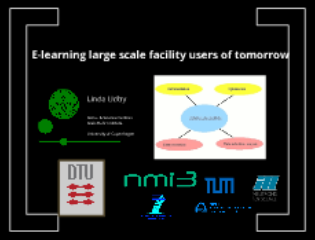
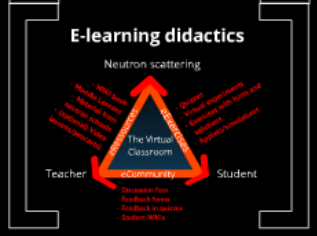
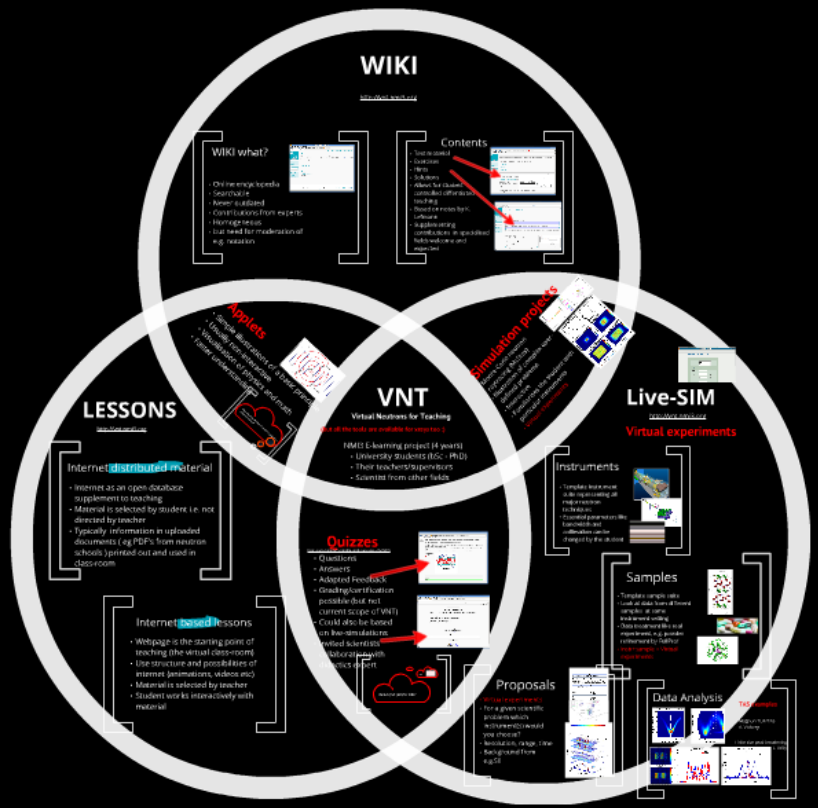
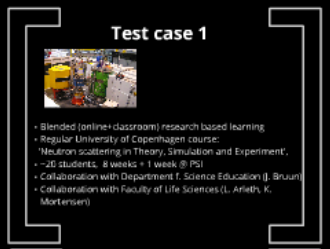



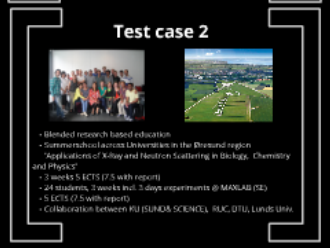


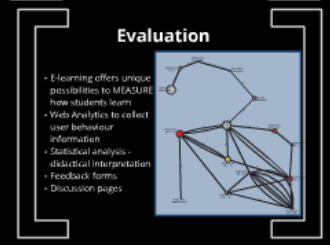


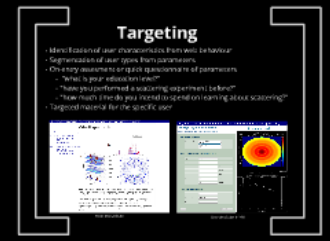


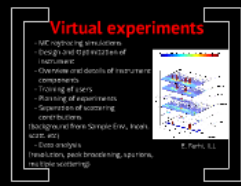


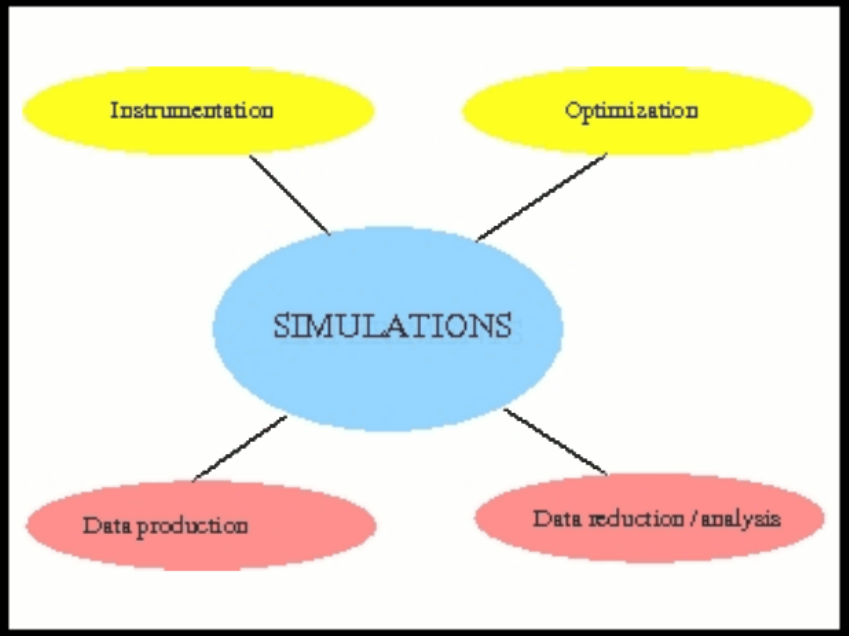

Note: Learning goals in targeted material (put it somewhere ....)
Learning goals in virtual experiments, specific instruments

