

***Displaced Photon
Background
Update***

October 11, 2012

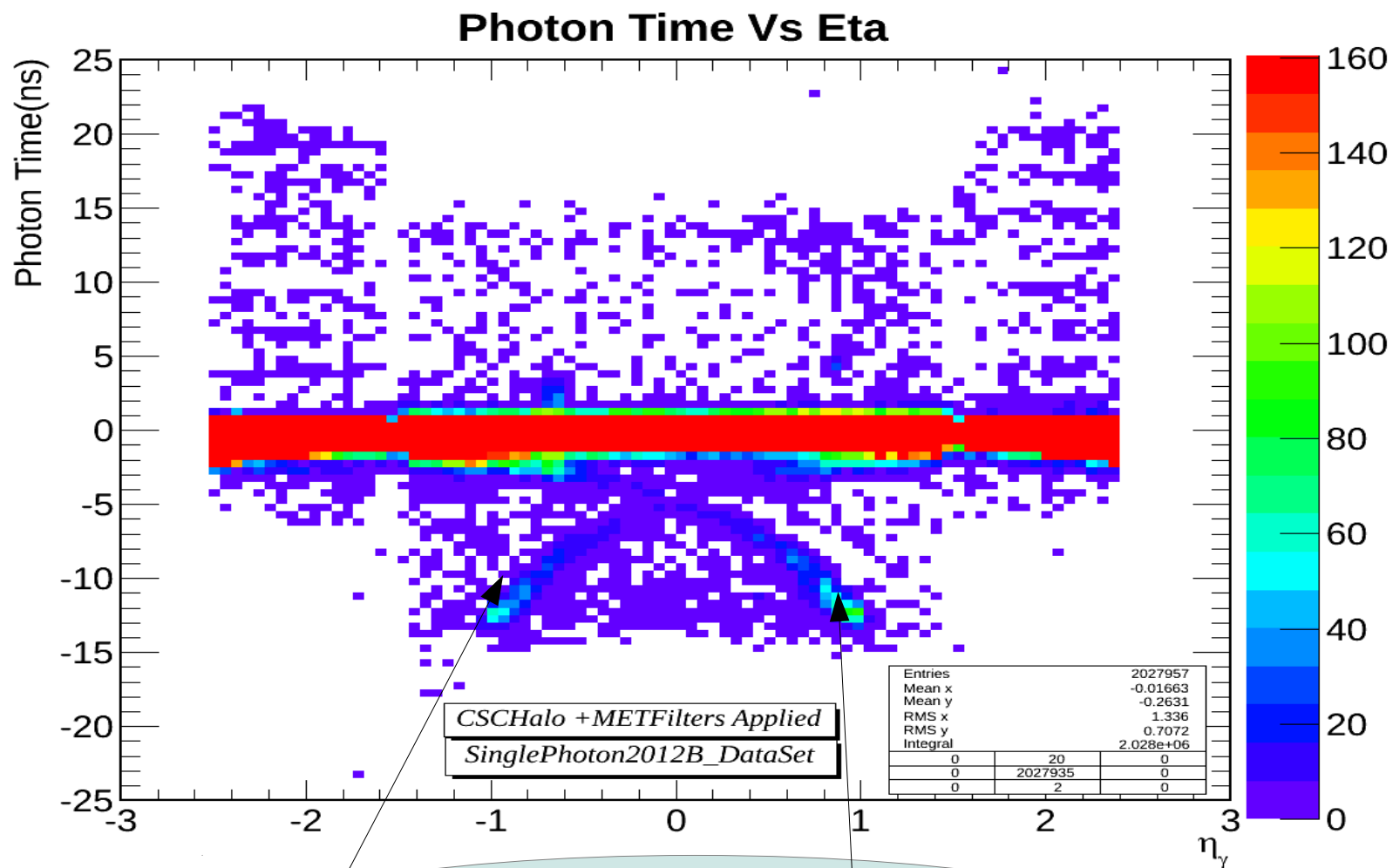
Data Set & Triggers

- **DataSets:**
 - /SinglePhoton/Run2012C/Prompt-Reco V1&2
 - Int Lumi = 29632.1 mb
- **HLT Triggers:**
 - HLT :HLT_Photon50_CaloIdVL_IsoL
 - HLT_DisplacedPhoton65_CaloIdVL_IsoL_PFMET25

