Linda Udby

Nano Science Center &
eScience Center

University of Copenhagen

Virtual Neutrons for Teaching

E-learning neutron users of tomorrow

Participants

- TUM (J. Neuhaus, O.Kreischer, J. Savin)
- UCPH (L. Udby, K. Lefmann, P. Jensen)
- ILL (H. Schober)
- Risø-DTU (P. Willendrup)

Pilot project

Test

- University of Copenhagen 'Neutron scattering in Theory, Simulation and Experiment',
- ~20 students, 8 weeks + 1 week @ PSI
- Collaboration with Department f. Science Education (J. Bruun)
- Collaboration with Faculty of Life Sciences (L. Arleth, K. Mortensen, S. Kynde)

Evaluation

Feedback

- Correction of WIKI/Lesson text (typo's etc)
- Extension of existing text
- New text material
- Level of hints
- Details of solutions
- New exercises

WIKI

WIKI what?

- Online encyclopedia
- Searchable
- Never outdated
- Contributions from experts
- Homogeneous
- so need for moderation of e.g. notation

Contents

- Text material
- Exercises
- Hints
- Solutions
- Based on notes by K. Lefmann and H. Schober

LESSONS

Internet distributed material

- Internet as an open database supplement to teaching
- Material is selected by student i.e. not directed by teacher
- Typically information in uploaded documents (eg PDFs from neutron scools) printed out and used in class-room

Internet based lessons

- Webpage is the starting point of teaching (the virtual class-room)
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Applets

- Simple illustrations of a basic principle
- Usually non-interactive
- Visualisation of physics and math
- Faster understanding

VNT

NMI3 E-learning project (4 years)

- University students
- Their teachers/supervisors
- Scientist from other fields

Simulation projects

- Monte-Carlo neutron ray-tracing (McStas)
- Illustrates / solves complex (user-defined) problems
- Interactivity
- Familiarises the student with particular instruments
- Virtual experiments

Live-SIM

Instruments

- Template instrument suite representing all major neutron techniques
- Essential parameters like bandwidth and collimation can be changed by the student

Samples

- Look at data from different samples at same instrument setting
- Data treatment like real experiment, e.g. powder refinement by FullProf

Proposals

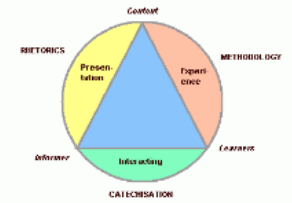
- Virtual experiments
- For a given scientific problem which instrument(s) would you choose?
- Resolution, range, time
- Background from e.g.SE

Quizzes

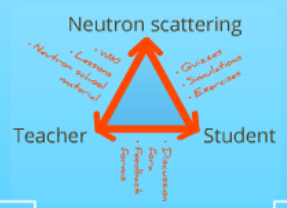
- Questions
- Answers
- Feedback
- Grading
- Could also be based on live-sim

Thanks!

Didactics



E-learning



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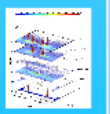

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nmi3

SEVENTH FRAMEWORK PROGRAMME

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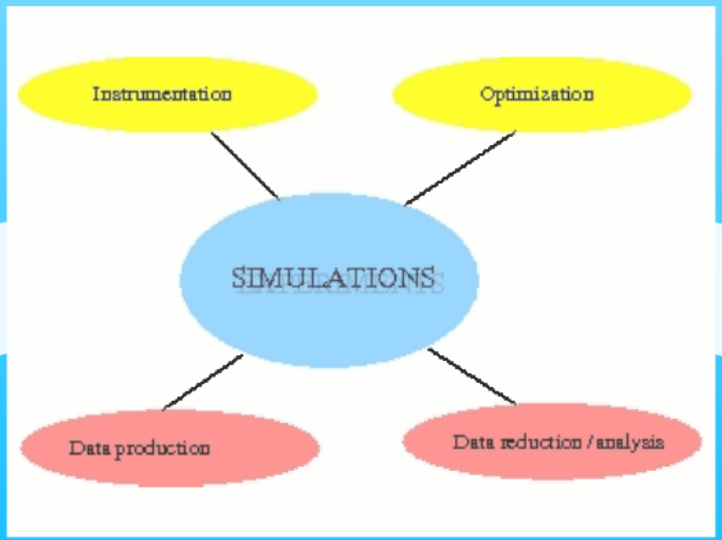