# E-learning large scale facility users of tomorrow

Linda Udby

Nano- & Science Centres
Niels Bohr Institute

University of Copenhagen




DTU

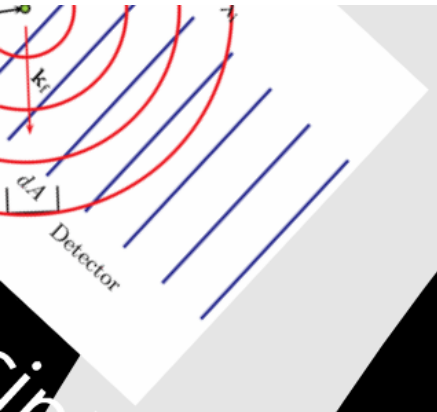
nmi3

TUM

NEUTRONS FOR SCIENCE

SEVENTH FRAMEWORK PROGRAMME

FRM II
Forschungs-Neutronenquelle
Heinz Maier-Leibnitz




# VNT

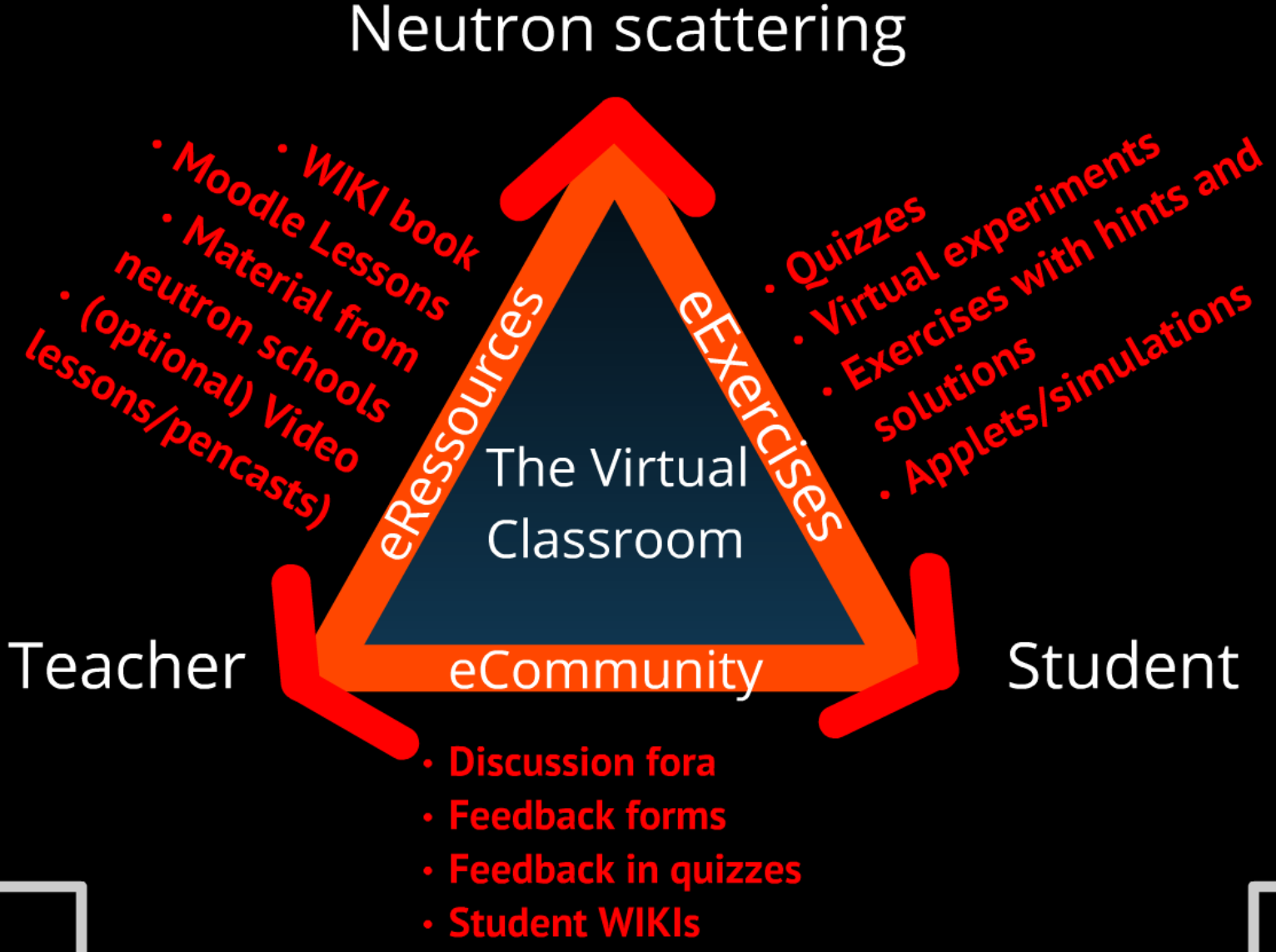
## Virtual Neutrons for Teaching

**(but all the tools are available for xrays too :)**

NMI3 E-learning project (4 years)

- University students (bSc - PhD)
- Their teachers/supervisors
- Scientist from other fields

# E-learning didactics



# WIKI

http://vnt.nmi3.org

## WIKI what?

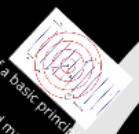
- Online encyclopedia
- Searchable
- Never outdated
- Contributions from experts
- Homogeneous
- but need for moderation of e.g. notation

## Contents

- Text material
- Exercises
- Hints
- Solutions
- Allows for student controlled diffentiated teaching
- Based on notes by K. Lefmann
- Supplementing contributions in specialised fields welcome and expected

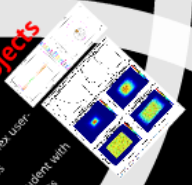
## Applets

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



## Simulation projects

- Monte-Carlo neutron raytracing (McStas)
- Illustration of complex user-defined problems
- Interactive
- Familiarises the student with particular instruments
- Virtual experiments



# LESSONS

http://vnt.nmi3.org

## 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 PDF's from neutron schools ) printed out and used in class-room

## Internet based lessons

- Webpage is the starting point of teaching (the virtual class-room)
- Use structure and possibilities of internet (animations, videos etc)
- Material is selected by teacher
- Student works interactively with material

# VNT

**Virtual Neutrons for Teaching**

(but all the tools are available for xrays too :)

NMI3 E-learning project (4 years)

- University students (bSc - PhD)
- Their teachers/supervisors
- Scientist from other fields

