

PARTICELLE E INTERAZIONI



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**INCONTRO DI ORIENTAMENTO
LAUREA MAGISTRALE IN SCIENZE FISICHE
DIPARTIMENTO DI FISICA, 19 MAGGIO 2015**

CHI SIAMO E I NOSTRI FONDI

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POST-DOC: C.M. CARLONI CALAME, M. CHIESA, H. MARTINEZ,
V. PROSPERI, A. SHIVAJI

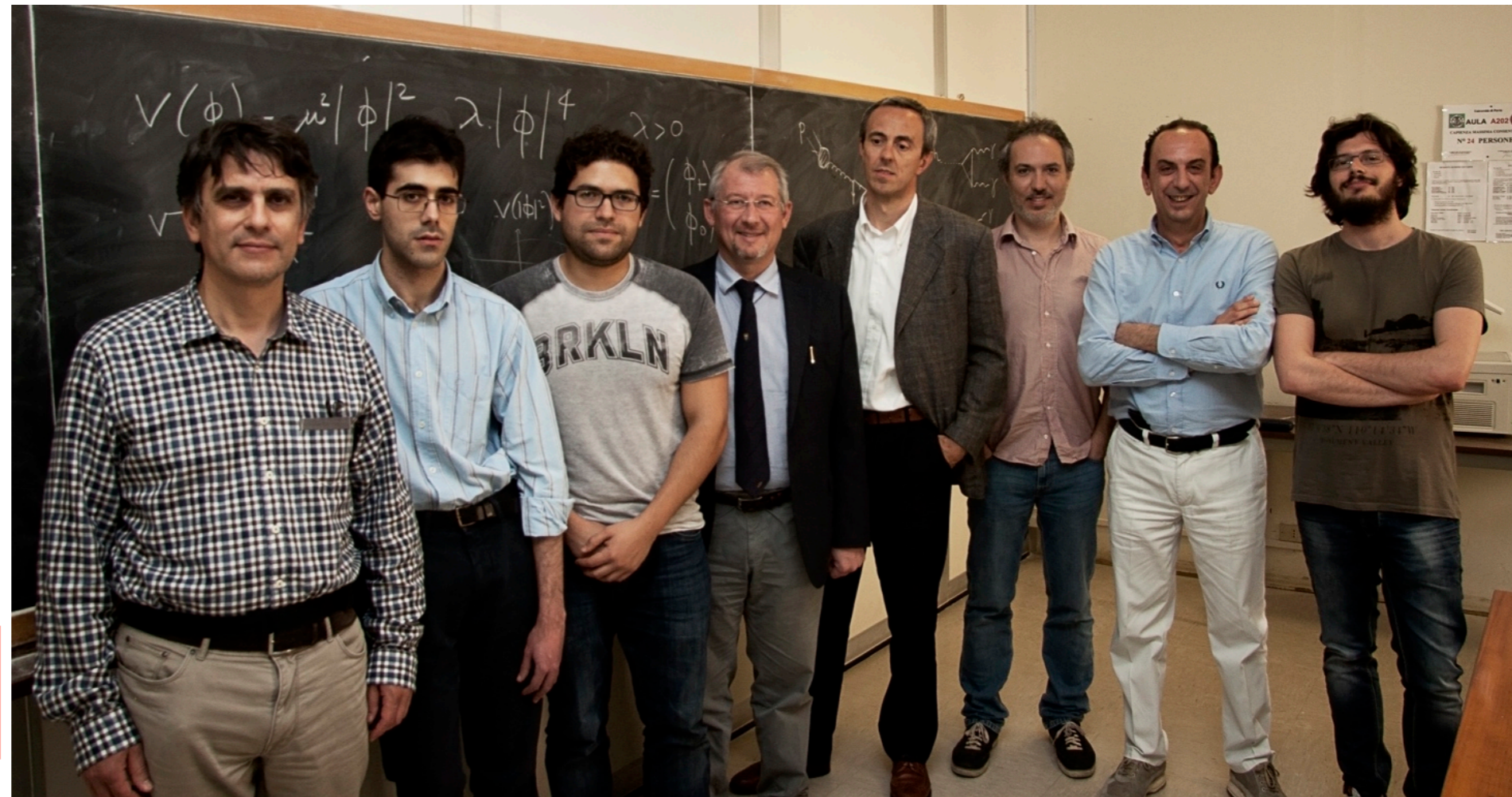
PHD: S. BOSELLI



QFT@COLLIDERS



**PRIN 2010-2011
FONDO GIOVANI**

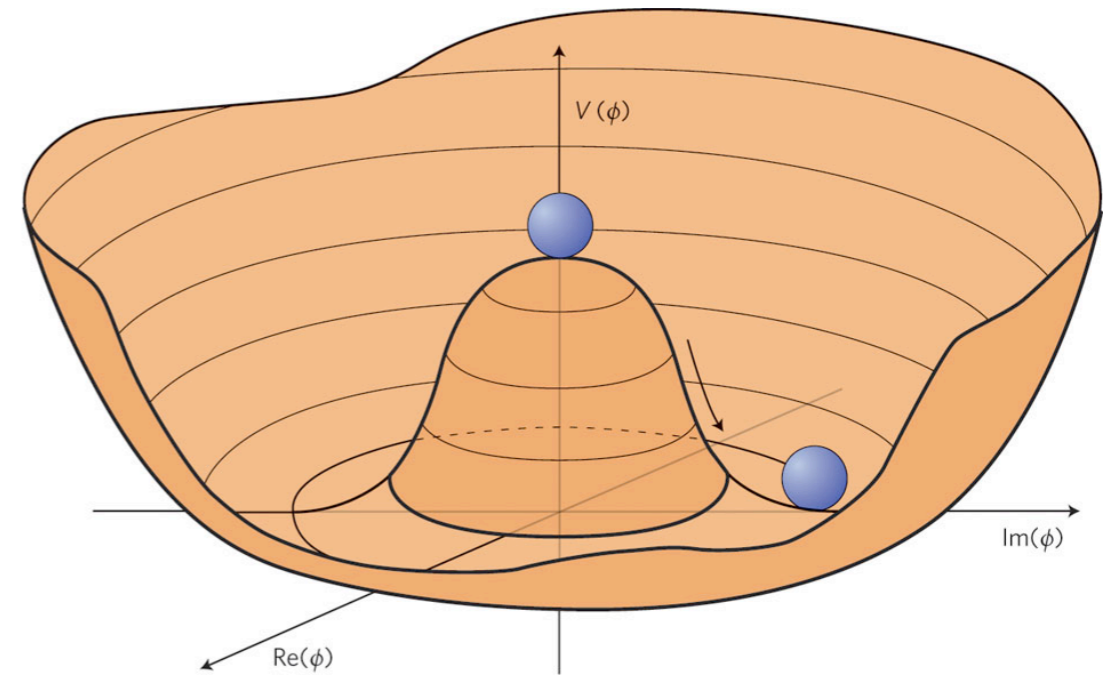
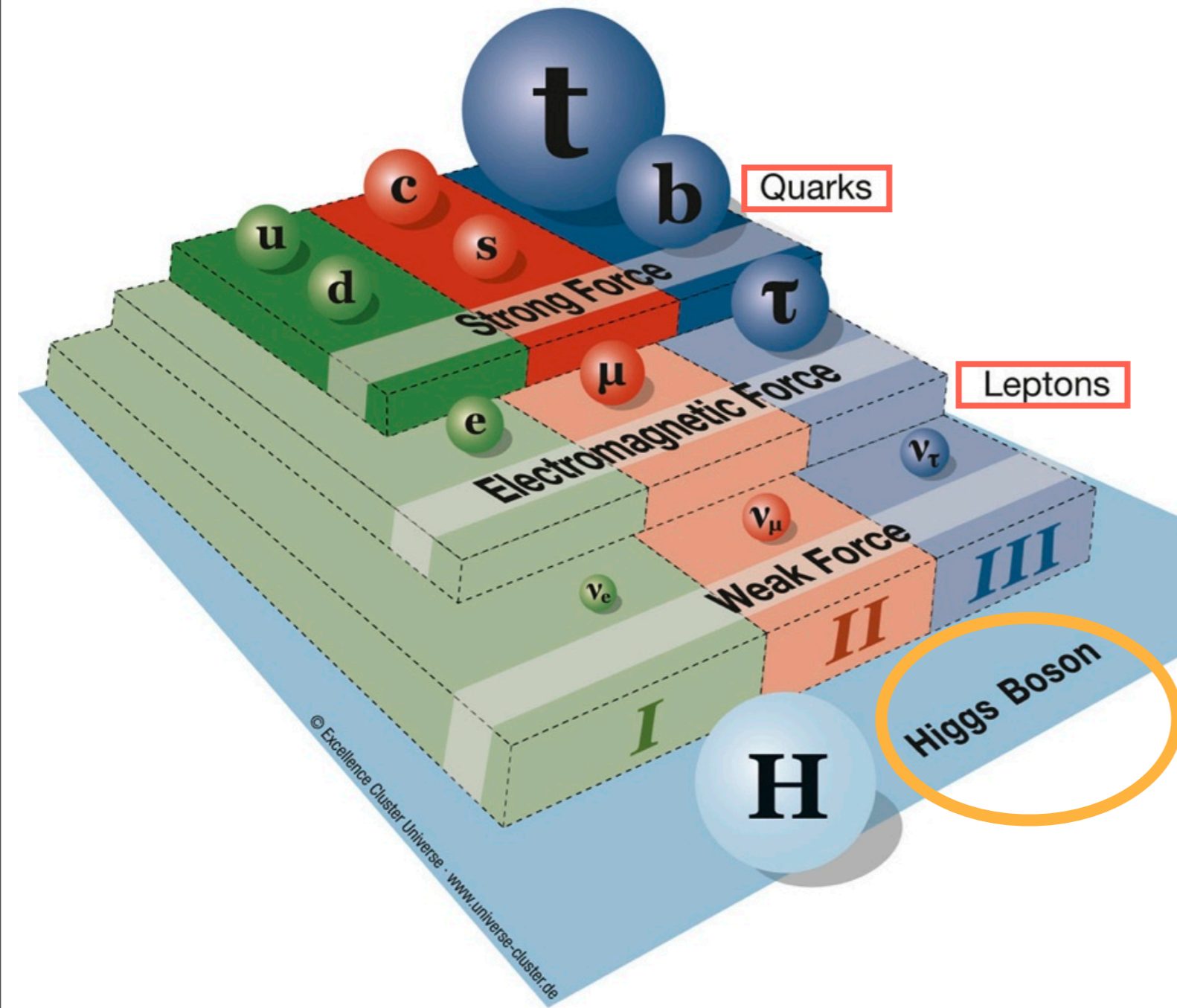


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LHC PHENONET 2011-2015

PARTICELLE ELEMENTARI E FORZE



IN OTTIMO ACCORDO COI DATI SPERIMENTALI...

LA SCOPERTA DELLA PARTICELLA DI HIGGS

H^0 (Higgs Boson)

The observed signal is called a Higgs Boson in the following, although its detailed properties and in particular the role that the new particle plays in the context of electroweak symmetry breaking need to be further clarified. The signal was discovered in searches for a Standard Model (SM)-like Higgs. See the following section for mass limits obtained from those searches.

H^0 MASS

VALUE (GeV)

125.9 ± 0.4 OUR AVERAGE

$125.8 \pm 0.4 \pm 0.4$

$126.0 \pm 0.4 \pm 0.4$

• • • We do not use the following

$126.2 \pm 0.6 \pm 0.2$

$125.3 \pm 0.4 \pm 0.5$

DOCUMENT ID

TECN

COMMENT

¹ CHATRCHYAN 13J CMS pp , 7 and 8 TeV

² AAD 12AI ATLS pp , 7 and 8 TeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

³ CHATRCHYAN 13J CMS pp , 7 and 8 TeV

⁴ CHATRCHYAN 12N CMS pp , 7 and 8 TeV

[HTTP://PDG.LBL.GOV](http://pdg.lbl.gov)