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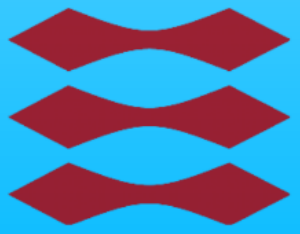
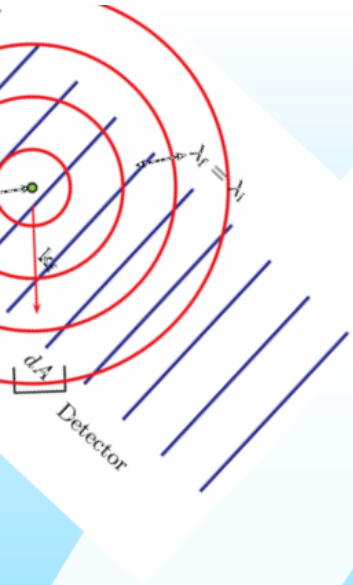


TUM

FRM II
Forschungs-Neutronenquelle
Heinz Maier-Leibnitz

NEUTRONS
FOR SCIENCE



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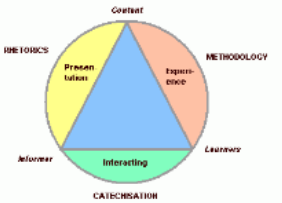

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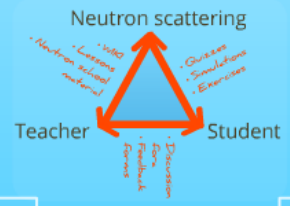

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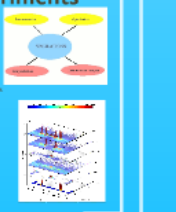

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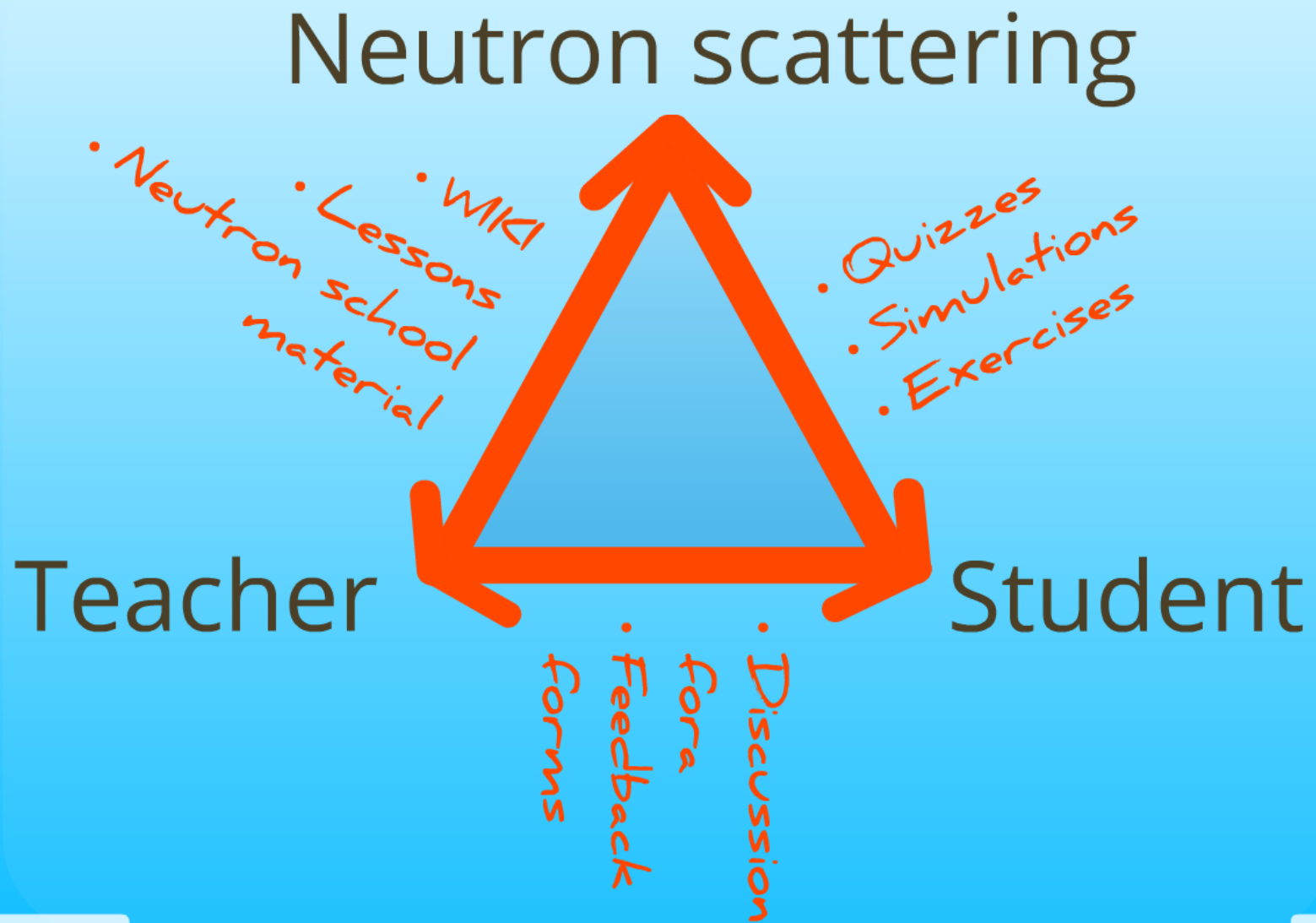
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• Neutron school material
• Lessons
• WIKI
• Quizzes
• Simulations
• Exercises
Teacher
Student
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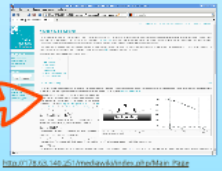

