SUSY Search at the CEPC

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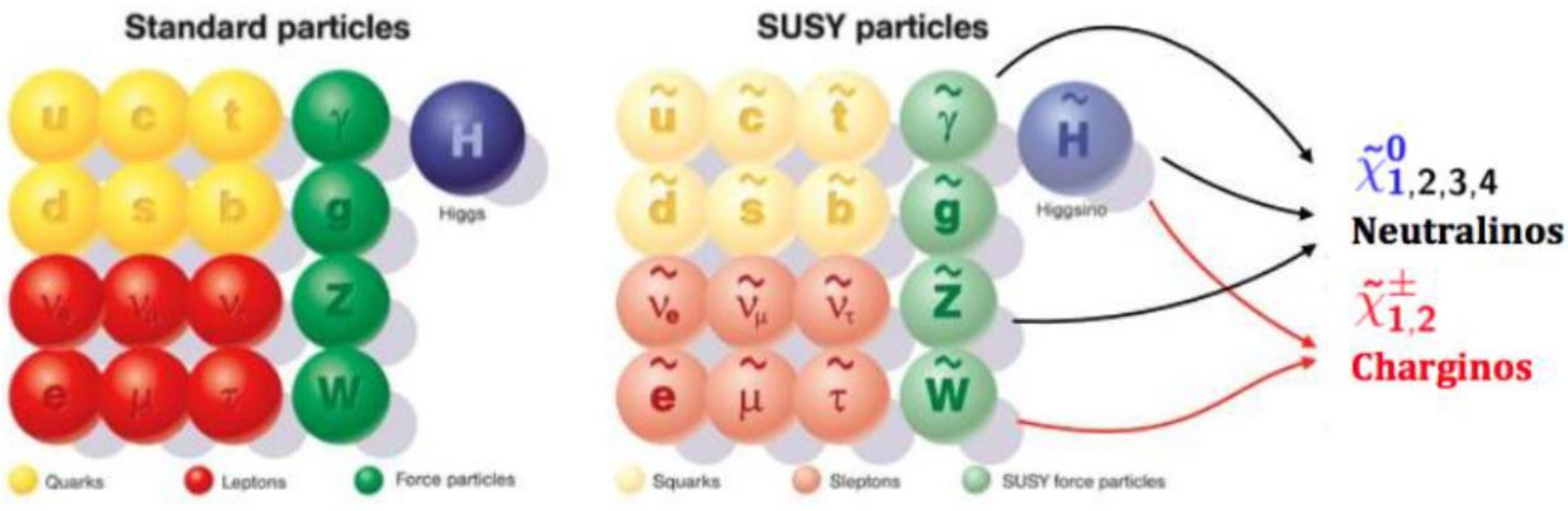
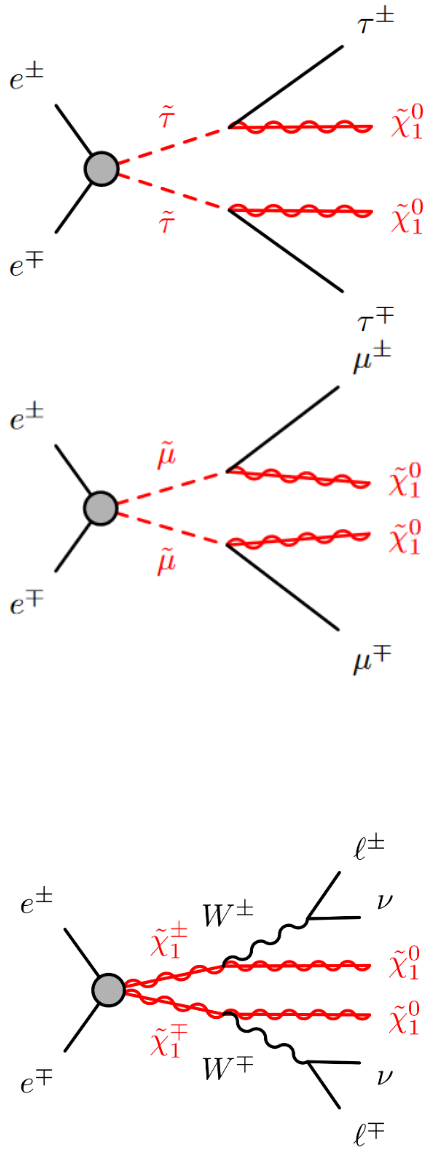
2020/12/9

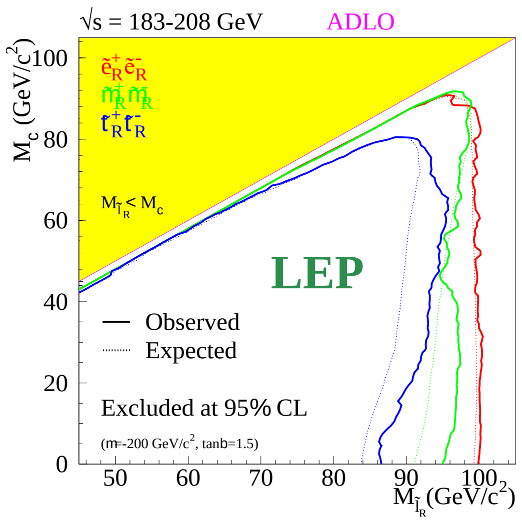
Supersymmetry Introduction

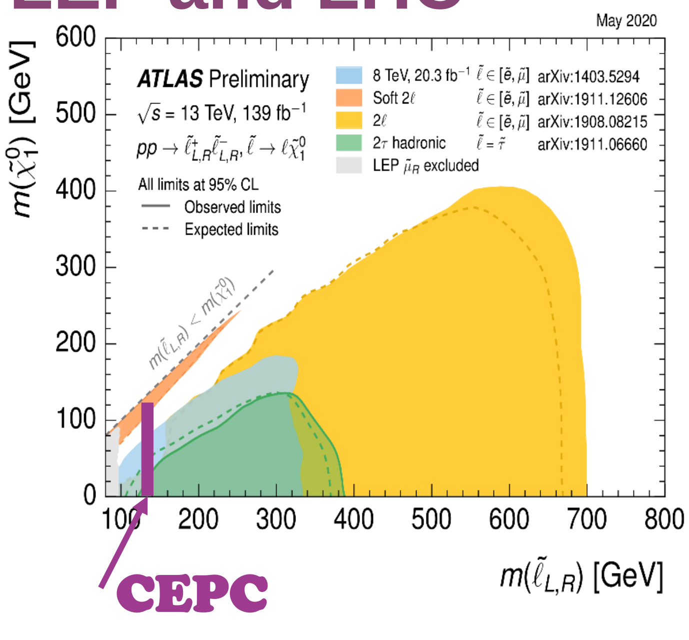


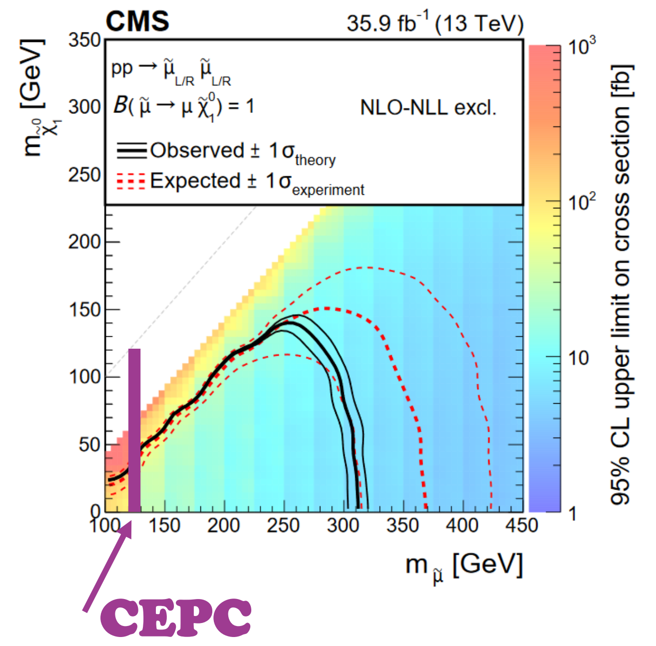
- The Supersymmetry is one of the most appealing BSM theories, which can be helpful for:
  dark matter candidate,
  hierarchy problem,
  grand unification of gauge couplings
  …

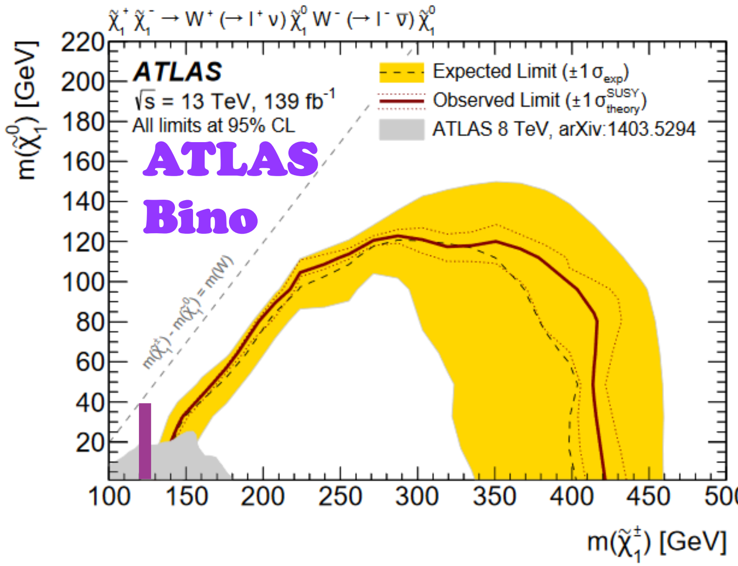
Current status from LEP and LHC

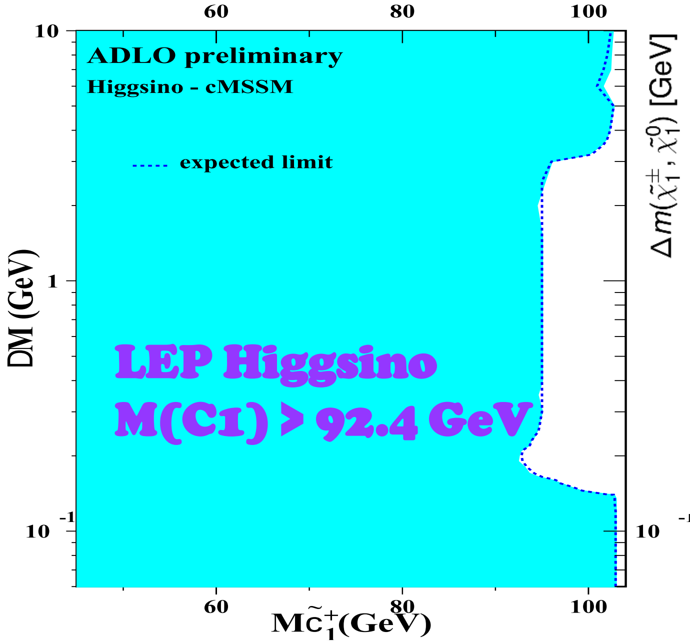


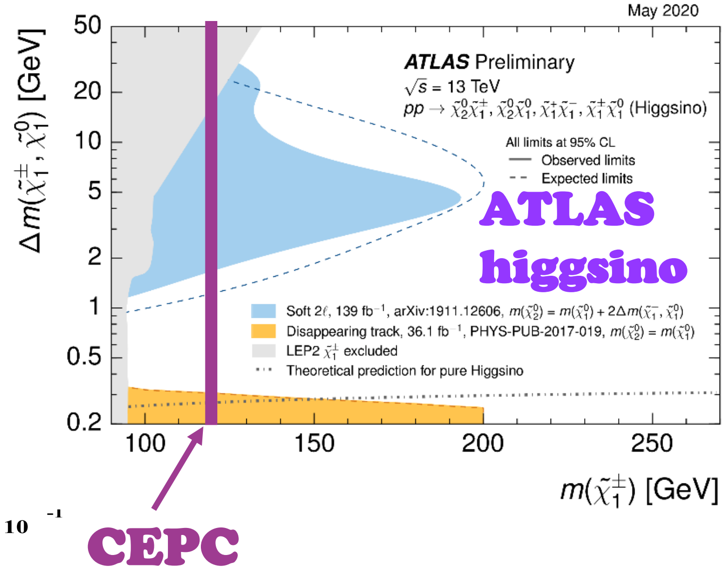






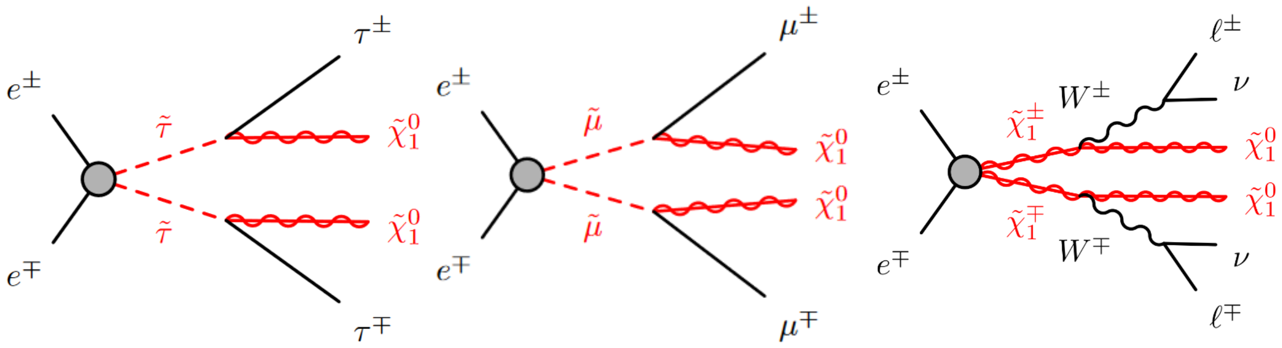


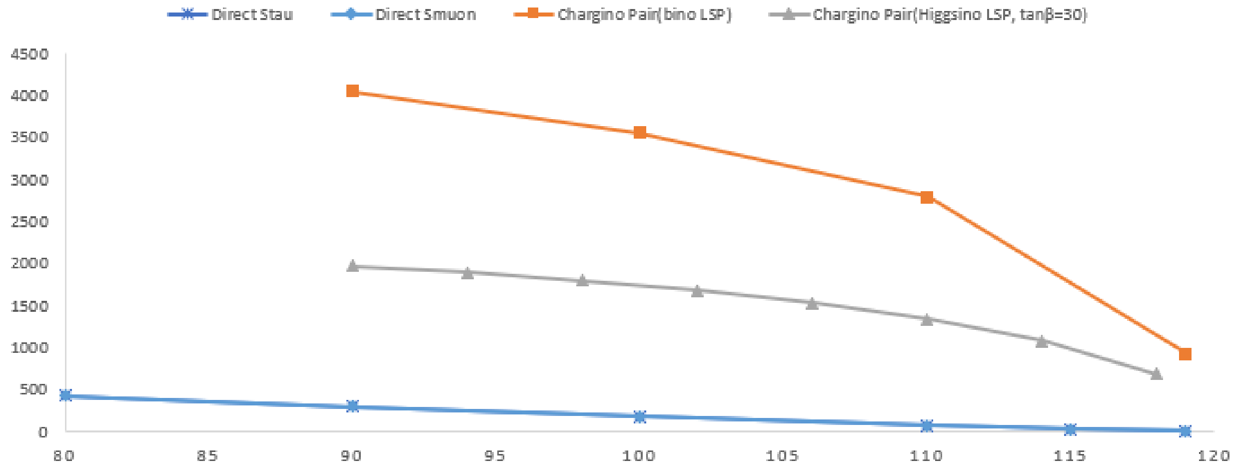




Overview

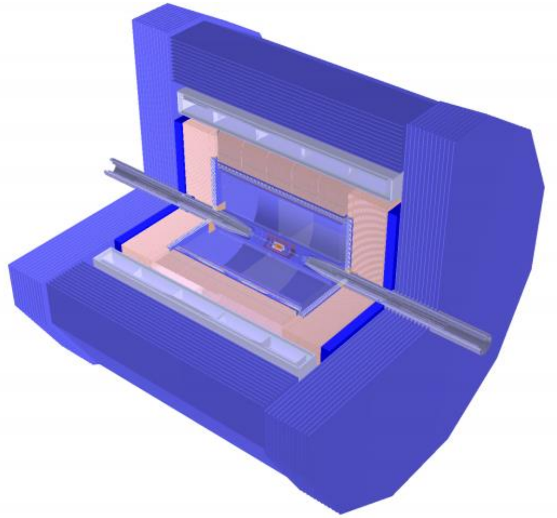
- Search for sleptons and electroweakinos at CEPC.
- Signal scenarios
  - ➢ Direct production of stau pairs (**DM relic density consistent with cosmology observation**)
  - ➢ Direct production of smuon pairs (can **explain g-2 excess**)
  - ➢ Production of chargino pairs decaying via W bosons (**Bino LSP**, **large cross section**)
  - ➢ Production of chargino pairs decaying via W bosons (**Higgsino LSP, interesting related with higgs**)
- Search results in final states with two opposite sign (OS) charged muons(in last 3 scenarios).





