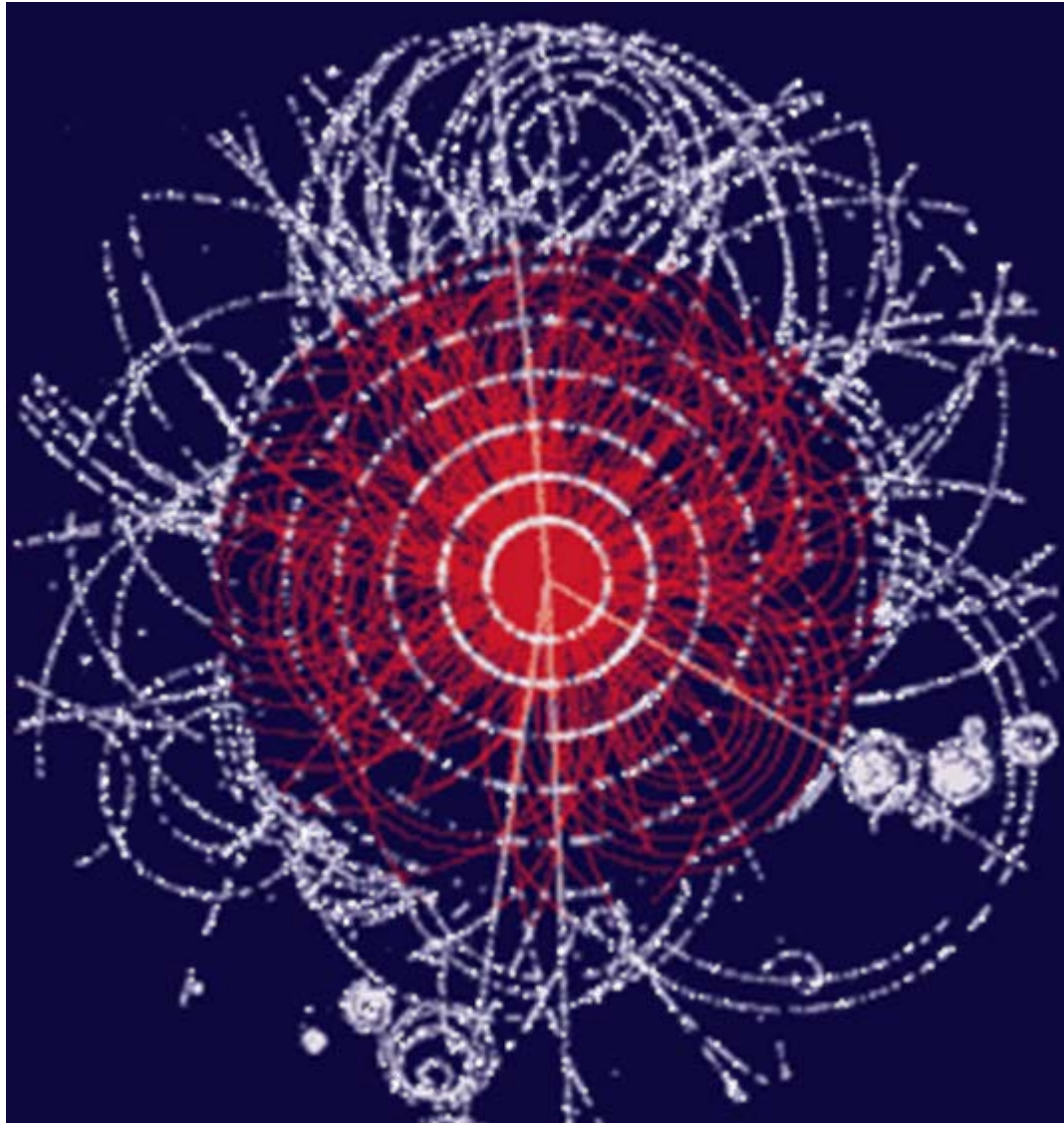


6. Physik des Higgs-Bosons



Meissner-Ochsenfeld-Effekt

$$\psi(\vec{r}) = \psi_0 \exp(i S(\vec{r}))$$

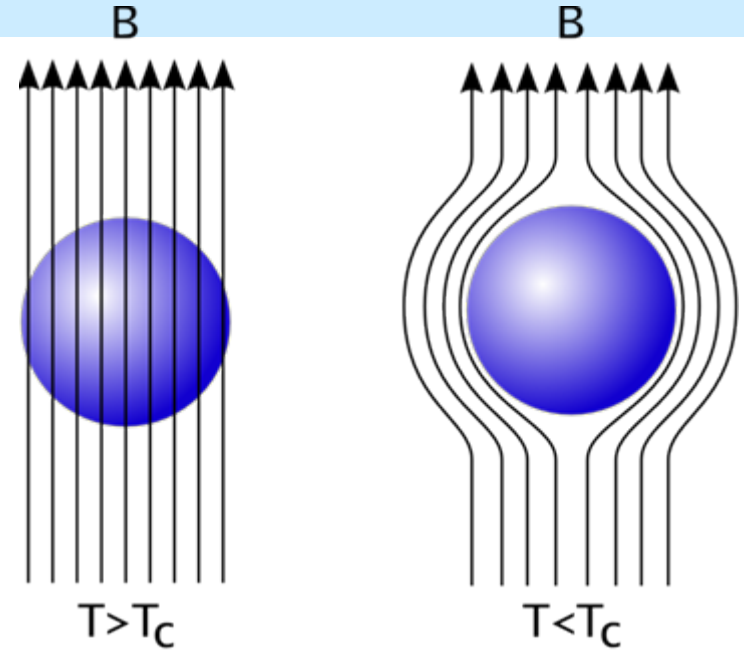
$$\hat{\vec{p}} = -i\hbar \vec{\nabla} - q\vec{A}$$

