Status on tsim ECL study

(preparation of preparation)

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Hanyang university
SuperBelle meeting (2008/12/10-12)

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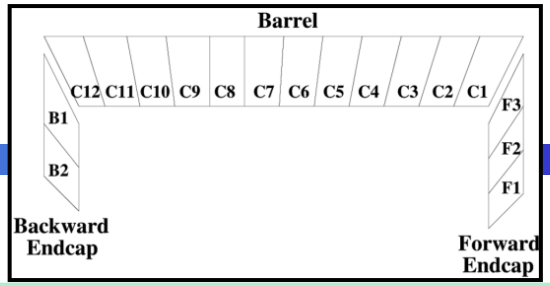
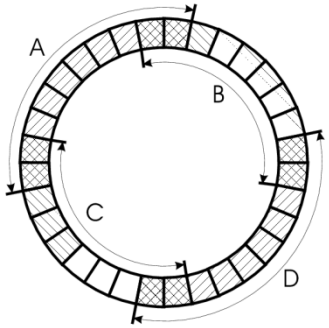
ECL trigger condition



- **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>1GeV) && !(Bhabha) && !(Cosmic)
  - ICN* = (ICN>3) && !(Cosmic)
  - where, Etot and ICN are in Barrel and forward-endcap

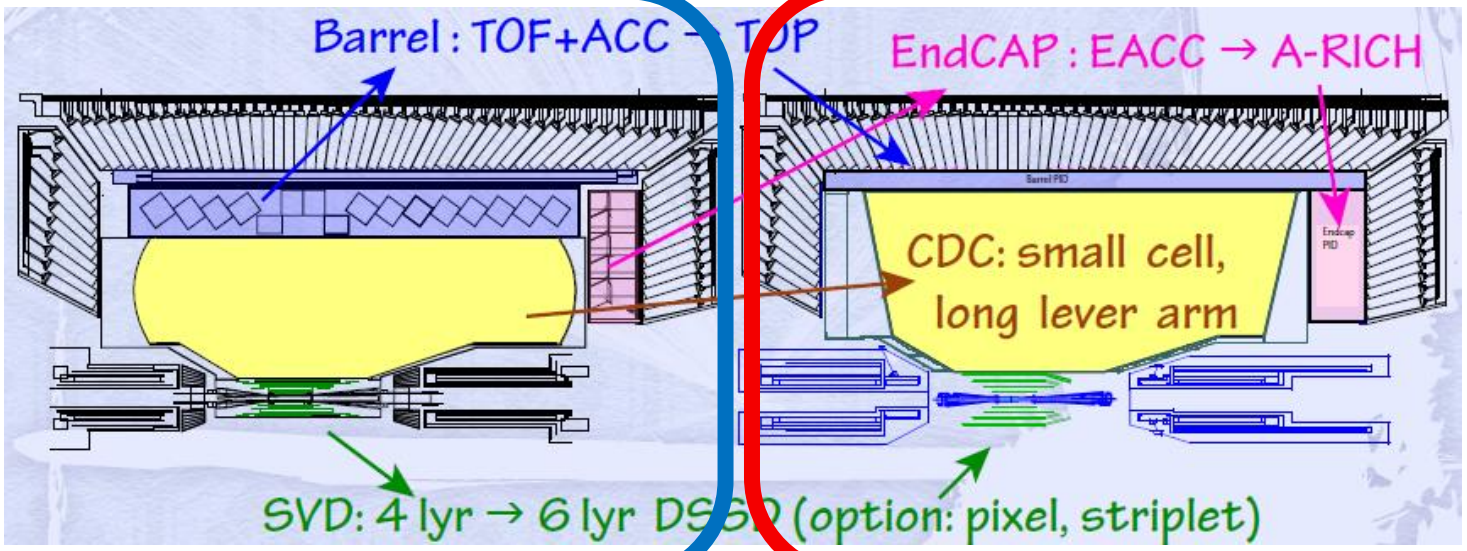
Pattern	Components	Threshold(GeV)
1	F1+F2+B1+B2	5.0
2	F2+F3+B1+B2+C11+C12	5.5
3	F2	5.0
4	F3+C10+C11+C12	5.0
5	C1+C9+C10	5.0
6	C1+C2+C9	5.0
7	C2+C8+C9	5.0
8	C3+C7+C8	5.0
9	C4+C6+C7	5.0
10	C5+C6	5.0
11	C10	3.0



Check tsim-ecl with Belle and sBelle

$B \rightarrow K\pi$ / $B \rightarrow \pi^0\pi^0$ / $B \rightarrow \rho^0\gamma$ / $B \rightarrow \tau\nu$ / $\tau \rightarrow \mu\gamma$ / $ee \rightarrow X(214)(\rightarrow \mu\mu)\gamma$

