

# **Forward ECal Occupancy Study & Geometry Redesign Follow-up**

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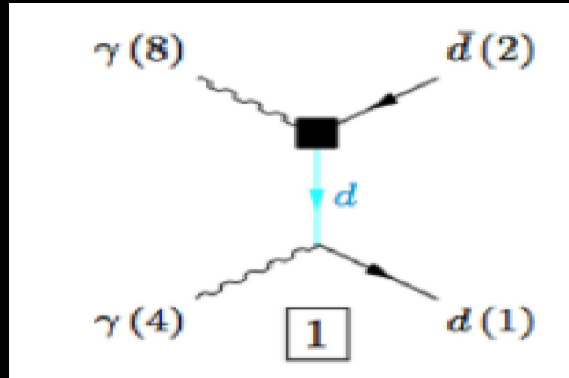
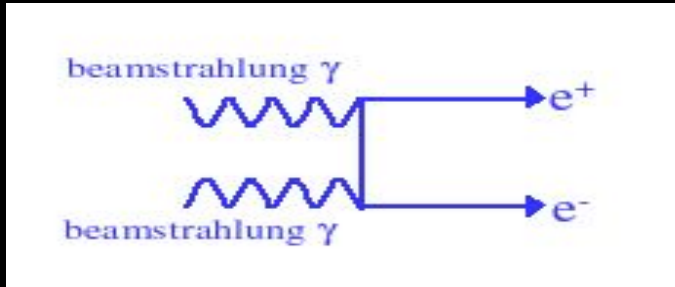
George Courcoubetis

