Measurement of Λ_b polarization and the angular parameters in the Λb —> J/psi Λ decay in the CMS detector

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Outline

- Motivation
- Strategy
- Selection
- Fit
- Results
- Conclusions and Comments

Motivation

- In the heavy quark effective theory (HQET) predicts a large fraction of the tranverse b-quark polarization to be retained after hadronization. **http://arxiv.org:hep-ph/0702191.** In the particular Λ_b baryons, the b-quark combines with a spin-0 *ud* pair, so all of the Λ_b spin resides on the valence b-quark and we expect b-polarization to become Λ_b polarization.

- A previous LHCb measurement in 2013 is published in **Physics Letters B 724 (2013) 27.** The reported value cannot exclude a transverse polarization at the order of 10%, however a polarization of 20% at level of ± 2.7sigma is discarded.

- Also, the asymmetry parameter in $\Lambda_b \rightarrow \Lambda V$ decays has been calculated in many publications. Most predictions lie in the range from -21% and -10% , while HQET obtains a large positive value **arXiv:hep-ph/0412116.**

Method	Value
Factorisation	−0.1
Factorisation	−0.18
Covariant oscillator quark model	−0.208
Perturbative QCD	−0.17 to −0.14
Factorisation (HQET)	0.777
Light front quark model	−0.204

LHCb

- To summarize, a measurement of the polarization provides a test of HQET and information about heavy baryon hadronization and non-perturbative corrections to spin transfer in fragmentation.

The strategy

- The helicity formalism provides a general method to obtain the angular distributions in a chain of decaying particles
- *A —> B + C* , so we can describe the decay by the angular function of final states.

$$\frac{d\Gamma}{d\Omega_5}(\Theta,\Phi) \approx \sum_{0}^{19} \eta_i(T_{++},T_{+0},T_{-0},T_{--})c_i(P,\alpha_\Lambda)f_i(\Theta,\Phi)$$

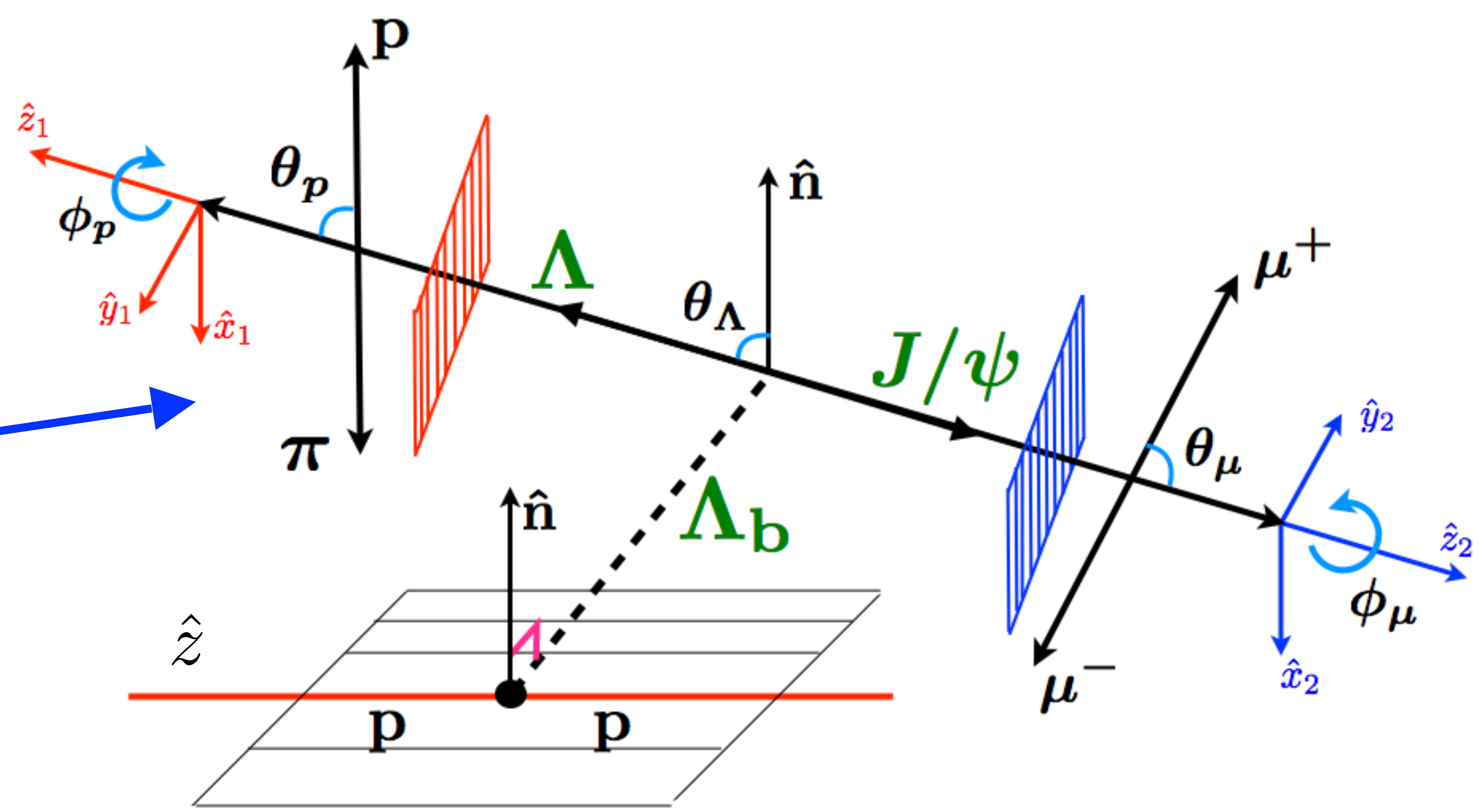
$$\Theta = (\theta_\Lambda, \theta_p, \theta_\mu)$$

$$\Phi = (\varphi_p, \varphi_\mu)$$

Helicity Amplitudes

Polarization and asymmetry parameter

Observable angles



The helicity amplitudes in the angular function can be parametrized, and consider azimuthal uniform of the detector, we get the simplified angular function.

i	η_i	c_i	f_i
1	1	1	1
2	α_2	α_Λ	$\cos\theta_p$
3	$-\alpha_1$	P	$\cos\theta_\Lambda$
4	$-(1+2\gamma_0)/3$	$\alpha_\Lambda P$	$\cos\theta_\Lambda\cos\theta_p$
5	$\gamma_0/2$	1	$(3\cos^2\theta_\mu - 1)/2$
6	$(3\alpha_1-\alpha_2)/4$	α_Λ	$\cos\theta_p(3\cos^2\theta_\mu - 1)/2$
7	$(\alpha_1-3\alpha_2)/4$	P	$\cos\theta_\Lambda(3\cos^2\theta_\mu - 1)/2$
8	$(\gamma_0-4)/6$	$\alpha_\Lambda P$	$\cos\theta_\Lambda\cos\theta_p(3\cos^2\theta_\mu - 1)/2$
9	$-3\alpha_3/(2\sqrt{2})$	P	$\sin\theta_\Lambda\sin\theta_\mu\cos\theta_\mu\cos\varphi_\mu$
10	$3\delta_1/(2\sqrt{2})$	P	$\sin\theta_\Lambda\sin\theta_\mu\cos\theta_\mu\sin\varphi_\mu$
11	$3\alpha_4/(2\sqrt{2})$	α_Λ	$\sin\theta_p\sin\theta_\mu\cos\theta_\mu\cos(\varphi_\mu+\varphi_p)$
12	$-3\delta_2/(2\sqrt{2})$	α_Λ	$\sin\theta_p\sin\theta_\mu\cos\theta_\mu\sin(\varphi_\mu+\varphi_p)$
13	$-3\gamma_1/2$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\sin\theta_p\sin^2\theta_\mu\cos\varphi_p$
14	$3\beta_1/2$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\sin\theta_p\sin^2\theta_\mu\sin\varphi_p$
15	$-3\gamma_2/4$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\sin\theta_p\sin^2\theta_\mu\cos(2\varphi_\mu+\varphi_p)$
16	$3\beta_2/4$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\sin\theta_p\sin^2\theta_\mu\sin(2\varphi_\mu+\varphi_p)$
17	$-3\gamma_3/(2\sqrt{2})$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\cos\theta_p\sin\theta_\mu\cos\theta_\mu\cos\varphi_\mu$
18	$3\beta_3/(2\sqrt{2})$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\cos\theta_p\sin\theta_\mu\cos\theta_\mu\sin\varphi_\mu$
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20	$3\beta_4/(2\sqrt{2})$	$\alpha_\Lambda P$	$\sin\theta_\Lambda\sin\theta_p\sin\theta_\mu\cos\theta_\mu\sin(\varphi_\mu+\varphi_p)$

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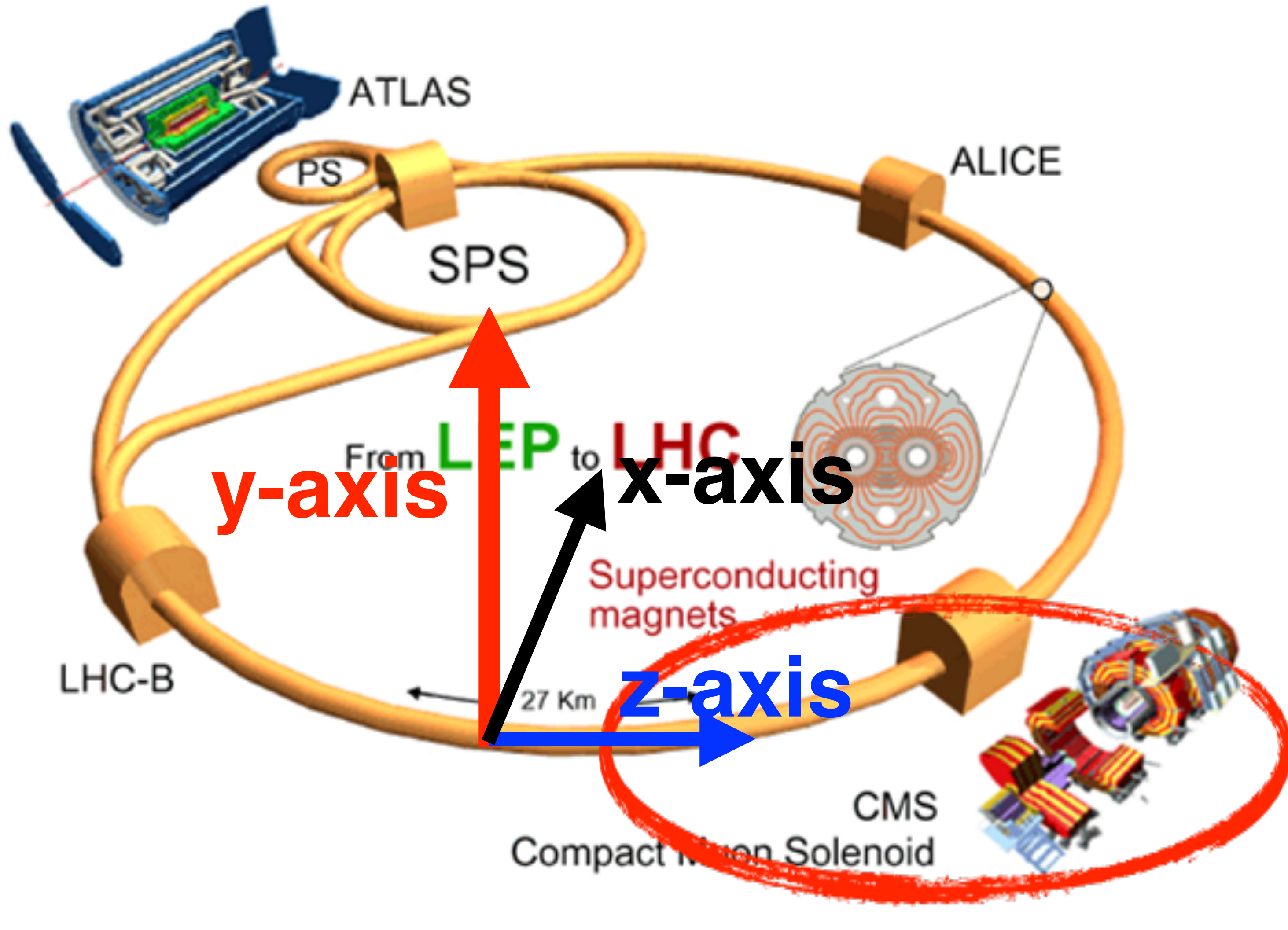
8	$(\gamma_0-4)/6$	$\alpha_\Lambda P$	$cos\theta_\Lambda cos\theta_p(3cos^2\theta_\mu - 1)/2$

We obtain $(P, \alpha_1, \alpha_2, \gamma)$ from a un-binned likelihood fit.



*Kramer-Sima Parametrization reference in: Nuclear Physics B50 (1996) 125

Selection

- ✓ **2011 and 2012 data at 7 TeV, 8 TeV corresponds to an integrated luminosity 5.2 fb^{-1} and 19.7fb^{-1} respectively in pp collisions (Run I data).**
- ✓ **Reconstruct J/psi -> μ+μ- , /\ -> p+π-, then**
- ✓ **/\b -> J/psi + /**
- ✓ **The data sample was selected with trigger of displaced vertex.**

Triggering

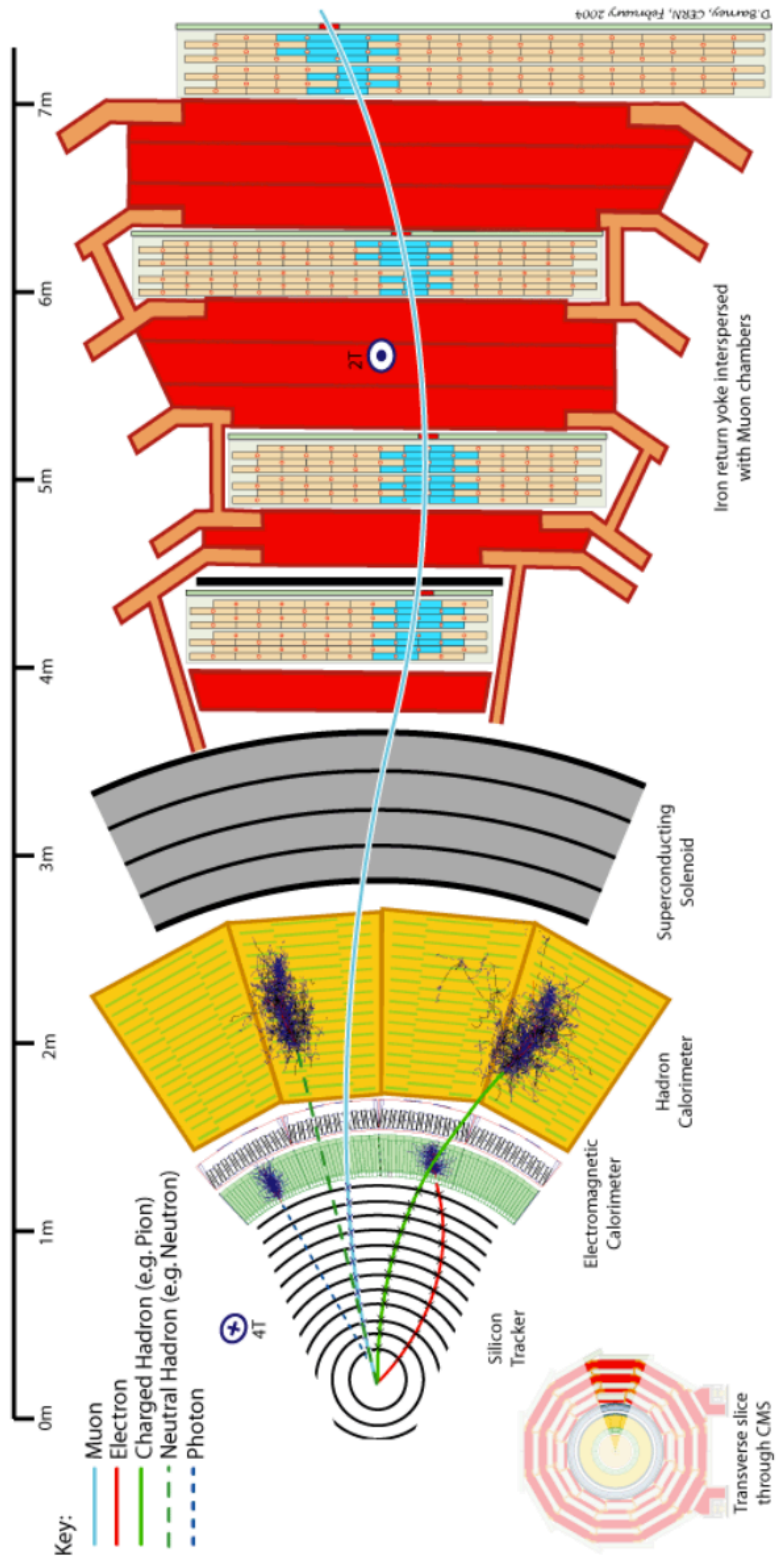
2011

$HLT\_DoubleMu4\_Jpsi\_Displaced\_v1$
$HLT\_DoubleMu3p5\_Jpsi\_Displaced\_v2$
$HLT\_Dimuon7\_Jpsi\_Displaced\_v1$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v4$
$HLT\_Dimuon7\_LowMass\_Displaced\_v4$
$HLT\_Dimuon6p5\_LowMass\_Displaced\_v1$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v5$
$HLT\_DoubleMu5\_Jpsi\_Displaced\_v1$
$HLT\_Dimuon7\_LowMass\_Displaced\_v3$

2012

$HLT\_DoubleMu3p5\_LowMass\_Displaced\_v6$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v10$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v9$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v11$

	Observable	cuts
J/ψ selection	$p_T(\mu)$	$> 4GeV$
	vtx prob	$> 15\%$
	$\|\eta(\mu)\|$	< 2.2
	L_{xy}/σ	> 3
	$\cos(\alpha)$	> 0.95
	$p_T(J/\psi)$	$> 8Gev$
	$m(J/\psi)$	$m_{PDG} \pm 150MeV$
Λ^0 selection	$p, \pi \#hits$	≥ 6
	track $\chi^2/ndof$	< 5
	track $d0$	$> 2\sigma$
	vertex χ^2	< 7
	L_{xy}/σ	≥ 15
	$p_T(p)$	$> 1GeV$
	$p_T(\pi)$	$> 0.3GeV$
	$p_T(\Lambda)$	$> 1.3GeV$
	vtx prob(Λ)	$> 2\%$
	window mass $m(\Lambda)$	$m_{PDG} \pm 9MeV$
	$m(K_s)$ veto	$m_{PDG} \pm 20MeV$
Λ_b candidates	$p_T(\Lambda_b)$	$> 10GeV$
	vtx prob(Λ_b)	$> 3\%$
	$m(\Lambda_b)$	$5.40 - 5.84$ GeV/c^2



- **These triggers cover the data sample. >99% in 2011 and 2012**

Selection

- ✓ 2011 and 2012 data at 7 TeV, 8 TeV corresponds to an integrated luminosity 5.2 fb^{-1} and 19.7fb^{-1} respectively in pp collisions.

