

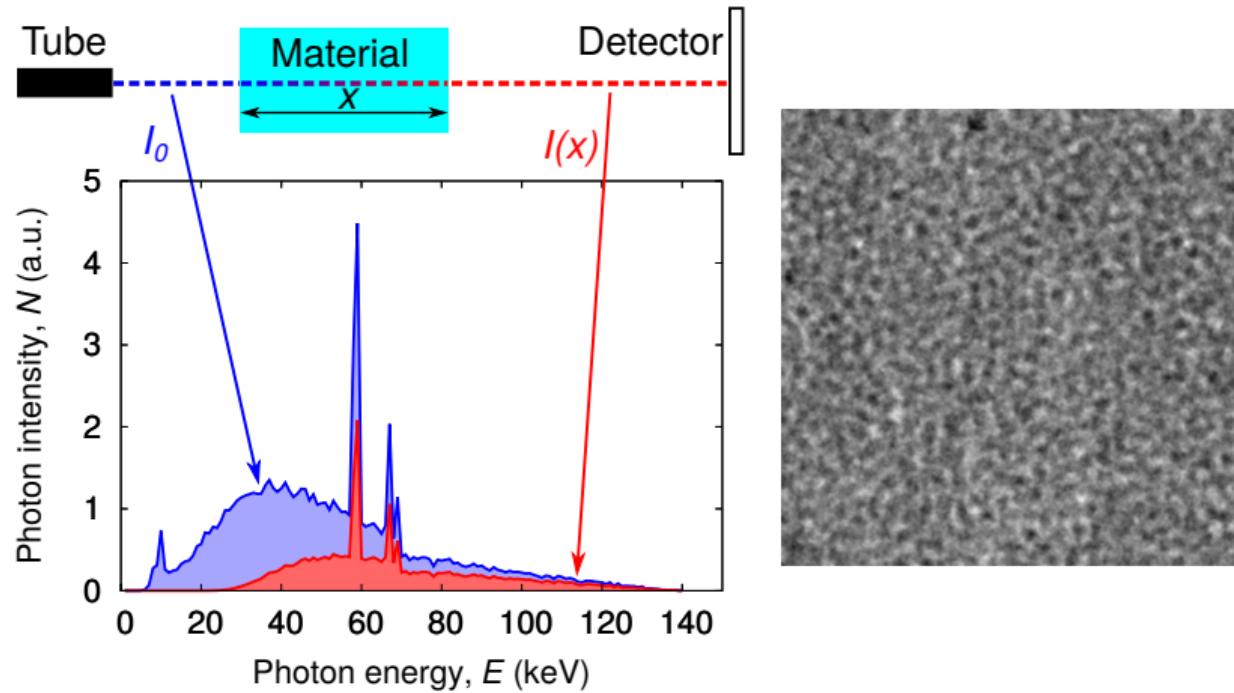


PhD defense  
**Manuel Baur**

Funded by the German  
Federal Ministry for  
Economic Affairs and  
Energy, grant no. 50WM

1653

# X-ray radiography of granular systems – particle densities and dynamics



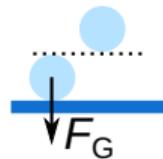
# X-ray radiography of granular systems – particle densities and dynamics



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**Granular materials are athermal**



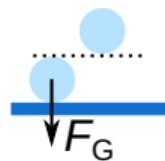
$$E_{\text{pot}} \approx 10^{10} E_{\text{thermal}}$$



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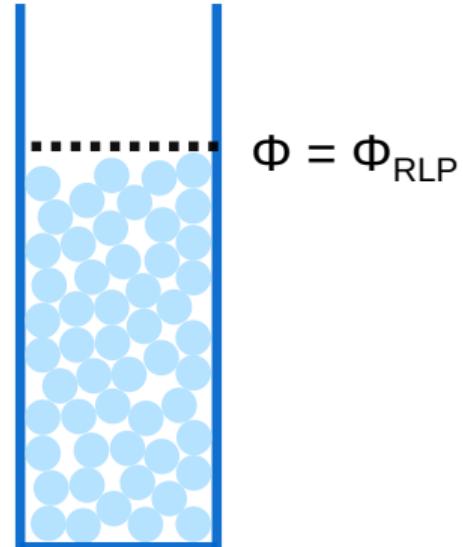


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**Volume fraction**

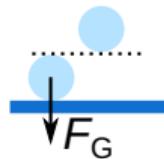
$$\Phi = \frac{V_{\text{Particles}}}{V_{\text{Container}}}$$



