EF08: BSM Model Specific Explorations

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Main EF08 pieces of BSM report

- We will not to a report walk through, you are invited to read/browse the report and suggest modifications. Particularly for balance to ensure it represents the range of view in the EF community.

  Current drafts and comment pages here

- Here are the sections that were primarily lead by EF08

    B. Anomalies in Indirect Measurements (g-2, m_W, etc)

III. Theoretical guidance & motivation
    A. Naturalness
    B. Higgs and Electroweak Symmetry Breaking
    C. Composite Higgs and Extra Dimensions
    D. Supersymmetry (SUSY)

Model dependent here basically means using top down motivations, but also includes how to address anomalies (cuts across BSM)

IV. Methods
    A. Benchmark collider scenarios
    B. Discovery versus Exclusion Limits
    C. Estimation Methods

Most relevantly we relied heavily on parton luminosity based extrapolation with comparison/validation where possible

V. Composite Higgs and Extra Dimensions
    A. Kaluza-Klein Excitations
    B. Composite Higgs

VI. Supersymmetry (SUSY)
    A. pMSSM Scans

VII. Leptoquarks

Set of models cutting across strong and weak coupling, focused on very small set of well studied models for comparison (otherwise can't do comparisons)

# Places to hear about and discussion "model dependent" contents at CSS

- This session
  - Following talks will focus on direct searches at hadron and lepton colliders
  - This talk will contain brief mention of precision constraints which were also discussed in previous talk

- Tomorrow (Tues) in the TF-EF cross-frontier session: https://indico.fnal.gov/event/22303/contributions/246693/
  - Includes discussion of Physics goals in exploring BSM physics
  - Precision versus direct searches: What does precision mean and what does it take to achieve it at different colliders?

- Friday open discussion (1 hour) on model dependent part of BSM report: https://indico.fnal.gov/event/22303/contributions/245680/ … lots of time to come and be heard

- Saturday full BSM report review in EF plenary: https://indico.fnal.gov/event/22303/sessions/20640/#20220723

EF report grand summary

The whole EF08 part of the BSM report is largely condensed to three key plots (next three slides)

SUSY direct searches as a proxy for different weakly coupled new physics scenarios… i.e. we assume that different top partners will not have dramatically different sensitivity in same collider (both strongly coupled), but use mass splitting as a proxy for possible range

