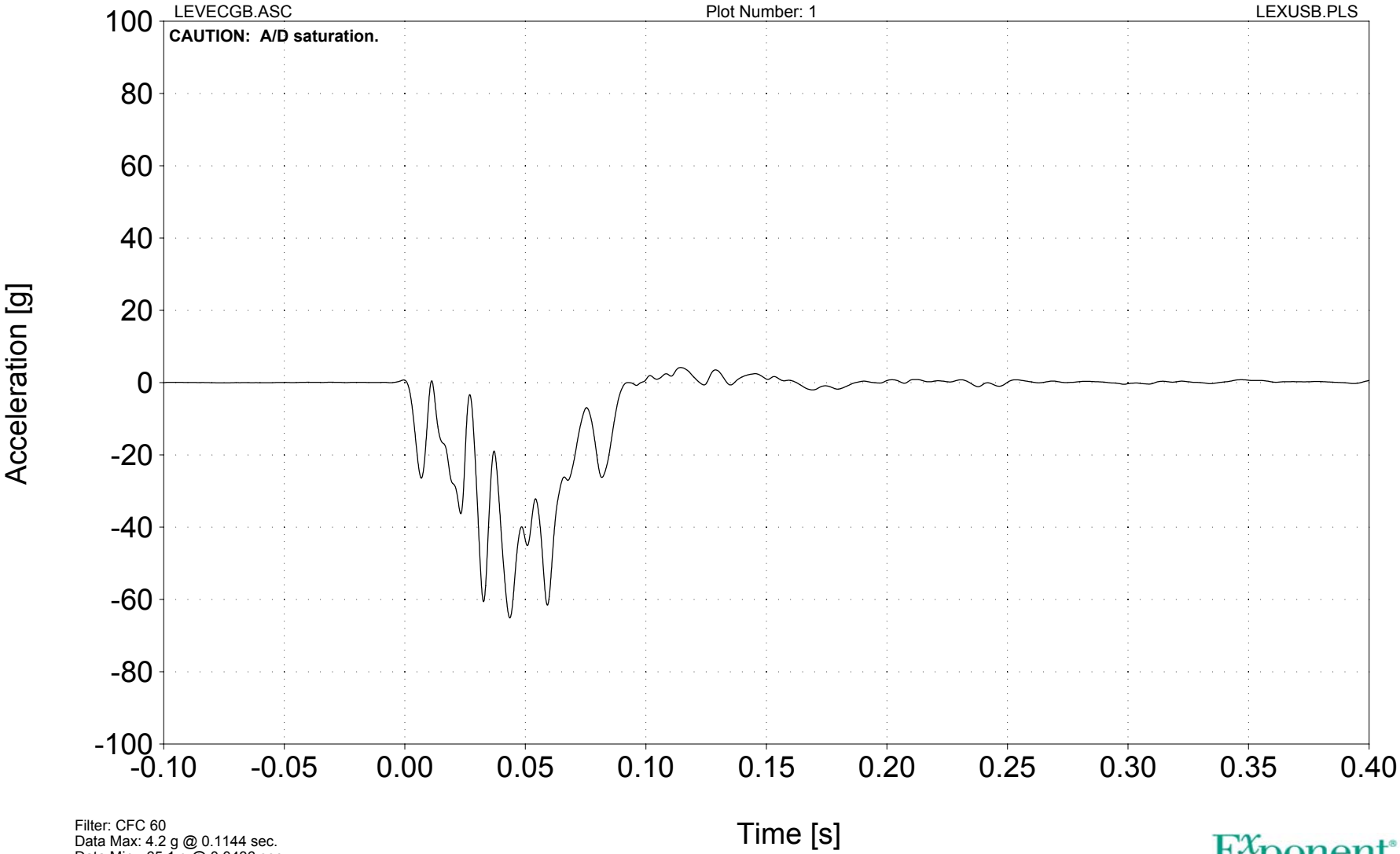
Longitudinal Acceleration v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 4.2 g @ 0.1144 sec.
Data Min: -65.1 g @ 0.0436 sec.

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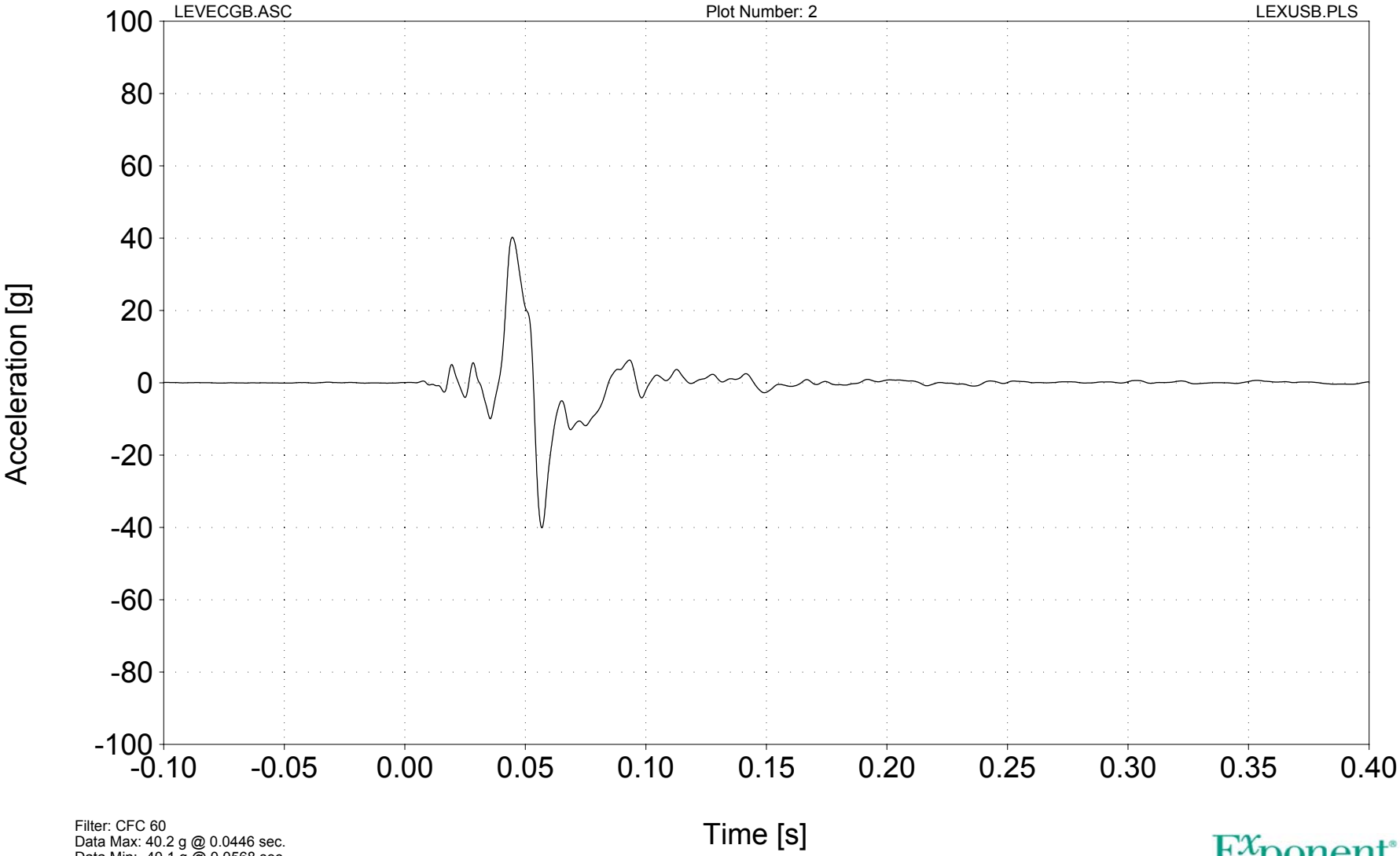
Lateral Acceleration v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 40.2 g @ 0.0446 sec.
Data Min: -40.1 g @ 0.0568 sec.

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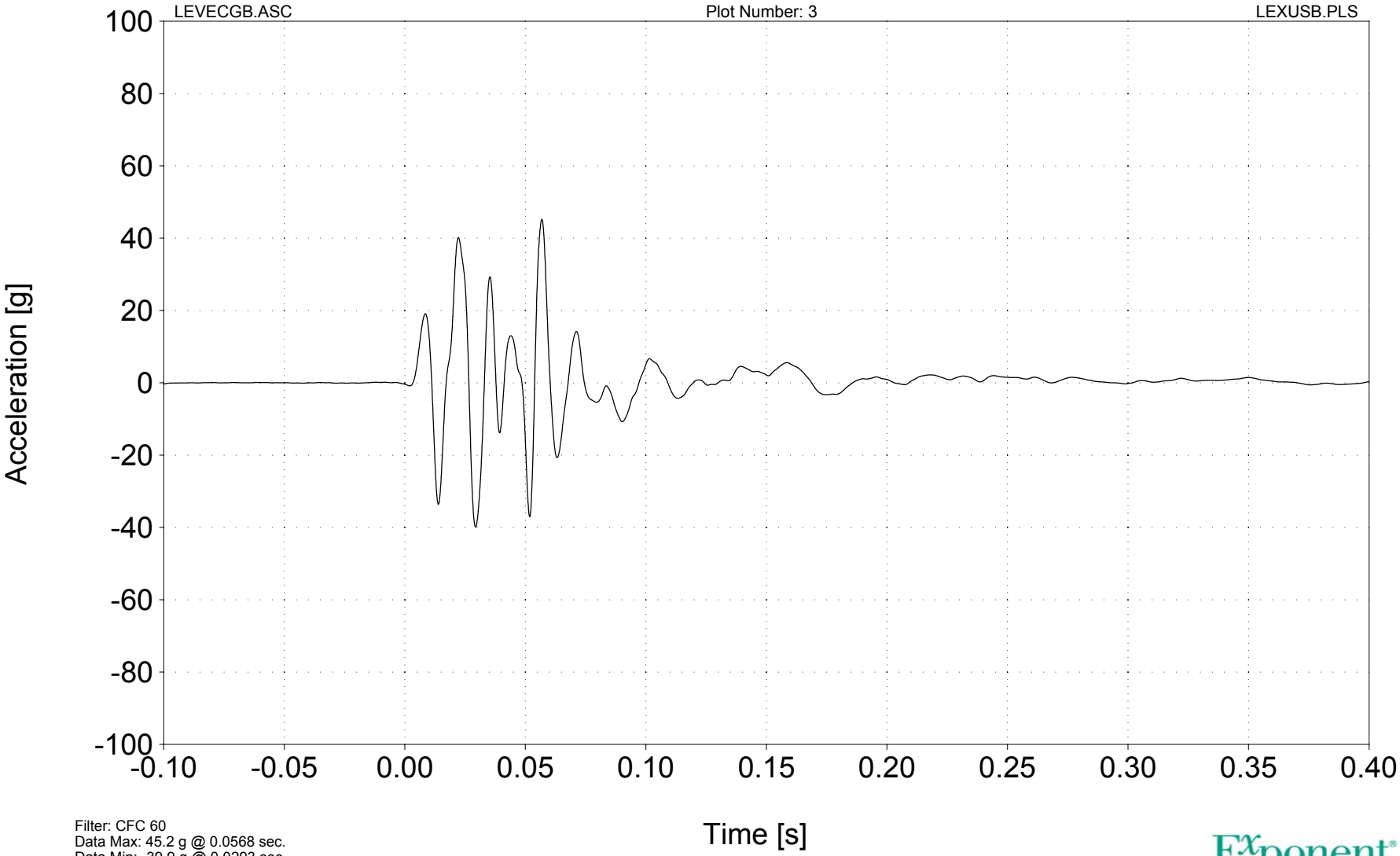
Vertical Acceleration v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 45.2 g @ 0.0568 sec.
Data Min: -39.9 g @ 0.0293 sec.

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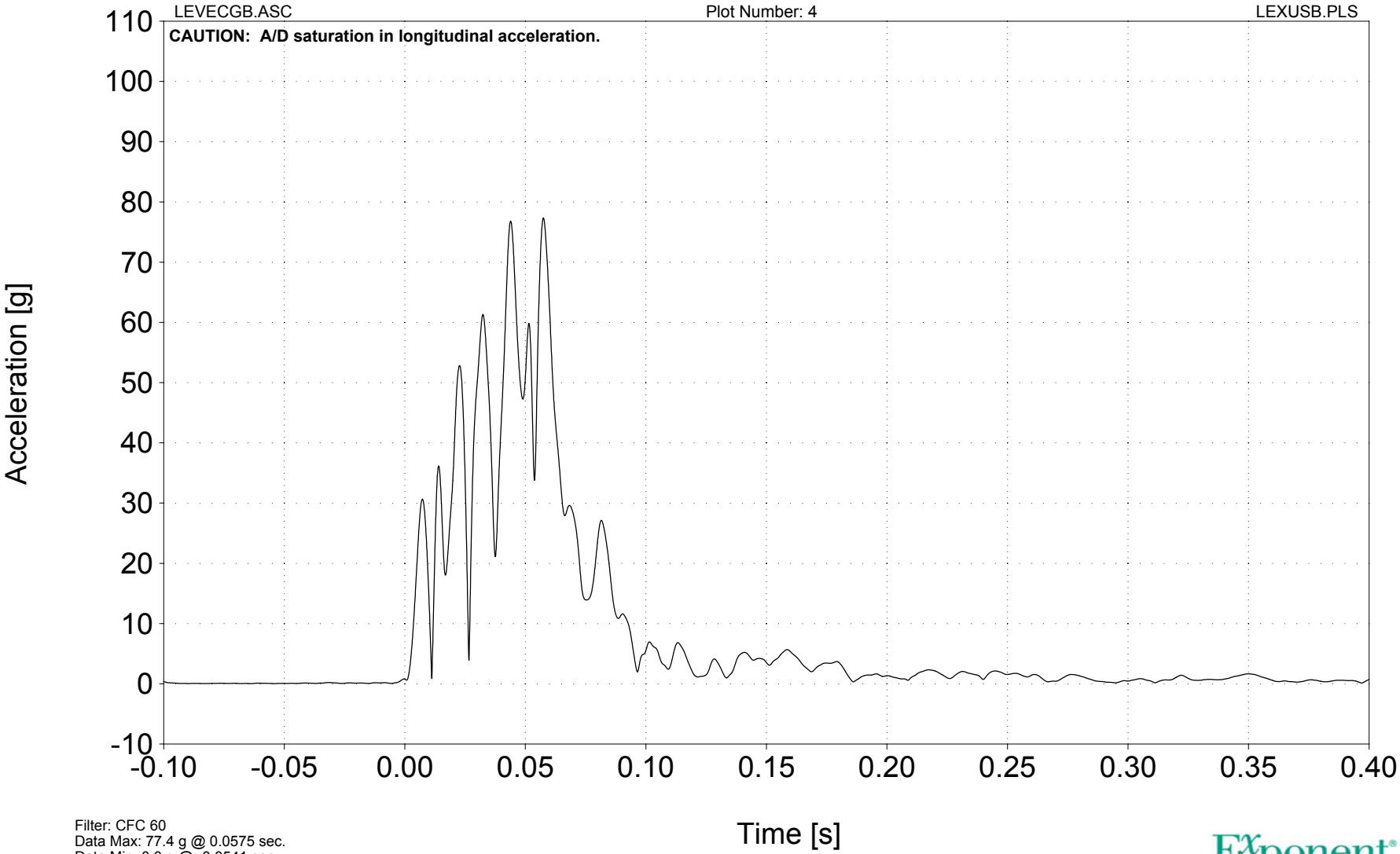
Resultant Acceleration v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 77.4 g @ 0.0575 sec.
Data Min: 0.0 g @ -0.0541 sec.

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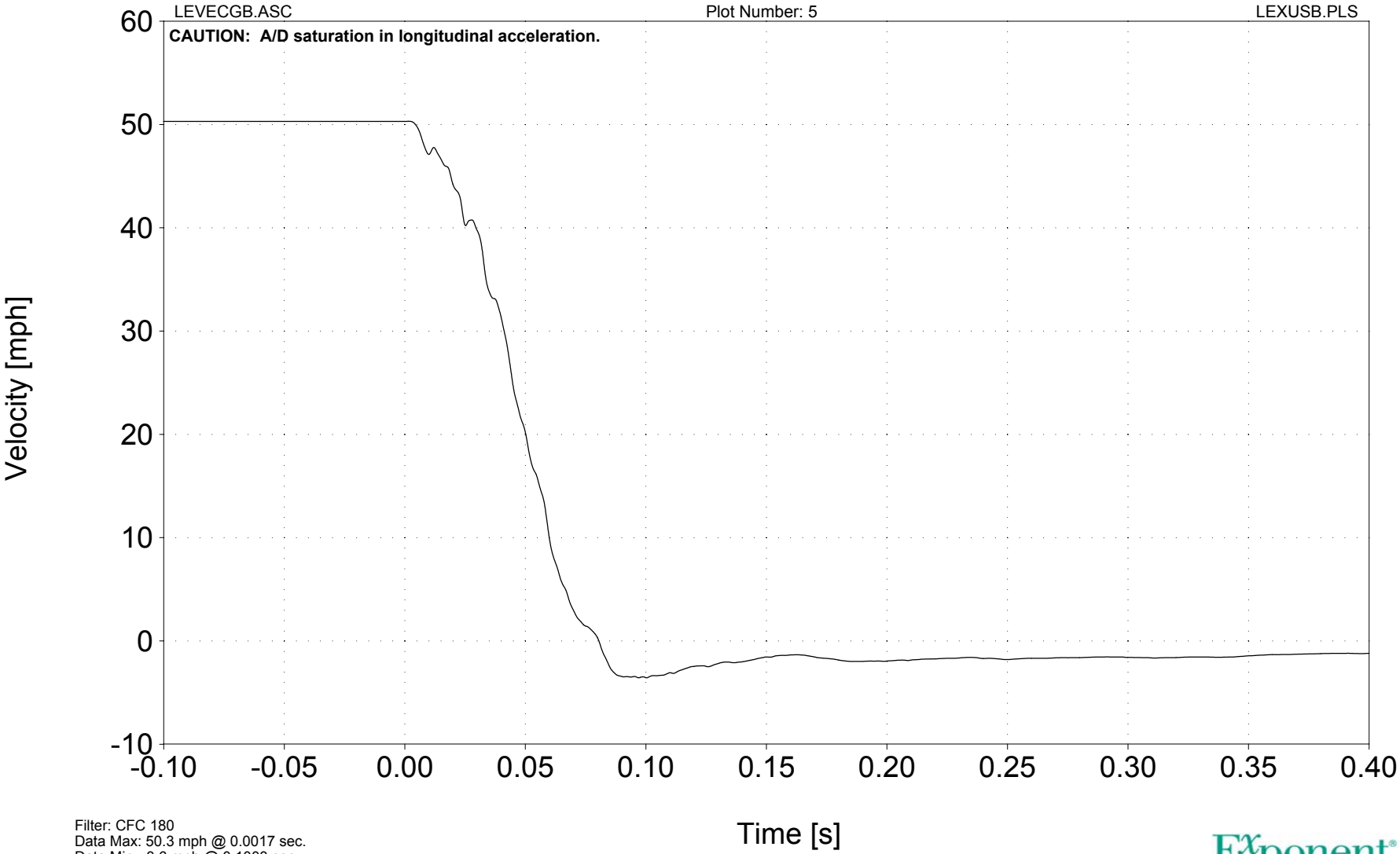
Longitudinal Velocity v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 50.3 mph @ 0.0017 sec.
Data Min: -3.6 mph @ 0.1003 sec.

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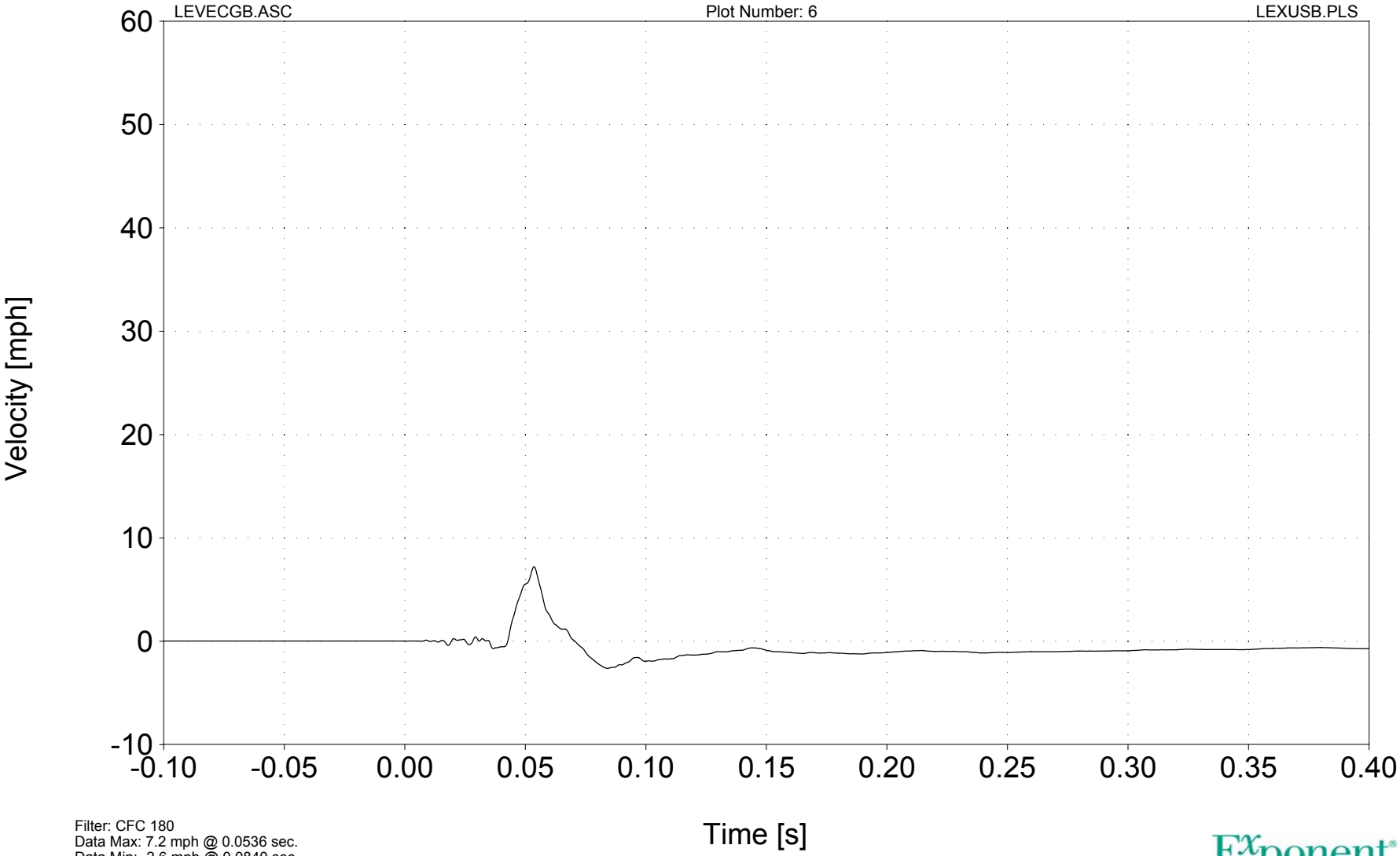
Lateral Velocity v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 7.2 mph @ 0.0536 sec.
Data Min: -2.6 mph @ 0.0840 sec.

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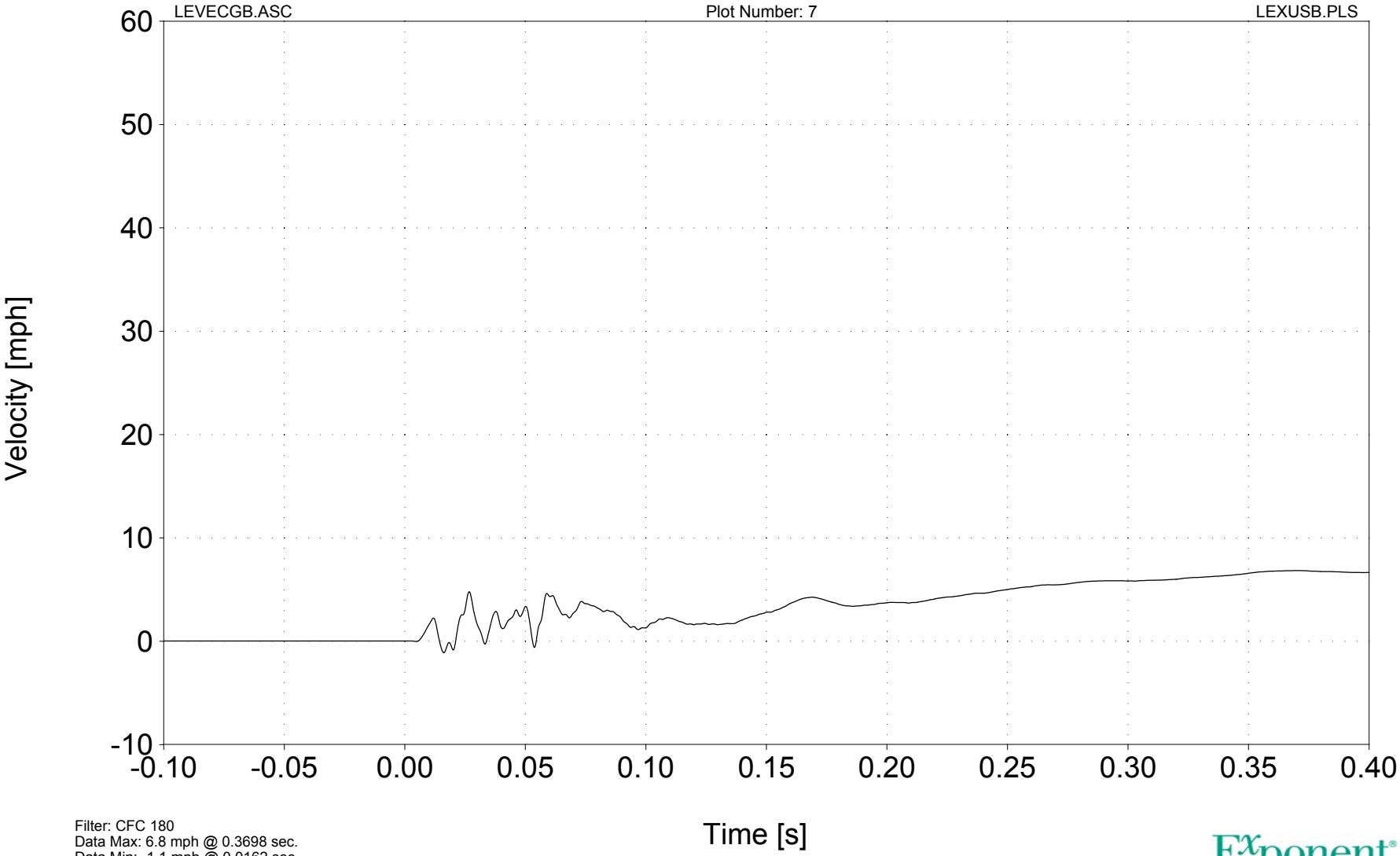
Vertical Velocity v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 6.8 mph @ 0.3698 sec.
Data Min: -1.1 mph @ 0.0162 sec.

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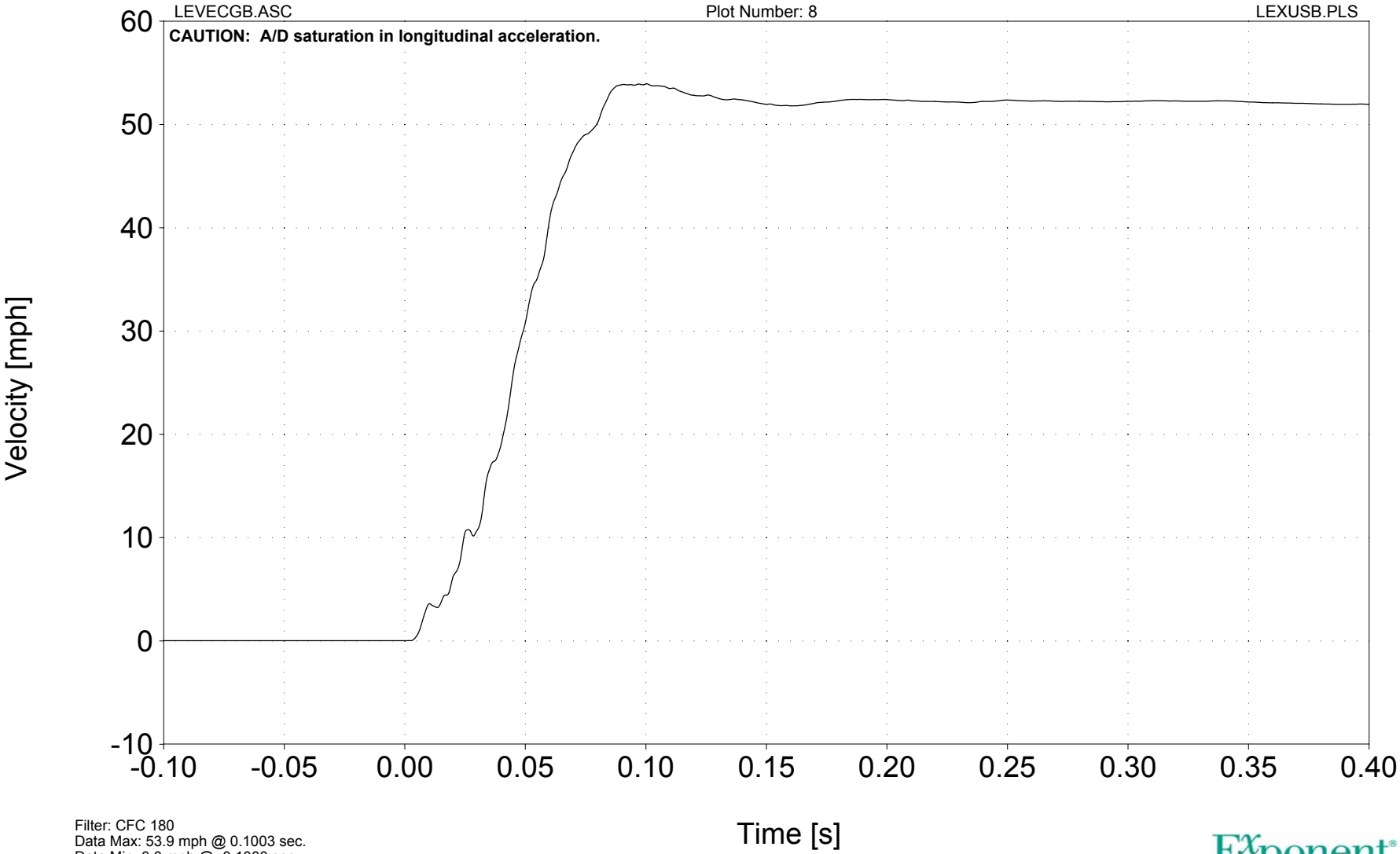
Delta Velocity v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 53.9 mph @ 0.1003 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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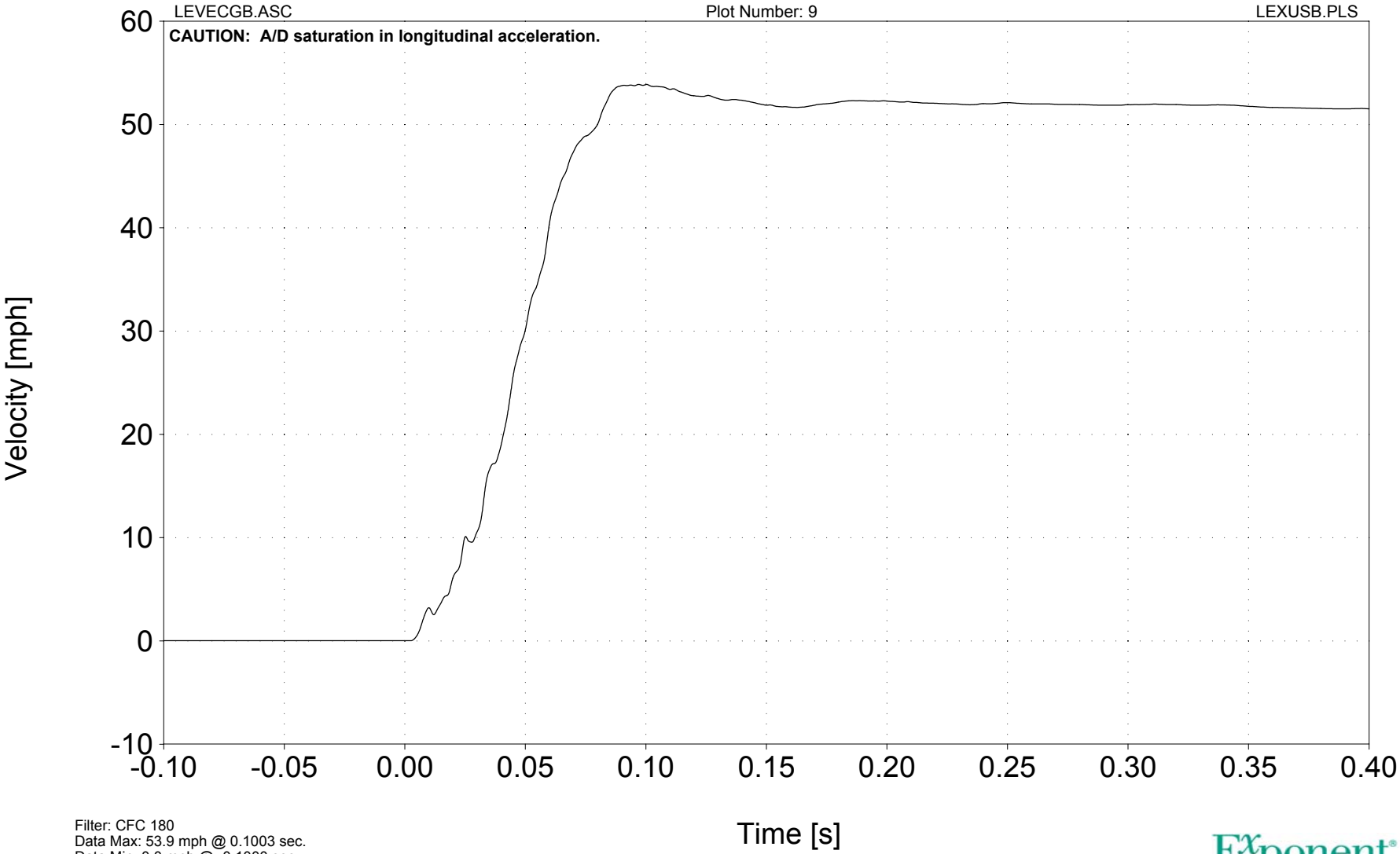
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 53.9 mph @ 0.1003 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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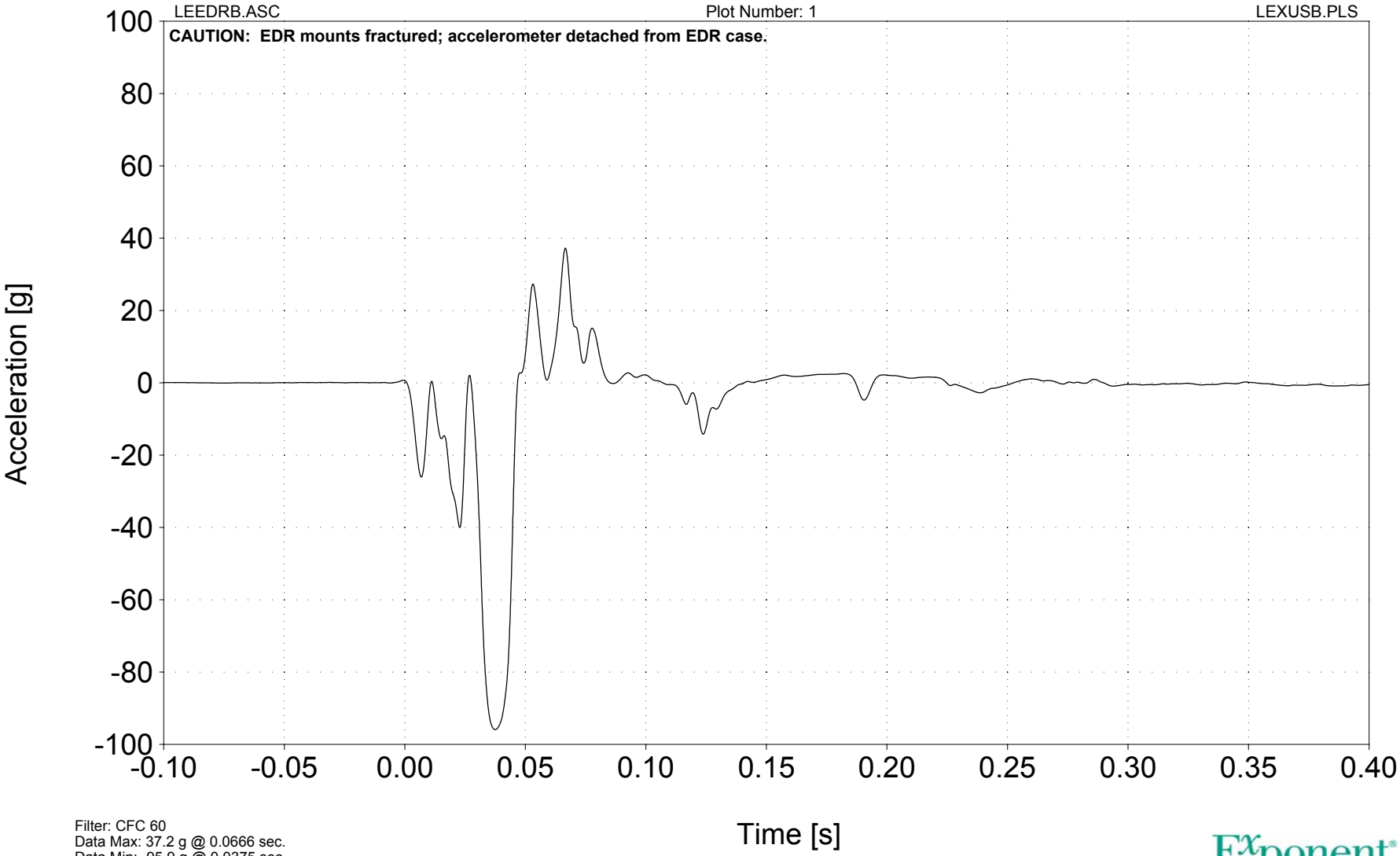
Longitudinal Acceleration v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 37.2 g @ 0.0666 sec.
Data Min: -95.9 g @ 0.0375 sec.

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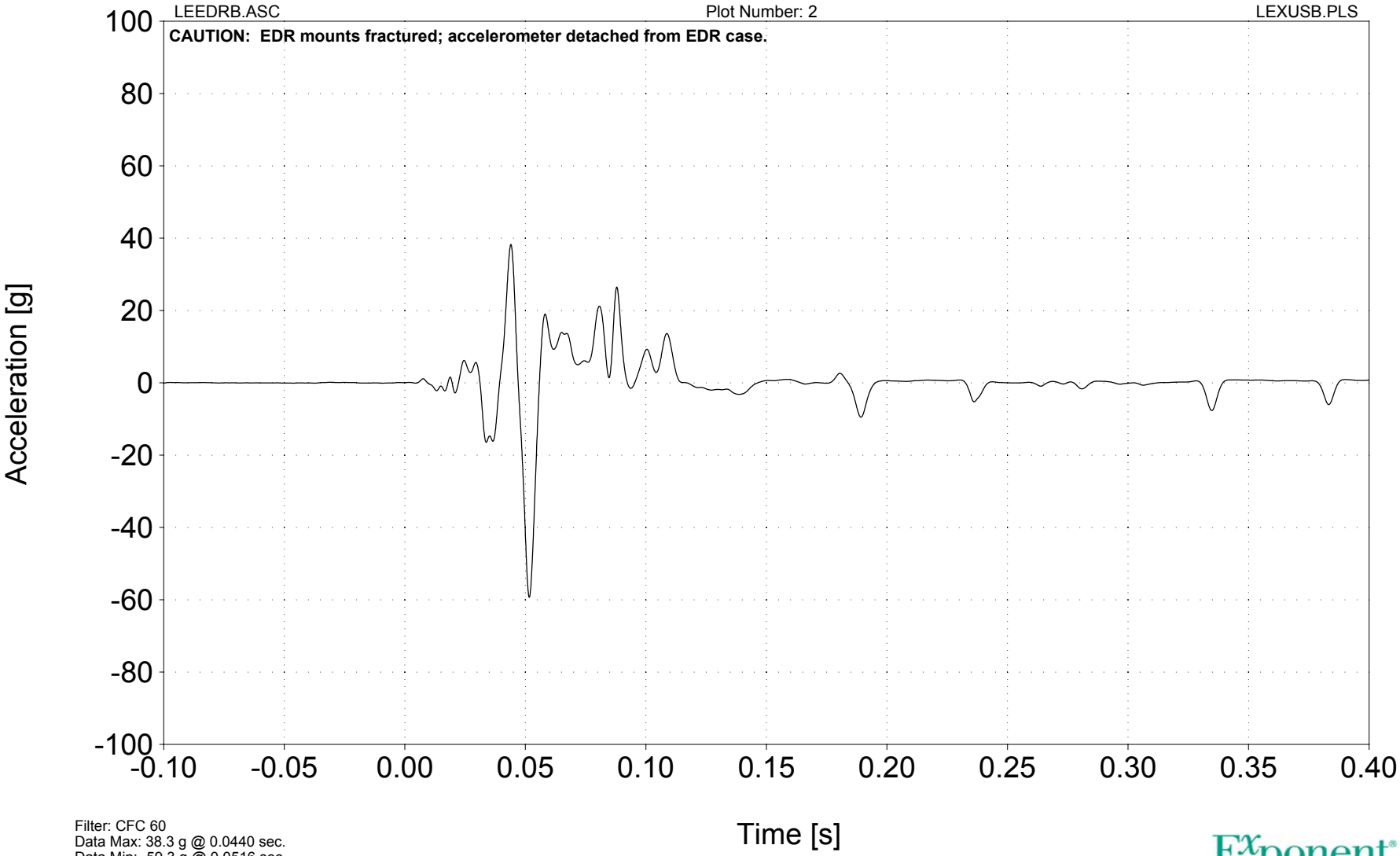
Lateral Acceleration v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 38.3 g @ 0.0440 sec.
Data Min: -59.3 g @ 0.0516 sec.

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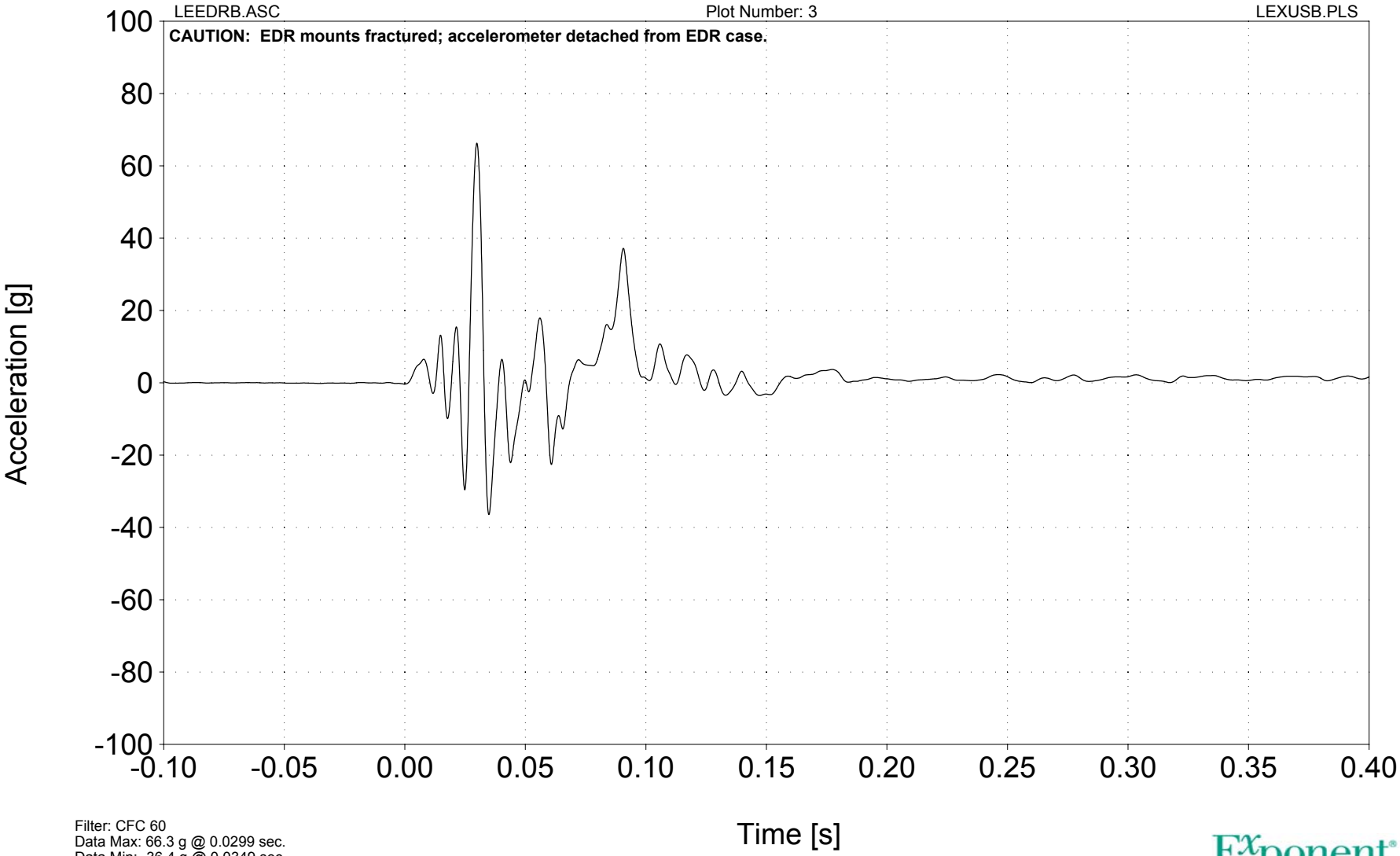
Vertical Acceleration v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 66.3 g @ 0.0299 sec.
Data Min: -36.4 g @ 0.0349 sec.

