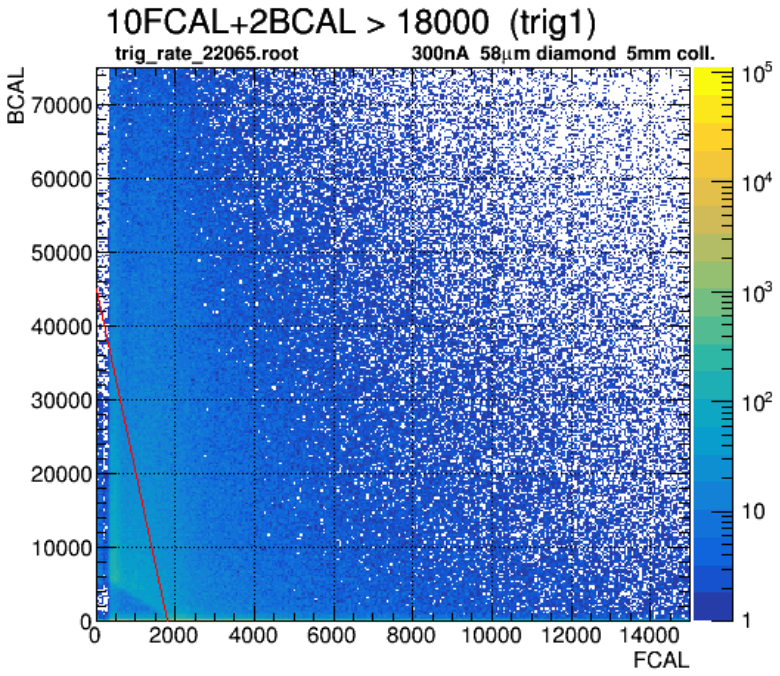
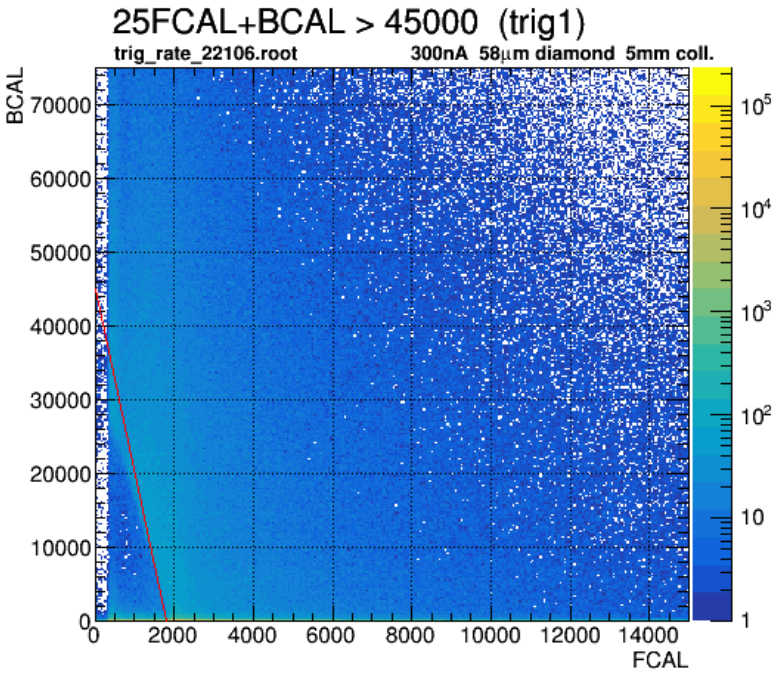
# Current Status

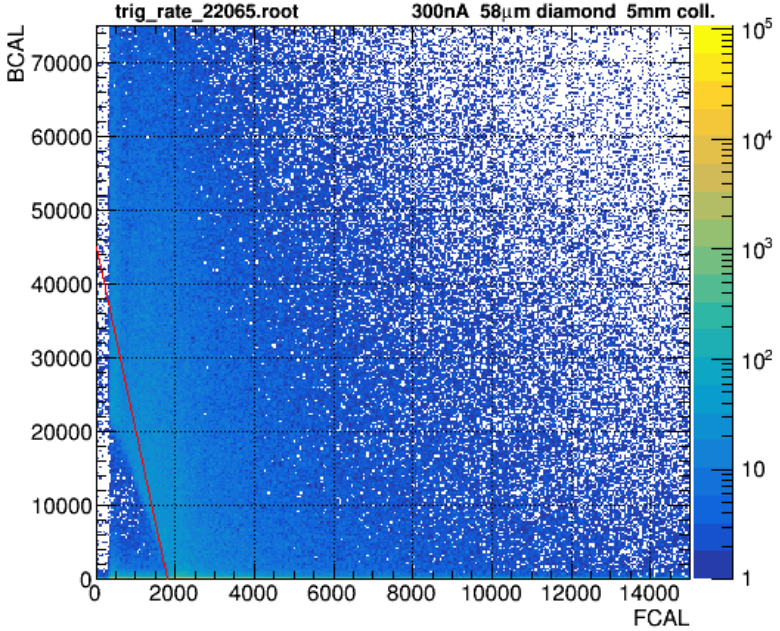
- Accepted event rate limited by fADC125 to ~90kHz (4-5 x $10^7\gamma$/s)
- Event size reduced to 16-20kB/event
- Total expected data rate ~2GB/sec
- Dual streams could handle rate w/o L3