## Quizzes

- Questions
- Answers
- Adapted Feedback
- Grading/certification possible (but not current scope of VNT)
- Could also be based on live-simulations
- Invited scientists collaboration with didactics expert

# Live-SIM

http://vnt.nmi3.org

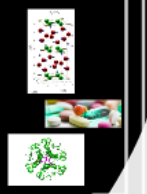
**Virtual experiments**

## Instruments

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

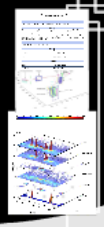
## Samples

- Template sample suite
- Look at data from different samples at same instrument setting
- Data treatment like real experiment, e.g. powder refinement by FullProf
- Instr+sample = Virtual experiments



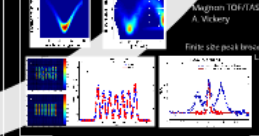
## Proposals

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



## Data Analysis

TAS examples



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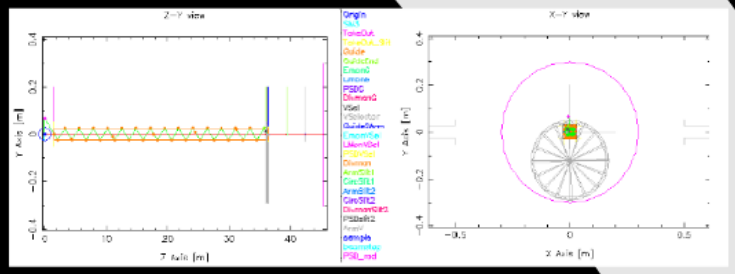

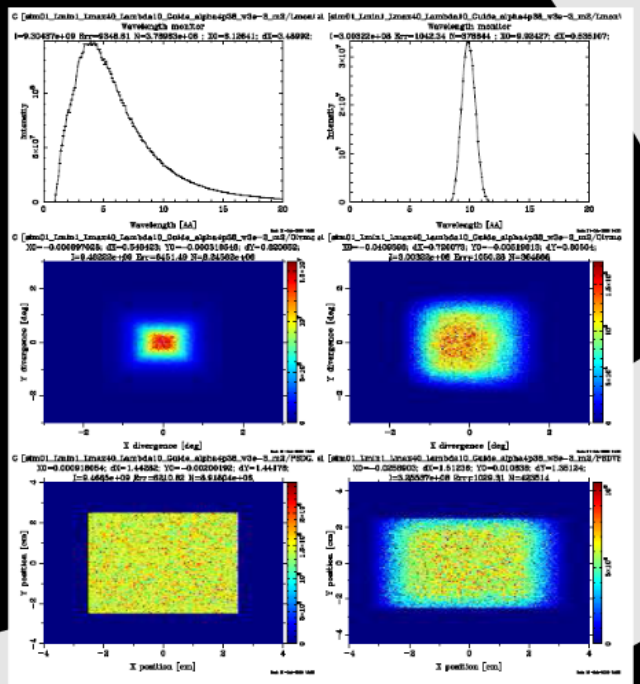

Figure 10.5: Wavelength, divergence and position distribution of the rays before and after the velocity selector

# The Virtual Classroom

# WIKI

http://vnt.nmi3.org

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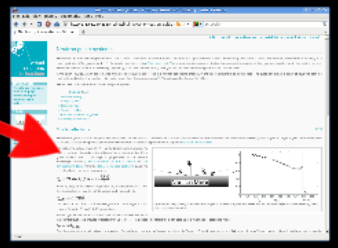

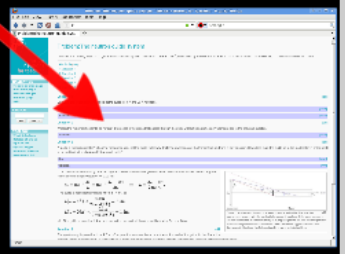

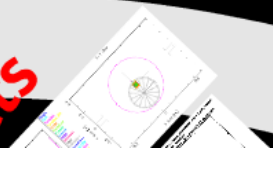

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(but all the to

NM

Quiz

http://tvnt.nmi3.org/moodle/mo

- Questions
- Answers
- Adapted F
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- Could also on live-sim
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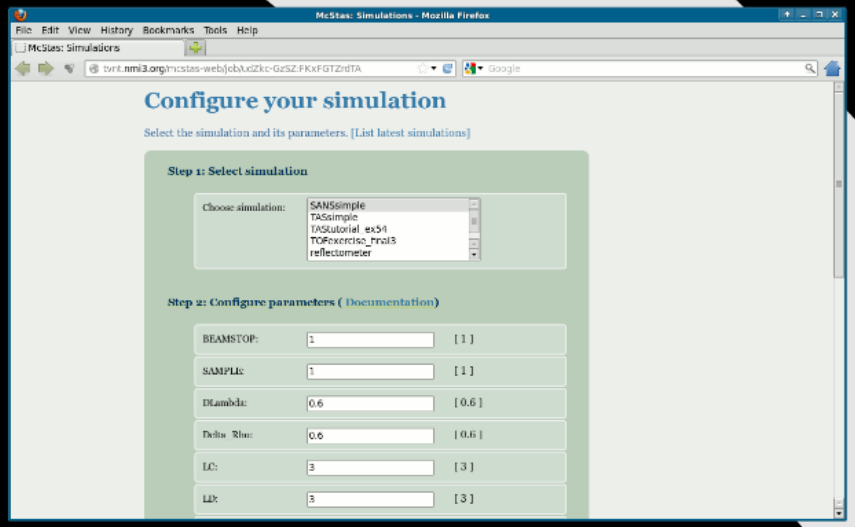


# Live-SIM

http://vnt.nmi3.org

# Virtual experiments

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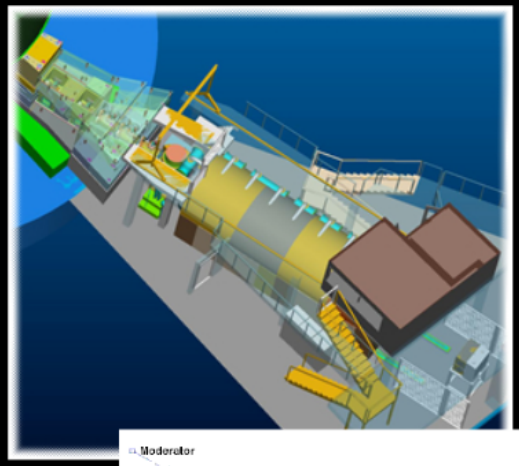

