

Interference effects and W' searches

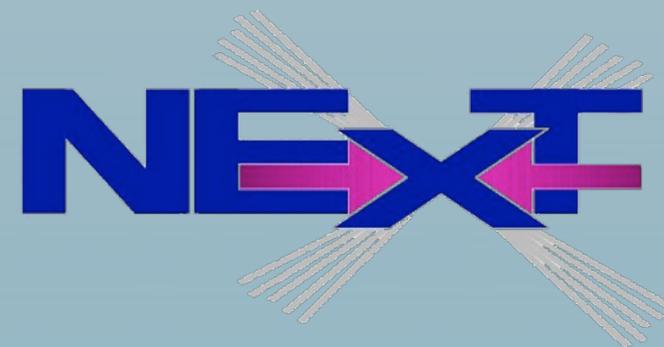
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in collaboration with S. De Curtis, D. Dominici, L. Fedeli

UNIVERSITY OF
Southampton



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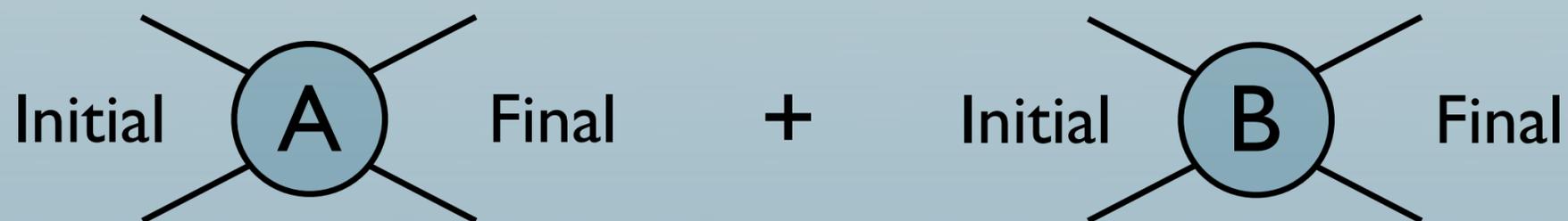
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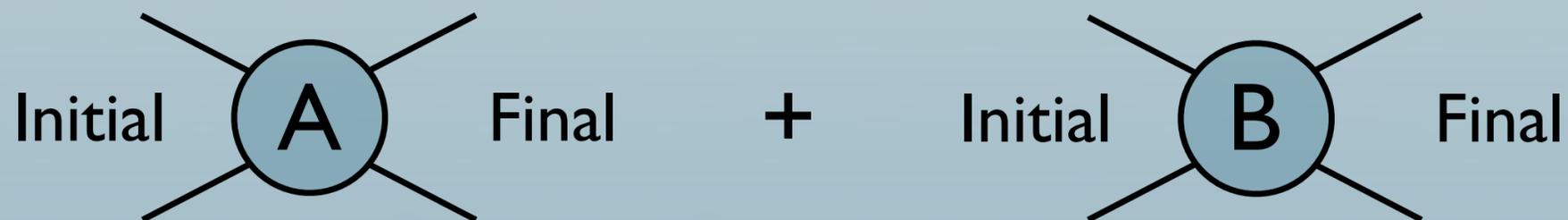


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Interference
between A & B

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- If $A^2 \sim B^2$ then also $\sim AB$

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- However misconceptions still widespread
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- Raise awareness and warn against inaccurate
statements

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- Drell-Yan with W'/Z' : up until now interference neglected in experimental searches

Drell-Yan with W'/Z'

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$$M^2 \supset M_A M_B^* = \text{quarks} \begin{array}{c} \diagup \\ \diagdown \end{array} \overset{A}{\text{---}} \begin{array}{c} \diagdown \\ \diagup \end{array} \text{leptons} \begin{array}{c} \diagup \\ \diagdown \end{array} \overset{B}{\text{---}} \begin{array}{c} \diagdown \\ \diagup \end{array} \text{quarks}$$

