



**PEDESTRIAN IMPACT SENSOR TEST**

**Test Date: April 18 – April 21, 2006**

**Report Date: May 22, 2006**

**MGA Reference Number: C06I3-005.1**

**FINAL REPORT**

**PREPARED FOR:**

**FLEX POINT  
106 WEST 12200 SOUTH  
DRAPER, UT 84020**

**PREPARED BY:**


**MGA RESEARCH CORPORATION  
5000 WARREN ROAD  
BURLINGTON, WI 53105**

**SIGNATURE APPROVAL PAGE**

Procedure Number:           Linear Impactor  
  Dated April 2006

Total Pages:                 41

Prepared By:                   
  Jeff Koehler, Project Engineer

Reviewed By:                   
  Mike Janovicz, Project Engineer

Secretary:                    Cyndy Kline

The results presented in this report relate only to the specified test items.

## TABLE OF CONTENTS

<u>Section</u>		<u>Page No</u>
1	Test Summary	1
2	Test Data	2
3	Test Photographs	37

## SECTION 1

### TEST SUMMARY

A Flexpoint Sensor Systems Bend Sensor was tested using two different test setups to evaluate the similarities and differences in the process and results. The test setups were a linear impact system and a pendulum impact system. The testing was performed to evaluate the effectiveness of the Flexpoint system to differentiate between a leg form and a steel pole.

Sixteen (16) individual sensors were evaluated at different impact speeds and in various impact conditions. Two target impact speeds were used for testing; 25 kph and 40 kph. At each speed, a sensor was first impacted with either the leg form or the pole and then impacted by the other object. Each test was performed on two individual sensors for more accurate data.

Sensor Number	Impact Type	First Object	Second Object	Target Speed	First Object's Actual Speed	Second Object's Actual Speed
Sensor 1	Pendulum	Leg	Pole	25 kph	24.9 kph	24.8 kph
Sensor 2	Pendulum	Leg	Pole	25 kph	25.0 kph	25.1 kph
Sensor 3	Linear	Leg	Pole	25 kph	25.3 kph	25.7 kph
Sensor 4	Linear	Leg	Pole	25 kph	25.3 kph	25.7 kph
Sensor 5	Pendulum	Pole	Leg	25 kph	25.1 kph	24.8 kph
Sensor 6	Pendulum	Pole	Leg	25 kph	25.2 kph	24.8 kph
Sensor 7	Linear	Pole	Leg	25 kph	25.5 kph	25.0 kph
Sensor 8	Linear	Pole	Leg	25 kph	25.9 kph	24.7 kph
Sensor 9	Pendulum	Leg	Pole	40 kph	38.0 kph	39.9 kph
Sensor 10	Pendulum	Leg	Pole	40 kph	40.4 kph	39.2 kph
Sensor 11	Linear	Leg	Pole	40 kph	39.8 kph	41.0 kph
Sensor 12	Linear	Leg	Pole	40 kph	39.9 kph	41.0 kph
Sensor 13	Pendulum	Pole	Leg	40 kph	38.4 kph	40.1 kph
Sensor 14	Pendulum	Pole	Leg	40 kph	40.3 kph	40.0 kph
Sensor 15	Linear	Pole	Leg	40 kph	41.8 kph	39.9 kph
Sensor 16	Linear	Pole	Leg	40 kph	40.4 kph	39.5 kph

During the testing only one of the four segments on the sensor was impacted as to give the best data. Data from all four segments is plotted for both the leg impact and the pole impact for each sensor. In addition, the impacted segment on both the leg impact and the pole impact were plotted together to allow easier comparison.

The test was setup using a piece of Styrofoam and thin plastic to represent the bumper. The Flexpoint sensor was attached to the back of the thin plastic using the adhesive on the sensor. It was then sandwiched in between the Styrofoam and the plastic. Also, there was a membrane sensor attached to the outside of the plastic. This was done to see the response time of the Flexpoint sensor for each test.

## SECTION 2

### TEST DATA

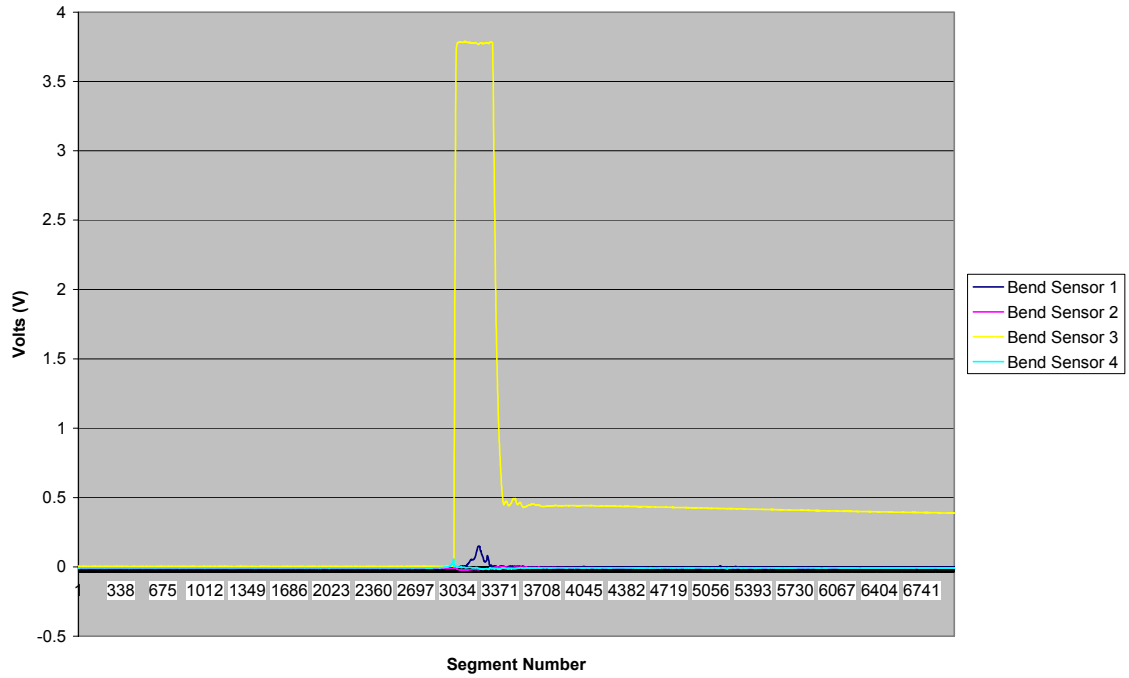
Sensor Number	Pole Response Time (ms)	Leg Response Time (ms)
Sensor 1	0.4	0.2
Sensor 2	0.1	0.4
Sensor 3	0.2	3.4
Sensor 4	0.4	0.6
Sensor 5	0.2	0.7
Sensor 6	0.2	0.4
Sensor 7	0.4	0.7
Sensor 8	0.2	0.7
Sensor 9	-0.2	0.8
Sensor 10	-0.1	0.9
Sensor 11	0.0	1.4
Sensor 12	0.1	1.4
Sensor 13	0.3	0.4
Sensor 14	0.2	0.4
Sensor 15	0.1	0.9
Sensor 16	0.1	0.4

## TEST DATA (Cont')

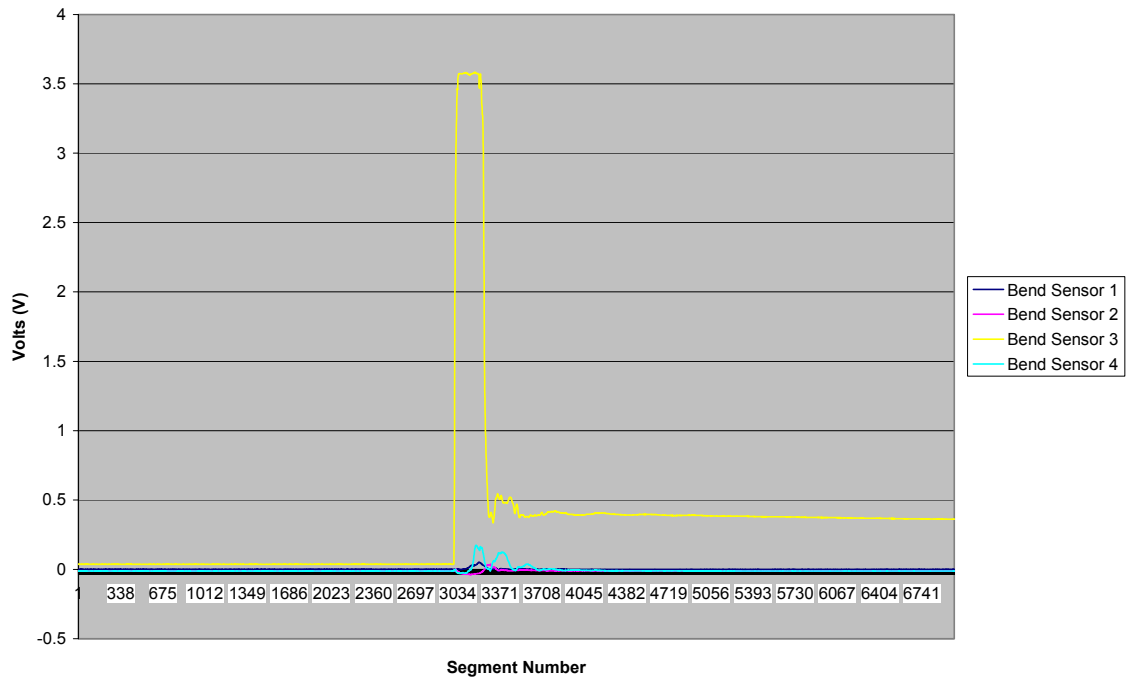
	<u>Page No.</u>
Plot No. 1 – Leg into Bumper, Sensor 1	5
Plot No. 2 – Pole into Bumper, Sensor 1	5
Plot No. 3 – Impact Sensor 1, Leg and Pole	6
Plot No. 4 – Leg into Bumper, Sensor 2	7
Plot No. 5 – Pole into Bumper, Sensor 2	7
Plot No. 6 – Impact Sensor 2, Leg and Pole	8
Plot No. 7 – Leg into Bumper, Sensor 3	9
Plot No. 8 – Pole into Bumper, Sensor 3	9
Plot No. 9 – Impact Sensor 3, Leg and Pole	10
Plot No. 10 – Leg into Bumper, Sensor 4	11
Plot No. 11 – Pole into Bumper, Sensor 4	11
Plot No. 12 – Impact Sensor 4, Leg and Pole	12
Plot No. 13 – Leg into Bumper, Sensor 5	13
Plot No. 14 – Pole into Bumper, Sensor 5	13
Plot No. 15 – Impact Sensor 5, Leg and Pole	14
Plot No. 16 – Leg into Bumper, Sensor 6	15
Plot No. 17 – Pole into Bumper, Sensor 6	15
Plot No. 18 – Impact Sensor 6, Leg and Pole	16
Plot No. 19 – Leg into Bumper, Sensor 7	17
Plot No. 20 – Pole into Bumper, Sensor 7	17
Plot No. 21 – Impact Sensor 7, Leg and Pole	18
Plot No. 22 – Leg into Bumper, Sensor 8	19
Plot No. 23 – Pole into Bumper, Sensor 8	19
Plot No. 24 – Impact Sensor 8, Leg and Pole	20
Plot No. 25 – Leg into Bumper, Sensor 9	21
Plot No. 26 – Pole into Bumper, Sensor 9	21
Plot No. 27 – Impact Sensor 9, Leg and Pole	22
Plot No. 28 – Leg into Bumper, Sensor 10	23
Plot No. 29 – Pole into Bumper, Sensor 10	23
Plot No. 30 – Impact Sensor 10, Leg and Pole	24
Plot No. 31 – Leg into Bumper, Sensor 11	25
Plot No. 32 – Pole into Bumper, Sensor 11	25
Plot No. 33 – Impact Sensor 11, Leg and Pole	26
Plot No. 34 – Leg into Bumper, Sensor 12	27
Plot No. 35 – Pole into Bumper, Sensor 12	27
Plot No. 36 – Impact Sensor 12, Leg and Pole	28

Plot No. 37 – Leg into Bumper, Sensor 13	29
Plot No. 38 – Pole into Bumper, Sensor 13	29
Plot No. 39 – Impact Sensor 13, Leg and Pole	30
Plot No. 40 – Leg into Bumper, Sensor 14	31
Plot No. 41 – Pole into Bumper, Sensor 14	31
Plot No. 42 – Impact Sensor 14, Leg and Pole	32
Plot No. 43 – Leg into Bumper, Sensor 15	33
Plot No. 44 – Pole into Bumper, Sensor 15	33
Plot No. 45 – Impact Sensor 15, Leg and Pole	34
Plot No. 46 – Leg into Bumper, Sensor 16	35
Plot No. 47 – Pole into Bumper, Sensor 16	35
Plot No. 48 – Impact Sensor 16, Leg and Pole	36

