Los Alamos NATIONAL LABORATORY EST. 1943

Some applications of Photonic Doppler Velocimetry (PDV) to Gas Gun Experiments

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Livermore, California

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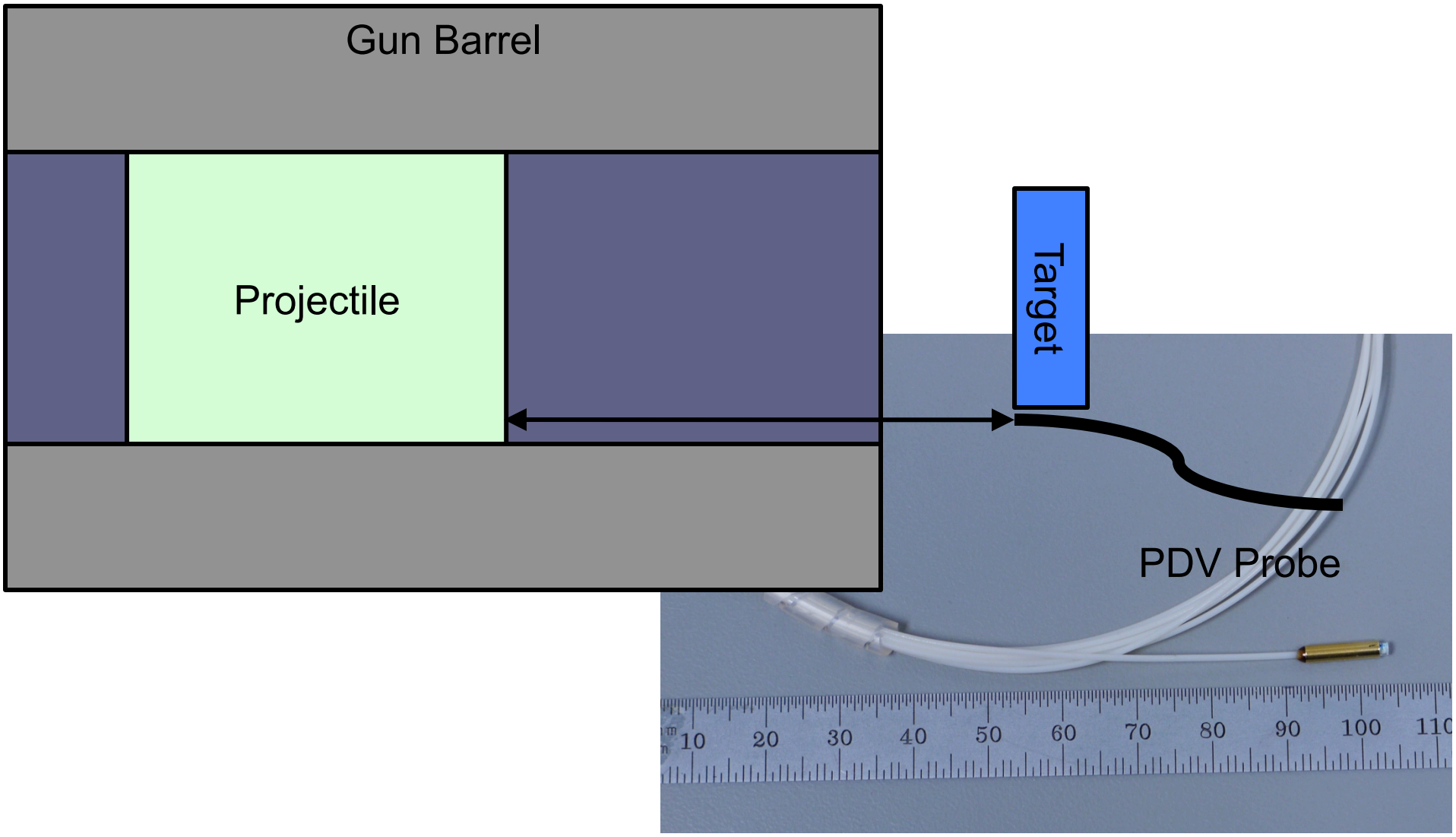
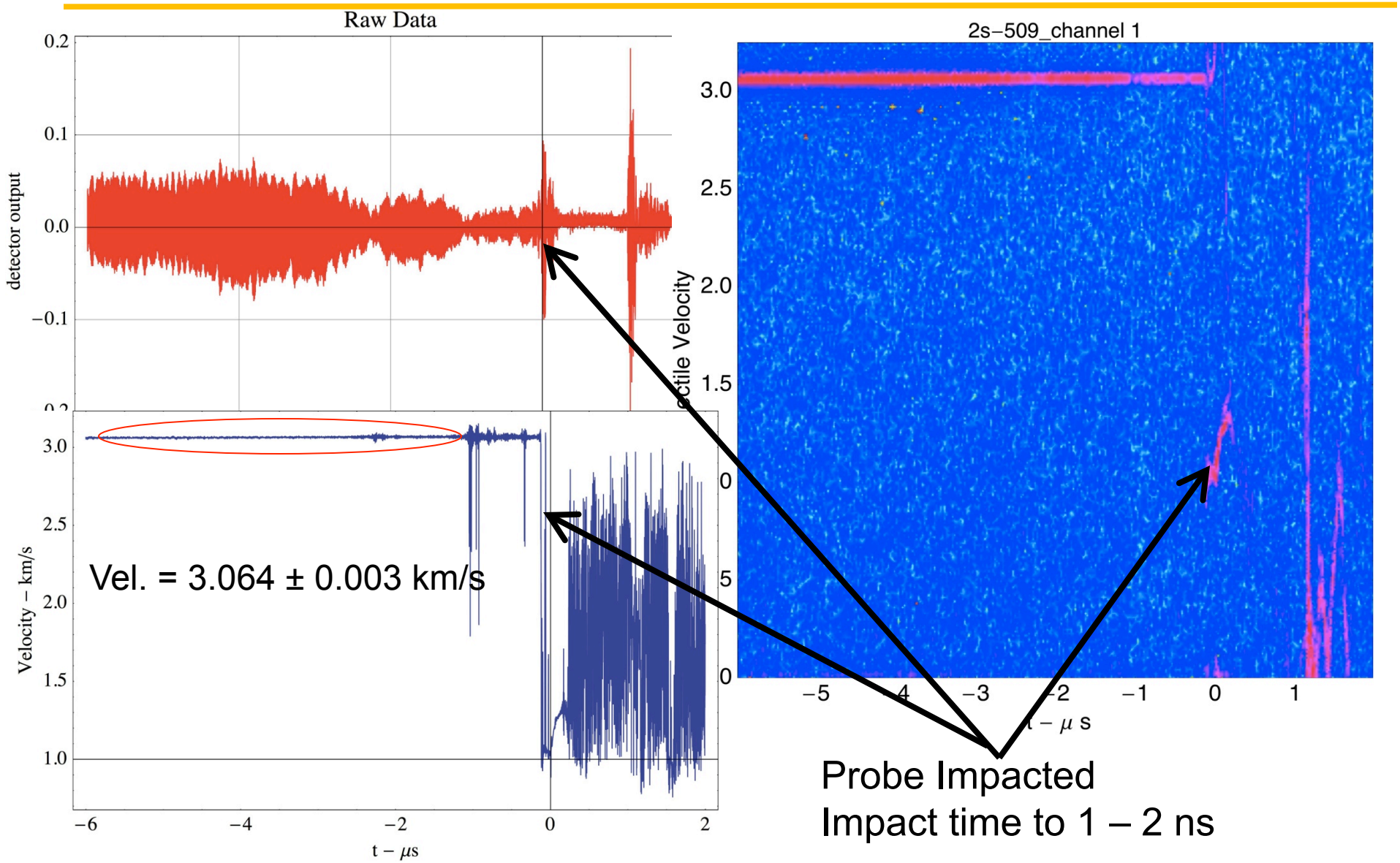
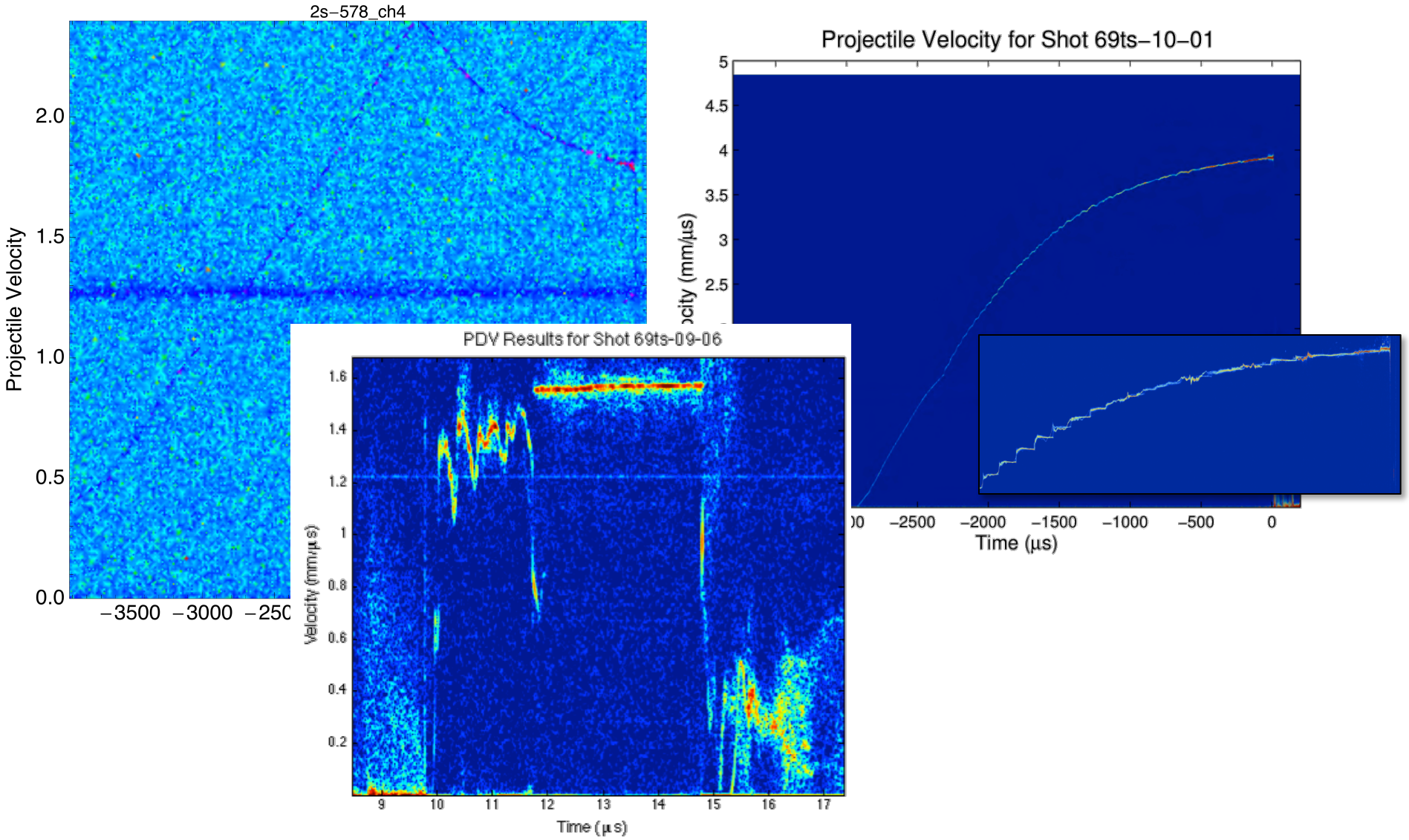
1 - Projectile velocity (1 probe)



