

# *Delayed Photon Bgd Studies Update*

*Sept 05 2012*

# ***DataSet & HLT***

- **Data Sets :**

- Run2012B/SinglePhoton/RECO/PromptReco-v1/
- Run2012B/PhotonHad/RECO/PromptReco-v1/

- **HLT Trigger**

- HLT\_DisplacedPhoton65\_CaloIdVL\_IsoL\_PF  
MET25
- HLT\_Photon50\_CaloIdVL\_IsoL\_

## *Event Selection*

- $\text{Pt\_Lead photon(Trailing)} > 70 \text{ (40) GeV/c} .$
- $|\text{Eta}| < 2.4 .$
- $0.15 < \text{Sminor} < 0.30 .$
- $\text{MET Offline (HLT)} > 0 \text{ (25) GeV}.$
- $\text{Pt\_Jet} > 30 \text{ GeV}.$
- Very Loose Iso Photon Criteria by Egamma.
- Events pass DP Trigger or AND Photon50 Trigger.



# *Addressing Anomalous Photons(AP)*

**Anomalous photon :**

## **I. Distribution is dataset dependent ?**

Photon\_Had2012B Vs Single\_Photon2012

## **II. Is mostly from large timing photons?**

Look at Eta and Phi of photons with time < -10.0 ns & time > 10.0ns

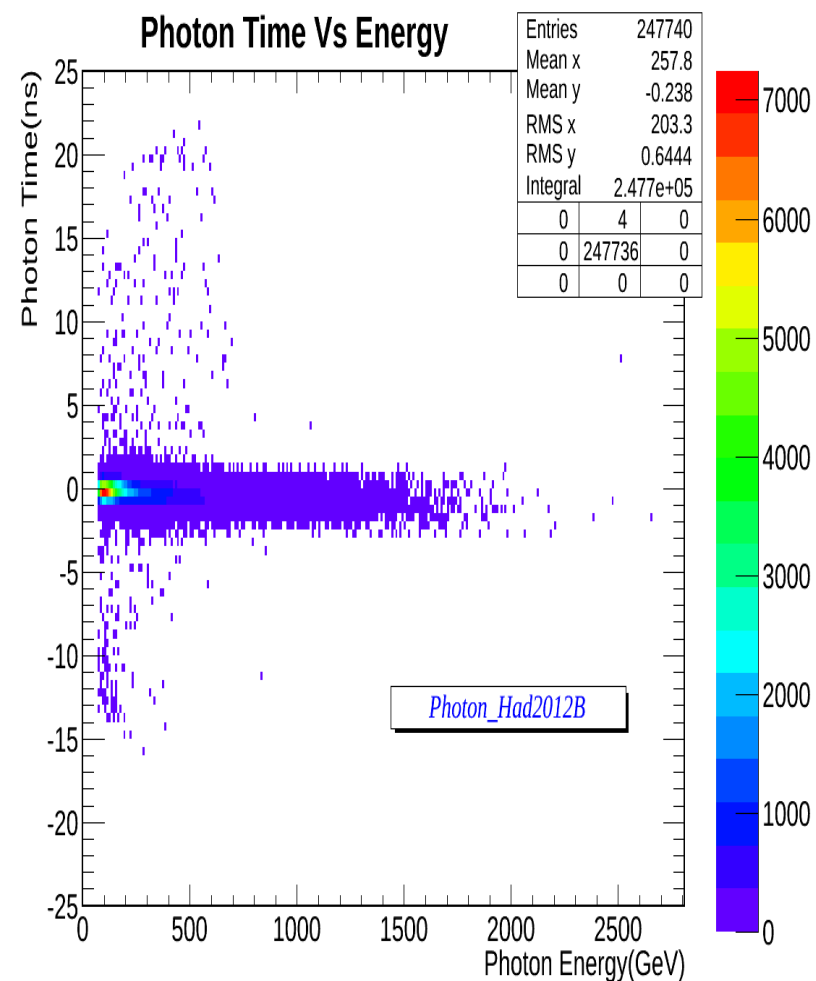
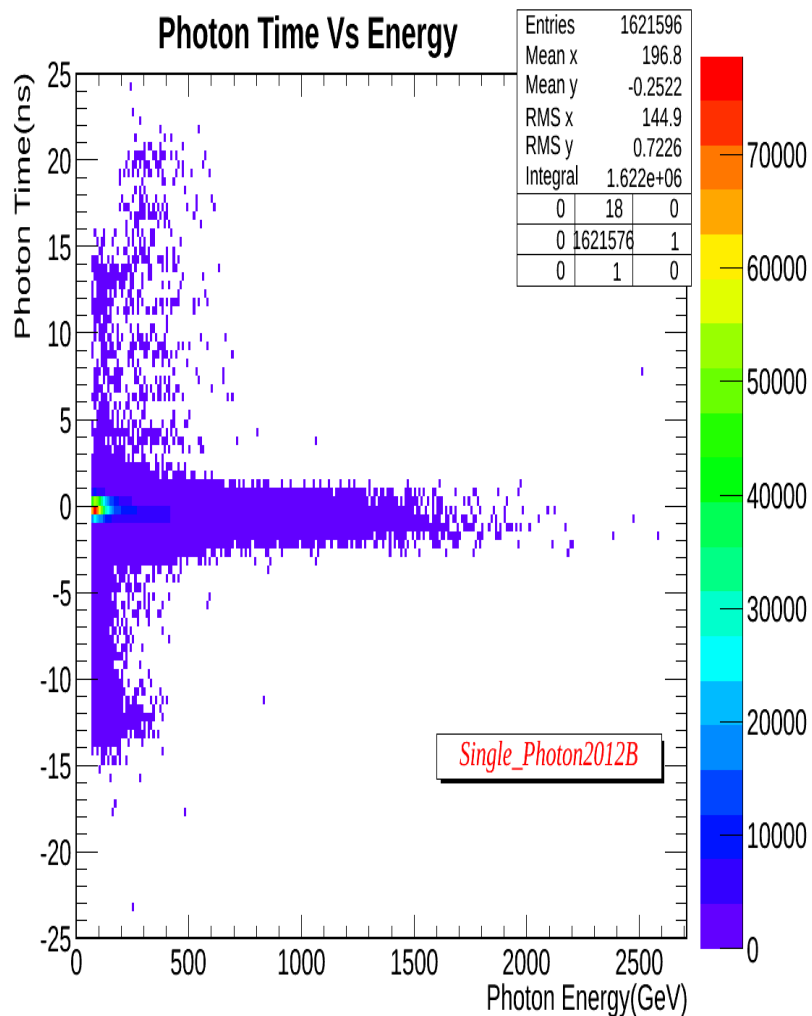
## **III. Is jet multiplicity dependent ?**

Look at photon time for different number of jets events.

