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Evaluation of the PCB 3991 Accelerometer

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(Work performed by Danny Frew and Henry Duong)

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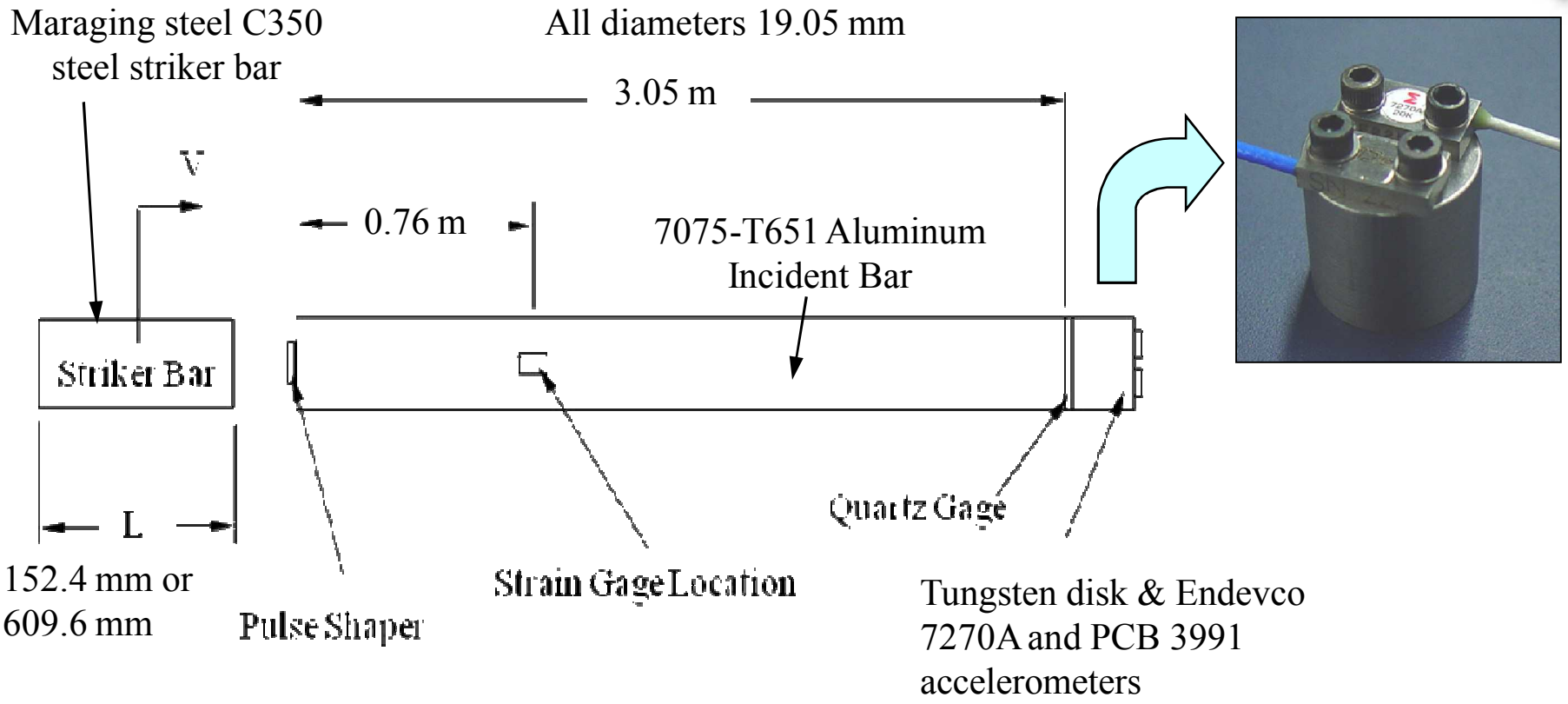
Purpose