### Leg into Bumper, Sensor 1

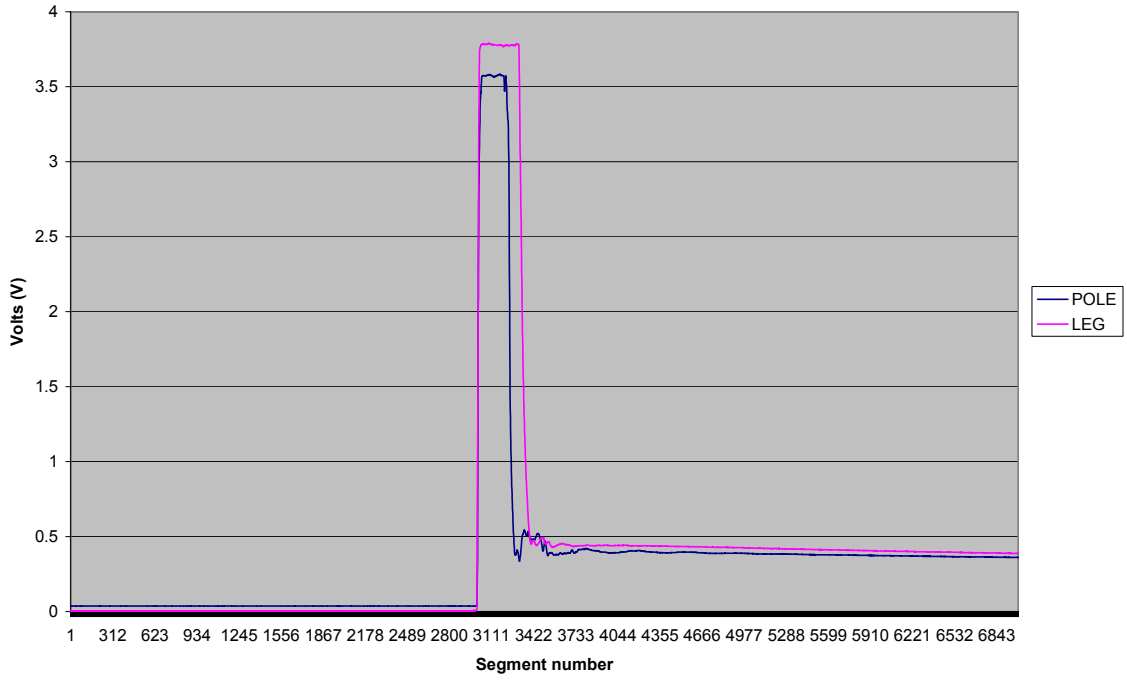


### Pole into Bumper, Sensor 1

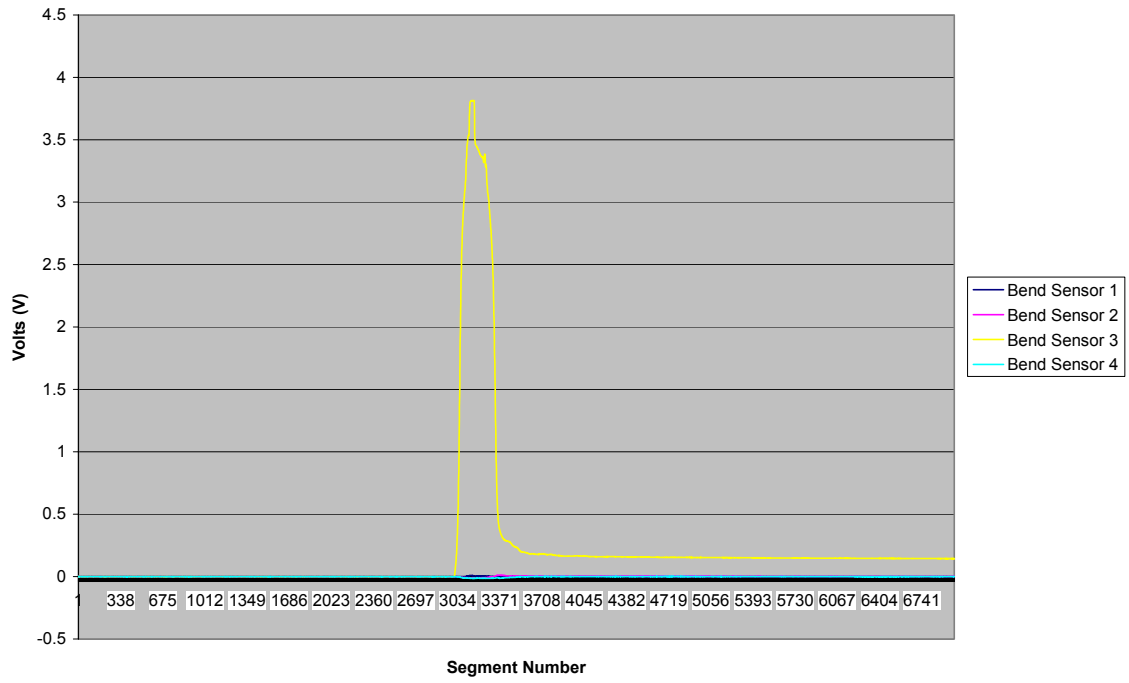




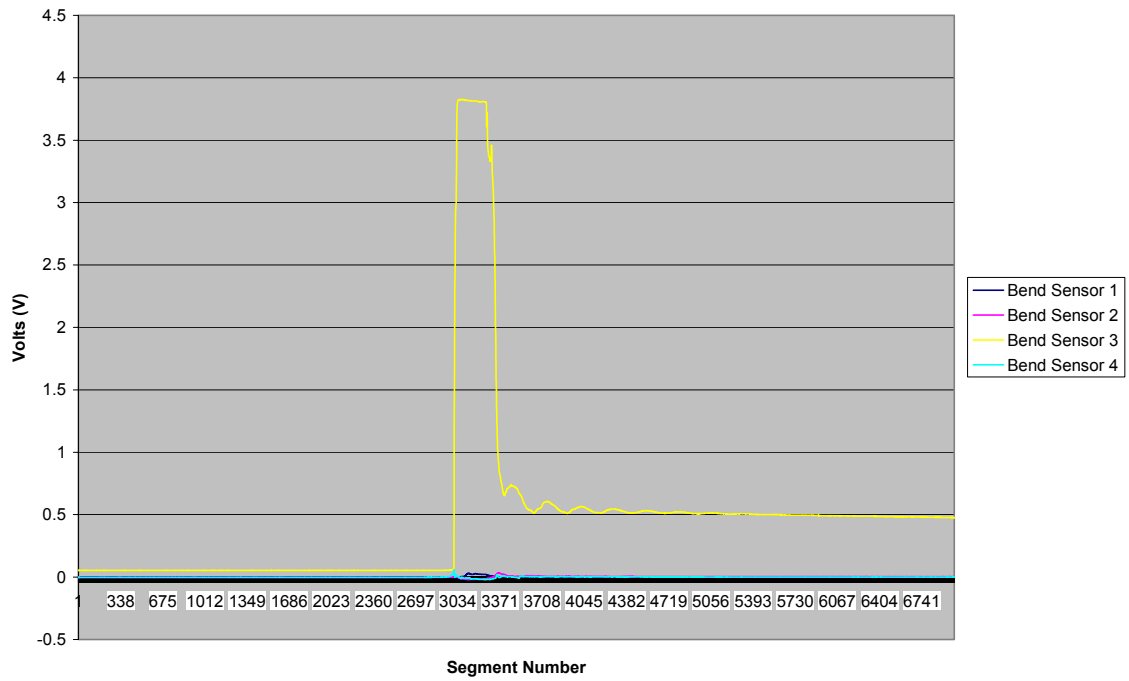
IMPACT SENSOR 1 - LEG & POLE



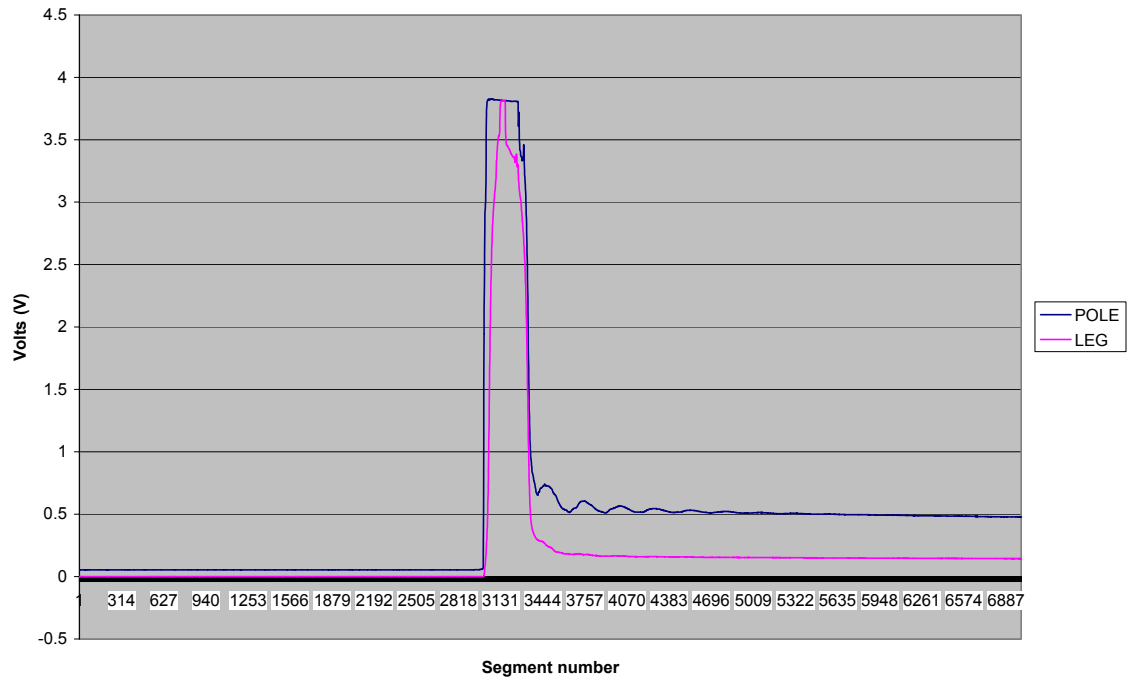
### Leg into Bumper, Sensor 2



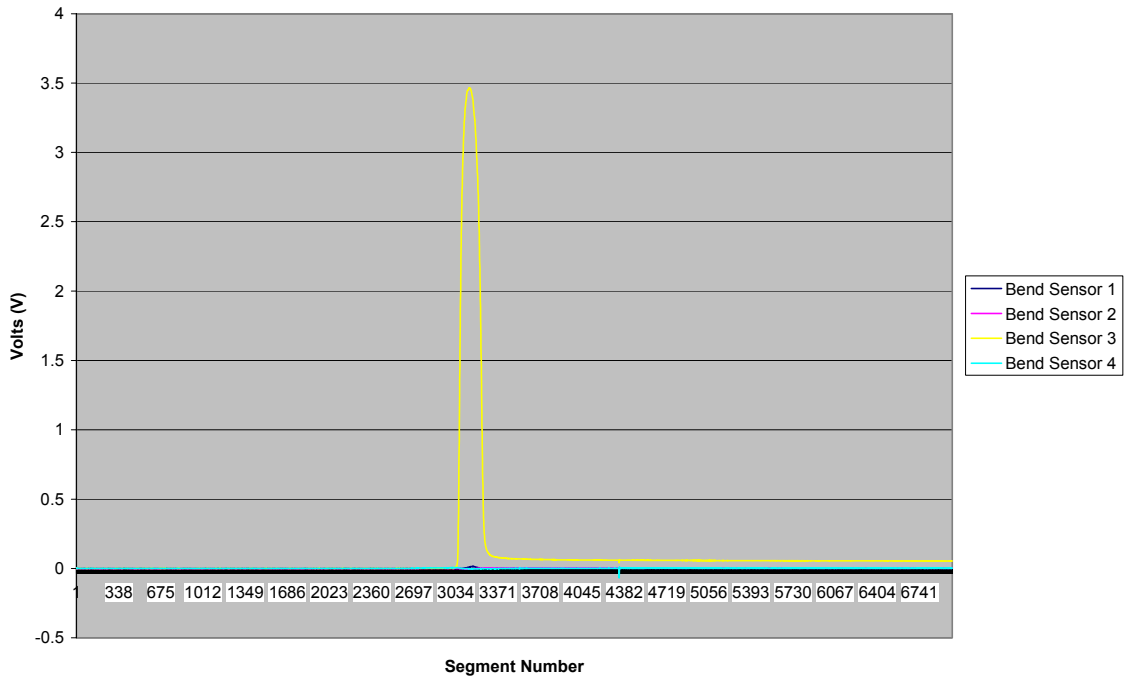
### Pole into Bumper, Sensor 2



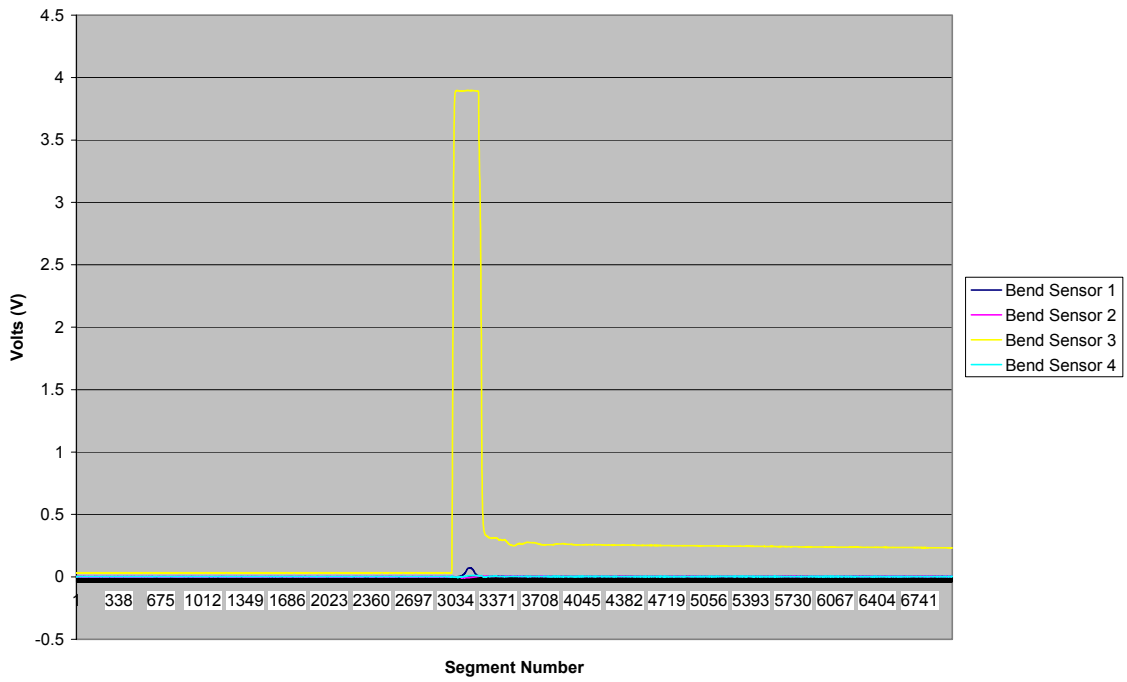
### IMPACT SENSOR 2 - LEG & POLE



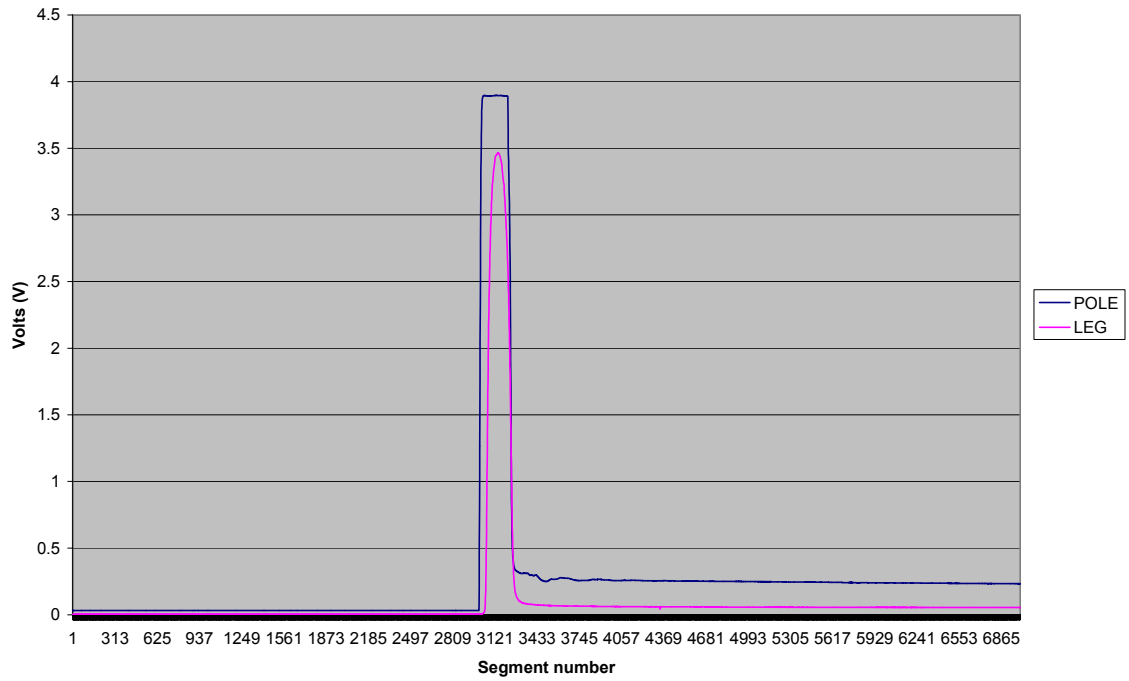
### Leg into Bumper, Sensor 3



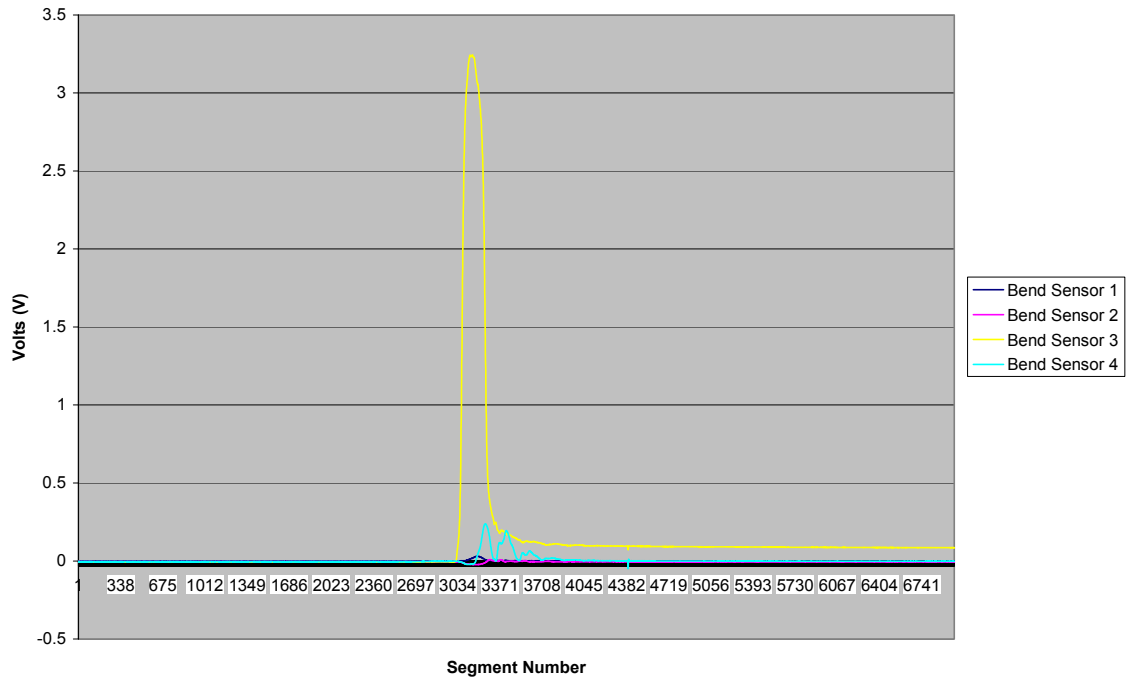