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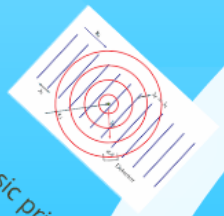

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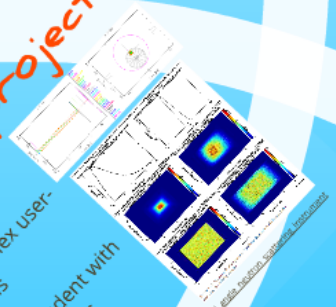

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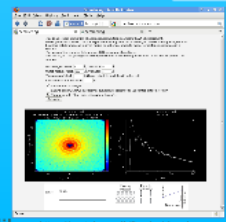
Live-SIM

Instruments



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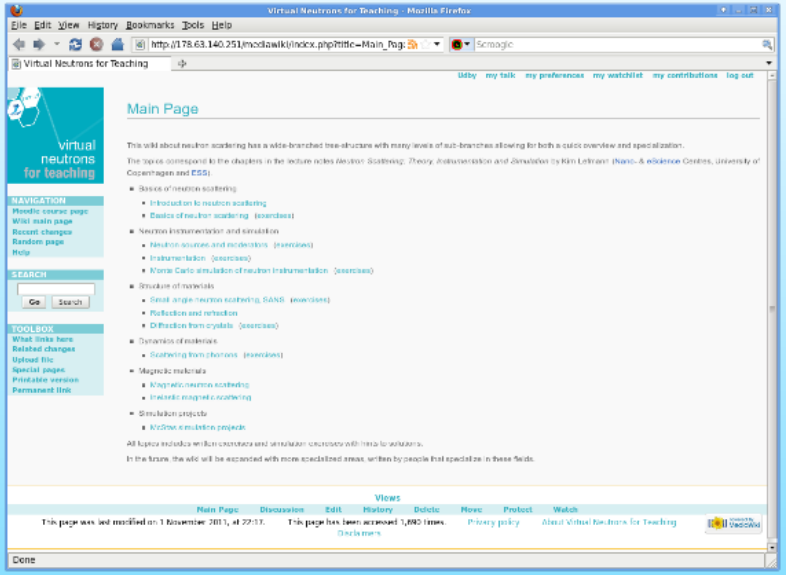

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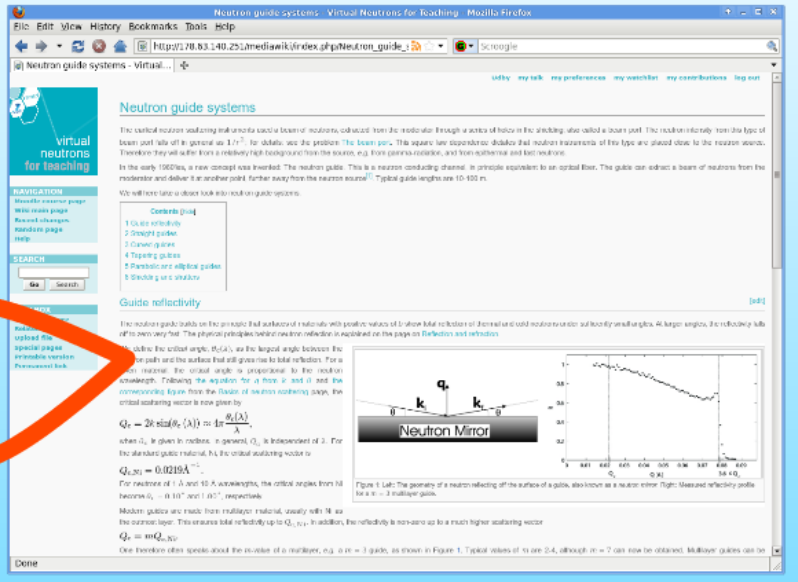