- **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**

Test Setup

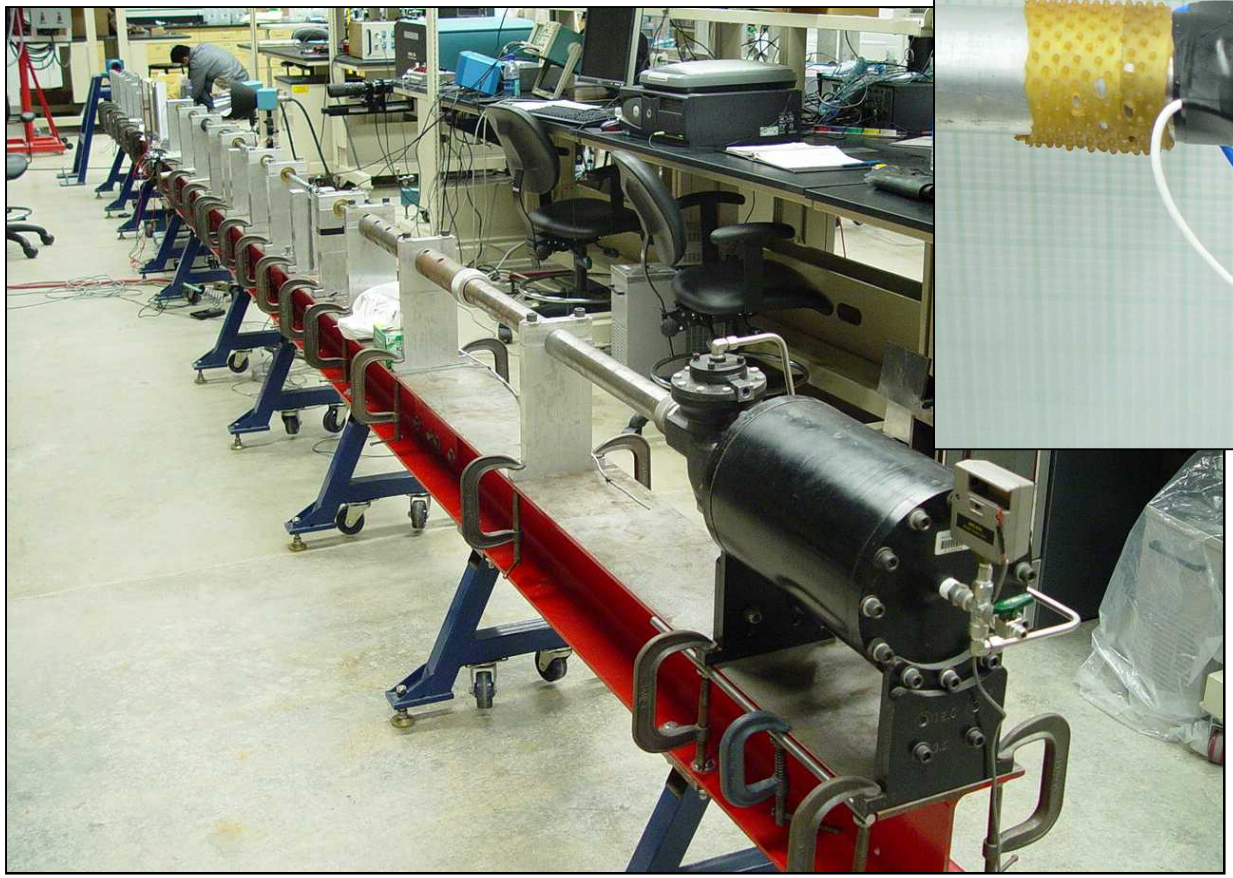


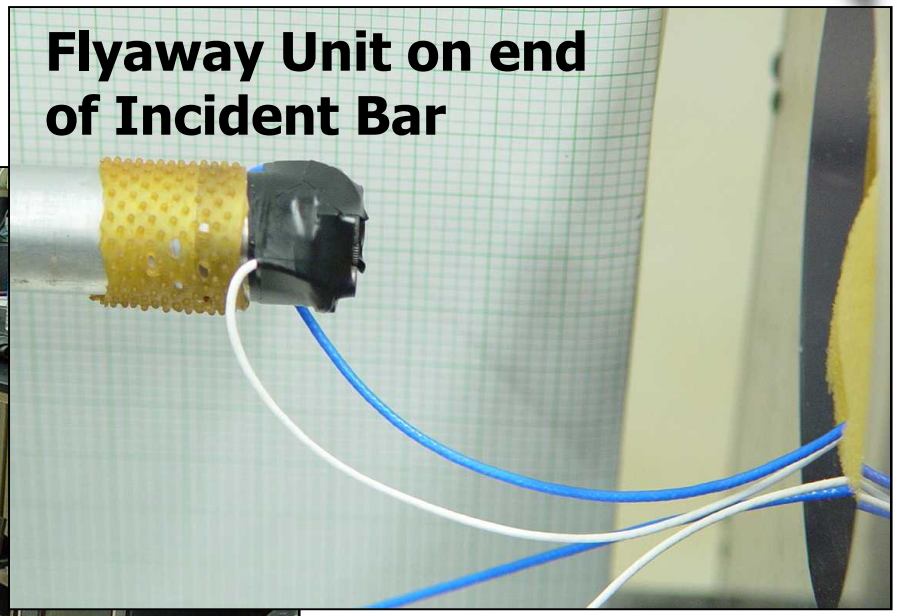
Split Hopkinson Pressure Bar or Kolsky Bar

