Searching for B_{sJ} via $B_{sJ} \to B\pi^0$ decay

Introduction

QCD predicts existence of 4 P-wave states of Bs

$$B_{s1}^{'}, \quad B_{s0}^{*}, \quad B_{s1} \quad and \quad B_{s2}^{*}$$

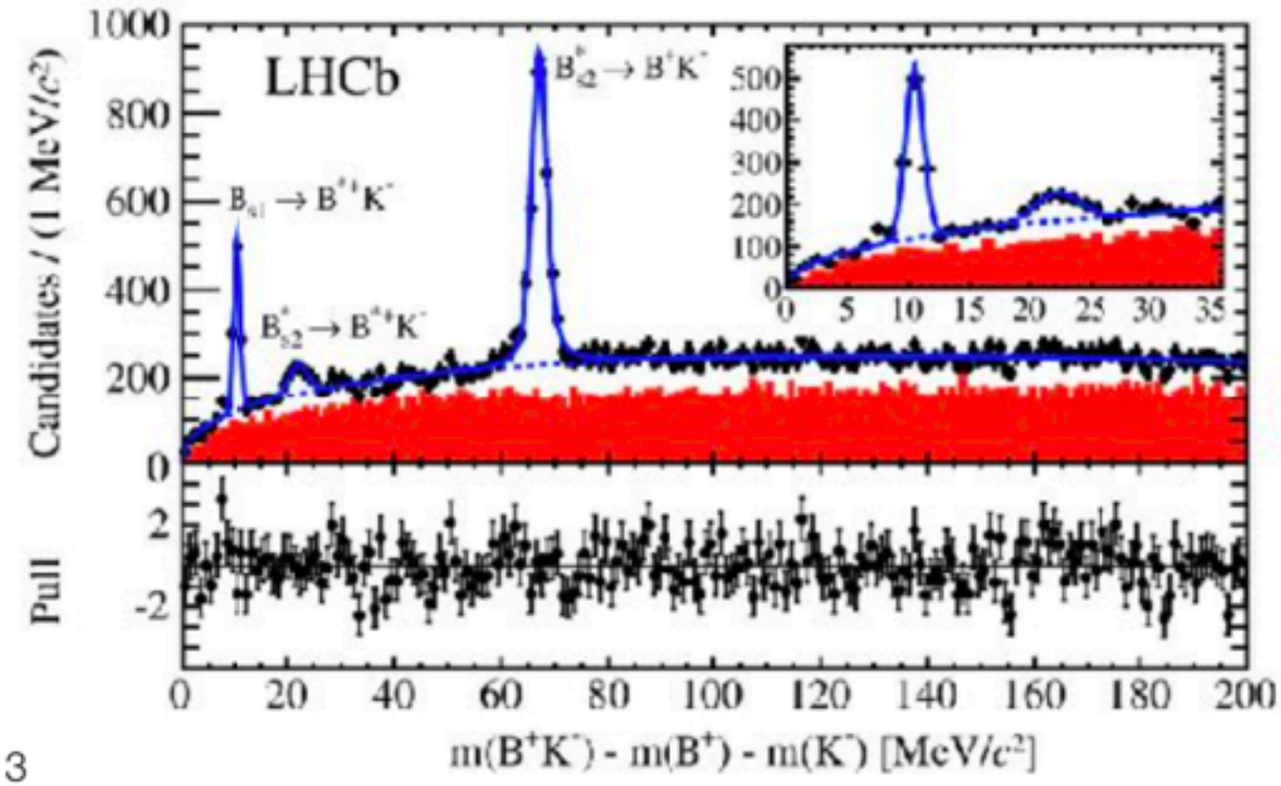
2 states $B_{s1}(5830)$ and $B_{s2}^{*}(5840)$ have been observed by

CDF and D0 [arXiv:0710.4199, arXiv:0711.0319]

$B_{s1}^{'}$ and B_{s0}^{*} still haven't been unobserved

LHCb-PAPER-2012-030

Spin-parity of light quark j^P	Spin-parity of B_s meson J^P	
1/2-	0-	B_s
	1-	B_s^*
1/2+	0+	B_{s0}^*
	1+	$B_{s1}^{'}$
3/2+	1+	B_{s1}
	2+	B_{s2}^*



INTRODUCTION

Decays of B_{sJ} states

$$B^*_{s0} \to B^*_s \gamma$$

$$B^*_{s0} \to B_s \pi^0$$

$$B_{s1} \to B_s \gamma$$

$$B_{s1} \to B^*_s \gamma$$

Analysis Strategy

Select B_s candidates via decay $B_s \to (D_s^- \to K^+K^-\pi^-)\pi^+$

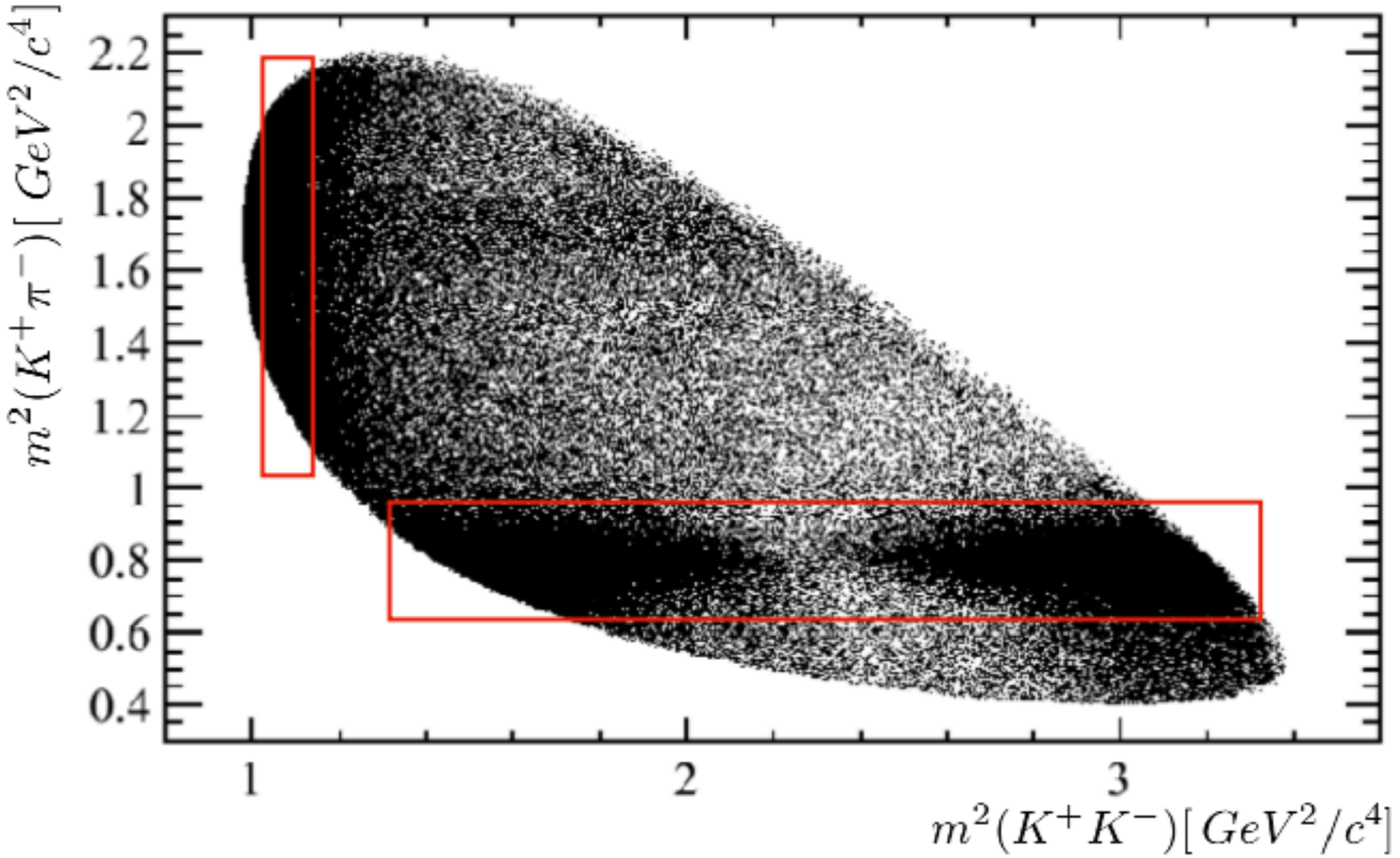
Select Bs1 canditates, combine Bs Candidates to π°