Without beam background



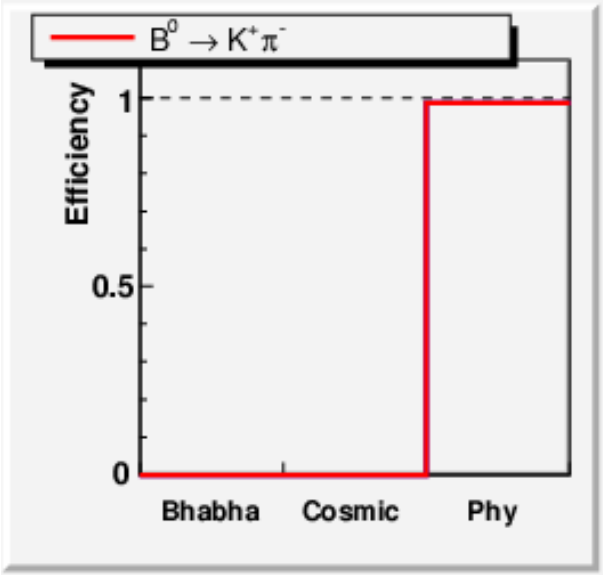
Belle tsim-ecl

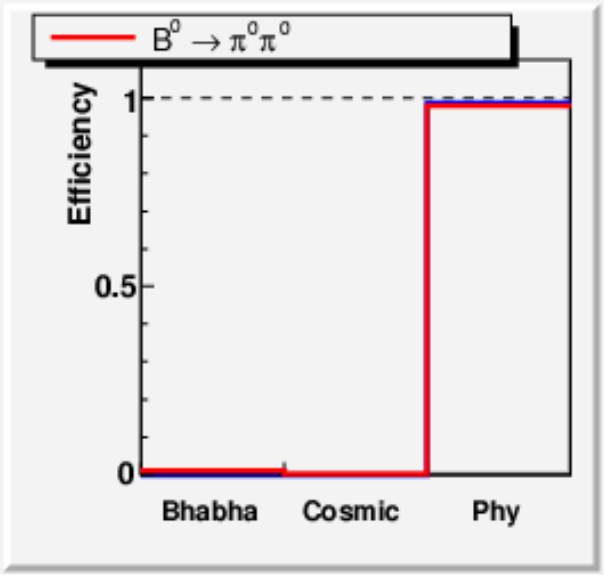
Belle ecl performance

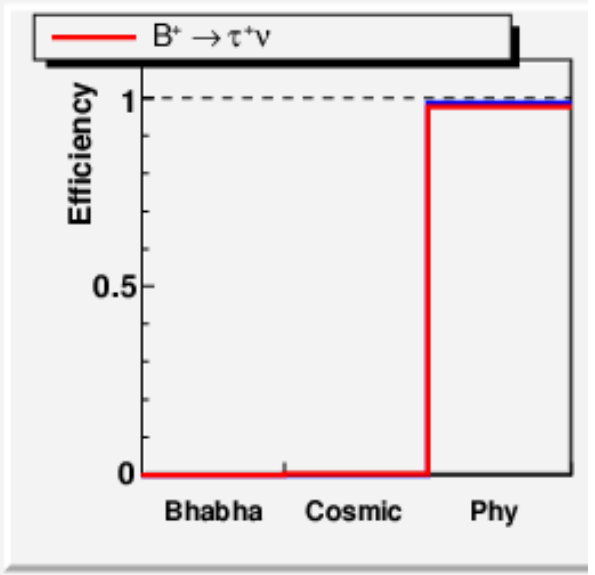
sBelle tsim-ecl

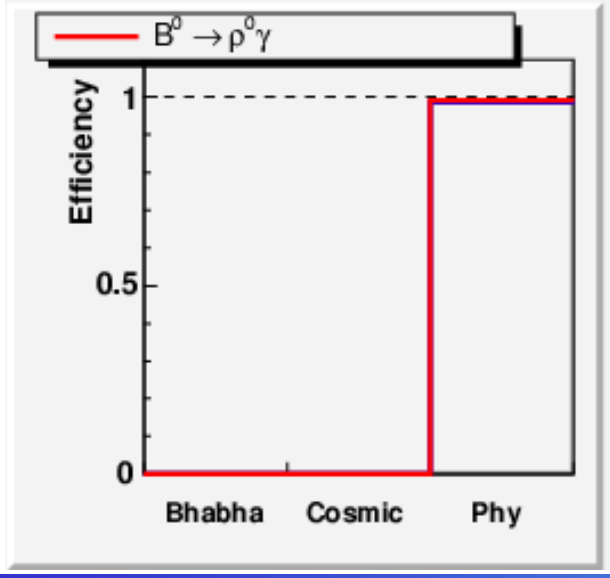
sBelle ecl performance

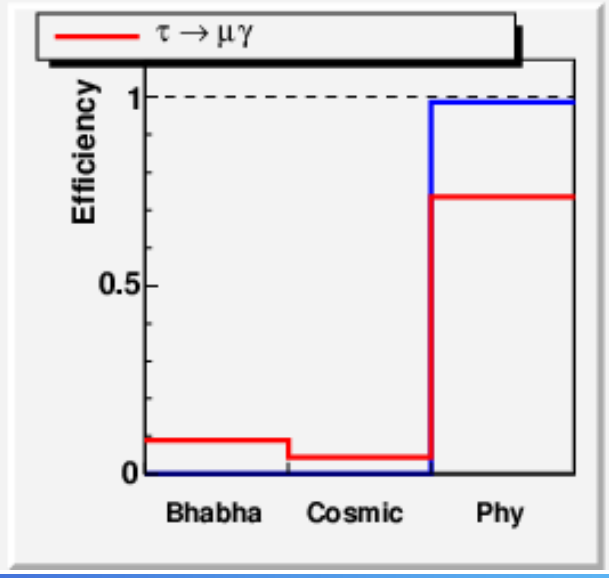
Belle : trigger efficiency

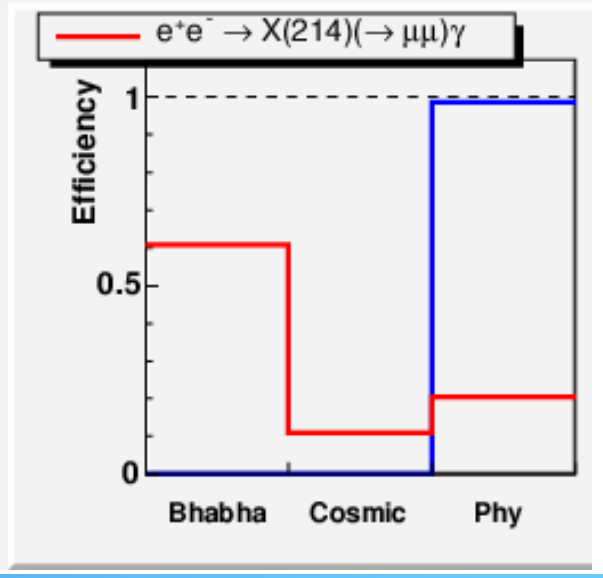








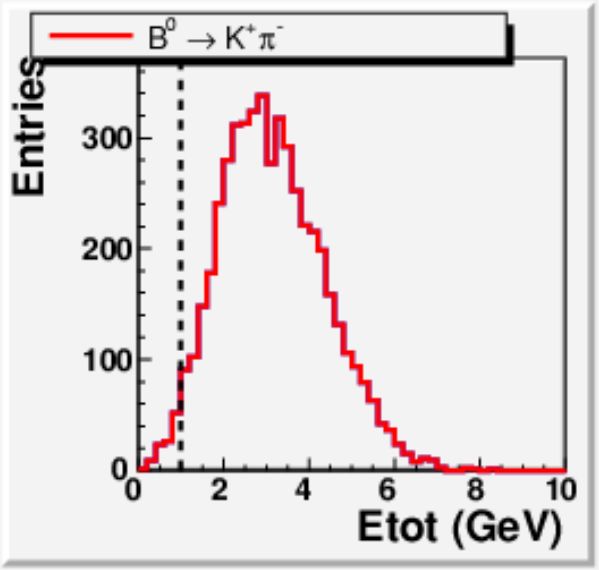


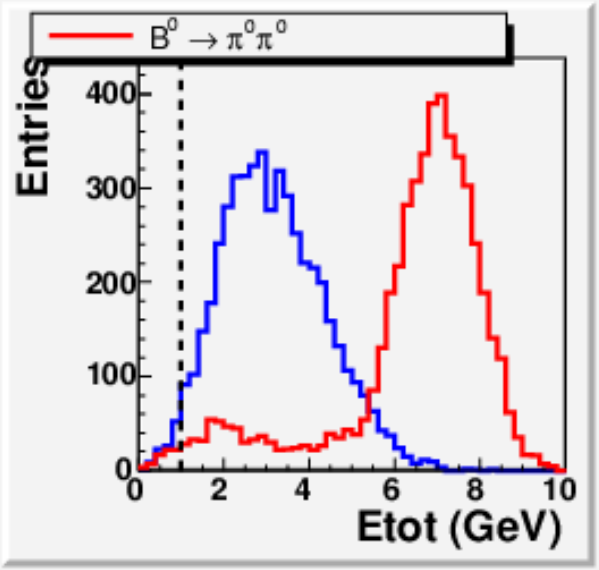


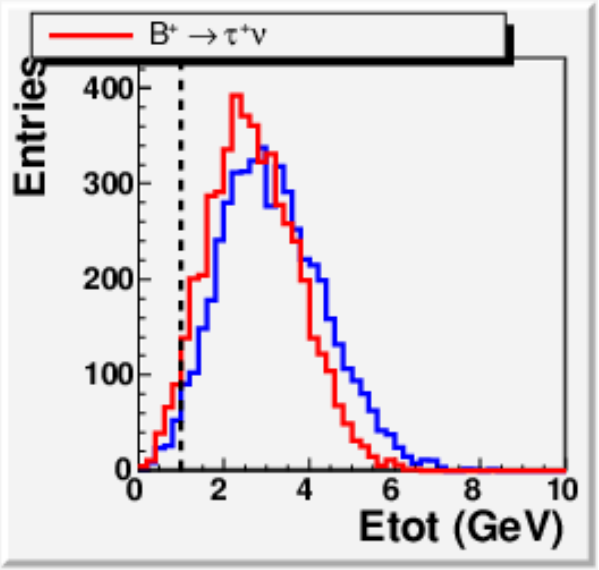
Belle : trigger efficiency

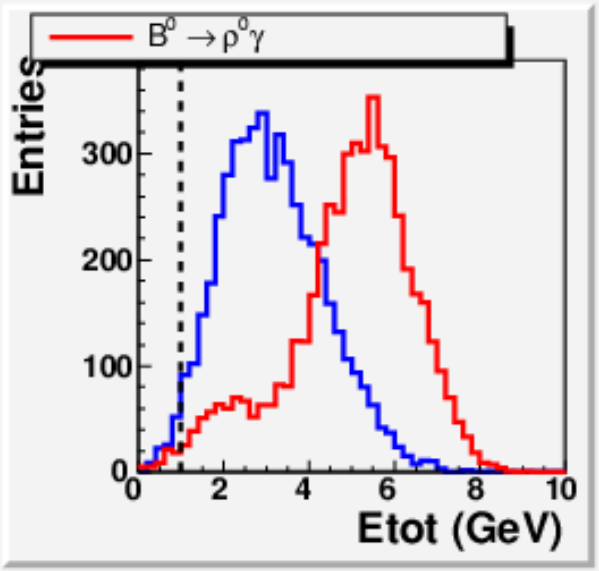
	Bhabha(%)	Cosmic(%)	Physics(%)
$B^+ \to K^+\pi^-$	0±0	0.06±0.03	98.8±0.2
$B^0 \to \pi^0\pi^0$	1.1±0.2	0.2±0.1	98.0±0.2
$B^0 \to \rho^0\gamma$	0.04±0.03	0.06±0.03	99.2±0.1
$B^+ \to \tau^+\nu$	0±0	0.10±0.04	97.7±0.2
$\tau^+ \to \mu^+\gamma$	9.0±0.4	4.5±0.3	73.5±0.6
$e^+e^- \to \mu^+\mu^-\gamma$	60.8±0.7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

