A Case Study in the Application of Model-Based Systems Engineering to Laboratory Research Science

Brad Crochet

Date of Award
Winter 12-2017

Degree Type
Dissertation

Degree Name
Doctor of Philosophy (PhD)

Department
Computing

Committee Chair
Dr. Chris Winstead

Committee Chair Department
Physics and Astronomy

Committee Member 2
Dr. Wonryull Koh

Committee Member 2 Department
Computing

Committee Member 3
Dr. Ras B. Pandey

Committee Member 3 Department
Physics and Astronomy

Committee Member 4
Dr. Michael Vera

Committee Member 4 Department
Physics and Astronomy

Abstract
This dissertation presents an exploration of the application of Model-Based Systems Engineering (MBSE) tools and methods to the design and execution of sophisticated laboratory experiments. An experiment to measure the first excited state diffusion coefficient, recently attempted by the author, is used as an example. Several MBSE analysis methods are applied, retrospectively, to the process by which the experiment in question was planned and executed. The potential for increased efficiency in managing the diverse types of information associated with such laboratory experiments is demonstrated, as well as possible further avenues for future research.

Copyright
2017, Brad Crochet

Recommended Citation
Crochet, Brad, "A Case Study in the Application of Model-Based Systems Engineering to Laboratory Research Science" (2017). Dissertations. 1450.
https://aquila.usm.edu/dissertations/1450
Formalizes the practice of systems development through the use of models. Life Cycle Support. Broad in scope – includes multiple modeling domains across life cycle from SOS to component. Results in quality/productivity improvements & lowe Model-Based Systems Engineering (MBSE) has grown in popularity since the introduction of SysML a decade ago. Pockets of modeling excellence have developed within many government, industrial, and educational organizations. Few, if any, more. Model-Based Systems Engineering (MBSE) has grown in popularity since the introduction of SysML a decade ago. Pockets of modeling excellence have developed within many government, industrial, and educational organizations. Few, if any, have achieved "wall-to-wall" adoption. This paper will focus on a key component of a successful system model.