Event Selection

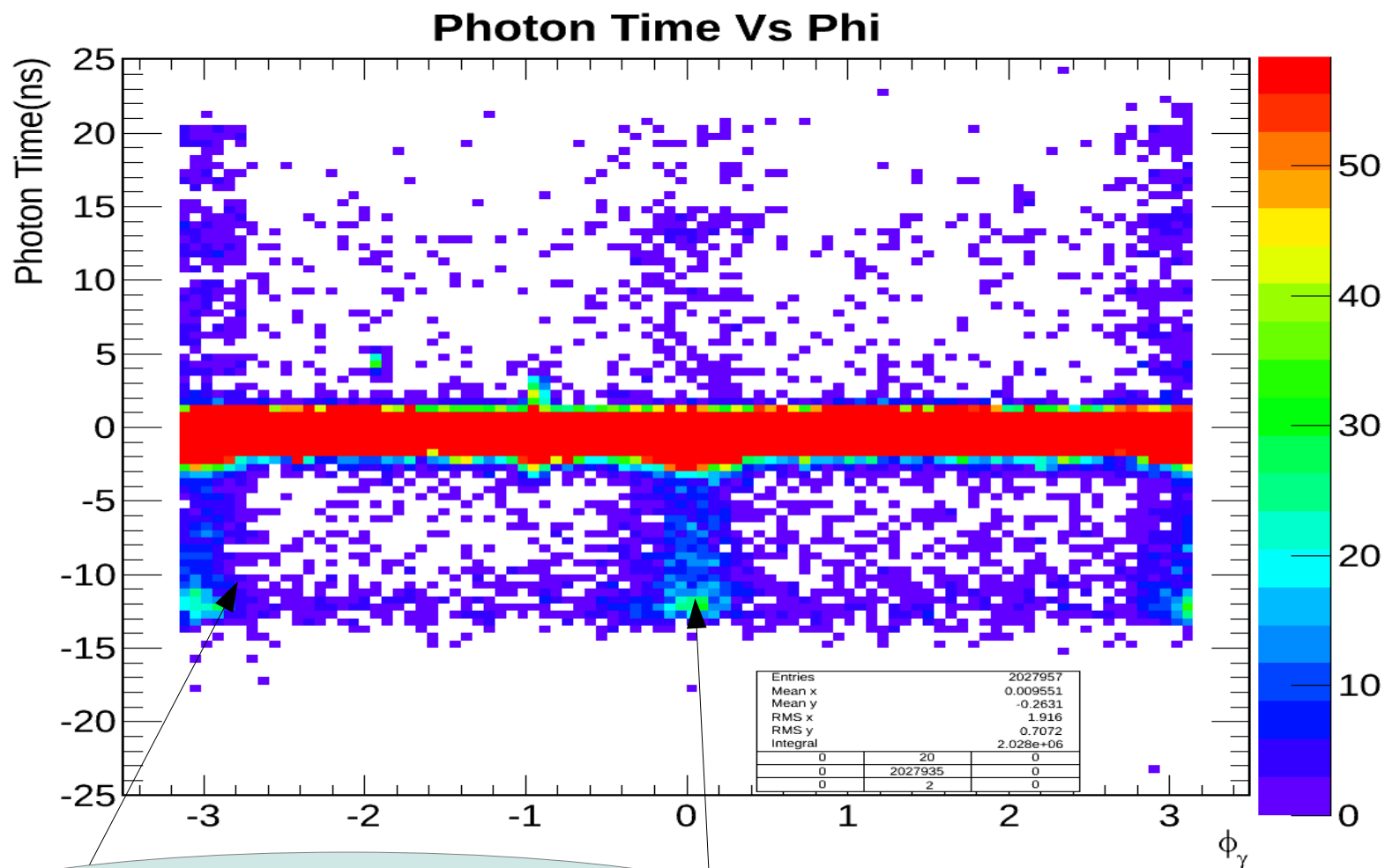
- **Selection 1:**
 - $\text{Gamma_Pt1}(2) > 60(45)\text{GeV}/c$
 - $|\eta| < 2.5, \text{Jet_pt} > 35 \text{ GeV}/c$
 - Egamma VL Iso cuts
 - CSC Segment $|\eta| > 1.6$
- **Selection 2:**
 - $|\eta| < 2.4, \text{Jet_pt} > 30\text{GeV}/c$
 - $0.15 < \text{Sminor} < 0.30, \text{Met} > 25 \text{ GeV}$
 - Halo tagged if $\text{dPhi}(\text{cscSeg}, \text{gamma}) < 0.6 + \text{ALL TightHaloID}(\text{CSC}, \text{Ecal}, \text{Hcal}, \text{Beam} \dots)$

What are these?



Cosmic Muons? Beam Halo Muons?

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Cosmic Muons? Beam Halo Muons?

ID Strategy

- **NOT NEW**

David Petyt : <https://indico.cern.ch/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=101219>

Andrew Askew: <https://indico.cern.ch/getFile.py/access?contribId=0&resId=0&materialId=slides&confId=189177>

- **Our Strategy:**

1) Use CSC Segment + CSC HaloTrack matching + BeamHaloCleaning (later slides).

2) Use shower shape(reducedRechits collection) (next step)

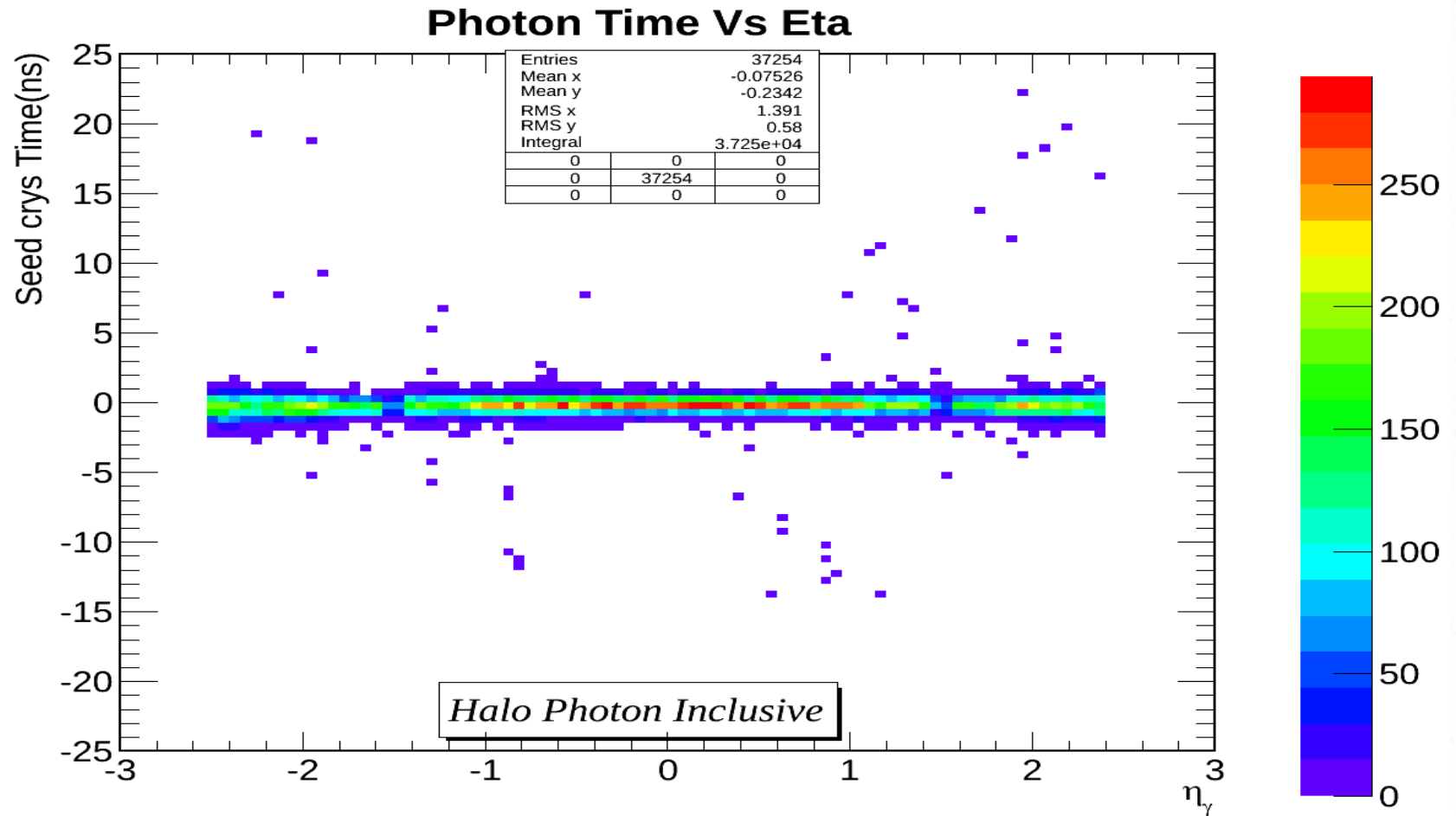
Definition

- Egamma Photon :
 - * Egamma Iso selection criteria + Sminor.
- Halo Photon :

