

APV25 Rates

Pelle

Intro

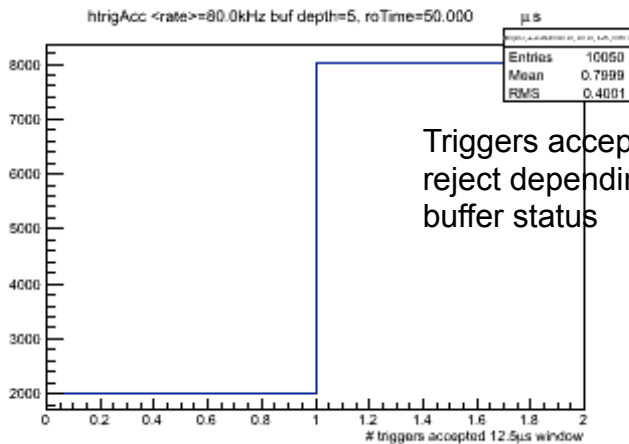
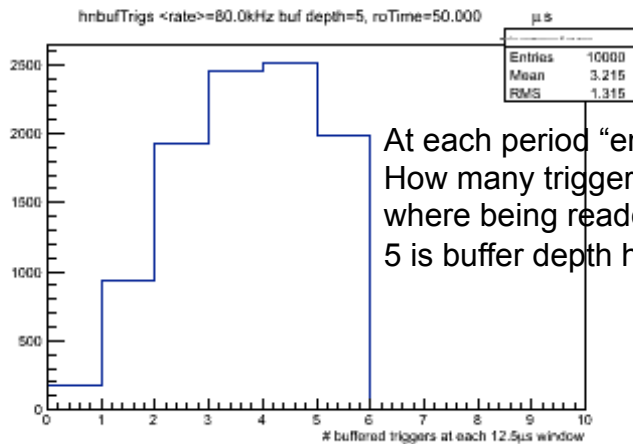
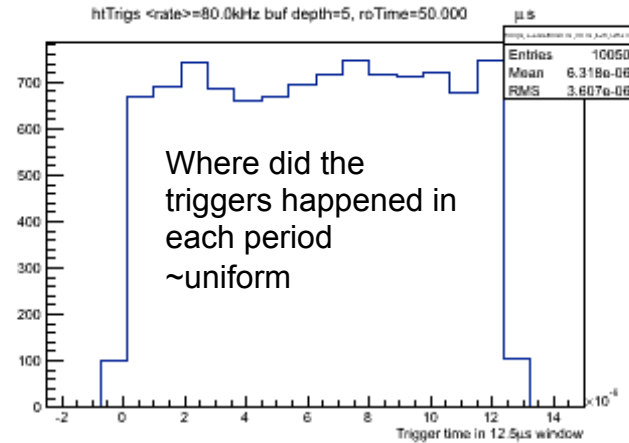
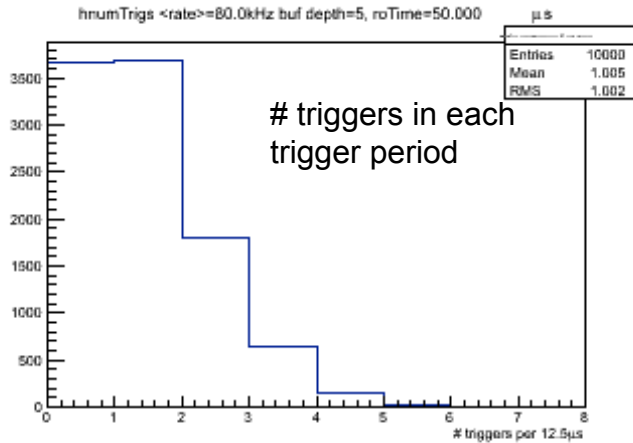
- What is the rate limit from the APV25?
- Readout time/event ~ 940 clocks (i.e. 23.5us) limit rate of sequential triggers to ~ 43 kHz
- APV25 support overlapping trigger/readout
 - At least for Single/multi-mode (no obvious reason it wouldn't work for our "double trig" mode (?))
- With 6 sample readout effective limit at 5 buffered triggers (APV25 support 30×128 buffered samples)
- Build Toy Model to look at maximum trigger rate in buffered readout mode