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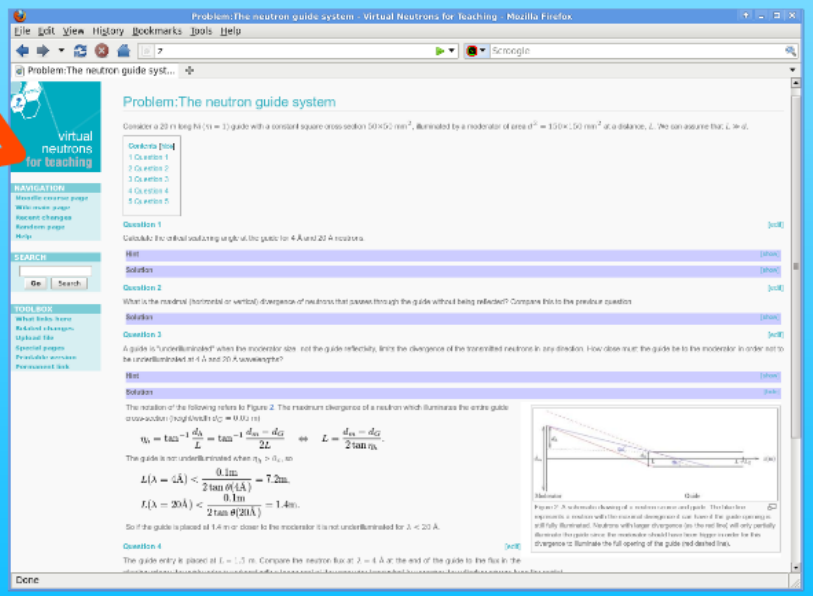

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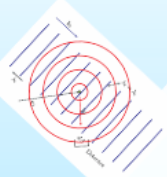

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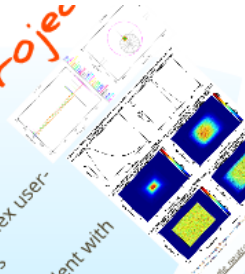

Quizzes

- Questions
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http://www1.ind.ku.dk/moodle/mod/quiz/view.php?id=261

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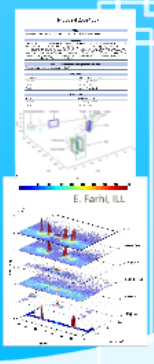

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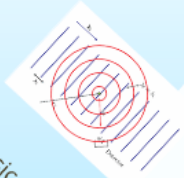

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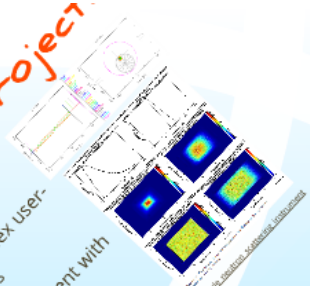

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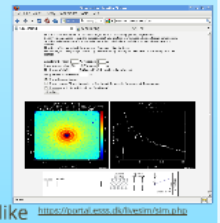

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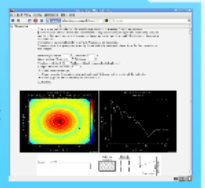

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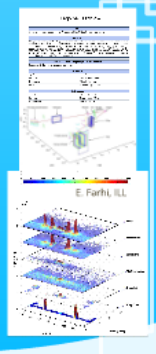

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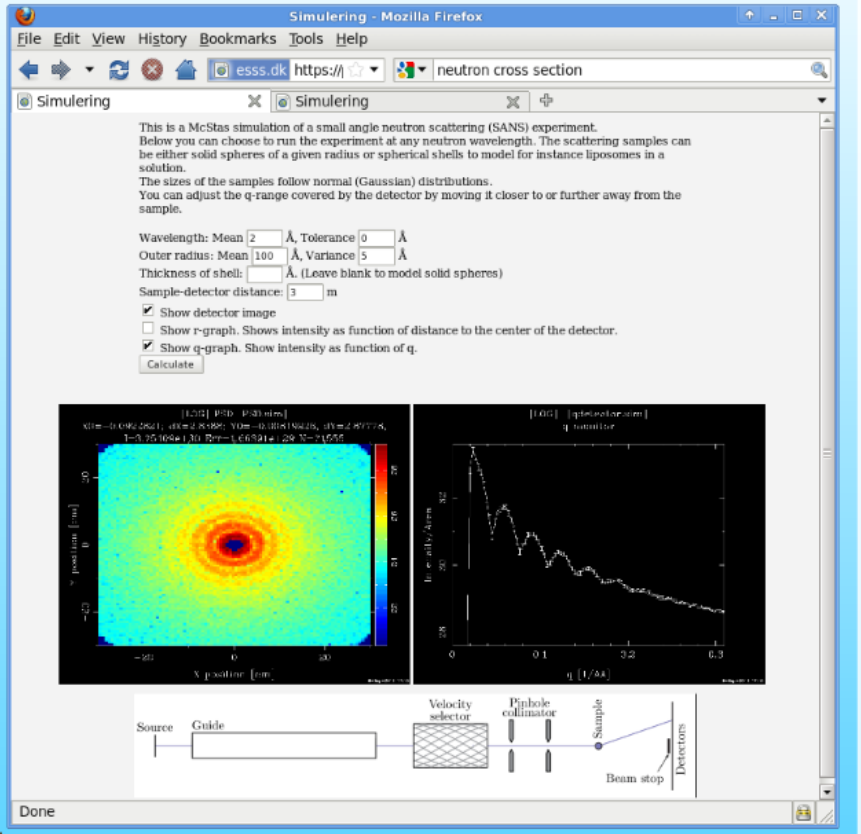

