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Li/CF_x Battery Pack Shock Test

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Outline

- Battery Design
- Test Description
- Results
- Conclusions
- Future Activities

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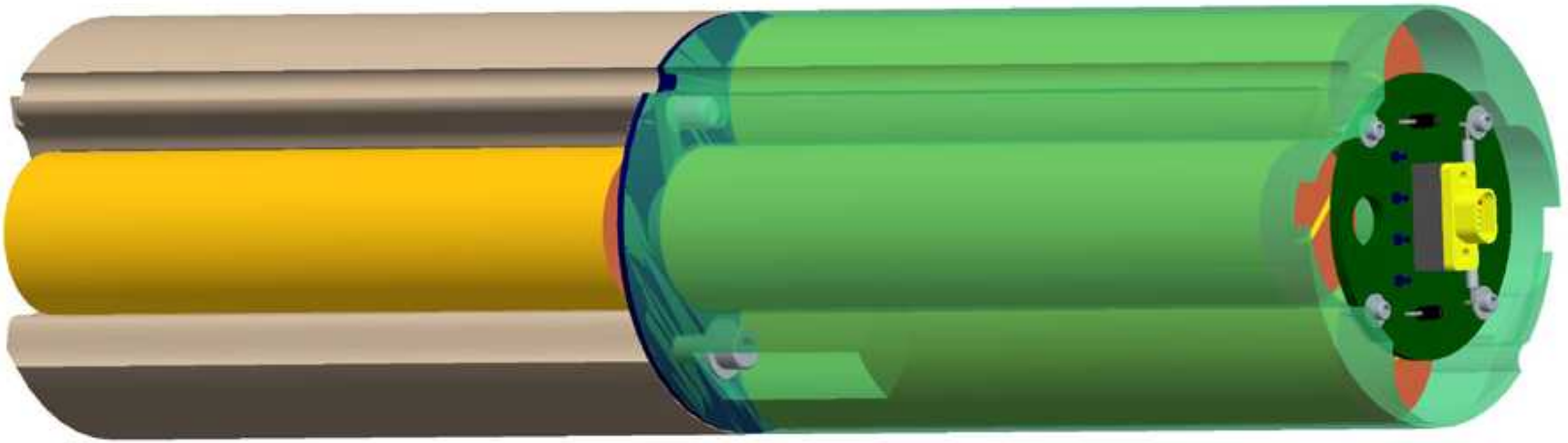
Battery Design

- Battery consists of eight EaglePicher LCF-112 (Li/CF_x DD) cells in a 2P4S configuration
- Battery needs to survive an estimated 1000g 30msec earth penetrater shock
- Consultation with EPT indicated highest probability of success would be with cells mounted with vent end down
- Analysis predicts a maximum stress of ~10kpsi on the impact end of the battery
- Machined housing of G10 selected to support the cells

Battery Design



Eight LCF-112 cells in a 2P4S configuration

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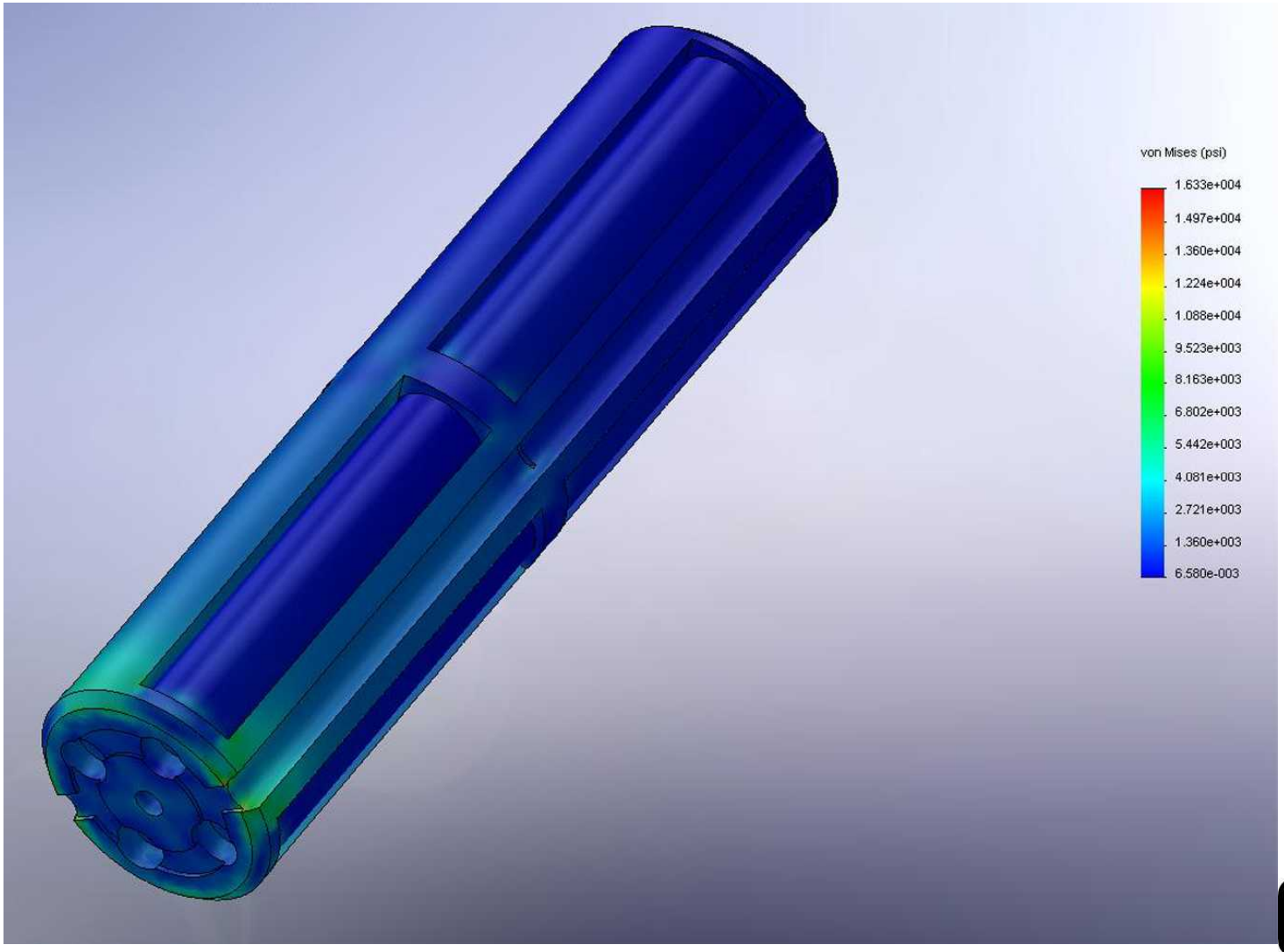
Predicted Stress Pattern



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Test Description

- Drop test in SNL environmental test lab
  - Application shock cannot be simulated in lab due to equipment limitations
  - Shock applied was higher amplitude and shorter duration than application
  - Rate of change of acceleration was approximately an order of magnitude greater than in the application

