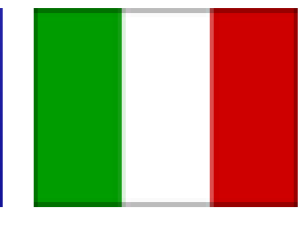
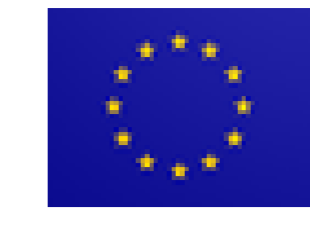


Our week at DESY.

Istituto Statale di Istruzione Secondaria Superiore



"Federigo Enriques"

Nadia Padovani and Gabriele Pomponi
Tutor: Andrea Cardini

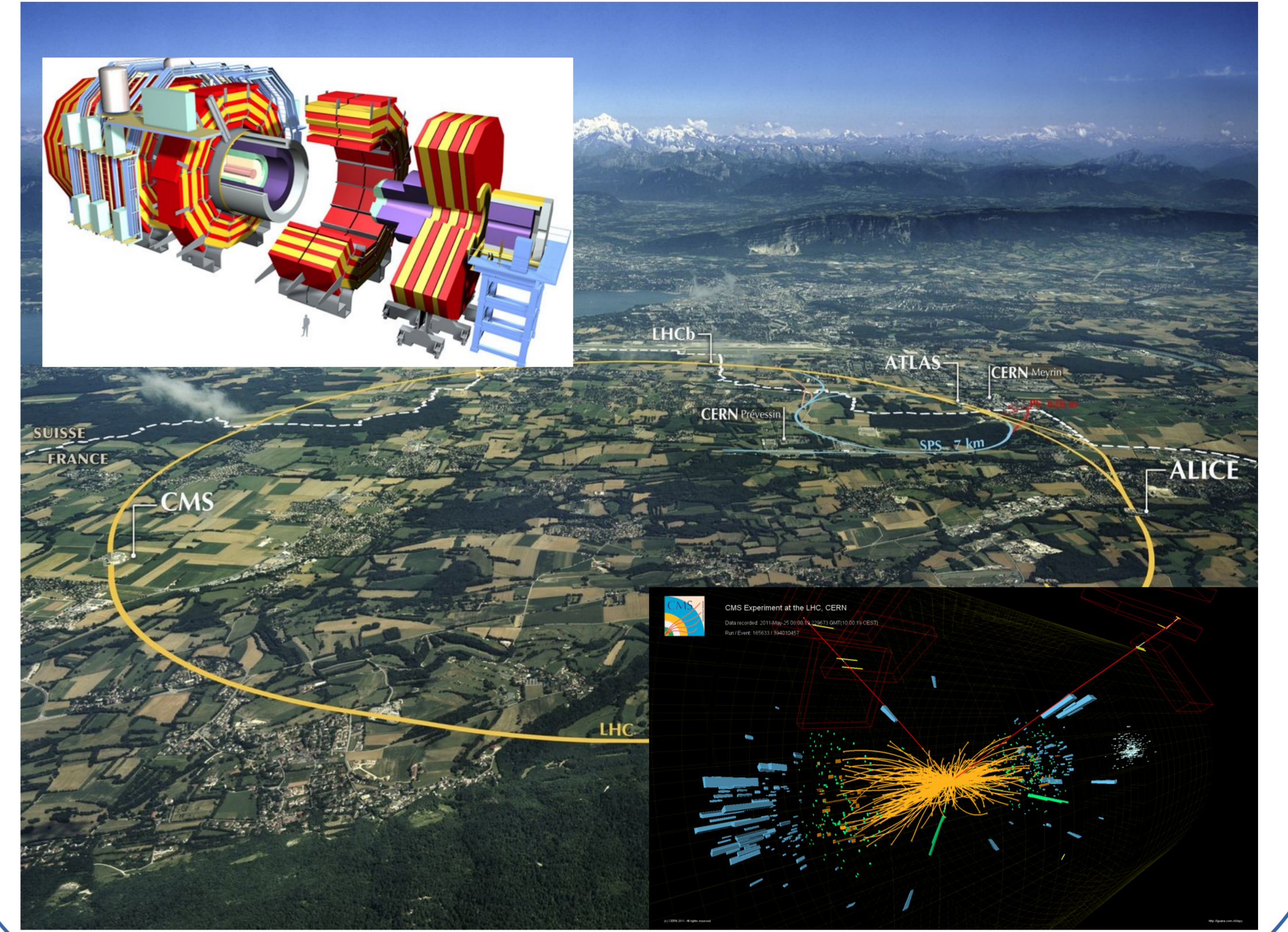
The Standard Model

	1st	2nd	3rd			
Quarks	u up	c charm	t top	γ photon	H Higgs Boson	
	d down	s strange	b beauty			W^\pm W boson
	e electron	μ muon	τ tau			
Leptons	ν_e neutrino electron	ν_μ neutrino muon	ν_τ neutrino tau	Z^0 Z boson	Gauge Bosons	
				g gluon		

