



ODIN: Optical and Diffraction Imaging with Neutrons at the ESS

Status and perspectives of the ODIN Project

PSI: M. Morgano, M. Strobl

TUM: E. Calzada, M. Lerche, B. Schillinger, M. Schulz

Outline

- ODIN overview/goals
- ODIN Project Update

ODIN at ESS

- **Optical and Diffraction Imaging with Neutrons:** Neutron radiography and ToF imaging with variable wavelength resolution
- ODIN will be the only imaging instrument installed during the first round
- It will be a “day-1” instrument: first neutrons planned for 2021
- Joint project of PSI and TUM (lead institution)
- Budget 11.6M€.

ODIN Overview

- Multi purpose imaging instrument
- 50m Source to pinhole
- Sample located up to 14m from the pinhole
- Straight beamline (direct view of the source)
- Chopper cascade consisting of 9 axis (plus 1 PPSc)
- Range of operational modes:
 - “White beam” imaging with spectral choice
 - Low Time of Flight resolution
 - Grating interferomete
 - SEMSANS imaging
 - Medium Time of Flight Resolution
 - Polarized and polarimetric neutron imaging set-up, Bragg-edge and diffraction
 - High Time of Flight Resolution: Bragg-edge and diffraction geometry set-up
 - Perpendicular X-ray imaging set-up

