

中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

QUARTERLY ASSESSMENT REPORT

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Outline

$$Q = \frac{1}{(p_{T_j})^\kappa} \sum_{i \in \text{Tr}} (p_T^i)^\kappa \times q_i$$

- **Jet charge at CEPC**

add pT weighted Method

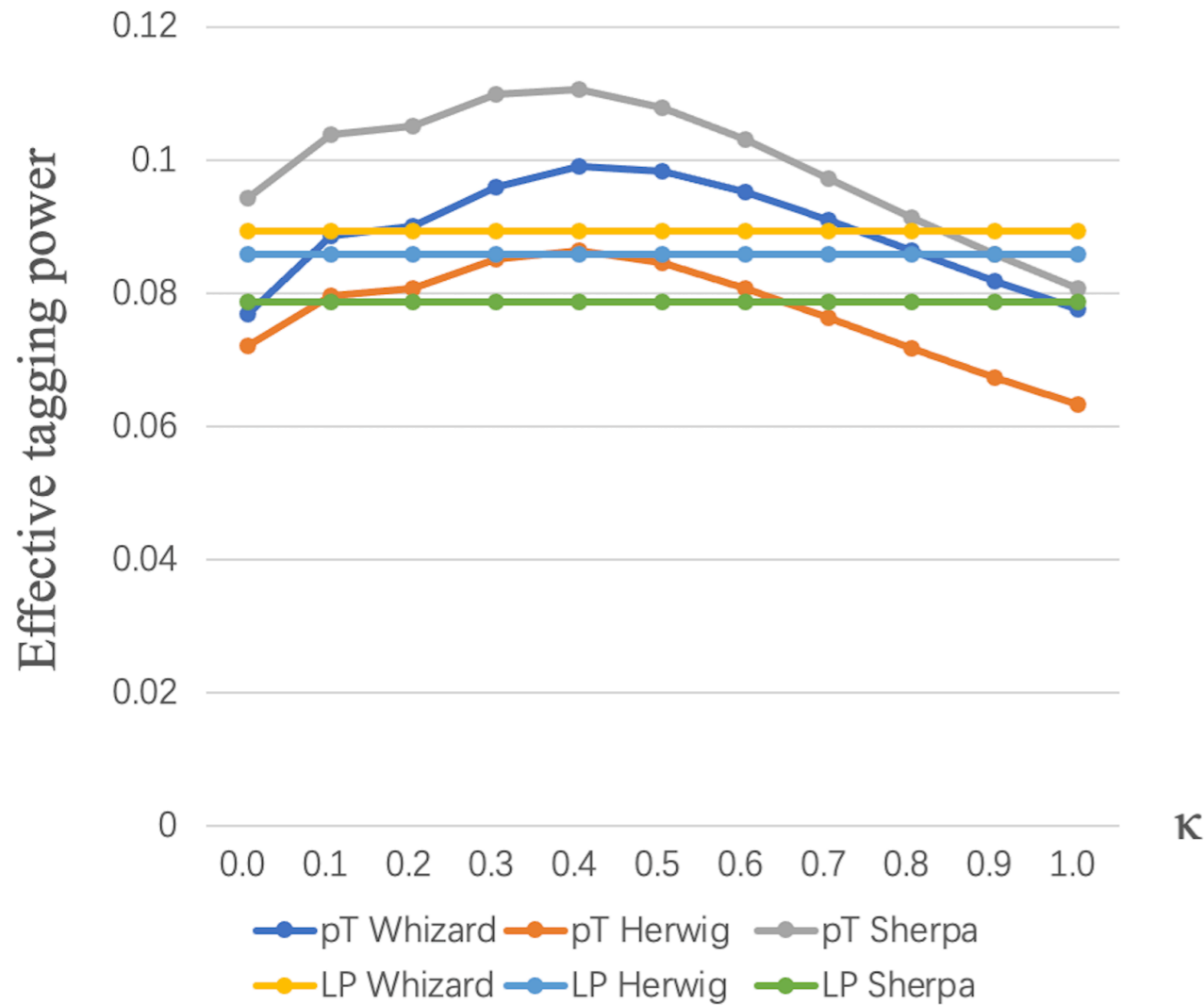
- **Percent distributions of $Z \rightarrow b\bar{b}(c\bar{c}) \rightarrow \text{B(D)}$ hadrons**
- **Accuracy estimation of $Z \rightarrow b\bar{b} \rightarrow T_{bb\bar{q}\bar{q}}$**