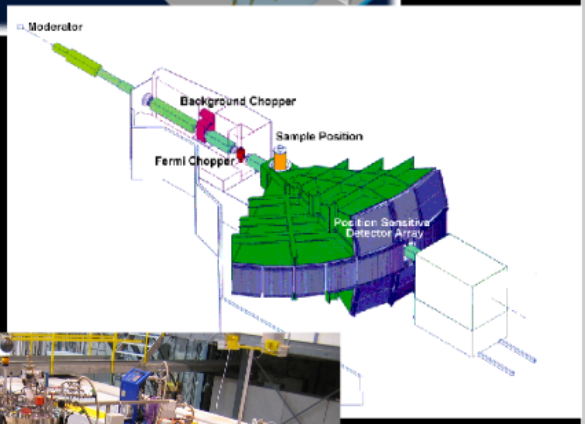


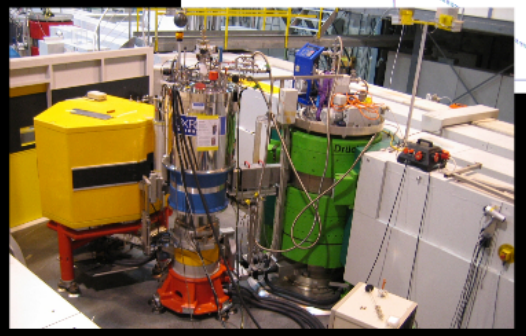

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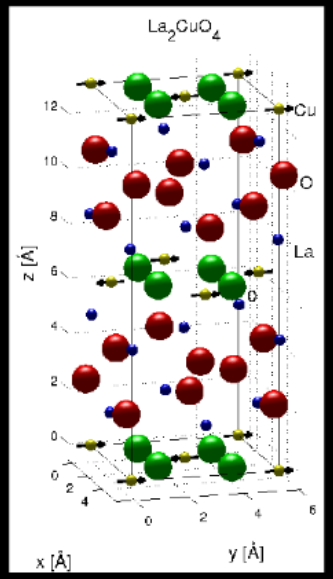


# Proposals

- Virtual experiments
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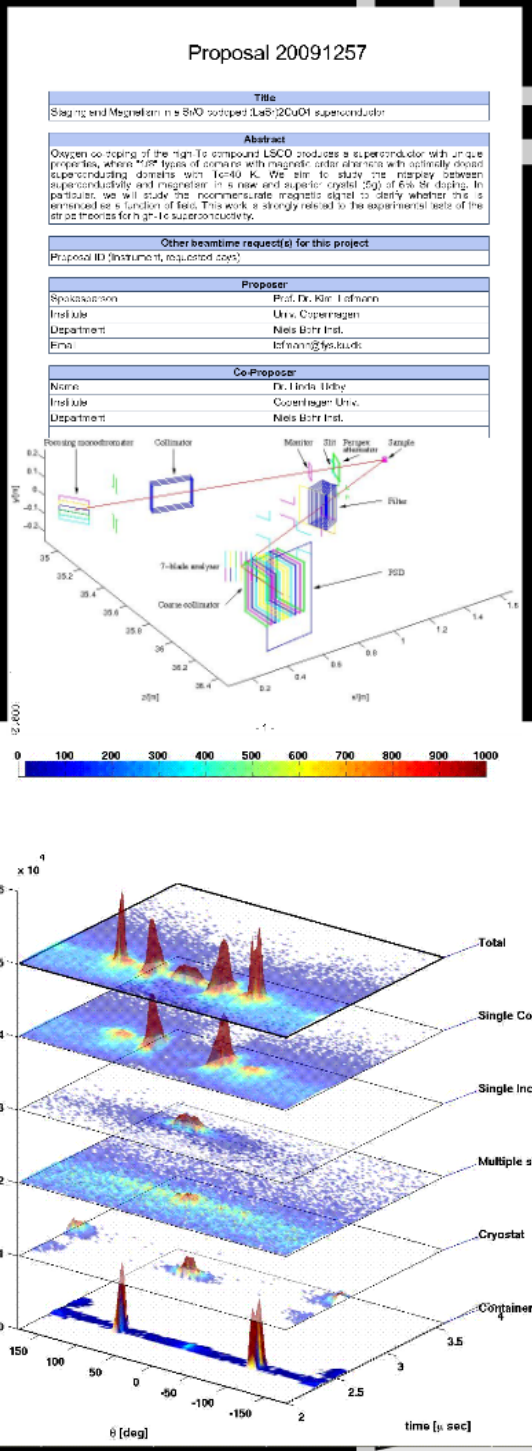


Proposal 20091257

| Title |
| --- |
| Staging and Magnetism in a SrO codoped (La$_{2}$Sr)$_{2}$CuO$_{4}$ superconductor |

| Abstract |
| --- |
| Oxygen co-doping of the high-Tc compound LSCO produces a superconductor with unique properties, where "clean" types of domains with magnetic order alternate with optimally doped superconducting domains with Tc=40 K. We aim to study the interplay between superconductivity and magnetism in a new and superior crystal (50g) of 6% Sr doping. In particular, we will study the incommensurate magnetic signal to identify whether this is enhanced as a function of field. This work is strongly related to the experimental tests of the stripe theories for high-Tc superconductivity. |

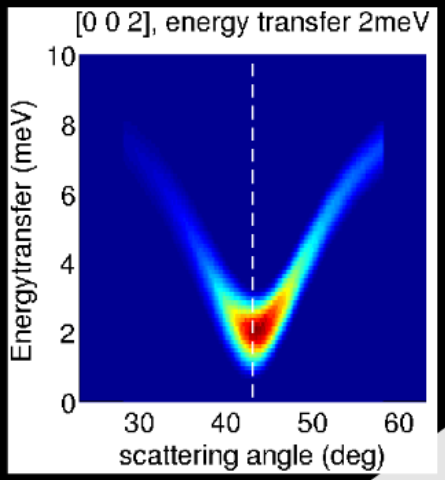
| Other beamtime request(s) for this project |
| --- |
| Proposal ID (instrument, requested days) |

