

# The Common Shielding Project

IKON15

Lund, 12<sup>th</sup> of September 2018

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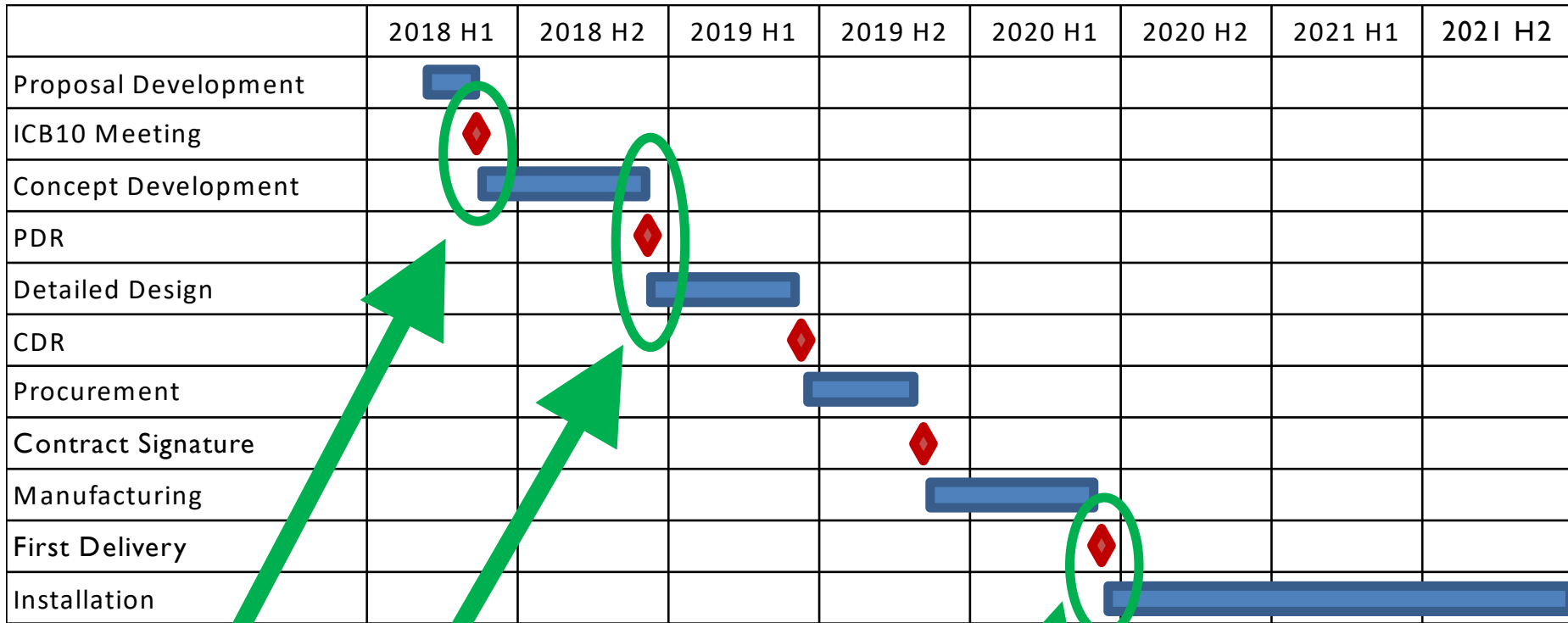
# Shielding costs from scope-setting

