

TG-2 meeting of Bifrost

Our experiences

Rasmus Toft-Petersen (Lead scientist)

Liam Whitelegg (Lead engineer)

Giuseppe Aprigliano (Lead engineer on NMX)

Technical University of Denmark

Bifrost TG-2 process

- STAP meeting – September '16 ✓
- Scope setting meeting – October '16 ✓

January 17: Lead engineer onboard! 😊😊😊

- TG-2 documentation handed in February '17 ✓
- TG-2 meeting March '17
- Final approval May '17

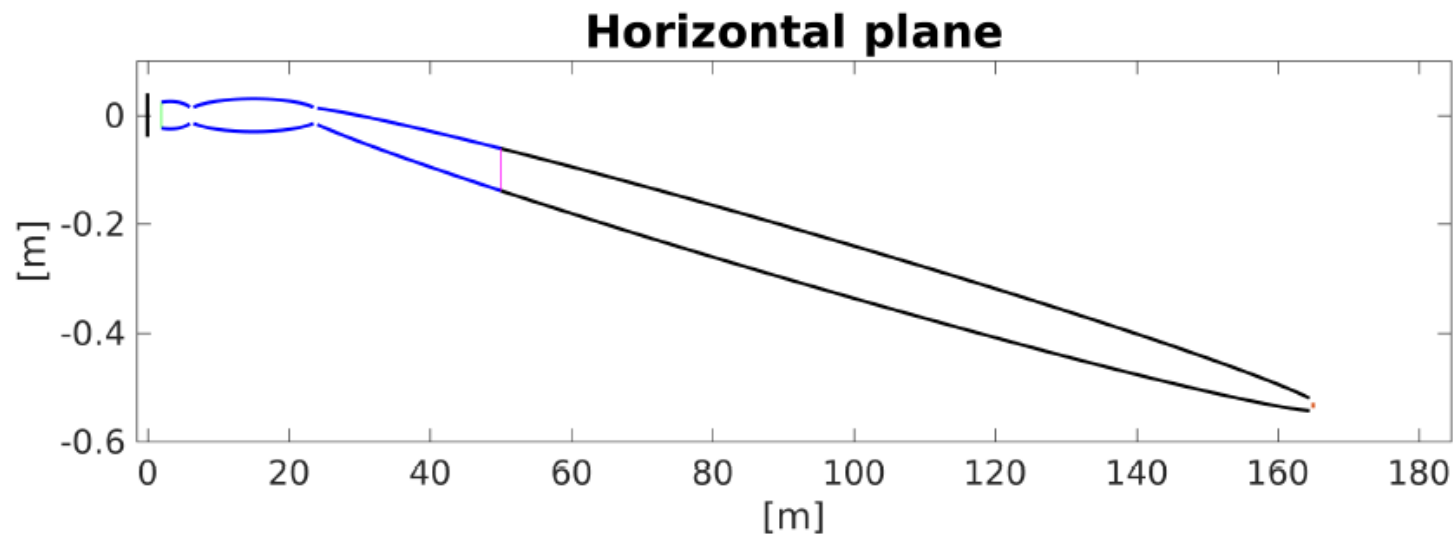


Things discussed

- Last minute change in guide concept – Jonas' work (KU + PSI)
- Shielding design – Rodions work (IFE)
- Chopper design – with focus on glue (LLB)
- Radiation issues & sample handling (DTU)
- Schedule, Risks and Budget (All)
- High level requirements (All)