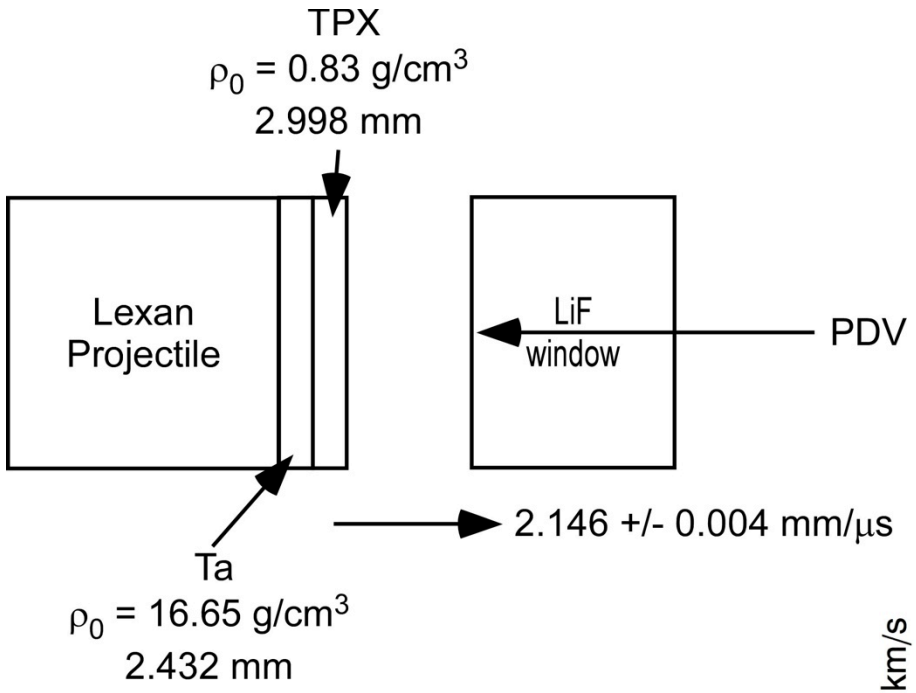
Data from a shot

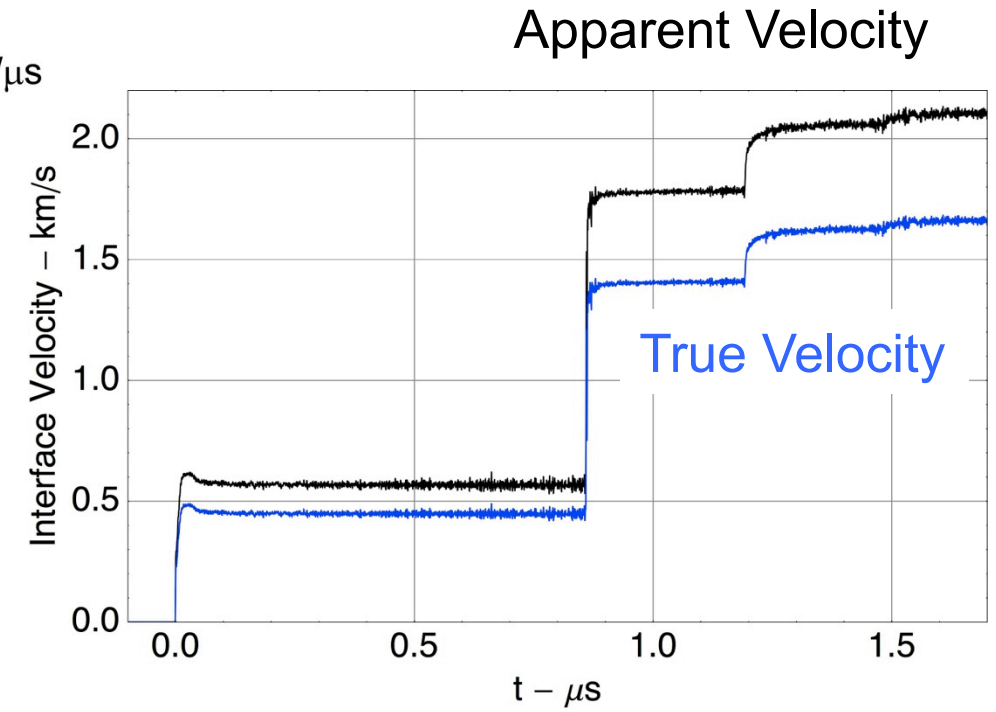


Full launch to impact measurement

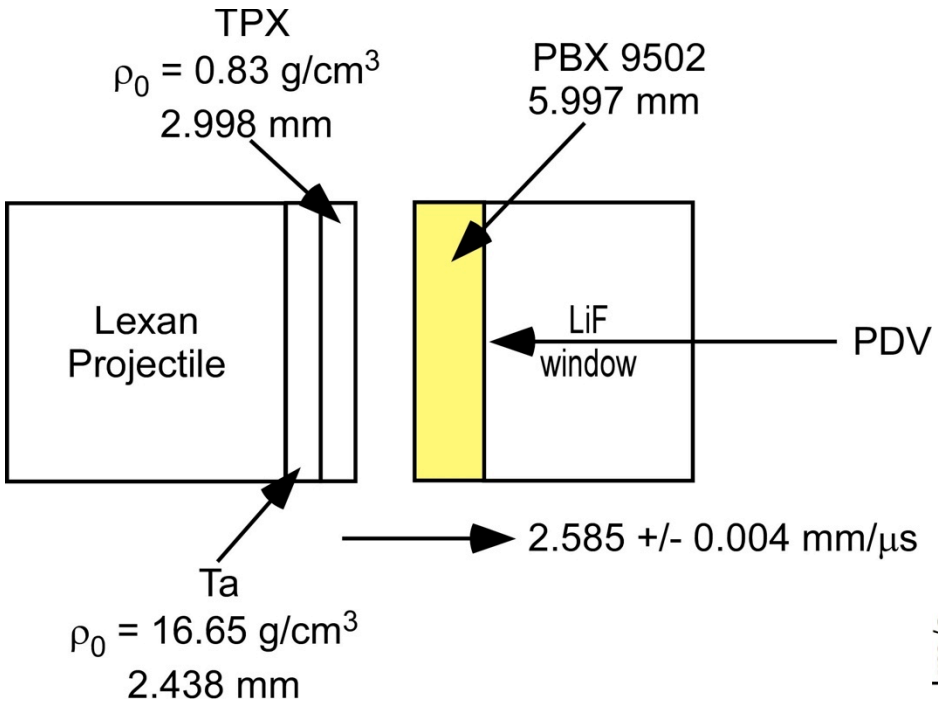


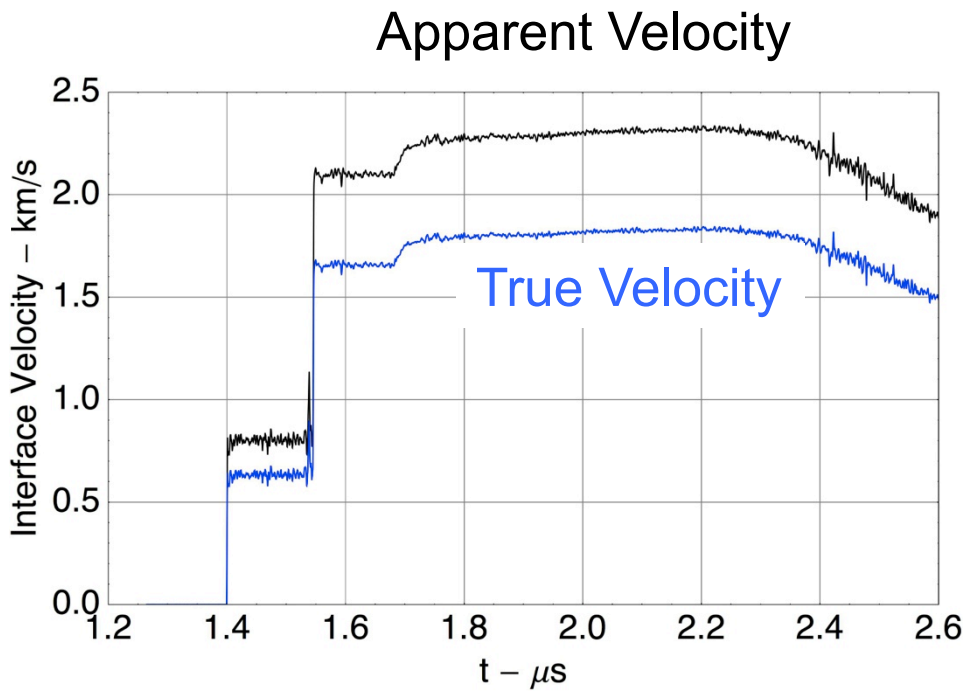
