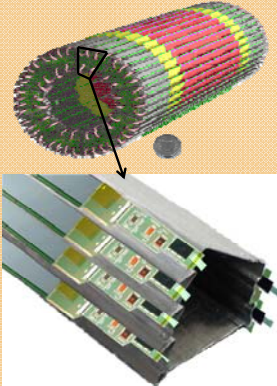# The ALICE SPD readout electronics

The ALICE Silicon Pixel Detector (SPD)

The ALICE SPD constitutes the two innermost layers of the ALICE inner tracking system which contains 9.8×10^6 pixels organized in 120 detector modules called half staves. Each half stave consists of two detector elements (ladders) read out using a multi-chip module (MCM).
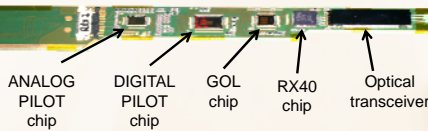
Ladder

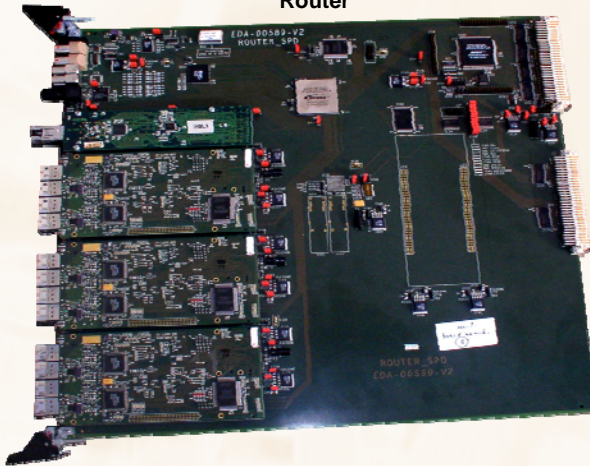Each ladder is a linear array of 5 pixel readout chips bump bonded to a silicon sensor.

Multi Chip Module (MCM)

ANALOG PILOT chip   DIGITAL PILOT chip   GOL chip   RX40 chip   Optical transceiver

Router

EDA-00589-V2 ROUTER SPD

ROUTER SPD EDA-00589-V2

1 read-out channel of the Router

ALICE Central Trigger Processor

SPD off detector electronics (20 Routers)

ALICE DAQ

ALICE DCS in the control room

ALICE SPD installed inside ITS and TPC

The Routers interface the on-detector readout electronics, the trigger system, the data acquisition system and the detector control system.
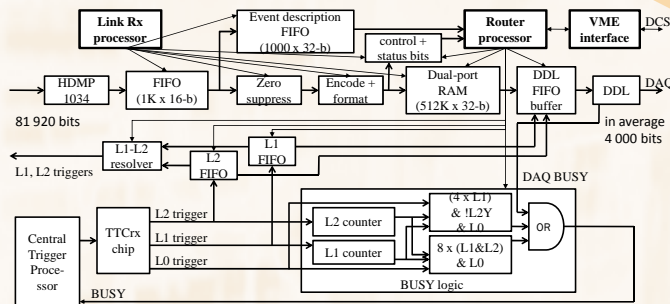
The ALICE SPD on-detector readout electronics (MCM) reads data from 10 pixel chips and stores binary hit information in a delay line during the L1 decision time. In case of a positive L1 decision the hit is stored in one out of four multi-event buffers where the data wait for the L2 decision to be read out or discarded.

The ALICE SPD off-detector readout electronics (Router) controls, configures and reads out the detector via bidirectional optical links. The front-end data streams from the 120 half-staves are processed in 20 readout modules (Router), housed in the control room, based on FPGAs, each carrying three 2-channel link receiver daughter cards.

On the link receiver the pixel data stream from the detector is de-serialized, checked for format errors and stored in a FIFO buffer before being zero suppressed, encoded, re-formatted and written to a dual port memory. After reception of the positive L2 decision, the Router starts to check the event ready flag in the status register of the link receivers. When the event ready flag appears the router processor reads the data from the link receiver dual port memory. The processed data are sent to the ALICE-DAQ system on the ALICE detector data link (DDL) for permanent storage. The SPD control, configuration and data monitoring are performed using the VME interface of the routers.
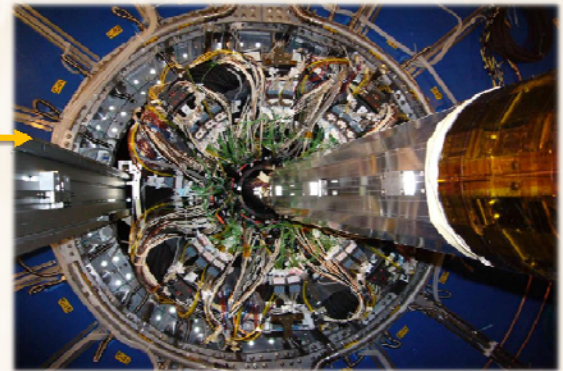
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