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# **Status on tsim ECL study**

**(preparation of preparation)**

B.G.Cheon / Y. Unno

Hanyang university

SuperBelle meeting (2008/12/10-12)

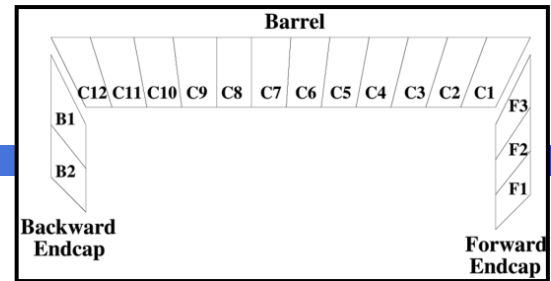
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# ECL trigger condition



Pattern	Components	Threshold(GeV)
1	F1+F2+B1+B2	5.0
2	F2+F3+B1+B2+C11+C12	5.5
3	F2	5.0
4	F3+C10+C11+C12	5.0
5	C1+C9+C10	5.0
6	C1+C2+C9	5.0
7	C2+C8+C9	5.0
8	C3+C7+C8	5.0
9	C4+C6+C7	5.0
10	C5+C6	5.0
11	C10	3.0

## Bhabha

- (Bhabha\*) && (ICN<4)
- Bhabha\* =  $(E^i > E_{thr}^i)$ ,  $i = 1-11$

## Pre-scaled Bhabha

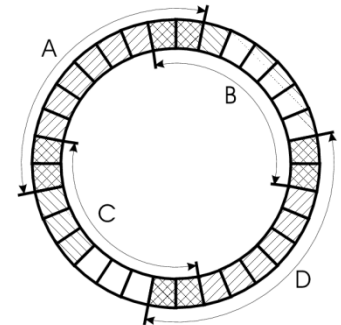
- (pre-Bhabha\*) && (ICN < 4)
- pre-Bhabha\* = scaled Bhabha\*

## Cosmic

- $(ICN_A > 0 \ \&\& \ ICN_C > 0) \ || \ (ICN_B > 0 \ \&\& \ ICN_D > 0)$

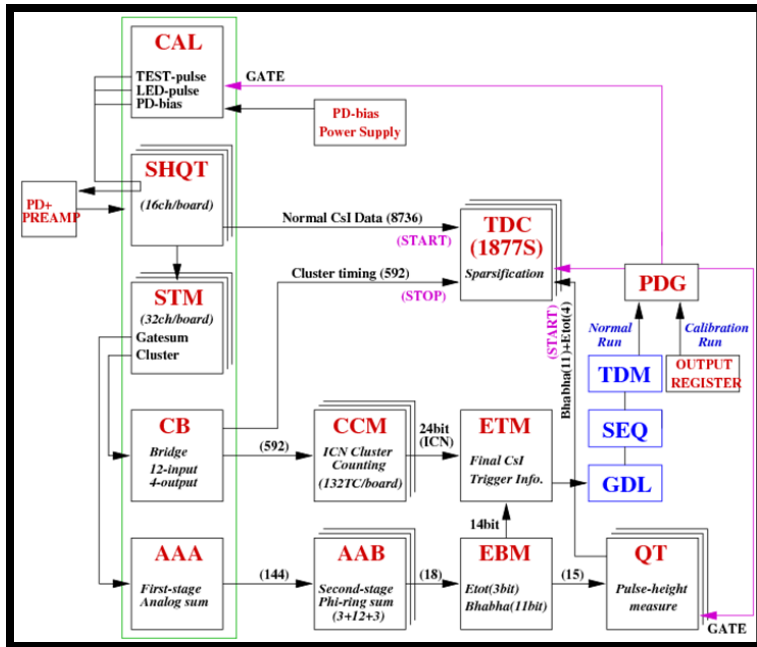
## Physics

- $Etot^* \ || \ ICN^*$
- $Etot^* = (Etot > 1\text{GeV}) \ \&\& \ !(Bhabha) \ \&\& \ !(Cosmic)$
- $ICN^* = (ICN > 3) \ \&\& \ !(Cosmic)$
- where, Etot and ICN are in Barrel and forward-endcap

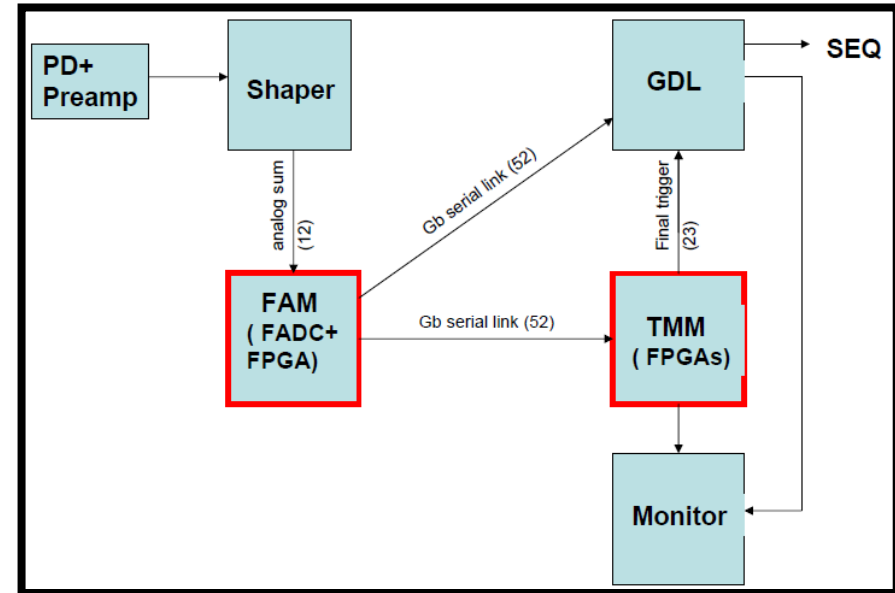


# ECL electronics

## Belle



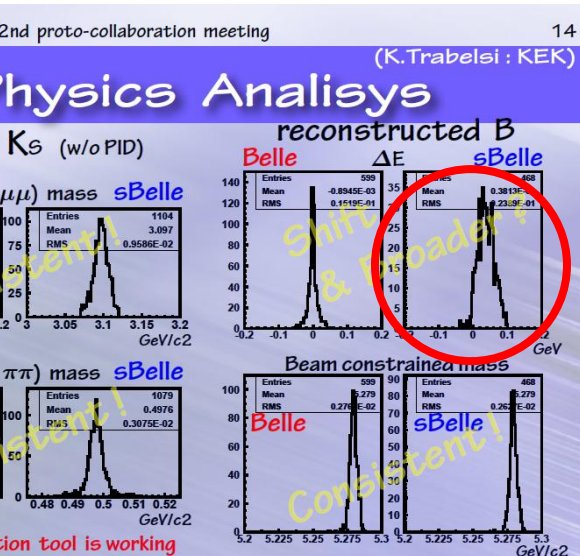
## sBelle



Many changes(see BG. Cheon's slide), but, no essential change for trigger algorithm

# Analysis condition

- Compare tsim-ecl outputs between gsim and g4superb for
  - $B \rightarrow K\pi$  /  $B \rightarrow \pi^0\pi^0$  /  $B \rightarrow \rho^0\gamma$  /  $B \rightarrow \tau\nu$  /  $\tau \rightarrow \mu\gamma$  /  $ee \rightarrow X(214)(\rightarrow \mu\mu)\gamma$
- Analysis environment (Sorry for new collaborator, this is too detail...)
  - BELLE\_LEVEL = b20080525\_1934
  - MY\_TOP\_DIR = /bwf/g24home/harat/belle/gsim4wb080525v2/belle
  - Crystall is only CsI(Tl) in current g4superb-ecl.
- Problem related to g4superb(?)



o It was reported before that DE distribution has a significant shift (its center not zero) for J/psiKs. I've checked it using 20081107\_1418 lib., but don't see a big shift.

o Currently the reconstruction eff. for J/psiKs with g4 seems to be ~15% lower than that with gsim (=in current Belle).

H.O.

- According to Ozaki-san, results depend on g4superb version.
  - will check with new version(although above is related to tracking...)

# Analysis condition

- Problems about g4superb

- DATECL\_MC\_EHITS is not available yet → will be fixed by P.Anton(?)

- Use DATECL\_EHITS

B→Kpi	5000evt	Bhabha(%)	Cosmic(%)	Physics(%)
Belle	DATECL_MC_EHITS	$0 \pm 0$	$0.06 \pm 0.03$	$98.80 \pm 0.15$
Belle	DATECL_EHITS	$0 \pm 0$	$0.06 \pm 0.03$	$98.78 \pm 0.16$

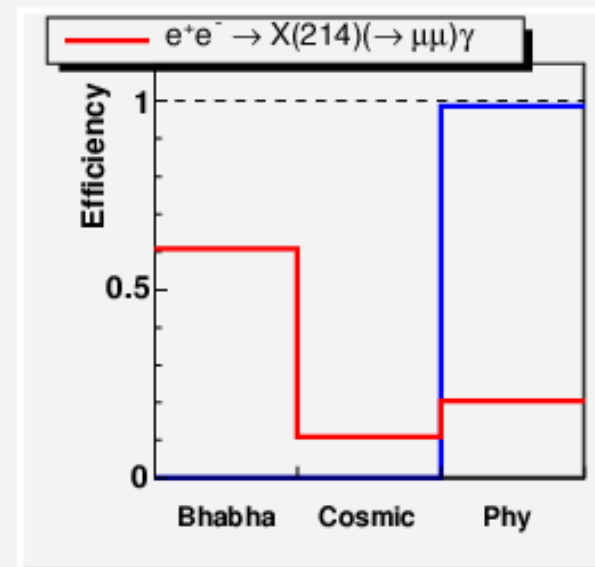
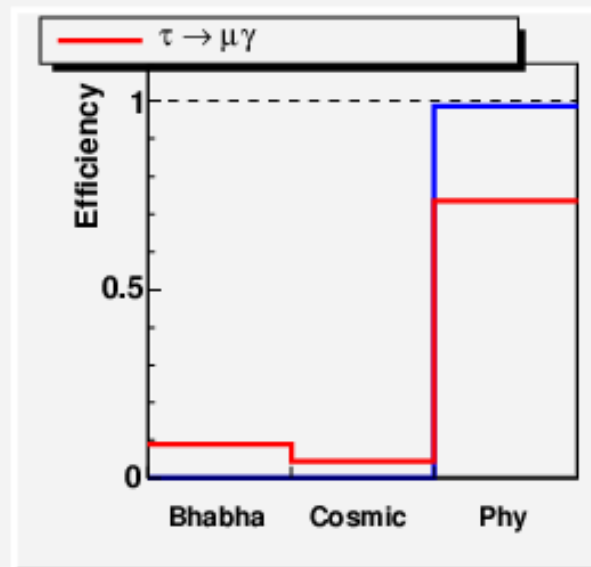
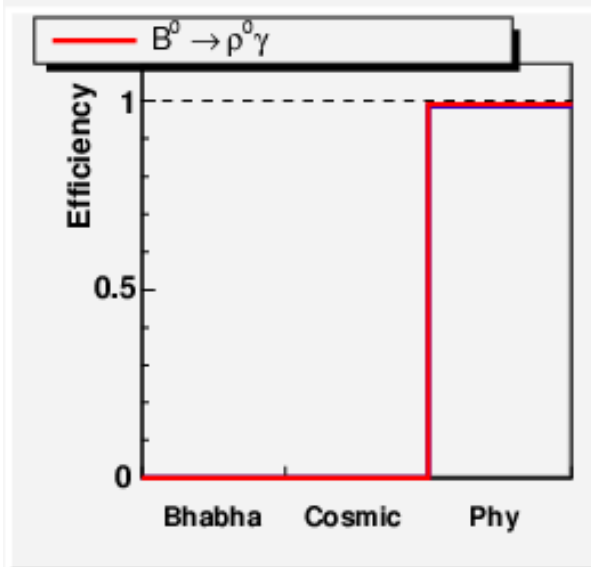
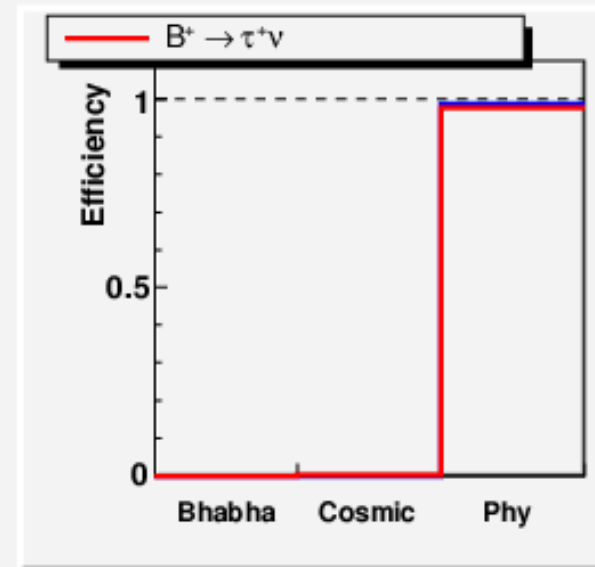
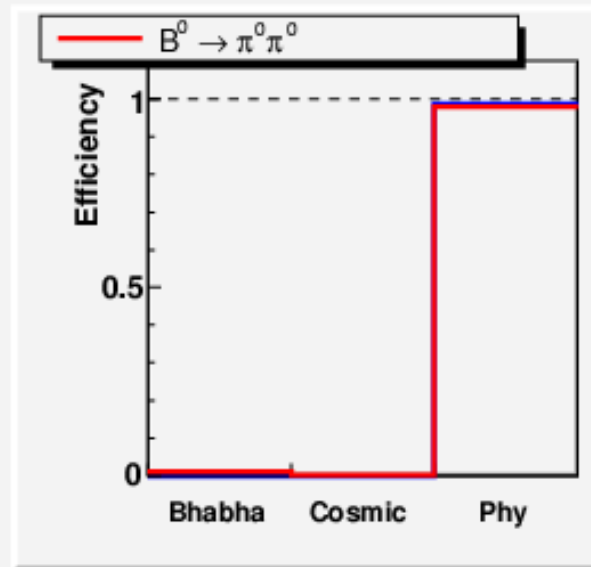
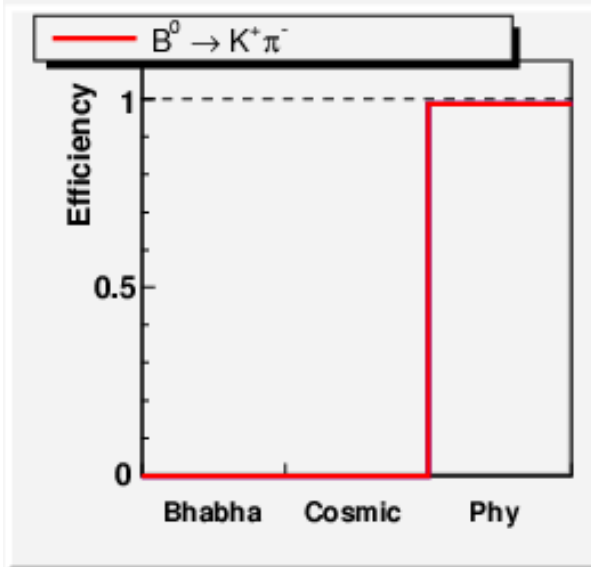
- w/ and w/o beam background(addbg is not available in g4superb yet)

