# Start Time Correction Effects

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# Start Time Correction

- Correction for events with electron in FT: $\beta$ is recalculated using improved **Start Time** and tracks are assigned to negative and positive particles according to their $\beta$ vs. p range
- We start from the electron in FT and from the bank REC::ForwardTagger and we take the cluster time to achieve the StartTime: we subtract the TOF achieved using the (x, y, z) of the cluster and a straight trajectory from the target center

```
double RFT=Math.sqrt(Math.pow(xFT[i], 2)+Math.pow(yFT[i], 2)+Math.pow(zFT[i], 2));
double tof=RFT/PhysicsConstants.speedOfLight();
vertexTime = timeFT[i]-tof;
```

- We apply the RF correction to synchronize the Start Time with a beam bunch

```
final double rfBucketLength = 2.004;
final double deltatr = - vertexTime + RFTime[0] + (800+0.5)*rfBucketLength;
final double rfCorr = deltatr % rfBucketLength - rfBucketLength/2;
startTime = vertexTime + rfCorr;
```

- We use the Start Time corrected with the RF to calculate the TOF of charged particles $\longrightarrow \beta$

```
double ctime = scintBankEB.getFloat("time", loop1) - startTime;
double cpath = scintBankEB.getFloat("path", loop1);
double beta = cpath/ctime/30.0;
```

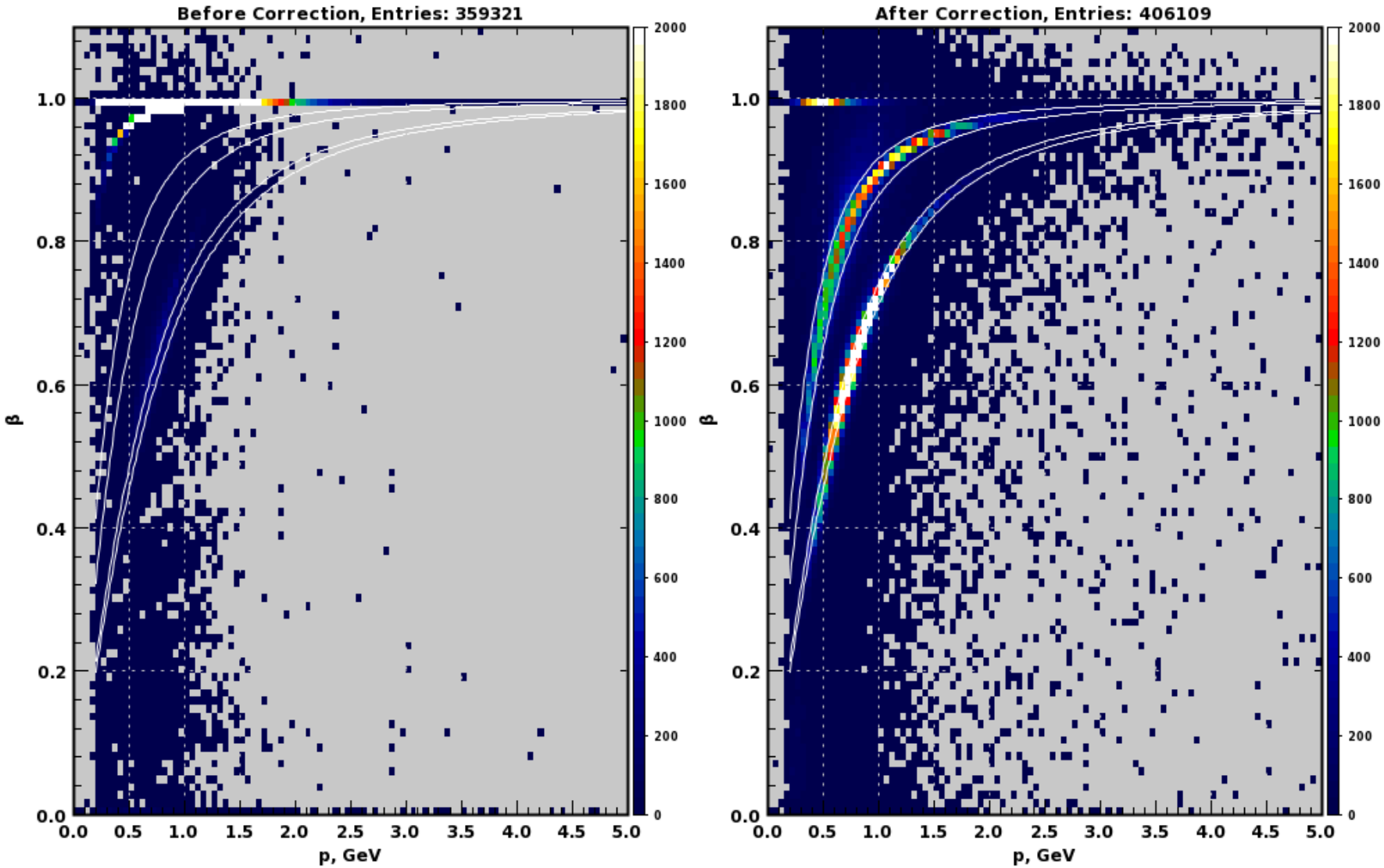
# StartTime Correction Application to Data

StartTime Correction is applied to both Simulated and Experimental data.

# Simulated Data Conditions

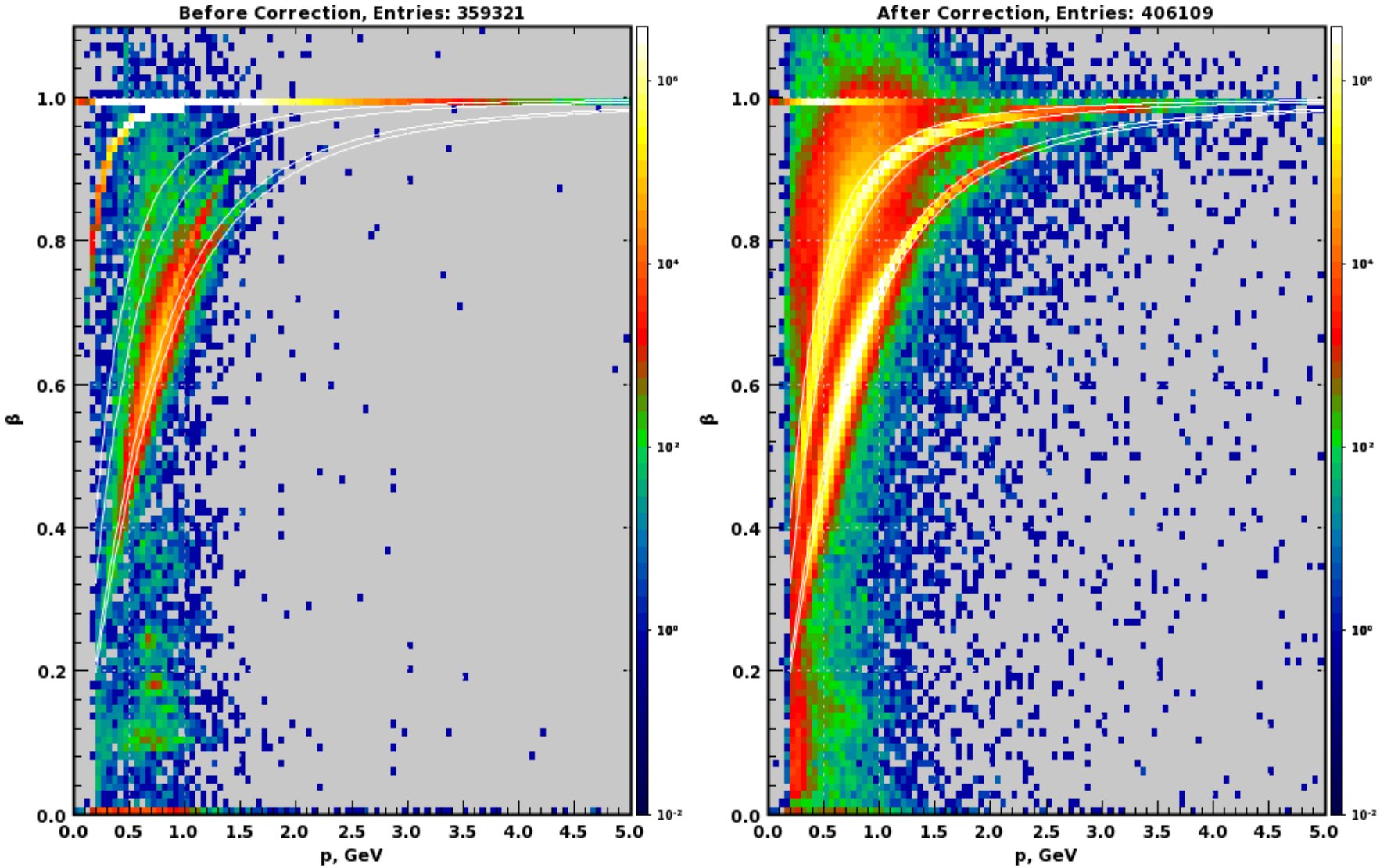
- $E_{beam} = 7.4$ GeV
- $e^-$ p $\rightarrow e^-$ $K^+$ $\Lambda^0$
- Decay Mode: $\Lambda^0$ decays to $\pi^-$p in the event generator
- $Q^2$ range: 0.08 - 6.0 $GeV^2$
- W range: 1.6 - 4.0 GeV
- Magnets Configurations:
  - Torus/Solenoid current: 100%/ -100% (Negative Outbending, -3775 A)
  - ca 1 M events $\rightarrow$ ca 600 K with electron in FT
- Coatjava: PLUGIN=5.6.2 FV=4.3.3 GEMC: 4a.2.4