Bruce Schumm

UCSC/SCIPP

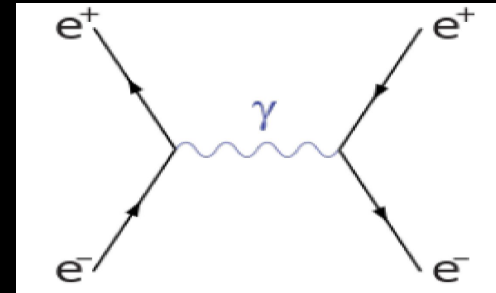
# Event Types Included

## Pair Backgrounds

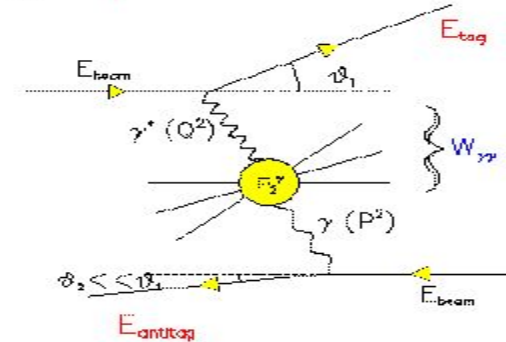


Gamma-gamma to Hadron

## BhaBha



## Singly tagged $e\gamma$ events:



Low Cross-section

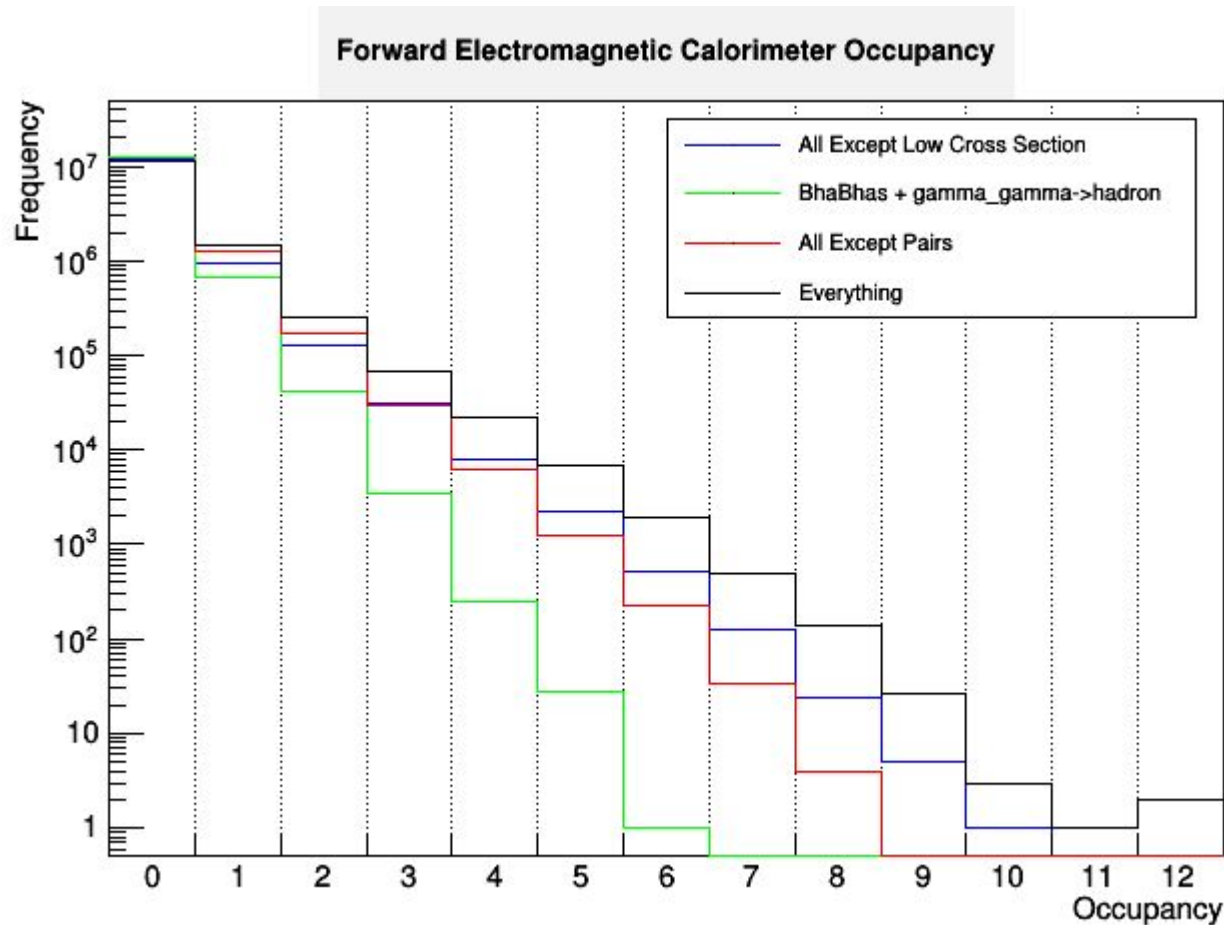
**Raw Occupancy:** Number of channels across all layers (y-axis) which were hit exactly the given number of times (x-axis), across a luminosity upgrade train's (2624\*) worth of bunch crossings.

*Note: All other plots are also over a LU train.*

*\*Individual event rates calculated as:  
 $Luminosity_{train} * Cross\_section_{Event}$*

