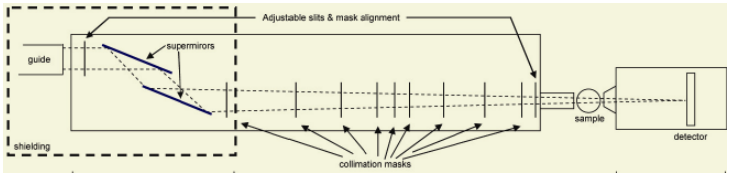
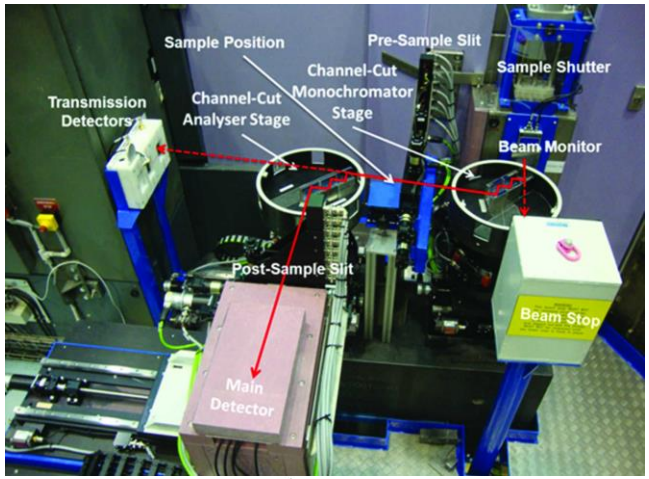
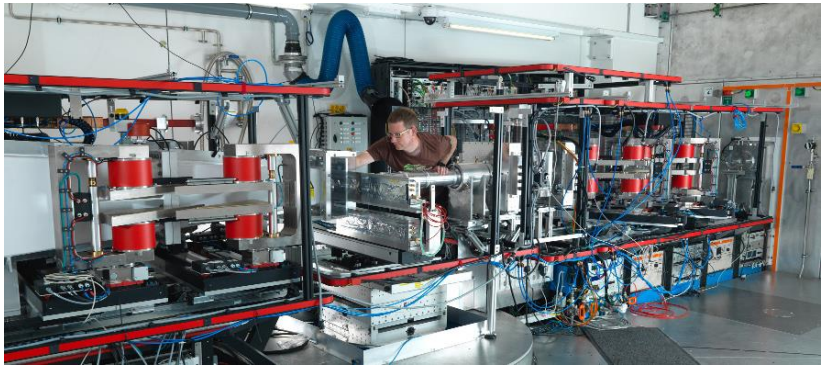
Extended *Q*-range





① Neutron guide NL3a
② Velocity selector
③ Entrance aperture
④ Toroidal mirror
⑤ Mirror chamber
⑥ Sample positions
⑦ Detector



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Possible discussion topics extended *Q*-range

- Software for data-analysis
- Multiple scattering
- Anisotropic scattering in USANS and SESANS
- Combined analysis with imaging/tomography
- Combined analysis with conventional SAS
- Calibration samples

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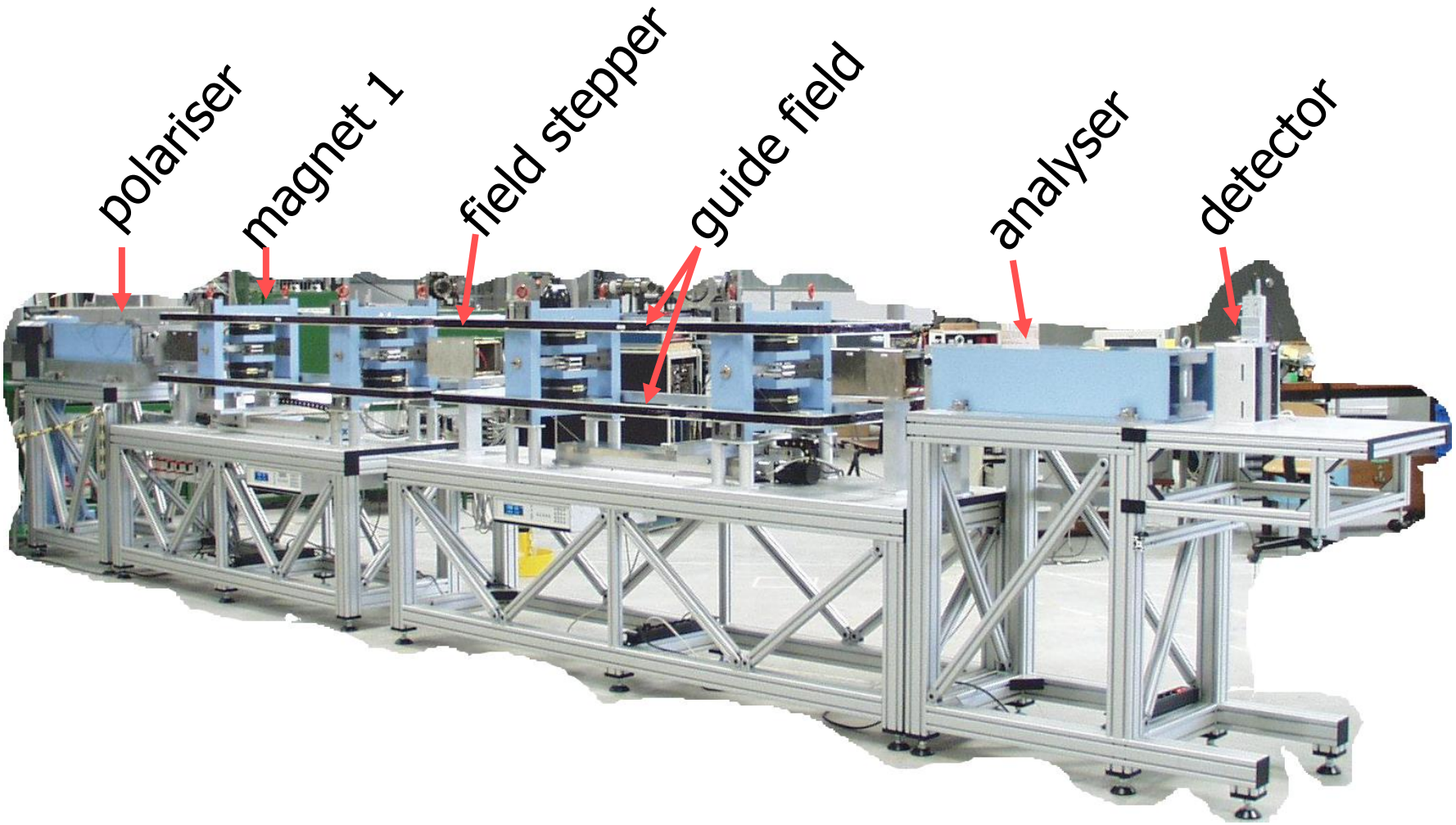
SESANS
spin-echo small-angle neutron scattering



