DAQ Dead Time Studies

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SLAC NATIONAL ACCELERATOR LABORATORY

DAQ setup

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Trigger using special ecal configuration

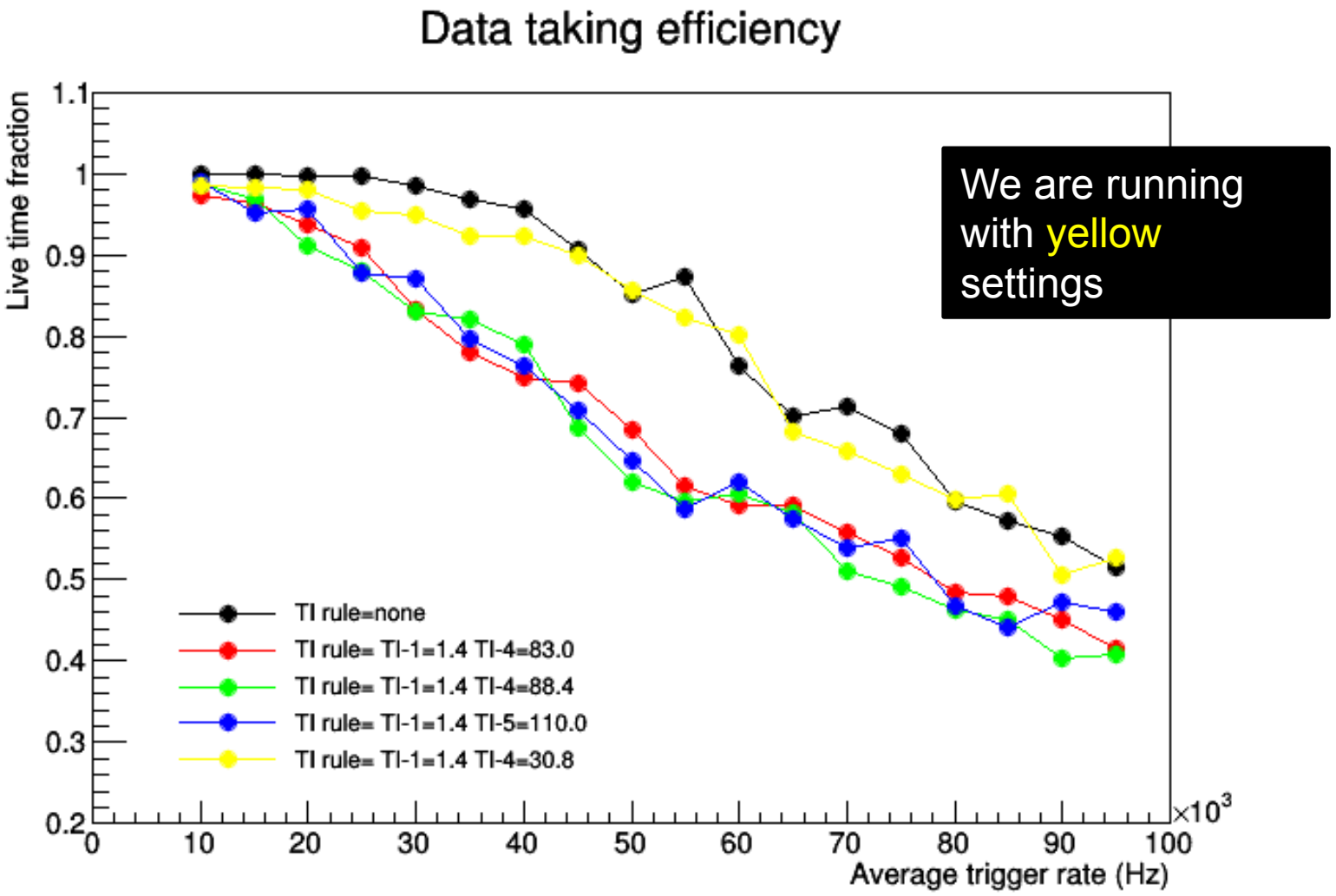
- HV OFF
- Two crystals with low thresholds (all other super large)
- Singles-0 and singles-1 active with different thresholds (to allow “fine” tuning of rates)
- Event size with ECal only is ~ 1kB per event

SVT is configured normally

- Chiller at +5C: hybrids at ~8C while running)
- Bias at 180V
- All FEBs and hybrids included (if not otherwise specified)
- New thresholds derived and applied at this temperature
- Event size with SVT is ~4kB per event

Good news is that we never crashed with the SVT in (run for hours with lots of high rates) => Busy is working.