Procedure

- Input
 - Average trigger rate (e.g. 50kHz), Poisson (mean=1) distributed nr of triggers in that time window
 - APV25 single buffer readout time/dead time (e.g. 25us)
 - Buffer depth (e.g. 5)
- Steps
 - Find # triggers in a given trigger period from Poisson distribution
 - Find time of the triggers in that time window (uniformly distributed)
 - Check if buffer is full, if not, add it to the buffer
 - Loop over trigger time periods (“roll around buffers”)
- Known flaws
 - Triggers are uniformly distributed; reality is that they cannot be infinitely close but separated with 16ns? (need to check but will be tiny effect since average rate is long c.f. this time)
 - Trigger Latency: ~100 clocks (manual mentions 35 cycles?; what’s happening during this time?). I apply this to *all* triggers, not only when buffer is empty....not sure it’s correct
 - No other dead time applied (is there a sync pulse between triggers in buffered mode?)

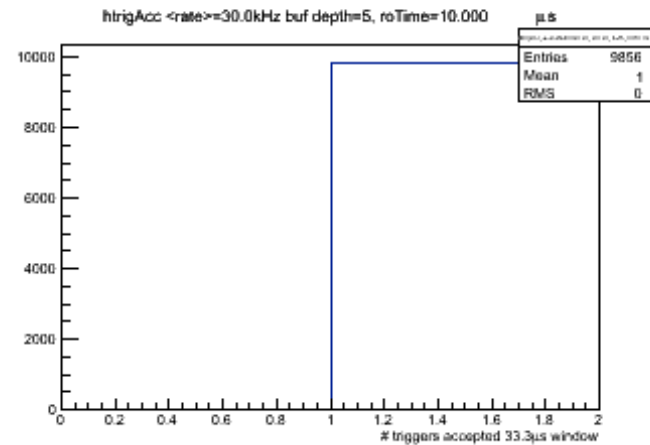
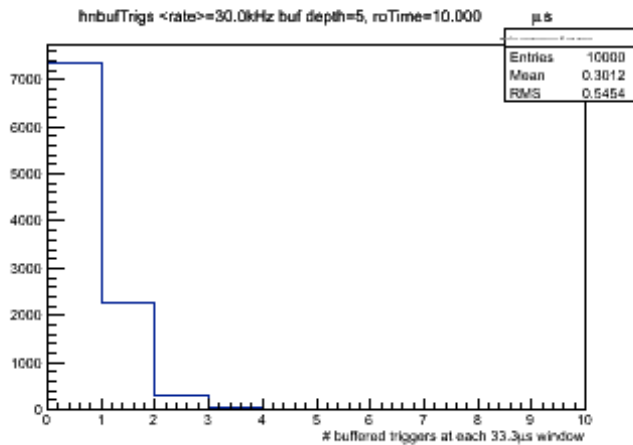
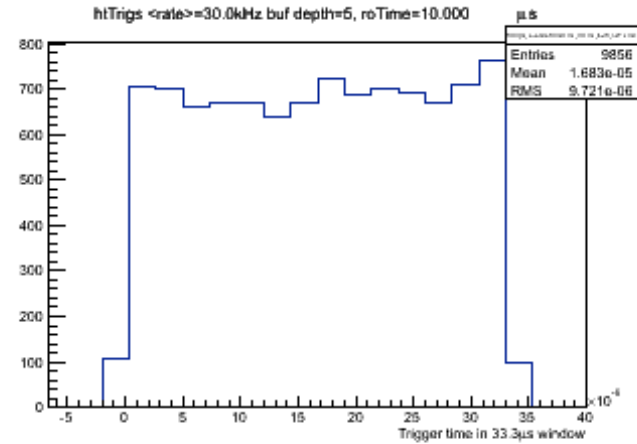
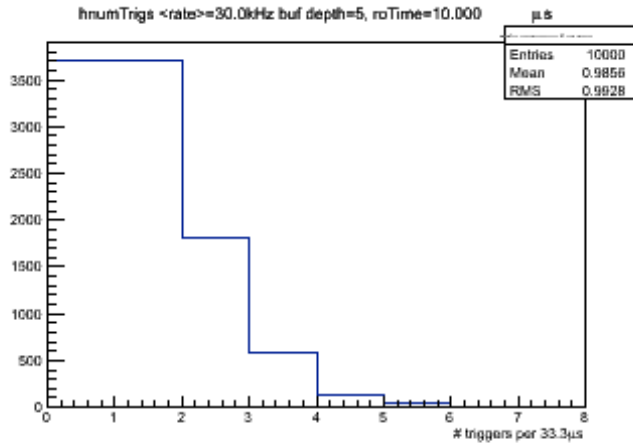
80kHz, roTime=50us

