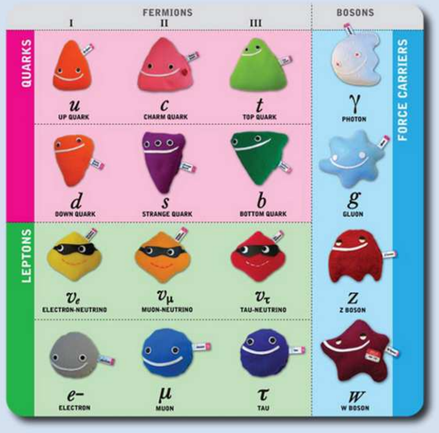
Higgs Exclusive Production

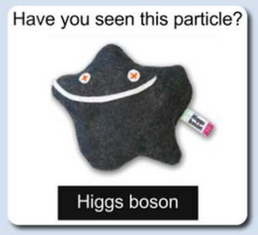
Alice Dechambre
Université de Liège

The Standard-Model Particles



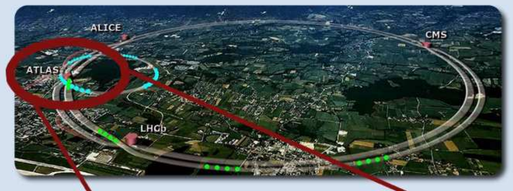
The Higgs boson is the last undetected particle of the Standard Model.

It explains why particles have a mass



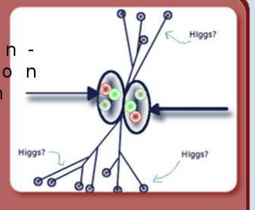
Its discovery should validate the Standard Model as the right theory.

The Large Hadron Collider

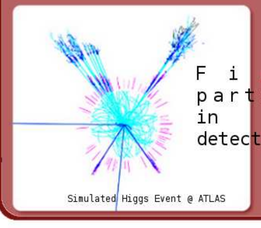


To find the Higgs boson, Physicists have imagined the LHC. A machine where protons will collide at energies of 10 or 14 TeV . Each collison will produce Standard Model particles and if physicists are right, one of them will be the Higgs boson.

Proton-proton Collision



Final particles in the detector

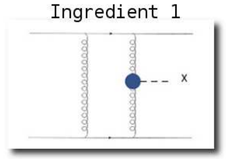


Work done in collaboration with J. R. Cudell, I. P. Ivanov and O. F. Hernadez.

I thanks the organizing commitee of SUSSP65 for support.

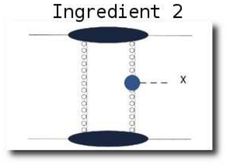
The Standard Scheme for Exclusive Production Calculation

Ingredient 1



Lowest order QCD calculation at the parton level:
qq -> q + X + q
The produced system is in a colour singlet state.

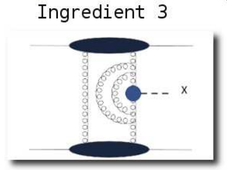
Ingredient 2



Embed partons into the proton via a proton impact factor

I. P. Ivanov, N. N. Nikolaev and A. A. Savin, 2006
J. R. Cudell and O. F. Hernandez,1996

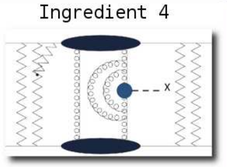
Ingredient 3



Add virtual corrections that can be large and viewed as a Sudakov form factor

Y. L. Dokshitzer, D. Diakonov and S. I. Troian,1980
V. A. Khoze, A. D. Martin and M. G. Ryskin,2000

Ingredient 4

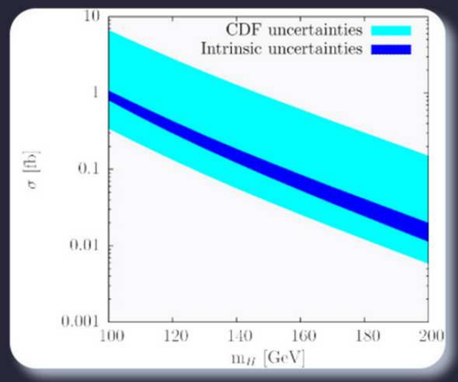


Gap Survival: Take proton rescattering corrections into account

L. Frankfurt, C. E. Hyde-Wright, M. Strikman and C. Weiss, 2007

Non-perturbative quantities not yet under theoretical control
BUT common to all exclusive processes
-> Can be tuned on Exclusive dijet @ TEVATRON

RESULTS: Higgs Exclusive cross section as a function of the Higgs mass



3 Higgs Exclusive events for a luminosity of 3 fm^{-1}

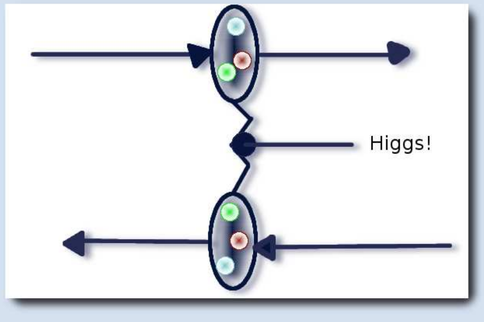
Exclusive Production

p + p -> p + H + p

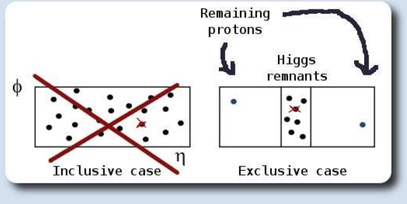
But, due to the huge amount of energy available, a lot of particles should be produced. The Higgs boson could be completely hidden in the background

In a few events, the Higgs boson is produced alone and the initial protons remain intact.

Even if the rate is small, the detection of a standard light Higgs boson will be easier in the exclusive channel.



The final state looks like this:



A challenge for forward detectors as FP420!