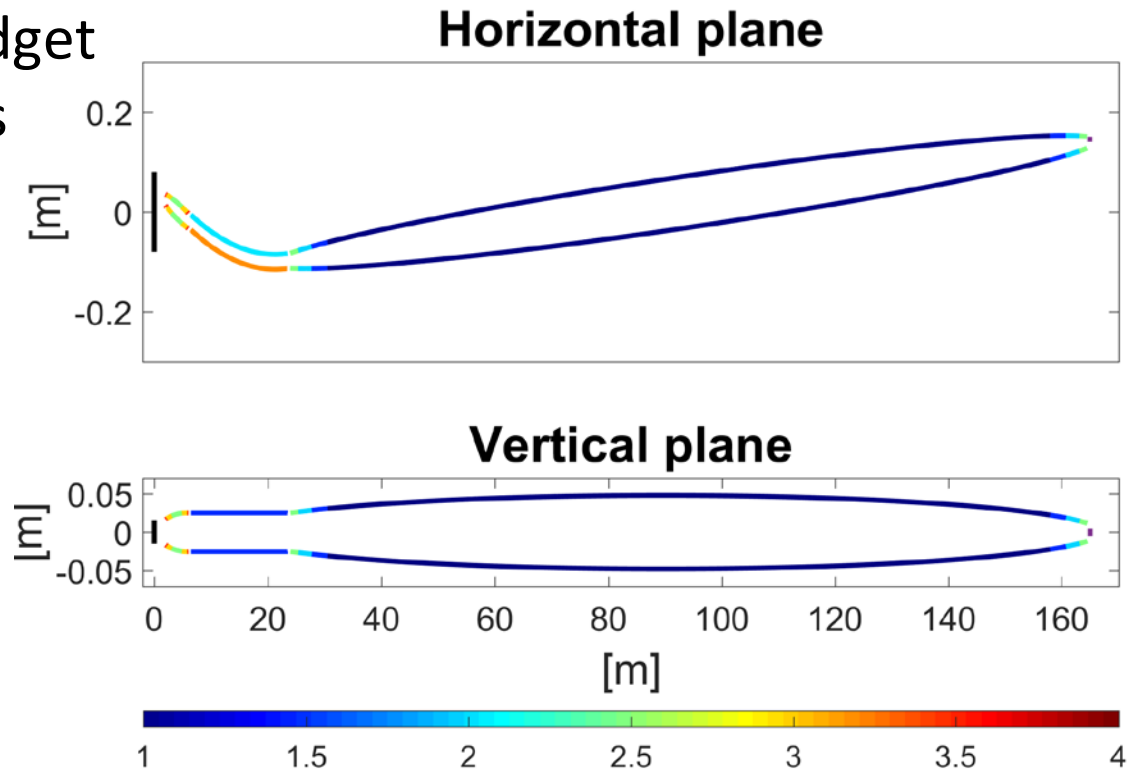
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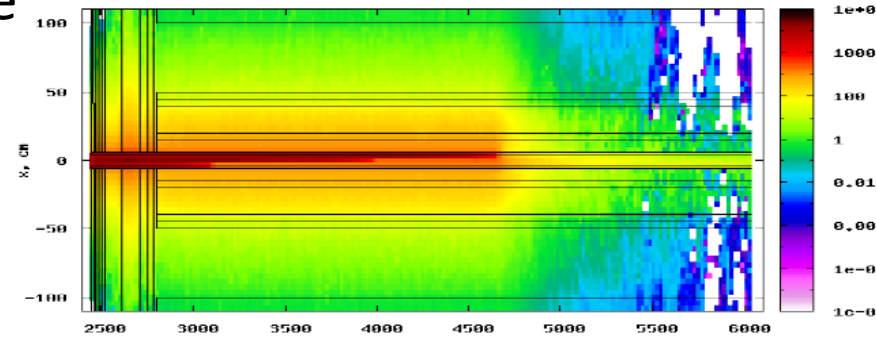
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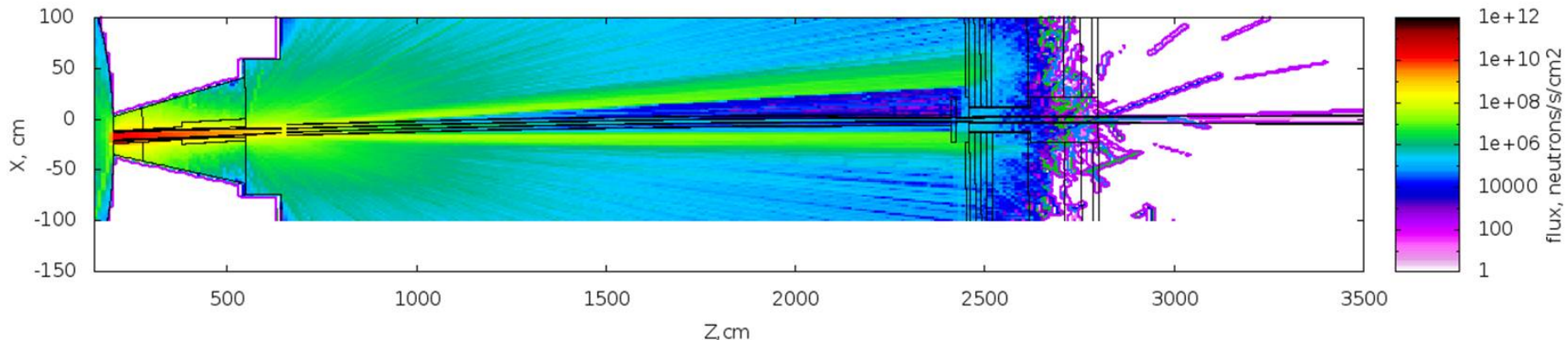


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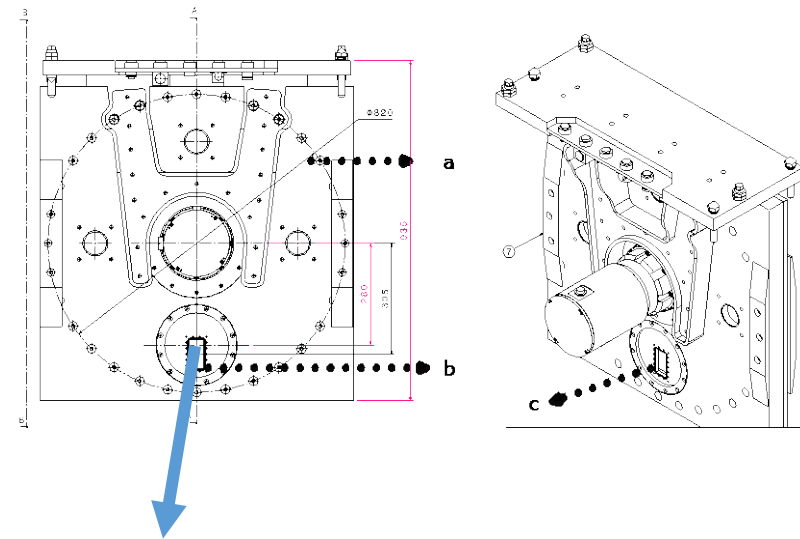
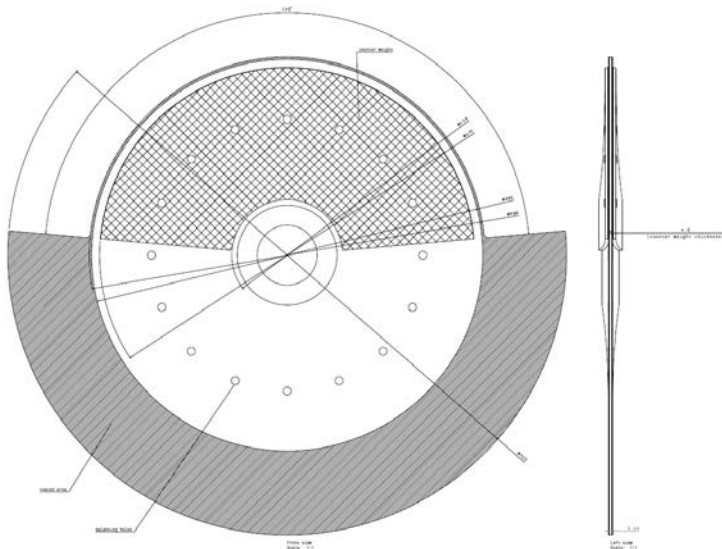


Flux of neutrons above 20MeV; ZX plane cut at guide height, n/cm²/s



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**3600 Gy/h for
6x6 cm²
50 Gy/h for 3x3
cm²**

Gave problem back to the ESS - ✓

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We were asked to examine sample activation issues. And there are issues...