B_s selection - Dalitz plot analysis

Three-body decay $D_s^- \to K^+K^-\pi^-$

Select $m(K^+K^-)$ **in range** $m(\phi(1020)) \pm 2\sigma$

and $m(K^+\pi^-)$ **in range** $m(K^{0*}) \pm 2\sigma$



Offline selections:

- Dalitz plot selection

- Mass of D_s

  1955 < Ds_M < 1980

- Direction of D_s

  Ds_DIRA_ORIVX > 0

- Chi-2 of impact parameter of B_s

  Bs0_IPCHI2_OWNPV <10

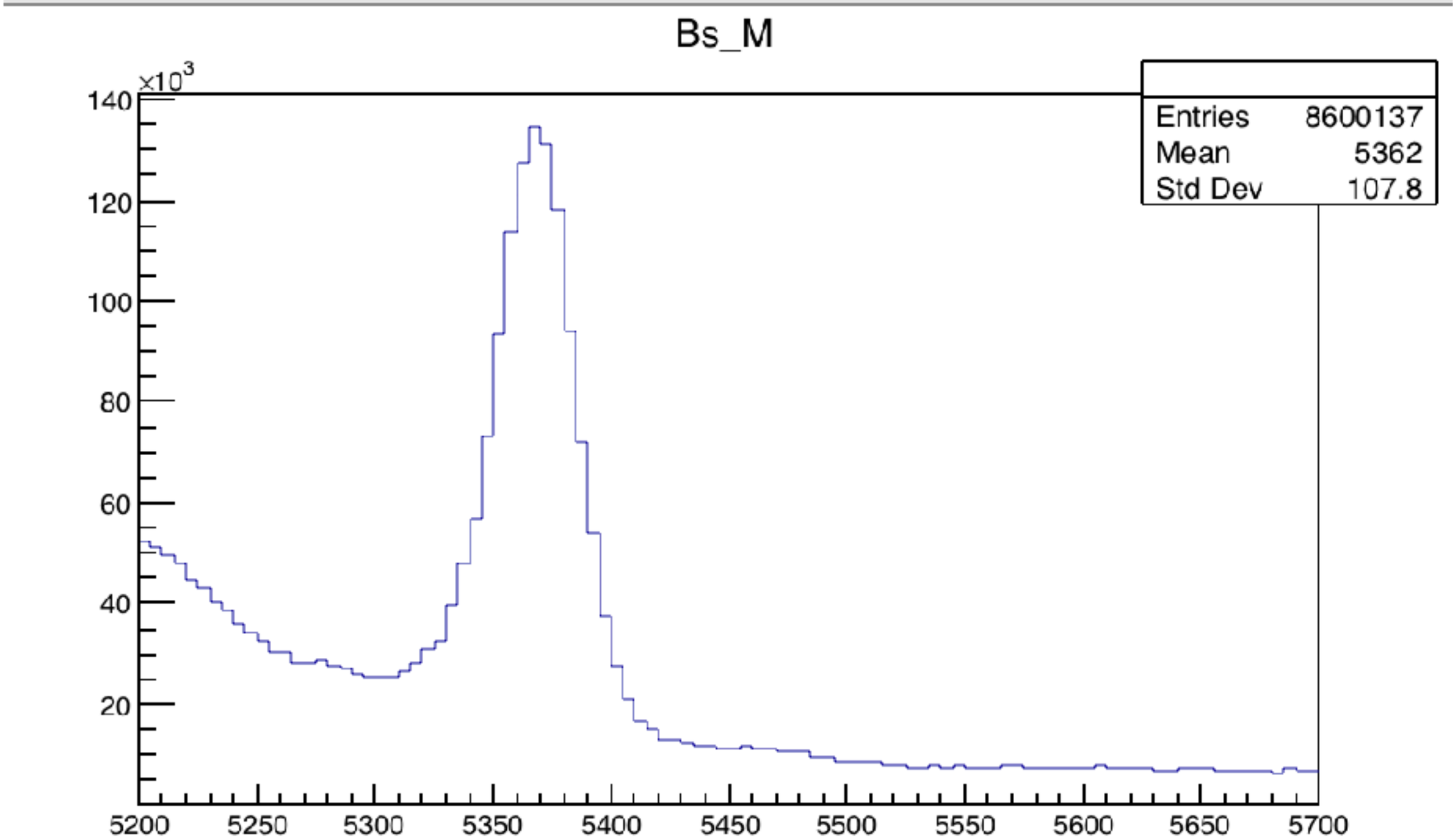
- $\chi^2/nDoF$ of B_s with constraint on