$$m\vec{v}\psi = \hat{\vec{p}}\psi = (\hbar\vec{\nabla}S - q\vec{A})\psi$$

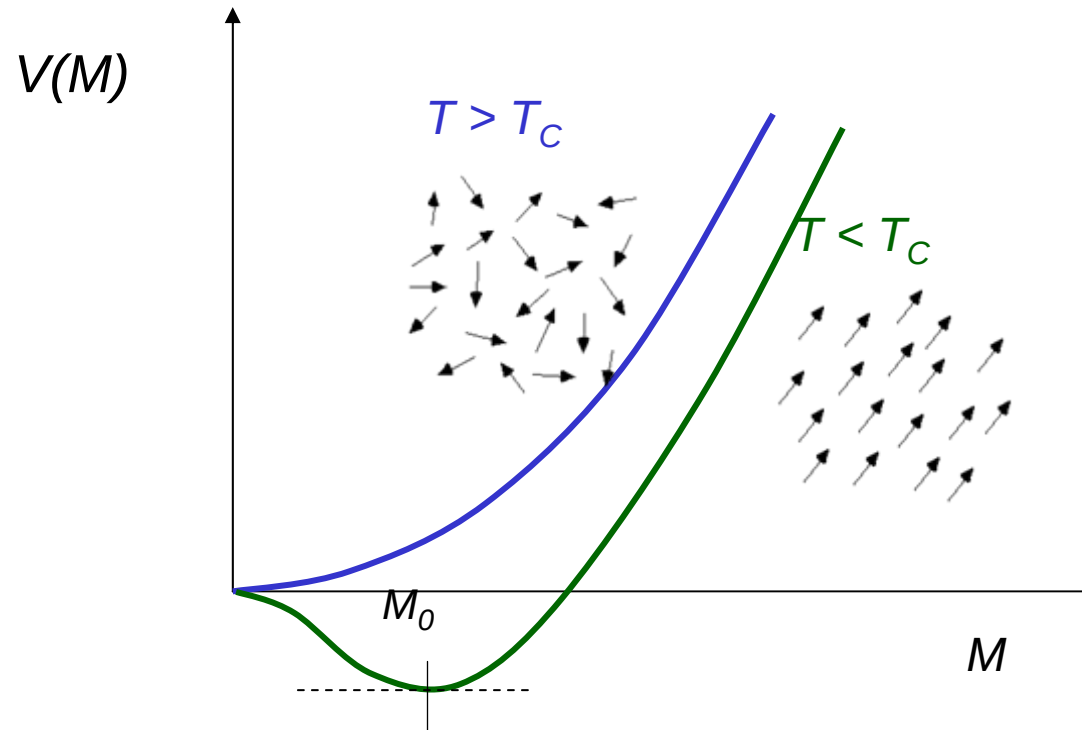
$$\vec{v} = \frac{\hbar}{m}\vec{\nabla}S - \frac{q}{m}\vec{A}$$

$$\vec{j} = qn\vec{v}$$

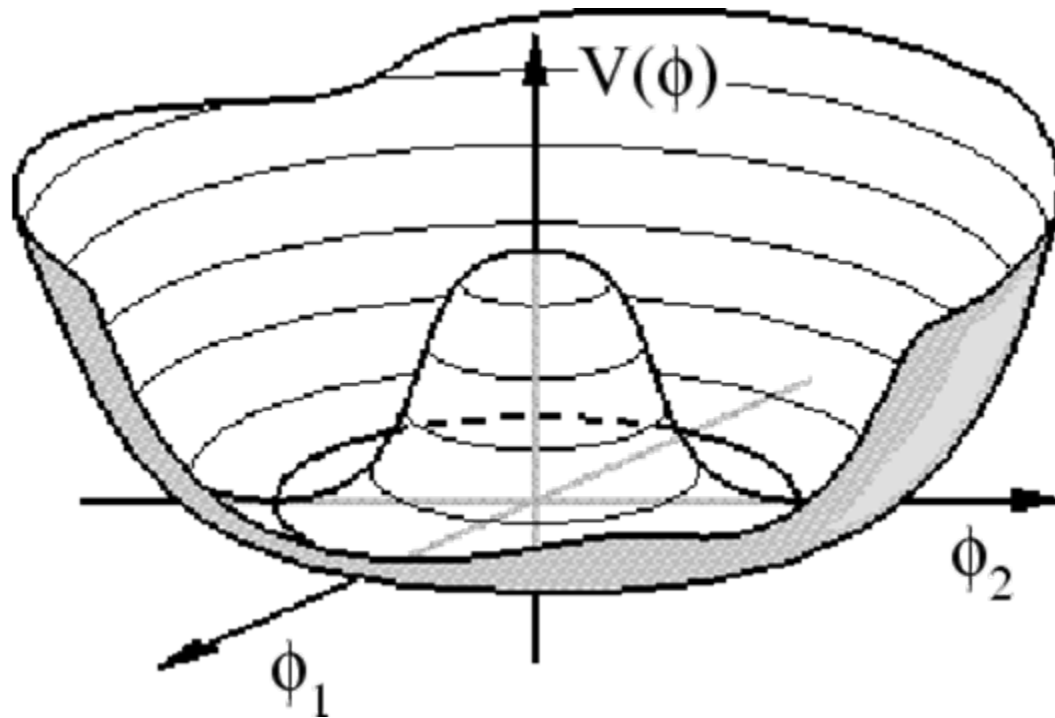
$$\vec{j} = \frac{nq\hbar}{m}\vec{\nabla}S - \frac{nq^2}{m}\vec{A}$$