# Simulations: $\beta$ vs. p for Positive Particles before and after Correction



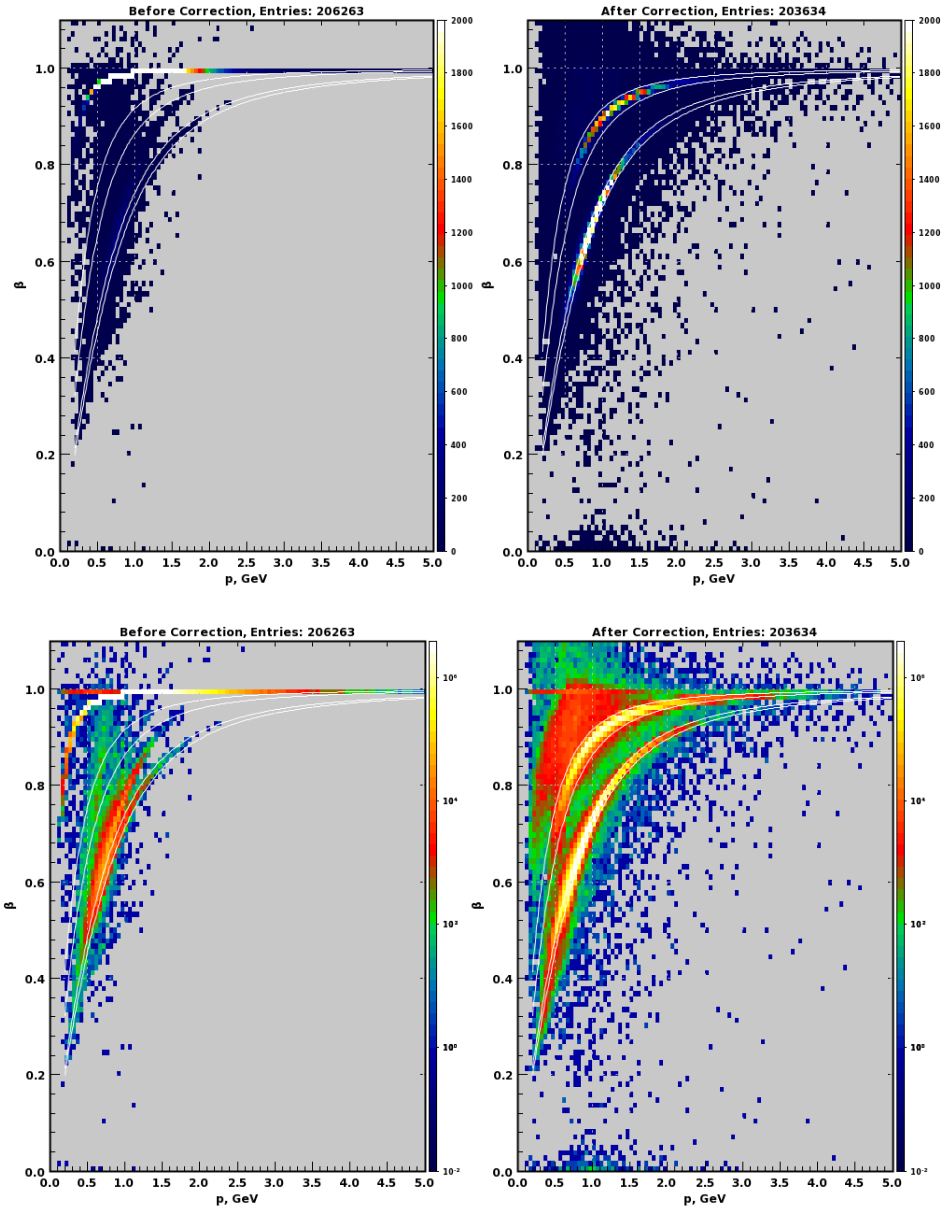

Z Axis: Linear Scale

# Simulations: $\beta$ vs. p for Positive Particles before and after Correction

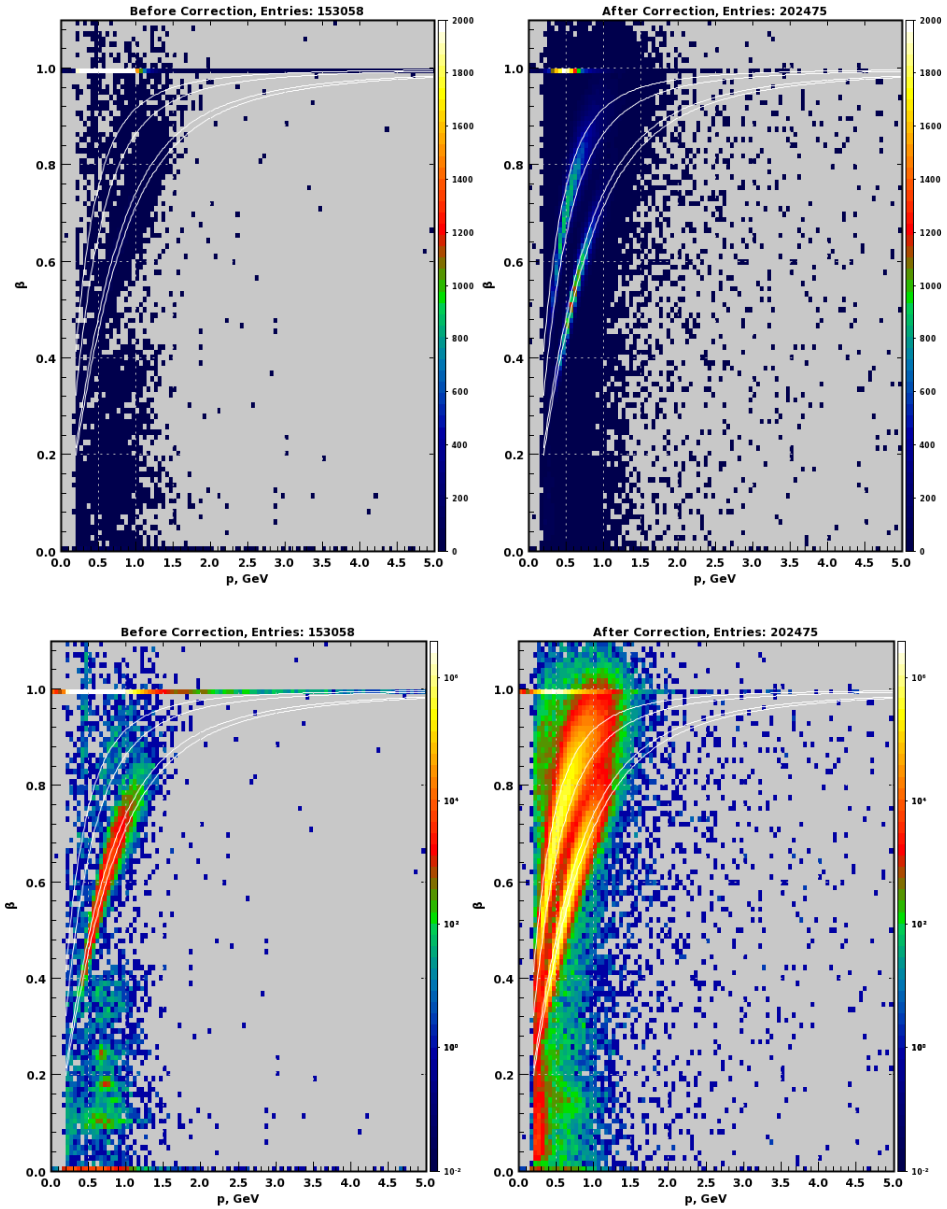



Z Axis: Logarithmic Scale

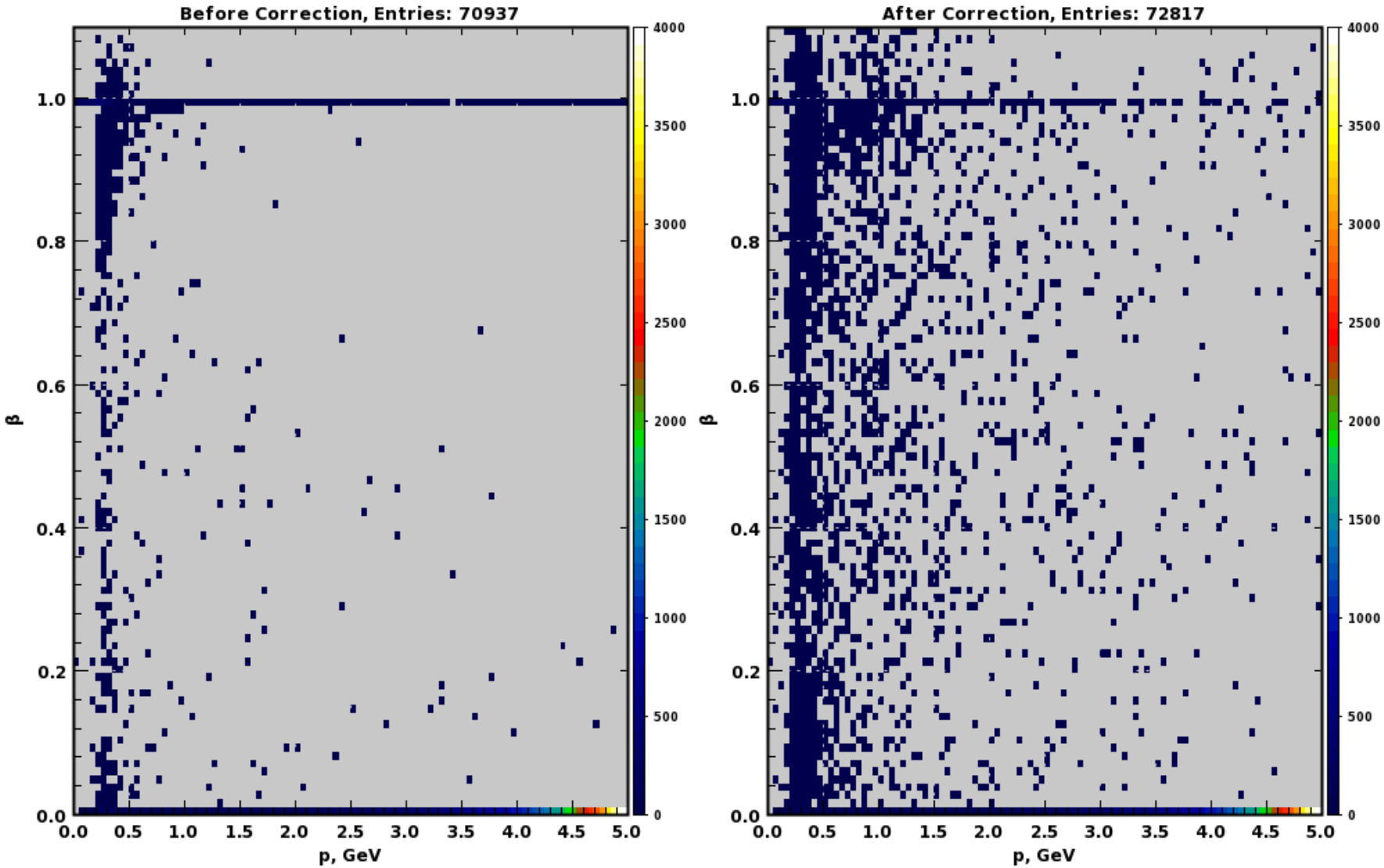
# Simulations: $\beta$ vs. p for Positive Particles: Forward Tracks



