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LHCb Background

This page contains information related to machine related background studies in the LHCb experiment.

Additional information can be found on the old webpage [↗](#).

Mechanisms of background formation

Following Chamonix XV [↗](#), we consider several different mechanisms of machine background formation. These mechanisms are studied as **independent** and the effect of the background is estimated separately for each of them.

Beam halo losses at the tertiary collimators

Beam halo that accompanies the circulating beam in the LHC must be absorbed by two cleaning insertions in IR3 and IR7 at the collimators that act as primary aperture limitations in the machine. The uncleaned halo can be lost at other limiting apertures in the machine structure, and in the case of the loss close to the experiment can create machine background. Two tertiary collimators (TCTs) installed close to separation dipoles at each side of the LHCb interaction point provide such aperture restrictions for beam halo losses.

Elastic beam-gas scattering in the LHC arcs

Elastic scattering of the beam at the residual gas nuclei is one of the processes that populates the beam halo. The halo created along the LHC sectors close to the experiment can be lost at the TCTs before it will reach the cleaning insertions. More...

Cleaning inefficiency in IR3 and IR7

Some fraction of beam halo particles may be out-scattered and not absorbed in the cleaning insertions but rather lost at the TCTs downstream. More...

Beam-gas losses in the Long Straight Section

Inelastic interactions of the beam with the residual gas in the Long Straight Section of the LHCb interaction point can create background directly visible in the experiment. More...

Particle collisions in IP1

Elastic proton-proton collisions in the interaction points is another process that contributes to the beam halo. In the case of particle collisions in IP1 the resulting halo can reach the TCTs close to LHCb. More...

Sources of background

Estimation of machine background and its effect for the experiment depends on the combination of machine operational parameters. For each operational scenario there are several source files of the background particles prepared for use in the LHCb simulation.

The source files in the raw format are located at castor under the directory `/castor/cern.ch/lhcb/background/LHC` and on this [↗](#) webpage. In addition the package `MIBData` contains the most important sources in root-file format.

A number of xdsts have been created describing various scenarios. These files reside in castor at `/castor/cern.ch/lhcb/background/LHC/xdst`.

Pilot bunches and 2009 run at 450 GeV

Estimates have been generated for 450 GeV beam energy in order to ascertain the background of the earliest data. More...

Year 2009 start-up at 3.5

There is an attempt to predict the background with the operational parameters as defined for the LHC start-up in 2009. More...

Nominal running conditions at 7

Nominal running conditions assume perfect machine, clean vacuum, complete collimation scheme and full stored beam energy. More...

Background analysis in the detectors

Analysis of the machine background in the experiment is performed with the set of tools developed within the LHCb simulation framework. More...

Beam Condition Monitors

More...

Beam Loss Scintillators

More...

Velo and IT

More...

Simulation Software and Infrastructure

FLUKA is used for the transport of the showers from the losses in the accelerator to LHCb. It is also used to evaluate Radiation level in the LHCb cavern itself. The use of FLUKA in LHCb can be found [here](#).

Gauss is used for the simulation of MIB in the LHCb detector: a special generator algorithm has been developed to sample the source produced with FLUKA and input them into Gauss that uses Geant4 for the transport of particles in the experimental setup.

FLUKA simulation of Radiation Levels in the LHCb cavern

Access to FLUKA results

A web pages is available for accessing the Radiation Level results. Details on how to configure the system and access the results are available at [this page](#)

Running FLUKA simulations with GANGA

Details on how to run simulation for radiation levels studies with FLUKA on the GRID via GANGA are provided in the following page

Documentation

Meetings

2009

- November 27 [↗](#)
- September 14 [↗](#)

Presentations

These are presentation and reports outside the regular meetings:

2006

- Aspects of Machine Induced Background in the LHC Experiments [↗](#), G.Corti, V.Talanov, LHC Project Workshop "Chamonix XV".
- Residual gas estimates for IR8 and the LHCb experimental region [↗](#), A.Rossi, 41th LHCb Week.
- Collimators related background in IR8 [↗](#), V.Talanov, 41th LHCb Week.
- Machine Induced Background in LHCb [↗](#), G.Corti, L.Wiggers, 41th LHCb Week.

Papers

Some collection of papers is available also on the old webpage [↗](#).

Links to webs of interest

- LHC Simulation background resources [↗](#)

-- VadimTalanov - 19-Nov-2009

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