

# Exploring Right Handed Neutrinos at ILC

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10, March 2021

S O K E N D A I

The logo for SOKENDAI, consisting of the letters S, O, K, E, N, D, A, I in a bold, sans-serif font. Below the letters is a thick black line that starts at the left edge of the slide, goes down to the level of the 'K', then up to the level of the 'E', then down to the level of the 'N', then up to the level of the 'D', then down to the level of the 'A', and finally up to the level of the 'I'.

# Study 4 benchmarks - WHIZARD

Not excluded by LHC

$M_N$ [GeV]	$M_{Zp}$ [TeV]	$g_{lp}$	$ V_{eN} ^2$	$\sigma (ee \rightarrow NN)$ [fb]	Event # [1600fb <sup>-1</sup> ]
100	7	1	0.001	7.03E-02	100
200	7	1	0.005	2.76E-01	430
100	3	0.05	0.001	3.30E-02	50
200	3	0.05	0.005	3.24E-01	500

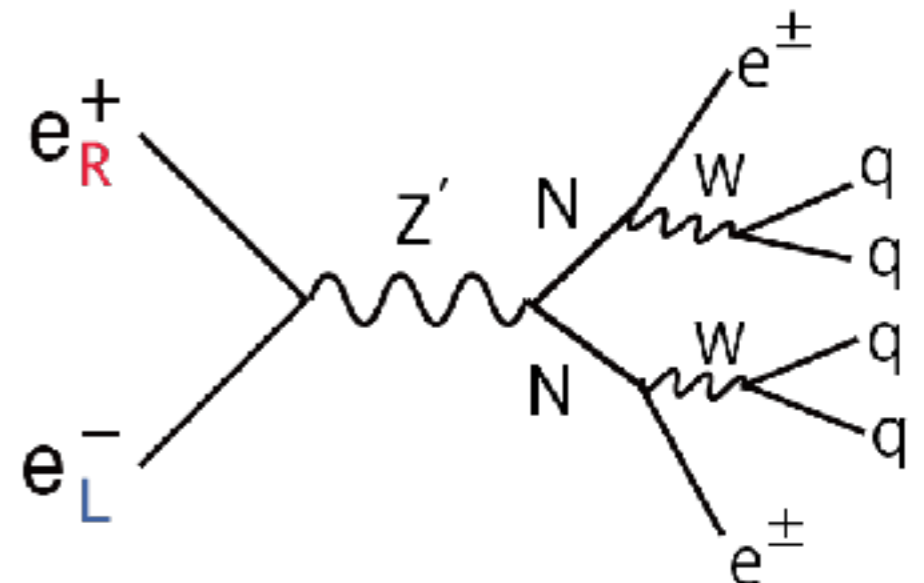
►  $U(1)_x$  minimal B-L model [arXiv\[1812.11931\]](#)

► eLpR(100%)

