

The Bunker : Going from 5.5m to $1\mu\text{Sv}/\text{hour}$

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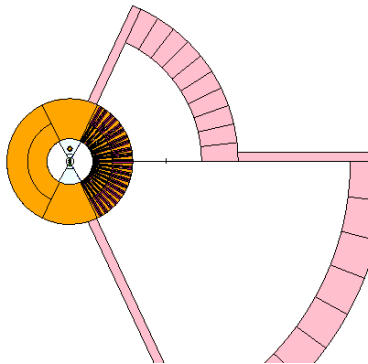
European Spallation Source, Lund, Sweden.

September 14, 2016

We start with 10^{16} neutrons per second $>1\text{MeV}$.

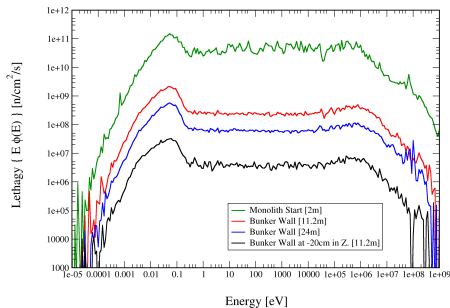
Interested in:

- Dose at outside a wall (<100 n/sec/cm²)
- Signal to noise ratio (S/N) (≈ 1 n/sec/cm²)
- Elastic interactions require ~ 100 collision to get to 1eV
- Ports provide significant channels of low collision number neutrons



- Bunker is a huge open void
- Non-directed neutrons become lost in the huge surface area of the bunker
- Ideally every neutron has one scatter within the bunker
- If instruments don't follow this idea – everyone pays

Empty Bunker Lethagy



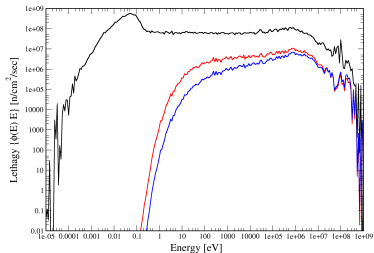
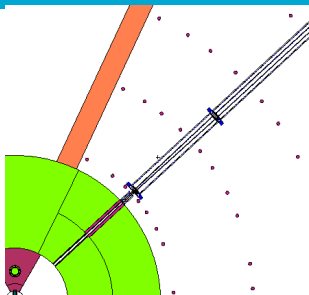
Green : At monolith exit

Red : Centre short sector

Blue : Centre long sector

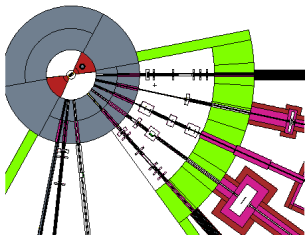
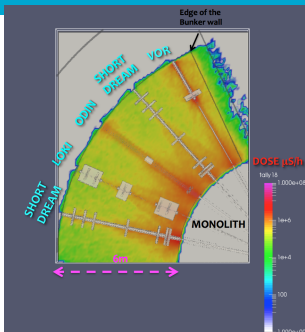
Black : 20cm off Z axis (Short)

Off axis is the most significant modifier in an empty bunker as it makes use of the monolith



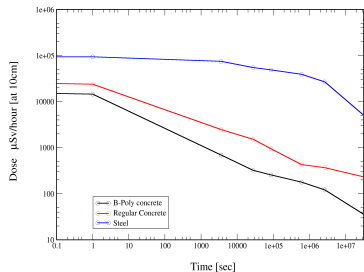
- Focused guide (to a pin holes) and Bender to a scrapper produce the similar effect.

Filled Bunker

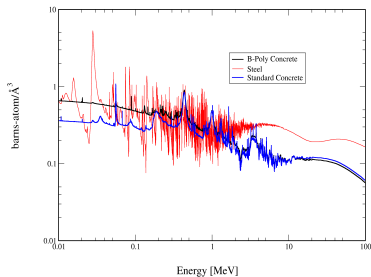


- Despite the open bunker – interference is weak after 9m
- Cross talk can be further suppressed by steel strips at beam high

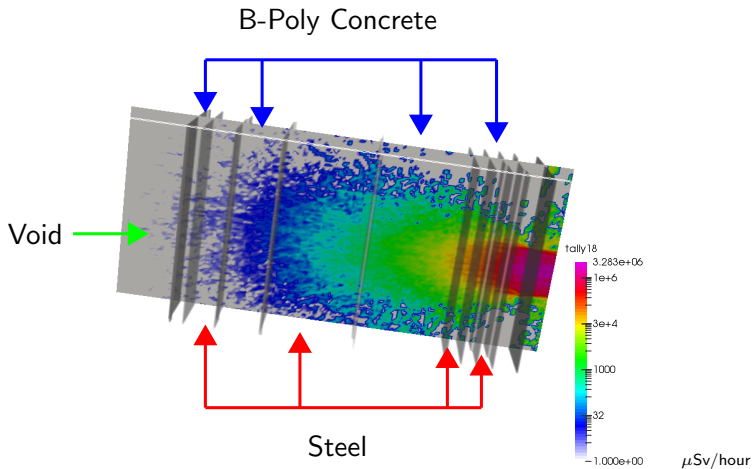
Bunker Wall Layout



- Complementary combination of *B-Poly Concrete* and steel.
- Gain in the intermediate energies
- Less activation

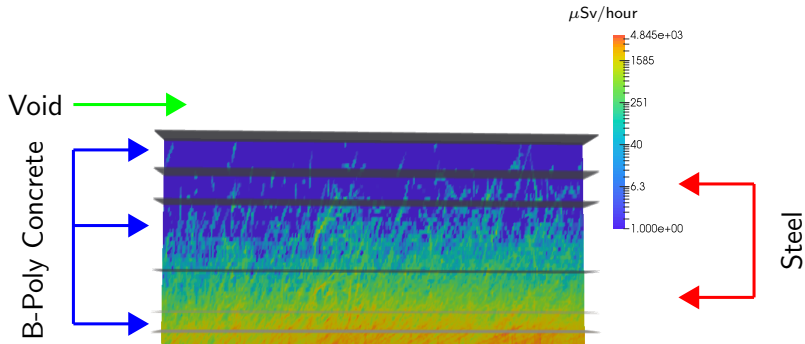


Bunker Wall Dose



Alternating B-Poly-Concrete and Steel.

Bunker Roof Dose



- Classic 5-layer design
- Beamline is metal guide focussed to a point

- Bunker is has sufficient shielding to allow **ANY** in beamline object.
- Instrument teams should only worry about their own exits
- The less your can put close to your guide would better [first approximation].