Page 1

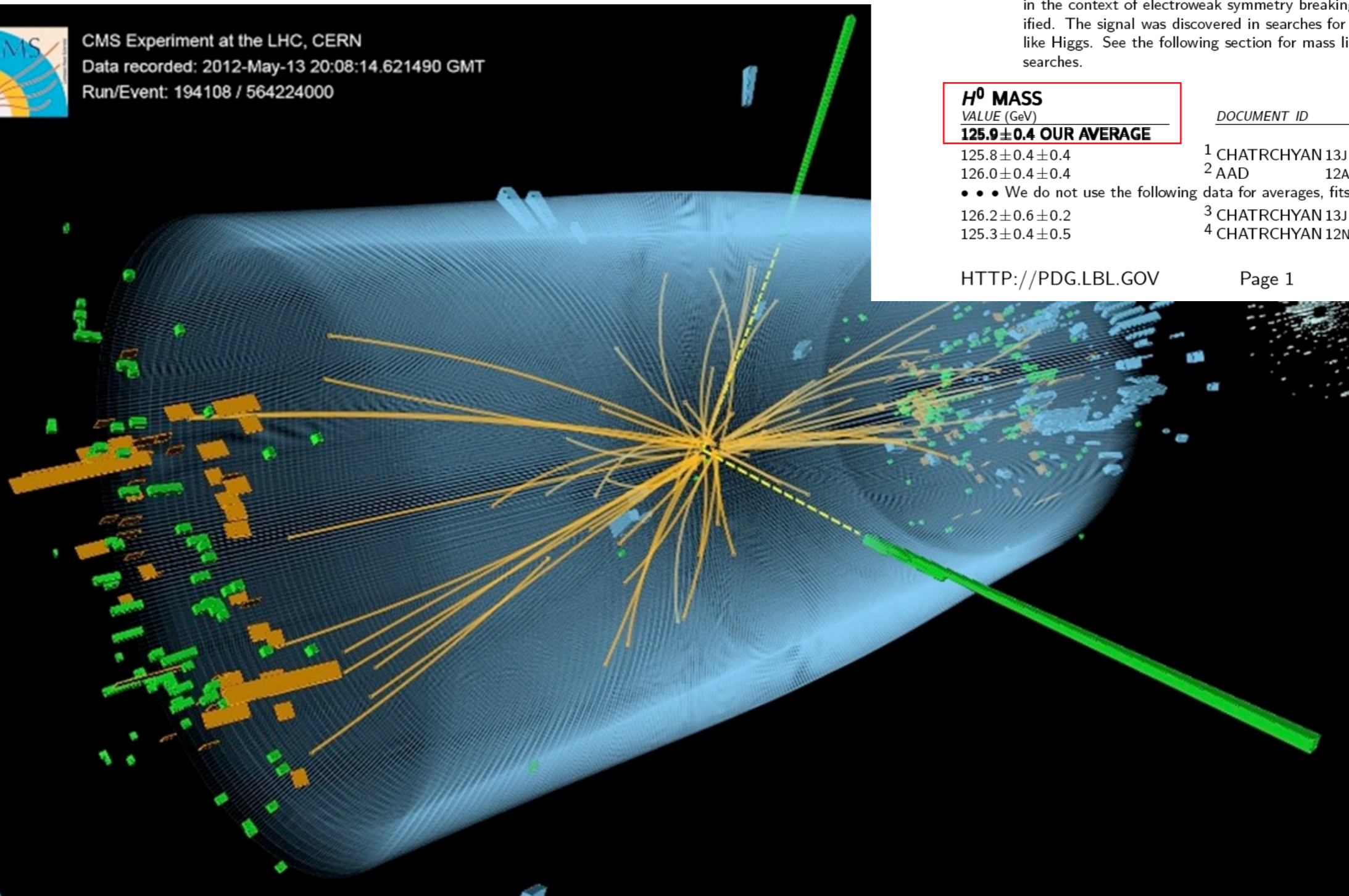
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CMS Experiment at the LHC, CERN

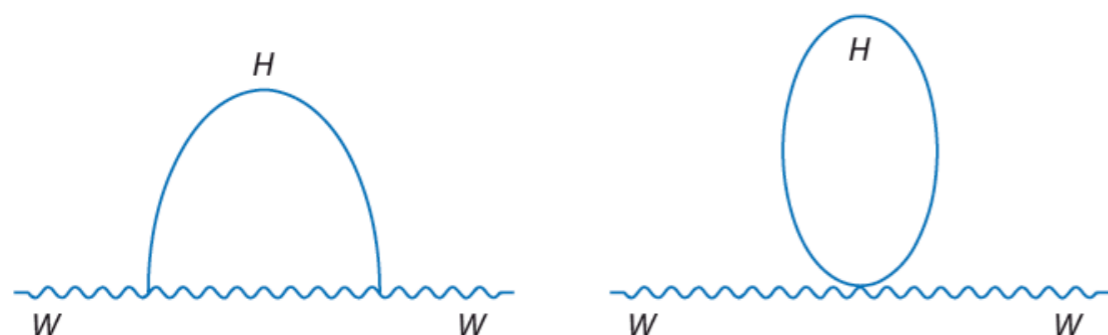
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Run/Event: 194108 / 564224000



PERCHE' SAPEVAMO DOVE CERCARLA

RICERCA INDIRECTA A LEP1



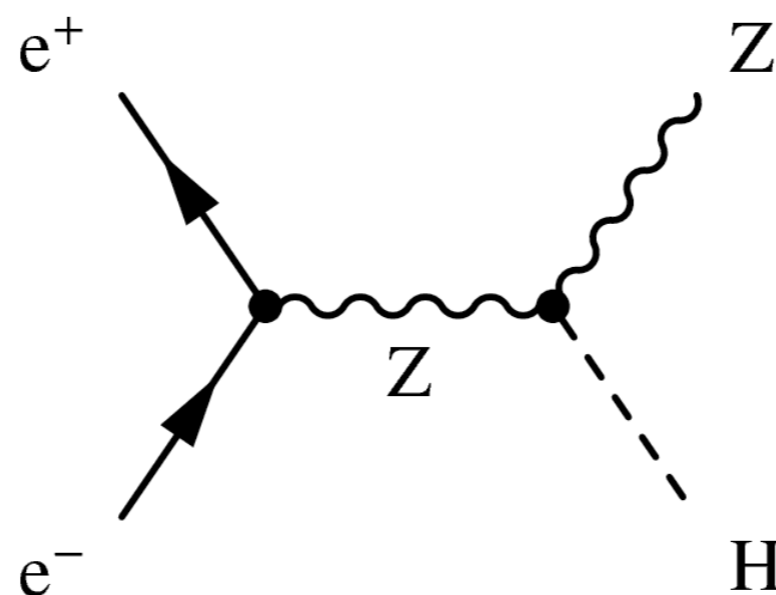
$$M_W^2 \left(1 - \frac{M_W^2}{M_Z^2} \right) = \frac{\pi \alpha}{\sqrt{2} G_F} \left(\frac{1}{1 - \Delta r} \right)$$