Drell-Yan with W'/Z'

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$$\boxed{(g_L^A g_L^B + g_R^A g_R^B)_{\text{quarks}} (\dots)_{\text{leptons}}}$$

(after $\int d\cos\theta$)

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- Neutrinos not detected \rightarrow transverse mass:

$$\sqrt{\hat{S}} \longrightarrow M_T \approx \sin\theta \sqrt{\hat{S}}$$

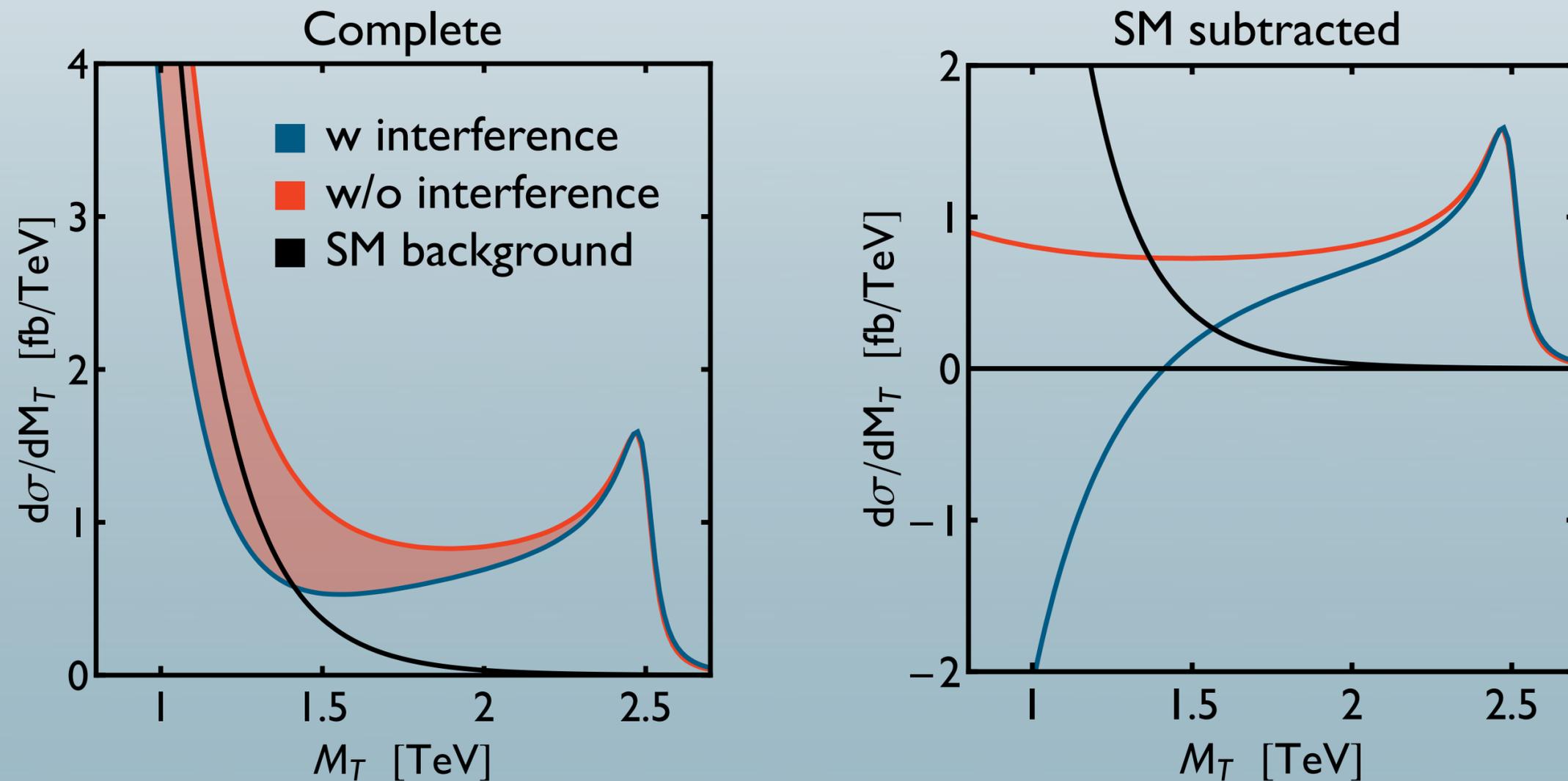
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Reduction of events in intermediate range

