Measurement of AP&CT probabilities

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Electronics Simulation & Vinogradov

1 PE at t0 can induce:

- Direct Cross Talks (DiCT): at t0 with mean number = mu
- {0,1} After Pulse (AP) at t1 + t0

DiCT and AP can induce in turn DiCT and AP

Since AP are delayed, we can study the statistics of all hits at t0 only, and then repeating the procedure for all hits at t1 + t0, and so on.



We can treat hits at different times as independent events

Electronics Simulation & Vinogradov

If the mean number of CTs for each PE is mu, we expect an **effective mean value** due to the CTs induced by CTs themselves as **mu_eff = mu / (1 - mu)**

Up to now, we have treated the statistics of CTs as **Poisson(mu/(1 - mu))**, but this is wrong.

We have tested it with a toy MC



Laser Runs

Procedure

- (1) Fit of laser spectra
- (2) Integral of each peak
- (3) Fill pe spectra



Since we trigger on laser, no possibility to induce AP/CT when no laser photon is detected

npe = 0 is a direct measurement of laser occupancy:

=> f = # 0 hits / # all hits = Exp(-mu) => **mu = log(1/f)**



Laser Runs

Data MC

10

10³

10²

10

pe

ululululululu

0.2

0.16

0.18 CT mean number [pe]

9

0.3 Laser Poisson statistics is fixed by bin in 0 pe 0.25 The difference between data and 0.2 without AP/CT simulation is due to AP and CT 0.15 Fit of CT mean number and AP probability 0.1 with toy MC (scan + minimization) 0.05 1 2 З 0.35 0.24 probability Data 0.22 0.3 MC 0. AP 0.18 0.25 0.16 0.2 0.14 with AP/CT 0.12 0.15 0.1 0.08 0.1 0.06 0.05 0.04 0.02 0 10 2 8 0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 pe

0.35

Laser Runs



²⁴¹Am Source Runs

Resolutions suffer from geometrical effects



We need field-on runs for different Vbias

²⁴¹Am Source Runs

Matching the energy scale

Matching the resolution



²⁴¹Am Source Runs

Sum of all channels corrected for TBA



xy response

²⁴¹Am at different phi angles



Conclusions

- Direct measurement of AP, CT, and PDE
- PDE increases with Vbias but slower than AP and CT
- 241 Am resolution not yet fully understood
- Likely, there is an xy geometrical effect to account for