Neutronics – dilatation joint

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Introduction

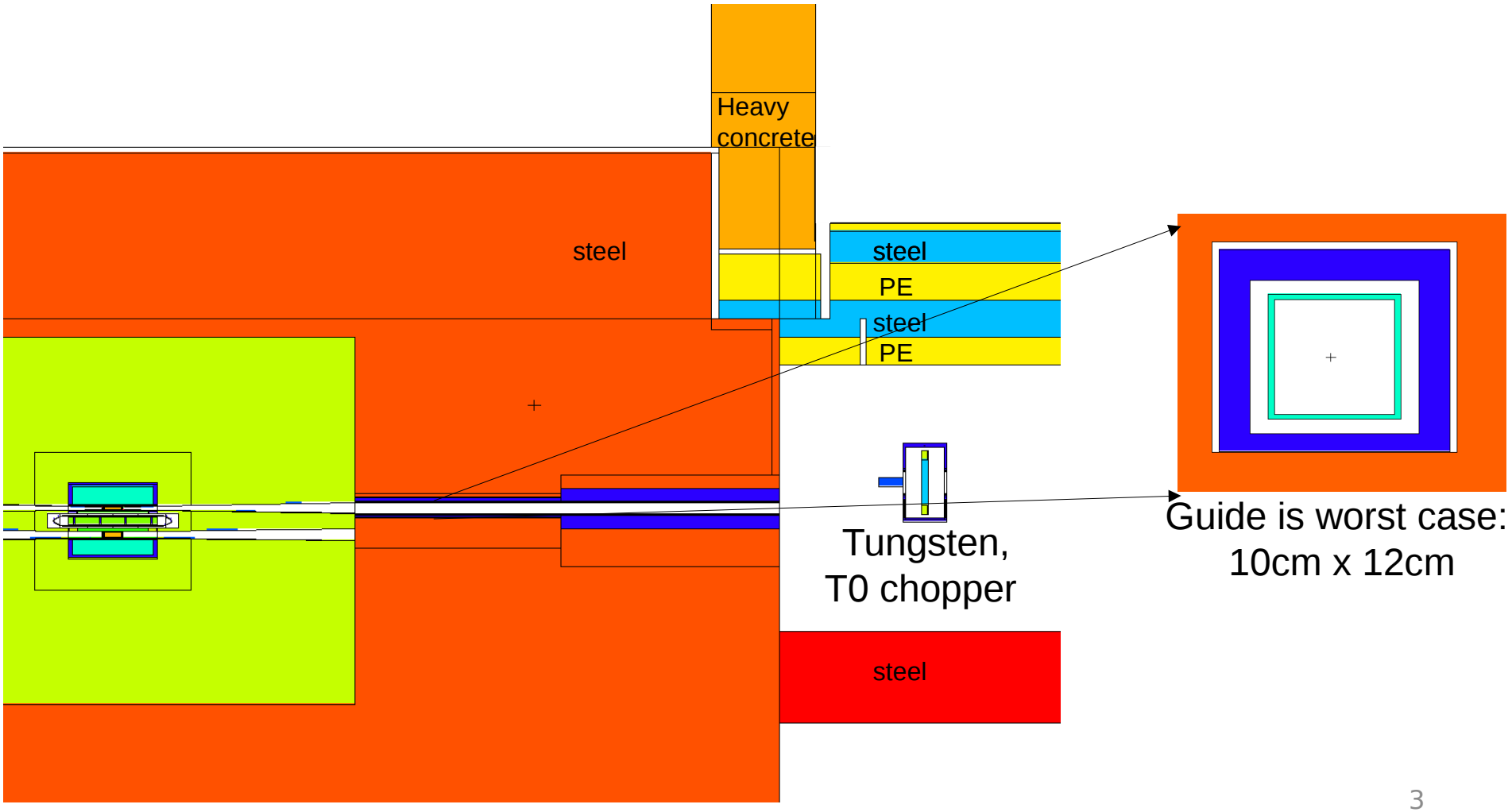
Concern: Earthquake gaps facilitate neutron streaming – in particular when taking into account T0 chopper, acting as a secondary target.

