Analysis compatible with E-expansion

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Problem

EFT or any parametrization that involves an expansion in energy, assumes

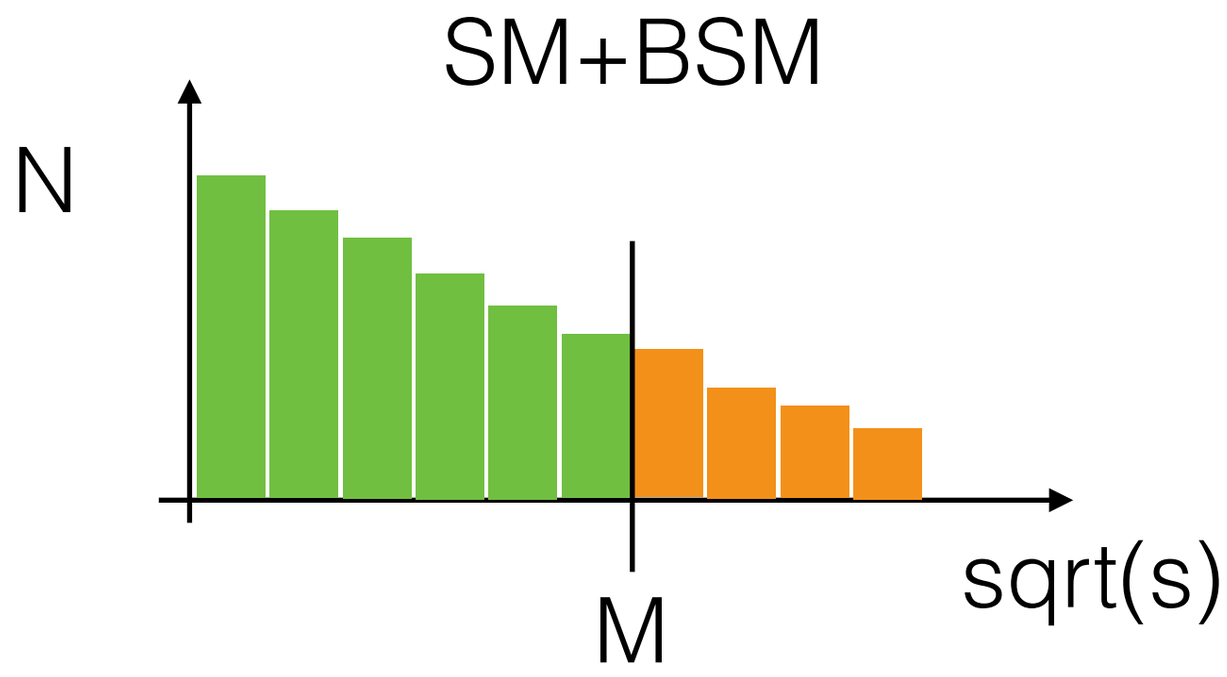
E<<M

1) What is M? We measure c/M -> validity assessment possible a posteriori only through model-dependent assumptions

2) What is E at a hadron collider?

Cut on Center-of-mas energy

$$p + p \to \mu^+ \mu^-$$



For a given M:

ok

EFT good

?

EFT bad: unknown

UV complete theory should be used

Conservative analysis uses only events below M

(see CMS ZZ)

Cut on reconstructed center-of-mas energy

$pp \to WZ$

Possible to reconstruct W from MET (ambiguity)