► ILC 500 with ISR / BS

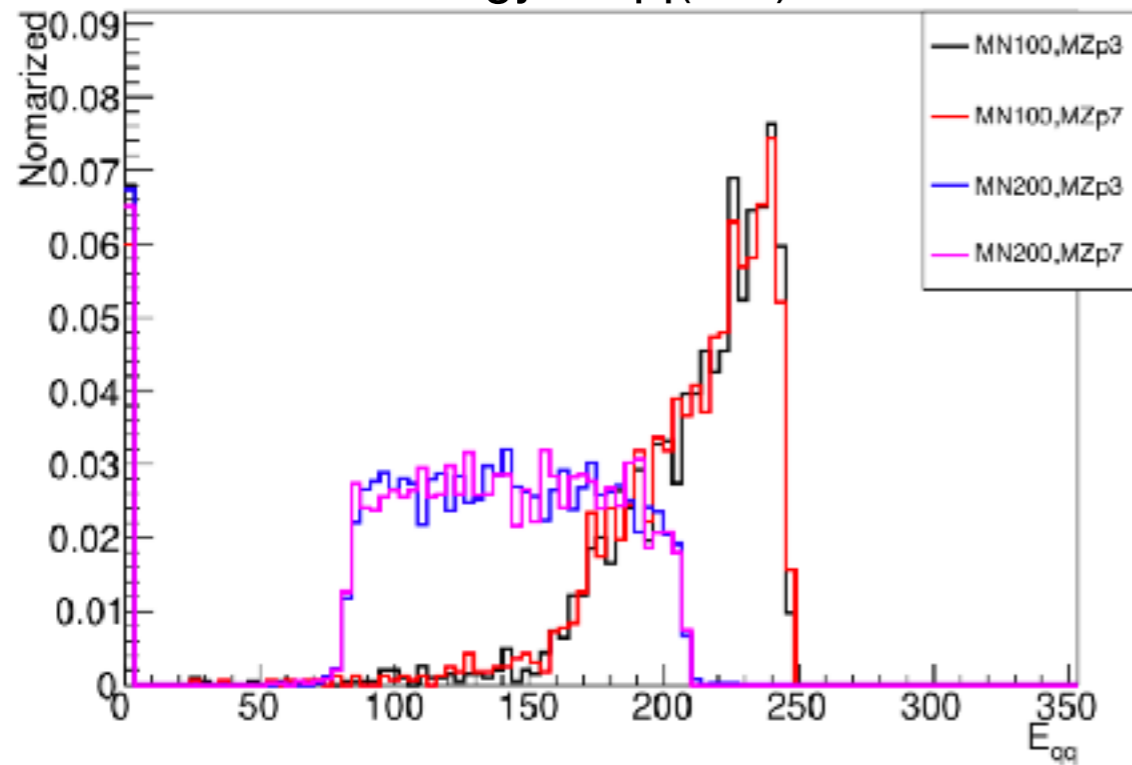
► Generated event # = 5000

► Delphes miniDST, ILC detector cards

