The LHCb experiment was designed to study Flavour Physics. It is a single-arm forward detector covering an acceptance of 2<\(\eta\)<5. Upgraded detector → Same geometry with improved sub-detectors.

**Purpose**

The LHCb Upgrade is an upgrade to the currently installed TT. The LHCb experiment was designed to study Flavour Physics. It is a single-arm forward detector covering an acceptance of 2<\(\eta\)<5. Upgraded detector → Same geometry with improved sub-detectors.

**Geometry**

Four planes of silicon sensors
Finer segmentation and larger coverage than the TT
16 (18) staves per plane, staggered in \(z\) to provide overlap of the active regions (no gaps in the acceptance)

The stave consists of a cooling tube and foam sandwiched between two carbon fiber sheets
On each side of the stave there is a single flex cable carrying the data lines, the high voltage and ground strips
Modules consisting of a silicon sensor, ASIC readout chips as well as a hybrid flex circuit are mounted alternatively on each side of the stave

**Silicon micro-strip sensor**

Four types of sensor geometries in UT. The majority consists of 10cm \(^2\) p'\(-\)in-n sensors: 512 readout strips (Type A) with 190 um pitch

Sensors of Type B, C and D will be n\(-\)in-p due to the radiation hardness of this type of technology: 1024 readout strips with 95 um pitch to accommodate higher track occupancy near the beam-pipe

**Cooling and prototyping**

Evaporative CO\(_2\) is used for cooling
Titanium “snake” pipe embedded within the carbon fiber stave
Solution validated with extensive thermal simulations

A full size demonstrator has been built with mock sensor and ASIC heaters to test this cooling strategy
Other options for cooling pipe geometries are also being explored

**Readout Electronics**

The Si sensors will be read out via novel SALT (Silicon ASIC for LHCb Tracker)
A prototype was built using 130nm technology by AGH UST Krakow

Promising results

**July 2014**