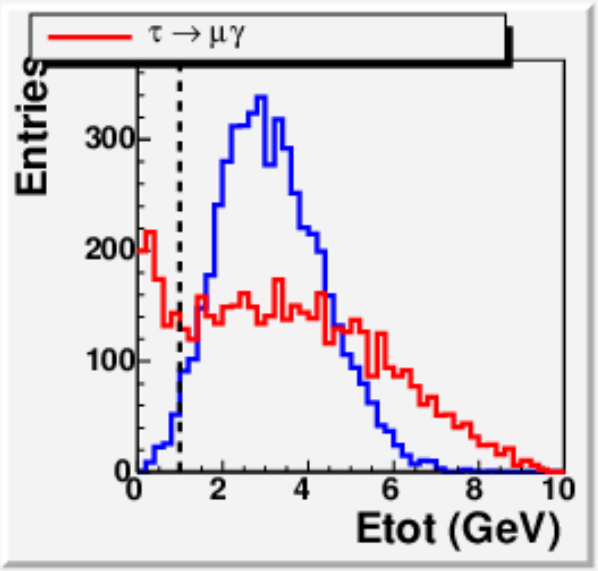
Belle : Etot distribution

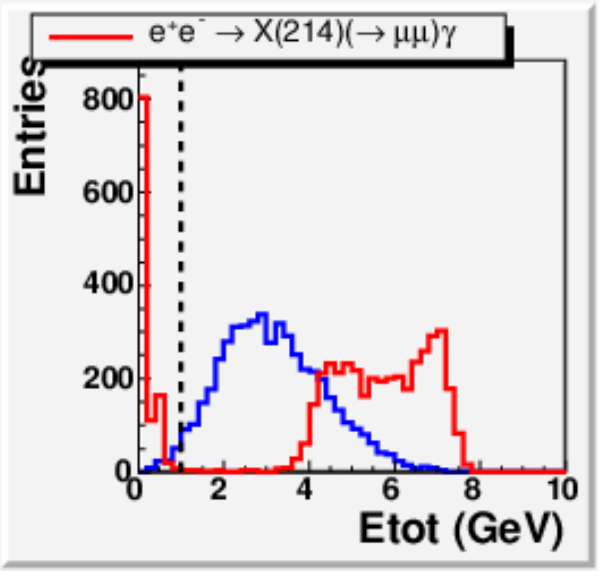




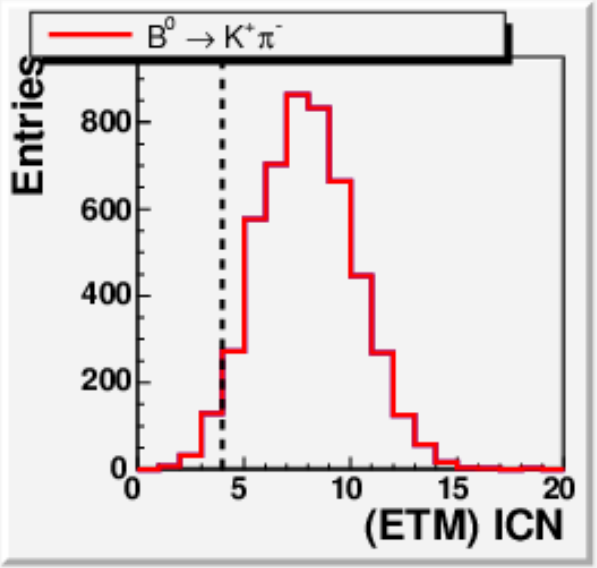


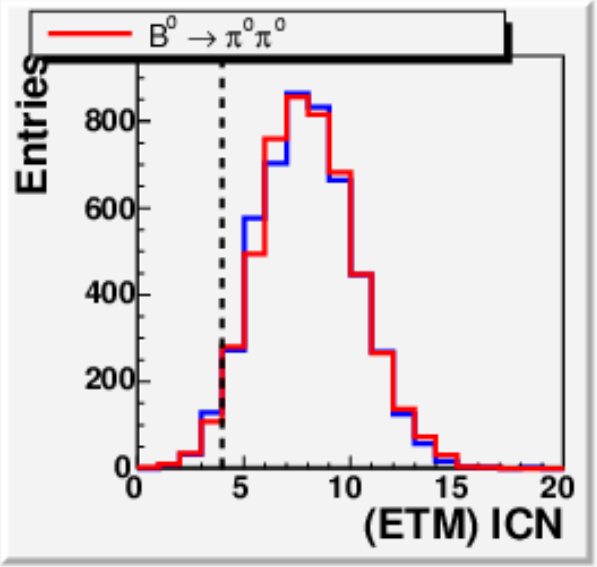


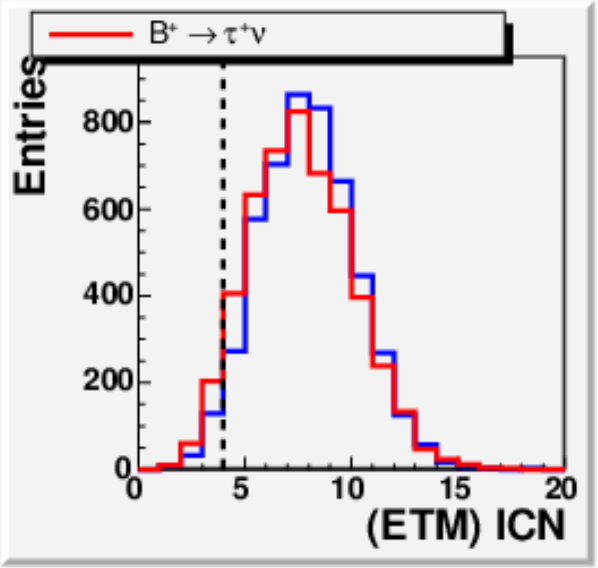


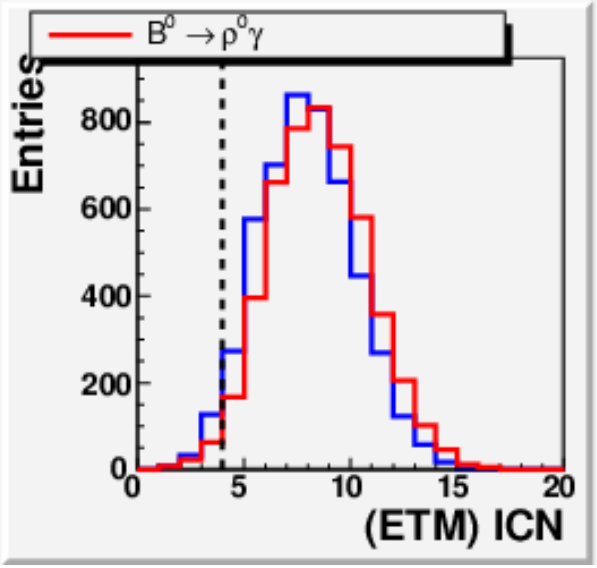


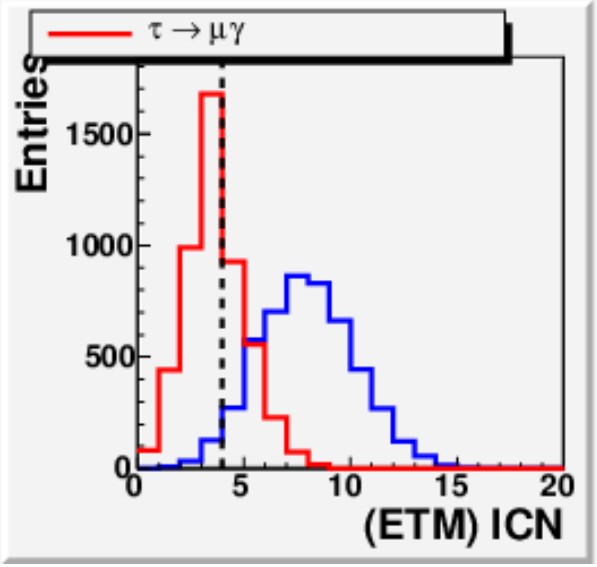
Belle : ICN distribution

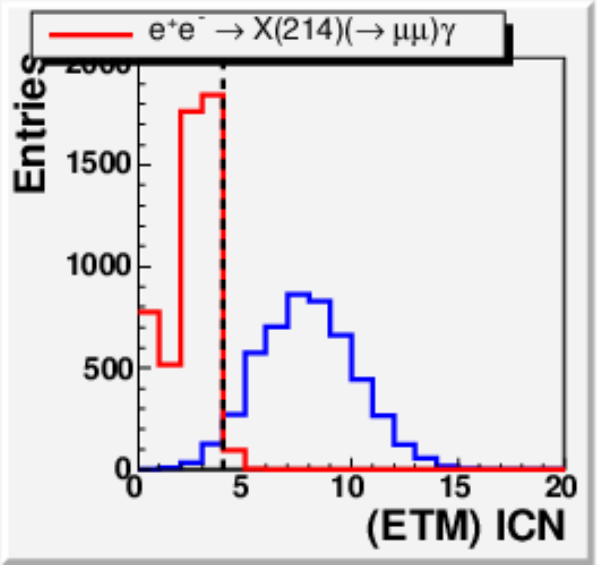






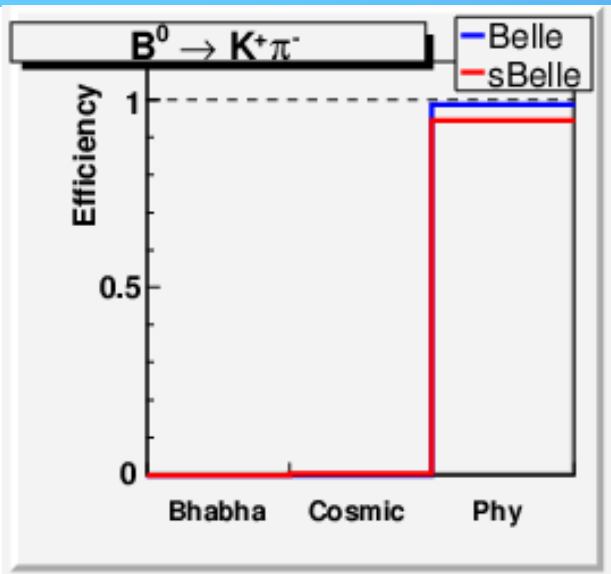


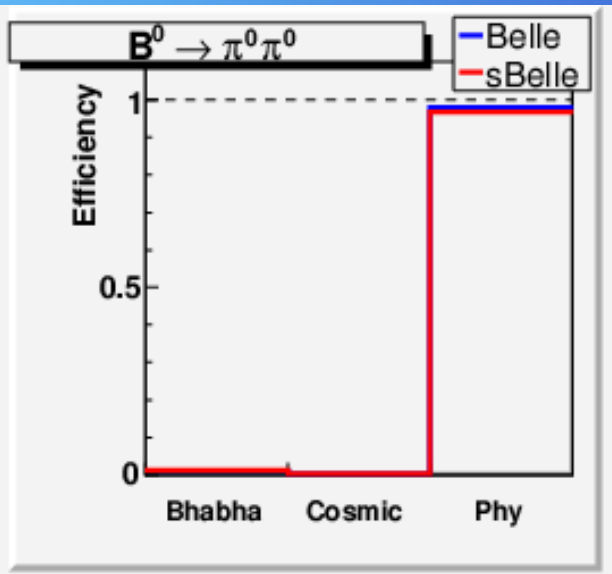


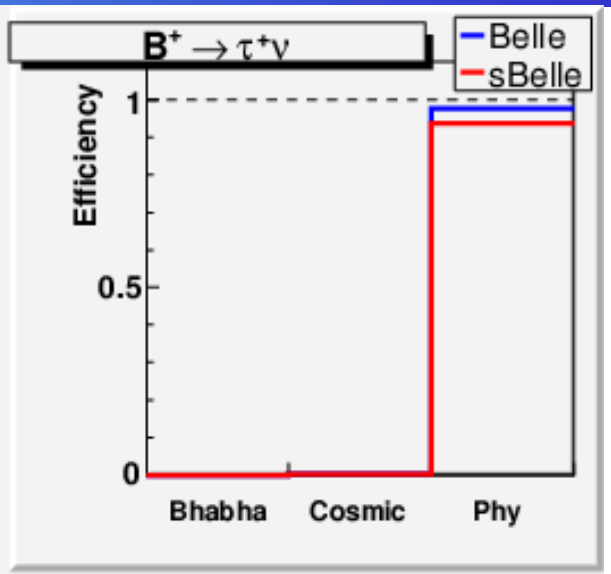


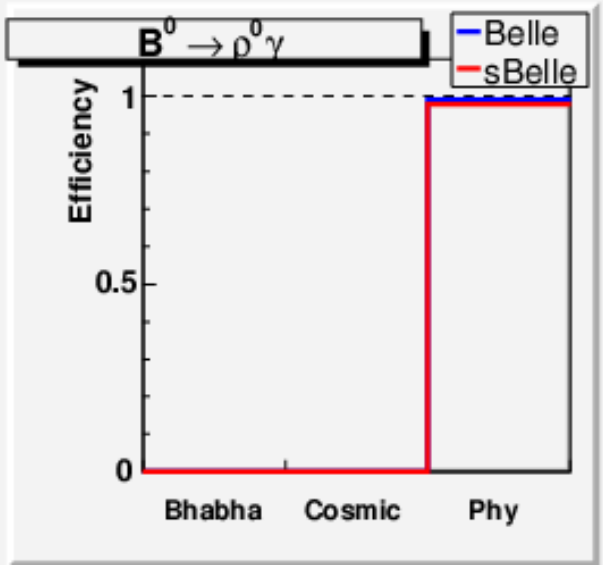
Comparison between Belle and sBelle

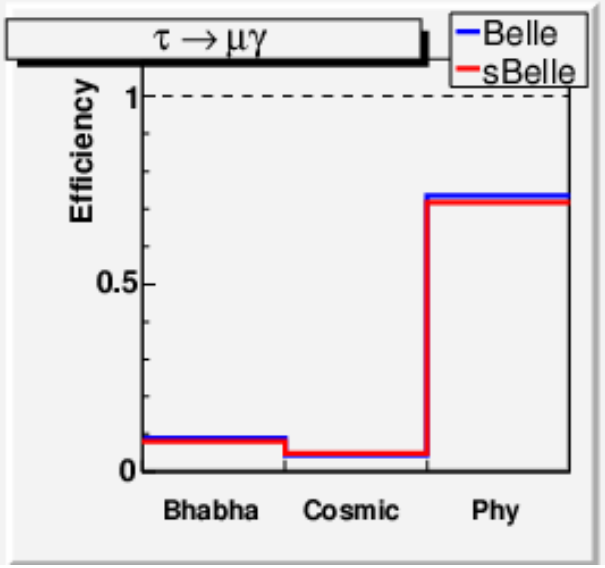
Belle vs sBelle : trigger efficiency

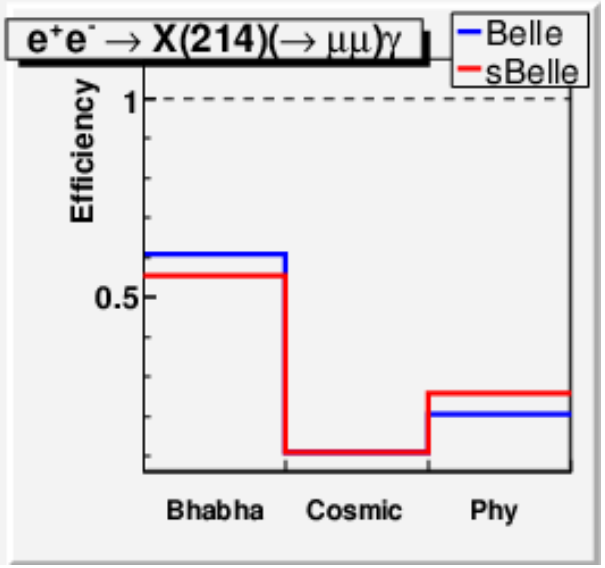










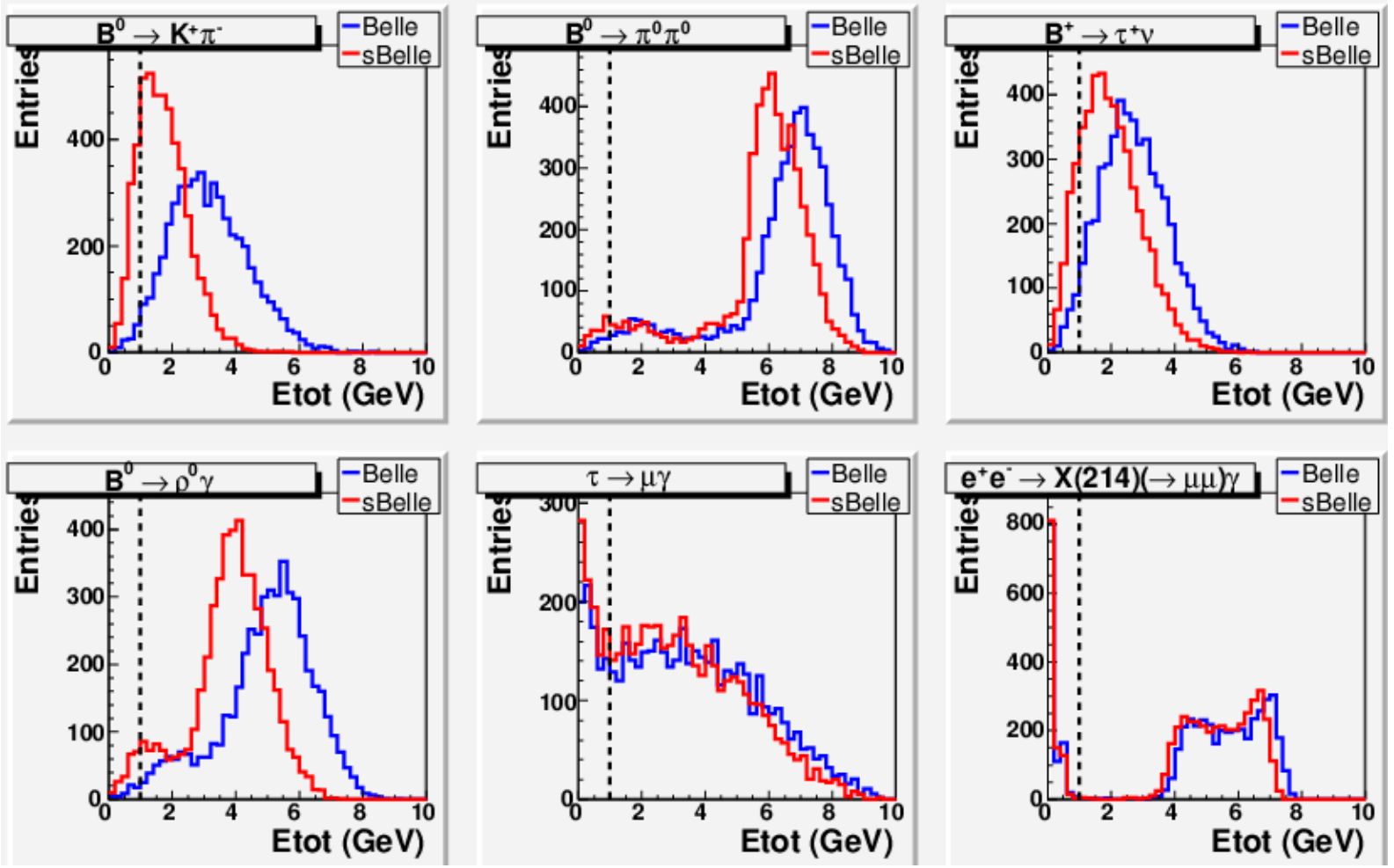


Belle vs sBelle : trigger efficiency

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

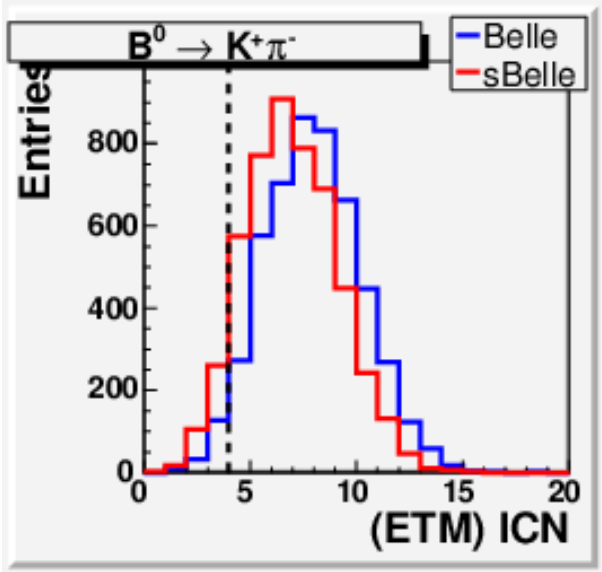
- Performances for all modes(ex. ee→μμγ) become worse.
- It would be due to differences in energy deposit…
- Have to check more in details…

