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The LHCb VELO Upgrade

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The upgrade of the LHCb experiment, scheduled for LHC Run-3, will transform the experiment to a triggerless system reading out the full detector at 40 MHz event rate.
All data reduction algorithms will be executed in a high-level software farm.
enabling the detector to run at luminosities of $2 \times 10^{33}/\mathrm{cm}^2/\mathrm{s}$.

The Vertex Locator (VELO) is the silicon vertex detector surrounding the interaction region.
The current detector will be replaced with a hybrid pixel system equipped with electronics capable of reading out at 40 MHz. The upgraded VELO will provide fast pattern recognition and track reconstruction to the software trigger. The silicon pixel sensors have
with 55×55 $\mu\mathrm{m}^2$ pitch, and are read out by the VeloPix ASIC, from the Timepix/Medipix family.
The hottest region will have pixel hit rates of 900 Mhits/s yielding a total data rate more than 3 Tbit/s for the upgraded VELO. The detector modules are located in a separate vacuum, separated from the beam vacuum by a thin custom made foil. The foil will be manufactured through milling and possibly thinned further by chemical etching.

The material budget will be minimised by the use of evaporative CO_2 coolant circulating in microchannels within 400 um thick silicon substrates.
The current status of the VELO upgrade will be described and latest results from operation of irradiated sensor assemblies will be presented.

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