Tag as HaloPhoton if either:

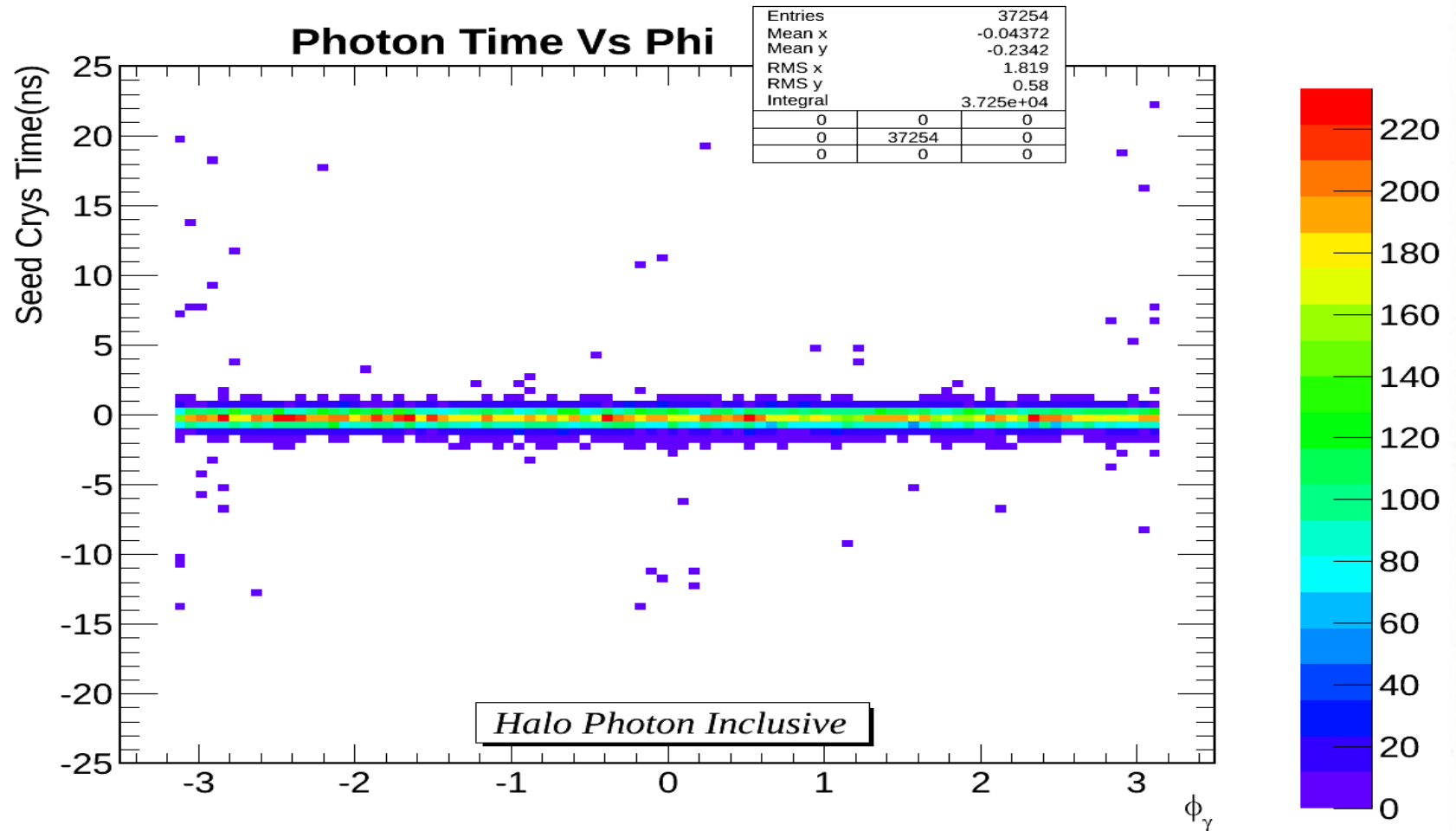
 - *CSC Segment matching: $d\phi(\text{cscsegment}, \text{gamma}) < 0.6$
 - * csc, Ecal, Hcal, Beam halo TightID
 - *CSC Track matching: $d\phi(\text{cscTrk} - \text{gamma}) < 0.18$

