

ProtoDUNE-SP Beamline Time of Flight: Time of Flight versus Channel

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**ProtoDUNE Beam Instrumentation Group
Meeting**

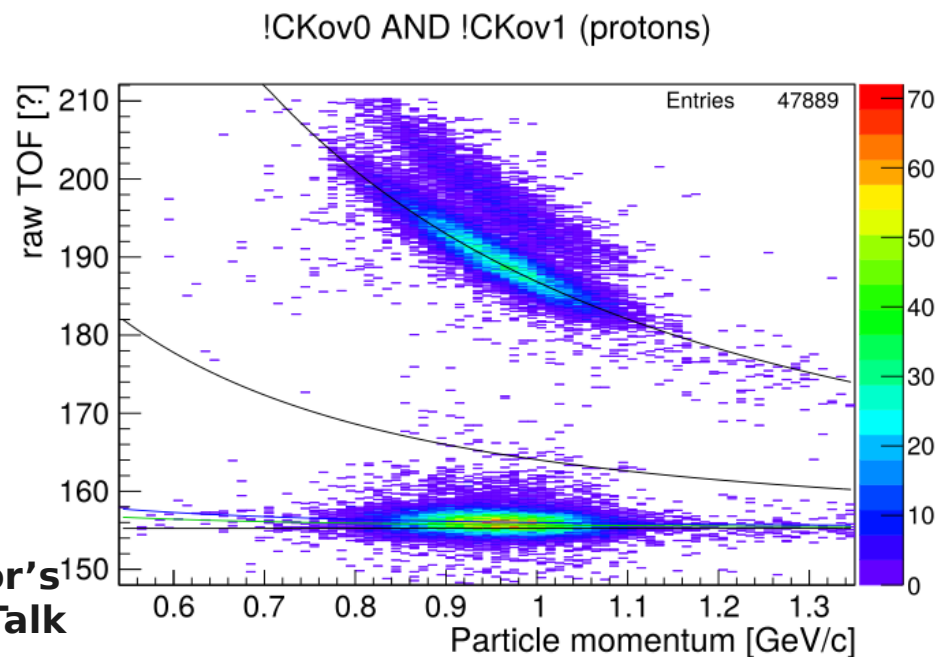
2018-12-06



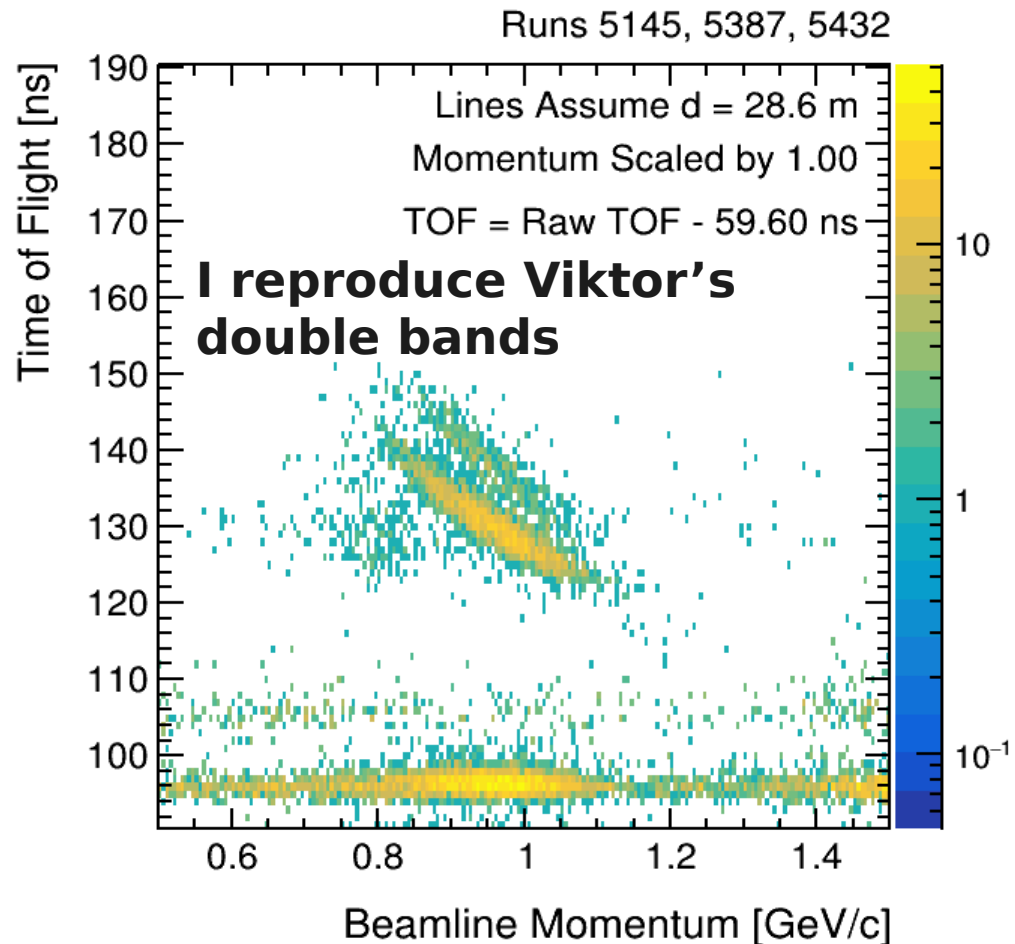
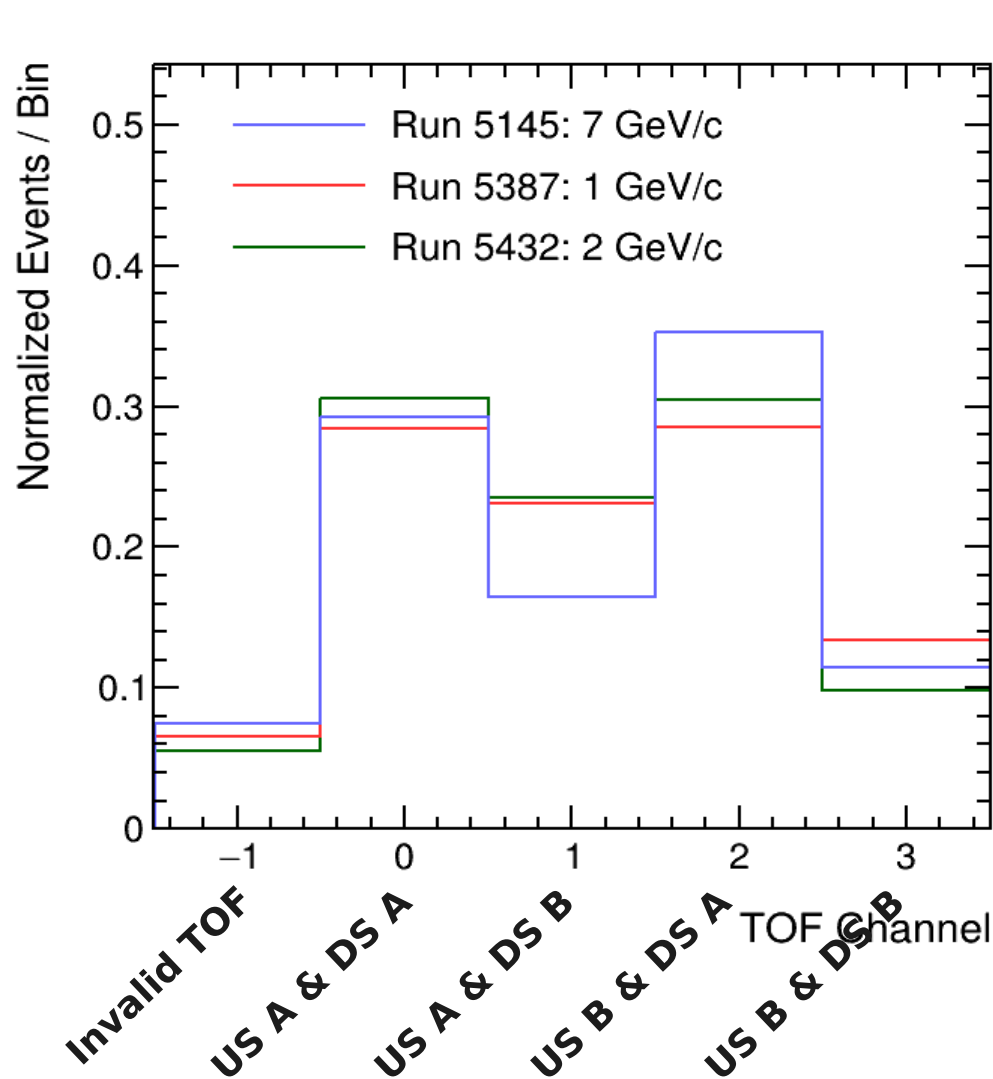
Introduction

- Jake's latest version of BeamEvent exposes TOFs from multiple combinations of scintillator modules to LArSoft analyzers
- Maybe one combination of modules could lead to the second proton band Viktor found
- There are two upstream modules, US A & US B, and two downstream modules, US A & US B
- I'll also show my latest cut tables