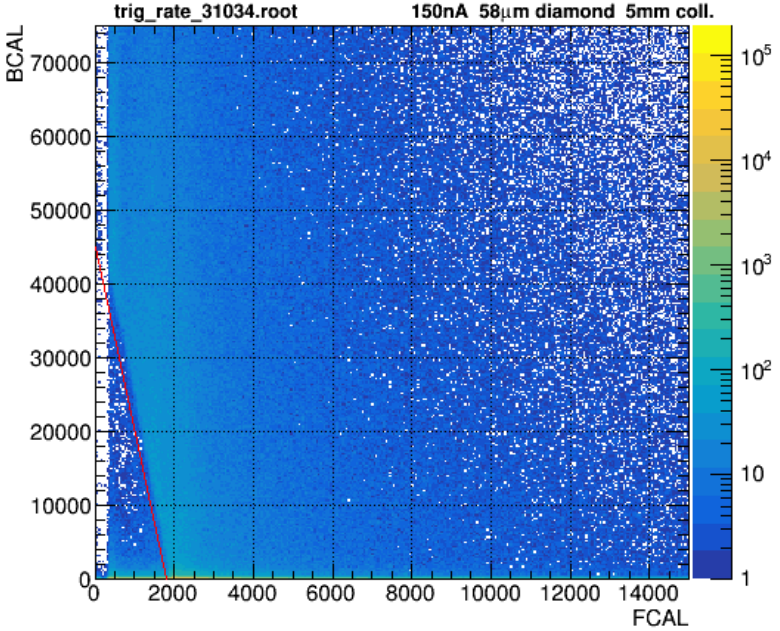
# Summary of Report from June 2016 review

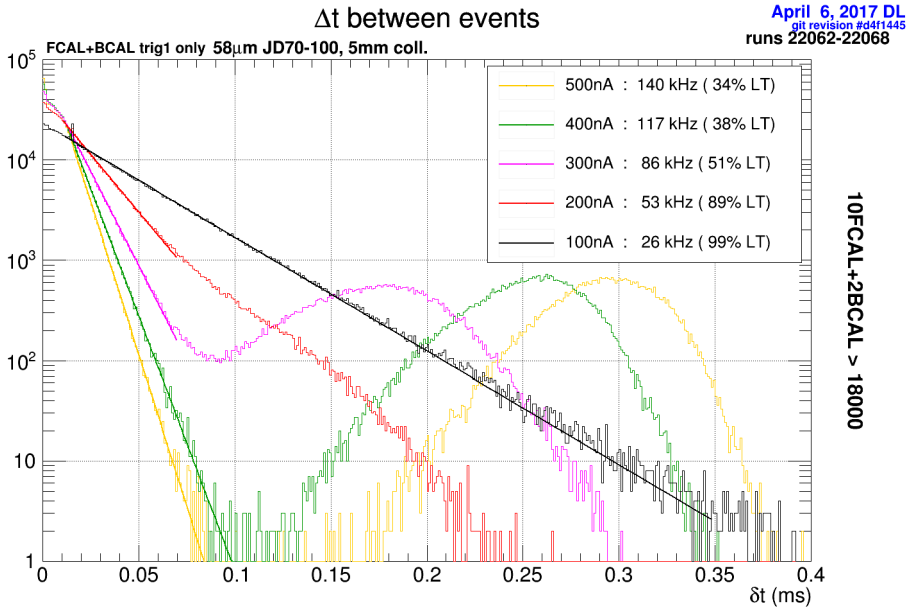
- fADC125 Performance issues at high rates needs to be addressed
- Understand L1 trigger and optimize
- 10GB/s link from crate must be tested with full DAQ rate to ensure adequate CPU
- ***Impact of higher data volumes for offline analysis. Discuss with IT.***
- L3 specific
  - Are timing algorithms understood for high intensity events with greater multiplicity
  - Are algorithms that reduce event size being considered (in addition to just filtering events)
  - Prediction of rates per farm node and reduction factor by extrapolating Spring 2016 data. (How many nodes for 9GB/s?)
  - Are alternatives to original design being considered given parameters have changed (estimated data rate and potential reduction factor)
    - Should L3 farm be housed in Computer Center?

