

New Higgs Production Mechanism In Composite Higgs Models

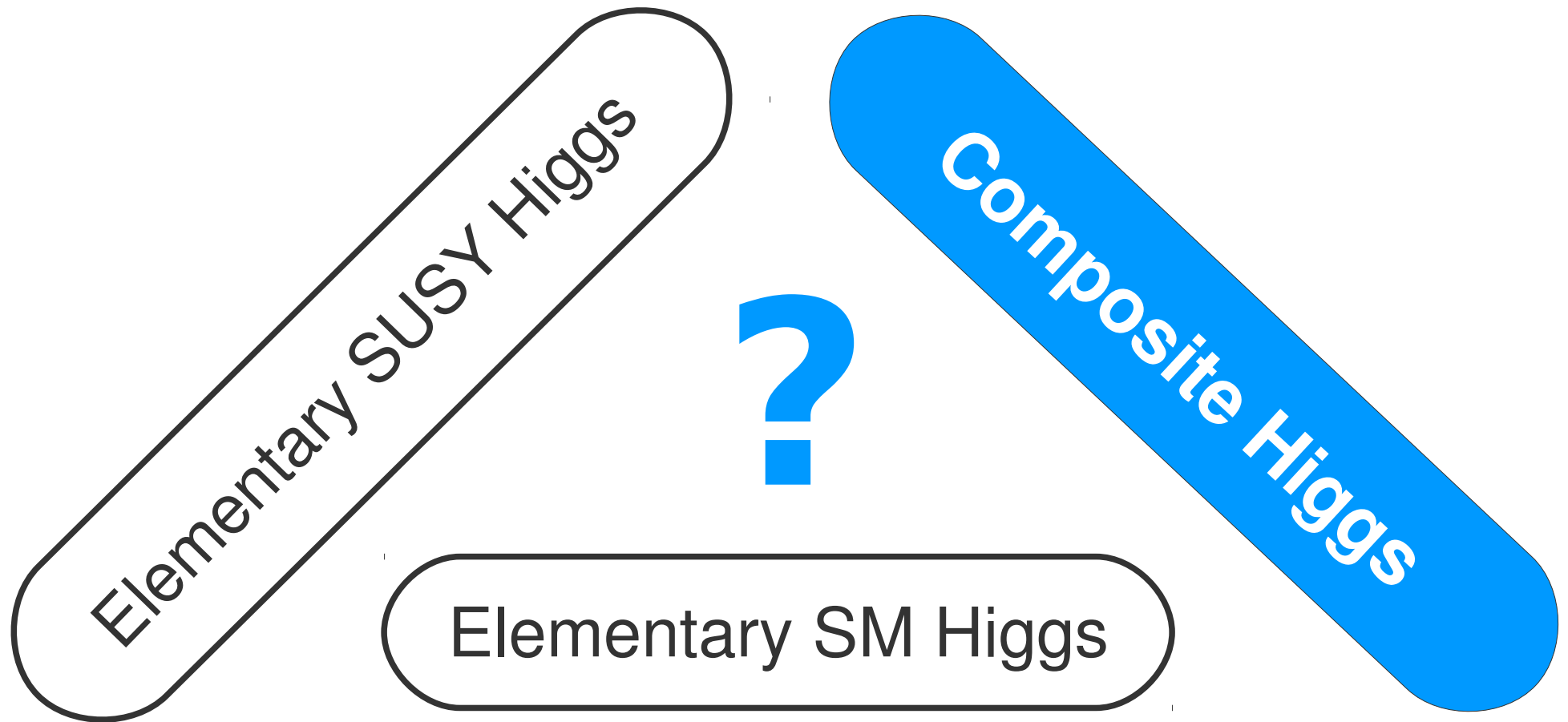
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Based on [Adrián Carmona](#), [Mikael Chala](#) and [José Santiago](#);

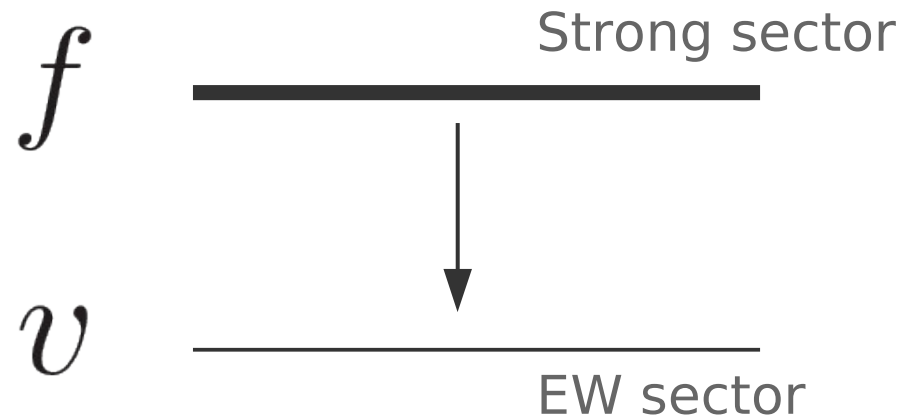
JHEP **1207** (2012) 049, arXiv:1205.2378 [hep-ph]

