

Evaluation of the PCB 3991 Accelerometer

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(Work performed by Danny Frew and Henry Duong)

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Sandia National Laboratories



Sandia National Laboratories

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.



Purpose

PCB Accelerometer Evaluation

Joint Munitions Project/TCG-X

- Hard Target Data Recorders and Fuzes require the use of sensors that survive the impact environment
 - Has been a problem in the past
- Evaluate the performance of a new accelerometer (PCB 3991) against the traditional sensor (Endevco 7270A)
- Make performance assessment



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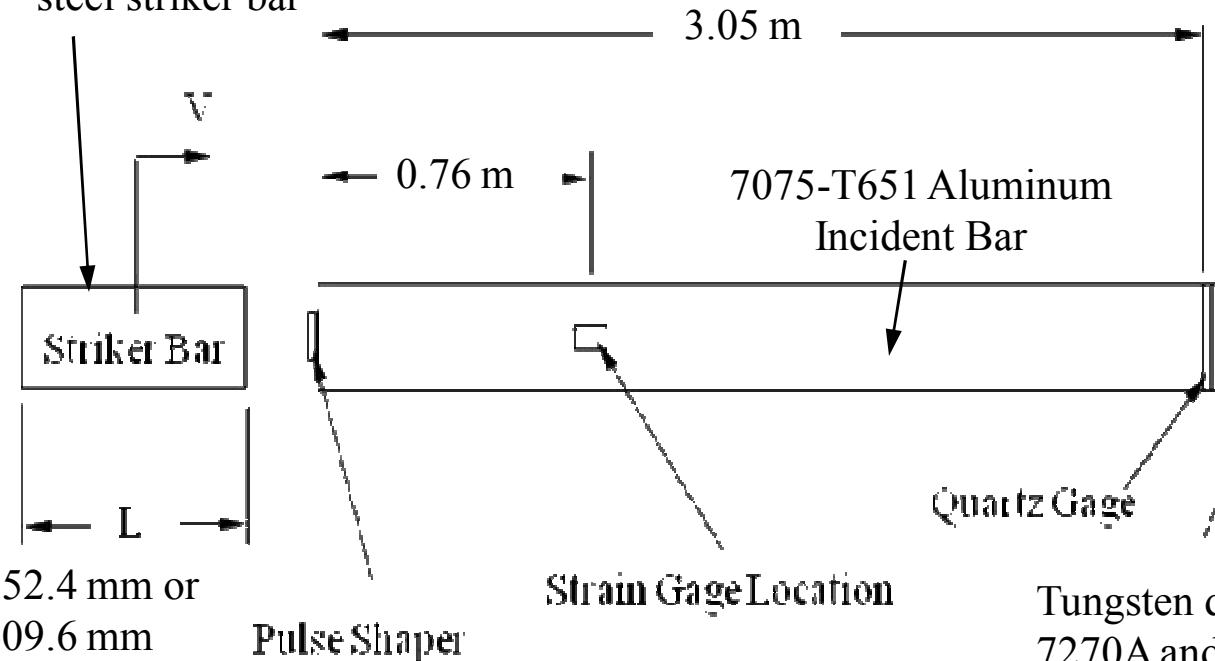


