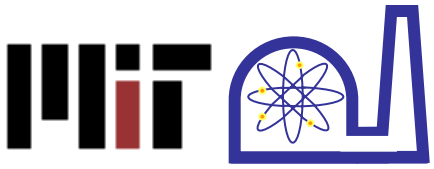


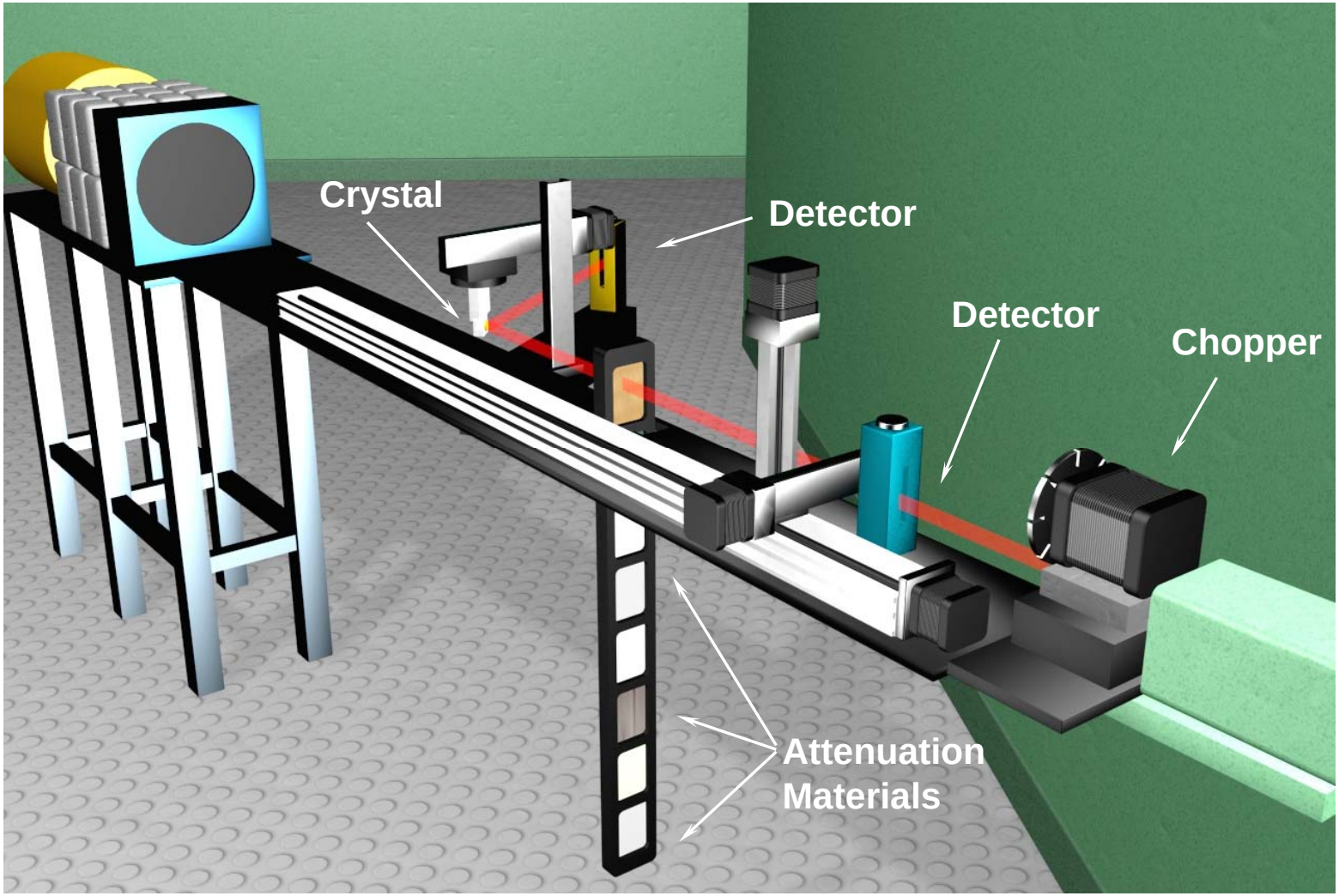
Progress Towards Deployment of a Web-Enabled Neutron Spectrometer