Double Shock - front surface impact



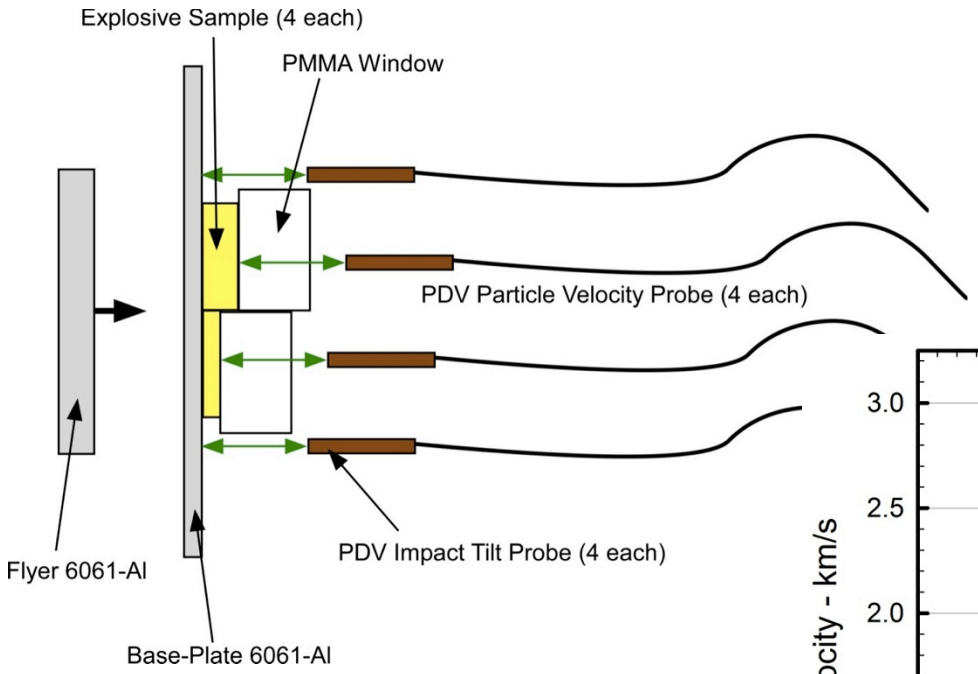


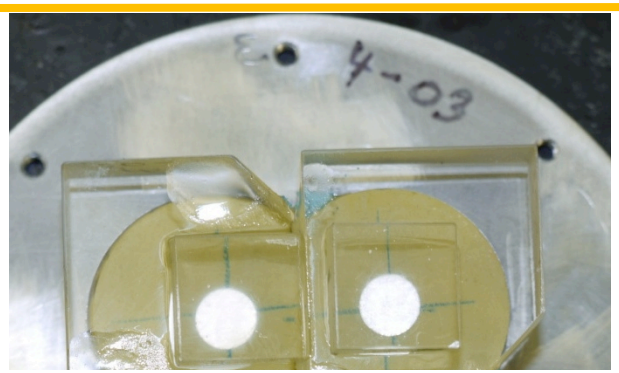
Double shock - transmitted

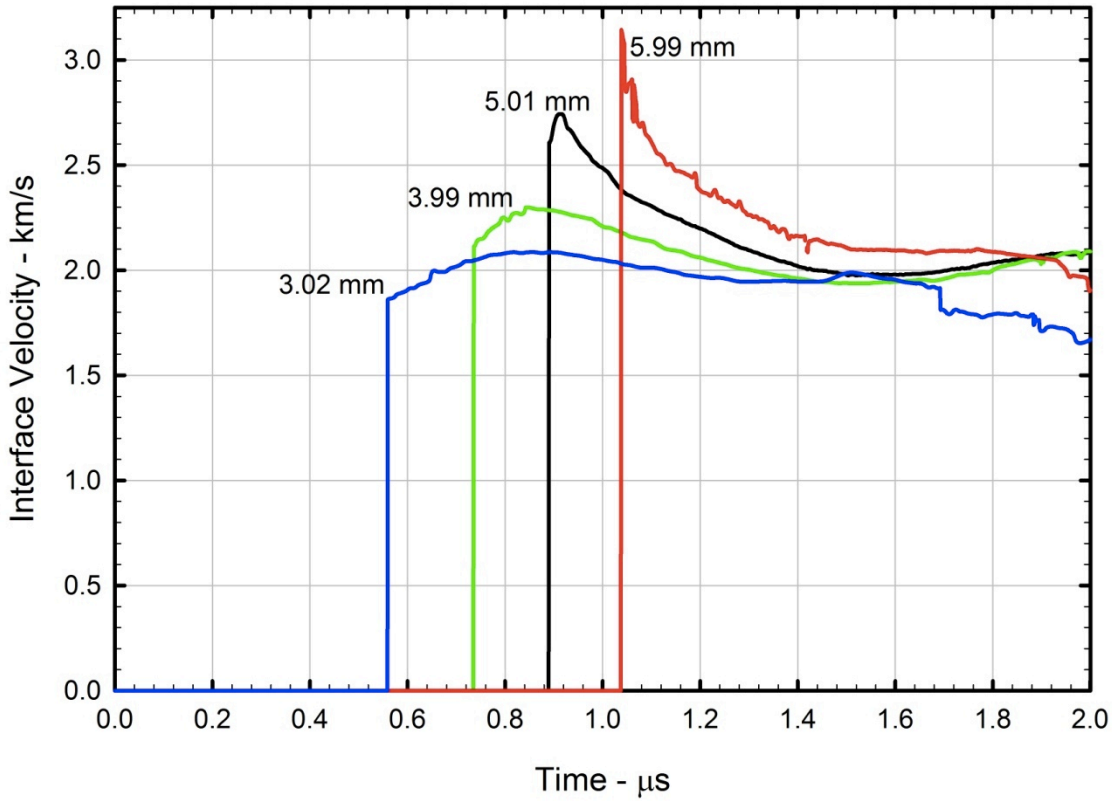