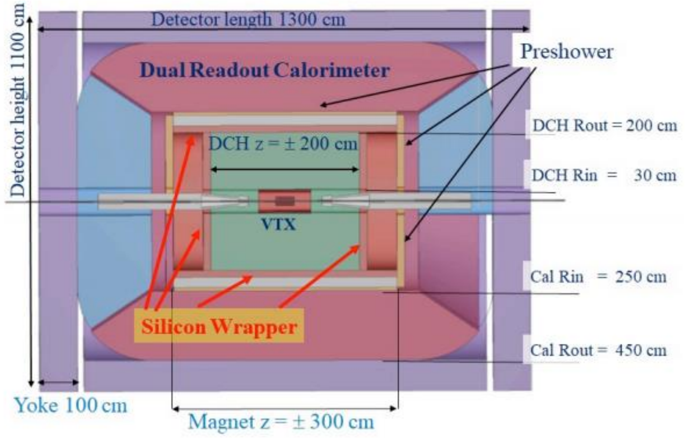
Cross-section based on Madgraph calculation

Technical detail



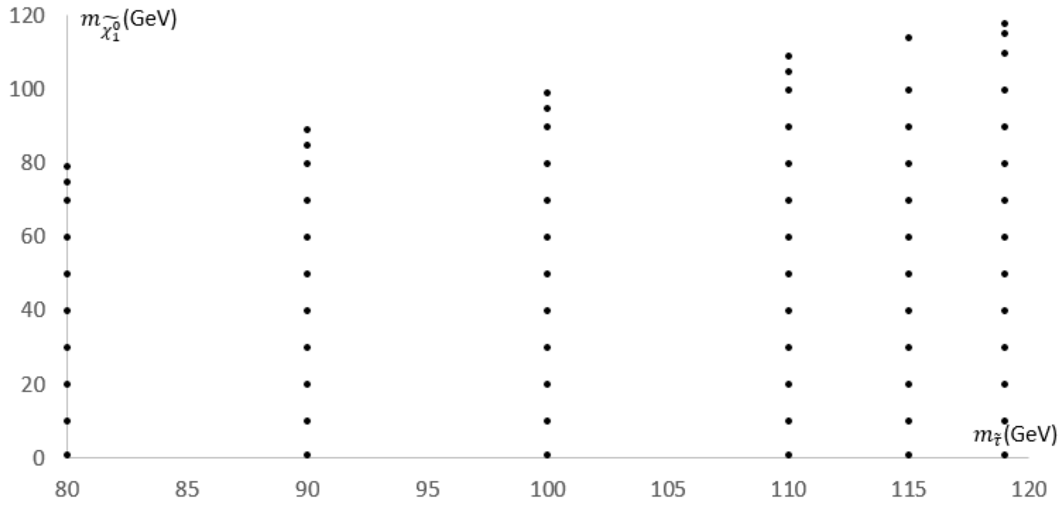
- About CEPC
  ECM=240GeV, higgs factory, 100 km circumference, 2 interaction points.
  ILD-like detector
- Software
  Signal samples: MadGraph+Pythia8
  Simulation: Mokka
  Reconstruction: Marlin
- Normalized to $5050\ \mathrm{fb}^{-1}$
- **Dominant backgrounds:**
  - **SM processes with two-e or two-μ or two-τ and large missing energy final states.**

process	Cross Section [fb]
$\mu\mu$	4967.58
$\tau\tau$	4374.94
$WW \to \ell\ell$	392.96
$ZZ or WW \to \mu\mu\nu\nu$	214.81
$ZZ or WW \to \tau\tau\nu\nu$	205.84
$\nu Z, Z \to \mu\mu$	43.33
$ZZ \to \mu\mu\nu\nu$	18.17
$\nu Z, Z \to \tau\tau$	14.57
$ZZ \to \tau\tau\nu\nu$	9.2
$\nu\nu H, H \to \tau\tau$	3.07
$e\nu W, W \to \mu\nu$	429.2
$e\nu W, W \to \tau\nu$	429.42
$eeZ, Z \to \nu\nu$	29.62
$eeZ, Z \to \nu\nu$ or $e\nu W, W \to e\nu$	249.34

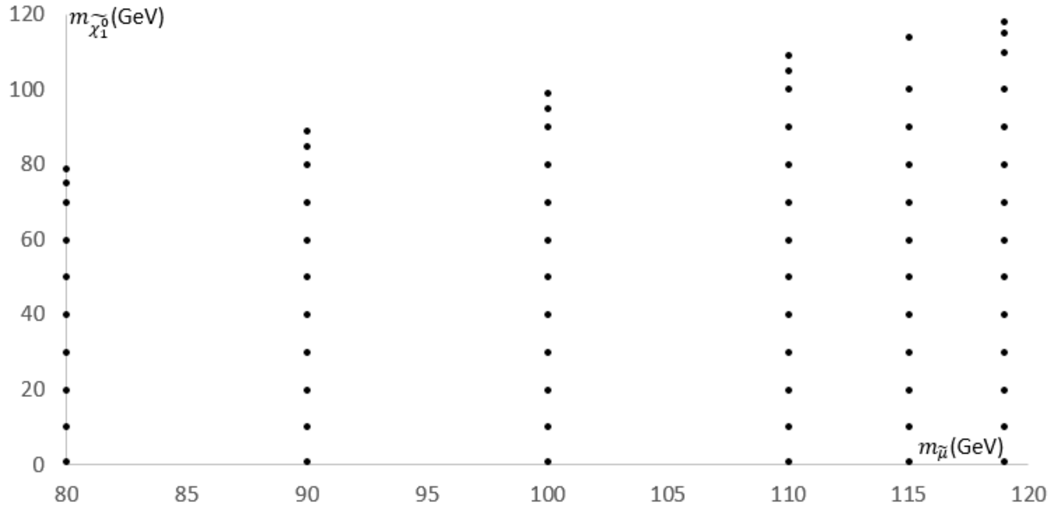


Signal samples

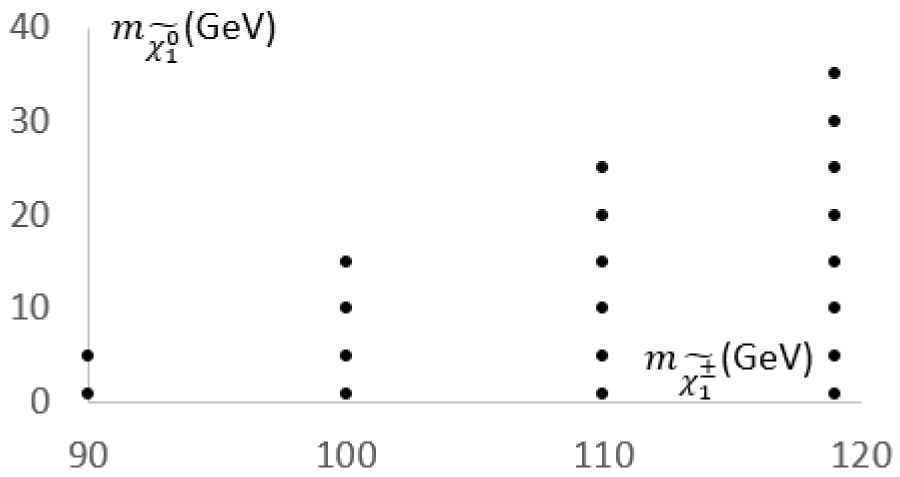
Direct stau



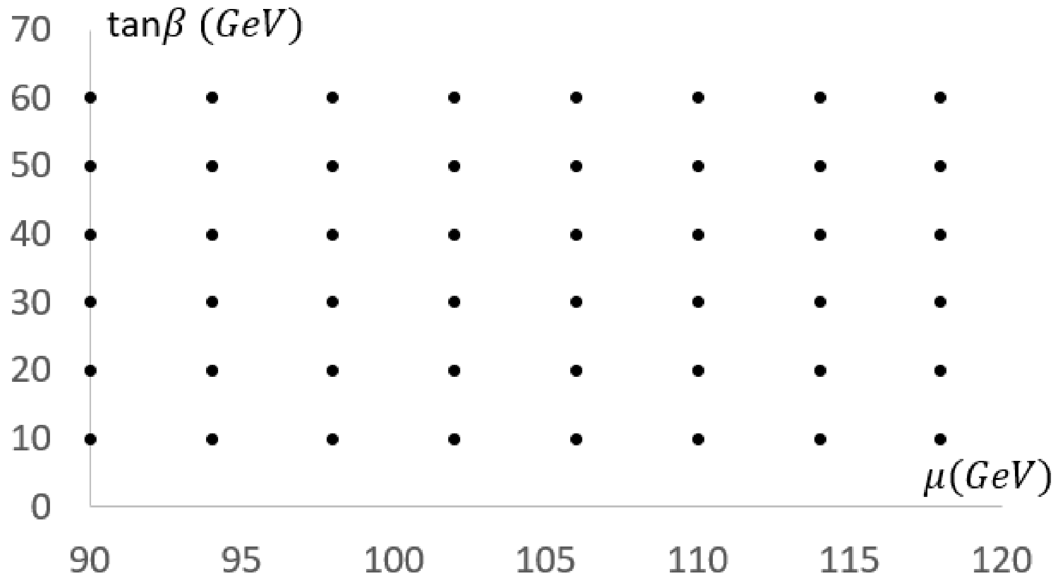
Direct smuon



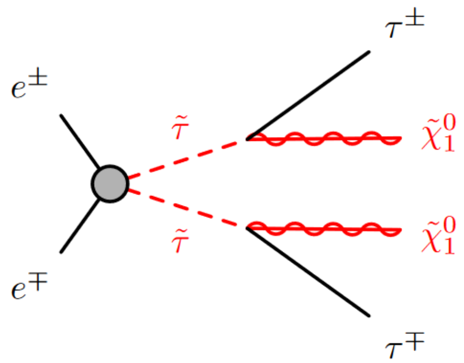
Chargino (Bino)



Chargino (Higgsino)



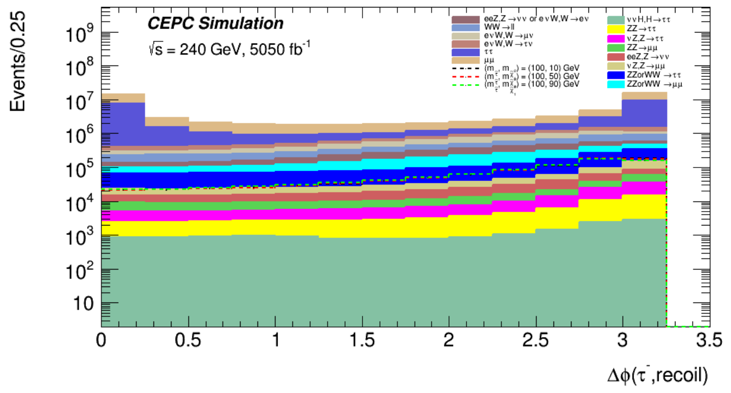
Direct stau: Optimization Strategy

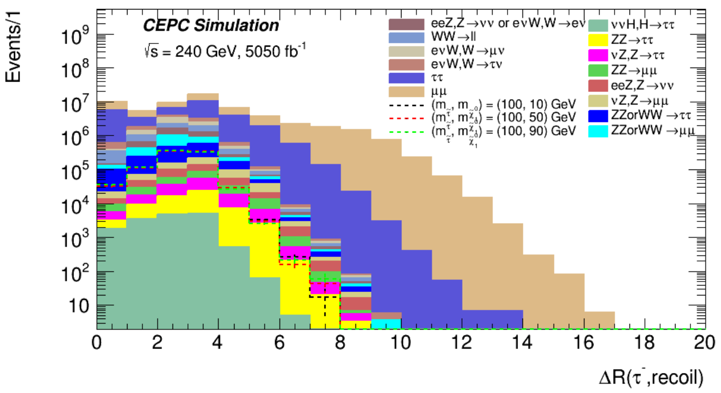


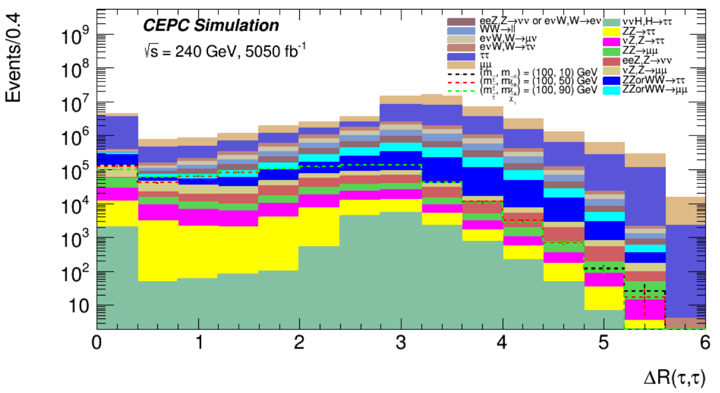
- Use the leading track with minus(positive) charge to represent the $\tau^-(\tau^+)$ for simplicity.
- Select events with 2 OS τ with energy > 0.5GeV.
- Perform a multi-dimension optimization, considering variables:

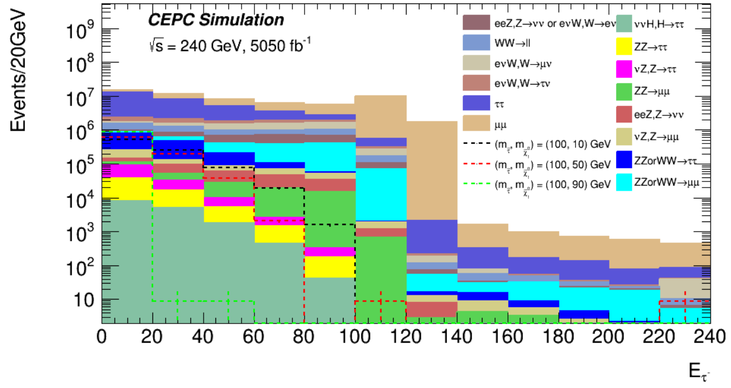
$$\Delta R(\tau,\tau), \Delta R(\tau,recoil), \Delta\varphi(\tau,\tau), \Delta\varphi(\tau,recoil), M_{\tau\tau}, M_{recoil}, E_\tau$$

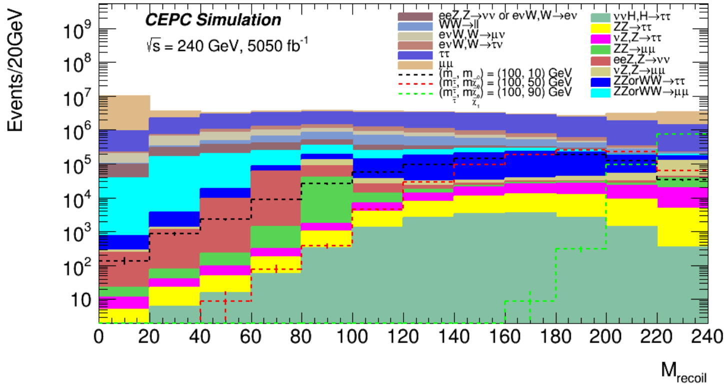
- Check for both upper cut and down cut for each variable.
- Use $\frac{S}{\sqrt{B+dB^2}}$ as a sensitivity measurement (consider statistical uncertainty and 5% systematic uncertainty).