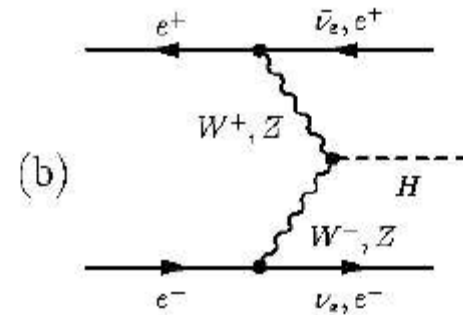
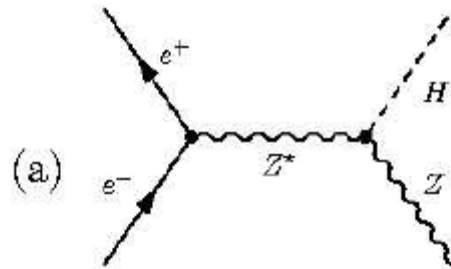
Spontane Symmetriebrechung bei Magnetisierung



Higgs-Potential

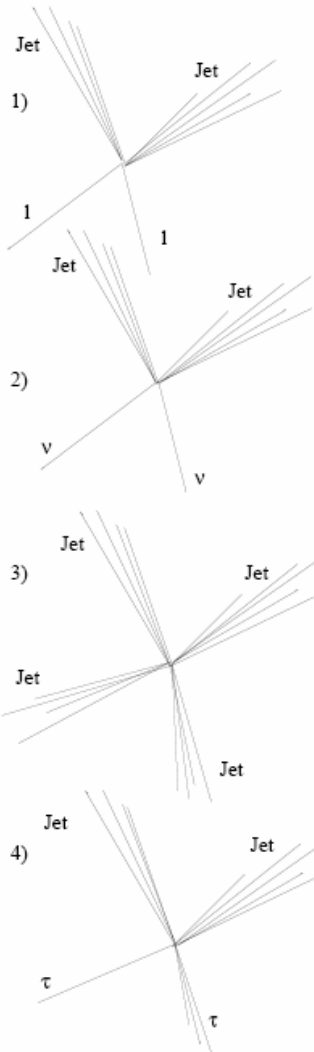


Higgs-Suche bei LEP



$$e^+e^- \rightarrow Z^{0*} \rightarrow Z^0 H$$

Ereignistopologien bei LEP



HZ
 $H \rightarrow b\bar{b}, Z \rightarrow l\bar{l}$

2 isolierte Leptonen und zwei akoplanare Jets

Detektoreffizienz: 70%

Branchingratio 6%

HZ
 $H \rightarrow b\bar{b}, Z \rightarrow \nu\bar{\nu}$