# *1) Data Set Dependence:*

*Single\_Photon2012B Vs  
Photon\_Had 2012B DataSet.*

# Data Set Dependence?



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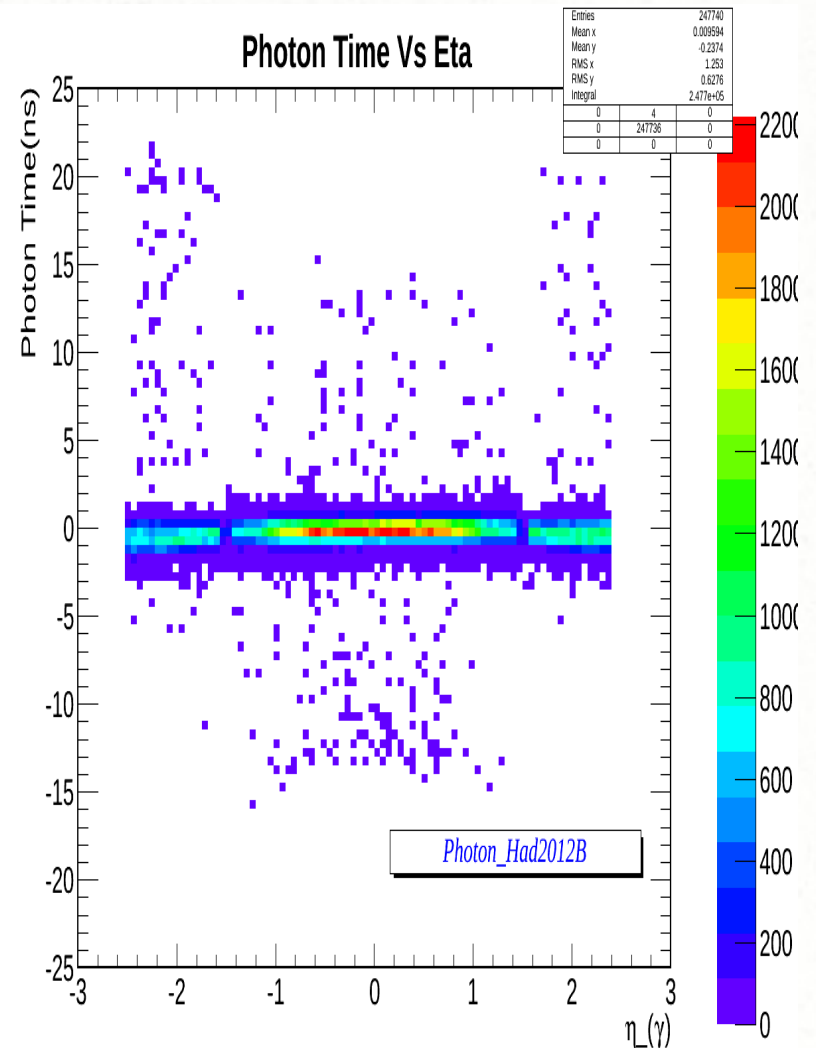
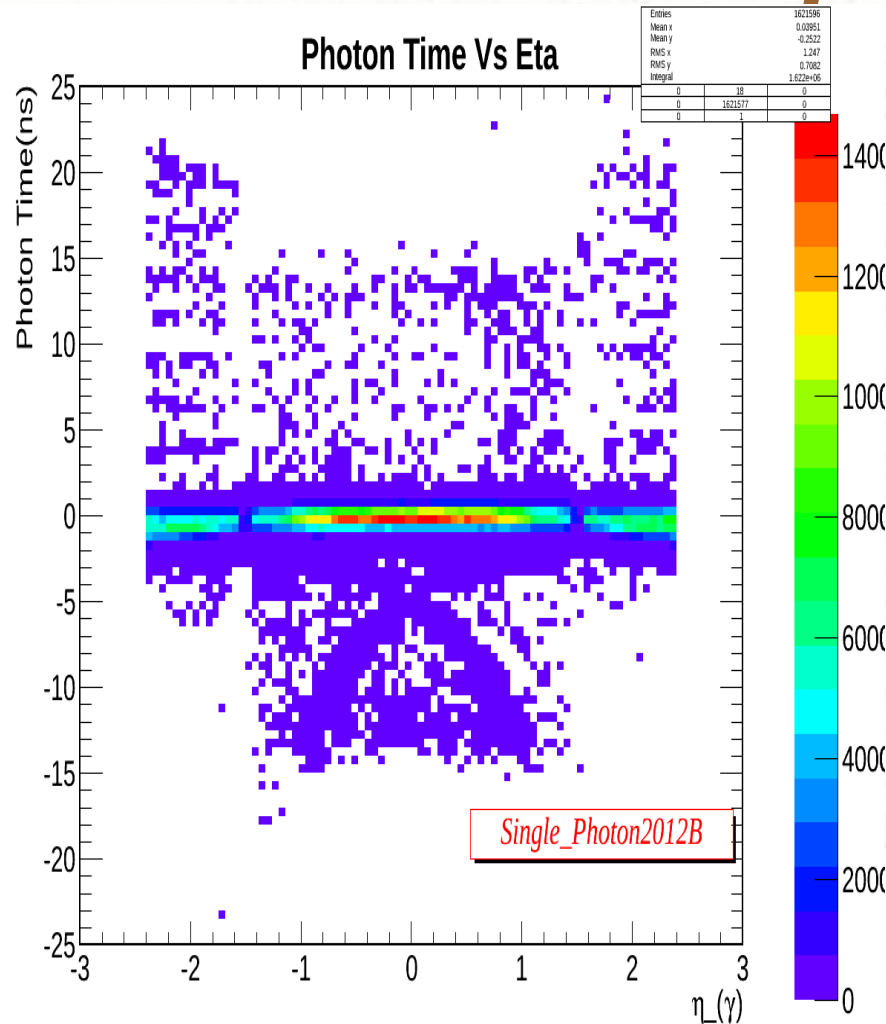
- Many early photons.

1 EN

6



# Data set Dependence?

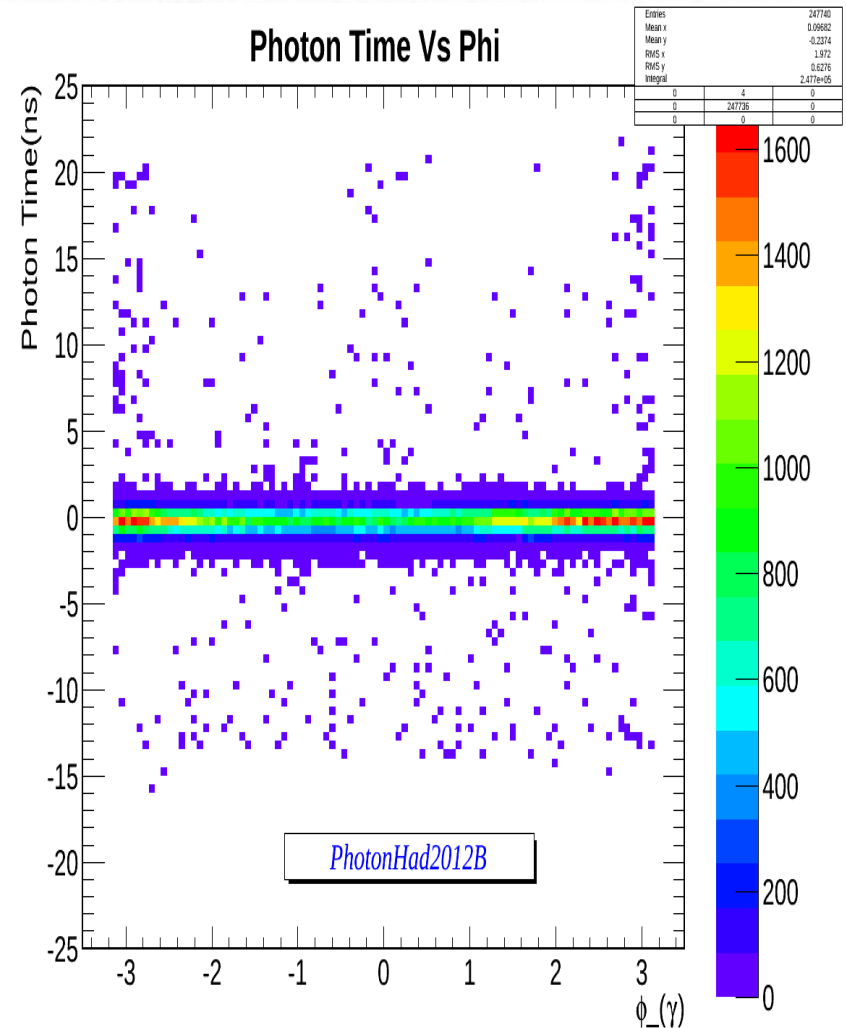
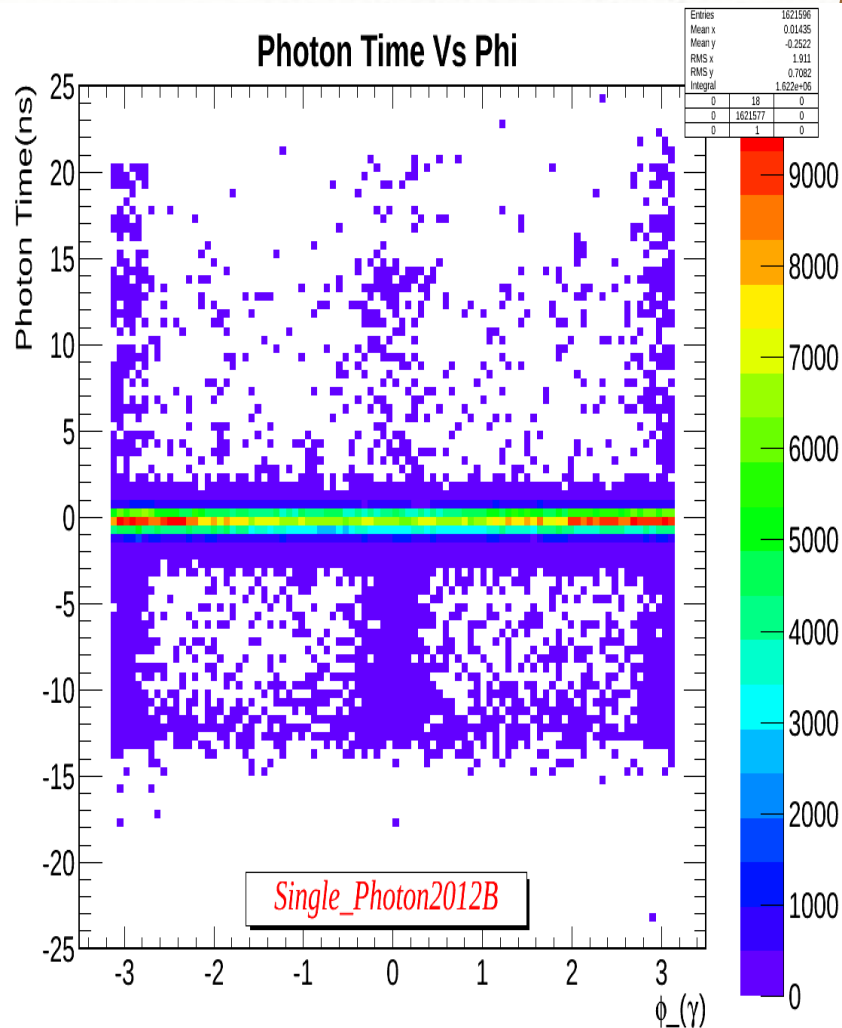