Figure 2

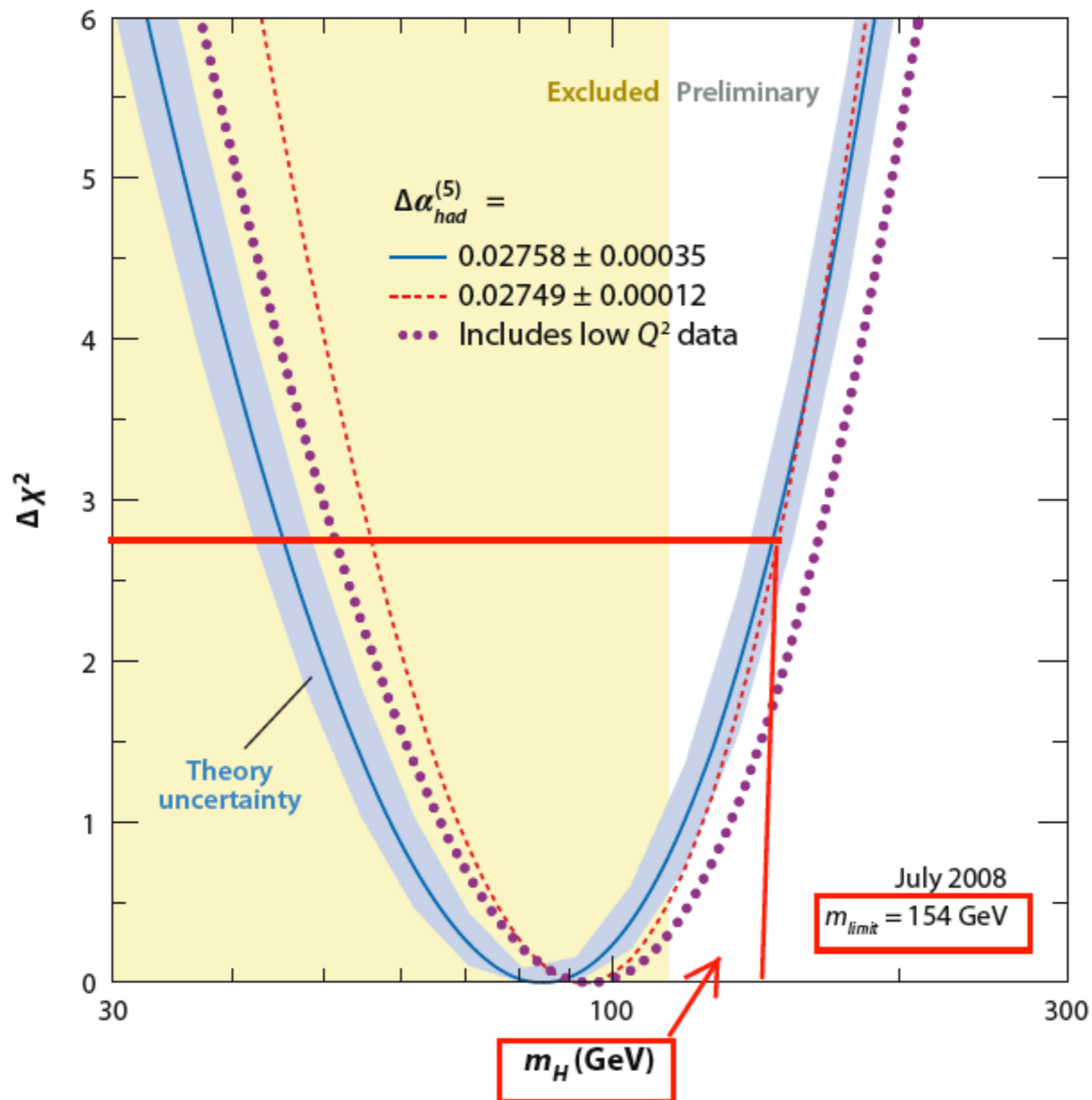
Higgs one-loop contributions to the W boson mass. Reproduced from Reference 20 with permission.

$$\Delta r = \Delta \alpha + \Delta \rho [(M_{\text{top}}/M_Z)^2] + \Delta \chi [\ln(M_H/M_Z)]$$