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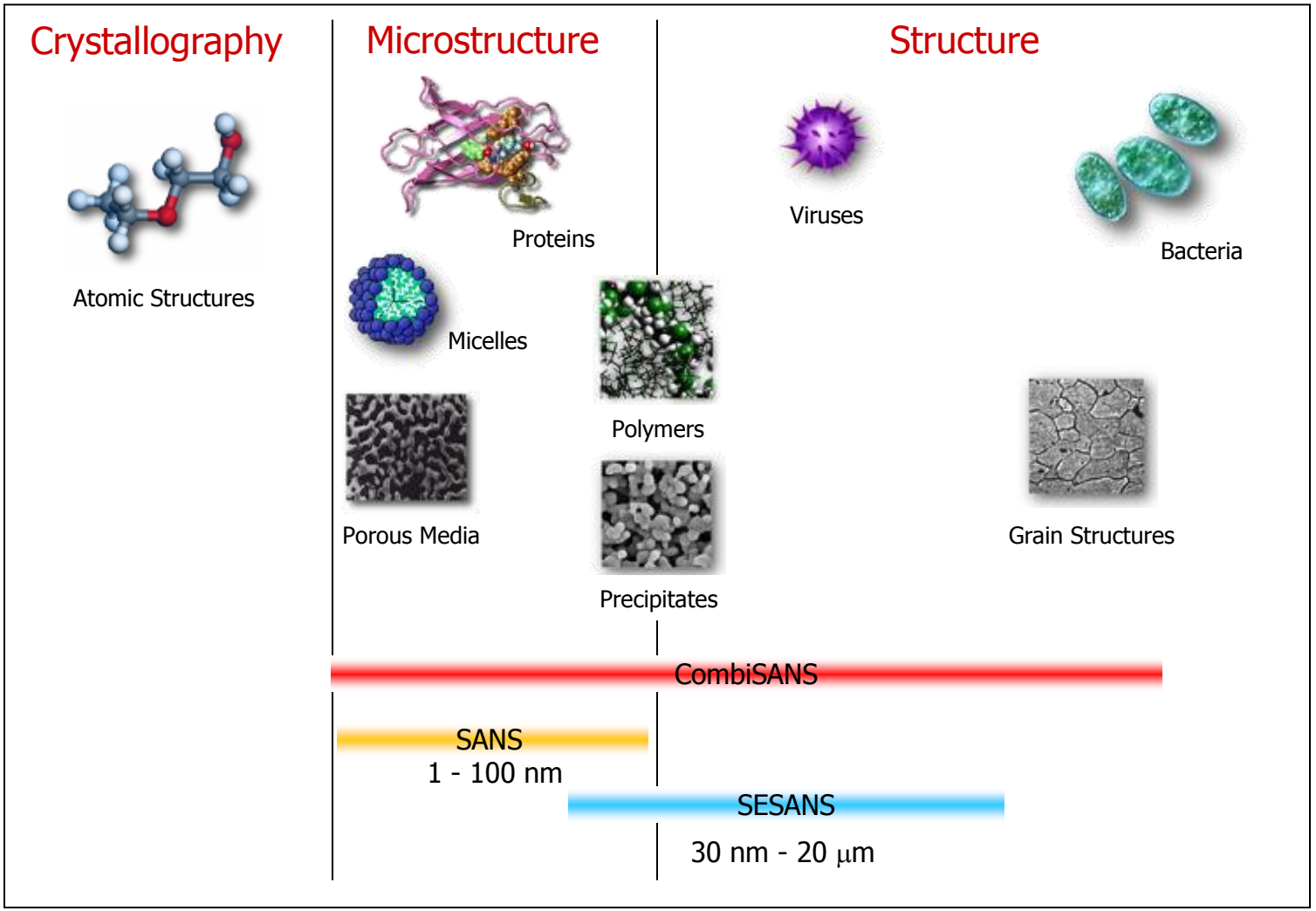
Length scales accessible



10^{-11} m 10^{-9} m 10^{-7} m 10^{-5} m 10^{-3} m

Size probed

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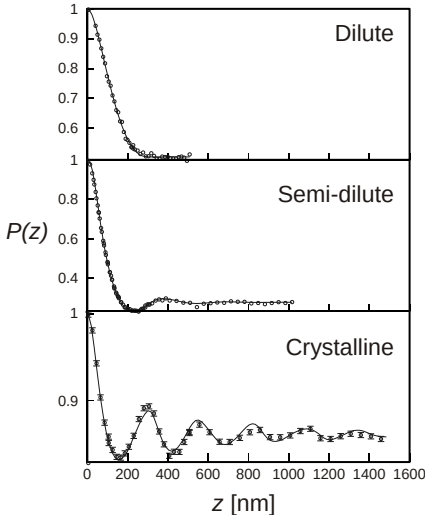
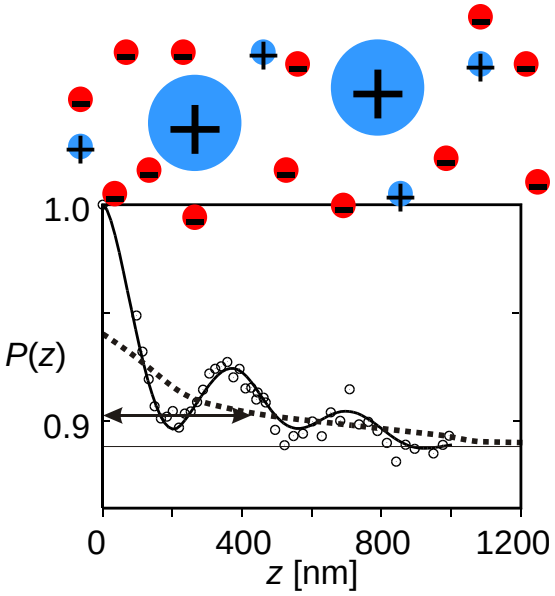
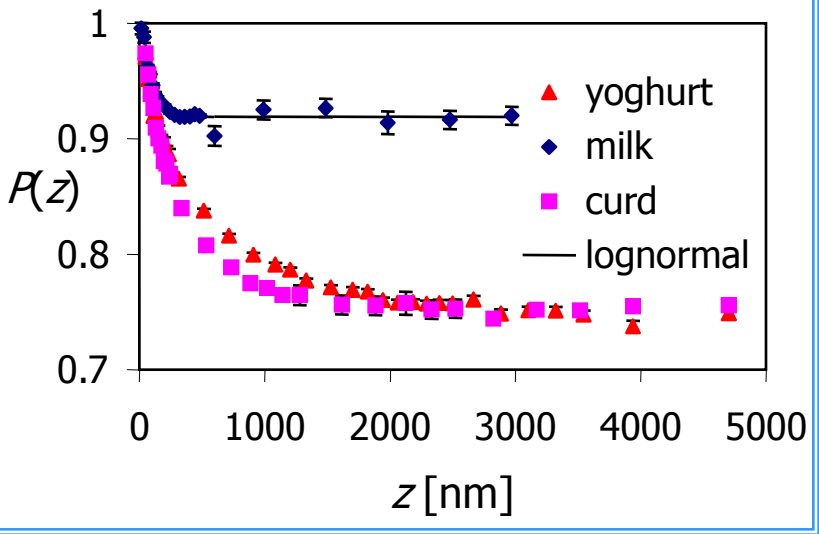
Applications of SESANS
real space, range 30 nm – 18 μm, no collimation

