

# Topology Analysis <sup>\*</sup>

(v1.6.1)

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<sup>\*</sup>This package is implemented with reference to a program called TOPO, which is developed by Prof. Shuxian Du from Zhengzhou University in China and has been widely used by people in BESIII collaboration. Several years ago, when I was a PhD student working on BESIII experiment, I learned the idea of topology analysis and a lot of programming techniques from the TOPO program. So, I really appreciate Prof. Du's original work very much. To meet my own needs and to practice developing analysis tools with C++, ROOT and LaTeX, I wrote the package from scratch. At that time, the package functioned well but was relatively simple. At the end of last year (2017), my co-supervisor, Prof. Chengping Shen reminded me that it could be a useful tool for Belle II experiment as well. So, I revised and extended it, making it more well-rounded and suitable for Belle II experiment. Here, I would like to thank Prof. Du for his original work, Prof. Shen for his suggestion and encouragement, and Wencheng Yan, Sen Jia, Yubo Li, Suxian Li, Longke Li, Guanda Gong, Junhao Yin, Xiaoping Qin, Xiqing Hao, HongPeng Wang, JiaWei Zhang and Yeqi Chen for their efforts in helping me test the program.

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Table 1: Event trees and their respective initial-final states.

index	event tree (event initial-final states)	iEvtTr	iEvtIFSts	nEvts	nCmltEvts
1	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \pi^+ \omega D^-, \bar{B}^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- D^{*+}, \rho^0 \rightarrow \pi^+ \pi^-, \omega \rightarrow \pi^0 \gamma, D^- \rightarrow \mu^- \bar{\nu}_\mu K^*,$ $D^{*+} \rightarrow \pi^+ D^0, K^* \rightarrow \pi^- K^+, D^0 \rightarrow K^- a_1^+, a_1^+ \rightarrow \rho^0 \pi^+, \rho^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^+ \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma \gamma \gamma \gamma)$	0	0	1	1
2	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^* \chi_{c0}, \bar{B}^0 \rightarrow D^{*+} D_s^-, K^* \rightarrow \pi^- K^+, \chi_{c0} \rightarrow \omega K^+ K^-, D^{*+} \rightarrow \pi^+ D^0,$ $D_s^- \rightarrow \pi^0 \pi^- \bar{K}^*, \omega \rightarrow \pi^0 \pi^+ \pi^-, D^0 \rightarrow K_S K^+ K^-, \bar{K}^* \rightarrow \bar{K}^0 \gamma, K_S \rightarrow \pi^+ \pi^-, \bar{K}^0 \rightarrow K_L$ $(\Upsilon(4S) \rightarrow K_L \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^+ K^- K^- \gamma \gamma \gamma \gamma)$	1	1	1	2
3	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ \bar{D}^{*-} D^{*0}, \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D_0^{*+}, \bar{D}^{*-} \rightarrow \pi^0 D^-, D^{*0} \rightarrow \pi^0 D^0, D_0^{*+} \rightarrow \pi^0 D^+,$ $D^- \rightarrow e^- \bar{\nu}_e K^*, D^0 \rightarrow \pi^0 \pi^+ K^-, D^+ \rightarrow K_L a_1^+, K^* \rightarrow \pi^- K^+, a_1^+ \rightarrow \rho^0 \pi^+, \rho^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \mu^- \bar{\nu}_\mu K_L \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- \gamma \gamma \gamma \gamma \gamma \gamma)$	2	2	1	3
4	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^+ \pi^+ \pi^- \bar{D}^{*-}, \bar{B}^0 \rightarrow D^{*+} D_s^-, \bar{D}^{*-} \rightarrow \pi^0 D^-, D^{*+} \rightarrow \pi^+ D^0, D_s^- \rightarrow D_s^- \gamma,$ $D^- \rightarrow K_L a_1^-, D^0 \rightarrow K^+ K^-, D_s^- \rightarrow \rho^- \eta', a_1^- \rightarrow \rho^0 \pi^-, \rho^- \rightarrow \pi^0 \pi^-, \eta' \rightarrow \pi^+ \pi^- \eta,$ $\rho^0 \rightarrow \pi^+ \pi^-, \eta \rightarrow \gamma \gamma$ $(\Upsilon(4S) \rightarrow K_L \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	3	3	1	4