B→Kpi	5000evt	Bhabha(%)	Cosmic(%)	Physics(%)
Belle	w/ addbg (exp51)	$0 \pm 0$	$0.12 \pm 0.05$	$98.88 \pm 0.15$
Belle	w/o addbg (exp51)	$0 \pm 0$	$0.06 \pm 0.03$	$98.78 \pm 0.16$

- DATECL\_EHITS w/o addbg looks no significant difference for Belle.

- For the meantime, use DATECL\_EHITS w/o addbg for Belle and sBelle

# Belle : trigger efficiency

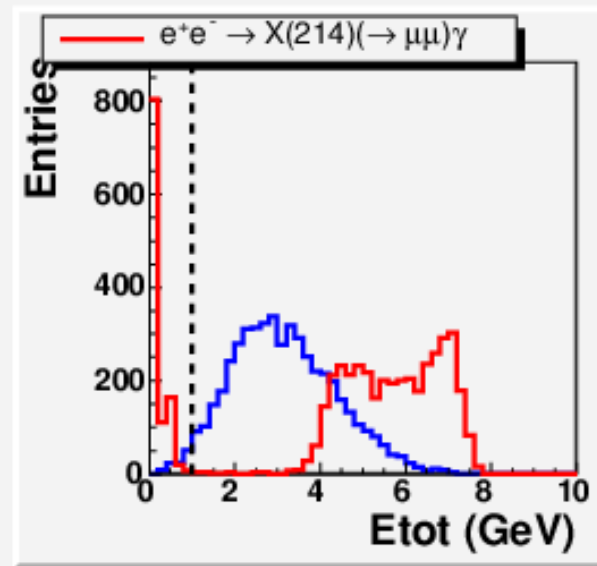
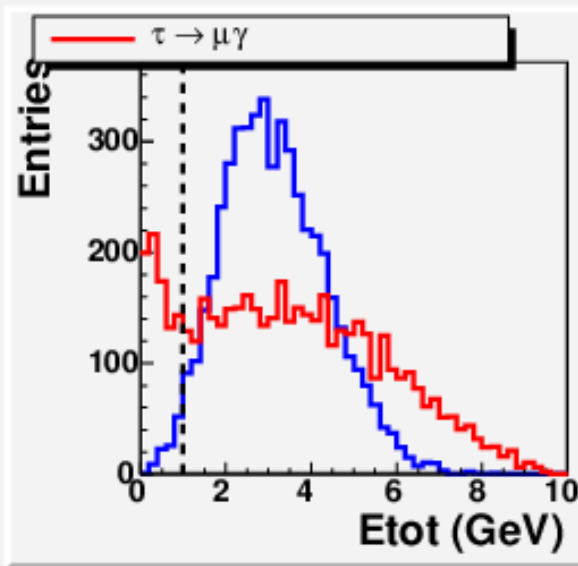
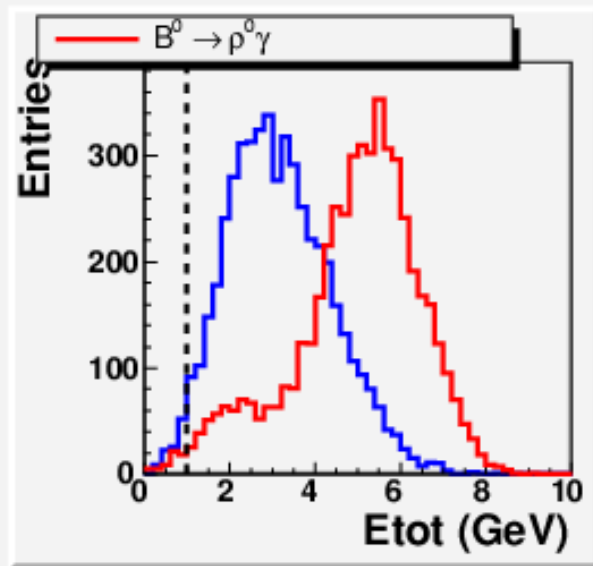
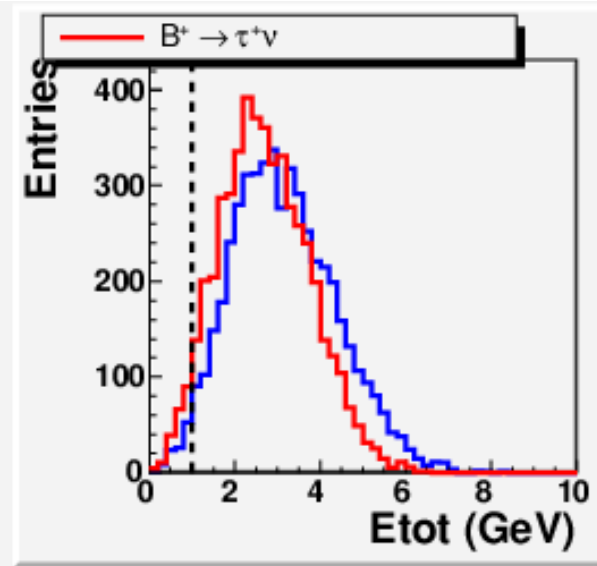
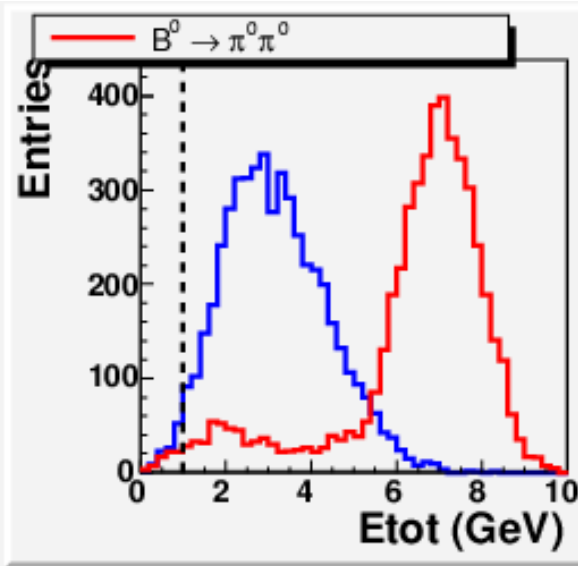
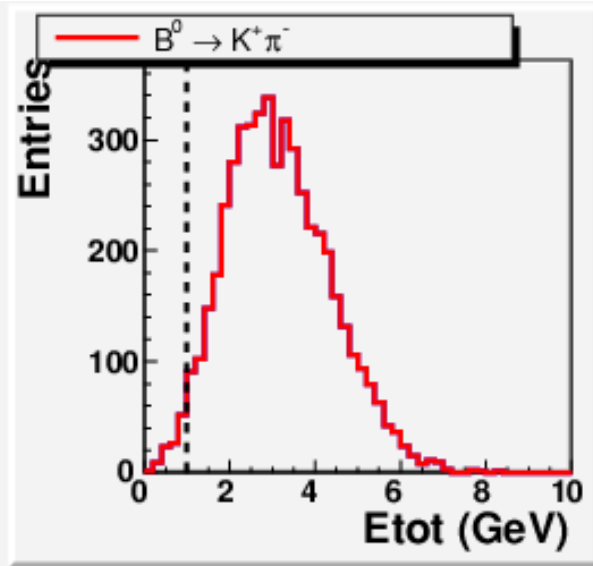


# Belle : trigger efficiency

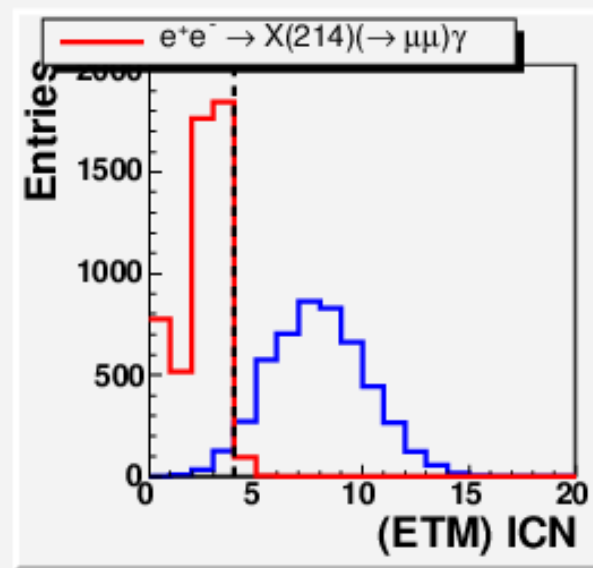
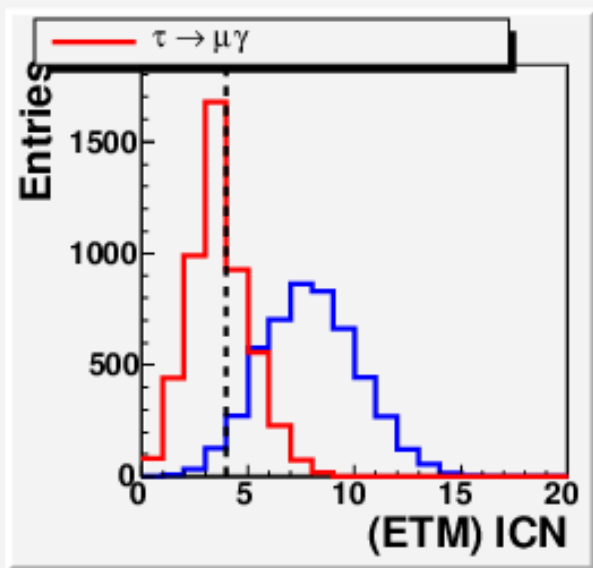
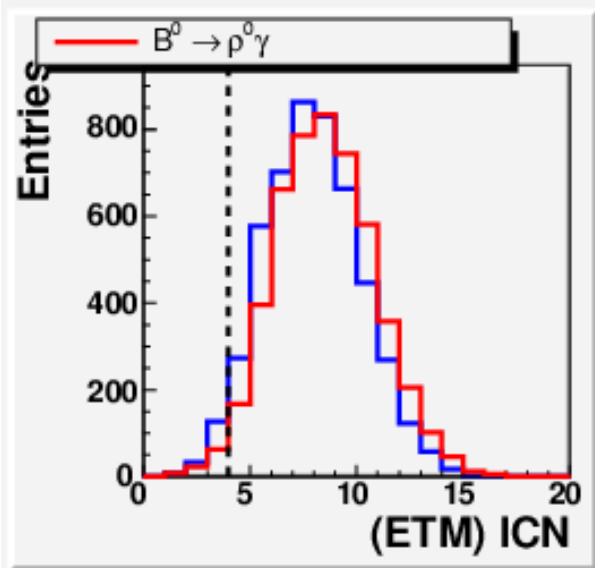
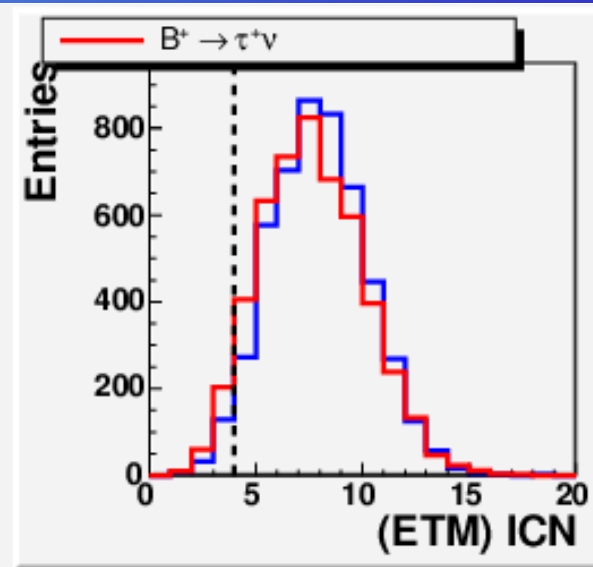
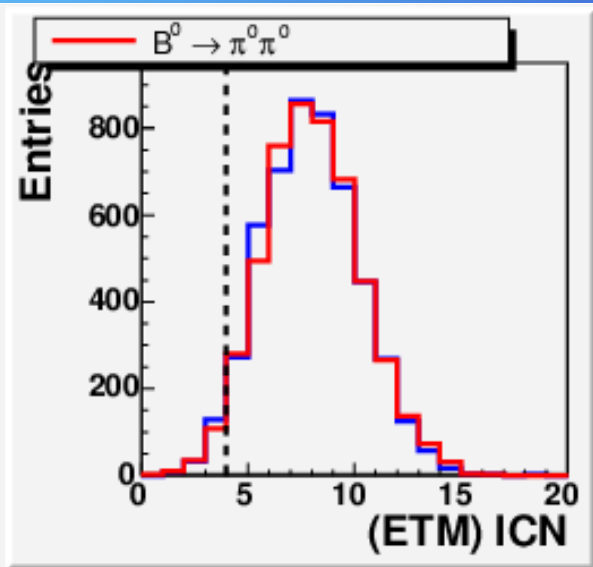
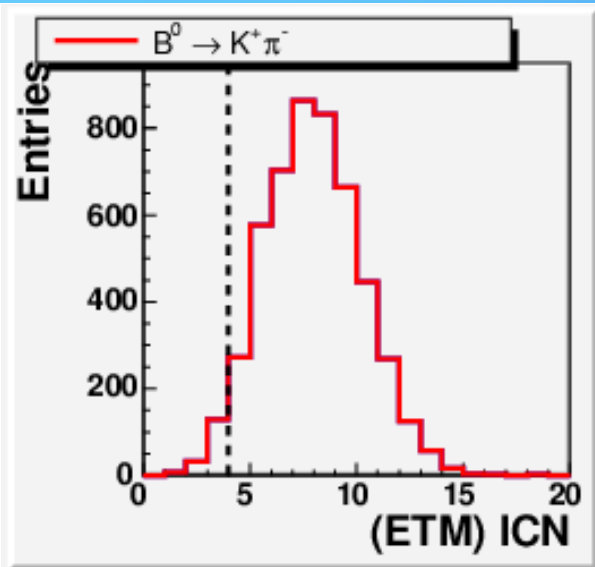
	<b>Bhabha(%)</b>	<b>Cosmic(%)</b>	<b>Physics(%)</b>
$B^+ \rightarrow K^+ \pi^-$	$0 \pm 0$	$0.06 \pm 0.03$	$98.8 \pm 0.2$
$B^0 \rightarrow \pi^0 \pi^0$	$1.1 \pm 0.2$	$0.2 \pm 0.1$	$98.0 \pm 0.2$
$B^0 \rightarrow \rho^0 \gamma$	$0.04 \pm 0.03$	$0.06 \pm 0.03$	$99.2 \pm 0.1$
$B^+ \rightarrow \tau^+ \nu$	$0 \pm 0$	$0.10 \pm 0.04$	$97.7 \pm 0.2$
$\tau^+ \rightarrow \mu^+ \gamma$	$9.0 \pm 0.4$	$4.5 \pm 0.3$	$73.5 \pm 0.6$
$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$	$60.8 \pm 0.7$	$11.0 \pm 0.4$	$20.6 \pm 0.6$



# Belle : E<sub>tot</sub> distribution



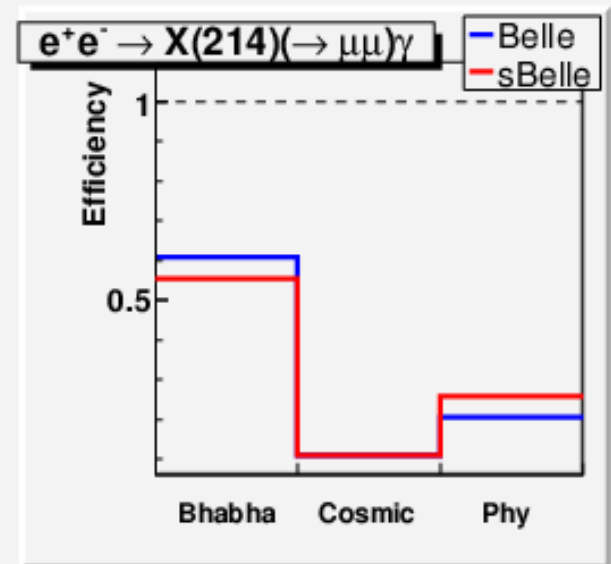
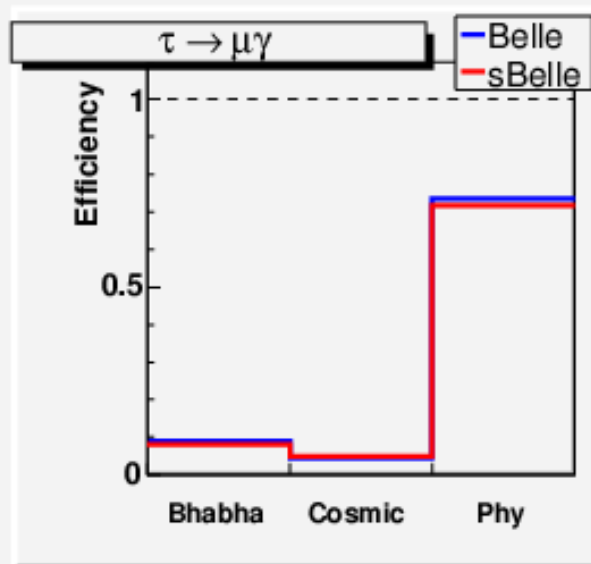
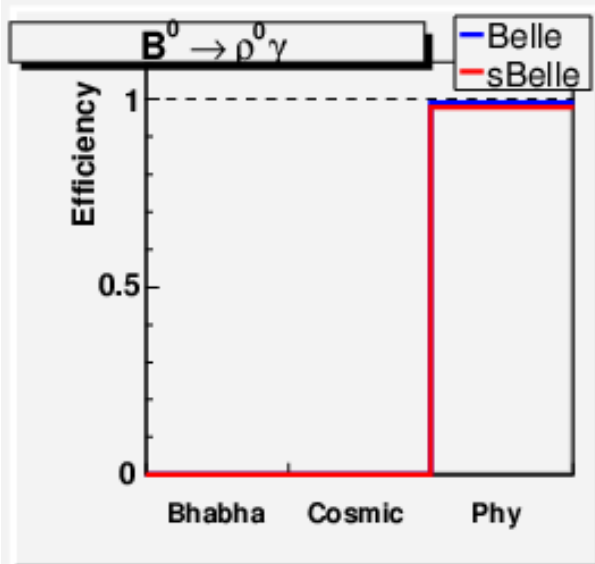
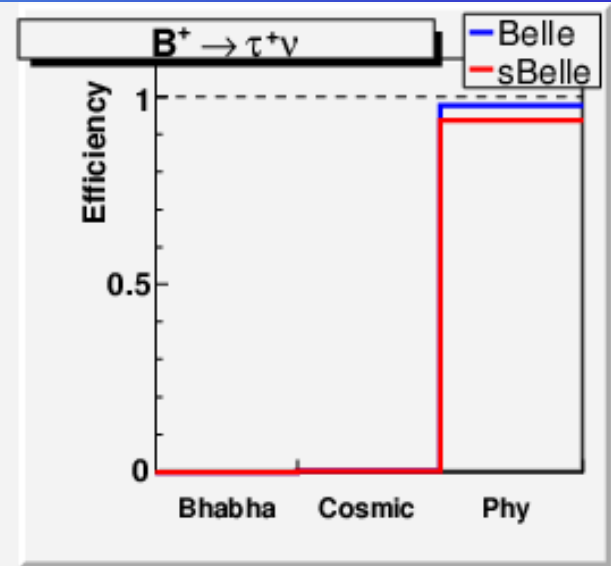
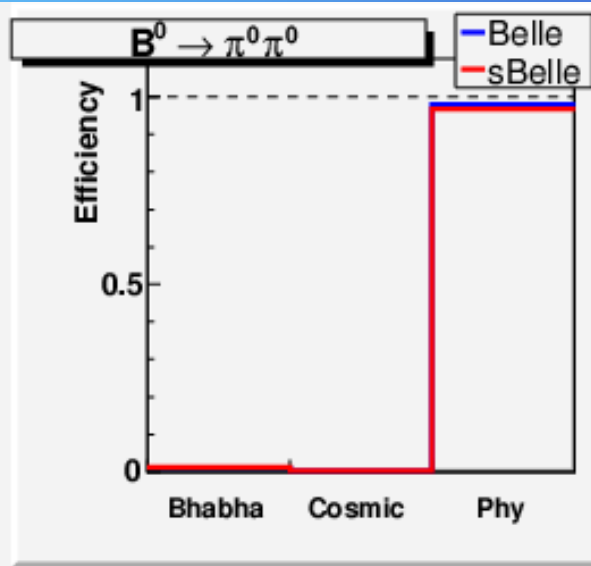
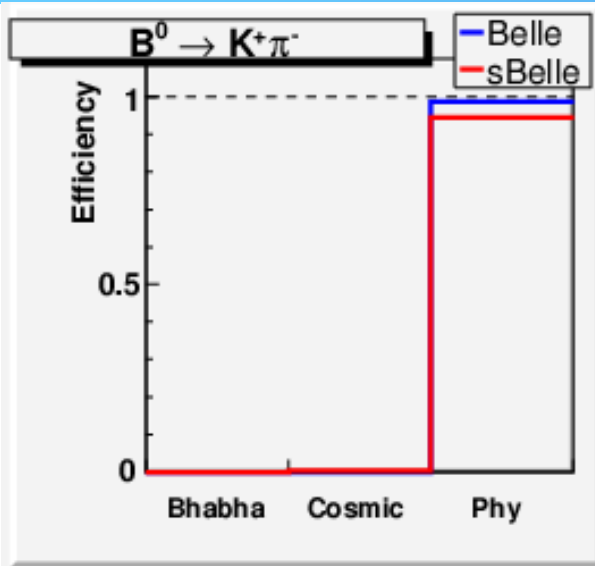
# Belle : ICN distribution