Test Setup

PCB Accelerometer Evaluation

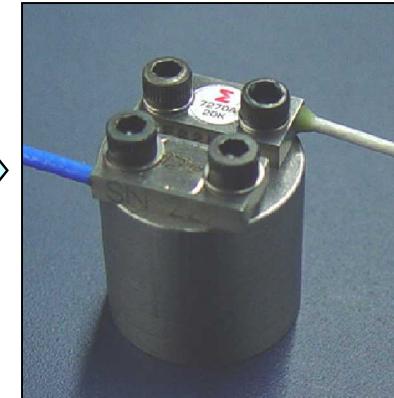
Maraging steel C350
steel striker bar

All diameters 19.05 mm



Joint Munitions Project/TCG-X

Tungsten disk & Endevco
7270A and PCB 3991
accelerometers



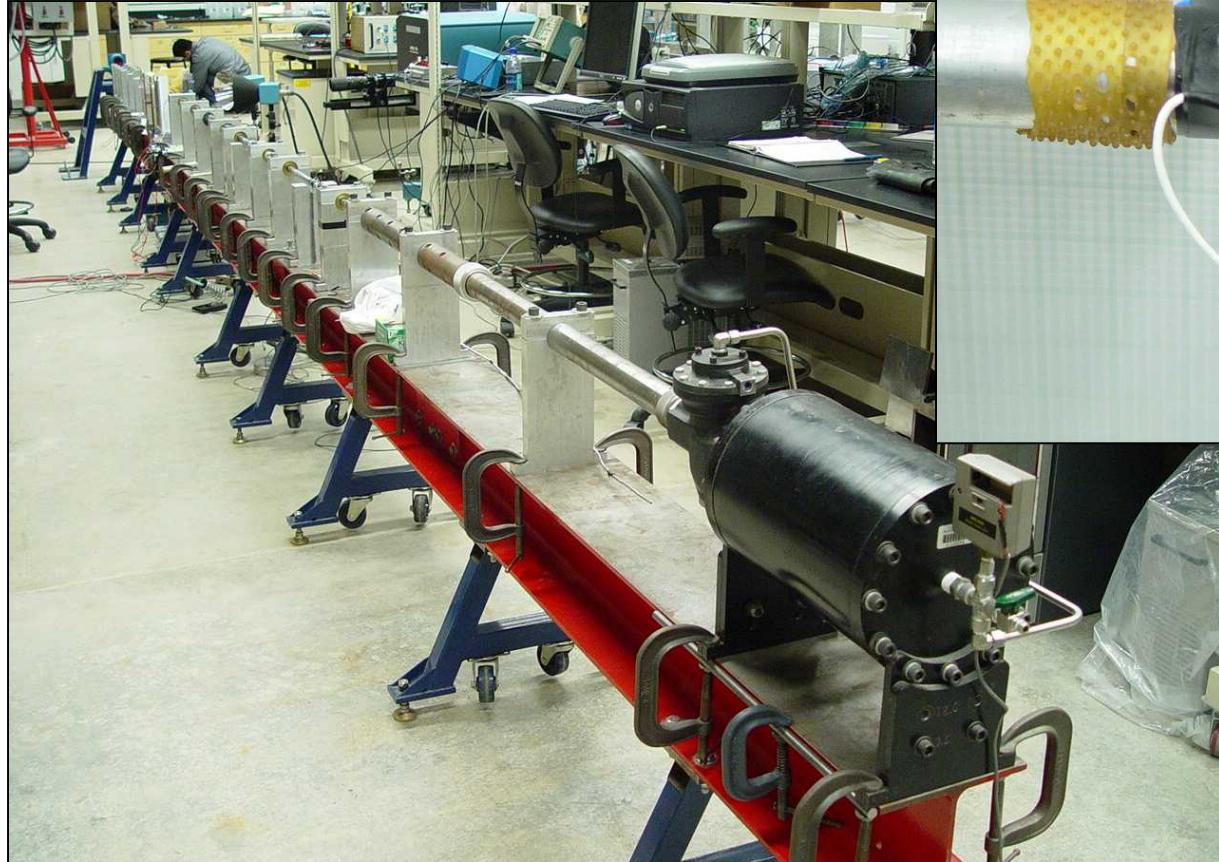
Split Hopkinson Pressure Bar or Kolsky Bar

(Performed at Purdue University in Cooperation with Dr. Wayne Chen)

Pictures of Lab and Setup

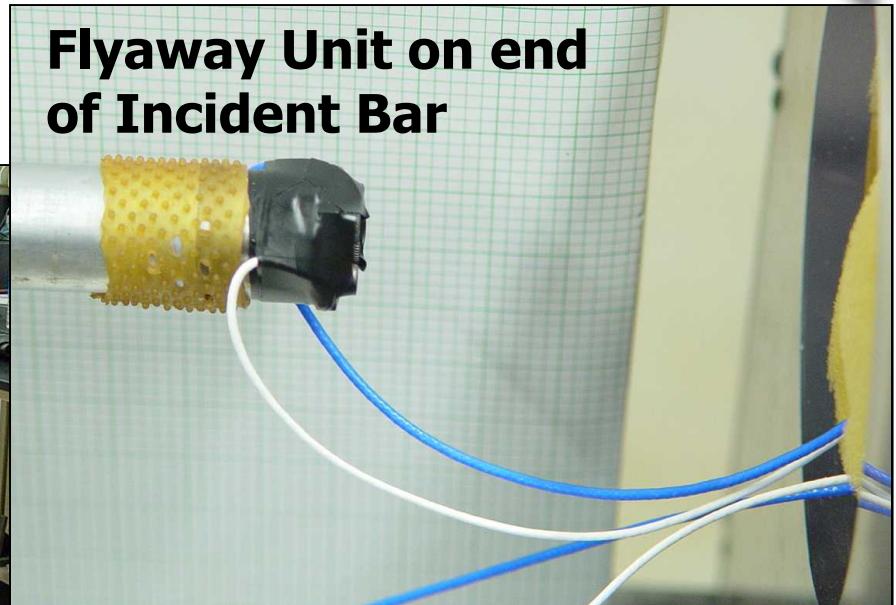
PCB Accelerometer Evaluation

Purdue Kolsky Bar Lab



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Flyaway Unit on end of Incident Bar