- ✓ Reconstruct J/psi -> μ+μ- , Λ -> p+π-, then
- ✓ Λb -> J/psi + Λ

- ✓ The data sample was selected with trigger of displaced vertex.

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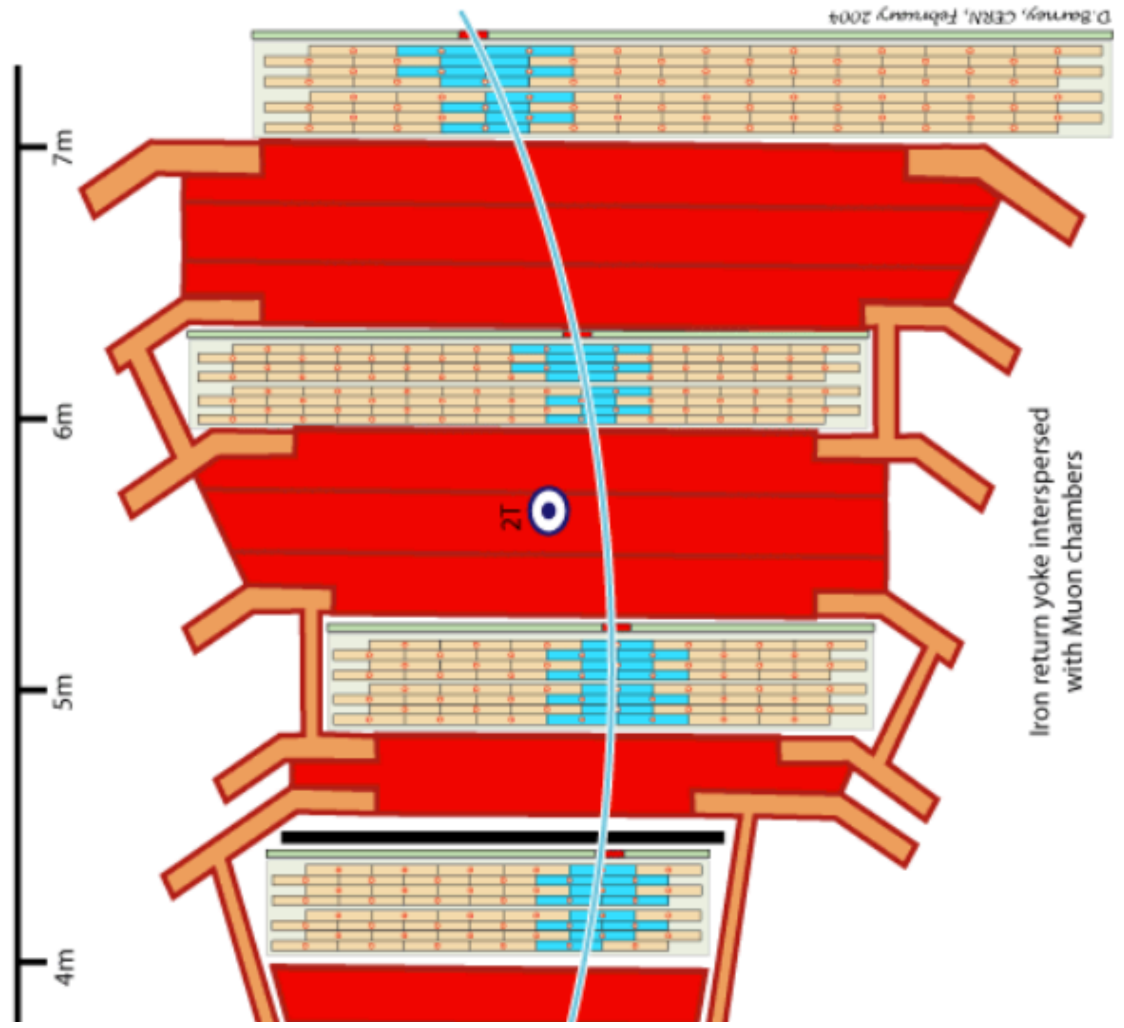

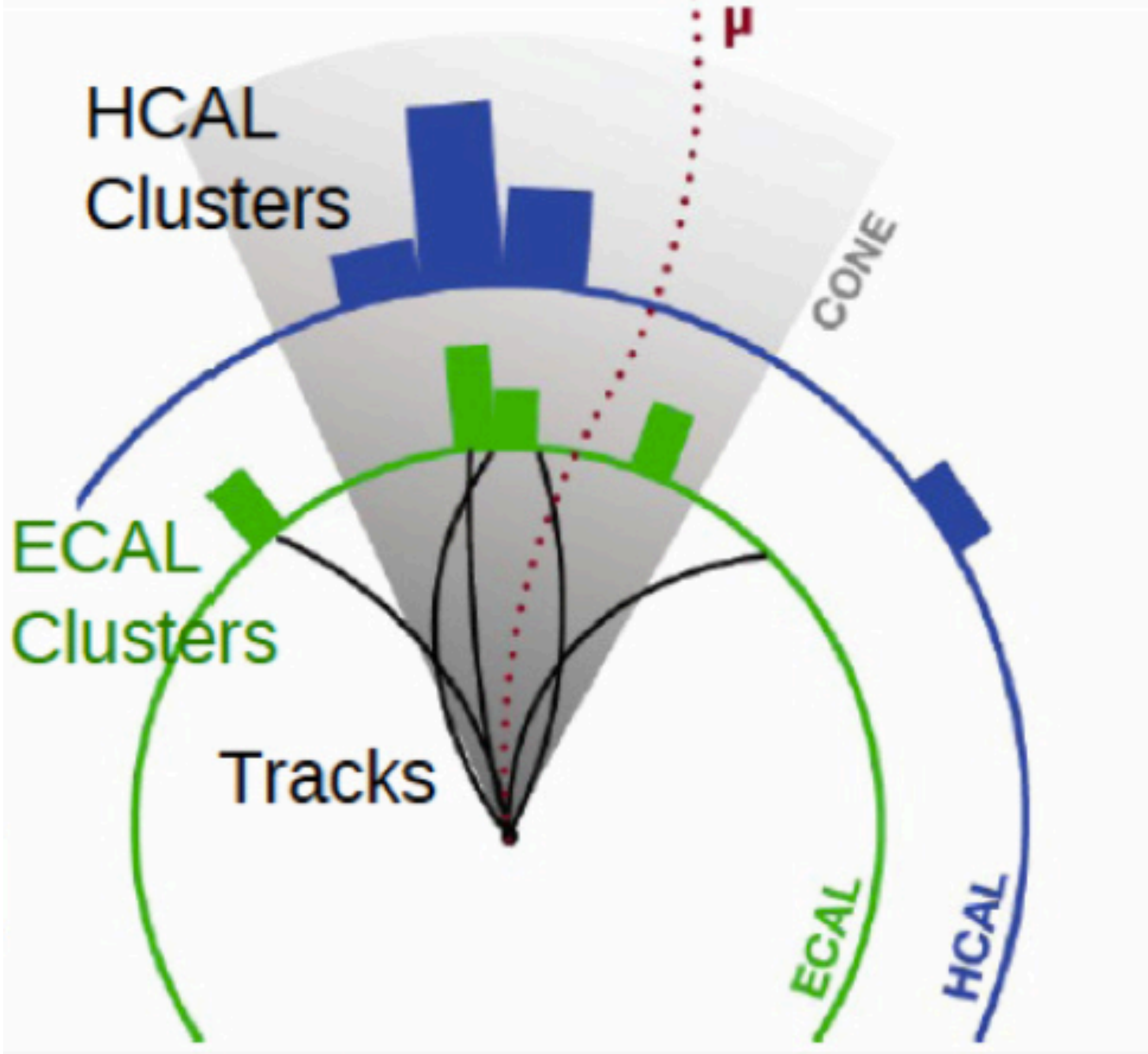

Triggering

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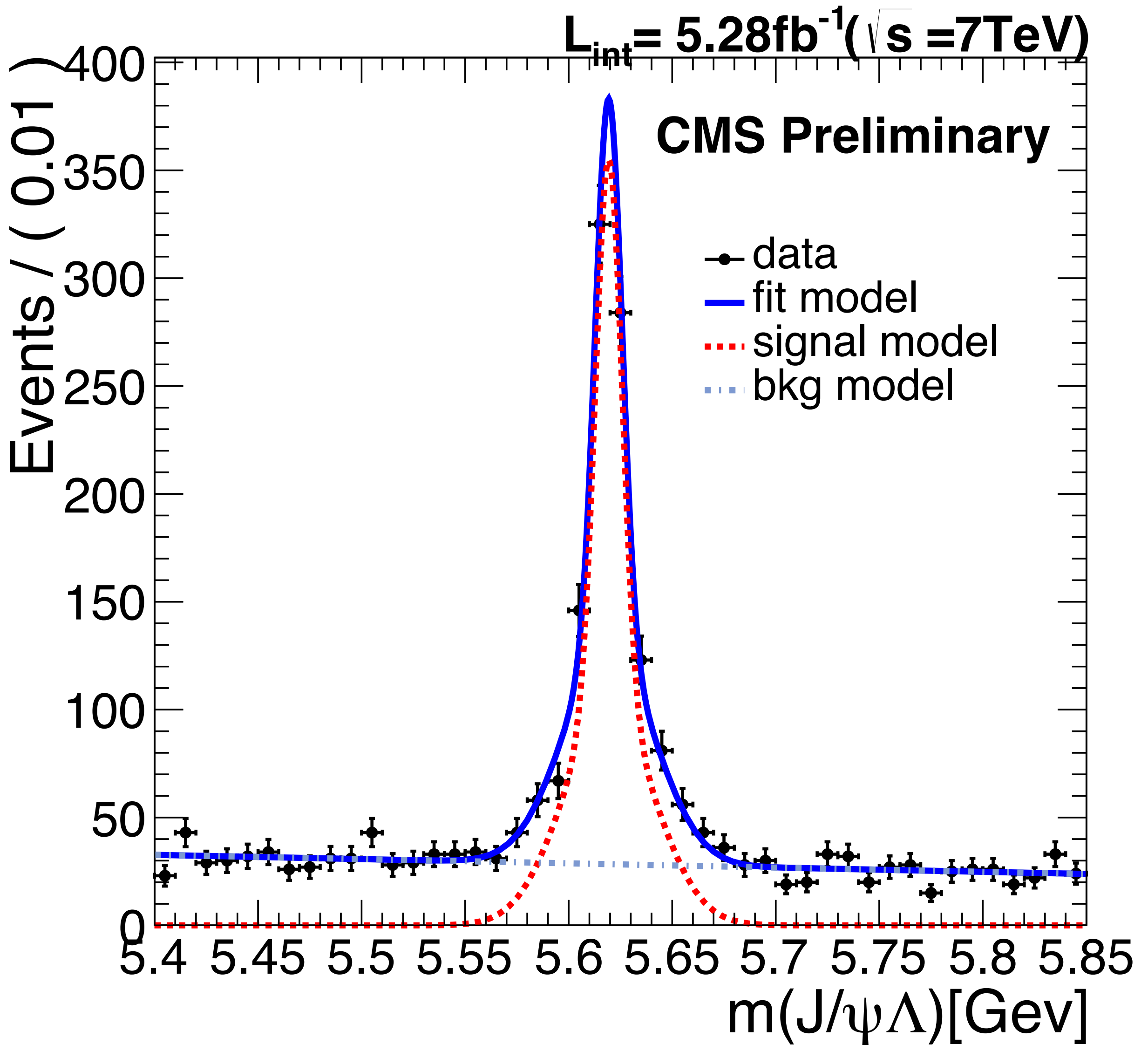
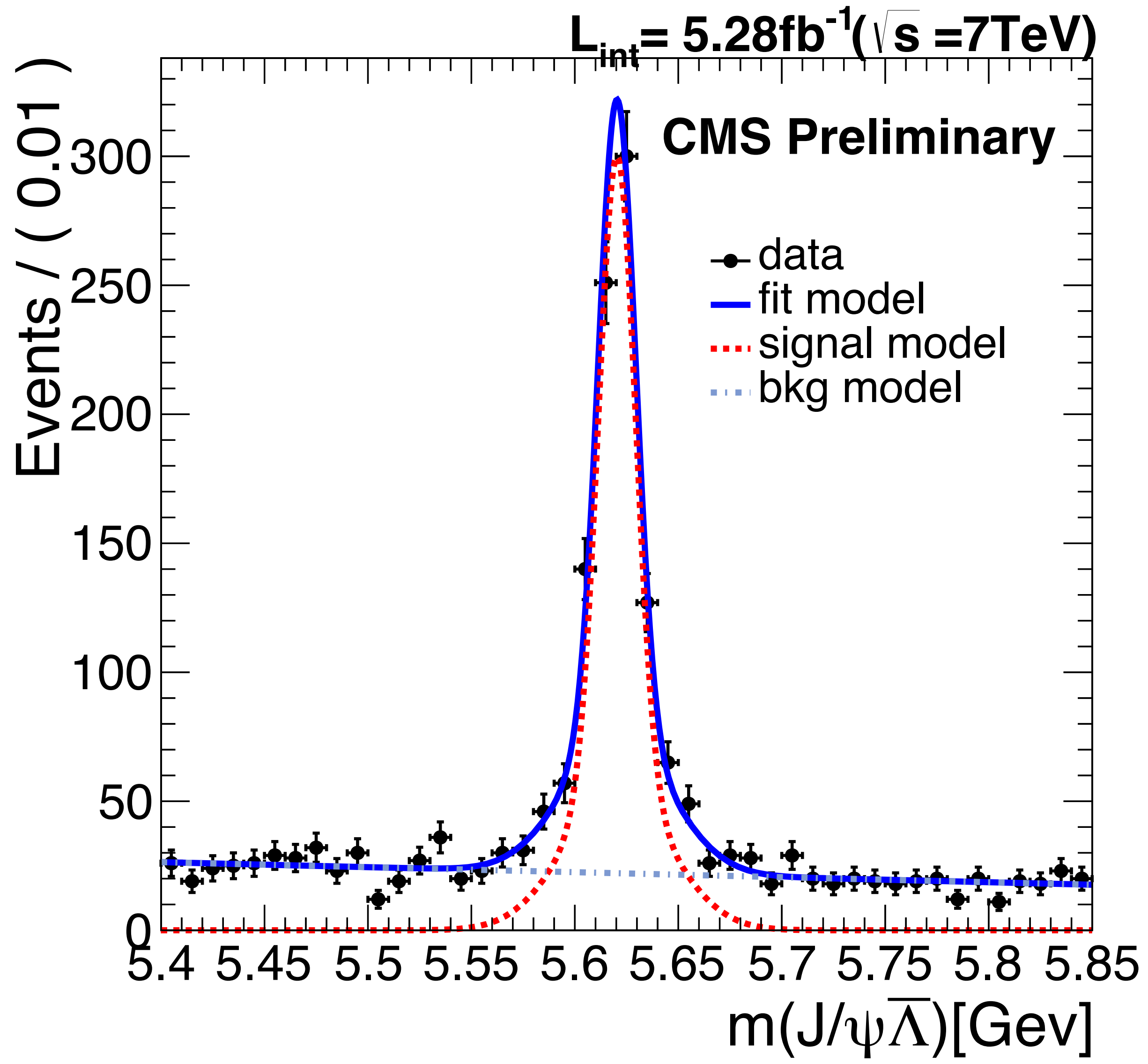
2012

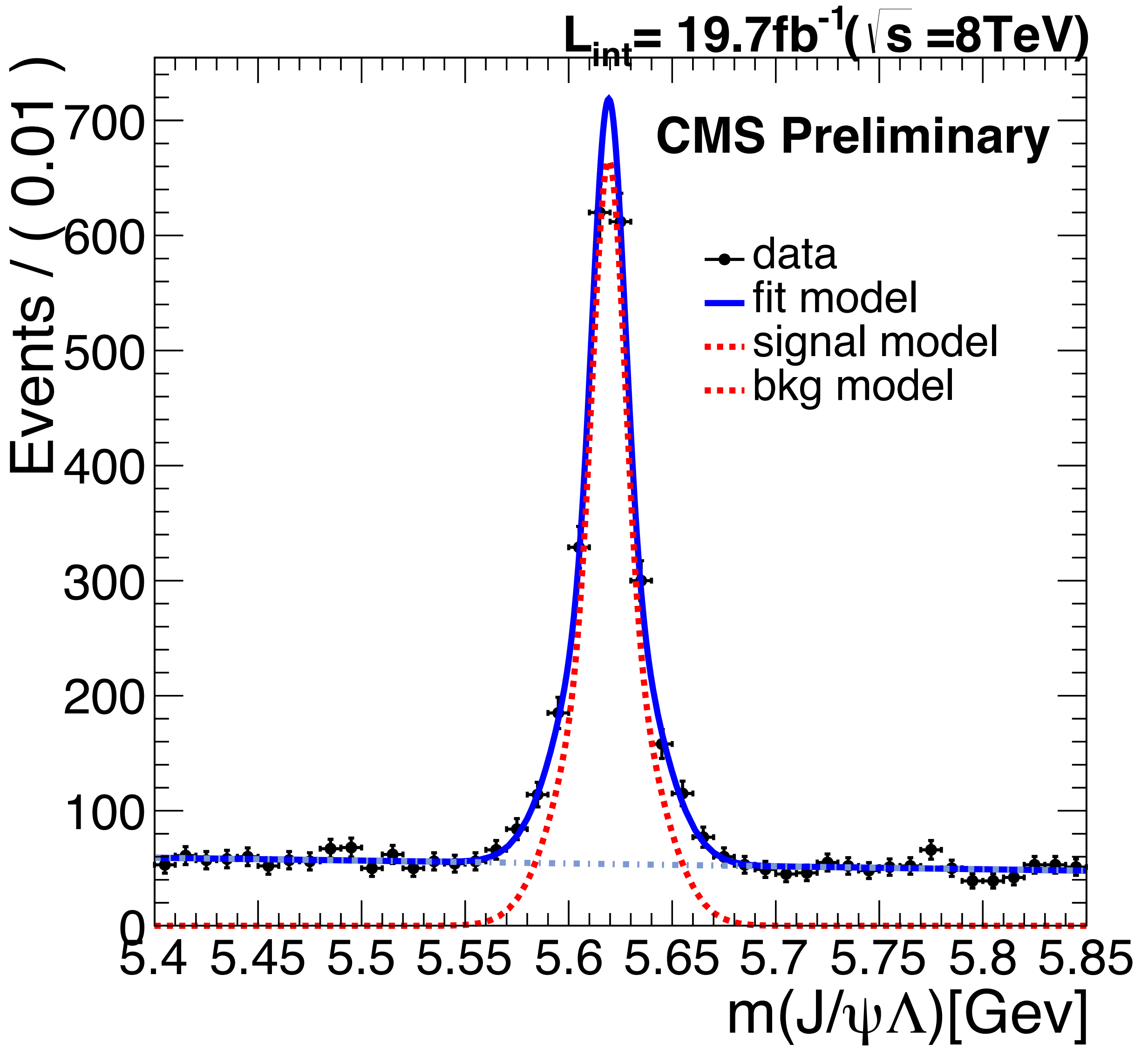
$HLT\_DoubleMu3p5\_LowMass\_Displaced\_v6$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v10$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v9$
$HLT\_DoubleMu4\_Jpsi\_Displaced\_v11$

