

Topology Analysis ^{*†‡§}

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[†]This package is implemented referring to a program called TOPO, which is first developed by Prof. Shuxian Du from Zhengzhou University and later extended and maintained by Prof. Gang Li from Institute of High Energy Physics, Chinese Academy of Sciences. The TOPO program has been widely used by colleagues in BESIII collaboration. Several years ago, when I was a Ph.D. student working on the BESIII experiment, I learned the idea of topology analysis and a lot of programming techniques from the TOPO program. So, I really appreciate the original works of Prof. Du and Prof. Li 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 2017, when I just started my post-doctoral research at Beihang University, my co-supervisor Prof. Chengping Shen reminded me that it could be a useful tool for the Belle II experiment as well. So, I revised and extended it, making it more well-rounded and suitable for the Belle II experiment. Now, it also applies to many other similar high energy physics experiments. Here, I would like to thank Prof. Du and Prof. Li for their original works, and Prof. Shen for his suggestion, guidance, support, and encouragement.

[‡]Besides, I would like to thank all of the people who have helped me in the development of the program. I am particularly grateful to Prof. Xingtao Huang for his comments on the principles and styles of the program, to Remco de Boer for his suggestions on the tex output and the use of GitHub, and to Xi Chen for his discussions on the core algorithms. I am especially indebted to Prof. Xiqing Hao, Longke Li, Xiaoping Qin, Ilya Komarov, Yubo Li, Guanda Gong, Suxian Li, Junhao Yin, Prof. Xiaolong Wang, Yeqi Chen, Hannah Wakeling, Hongrong Qi, Hui Li, Ning Cao, Sanjeeda Bharati Das, Kazuki Kojima, Tingting Han, Fang Yan, Lin Wang, Meiru An, and Noreen Rauls for their advice in extending and perfecting the program. Also, I thank Xi'an Xiong, Runqiu Ma, Wencheng Yan, Sen Jia, Lu Cao, Dong Liu, Hongpeng Wang, Jiawei Zhang, Jiajun Liu, Maoqiang Jing, Yi Zhang, Wei Shan, and Yadi Wang for their efforts in helping me test the program.

[§]The paper on the tool has been published by *Computer Physics Communications*. You can find this paper and the preprint corresponding to it in the links [Comput. Phys. Commun. 258 \(2021\) 107540](#) and [arXiv:2001.04016](#), respectively. If the tool really helps your researches, we would appreciate it very much if you could cite the paper in your publications.

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

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
1	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^{*-} D^{*0}, \bar{B}^0 \rightarrow \rho^- D^+, D^{*-} \rightarrow \pi^- \bar{D}^0, D^{*0} \rightarrow \pi^0 D^0, \rho^- \rightarrow \pi^0 \pi^-,$ $D^+ \rightarrow \pi^+ \pi^+ K^-, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^-)$	2963	6	6
2	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^- D^{*0}, \bar{B}^0 \rightarrow \bar{K}^0 K^+ K^-, D^- \rightarrow \pi^0 \pi^- K^*, D^{*0} \rightarrow \pi^0 D^0, \bar{K}^0 \rightarrow K_L^0,$ $K^* \rightarrow \pi^0 K^0, D^0 \rightarrow K^- a_1^+, K^0 \rightarrow K_L^0, a_1^+ \rightarrow \pi^0 \rho^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^- K^+ K^+ K^- K^-)$	160	4	10
3	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^* \gamma, B^0 \rightarrow D^{*-} D_{s1}^+, K^* \rightarrow \pi^- K^+, D^{*-} \rightarrow \pi^- \bar{D}^0, D_{s1}^+ \rightarrow K^+ D^{*0},$ $\bar{D}^0 \rightarrow \pi^0 \phi, D^{*0} \rightarrow \pi^0 D^0, \phi \rightarrow K^+ K^-, D^0 \rightarrow \pi^+ \pi^- \bar{K}^*, \bar{K}^* \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^+ K^- K^- \gamma)$	634	3	13
4	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \bar{K}^0 K^* \bar{D}^0, \bar{B}^0 \rightarrow \pi^0 D^{*0}, \bar{K}^0 \rightarrow K_S^0, K^* \rightarrow \pi^0 K^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^{*+},$ $D^{*0} \rightarrow \pi^0 D^0, K_S^0 \rightarrow \pi^+ \pi^-, K^0 \rightarrow K_S^0, K^{*+} \rightarrow \pi^0 K^+, D^0 \rightarrow \pi^+ K^-, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	854	3	16
5	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^- K^+ D^{*+} D^{*-}, \bar{B}^0 \rightarrow \rho^- D^{*+}, D^{*+} \rightarrow \pi^0 D^+, D^{*-} \rightarrow \pi^- \bar{D}^0, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, D^+ \rightarrow \pi^+ K^+ K^-, \bar{D}^0 \rightarrow K^+ a_1^-, D^0 \rightarrow \pi^0 \pi^+ K^- \gamma^F, a_1^- \rightarrow \pi^0 \rho^-, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^+ K^- K^- \gamma^F)$	2558	3	19
6	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ \eta D^-, \bar{B}^0 \rightarrow \pi^+ K_0^{*-}, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^0 \pi^0, D^- \rightarrow \pi^0 \pi^+ \pi^- \pi^-,$ $K_0^{*-} \rightarrow \pi^0 K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^-)$	2903	3	22
7	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^{*-} \gamma, \bar{B}^0 \rightarrow \rho^0 \pi^- \eta \omega D^+, \rho^+ \rightarrow \pi^0 \pi^+, D^{*-} \rightarrow \pi^- \bar{D}^0, \rho^0 \rightarrow \pi^+ \pi^-,$ $\eta \rightarrow \gamma \gamma, \omega \rightarrow \pi^0 \pi^+ \pi^-, D^+ \rightarrow \pi^0 \pi^+ \bar{K}^*, \bar{D}^0 \rightarrow K^+ K^-, \bar{K}^* \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- K^- \gamma \gamma \gamma)$	16	2	24
8	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^- K_0^{*+}, \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D^{*+}, K_0^{*+} \rightarrow \pi^0 K^+, D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow \pi^0 K_L^0 \pi^+ \pi^-,$ $K_L^0 \rightarrow e^+ \nu_e \pi^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^-)$	52	2	26
9	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^+ K^+ K^- K^{*+} K^{*-} D^{*-}, \bar{B}^0 \rightarrow \pi^0 D^0, K^{*+} \rightarrow \pi^+ K^0, K^{*-} \rightarrow \pi^- \bar{K}^0, D^{*-} \rightarrow \pi^- \bar{D}^0,$ $D^0 \rightarrow \pi^0 \pi^+ K^- \gamma^F, K^0 \rightarrow K_S^0, \bar{K}^0 \rightarrow K_L^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F)$	74	2	28
10	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow J/\psi \bar{K}_1^0, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \rho^- K^+, J/\psi \rightarrow \pi^- \bar{K}^0 K^{*+},$ $\bar{K}_1^0 \rightarrow \rho^+ K^-, \rho^- \rightarrow \pi^0 \pi^-, \bar{K}^0 \rightarrow K_L^0, K^{*+} \rightarrow \pi^+ K^0, \rho^+ \rightarrow \pi^0 \pi^+, K^0 \rightarrow K_L^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	125	2	30
11	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^* \eta_c(2S), \bar{B}^0 \rightarrow D^+ a_1^-, K^* \rightarrow \pi^- K^+, \eta_c(2S) \rightarrow \pi^+ K^0 K^-, D^+ \rightarrow K_L^0 \pi^+ \pi^+ K^-,$ $a_1^- \rightarrow \pi^0 \rho^-, K^0 \rightarrow K_L^0, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^- K^-)$	162	2	32

