# Preliminary results of 2D selections

Min Zhong, Yanxi Gu

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Introduction

➢ **Use "2D" cut to suppress signal overlap**
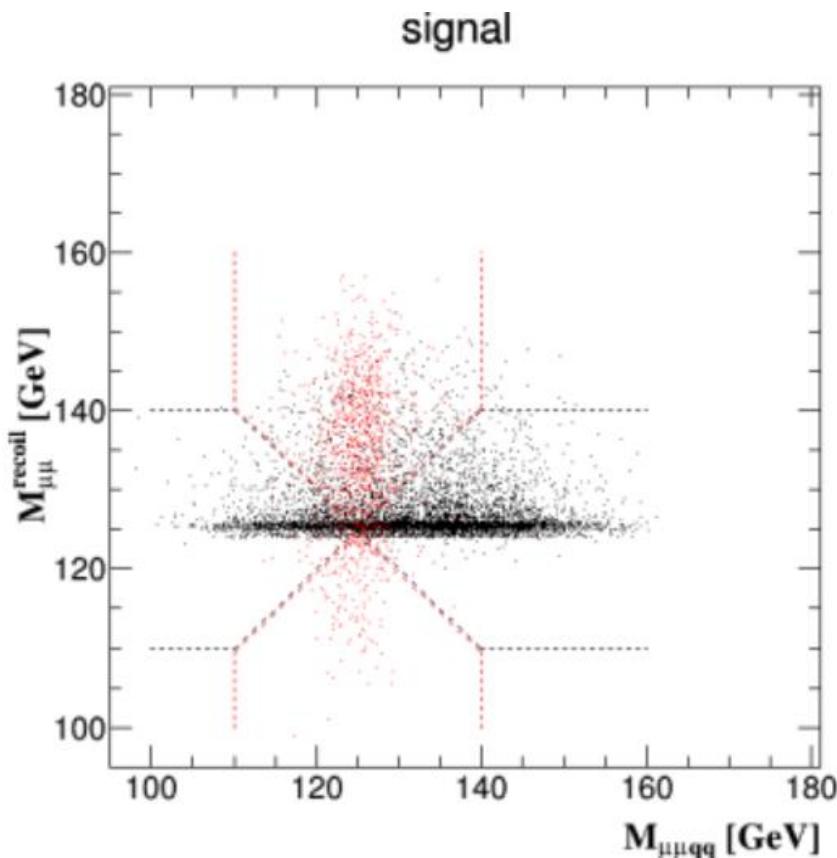
signal

- Separate this phase space into two regions, so as to eliminate the overlap of analysis region.

- μμHννqq $\longrightarrow$ "black region" or " μμHννqq' "

  ννHμμqq $\blacktriangleright$ "red region" or " ννHμμqq' "

$\mu\mu H\nu\nu qq$

➤ 2D mass distribution (signal)
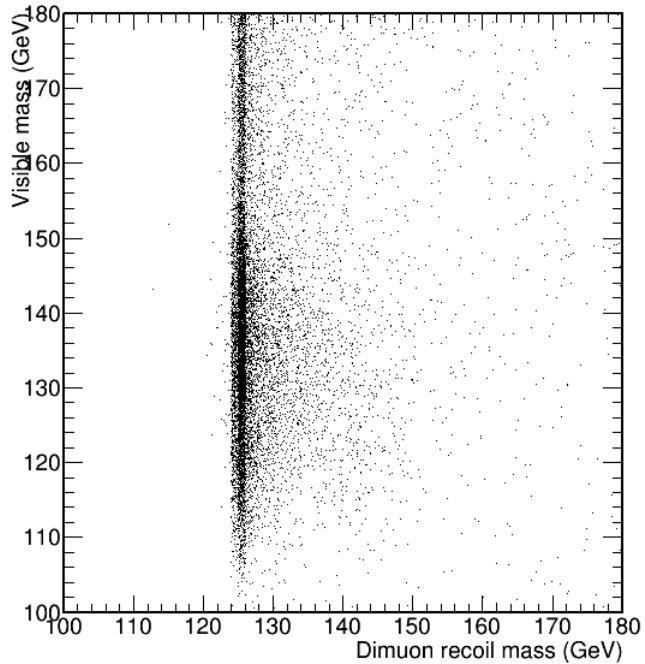
Before all cuts
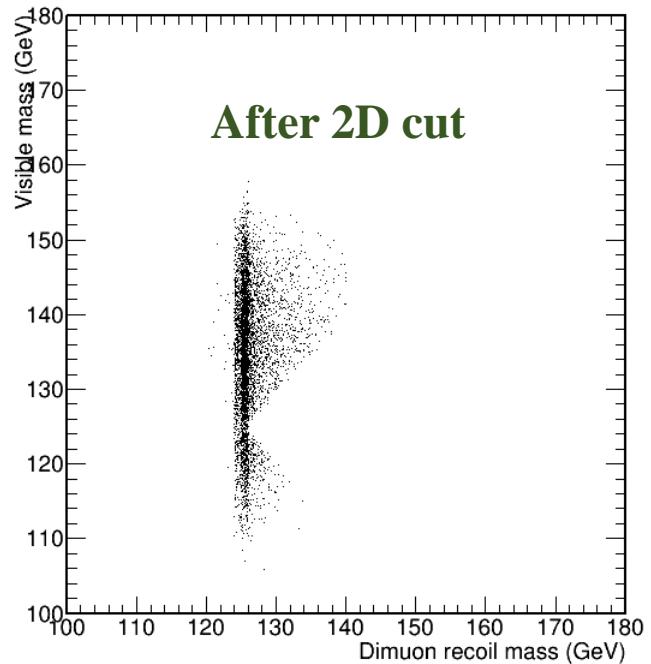
After 2D cut