just a start

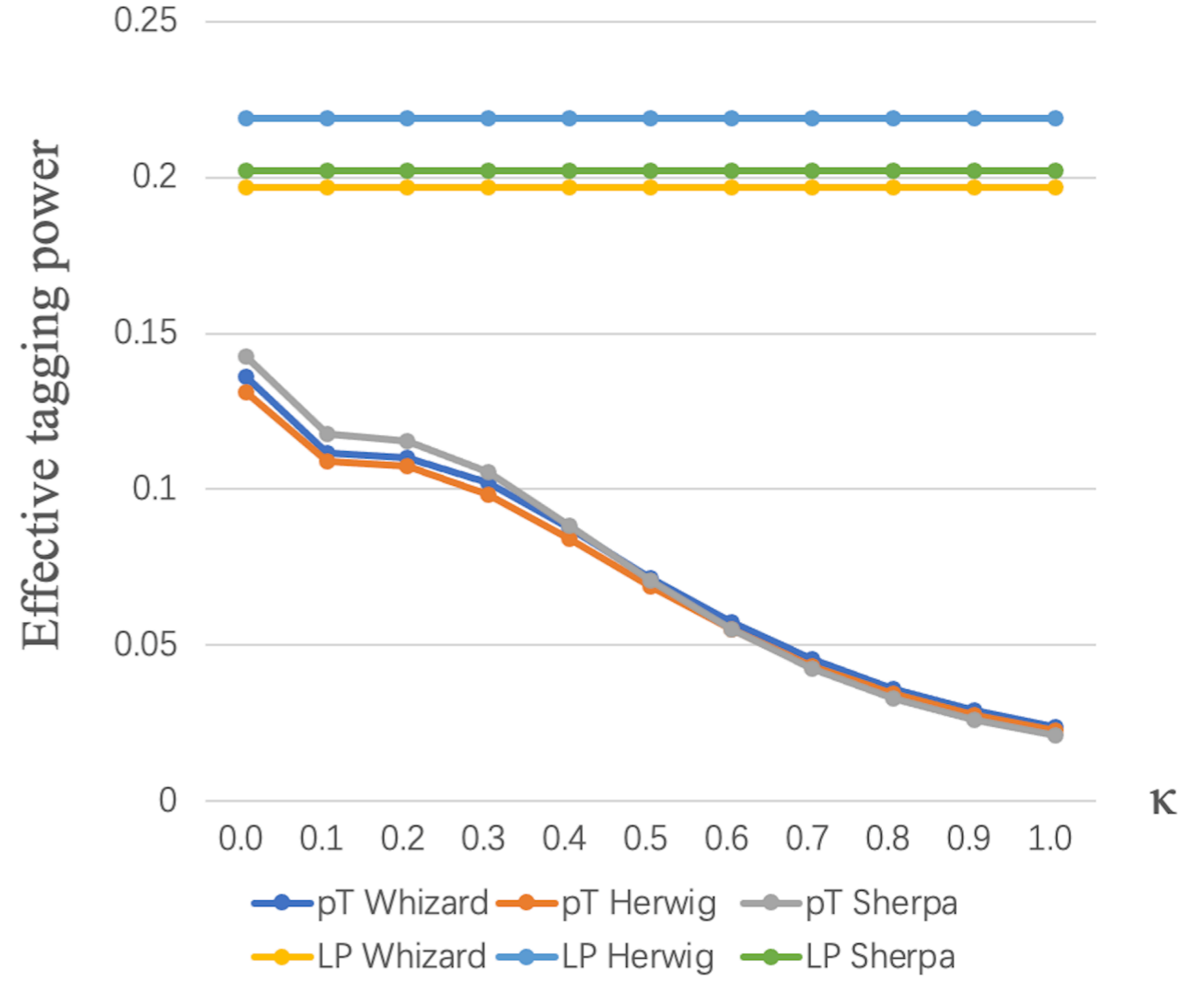
- **Measurements of $Higgs \rightarrow b\bar{b} c\bar{c} gg$**
- **PID performance at CEPC baseline detector**