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
12	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^- D^{*0}, \bar{B}^0 \rightarrow \rho^- D^{*+}, D^- \rightarrow \pi^- K^- K^{*+}, D^{*0} \rightarrow \pi^0 D^0, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, K^{*+} \rightarrow \pi^0 K^+, D^0 \rightarrow \pi^0 \pi^+ K^-, \bar{D}^0 \rightarrow \pi^+ K^- \gamma^F$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- K^- \gamma^F)$	166	2	34
13	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \rho^+ \omega K^* \bar{K}^* D^{*-}, \bar{B}^0 \rightarrow \pi^0 K_2^{*0}, \rho^+ \rightarrow \pi^0 \pi^+, \omega \rightarrow \pi^0 \pi^+ \pi^-, K^* \rightarrow \pi^- K^+,$ $\bar{K}^* \rightarrow \pi^+ K^-, D^{*-} \rightarrow \pi^- \bar{D}^0, K_2^{*0} \rightarrow \pi^+ K^-, \bar{D}^0 \rightarrow \pi^0 \rho^- K^+, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- K^-)$	184	2	36
14	$\Upsilon(4S) \rightarrow \bar{B}^0 \bar{B}^0, \bar{B}^0 \rightarrow K^+ K_0^{*-}, \bar{B}^0 \rightarrow \pi^- D^{*+} \gamma^F \gamma^F, K_0^{*-} \rightarrow \pi^0 K^-, D^{*+} \rightarrow \pi^0 D^+, D^+ \rightarrow \mu^+ \nu_\mu \bar{K}^0,$ $\bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^0 \pi^0 \pi^0 \pi^- K^+ K^- \gamma^F \gamma^F)$	211	2	38
15	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^+ \eta' D^{*-}, \bar{B}^0 \rightarrow \pi^+ K_0^{*-}, \eta' \rightarrow \pi^0 \pi^0 \eta, D^{*-} \rightarrow \pi^0 D^-, K_0^{*-} \rightarrow \pi^0 K^-,$ $\eta \rightarrow \pi^0 \pi^0 \pi^0, D^- \rightarrow \pi^0 \pi^- K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- K^-)$	243	2	40
16	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^- K_0^{*+}, \bar{B}^0 \rightarrow \pi^+ \pi^- K^- D^+ \bar{D}^{*0}, \rho^- \rightarrow \pi^0 \pi^-, K_0^{*+} \rightarrow \pi^0 K^+, D^+ \rightarrow \pi^0 \pi^+ K_S^0,$ $\bar{D}^{*0} \rightarrow \bar{D}^0 \gamma, K_S^0 \rightarrow \pi^0 \pi^0, \bar{D}^0 \rightarrow \pi^0 K_S^0, \pi^0 \rightarrow e^+ e^- \gamma^F, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- K^+ K^- \gamma^F \gamma^F)$	265	2	42
17	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D^{*+}, \bar{D}^{*0} \rightarrow \bar{D}^0 \gamma, D^{*+} \rightarrow \pi^+ D^0, \bar{D}^0 \rightarrow \pi^- K^+,$ $D^0 \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^+ \pi^+ \pi^- K^+ K^- \gamma)$	293	2	44
18	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow K^- D^{*+} \bar{D}^{*0}, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+ \gamma^F \gamma^F, D^{*+} \rightarrow \pi^+ D^0, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0,$ $D^0 \rightarrow e^+ \nu_e K^{*-}, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+ \gamma^F, K^{*-} \rightarrow \pi^0 K^-$ $(\Upsilon(4S) \rightarrow e^+ e^- \nu_e \bar{\nu}_e \pi^0 \pi^0 \pi^0 \pi^+ \pi^- K^+ K^+ K^- K^- \gamma^F \gamma^F \gamma^F)$	314	2	46
19	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} D_s^+, \bar{B}^0 \rightarrow K^- D^{*+} \gamma^F, D^{*-} \rightarrow \pi^0 D^-, D_s^+ \rightarrow \pi^+ \eta', D^{*+} \rightarrow \pi^+ D^0,$ $D^- \rightarrow \pi^0 \pi^- K^*, \eta' \rightarrow \rho^0 \gamma, D^0 \rightarrow \pi^0 \pi^0 \pi^+ \pi^-, K^* \rightarrow \pi^- K^+, \rho^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	378	2	48
20	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- \rho^+ \rho^- D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+, \rho^+ \rightarrow \pi^0 \pi^+,$ $\rho^- \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^0 D^+, D^+ \rightarrow \pi^0 \pi^+ \bar{K}^*, \bar{K}^* \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^-)$	392	2	50
21	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow \pi^0 \omega \omega K^- D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+ \gamma^F \gamma^F, \omega \rightarrow \pi^0 \pi^+ \pi^-,$ $\omega \rightarrow \pi^0 \pi^+ \pi^-, D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow \pi^0 \pi^+ K^- \gamma^F$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- K^- \gamma^F \gamma^F \gamma^F)$	417	2	52
22	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^- K^+, \bar{B}^0 \rightarrow \pi^+ \pi^- D^+ D_s^-, D^+ \rightarrow \pi^0 \pi^+ \omega, D_s^- \rightarrow \pi^0 \pi^- \omega, \omega \rightarrow \pi^0 \pi^+ \pi^-,$ $\omega \rightarrow \pi^0 \pi^+ \pi^- \gamma^F$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ \gamma^F)$	418	2	54
23	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 f_0(980), \bar{B}^0 \rightarrow \mu^- \bar{\nu}_\mu D^{*+}, f_0(980) \rightarrow K^+ K^- \gamma^F, D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^+ \pi^+ K^+ K^- K^- \gamma^F)$	420	2	56

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
24	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^- K_0^{*+}, B^0 \rightarrow \pi^0 \pi^+ \omega D^-, K_0^{*+} \rightarrow \pi^0 K^+, \omega \rightarrow \pi^0 \pi^+ \pi^-, D^- \rightarrow \pi^- \eta K_S^0,$ $\eta \rightarrow \pi^0 \pi^+ \pi^-, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	425	2	58
25	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^0 \omega \omega \bar{D}^0, \bar{B}^0 \rightarrow \bar{K}^0 K^+ K^-, \omega \rightarrow \pi^0 \pi^+ \pi^-, \omega \rightarrow \pi^0 \pi^+ \pi^-, \bar{D}^0 \rightarrow \pi^+ \pi^- K^*,$ $\bar{K}^0 \rightarrow K_S^0, K^* \rightarrow \pi^0 K^0, K_S^0 \rightarrow \pi^0 \pi^0, K^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	433	2	60
26	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \pi^0 K^0 K^- \phi D^{*+}, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+ \gamma^F, K^0 \rightarrow K_L^0, \phi \rightarrow K^+ K^-,$ $D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow K^- a_1^+, a_1^+ \rightarrow \pi^0 \rho^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ K^+ K^+ K^- K^- K^- \gamma^F)$	464	2	62
27	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} D_s^{*+}, \bar{B}^0 \rightarrow K_S^0 \eta_c(2S), D^{*-} \rightarrow \pi^- \bar{D}^0, D_s^{*+} \rightarrow D_s^+ \gamma, K_S^0 \rightarrow \pi^0 \pi^0,$ $\eta_c(2S) \rightarrow K^+ K^-, \bar{D}^0 \rightarrow \pi^0 \pi^0 \pi^- K^+, D_s^+ \rightarrow \pi^+ \pi^+ \pi^+ \pi^- \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma)$	465	2	64
28	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^{*-} D^{*0}, \bar{B}^0 \rightarrow \pi^0 D^0, D^{*-} \rightarrow \pi^- \bar{D}^0, D^{*0} \rightarrow \pi^0 D^0, D^0 \rightarrow \pi^0 \pi^+ K^-,$ $\bar{D}^0 \rightarrow \mu^- \bar{\nu}_\mu K^{*+} \gamma^F, D^0 \rightarrow \pi^0 \pi^+ K^-, K^{*+} \rightarrow K^+ \gamma$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- K^+ K^+ K^- K^- \gamma^F \gamma)$	466	2	66
29	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^- K_0^{*+}, \bar{B}^0 \rightarrow \pi^0 \pi^- \eta K^+ K^- D^{*+}, \rho^- \rightarrow \pi^0 \pi^-, K_0^{*+} \rightarrow \pi^0 K^+, \eta \rightarrow \pi^0 \pi^+ \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow K^- K^{*+}, K^{*+} \rightarrow \pi^+ K^0, K^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^-)$	484	2	68
30	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- K^+ \eta_c, \bar{B}^0 \rightarrow \bar{K}^0 K^+ K^-, \eta_c \rightarrow K^- p \bar{\Lambda}, \bar{K}^0 \rightarrow K_S^0, \bar{\Lambda} \rightarrow \pi^+ \bar{p},$ $K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^- K^+ K^+ K^- K^- p \bar{p})$	488	2	70
31	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^+ K^-, \bar{B}^0 \rightarrow \rho^- K^+ K^{*-} D^{*+} \gamma^F, \rho^- \rightarrow \pi^0 \pi^-, K^{*-} \rightarrow \pi^0 K^-, D^{*+} \rightarrow \pi^0 D^+,$ $D^+ \rightarrow e^+ \nu_e \bar{K}^0 \gamma^F, \bar{K}^0 \rightarrow K_L^0$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 K_L^0 \pi^- K^+ K^+ K^- K^- \gamma^F \gamma^F)$	535	2	72
32	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow D^{*+} D_s^{*-}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+, D^{*+} \rightarrow \pi^+ D^0,$ $D_s^{*-} \rightarrow D_s^- \gamma, D^0 \rightarrow \pi^+ \pi^+ \pi^- K^-, D_s^- \rightarrow \tau^- \bar{\nu}_\tau, \tau^- \rightarrow \nu_\tau \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \nu_\tau \bar{\nu}_\tau \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma)$	540	2	74
33	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \pi^- \rho^+ \rho^- D^{*+}, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+, \rho^+ \rightarrow \pi^0 \pi^+, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^-)$	612	2	76
34	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 D_s^- D_s^{*+}, \bar{B}^0 \rightarrow \pi^0 \pi^+ K^-, K^0 \rightarrow K_S^0, D_s^- \rightarrow K^* K^{*-}, D_s^{*+} \rightarrow D_s^+ \gamma,$ $K_S^0 \rightarrow \pi^+ \pi^-, K^* \rightarrow \pi^- K^+, K^{*-} \rightarrow \pi^0 K^-, D_s^+ \rightarrow \pi^+ K^+ K^- \gamma^F$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F \gamma)$	644	2	78
35	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^- K^{*+}, B^0 \rightarrow \pi^0 \pi^+ \pi^+ \pi^- D^-, K^{*+} \rightarrow \pi^0 K^+, D^- \rightarrow \pi^0 K_L^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^-)$	715	2	80