Results



- Limited statistics in 2012C dataset

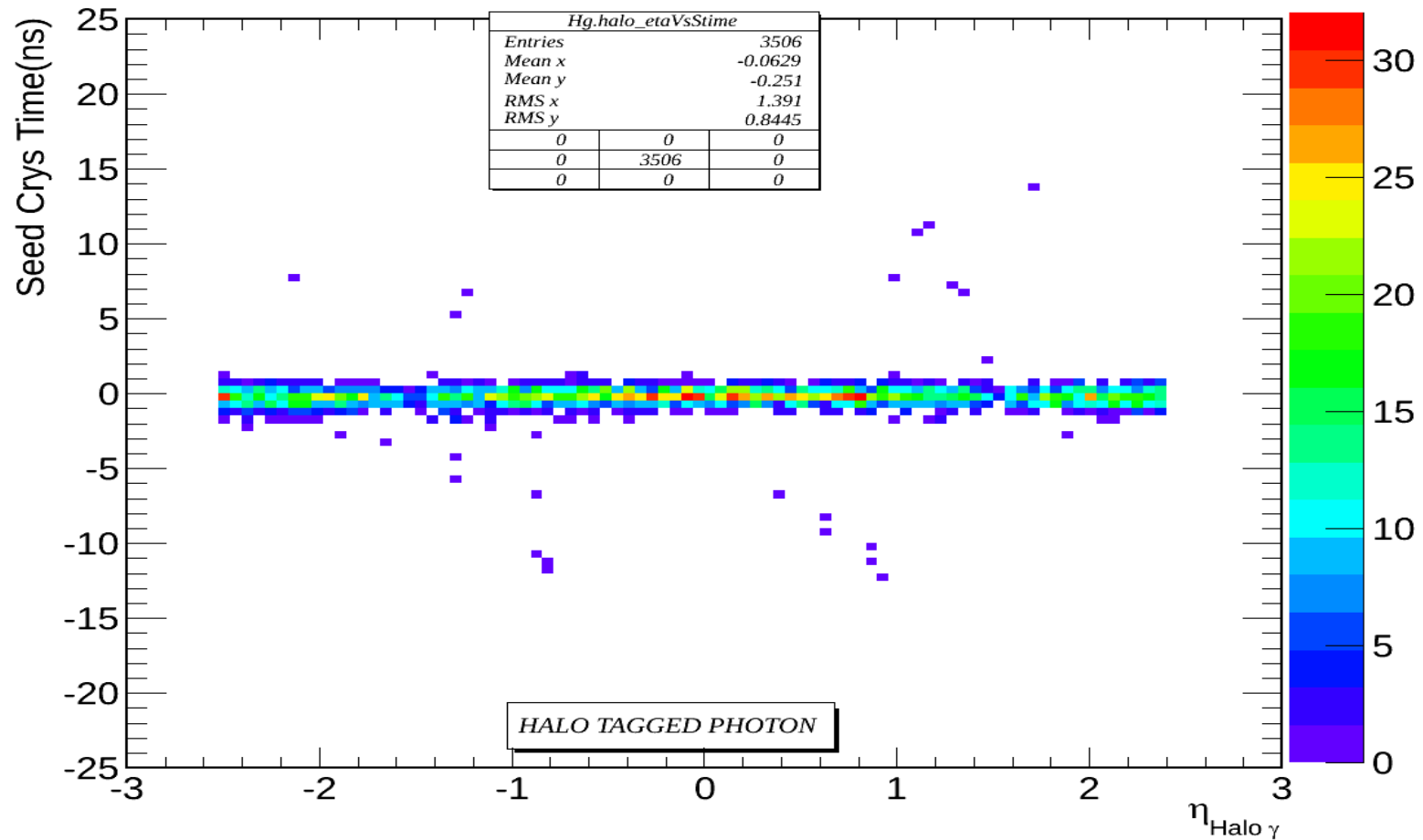
Results



- Limited statistics in 2012C dataset

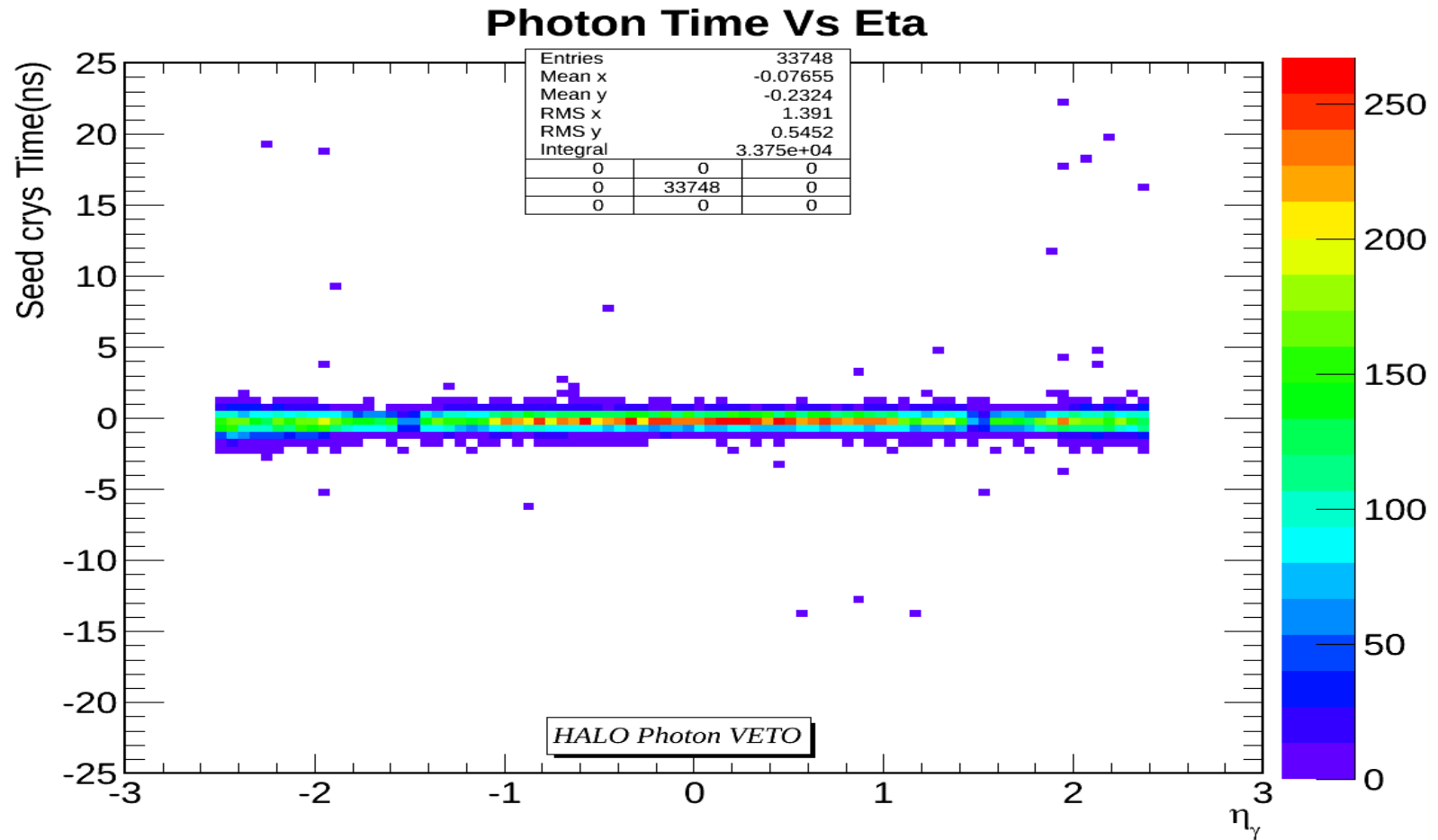
Results