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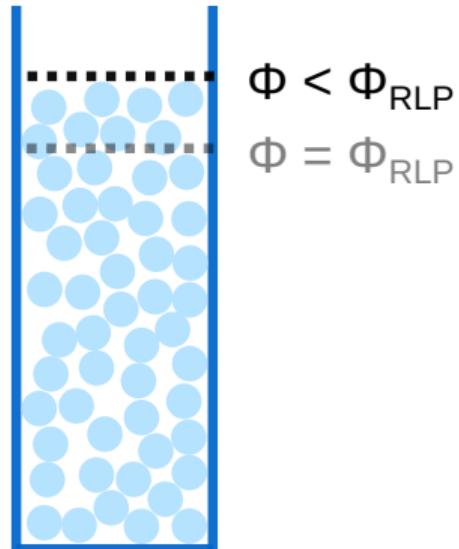
**Dissipative interactions**



Driscoll *et al* (2016)

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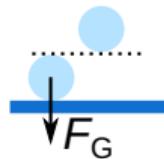
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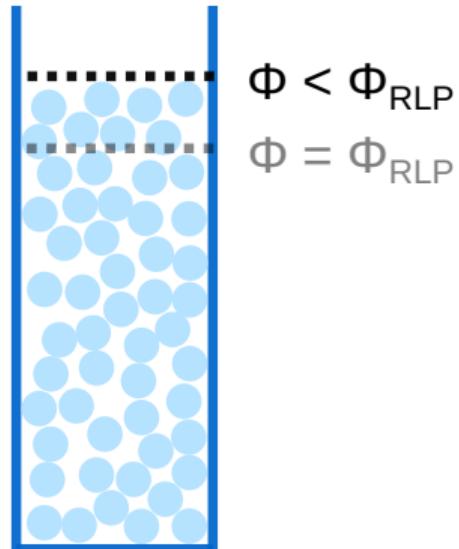
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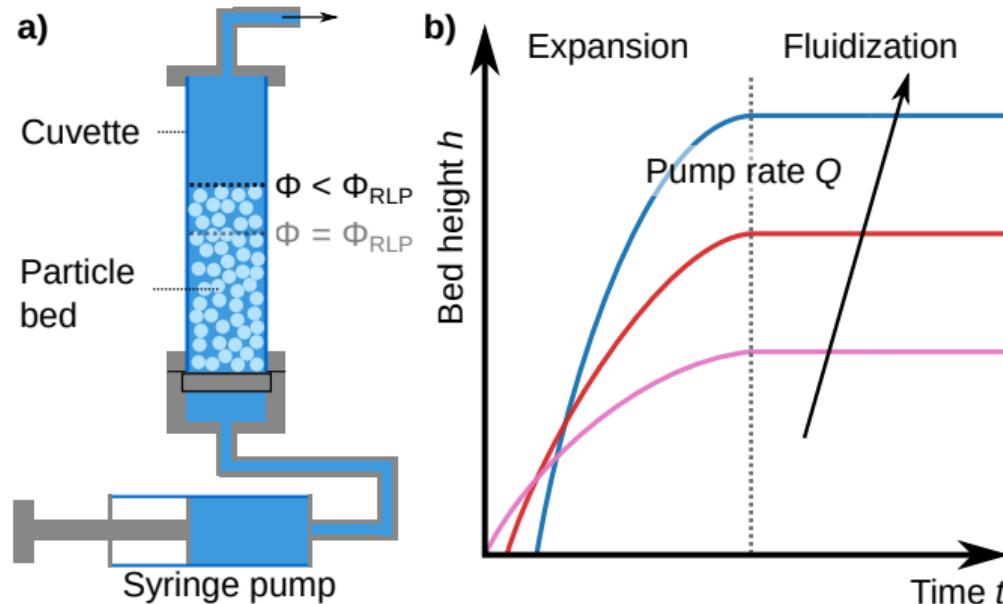
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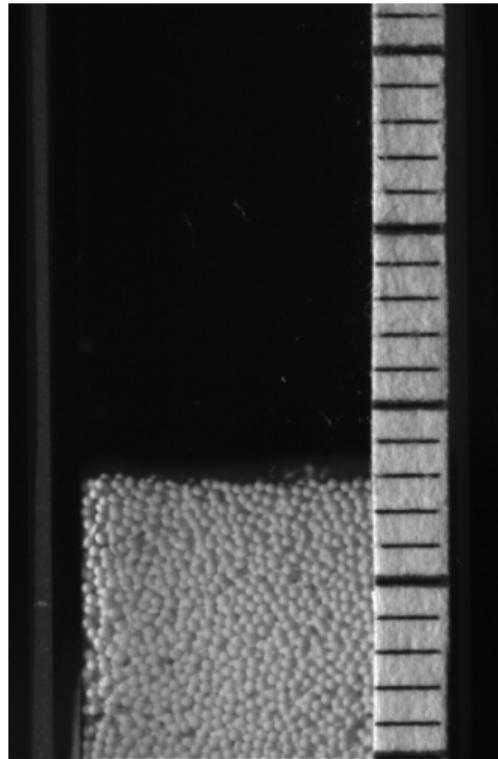
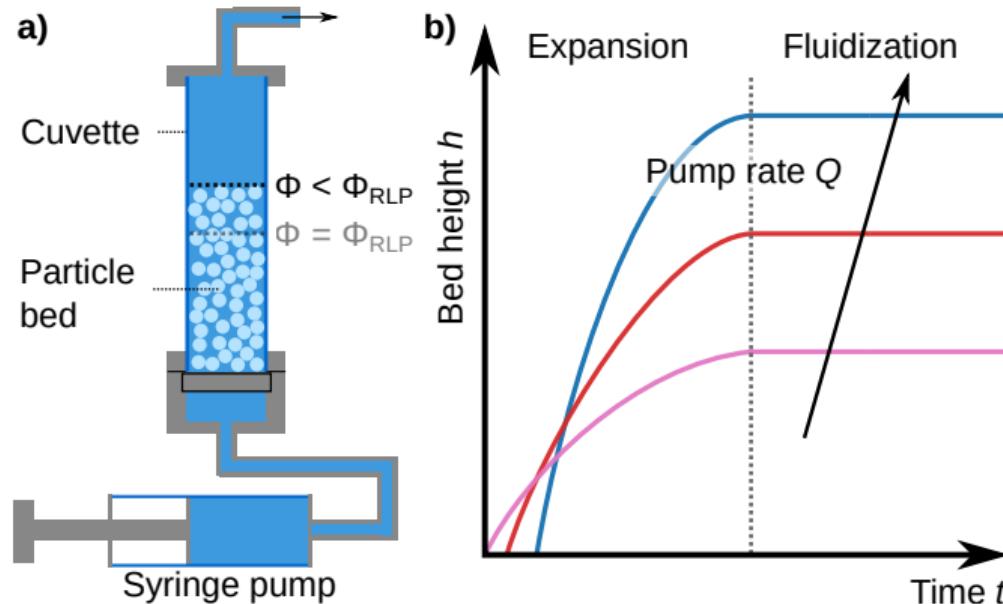
# X-ray radiography of granular systems – particle densities and dynamics