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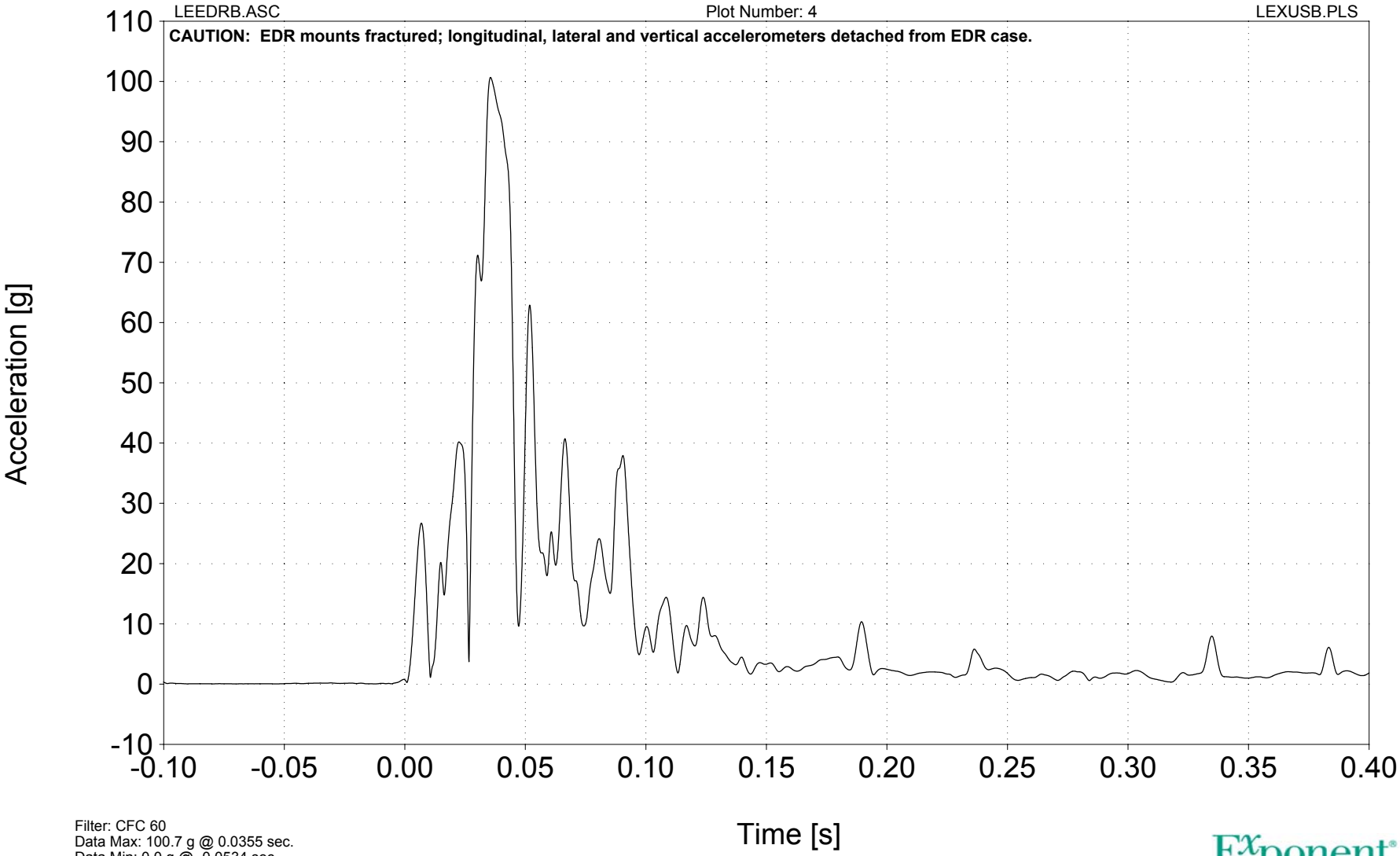
Resultant Acceleration v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 60
Data Max: 100.7 g @ 0.0355 sec.
Data Min: 0.0 g @ -0.0534 sec.

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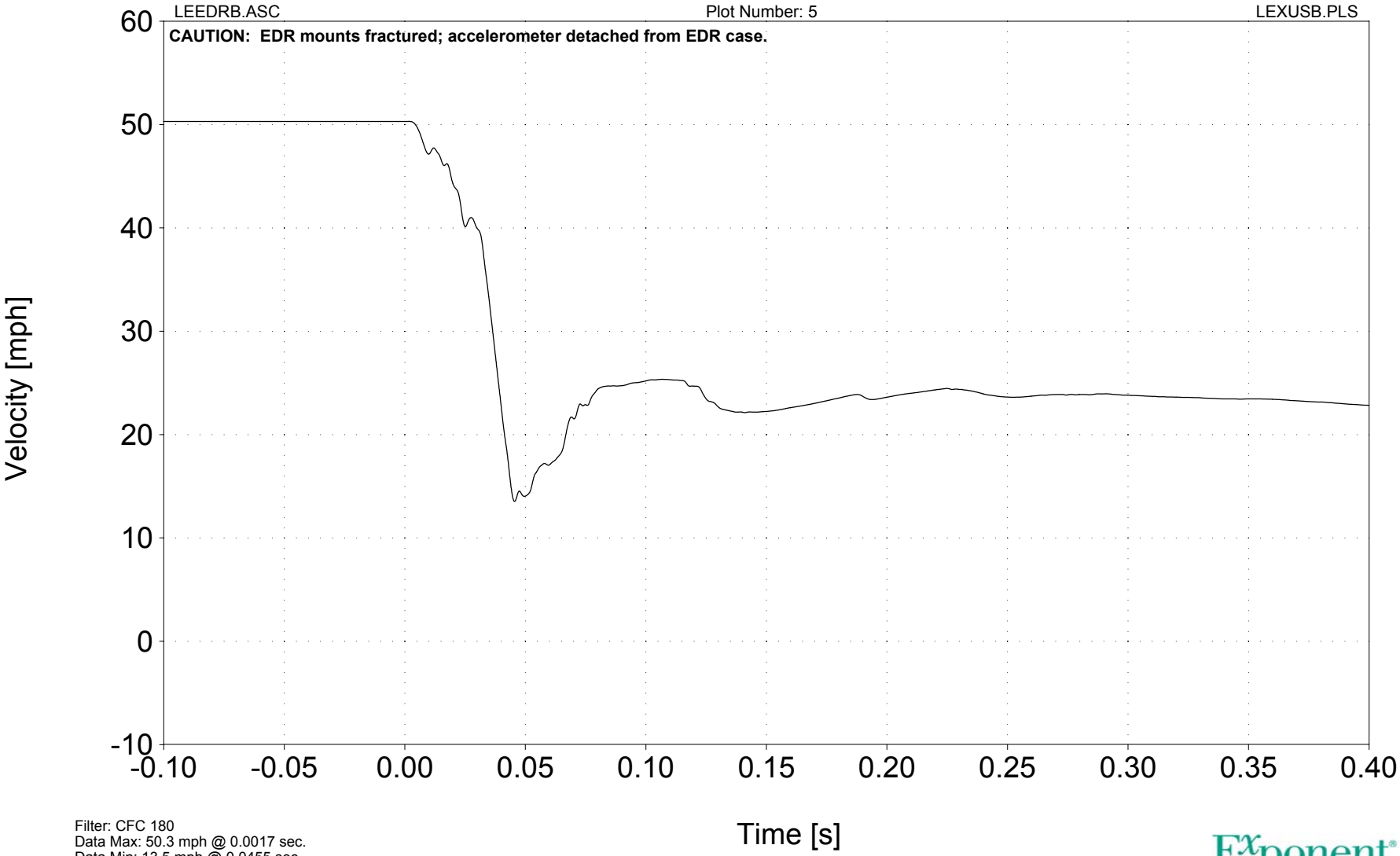
Longitudinal Velocity v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 50.3 mph @ 0.0017 sec.
Data Min: 13.5 mph @ 0.0455 sec.

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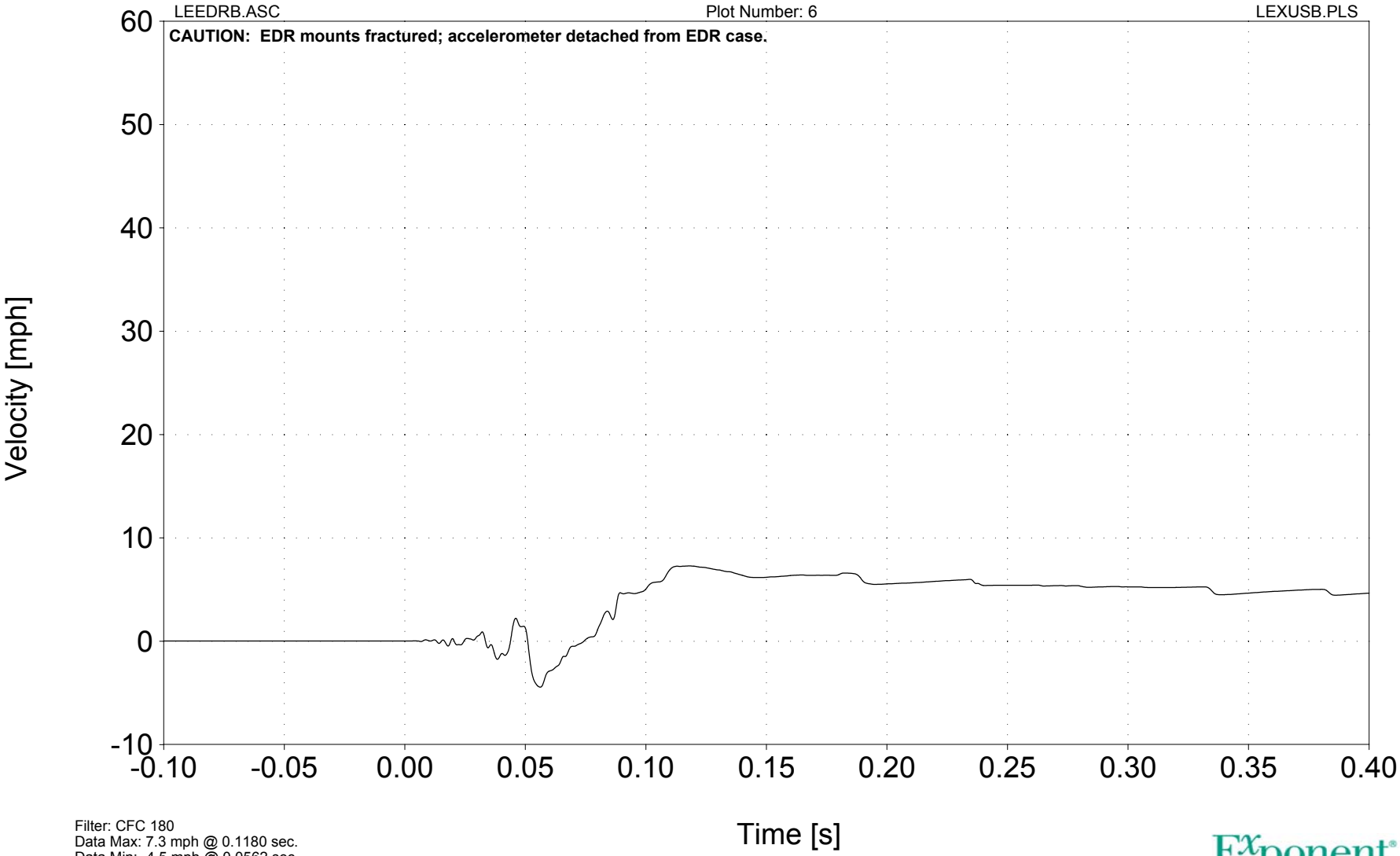
Lateral Velocity v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 7.3 mph @ 0.1180 sec.
Data Min: -4.5 mph @ 0.0562 sec.

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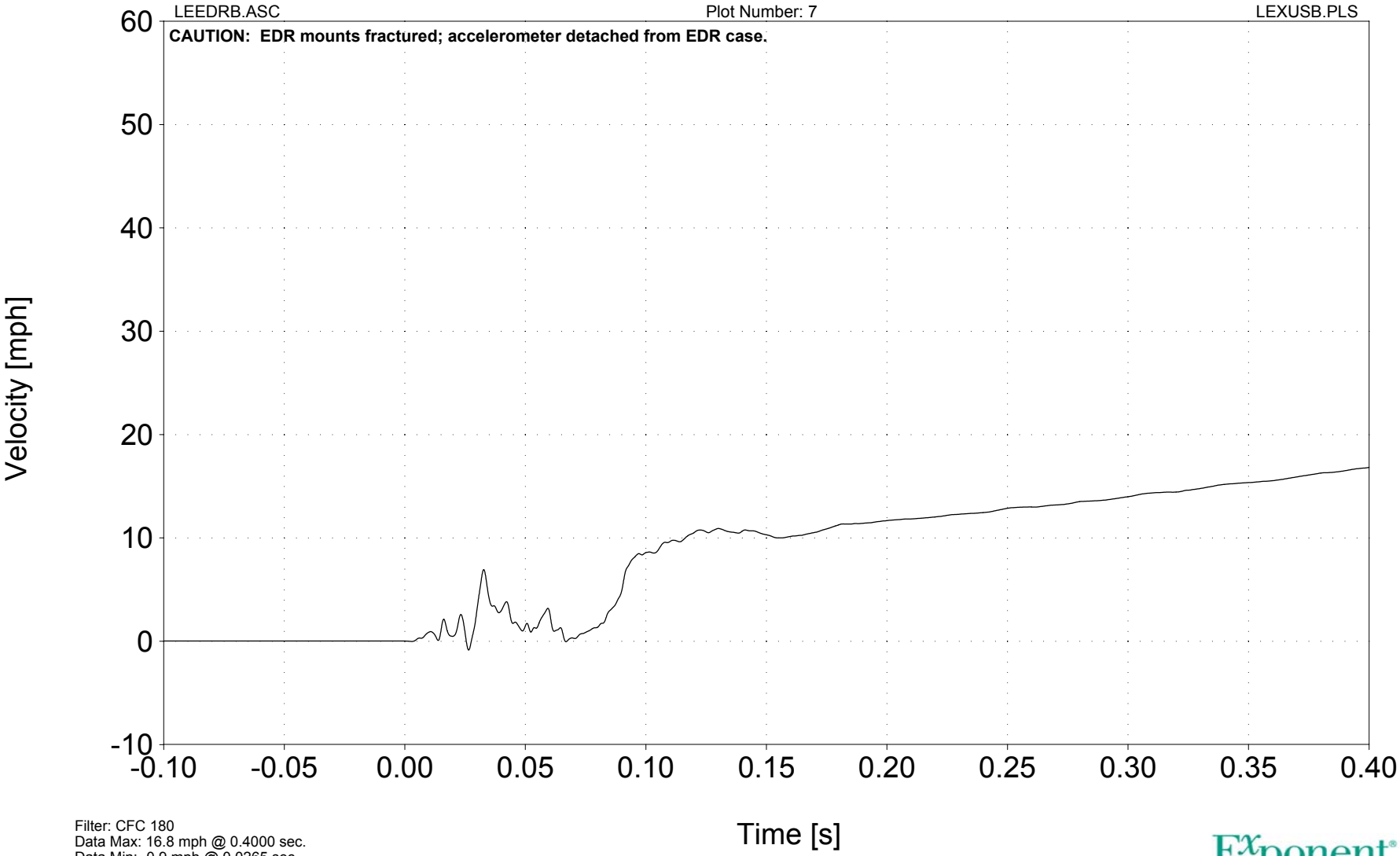
Vertical Velocity v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 16.8 mph @ 0.4000 sec.
Data Min: -0.9 mph @ 0.0265 sec.

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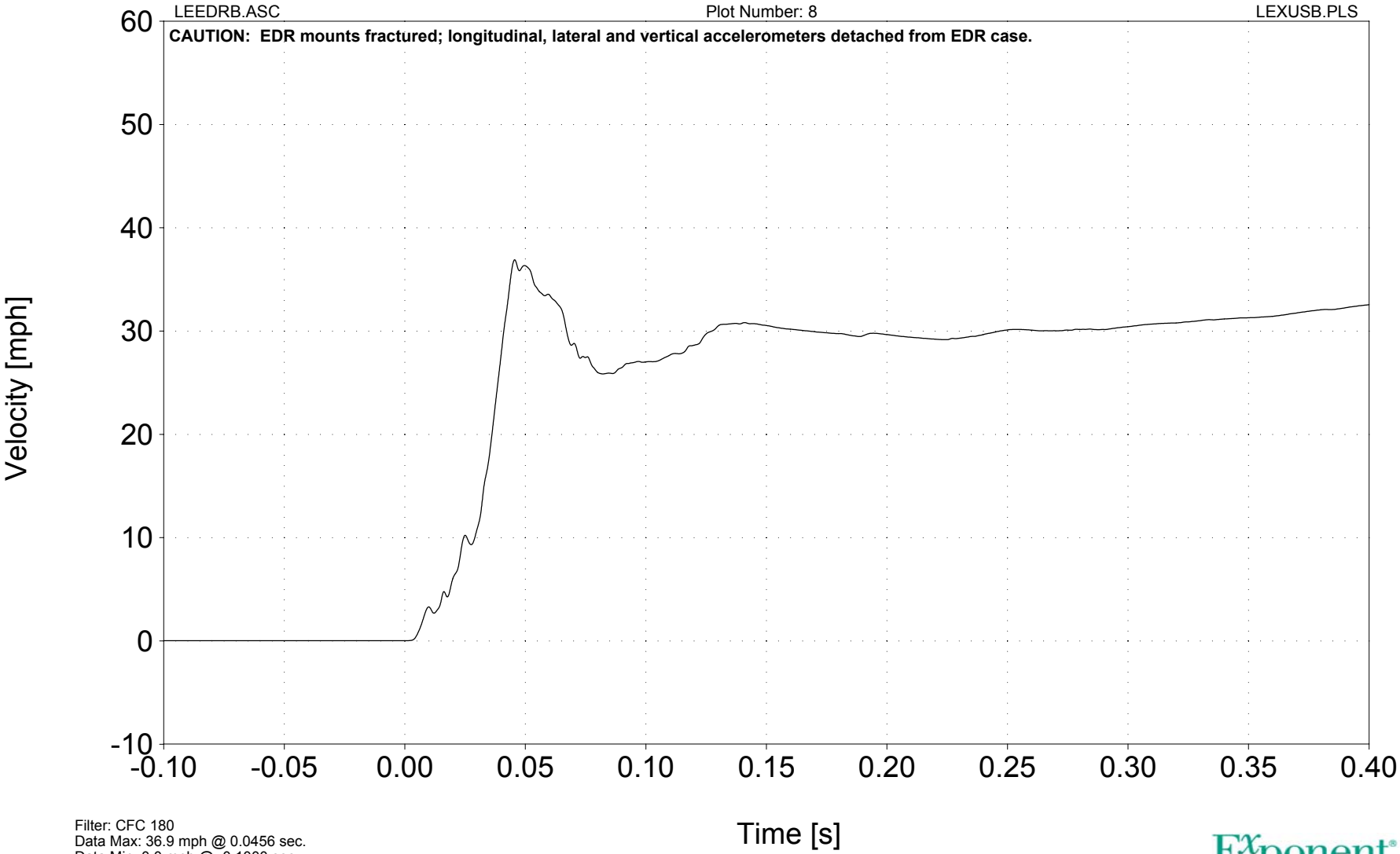
Delta Velocity v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



Filter: CFC 180
Data Max: 36.9 mph @ 0.0456 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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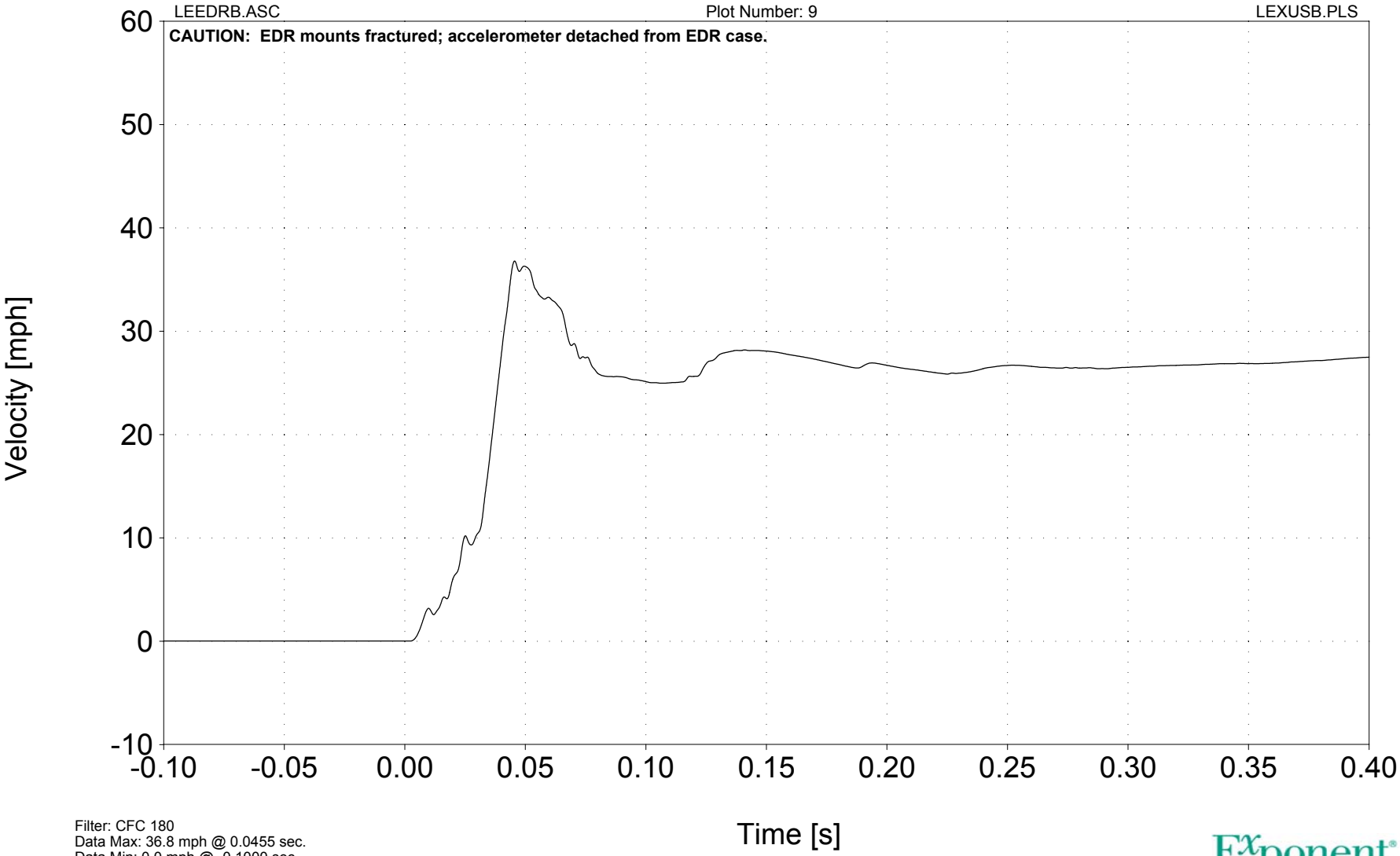
Longitudinal Delta Velocity v Time

EDR
2007 Lexus ES 350
Barrier Crash Test - 2/15/11



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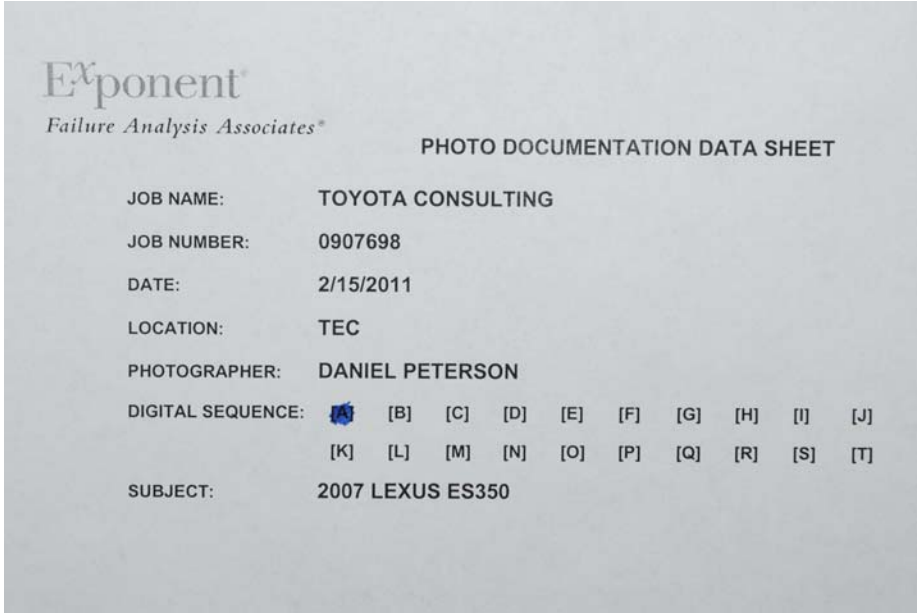

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PHOTO DOCUMENTATION DATA SHEET

JOB NAME:	TOYOTA CONSULTING
JOB NUMBER:	0907698
DATE:	2/15/2011
LOCATION:	TEC
PHOTOGRAPHER:	DANIEL PETERSON
DIGITAL SEQUENCE:	[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T]
SUBJECT:	2007 LEXUS ES350

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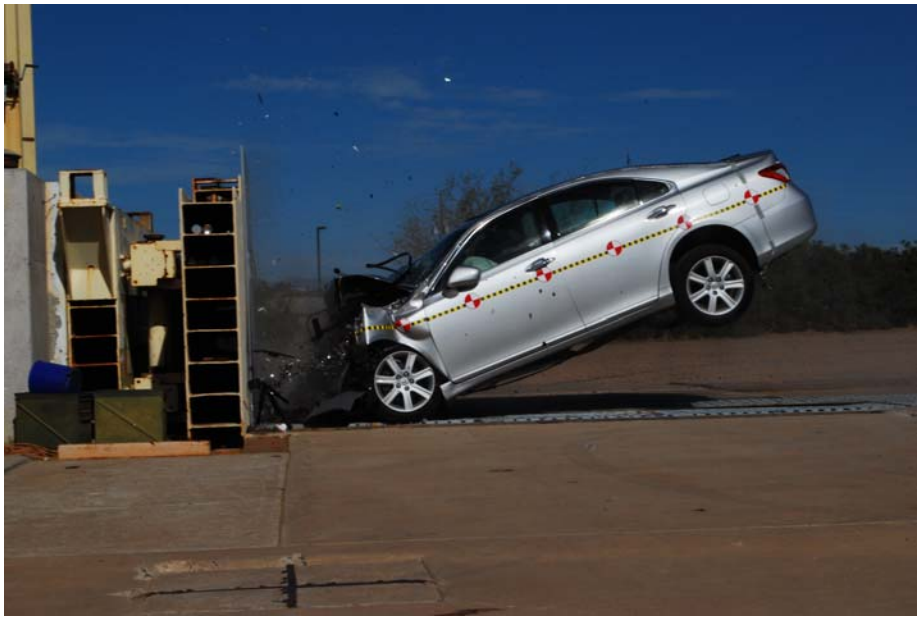

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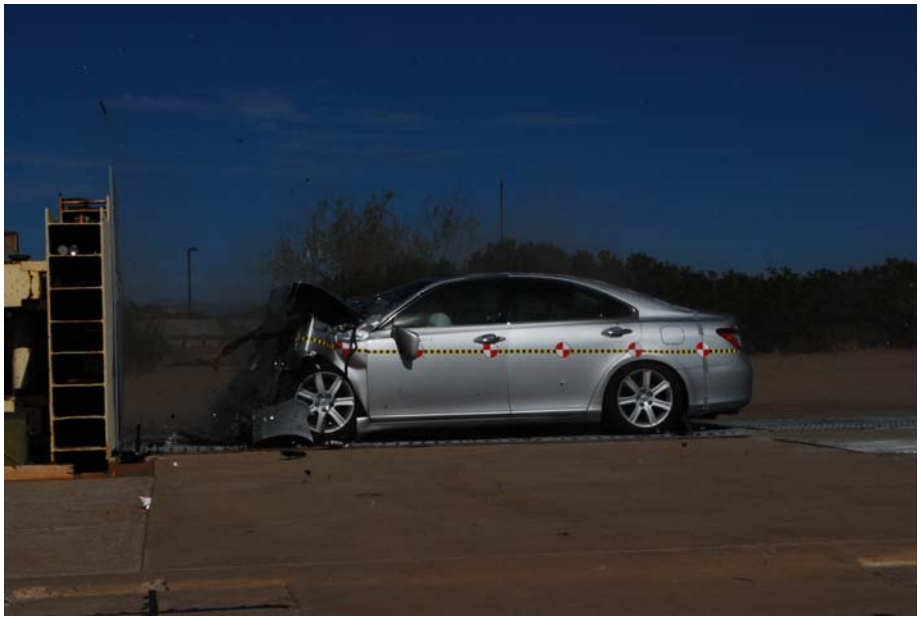

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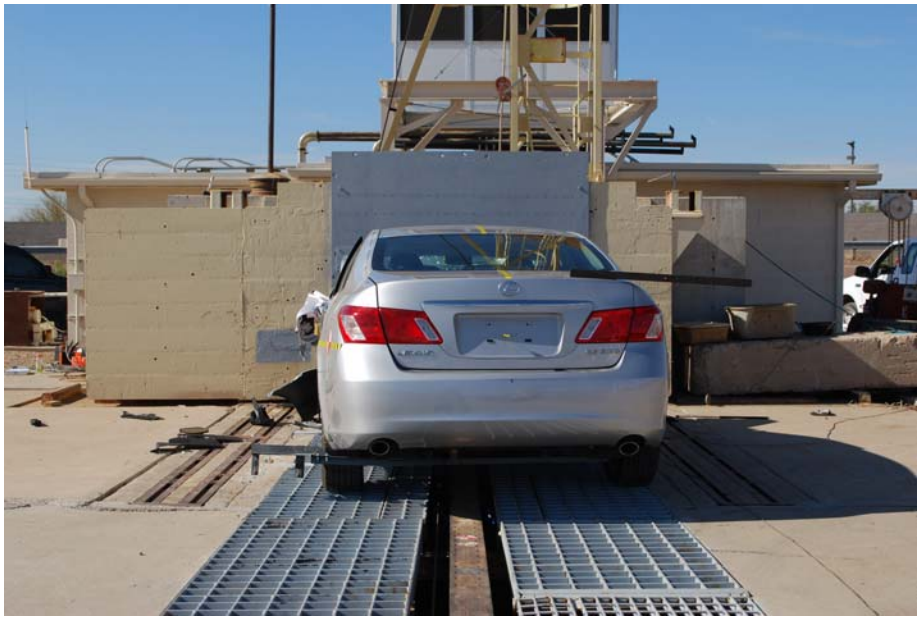

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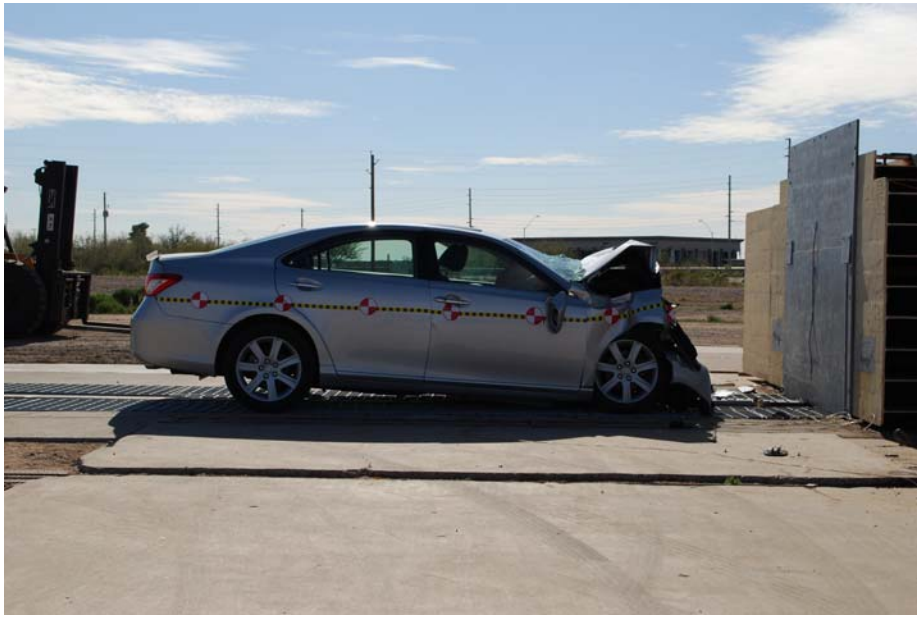

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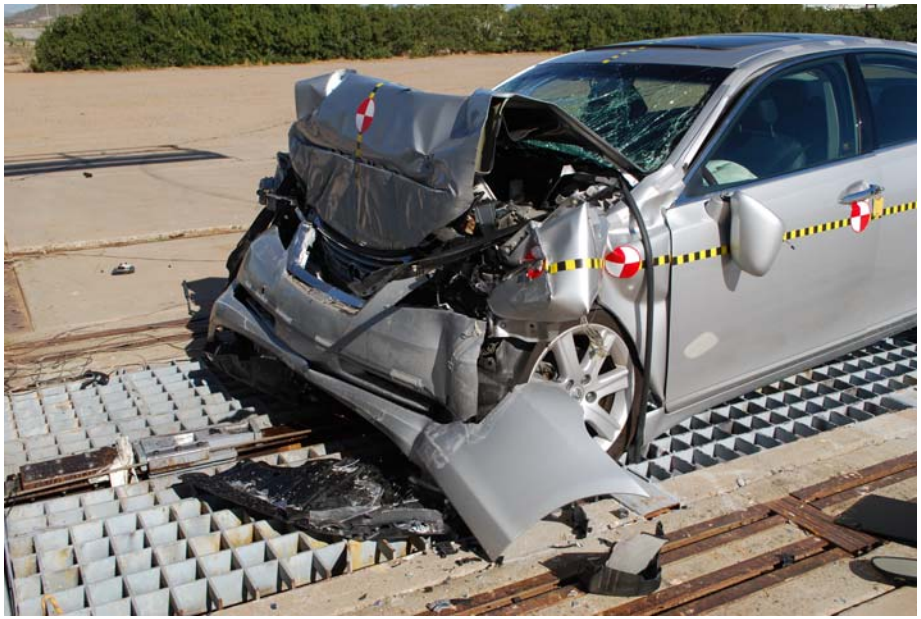

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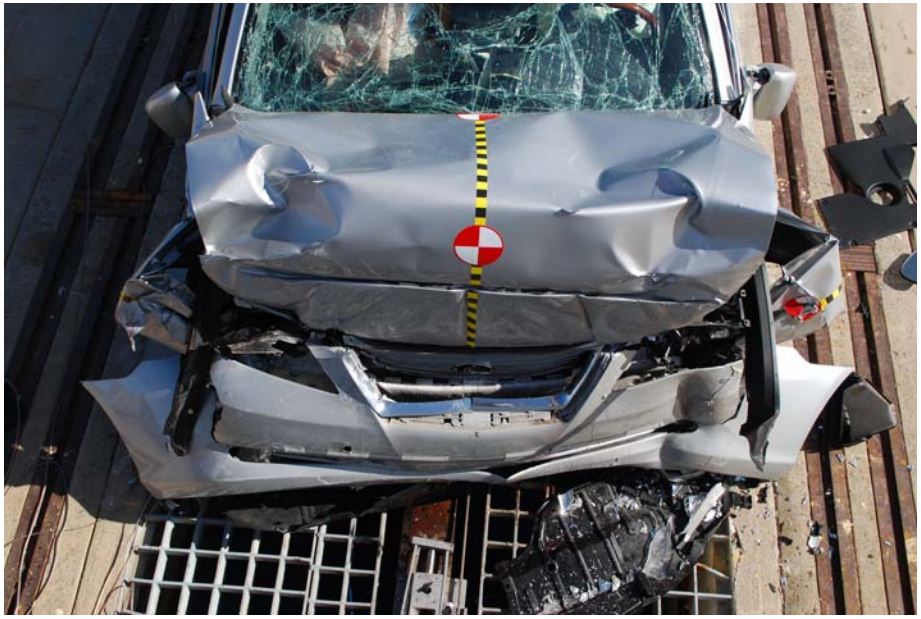

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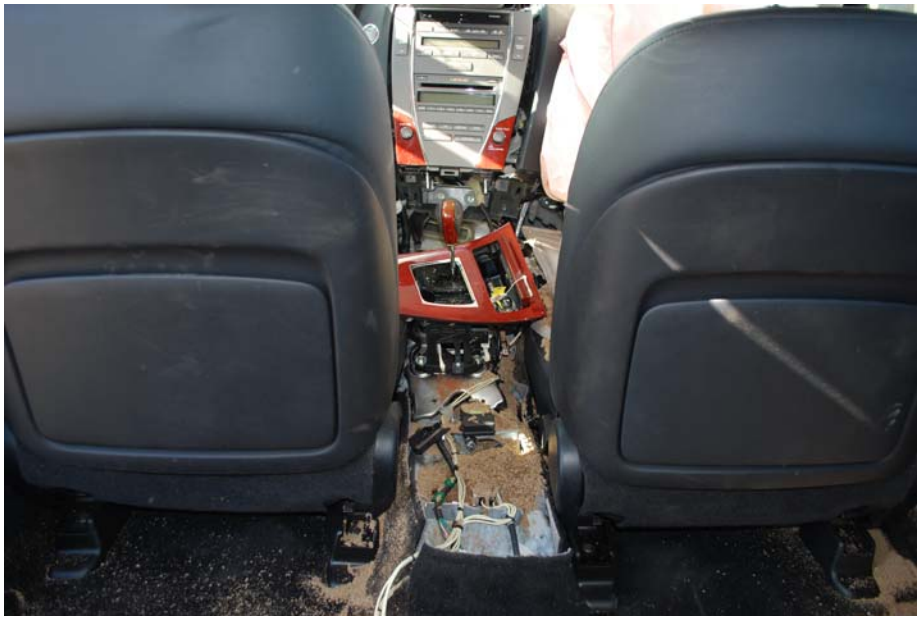

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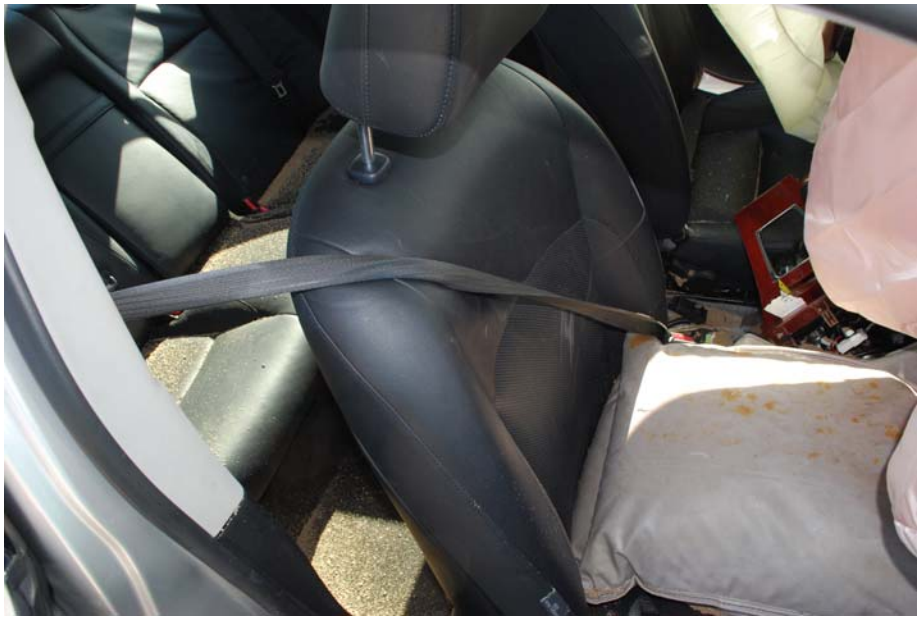

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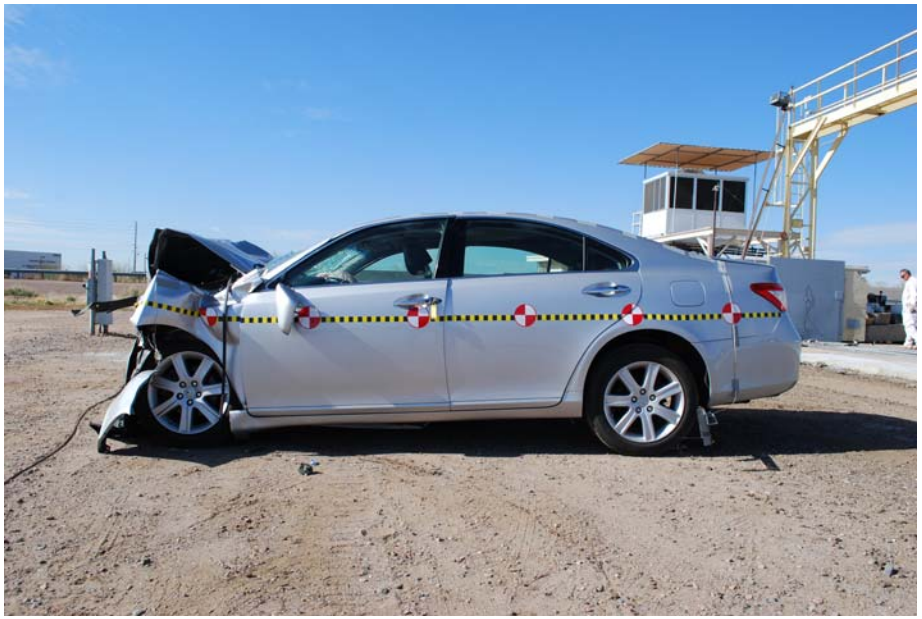

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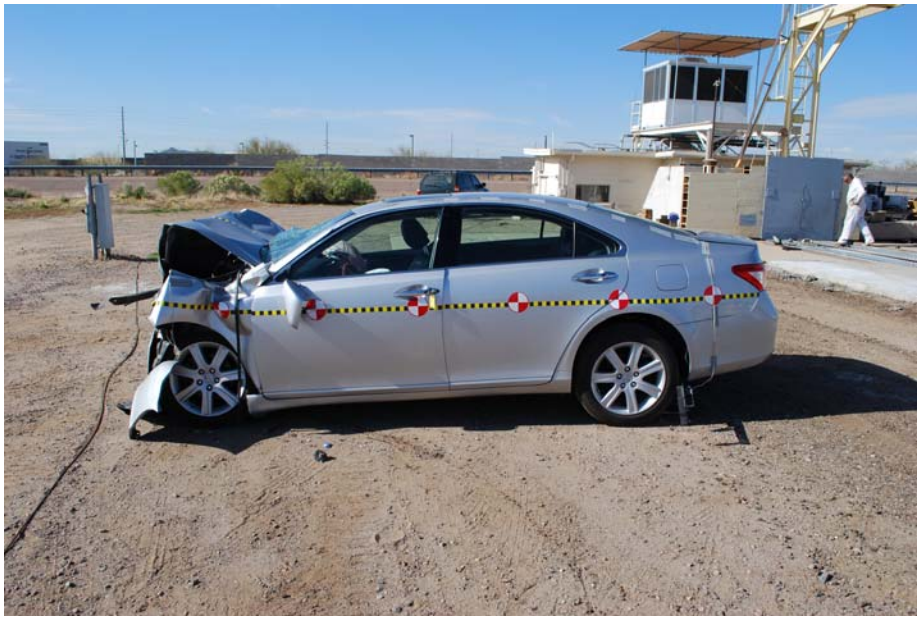

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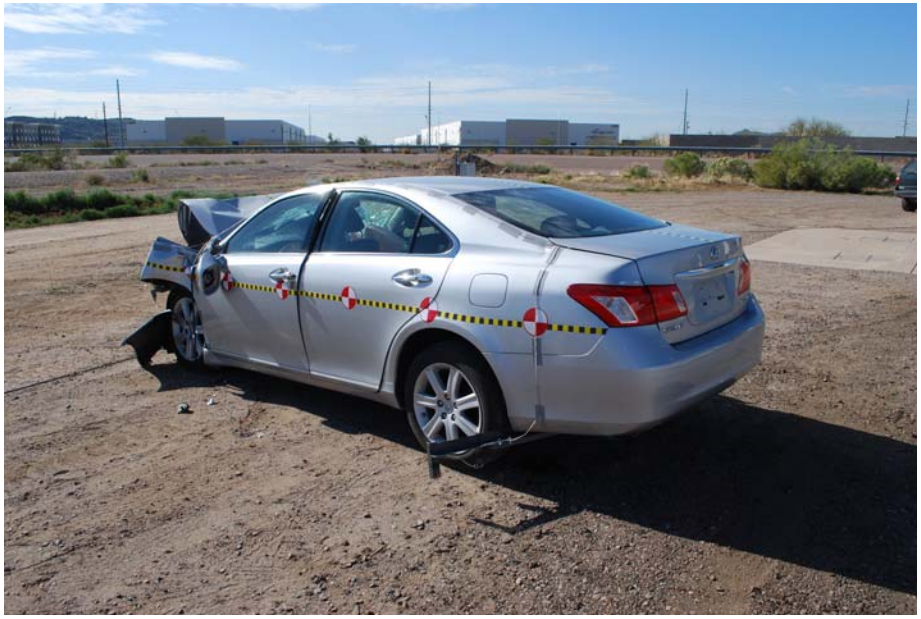

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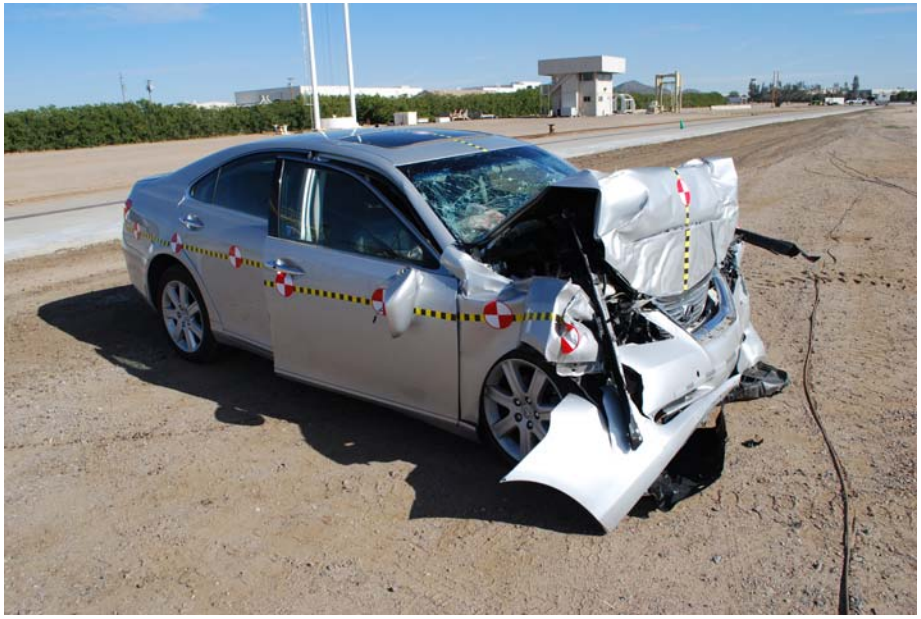

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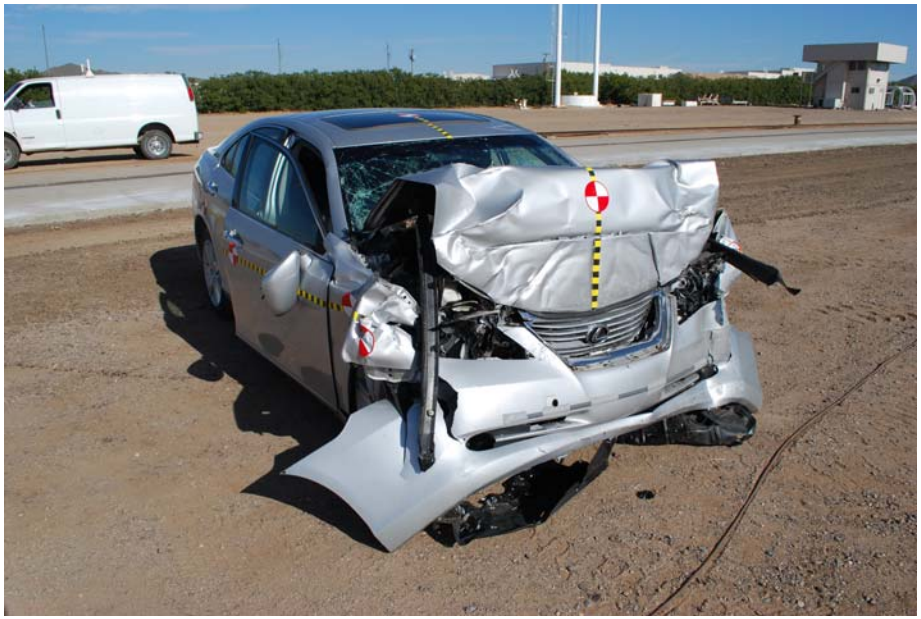

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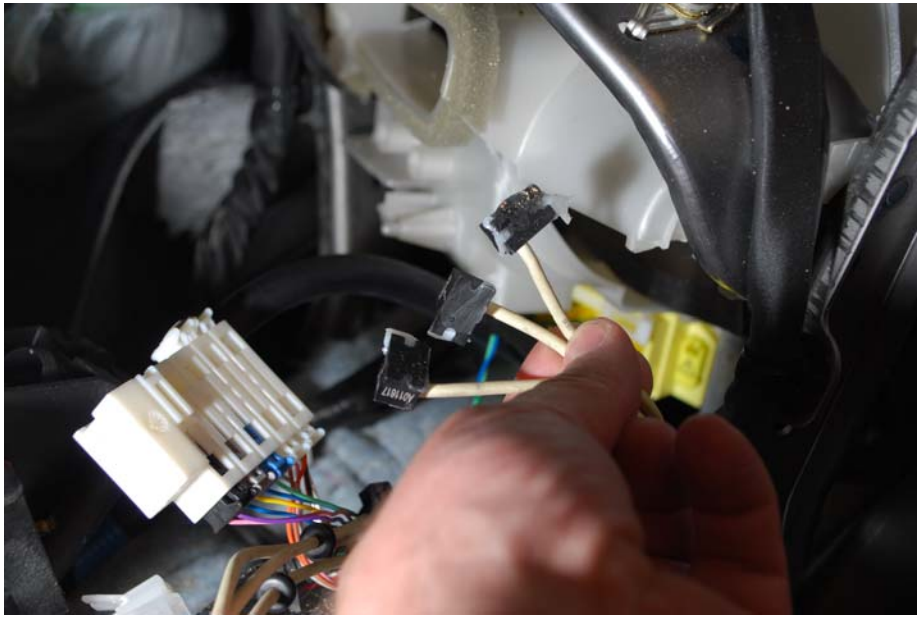

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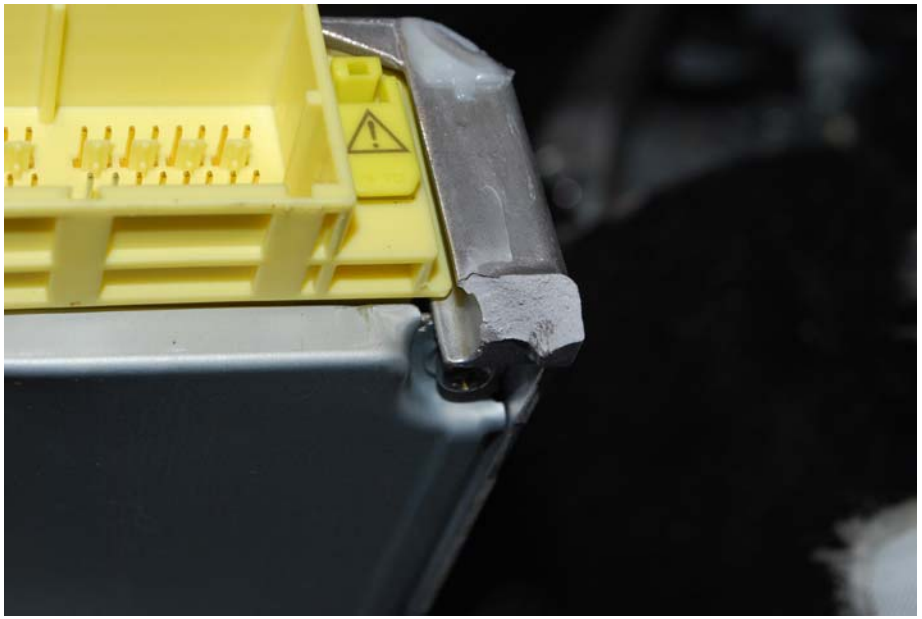

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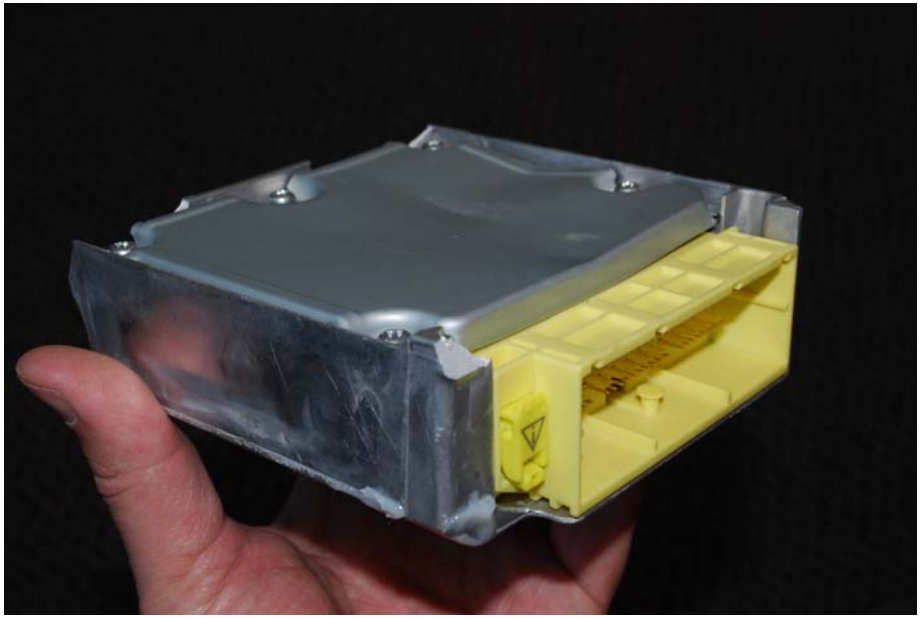

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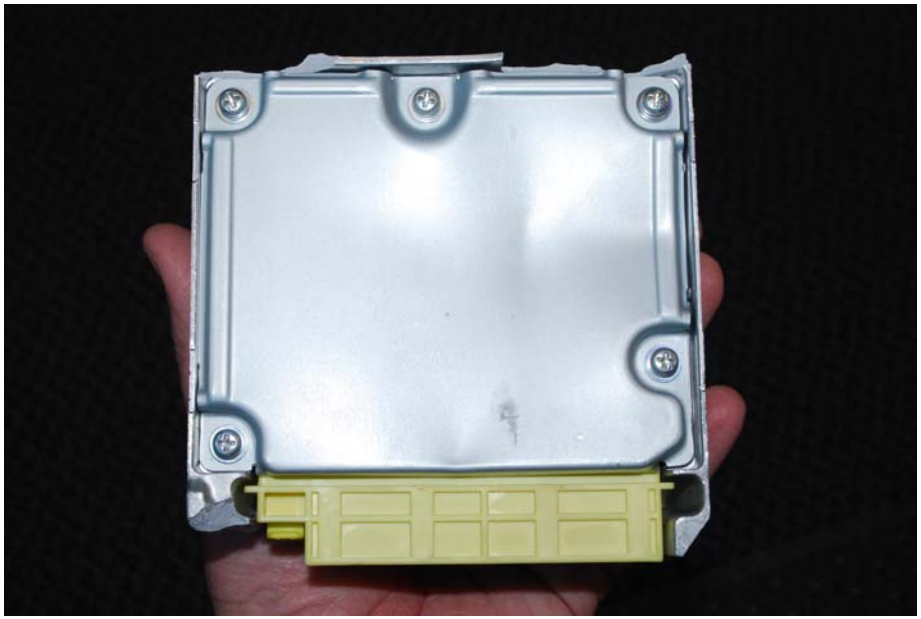

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0907698 A0T0 - 06263PH_0216

0907698 A0T0 - 06263PH_0217

Appendix H

Barrier Crash Test, 2002 Toyota Camry, September 19, 2011

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2002 Toyota Camry

Toyota Consulting
0907698

September 19, 2011

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2002 Toyota Camry

Toyota Consulting
0907698

September 19, 2011

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

September 2011

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/0911/R308

Exponent®

Test Description

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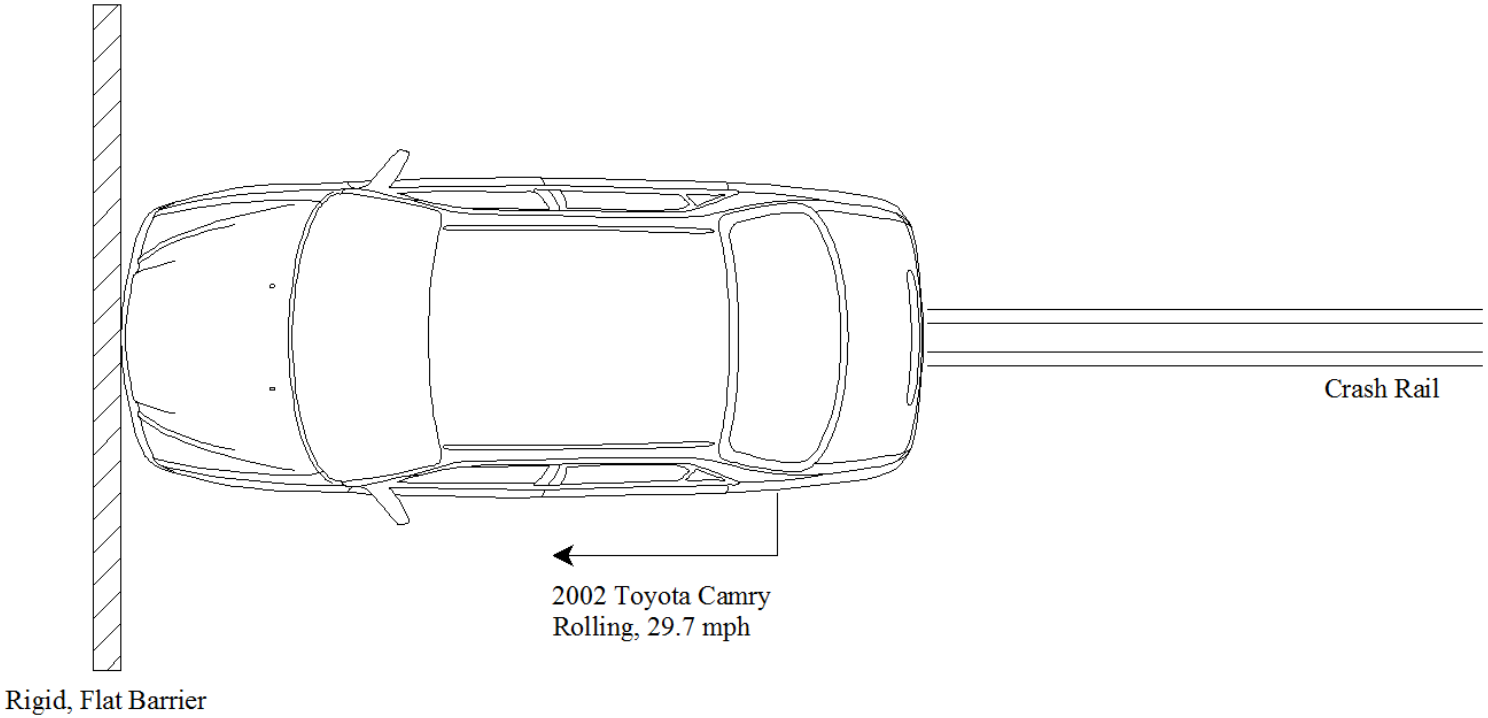
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	September 19, 2011
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2002 Toyota Camry
IMPACT SPEED:	29.7 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set on trunk floor
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. Three sandbags were added to the driver seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 29.7 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
September 19, 2011



Exponent®

2002 Toyota Camry

Exponent®
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VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	7059			DATE RECEIVED:	9/15/2011
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2002	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	WHITE
VEHICLE IDENTIFICATION NUMBER:	4T1BF32KX2U007715			DATE OF MANUFACTURE:	10/01
GVWR (lb):	4277	FRONT GAWR (lb):	2668	REAR GAWR (lb):	2668
RECOMMENDED TIRE SIZE - F/R:	P205/65R15			RECOMMENDED TIRE PRESSURE - F/R (psi):	29

INSTALLED TIRE SIZE:	LF:	P205/65R15	RF:	P205/65R15	LR:	P205/65R15	RR: P205/65R15

ENGINE TYPE:	6-CYLINDER	ENGINE DISPLACEMENT:	3.0 LITER	ODOMETER (mi):	94,064
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	CENTER, FORWARD OF REAR AXLE			FILLER CAP LOC:	LEFT REAR QUARTER PANEL

DESIGNATED SEATING - FRONT:	2	MID:	0	REAR:	3	TOTAL:	5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	Y
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	Y	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	N	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	Y	ANTI-LOCK BRAKES F:	Y
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	N	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	Y
SUNROOF:	N	ROOF RACK:	N						
ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES:	NONE								
SIGNIFICANT BODY DAMAGE/CORROSION:	NONE								

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

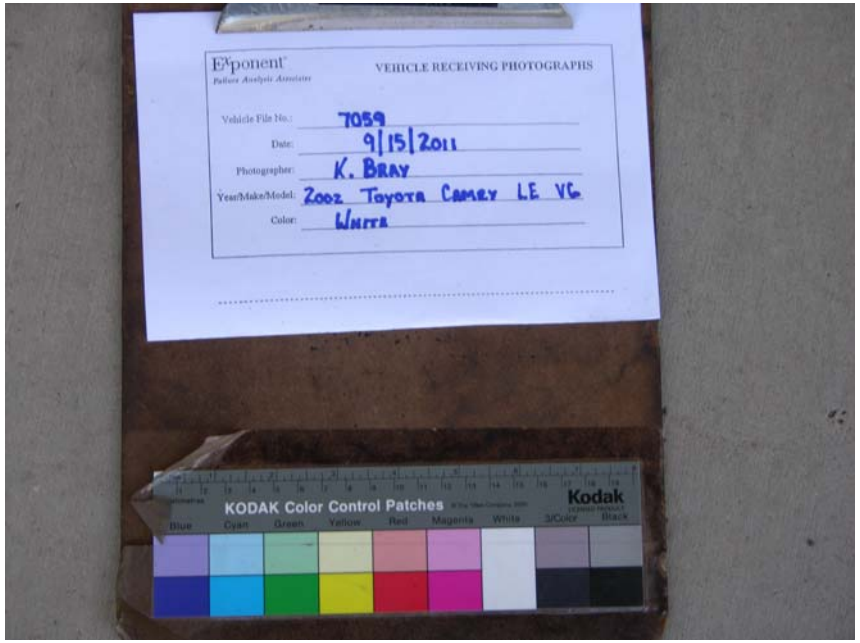
LEFT FRONT:	1033	RIGHT FRONT:	1006	TOTAL FRONT:	2039	PERCENT FRONT:	61%
LEFT REAR:	651	RIGHT REAR:	656	TOTAL REAR:	1307	PERCENT REAR:	39%
				TOTAL WEIGHT:	3346		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

LEFT FRONT:	27.1	AT	WHL WELL @ AXLE	RIGHT FRONT:	27.0	AT	WHL WELL @ AXLE
LEFT REAR:	26.6	AT	WHL WELL @ AXLE	RIGHT REAR:	26.6	AT	WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	189.3	OVERALL WIDTH:	71.2	OVERALL HEIGHT:	57.9
WHEELBASE:	107.0	FRONT TRACK:	61.1	REAR TRACK:	60.4
REAR OVERHANG:	45.1	FRONT BUMPER HEIGHT:	21.2	REAR BUMPER HEIGHT:	24.2
COMMENTS:	NONE				
EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	SL	CHECKED BY:	JS



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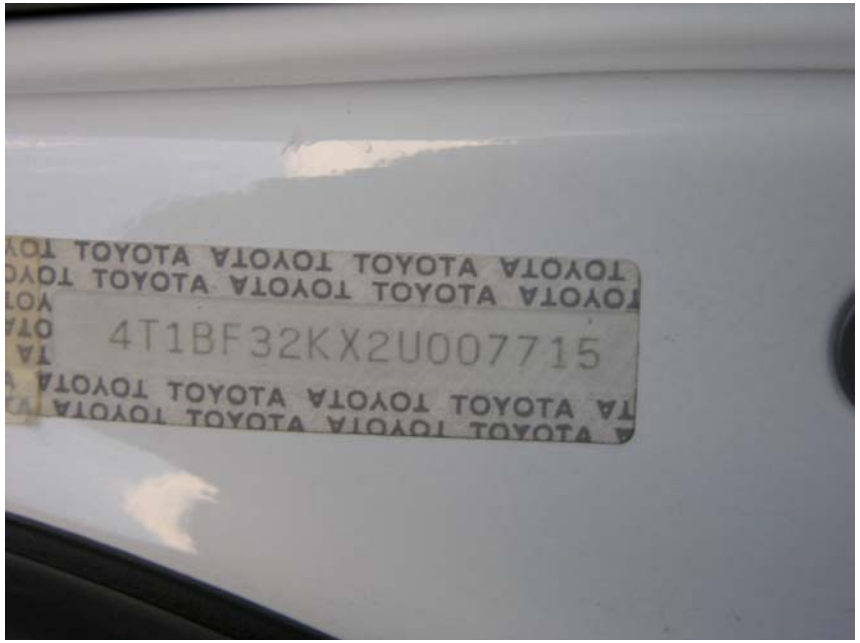

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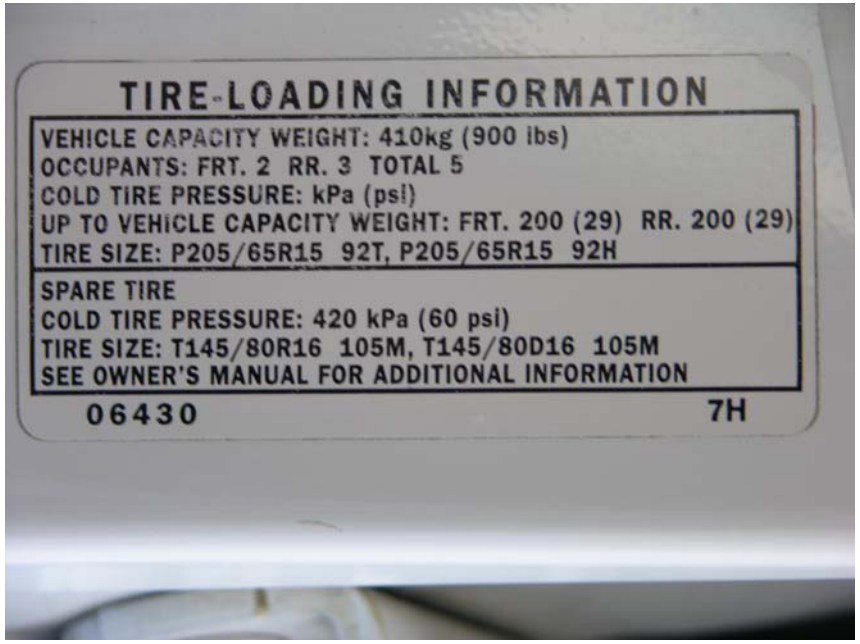

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Exponent®

Test Setup

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Failure Analysis Associates®

VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
VEHICLE YEAR:	2002	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	WHITE
VEHICLE IDENTIFICATION NUMBER:	4T1BF32KX2U007715			ODOMETER (mi):	94,066

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P205/65R15 | 29 PSI | 8/32"	P205/65R15 | 29 PSI | 8/32"
REAR:	P205/65R15 | 29 PSI | 7/32"	P205/65R15 | 29 PSI | 7/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	1080	RIGHT FRONT:	1019	TOTAL FRONT:	2099	PERCENT FRONT:	63%
LEFT REAR:	641	RIGHT REAR:	607	TOTAL REAR:	1248	PERCENT REAR:	37%
				TOTAL WEIGHT:	3347		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	26.7	AT	WHL WELL @ AXLE	RIGHT FRONT:	26.7	AT	WHL WELL @ AXLE
LEFT REAR:	26.7	AT	WHL WELL @ AXLE	RIGHT REAR:	26.7	AT	WHL WELL @ AXLE
SUSPENSION ADJUSTMENTS:	NONE						
OTHER MEASUREMENTS:	NONE						

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRAME RAILS, FORWARD OF FRONT AXLE		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	TRUNK		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE*	CENTER FRONT:	N/A	RIGHT FRONT:	NONE
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	FULL AFT	FULL FORWARD
OTHER:	SEATBELT BUCKLED, D-RING FULL DOWN, STEERING WHEEL AT MID TILT	SEATBELT NOT BUCKLED, D-RING FULL DOWN

COMMENTS

*THREE SANDBAGS (153 LBS TOTAL) PLACED IN DRIVER SEAT

	FORM COMPLETED BY:	JS	CHECKED BY: DSP

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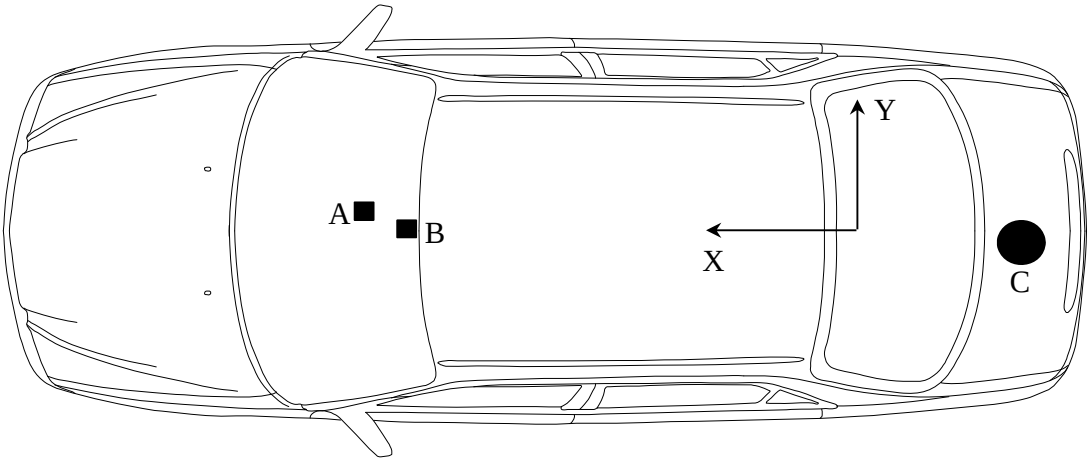
Failure Analysis Associates®

VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
VEHICLE YEAR:	2002	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE IDENTIFICATION NUMBER:	4T1BF32KX2U007715				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	81.3 in.	2.2 in.	14.6 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	76.0 in.	-0.1 in.	13.0 in.
C	TRIAXIAL ACCELEROMETER SET, BOTTOM OF TRUNK	-29.2 in.	-1.0 in.	11.1 in.

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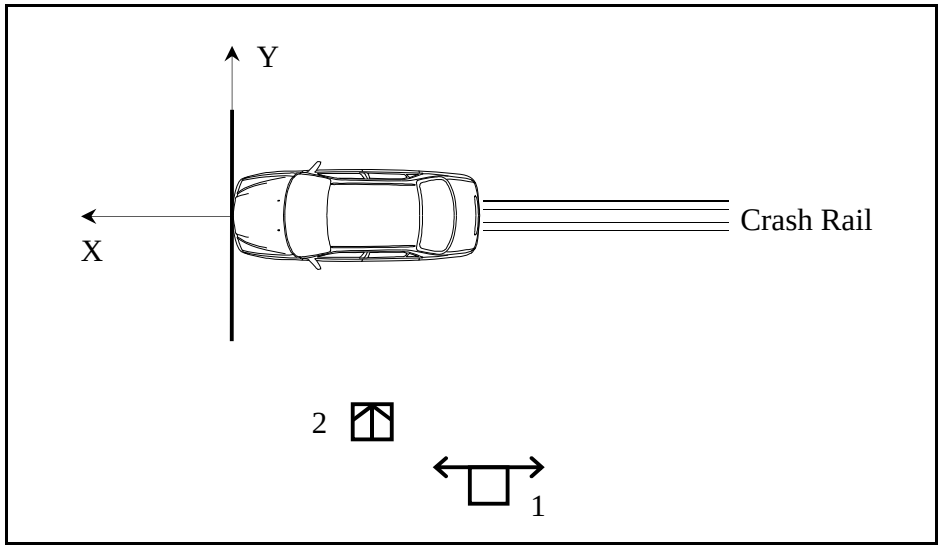
CAMERA SETUP RECORD

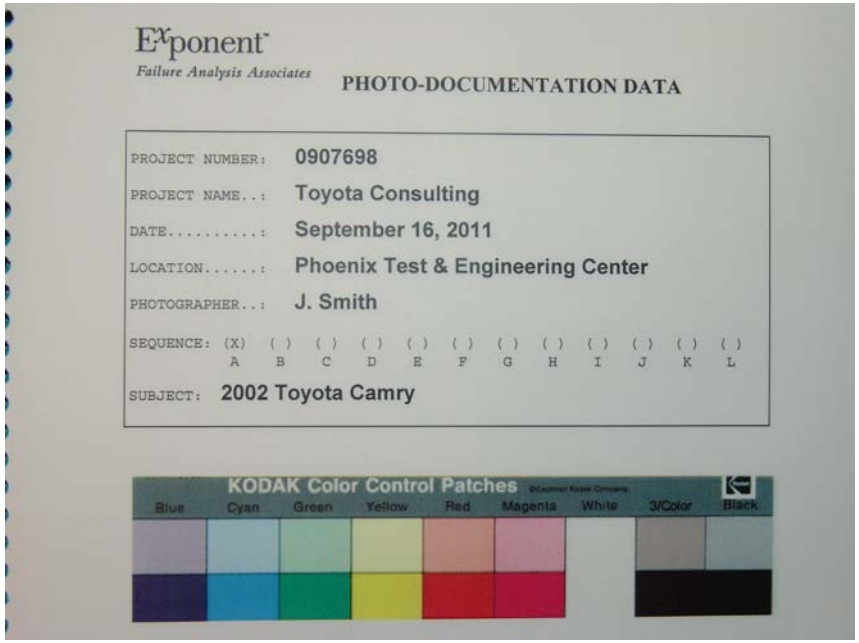
PROJECT NO:	0907698	TEST DATE:	9/19/2011
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2002 TOYOTA CAMRY		
TEST SPEED:	29.7 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-12.0	-37.0	4.0	RT	--



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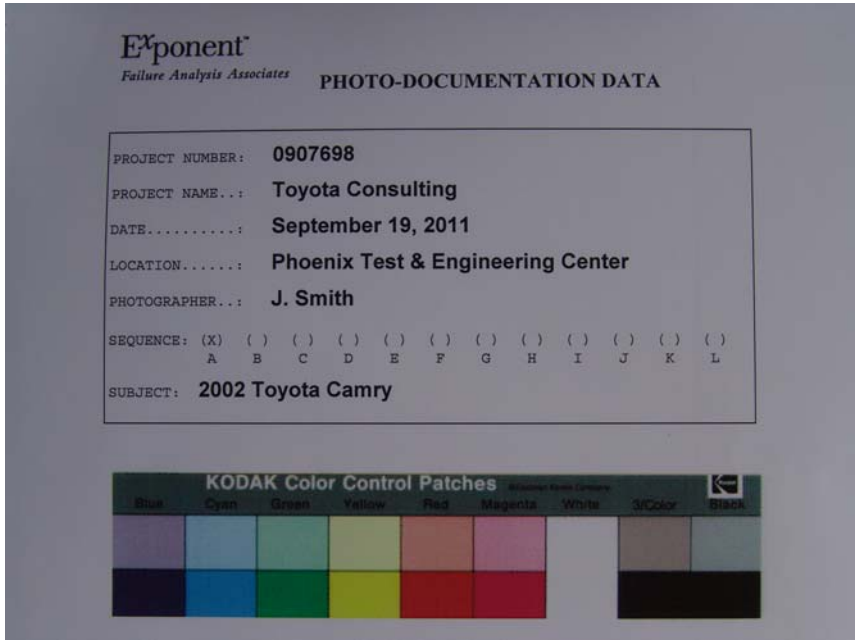

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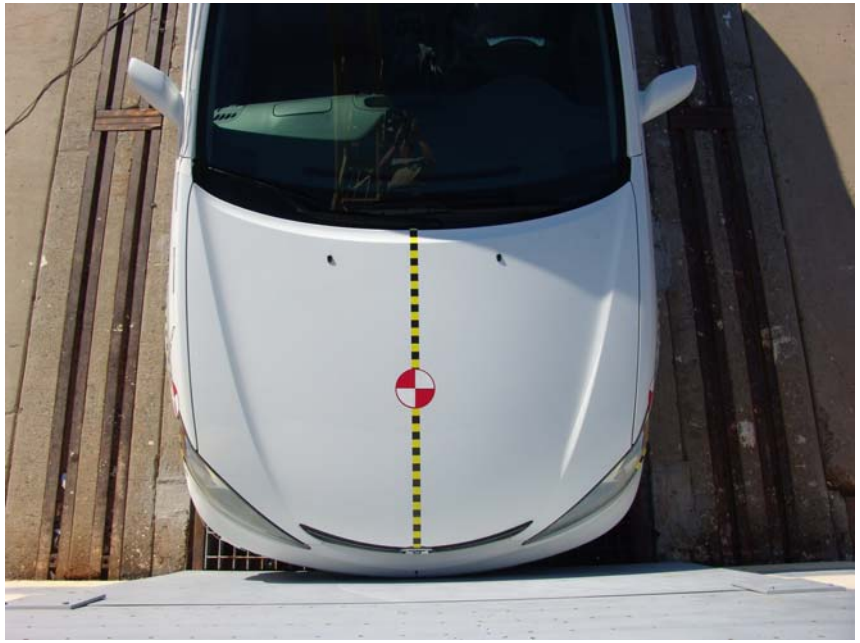

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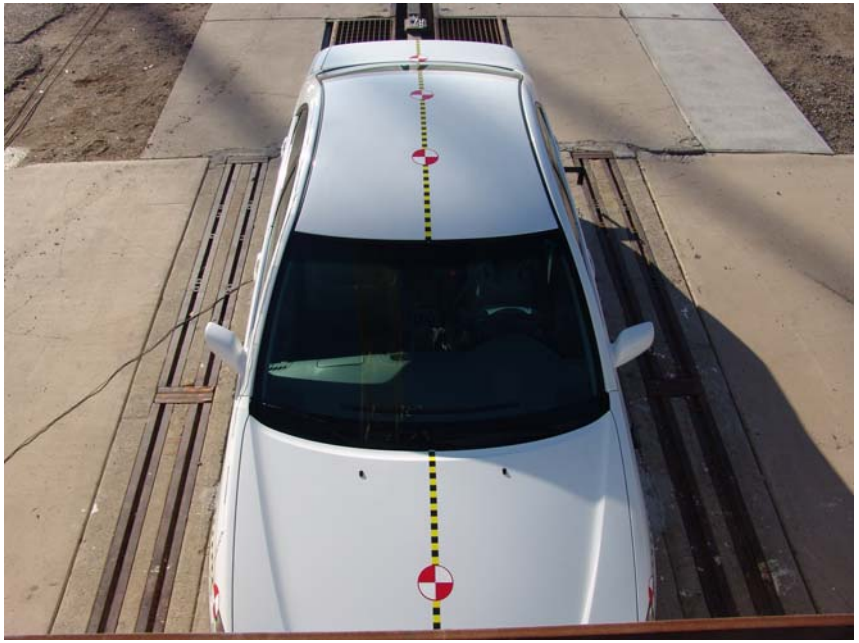

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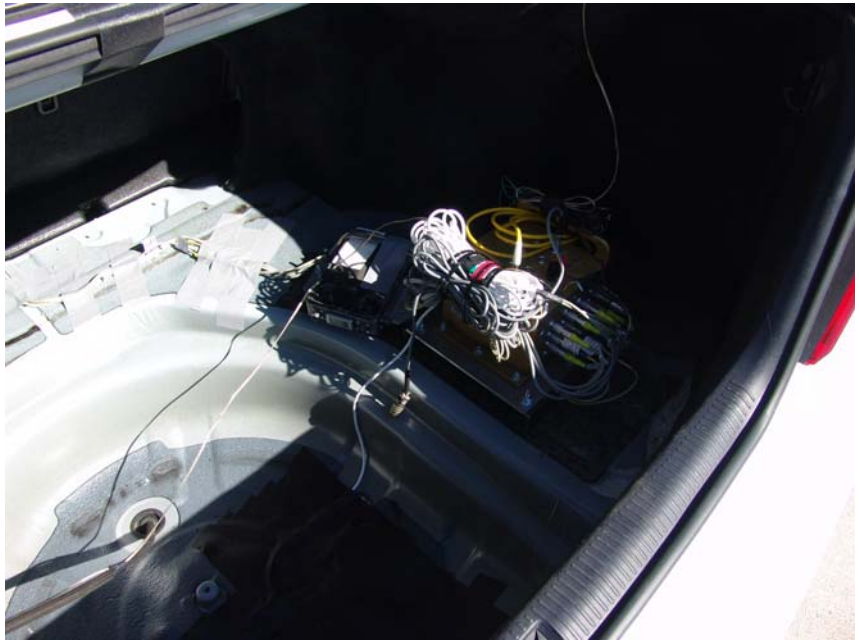
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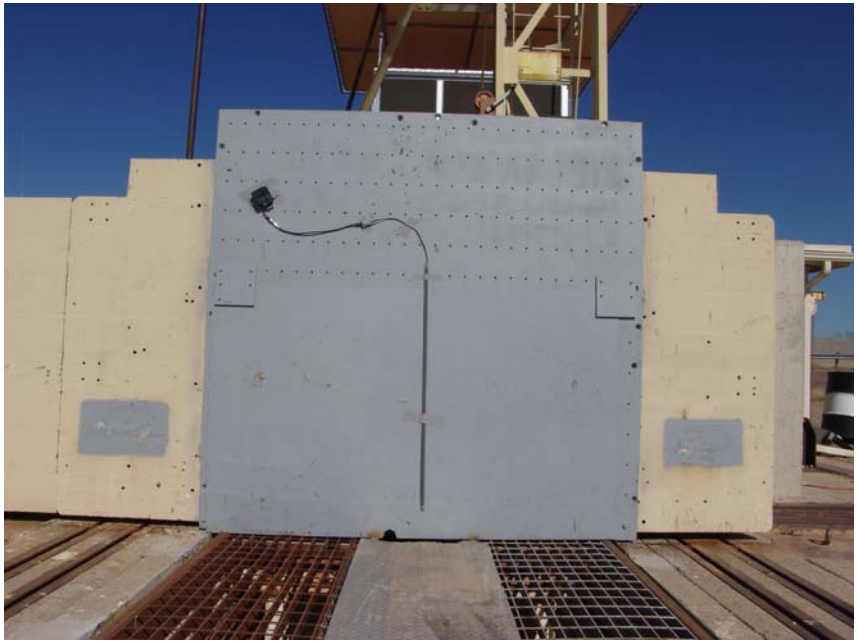

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Test Results

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Failure Analysis Associates®

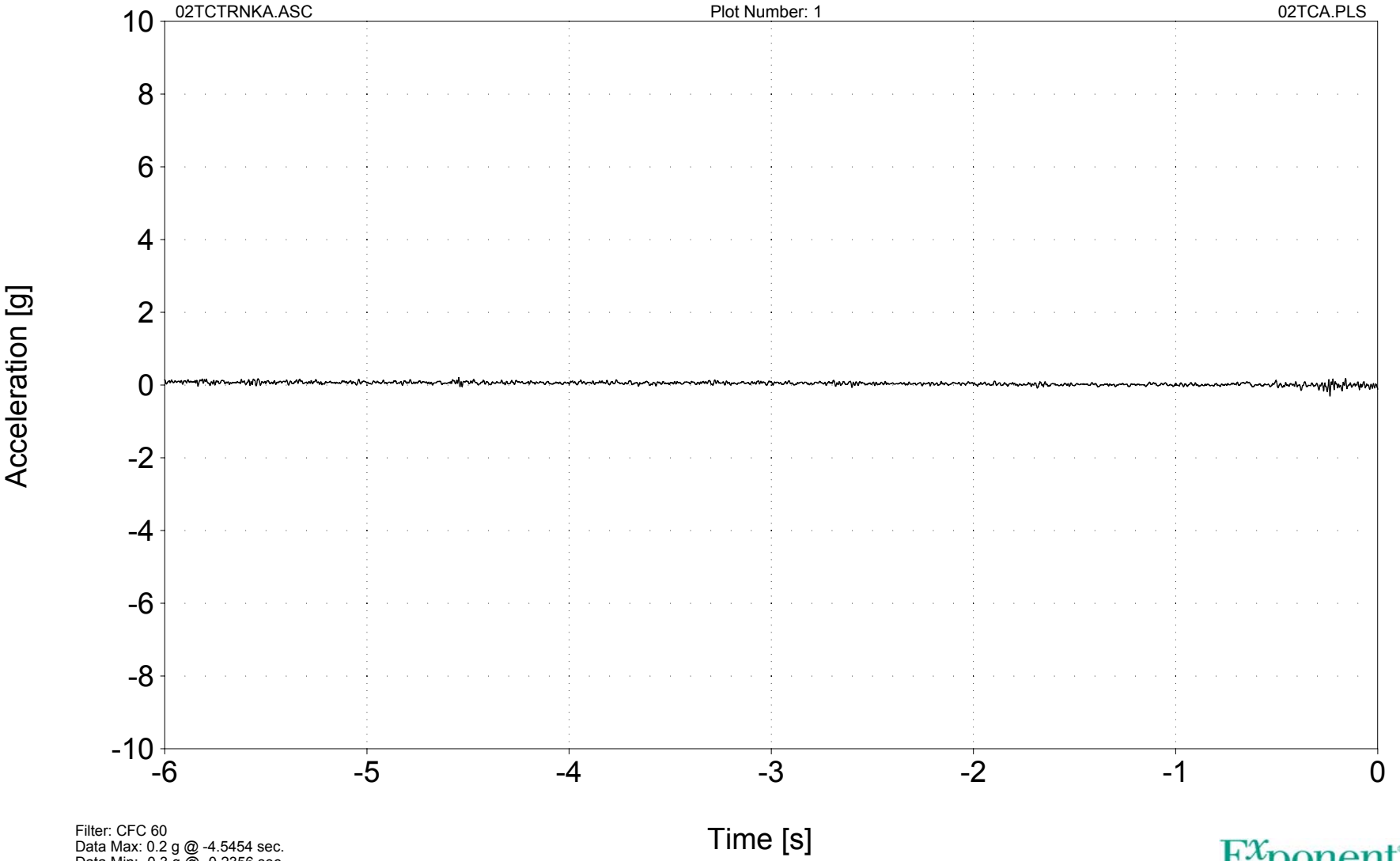
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
OPERATOR:	JS	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	TESTED VEHICLE: 2002 TOYOTA CAMRY				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
091911-2002 CAMRY	Channel 1	--	29.7	43.6	DP
	Channel 2	--	29.7	43.6	
	Average	--	29.7	43.6	

Longitudinal Acceleration v Time

Trunk
2002 Toyota Camry
Barrier Crash Test - 9/19/11



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Toyota Consulting
0907698

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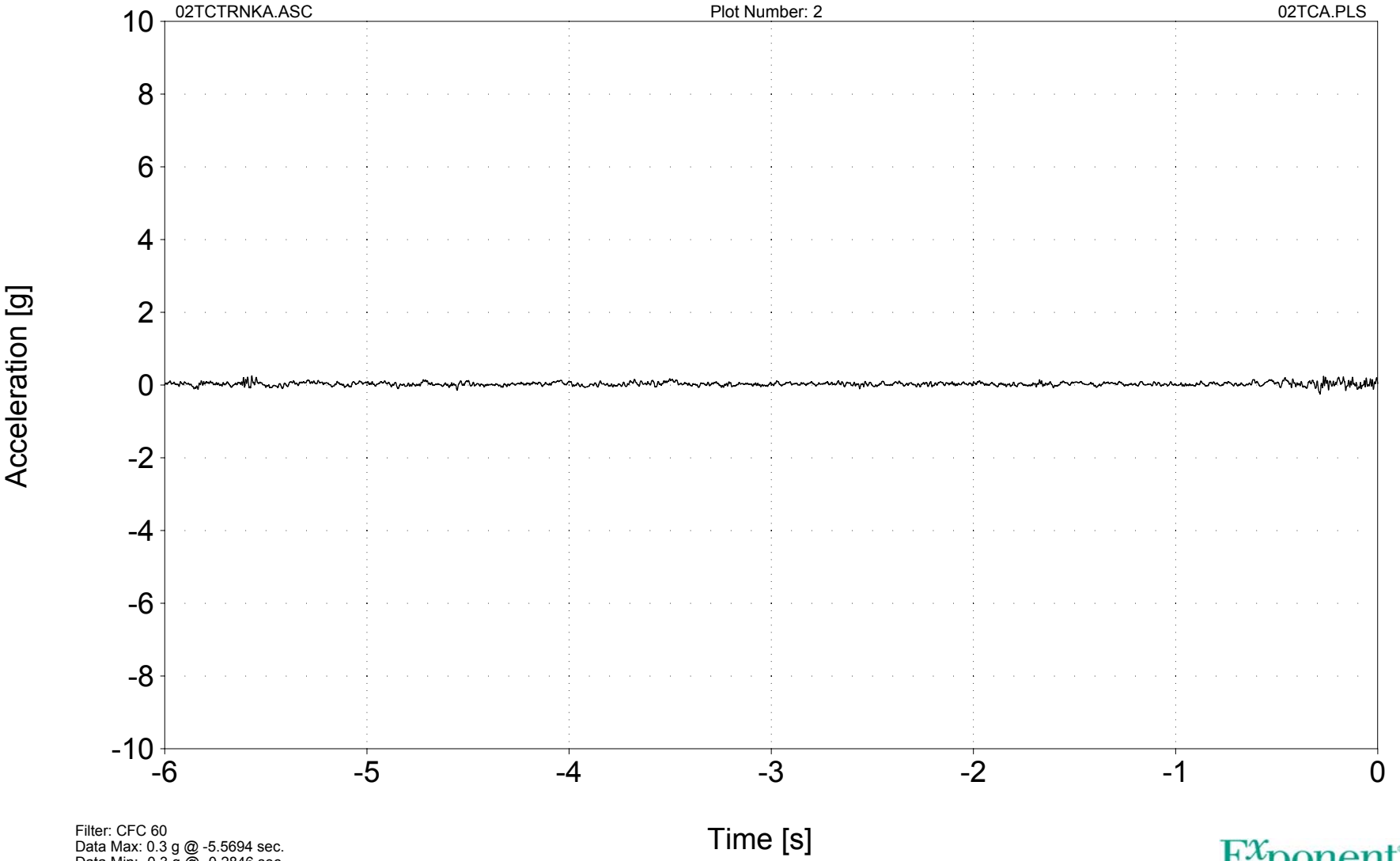
Lateral Acceleration v Time

Trunk
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
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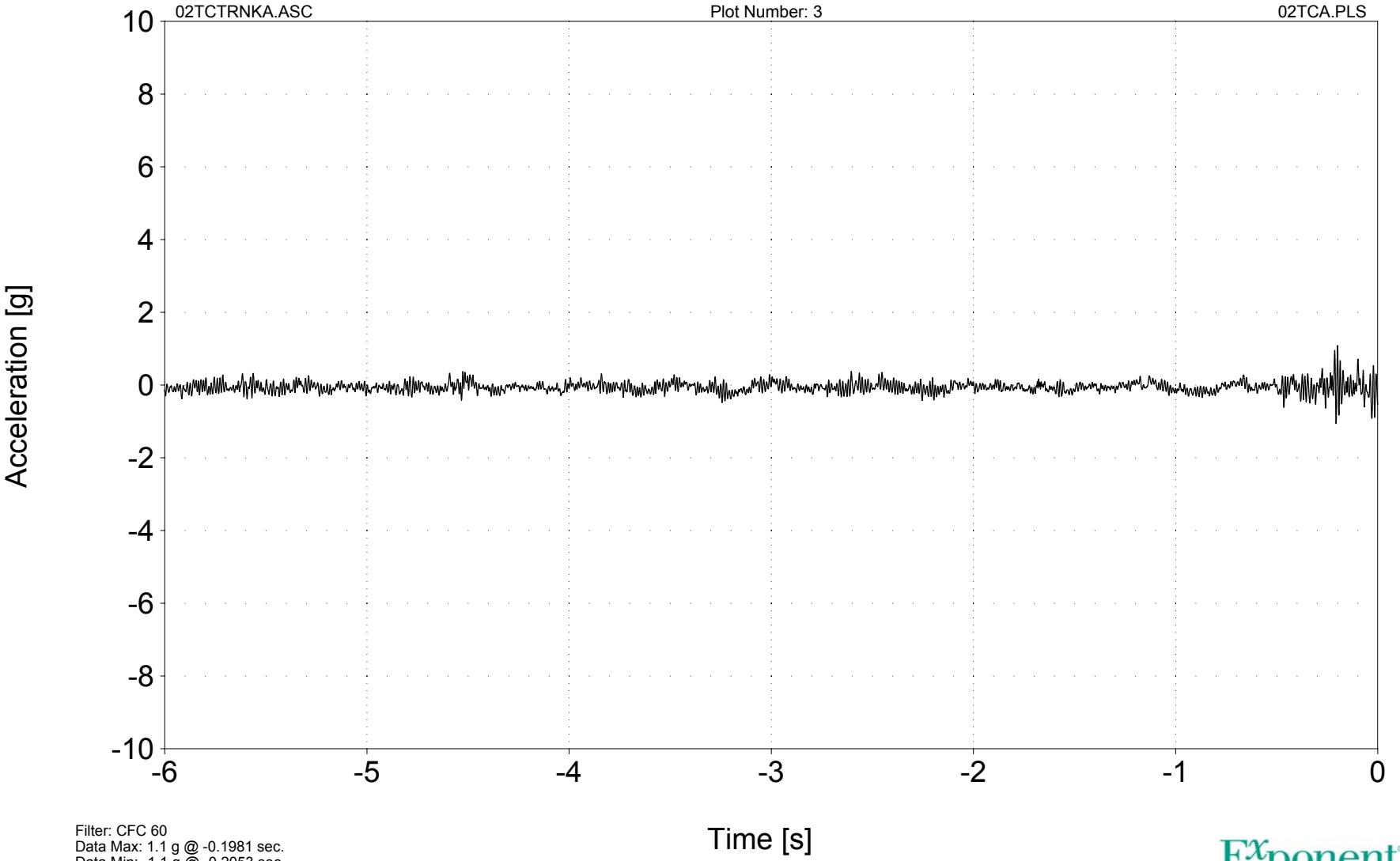
Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Vertical Acceleration v Time

Trunk
2002 Toyota Camry
Barrier Crash Test - 9/19/11



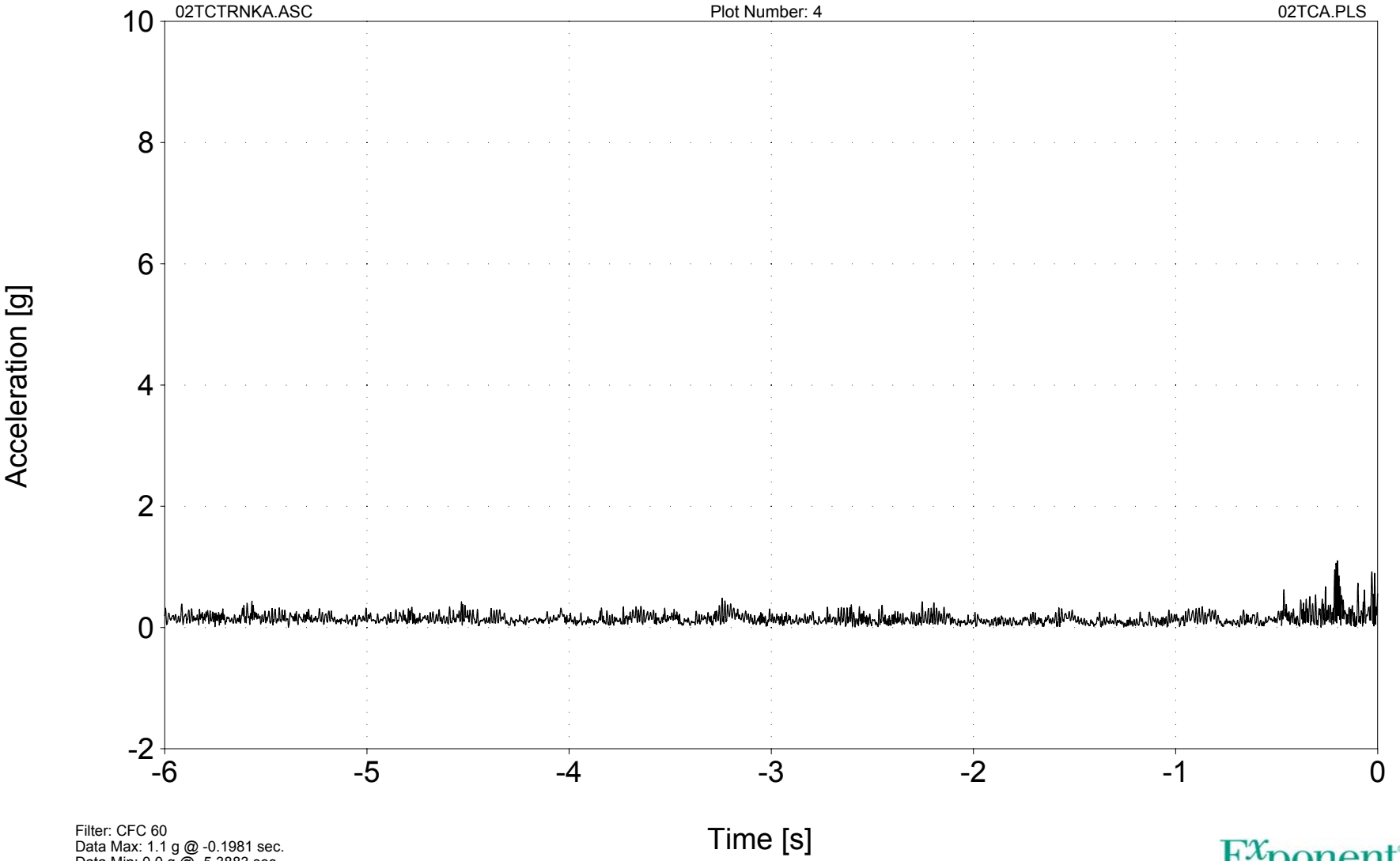
Filter: CFC 60
Data Max: 1.1 g @ -0.1981 sec.
Data Min: -1.1 g @ -0.2053 sec.

Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Resultant Acceleration v Time

Trunk
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
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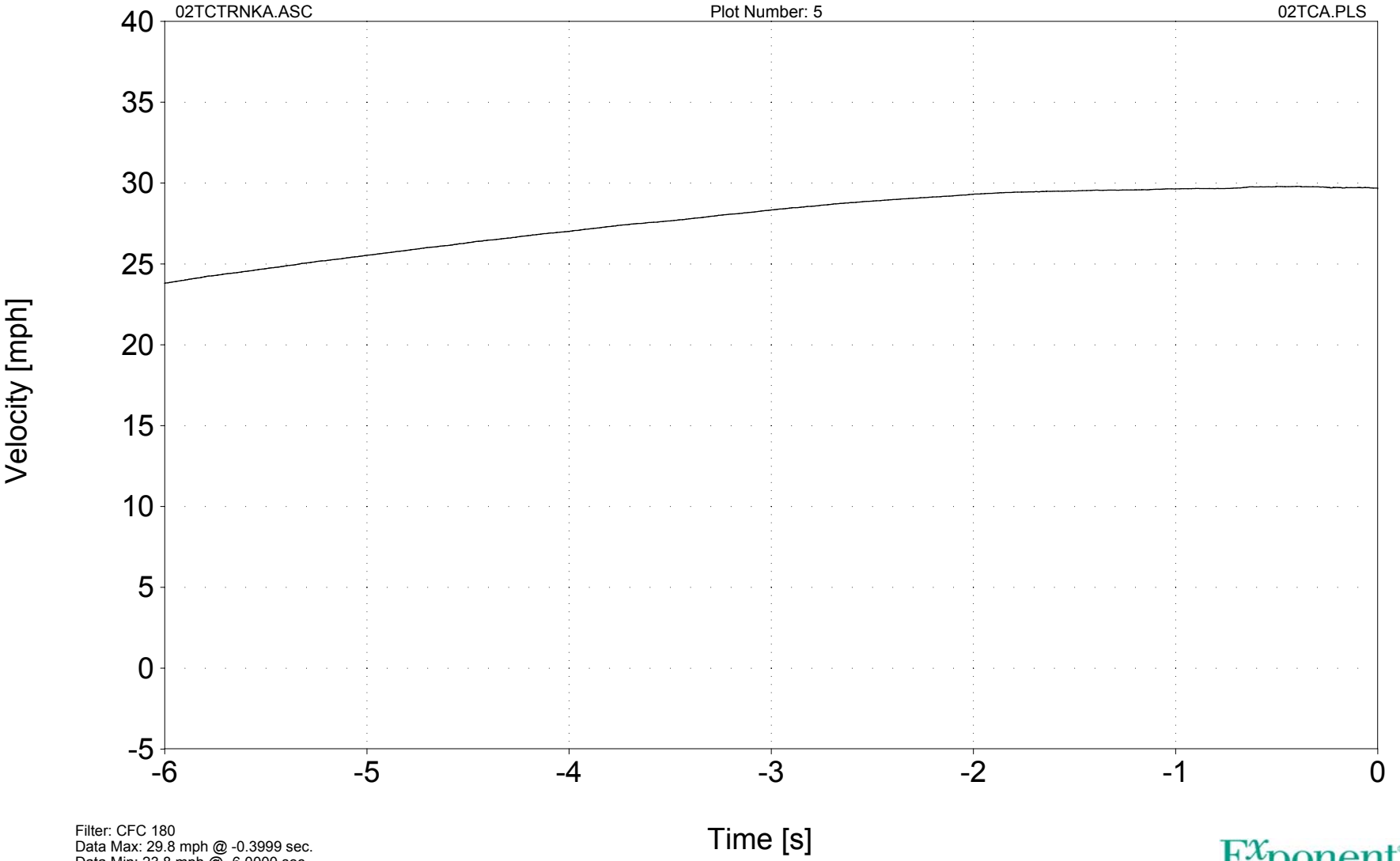
Toyota Consulting
0907698

Exponent®
Failure Analysis Associates®

Longitudinal Velocity v Time

Trunk
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 29.8 mph @ -0.3999 sec.
Data Min: 23.8 mph @ -6.0000 sec.

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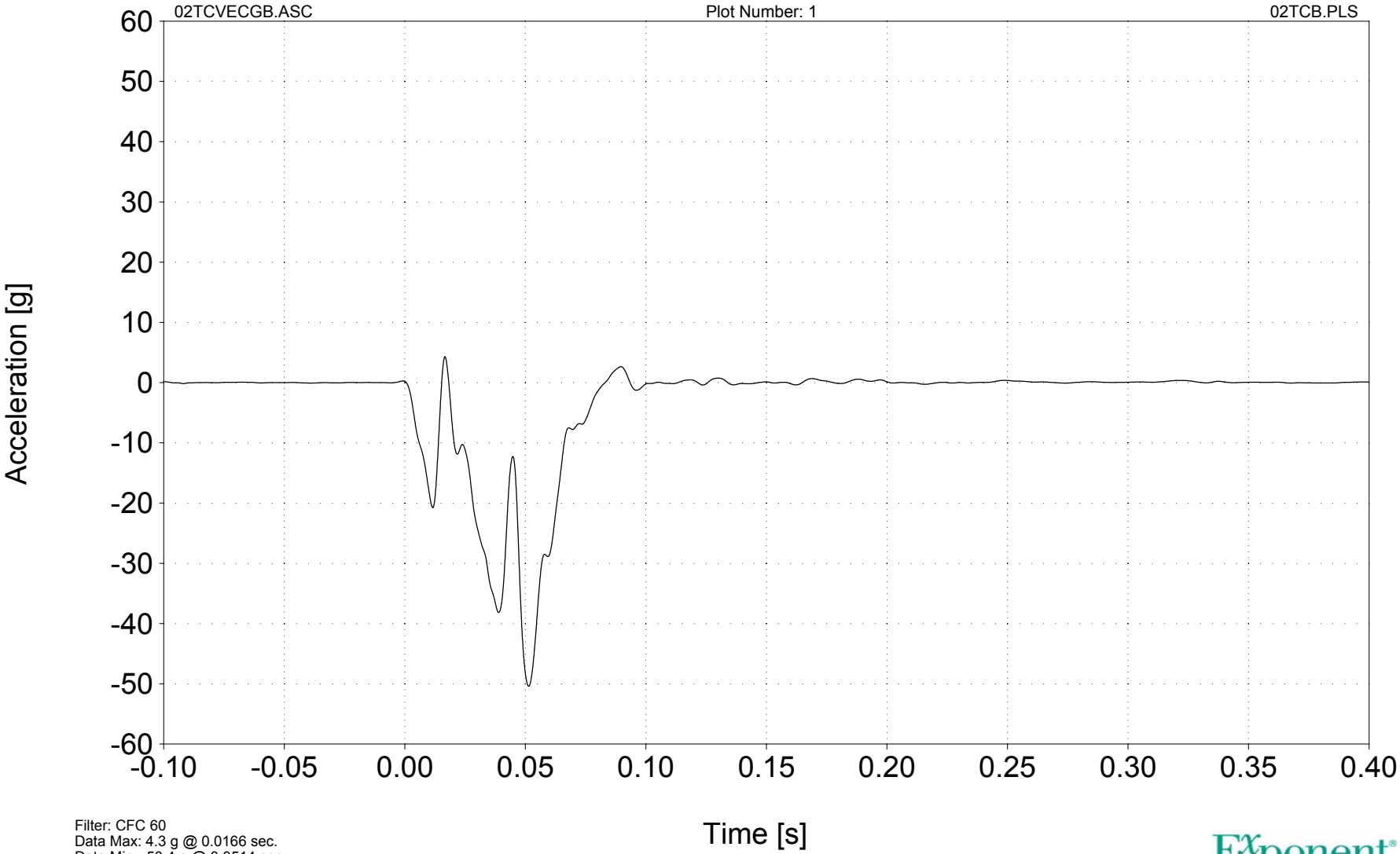
Longitudinal Acceleration v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 4.3 g @ 0.0166 sec.
Data Min: -50.4 g @ 0.0514 sec.

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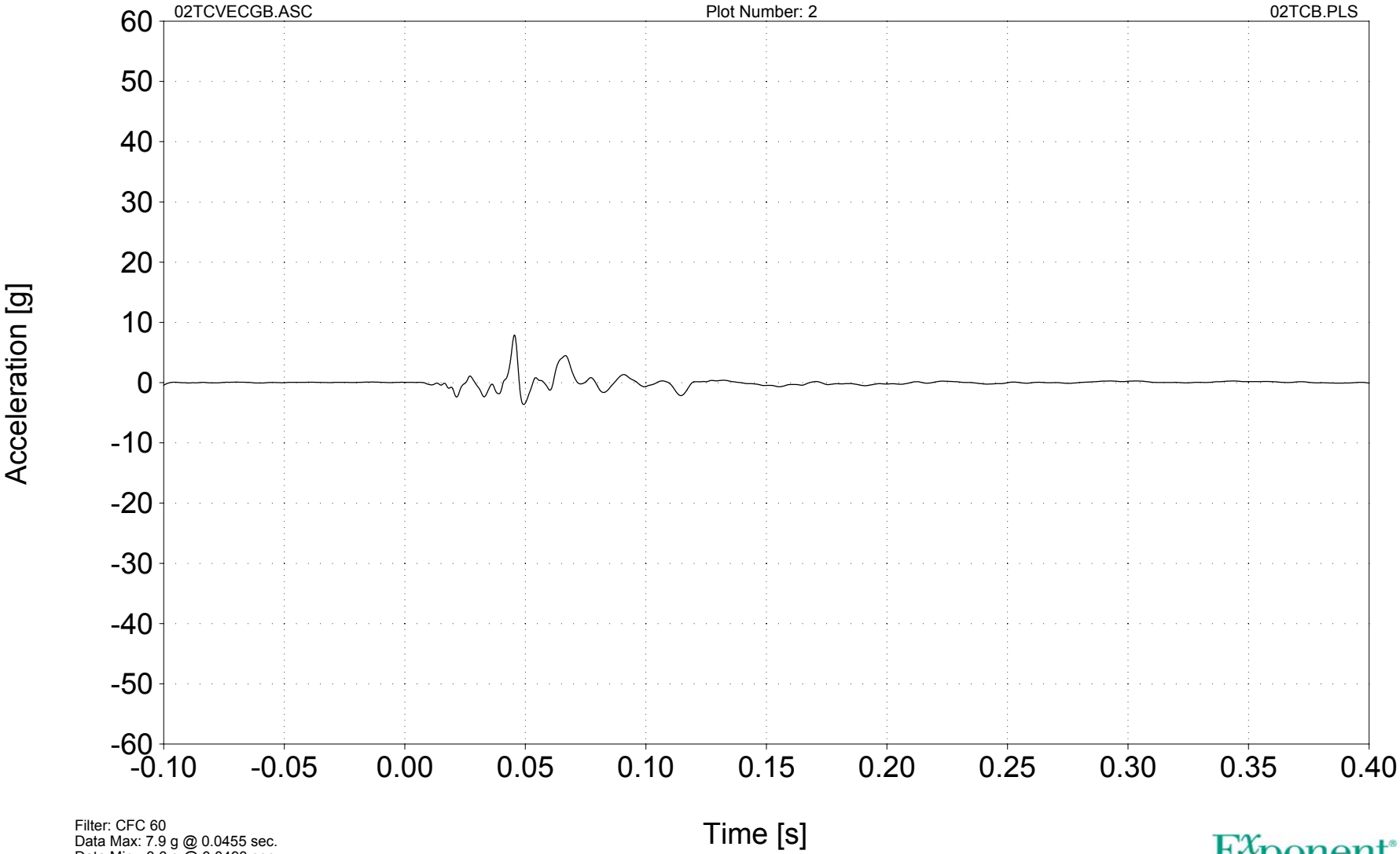
Lateral Acceleration v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 7.9 g @ 0.0455 sec.
Data Min: -3.6 g @ 0.0493 sec.

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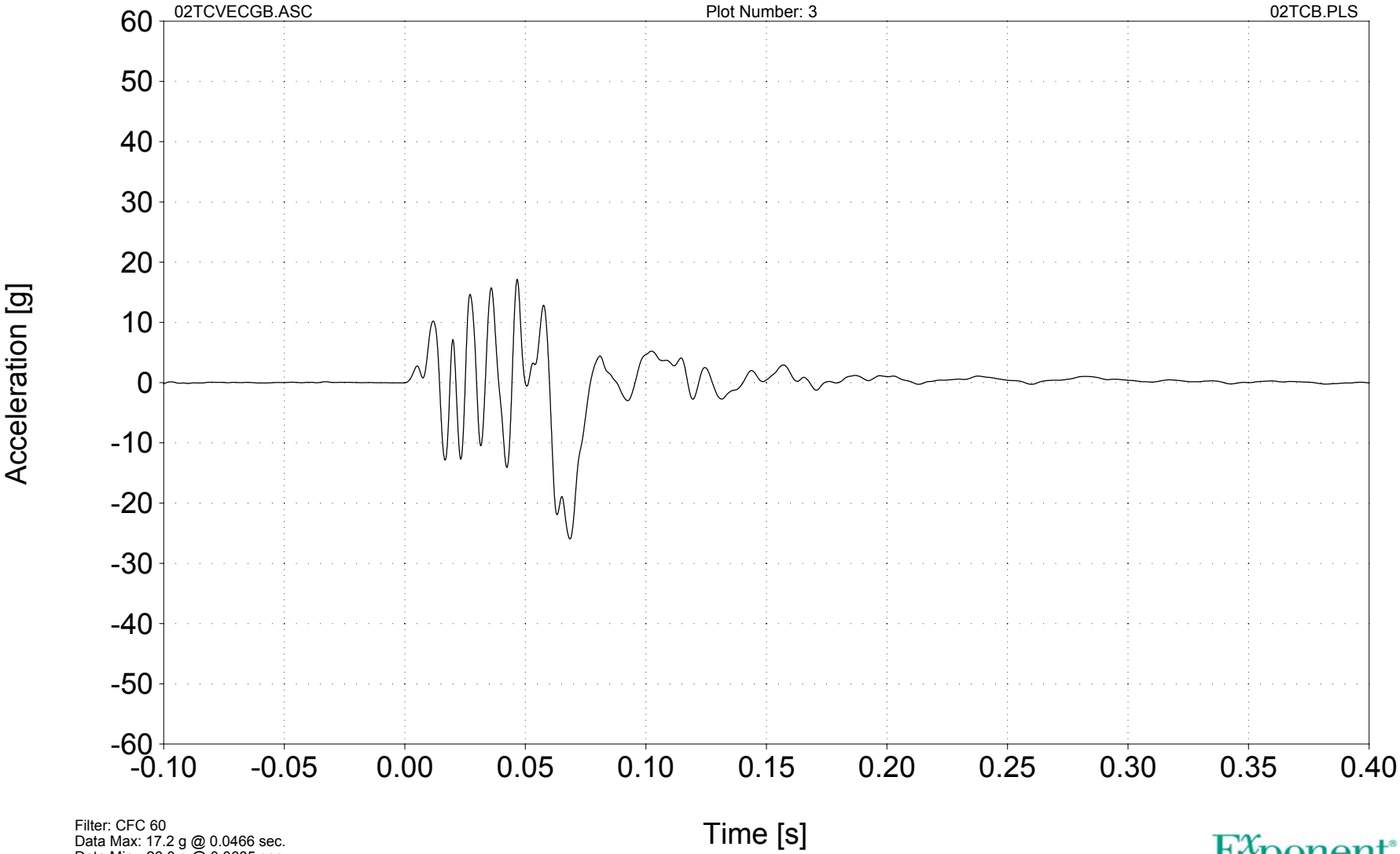
Vertical Acceleration v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 17.2 g @ 0.0466 sec.
Data Min: -26.0 g @ 0.0685 sec.

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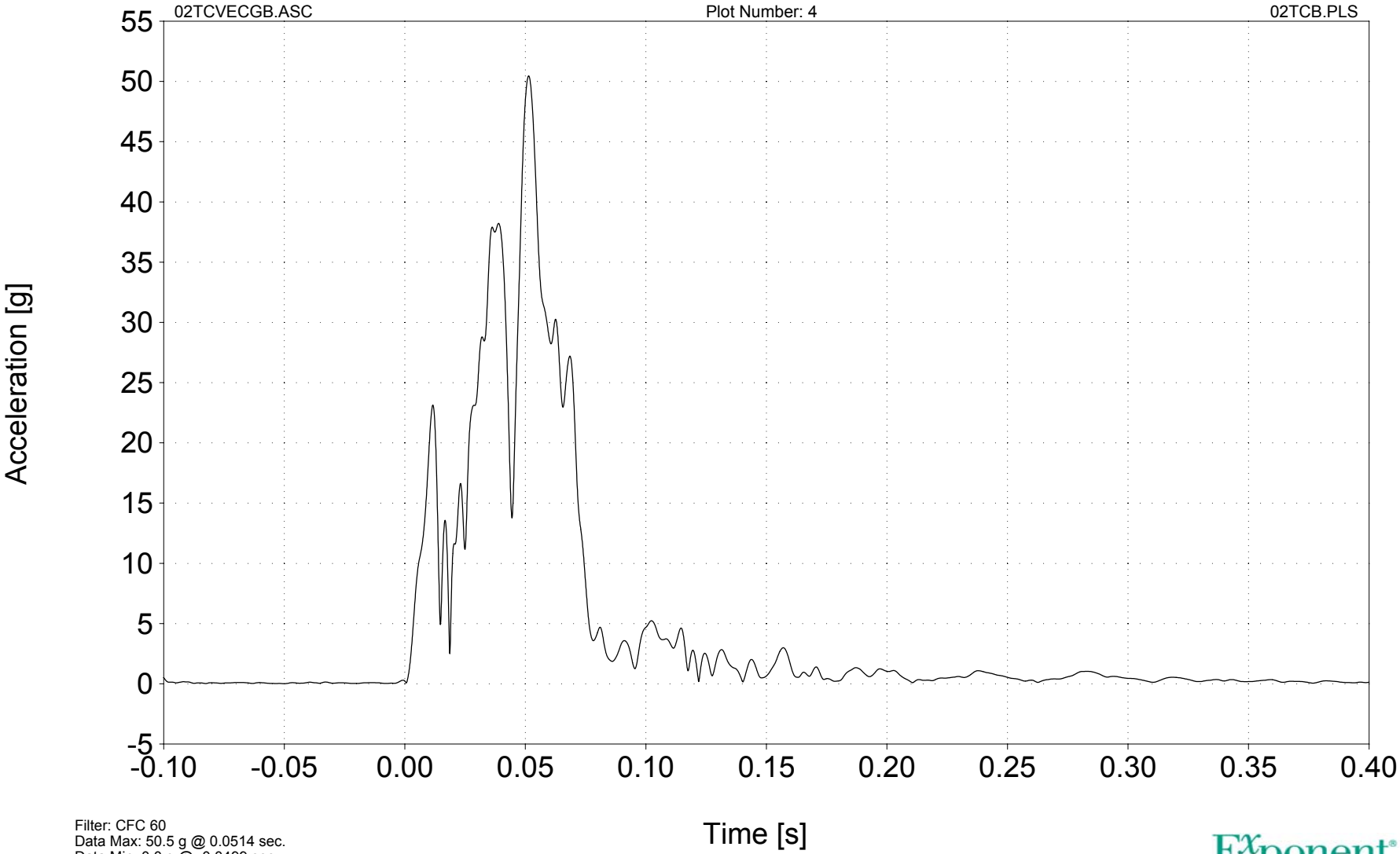
Resultant Acceleration v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 50.5 g @ 0.0514 sec.
Data Min: 0.0 g @ -0.0499 sec.

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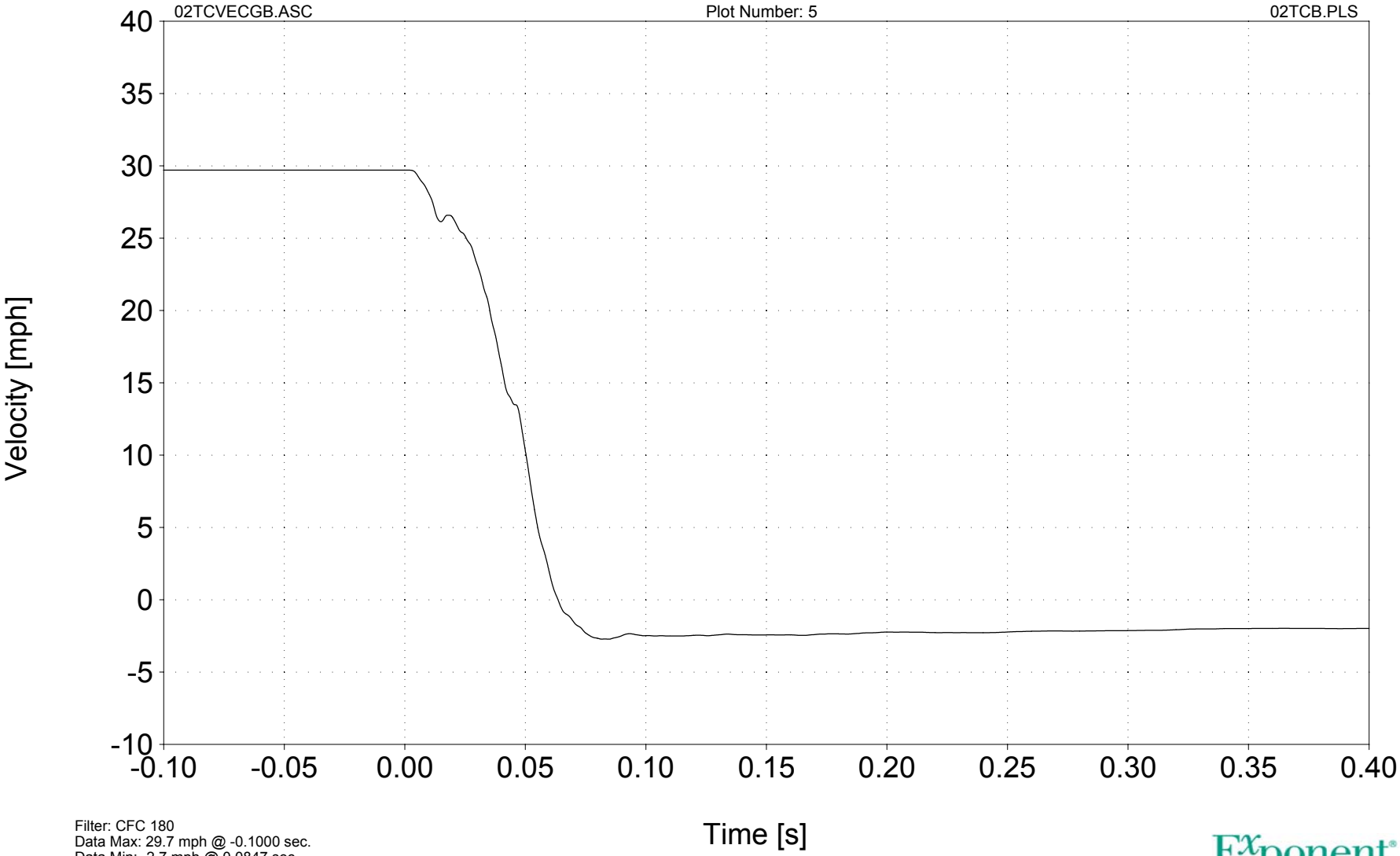
Longitudinal Velocity v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 29.7 mph @ -0.1000 sec.
Data Min: -2.7 mph @ 0.0847 sec.

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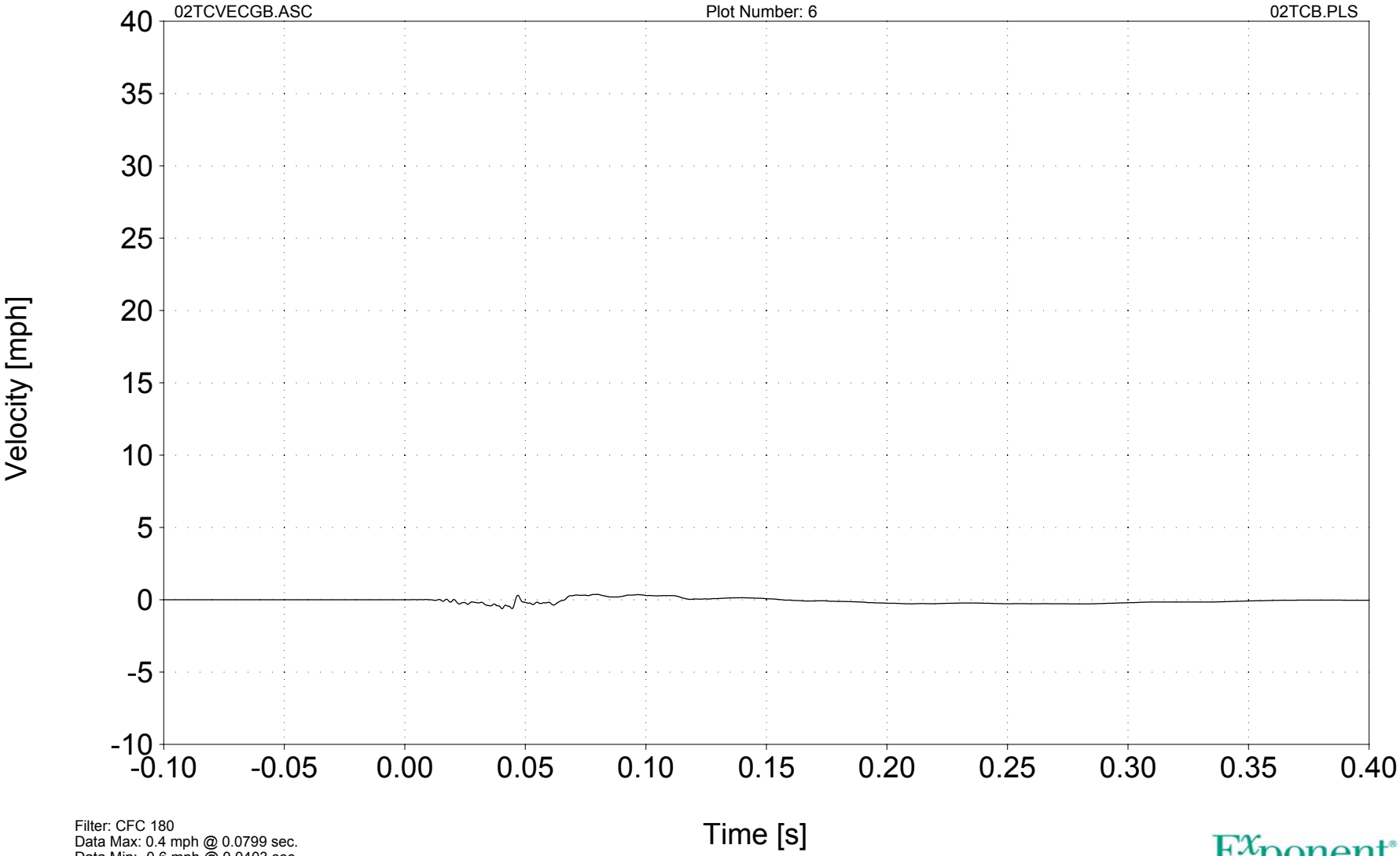
Lateral Velocity v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 0.4 mph @ 0.0799 sec.
Data Min: -0.6 mph @ 0.0403 sec.

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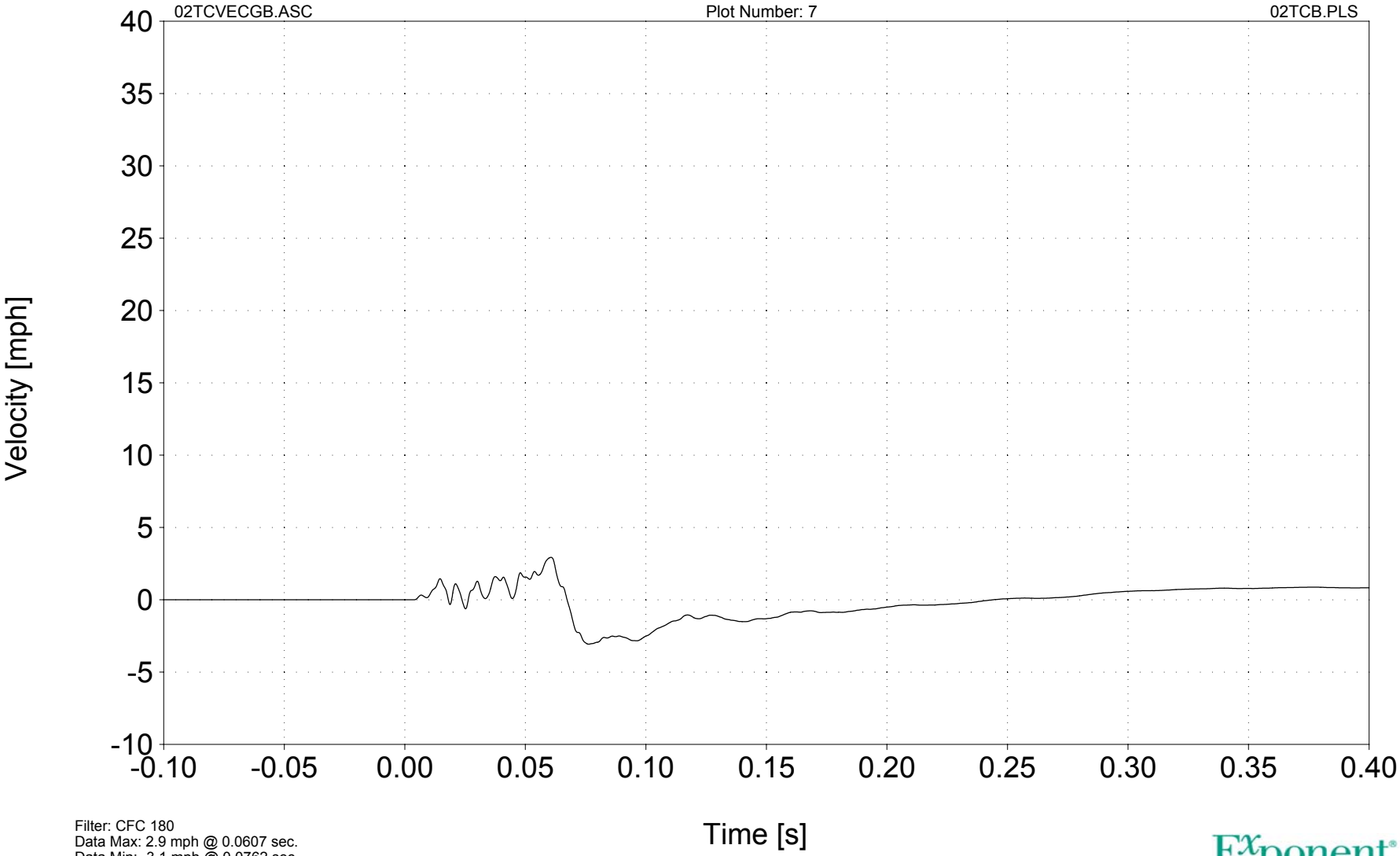
Vertical Velocity v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 2.9 mph @ 0.0607 sec.
Data Min: -3.1 mph @ 0.0762 sec.

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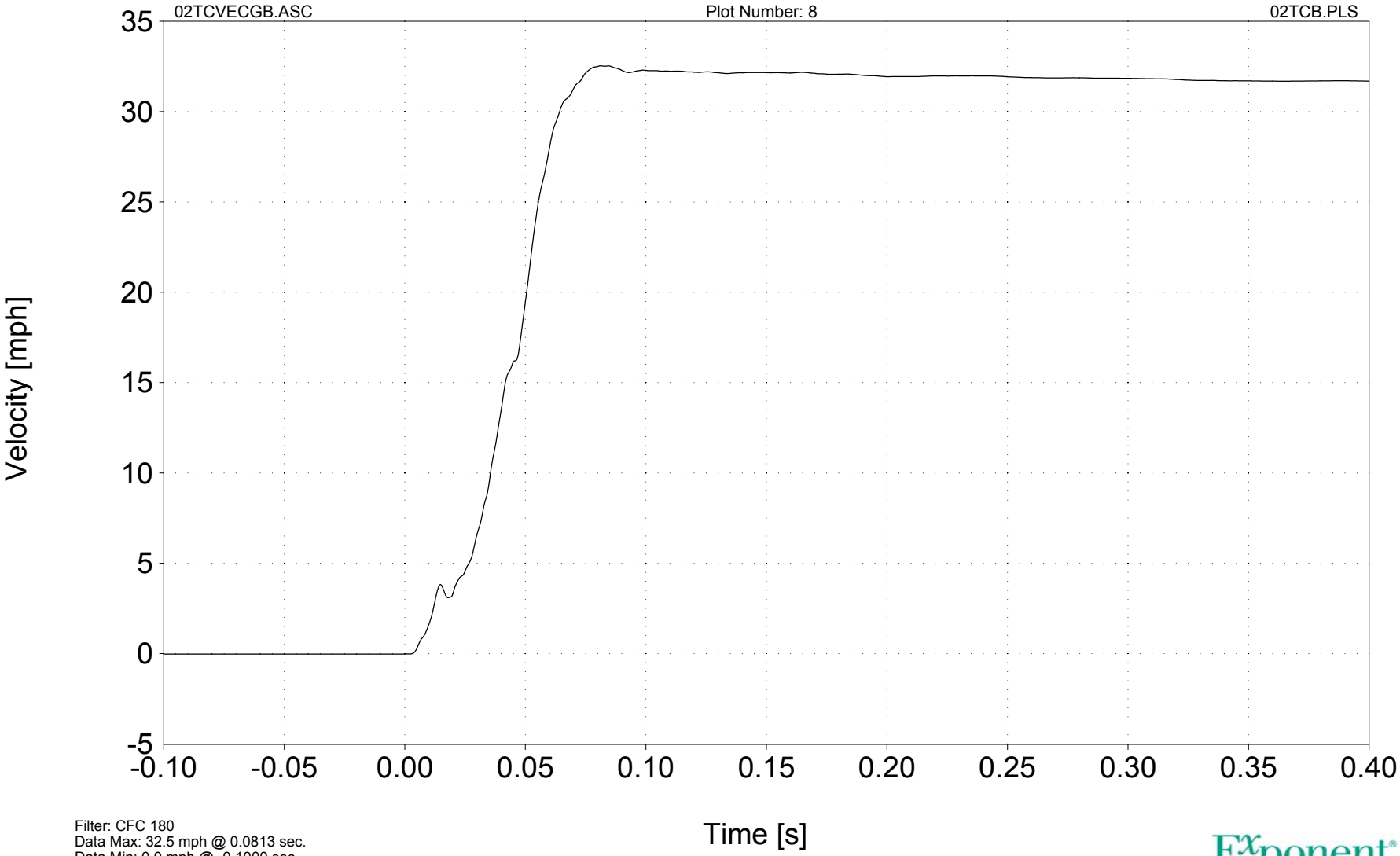
Delta Velocity v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 32.5 mph @ 0.0813 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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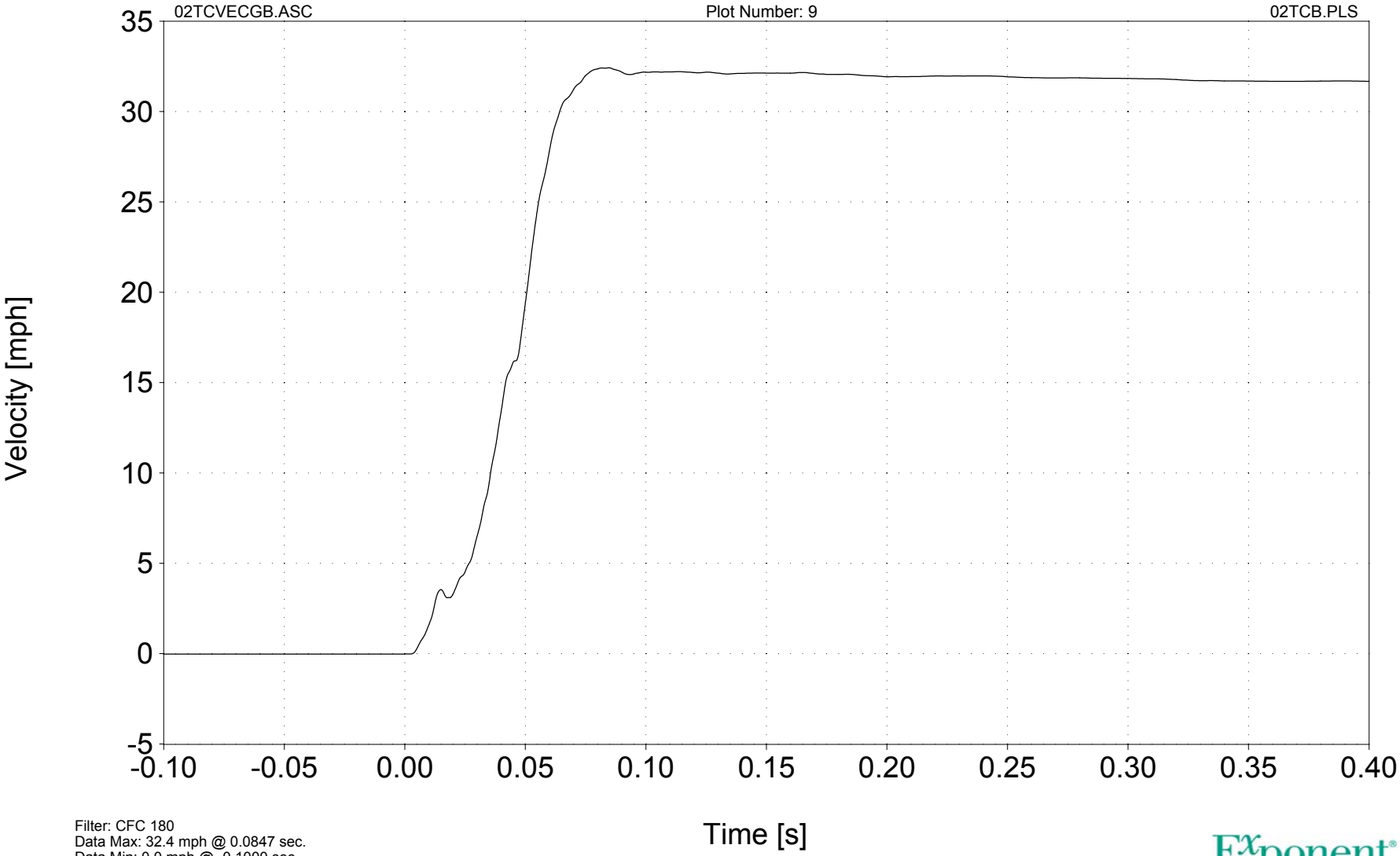
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 32.4 mph @ 0.0847 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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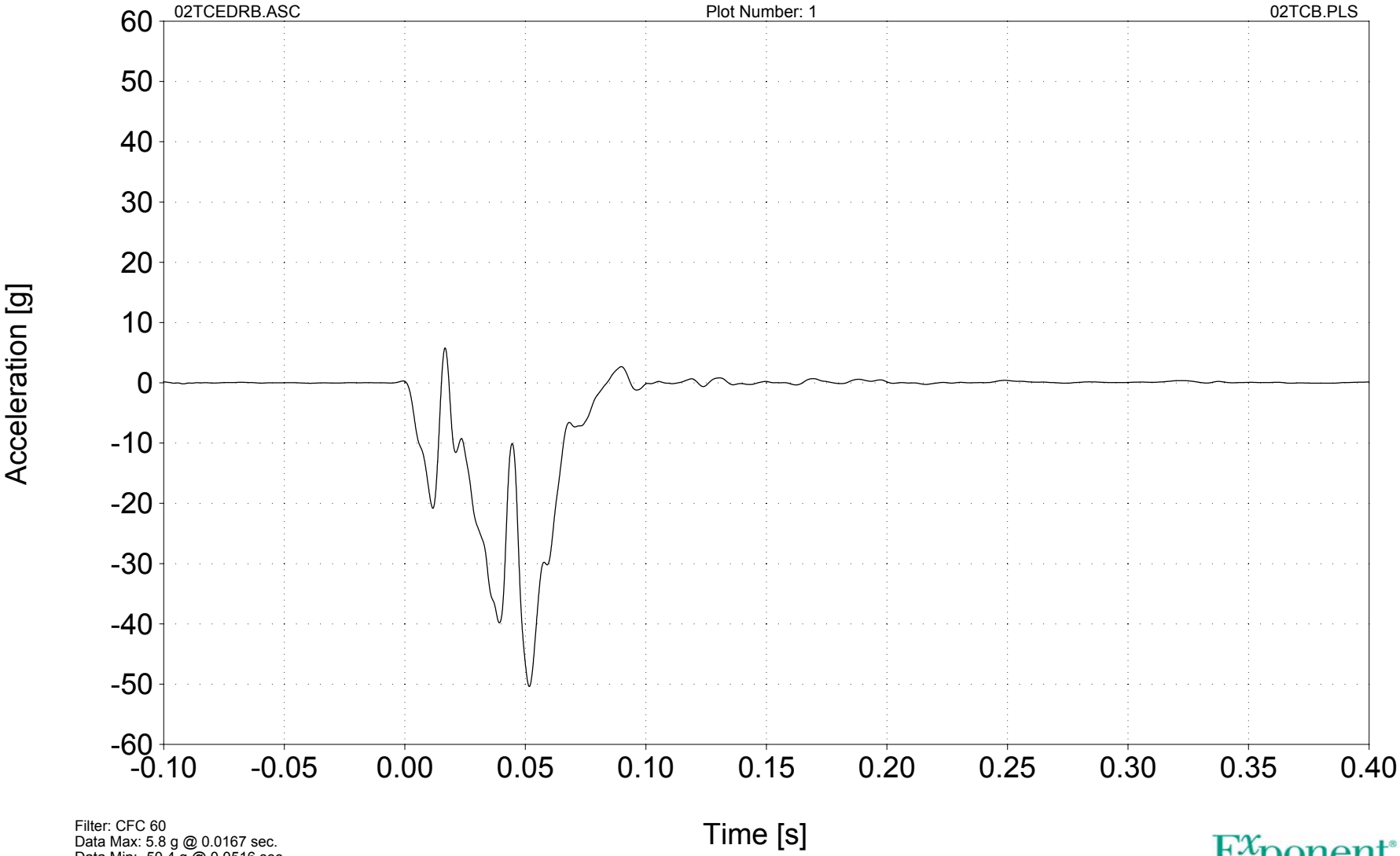
Longitudinal Acceleration v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 5.8 g @ 0.0167 sec.
Data Min: -50.4 g @ 0.0516 sec.

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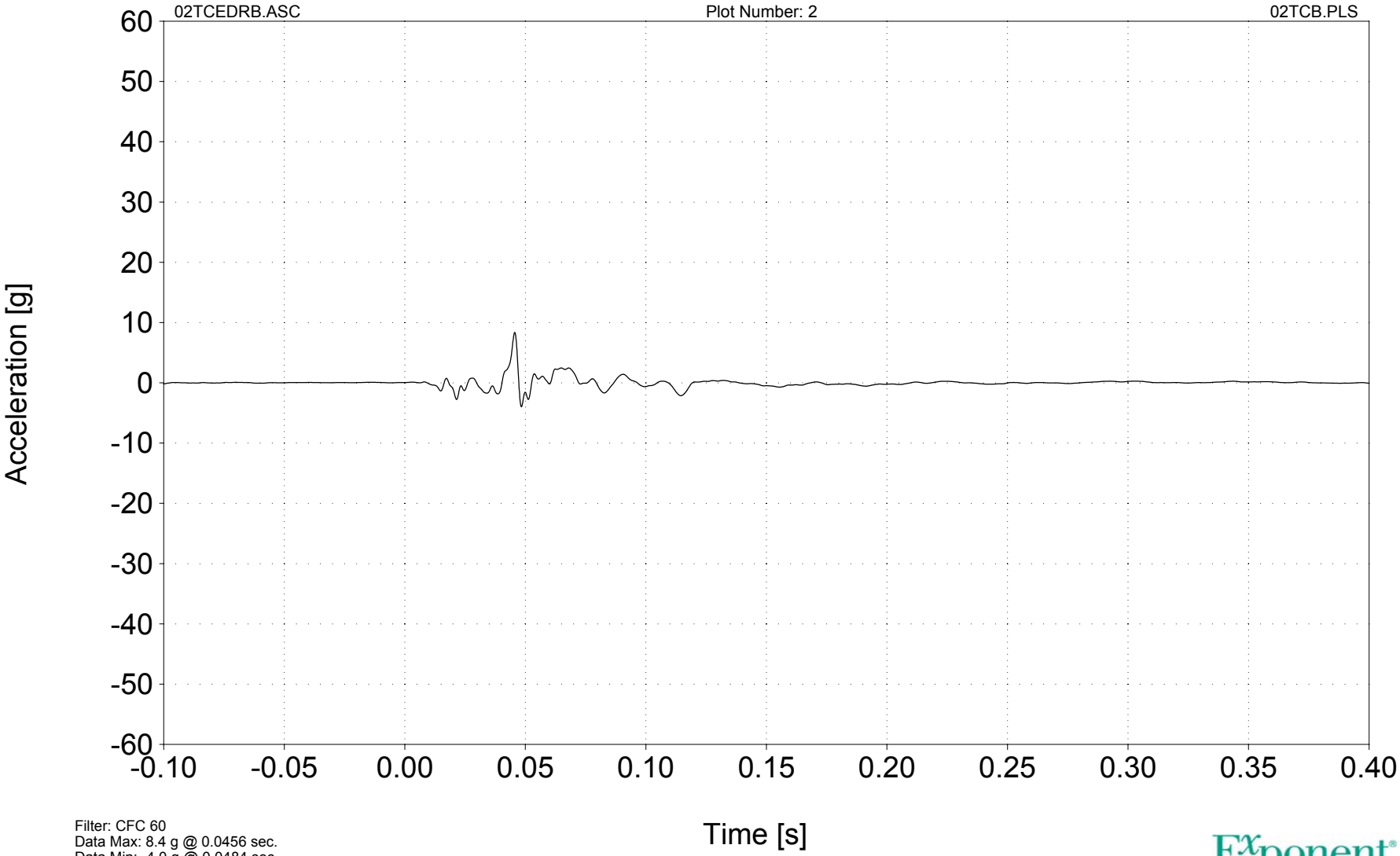
Lateral Acceleration v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 8.4 g @ 0.0456 sec.
Data Min: -4.0 g @ 0.0484 sec.

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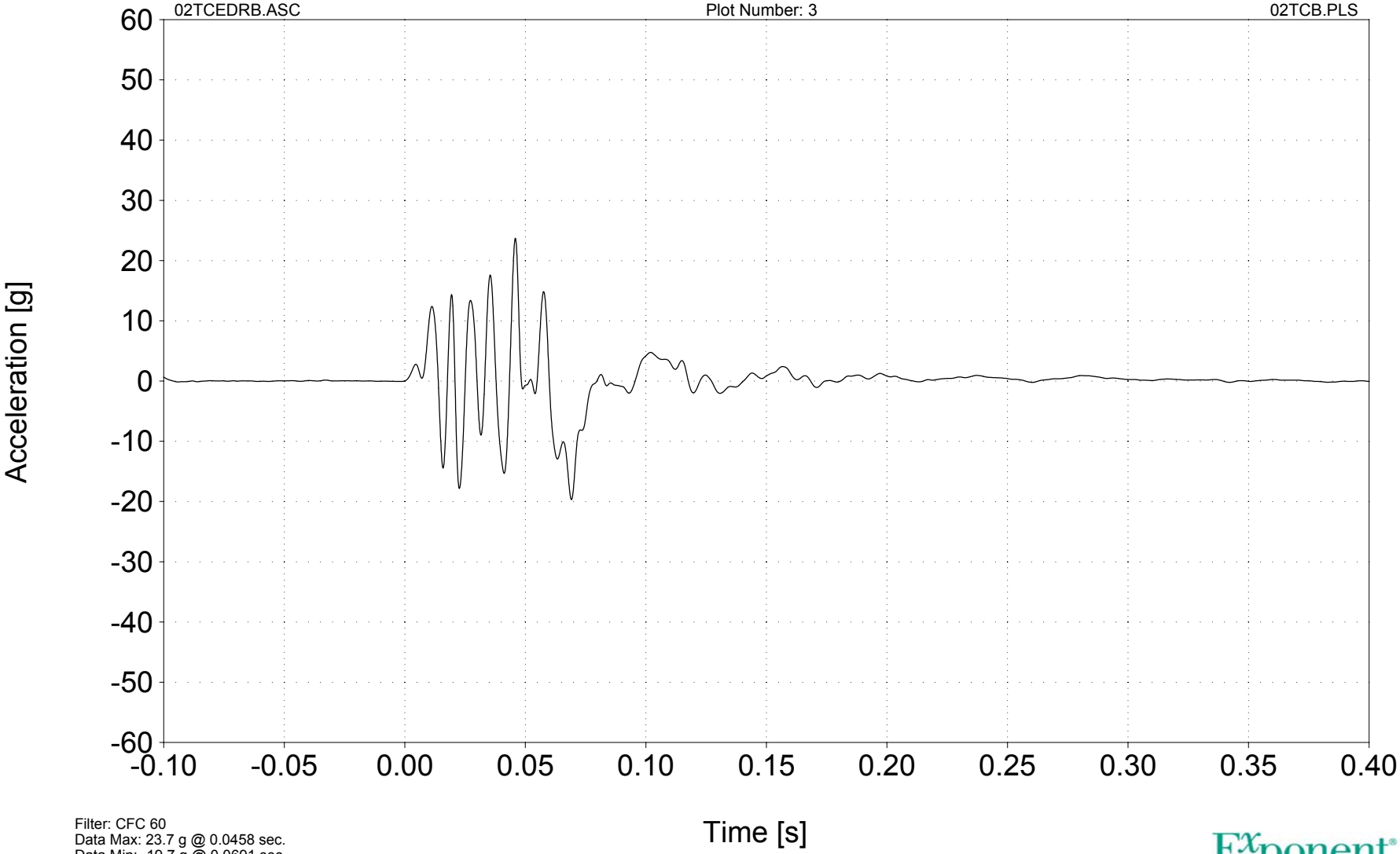
Vertical Acceleration v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 23.7 g @ 0.0458 sec.
Data Min: -19.7 g @ 0.0691 sec.

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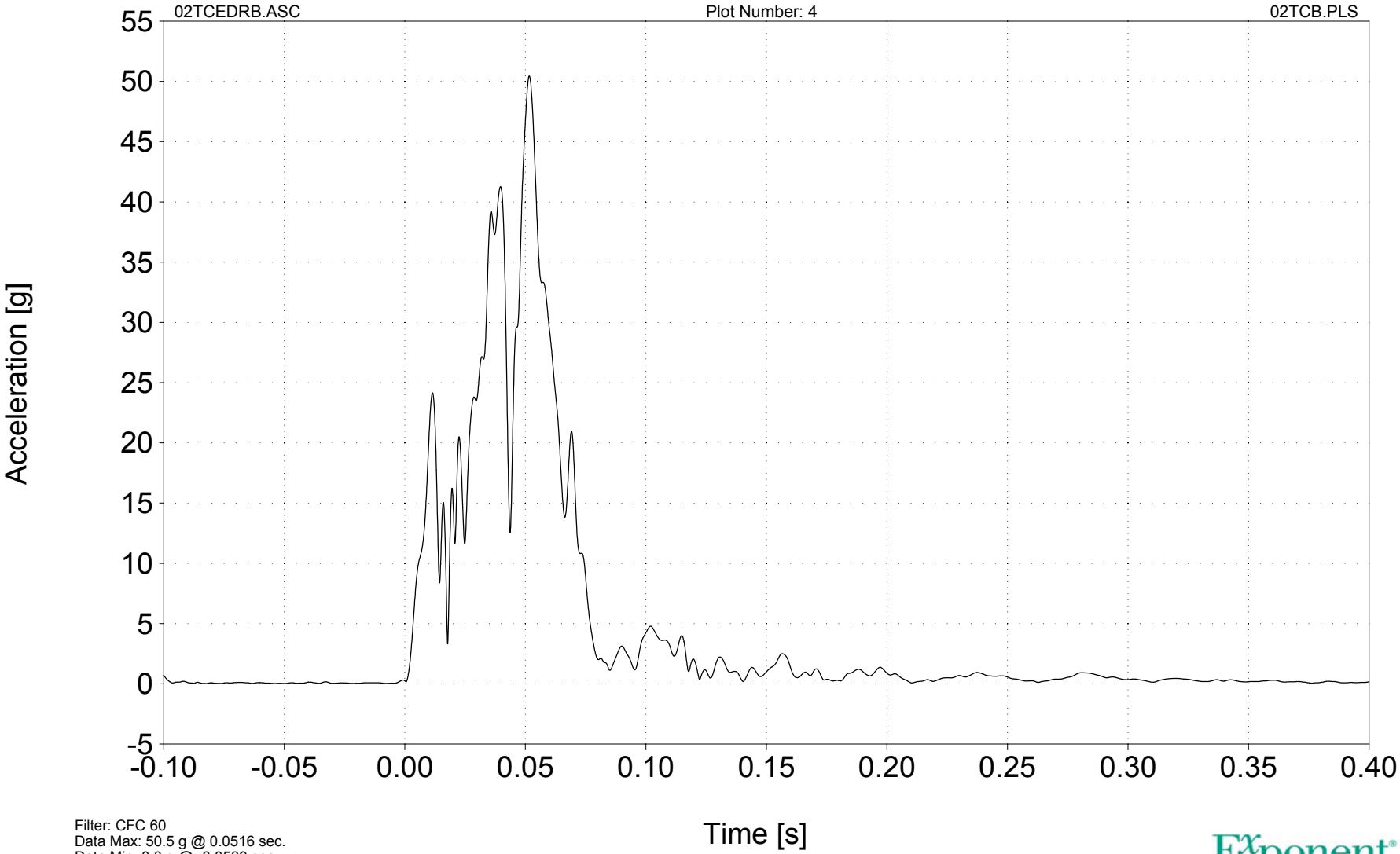
Resultant Acceleration v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 50.5 g @ 0.0516 sec.
Data Min: 0.0 g @ -0.0539 sec.

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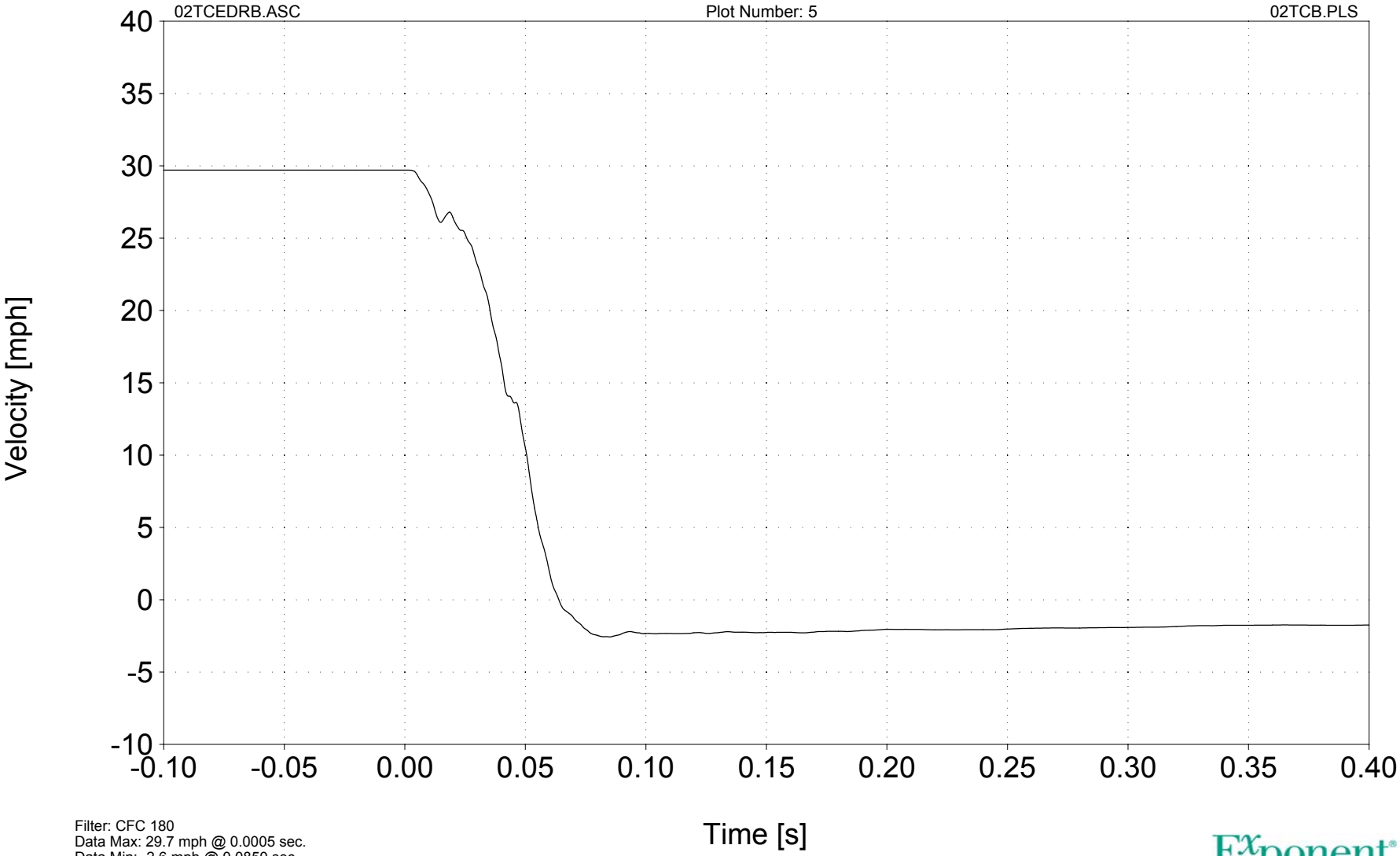
Longitudinal Velocity v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 29.7 mph @ 0.0005 sec.
Data Min: -2.6 mph @ 0.0850 sec.

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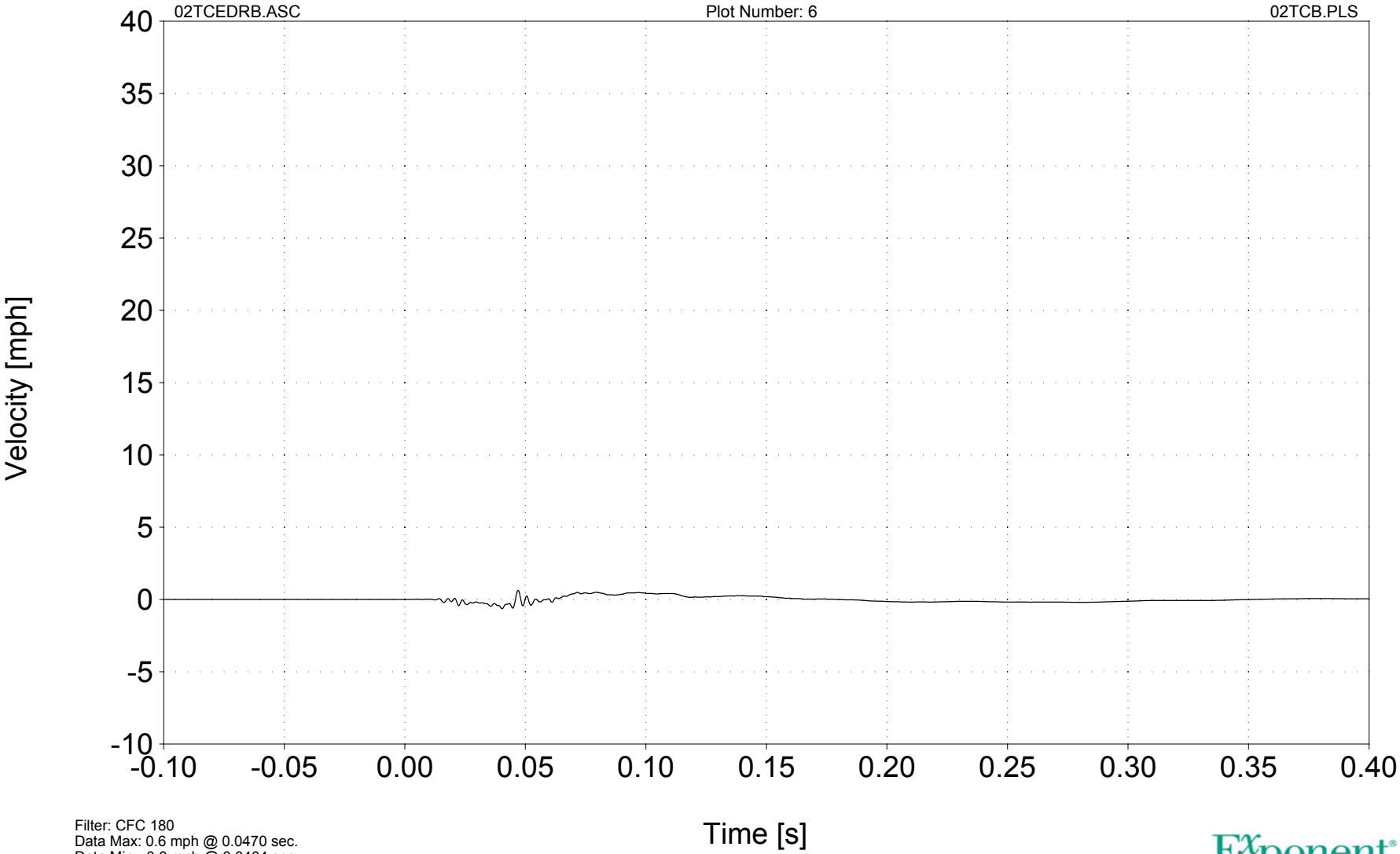
Lateral Velocity v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 0.6 mph @ 0.0470 sec.
Data Min: -0.6 mph @ 0.0404 sec.

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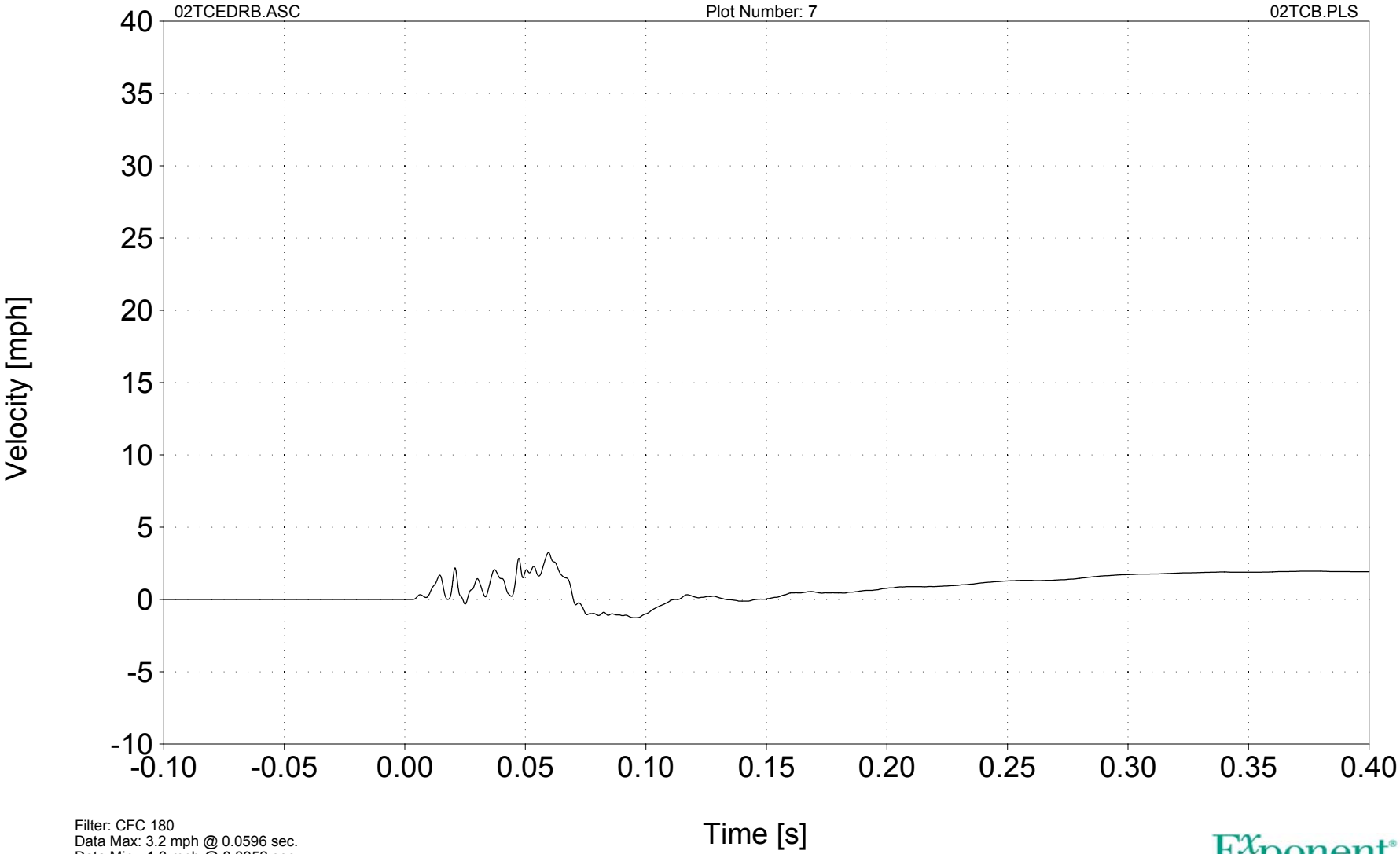
Vertical Velocity v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 3.2 mph @ 0.0596 sec.
Data Min: -1.3 mph @ 0.0952 sec.

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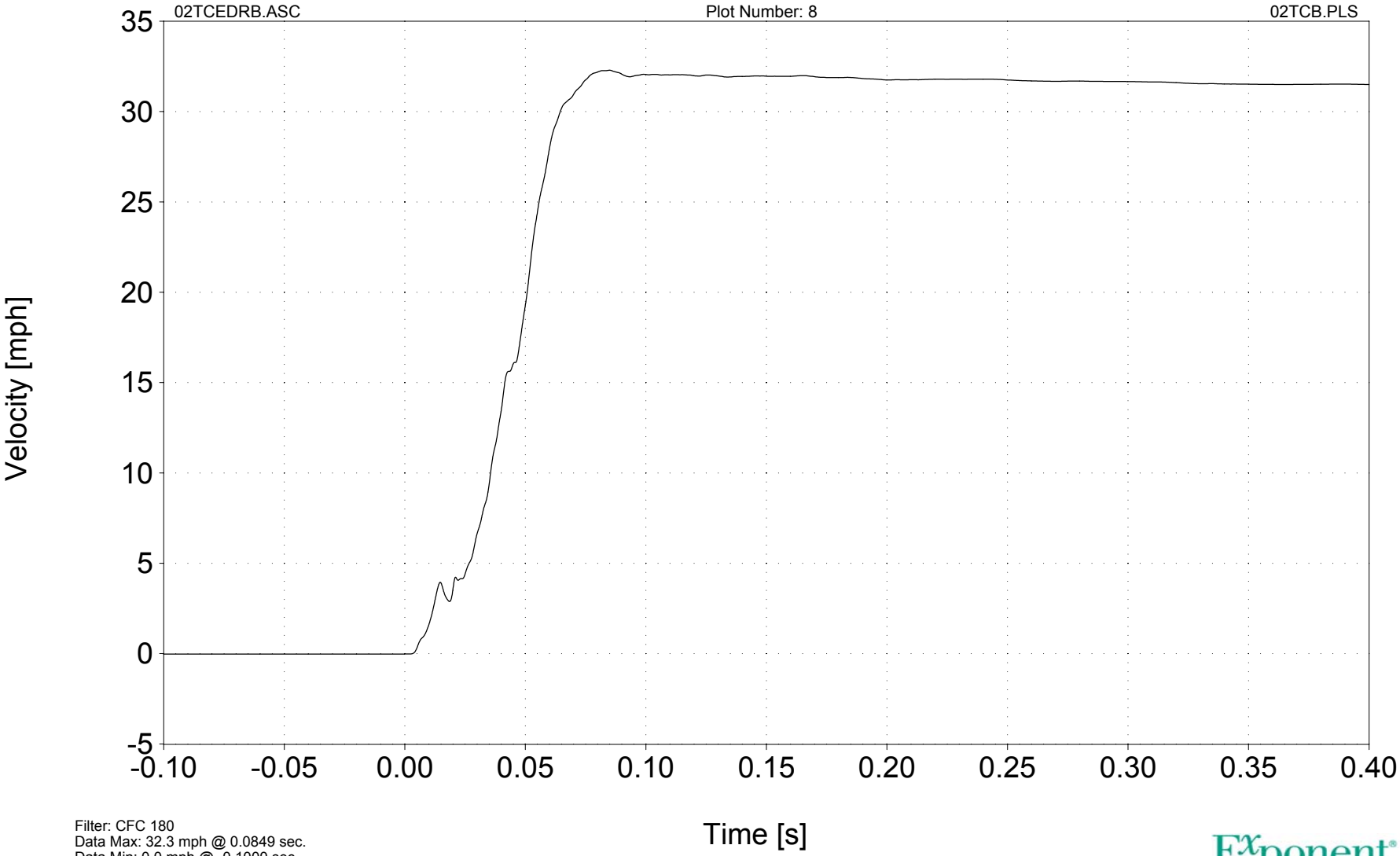
Delta Velocity v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 32.3 mph @ 0.0849 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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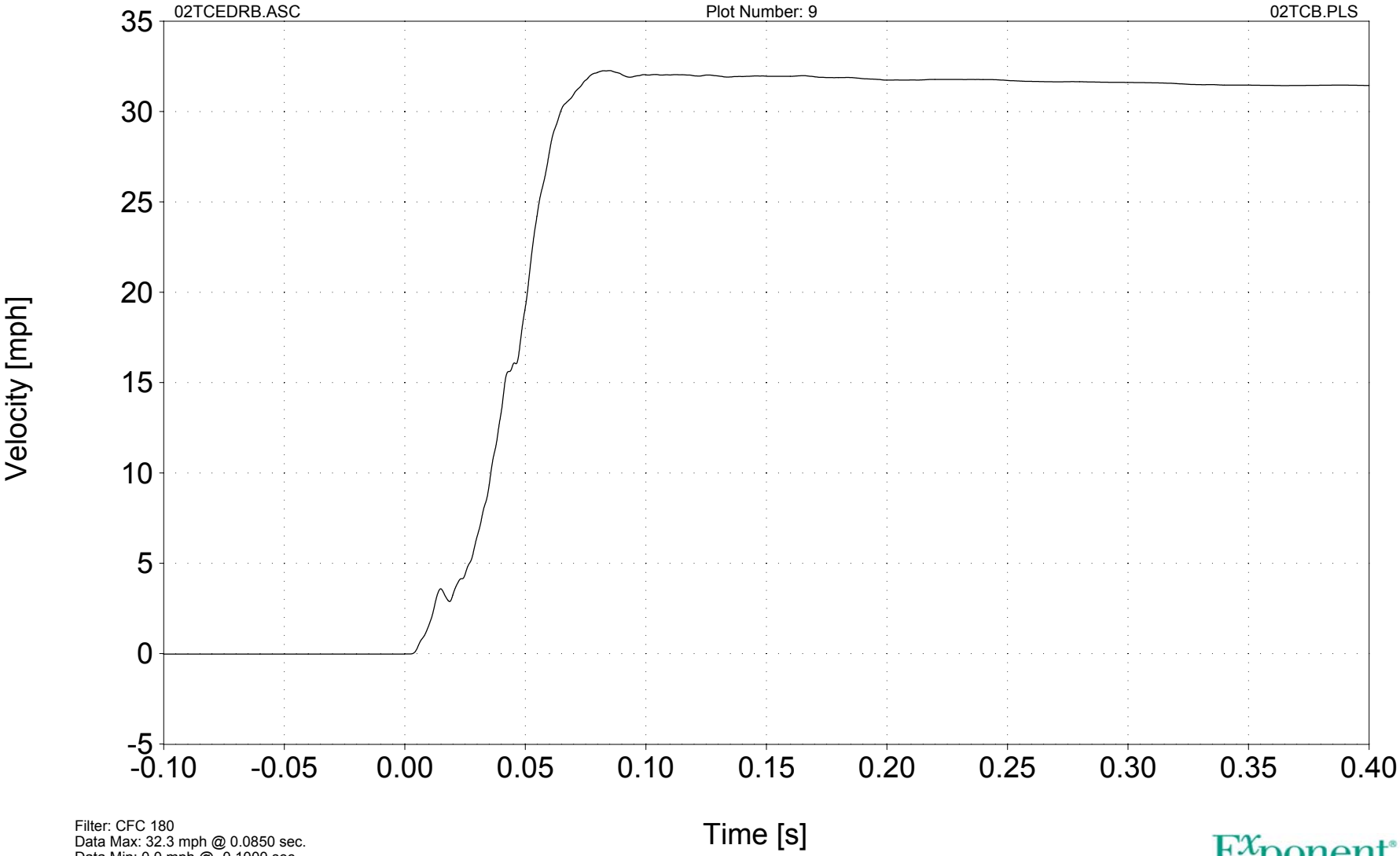
Longitudinal Delta Velocity v Time

EDR
2002 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 32.3 mph @ 0.0850 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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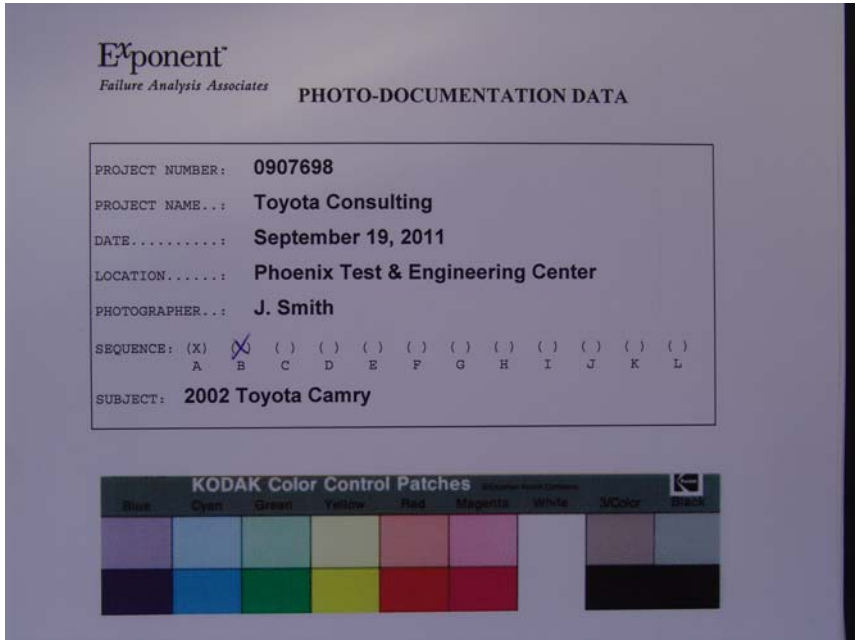

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0907698 A0T0 - 06676PH_0174

0907698 A0T0 - 06676PH_0175

0907698 A0T0 - 06676PH_0176

0907698 A0T0 - 06676PH_0177

Failure Analysis Associates

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Appendix I

Barrier Crash Test, 2003 Toyota Camry, September 19, 2011

Failure Analysis Associates
Test and Engineering Center

Exponent®

Barrier Crash Test
2003 Toyota Camry

Toyota Consulting
0907698

September 19, 2011

Exponent
23445 North 19th Avenue
Phoenix, AZ 85027

telephone 623-582-6949
facsimile 623-581-8814
www.exponent.com

Barrier Crash Test
2003 Toyota Camry

Toyota Consulting
0907698

September 19, 2011

Prepared for:

Toyota Motor Corporation
1001 Cherry Blossom Way
Georgetown, KY 40324

September 2011

Project Name: Toyota Consulting
Report No: 0907698.000/A0T0/0911/R309

Exponent®

Test Description

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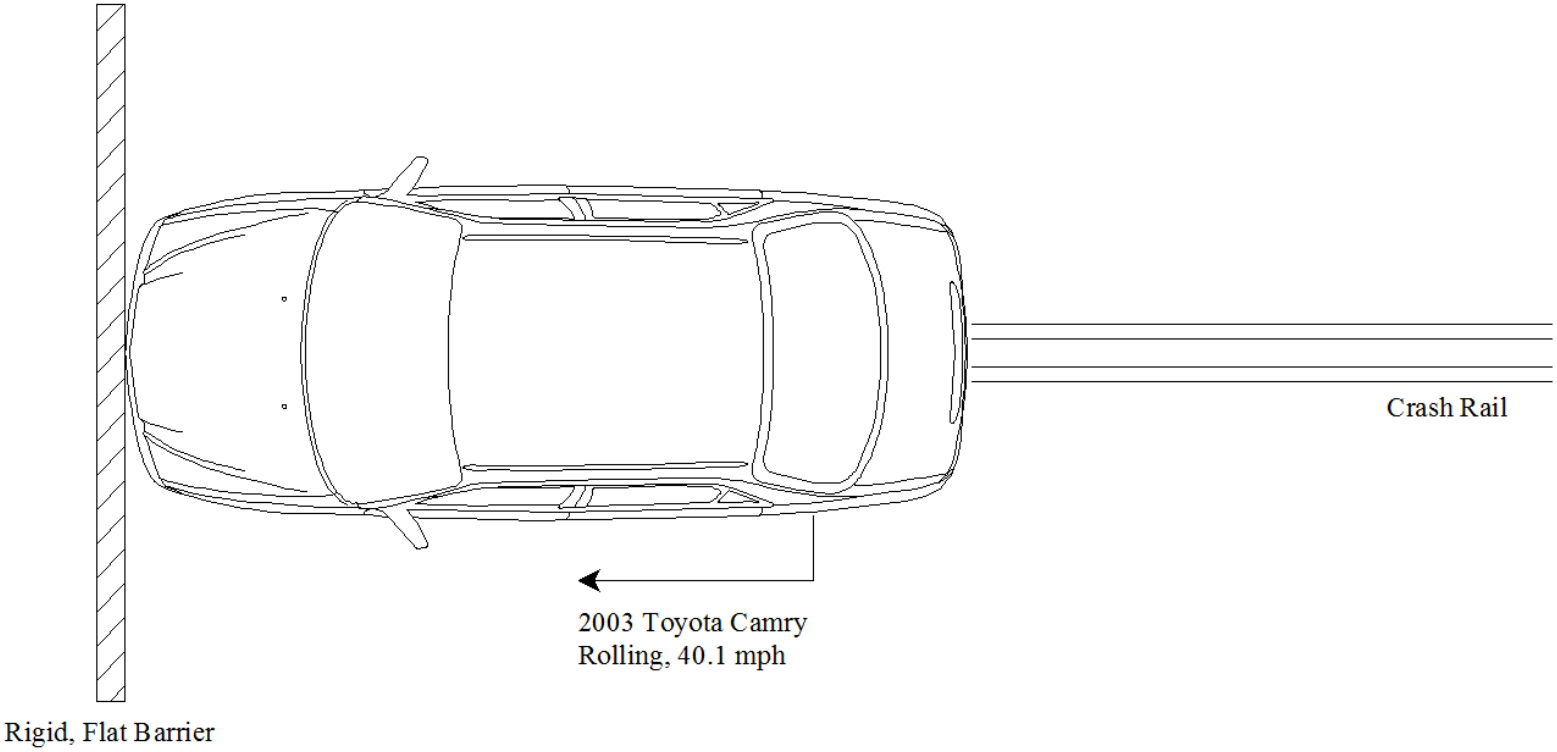
Failure Analysis Associates®

TEST DESCRIPTION

PROJECT NAME:	Toyota Consulting
DATE:	September 19, 2011
TEST TYPE:	Barrier crash test
TEST VEHICLE:	2003 Toyota Camry
IMPACT SPEED:	40.1 mph
INSTRUMENTATION:	Triaxial accelerometer set near the vehicle center of gravity (C.G.) Triaxial accelerometer set on Event Data Recorder (EDR) Triaxial accelerometer set on trunk floor
PHOTOGRAPHY:	One panning real-time video camera One stationary real-time video camera Still photographs
TEST SETUP:	The test vehicle fuel was drained to a useable capacity of approximately 1 gallon, and instrumentation equipment and a tow system were installed. Three sandbags were added to the driver seat to simulate occupant loading. The vehicle was towed forward, rolling on its wheels, up to a speed of 40.1 mph and released just prior to impact with Exponent's rigid, flat barrier. Reference the *Impact Configuration* diagram on the following page.
NOTE:	During the event, the rearmost EDR mounting tab broke. The other EDR mounting tabs remained intact.

Impact Configuration

Toyota Consulting (0907698)
Barrier Crash Test
September 19, 2011



Exponent®

2003 Toyota Camry

Exponent®
Failure Analysis Associates®

VEHICLE RECEIVING SUMMARY

VEHICLE FILE NUMBER:	7060			DATE RECEIVED:	9/15/2011
PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING		
VEHICLE YEAR:	2003	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	GRAY
VEHICLE IDENTIFICATION NUMBER:	4T1BE32K03U759556			DATE OF MANUFACTURE:	6/03
GVWR (lb):	4189	FRONT GAWR (lb):	2668	REAR GAWR (lb):	2668
RECOMMENDED TIRE SIZE - F/R:	P205/65R15			RECOMMENDED TIRE PRESSURE - F/R (psi):	29

INSTALLED TIRE SIZE:	LF:	P205/65R15	RF:	P205/65R15	LR:	P205/65R15	RR: P205/65R15

ENGINE TYPE:	4-CYLINDER	ENGINE DISPLACEMENT:	2.4 LITER	ODOMETER (mi):	151,299
TRANSMISSION TYPE:	AUTOMATIC	SHIFT LEVER LOCATION:	CONSOLE	FUEL CAPACITY (gal):	NR
FUEL TANK LOC:	CENTER, FORWARD OF REAR AXLE	FILLER CAP LOC:	LEFT REAR QUARTER PANEL		
DESIGNATED SEATING - FRONT: 2	MID: 0	REAR: 3	TOTAL: 5	FRONT SEAT TYPE:	BUCKET

RESTRAINT SYSTEM DESCRIPTION

DRIVER:	3-PT ACTIVE BELT	CENTER FRONT:	N/A	RIGHT FRONT:	3-PT ACTIVE BELT
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	3-PT ACTIVE BELT	CENTER REAR:	3-PT ACTIVE BELT	RIGHT REAR:	3-PT ACTIVE BELT

VEHICLE EQUIPMENT & CONDITION

AIR CONDITIONING:	Y	POWER STEERING:	Y	POWER BRAKES:	Y	POWER WINDOWS:	Y	POWER SEATS:	Y
POWER DOOR LOCKS:	Y	CRUISE CONTROL:	Y	SPACE SAVER SPARE:	Y	FRONT WHEEL DRIVE:	Y	4-WHEEL DRIVE:	N
TELESCOPING WHEEL:	N	TILT WHEEL:	Y	FRONT DISK BRAKES:	Y	REAR DISK BRAKES:	N	ANTI-LOCK BRAKES F:	N
DRIVER AIRBAG:	Y	RF PASSENGER AIRBAG:	Y	SIDE AIRBAGS:	N	ADJUSTABLE D-RING:	Y	ANTI-LOCK BRAKES R:	N
SUNROOF:	N	ROOF RACK:	N						

ADDITIONAL SIGNIFICANT OPTIONS/ACCESSORIES: RECEIVED WITH A FULL SIZE SPARE TIRE

SIGNIFICANT BODY DAMAGE/CORROSION: NONE

VEHICLE WEIGHTS AS RECEIVED (WITH MAX. FLUIDS/lb)

LEFT FRONT:	952	RIGHT FRONT:	913	TOTAL FRONT:	1865	PERCENT FRONT:	59%
LEFT REAR:	647	RIGHT REAR:	638	TOTAL REAR:	1285	PERCENT REAR:	41%
				TOTAL WEIGHT:	3150		

VEHICLE ATTITUDE MEASUREMENTS AS RECEIVED (WITH MAX. FLUIDS/in.)

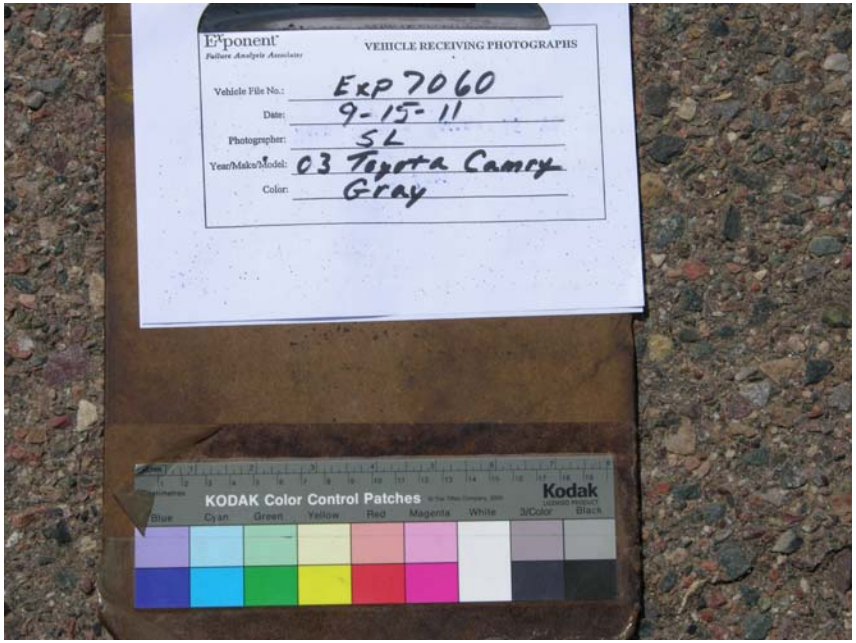
LEFT FRONT:	26.8	AT WHL WELL @ AXLE	RIGHT FRONT:	27.2	AT WHL WELL @ AXLE
LEFT REAR:	26.5	AT WHL WELL @ AXLE	RIGHT REAR:	26.5	AT WHL WELL @ AXLE

VEHICLE EXTERIOR DIMENSIONS (in.)

OVERALL LENGTH:	189.2	OVERALL WIDTH:	71.1	OVERALL HEIGHT:	57.7
WHEELBASE:	107.0	FRONT TRACK:	61.2	REAR TRACK:	60.3
REAR OVERHANG:	45.1	FRONT BUMPER HEIGHT:	21.5	REAR BUMPER HEIGHT:	24.2

COMMENTS: NONE

EIGHT POINT PHOTOS TAKEN? (Y/N):	Y	FORM COMPLETED BY:	SL / KH	CHECKED BY:	JS



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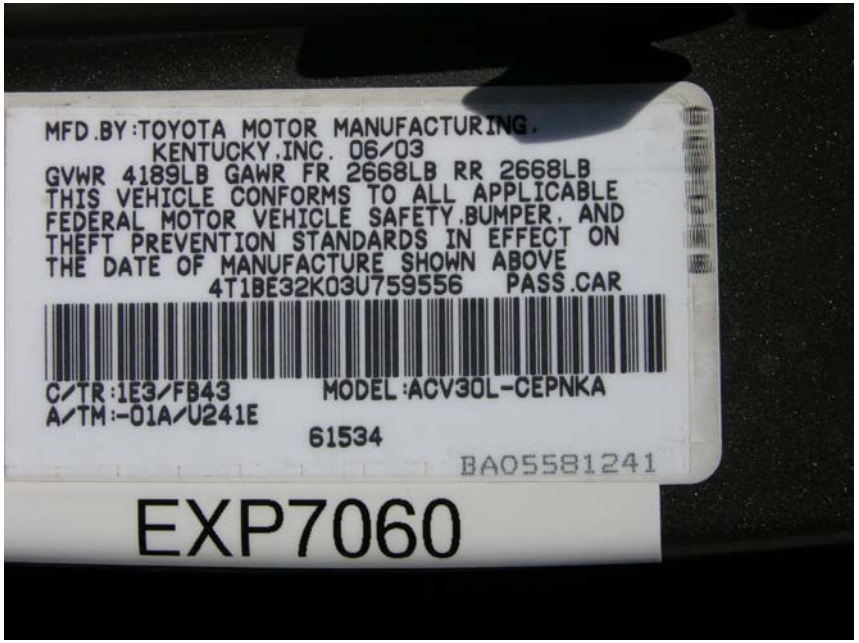

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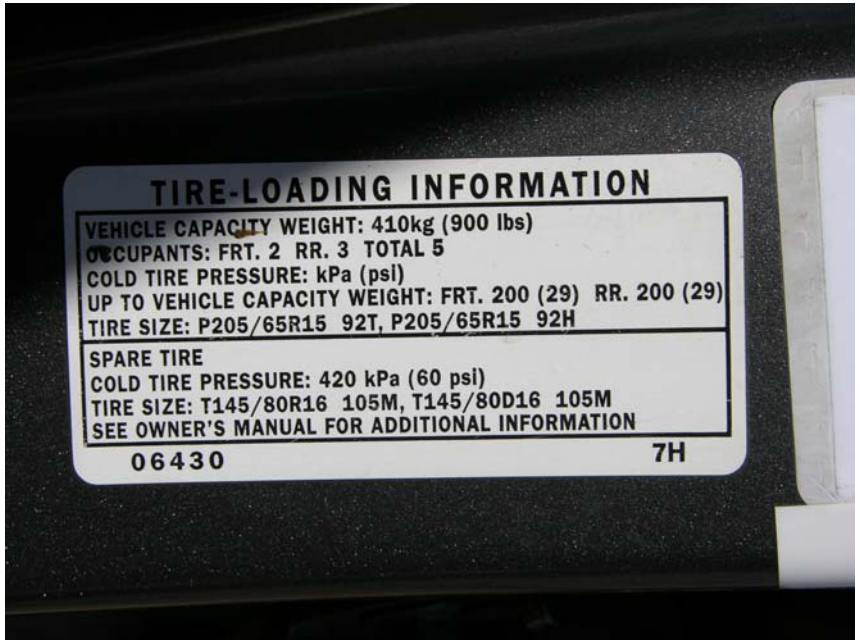

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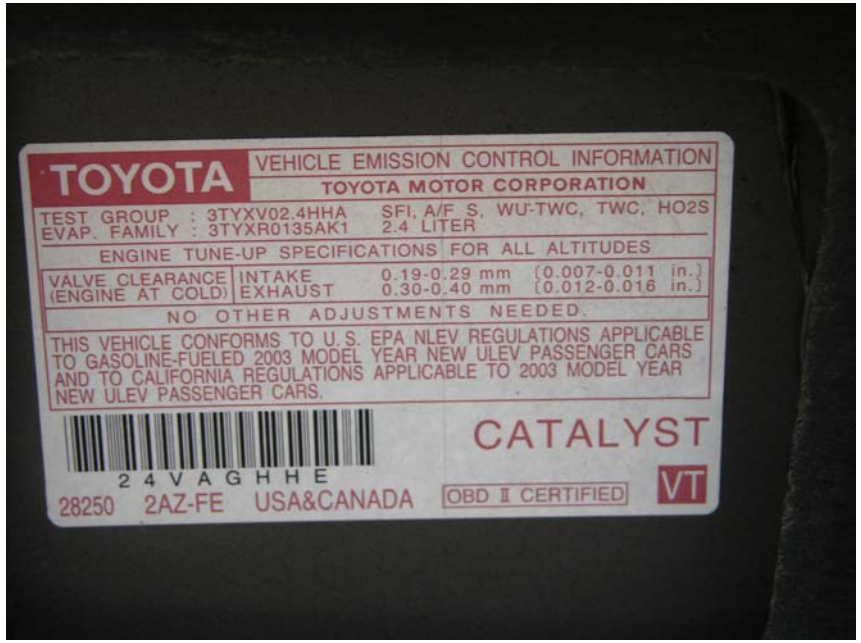

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0907698 A0T0 - 06677PH_0020

0907698 A0T0 - 06677PH_0021

0907698 A0T0 - 06677PH_0022

0907698 A0T0 - 06677PH_0023

Exponent®

Test Setup

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Failure Analysis Associates®

VEHICLE CRASH TEST CONDITION

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
VEHICLE YEAR:	2003	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE BODY STYLE:	4-DOOR SEDAN			VEHICLE COLOR:	GRAY
VEHICLE IDENTIFICATION NUMBER:	4T1BE32K03U759556			ODOMETER (mi):	151,300

INSTALLED TIRES	LEFT - SIZE | PRESSURE (psi) | TREAD DEPTH	RIGHT - SIZE | PRESSURE (psi) | TREAD DEPTH
FRONT:	P205/65R15 | 29 PSI | 9/32"	P205/65R15 | 29 PSI | 9/32"
REAR:	P205/65R15 | 29 PSI | 6/32"	P205/65R15 | 29 PSI | 7/32"

VEHICLE TEST WEIGHT (lb)

LEFT FRONT:	948	RIGHT FRONT:	967	TOTAL FRONT:	1915	PERCENT FRONT:	61%
LEFT REAR:	615	RIGHT REAR:	620	TOTAL REAR:	1235	PERCENT REAR:	39%
				TOTAL WEIGHT:	3150		

VEHICLE TEST ATTITUDE MEASUREMENTS (in.)

LEFT FRONT:	26.7	AT	WHL WELL @ AXLE	RIGHT FRONT:	26.8	AT	WHL WELL @ AXLE
LEFT REAR:	27.0	AT	WHL WELL @ AXLE	RIGHT REAR:	26.9	AT	WHL WELL @ AXLE

SUSPENSION ADJUSTMENTS:	NONE		
OTHER MEASUREMENTS:	NONE		

VEHICLE MODIFICATIONS & ADDITIONS

TOW SHOE LOCATION(S):	FRAME RAILS, FORWARD OF FRONT AXLE		
BRAKE ABORT SYSTEM:	MANUAL	TIME DELAY (sec):	N/A
ONBOARD CAMERA LOCATION(S):	NONE		
EVENT FLASH LOCATION(S):	NONE		
TARGET LOCATION(S):	LEFT & RIGHT SIDES, HOOD & ROOF CENTERLINE / 24" CTR-TO-CTR FROM FRONT		
INSTALLED TRANSDUCER(S):	REFERENCE VEHICLE TRANSDUCER LOCATION RECORD		
INSTRUMENTATION PACKAGE LOCATION:	TRUNK		
OTHER:	BREAK WIRE INSTALLED BEHIND LEFT REAR TIRE TO TRIGGER DATA ACQUISITION		

VEHICLE CONDITION

TRANSMISSION GEAR:	NEUTRAL	WINDOW POSITION:	CLOSED	DOOR LOCKS:	LOCKED
FUEL TANK LEVEL:	< 1 GALLON FUEL	FLUID TYPE:	GASOLINE	BRAKES:	DISENGAGED
OTHER:	ENGINE IDLING				

ANTHROPOMORPHIC DUMMIES / RESTRAINTS

DRIVER:	NONE	CENTER FRONT:	N/A	RIGHT FRONT:	NONE*
LEFT MID:	N/A	CENTER MID:	N/A	RIGHT MID:	N/A
LEFT REAR:	NONE	CENTER REAR:	NONE	RIGHT REAR:	NONE

	DRIVER	PASSENGER
SEAT BACK ANGLE:	FULL UPRIGHT	FULL UPRIGHT
MEASURED AT:	--	--
FORE/AFT SEAT POSITION:	FULL FORWARD	FULL AFT
OTHER:	SEATBELT NOT BUCKLED, D-RING FULL DOWN, STEERING WHEEL AT TOP TILT POSITION	SEATBELT BUCKLED, D-RING FULL DOWN

COMMENTS

*THREE SANDBAGS (153 LBS TOTAL) PLACED IN RIGHT FRONT SEAT

	FORM COMPLETED BY:	JS	CHECKED BY: DSP

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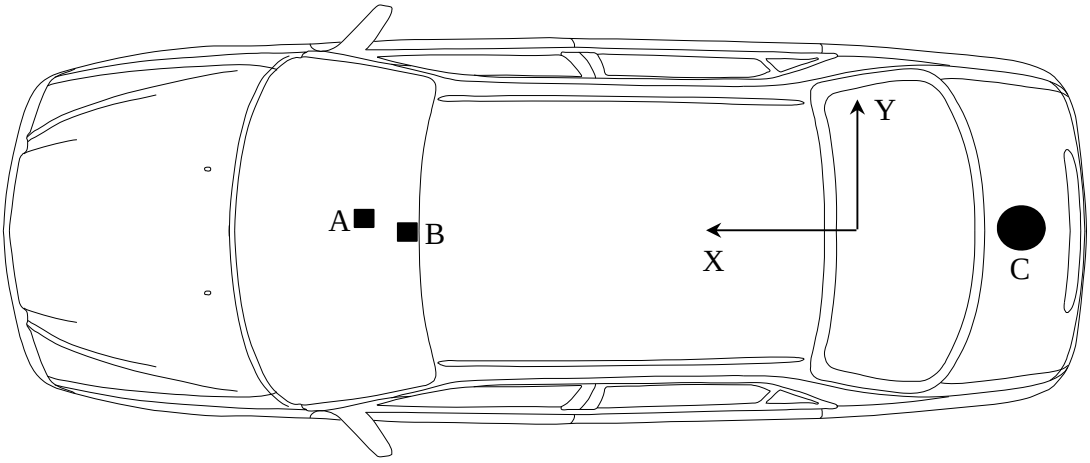
VEHICLE TRANSDUCER LOCATION RECORD

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
VEHICLE YEAR:	2003	VEHICLE MAKE:	TOYOTA	VEHICLE MODEL:	CAMRY
VEHICLE IDENTIFICATION NUMBER:	4T1BE32K03U759556				



NOTES: NOT TO SCALE, Z-AXIS MEASURED UP FROM GROUND

REF #	TRANSDUCER LOCATION DESCRIPTION	LONGITUDINAL (X)	LATERAL (Y)	VERTICAL (Z)
A	TRIAXIAL ACCELEROMETER SET, EDR MODULE	82.8 in.	2.2 in.	15.1 in.
B	TRIAXIAL ACCELEROMETER SET, CENTER TUNNEL	77.4 in.	0.0 in.	14.2 in.
C	TRIAXIAL ACCELEROMETER SET, BOTTOM OF TRUNK	-30.1 in.	0.0 in.	11.7 in.

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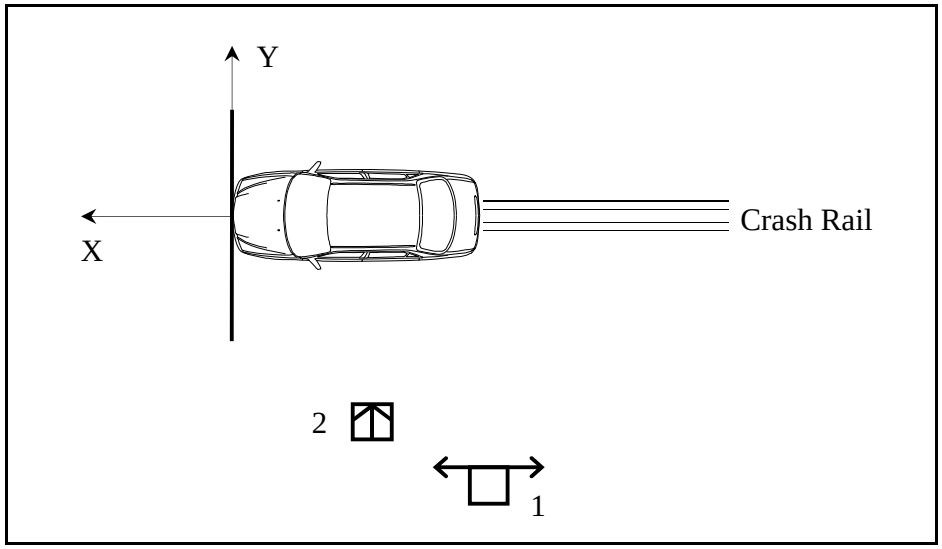
CAMERA SETUP RECORD

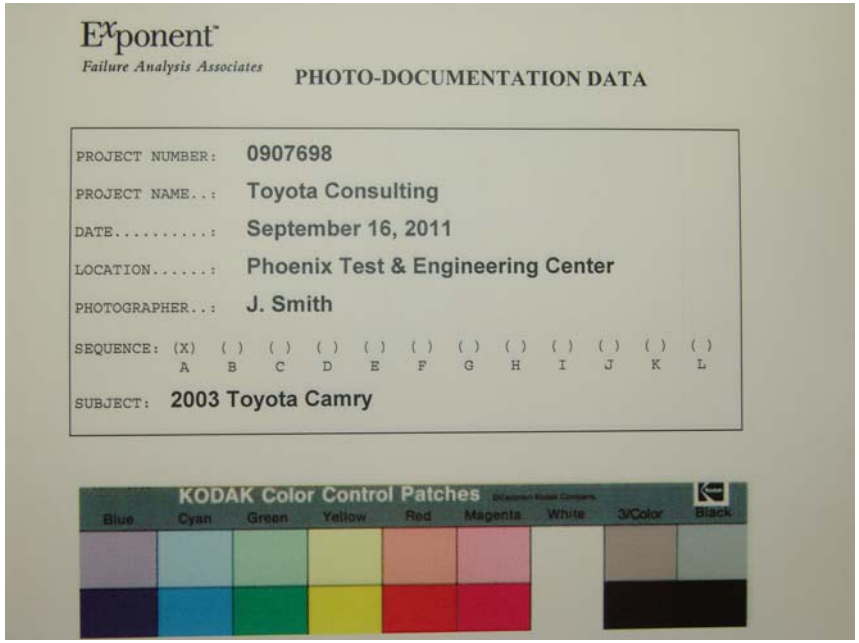
PROJECT NO:	0907698	TEST DATE:	9/19/2011
PROJECT NAME:	TOYOTA CONSULTING		
TEST TYPE:	BARRIER CRASH TEST		
TEST VEHICLE:	2003 TOYOTA CAMRY		
TEST SPEED:	40.1 MPH		
COMMENTS:	NONE		



OVERHEAD PIT ONBOARD GROUND PANNING

NOTES: ALL DIMENSIONS IN FEET. NOT TO SCALE. Z-AXIS MEASURED UP FROM GROUND.

LOC NO	CAMERA TYPE	FIELD OF VIEW	IMPACT DISTANCE (X)	CENTERLINE DISTANCE (Y)	CAMERA HEIGHT (Z)	SET SPEED (fps)	LENS SIZE (mm)
1	VIDEO	PANNING EVENT VIEW	-17.5	-53.8	4.8	RT	--
2	VIDEO	MEDIUM WIDE LATERAL VIEW	-12.0	-37.0	4.0	RT	--



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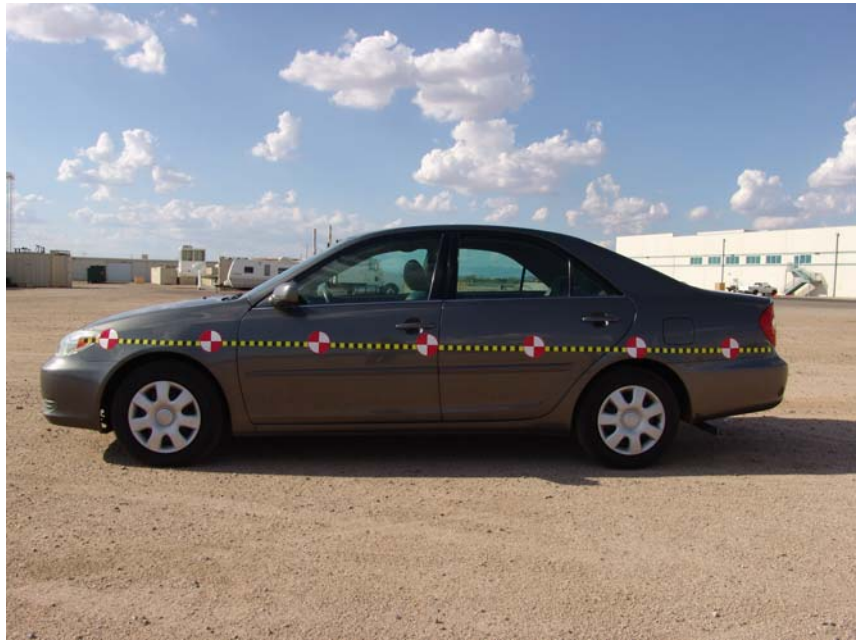
0907698 A0T0 - 06679PH_0026



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0907698 A0T0 - 06679PH_0032

0907698 A0T0 - 06679PH_0033

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0907698 A0T0 - 06679PH_0037

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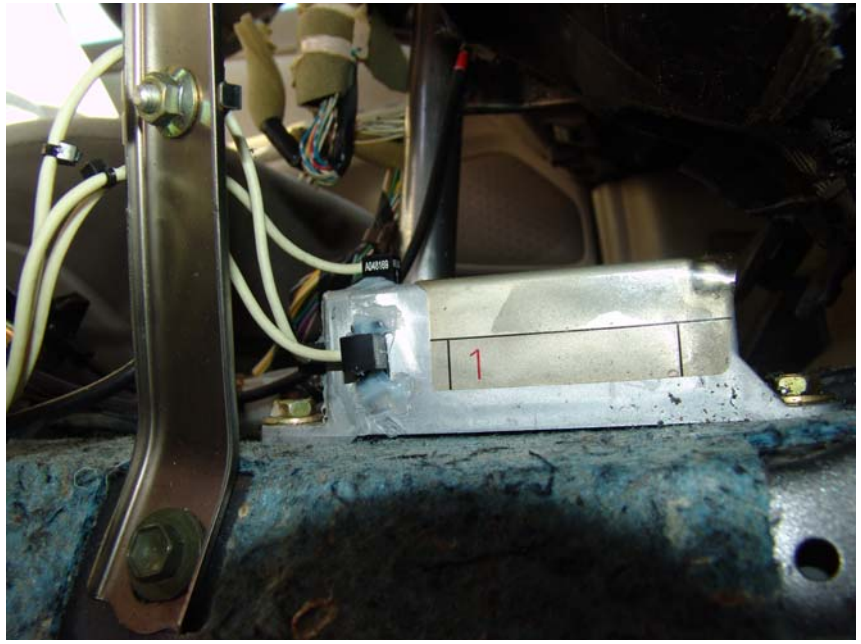

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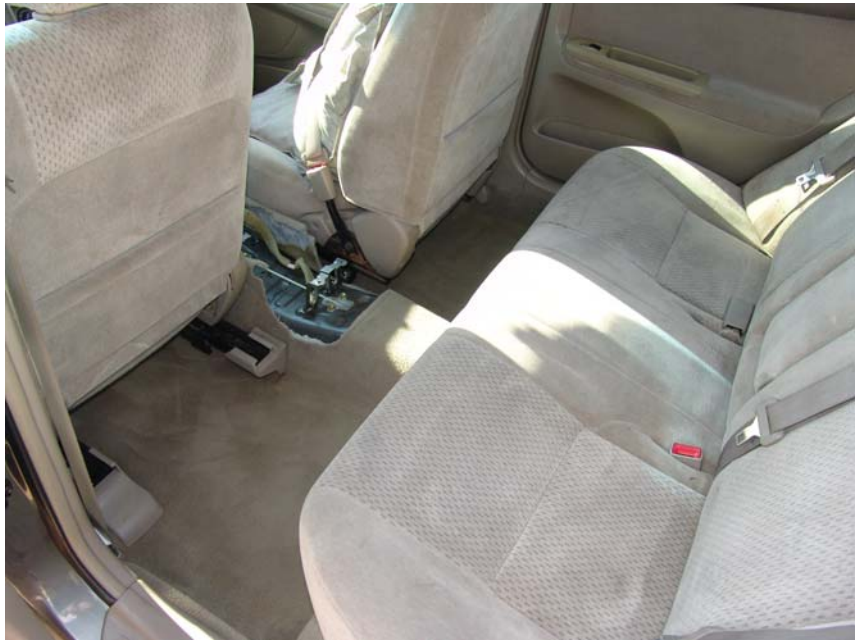

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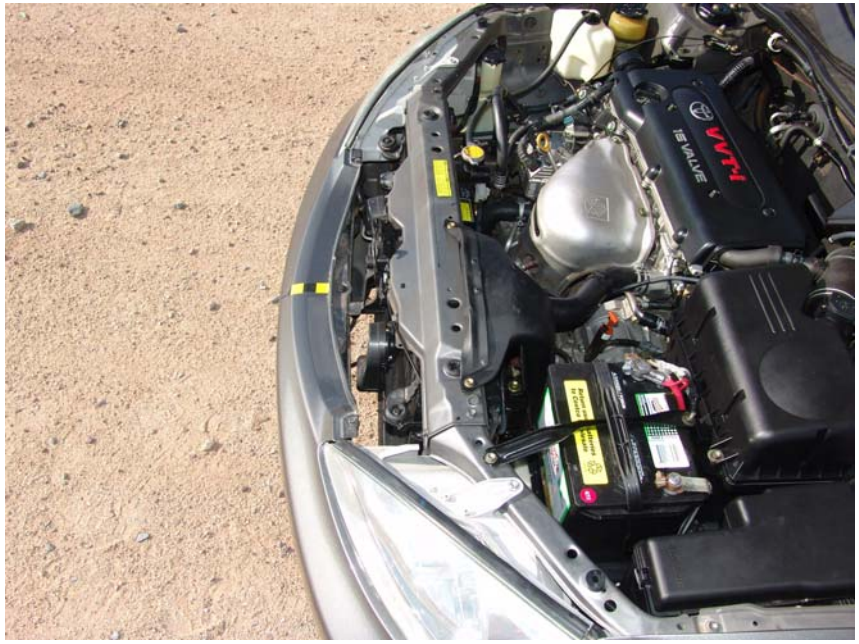

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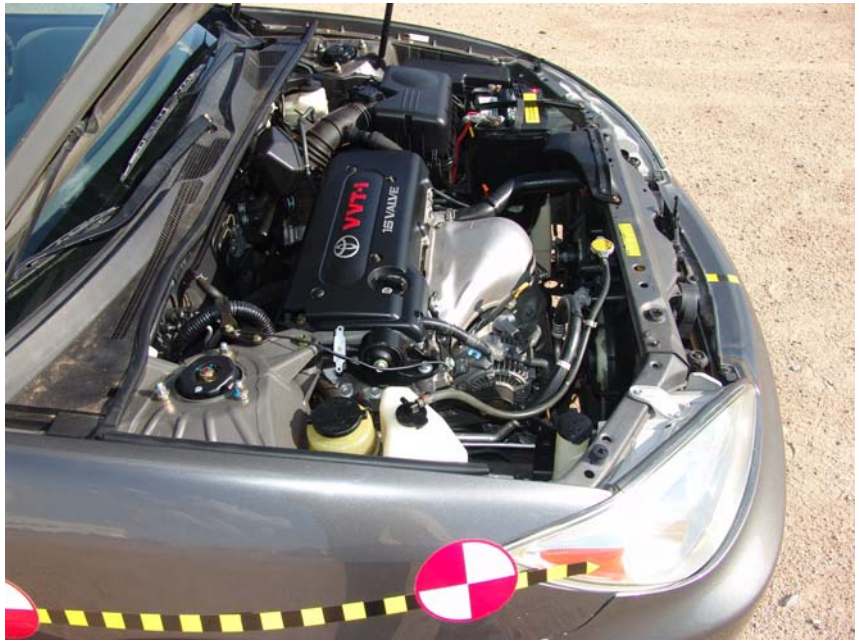

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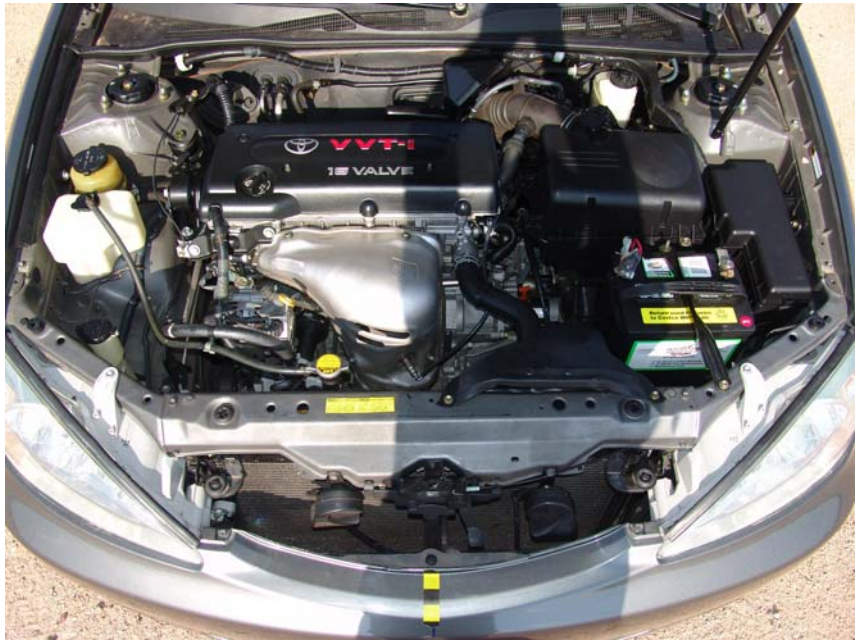

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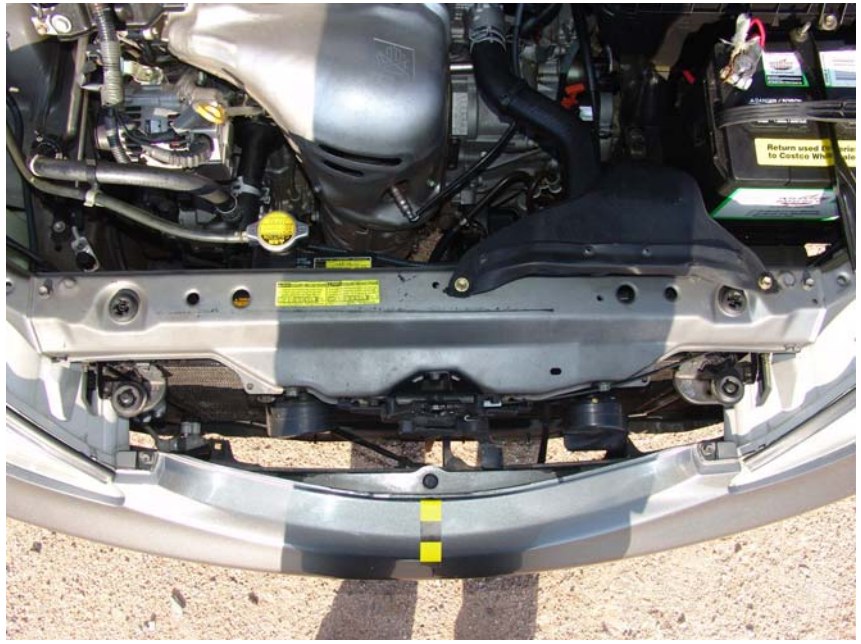
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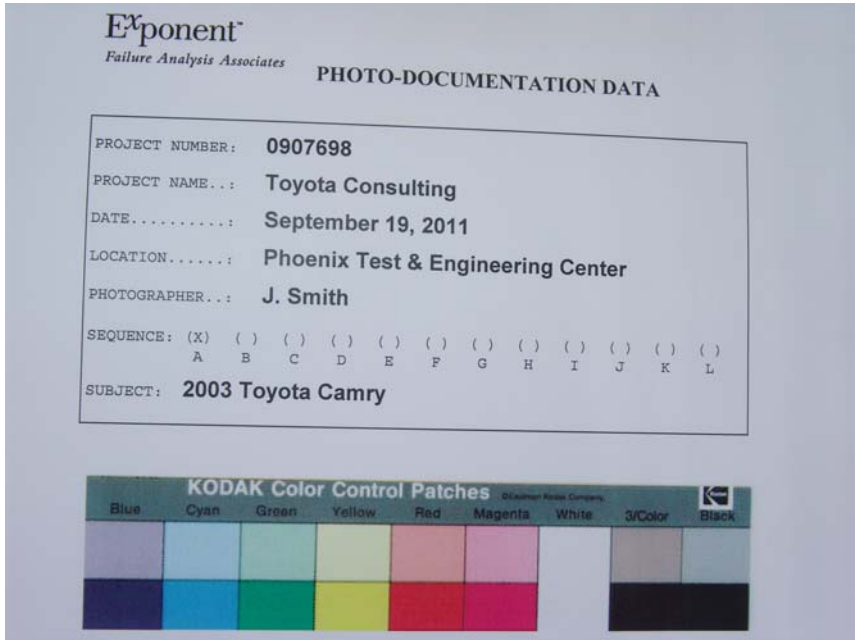

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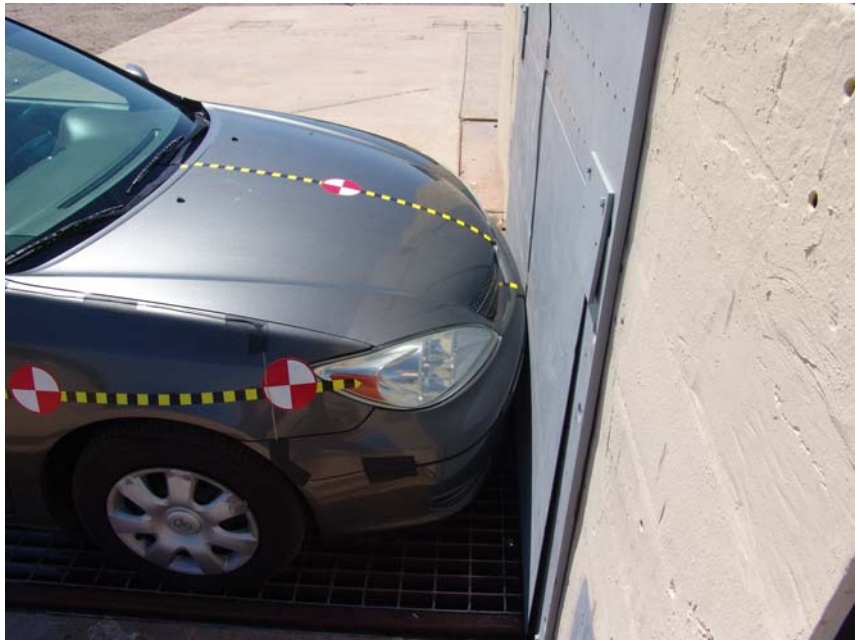

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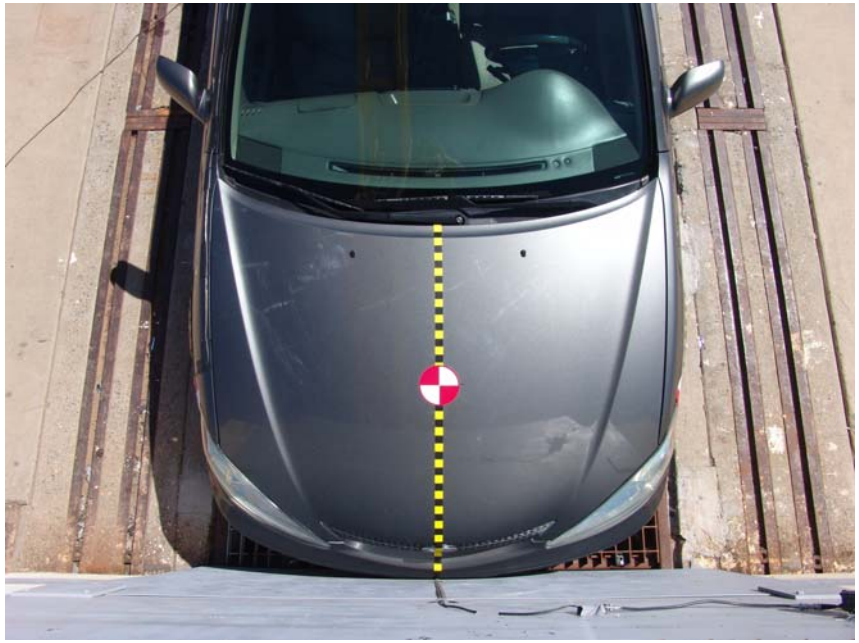

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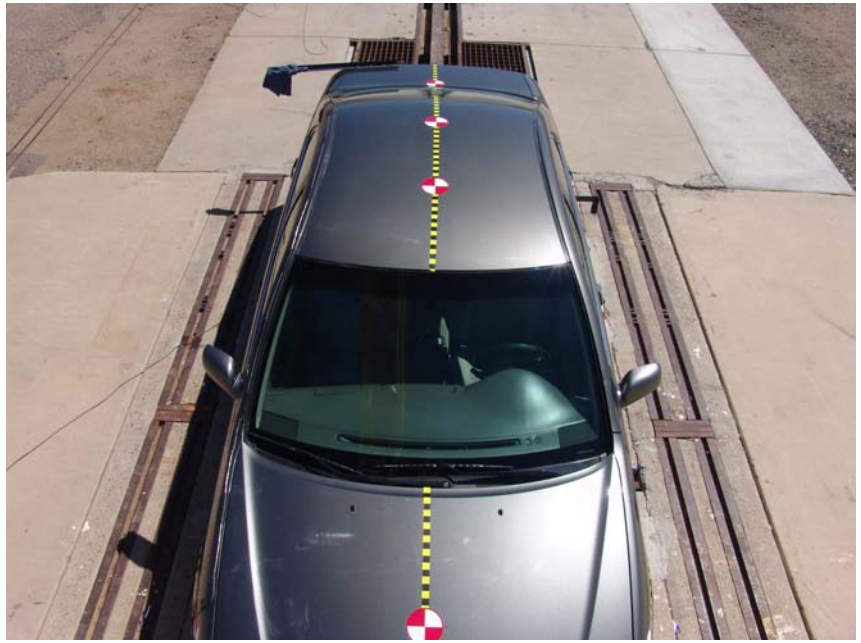

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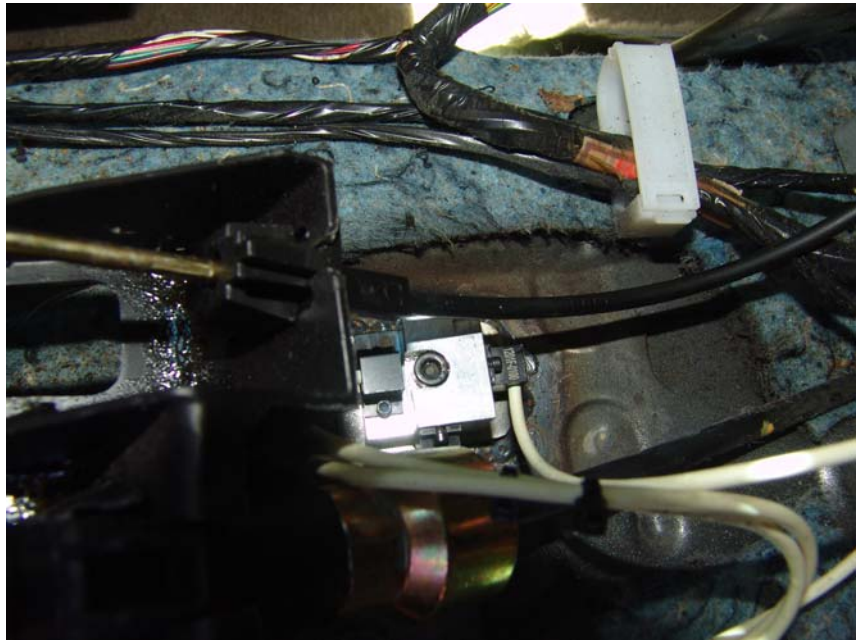

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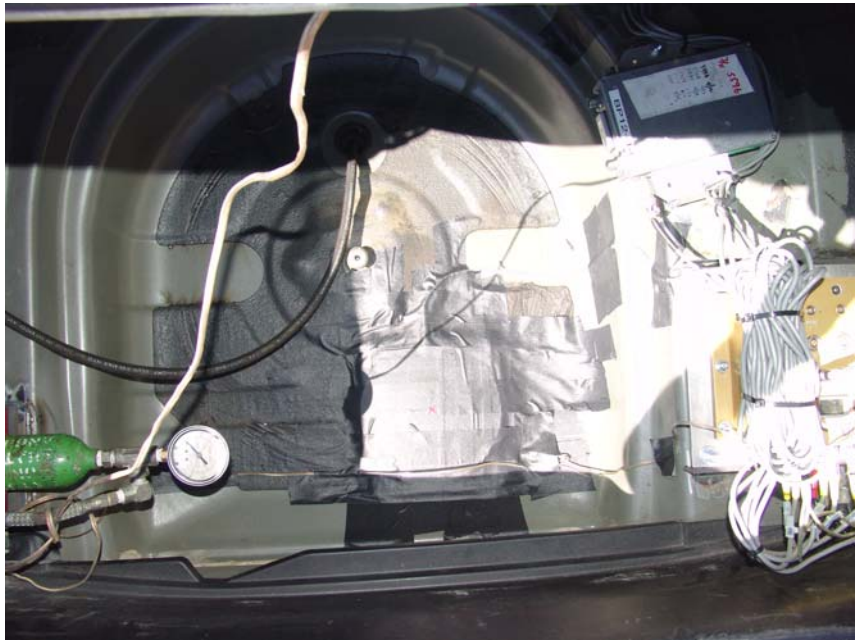

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0907698 A0T0 - 06679PH_0149

0907698 A0T0 - 06679PH_0150

0907698 A0T0 - 06679PH_0151

0907698 A0T0 - 06679PH_0152

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Test Results

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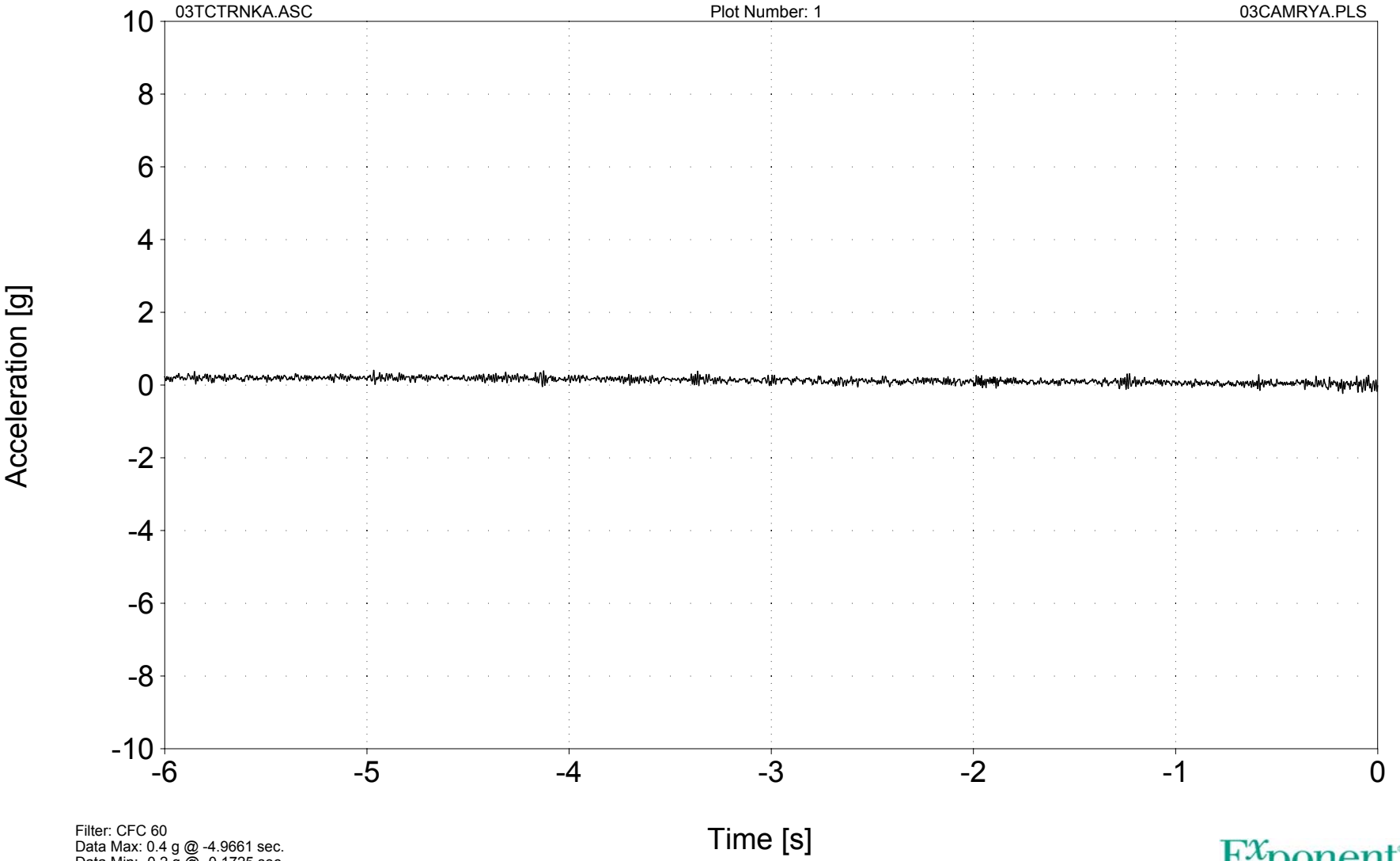
SPEED TRAP COUNTER LOG

PROJECT NO:	0907698	PROJECT NAME:	TOYOTA CONSULTING	TEST DATE:	9/19/2011
OPERATOR:	JS	SPEED COUNTER S/N:	JS-13000	CALIBRATION DUE DATE:	12/10/2011
COMMENTS:	TESTED VEHICLE: 2003 TOYOTA CAMRY; CHANNEL 1 FAILED				

Test ID		Time [ms]	Speed [mph]	Speed [fps]	Checked By
091911-2003 CAMRY	Channel 1	--	--	--	DP
	Channel 2	--	40.1	58.8	
	Average	--	40.1	58.8	

Longitudinal Acceleration v Time

Trunk
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 0.4 g @ -4.9661 sec.
Data Min: -0.2 g @ -0.1725 sec.

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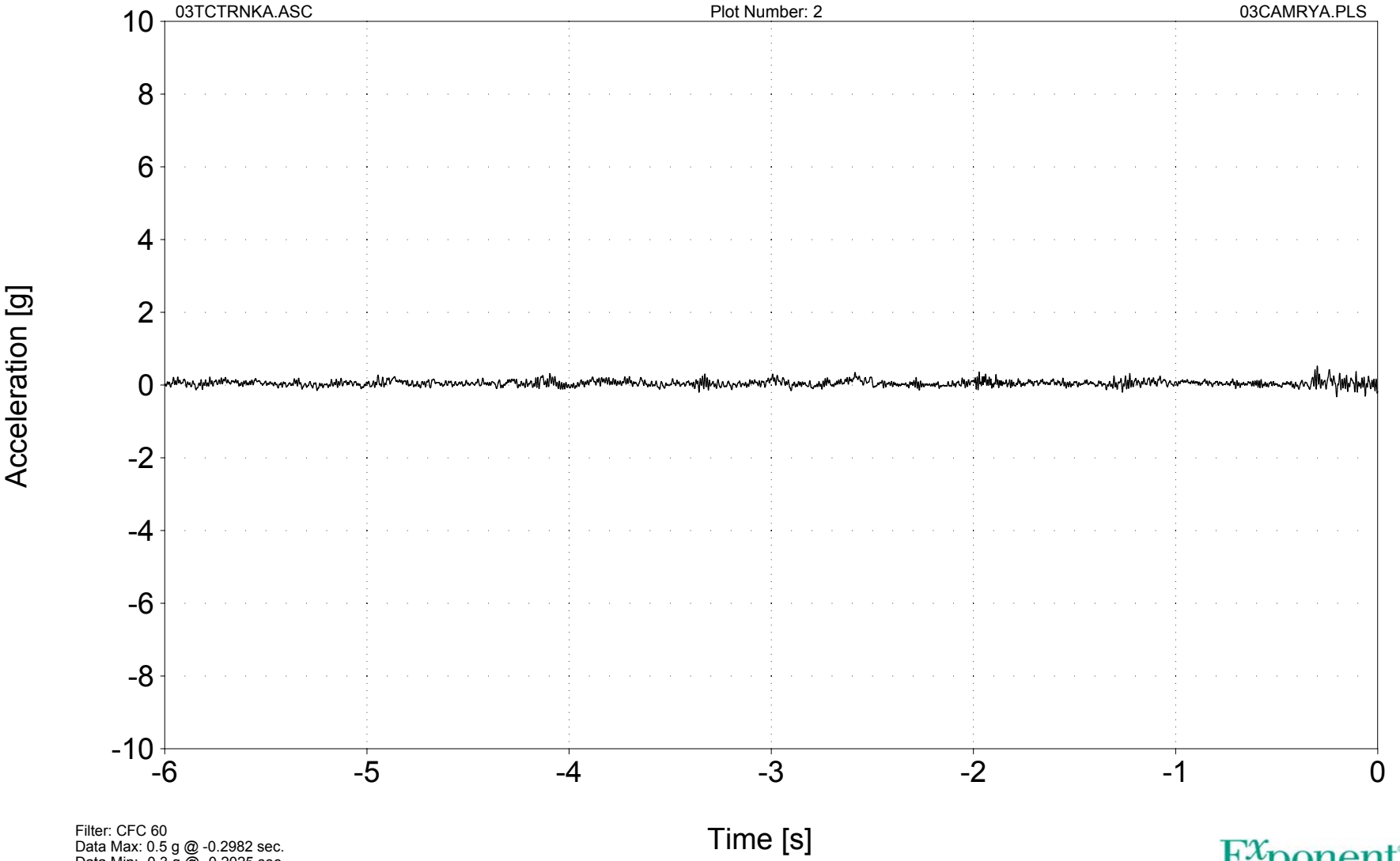
Lateral Acceleration v Time

Trunk
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 0.5 g @ -0.2982 sec.
Data Min: -0.3 g @ -0.2025 sec.

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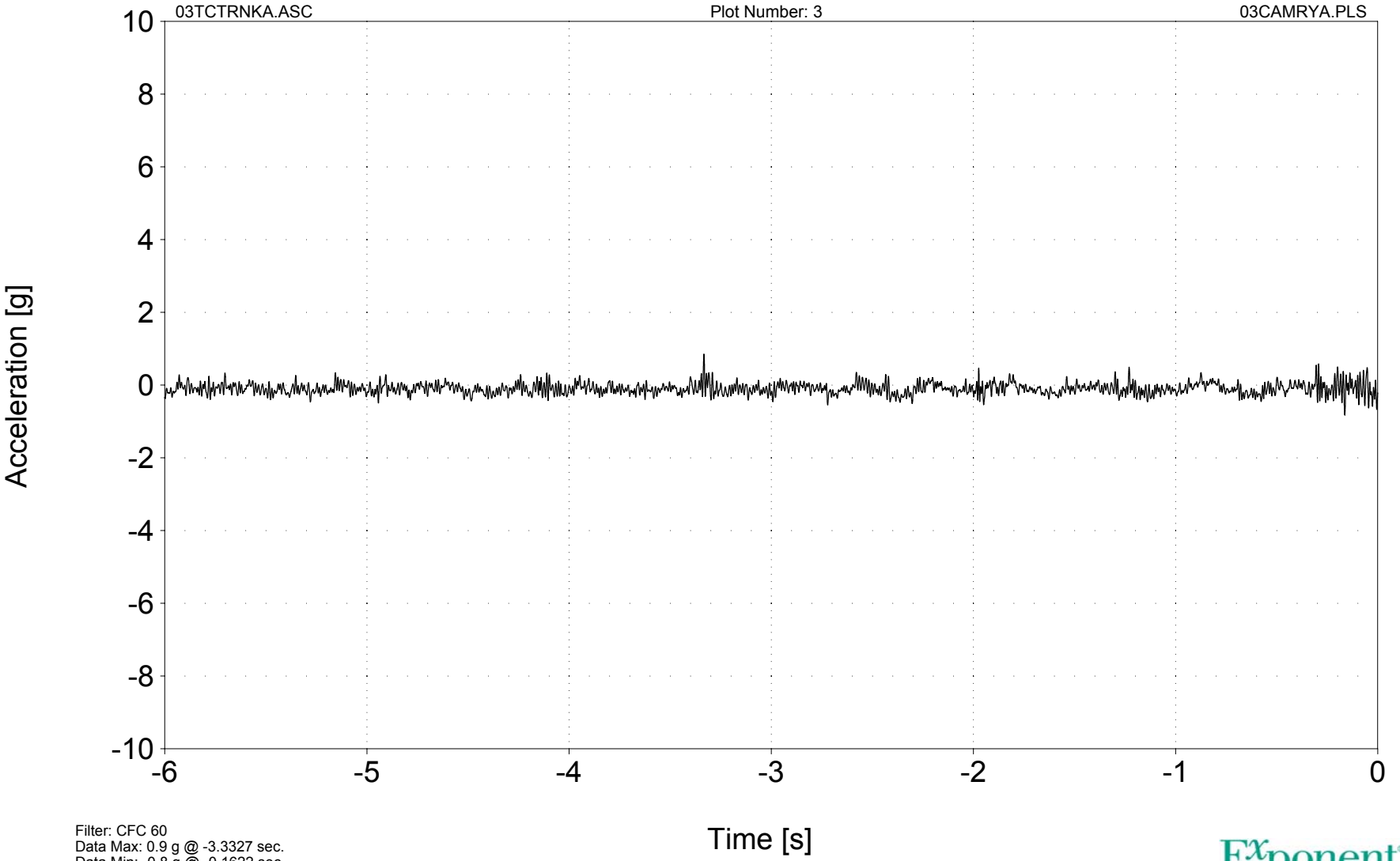
Vertical Acceleration v Time

Trunk
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 0.9 g @ -3.3327 sec.
Data Min: -0.8 g @ -0.1622 sec.

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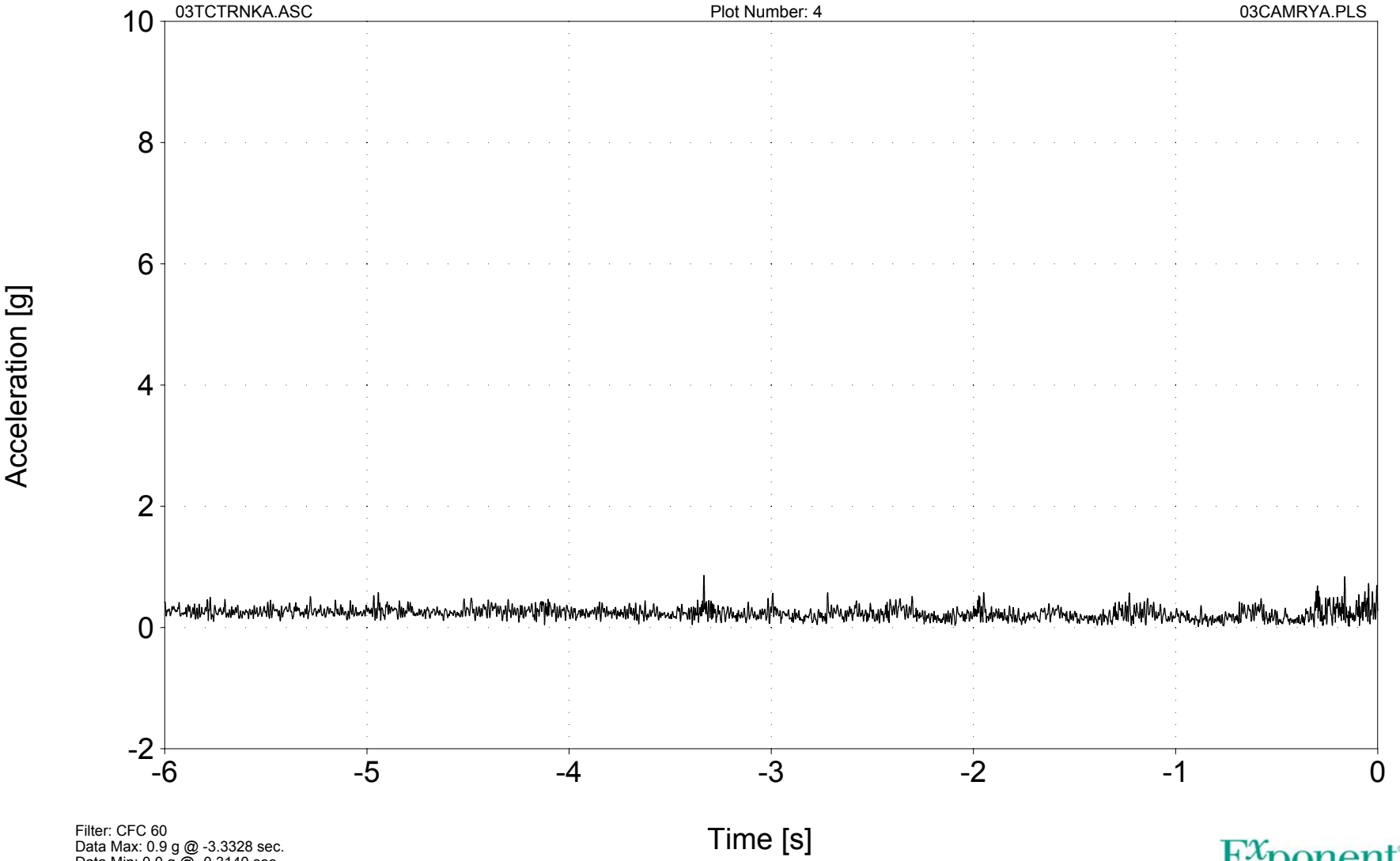
Resultant Acceleration v Time

Trunk
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 0.9 g @ -3.3328 sec.
Data Min: 0.0 g @ -0.3140 sec.

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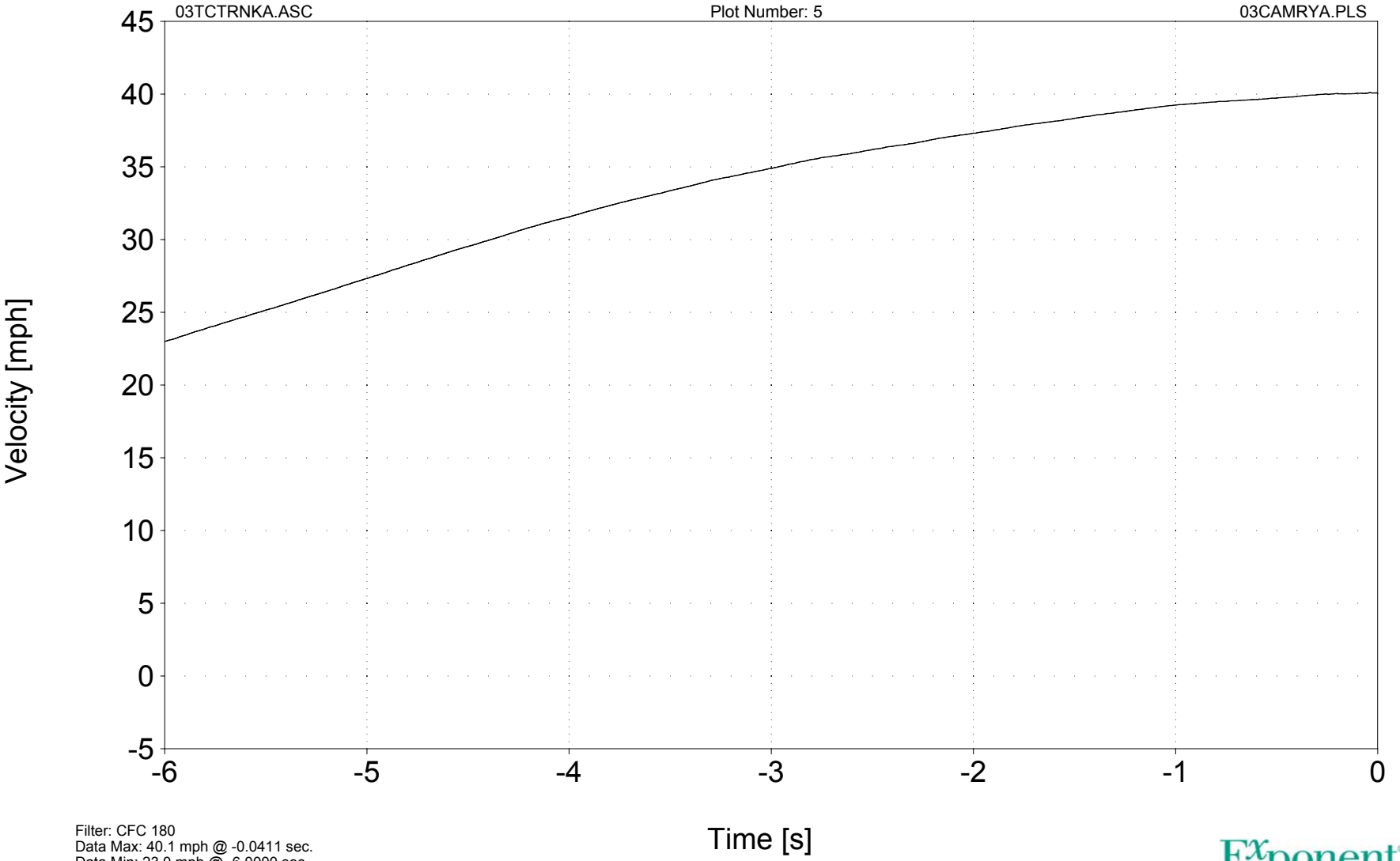
Longitudinal Velocity v Time

Trunk
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 40.1 mph @ -0.0411 sec.
Data Min: 23.0 mph @ -6.0000 sec.

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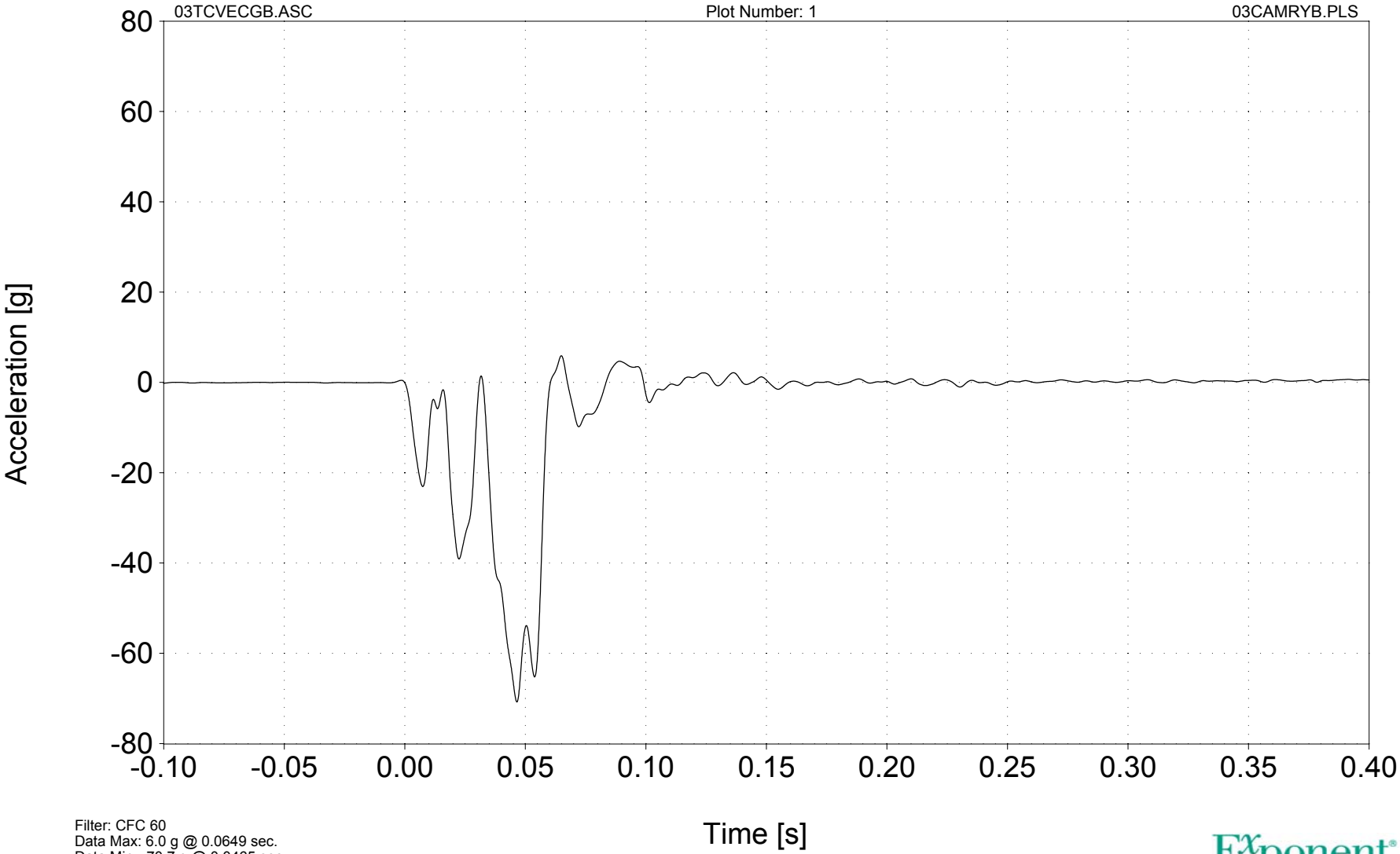
Longitudinal Acceleration v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 6.0 g @ 0.0649 sec.
Data Min: -70.7 g @ 0.0465 sec.

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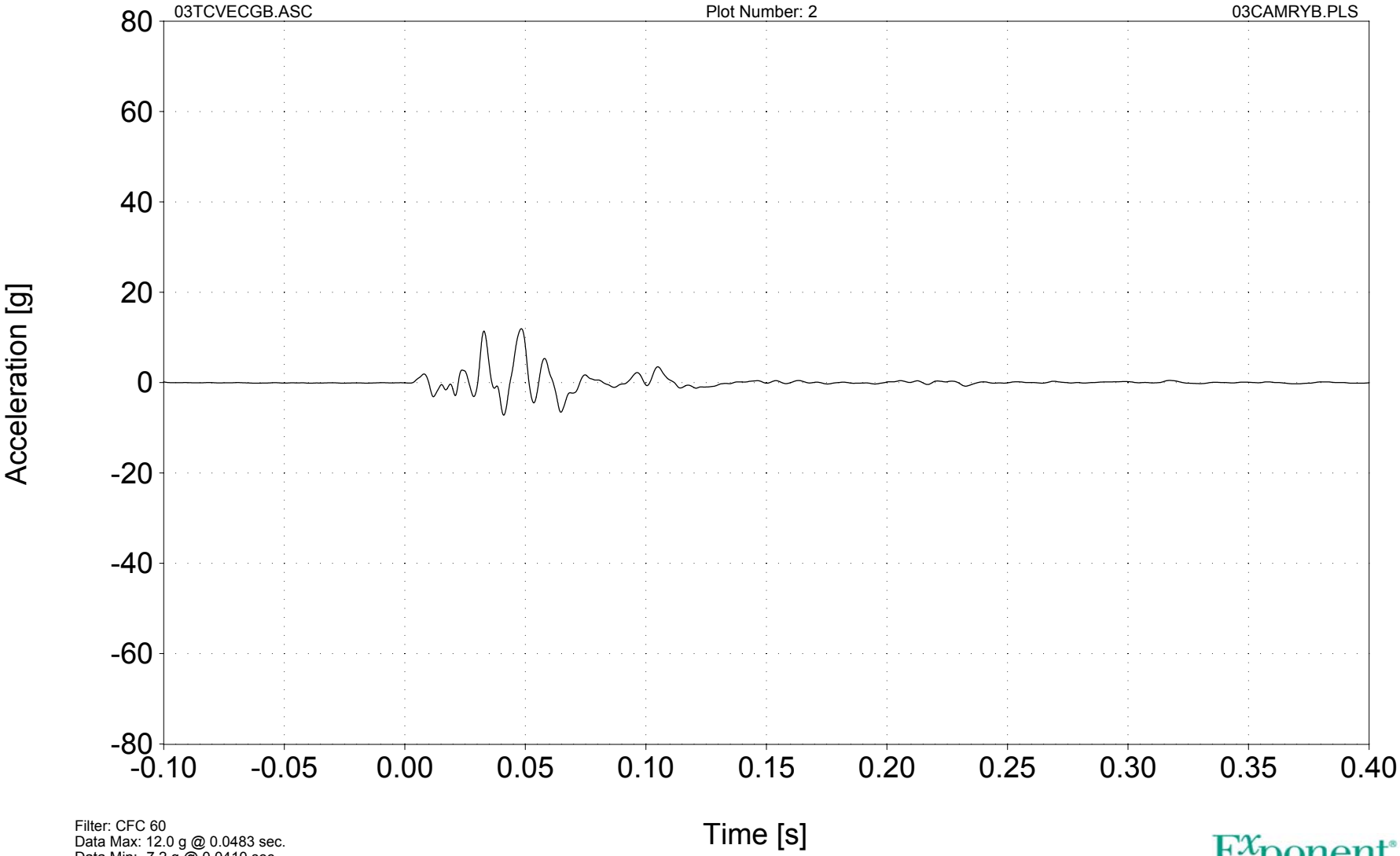
Lateral Acceleration v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 12.0 g @ 0.0483 sec.
Data Min: -7.2 g @ 0.0410 sec.

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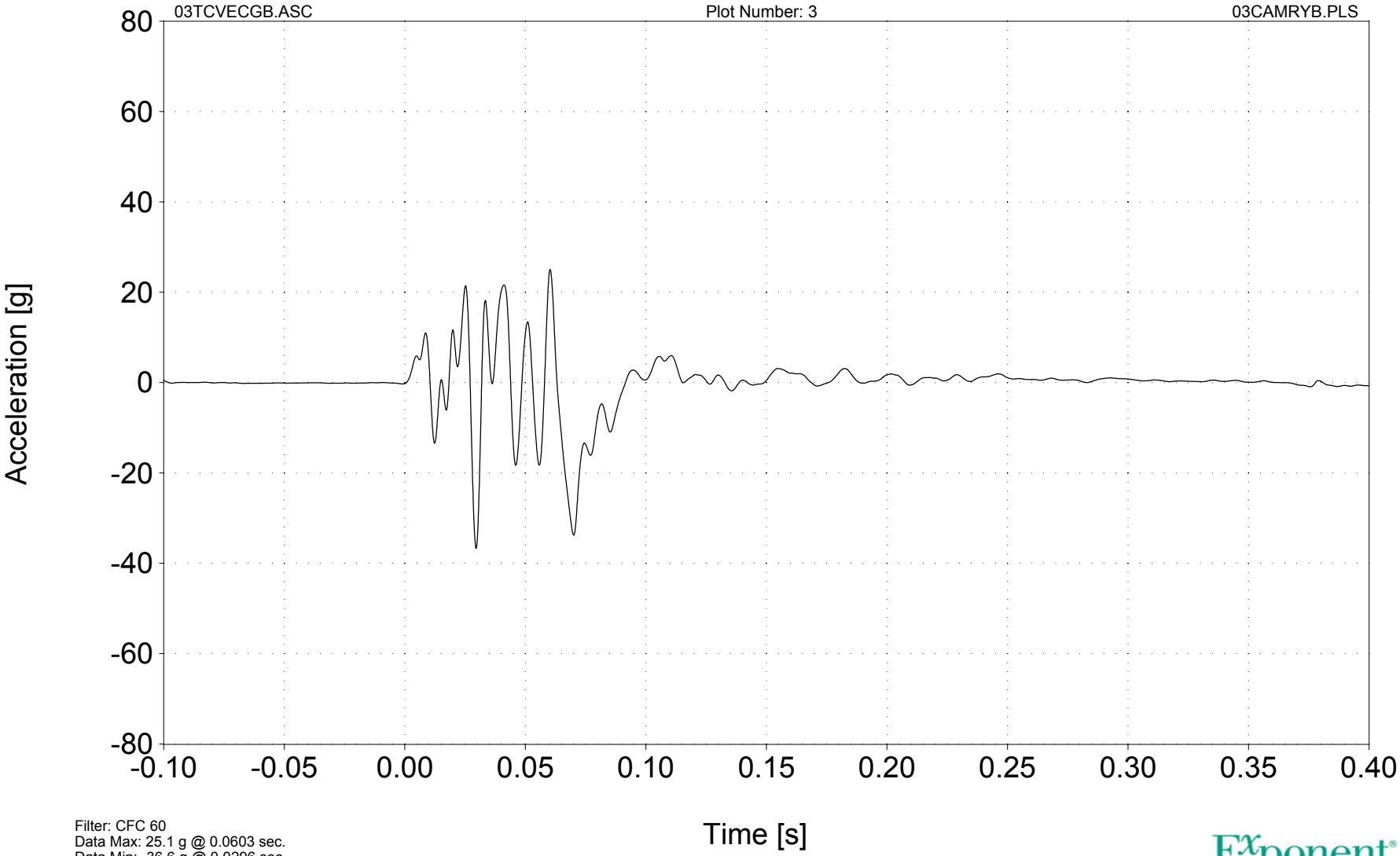
Vertical Acceleration v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 25.1 g @ 0.0603 sec.
Data Min: -36.6 g @ 0.0296 sec.

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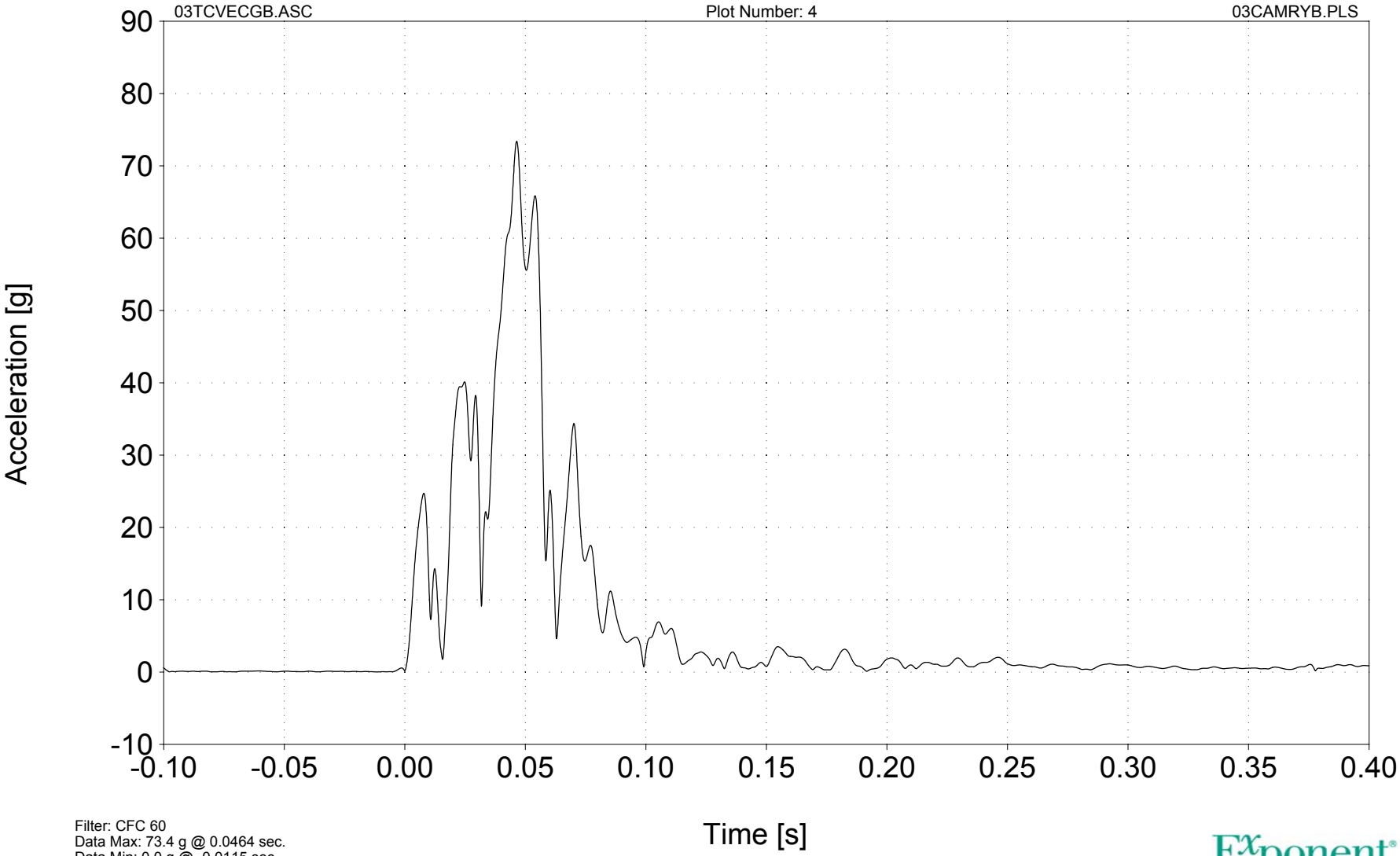
Resultant Acceleration v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 73.4 g @ 0.0464 sec.
Data Min: 0.0 g @ -0.0115 sec.

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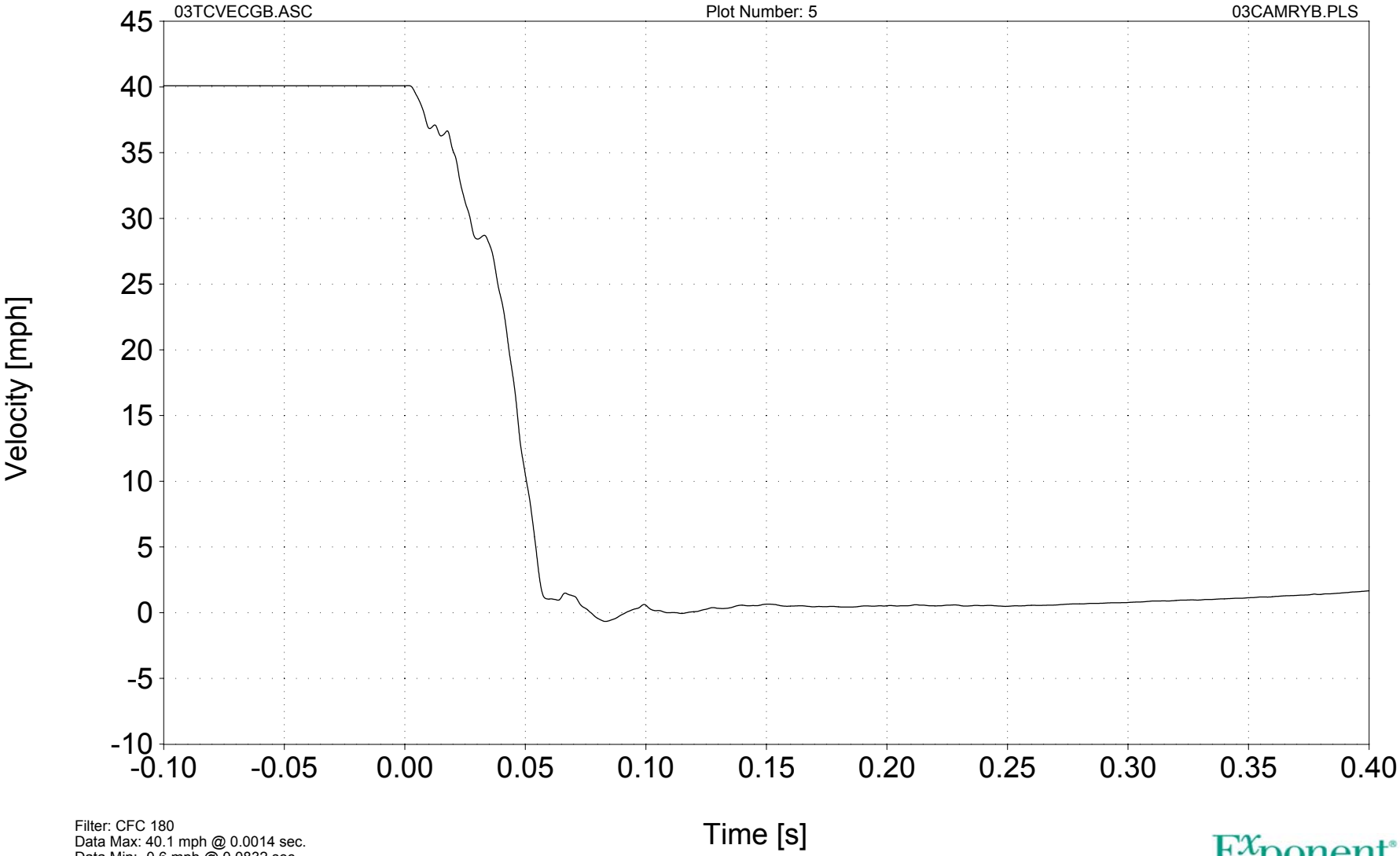
Longitudinal Velocity v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 40.1 mph @ 0.0014 sec.
Data Min: -0.6 mph @ 0.0832 sec.

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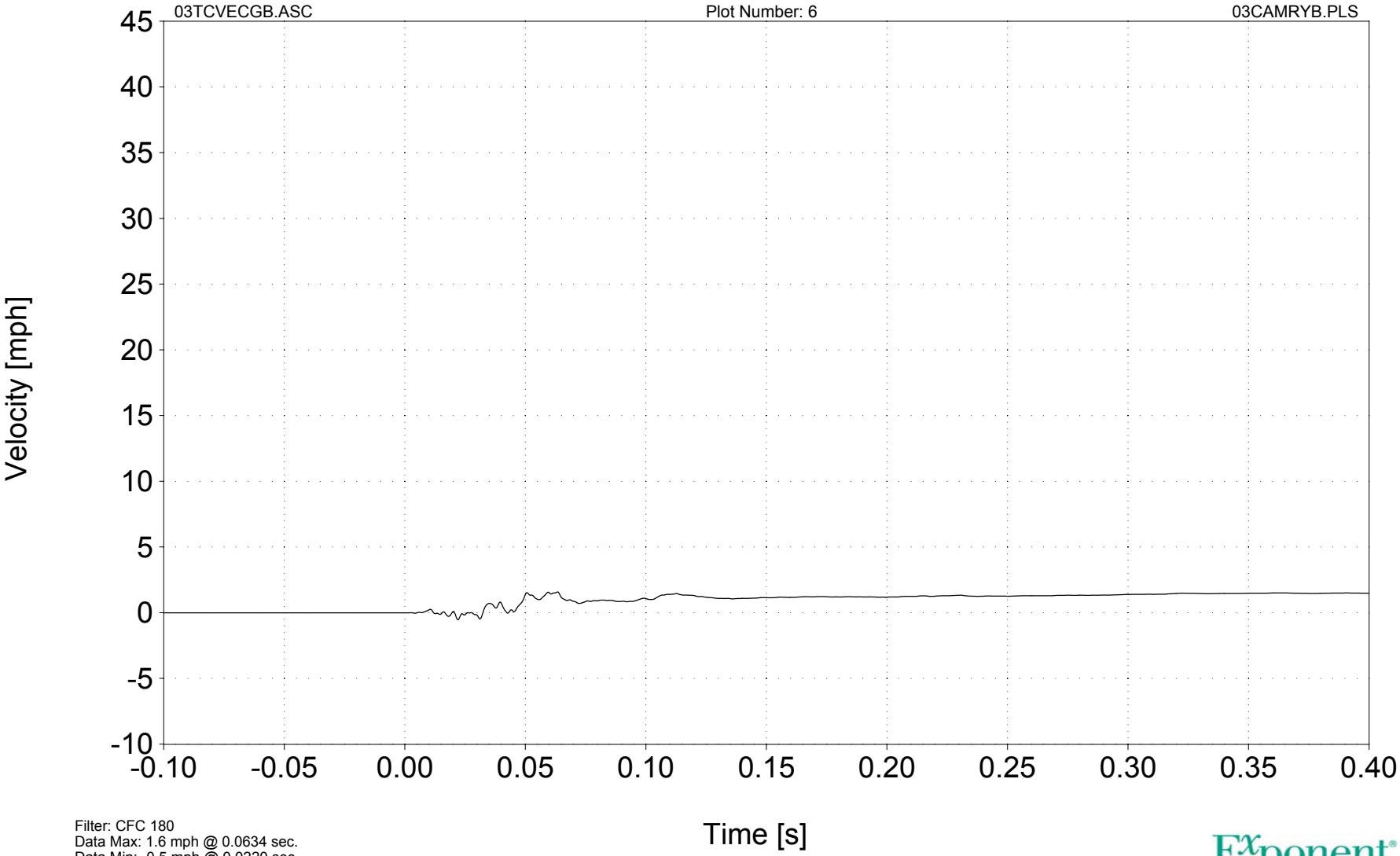
Lateral Velocity v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 1.6 mph @ 0.0634 sec.
Data Min: -0.5 mph @ 0.0220 sec.

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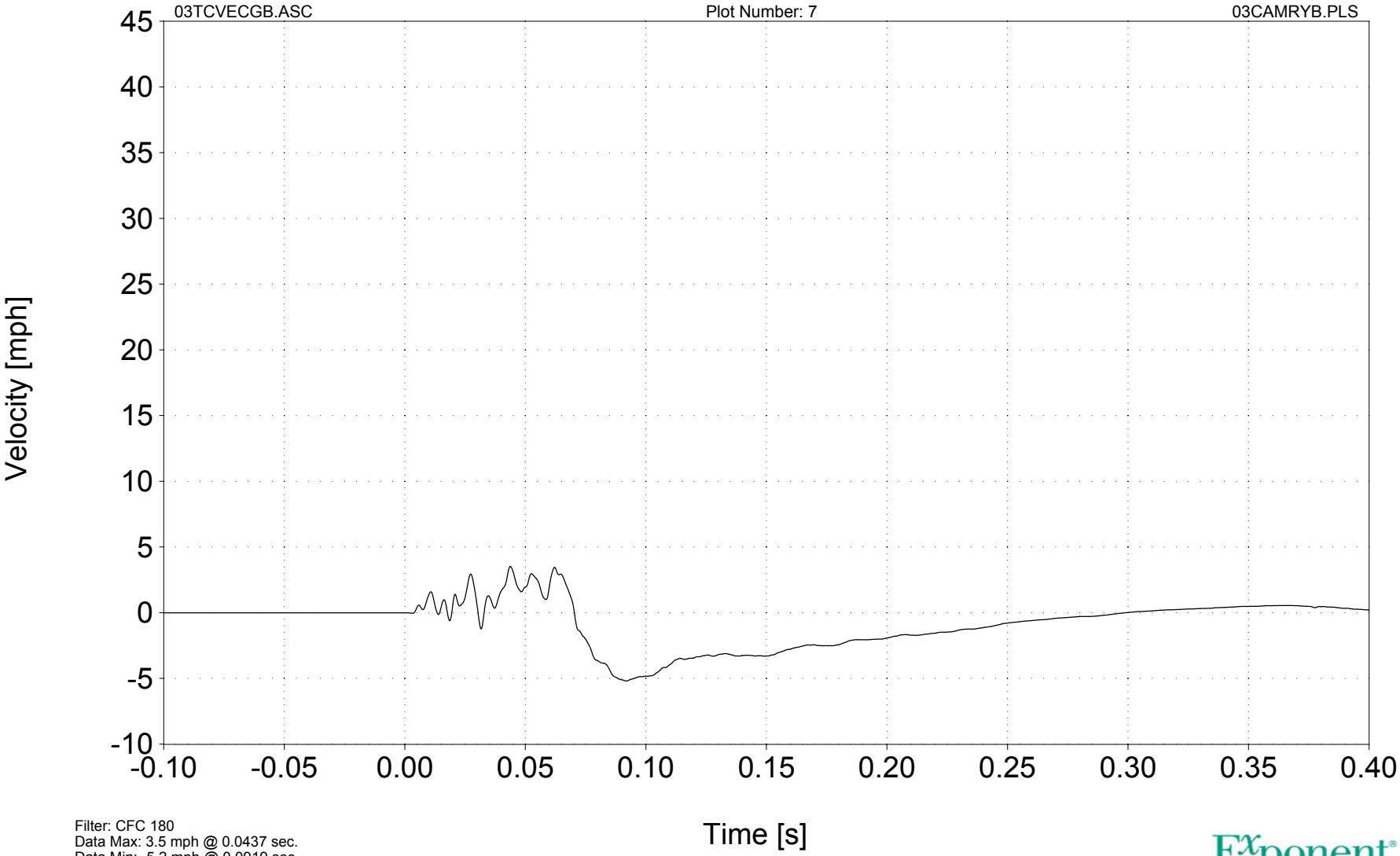
Vertical Velocity v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 3.5 mph @ 0.0437 sec.
Data Min: -5.2 mph @ 0.0919 sec.