# Simulations: $\beta$ vs. p for Positive Particles: Central Tracks

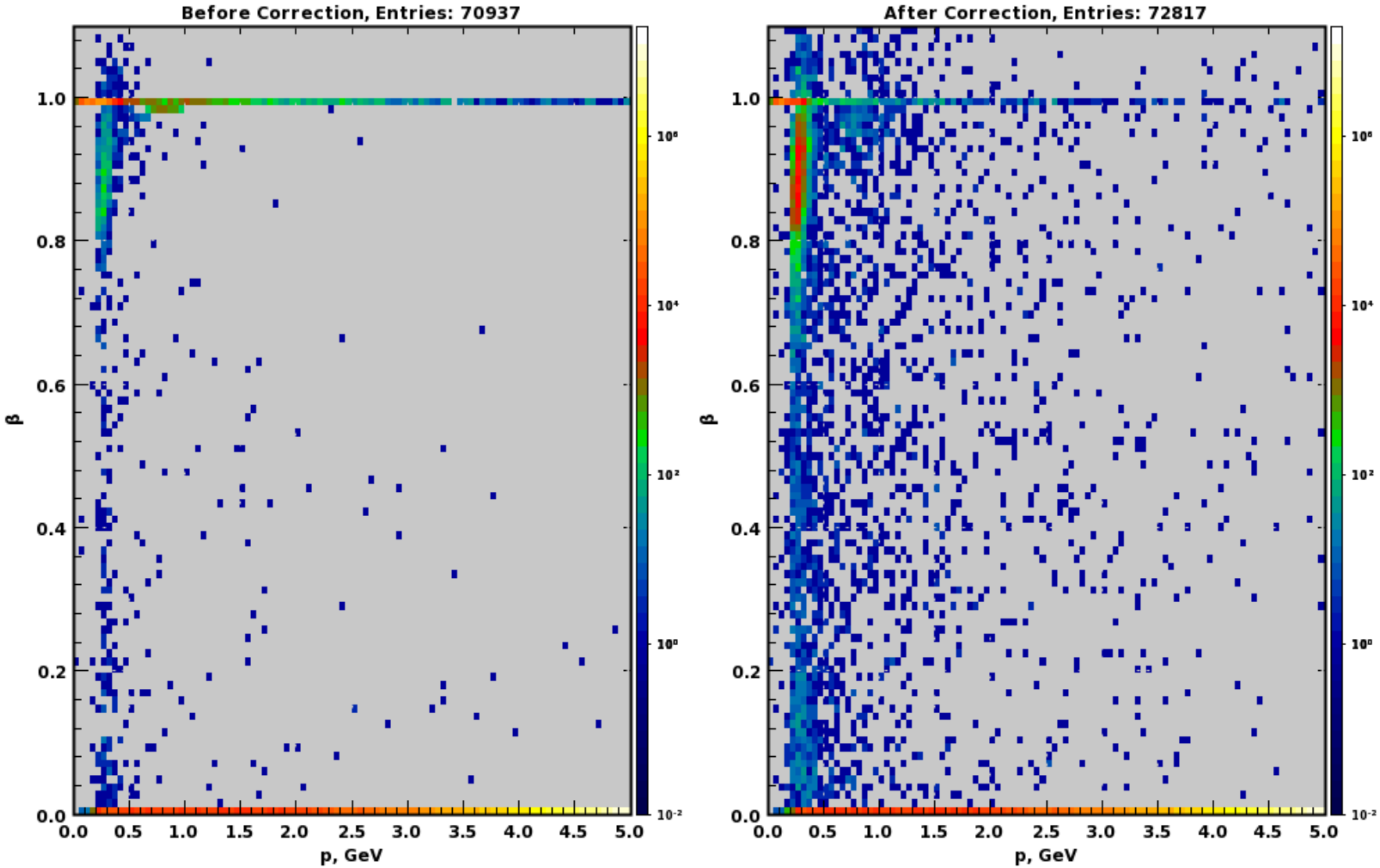


# Simulations: $\beta$ vs. p for Negative Particles before and after Correction



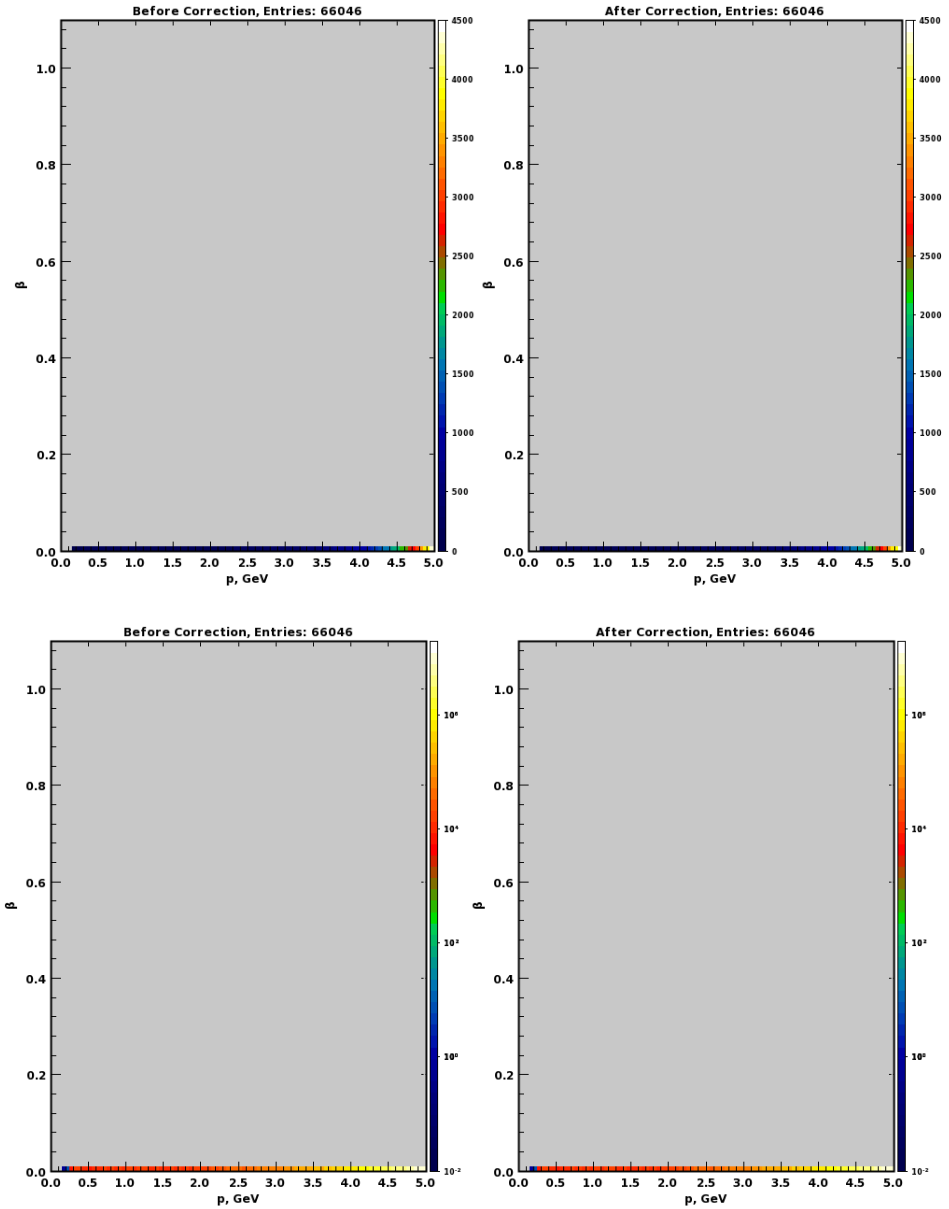

Z Axis: Linear Scale

# Simulations: $\beta$ vs. p for Negative Particles before and after Correction

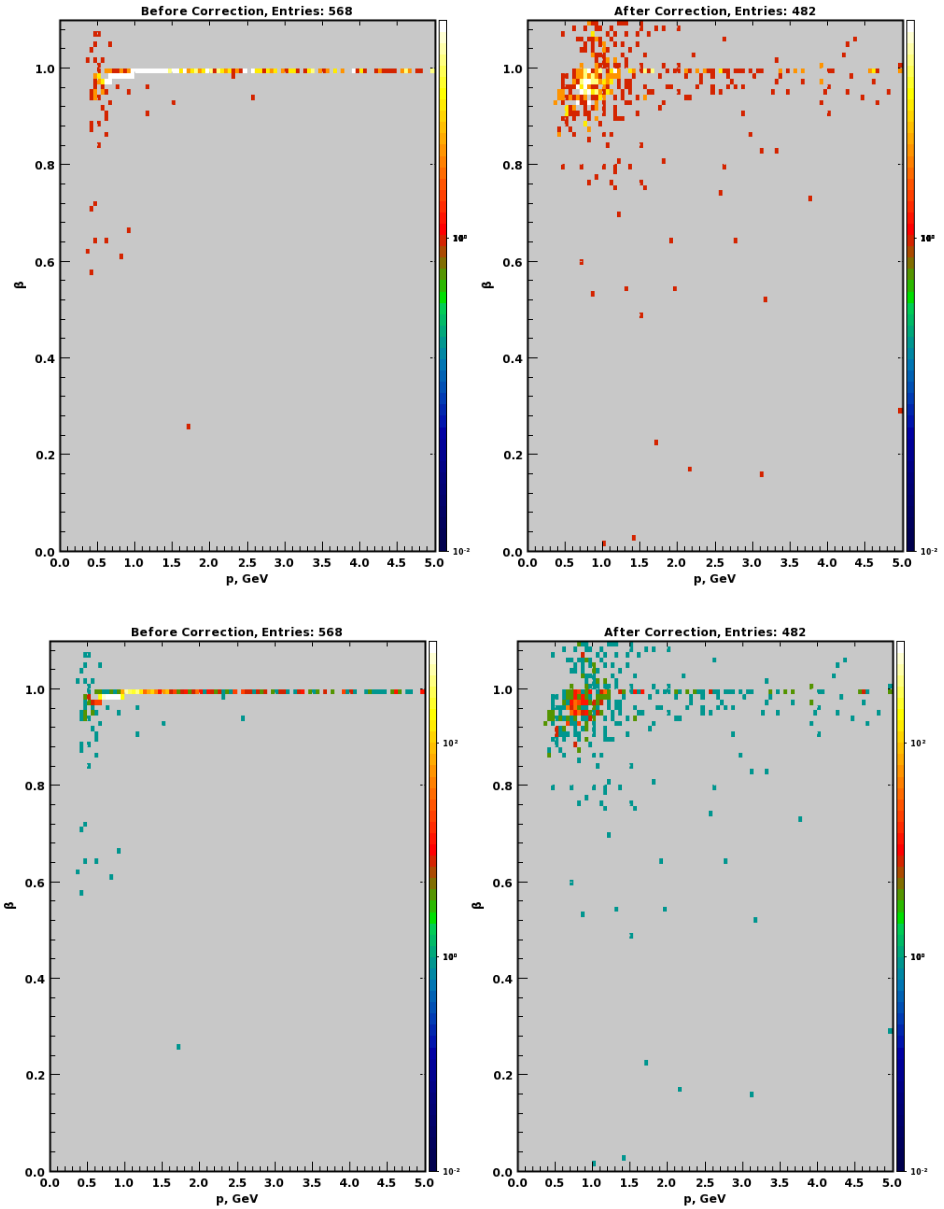