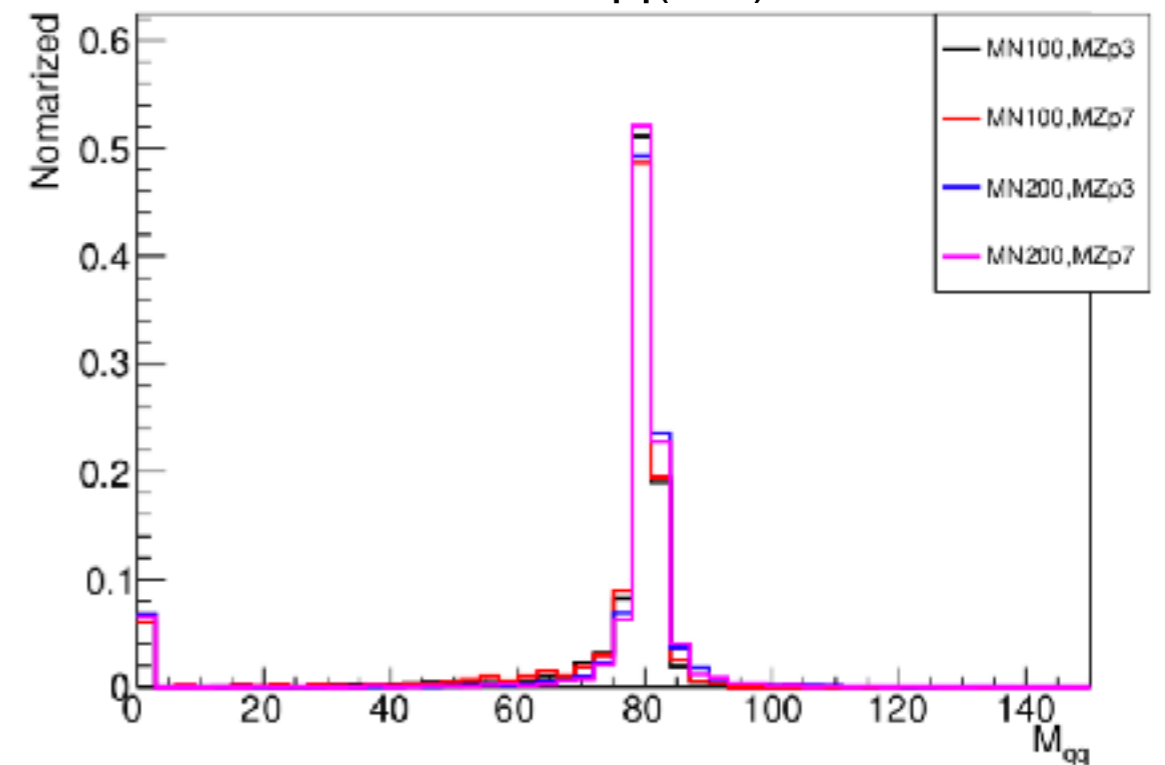


# Checking samples -MC Particles

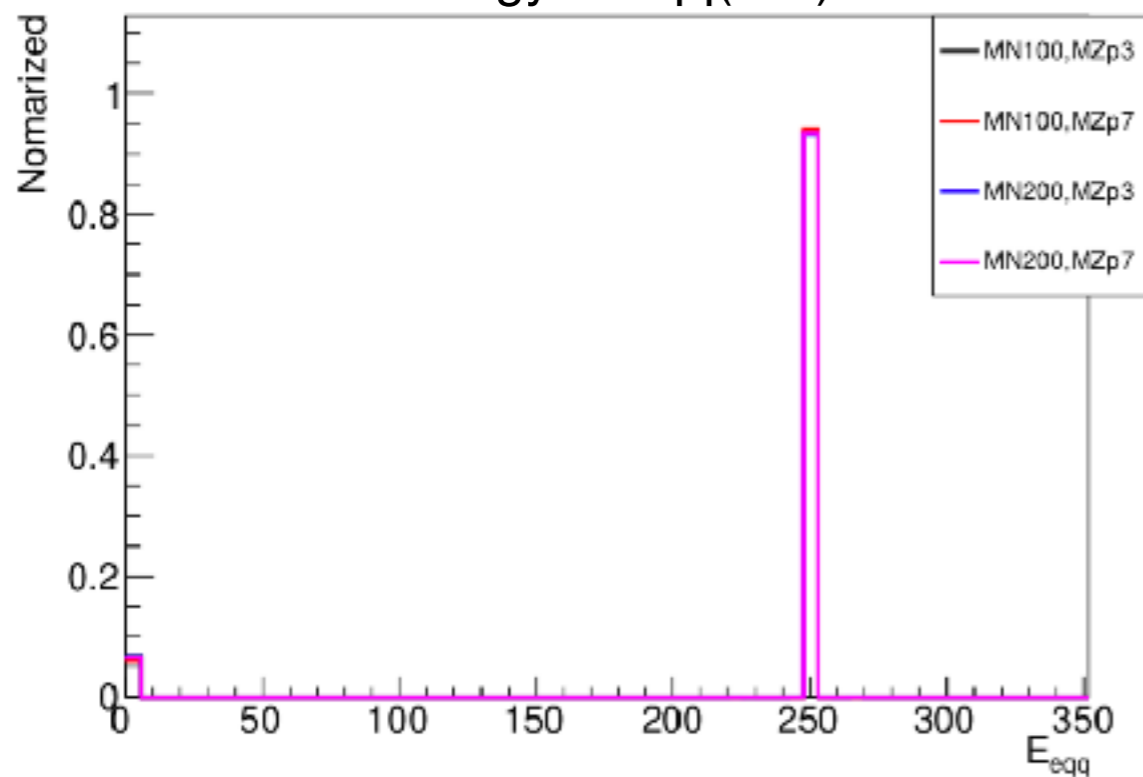
Energy of qq(MC)



