

# Headrest Test

- Is this test ok as is?
- What do we need to improve?
  - Target?
  - How close do we need to come?
- Next Steps?

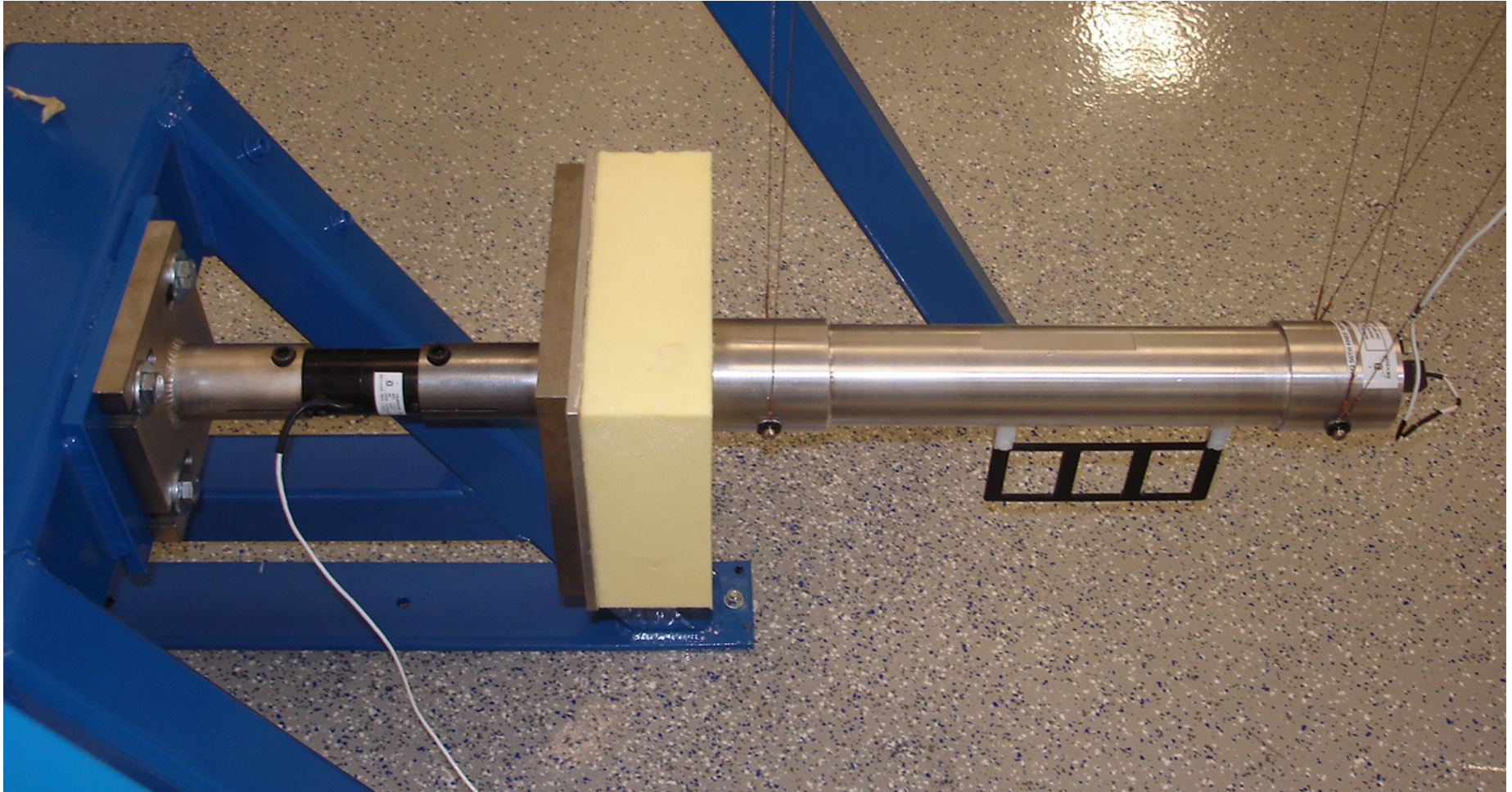
# Headrest Test

## Foam Pad Verification

- Foam Head Pad verification necessary
  - Assure consistency between labs
  - Control production
  - Prevent change over time
- Impact test on pad using knee stand
  - Use H-III50M knee impact probe
  - Velocity 1.50 m/s

