Electronics validation study for coded masks

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Simulations for validation

Validation software scheme

GEANT4 output: photon arrival times on whole sensor matrix

1. Select detected photons (PDE = 20%)
2. Assign photon to pixel
3. Run Behavioral Model in batch mode
4. Save output dictionary as pickle file

simulation

- Simulation sample: 120 spills
- Submitted 1 job per spill at Tier 1,
- 1 - 10 s per pixel, total execution time limited to 24h
- Spill with many tracks or dazzled cameras are underrepresented in the following analysis

Parameters under test


```
"SigmaMismatch": 0.10000000149011612,
"Vsat": 0.6000000238418579,
"discr_Vth": 14.3,
"discr_deadT": 9.0,
"discr_holdOn": 20.0,
"intg_R": 1100.0,
"intg_Ca": 0.5,
"intg_Cb": 1.5,
"intg_T": 40.0,
"intg_deadT": 6.40,
"tac_Isrc": 0.01099999940395355,
"tac_cap": 0.10000000149011612,
"tac_coarse_clk_period": 3.20,
"Wilkison_resNbits": 9,
"Wilkison_cap": 0.6000000238418579,
"Wilkison_Isrc": 0.20000000298023224,
"Wilkison_deadT": 3.20,
"Wilkison_pclk": 3.20
```