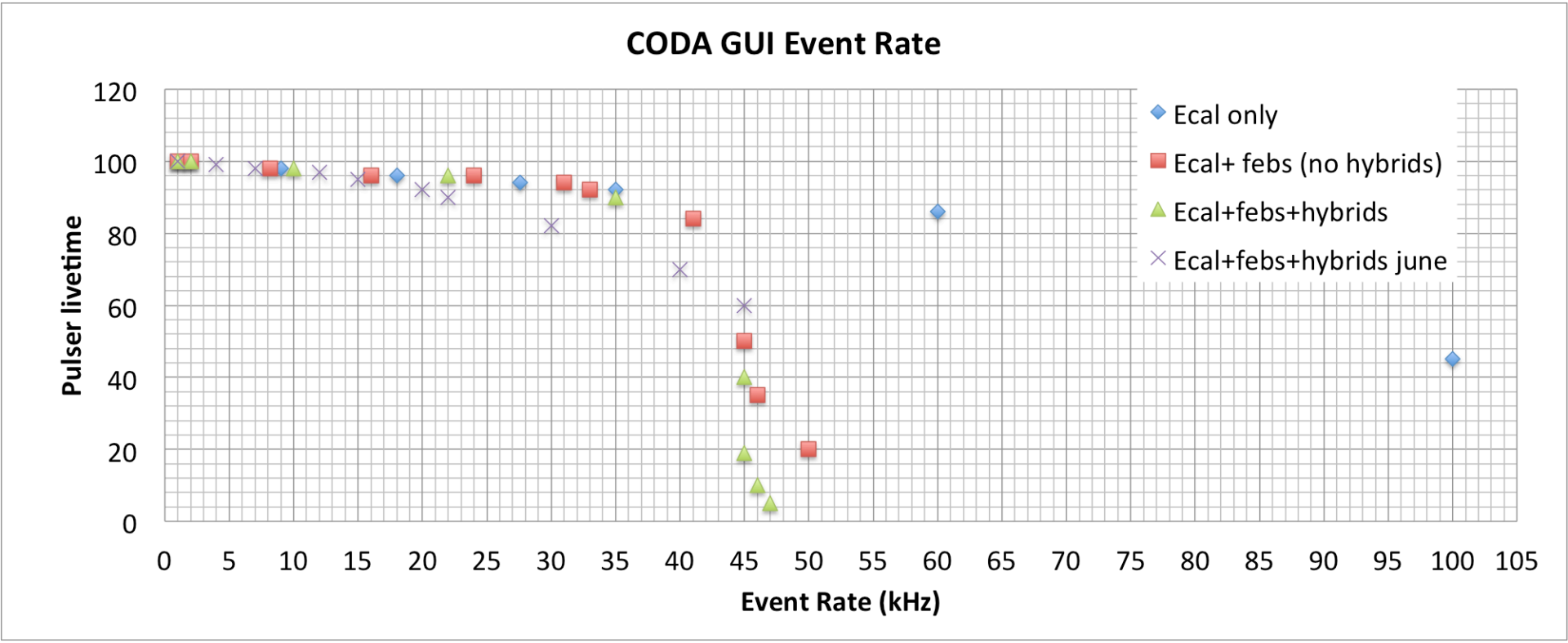
Simulation



NOTE: the average rate here is input or "ungated" rate

GUI rates

Eyeball run control GUI rate



June measurements were worse. Not clear why at this point.