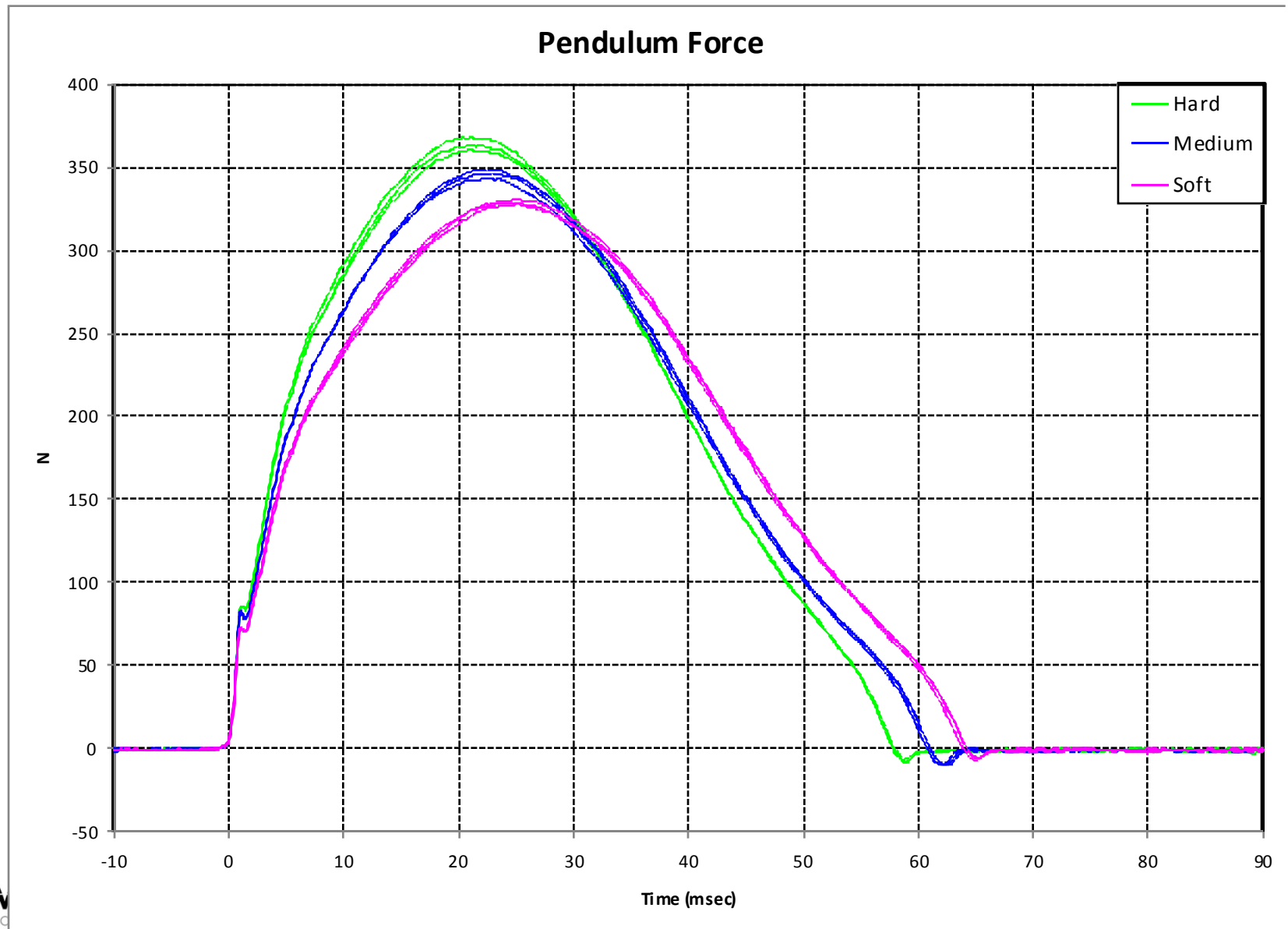
# Headrest Test

## Foam Pad Verification



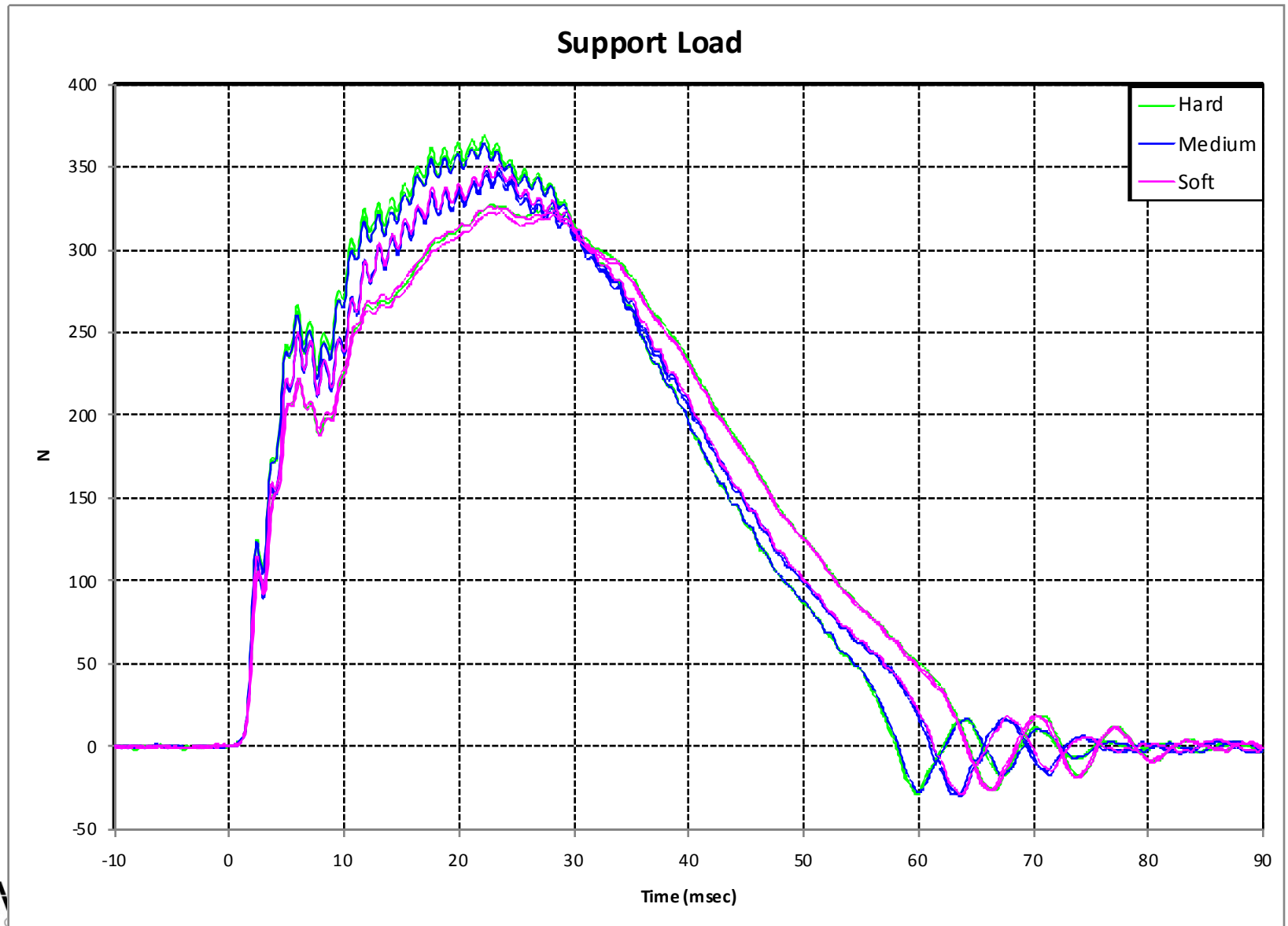
# Headrest Test

## Foam Pad Verification



# Headrest Test

## Foam Pad Verification

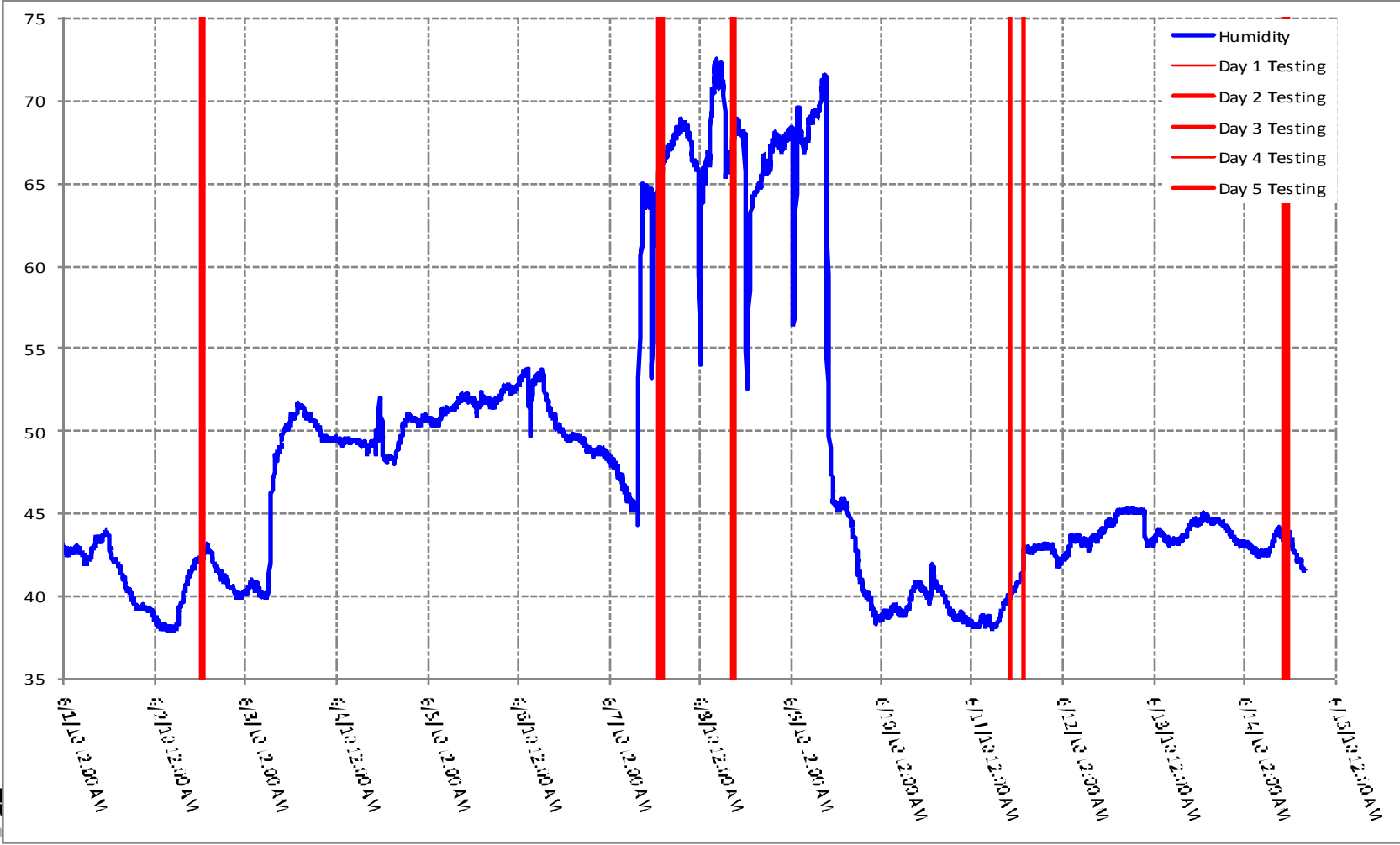


# Humidity Effect on mini-sled ETD

- Study Goal:
  - Determine if humidity affects the performance of the impact blocks during sled certification with weight package
- Study Design
  - Selected 4 blocks
    - 2 Normal blocks
    - 2 Vinyl seal blocks
  - Pretested blocks at ~42%RH prior to increasing humidity to ~65%RH
    - 3 tests each block
  - Increased humidity to ~65%RH and soak time was overnight prior to testing each block 3 times each.
  - Repeated second day with humidity remaining at the ~65%RH range
  - Returned humidity to normal level and retested after weekend.
  - Waited additional 2 days and repeated testing to see if block fully returned.