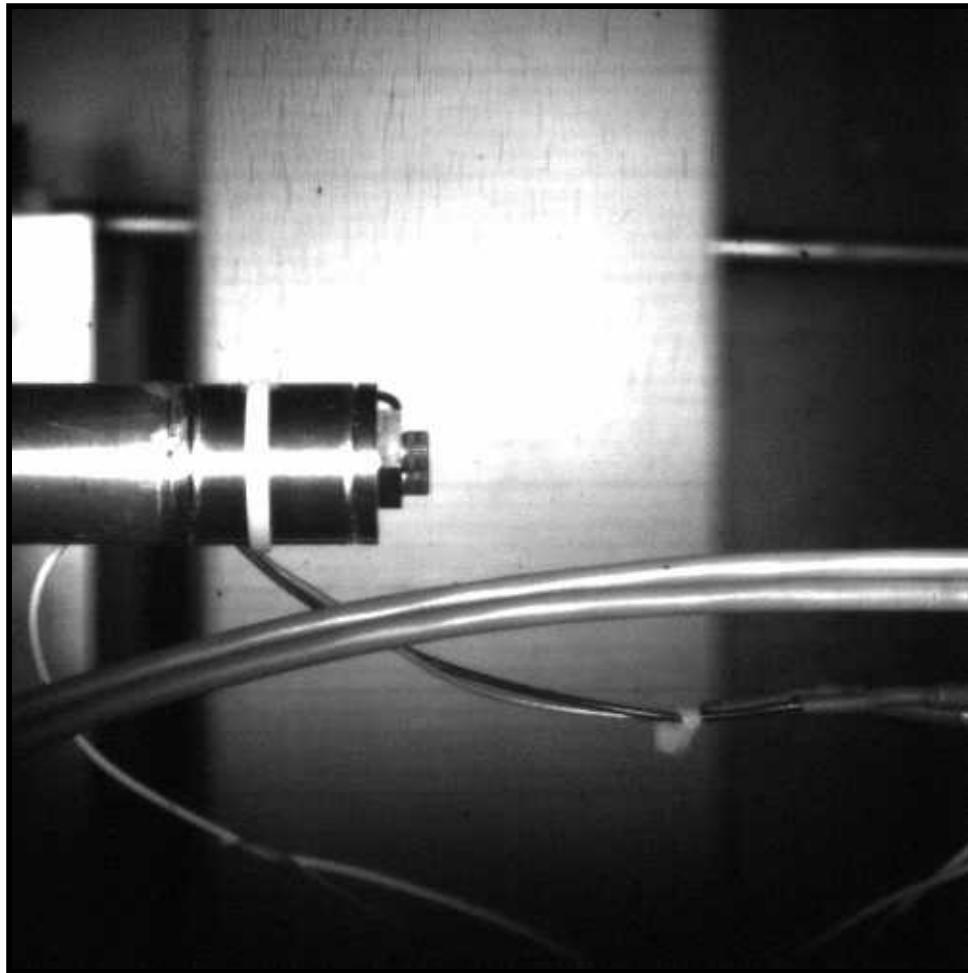
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Example from other testing