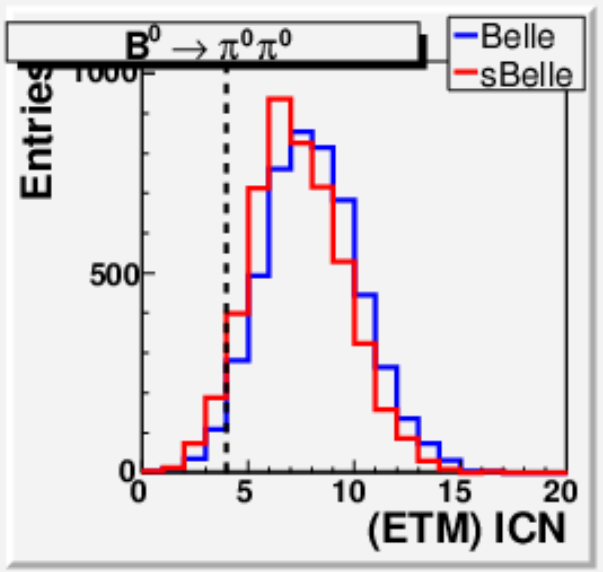
Belle vs sBelle : Etot distribution

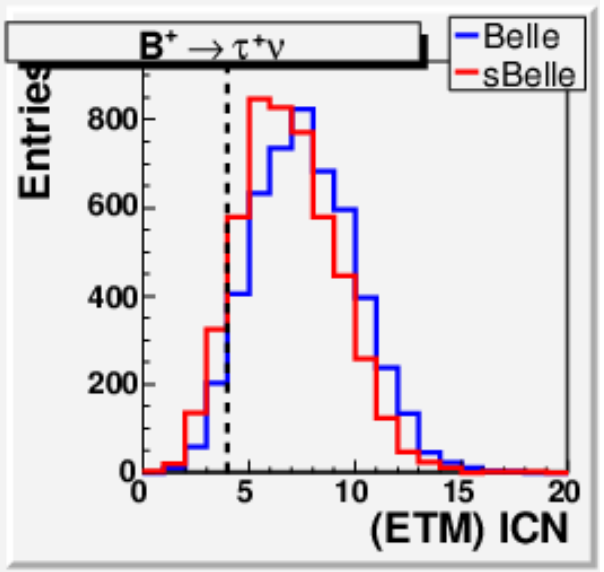


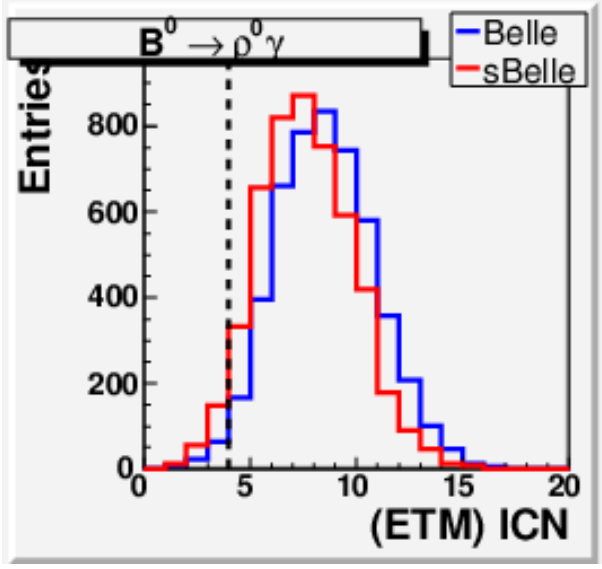
Clear discrepancies can be seen…why?...Amount of material?
Any mistake?...Have to investigate…

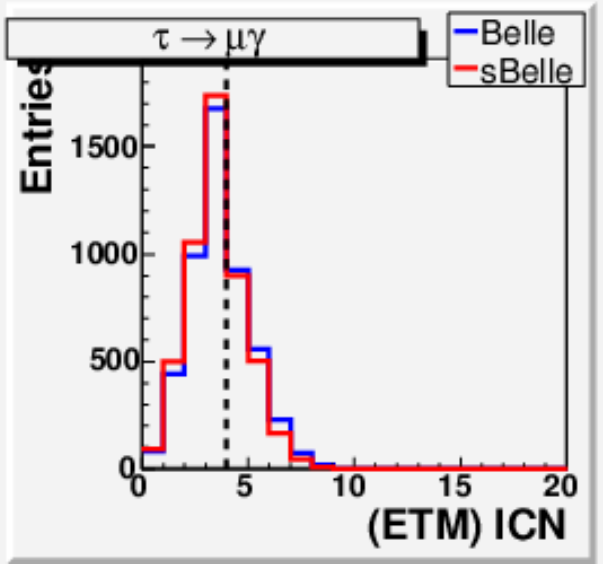
Belle vs sBelle : ICN distribution

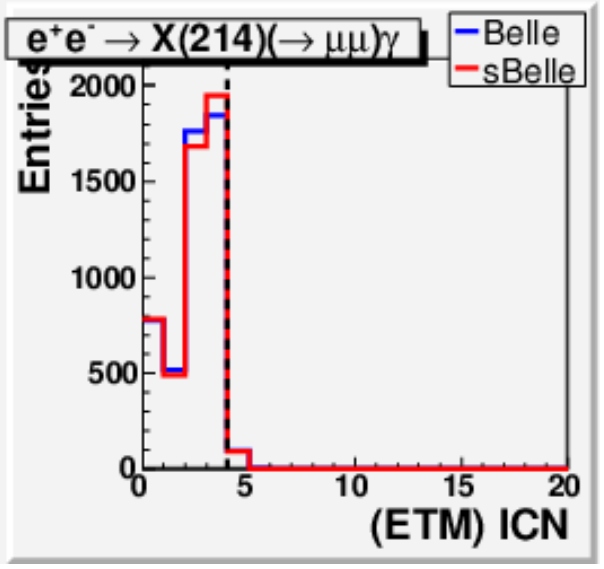












Summary / Plan

- Summary
  - Tsim-ecl study has been started w/ g4superb now.
  - Large discrepancy in Etot between Belle and sBelle

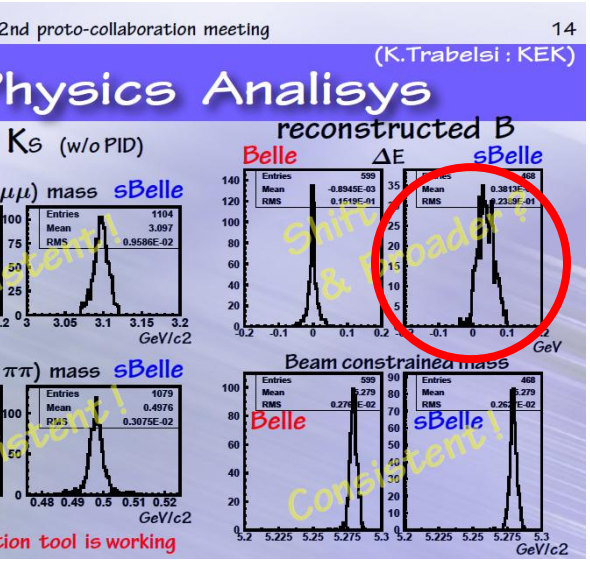
- To do:
  - Check Etot difference between Belle and sBelle
  - Prepare tsim-ecl for sBelle(no dramatic change from Belle)
  - Check Bhabha event
  - Check with background(have to wait Isawaki-san's study?!)
  - Test new Bhabha scheme(BN477)
  - Check cosmic trigger with cosmic event(?!)
  - Compare data and mc with current Belle
  - Check performance with pure CsI 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

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(?)

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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.
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- 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±0	0.06±0.03	98.80±0.15
Belle DATECL_EHITS	0±0	0.06±0.03	98.78±0.16

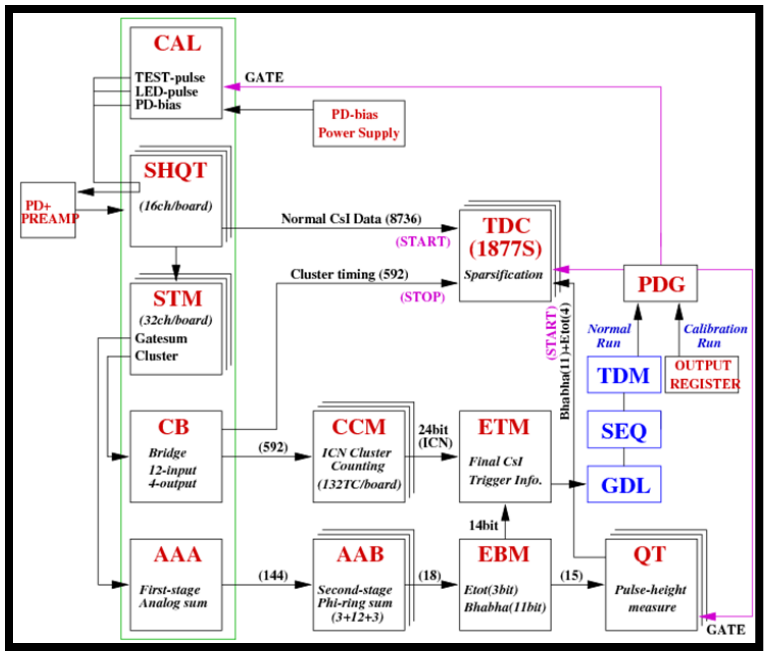
  - w/ and w/o beam background(addbg is not available in g4superb yet)

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

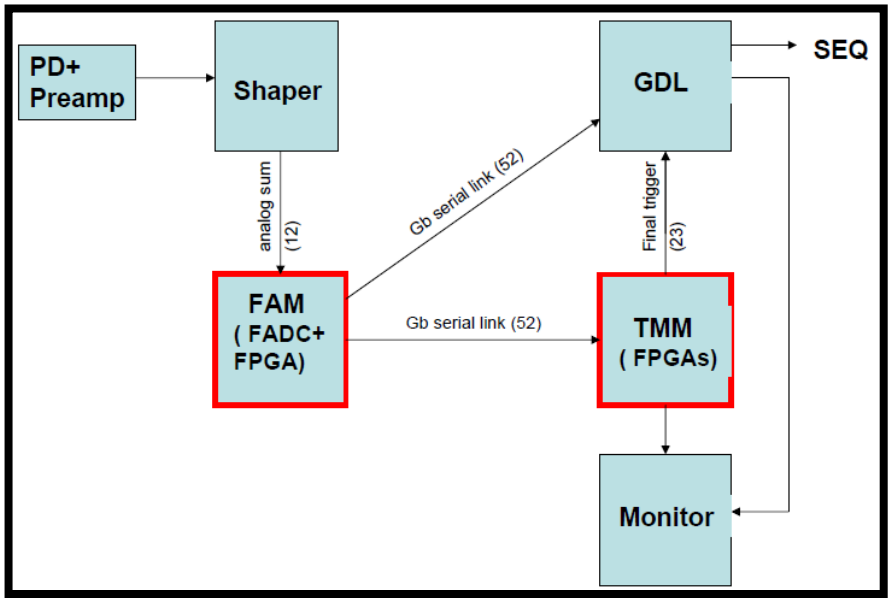
  - DATECL_EHITS w/o addbg looks no significant difference for Belle.
  - For the meantime, use DATECL_EHITS w/o addbg for Belle and sBelle