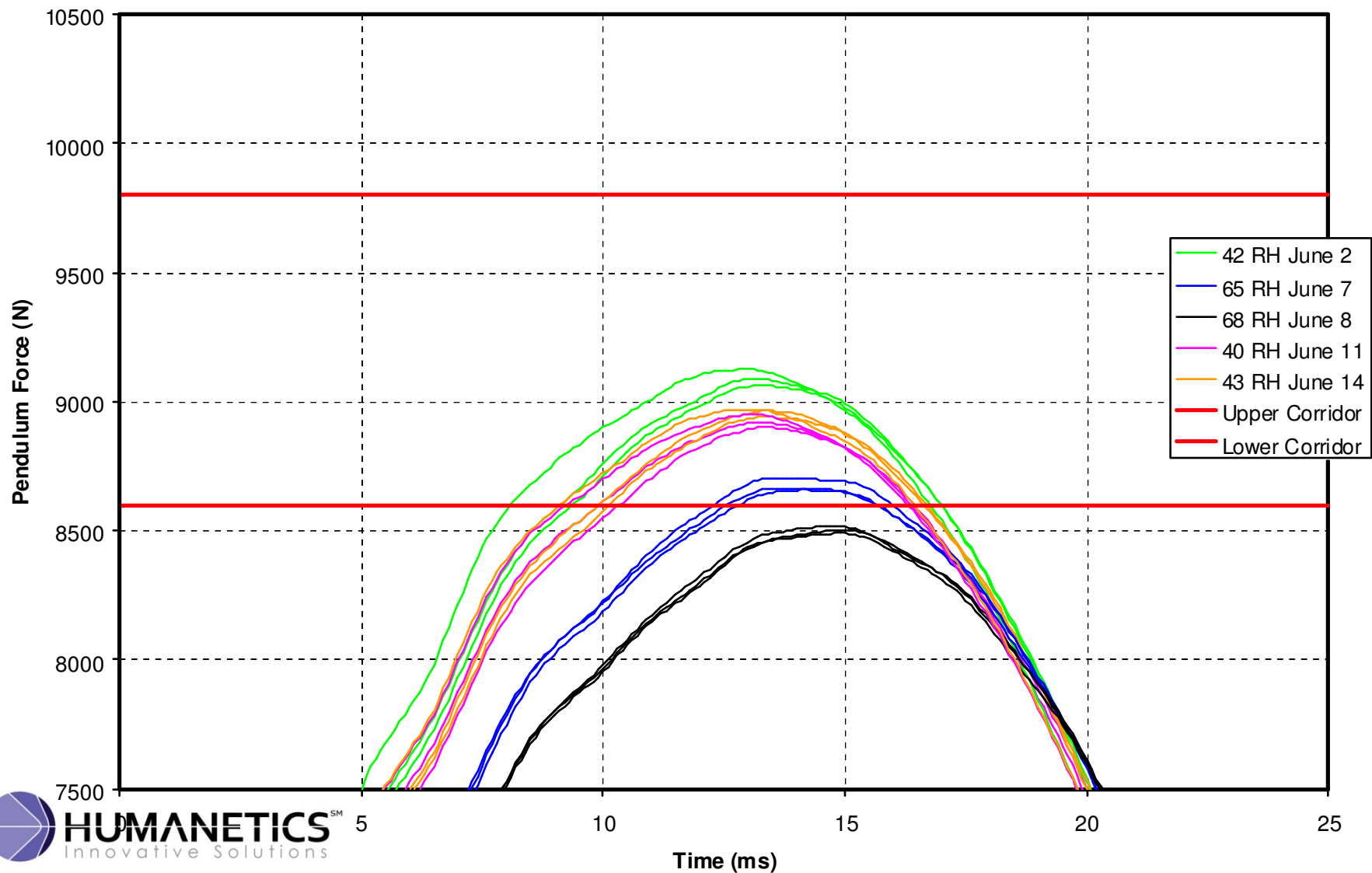
# Humidity Effect on mini-sled ETD

- Humidity varied around targets during experiment – don't look at specific values, just approximate trends.



# Humidity Effect on mini-sled ETD

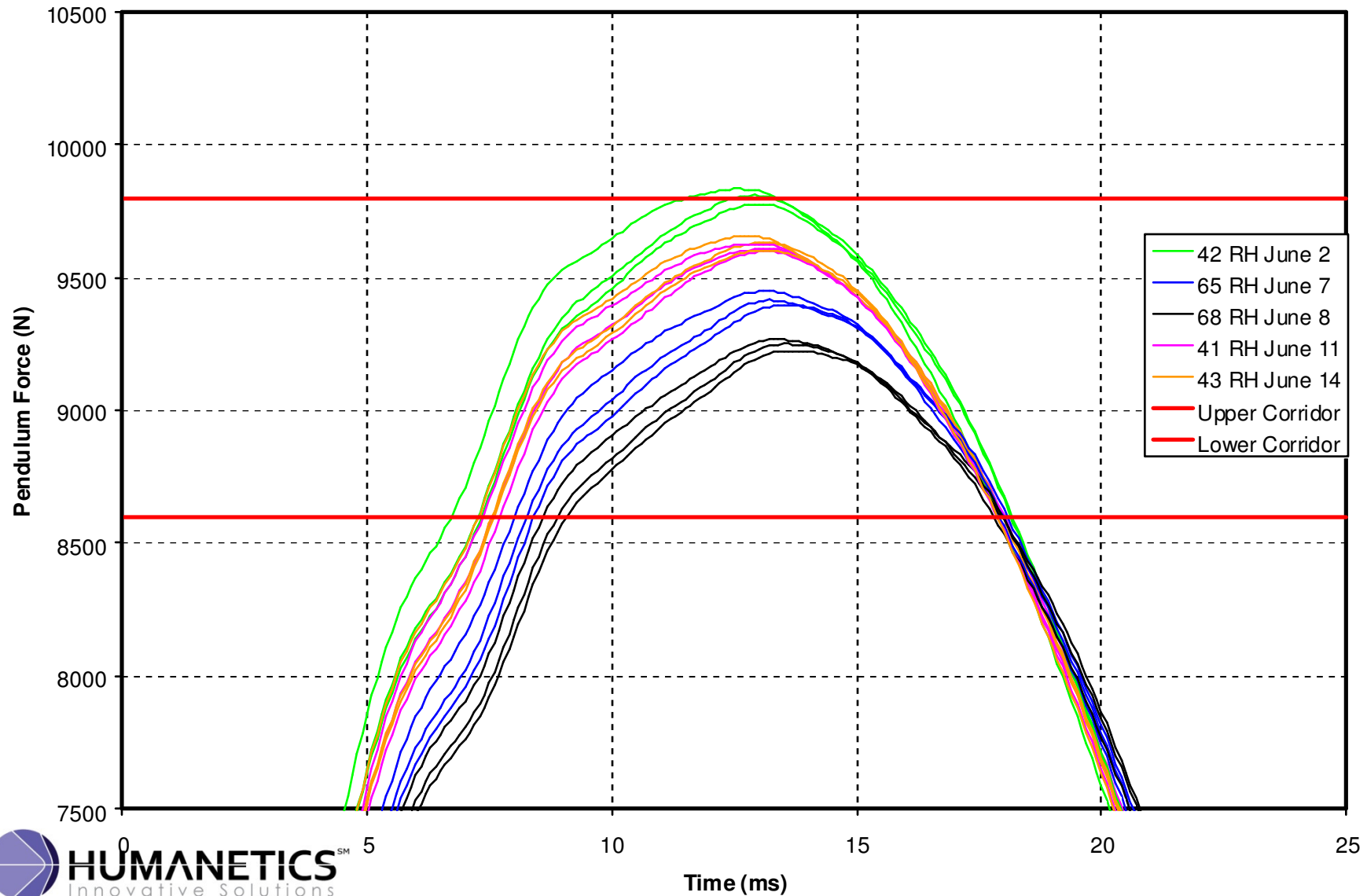
Humidity Effect - Pend Force (N) - Block 0001