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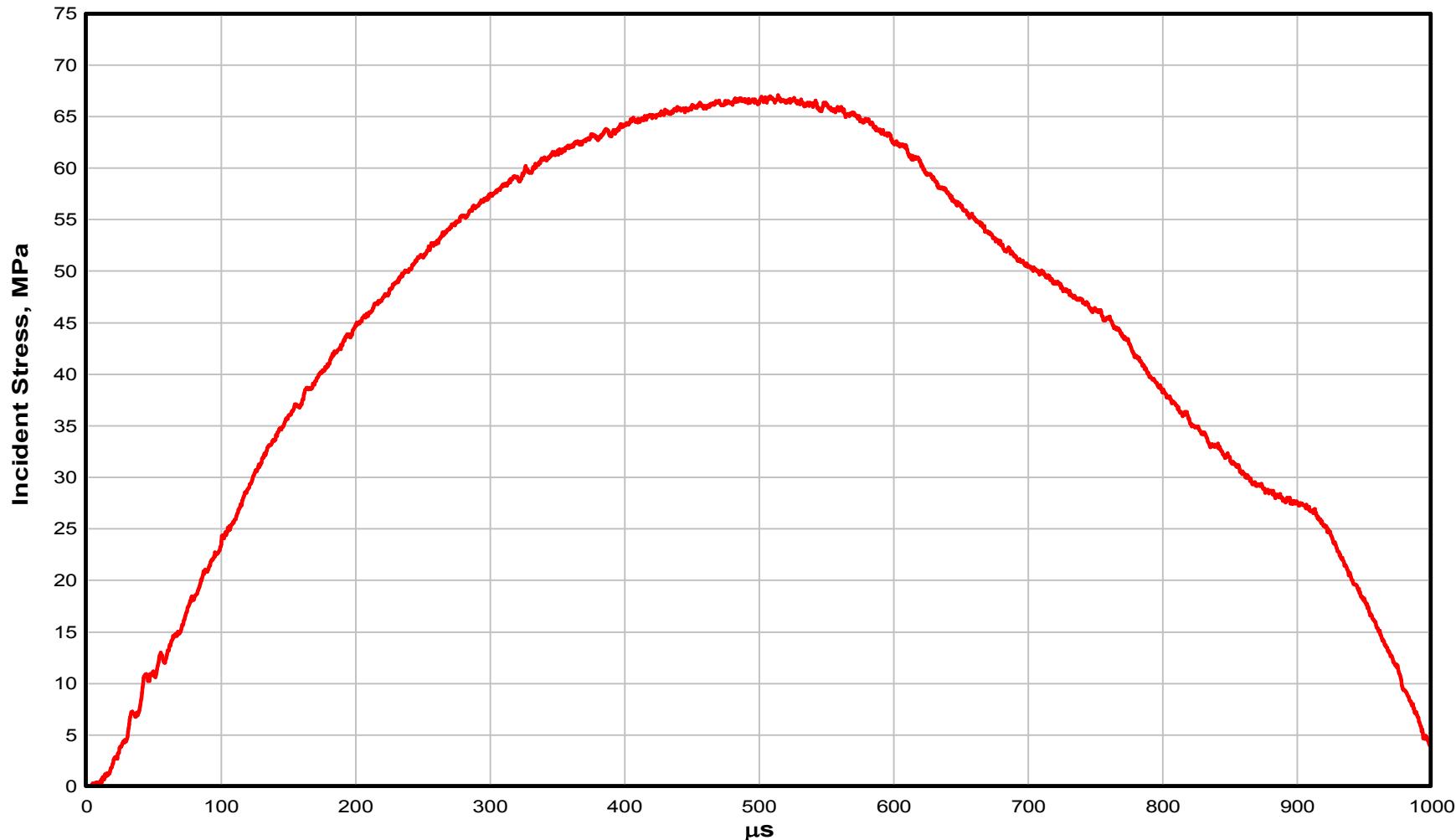
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Low Level Incident Stress Pulse

PCB Accelerometer Evaluation

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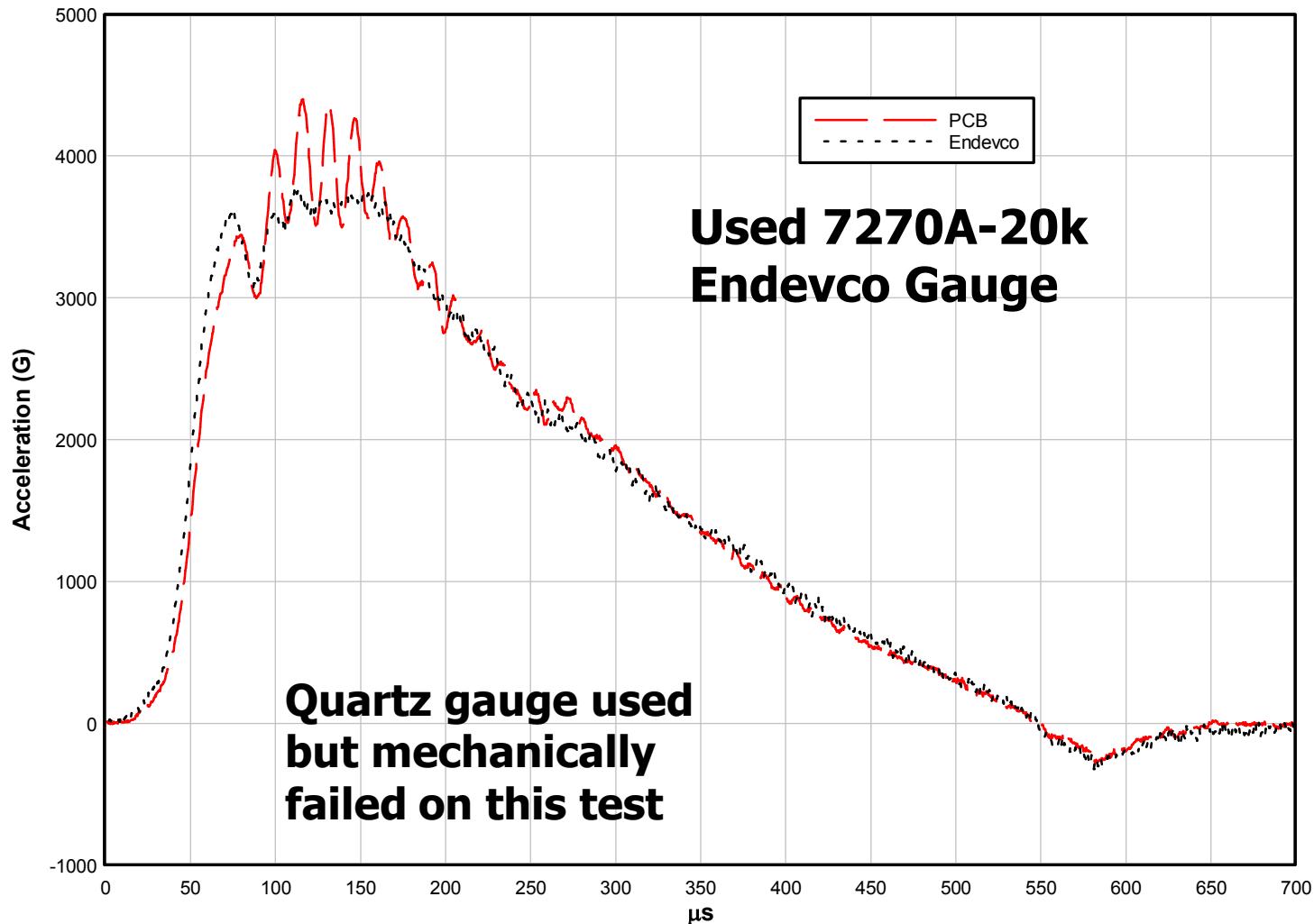
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Low Level Acceleration Comparison