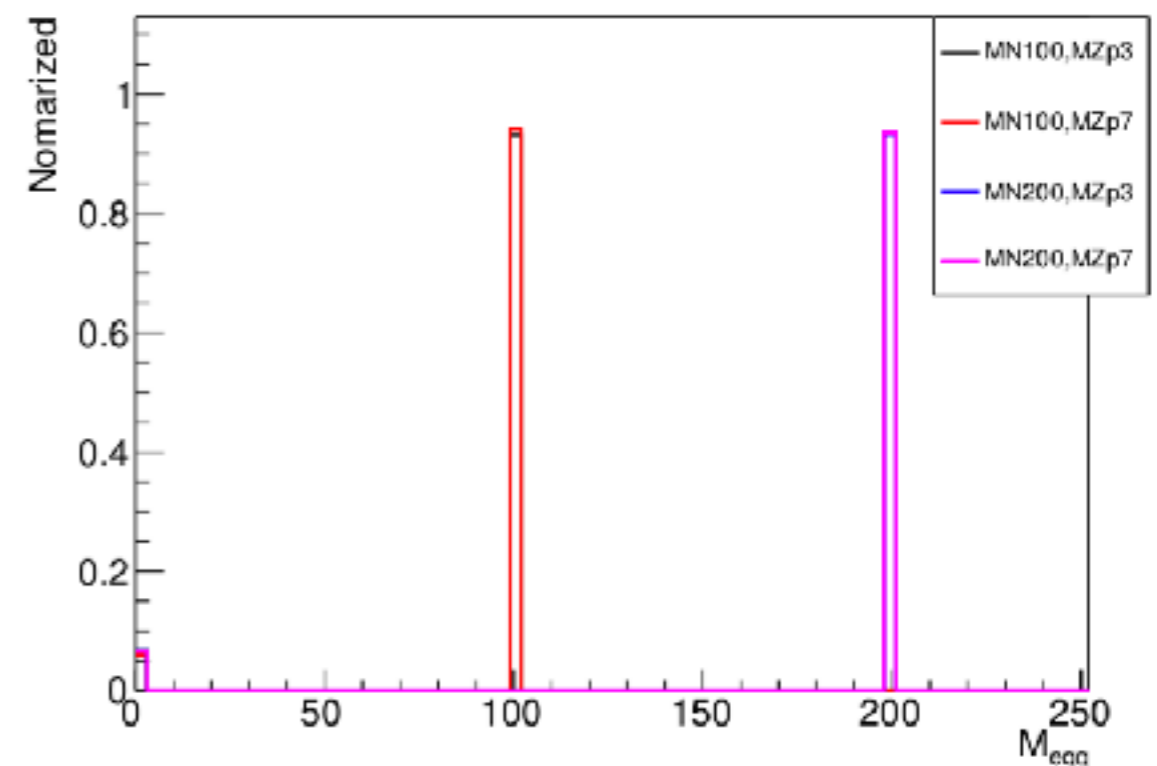
Mass of qq(MC)



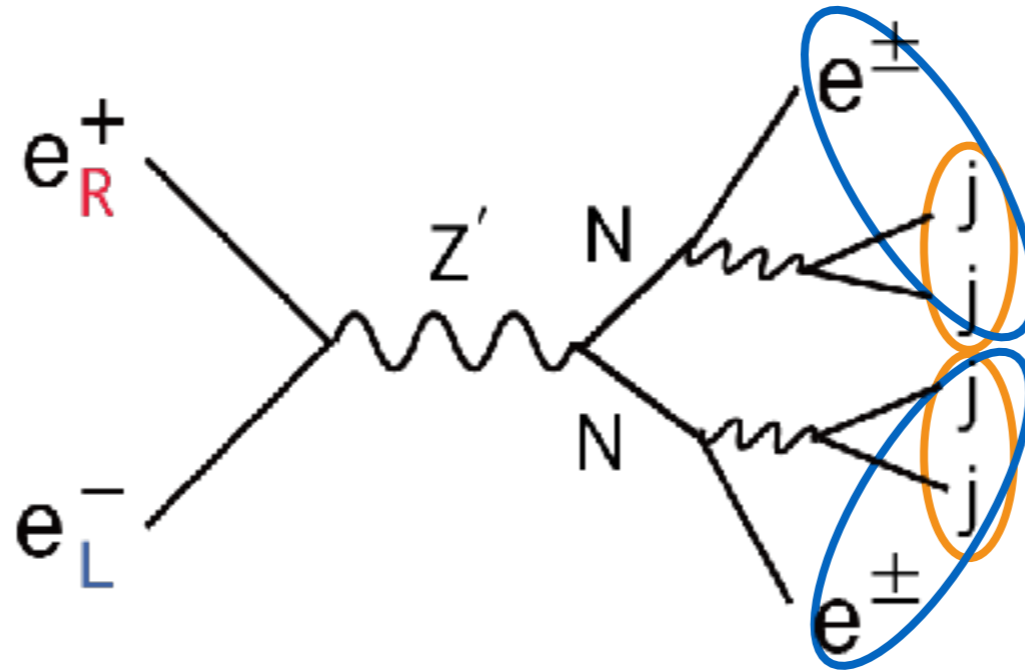
Energy of eqq(MC)



Mass of eqq(MC)



# Reconstruction methods



Search for the correct combination of **jj** and **jje**

Jet pair 1  $\rightarrow M_{jj1}$ , Jet pair 2  $\rightarrow M_{jj2}$

$$F = (M_{jj1} - M_w)^2 + (M_{jj2} - M_w)^2$$

Best jet pair 1 + iso e  $\rightarrow M_{jje1}$

Best jet pair 2 + iso e  $\rightarrow M_{jje2}$

We expect for " $M_{jje1} = M_{jje2}$ "

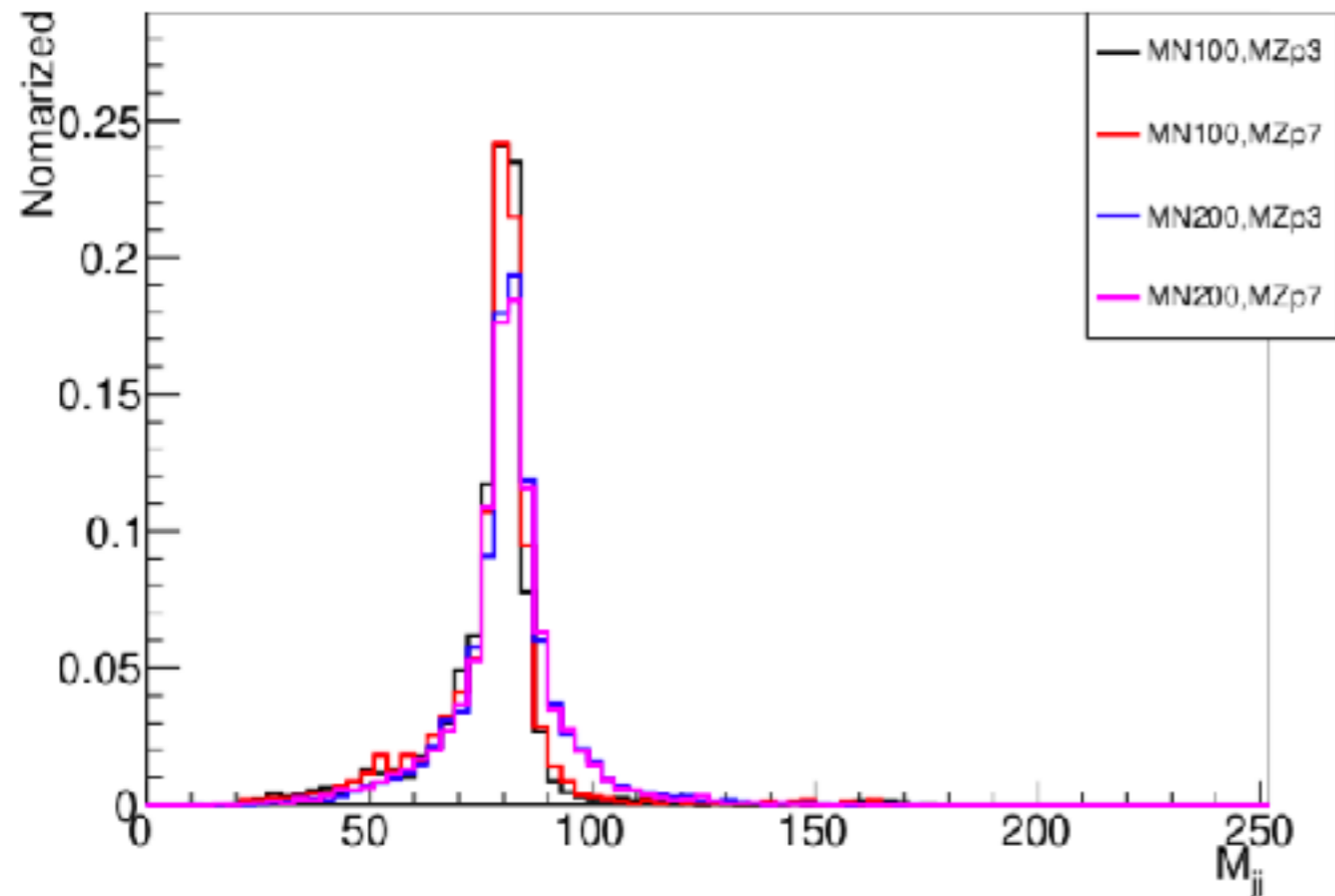
$$F = (M_{jje1} - M_{jje2})^2$$

**Choose combination with minimum F**

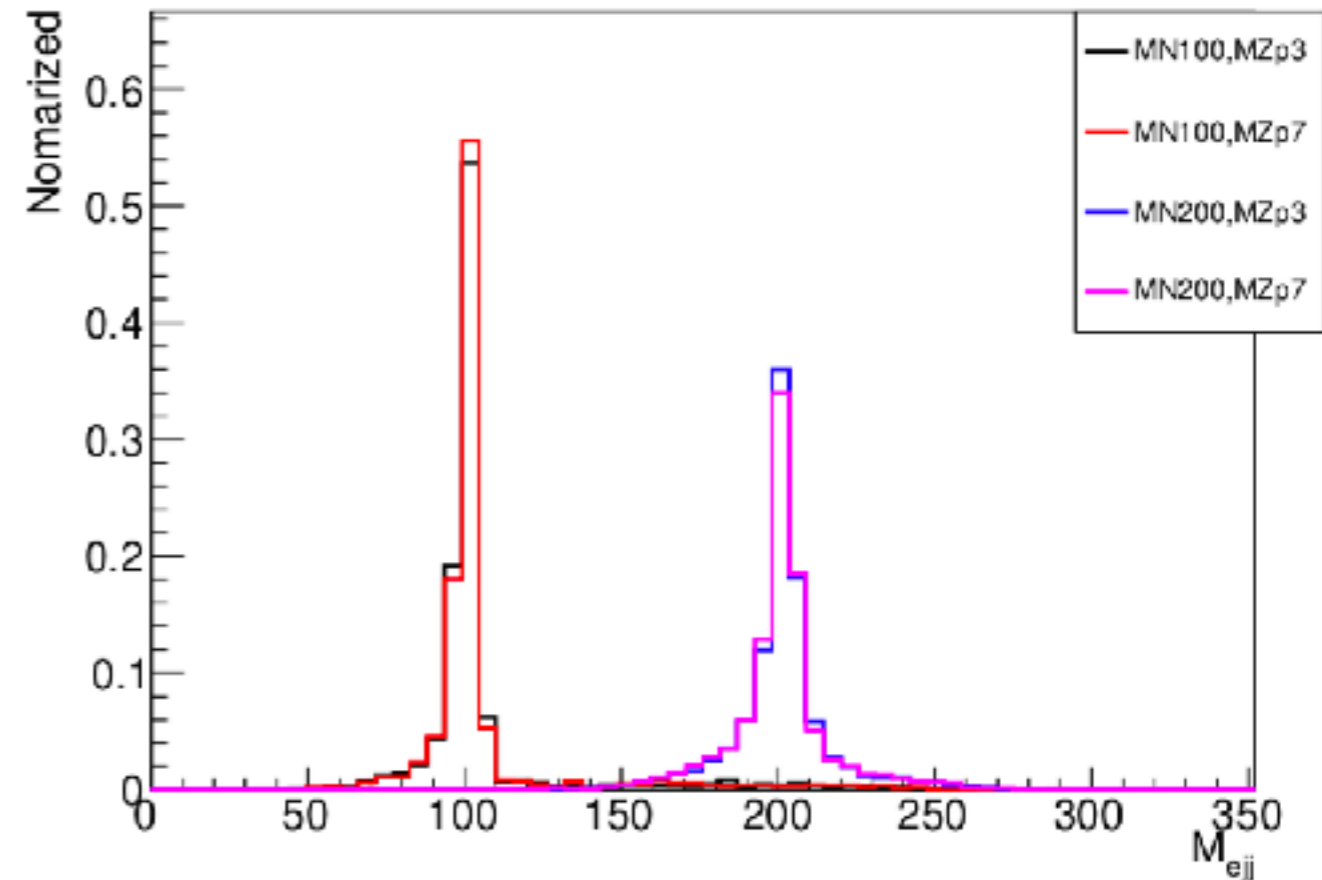
# Reconstructed jets

- ▶ Isolated electron # = 2, Isolated photon # = 0
- ▶ Choose the best combination