Test case



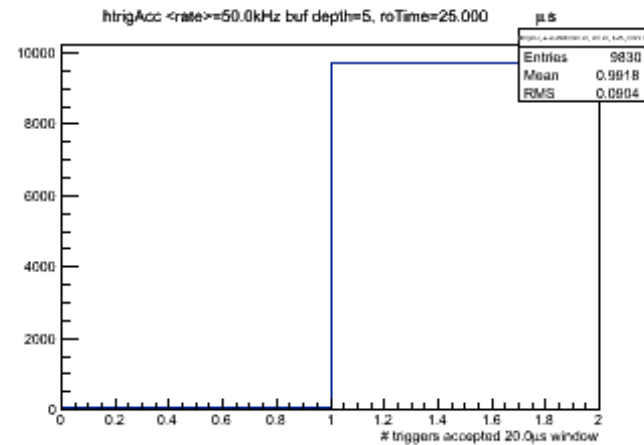
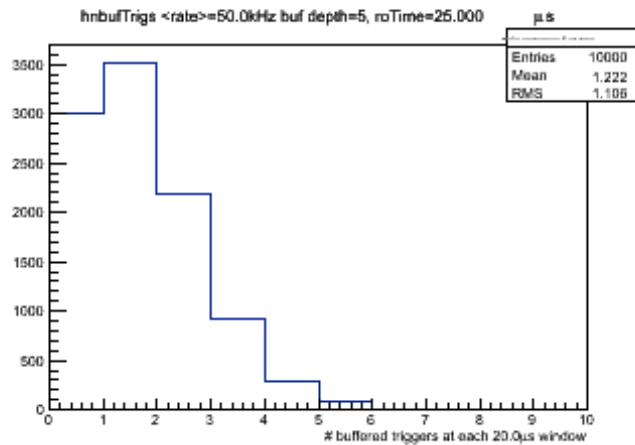
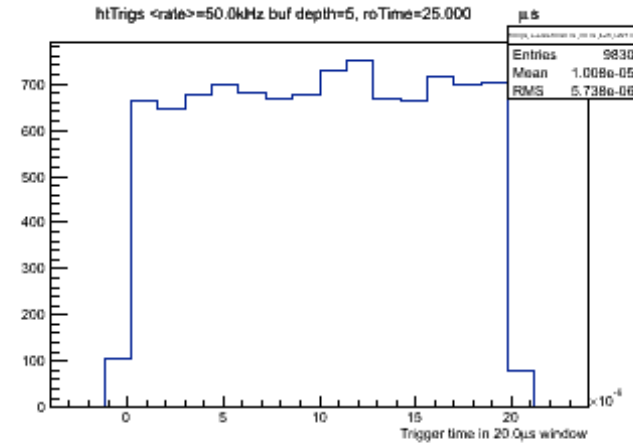
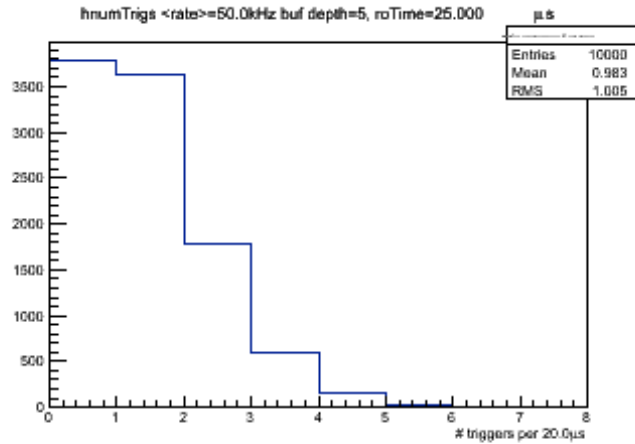
30kHz, roTime=10us