Colloidal interaction

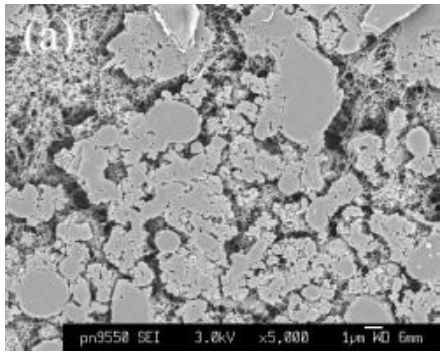


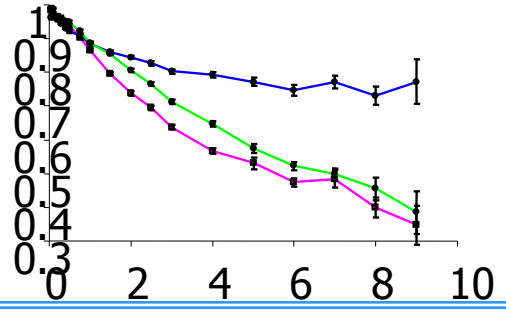


Dairy products



μ-emulsions





- Granular materials
- Drug delivery systems

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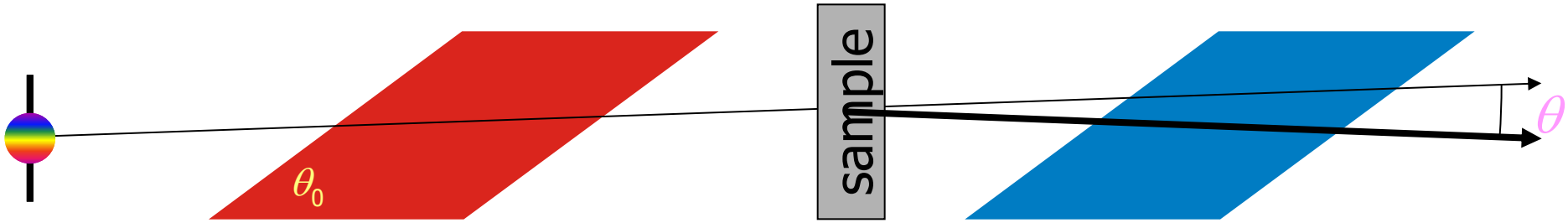
Larmor encoding of scattering angle
spin-echo small angle neutron scattering



- Unscattered beam gives spin echo $\phi = 0$
  independent of height and angle
- Scattering by sample $\rightarrow$ no complete spin echo
  $\rightarrow$ net precession angle
- Measure precession angle (or neutron polarization)
  as a function of magnetic field $\rightarrow$ correlation function $G(\delta)$

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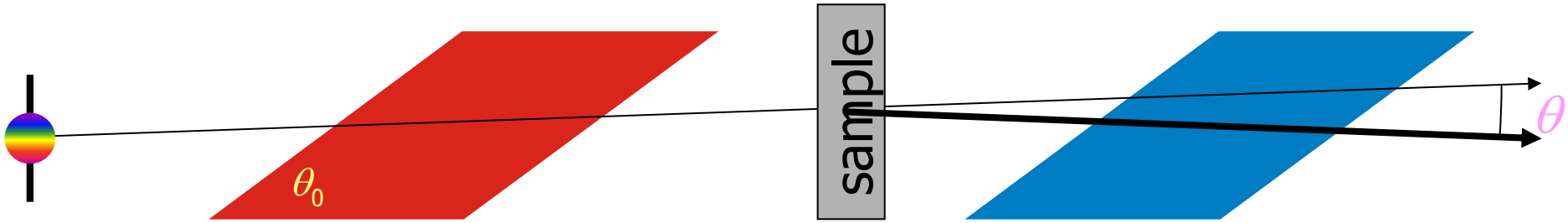
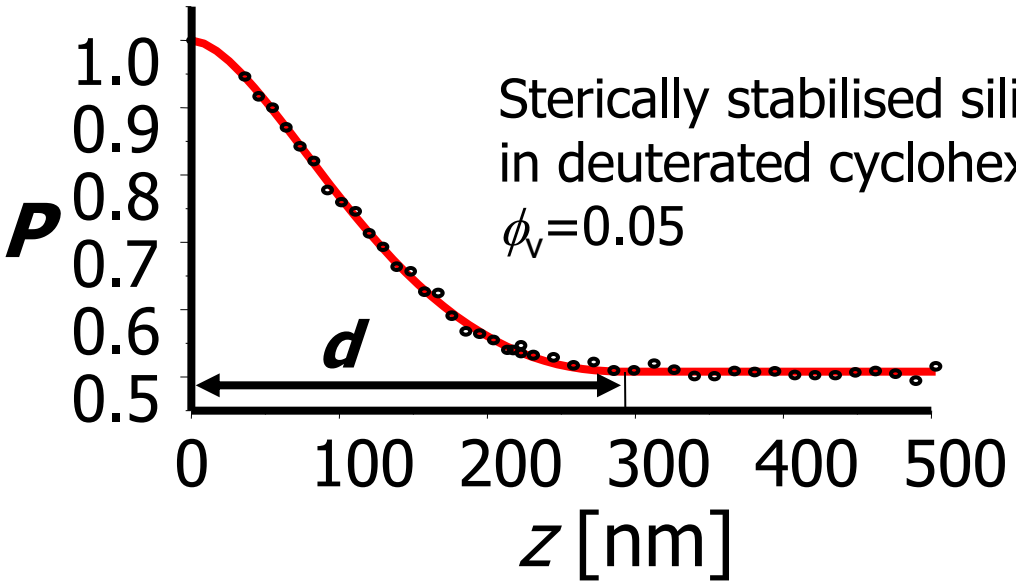
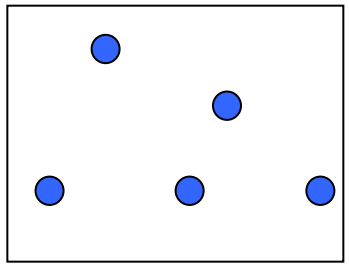
SESANS = density correlation functions



- Polarisation as function spin-echo length = scattering length density correlation function



Sterically stabilised silica particles d=298 nm
in deuterated cyclohexane
ϕ_v=0.05



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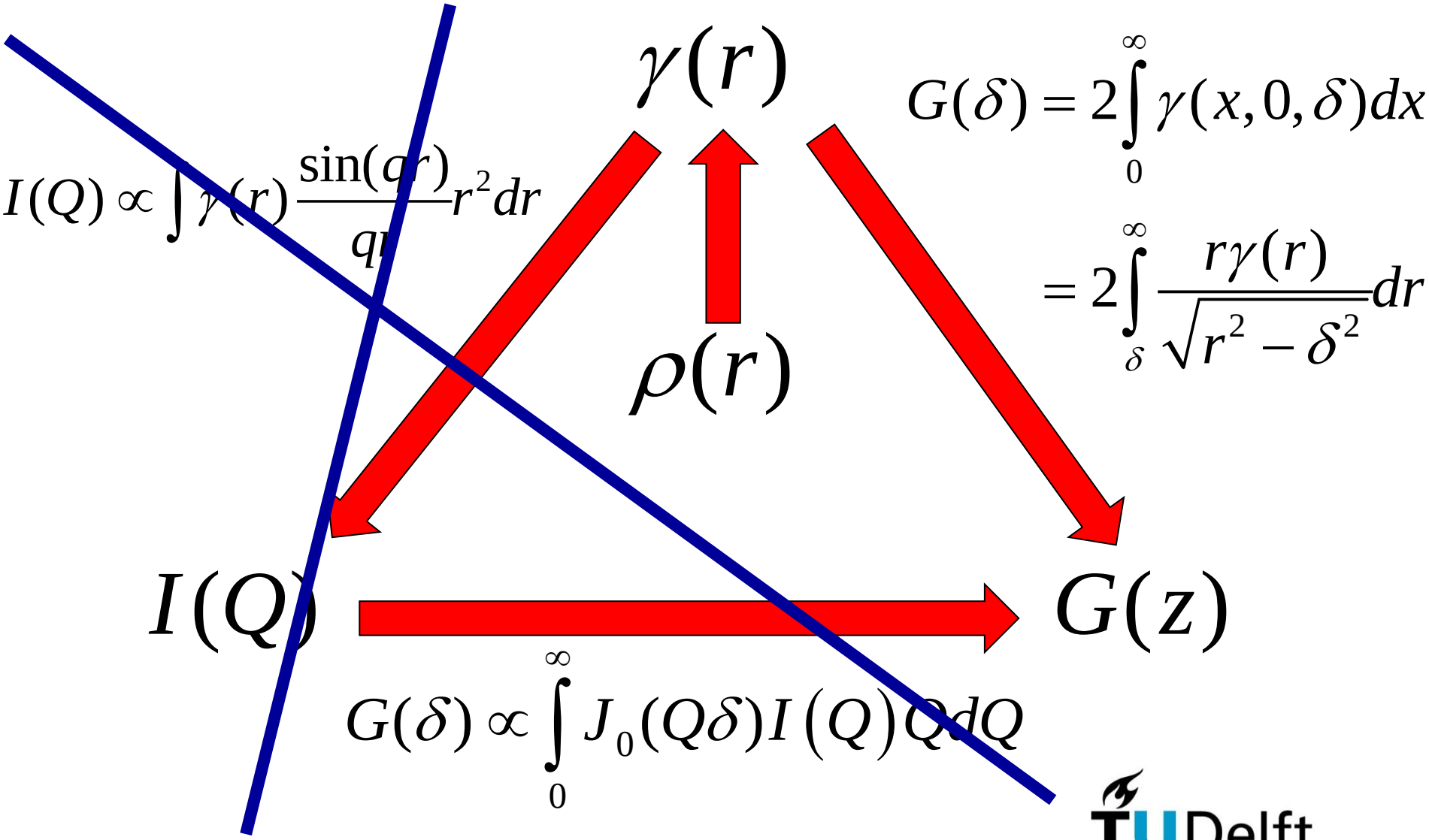
Density, correlation, SANS, SESANS