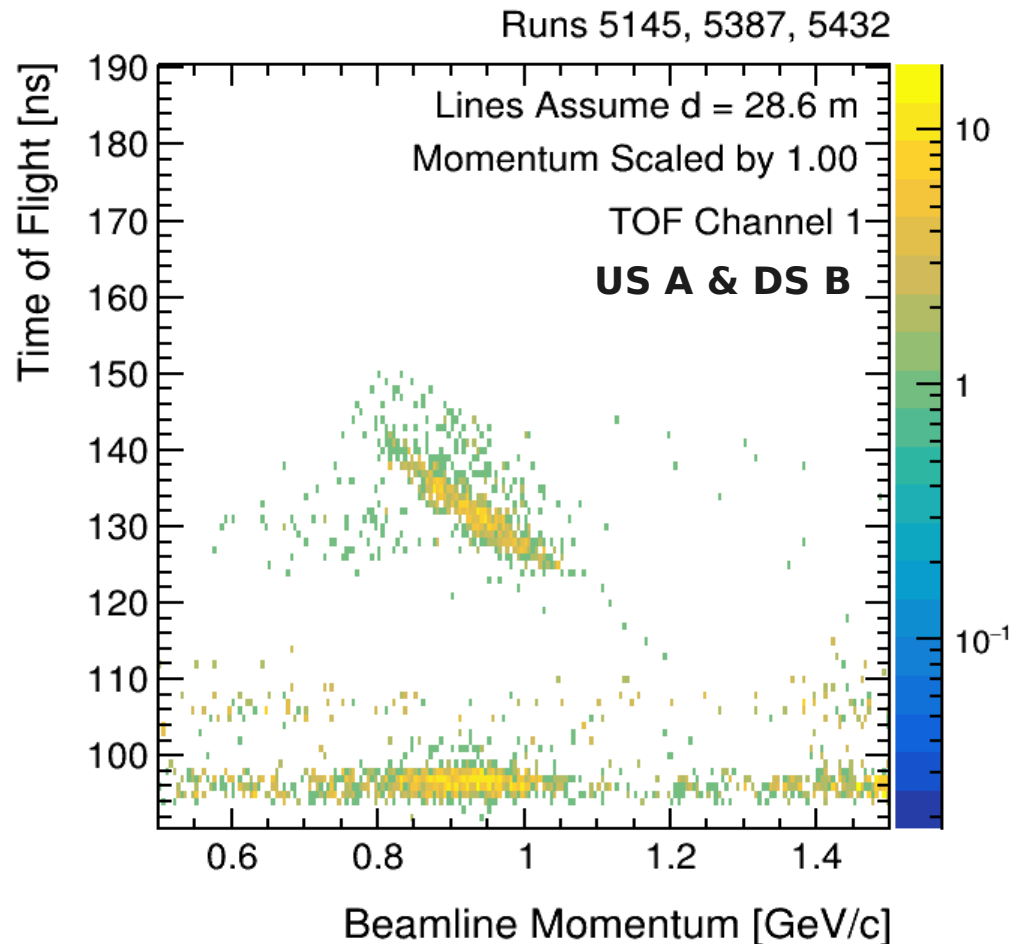
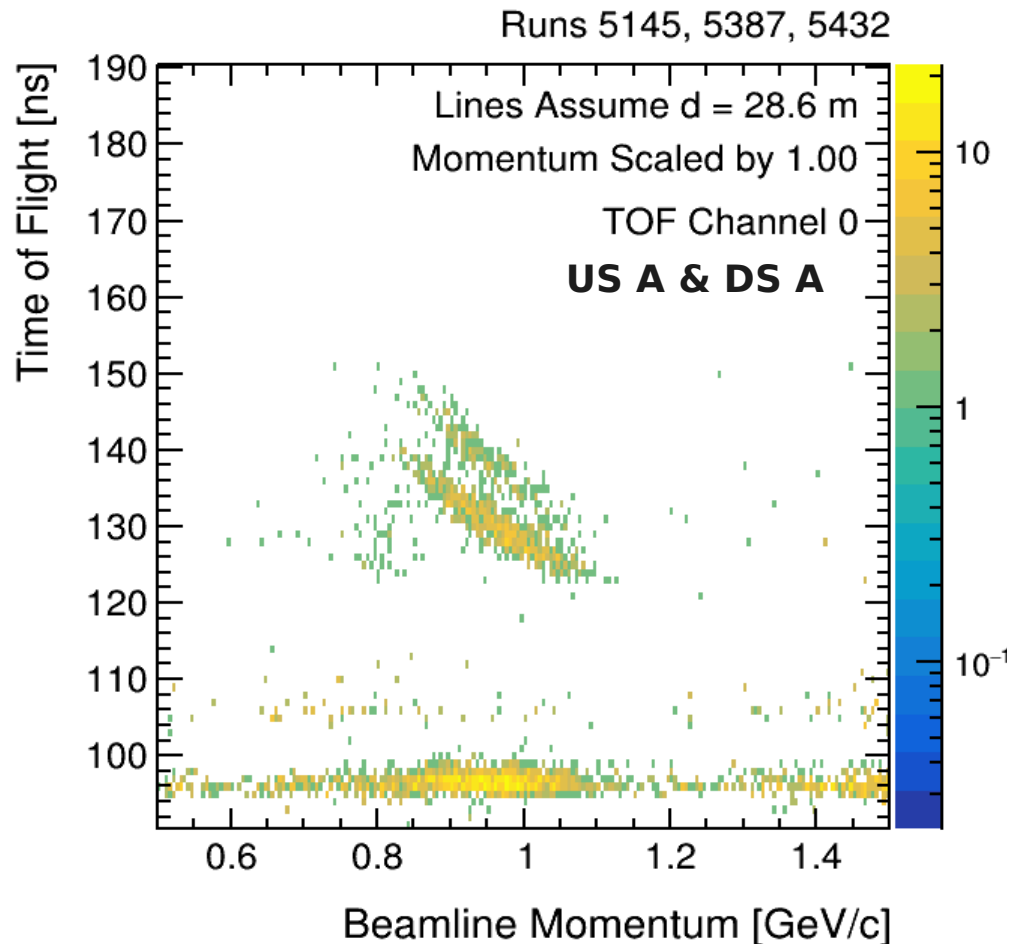
From Viktor's
Sim/Reco Talk



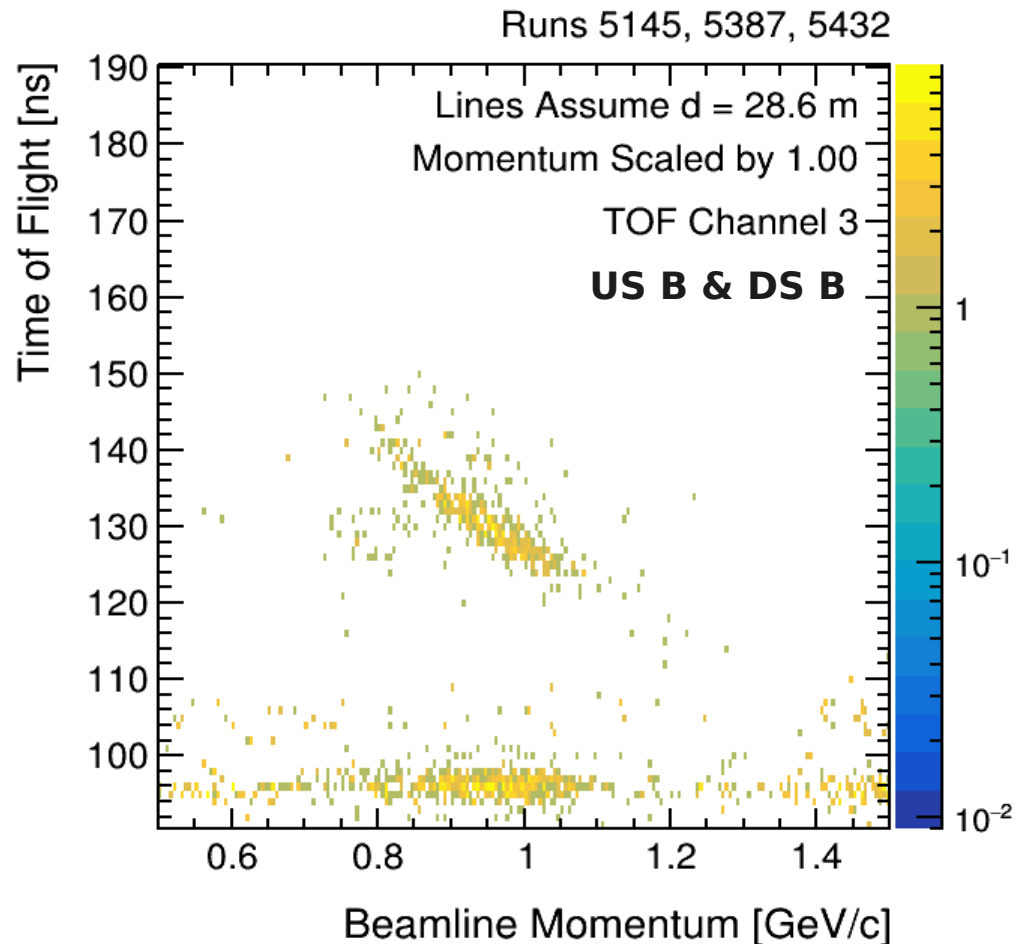
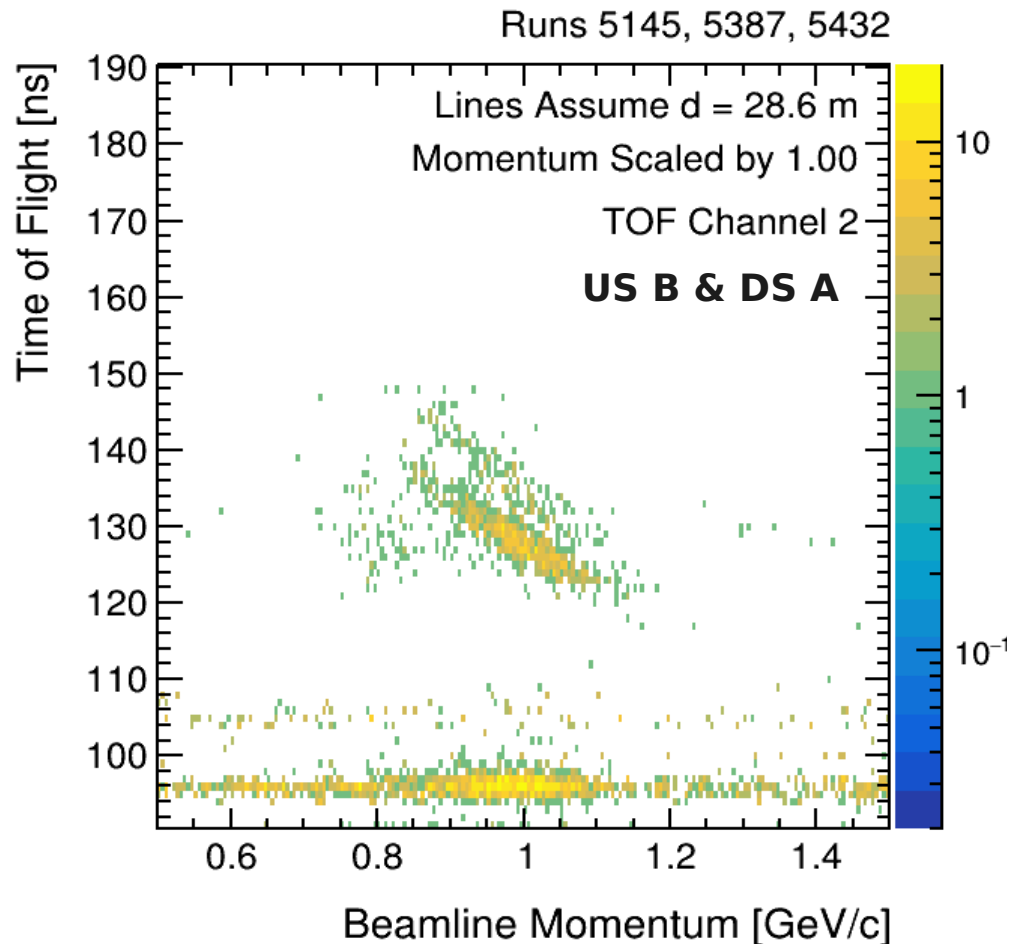
Time of Flight Channel & TOF versus Momentum



TOF versus Momentum 1 GeV Protons: by TOF module

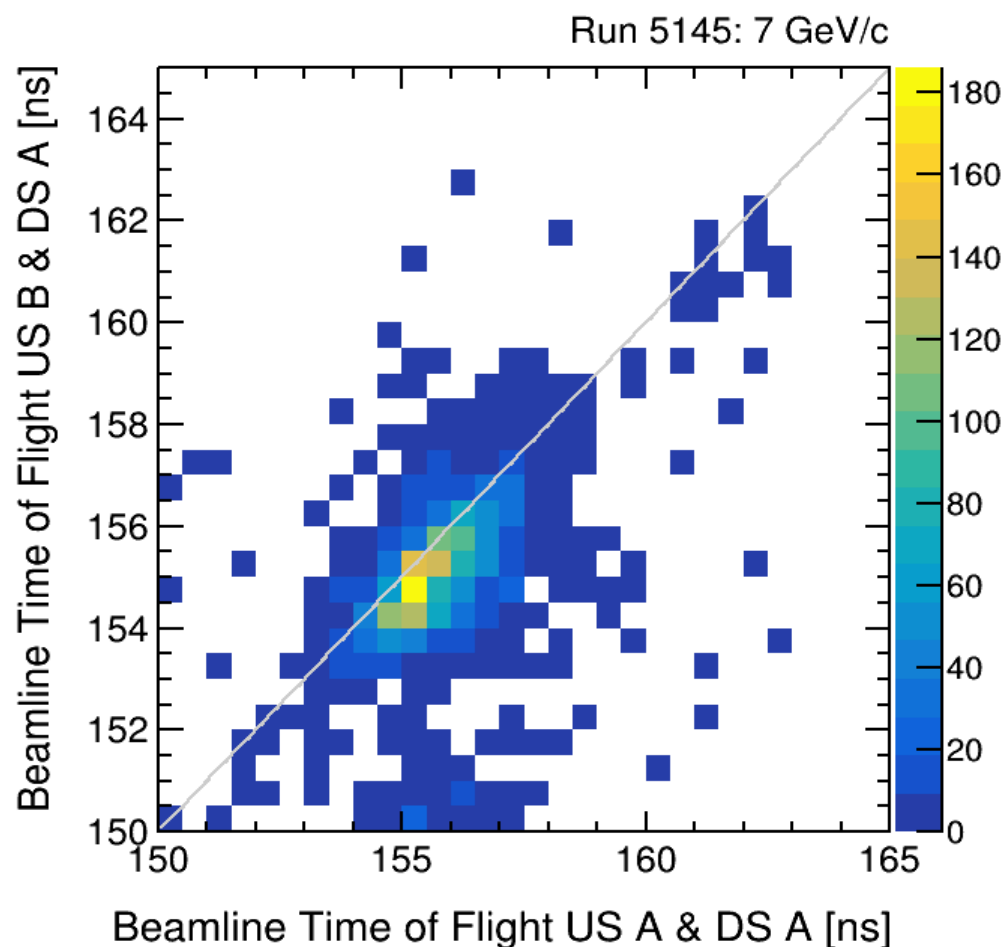
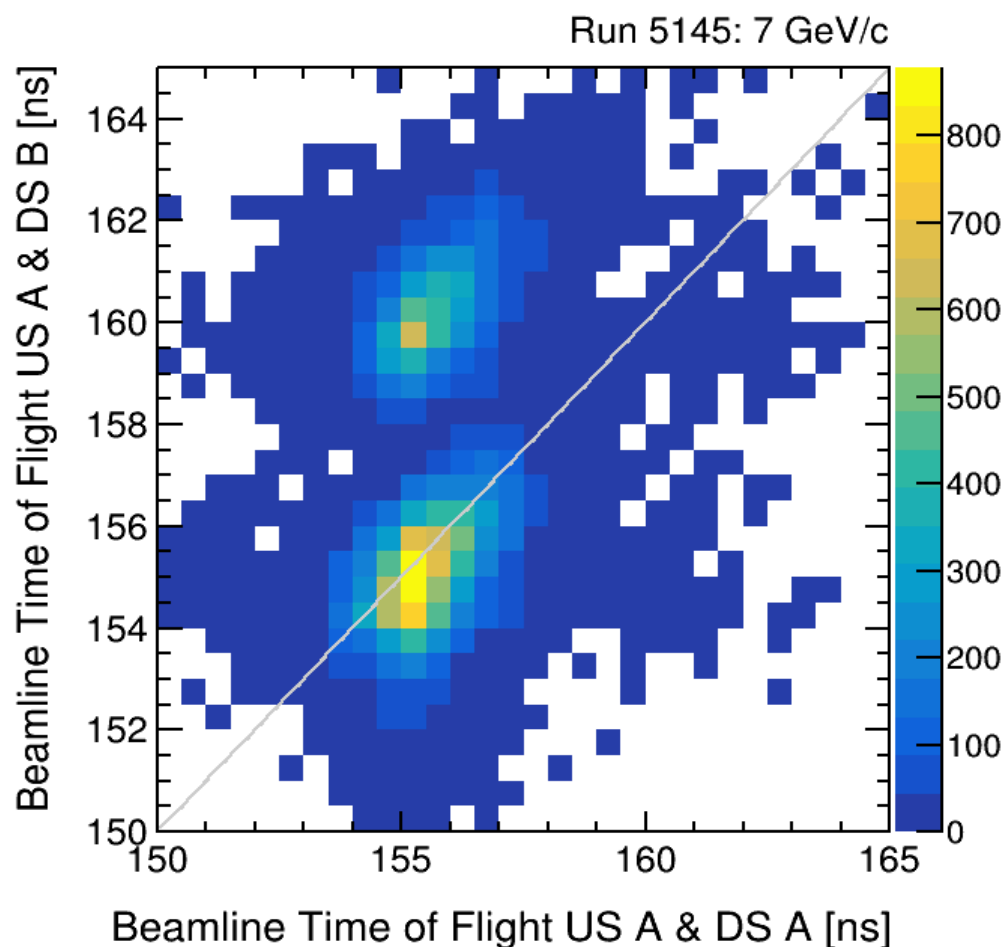


TOF versus Momentum 1 GeV Protons: by TOF module



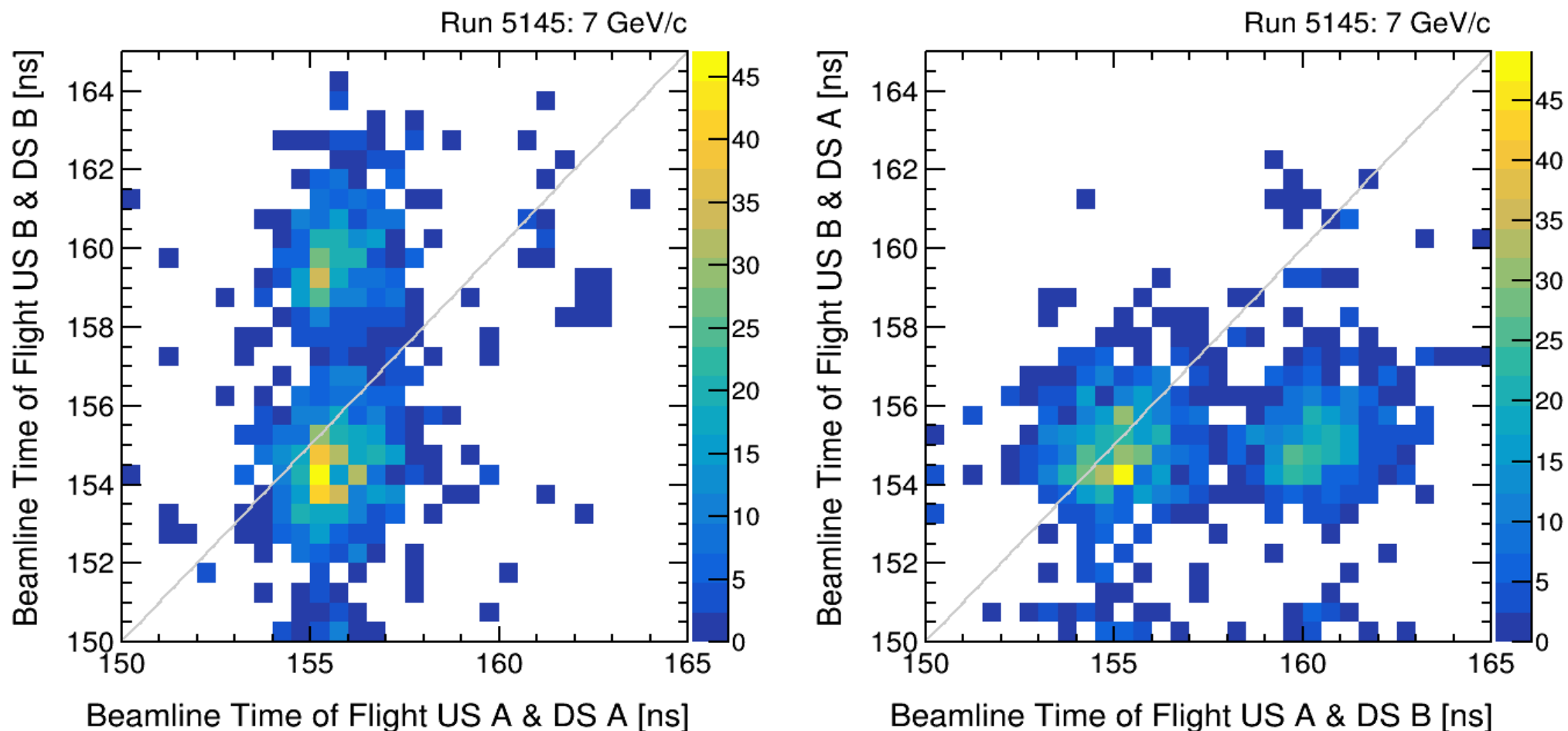
It seems like the double proton band is present in all TOF module combinations but US B & DS B—but I was hoping in only one module