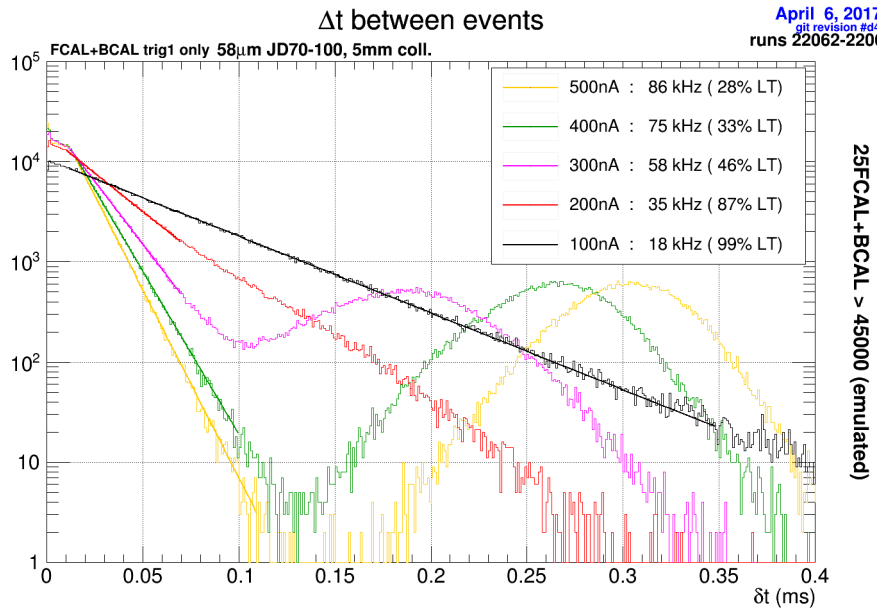

10FCAL+2BCAL > 18000 (trig1)
trig_rate_22065.root
300nA 58μm diamond 5mm coll.
BCAL
FCAL

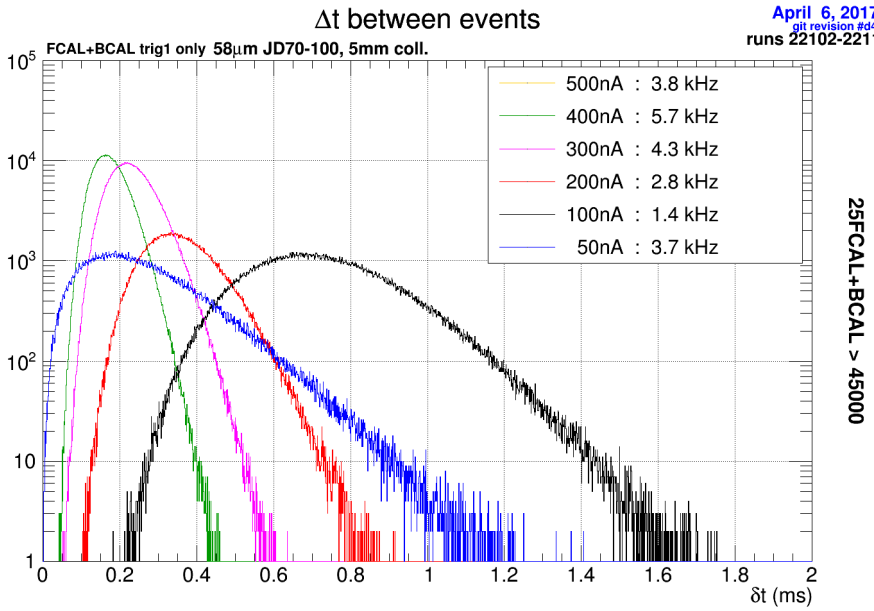

25FCAL+BCAL > 45000 (trig1)
trig_rate_22106.root
300nA 58μm diamond 5mm coll.
BCAL
FCAL

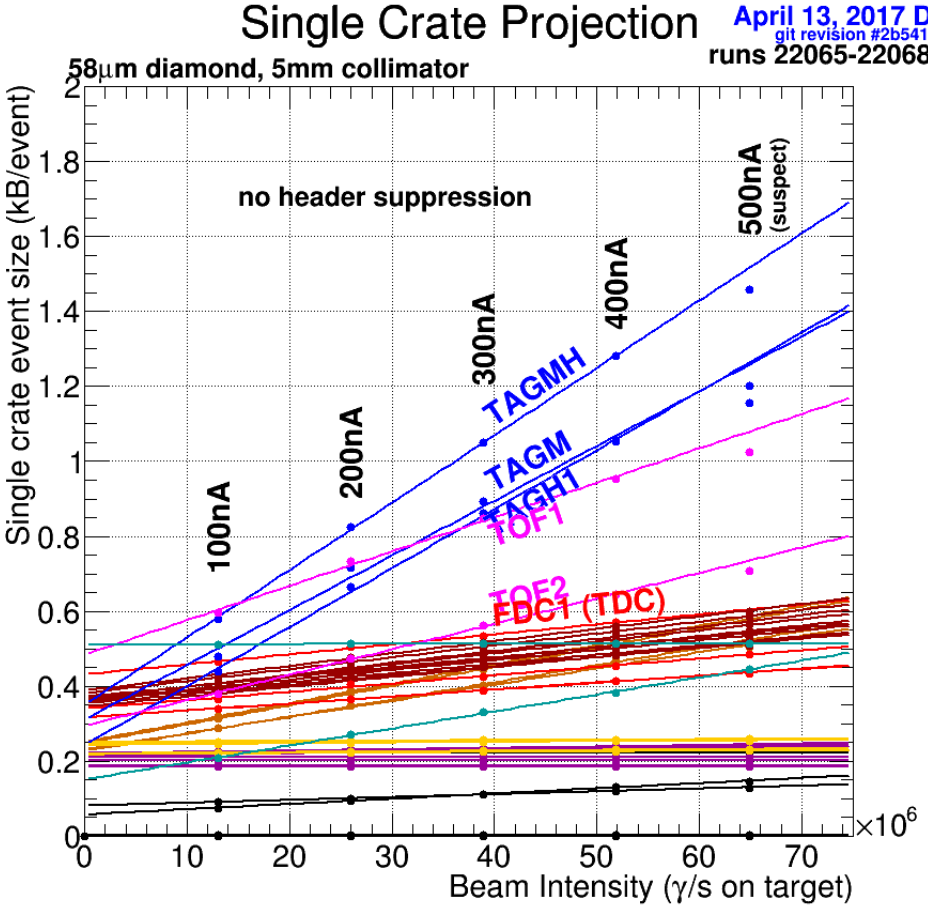

20FCAL+BCAL > 36000 (trig6)
trig_rate_22065.root
300nA 58μm diamond 5mm coll.
BCAL
FCAL