The Higgs is already here, but **what Higgs?**



Composite Higgs Models

$$\xi = \frac{v^2}{f^2} < 1$$

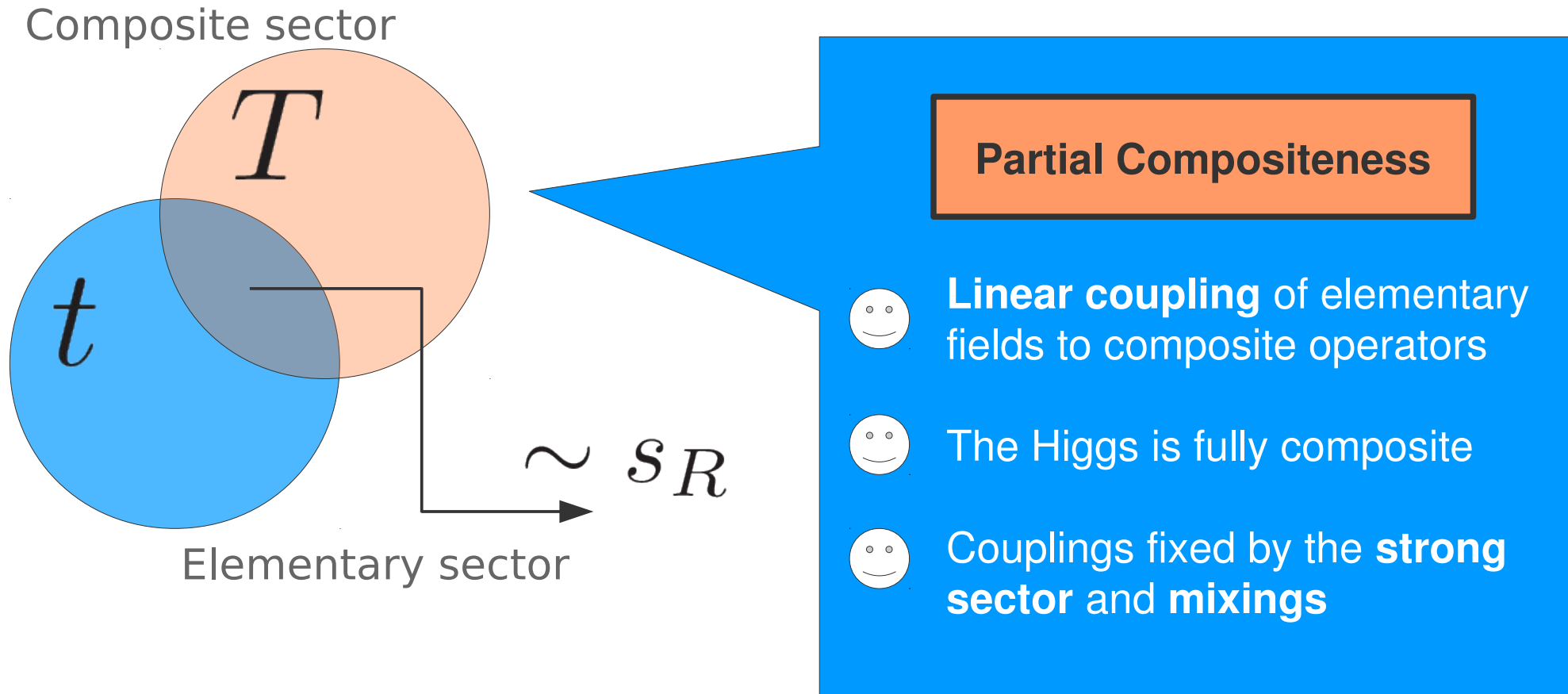


The Higgs boson is a **bound state** of a **new strongly interacting sector**



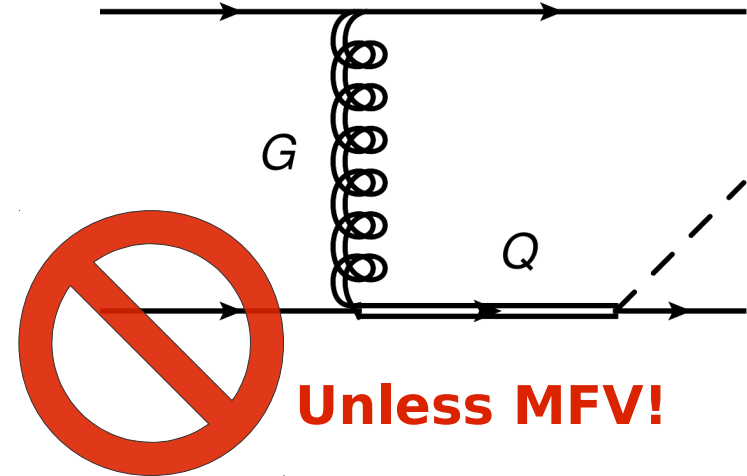
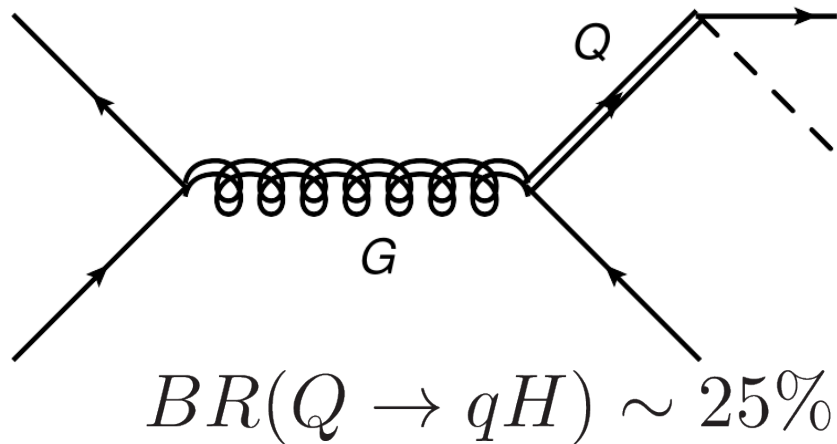
Mass protected also by its **PNGB** nature

The role of resonances in Composite Higgs production



$$i\bar{q}Dq + i\bar{Q}(\partial - m_Q)Q + \Delta_{qQ} \bar{q}Q + \dots$$

New Composite Higgs Production Mechanism



Color octets: almost unavoidable in partial compositeness



Very distinctive kinematics of single production

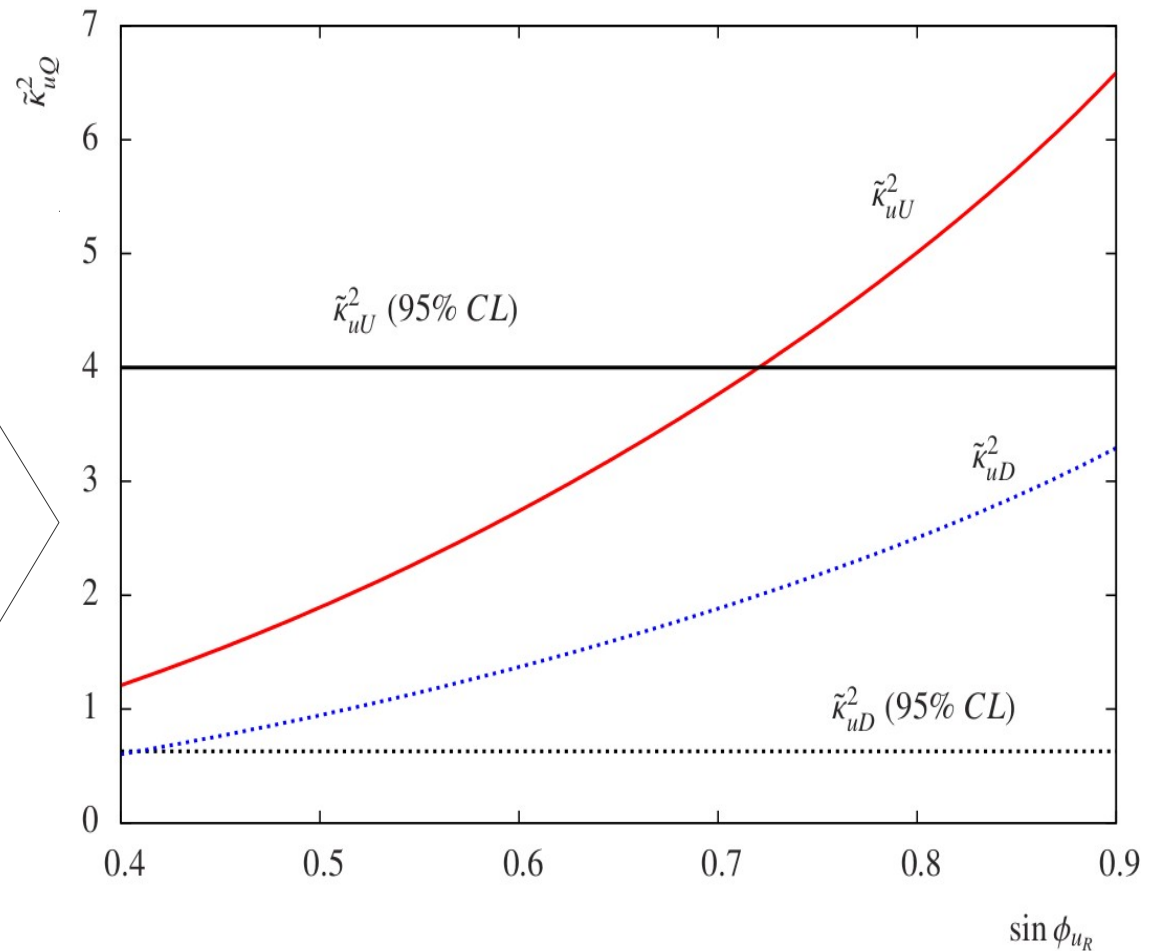


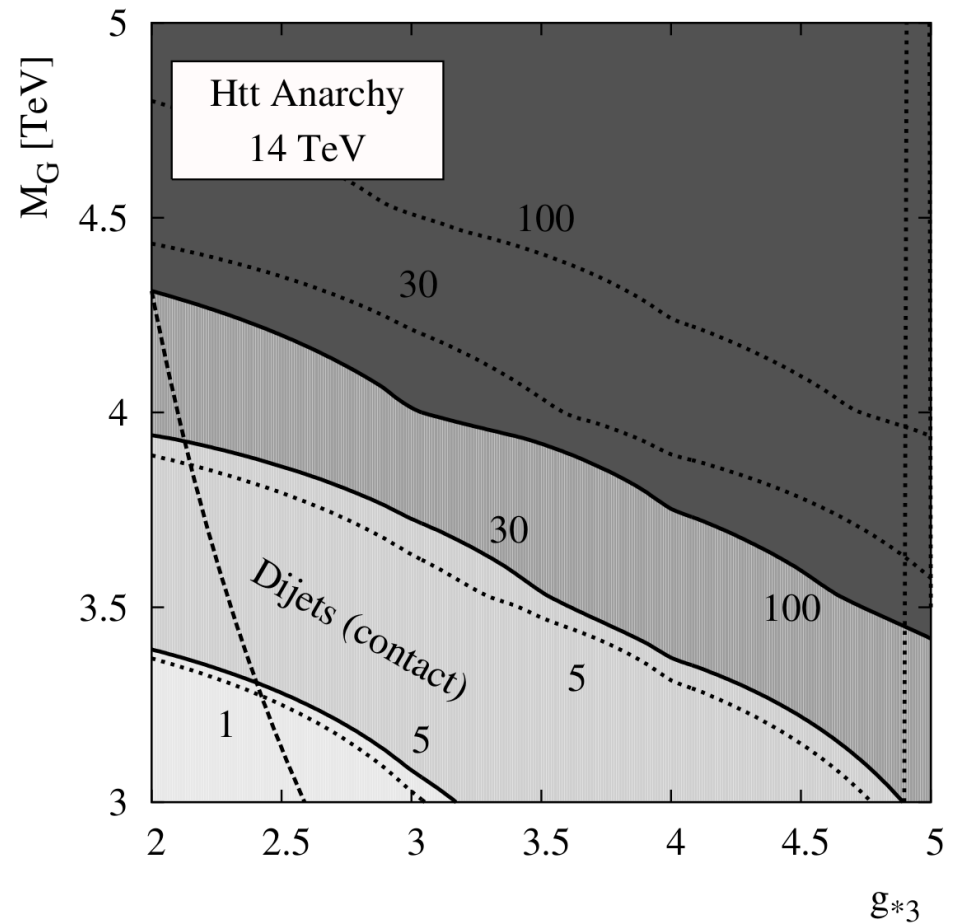
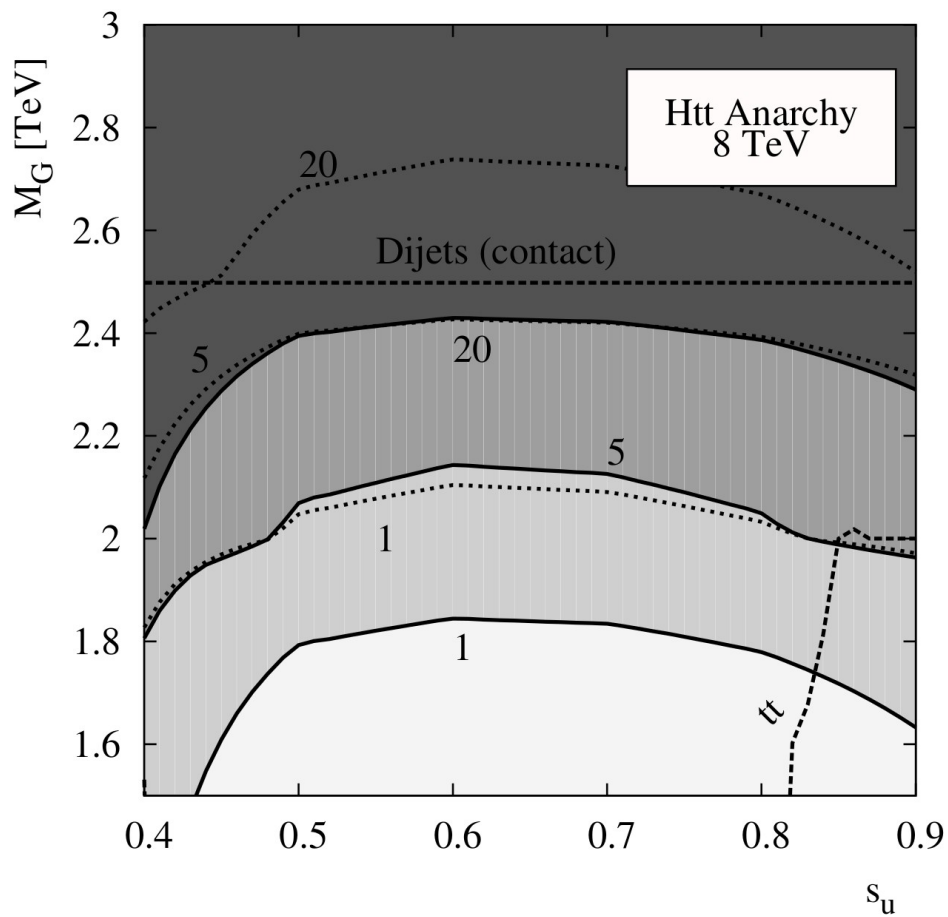
Use **PYTHIA** and **Delphes** after **MadGraph** (signal), **Alpgen** ($t\bar{t}$, $t\bar{t}b\bar{b}$, W , Z , WW , \dots , +jets)

Experimental constraints

- ☺ Higgs Searches
- ☺ Vector-like quark searches
- ☺ Top-antitop resonance searches
- ☺ Di-jet searches

$$0 \leq \xi \leq 0.4$$





7 TeV	95% exclusion in	$M_G \sim 2 - 2.3 \text{ TeV}, s_u \sim 0.5 - 0.7$
8 TeV	$M_G \sim 2.5$	can be discovered (excluded) with 20 1/fb (5 1/fb)
14 TeV	discovery for,	$M_G \sim 3 - 4.5$, exclusion for up to 5 TeV

Conclusions

- The **Higgs boson** has been already **discovered**
- If **composite**, the strong sector can be probed through Higgs production mediated by color octets and fermion resonances
- **Color octets should be present in models with partial compositeness**
- Very **distinctive kinematics**: easy to look for!
- Masses of color octets up to **2.8 TeV** can be probed with the **2011/12 data sets**
- Masses of color octets up to **5 TeV** can be probed in the **large LHC run**

**Thank you for
your attention!**