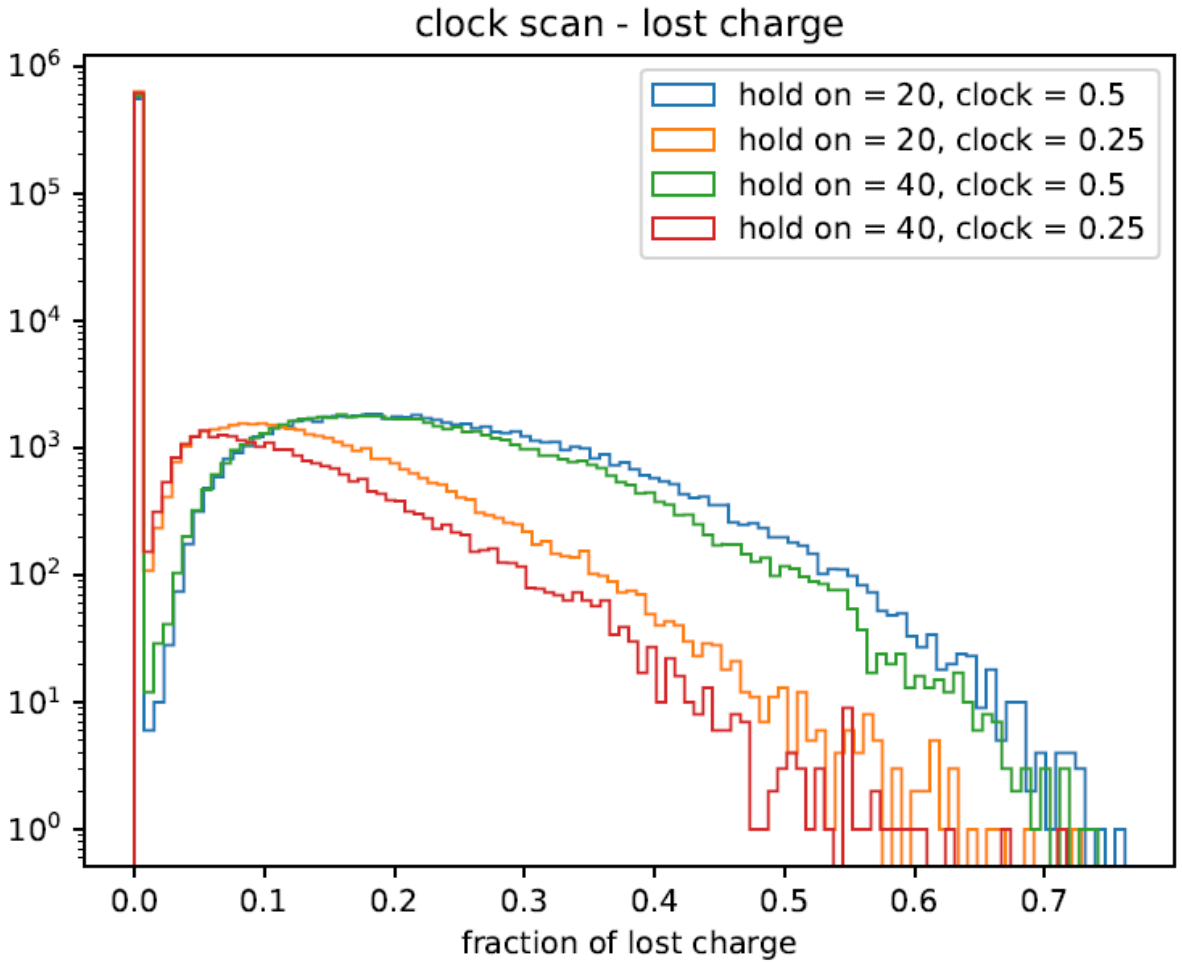

Threshold fixed to 0.5 pe

Discriminator holdOn: 20 ns, 40 ns