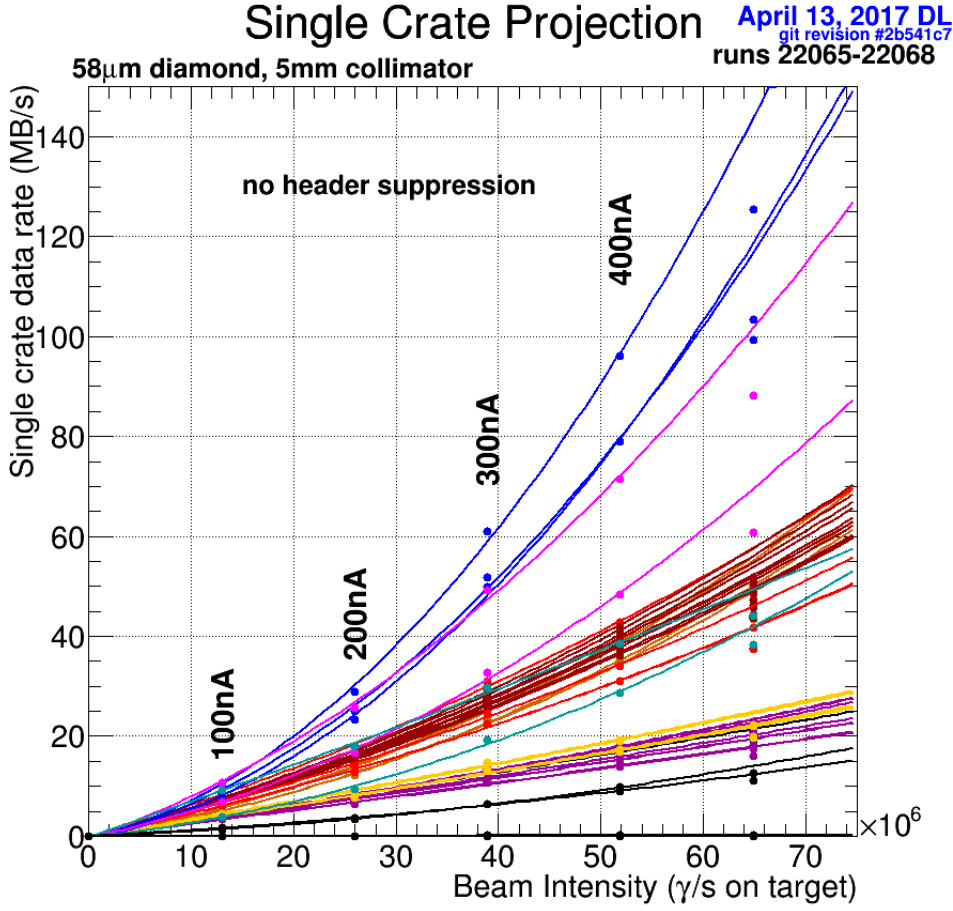

25FCAL+BCAL > 45000 (trig1)
trig_rate_31034.root
150nA 58μm diamond 5mm coll.
BCAL
FCAL

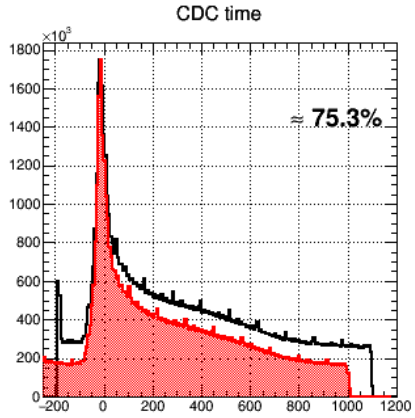

Δt between events
April 6, 2017 DL
git revision #d4f1445
runs 22062-22068
FCAL+BCAL trig1 only 58μm JD70-100, 5mm coll.
500nA : 140 kHz ( 34% LT)
400nA : 117 kHz ( 38% LT)
300nA : 86 kHz ( 51% LT)
200nA : 53 kHz ( 89% LT)
100nA : 26 kHz ( 99% LT)
δt (ms)
10FCAL+2BCAL > 18000