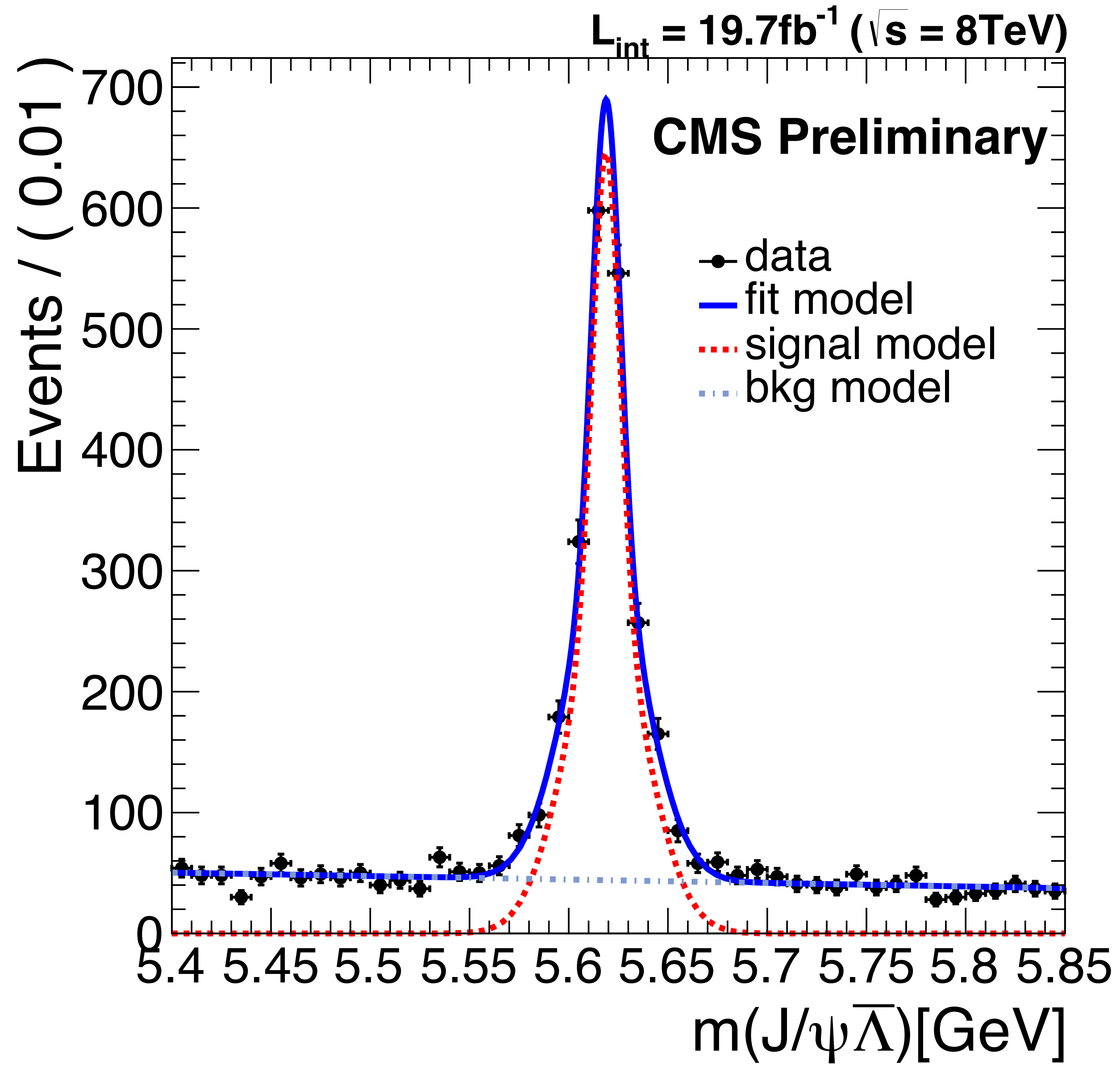
- These triggers cover the data sample. >99% in 2011 and 2012

Selection









- **Event yields were extracted from a simultaneous fit to 4 samples (2011 /\b, 2012 /\b, 2011 /\bbar, & 2012 /\bbar)**

Parameter	2011 Sample		2012 Sample	
	Λ_b	$\bar{\Lambda}_b$	Λ_b	$\bar{\Lambda}_b$
$\mu\,(GeV)$	5.6193 ± 0.0002			
$\sigma_1\,(GeV)$	0.022 ± 0.003	0.009 ± 0.001	0.021 ± 0.001	0.021 ± 0.002
$\sigma_2\,(GeV)$	0.006 ± 0.001	0.028 ± 0.008	0.008 ± 0.001	0.007 ± 0.001
f	0.57 ± 0.07	0.66 ± 0.09	0.61 ± 0.06	0.62 ± 0.07
a	-0.15 ± 0.01	-0.15 ± 0.01	-0.13 ± 0.02	-0.14 ± 0.01
N_{bkg}	925 ± 41	737 ± 43	1800 ± 54	1510 ± 52
N_{sig}	984 ± 41	919 ± 45	2114 ± 57	2021 ± 57

~ 6000 /\b candidates

$$Pol(x) = 1 + ax$$

Background

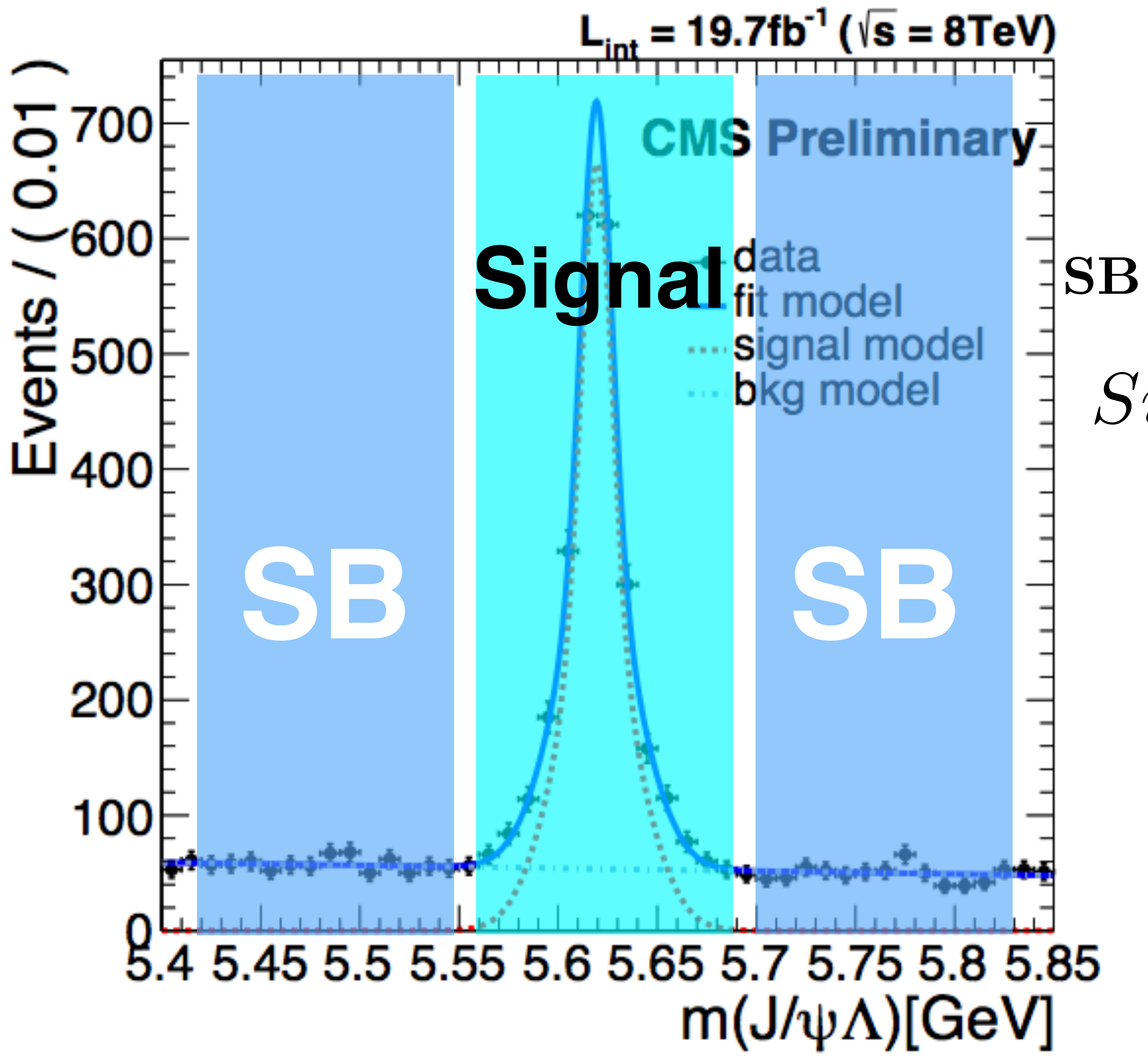
$$\mathbf{G}(\mathbf{x};\mu,\sigma_1,\sigma_2,\mathbf{f}) = \mathbf{f} \bullet \mathbf{G_1}(\mathbf{x};\mu,\sigma_1) + (\mathbf{1}-\mathbf{f}) \bullet \mathbf{G_2}(\mathbf{x};\mu,\sigma_2)$$

Signal

Fit

- We obtain the polarization and the angular parameters from an unbinned maximum likelihood fit. The likelihood function has the form:

$$L = \exp(-\mathrm{N_{sig}} - \mathrm{N_{bkg}}) \prod_{j=1}^{N} [\mathrm{N_{sig}} \cdot \mathrm{PDF_{sig}} + \mathrm{N_{bkg}} \cdot \mathrm{PDF_{bkg}}]$$



$$\mathbf{SB} \equiv [\mu - \mathbf{10}\sigma, \mu - \mathbf{5}\sigma] \cup [\mu + \mathbf{5}\sigma, \mu + \mathbf{10}\sigma]$$

$$Signal \equiv [\mu - 3.5\sigma, \mu + 3.5\sigma]$$

Signal

$$PDF_{sig}^{+(-)} = F_{sig}^{+(-)}(\Theta, \alpha) \cdot \epsilon(\Theta)^{+(-)} \cdot G^{+(-)}(m; \mu, \sigma_1, \sigma_2, f).$$

- Angular distribution of the signal: the terms were described on the slide 3
- Angular efficiency shaped by the detector
- Mass Model: described on the previous slide

Background

$$PDF_{bkg}^{+(-)} = F_{bkg}^{+(-)} \cdot Pol^{+(-)}(m)$$

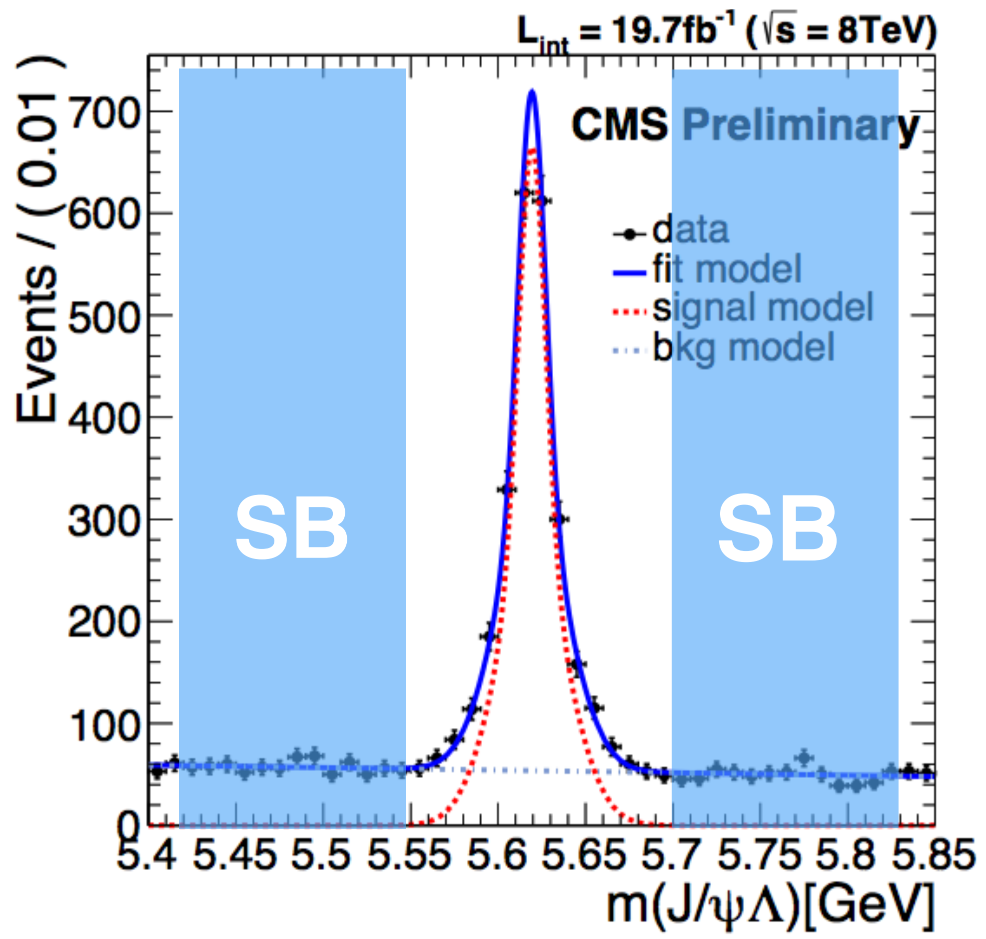
- Angular model of BKG from Side Bands
- Mass Model described on the previous slide

Note : +(-) Relative to particle and anti particle

- The simultaneous fit to the 2011 and 2012 is performed in the signal mass range [μ±3.5sigma] GeV
  - Contains ~ 99% of events of the signal
  - Reduce the number of bkg events, the fit is less sensitive to the angular background modeling.
- The parameters of the the efficiency shape and bkg model are fixed to the previous fit.

Fit (BKG model)

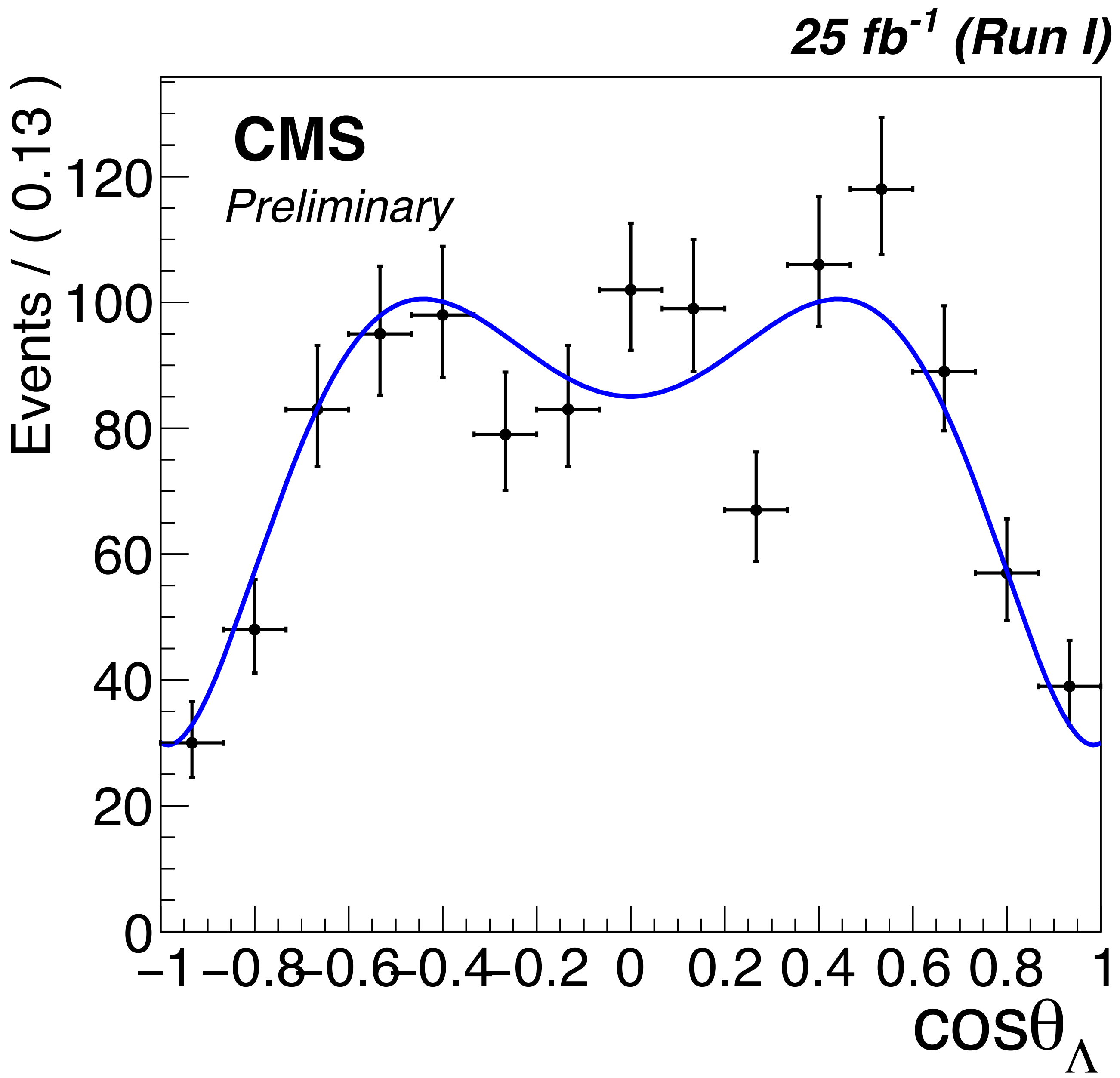
- **The background angular distribution was modelled from the sidebands region.**
- **We used Chebyshev polynomials and Error function to model the angular background.**