co-writer

Leading Particle v.s. pT weighted



b jet

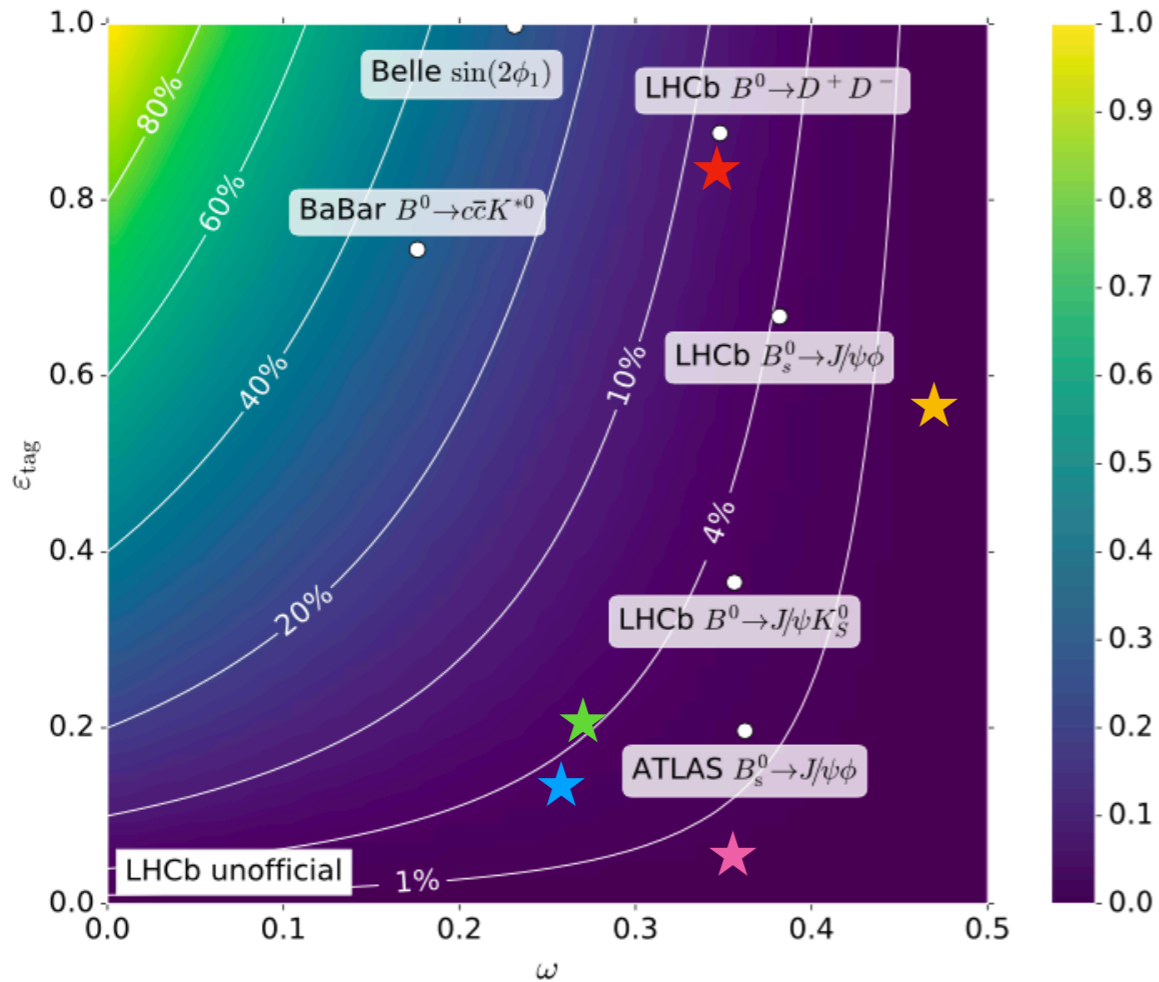


c jet

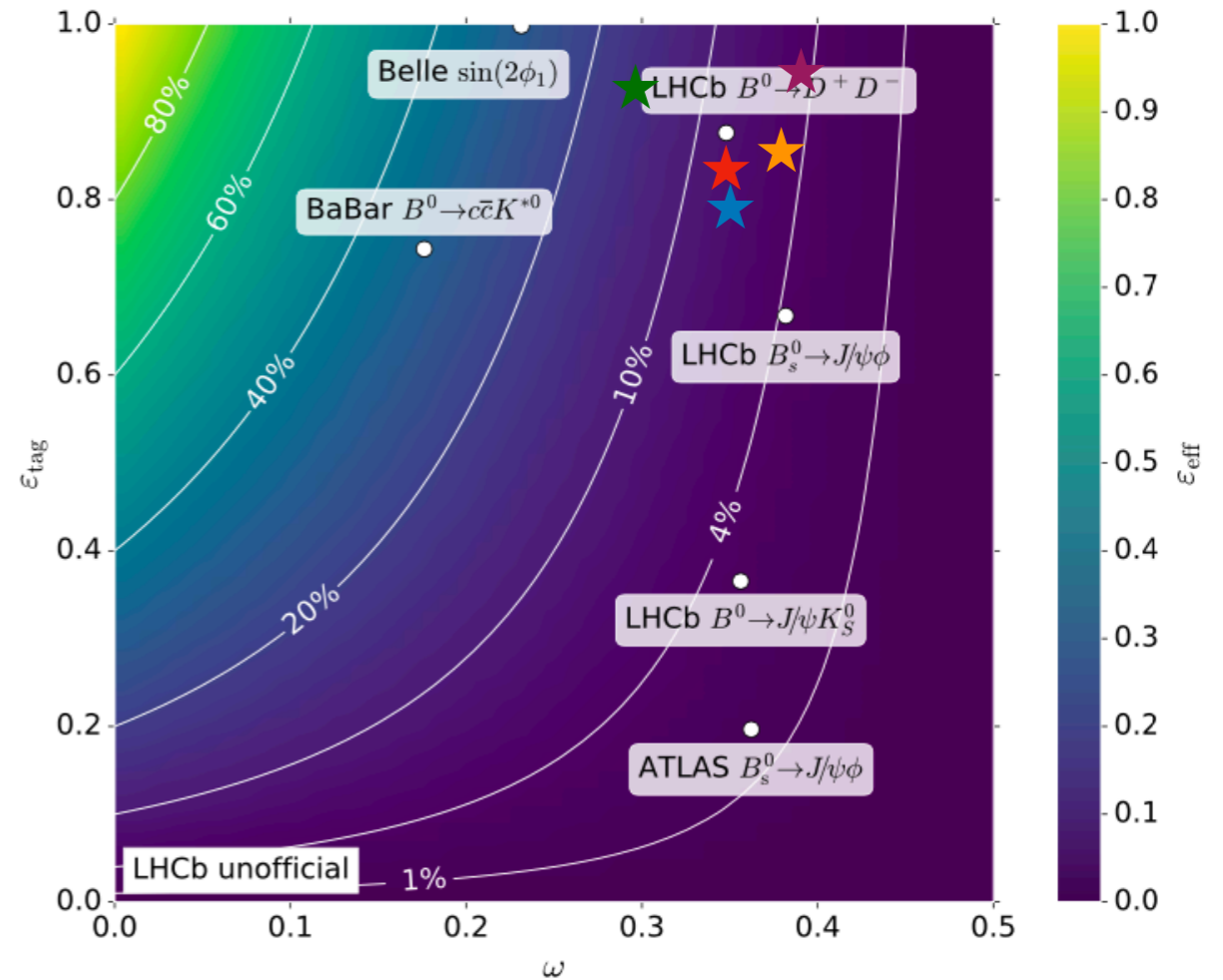
	b jet			c jet		
Effective Tagging Power	Whizard	Herwig	Sherpa	Whizard	Herwig	Sherpa
pT Weighted	0.099	0.086	0.110	0.136	0.141	0.142
Leading Particle	0.089	0.086	0.079	0.197	0.219	0.202