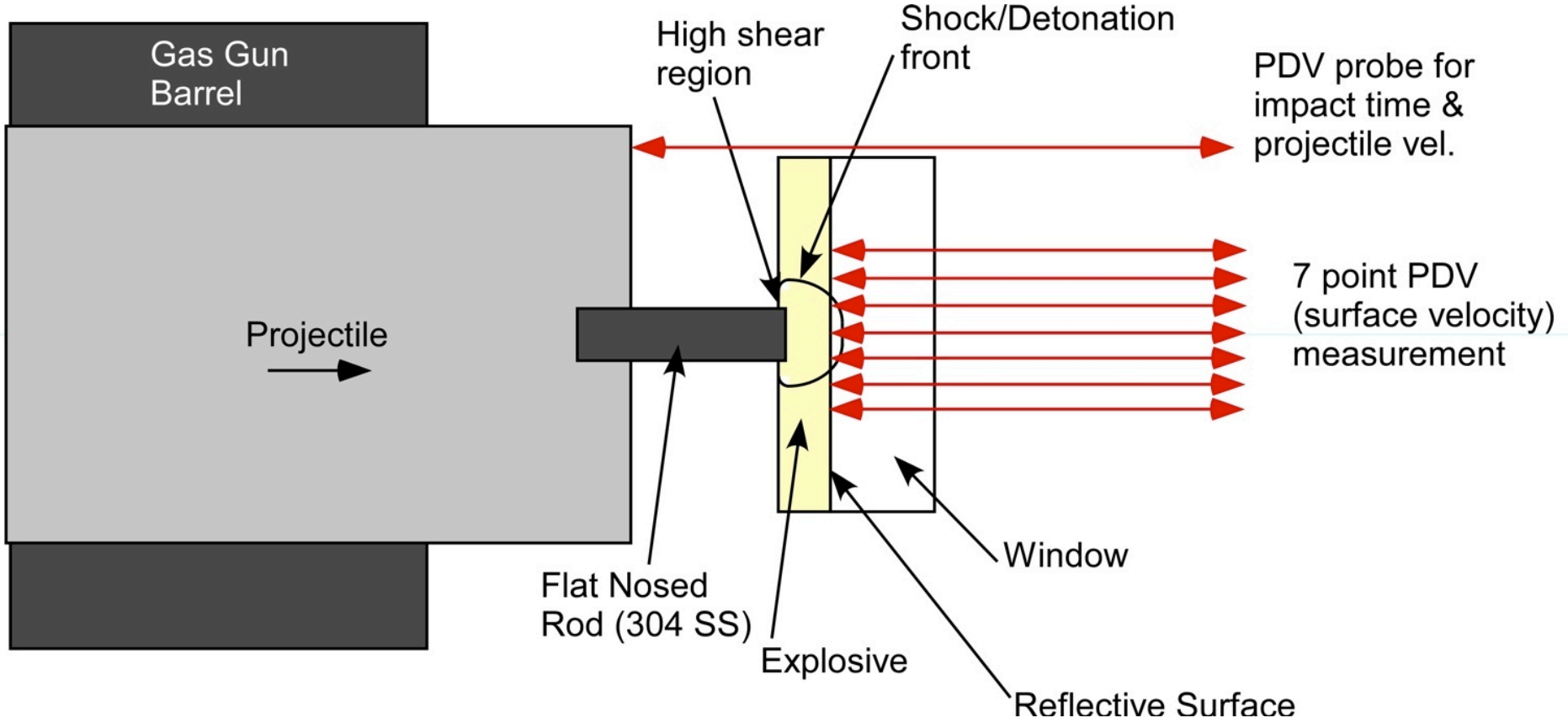
Multi-slug plate impact experiment



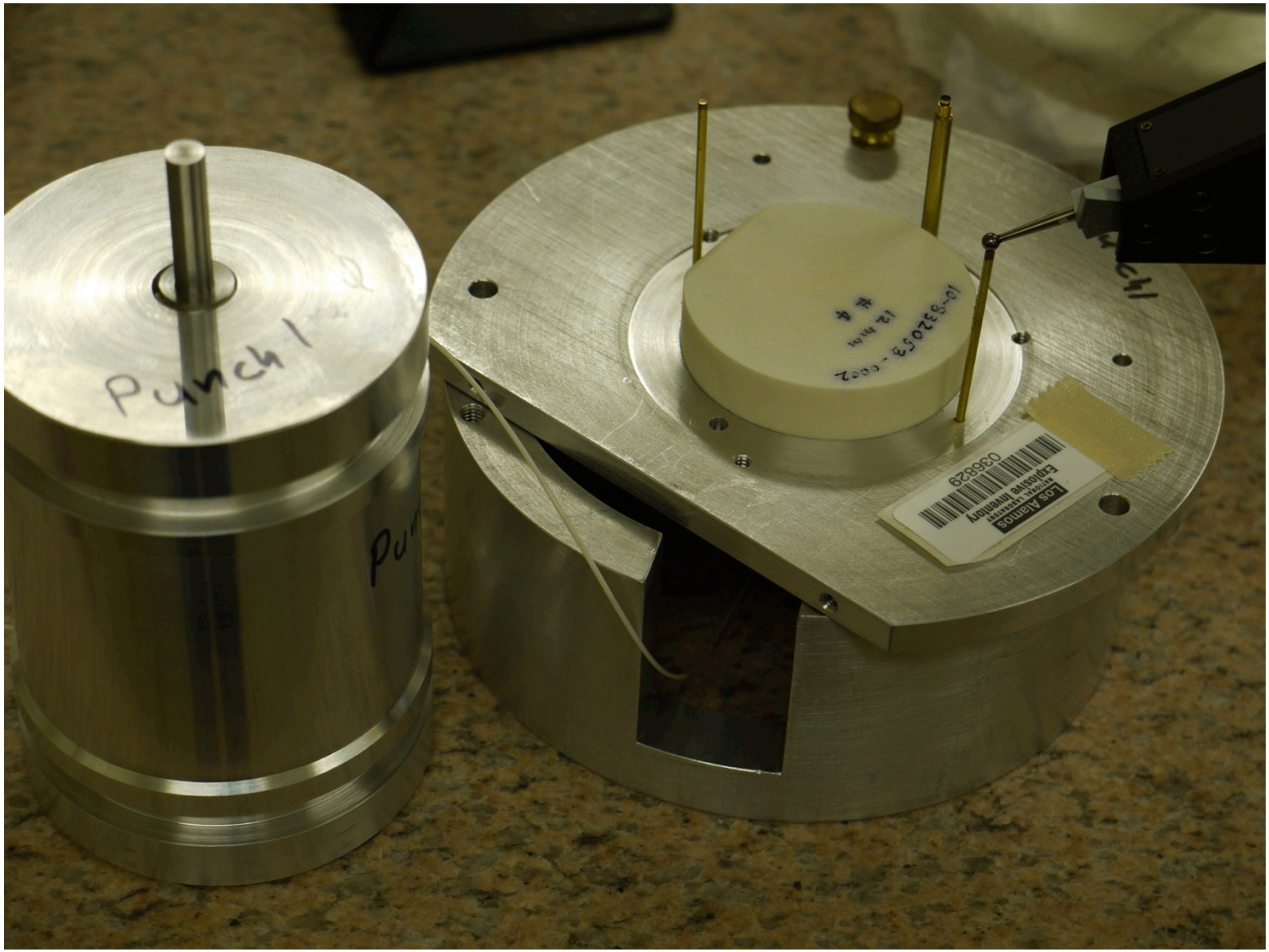




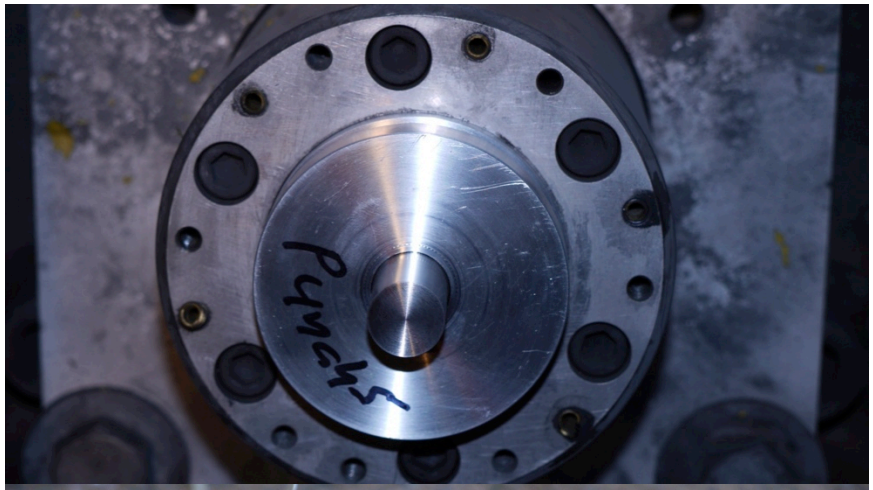
Flat nosed rods: a 2-D shock initiation experiment

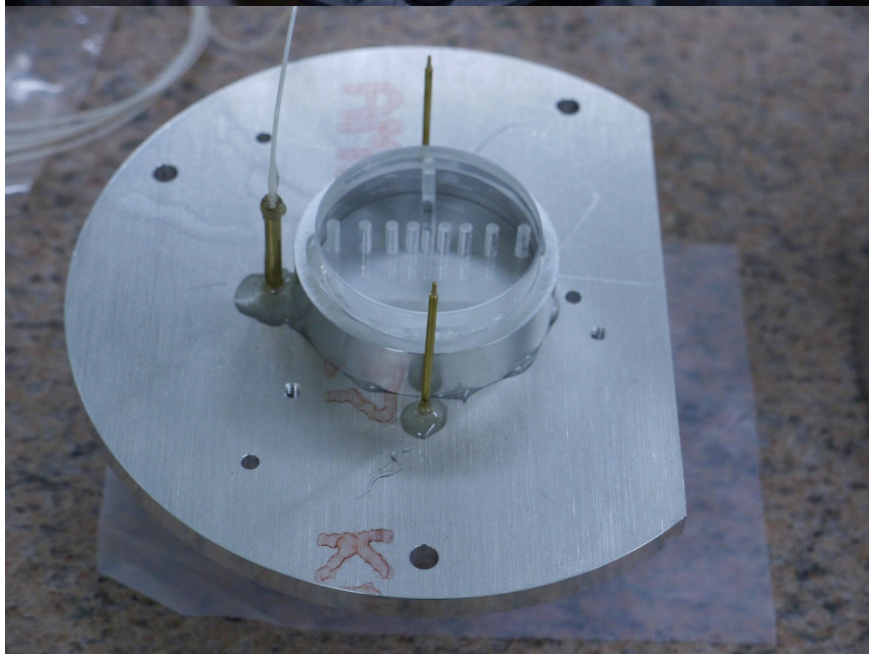


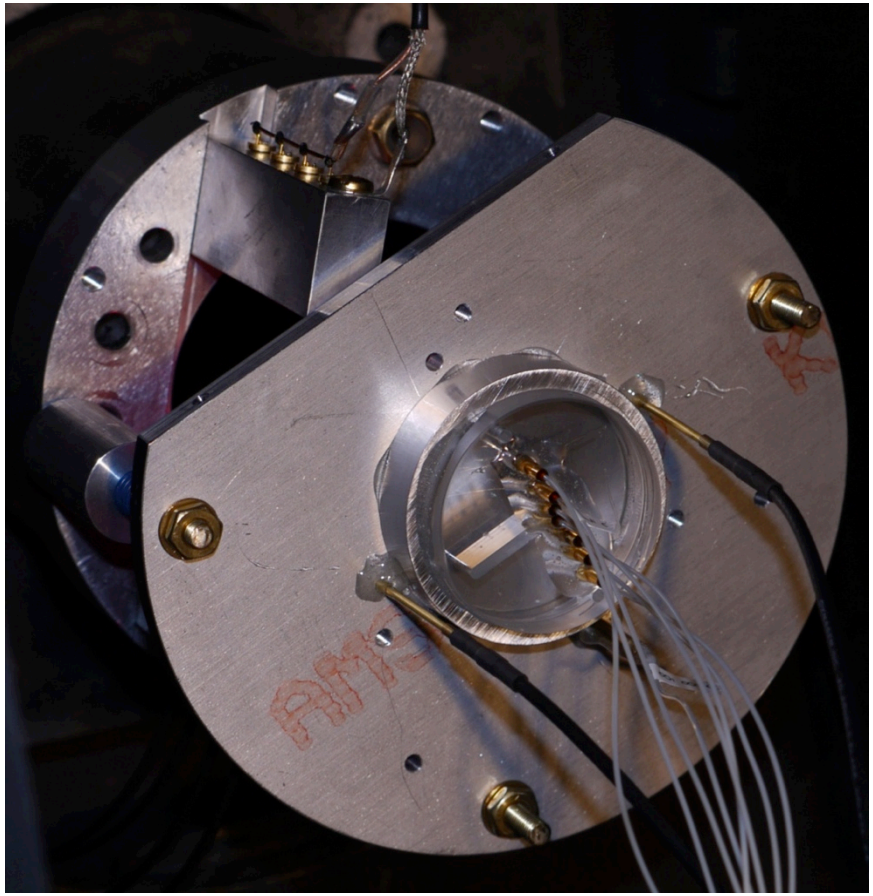
impactor and front of target



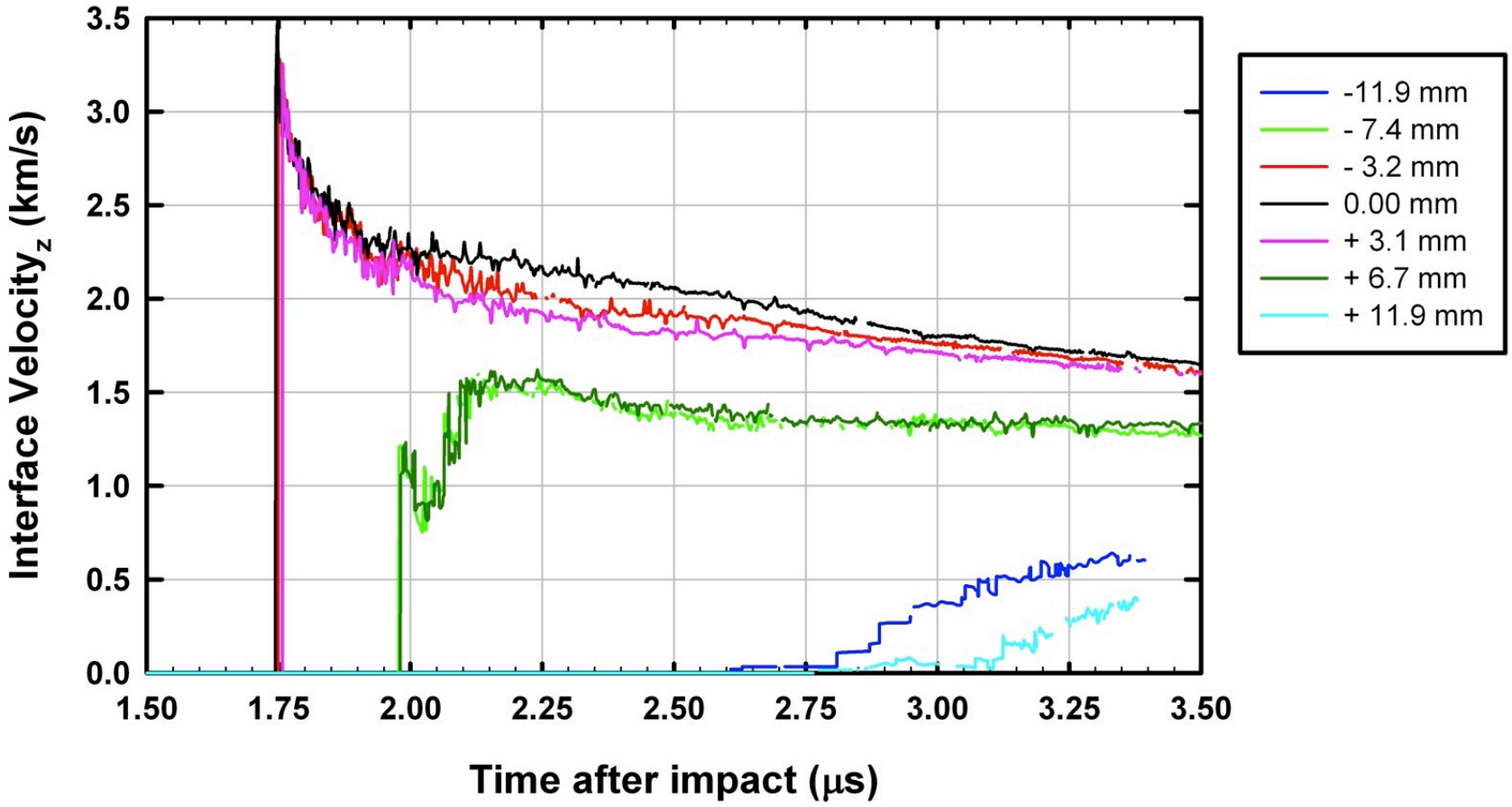
Flat nosed rod experiment



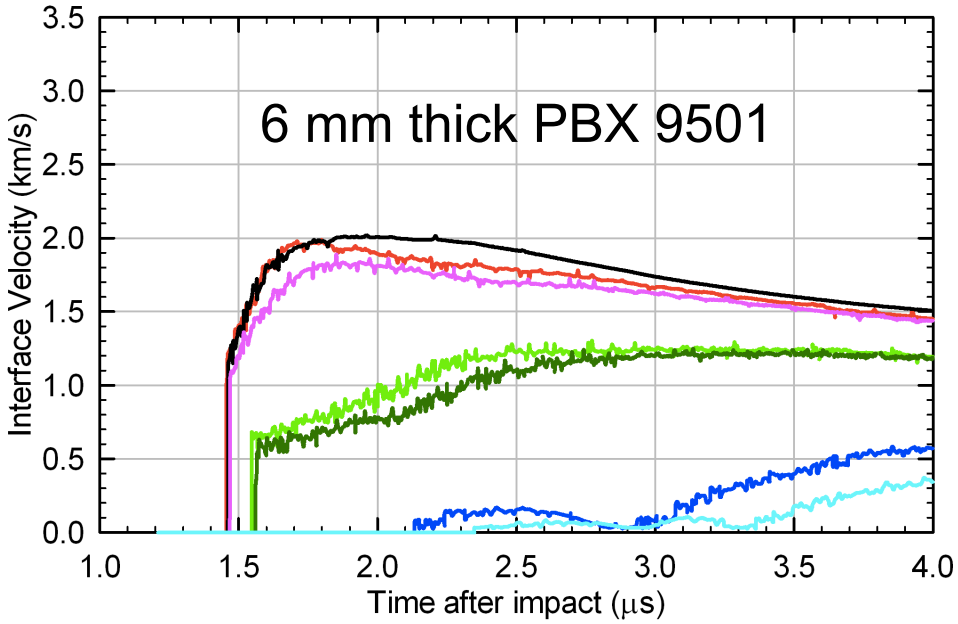