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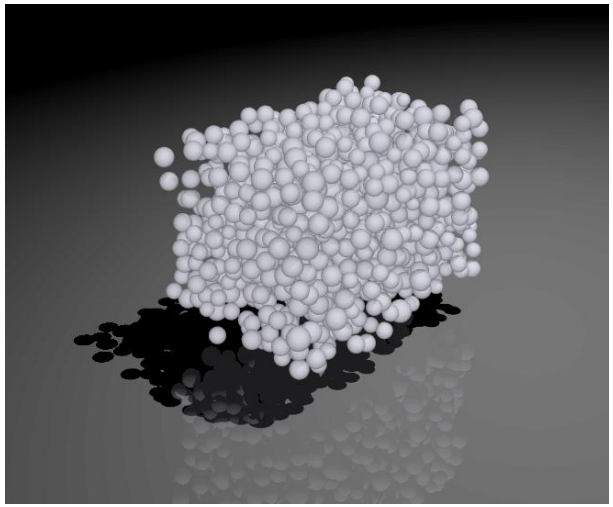
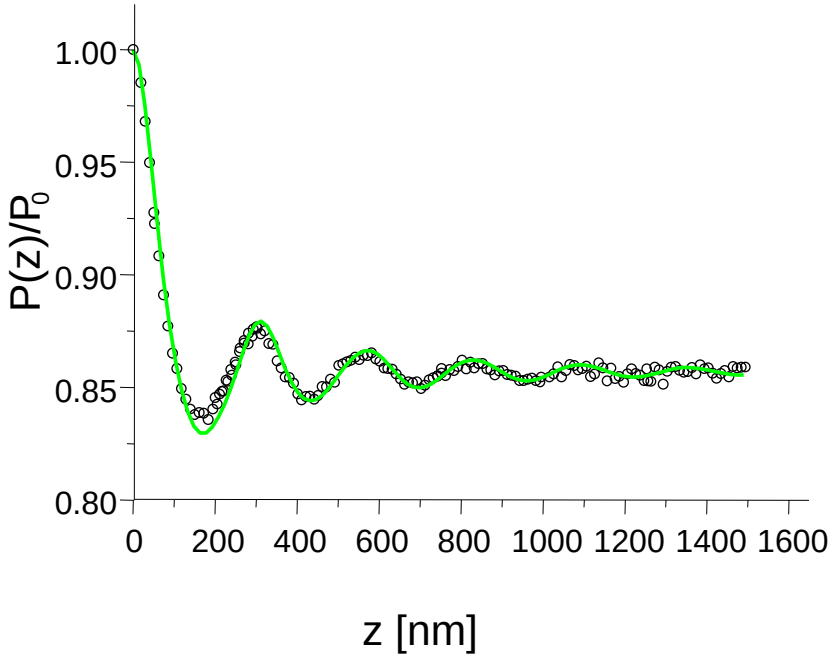
From structure to polarisation





structure

$$\gamma(\mathbf{r}) = \int_V \rho(\mathbf{r}')\rho(\mathbf{r}+\mathbf{r}')d\mathbf{r}'$$

density correlation function

$$G(z) = 2\int_0^\infty \gamma(x,0,z)dx$$

SESANS correlation function

$$P(z) = e^{(G(z)-G(0))}$$

polarisation

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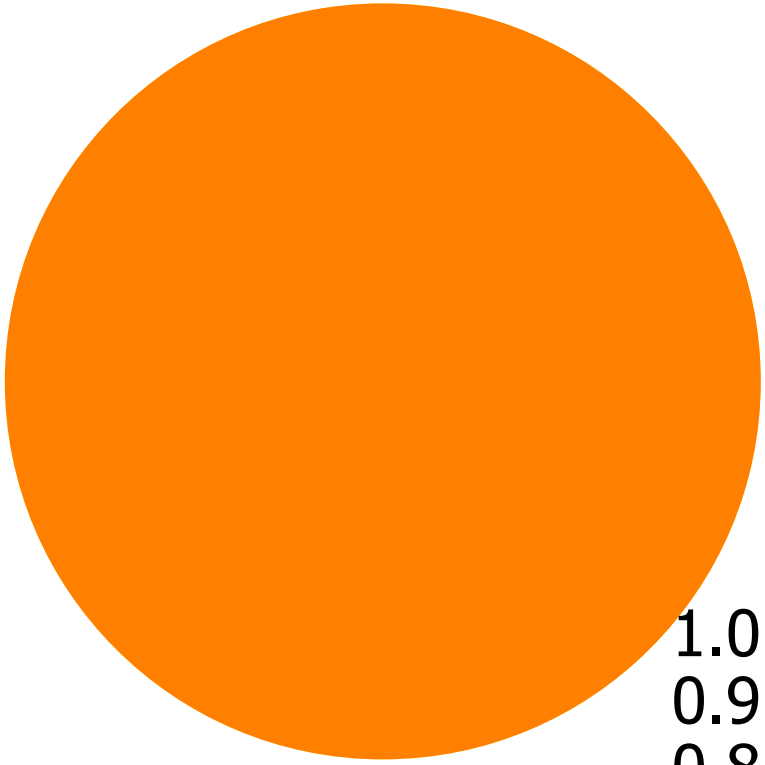
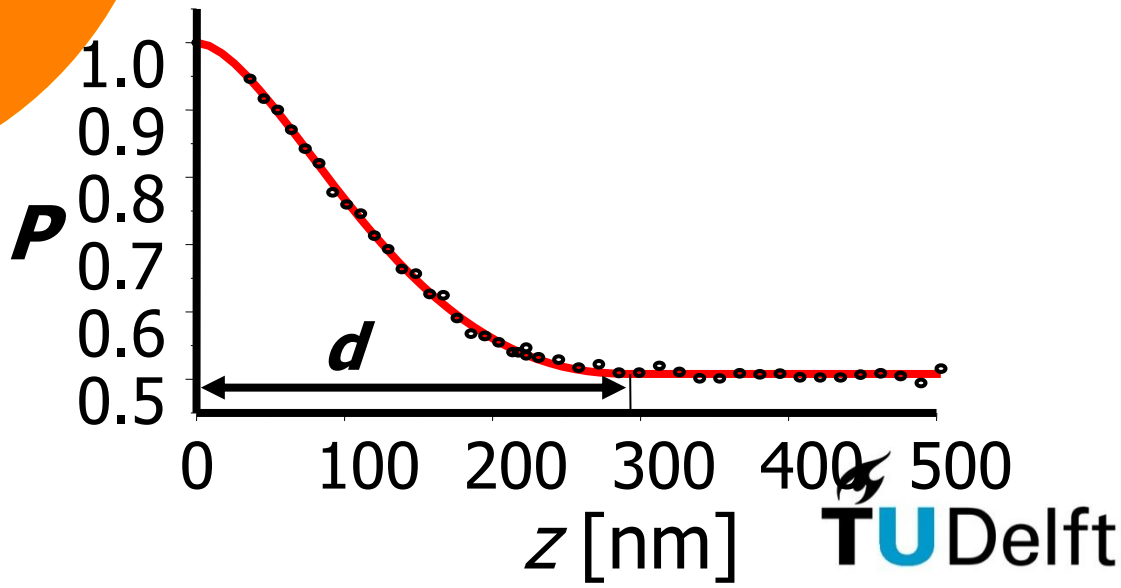
Reciprocal space is redundant