  D_s **0 < Bs0_CHI2NDOF_DTF_Ds <3.5**

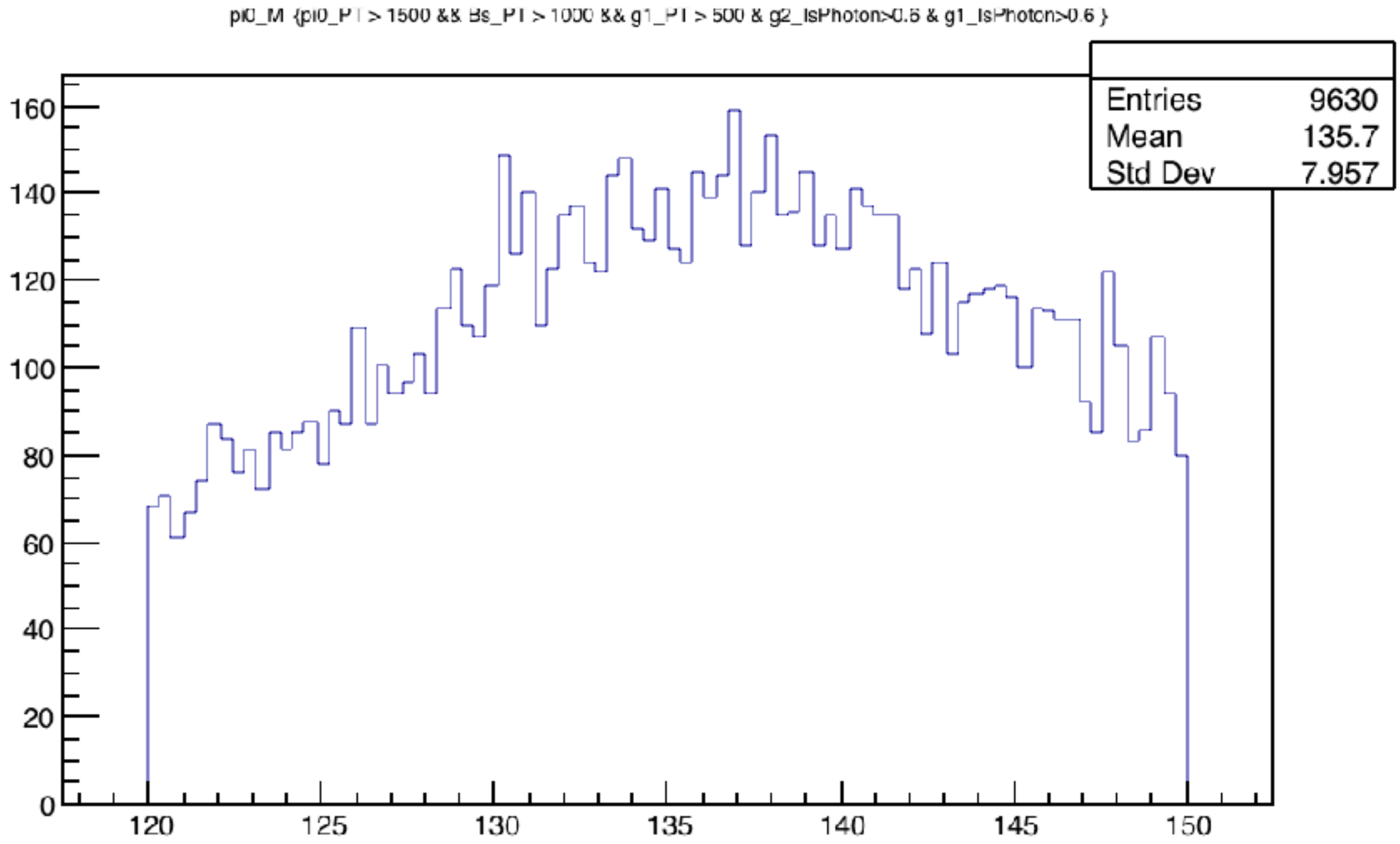
Types Of π^0 Decays

- Π^0 Resolved
- Π^0 Merged
- Dalitz
- 1Gamma Converted
- 2Gamma Converted

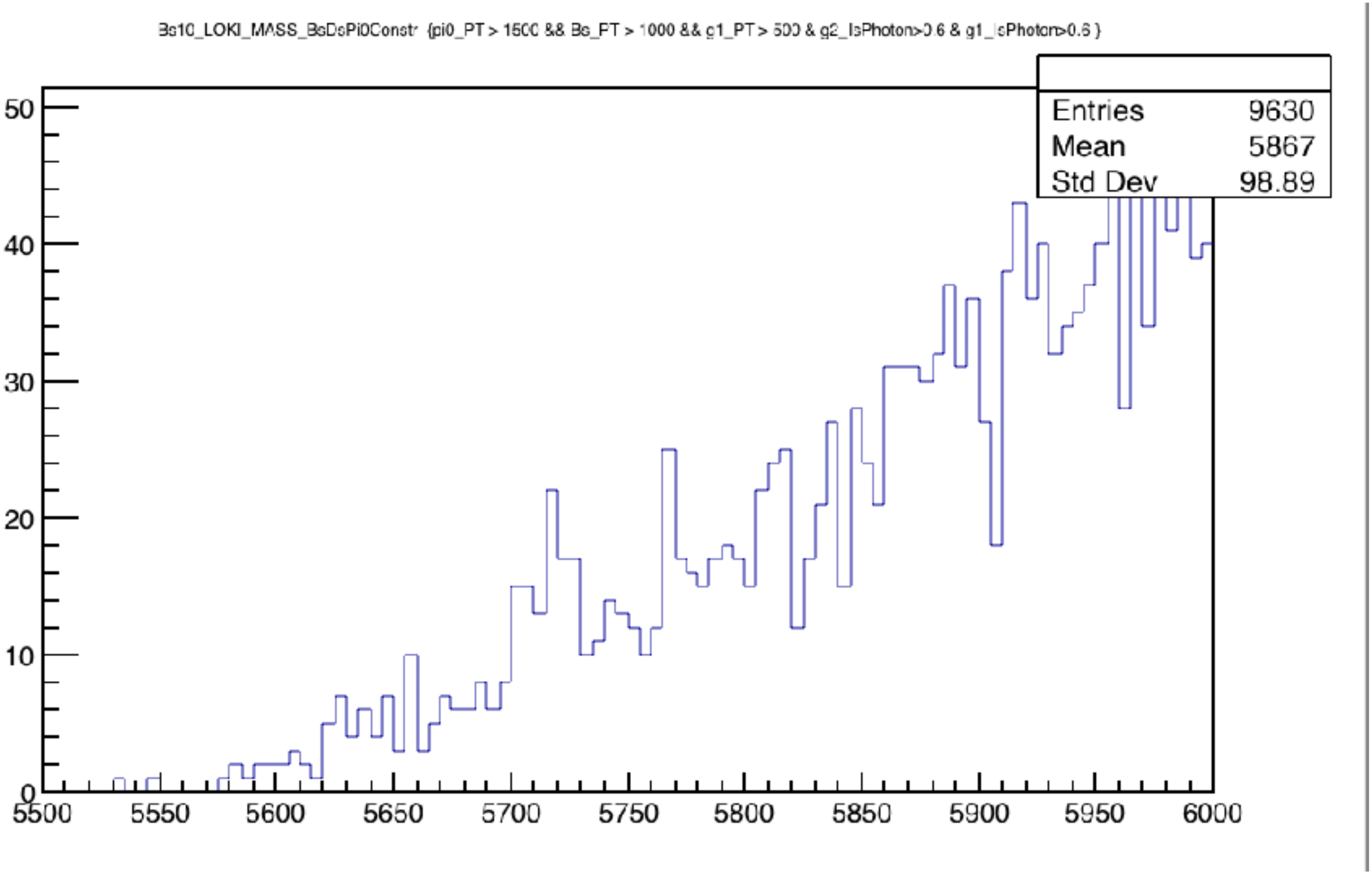
Π° Resolved