Strategy:

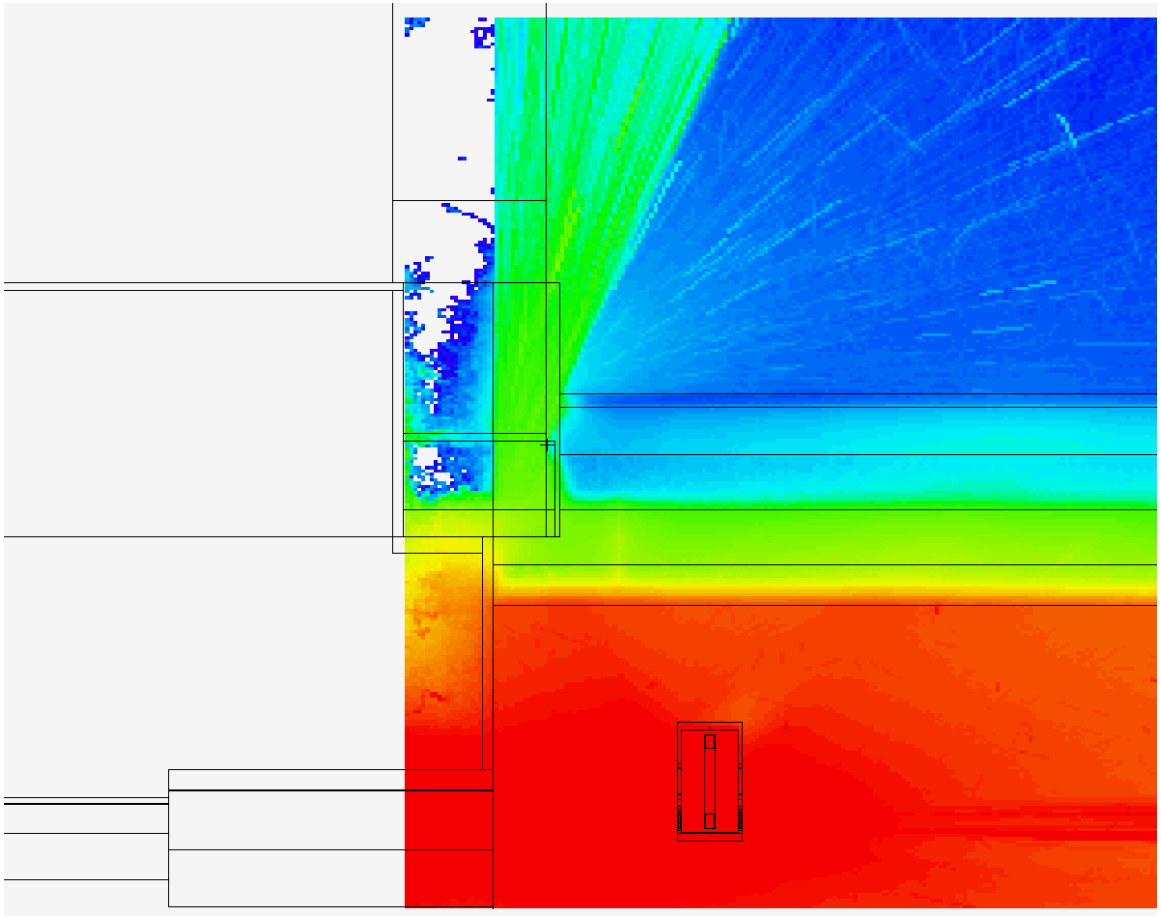
1) Consider the worst possible scattering instrument: *10cm x 12cm* straight guide insert.
To increase simulation efficiency, precise estimates are obtained using a dedicated neutron source at 2m (ESS-0118440)

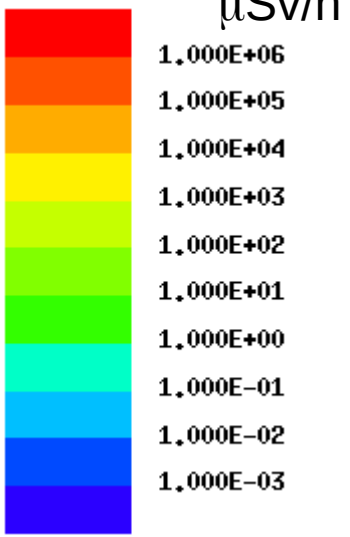
2) In addition, contributions from bulk penetration of monolith are considered using the baseline proton source