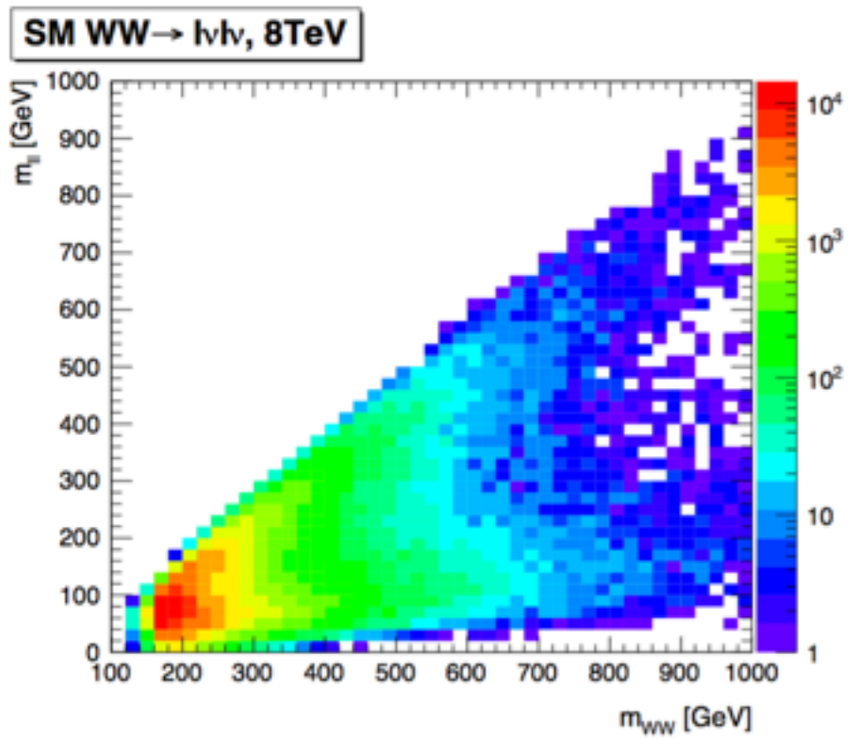
Cut e.g. on COM of both solutions

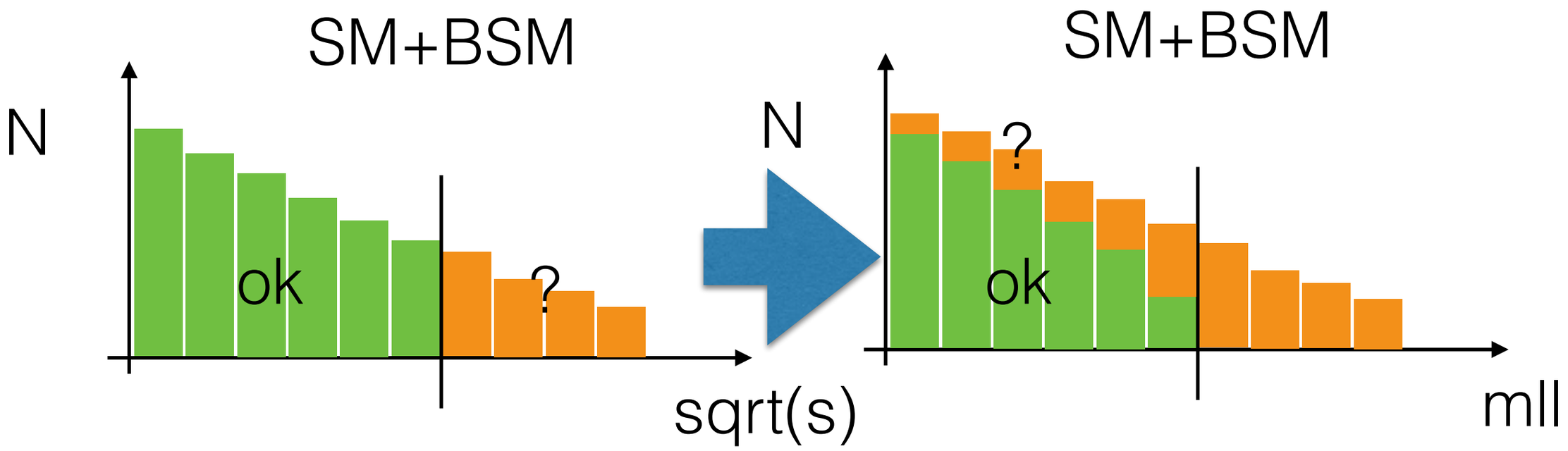
→ Error on cut becomes smaller at high pt

Unknown Center-of-mas energy

$$p + p \rightarrow W^+ + W^-$$

Problem: $m_{ll} \neq \sqrt{s}$





Events below M propagate in all mll<M too!