Missing energy und zwei akoplanare Jets

Detektoreffizienz: 50%

Branchingratio 20%

HZ
 $H \rightarrow b\bar{b}, Z \rightarrow q\bar{q}$

4 Jets, b-tagging von Higgs Jets (BR 65%)

Detektoreffizienz: 25%

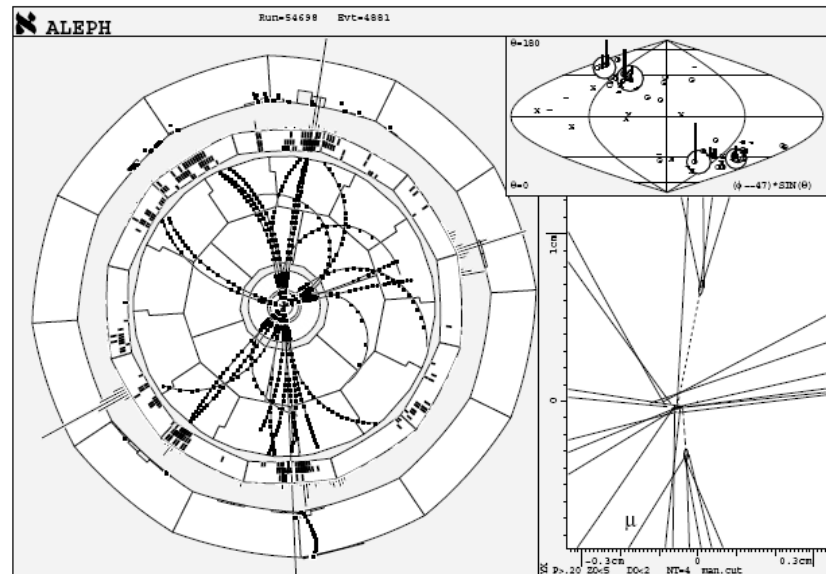
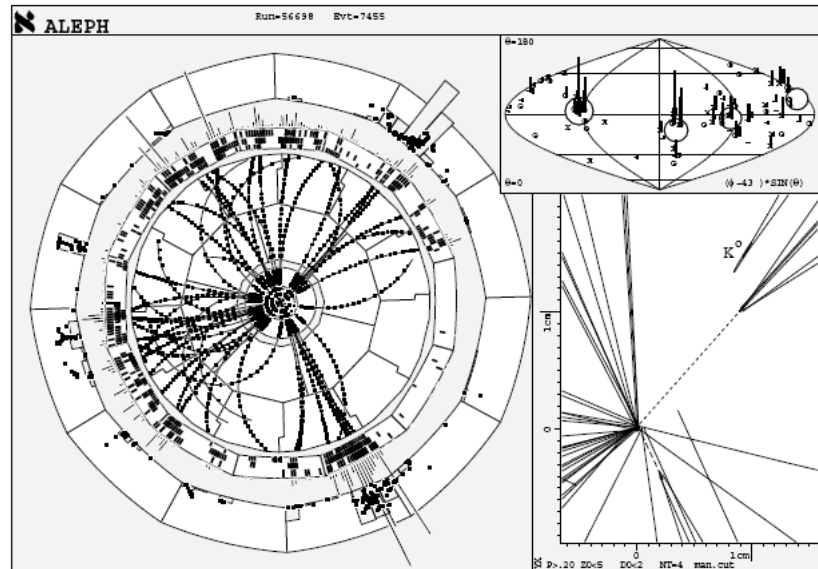
Branchingratio 65%

HZ
 $H \rightarrow b\bar{b}, Z \rightarrow \tau\bar{\tau}$
 $H \rightarrow \tau\bar{\tau}, Z \rightarrow q\bar{q}$

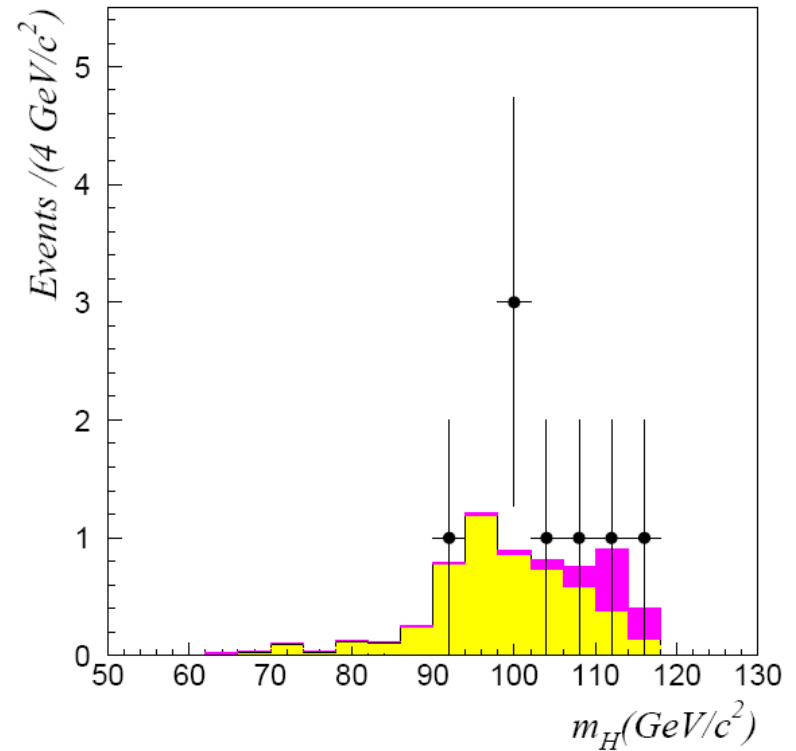
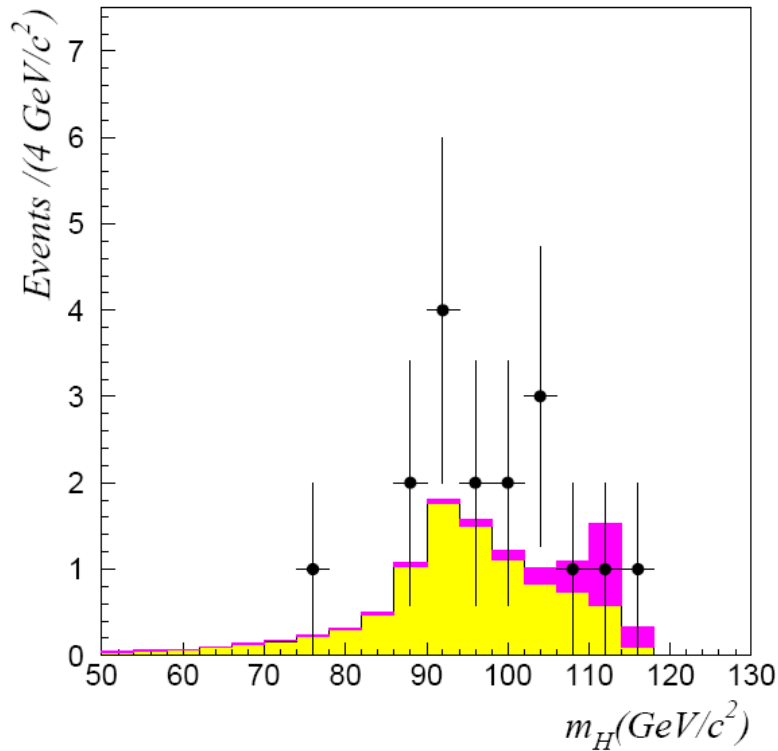
Taus + Jets