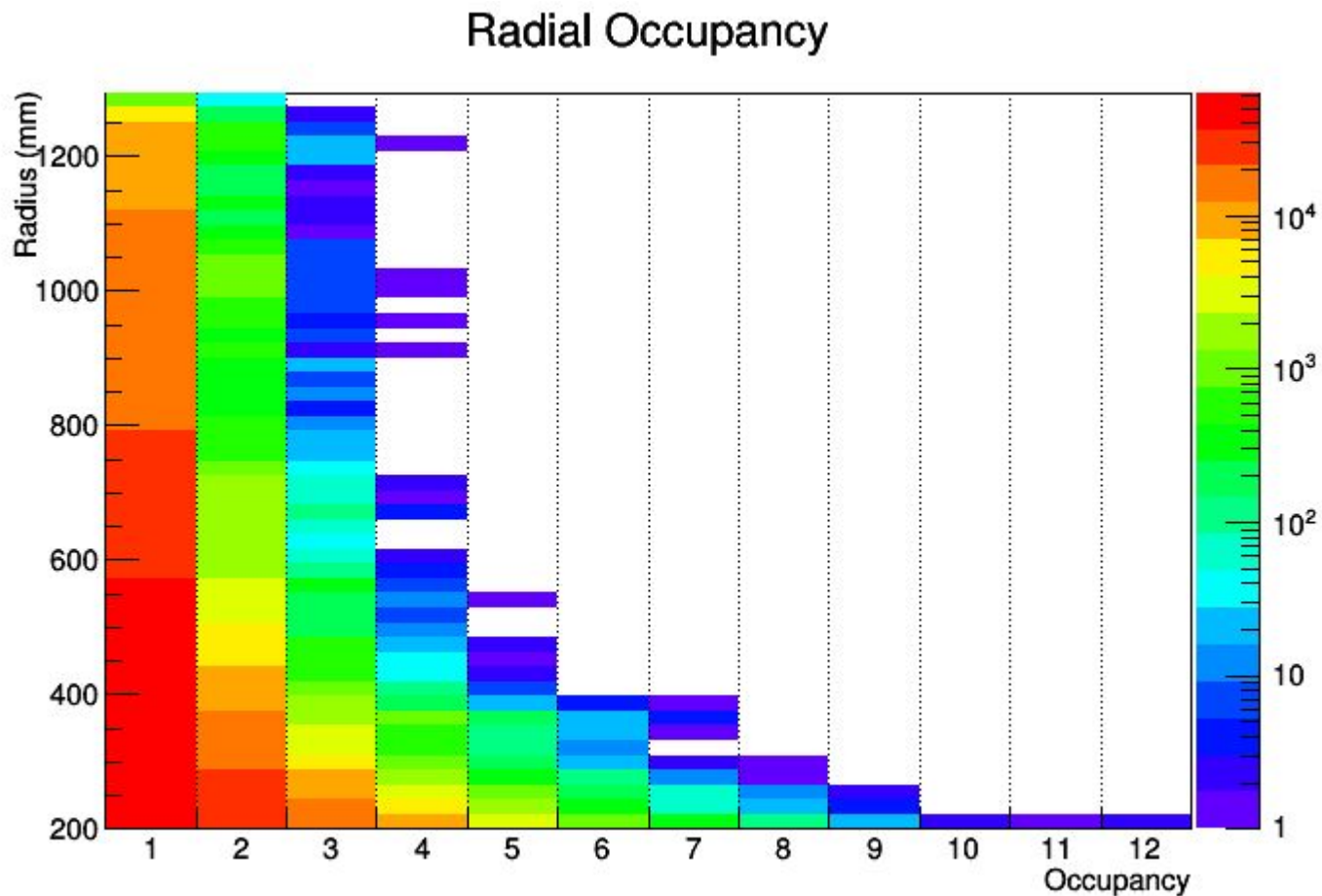
*where  $Luminosity_{train} =$   
 $Luminosity/frequency =$   
 $3.6 * 10^{-34} cm^{-2} s^{-1} / 5Hz =$   
 $7.2 * 10^{-6} fb^{-1}.$*

*Pairbackgrounds rate was once per bunch crossing*



## Raw Radial Occupancy:

As before, but with number of channels also now given as a function of radius (channel frequency given by color)