Data analysis until 2014

- Mostly ad hoc Matlab written real space models
- Loads of work allready for the few users

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Need for user friendly SESANS analysis software

- Collaboration with ISIS: OFFSPEC & Larmor
- Users in Delft
- LENS and ad hoc at Oak Ridge
- Gatchina

- SKADI: SANS with SESANS add on

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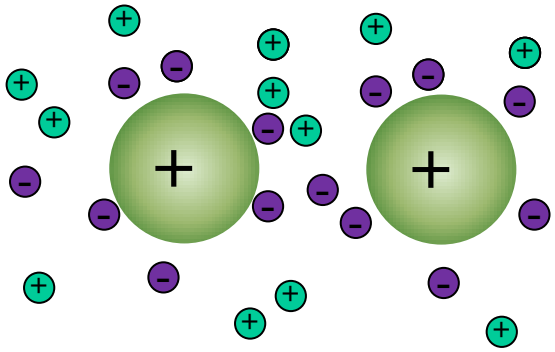
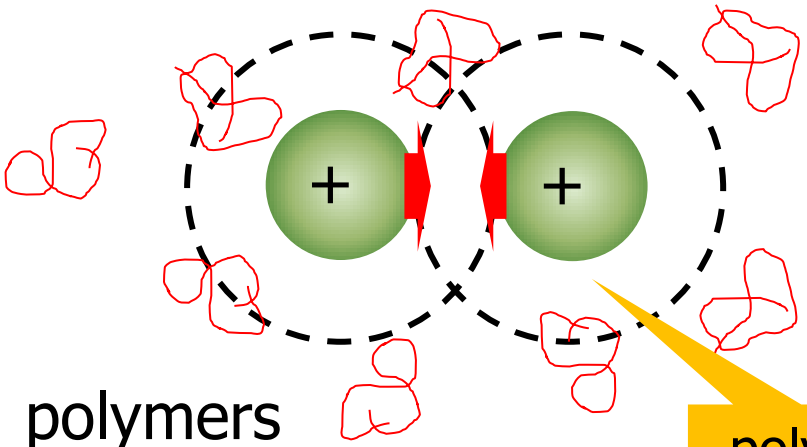
Depletion interactions in charged, aqueous colloid-polymer mixtures (model for e.g. milk)



salt
reduces
repulsion



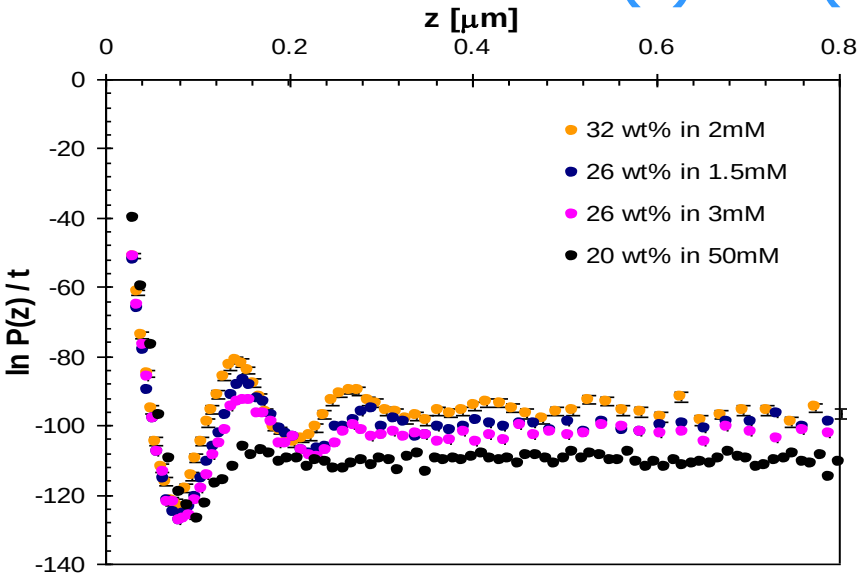
polymers
give
attraction

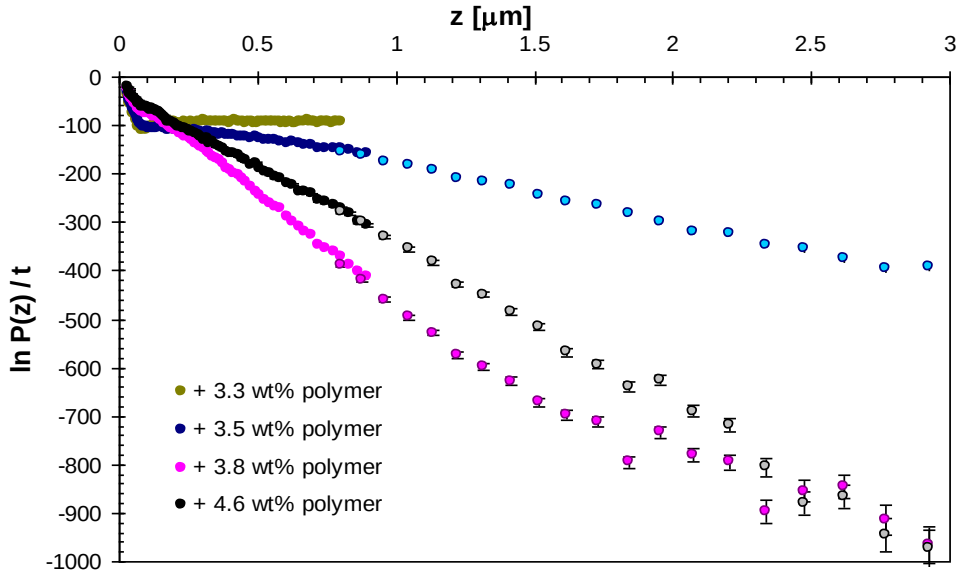
Kitty van Gruijthuijsen

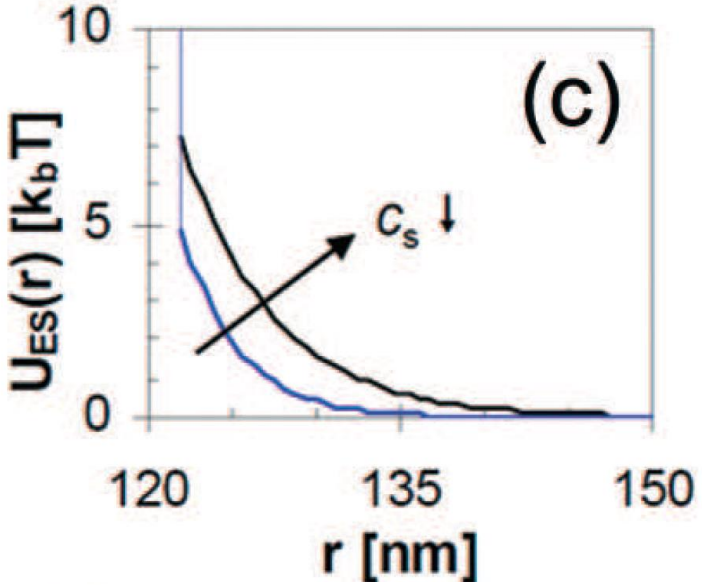
Peter Schurtenberger, Anna Stradner - Lund University