Detektoreffizienz: 25%

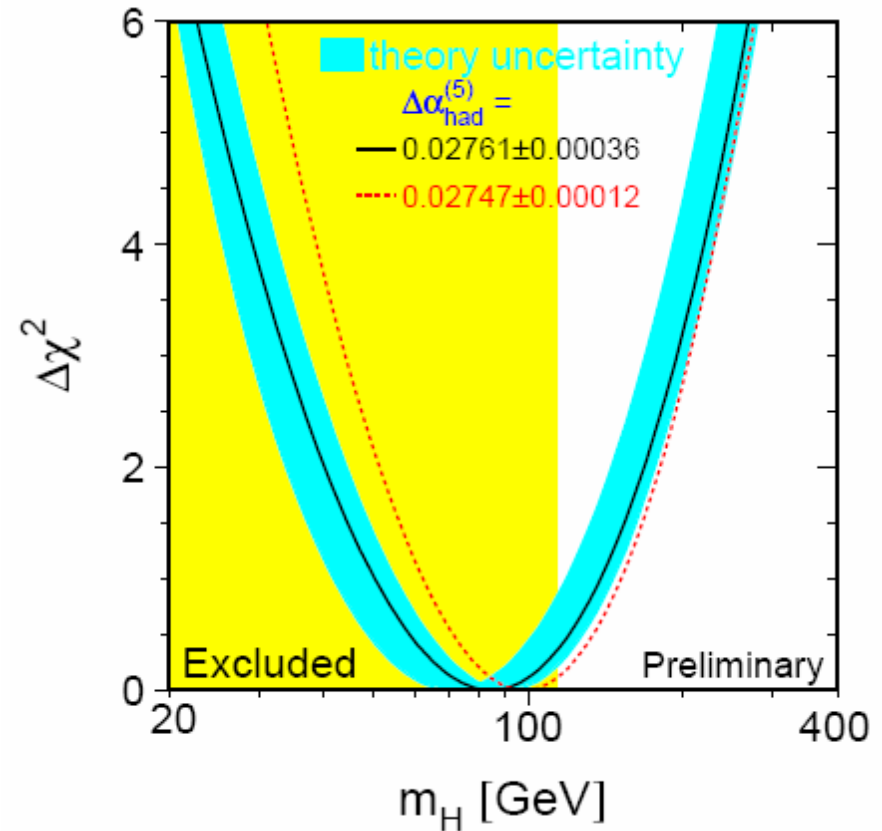
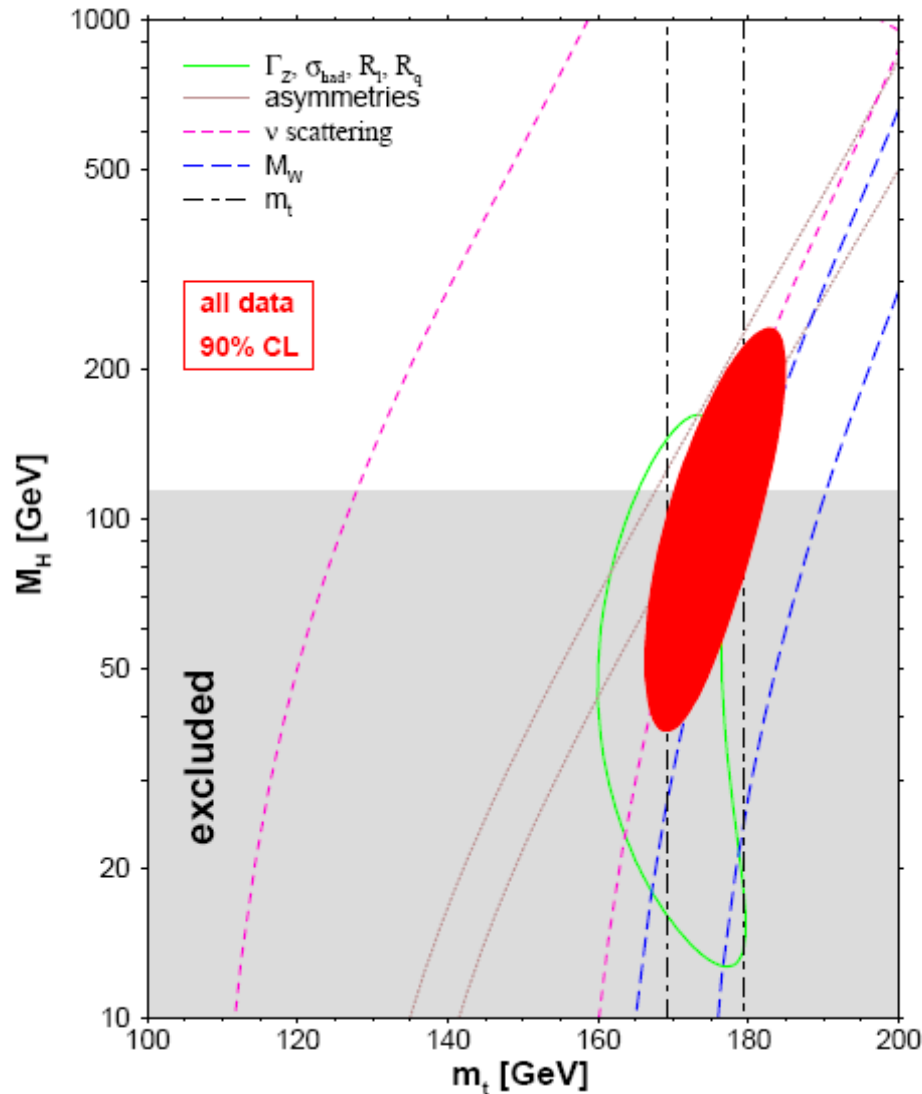
Branchingratio 9%