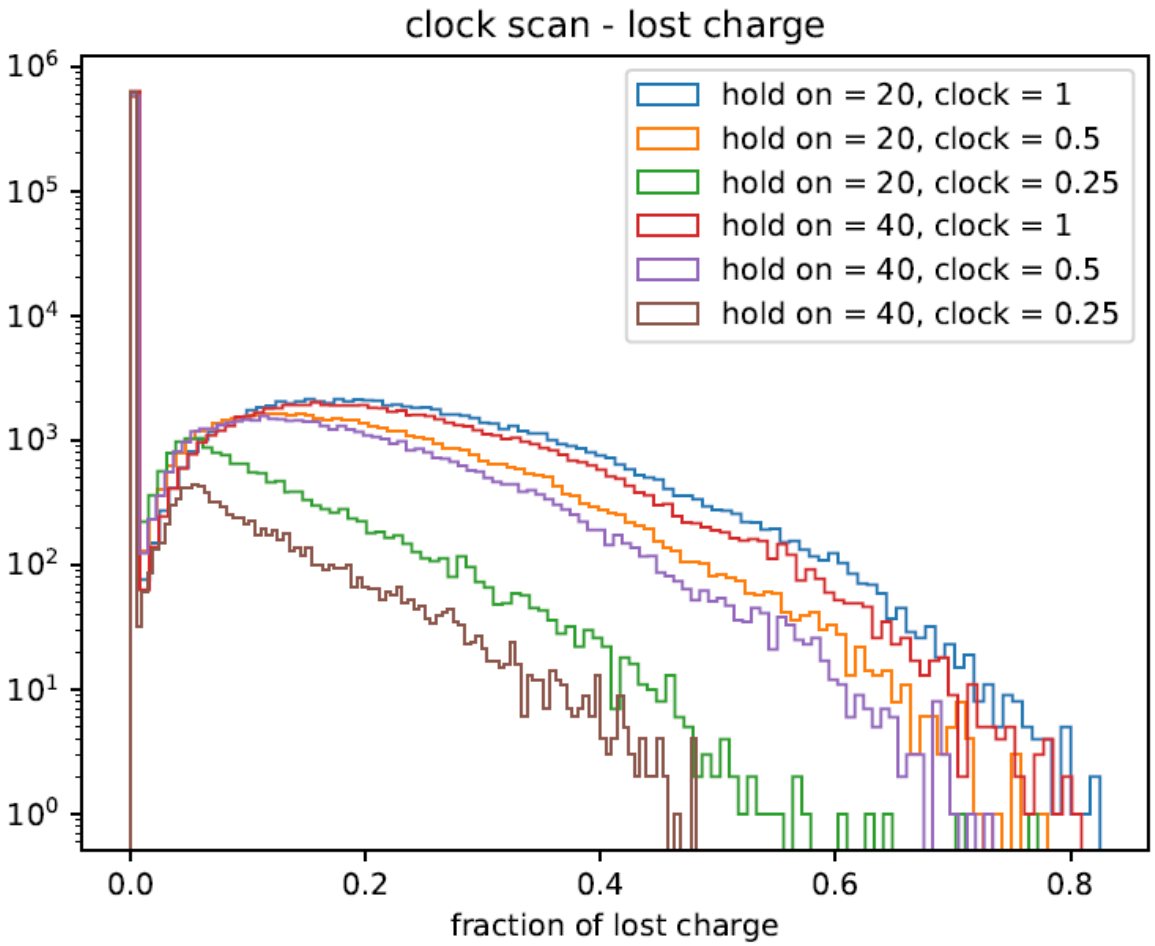
Wilkinson clock: T , ½ T , ¼ T

Lost charge