## Liquid fluidized bed



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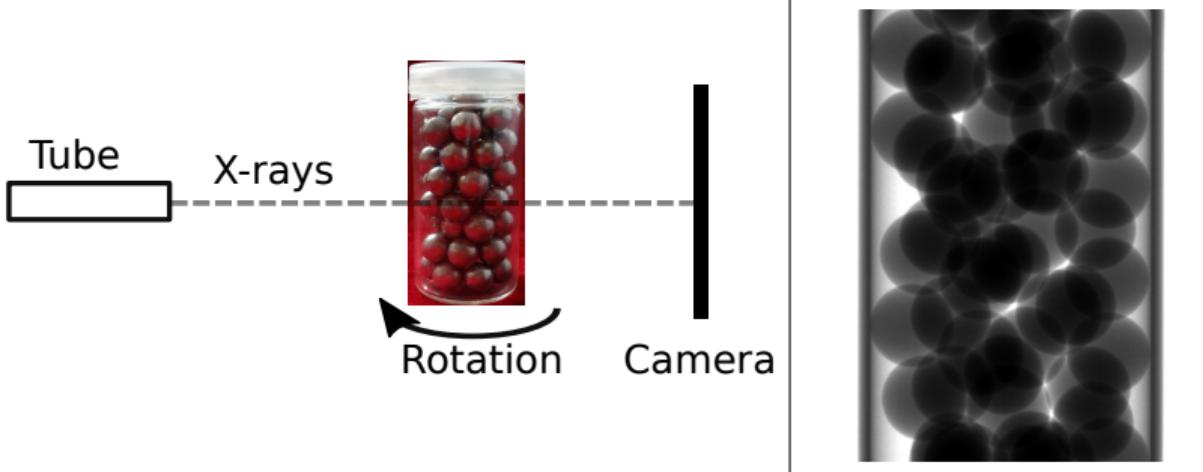
## Liquid fluidized bed



Master thesis Welm Pätzold

Particulate flows are opaque

# X-ray radiography & tomography



Radiogram

2D projections of 3D object  
Short acquisition time  
→ Dynamic system

# X-ray radiography & tomography