ECL electronics

Belle



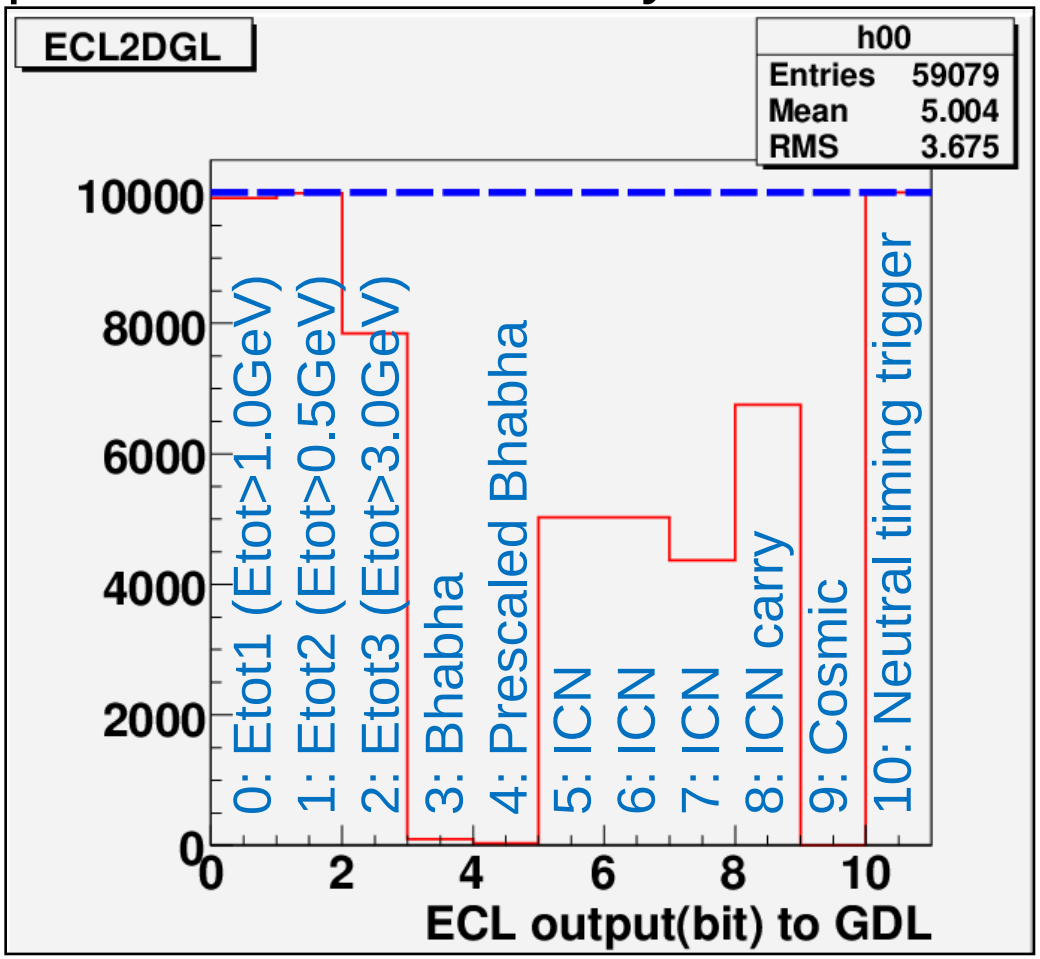
sBelle



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

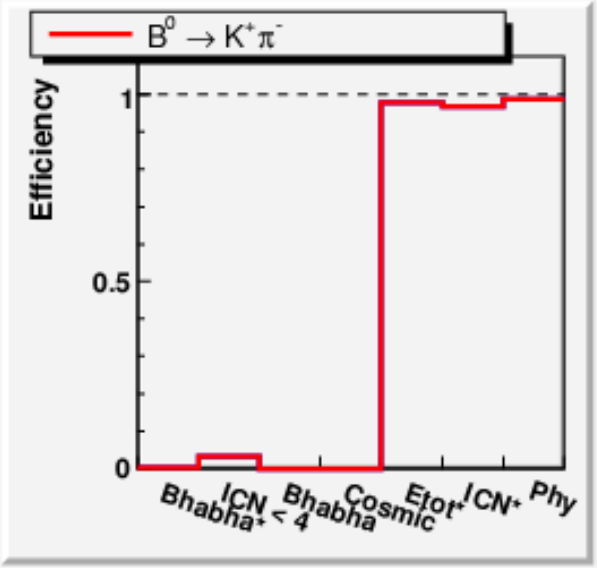
Output to GDL from tsim-ecl

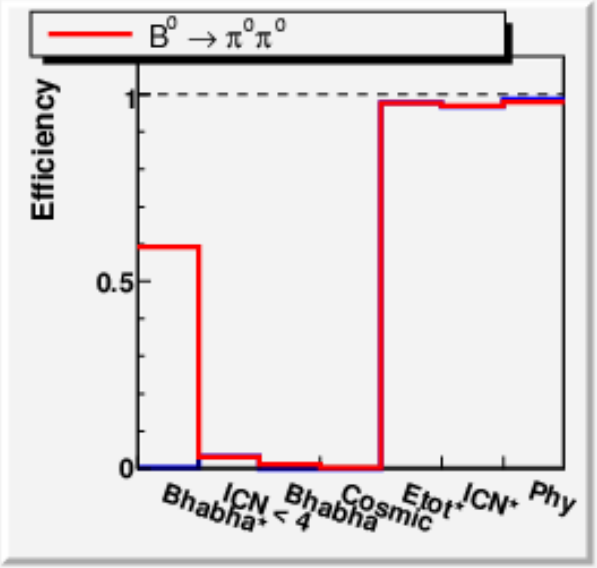
Out put from TEETM is only bit information

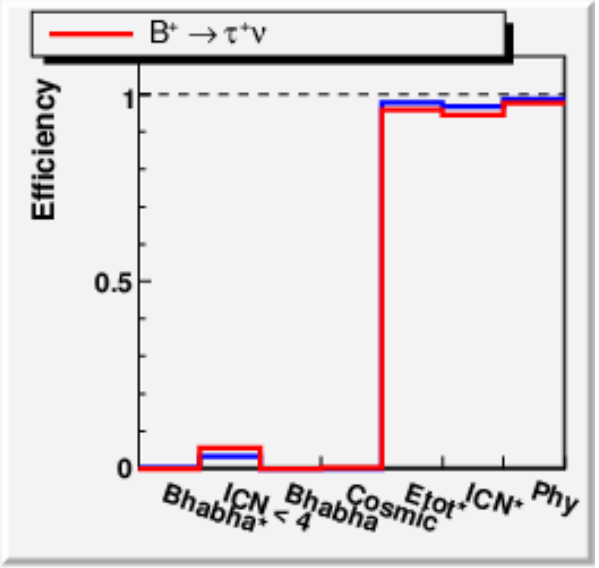


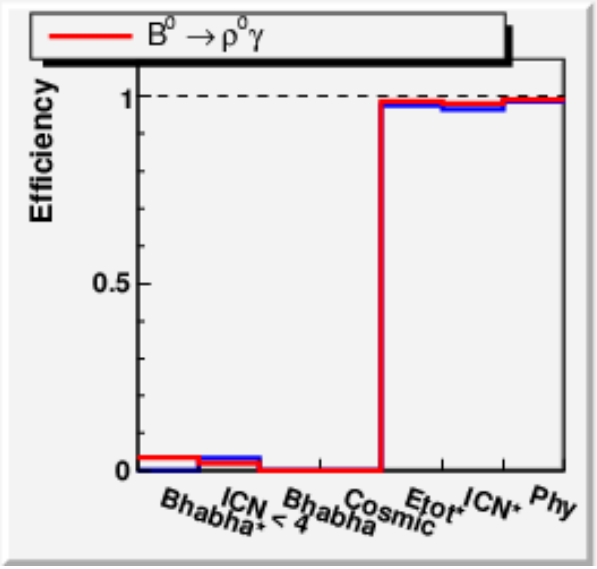
Will we keep current number of bit?