Rq 500

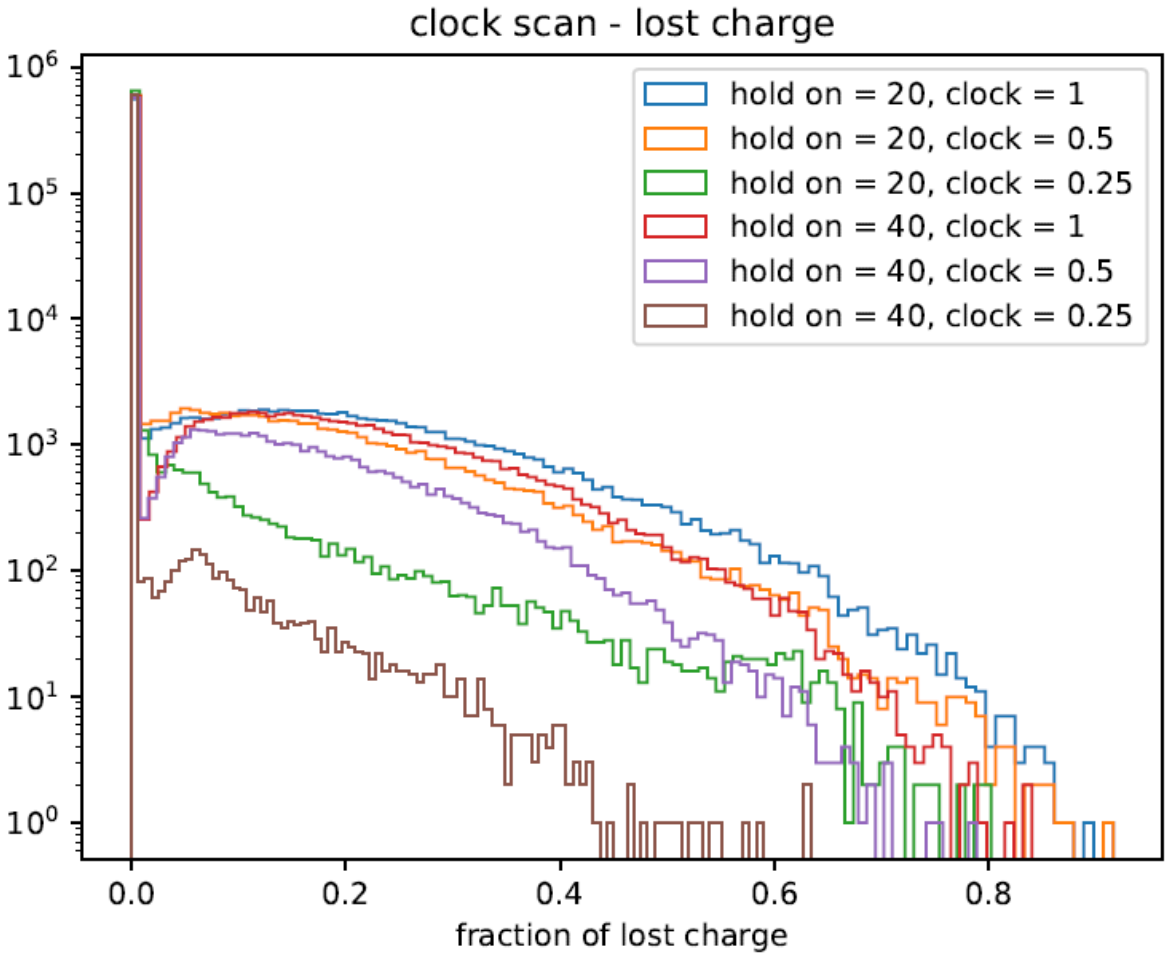


Rq 1000

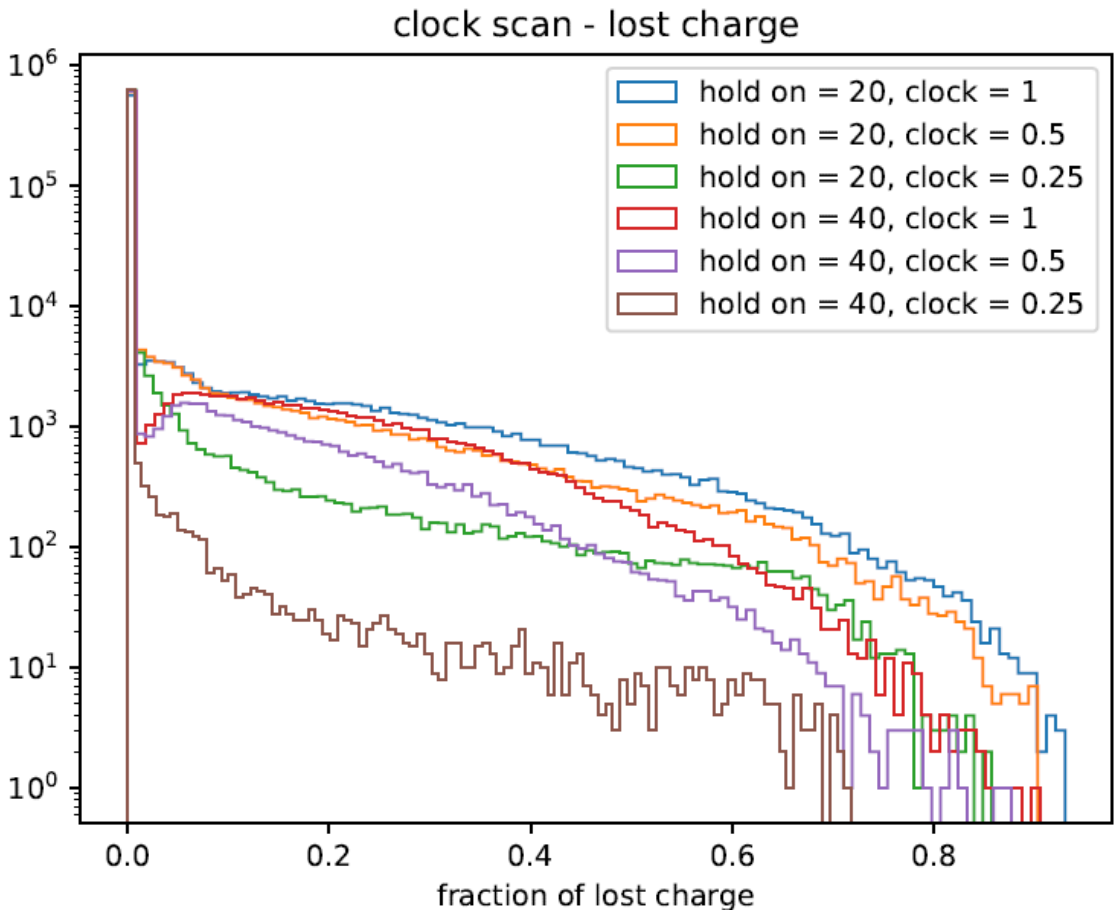