Halo Photon Eta Vs Seed Xtal Time



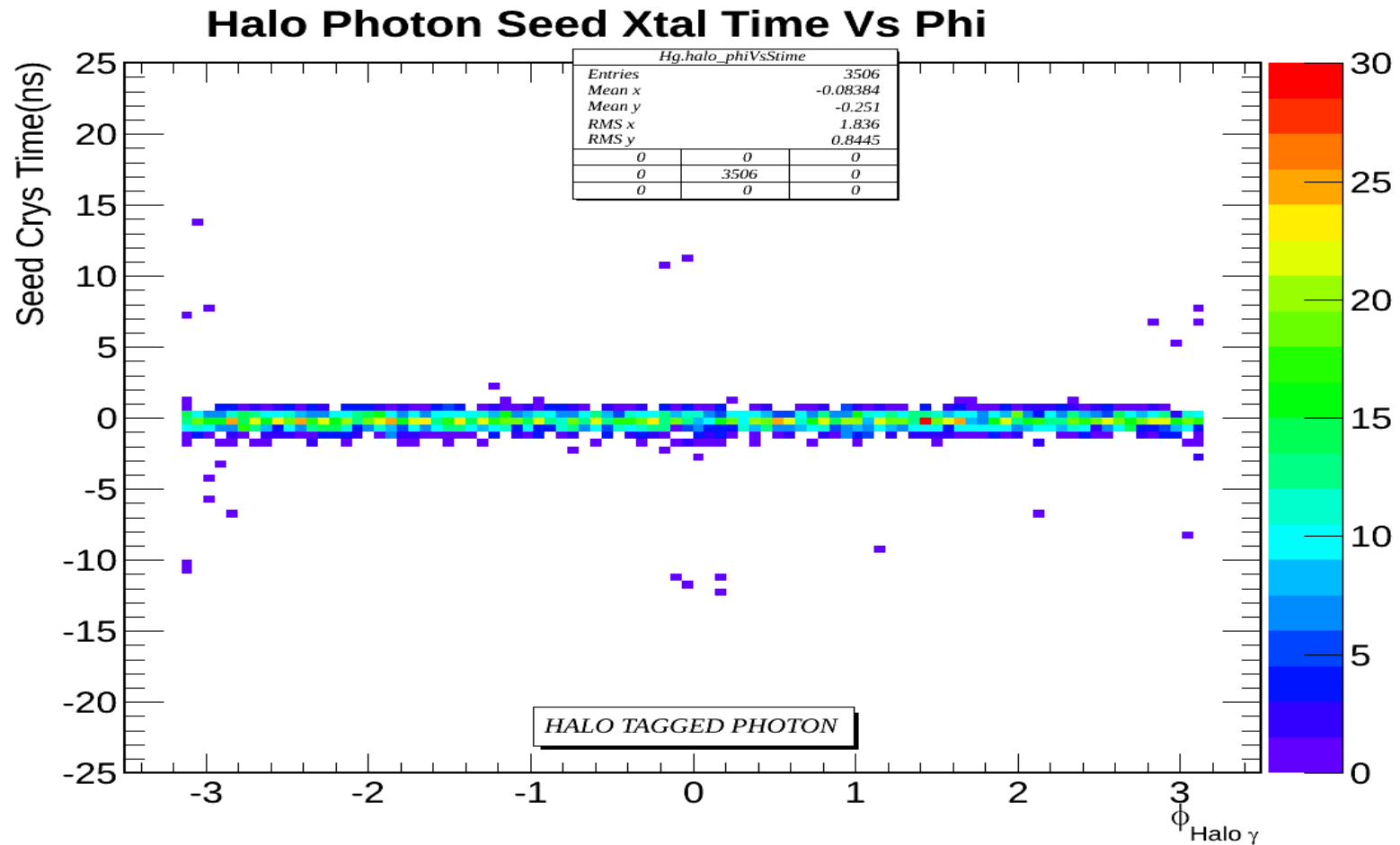
- Halo Tagged Photon

Results



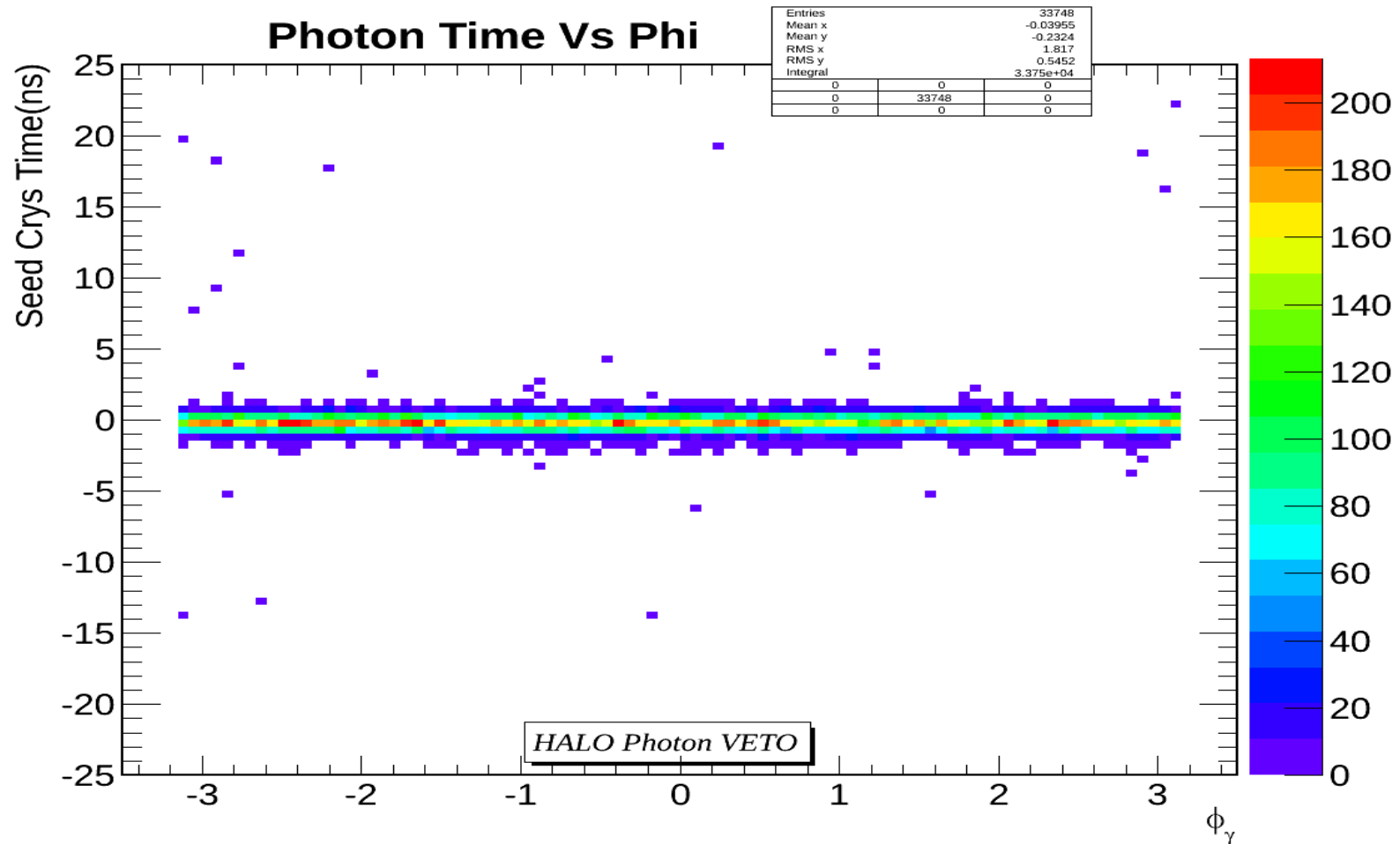
- Egamma (Real) Photon -(Halo photon removed)