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

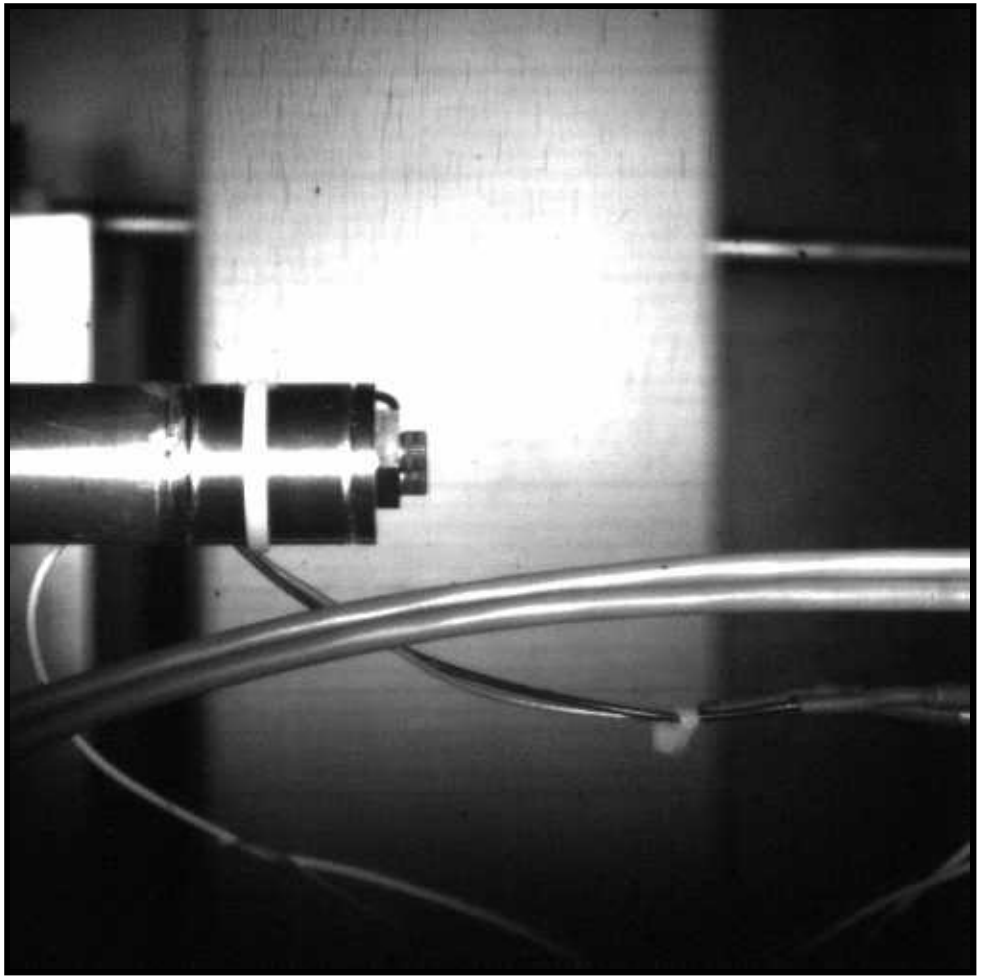
Pictures of Lab and Setup