Test case



50kHz, roTime=25us

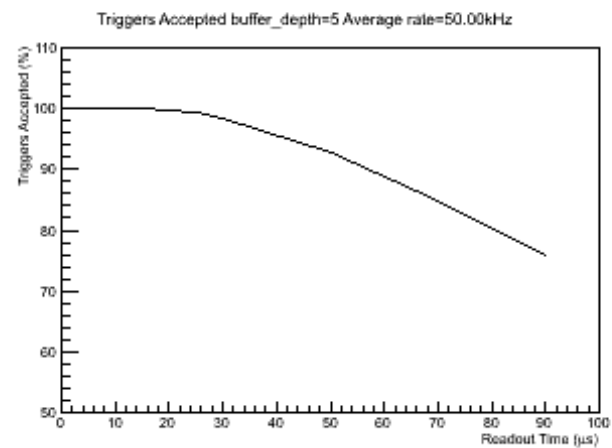
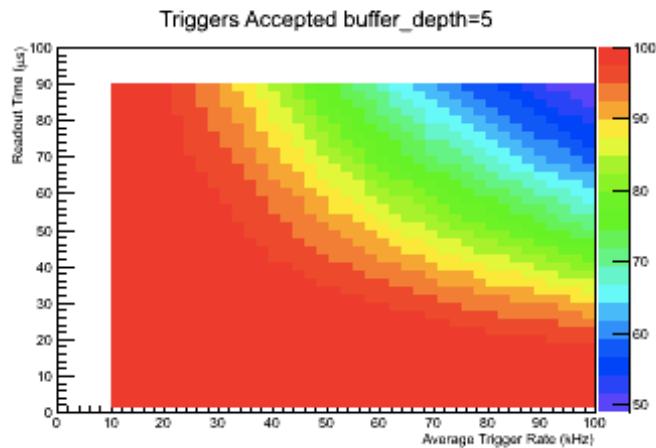
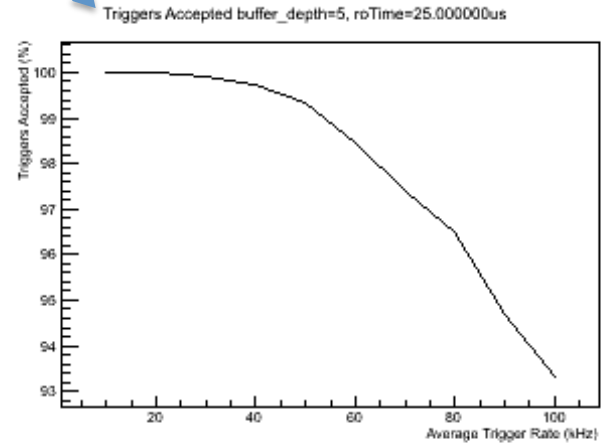
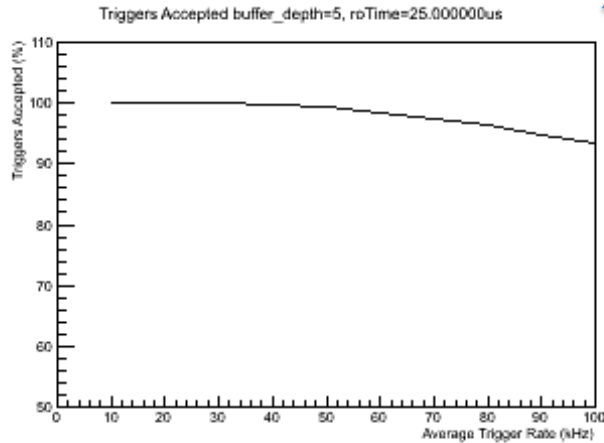
More realistic



APV25 Accepted Triggers

Same thing, different scales

Summary large scale



APV25 Accepted Triggers

Same thing, different scales

Summary small scale