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- A “strange” structure in early photons!

# Data set Dependence?



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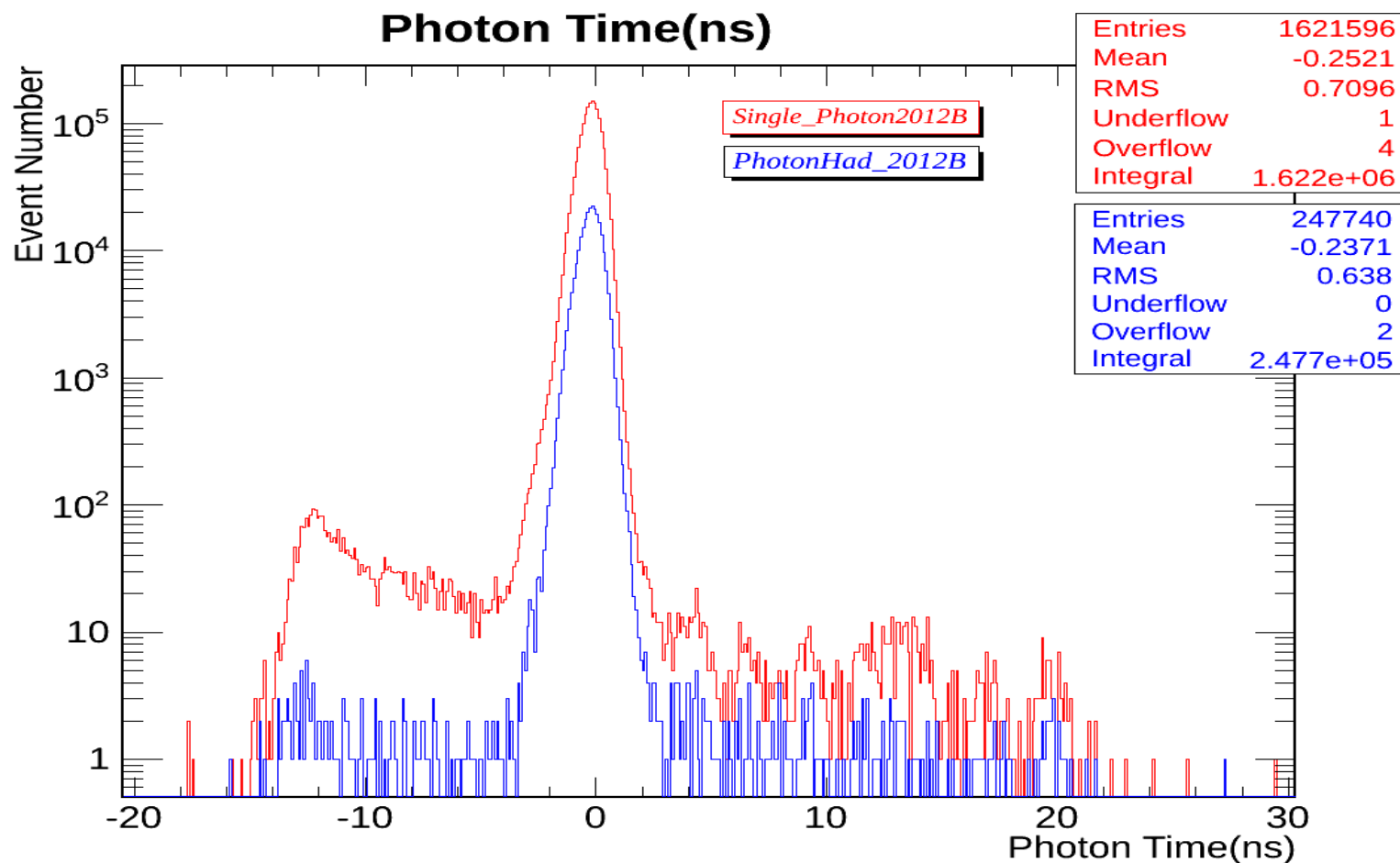
1 EN

8



# *Data set Dependence?*

## *Photon time*



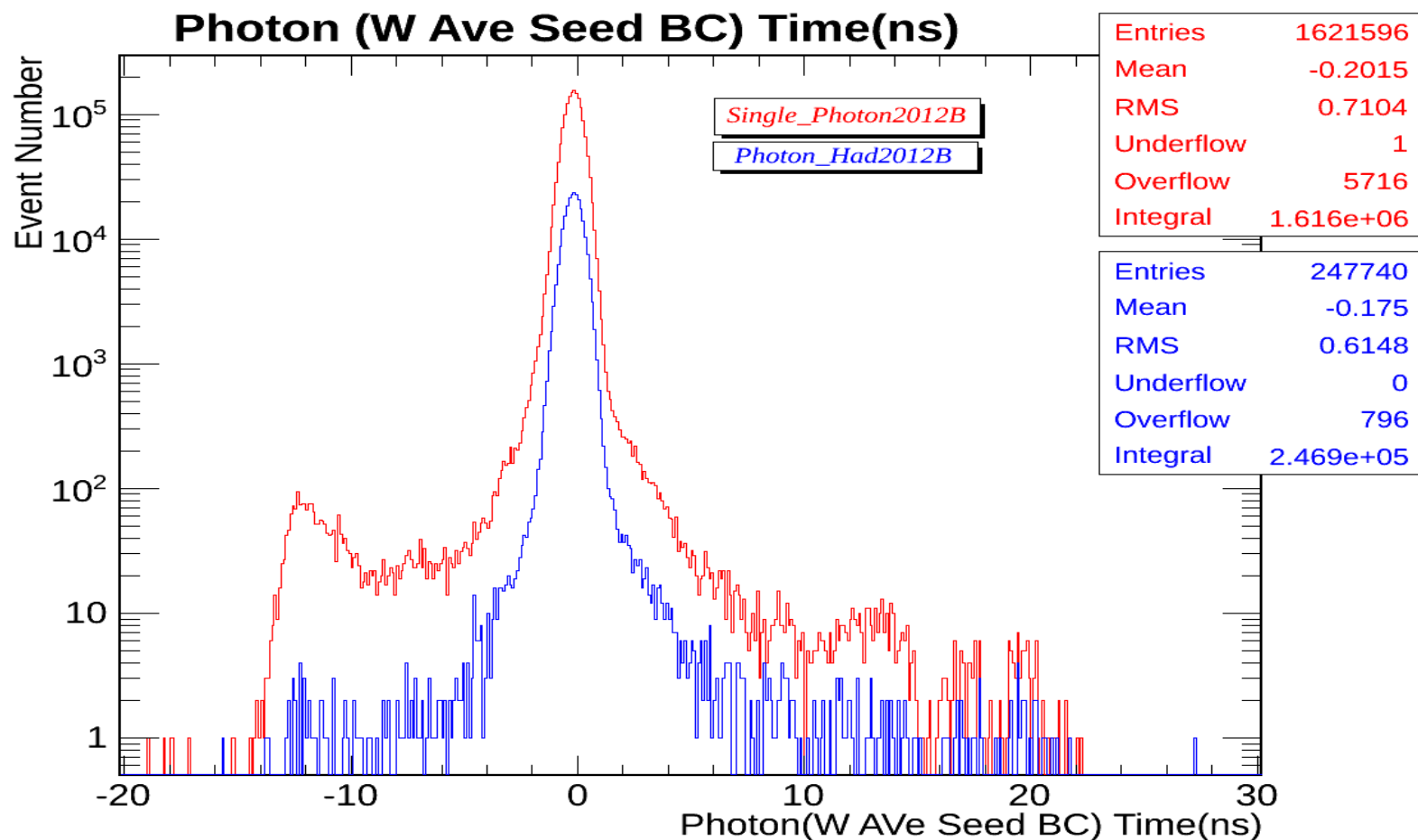
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Anomalous signal on both datasets.