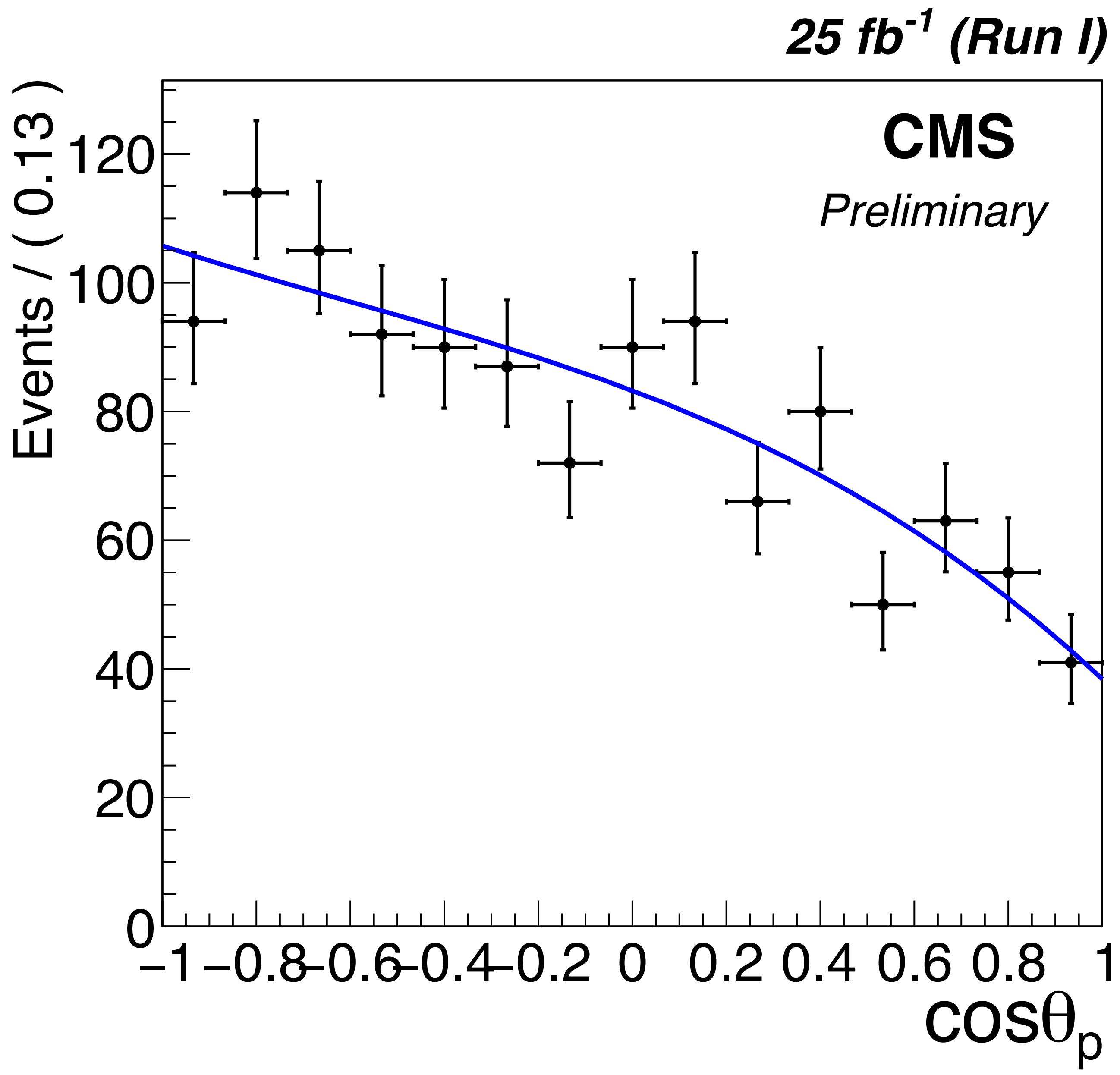


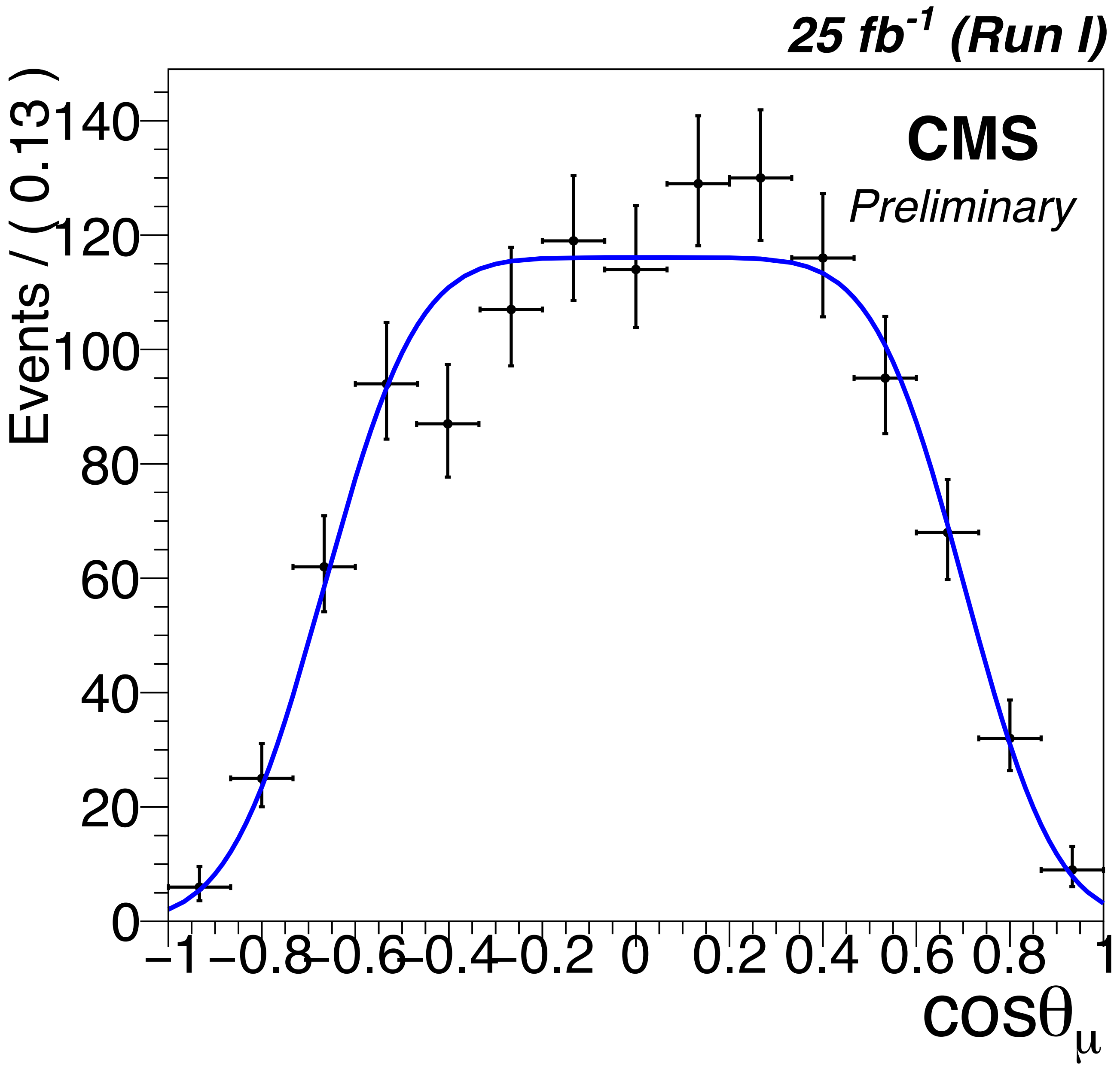
$$SB \equiv [\mu - 10\sigma, \mu - 5\sigma] \cup [\mu + 5\sigma, \mu + 10\sigma]$$

$$\mathbf{F}_{\mathbf{bkg}}^{+(-)}(\mathbf{\Theta}) = \left(\sum_{\mathbf{i=0}}^{\mathbf{n}_{\mathbf{\Lambda}}^{+(-)}} \mathbf{B}_{\mathbf{i}}^{+(-)} \cdot \mathbf{T}_{\mathbf{i}}(\cos\theta_{\mathbf{\Lambda}})\right) \cdot \left(\sum_{\mathbf{i=0}}^{\mathbf{n}_{\mathbf{p}}^{+(-)}} \mathbf{C}_{\mathbf{i}}^{+(-)} \cdot \mathbf{T}_{\mathbf{i}}(\cos\theta_{\mathbf{p}})\right) \cdot \mathbf{E}^{+(-)}(\cos\theta_{\mu})$$

$$E^{+(-)}(\cos\theta_{\mu}) = \left(1 + erf\left(\frac{\cos\theta_{\mu} - k_1^{+(-)}}{k_2^{+(-)}}\right)\right) \cdot \left(1 + erf\left(\frac{-\cos\theta_{\mu} - k_3^{+(-)}}{k_4^{+(-)}}\right)\right)$$

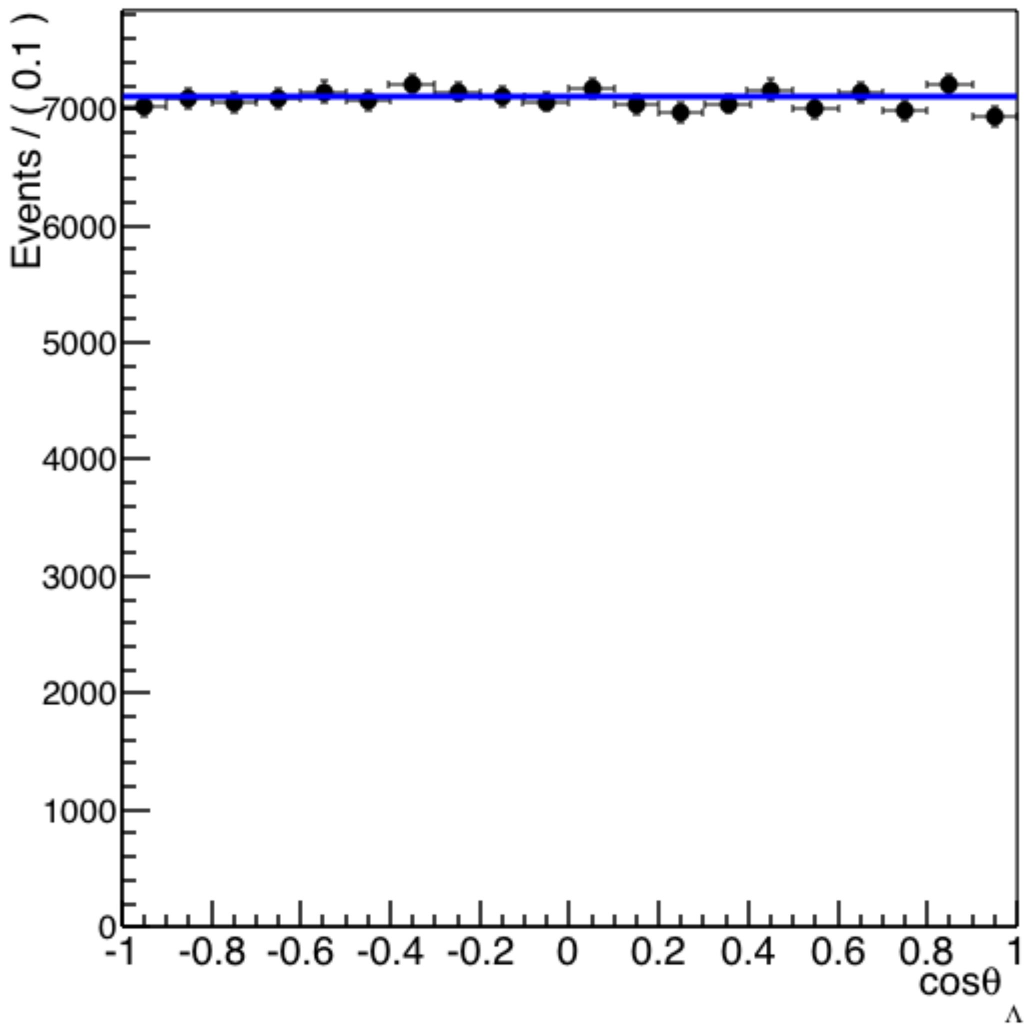




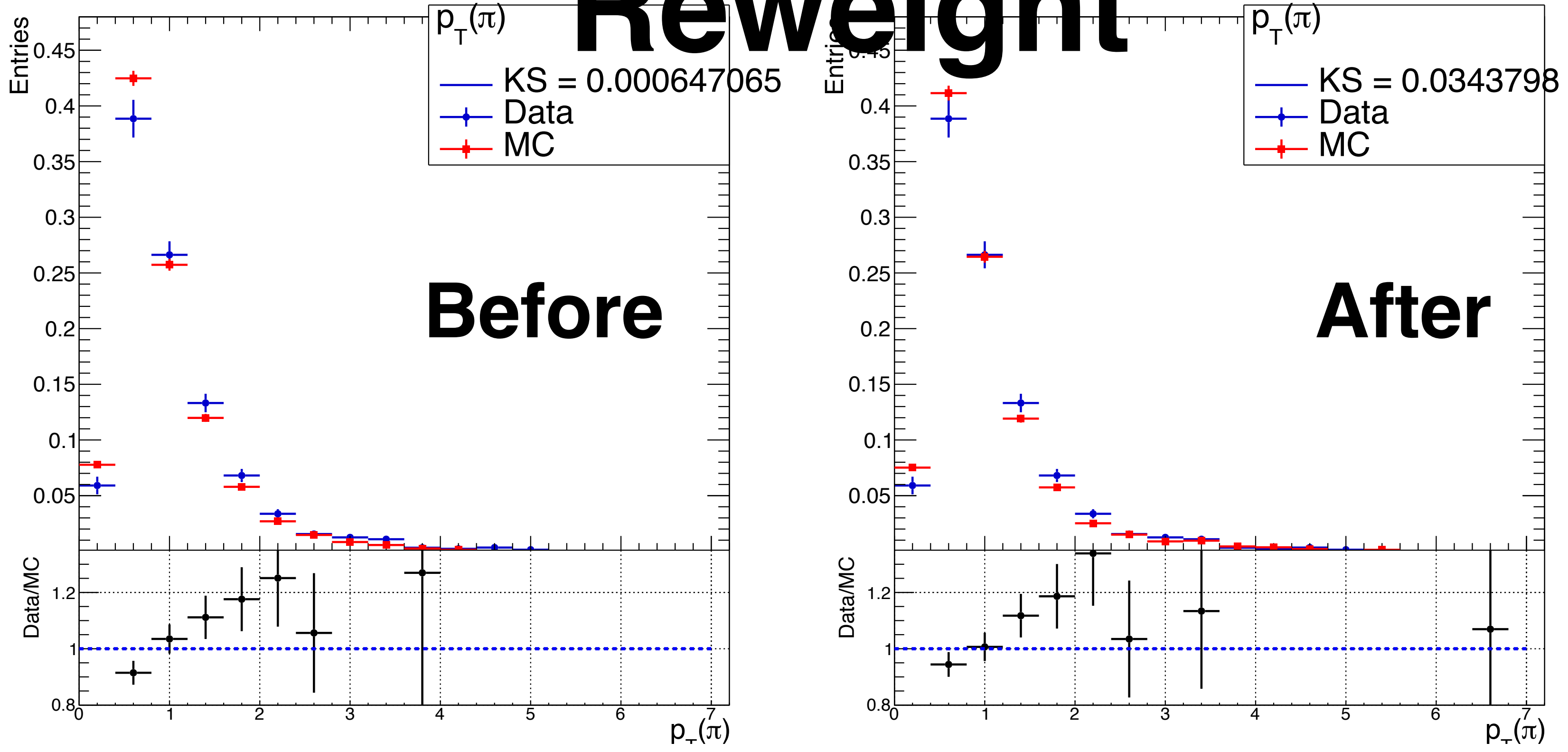


Fit (Efficiency model)

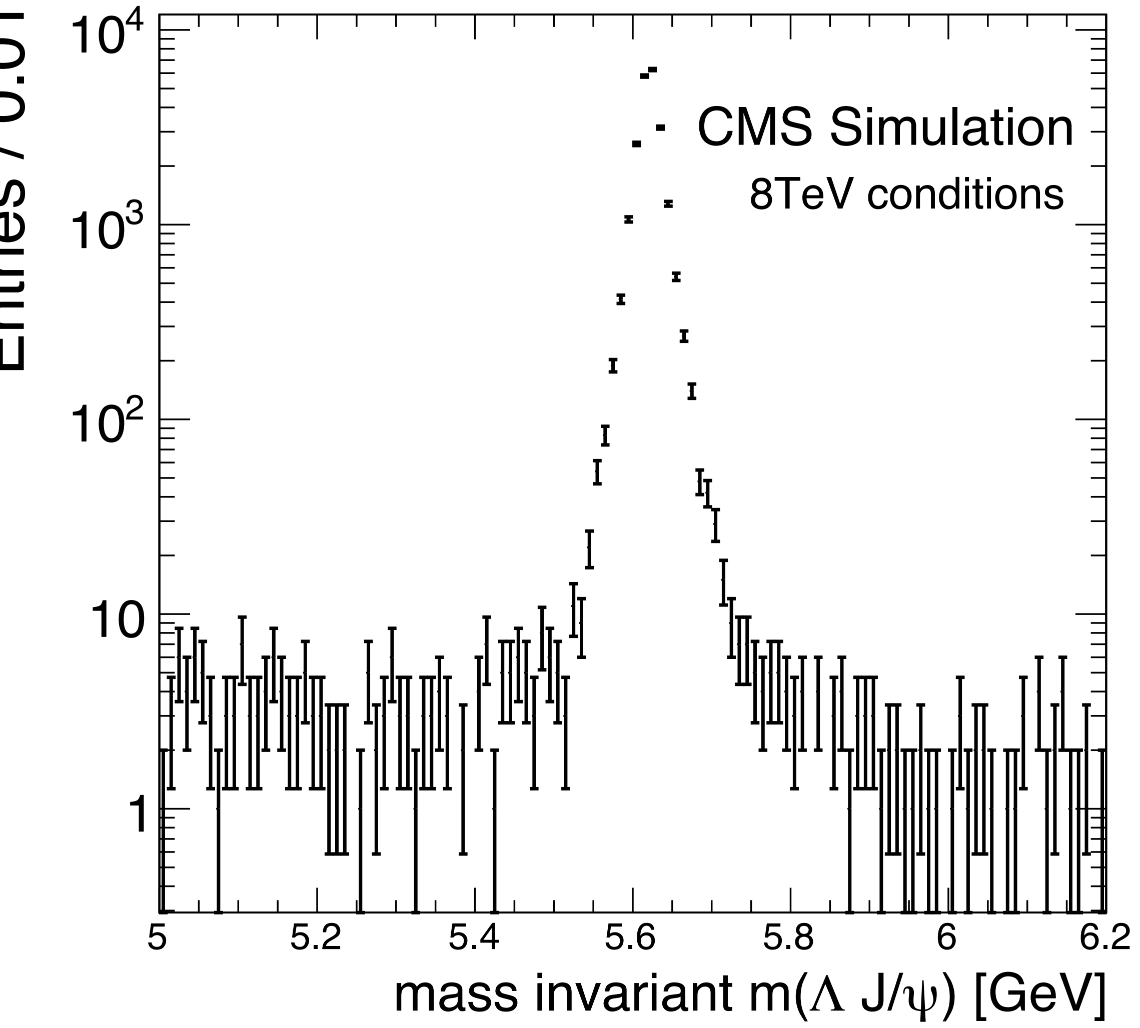
- **The efficiency shapes were estimated from official 2011 and 2012 MC with HLT + PU.**
- **Angular distribution are uniform at truth level (PHSP decay models) to achieve precise angular efficiency estimates in all angular region.**
- **We apply the reconstruction & selection processes as in data.**
- **Reweighting procedure removes effectively small differences MC and (background-subtracted) data.**
- **The model of the efficiency is the product of Chebyshev polynomials. The same order of the polynomials is applied either /\b & /\bbar candidates:**

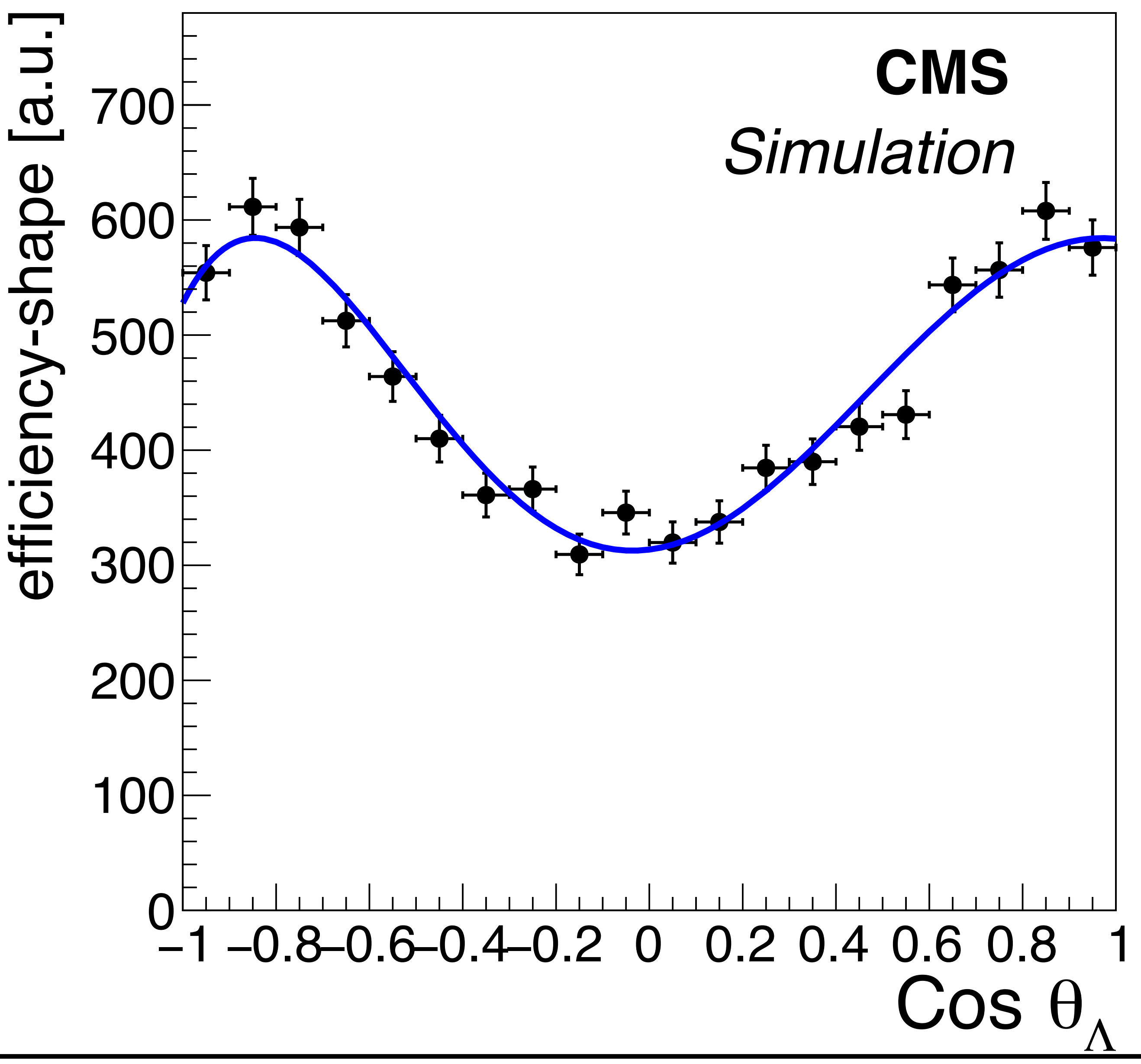


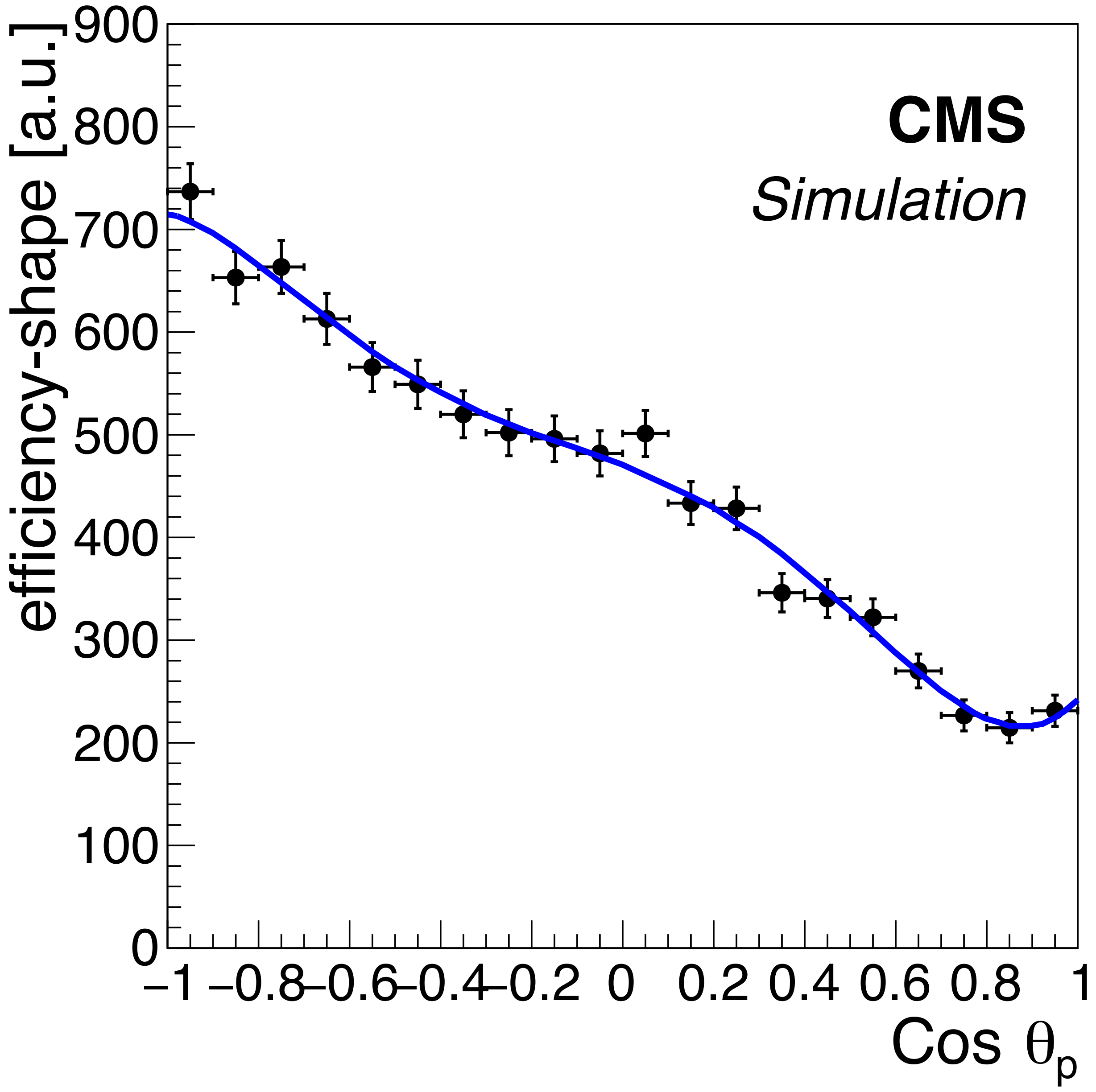
Reweight

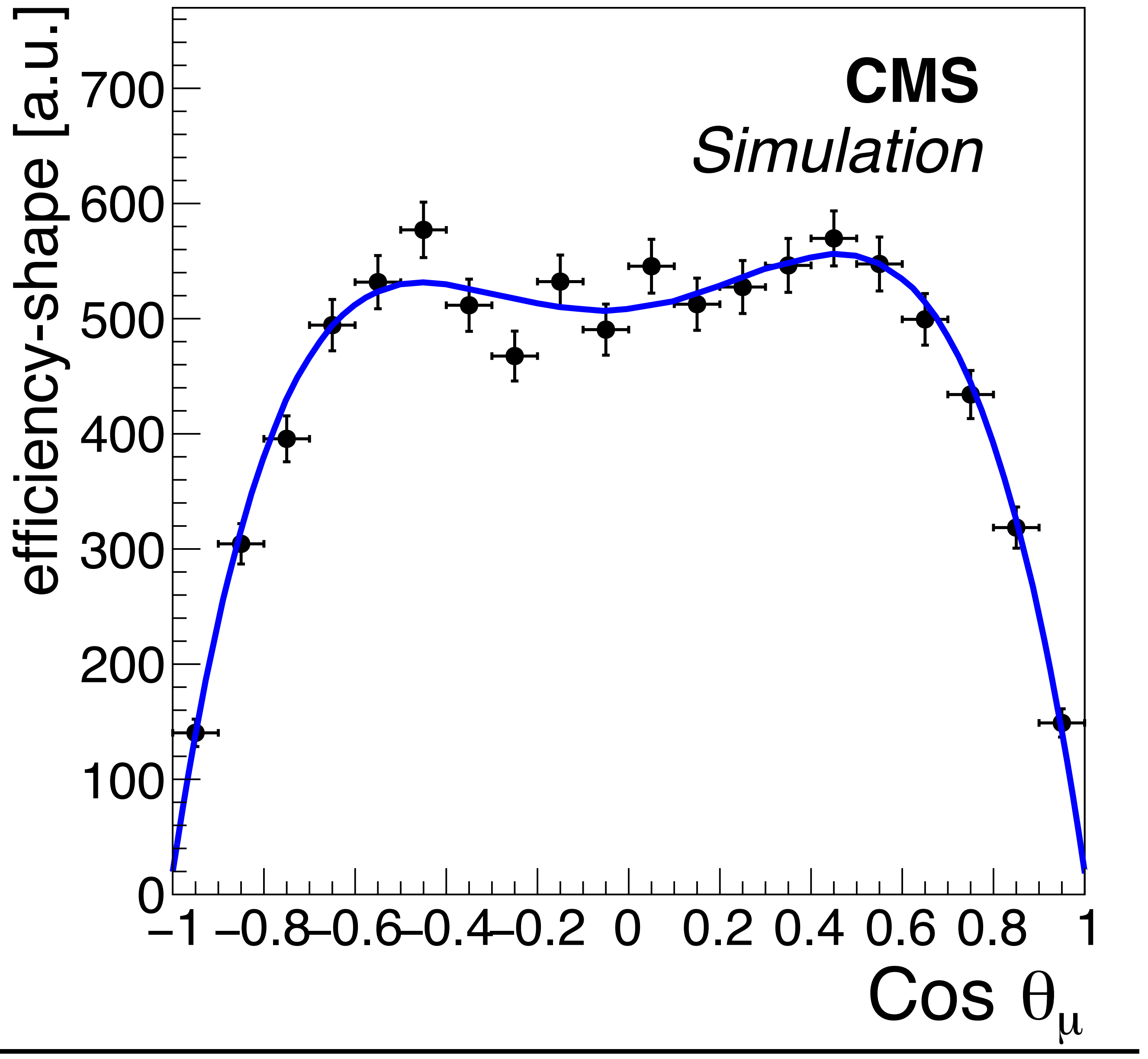


$$\epsilon^{+(-)}\left(\cos\theta_\Lambda, \cos\theta_p, \cos\theta_\mu\right) = \prod_{j=\Lambda,p,\mu}\left(\sum_i^{N_j} A_{j,i}^{+(-)} \cdot T_i\left(\cos\theta_j\right)\right)$$