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# Comparison between Belle and sBelle

# Belle vs sBelle : trigger efficiency

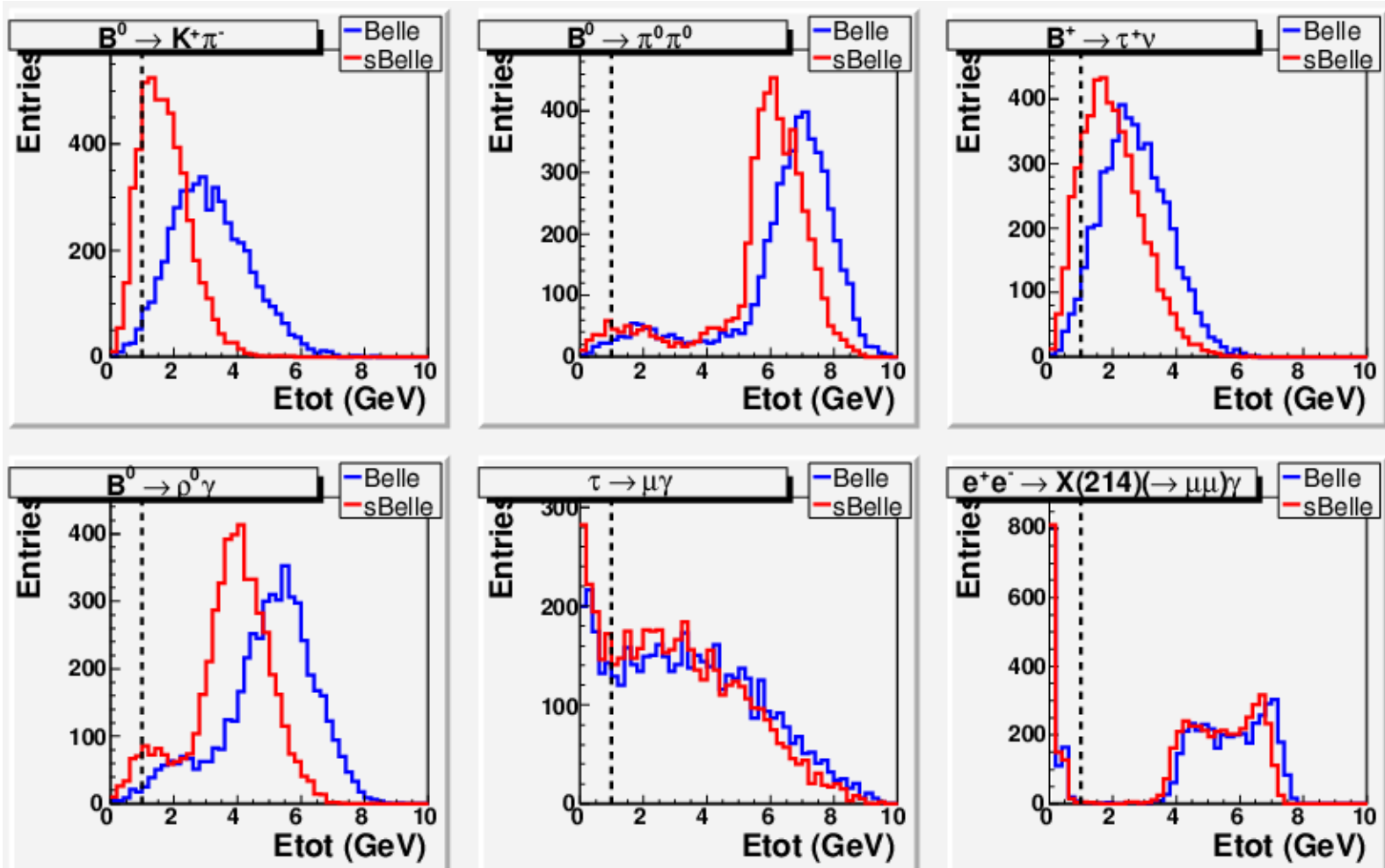


# Belle vs sBelle : trigger efficiency

	Bhabha(%)		Cosmic(%)		Physics(%)	
	Belle	sBelle	Belle	sBelle	Belle	sBelle
$B^+ \rightarrow K^+ \pi^-$	$0 \pm 0$	$0 \pm 0$	$0.06 \pm 0.03$	$0.3 \pm 0.1$	$98.8 \pm 0.2$	$94.4 \pm 0.3$
$B^0 \rightarrow \pi^0 \pi^0$	$1.1 \pm 0.2$	$1.3 \pm 0.2$	$0.2 \pm 0.1$	$0.3 \pm 0.1$	$98.0 \pm 0.2$	$9 \pm 0.3$
$B^0 \rightarrow \rho^0 \gamma$	$0.04 \pm 0.03$	$0.04 \pm 0.03$	$0.06 \pm 0.03$	$0.12 \pm 0.05$	$99.2 \pm 0.1$	$97.9 \pm 0.2$
$B^+ \rightarrow \tau^+ \nu$	$0 \pm 0$	$0 \pm 0$	$0.10 \pm 0.04$	$0.22 \pm 0.07$	$97.7 \pm 0.2$	$93.8 \pm 0.3$
$\tau^+ \rightarrow \mu^+ \gamma$	$9.0 \pm 0.4$	$8.1 \pm 0.4$	$4.5 \pm 0.3$	$5.0 \pm 0.3$	$73.5 \pm 0.6$	$71.8 \pm 0.6$
$e^+ e^- \rightarrow \mu^+ \mu^- \gamma$	$60.8 \pm 0.7$	$55.3 \pm 0.7$	$11.0 \pm 0.4$	$10.9 \pm 0.4$	$20.6 \pm 0.6$	$25.8 \pm 0.6$

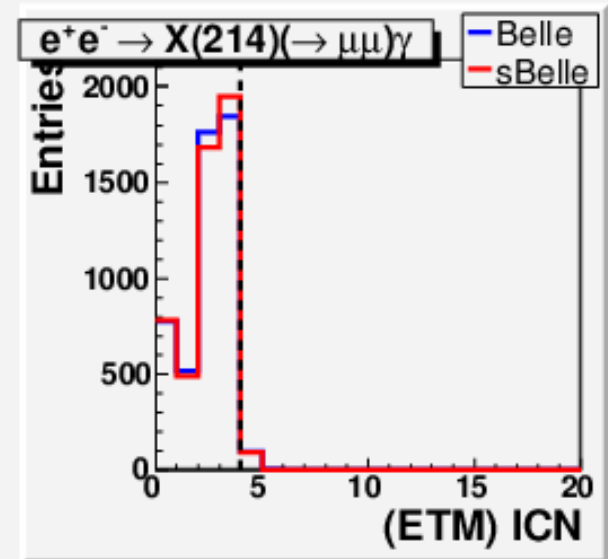
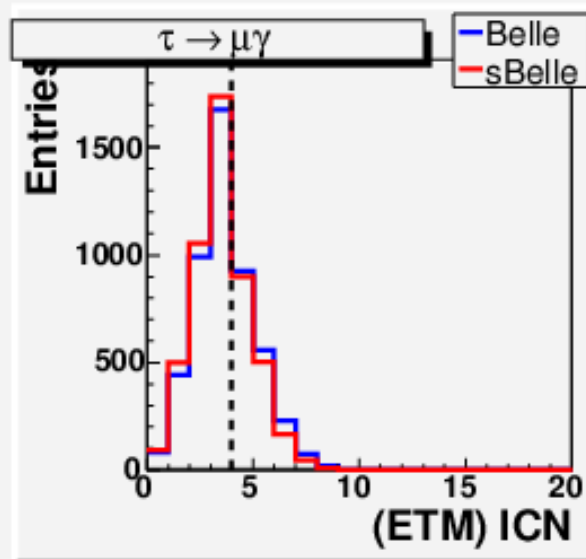
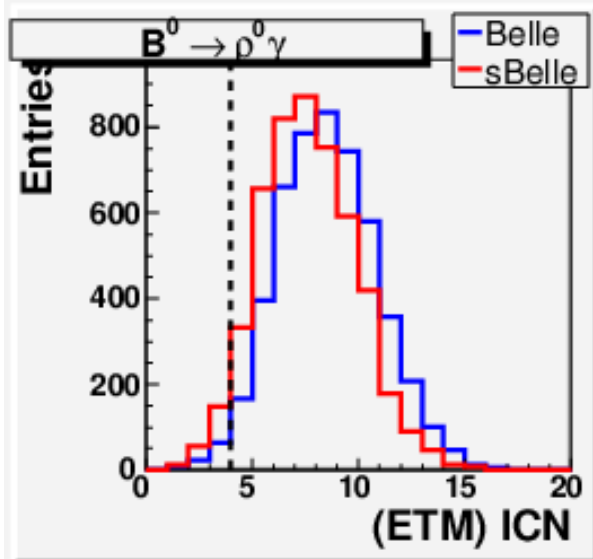
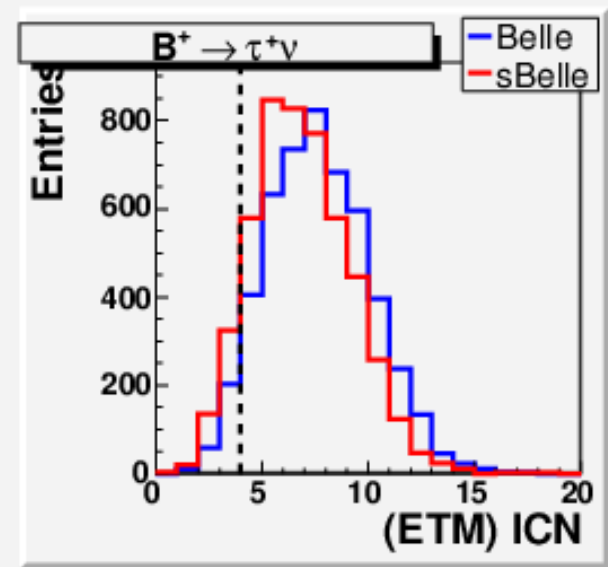
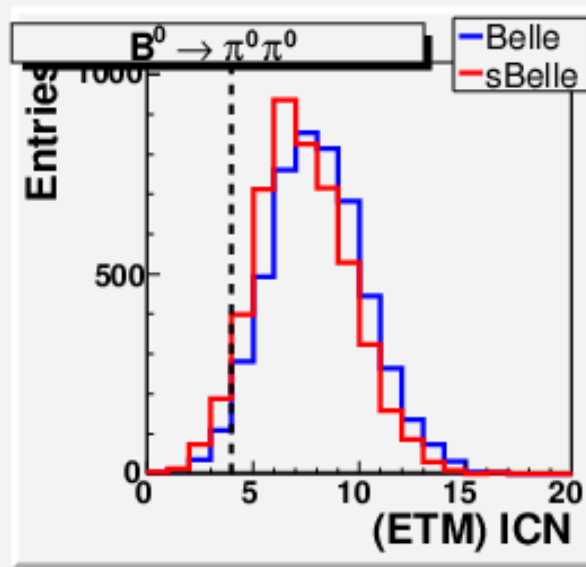
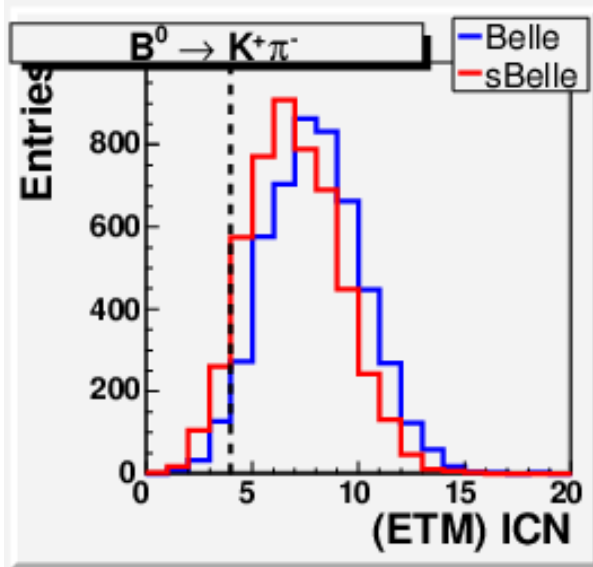
- Performances for all modes(ex.  $ee \rightarrow \mu\mu\gamma$ ) become worse.
- It would be due to differences in energy deposit...
- Have to check more in details...