Mass of jj



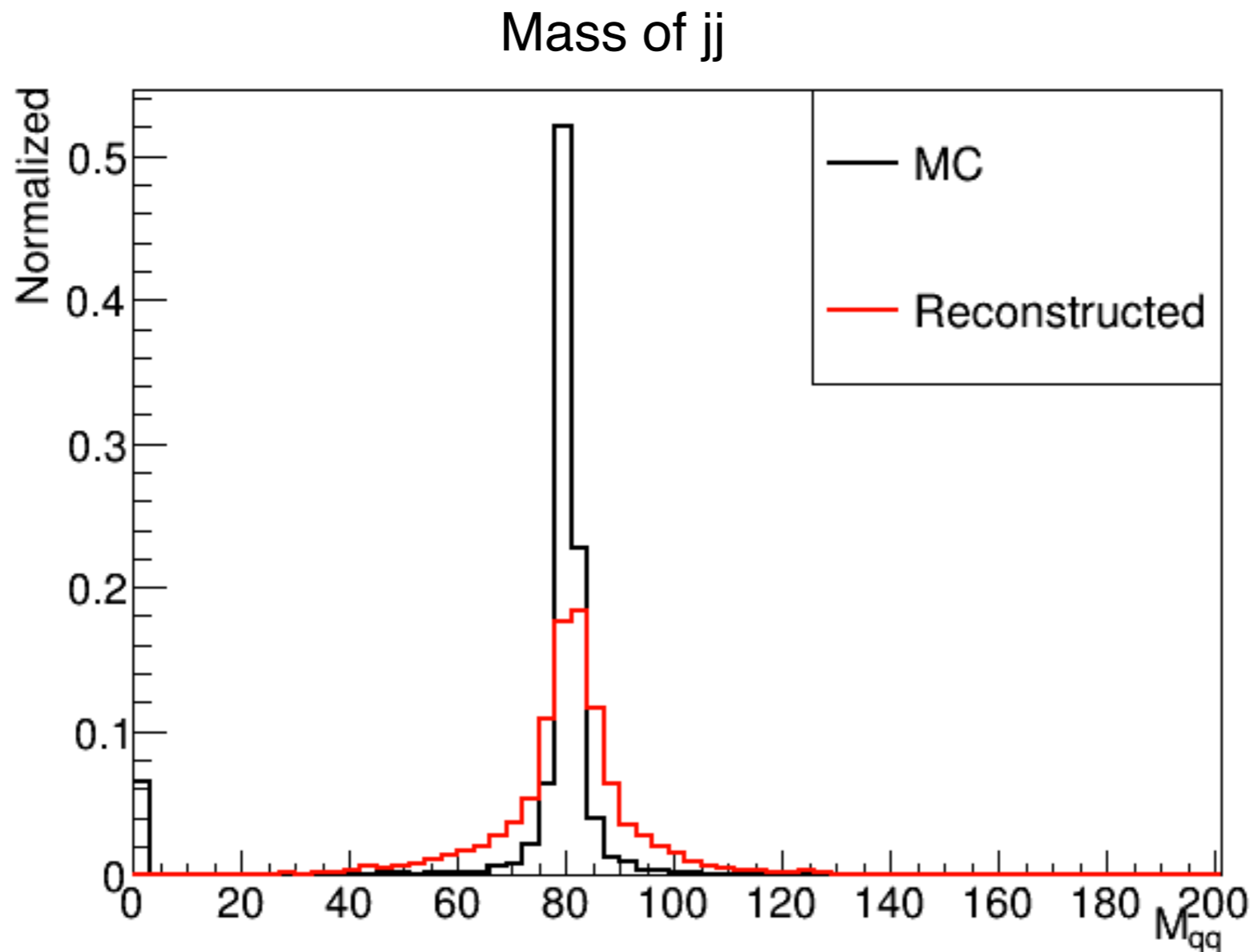
Mass of ejj



Backup

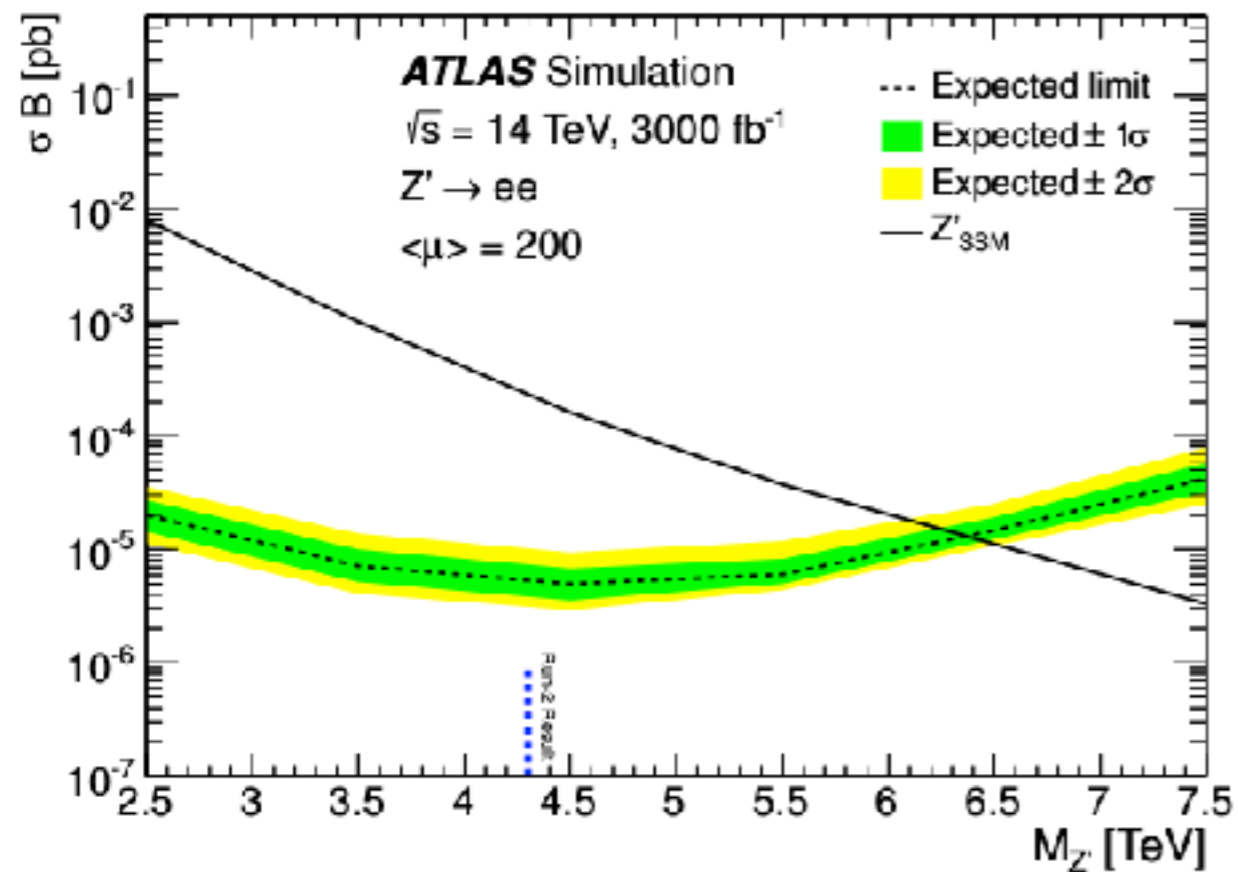
# Comparison between MC and Reconomethod