Comparing TOF Between Modules



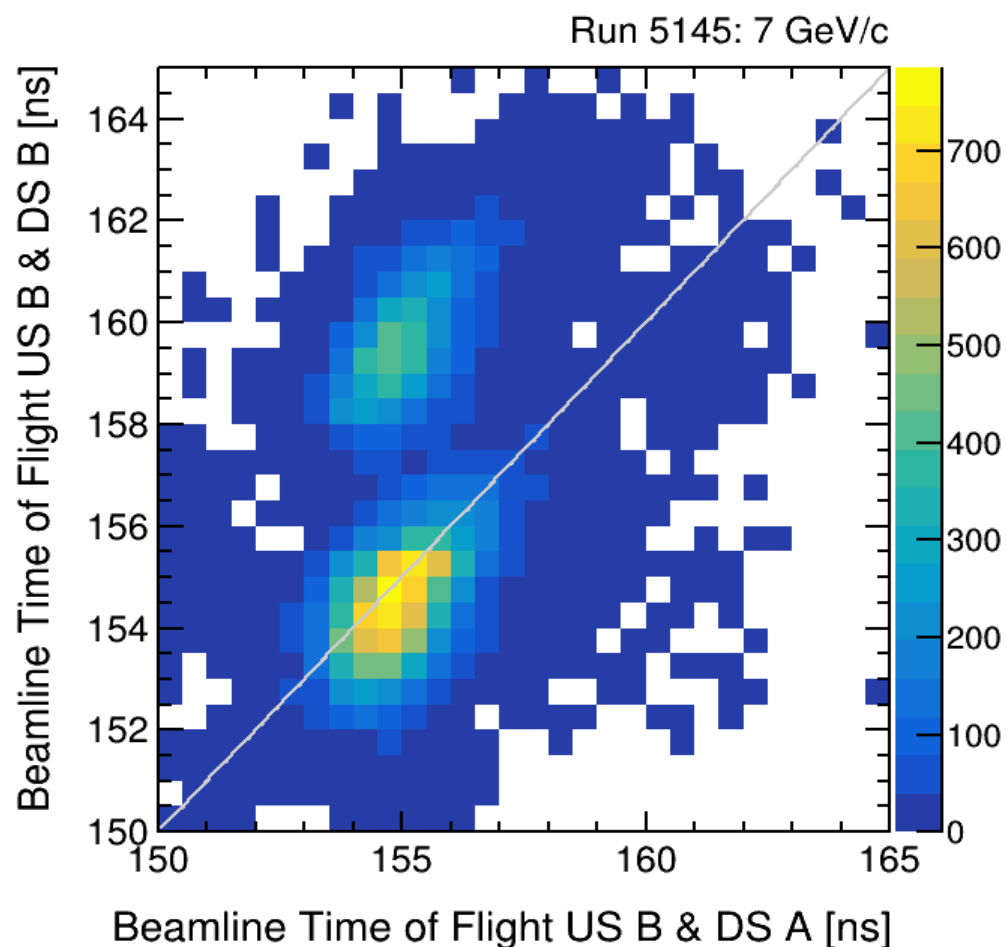
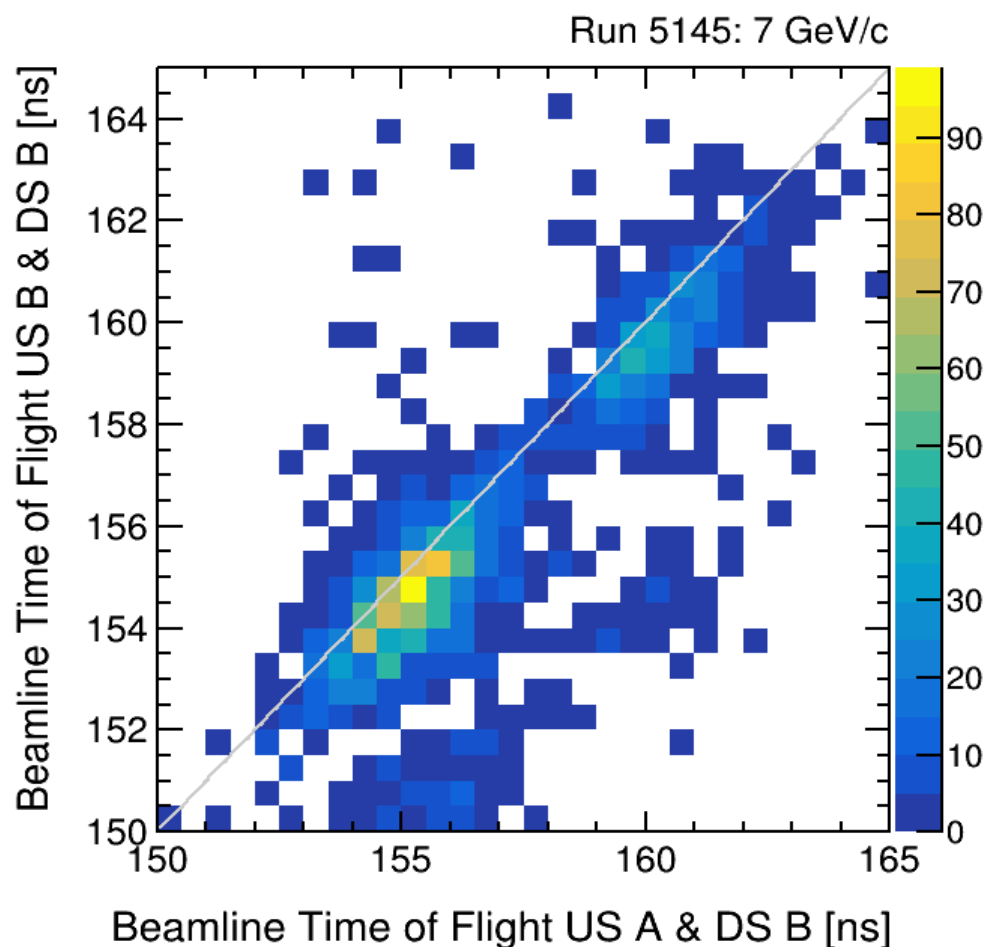
- **One entry per event that has TOFs in both of the pairs of modules**
- **Notice the funky second blob in some of the plots**