# *Data set Dependence?*

## *Photon time*



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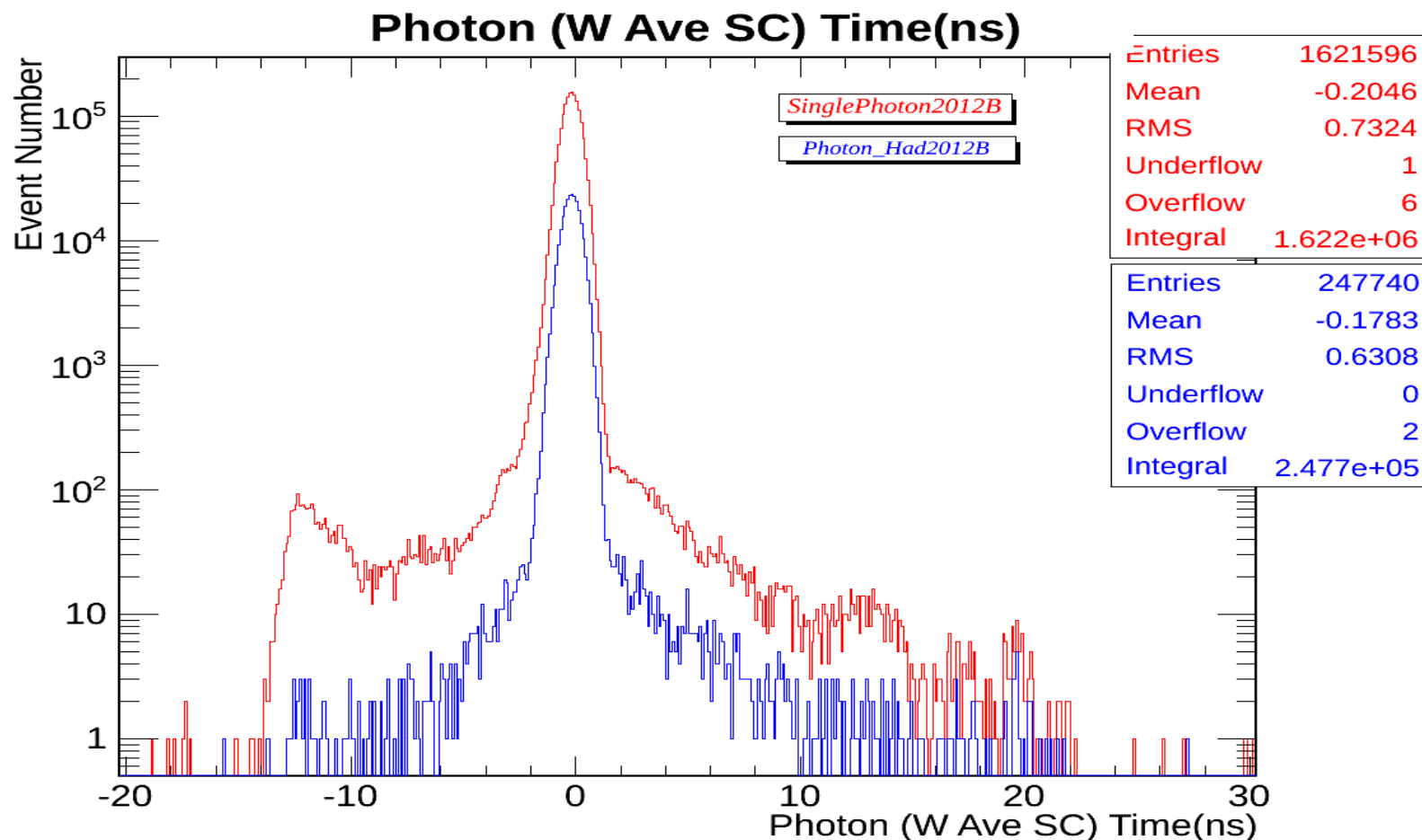
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Anomalous signal on both datasets.

10

# *Data set Dependence?*

## *Photon time*



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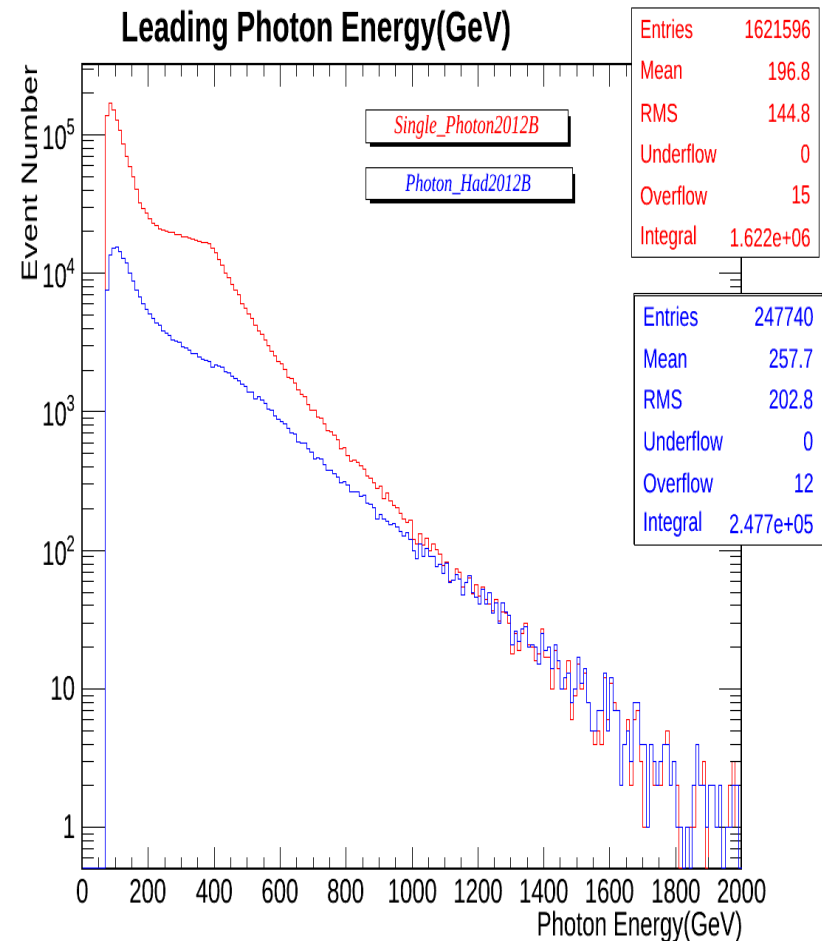
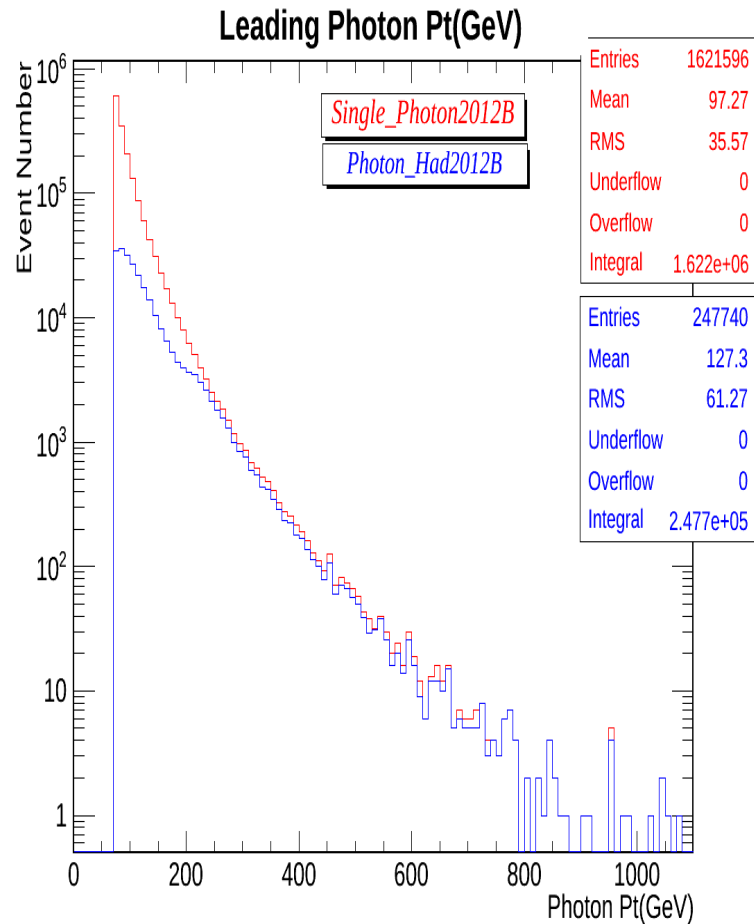
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Anomalous signal on both datasets.