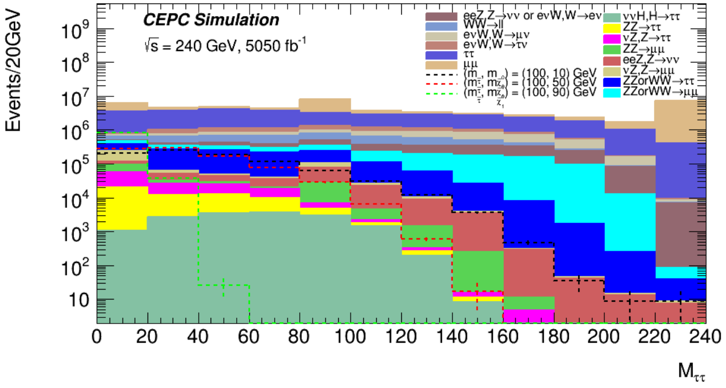












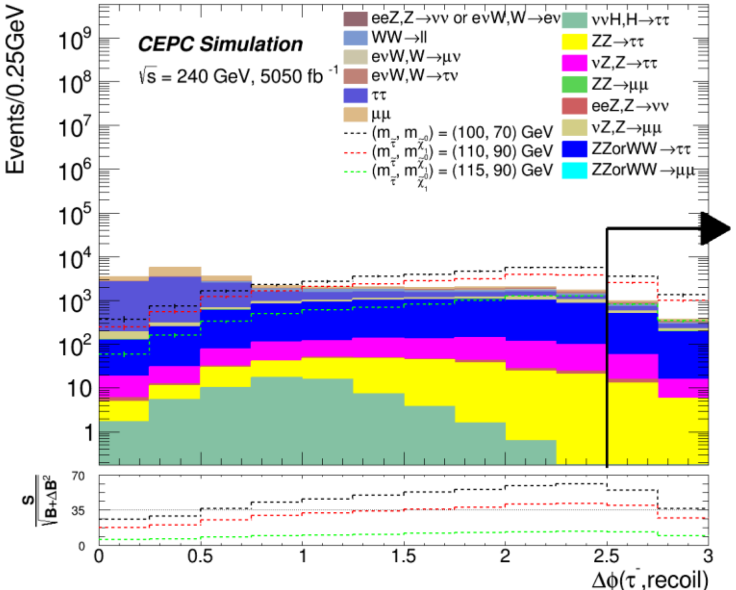
Direct stau: SR & Results

SR-lowDeltaM

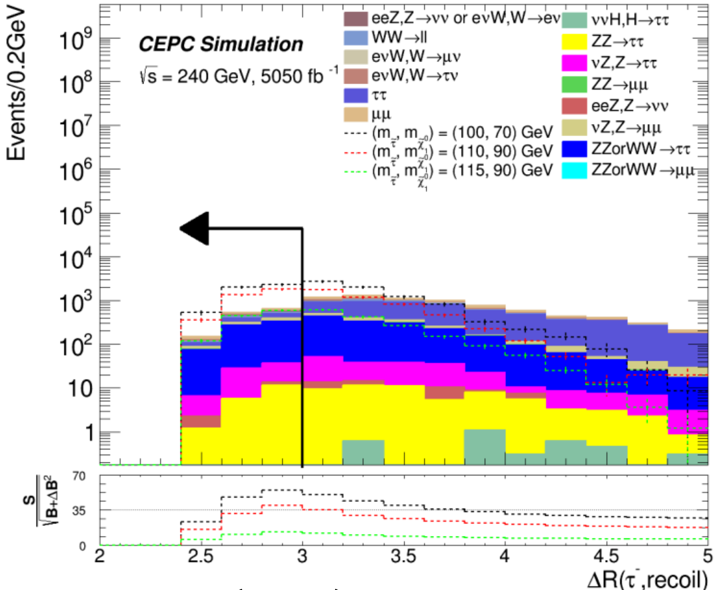
- Two SRs are defined for different $\Delta m(\tilde{\tau}, \tilde{\chi}_1^0)$.

SR-lowDeltaM	SR2-highDeltaM
$\lvert\Delta\phi(\tau, recoil)\rvert > 2.5$	
$\Delta R(\tau, recoil) < 3$	
$\lvert\Delta R(\tau,\tau)\rvert > 1.2$	$\lvert\Delta R(\tau,\tau)\rvert > 0.6$
$E_\tau < 15GeV$	
$m_{\tau\tau} < 30GeV$	$m_{recoil} < 180GeV$
	$m_{\tau\tau} < 35GeV$

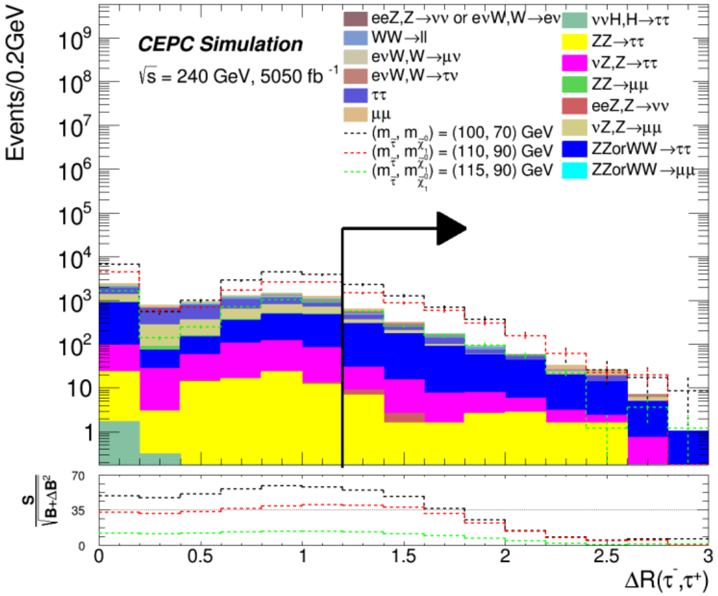
Process	SR-lowDeltaM	SR2-highDeltaM
$\tau\tau$	199.76±21.2945	6.81±3.93176
$\nu\nu H, H \to \tau\tau$	0.155±0.155	0.155±0.155
$ZZorWW \to \tau\tau\nu\nu$	611.82±25.1033	41.2±6.51429
$ZZ \to \tau\tau\nu\nu$	18.76±3.17102	7.504±2.00553
$\nu Z, Z \to \tau\tau$	50.388±6.11044	4.446±1.81507
$ZZorWW \to \mu\mu\nu\nu$	8.544±3.02076	1.068±1.068
$ZZ \to \mu\mu\nu\nu$	6.92±3.09472	0
$WW \to \ell\ell$	85.932±9.37595	12.276±3.54378
$\nu Z, Z \to \mu\mu$	106.848±10.9051	1.113±1.113
$\mu\mu$	121.74±27.2219	0
$evW, W \to \mu\nu$	0	0
$evW, W \to \tau\nu$	91.637±9.60617	45.315±6.75516
$eeZ, Z \to \nu\nu$	3.072±1.77362	0
$eeZ, Z \to \nu\nu \ or \ evW, W \to ev$	19.855±4.55505	5.225±2.33669
Total background	1325.43±47.0509	125.112±11.4571
(100,10)	1209.58±102.228	751.668±80.5873
(100,50)	2531.48±147.891	639.35±74.3229
(100,90)	7283.4±250.854	0



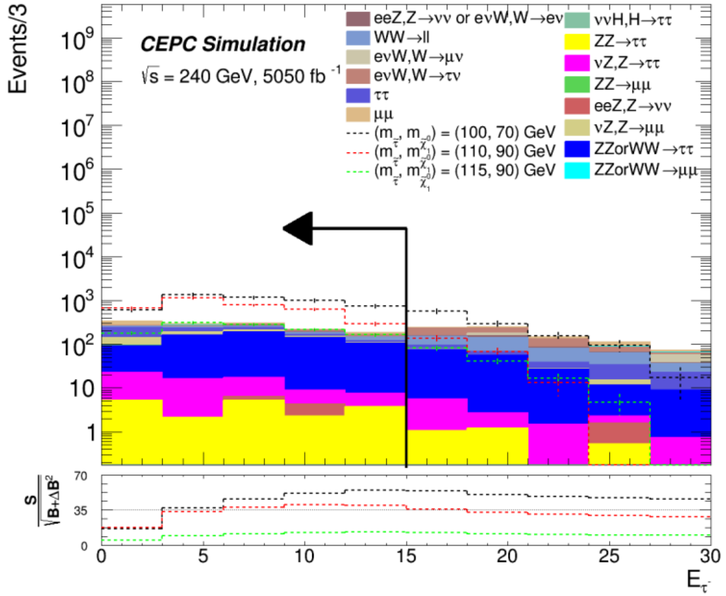
$\lvert\Delta\phi(\tau, recoil)\rvert > 2.5$: $\tau\tau; ZZorWW \to \tau\tau\nu\nu; \mu\mu$



$\Delta R(\tau, recoil) < 3$: $\tau\tau; ZZorWW \to \tau\tau\nu\nu; \mu\mu$



$\lvert\Delta R(\tau,\tau)\rvert > 1.2$: $\tau\tau; ZZorWW \to \tau\tau\nu\nu; \nu Z, Z \to \mu\mu$



$E_\tau < 15GeV$: $WW \to ll; \mu\mu; evW, W \to \tau\nu$

Direct stau: SR & Results

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SR-lowDeltaM	SR2-highDeltaM
$\lvert\Delta\phi(\tau, recoil)\rvert > 2.5$	
$\Delta R(\tau, recoil) < 3$	
$\lvert\Delta R(\tau,\tau)\rvert > 1.2$	$\lvert\Delta R(\tau,\tau)\rvert > 0.6$
$E_\tau < 15GeV$	
$m_{\tau\tau} < 30GeV$	$m_{recoil} < 180GeV$
	$m_{\tau\tau} < 35GeV$

Process	SR-lowDeltaM	SR2-highDeltaM
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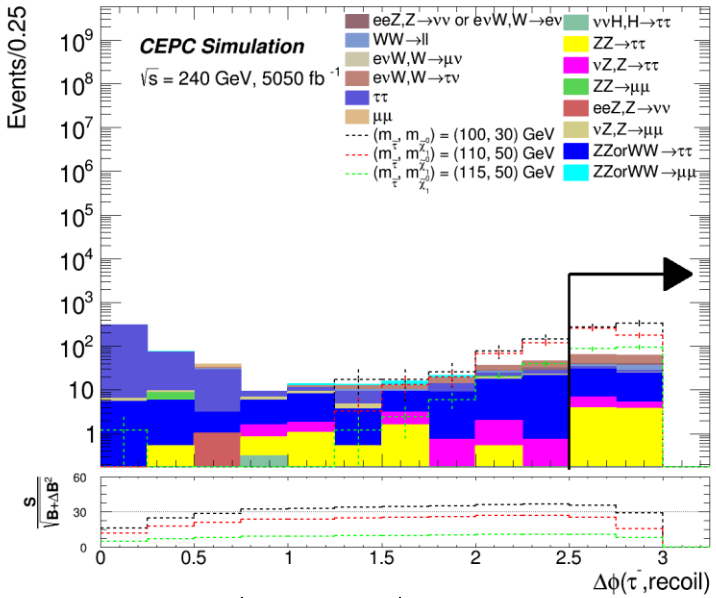
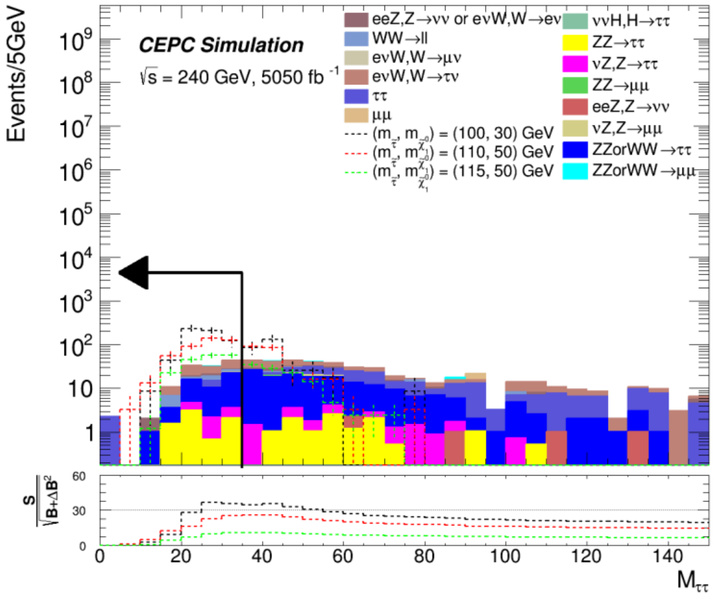
$\nu Z, Z \to \mu\mu$	106.848±10.9051	1.113±1.113
$\mu\mu$	121.74±27.2219	0
$e\nu W, W \to \mu\nu$	0	0
$e\nu W, W \to \tau\nu$	91.637±9.60617	45.315±6.75516
$eeZ, Z \to \nu\nu$	3.072±1.77362	0
$eeZ, Z \to \nu\nu\ or\ e\nu W, W \to e\nu$	19.855±4.55505	5.225±2.33669
Total background	1325.43±47.0509	125.112±11.4571
(100,10)	1209.58±102.228	751.668±80.5873
(100,50)	2531.48±147.891	639.35±74.3229
(100,90)	7283.4±250.854	0

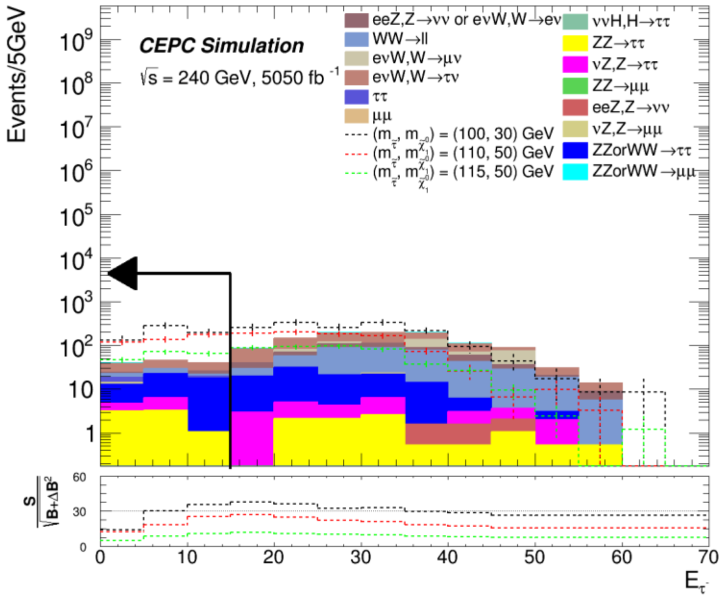
SR-highDeltaM



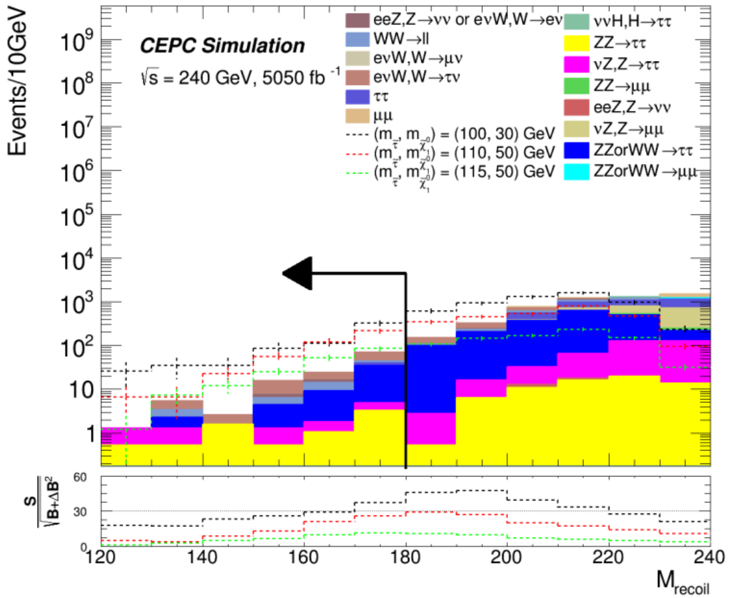
$\lvert\Delta\phi(\tau, recoil)\rvert > 2.5$: $\tau\tau$



$m_{\tau\tau} < 35GeV$: $\tau\tau$; $ZZorWW \to \tau\tau\nu\nu$; $\nu Z, Z \to \mu\mu$



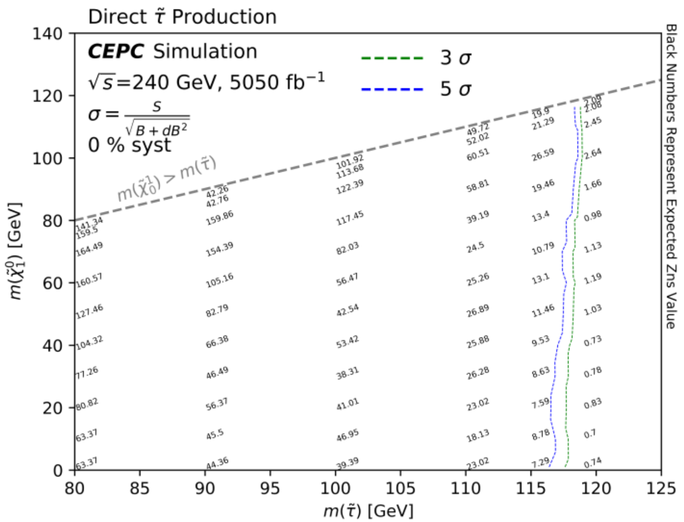
$E_\tau < 15GeV$: $WW \to ll$; $e\nu W, W \to \tau\nu$