➤ Suppressed: $\nu\nu H\mu\mu qq$

Before all cuts

$\mu\mu H\nu\nu qq$

➤ Cut flow comparison

	signal	ZH	2f	4f
Previous	50.14	36	0	4
2D cut applied	52.85	33	0	4

➤ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_e3e3	2	3	zz_sl0mu_down	7	1
e2e2h_ww	22	22	zz_sl0tau_up	1	1
nnh_zz	10	6	zz_l0taumu	1	2

$\mu\mu Hqq\nu\nu$

➢ **2D mass distribution (signal)**
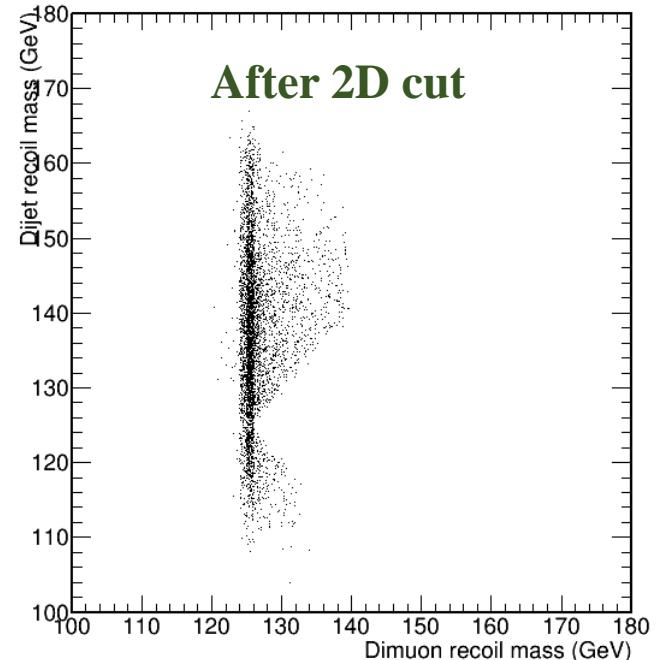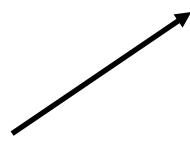
Before all cuts

➢ **Suppressed:** *qqHμμνν*

After 2D cut

Before all cuts

$\mu\mu Hqq\nu\nu$
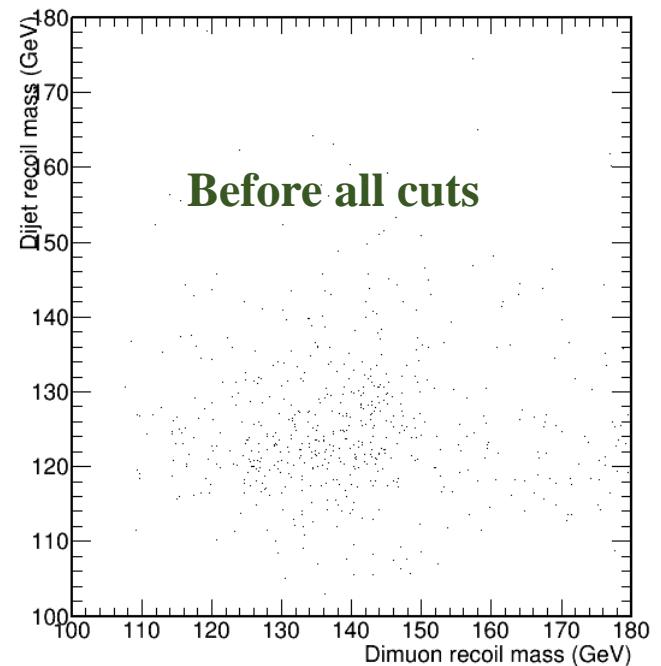
➢ Cut flow comparison