Instrument	cave cost	guide shield cost	total shield cost
FREIA	720 k€	1,101 k€	1,821 k€
BEER	658 k€	1,885 k€	2,543 k€
BIFROST	686 k€	1,667 k€	2,353 k€
CSPEC	867 k€	1,344 k€	2,211 k€
DREAM	1000 k€	996 k€	1,996 k€
ODIN	1500 k€	1,887 k€	3,387 k€
SKADI	1000 k€	1,999 k€	2,999 k€
LOKI	1000 k€	730 k€	1,730 k€
MAGIC	457 k€	952 k€	1,409 k€
MIRACLES	1080 k€	1,109 k€	2,189 k€
T-REX	538 k€	1,686 k€	2,224 k€
VESPA	822 k€	2,221 k€	3,043 k€
HEIMDAL	630 k€	2,070 k€	2,700 k€
<b>Total</b>	<b>10,958 k€</b>	<b>19,647 k€</b>	<b>30,605 k€</b>
<b>Average</b>	<b>843 k€</b>	<b>1,511 k€</b>	<b>2,354 k€</b>

# Scope of proposal

- Proposal: guide shielding for long and medium instruments
  - from bunker to cave
  - include shielding around choppers
  - Include all long instruments (West sector)
  - No short instruments: LOKI, FREIA, ESTIA
    - strongly integrated with neighbouring beamlines
  - Include medium instruments: ODIN, DREAM, VESPA, SKADI
- Use engineering resources from bunker team
- Use whatever neutronics resources we can get our hands on
  - Mainly from instruments which have signed up
- 8 instruments signed up:
  - Long instruments: CSPEC, BIFROST, MAGIC, T-REX, HEIMDAL
  - Medium instruments: ODIN, DREAM, VESPA