11



# Data set Dependence?

## Photon kinematics



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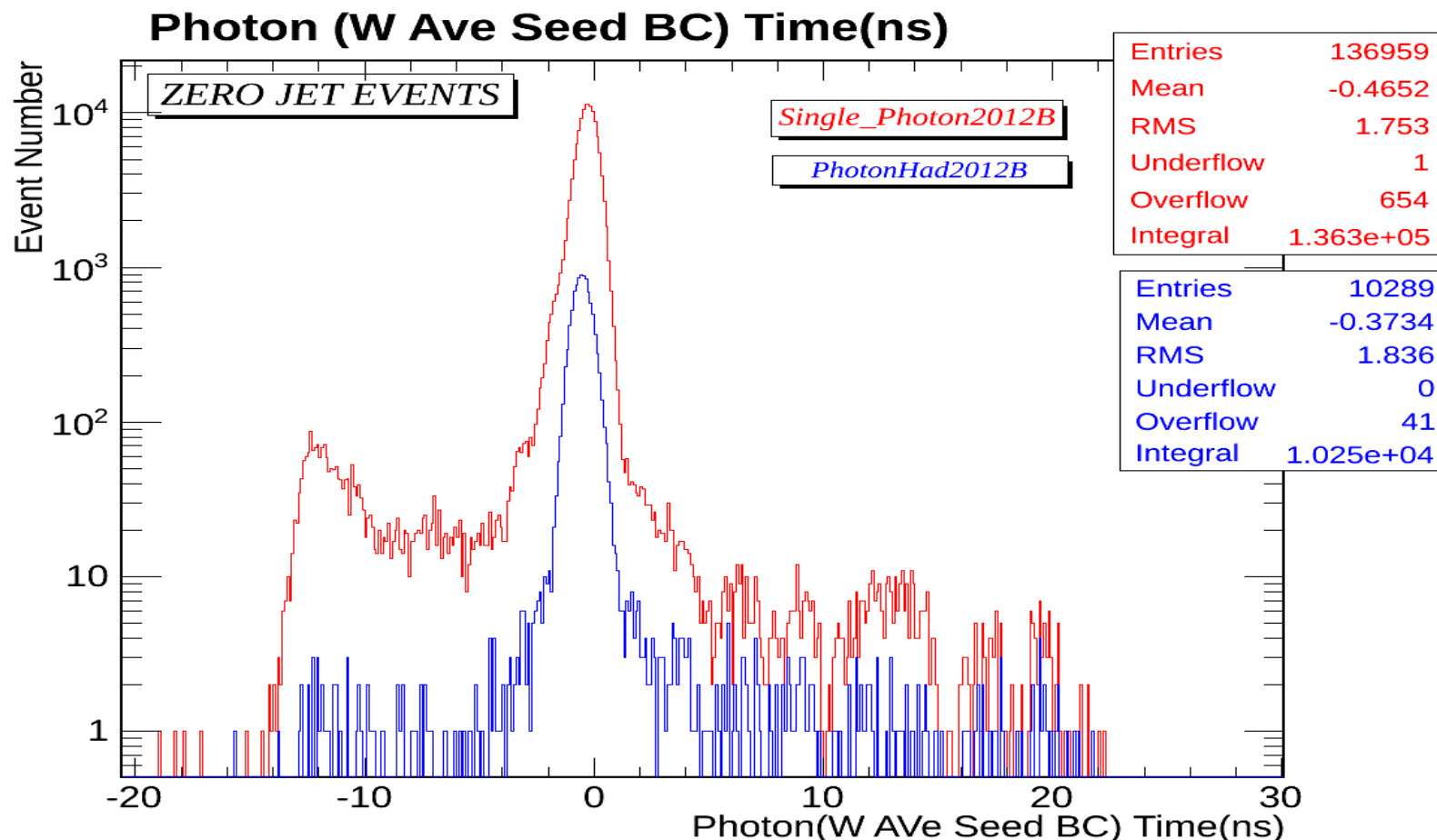
1 EN

Photon Pt and E not so similar in both DS.

