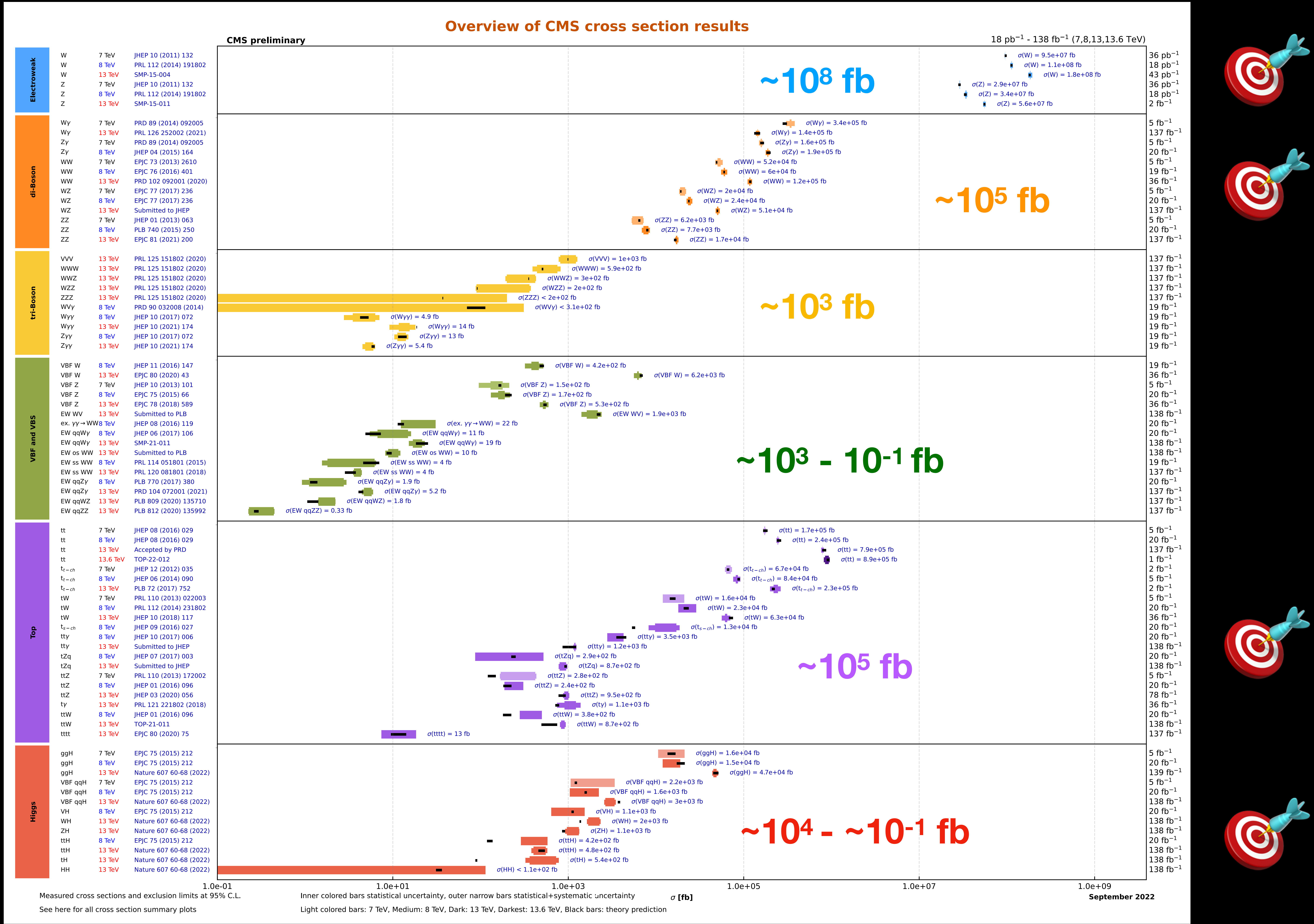
Stress-testing the Standard Model using the Effective Field Theory formalism

P5 town hall at SLAC

Saptaparna Bhattacharya
Northwestern University, Humboldt Fellow

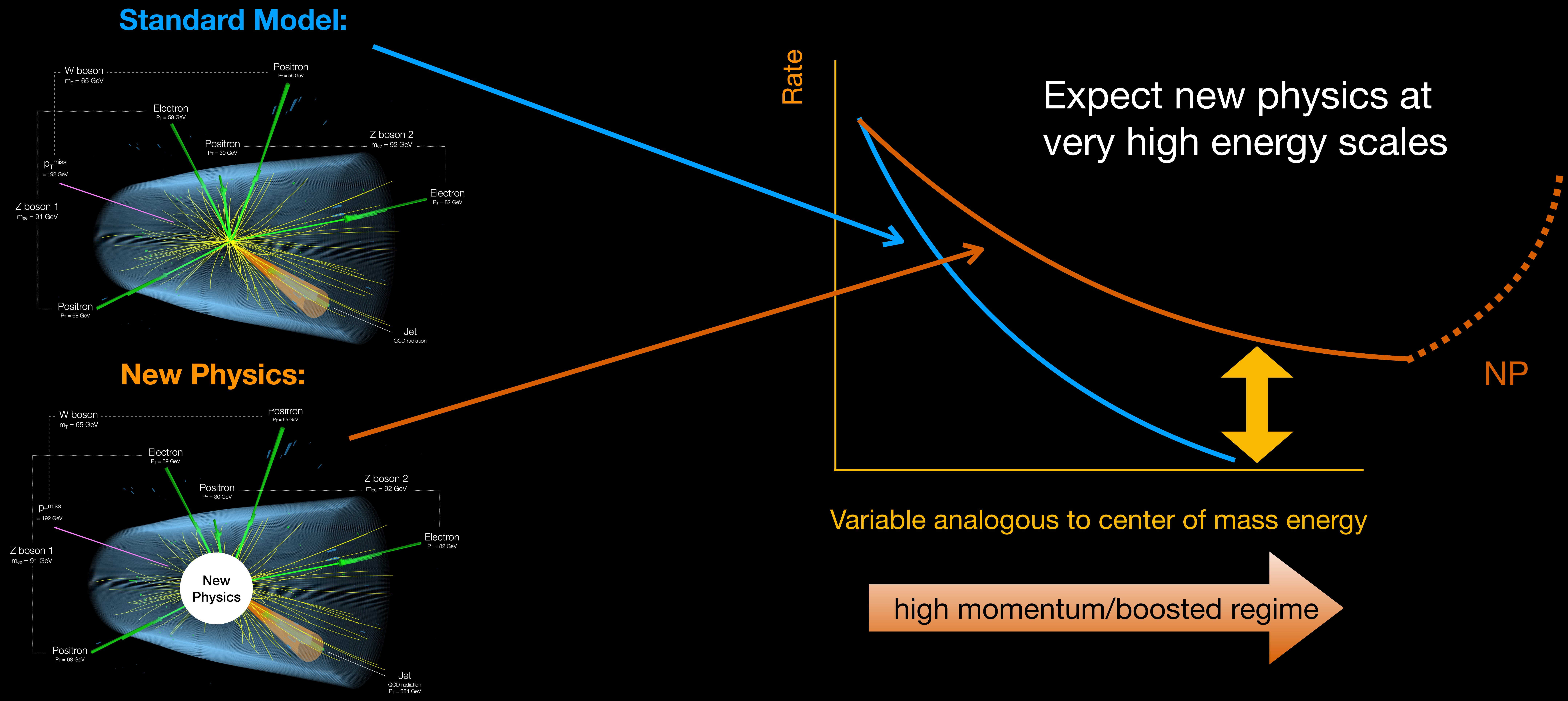
Spans 10 orders of magnitude

Spans 14 orders of magnitude when inelastic cross sections are taken into account