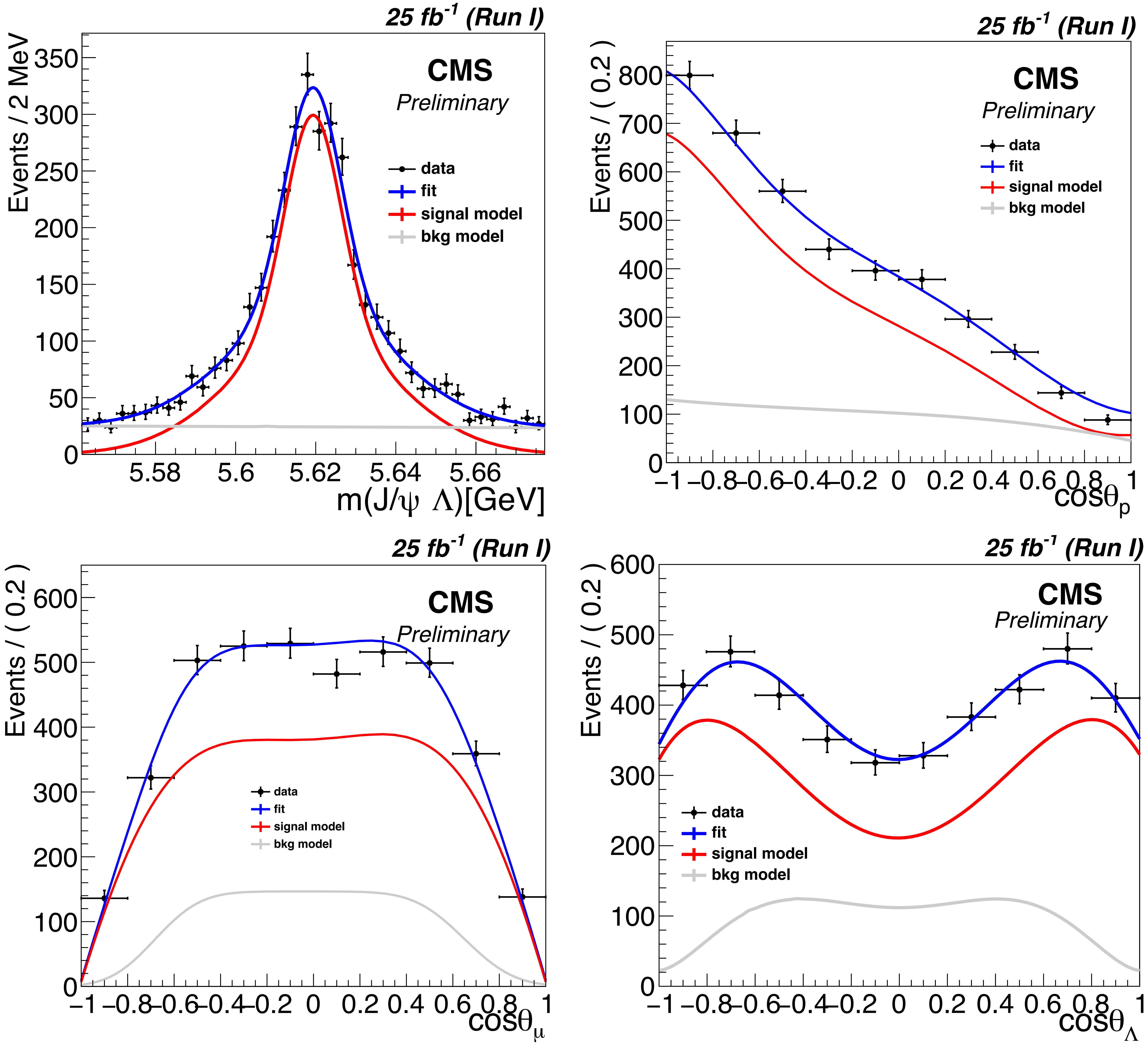








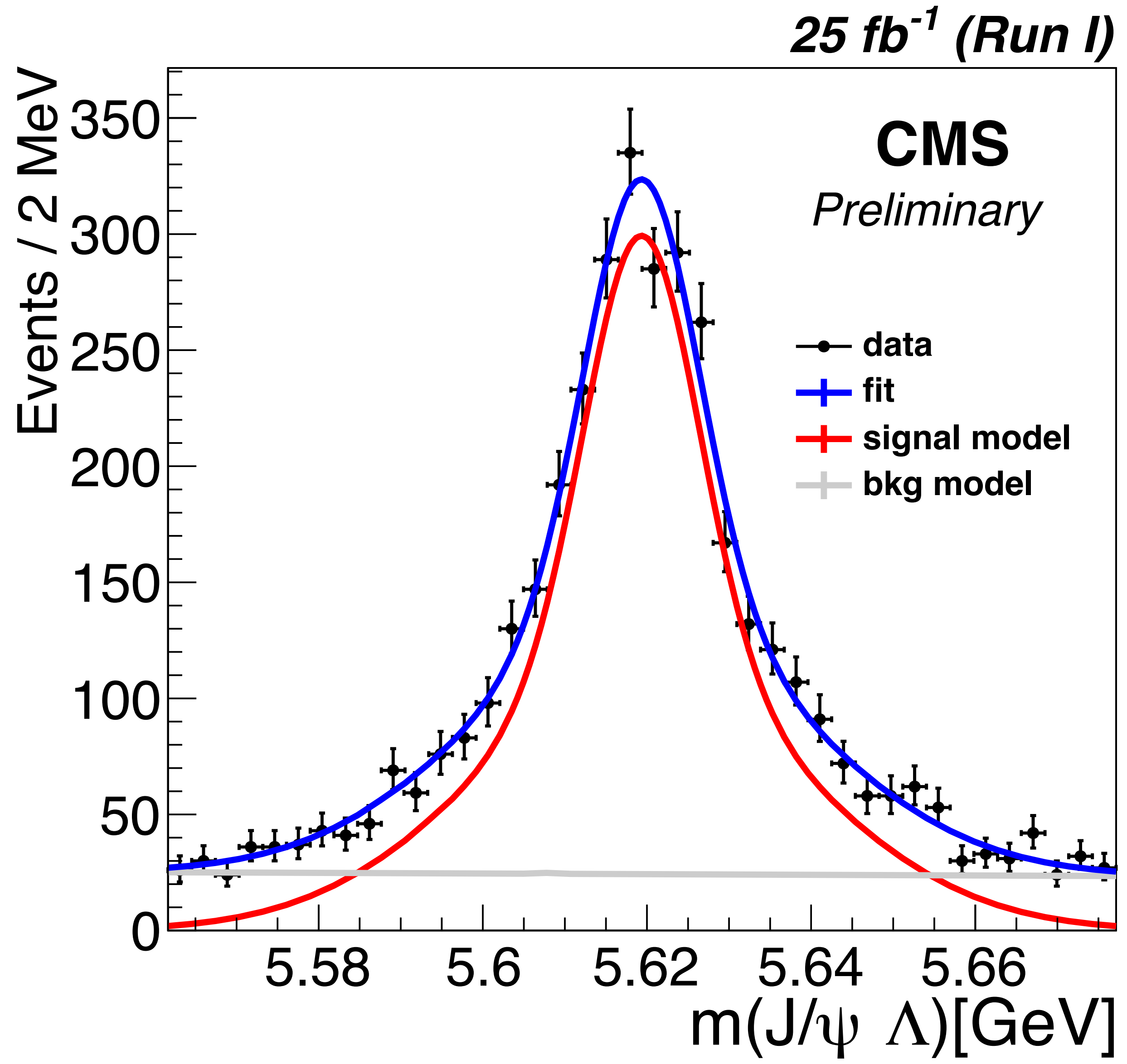
Results

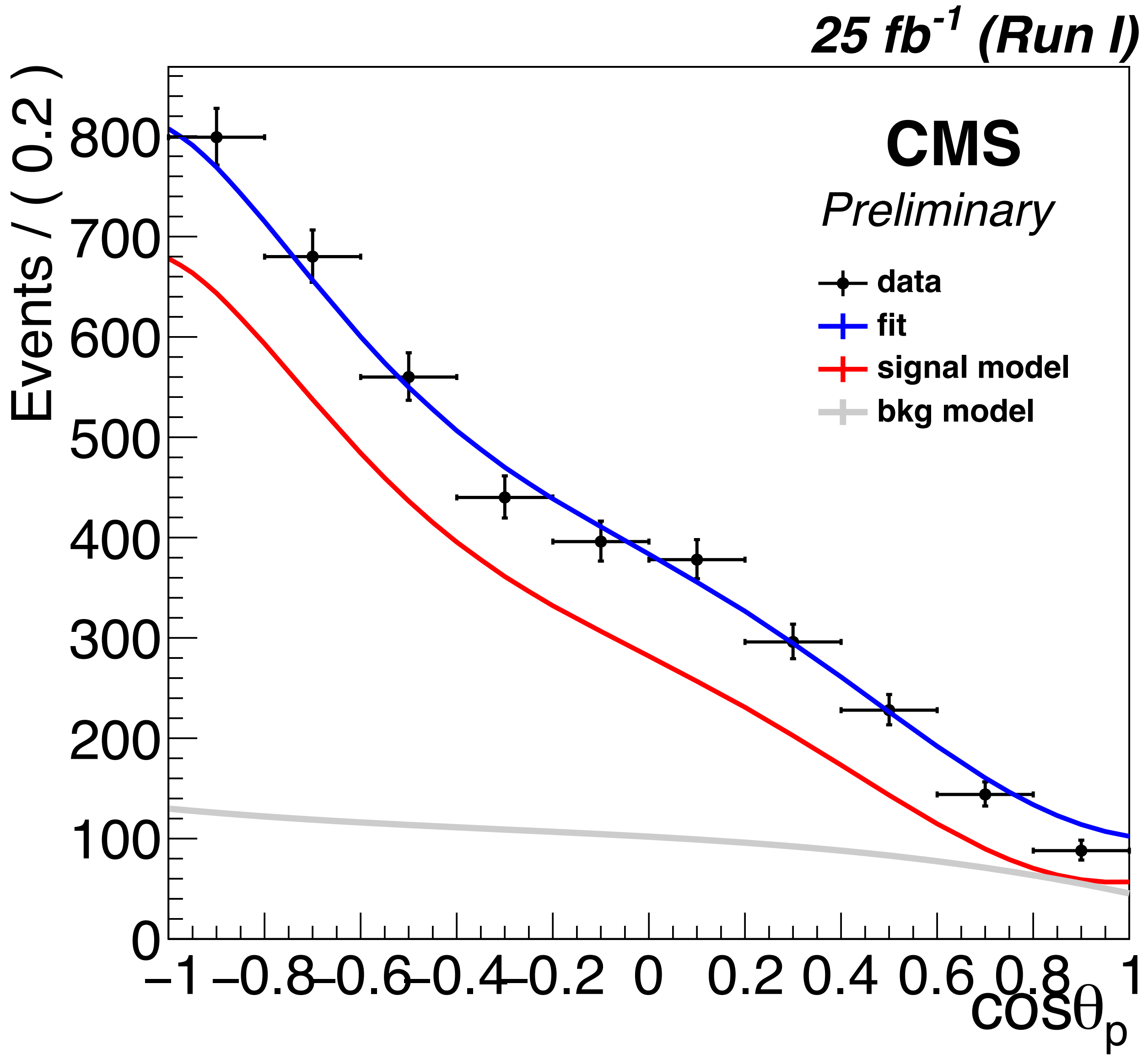


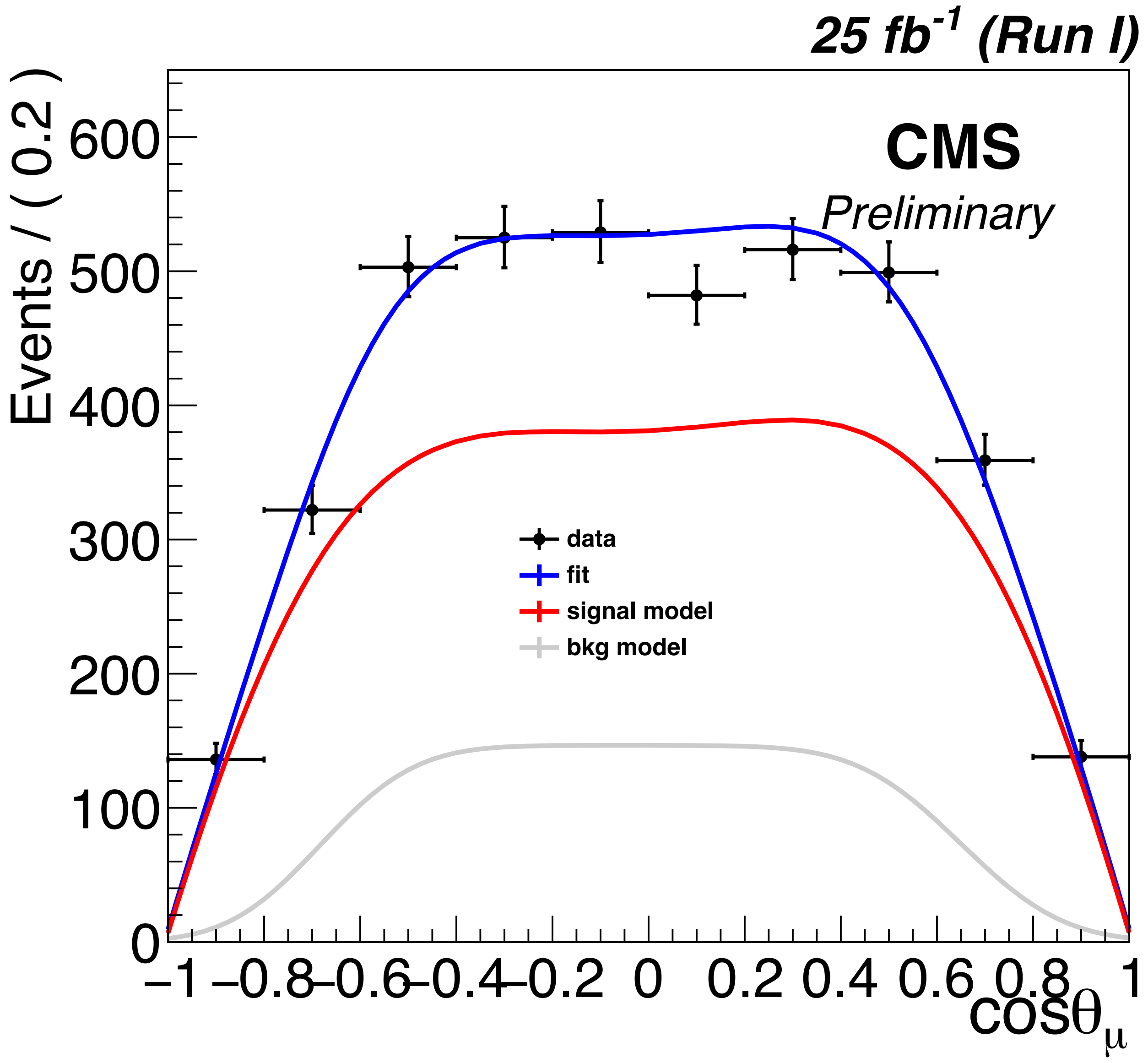
$$P = 0.00 \pm 0.06,$$
$$\alpha_1 = 0.14 \pm 0.14,$$
$$\alpha_2 = -1.11 \pm 0.04,$$
$$\gamma_0 = -0.27 \pm 0.08,$$

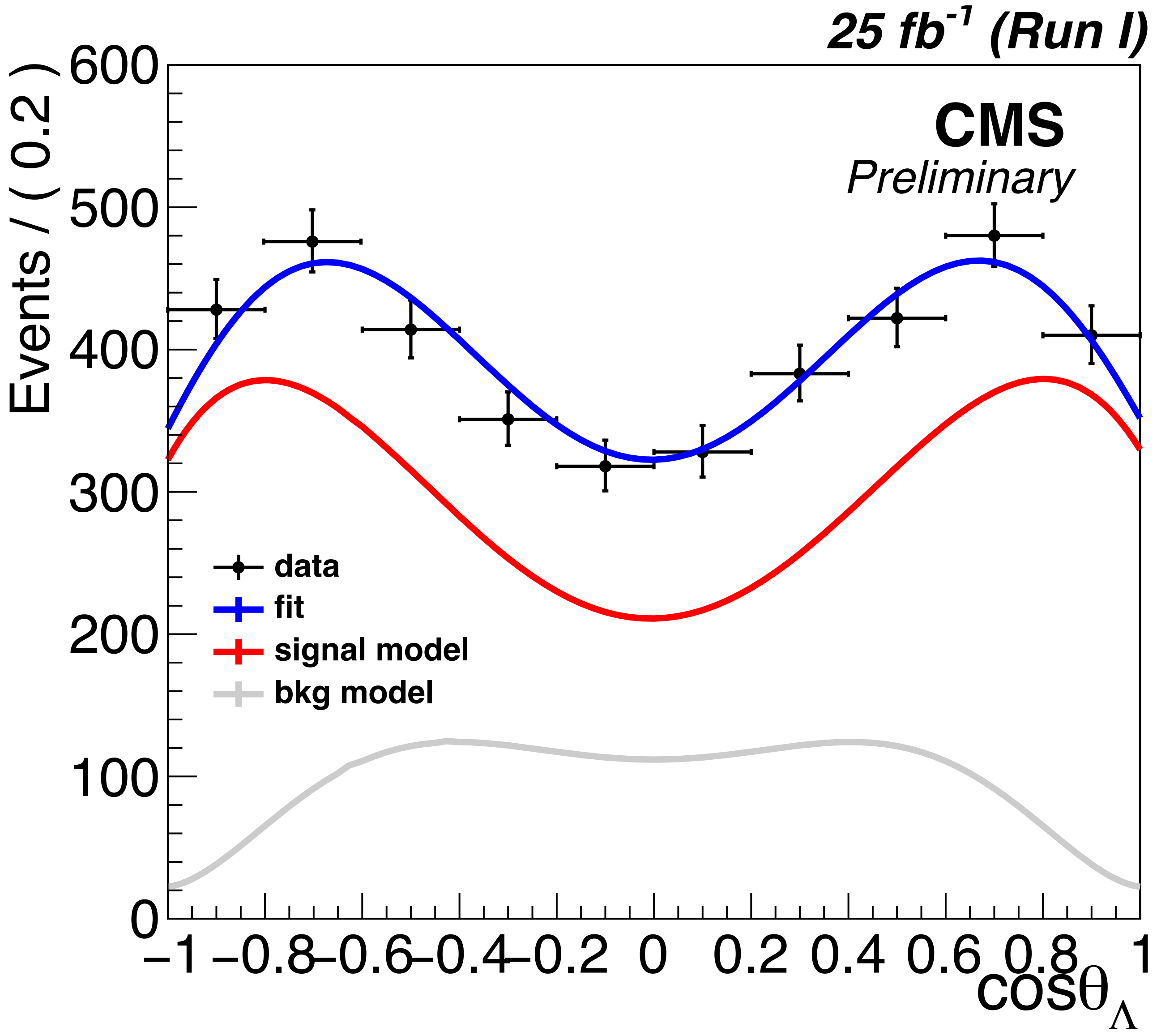
$$|T_{-0}|^2 = 0.51 \pm 0.03,$$
$$|T_{+0}|^2 = -0.10 \pm 0.04,$$
$$|T_{--}|^2 = 0.52 \pm 0.04,$$
$$|T_{++}|^2 = 0.05 \pm 0.04.$$

Results









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Systematics

- We consider the following systematics sources:
  - **Fit Bias**. From Toy MC we take the difference between the input values and the mean of the fitted values as systematic
  - **Asymmetry parameter**. The maximum difference when we vary the value of this parameter within ±sigma of its measured value is taken as systematic.
  - **Background mass model**. We use an exponential instead of a first order polynomial, also we vary bkg parameters ±sigma.
  - **Background angular model**. We change the model to estimate the shape of the angular background. The difference with the nominal result is taken as systematic.
  - **Signal mass model**. This uncertainty is estimated by varying the parameters within their uncertainties and taking into account the correlations . The difference with the nominal result is taken as systematic.
  - **Angular efficiency**. The values of the Chebyshev coefficients are varied ±sigma. The maximum difference with respect to the nominal fit is taken as systematic.
  - **Angular resolution**. The measurement resolution of the angular observables is considered. First, we determine angular resolution from MC, the resulting Gaussian models are used to generate random numbers that are added to the 3 polar angles of MC events at gen-level. The difference between the parameters obtained from fits using events with/out random terms added is quoted as systematic.
  - **Azimuthal efficiency**. The non-uniformity of the azimuthal efficiency shape is investigated from Toy MC. We generate 500 pseudo-experiments, using the 5D angular distribution (3 polar & 2 azimuthal angles) multiplied by the polar and azimuthal efficiency shape (from full MC simulation). Then we fit them with the 3D nominal model. Difference of the mean values with respect to the input values are taken as systematic.
  - **Reweighting procedure.** We apply a procedure where weights are varied in each iteration. The histograms of MC distribution are varied ±sigma(bin error) and then compute the weight per event. We take the largest difference with respect to the nominal value as systematic.
  - **Possible reco-bias.** Possible unaccounted reconstruction bias is considered. In order to estimate this systematic uncertainty, we generate a MC sample with input values of the helicity amplitudes and polarization similar to the observed values in data, we fit the MC sample and take the differences between input and fit values for every angular parameter and the polarization. Since we are considering the Full MC, we subtract the sum in quadrature of the systematic sources involved in the fit from those observed differences, finally we take the square root of this subtraction as the estimation of the systemati

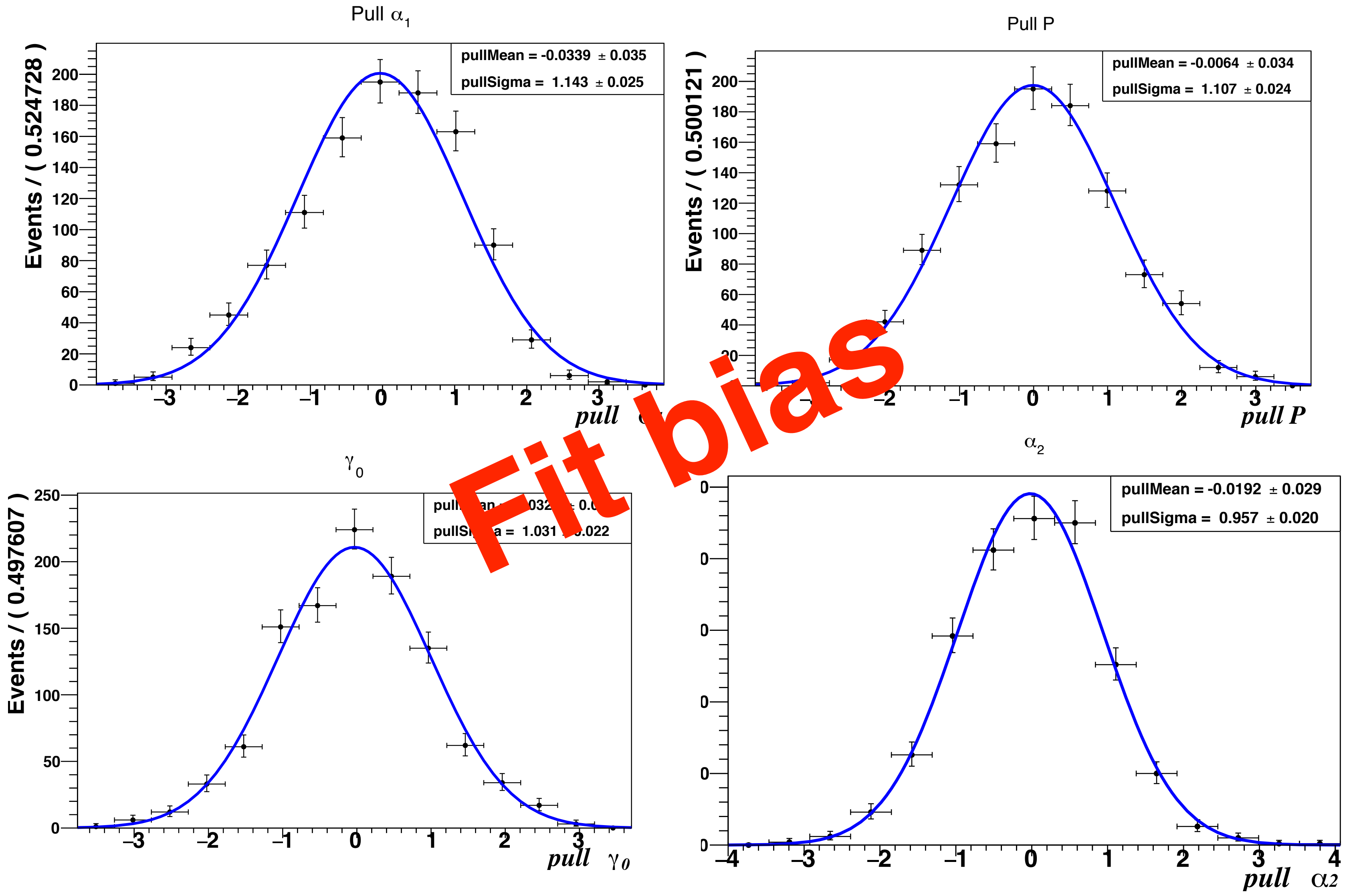
Systematics

- We consider the following systematics sources:
  - **Fit Bias**. From Toy MC we take the difference between the input values and the mean of the fitted values as systematic
  - **Asymmetry parameter**. The maximum difference when we vary the value of this parameter within ±sigma of its measured value is taken as systematic.
  - **Background mass model**. We use an exponential instead of a first order polynomial, also we vary bkg parameters ±sigma.
  - **Background angular model**. We change the model to estimate the shape of the angular background. The difference with the nominal result is taken as systematic.
  - **Signal mass model**. This uncertainty is estimated by varying the parameters within their uncertainties and taking into account the correlations . The difference with the nominal result is taken as systematic.
  - **Angular efficiency**. The values of the Chebyshev coefficients are varied ±sigma. The maximum difference with respect to the nominal fit is taken as systematic.
  - **Angular resolution**. The measurement resolution of the angular observables is considered. First, we determine angular resolution from MC, the resulting Gaussian models are used to generate random numbers that are added to the 3 polar angles of MC events at gen-level. The difference between the parameters obtained from fits using events with/out random terms added is quoted as systematic.
  - **Azimuthal efficiency**. The non-uniformity of the azimuthal efficiency shape is investigated from Toy MC. We generate 500 pseudo-experiments, using the 5D angular distribution (3 polar & 2 azimuthal angles) multiplied by the polar and azimuthal efficiency shape (from full MC simulation). Then we fit them with the 3D nominal model. Difference of the mean values with respect to the input values are taken as systematic.
  - **Reweighting procedure.** We apply a procedure where weights are varied in each iteration. The histograms of MC distribution are varied ±sigma(bin error) and then compute the weight per event. We take the largest difference with respect to the nominal value as systematic.
  - **Possible reco-bias.** Possible unaccounted reconstruction bias is considered. In order to estimate this systematic uncertainty, we generate a MC sample with input values of the helicity amplitudes and polarization similar to the observed values in data, we fit the MC sample and take the differences between input and fit values for every angular parameter and the polarization. Since we are considering the Full MC, we subtract the sum in quadrature of the systematic sources involved in the fit from these observed differences, finally we take the square root of this subtraction as the estimation of the systemati

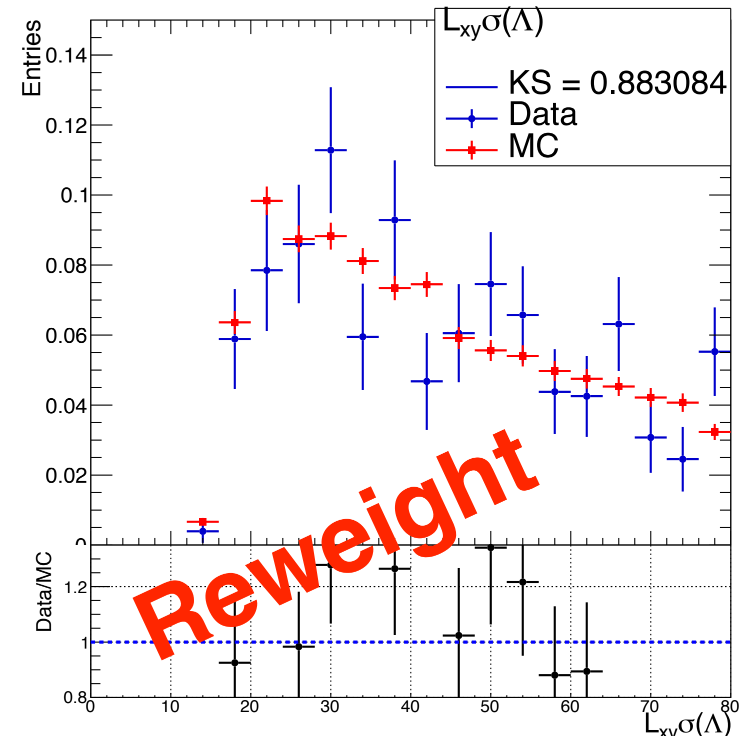
Summary in the next Slide

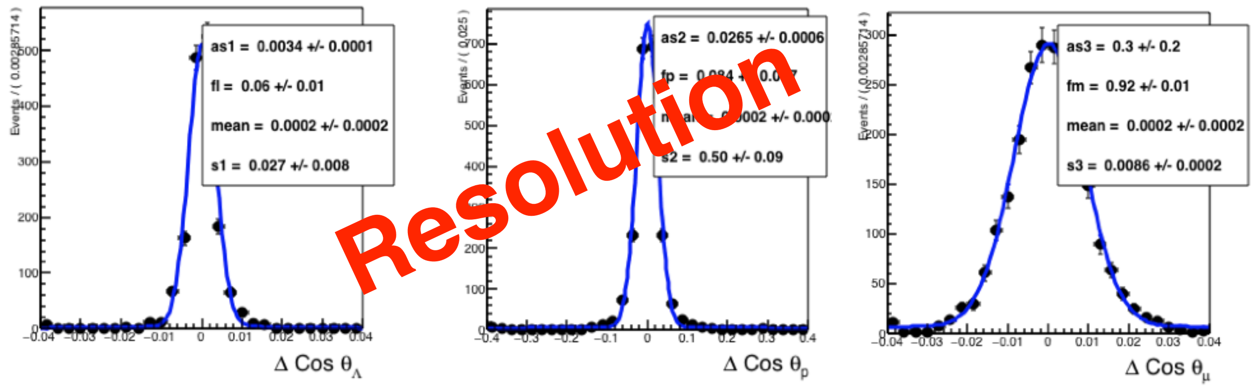
Systematics

Source	$P \times 10^{-2}$	$\alpha_1 \times 10^{-2}$	$\alpha_2 \times 10^{-2}$	$\gamma_0 \times 10^{-2}$
Angular Efficiency	0.1	0.3	3.0	1.0
Azimuthal Efficiency	0.1	1.0	0.3	0.1
Fit Bias	0.1	0.3	0.1	0.2
Angular Resolution	1.0	0.1	2.6	0.8
Background mass model	0.01	0.5	1.0	0.9
Background angular model	0.4	0.5	0.9	5.0
Signal mass model	0.01	0.3	1.0	1.0
Asymmetry parameter α_Λ.	0.4	0.7	2.0	0.6
Reweight procedure	0.1	1.3	0.4	2.0
Reconstruction bias	5.6	10.0	5.1	9.1
Total(sqrt of the quadratic sum)	5.8	10.0	5.1	11.1



$$\mathrm{pull}(x_i) = \frac{x_i^{fit} - x_i^{true}}{\sigma_i^{fit}}$$

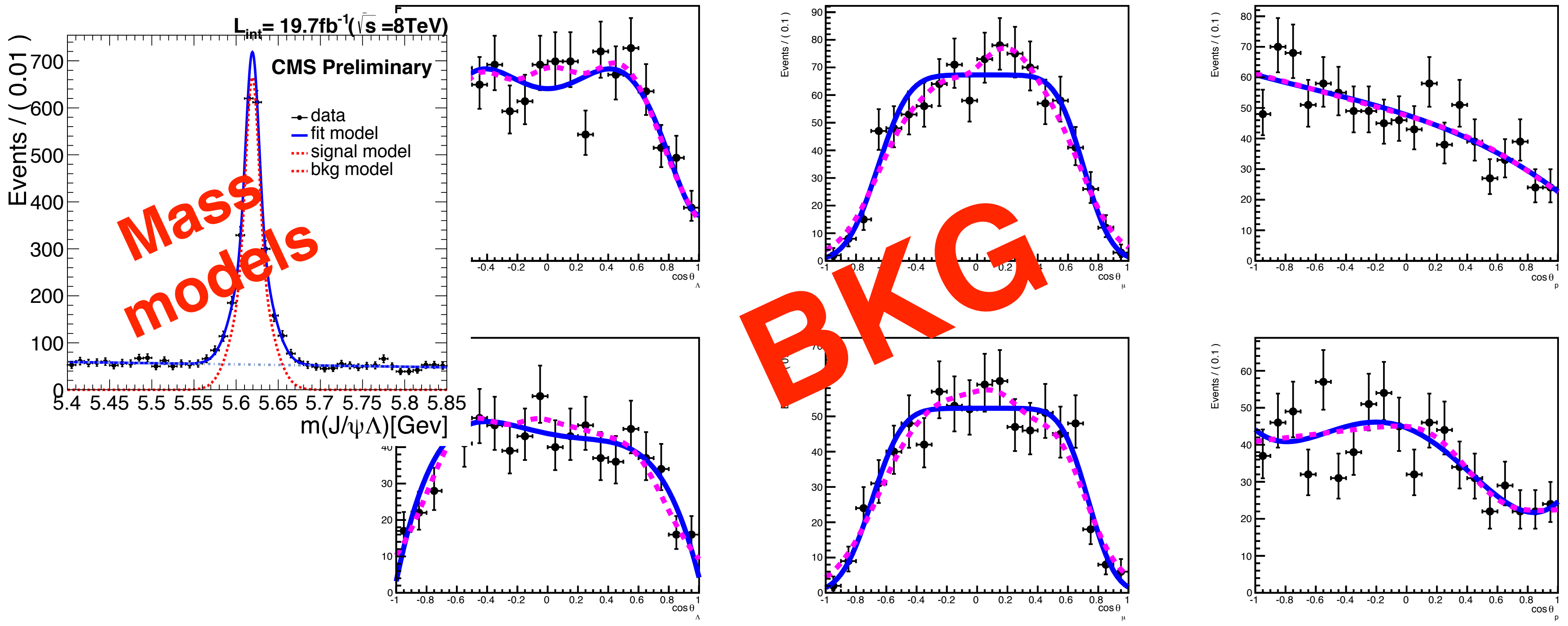


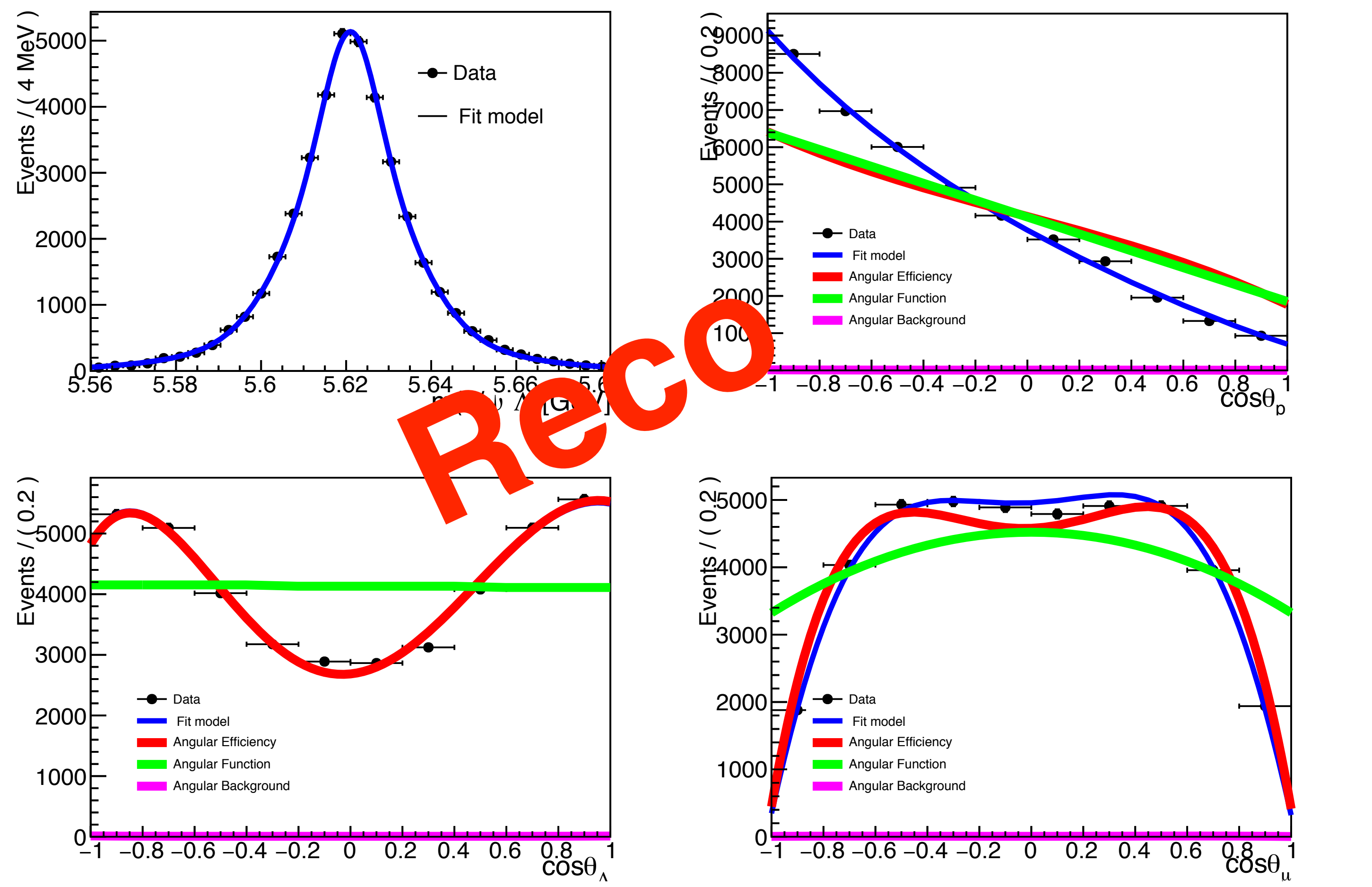


$$T_{+0}, T_{-0}, T_{--})c_i(P, \alpha_\Lambda)f_i(\Theta, \Phi)$$

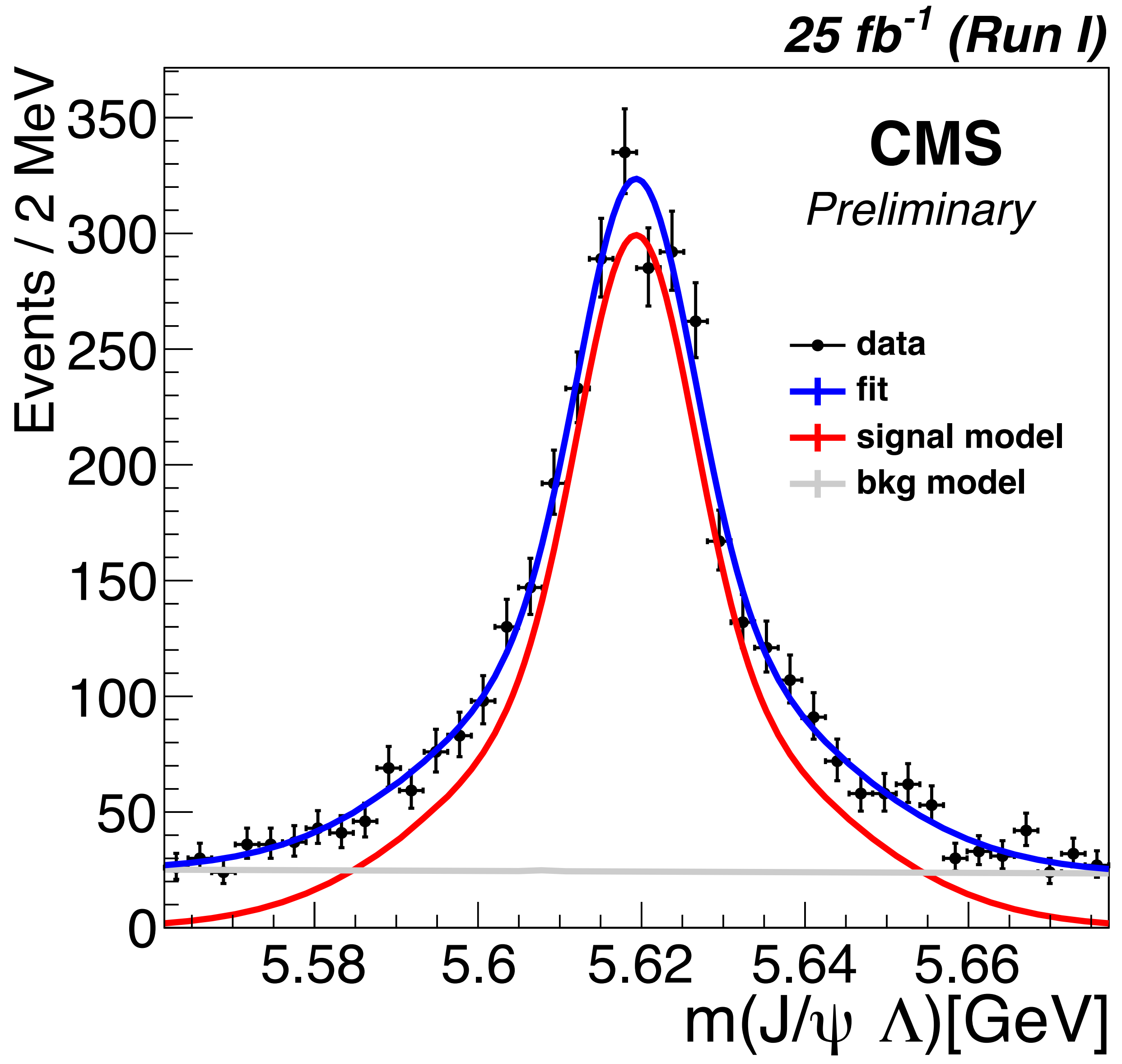
✤ **The contributions from the different uncertainty sources are assumed to be independent**