# Belle vs sBelle : Etot distribution



Clear discrepancies can be seen...why?...Amount of material?  
Any mistake?...Have to investigate...

# Belle vs sBelle : ICN distribution



# Summary / Plan

- Summary
  - Tsim-ecl study has been started w/ g4superb now.
  - Large discrepancy in  $E_{tot}$  between Belle and sBelle
- To do:
  - Check  $E_{tot}$  difference between Belle and sBelle
  - Prepare tsim-ecl for sBelle(no dramatic change from Belle)
  - Check Bhabha event
  - Check with background(have to wait Isawaki-san's study?!)
  - Test new Bhabha scheme(BN477)
  - Check cosmic trigger with cosmic event(?!)
  - Compare data and mc with current Belle
  - Check performance with pure Csl in g4superb(?!)

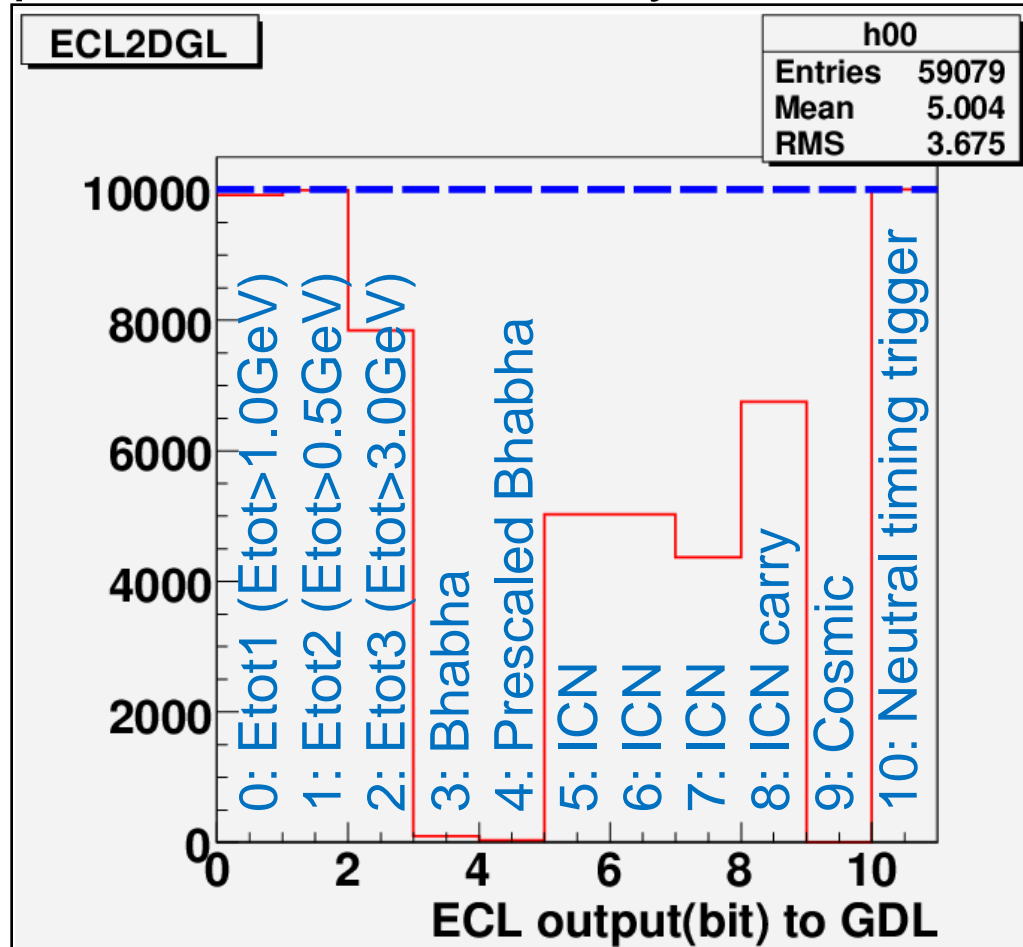
Thanks to T.Hara-san / Nakazawa-san / T'Mir / Oxana / Inami-san / K.Hara-san / Nishida-san for their help.



# Back up slides

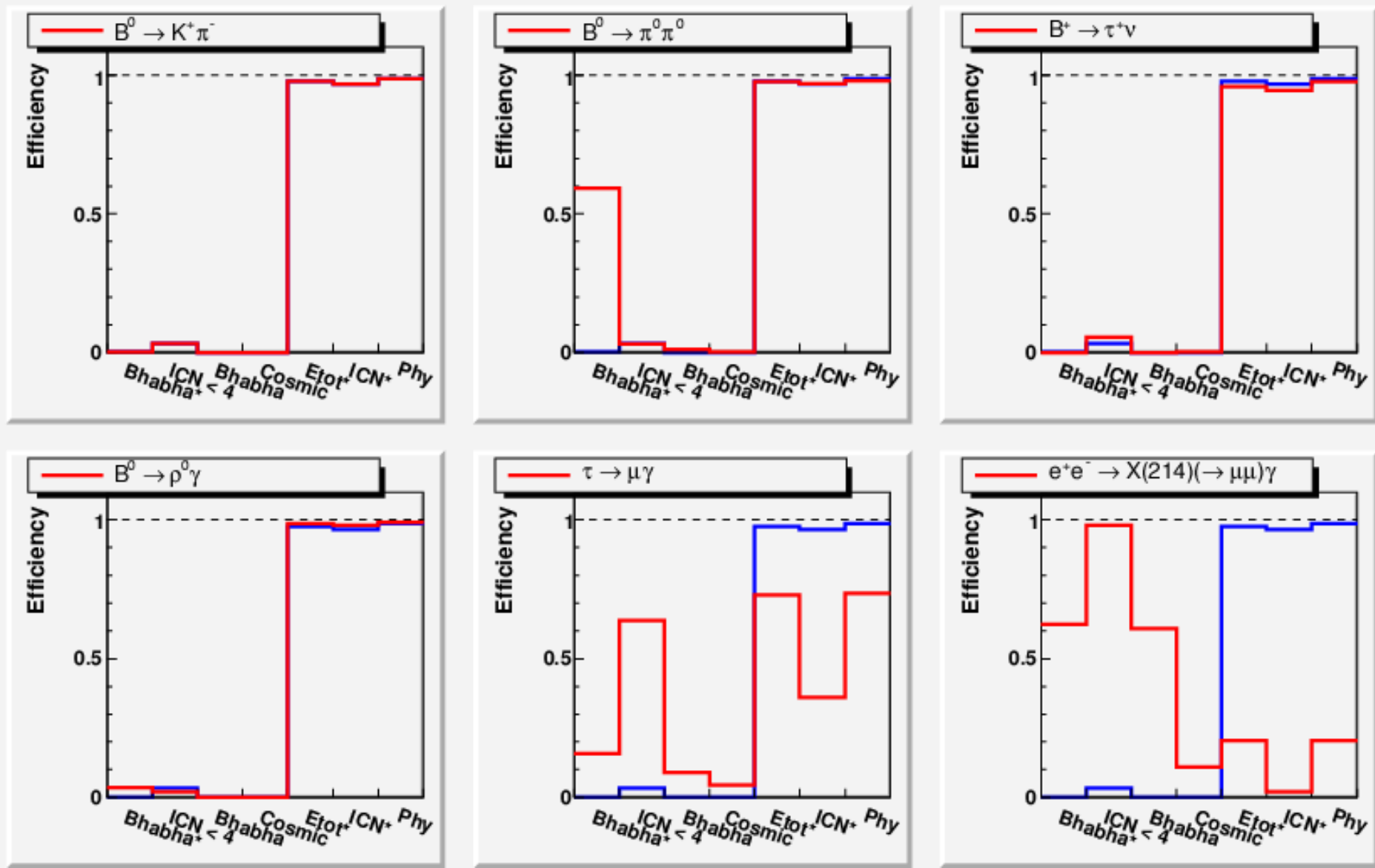
# Output to GDL from tsim-ecl

Out put from TEETM is only bit information

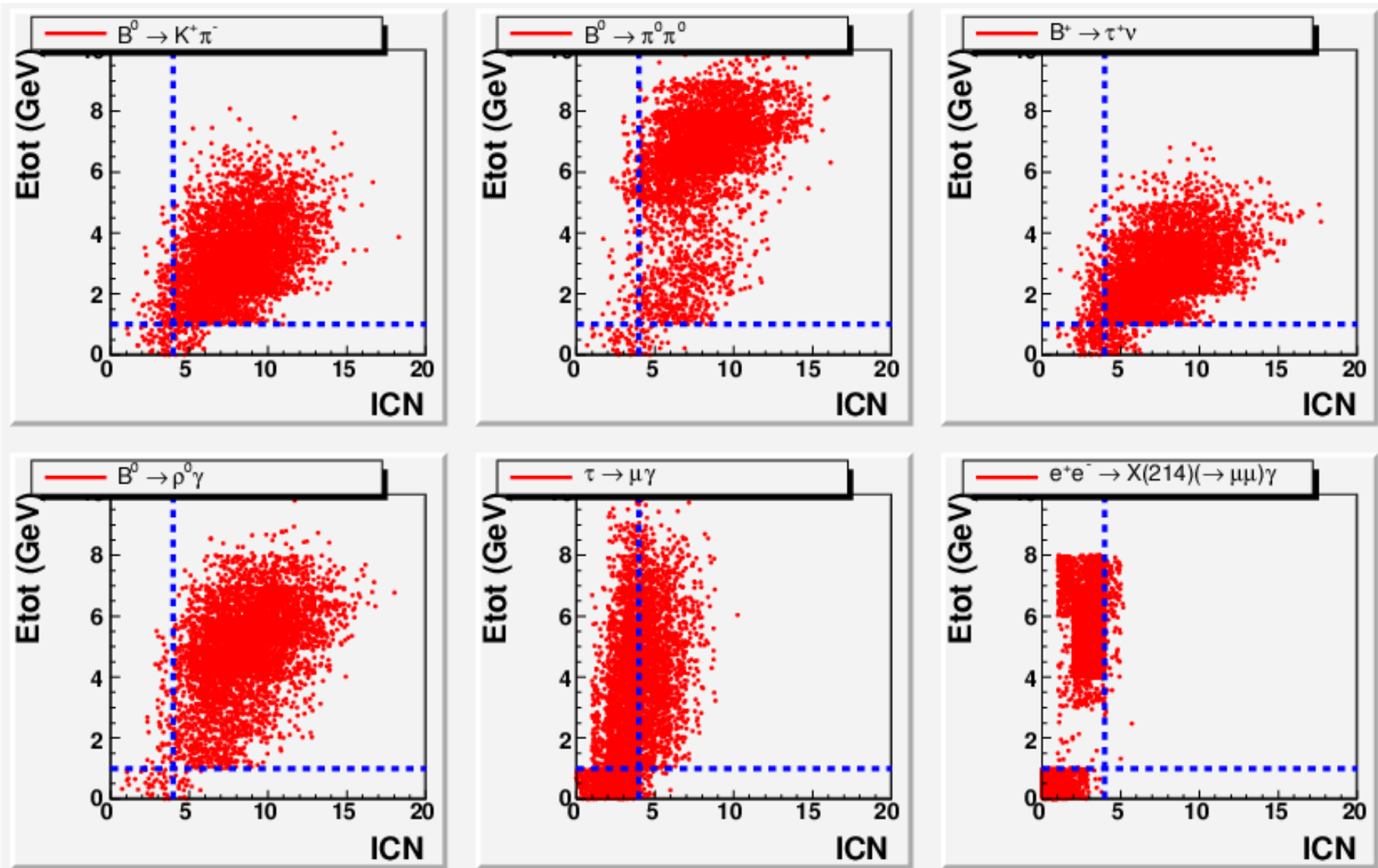


Will we keep current number of bit?