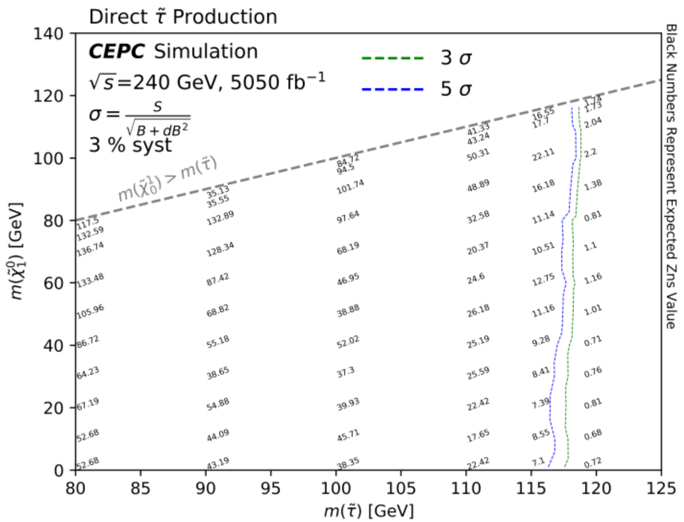


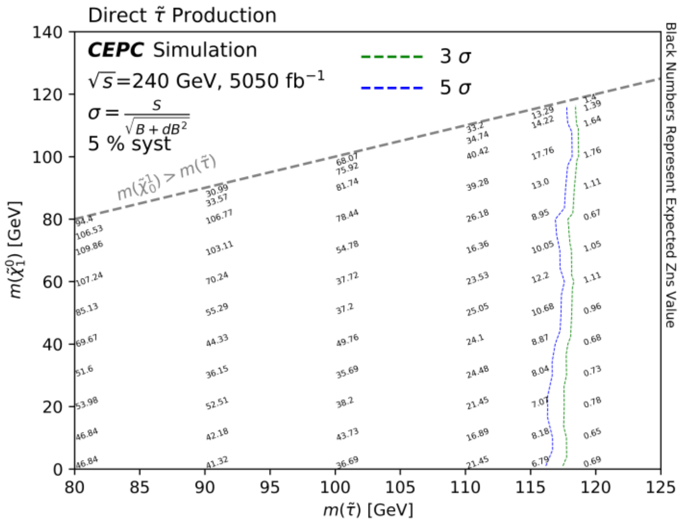
$m_{recoil} < 180GeV$: $\tau\tau$, $ZZorWW \to \tau\tau$; $e\nu W, W \to \tau\nu$

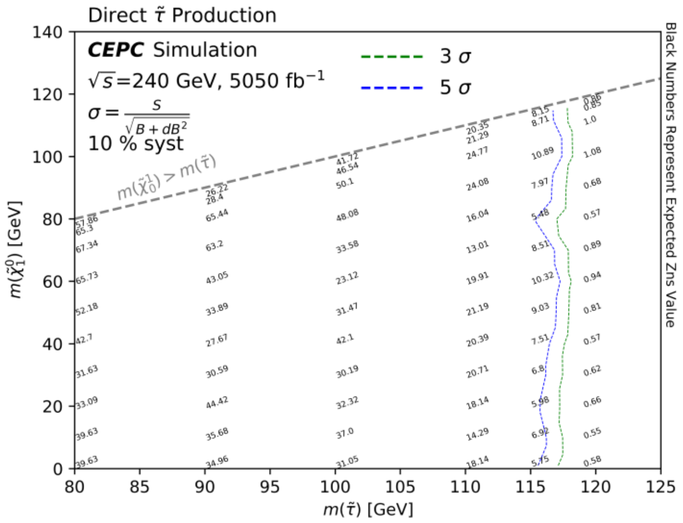
Direct stau: Sensitivity map

- With 10% syst, for direct stau production, the discovery sensitivity reaches 115 GeV in stau mass.

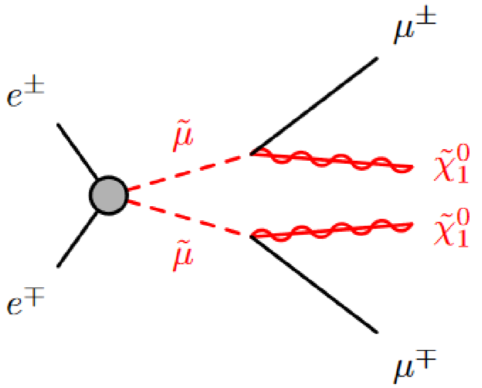








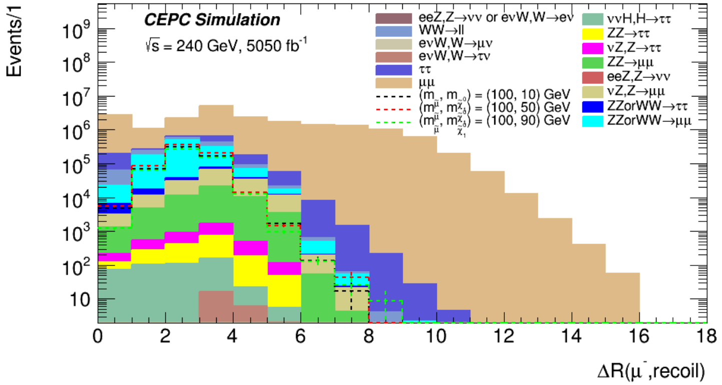
Direct smuon: Optimization Strategy

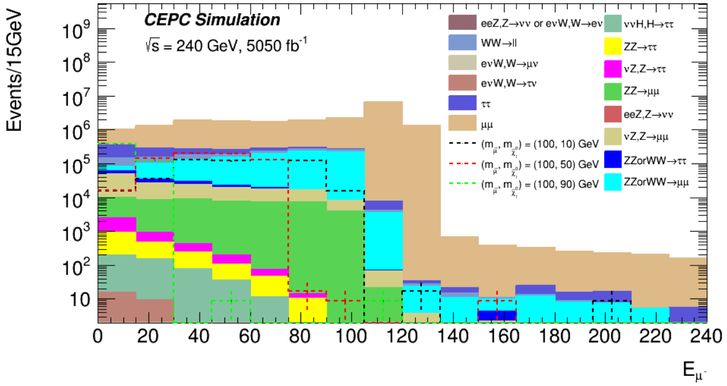


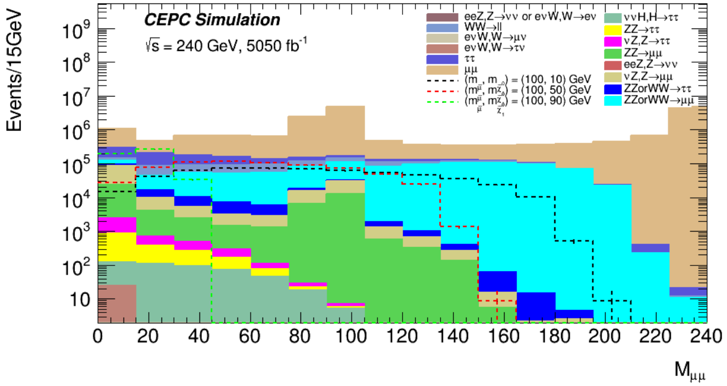
- Select events with 2 OS muons with energy > 0.5GeV.
- Perform a multi-dimension optimization, considering variables:

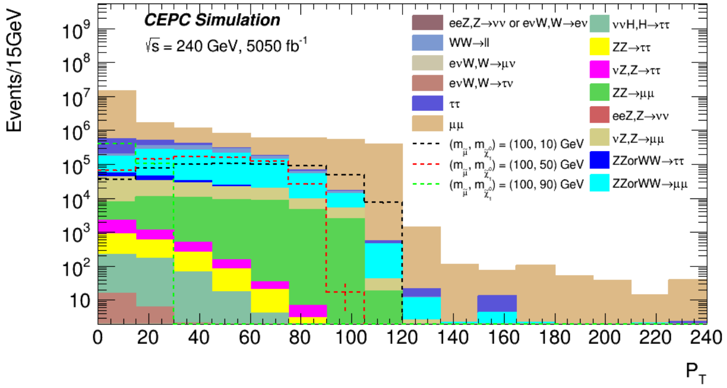
$$\Delta R(\mu,\mu), \Delta R(\mu, recoil), \Delta\varphi(\mu,\mu), \Delta\varphi(\mu, recoil), M_{\mu\mu}, M_{recoil}, E_{\mu\mu}, P_T^{\mu\mu}, E_{\mu}, P_T^{\mu}$$

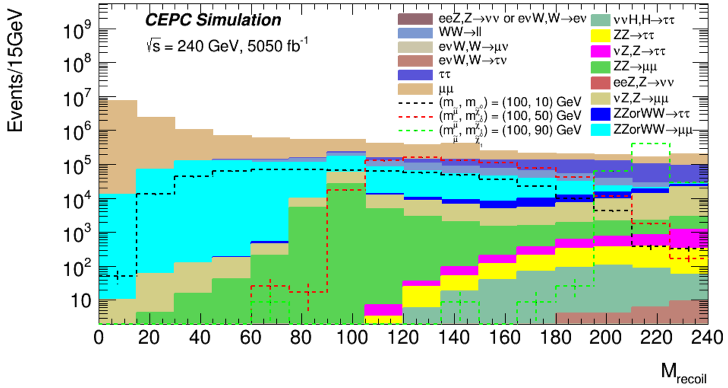
- Check for both upper cut and down cut for each variable.
- Use $\frac{S}{\sqrt{B+dB^2}}$ as a sensitivity measurement (consider statistical uncertainty and 5% systematic uncertainty).











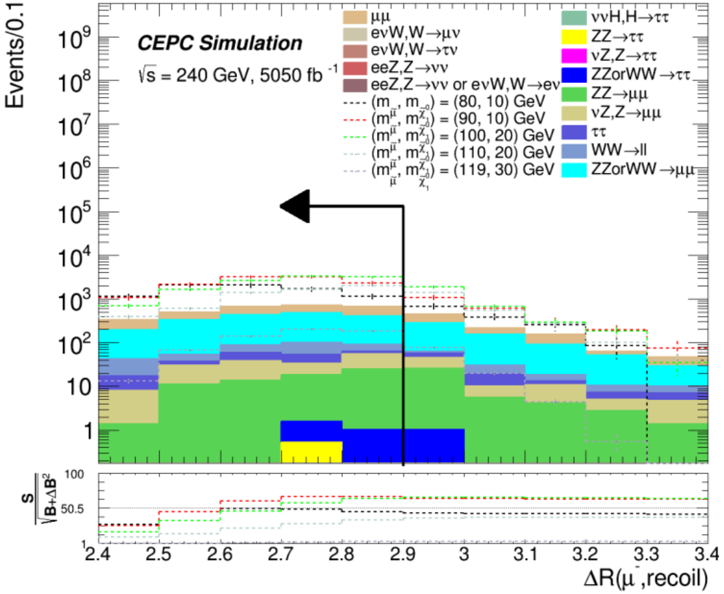
Direct smuon: SR & Results

- Three SRs are defined for different $\Delta m(\tilde{\mu}, \tilde{\chi}_1^0)$

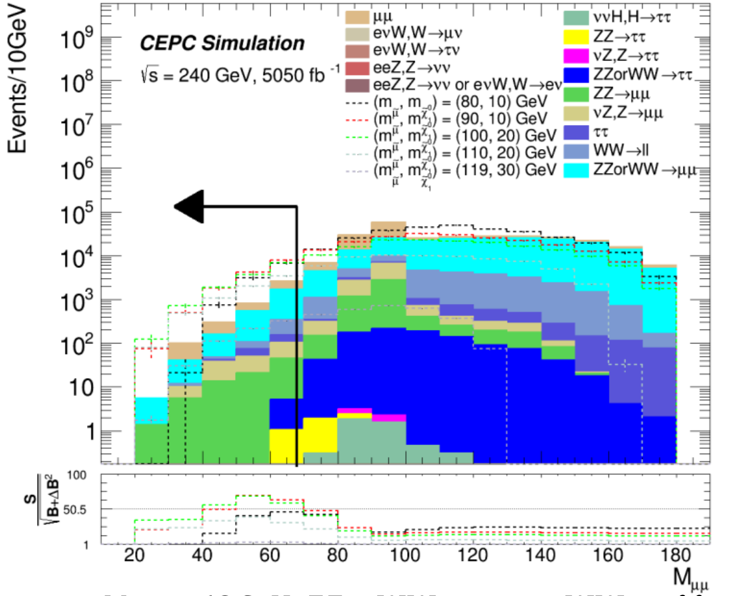
SR-highDeltaM	SR-midDeltaM	SR-lowDeltaM
2 μ (OS, both energy > 0.5GeV)		
$\Delta R(\mu, recoil) < 2.9$	$\Delta R(\mu, recoil) < 2.6$	$\Delta R(\mu, recoil) < 2.7$
$E_\mu > 40GeV$	$E_\mu < 50GeV$	
$M_{\mu\mu} < 68GeV$	$p_T > 50GeV/c$	$M_{\mu\mu} < 85GeV$
$M_{recoil} > 60GeV$		$M_{recoil} > 135GeV$

process	SR-highΔm	SR-midΔm	SR-lowΔm
$\tau\tau$	72.64±12.84	68.1±12.43	5361.74±110.32
$\nu\nu H, H \to \tau\tau$	0	0	60.76±3.07
$ZZorWW \to \tau\tau\nu\nu$	3.09±1.78	1.03±1.03	2242.31±48.0581
$ZZ \to \tau\tau\nu\nu$	1.07±0.76	0	68.608±6.06
$\nu Z, Z \to \tau\tau$	0	0	115.60±9.26
$ZZorWW \to \mu\mu\nu\nu$	1561.42±40.84	624.78±25.83	19535.9±114.45
$ZZ \to \mu\mu\nu\nu$	69.2±9.79	15.22±4.59	218.67±17.40
$WW \to \ell\ell$	163.68±12.94	154.47±12.57	7589.64±88.11
$\nu Z, Z \to \mu\mu$	96.83±10.38	12.24±3.69	736.81±28.64
$\mu\mu$	1095.66±81.67	298.26±42.61	11060.10±259.47
$e\nu W, W \to \mu\nu$	0	0	0
$e\nu W, W \to \tau\nu$	0	0	0
$eeZ, Z \to \nu\nu$	0	0	0
$eeZ, Z \to \nu\nu$ or $e\nu W, W \to e\nu$	0	0	0
total background	3063.59±94.22	1174.11±53.21	46990.10±334.20
Ref. point (100,10)	8817.9±276.10	587.86±71.29	19771.1±413.43
Ref. point (100,50)	8186.81±266.04	3423.42±172.42	61094.20±726.75
Ref. point (100,90)	0	0	139210±1094.03