Lost charge

Rq 1500

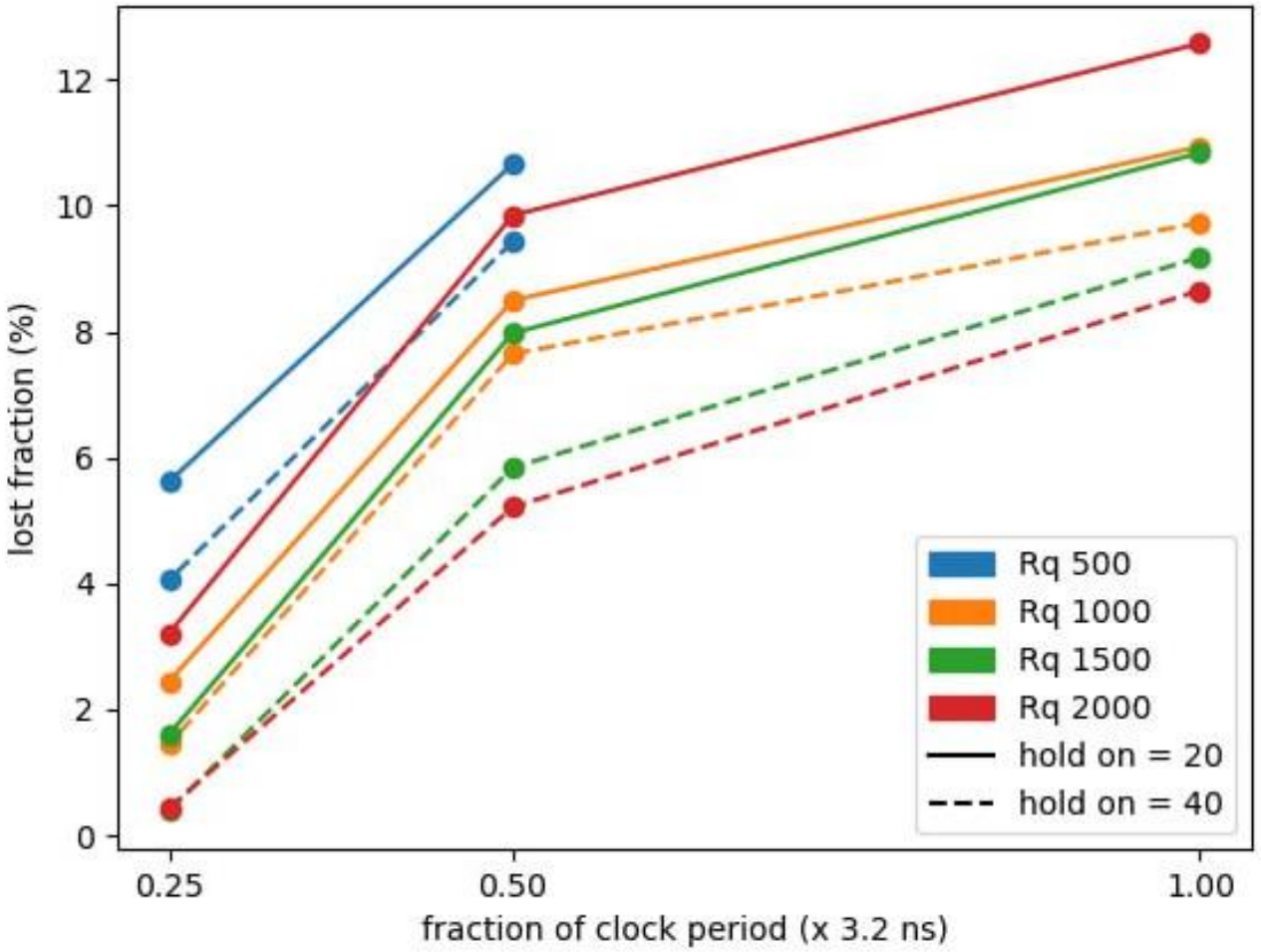


Rq 2000