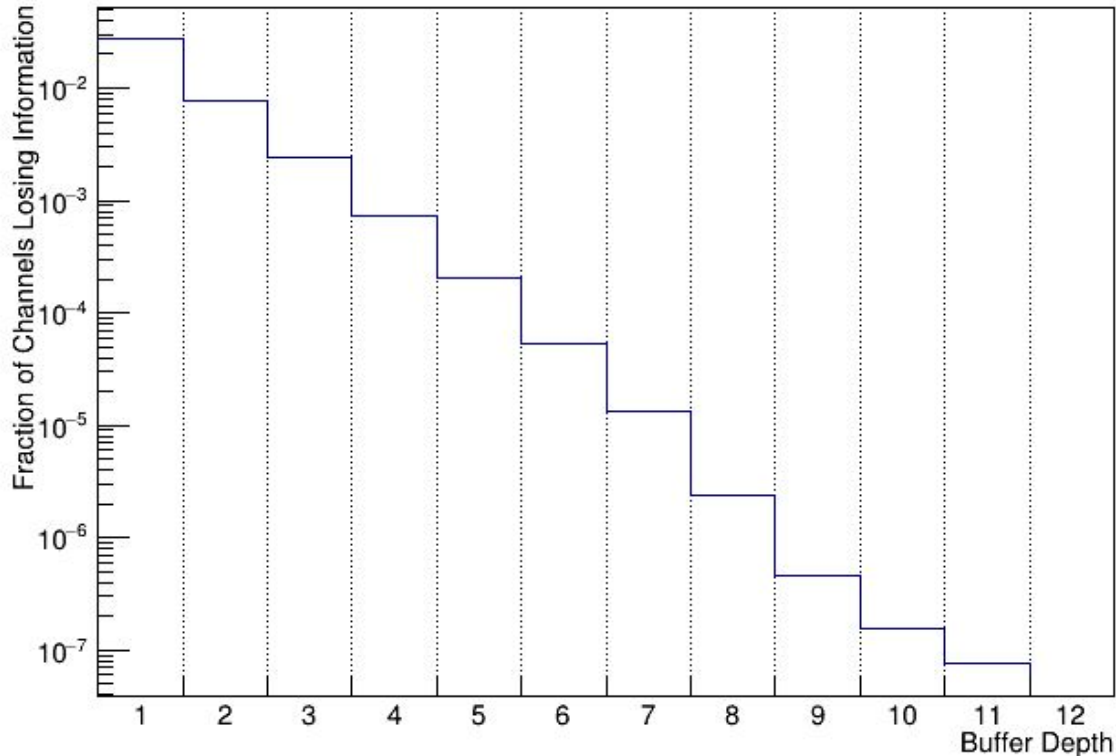




## Integrated Occupancy / Buffer

**Depth:** The  $i^{\text{th}}$  bin contains the fraction of channels which were hit 'i' times *or more*. i.e. bin 2 contains the fraction of channels hit 2 times plus the fraction hit 3 times plus ... plus the fraction hit 12 times.