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- Compare observed events to predicted cross-sections in high- M_T search window
- If M_T^{\min} cut **chosen high enough** compared to m_W
→ interference no big effect
- Limits from latest CMS analysis (April 2012):
w/o interf. = 2.5 TeV; w interf. = 2.4 TeV

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CMS-EXO-11-024

arXiv:1204.4764

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$(W'_R) \times B(W'_R \rightarrow \ell\nu), \nu$

W' mass (GeV)	M_T^{\min} (GeV)	
500	350	44
700	550	96
900	700	3
1000	800	15
1400	1050	2
1600	1150	1
1800	1200	6
2100	1350	18
2400	1450	5.4
2700	1450	1.5
3000	1400	0.3

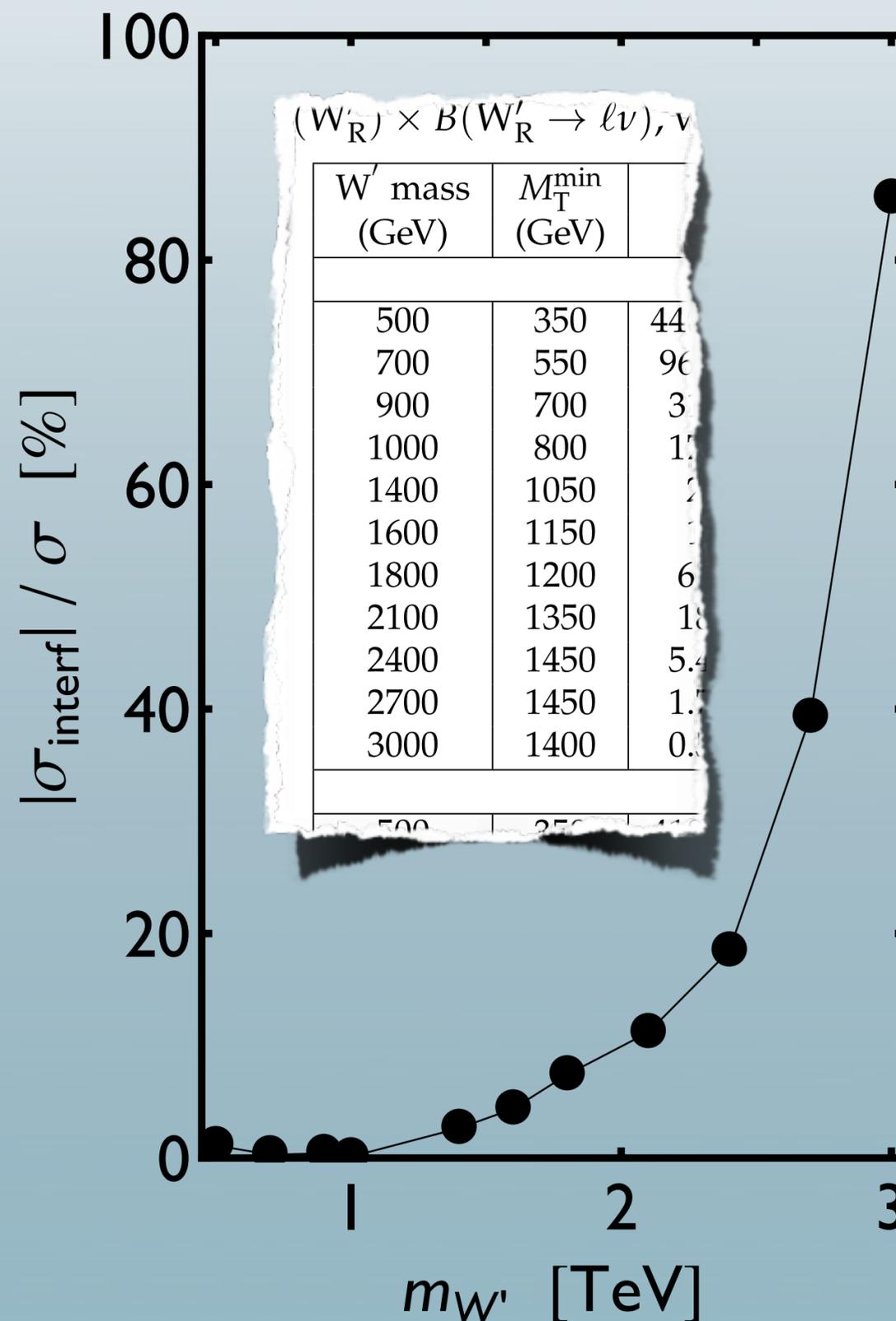
500 250 110