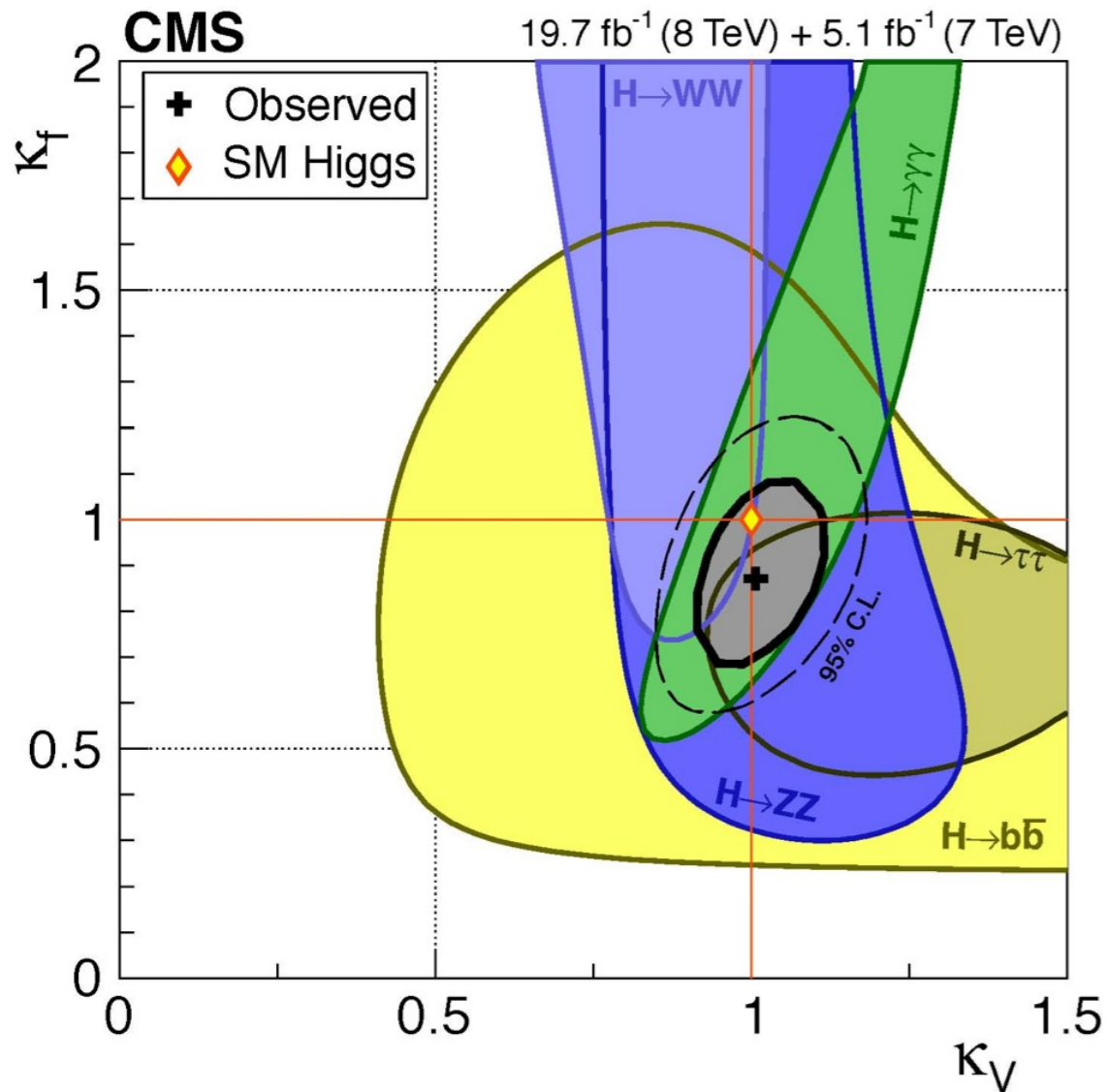
RICERCA DIRETTA A LEP2



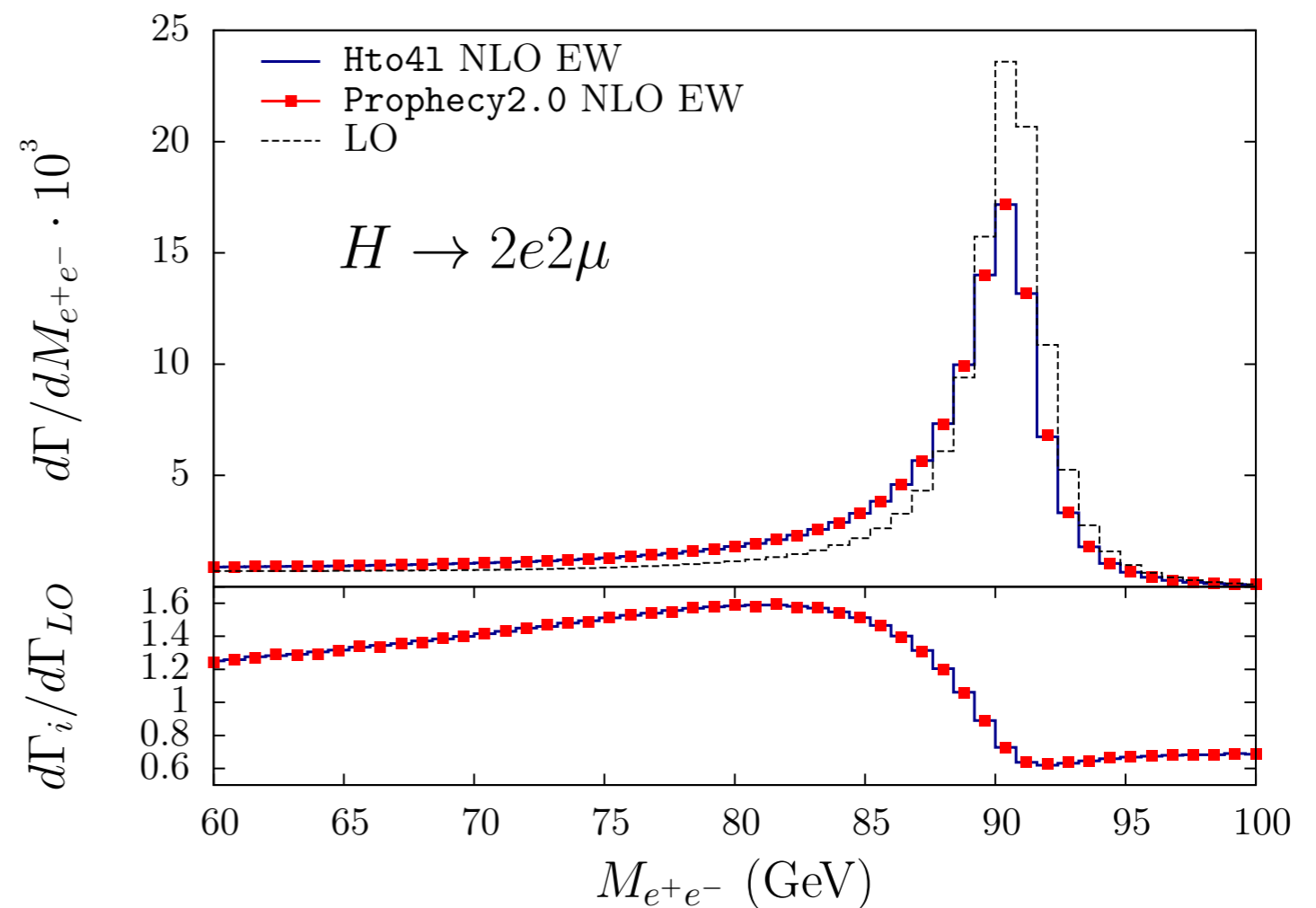
PERCHE' SAPEVAMO DOVE CERCARLA



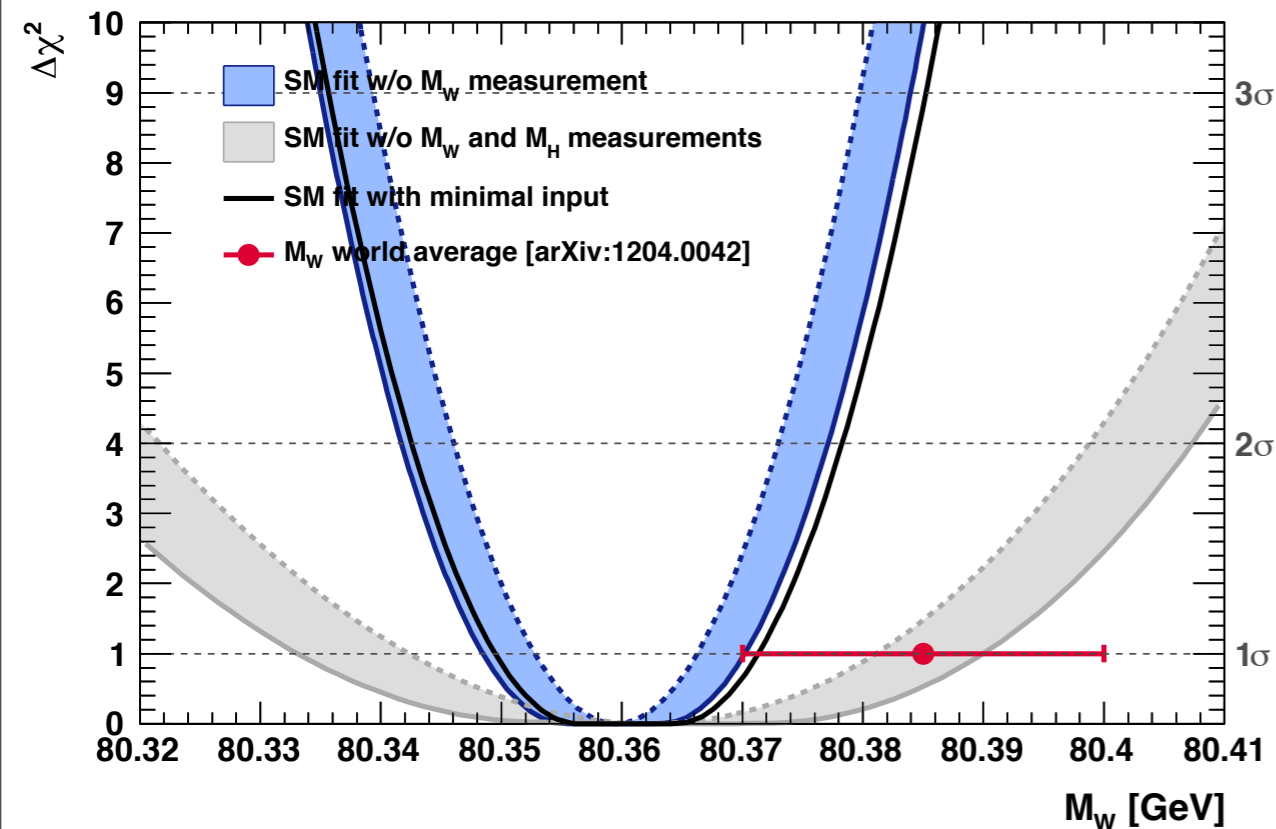
LA PARTICELLA DI HIGGS IN FUTURO



LAVORO DEL NOSTRO GRUPPO
Higgs Boson Decay into Four Leptons at NLOPS
Electroweak Accuracy
JHEP 2015



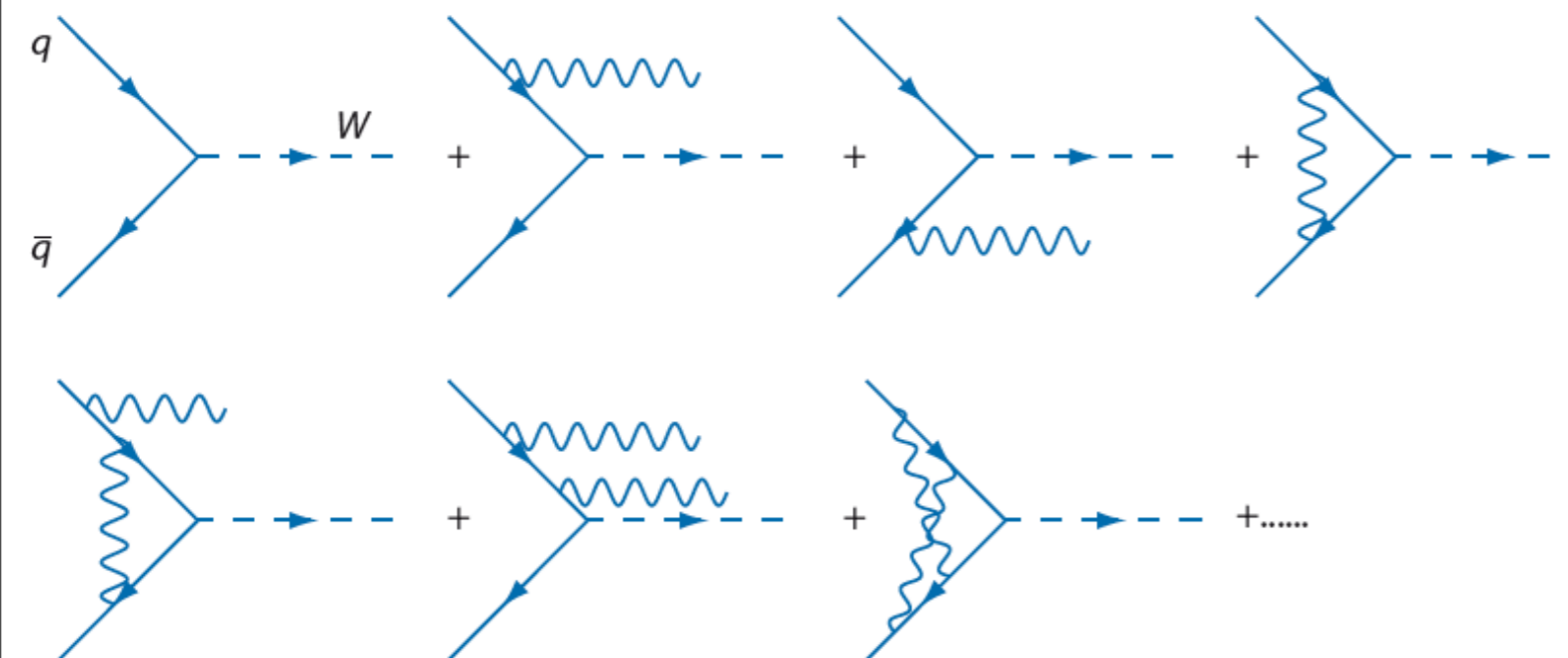
IL NOSTRO LAVORO IN CONCRETO: TEORIA



ESEMPIO: DETERMINAZIONE DI MASSA W DAI DATI
*Precision measurement of the W -boson mass:
 electroweak contributions and uncertainties*
LAVORO DEL NOSTRO GRUPPO IN PREPARAZIONE

CALCOLO SIMBOLICO

DIAGRAMMI DI FEYNMAN



```

Symbol x,x1,x2;
CFunction H,H1;
Local F = H(3,4,2,6,1,1,1,2);
Print "<1> %t";
Repeat id H(?a,x?!{0,1},?b) = H(?a,0,x-1,?b);
Print "<2> %t";
Multiply H1;
Repeat id H(x?,?a)*H1(?b) = H(?a)*H1(?b,1-x);
id H*H1(?a) = H(?a);
Print "<3> %t";
Repeat id H(x1?,x2?,?a) = H(2*x1+x2,?a);
Print "<4> %t";
.end
<1> + H(3,4,2,6,1,1,1,2)
<2> + H(0,0,1,0,0,0,1,0,1,0,0,0,0,0,1,1,1,1,0,1)
<3> + H(1,1,0,1,1,1,0,1,0,1,1,1,1,1,1,0,0,0,0,1,0)
<4> + H(907202)
  