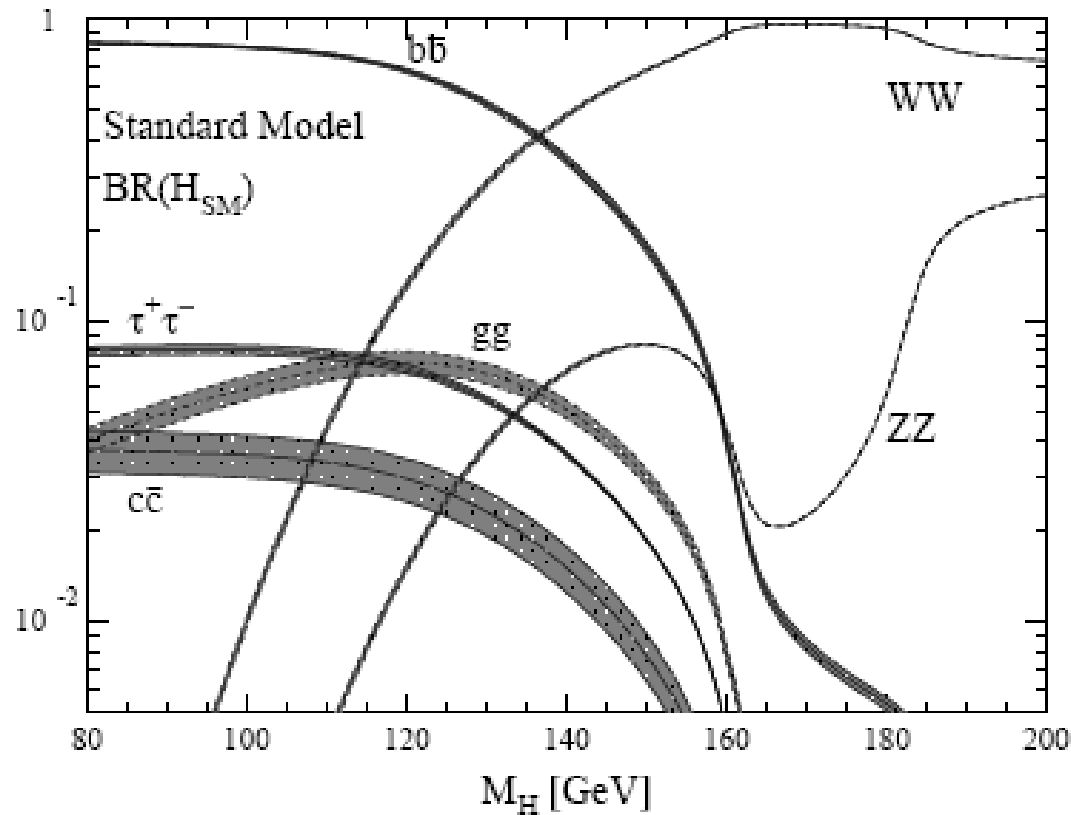
Higgs-Kandidaten (ALEPH)