12

# Data set Dependence?

## Zero Jet Events



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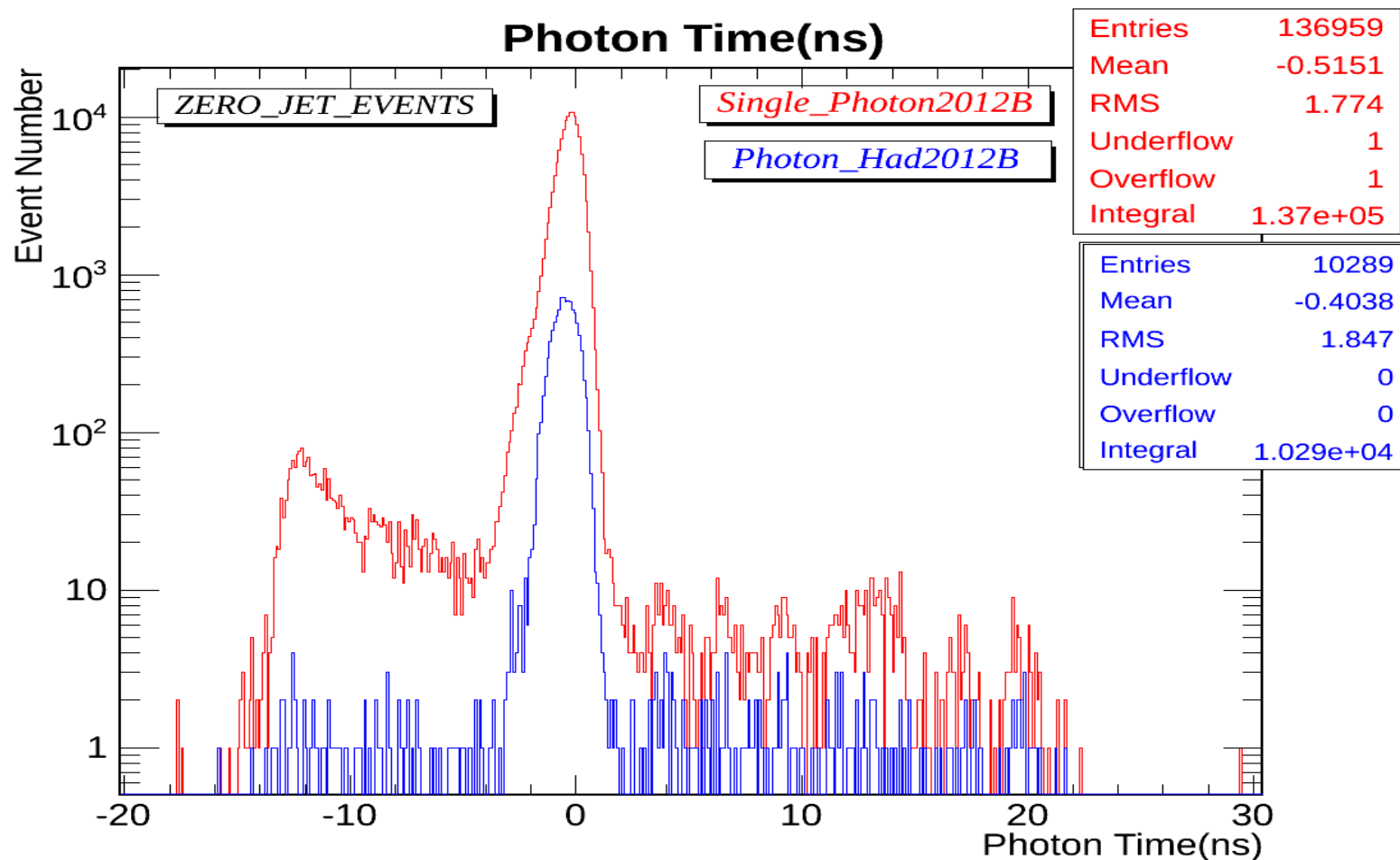
1E1N

Photon statistics not enough but AP present.

15

# *Data set Dependence?*

## *Zero Jet Events*



09/06/12

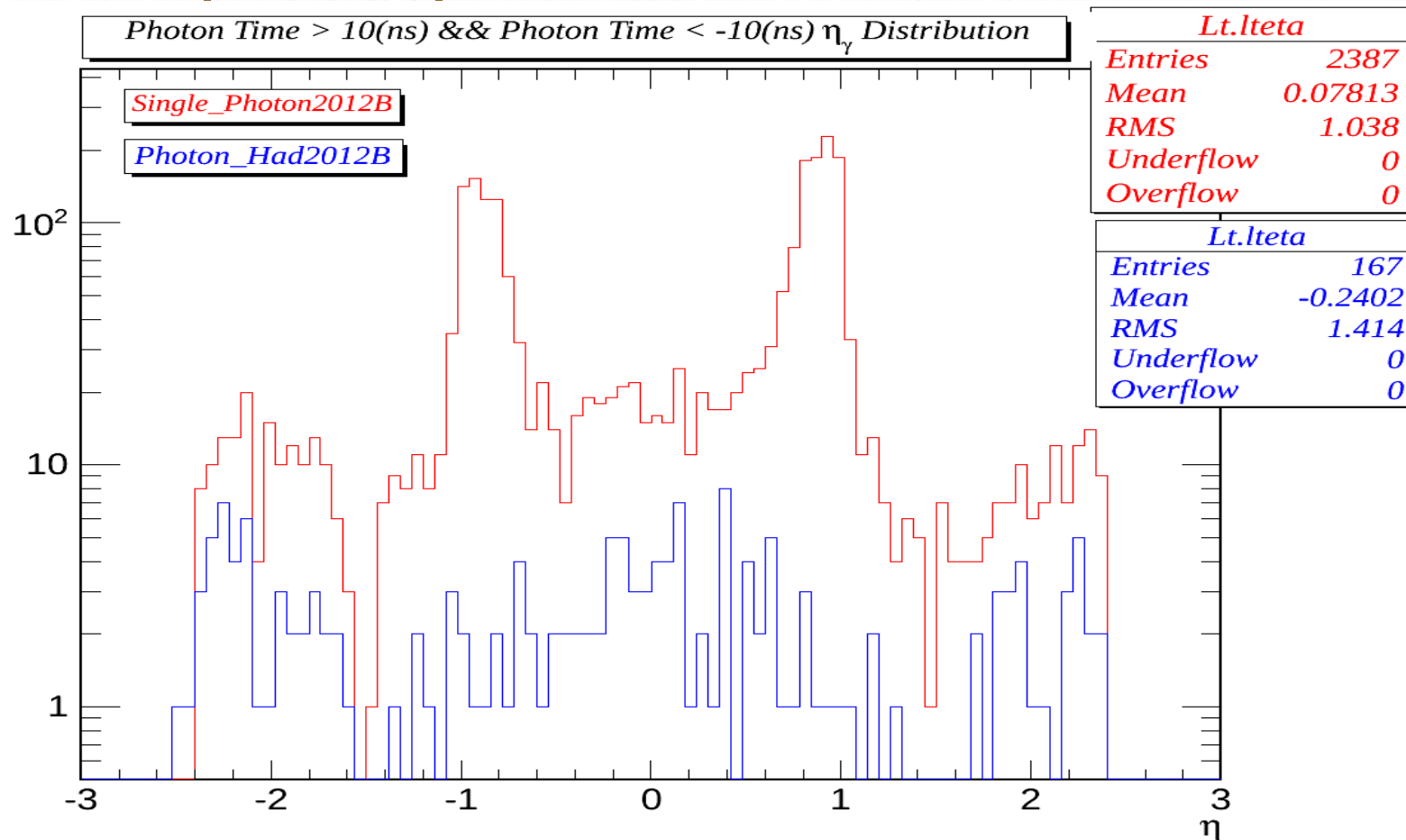
1E11

Photon statistics not enough but AP present.



# Data set Dependence?

## $|Time| > 10ns$ events



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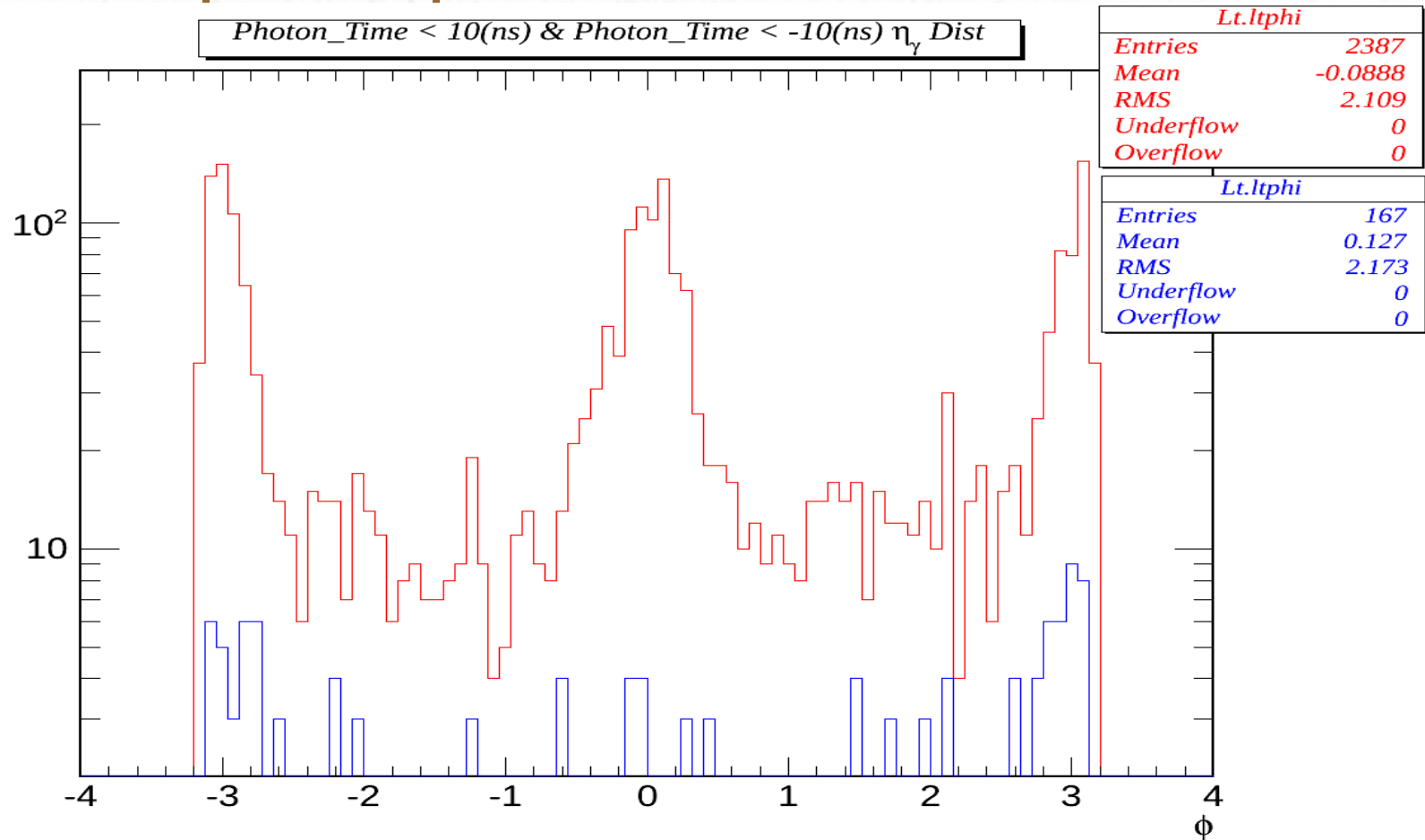
1E11