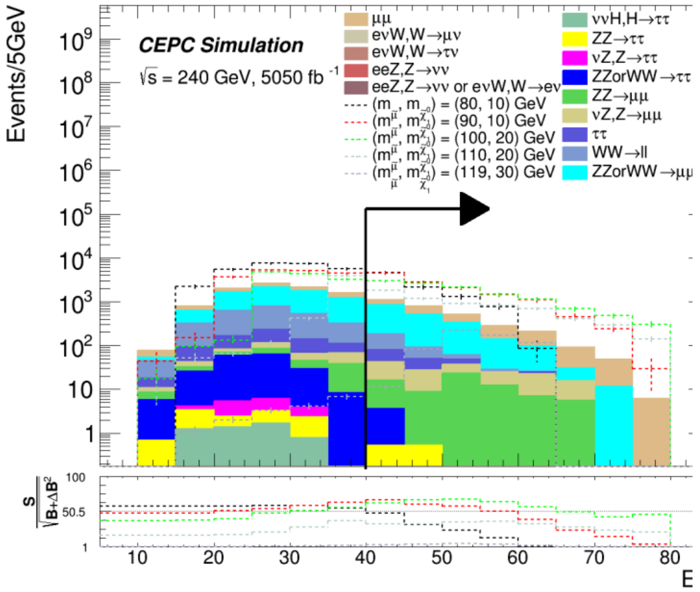
SR-highDeltaM



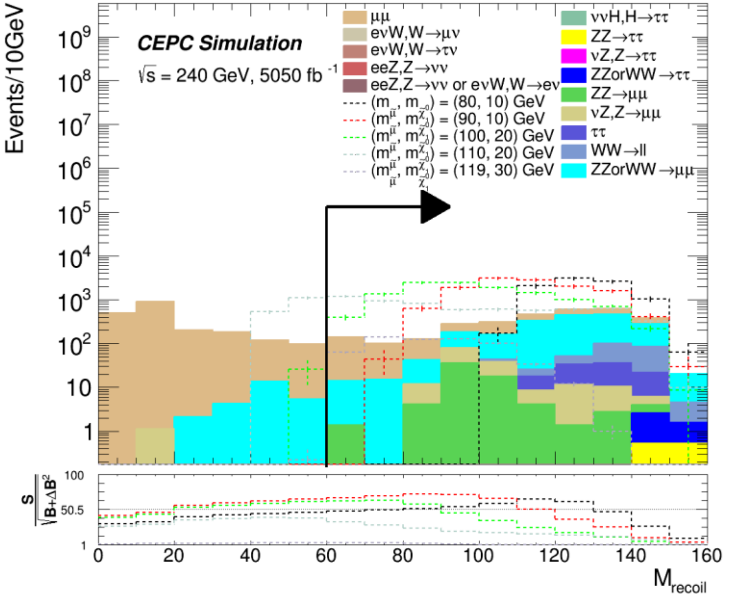
$\Delta R(\mu, recoil) < 2.9$: $\mu\mu$; $ZZorWW \to \mu\mu\nu\nu$



$M_{\mu\mu} < 68GeV$: $ZZorWW \to \mu\mu\nu\nu$; $WW \to \ell\ell$



$E_\mu > 40GeV$: $ZZorWW \to \mu\mu\nu\nu$; $WW \to \ell\ell$; $\mu\mu$



$M_{recoil} > 60GeV$: $\mu\mu$

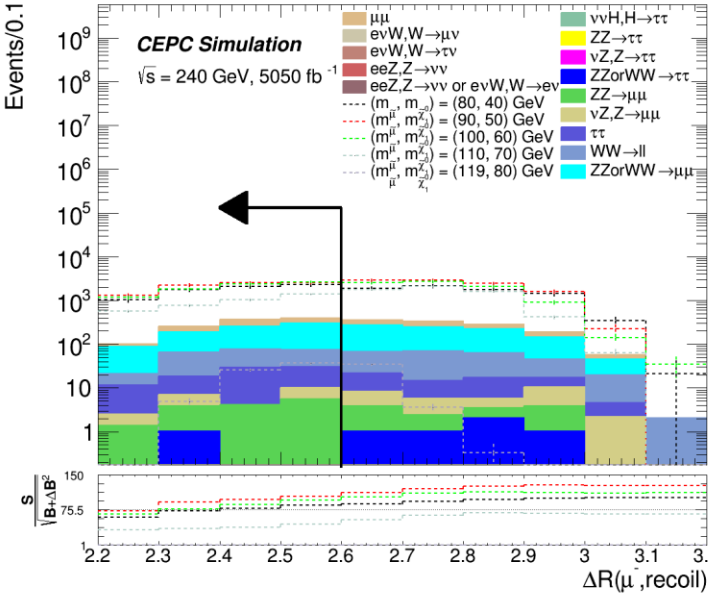
Direct smuon: SR & Results

- Three SRs are defined for different $\Delta m(\tilde{\mu}, \tilde{\chi}_1^0)$.

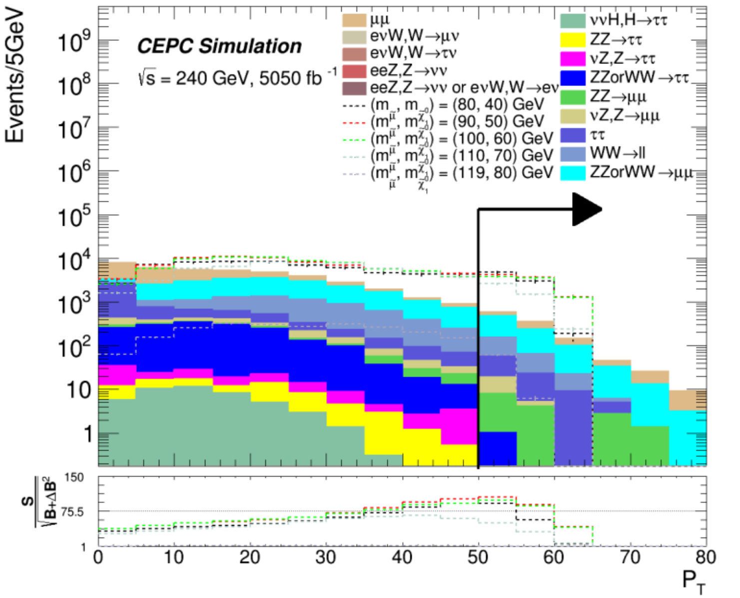
SR-highDeltaM	SR-midDeltaM	SR-lowDeltaM
$2\ \mu$ (OS, both energy > 0.5GeV)		
$\Delta R(\mu, recoil) < 2.9$ $E_\mu > 40GeV$ $M_{\mu\mu} < 68GeV$ $M_{recoil} > 60GeV$	$\Delta R(\mu, recoil) < 2.6$ $E_\mu < 50GeV$ $p_T > 50GeV/c$	$\Delta R(\mu, recoil) < 2.7$ $M_{\mu\mu} < 85GeV$ $M_{recoil} > 135GeV$

process	SR-highΔm	SR-midΔm	SR-lowΔm
$\tau\tau$	72.64±12.84	68.1±12.43	5361.74±110.32
$\nu\nu H, H\to\tau\tau$	0	0	60.76±3.07
$ZZorWW\to\tau\tau\nu\nu$	3.09±1.78	1.03±1.03	2242.31±48.0581
$ZZ\to\tau\tau\nu\nu$	1.07±0.76	0	68.608±6.06
$\nu Z, Z\to\tau\tau$	0	0	115.60±9.26
$ZZorWW\to\mu\mu\nu\nu$	1561.42±40.84	624.78±25.83	19535.9±114.45
$ZZ\to\mu\mu\nu\nu$	69.2±9.79	15.22±4.59	218.67±17.40
$WW\to\ell\ell$	163.68±12.94	154.47±12.57	7589.64±88.11
$\nu Z, Z\to\mu\mu$	96.83±10.38	12.24±3.69	736.81±28.64
$\mu\mu$	1095.66±81.67	298.26±42.61	11060.10±259.47
$e\nu W, W\to\mu\nu$	0	0	0
$e\nu W, W\to\tau\nu$	0	0	0
$eeZ, Z\to\nu\nu$	0	0	0
$eeZ, Z\to\nu\nu\ or\ e\nu W, W\to e\nu$	0	0	0
total background	3063.59±94.22	1174.11±53.21	46990.10±334.20
Ref. point (100,10)	8817.9±276.10	587.86±71.29	19771.1±413.43
Ref. point (100,50)	8186.81±266.04	3423.42±172.42	61094.20±726.75
Ref. point (100,90)	0	0	139210±1094.03

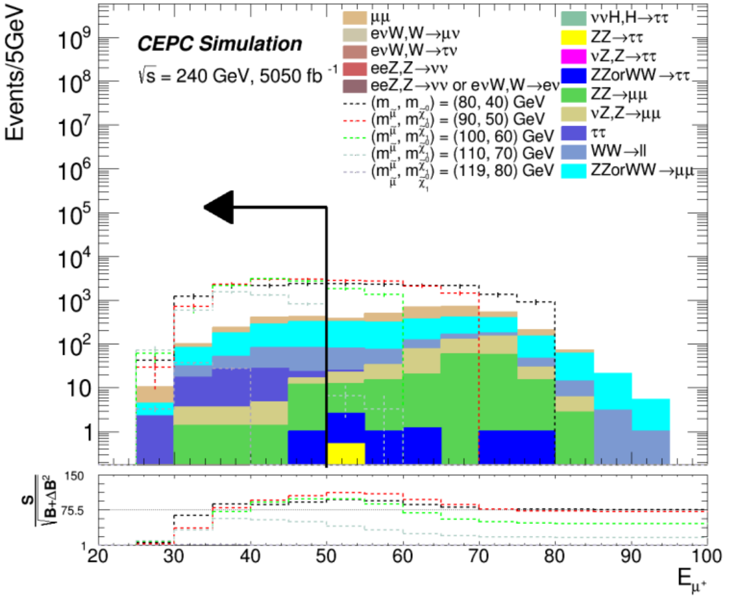
SR-midDeltaM



$\Delta R(\mu, recoil) < 2.6$: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$



$p_T > 50GeV/c$: $ZZorWW \to \mu\mu\nu\nu, WW \to \ell\ell$, $\mu\mu$



$E_\mu < 50GeV$: $ZZorWW \to \mu\mu\nu\nu$, $\mu\mu$

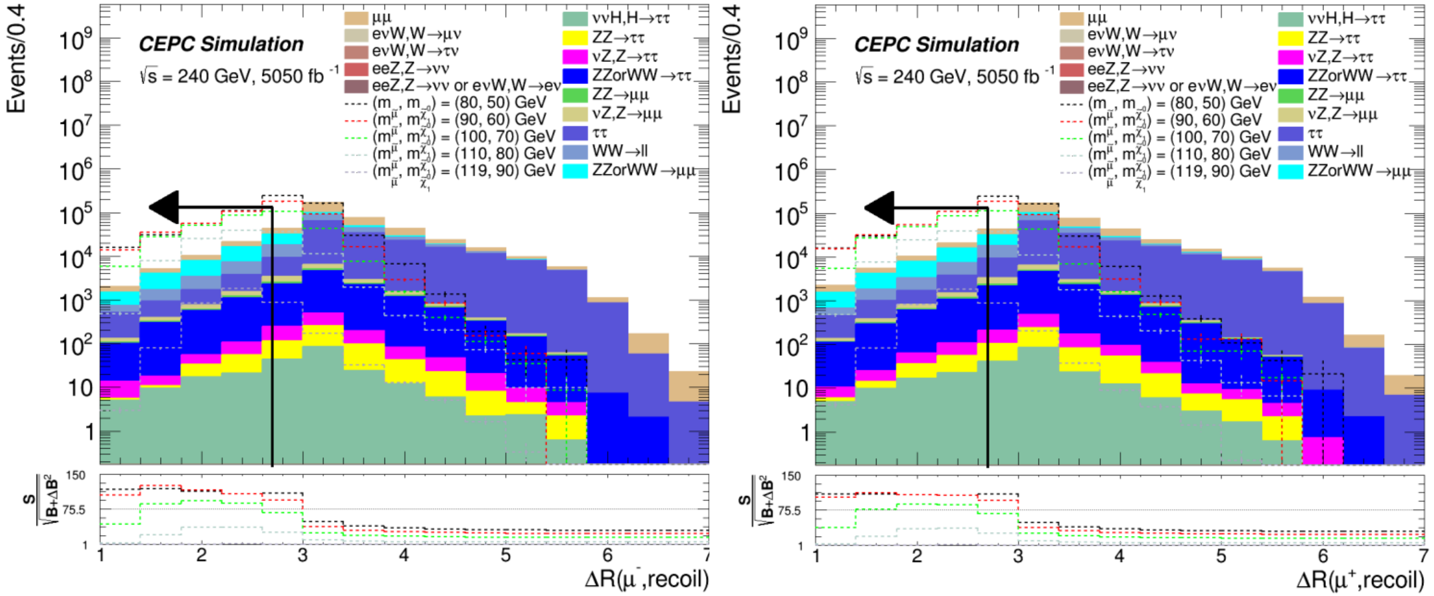
Direct smuon: SR & Results

- Three SRs are defined for different $\Delta m(\tilde{\mu}, \tilde{\chi}_1^0)$.

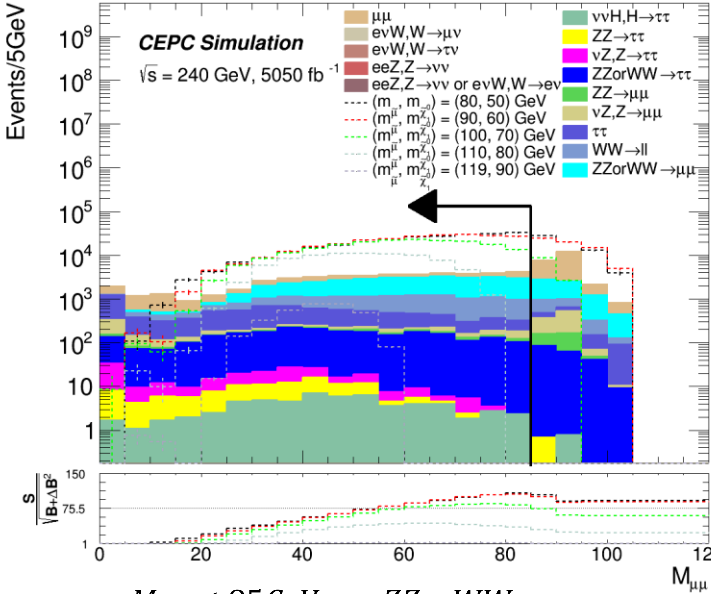
SR-highDeltaM	SR-midDeltaM	SR-lowDeltaM
2 μ (OS, both energy > 0.5GeV)		
$\Delta R(\mu, recoil) < 2.9$	$\Delta R(\mu, recoil) < 2.6$	$\Delta R(\mu, recoil) < 2.7$
$E_\mu > 40GeV$	$E_\mu < 50GeV$	
$M_{\mu\mu} < 68GeV$	$p_T > 50GeV/c$	$M_{\mu\mu} < 85GeV$
$M_{recoil} > 60GeV$		$M_{recoil} > 135GeV$

process	SR-highΔm	SR-midΔm	SR-lowΔm
$\tau\tau$	72.64±12.84	68.1±12.43	5361.74±110.32
$\nu\nu H, H \to \tau\tau$	0	0	60.76±3.07
$ZZorWW \to \tau\tau\nu\nu$	3.09±1.78	1.03±1.03	2242.31±48.0581
$ZZ \to \tau\tau\nu\nu$	1.07±0.76	0	68.608±6.06
$\nu Z, Z \to \tau\tau$	0	0	115.60±9.26
$ZZorWW \to \mu\mu\nu\nu$	1561.42±40.84	624.78±25.83	19535.9±114.45
$ZZ \to \mu\mu\nu\nu$	69.2±9.79	15.22±4.59	218.67±17.40
$WW \to \ell\ell$	163.68±12.94	154.47±12.57	7589.64±88.11
$\nu Z, Z \to \mu\mu$	96.83±10.38	12.24±3.69	736.81±28.64
$\mu\mu$	1095.66±81.67	298.26±42.61	11060.10±259.47
$evW, W \to \mu\nu$	0	0	0
$evW, W \to \tau\nu$	0	0	0
$eeZ, Z \to \nu\nu$	0	0	0
$eeZ, Z \to \nu\nu$ or $evW, W \to e\nu$	0	0	0
total background	3063.59±94.22	1174.11±53.21	46990.10±334.20
Ref. point (100,10)	8817.9±276.10	587.86±71.29	19771.1±413.43
Ref. point (100,50)	8186.81±266.04	3423.42±172.42	61094.20±726.75
Ref. point (100,90)	0	0	139210±1094.03

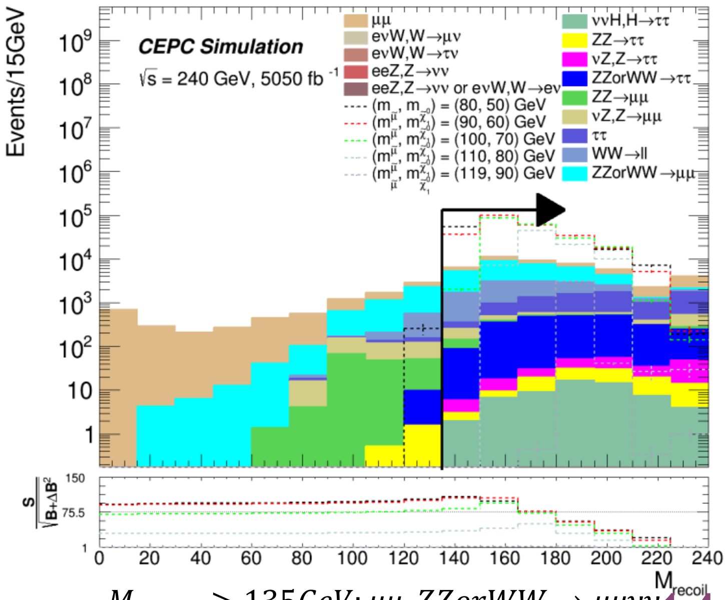
SR-lowDeltaM



$\Delta R(\mu, recoil) < 2.7$: $\tau\tau, WW \to \ell\ell, \mu\mu$



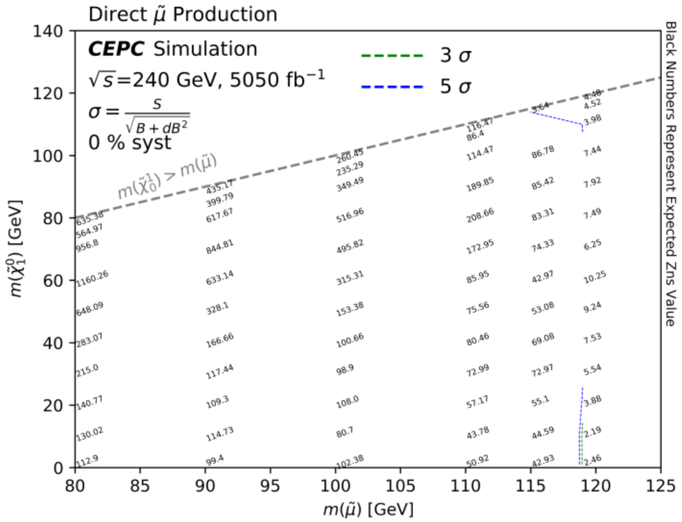
$M_{\mu\mu} < 85GeV$: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$

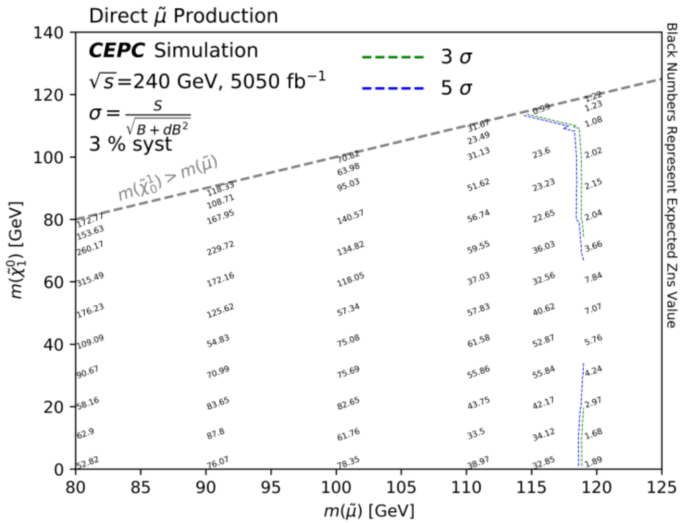


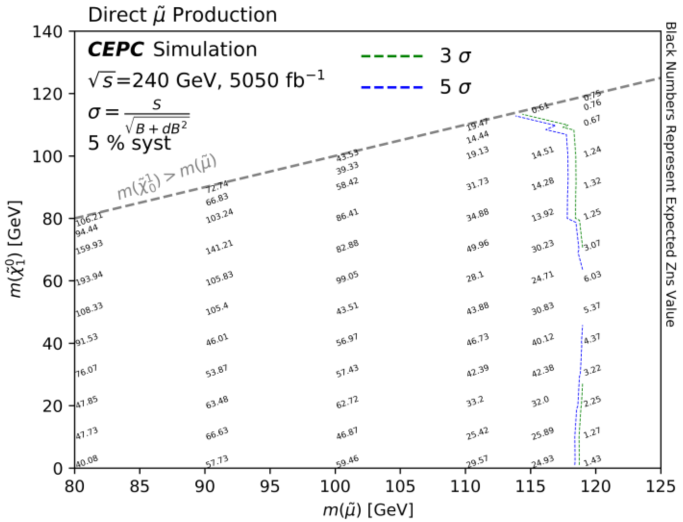
$M_{recoil} > 135GeV$: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$

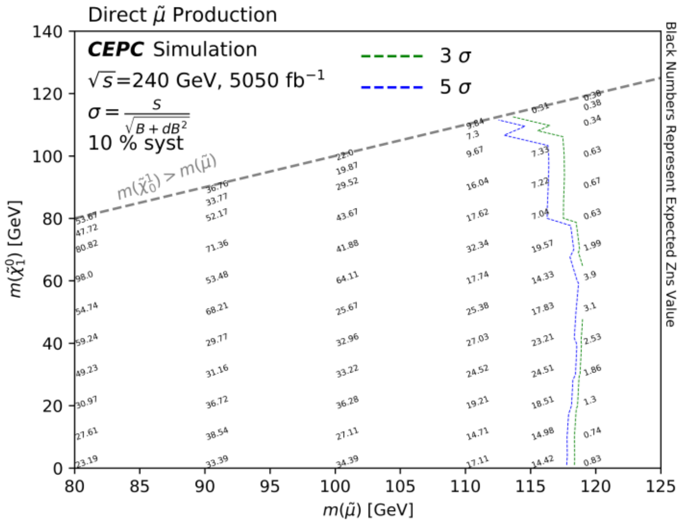
Direct smuon: Sensitivity map

- With 10% syst, for direct smuon production, the discovery sensitivity reaches 115 GeV in smuon mass.

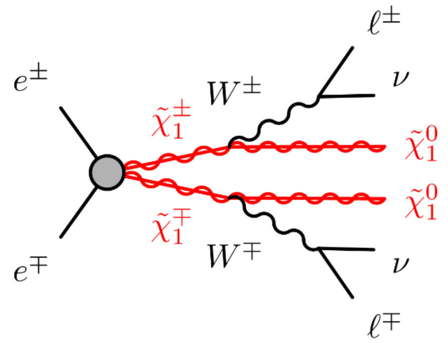








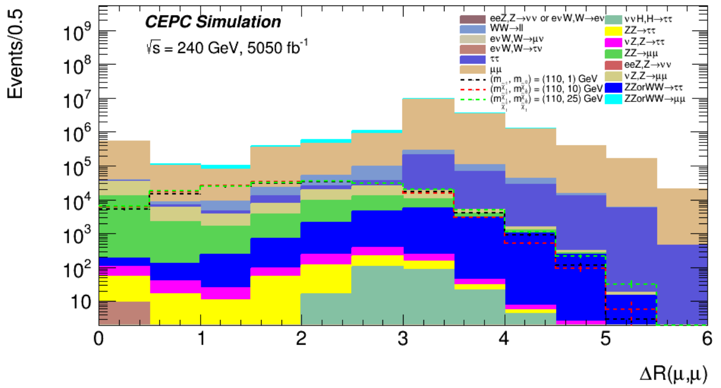
Chargino pair (Bino LSP): Optimization Strategy

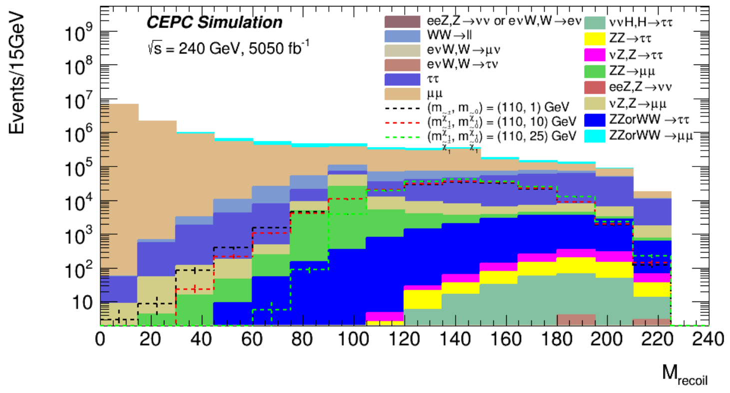


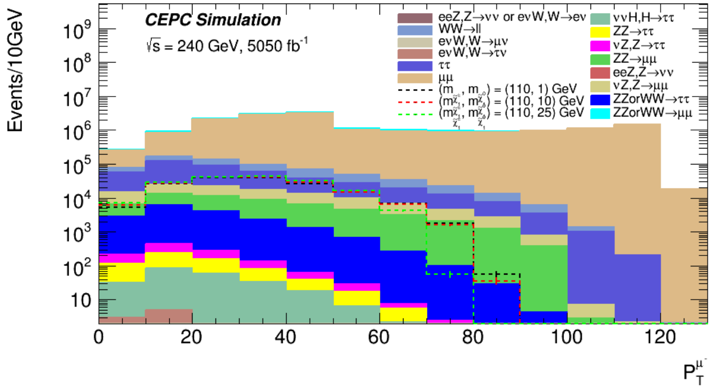
- Select events with 2 OS muons with energy > 10 GeV.
- Perform a multi-dimension optimization considering variables:

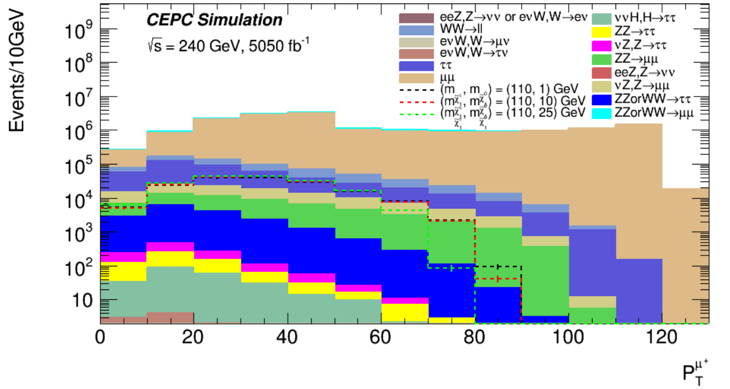
$$\Delta R(\mu,\mu), \Delta R(\mu, recoil), \Delta\varphi(\mu,\mu), \Delta\varphi(\mu, recoil), M_{\mu\mu}, M_{recoil}, E_{\mu\mu}, P_T^{\mu\mu}, E_{\mu}, P_T^{\mu}$$

- Check for both upper cut and down cut for each variable.
- Use $\frac{S}{\sqrt{S+B+dB^2}}$ as a sensitivity measurement (consider statistical uncertainty and 5% systematic uncertainty).







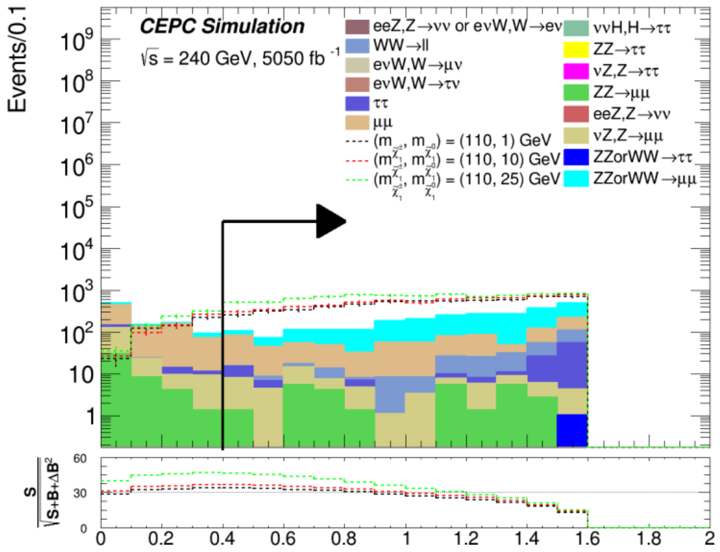


Chargino pair (Bino LSP): SR & Results

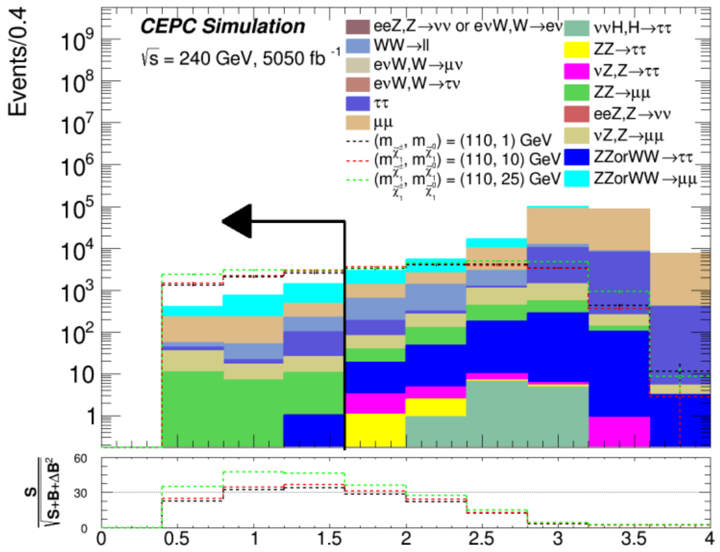
- One signal region is defined.

Signal Region
2 μ (OS, both energy > 10GeV)
$0.4 < \lvert\Delta R(\mu,\mu)\rvert < 1.6$
$M_{recoil} > 130$ GeV
$p_T^{\mu} > 30$ GeV/c

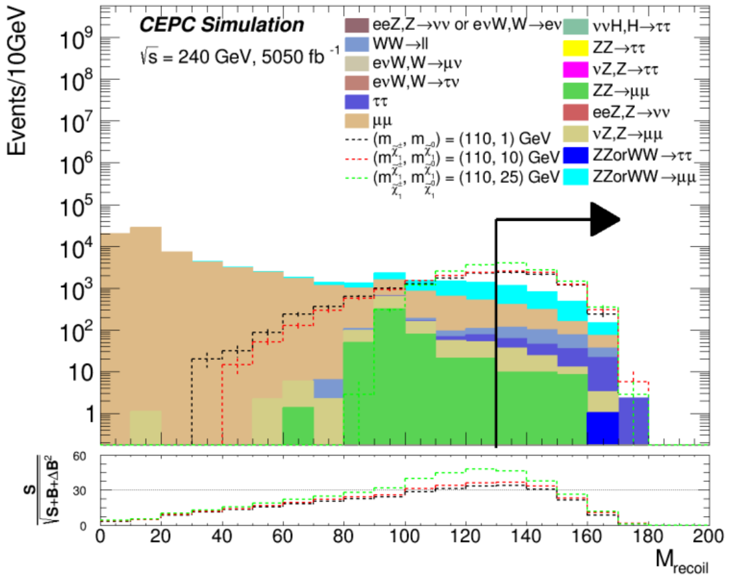
Process	Yield
$\tau\tau$	88.47±14.17
$\nu\nu H, H \to \tau\tau$	0
$ZZorWW \to \tau\tau\nu\nu$	0.74±0.74
$ZZ \to \tau\tau\nu\nu$	0
$\nu Z, Z \to \tau\tau$	0
$ZZorWW \to \mu\mu\nu\nu$	1637.9±41.75
$ZZ \to \mu\mu\nu\nu$	27.68±6.19
$WW \to \ell\ell$	162.66±12.90
$\nu Z, Z \to \mu\mu$	47.86±7.30
$\mu\mu$	608.7±60.87
$evW, W \to \mu\nu$	0
$evW, W \to \tau\nu$	0
$eeZ, Z \to \nu\nu$	0
$eeZ, Z \to \nu\nu$ or $evW, W \to e\nu$	0
total background	2568.01±76.86
Ref. point (110,1)	5937.33±130.879
Ref. point (110,10)	6468.17±136.60
Ref. point (110,25)	8470.36±156.32