Unknown Center-of-mas energy

$$p + p \rightarrow W^+ + W^-$$

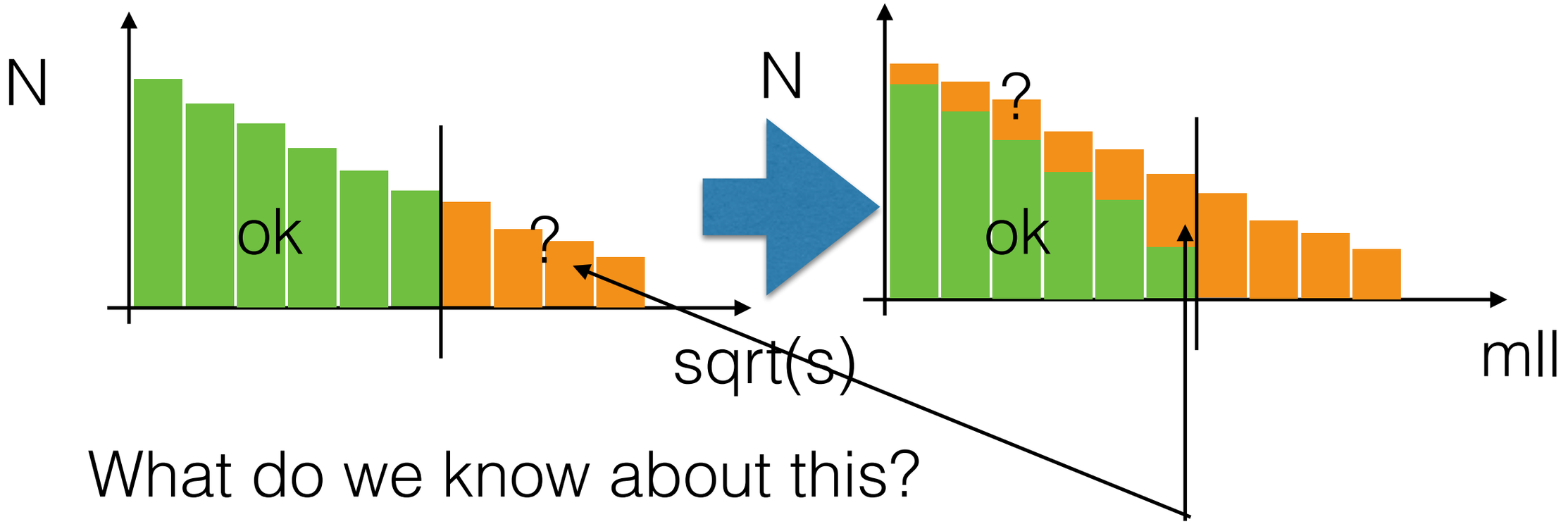
Problem: $m_{ll} \neq \sqrt{s}$

Possibility 1: try to reconstruct CoM Energy
(MET -> neutrinos)
How much is the associated error?

Cut on Center-of-mas energy -Possibility 2

See Pobbe,Wulzer,Zanetti'17 and Wulzer talk at kickoff WG2 meeting

$$p + p \to W^+ + W^-$$



What do we know about this?

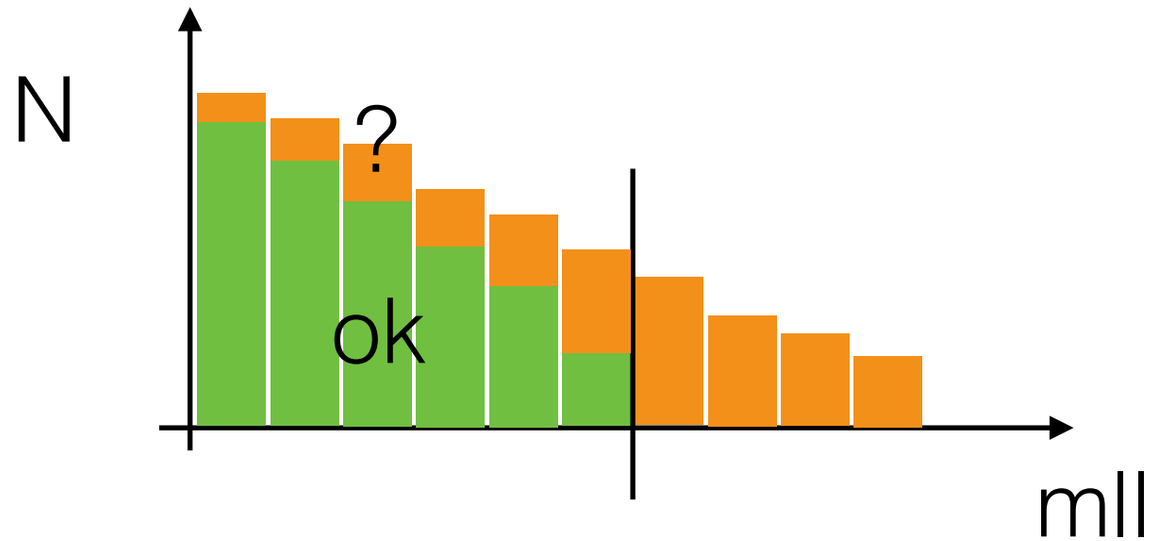
$$\sigma^{SM+BSM}|_{E>M} \geq 0 \quad \Rightarrow \quad \delta N_? > 0$$

$$\chi^2 \sim \frac{(N_{SM+BSM} + \delta N_? - N_{data})^2}{error}$$

Nuisance

Cut on Center-of-mas energy

$$p + p \to W^+ + W^-$$



Admittedly $\delta N_? > 0$ is a bit conservative for the lowest bins, which are typically not so much contaminated by physics above cutoff.
Ideally nuisance should reflect correlations: