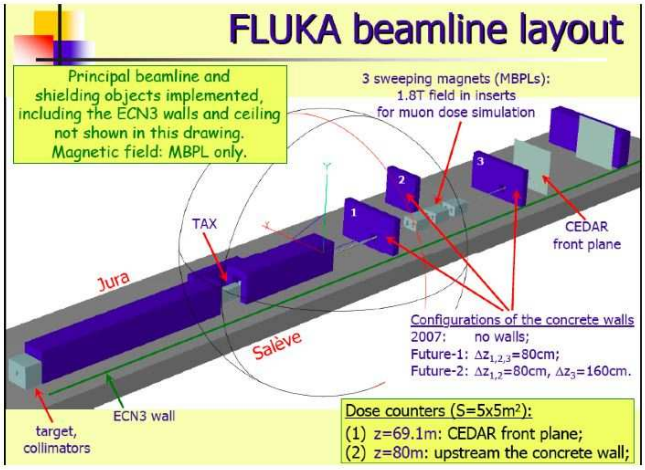
IT Services

Case Study

BlueBEAR provides a substantial computing resource that properly supports the research work of research staff and students at Birmingham. It provides a cost effective facility that optimises the effectiveness of research and ensures the University continues to be a world-class academic learning and research environment.

Simulation of High-radiation environment in the high-energy particle experiment NA62 at CERN



Challenges

The NA62 experiment at CERN will investigate rare decays of particles containing the strange quark, to test the Standard Model of particle physics at extreme precision and investigate the existence of new phenomena and yet undiscovered particles.

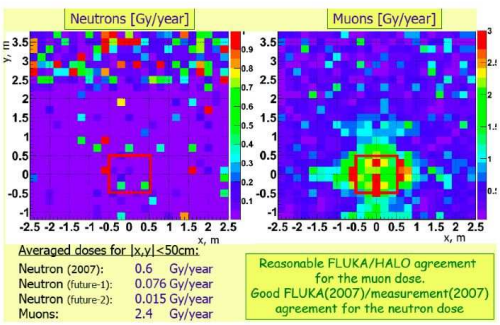
Being able to predict the level of radiation around the future beam line of the experiment is crucial to design the detectors and their readout electronics. In particular, trigger and readout electronics are very sensitive to the radiation level, and only very special components are able to survive in a high-radiation environment.

Solution

To fully assess the level of radiation around the future beam line, we accomplished realistic simulation of the radiation level in the NA62 underground experimental hall.
The simulation included particle production by the primary proton beam, and the principal elements of the beam line including the envisaged radiation shielding. Special attention has been paid to propagation of the slow neutrons, which are produced in large quantities and have a large penetrative power. We have simulated about 10 million proton collisions on a Beryllium target, and the neutrons and muons produced in the collisions have been propagated through the collimators, shielding and magnets constituting the beam line, up to the detector region.

Results

We were able to reproduce the results obtained previously with a different simulation and to reproduce the measurements taken in 2007, both relative to the old beam line. Therefore we are confident that we are now able to simulate the radiation environment of the new beam line, and so to design detector and electronics accordingly.



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Product Used
FLUKA package

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