Geometry


Heavy concrete
steel
steel
PE
steel
PE
steel
Tungsten,
T0 chopper
Guide is worst case:
10cm x 12cm

1) Streaming



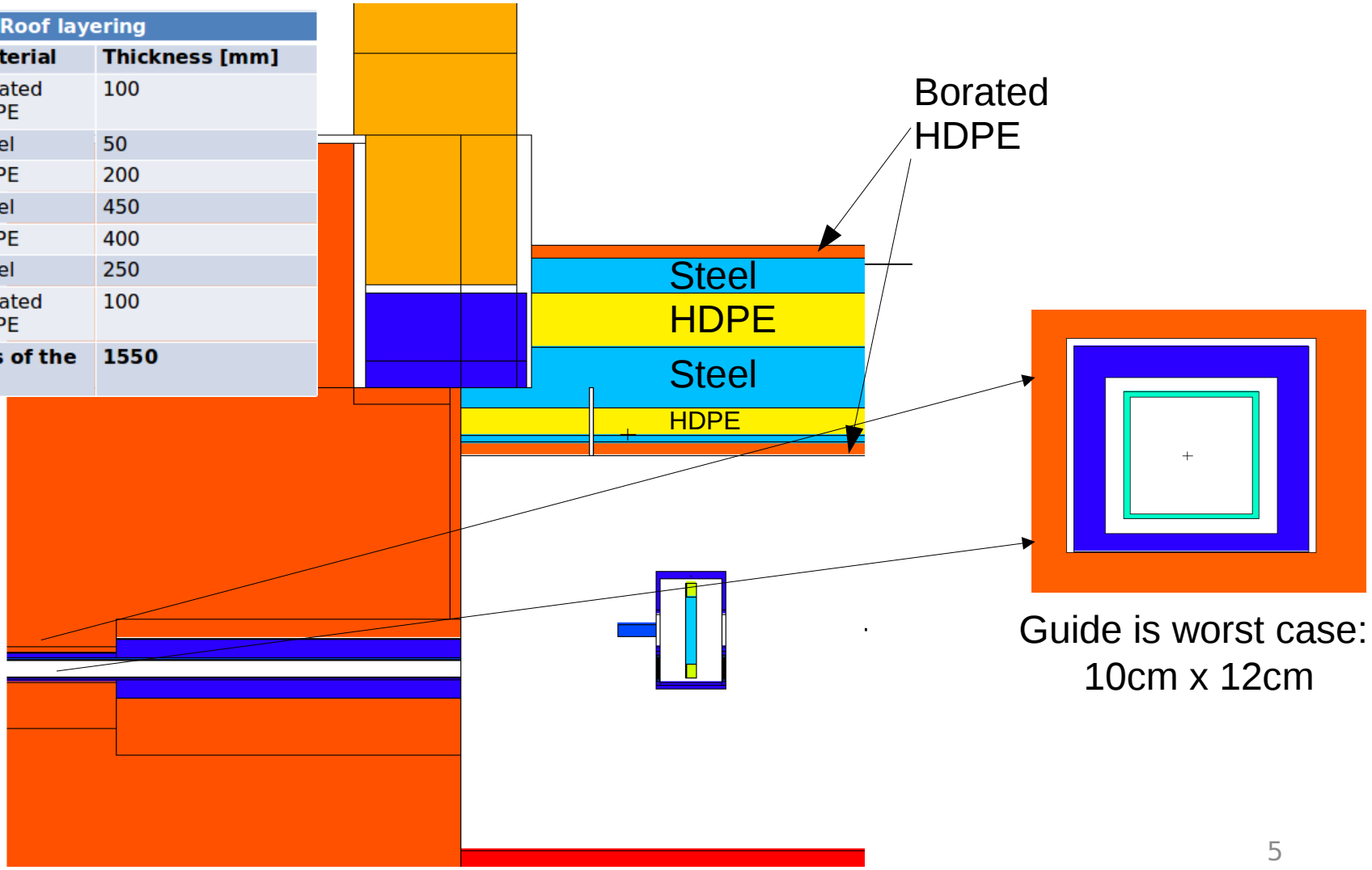


y bin: 0cm

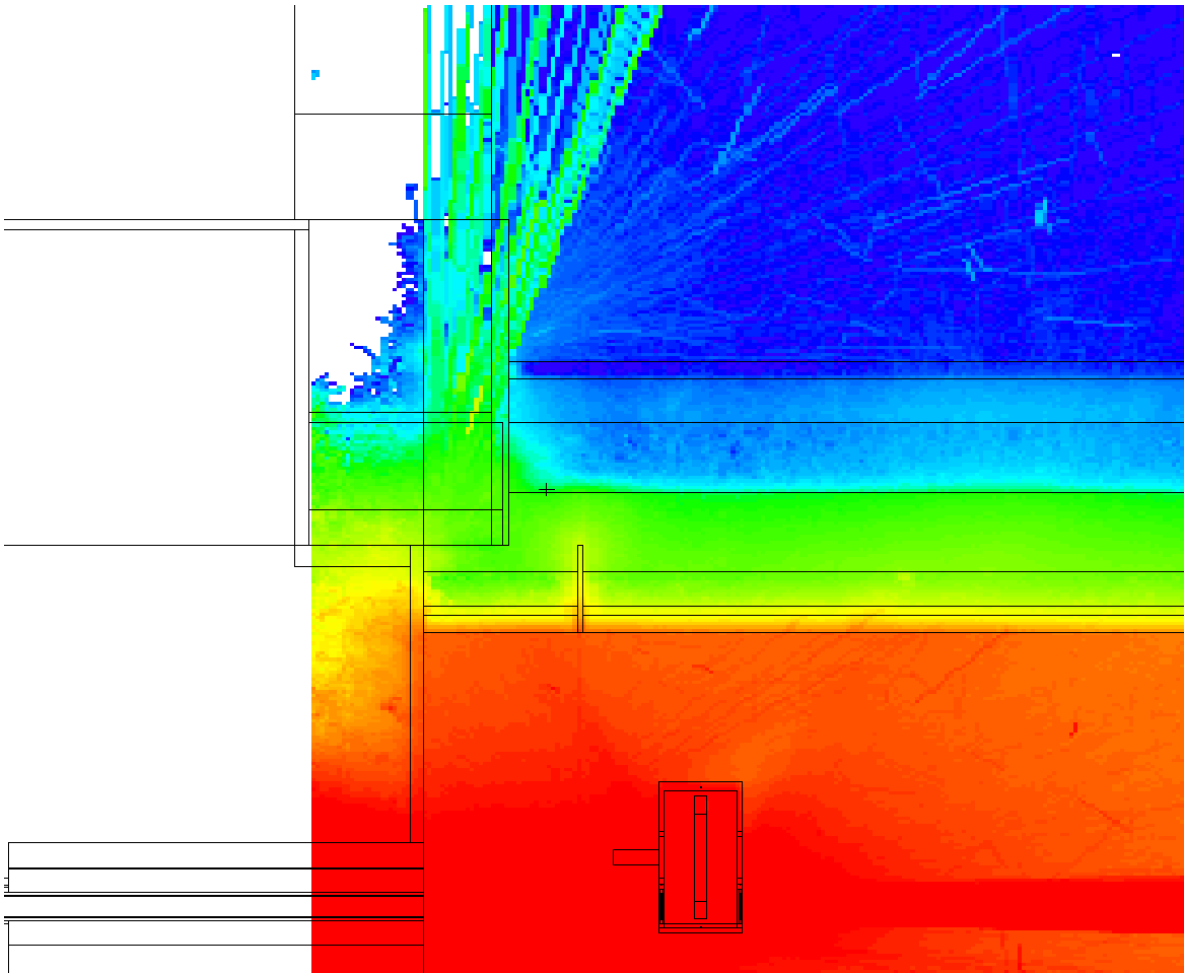
Streaming through dilatation joint: ~10μSv/h, oriented upward. Note, the region on top of the bunker is fenced and re-classified to red zone - see Günter's talk

Geometry - updated

Roof layering		
Layer no.	**Material**	**Thickness [mm]**
1	Borated HDPE	100
2	Steel	50
3	HDPE	200
4	Steel	450
5	HDPE	400
6	Steel	250
7	Borated HDPE	100
Total thickness of the roof		**1550**