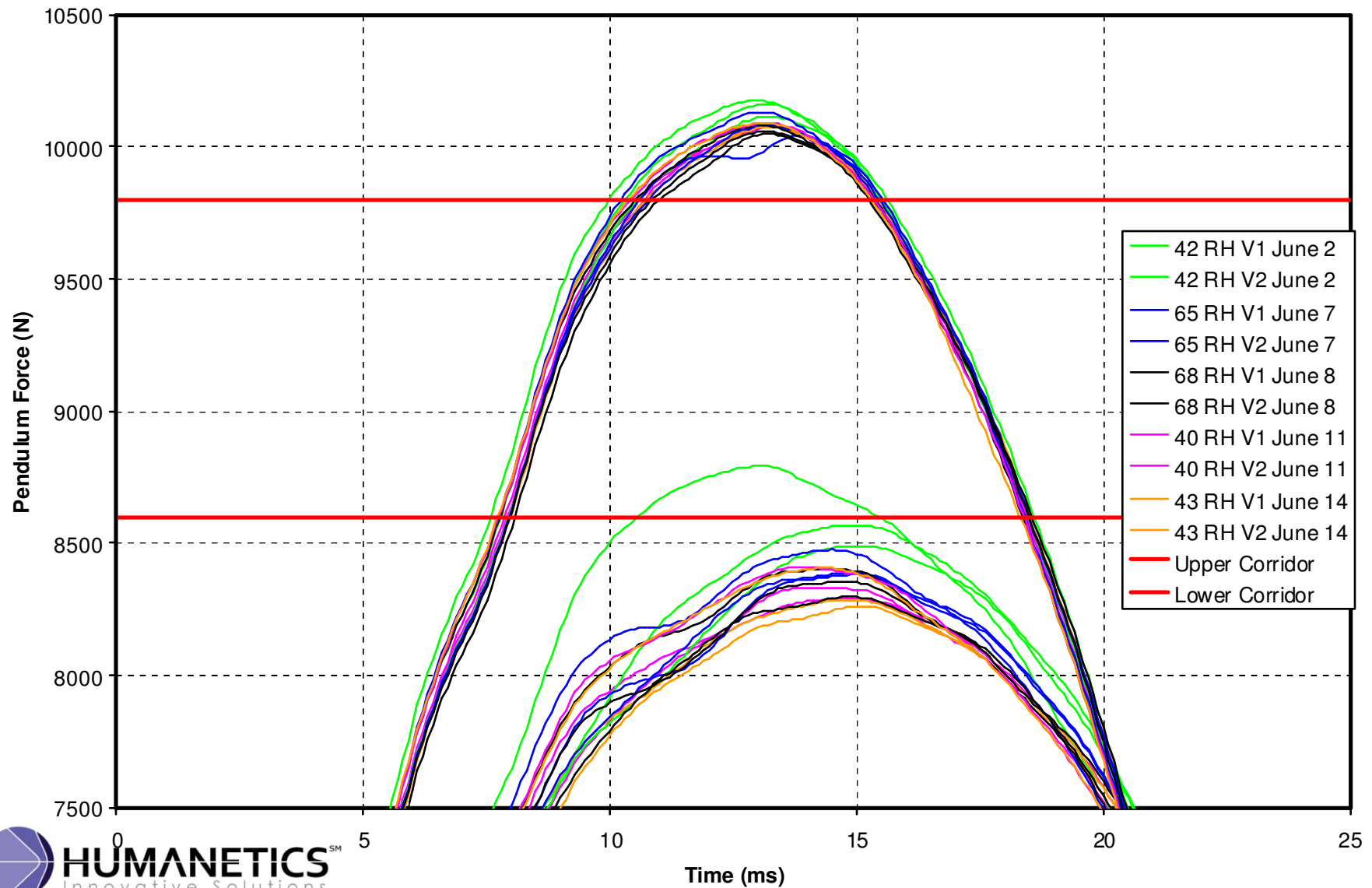
# Humidity Effect on mini-sled ETD

Humidity Effect - Pend Force (N) - Block 16342



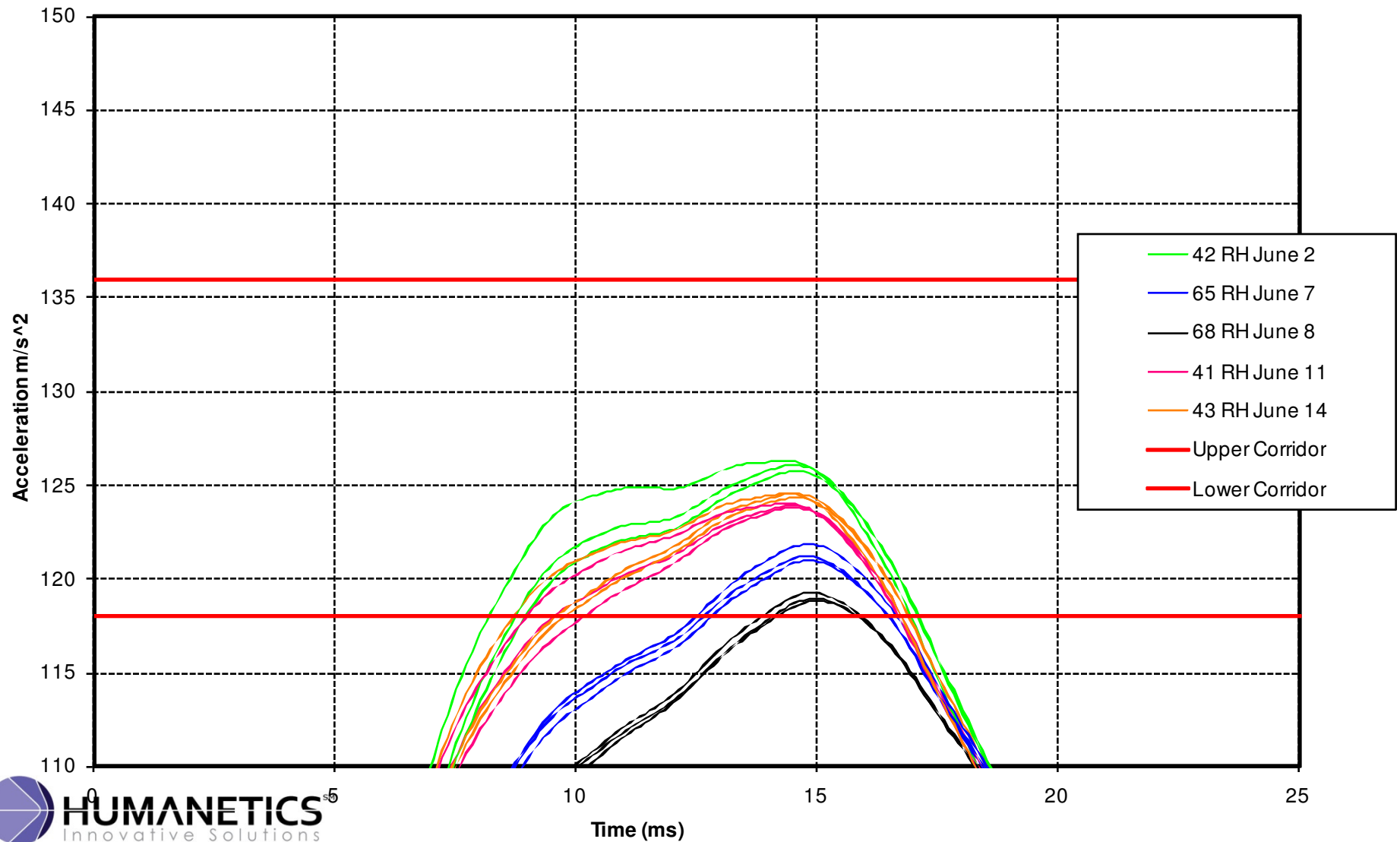
# Humidity Effect on mini-sled ETD

Humidity Effect - Pend Force (N) - Sealed Blocks



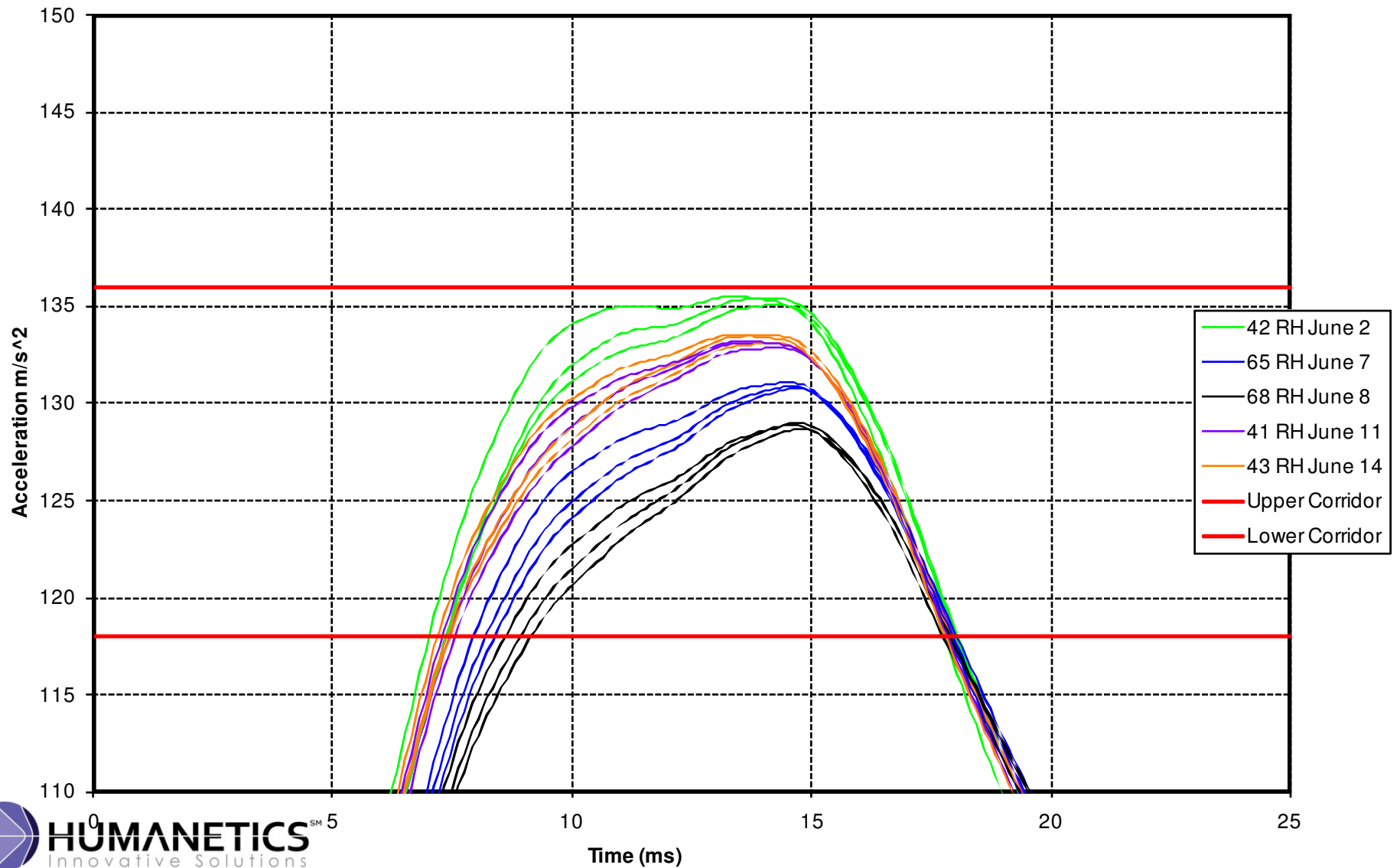
# Humidity Effect on mini-sled ETD

Humidity Effect - Sled Accel - Block 0001



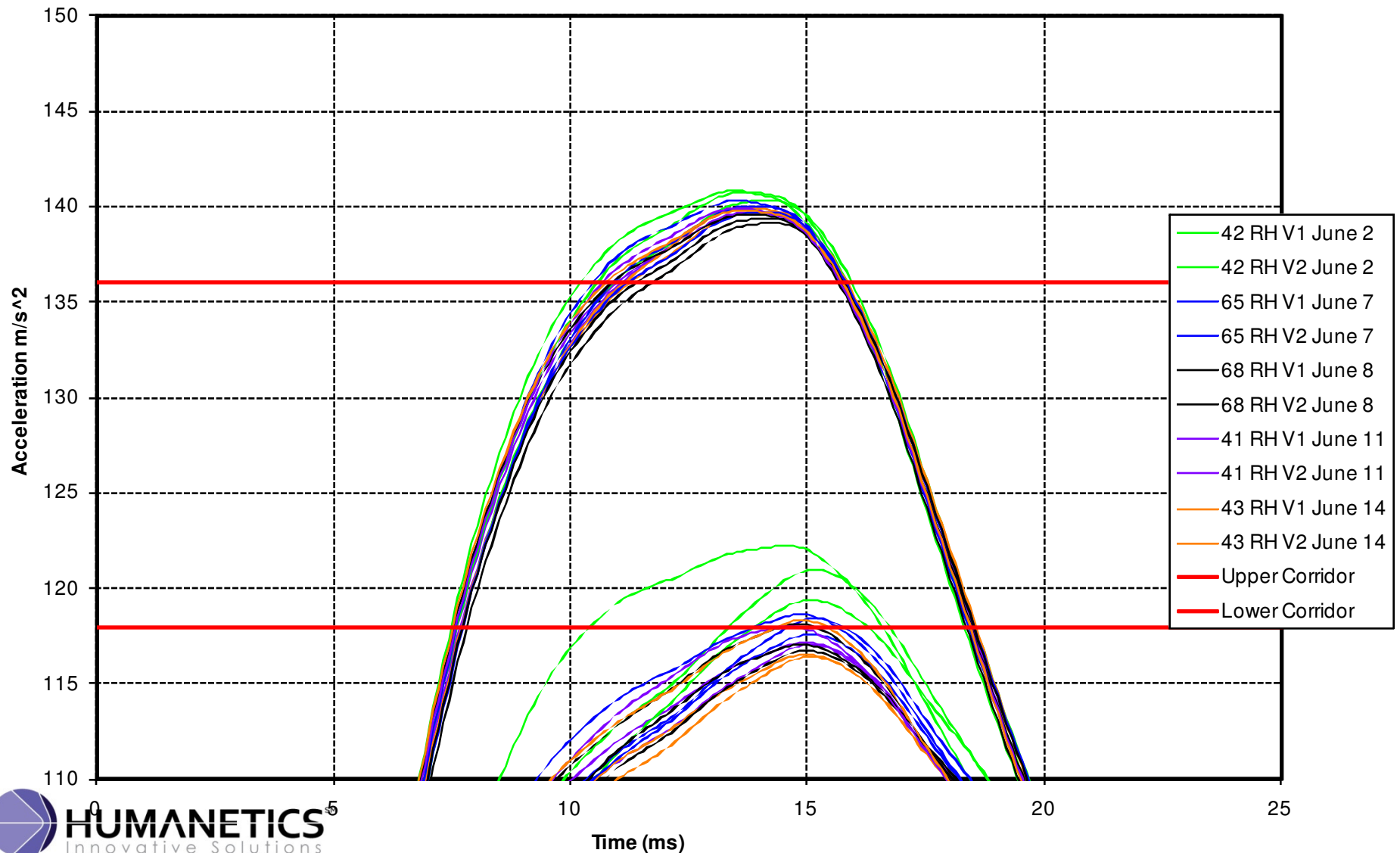
# Humidity Effect on mini-sled ETD

Humidity Effect - Sled Accel - Block 16342



# Humidity Effect on mini-sled ETD

Humidity Effect - Sled Accel - Sealed Blocks



# Humidity Effect on mini-sled ETD

- Conclusion
  - Humidity quickly changes the performance of the unsealed impact blocks
  - The Higher humidity causes a lower Pendulum Force and Sled Accelerations for unsealed blocks.
  - Blocks appear to return to normal within a couple days.
  - Sealed block appear unaffected by humidity changes.