Also include some comparison to precision Higgs constraints

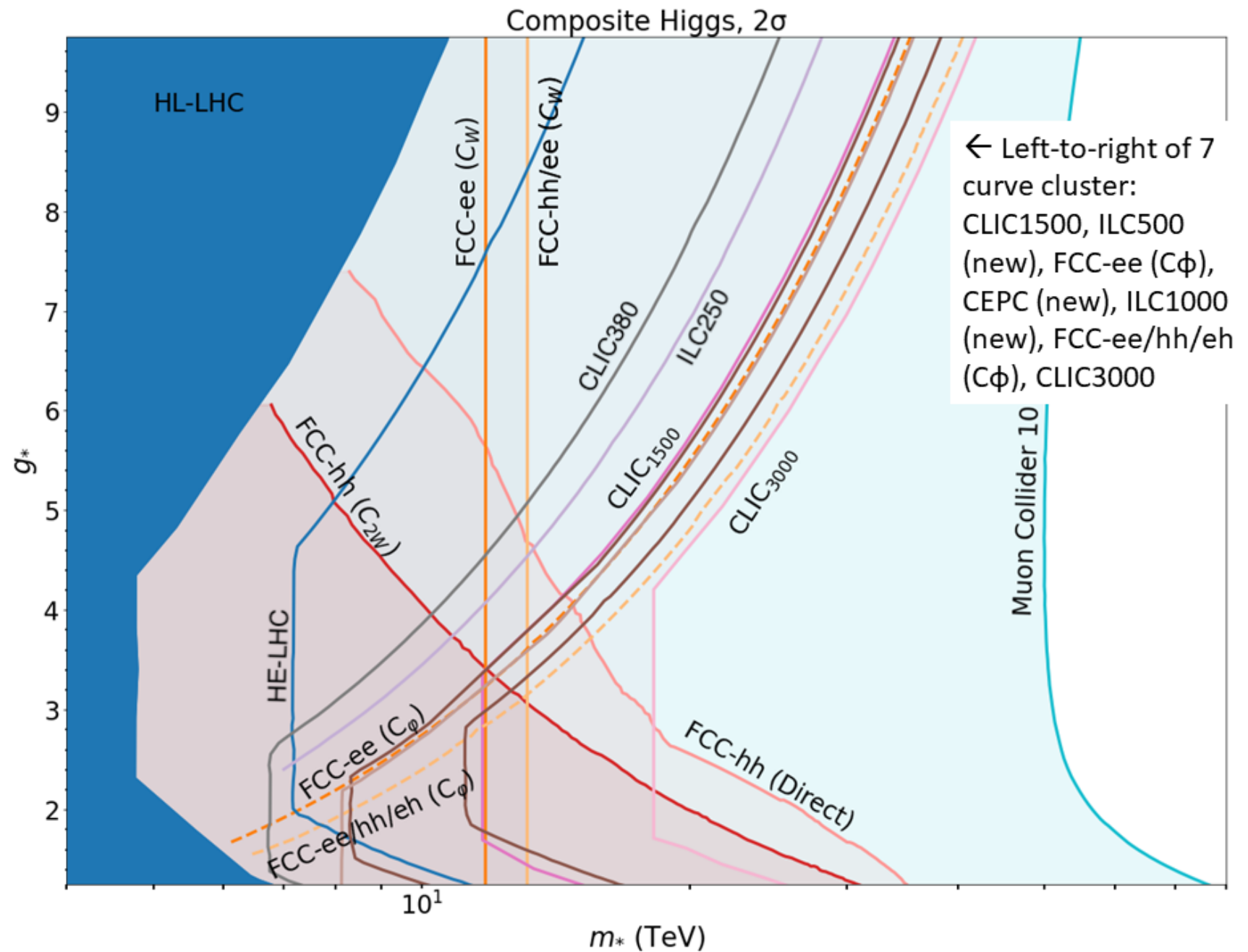Snowmass 2021: Energy Frontier Collider Sensitivities
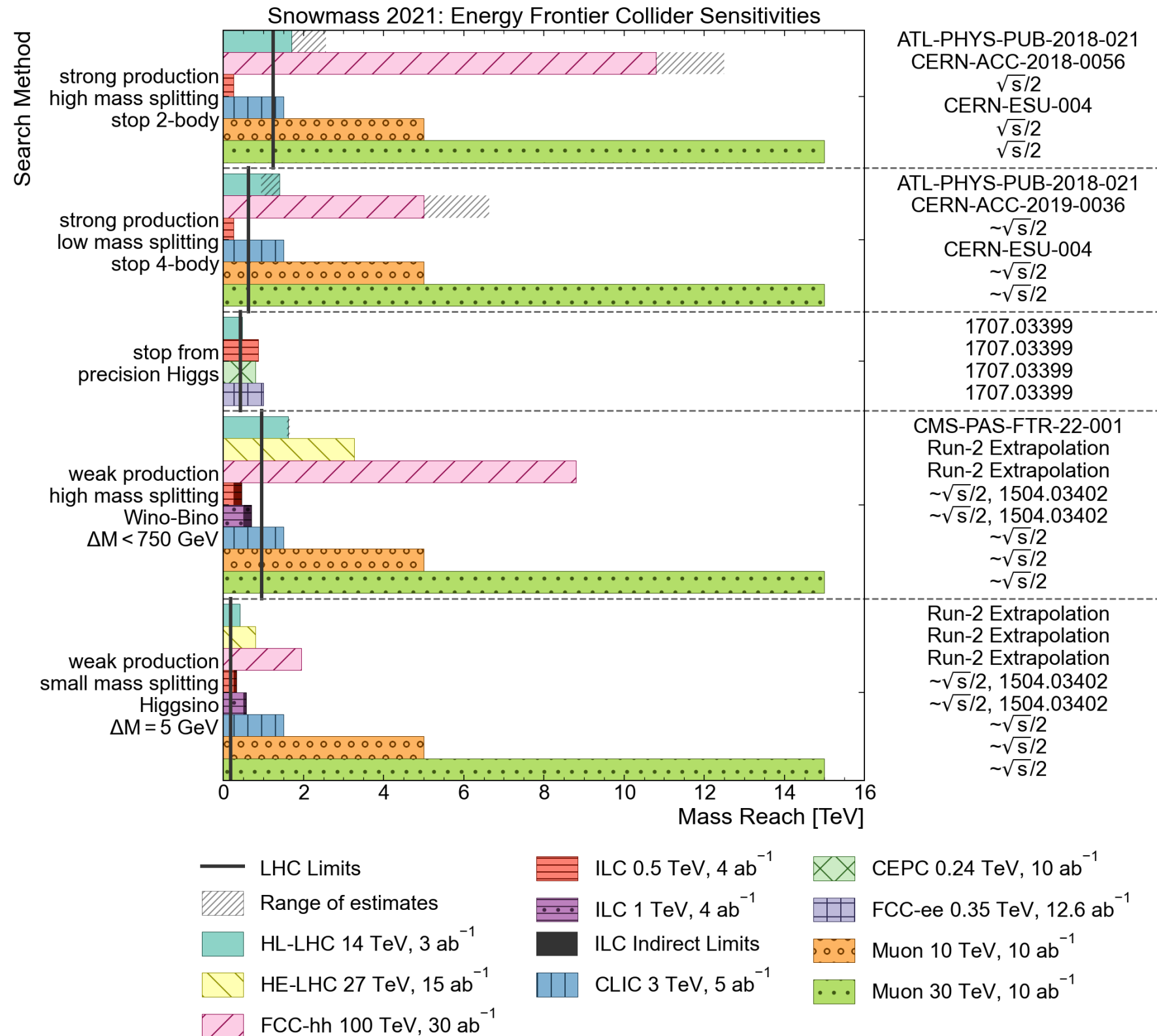
EF report grand summary