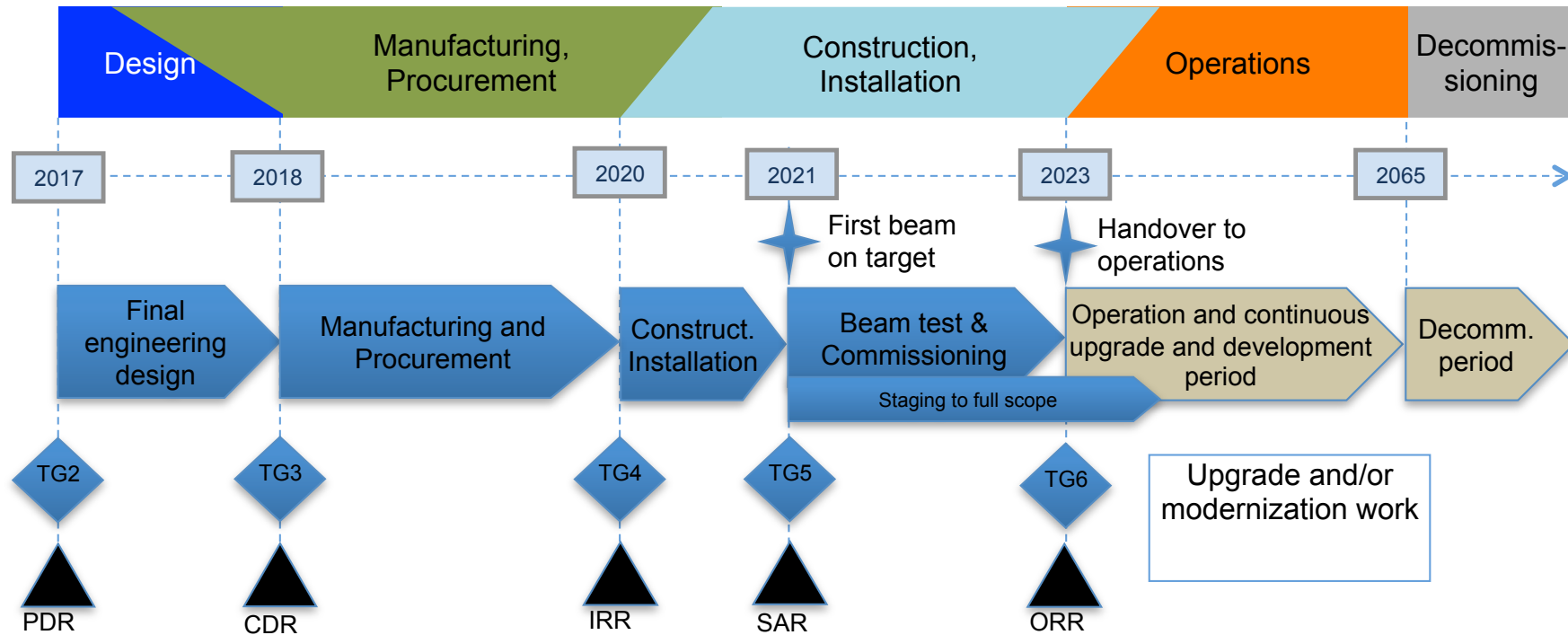
High Level Goals

- Conventional Imaging
 - High resolution: **Real space resolution of 10 μ m**
 - Large homogenous Field of View: **20 \times 20cm² with a homogeneity of >75%**
 - Variable Wavelength: **λ -range from 1 to 20 Å**
 - High time resolution: **<70 ms in kinetic measurements**

- New (wavelength dependent) techniques