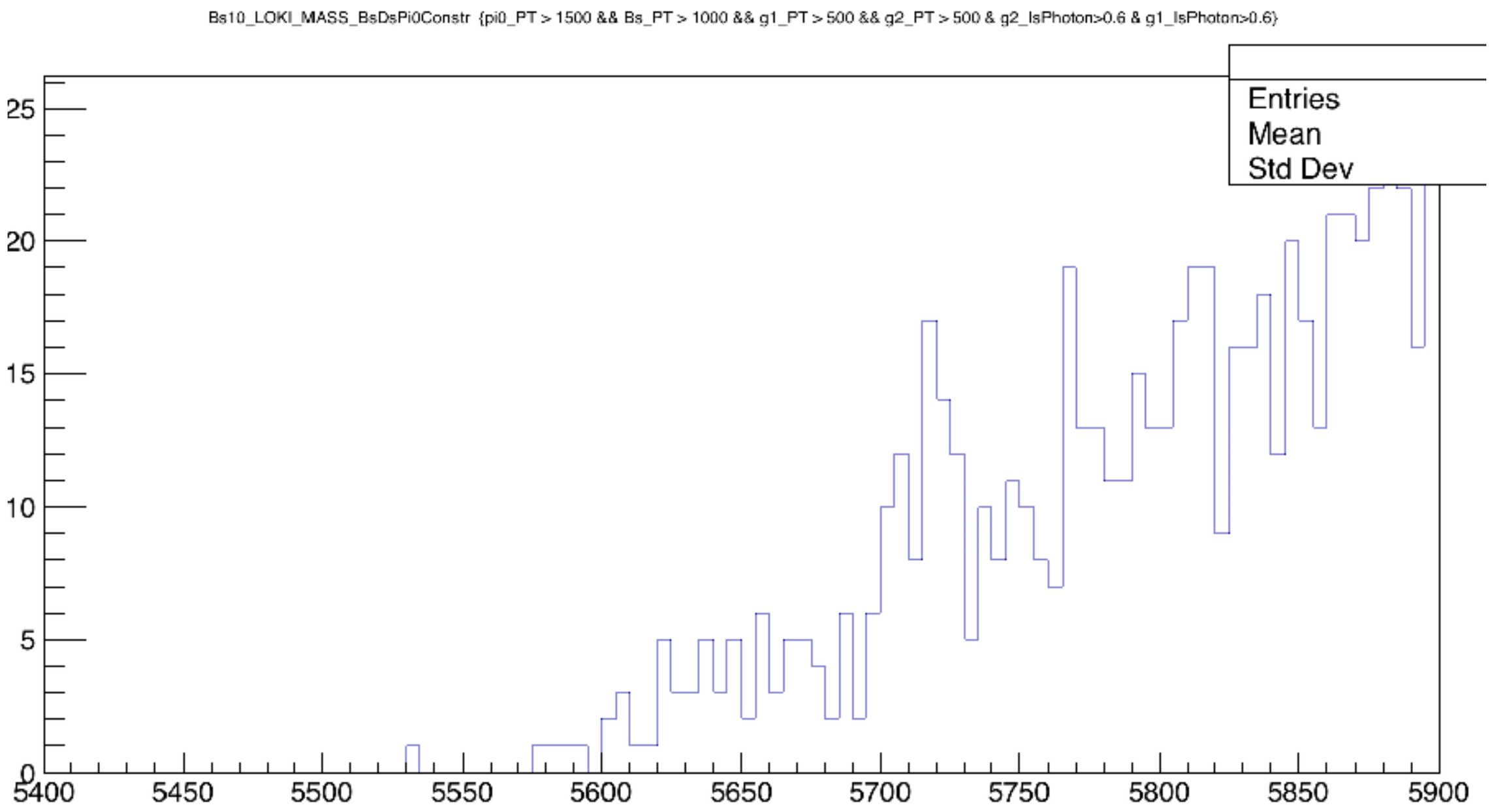
Bs M plot


pi0_M {pi0_PT > 1500 && Bs_PT > 1000 && g1_PT > 500 & g2_IsPhoton>0.6 & g1_IsPhoton>0.6 }
Entries 9630
Mean 135.7
Std Dev 7.957
160
140
120
100
80
60
40
20
0
120
125
130
135
140
145
150

Pi0 M Plot

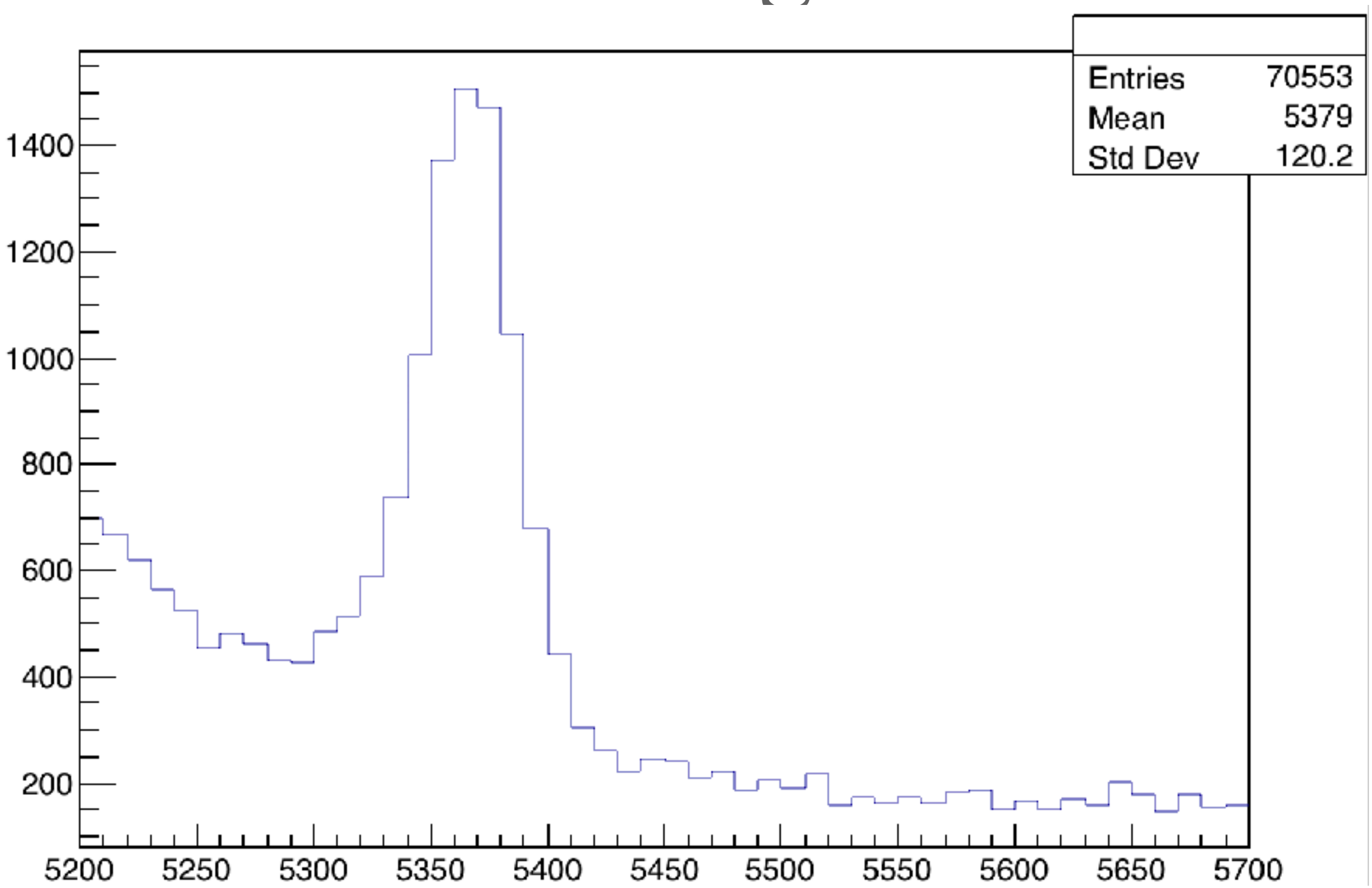


Bs10 Mass Plot

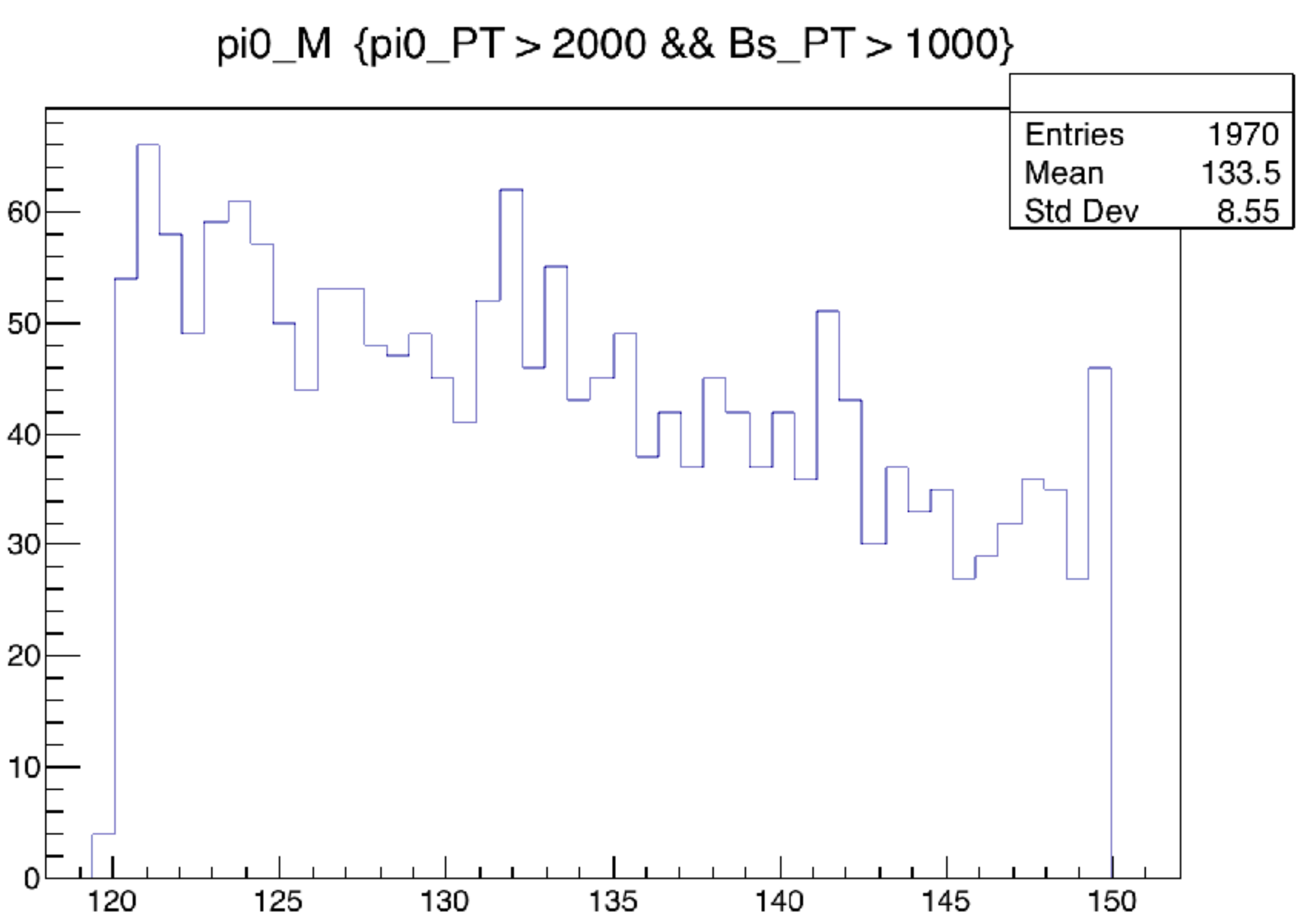


Bs10 Mass Plot

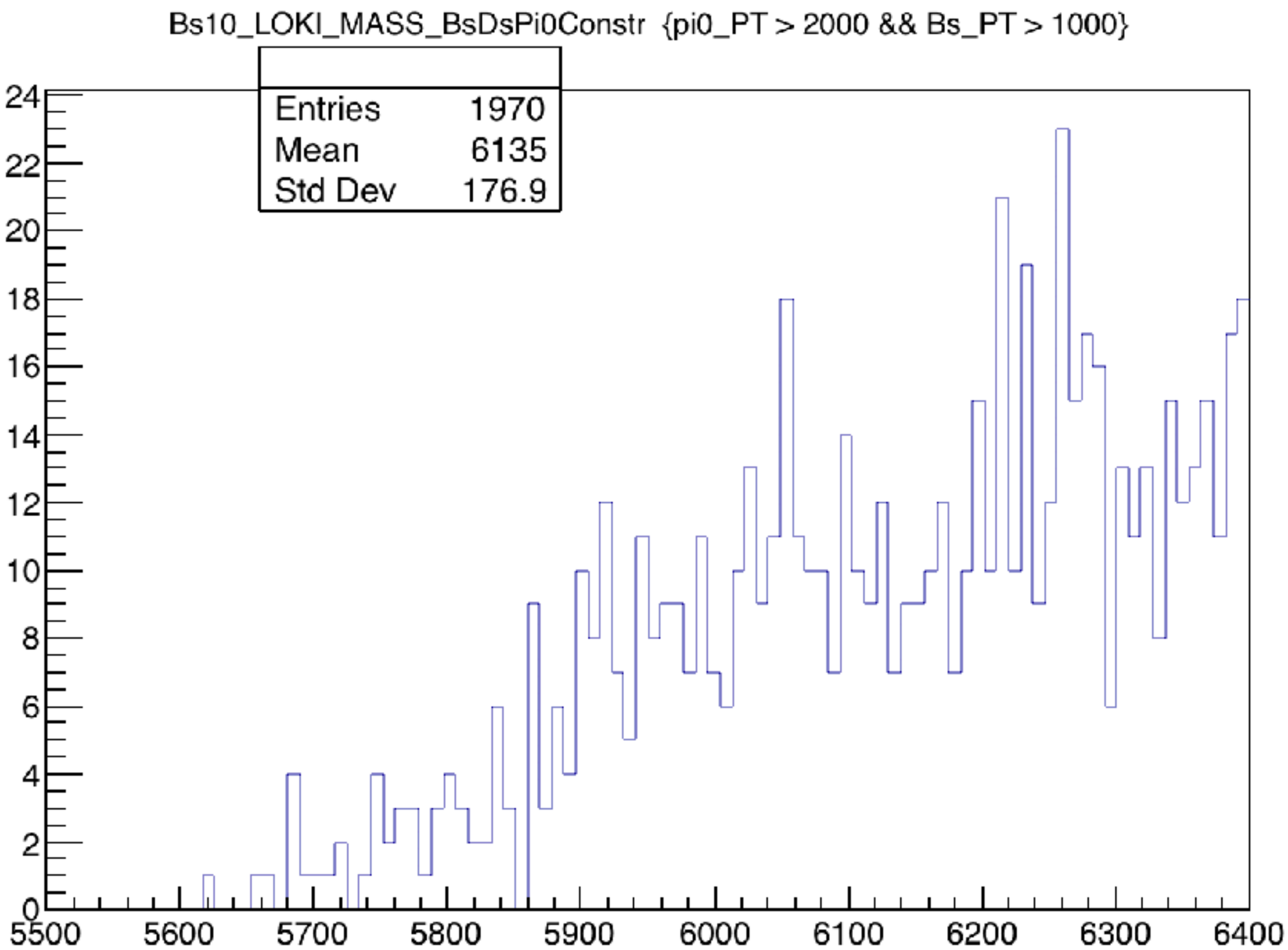
Π° Merged