Jet Charge Experiments

Leading Particle Method



pT Weighted Method



CEPC $Z \rightarrow bb$ inclusive channels

CEPC b quark \rightarrow lepton

CEPC b quark \rightarrow Kaon

CEPC b quark \rightarrow pion

CEPC b quark \rightarrow proton

CEPC $Z \rightarrow bb$ inclusive channels

CEPC $B^0 \rightarrow$ anything

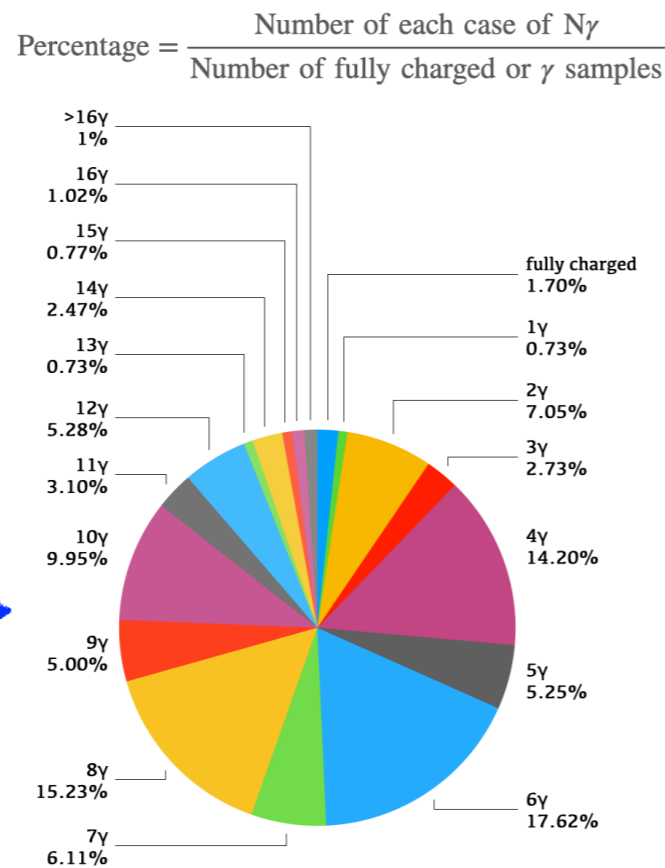
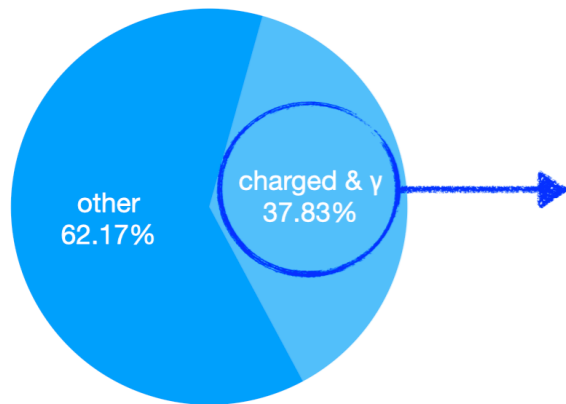
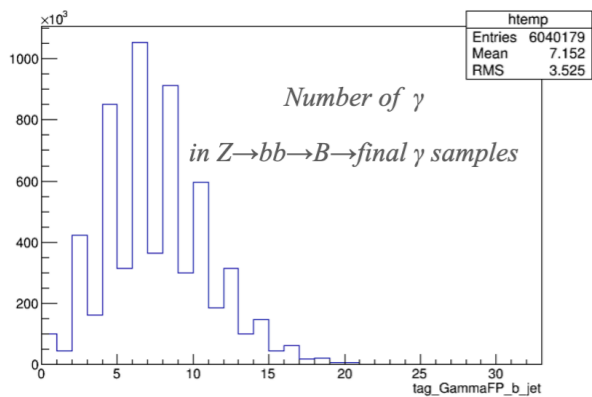
CEPC $B^- \rightarrow$ anything

CEPC $B_c \rightarrow$ anything

CEPC $\Lambda_b \rightarrow$ anything

Only one B hadron at each jet

Statistics of $Z \rightarrow bb \rightarrow B \rightarrow$ final fully charged particles

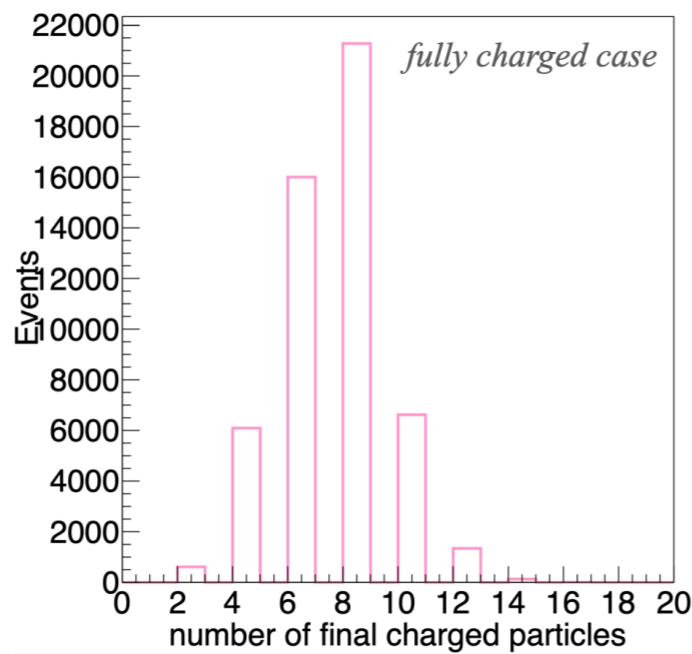
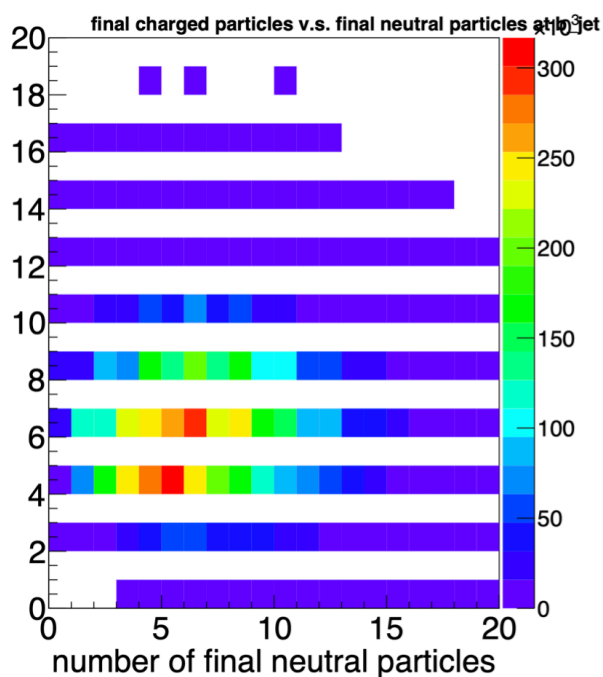