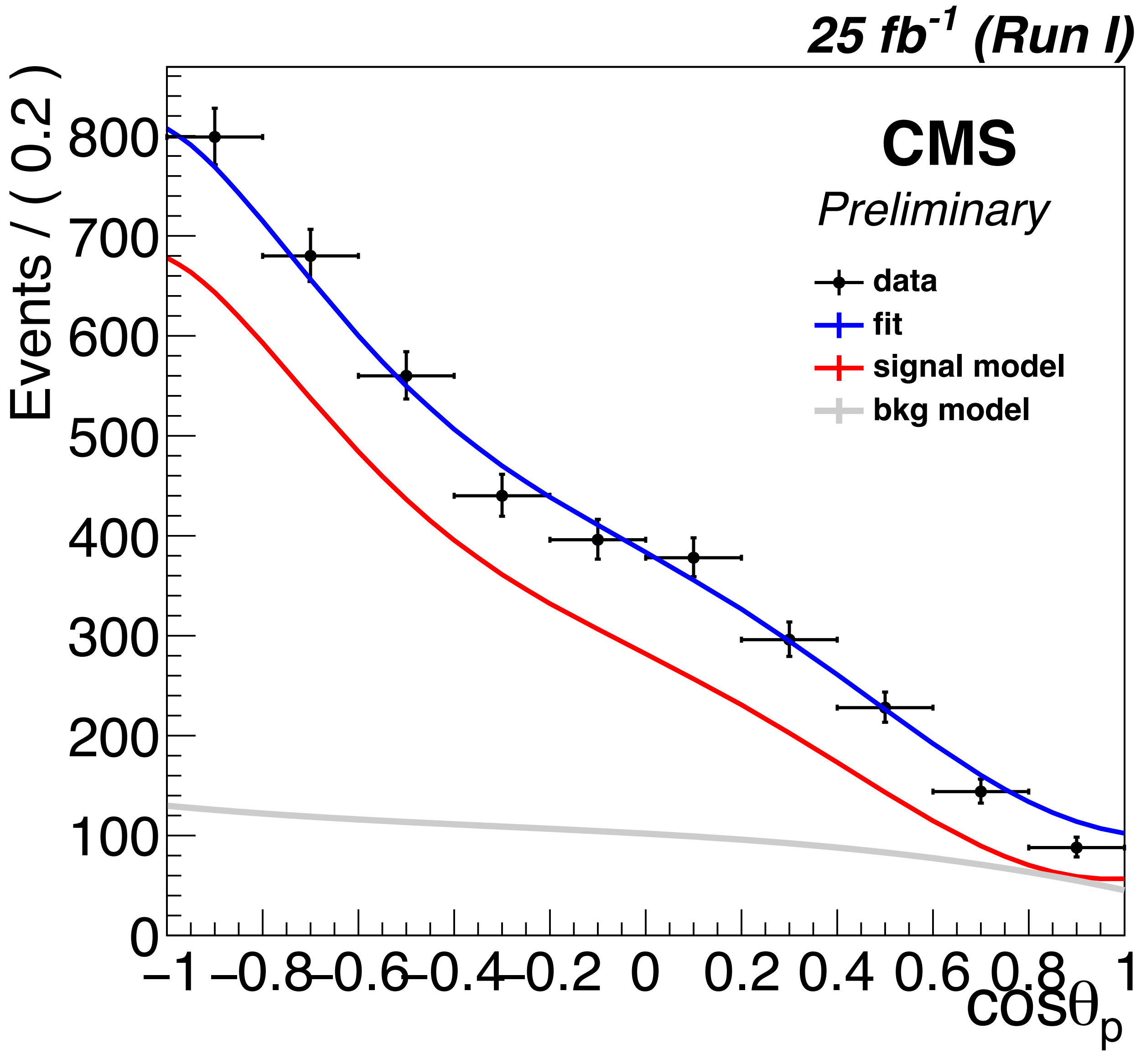
✤ **The total systematic uncertainty is calculated as the square root of the quadratic sum of all uncertainties.**

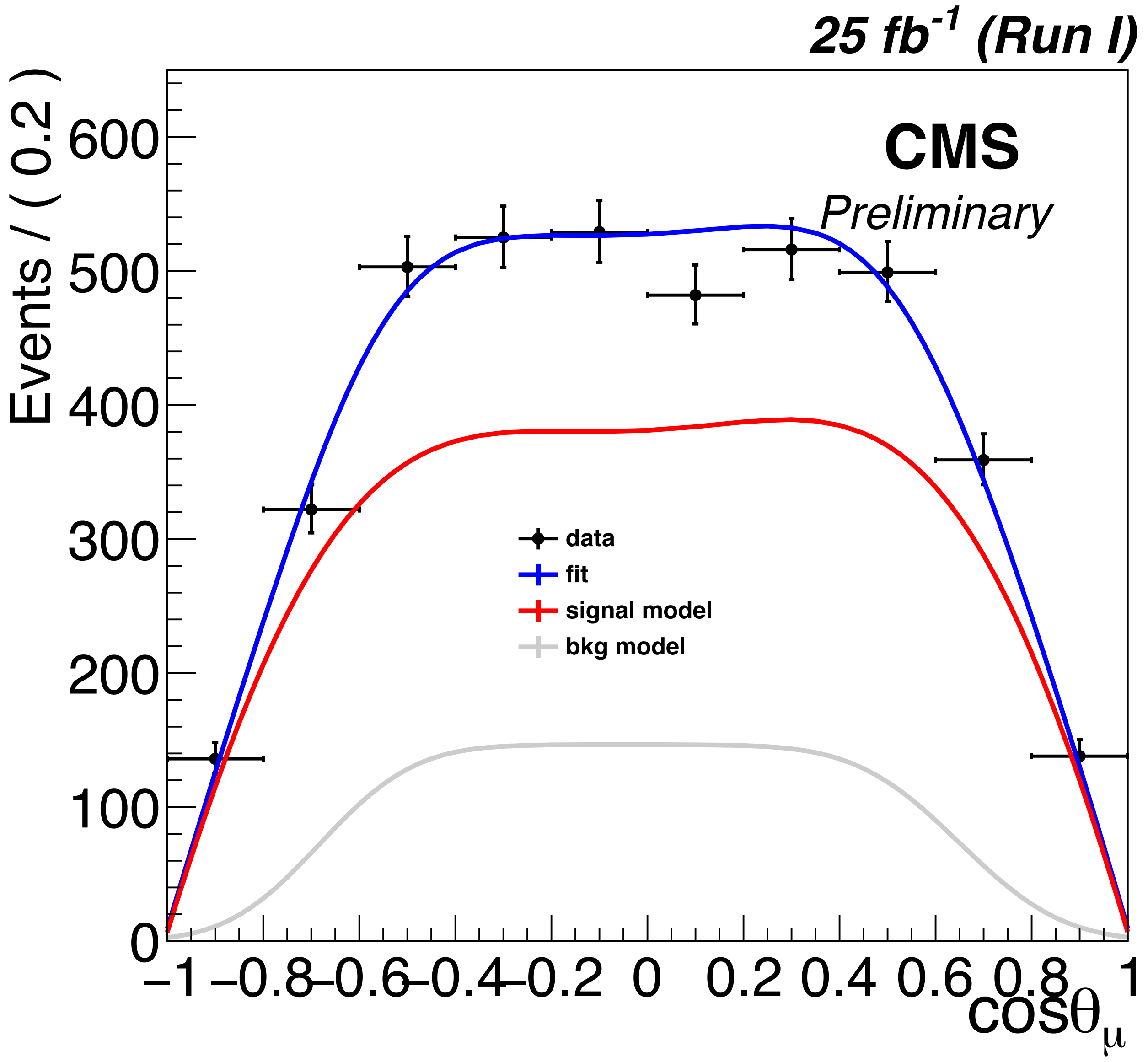


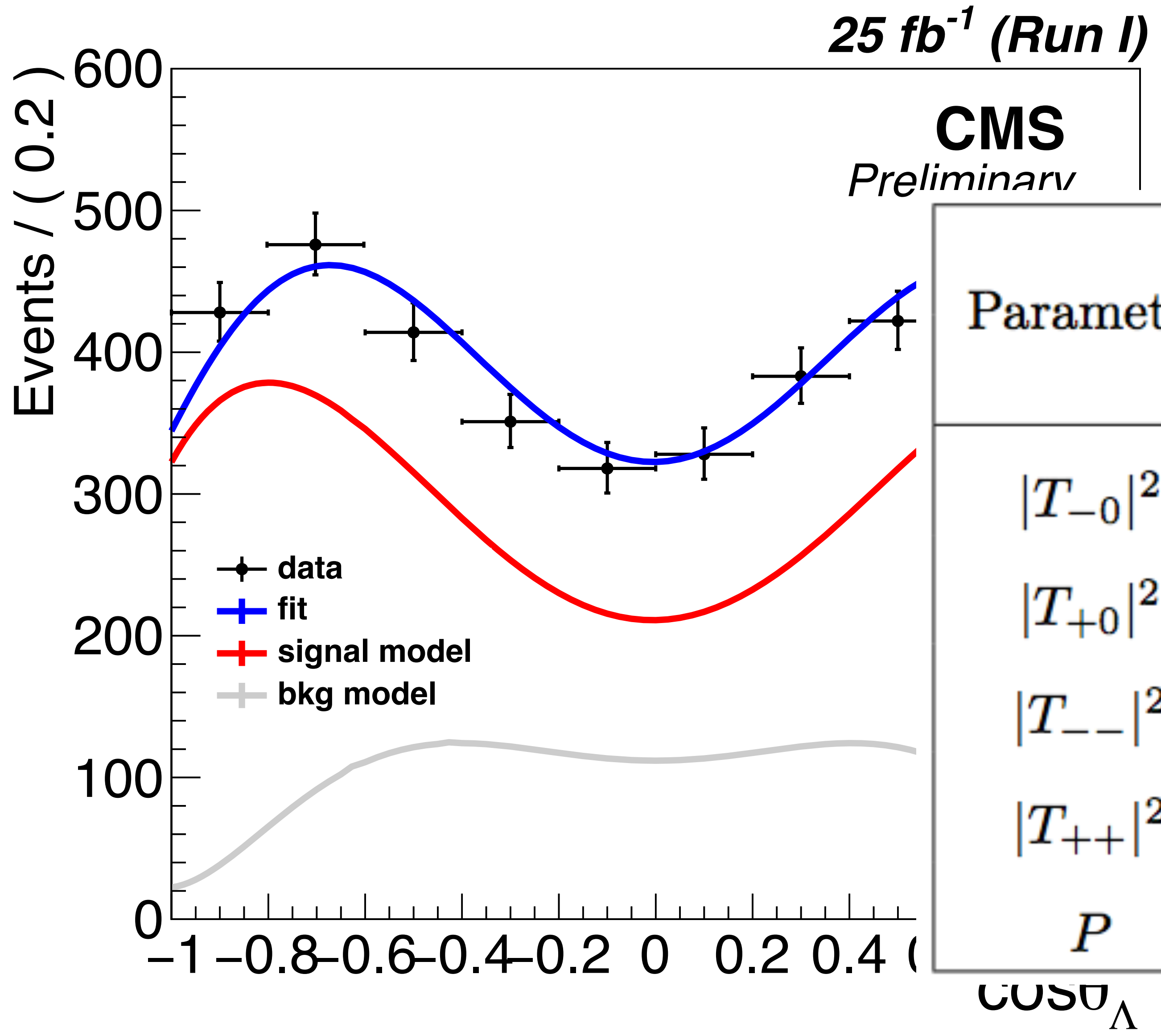


Conclusions







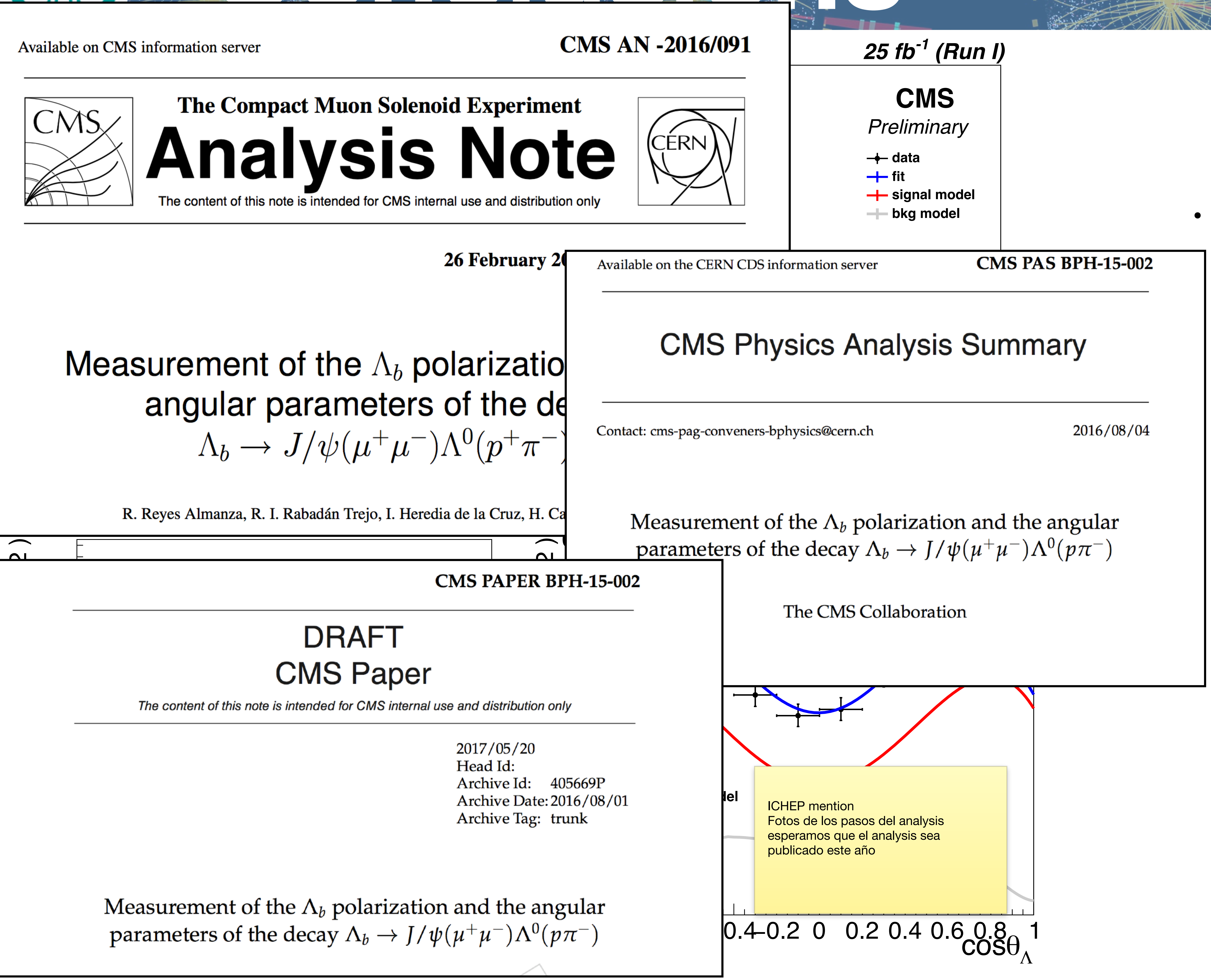


$$P = 0.00 \pm 0.06(stat) \pm 0.06(syst),$$
$$\alpha_1 = 0.14 \pm 0.14(stat) \pm 0.10(syst),$$
$$\alpha_2 = -1.11 \pm 0.04(stat) \pm 0.05(syst),$$
$$\gamma_0 = -0.27 \pm 0.08(stat) \pm 0.11(syst)$$

$$|T_{-0}|^2 = 0.52 \pm 0.03(stat) \pm 0.04(syst),$$
$$|T_{+0}|^2 = -0.10 \pm 0.04(stat) \pm 0.04(syst),$$
$$|T_{--}|^2 = 0.53 \pm 0.04(stat) \pm 0.04(syst),$$
$$|T_{++}|^2 = 0.04 \pm 0.04(stat) \pm 0.04(syst).$$

Parameter	CMS	LHCb		ATLAS	
		result	difference	result	difference
$\lvert T_{-0}\rvert^2$	$0.52 \pm 0.03 \pm 0.04$	$0.57 \pm 0.06 \pm 0.03$	0.71σ	$0.35^{+0.07}_{-0.08} \pm 0.04$	1.60σ
$\lvert T_{+0}\rvert^2$	$-0.10 \pm 0.04 \pm 0.04$	$0.01 \pm 0.04 \pm 0.03$	1.45σ	$0.03^{+0.04}_{-0.06} \pm 0.03$	1.48σ
$\lvert T_{--}\rvert^2$	$0.53 \pm 0.04 \pm 0.04$	$0.51 \pm 0.05 \pm 0.02$	0.13σ	$0.62^{+0.06}_{-0.08} \pm 0.02$	1.00σ
$\lvert T_{++}\rvert^2$	$0.04 \pm 0.04 \pm 0.04$	$-0.10 \pm 0.04 \pm 0.03$	1.98σ	$0.01^{+0.02}_{-0.01} \pm 0.01$	0.65σ
P	$0.00 \pm 0.06 \pm 0.06$	$0.06 \pm 0.07 \pm 0.06$	0.47σ	———	

Conclusions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The Compact Muon Solenoid Experiment

Analysis Note

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26 February 2

Measurement of the Λ_b polarizatio
angular parameters of the de
$\Lambda_b \to J/\psi(\mu^+\mu^-)\Lambda^0(p^+\pi^-)$

R. Reyes Almanza, R. I. Rabadán Trejo, I. Heredia de la Cruz, H. Ca

Available on the CERN CDS information server — CMS PAS BPH-15-002

CMS Physics Analysis Summary

Contact: cms-pag-conveners-bphysics@cern.ch — 2016/08/04

Measurement of the Λ_b polarization and the angular parameters of the decay $\Lambda_b \to J/\psi(\mu^+\mu^-)\Lambda^0(p\pi^-)$

The CMS Collaboration

CMS PAPER BPH-15-002

DRAFT
CMS Paper

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2017/05/20
Head Id:
Archive Id: 405669P
Archive Date: 2016/08/01
Archive Tag: trunk

Measurement of the Λ_b polarization and the angular parameters of the decay $\Lambda_b \to J/\psi(\mu^+\mu^-)\Lambda^0(p\pi^-)$

- **Our result of the Λ_b polarization is consistent with a polarization of ~10%, at the level 1.5sigma of but it disfavours the 20% expectation reported in the literature.**

  Using standard techniques we presented a robust angular analysis,

  This analysis have been approved from several filters in the collaboration and we are waiting for the CWR. We hope this work will be published this year.

- Thanks