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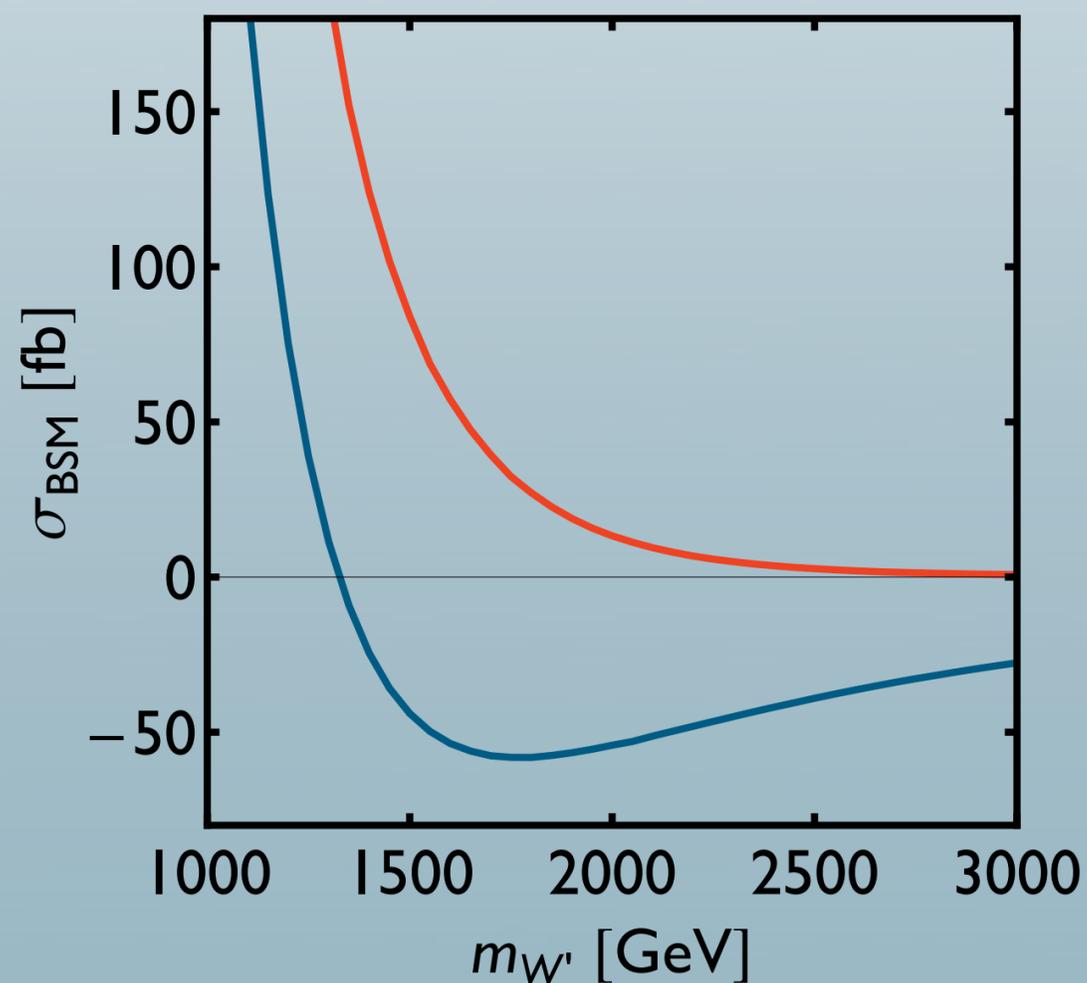
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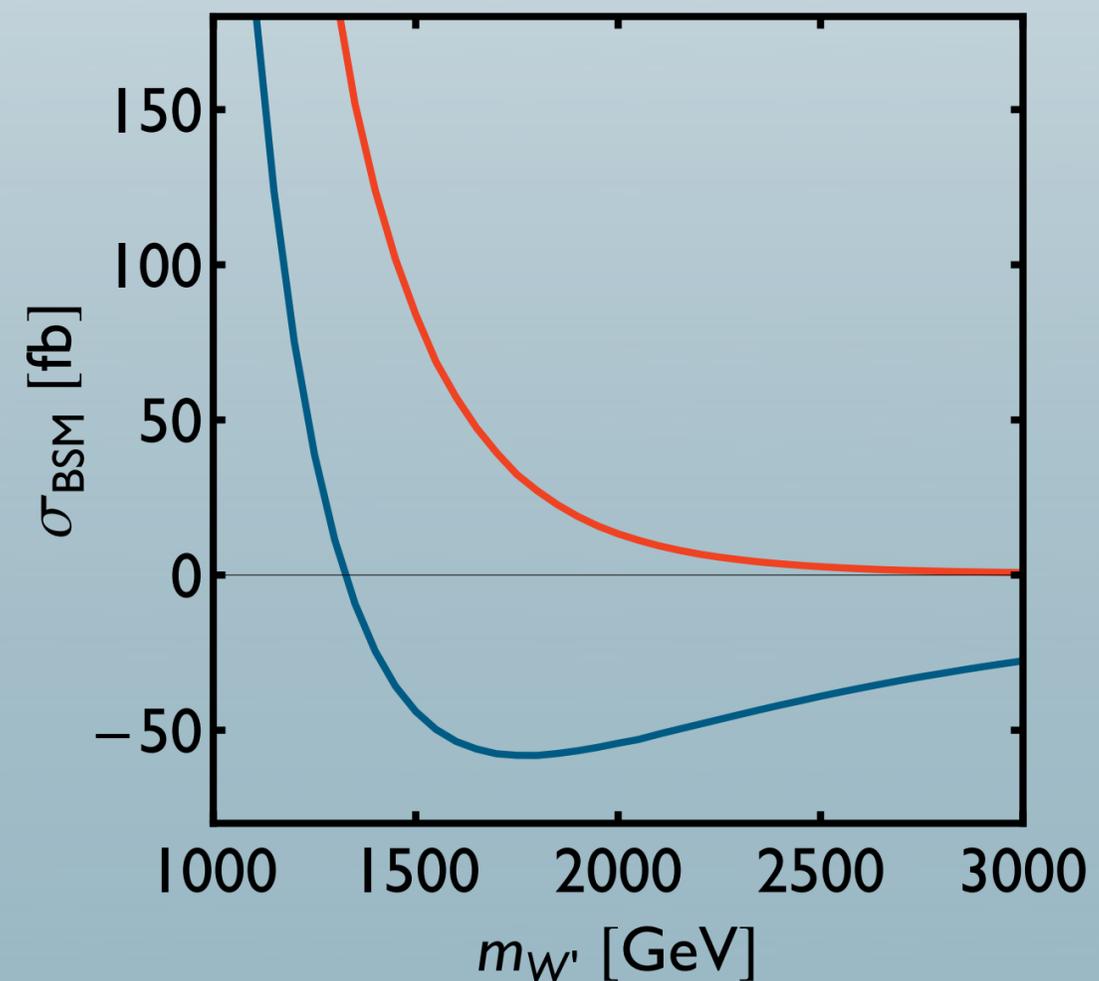
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- Quantity receives large contributions from PDF, and can be dominated by interference
- Should instead represent high energy behaviour