Results



- Halo Tagged Photon

Results

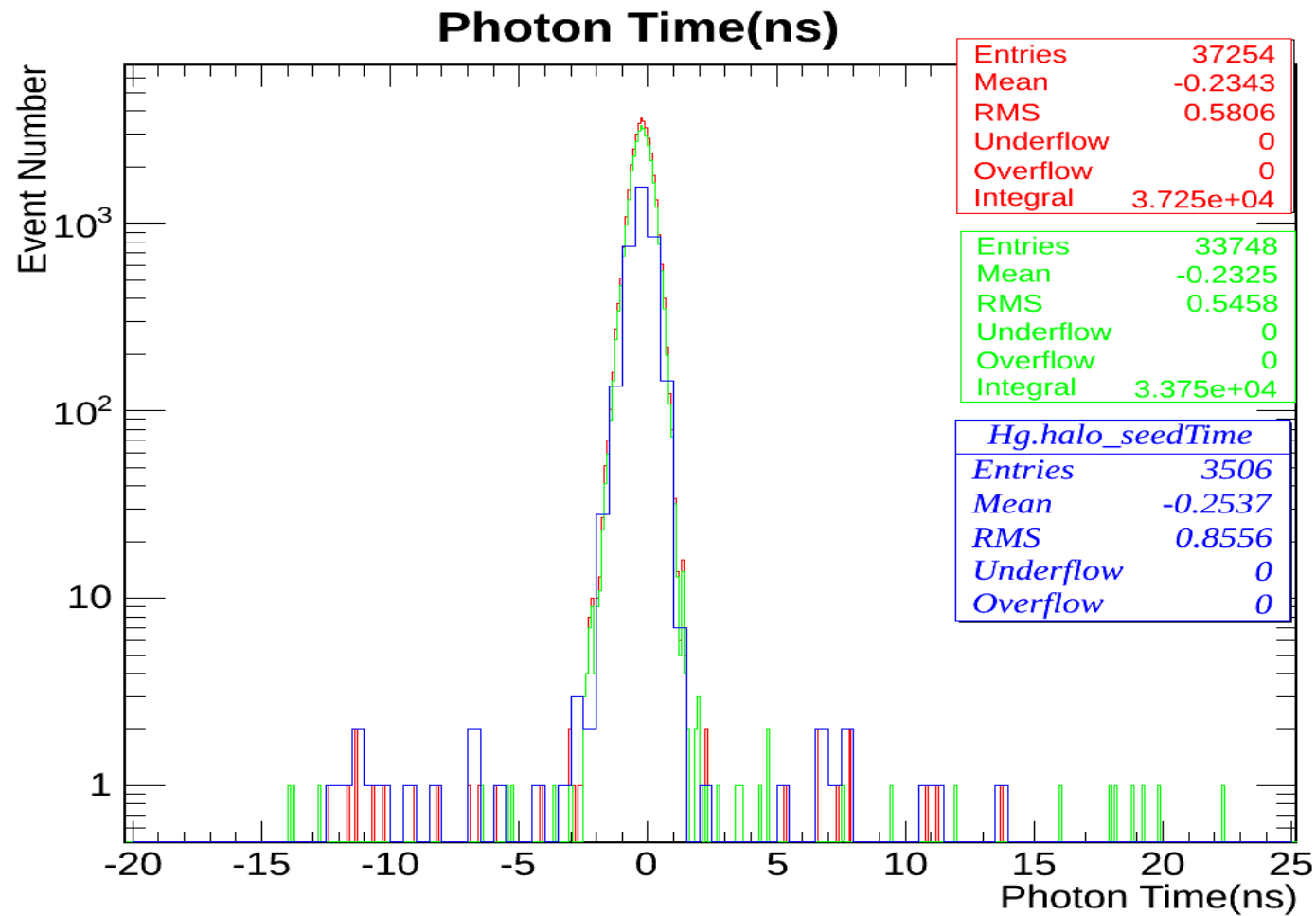


- Egamma (Real) Photon -(Halo photon removed)

Legend of Next slides

- **RED** = Combined Real + Halo Tagged Photon
- **GREEN** = Real Photon
- **BLUE/BLACK** = Halo Tagged Photon