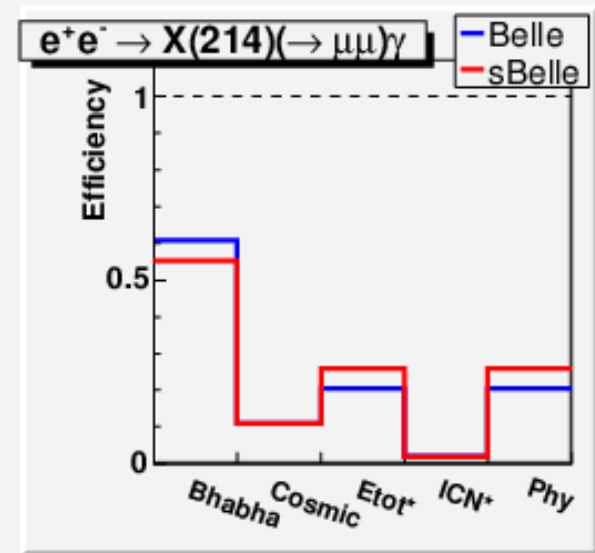
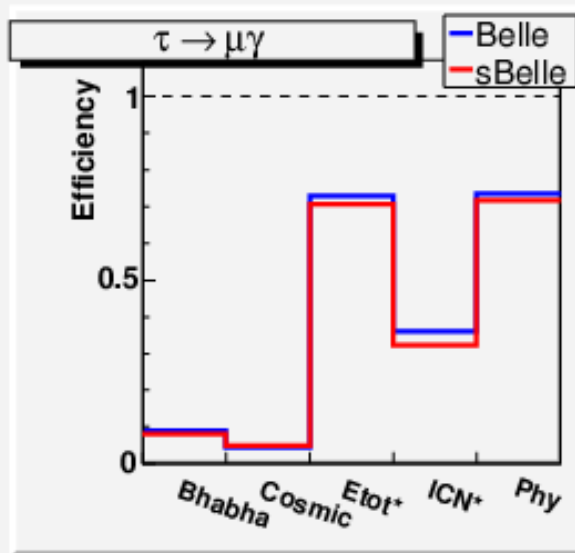
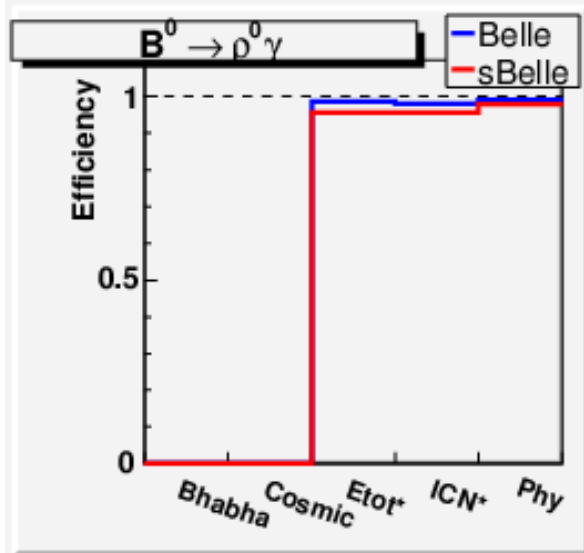
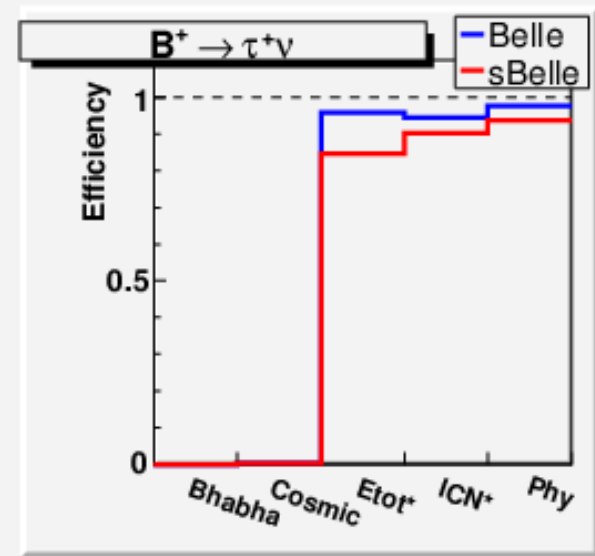
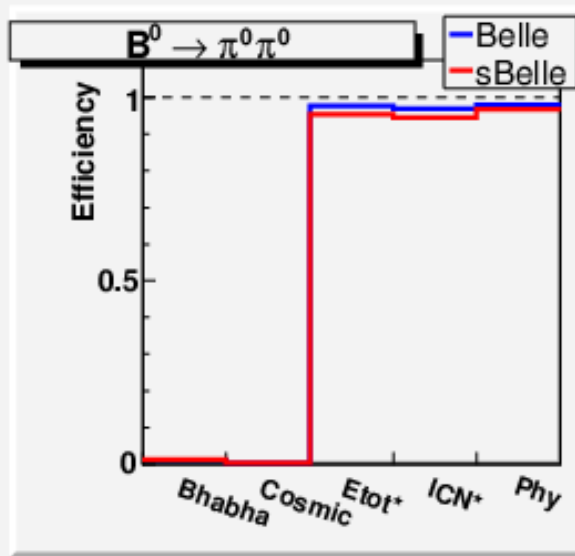
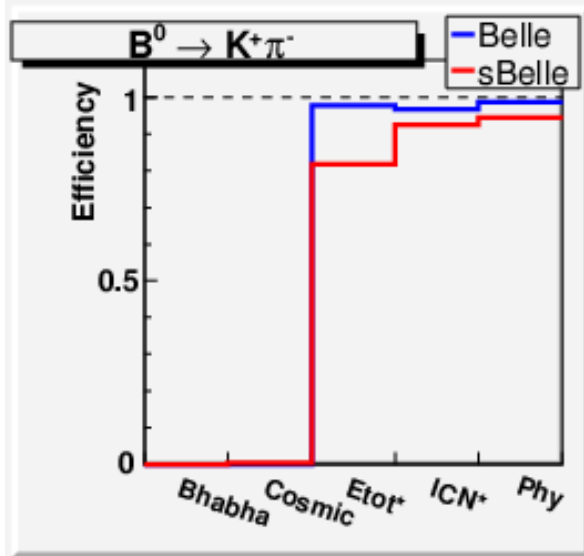
# Belle : trigger efficiency