PCB Accelerometer Evaluation

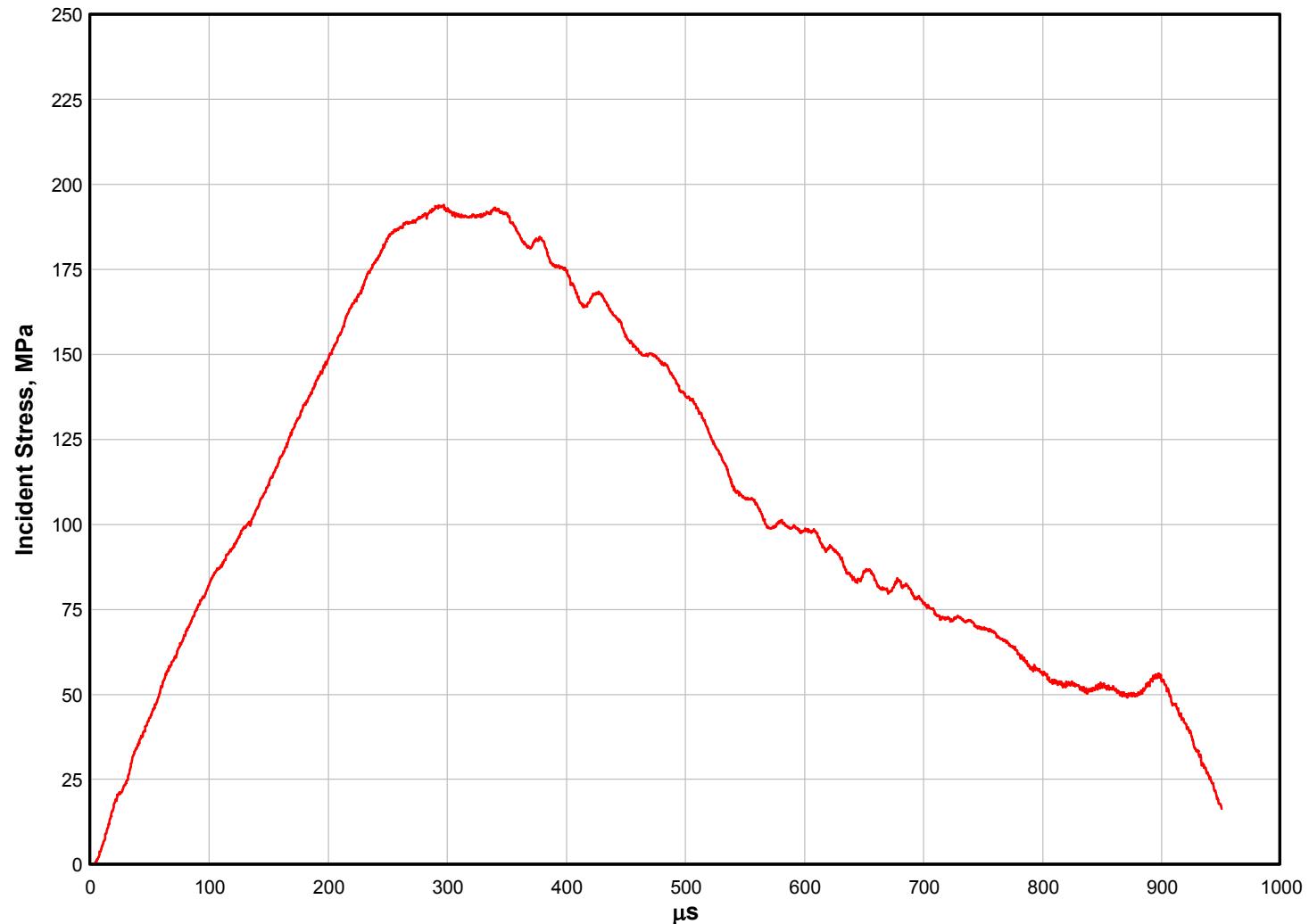
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Mid Level Incident Stress Pulse