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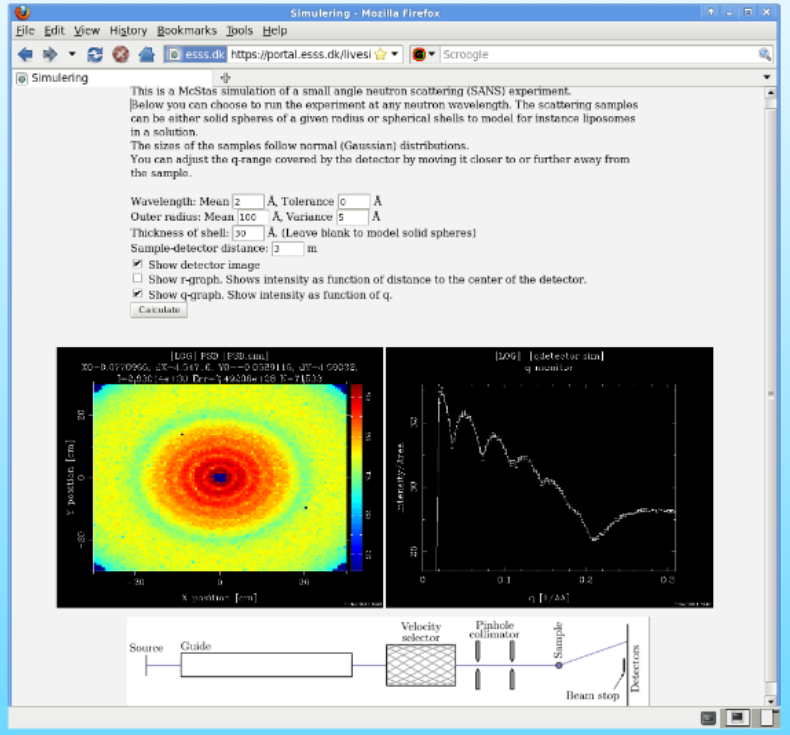

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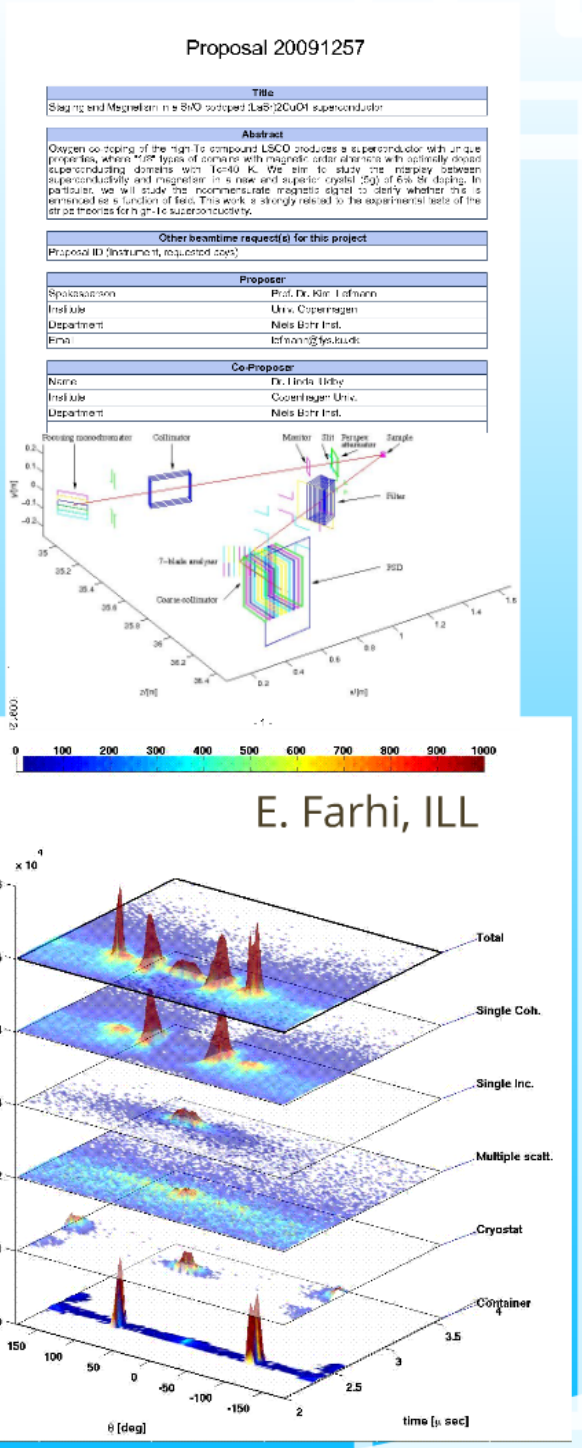