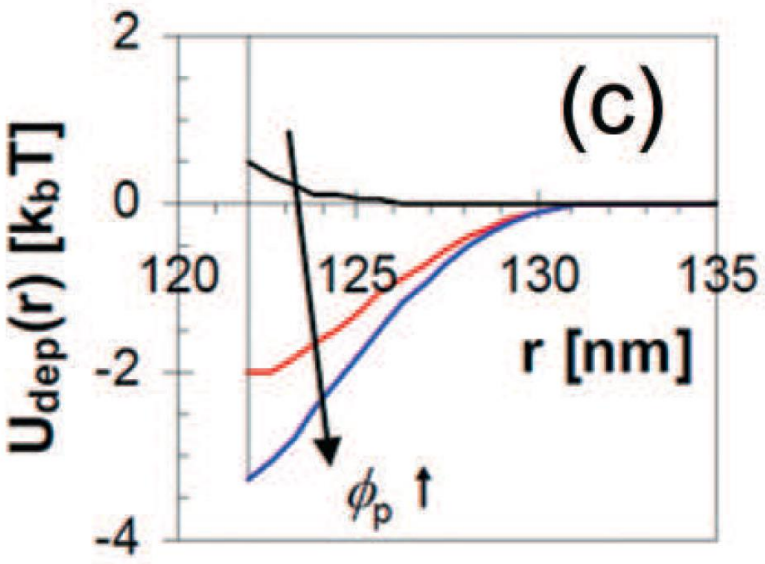
Adolphe Merkle Institute, Université de Fribourg