5	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow e^+ \nu_e D^-, \bar{B}^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- D^{*+}, D^- \rightarrow e^- \bar{\nu}_e K^0, D^{*+} \rightarrow \pi^+ D^0, K^0 \rightarrow K_S,$ $D^0 \rightarrow e^+ \nu_e K^{*-}, K_S \rightarrow \pi^+ \pi^-, K^{*-} \rightarrow \pi^- \bar{K}^0, \bar{K}^0 \rightarrow K_L$ $(\Upsilon(4S) \rightarrow e^+ e^+ e^- \nu_e \nu_e \bar{\nu}_e K_L \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \gamma \gamma)$	4	4	1	5
6	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- \rho^+ \bar{D}^{*0}, \bar{B}^0 \rightarrow K^{*+} \bar{D}^{*-} D^{*0}, \rho^+ \rightarrow \pi^0 \pi^+, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, K^{*+} \rightarrow \pi^0 K^+,$ $\bar{D}^{*-} \rightarrow \pi^- \bar{D}^0, D^{*0} \rightarrow \pi^0 D^0, \bar{D}^0 \rightarrow e^- \bar{\nu}_e \pi^0 K^+, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+, D^0 \rightarrow \pi^0 \pi^0 \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^- e^- \bar{\nu}_e \bar{\nu}_e \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^+ \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	5	5	1	6
7	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- \bar{D}^0 D_s^{*+}, \bar{B}^0 \rightarrow \pi^0 \rho^0 \pi^- \pi^- \rho^+ D^+, \bar{D}^0 \rightarrow \pi^+ \pi^- \pi^- K^+, D_s^{*+} \rightarrow D_s^+ \gamma, \rho^0 \rightarrow \pi^+ \pi^-,$ $\rho^+ \rightarrow \pi^0 \pi^+, D^+ \rightarrow \mu^+ \nu_\mu \bar{K}^0, D_s^+ \rightarrow \mu^+ \nu_\mu \phi, \bar{K}^0 \rightarrow K_S, \phi \rightarrow K_L K_S, K_S \rightarrow \pi^+ \pi^-,$ $K_S \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \mu^+ \mu^+ \nu_\mu \nu_\mu K_L \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- \pi^- K^+ \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	6	6	1	7
8	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \tau^+ \nu_\tau D^-, \bar{B}^0 \rightarrow e^- \bar{\nu}_e D^{*+}, \tau^+ \rightarrow \bar{\nu}_\tau \pi^+ \pi^+ \pi^-, D^- \rightarrow \pi^0 \pi^- \pi^- K^+, D^{*+} \rightarrow \pi^+ D^0,$ $D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \nu_\tau \bar{\nu}_\tau \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma \gamma \gamma)$	7	7	1	8
9	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^- \rho^+ \eta p \bar{\Lambda}_c^-, \bar{B}^0 \rightarrow e^- \bar{\nu}_e \pi^0 D^+, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^+ \pi^-, \bar{\Lambda}_c^- \rightarrow \pi^- \eta' \bar{n},$ $D^+ \rightarrow \mu^+ \nu_\mu \pi^+ K^-, \eta' \rightarrow \pi^0 \pi^0 \eta, \eta \rightarrow \gamma \gamma$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \mu^+ \nu_\mu \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^- \bar{n} p \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	8	8	1	9
10	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \mu^+ \nu_\mu D_1^-, \bar{B}^0 \rightarrow \rho^- D_2^{*+}, D_1^- \rightarrow \pi^- \bar{D}^{*0}, \rho^- \rightarrow \pi^0 \pi^-, D_2^{*+} \rightarrow \pi^+ D^{*0},$ $\bar{D}^{*0} \rightarrow \bar{D}^0 \gamma, D^{*0} \rightarrow \pi^0 D^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, D^0 \rightarrow K_S K_S K_S, K_S \rightarrow \pi^0 \pi^0, K_S \rightarrow \pi^+ \pi^-,$ $K_S \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- K^+ \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	9	9	1	10