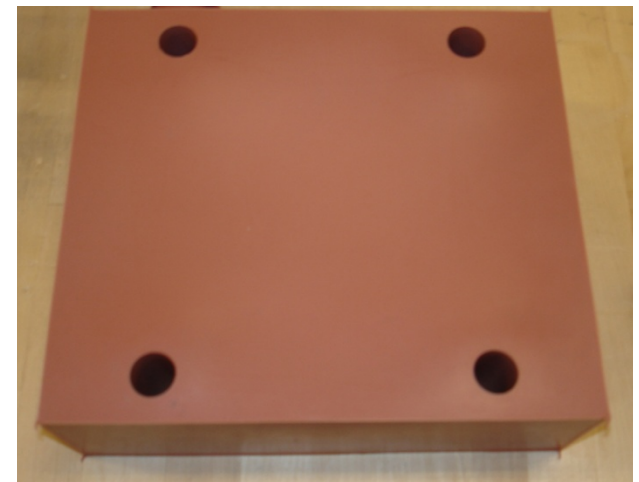
# Humidity Effect on mini-sled ETD

## Sealed foam blocks



**Mini-sled w/o  
headrest ETD**

**Mini-sled with  
headrest ETD**

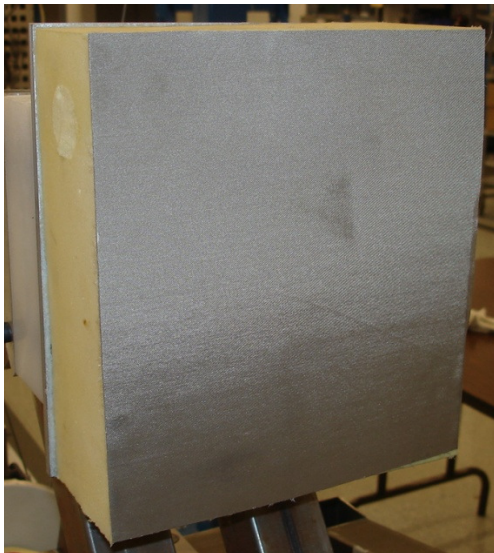


**Headrest pad**



# Head Contact Switch Proposal

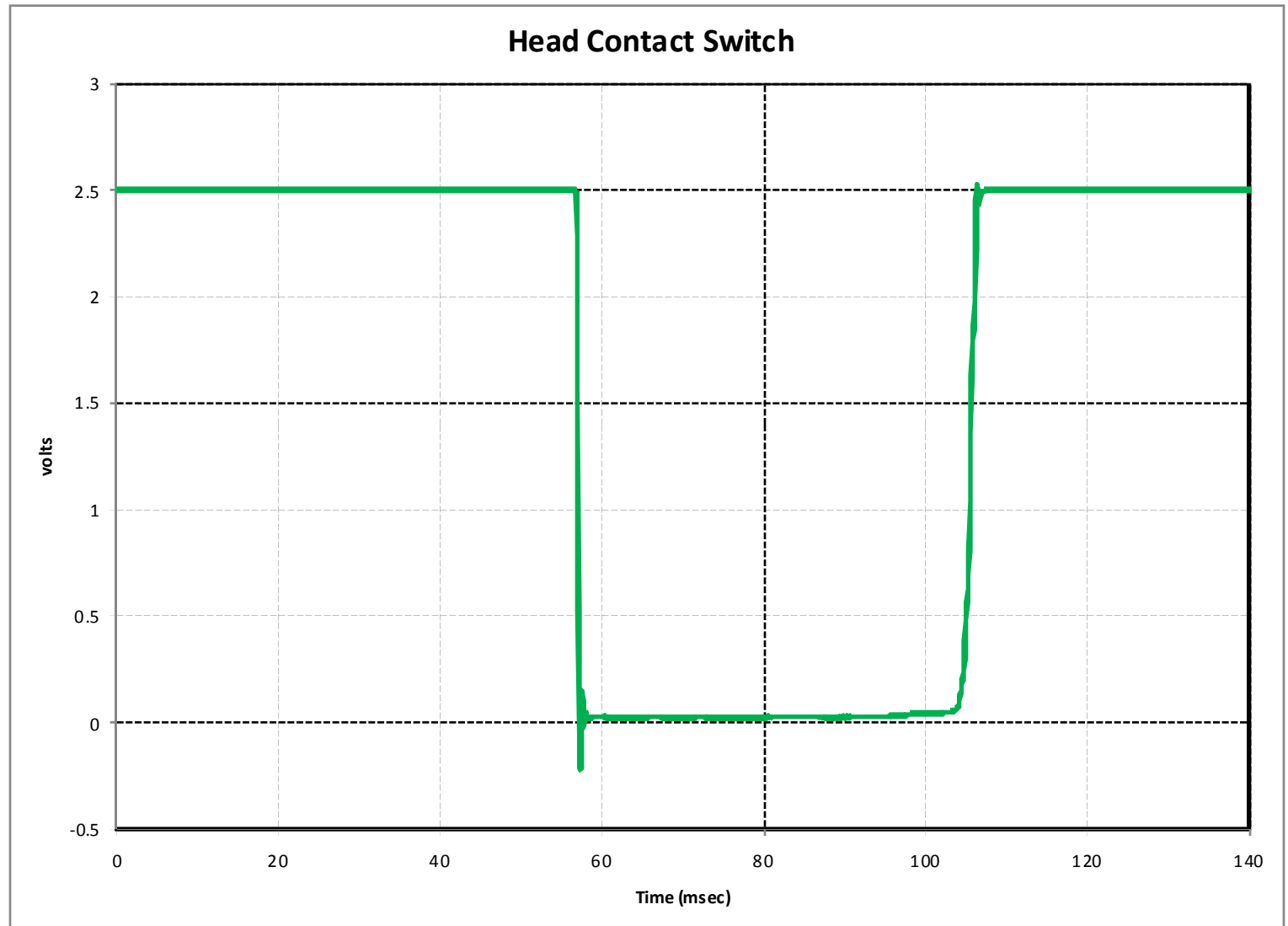
- Conductive paint on standard vinyl
- Very flexible conductive cloth to bond to headrest with spray glue



**No wires to headrest.  
Cloth completes  
circuit across head  
halves.**



# Head Contact Switch Proposal



# Variation Studies

- Jacket stiffness & head MMI
- Jacket water
- Amount of oil in damper
- Upcoming

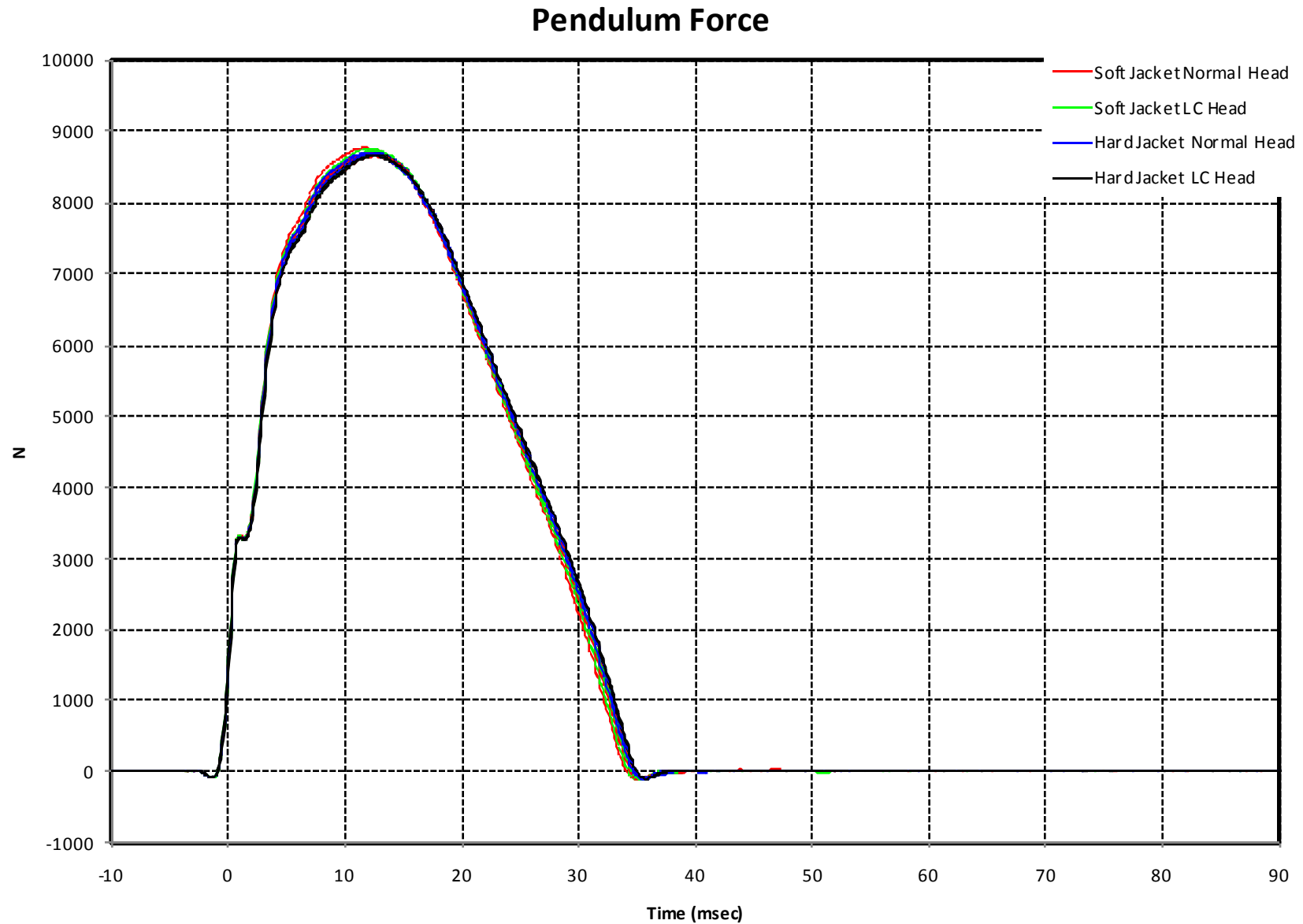
# Variation Studies:

## Jacket Stiffness and Head MMI

- Study Goal
  - Determine if jacket types and head types cause test differences
- Study Design (*Jacket – Head DOE*)
  - Variables
    - Two jacket types (Expected range in field)
      - Hard
      - Soft
    - Two head types (Heads have different mmi)
      - Normal head
      - Load cell head
  - Run both the Dummy Certification Test and Headrest Test

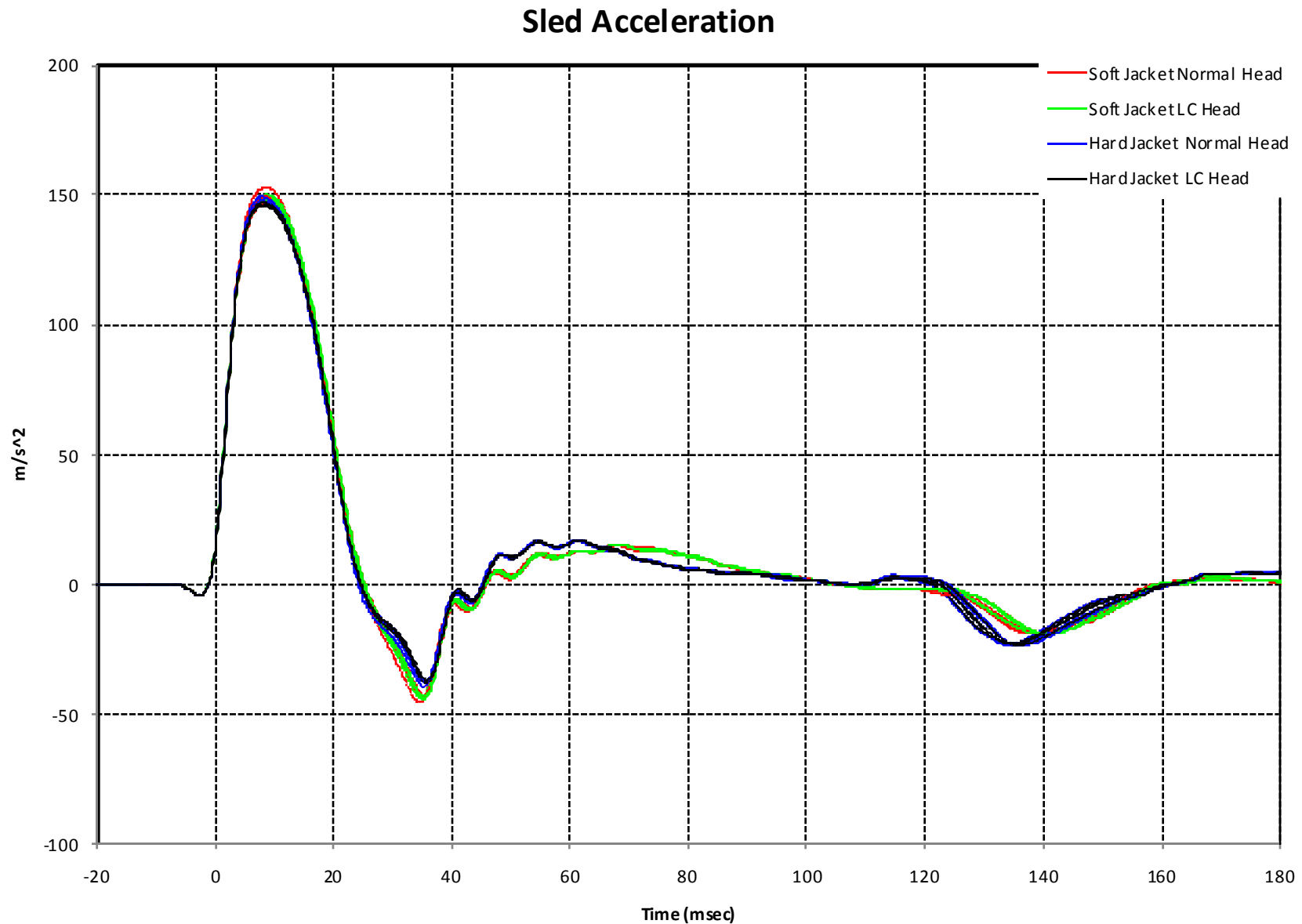