 - Variable Wavelength resolutions: **10%, 1% and down to below 0.5%**
 - Variable Bandwidths: **Bandwidths of ~4.5 Å or ~9 Å selectable between 1-20 Å**
 - Time resolutions in quasi-stroboscopic mode: **~1 μ s**

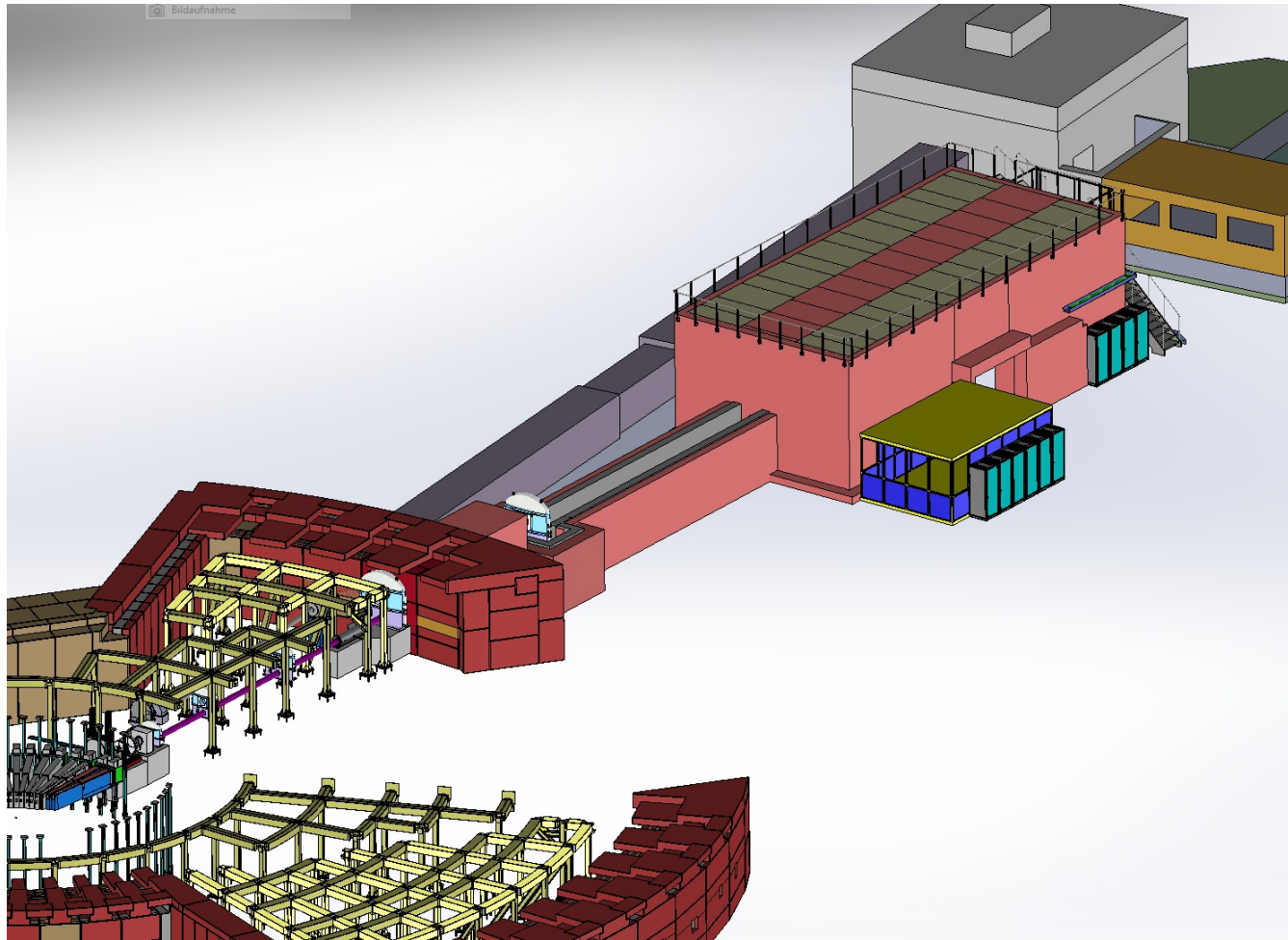
- Synergy
 - X-ray contrast: **with comparable spatial resolution**
 - Diffraction capabilities: **with equivalent wavelength resolution**