Potential nature of new physics

- Look for appearance of new physics **indirectly** in interactions

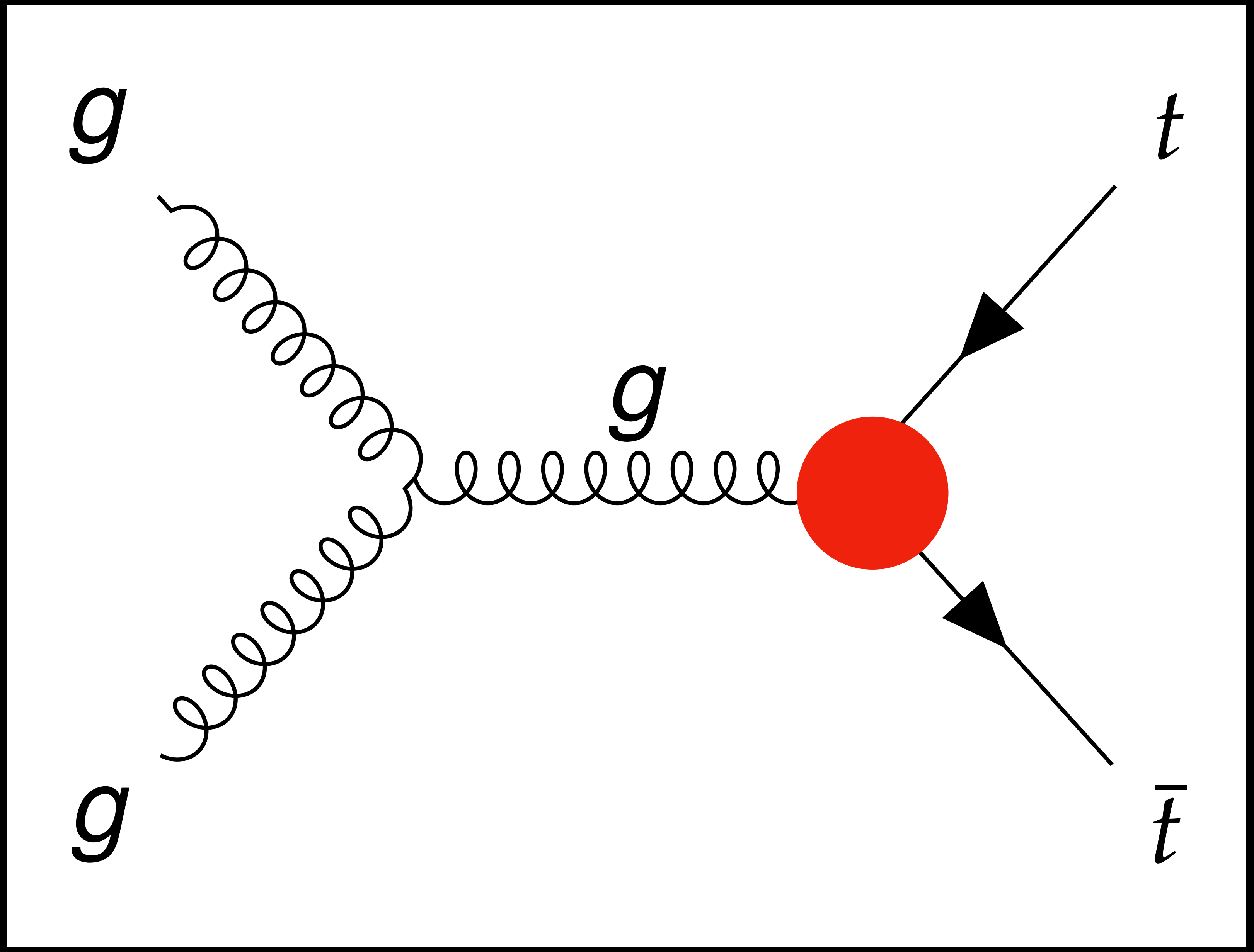


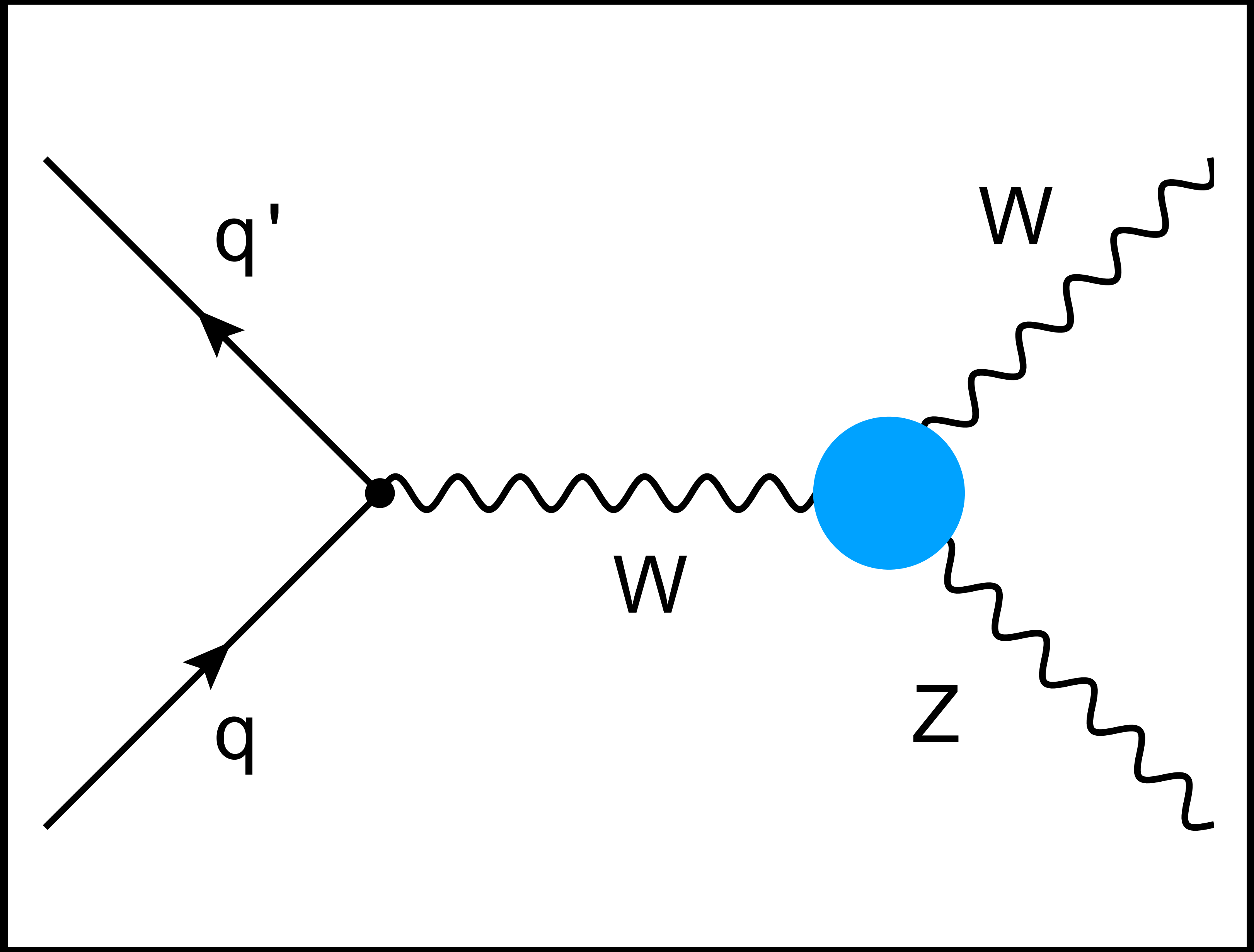
Effective Field Theory Framework

$$\mathcal{L} = \mathcal{L}_{SM} + \sum_i \frac{c_i}{\Lambda^2}\mathcal{O}_i + \sum_j \frac{f_j}{\Lambda^4}\mathcal{O}_j$$

- Extend Standard Model Lagrangian in inverse powers of the *scale of new physics*
- **Operators of dimension-6** and **operators of dimension-8**
- Constraints computed on multiplicative terms associated with each of these operators → **Wilson Coefficients**

Using all measurements and interpreting in the Effective Field Theory Framework





Combine constraints from various sectors of Standard Model

Legacy of the LHC

- The Standard Model Effective Field Theory formalism is a systematic framework to characterize the potential nature of New Physics
- Constraints on the Wilson Coefficients from top, electroweak and jet measurements will be an important legacy of the LHC
- Can be combined with constraints from electroweak precision measurements (à la LEP)
- Provide important input for future experiments
- It is my request to the P5 committee to retain focus on precision measurements which then by extension can be used to describe deviations from Standard Model expectations in the language of the Effective Field Theory
- A successful partnership with the particle theory community is crucial from my (an experimentalist's) point of view