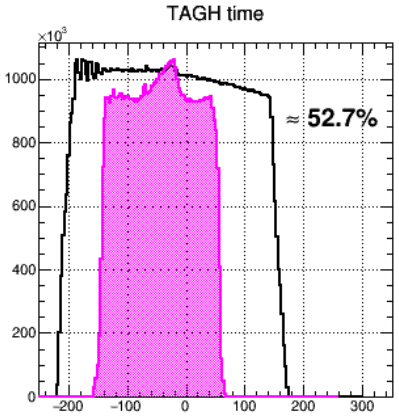

Δt between events
April 6, 2017 DL
git revision #d4f1445
runs 22062-22068
FCAL+BCAL trig1 only 58μm JD70-100, 5mm coll.
500nA : 86 kHz ( 28% LT)
400nA : 75 kHz ( 33% LT)
300nA : 58 kHz ( 46% LT)
200nA : 35 kHz ( 87% LT)
100nA : 18 kHz ( 99% LT)
δt (ms)
25FCAL+BCAL > 45000 (emulated)

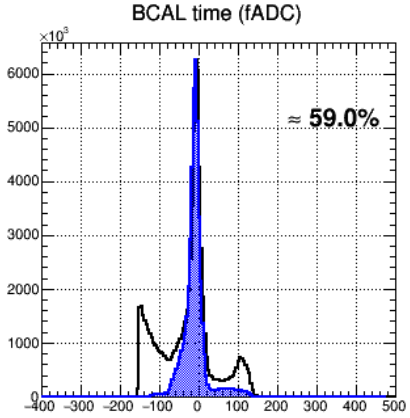

Δt between events
April 6, 2017 DL
git revision #d4f1445
runs 22102-22114
FCAL+BCAL trig1 only 58μm JD70-100, 5mm coll.
500nA : 3.8 kHz
400nA : 5.7 kHz
300nA : 4.3 kHz
200nA : 2.8 kHz
100nA : 1.4 kHz
50nA : 3.7 kHz
δt (ms)
25FCAL+BCAL > 45000


Single Crate Projection
April 13, 2017 DL
git revision #2b541c7
runs 22065-22068
58μm diamond, 5mm collimator
no header suppression
Single crate event size (kB/event)
Beam Intensity (γ/s on target)
×10^6
100nA
200nA
300nA
400nA
500nA (suspect)
TAGMH
TAGM
TAGH1
TOF1
TOF2
FDC1 (TDC)


Single Crate Projection
April 13, 2017 DL
git revision #2b541c7
runs 22065-22068
58μm diamond, 5mm collimator
no header suppression
Single crate data rate (MB/s)
Beam Intensity (γ/s on target)
×10^6
100nA
200nA
300nA
400nA



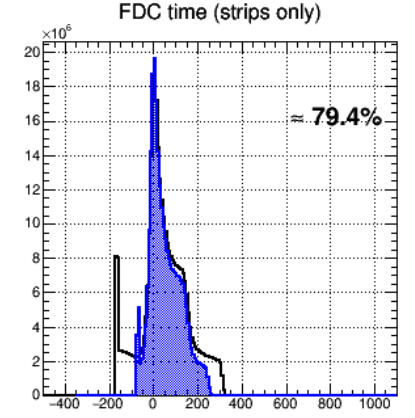



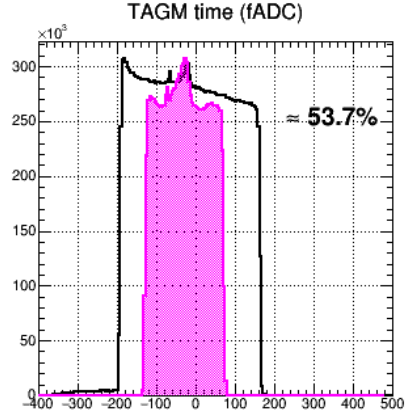

**Black line: run 11363**

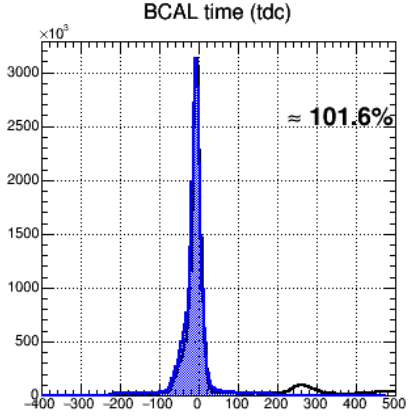
Spring 2016
400nA
20μm diamond
3.4mm coll.

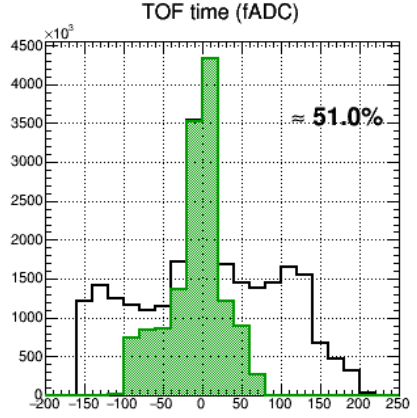
**Shaded: run 22068**

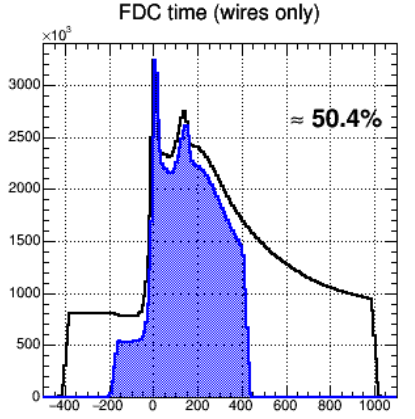
Fall 2016
100nA
58μm diamond
5mm coll.

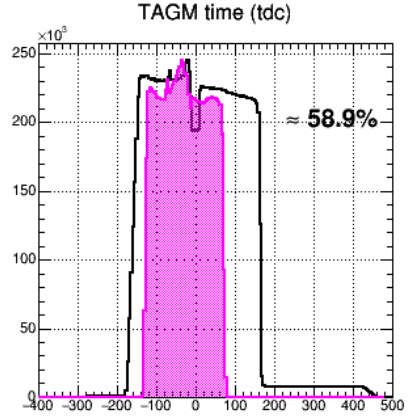


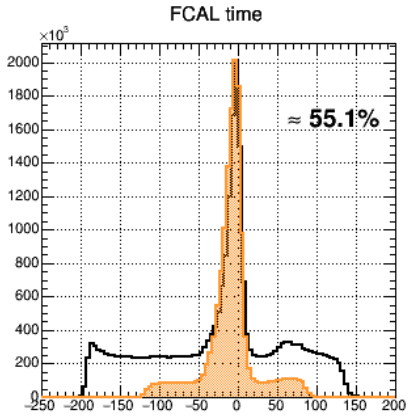



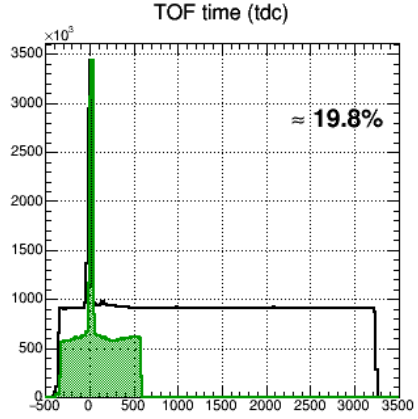



# Total trig1 Data Rate

April 13, 2017 DL
git revision #2b541c7
runs 22065-22068

58μm diamond, 5mm collimator

no header suppression

100nA
200nA
300nA
400nA
500nA (suspect)

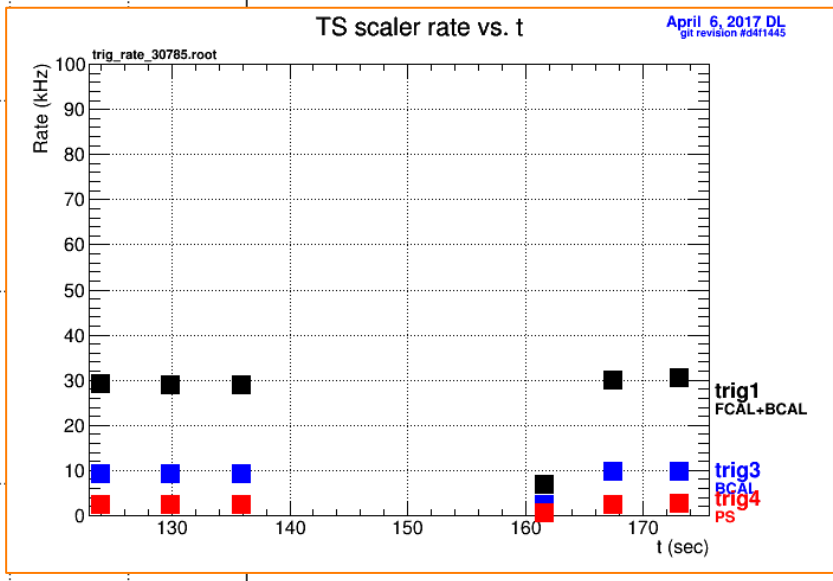
Justin PS analysis

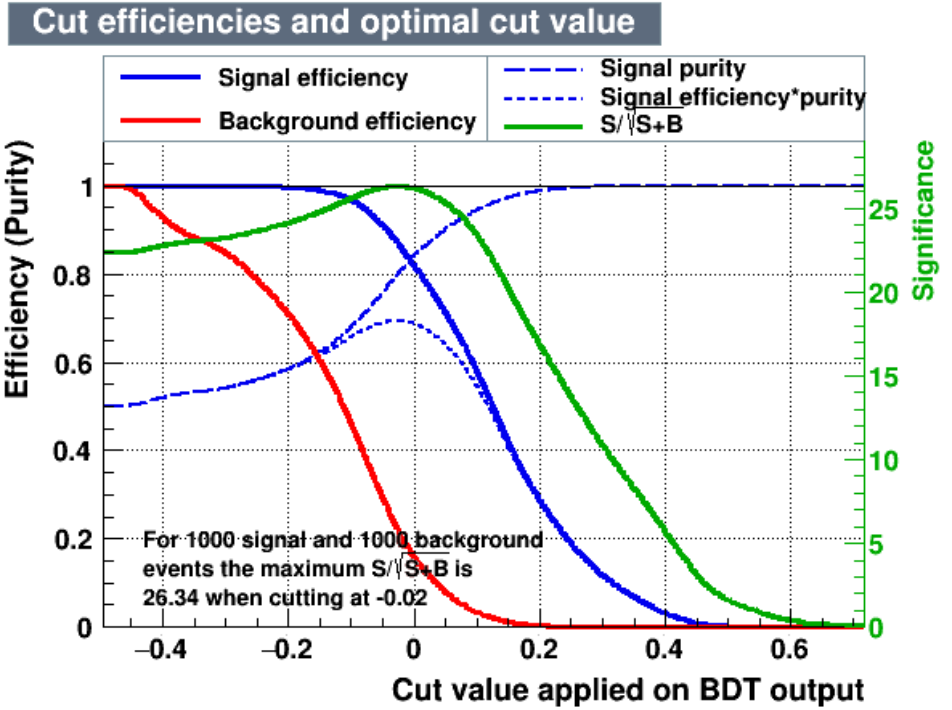
Richard calculator

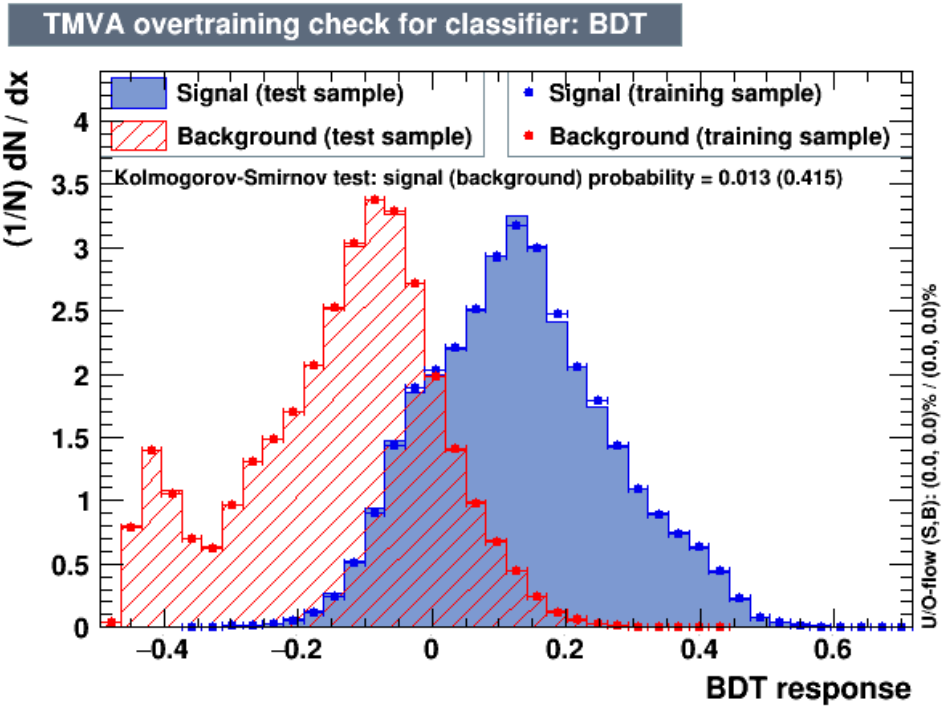
Data rate (GB/s)

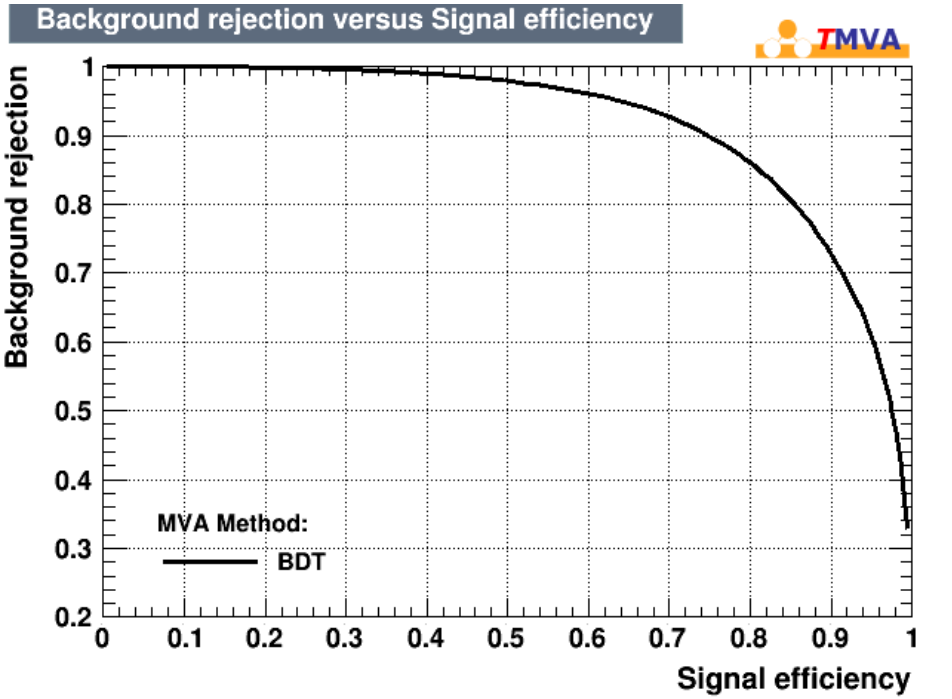
Beam Intensity (γ/s on target)

×10^6




Cut efficiencies and optimal cut value
Signal efficiency
Background efficiency
Signal purity
Signal efficiency*purity
S/√S+B
Efficiency (Purity)
Significance
For 1000 signal and 1000 background events the maximum S/√S+B is 26.34 when cutting at -0.02
Cut value applied on BDT output