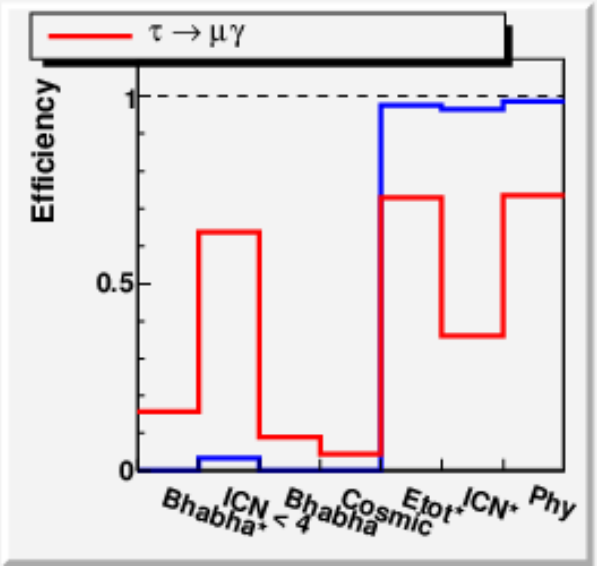
Belle : trigger efficiency

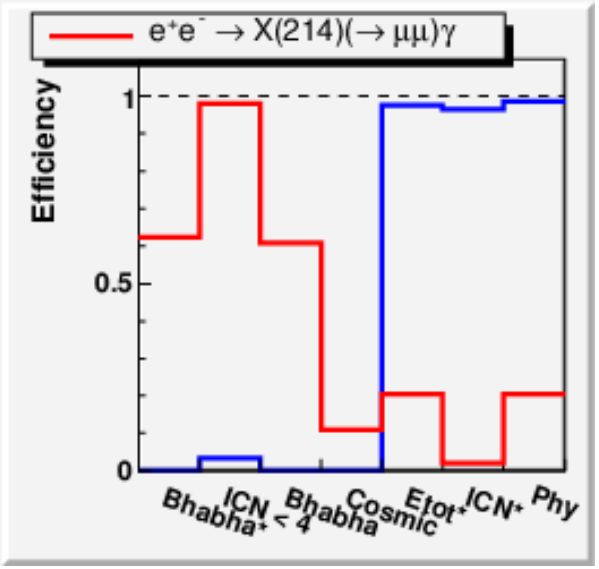




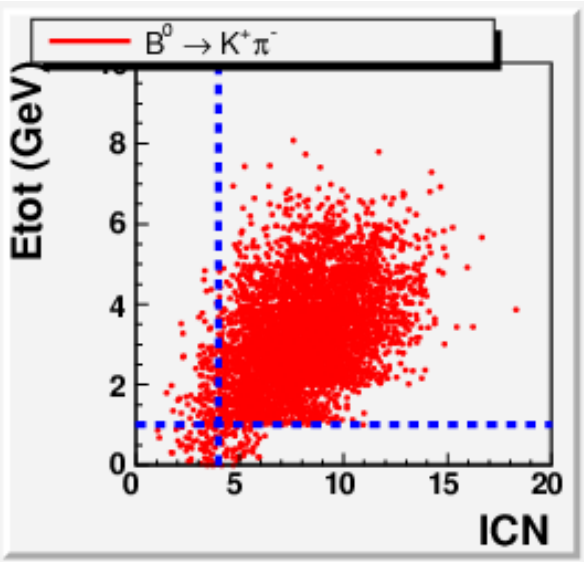


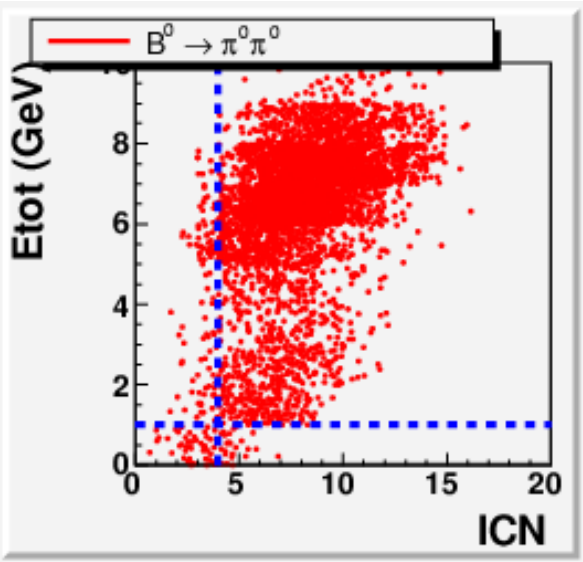


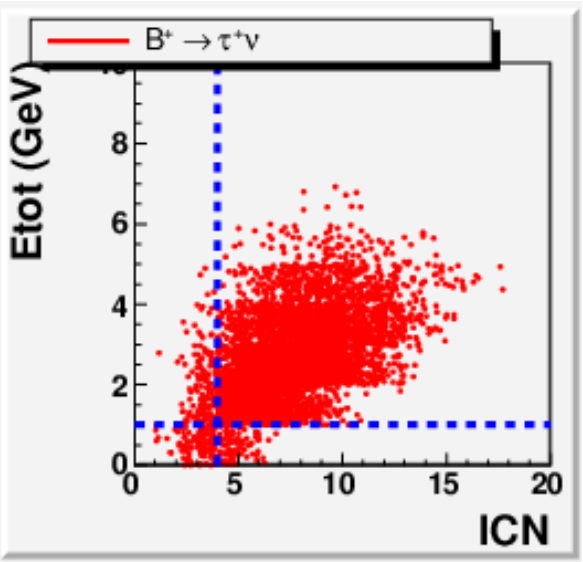


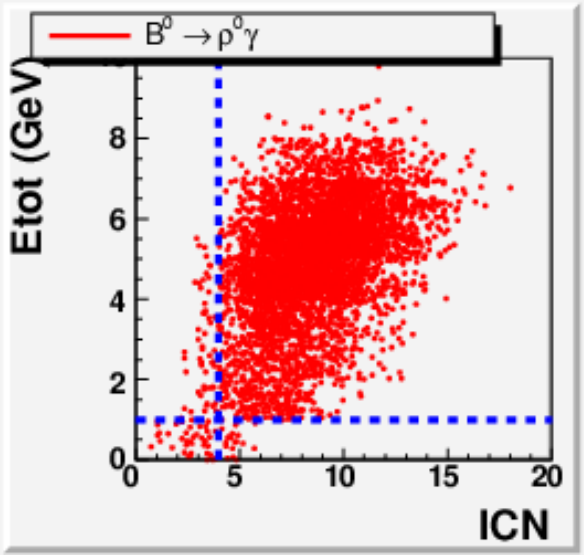


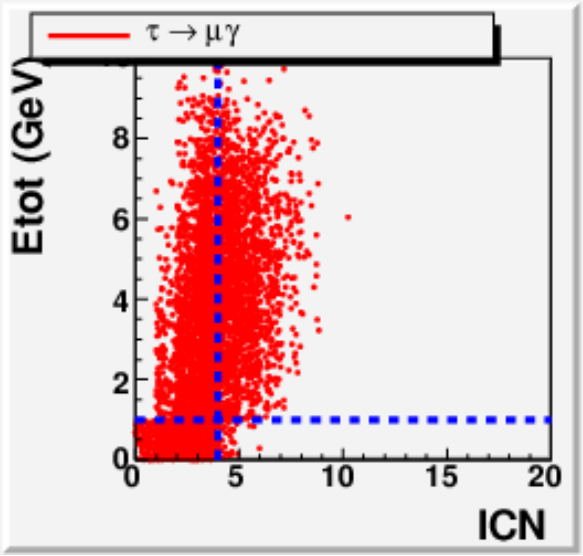
Belle : Etot vs ICN distribution

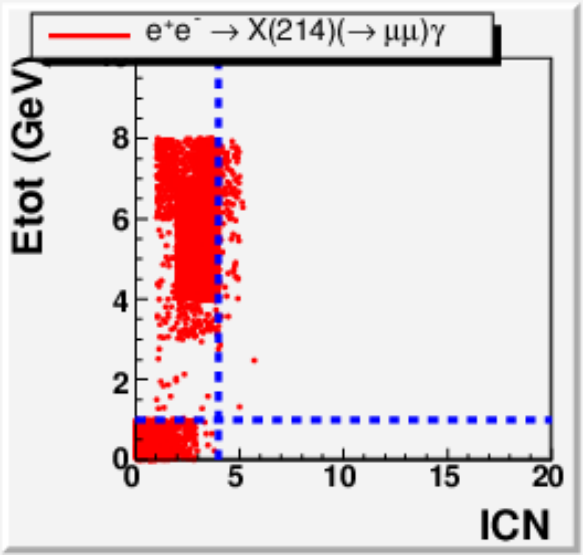




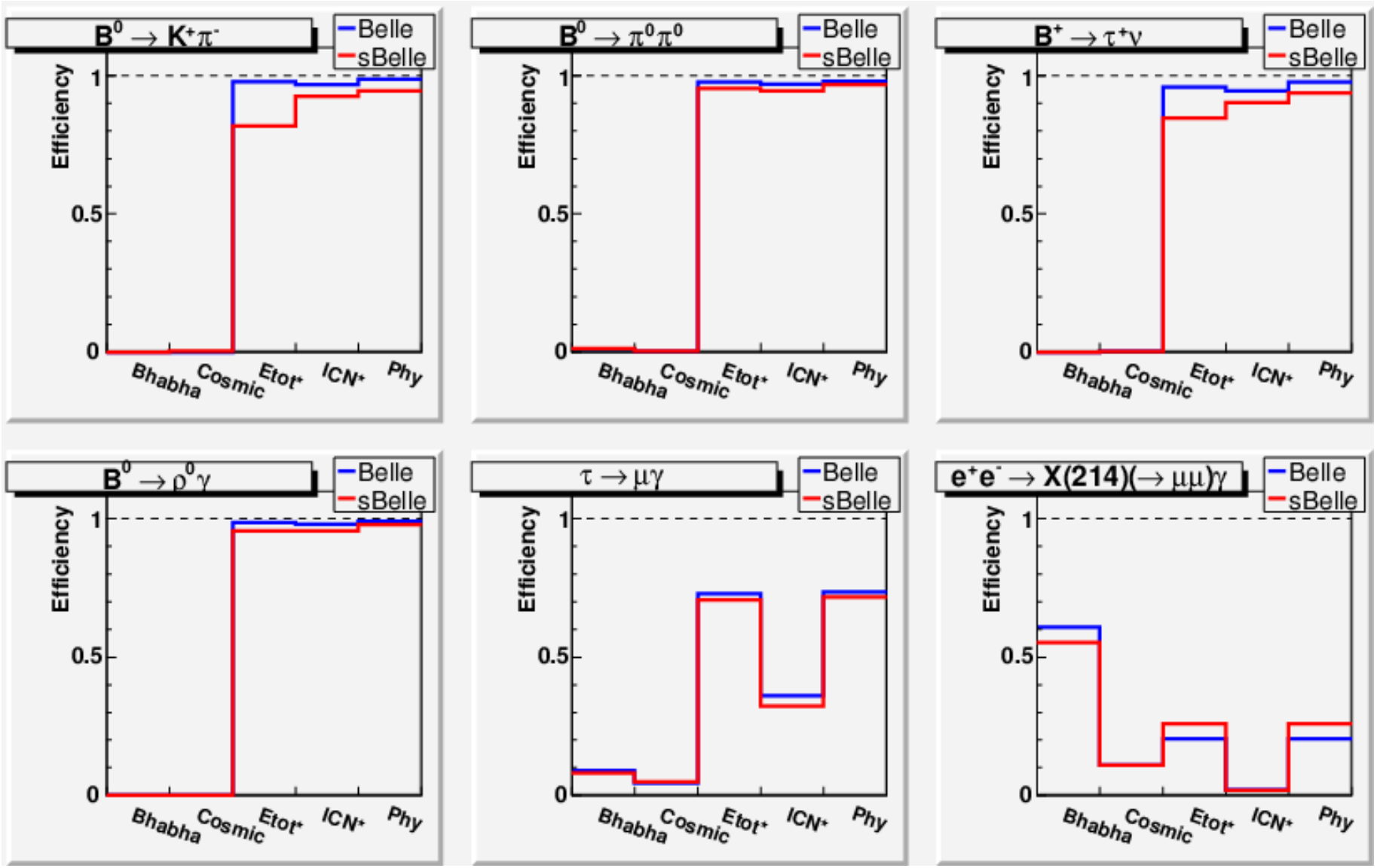