# Project Timeline



Register interest:  
pay 10 k€ towards concept development

Decision point:  
cost offer made  
commit expenditure from instrument budget

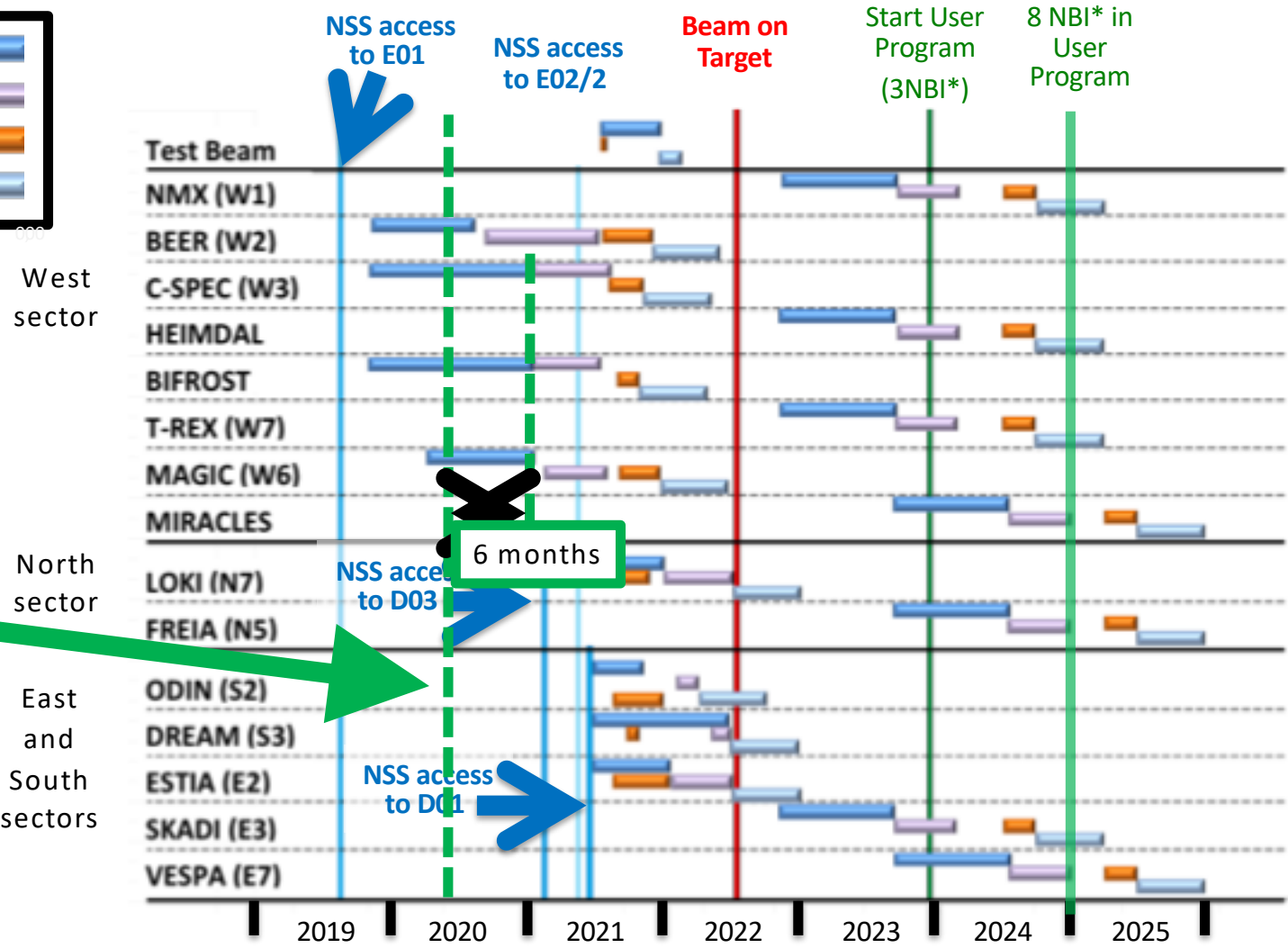
Earliest possible start of installation

# Proposed rebaseline schedule for NBI\* Installation (TG4 → TG5) (V4.-0.4, 12<sup>th</sup> April 2018)



(based on CF building access dates of 12<sup>th</sup> April)

- Cave installation & fitout
- OOB Guides & shielding
- In bunker installation
- Cold commissioning