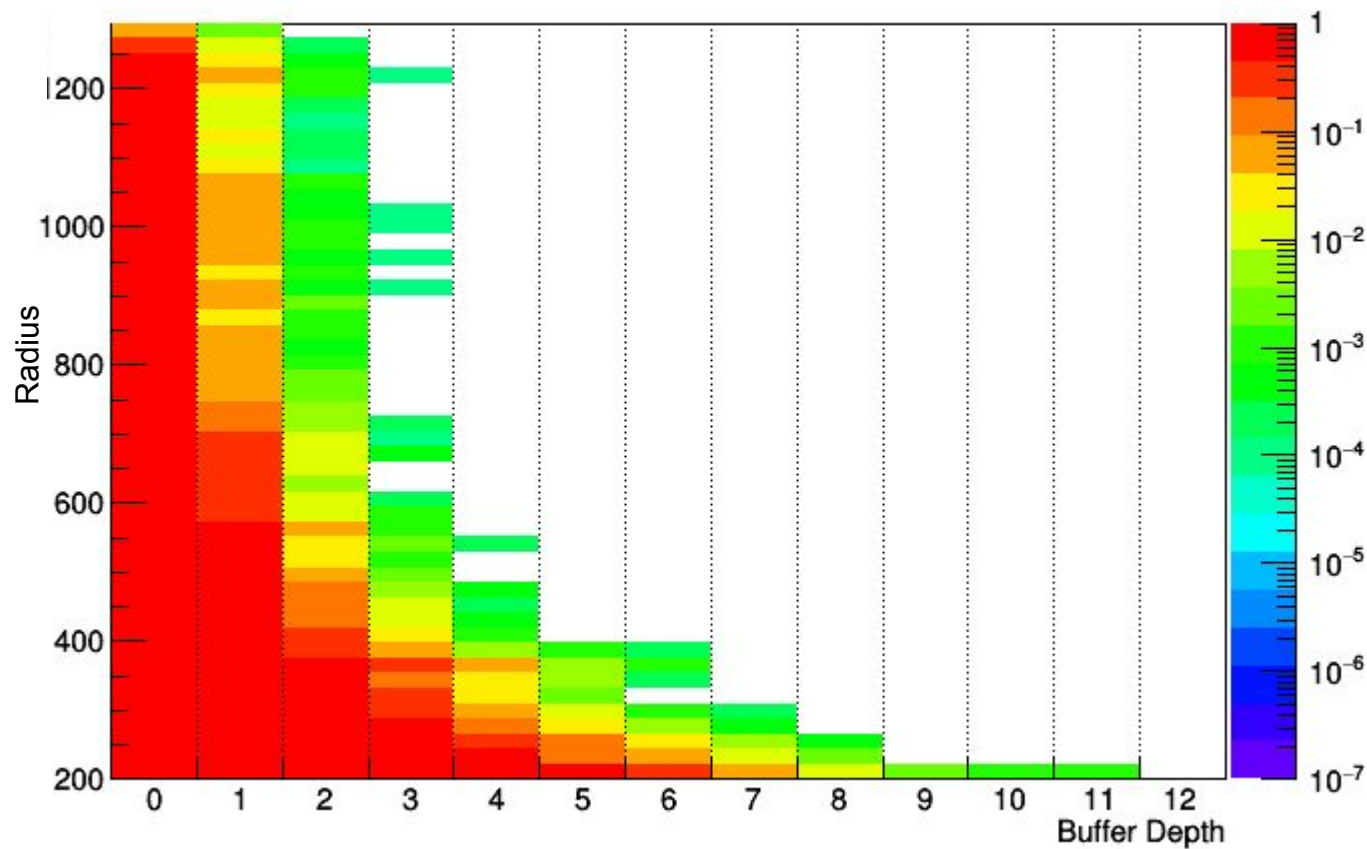
Fraction of Tiles Losing Information as a Function of Buffer Depth



## Radial Integrated

**Occupancy:** Like the previous plot, but as a function of radius, with the fraction given in color

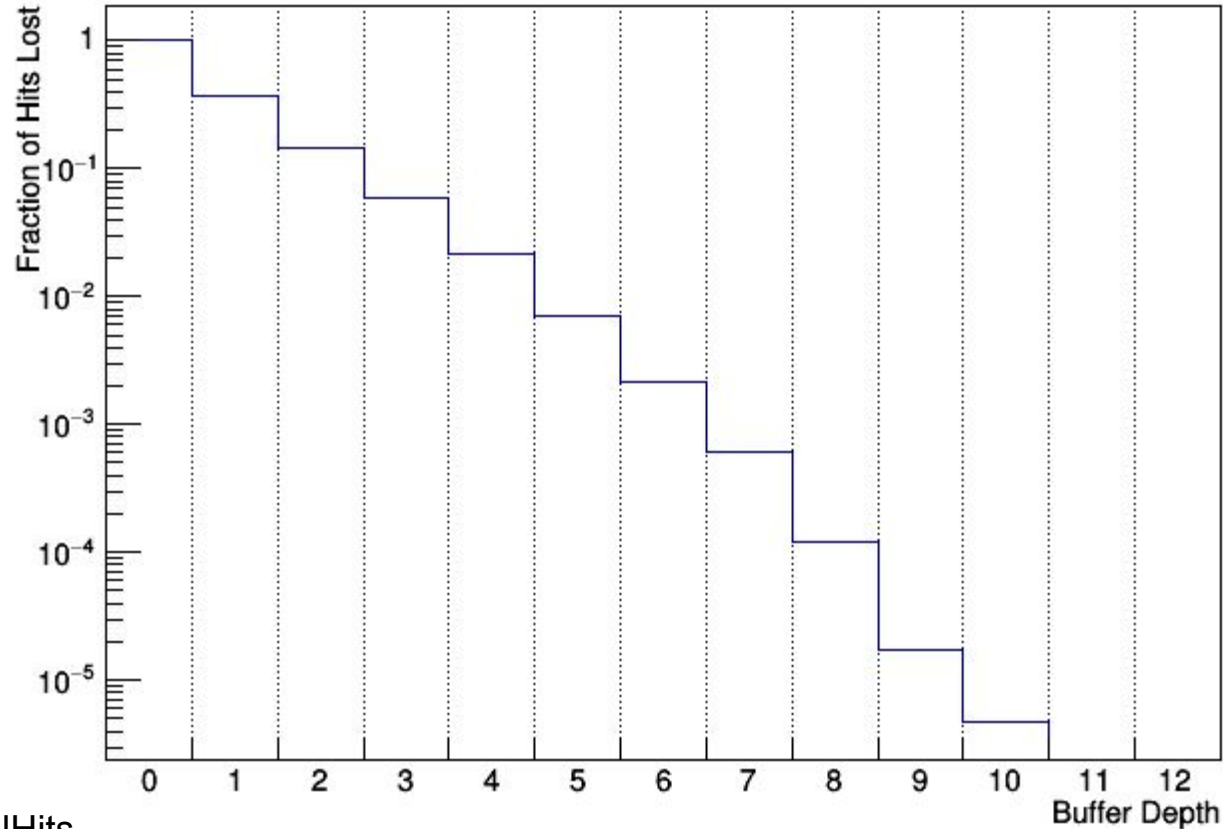
## Per Radius Integrated Occupancy







## Fraction of Hits Lost as a Function of Buffer Depth



### Weighted Integrated Occupancy:

The  $i^{\text{th}}$  bin contains the number of *hits* that are lost with a given buffer depth. Specifically,

$$\text{Bin}_{i-1} = \sum_{j=i}^{12} [(\text{frequency}_j) * (j-i+1)] / \text{totalHits}$$

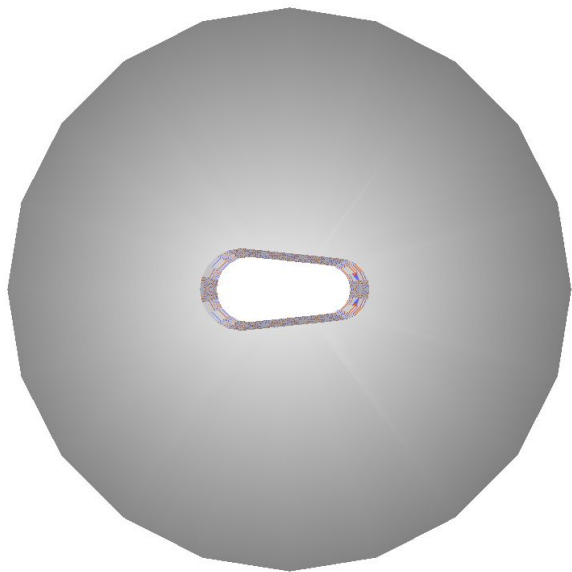
where frequency is the number of times a channel received  $i$  number of hits.

So  $(\text{frequency}_i * i)$  equals the number of times the channel was hit.

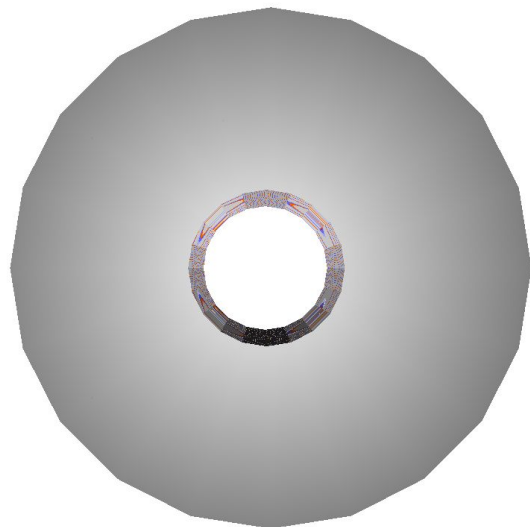
# Geometry Redesign Follow Up

Tested BeamCal Reconstruction Efficiency and Vertex Endcap/Barrel Occupancy with BeamCal Plug Region removed, and with anti-did field

**Wedge**

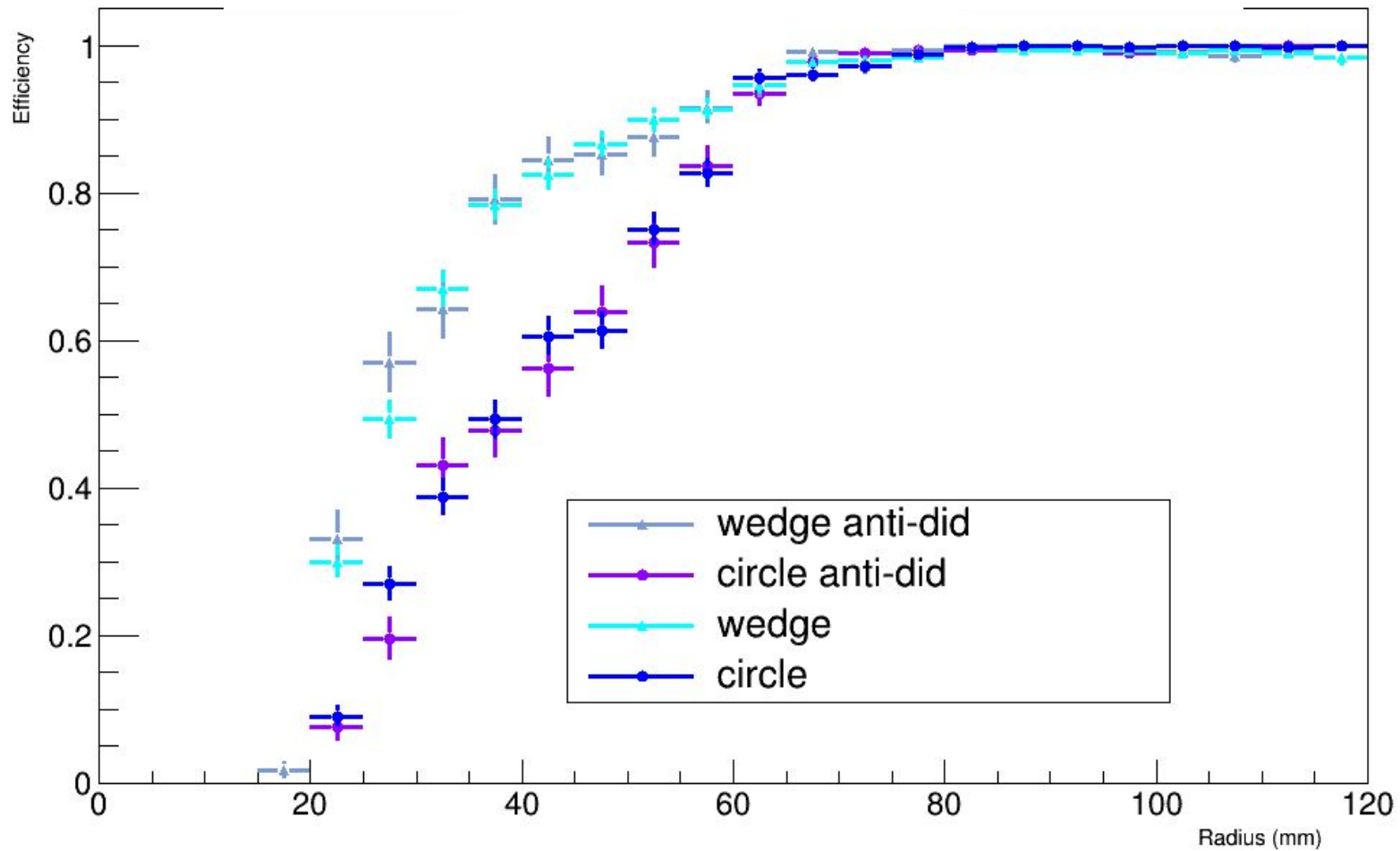


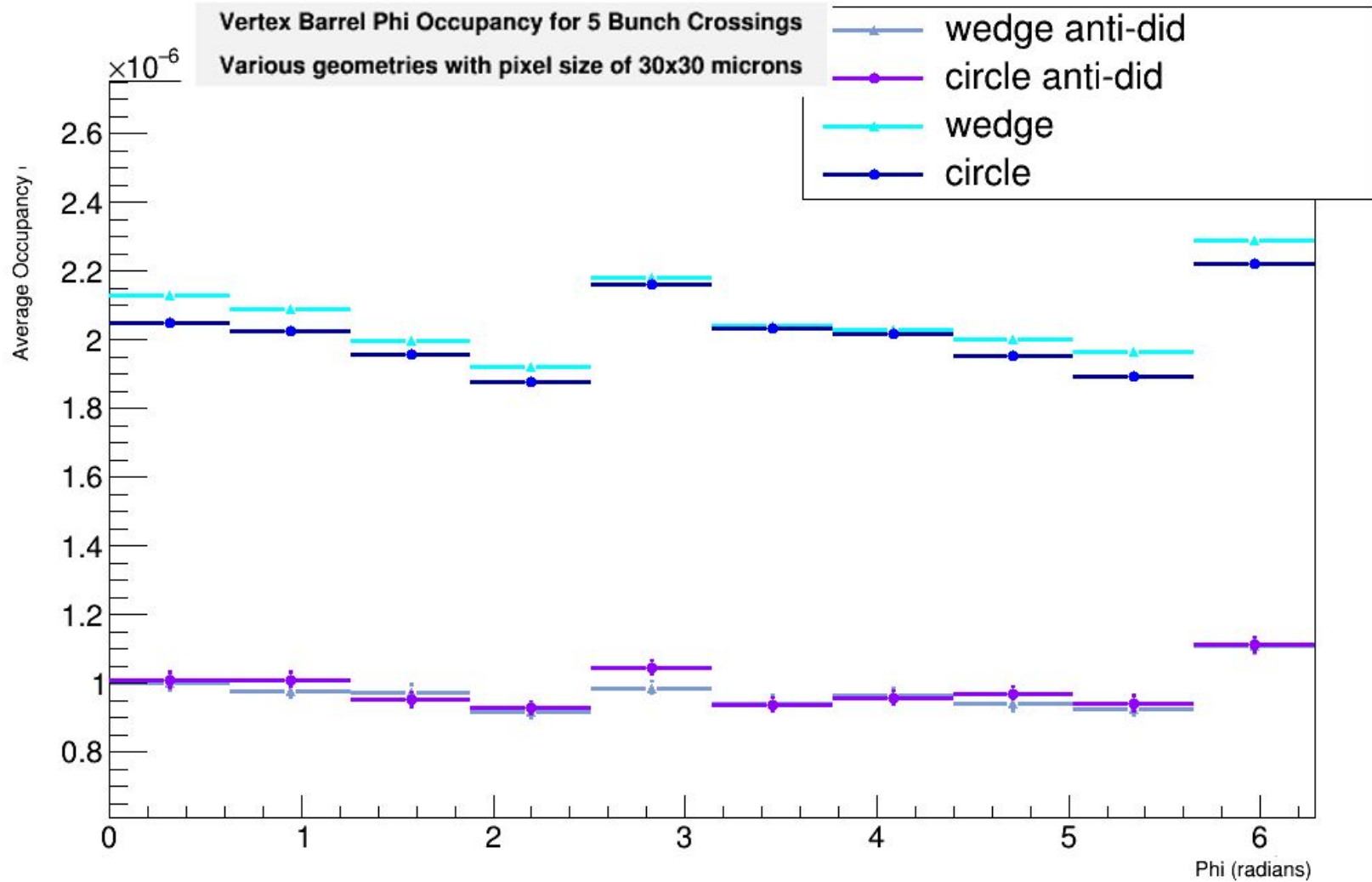
**Circle**



BeamCal

# BeamCal Total Reconstruction Efficiency





# Vertex Endcap Radial Occupancy for 5 Bunch Crossings

Various geometries with pixel size of 30x30 microns