```


IL NOSTRO LAVORO: SIMULAZIONE

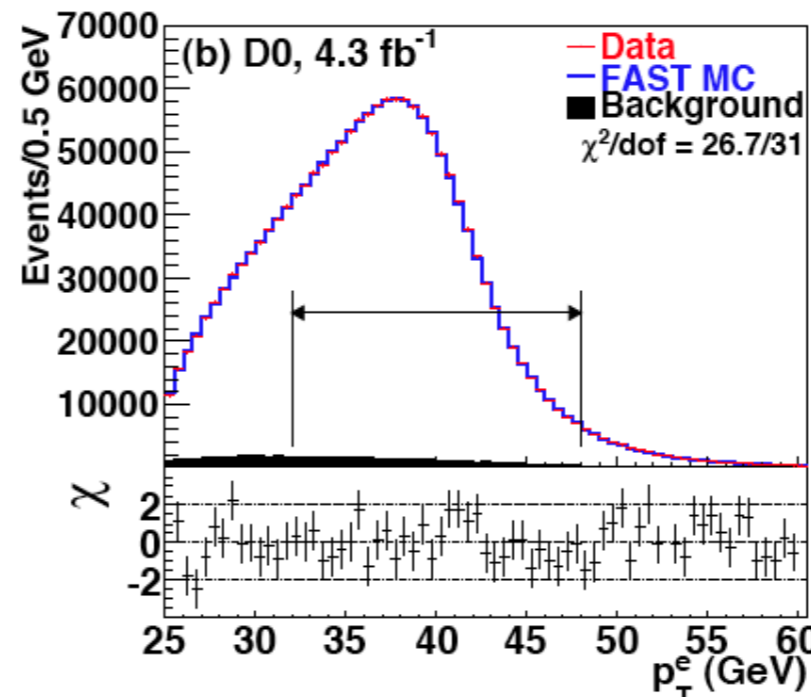
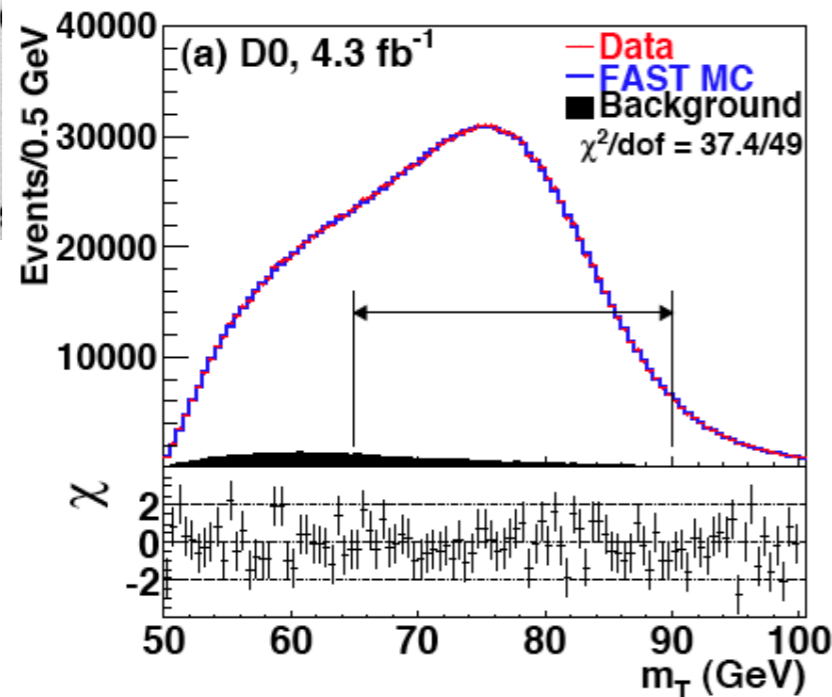
CODICE DI SIMULAZIONE

CALCOLO NUMERICO

```
#print " " ,src
time.sleep(random.random())
try:
    downloadURL(src, ""+str(cardnumber)+"/output")
except urllib2.URLError, msg:
    print "ncfiles: Urllib2 error (%s)" % msg
except socket.error, (errno, strerror):
    print "ncfiles: Socket error (%s) for host %s (%s)" % (errno,
for h3 in page.findAll("h3"):
    value = (h3.contents[0])
    if value != "Afdeling":
        print >> txt, value
        import codecs
        f = codecs.open("alle.txt", "r", encoding="utf-8")
        text = f.read()
        f.close()
        # open the file again for writing
        f = codecs.open("alle.txt", "w", encoding="utf-8")
        f.write(value+"\n")
        # write the original contents
        f.write(text)
```



CONFRONTO COI DATI



**IL NOSTRO CLUSTER:
~ 700 CORE**

COLLABORAZIONI E VIAGGI



logomark

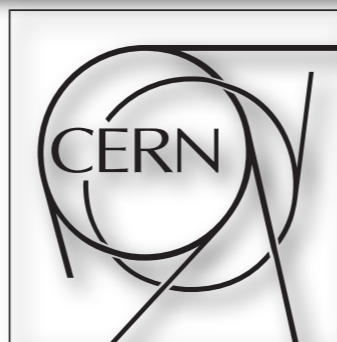
logotype



Institute of High Energy Physics Chinese Academy of Sciences



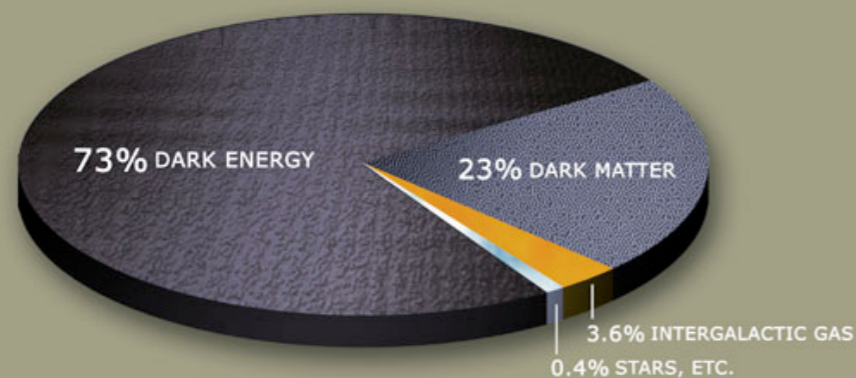
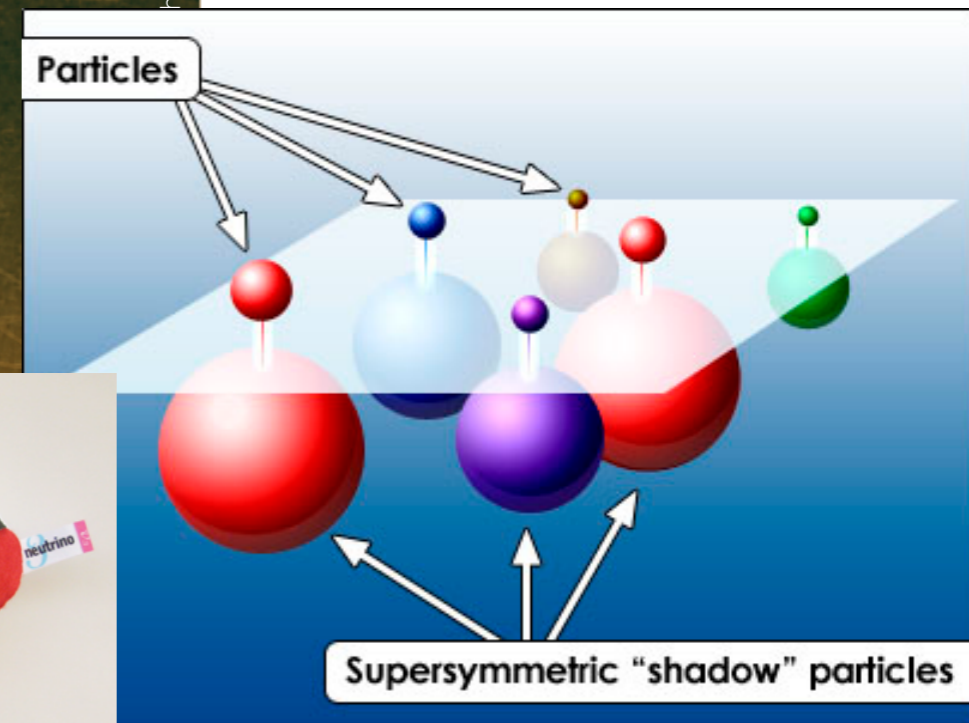
HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION



The Galileo Galilei Institute for Theoretical Physics
Arcetri, Florence

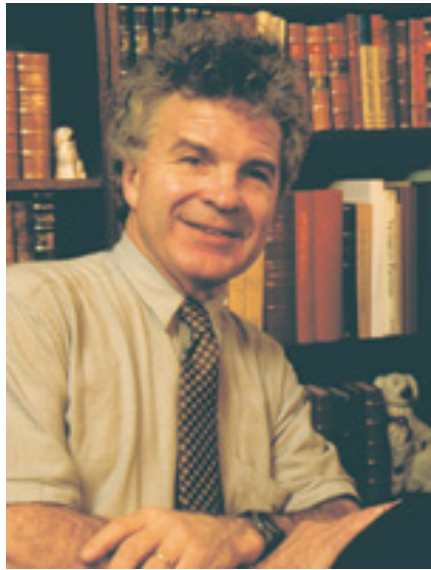


COSA RESTA DA FARE?



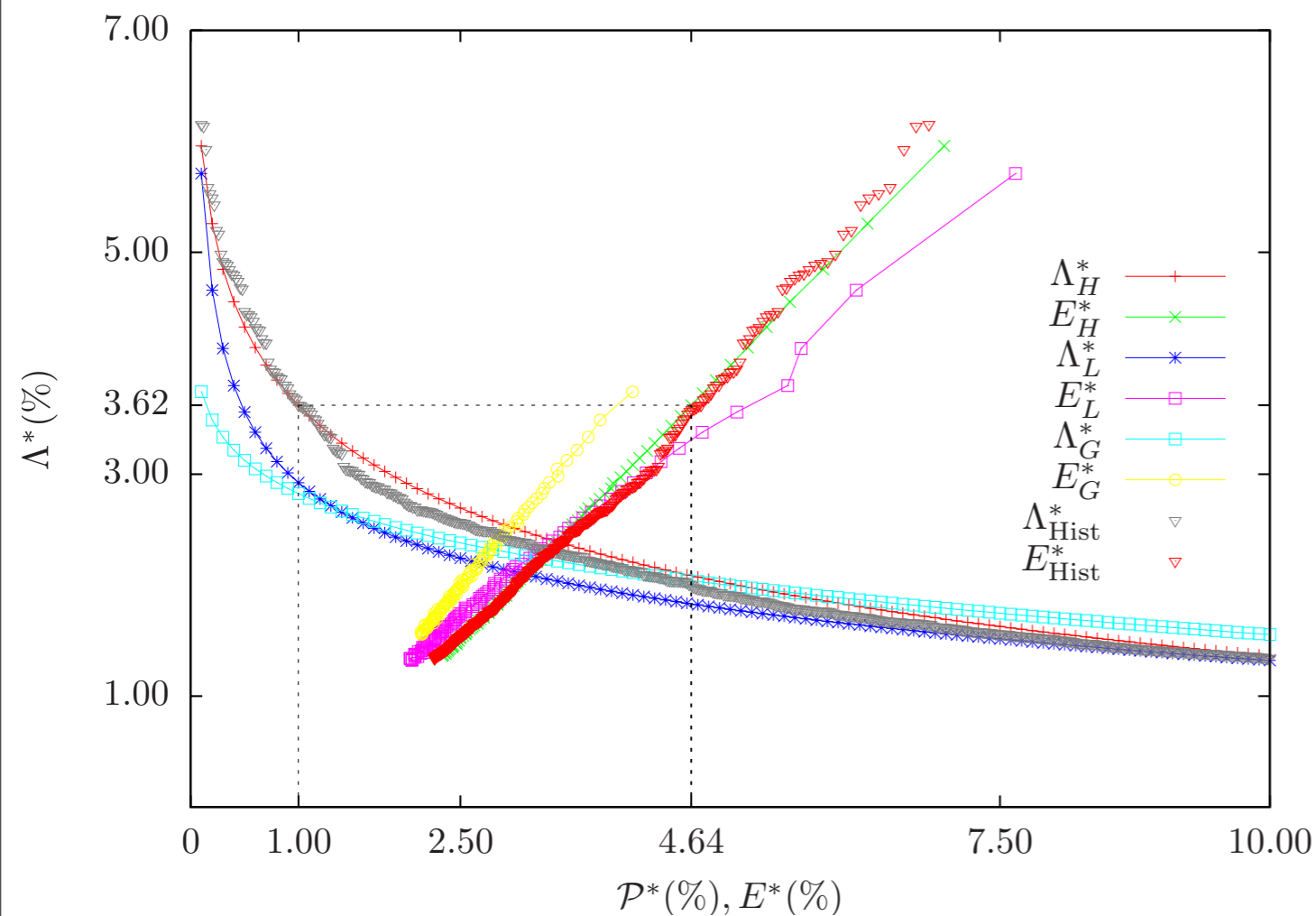
**GRAZIE ALLA GENERALITA' DEI METODI
DELLA FISICA TEORICA
FACCIAMO ANCHE UN PO' DI ...**

...RICERCA IN ECONOFISICA



“L'econofisica e` l'applicazione dei metodi della fisica teorica allo studio dei mercati finanziari, considerati come sistemi complessi”

H.E. STANLEY



RICERCA:

G. BORMETTI, SCUOLA NORMALE SUPERIORE PISA

D. DELPINI, ECONOMIA SASSARI

G. LIVAN, UNIVERSITY COLLEGE LONDON

PROFESSIONE:

V. CAZZOLA, UNICREDIT

E. CISANA, PRICEWATERHOUSECOOPERS

L. FERMI, BANCAIMI

N. MORENI, BANCAIMI

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