index	event tree (event initial-final states)	iEvtTr	iEvtIFSts	nEvts	nCmltEvts
11	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^+ \pi^- \rho^+ \eta D^-, \bar{B}^0 \rightarrow \pi^- \rho^+ \rho^- D^+, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \gamma \gamma, D^- \rightarrow \pi^0 K_L \pi^-,$ $\rho^+ \rightarrow \pi^0 \pi^+, \rho^- \rightarrow \pi^0 \pi^-, D^+ \rightarrow e^+ \nu_e \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e K_L \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^- \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	10	10	1	11
12	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^+ \Sigma^- \bar{\Xi}_c^{*0}, \bar{B}^0 \rightarrow \pi^- \bar{\Delta}^+ \Sigma_c^{*+}, \Sigma^- \rightarrow \pi^- n, \bar{\Xi}_c^{*0} \rightarrow \bar{\Xi}_c^0 \gamma, \bar{\Delta}^+ \rightarrow \pi^- \bar{n},$ $\Sigma_c^{*+} \rightarrow \pi^+ \Lambda_c^+, \bar{\Xi}_c^0 \rightarrow \rho^- \bar{\Xi}^+, \Lambda_c^+ \rightarrow \pi^0 \pi^+ \pi^- \Sigma^+, \rho^- \rightarrow \pi^0 \pi^-, \bar{\Xi}^+ \rightarrow \pi^+ \bar{\Lambda}, \Sigma^+ \rightarrow \pi^0 p,$ $\bar{\Lambda} \rightarrow \pi^0 \bar{n}$ $(\Upsilon(4S) \rightarrow \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- n \bar{n} \bar{p} \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	11	11	1	12
13	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 D^{*0} \bar{D}^{*0}, \bar{B}^0 \rightarrow D^{*+} a_1^-, K^0 \rightarrow K_S, D^{*0} \rightarrow D^0 \gamma, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0,$ $D^{*+} \rightarrow \pi^+ D^0, a_1^- \rightarrow \pi^0 \rho^-, K_S \rightarrow \pi^+ \pi^-, D^0 \rightarrow \pi^0 \pi^+ \pi^- \bar{K}^*, \bar{D}^0 \rightarrow K_S K^+ K^-, D^0 \rightarrow e^+ \nu_e \pi^- \bar{K}^0,$ $\rho^- \rightarrow \pi^0 \pi^-, \bar{K}^* \rightarrow \pi^0 \bar{K}^0, K_S \rightarrow \pi^0 \pi^0, \bar{K}^0 \rightarrow K_S, \bar{K}^0 \rightarrow K_S, K_S \rightarrow \pi^+ \pi^-,$ $K_S \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^+ \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	12	12	1	13
14	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \mu^+ \nu_\mu \bar{D}^{*-}, \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D_1'^+, \bar{D}^{*-} \rightarrow \pi^- \bar{D}^0, D_1'^+ \rightarrow \pi^0 D^{*+}, \bar{D}^0 \rightarrow \pi^- K^+,$ $D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow K^- a_1^+, a_1^+ \rightarrow \pi^0 \rho^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \mu^+ \mu^- \nu_\mu \bar{\nu}_\mu \pi^+ \pi^+ \pi^- \pi^- K^+ K^- \gamma \gamma \gamma \gamma \gamma)$	13	13	1	14
15	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^- \bar{D}^0 D_s^+, \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D^{*+}, K^0 \rightarrow K_L, \bar{D}^0 \rightarrow \pi^0 \pi^0 K^+ K^-, D_s^+ \rightarrow \rho^+ \eta,$ $D^{*+} \rightarrow \pi^+ D^0, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^+ \pi^-, D^0 \rightarrow e^+ \nu_e K^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \mu^- \bar{\nu}_\mu K_L \pi^+ \pi^+ \pi^+ \pi^- K^+ K^- K^- K^- \gamma \gamma \gamma \gamma \gamma \gamma \gamma)$	14	14	1	15
rest	$\Upsilon(4S) \rightarrow \text{others}$ $(\Upsilon(4S) \rightarrow \text{corresponding to others})$	—	—	185	200