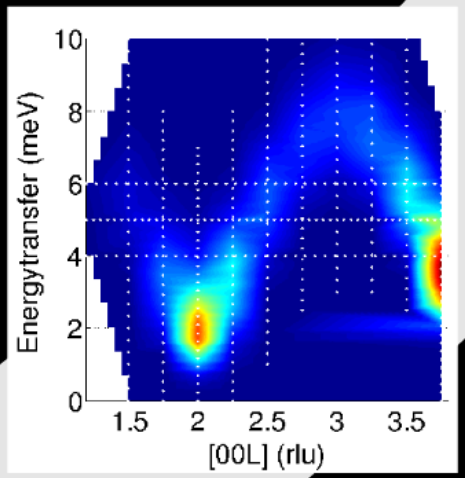
| Proposer | |
| --- | --- |
| Spokesperson | Prof. Dr. Kim Lefmann |
| Institute | Univ. Copenhagen |
| Department | Niels Bohr Inst. |
| Email | lefmann@fys.ku.dk |

| Co-Proposer | |
| --- | --- |
| Name | Dr. Linda Udby |
| Institute | Copenhagen Univ. |
| Department | Niels Bohr Inst. |

# Data Analysis

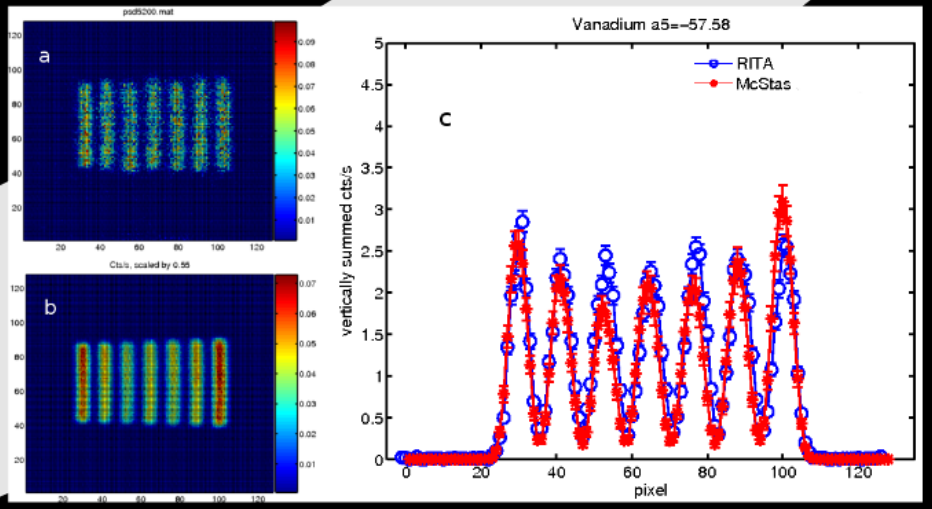
## TAS examples

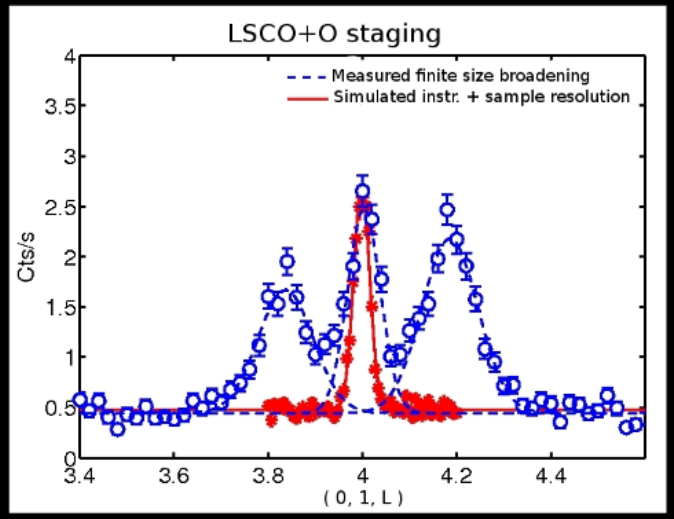


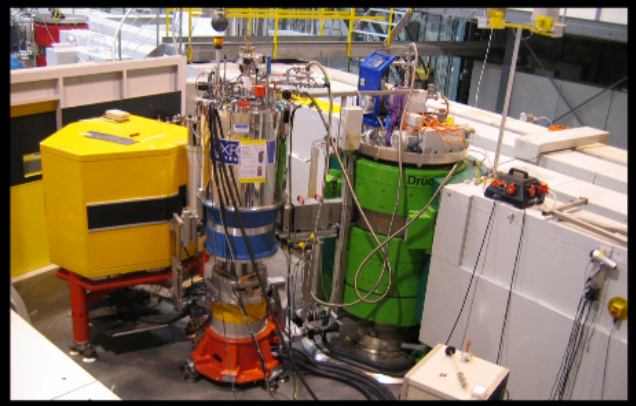

Magnon TOF/TAS
A. Vickery

Finite size peak broadening
L. Udby



# Test case 1



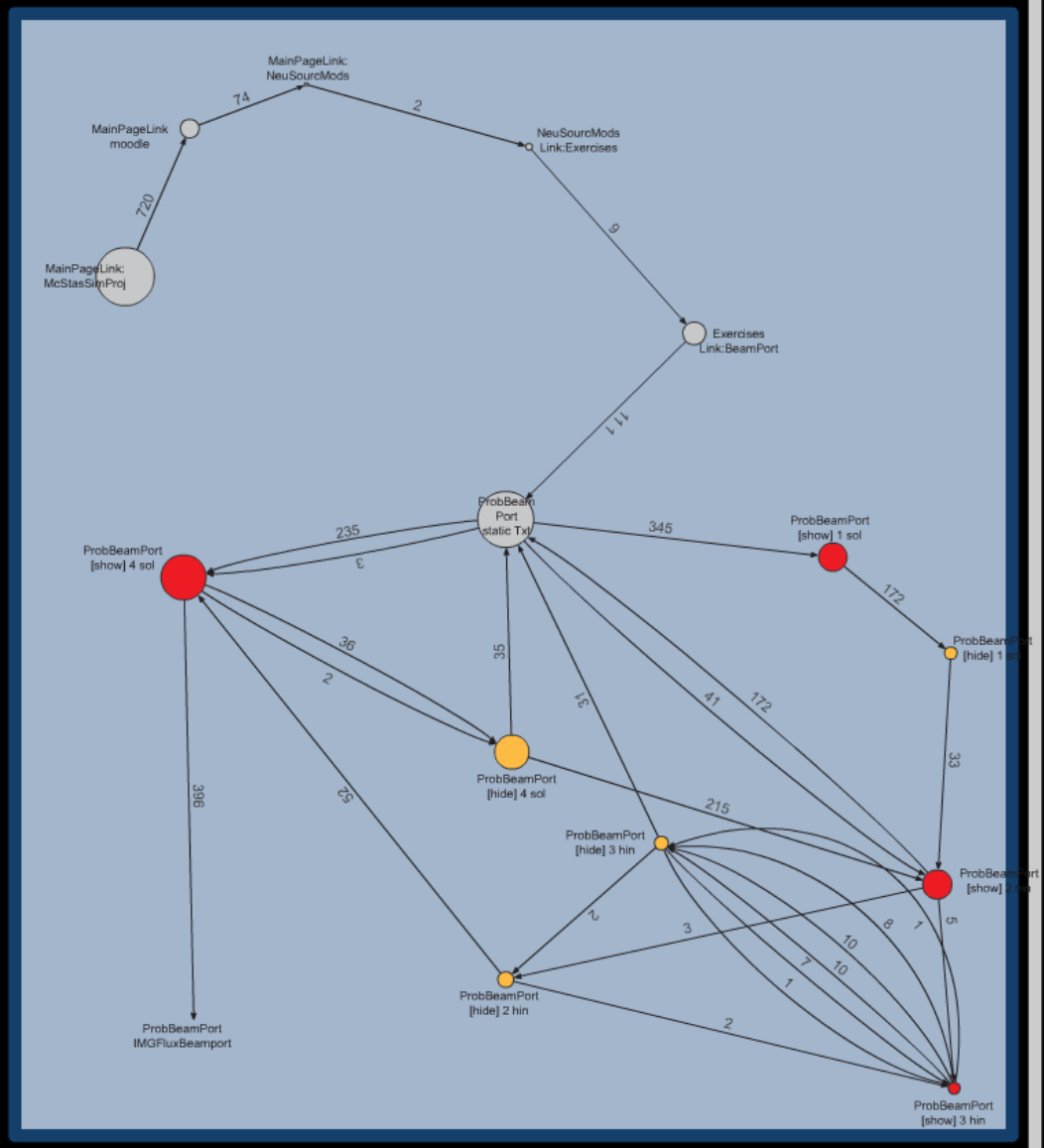
- Blended (online+classroom) research based learning
- Regular University of Copenhagen course:
  'Neutron scattering in Theory, Simulation and Experiment',
- ~20 students,  8 weeks + 1 week @ PSI