Ready to start installation of guide shielding

North sector  
East and South sectors

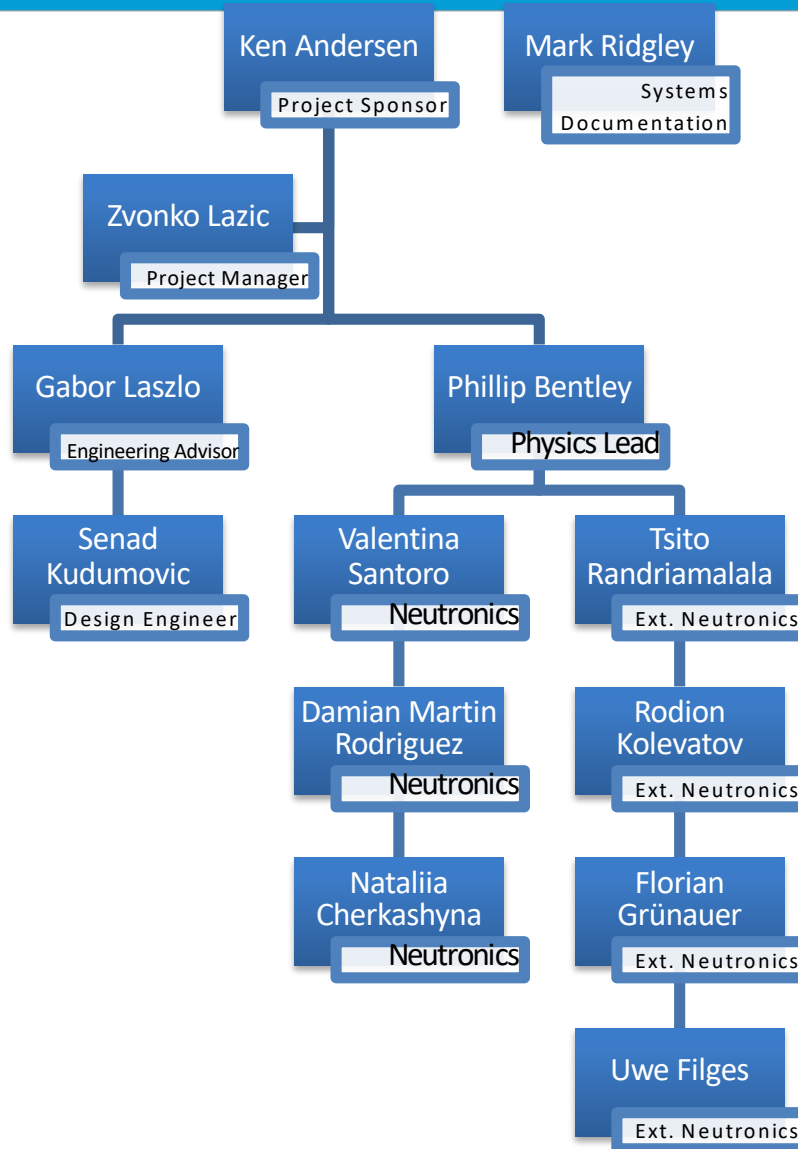
6 months

\* NBI = Neutron Beam Instrument

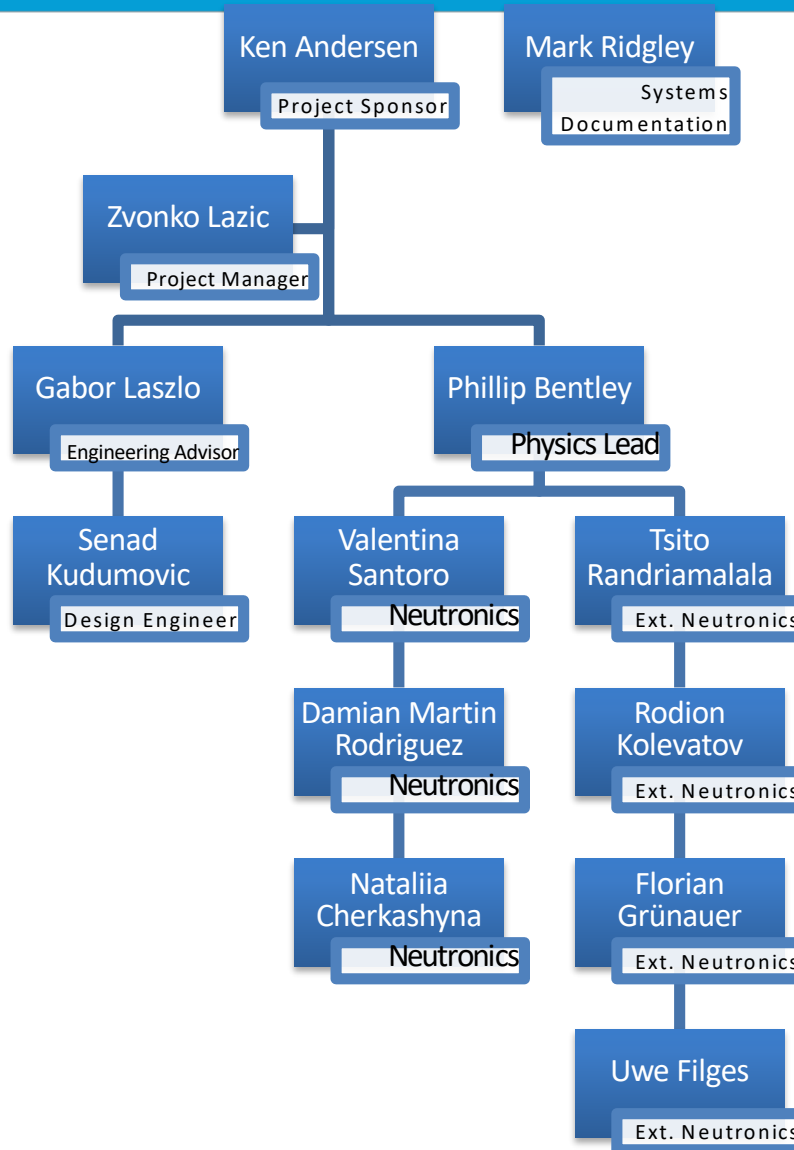
# Project Scope

- PDR deliverables (December 2018)
  - mechanical design completed
    - analysis of different beamline scenarios (straight, curved, high-m)
    - analysis of compatibility with logistics
    - 3D model
    - integration drawing(s)
  - neutronics calculations completed
    - validating and driving mechanical design
    - reports issued
  - hazard analysis done and documented
  - cost estimate for each instrument
  - manufacturing and purchasing strategy agreed
- CDR deliverables (May 2019)
  - mechanical design completed and approved
  - all neutronics work completed
    - design, validation, background
    - all reports completed and approved
  - all systems documentation completed and approved
  - procurement and manufacturing plan prepared and ready for initiation

# Project Organisation



# Project Organisation



**Project Budget: 150k€**

Instrument Contributions  
10k€ each

MAGIC & VESPA













DREAM & T-REX

BIFROST & HEIMDAL

CSPEC & ODIN



# What is happening?

2018	April	May	June	July	August	Sep.	Oct.	Nov.	Dec.
Proposal Development									
ICB10 Meeting									
Sign-up									
Preparation									
Project kick-off									