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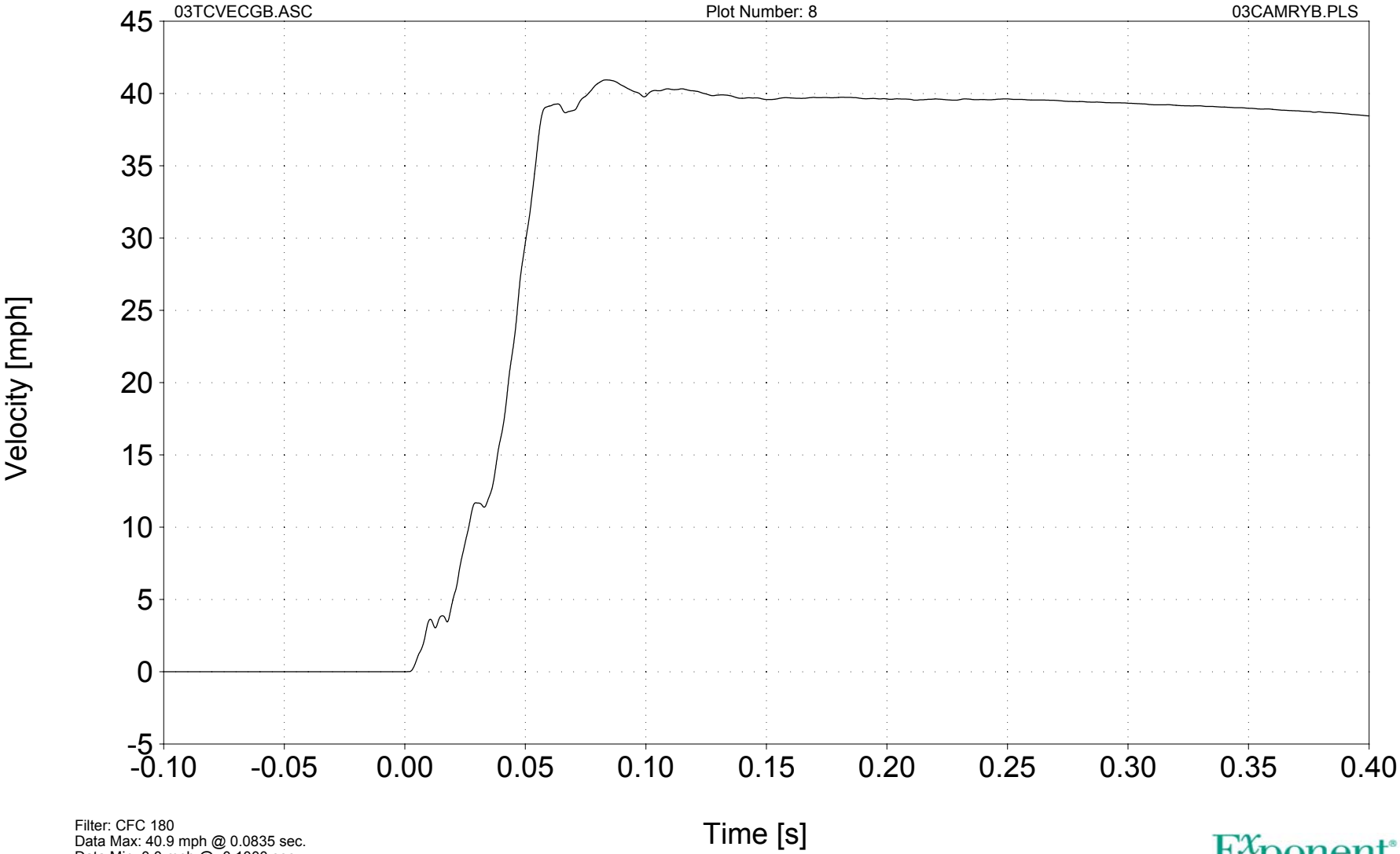
Delta Velocity v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 40.9 mph @ 0.0835 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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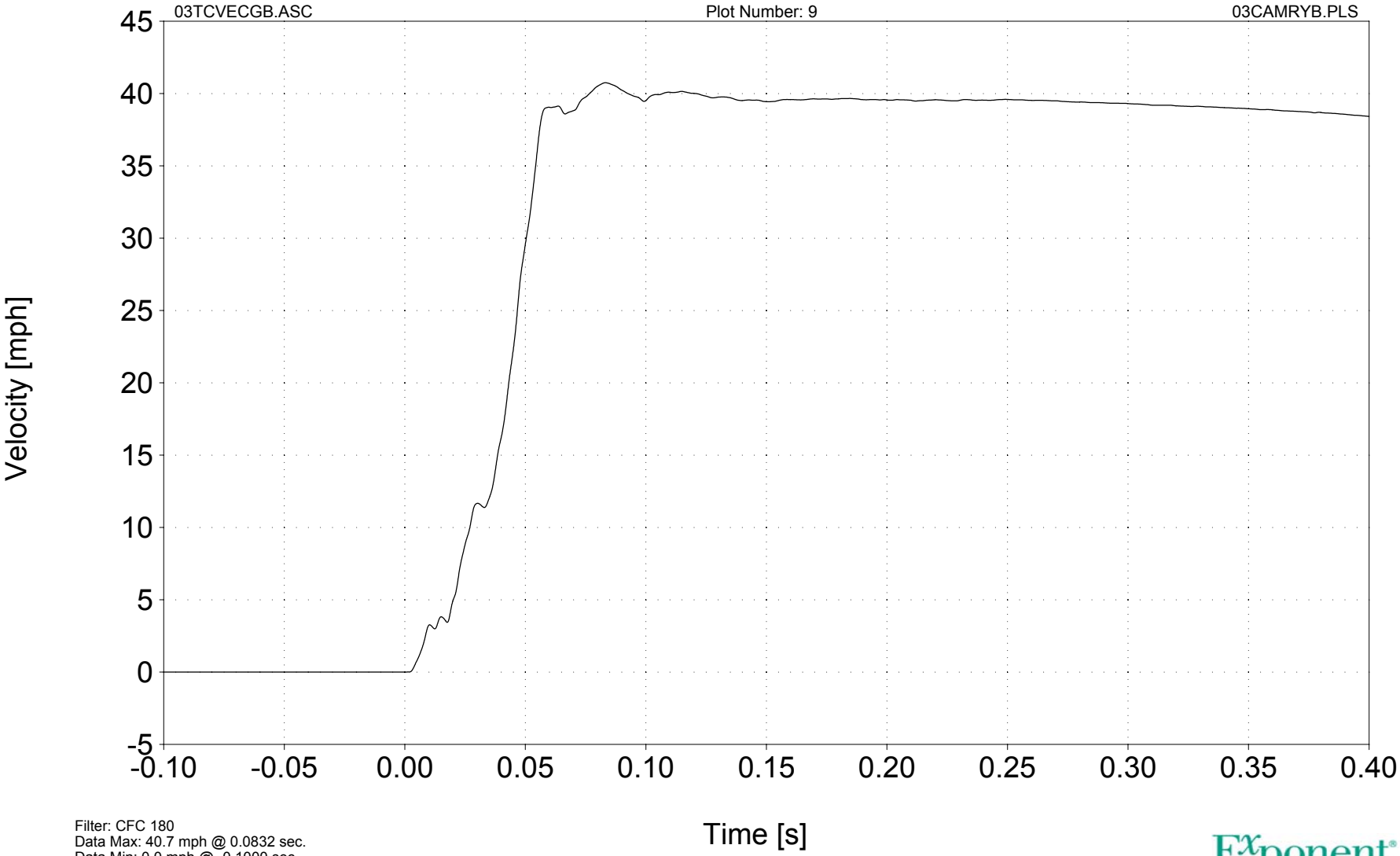
Longitudinal Delta Velocity v Time

Near Vehicle C.G.
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 40.7 mph @ 0.0832 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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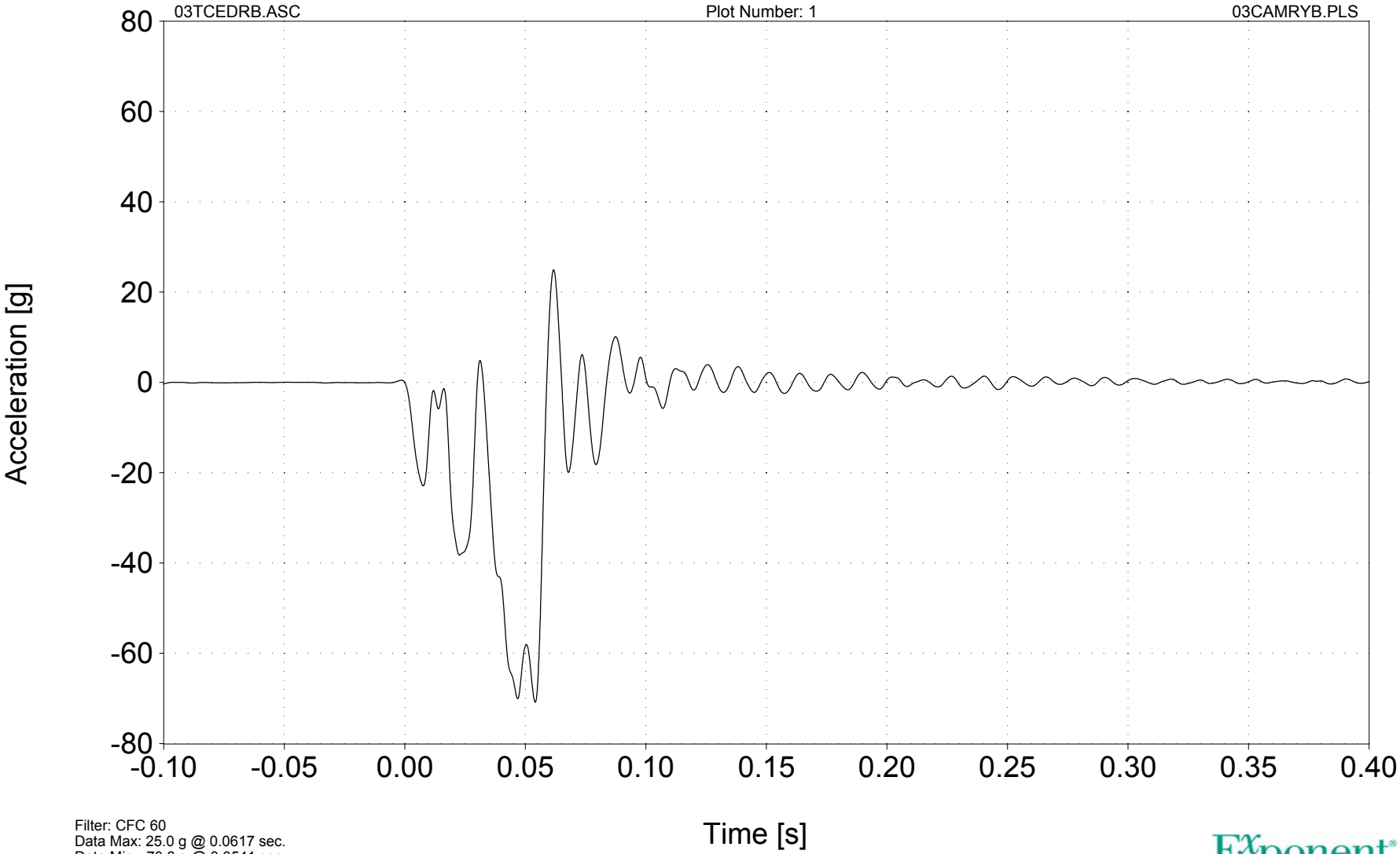
Longitudinal Acceleration v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 25.0 g @ 0.0617 sec.
Data Min: -70.8 g @ 0.0541 sec.

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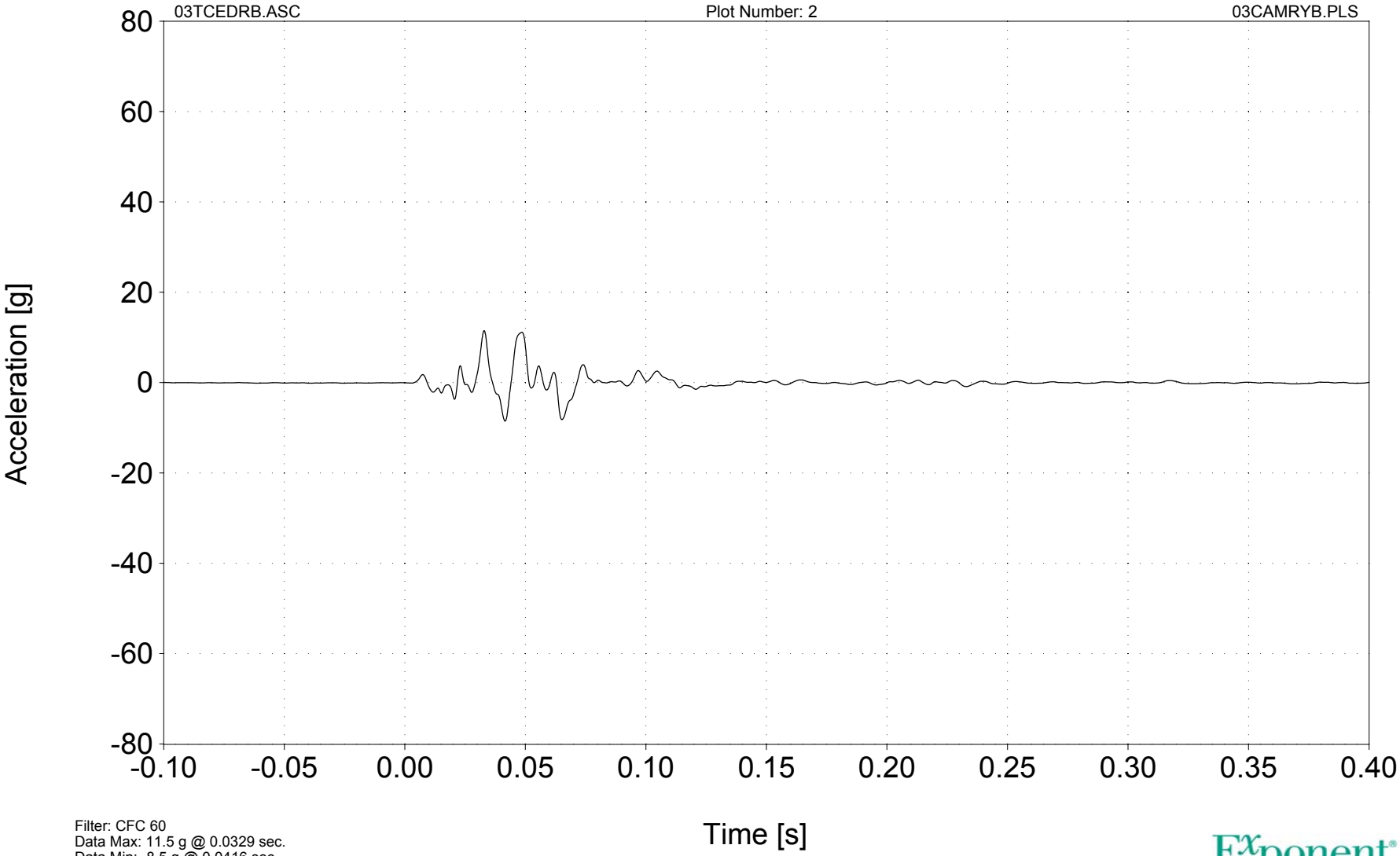
Lateral Acceleration v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 11.5 g @ 0.0329 sec.
Data Min: -8.5 g @ 0.0416 sec.

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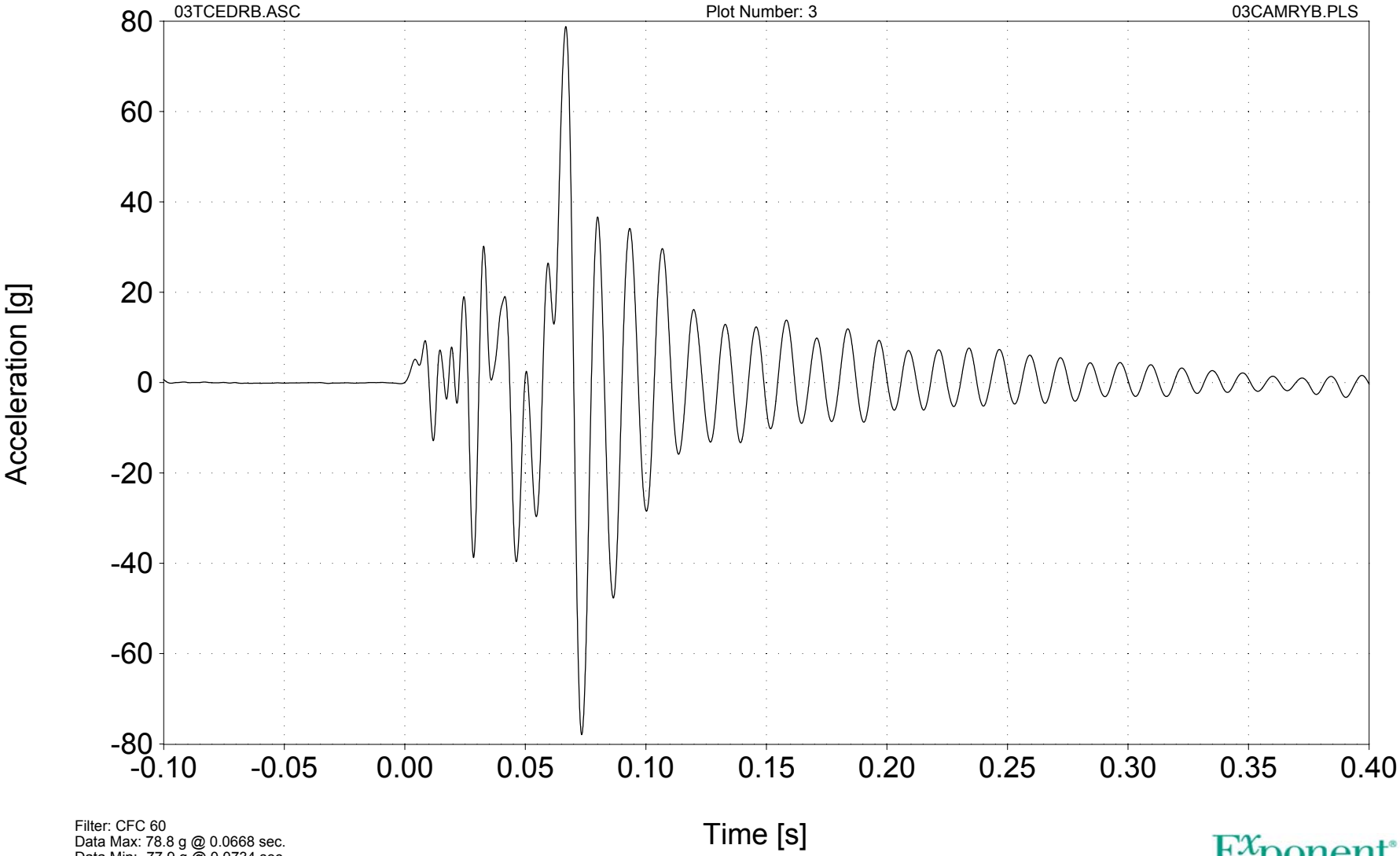
Vertical Acceleration v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 78.8 g @ 0.0668 sec.
Data Min: -77.9 g @ 0.0734 sec.

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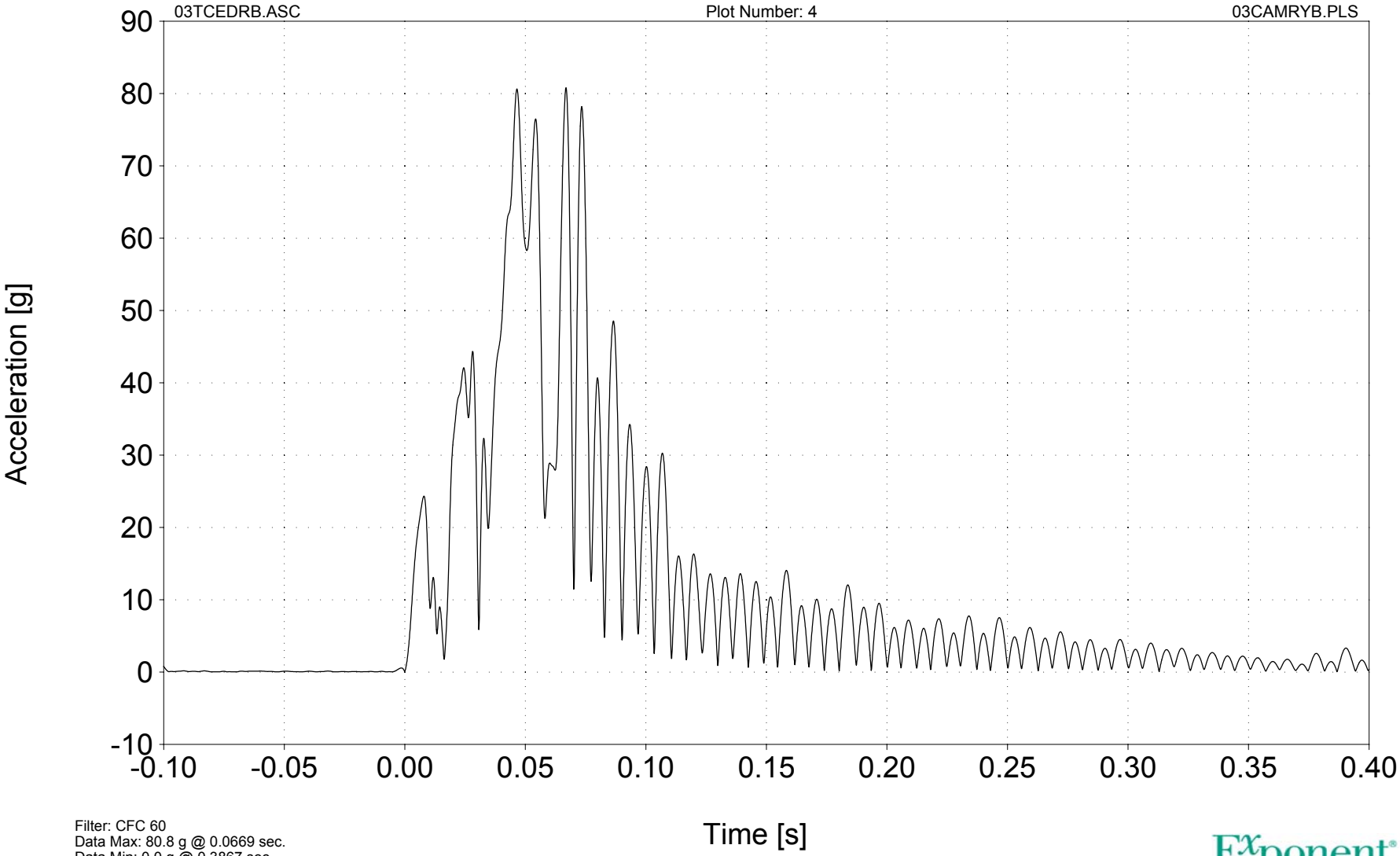
Resultant Acceleration v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 60
Data Max: 80.8 g @ 0.0669 sec.
Data Min: 0.0 g @ 0.3867 sec.

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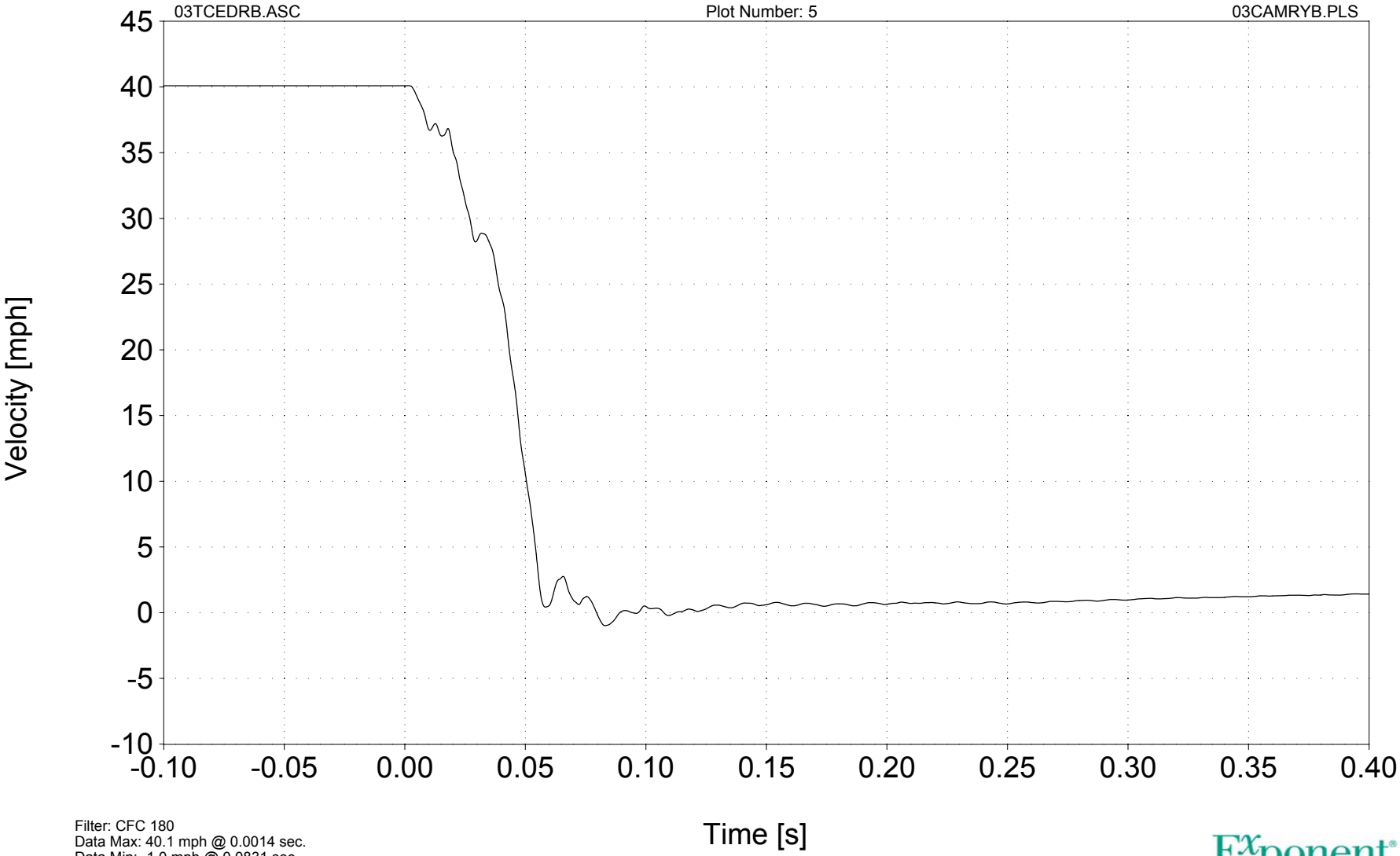
Longitudinal Velocity v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 40.1 mph @ 0.0014 sec.
Data Min: -1.0 mph @ 0.0831 sec.

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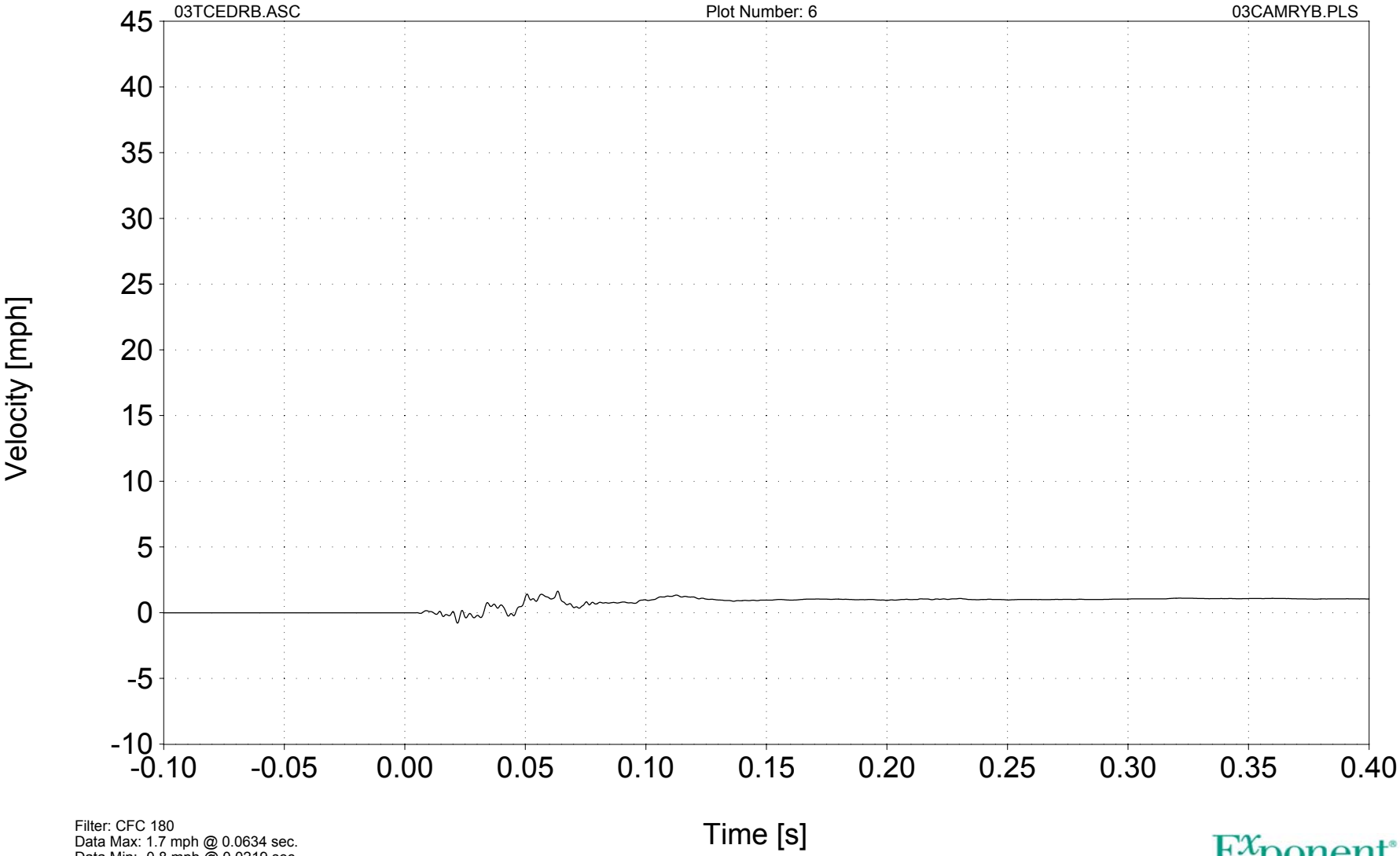
Lateral Velocity v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 1.7 mph @ 0.0634 sec.
Data Min: -0.8 mph @ 0.0219 sec.

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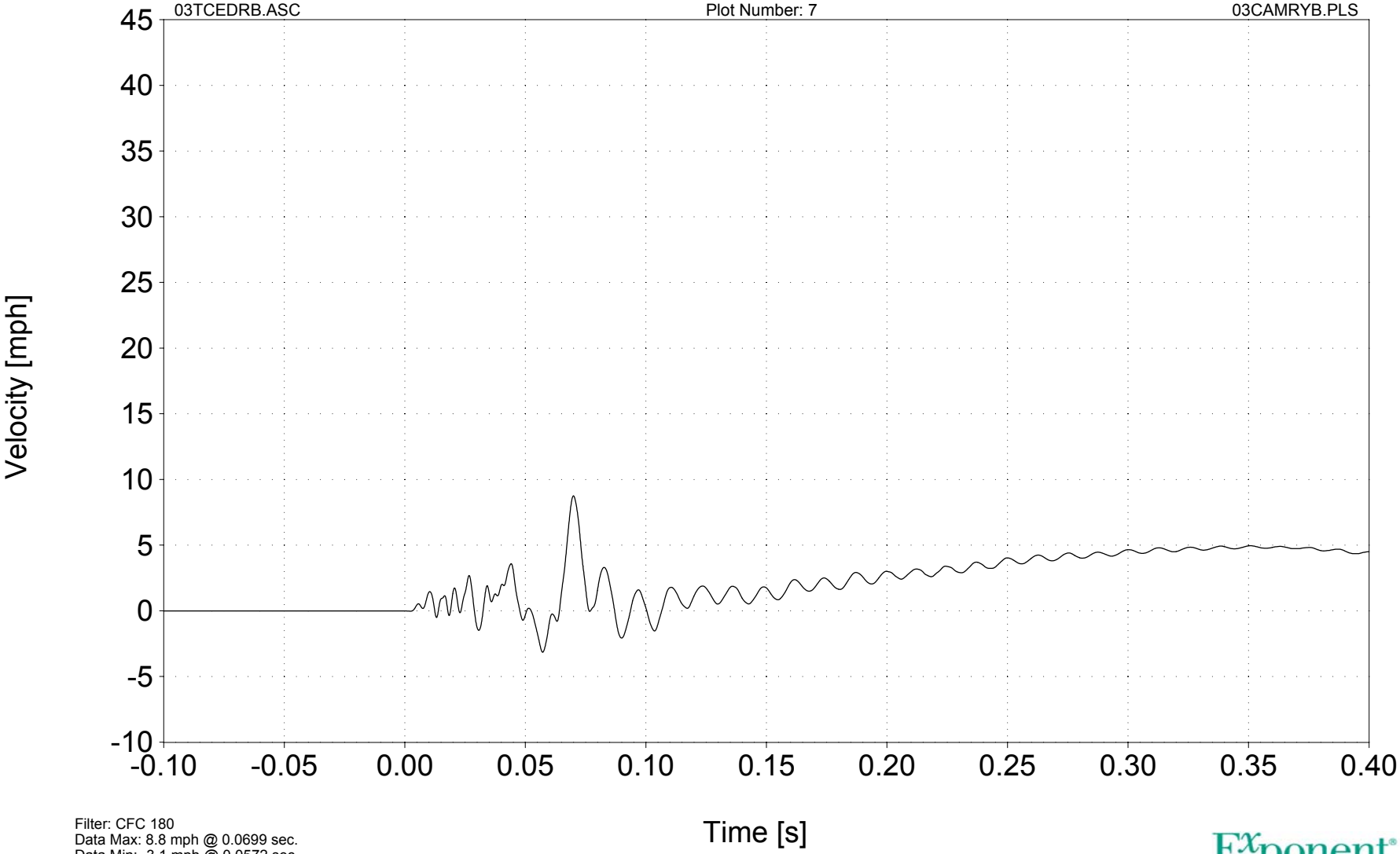
Vertical Velocity v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 8.8 mph @ 0.0699 sec.
Data Min: -3.1 mph @ 0.0572 sec.

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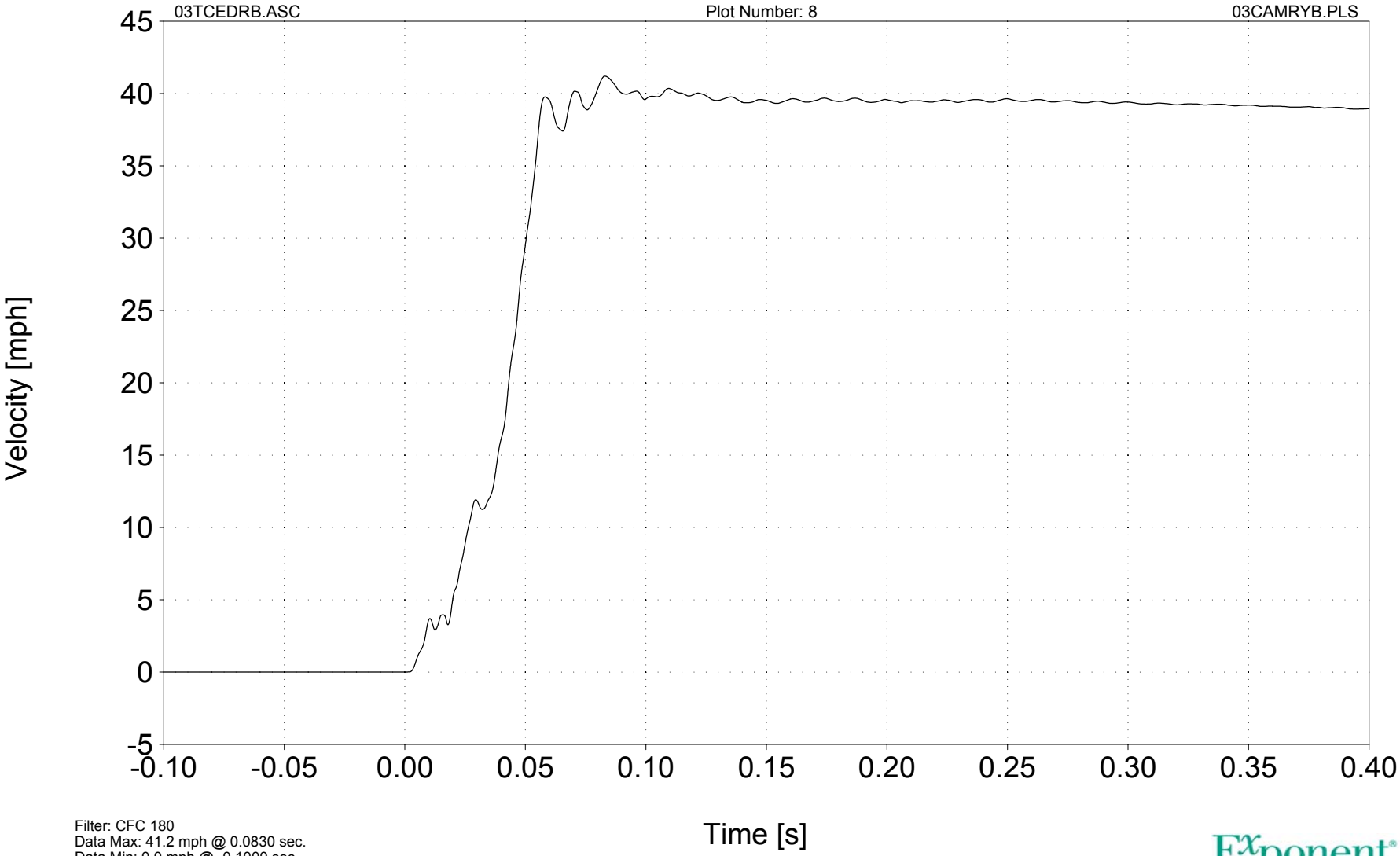
Delta Velocity v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 41.2 mph @ 0.0830 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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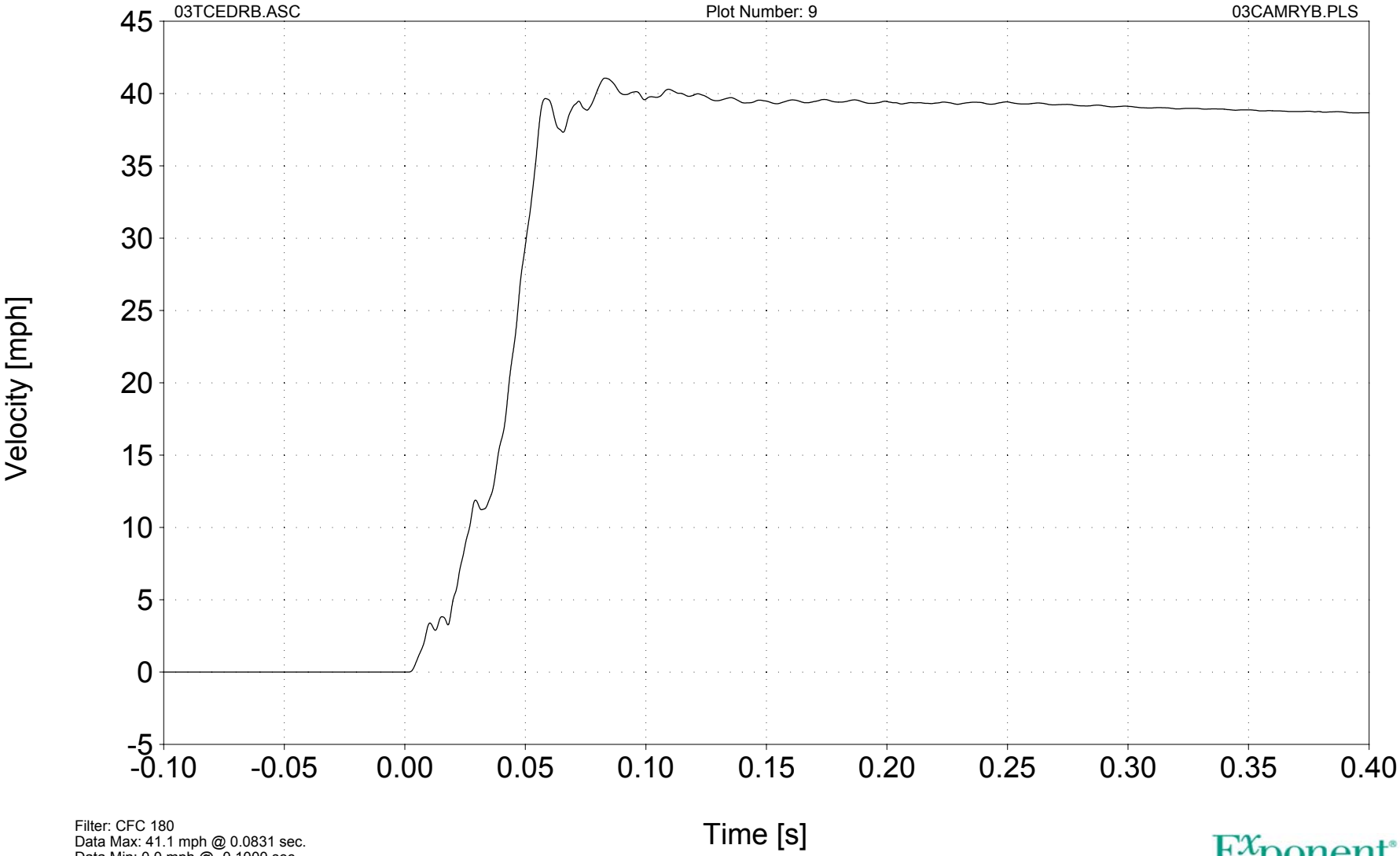
Longitudinal Delta Velocity v Time

EDR
2003 Toyota Camry
Barrier Crash Test - 9/19/11



Filter: CFC 180
Data Max: 41.1 mph @ 0.0831 sec.
Data Min: 0.0 mph @ -0.1000 sec.

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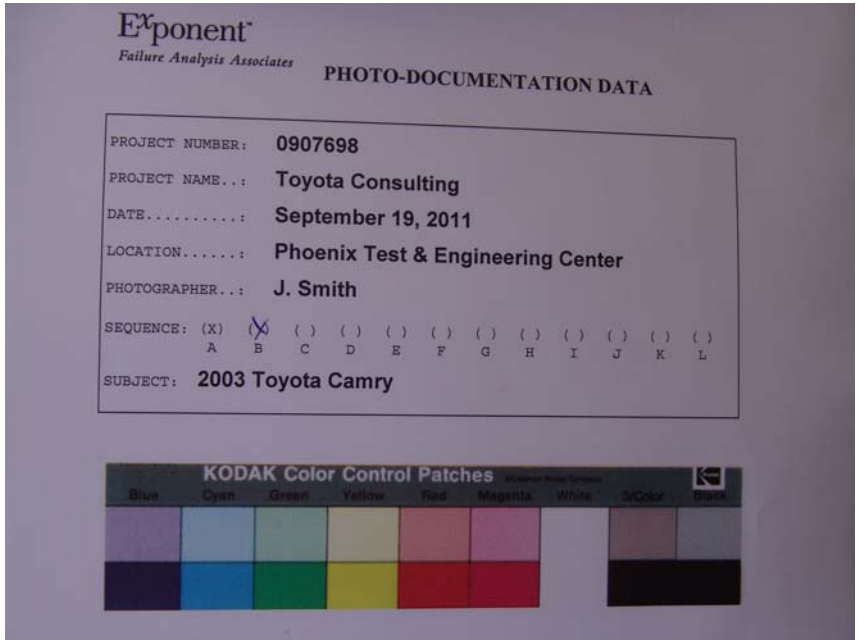

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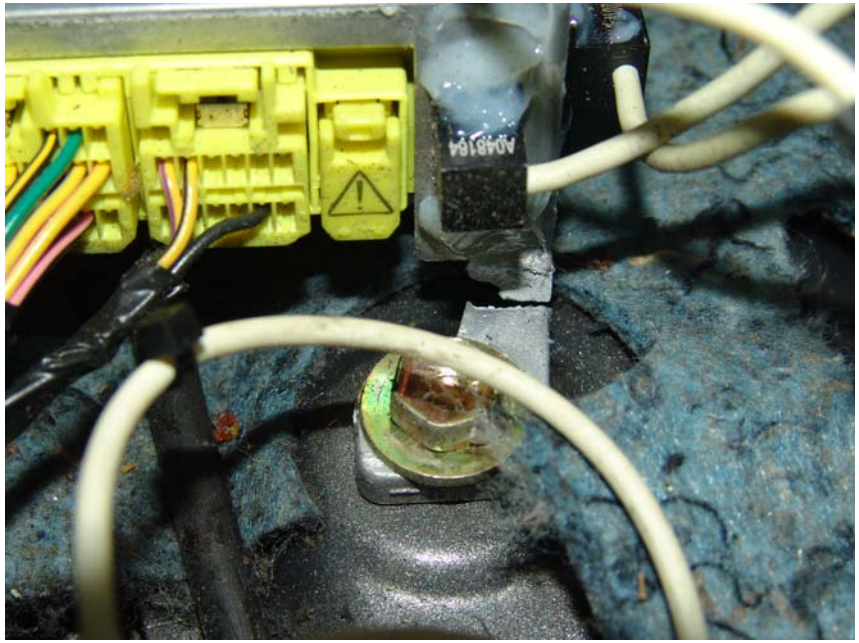

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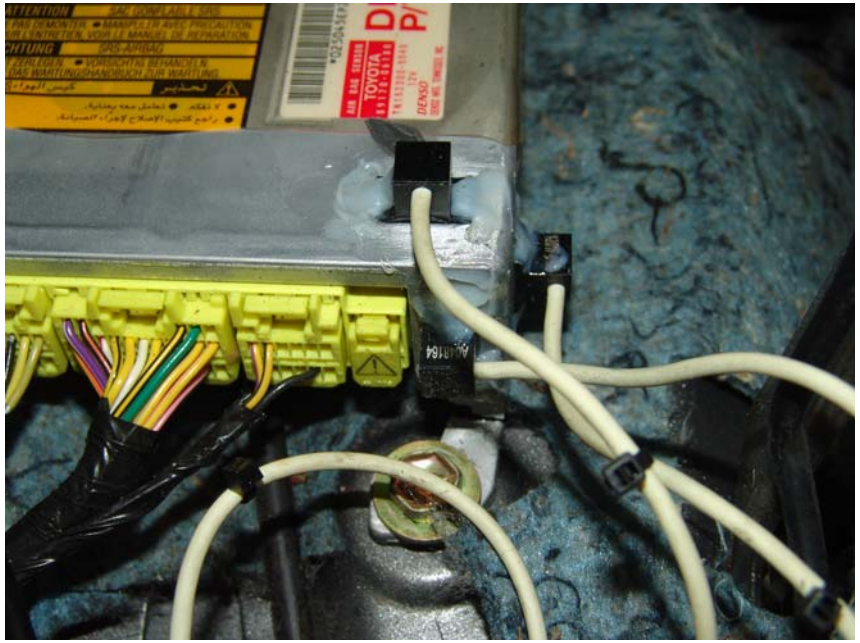

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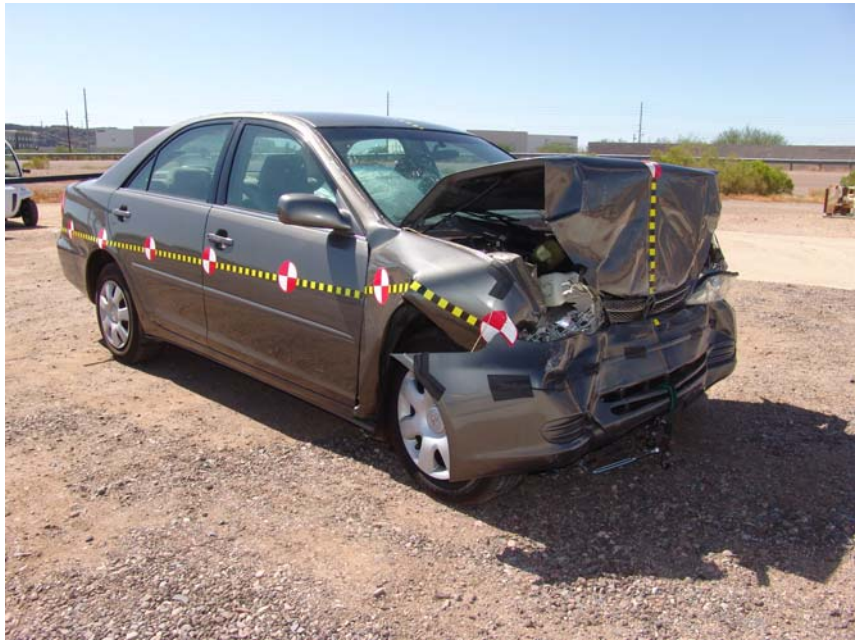

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