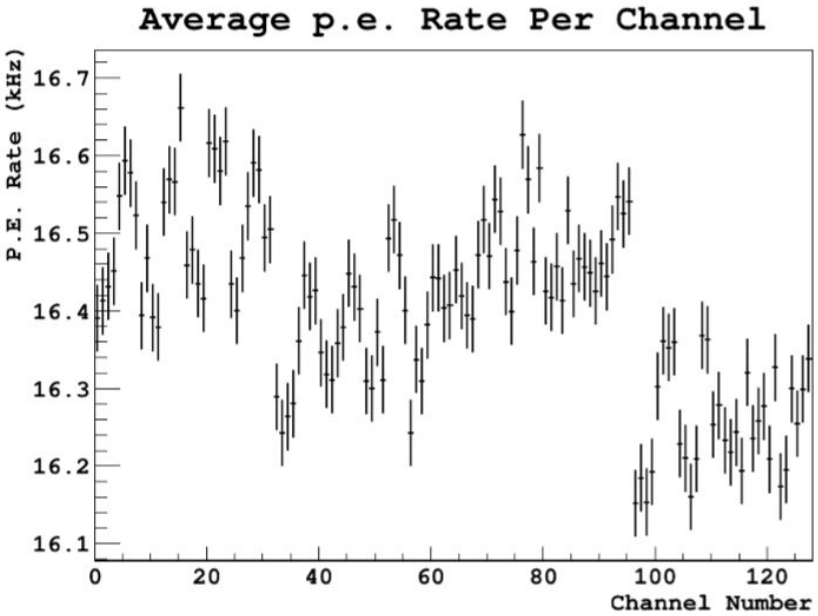
DAQ in the Outer Veto

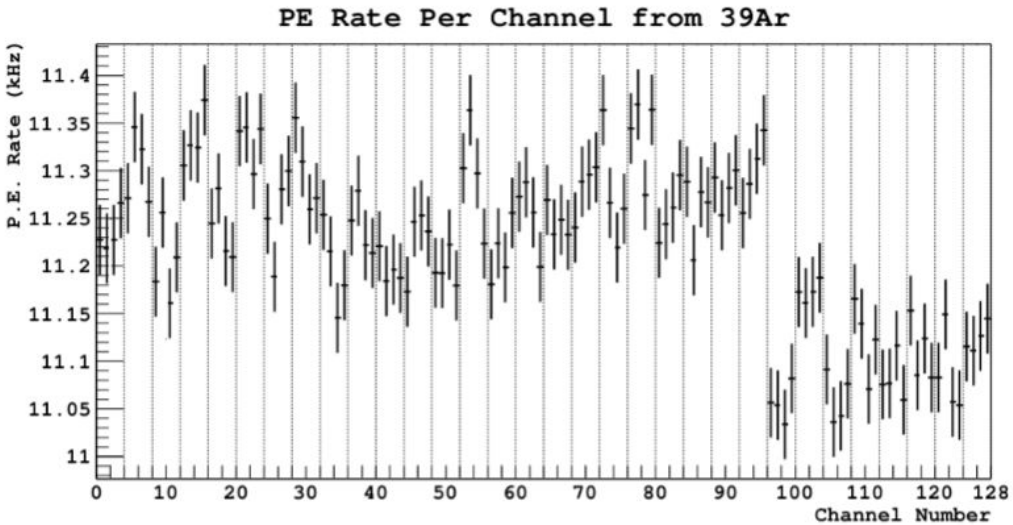
Michela on behalf of the OV working group

DAQ Weekly call

Plots/simulations
by Alec Peck

Background in the OV dominated by 39Ar





From discussions with Simone Stracka, Shawn and Marco

From the vPDUs to the digitizers

Bandwidth limit for CAEN VX2745 = 100 MB/s for 1 Gbps network

- About 17 Hz from background, dominated by 39Ar
- ZLE_length = 400 sample/(125 MSample/s) = 3.2 us
- 17kHz x ZLE_length x 250 MB/second x (32 vPDUs x 4 channels) / 4 OV digitizers = 435 MB/s per digitizer (need x 5 downsampling)
- While assuming all the 12 digitizers of the IV mixed with OV
- 17 kHz x ZLE_length x 250 MB/second x (32 vPDUs x 4 channels) / 12 mixed digitizers = 165 MB/s per digitizer (need x 2 downsampling)

From discussions with Simone Stracka, Shawn and Marco

From the digitizer to the FEP

Bandwidth limit for CAEN VX2745 = 100 MB/s for 1 Gbps network

- Assuming 165 MB/s per digitizer/2 (downsampling) = 83 MB/s
- FIFO deepness= 1024/(64 CH x 17 kHz) ~ 1 ms needed to be filled
- 64 FIFO available, so 64 ms needed in total for each FEP buffer
- Each FEP takes 1 GB/s in input, no further data reduction needed up to now

From discussions with Simone Stracka, Shawn and Marco

From the FEP to the TSP

Bandwidth limit for TSP = 1000 MB/s for 10 Gbps network

- 83 MB/s/ digitizer x 12 digitizer = 996 MB/s from (IV + OV)
- Need to strongly reduce the data rate at the TSP
- Solution: have multiple TS nodes, and increasing the TS width, at the cost to delay the arrival time at the TSP
- The buffer needed at the FEP from the veto system is is B = 48 * n * T^2 / 1000 M = 960 MB with n=2 digitizers going to one FEP, and T= 100MB/s as transfer rate to the TSP (1Gb/s network)
- Maximum latency from the FEP to TSP of L= 4.8s

From the TSP to Data storage

Target logging rate = 60 MB/s

- Data reduction strongly informed by the analysis expected in the veto system:
  - Background rejection (main purpose)
  - 39Ar activity, half-life, nuclear parameters
  - Multi-channel detection of SN neutrinos
  - Search for heavy, multi-scattering dark matter
- Next step: DAQ simulation in DSLab (thanks Ashlea and Zoe!)