Engineering design									
Neutronics workshop									
Neutronics start									
Neutronics work									
Design work complete									
Costing & documentation									
Project completion									

# What happened at neutronics workshop

- Presentation of engineering design
- Presentation of neutronics work already done
  - Source terms (Valentina Santoro)
  - PSI: MAGIC, ESTIA, PSI state-of-the-art (Uwe Filges)
  - TUM: ODIN shielding (Florian Grünauer)
  - FZJ: DREAM shielding (Tsito Randriamalala)
  - IFE: BIFROST, prompt-gamma shielding, fast-neutron streaming (Rodion Kolevatov)
- Agreed on work plan
  - Florian, Tsito, Rodion available until December
  - Once engineering concept is ready
- Agreed on working method
  - Weekly (Thursday) meetings
  - Log results, discussions, decisions on Confluence page

# Priorities for Guide Shielding

- 1. Shielding performance
  - Reaching 3  $\mu\text{Sv/hr}$
- 2. Activation
  - Choose standard components, so they count as spare parts, not waste
  - Apply ALARA for decommissioning
  - Maintenance access within 24 hours
- 3. Instrument background
  - Primarily addressed by cave design
  - Long distance (60-170m) also helps
- Expected outcome: cost-effective solution which instruments will choose to sign up to
- Modular design
  - Provide small menu of options: within LOS, outside LOS, chopper pit
  - Vary materials thicknesses as required