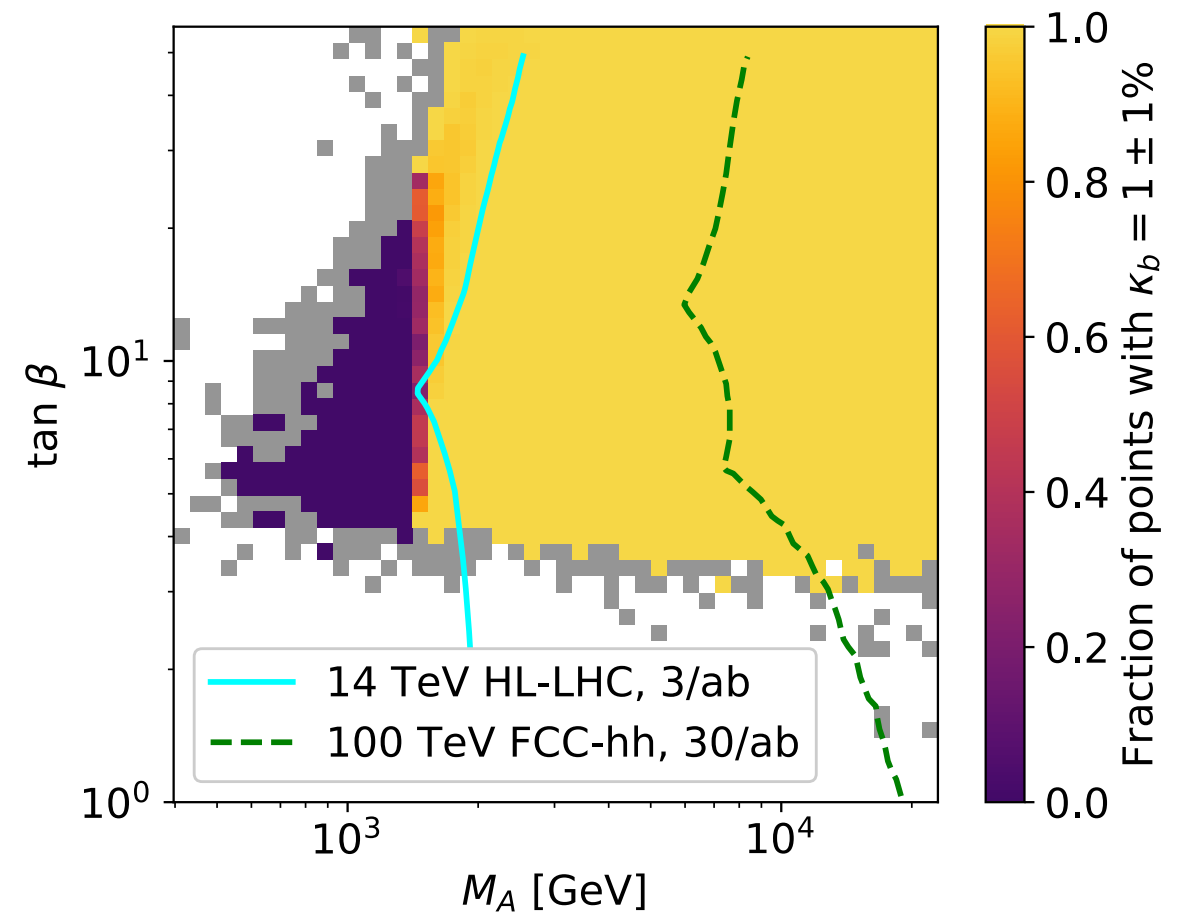Currently only one composite plot for a minimal composite Higgs