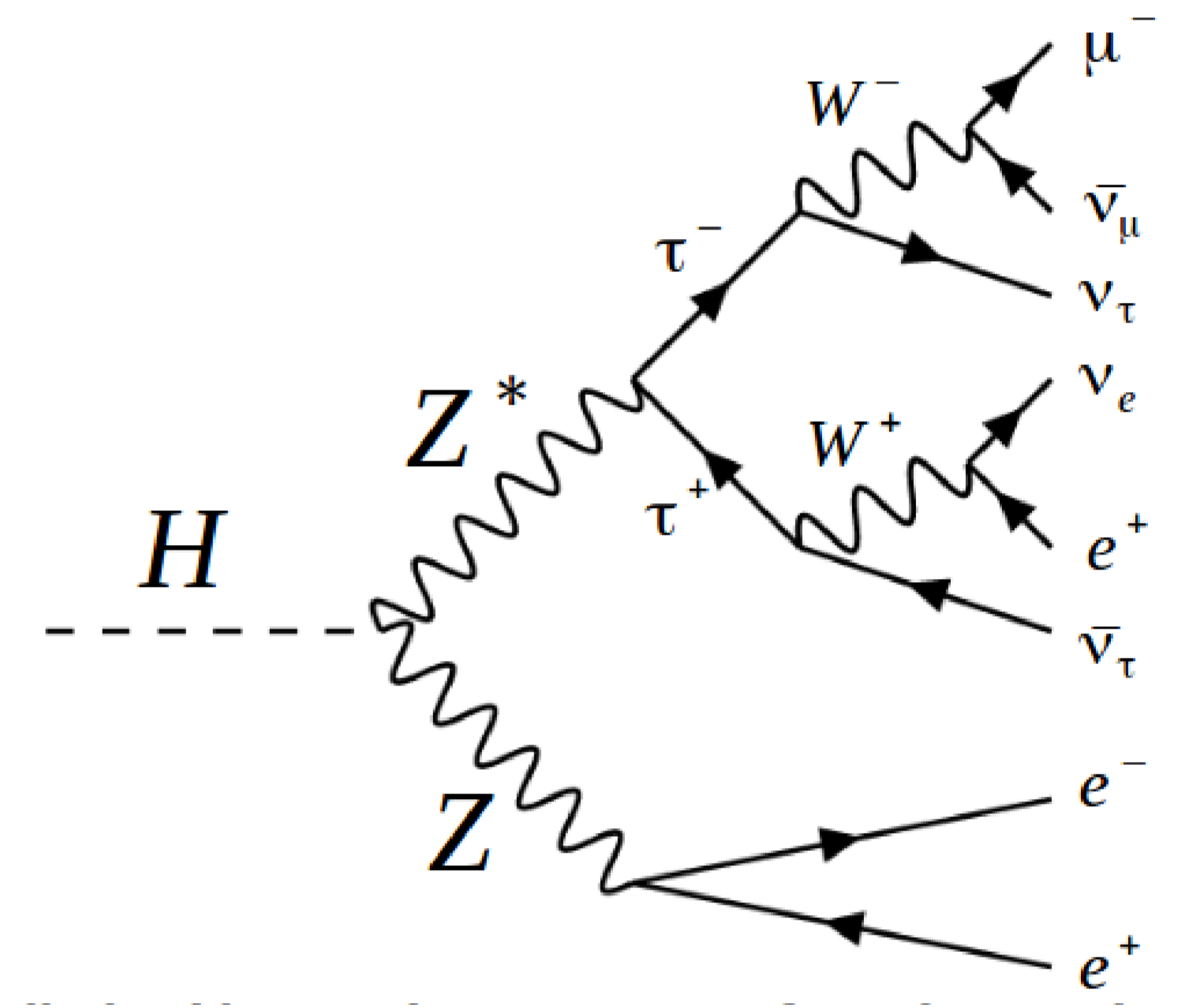