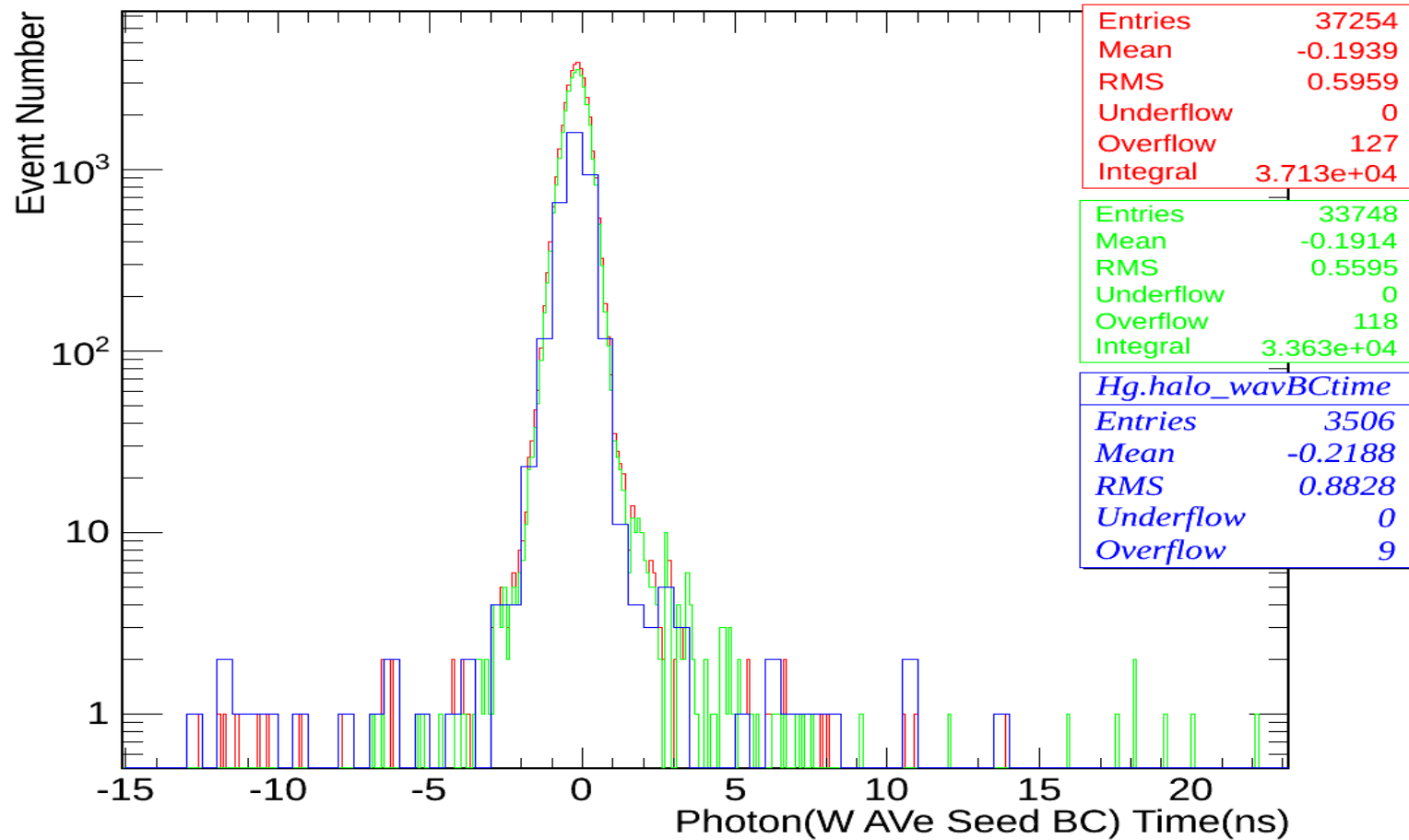
Results



- Seed crystal photon time.

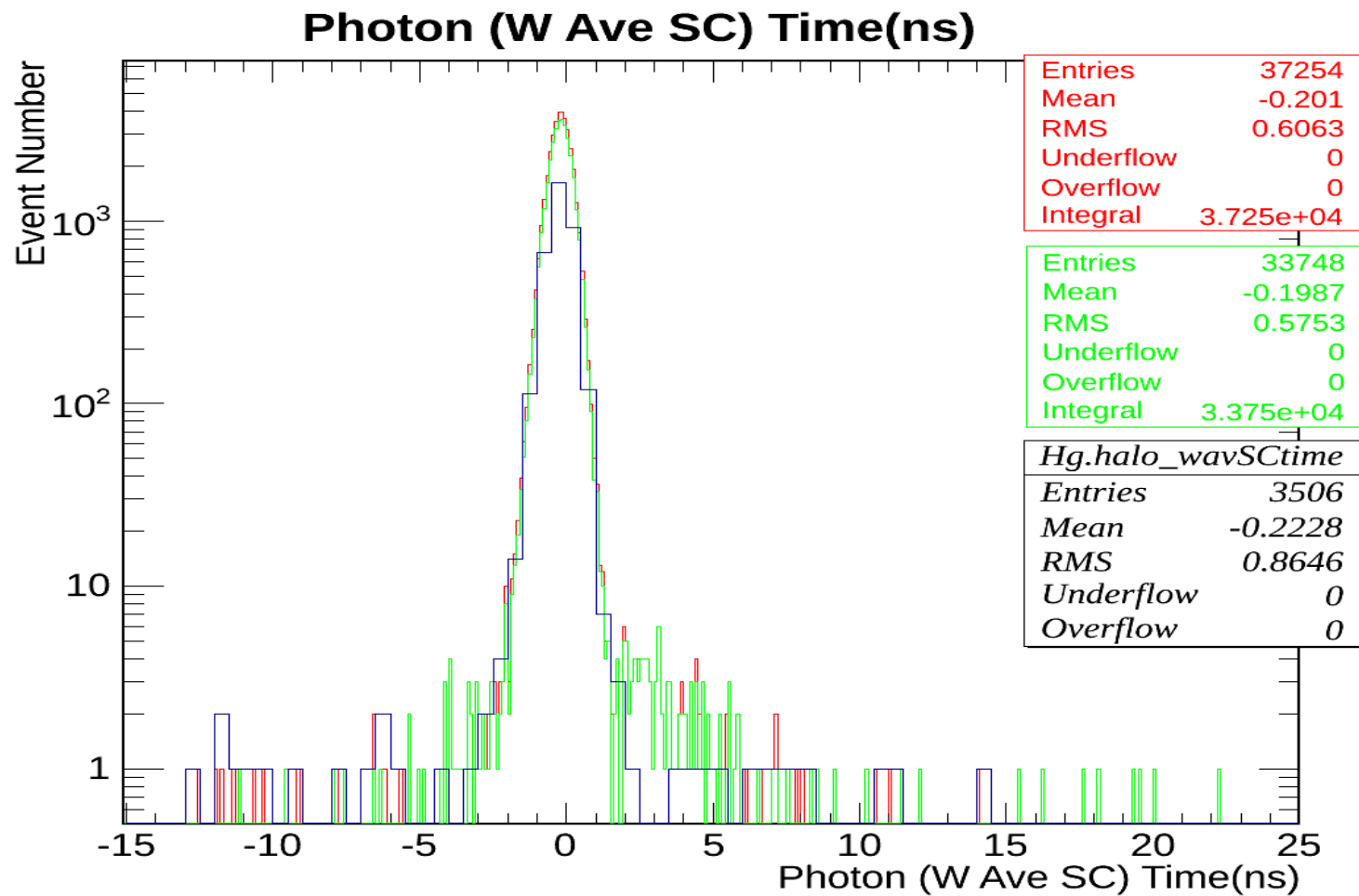
Results

Photon (W Ave Seed BC) Time(ns)