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
36	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \pi^0 \pi^- \pi^- \rho^+ D^{*+} \gamma^F \gamma^F, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, \rho^+ \rightarrow \pi^0 \pi^+, D^{*+} \rightarrow \pi^+ D^0,$ $\bar{D}^0 \rightarrow \mu^- \bar{\nu}_\mu K^+, D^0 \rightarrow K^- a_1^+, a_1^+ \rightarrow \pi^0 \rho^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	758	2	82
37	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^0 \pi^- K^+, \bar{B}^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- K^- K^{*+} D^+, K^{*+} \rightarrow \pi^+ K^0, D^+ \rightarrow \pi^+ \rho^+ K^-, K^0 \rightarrow K_S^0,$ $\rho^+ \rightarrow \pi^0 \pi^+, K_S^0 \rightarrow \pi^0 \pi^0, \pi^0 \rightarrow e^+ e^- \gamma^F$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- K^- \gamma^F)$	767	2	84
38	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^*(1680)^0, \bar{B}^0 \rightarrow D^{*+} D_s^-, K^*(1680)^0 \rightarrow \pi^- K^+, D^{*+} \rightarrow D^+ \gamma, D_s^- \rightarrow \pi^- K^+ K^-,$ $D^+ \rightarrow K_L^0 a_1^+, a_1^+ \rightarrow \pi^0 \rho^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^- \pi^- K^+ K^+ K^- \gamma)$	779	2	86
39	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ a_1^-, \bar{B}^0 \rightarrow \pi^0 \pi^0 \rho^- \eta D^+, a_1^- \rightarrow \pi^0 \rho^-, \rho^- \rightarrow \pi^0 \pi^-, \eta \rightarrow \gamma \gamma,$ $D^+ \rightarrow \pi^0 \pi^+ \pi^+ \pi^- \eta, \rho^- \rightarrow \pi^0 \pi^- \gamma^F, \eta \rightarrow \pi^0 \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ \gamma^F \gamma \gamma)$	786	2	88
40	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^- D_{s1}^+, \bar{B}^0 \rightarrow \rho^+ K^{*-}, D^- \rightarrow \pi^0 \pi^- K^*, D_{s1}^+ \rightarrow \pi^0 D_s^{*+}, \rho^+ \rightarrow \pi^0 \pi^+,$ $K^{*-} \rightarrow \pi^0 K^-, K^* \rightarrow \pi^- K^+, D_s^{*+} \rightarrow D_s^+ \gamma, D_s^+ \rightarrow \rho^+ \phi, \rho^+ \rightarrow \pi^0 \pi^+, \phi \rightarrow K^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma)$	837	2	90
41	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D_2^{*-} D_s^+, \bar{B}^0 \rightarrow \pi^0 \rho^+ K^- \gamma^F, D_2^{*-} \rightarrow \pi^- \bar{D}^0, D_s^+ \rightarrow \pi^0 \pi^+ \omega, \rho^+ \rightarrow \pi^0 \pi^+,$ $\bar{D}^0 \rightarrow \pi^+ \pi^- K^*, \omega \rightarrow \pi^0 \pi^+ \pi^-, K^* \rightarrow \pi^0 K^0, K^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^- \gamma^F)$	874	2	92
42	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow \rho^- D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^0 \pi^- K^*, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, K^* \rightarrow \pi^- K^+, D^0 \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	896	2	94
43	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^*, \bar{B}^0 \rightarrow K^{*-} D^{*+} \bar{D}^0, K^* \rightarrow \pi^- K^+, K^{*-} \rightarrow \pi^0 K^- \gamma^F, D^{*+} \rightarrow \pi^+ D^0,$ $\bar{D}^0 \rightarrow \rho^- K^{*+}, D^0 \rightarrow e^+ \nu_e K^{*-}, \rho^- \rightarrow \pi^0 \pi^-, K^{*+} \rightarrow \pi^0 K^+, K^{*-} \rightarrow \pi^0 K^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F)$	905	2	96
44	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \bar{K}^{*-} D^+ D^{*-}, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, \bar{K}^{*-} \rightarrow \pi^+ K^-, D^+ \rightarrow \pi^+ \pi^+ K^-,$ $D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{D}^0 \rightarrow \pi^- K^+ \gamma^F, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F)$	908	2	98
45	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^+ D^{*-}, \bar{B}^0 \rightarrow \bar{K}^{*-} D^{*+} D^{*-}, D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{K}^{*-} \rightarrow \pi^+ K^- \gamma^F, D^{*+} \rightarrow \pi^0 D^+,$ $D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{D}^0 \rightarrow \pi^- K^+, D^+ \rightarrow e^+ \nu_e \bar{K}^0, \bar{D}^0 \rightarrow \pi^0 \pi^0 K^+ K^-, \bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F)$	941	2	100
46	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^- K^+ \gamma^F, \bar{B}^0 \rightarrow \pi^+ K^{*-} D^+ D^{*-}, \rho^- \rightarrow \pi^0 \pi^-, K^{*-} \rightarrow \pi^0 K^-, D^+ \rightarrow K_L^0 a_1^+,$ $D^{*-} \rightarrow \pi^- \bar{D}^0, a_1^+ \rightarrow \pi^+ f_0(600), \bar{D}^0 \rightarrow \pi^0 \pi^- K^{*+}, f_0(600) \rightarrow \pi^0 \pi^0, K^{*+} \rightarrow \pi^0 K^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma^F)$	1067	2	102
47	$\Upsilon(4S) \rightarrow \bar{B}^0 \bar{B}^0, \bar{B}^0 \rightarrow \pi^0 f_2', \bar{B}^0 \rightarrow \rho^0 \pi^+ \pi^- \pi^- D^{*+}, f_2' \rightarrow K^+ K^-, \rho^0 \rightarrow \pi^+ \pi^-, D^{*+} \rightarrow \pi^+ D^0,$ $D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- K^-)$	1203	2	104