Table 2: Event initial-final states.

index	event initial-final states	iEvtIFSts	nEvts	nCmltEvts
1	$e^+e^- \rightarrow \mu^+\mu^-\nu_\mu\bar{\nu}_\mu\pi^+\pi^+\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma$	13	3	3
2	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+K^+K^-K^-\gamma\gamma\gamma\gamma$	1	1	4
3	$e^+e^- \rightarrow e^-\bar{\nu}_e\mu^-\bar{\nu}_\mu K_L\pi^+\pi^+\pi^+\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma$	2	1	5
4	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	3	1	6
5	$e^+e^- \rightarrow e^+e^+e^-\nu_e\nu_e\bar{\nu}_e K_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\gamma\gamma$	4	1	7
6	$e^+e^- \rightarrow e^-e^-\bar{\nu}_e\bar{\nu}_e\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	5	1	8
7	$e^+e^- \rightarrow \mu^+\mu^+\nu_\mu\nu_\mu K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	6	1	9
8	$e^+e^- \rightarrow e^-\bar{\nu}_e\nu_\tau\bar{\nu}_\tau\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma$	7	1	10
9	$e^+e^- \rightarrow e^-\bar{\nu}_e\mu^+\nu_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^-\bar{n}p\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	8	1	11
10	$e^+e^- \rightarrow \mu^+\nu_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	9	1	12
11	$e^+e^- \rightarrow e^+\nu_e K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	10	1	13
12	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-n\bar{n}\bar{n}p\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	11	1	14
13	$e^+e^- \rightarrow e^+\nu_e\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	12	1	15
14	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma$	0	1	16
15	$e^+e^- \rightarrow e^+\nu_e\mu^-\bar{\nu}_\mu K_L\pi^+\pi^+\pi^+\pi^-K^+K^-K^-K^-\gamma\gamma\gamma\gamma\gamma\gamma$	14	1	17
16	$e^+e^- \rightarrow e^-\bar{\nu}_e K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma$	15	1	18
17	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	16	1	19
18	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	17	1	20
19	$e^+e^- \rightarrow e^-\bar{\nu}_e K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma$	18	1	21
20	$e^+e^- \rightarrow K_L K_L K_L\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma$	19	1	22
21	$e^+e^- \rightarrow e^+\nu_e\mu^-\mu^-\bar{\nu}_\mu\bar{\nu}_\mu K_L K_L\pi^+\gamma\gamma\gamma\gamma\gamma\gamma$	20	1	23
22	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma$	21	1	24
23	$e^+e^- \rightarrow e^+e^-\nu_e\nu_e\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	22	1	25
24	$e^+e^- \rightarrow e^+\nu_e\mu^+\mu^-\nu_\mu\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma$	23	1	26
25	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+n\bar{n}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	24	1	27
26	$e^+e^- \rightarrow K_L K_L K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	25	1	28
27	$e^+e^- \rightarrow e^-\bar{\nu}_e K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^-K^-\gamma\gamma\gamma\gamma$	26	1	29
28	$e^+e^- \rightarrow \mu^-\nu_\mu K_L K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	27	1	30
29	$e^+e^- \rightarrow e^+e^-\nu_e\bar{\nu}_e\pi^+\pi^+\pi^+\pi^-\pi^-K^-K^-\gamma\gamma$	28	1	31
30	$e^+e^- \rightarrow \mu^+\mu^-\nu_\mu\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma$	29	1	32
31	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^+K^+K^-\bar{n}p\gamma\gamma$	30	1	33
32	$e^+e^- \rightarrow \mu^+\nu_\mu\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-K^-n\bar{n}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	31	1	34