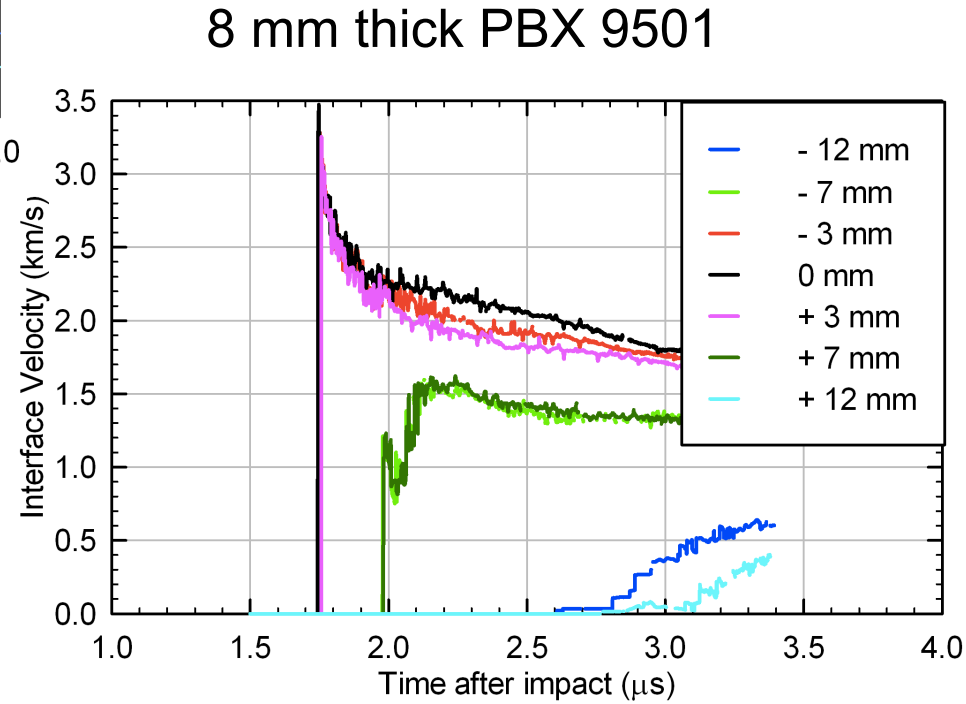
Result from a single experiment: 17 mm φ rod impacting 8 mm PBX 9501 at 0.74 km/s



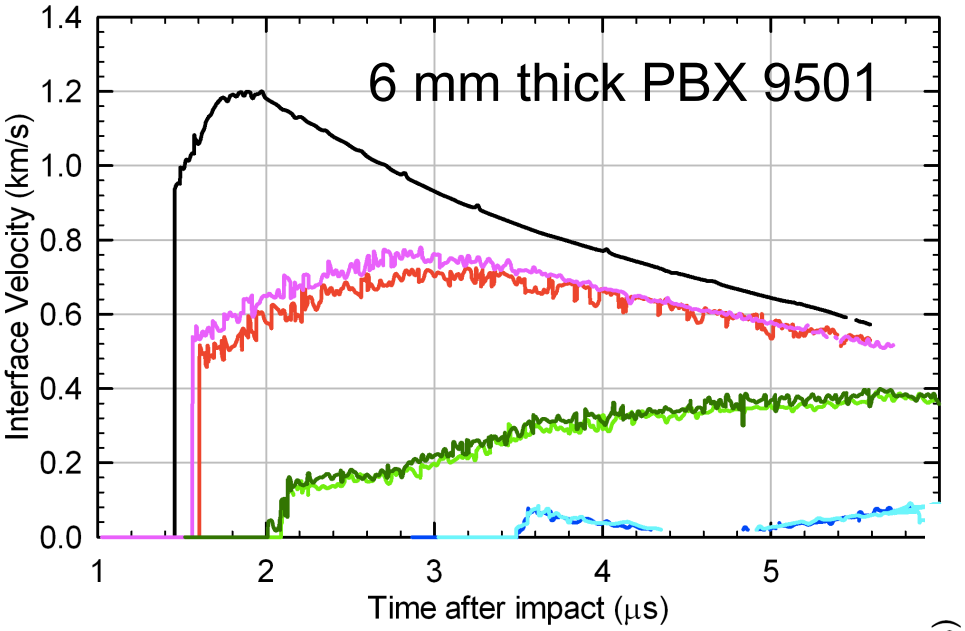
17 mm φ rod impacting PBX 9501 at 0.74 km/s