Comparing TOF Between Modules



Especially in the left BB versus AA, you can see an offset

Comparing TOF Between Modules



The second blob seems to be due to DS B, sometimes we get an after-pulse on it or something?

“Good Beam” Selection Cuts: % of All

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Cumulative Cuts Percentage of Top Row
=====

	Run 5387: 1 GeV/c Dec 4	Run 5432: 2 GeV/c Dec 4	Run 5145: 7 GeV/c Dec 4

All	100.0	100.0	100.0
Timing Beam Trigger	36.1	56.5	82.4
Matched Beam Trigger to Timing Trigger	36.1	56.5	82.4
CTB BI Info Valid	34.0	50.0	70.3
TOF Info Valid	34.0	50.0	70.3
> 0 Beam Tracks	33.5	49.4	69.6
> 0 Beam Momenta	33.0	49.1	69.2

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- “Timing Beam Trigger” fails are just cosmic triggers
- A reasonable fraction of events are available for beam analysis

“Good Beam” Selection Cuts: % of Previous Row

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Cumulative Cuts Percentage of Previous Row
=====
Run 5387: Run 5432: Run 5145:
 1 GeV/c   2 GeV/c   7 GeV/c
  Dec 4    Dec 4    Dec 4
-----
All                100.0    100.0    100.0
Timing Beam Trigger    36.1    56.5    82.4
Matched Beam Trigger to Timing Trigger 100.0    100.0    100.0
CTB BI Info Valid     94.2    88.6    85.4
TOF Info Valid        100.0    100.0    100.0
> 0 Beam Tracks       98.6    98.8    99.0
> 0 Beam Momenta      98.5    99.3    99.4
=====

```

- “Timing Beam Trigger” fails are just cosmic triggers
- CTB BI Info Valid is the largest inefficiency, but not too bad

Conclusions & Next Steps

- **Looked at TOF for various combinations of scintillator modules**
 - **Doesn't explain the double band in the 1 GeV/c protons**
 - **Seems like downstream module B has some funny behavior**
- **Could look more into relative calibration of scintillator modules if BIG doesn't have it already**
- **My "Good Beam" selection seems to give us a good fraction of events**

Backup Slides

“Good Beam” Selection Cuts: Number of Events

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=====
Cumulative Cuts
=====

```

	Run 5387: 1 GeV/c Dec 4	Run 5432: 2 GeV/c Dec 4	Run 5145: 7 GeV/c Dec 4

All	19767.0	156860.0	256304.0
Timing Beam Trigger	7136.0	88606.0	211075.0
Matched Beam Trigger to Timing Trigger	7136.0	88600.0	211075.0
CTB BI Info Valid	6721.0	78462.0	180221.0
TOF Info Valid	6721.0	78462.0	180221.0
> 0 Beam Tracks	6627.0	77519.0	178505.0
> 0 Beam Momenta	6528.0	76995.0	177463.0
=====			

- “Timing Beam Trigger” fails are just cosmic triggers
- CTB BI Info Valid is the largest inefficiency, but not too bad