Strange eta distribution for Single\_Photon DS.

15

# Data set Dependence?

## $|Time| > 10ns$ events



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1E1N

Strange Phi distribution for Single\_Photon DS.

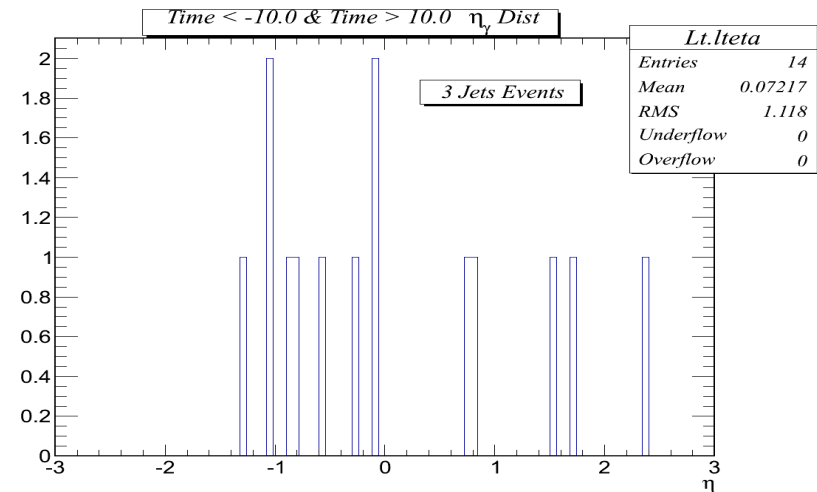
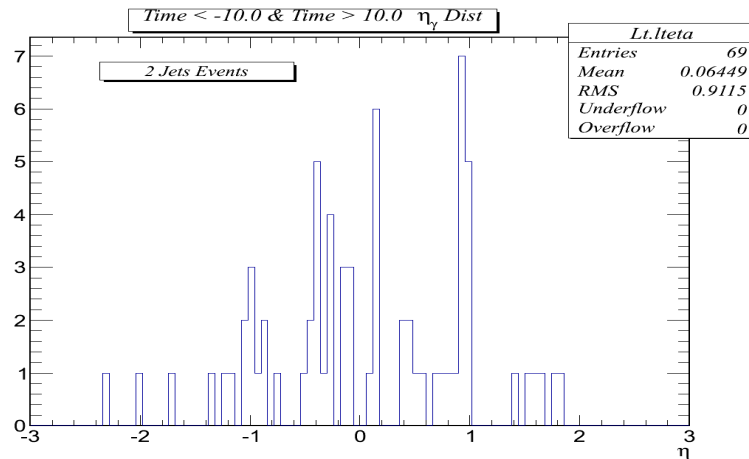
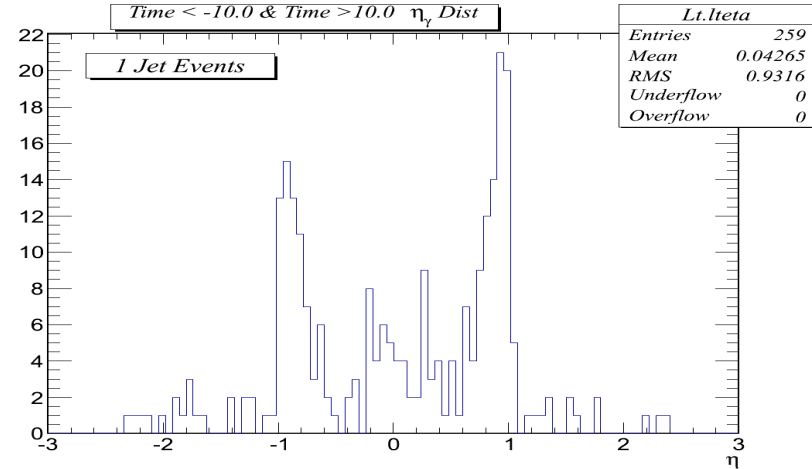
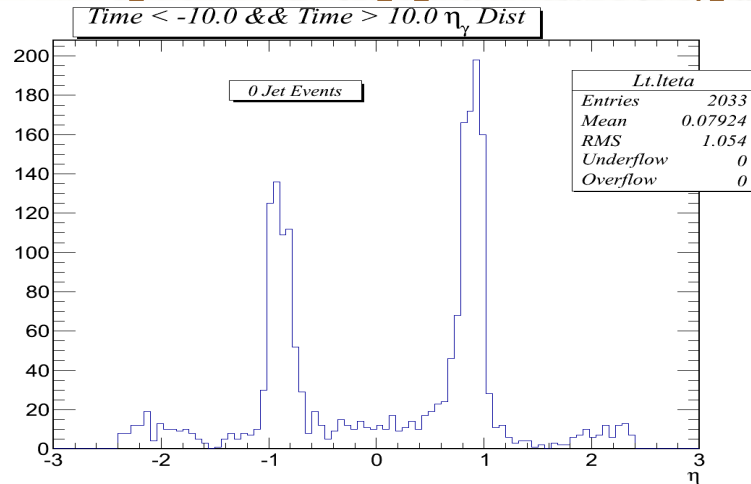
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***2) Large Timing Photons {  
Time < -10 (ns) & Time >  
10(ns) }***