### Pole into Bumper, Sensor 3



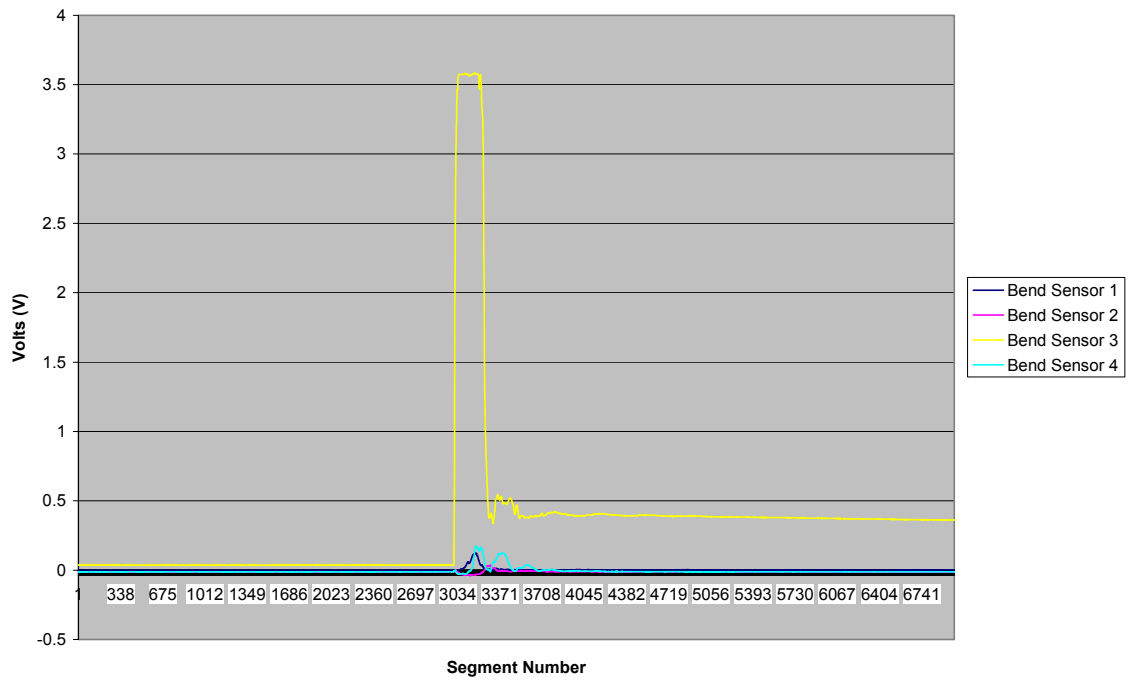
### IMPACT SENSOR 3 - LEG & POLE



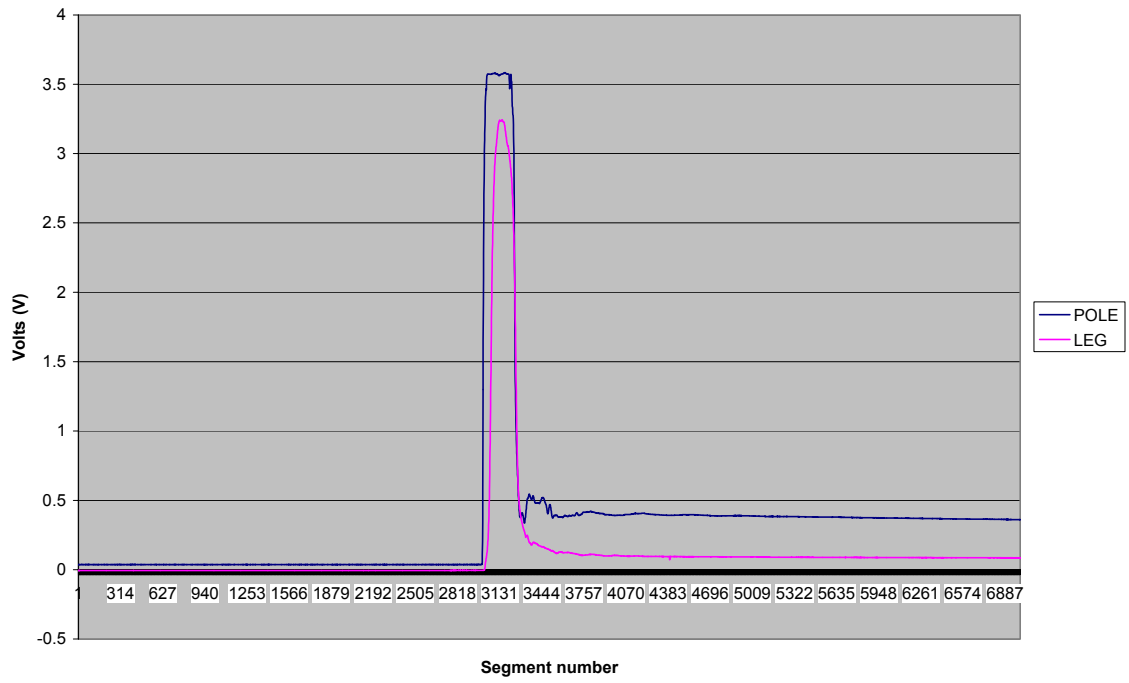
### Leg into Bumper, Sensor 4



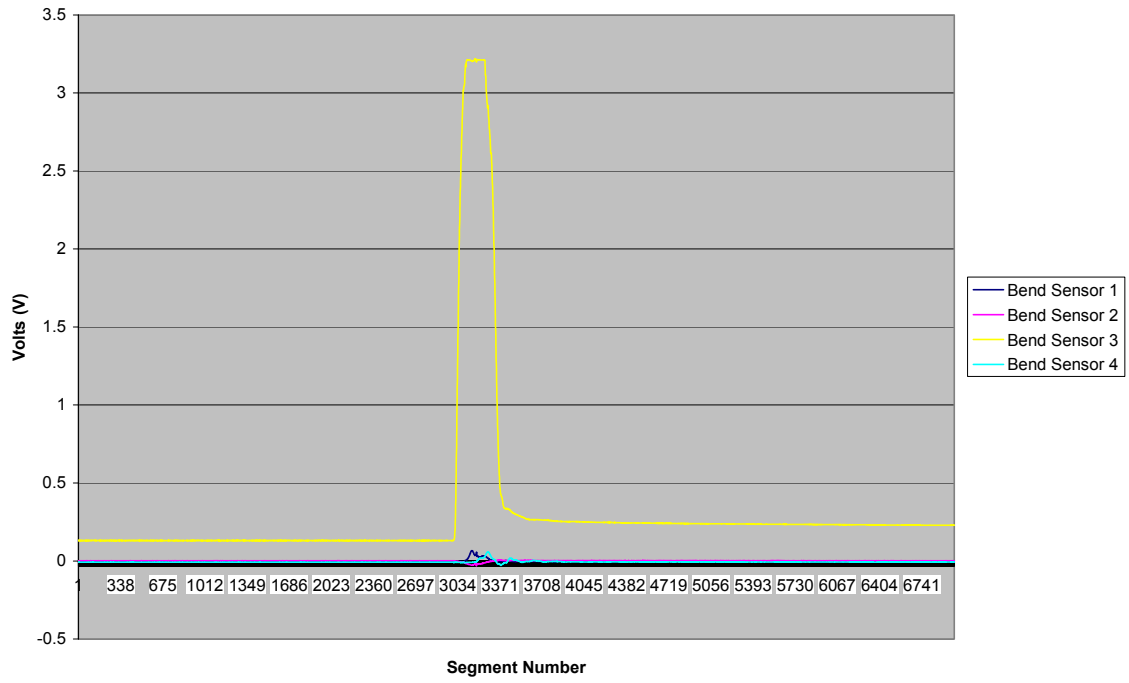
### Pole into Bumper, Sensor 4



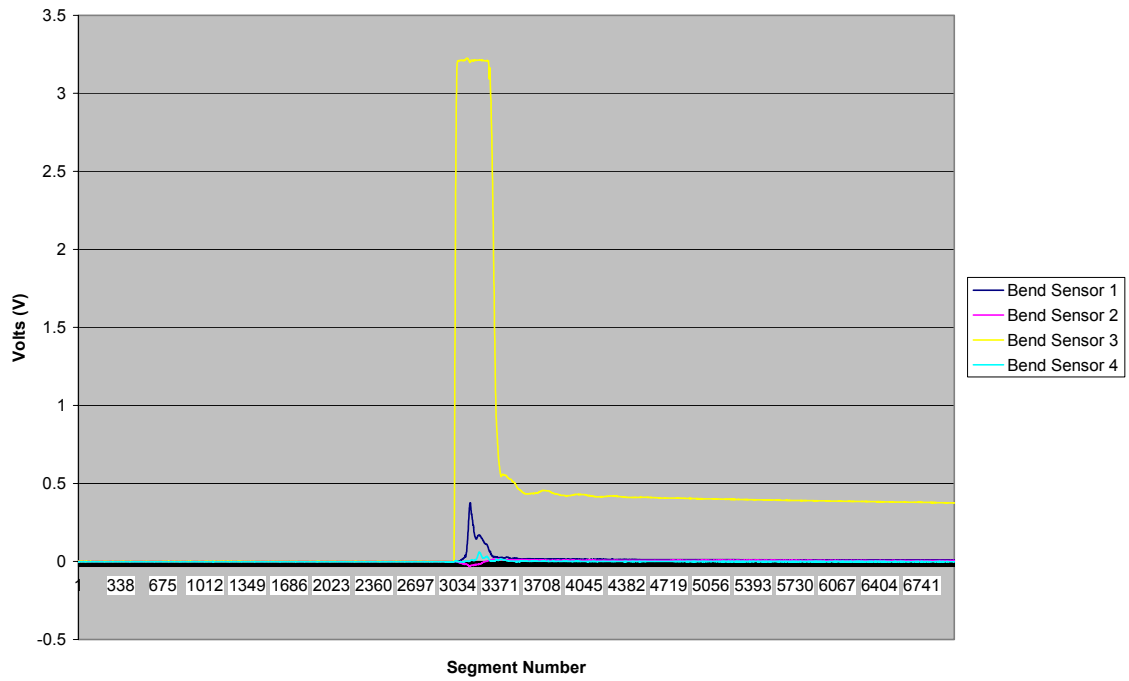
### IMPACT SENSOR 4 - LEG & POLE



### Leg into Bumper, Sensor 5

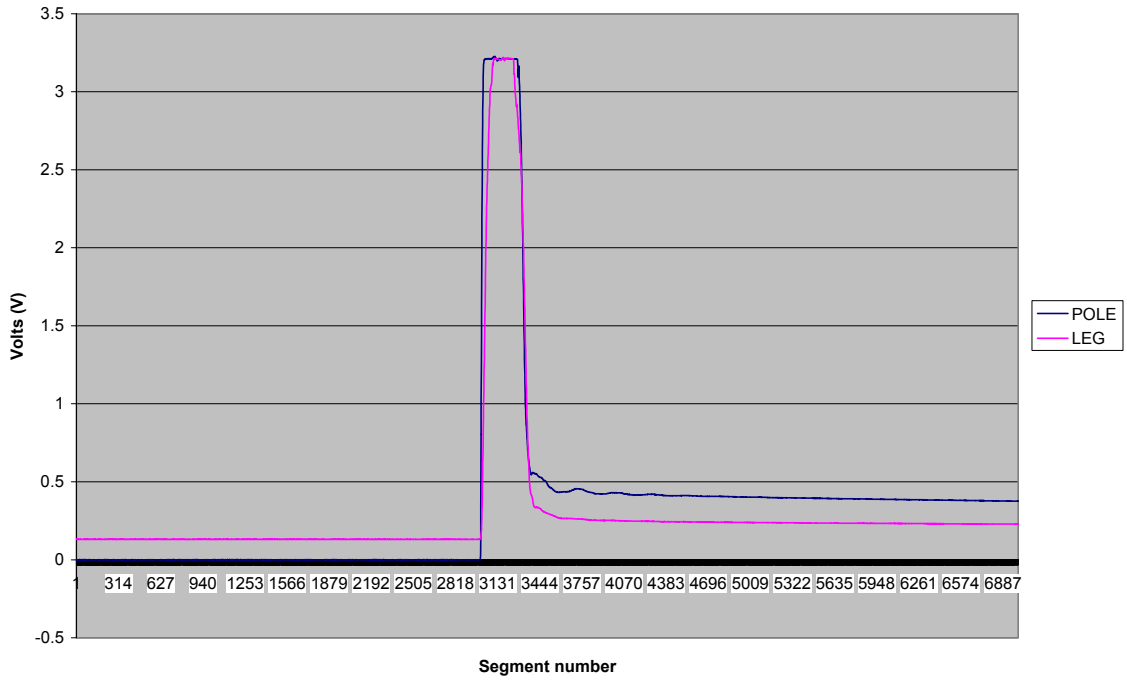


### Pole into Bumper, Sensor 5

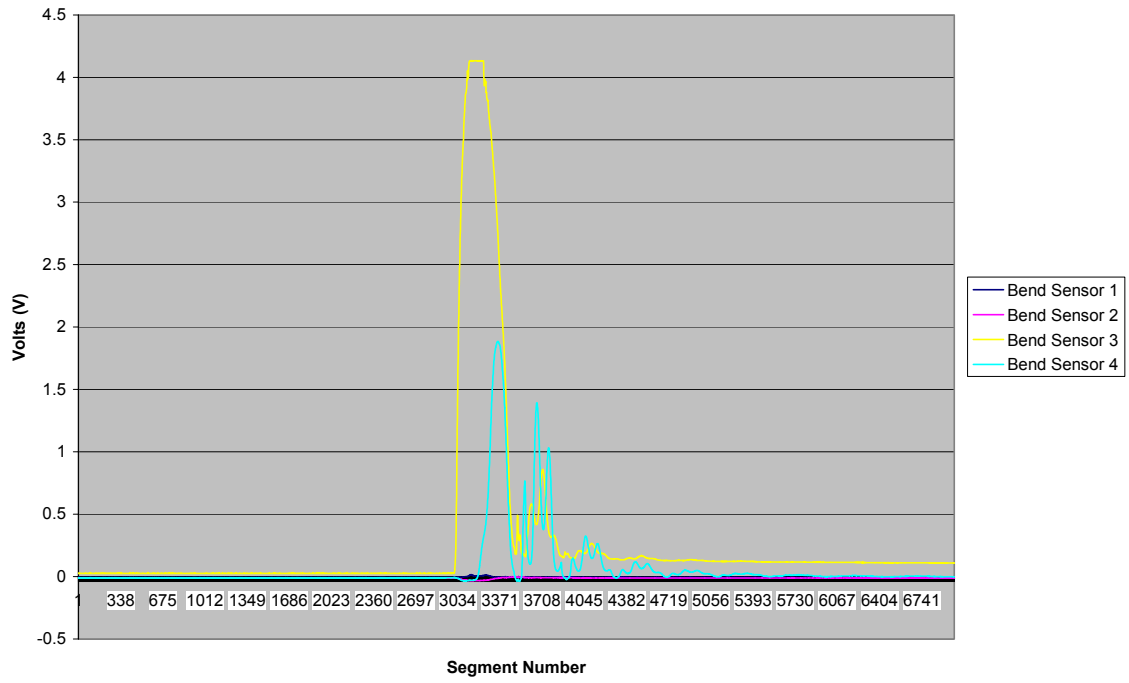




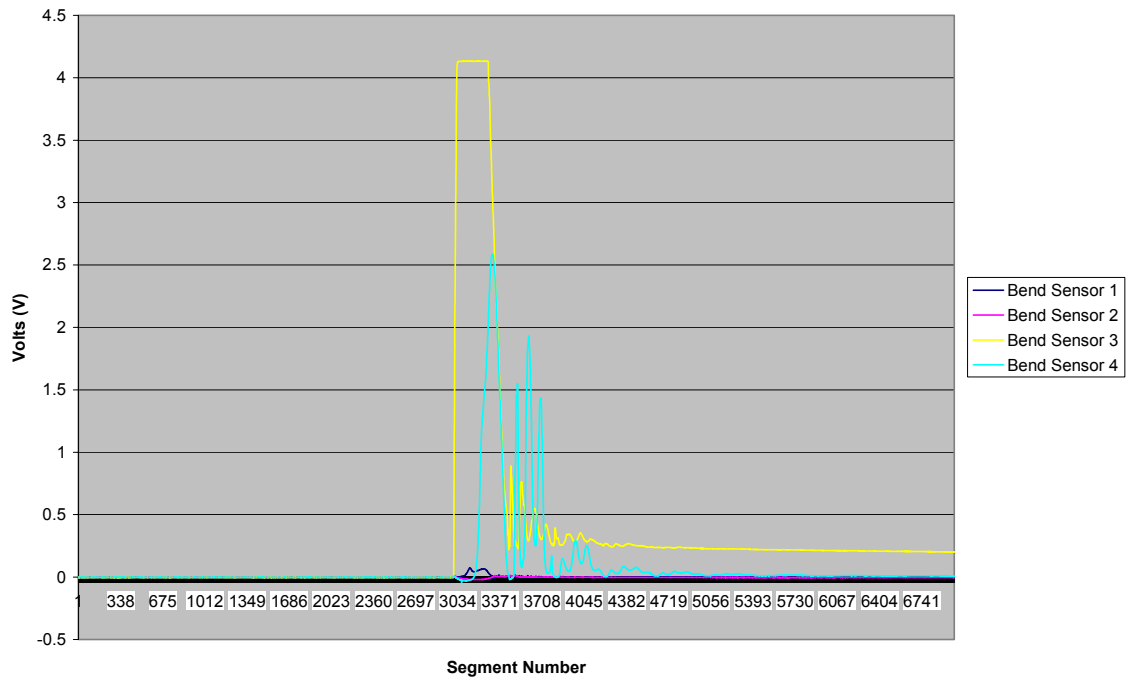