Percentage = $\frac{\text{Number of fully charged samples}}{\text{Number of all samples}}$

Percentage	b jet	bbar jet
All B hadrons	0.0064	0.0064
B0	0.0077	0.0077
B+-	0.0049	0.0049
Bs	0.0040	0.0041
Bc	0.0056	0.0043
Λ_b	0.0104	0.0107

Percentage = $\frac{\text{Number of fully charged or } \gamma \text{ samples}}{\text{Number of all samples}}$

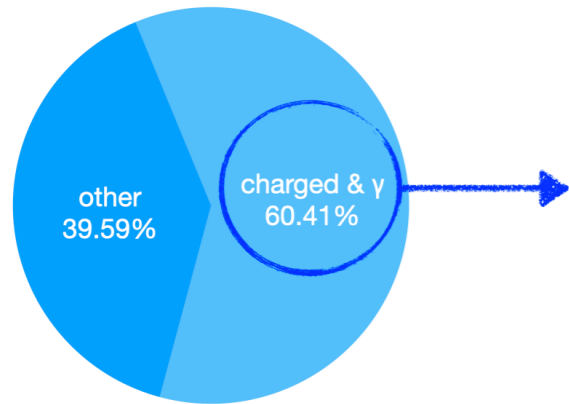
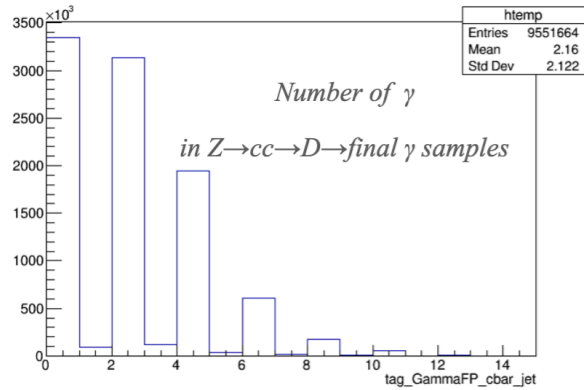
Percentage	b jet	bbar jet
All B hadrons	0.3783	0.3782
B0	0.3647	0.3644
B+-	0.4047	0.4051
Bs	0.3622	0.3610
Bc	0.3682	0.3586
Λ_b	0.3178	0.3166



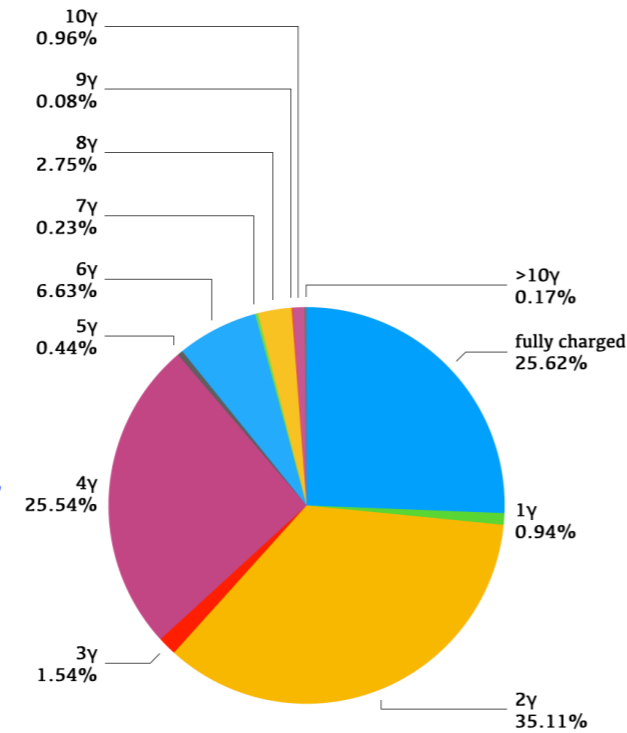
~59 times than fully charged case

Only one D hadron at each jet

Statistics of $Z \rightarrow cc \rightarrow D \rightarrow$ final fully charged particles



$$\text{Percentage} = \frac{\text{Number of each case of } N_\gamma}{\text{Number of fully charged or } \gamma \text{ samples}}$$



$$\text{Percentage} = \frac{\text{Number of fully charged samples}}{\text{Number of all samples}}$$