Fit SESANS with interaction potential: $U(r) - I(q) - G(z)$

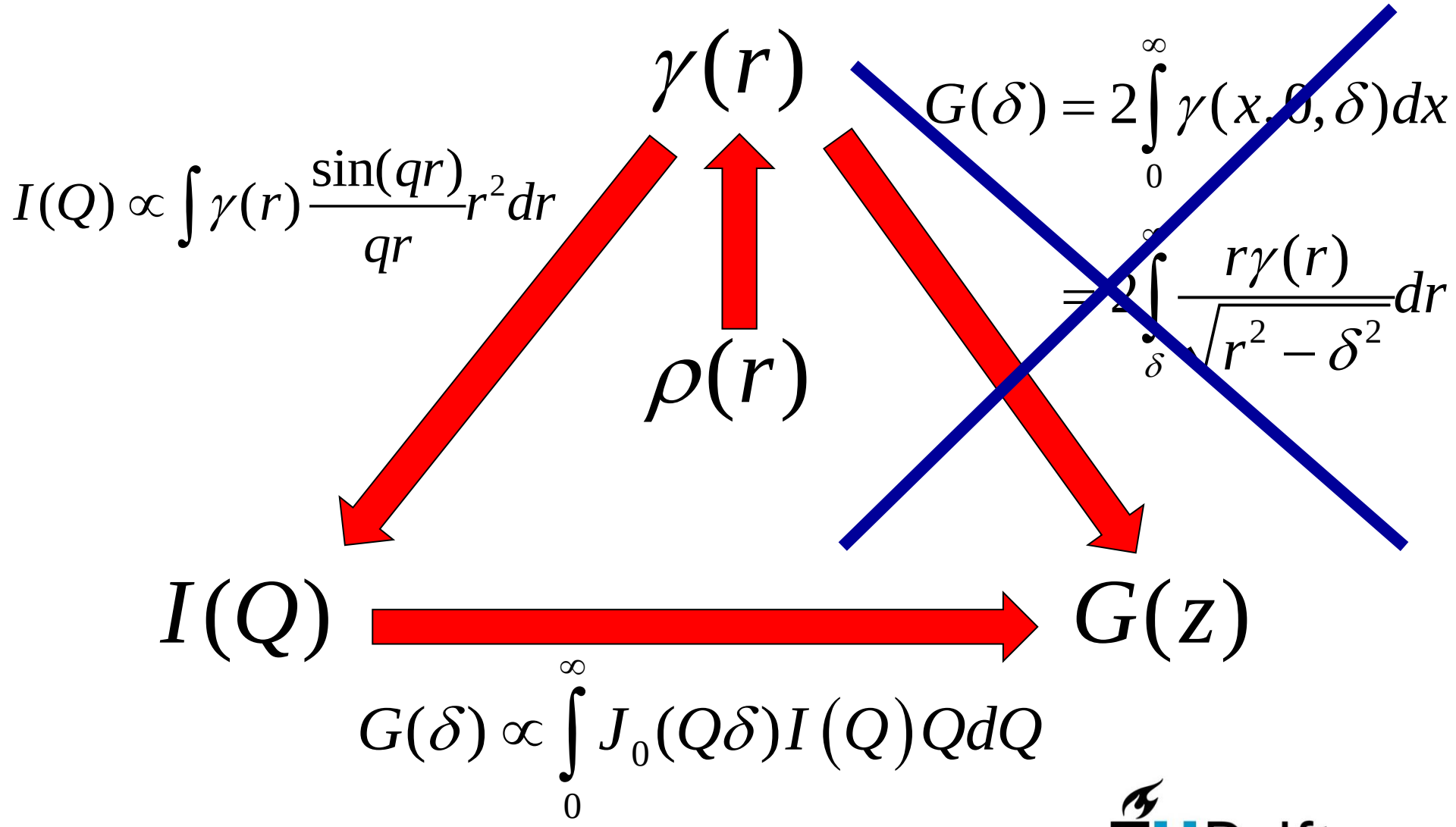








Density, correlation, SANS, SESANS



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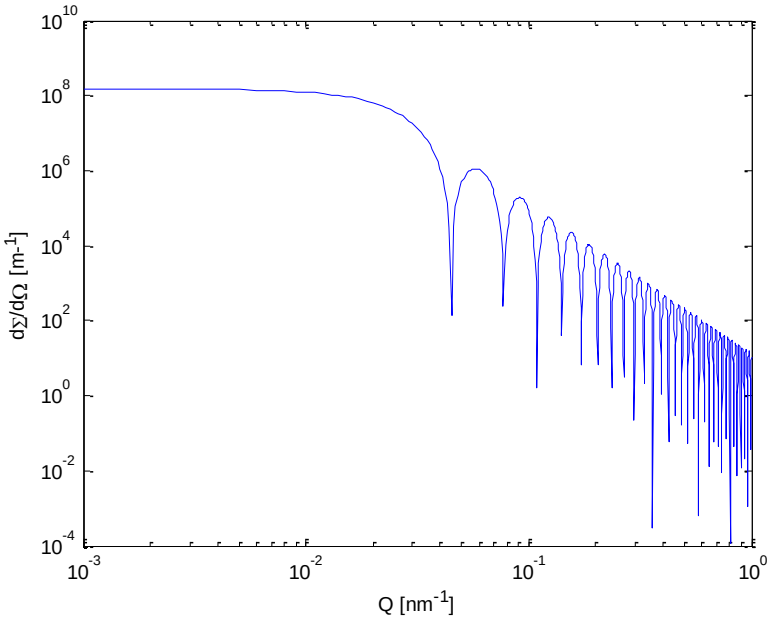
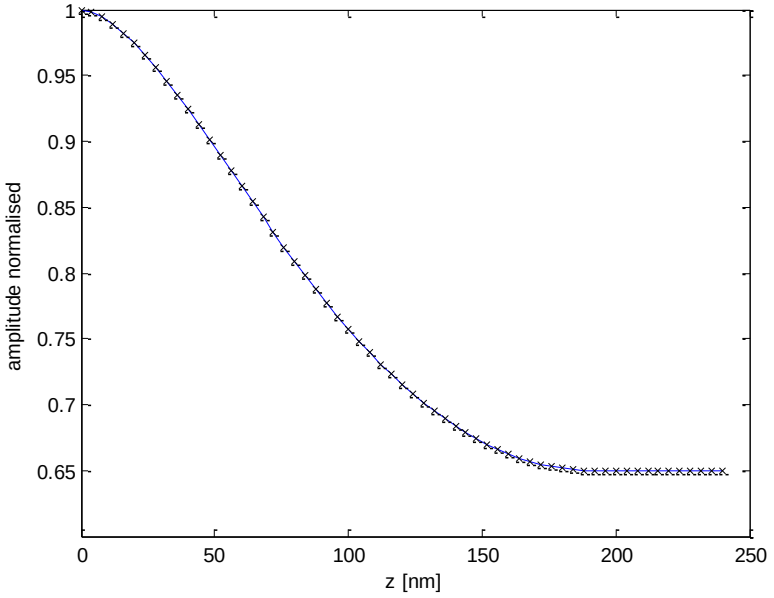
Need SANS into SESANS conversion spheres R=100 nm





$$\tilde{G}(z) = \int_0^\infty J_0(Qz)\frac{d\Sigma}{d\Omega}(Q)QdQ \qquad P(z) = e^{\frac{t\lambda^2}{2\pi}\left(\tilde{G}(z)-\tilde{G}(0)\right)}$$

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4 code camps with SasView team

Jurrian Bakker

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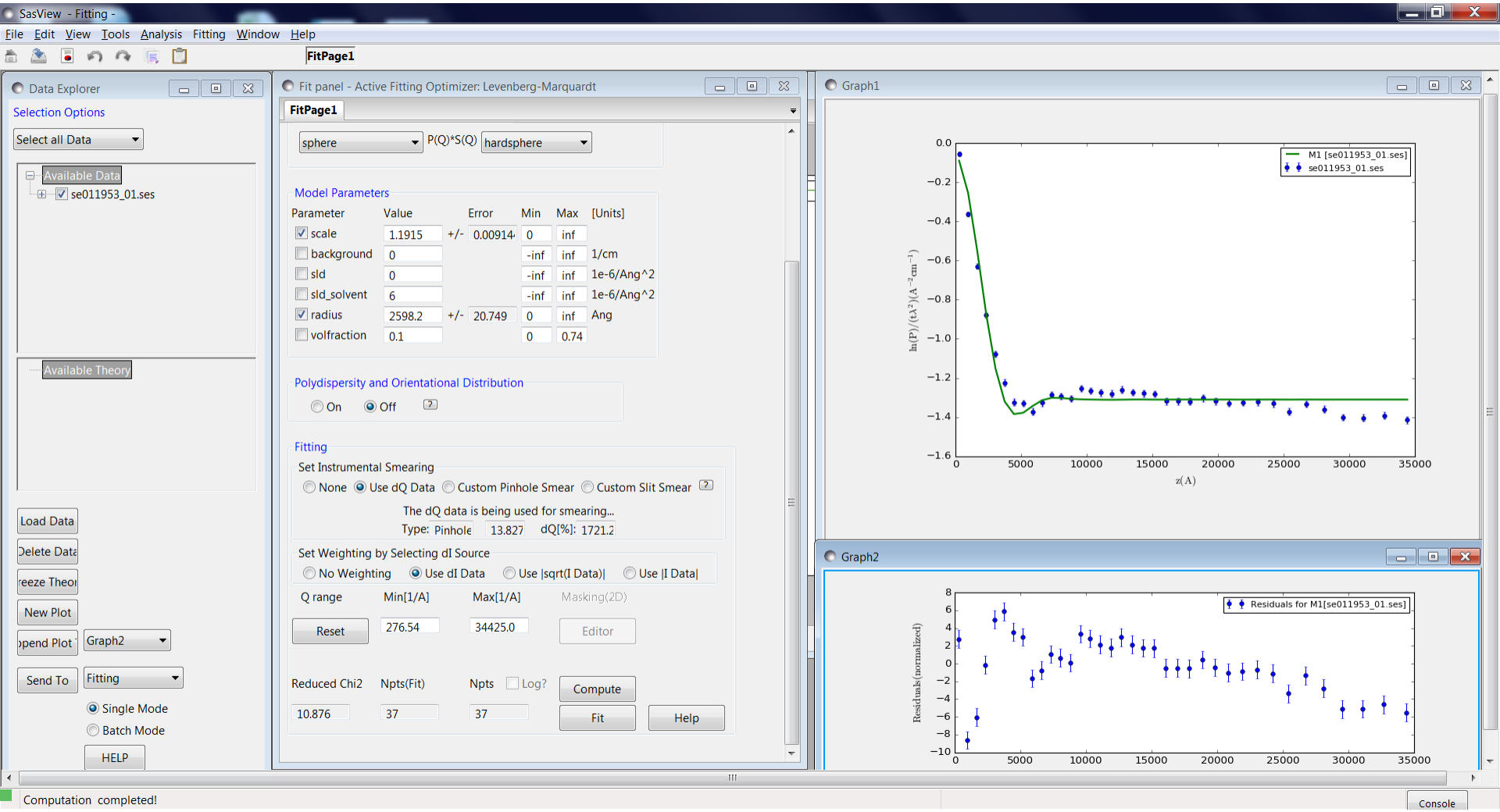
Full functionality and all models from SasView