IMPACT SENSOR 5 - LEG & POLE



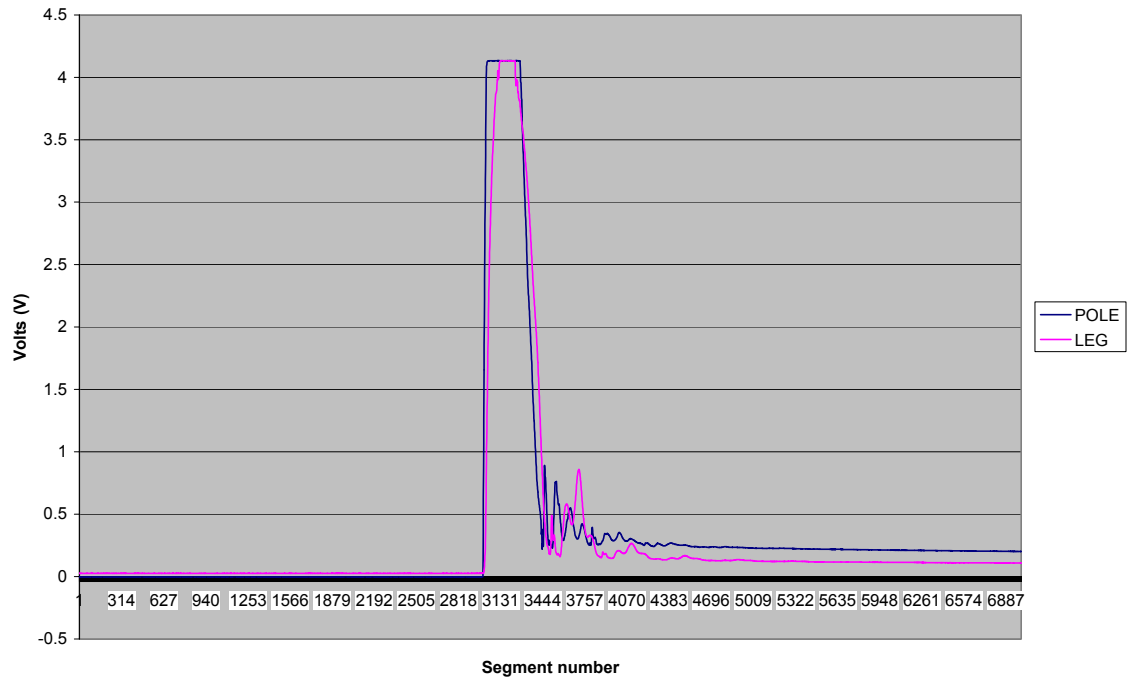
### Leg into Bumper, Sensor 6



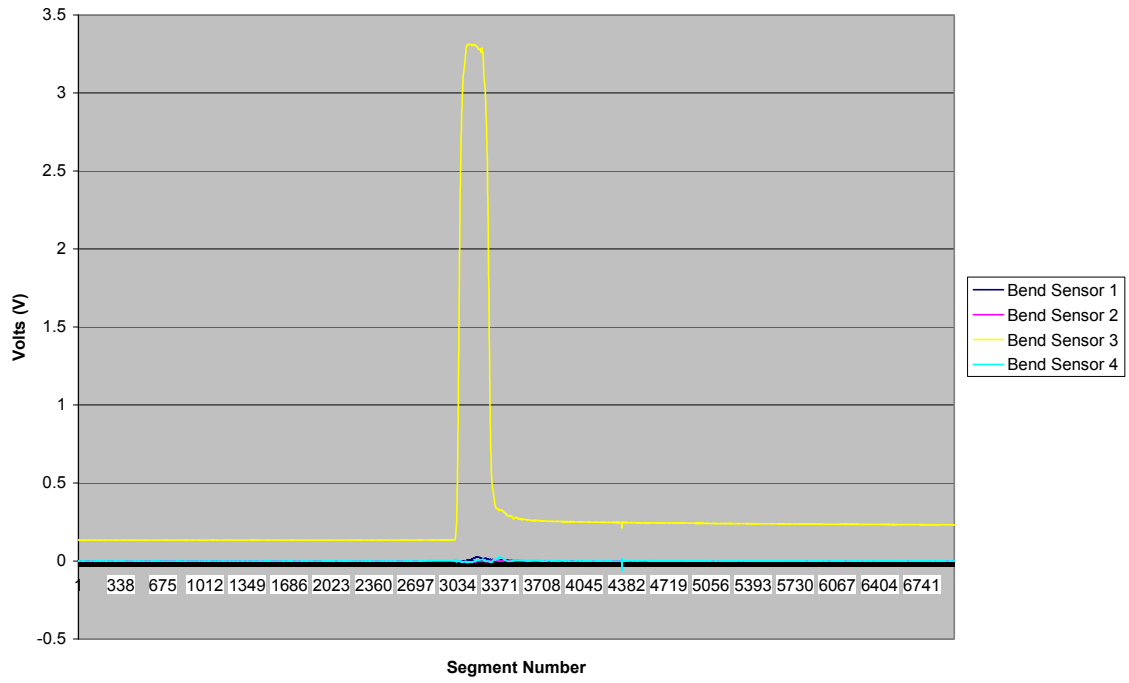
### Pole into Bumper, Sensor 6



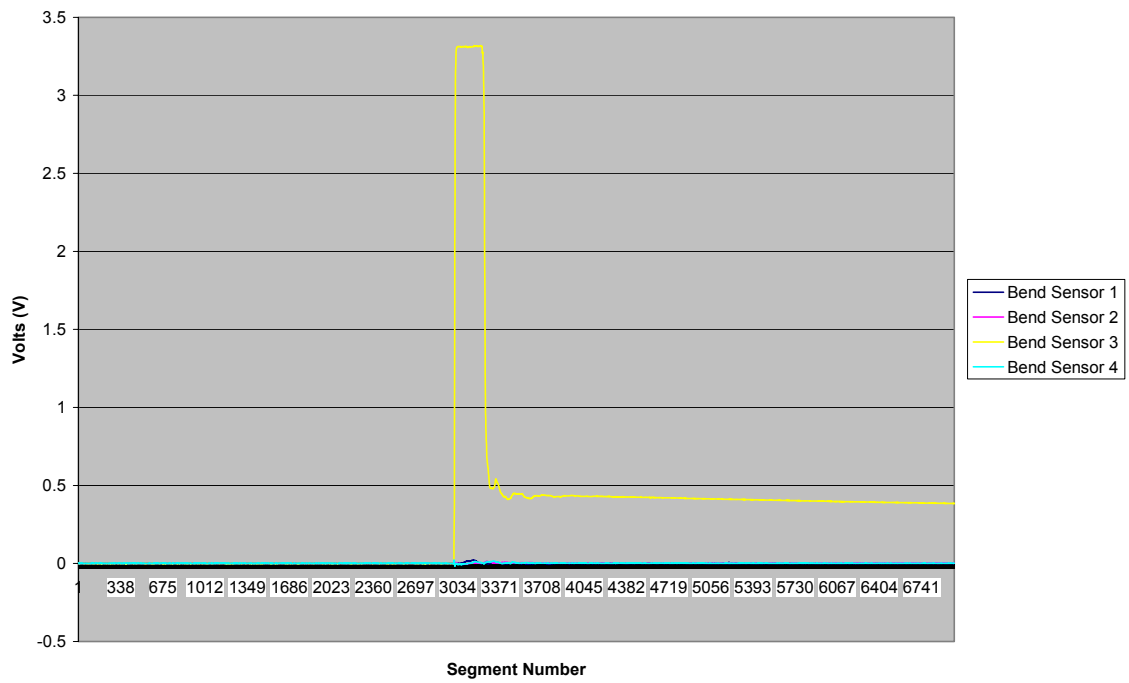
### IMPACT SENSOR 6 - LEG & POLE



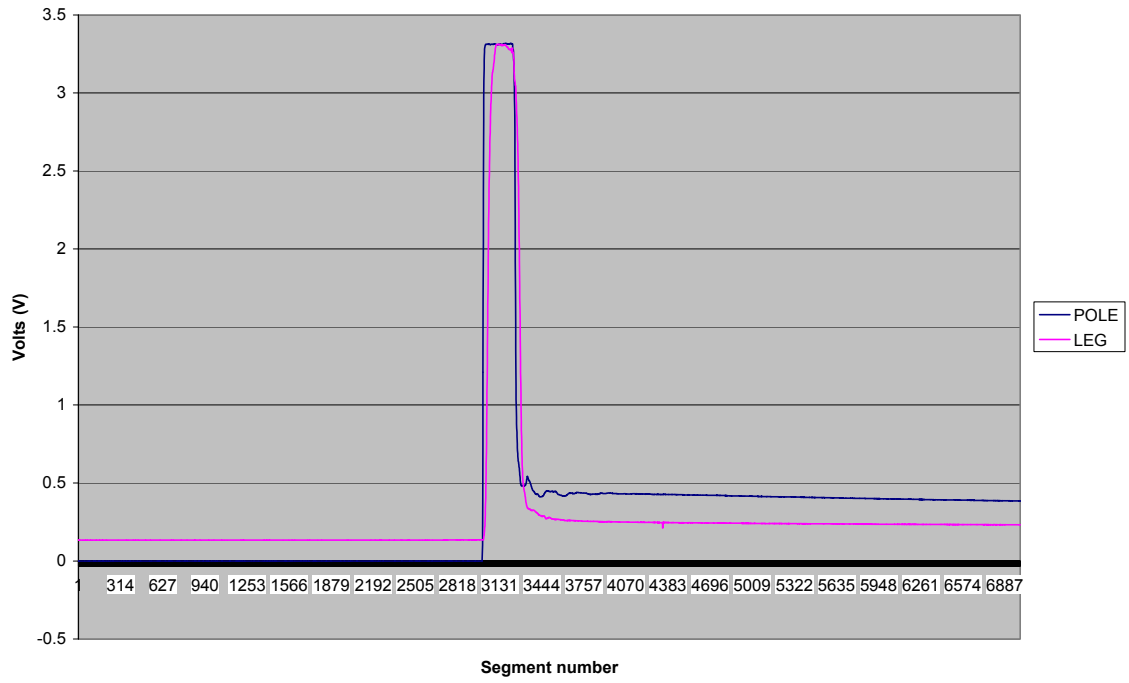
### Leg into Bumper, Sensor 7



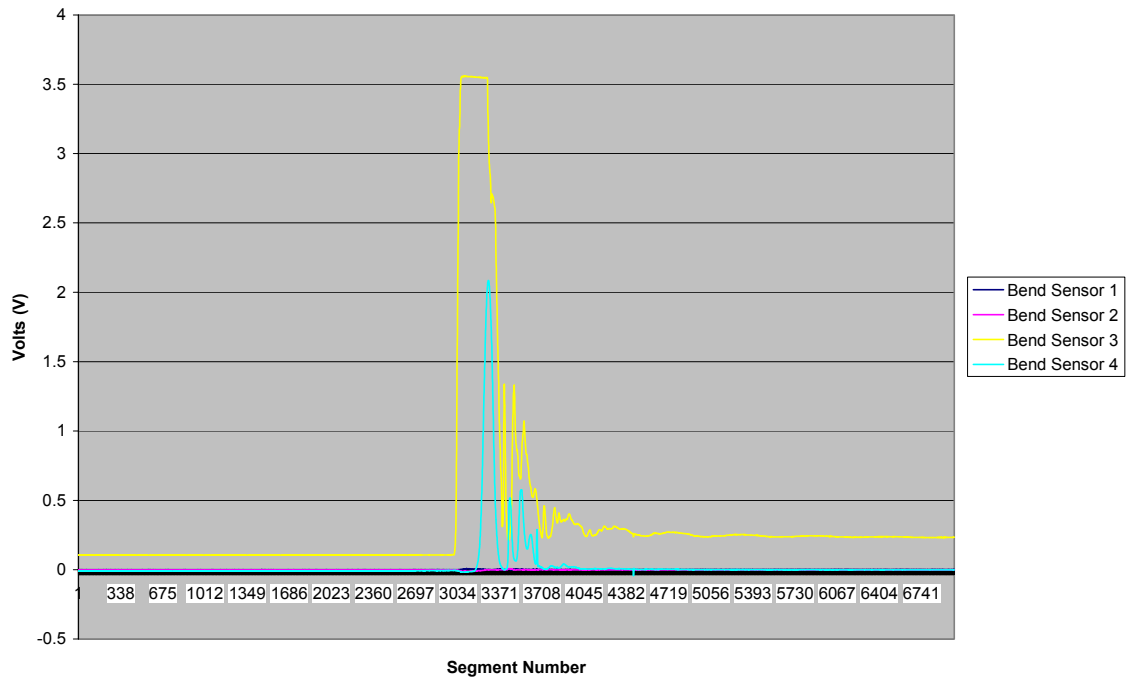
### Pole into Bumper, Sensor 7



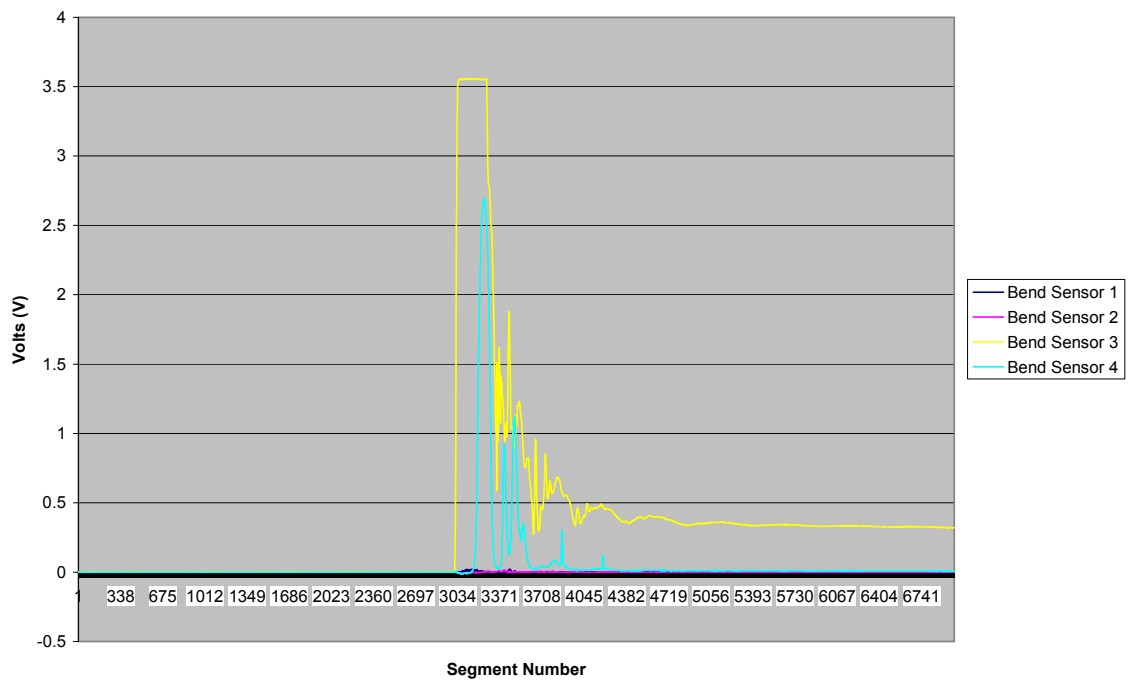
### IMPACT SENSOR 7 - LEG & POLE



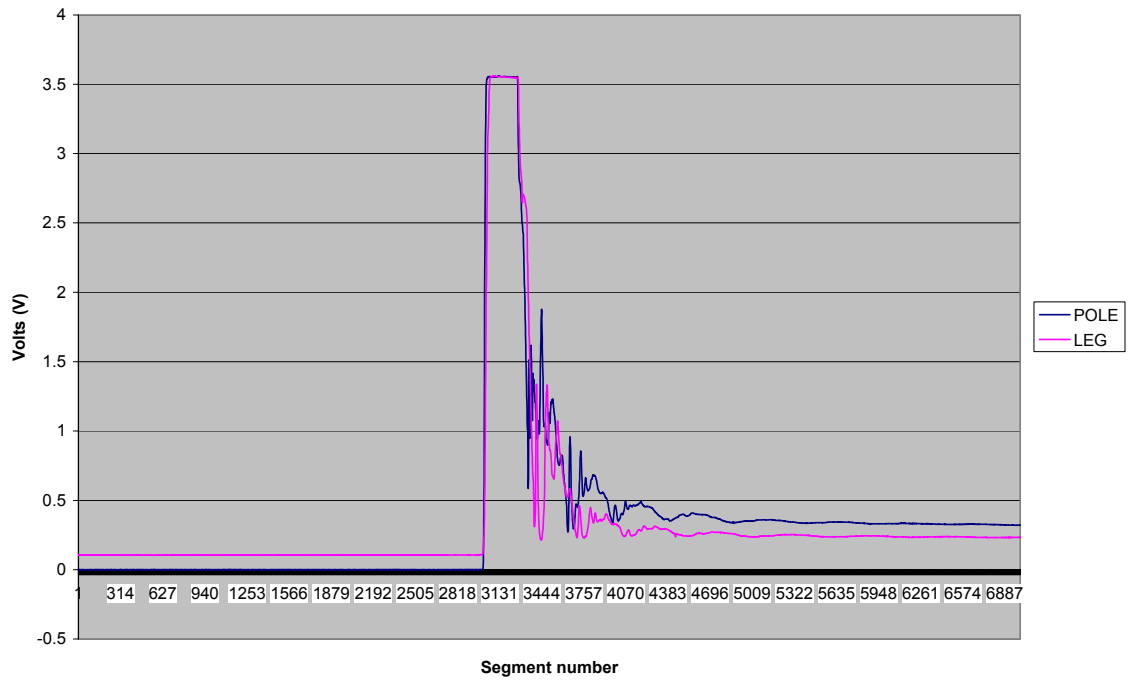