M_T cut dependent limits

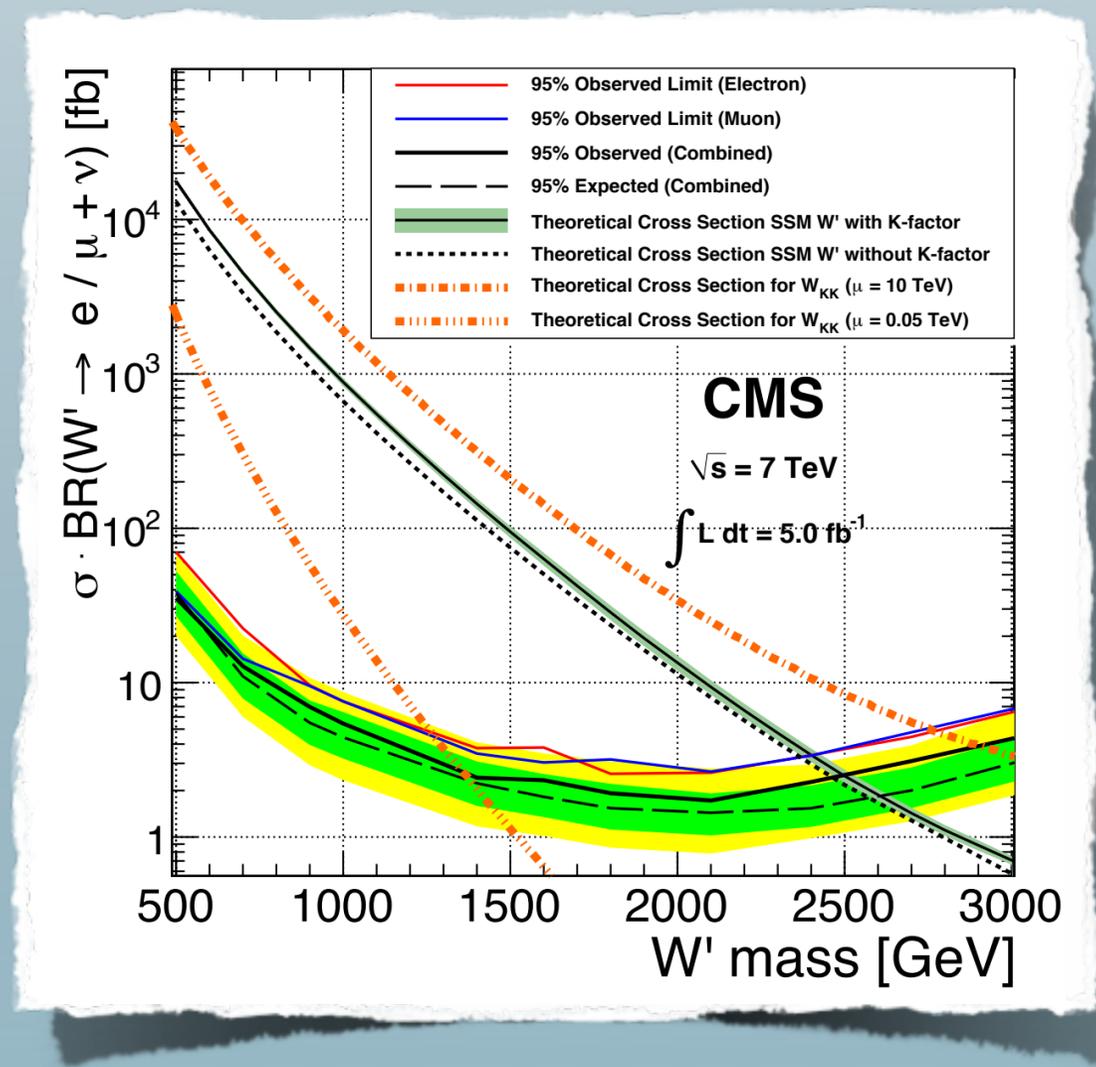