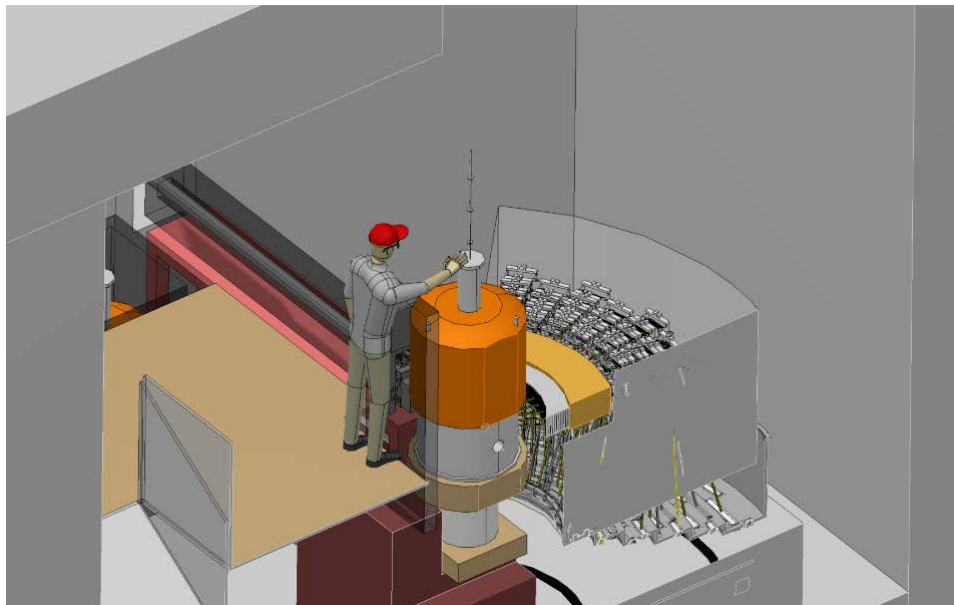
We could end up with up to 10 mSv/h.

ESS radiation protection has been very reasonable, and we are so far able to implement simple precautions.

Element	Lanthanum	Copper	Cobalt	Iridium	Manganese
Dose rate after beam off [mSv/h]	1.6	0.14	10	5	2.7
Dose rate after 1 h [mSv/h]	1.6	0.11	0.25	2.8	2
Dose rate after 24 h [mSv/h]	1.12	0.036	0.063	1.16	0.004
Dose rate after 15 days [mSv/h]	0.003	0	0.063	0.6	0
Close-shutter early strategy?	No	Yes	Yes	No	Yes
End-of-Cycle strategy?	Yes	Yes	Yes	Possibly?	Yes
Special procedure for handling?	No	No	No	Yes	No
Special storage time?	2 weeks	2 days	30 years (a career)	2 years	1 day

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We are already battling with some of these risks.

Schedule is changing, milestones are changing, budget seems ok still.

Risk	Prob.	Effect	Cost		Mitigation	Responsible
			Risk Level			
Shielding cost estimates are exceeded	3	4	12		More contingency moved to DK budget, preliminary quotes	Instrument Team
Increase in shielding requirements	2	3	6		Performing calculations early	Instrument Team
Tank cost estimates are exceeded	2	3	6		Get preliminary quotes	Instrument Team
Detector cost estimates are exceeded	2	3	6		Constant design iterations and quote stages	Instrument Team

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Risk	Schedule				Responsible
	Prob.	Effect	Risk Level	Mitigation	
Delay in Monolith or Bunker delivery	4	3	12	Keep up-to date with NSS schedules	ESS
Late delivery of detectors	3	3	9	Early (ish) procurement	Instrument Team
Delay in PSC or FOC delivery	2	4	8	Prioritise design and procurement	Instrument Team
Changes to integration features i.e. Bunker, Monolith,	2	4	8	Keep up-to date with NSS design changes	ESS
Delay in delivery of key optic components	2	4	8	Early design confirmation and procurement	Instrument Team

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Our requirements were imprecise and a little optimistic.
We fixed that and included the upgrade paths...

Post TG-2 meeting....