### Leg into Bumper, Sensor 8



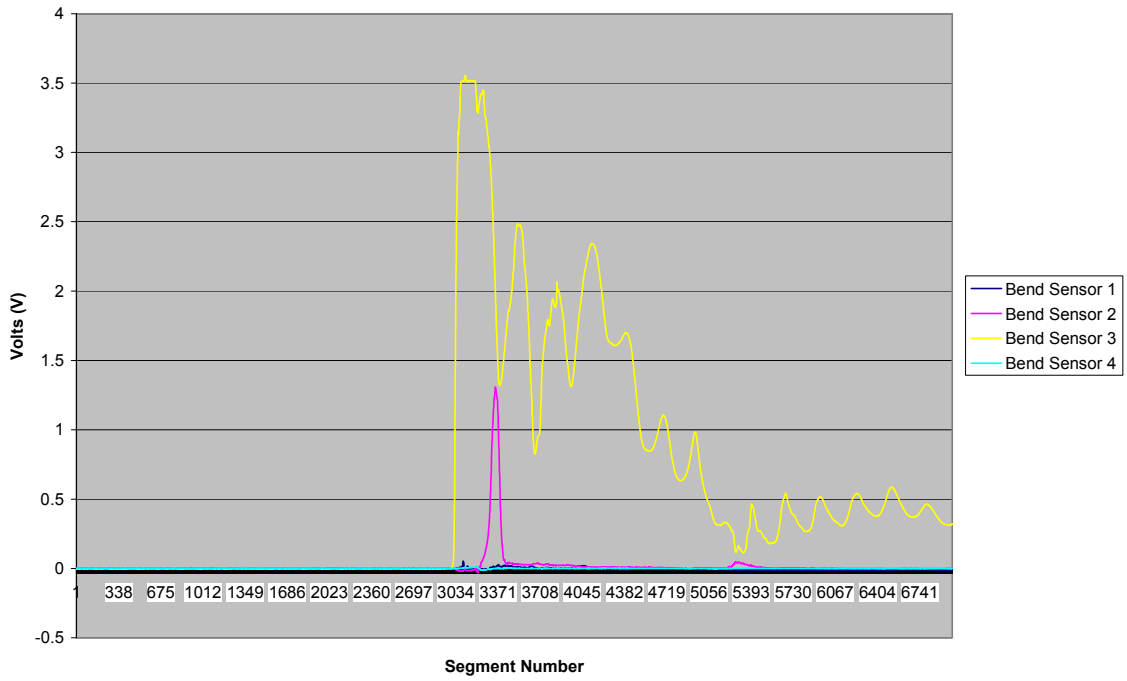
### Pole into Bumper, Sensor 8



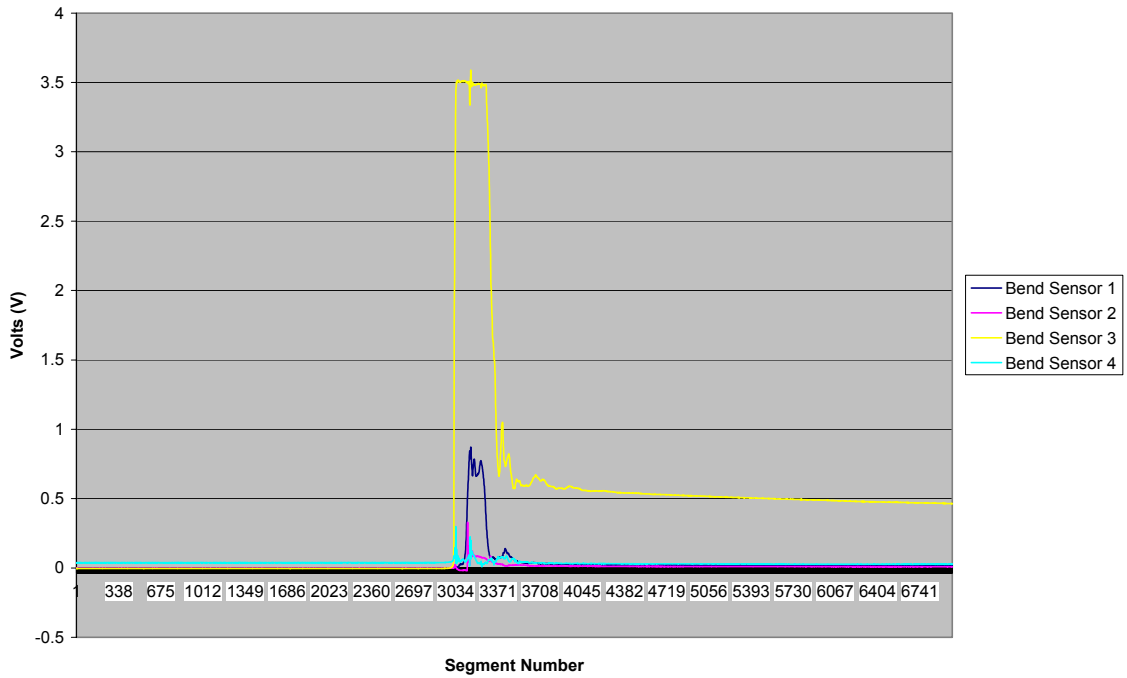
### IMPACT SENSOR 8 - LEG & POLE



### Leg into Bumper, Sensor 9

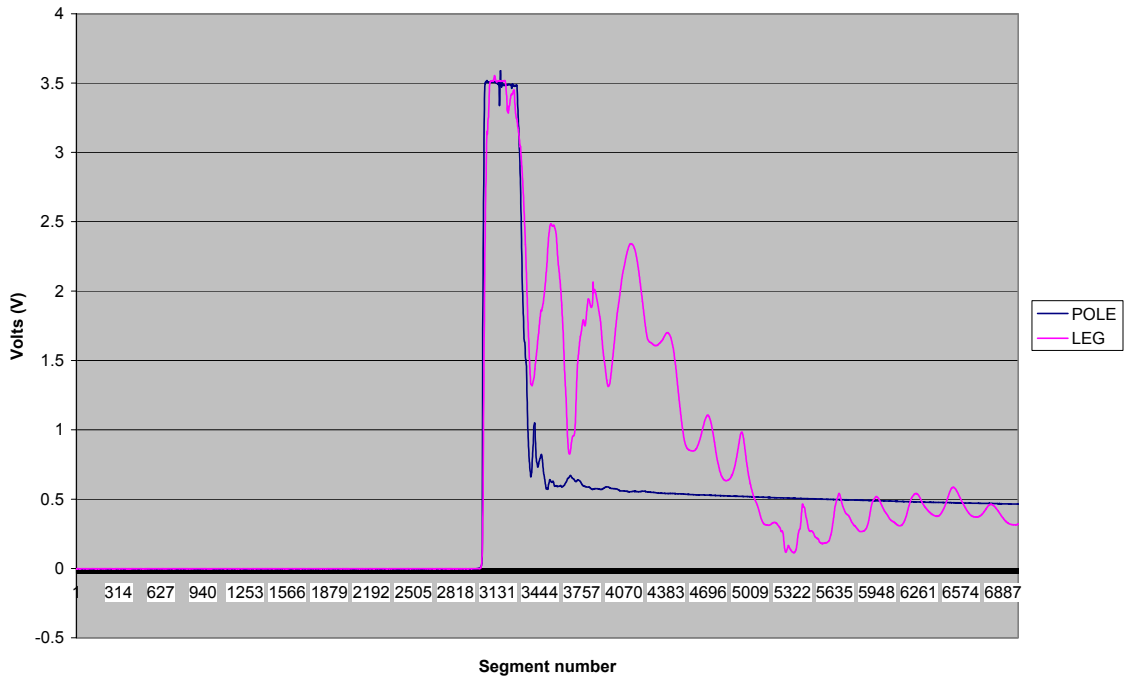


### Pole into Bumper, Sensor 9

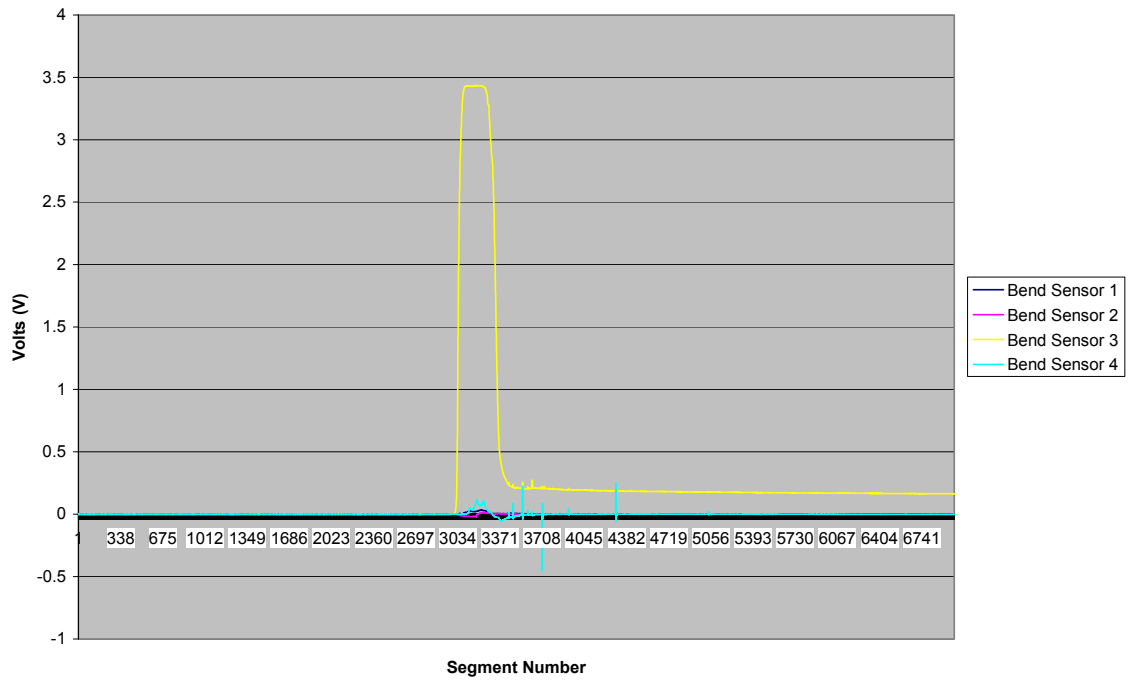




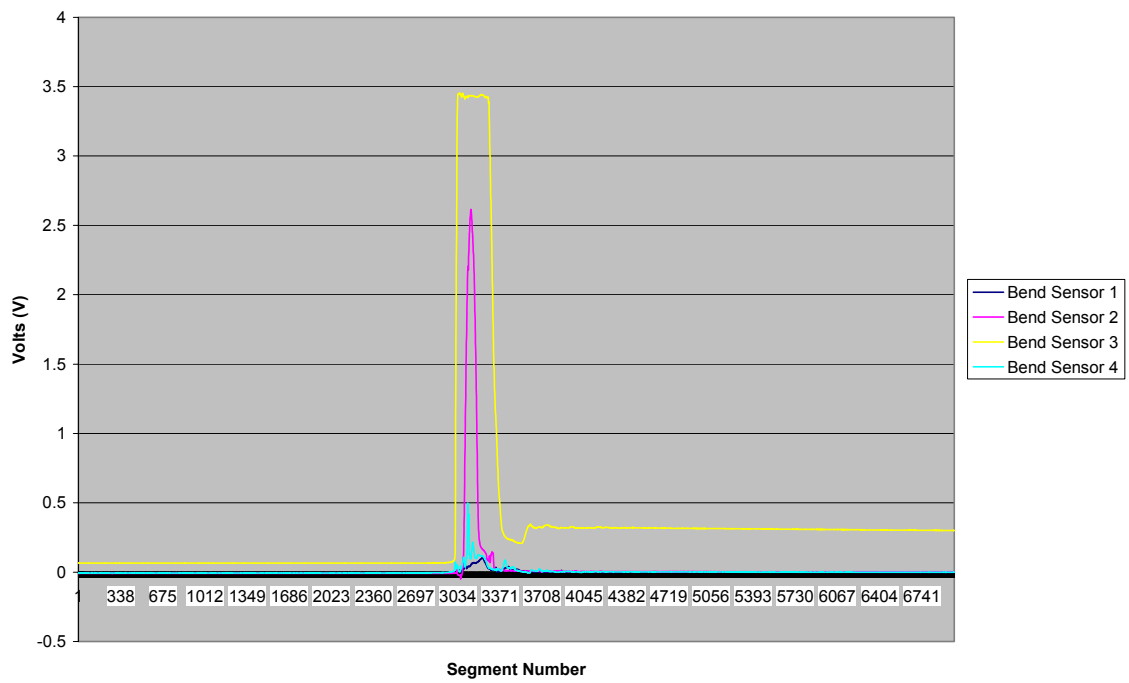
IMPACT SENSOR 9 - LEG & POLE



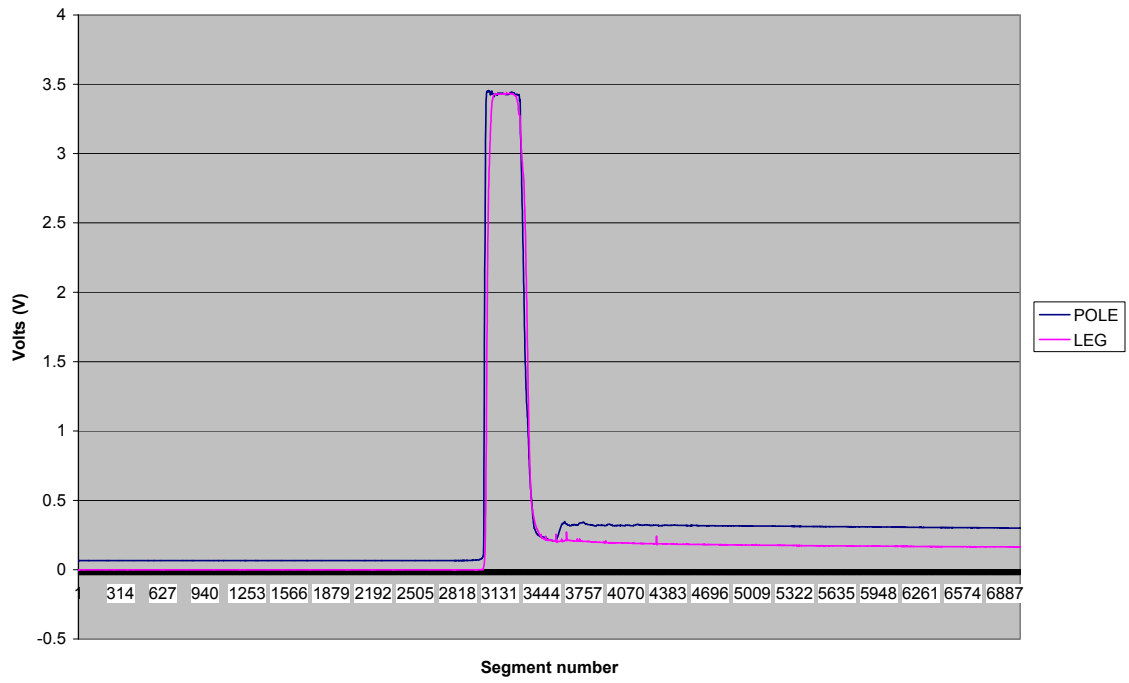
### Leg into Bumper, Sensor 10



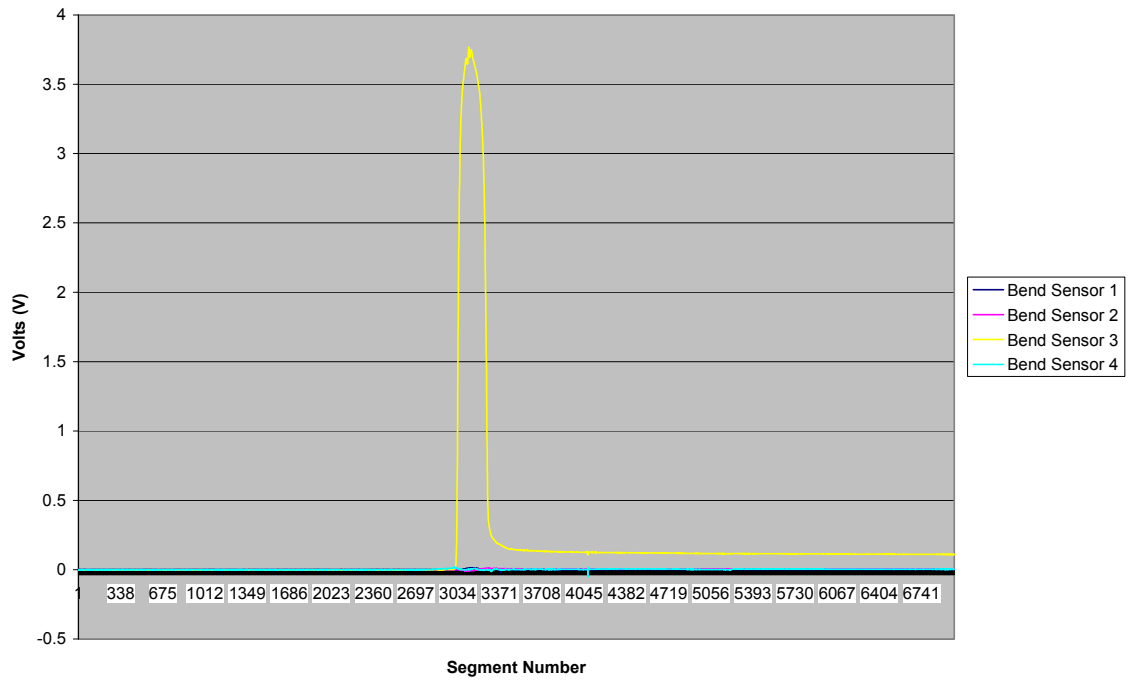
### Pole into Bumper, Sensor 10



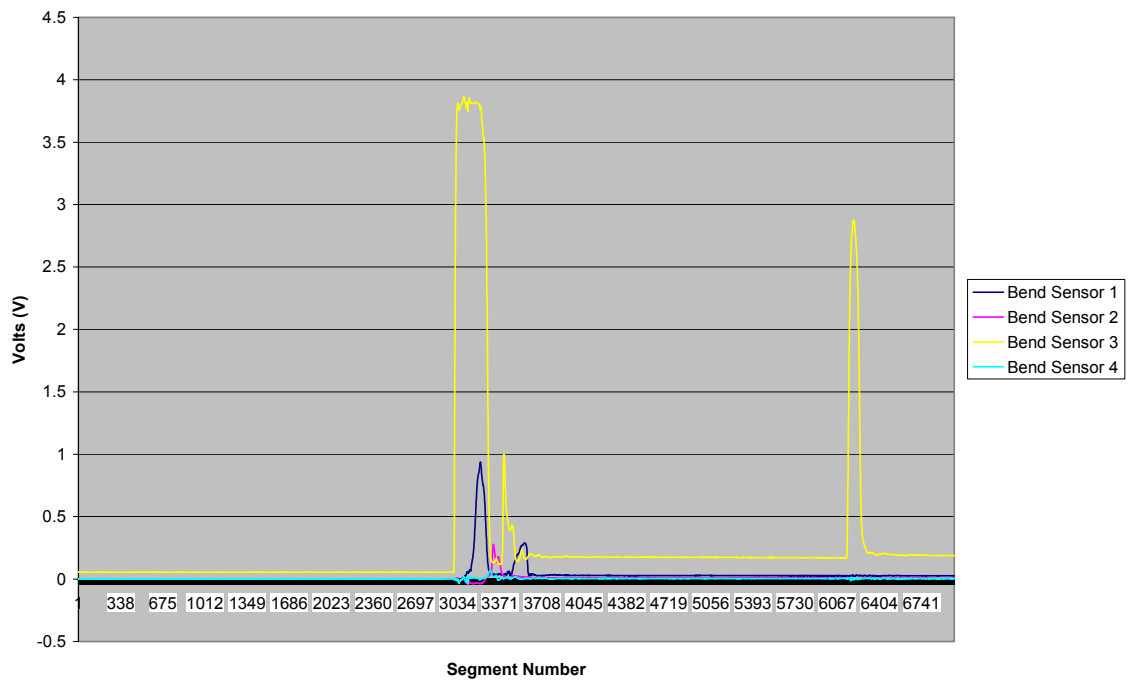
### IMPACT SENSOR 10 - LEG & POLE



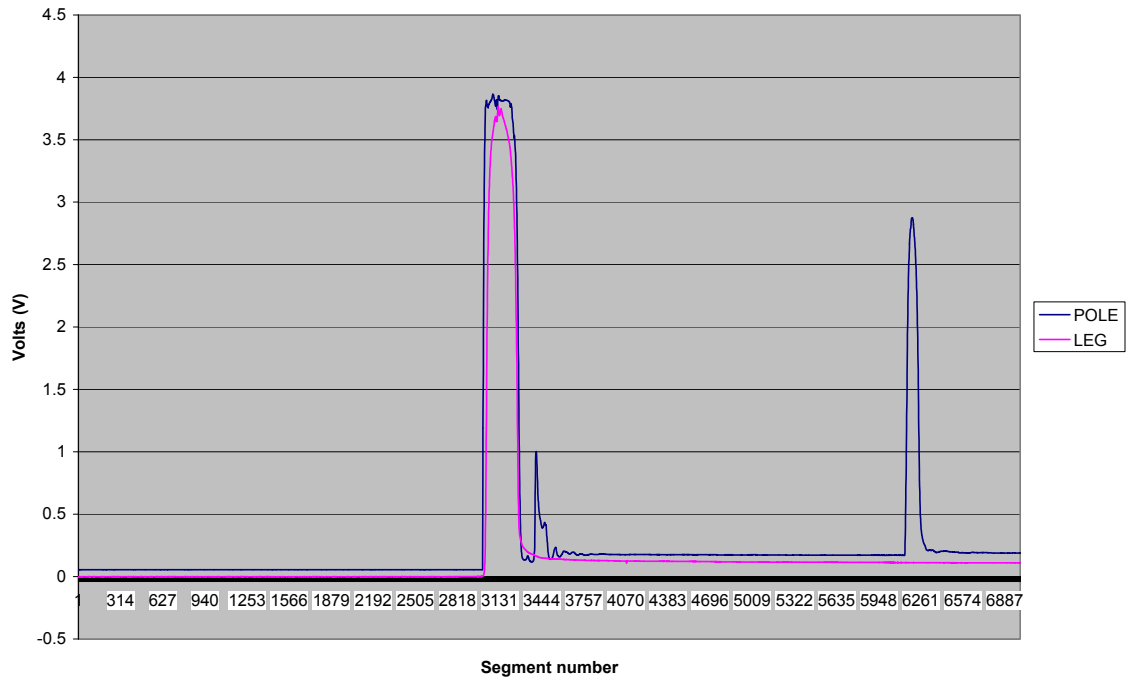
### Leg into Bumper, Sensor 11



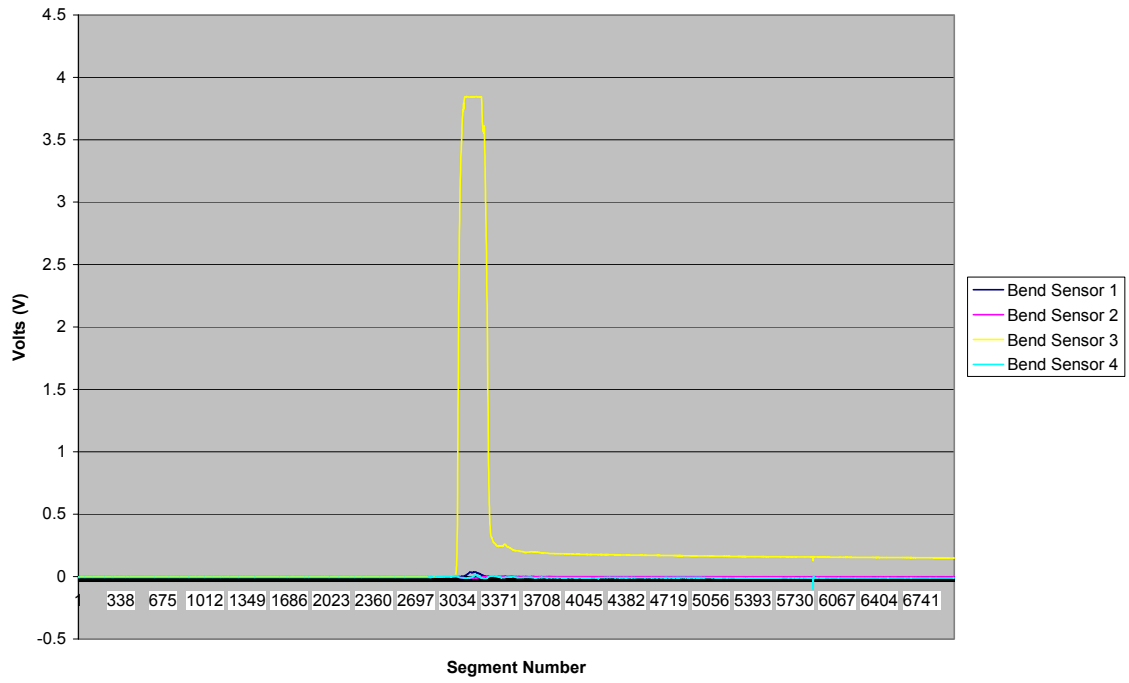
### Pole into Bumper, Sensor 11



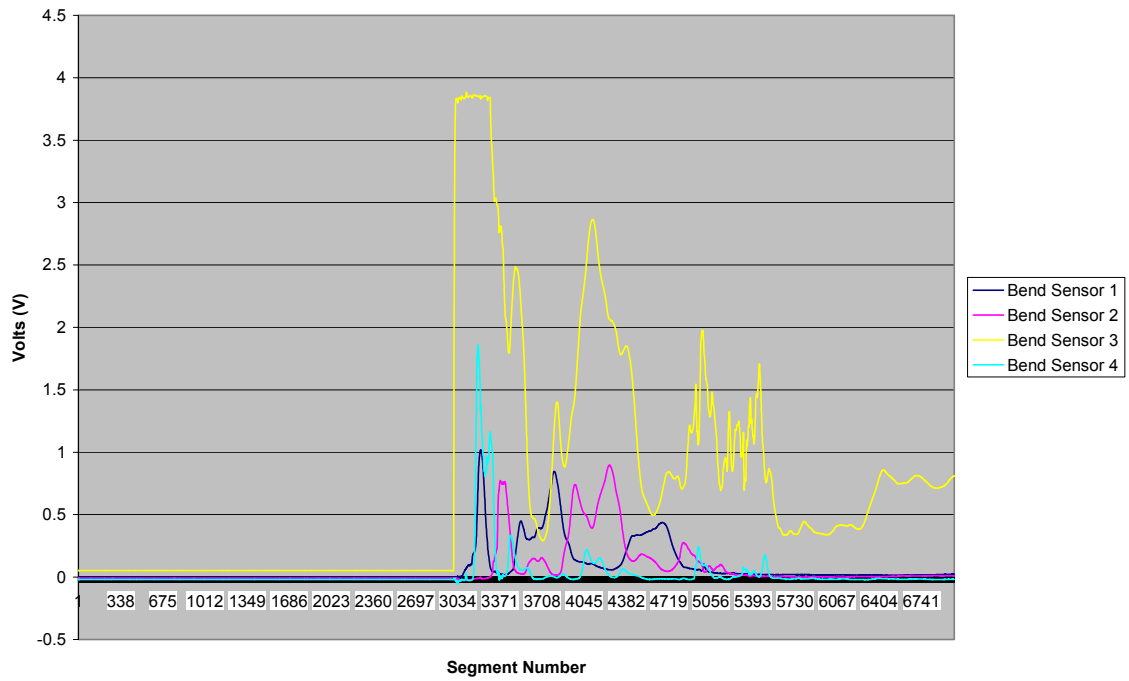
### IMPACT SENSOR 11 - LEG & POLE



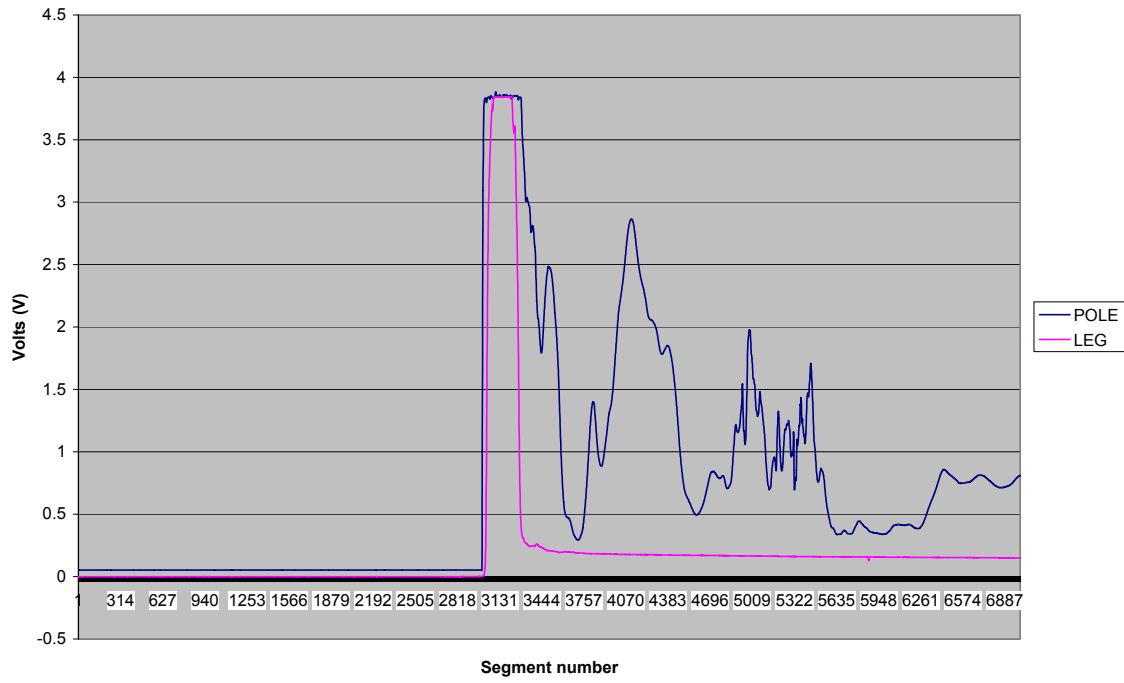
### Leg into Bumper, Sensor 12



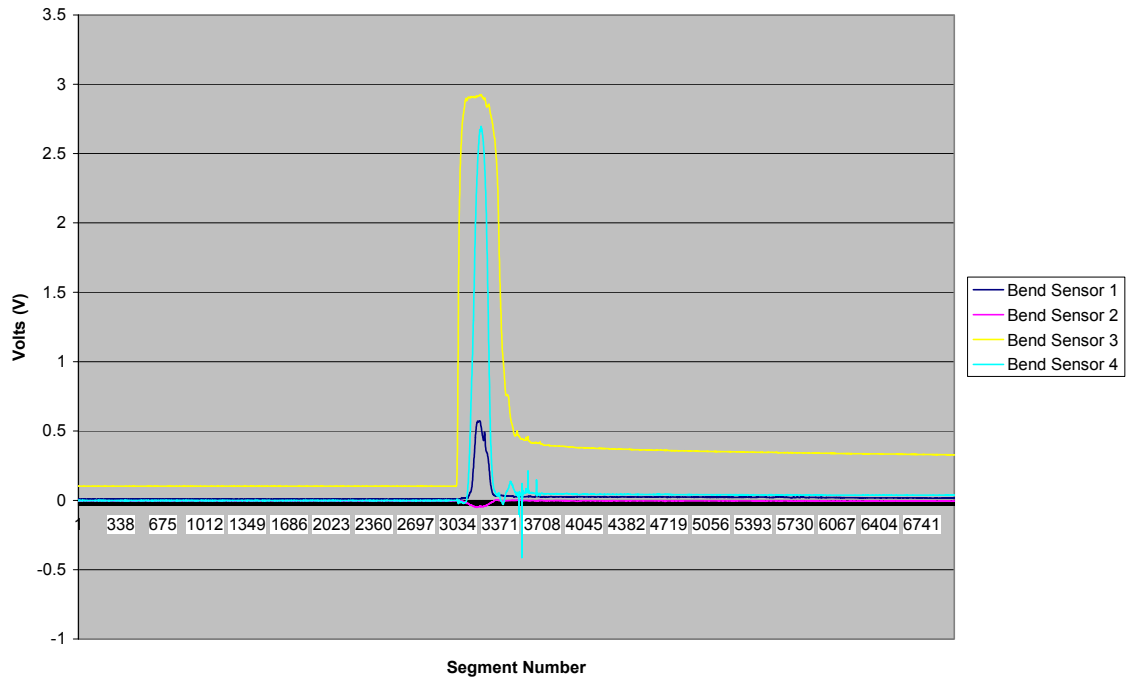
### Pole into Bumper, Sensor 12



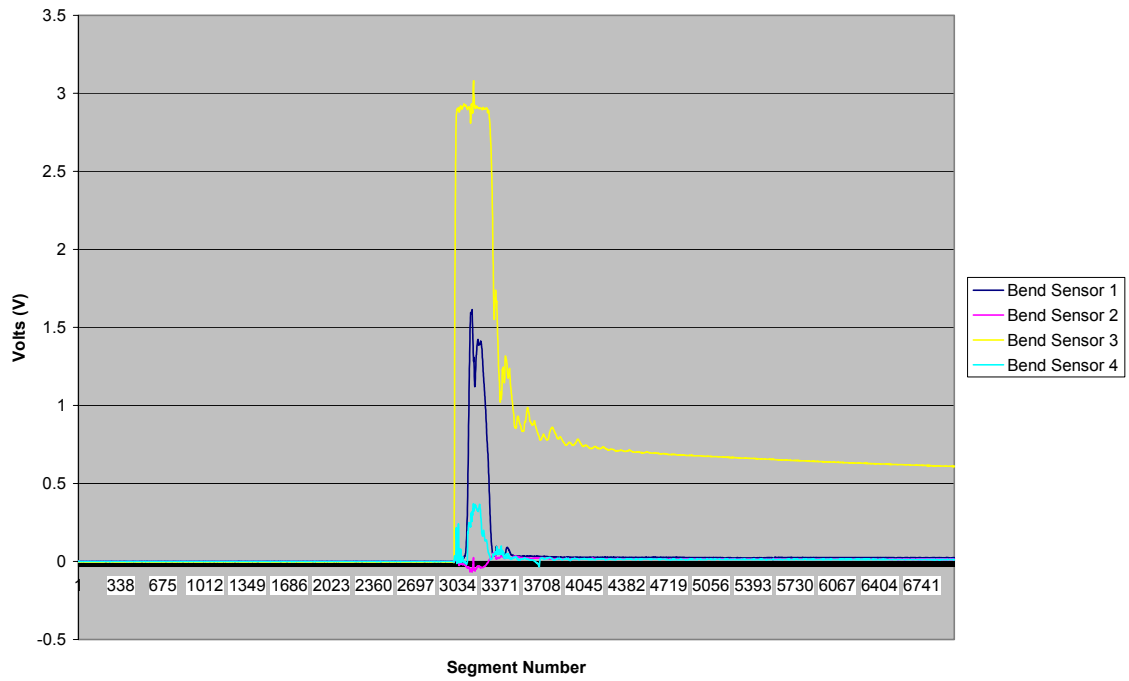