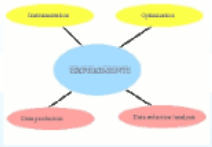

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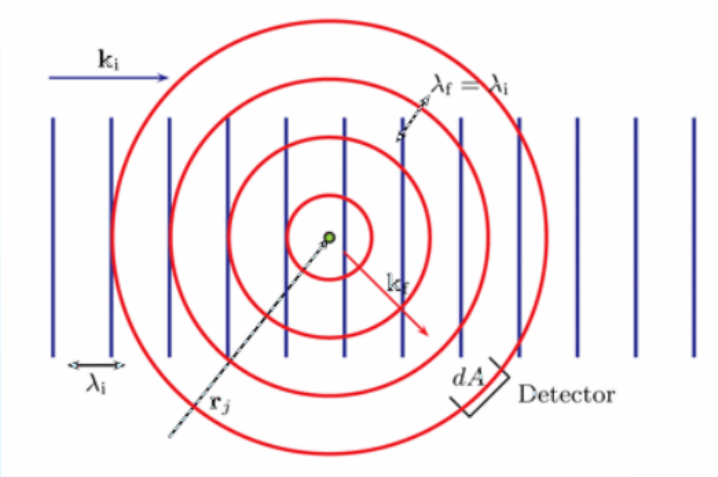

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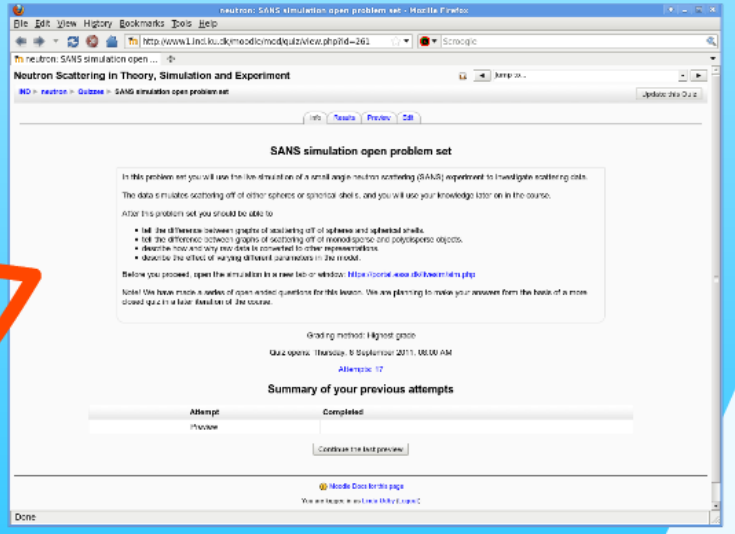

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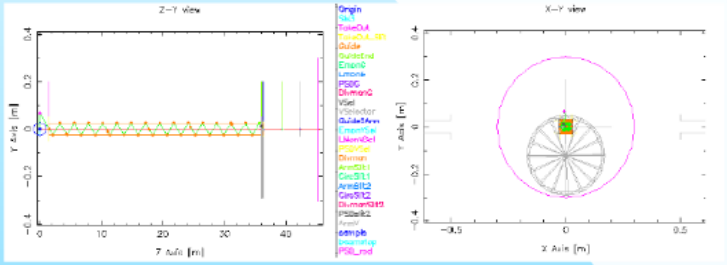