Gordon Kohse
Timothy Lucas
Jeremy Cohen
Judith Maro
Lin-wen Hu

Experiments in Basic Neutron Science

- **Demonstration of a Thermal Neutron Beam**
- **Demonstration of the DeBroglie wavelength through Time-of-Flight Experiment**
- **Demonstration of Bragg diffraction**
- **Demonstration of Neutron Scattering and Absorption**

⇒Provides an accessible and important foundation for Physics, Nuclear Science and Engineering Studies



Source: Original rendering of the principal components of the student spectrometer by R. Mark Bessette (MIT).

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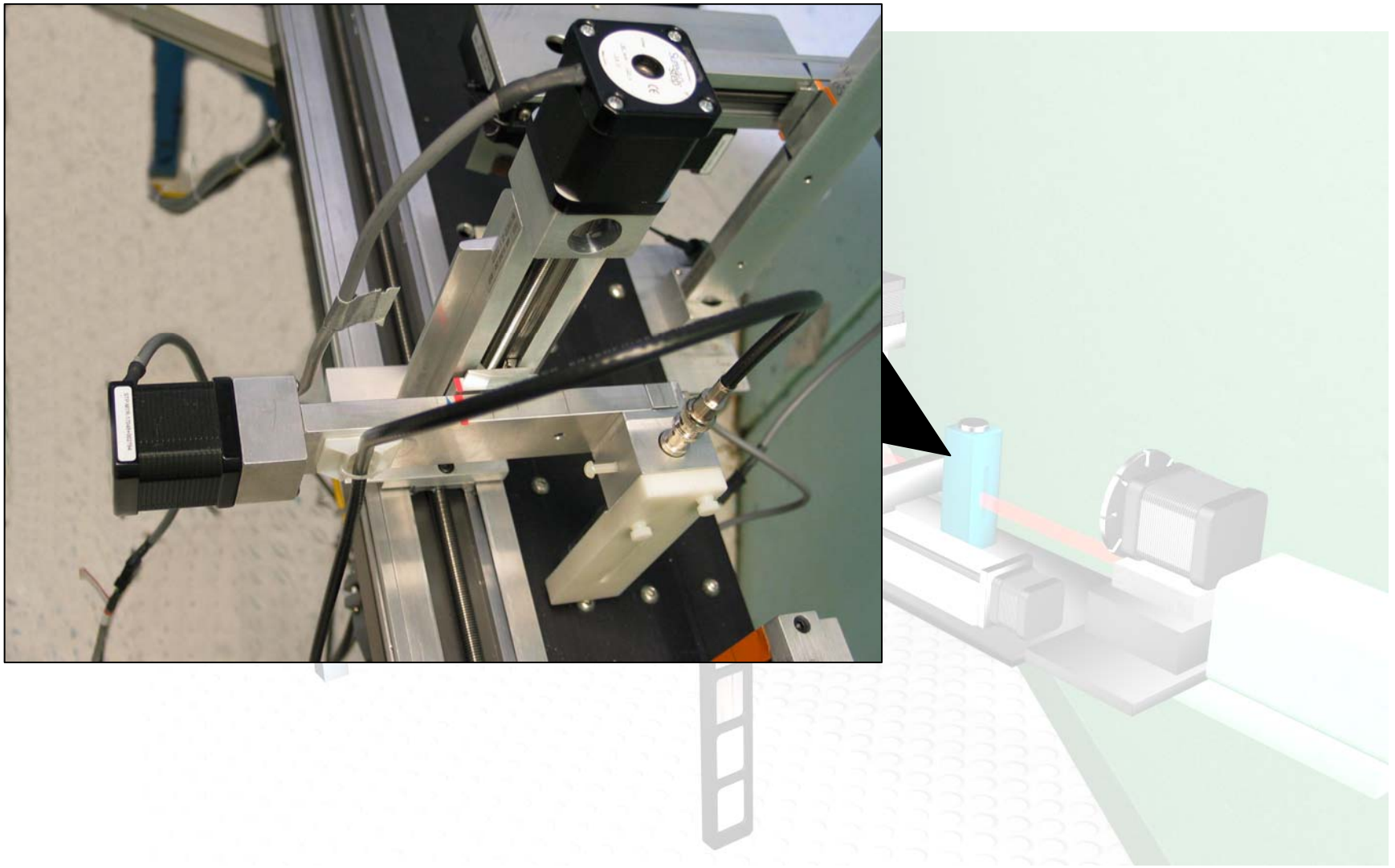
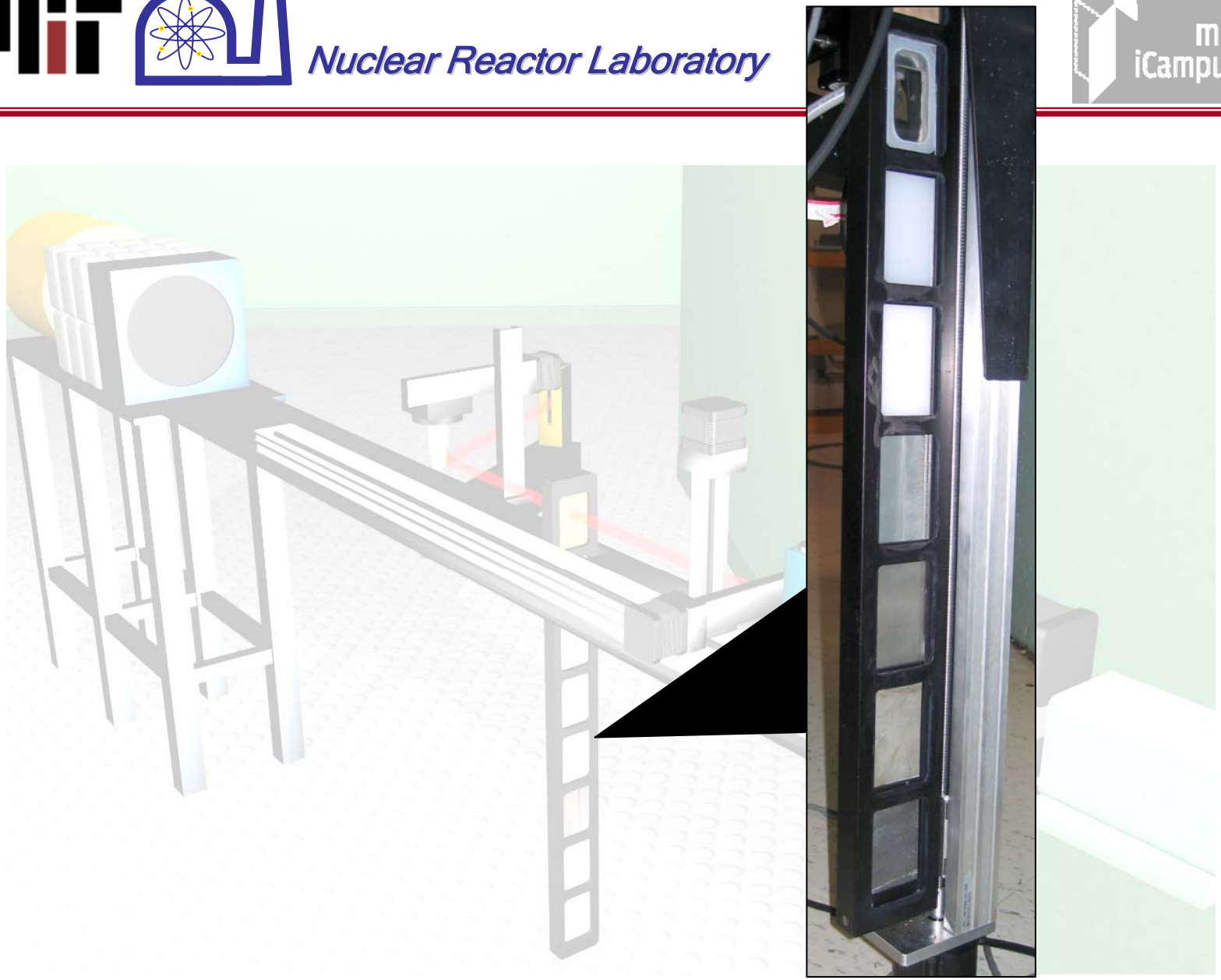