GUI rates – more info

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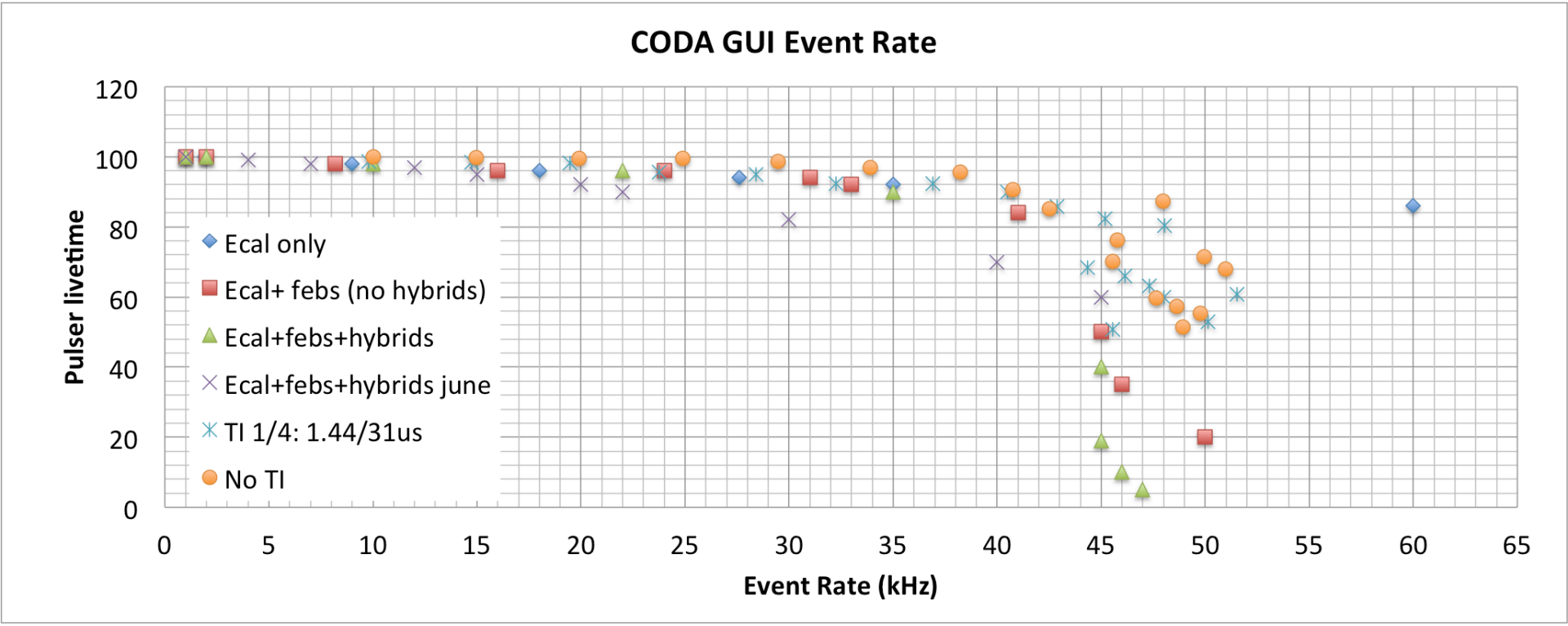
Compare to simulation



"No TI" and "TI 1/4" are simulated rates (see 1st slide), stat. uncertainty obvious at high rates

Live time seems turns down at the same place (except June tests)

Would like 3 more data points at 38, 41, 43kHz.

Gated vs GUI rates

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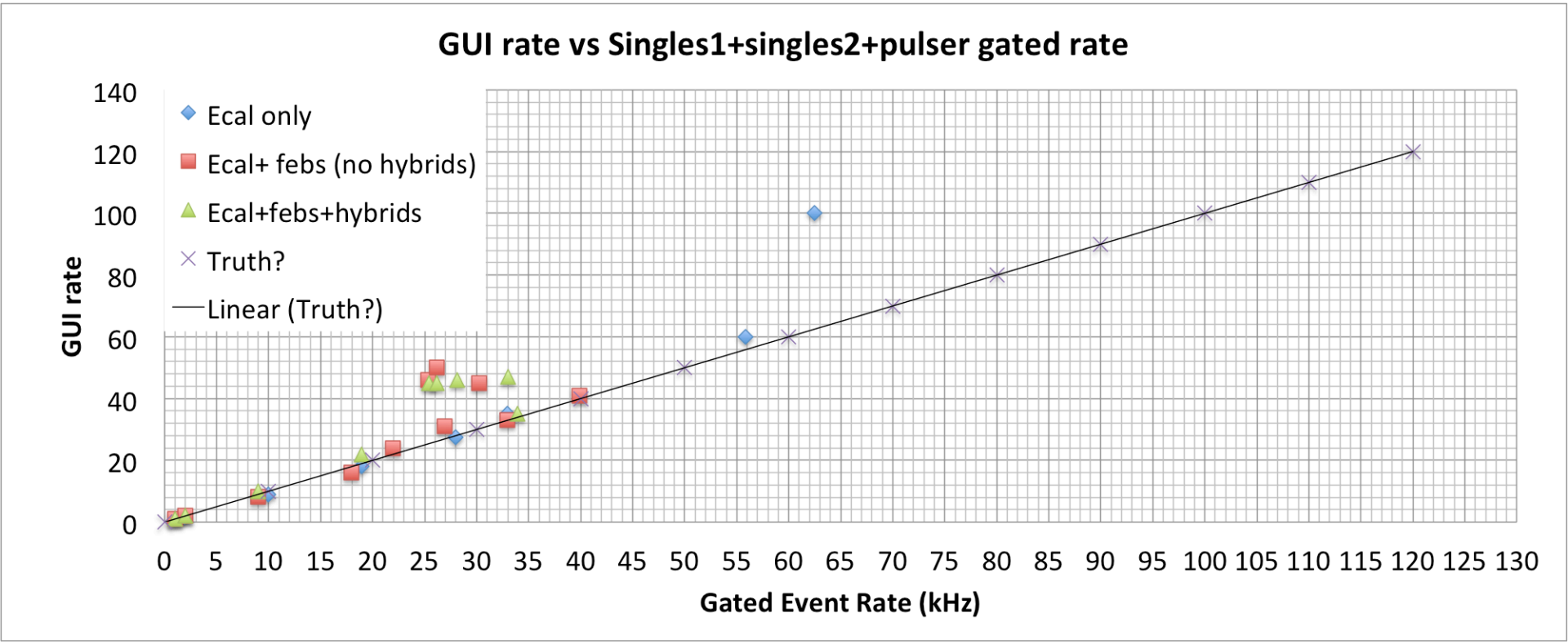
Should I expect that sum of gated rates == GUI rate?