Z Axis: Logarithmic Scale

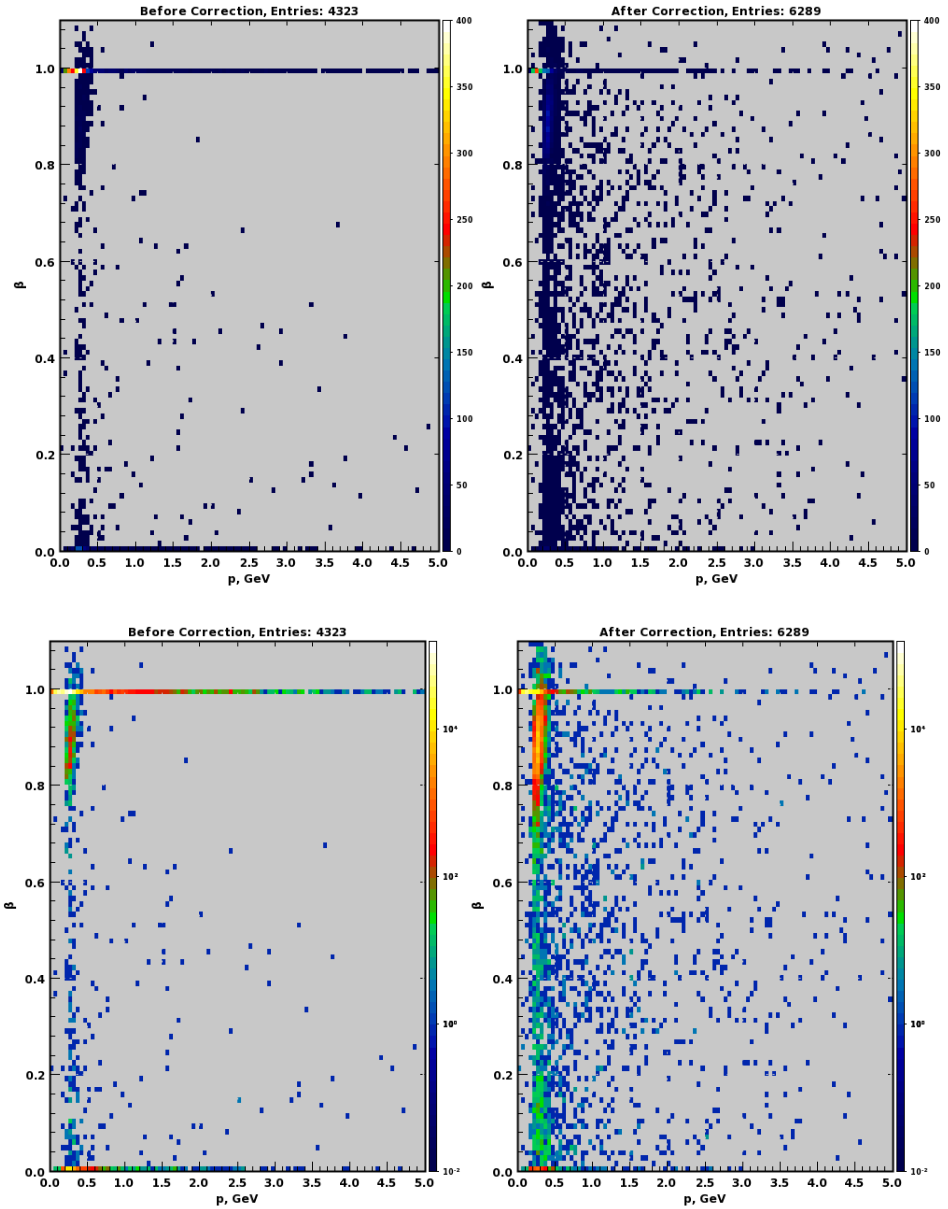
# Simulations: $\beta$ vs. p for Negative Particles: FT Tracks



# Simulations: $\beta$ vs. p for Negative Particles: Forward Tracks



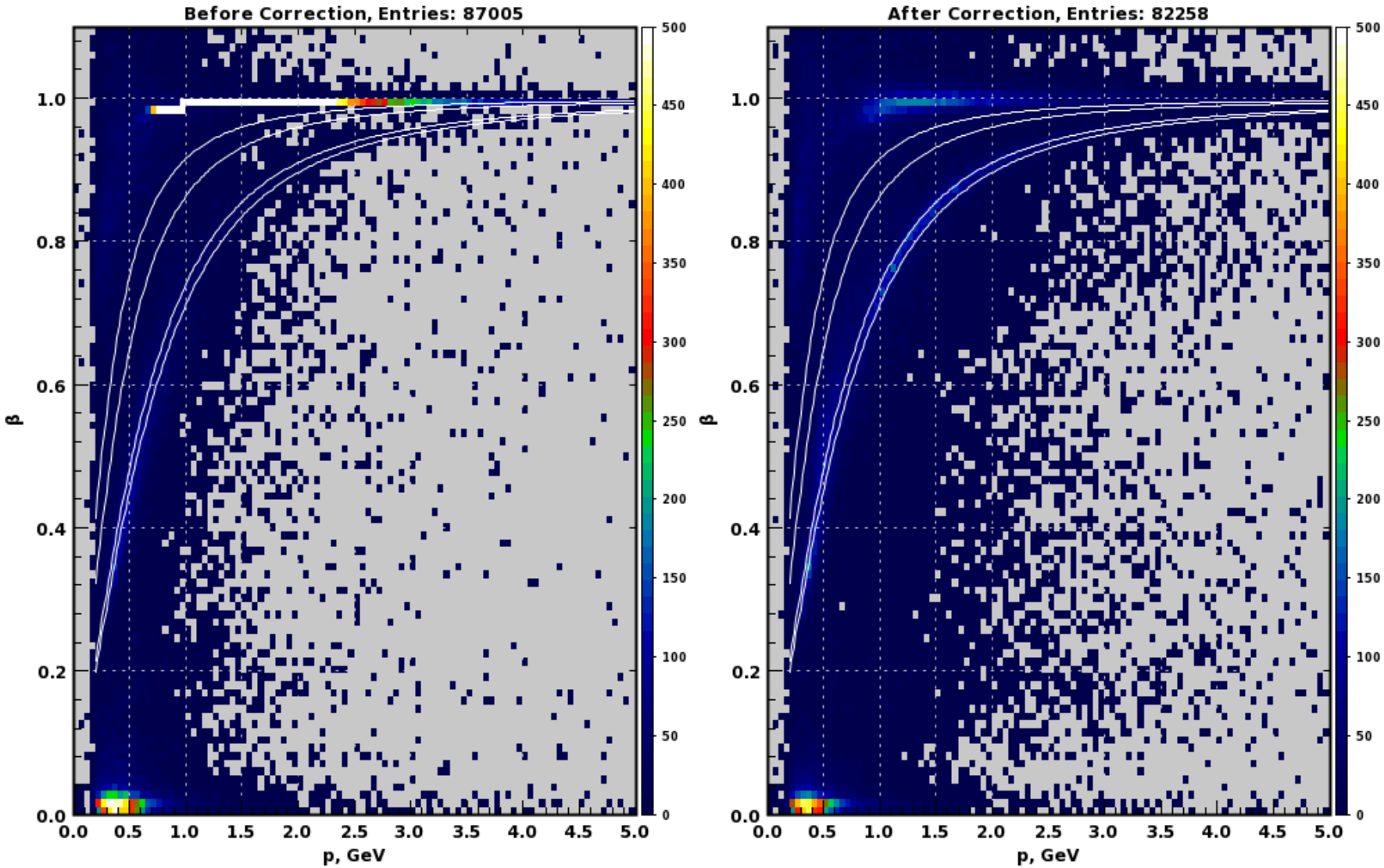
# Simulations: $\beta$ vs. p for Negative Particles: Central Tracks