Purdue Kolsky Bar Lab

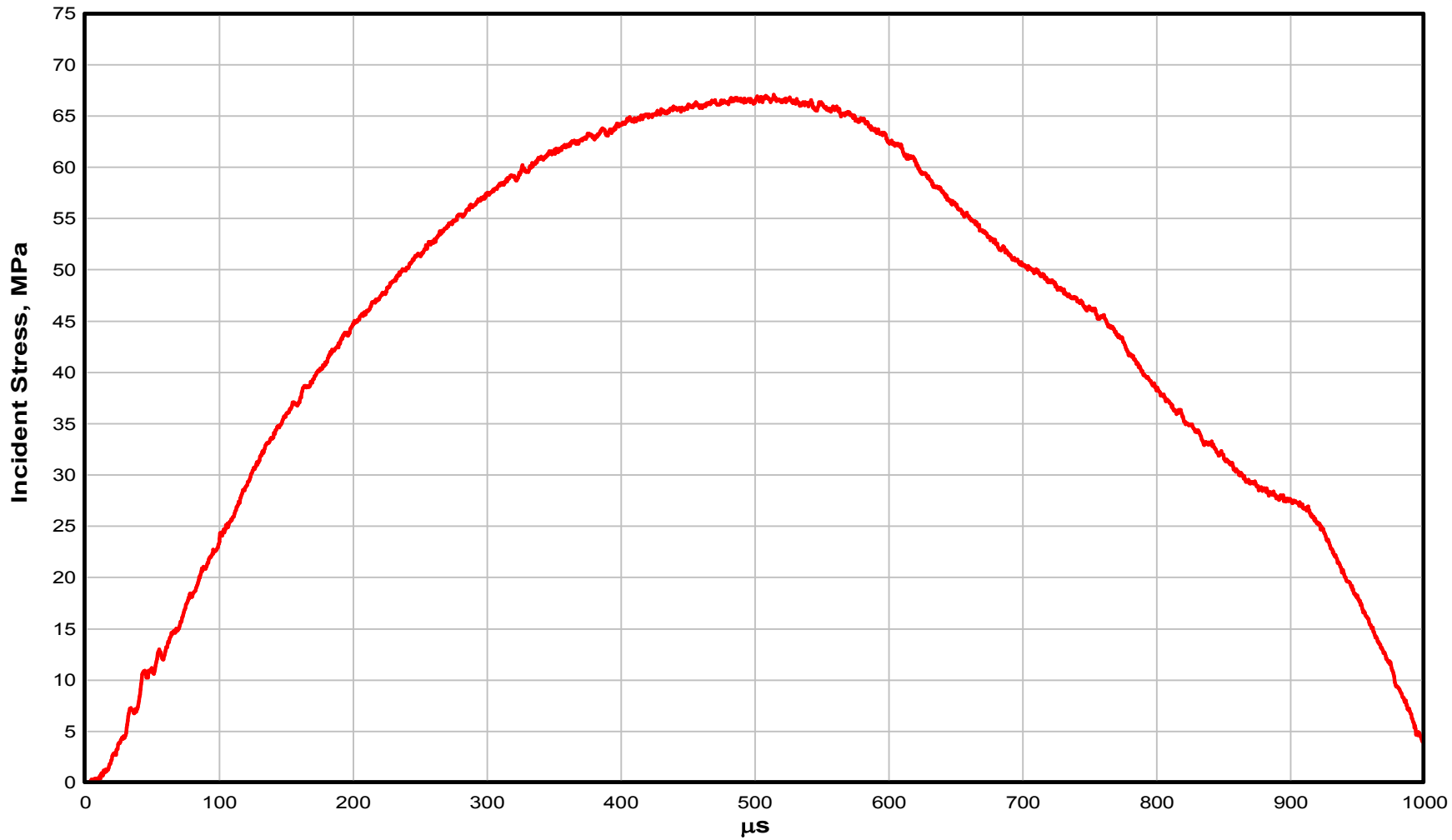




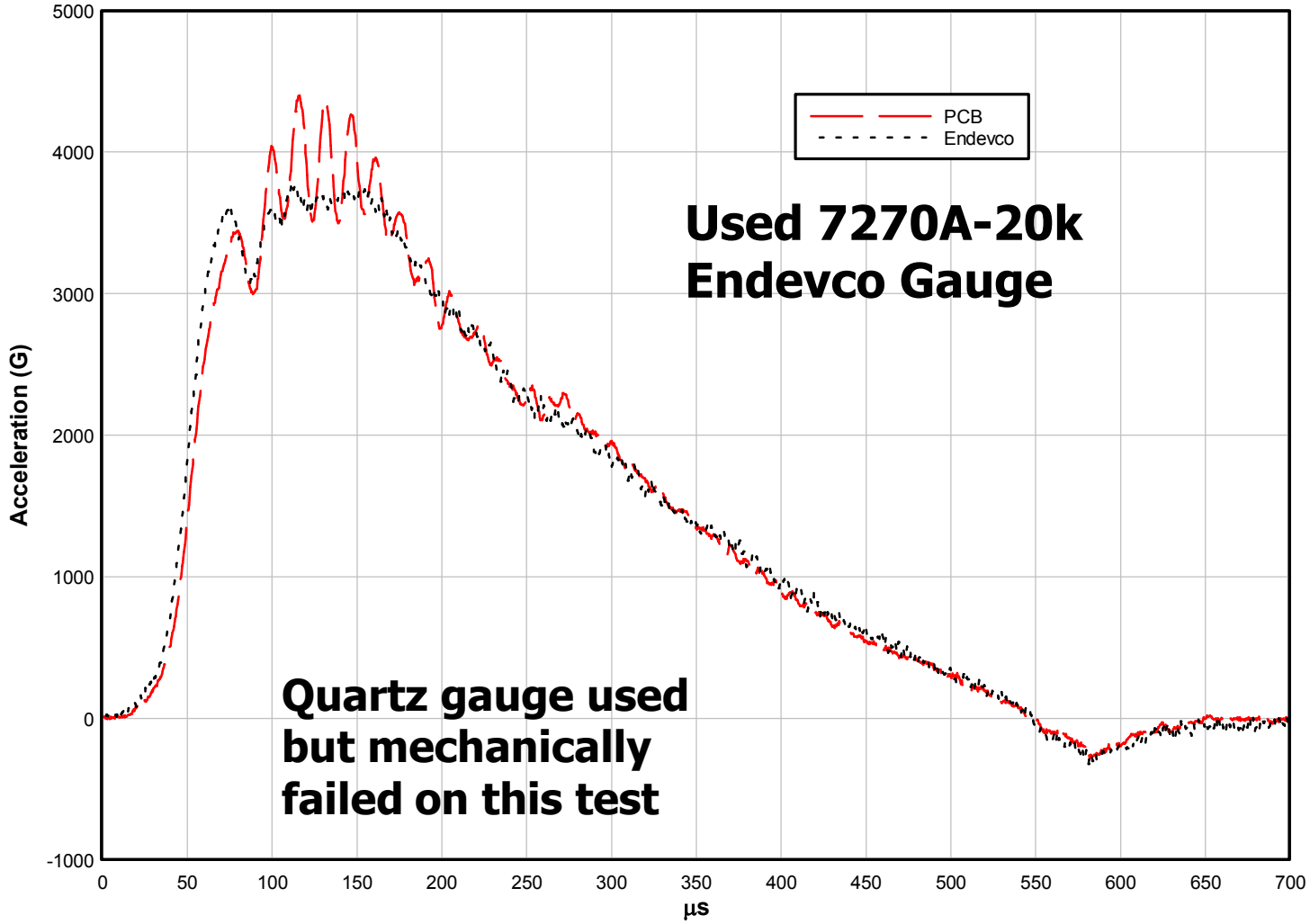