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
48	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 K^0 D^+ D^-, \bar{B}^0 \rightarrow \bar{K}^0 K^+ K^-, \rho^0 \rightarrow \pi^+ \pi^-, K^0 \rightarrow K_S^0, D^+ \rightarrow \mu^+ \nu_\mu \bar{K}^*,$ $D^- \rightarrow \pi^- \phi, \bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^0 \pi^0, \bar{K}^* \rightarrow \pi^0 \bar{K}^0, \phi \rightarrow K_L^0 K_S^0, K_S^0 \rightarrow \pi^0 \pi^0,$ $\bar{K}^0 \rightarrow K_L^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	1211	2	106
49	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \bar{K}^* D^{*+} D^{*-}, \bar{D}^0 \rightarrow e^- \bar{\nu}_e K^+, \bar{K}^* \rightarrow \pi^+ K^- \gamma^F, D^{*+} \rightarrow \pi^+ D^0,$ $D^{*-} \rightarrow \pi^- \bar{D}^0, D^0 \rightarrow K^- a_1^+, \bar{D}^0 \rightarrow \mu^- \bar{\nu}_\mu K^+, a_1^+ \rightarrow \rho^0 \pi^+, \rho^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \mu^- \bar{\nu}_\mu \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F)$	1215	2	108
50	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \pi^0 \rho^0 \pi^+ \pi^- \pi^- \eta D^{*+}, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, \rho^0 \rightarrow \pi^+ \pi^-, \eta \rightarrow \pi^0 \pi^+ \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, D^0 \rightarrow e^+ \nu_e K^{*-}, K^{*-} \rightarrow \pi^- \bar{K}^0, \bar{K}^0 \rightarrow K_L^0$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- K^+)$	1224	2	110
51	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^+ K^-, \bar{B}^0 \rightarrow \pi^+ \pi^- \rho^- D^{*+}, K^0 \rightarrow K_S^0, \rho^- \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^+ D^0,$ $K_S^0 \rightarrow \pi^0 \pi^0, D^0 \rightarrow \mu^+ \nu_\mu K^-$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^- K^-)$	1241	2	112
52	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^- K^+, \bar{B}^0 \rightarrow \pi^0 \pi^+ D^0 D_s^{*-}, D^0 \rightarrow \rho^+ K^{*-}, D_s^{*-} \rightarrow D_s^- \gamma, \rho^+ \rightarrow \pi^0 \pi^+ \gamma^F,$ $K^{*-} \rightarrow \pi^0 K^-, D_s^- \rightarrow \pi^0 K_L^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^- \gamma^F \gamma)$	1334	2	114
53	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^+ K^-, \bar{B}^0 \rightarrow \pi^- \eta \eta K^0 \bar{K}^0 D^{*+}, \eta \rightarrow \gamma \gamma, \eta \rightarrow \gamma \gamma, K^0 \rightarrow K_S^0,$ $\bar{K}^0 \rightarrow K_S^0, D^{*+} \rightarrow \pi^0 D^+, K_S^0 \rightarrow \pi^+ \pi^-, K_S^0 \rightarrow \pi^+ \pi^-, D^+ \rightarrow K_L^0 K^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma \gamma \gamma)$	1339	2	116
54	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \bar{K}^* D^{*+} D^{*-}, \bar{D}^0 \rightarrow \pi^0 \pi^+ \pi^- K^*, \bar{K}^* \rightarrow \pi^+ K^- \gamma^F, D^{*+} \rightarrow \pi^+ D^0,$ $D^{*-} \rightarrow \pi^0 D^-, K^* \rightarrow \pi^- K^+, D^0 \rightarrow K^- a_1^+, \pi^0 \rightarrow e^+ e^- \gamma^F, D^- \rightarrow \pi^- \pi^- K^+ \gamma^F, a_1^+ \rightarrow \pi^0 \rho^+,$ $\rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F \gamma^F \gamma^F)$	1352	2	118
55	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- K_0^{*+}, \bar{B}^0 \rightarrow D^+ a_1^-, K_0^{*+} \rightarrow \pi^0 K^+, D^+ \rightarrow \pi^0 \pi^+ K_S^0, a_1^- \rightarrow \pi^0 \rho^-,$ $K_S^0 \rightarrow \pi^+ \pi^-, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+)$	1370	2	120
56	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \mu^+ \nu_\mu D^{*-}, \bar{B}^0 \rightarrow \rho^- D^+, D^{*-} \rightarrow \pi^0 D^-, \rho^- \rightarrow \pi^0 \pi^-, D^+ \rightarrow \pi^+ \pi^+ K^-,$ $D^- \rightarrow \pi^- \pi^- K^+$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^-)$	1375	2	122
57	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \pi^+ \eta K^-, \rho^0 \rightarrow \pi^+ \pi^-, \bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, \eta \rightarrow \pi^0 \pi^0 \pi^0,$ $\pi^0 \rightarrow e^+ e^- \gamma^F, \bar{D}^0 \rightarrow K^+ K^{*-}, K^{*-} \rightarrow \pi^- \bar{K}^0, \bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^+ \pi^- \gamma^F$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	1384	2	124
58	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} D_s^{*+}, \bar{B}^0 \rightarrow \bar{K}^0 K^+ K^- \gamma^F, D^{*-} \rightarrow \pi^0 D^-, D_s^{*+} \rightarrow D_s^+ \gamma, \bar{K}^0 \rightarrow K_S^0,$ $D^- \rightarrow \pi^0 K_L^0 \pi^-, D_s^+ \rightarrow \rho^+ \eta, K_S^0 \rightarrow \pi^0 \pi^0, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \gamma \gamma$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^- K^+ K^- \gamma^F \gamma \gamma)$	1429	2	126

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
59	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow X_{sd} \gamma, \bar{B}^0 \rightarrow D^{*+} D_s^- \gamma, X_{sd} \rightarrow \pi^- K^+, D^{*+} \rightarrow \pi^+ D^0, D_s^- \rightarrow K^* K^{*-},$ $D^0 \rightarrow \pi^0 \bar{K}_1^0, K^{*-} \rightarrow \pi^- K^+, K^{*-} \rightarrow \pi^0 K^-, \bar{K}_1^0 \rightarrow \rho^+ K^-, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma \gamma)$	1432	2	128
60	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- K_1^+, \bar{B}^0 \rightarrow D^{*+} \bar{\Lambda} \Xi^-, K_1^+ \rightarrow \pi^0 K^{*+}, D^{*+} \rightarrow D^+ \gamma, \bar{\Lambda} \rightarrow \pi^+ \bar{p},$ $\Xi^- \rightarrow \pi^- \Lambda, K^{*+} \rightarrow \pi^0 K^+, D^+ \rightarrow \pi^0 \pi^+ \pi^+ \pi^-, \Lambda \rightarrow \pi^0 n$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ n \bar{p} \gamma)$	1494	2	130
61	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^- K^+ D^0 \bar{D}^{*0}, \bar{B}^0 \rightarrow \pi^0 D^0, D^0 \rightarrow \pi^+ K^-, \bar{D}^{*0} \rightarrow \bar{D}^0 \gamma, D^0 \rightarrow \pi^0 \pi^+ K^-,$ $\bar{D}^0 \rightarrow K^+ a_1^-, a_1^- \rightarrow \pi^0 \rho^-, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma)$	1517	2	132
62	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^- a_1^+, \bar{B}^0 \rightarrow K^{*-} D^+ \bar{D}^0, D^- \rightarrow \pi^- \pi^- K^+, a_1^+ \rightarrow \pi^0 \rho^+, K^{*-} \rightarrow \pi^0 K^-,$ $D^+ \rightarrow \pi^+ \pi^+ K^-, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, \rho^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^-)$	1581	2	134
63	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \pi^+ \pi^- \rho^+ D^-, \bar{B}^0 \rightarrow \bar{X}_{sd} \gamma, \rho^0 \rightarrow \pi^+ \pi^-, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow e^- \bar{\nu}_e K^*,$ $\bar{X}_{sd} \rightarrow \pi^+ K^-, K^* \rightarrow \pi^- K^+$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma)$	1596	2	136
64	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} a_1^+, \bar{B}^0 \rightarrow \pi^0 D^0, D^{*-} \rightarrow \pi^0 D^-, a_1^+ \rightarrow \pi^+ \pi^+ \pi^- \gamma^F, D^0 \rightarrow \pi^0 K^+ K^-,$ $D^- \rightarrow \mu^- \bar{\nu}_\mu K^0, K^0 \rightarrow K_L^0$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- K^+ K^- \gamma^F)$	1645	2	138
65	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^+ K^+ K^- K^- K^{*+} D^{*-}, \bar{B}^0 \rightarrow \rho^+ K^-, K^{*+} \rightarrow \pi^+ K^0, D^{*-} \rightarrow \pi^- \bar{D}^0, \rho^+ \rightarrow \pi^0 \pi^+ \gamma^F,$ $K^0 \rightarrow K_S^0, \bar{D}^0 \rightarrow \pi^0 \pi^0 \pi^- K^+, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^+ K^- K^- \gamma^F)$	1680	2	140
66	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^{*+} D^{*-} D^0, \bar{B}^0 \rightarrow \pi^0 D^0, K^{*+} \rightarrow \pi^0 K^+, D^{*-} \rightarrow \pi^0 D^-, D^0 \rightarrow \pi^0 \bar{K}_1^0,$ $D^0 \rightarrow \pi^0 \pi^+ K^-, D^- \rightarrow \pi^0 \pi^+ \pi^- K^-, \bar{K}_1^0 \rightarrow \pi^0 \bar{K}^*, \pi^0 \rightarrow e^+ e^- \gamma^F, \bar{K}^* \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- K^+ K^- K^- K^- \gamma^F)$	1718	2	142
67	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K_2^{*0}, \bar{B}^0 \rightarrow D^{*+} \Delta^0 \bar{\Delta}^-, K_2^{*0} \rightarrow \pi^- K^+, D^{*+} \rightarrow \pi^0 D^+, \Delta^0 \rightarrow \pi^0 n,$ $\bar{\Delta}^- \rightarrow \pi^0 \bar{p}, D^+ \rightarrow \pi^+ \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- K^+ K^- n \bar{p})$	1723	2	144
68	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 K^*(1410)^0, \bar{B}^0 \rightarrow K^0 K^{*-} \phi D^{*+}, K^*(1410)^0 \rightarrow \pi^0 K^*, K^0 \rightarrow K_S^0, K^{*-} \rightarrow \pi^0 K^-,$ $\phi \rightarrow K^+ K^-, D^{*+} \rightarrow \pi^+ D^0, K^* \rightarrow \pi^- K^+, K_S^0 \rightarrow \pi^+ \pi^-, D^0 \rightarrow \rho^+ K^{*-}, \rho^+ \rightarrow \pi^0 \pi^+,$ $K^{*-} \rightarrow \pi^0 K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- K^-)$	1729	2	146
69	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ \rho^+ \rho^- \eta D^-, \bar{B}^0 \rightarrow \pi^0 D^0, \rho^+ \rightarrow \pi^0 \pi^+, \rho^+ \rightarrow \pi^0 \pi^+, \rho^- \rightarrow \pi^0 \pi^- \gamma^F,$ $\eta \rightarrow \gamma \gamma, D^- \rightarrow \rho^- K^*, D^0 \rightarrow \pi^+ K^-, \rho^- \rightarrow \pi^0 \pi^-, K^* \rightarrow \pi^0 K^0, K^0 \rightarrow K_S^0,$ $K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^- \gamma^F \gamma \gamma)$	1764	2	148