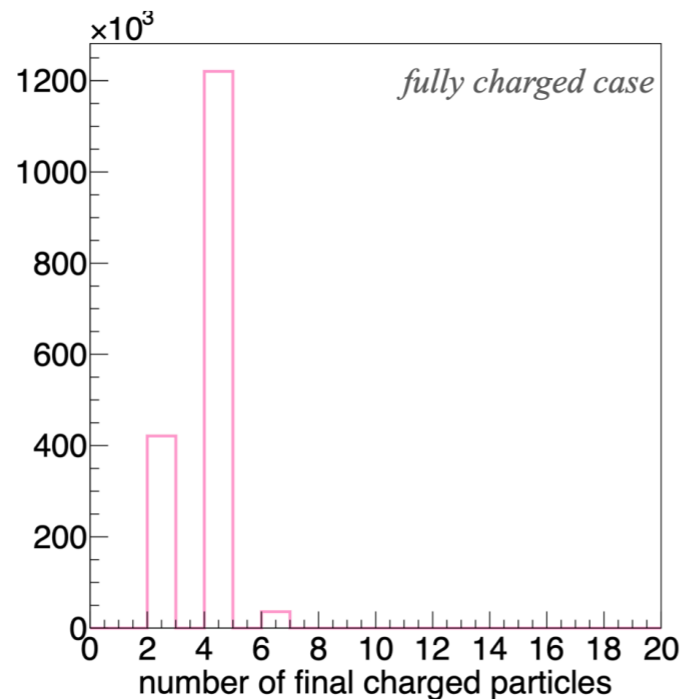
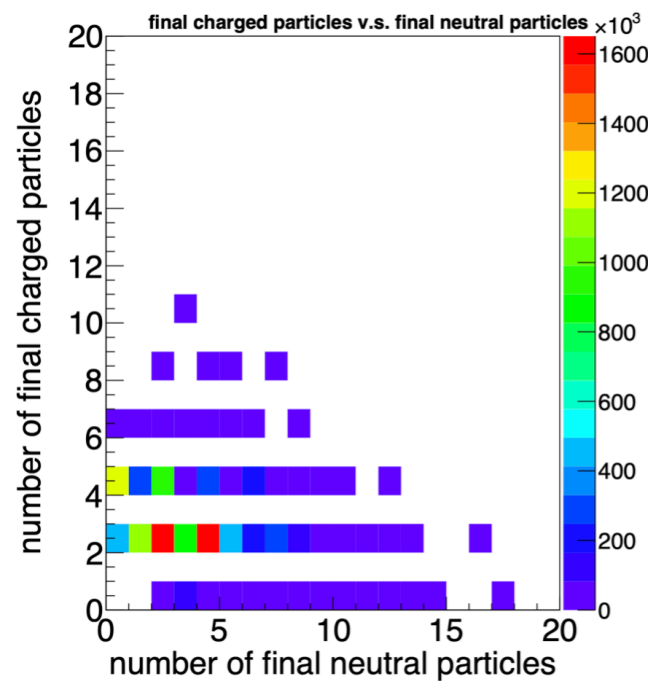
Percentage	c jet	cbar jet
All D hadrons	0.1548	0.1547
D0	0.1684	0.1684
D+-	0.1435	0.1432
Ds	0.0973	0.0951
Λ_c	0.1343	0.1343

~24 times than $Z \rightarrow bb$ samples

$$\text{Percentage} = \frac{\text{Number of fully charged or } \gamma \text{ samples}}{\text{Number of all samples}}$$

Percentage	c jet	cbar jet
All D hadrons	0.604123	0.604087
D0	0.664451	0.664455
D+-	0.442728	0.442268
Ds	0.635283	0.635054
Λ_c	0.531682	0.532399