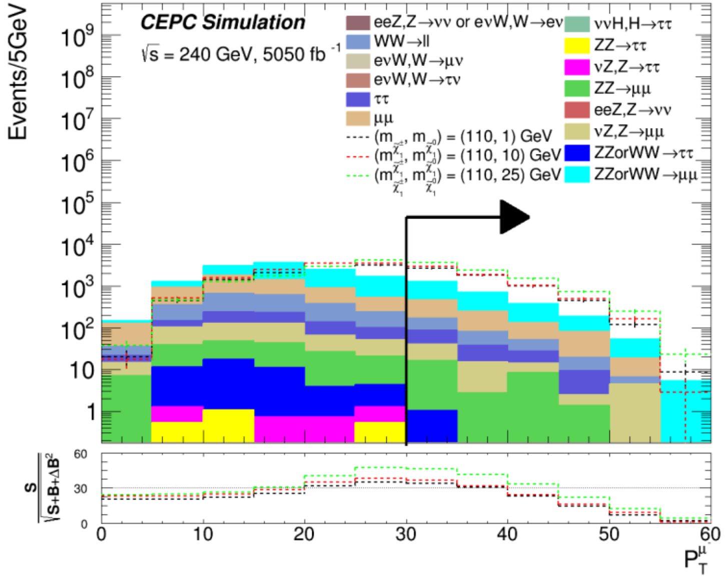
$\Delta R(\mu,\mu) > 0.4$: $\mu\mu$



$\Delta R(\mu,\mu) < 1.6$: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$



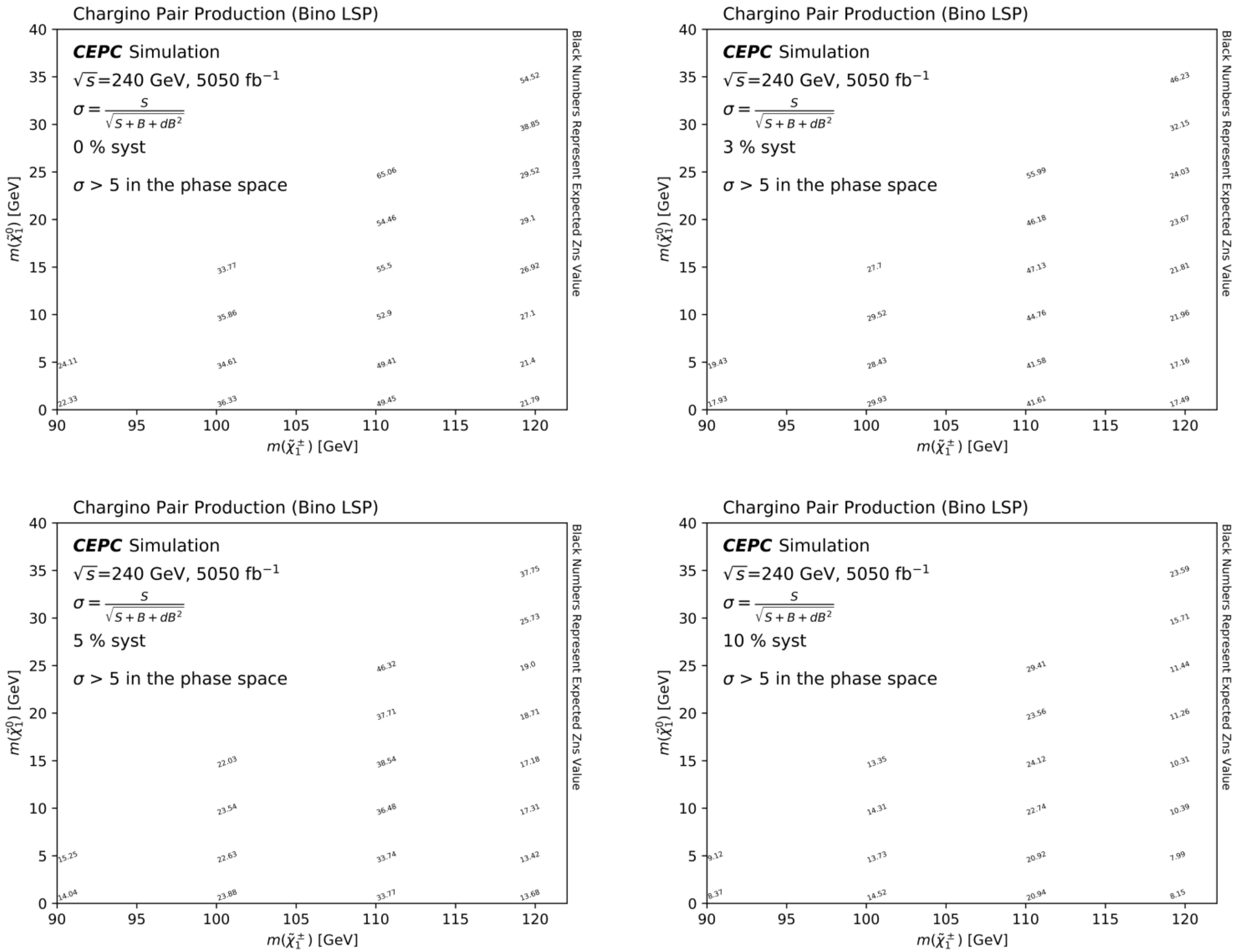
$M_{recoil} > 130$GeV: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$



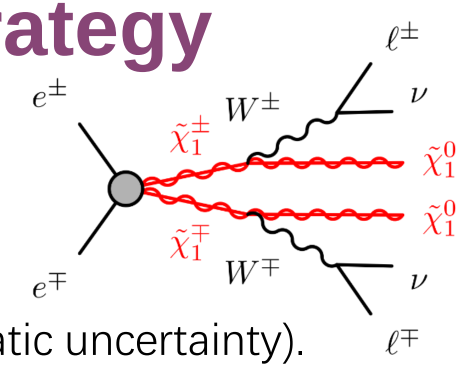
$p_T^{\mu} > 30$ GeV/c: $\mu\mu, ZZorWW \to \mu\mu\nu\nu$

Chargino pair (Bino LSP): Sensitivity map

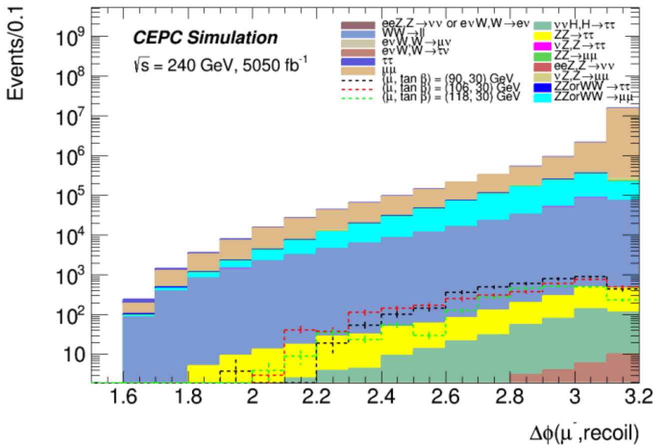
- With 10% syst, for chargino pair production (Bino LSP), the discovery sensitivity reaches the phase space.

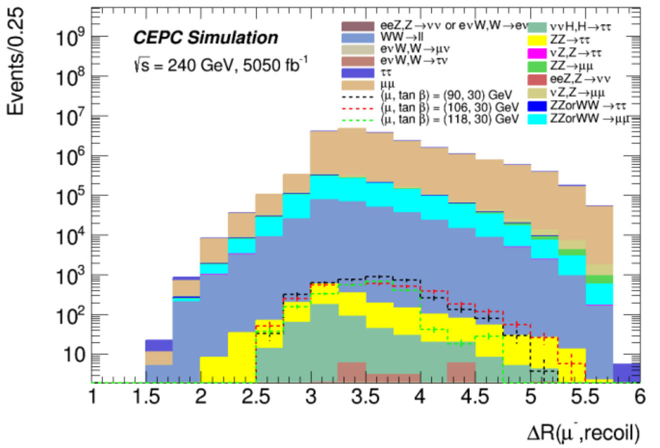


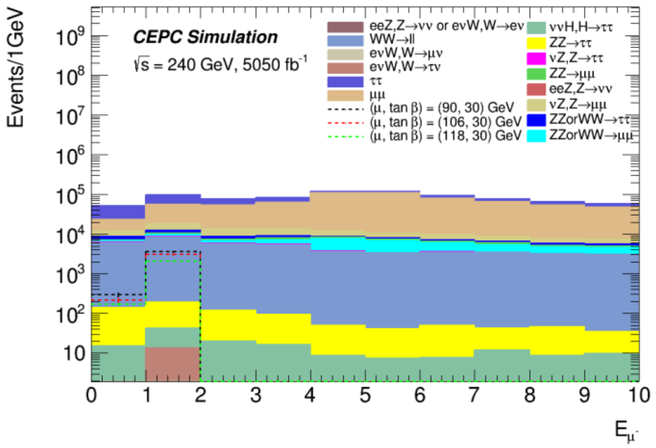
Chargino pair (Higgsino LSP): Optimization Strategy

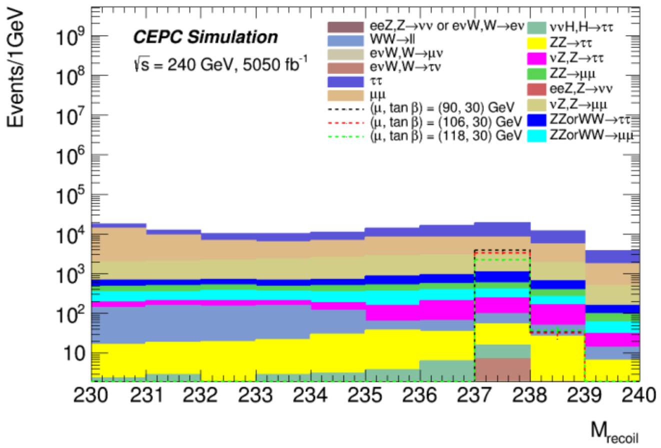


- Select events with 2 OS muons.
- Perform a multi-dimension optimization considering variables:
$$\Delta R(\mu,\mu), \Delta R(\mu, recoil), \Delta\varphi(\mu,\mu), \Delta\varphi(\mu, recoil), M_{\mu\mu}, M_{recoil}, E_{\mu\mu}, P_T^{\mu\mu}, E_{\mu}, P_T^{\mu}$$
- Check for both upper cut and down cut for each variable.
- Use $Z_n = \sqrt{2}\,\mathrm{erf}^{-1}(1-2p)$ as a sensitivity measurement (consider statistical uncertainty and 5% systematic uncertainty).







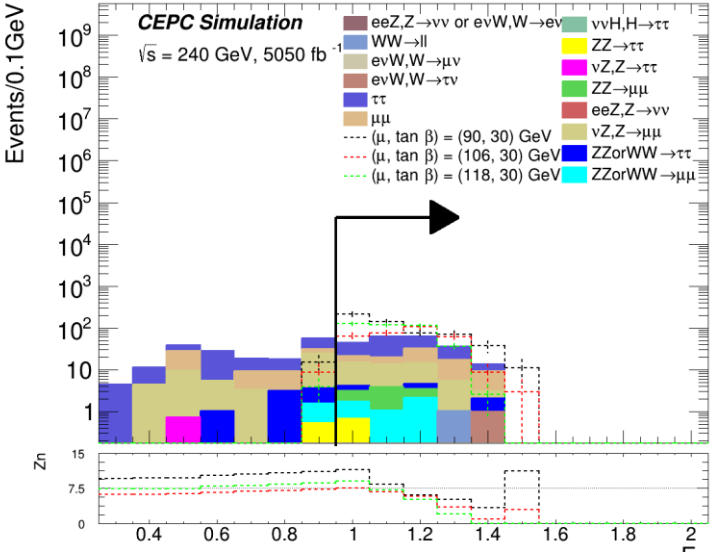


Chargino pair (Higgsino LSP): SR & Results

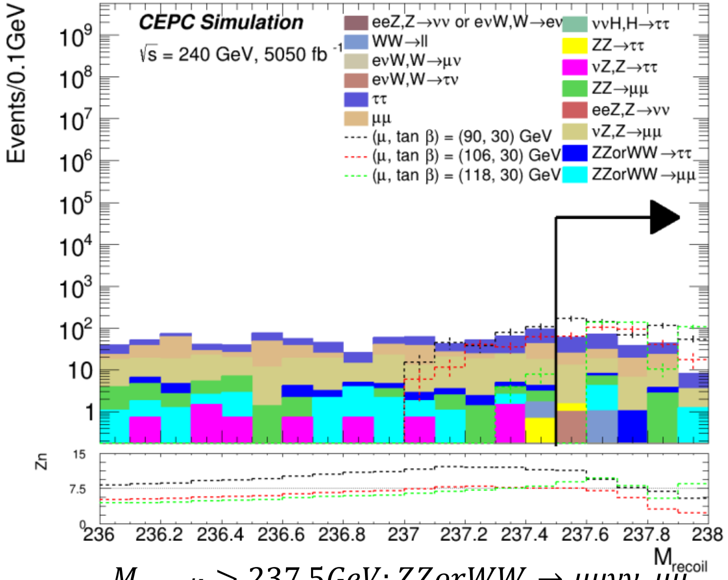
- One signal region is defined.

Signal Region
2 OS μ
$M_{recoil} > 237.5GeV$
E_{μ}>0.95GeV
$3.2 < \Delta R(\mu, recoil) < 4.6$
$\lvert\Delta\phi(\mu, recoil)\rvert < 2.9$

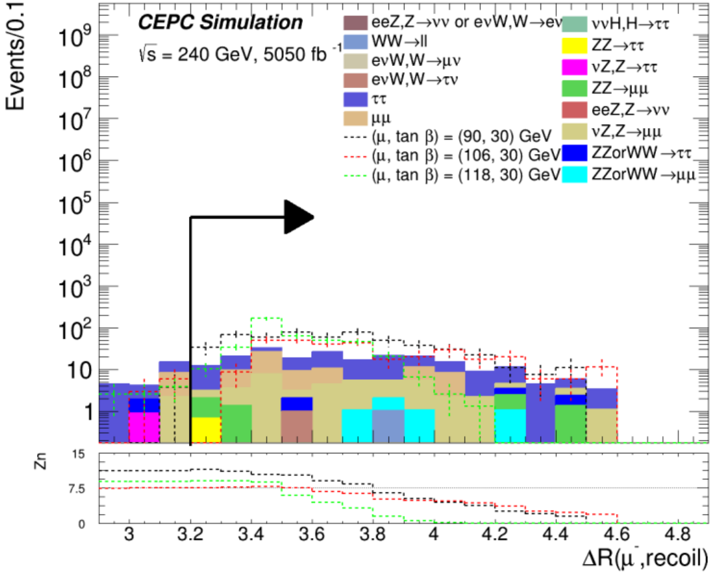
Selection	Yields
$\tau\tau$	117.957±16.3577
$\nu\nu H, H \to \tau\tau$	0.155±0.155
$ZZorWW \to \tau\tau\nu\nu$	3.0975±1.78834
$ZZ \to \tau\tau\nu\nu$	0.5264±0.5264
$\nu Z, Z \to \tau\tau$	0
$ZZorWW \to \mu\mu\nu\nu$	4.272±2.136
$ZZ \to \mu\mu\nu\nu$	5.536±2.768
$WW \to \ell\ell$	1.023±1.023
$\nu Z, Z \to \mu\mu$	36.729±6.3937
$\mu\mu$	48.696±17.2166
$e\nu W, W \to \mu\nu$	0
$e\nu W, W \to \tau\nu$	1.007±1.007
$eeZ, Z \to \nu\nu$	0
$eeZ, Z \to \nu\nu$ or $e\nu W, W \to e\nu$	0
total background	218.999±24.9529
Ref. point (90,30)	546.04±45.1906
Ref. point (106,30)	319±30.4155
Ref. point (118,30)	400.4±22.8149



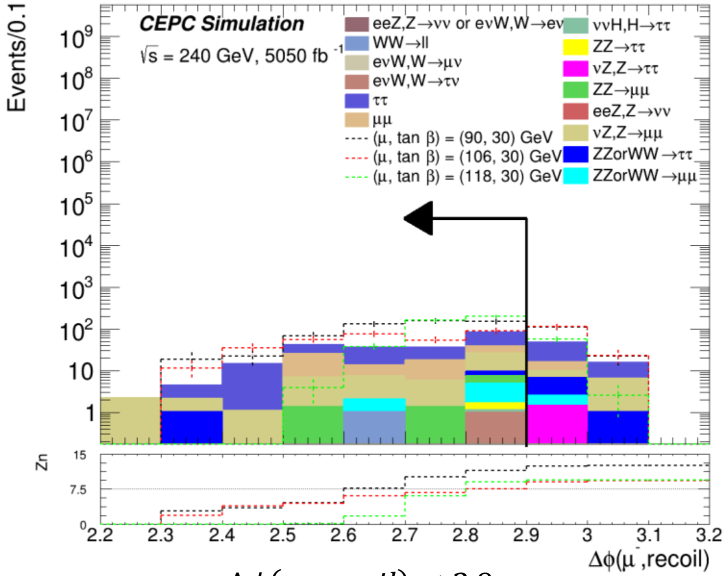
$E_{\mu} > 0.95GeV$: $\nu Z, Z \to \mu\mu, \mu\mu$