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
70	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \pi^+ \rho^- \bar{K}^0 K^+ D^{*-}, \bar{B}^0 \rightarrow \pi^0 D^0, \rho^0 \rightarrow \pi^+ \pi^-, \rho^- \rightarrow \pi^0 \pi^-, \bar{K}^0 \rightarrow K_L^0,$ $D^{*-} \rightarrow D^- \gamma, D^0 \rightarrow \pi^0 \pi^+ K^-, D^- \rightarrow \pi^0 \pi^- K^*, K^* \rightarrow \pi^- K^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma)$	1825	2	150
71	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \rho^- K^+, \bar{B}^0 \rightarrow \rho^- D^{*+}, \rho^- \rightarrow \pi^0 \pi^-, \rho^+ \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^+ D^0,$ $\pi^0 \rightarrow e^+ e^- \gamma^F, D^0 \rightarrow \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow e^+ e^- \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ \gamma^F)$	1850	2	152
72	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} \bar{\Delta}^- \Delta^{++}, \bar{B}^0 \rightarrow \rho^- D^{*+}, D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{\Delta}^- \rightarrow \pi^0 \bar{p}, \Delta^{++} \rightarrow \pi^+ p,$ $\rho^- \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^+ D^0, \bar{D}^0 \rightarrow K^+ a_1^-, D^0 \rightarrow \pi^+ K^-, a_1^- \rightarrow \pi^0 \rho^-, \rho^- \rightarrow \pi^0 \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- p \bar{p})$	1858	2	154
73	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \pi^- \eta K^* \bar{K}^* D^{*+}, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, \eta \rightarrow \pi^+ \pi^- \gamma^F, K^* \rightarrow \pi^0 K^0,$ $\bar{K}^* \rightarrow \pi^+ K^-, D^{*+} \rightarrow \pi^+ D^0, K^0 \rightarrow K_L^0, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- K^- \gamma^F)$	1863	2	156
74	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow \bar{K}^0 \bar{K}^0 D^- D_s^{*+}, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, \bar{K}^0 \rightarrow K_L^0, \bar{K}^0 \rightarrow K_L^0,$ $D^- \rightarrow \pi^0 \pi^- K_S^0, D_s^{*+} \rightarrow D_s^+ \gamma, K_L^0 \rightarrow \pi^0 \pi^0 \pi^0, K_S^0 \rightarrow \pi^+ \pi^-, D_s^+ \rightarrow \bar{K}^* K^{*+}, \bar{K}^* \rightarrow \pi^+ K^-,$ $K^{*+} \rightarrow \pi^+ K^0, K^0 \rightarrow K_L^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma)$	1875	2	158
75	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^{*-} D^{*0}, \bar{B}^0 \rightarrow \pi^0 \bar{K}_0^{*0}, D^{*-} \rightarrow \pi^0 D^-, D^{*0} \rightarrow D^0 \gamma, \bar{K}_0^{*0} \rightarrow \pi^+ K^-,$ $D^- \rightarrow \pi^- \pi^- K^+, D^0 \rightarrow \rho^+ K^{*-}, \rho^+ \rightarrow \pi^0 \pi^+, K^{*-} \rightarrow \pi^- \bar{K}^0, \bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^+ \pi^- \gamma^F$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma^F \gamma)$	1945	2	160
76	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^0 \rho^+ \eta D^{*-}, \bar{B}^0 \rightarrow \rho^- D^{*+}, \rho^0 \rightarrow \pi^+ \pi^-, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^+ \pi^-,$ $D^{*-} \rightarrow \pi^- \bar{D}^0, \rho^- \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^0 D^+, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+, D^+ \rightarrow e^+ \nu_e \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^-)$	1954	2	162
77	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D_s^{*-}, B^0 \rightarrow K^0 K^0 \bar{K}^0 D^+ D^-, D_s^{*-} \rightarrow D_s^- \gamma, K^0 \rightarrow K_L^0, K^0 \rightarrow K_S^0,$ $\bar{K}^0 \rightarrow K_L^0, D^+ \rightarrow e^+ \nu_e \bar{K}^0, D^- \rightarrow \pi^0 K_L^0 \pi^-, D_s^- \rightarrow K_S^0 K^- \gamma^F, K_S^0 \rightarrow \pi^+ \pi^-, K_L^0 \rightarrow \mu^+ \nu_\mu \pi^- \gamma^F,$ $\bar{K}^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^+ \pi^-, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \mu^+ \nu_\mu \pi^0 \pi^0 \pi^0 K_L^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F \gamma)$	1961	2	164
78	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \eta K_2^{*0}, \bar{B}^0 \rightarrow D_s^{*-} D_1^+, \eta \rightarrow \gamma \gamma, K_2^{*0} \rightarrow \pi^0 K^*, D_s^{*-} \rightarrow D_s^- \gamma,$ $D_1^+ \rightarrow \pi^+ D^{*0}, K^* \rightarrow \pi^- K^+, D_s^- \rightarrow \pi^- K^+ K^-, D^{*0} \rightarrow \pi^0 D^0, D^0 \rightarrow \rho^0 \bar{K}^*, \rho^0 \rightarrow \pi^+ \pi^-,$ $\bar{K}^* \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma \gamma \gamma)$	1984	2	166
79	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^- K^* (1680)^+, \bar{B}^0 \rightarrow K^- D^+ \bar{D}^{*0}, K^* (1680)^+ \rightarrow \pi^0 K^+, D^+ \rightarrow K_L^0 K^{*+}, \bar{D}^{*0} \rightarrow \bar{D}^0 \gamma,$ $K^{*+} \rightarrow \pi^+ K^0, \bar{D}^0 \rightarrow K^+ a_1^-, K^0 \rightarrow K_S^0, a_1^- \rightarrow \pi^+ \pi^- \pi^- \gamma^F, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma^F \gamma)$	2013	2	168
80	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^+ K^-, \bar{B}^0 \rightarrow \pi^0 \rho^0 \pi^- D^+, K^0 \rightarrow K_S^0, \rho^0 \rightarrow \pi^+ \pi^- \gamma^F, D^+ \rightarrow \pi^0 K_L^0 \pi^+,$ $K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^- \gamma^F)$	2016	2	170