Grenzen der Higgs-Masse



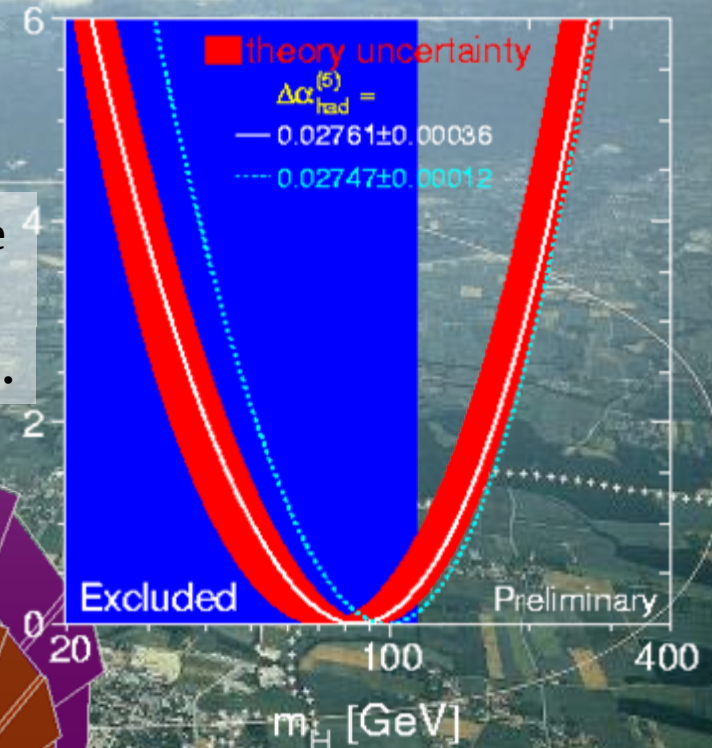
Higgs-Suche am TEVATRON



Large Hadron Collider im CERN/Genf

Suche nach

- dem Higgs-Teilchen
- nach Supersymmetrie (→ Dunkle Materie?)
- Extra-Dimensionen ...



ATLAS detector

ATLAS im Aufbau

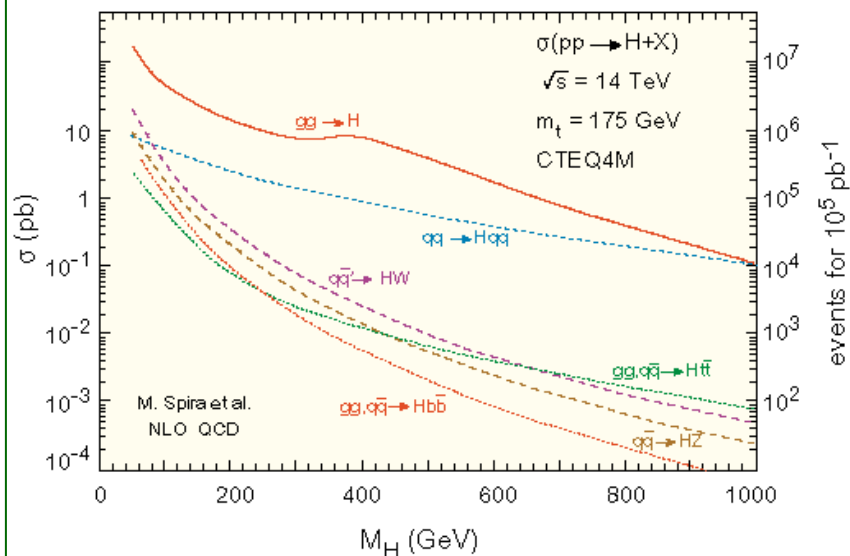
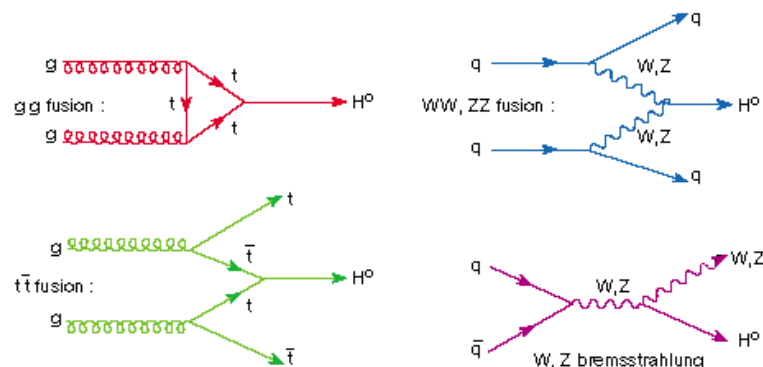