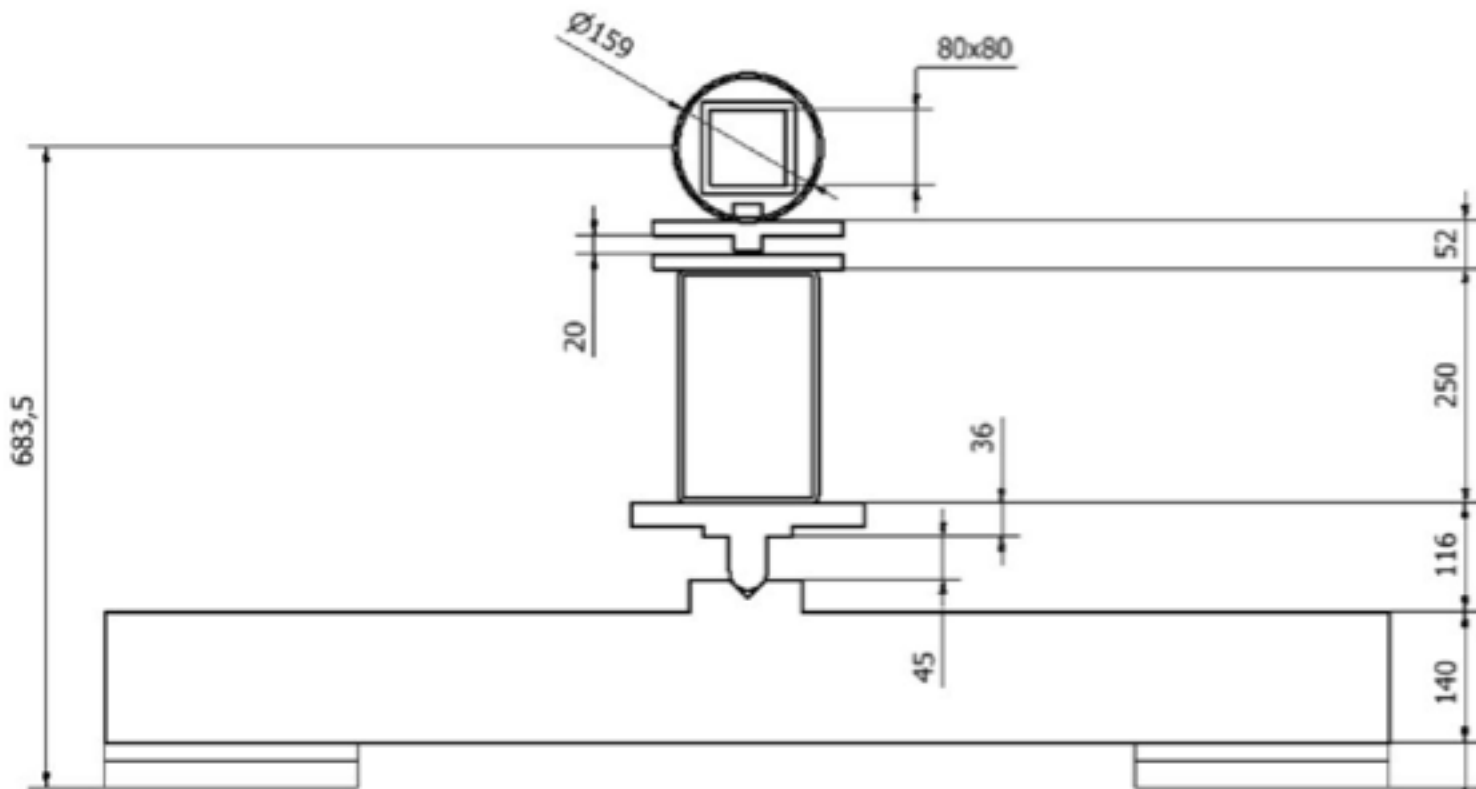
- Guide interface
  - Use 4m sections, prealigned on 4m girders
  - Alignment access only at ends – from sides OK
  - Alignment under supporting 4m girder, using adjustable kinematic mount