$M_{recoil} > 237.5GeV$: $ZZorWW \to \mu\mu\nu\nu, \mu\mu$



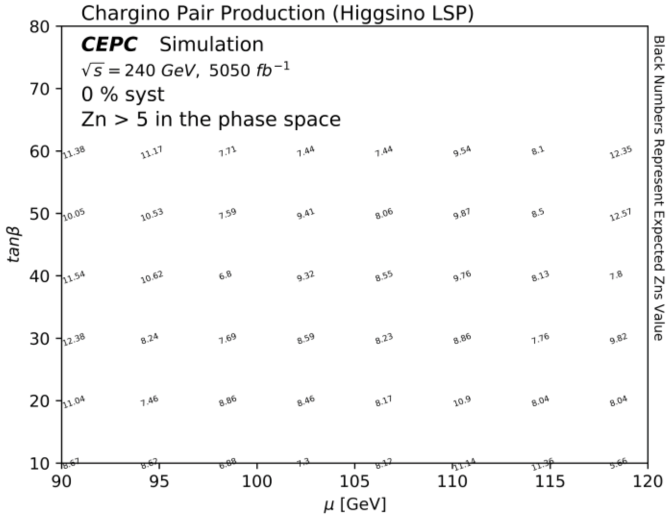
$3.2 < \Delta R(\mu, recoil)$: $\tau\tau, \mu\mu$

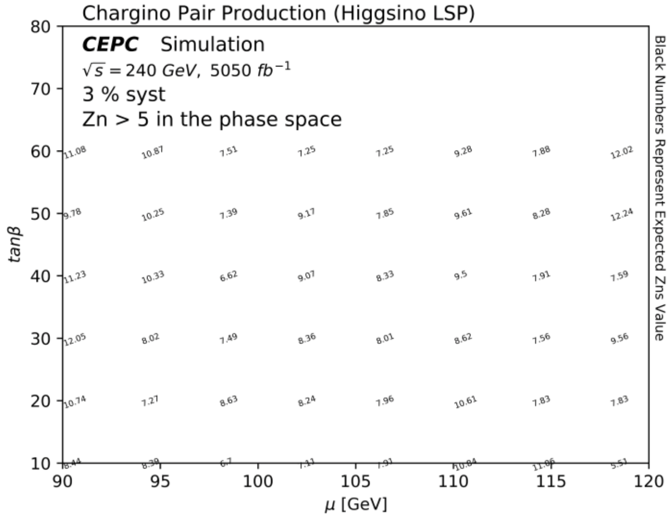


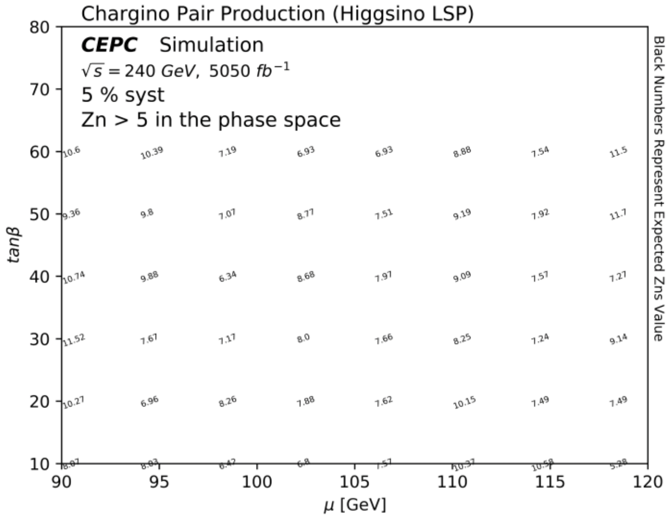
$\Delta\phi(\mu, recoil) < 2.9$: $\tau\tau$

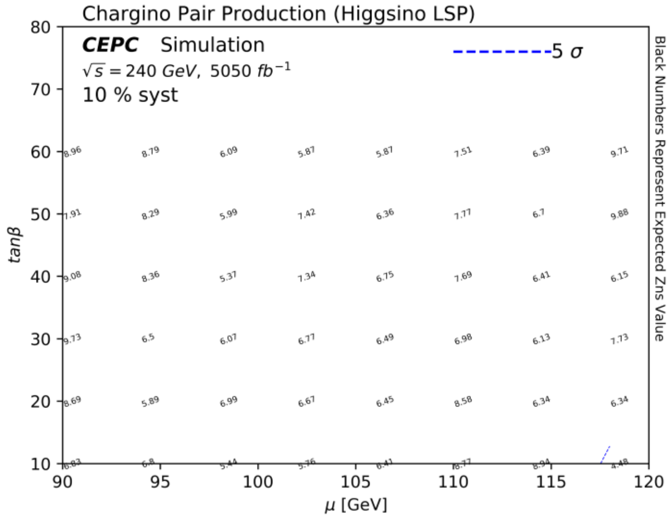
Chargino pair (Higgsino LSP): Zn map

- With 10% syst, for or chargino pair production (Higgsino LSP), the discovery sensitivity reaches up all the mass phase space except a corner at high μ region.



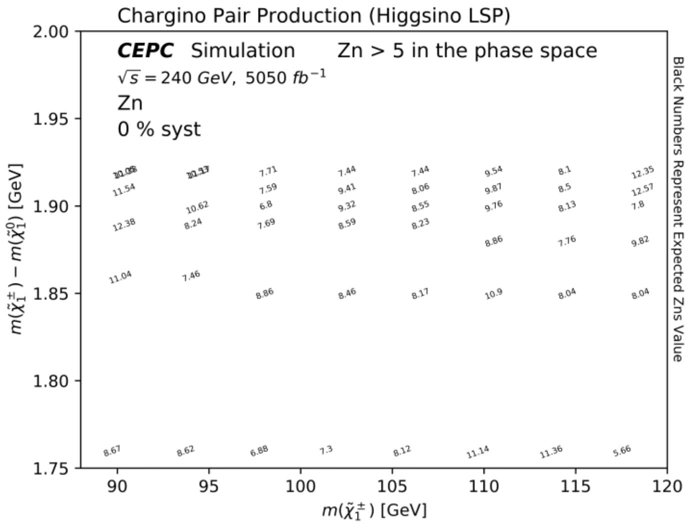


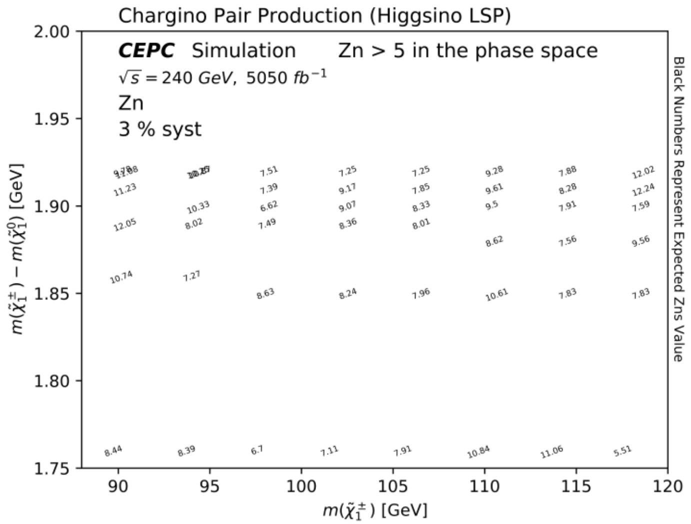


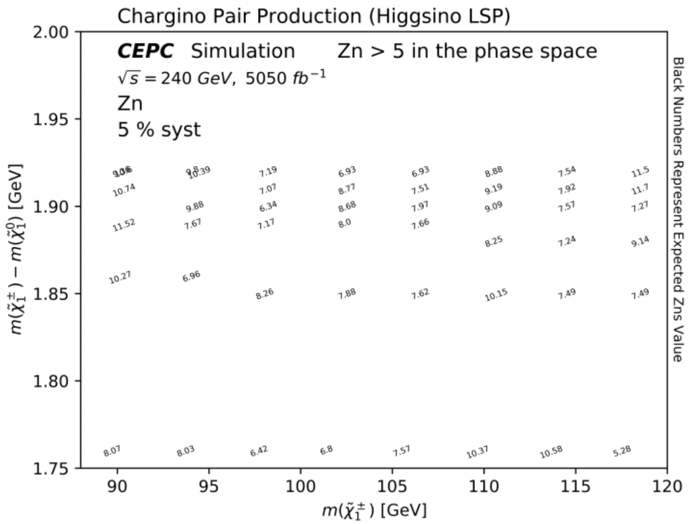


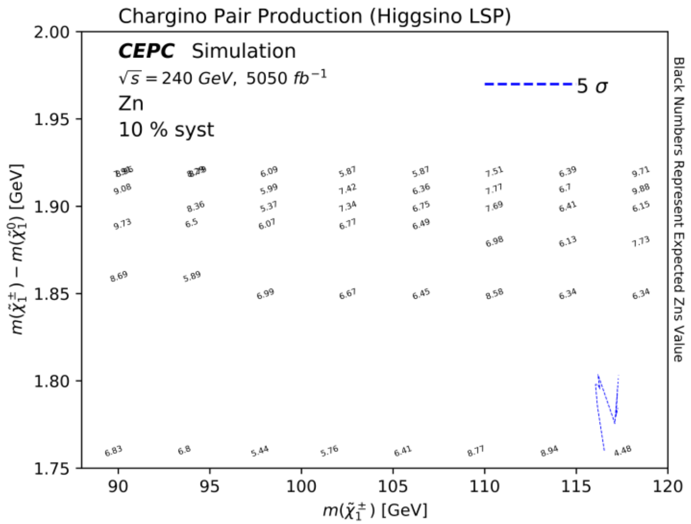
Chargino pair (Higgsino LSP): Zn map

- With 10% syst, for or chargino pair production (Higgsino LSP), the discovery sensitivity reaches up all the mass phase space except a corner at high $\tilde{\chi}_1^{\pm}$ mass region.









Summary

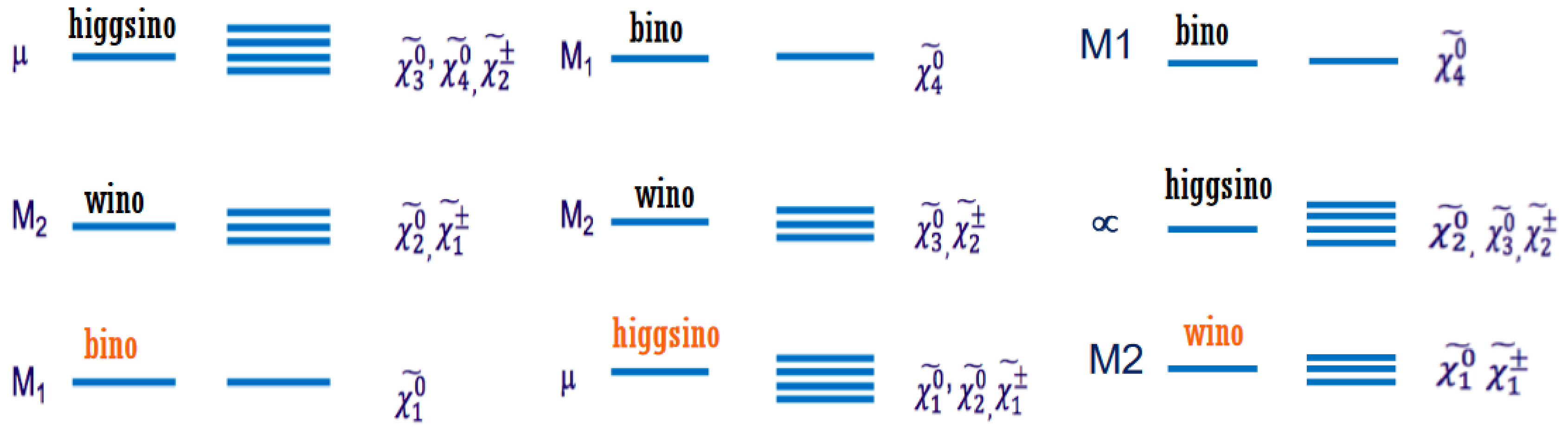
- A preliminary SUSY sensitivity study has been performed to direct stau / smuon production and chargino pair production (Bino LSP and Higgsino LSP) in CEPC, which is promising. With assuming 10% systematic uncertainty:
  - For direct stau / smuon production, the discovery sensitivity reaches 115 GeV in stau / smuon mass.
  - For chargino pair production (Bino LSP), the discovery sensitivity reaches the phase space.
  - For chargino pair production (Higgsino LSP), the discovery sensitivity reaches up all the mass phase space except a corner at high μ region.
- Internal note and paper draft is ongoing.

Thank you.

Backup

Electrowikinos mass split

Bino LSP | **Higgsino LSP** | **Wino LSP**



Standard wino-bino case: large Δm between N1 and C1/N2;

➔ MET + hard leptons

N1,N2,C1 almost degenerate: experimental challenging;

➔ MET + soft leptons

➔ **Lower xsec than higgsino LSP;**

➔ WW+MET dominant;

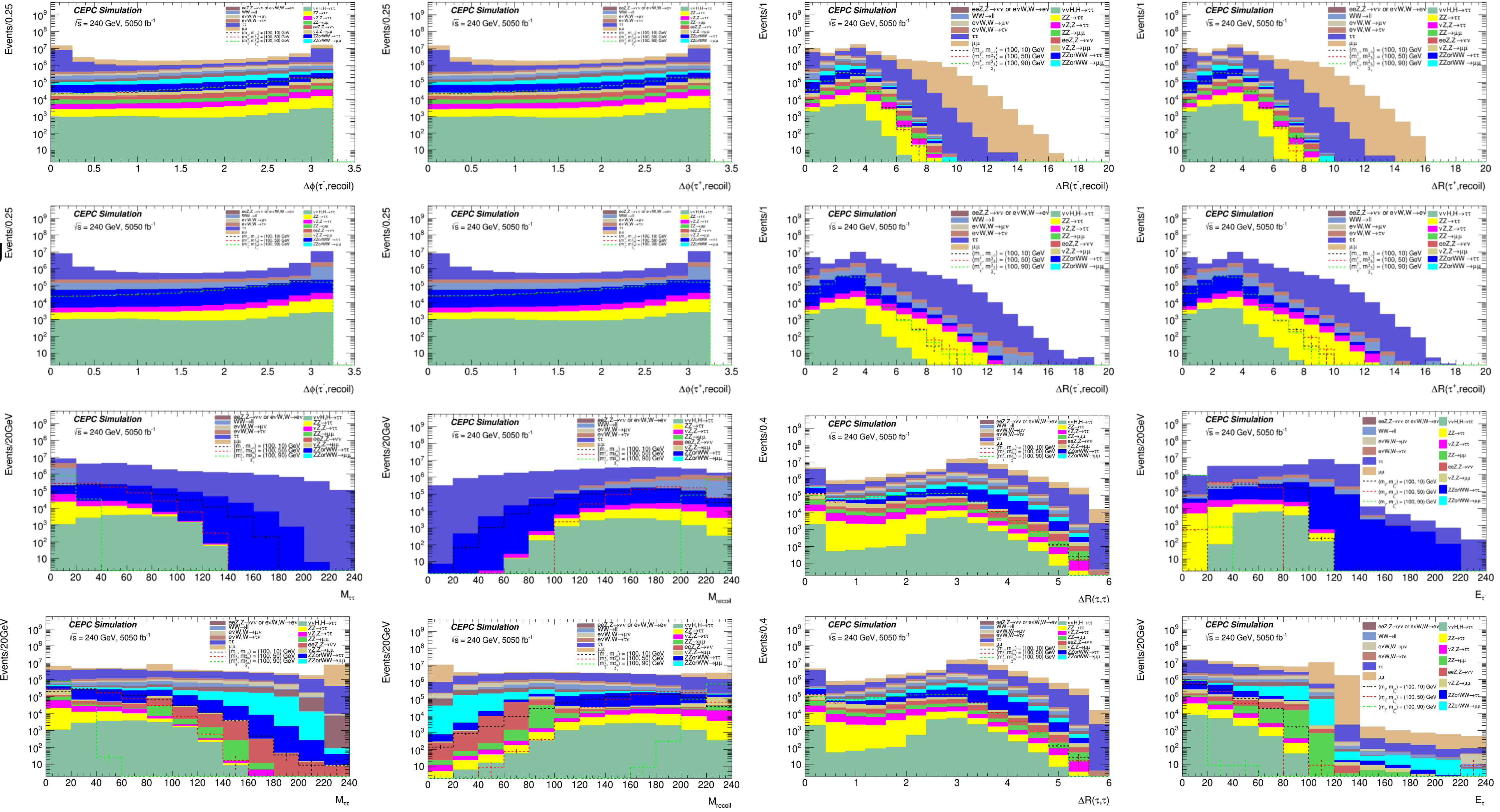
Direct stau: MC – rec

MC

leading track

MC

leadir track



Direct stau: MC – rec