ATLAS-Kollaboration

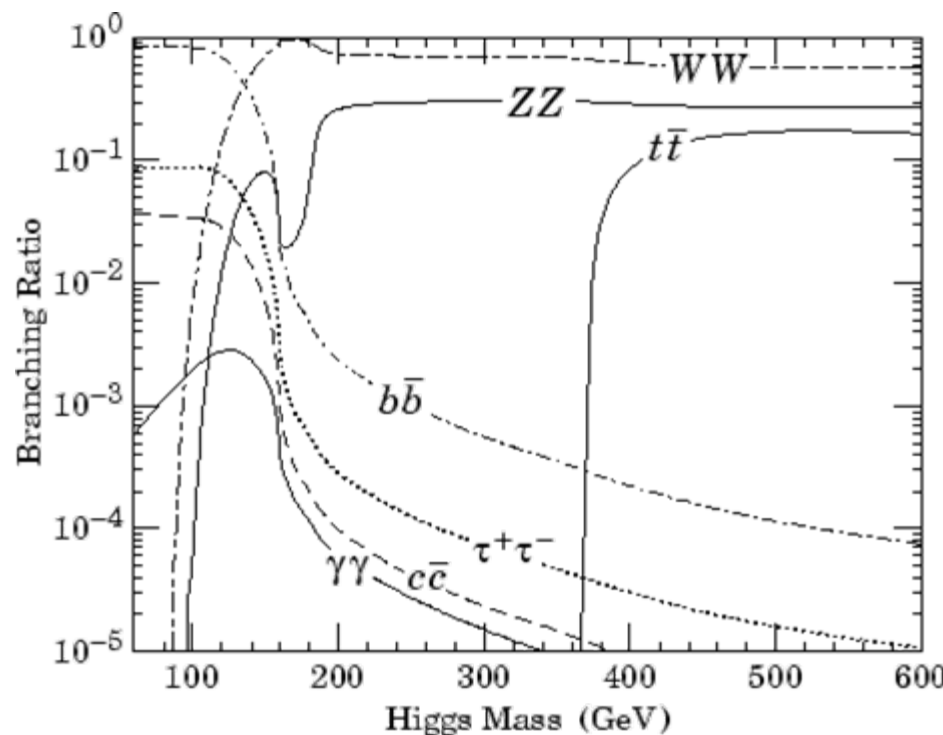


LHC: Higgs-Produktion und -Zerfälle

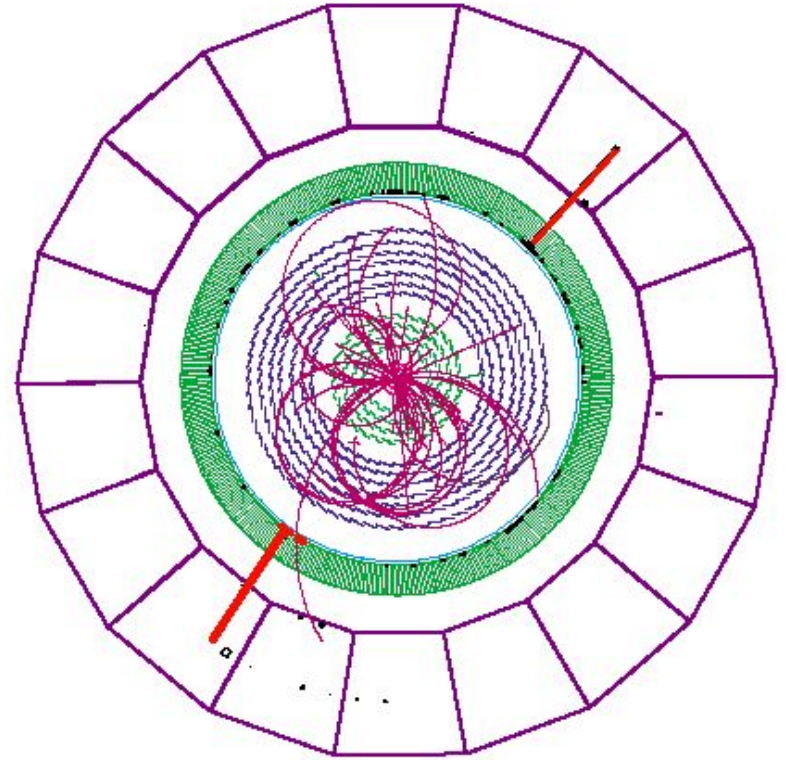
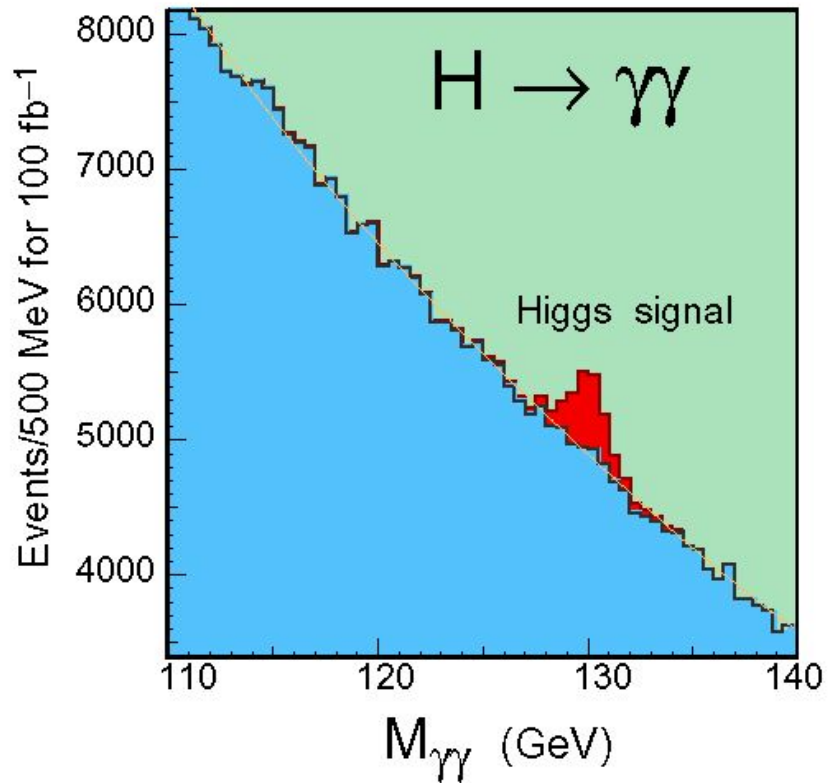
H^0 production at hadron colliders:



But : $BR(H \rightarrow Z_1 Z_1 \rightarrow 4l) = 1.4 \times 10^{-3}$
 $BR(H \rightarrow Z_1 Z_1 \rightarrow 4\mu) = 3 \times 10^{-4}$



LHC: Higgs $\rightarrow \gamma\gamma$



Präzisionsmessungen - Higgs, SUSY,... : **International Linear Collider**