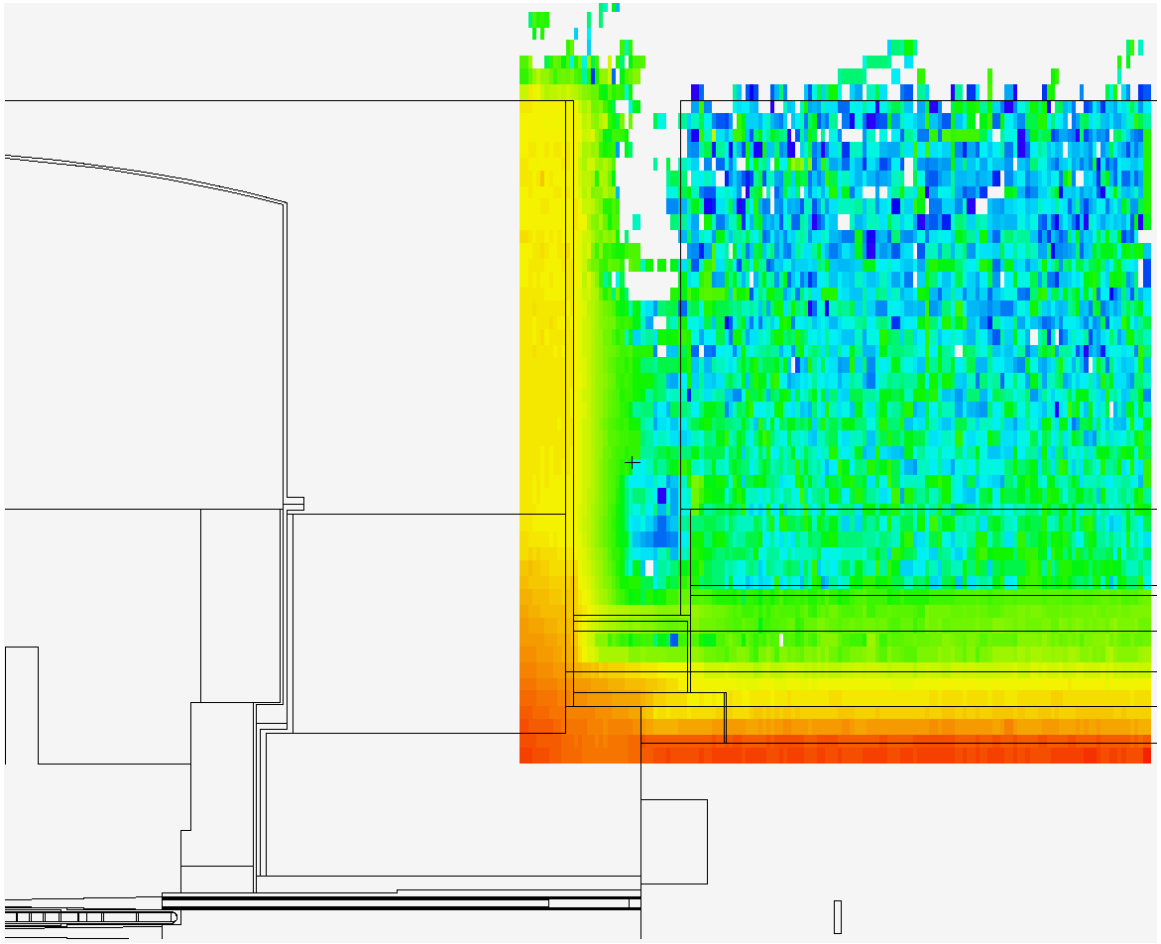
1) Streaming

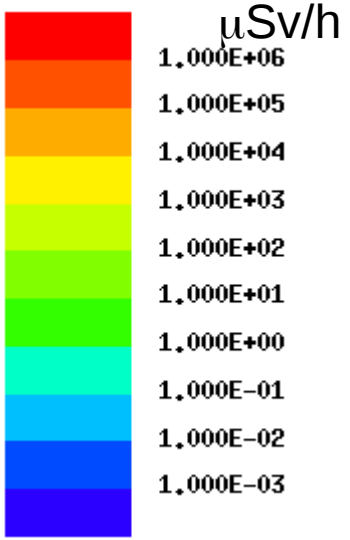


y bin: -5cm

Streaming through dilatation joint: ~10μSv/h, oriented upward. Note, the region on top of the bunker is fenced and re-classified to red zone - see Günter's talk

2) Bulk penetration





Bulk contribution in the 1μSv/h range

Conclusions

- Geometry implementation error found in last minut – does not significantly change results. Miscommunication – apologies!