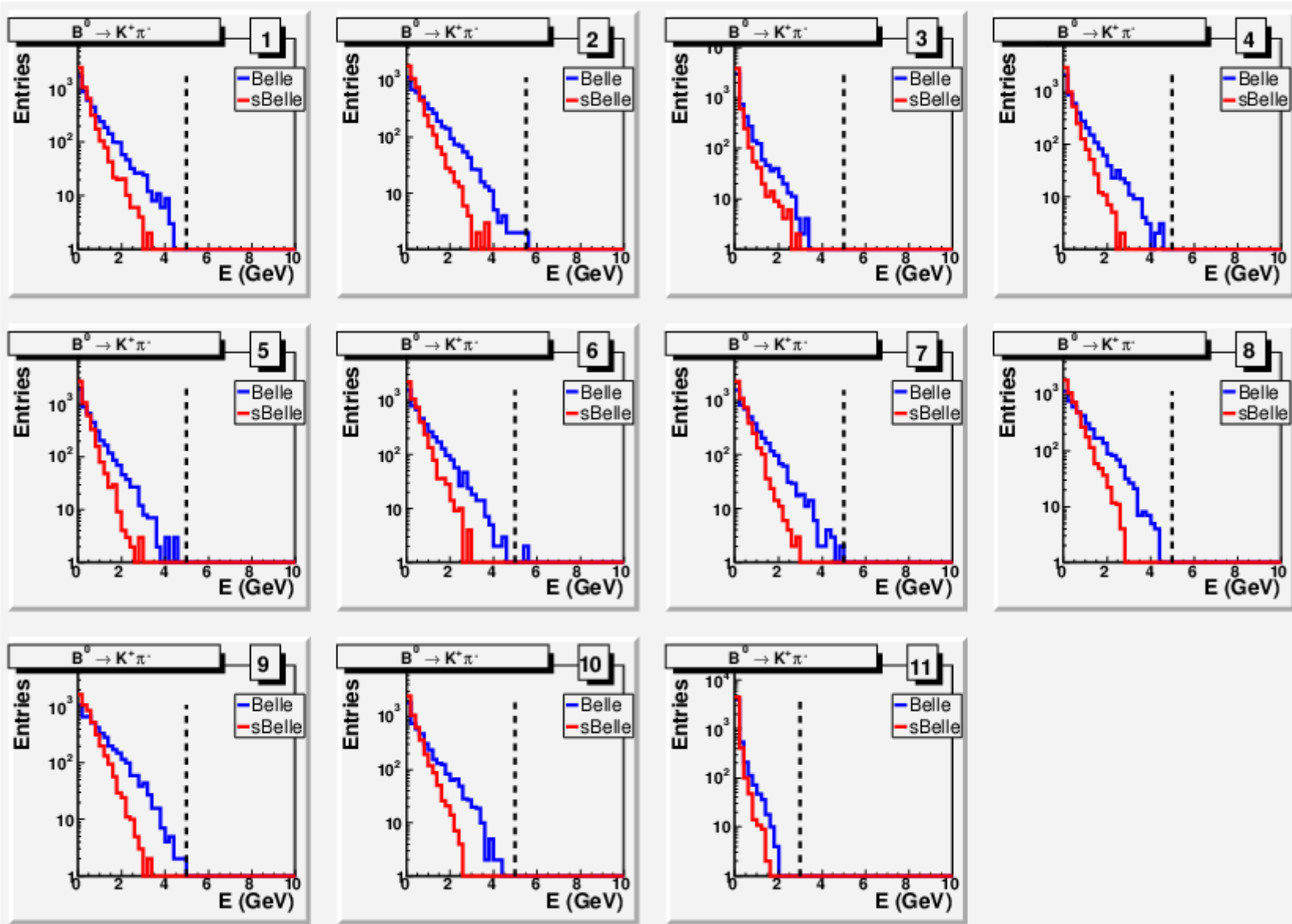
# Belle : Etot vs ICN distribution



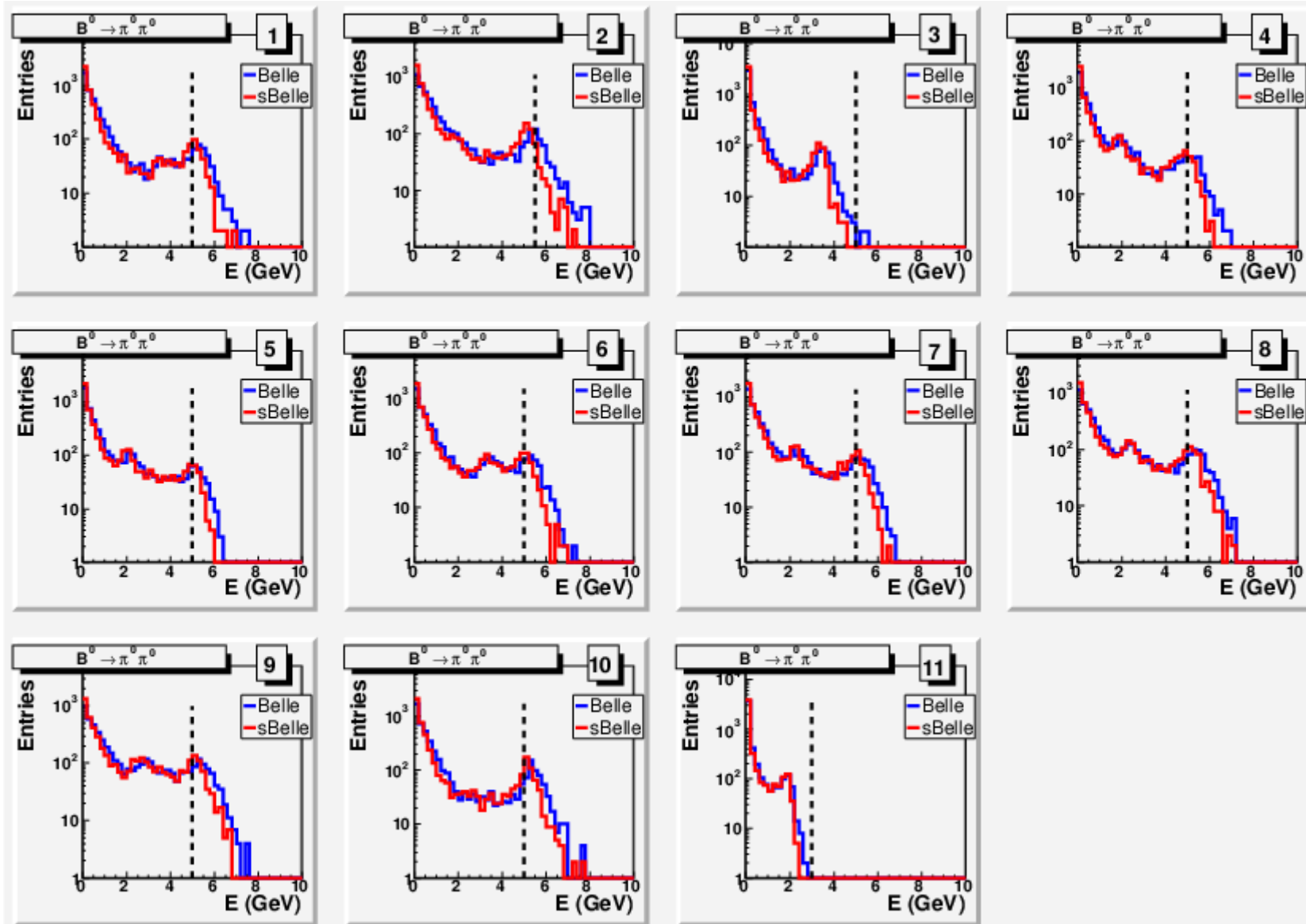
# Belle vs sBelle : trigger efficiency



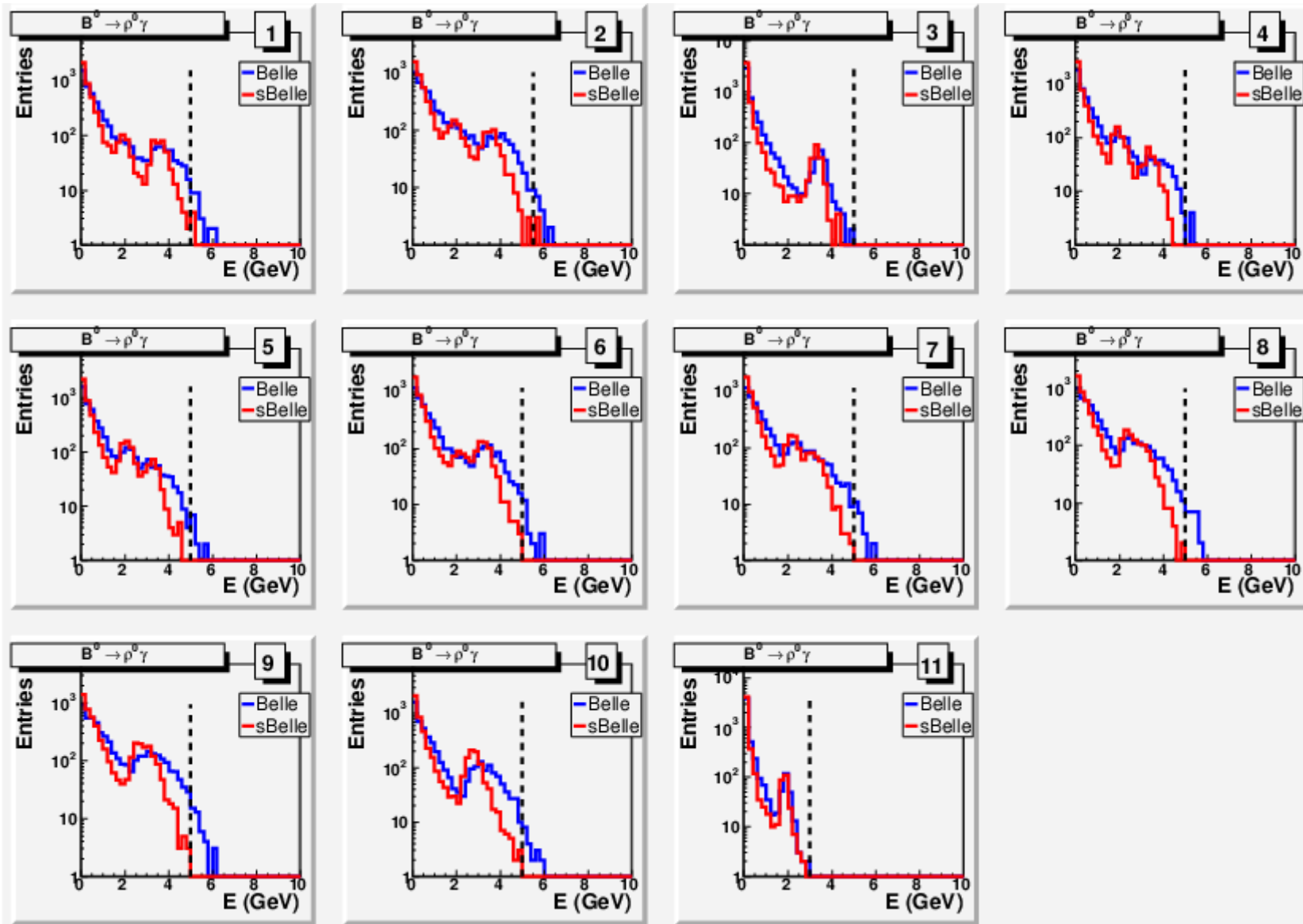
# Belle vs sBelle : Bhabha\*( $B^+ \rightarrow K^+ \pi^-$ )