# Start Time Correction on 4013 Run

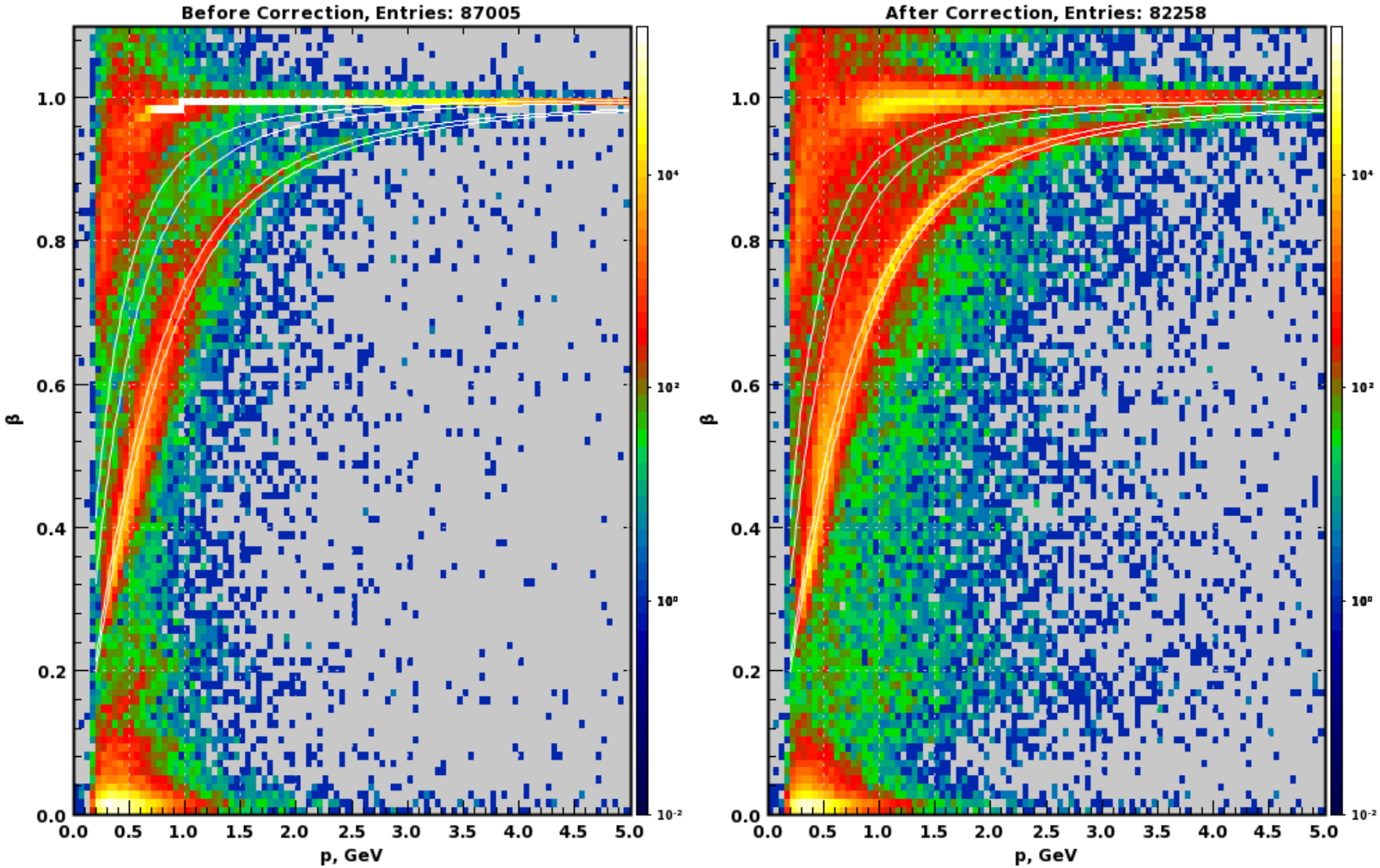
- $E_{beam} = 10.6$ GeV
- Torus/Solenoid current: -100%/ -100% (Negative Inbending, 3775 A)
- 60 K events
- Filter: one electron in the FT, 1 positive track in the central detector, 1 positive and 1 negative in the forward detector

# 4013 Run: $\beta$ vs. p for Positive Particles Before and After Correction



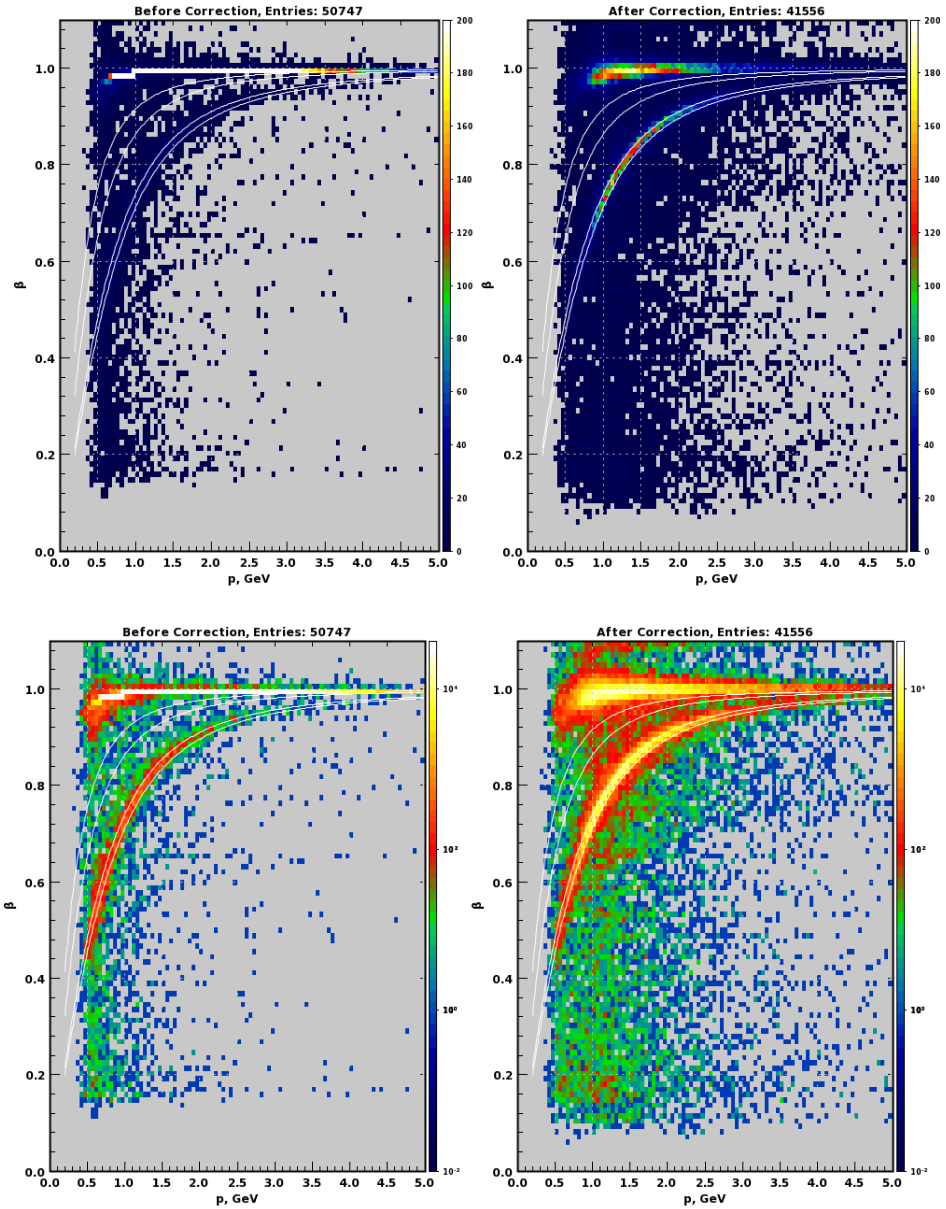

Z Axis: Linear Scale

# 4013 Run: $\beta$ vs. p for Positive Particles Before and After Correction

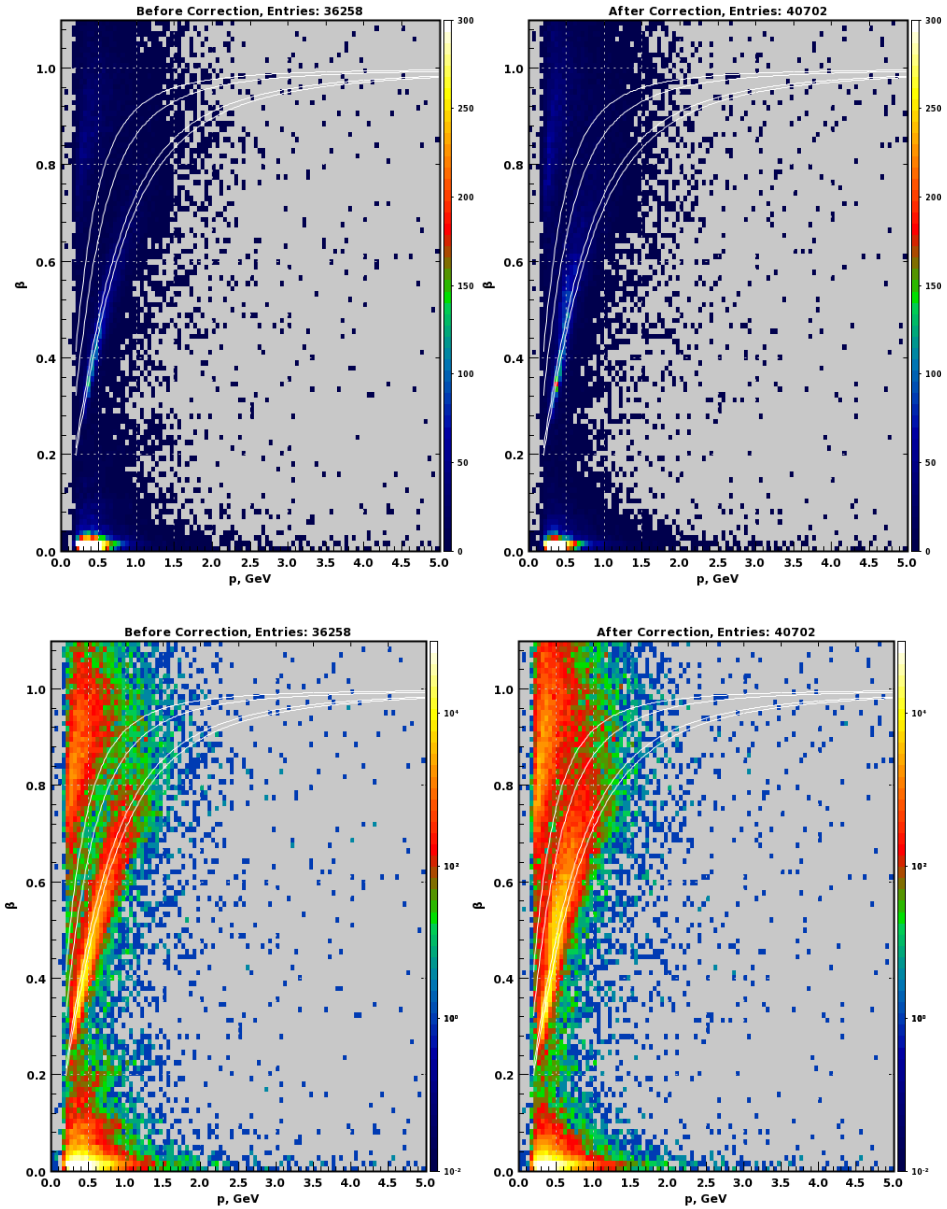



Z Axis: Logarithmic Scale

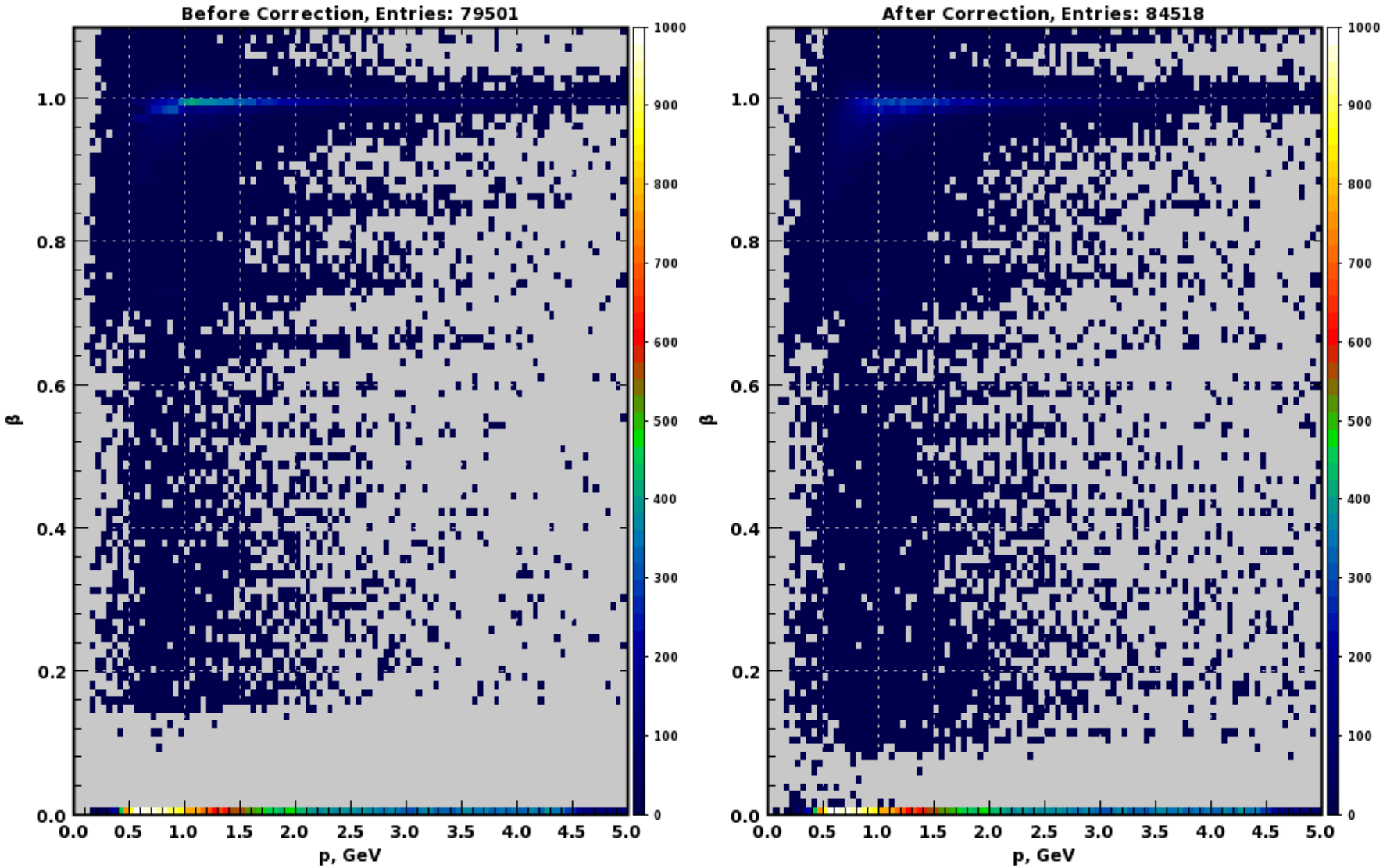
# 4013 Run $\beta$ vs. p for Positive Particles: Forward Tracks