PCB Accelerometer Evaluation

Joint Munitions Project/TCG-X



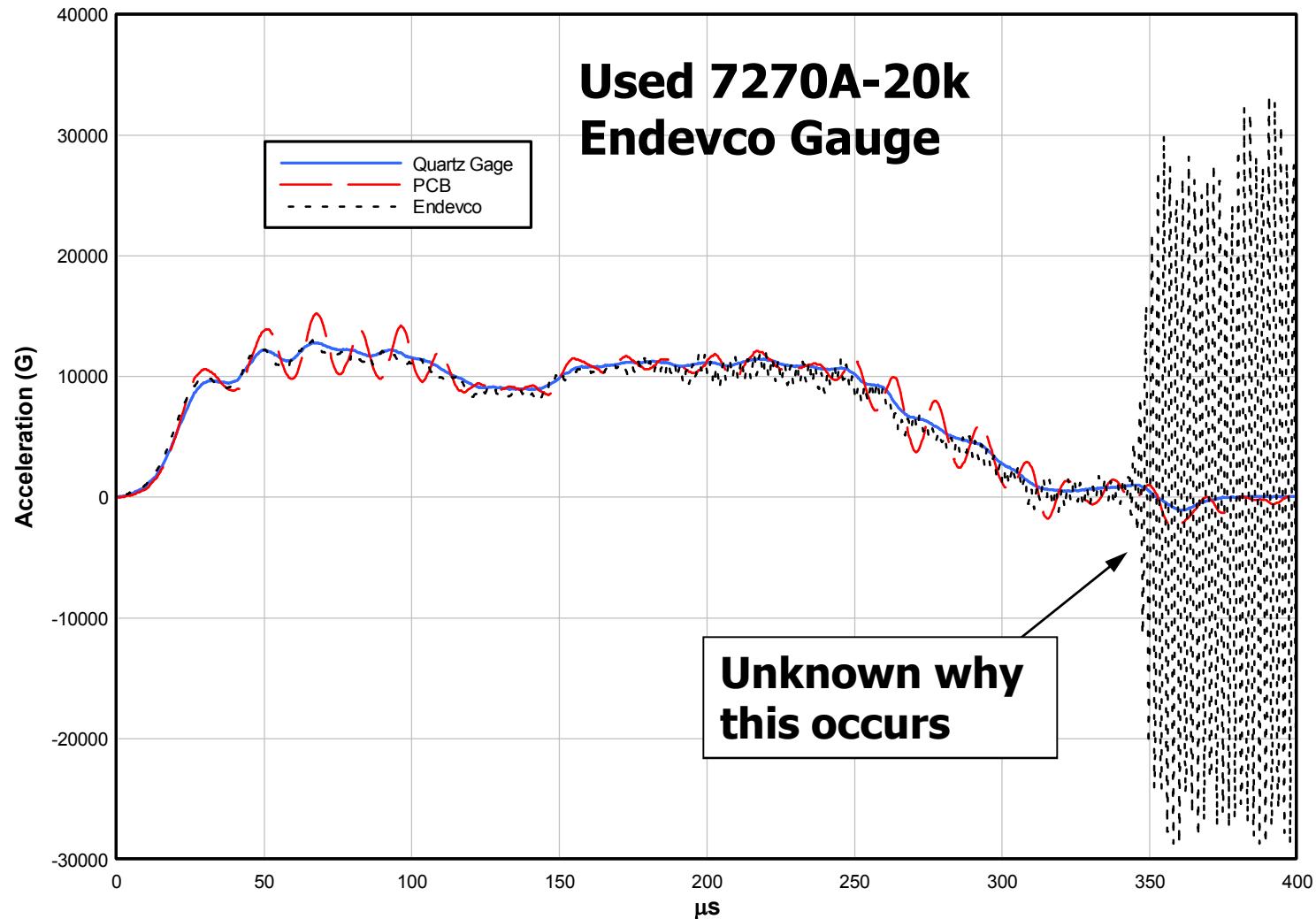
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Mid Level Acceleration Comparison