index	event initial-final states	iEvtIFSts	nEvts	nCmltEvts
33	$e^+e^- \rightarrow e^+\nu_e\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	32	1	35
34	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^-\bar{n}p\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	33	1	36
35	$e^+e^- \rightarrow e^-\bar{\nu}_e\mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+n\bar{n}\gamma\gamma\gamma\gamma\gamma$	34	1	37
36	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	35	1	38
37	$e^+e^- \rightarrow K_LK_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-p\bar{p}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	36	1	39
38	$e^+e^- \rightarrow e^-\bar{\nu}_eK_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	37	1	40
39	$e^+e^- \rightarrow e^-\bar{\nu}_eK_LK_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	38	1	41
40	$e^+e^- \rightarrow e^+\nu_e\mu^-\nu_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	39	1	42
41	$e^+e^- \rightarrow e^+e^-\mu^+\nu_\mu K_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	40	1	43
42	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	41	1	44
43	$e^+e^- \rightarrow \mu^+\nu_\mu K_LK_L\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	42	1	45
44	$e^+e^- \rightarrow \mu^+\nu_\mu K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	43	1	46
45	$e^+e^- \rightarrow K_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-K^+K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	44	1	47
46	$e^+e^- \rightarrow e^+\nu_e\mu^+\mu^-\nu_\mu\bar{\nu}_\mu\pi^+\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	45	1	48
47	$e^+e^- \rightarrow \mu^+\nu_\mu K_LK_L\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	46	1	49
48	$e^+e^- \rightarrow e^+e^+\nu_e\nu_e\mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	47	1	50
49	$e^+e^- \rightarrow e^+\nu_e\mu^+\mu^-\nu_\mu\bar{\nu}_\mu\nu_\tau\bar{\nu}_\tau\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^-\bar{n}p\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	48	1	51
50	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu K_LK_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-K^+\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	49	1	52
51	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^+K^-\bar{n}p\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	50	1	53
52	$e^+e^- \rightarrow \mu^-\bar{\nu}_\mu K_LK_L\pi^+\pi^+\pi^+\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	51	1	54
53	$e^+e^- \rightarrow e^-\bar{\nu}_e\mu^+\nu_\mu\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	52	1	55
54	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	53	1	56
55	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^+K^-\bar{n}\bar{n}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	54	1	57
56	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-K^+K^+p\bar{p}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	55	1	58
57	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-K^+K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	56	1	59
58	$e^+e^- \rightarrow K_LK_LK_L\pi^+\pi^+\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\pi^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	57	1	60
59	$e^+e^- \rightarrow e^+e^+e^-\nu_e\nu_e\bar{\nu}_e\pi^+\pi^+\pi^+\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	58	1	61
60	$e^+e^- \rightarrow e^+e^-\nu_e\bar{\nu}_e\mu^-\bar{\nu}_\mu K_LK_L\pi^+\pi^+\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	59	1	62
61	$e^+e^- \rightarrow e^-\bar{\nu}_e\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+n\bar{n}p\bar{p}\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	60	1	63
62	$e^+e^- \rightarrow e^+e^-\nu_e\bar{\nu}_e\mu^-\bar{\nu}_\mu\pi^+\pi^+\pi^+\pi^-\pi^-K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	61	1	64
63	$e^+e^- \rightarrow \pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-K^+K^+K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	62	1	65
64	$e^+e^- \rightarrow e^+\nu_e K_L\pi^+\pi^+\pi^+\pi^+\pi^-\pi^-\pi^-\pi^-K^-\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma\gamma$	63	1	66



[illegible]