Adapted from ESG report with new Muon Collider line

Shows much stronger constraints from precision program

More on precision for SUSY

Constraints in M_A vs tanβ from precision Higgs (scale around 95% CL for ultimate precision)
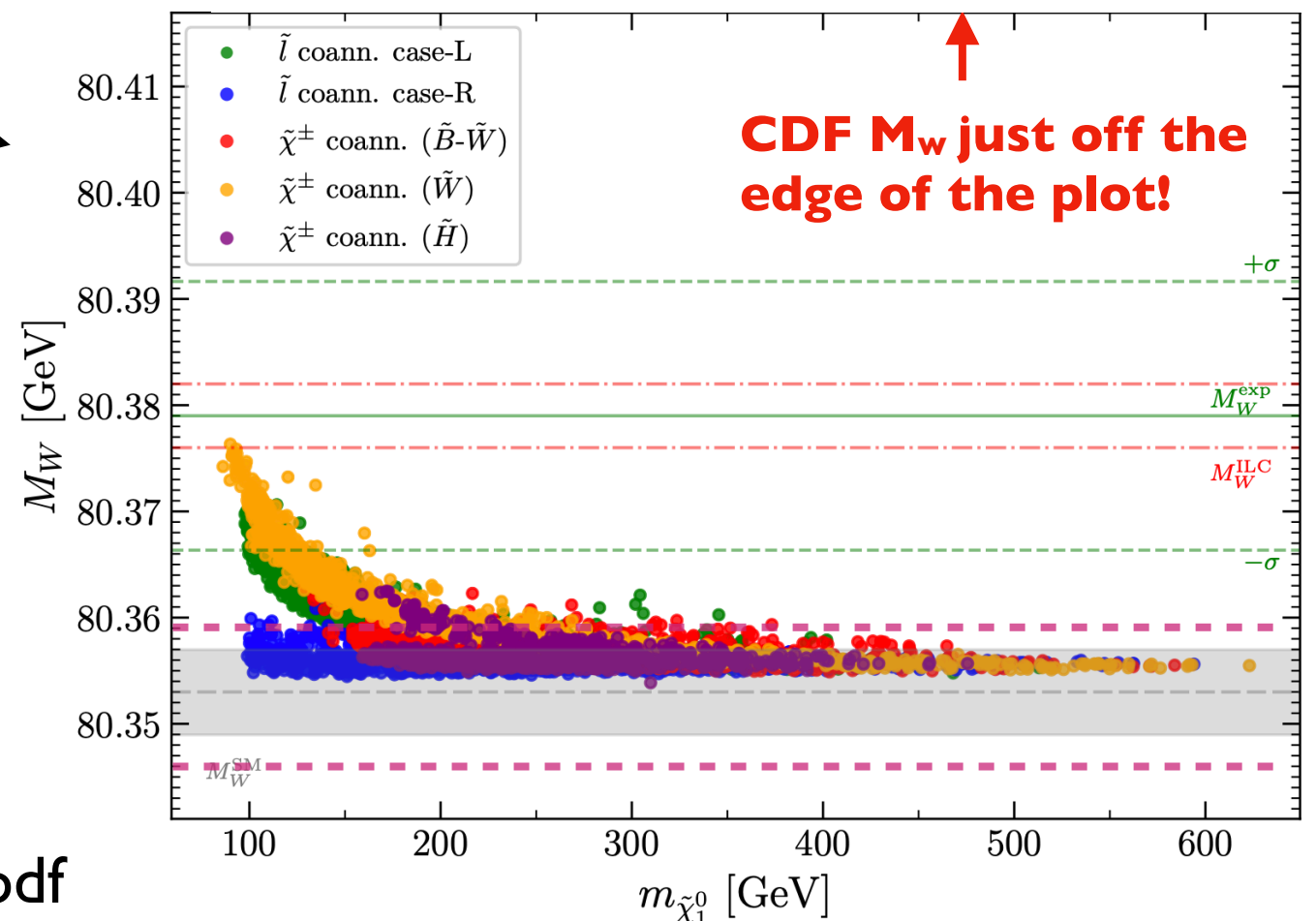

Constraints from M_W (not in current report)

green = current M_W (with 1σ)

red = rough future 1σ around current M_W

purple = rough future 2σ around SM M_W

CDF M_W just off the edge of the plot!

Plot from https://arxiv.org/pdf/2203.15710.pdf