PCB Accelerometer Evaluation

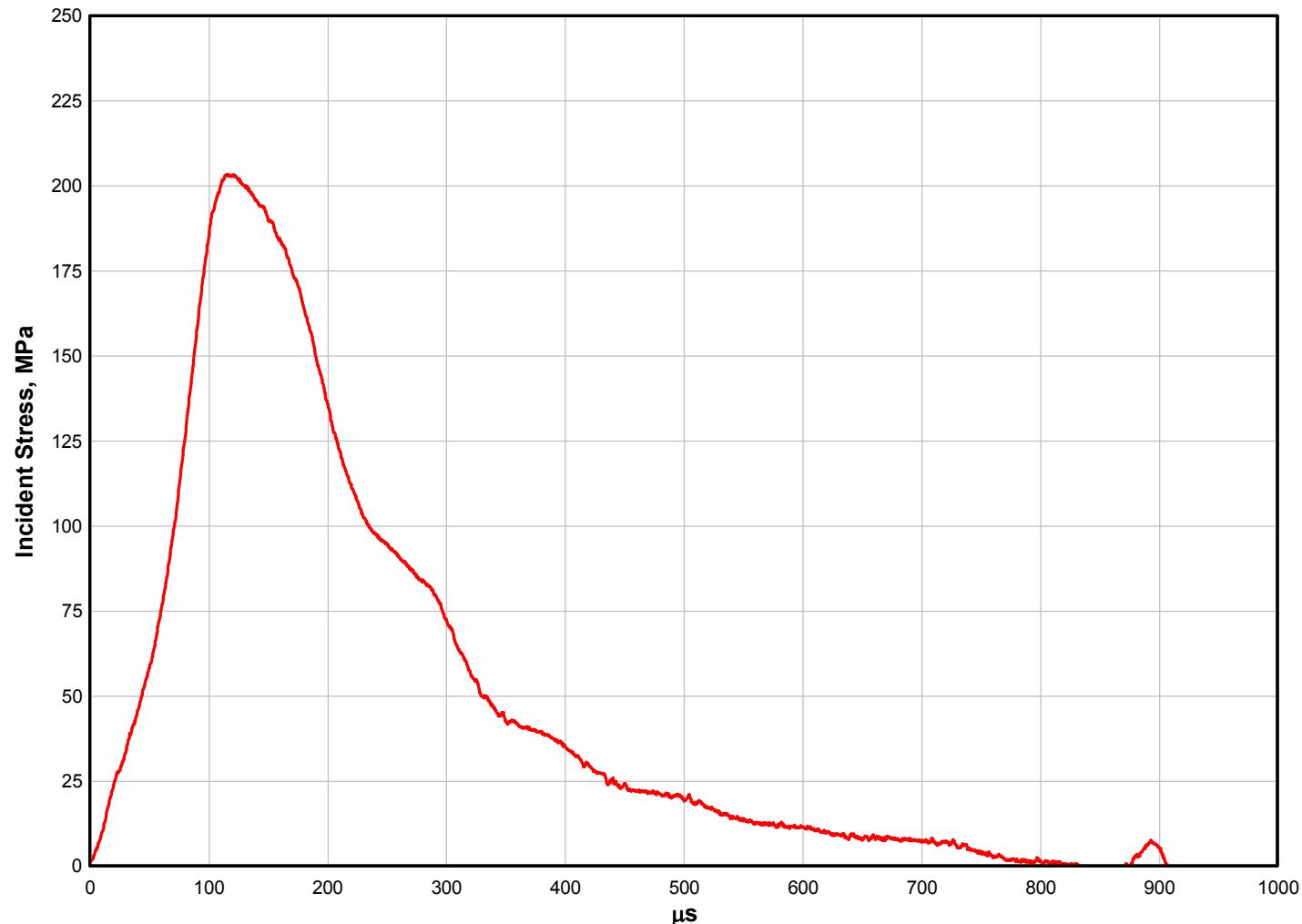
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High Level Incident Stress Pulse