Life Cycle

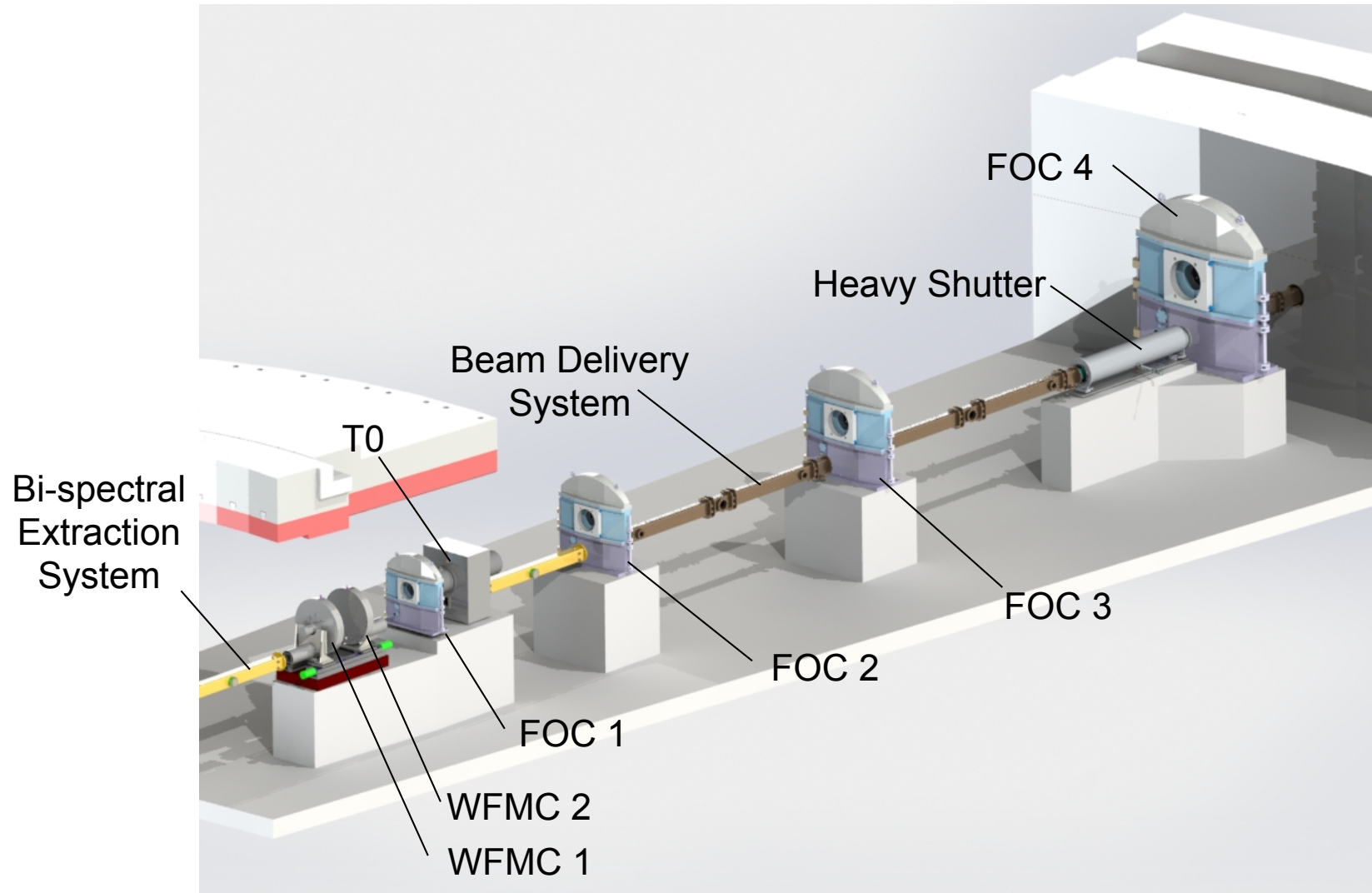


bunker wall penetration design	design monolith insert envelop	arrival in-monolith optics to ESS site	start installation in-monolith inserts	Start In-bunker installation	Partial Access D01	End In-bunker installation	Early Science (TG5)	User Programme
03-Mar-17	31-Mar-17	30-Nov-18	20-Mar-19	15-Nov-19	02-Mar-20	15-May-20	01-Feb-21	31-Aug-23