~1.6 times than $Z \rightarrow bb$ samples; ~3.9 times than fully charged case

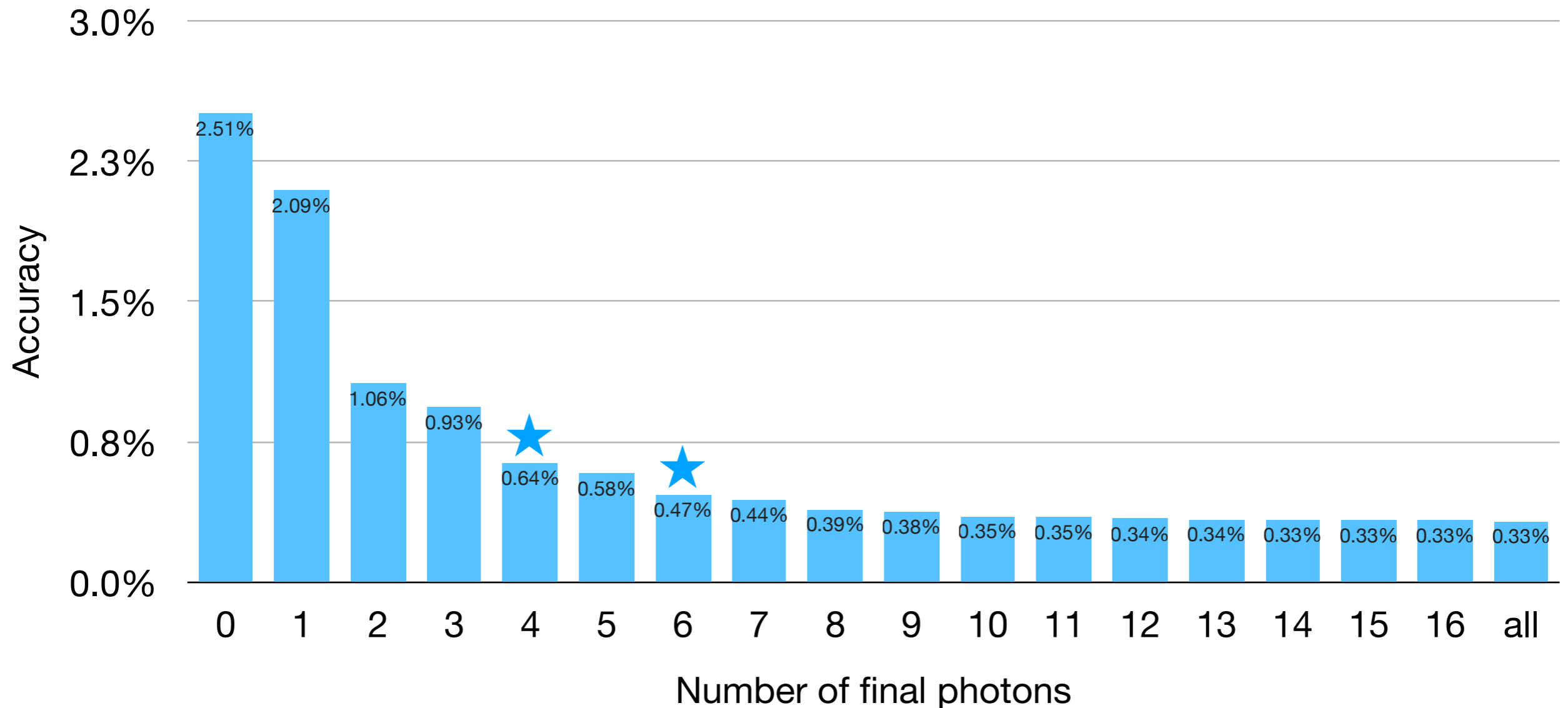


Only one B hadron at each jet

Accuracy estimation of $Z \rightarrow b\bar{b} \rightarrow T_{bb\bar{q}\bar{q}}$

$$\text{Accuracy} = \frac{1}{\sqrt{\text{Yield}_{T_b} * \text{effi}(\text{reco}) * \text{effi}(\text{select}) * \text{purity}}}$$

- **Yield:** $Z \rightarrow b\bar{b} \rightarrow T_{bb\bar{q}\bar{q}} \sim 10^6$ at **CEPC Z pole**
- **effi(reco) ~ 50%; purity ~ 50%**
- **effi(select): fully charged, $1\gamma, 2\gamma, 3\gamma, \dots, 16\gamma, >16\gamma$**



Prepare for articles

2 Jet Charge Measurement Using $e^+e^- \rightarrow Z \rightarrow q\bar{q}$ Process 3 at CEPC Z pole operation

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The *Higgs* $\rightarrow b\bar{b}, c\bar{c}, gg$ measurement at CEPC

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Particle identification performance study at CEPC baseline detector

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CEPC detector performance study

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Conclusion

Main works:

pT weighted method of jet charge

An estimation of final particle distributions of B/D hadrons decay

An estimation of $T_{bb\bar{q}\bar{q}}$ accuracy

Measurements of $Higgs \rightarrow b\bar{b} c\bar{c} gg$

PID performance at CEPC baseline detector

Future:

Jet charge article

Analysis of B/D hadrons

Measurements of $B_s \rightarrow \phi\gamma$

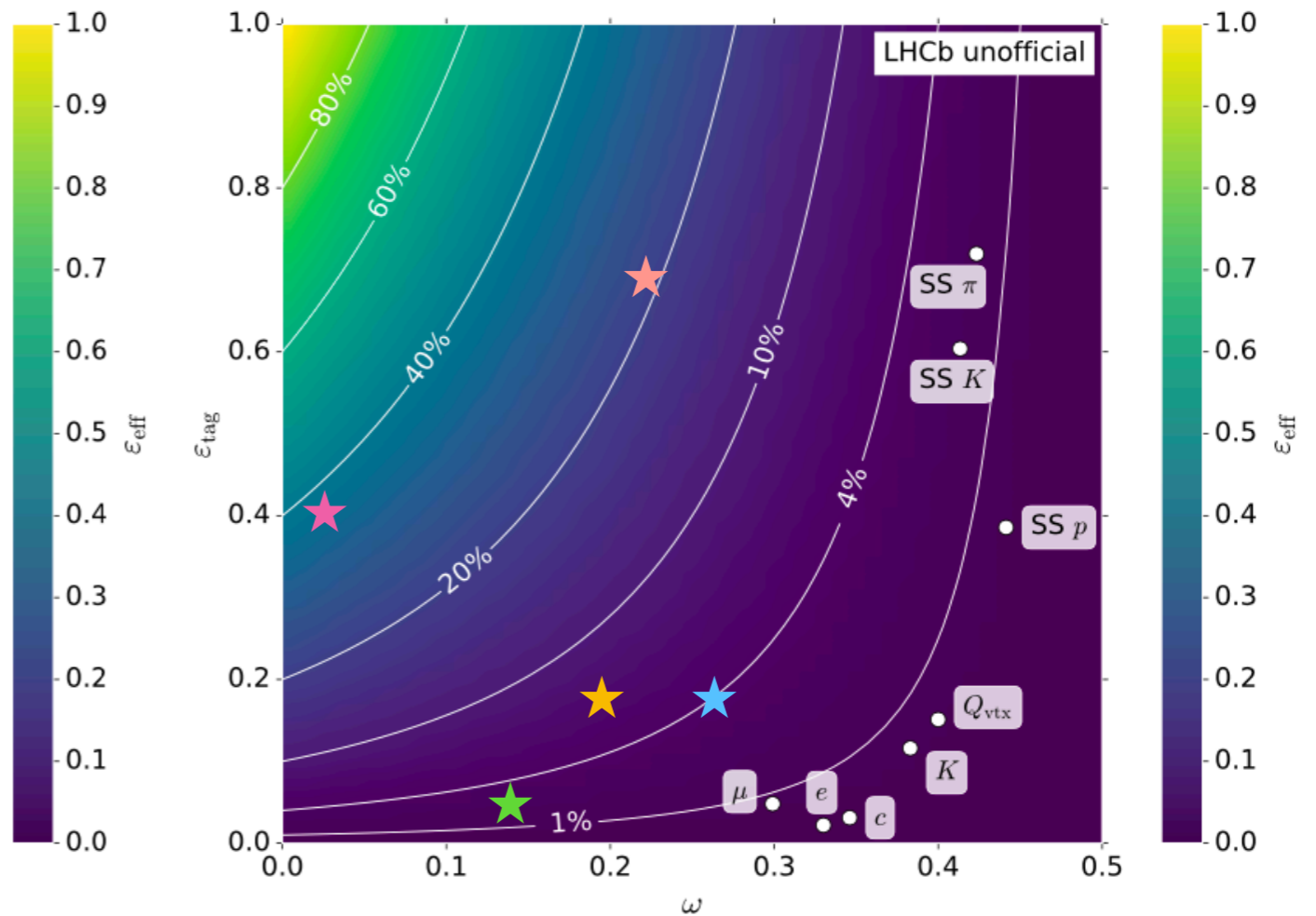
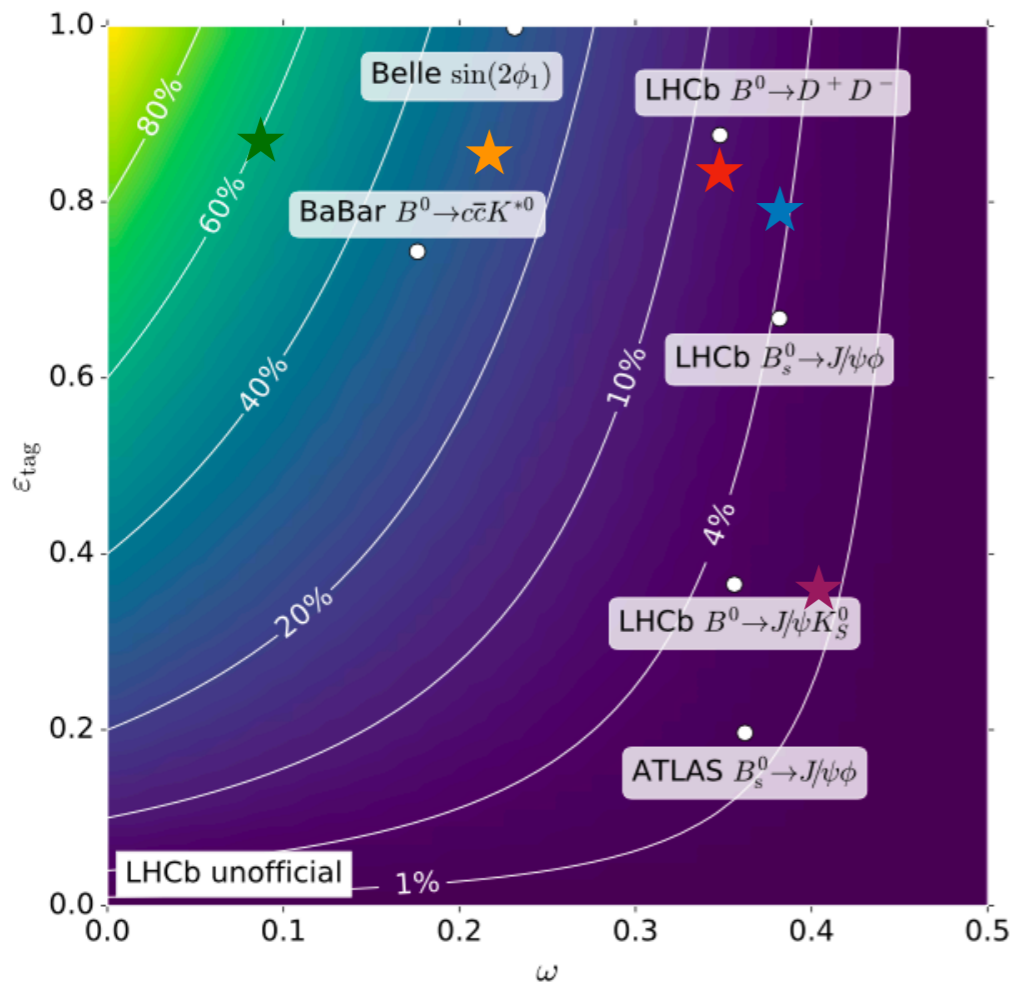
Vertex performance at CEPC

Thanks!

Back Up

Jet Charge Experiments

exclude final particles from QCD



CEPC $Z \rightarrow b\bar{b}$ inclusive channels

CEPC $B^0 \rightarrow \text{anything}$

CEPC $B^- \rightarrow \text{anything}$

CEPC $B_c \rightarrow \text{anything}$

CEPC $\Lambda_b \rightarrow \text{anything}$

p_T Weighted Method

CEPC $B_s \rightarrow J/\psi \phi$

CEPC $B^0 \rightarrow \text{Kaon}$

CEPC $B^- \rightarrow \text{Kaon}$

CEPC $B_c \rightarrow \text{lepton}$

CEPC $\Lambda_b \rightarrow \text{proton}$

Leading Particle Method

Kaon Method