# 4013 Run $\beta$ vs. p for Positive Particles: Central Tracks

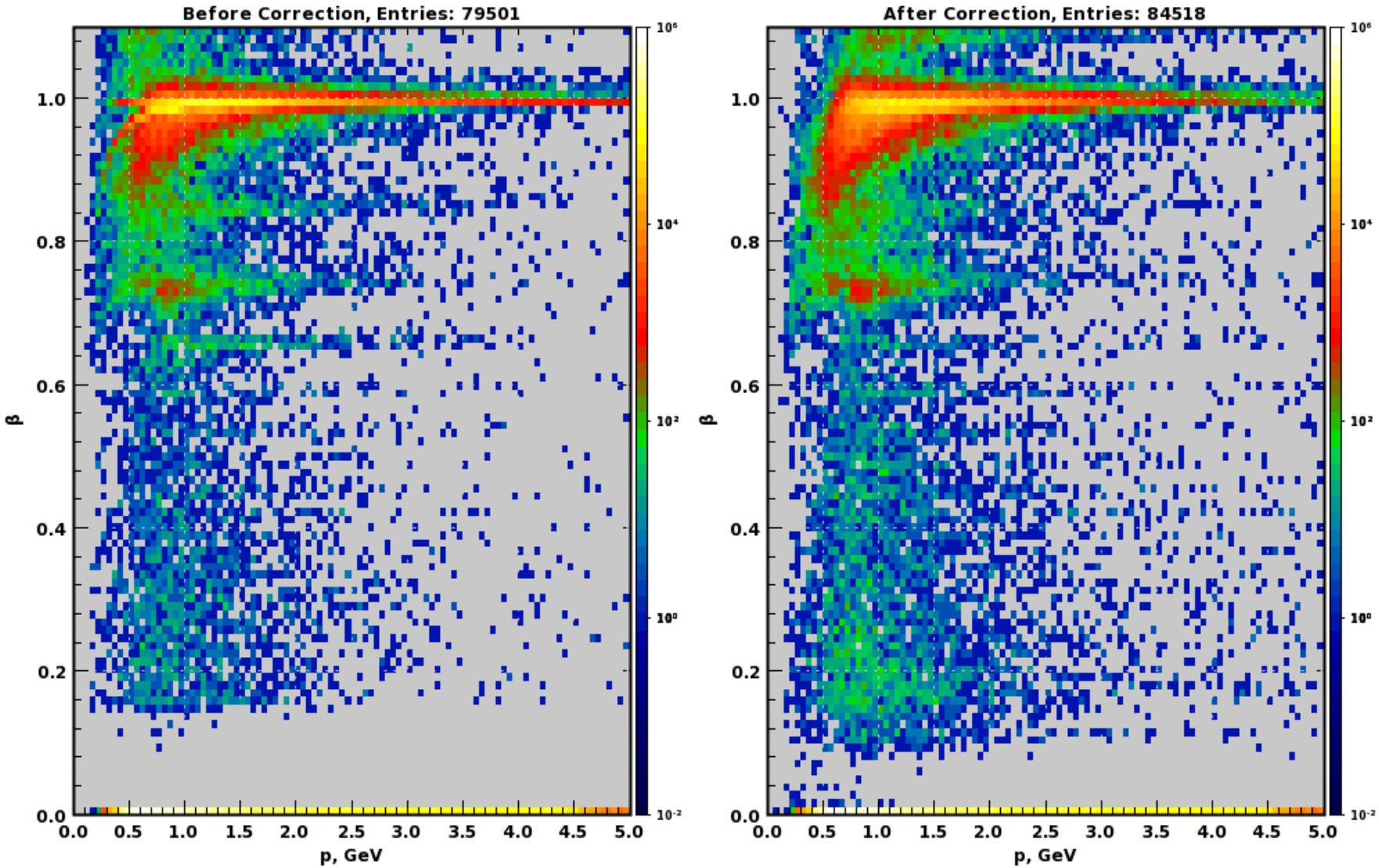


# 4013 Run: $\beta$ vs. p for Negative Particles Before and After Correction



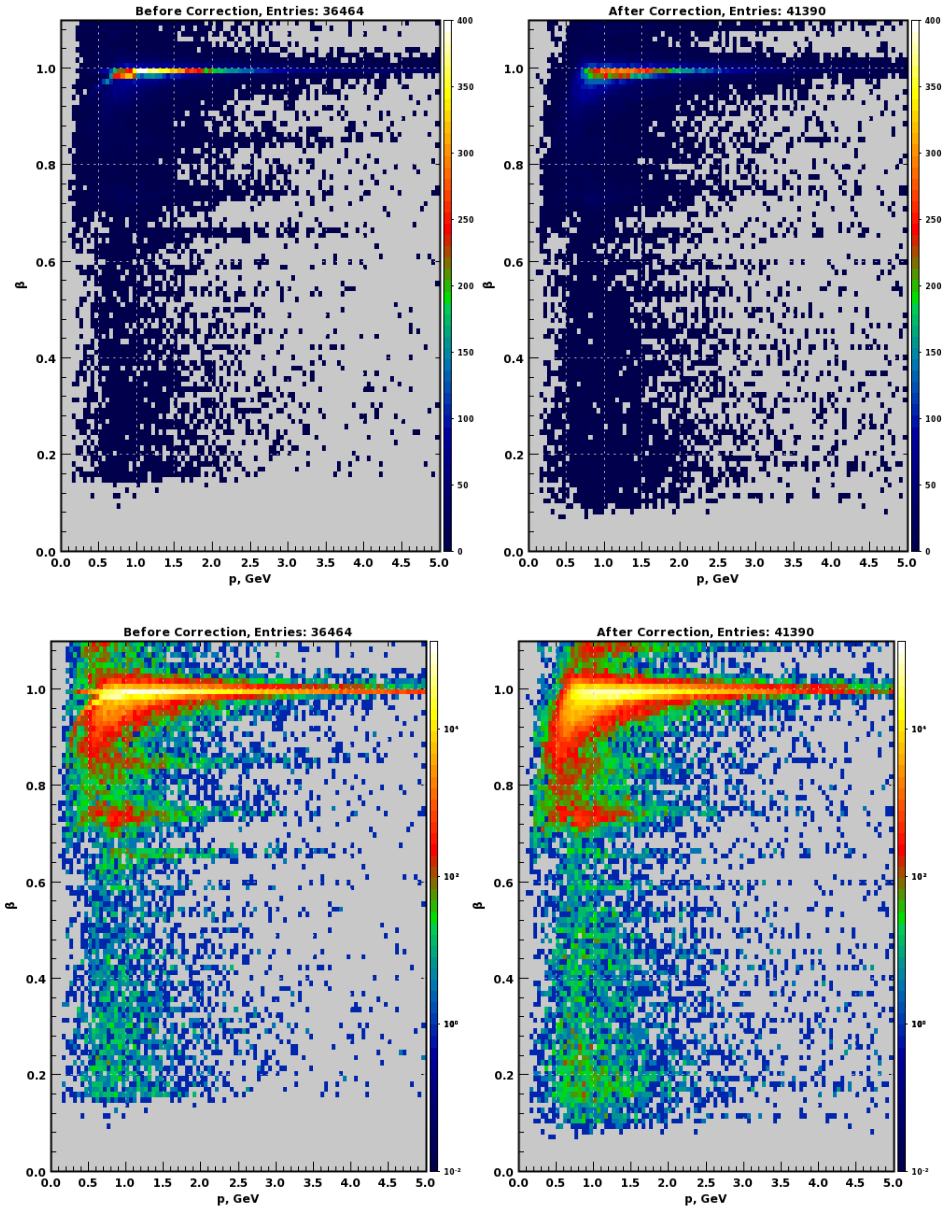

Z Axis: Linear Scale

# 4013 Run: $\beta$ vs. p for Negative Particles Before and After Correction

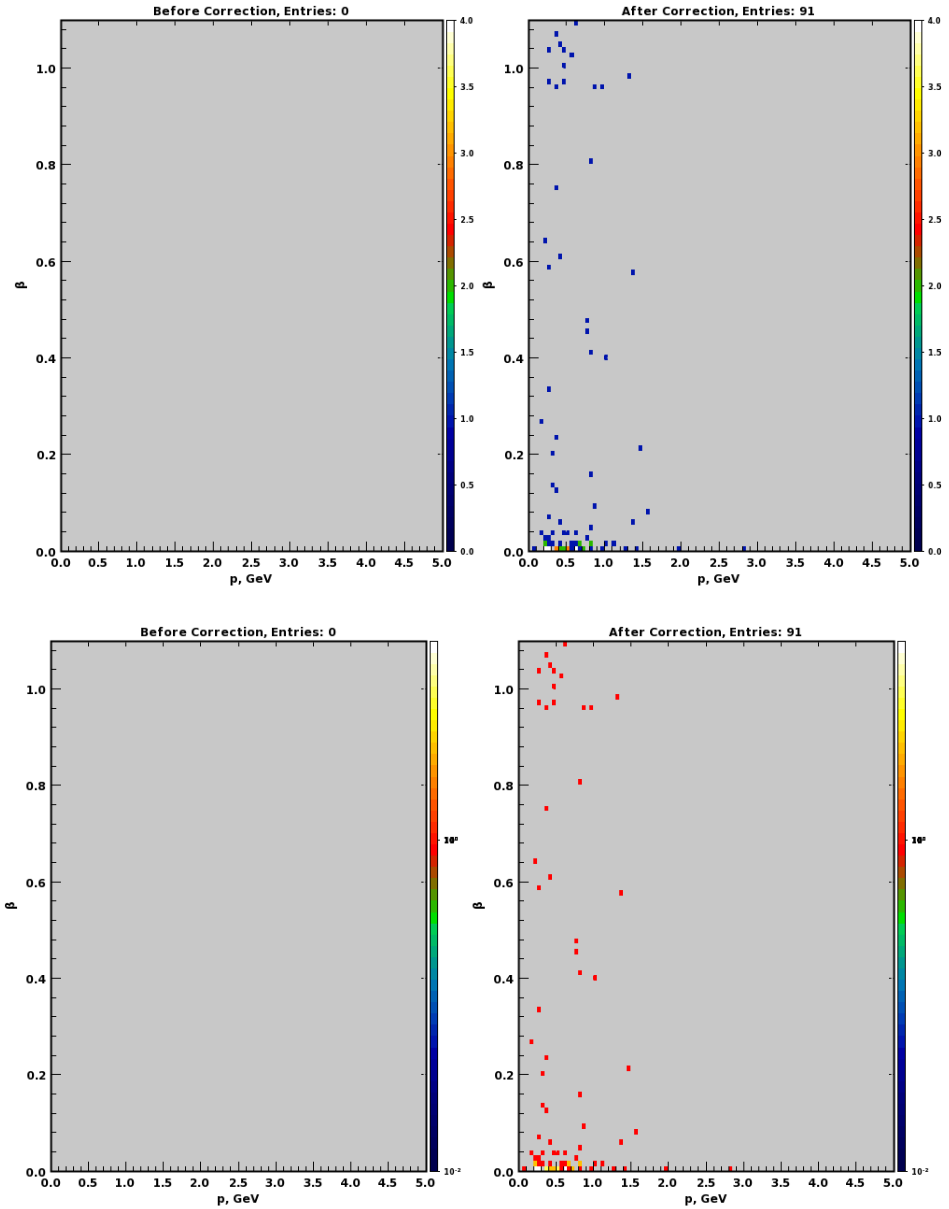



Z Axis: Logarithmic Scale

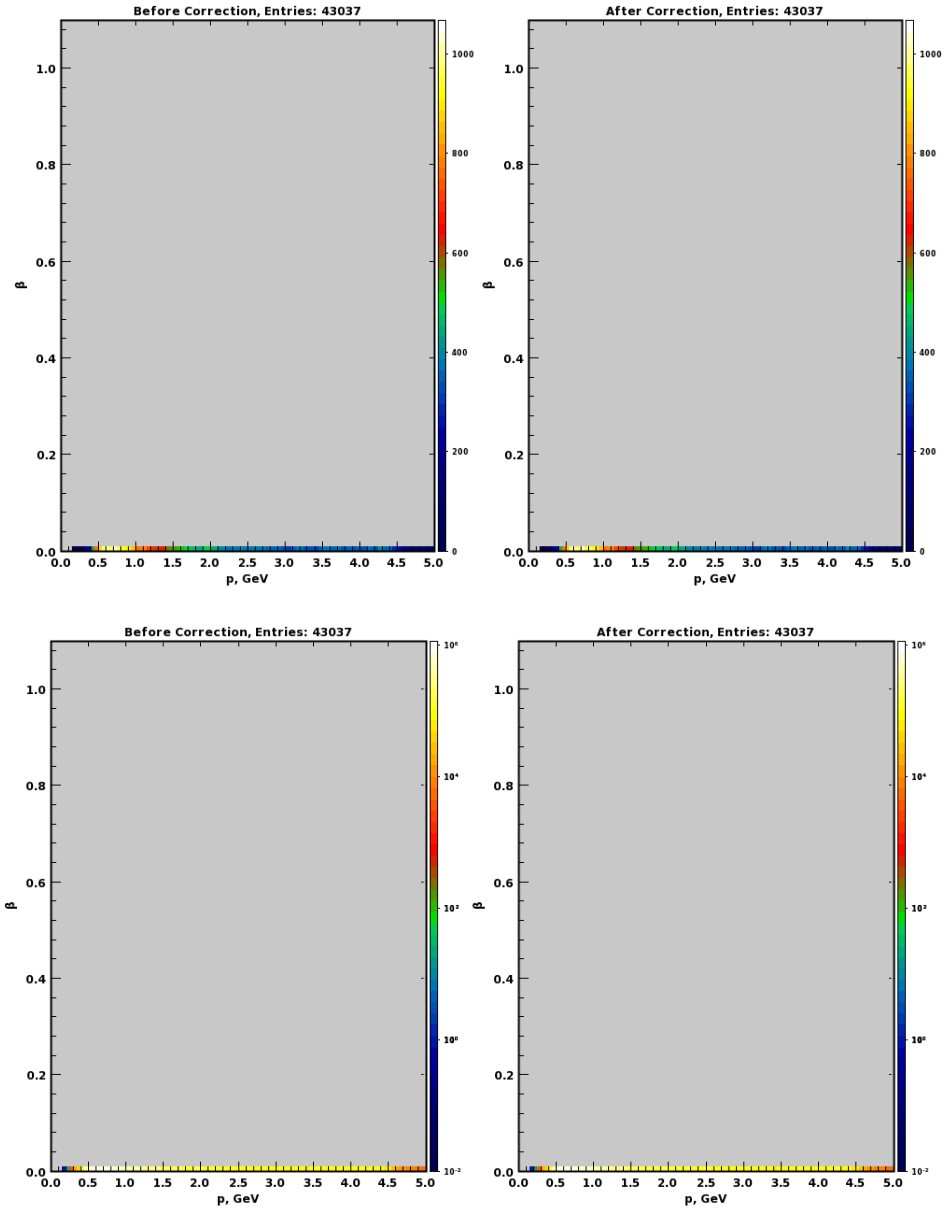
# 4013 Run $\beta$ vs. p for Negative Particles: Forward Tracks