Source: Original rendering of the principal components of the student spectrometer by R. Mark Bessette (MIT).



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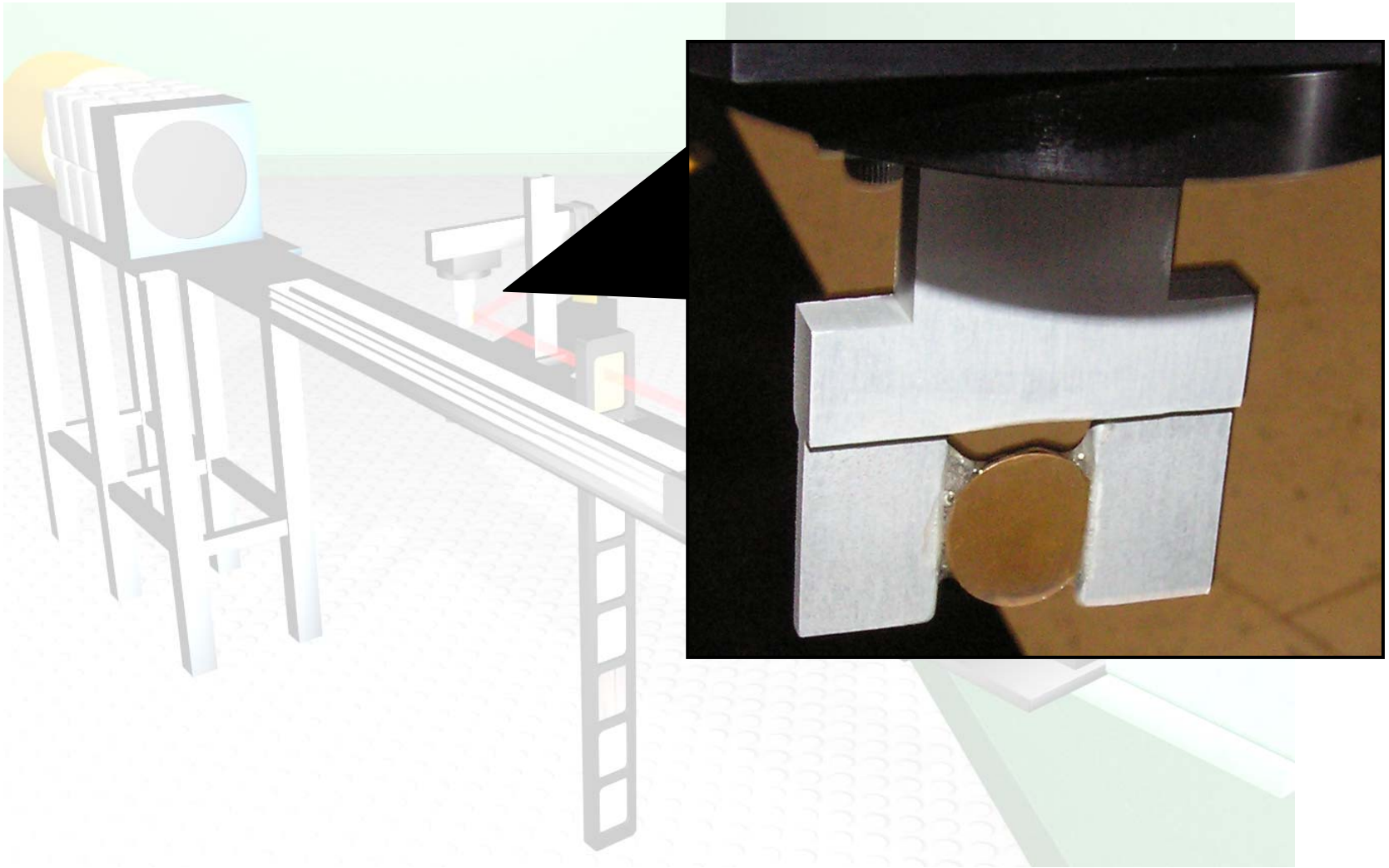


Source: Original rendering of the principal components of the student spectrometer by R. Mark Bessette (MIT).

Animation

Source: Original animation of the principal components of the student spectrometer by R. Mark Bessette (MIT).

The Need for On-line Services

- **Limited access to the existing laboratory because of visiting student restrictions/insurance issues**
- **Limited availability of similar neutron sources for educational use (Many URR do not have student spectrometer and do not operate 24 hours/day).**
- **Unavailable to students who are minors because of radiation worker restrictions**

⇒Diffusion of this laboratory to <u>new</u> communities of users is now possible

Current Availability

- **MIT operates a 5 MW Research Reactor on a 24/7 basis to support educational and research missions**
- **Licensed operator already on-site to initiate and secure the beam. No additional requirements.**

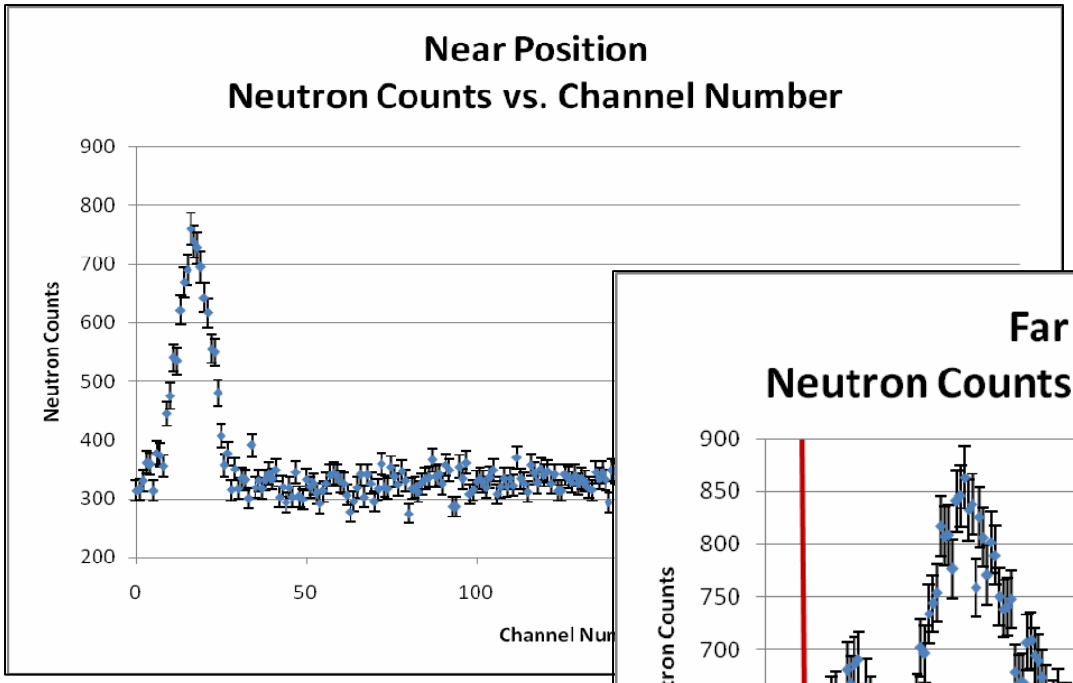
Target Audience – Educational Impact

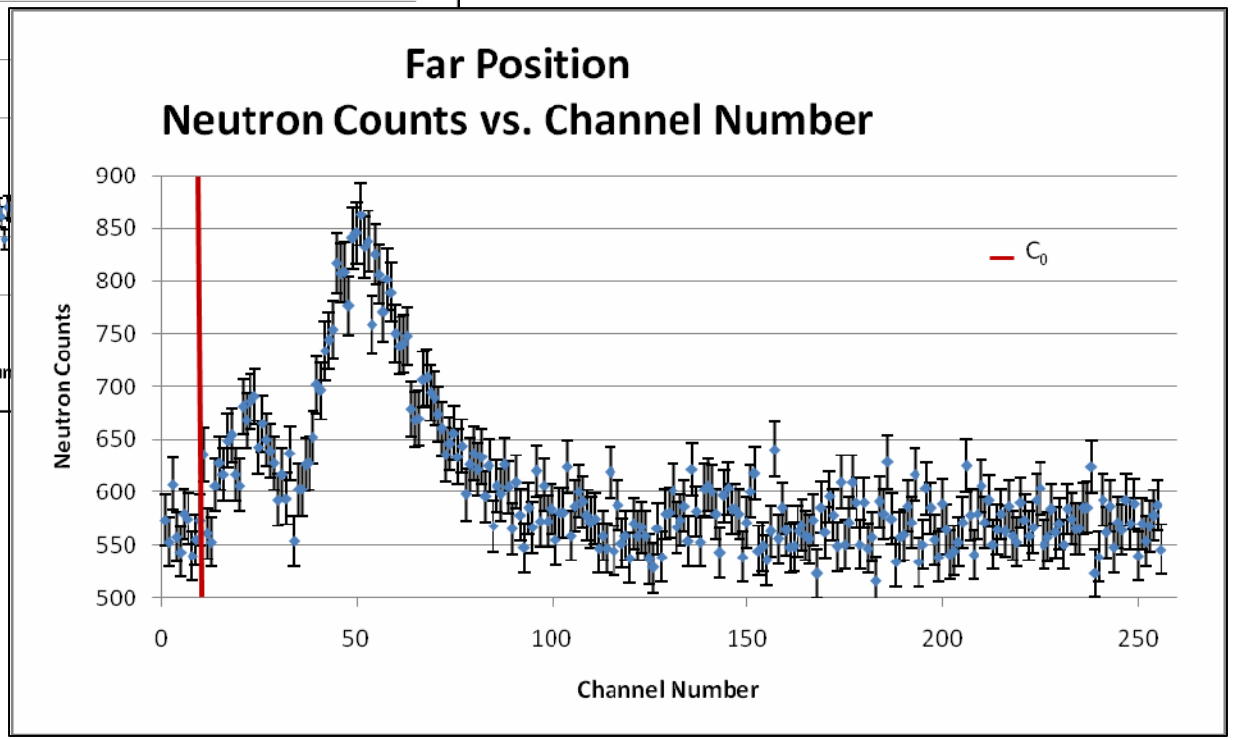
- **Advanced Physics and Chemistry Instructors in secondary schools that incorporate the lab into their current curricula.**
- **Undergraduate and graduate courses without on-site access to neutron sources**
- **International use for students in countries without nuclear technologies in conjunction with MIT's partnerships in Singapore, Cambridge, and Portugal**

Milestones Completed

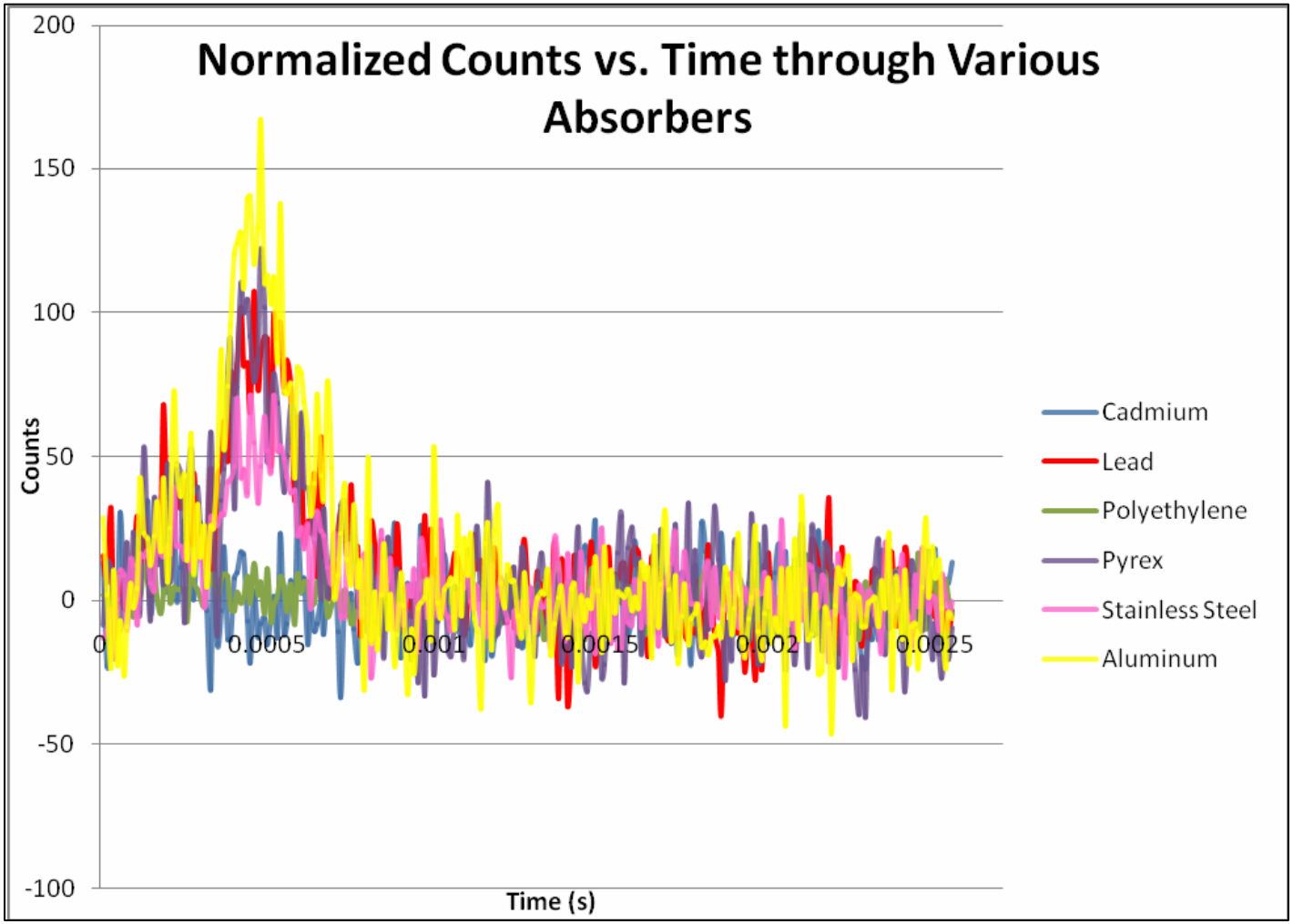
- **Complete hardware conversion of the existing experiment to a LabVIEW-enabled experiment**
- **Partial completion of the software interface that students will use to operate the experiment**
- **Pilot test/demonstration completed with three key groups and with Science Teachers sked for Mar08**
  - **Undergraduates at MIT in NSE**
  - **Junior and Senior High School Students**
  - **Nuclear Power Executives in MIT Exec. Ed. Course**

Data from Time-of Flight Experiment





Data from Shielding Experiments



Milestones to be Completed

Phase II: Trial with MIT undergraduates demonstrated two weaknesses:

1 – Electronic Noise Distraction

2 – Software Slowness and Unreliability

Summer 07: UROP student and lead project engineers will correct noted deficiencies

Initial Remote Deployment: Scheduled for Fall 07

Dissemination Plan for Deployment

- **Test and evaluate effectiveness through existing iLab collaborations with academic universities**
- **Seek out partnerships with specific international partners that have the resources to support online facilities (e.g. SMA, IAEA Partnerships)**