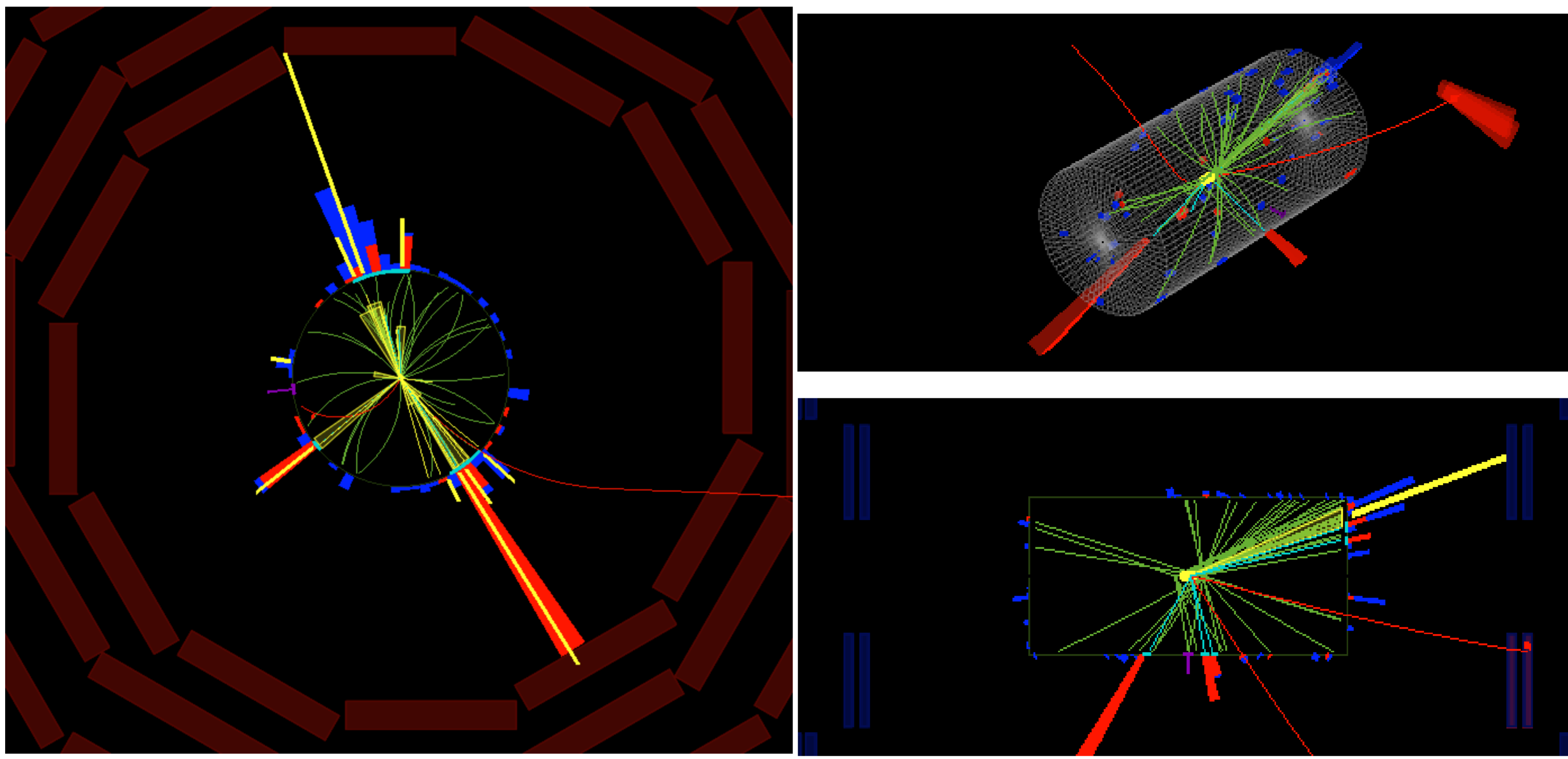
Elementary particles in the SM are:

- 6 quarks
- 6 leptons (3 charged and 3 neutral)
- 4 bosons which mediate the strong and electroweak interactions
- 1 scalar boson: the Higgs boson

CMS experiment



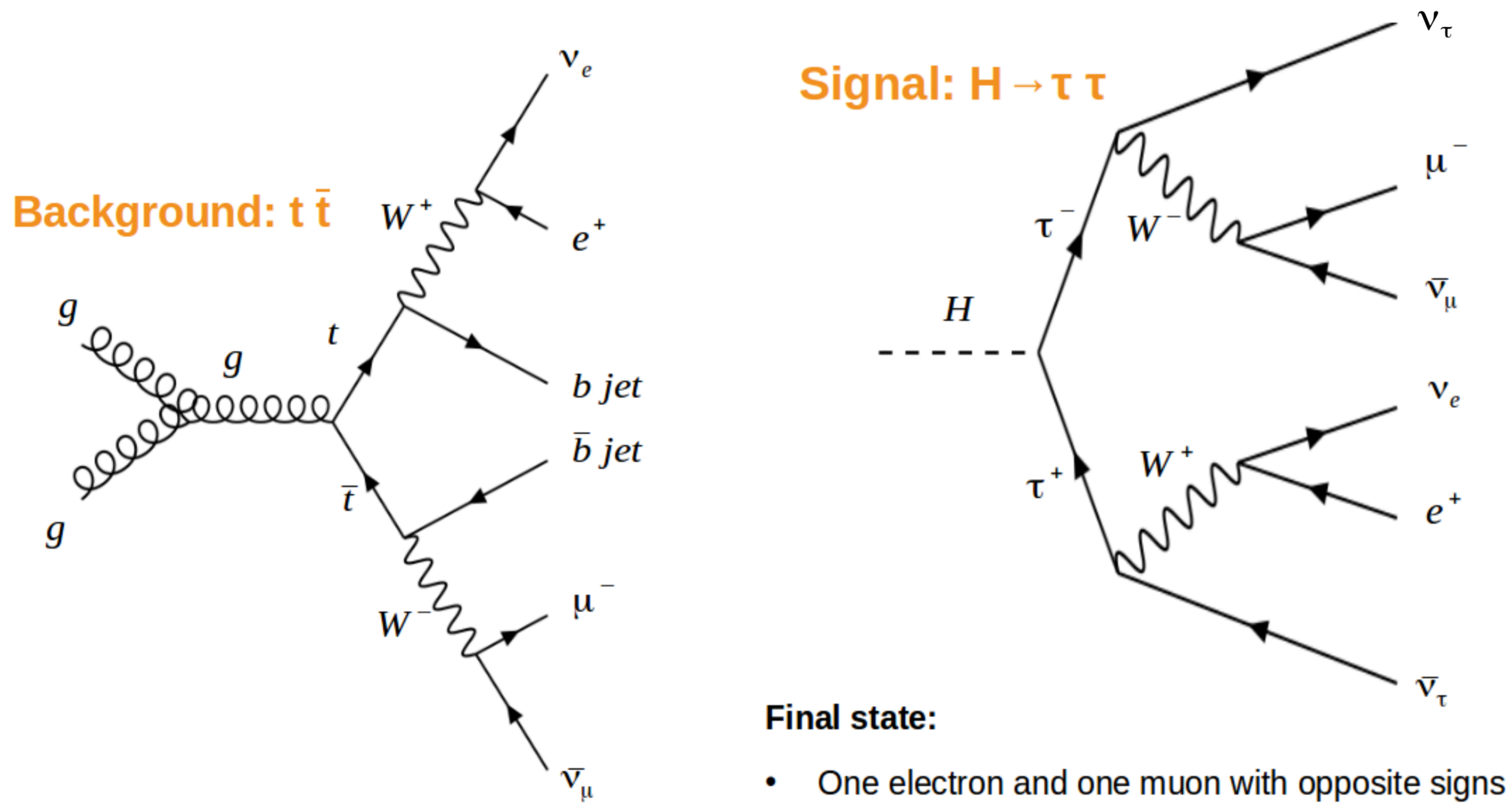
Our work with CMS show



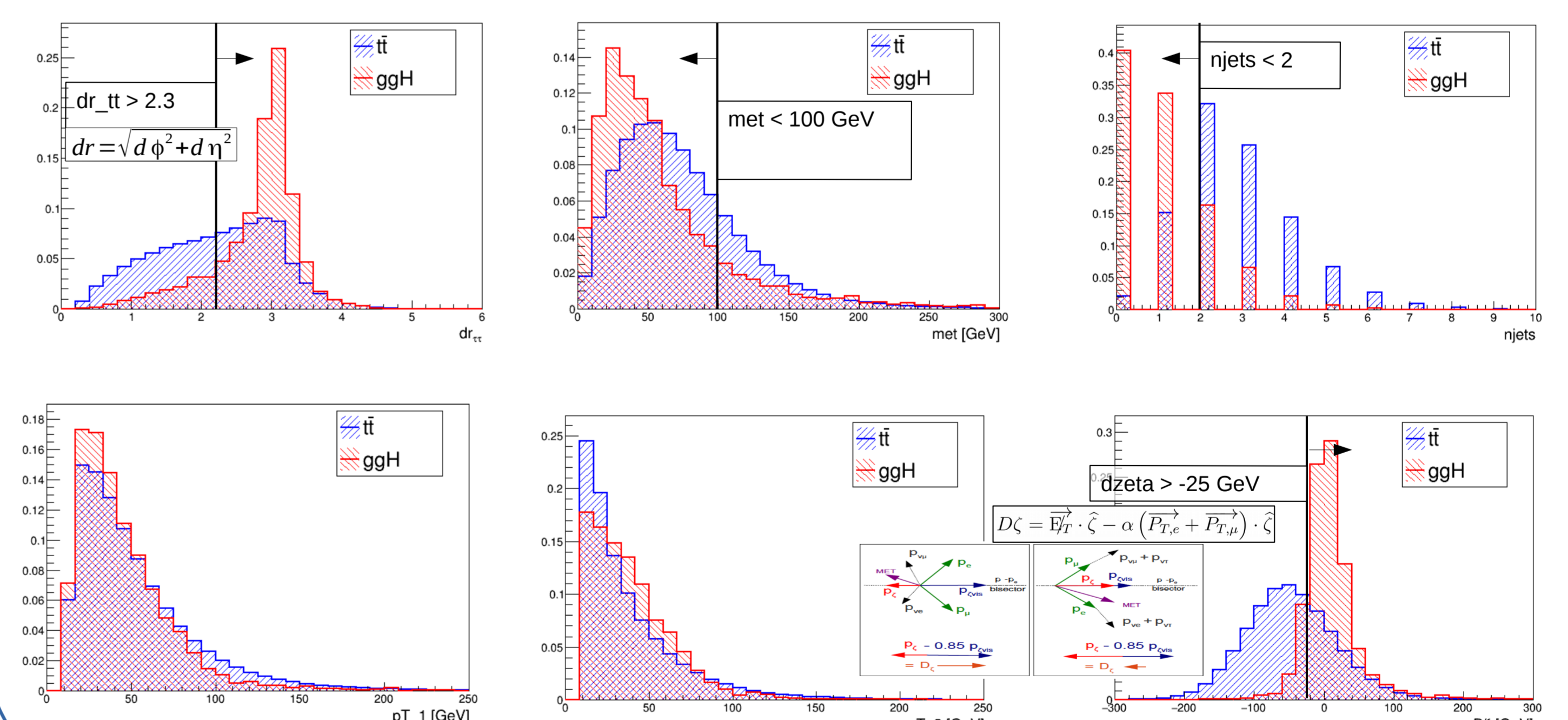
While looking at the events we found one where:

- Electron positron pair with $m=89.350$ GeV
 - The invariant mass of the system made by 3 electrons, a muon and the met was 127.315 GeV
- \Rightarrow this could be a Higgs boson decaying in two Z of which one decays into $e^+ e^-$ and the other in $\tau^+ \tau^-$