Bs M plot

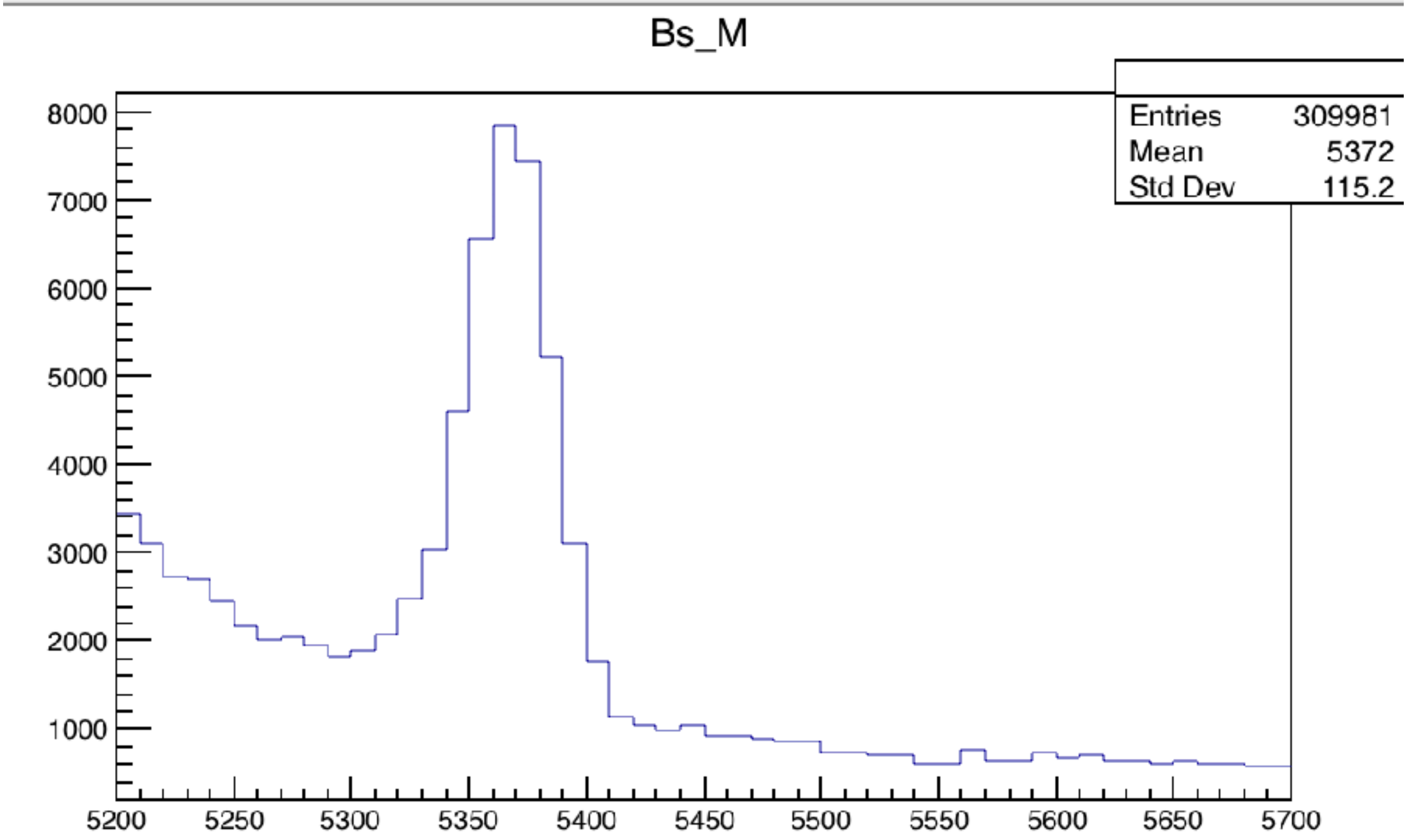

pi0_M {pi0_PT > 2000 && Bs_PT > 1000}
Entries 1970
Mean 133.5
Std Dev 8.55
60
50
40
30
20
10
0
120
125
130
135
140
145
150

