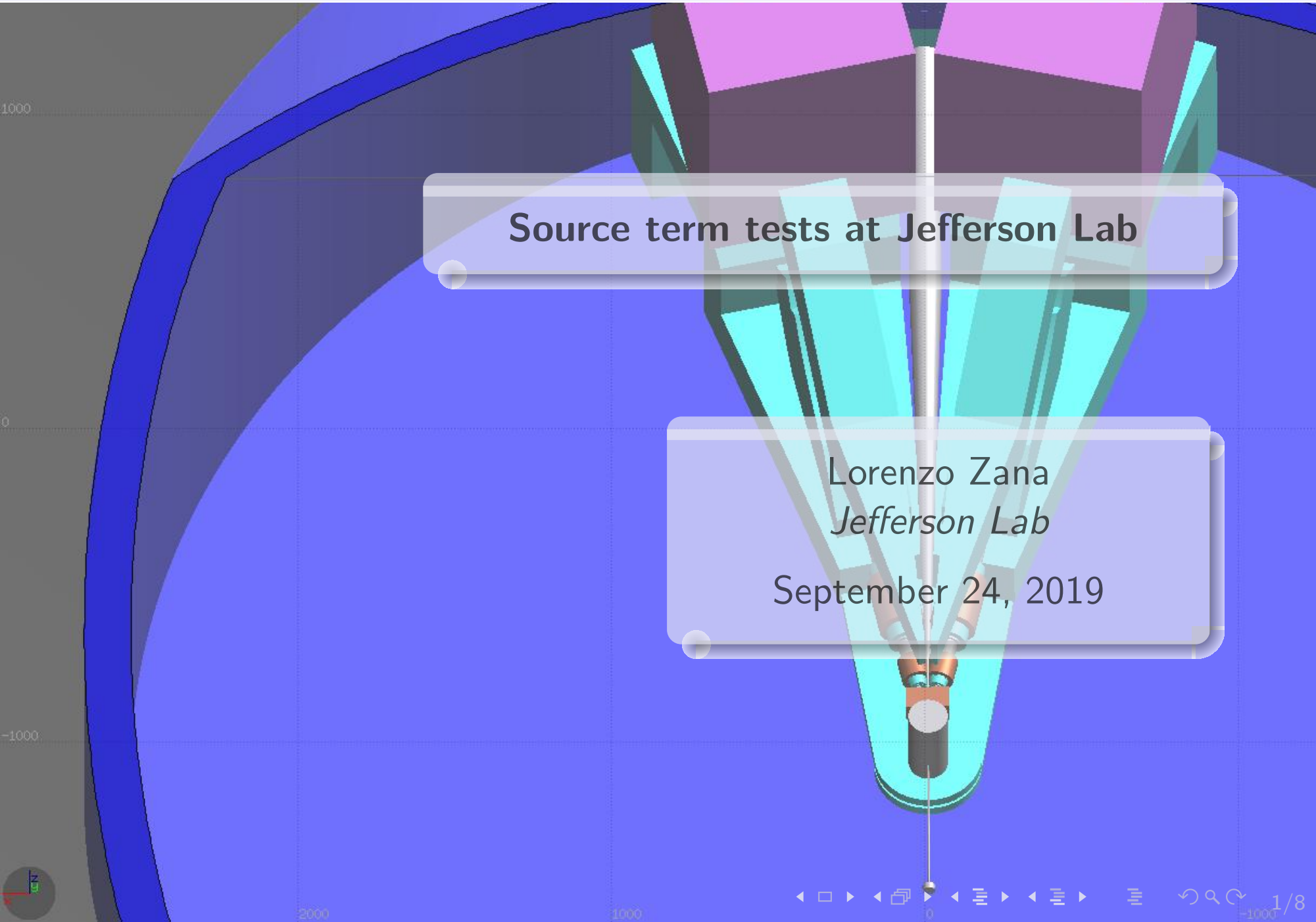

Source term tests at Jefferson Lab

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September 24, 2019

Geant4 at Jefferson Lab

Geant4 at Jefferson Lab for Radiation Control

- Geant4 is widely used at Jefferson Lab by the user community also for Radiation Control Studies
- The RadCon group at Jefferson Lab at this moment uses FLUKA and GEANT3/DINREG for their calculations
- The flexibility of Geant4 and the easier way of modeling put GEANT4 as one real possibility for the future, expecially for particular applications

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Source Term

- Important with Jefferson Lab experiments: high intensity , thin targets
- Expecially for particular configurations

Geant4 at Jefferson Lab

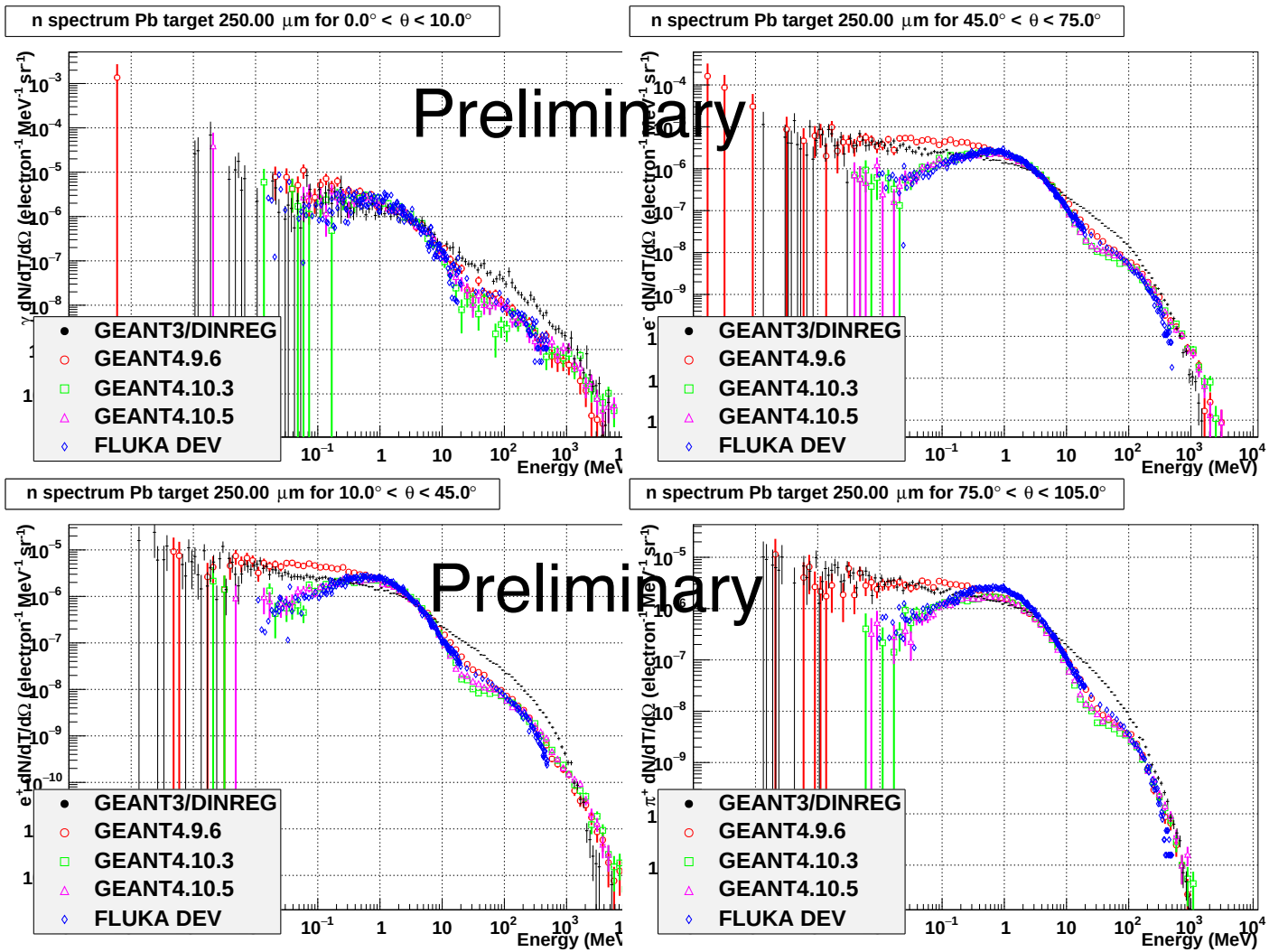
A Success: The PREXII experiment

- The PREXI experiment was impacted by hi level of radiation
- The PREXII collaboration developed the upgrade using GEANT4 for radiation estimates and shielding
- The experiment was just completed successfully at the start of this month.
- Different simulation software (MCNP, FLUKA) have been used for confirming key aspects of the simulation.

Testing the simulations: PREX

NEUTRON 250 μmPb $\frac{d^2N}{dT\,d\Omega}$ for different θ range: Beam= 11GeV

e-



Source testing: Hall-B

Some history

- The D_2 target run in Hall-B at Jefferson Lab last spring
- The Silicon Vertex Tracker (SVT) detector showed higher neutron rates than expected from Geant4 simulation, comparing with rates with Liquid Hydrogen
- The SVT detector covers angles from 35° to 125° (inner layer at 6.5cm)
- Different tests have been done with different physics lists, showing comparable results

Testing the simulations

Other targets tested: 11GeV e- beam

- Neutron Production on 168 μm Carbon: Cross section is reasonable and comparable to other simulations
- Neutron Production on 40 $cmLiquidH_2$: Cross section is reasonable and comparable to other simulations
- Problem comes when we checked on 40 $cmLiquidD_2$

Testing the simulations: D_2 target

NEUTRON 40cm D_2 $\frac{d^2N}{dT\,d\Omega}$ for different θ range: Beam= 11GeV e-