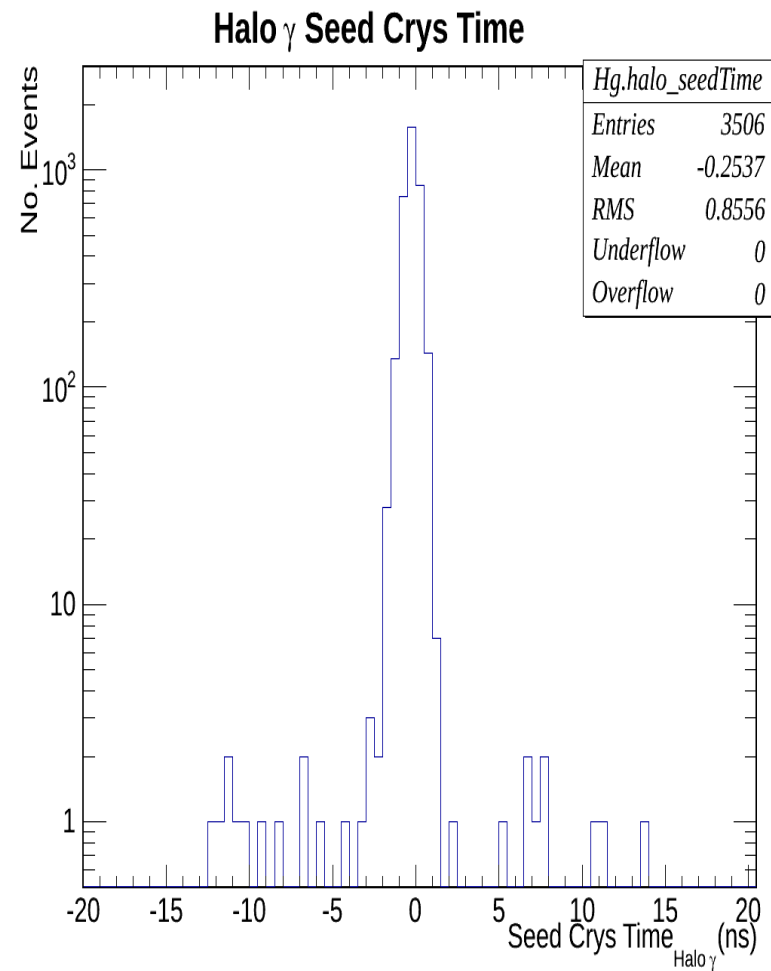
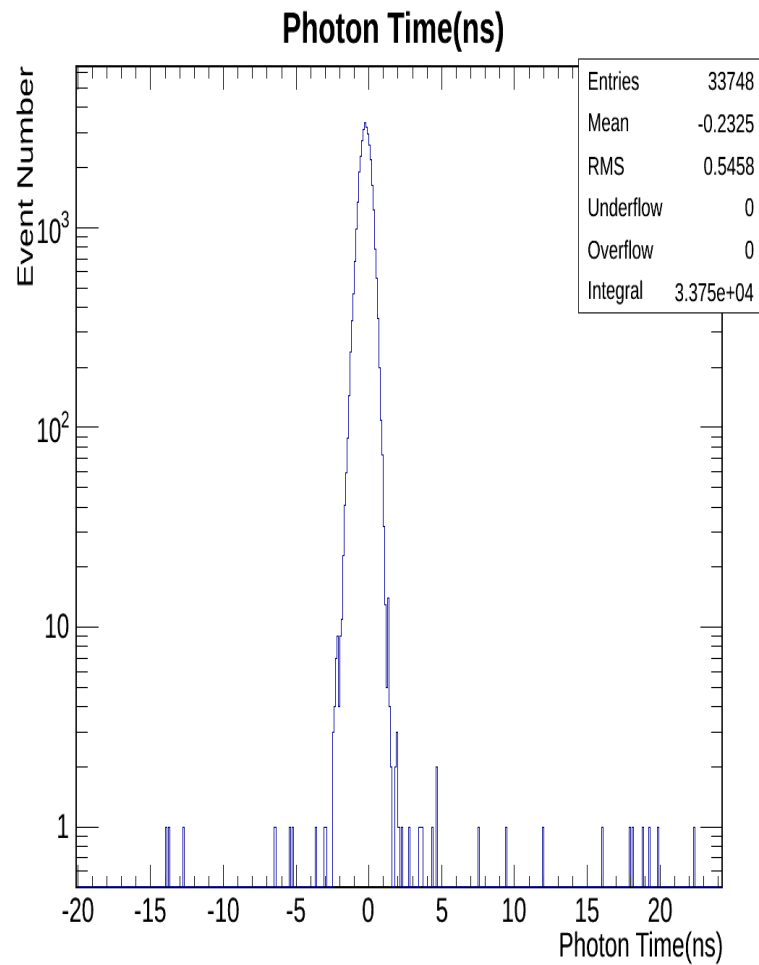
- W. Ave seed BC photon time.

Results



- W. Ave SC photon time.

Results



Real photon(left)

Vs

Halo photon(right)

Halo Rejection & Real Photon Selection Eff

	Before Selection	After Event Selection 1	After Event Selection 2	After Halo Tagging (real photons)	Halo Tagged Photons
Total number of events	22919173	3441614	37254	33748	3506

- After event selection 1 and halo tagging:
- Halo tagging efficiency : 9.04%
- Photo selection efficiency: 90.5%

Not dramatic but we could improve.

Conclusion

- CSC Segment tagging seems to be improving halo cleaning (9.0% rejection efficiency)
- Need to do better (SS or use reduceRechits)
- Run on 2012B dataset (with all its complication and find out what happens).
- Still have to debug why 2012C dataset has very low statistics(CRAB?).
- Do halo rejection/photon selection efficiency for $t < 0$, $t > 0$ and $t=0$ events or timing bin.