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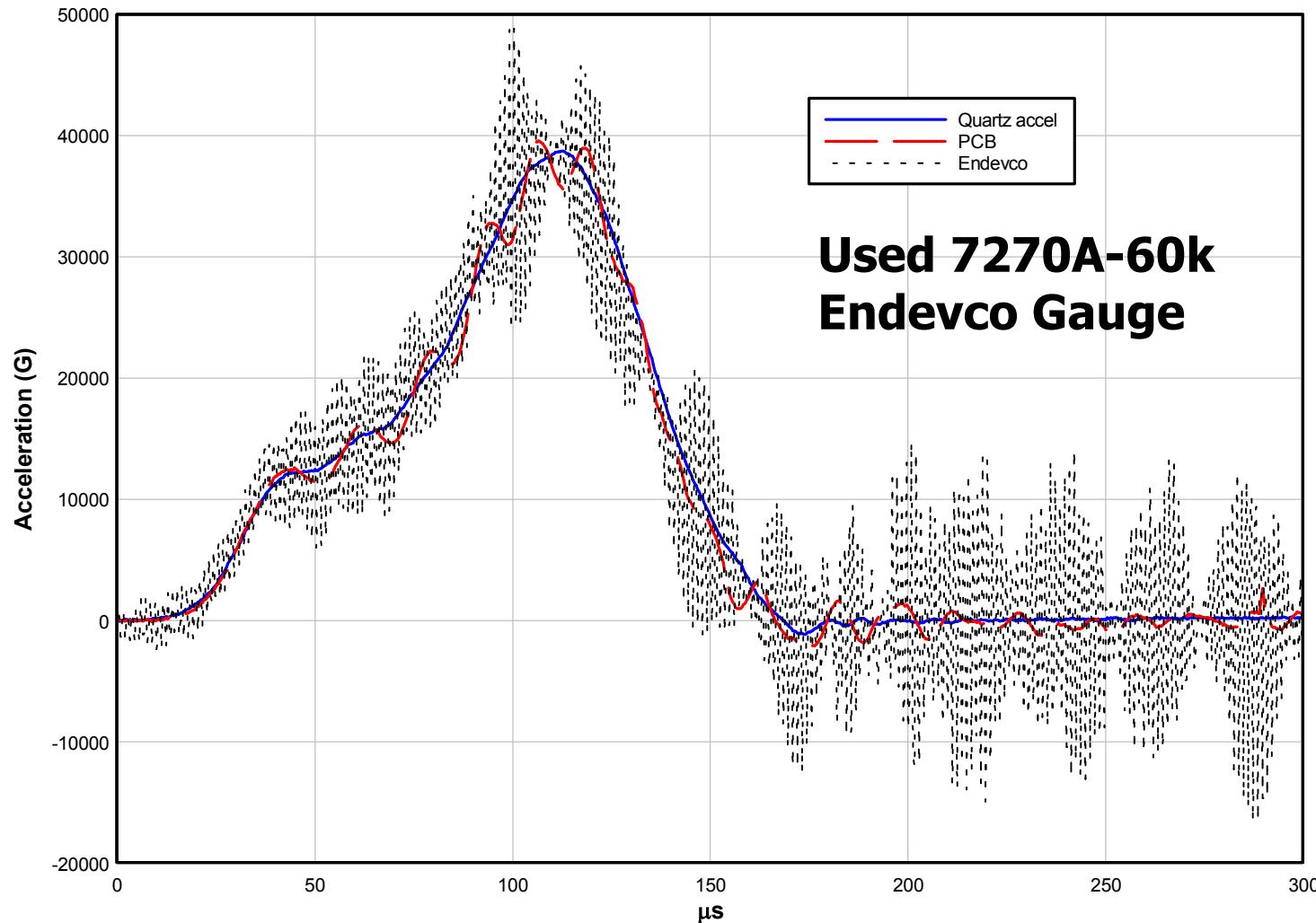
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High Level Acceleration Comparison

PCB Accelerometer Evaluation

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Conclusions

PCB Accelerometer Evaluation

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- **PCB 3991 damped response shows minor oscillations around the rigid-body acceleration of the body**
 - Due to lower natural frequency; Controlled by mechanical damping
 - Damped resonant frequency of ~66KHz
- **Endevco 7270A output shows large effect of high resonant frequencies when impulse levels are above 10,000 g**
 - May be possible failure mechanism for this gauge
- **Results are encouraging**
 - Appears to be a valid gauge
 - Accurately represents acceleration environments
 - May need to filter out natural frequency of gauge
- **Further testing needed**
 - Longer duration pulses (subscale gun testing)
 - Off-axis impacts (impact angles in gun testing)



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