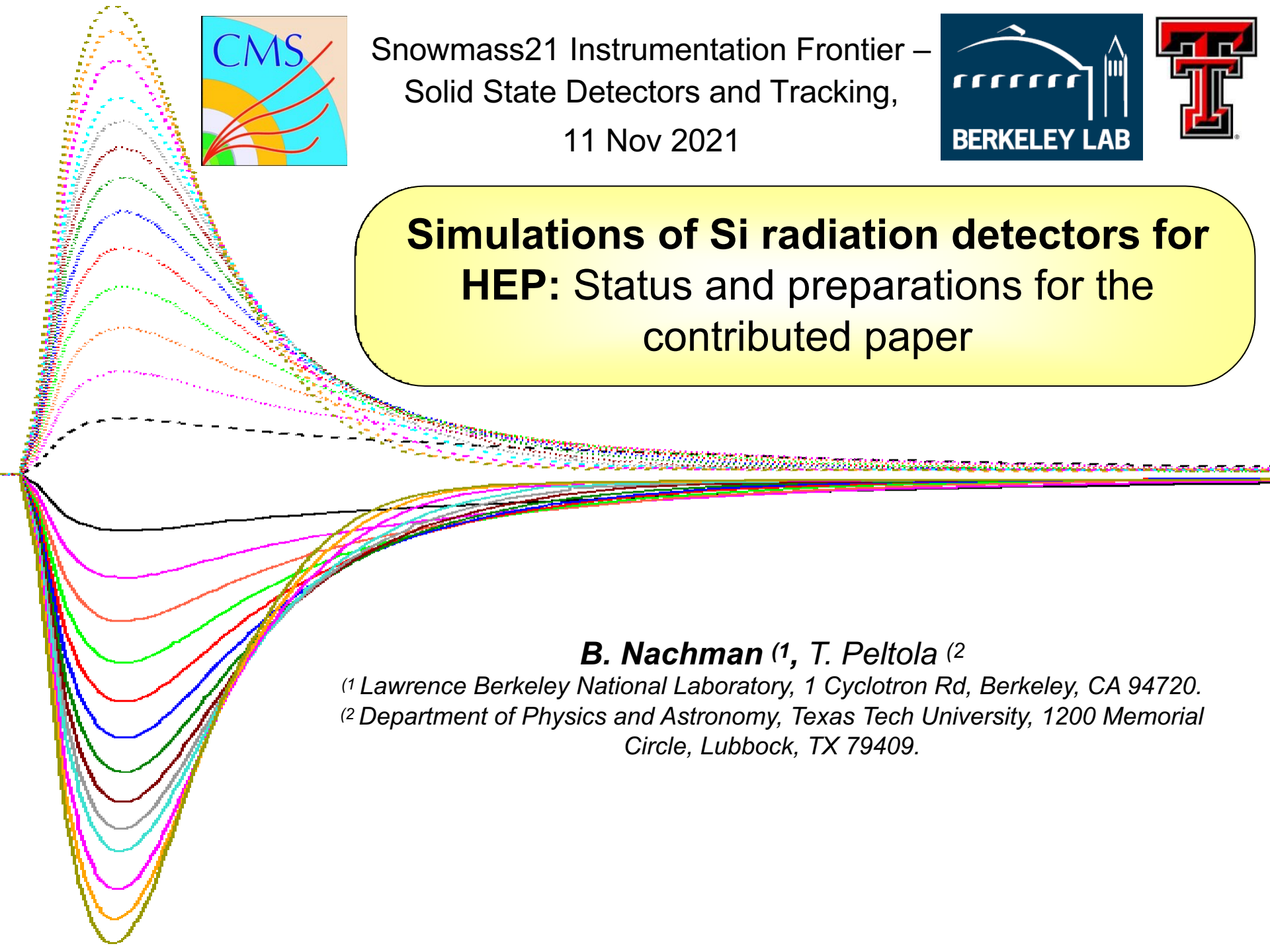

Snowmass21 Instrumentation Frontier – Solid State Detectors and Tracking, 11 Nov 2021

Simulations of Si radiation detectors for HEP: Status and preparations for the contributed paper

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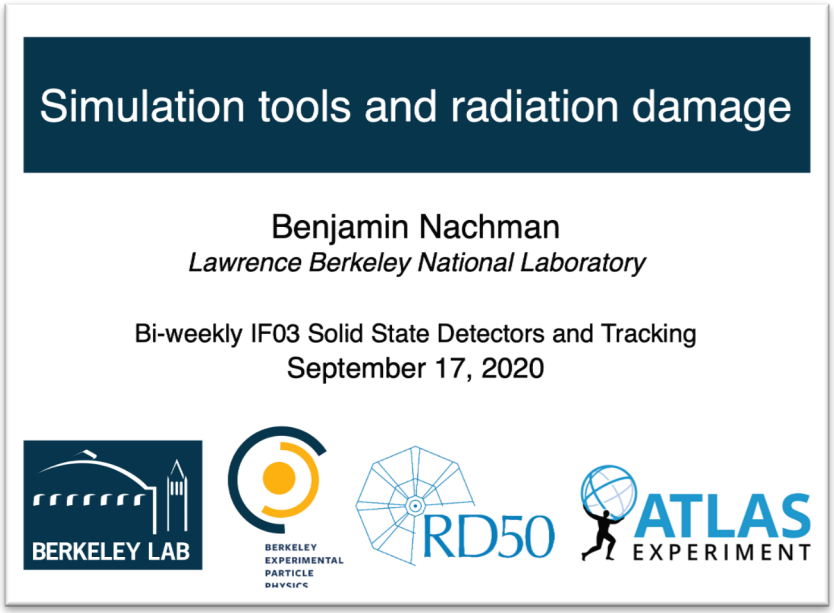
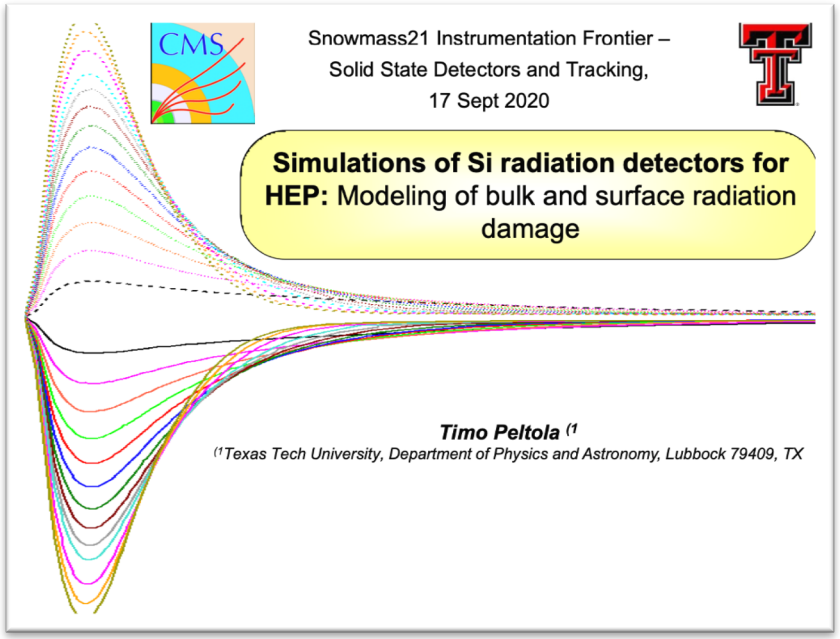
Previous reports

September 2020 IF03 meeting:





Proposed report outline

Part I: Existing Tools

- Models for single quantities
  - Annealing (e.g. Hamburg Models)
  - Straggling (e.g. Bichsel Model)
- TCAD simulations for detector properties
  - Many multitrap models for radiation damage
  - Lighter-weight alternatives: TRACS and Weightfield2
- Testbeam
  - Pixelav
  - Allpix^2
- Full detector systems
  - ATLAS approach (modified digitization)
  - CMS approach (efficiency corrections)
  - LHCb approach (tuned charge transport)

Proposed report outline

Part II: Challenges and Needs

- Unified radiation damage (TCAD) and annealing model
- Prescription for uncertainties in TCAD models
- Measurements of damage factors (many of the inputs in the RD50 database are based on simulation or less)
- Update to basic silicon properties? https://cds.cern.ch/record/2629889
- How to deal with proprietary software and device properties?
- Feedback between full detector systems and per-sensor models
- Extreme fluences of future colliders

Plan

- Identify experts who can contribute to various sections
- Transfer the outline above to a common document to begin integrating contributions