

# Simulations of Silicon Radiation Detectors for HEP

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**Benjamin Nachman (editor),<sup>1</sup> Timo Peltola (editor),<sup>2</sup> and addyourself**

<sup>1</sup>*Physics Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA*

*E-mail:* [bpnachman@lbl.gov](mailto:bpnachman@lbl.gov)

ABSTRACT: TBD

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## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
<b>2</b>	<b>Existing Tools</b>	<b>2</b>
2.1	Models for Single Quantities	2
2.1.1	Straggling	2
2.1.2	Annealing	2
2.2	TCAD Simulations for Detector Properties	2
2.3	Testbeam	2
2.4	Full detector systems	2
<b>3</b>	<b>Challenges and Needs</b>	<b>2</b>

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## 1 Introduction

Should reference the recent Yellow Report [1].

## 2 Existing Tools

### 2.1 Models for Single Quantities

#### 2.1.1 Straggling

#### 2.1.2 Annealing

### 2.2 TCAD Simulations for Detector Properties

Many multitrap models for radiation damage and lighter-weight alternatives (TRACS and Weightfield2)

### 2.3 Testbeam

Pixelav, Allpix<sup>2</sup>, ...

### 2.4 Full detector systems

ATLAS approach (modified digitization), CMS approach (efficiency corrections), LHCb approach (tuned charged transport)

## 3 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

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## References

- [1] I. Dawson, *Radiation effects in the LHC experiments: Impact on detector performance and operation*. CERN Yellow Reports: Monographs. CERN, Geneva, 2021, [10.23731/CYRM-2021-001](https://cds.cern.ch/record/2629889).