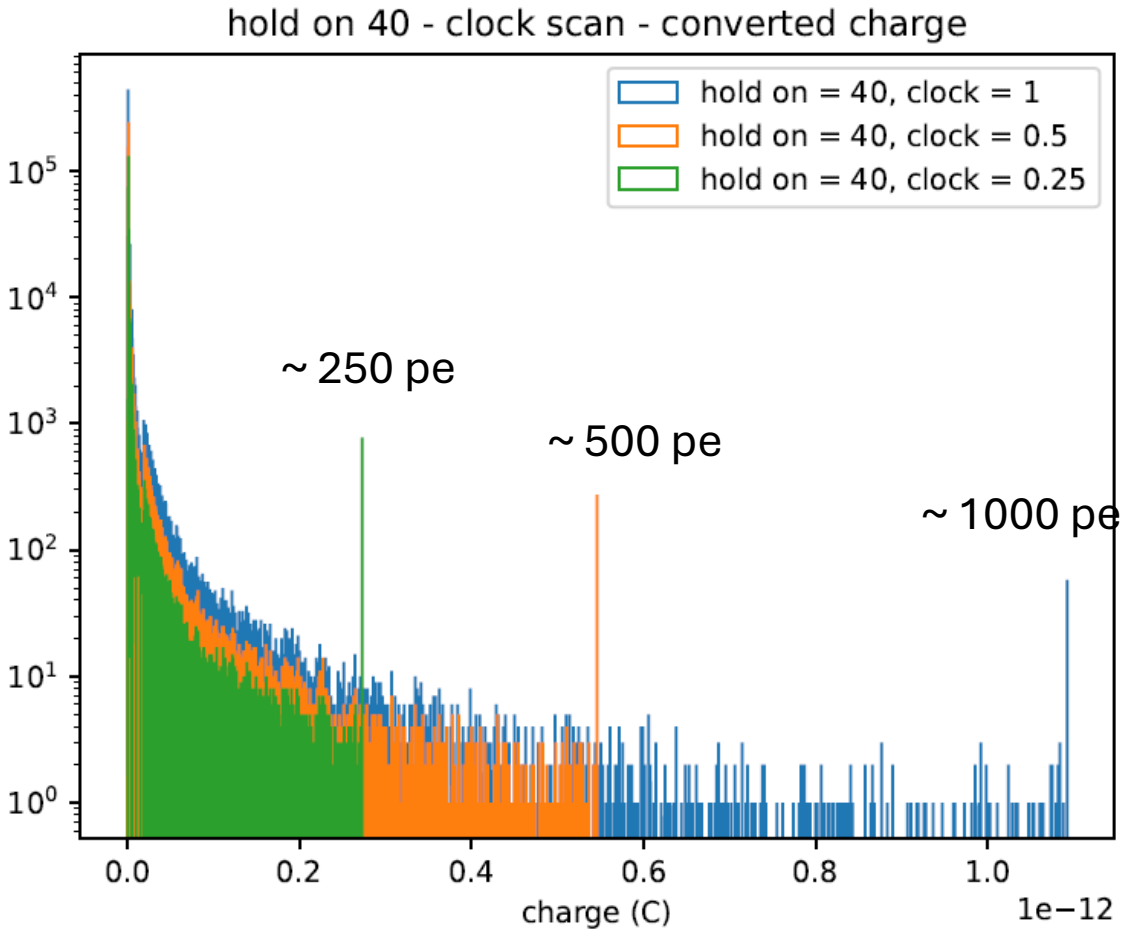
Lost charge - summary

fraction of pixels that loose more than 2% charge:

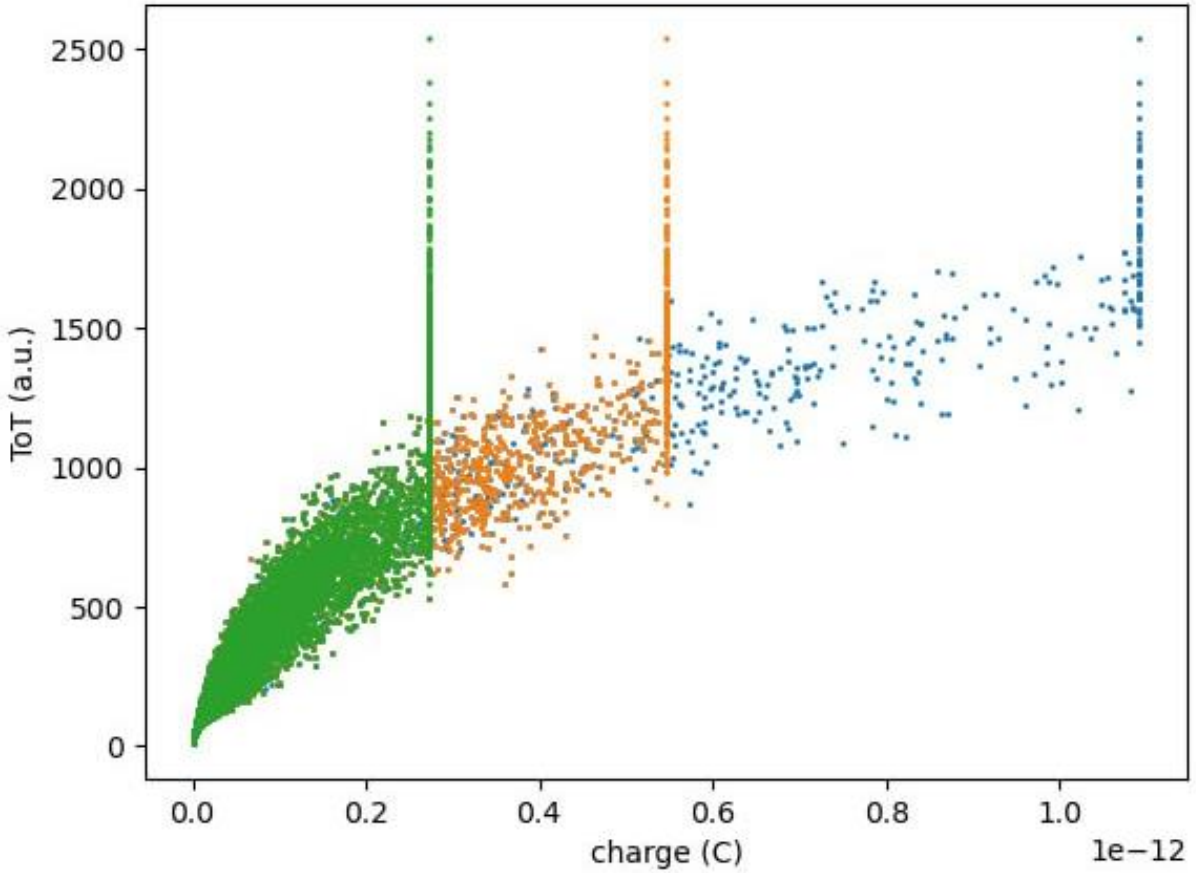


Measured charge

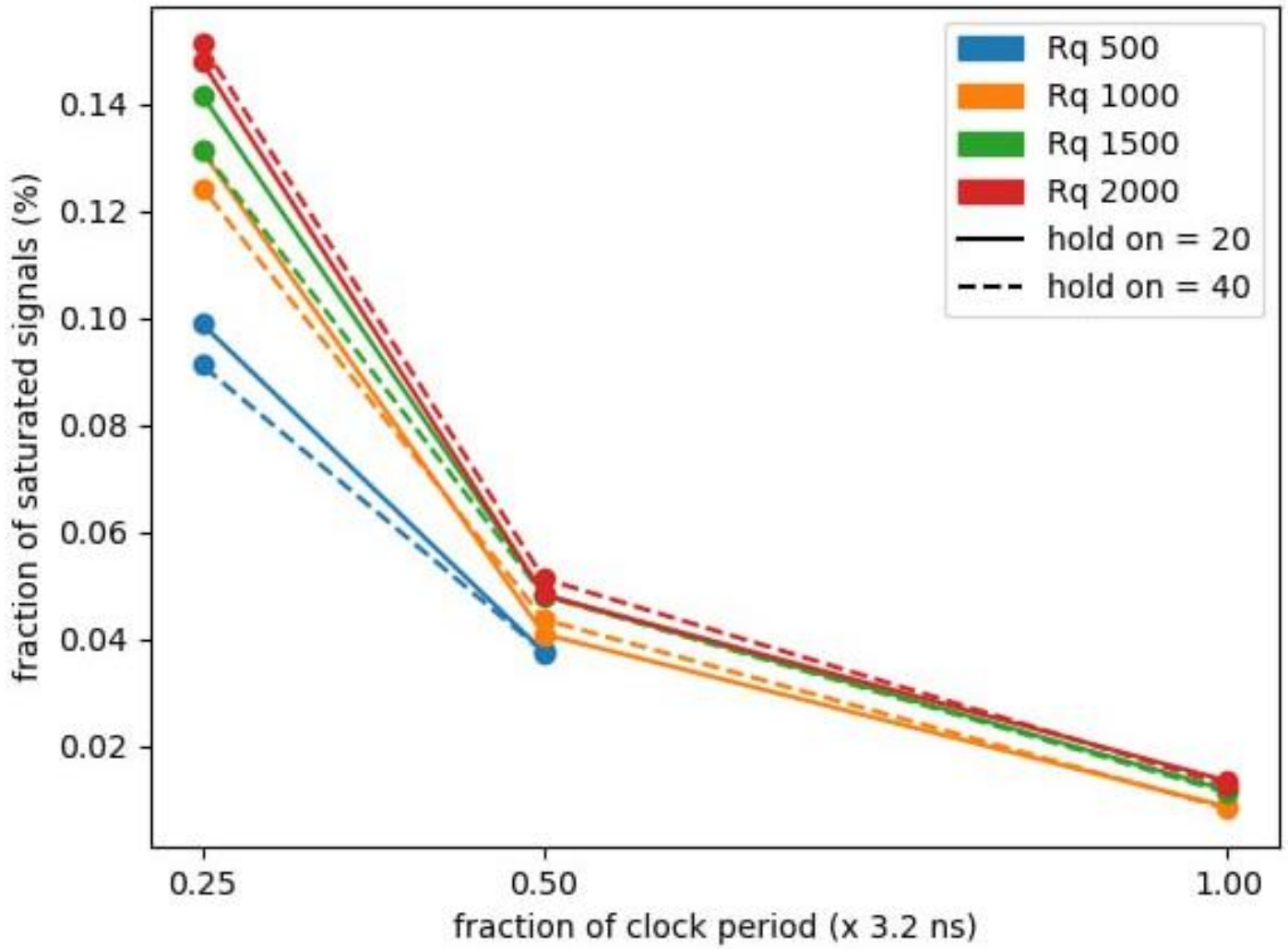
Rq 1000



Charge - ToT



Fraction of saturated signal



Next steps

- Next runs may be faster :
  - fixed handling of exceptions in DiscriminatorWithHoldonFast function (thank you Valerio and Sofia!)

- Test longer holdOn intervals (~ 100 ns)
- T Wilkinson = 1/2 T may be beneficial:
  - Adjust parameters of integrator for charge saturation and range