Ideas for determining and quantifying in-beam ALPIDEs rates and PID features

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Timestamp problems & ideas

- Whiterabbit timestamp to MOSAIC's supplied via slow (6.25 MHz) rataclock
  - Transmission over LEMO problematic, receiver side not always locked.
  - To compensate, used thick LEMO -> still unstable

- To correlate with other systems, a <1us precise clock isn't necessary.
- White Rabbit = UNIX time in nanoseconds

- **Could we just poll unix system time?**

Data compression

- S118 ALPIDE disk usage = ~ 1-5% of the payload data
- For barrel mode, data rate drastically increases
  - Preliminary calculations 1-10 GBit/s just ALPIDE

- Zero-suppression encoding for binary readout?
  - Encode full address of first hit, then 2-3 bits encoding of nearby pixels in the row
  - Can be done in the f_user.c [drasi] => might increase deadtime
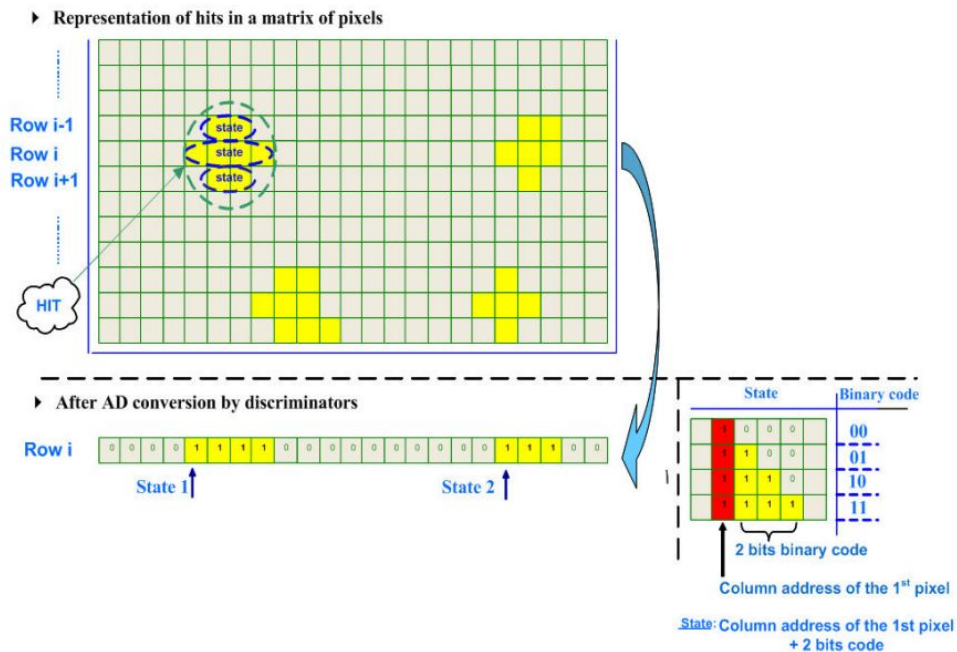 - Possible without FPGA implementation?

Figure taken from:
A. Himmi et al., *A Zero Suppression Micro-Circuit for Binary Readout CMOS Monolithic Sensors*

Understanding thresholds

- Discriminator thresholds aren't optimized
- Right now: decreasing threshold parameter until noise

- More correct optimization procedure:
  - Charge injection (R3BThresholdscan class)
  - S-curve analysis
  - Supported with ideas from ALICE GSI

- GSI Summer Student programme topic: ALPIDE detectors for R3B/Super-FRS EC