	signal	ZH	2f	4f
previous	48.0	774	0	659
2D cut applied	50.4	808	0	520

➢ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_bb	419	457	qqh_e3e3	7	4
e2e2h_cc	5	6	qqh_ww	1	0
e2e2h_e3e3	5	6	qqh_zz	21	14
e2e2h_gg	1	2	zz_sl0mu_up	159	124
e2e2h_ww	303	312	zz_sl0mu_down	488	386
e2e2h_zz	6	7	zz_sl0tau_down	5	4
e3e3h_zz	1	2	ww_sl0muq	6	6

$\nu\nu H\mu\mu qq$

> ## 2D mass distribution (signal)
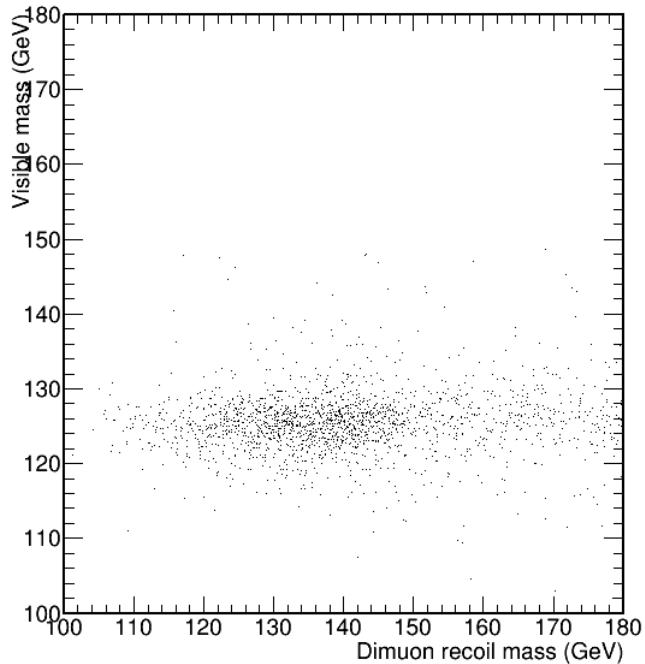
Before all cuts

After 2D cut
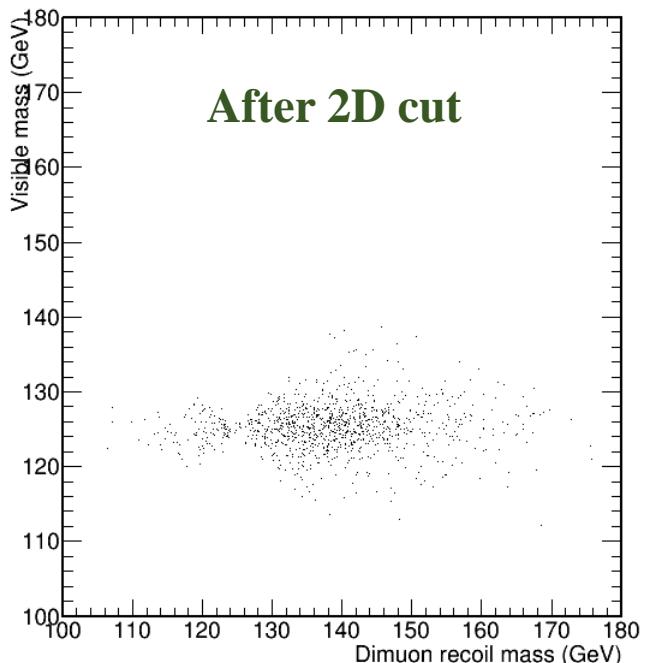
Before all cuts

> ## Suppressed: $\mu\mu H\nu\nu qq$

$\nu\nu H\mu\mu qq$
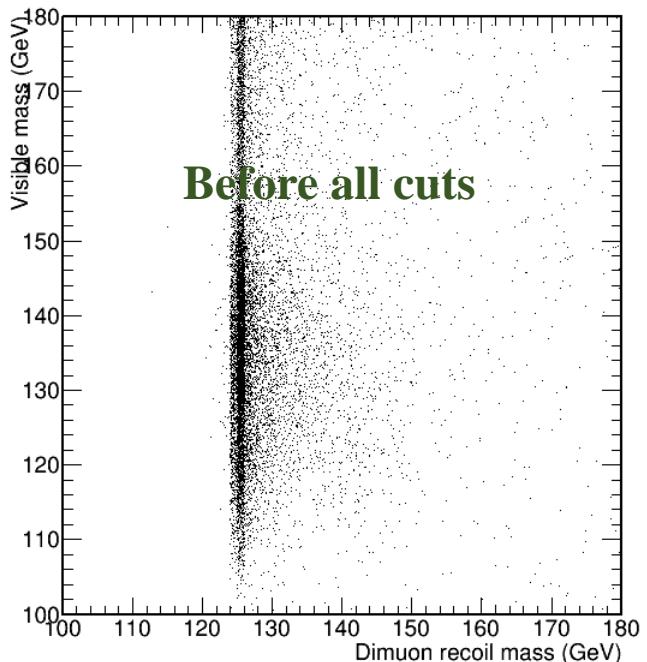
➤ Cut flow comparison

	signal	ZH	2f	4f
previous	72.56	17	0	9
2D cut applied	75.5	15	0	6

➤ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_ww	4	4	ww_sl0muq	3	3
e2e2h_zz	9	9	ww_sl0tauq	1	1
e3e3h_ww	2	2	zzorww_l0mumu	1	0
zz_sl0tau_up	1	0	sze_l0mu	1	1
zz_l0taumu	1	1			

$\nu\nu Hqq\mu\mu$

2D mass distribution (signal)
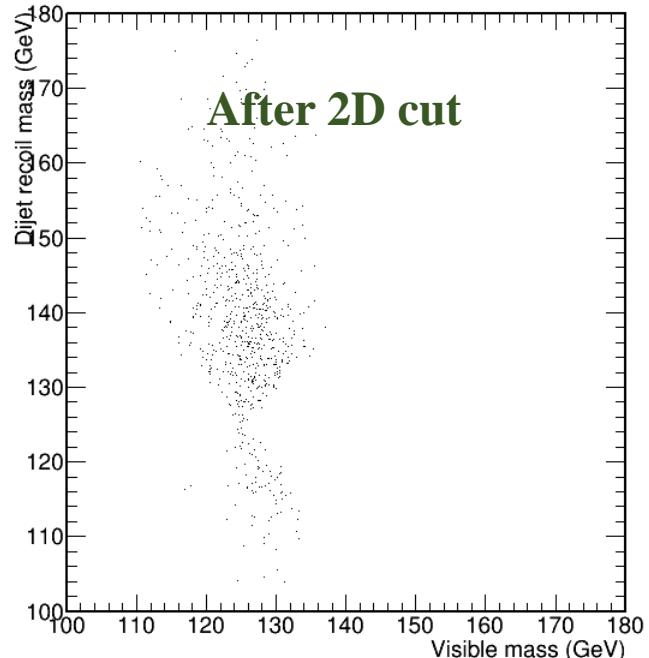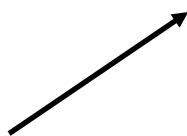
Before all cuts