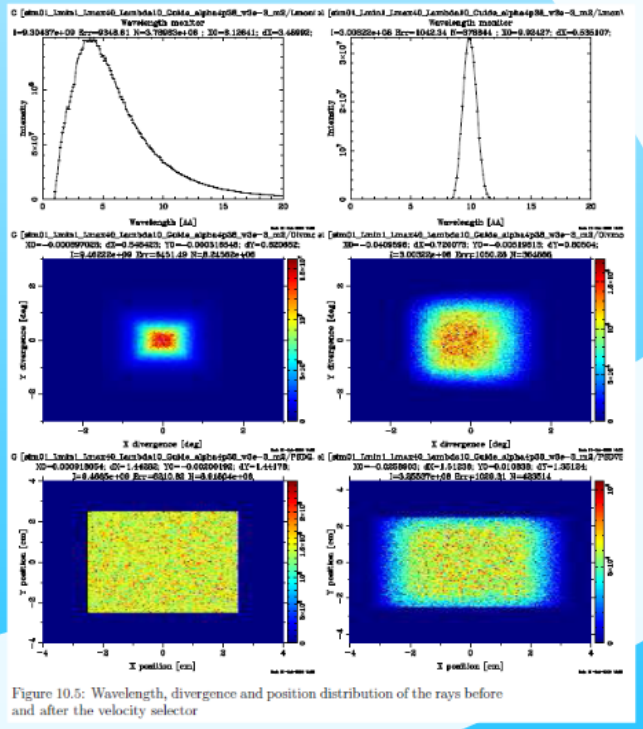

Figure 10.5: Wavelength, divergence and position distribution of the rays before and after the velocity selector

http://178.63.140.251/mediawiki/index.php/Simulation_project:A_small_angle_neutron_scattering_instrument

Linda Udby

Nano Science Center &
eScience Center

University of Copenhagen

Virtual Neutrons for Teaching

E-learning neutron users of tomorrow

Participants

- TUM (J. Neuhaus, O.Kreischer, J. Savin)
- UCPH (L. Udby, K. Lefmann, P. Jensen)
- ILL (H. Schober)
- Risø-DTU (P. Willendrup)

Pilot project

Test

- University of Copenhagen 'Neutron scattering in Theory, Simulation and Experiment',
- ~20 students, 8 weeks + 1 week @ PSI
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Evaluation

Feedback

- Correction of WIKI/Lesson text (typo's etc)
- Extension of existing text
- New text material
- Level of hints
- Details of solutions
- New exercises

WIKI

WIKI what?

- Online encyclopedia
- Searchable
- Never outdated
- Contributions from experts
- Homogeneous
- so need for moderation of e.g. notation

Contents

- Text material
- Exercises
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- Solutions
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VNT

NMI3 E-learning project (4 years)

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- Their teachers/supervisors
- Scientist from other fields

LESSONS

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- Better understanding

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- Virtual experiments

Live-SIM

Instruments

- Template instrument suite representing all major neutron techniques
- Essential parameters like bandwidth and collimation can be changed by the student

Samples

- Look at data from different samples at same instrument setting
- Data treatment like real experiment, e.g. powder refinement by F.-Prof
- Instr'example = Virtual experiments

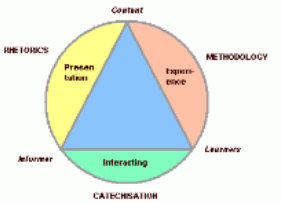
Quizzes

- Questions
- Answers
- Feedback
- Grading
- Could also be based on live-sim

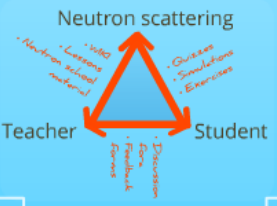
Proposals

- Virtual experiments
- For a given scientific problem which instrument(s) would you choose?
- Resolution, range, time
- Background from e.g.SE

Didactics



E-learning



Virtual experiments

- Connects theory and experiment
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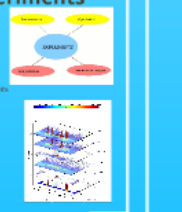
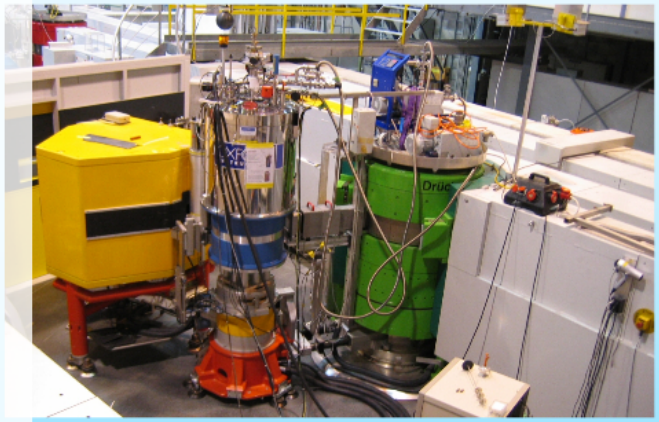


Thanks!

Test



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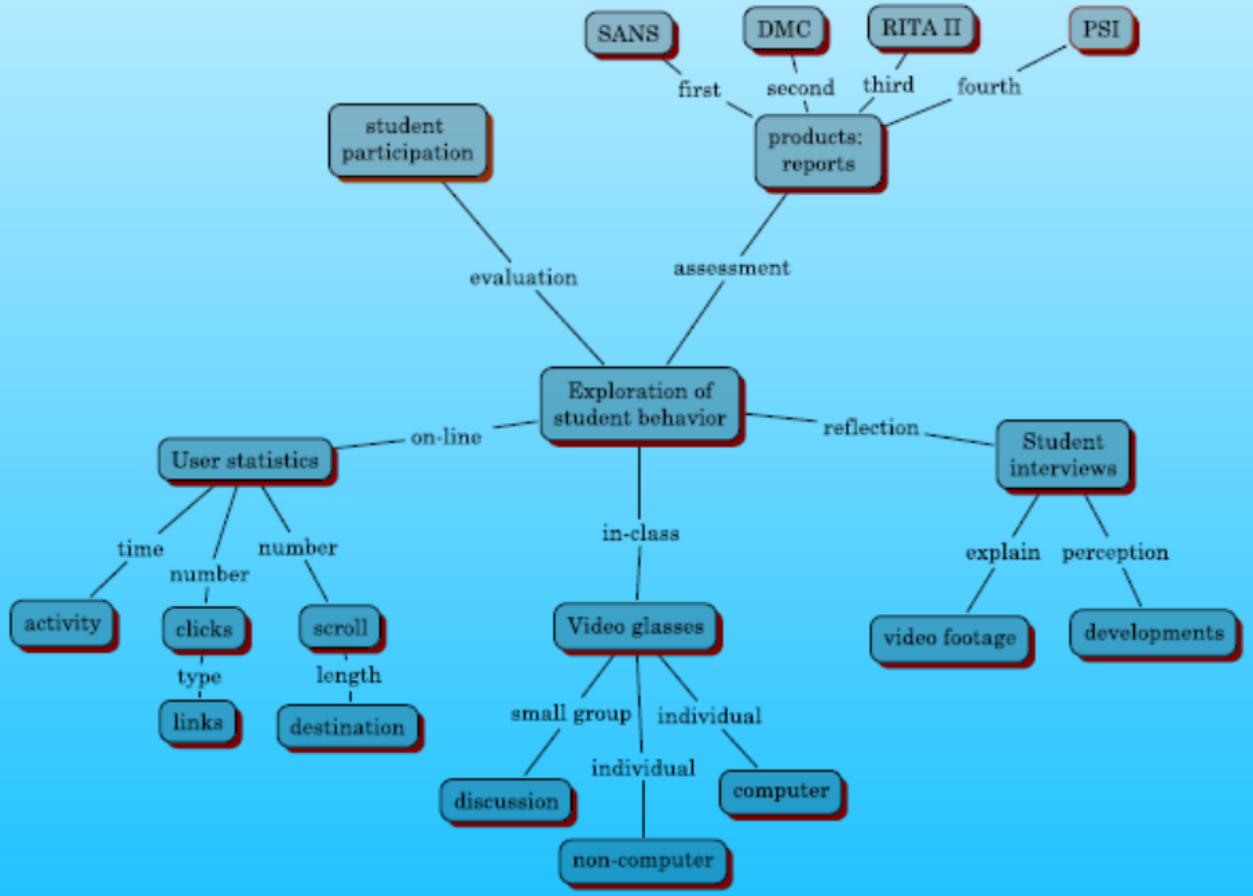
SANS
DMC
RITA II
PSI
first
second
third
fourth
student participation
products: reports
evaluation
assessment
Exploration of student behavior
on-line
reflection
User statistics
Student interviews
time
number
number
in-class
explain
perception
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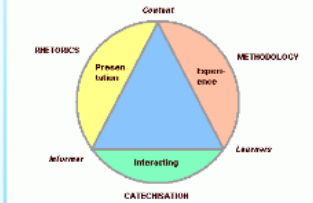

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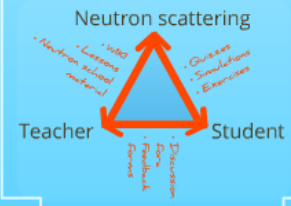

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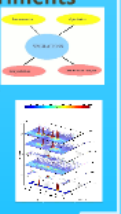

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