- ▶  $M_N = 200$  GeV
- ▶  $M_{Z'} = 7$  TeV



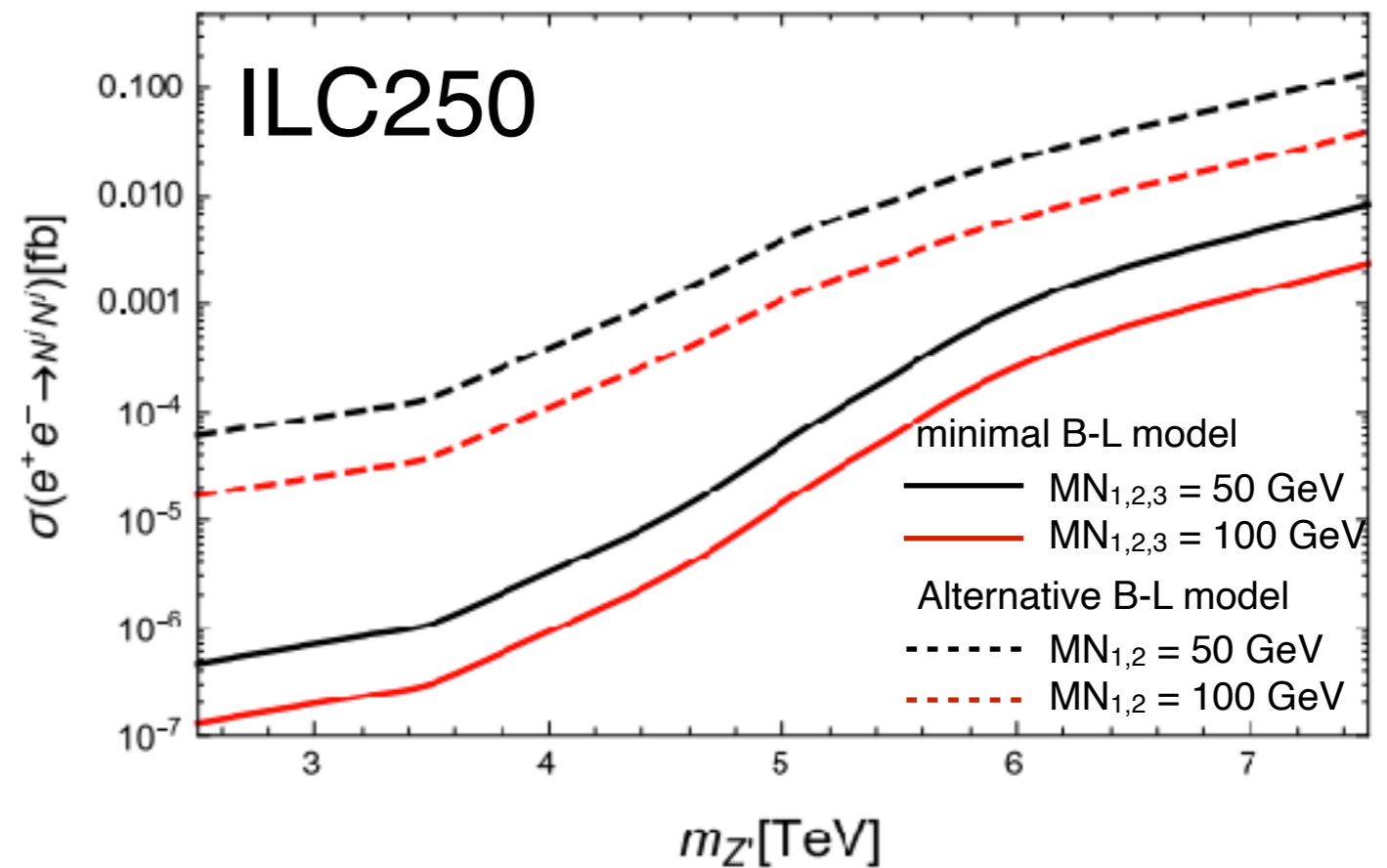
# Current limits - Z' mass

SM like Z' coupling



ATLAS-TDR-LHCC2017-2018

HL-LHC prospects limit for U(1)x B-L model

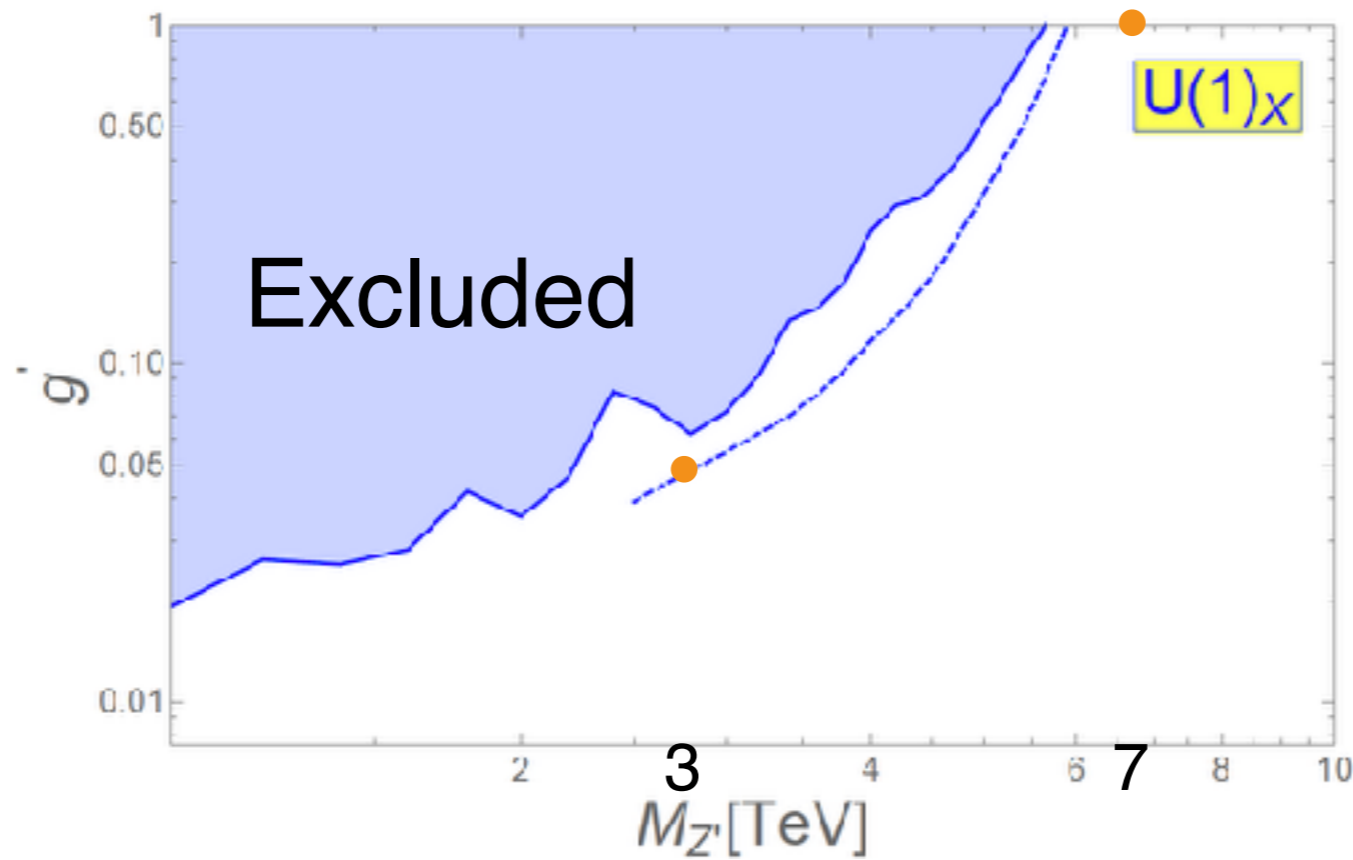


[arXiv\[1812.11931\]](https://arxiv.org/abs/1812.11931)