- Collaboration with Department f. Science Education (J. Bruun)
- Collaboration with Faculty of Life Sciences (L. Arleth, K. Mortensen)

# Test case 2

- Blended research based education
- Summerschool across Universities in the Øresund region
  'Applications of X-Ray and Neutron Scattering in Biology, Chemistry and Physics'
- 3 weeks 5 ECTS (7.5 with report)
- 24 students, 3 weeks incl. 3 days experiments @ MAXLAB (SE)
- 5 ECTS (7.5 with report)
- Collaboration between KU (SUND& SCIENCE), RUC, DTU, Lunds Univ.

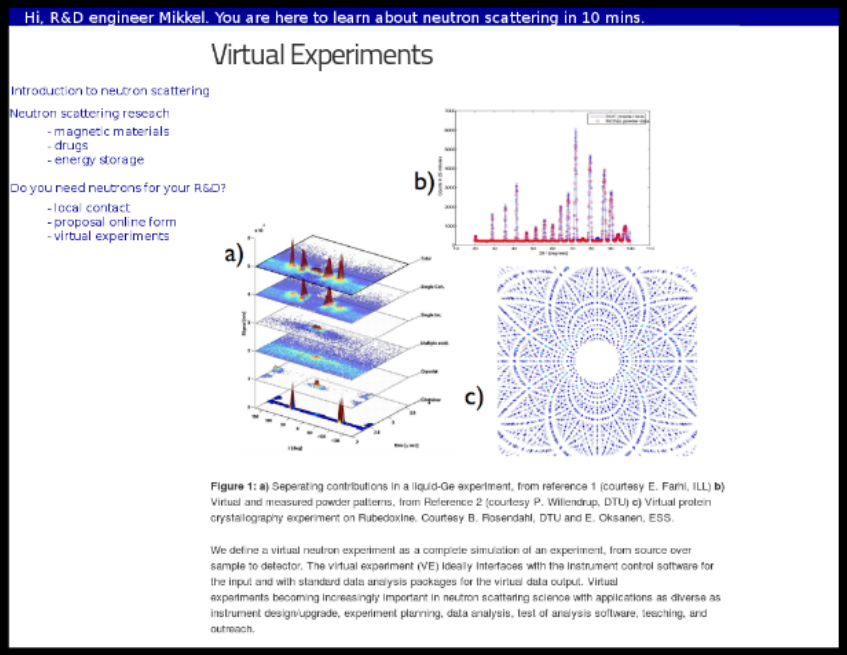
# Evaluation

- E-learning offers unique possibilities to MEASURE how students learn
- Web Analytics to collect user behaviour information
- Statistical analysis - didactical interpretation
- Feedback forms
- Discussion pages