### IMPACT SENSOR 12 - LEG & POLE



### Leg into Bumper, Sensor 13

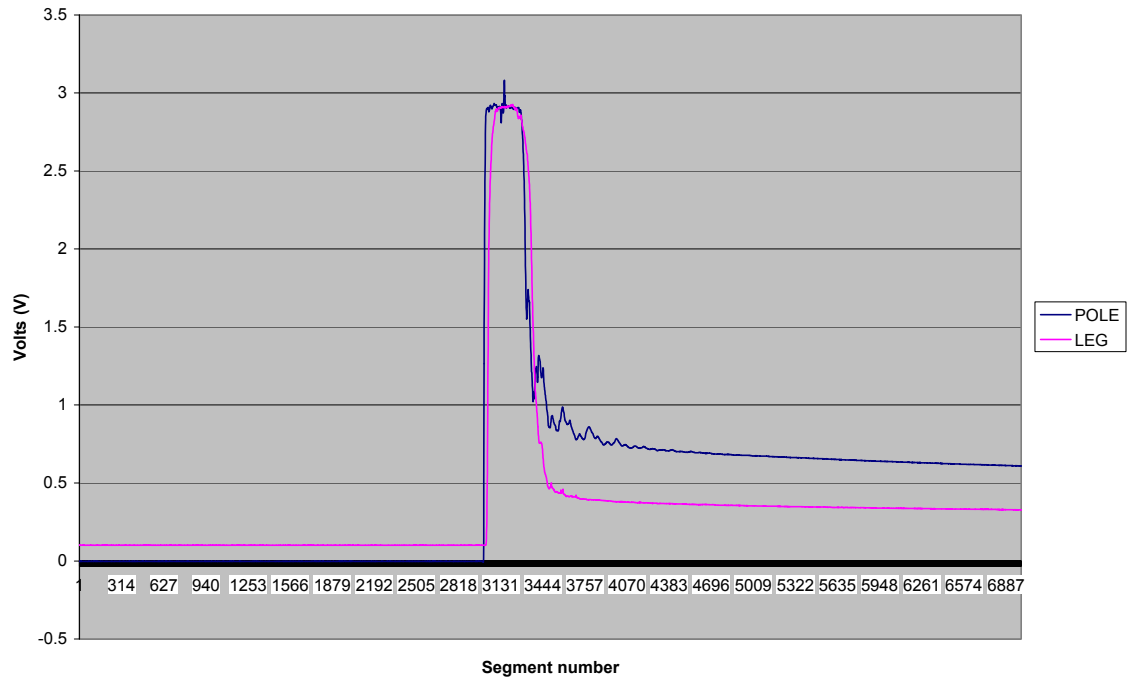


### Pole into Bumper, Sensor 13

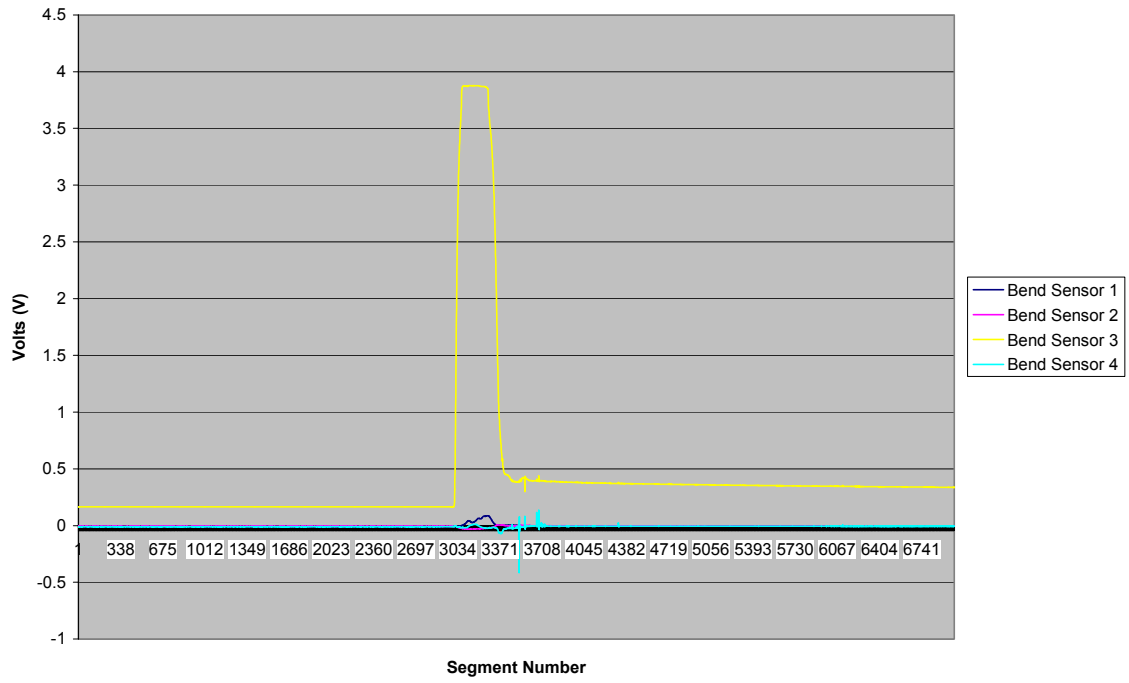




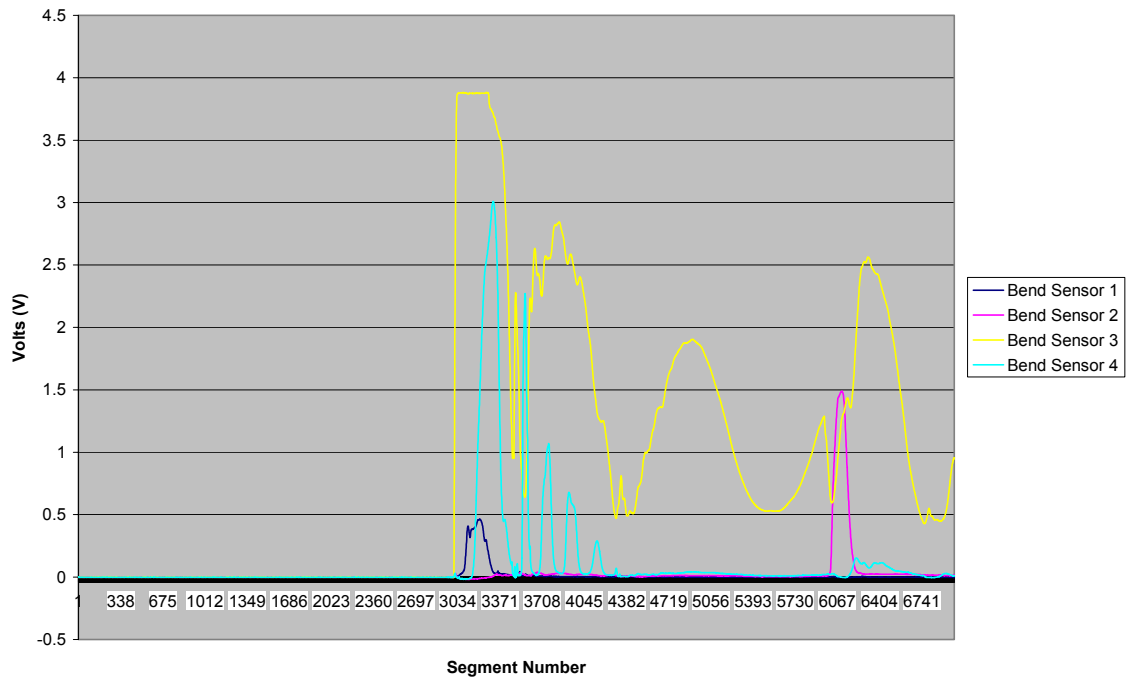
### IMPACT SENSOR 13 - LEG & POLE



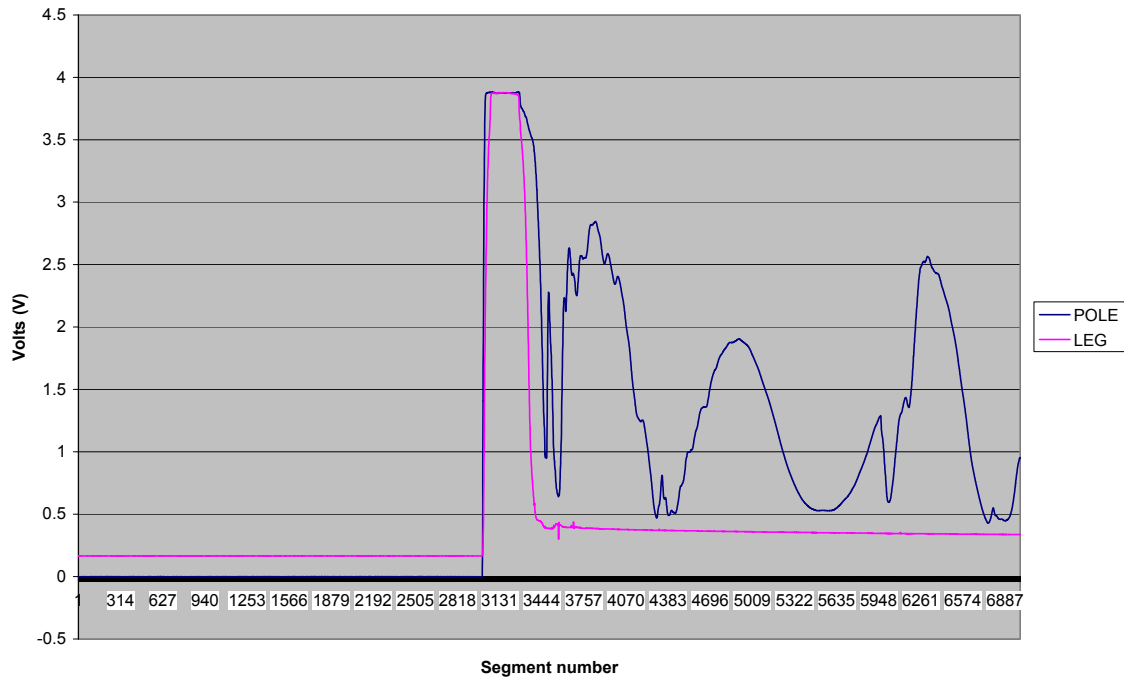
### Leg into Bumper, Sensor 14



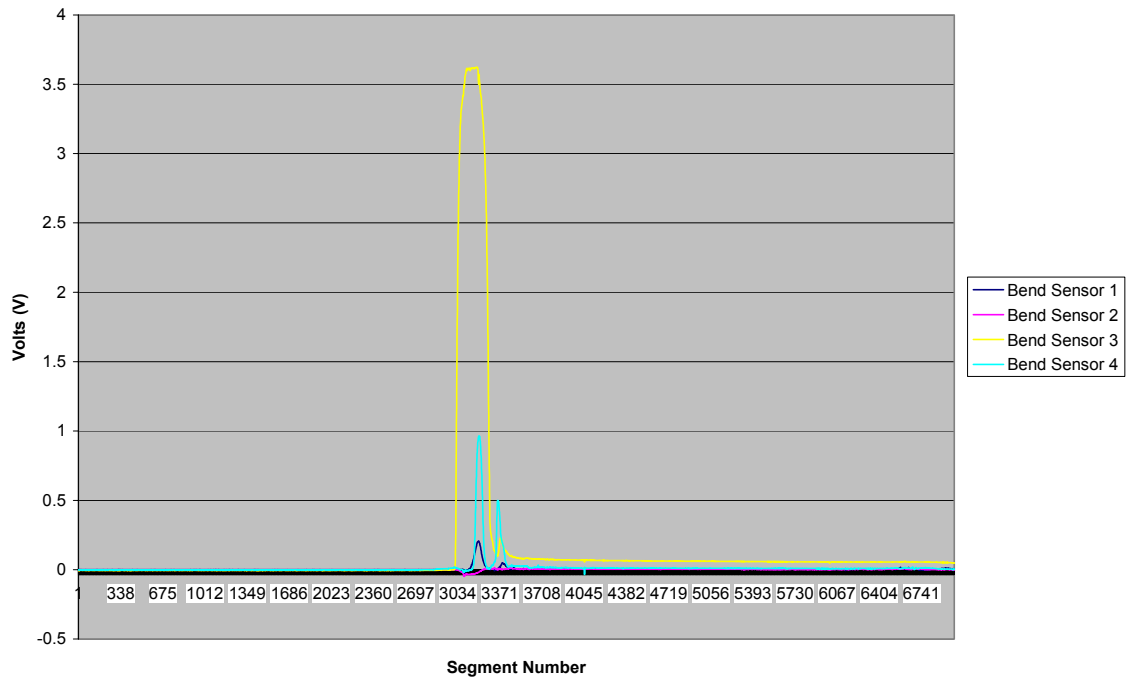
### Pole into Bumper, Sensor 14



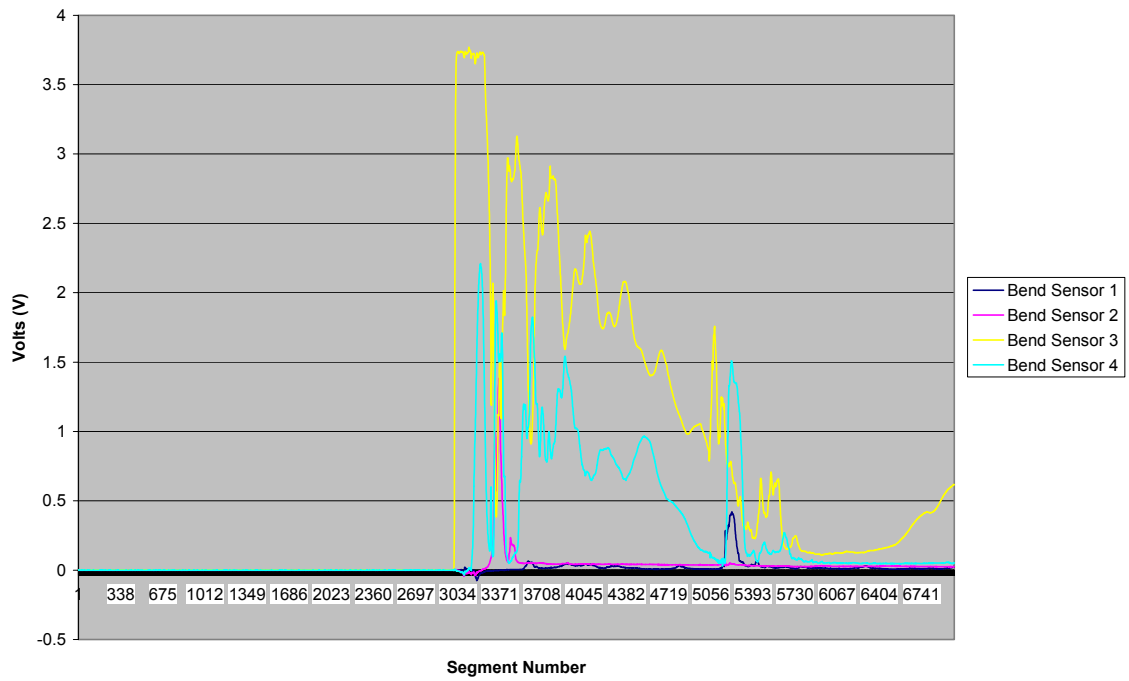
### IMPACT SENSOR 14 - LEG & POLE



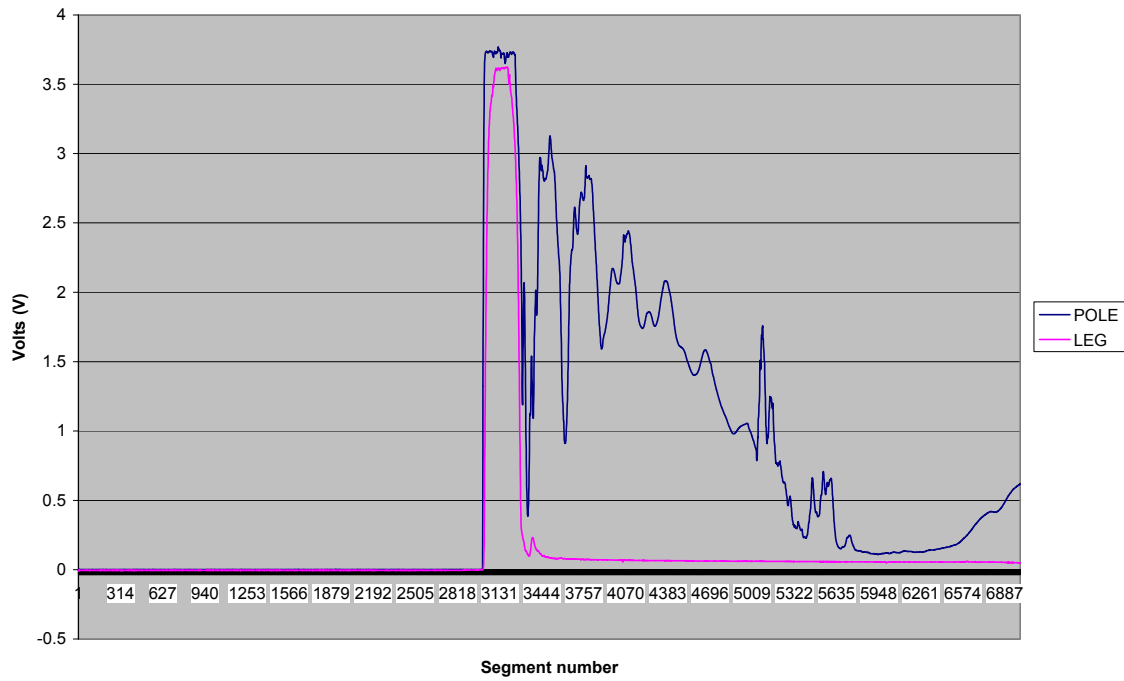