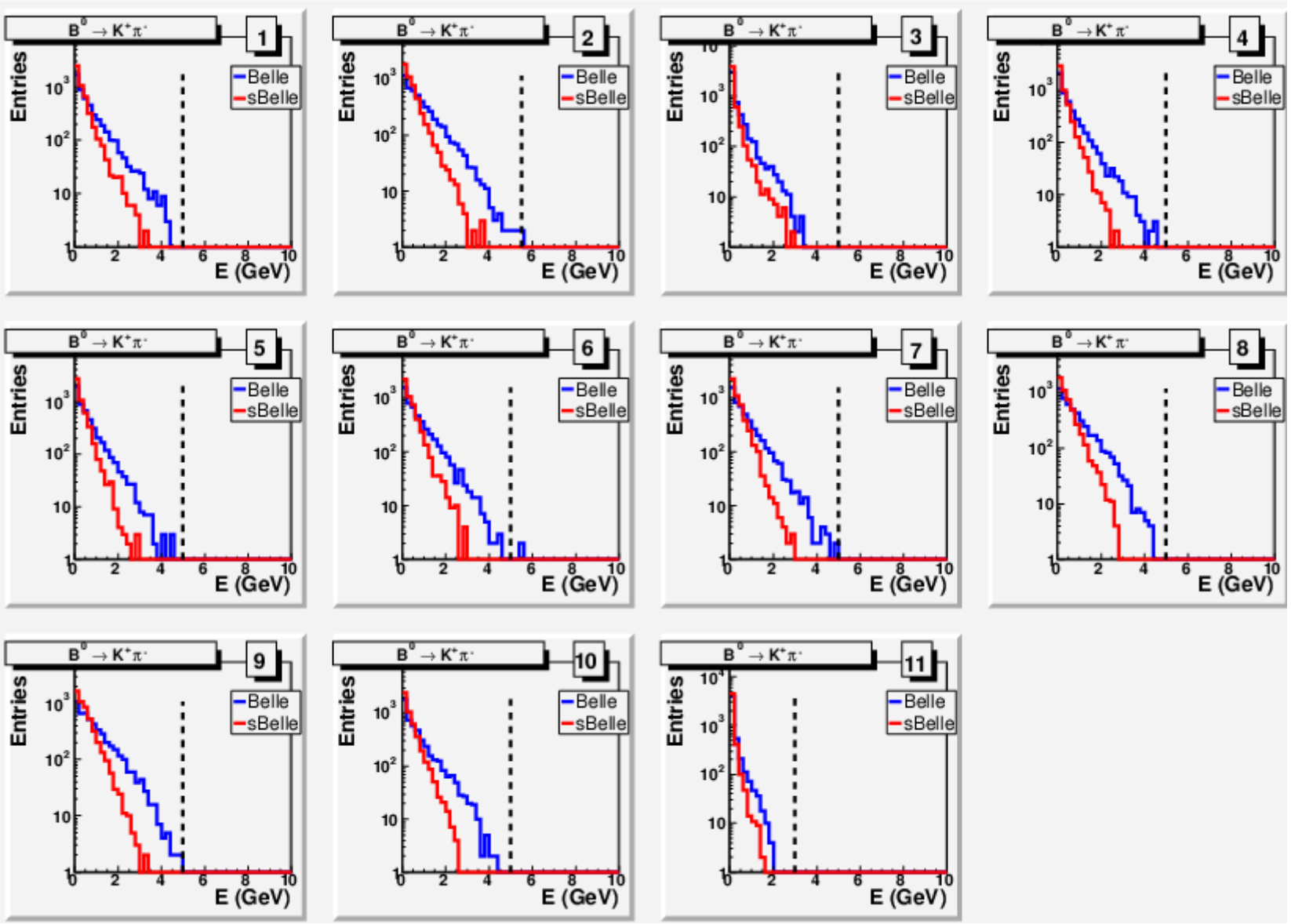




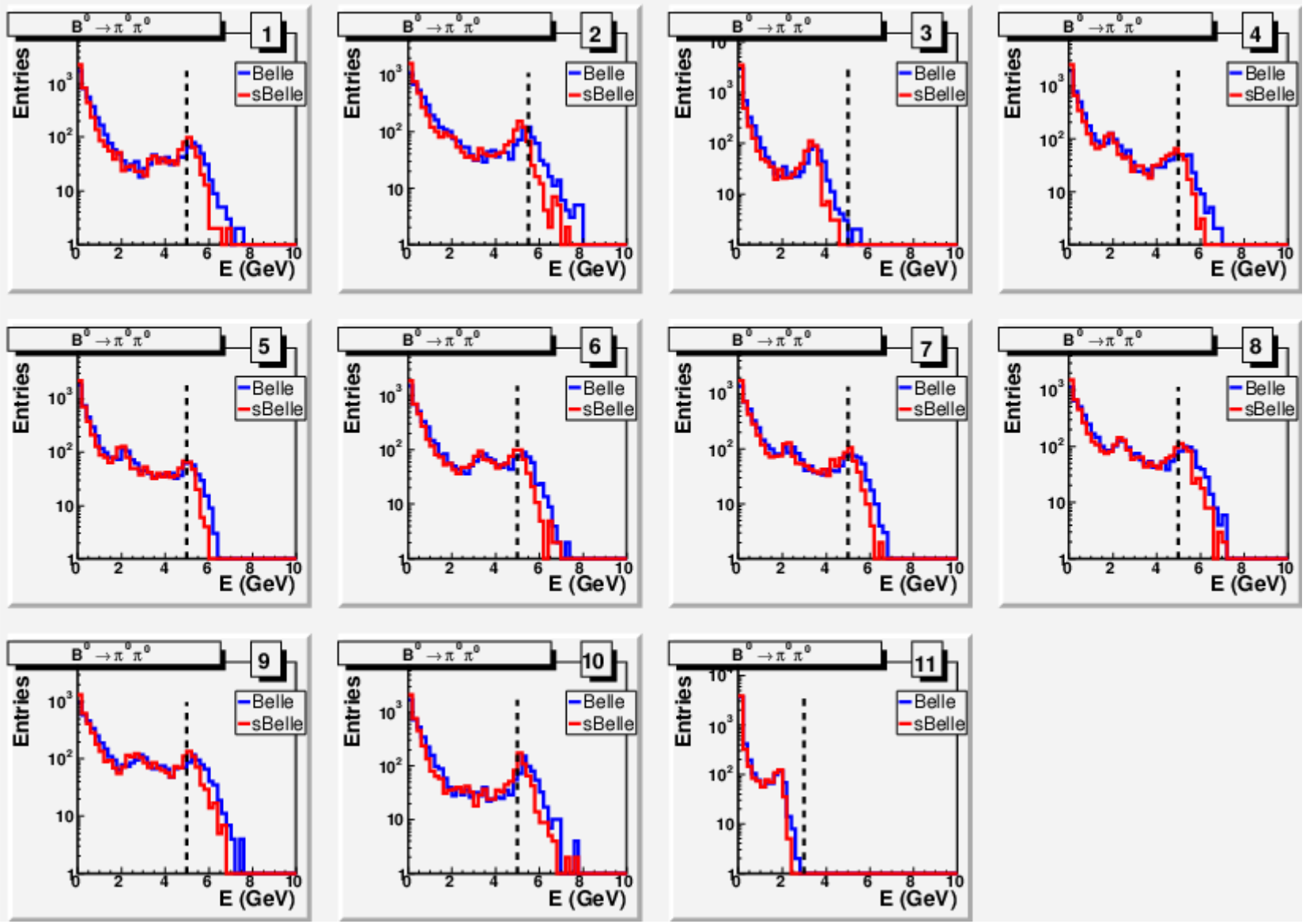
Belle vs sBelle : trigger efficiency



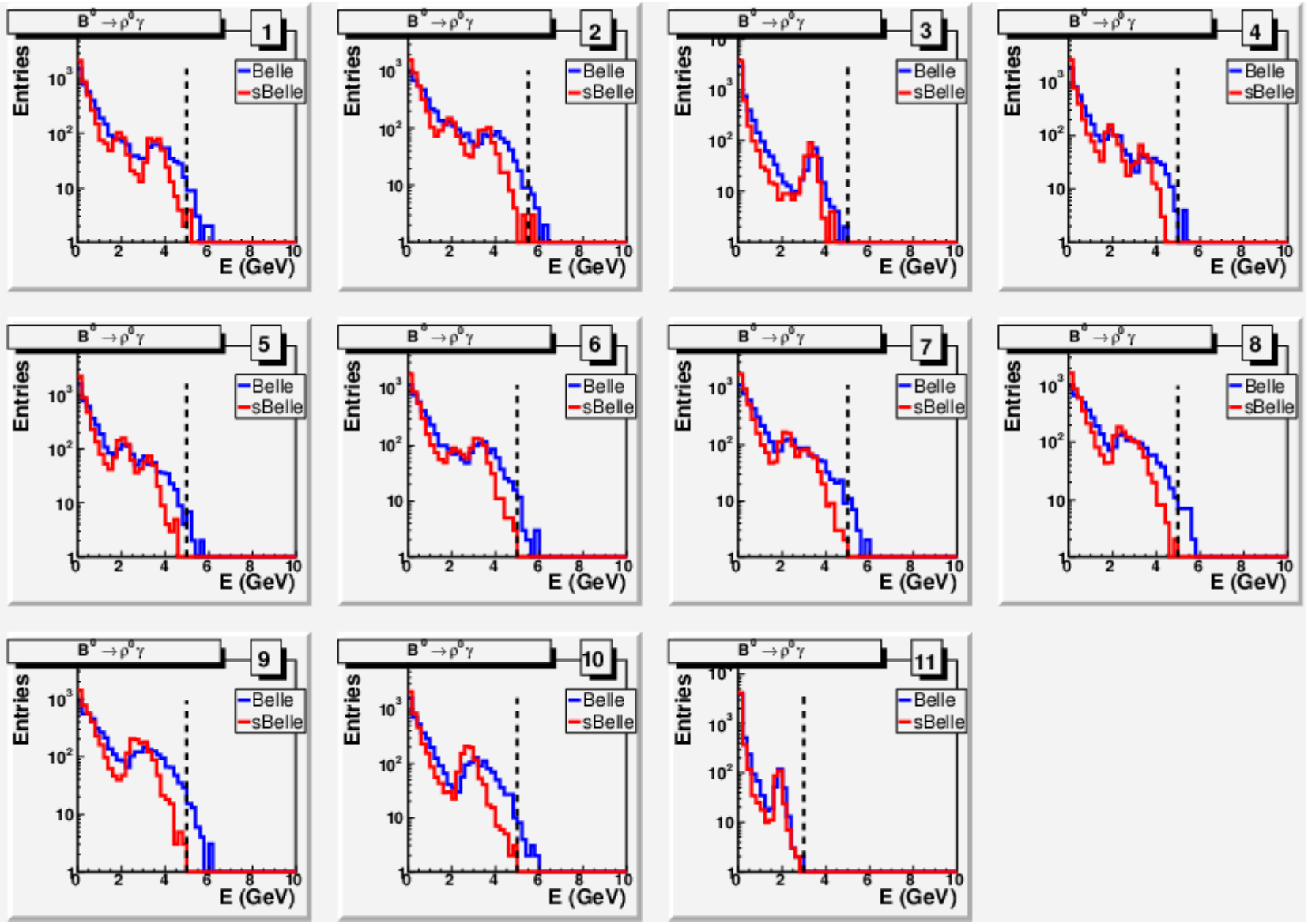
Belle vs sBelle : Bhabha*($B^+ \rightarrow K^+\pi^-$)



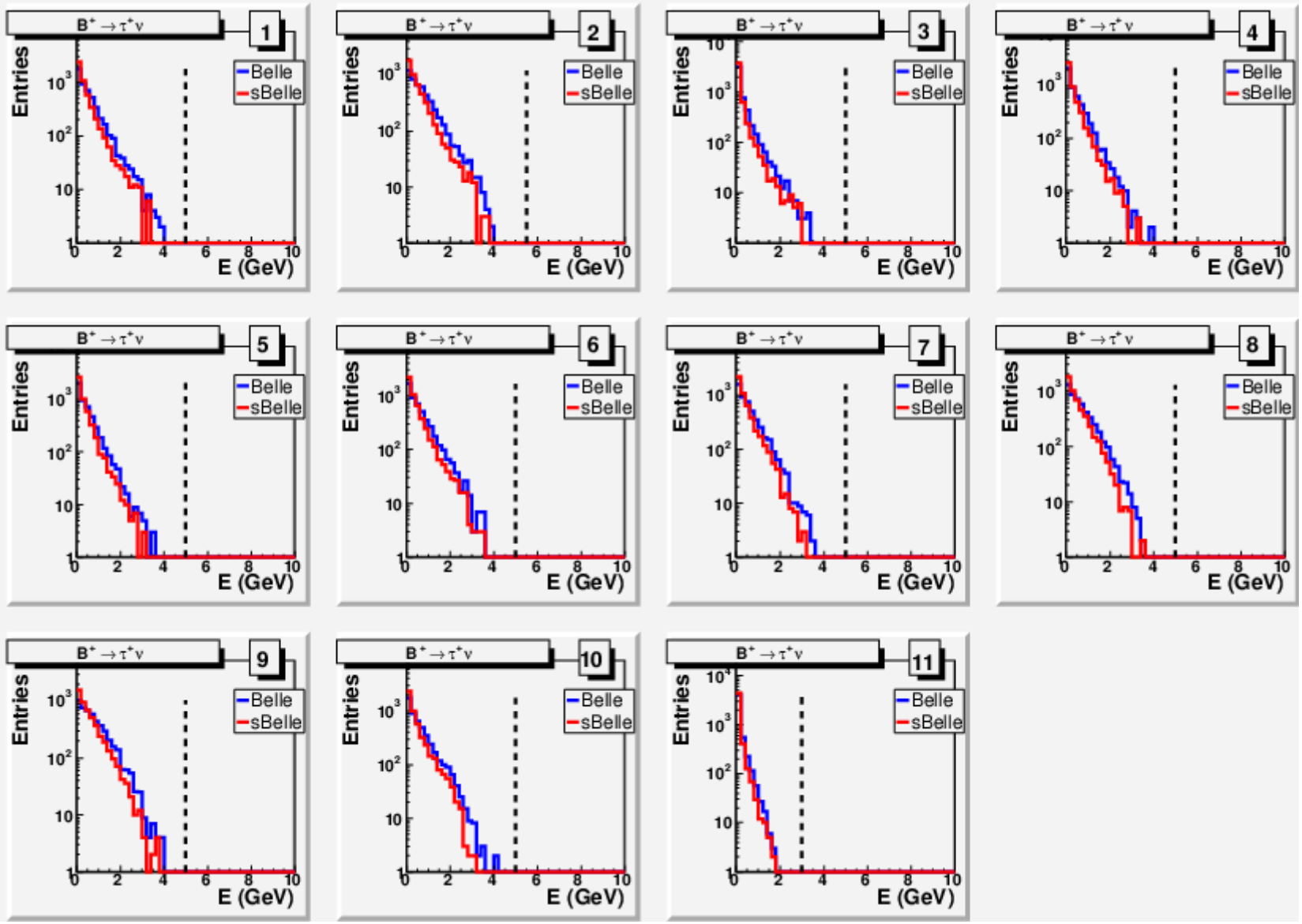
Belle vs sBelle : Bhabha*($B^0 \rightarrow \pi^0\pi^0$)



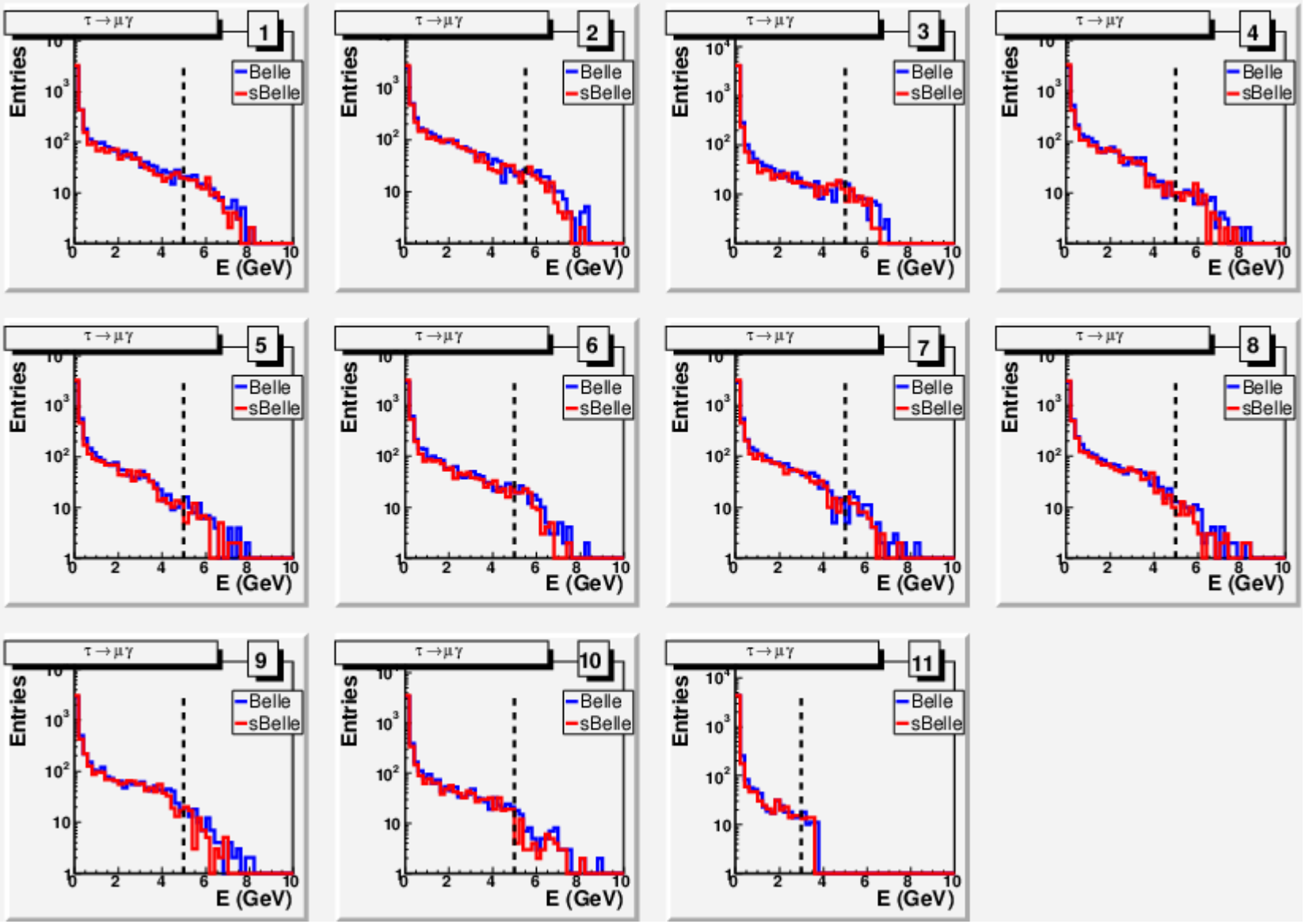
Belle vs sBelle : Bhabha*($B^0 \rightarrow \rho^0\gamma$)