# Jacket – Head DOE

## Dummy Certification



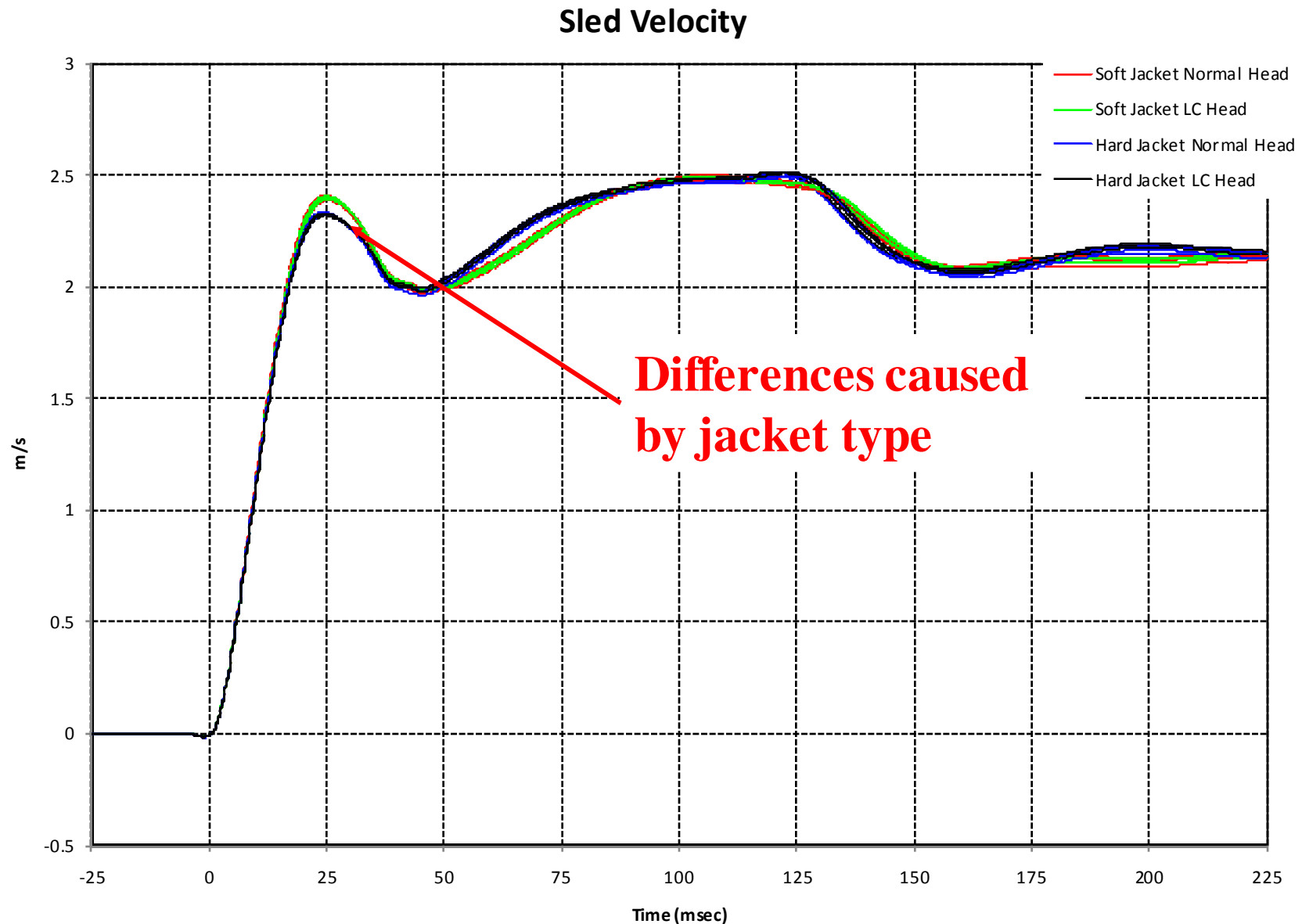
# Jacket – Head DOE

## Dummy Certification



# Jacket – Head DOE

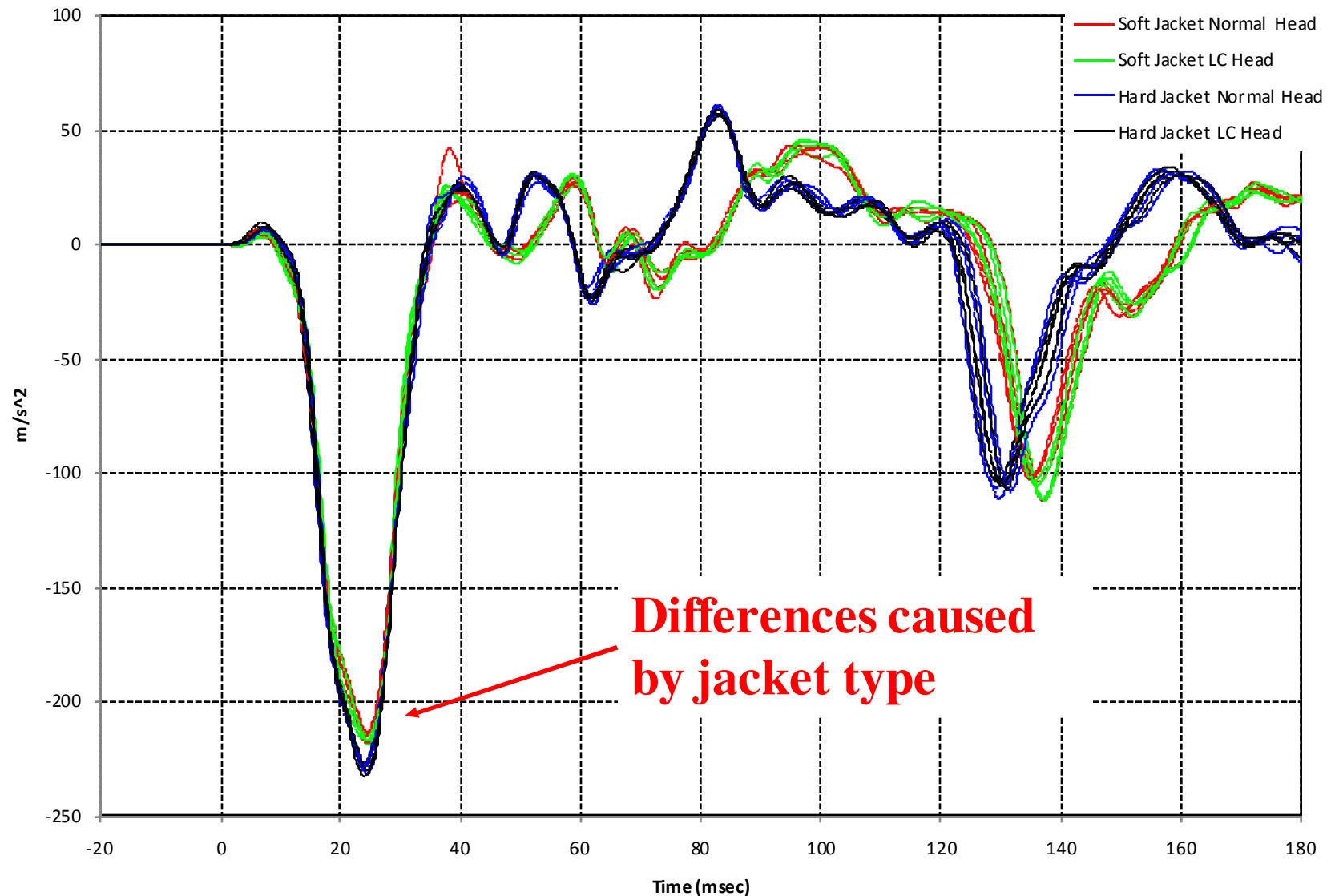
## Dummy Certification



# Jacket – Head DOE

## Dummy Certification

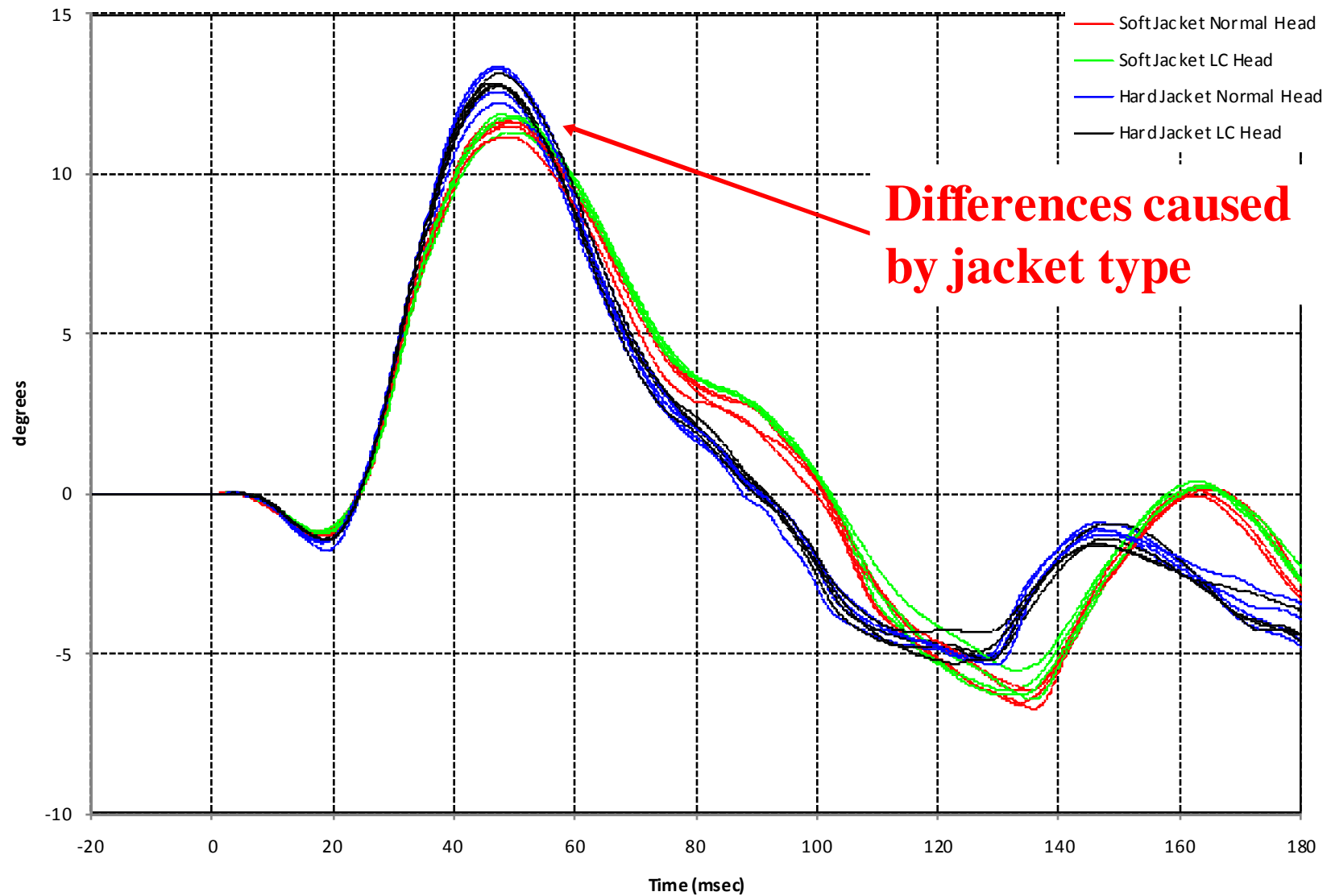
### T1 X Acceleration



# Jacket – Head DOE

## Dummy Certification

### Pot A - Head Rotation about OC





# Jacket – Head DOE

## Dummy Certification

Pot B - Neck Link Rotation about T1