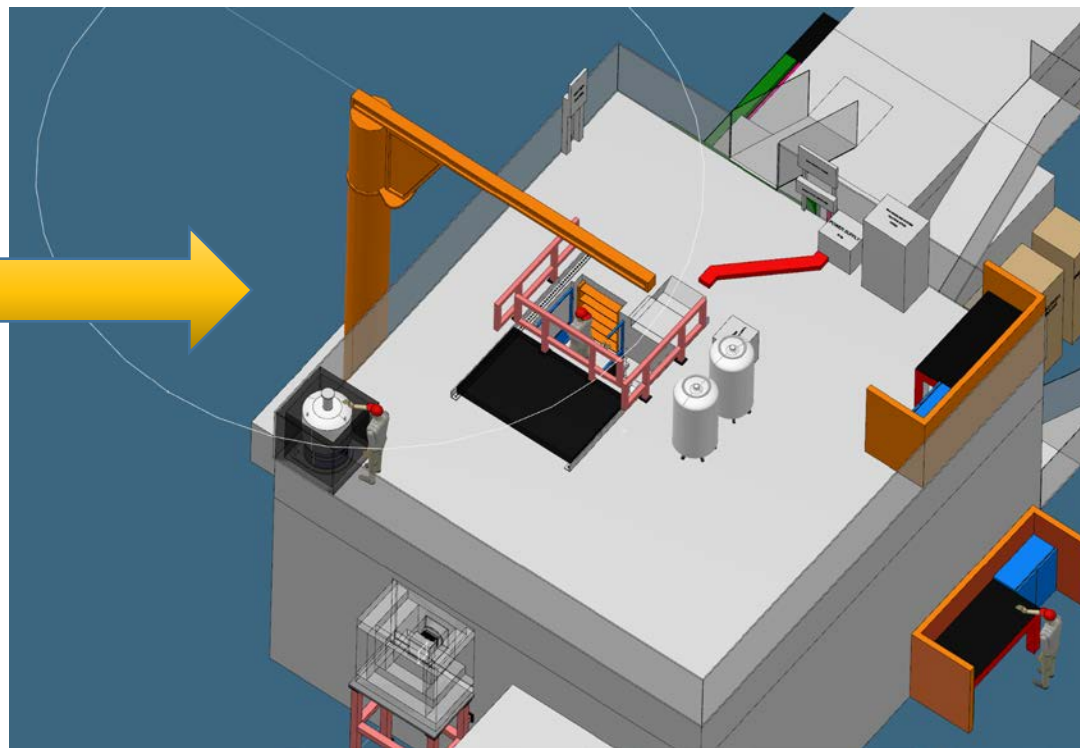
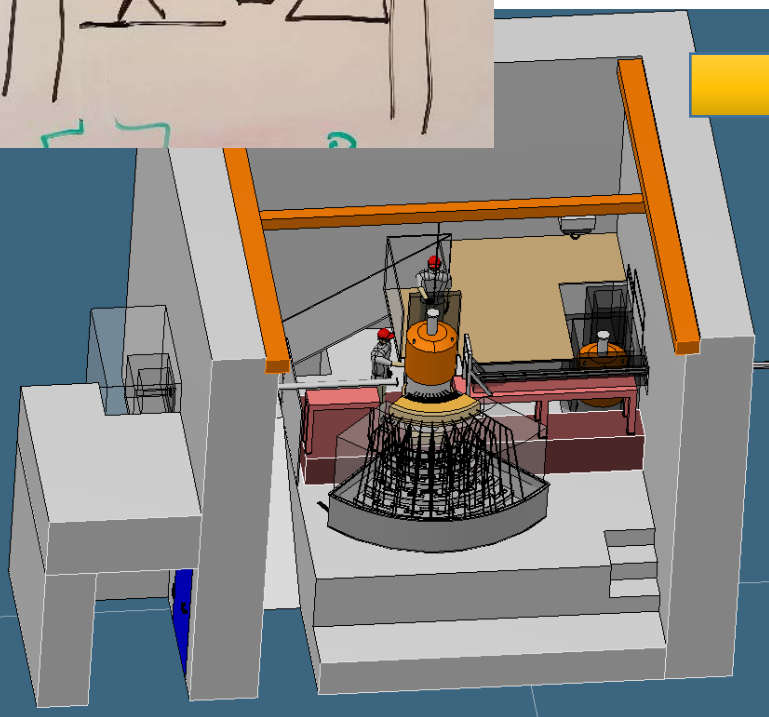
*Computer says yes,
engineer says no*

What we have changed since TG-2:

- Cave design
- Sample access strategy
- Guide substrate (perhaps)
- Detector arrangement
- Filter/collimator design
- Shielding design
- Chopper positions and opening angle



Example



Conclusion

We had a very good meeting, where we were able to align expectations and make our problems known to management.

Documentation requirements too high, the technical details are best discussed with the other teams.

Second opinions are sometimes useful even if you are in a hurry



Conclusion

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Documentation requirements too high, the technical details are best discussed with the other teams

So we look forward to yet another IKON

Second opinions are sometimes useful even if you are in a hurry



Thank you for your attention

Thanks to the large Bifrost team:

Finn Saxild (DTU)
Sylvain Rodrigues (LLB)
Rodion Kolevator (IFE)
Jonas Okkels Birk (KU)
Philippe Bourges (LLB)
Niels Bech Christensen (DTU)
Kim Lefmann (KU)
Henrik Rønnow (EPFL)
Christof Niedermayer (PSI)
Felix Groitl (PSI)
Isabel Llamas (IFE)
Bjørn Hauback (IFE)
Christof Frommen (IFE)
Marko Marton (Wigner)
Keld Theodor (KU)
Liam Whitelegg (DTU)