TMVA overtraining check for classifier: BDT
Signal (test sample)
Background (test sample)
Signal (training sample)
Background (training sample)
Kolmogorov-Smirnov test: signal (background) probability = 0.013 (0.415)
(1/N) dN / dx
U/O-flow (S,B): (0.0, 0.0)% / (0.0, 0.0)%
BDT response


Background rejection versus Signal efficiency
TMVA
Background rejection
MVA Method:
BDT
Signal efficiency

# BDT training on Run 30661

| Rank | Variable | Variable Importance |
|---|---|---|
| 1 | Efcal_clusters | 8.799e-02 |
| 2 | NDNeutralParticle | 5.119e-02 |
| 3 | NDTrackTimeBased | 5.023e-02 |
| 4 | Ebcal_clusters | 3.782e-02 |
| 5 | NDChargedTrack | 3.713e-02 |
| 6 | NDf125FDCPulse | 3.470e-02 |
| 7 | NDBCALPoint | 2.862e-02 |
| 8 | NDBCALCluster | 2.798e-02 |
| 9 | NDf250PulseData | 2.676e-02 |
| 10 | Ebcal_points | 2.643e-02 |
| 11 | NFDCCathodes_package4 | 2.575e-02 |
| 12 | NDFCALCluster | 2.505e-02 |
| 13 | Rfcal_max | 2.290e-02 |
| 14 | NDF1TDCHit | 2.262e-02 |
| 15 | NDTrackWireBased | 2.118e-02 |
| 16 | NDBCALTDCDigiHit | 2.051e-02 |
| 17 | NDBCALDigiHit | 1.995e-02 |
| 18 | trig_mask | 1.886e-02 |
| 19 | NFDCCathodes_package1 | 1.757e-02 |
| 20 | Esc_tot | 1.482e-02 |
| 21 | NCDC_superlayer1 | 1.344e-02 |
| 22 | NDFCALDigiHit | 1.288e-02 |
| 23 | NDTrackCandidate | 1.249e-02 |
| 24 | NFDCCathodes_package2 | 1.197e-02 |
| 25 | NCDC_superlayer2 | 1.196e-02 |
| 26 | NDTOFHit | 1.097e-02 |
| 27 | NDSCHit | 1.087e-02 |
| 28 | Rfcal_min | 1.083e-02 |
| 29 | Nbeam_photons_3_4 | 1.053e-02 |
| 30 | NFDCwires_package1 | 1.053e-02 |
| 31 | NDSCDigiHit | 1.043e-02 |
| 32 | NTOF_half_width | 1.016e-02 |
| 33 | NFDCwires_package4 | 1.006e-02 |
| 34 | NDTOFPoint | 9.639e-03 |
| 35 | NDFDCWireDigiHit | 9.621e-03 |
| 36 | NFDCCathodes_package3 | 9.411e-03 |
| 37 | NDTAGMDigiHit | 9.017e-03 |
| 38 | Nbeam_photons_4_5 | 8.657e-03 |
| 39 | NDSCTDCDigiHit | 8.602e-03 |
| 40 | Etof_tot | 8.596e-03 |
| 41 | NTOF_half_length | 8.418e-03 |
| 42 | NFDCwires_package3 | 8.357e-03 |
| 43 | Nbeam_photons_9_10 | 8.335e-03 |
| 44 | NDTAGHDigiHit | 8.119e-03 |
| 45 | NDTAGHTDCDigiHit | 8.032e-03 |
| 46 | NDTOFDigiHit | 7.972e-03 |
| 47 | NFDCwires_package2 | 7.958e-03 |
| 48 | Nbeam_photons_8_9 | 7.758e-03 |
| 49 | NCDC_superlayer4 | 7.538e-03 |
| 50 | NDCAEN1290TDCHit | 7.475e-03 |
| 51 | Nbeam_photons_11_12 | 7.403e-03 |
| 52 | NDf125CDCPulse | 6.936e-03 |
| 53 | NDPSDigiHit | 6.550e-03 |
| 54 | Nbeam_photons_6_7 | 6.505e-03 |
| 55 | NDTOFTDCDigiHit | 6.403e-03 |
| 56 | NDTAGMTDCDigiHit | 6.379e-03 |
| 57 | NCDC_superlayer3 | 6.359e-03 |
| 58 | Nbeam_photons_coherent | 6.345e-03 |
| 59 | Nbeam_photons_10_11 | 6.074e-03 |
| 60 | NDCDCDigiHit | 5.981e-03 |
| 61 | Nbeam_photons_7_8 | 5.974e-03 |
| 62 | NDBeamPhoton | 5.965e-03 |
| 63 | Nbeam_photons_5_6 | 5.883e-03 |
| 64 | NCDC_superlayer5 | 5.269e-03 |
| 65 | NDTPOLSectorDigiHit | 3.289e-03 |
| 66 | NDFDCCathodeDigiHit | 0.000e+00 |
| 67 | NDPSCTDCDigiHit | 0.000e+00 |
| 68 | NDPSCDigiHit | 0.000e+00 |
| 69 | NDNeutralShower | 0.000e+00 |
| 70 | fp_trig_mask | 0.000e+00 |
| 71 | Ptot_candidates | 0.000e+00 |