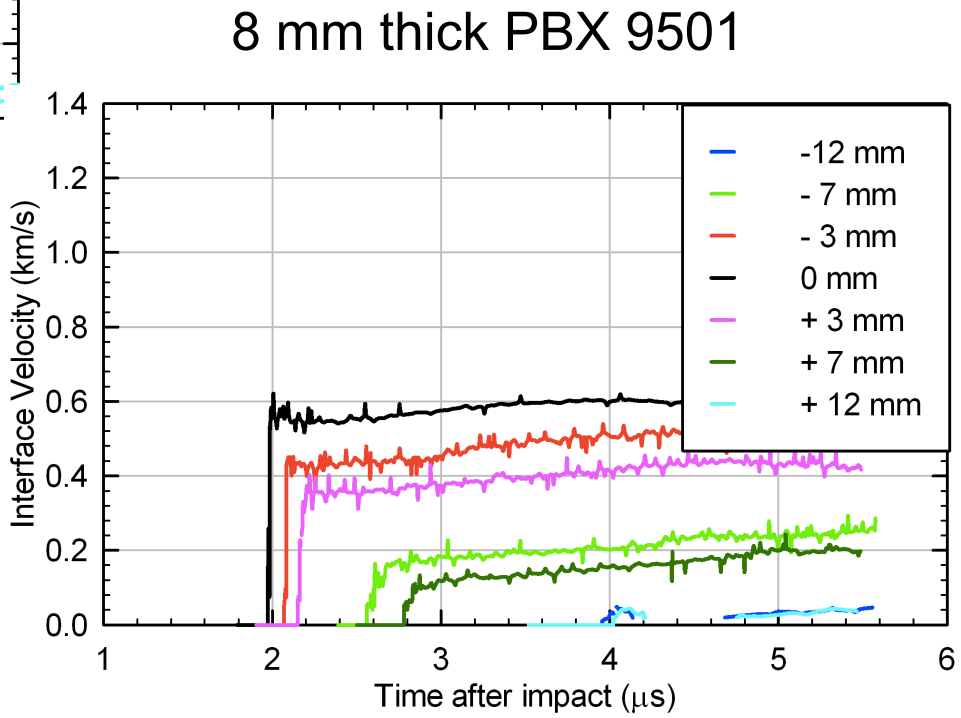
(Detonation)
P = 4.4 Gpa
u_p = 0.62 mm/μs
tau = 0.50 μs
E = 1.37



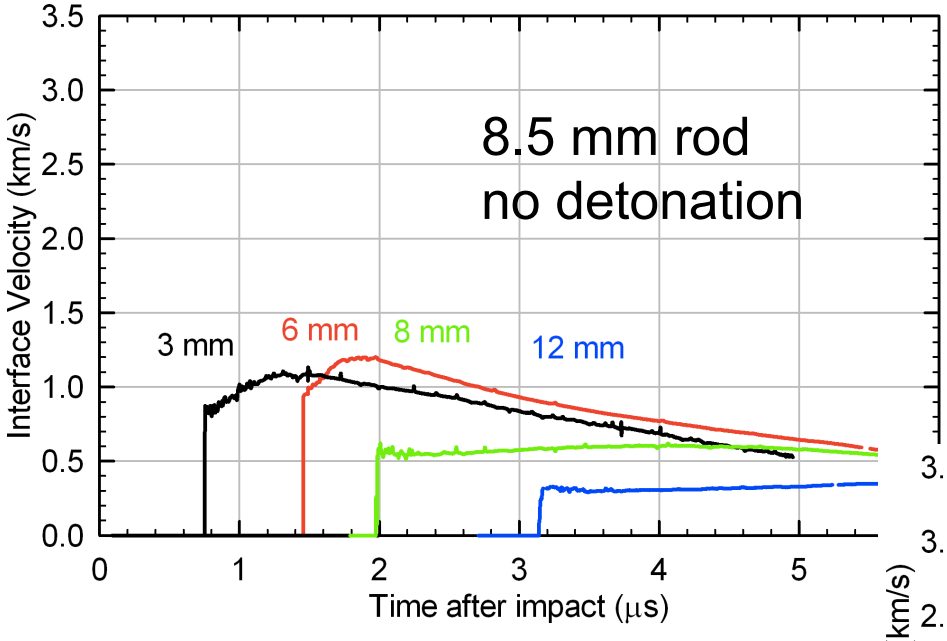
8.5 mm φ rod impacting PBX 9501 at 0.74 km/s

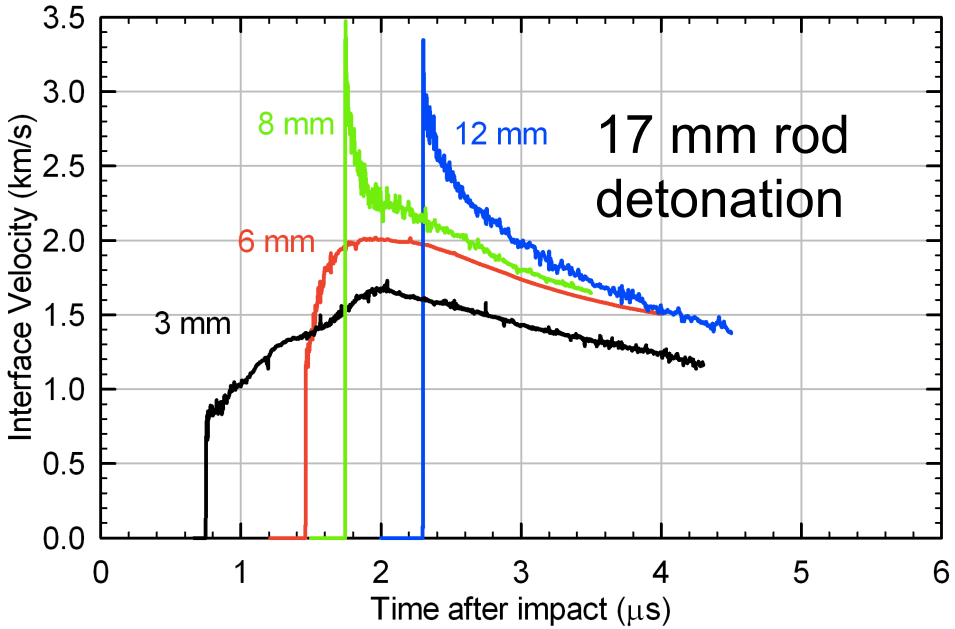


(No Detonation)
P = 4.4 Gpa
u_p = 0.62 mm/μs
tau = 0.25 μs
E = 0.69



centerline results for flat-nosed rods on PBX 9501 at 0.74 km/s





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Summary

- Gas gun experiments can use PDV in many different ways
  - projectile velocity
  - projectile integrity
  - impact time
  - transit times
  - wave profiles

- Advantages include
  - easy to set-up
  - easy to field
  - easy to time correlate many channels
  - moderate per-channel cost
  - large number of users to ask for advice