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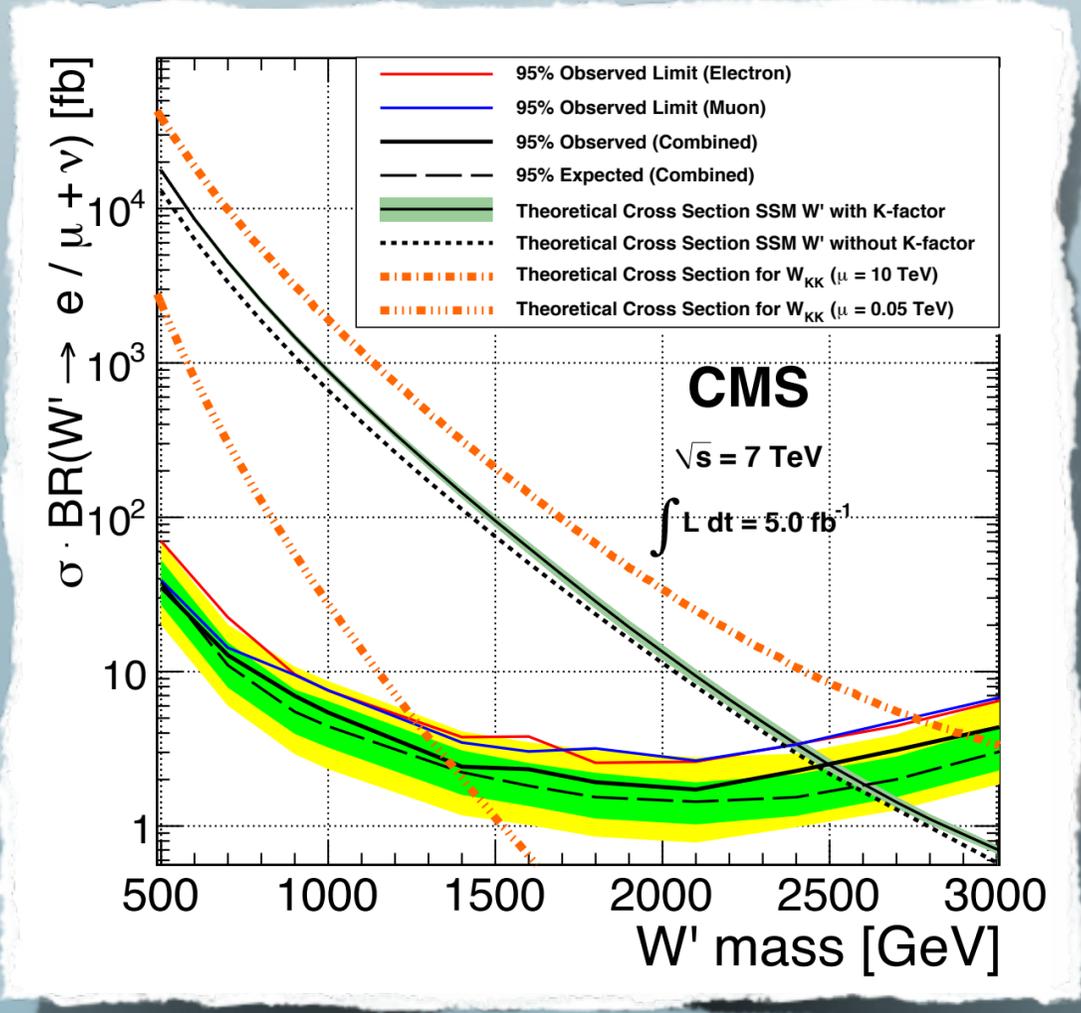
Total cross-section



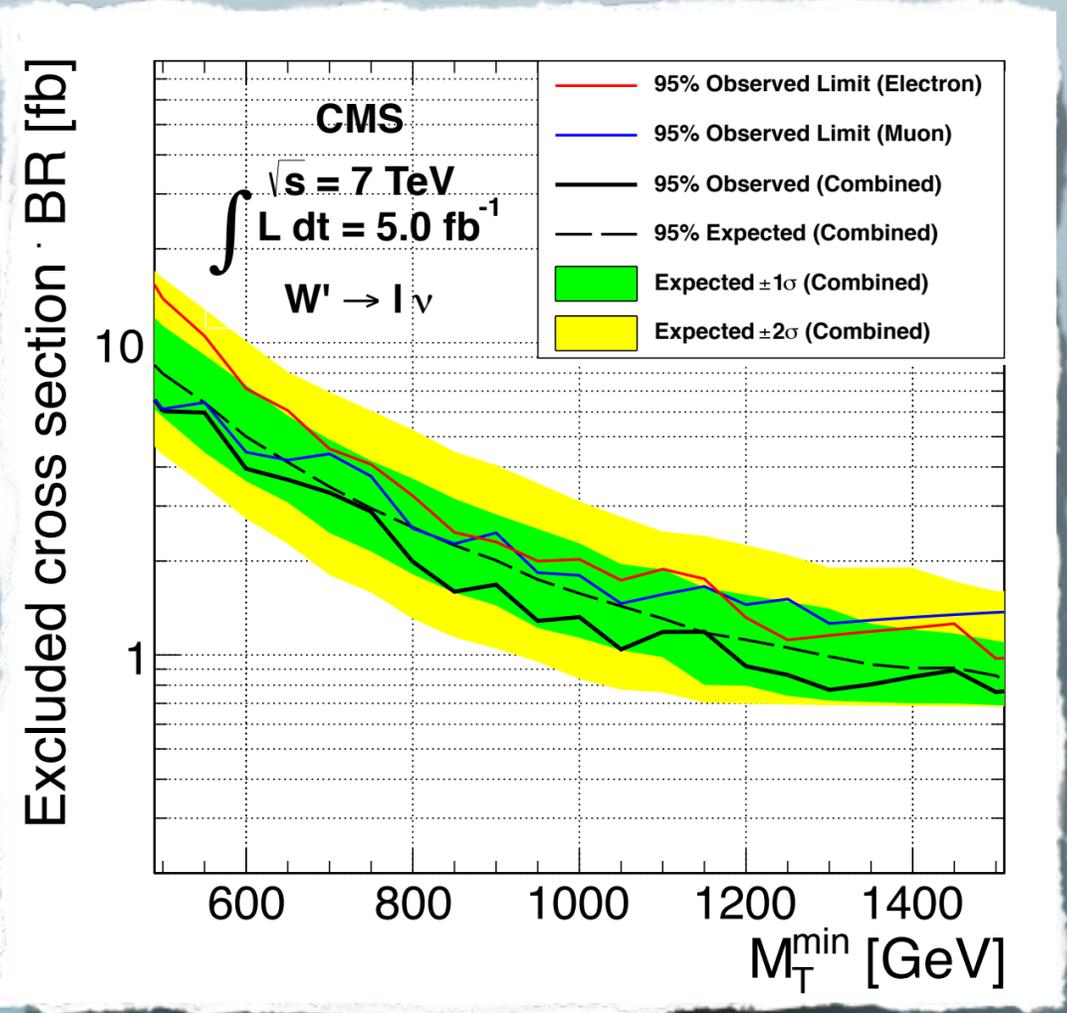
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Total cross-section



For given M_T cut



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- Experimentalists might move on to more sophisticated W' search strategies: fit to data
- Discussion of effect in Z' searches

Thank you!