

IKON 2018

Shielding - Guidelines and Licensing Process

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European Spallation Source

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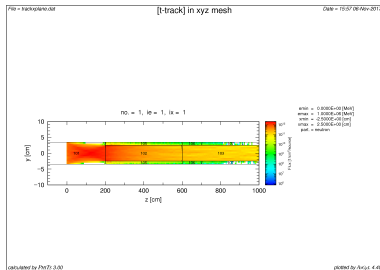
Main Points

- Update
- TG3!? But we just finished TG2...
- Centralisation... Decentralisation... Centralisation...

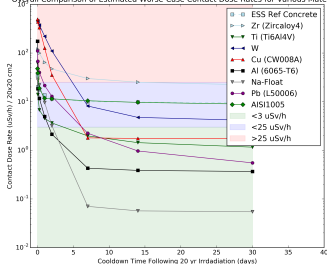
Activation and Materials

Material Activation

- Good understanding of materials in bunker
- Possible to optimise for human access
- No show-stoppers
- Several “forbidden” materials
- Good convergence with regular communication with Radiation Protection group

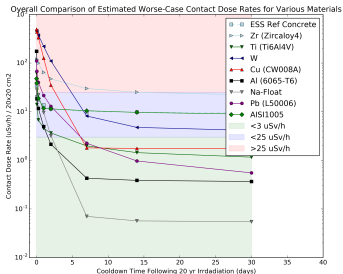
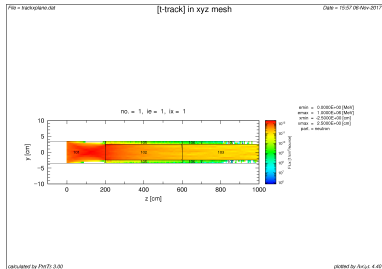


Overall Comparison of Estimated Worst-Case Contact Dose Rates for Various Materials



Material Activation

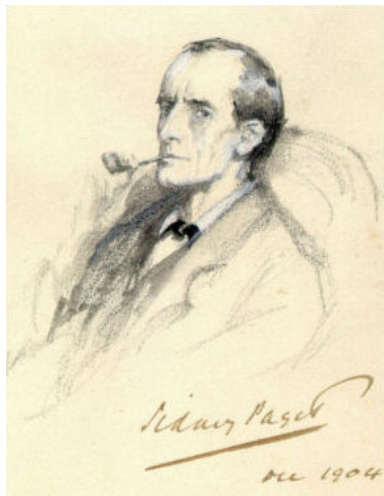
- Confluence page: “allowed materials”
- ESS Document ESS-0185932 for licensing
- Already lots of teams requesting exceptions
- Organisation: who/how; “yes” or “no”; quantity...



Exceptions

"I never make exceptions. An exception disproves the rule."

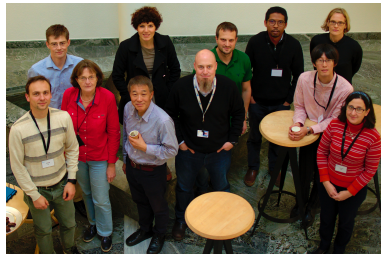
- Sherlock Holmes, The Sign of the Four by A.I.C. Doyle



“...thanks to your lecture, the Git environment in the PHITS team has been improved. Branch structure and the role of branches have been drastically redefined. Everyone in our team can use GUI-based merge now. Thank you so much.”

– T. Ogawa

- *Intensive 2 day course*
- Attended by 9 people



CombLayer Training

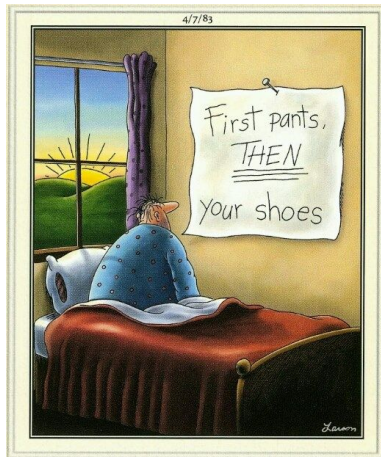
- 5 day course
- Attended by 7 people



- 2 day meeting in October
- Day 1: Engineering
- Day 2: Neutronics
- I felt it was fairly productive

Tollgate 3

- See ESS-0052625
- Documentation can be in two parts
 - Risk assessment (like TG2, if you did it)
 - Calculations / simulations, referencing a commit on nosg-baselines (bitbucket)



Example H1/H2 Scenarios

■ H1

- Full, white beam with component closed (slit, chopper)
- Full, white beam on worst sample (many have done this already)
- Full, white beam on beamstop

■ H2

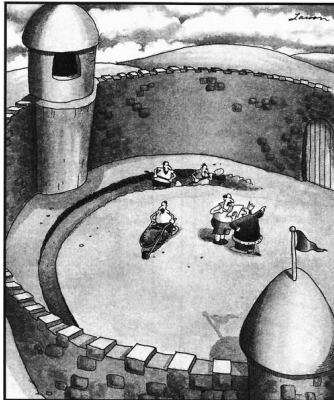
- Misaligned sample environment
- Sheet of cadmium at sample position

Shielding Calculations

- Must also comply with ESS-0019931
 - Hand calculations – $3\times$ safety margin
 - CombLayer, MCNP, FLUKA, MARS, PHITS – $2\times$ safety margin
 - Cinder, dchain for activation
 - We might (=probably will) audit your code/input
 - Recommend hand calcs, one code, cross check agreement

- H1/H2 Risk Assessment
 - ODIN has approved risk assessment
 - CSPEC and NMX are under review
 - Recommend using one of those as a template :)
- Calculations
 - Nothing submitted so far
 - What we see from Rodion & Tsito is good work, on the right track

Acceptance Testing



Suddenly, a heated exchange took place between the king and the moat contractor.

NOSG Handbook anticipates the following:

1 Optical Testing

- 1 Reflectivity measurements on a subset of mirrors during manufacture, in partnership with guide vendors, by NOSG staff
- 2 ~~Photon characterisation of mirror surfaces to measure mechanical precision on arrival at ESS~~
- 3 Characterisation of entrance plane of optical components to validate resistance to possible radiation damage, absorber frames.
- 4 Laser Induced Breakdown Spectroscopy on samples of mirror substrate to verify chemical composition, to assure lifetime under radiation load and activation.
- 5 X-Ray fluorescence on samples of mirror substrates to verify chemical composition, to assure lifetime under radiation load and activation.

NOSG Handbook anticipates the following:

- Shielding and Materials Testing
 - 1 Laser Induced Breakdown Spectroscopy on materials to verify chemical composition
 - 2 X-Ray fluorescence on materials to verify chemical composition (there's a typo in the Handbook that repeats a point above)
- These affect activation, waste, radiochemistry, performance and safety.

Is it important?

- If you fail on *optics* your performance may be degraded
- If you fail on *materials*
 - You will not be able to install the equipment — it would break licensing conditions / agreed waste etc.
 - Your equipment will probably be sent back.
 - This will be expensive

Centralisation

Centralisation

- At ICB last year, proposal to re-centralise shielding
- ESS would
 - 1 Provide cave options (cheapest or reasonably low background)
 - 2 Provide standard, parametric guide shielding concept for all beams, both straight and curved
 - 3 Fund this from participating instrument shielding budgets
- ESS would *not*
 - 1 Reinvent the wheel. Much (but not all) existing work would merge

- LOKI & FREIA define short LSS standards
- - 1 Provide cave options (cheapest or reasonably low background)
 - 2 Provide standard, parametric guide shielding concept for all beams, both straight and curved
 - 3 Fund this from participating instrument shielding budgets
- ESS would *not*
 - 1 Reinvent the wheel. Much existing work would merge

- RAL (LOKI & FREIA) define short LSS standards
- Rodion & Tsito would continue working with us
- Engineering would be done in-house
- Participating beams would get off-the-shelf solutions
- Pricing etc needs to be worked out

Thank You

Thank you for your attention