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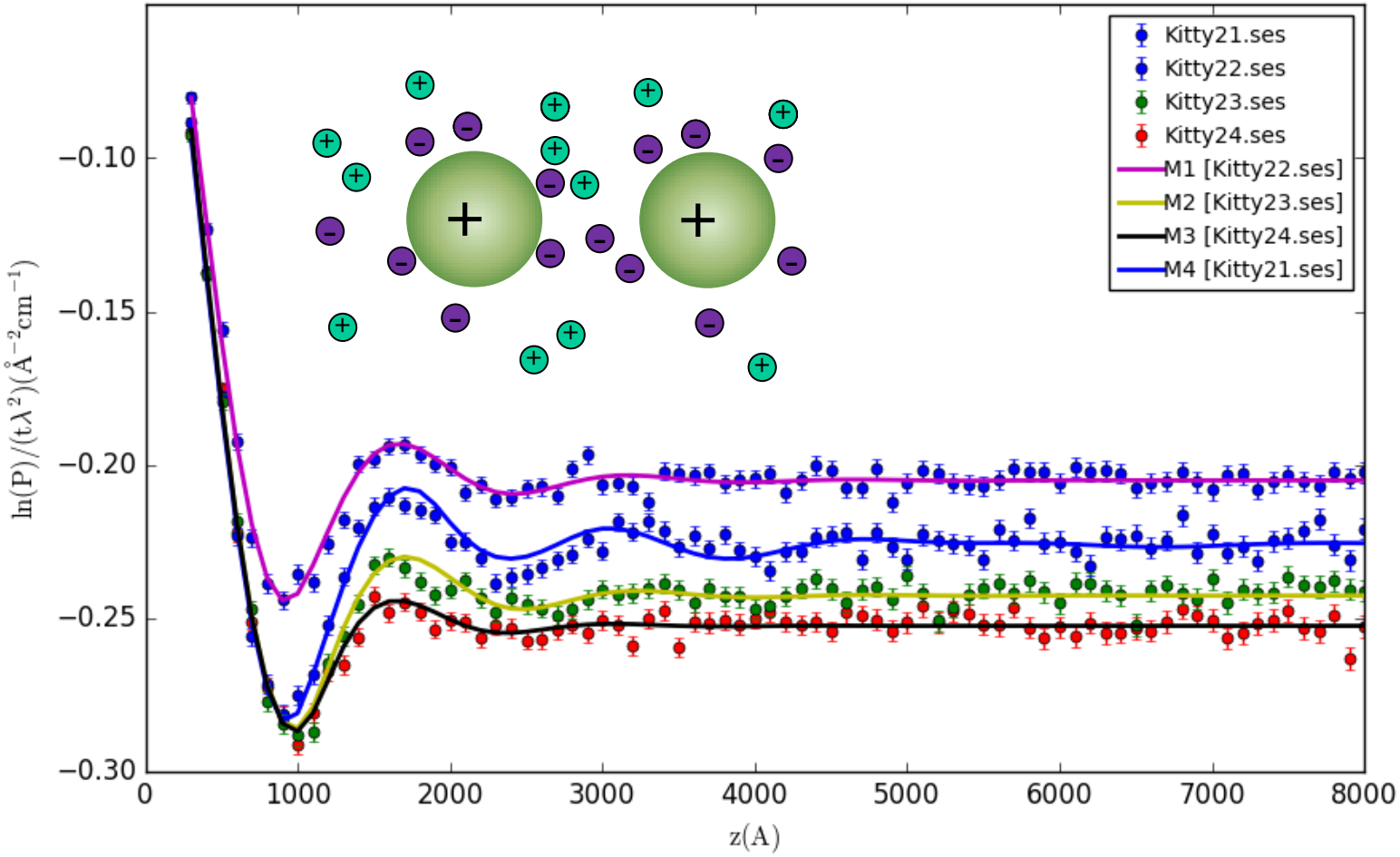
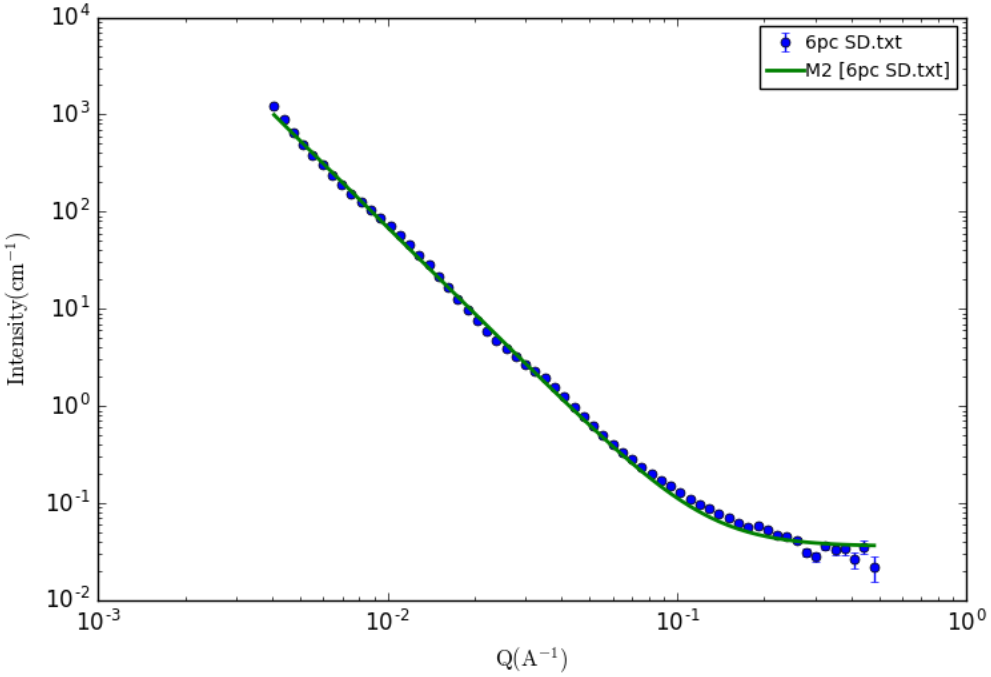
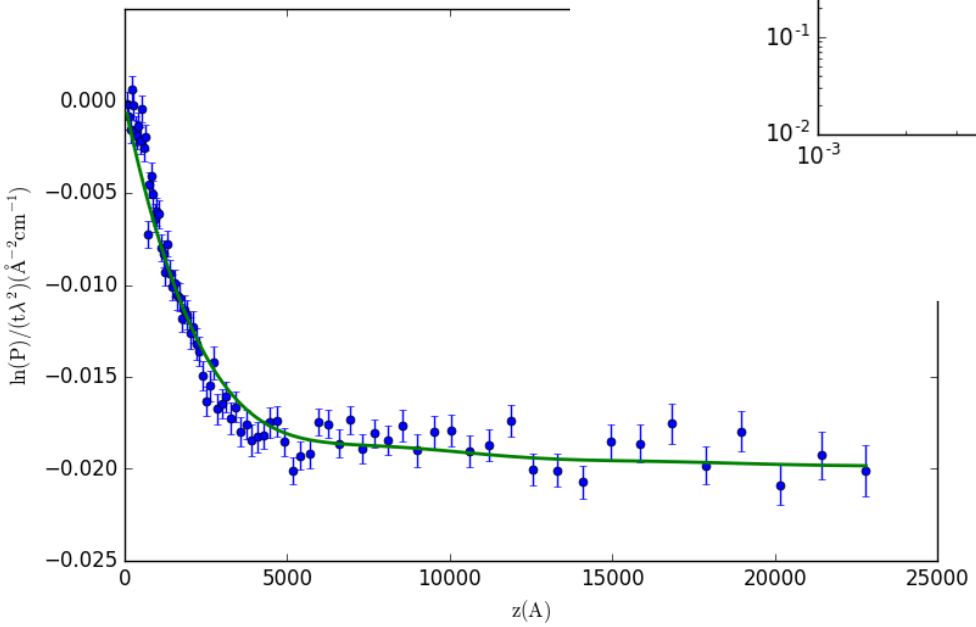
Batch fit


Kitty21.ses
Kitty22.ses
Kitty23.ses
Kitty24.ses
M1 [Kitty22.ses]
M2 [Kitty23.ses]
M3 [Kitty24.ses]
M4 [Kitty21.ses]
−0.10
−0.15
−0.20
−0.25
−0.30
0
1000
2000
3000
4000
5000
6000
7000
8000
z(A)
ln(P)/(tλ²)(Å⁻²cm⁻¹)

Simultaneous fit SESANS and SANS





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Joachim Kohlbrecher included also SESANS in SasFit

research papers

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Transformation cycle between the spherically symmetric correlation function, projected correlation function and differential cross section as implemented in *SASfit*

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Possible discussion topics extended *Q*-range

- Software for data-analysis
- Multiple scattering
- Anisotropic scattering in USANS and SESANS
- Combined analysis with imaging/tomography
- Combined analysis with conventional SAS
- Calibration samples

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