Not clear what this means…
We could have a typo in our notebooks but not all of them (and not both of us)

Gated rates

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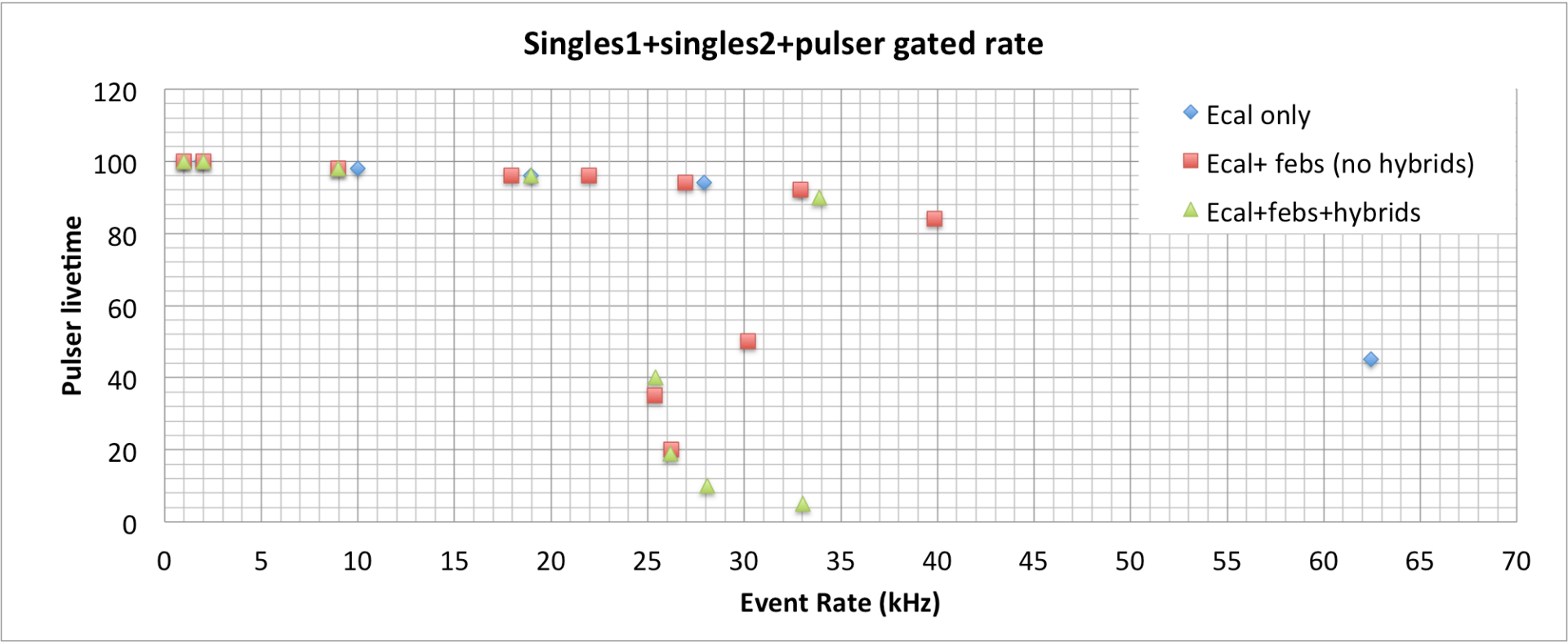
Use strip charts to get an “average”



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Summary

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DAQ live time is about 92% at 35kHz. Drops to about 45% at 45kHz

Up to 35kHz within few percent from simulation. At 45kHz we are around 40% lower than simulation.

Hard to get a good measurement at 40-50kHz because it fluctuates wildly (we are close to the limit)

See still pretty large, ~10kHz over minutes, fluctuation of singles trigger rates (at e.g. 20kHz): temperature or other environmental dependence?

Next steps

- Need to understand the gated vs GUI vs live time numbers to be sure this is actually working?
- Try to get a few more measurements between 35-45kHz rate.
- Data rates were up to 220MB/s; do we want to write to disk in order to make sure it's stable?
- Switch to 64-bit CODA at some point (if we are going to use it)?
- Repeat after SVT updates (e.g. data format) in the next few weeks