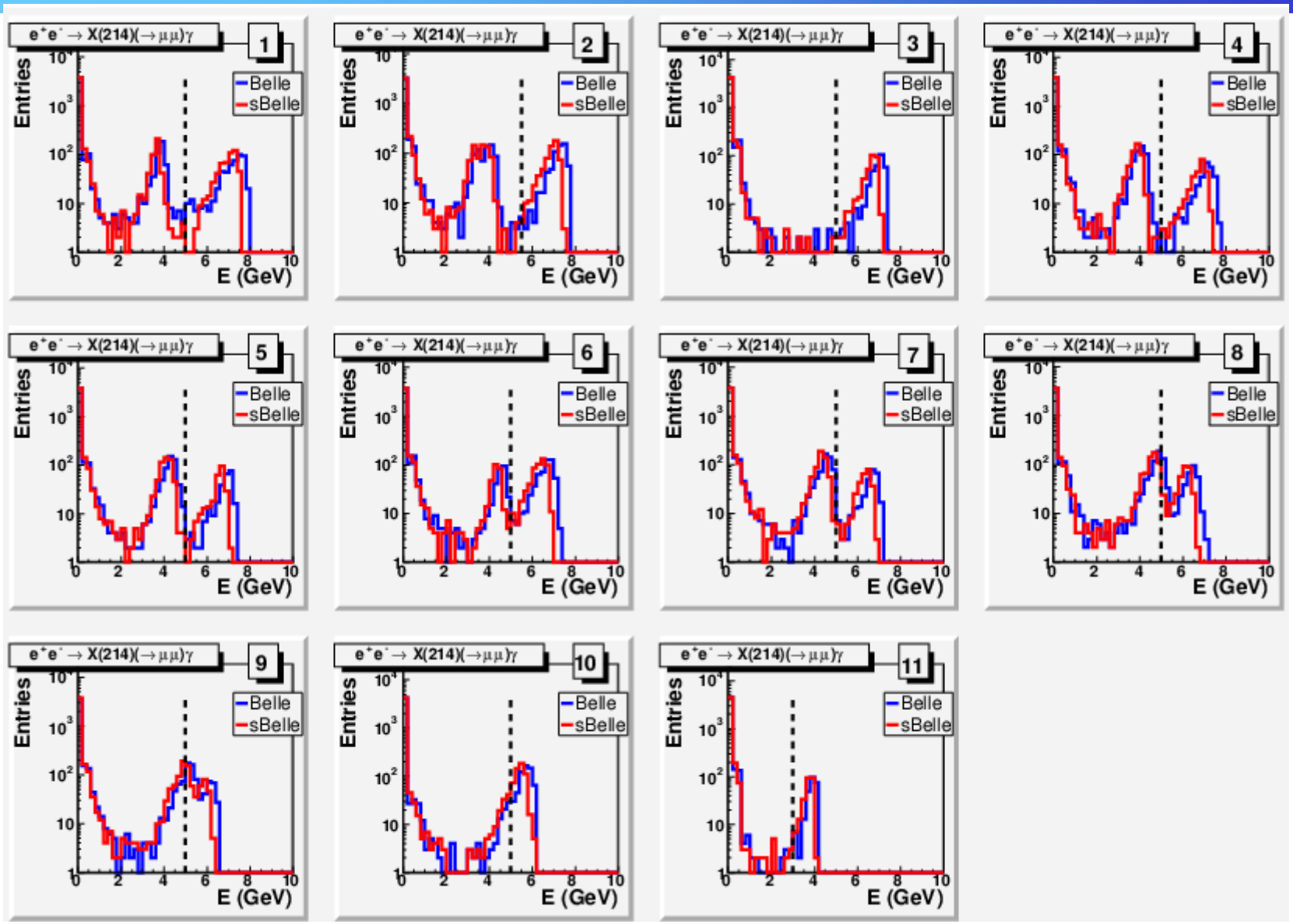
Belle vs sBelle : Bhabha*($B^+ \rightarrow \tau^+ \nu$)



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

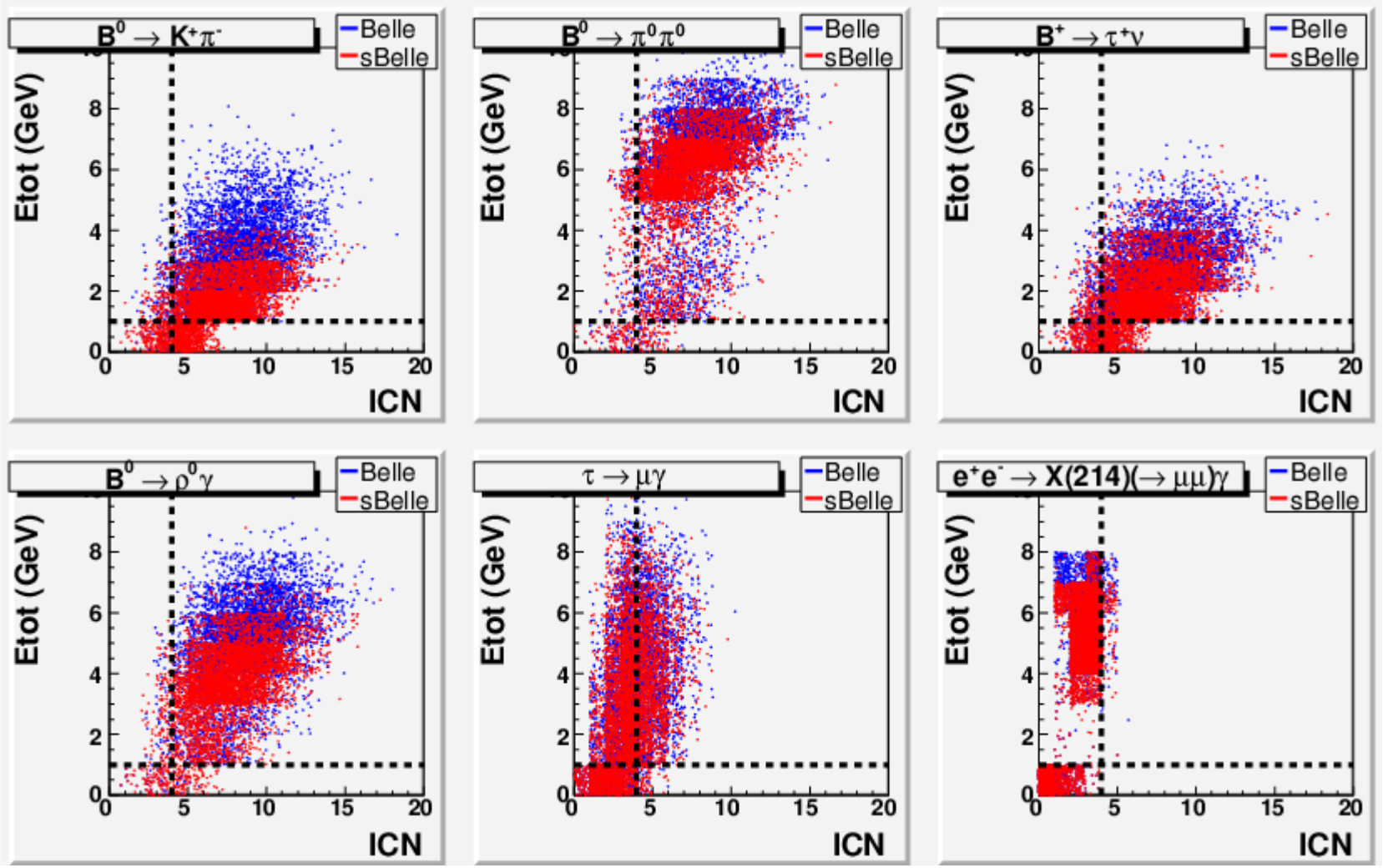


Belle vs sBelle : Bhabha*($e^+e^- \rightarrow \mu^+\mu^-\gamma$)



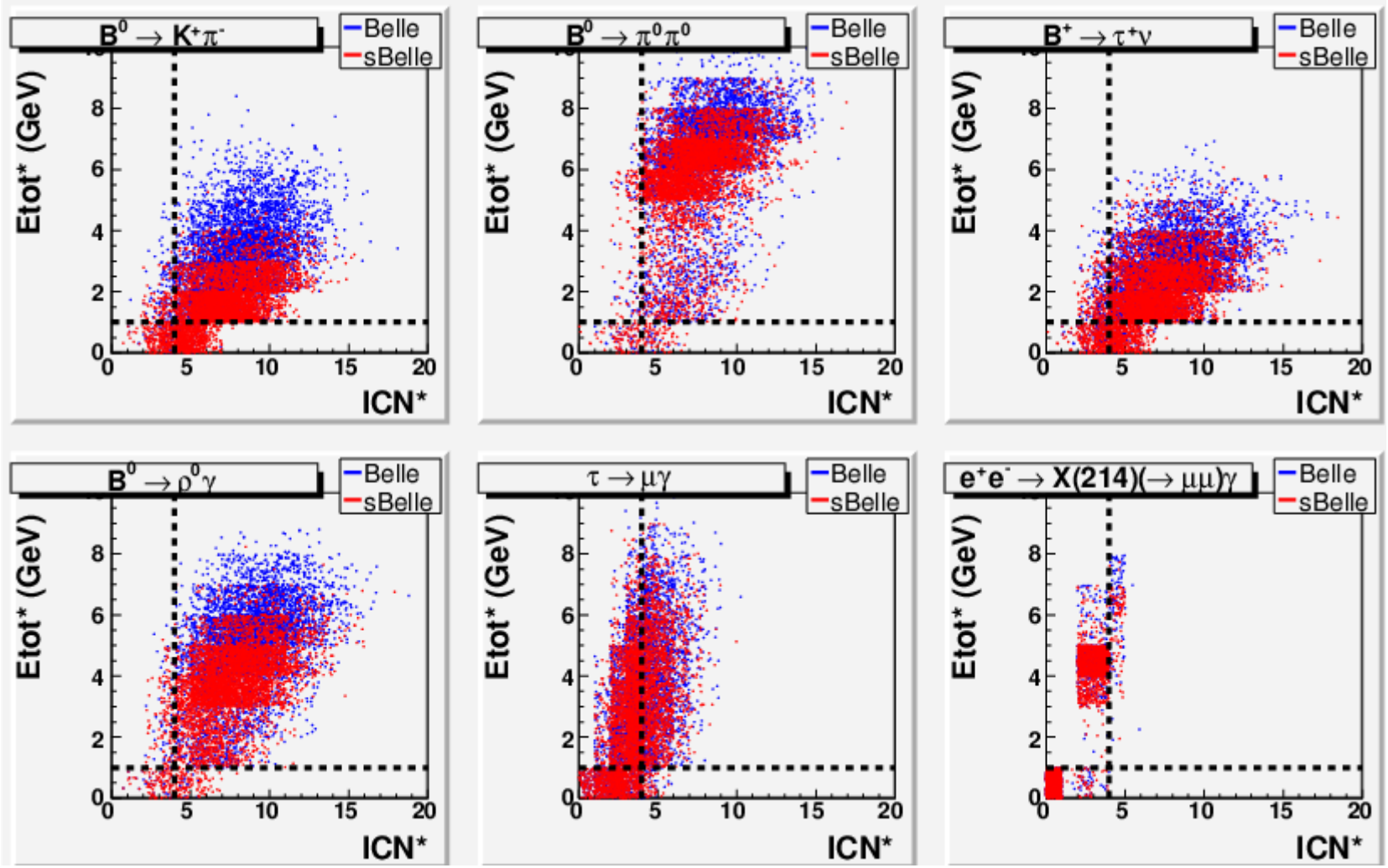
Belle vs sBelle : Etot vs ICN

Bhabha and cosmic veto are not applied here.



Belle vs sBelle : Etot* vs ICN*

Both Bhabha and cosmic veto are applied



Belle vs sBelle : Etot* vs ICN*

Only cosmic veto is applied(no bhabha veto)