- Streaming through dilatation joint: ~10μSv/h, oriented upward.
- Not problematic, since the region on top of the bunker is fenced and re-classified to red zone, as explained by Günter

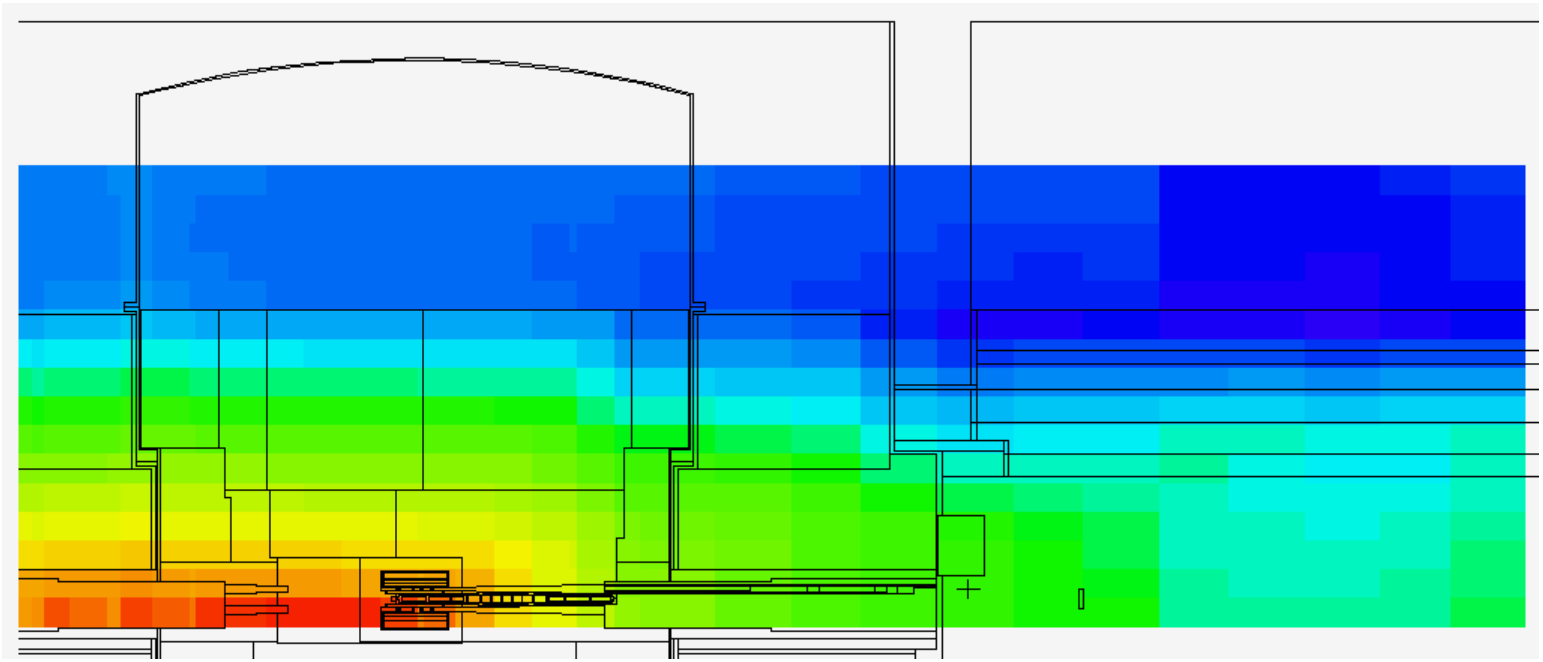
- The bunker roof is thick enough to shield against T0 acting as secondary source. Holes/cavities in the roof are not considered here (see Stuart's talk)

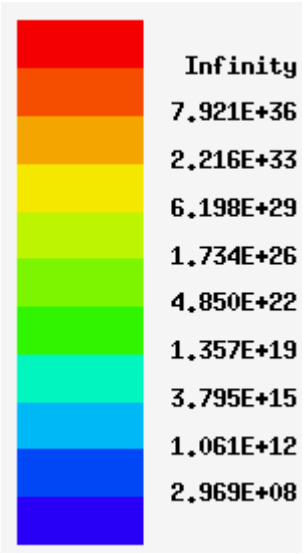
- Bulk contribution at the curtain-bunker-roof interface region constitute ~1μSv/h
- Not problematic – there is 1m concrete toward High Bay (superwised area)