Suppressed: $qqH\nu\nu\mu\mu$

After 2D cut

Before all cuts

$\nu\nu Hqq\mu\mu$
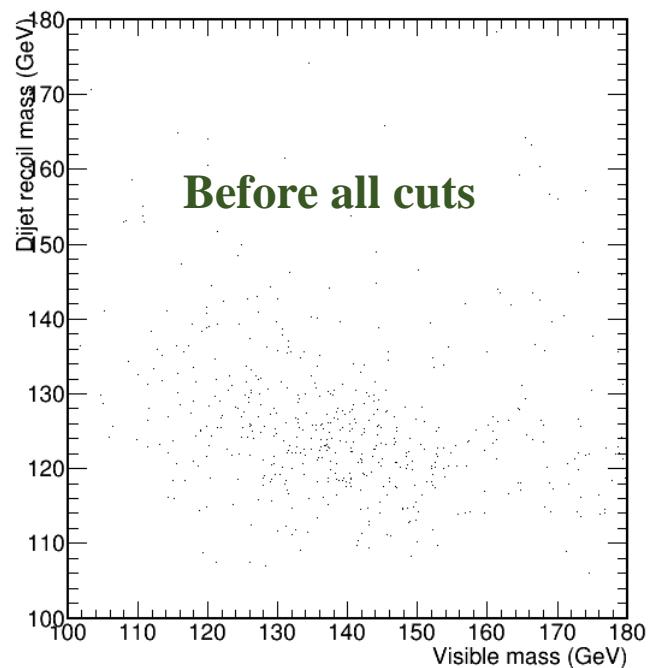
➤ Cut flow comparison

	signal	ZH	2f	4f
Previous	52.3	159	0	52
2D cut applied	50.58	125	0	46

➤ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_bb	8	7	zz_sl0mu_down	3	3
e2e2h_ww	7	7	zz_sl0tau_up	9	8
e3e3h_bb	3	2	zz_sl0tau_down	25	23
e3e3h_ww	11	10	ww_sl0muq	3	2
qqh_e3e3	50	34	ww_sl0tauq	4	4
qqh_ww	55	51	sze_l0mu	6	5
qqh_zz	18	11			

$qqH\nu\nu\mu\mu$
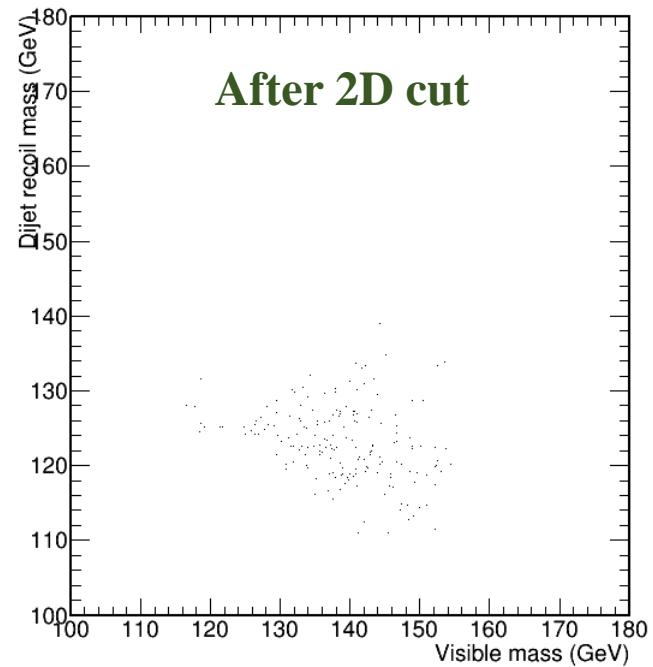
➢ **2D mass distribution (signal)**

Before all cuts

➢ **Suppressed:** $\nu\nu Hqq\mu\mu$

After 2D cut

Before all cuts

$qqH\nu\nu\mu\mu$
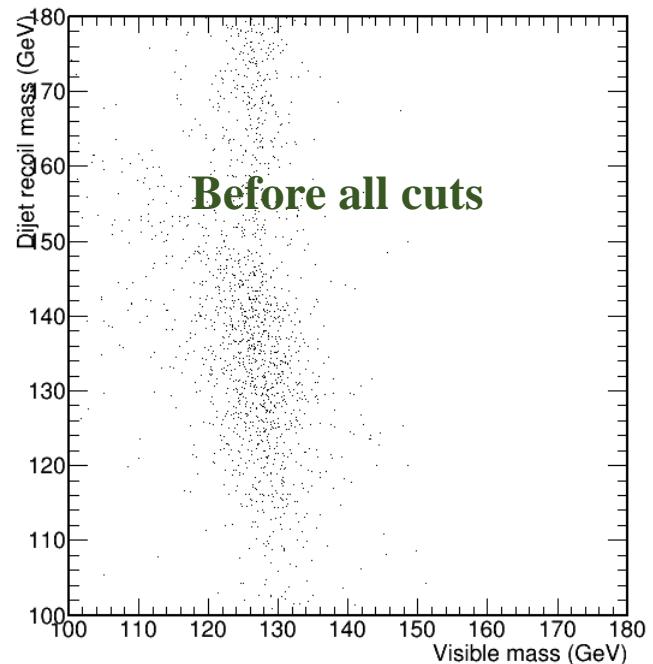
➢ Cut flow comparison

	signal	ZH	2f	4f
previous	41.72	326	0	190
2D cut applied	36.25	285	0	157

➢ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_bb	12	11	qqh_ww	87	76
e2e2h_ww	4	3	zz_sl0mu_up	4	4
e3e3h_bb	8	8	zz_sl0mu_down	5	3
e3e3h_ww	10	2	zz_sl0tau_up	58	50
nnh_zz	18	10	zz_sl0tau_down	115	95
qqh_e3e3	182	169	sze_l0mu	6	4

qqHμμνν
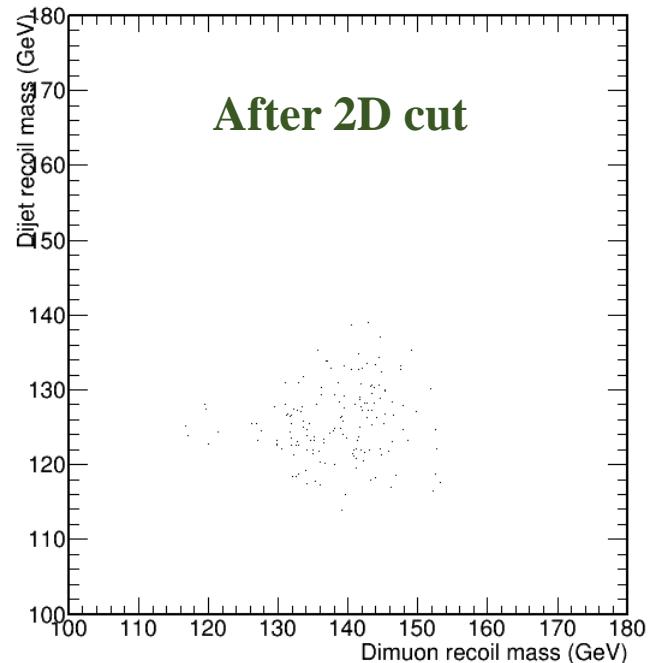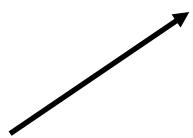
➢ **2D mass distribution (signal)**

Before all cuts

After 2D cut

➢ **Suppressed: *μμHqqνν***

Before all cuts

$qqH\mu\mu\nu\nu$
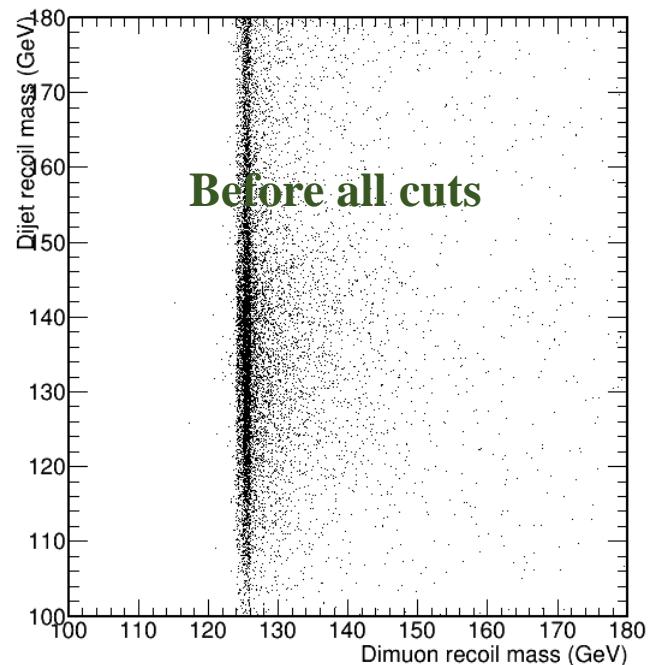
➤ Cut flow comparison

	signal	Zh	2f	4f
previous	35.44	206	0	305
2D cut applied	31.6	166	0	190

➤ Background Info.

	previous	2D cut applied		previous	2D cut applied
e2e2h_bb	120	100	zz_sl0mu_up	85	55
e2e2h_cc	1	2	zz_sl0mu_down	217	133
e2e2h_ww	55	42	zz_sl0tau_up	1	1
e2e2h_zz	8	6	zz_sl0tau_down	1	1
qqh_e3e3	15	14	ww_sl0muq	1	1
qqh_ww	1	2			