Shock Test Setup

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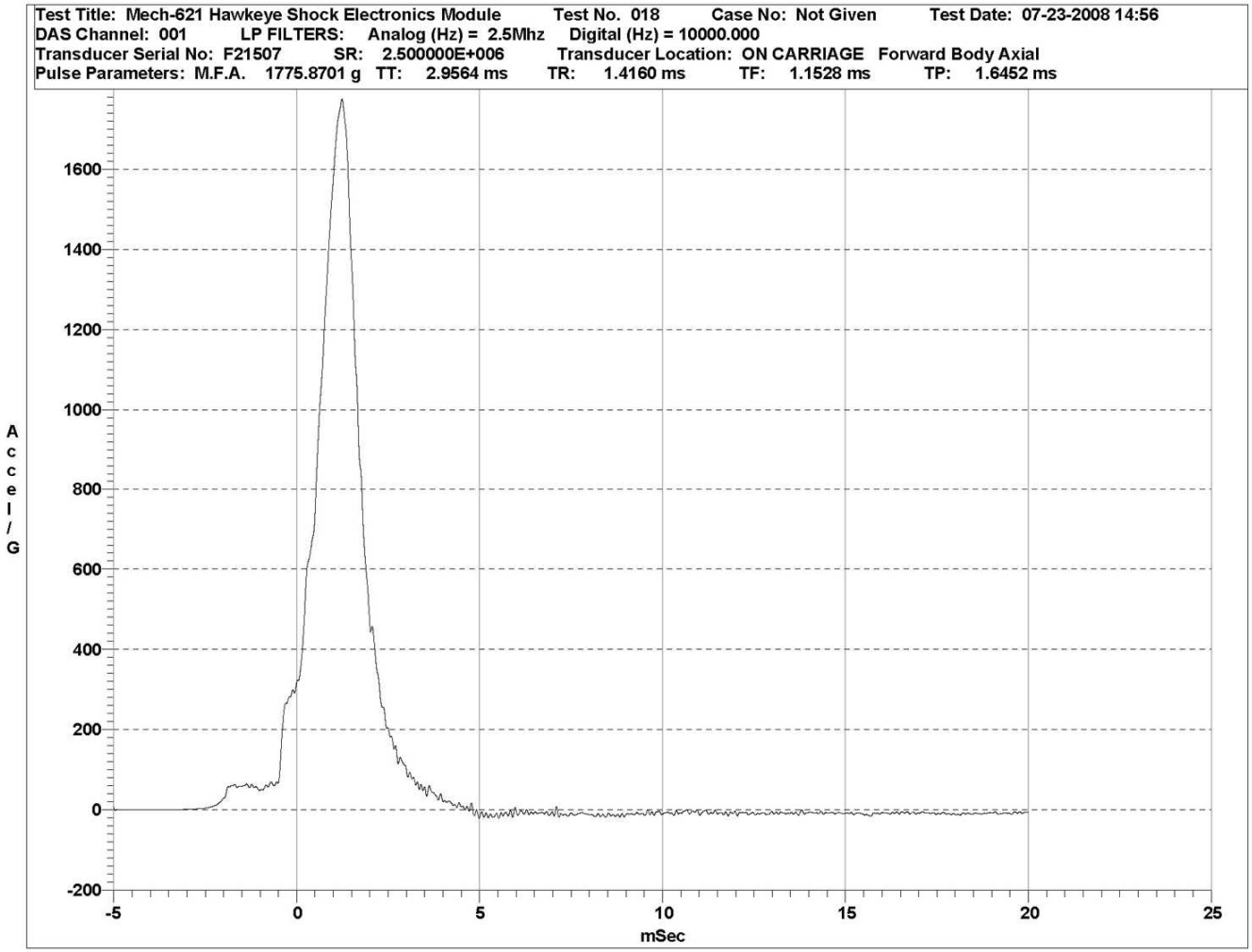
Shock Pulse



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Results

- The battery was leaking electrolyte from both strings after the shock was applied
- Visual examination of the exposed vents showed distortion and some punctures
- X-ray examination showed the jelly roll had shifted