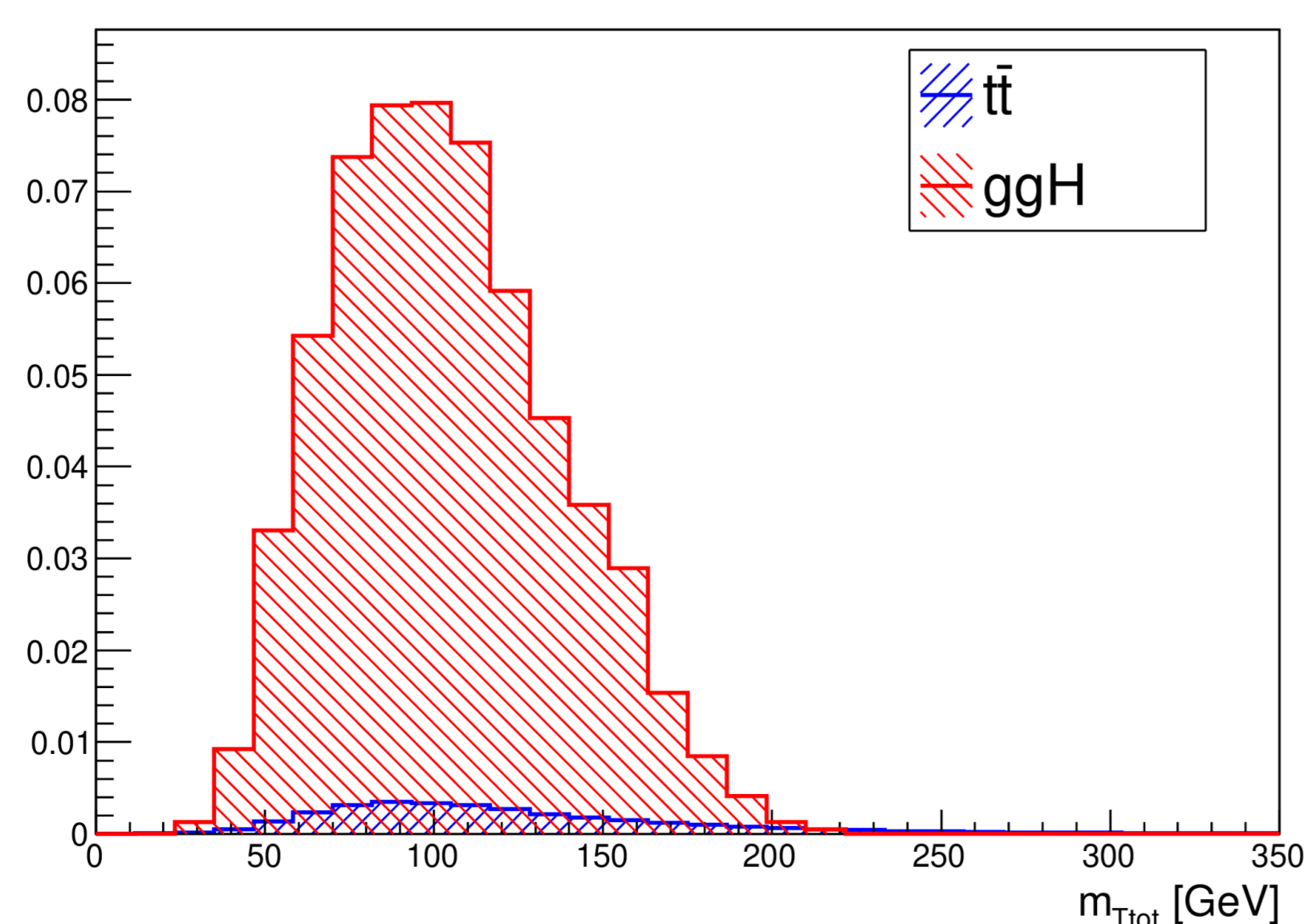
Comparison between Background and Signal



Variable distributions for Background and Signal



Improving event selection to identify the Higgs



Through cuts made using the variables in the previous slide, we were able to cut a lot of noise while keeping most of the signal

$$\epsilon_s = \frac{n_s}{N_s} \sim 60\%$$

$$R_{BKG} = 1 - \frac{n_{BKG}}{N_{BKG}} \sim 97\%$$

$$\sigma = \frac{n_s}{\sqrt{n_{BKG}}} \sim 5.28$$

Our experience