- Results summarized in ESS-0193677 – will be updated ~tomorrow

Backup

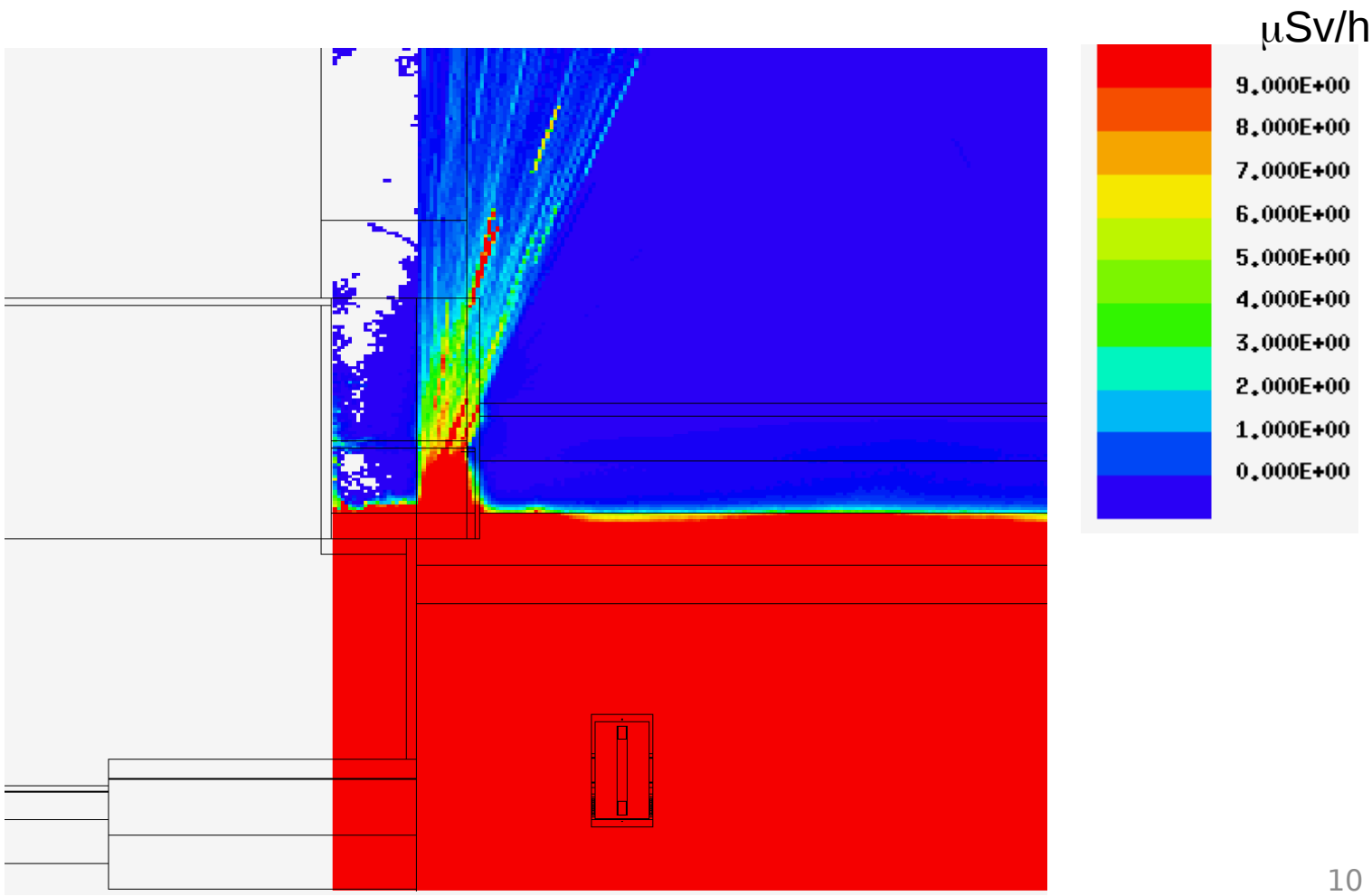
Weight windows





Backup

1) Streaming (neutron source) – alternative dose-rate scale



Backup

2) Bulk penetration (proton source) – alternative dose-rate scale