Battery Pack - Post Shock

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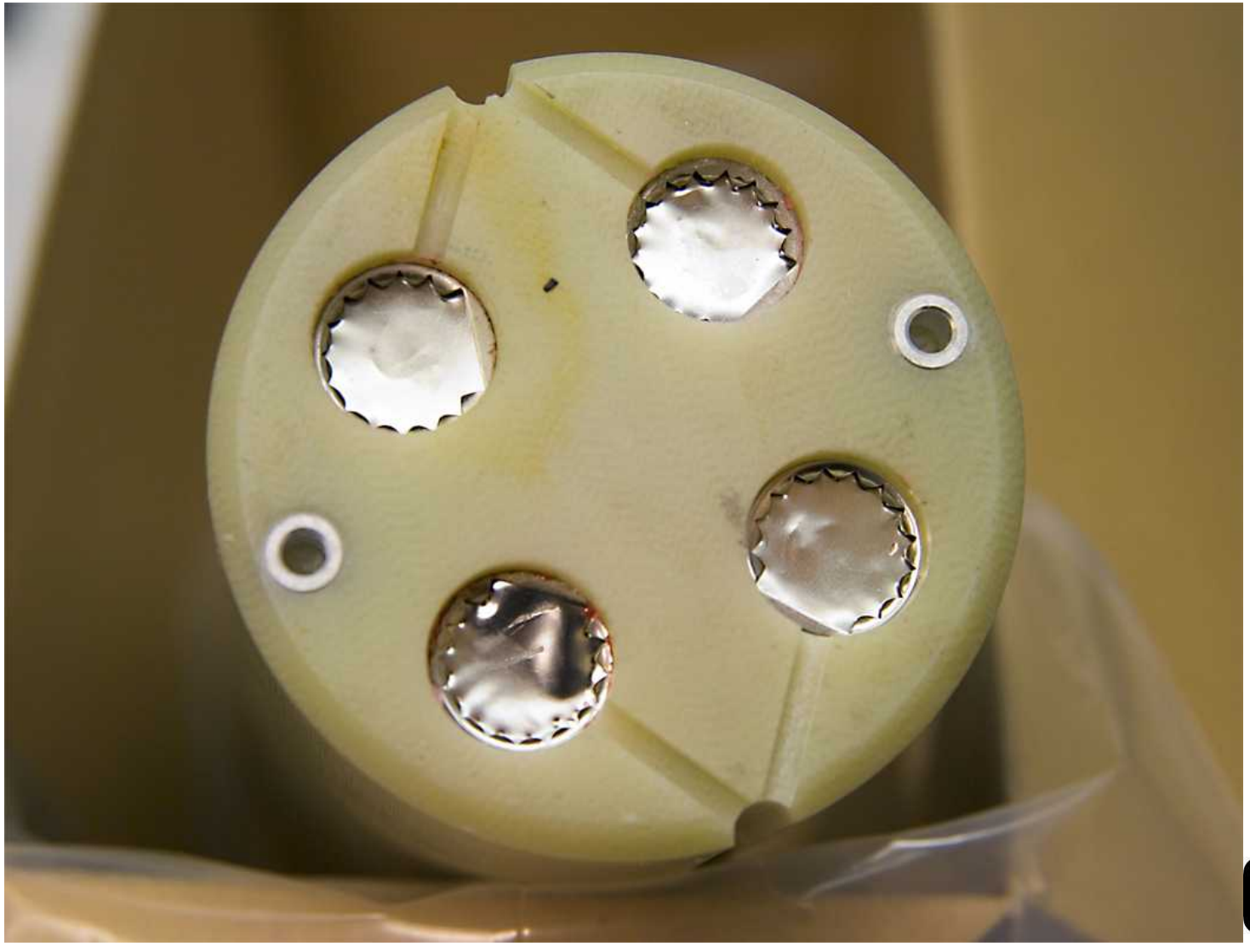
Battery Pack Vent End - Post Shock