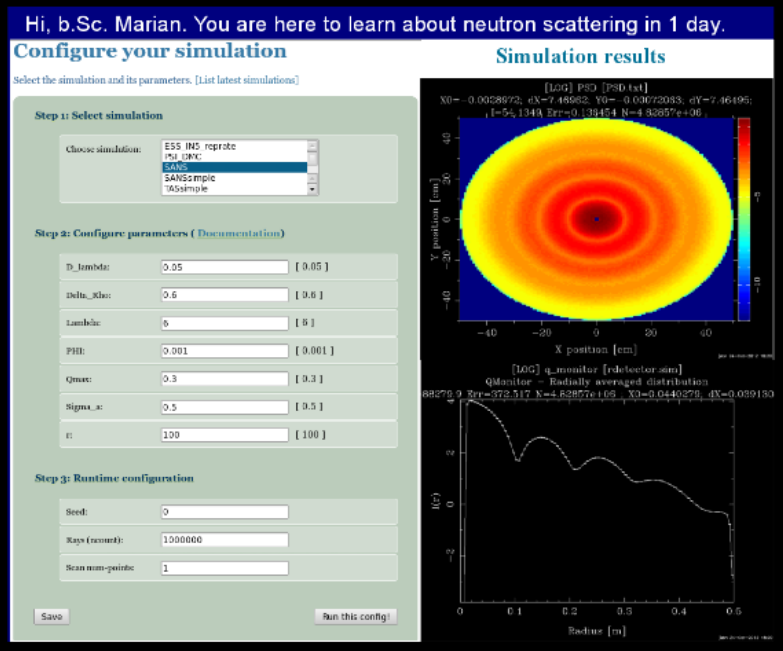


# Targeting

- Identification of user characteristics from web behaviour
- Segmentation of user types from parameters
- On-entry assesment or quick questionnaire of parameters
  - "what is your education level?"
  - "have you performed a scattering experiment before?"
  - "how much time do you intend to spend on learning about scattering?"
- Targeted material for the specific user




From ESS website




Live-simulator in VNT

Hi, R&D engineer Mikkel. You are here to learn about neutron scattering in 10 mins.

# Virtual Experiments

Introduction to neutron scattering

Neutron scattering reseach

- magnetic materials
- drugs
- energy storage

Do you need neutrons for your R&D?

- local contact
- proposal online form
- virtual experiments

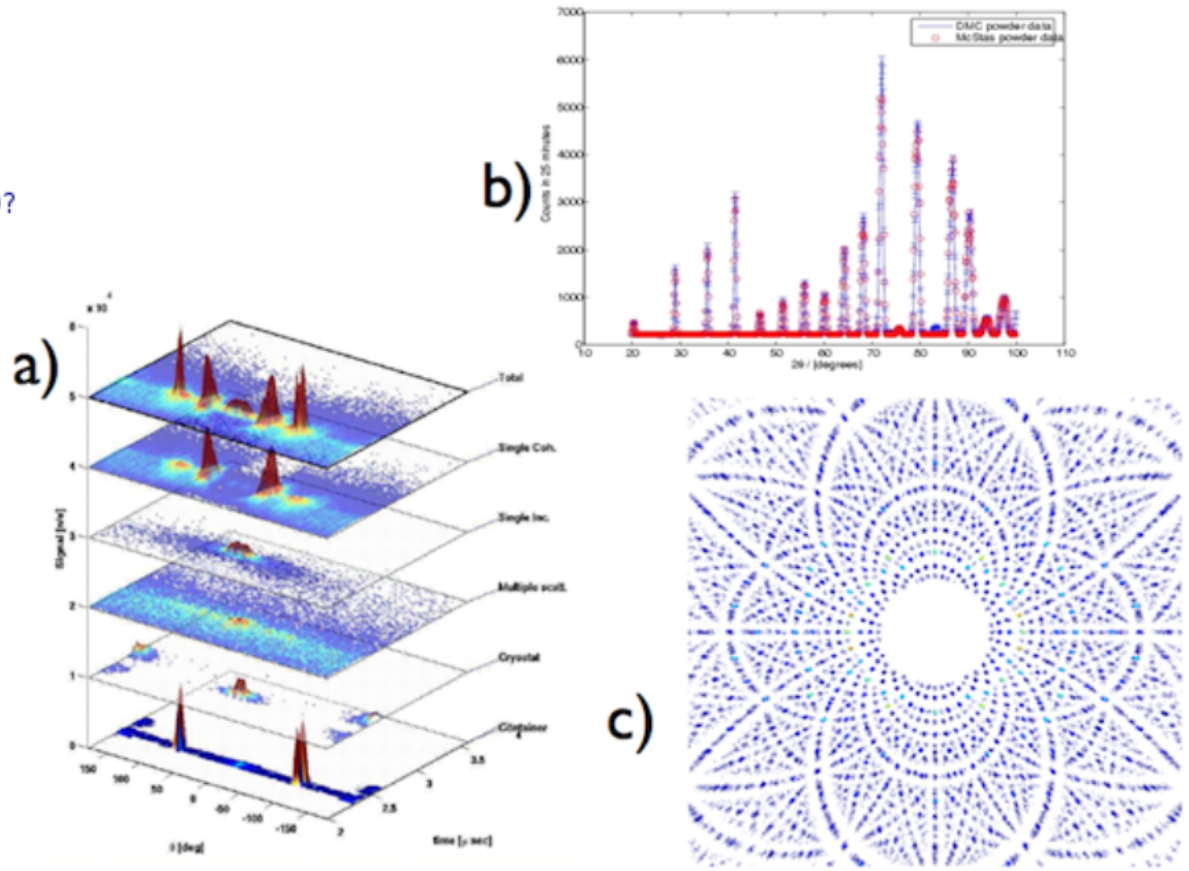



**Figure 1: a)** Seperating contributions in a liquid-Ge experiment, from reference 1 (courtesy E. Farhi, ILL) **b)** Virtual and measured powder patterns, from Reference 2 (courtesy P. Willendrup, DTU) **c)** Virtual protein crystallography experiment on Rubedoxine. Courtesy B. Rosendahl, DTU and E. Oksanen, ESS.

We define a virtual neutron experiment as a complete simulation of an experiment, from source over sample to detector. The virtual experiment (VE) ideally interfaces with the instrument control software for the input and with standard data analysis packages for the virtual data output. Virtual experiments becoming increasingly important in neutron scattering science with applications as diverse as instrument design/upgrade, experiment planning, data analysis, test of analysis software, teaching, and outreach.

Hi, b.Sc. Marian. You are here to learn about neutron scattering in 1 day.