Example from other testing



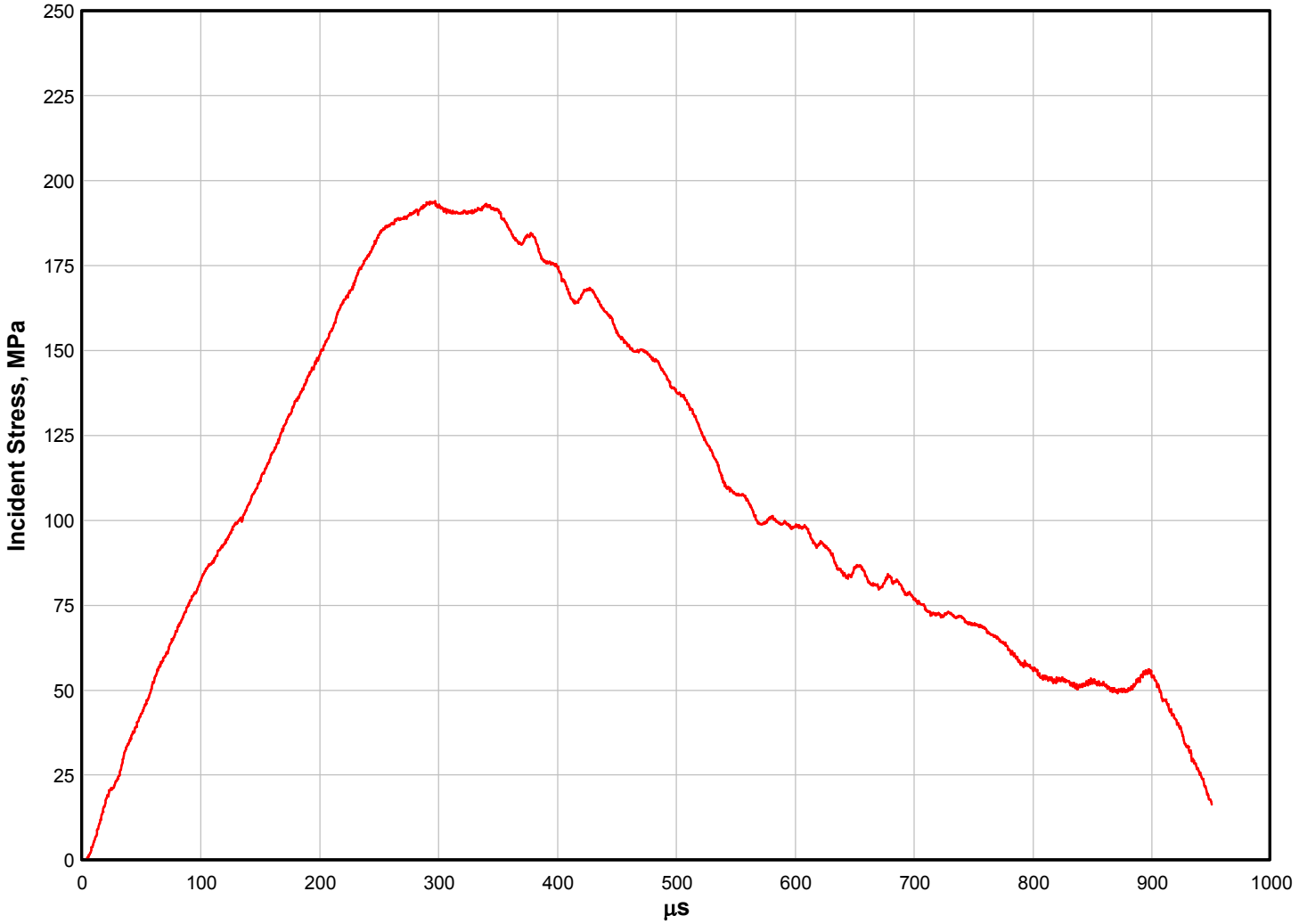
Low Level Incident Stress Pulse



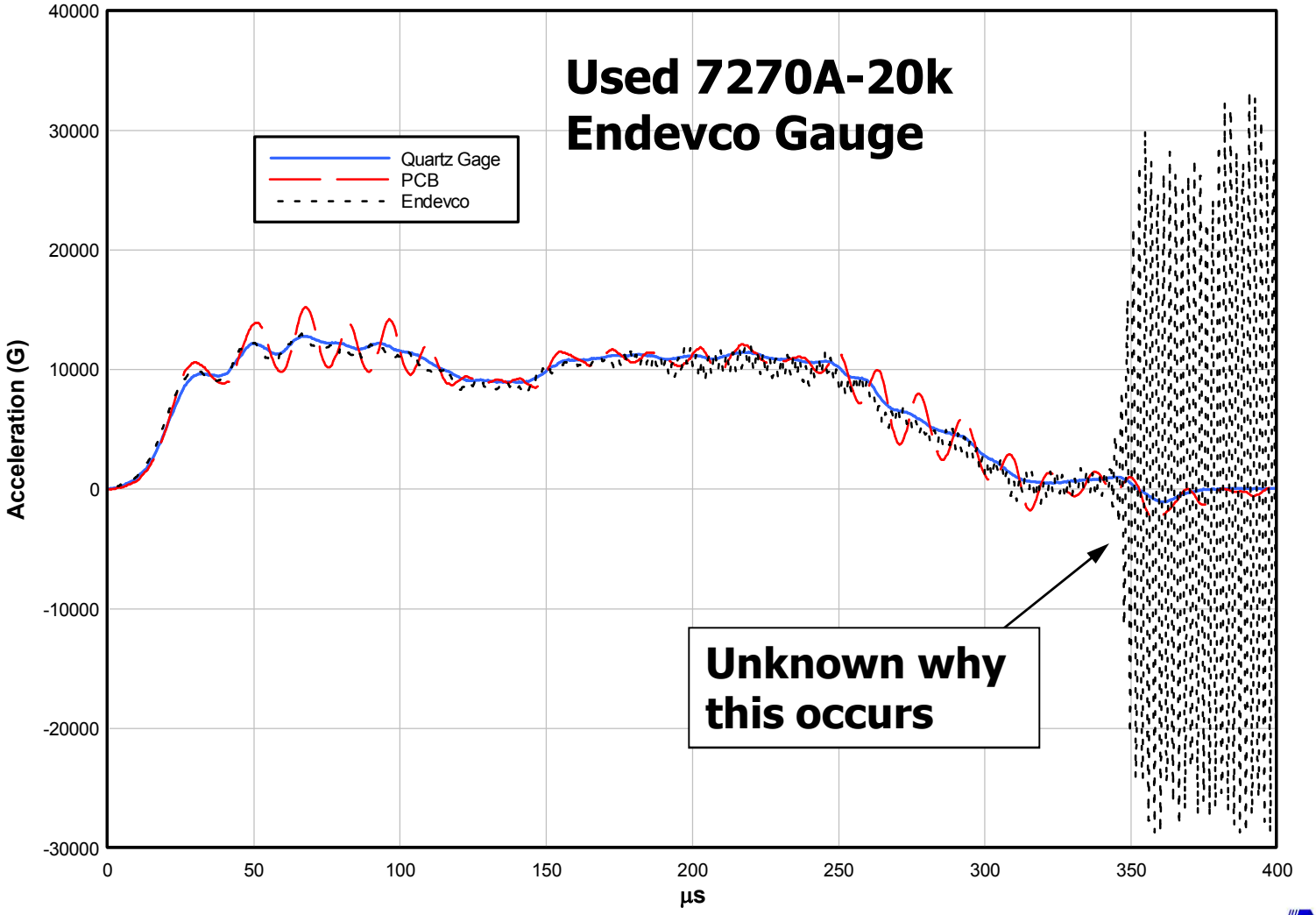
Low Level Acceleration Comparison



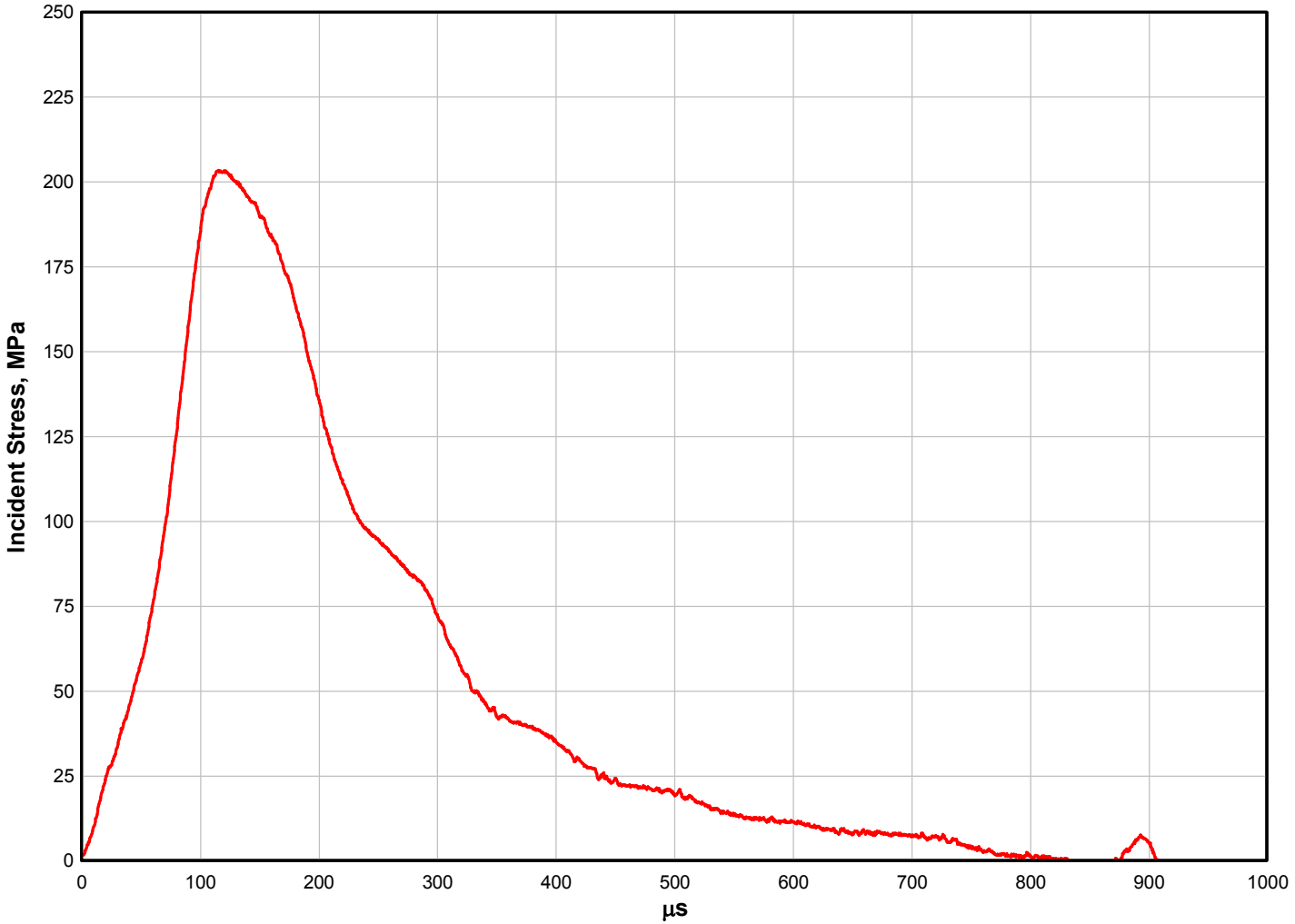
Mid Level Incident Stress Pulse



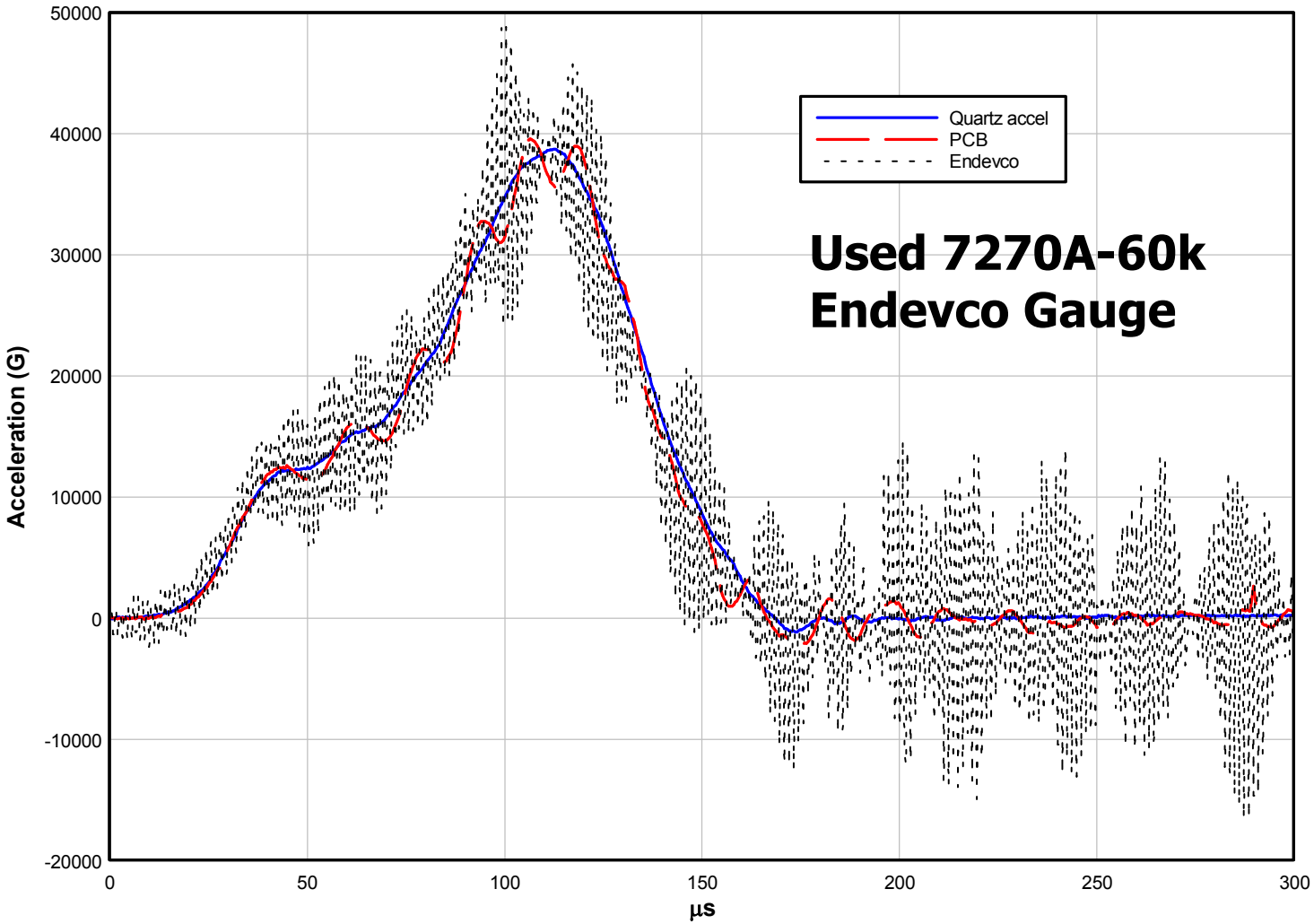
Mid Level Acceleration Comparison



High Level Incident Stress Pulse



High Level Acceleration Comparison



Conclusions

- **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)