# Status on tsim ECL study 

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## ECL trigger condition

## - Bhabha

- (Bhabha*) \&\& (ICN<4)
- Bhabha* $=\left(E^{i}>E_{t h r}^{i}\right), i=1-11$
- Pre-scaled Bhabha
- (pre-Bhabha*) \&\& (ICN < 4)
- pre-Bhabha* = scaled Bhabha*
- Cosmic

|  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
| Pattern | Components |  |  |  | Thres | shold | Id(G) |
| 1 | F1+F2+B1+B2 |  |  |  |  | 5.0 |  |
| 2 | $\mathrm{F} 2+\mathrm{F} 3+\mathrm{B} 1+\mathrm{B} 2+\mathrm{C} 11+\mathrm{C} 12$ |  |  |  |  | 5.5 |  |
| 3 | F2 |  |  |  |  | 5.0 |  |
| 4 | $\mathrm{F} 3+\mathrm{C} 10+\mathrm{C} 11+\mathrm{C} 12$ |  |  |  |  | 5.0 |  |
| 5 | C1+C9+C10 |  |  |  |  | 5.0 |  |
| 6 | $\mathrm{C} 1+\mathrm{C} 2+\mathrm{C} 9$ |  |  |  |  | 5.0 |  |
| 7 | $\mathrm{C} 2+\mathrm{C} 8+\mathrm{C} 9$ |  |  |  |  | 5.0 |  |
| 8 | $\mathrm{C} 3+\mathrm{C} 7+\mathrm{C} 8$ |  |  |  |  | 5.0 |  |
| 9 | C4+C6+C7 |  |  |  |  | 5.0 |  |
| 10 | C5+C6 |  |  |  |  | 5.0 |  |
| 11 | C10 |  |  |  |  | 3.0 |  |

- $\left(I_{C N}^{A}>0\right.$ \&\& $\left.I C N_{D}>0\right)\left|\mid\left(I C N_{B}>0\right.\right.$ \&\& $\left.I C N_{C}>0\right)$
- (only barrel) || (only forward-endcap)
- Physics
- Etot * || ICN*
- Etot ${ }^{*}=($ Etot $>1 \mathrm{GeV})$ \&\& !(Bhabha) \&\& !(Cosmic)
- $\mathrm{ICN}^{*}=(\mathrm{ICN}>3) \& \&!(\mathrm{Cosmic})$

- where, Etot and ICN are in Barrel and forward-endcap


## Check tsim-ecl with Belle and sBelle

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

## Without beam backgrqund


geant3

geant4


## Belle vs sBelle : Etot distribution








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

## Check with single track

To investigate the discrepancy between gsim and g4superb, responses from single tracks ( $\gamma / \mathrm{e}-/ \mu^{-} / \pi-/ \mathrm{K}+$ ) are checked.

- Generate $\mathrm{p}=5 \mathrm{GeV} / \mathrm{c}$ single track in CM isotrapically.
- Without beam background
- Check only Barrel region





## Check with single track






Logarithm scale

- Clear differences for $\pi^{-}$and $\mathrm{K}^{+}$can be seen.
- hadron interaction effect in g4superb-ecl is strange???


## Check with single track

Comparison between w/ and w/o inner detector






Note that there is no difference between w/ and w/o inner detector for gsim too.

## Effect of beam bkg



- Beam background will be ~20 times larger than now.
- Have to place top priority on evaluation of the effect for trigger with tsim.
- Check tsim response for signal MC with "beam background".
- by using current tsim-ecl and gsim
- "beam background"(addbg) is real random-triggered data.
- Used here is exp. 51 data: 2006/04-06(peak $L=\sim 16 \times 10^{33} / \mathrm{cm}^{2} / \mathrm{sec}$ )
- (exp. 51 beam bkg) x 1,5,10,15, 20 are tested.


## Effect of beam bkg

|  |
| :---: |




## Effect of beam bkg



## Effect of beam bkg

- physics
— bhabha
beam bkg

Random triggered event under x20 bkg will be all triggered as physics event ?!.....


## Effect of beam bkg

- Beam bkg effect with addbg is overestimated for trigger study?
- Y.lwasaki-san pointed out that shaping times are very different between for trigger and energy measurement in Shaper/QT.

- If we can scale the result with addbg by $1 / 5$ or $1 / 10$ simply, Beam background effect at sBelle looks not so significant. - Anyway, need to check more detail, and correctly/carefully.


## Summary / Plan

- Summary
- Discrepancy between gsim and g4superb seems due to strange hadron interaction in g4superb(?)
- Beam bkg effect has been roughly checked with addbg. But more detail study is needed (correctly and carefully).
- To do:
- Check beam background effect more, carefully.
- Check Bhabha event
- Test new Bhabha scheme(BN477)
- Prepare tsim-ecl for sBelle
- Check cosmic trigger with cosmic event(?!)
- Compare data and mc with current Belle
- Check performance with pure Csl in g4superb(?!)


## Back up slides

## @ last sBelle meeting

## 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 Csl in g4superb(?!)

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## Belle vs sBelle : Bhabha* $\left(\mathrm{B}^{+} \rightarrow \mathrm{K}^{+} \pi^{-}\right)$



## Belle vs sBelle : Bhabha* $\left(\mathrm{B}^{0} \rightarrow \pi^{0} \pi^{0}\right)$




## Belle vs sBelle : Bhabha* $\left(\mathrm{B}^{0} \rightarrow \rho^{0} \gamma\right)$











## Belle vs sBelle : Bhabha* $\left(\mathrm{B}^{+} \rightarrow \tau^{+} v\right)$













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





## Belle vs sBelle : Bhabha* $\left(\mathrm{e}^{+} \mathrm{e}^{-} \rightarrow \mu^{+} \mu^{-} \gamma\right)$