Floorplan

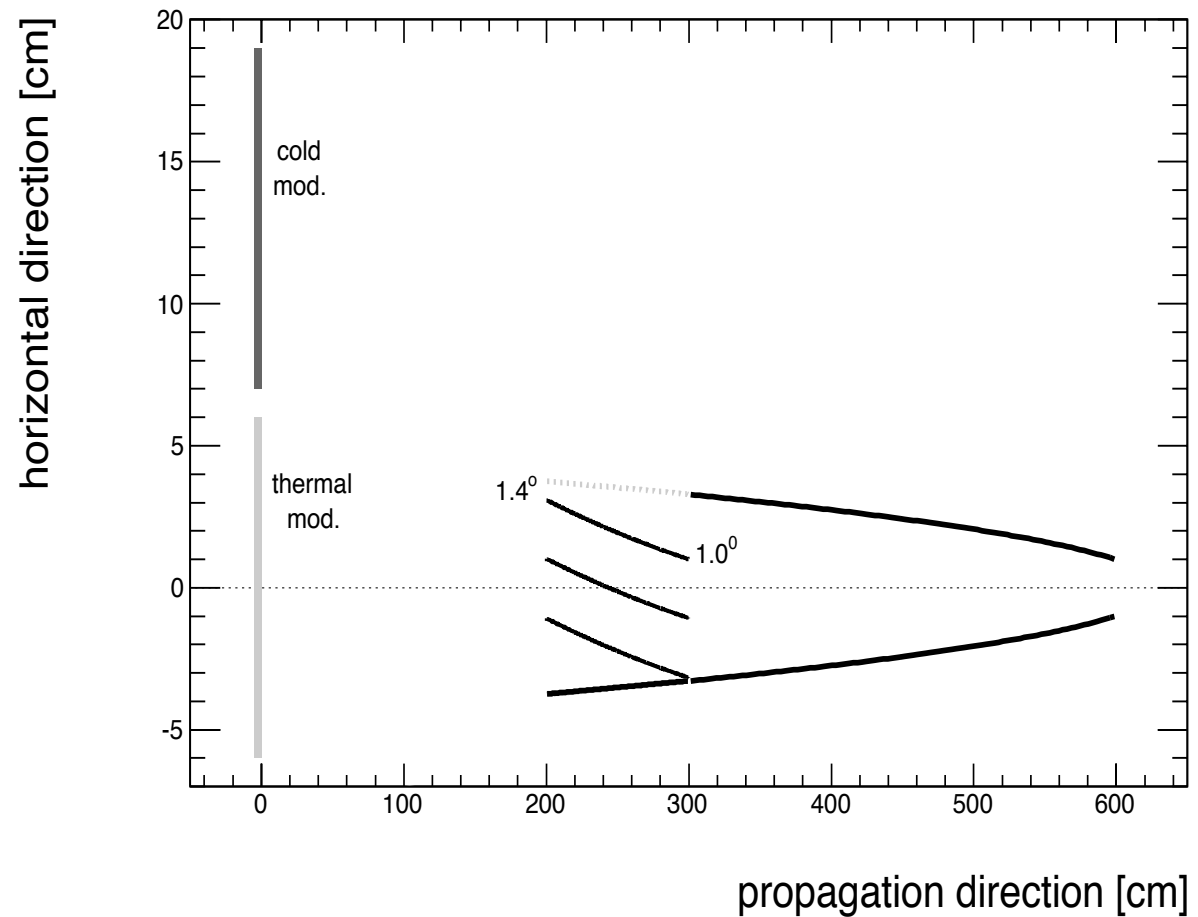


Bunker Area

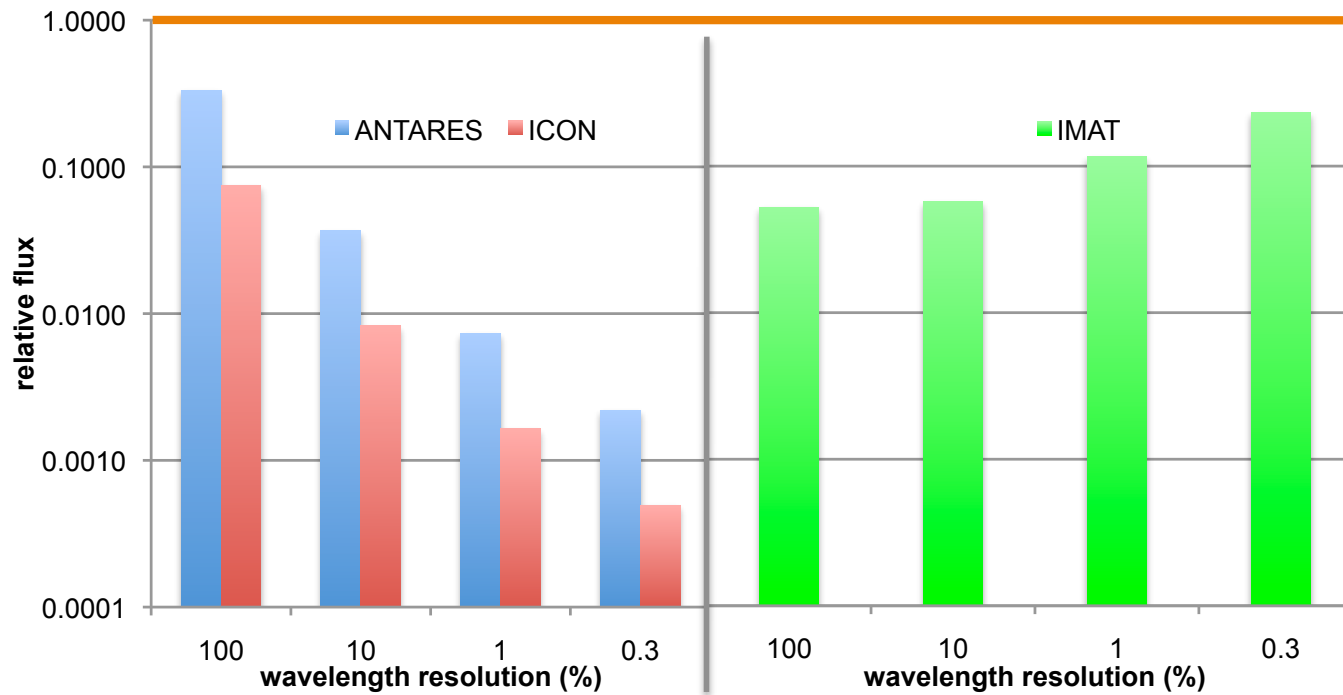


Bi-spectral Extraction System

- Schematic

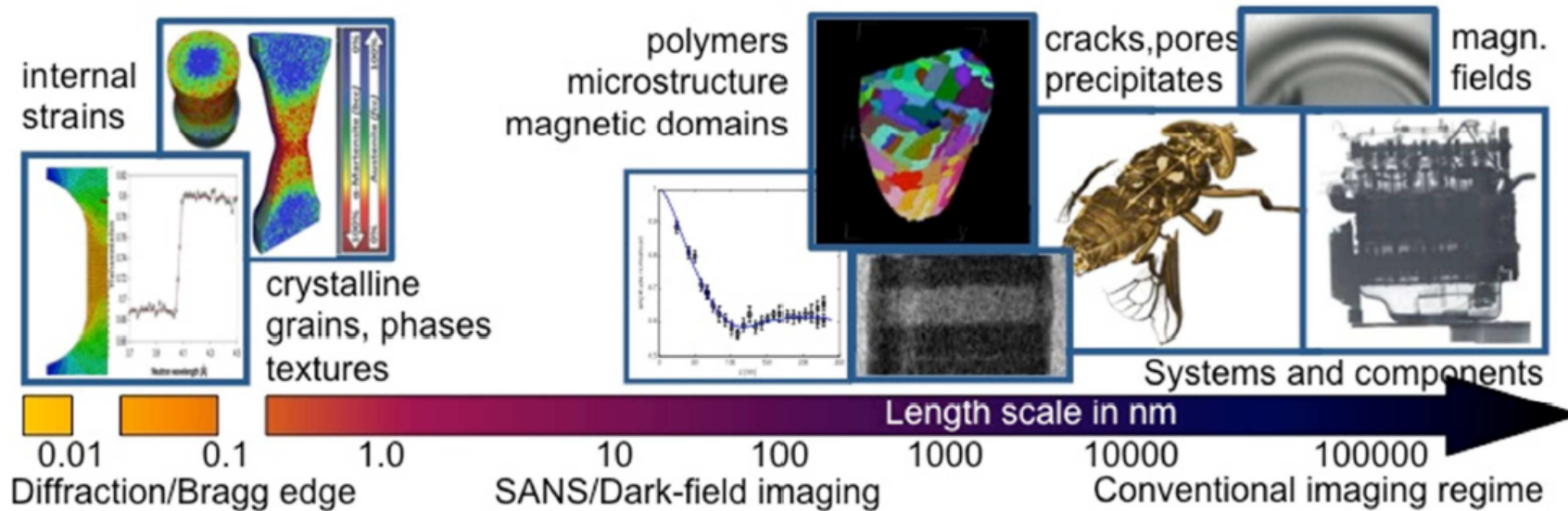


Flux Comparison



Full scope of ODIN

- White beam imaging with best spatial resolution and variable FoV:
- Polarized neutron imaging
- Dark field imaging
- Wavelength resolved Bragg edge imaging



ODIN status update

- PROGRESS since 11/2016 (technical and project)
 - Phase1 completed
 - TG2 on 2/24/2017
 - Design progress (Cave, Control hatch, chopper cascade)
 - ESS work units moved to PSI (ToF detectors) and to TUM (T0-chopper)
 - TG2 passed on 5/31/2017
 - Design progress (Cave, Control hatch, chopper cascade)
 - In kind contract in preparation, discussion ongoing TUM-ESS meeting mid October
 - Technical Annex completed internal and ESS review pending

ODIN status update

■ RISKS

- Scheduling
 - In kind contract
 - Design build contracts for Chopper Cascade (update: Tender in preparation)
 - Contracts for Shielding calculations (update: H1/H2 scenarios pending approval)
 - Personnel hire...
- Budget
 - VAT: up to 960 k€ to be paid in Germany
 - cannot come from ODIN budget w/o affecting its basic scope
- Design
 - FOC 4 issue (smaller disc diameter due to bunker height change)



Thank You!