***On Single Photon2012B  
DataSet.***



# Large time Photons : Eta for different jet multiplicity events.



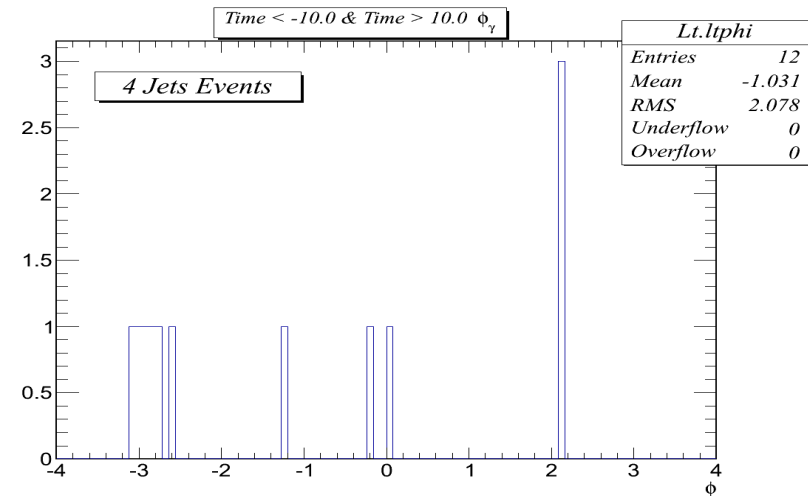
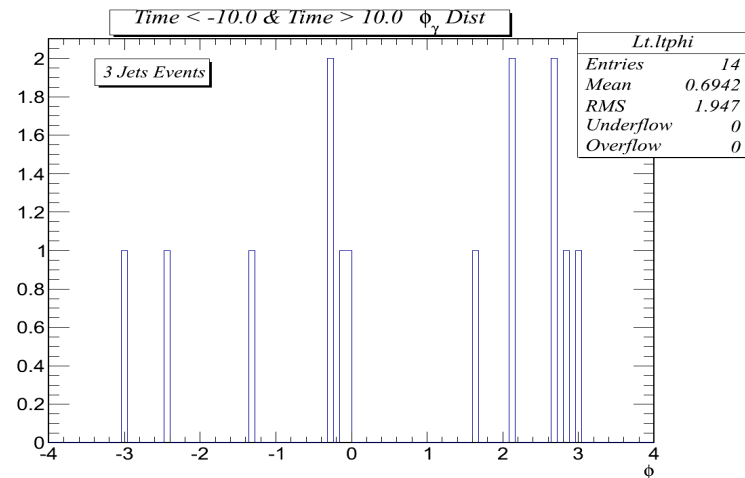
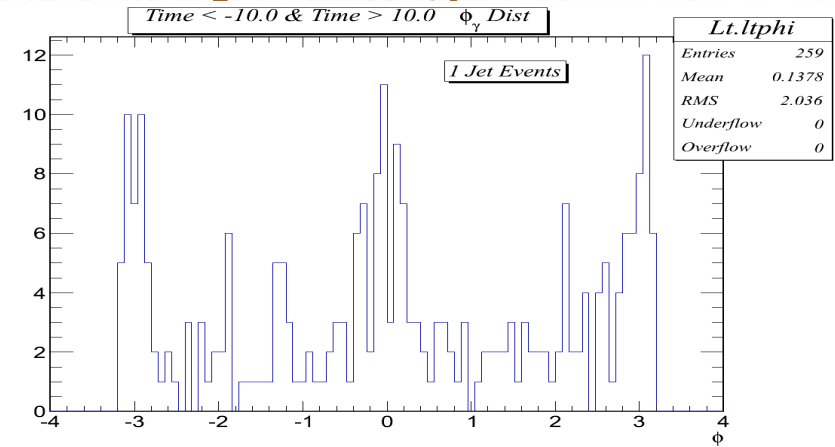
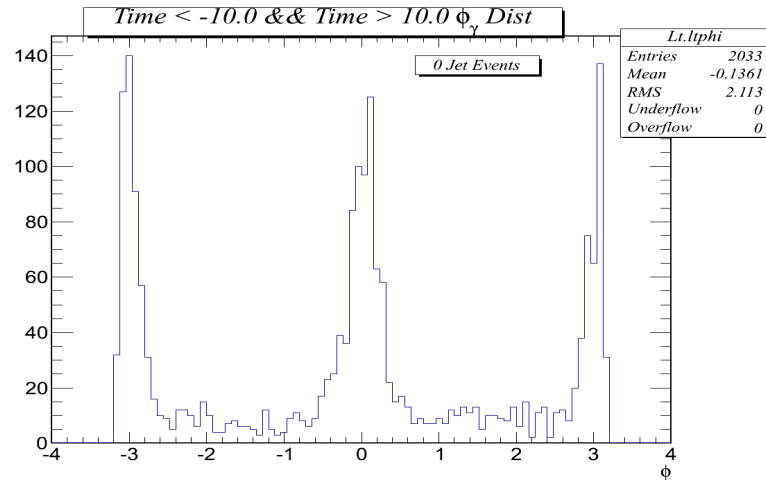
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1EIN

1 jet events do have strange eta distribution.

10

# Large time Photons : Phi for different jet multiplicity events.



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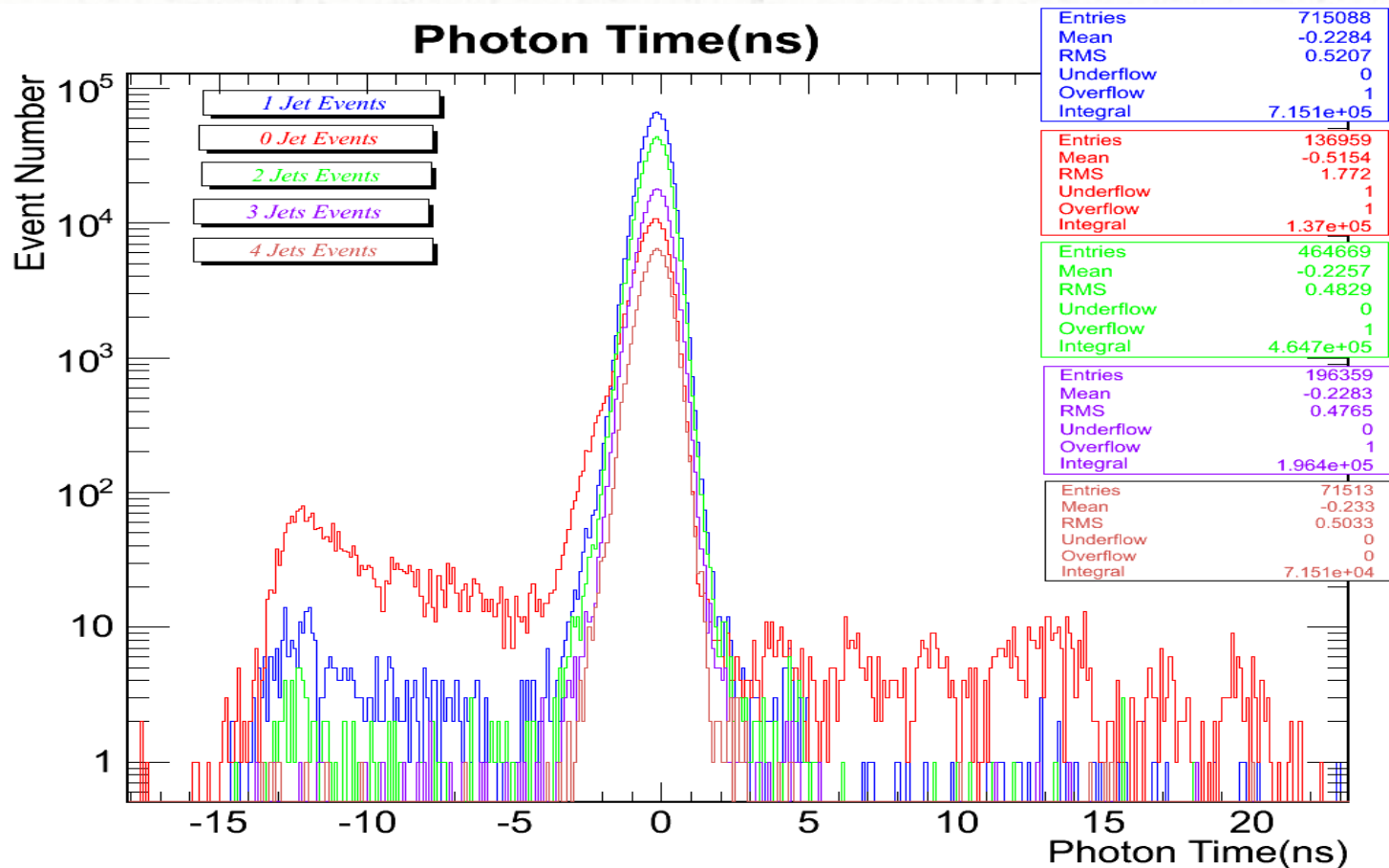
1 jet events do have strange phi distribution.

19

***2) Jet Multiplicity :***  
***On Single Photon2012B***  
***DataSet.***



# Jet Multiplicity on : Photon Time



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- AP exists also in 1 & 2 jet multiplicity events.

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# *Conclusion*

- Understanding origin of anomalous photons might need much detail studies.

At the moment, we can either :

- A) Select  $n_{\text{jets}} \geq 3$  events since anomalous photon statistics is low .

Or

- B) Develop a **robust Filter** for these anomalous photons.