# Instrument Information

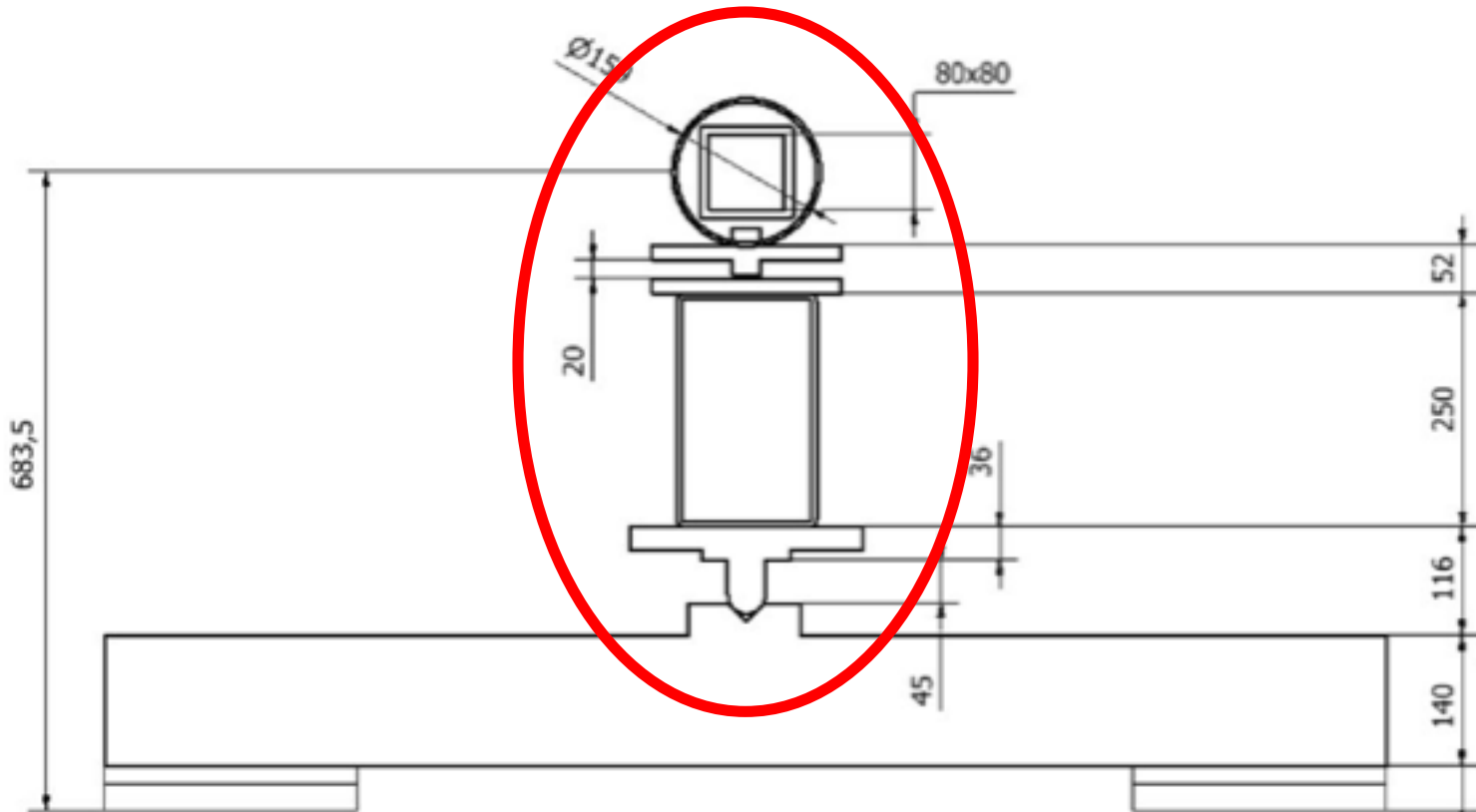
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Use same solution in both E02 and D01/D03



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- All instruments need to provide ray-tracing input files
  - Done!
  - Needed for prompt-gamma calculation
- All instruments need to use neutron-absorbing guide substrates or add absorber around guides
  - Same requirement as in bunker

# Today's Agenda

- 9:00-10:30 Introduction & Overview
  - 9:00 Ken Andersen: Organisation and status of the project
  - 9:30 Senad Kudumovic: Engineering designs
  - 10:00 Michal Kazda: BEER shielding
- 13:30-15:00 Neutronics
  - 13:30 Phil Bentley: Organisation of neutronics work
  - 13:45 Uwe Filges: Overview of inside and outside LOS neutronics
  - 14:00 Tsito Randriamalala: Guides within LOS
  - 14:15 Rodion Kolevatov: Guides outside LOS
  - 14:30 Valentina Santoro: Neutron source terms

Thank you!



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