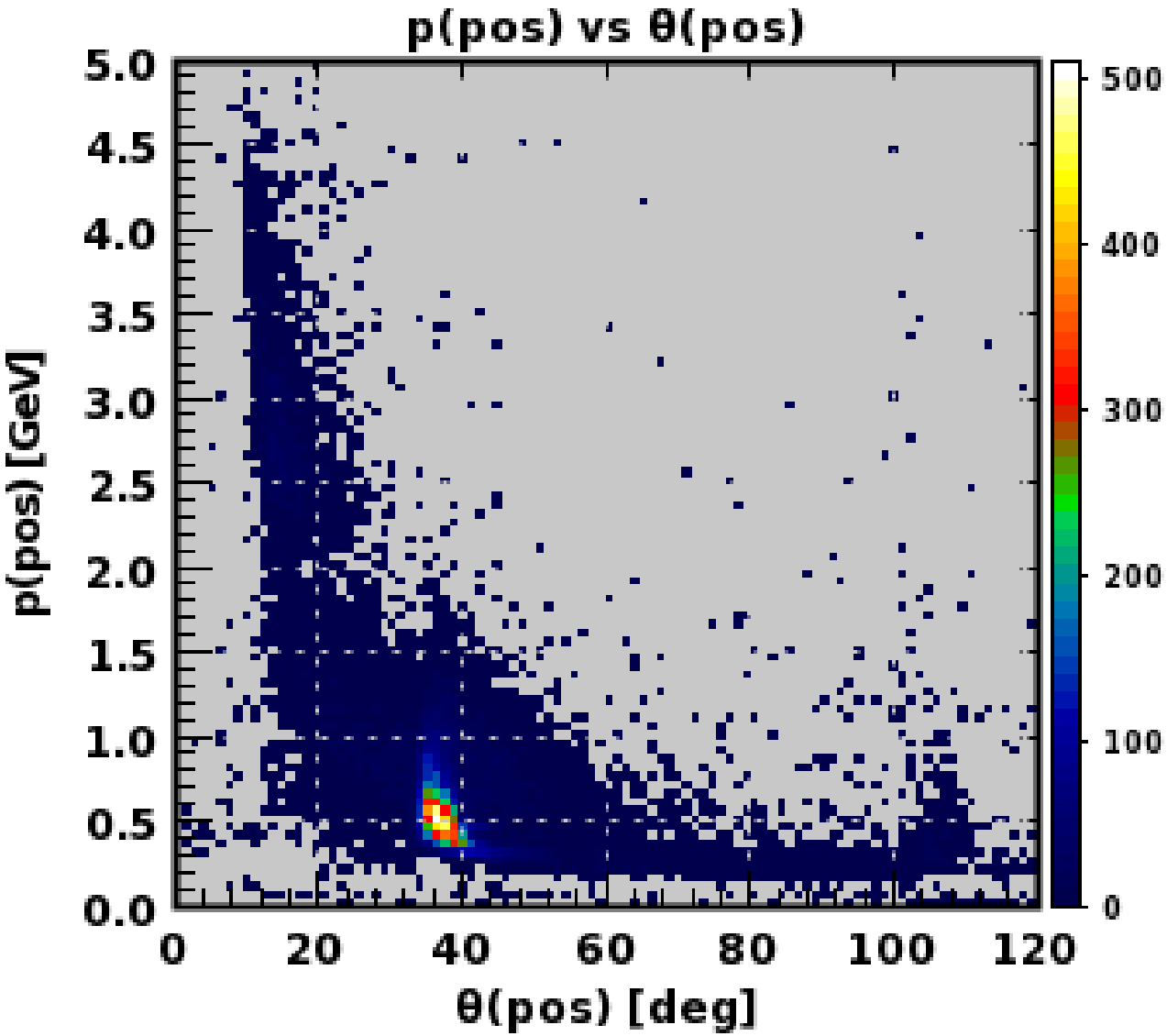
# 4013 Run $\beta$ vs. p for Negative Particles: Central Tracks



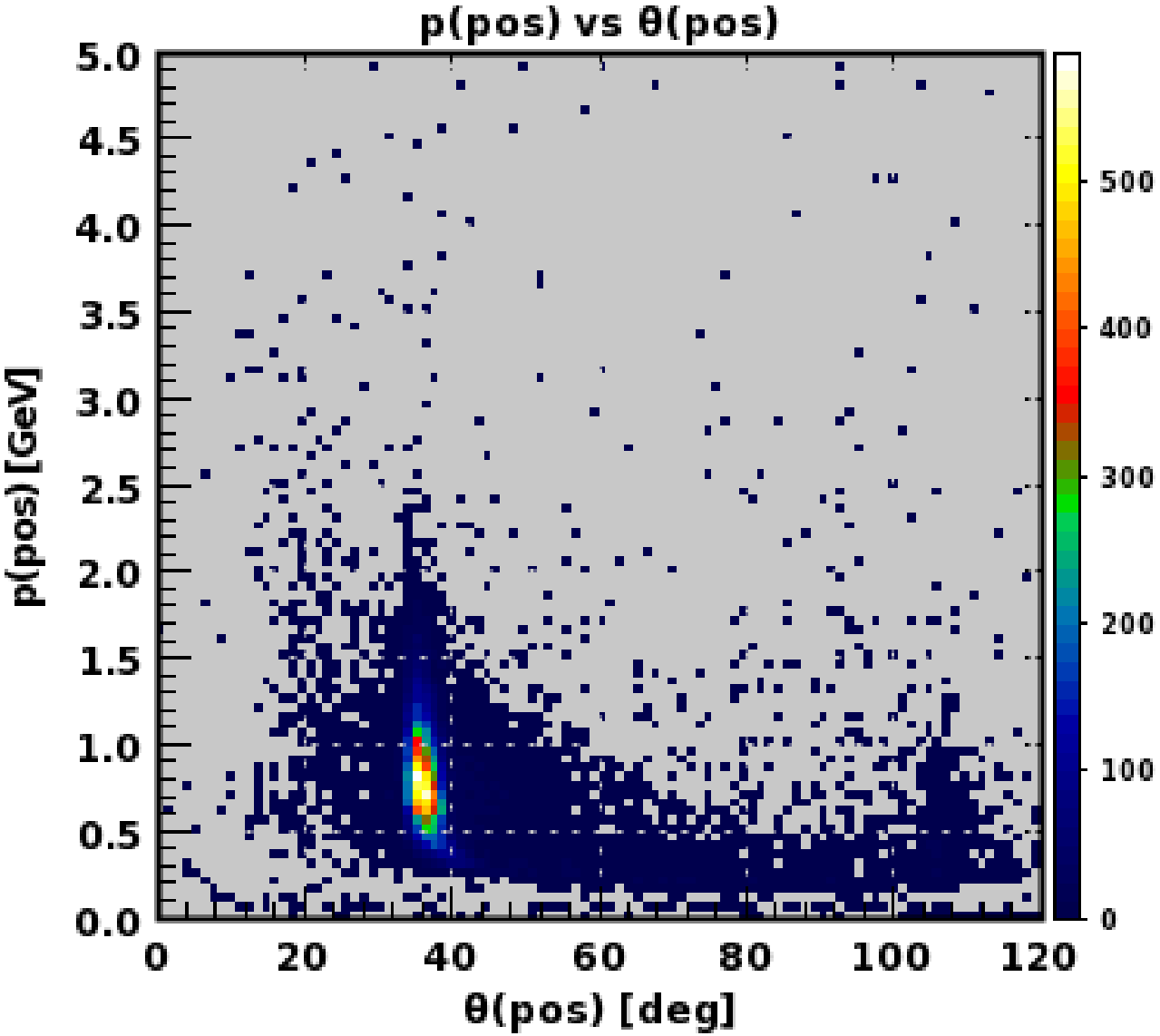
# 4013 Run $\beta$ vs. p for Negative Particles: FT Tracks



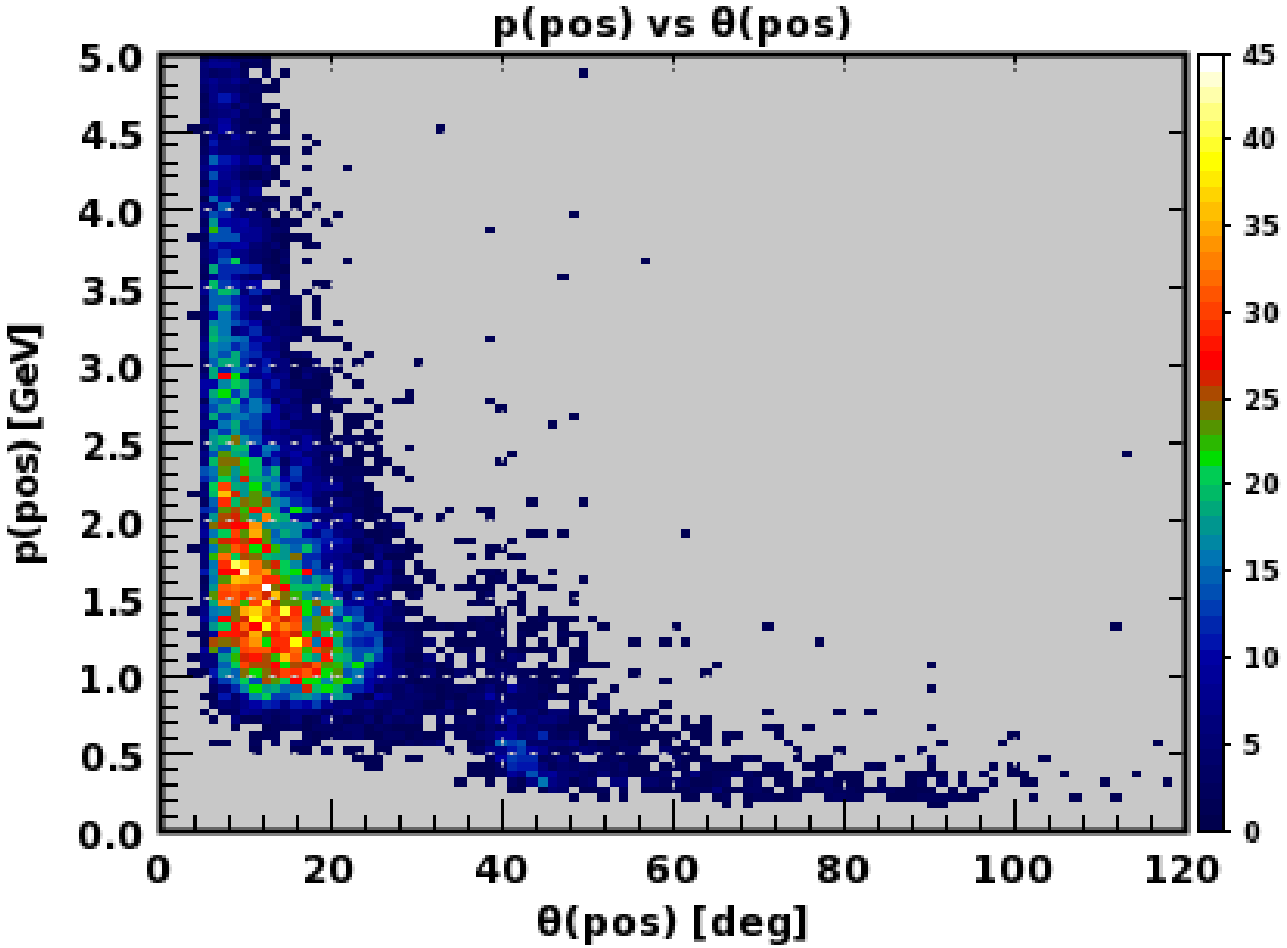
# Backup: Momentum vs. $\theta$ for Positive Particles with $\beta \sim 1$



# Backup: Momentum vs. $\theta$ for Positive Particles with $\beta \sim 0$



# Backup: 4013 Momentum vs. $\theta$ for Positive Particles with $\beta \sim 1$



# Backup: 4013 Momentum vs. $\theta$ for Positive Particles with $\beta \sim 0$