# Configure your simulation

Select the simulation and its parameters. [List latest simulations]

### Step 1: Select simulation

Choose simulation:

- ESS_IN5_reprate
- PSI_DMC
- SANS
- SANSsimple
- TASsimple

### Step 2: Configure parameters ( Documentation)

| | | |
|---|---|---|
| D_lambda: | 0.05 | [ 0.05 ] |
| Delta_Rho: | 0.6 | [ 0.6 ] |
| Lambda: | 6 | [ 6 ] |
| PHI: | 0.001 | [ 0.001 ] |
| Qmax: | 0.3 | [ 0.3 ] |
| Sigma_a: | 0.5 | [ 0.5 ] |
| r: | 100 | [ 100 ] |

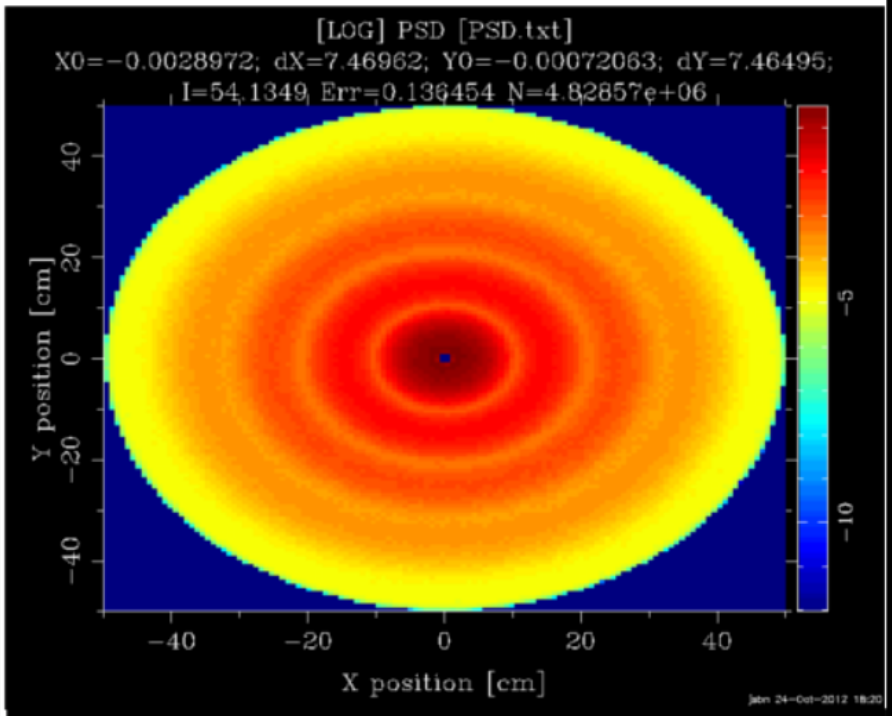
### Step 3: Runtime configuration

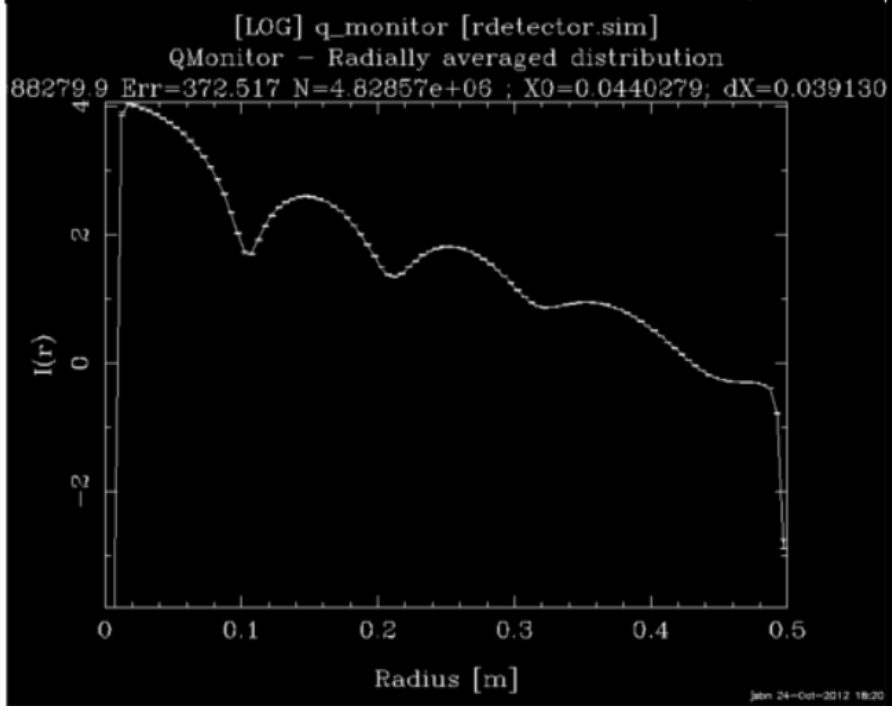
| | |
|---|---|
| Seed: | 0 |
| Rays (ncount): | 1000000 |
| Scan num-points: | 1 |

Save

Run this config!

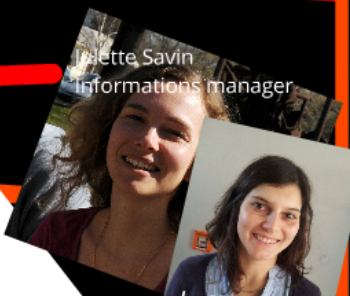
# Simulation results



# Participants

Jurgen Neuhaus
Project leader



Juliette Savin
Informations manager



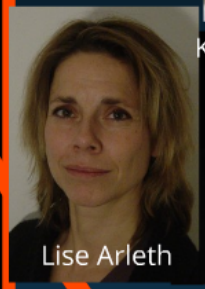
Inês Crespo

Jörg Pulz
VNT Server

## Lecture Notes (WIKI book)

Kim Lefmann

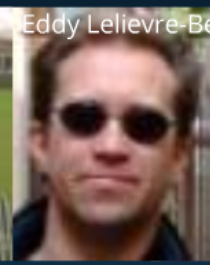
Helmut Schober



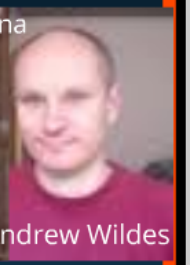
Lise Arleth

Kell Mortensen

Bente Lebech



Eddy Lelievre-Berna



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**Thanks!**

**Please contribute :)**
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