Pi0 M Plot

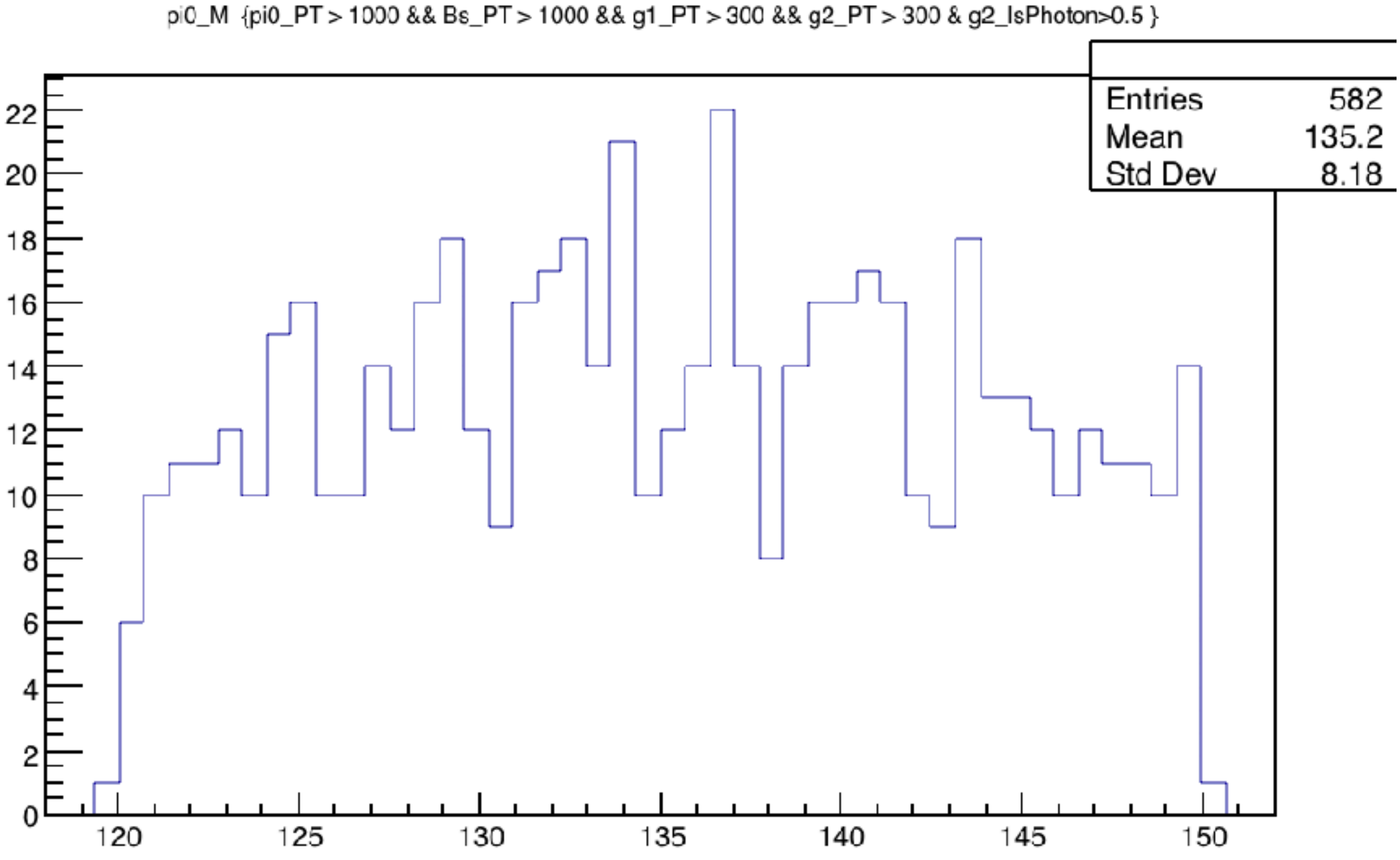


Bs10 Mass Plot

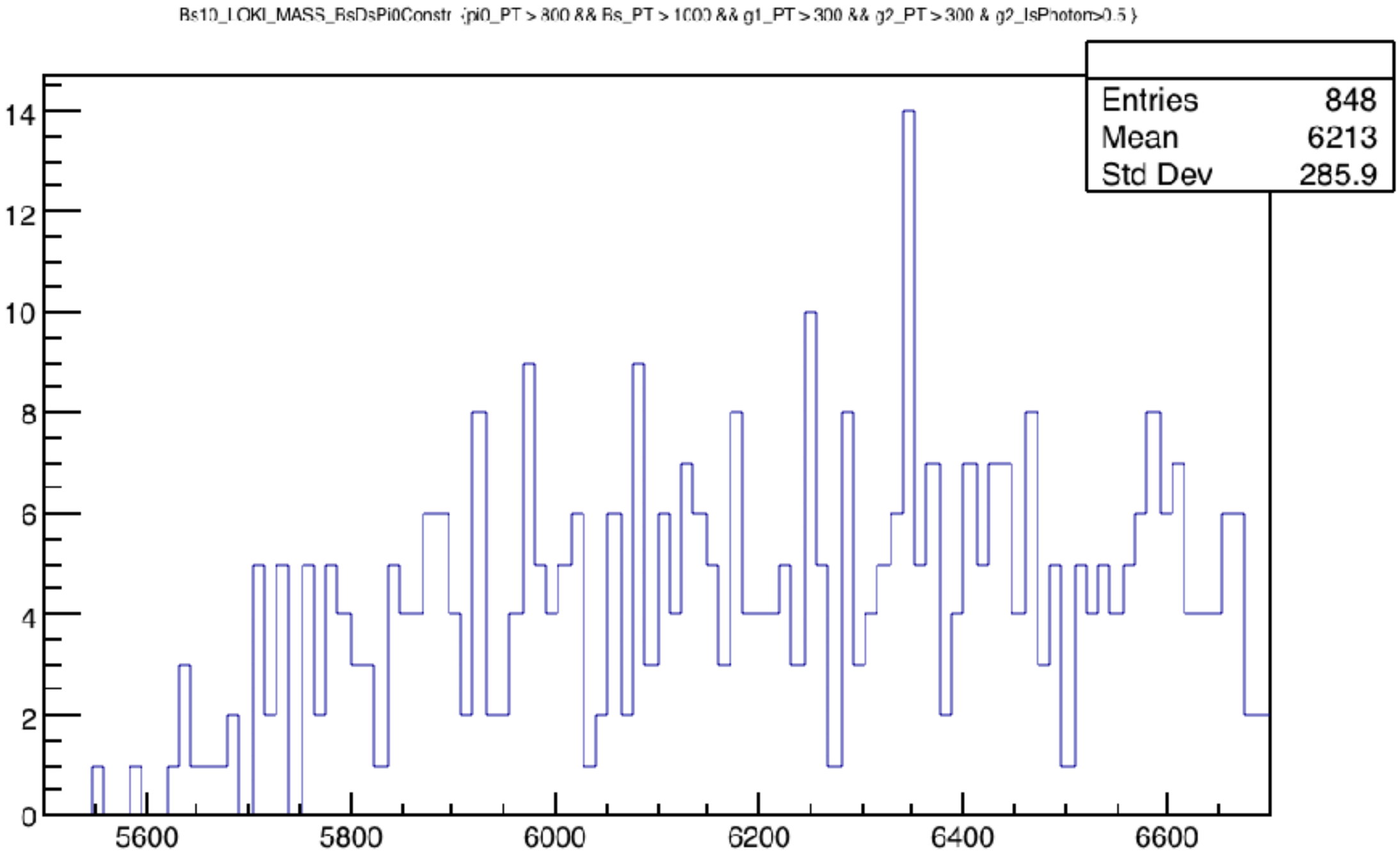
Π° Dalitz



Bs M plot

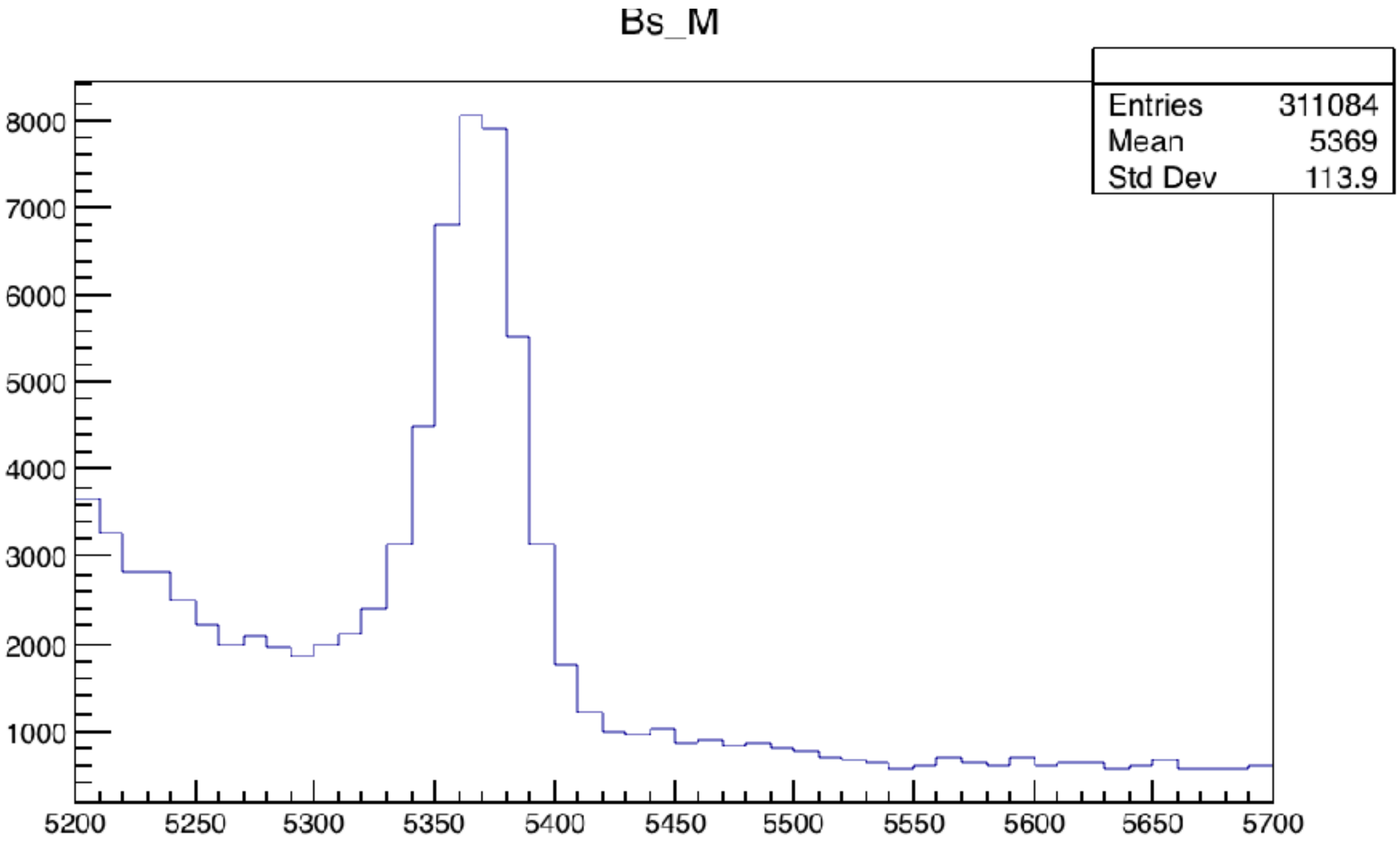

pi0_M {pi0_PT > 1000 && Bs_PT > 1000 && g1_PT > 300 && g2_PT > 300 & g2_IsPhoton>0.5 }
Entries 582
Mean 135.2
Std Dev 8.18
22
20
18
16
14
12
10
8
6
4
2
0
120
125
130
135
140
145
150

