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Upgrade of the LHCb VELO detector

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The upgrade of the LHCb experiment, planned for 2019, will transform the experiment to a trigger-less system reading out the full detector at 40 MHz event rate. All data reduction algorithms will be executed in a high-level software farm. The upgraded detector will run at luminosities of 2 x 1033 /cm2/s and probe physics beyond the Standard Model in the heavy flavour sector with unprecedented precision.
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 detector comprises silicon pixel sensors with 55x55 um2 pitch, 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 detector halves are retracted when the beams are injected and closed at stable beams, positioning the first sensitive pixel at 5.1 mm from the beams. The material budget will be minimised by the use of evaporative CO2 coolant circulating in microchannels within 400 um thick silicon substrates.
The current status of the VELO upgrade will be described and latest results from irradiated sensor assemblies will be presented.

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