Design of the beam dump for HADES at SIS100

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HADES at SIS100 will be placed in front of the CBM experiment as sketched in Figure 1. The beam can be focused either on the target of HADES (left setup), or on the CBM target (right setup). The possibility to run the HADES experiment with the CBM experiment in place was studied using FLUKA [1, 2].

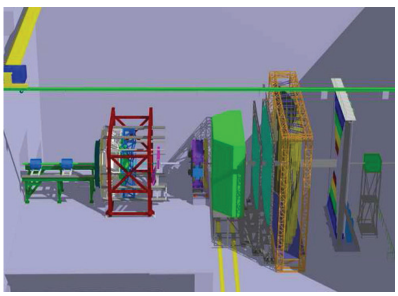

Figure 1: HADES (left setup) and CBM (right setup) experiments.

If the beam is focused on the HADES target, the beam size in the CBM Silicon Tracking Stations (STS) will be larger as a CBM beam pipe. FLUKA calculations have been performed to study the non-ionizing energy loss (NIEL) in the CBM cave for different scenarios. Figure 2 (left) illustrates the NIEL in the CBM cave for Ni+Ni collisions at 8 GeV/u with an intensity 10^7 ions per second at the HADES target. For comparison, in Figure 2 (right) the NIEL distribution during a CBM run of Au+Au collisions at 10 GeV/u with an intensity 10^7 ions per second is shown.

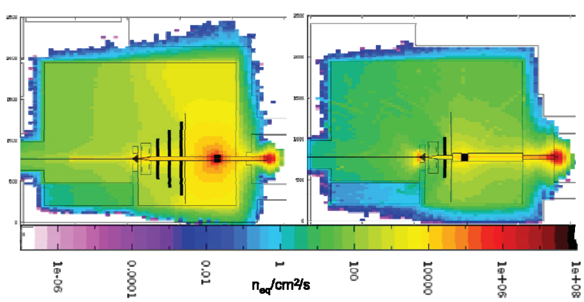

Figure 2: NIEL distributions in the CBM cave during the HADES experiment Ni+Ni at 8 GeV/u with an intensity 10^7 ions per second (left), and during the CBM run Au+Au at 10 GeV/u with an intensity 10^7 ions per second (right).

In order to protect CBM experiment during runs with HADES, a beam dump will be placed in front of the CBM magnet. In a first step, the thickness of an iron beam dump was determined with FLUKA. It was found, that a thickness of 1.5 m iron is sufficient to fully stop the beam. However, the radiation level outside the iron is too high (see Fig. 3 left). In order to reduce this radiation an additional concrete shielding was studied. It turns out, that the radiation level can be drastically reduced by 50 cm of concrete around the iron core, and 150 cm of concrete in front of the iron (see Fig. 3 right).

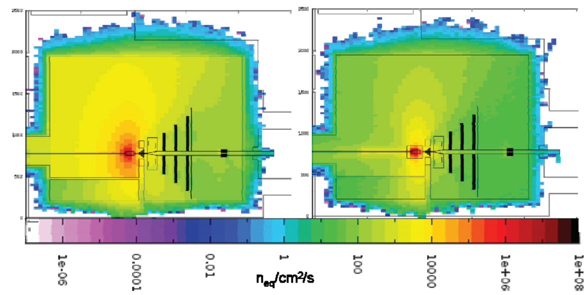

Figure 3: NIEL distributions in the CBM cave during the HADES experiment Ni+Ni at 8 GeV/u with an intensity 10^7 ions per second: with 1.5 m iron as beam dump (left), and with concrete around the iron (right).

References

[1] "The FLUKA code: Description and benchmarking", G. Battistoni, S. Muraro, P.R. Sala, F. Cerutti, A. Ferrari, S. Roesler, A. Fasso`, J. Ranft, Proceedings of the Hadronic Shower Simulation Workshop 2006, Fermilab 6-8 September 2006, M. Albrow, R. Raja eds., AIP Conference Proceeding 896, 31-49, (2007)

[2] "FLUKA: a multi-particle transport code", A. Fasso`, A. Ferrari, J. Ranft, and P.R. Sala, CERN-2005-10 (2005), INFN/TC_05/11, SLAC-R-773