Pi0 M Plot

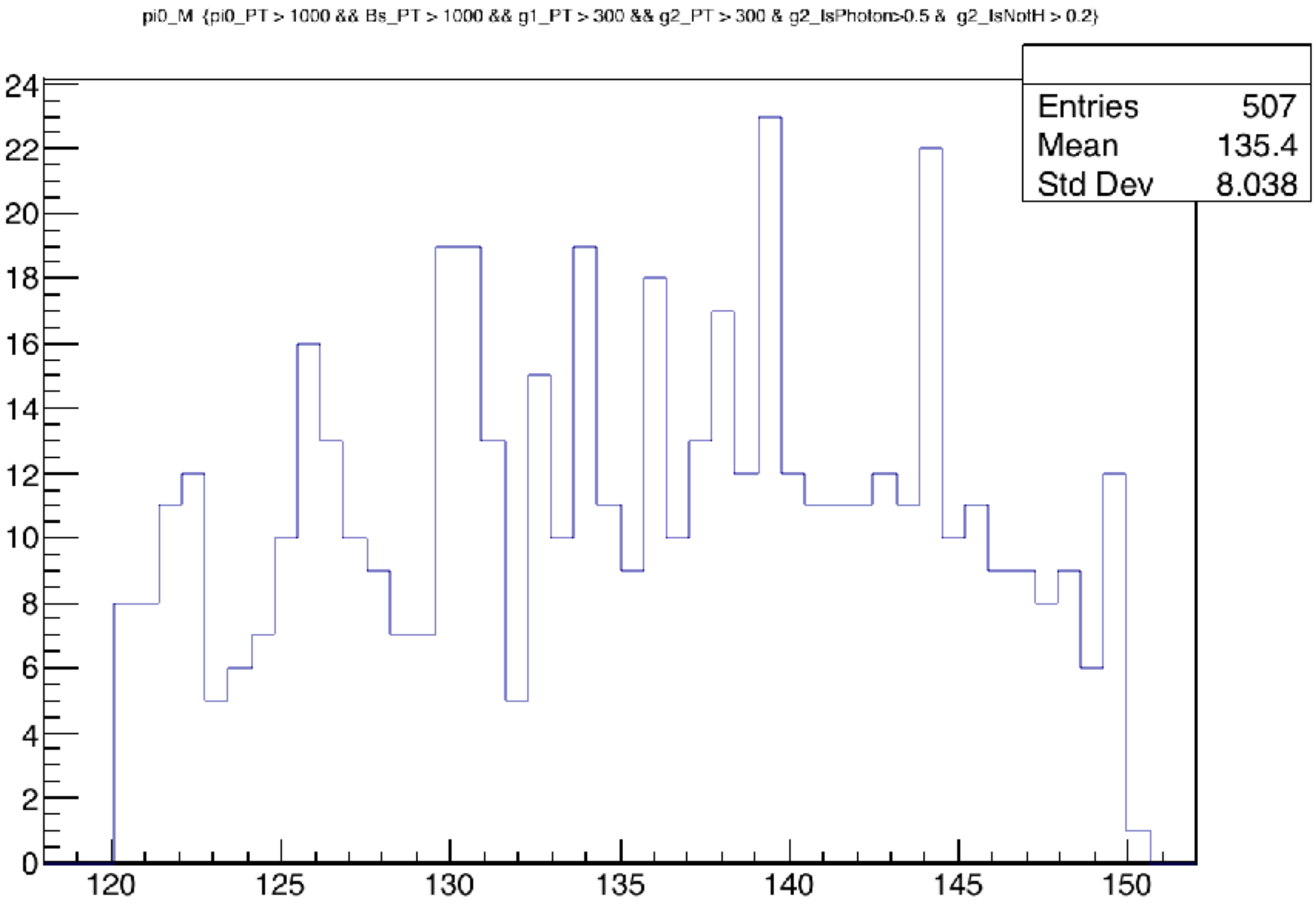


Bs10 Mass Plot

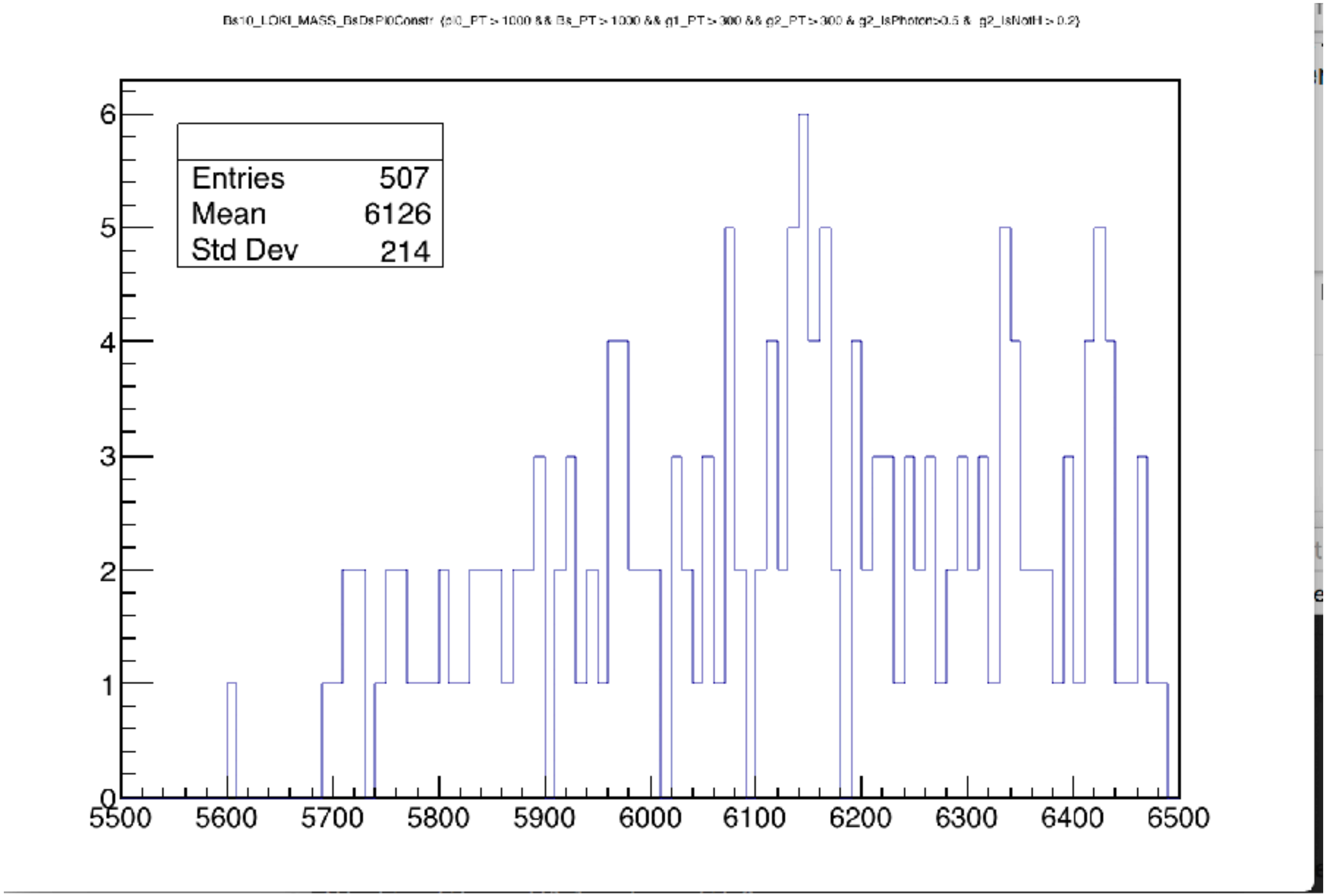
1Gamma Converted



Bs M plot


pi0_M {pi0_PT > 1000 && Bs_PT > 1000 && g1_PT > 300 && g2_PT > 300 & g2_IsPhoton>0.5 & g2_IsNotH > 0.2}
Entries 507
Mean 135.4
Std Dev 8.038
24
22
20
18
16
14
12
10
8
6
4
2
0
120
125
130
135
140
145
150

Pi0 M Plot



Bs10 Mass Plot

Future Plans

Add more Data from 2011, 2015 & 2016

Checking the result by using different B_s decay mode like

$$B_s \to J/\psi\phi$$