# Belle vs sBelle : Bhabha\*( $B^0 \rightarrow \pi^0 \pi^0$ )

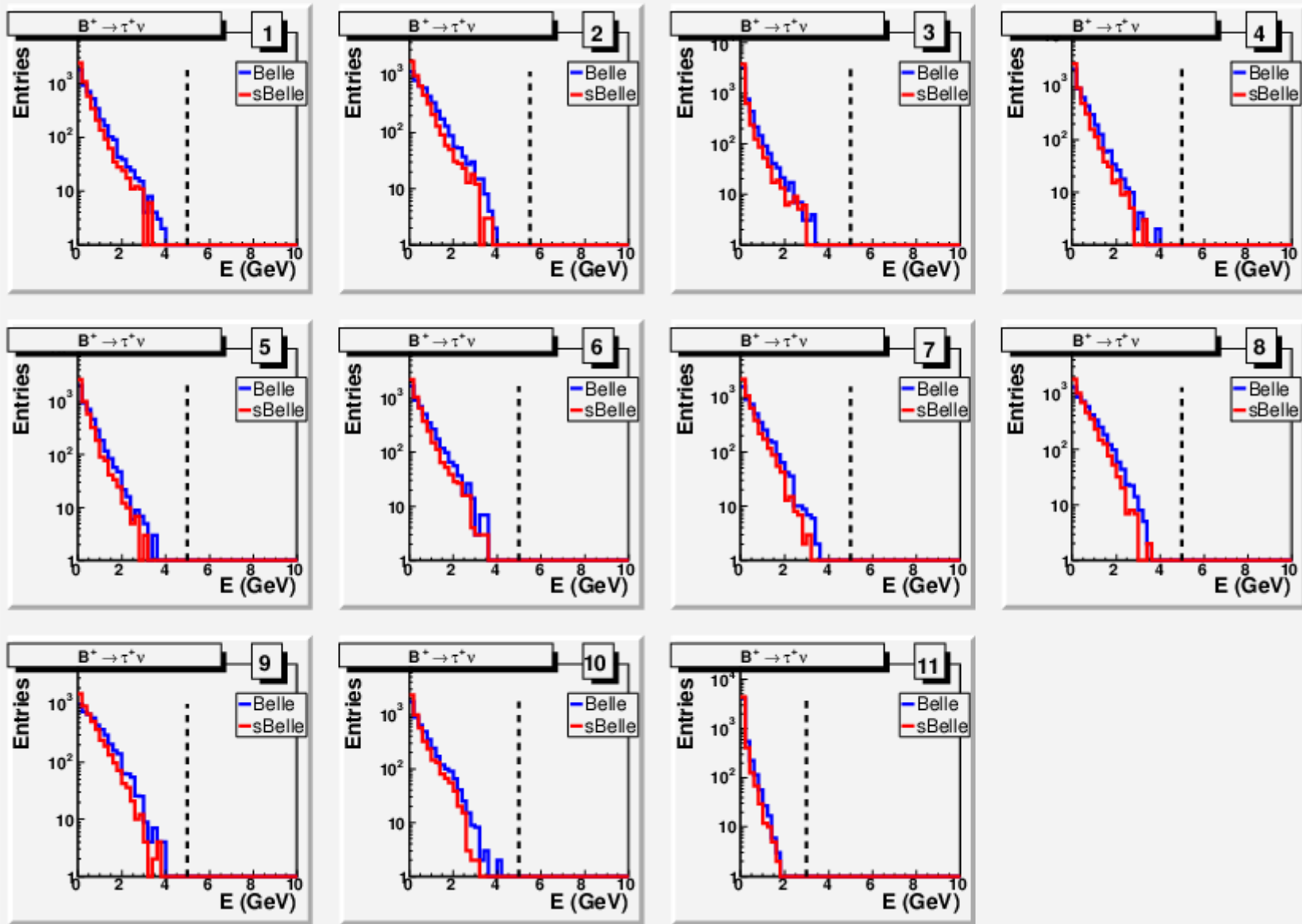


# Belle vs sBelle : Bhabha\*( $B^0 \rightarrow \rho^0 \gamma$ )

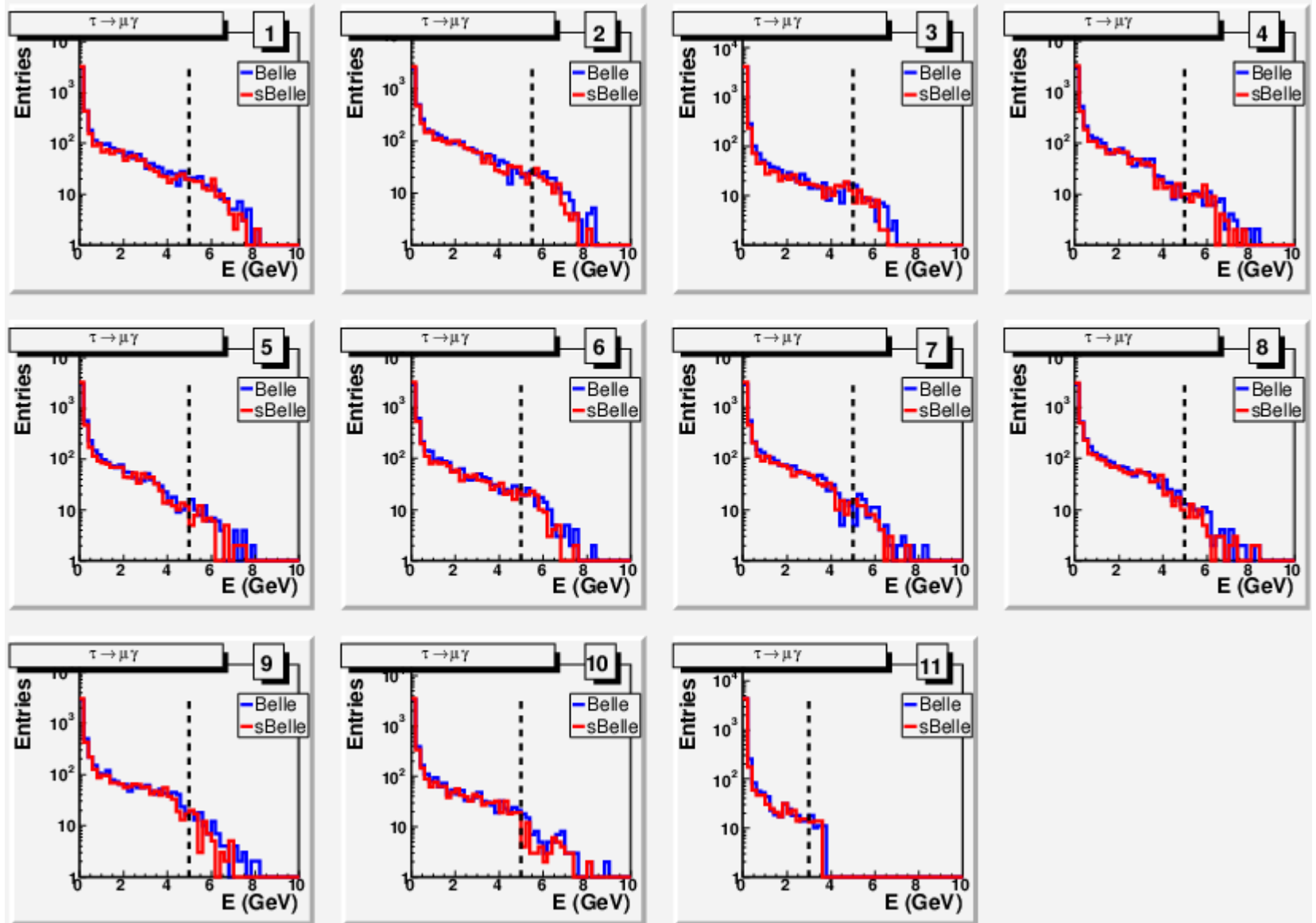




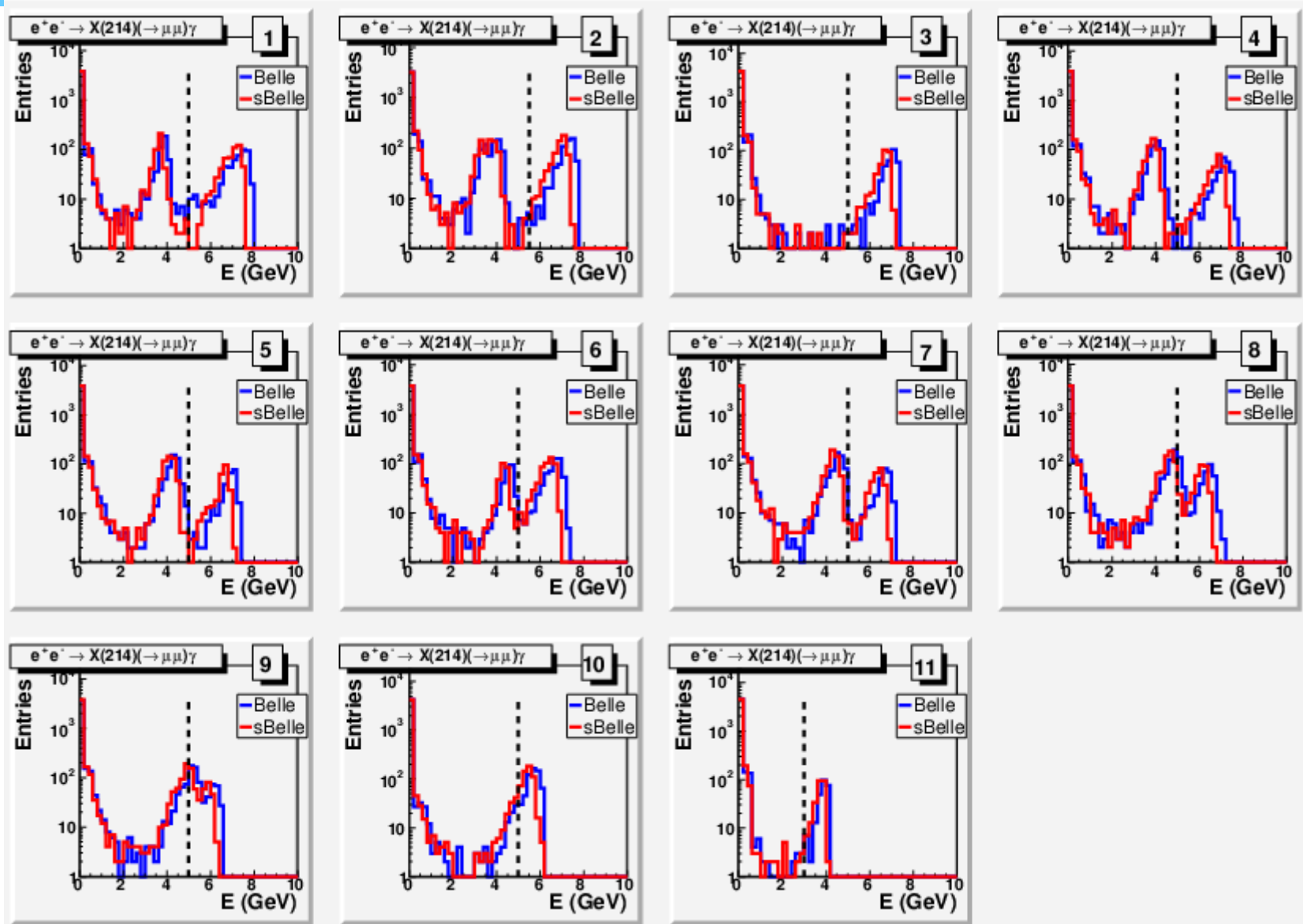
# Belle vs sBelle : Bhabha\*( $B^+ \rightarrow \tau^+ \nu$ )



# Belle vs sBelle : Bhabha\*( $\tau^+ \rightarrow \mu^+ \gamma$ )

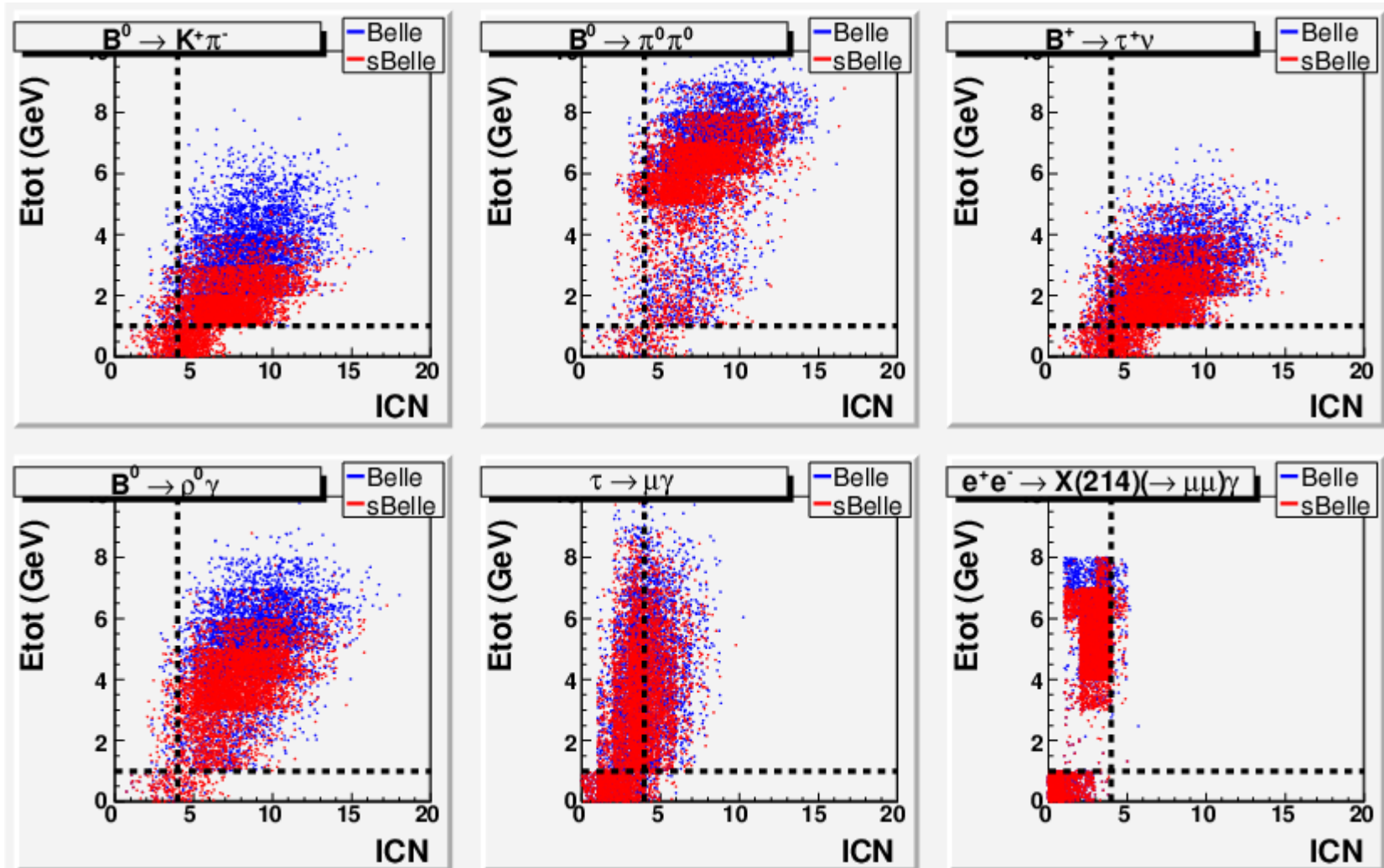


# Belle vs sBelle : Bhabha\*( $e^+e^- \rightarrow \mu^+\mu^-\gamma$ )



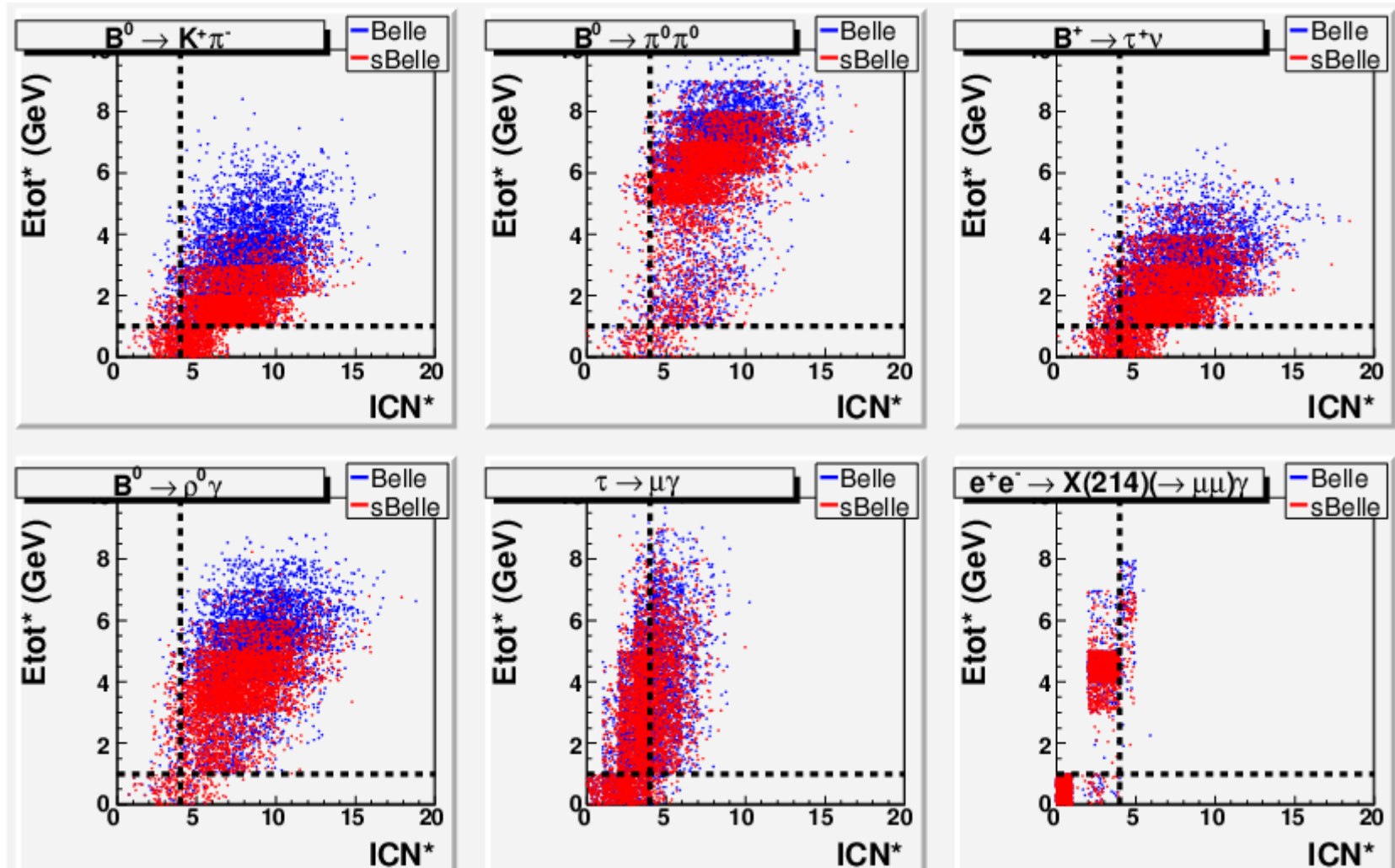
# Belle vs sBelle : Etot vs ICN

Bhabha and cosmic veto are not applied here.



# Belle vs sBelle : $E_{tot}^*$ vs $ICN^*$

Both Bhabha and cosmic veto are applied



# Belle vs sBelle : $E_{tot}^*$ vs $ICN^*$

Only cosmic veto is applied(no bhabha veto)