# Current Limits and prospects - $Z'$ mass, $g_1'$

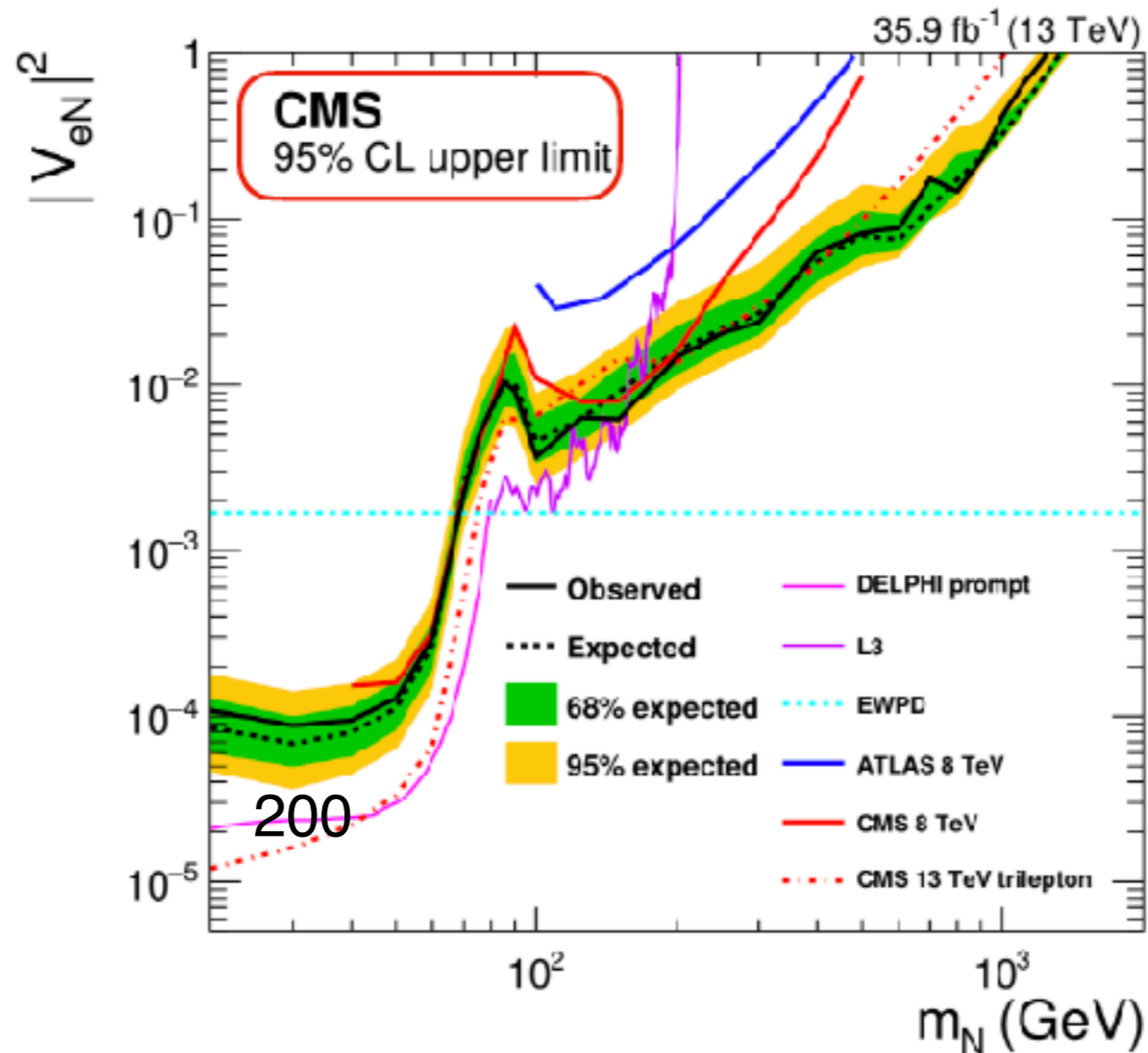
$G_1'$  :  $U(1)_X$  gauge coupling constant



By Arindam.D

# Current limits $|V_{eN}|^2$

$|V_{eN}|^2$  : the “light-heavy” neutrino mixing matrix



CMS PAS EXO-19-019