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
81	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^* \bar{K}^*, B^0 \rightarrow K^0 D^- D^{*+}, K^* \rightarrow \pi^- K^+, \bar{K}^* \rightarrow \pi^+ K^-, K^0 \rightarrow K_S^0,$ $D^- \rightarrow \pi^0 \pi^+ \pi^- \pi^-, D^{*+} \rightarrow \pi^0 D^+, K_S^0 \rightarrow \pi^0 \pi^0, D^+ \rightarrow \pi^0 \pi^+ K_S^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^-)$	2023	2	172
82	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \pi^+ \pi^- \pi^- D^{*-} \gamma^F, \bar{B}^0 \rightarrow \rho^- D^+, \rho^0 \rightarrow \pi^+ \pi^- \gamma^F, D^{*-} \rightarrow \pi^- \bar{D}^0, \rho^- \rightarrow \pi^0 \pi^-,$ $D^+ \rightarrow \pi^+ \pi^+ K^{*-}, \bar{D}^0 \rightarrow K^+ a_1^-, K^{*-} \rightarrow \pi^0 K^-, a_1^- \rightarrow \pi^- f_0(600), f_0(600) \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	2027	2	174
83	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^+ K^-, \bar{B}^0 \rightarrow \pi^0 \rho^0 \pi^+ \pi^- \rho^- D^{*+}, K^0 \rightarrow K_S^0, \rho^0 \rightarrow \pi^+ \pi^- \gamma^F, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^+ D^0, K_S^0 \rightarrow \pi^0 \pi^0, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- K^- \gamma^F)$	2092	2	176
84	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} D_{s0}^{*+}, \bar{B}^0 \rightarrow \rho^- D^{*+}, D^{*-} \rightarrow \pi^- \bar{D}^0, D_{s0}^{*+} \rightarrow \pi^0 D_s^+, \rho^- \rightarrow \pi^0 \pi^-,$ $D^{*+} \rightarrow \pi^0 D^+, \bar{D}^0 \rightarrow \pi^0 \rho^- K^+, D_s^+ \rightarrow e^+ \nu_e \eta \gamma^F, D^+ \rightarrow \pi^+ \pi^+ K^- \gamma^F, \rho^- \rightarrow \pi^0 \pi^-, \eta \rightarrow \pi^0 \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	2154	2	178
85	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^0 \pi^0 \rho^+ \eta \bar{K}^0 K^* D^{*-}, \bar{B}^0 \rightarrow \pi^0 D^{*0}, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^0 \pi^0, \bar{K}^0 \rightarrow K_S^0,$ $K^* \rightarrow \pi^- K^+ \gamma^F, D^{*-} \rightarrow \pi^0 D^-, D^{*0} \rightarrow \pi^0 D^0, K_S^0 \rightarrow \pi^0 \pi^0, D^- \rightarrow \pi^- \pi^- K^+, D^0 \rightarrow \mu^+ \nu_\mu K^-$ $(\Upsilon(4S) \rightarrow \mu^+ \nu_\mu \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma^F)$	2177	2	180
86	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^+ K^- \gamma^F, \bar{B}^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- D^{*+}, K^0 \rightarrow K_S^0, D^{*+} \rightarrow \pi^+ D^0, K_S^0 \rightarrow \pi^+ \pi^-,$ $D^0 \rightarrow \pi^0 \pi^0 K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma^F)$	2180	2	182
87	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^+ D^{*-}, \bar{B}^0 \rightarrow \rho^0 \pi^- \omega D^+ n \bar{n}, D^{*-} \rightarrow \pi^0 D^-, \rho^0 \rightarrow \pi^+ \pi^-, \omega \rightarrow \pi^0 \pi^+ \pi^-,$ $D^+ \rightarrow \pi^0 \pi^+ K_S^0, D^- \rightarrow \pi^- K_S^0, K_S^0 \rightarrow \pi^0 \pi^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ n \bar{n})$	2187	2	184
88	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \pi^- \rho^+ K^0 \bar{K}^0 K^+ K^-, \bar{B}^0 \rightarrow \pi^- D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, K^0 \rightarrow K_L^0, \bar{K}^0 \rightarrow K_S^0,$ $D^{*+} \rightarrow \pi^0 D^+, K_S^0 \rightarrow \pi^+ \pi^-, D^+ \rightarrow \pi^0 \pi^+ K_S^0, K_S^0 \rightarrow \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^-)$	2205	2	186
89	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^* D_s^+ D_s^{*-}, \bar{B}^0 \rightarrow \pi^+ K^{*-}, K^* \rightarrow \pi^- K^+, D_s^+ \rightarrow K_S^0 K^+, D_s^{*-} \rightarrow D_s^- \gamma,$ $K^{*-} \rightarrow \pi^0 K^-, K_S^0 \rightarrow \pi^+ \pi^-, D_s^- \rightarrow \rho^- \eta', \rho^- \rightarrow \pi^0 \pi^-, \eta' \rightarrow \pi^+ \pi^- \eta, \eta \rightarrow \pi^0 \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma)$	2264	2	188
90	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^- K^{*+} \gamma \gamma, \bar{B}^0 \rightarrow K^- D^{*+} \bar{D}^{*0}, \rho^- \rightarrow \pi^0 \pi^-, K^{*+} \rightarrow \pi^0 K^+, D^{*+} \rightarrow \pi^+ D^0,$ $\bar{D}^{*0} \rightarrow \pi^0 \bar{D}^0, D^0 \rightarrow \pi^0 \pi^0 \pi^0 K_S^0, \bar{D}^0 \rightarrow K^+ K^{*-}, K_S^0 \rightarrow \pi^+ \pi^-, K^{*-} \rightarrow \pi^0 K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^- \pi^- K^+ K^+ K^- K^- \gamma \gamma)$	2290	2	190
91	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow D^{*-} D_{s1}^{*+}, \bar{B}^0 \rightarrow \pi^- D^+ \gamma^F, D^{*-} \rightarrow \pi^- \bar{D}^0, D_{s1}^{*+} \rightarrow \pi^0 D_s^{*+}, D^+ \rightarrow \pi^0 \pi^0 \pi^+,$ $\bar{D}^0 \rightarrow \pi^0 \pi^0 K_S^0, D_s^{*+} \rightarrow D_s^+ \gamma, K_S^0 \rightarrow \pi^0 \pi^0, D_s^+ \rightarrow \bar{K}^0 K^{*+}, \bar{K}^0 \rightarrow K_L^0, K^{*+} \rightarrow \pi^0 K^+,$ $K_L^0 \rightarrow \pi^0 \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- K^+ \gamma^F \gamma)$	2328	2	192

rowNo	decay tree (decay initial-final states)	iDcyTr	nEtr	nCEtr
92	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow D^{*+} D_{s1}^{\prime-}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+, D^{*+} \rightarrow \pi^+ D^0,$ $D_{s1}^{\prime-} \rightarrow D_s^- \gamma, D^0 \rightarrow K^* \bar{K}^*, D_s^- \rightarrow \pi^- \eta', K^* \rightarrow \pi^- K^+, \bar{K}^* \rightarrow \pi^+ K^-, \eta' \rightarrow \pi^+ \pi^- \eta,$ $\eta \rightarrow \pi^0 \pi^+ \pi^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- \pi^- \pi^- K^+ K^+ K^- \gamma)$	2329	2	194
93	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow K^0 K^+ K_0^{*-}, \bar{B}^0 \rightarrow \rho^- D_1^+, K^0 \rightarrow K_S^0, K_0^{*-} \rightarrow \pi^0 K^-, \rho^- \rightarrow \pi^0 \pi^-,$ $D_1^+ \rightarrow \pi^+ D^{*0}, K_S^0 \rightarrow \pi^+ \pi^-, D^{*0} \rightarrow \pi^0 D^0, D^0 \rightarrow \pi^+ \eta K^-, \eta \rightarrow \gamma \gamma$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^- K^- \gamma \gamma)$	2361	2	196
94	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \rho^0 \pi^+ \eta K^+ K^- D^-, \bar{B}^0 \rightarrow \pi^0 D^{*0}, \rho^0 \rightarrow \pi^+ \pi^- \gamma^F, \eta \rightarrow \gamma \gamma, D^- \rightarrow \pi^- K_S^0,$ $D^{*0} \rightarrow \pi^0 D^0, K_S^0 \rightarrow \pi^0 \pi^0, D^0 \rightarrow \pi^+ K^-$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^- K^- \gamma^F \gamma \gamma)$	2372	2	198
95	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^-, \bar{B}^0 \rightarrow \bar{K}^* D^- D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+, \bar{K}^* \rightarrow \pi^+ K^-,$ $D^- \rightarrow e^- \bar{\nu}_e K^0, D^{*+} \rightarrow \pi^+ D^0, K^0 \rightarrow K_L^0, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^0 K_L^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^- K^-)$	2374	2	200
96	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \bar{D}^0, \bar{B}^0 \rightarrow K^- D^{*+} \bar{D}^{*0}, \bar{D}^0 \rightarrow \pi^+ \pi^- \pi^- K^+, D^{*+} \rightarrow \pi^+ D^0, \bar{D}^{*0} \rightarrow \bar{D}^0 \gamma,$ $D^0 \rightarrow \pi^+ K^-, \bar{D}^0 \rightarrow \omega K^*, \omega \rightarrow \pi^0 \pi^+ \pi^-, K^* \rightarrow \pi^- K^+$ $(\Upsilon(4S) \rightarrow \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^+ K^- K^- \gamma)$	2381	2	202
97	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^0 \rho^0 \pi^+ \omega D^-, \bar{B}^0 \rightarrow \rho^- D^{*+} \gamma, \rho^0 \rightarrow \pi^+ \pi^-, \rho^0 \rightarrow \pi^+ \pi^-, \omega \rightarrow \pi^0 \pi^+ \pi^-,$ $D^- \rightarrow \mu^- \bar{\nu}_\mu K^*, \rho^- \rightarrow \pi^0 \pi^-, D^{*+} \rightarrow \pi^0 D^+, K^* \rightarrow \pi^- K^+, D^+ \rightarrow \pi^0 \pi^+$ $(\Upsilon(4S) \rightarrow \mu^- \bar{\nu}_\mu \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- \pi^- K^+ \gamma)$	2428	2	204
98	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ D^{*-}, \bar{B}^0 \rightarrow e^- \bar{\nu}_e D^{*+}, \rho^+ \rightarrow \pi^0 \pi^+, D^{*-} \rightarrow \pi^- \bar{D}^0, D^{*+} \rightarrow \pi^+ D^0,$ $\bar{D}^0 \rightarrow \pi^- K^+, D^0 \rightarrow \pi^0 \pi^+ K^-$ $(\Upsilon(4S) \rightarrow e^- \bar{\nu}_e \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^- \pi^- K^+ K^-)$	2439	2	206
99	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \pi^0 \rho^+ \eta D^-, \bar{B}^0 \rightarrow \pi^0 D^0, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \pi^0 \pi^0 \pi^0, D^- \rightarrow \pi^- \pi^- K_S^0 K^+,$ $D^0 \rightarrow e^+ \nu_e K^- \gamma^F \gamma^F, K_S^0 \rightarrow \pi^0 \pi^0$ $(\Upsilon(4S) \rightarrow e^+ \nu_e \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^0 \pi^+ \pi^- \pi^- K^+ K^- \gamma^F \gamma^F)$	2465	2	208
100	$\Upsilon(4S) \rightarrow B^0 \bar{B}^0, B^0 \rightarrow \rho^+ \eta D^{*-}, \bar{B}^0 \rightarrow K^- D^+, \rho^+ \rightarrow \pi^0 \pi^+, \eta \rightarrow \gamma \gamma, D^{*-} \rightarrow \pi^- \bar{D}^0,$ $D^+ \rightarrow \pi^0 K_L^0 \pi^+, \bar{D}^0 \rightarrow \pi^- K^+ \eta', K_L^0 \rightarrow e^- \nu_e \pi^+ \gamma^F \gamma^F, \eta' \rightarrow \pi^+ \pi^- \eta, \eta \rightarrow \gamma \gamma$ $(\Upsilon(4S) \rightarrow e^- \nu_e \pi^0 \pi^0 \pi^+ \pi^+ \pi^+ \pi^+ \pi^- \pi^- \pi^- K^+ K^- \gamma^F \gamma^F \gamma \gamma \gamma \gamma)$	2489	2	210
rest	$\Upsilon(4S) \rightarrow \text{others (3413 in total)}$ $(\Upsilon(4S) \rightarrow \text{corresponding to others})$	—	3443	3653

Table 2: Decay branches of B^0 .

rowNo	decay branch of B^0	iDcyBrP	nCase	nCCase
1	$B^0 \rightarrow \pi^0 \bar{D}^0$	3	238	238
2	$B^0 \rightarrow \rho^+ D^-$	26	220	458
3	$B^0 \rightarrow \rho^+ D^{*-}$	15	196	654
4	$B^0 \rightarrow \pi^0 \bar{D}^{*0}$	11	154	808
5	$B^0 \rightarrow K^0 K^+ K^-$	2	96	904
6	$B^0 \rightarrow \pi^0 K^+ K^-$	25	87	991
7	$B^0 \rightarrow K^- K_0^{*+}$	40	61	1052
8	$B^0 \rightarrow \pi^0 \pi^+ D^{*-}$	5	59	1111
9	$B^0 \rightarrow K^+ D^{*-} D^{*0}$	20	45	1156
10	$B^0 \rightarrow K^- K^{*+}$	77	44	1200
11	$B^0 \rightarrow D^{*-} D_{s0}^{*+}$	7	42	1242
12	$B^0 \rightarrow D^{*-} D_s^{*+}$	8	40	1282
13	$B^0 \rightarrow K^+ D^-$	107	40	1322
14	$B^0 \rightarrow \pi^0 K^* (1410)^0$	31	32	1354
15	$B^0 \rightarrow \pi^- K_0^{*+}$	48	28	1382
16	$B^0 \rightarrow D^{*-} D_{s1}'^+$	1	28	1410
17	$B^0 \rightarrow X_{sd} \gamma$	65	26	1436
18	$B^0 \rightarrow \pi^0 \pi^+ \pi^- \pi^- D^{*-}$	124	26	1462
19	$B^0 \rightarrow \mu^+ \nu_\mu D^{*-}$	69	24	1486
20	$B^0 \rightarrow \rho^- K^+$	101	24	1510
21	$B^0 \rightarrow K^+ D^- D^{*0}$	103	24	1534
22	$B^0 \rightarrow K^+ D^{*-}$	184	24	1558
23	$B^0 \rightarrow D^{*-} a_1^+$	49	23	1581
24	$B^0 \rightarrow \tau^+ \nu_\tau D^{*-}$	83	23	1604
25	$B^0 \rightarrow e^+ \nu_e D^{*-}$	30	22	1626
26	$B^0 \rightarrow D^- D_s^+$	113	22	1648
27	$B^0 \rightarrow \pi^+ D^-$	18	19	1667
28	$B^0 \rightarrow \pi^0 f_0(980)$	84	19	1686
29	$B^0 \rightarrow K^+ a_1^-$	292	19	1705
30	$B^0 \rightarrow \pi^0 K^+ K^- \gamma^F$	95	18	1723
31	$B^0 \rightarrow \rho^+ D^- \gamma$	157	17	1740
32	$B^0 \rightarrow K^0 D^{*+} D^{*-}$	32	16	1756
33	$B^0 \rightarrow D^- D_s^{*+}$	23	15	1771