### Leg into Bumper, Sensor 15



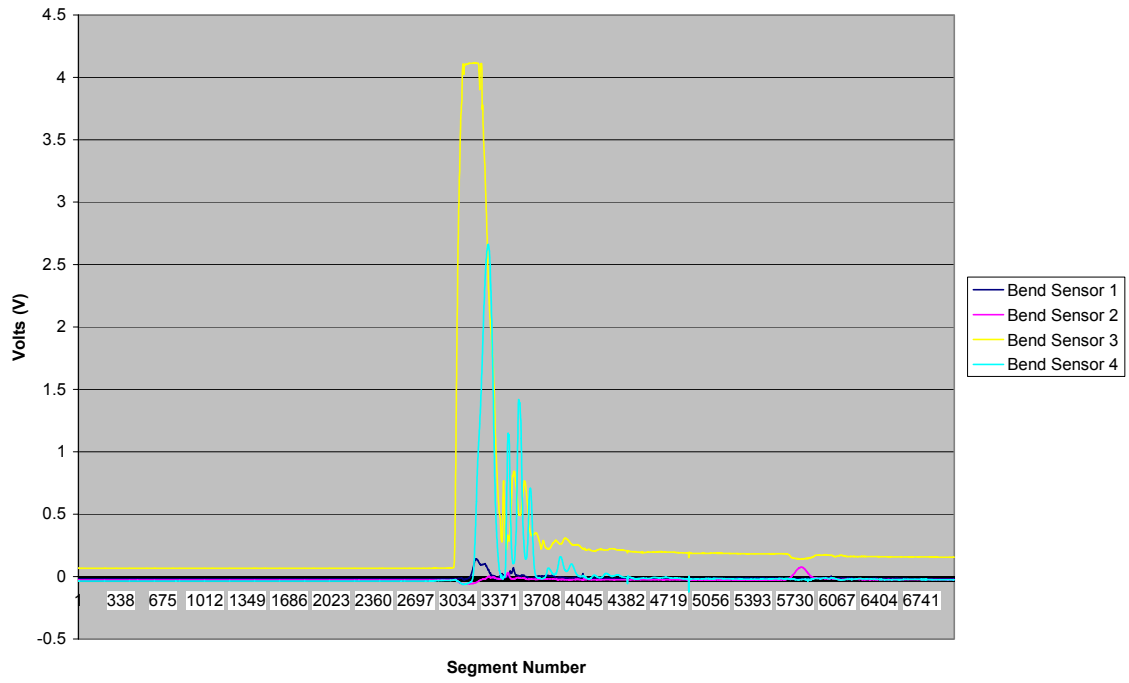
### Pole into Bumper, Sensor 15



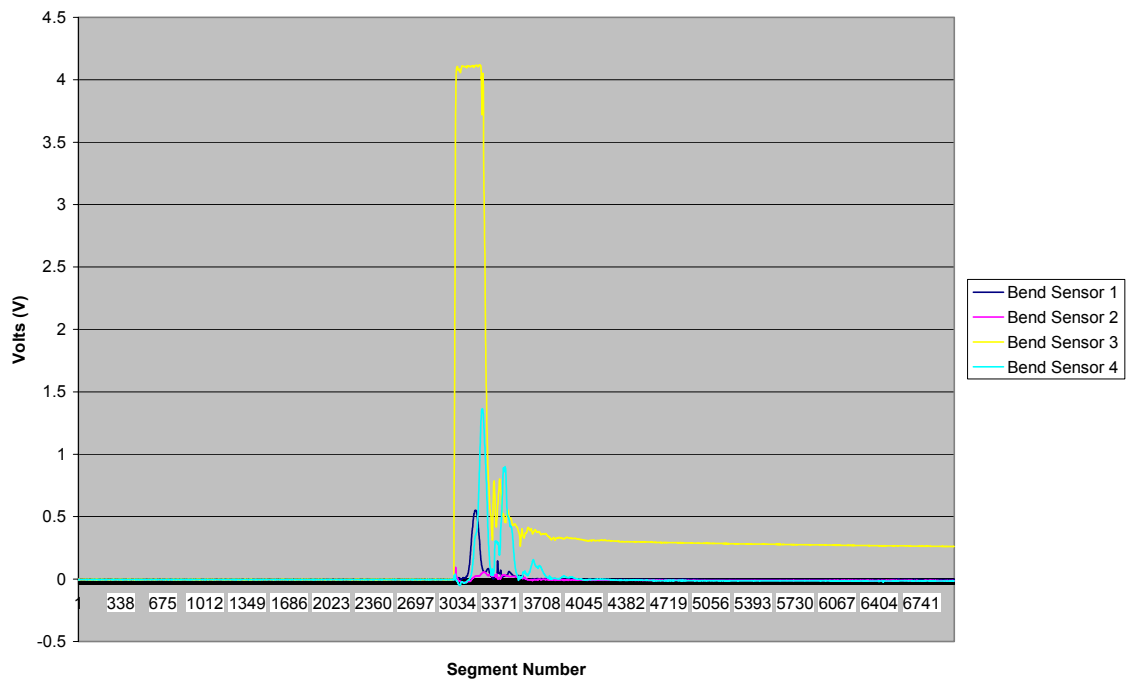
IMPACT SENSOR 15 - LEG & POLE



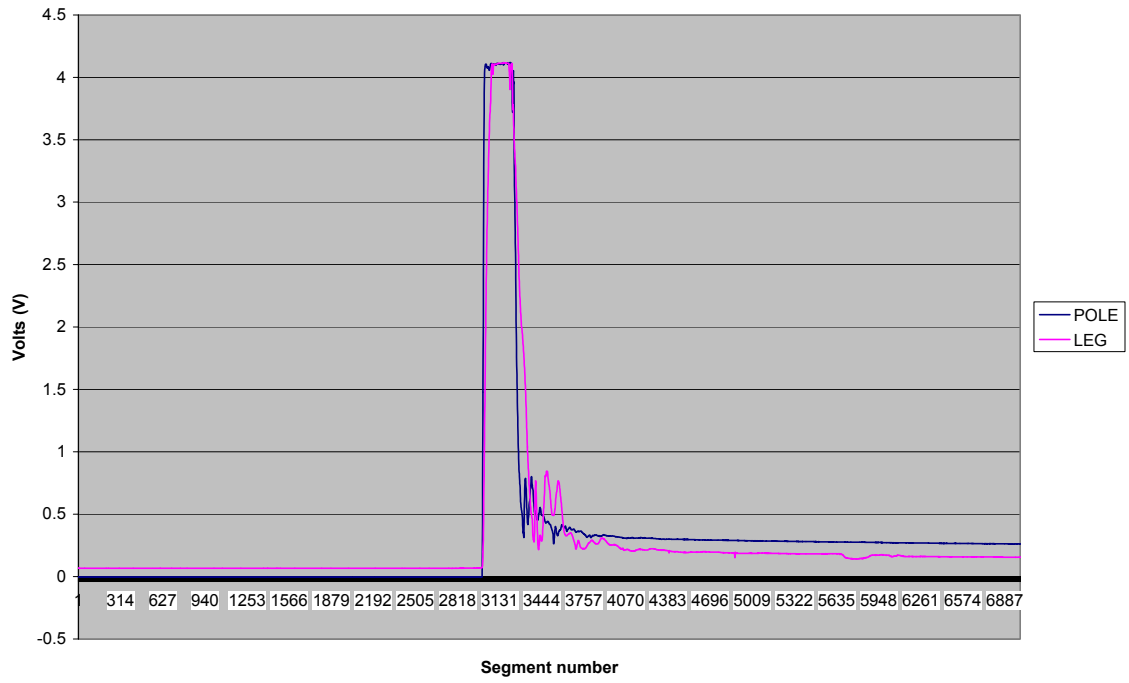
Leg into Bumper, Sensor 16



Pole into Bumper, Sensor 16



### IMPACT SENSOR 16 - LEG & POLE



**SECTION 3**  
**TEST PHOTOGRAPHS**

	<u>Page No.</u>
Photo No. 1 – Linear Impact System Setup	38
Photo No. 2 – Pendulum Impact System Setup	38





Photo No. 1 – Linear Impact System Set-Up



Photo No. 2 – Pendulum Impact System Set-Up