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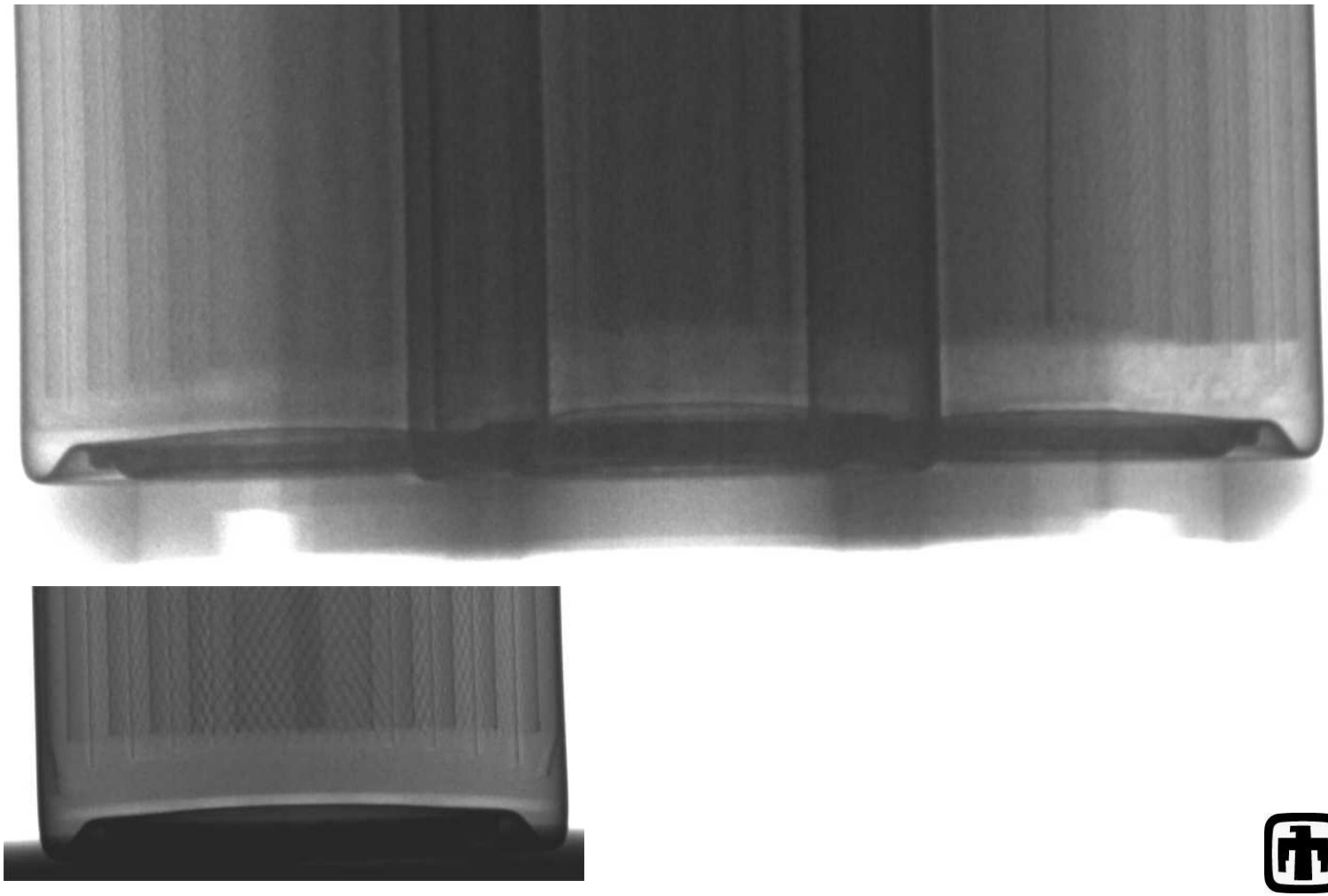
X-ray of Vent End - Post Shock Battery Pack Compared With Untested Cell



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Conclusions

- The very rapid change in acceleration caused the jelly roll to shift enough to push the thin foil at the vent end of some of the cells into the serrated end of the cell case, resulting in a puncture allowing the electrolyte to leak

Future Plans

- **Build four cell battery packs for additional shock testing that more nearly simulates the application**
  - **Davis gun**
  - **Aircraft drop tests**

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