rowNo	decay branch of B^0	iDcyBrP	nCase	nCCase
34	$B^0 \rightarrow \pi^0 \pi^- K^+$	52	15	1786
35	$B^0 \rightarrow D^- D_s^{*+}$	41	15	1801
36	$B^0 \rightarrow \rho^+ D^{*-} \gamma$	17	15	1816
37	$B^0 \rightarrow K^0 K^+ K^- \gamma^F$	126	15	1831
38	$B^0 \rightarrow \pi^+ D^{*-}$	127	15	1846
39	$B^0 \rightarrow D^{*-} D_s^+$	44	14	1860
40	$B^0 \rightarrow \pi^0 \rho^- K^+$	66	13	1873
41	$B^0 \rightarrow f_2(1270) K^*$	46	12	1885
42	$B^0 \rightarrow K^{*+} D^{*-} D^{*0}$	144	12	1897
43	$B^0 \rightarrow K^0 D^- D^{*+}$	346	12	1909
44	$B^0 \rightarrow K^* \gamma$	35	11	1920
45	$B^0 \rightarrow K^{*+} D^{*-} D^0$	99	11	1931
46	$B^0 \rightarrow \rho^- K_0^{*+}$	154	11	1942
47	$B^0 \rightarrow \pi^0 \pi^0 \bar{D}^0$	457	11	1953
48	$B^0 \rightarrow D_2^{*-} D_s^{*+}$	511	11	1964
49	$B^0 \rightarrow \pi^+ \pi^+ \pi^+ \pi^- \pi^- D^{*-}$	42	10	1974
50	$B^0 \rightarrow D^- a_1^+$	116	10	1984
51	$B^0 \rightarrow \pi^0 K^*$	130	10	1994
52	$B^0 \rightarrow K^+ D_s^-$	138	10	2004
53	$B^0 \rightarrow D_2^{*-} D_s^+$	226	10	2014
54	$B^0 \rightarrow e^+ \nu_e D^{*-} \gamma^F$	304	10	2024
55	$B^0 \rightarrow K^* D^{*+} D^{*-}$	96	9	2033
56	$B^0 \rightarrow \pi^0 a_0^0$	64	9	2042
57	$B^0 \rightarrow \pi^- \bar{D}^0 D_s^{*+}$	219	9	2051
58	$B^0 \rightarrow \mu^+ \nu_\mu D^-$	297	9	2060
59	$B^0 \rightarrow D^- D_{s1}^+$	355	9	2069
60	$B^0 \rightarrow \rho^- K^{*+}$	461	9	2078
61	$B^0 \rightarrow \bar{K}^0 K^+ D^-$	108	8	2086
62	$B^0 \rightarrow \rho^+ D_2^{*-}$	181	8	2094
63	$B^0 \rightarrow K^- K^* (1680)^+$	267	8	2102
64	$B^0 \rightarrow K^- K_0^{*+} \gamma^F$	269	8	2110
65	$B^0 \rightarrow e^+ \nu_e D^-$	311	8	2118
66	$B^0 \rightarrow K^* K^+ K^-$	333	8	2126
67	$B^0 \rightarrow \pi^0 \phi$	51	7	2133
68	$B^0 \rightarrow \pi^- K_0^{*+} \gamma^F$	27	7	2140

rowNo	decay branch of B^0	iDcyBrP	nCase	nCCase
69	$B^0 \rightarrow \bar{K}^0 K^+ D^{*-}$	178	7	2147
70	$B^0 \rightarrow \pi^0 \pi^0 \pi^- K^+$	229	7	2154
71	$B^0 \rightarrow \pi^0 K_2^{*0}$	281	7	2161
72	$B^0 \rightarrow K^{*} D^+ D^{*-}$	91	6	2167
73	$B^0 \rightarrow \pi^- K^{*+}$	94	6	2173
74	$B^0 \rightarrow \pi^0 \pi^0 K^+ K^-$	67	6	2179
75	$B^0 \rightarrow \pi^+ \pi^- \rho^+ D^{*-}$	73	6	2185
76	$B^0 \rightarrow \pi^- K^* (1410)^+$	75	6	2191
77	$B^0 \rightarrow K^* \eta_c(2S)$	105	6	2197
78	$B^0 \rightarrow \pi^0 \pi^0 \bar{D}^{*0}$	160	6	2203
79	$B^0 \rightarrow K^* f_0(980)$	167	6	2209
80	$B^0 \rightarrow \rho^- K^+ \gamma^F$	228	6	2215
81	$B^0 \rightarrow e^+ \nu_e D_1'^-$	409	6	2221
82	$B^0 \rightarrow \mu^+ \nu_\mu D^- \gamma^F$	92	5	2226
83	$B^0 \rightarrow K^0 D^{*0} \bar{D}^{*0}$	81	5	2231
84	$B^0 \rightarrow \rho^+ \eta D^{*-}$	55	5	2236
85	$B^0 \rightarrow \mu^+ \nu_\mu D_1^-$	14	5	2241
86	$B^0 \rightarrow e^+ \nu_e D_0^{*-} \gamma^F$	24	5	2246
87	$B^0 \rightarrow \tau^+ \nu_\tau D^-$	119	5	2251
88	$B^0 \rightarrow \pi^0 \pi^- \bar{D}^0 D_s^{*+}$	129	5	2256
89	$B^0 \rightarrow \pi^0 \pi^+ \eta D^{*-}$	188	5	2261
90	$B^0 \rightarrow \pi^0 \rho^+ \eta D^-$	189	5	2266
91	$B^0 \rightarrow \pi^0 \pi^+ \omega D^-$	220	5	2271
92	$B^0 \rightarrow \pi^0 \pi^+ D^{*-} \gamma^F$	223	5	2276
93	$B^0 \rightarrow \pi^- \bar{D}^0 D_s^+$	231	5	2281
94	$B^0 \rightarrow \tau^+ \nu_\tau D_2^{*-}$	265	5	2286
95	$B^0 \rightarrow D^{*-} D_{s1}^+$	291	5	2291
96	$B^0 \rightarrow \pi^+ \omega D^-$	378	5	2296
97	$B^0 \rightarrow \pi^0 \pi^+ \pi^- \rho^+ D^{*-}$	384	5	2301
98	$B^0 \rightarrow D_s^{*+} D_1'^-$	394	5	2306
99	$B^0 \rightarrow \rho^+ \eta D^-$	406	5	2311
100	$B^0 \rightarrow K^* D^+ D^-$	431	5	2316
rest	$B^0 \rightarrow \text{others (938 in total)}$	—	1317	3633

Table 3: Cascade decay branches of B^0 (only the first ten hierarchies are involved).

rowNo	cascade decay branch of B^0	iCascDcyBrP	nCase	nCCase
1	$B^0 \rightarrow \rho^+ D^-, \rho^+ \rightarrow \pi^0 \pi^+, D^- \rightarrow \pi^- \pi^- K^+$	27	105	105
2	$B^0 \rightarrow \pi^0 K^+ K^-$	26	87	192
3	$B^0 \rightarrow \pi^0 \bar{D}^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+$	3	84	276
4	$B^0 \rightarrow \rho^+ D^{*-}, \rho^+ \rightarrow \pi^0 \pi^+, D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{D}^0 \rightarrow \pi^- K^+$	15	78	354
5	$B^0 \rightarrow K^0 K^+ K^-, K^0 \rightarrow K_S^0, K_S^0 \rightarrow \pi^0 \pi^0$	35	64	418
6	$B^0 \rightarrow K^- K_0^{*+}, K_0^{*+} \rightarrow \pi^0 K^+$	46	57	475
7	$B^0 \rightarrow K^- K^{*+}, K^{*+} \rightarrow \pi^0 K^+$	100	43	518
8	$B^0 \rightarrow \pi^0 \bar{D}^0, \bar{D}^0 \rightarrow \pi^- K^+$	135	41	559
9	$B^0 \rightarrow \rho^+ D^{*-}, \rho^+ \rightarrow \pi^0 \pi^+, D^{*-} \rightarrow \pi^- \bar{D}^0, \bar{D}^0 \rightarrow \pi^0 \pi^- K^+$	101	30	589
10	$B^0 \rightarrow \pi^- K_0^{*+}, K_0^{*+} \rightarrow \pi^0 K^+$	58	28	617
rest	$B^0 \rightarrow \text{others (2163 in total)}$	—	3016	3633